
Colorado – New Mexico Regional Extreme Precipitation Study

Summary Report

Volume II

Appendix F

Storm Data

Prepared by:
Applied Weather Associates

November 30, 2018



COLORADO
Division of Water Resources
Department of Natural Resources



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List of Storms Analyzed

Table F.1 CO/NM PMP Short Storm List - General Storms

SPAS_ID	NAME	STATE	LAT	LON	YEAR	MONTH	DAY	MAX_PPT	PMP_TYPE
SPAS_1614_1	WARD DISTRICT	CO	39.804	-105.329	1894	5	29	11.15	General
SPAS_1614_2	LAKE MORaine	CO	38.804	-104.946	1894	5	30	8.91	General
SPAS_1274_1	RATTLESNAKE	ID	43.673	-115.744	1909	11	18	17.20	General
SPAS_1650A_1	TAJIQUE 1 to 120h	NM	34.746	-106.413	1915	7	19	6.46	General
SPAS_1650B_1	TAJIQUE 121 to 264h	NM	33.733	-106.968	1915	7	19	7.12	General
SPAS_1144_2	MOGOLLON RIM	AZ	33.904	-111.413	1916	1	14	13.43	General
SPAS_1144_3	CIBOLA NF	NM	35.113	-108.196	1916	1	14	8.45	General
SPAS_1144_4	SANTA CATALINA	AZ	32.429	-110.813	1916	1	14	10.63	General
SPAS_1325_1	SAVAGETON	WY	43.846	-105.804	1923	9	27	17.56	General
SPAS_1325_2	HUNTERS	WY	44.421	-107.029	1923	9	27	10.13	General
SPAS_1651_1	PALISADE LAKE	CO	37.454	-107.253	1927	6	26	6.37	General
SPAS_1606_1	SMITH RANCH	CO	40.479	-105.229	1938	8	30	11.77	General
SPAS_1587_1	PRAIRIEVIEW	NM	33.138	-103.079	1941	5	20	11.08	General
SPAS_1486_1	MCCOLLEUM RANCH	NM	32.146	-104.746	1941	9	20	21.81	General
SPAS_1251_1	LAKE MALOYA	NM	37.009	-104.341	1955	5	19	14.82	General
SPAS_1652_1	PYRAMID	CO	40.540	-106.721	1961	9	20	6.14	General
SPAS_1211_1	GIBSON DAM	MT	48.354	-113.371	1964	6	6	19.16	General
SPAS_1141_1	JUNIPINE	AZ	34.979	-111.771	1966	12	4	10.74	General
SPAS_1141_3	PASTORA PEAK	AZ	36.821	-109.188	1966	12	4	4.26	General
SPAS_1253_1	BIG ELK MEADOW	CO	40.267	-105.417	1969	5	4	20.01	General
SPAS_1150_2	BEAR SPRING	AZ	34.038	-111.488	1978	2	27	15.52	General
SPAS_1266_1	CONRAD RANCH	UT	40.585	-111.590	1979	10	18	5.78	General
SPAS_1138_1	ROCK SPRINGS	AZ	34.013	-112.263	1980	2	13	11.10	General
SPAS_1138_2	CROWN KING	AZ	34.221	-112.346	1980	2	13	17.63	General
SPAS_1265_1	MT TIMPANOGOS	UT	40.404	-111.638	1982	9	26	10.13	General
SPAS_1265_2	FLAT TOP MOUNTAIN	UT	40.379	-112.204	1982	9	26	10.02	General
SPAS_1265_3	COTTONWOOD	UT	41.604	-112.012	1982	9	26	9.71	General
SPAS_1139_2	KNOLES HOLE SPRING	AZ	33.829	-110.913	1993	1	5	13.36	General
SPAS_1139_3	SPENCER CANYON	AZ	32.413	-110.746	1993	1	5	11.15	General
SPAS_1653_1	WOLF CREEK	CO	37.463	-106.721	1993	8	27	6.05	General
SPAS_1149_2	COOKS MESA	AZ	34.460	-111.230	2007	11	30	8.60	General
SPAS_1149_3	MARSHALL SADDLE	AZ	32.440	-110.780	2007	11	30	6.54	General
SPAS_1149_4	MT HOPE	CO	37.540	-106.870	2007	11	30	6.69	General
SPAS_1200_2	PETERSON RANCH	AZ	33.810	-110.910	2010	1	19	14.93	General
SPAS_1200_4	SANTA RITA EXP RANGE	AZ	31.760	-110.840	2010	1	19	6.63	General
SPAS_1241_1	ANDREW NYMAN MOUNTAIN	UT	42.050	-111.620	2010	10	25	5.97	General
SPAS_1241_2	DEER CREEK DAM	UT	41.360	-111.910	2010	10	25	4.74	General
SPAS_1241_3	ALTA	UT	40.590	-111.640	2010	10	25	6.01	General
SPAS_1302_1	BOULDER	CO	40.015	-105.265	2013	9	8	20.41	General
SPAS_1302_2	CHEYENNE MOUNTAIN	CO	38.745	-104.865	2013	9	8	18.92	General
SPAS_1302_3	AURORA	CO	39.705	-104.835	2013	9	8	15.45	General
SPAS_1302_5	COAL CREEK	CO	39.865	-105.285	2013	9	8	18.13	General
SPAS_1530_1	GUADALUPE PASS	TX	32.035	-104.555	2013	9	10	18.34	General
SPAS_1530_2	SUMNER LAKE	NM	34.595	-104.475	2013	9	10	9.63	General
SPAS_1530_4	CHAPARRAL	NM	32.145	-105.995	2013	9	10	11.94	General

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Table F.1 CO/NM PMP Short Storm List - Local/Hybrid Storms

SPAS_ID	NAME	STATE	LAT	LON	YEAR	MONTH	DAY	MAX_PPT	PMP_TYPE
SPAS_1294_1	PENROSE	CO	38.464	-105.070	1921	6	2	12.19	HYBRID (G/L)
SPAS_1294_2	ADELAIDE	CO	38.630	-104.962	1921	6	2	9.27	HYBRID (G/L)
SPAS_1655_1	VIRSYLVIA (CERRO)	NM	36.804	-105.604	1922	8	17	7.53	Local
SPAS_1295_1	ELBERT CHERRY CREEK	CO	39.238	-104.488	1935	5	30	24.00	Local
SPAS_1295_2	GENOA	CO	39.329	-103.538	1935	5	30	12.65	Local
SPAS_1295_3	HALE	CO	39.613	-102.263	1935	5	30	18.00	Local
SPAS_1485_1	LAS CRUCES	NM	32.304	-106.796	1935	8	30	10.03	Local
SPAS_1615_1	MASONVILLE	CO	40.454	-105.196	1938	9	10	7.03	Local
SPAS_1613_1	GOLDEN	CO	39.788	-105.288	1948	6	7	6.00	Local
SPAS_1560_1	CONWAY	TX	35.221	-101.396	1951	5	13	15.21	HYBRID (G/L)
SPAS_1656_1	SAN LUIS	CO	37.179	-105.413	1957	8	12	3.03	Local
SPAS_1248_1	MORGAN	UT	41.079	-111.654	1958	8	16	7.01	Local
SPAS_1293_1	HOLLY	CO	37.713	-102.404	1965	6	16	19.18	Local
SPAS_1293_2	RATON	NM	36.754	-104.538	1965	6	16	11.04	HYBRID (G/L)
SPAS_1293_3	ELBERT	CO	39.188	-104.296	1965	6	16	16.28	HYBRID (G/L)
SPAS_1293_4	PLUM CREEK	CO	39.221	-104.896	1965	6	15	14.25	HYBRID (G/L)
SPAS_1568_1	CARLSBAD	NM	32.254	-104.613	1966	8	22	17.35	HYBRID (G/L)
SPAS_1657_1	GRANTS	NM	35.188	-107.754	1967	9	8	4.00	Local
SPAS_1249_1	BLANDING	UT	37.826	-109.543	1968	8	1	6.67	Local
SPAS_1511_1	SWEETWATER	CO	39.721	-107.038	1976	7	13	6.00	Local
SPAS_1231_1	BIG THOMPSON CANYON	CO	40.479	-105.429	1976	7	31	12.52	Local
SPAS_1658_1	PENA BLANCA	NM	35.596	-106.429	1977	7	8	4.65	Local
SPAS_1487_1	WHITE SANDS	NM	32.387	-106.529	1978	8	19	10.43	Local
SPAS_1659_1	BELEN	NM	34.654	-106.821	1980	6	9	4.21	Local
SPAS_1247_1	FRIJOLE CREEK	CO	37.096	-104.379	1981	7	3	16.33	Local
SPAS_1063_1	PRESCOTT	AZ	34.621	-112.554	1983	9	23	17.95	Local
SPAS_1660_1	ALBUQUERQUE	NM	35.096	-106.479	1988	7	9	5.77	Local
SPAS_1264_1	OPAL	WY	41.738	-110.246	1990	8	16	7.16	Local
SPAS_1661_1	COTOPAXI	CO	38.455	-105.595	1996	8	1	2.03	Local
SPAS_1086_1	TUCSON	AZ	32.390	-110.800	1996	9	3	7.37	Local
SPAS_1654_1	RUXTON PARK	CO	38.855	-104.965	1997	6	6	5.04	HYBRID (G/L)
SPAS_1230_1	FORT COLLINS	CO	40.548	-105.133	1997	7	28	14.48	HYBRID (G/L)
SPAS_1036_1	PAWNEE CREEK	CO	40.775	-103.625	1997	7	29	13.58	Local
SPAS_1115_1	JOSEPH CITY	AZ	34.945	-110.355	1998	7	31	4.20	Local
SPAS_1087_1	SABINO CANYON	AZ	32.385	-110.705	1999	7	14	7.87	Local
SPAS_1662_1	SAGUACHE	CO	38.215	-106.295	1999	7	25	6.68	Local
SPAS_1509_1	DALLAS CREEK	CO	38.095	-107.915	1999	7	31	5.07	Local
SPAS_1508_1	PLACERVILLE	CO	38.005	-107.955	2001	8	8	5.66	Local
SPAS_1131_1	BLUFF	UT	37.255	-109.575	2001	8	14	6.28	Local
SPAS_1033_1	OGALLALA	NE	41.125	-101.717	2002	7	6	14.92	Local
SPAS_1510_1	COLLBRAN	CO	39.285	-107.895	2003	8	15	4.27	Local
SPAS_1109_1	ROOSEVELT LAKE	AZ	33.596	-111.065	2003	9	6	11.19	Local
SPAS_1120_2	CEDAR CITY	UT	37.375	-113.075	2006	7	31	5.69	Local
SPAS_1528_1	EL PASO	TX	31.935	-106.515	2006	8	1	10.25	Local
SPAS_1663_1	SAN LUIS VALLEY	CO	37.525	-105.945	2007	7	19	2.11	Local
SPAS_1113_1	PETRIFIED FOREST	AZ	34.725	-109.645	2007	7	27	7.18	Local
SPAS_1128_2	HAVASUPAI	AZ	35.155	-112.575	2008	8	15	4.49	Local
SPAS_1595_1	SPEARMAN	TX	36.135	-101.495	2010	6	13	13.89	Local
SPAS_1557_1	GAIL	TX	32.725	-101.405	2014	9	21	13.96	Local
SPAS_1588_1	TAHOKA	TX	33.105	-101.825	2015	5	5	10.51	Local

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Table F.1 CO/NM PMP Short Storm List - Tropical Storms

SPAS_ID	NAME	STATE	LAT	LON	YEAR	MONTH	DAY	MAX_PPT	PMP_TYPE
SPAS_1107_1	WAGON WHEEL	CO	37.663	-106.938	1911	10	3	7.88	Tropical
SPAS_1076_2	BRADSHAW CITY	AZ	34.204	-112.354	1951	8	26	14.99	Tropical
SPAS_1075_1	MT LEMMON	AZ	32.411	-110.721	1970	9	4	9.31	Tropical
SPAS_1075_2	WORKMAN CREEK	AZ	33.820	-110.904	1970	9	4	12.13	Tropical
SPAS_1075_3	INDIAN WELLS	AZ	35.495	-110.421	1970	9	4	7.00	Tropical
SPAS_1075_4	BAYFIELD	CO	37.304	-107.413	1970	9	3	5.95	Tropical
SPAS_1102_2	JOANNE	AZ	33.821	-110.921	1972	10	4	11.66	Tropical
SPAS_1097_1	NOGALES	AZ	31.339	-110.935	1977	10	6	15.97	Tropical
SPAS_1184_1	CLYDE	TX	32.479	-99.479	1981	10	10	23.23	Tropical
SPAS_1074_1	ALTAR	MX	30.646	-111.771	1983	9	27	13.86	Tropical
SPAS_1074_2	MT GRAHAM	AZ	33.288	-109.104	1983	9	27	13.99	Tropical
SPAS_1088_2	JAVIER	AZ	34.730	-113.020	2004	9	18	10.10	Tropical
SPAS_1529_1	SUNSPOT	NM	33.335	-105.795	2008	7	26	8.81	Tropical
SPAS_1531_1	THE BOWL	TX	31.935	-104.825	2014	9	21	10.83	Tropical

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General Storms

Ward District, CO

May 29 – June 1, 1894

Storm Type: General

Storm Precipitation Analysis System (SPAS) For Storm #1614_1

General Storm Location: Ward District and Lake Moraine Colorado

Storm Dates: May 29 - June 1, 1894

Event: Synoptic

DAD Zone 1

Latitude: 39.8042

Longitude: -105.3292

Max. Grid Rainfall Amount: 11.15"

Max. Observed Rainfall Amount: 8.54" (Ward District, CO)

Number of Stations: 43

SPAS Version: 10.0

Basemap: USACE Isohyetal Map

Spatial resolution: 0.2568

Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

Reliability of results: The updated analysis, part of the CO//NM PMP study, included the WRF analysis max grid (based on four member run) as the basemap. This analysis was based on 43 hourly stations, daily data, and supplemental station data. We have a good degree of confidence for the station based storm total results. The spatial pattern is dependent heavily on the basemap created from the USACE MR 6-14 Isohyetal image. Timing is based on the hourly pseudo stations near the storm center (based on USACE MR 6-14). Several daily stations were moved to supplemental stations due to timing issues and to ensure data consistency.

CO-NM Regional Extreme Precipitation Study

DEPARTMENT OF THE ARMY

CORPS OF ENGINEERS

STORM STUDIES - PERTINENT DATA SHEET



Storm of 29 May - 31 May 1894
 Assignment MR 6-14
 Location Central Colorado
 Study Prepared by:
 Missouri River Division
 Denver District Office

Part I Reviewed by H. M. Sec. of
 Weather Bureau, 9/12/47
 Part II Approved by Office, Chief
 of Engineers for Distribution
 of Factual Data, 6/14/49
 Remarks: Center at Ward
 District, Colorado
 Dewpt. 62°-Ref. Pt. 325 SE
 Grid E-20

DATA AND COMPUTATIONS COMPILED

PART I

Preliminary isohyetal map, in 1 sheet, scale 1: 500,000
 Precipitation data and mass curves: (Number of Sheets)
 Form 5001-C (Hourly precip. data)----- 4
 Form 5001-B (24-hour " ")----- 6
 Form 5001-D (" " " ")----- 8
 Misc. precip. records, meteorological data, etc.----- 16
 Form 5002 (Mass rainfall curves)----- 9

PART II

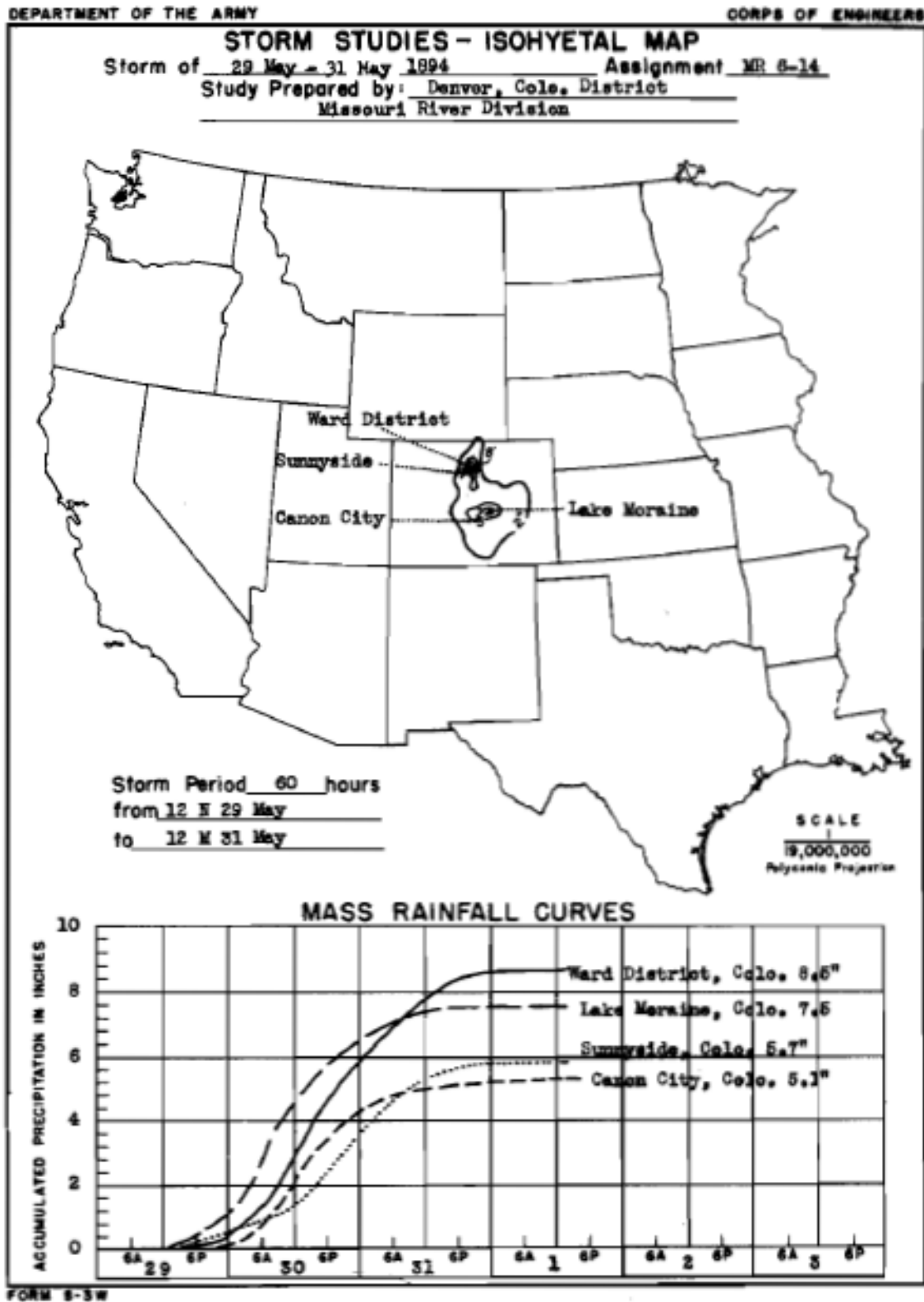
Final isohyetal maps, in 1 sheet, scale 1: 500,000
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 Form S-11 (Depth-area data from isohyetal map)----- 1
 Form S-12 (Maximum depth-duration data)----- 12
 Maximum duration-depth-area curves----- 1
 Data relating to periods of maximum rainfall----- 1

MAXIMUM AVERAGE DEPTH OF RAINFALL IN INCHES

Area in Sq. Mi.	Duration of Rainfall in Hours										
	6	12	18	24	30	36	48	60			
10	1.7	3.3	4.7	5.6	6.6	7.3	8.2	8.5			
100	1.7	3.2	4.3	5.2	6.0	6.5	7.3	7.5			
200	1.7	3.1	4.2	5.0	5.8	6.3	7.0	7.2			
500	1.7	3.0	4.0	4.8	5.5	5.9	6.6	6.8			
1,000	1.6	2.9	3.8	4.6	5.3	5.7	6.3	6.5			
2,000	1.6	2.7	3.6	4.4	5.0	5.3	5.9	6.1			
5,000	1.5	2.5	3.2	3.9	4.5	4.7	5.3	5.5			
10,000	1.3	2.2	2.8	3.5	4.0	4.3	4.7	4.9			
20,000	1.0	1.8	2.3	2.8	3.2	3.5	3.8	4.0			
25,300	0.9	1.5	2.1	2.5	2.9	3.1	3.4	3.6			

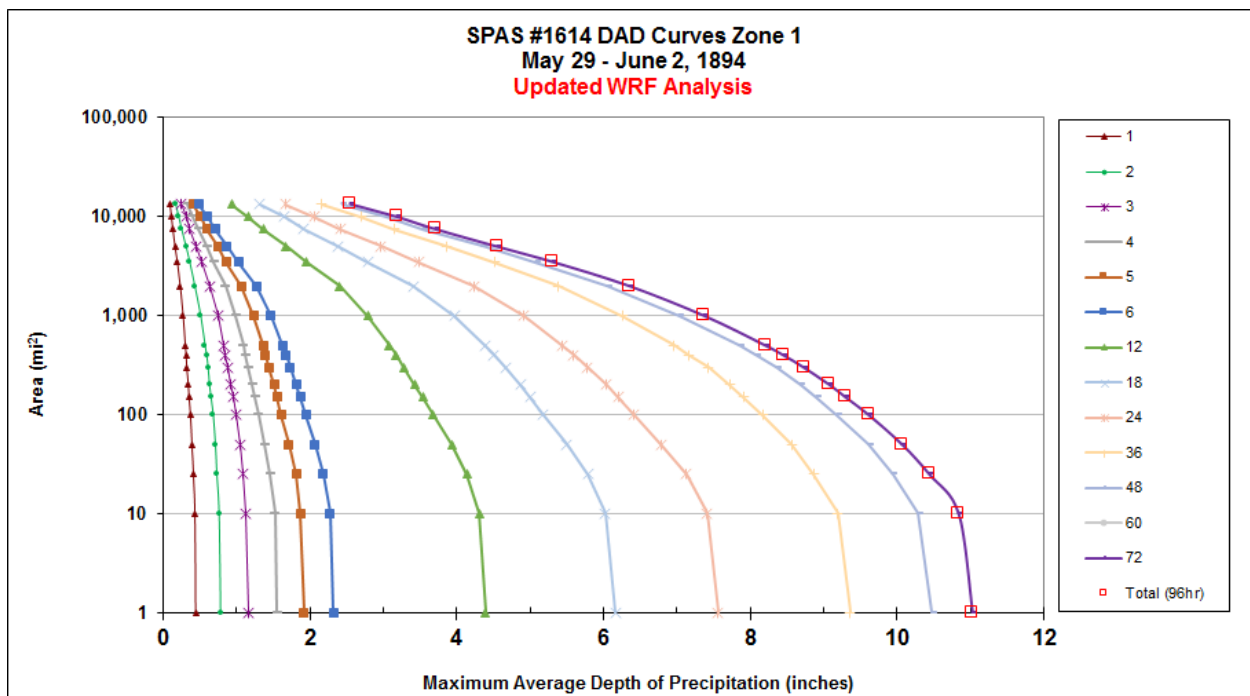
Form S-2

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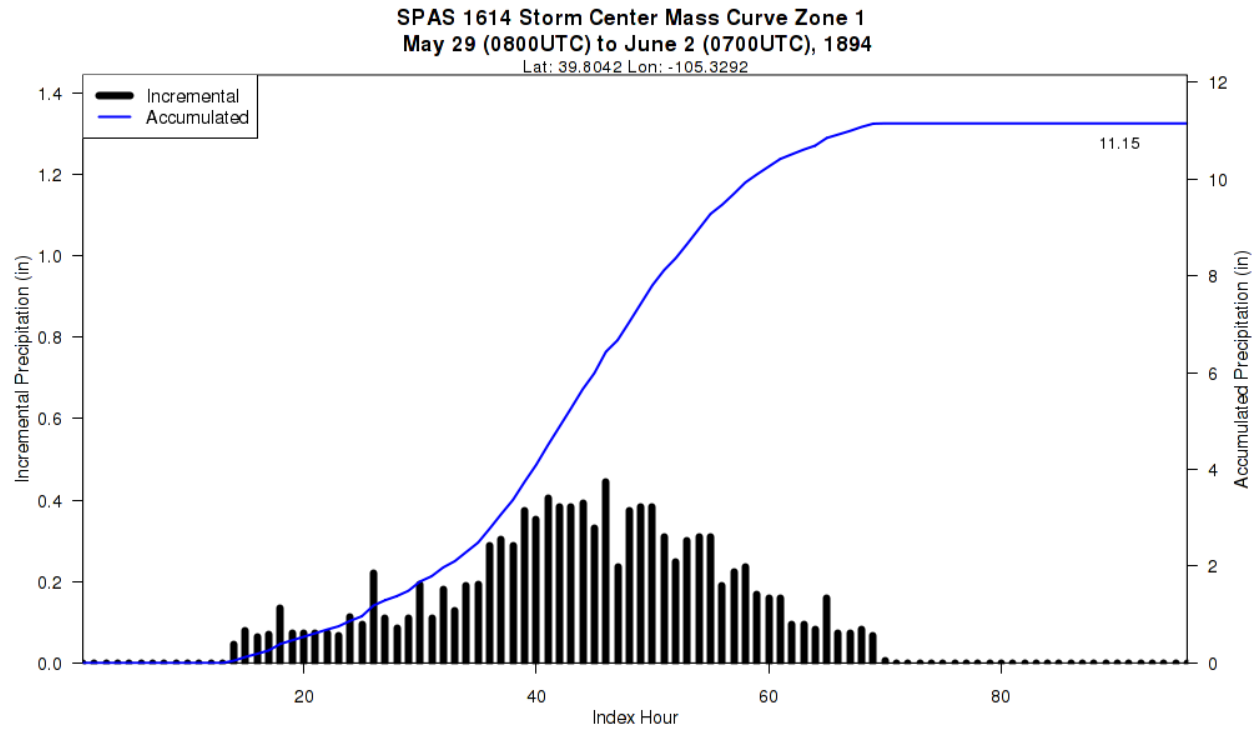


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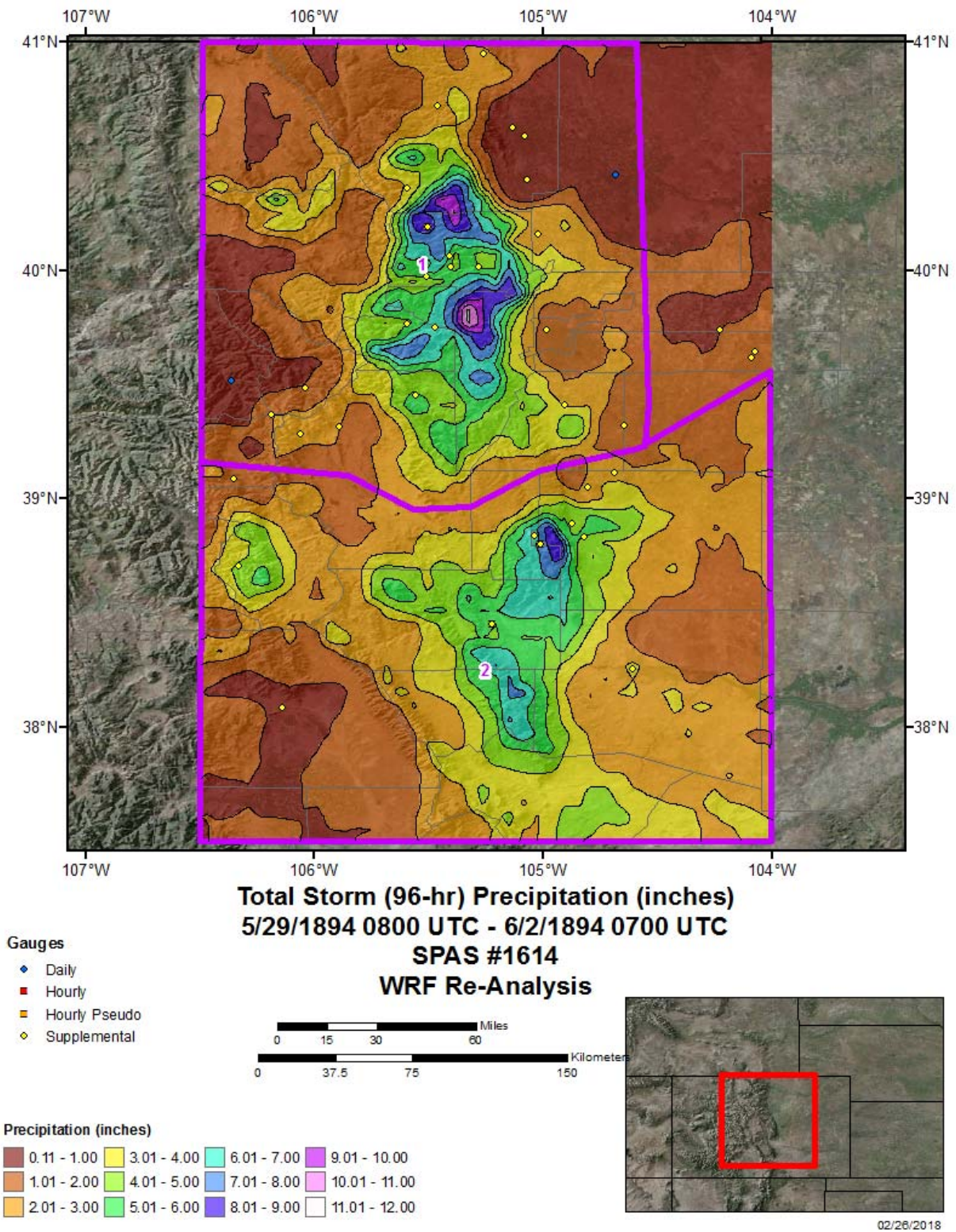
Storm 1614 Zone 1 - May 29 (0800 UTC) - June 2 (0700 UTC), 1894														
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES) Updated WRF Analysis														
areasqmi	Duration (hours)													
	1	2	3	4	5	6	12	18	24	36	48	60	72	Total (96hr)
0.4	0.44	0.79	1.17	1.56	1.93	2.34	4.42	6.20	7.61	9.42	10.55		11.11	11.11
1	0.44	0.78	1.16	1.55	1.92	2.32	4.39	6.16	7.56	9.36	10.48		11.03	11.03
10	0.43	0.76	1.12	1.52	1.87	2.27	4.31	6.02	7.41	9.19	10.29		10.84	10.84
25	0.41	0.73	1.09	1.46	1.81	2.18	4.14	5.79	7.13	8.86	9.94		10.44	10.44
50	0.39	0.71	1.04	1.38	1.71	2.07	3.93	5.50	6.78	8.56	9.61		10.07	10.07
100	0.37	0.68	0.99	1.30	1.61	1.94	3.68	5.18	6.42	8.17	9.18		9.61	9.61
150	0.35	0.65	0.96	1.25	1.55	1.87	3.54	5.00	6.20	7.91	8.90		9.30	9.3
200	0.34	0.63	0.92	1.21	1.51	1.81	3.43	4.87	6.04	7.72	8.69		9.08	9.08
300	0.32	0.61	0.88	1.16	1.44	1.73	3.28	4.66	5.78	7.43	8.36		8.73	8.73
400	0.31	0.59	0.85	1.12	1.39	1.67	3.17	4.50	5.59	7.16	8.08		8.45	8.45
500	0.30	0.57	0.83	1.09	1.36	1.63	3.08	4.38	5.43	6.96	7.85		8.21	8.21
1,000	0.27	0.51	0.74	0.99	1.23	1.47	2.79	3.97	4.92	6.26	7.04		7.37	7.37
2,000	0.23	0.43	0.64	0.85	1.06	1.27	2.40	3.41	4.23	5.39	6.05		6.35	6.35
3,500	0.19	0.36	0.53	0.69	0.86	1.03	1.95	2.79	3.48	4.51	5.08		5.31	5.31
5,000	0.16	0.31	0.45	0.59	0.74	0.87	1.67	2.38	2.97	3.86	4.35		4.55	4.55
7,500	0.13	0.25	0.36	0.48	0.59	0.71	1.36	1.92	2.41	3.14	3.54		3.71	3.71
10,000	0.11	0.21	0.31	0.40	0.51	0.60	1.16	1.65	2.06	2.69	3.04		3.18	3.18
13,430	0.09	0.17	0.25	0.33	0.41	0.48	0.93	1.32	1.66	2.16	2.44		2.55	2.55



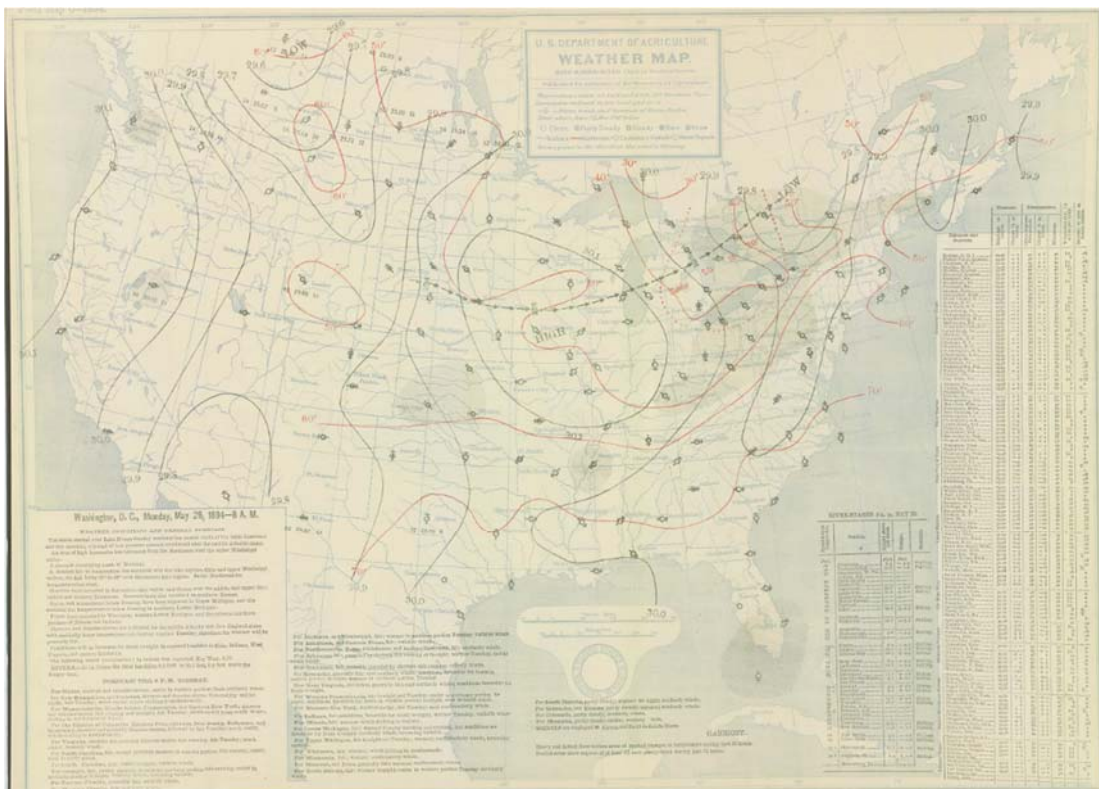
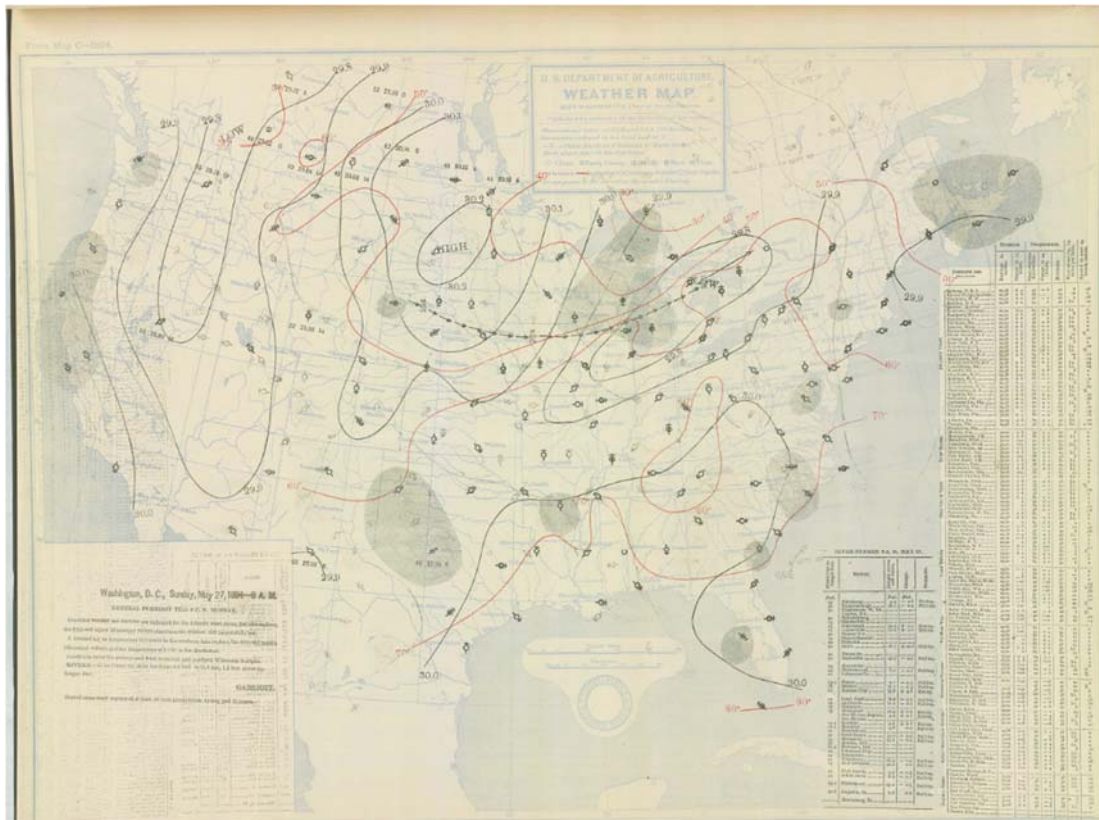
CO-NM Regional Extreme Precipitation Study



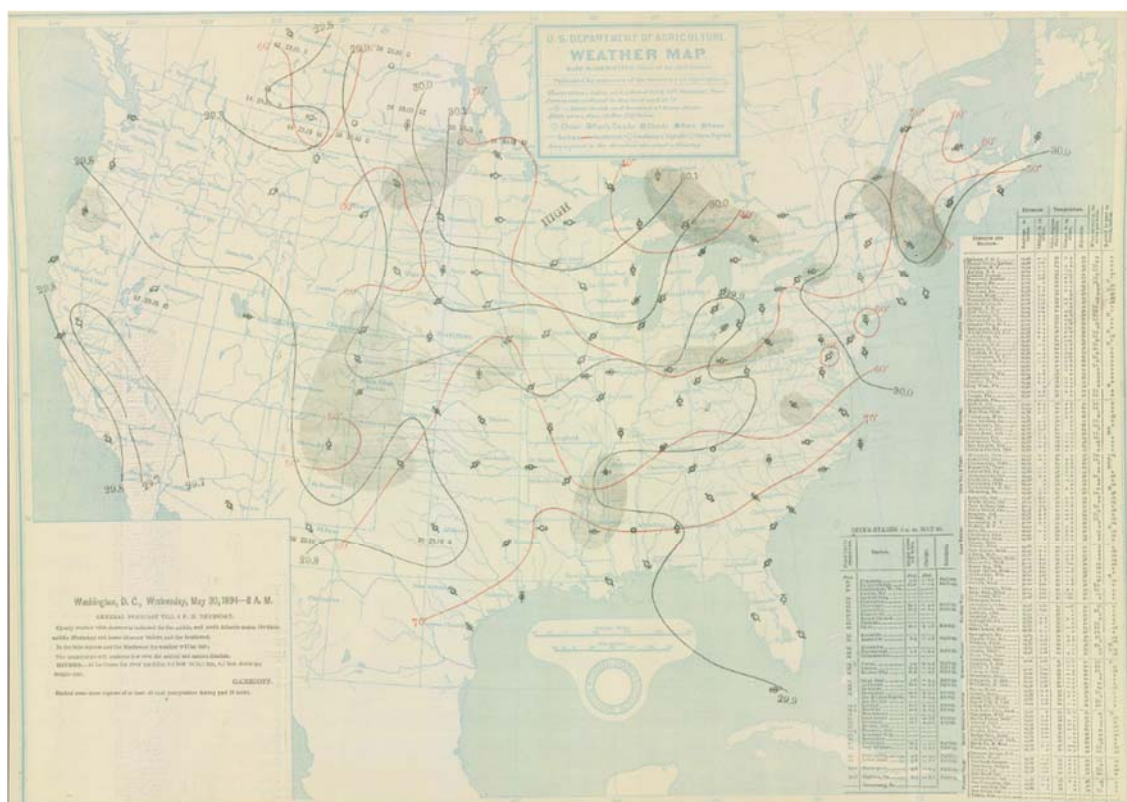
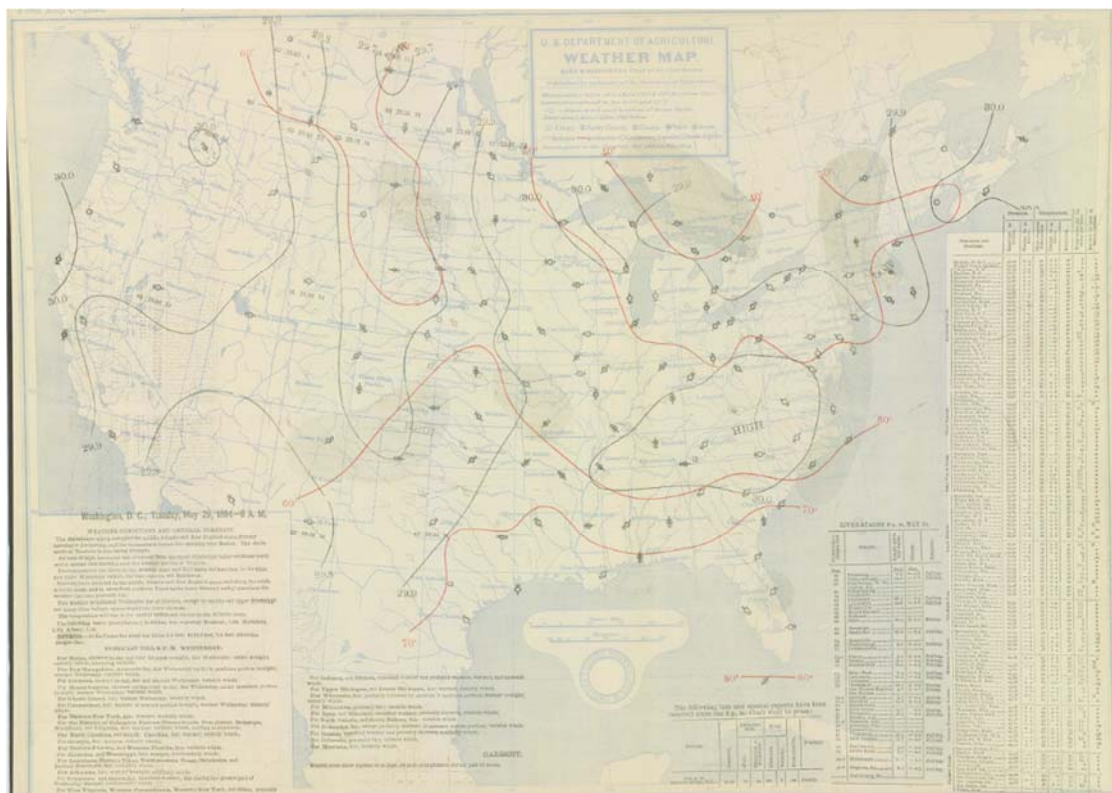
CO-NM Regional Extreme Precipitation Study



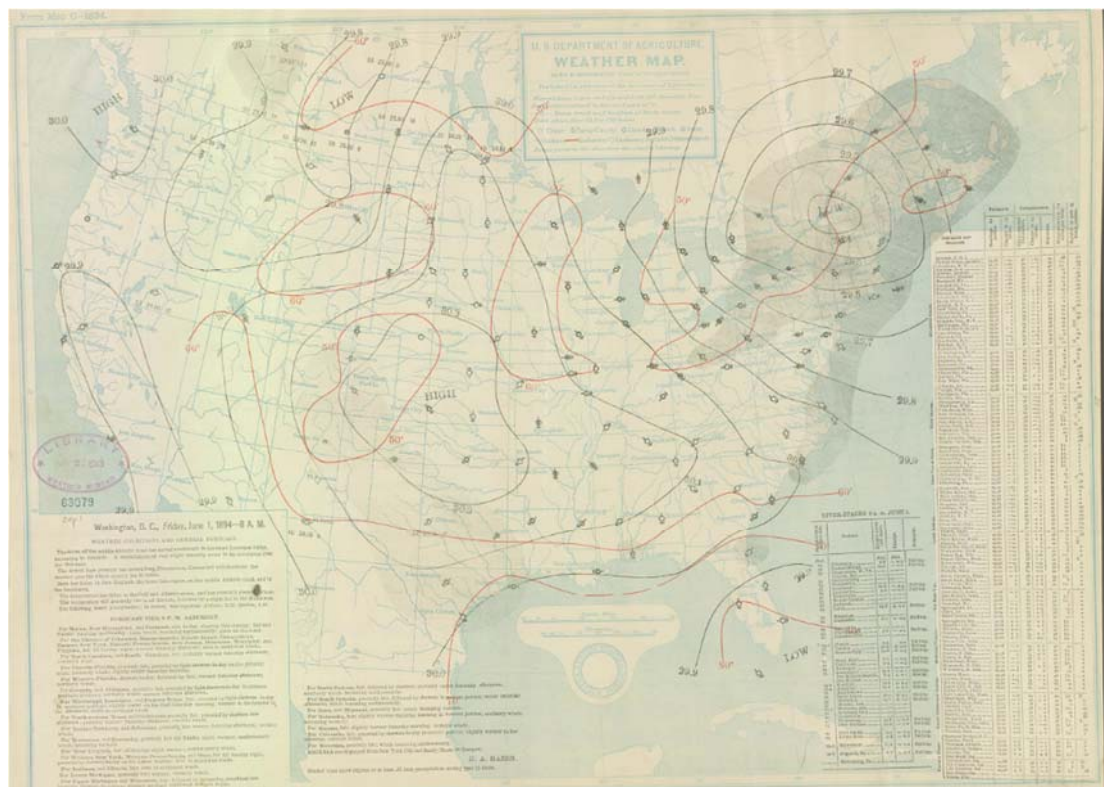
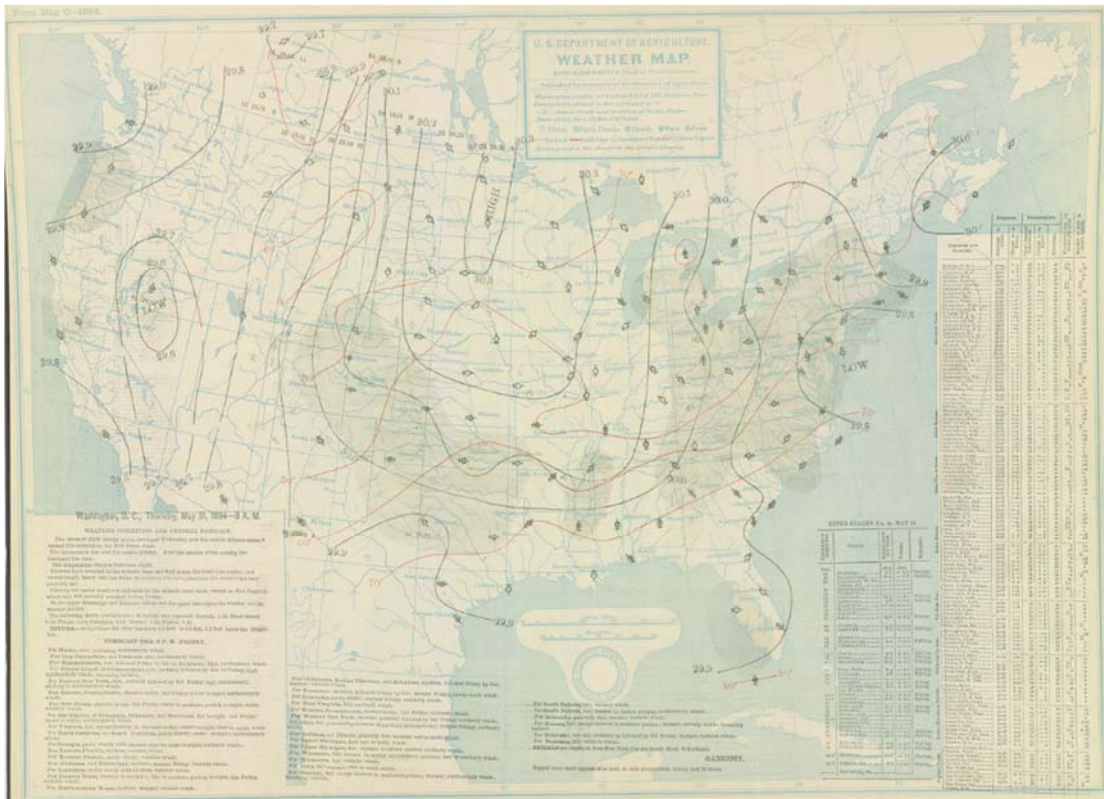
CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study

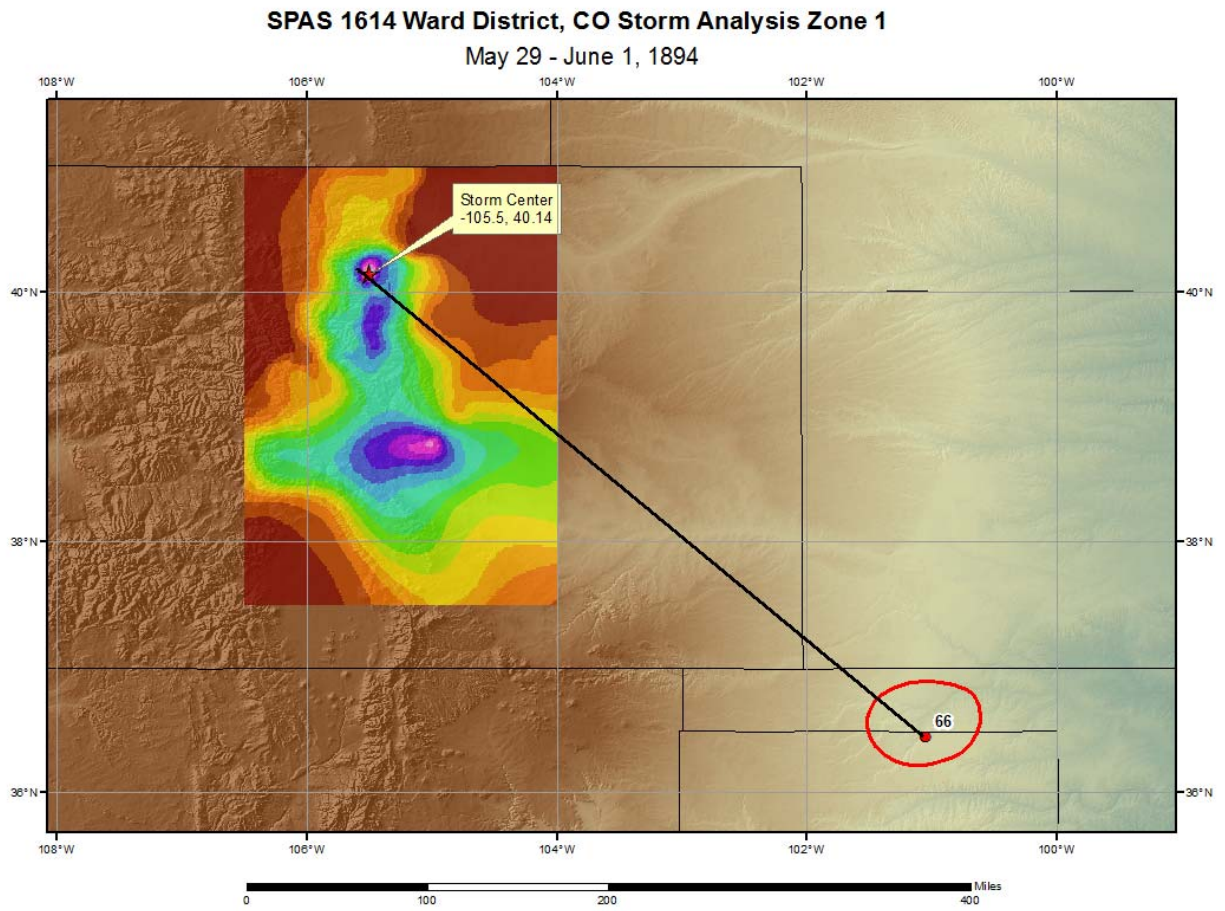


CO-NM Regional Extreme Precipitation Study

6.

Storm Date	Assignment Number	Representative Storm Dewpoint	Reference Point
<u>1890</u>			
Jul 1-5	GL 1-2	69	250 SW of Constableville, N. Y.
Sep 8-13	GL 4-1	70	330 SSE of S.Canistota, N. Y.
<u>1891</u>			
Jun 23-28	MR 4-2	72	200 S of Larrabee, Iowa.
Dec 13-15	GL 2-7	55	410 SSE of Lincoln, Wis.
<u>1892</u>			
Jul 24-28	UMW 1-1	72	200 S of Minneapolis, Minn.
Aug 24-27	GL 1-3	70	270 S of North Hammond, N. Y.
<u>1893</u>			
Aug 24-29	GL 1-4	72	220 S of Lowville, N. Y.
Aug 26-28	SA 2-1	75	80 E of Manning, S. C.
Sep 6-10	LMW 3-2	71	100 E of Franklin, La.
<u>1894</u>			
Mar 17-20	LMW 1-1	67	120 SSE of Washington, Ark.
May 17-22	NA 1-4	64	50 W of Bridgeton, N. J.
May 29-Jun 1	MR 6-14	62	325 SE of Lake Moraine, Colo.
Sep 18-20	SA 1-13	67	250 SSW of Smith's Corner, Pa.
<u>1895</u>			
Oct 11-15	NA 1-5	60	100 ESE of Grosvenordale, Conn.
Dec 16-20	MR 1-1	59	260 S of Phillipsburg, Mo.
Dec 16-21	GL 2-8	51	350 SW of Three Rivers, Mich.
<u>1896</u>			
Jun 4-5	MR 4-3	68	250 SSE of Greeley Center, Nebr.
Sep 27-30	SA 1-19	71	240 SE of Bloomery, W. Va.
Dec 31-Jan 3	UMW 2-1	61	125 S of Pine Bluff, Ark.

CO-NM Regional Extreme Precipitation Study



Lake Moraine, CO

May 29 – June 1, 1894

Storm Type: General

Storm Precipitation Analysis System (SPAS) For Storm #1614_2

General Storm Location: Ward District and Lake Moraine Colorado

Storm Dates: May 29 - June 1, 1894

Event: Synoptic

DAD Zone 2

Latitude: 38.8042

Longitude: -104.9458

Max. Grid Rainfall Amount: 8.91"

Max. Observed Rainfall Amount: 7.50" (Lake Moraine, CO)

Number of Stations: 43

SPAS Version: 10.0

Basemap: USACE Isohyetal Map

Spatial resolution: 0.2568

Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

Reliability of results: This analysis was based on 43 hourly stations, daily data, and supplemental station data. We have a good degree of confidence for the station based storm total results. The spatial pattern is dependent heavily on the basemap created from the USACE MR 6-14 Isohyetal image. Timing is based on the hourly pseudo stations near the storm center (based on USACE MR 6-14). Several daily stations were moved to supplemental stations due to timing issues and to ensure data consistency.

CO-NM Regional Extreme Precipitation Study

DEPARTMENT OF THE ARMY

CORPS OF ENGINEERS

STORM STUDIES - PERTINENT DATA SHEET



Storm of 29 May - 31 May 1894
 Assignment MR 6-14
 Location Central Colorado
 Study Prepared by:
 Missouri River Division
 Denver District Office

Part I Reviewed by H. M. Sec. of
 Weather Bureau, 9/12/47
 Part II Approved by Office, Chief
 of Engineers for Distribution
 of Factual Data, 6/14/49
 Remarks: Center at Ward
 District, Colorado
 Dewpt. 62°-Ref. Pt. 325 SE
 Grid B-20

DATA AND COMPUTATIONS COMPILED

PART I

Preliminary isohyetal map, in 1 sheet, scale 1: 500,000
 Precipitation data and mass curves: (Number of Sheets)
 Form 5001-C (Hourly precip. data)----- 4
 Form 5001-B (24-hour " ")----- 6
 Form 5001-D (" " " ")----- 8
 Misc. precip. records, meteorological data, etc.----- 16
 Form 5002 (Mass rainfall curves)----- 9

PART II

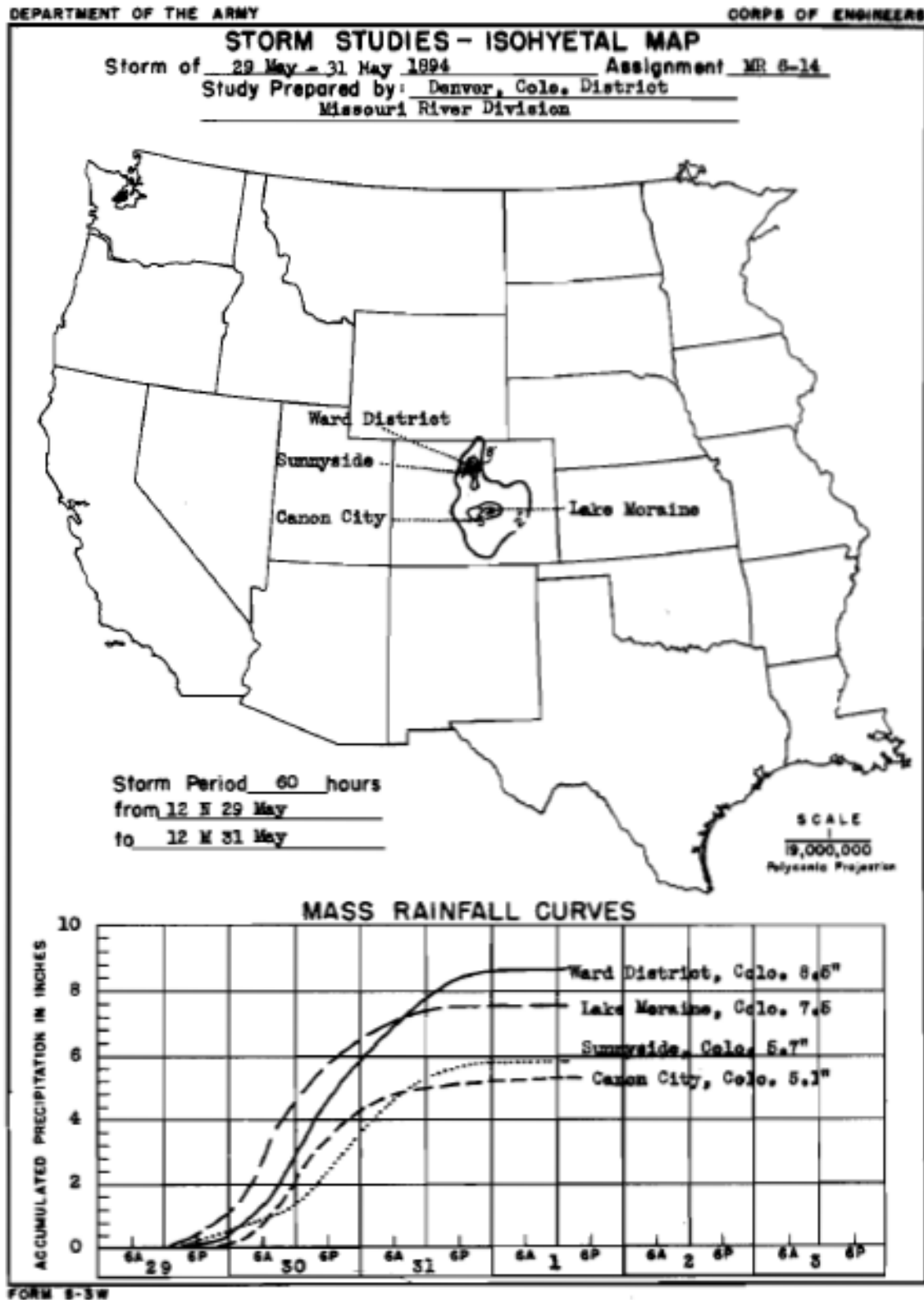
Final isohyetal maps, in 1 sheet, scale 1: 500,000
 Data and computation sheets:
 Form S-10 (Data from mass rainfall curves)----- 2
 Form S-11 (Depth-area data from isohyetal map)----- 1
 Form S-12 (Maximum depth-duration data)----- 12
 Maximum duration-depth-area curves----- 1
 Data relating to periods of maximum rainfall----- 1

MAXIMUM AVERAGE DEPTH OF RAINFALL IN INCHES

Area in Sq. Mi.	Duration of Rainfall in Hours										
	6	12	18	24	30	36	48	60			
10	1.7	3.3	4.7	5.6	6.6	7.3	8.2	8.5			
100	1.7	3.2	4.3	5.2	6.0	6.5	7.3	7.5			
200	1.7	3.1	4.2	5.0	5.8	6.3	7.0	7.2			
500	1.7	3.0	4.0	4.8	5.5	5.9	6.6	6.8			
1,000	1.6	2.9	3.8	4.6	5.3	5.7	6.3	6.5			
2,000	1.6	2.7	3.6	4.4	5.0	5.3	5.9	6.1			
5,000	1.5	2.5	3.2	3.9	4.5	4.7	5.3	5.5			
10,000	1.3	2.2	2.8	3.5	4.0	4.3	4.7	4.9			
20,000	1.0	1.8	2.3	2.8	3.2	3.5	3.8	4.0			
25,300	0.9	1.5	2.1	2.5	2.9	3.1	3.4	3.6			

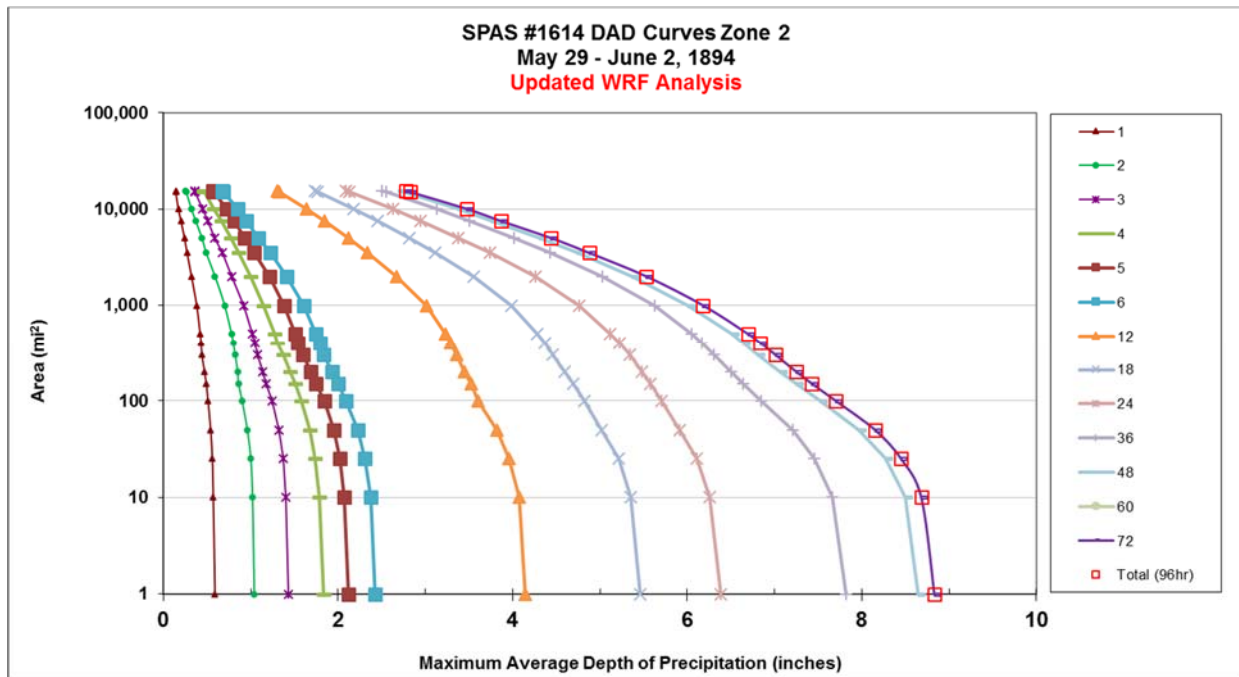
Form 5-2

CO-NM Regional Extreme Precipitation Study

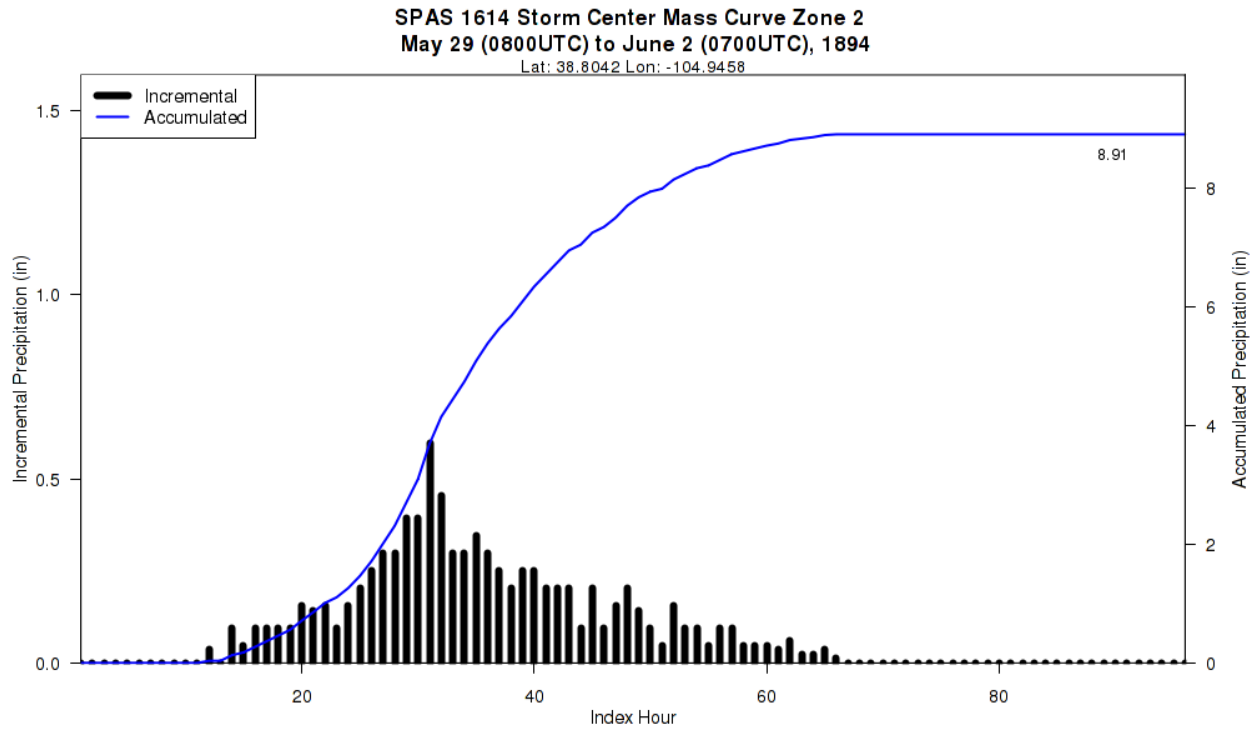


CO-NM Regional Extreme Precipitation Study

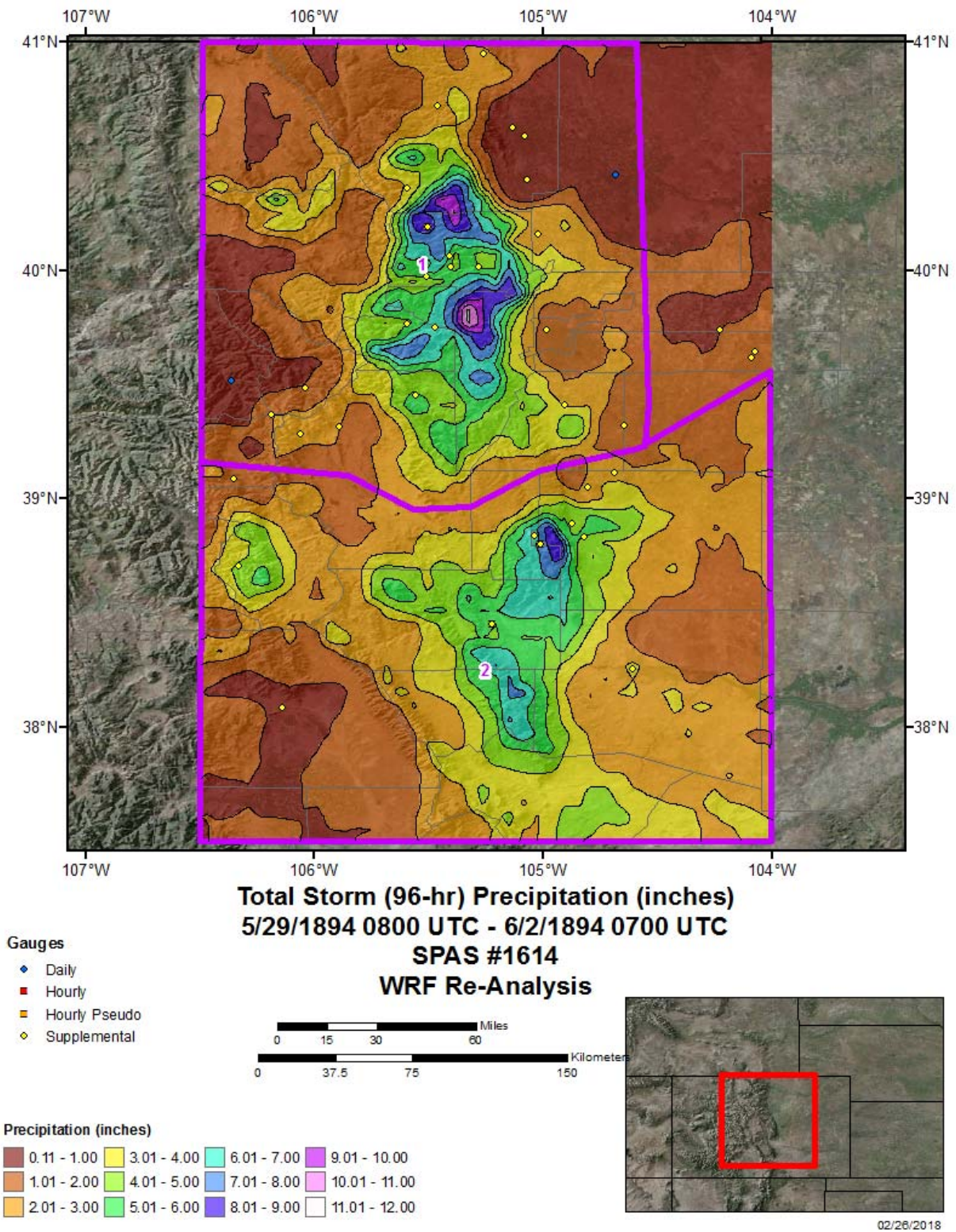
Storm 1614 Zone 2 - May 29 (0800 UTC) - June 2 (0700 UTC), 1894														
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES) Updated WRF Analysis														
areasqmi	Duration (hours)													
	1	2	3	4	5	6	12	18	24	36	48	60	72	Total (96hr)
0.4	0.60	1.05	1.44	1.84	2.13	2.43	4.16	5.49	6.42	7.87	8.69		8.88	8.88
1	0.59	1.04	1.43	1.83	2.12	2.42	4.14	5.46	6.38	7.82	8.64		8.83	8.83
10	0.57	1.02	1.40	1.78	2.07	2.37	4.07	5.35	6.26	7.66	8.50		8.68	8.68
25	0.56	1.00	1.37	1.74	2.02	2.31	3.96	5.21	6.11	7.46	8.27		8.45	8.45
50	0.54	0.96	1.32	1.68	1.95	2.23	3.82	5.02	5.91	7.21	7.97		8.15	8.15
100	0.51	0.90	1.24	1.58	1.84	2.09	3.60	4.82	5.71	6.85	7.52		7.70	7.7
150	0.49	0.86	1.18	1.51	1.75	2.00	3.52	4.69	5.58	6.64	7.25		7.43	7.43
200	0.47	0.85	1.14	1.45	1.69	1.93	3.45	4.60	5.48	6.50	7.06		7.25	7.25
300	0.44	0.82	1.08	1.37	1.60	1.83	3.36	4.46	5.34	6.31	6.81		7.01	7.01
400	0.43	0.80	1.05	1.30	1.54	1.79	3.29	4.37	5.22	6.17	6.64		6.84	6.84
500	0.42	0.78	1.02	1.27	1.51	1.75	3.23	4.28	5.12	6.05	6.51		6.70	6.7
1,000	0.38	0.70	0.92	1.15	1.38	1.61	3.01	3.99	4.76	5.63	6.01		6.18	6.18
2,000	0.32	0.59	0.78	1.00	1.21	1.41	2.67	3.55	4.26	5.03	5.37		5.53	5.53
3,500	0.27	0.49	0.67	0.86	1.04	1.22	2.34	3.11	3.74	4.43	4.74		4.88	4.88
5,000	0.24	0.44	0.59	0.77	0.93	1.09	2.12	2.82	3.38	4.02	4.31		4.44	4.44
7,500	0.20	0.37	0.51	0.66	0.81	0.95	1.84	2.45	2.94	3.50	3.76		3.87	3.87
10,000	0.17	0.32	0.45	0.58	0.72	0.85	1.64	2.18	2.63	3.13	3.38		3.48	3.48
15,000	0.14	0.26	0.36	0.47	0.58	0.68	1.32	1.77	2.13	2.55	2.75		2.83	2.83
15,417	0.14	0.25	0.36	0.46	0.57	0.67	1.30	1.74	2.09	2.50	2.70		2.78	2.78

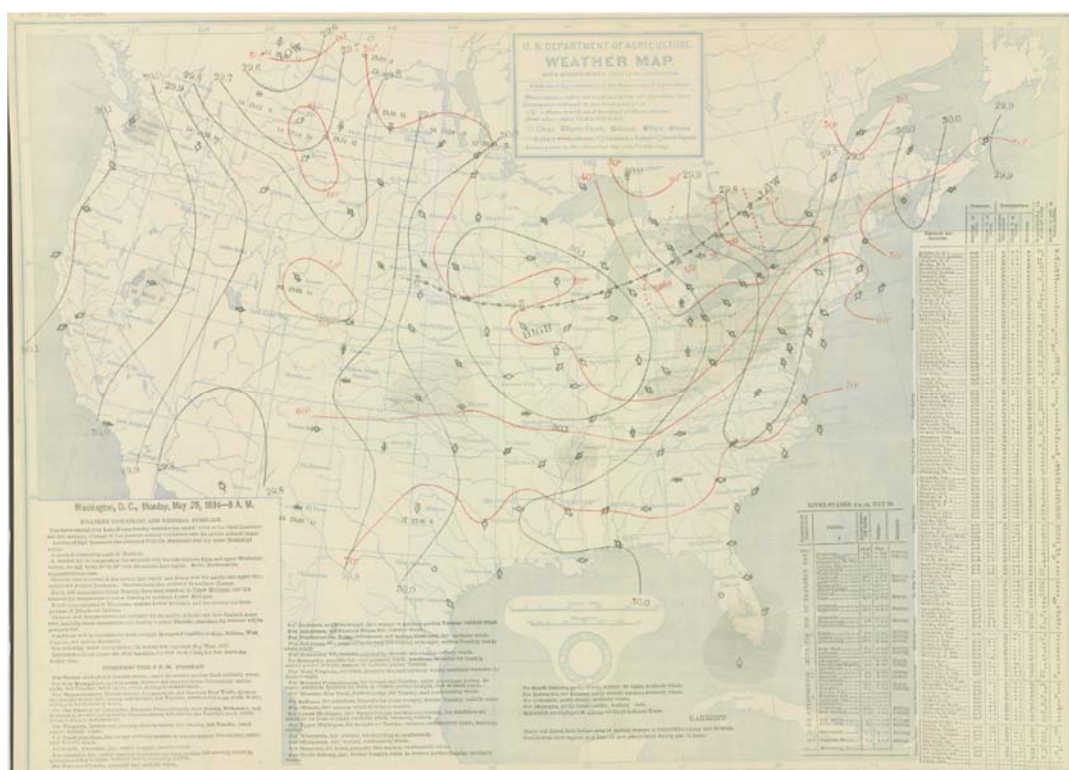


CO-NM Regional Extreme Precipitation Study

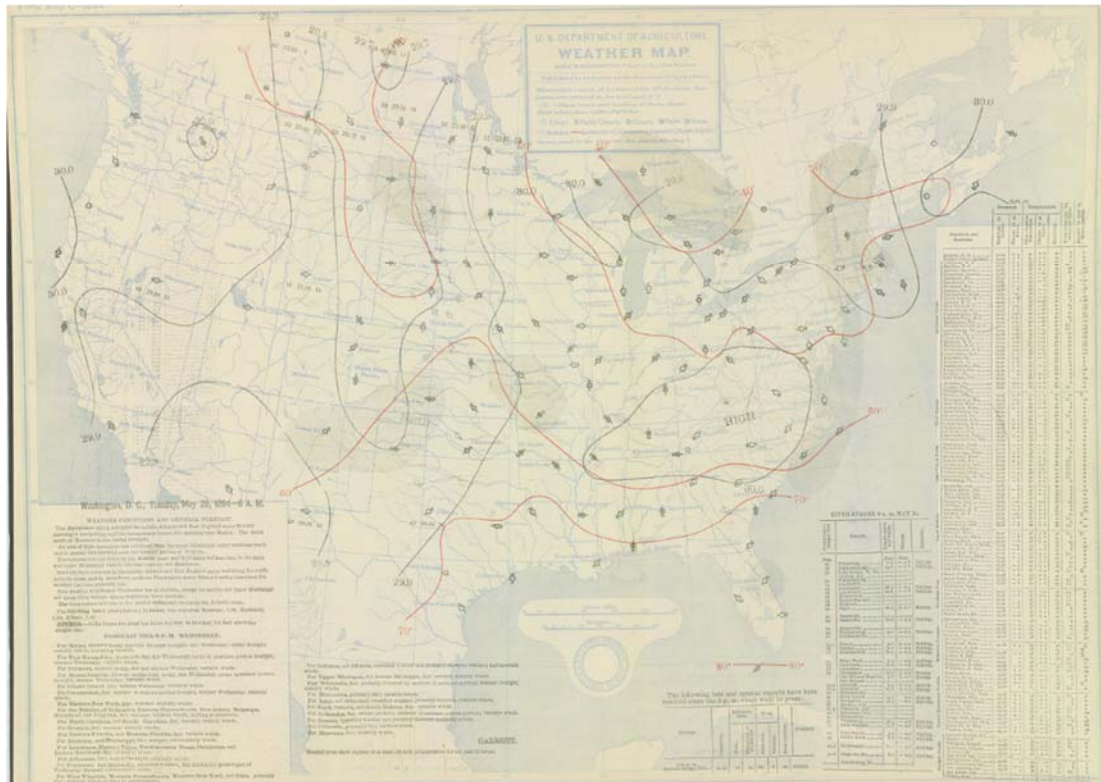


CO-NM Regional Extreme Precipitation Study

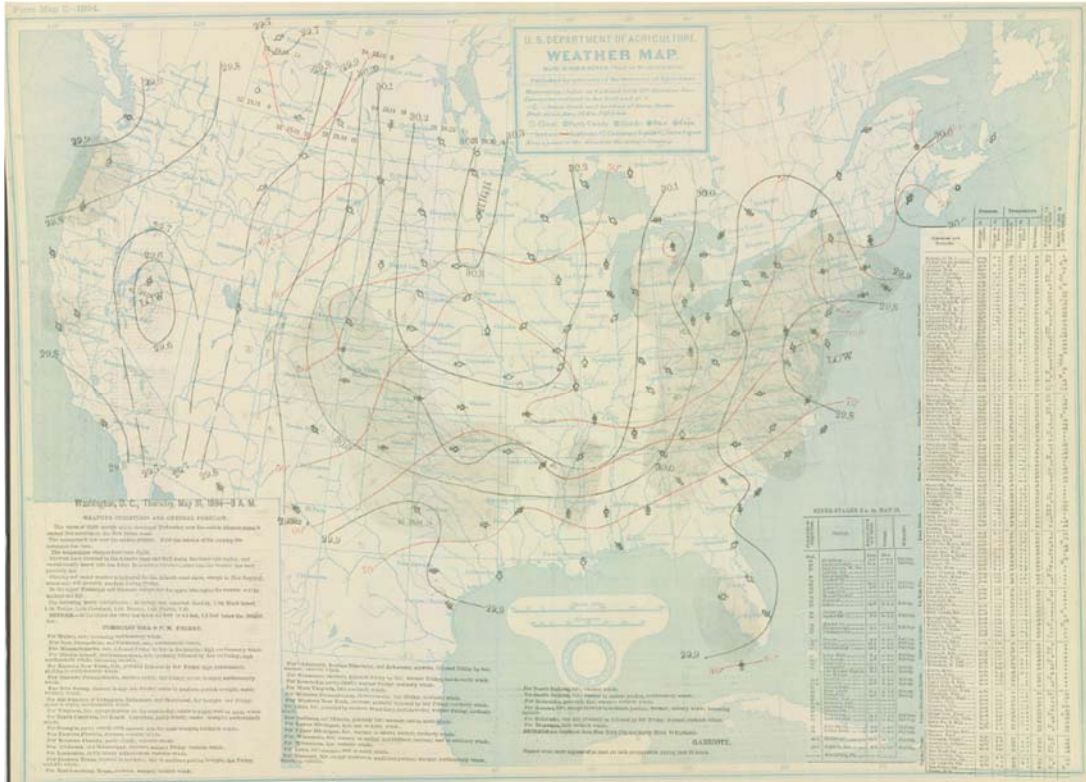


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CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study

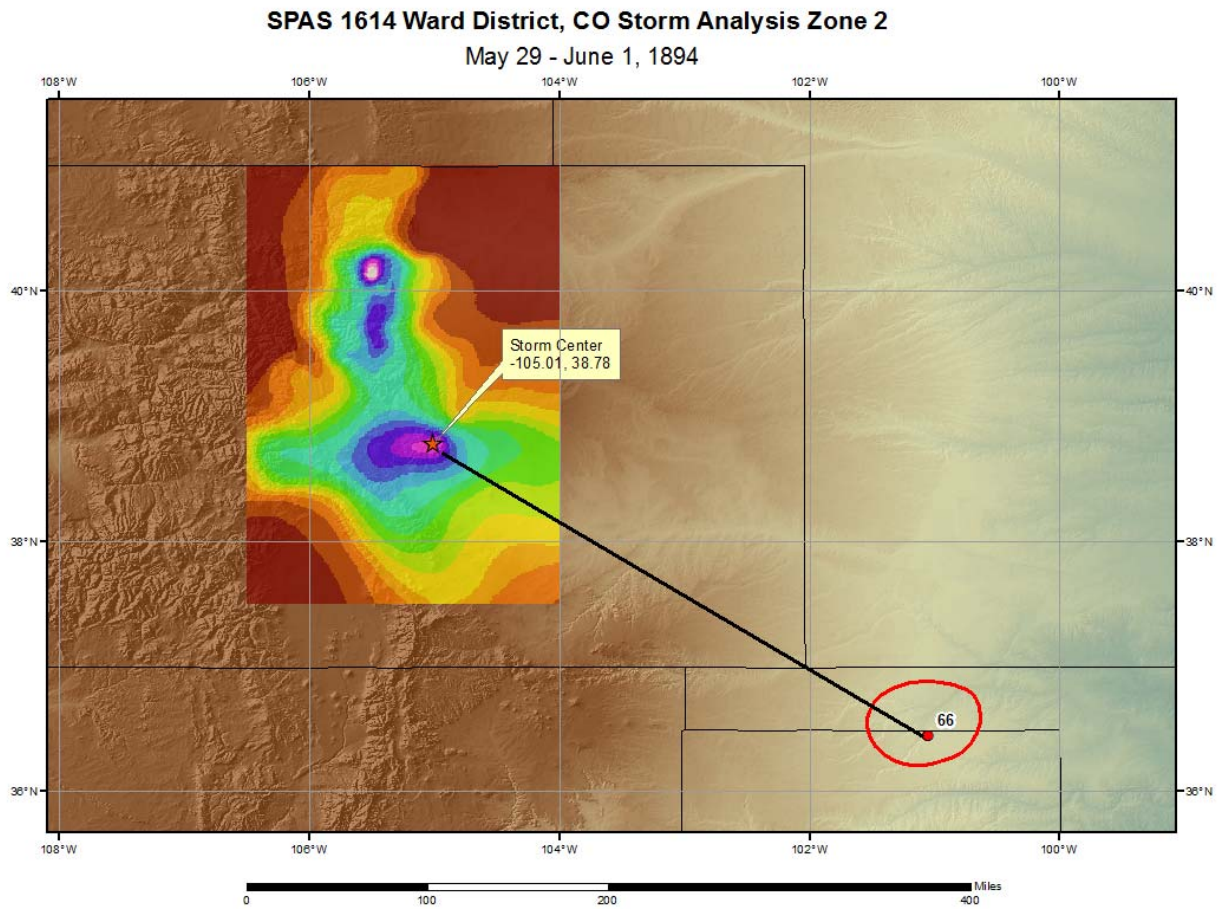


CO-NM Regional Extreme Precipitation Study

6.

Storm Date	Assignment Number	Representative Storm Deepoint	Reference Point
<u>1890</u>			
Jul 1-5	GL 1-2	69	250 SW of Constableville, N. Y.
Sep 8-13	GL 4-1	70	330 SSE of S.Canistee, N. Y.
<u>1891</u>			
Jun 23-28	MR 4-2	72	200 S of Larrabee, Iowa.
Dec 13-15	GL 2-7	55	410 SSE of Lincoln, Wis.
<u>1892</u>			
Jul 24-28	UMW 1-1	72	200 S of Minneapolis, Minn.
Aug 24-27	GL 1-3	70	270 S of North Hammond, N. Y.
<u>1893</u>			
Aug 24-29	GL 1-4	72	220 S of Lowville, N. Y.
Aug 26-28	SA 2-1	75	80 E of Manning, S. C.
Sep 6-10	LMW 3-2	71	100 E of Franklin, La.
<u>1894</u>			
Mar 17-20	LMW 1-1	67	120 SSE of Washington, Ark.
May 17-22	NA 1-4	64	50 W of Bridgton, N. J.
May 29-Jun 1	MR 6-14	62	325 SE of Lake Moraine, Colo.
Sep 18-20	SA 1-13	67	250 SSW of Smith's Corner, Pa.
<u>1895</u>			
Oct 11-15	NA 1-5	60	100 ESE of Grosvenordale, Conn.
Dec 16-20	MR 1-1	59	260 S of Phillipsburg, Mo.
Dec 16-21	GL 2-8	51	350 SW of Three Rivers, Mich.
<u>1896</u>			
Jun 4-5	MR 4-3	68	250 SSE of Greeley Center, Nebr.
Sep 27-30	SA 1-19	71	240 SE of Bloomery, W. Va.
Dec 31-Jan 3	UMW 2-1	61	125 S of Pine Bluff, Ark.

CO-NM Regional Extreme Precipitation Study



Rattlesnake, ID

November 18-24, 1909

Storm Type: General

Storm Precipitation Analysis System (SPAS) For Storm #1274_1

(update with WRF Rainfall Analysis/basemap)

General Storm Location: Rattlesnake, Idaho

Storm Dates: November 18-24, 1909

Event: Synoptic

DAD Zone 1

Latitude: 43.6726

Longitude: -115.7358

Max. Grid Rainfall Amount: 17.20"

Max. Observed Rainfall Amount: 17.20"

Number of Stations: 58 (45 Daily, 2 Hourly Pseudo, and 11 Supplemental Estimated)

SPAS Version: 9.5

Basemap: WRF max of four member re-analysis

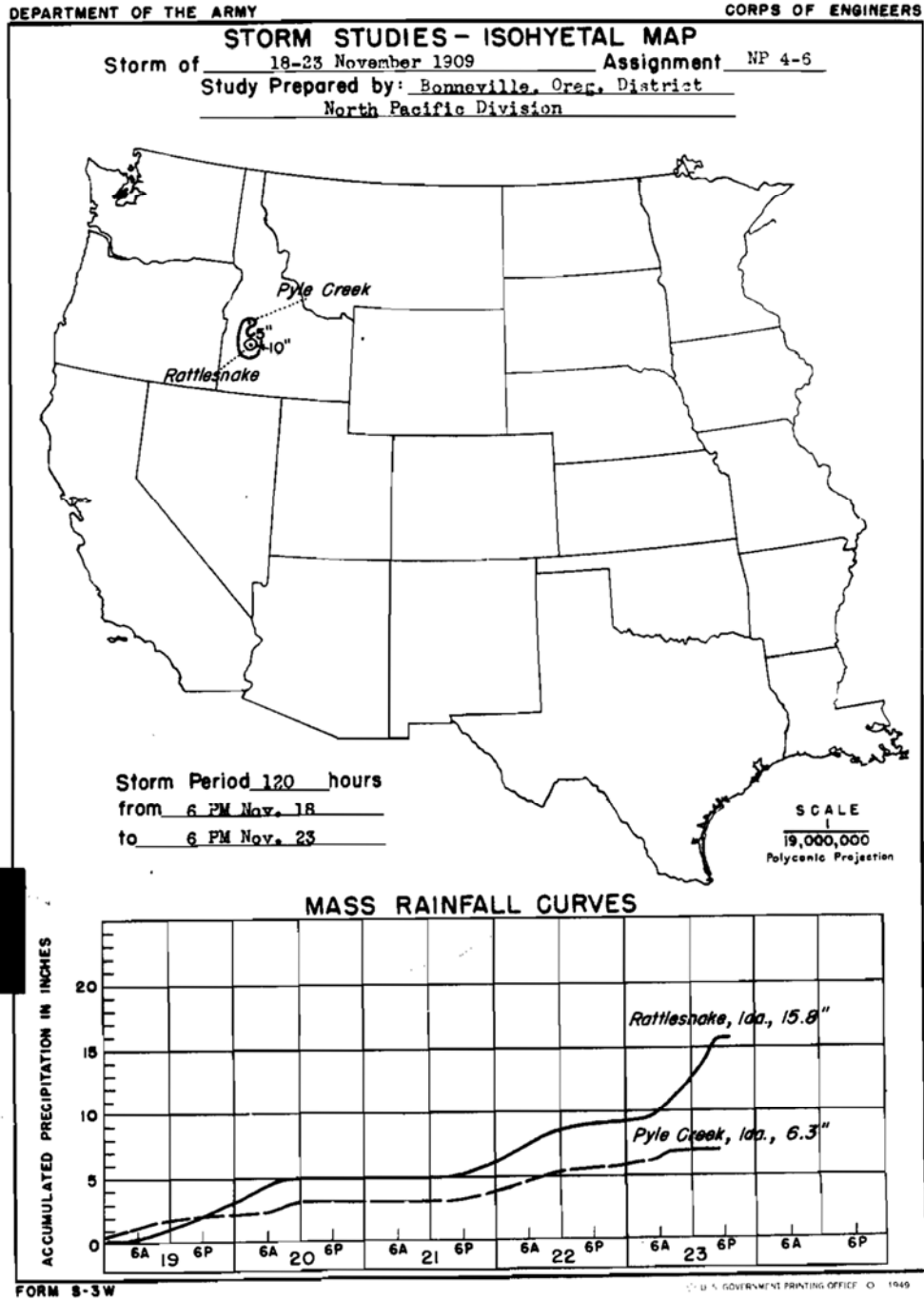
Spatial resolution: 00:00:30 (~ 0.30 mi²)

Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

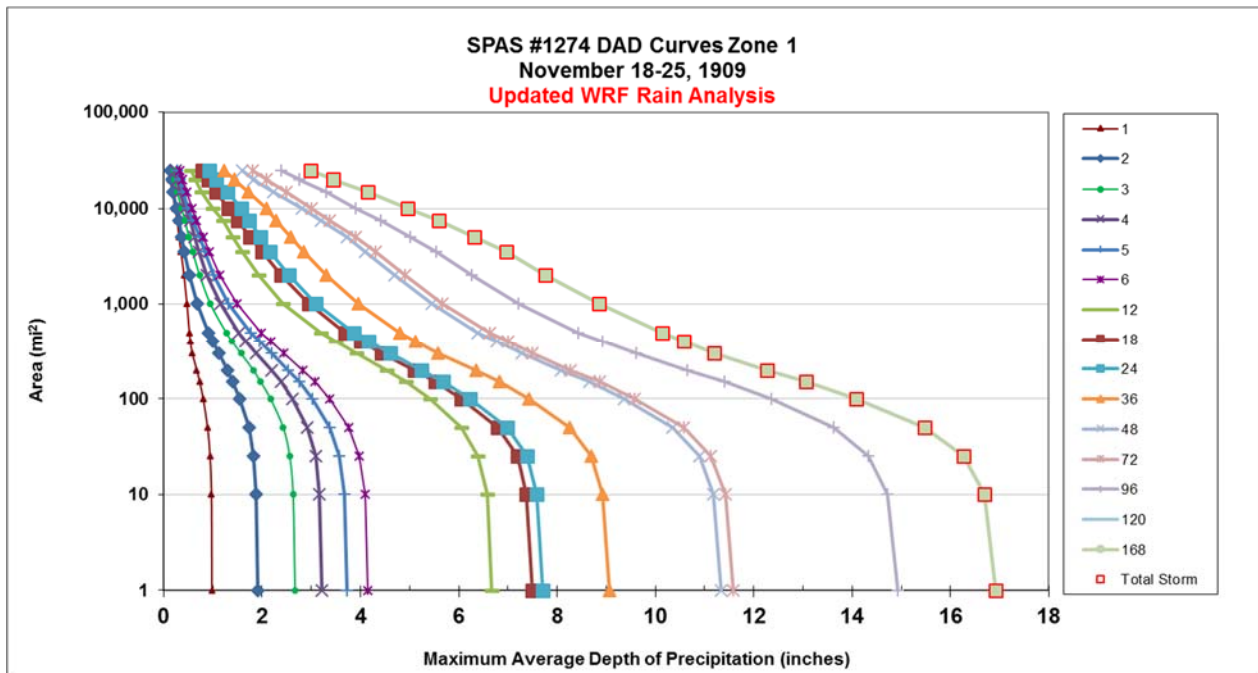
Reliability of results: The updated analysis, part of the CO//NM PMP study, included the WRF analysis max grid (based on four member run) the Mean SNOWNC field, these were used to estimate Rainfall grid used for the basemap. This analysis was based on hourly data (derived from USACE NP 4-6 Ma Curves), daily data, and supplemental data. We have a good level of confidence in the station based results, the spatial pattern is dependent on the basemap. Two hourly pseudo/estimated station were created based on information from HMR 57, and USACE storm NP 4-6 (Figure 1 and Figure 2). The SPAS 1274 point DAD values are similar to that of NP 4-6 DA point values, SPAS 1274 DAD values tend to decrease more rapidly than the previously published DAD table. This might be a reflection of overgeneralization of hand drawn rainfall contours versus a gridded IDW basemap aided interpolation.

CO-NM Regional Extreme Precipitation Study

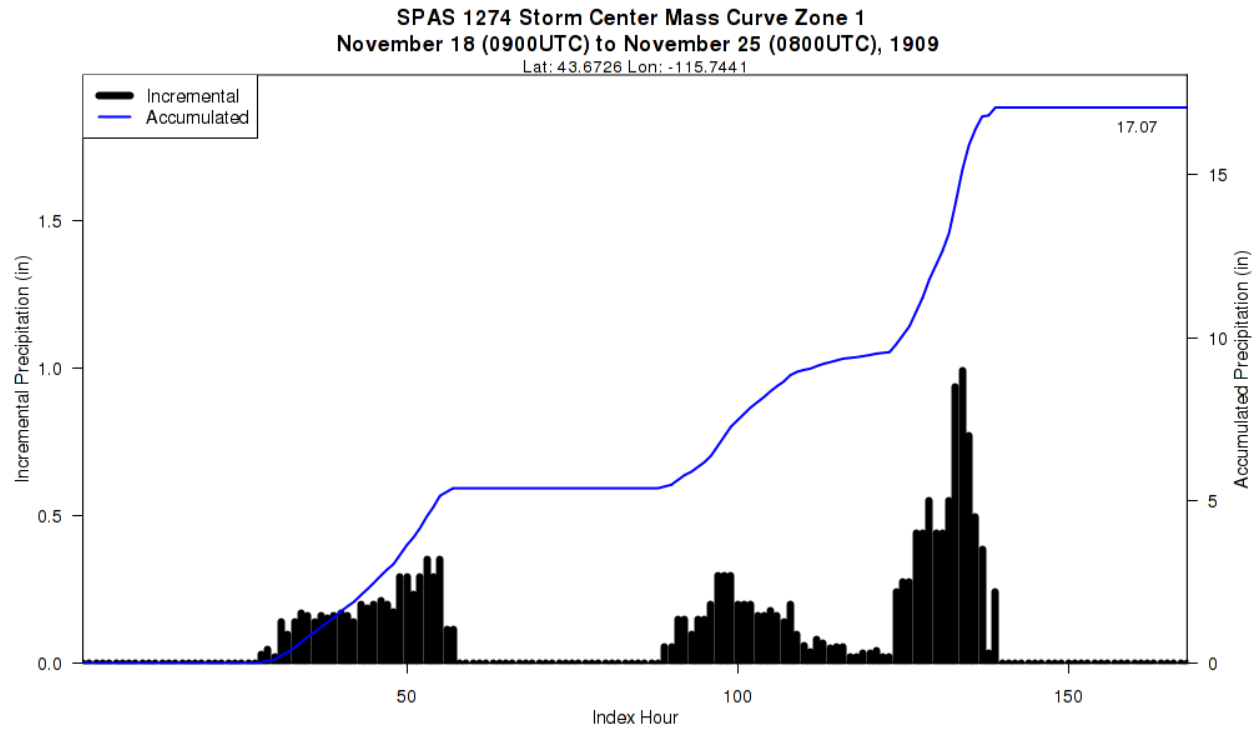


CO-NM Regional Extreme Precipitation Study

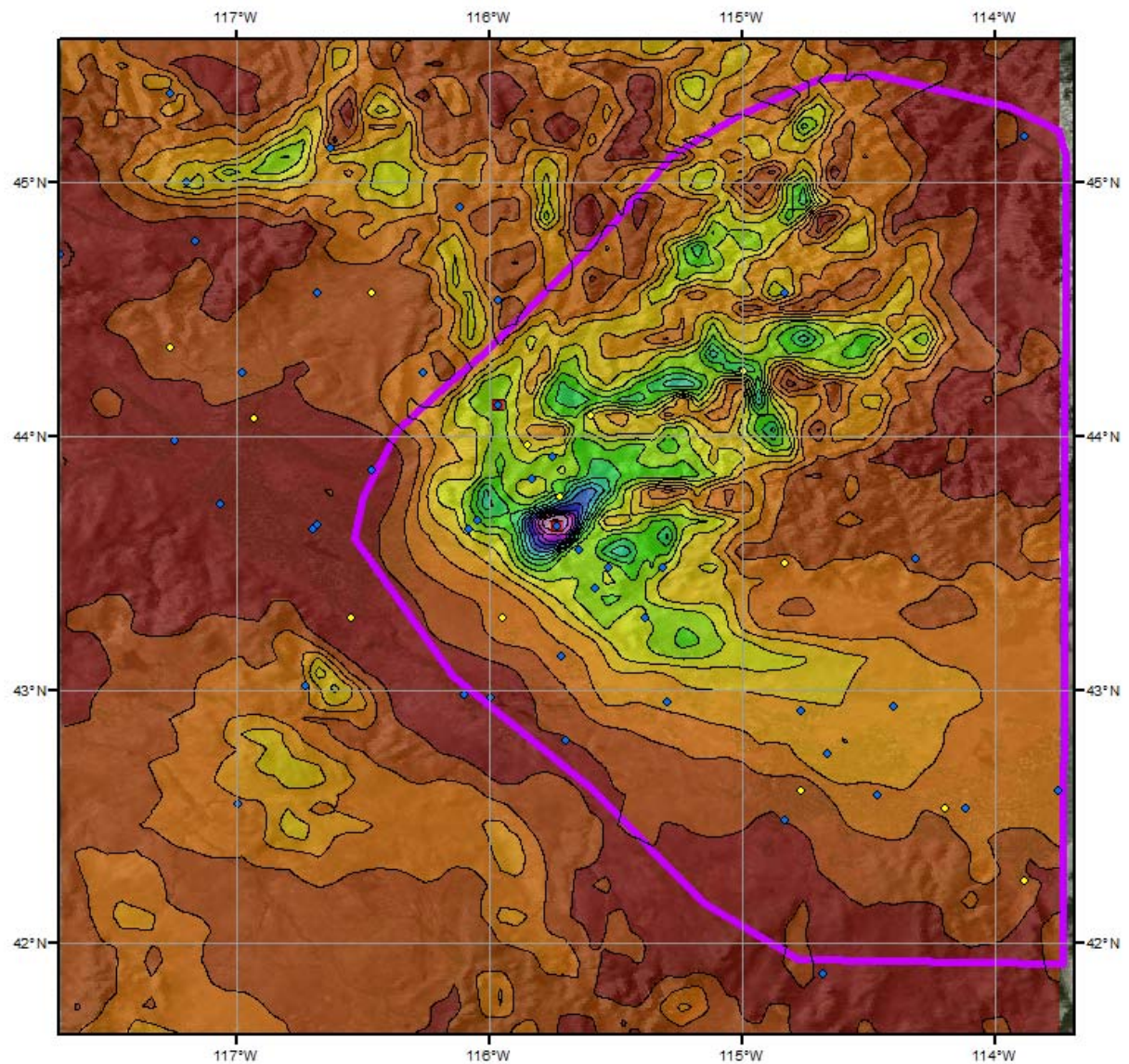
Storm 1274 Zone 1 - November 18 (0900 UTC) - November 25 (0800 UTC), 1909																
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)																
areasqmi	Duration (hours)															
	1	2	3	4	5	6	12	18	24	36	48	72	96	120	168	Total
0.4	0.99	1.92	2.69	3.24	3.74	4.18	6.71	7.54	7.75	9.11	11.41	11.66	15.01	17.02	17.02	17.02
1	0.98	1.91	2.67	3.22	3.72	4.15	6.67	7.49	7.70	9.06	11.34	11.59	14.93	16.92	16.92	16.92
10	0.97	1.87	2.63	3.17	3.67	4.10	6.58	7.38	7.59	8.92	11.18	11.43	14.72	16.69	16.69	16.69
25	0.94	1.83	2.56	3.09	3.56	3.98	6.39	7.19	7.39	8.69	10.89	11.13	14.33	16.26	16.26	16.26
50	0.89	1.73	2.43	2.92	3.37	3.77	6.05	6.80	6.99	8.25	10.35	10.58	13.62	15.47	15.47	15.47
100	0.80	1.55	2.17	2.61	3.02	3.37	5.41	6.06	6.23	7.42	9.37	9.58	12.35	14.08	14.08	14.08
150	0.73	1.41	1.97	2.38	2.75	3.07	4.93	5.53	5.68	6.82	8.66	8.87	11.41	13.07	13.07	13.07
200	0.67	1.30	1.82	2.19	2.53	2.83	4.54	5.10	5.25	6.35	8.07	8.27	10.65	12.27	12.27	12.27
300	0.58	1.12	1.57	1.88	2.19	2.44	3.92	4.44	4.60	5.58	7.28	7.50	9.61	11.20	11.20	11.20
400	0.54	0.99	1.39	1.67	1.94	2.17	3.50	4.00	4.17	5.12	6.77	7.00	8.92	10.57	10.57	10.57
500	0.52	0.90	1.27	1.53	1.77	1.98	3.19	3.69	3.87	4.80	6.39	6.64	8.43	10.13	10.13	10.13
1,000	0.47	0.68	0.95	1.15	1.32	1.49	2.42	2.95	3.10	3.95	5.45	5.66	7.21	8.86	8.86	8.86
2,000	0.41	0.52	0.73	0.87	1.02	1.14	1.93	2.39	2.54	3.30	4.70	4.90	6.27	7.76	7.76	7.76
3,500	0.35	0.42	0.59	0.71	0.84	0.93	1.59	2.00	2.16	2.84	4.10	4.31	5.54	6.97	6.97	6.97
5,000	0.31	0.37	0.51	0.62	0.73	0.81	1.40	1.75	1.96	2.58	3.72	3.90	5.01	6.32	6.32	6.32
7,500	0.27	0.31	0.43	0.53	0.59	0.66	1.20	1.50	1.73	2.29	3.20	3.38	4.41	5.59	5.59	5.59
10,000	0.23	0.25	0.36	0.44	0.49	0.58	1.00	1.32	1.58	2.08	2.81	3.00	3.91	4.96	4.96	4.96
15,000	0.17	0.19	0.27	0.33	0.39	0.46	0.77	1.07	1.29	1.72	2.23	2.49	3.30	4.15	4.15	4.15
20,000	0.13	0.16	0.22	0.27	0.33	0.38	0.64	0.91	1.07	1.44	1.83	2.09	2.75	3.44	3.44	3.44
24,523	0.11	0.14	0.20	0.24	0.28	0.32	0.56	0.78	0.92	1.23	1.59	1.80	2.39	2.98	2.98	2.98



CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



Total Storm (168-hr) Precipitation (inches)

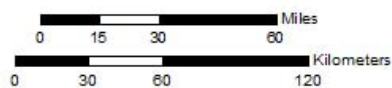
November 18-24, 1909

SPAS 1274 (Rattlesnake, ID)

WRF Rain Re-Analysis

Gauges

- ◆ Daily
- Hourly Pseudo
- ◆ Supplemental

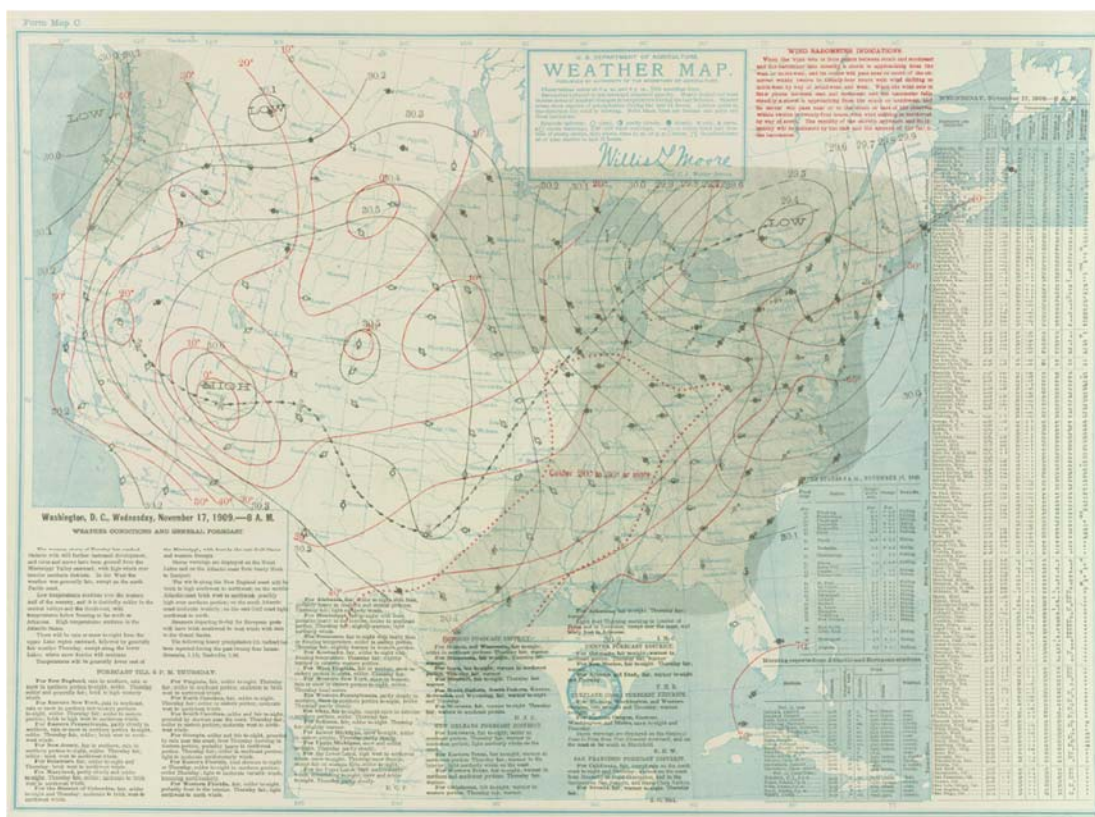


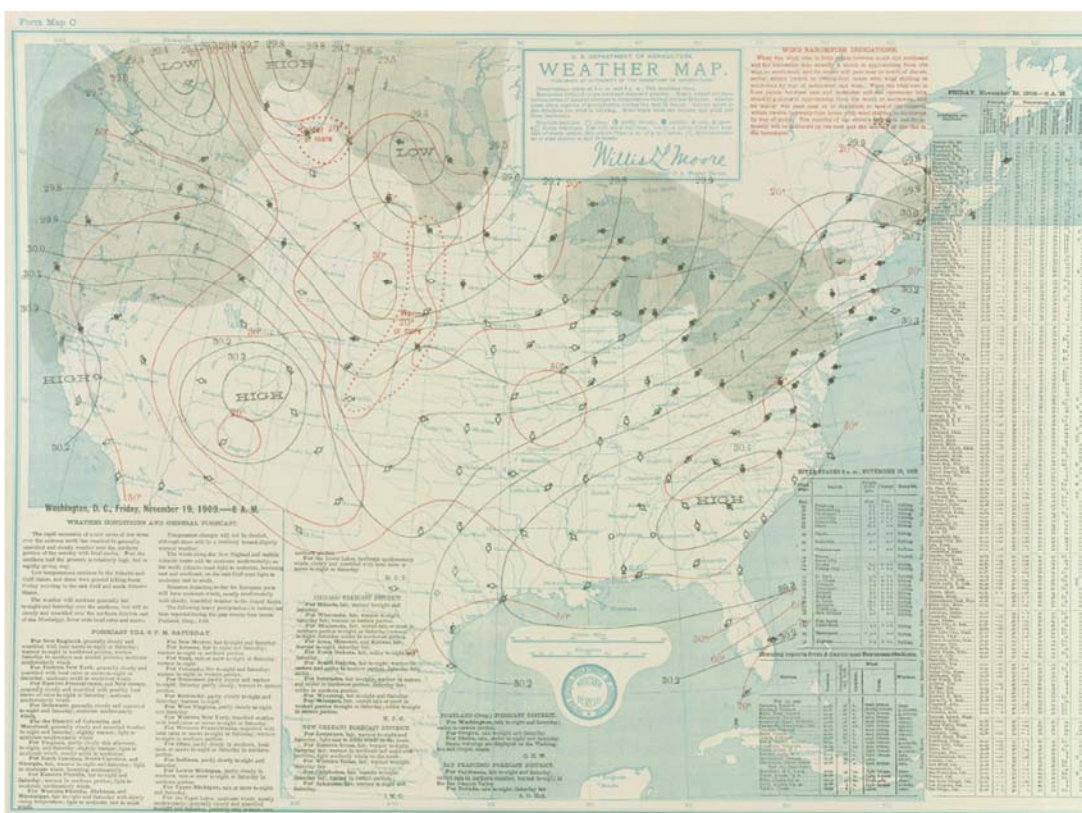
Percent Difference (%)



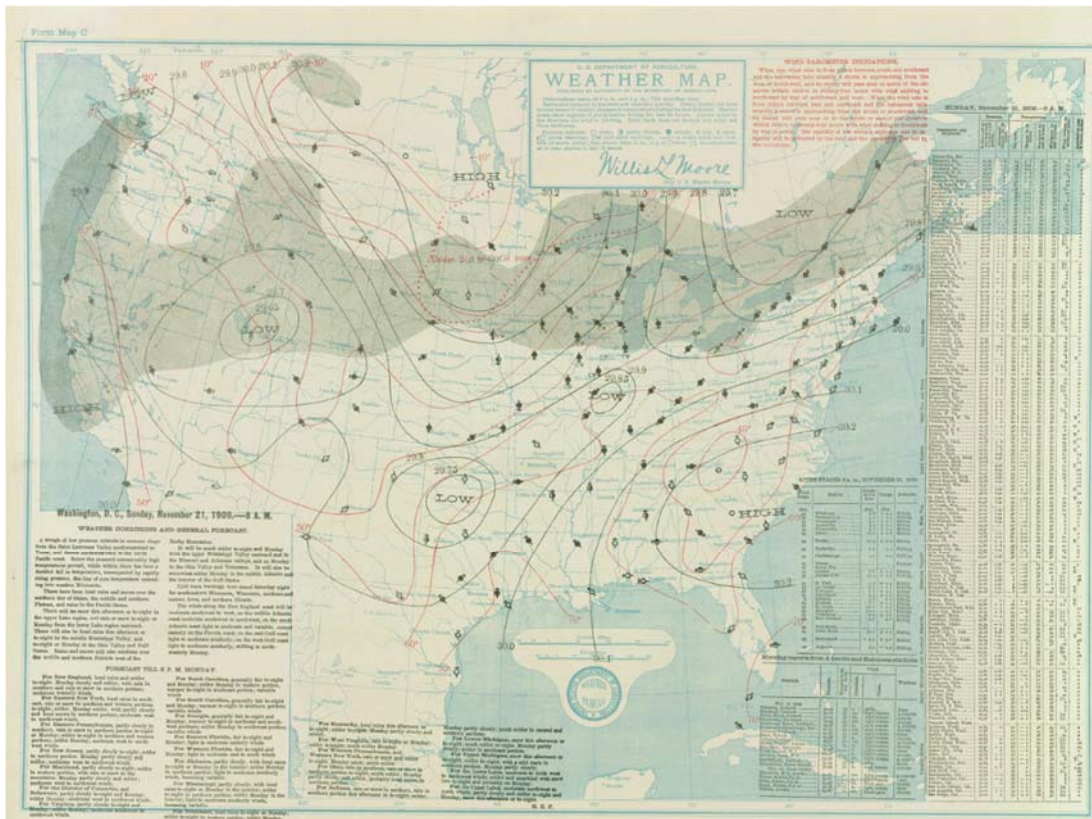
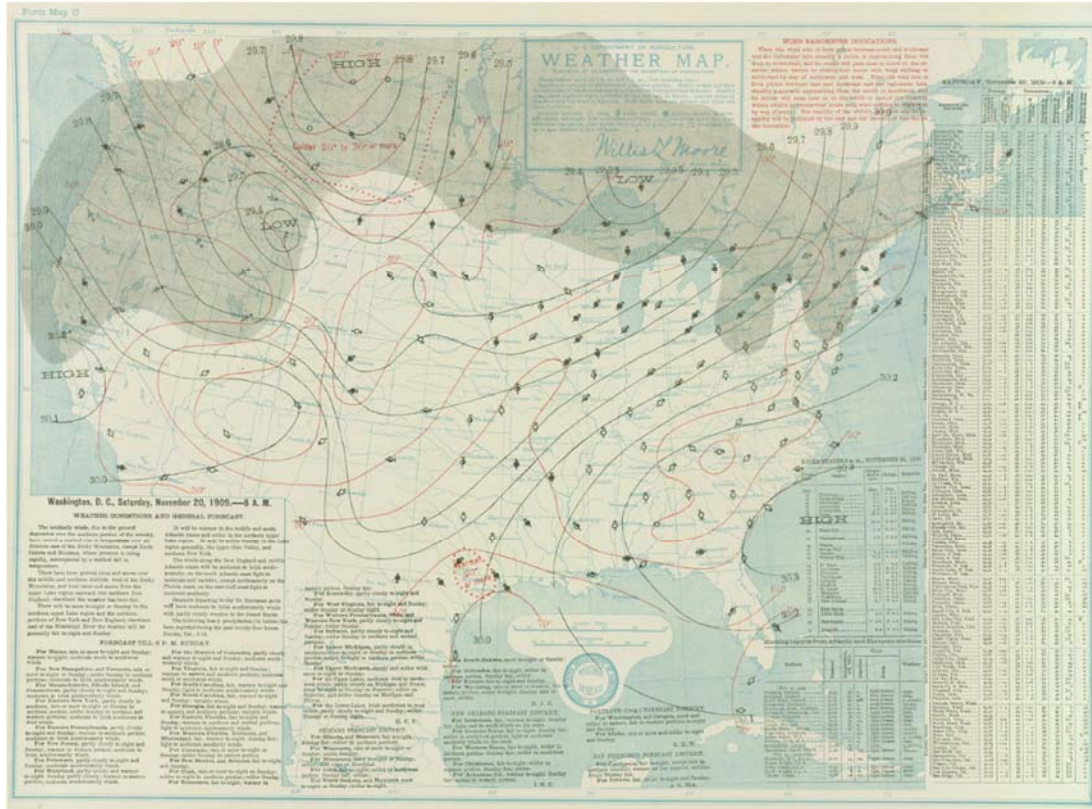
2/19/2018

Page 30 of 751

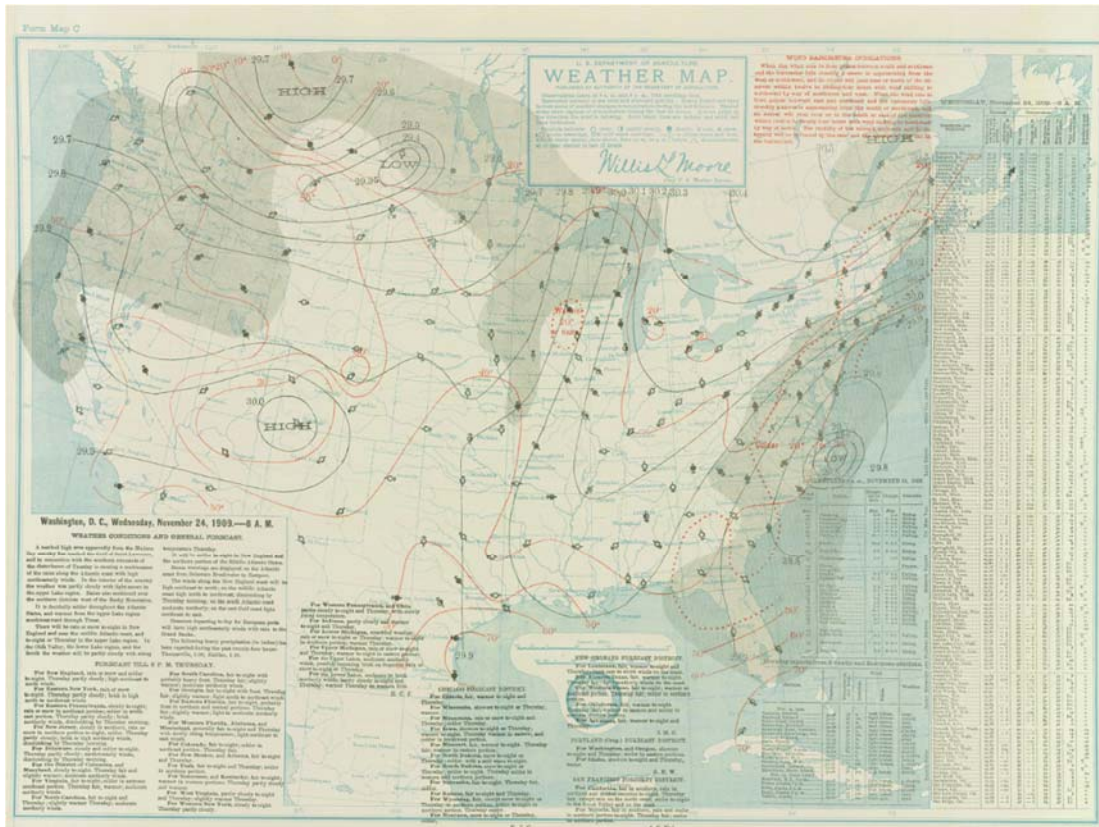


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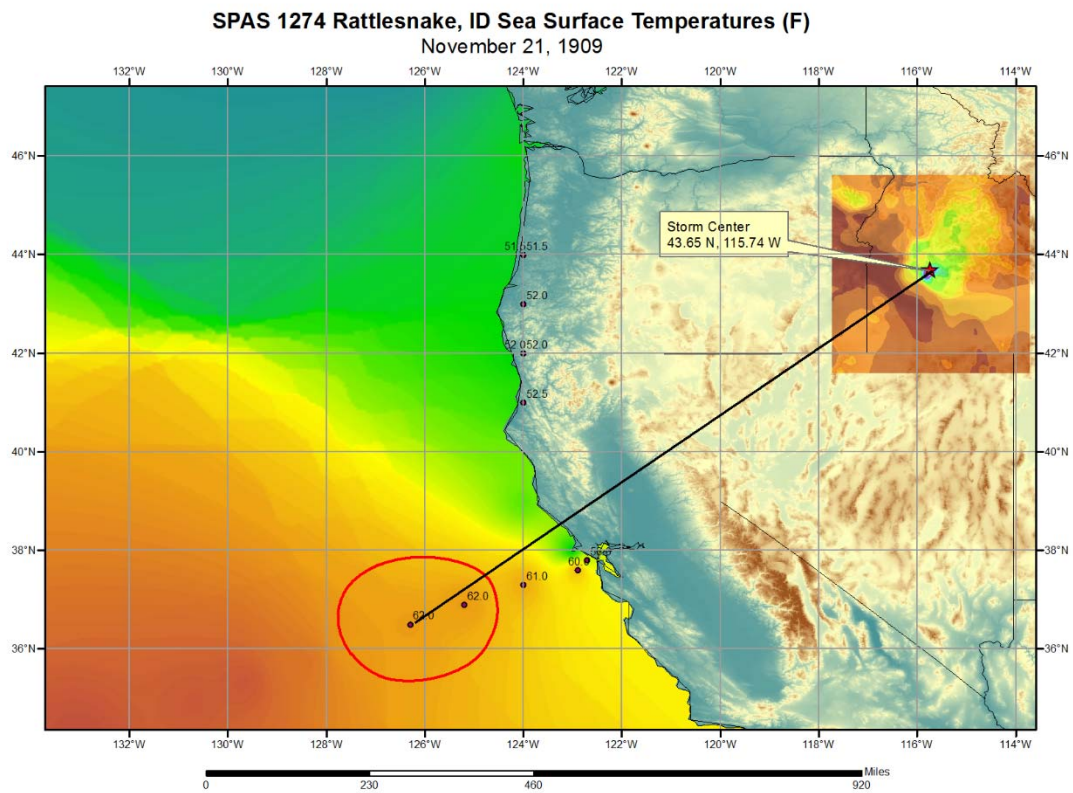
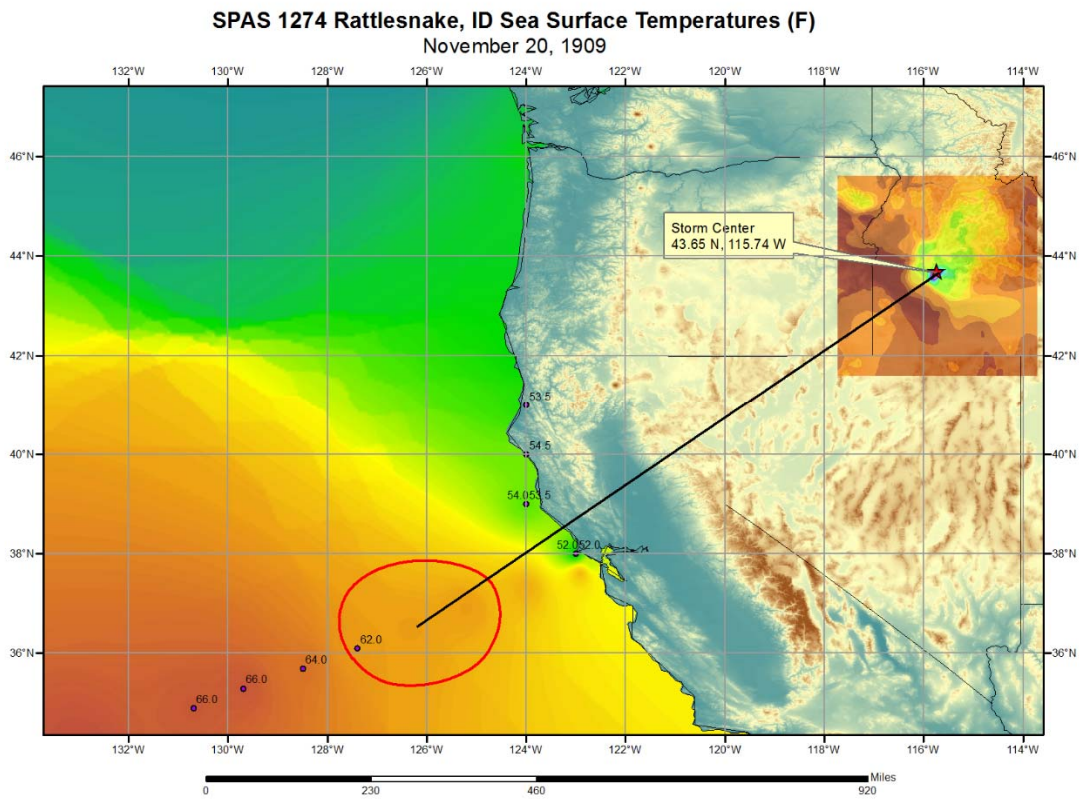
CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



Tajique, NM
July 18-28, 1915
Storm Type: General

Storm Precipitation Analysis System (SPAS) For Storm #1650A_1
(Hours 1-120)

General Storm Location: Tajique, NM

Storm Dates: July 18-28, 1915

Event: Local

DAD Zone 1 (A & B)

Latitude: 34.7458

Longitude: -106.4125

Max. grid rainfall amount: 10.36"

Max. observed rainfall amount: 9.90"

Number of Stations: 175

SPAS Version: 10.0

Base Map Used: PRISM_071915_in_sm

Spatial resolution: 0.2725

Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

Reliability of Results: This analysis was based on 175 hourly estimated stations, daily data, and supplemental station data. We have a good degree of confidence for the station based storm total results. The spatial pattern is fully dependent on the basemap created from the PRISM monthly climatology from July 1915. Timing is based on the five hourly pseudo stations created from the USACE and USGS mass curves. Several daily stations were moved to supplemental due to timing issues and to ensure data consistency.

CO-NM Regional Extreme Precipitation Study

DEPARTMENT OF THE ARMY

CORPS OF ENGINEERS

STORM STUDIES - PERTINENT DATA SHEET

LOCATION MAP

Storm of 19-28 July 1915
Assignment SW 1-18
Location N. M., Colo., Okla.
Study Prepared by:
Southwestern Division
Albuquerque District

Part I Reviewed by H. M. Sec. of
Weather Bureau, 5/20/44
Part II Approved by Office, Chief
of Engineers for Distribution
of Factual Data, 1/22/67
Remarks: Center at Taajique,
New Mexico

Grid B-20

DATA AND COMPUTATIONS COMPILED

PART I

Preliminary isohyetal map, in 1 sheet, scale 1:1,000,000

Precipitation data and mass curves: (Number of Sheets)

Form 5001-C (Hourly precip. data).....	12
Form 5001-B (24-hour " " " ").....	54
Form 5001-D (" " " " " ").....	0
Misc. precip. records, meteorological data, etc.....	0
Form 5002 (Mass rainfall curves).....	99

PART II

Final isohyetal maps, in 1 sheet, scale 1:1,000,000

Data and computation sheets:

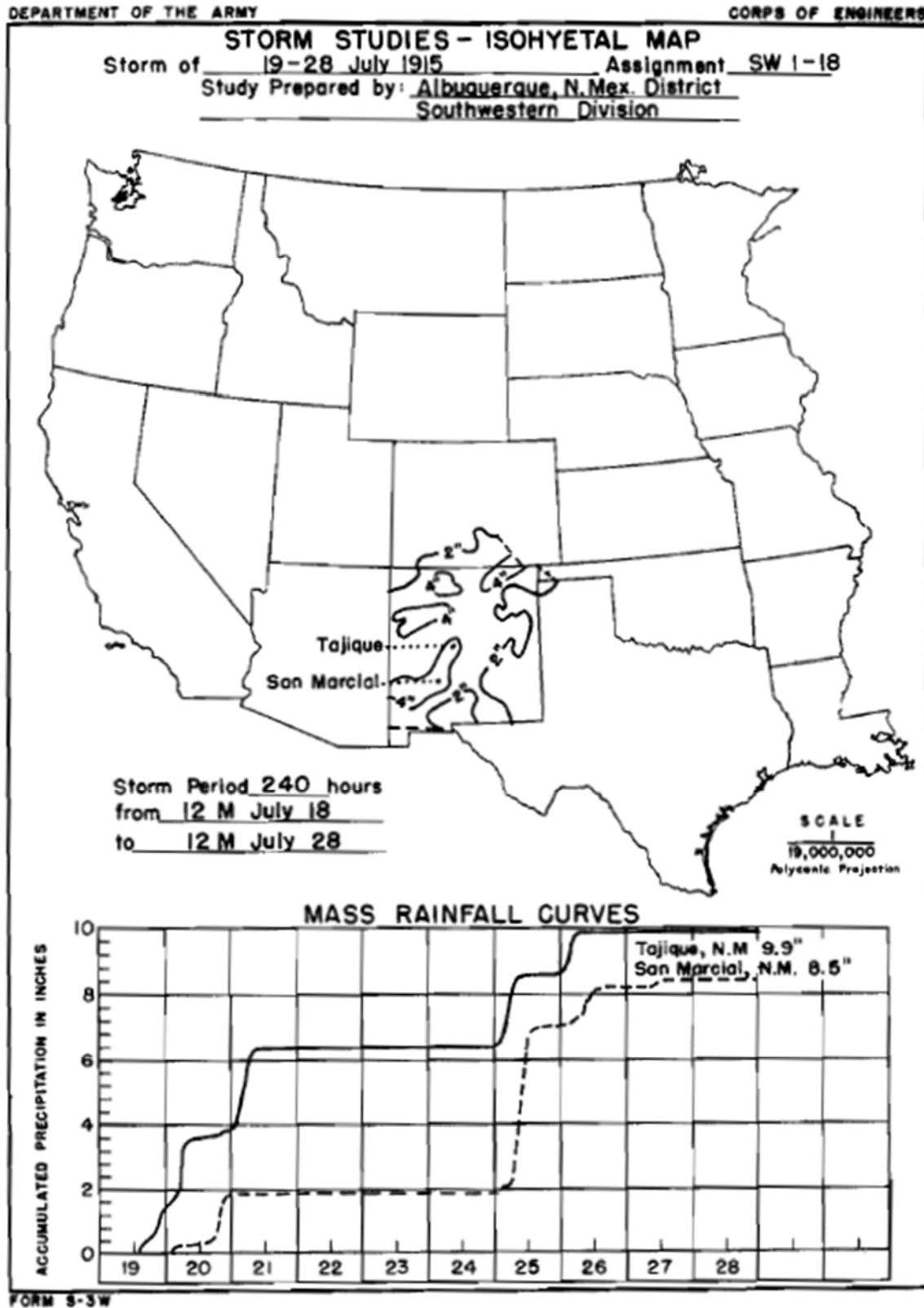
Form S-10 (Data from mass rainfall curves).....	8
Form S-11 (Depth-area data from isohyetal map).....	2
Form S-12 (Maximum depth-duration data).....	20
Maximum duration-depth-area curves.....	1
Data relating to periods of maximum rainfall.....	2

MAXIMUM AVERAGE DEPTH OF RAINFALL IN INCHES

Area in Sq. Mi.	Duration of Rainfall in Hours											
	6	12	18	24	36	48	72	96	120	150	240	
10	4.6	4.9	5.1	5.2	6.2	6.2	6.5	6.5	7.3	9.3	9.9	
100	4.5	4.8	5.0	5.0	6.0	6.0	6.4	6.4	7.1	8.3	9.0	
200	4.4	4.7	4.9	4.9	5.8	5.8	6.2	6.2	6.9	8.0	8.6	
500	4.1	4.3	4.6	4.6	5.5	5.5	5.8	5.8	6.5	7.4	8.1	
1,000	3.6	3.8	4.1	4.1	5.0	5.0	5.3	5.3	6.0	6.9	7.6	
2,000	2.7	3.0	3.3	3.3	4.0	4.1	4.5	4.5	5.4	6.3	7.2	
5,000	1.7	2.1	2.4	2.4	2.8	3.0	3.4	3.7	4.5	5.6	6.4	
10,000	1.2	1.5	1.9	1.9	2.2	2.5	2.9	3.2	3.8	5.0	5.8	
20,000	0.8	1.1	1.5	1.5	1.8	2.1	2.5	2.7	3.1	4.3	5.3	
50,000	0.4	0.7	1.0	1.0	1.3	1.6	1.9	2.1	2.4	3.3	4.3	
95,000	0.3	0.5	0.8	0.8	1.0	1.2	1.5	1.8	2.0	2.5	3.5	

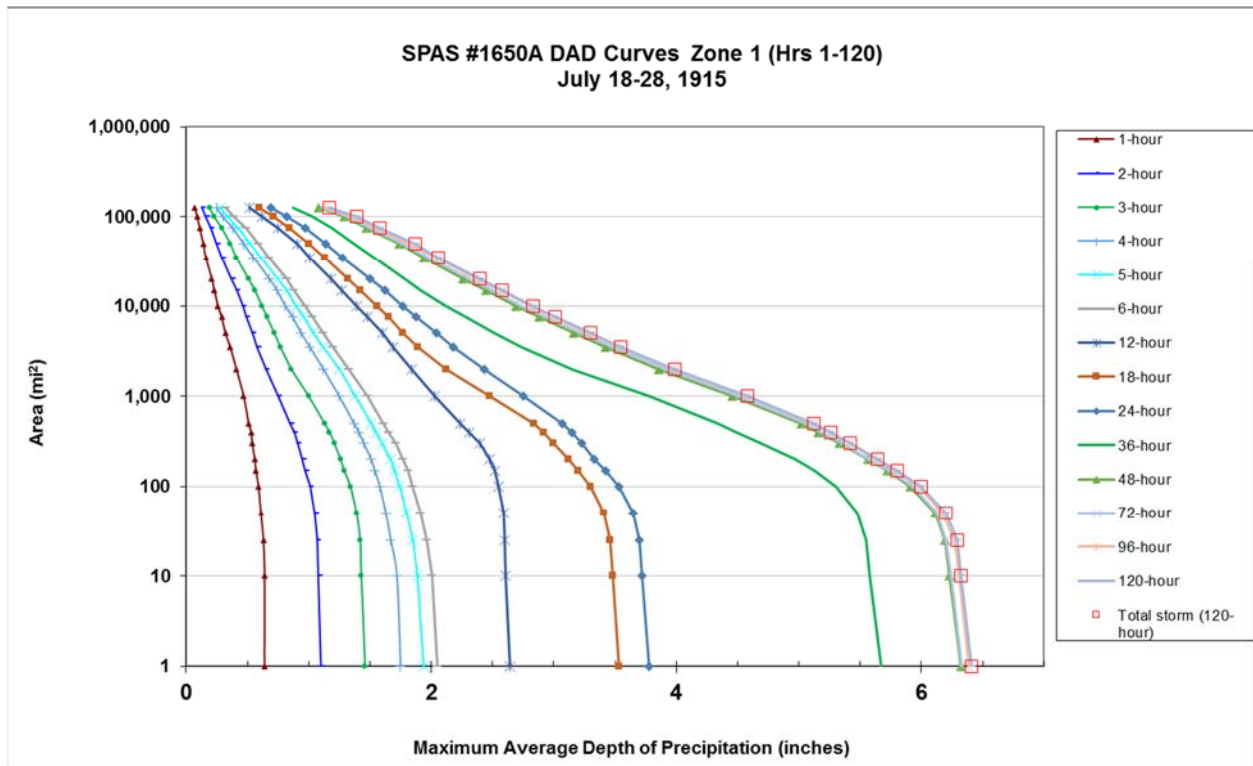
Form S-2

CO-NM Regional Extreme Precipitation Study

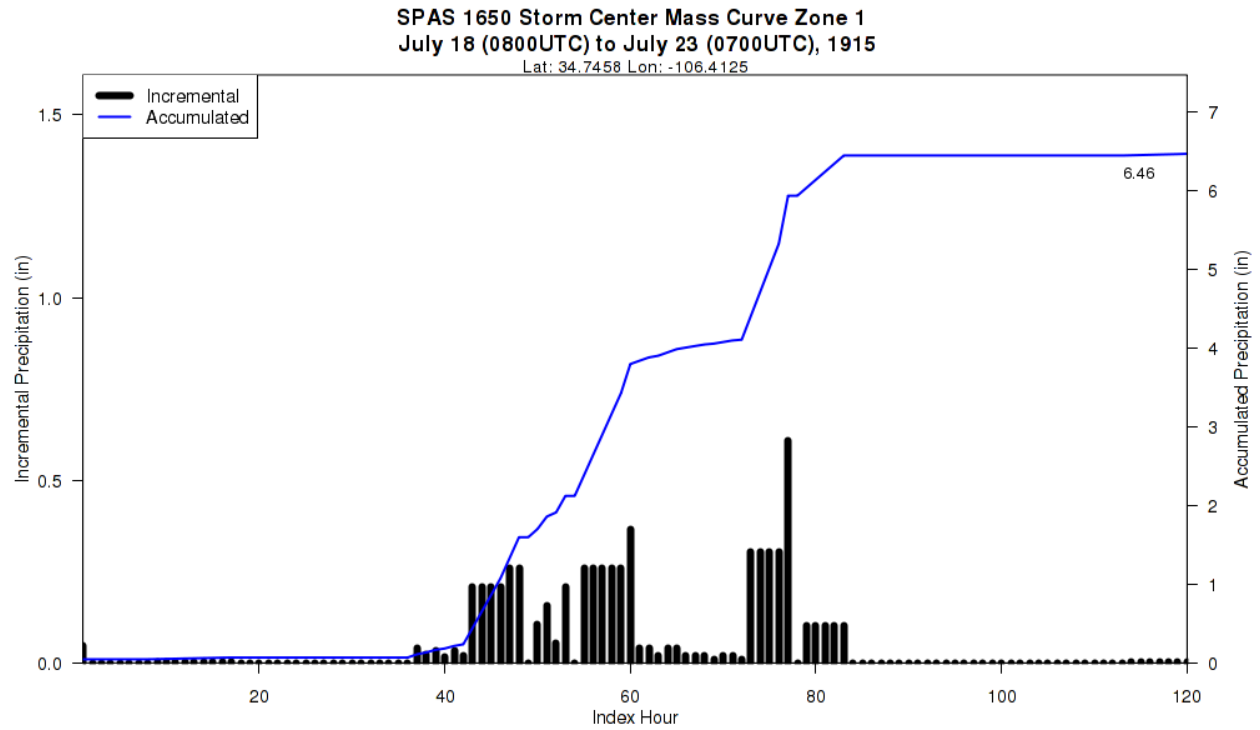


CO-NM Regional Extreme Precipitation Study

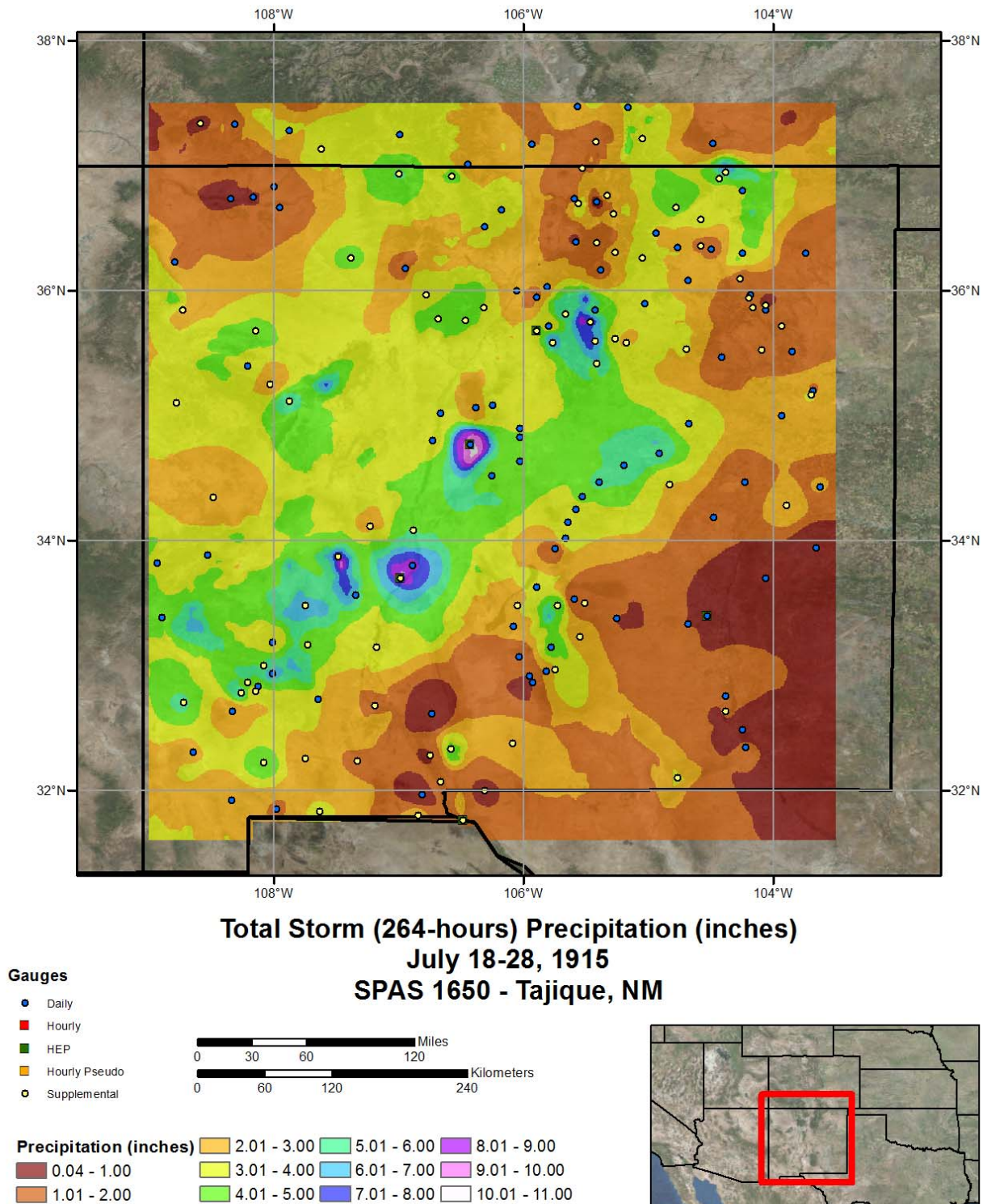
Storm 1650 - July 18 (0800 UTC) - July 29 (0700 UTC), 1915															
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)															
Area (mi ²)	Duration (hours)														
	1	2	3	4	5	6	12	18	24	36	48	72	96	120	Total
0.4	0.65	1.10	1.47	1.76	1.95	2.06	2.65	3.55	3.80	5.70	6.36	6.37	6.43	6.45	6.45
1	0.64	1.10	1.46	1.75	1.94	2.05	2.64	3.53	3.78	5.67	6.32	6.33	6.39	6.41	6.41
10	0.64	1.08	1.43	1.72	1.89	2.01	2.61	3.48	3.72	5.58	6.23	6.24	6.31	6.32	6.32
25	0.63	1.07	1.42	1.67	1.85	1.96	2.60	3.46	3.70	5.55	6.19	6.20	6.27	6.29	6.29
50	0.61	1.05	1.39	1.63	1.80	1.91	2.59	3.41	3.65	5.48	6.11	6.13	6.17	6.20	6.20
100	0.59	1.01	1.34	1.58	1.74	1.85	2.55	3.30	3.53	5.30	5.91	5.93	5.98	6.00	6.00
150	0.57	0.97	1.29	1.54	1.70	1.81	2.52	3.20	3.42	5.13	5.72	5.74	5.78	5.80	5.80
200	0.56	0.95	1.26	1.51	1.67	1.77	2.48	3.12	3.33	4.97	5.56	5.57	5.63	5.64	5.64
300	0.54	0.91	1.21	1.45	1.60	1.71	2.40	3.00	3.23	4.69	5.33	5.35	5.41	5.42	5.42
400	0.53	0.88	1.17	1.41	1.55	1.65	2.31	2.92	3.15	4.49	5.16	5.19	5.25	5.26	5.26
500	0.51	0.85	1.13	1.37	1.51	1.61	2.24	2.84	3.07	4.34	5.02	5.06	5.11	5.12	5.12
1,000	0.47	0.75	1.00	1.25	1.38	1.48	2.03	2.48	2.75	3.78	4.46	4.51	4.57	4.58	4.58
2,000	0.41	0.65	0.86	1.12	1.25	1.33	1.84	2.12	2.43	3.15	3.86	3.92	3.98	3.99	3.99
3,500	0.36	0.58	0.77	1.01	1.12	1.20	1.69	1.89	2.18	2.74	3.42	3.48	3.54	3.55	3.55
5,000	0.32	0.54	0.72	0.94	1.04	1.12	1.60	1.77	2.04	2.51	3.16	3.22	3.28	3.30	3.30
7,500	0.29	0.49	0.66	0.87	0.96	1.03	1.48	1.65	1.88	2.28	2.88	2.93	3.00	3.01	3.01
10,000	0.26	0.46	0.62	0.81	0.90	0.97	1.39	1.56	1.77	2.12	2.69	2.74	2.81	2.83	2.83
15,000	0.23	0.41	0.56	0.74	0.82	0.88	1.27	1.42	1.62	1.91	2.45	2.50	2.56	2.58	2.58
20,000	0.21	0.37	0.51	0.68	0.75	0.82	1.18	1.32	1.50	1.78	2.26	2.31	2.37	2.40	2.40
35,000	0.16	0.29	0.41	0.55	0.61	0.68	1.01	1.13	1.28	1.54	1.94	1.98	2.04	2.06	2.06
50,000	0.14	0.25	0.36	0.47	0.52	0.59	0.91	1.00	1.14	1.37	1.74	1.77	1.82	1.87	1.87
75,000	0.11	0.20	0.29	0.38	0.43	0.49	0.75	0.84	0.97	1.19	1.47	1.50	1.55	1.58	1.58
100,000	0.09	0.16	0.23	0.30	0.34	0.39	0.62	0.71	0.82	1.03	1.29	1.32	1.35	1.39	1.39
126,432	0.07	0.13	0.19	0.25	0.28	0.32	0.52	0.60	0.69	0.87	1.08	1.11	1.14	1.17	1.17



CO-NM Regional Extreme Precipitation Study

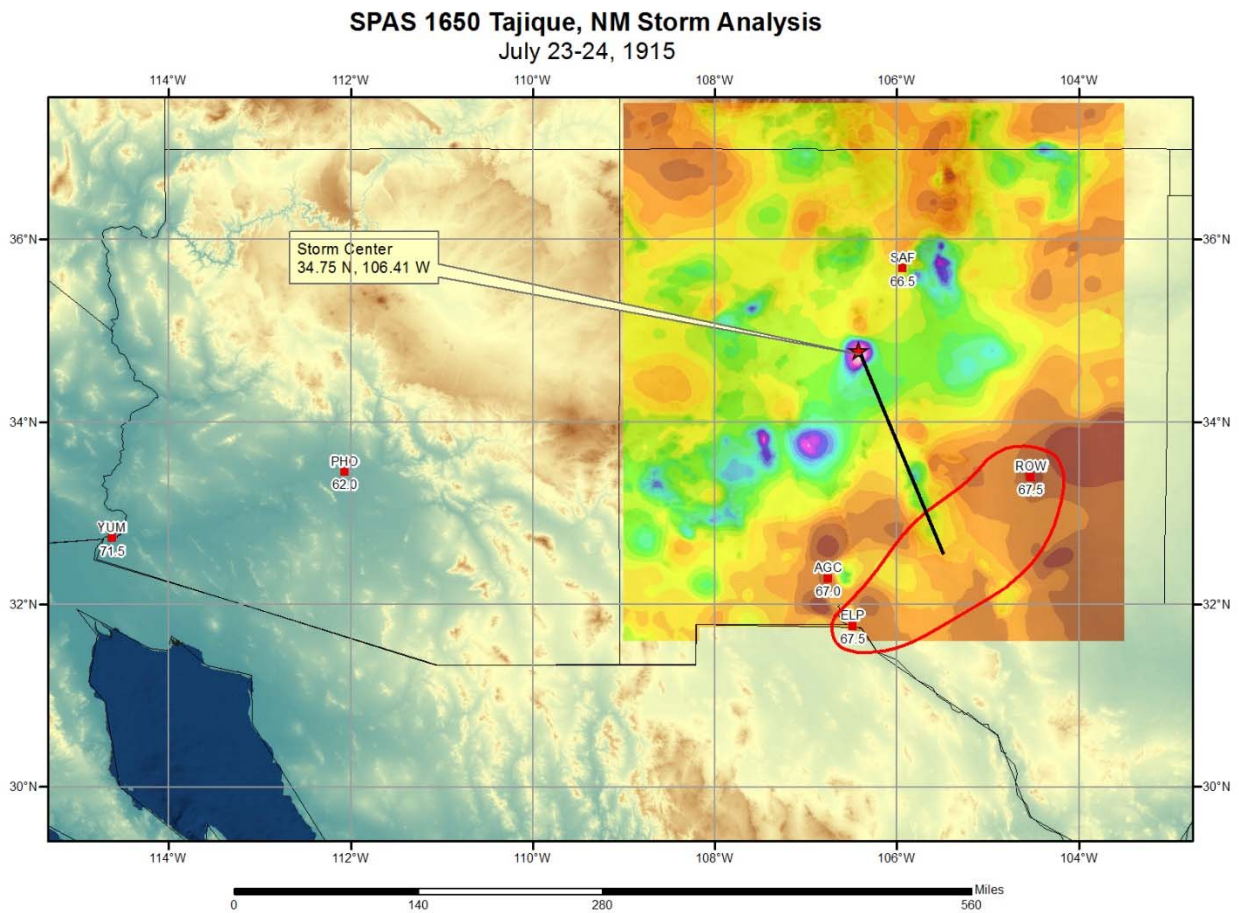


CO-NM Regional Extreme Precipitation Study



4/3/2015

CO-NM Regional Extreme Precipitation Study



Tajique, NM

July 18-28, 1915

Storm Type: General

Storm Precipitation Analysis System (SPAS) For Storm #1650B_1 (Hours 121-264)

General Storm Location: Tajique, NM

Storm Dates: July 18-28, 1915

Event: Local

DAD Zone 1 (A & B)

Latitude: 34.7458

Longitude: -106.4125

Max. grid rainfall amount: 10.36"

Max. observed rainfall amount: 9.90"

Number of Stations: 175

SPAS Version: 10.0

Base Map Used: PRISM_071915_in_sm

Spatial resolution: 0.2725

Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

Reliability of Results: This analysis was based on 175 hourly estimated stations, daily data, and supplemental station data. We have a good degree of confidence for the station based storm total results. The spatial pattern is fully dependent on the basemap created from the PRISM monthly climatology from July 1915. Timing is based on the five hourly pseudo stations created from the USACE and USGS mass curves. Several daily stations were moved to supplemental due to timing issues and to ensure data consistency.

DEPARTMENT OF THE ARMY

CORPS OF ENGINEERS

SCALE OF MILES

500 1000 1500

-LEGEND-

Area covered by final isohyetal map.

Area inclosed by 2-inch isohyet.

LOCATION MAP

Storm of 19-28 July 1915
Assignment SW 1-18
Location N. M., Colo., Okla.
Study Prepared by:
Southwestern Division
Albuquerque District

Part I Reviewed by H. M. Sec. of
Weather Bureau, 5/20/44
Part II Approved by Office, Chief
of Engineers for Distribution
of Factual Data, 1/22/57
Remarks: Center at Tajique,
New Mexico

Grid H-20

PART I

Precipitation data and mass curves:

(Number of Sheets)

Form 5001-C (Hourly precip. data)----- 12

12

Form 5001-B (24-hour " ") _____ 54

54

Form 5001-D (" " " ") _____ 0

0

Misc. precip. records, meteorological data, etc.-----0

0

Form 5002 (Mass rainfall curves)-----

59

Data and computation sheets:

Form S-10 (Data from mass rainfall curves)----- 8

8

Form S-II (Depth-area data from isohyetal map)----- 2

2

Form S-12 (Maximum depth-duration data)----- 20

20

Maximum duration-depth-area curves_____ 1

1

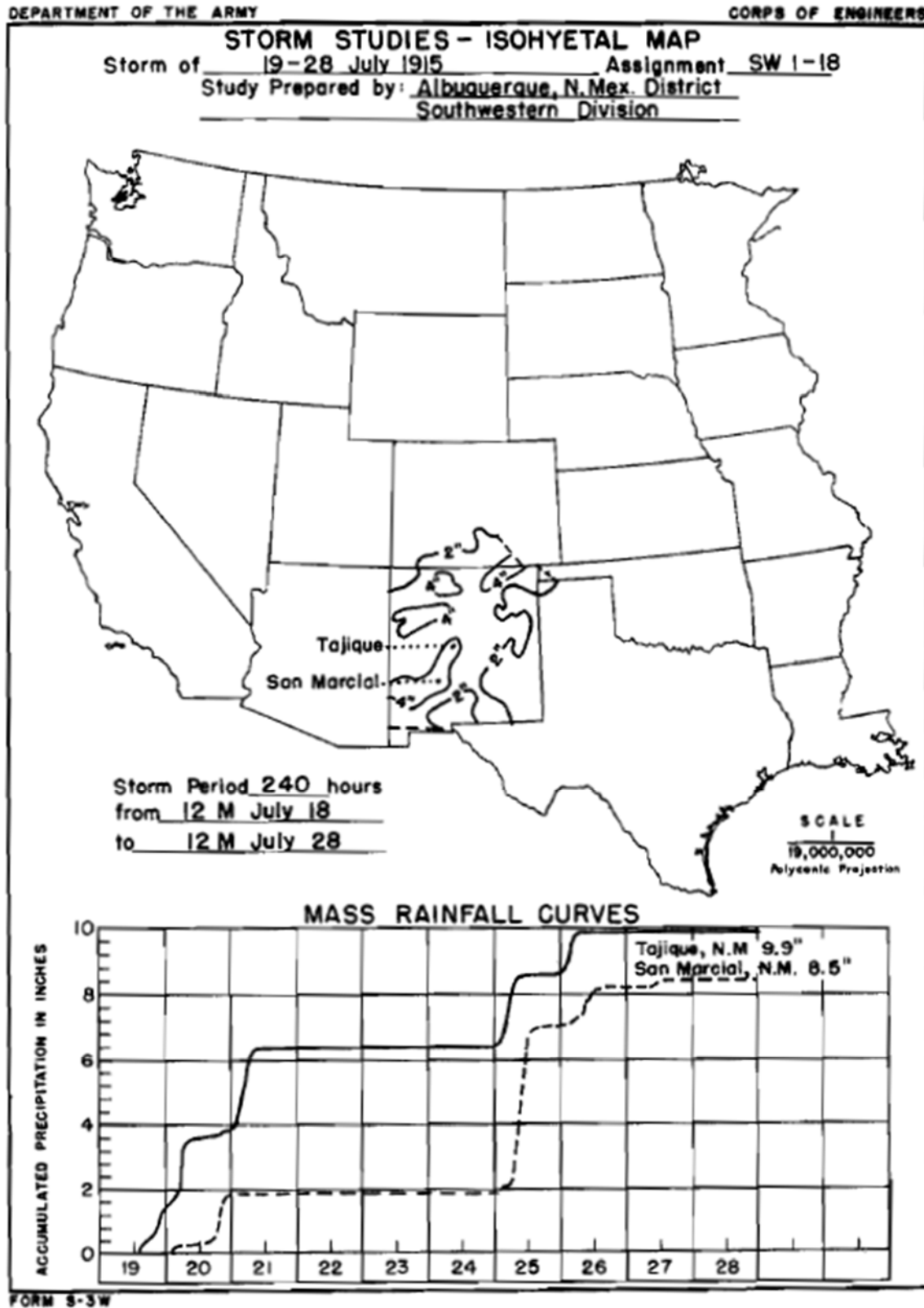
Data relating to periods of maximum rainfall_____ 2

2

Area in Sq. Mi.	Duration of Rainfall in Hours										
	6	12	18	24	36	48	72	96	120	150	240
10	4.6	4.9	5.1	5.2	6.2	6.2	6.5	6.5	7.3	9.3	9.9
100	4.5	4.8	5.0	5.0	6.0	6.0	6.4	6.4	7.1	8.3	9.0
200	4.4	4.7	4.9	4.9	5.8	5.8	6.2	6.2	6.9	8.0	8.6
500	4.1	4.3	4.6	4.6	5.5	5.5	5.8	5.8	6.5	7.4	8.1
1,000	3.6	3.8	4.1	4.1	5.0	5.0	5.3	5.3	6.0	6.9	7.6
2,000	2.7	3.0	3.3	3.3	4.0	4.1	4.5	4.5	5.4	6.3	7.2
5,000	1.7	2.1	2.4	2.4	2.8	3.0	3.4	3.7	4.5	5.6	6.4
10,000	1.2	1.5	1.9	1.9	2.2	2.5	2.9	3.2	3.8	5.0	5.8
20,000	0.8	1.1	1.5	1.5	1.8	2.1	2.5	2.7	3.1	4.3	5.3
50,000	0.4	0.7	1.0	1.0	1.3	1.6	1.9	2.1	2.4	3.3	4.3
95,000	0.3	0.5	0.8	0.8	1.0	1.2	1.5	1.8	2.0	2.5	3.5

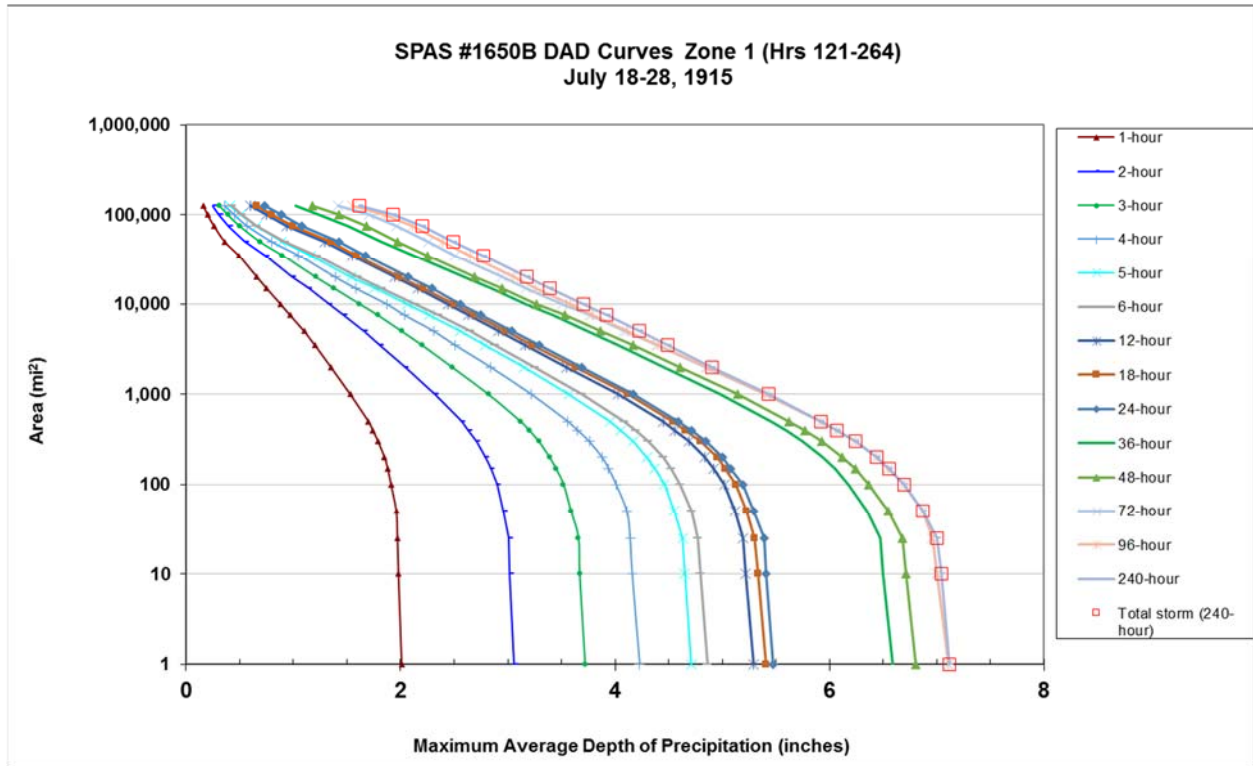
Form S-2

CO-NM Regional Extreme Precipitation Study

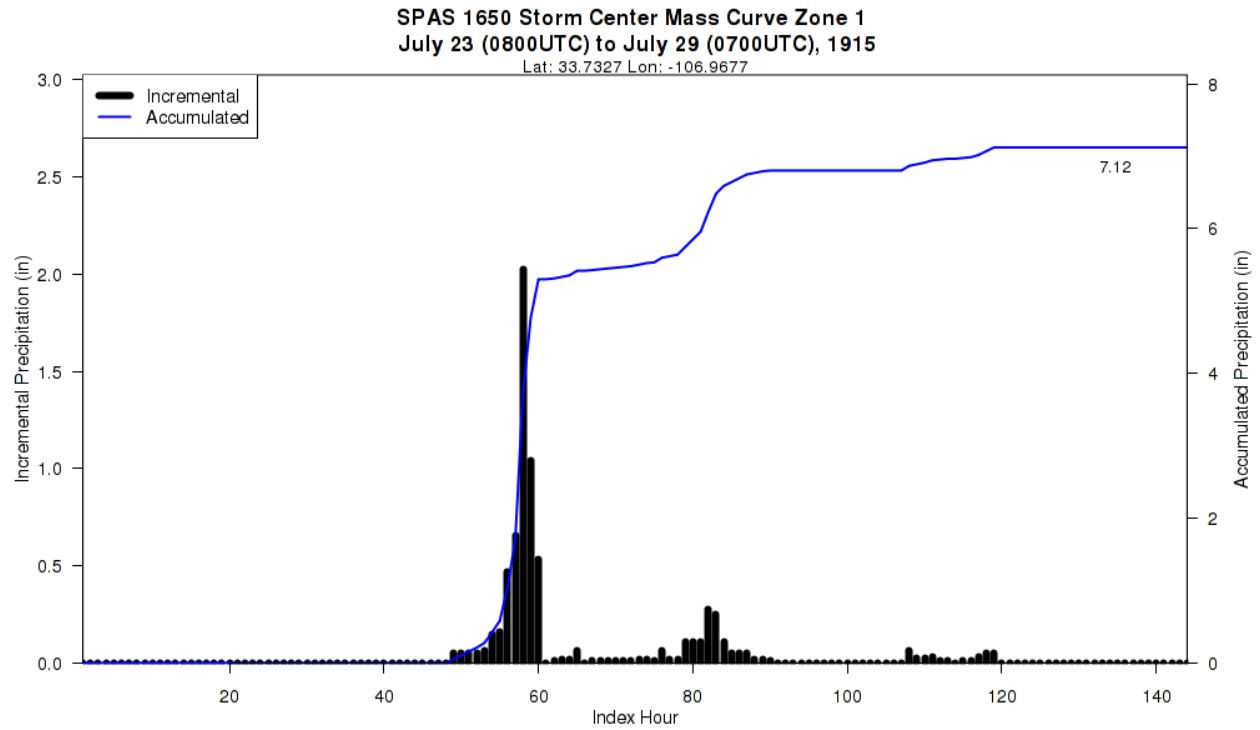


CO-NM Regional Extreme Precipitation Study

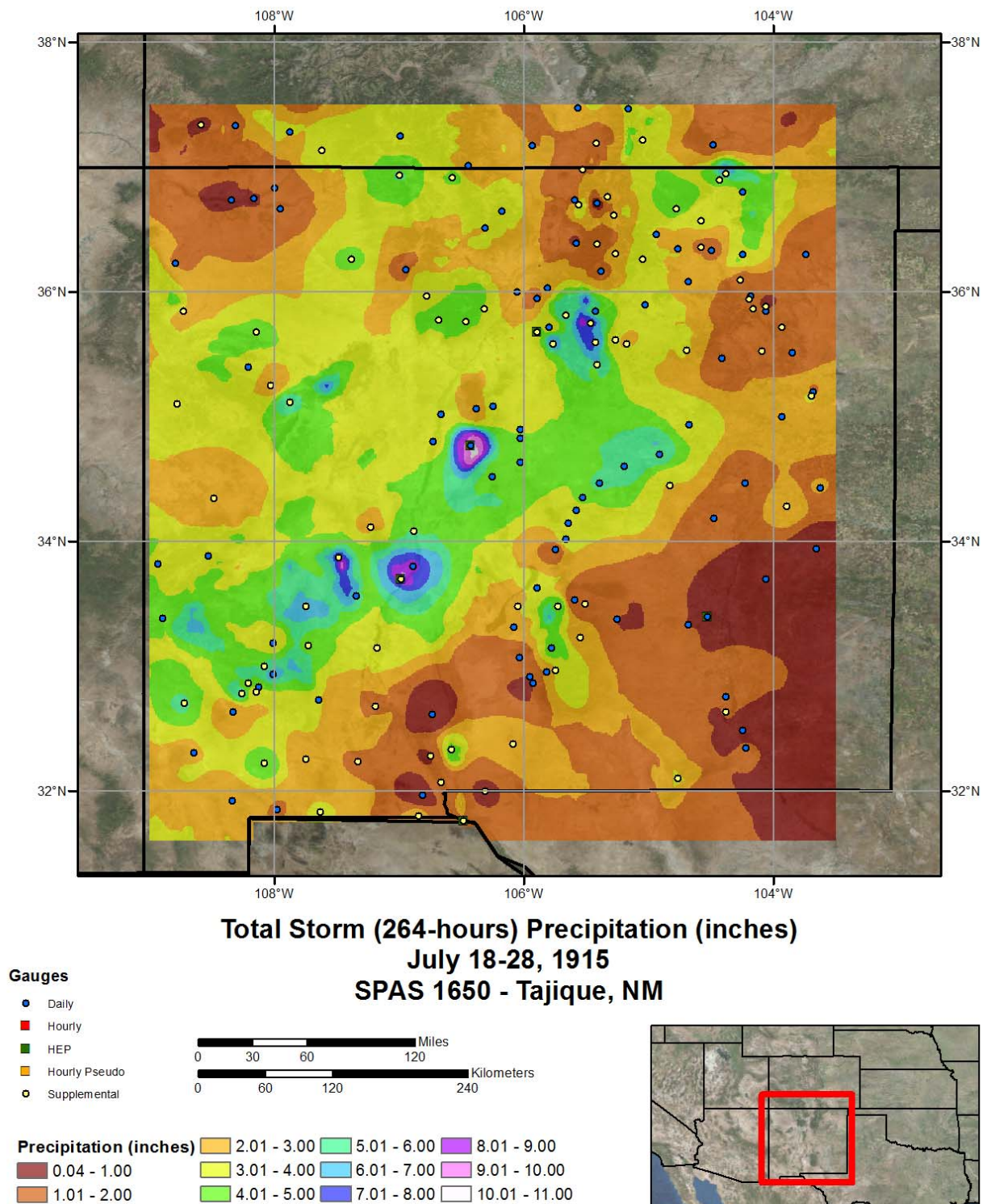
Storm 1650 - July 18 (0800 UTC) - July 29 (0700 UTC), 1915															
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)															
Area (mi ²)	Duration (hours)														
	1	2	3	4	5	6	12	18	24	36	48	72	96	120	Total
0.4	2.03	3.07	3.73	4.26	4.73	4.89	5.32	5.43	5.50	6.61	6.83	7.15	7.15	7.16	7.16
1	2.01	3.06	3.72	4.23	4.71	4.86	5.29	5.41	5.47	6.59	6.80	7.11	7.11	7.12	7.12
10	1.98	3.02	3.67	4.16	4.65	4.80	5.22	5.33	5.41	6.50	6.71	7.00	7.00	7.04	7.04
25	1.97	3.01	3.66	4.14	4.63	4.77	5.19	5.30	5.39	6.47	6.68	6.96	6.96	7.00	7.00
50	1.96	2.96	3.59	4.11	4.55	4.71	5.12	5.23	5.29	6.35	6.55	6.87	6.87	6.87	6.87
100	1.91	2.90	3.52	4.01	4.46	4.61	5.02	5.13	5.19	6.18	6.37	6.70	6.70	6.70	6.70
150	1.88	2.84	3.45	3.94	4.37	4.52	4.92	5.03	5.08	6.05	6.24	6.55	6.55	6.56	6.56
200	1.85	2.79	3.39	3.88	4.30	4.45	4.84	4.95	5.00	5.94	6.12	6.44	6.44	6.44	6.44
300	1.79	2.71	3.29	3.76	4.17	4.31	4.69	4.80	4.85	5.75	5.93	6.24	6.24	6.24	6.24
400	1.74	2.63	3.20	3.65	4.05	4.19	4.56	4.66	4.71	5.60	5.77	6.07	6.07	6.07	6.07
500	1.70	2.57	3.12	3.56	3.95	4.09	4.45	4.54	4.59	5.46	5.62	5.92	5.92	5.92	5.92
1,000	1.53	2.32	2.82	3.22	3.57	3.69	4.03	4.12	4.17	4.98	5.14	5.40	5.40	5.43	5.43
2,000	1.35	2.04	2.48	2.84	3.15	3.25	3.55	3.63	3.69	4.46	4.61	4.85	4.86	4.90	4.90
3,500	1.20	1.81	2.20	2.51	2.79	2.88	3.16	3.23	3.29	4.03	4.17	4.39	4.40	4.49	4.49
5,000	1.10	1.66	2.01	2.31	2.56	2.65	2.91	2.98	3.04	3.74	3.86	4.09	4.11	4.23	4.23
7,500	0.97	1.47	1.79	2.04	2.27	2.35	2.63	2.69	2.75	3.42	3.53	3.76	3.79	3.92	3.92
10,000	0.88	1.33	1.62	1.87	2.06	2.14	2.44	2.50	2.56	3.17	3.27	3.51	3.58	3.71	3.71
15,000	0.75	1.14	1.38	1.58	1.76	1.82	2.16	2.21	2.29	2.85	2.95	3.17	3.26	3.39	3.39
20,000	0.66	0.99	1.21	1.39	1.54	1.60	1.95	1.99	2.07	2.59	2.69	2.95	3.05	3.18	3.18
35,000	0.49	0.74	0.90	1.05	1.16	1.22	1.55	1.59	1.67	2.13	2.25	2.51	2.65	2.77	2.77
50,000	0.36	0.55	0.69	0.80	0.89	0.92	1.29	1.35	1.43	1.82	1.97	2.26	2.39	2.49	2.49
75,000	0.26	0.40	0.50	0.57	0.66	0.66	0.94	1.00	1.08	1.51	1.68	1.96	2.11	2.20	2.20
100,000	0.20	0.31	0.39	0.45	0.51	0.52	0.75	0.80	0.89	1.24	1.43	1.71	1.85	1.93	1.93
126,432	0.16	0.25	0.31	0.36	0.41	0.43	0.60	0.66	0.73	1.02	1.18	1.42	1.55	1.62	1.62



CO-NM Regional Extreme Precipitation Study

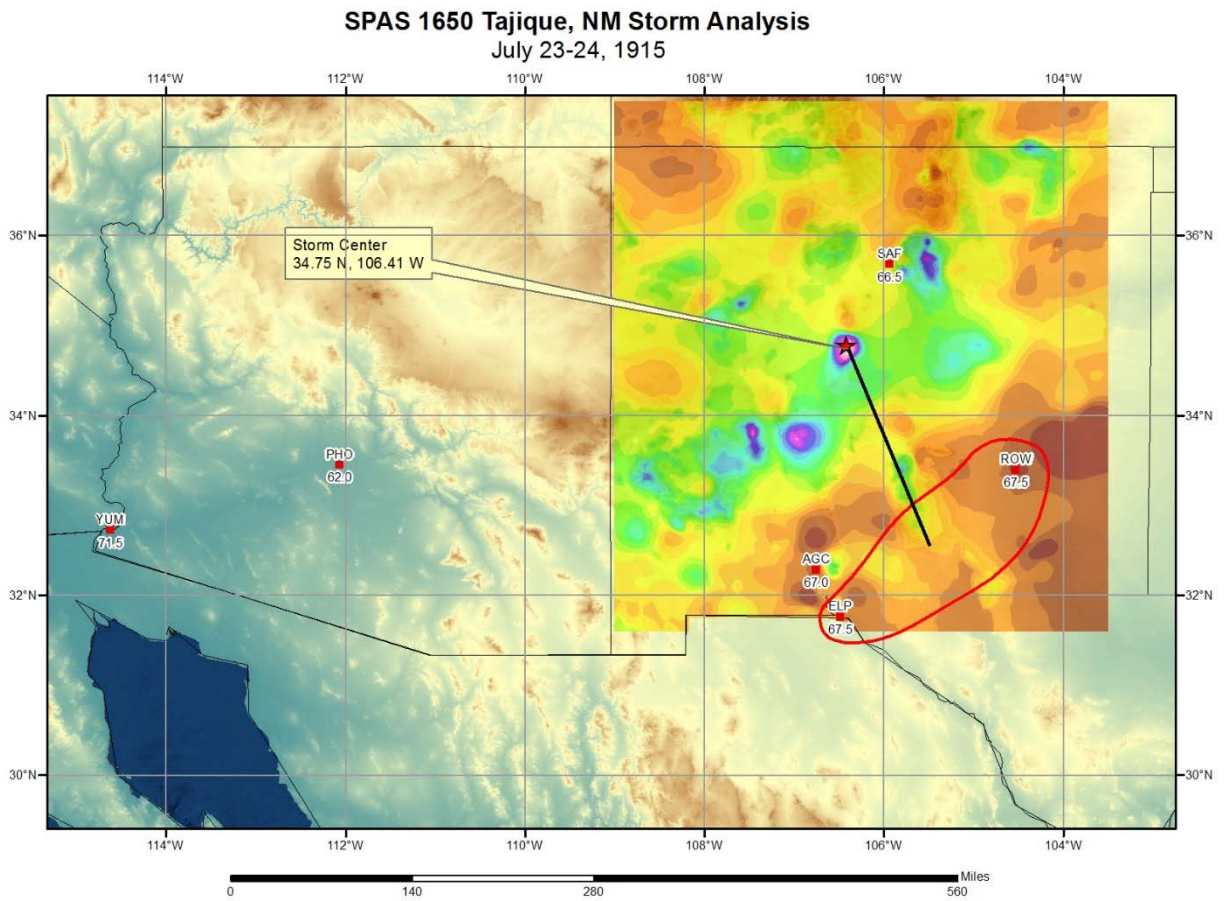


CO-NM Regional Extreme Precipitation Study



4/3/2015

CO-NM Regional Extreme Precipitation Study



Mongollon Rim, AZ

January 14-21, 1916

Storm Type: General Frontal

Storm Precipitation Analysis System (SPAS) For Storm #1144_2

General Storm Location: Reno RS (near), Arizona

Storm Dates: January 14 (0600Z) – January 21 (0600Z), 1916

Event: Winter storm

DAD Zone 2: Mongollon Rim

Latitude: 33.9042

Longitude: -111.4125

Max. Grid/Radar Rainfall Amount: 10.63”

Max. Observed Rainfall Amount: 8.90” Reno RS, AZ

Number of Stations: 217 (77 Daily, 45 Hourly, 15 Hourly Pseudo, 77 Supplemental and 3 Supplemental Pseudo)

SPAS Version: 7.0

Base Map Used: PRISM Mean (71-00) January Precipitation

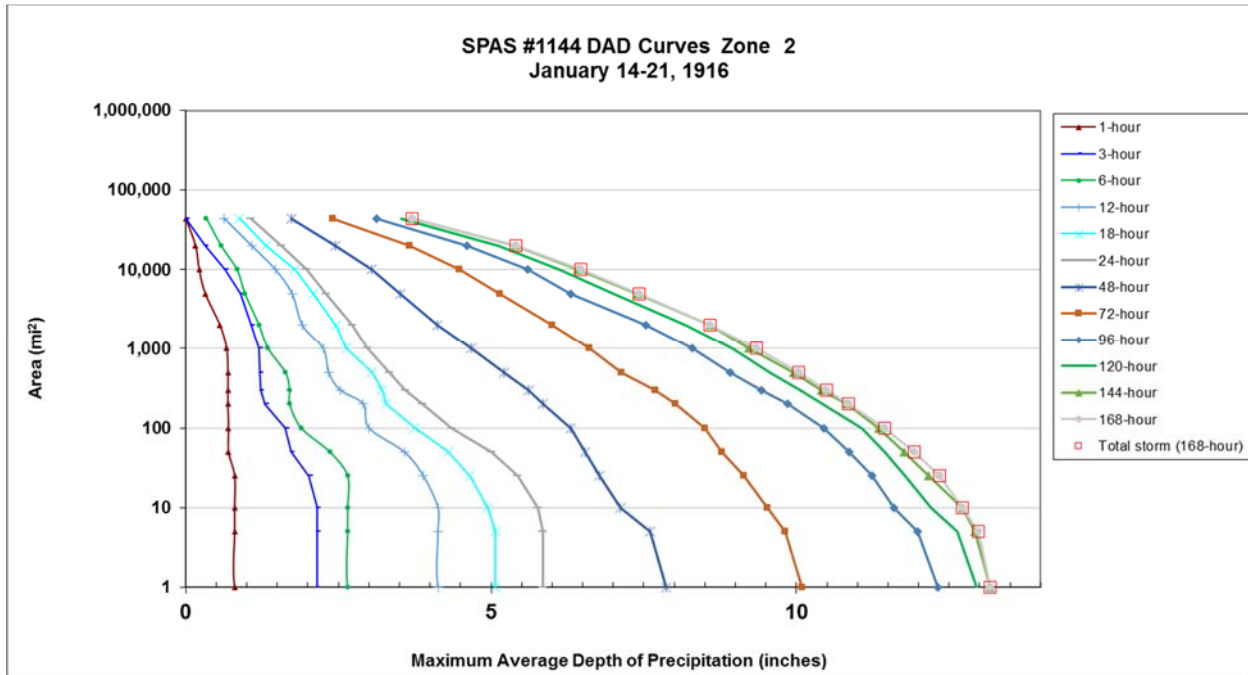
Spatial resolution: 30-sec

Radar Included: No

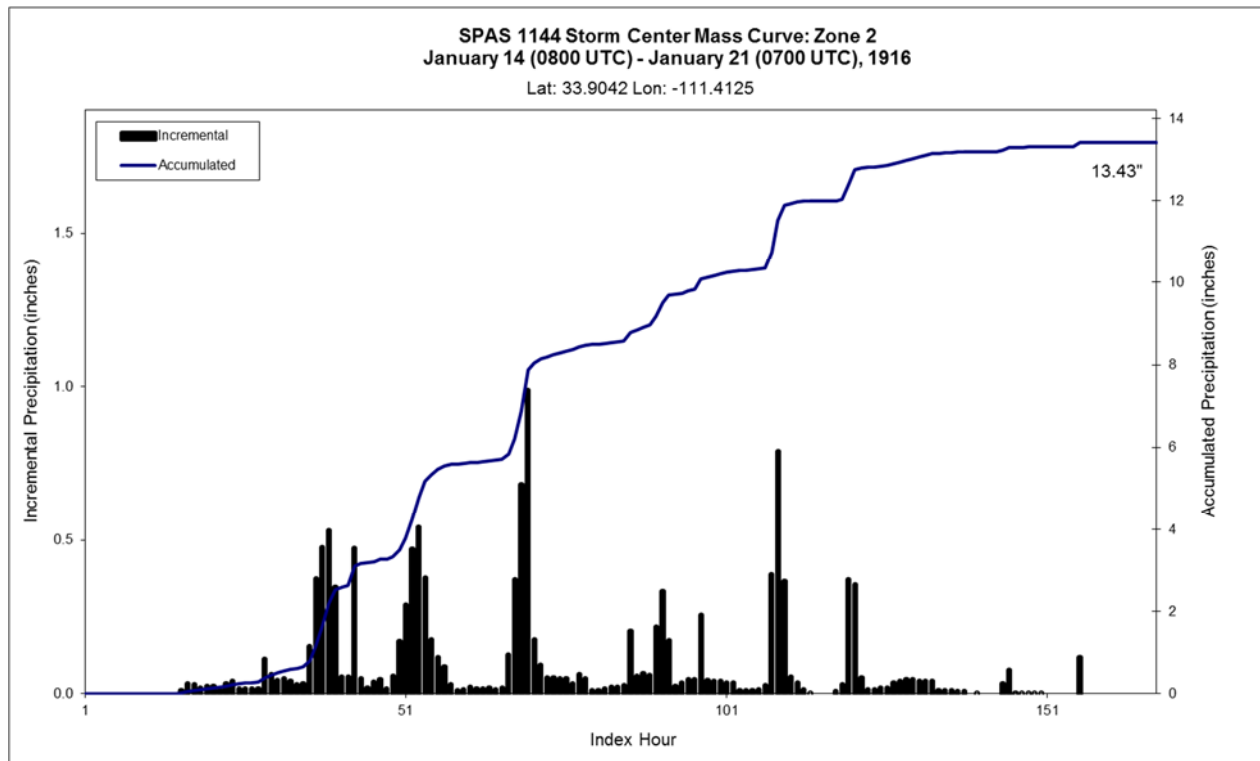
Depth-Area-Duration (DAD) analysis: Yes

CO-NM Regional Extreme Precipitation Study

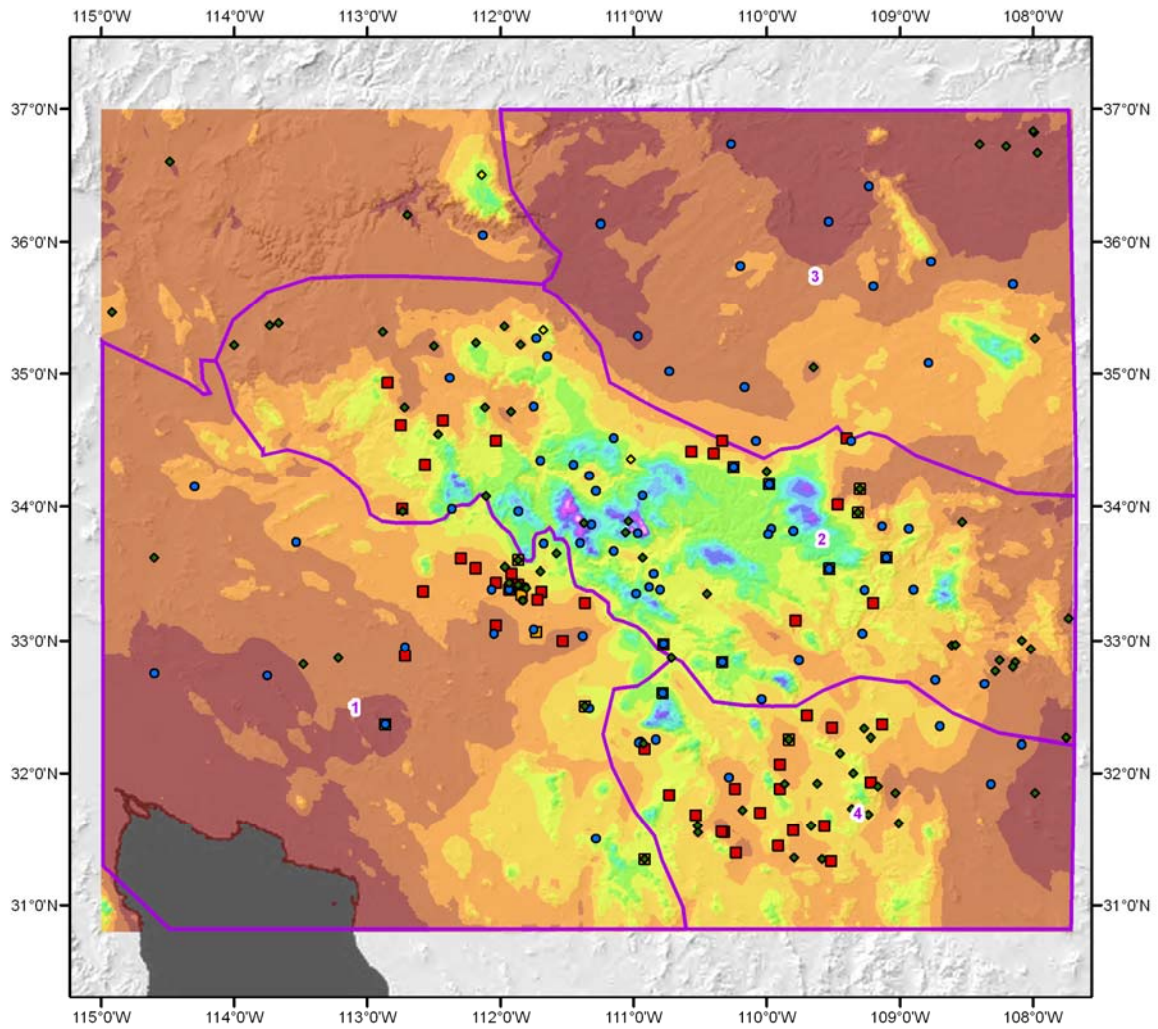
Storm 1144 - January 14 (0800 UTC) - January 21 (0700 UTC), 1916													
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)													
Area (mi ²)	Duration (hours)												
	1	3	6	12	18	24	48	72	96	120	144	168	Total
0.27	1.07	2.42	2.89	4.42	5.20	6.11	8.06	10.35	12.55	13.16	13.43	13.43	13.43
1	0.80	2.15	2.65	4.13	5.07	5.85	7.86	10.09	12.31	12.95	13.17	13.17	13.17
5	0.80	2.15	2.65	4.13	5.07	5.85	7.60	9.81	11.98	12.63	12.92	12.98	12.98
10	0.80	2.15	2.65	4.13	4.94	5.76	7.12	9.52	11.60	12.20	12.72	12.72	12.72
25	0.80	2.02	2.65	3.89	4.65	5.44	6.78	9.14	11.24	11.78	12.17	12.35	12.35
50	0.70	1.72	2.36	3.58	4.30	5.00	6.54	8.78	10.86	11.44	11.77	11.93	11.93
100	0.70	1.63	1.89	3.00	3.75	4.35	6.30	8.50	10.45	11.07	11.35	11.44	11.44
200	0.69	1.30	1.70	2.91	3.28	3.87	5.85	8.02	9.86	10.42	10.82	10.85	10.85
300	0.69	1.22	1.70	2.53	3.21	3.60	5.61	7.69	9.43	10.06	10.41	10.49	10.49
500	0.69	1.21	1.63	2.34	3.05	3.34	5.22	7.14	8.92	9.57	9.95	10.03	10.03
1,000	0.67	1.20	1.35	2.25	2.63	2.97	4.68	6.61	8.29	8.95	9.22	9.35	9.35
2,000	0.56	1.07	1.20	1.91	2.46	2.73	4.12	6.00	7.54	8.19	8.58	8.59	8.59
5,000	0.32	0.90	0.97	1.74	2.09	2.30	3.52	5.15	6.31	7.01	7.39	7.43	7.43
10,000	0.22	0.64	0.84	1.47	1.79	1.98	3.05	4.48	5.60	6.11	6.41	6.47	6.47
20,000	0.16	0.31	0.58	1.08	1.31	1.57	2.45	3.66	4.60	5.12	5.39	5.40	5.40
44,017	0.00	0.00	0.34	0.63	0.88	1.07	1.73	2.41	3.12	3.53	3.71	3.71	3.71



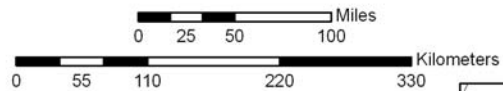
CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



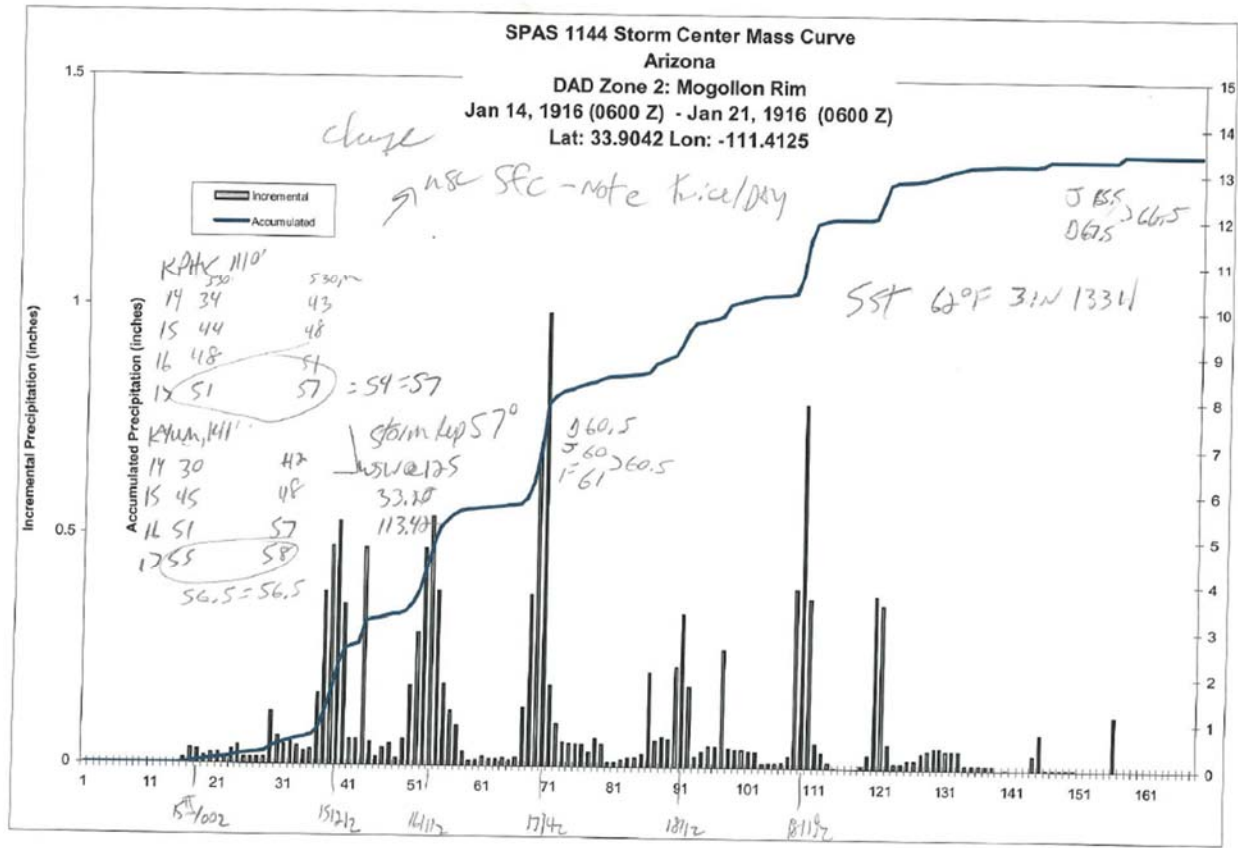
Total Storm Precipitation
SPAS storm number: 1144
January 14 (0600Z) – January 21 (0600Z), 1916



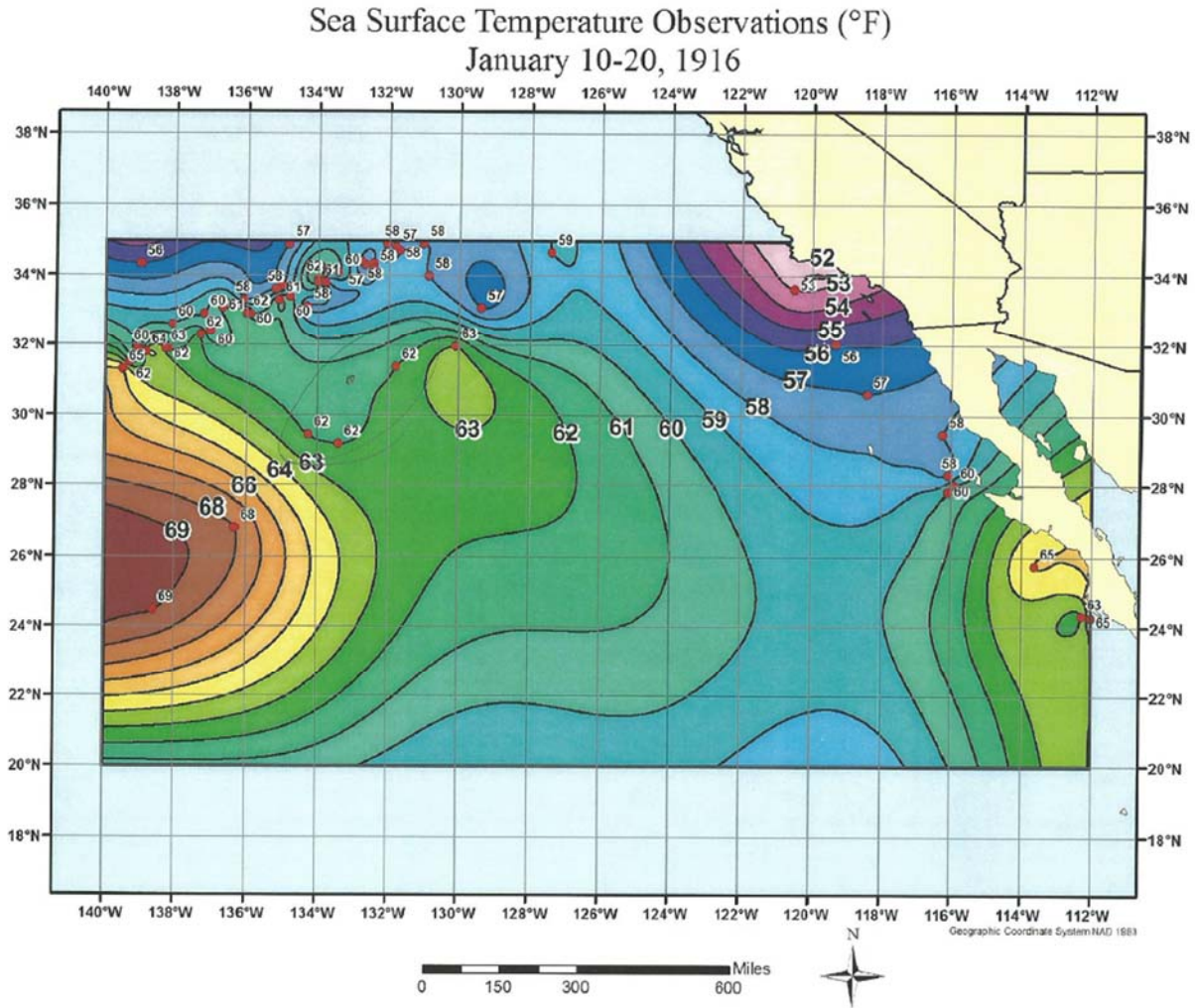
Precipitation (inches)



CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



Cibola NF, NM

January 14-21, 1916

Storm Type: General Frontal

Storm Precipitation Analysis System (SPAS) For Storm #1144_3

General Storm Location: Reno RS (near), Arizona

Storm Dates: January 14 (0600Z) – January 21 (0600Z), 1916

Event: Winter storm

DAD Zone 3: Colorado Plateau

Latitude: 35.1125

Longitude: -108.1958

Max. Grid/Radar Rainfall Amount: 8.45”

Max. Observed Rainfall Amount: n/a

Number of Stations: 217 (77 Daily, 45 Hourly, 15 Hourly Pseudo, 77 Supplemental and 3 Supplemental Pseudo)

SPAS Version: 7.0

Base Map Used: PRISM Mean (71-00) January Precipitation

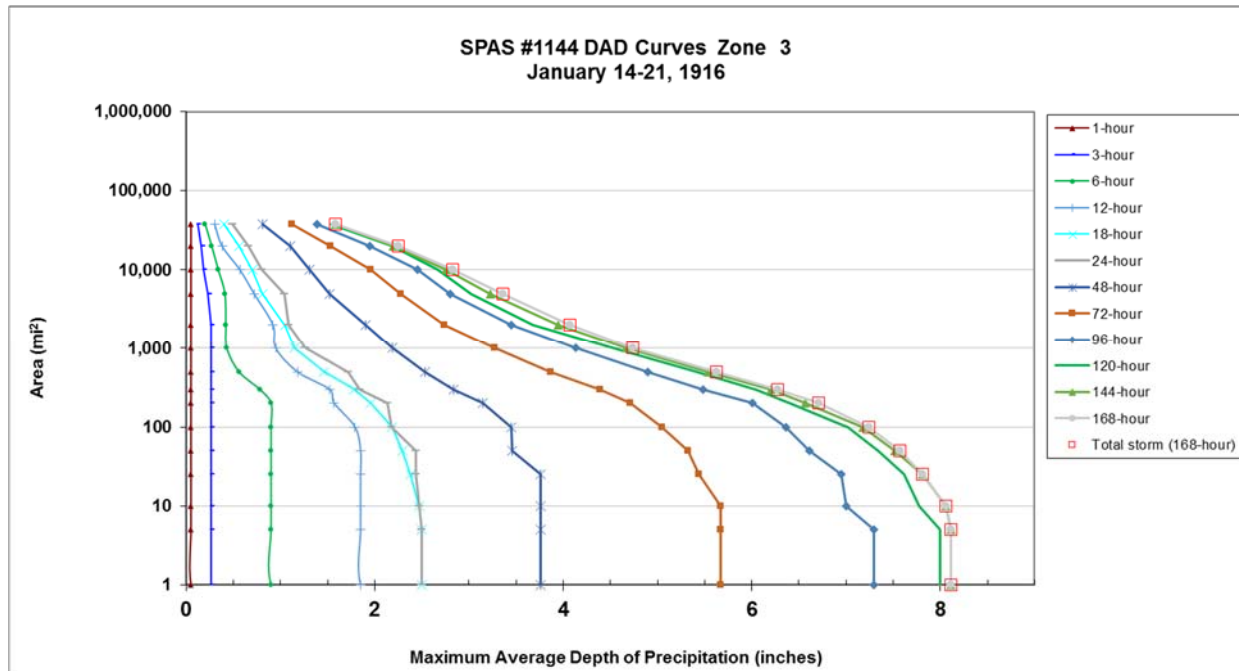
Spatial resolution: 30-sec

Radar Included: N

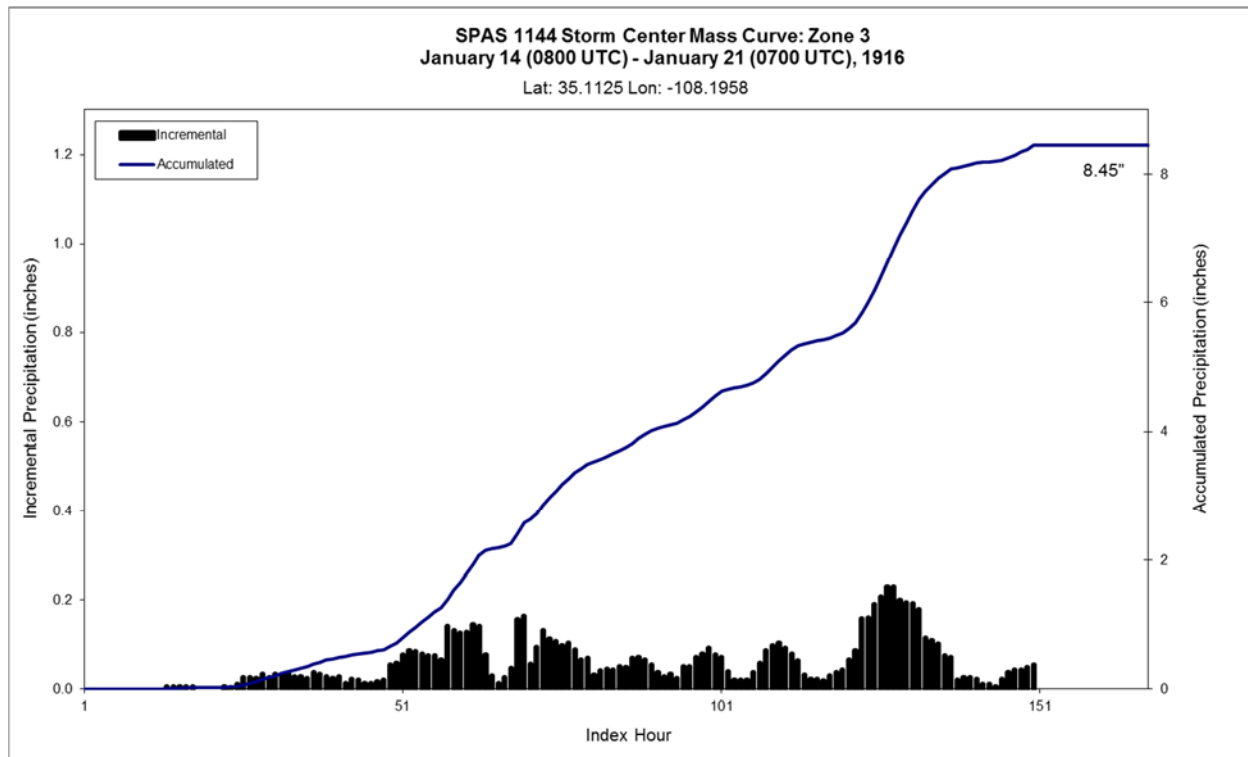
Depth-Area-Duration (DAD) analysis: Yes

CO-NM Regional Extreme Precipitation Study

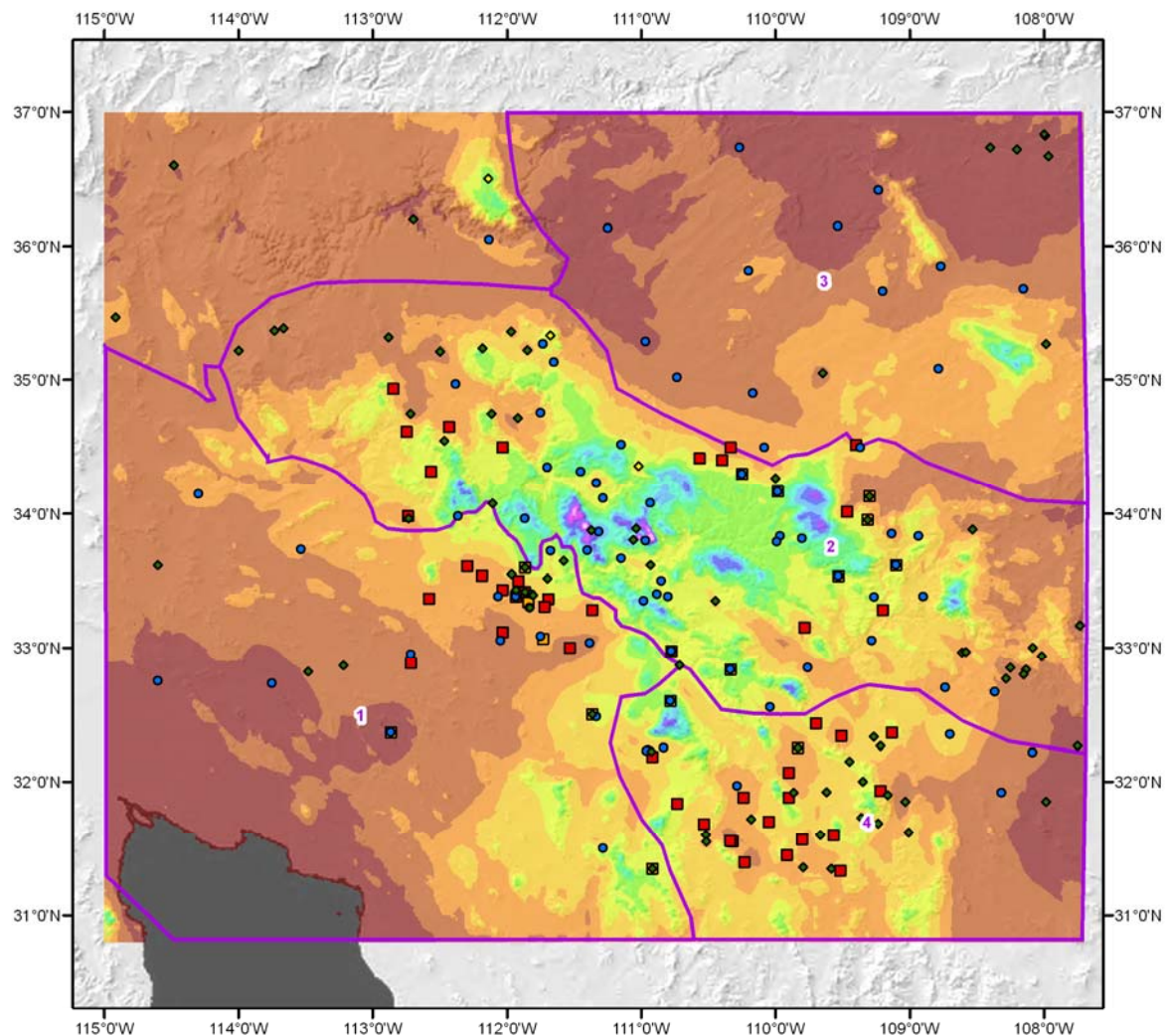
Storm 1144 - January 14 (0800 UTC) - January 21 (0700 UTC), 1916													
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)													
Area (mi ²)	Duration (hours)												
	1	3	6	12	18	24	48	72	96	120	144	168	Total
0.27	0.23	0.66	1.25	2.16	2.59	2.75	4.12	5.96	7.62	8.27	8.45	8.45	8.45
1	0.05	0.26	0.90	1.85	2.50	2.50	3.76	5.67	7.30	8.00	8.11	8.11	8.11
5	0.05	0.26	0.90	1.85	2.50	2.50	3.76	5.67	7.30	8.00	8.11	8.11	8.11
10	0.05	0.26	0.90	1.85	2.47	2.47	3.76	5.67	7.00	7.78	8.06	8.06	8.06
25	0.05	0.26	0.90	1.85	2.38	2.44	3.76	5.44	6.95	7.62	7.81	7.81	7.81
50	0.05	0.26	0.90	1.85	2.29	2.44	3.46	5.32	6.61	7.34	7.52	7.57	7.57
100	0.05	0.26	0.90	1.79	2.18	2.18	3.45	5.05	6.36	7.02	7.18	7.24	7.24
200	0.05	0.26	0.90	1.57	1.96	2.13	3.15	4.71	6.01	6.40	6.57	6.71	6.71
300	0.05	0.26	0.78	1.52	1.78	1.84	2.84	4.39	5.48	6.04	6.20	6.27	6.27
500	0.05	0.26	0.56	1.18	1.46	1.72	2.53	3.87	4.90	5.42	5.54	5.63	5.63
1,000	0.05	0.26	0.43	0.95	1.15	1.26	2.19	3.27	4.13	4.52	4.67	4.74	4.74
2,000	0.05	0.26	0.42	0.92	1.05	1.09	1.90	2.74	3.45	3.68	3.95	4.07	4.07
5,000	0.05	0.23	0.41	0.72	0.81	1.04	1.52	2.28	2.80	3.02	3.23	3.36	3.36
10,000	0.05	0.18	0.34	0.57	0.70	0.80	1.31	1.96	2.45	2.67	2.76	2.83	2.83
20,000	0.05	0.16	0.27	0.38	0.56	0.66	1.10	1.53	1.95	2.19	2.20	2.25	2.25
38,160	0.05	0.12	0.20	0.30	0.40	0.49	0.81	1.12	1.39	1.54	1.58	1.58	1.58



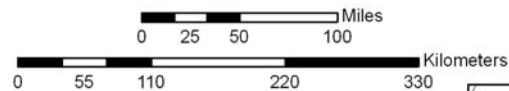
CO-NM Regional Extreme Precipitation Study



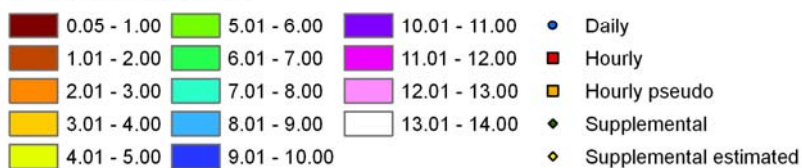
CO-NM Regional Extreme Precipitation Study



Total Storm Precipitation
SPAS storm number: 1144
January 14 (0800 Z) - January 21 (0700Z), 1916

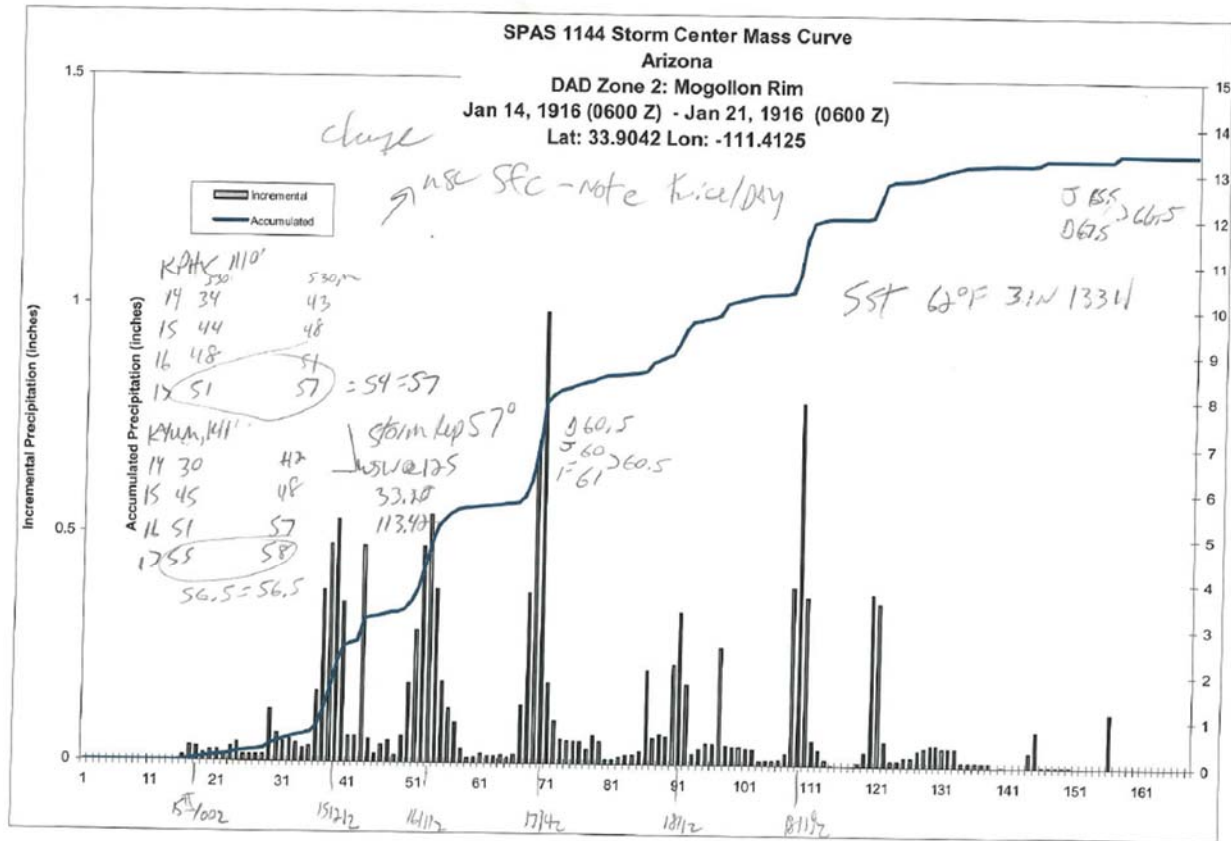


Precipitation (inches)

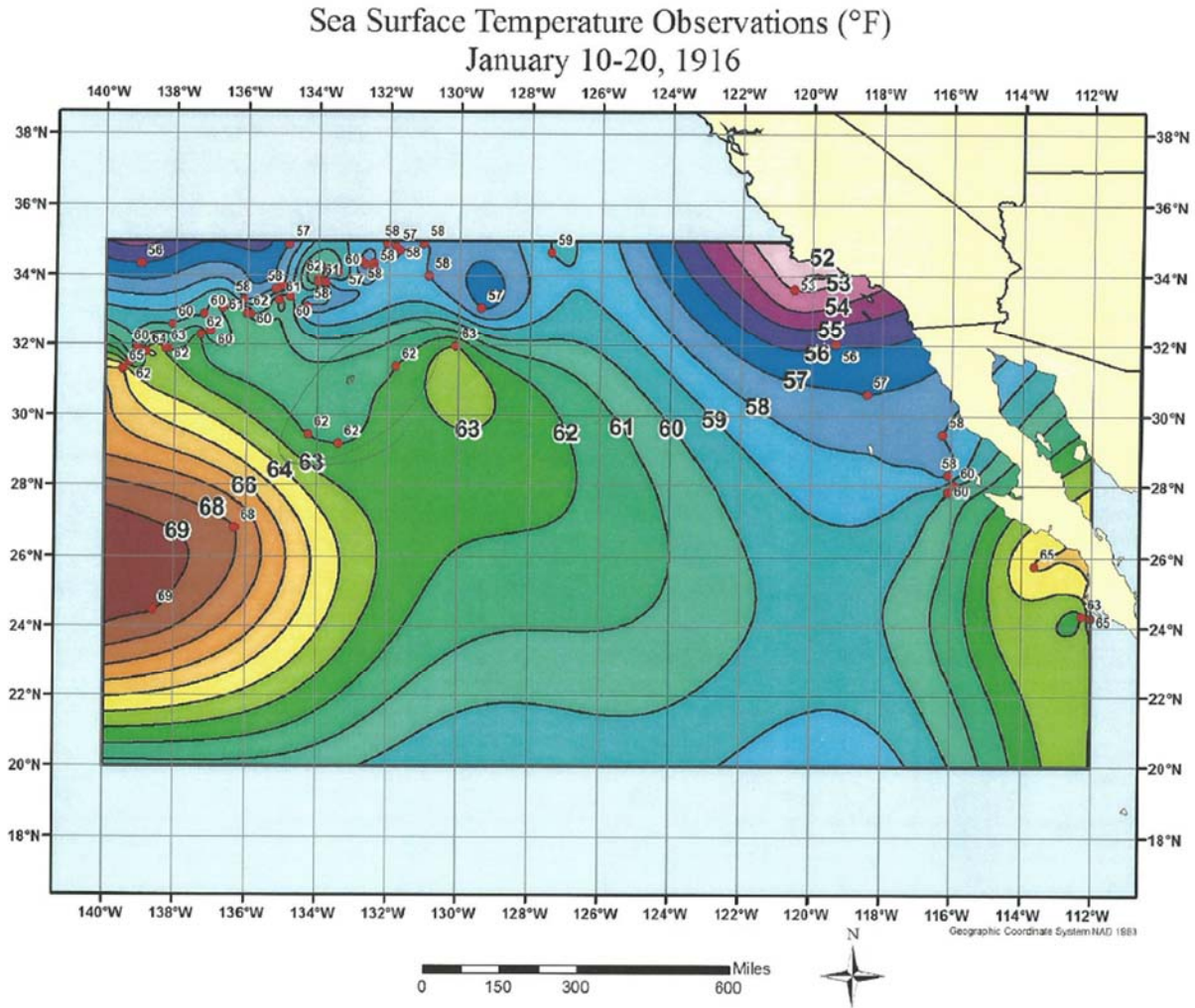


Metstat/AWA October 16, 2009

CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



Santa Catalina, AZ

January 14-21, 1916

Storm Type: General Frontal

Storm Precipitation Analysis System (SPAS) For Storm #1144_4

General Storm Location: Reno RS (near), Arizona

Storm Dates: January 14 (0600Z) – January 21 (0600Z), 1916

Event: Winter storm

DAD Zone 4: Basin/Range of Southeastern Arizona

Latitude: 32.4292

Longitude: -110.8125

Max. Grid/Radar Rainfall Amount: 10.63”

Max. Observed Rainfall Amount: n/a

Number of Stations: 217 (77 Daily, 45 Hourly, 15 Hourly Pseudo, 77 Supplemental and 3 Supplemental Pseudo)

SPAS Version: 7.0

Base Map Used: PRISM Mean (71-00) January Precipitation

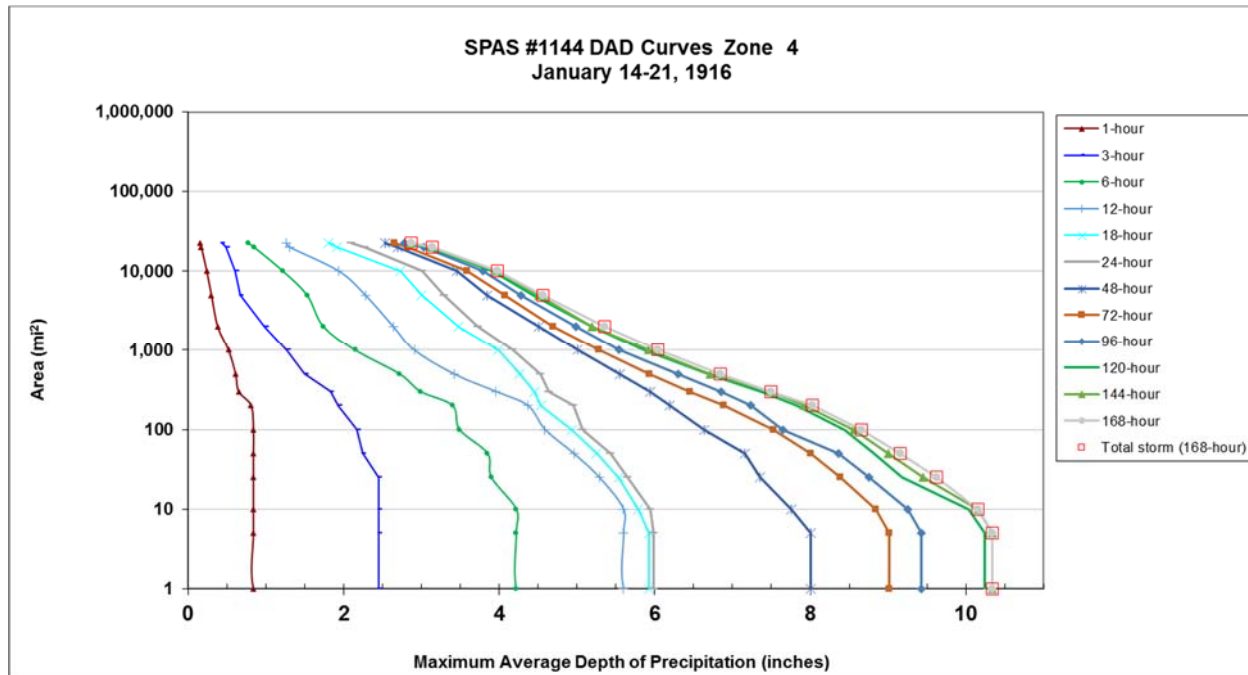
Spatial resolution: 30-sec

Radar Included: N

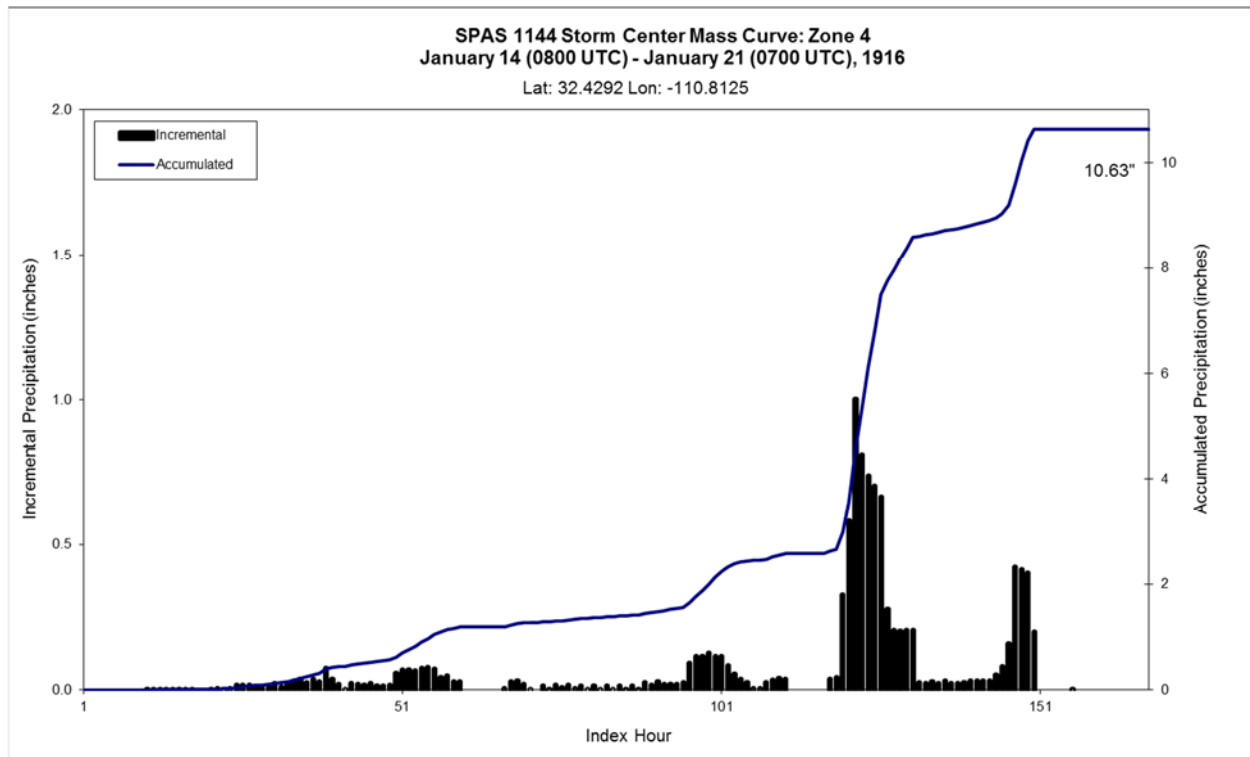
Depth-Area-Duration (DAD) analysis: Yes

CO-NM Regional Extreme Precipitation Study

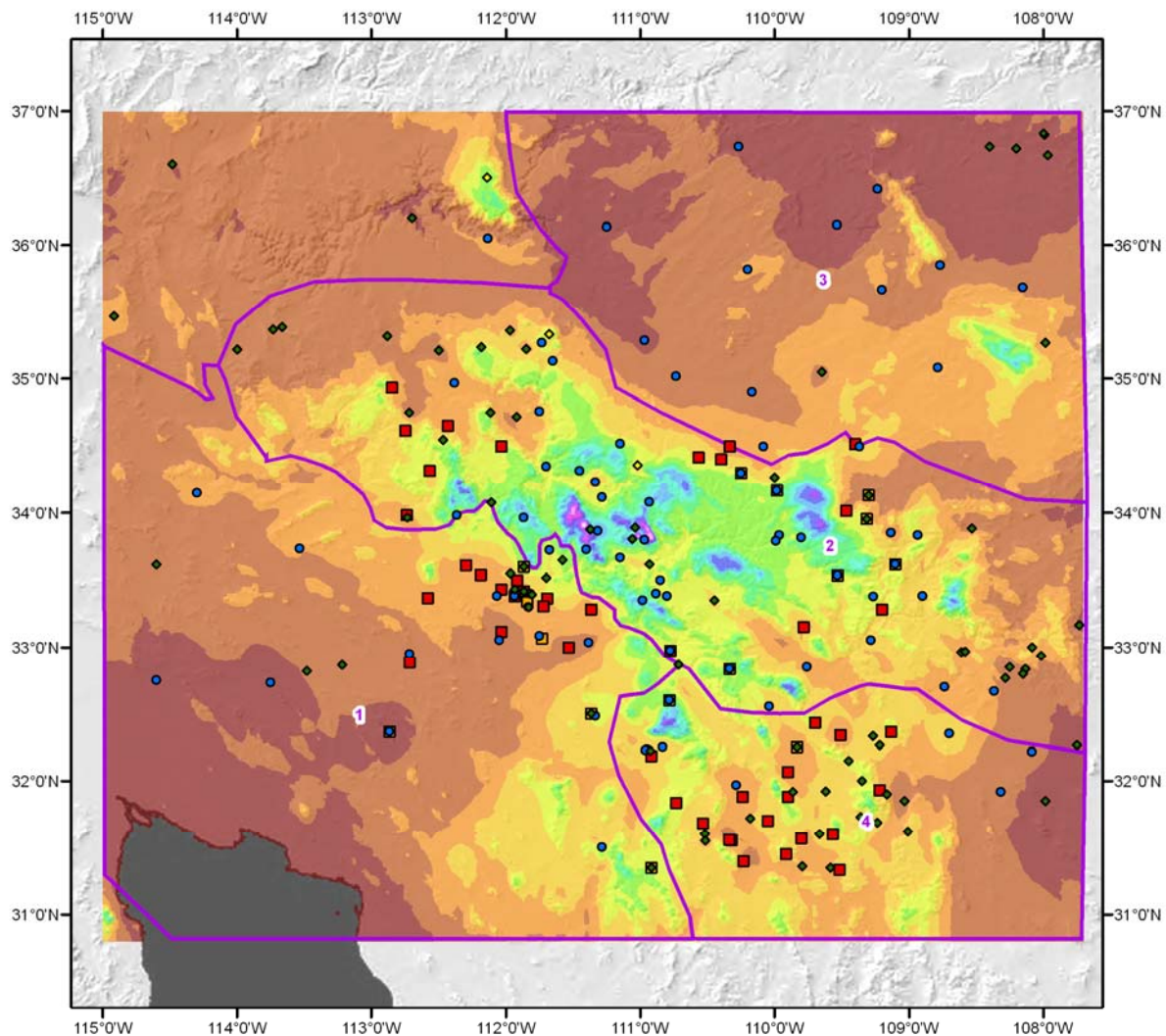
Storm 1144 - January 14 (0800 UTC) - January 21 (0700 UTC), 1916													
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)													
Area (mi ²)	Duration (hours)												
	1	3	6	12	18	24	48	72	96	120	144	168	Total
0.27	1.17	2.83	4.50	5.93	6.11	6.27	8.34	9.32	9.73	10.53	10.63	10.63	10.63
1	0.84	2.45	4.22	5.60	5.93	5.99	8.01	9.01	9.43	10.24	10.34	10.34	10.34
5	0.84	2.45	4.22	5.60	5.93	5.99	8.01	9.01	9.43	10.24	10.34	10.34	10.34
10	0.84	2.45	4.22	5.60	5.79	5.94	7.75	8.84	9.25	10.04	10.15	10.15	10.15
25	0.84	2.45	3.90	5.29	5.54	5.65	7.35	8.38	8.75	9.18	9.45	9.62	9.62
50	0.84	2.24	3.85	4.96	5.25	5.43	7.16	8.00	8.36	8.82	9.00	9.16	9.16
100	0.84	2.17	3.49	4.59	4.93	5.07	6.64	7.53	7.65	8.44	8.56	8.66	8.66
200	0.81	1.93	3.40	4.37	4.54	4.95	6.19	6.89	7.23	7.82	7.92	8.03	8.03
300	0.65	1.83	2.99	3.96	4.45	4.64	5.94	6.45	6.85	7.38	7.50	7.50	7.50
500	0.61	1.50	2.72	3.42	4.26	4.53	5.55	5.93	6.30	6.69	6.71	6.84	6.84
1,000	0.52	1.27	2.15	2.91	3.99	4.17	5.01	5.28	5.54	5.86	5.92	6.04	6.04
2,000	0.38	0.99	1.74	2.64	3.48	3.73	4.51	4.69	4.99	5.19	5.19	5.36	5.36
5,000	0.30	0.67	1.53	2.28	3.00	3.29	3.85	4.07	4.28	4.44	4.51	4.56	4.56
10,000	0.24	0.61	1.22	1.94	2.73	3.01	3.46	3.59	3.79	3.91	3.97	3.98	3.98
20,000	0.17	0.49	0.85	1.31	1.91	2.27	2.70	2.83	3.03	3.10	3.13	3.14	3.14
22,596	0.15	0.43	0.77	1.26	1.81	2.10	2.53	2.65	2.78	2.86	2.87	2.87	2.87



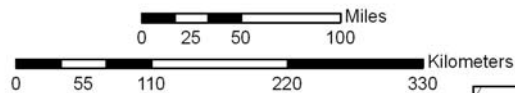
CO-NM Regional Extreme Precipitation Study



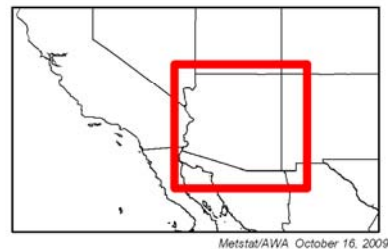
CO-NM Regional Extreme Precipitation Study



Total Storm Precipitation
SPAS storm number: 1144
January 14 (0800 Z) - January 21 (0700Z), 1916



Precipitation (inches)



SPAS 1144 Storm Center Mass Curve
Arizona
DAD Zone 2: Mogollon Rim
Jan 14, 1916 (0600 Z) - Jan 21, 1916 (0600 Z)
Lat: 33.9042 Lon: -111.4125

cluge
→ nsc SFC - note twice/day
SST 62°F 31N 133W
56.5 → 60.5
067.5

Incremental Precipitation (inches)
Accumulated Precipitation (inches)

KPHK 1110'
 14 34 530
 15 44 43
 16 48 48
 17 51 51
 18 57 57 = 54 = 57

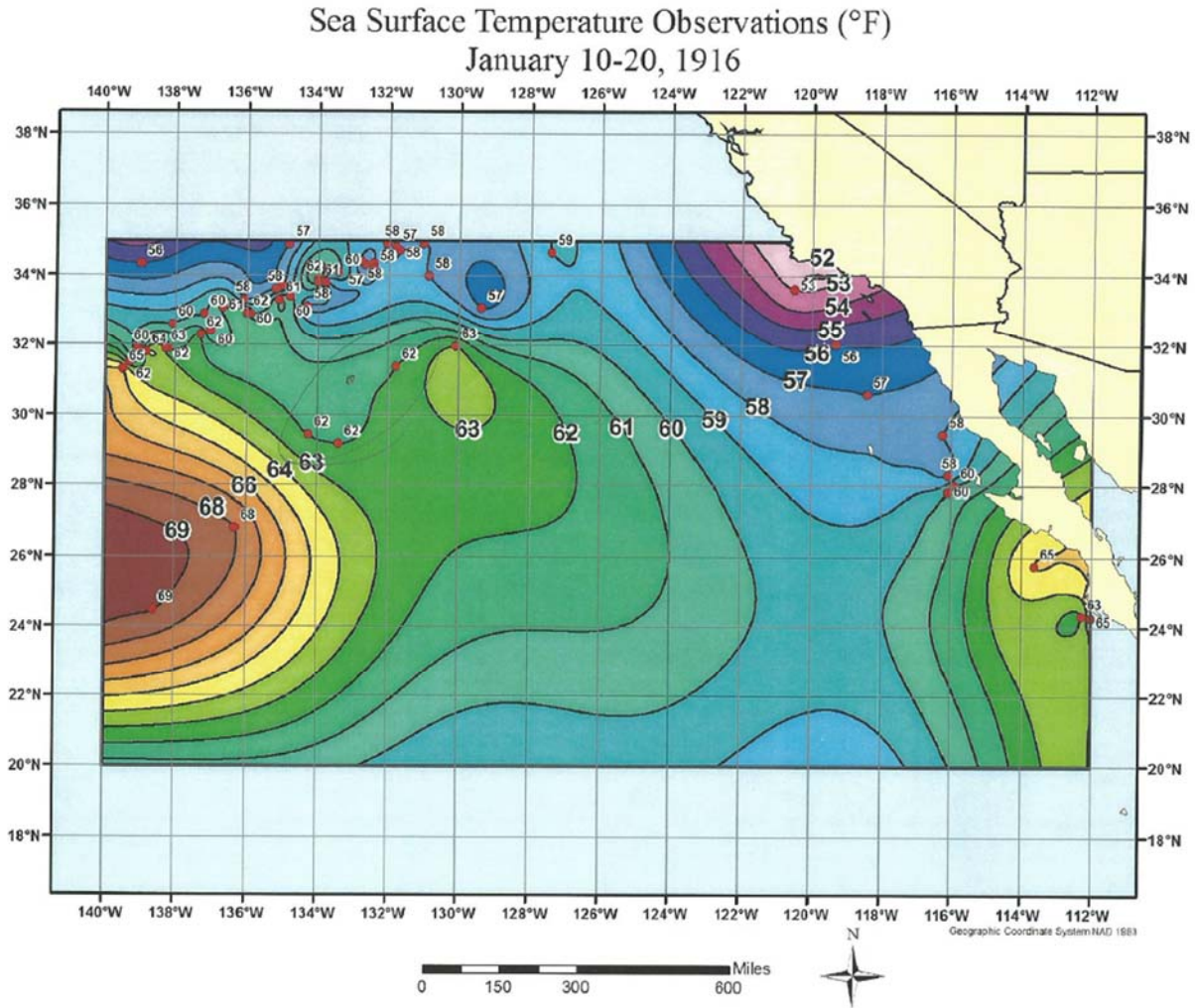
KAHK 1411'
 14 30 42
 15 45 48
 16 51 57
 17 55 58
 56.5 = 56.5

Storm up 57°
 51W 125
 33.75
 113.40

960.5
560
161
60.5

5/1002
15/12
14/12
17/12
18/12
19/12

CO-NM Regional Extreme Precipitation Study



Savageton, WY
September 27 – October 1, 1923
Storm Type: General

Storm Precipitation Analysis System (SPAS) For Storm #1325_1

General Storm Location: Savageton, Wyoming

Storm Dates: Sept. 27-Oct. 1, 1923

Event: Mid-latitude cyclone

DAD Zone 1

Latitude: 43.8458

Longitude: -105.8042

Max. grid rainfall amount: 17.56"

Max. observed rainfall amount: 17.10" (SAVAGETON WY)

Number of Stations: 111

SPAS Version: 9.5

Base Map Used: Based on digitized HMR Isohyetal Map (storm total Sept. 27-Oct. 1, 1923) and PRISM Sept/Oct monthly mean maps

Spatial resolution: 30 seconds

Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

Reliability of Results: The updated analysis, part of the CO//NM PMP study, included the WRF analysis max grid (based on four member run) as the basemap. The WRF analysis did not have great correlation with observation data, because of this the WRF basemap was not used and the original analysis is still used (just changed DAD zones). The complex terrain and limited number of hourly and daily data near the primary small storm center diminish the reliability of these results. In particular, there were only 5 hourly stations and their hourly data were estimated from USACE's smoothed mass rainfall curves. We theorize that the hourly data at these storm centers were estimated by USBR. However, given this was a synoptic storm with large areas of nearly continuous precipitation (rainfall), it's believed the temporal distribution of precipitation is fairly reliable. The use of the U.S. Army Corps of Engineers' isohyetal pattern coupled with the monthly mean maps for September and October provides some confidence in the spatial patterns and magnitudes of precipitation. Lastly, orographic effects (accounted for in the PRISM maps) have created a maxima in the grid (17.56") that is slightly higher than the maximum observed at a station (17.10") in the storm center; the effect at the storm center was constrained by editing the basemap.

WAR DEPARTMENT

CORPS OF ENGINEERS, U. S. ARMY

STORM STUDIES - PERTINENT DATA SHEET

Storm of 27 Sept.-1 Oct. 1923
 Assignment MR 4-23
 Location Mont., N. D., S.D., Wyo.
 Study Prepared by:
 Missouri River Division
 Omaha District Office

Part I Reviewed by H. M. Sec. of
 Weather Bureau, 8/21/45
 Part II Approved by Office, Chief
 of Engineers for Distribution
 of Factual Data, 10/15/46
 Remarks: Center at
 Savageton, Wyoming

DATA AND COMPUTATIONS COMPILED**PART I**

Preliminary Isohyetal map, in 1 sheet, scale 1:2,500,000
 Precipitation data and mass curves: (Number of Sheets)
 Form 5001-C (Hourly precip. data)----- 9
 Form 5001-B (24-hour " ")----- 22
 Form 5001-D (" " " ")----- 8
 Misc. precip. records, meteorological data, etc.----- 23
 Form 5002 (Mass rainfall curves)-----

PART II

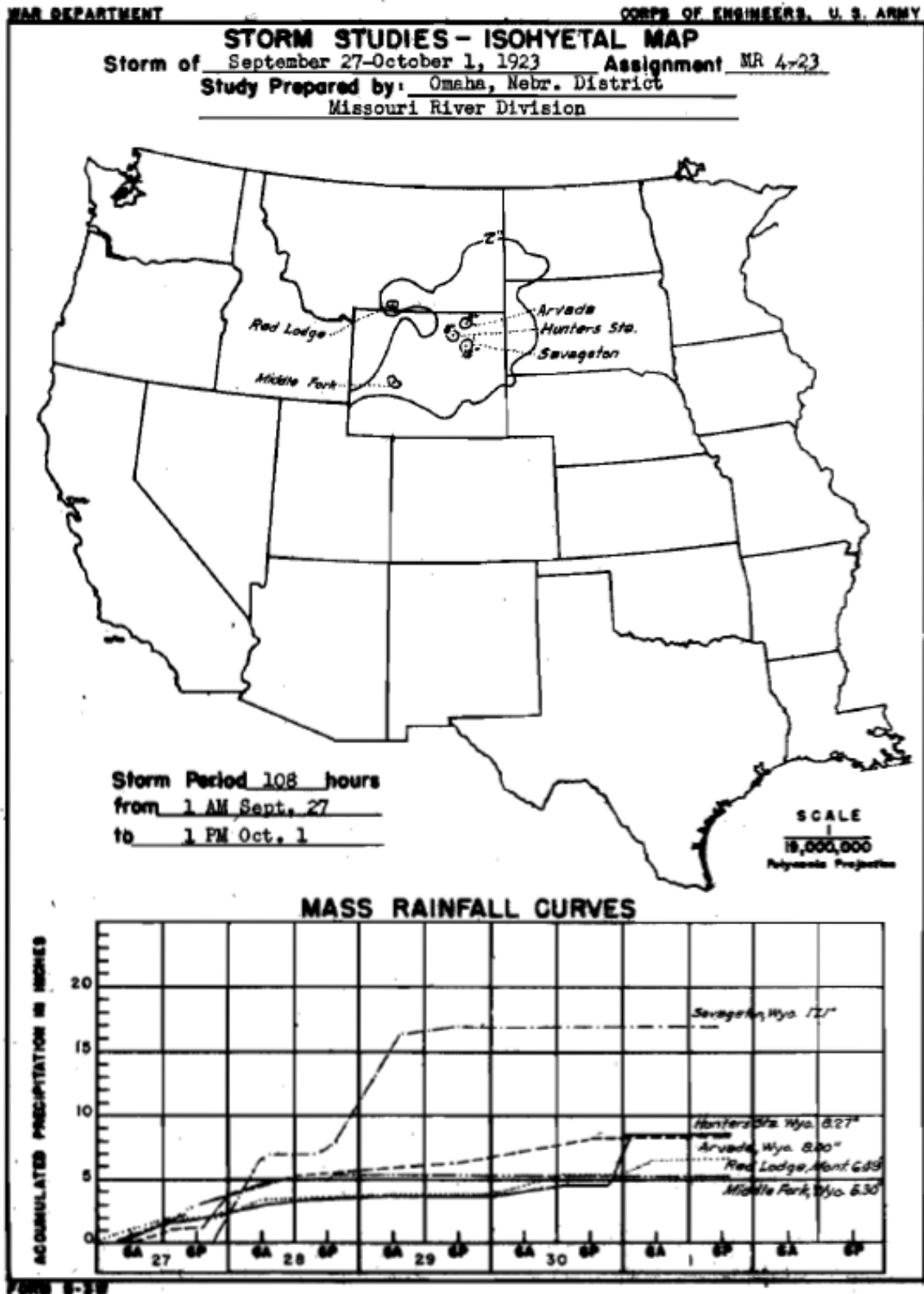
Final Isohyetal maps, in 1 sheet, scale 1:1,000,000
 Data and computation sheets:
 Form S-10 (Data from mass rainfall curves)----- 4
 Form S-11 (Depth-area data from isohyetal map)----- 1
 Form S-12 (Maximum depth-duration data)----- 22
 Maximum duration-depth-area curves----- 1
 Data relating to periods of maximum rainfall----- 2

MAXIMUM AVERAGE DEPTH OF RAINFALL IN INCHES

Area In Sq. Mi.	Duration of Rainfall in Hours										
	6	12	18	24	30	36	48	60	72	96	108
Max. Station	6.8	9.3	9.5	9.7	13.6	16.7	17.1	17.1	17.1	17.1	17.1
10	6.0	9.1	9.3	9.5	13.0	16.5	16.9	16.9	16.9	16.9	16.9
100	5.1	8.4	8.7	9.0	12.2	15.5	15.9	15.9	15.9	15.9	15.9
200	4.9	8.0	8.4	8.6	11.7	14.8	15.2	15.2	15.2	15.2	15.2
500	4.3	7.1	7.5	7.7	10.4	13.2	13.4	13.6	13.7	13.7	13.7
1,000	3.7	6.2	6.4	6.6	9.0	11.4	11.6	11.7	11.8	12.0	12.0
2,000	3.0	5.0	5.3	5.5	7.5	9.5	9.7	9.8	9.9	10.1	10.1
5,000	2.2	3.6	3.8	4.0	5.6	7.0	7.2	7.4	7.6	8.1	8.2
10,000	1.6	2.5	2.7	3.0	4.2	5.3	5.7	6.1	6.3	6.9	7.0
20,000	1.2	1.8	2.1	2.5	3.2	3.9	4.7	5.1	5.5	6.0	6.0
50,000	0.8	1.5	1.8	2.1	2.7	3.1	3.7	4.0	4.3	4.7	4.8
95,000	0.6	1.1	1.4	1.7	2.1	2.3	2.8	3.1	3.3	3.7	3.8

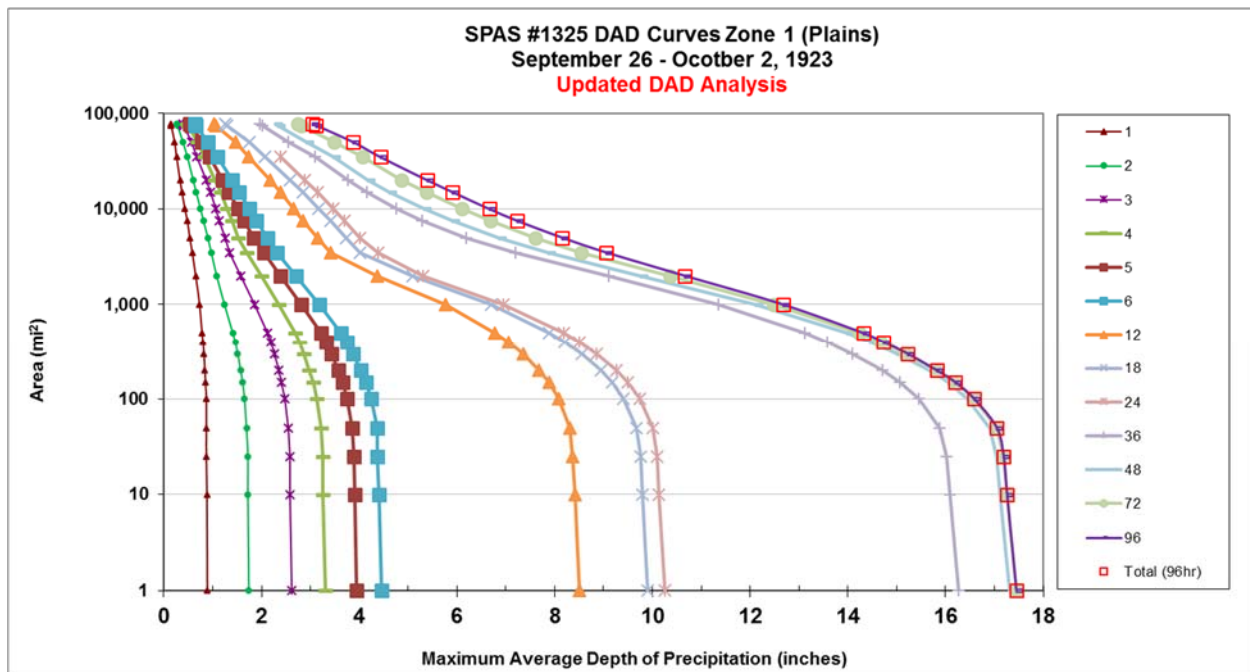
Form S-2

CO-NM Regional Extreme Precipitation Study

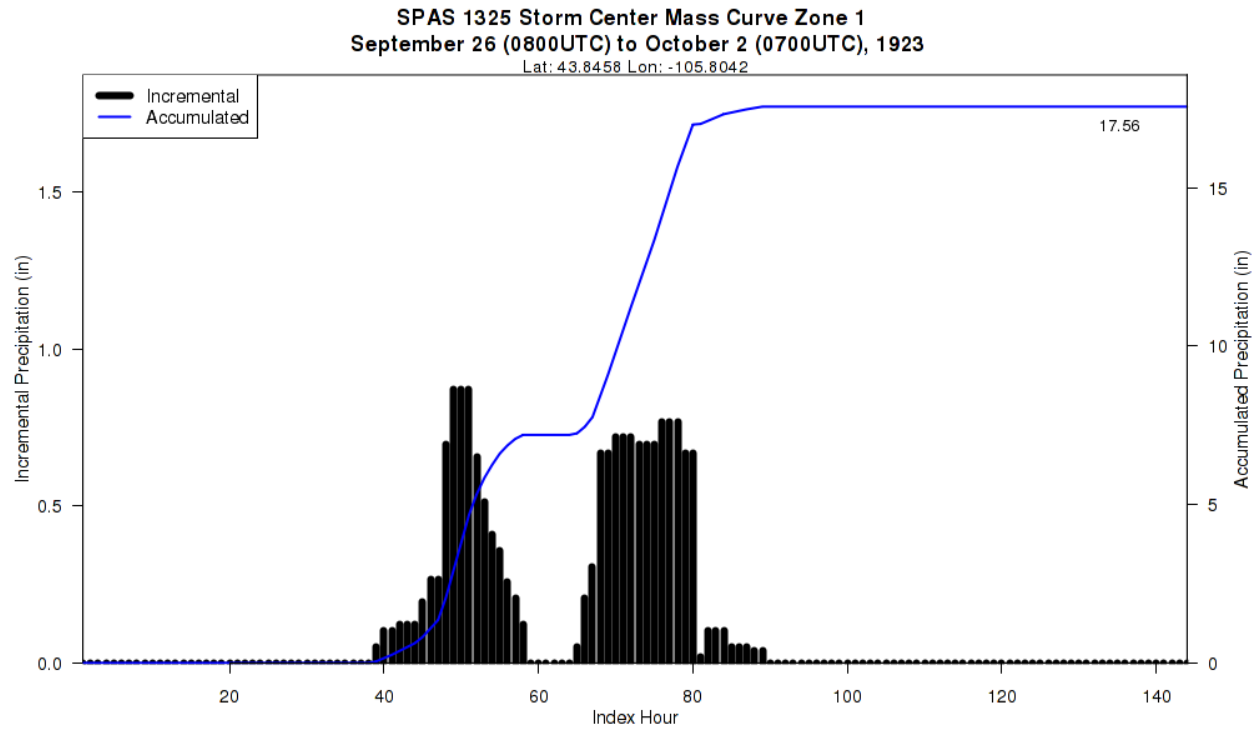


CO-NM Regional Extreme Precipitation Study

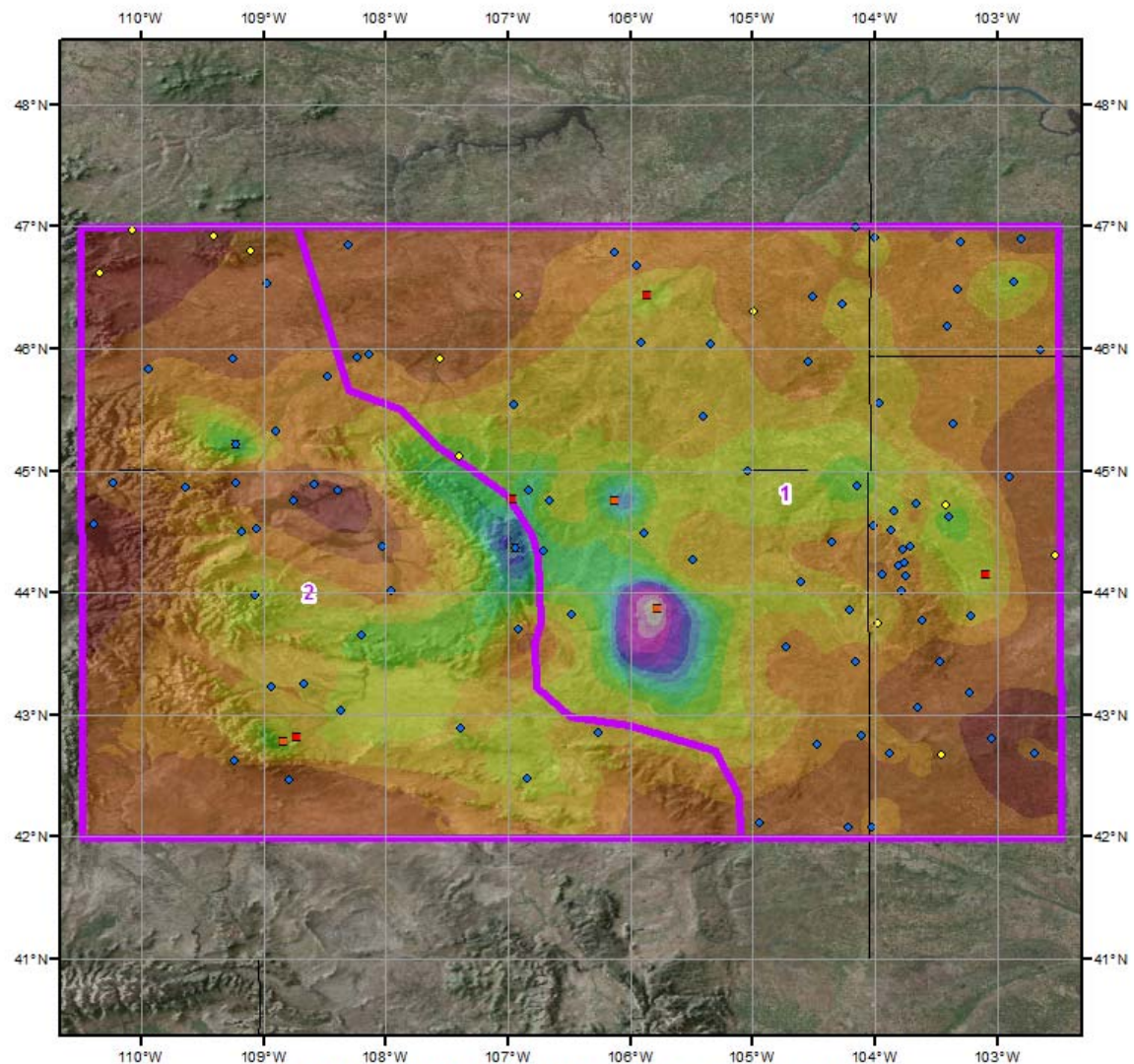
Storm 1325 Zone 1 - September 26 (0800 UTC) - October 2 (0700 UTC), 1923														
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES) Updated Analysis														
areasqmi	Duration (hours)													
	1	2	3	4	5	6	12	18	24	36	48	72	96	Total (96hr)
0.4	0.89	1.74	2.61	3.31	3.97	4.48	8.54	9.95	10.30	16.33	17.39	17.52	17.52	17.52
1	0.89	1.74	2.61	3.30	3.95	4.45	8.50	9.91	10.25	16.26	17.31	17.45	17.45	17.45
10	0.88	1.72	2.58	3.26	3.91	4.40	8.41	9.80	10.13	16.09	17.11	17.26	17.26	17.26
25	0.87	1.72	2.58	3.25	3.89	4.37	8.37	9.76	10.09	16.02	17.04	17.19	17.19	17.19
50	0.87	1.69	2.54	3.22	3.85	4.36	8.31	9.67	10.01	15.88	16.91	17.04	17.05	17.05
100	0.87	1.65	2.47	3.13	3.75	4.24	8.08	9.40	9.74	15.45	16.45	16.59	16.59	16.59
150	0.85	1.61	2.41	3.06	3.66	4.13	7.88	9.17	9.49	15.07	16.05	16.18	16.20	16.20
200	0.84	1.57	2.36	2.98	3.58	4.04	7.68	8.94	9.26	14.71	15.66	15.81	15.82	15.82
300	0.82	1.51	2.26	2.87	3.43	3.88	7.35	8.56	8.86	14.10	15.02	15.19	15.22	15.22
400	0.80	1.46	2.19	2.77	3.32	3.75	7.05	8.21	8.50	13.58	14.47	14.68	14.73	14.73
500	0.78	1.41	2.12	2.68	3.21	3.63	6.77	7.89	8.19	13.12	13.98	14.24	14.32	14.32
1,000	0.73	1.24	1.86	2.35	2.82	3.19	5.76	6.71	6.95	11.35	12.11	12.49	12.67	12.67
2,000	0.65	1.08	1.57	1.99	2.39	2.71	4.36	5.09	5.31	9.11	9.76	10.36	10.66	10.66
3,500	0.58	0.97	1.35	1.70	2.05	2.31	3.41	4.02	4.38	7.20	7.87	8.54	9.06	9.06
5,000	0.53	0.90	1.25	1.53	1.84	2.12	3.15	3.74	4.02	6.19	6.86	7.61	8.16	8.16
7,500	0.48	0.81	1.14	1.40	1.64	1.90	2.85	3.41	3.69	5.29	5.91	6.68	7.24	7.24
10,000	0.43	0.75	1.07	1.30	1.52	1.76	2.66	3.17	3.47	4.76	5.32	6.10	6.66	6.66
15,000	0.37	0.66	0.95	1.17	1.33	1.54	2.39	2.85	3.14	4.15	4.62	5.37	5.91	5.91
20,000	0.33	0.60	0.86	1.05	1.20	1.40	2.17	2.58	2.89	3.76	4.18	4.87	5.39	5.39
35,000	0.26	0.48	0.68	0.83	0.94	1.09	1.73	2.07	2.38	3.09	3.47	4.06	4.43	4.43
50,000	0.22	0.39	0.56	0.69	0.78	0.9	1.46	1.75	2	2.54	2.91	3.49	3.88	3.88
75,000	0.15	0.28	0.4	0.49	0.56	0.66	1.07	1.3	1.56	2.02	2.33	2.81	3.12	3.12
78,108	0.15	0.27	0.39	0.47	0.54	0.63	1.03	1.25	1.51	1.97	2.28	2.75	3.05	3.05



CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



Total Storm (144-hr) Precipitation (inches)

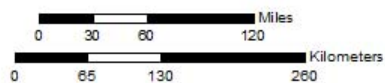
September 26 - October 2, 1923

SPAS 1325 (Savageton, WY)

Plains vs. Orographic DAD

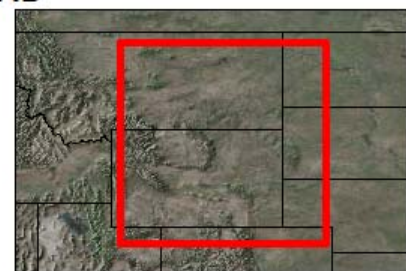
Gauges

- ◆ Daily
- Hourly
- Hour Estimated
- Hourly Est. Pseudo
- ◆ Supplemental



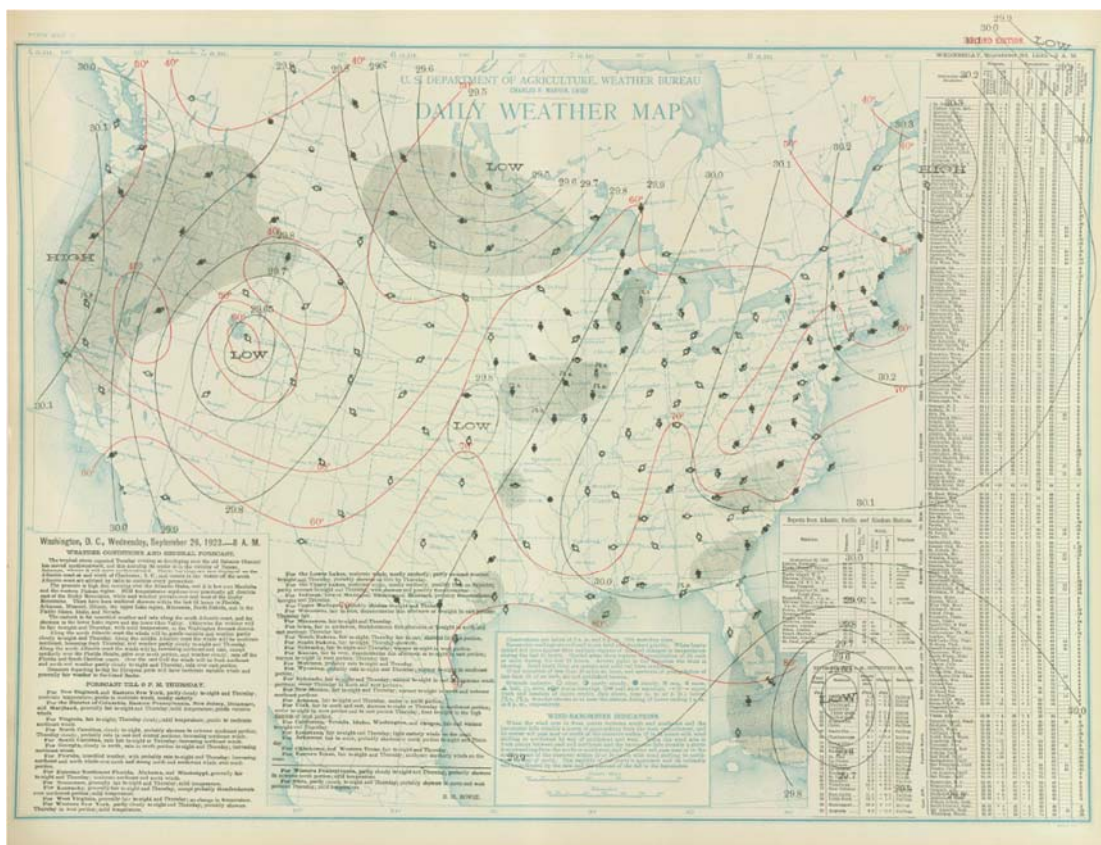
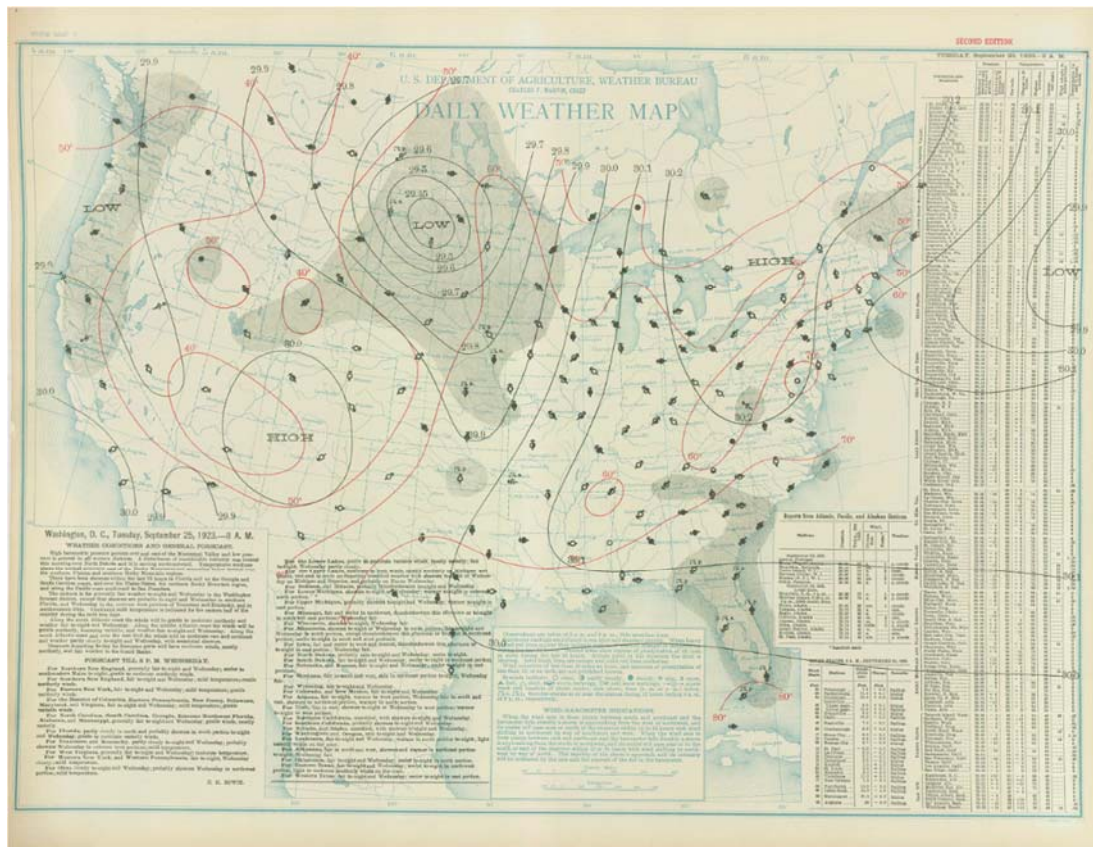
Percent Difference (%)

0.19 - 1.00	3.01 - 4.00	6.01 - 7.00	9.01 - 10.00	14.01 - 16.00
1.01 - 2.00	4.01 - 5.00	7.01 - 8.00	10.01 - 12.00	16.01 - 18.00
2.01 - 3.00	5.01 - 6.00	8.01 - 9.00	12.01 - 14.00	

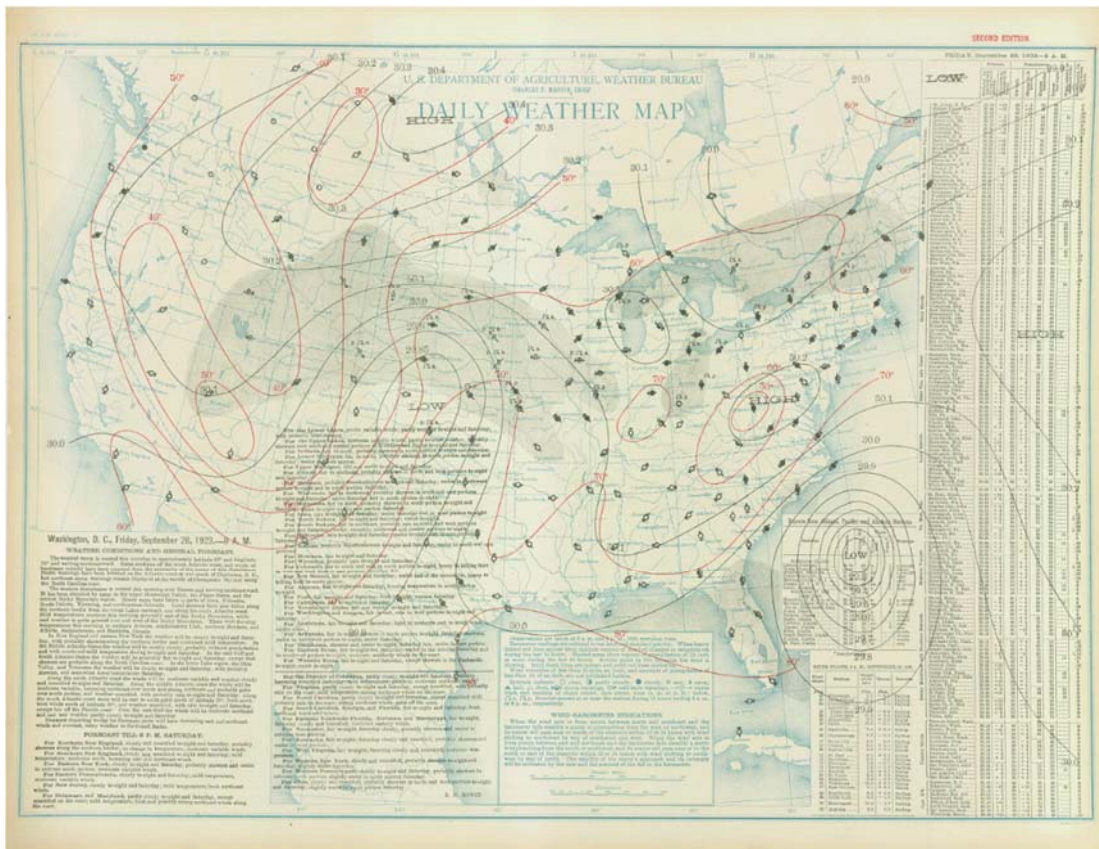
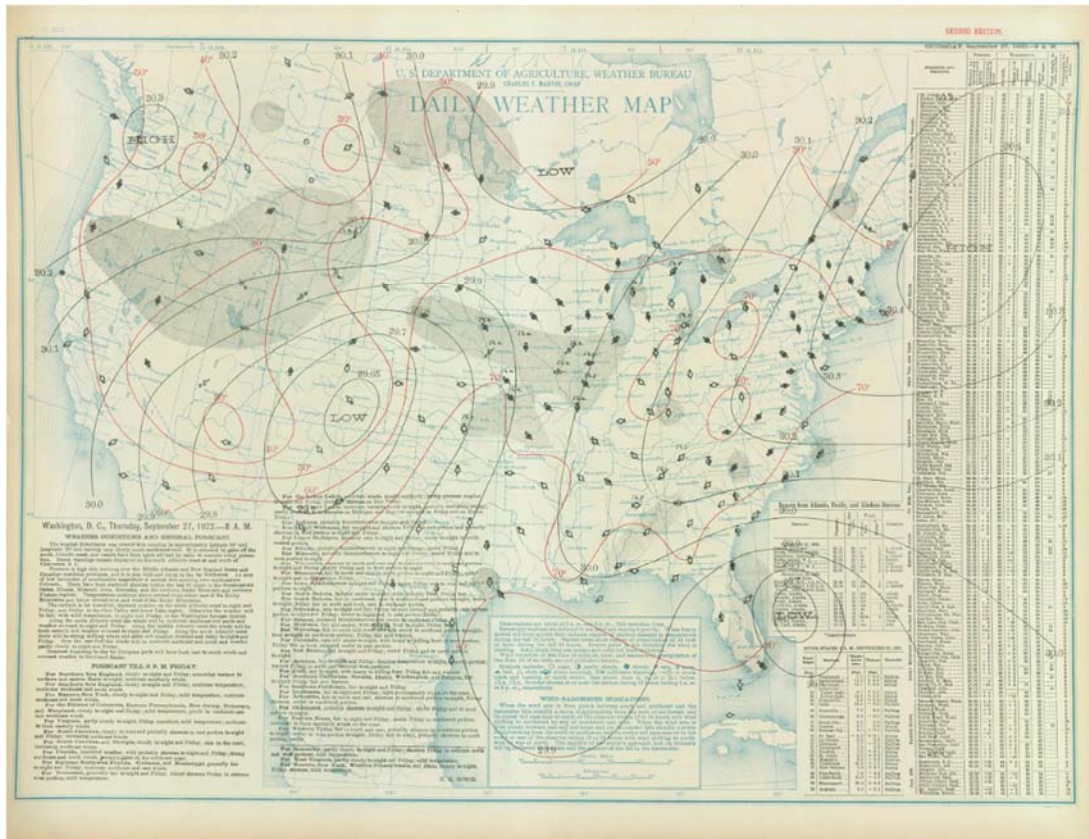


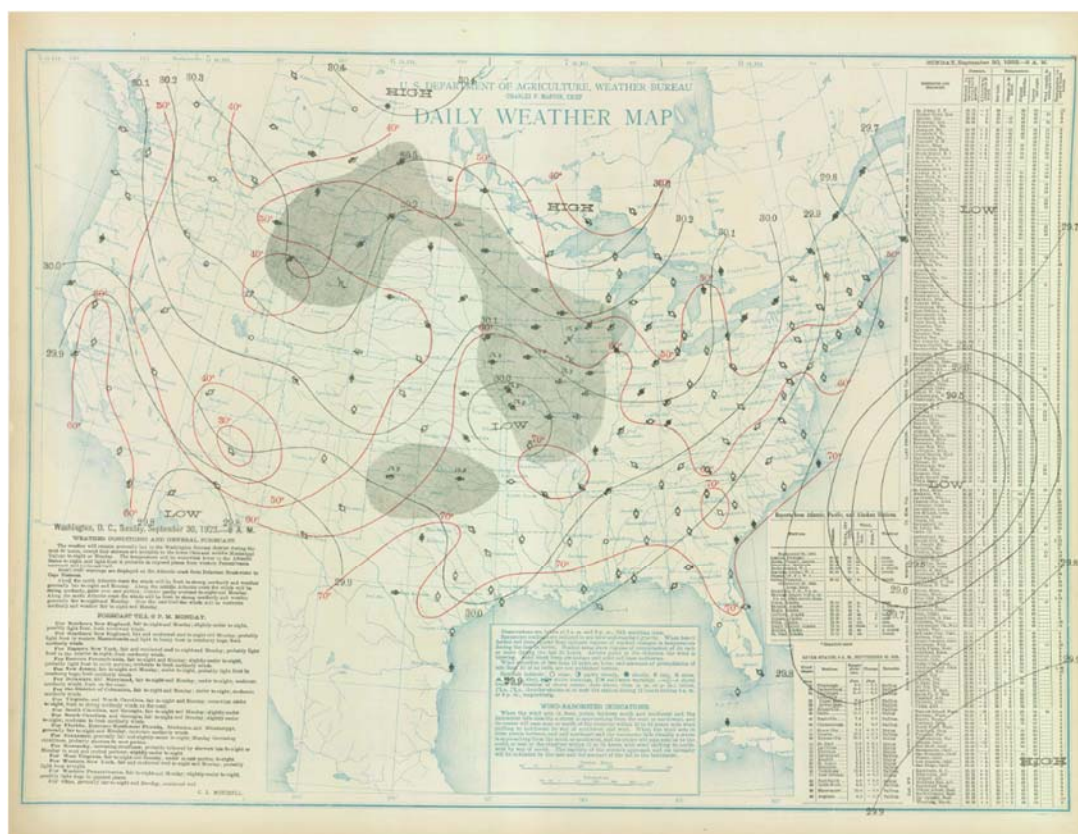
2/28/2018

CO-NM Regional Extreme Precipitation Study

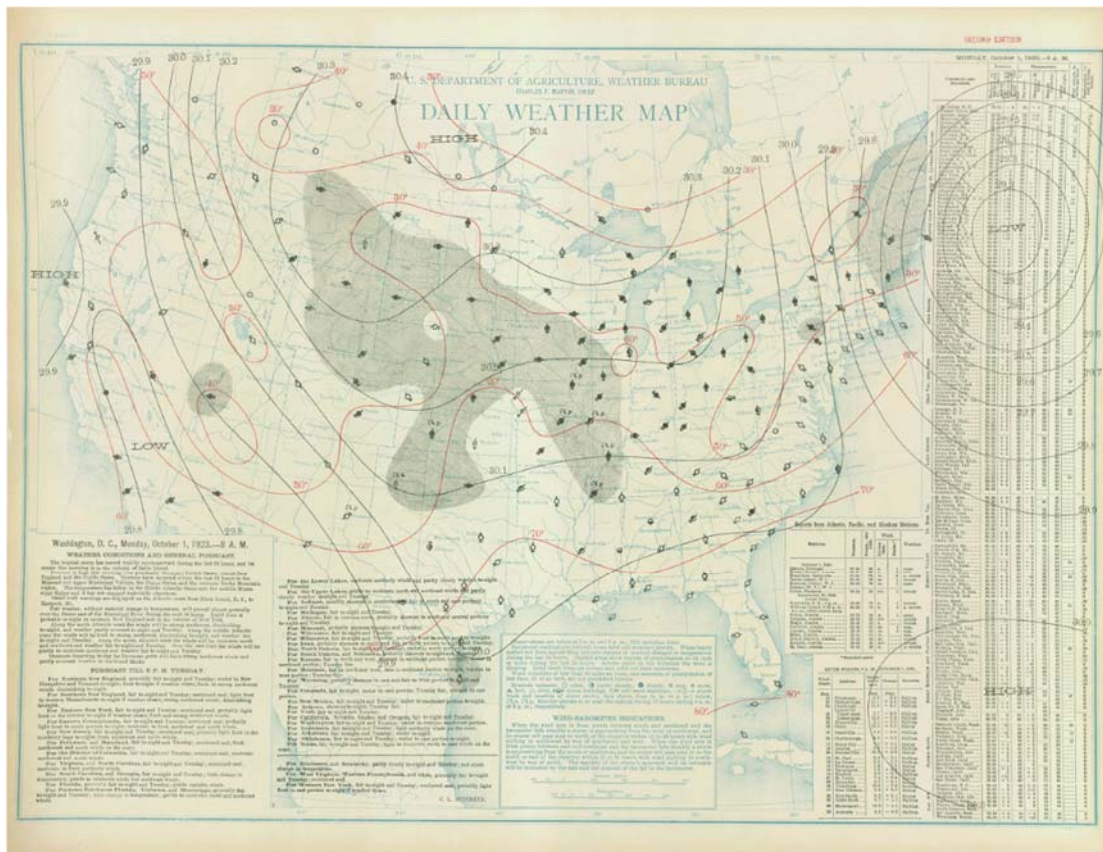


CO-NM Regional Extreme Precipitation Study

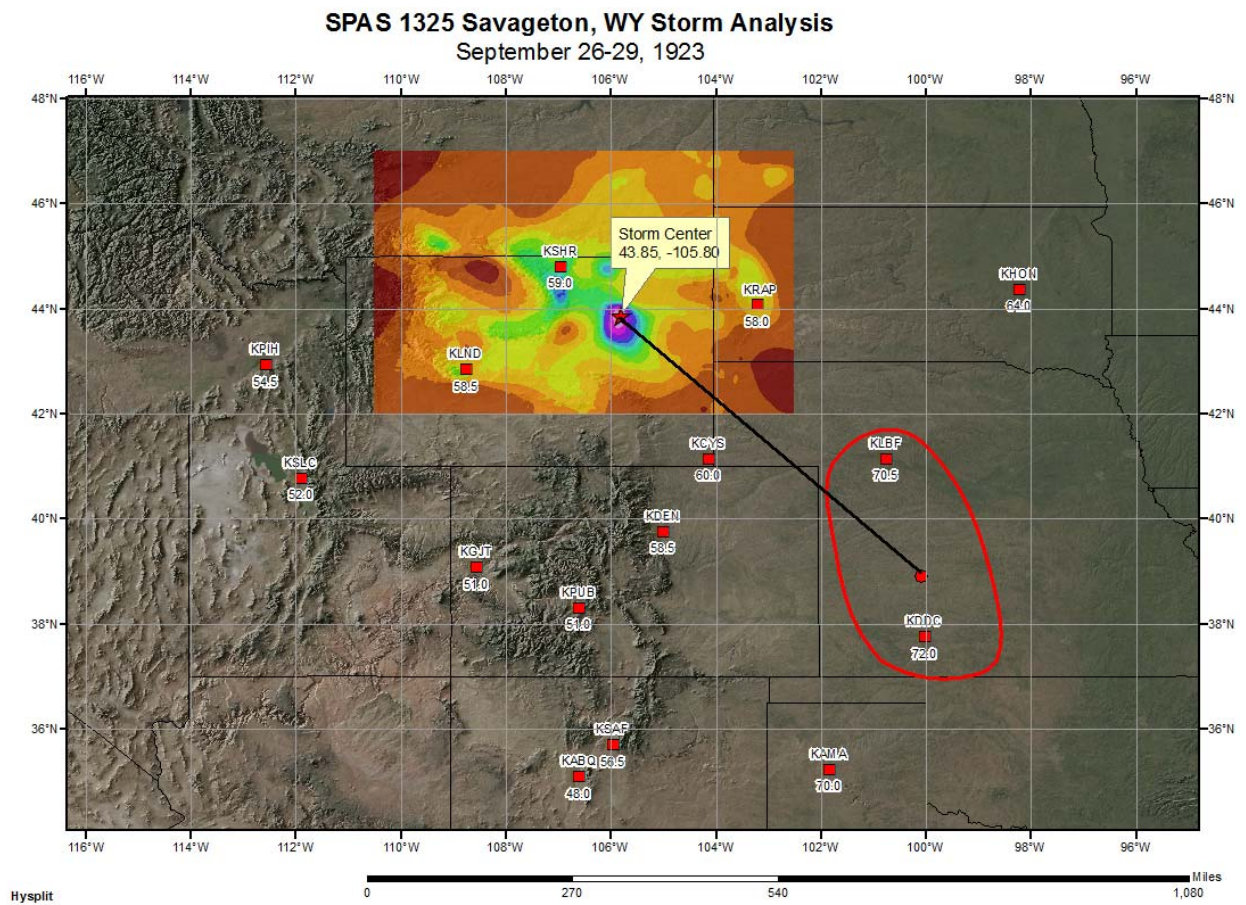


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CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



Hunters, WY
September 27 – October 1, 1923
Storm Type: General

Storm Precipitation Analysis System (SPAS) For Storm #1325_2

General Storm Location: Savageton, Wyoming

Storm Dates: Sept. 27-Oct. 1, 1923

Event: Mid-latitude cyclone

DAD Zone 2

Latitude: 44.4208

Longitude: -107.0292

Max. grid rainfall amount: 10.13"

Max. observed rainfall amount: 8.27" (HUNTERS WY)

Number of Stations: 111

SPAS Version: 9.5

Base Map Used: Based on digitized HMR Isohyetal Map (storm total Sept. 27-Oct. 1, 1923) and PRISM Sept/Oct monthly mean maps

Spatial resolution: 30 seconds

Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

Reliability of Results: The updated analysis, part of the CO//NM PMP study, included the WRF analysis max grid (based on four member run) as the basemap. The WRF analysis did not have great correlation with observation data, because of this the WRF basemap was not used and the original analysis is still used (just changed DAD zones). The complex terrain and limited number of hourly and daily data near the primary small storm center diminish the reliability of these results. In particular, there were only 5 hourly stations and their hourly data were estimated from USACE's smoothed mass rainfall curves. We theorize that the hourly data at these storm centers were estimated by USBR. However, given this was a synoptic storm with large areas of nearly continuous precipitation (rainfall), it's believed the temporal distribution of precipitation is fairly reliable. The use of the U.S. Army Corps of Engineers' isohyetal pattern coupled with the monthly mean maps for September and October provides some confidence in the spatial patterns and magnitudes of precipitation. Lastly, orographic effects (accounted for in the PRISM maps) have created a maxima in the grid (17.56") that is slightly higher than the maximum observed at a station (17.10") in the storm center; the effect at the storm center was constrained by editing the basemap.

WAR DEPARTMENT

CORPS OF ENGINEERS, U. S. ARMY

STORM STUDIES - PERTINENT DATA SHEET

Storm of 27 Sept.-1 Oct. 1923
 Assignment MR 4-23
 Location Mont., N. D., S.D., Wyo.
 Study Prepared by:
 Missouri River Division
 Omaha District Office

Part I Reviewed by H. M. Sec. of
 Weather Bureau, 8/21/45
 Part II Approved by Office, Chief
 of Engineers for Distribution
 of Factual Data, 10/15/46
 Remarks: Center at
 Savageton, Wyoming

DATA AND COMPUTATIONS COMPILED**PART I**

Preliminary Isohyetal map, in 1 sheet, scale 1:2,500,000
 Precipitation data and mass curves: (Number of Sheets)
 Form 5001-C (Hourly precip. data)----- 9
 Form 5001-B (24-hour " ")----- 22
 Form 5001-D (" " " ")----- 8
 Misc. precip. records, meteorological data, etc.----- 23
 Form 5002 (Mass rainfall curves)-----

PART II

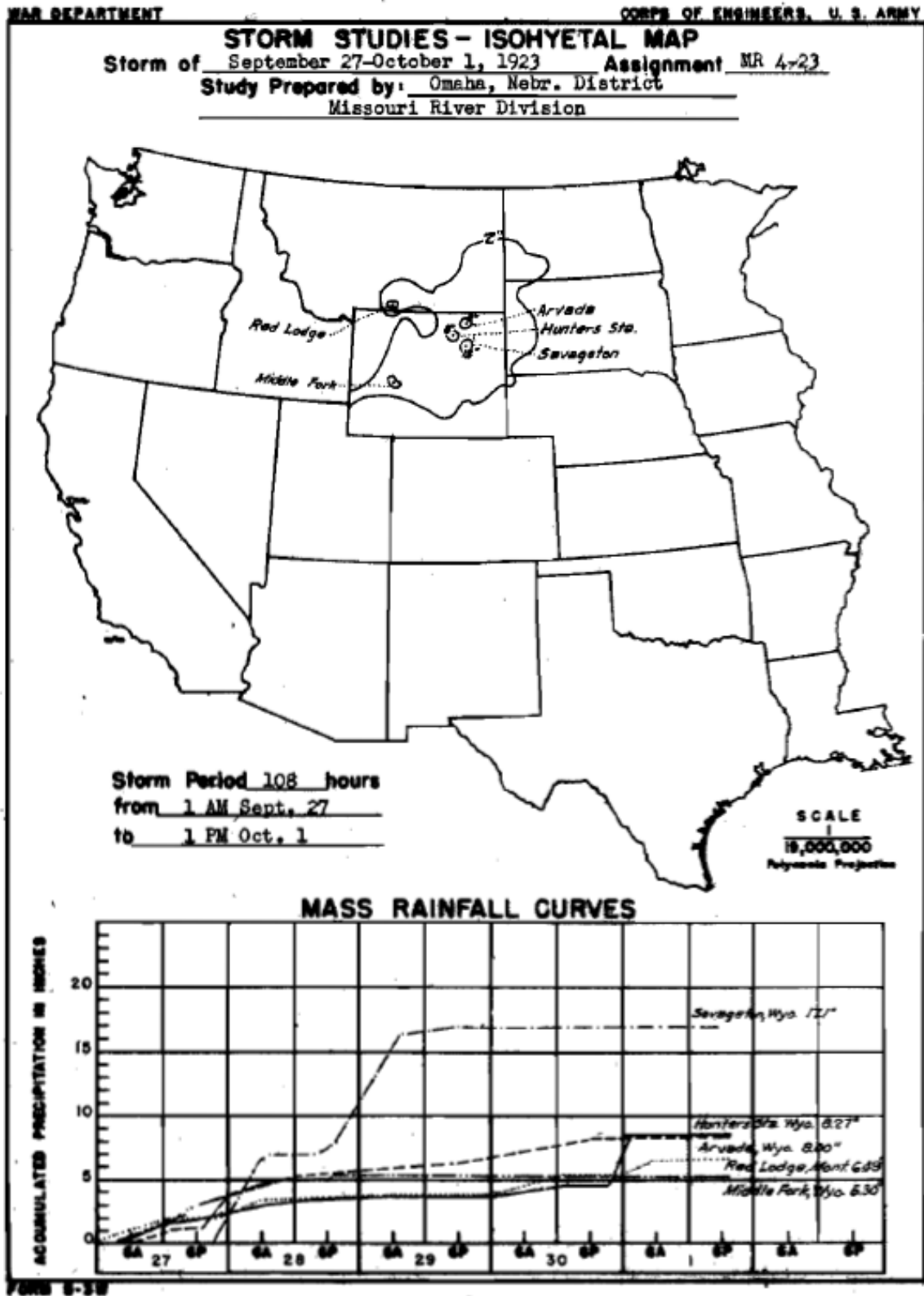
Final Isohyetal maps, in 1 sheet, scale 1:1,000,000
 Data and computation sheets:
 Form S-10 (Data from mass rainfall curves)----- 4
 Form S-11 (Depth-area data from isohyetal map)----- 1
 Form S-12 (Maximum depth-duration data)----- 22
 Maximum duration-depth-area curves----- 1
 Data relating to periods of maximum rainfall----- 2

MAXIMUM AVERAGE DEPTH OF RAINFALL IN INCHES

Area In Sq. Mi.	Duration of Rainfall in Hours										
	6	12	18	24	30	36	48	60	72	96	108
Max. Station	6.8	9.3	9.5	9.7	13.6	16.7	17.1	17.1	17.1	17.1	17.1
10	6.0	9.1	9.3	9.5	13.0	16.5	16.9	16.9	16.9	16.9	16.9
100	5.1	8.4	8.7	9.0	12.2	15.5	15.9	15.9	15.9	15.9	15.9
200	4.9	8.0	8.4	8.6	11.7	14.8	15.2	15.2	15.2	15.2	15.2
500	4.3	7.1	7.5	7.7	10.4	13.2	13.4	13.6	13.7	13.7	13.7
1,000	3.7	6.2	6.4	6.6	9.0	11.4	11.6	11.7	11.8	12.0	12.0
2,000	3.0	5.0	5.3	5.5	7.5	9.5	9.7	9.8	9.9	10.1	10.1
5,000	2.2	3.6	3.8	4.0	5.6	7.0	7.2	7.4	7.6	8.1	8.2
10,000	1.6	2.5	2.7	3.0	4.2	5.3	5.7	6.1	6.3	6.9	7.0
20,000	1.2	1.8	2.1	2.5	3.2	3.9	4.7	5.1	5.5	6.0	6.0
50,000	0.8	1.5	1.8	2.1	2.7	3.1	3.7	4.0	4.3	4.7	4.8
95,000	0.6	1.1	1.4	1.7	2.1	2.3	2.8	3.1	3.3	3.7	3.8

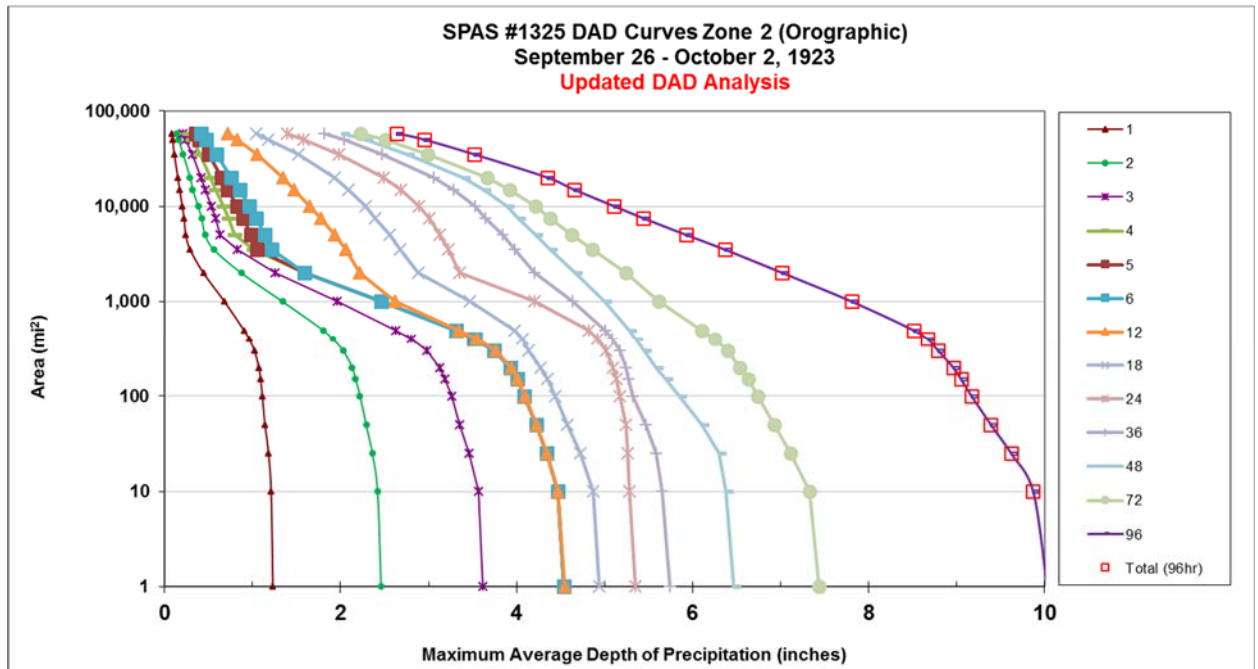
Form S-2

CO-NM Regional Extreme Precipitation Study

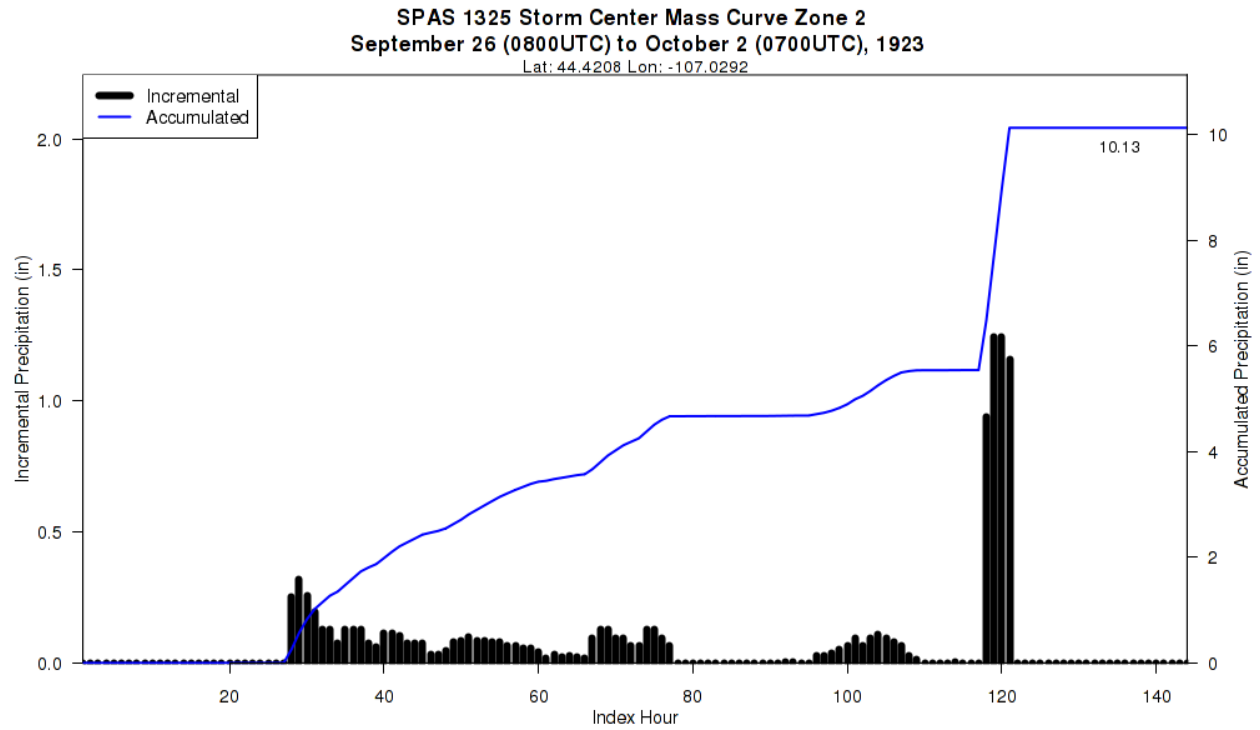


CO-NM Regional Extreme Precipitation Study

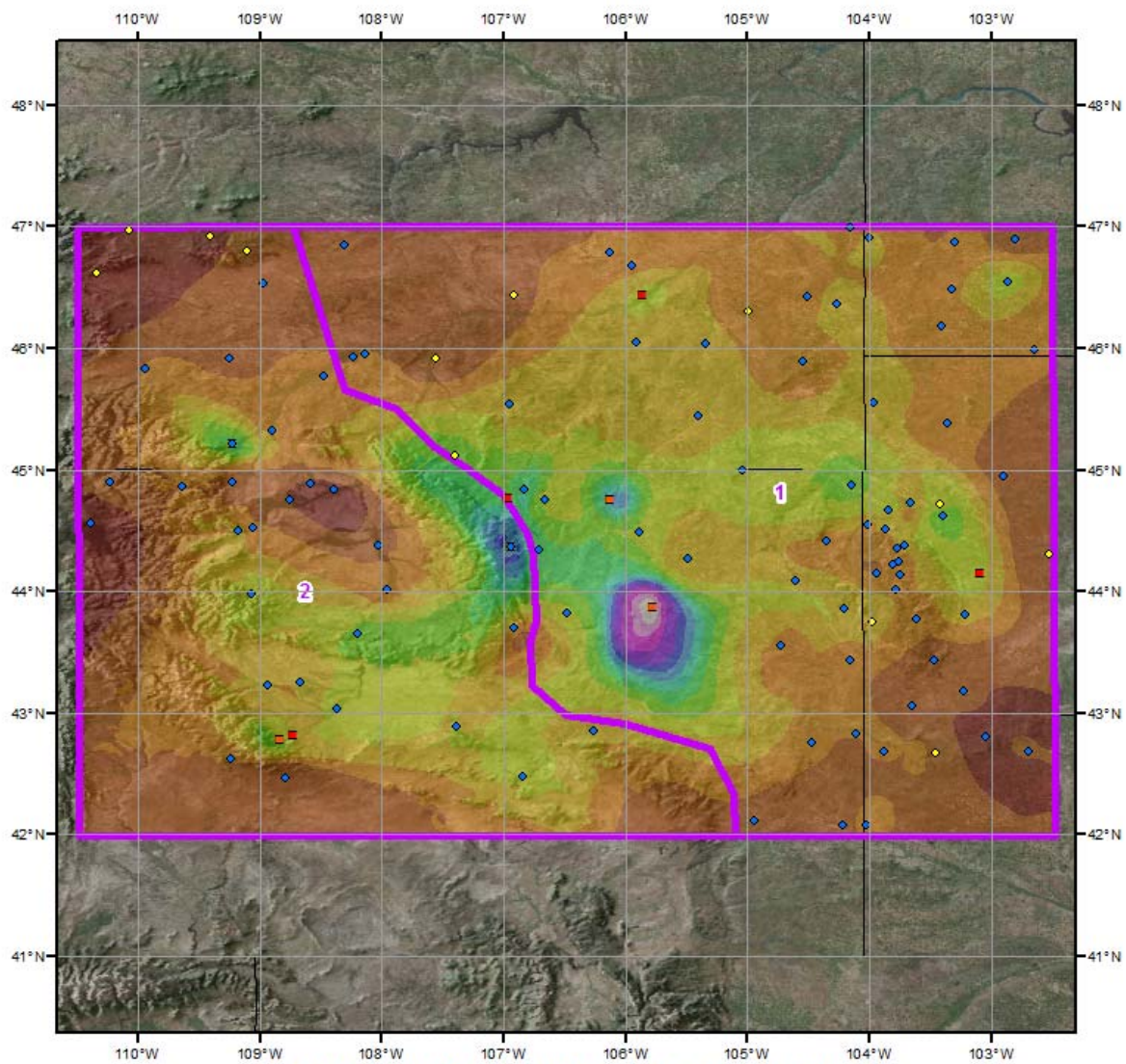
Storm 1325 Zone 2 - September 26 (0800 UTC) - October 2 (0700 UTC), 1923														
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES) Updated Analysis														
areasqmi	Duration (hours)													
	1	2	3	4	5	6	12	18	24	36	48	72	96	Total (96hr)
0.4	1.24	2.48	3.64	4.57	4.57	4.57	4.58	4.97	5.38	5.77	6.51	7.48	10.10	10.10
1	1.23	2.46	3.62	4.54	4.54	4.54	4.55	4.94	5.35	5.74	6.47	7.44	10.03	10.03
10	1.21	2.42	3.57	4.47	4.47	4.47	4.47	4.87	5.28	5.65	6.38	7.33	9.87	9.87
25	1.18	2.36	3.46	4.34	4.34	4.34	4.34	4.72	5.26	5.59	6.30	7.11	9.62	9.62
50	1.14	2.29	3.35	4.22	4.22	4.22	4.22	4.58	5.24	5.47	6.10	6.93	9.39	9.39
100	1.11	2.22	3.26	4.09	4.09	4.09	4.10	4.44	5.17	5.32	5.85	6.74	9.17	9.17
150	1.09	2.17	3.19	4.01	4.01	4.01	4.01	4.35	5.13	5.27	5.69	6.63	9.05	9.05
200	1.07	2.13	3.13	3.93	3.93	3.93	3.94	4.27	5.10	5.24	5.59	6.54	8.96	8.96
300	1.02	2.03	2.98	3.74	3.74	3.74	3.76	4.14	5.02	5.17	5.45	6.40	8.79	8.79
400	0.96	1.91	2.80	3.52	3.52	3.53	3.55	4.07	4.92	5.09	5.35	6.25	8.67	8.67
500	0.90	1.80	2.63	3.31	3.31	3.31	3.34	3.98	4.82	5.01	5.28	6.10	8.51	8.51
1,000	0.68	1.34	1.96	2.46	2.46	2.46	2.62	3.47	4.20	4.64	5.00	5.61	7.81	7.81
2,000	0.44	0.87	1.26	1.59	1.59	1.59	2.22	2.88	3.35	4.20	4.66	5.24	7.02	7.02
3,500	0.29	0.56	0.82	1.01	1.05	1.22	2.06	2.68	3.22	3.98	4.38	4.86	6.37	6.37
5,000	0.24	0.46	0.63	0.80	0.98	1.14	1.93	2.56	3.13	3.84	4.21	4.63	5.93	5.93
7,500	0.22	0.42	0.58	0.73	0.89	1.04	1.77	2.39	3.01	3.65	4.02	4.38	5.44	5.44
10,000	0.20	0.38	0.53	0.67	0.82	0.96	1.65	2.28	2.89	3.53	3.89	4.21	5.11	5.11
15,000	0.17	0.32	0.46	0.58	0.72	0.85	1.47	2.09	2.69	3.28	3.63	3.92	4.65	4.65
20,000	0.15	0.29	0.41	0.52	0.65	0.76	1.34	1.93	2.49	3.06	3.39	3.67	4.35	4.35
35,000	0.11	0.21	0.32	0.40	0.50	0.59	1.05	1.52	1.98	2.47	2.75	2.99	3.52	3.52
50,000	0.09	0.16	0.24	0.32	0.39	0.47	0.82	1.18	1.58	2.04	2.28	2.51	2.95	2.95
58,274	0.08	0.14	0.21	0.28	0.35	0.41	0.72	1.04	1.39	1.81	2.02	2.23	2.64	2.64



CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



Total Storm (144-hr) Precipitation (inches)

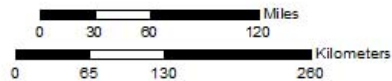
September 26 - October 2, 1923

SPAS 1325 (Savageton, WY)

Plains vs. Orographic DAD

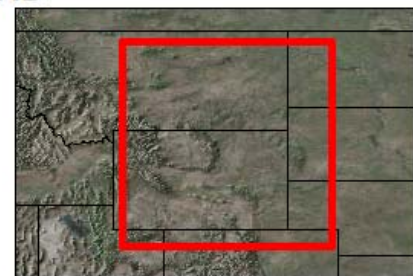
Gauges

- ◆ Daily
- Hourly
- Hourl Estimated
- Hourly Est. Pseudo
- ◆ Supplemental



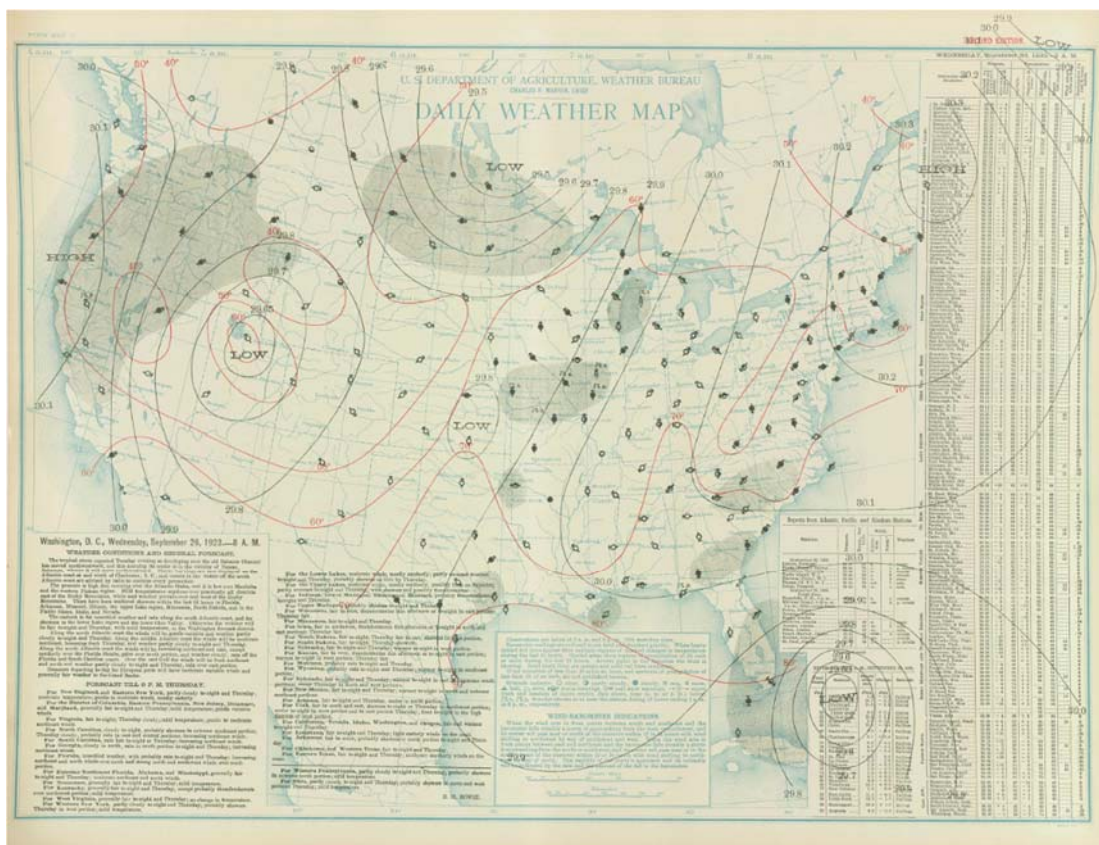
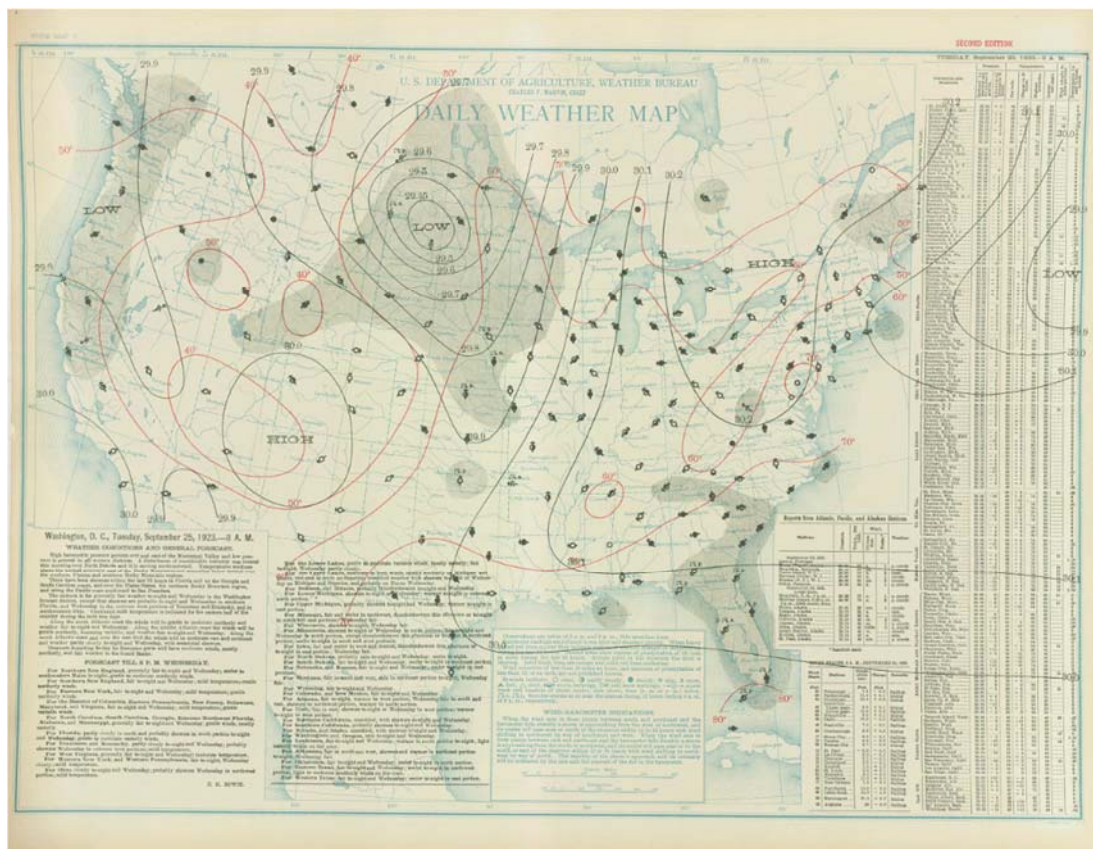
Percent Difference (%)

- | | | | | |
|-------------|-------------|-------------|---------------|---------------|
| 0.19 - 1.00 | 3.01 - 4.00 | 6.01 - 7.00 | 9.01 - 10.00 | 14.01 - 16.00 |
| 1.01 - 2.00 | 4.01 - 5.00 | 7.01 - 8.00 | 10.01 - 12.00 | 16.01 - 18.00 |
| 2.01 - 3.00 | 5.01 - 6.00 | 8.01 - 9.00 | 12.01 - 14.00 | |

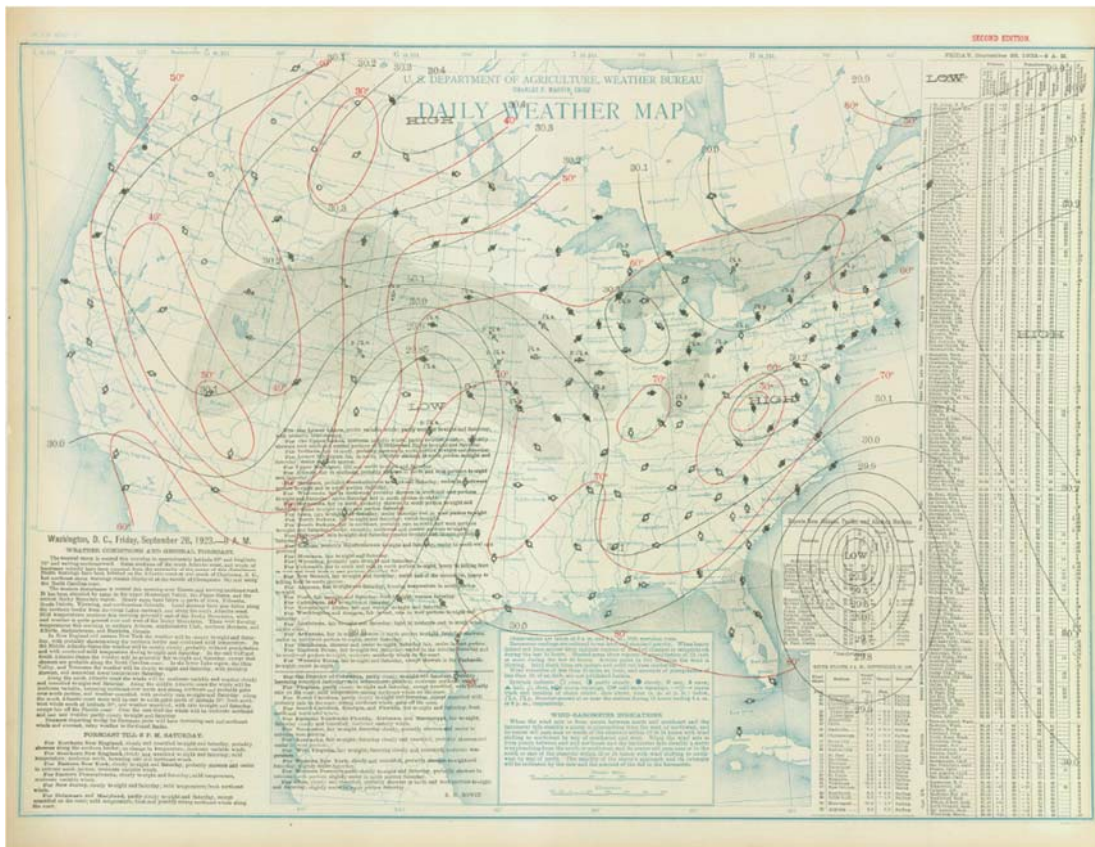
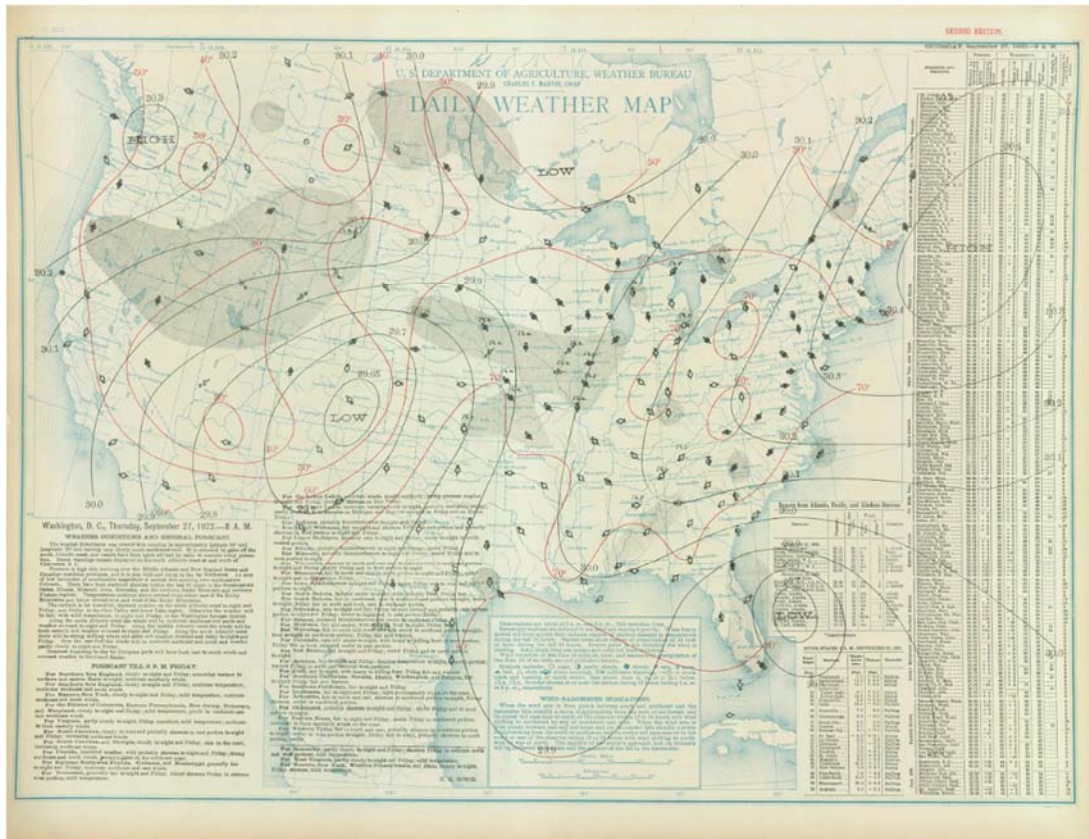


2/28/2018

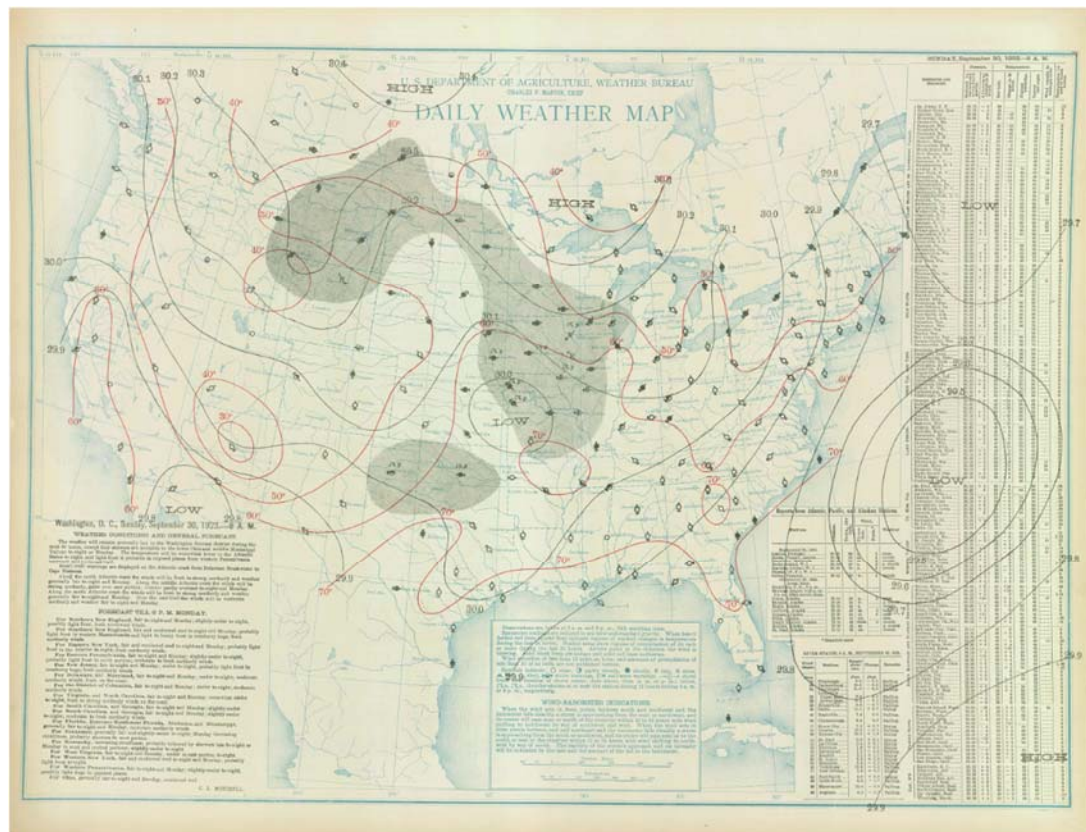
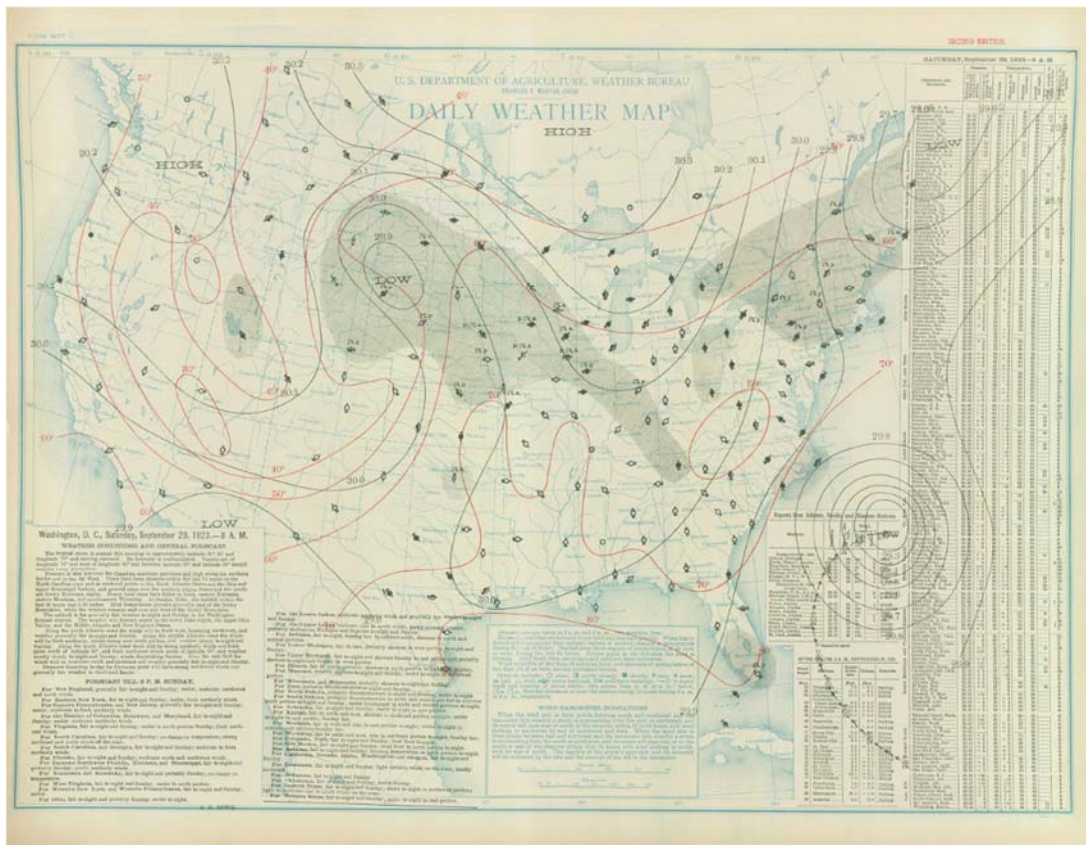
CO-NM Regional Extreme Precipitation Study

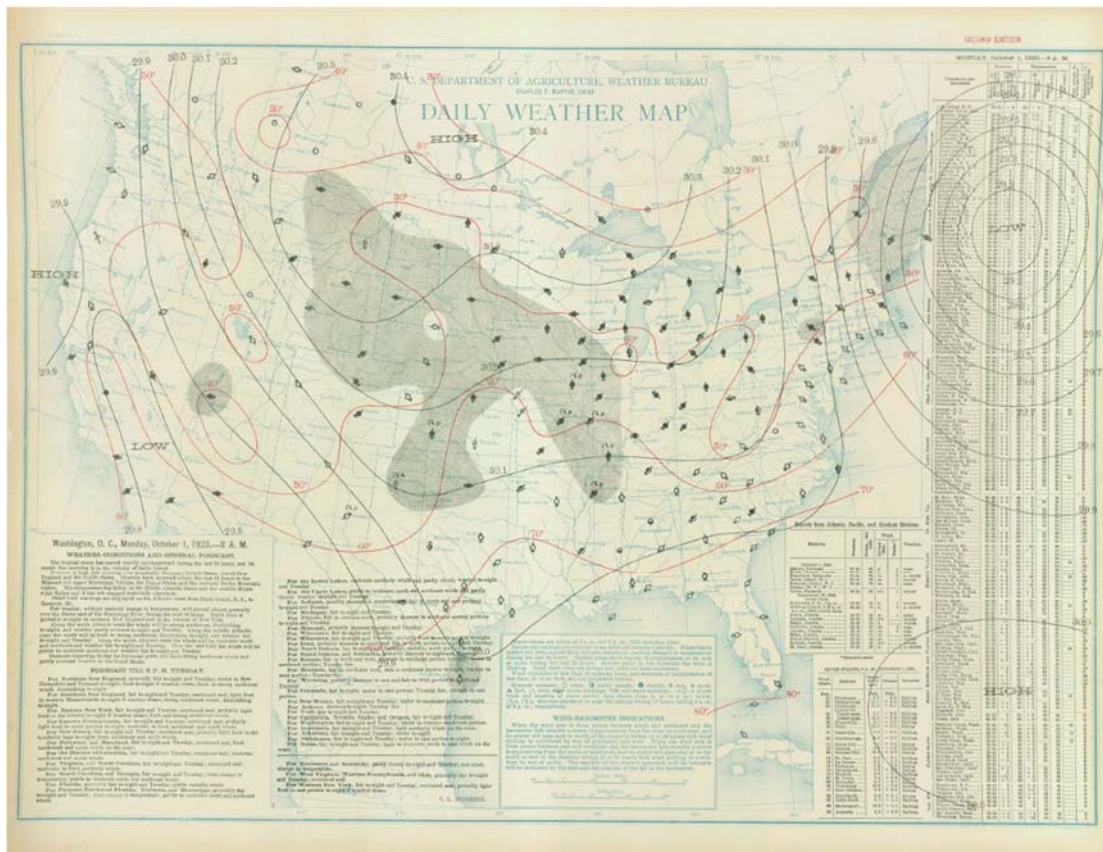


CO-NM Regional Extreme Precipitation Study

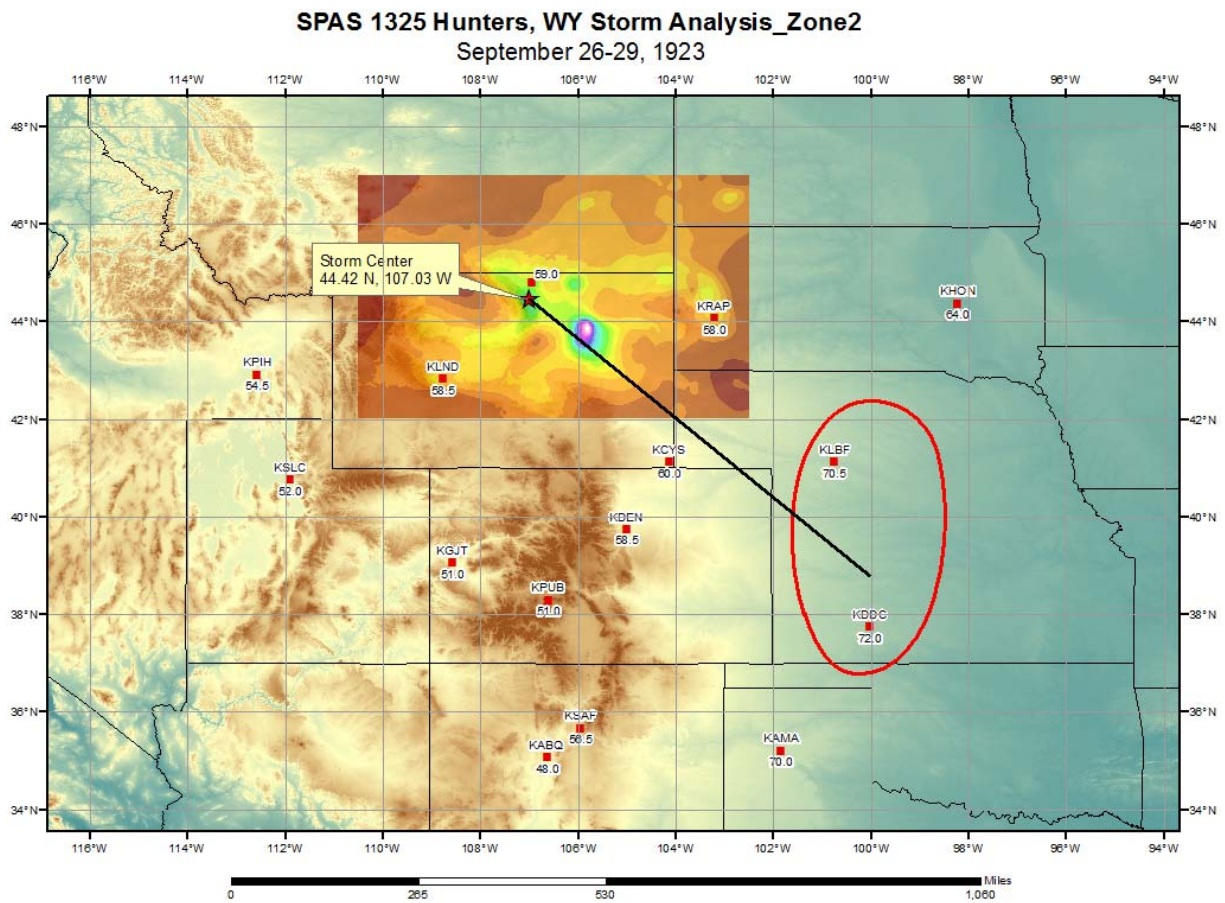


CO-NM Regional Extreme Precipitation Study





CO-NM Regional Extreme Precipitation Study



Palisade Lake, CO

June 25-29, 1927

Storm Type: General

Storm Precipitation Analysis System (SPAS) For Storm #1651_1

General Storm Location: Palisade Lake, CO

Storm Dates: June 25-29, 1927

Event: Synoptic

DAD Zone 1

Latitude: 37.4542

Longitude: -107.2532

Max. grid rainfall amount: 6.37"

Max. observed rainfall amount: 5.91"

Number of Stations: 28

SPAS Version: 10.0

Base Map Used: Blend of "1651_isohyetal" and "conus_prism_ppt_1971_2000_06"

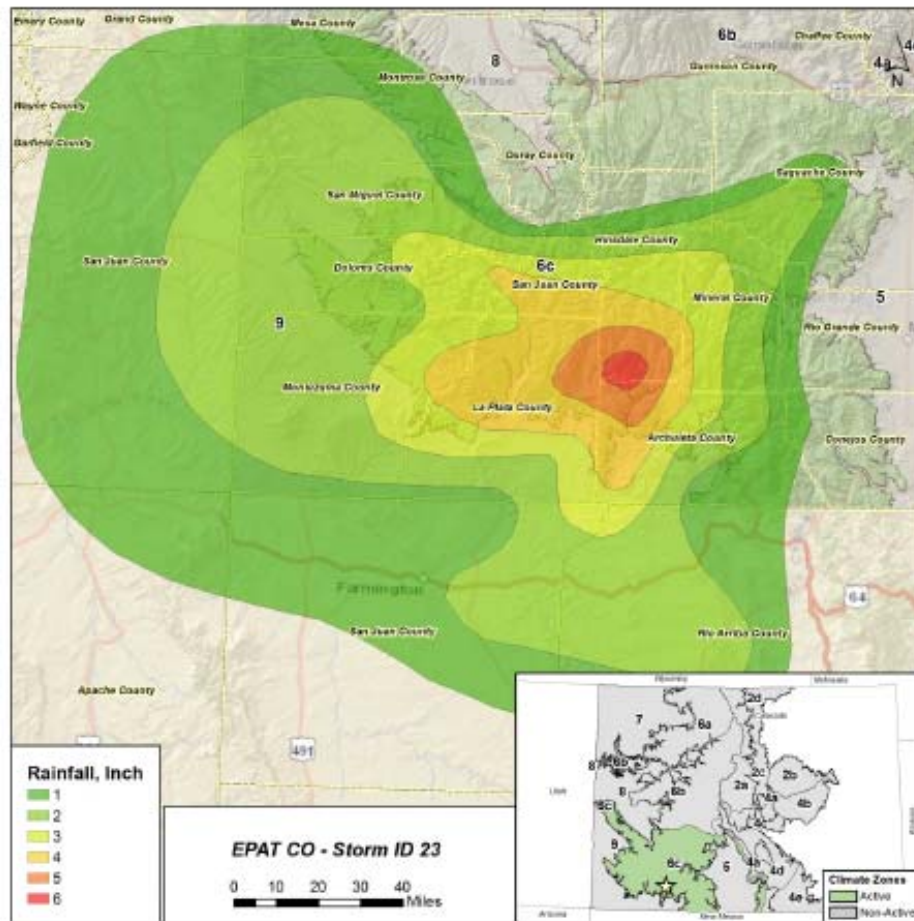
Spatial resolution: 0.2630

Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

Reliability of Results: This analysis was based on 28 hourly stations, daily data, and supplemental station data. We have a good degree of confidence for the station based storm total results. The spatial pattern is fully dependent on the blended basemap created from the total storm isohyetal image from the EPAT CO technical report for Storm ID 23 and the PRISM monthly climatology for June. Timing is based on the one hourly pseudo station created from the Palisade Lake mass curve from the same EPAT CO technical report. Several daily stations were moved to supplemental due to timing issues and to ensure data consistency.

CO-NM Regional Extreme Precipitation Study



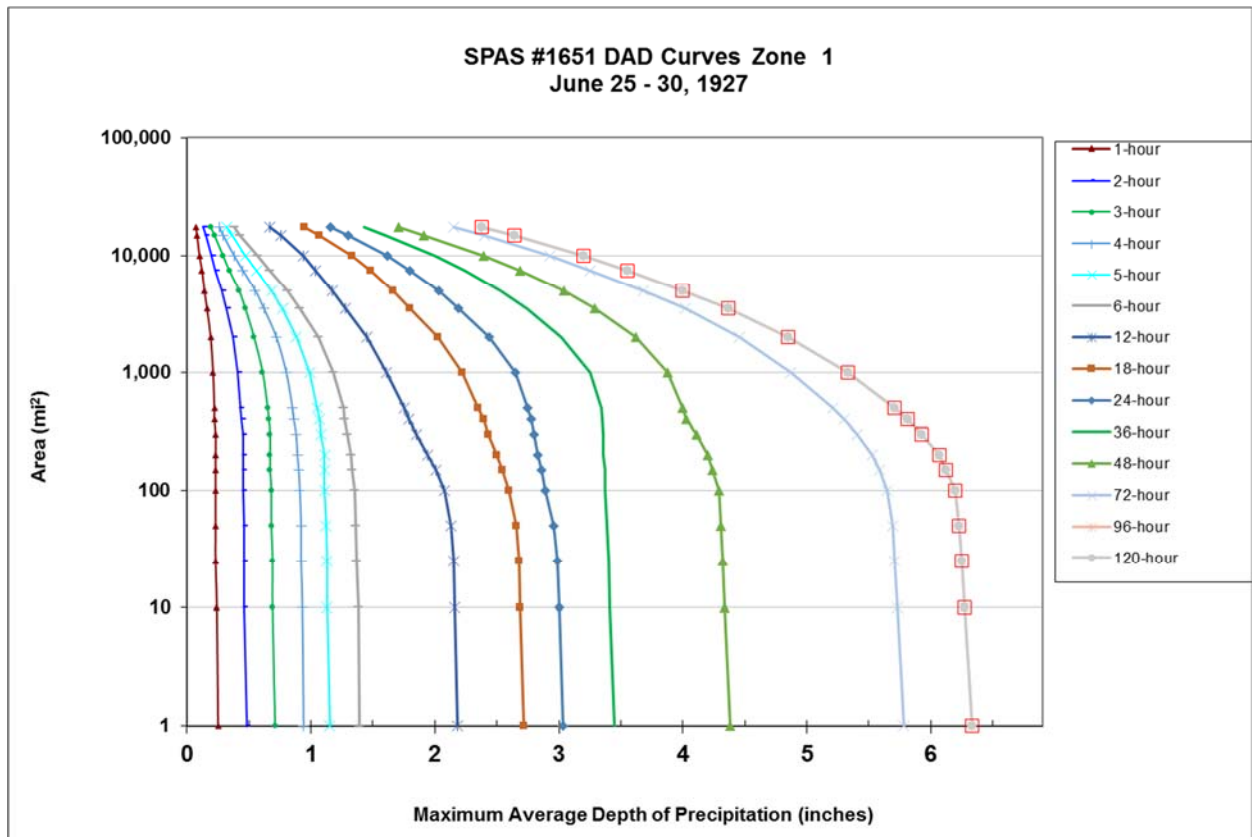
Synopsis and Climate Zone Classification:

Storm ID 23, Climate Zone 6c: A surface low (heat low) over SW Arizona in combination with an area of high pressure of central Texas made for the efficient conveyance of low level moisture from the south to the south facing slopes of the San Juan Range. The synoptic drivers of this event could only have produced this EPE in climate zone 6c as the low level flow would suffer too great a barrier depletion because of the San Juan Range to the north of this zone and not enough orographic lift in zone 5 or zone 9.

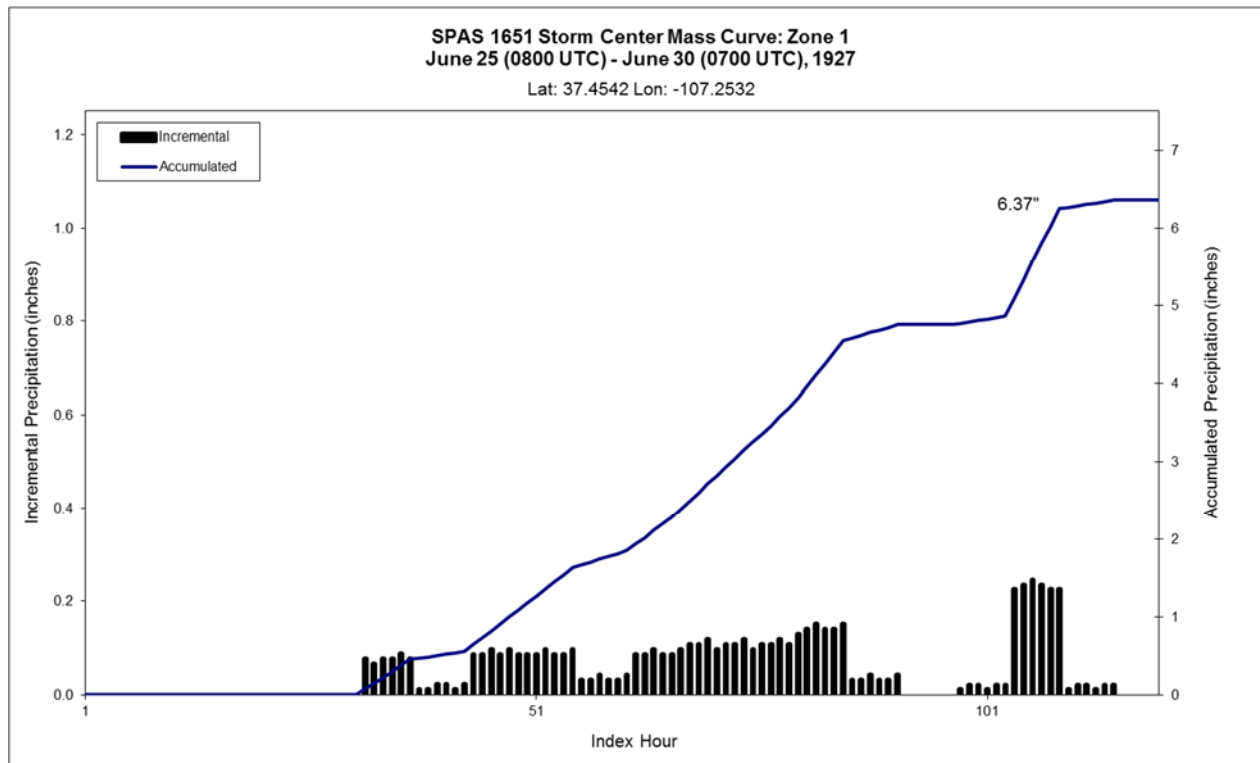
Start Date-End Date	June 26, 1927 – June 29, 1927
Storm ID/Name	STORM ID 23 – Palisade Lake
Storm Type	General Storm
State/Climate Zone Attribution	Colorado/Climate Zone 6c
Max Precipitation/Duration	5.90"/84 hours
Originator/Storm source	CSU report/HMR (COE temporal)
Low Level Wind	190 degrees
Upper Level Wind	190 degrees
Seasonal Max.PWl /-1000mb Td/ln-Place Max. Fctr. (source Td /location ID)	2.61" / 73F / 1.36 (51F @ KSAF per comment in NWS rept. In file obtained from USBR)
Elevation of Peak Precipitation	9836 ft.

CO-NM Regional Extreme Precipitation Study

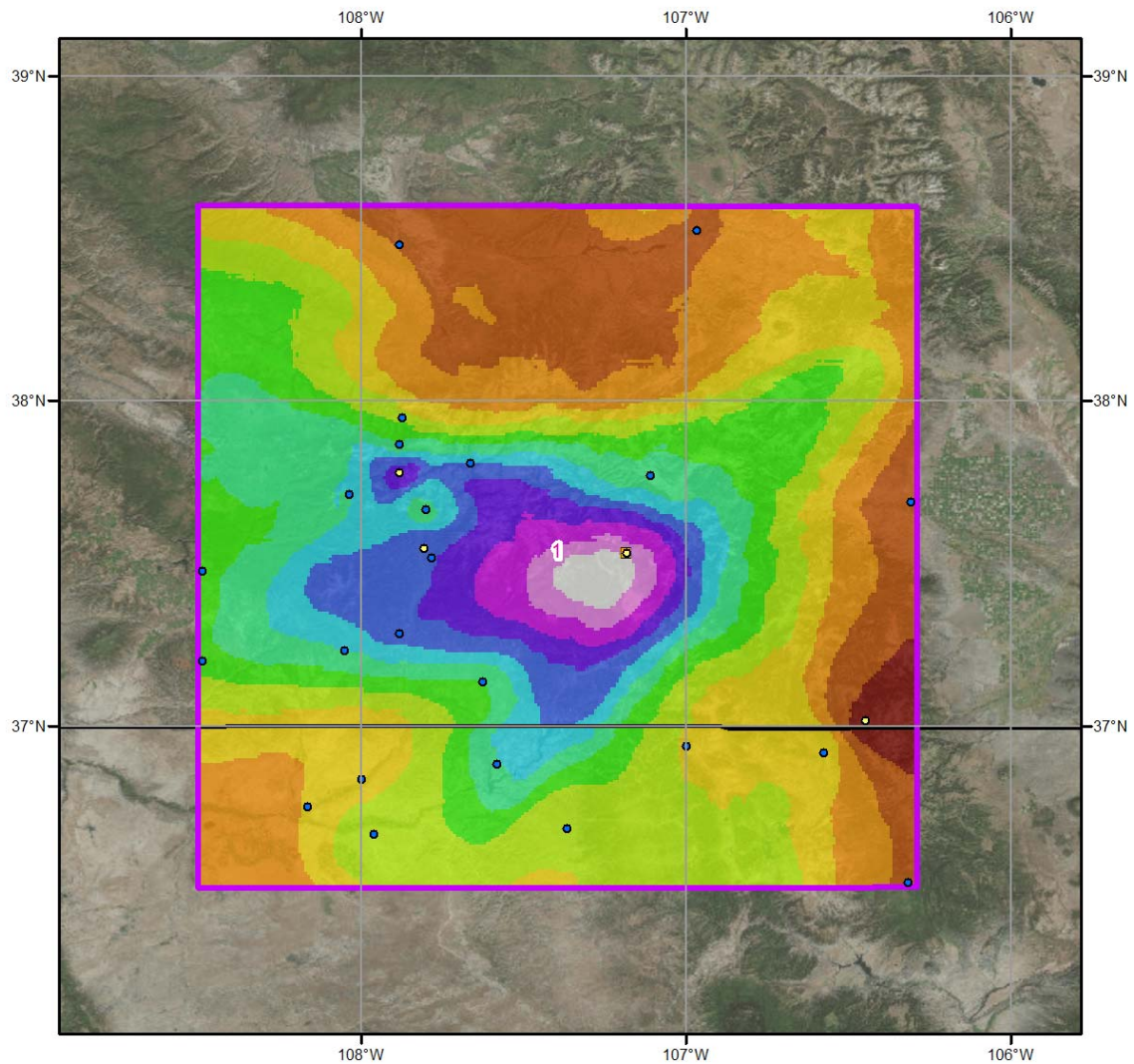
Storm 1651 - June 25 (0800 UTC) - June 30 (0700 UTC), 1927														
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
Area (mi ²)	Duration (hours)													
	1	2	3	4	5	6	12	18	24	36	48	72	96	120
0.4	0.25	0.48	0.72	0.94	1.16	1.39	2.19	2.73	3.04	3.47	4.40	5.80	6.36	6.36
1	0.25	0.48	0.71	0.94	1.15	1.39	2.18	2.72	3.03	3.45	4.38	5.78	6.33	6.33
10	0.24	0.46	0.69	0.93	1.13	1.38	2.16	2.69	3.00	3.41	4.34	5.73	6.27	6.27
25	0.23	0.46	0.69	0.92	1.13	1.37	2.15	2.68	2.99	3.40	4.32	5.71	6.25	6.25
50	0.23	0.46	0.68	0.92	1.12	1.36	2.13	2.66	2.96	3.39	4.31	5.69	6.23	6.23
100	0.23	0.45	0.68	0.91	1.11	1.35	2.08	2.60	2.89	3.37	4.29	5.65	6.20	6.20
150	0.23	0.45	0.67	0.90	1.11	1.33	2.01	2.54	2.86	3.37	4.24	5.59	6.12	6.12
200	0.23	0.45	0.67	0.89	1.11	1.32	1.94	2.50	2.83	3.36	4.20	5.53	6.07	6.07
300	0.23	0.45	0.67	0.88	1.08	1.29	1.85	2.43	2.80	3.36	4.11	5.41	5.93	5.93
400	0.22	0.44	0.66	0.86	1.07	1.27	1.79	2.39	2.78	3.35	4.03	5.30	5.81	5.81
500	0.22	0.43	0.65	0.85	1.05	1.26	1.75	2.35	2.75	3.34	4.00	5.21	5.71	5.71
1,000	0.21	0.41	0.61	0.80	0.99	1.18	1.61	2.22	2.65	3.25	3.88	4.87	5.33	5.33
2,000	0.19	0.37	0.54	0.72	0.88	1.06	1.45	2.02	2.44	3.02	3.62	4.46	4.85	4.85
3,500	0.16	0.32	0.47	0.62	0.77	0.91	1.28	1.80	2.19	2.74	3.29	4.02	4.37	4.37
5,000	0.14	0.28	0.42	0.55	0.68	0.81	1.17	1.66	2.03	2.53	3.04	3.68	4.00	4.00
7,500	0.12	0.23	0.34	0.45	0.56	0.67	1.04	1.48	1.80	2.24	2.69	3.25	3.55	3.55
10,000	0.10	0.20	0.29	0.38	0.47	0.57	0.94	1.33	1.62	2.00	2.39	2.93	3.20	3.20
15,000	0.08	0.15	0.22	0.29	0.36	0.43	0.76	1.07	1.30	1.60	1.91	2.40	2.64	2.64
17,573	0.07	0.13	0.19	0.26	0.32	0.38	0.67	0.95	1.16	1.43	1.71	2.15	2.38	2.38



CO-NM Regional Extreme Precipitation Study



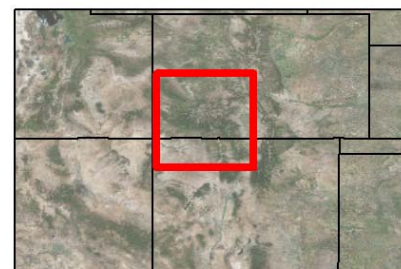
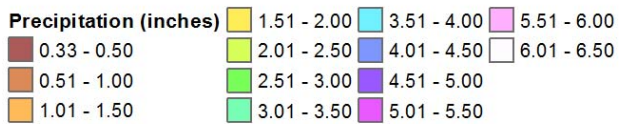
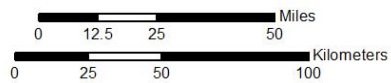
CO-NM Regional Extreme Precipitation Study



Total Storm (120-hours) Precipitation (inches)
June 25-29, 1927
SPAS 1651 - Palisade Lake, CO

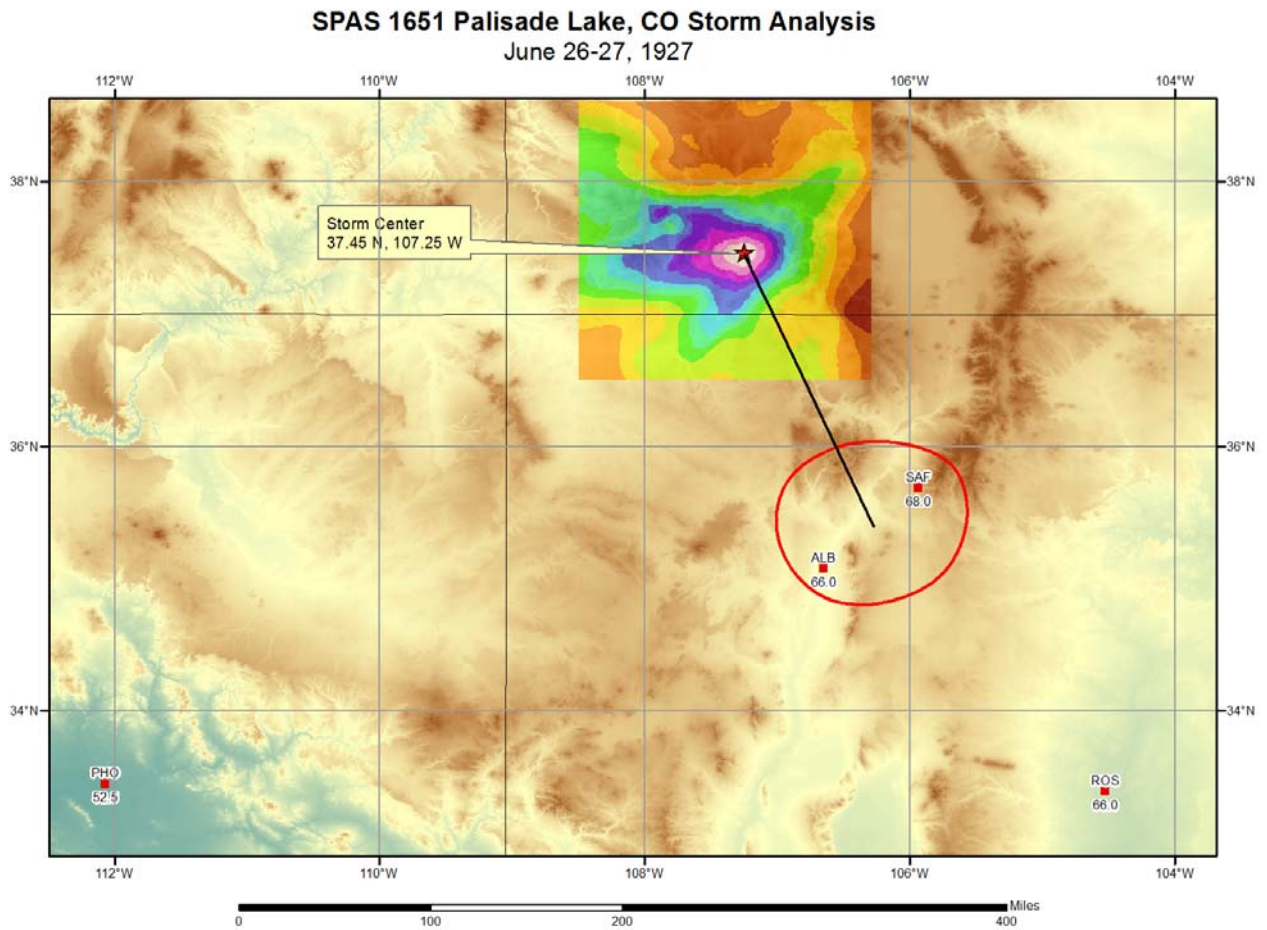
Gauges

- Daily
- Hourly
- Hourly Pseudo
- Supplemental



4/3/2015

CO-NM Regional Extreme Precipitation Study



Smith Ranch, CO
August 30 – September 4, 1938
Storm Type: General

Storm Precipitation Analysis System (SPAS) For Storm #1606_1

General Storm Location: Smith Ranch, CO

Storm Dates: Aug 30 – Sept 4, 1938

Event: Synoptic

DAD Zone 1

Latitude: 40.4792

Longitude: -105.2292

Max. Grid Rainfall Amount: 11.77"

Max. Observed Rainfall Amount: 11.52" (Smith Ranch, CO)

Number of Stations: 69

SPAS Version: 10.0

Basemap: U.S. Weather Bureau Isohyetal Image

Spatial resolution: 0.2531

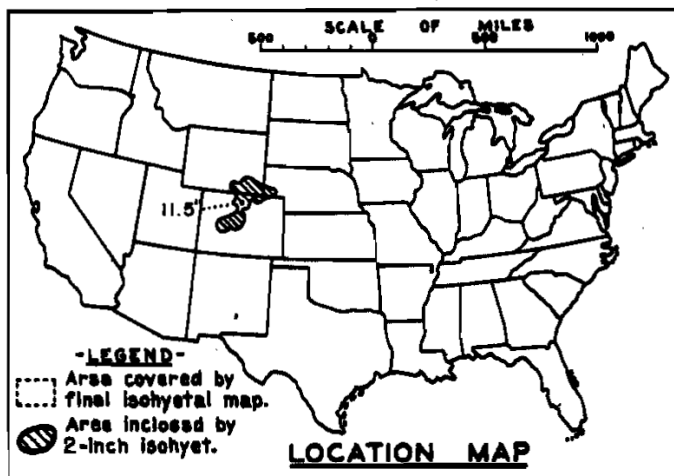
Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

Reliability of results: This analysis was based on 69 hourly stations, daily data, and supplemental station data. We have a good degree of confidence for the station based storm total results. The spatial pattern is dependent heavily on the basemap created from the U.S. Weather Bureau Isohyetal image from the EDADS Storm Report for 1938. Timing is based on the hourly and hourly pseudo stations near the storm center. Several daily stations were moved to supplemental due to timing issues and to ensure data consistency.

WAR DEPARTMENT

CORPS OF ENGINEERS, U.S. ARMY

STORM STUDIES - PERTINENT DATA SHEET

Storm of 30 Aug.-4 Sept. 1938

Assignment MR 5-8

Location Colo. - Wyo.

Study Prepared by:

Missouri River Division

Omaha District Office

Part I Reviewed by H. M. Sec. of
Weather Bureau, 4-14-44Part II Approved by Office, Chief
of Engineers for Distribution
of Factual Data, 12/6/46Remarks: Center near
Loveland, Colo. (Smith Ranch)**DATA AND COMPUTATIONS COMPILED****PART I**

Preliminary Isohyetal map, in 1 sheet, scale 1:500,000

Precipitation data and mass curves:

(Number of Sheets)

Form 5001-C (Hourly precip. data)-----	9
Form 5001-B (24-hour " " " ")-----	28
Form 5001-D (" " " " ")-----	4
Misc. precip. records, meteorological data, etc.-----	42
Form 5002 (Mass rainfall curves)-----	34

PART II

Final Isohyetal maps, in 1 sheet, scale 1:1,000,000

Data and computation sheets:

Form S-10 (Data from mass rainfall curves)-----	3
Form S-11 (Depth-area data from isohyetal map)-----	1
Form S-12 (Maximum depth-duration data)-----	14
Maximum duration-depth-area curves-----	1
Data relating to periods of maximum rainfall-----	2

MAXIMUM AVERAGE DEPTH OF RAINFALL IN INCHES

Area in Sq. Mi.	Duration of Rainfall in Hours										
	6	12	18	24	30	36	48	60	72	96	126
Max. Station	6.9	7.3	7.4	7.4	10.8	10.8	10.8	11.5	11.5	11.5	11.5
10	6.4	6.8	7.0	7.0	9.4	9.9	9.9	10.6	10.6	10.6	10.6
100	4.4	4.8	5.2	5.2	8.3	8.9	8.9	9.4	9.4	9.4	9.4
200	3.6	4.2	4.6	4.6	7.0	7.8	7.9	8.4	8.4	8.4	8.4
500	2.3	3.1	3.1	3.4	4.8	6.1	6.2	6.6	6.7	6.7	6.8
1,000	1.6	2.9	2.9	3.1	3.7	5.0	5.1	5.4	5.7	5.7	5.8
2,000	1.3	2.4	2.5	2.7	3.0	4.0	4.1	4.4	4.6	4.6	4.8
5,000	1.0	1.6	1.7	2.1	2.7	3.2	3.4	3.6	3.8	4.0	4.1
10,000	0.9	1.5	1.6	1.9	2.5	2.8	3.1	3.3	3.5	3.6	3.8
20,000	0.7	1.1	1.3	1.6	2.0	2.2	2.6	2.7	2.8	3.1	3.2
21,500	0.7	1.1	1.3	1.6	2.0	2.2	2.6	2.7	2.8	3.0	3.1

Form S-2

CO-NM Regional Extreme Precipitation Study

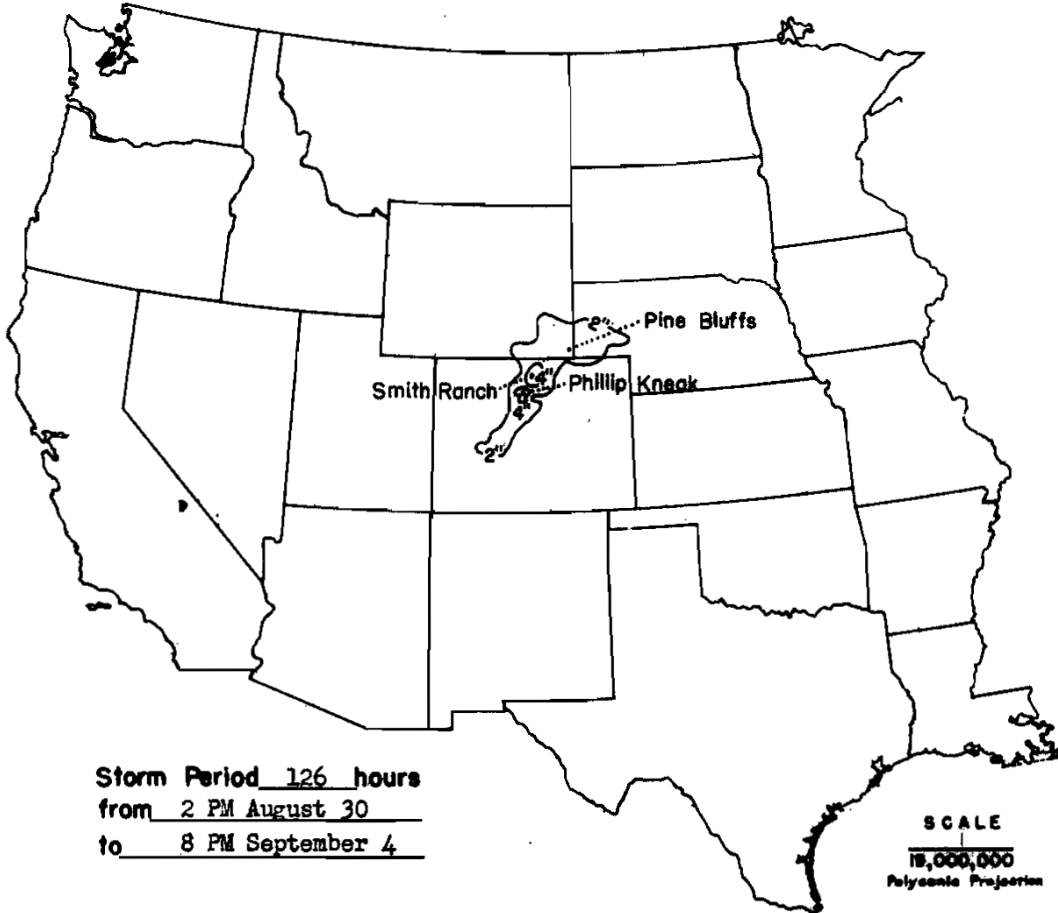
WAR DEPARTMENT

CORPS OF ENGINEERS, U. S. ARMY

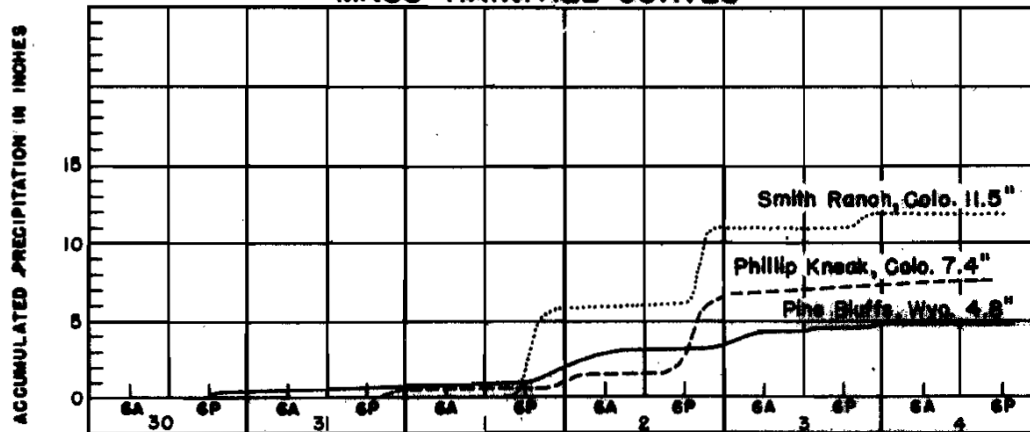
STORM STUDIES - ISOHYETAL MAP

Storm of August 30-September 4, 1938 Assignment MR 5-8

Study Prepared by: Omaha, Nebr. District
Missouri River Division



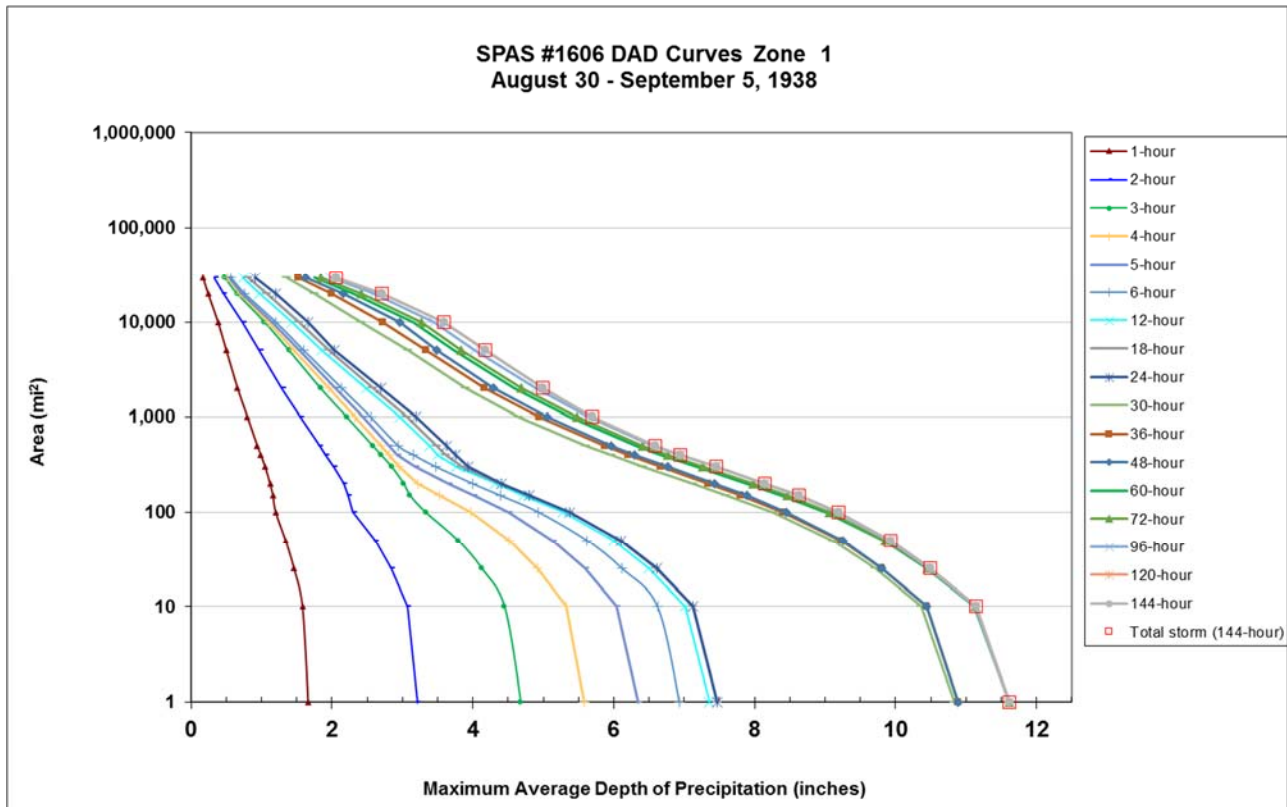
MASS RAINFALL CURVES



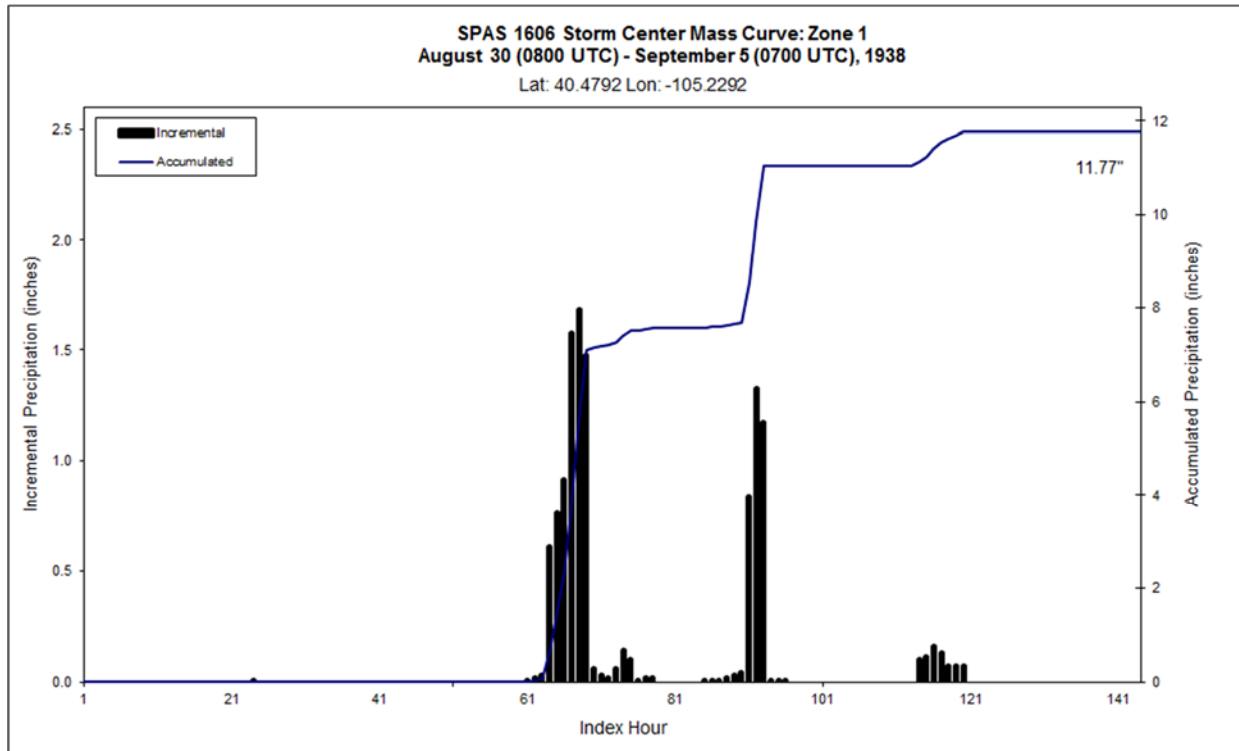
FORM 8-39

CO-NM Regional Extreme Precipitation Study

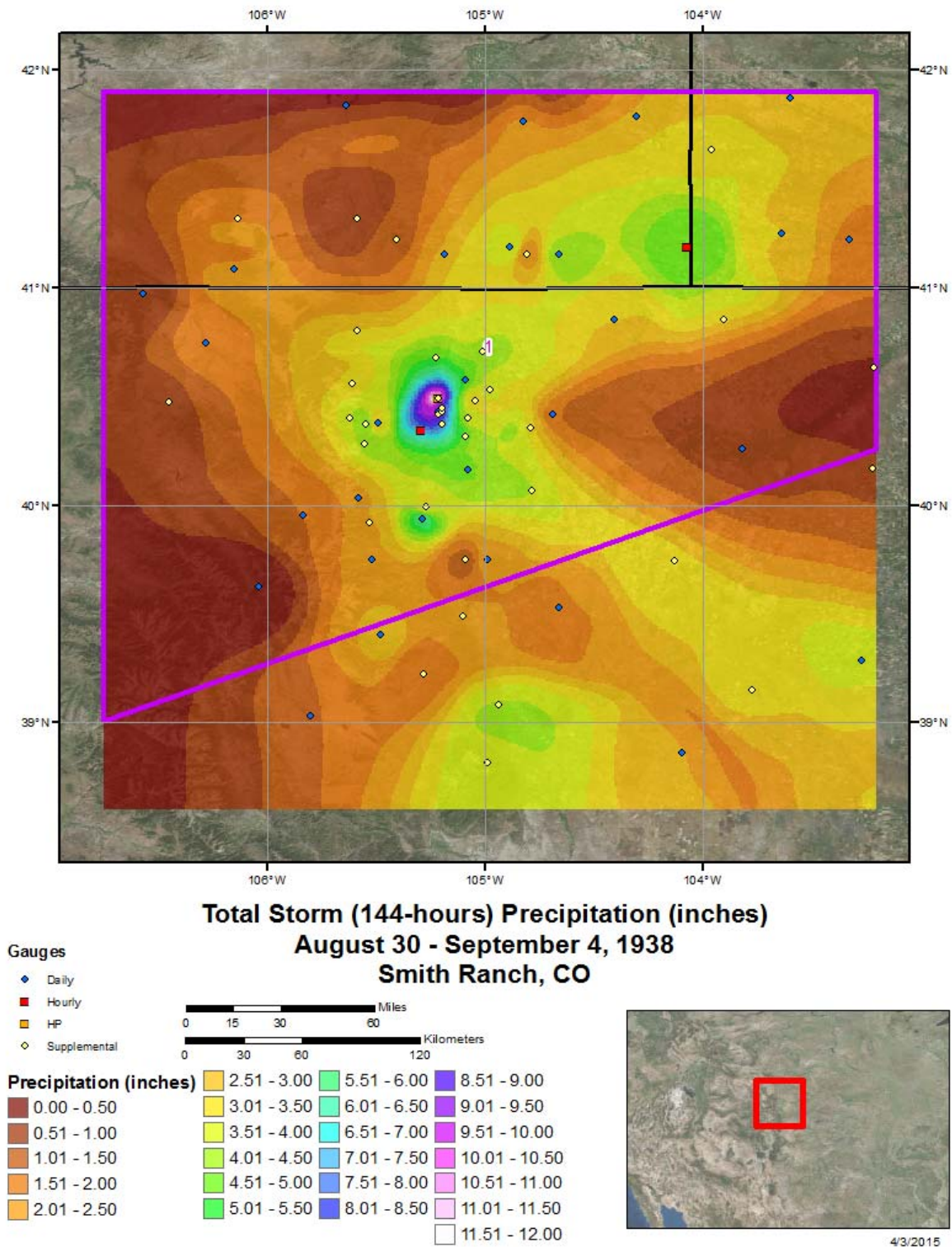
Storm 1606 - August 30 (0800 UTC) - September 5 (0700 UTC), 1938																		
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)																		
Area (mi ²)	Duration (hours)																	
	1	2	3	4	5	6	12	18	24	30	36	48	60	72	96	120	144	Total
0.4	1.67	3.25	4.72	5.63	6.39	7.00	7.42	7.53	7.53	10.93	10.99	10.99	11.71	11.71	11.71	11.71	11.71	11.71
1	1.66	3.21	4.68	5.58	6.34	6.93	7.36	7.47	7.47	10.84	10.89	10.89	11.62	11.62	11.62	11.62	11.62	11.62
10	1.58	3.07	4.45	5.32	6.04	6.62	7.01	7.12	7.12	10.37	10.44	10.44	11.12	11.13	11.13	11.14	11.14	11.14
25	1.46	2.84	4.13	4.92	5.59	6.12	6.50	6.60	6.61	9.72	9.80	9.81	10.44	10.45	10.47	10.49	10.49	10.49
50	1.34	2.61	3.79	4.52	5.13	5.62	6.00	6.09	6.10	9.11	9.23	9.25	9.84	9.86	9.90	9.93	9.93	9.93
100	1.20	2.30	3.33	3.97	4.51	4.93	5.28	5.37	5.38	8.26	8.40	8.45	9.01	9.07	9.17	9.19	9.19	9.19
150	1.16	2.23	3.11	3.53	4.01	4.39	4.72	4.79	4.80	7.60	7.80	7.89	8.37	8.46	8.62	8.63	8.63	8.63
200	1.12	2.16	3.02	3.22	3.65	4.00	4.32	4.39	4.40	7.12	7.34	7.43	7.89	7.98	8.13	8.14	8.14	8.14
300	1.05	2.02	2.85	2.95	3.18	3.48	3.77	3.84	3.93	6.41	6.66	6.77	7.17	7.27	7.44	7.45	7.45	7.45
400	0.99	1.91	2.70	2.81	2.93	3.16	3.50	3.61	3.76	5.96	6.20	6.30	6.67	6.77	6.93	6.95	6.95	6.95
500	0.94	1.82	2.58	2.70	2.81	2.94	3.38	3.49	3.63	5.61	5.87	5.96	6.32	6.41	6.55	6.59	6.59	6.59
1,000	0.80	1.55	2.21	2.33	2.44	2.55	2.97	3.06	3.19	4.65	4.94	5.06	5.38	5.48	5.65	5.70	5.70	5.70
2,000	0.66	1.29	1.84	1.95	2.04	2.14	2.49	2.58	2.70	3.89	4.16	4.29	4.59	4.69	4.89	4.99	4.99	4.99
5,000	0.50	0.97	1.39	1.46	1.53	1.60	1.86	1.95	2.03	3.08	3.34	3.49	3.73	3.83	4.02	4.18	4.18	4.18
10,000	0.38	0.73	1.04	1.10	1.15	1.20	1.43	1.53	1.66	2.42	2.72	2.96	3.15	3.27	3.45	3.59	3.59	3.59
20,000	0.24	0.45	0.65	0.69	0.72	0.76	0.97	1.07	1.20	1.75	2.00	2.16	2.30	2.42	2.60	2.71	2.71	2.71
29,149	0.17	0.33	0.48	0.51	0.54	0.57	0.74	0.81	0.91	1.35	1.52	1.63	1.75	1.84	1.98	2.06	2.06	2.06



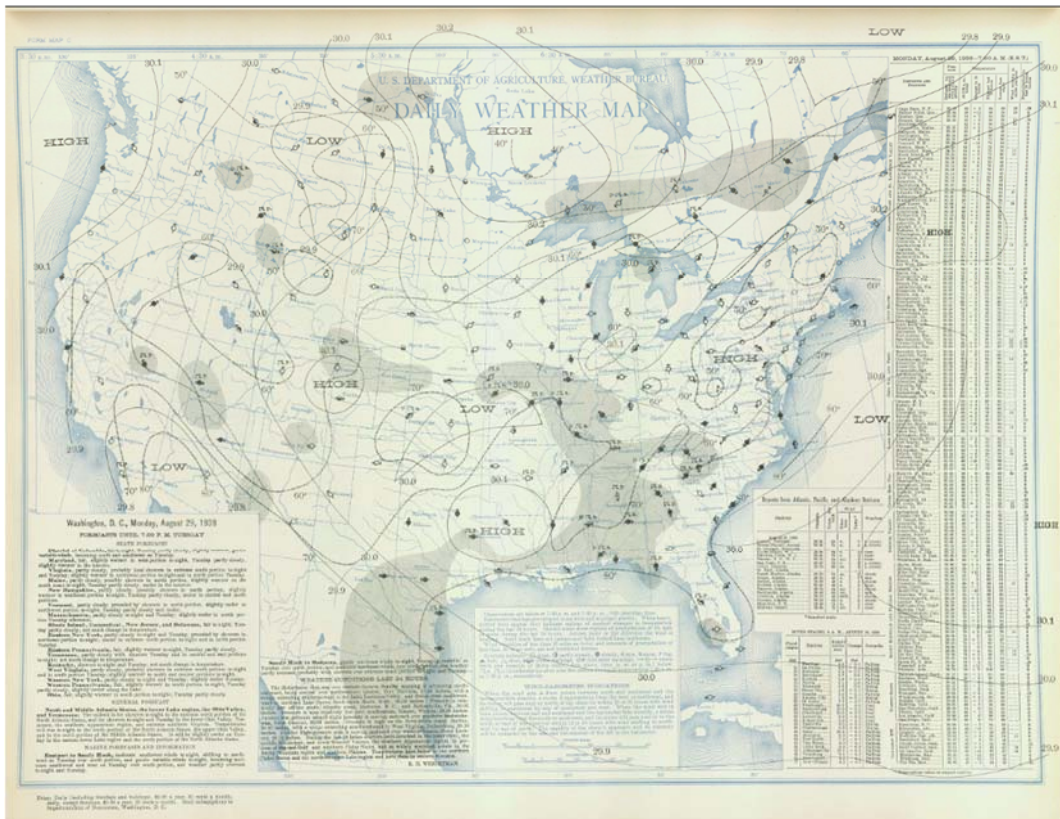
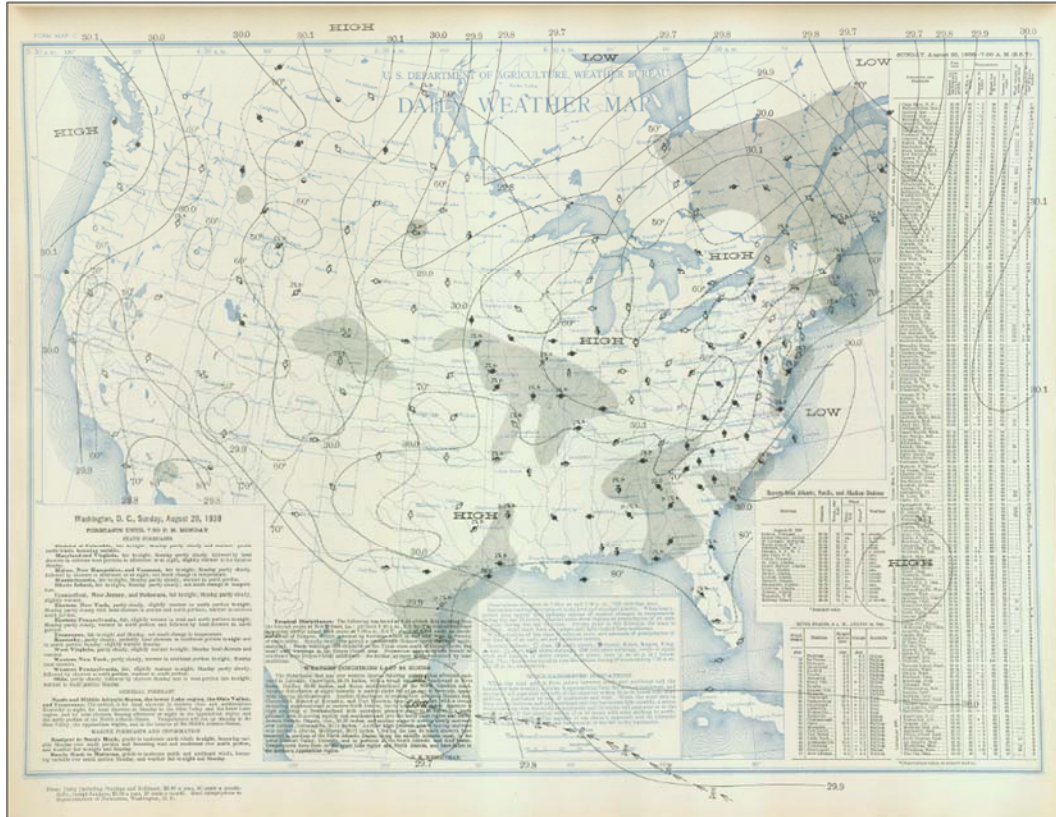
CO-NM Regional Extreme Precipitation Study



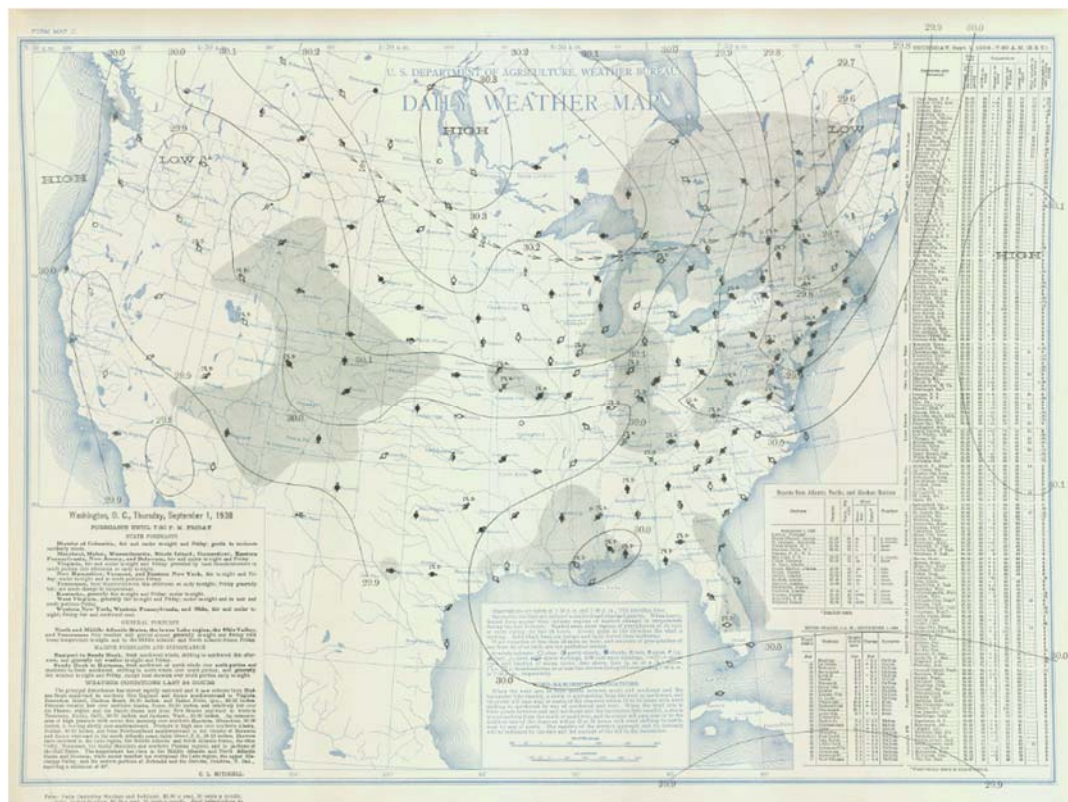
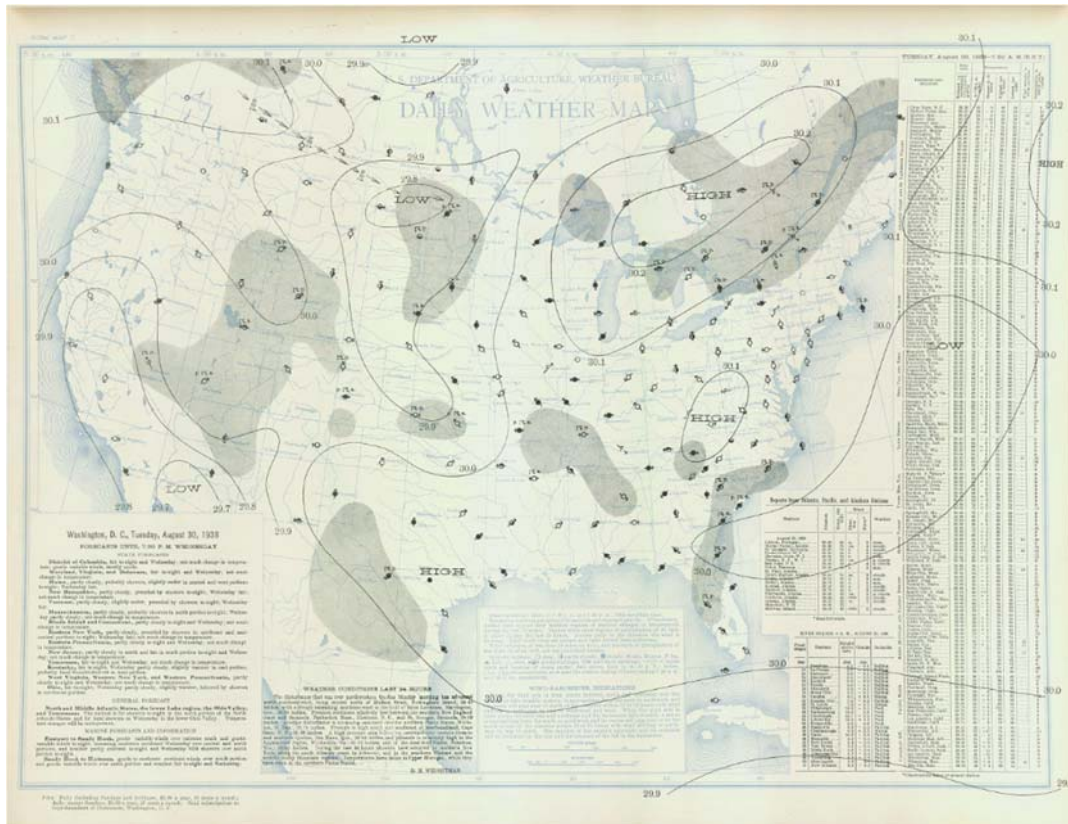
CO-NM Regional Extreme Precipitation Study



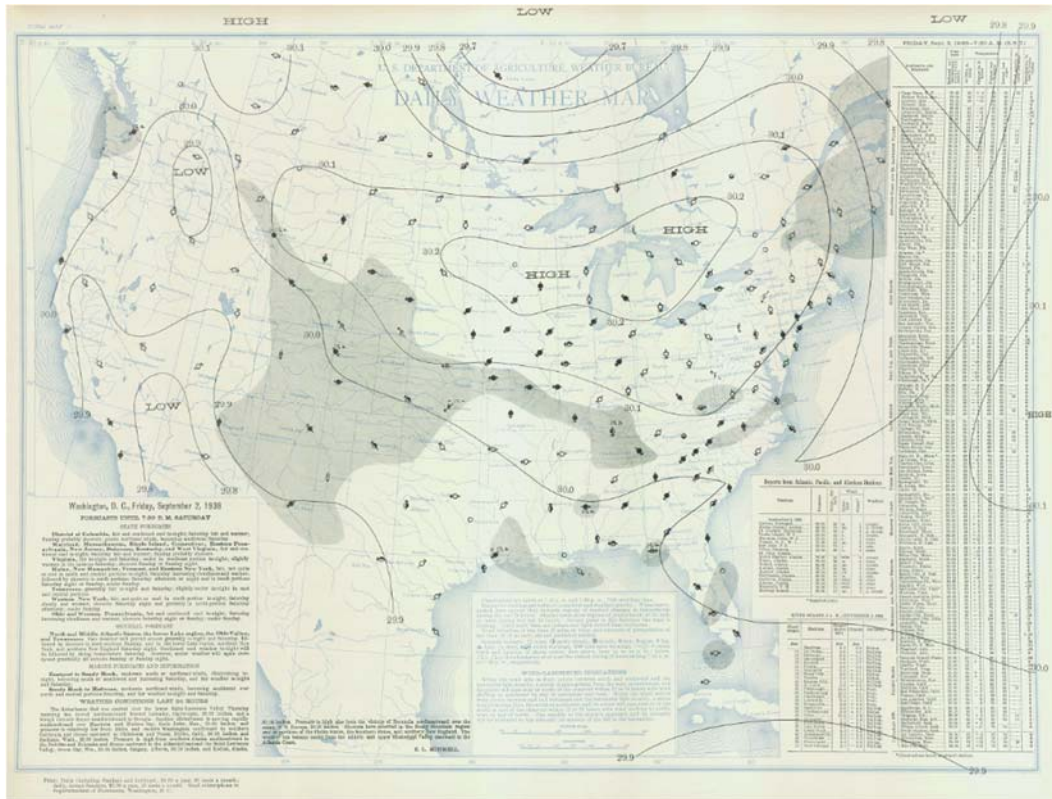
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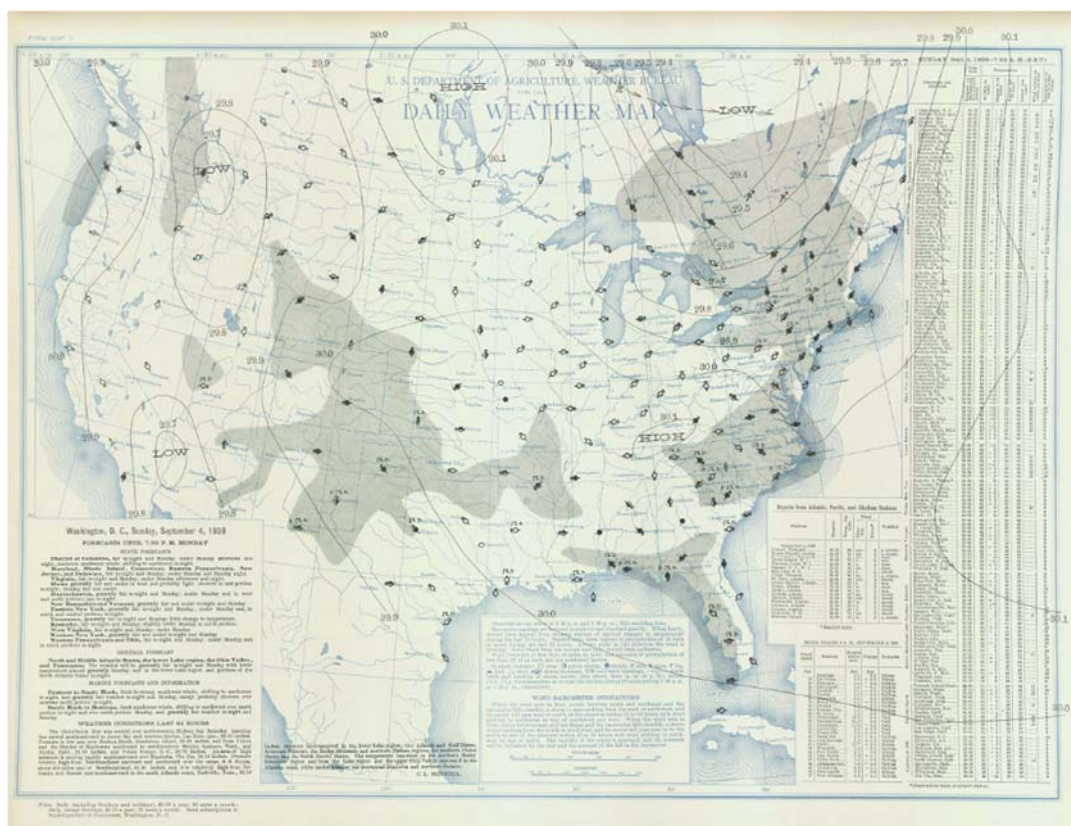
CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



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CO-NM Regional Extreme Precipitation Study

1936

Feb 1-5	GM 2-18	63	125 S of Meridian, Miss.
Mar 11-13	NA 1-29A	55	650 SSE of Pinkham Notch, N. H.
Mar 16-21	SA 1-27	56	160 ESE of Romney, W. Va.
Mar 16-22	NA 1-29B	57	650 SSE of Pinkham Notch, N. H.
Apr 5-10	SA 3-21A	66	300 SSW of Washington, Ga.
Apr 5-10	SA 3-21B	69	50 S of Franklin, La.
May 22-28	GM 5-5	70	120 SSE of La Grange, Tex.
Jun 27-Jul 4	GM 5-6	78	100 SSE of Bebe, Tex.
Sep 14-18	GM 5-7	77	350 SSE of Broome, Tex.
Sep 25-28	GM 5-8	75	200 SE of Hillsboro, Tex.

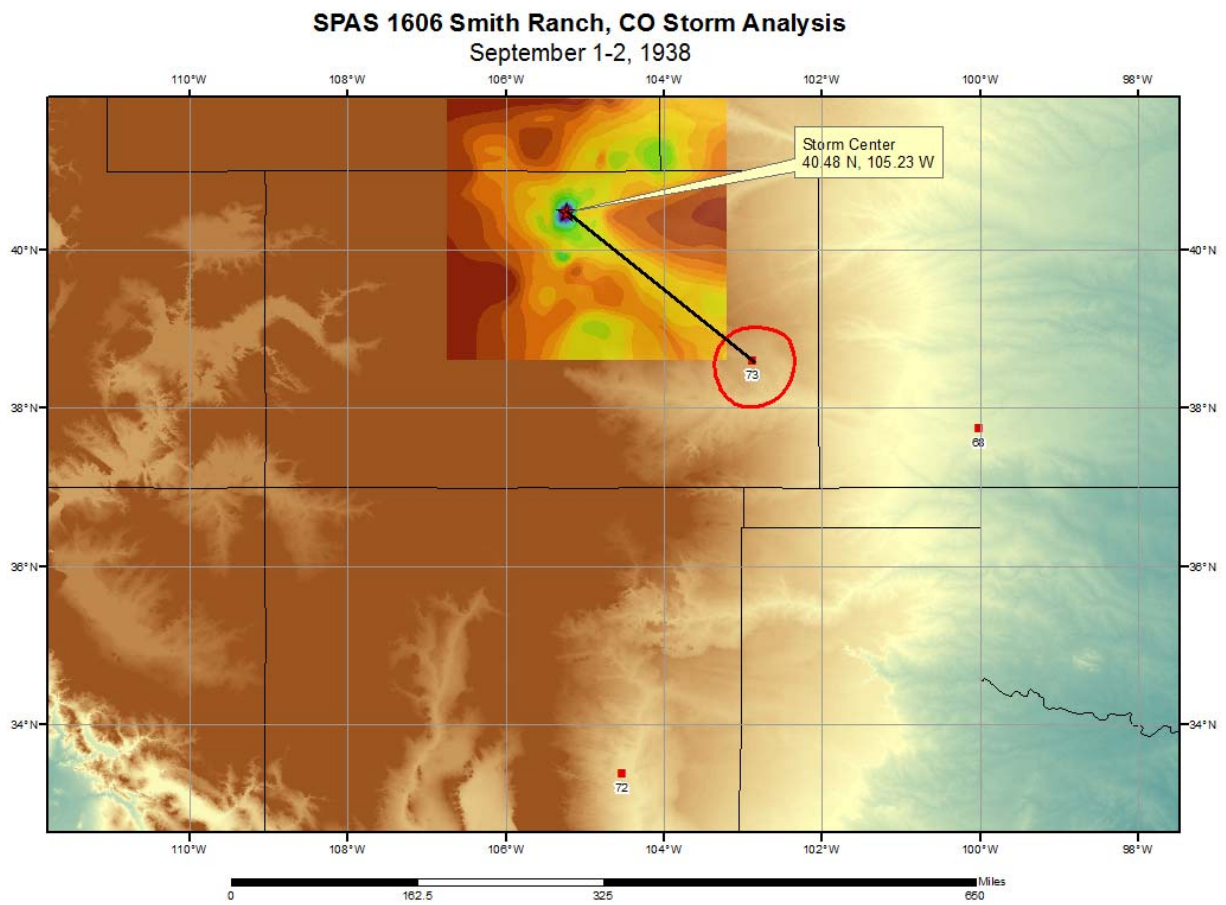
1937

Jan 20-25	OR 5-6	66	250 SE of Taylorsville, Ky.
Apr 24-28	SA 5-13	64	400 S of Clear Springs, Md.
May 26-30	GM 5-17	66	220 SE of Ragland, N. Mex.
Jun 11-13	MR 5-29	70	510 SSE of Circle, Mont.
Jun 16-22	GL 2-1	67	90 SW of Buffalo, N. Y.
Jul 10	OR 9-15	72	100 SW of Elm Grove, W. Va.
Jul 11-16	UMV 1-20	71	370 SSE of Baudette, Minn.
Aug 31-Sep 3	GL 3-5	72	240 SW of Wolverine, Mich.
Sep 6-10	SW 2-15A	73	140 SSE of Bentonville, Ark.
Sep 6-10	SW 2-15B	74	275 SSE of Cherokee, Okla.
Sep 30-Oct 4	LMV 4-22A	75	75 E of New Orleans, La.
Sep 30-Oct 4	LMV 4-22B	75	225 SE of Woodworth, La.
Oct 17-20	SA 5-14	69	210 SSE of Caesars Head, S. C.

1938

Feb 9-14	GL 2-27	56	175 SW of Lansing, Mich.
Feb 14-19	SW 2-17	64	235 S of Calvin, Okla.
Mar 28-31	OR 5-8	64	230 SSW of Fords Ferry, Ky.
Apr 5-9	GM 2-25	69	190 SW of Lock #2, Ala.
May 17-20	MR 5-6	51	450 ENE of Big Timber, Mont.
May 30-31	MR 3-29	68	290 SE of Sharon Springs, Kans.
Jun 10-11	UMV 3-17	70	210 SW of Crystal City, Mo.
Jun 26-28	SA 1-14	72	200 SW of Odessa, Del.
Jun 29-Jul 1	GL 3-11	72	125 SW of Libertyville, Ill.
Jul 19-25	GM 5-10	75	240 SSE of Christoval, Tex.
Jul 28-Aug 2	OR 5-9	73	290 S of Mayfield, Ky.
Aug 12-15	LMV 4-23	76	50 S of Koll, La.
Aug 29-30	-----	72	190 SSW of Burnsville, Miss.
Aug 30-Sep 4	MR 5-8	71	180 SE of Loveland, Colo.
Sep 16-21	SA 5-16	74	120 SW of Belhaven, N. C.
Sep 17-22	NA 2-2	68	100 SW of Barro, Mass.

CO-NM Regional Extreme Precipitation Study



Prairieview, NM

May 21-26, 1941

Storm Type: General

Storm Precipitation Analysis System (SPAS) For Storm #1587_1

General Storm Location: Prairieview, NM

Storm Dates: May 21-26, 1941

Event: Mid-latitude cyclone

DAD Zone 1

Latitude: 33.1375

Longitude: -103.0792

Max. Grid Rainfall Amount: 11.08"

Max. Observed Rainfall Amount: 10.79"

Number of Stations: 665

SPAS Version: 10.0

Basemap: Mean annual maximum 48-hour precipitation associated with MLCs

Spatial resolution: 0.2735

Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

Reliability of results: In addition to the NCDC stations, there were also four hourly stations added via digitizing some of the stations listed in the ACE report. With the density of stations available for this storm and with how closely the resulting SPAS analysis was to the ACE report, this analysis is deemed quite reliable.

WAR DEPARTMENT

CORPS OF ENGINEERS, U.S. ARMY

STORM STUDIES - PERTINENT DATA SHEET

Storm of May 20-25, 1941
 Assignment GM 5-18
 Location Texas and New Mexico
 Study Prepared by:
 Southwestern Division
 Galveston District Office

Part I Reviewed by H. M. Sec. of
 Weather Bureau, 7/18/43
 Part II Approved by Office, Chief
 of Engineers for Distribution
 of Factual Data, 2/18/44
 Remarks: Center at
 Prairieview, New Mexico

DATA AND COMPUTATIONS COMPILED**PART I**

Preliminary isohyetal map, in 1 sheet, scale 1:1,000,000

Precipitation data and mass curves: (Number of Sheets)

Form 5001-C (Hourly precip. data)----- 76

Form 5001-B (24-hour " " " ")----- -

Form 5001-D (" " " " " ")----- 26

Misc. precip. records, meteorological data, etc. (Hydrologic Network Special Supp)----- 10

Form 5002 (Mass rainfall curves)----- 78

PART II

Final isohyetal maps, in 1 sheet, scale 1:1,000,000

Data and computation sheets:

Form S-10 (Data from mass rainfall curves)----- 4

Form S-11 (Depth-area data from isohyetal map)----- 2

Form S-12 (Maximum depth-duration data)----- 15

Maximum duration-depth-area curves----- 1

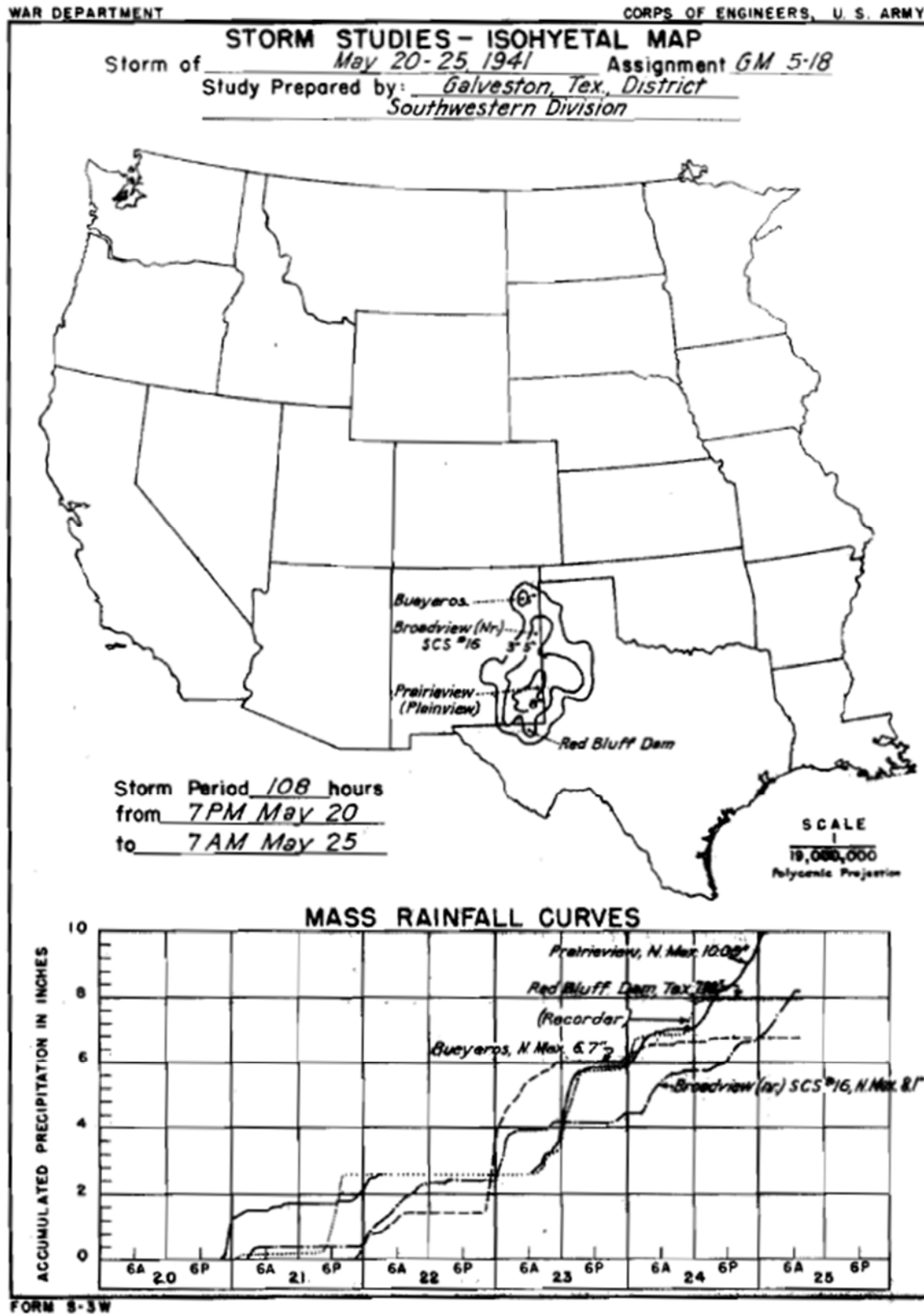
Data relating to periods of maximum rainfall----- 2

MAXIMUM AVERAGE DEPTH OF RAINFALL IN INCHES

Area in Sq. Mi.	Duration of Rainfall in Hours										
	6	12	18	24	30	36	48	60	72	96	108
10	3.8	4.8	6.0	6.5	6.9	7.0	7.4	7.4	8.4	9.3	10.0
100	3.0	4.0	5.2	6.3	6.7	6.8	6.9	7.0	8.1	9.0	9.6
200	2.7	3.7	4.7	6.0	6.4	6.6	6.7	6.9	8.0	8.8	9.5
500	2.3	3.3	4.1	5.4	5.8	6.1	6.4	6.7	7.7	8.6	9.2
1,000	2.1	3.0	3.7	4.9	5.3	5.7	6.1	6.4	7.5	8.4	9.0
2,000	1.8	2.7	3.2	4.3	4.7	5.2	5.7	6.1	7.2	8.1	8.7
5,000	1.4	2.2	2.7	3.5	3.9	4.4	5.0	5.6	6.6	7.6	8.2
10,000	1.2	1.9	2.2	2.9	3.2	3.7	4.4	5.0	5.9	7.0	7.6
20,000	0.9	1.5	1.8	2.3	2.6	3.0	3.7	4.3	5.1	6.2	6.7
44,000	0.6	1.1	1.3	1.5	1.8	2.1	2.7	3.4	3.9	4.9	5.2

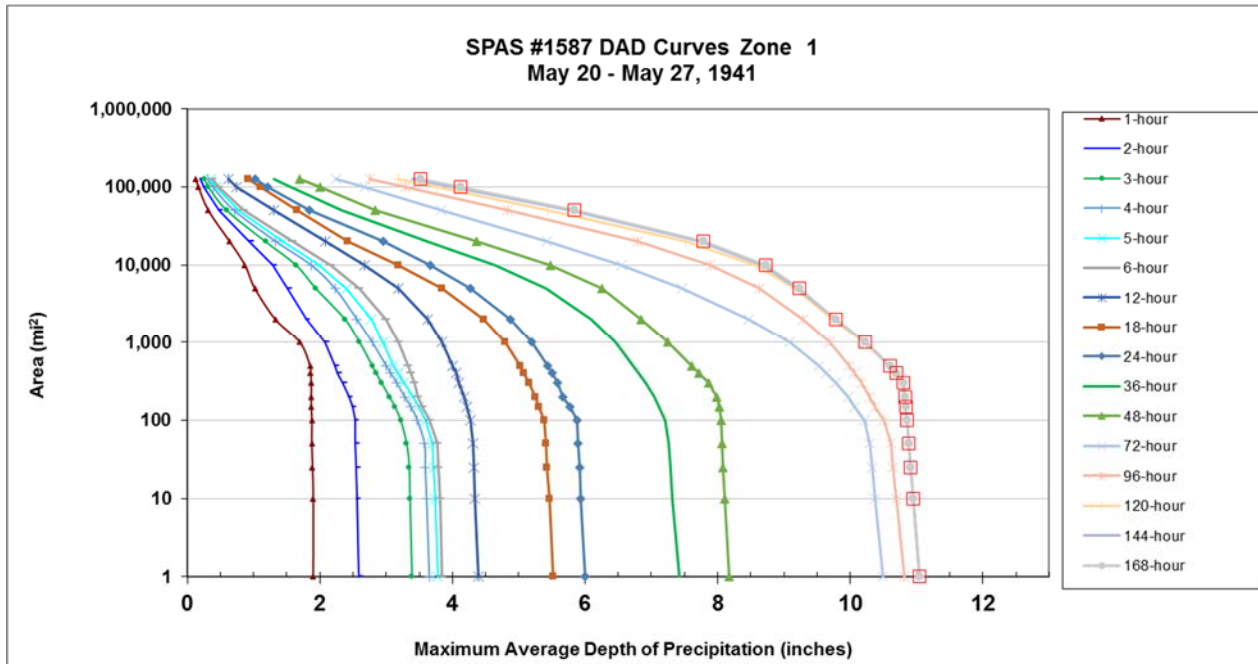
Form 3-2

CO-NM Regional Extreme Precipitation Study

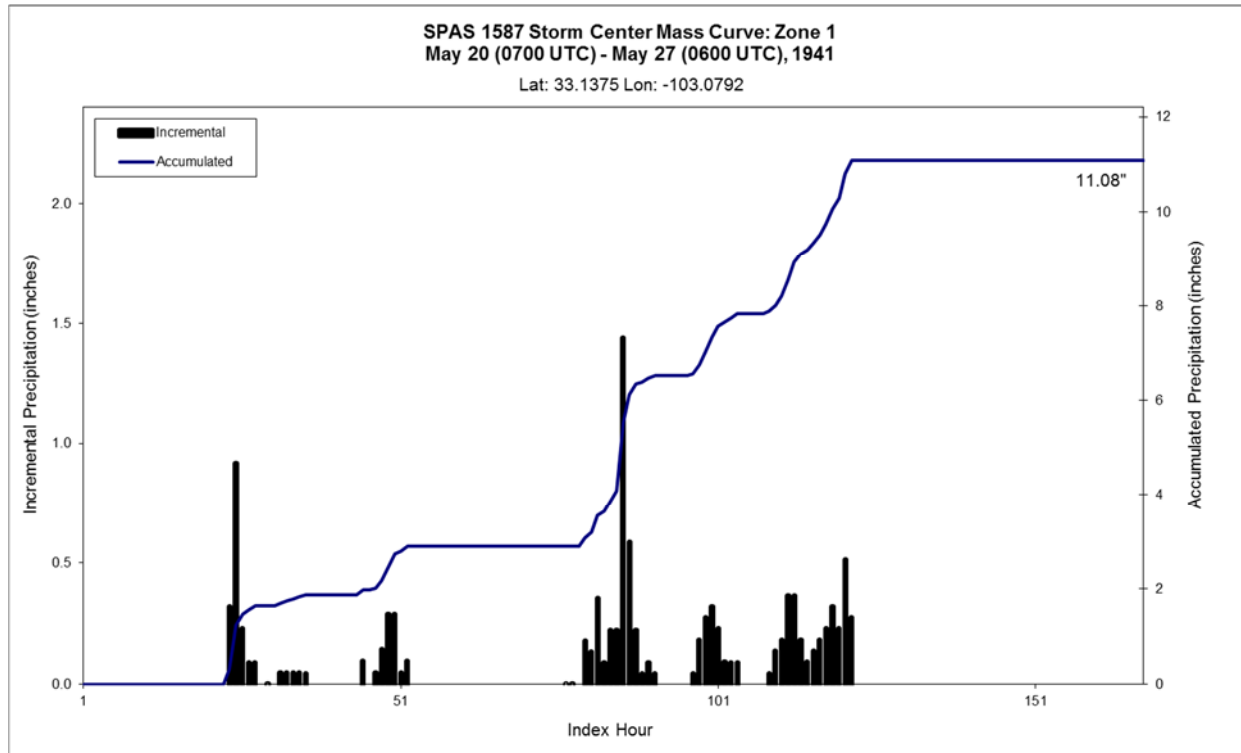


CO-NM Regional Extreme Precipitation Study

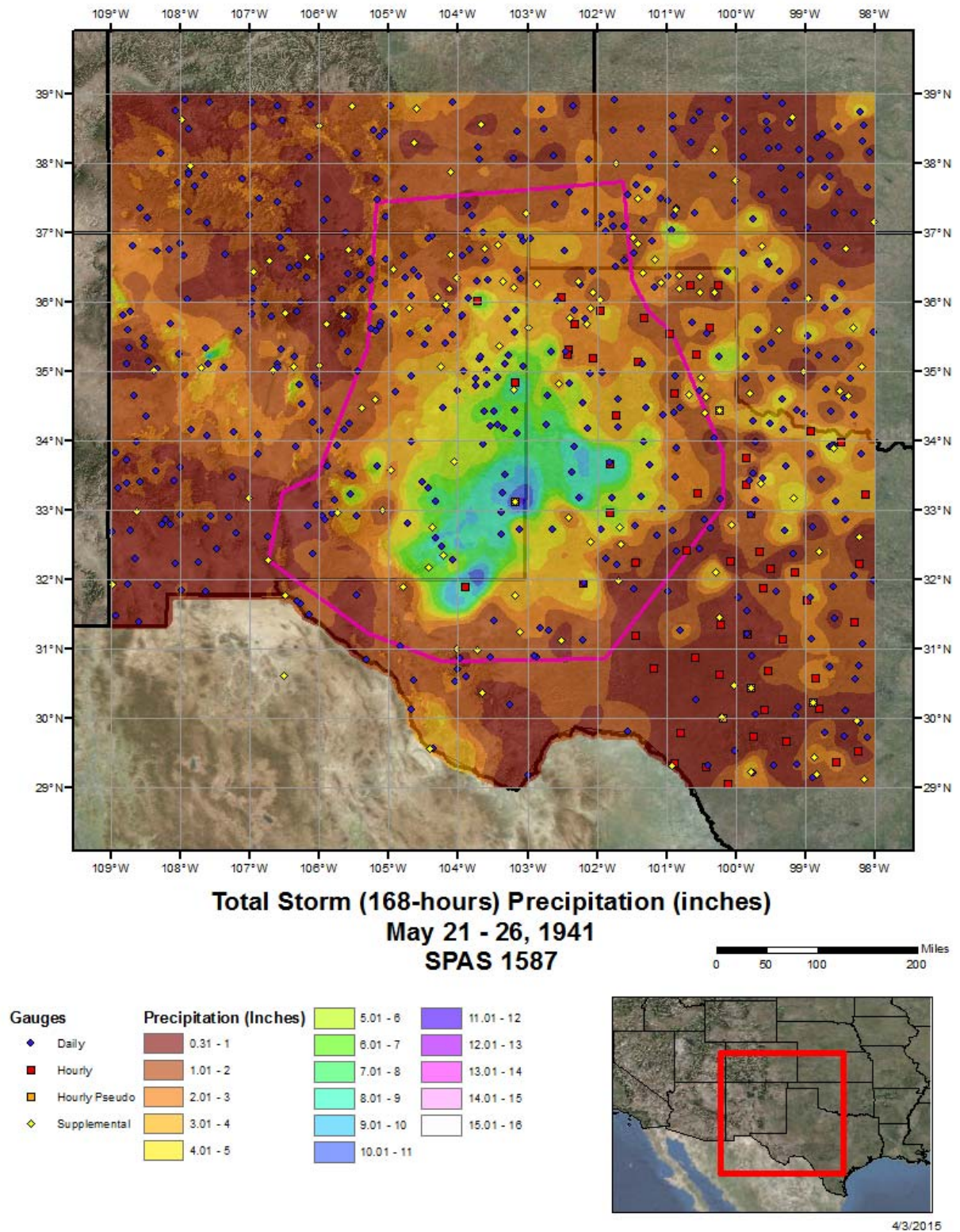
Storm 1587 - May 20 (0700 UTC) - May 27 (0600 UTC), 1941																	
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)																	
Area (mi ²)	Duration (hours)																
	1	2	3	4	5	6	12	18	24	36	48	72	96	120	144	168	Total
0.4	1.90	2.60	3.40	3.66	3.80	3.86	4.40	5.54	6.01	7.44	8.20	10.55	10.85	11.08	11.08	11.08	11.08
1	1.90	2.59	3.39	3.65	3.78	3.84	4.39	5.52	6.00	7.42	8.17	10.50	10.81	11.05	11.05	11.05	11.05
10	1.90	2.56	3.36	3.61	3.74	3.81	4.34	5.46	5.94	7.32	8.11	10.38	10.69	10.95	10.95	10.95	10.95
25	1.89	2.55	3.35	3.59	3.72	3.79	4.32	5.43	5.92	7.29	8.08	10.33	10.64	10.91	10.91	10.91	10.91
50	1.88	2.54	3.31	3.58	3.70	3.77	4.31	5.41	5.90	7.26	8.06	10.29	10.61	10.88	10.88	10.88	10.88
100	1.88	2.53	3.22	3.47	3.60	3.66	4.27	5.38	5.88	7.21	8.05	10.21	10.51	10.85	10.85	10.85	10.85
150	1.87	2.49	3.13	3.37	3.49	3.55	4.22	5.31	5.77	7.11	8.03	10.07	10.38	10.83	10.83	10.84	10.84
200	1.87	2.44	3.05	3.28	3.40	3.48	4.18	5.25	5.66	7.05	7.99	9.97	10.29	10.82	10.82	10.83	10.83
300	1.87	2.35	2.93	3.16	3.27	3.42	4.10	5.15	5.58	6.91	7.86	9.78	10.17	10.79	10.80	10.80	10.80
400	1.86	2.27	2.85	3.07	3.18	3.37	4.05	5.08	5.51	6.80	7.72	9.64	10.06	10.68	10.69	10.69	10.69
500	1.85	2.23	2.79	3.00	3.11	3.33	4.00	5.02	5.44	6.73	7.61	9.53	9.98	10.59	10.60	10.60	10.60
1,000	1.70	2.08	2.60	2.79	2.95	3.19	3.84	4.80	5.20	6.46	7.25	9.09	9.69	10.20	10.22	10.22	10.22
2,000	1.33	1.79	2.38	2.56	2.77	3.00	3.63	4.47	4.88	6.09	6.85	8.47	9.29	9.74	9.78	9.79	9.79
5,000	1.02	1.52	1.94	2.23	2.40	2.60	3.18	3.84	4.27	5.41	6.25	7.46	8.63	9.16	9.21	9.23	9.23
10,000	0.87	1.29	1.64	1.87	1.99	2.17	2.68	3.19	3.67	4.64	5.48	6.55	7.89	8.58	8.69	8.72	8.72
20,000	0.64	0.94	1.18	1.34	1.45	1.59	2.09	2.42	2.95	3.61	4.37	5.42	6.79	7.52	7.73	7.78	7.78
50,000	0.32	0.48	0.60	0.71	0.78	0.85	1.30	1.66	1.84	2.32	2.84	3.83	4.83	5.44	5.77	5.84	5.84
100,000	0.17	0.25	0.32	0.39	0.44	0.47	0.75	1.10	1.21	1.56	2.00	2.67	3.29	3.78	4.02	4.13	4.13
126,432	0.13	0.20	0.26	0.31	0.35	0.38	0.62	0.92	1.02	1.31	1.69	2.24	2.75	3.18	3.40	3.52	3.52



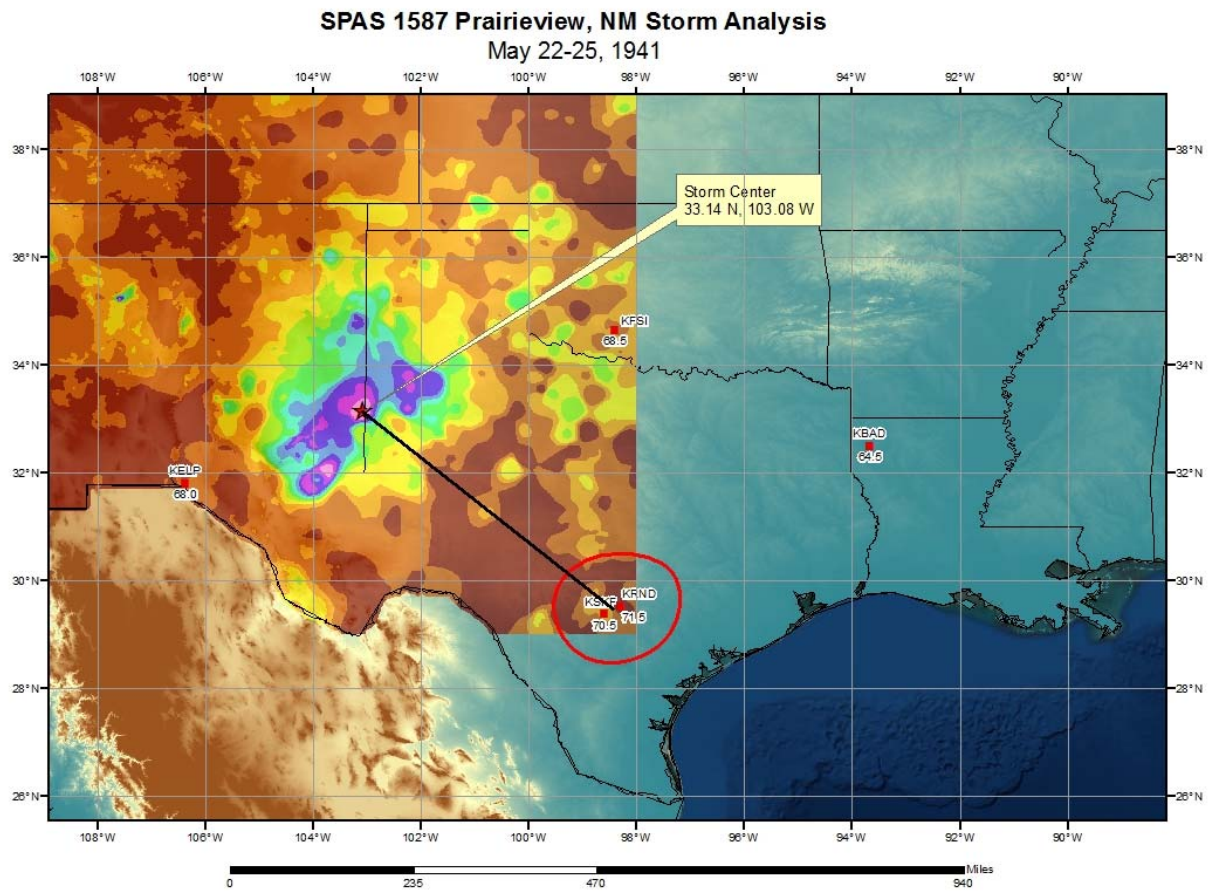
CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



McColleum Ranch, NM –September 1941

Storm Type: Synoptic

Storm Precipitation Analysis System (SPAS) For Storm #1486_1

General Storm Location: Dave McColleum Ranch, NM

Storm Dates: September 19-24, 1941

Event: Extreme Precipitation Event

DAD Zone 1

Latitude: 32.1458

Longitude: -104.7458

Max. Grid Rainfall Amount: 21.81”

Max. Observed Rainfall Amount: 21.25”

Number of Stations: 317

SPAS Version: 10.0

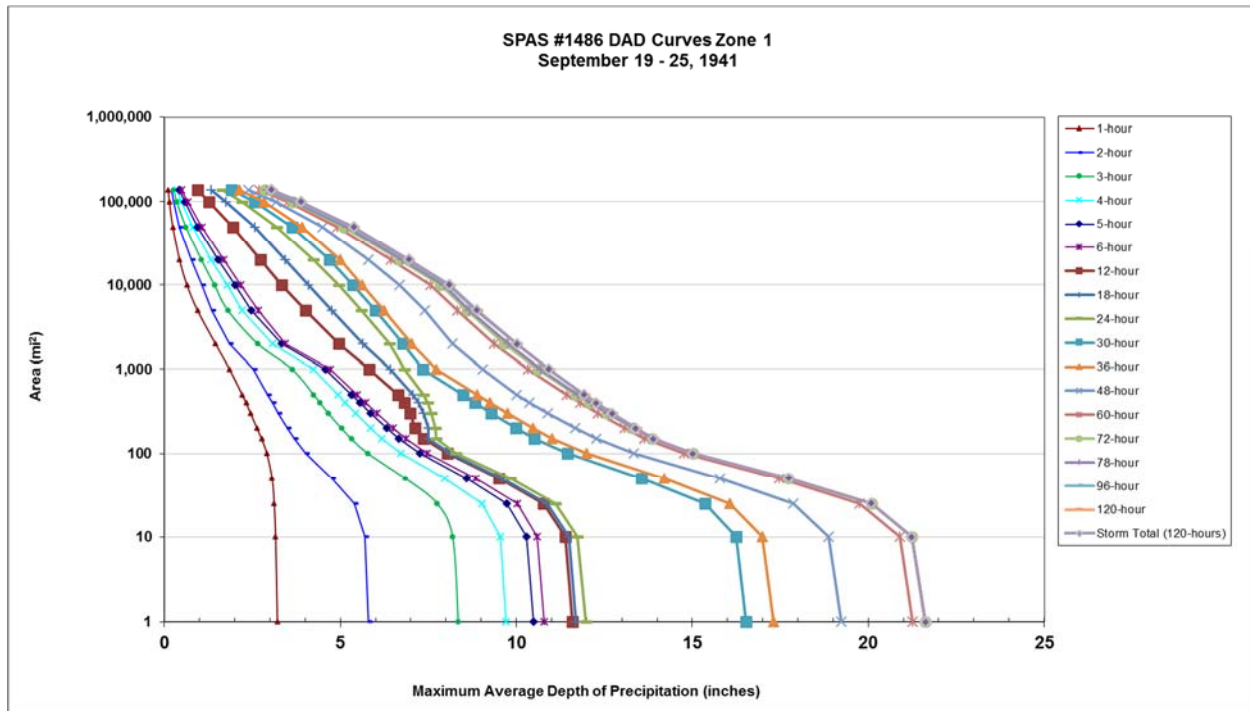
Basemap: PRISM Monthly Basemap for September 1941

Radar Included: No

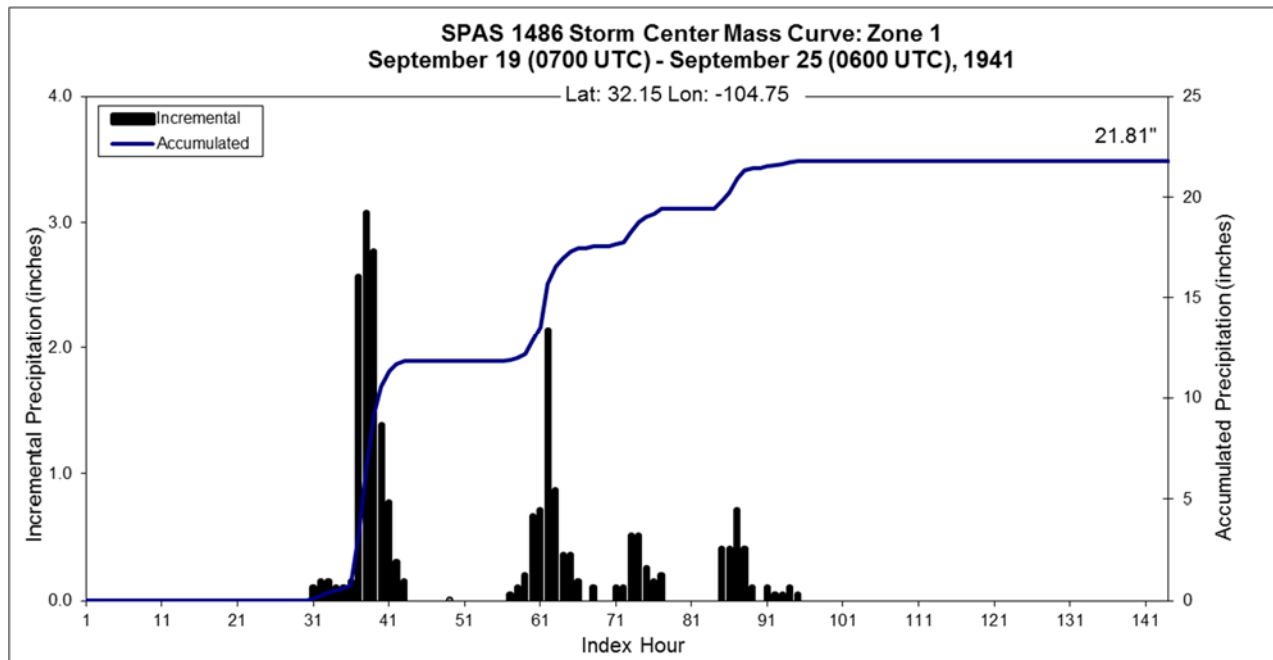
Depth-Area-Duration (DAD) analysis: Yes

CO-NM Regional Extreme Precipitation Study

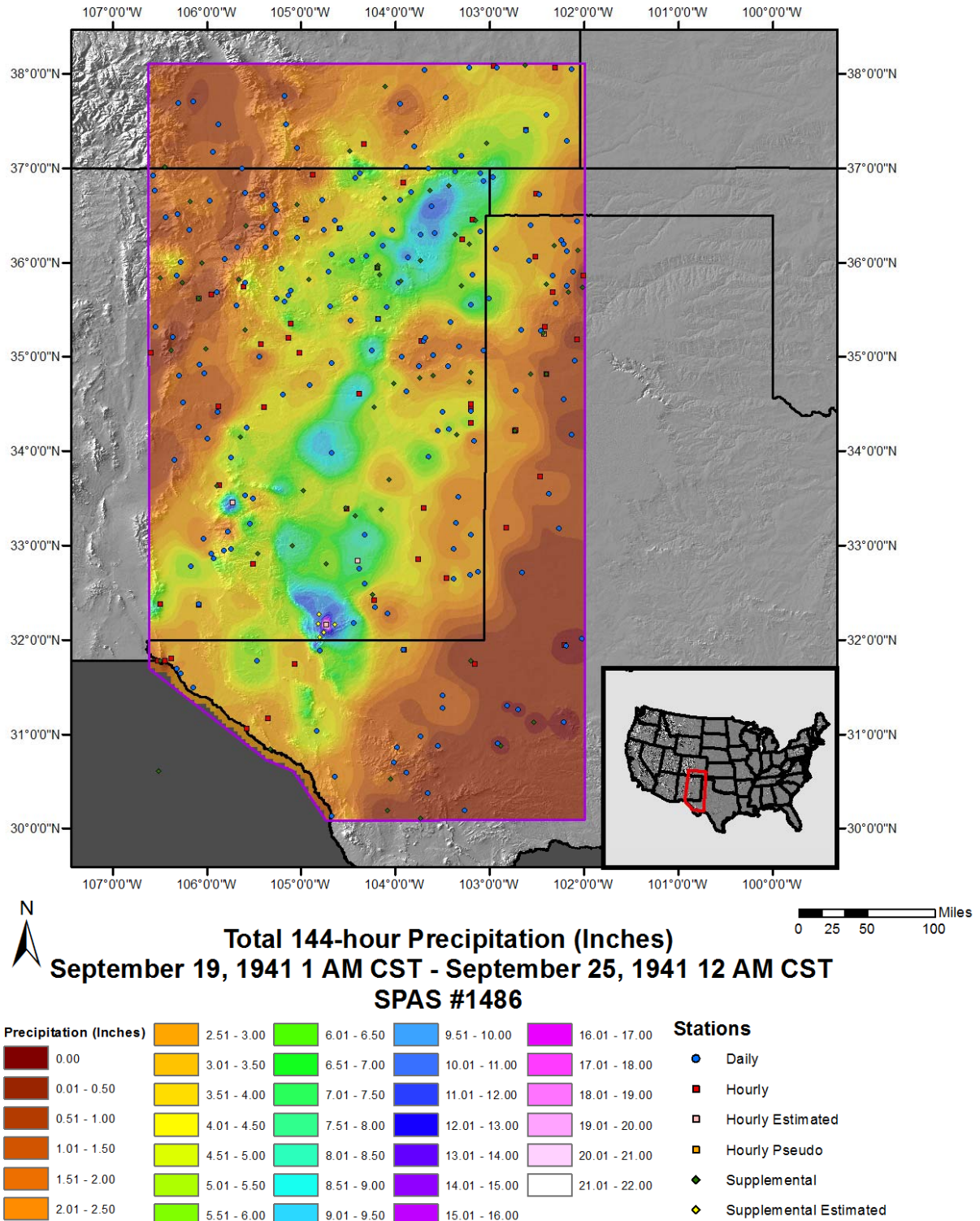
Storm 1486 Zone 1 - Sep 19 (0700 UTC) - Sep 25 (0600 UTC), 1941																	
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)																	
areasqmi	Duration (hours)																
	1	2	3	4	5	6	12	18	24	30	36	48	60	72	78	96	120
0.4	3.23	5.84	8.40	9.78	10.54	10.85	11.67	11.77	12.04	16.64	17.40	19.35	21.40	21.75	21.75	21.75	21.75
1	3.21	5.80	8.35	9.71	10.48	10.79	11.59	11.70	11.97	16.53	17.30	19.24	21.26	21.62	21.62	21.62	21.62
10	3.16	5.69	8.19	9.55	10.29	10.59	11.40	11.49	11.74	16.24	16.99	18.87	20.89	21.23	21.23	21.23	21.23
25	3.12	5.39	7.75	9.03	9.73	10.02	10.78	10.87	11.12	15.36	16.07	17.86	19.76	20.09	20.09	20.09	20.09
50	3.06	4.76	6.84	7.96	8.59	8.84	9.50	9.59	9.82	13.55	14.19	15.78	17.46	17.73	17.73	17.73	17.73
100	2.91	4.02	5.78	6.73	7.26	7.47	8.04	8.13	8.29	11.46	11.99	13.34	14.77	15.02	15.02	15.02	15.02
150	2.76	3.69	5.31	6.17	6.66	6.86	7.37	7.51	7.72	10.52	11.02	12.28	13.64	13.86	13.86	13.89	13.89
200	2.63	3.50	5.03	5.85	6.31	6.50	7.12	7.50	7.71	9.99	10.47	11.68	13.08	13.31	13.33	13.39	13.39
300	2.45	3.24	4.66	5.43	5.85	6.03	6.99	7.37	7.59	9.29	9.74	10.89	12.32	12.57	12.61	12.71	12.72
400	2.32	3.07	4.42	5.14	5.55	5.71	6.82	7.22	7.48	8.82	9.25	10.37	11.81	12.07	12.13	12.26	12.27
500	2.21	2.94	4.24	4.93	5.32	5.48	6.63	7.06	7.36	8.48	8.88	10.01	11.43	11.70	11.76	11.91	11.93
1,000	1.85	2.52	3.63	4.24	4.58	4.71	5.81	6.41	6.83	7.35	7.72	9.05	10.32	10.61	10.70	10.91	10.93
2,000	1.45	1.85	2.65	3.08	3.33	3.43	4.95	5.64	6.40	6.79	7.02	8.18	9.37	9.65	9.76	9.99	10.01
5,000	0.94	1.35	1.80	2.20	2.46	2.67	4.01	4.76	5.60	5.99	6.24	7.41	8.32	8.60	8.67	8.85	8.88
10,000	0.64	1.06	1.42	1.78	2.00	2.17	3.34	4.10	4.95	5.36	5.62	6.67	7.56	7.84	7.94	8.07	8.10
20,000	0.43	0.76	1.05	1.33	1.52	1.68	2.72	3.43	4.23	4.69	4.99	5.79	6.44	6.69	6.76	6.89	6.95
50,000	0.24	0.43	0.61	0.81	0.94	1.07	1.95	2.57	3.19	3.64	3.91	4.50	4.91	5.10	5.20	5.33	5.38
100,000	0.14	0.26	0.35	0.49	0.58	0.67	1.27	1.75	2.21	2.57	2.82	3.18	3.52	3.65	3.70	3.81	3.88
138,427	0.11	0.20	0.27	0.36	0.43	0.49	0.95	1.32	1.65	1.91	2.12	2.39	2.68	2.86	2.92	3.00	3.05



CO-NM Regional Extreme Precipitation Study

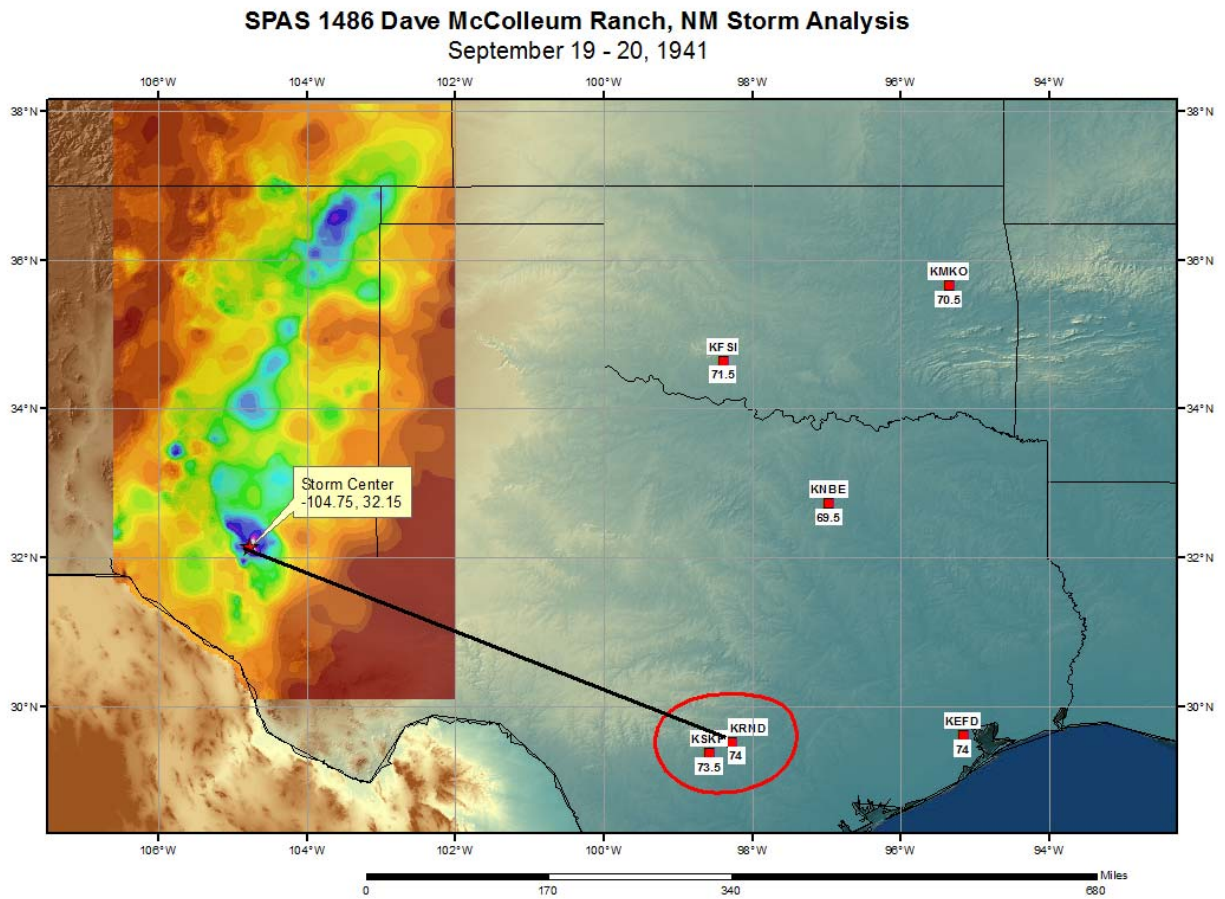


CO-NM Regional Extreme Precipitation Study



WJM 01/22/2015

CO-NM Regional Extreme Precipitation Study



Lake Maloya, NM

May 17-21, 1955

Storm Type: General

Storm Precipitation Analysis System (SPAS) For Storm #1251_1

General Storm Location: New Mexico and Colorado

Storm Dates: May 17-21, 1955

Event: Synoptic

DAD Zone 1

Latitude: 37.009

Longitude: -104.341

Max. Grid Rainfall Amount: 14.82"

Max. Observed Rainfall Amount: 13.69"

Number of Stations: 182 (133 Daily, 18 Hourly, 15 Hourly Pseudo, and 16 Supplemental)

SPAS Version: 9.5

Basemap: PRISM May 1955 precipitation

Spatial resolution: 00:00:30 (~ 0.30 mi²)

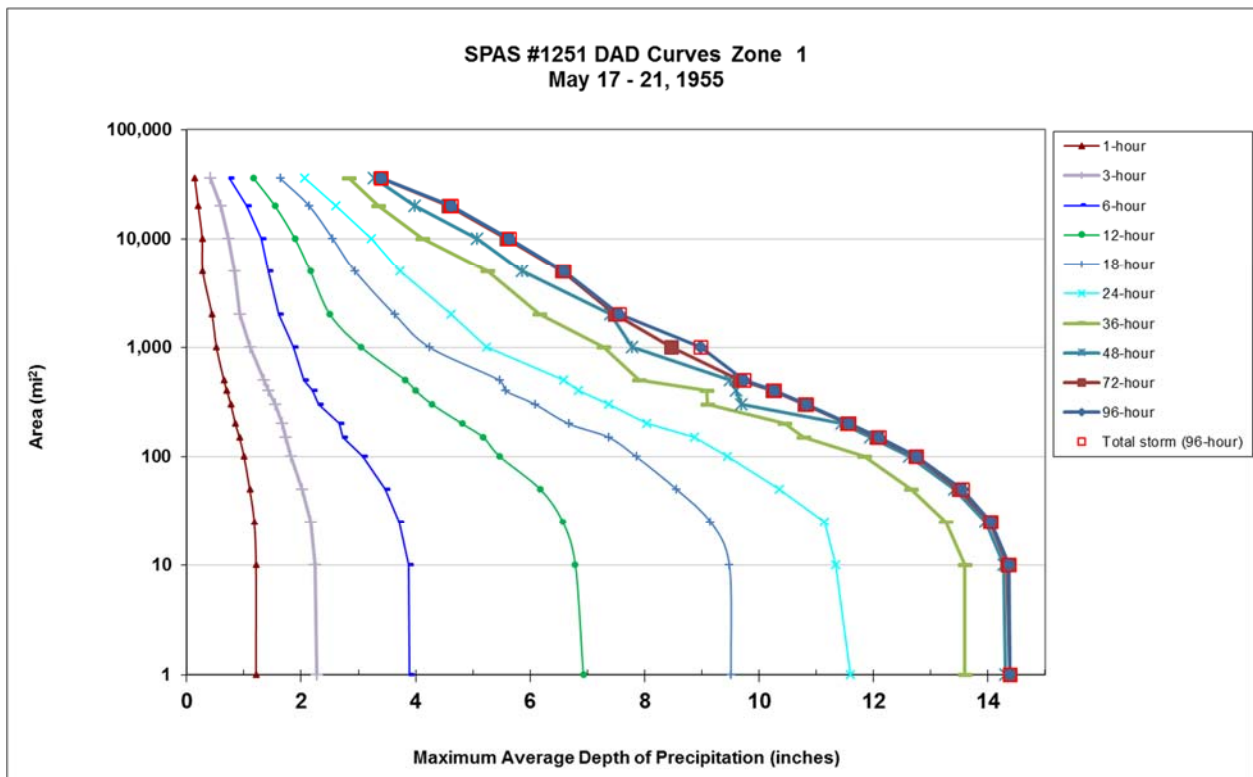
Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

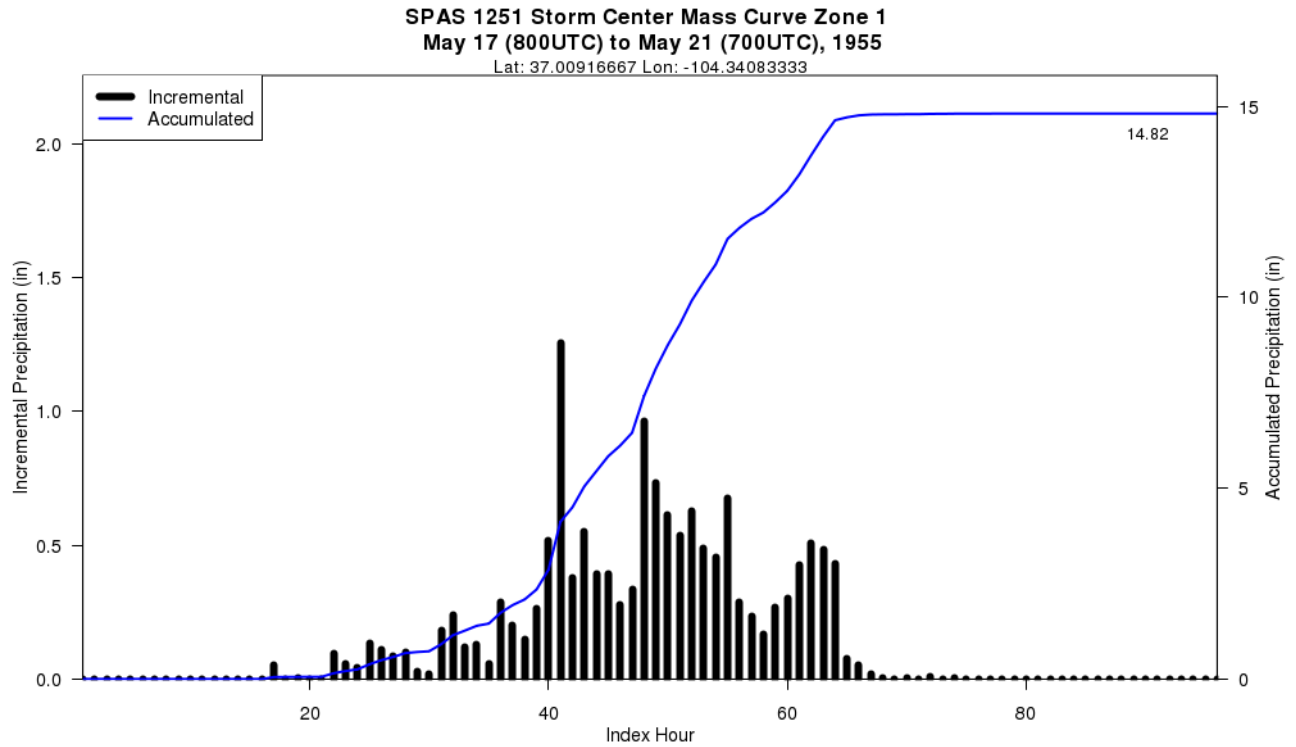
Reliability of results: This analysis was based on hourly data, daily data, and previously analyzed isohyetal pattern. We have a high degree of confidence in the station based results, and spatial pattern is dependent on PRISM basemap. The closest hourly station to Lake Maloya, NM was Raton, NM. The Lake Maloya, NM station recorded 11.28: in a 24-hr period, this value is a state record for New Mexico.

CO-NM Regional Extreme Precipitation Study

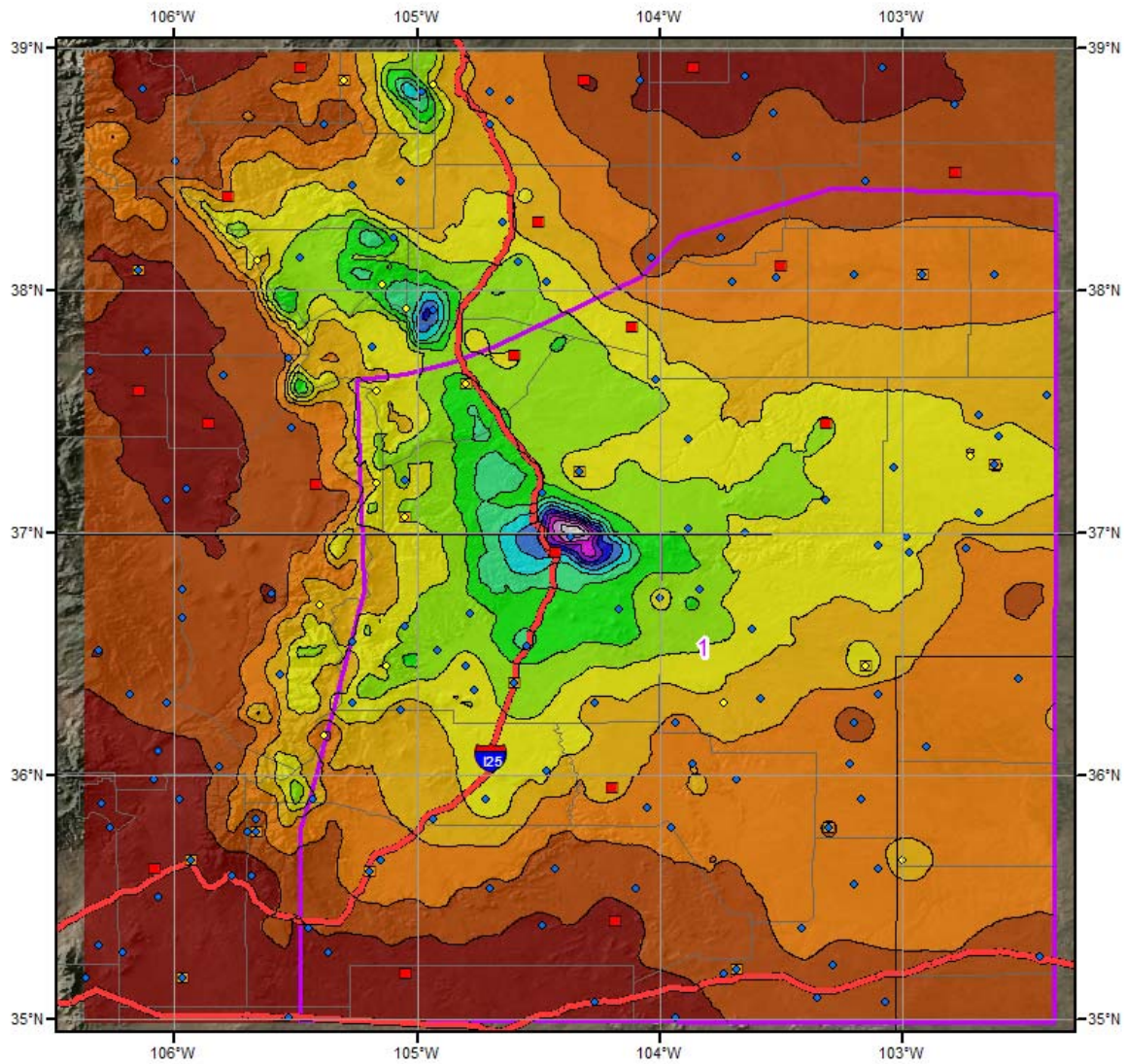
SPAS 1251 - May 17 (800 UTC) - May 21 (700 UTC), 1955											
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)											
Area (mi ²)	Duration (hours)										
	1	3	6	12	18	24	36	48	72	96	Total
0.3	1.26	2.32	3.98	7.09	9.77	11.90	14.04	14.74	14.82	14.82	14.82
1	1.21	2.27	3.89	6.93	9.51	11.60	13.60	14.30	14.38	14.38	14.38
10	1.21	2.25	3.87	6.79	9.48	11.34	13.60	14.27	14.34	14.36	14.36
25	1.18	2.16	3.71	6.57	9.15	11.14	13.26	13.95	14.03	14.04	14.04
50	1.10	2.02	3.47	6.18	8.56	10.36	12.65	13.41	13.49	13.54	13.54
100	1.00	1.82	3.08	5.47	7.85	9.45	11.84	12.63	12.73	12.74	12.74
150	0.92	1.73	2.72	5.18	7.37	8.87	10.78	11.95	12.05	12.10	12.10
200	0.85	1.67	2.66	4.81	6.67	8.04	10.44	11.44	11.54	11.57	11.57
300	0.77	1.54	2.30	4.29	6.09	7.37	9.10	9.69	10.80	10.83	10.83
400	0.70	1.42	2.20	4.00	5.57	6.85	9.08	9.59	10.23	10.26	10.26
500	0.65	1.35	2.04	3.82	5.46	6.58	7.91	9.49	9.66	9.74	9.74
1,000	0.52	1.11	1.86	3.05	4.24	5.24	7.28	7.78	8.47	8.97	8.97
2,000	0.44	0.93	1.60	2.50	3.63	4.62	6.16	7.40	7.48	7.55	7.55
5,000	0.28	0.83	1.42	2.16	2.94	3.73	5.25	5.86	6.56	6.59	6.59
10,000	0.27	0.73	1.31	1.89	2.55	3.22	4.12	5.08	5.59	5.63	5.63
20,000	0.20	0.60	1.04	1.54	2.14	2.60	3.35	3.98	4.58	4.62	4.62
35,752	0.14	0.41	0.75	1.17	1.63	2.06	2.83	3.27	3.40	3.40	3.40



CO-NM Regional Extreme Precipitation Study



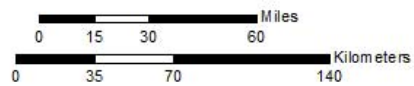
CO-NM Regional Extreme Precipitation Study



Total Precipitation (96-hours)
SPAS1251 - Lake Maloya, NM
5/17/1955 0800 GMT - 5/21/1955 0700 GMT

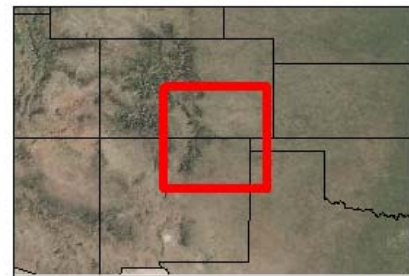
Gauges

- ◆ Daily
- Hourly
- Hourly Pseudo
- ◆ Supplemental



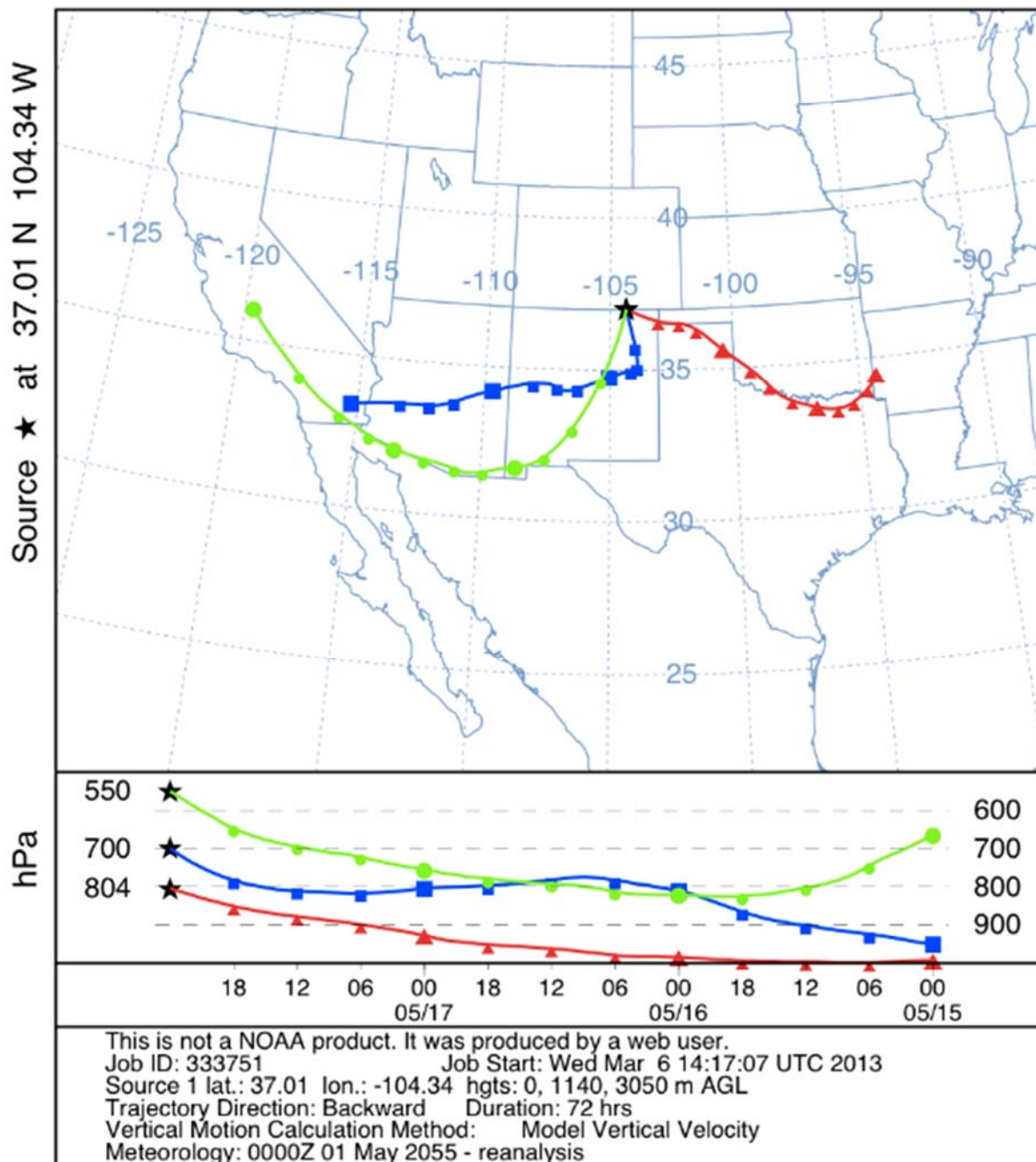
Precipitation (inches)

0.00 - 1.00	3.01 - 4.00	6.01 - 7.00	9.01 - 10.00	12.01 - 13.00
1.01 - 2.00	4.01 - 5.00	7.01 - 8.00	10.01 - 11.00	13.01 - 14.00
2.01 - 3.00	5.01 - 6.00	8.01 - 9.00	11.01 - 12.00	14.01 - 15.00

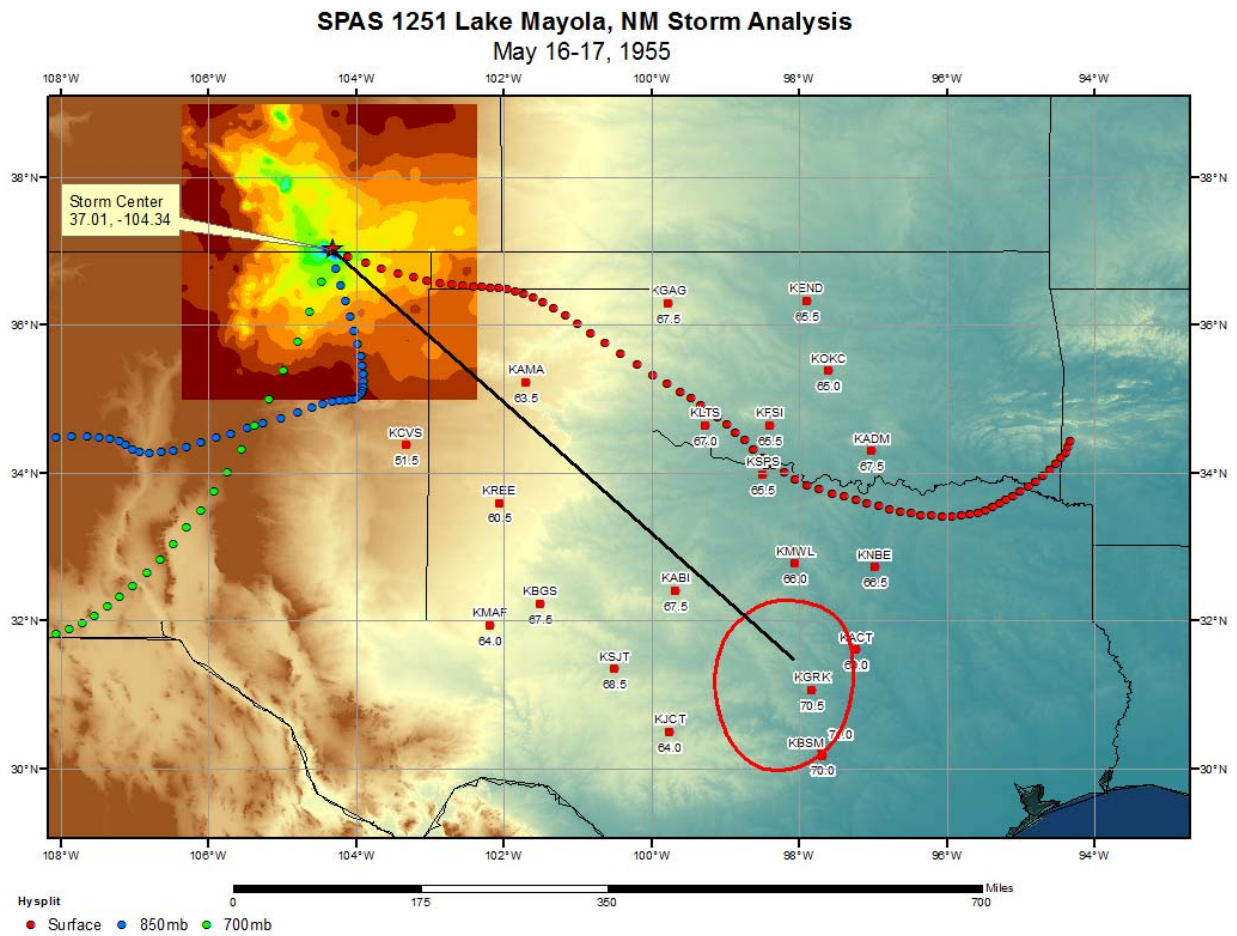


9/11/2012

NOAA HYSPLIT MODEL
Backward trajectories ending at 0000 UTC 18 May 55
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study



Pyramid, CO
September 20-24, 1961
Storm Type: General

Storm Precipitation Analysis System (SPAS) For Storm #1652_1

General Storm Location: Pyramid, CO

Storm Dates: September 20-24, 1961

Event: General

DAD Zone 1

Latitude: 40.5395

Longitude: -106.7208

Max. Grid Rainfall Amount: 6.14"

Max. Observed Rainfall Amount: 6.04"

Number of Stations: 124

SPAS Version: 10.0

Basemap: "blend_sm" is blend of 1652_isohyetal map and PRISM monthly climo

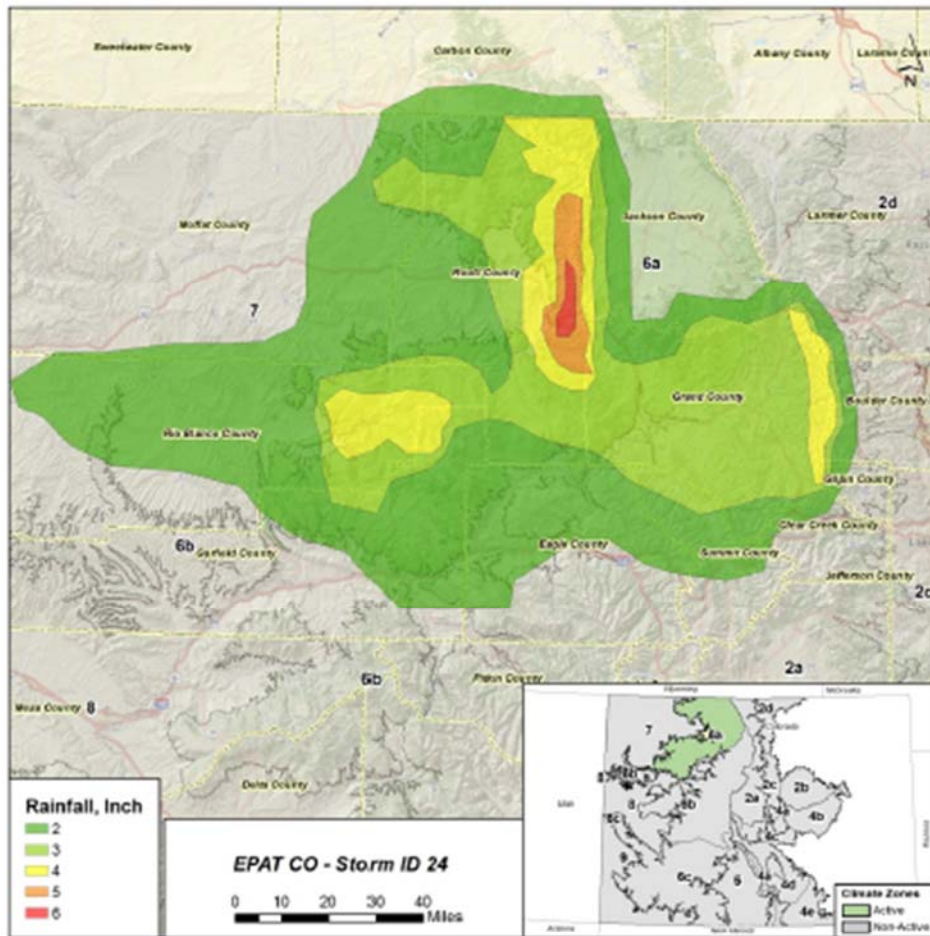
Spatial resolution: 0.2538

Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

Reliability of Results: This analysis was based on 124 hourly stations, daily data, and supplemental station data. We have a good degree of confidence for the station based storm total results. The spatial pattern is fully dependent on the blended basemap created from the total storm isohyetal image from the EPAT CO technical report for Storm ID 24 and the PRISM monthly climatology for September. Timing is based on the hourly stations and hourly estimated pseudo station created from the "Pyramid" mass curve from the same EPAT CO technical report. Several daily stations were moved to supplemental due to timing issues and to ensure data consistency.

CO-NM Regional Extreme Precipitation Study



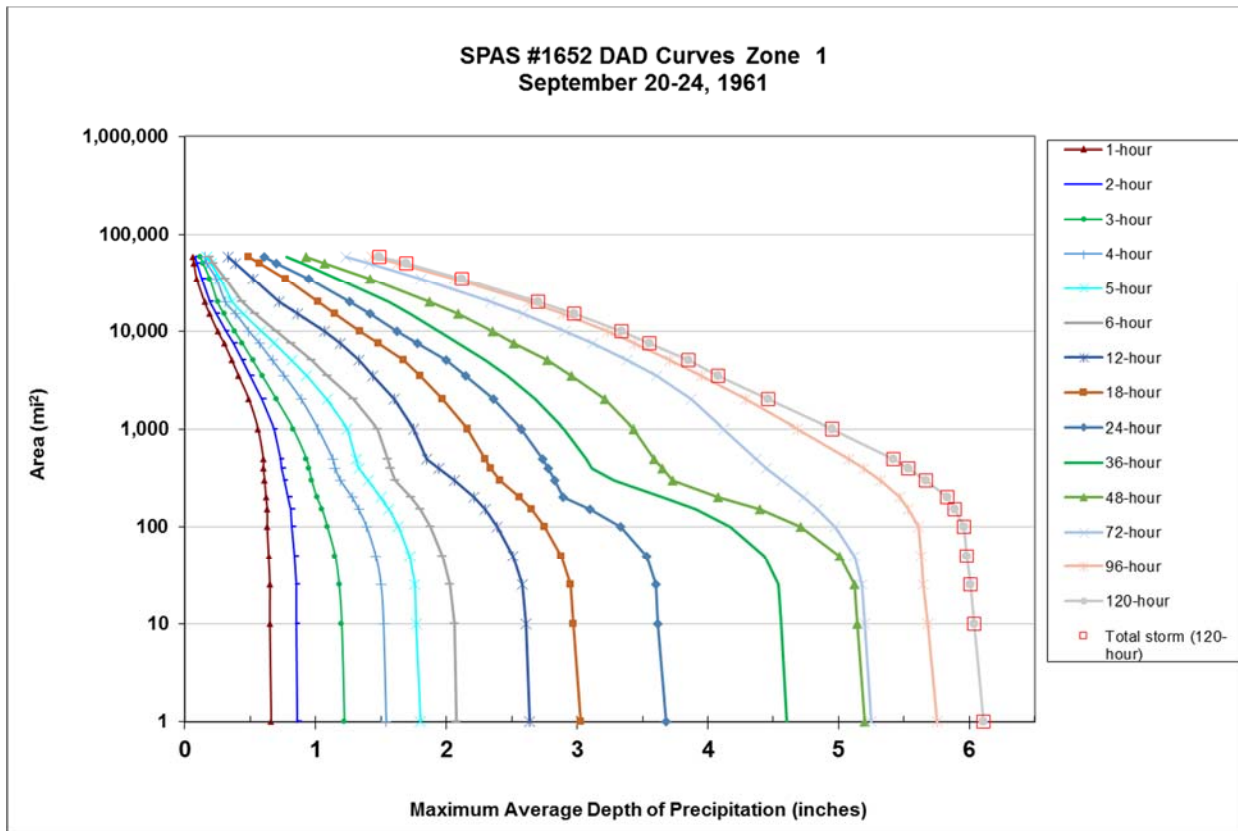
Synopsis and Climate Zone Classification:

Storm ID 24, Climate Zone 6a: A frontal boundary extended over Colorado for a 4 day period providing an additional dynamic component to the daily late monsoonal thunderstorm activity. 3.64" were reported in Marvina over a 2 day period. This storm is currently allowed in only climate zone 6a, however, due to the nature of the shifting frontal boundary that was the synoptic driver of this event and similar terrain in zones 6b and 6c, attribution to these climate zones could be theoretically possible for this storm.

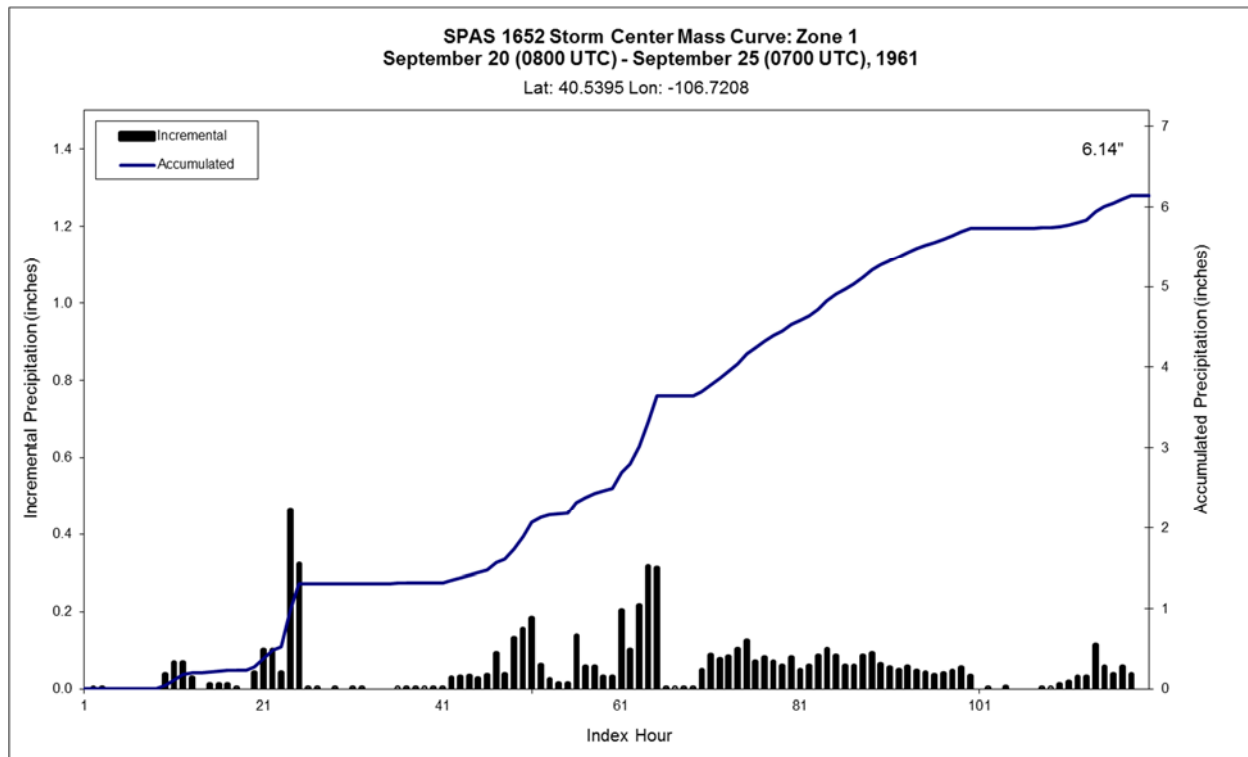
Start Date-End Date	September 20, 1961 – September 24, 1961
Storm ID/Name	STORM ID 24 – Pyramid
Storm Type	General Storm
State/Climate Zone Attribution	Colorado/Climate Zone 6a
Max Precipitation/Duration	6.00"/120 hours
Originator/Storm source	CSU report/HMR (HDR temporal)
Low Level Wind	290 degrees
Upper Level Wind	290 degrees
Seasonal Max.PWI /-1000mb Td/In-Place Max. Fctr. (source Td /location ID)	2.27" / 70.1F / 1.50 (47F @ KGJT AM sounding 9/22 1 obs. used)
Elevation of Peak Precipitation	9659 ft.

CO-NM Regional Extreme Precipitation Study

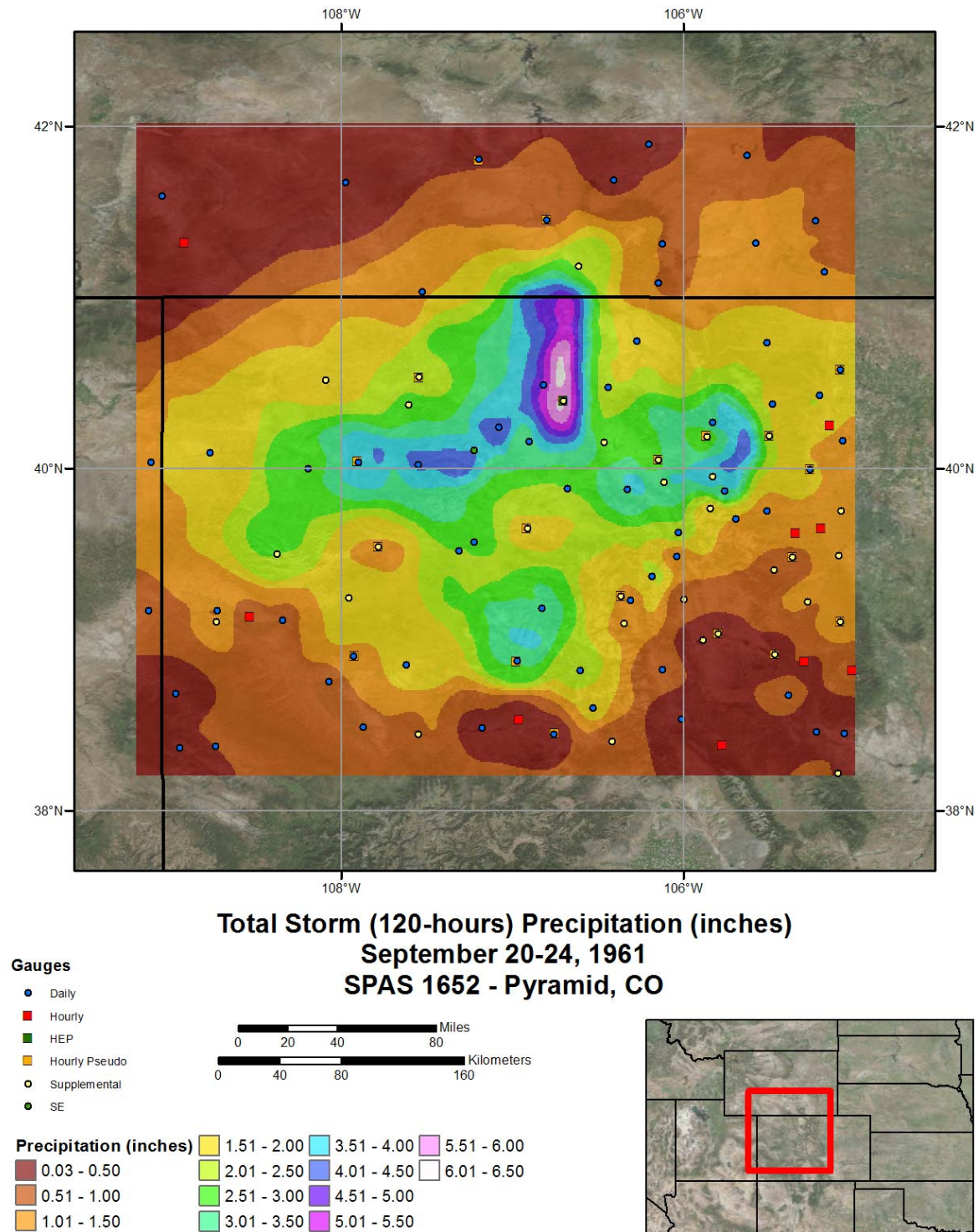
Storm 1652 - September 20 (0800 UTC) - September 25 (0700 UTC), 1961														
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
Area (mi ²)	Duration (hours)													
	1	2	3	4	5	6	12	18	24	36	48	72	96	120
0.4	0.66	0.86	1.22	1.55	1.82	2.09	2.66	3.04	3.69	4.62	5.22	5.27	5.76	6.14
1	0.66	0.86	1.22	1.54	1.80	2.08	2.64	3.03	3.68	4.60	5.20	5.25	5.75	6.11
10	0.65	0.85	1.20	1.52	1.77	2.06	2.61	2.97	3.62	4.56	5.14	5.20	5.68	6.04
25	0.65	0.85	1.18	1.50	1.76	2.03	2.58	2.95	3.60	4.54	5.12	5.18	5.65	6.01
50	0.64	0.84	1.15	1.46	1.72	1.97	2.51	2.88	3.53	4.43	5.01	5.12	5.63	5.98
100	0.63	0.82	1.09	1.39	1.63	1.88	2.39	2.75	3.33	4.17	4.71	4.97	5.61	5.96
150	0.63	0.81	1.05	1.33	1.56	1.80	2.30	2.65	3.10	3.91	4.40	4.84	5.53	5.89
200	0.62	0.79	1.01	1.28	1.50	1.73	2.21	2.56	2.89	3.65	4.08	4.73	5.47	5.83
300	0.61	0.76	0.97	1.19	1.40	1.61	2.06	2.41	2.83	3.28	3.73	4.57	5.32	5.67
400	0.60	0.74	0.95	1.15	1.33	1.57	1.94	2.34	2.78	3.11	3.65	4.45	5.19	5.53
500	0.60	0.73	0.93	1.13	1.31	1.55	1.85	2.30	2.74	3.07	3.59	4.37	5.08	5.42
1,000	0.56	0.68	0.83	1.02	1.24	1.47	1.75	2.16	2.57	2.90	3.43	4.12	4.69	4.95
2,000	0.49	0.59	0.70	0.89	1.09	1.29	1.60	1.97	2.36	2.68	3.21	3.87	4.29	4.46
3,500	0.41	0.50	0.59	0.76	0.93	1.09	1.44	1.80	2.15	2.47	2.96	3.61	3.95	4.08
5,000	0.36	0.44	0.52	0.67	0.82	0.97	1.33	1.67	2.00	2.30	2.77	3.38	3.71	3.85
7,500	0.30	0.37	0.44	0.57	0.68	0.81	1.19	1.48	1.78	2.09	2.52	3.12	3.44	3.55
10,000	0.25	0.31	0.38	0.49	0.58	0.70	1.07	1.34	1.62	1.94	2.35	2.91	3.23	3.34
15,000	0.19	0.24	0.30	0.39	0.45	0.54	0.86	1.15	1.42	1.72	2.09	2.59	2.89	2.98
20,000	0.15	0.19	0.25	0.31	0.36	0.44	0.72	1.02	1.26	1.56	1.87	2.34	2.63	2.70
35,000	0.09	0.13	0.19	0.24	0.27	0.31	0.52	0.77	0.95	1.17	1.42	1.81	2.06	2.12
50,000	0.07	0.09	0.14	0.17	0.20	0.22	0.39	0.57	0.70	0.90	1.07	1.41	1.63	1.69
58,631	0.06	0.08	0.12	0.15	0.17	0.19	0.33	0.49	0.61	0.78	0.93	1.23	1.43	1.49



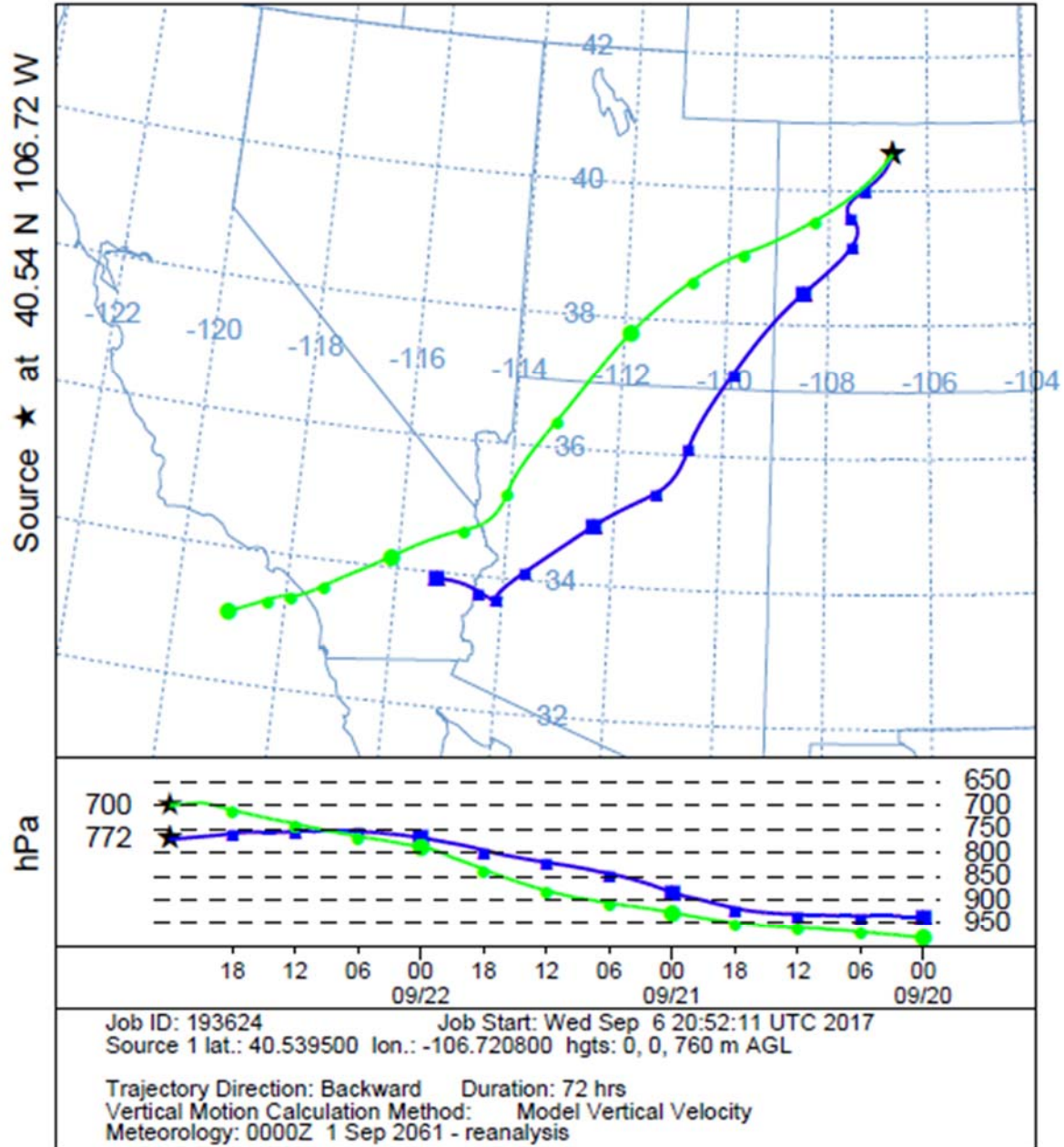
CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study

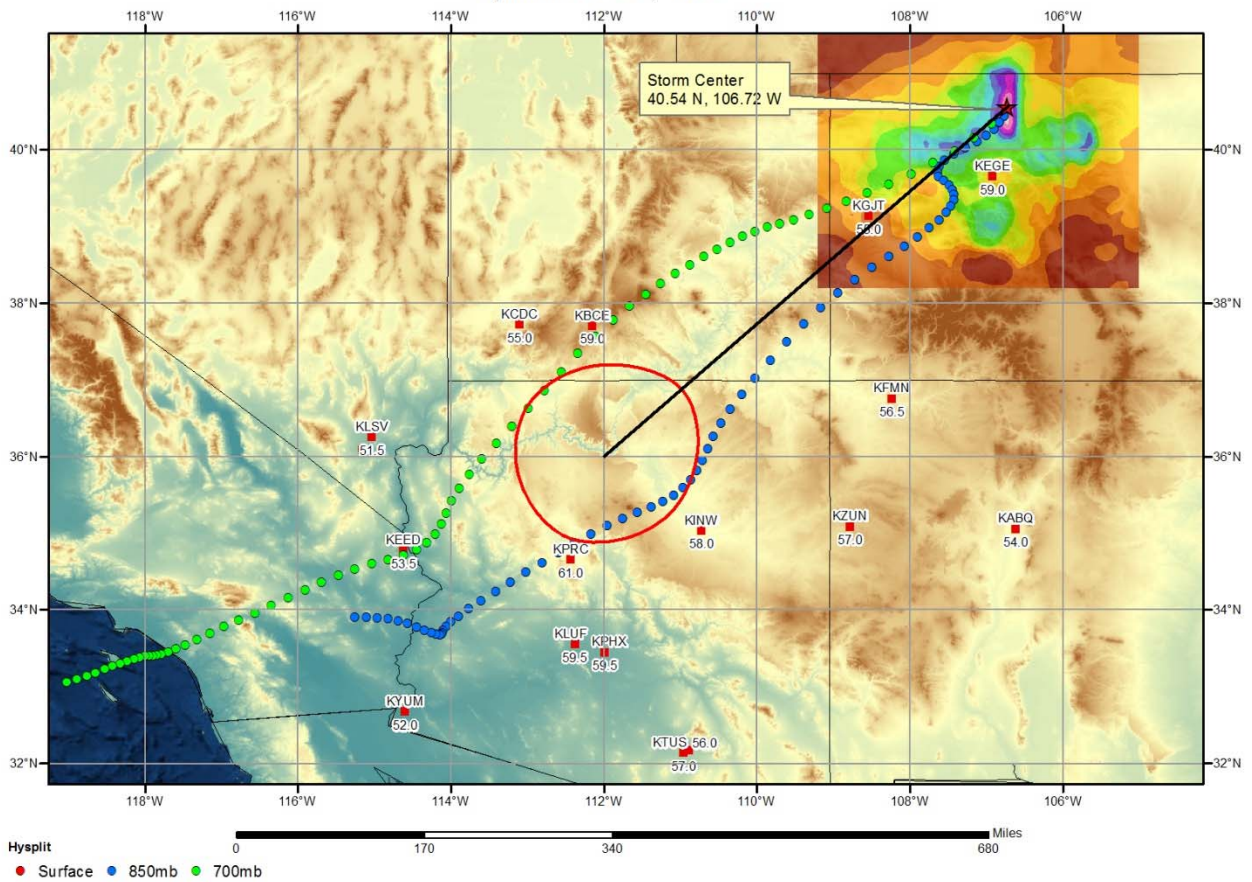


NOAA HYSPLIT MODEL
Backward trajectories ending at 0000 UTC 23 Sep 61
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study

SPAS 1652 Pyramid, CO Storm Analysis September 21-22, 1961



Gibson Dam, MT

June 6-10, 1964

Storm Type: General

Storm Precipitation Analysis System (SPAS) For Storm #1211_1

General Storm Location: Gibson Dam and Summit, Montana (a.k.a. HMR 57 #155)

Storm Dates: June 6-9, 1964 (6/6/1964 0600 UTC – 6/10/1964 0500 – 96-hours)

Event: Mid-latitude cyclone/upslope

DAD Zone 1

Latitude: 48.35416°

Longitude: -113.37083°

Max. Grid Rainfall Amount: 487mm

Max. Observed Rainfall Amount: 393.7mm at Summit, MT (Marias Pass)

Number of Stations: 510 (87 daily, 26 hourly, 1 hourly estimated, 1 hourly estimated pseudo, 5 hourly pseudos, 387 supplemental and 3 supplemental estimated)

SPAS Version: 8.5

Base Map Used: PRISM mean 1971-2000 June precipitation

Spatial resolution: 30 seconds (degree: minute: second, WGS84, ~ 0.2 mi², 0.52 km²)

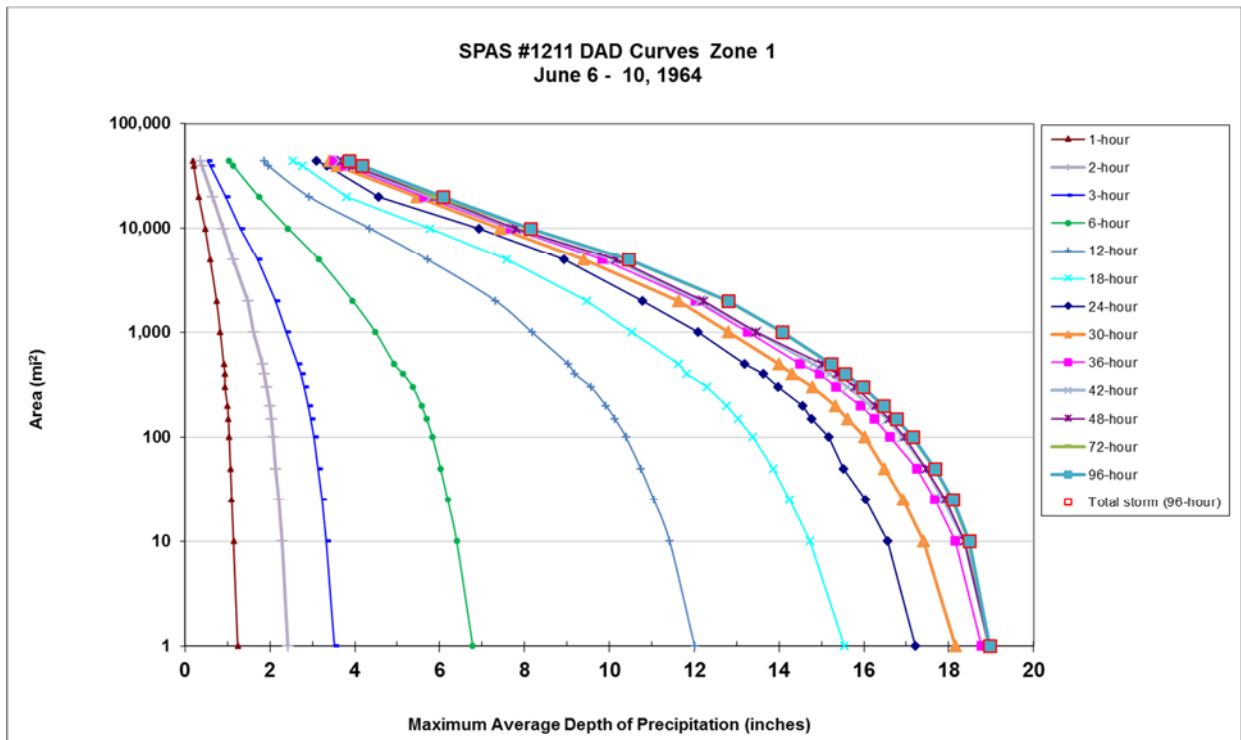
Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

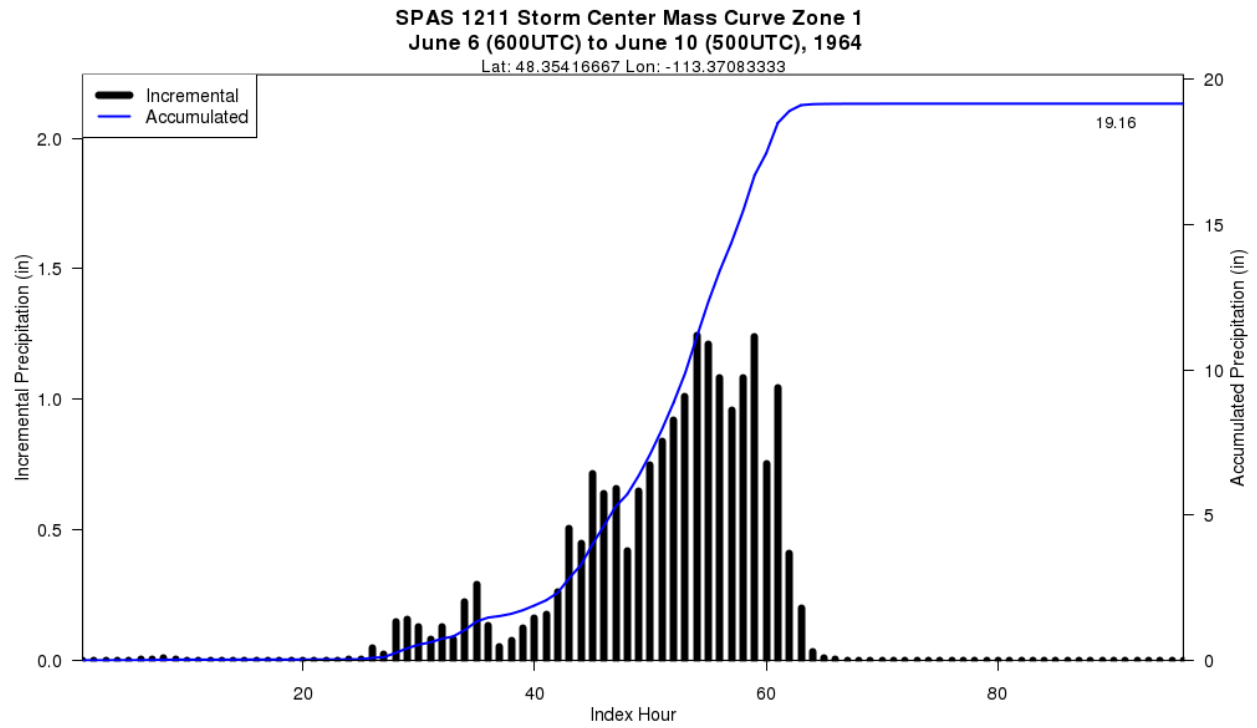
Reliability of results: Over most of the storm analysis domain, abundant gauge data and well positioned hourly rain gauges provided better than average confidence in the results. At the time this analysis was completed, no hourly recording stations were available in southern Alberta, therefore we have lower confidence in the temporal distribution of precipitation across the northern portion of the analysis domain. And although we generally had abundant gauge data, the wettest mountain locations were not well covered by observations, therefore the maximum storm precipitation centers are driven by the basemap (PRISM mean 1971-2000 June precipitation).

CO-NM Regional Extreme Precipitation Study

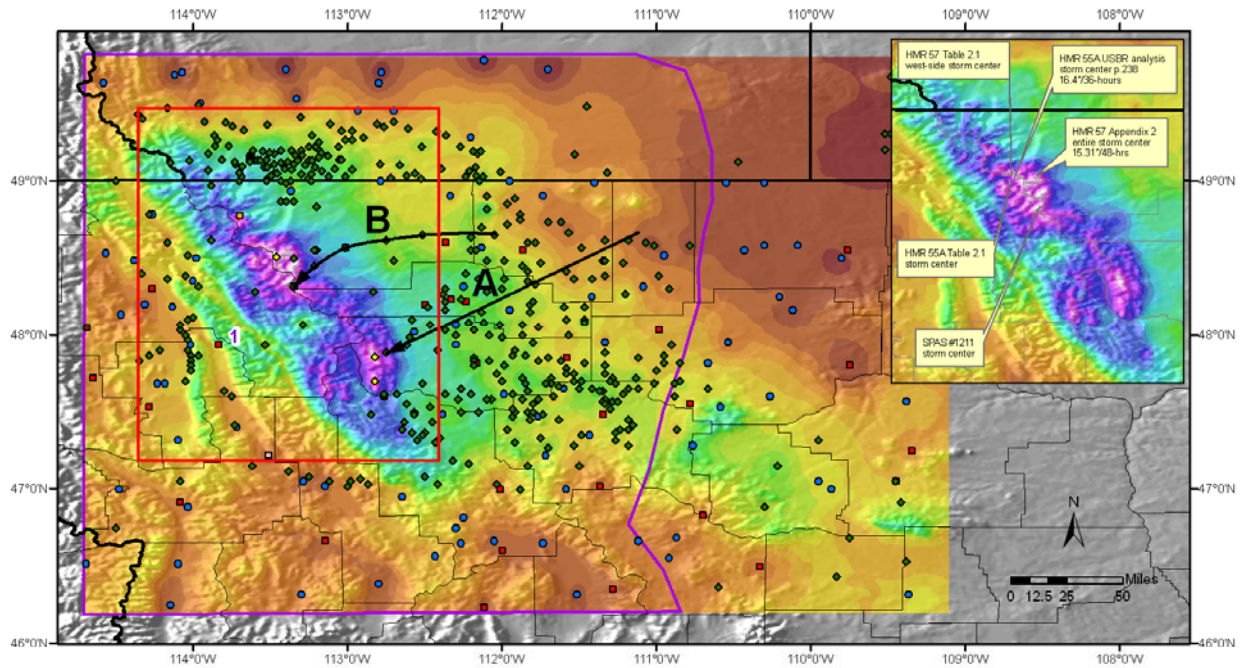
Storm 1211 - June 6 (0600 UTC) - June 10 (0500 UTC), 1964														
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
Area (mi ²)	Duration (hours)													
	1	2	3	6	12	18	24	30	36	42	48	72	96	Total
0.2	1.25	2.46	3.54	6.82	12.13	15.66	17.38	18.28	19	19.12	19.13	19.15	19.16	19.16
1	1.24	2.42	3.52	6.78	12.01	15.54	17.22	18.16	18.78	18.94	18.95	18.96	18.96	18.96
10	1.14	2.29	3.33	6.4	11.42	14.72	16.56	17.4	18.15	18.37	18.37	18.47	18.48	18.48
25	1.1	2.2	3.22	6.19	11.05	14.24	16.04	16.92	17.68	17.86	17.93	18.08	18.09	18.09
50	1.07	2.14	3.13	6.02	10.74	13.86	15.51	16.48	17.25	17.46	17.46	17.67	17.68	17.68
100	1.04	2.08	3.03	5.83	10.39	13.38	15.17	16.01	16.61	16.9	16.96	17.14	17.15	17.15
150	1.02	2.03	2.96	5.69	10.13	13.04	14.77	15.61	16.24	16.55	16.59	16.76	16.77	16.77
200	1	1.99	2.91	5.57	9.92	12.77	14.55	15.32	15.93	16.18	16.27	16.46	16.47	16.47
300	0.94	1.92	2.81	5.37	9.57	12.3	13.98	14.79	15.34	15.61	15.79	15.96	15.97	15.97
400	0.94	1.87	2.73	5.14	9.19	11.81	13.63	14.31	14.95	15.19	15.37	15.55	15.56	15.56
500	0.91	1.82	2.66	4.93	9.02	11.63	13.18	14	14.5	14.8	15.02	15.2	15.22	15.22
1,000	0.83	1.61	2.39	4.49	8.18	10.52	12.09	12.8	13.26	13.46	13.46	14.07	14.08	14.08
2,000	0.74	1.47	2.13	3.95	7.32	9.47	10.77	11.63	12.03	12.12	12.23	12.78	12.8	12.80
5,000	0.59	1.13	1.71	3.15	5.71	7.58	8.93	9.4	9.83	10.08	10.17	10.44	10.45	10.45
10,000	0.47	0.9	1.31	2.43	4.35	5.78	6.93	7.42	7.67	7.78	7.79	8.13	8.14	8.14
20,000	0.32	0.64	0.95	1.74	2.93	3.81	4.56	5.46	5.64	5.8	5.88	5.95	6.08	6.08
40,000	0.2	0.39	0.59	1.13	1.95	2.77	3.34	3.58	3.76	3.9	3.95	4.17	4.17	4.17
44,374	0.18	0.36	0.54	1.04	1.86	2.54	3.09	3.41	3.52	3.64	3.7	3.85	3.86	3.86



CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



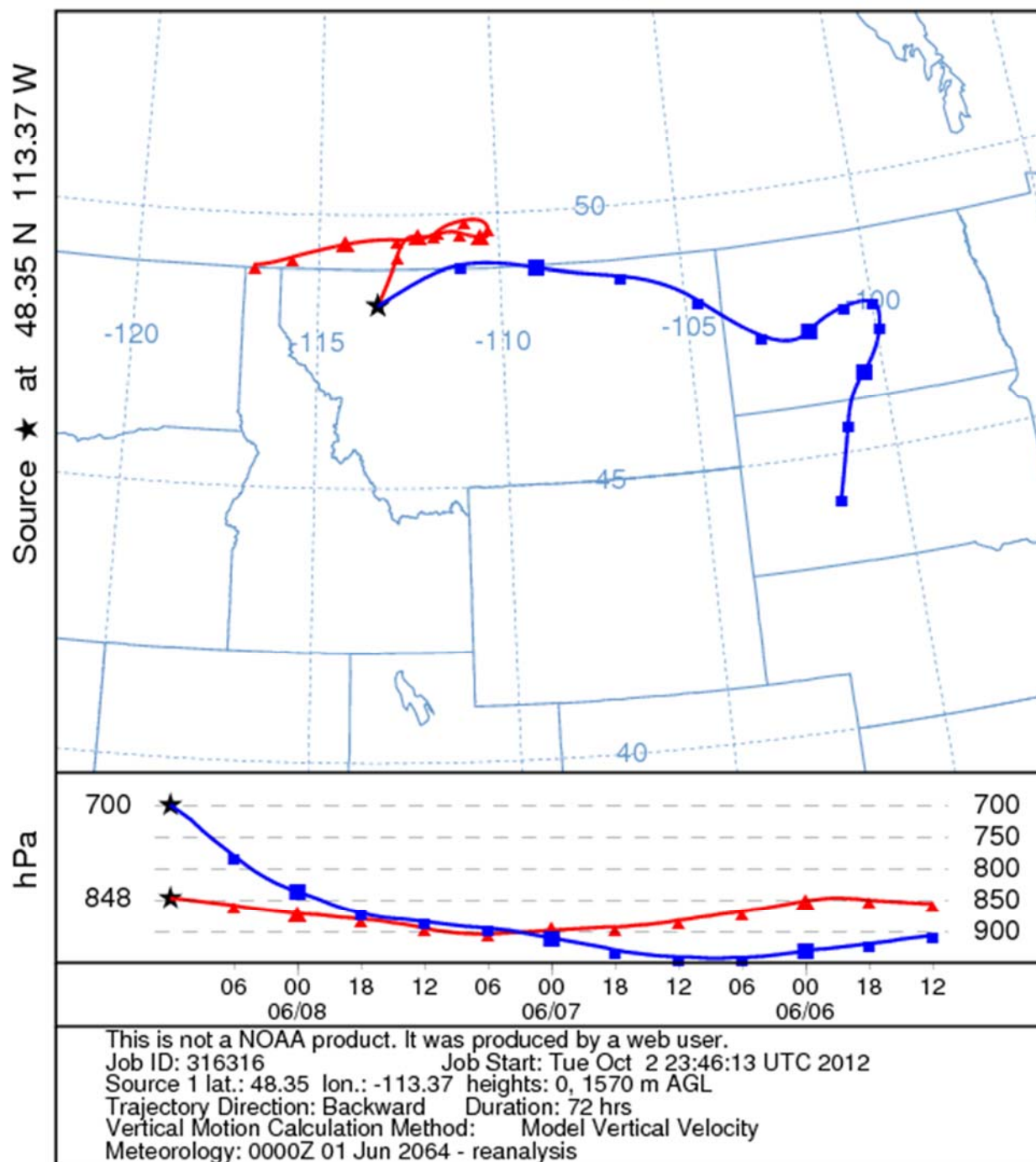
Total 96-hour Precipitation
SPAS #1211

June 6, 1964 0600 UTC - June 10, 1964 0500 UTC

Precipitation (inches)

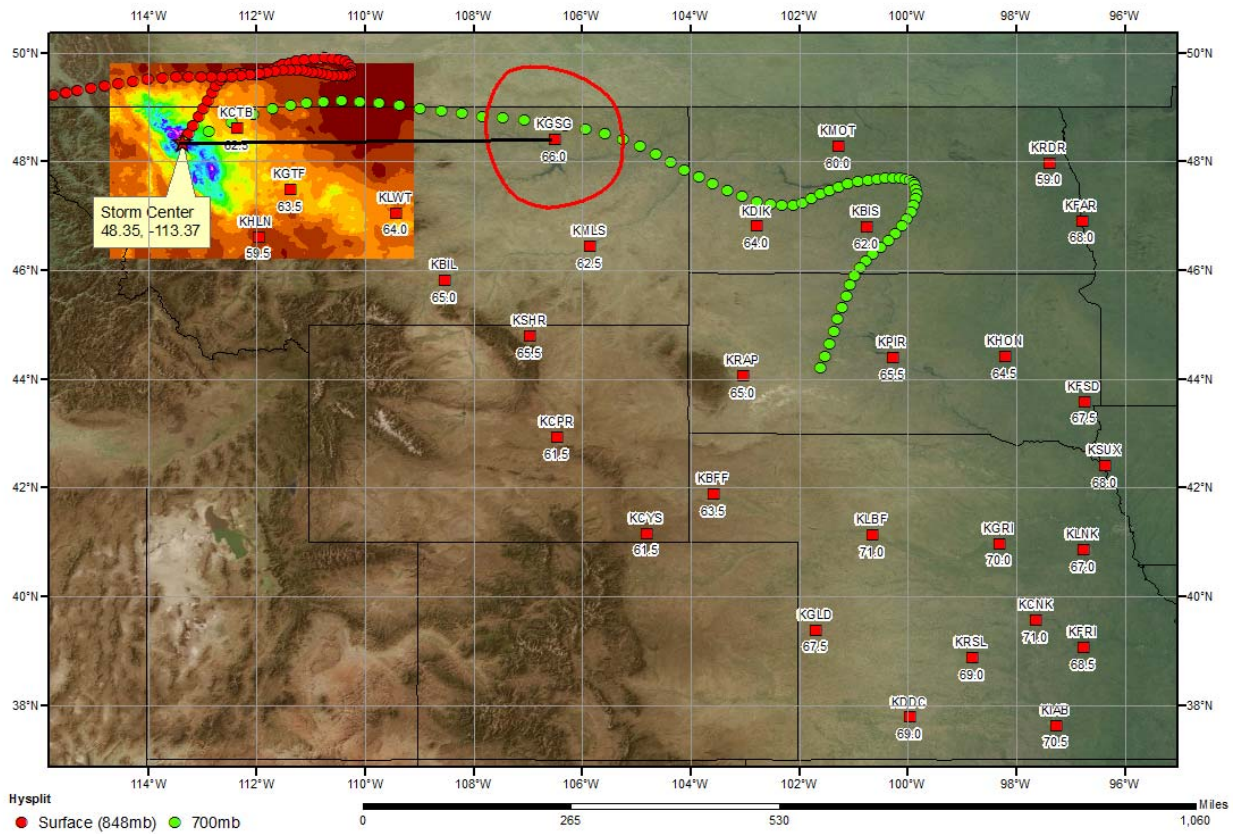


NOAA HYSPLIT MODEL
Backward trajectories ending at 1200 UTC 08 Jun 64
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study

SPAS 1211 Gibson, MT Storm Analysis June 5-8, 1964



Junipine, AZ

December 2-8, 1966

Storm Type: General Winter

Storm Precipitation Analysis System (SPAS) For Storm #1141_1

General Storm Location: Junipine, Arizona

Storm Dates: Dec. 2-8, 1966

Event: Winter synoptic

DAD Zone 1

Latitude: 34.9792

Longitude: -111.7708

Max. Grid Rainfall Amount: 10.74"

Max. Observed Rainfall Amount: n/a

Number of Stations: **462** (304 Daily, 37 Hourly, 30 Hourly Pseudo, 4 Hourly Estimated, 4 Hourly Estimated Pseudo, 74 Supplemental, and 9 Supplemental Estimated)

SPAS Version: 8.0

Base Map Used: Yes, conus_prism_ppt_in_1971_2000_12

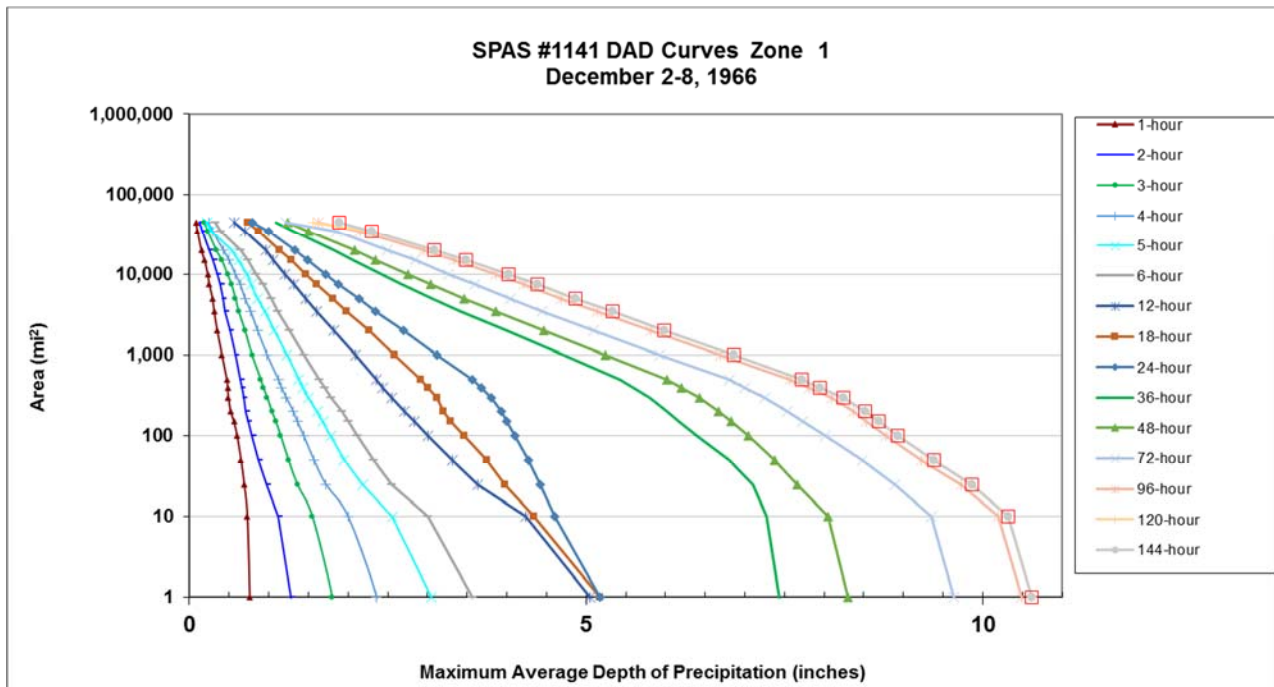
Spatial resolution: 00:00:30 (0.27 sq. miles)

Radar Included: No

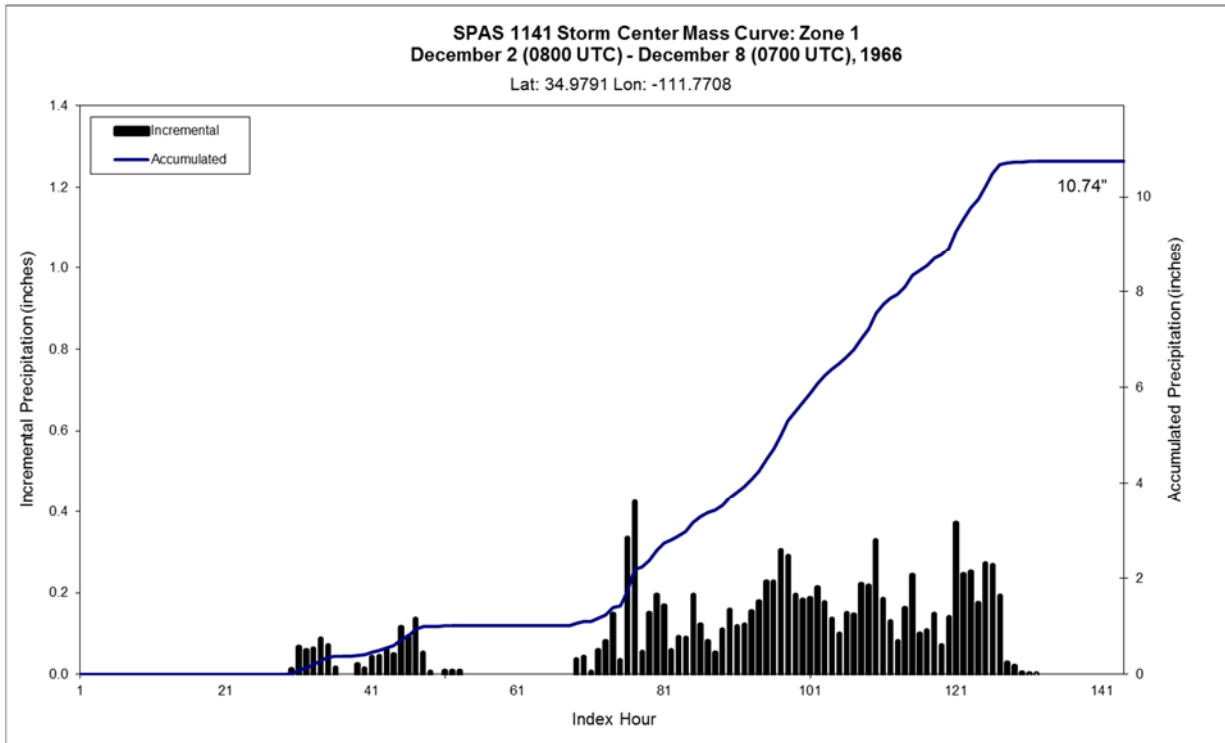
Depth-Area-Duration (DAD) analysis: Yes

CO-NM Regional Extreme Precipitation Study

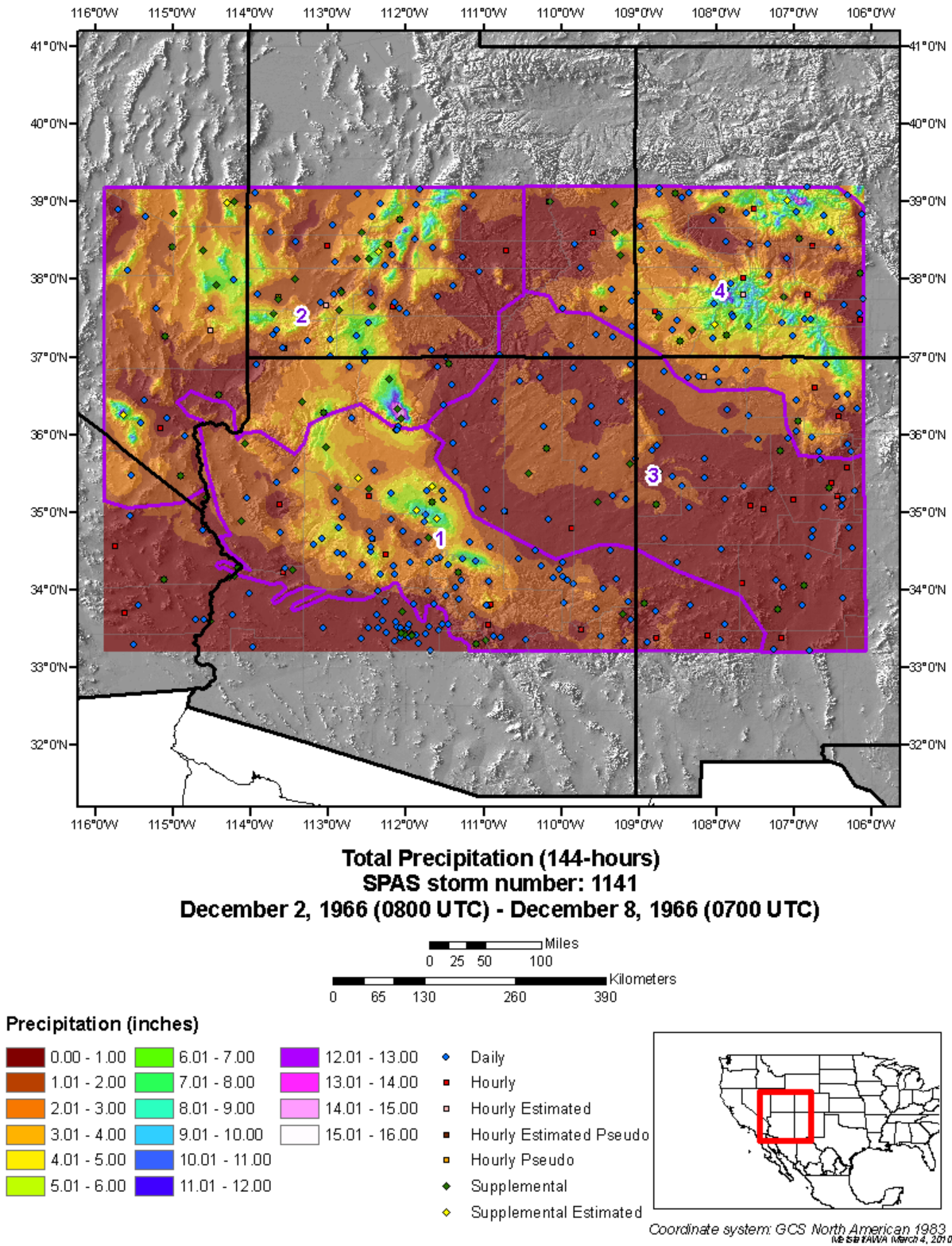
Storm 1141 - December 2 (0800 UTC) - December 8 (0700 UTC), 1966																
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)																
Area (mi ²)	Duration (hours)															
	1	2	3	4	5	6	12	18	24	36	48	72	96	120	144	Total
0.4	0.77	1.29	1.83	2.38	3.08	3.60	5.12	5.22	5.22	7.50	8.35	9.70	10.57	10.70	10.70	10.70
1	0.76	1.28	1.80	2.36	3.05	3.56	5.05	5.17	5.17	7.43	8.30	9.63	10.49	10.62	10.62	10.62
10	0.73	1.12	1.55	2.00	2.56	3.01	4.24	4.34	4.60	7.27	8.05	9.35	10.19	10.32	10.32	10.32
25	0.69	0.97	1.36	1.72	2.18	2.55	3.63	3.98	4.42	7.10	7.66	8.89	9.73	9.86	9.86	9.86
50	0.65	0.87	1.25	1.57	1.95	2.32	3.31	3.75	4.27	6.81	7.38	8.48	9.22	9.38	9.38	9.38
100	0.60	0.79	1.15	1.44	1.78	2.12	3.01	3.46	4.10	6.40	7.04	8.01	8.78	8.93	8.93	8.93
150	0.56	0.74	1.09	1.36	1.68	2.00	2.83	3.29	4.00	6.17	6.83	7.73	8.53	8.69	8.69	8.69
200	0.52	0.71	1.04	1.31	1.61	1.92	2.71	3.20	3.93	6.02	6.67	7.54	8.37	8.52	8.52	8.52
300	0.49	0.68	0.98	1.22	1.50	1.79	2.55	3.12	3.81	5.80	6.43	7.25	8.09	8.24	8.24	8.24
400	0.48	0.66	0.93	1.16	1.43	1.71	2.44	3.01	3.68	5.60	6.20	7.00	7.81	7.95	7.95	7.95
500	0.47	0.64	0.90	1.12	1.38	1.64	2.36	2.91	3.56	5.43	6.02	6.81	7.57	7.72	7.72	7.72
1,000	0.41	0.58	0.79	0.98	1.23	1.44	2.09	2.59	3.12	4.72	5.24	5.93	6.69	6.86	6.86	6.86
2,000	0.35	0.51	0.70	0.86	1.07	1.26	1.82	2.26	2.70	4.00	4.47	5.09	5.81	5.99	5.99	5.99
3,500	0.31	0.45	0.62	0.77	0.95	1.11	1.60	1.98	2.35	3.42	3.86	4.44	5.14	5.33	5.33	5.33
5,000	0.29	0.42	0.58	0.70	0.86	1.03	1.47	1.81	2.14	3.06	3.46	4.05	4.68	4.87	4.87	4.87
7,500	0.25	0.39	0.53	0.64	0.78	0.93	1.32	1.60	1.88	2.68	3.04	3.60	4.22	4.39	4.39	4.39
10,000	0.23	0.35	0.48	0.58	0.73	0.84	1.20	1.47	1.72	2.42	2.75	3.27	3.86	4.02	4.02	4.02
15,000	0.19	0.30	0.41	0.50	0.62	0.74	1.05	1.28	1.49	2.06	2.35	2.85	3.34	3.49	3.49	3.49
20,000	0.15	0.25	0.34	0.43	0.54	0.65	0.96	1.13	1.33	1.82	2.08	2.49	2.95	3.09	3.09	3.09
35,000	0.10	0.16	0.23	0.29	0.27	0.39	0.70	0.87	1.00	1.32	1.50	1.85	2.15	2.30	2.30	2.30
45,393	0.08	0.13	0.19	0.24	0.22	0.33	0.57	0.74	0.79	1.09	1.24	1.21	1.63	1.56	1.89	1.89



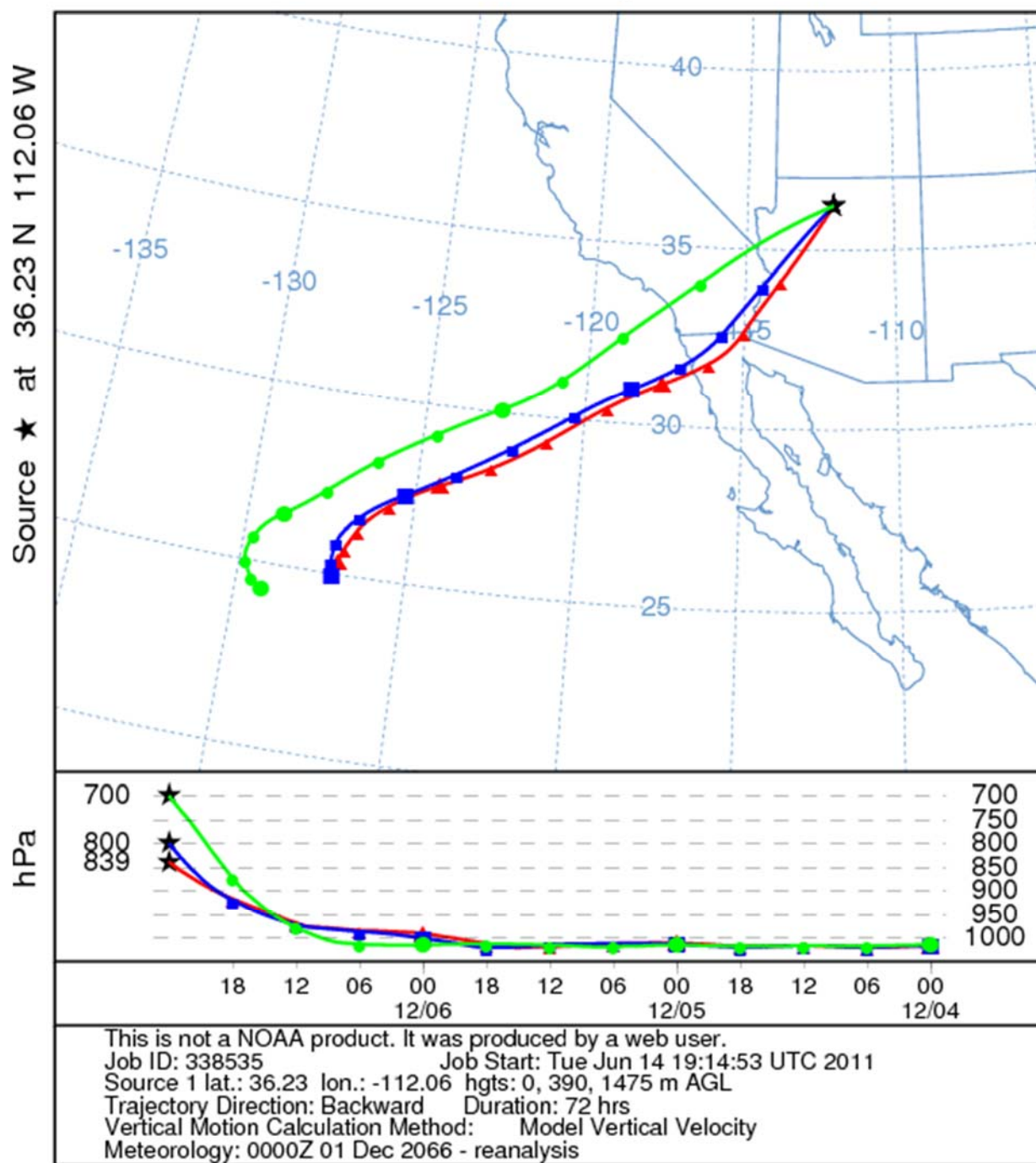
CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study

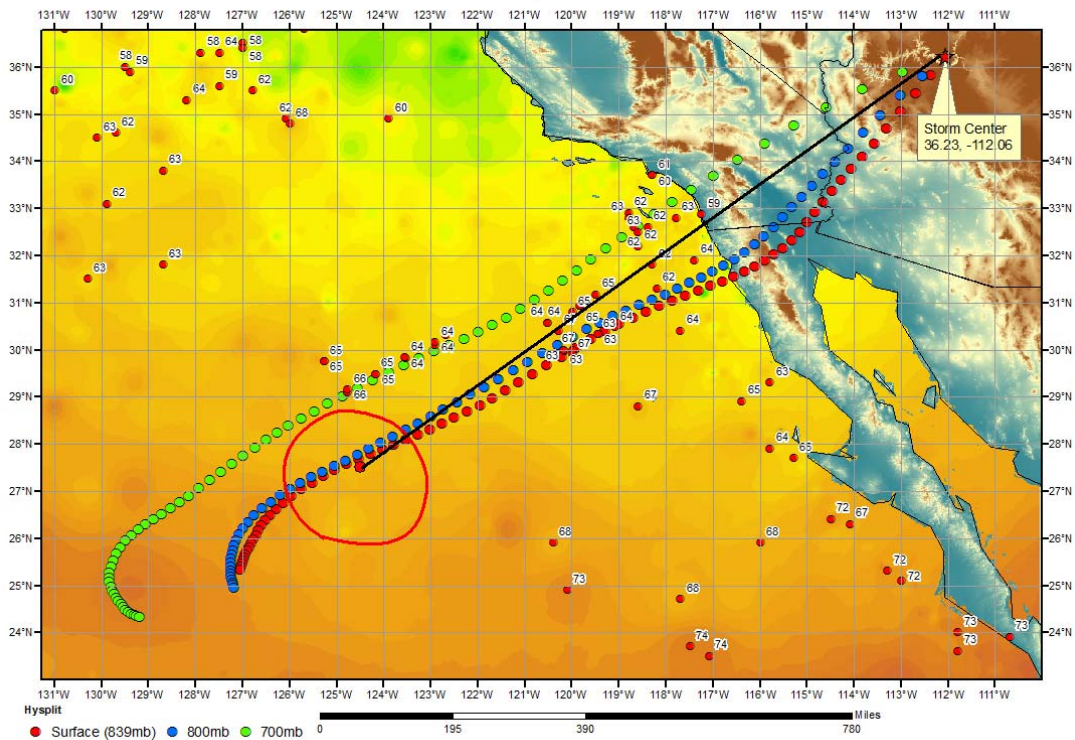


NOAA HYSPLIT MODEL
Backward trajectories ending at 0000 UTC 07 Dec 66
CDC1 Meteorological Data

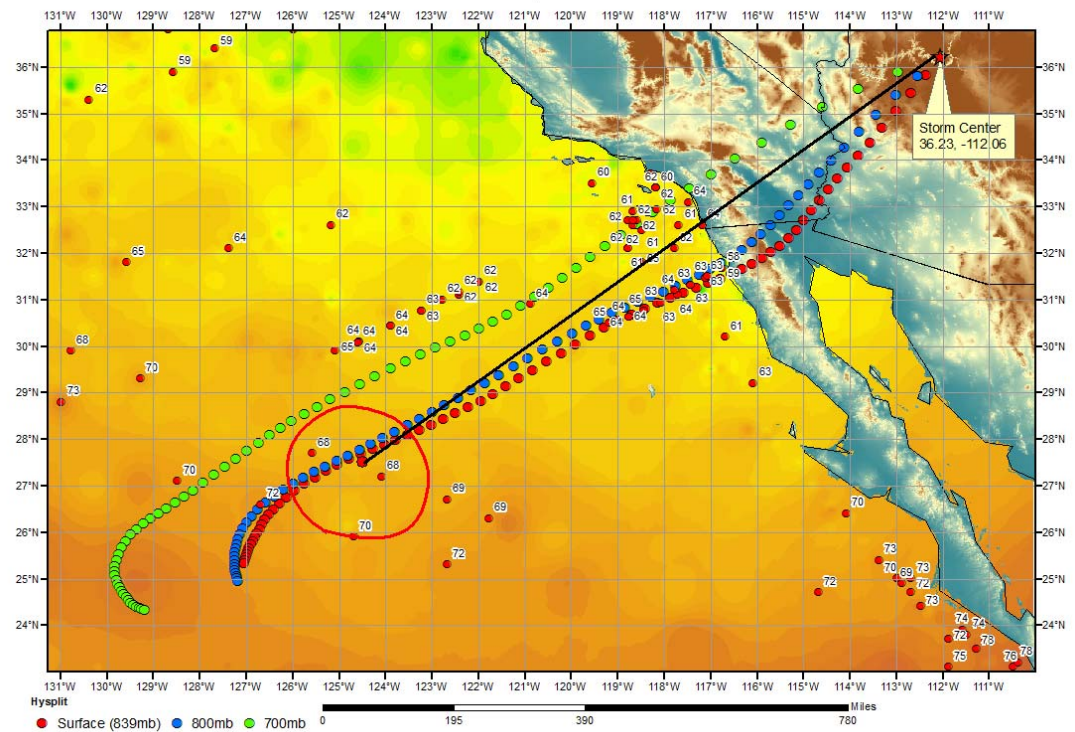


CO-NM Regional Extreme Precipitation Study

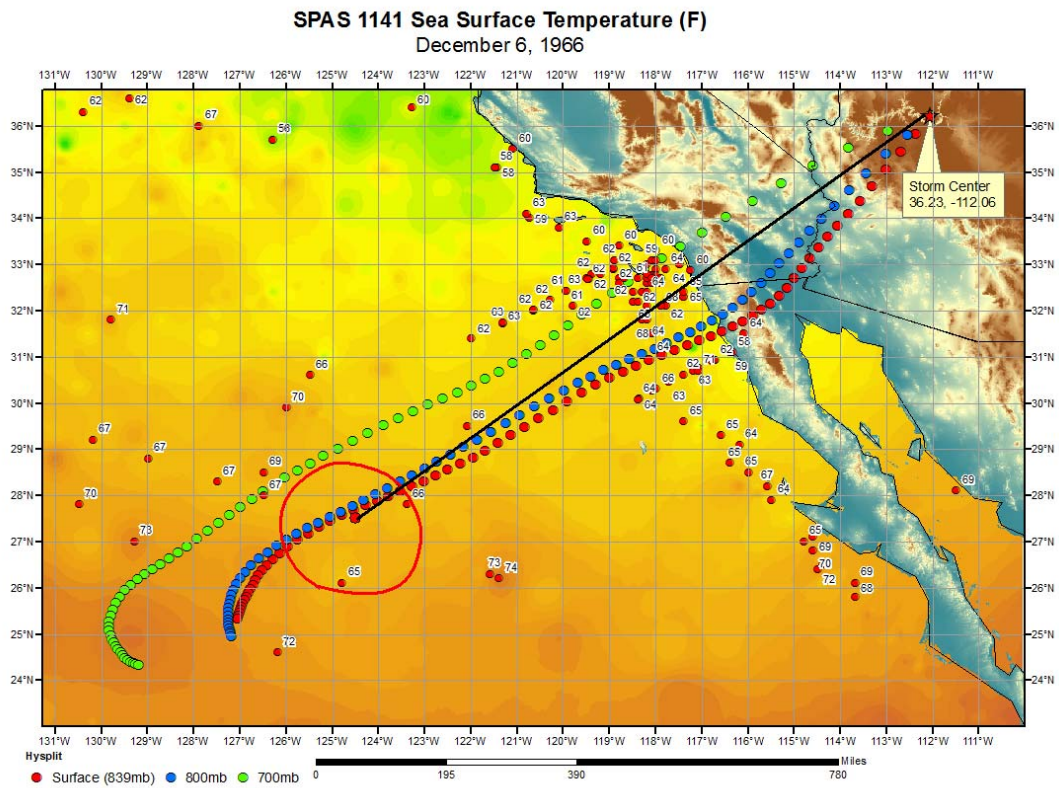
SPAS 1141 Sea Surface Temperature (F)
December 4, 1966



SPAS 1141 Sea Surface Temperature (F)
December 5, 1966



CO-NM Regional Extreme Precipitation Study



Pastora Peak, AZ
December 2-8, 1966
Storm Type: General Winter

Storm Precipitation Analysis System (SPAS) For Storm #1141_3

General Storm Location: Junipine, Arizona

Storm Dates: Dec. 2-8, 1966

Event: Winter synoptic

Zone 3

Latitude: 36.8208

Longitude: -109.1875

Max. Grid Rainfall Amount: 4.26"

Max. Observed Rainfall Amount: n/a

Number of Stations: **462** (304 Daily, 37 Hourly, 30 Hourly Pseudo, 4 Hourly Estimated, 4 Hourly Estimated Pseudo, 74 Supplemental, and 9 Supplemental Estimated)

SPAS Version: 8.0

Base Map Used: Yes, conus_prism_ppt_in_1971_2000_12

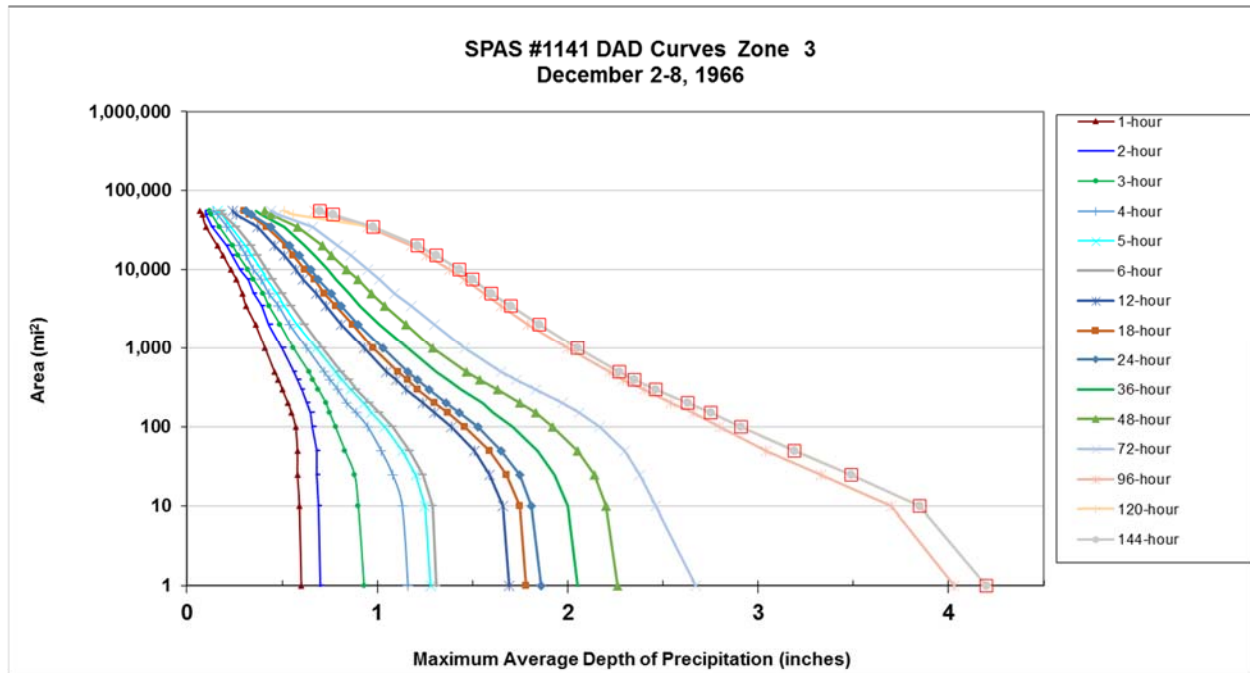
Spatial resolution: 00:00:30 (0.27 sq. miles)

Radar Included: No

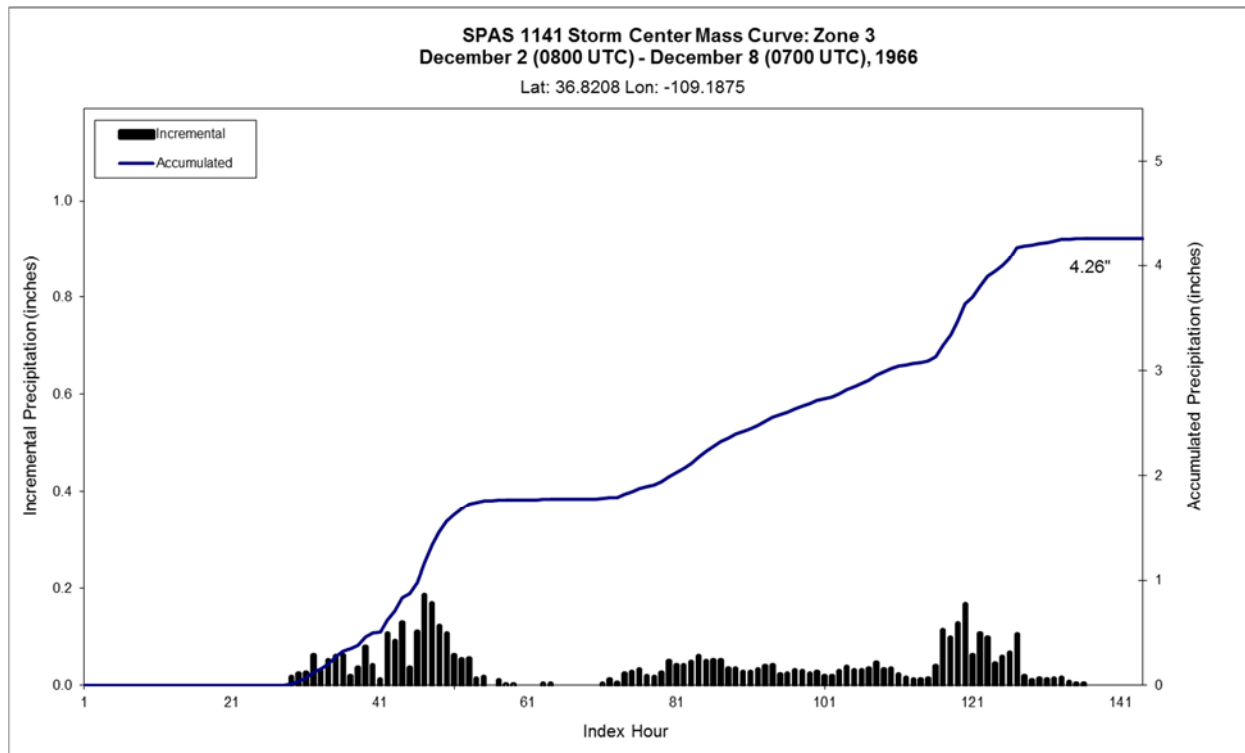
Depth-Area-Duration (DAD) analysis: Yes

CO-NM Regional Extreme Precipitation Study

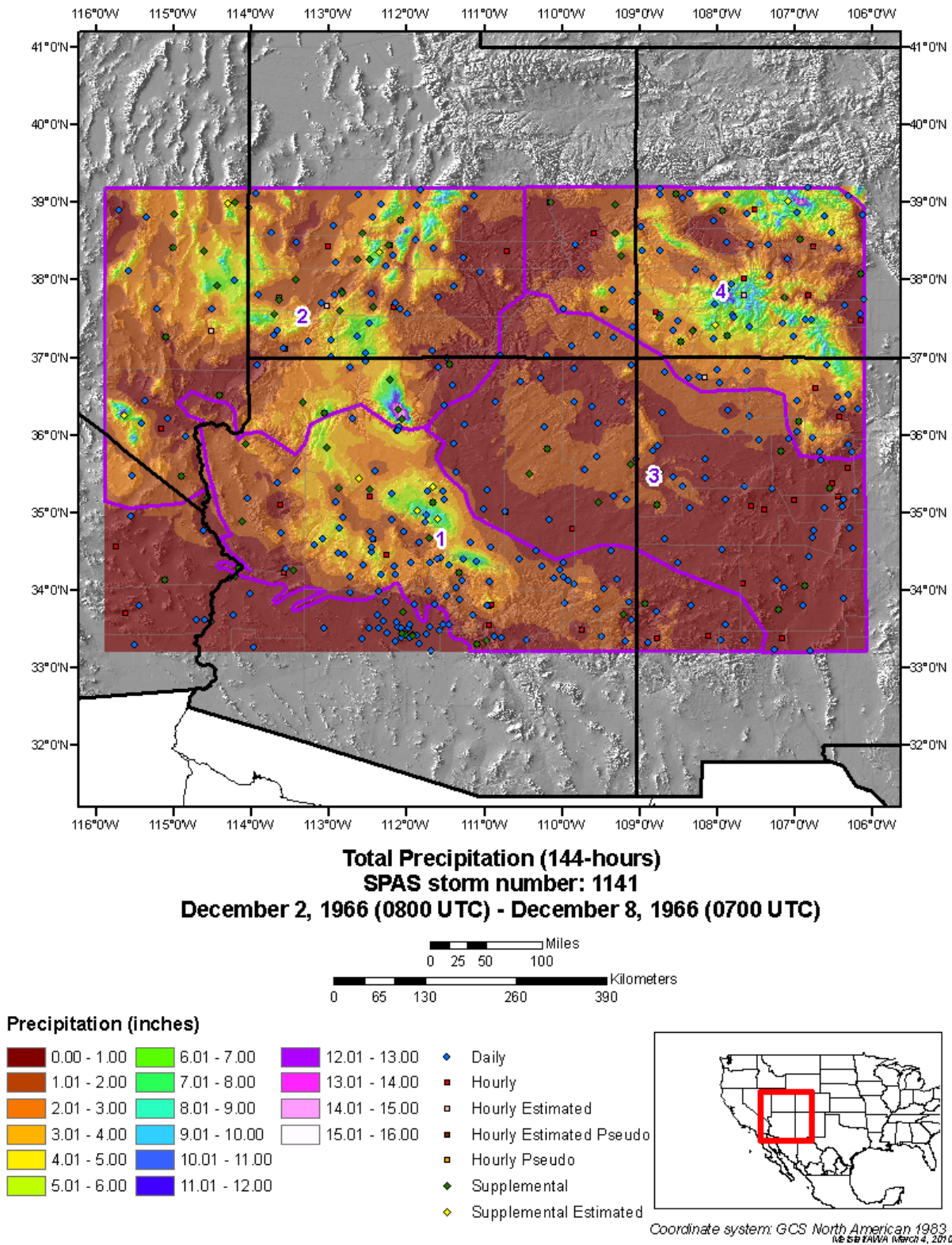
Storm 1141 - December 2 (0800 UTC) - December 8 (0700 UTC), 1966																
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)																
Area (mi ²)	Duration (hours)															
	1	2	3	4	5	6	12	18	24	36	48	72	96	120	144	Total
0.4	0.60	0.71	0.94	1.16	1.28	1.33	1.71	1.80	1.87	2.06	2.28	2.70	4.08	4.24	4.24	4.24
1	0.60	0.70	0.93	1.16	1.28	1.31	1.69	1.78	1.86	2.05	2.26	2.67	4.03	4.20	4.20	4.20
10	0.59	0.69	0.90	1.13	1.25	1.29	1.66	1.75	1.81	2.00	2.20	2.46	3.70	3.85	3.85	3.85
25	0.58	0.68	0.88	1.08	1.20	1.24	1.59	1.68	1.75	1.93	2.14	2.38	3.33	3.49	3.49	3.49
50	0.58	0.68	0.83	1.02	1.13	1.17	1.51	1.59	1.65	1.84	2.05	2.30	3.04	3.20	3.19	3.19
100	0.57	0.66	0.78	0.95	1.04	1.08	1.39	1.46	1.53	1.71	1.92	2.17	2.80	2.91	2.91	2.91
150	0.55	0.65	0.75	0.89	0.97	1.01	1.30	1.37	1.43	1.61	1.83	2.06	2.66	2.75	2.75	2.75
200	0.53	0.63	0.73	0.84	0.93	0.96	1.24	1.30	1.36	1.55	1.75	1.97	2.54	2.63	2.63	2.63
300	0.50	0.60	0.69	0.79	0.86	0.89	1.15	1.21	1.27	1.44	1.63	1.83	2.40	2.46	2.46	2.46
400	0.48	0.58	0.66	0.75	0.81	0.85	1.10	1.16	1.21	1.37	1.54	1.73	2.29	2.35	2.35	2.35
500	0.46	0.56	0.64	0.72	0.78	0.81	1.05	1.11	1.16	1.31	1.47	1.65	2.22	2.27	2.27	2.27
1,000	0.41	0.50	0.56	0.63	0.68	0.71	0.93	0.98	1.03	1.16	1.29	1.46	2.00	2.05	2.05	2.05
2,000	0.36	0.43	0.49	0.54	0.58	0.62	0.81	0.87	0.90	1.01	1.15	1.30	1.79	1.85	1.85	1.85
3,500	0.31	0.39	0.43	0.48	0.51	0.55	0.73	0.78	0.81	0.91	1.04	1.18	1.65	1.70	1.70	1.70
5,000	0.29	0.35	0.40	0.43	0.47	0.50	0.68	0.72	0.76	0.85	0.97	1.09	1.56	1.60	1.60	1.60
7,500	0.26	0.32	0.35	0.39	0.42	0.45	0.61	0.67	0.69	0.78	0.90	1.01	1.46	1.50	1.50	1.50
10,000	0.23	0.28	0.32	0.35	0.39	0.42	0.57	0.62	0.65	0.74	0.84	0.95	1.38	1.43	1.43	1.43
15,000	0.19	0.24	0.27	0.31	0.34	0.37	0.51	0.56	0.59	0.67	0.76	0.86	1.26	1.31	1.31	1.31
20,000	0.16	0.21	0.24	0.28	0.31	0.34	0.46	0.52	0.54	0.62	0.71	0.79	1.18	1.21	1.21	1.21
35,000	0.10	0.13	0.17	0.21	0.23	0.26	0.37	0.42	0.44	0.51	0.58	0.66	0.95	0.98	0.98	0.98
50,000	0.08	0.10	0.13	0.16	0.18	0.19	0.26	0.33	0.34	0.39	0.44	0.48	0.74	0.77	0.77	0.77
55,781	0.07	0.10	0.12	0.14	0.16	0.18	0.24	0.30	0.31	0.36	0.41	0.44	0.67	0.70	0.70	0.70



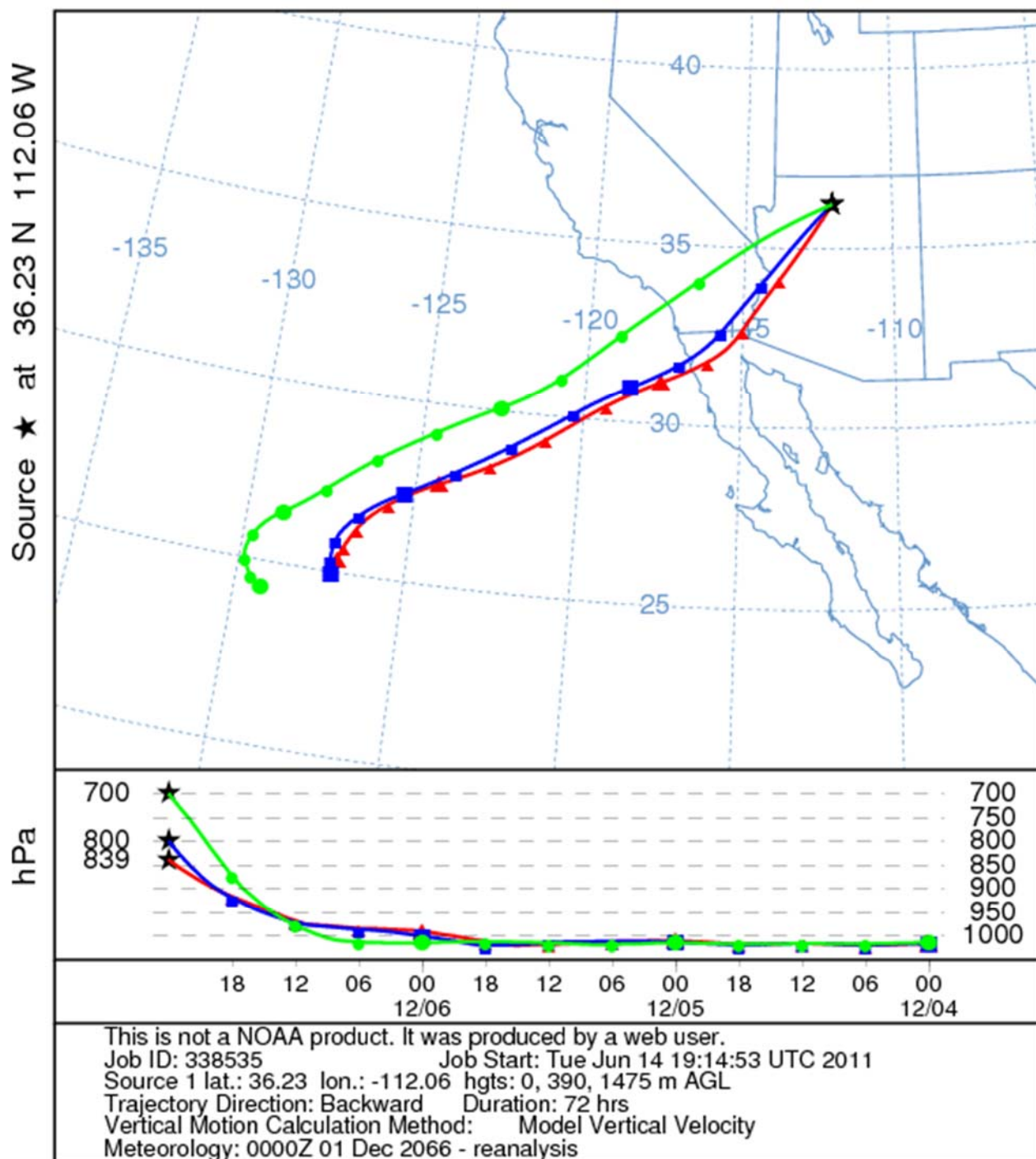
CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study

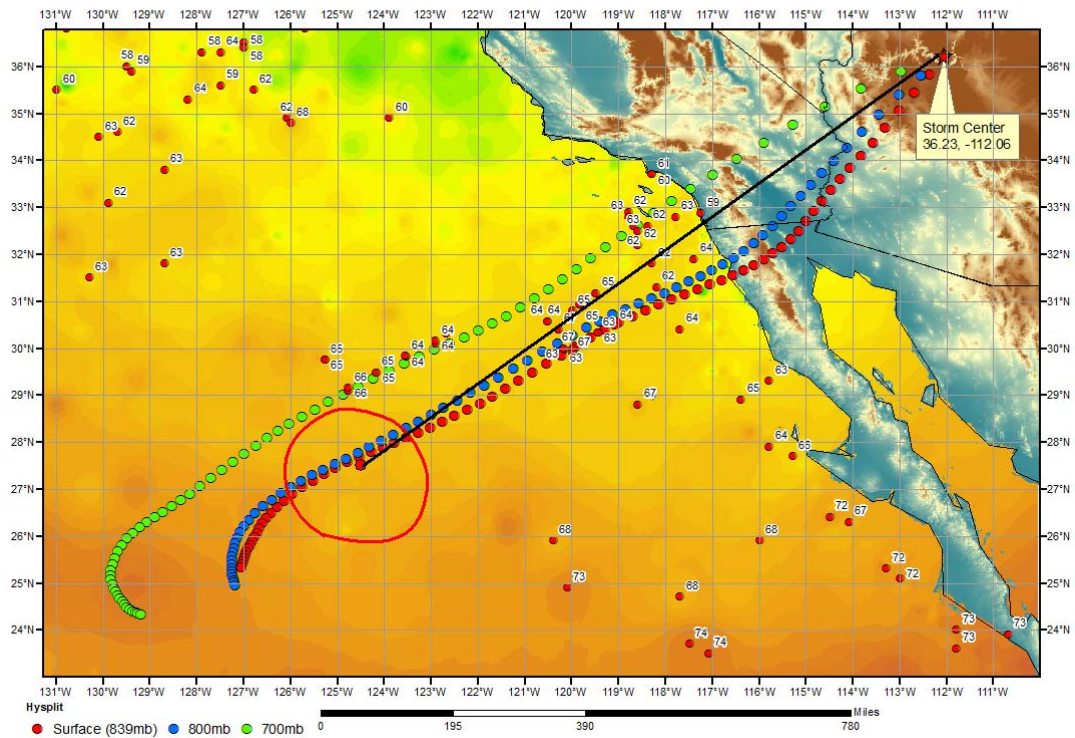


NOAA HYSPLIT MODEL
Backward trajectories ending at 0000 UTC 07 Dec 66
CDC1 Meteorological Data

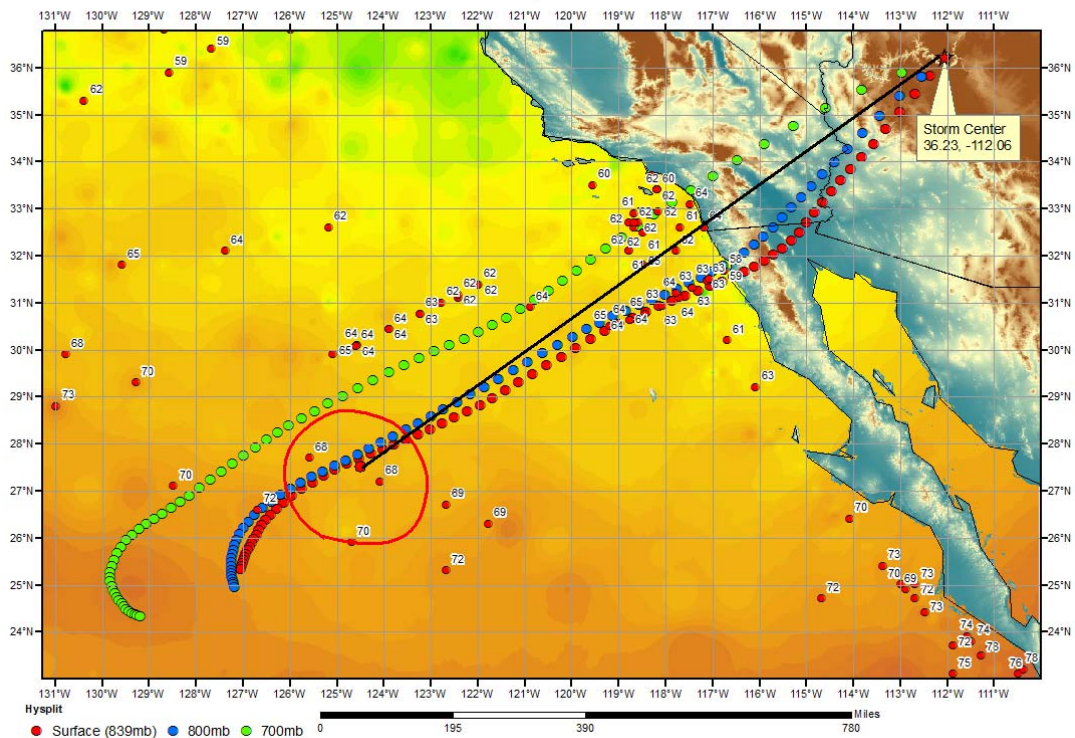


CO-NM Regional Extreme Precipitation Study

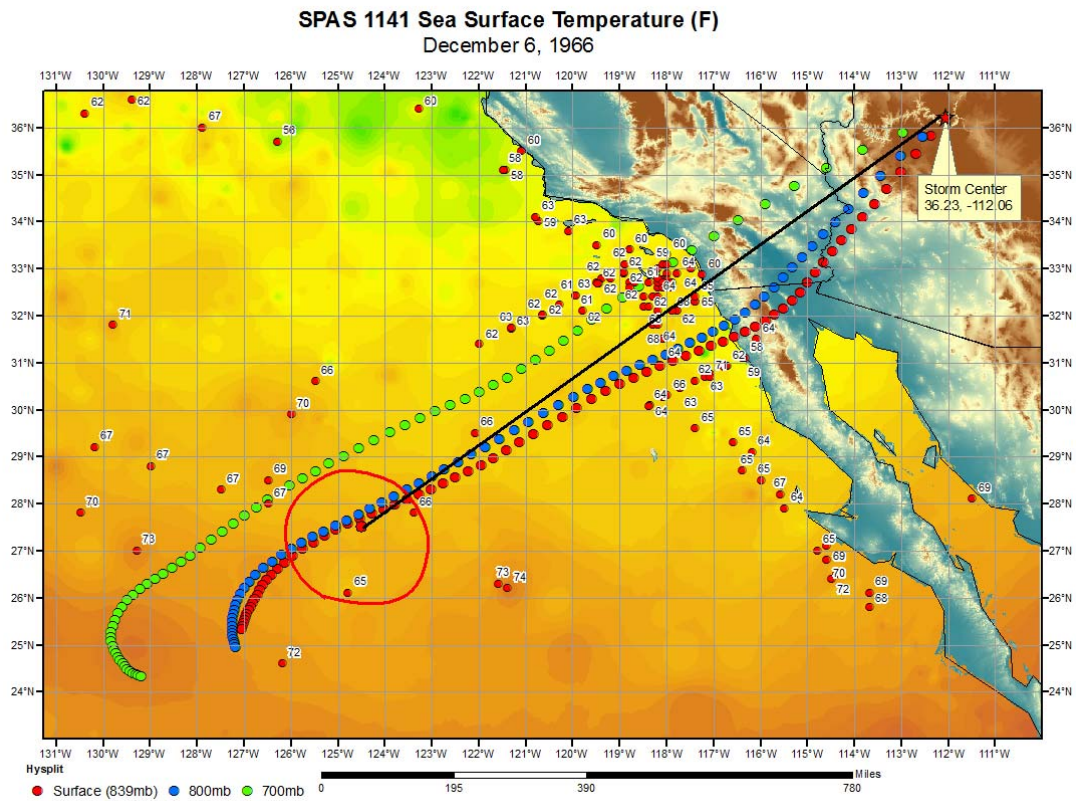
SPAS 1141 Sea Surface Temperature (F)
December 4, 1966



SPAS 1141 Sea Surface Temperature (F)
December 5, 1966



CO-NM Regional Extreme Precipitation Study



Big Elk Meadow, CO

May 3-8, 1969

Storm Type: General

Storm Precipitation Analysis System (SPAS) For Storm #1253_1

General Storm Location: Colorado

Storm Dates: May 3-8, 1969

Event: Synoptic

DAD Zone 1

Latitude: 40.27

Longitude: -105.42

Max. Grid Rainfall Amount: 20.01"

Max. Observed Rainfall Amount: 20.00"

Number of Stations: 332 (182 Daily, 27 Hourly, 7 Hourly Pseudo, 107 Supplemental, and 9 Supplemental Estimated)

SPAS Version: 9.5

Basemap: PRISM May 1969 precipitation

Spatial resolution: 00:00:30 (~ 0.30 mi²)

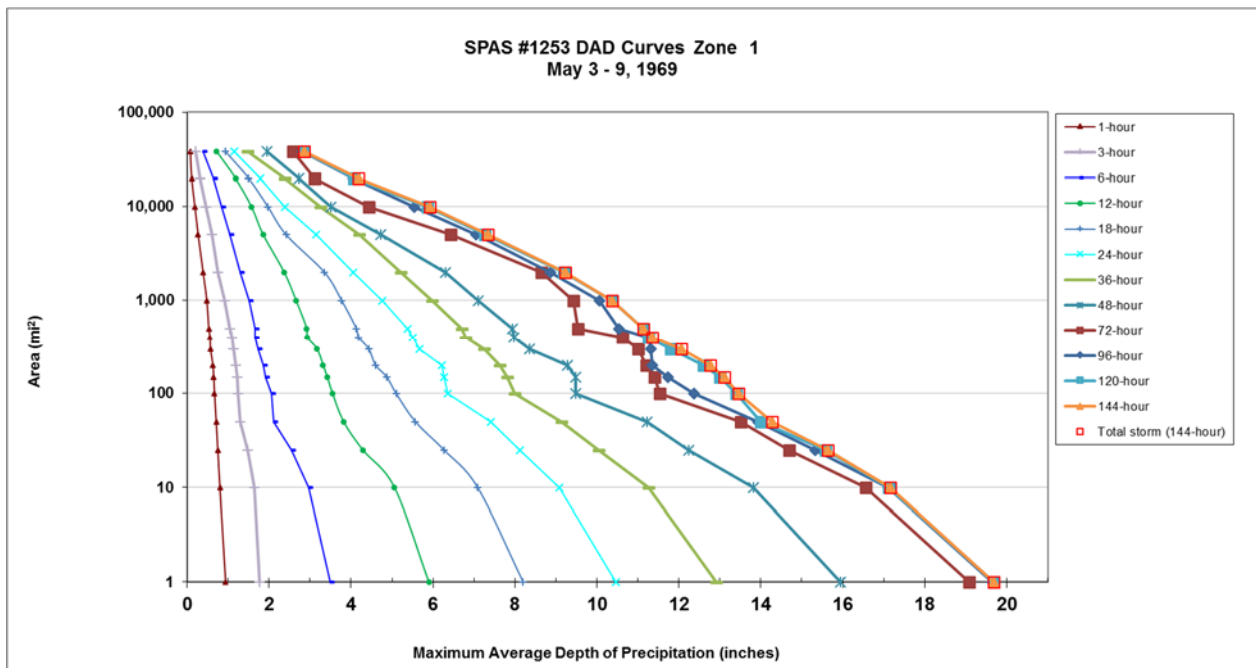
Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

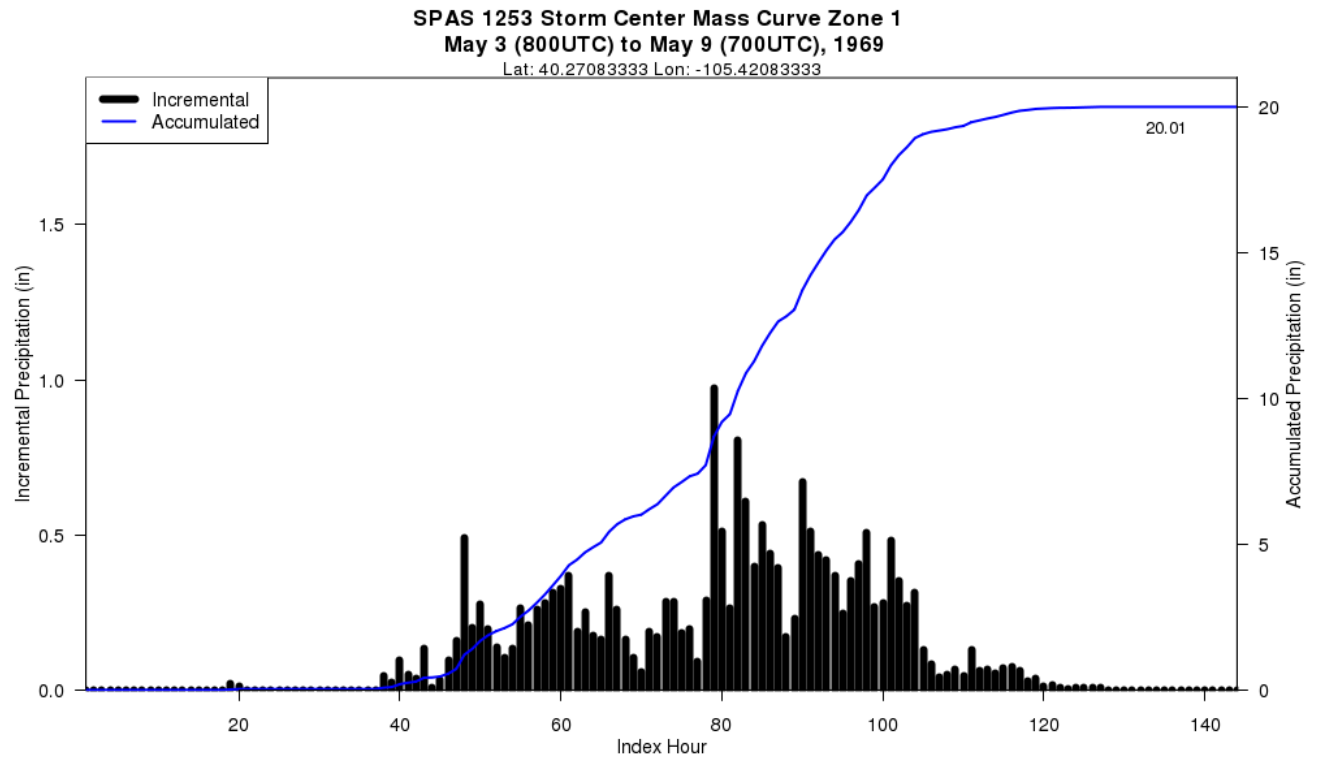
Reliability of results: This analysis was based on hourly data, daily data, supplemental bucket survey data, and previously analyzed isohyetal pattern. We have a high degree of confidence in the station based results, and spatial pattern is dependent on PRISM basemap. The closest hourly station to Big Elk Meadow was Boulder no2, CO. The Big Elk Meadow, CO bucket survey supplemental station recorded 20.00" (bucket survey data from NCDC Colorado Climatological Data May 1969). This value was adjusted to 20.21" in order for SPAS to maintain a 20.00" value at the station grid cell location.

CO-NM Regional Extreme Precipitation Study

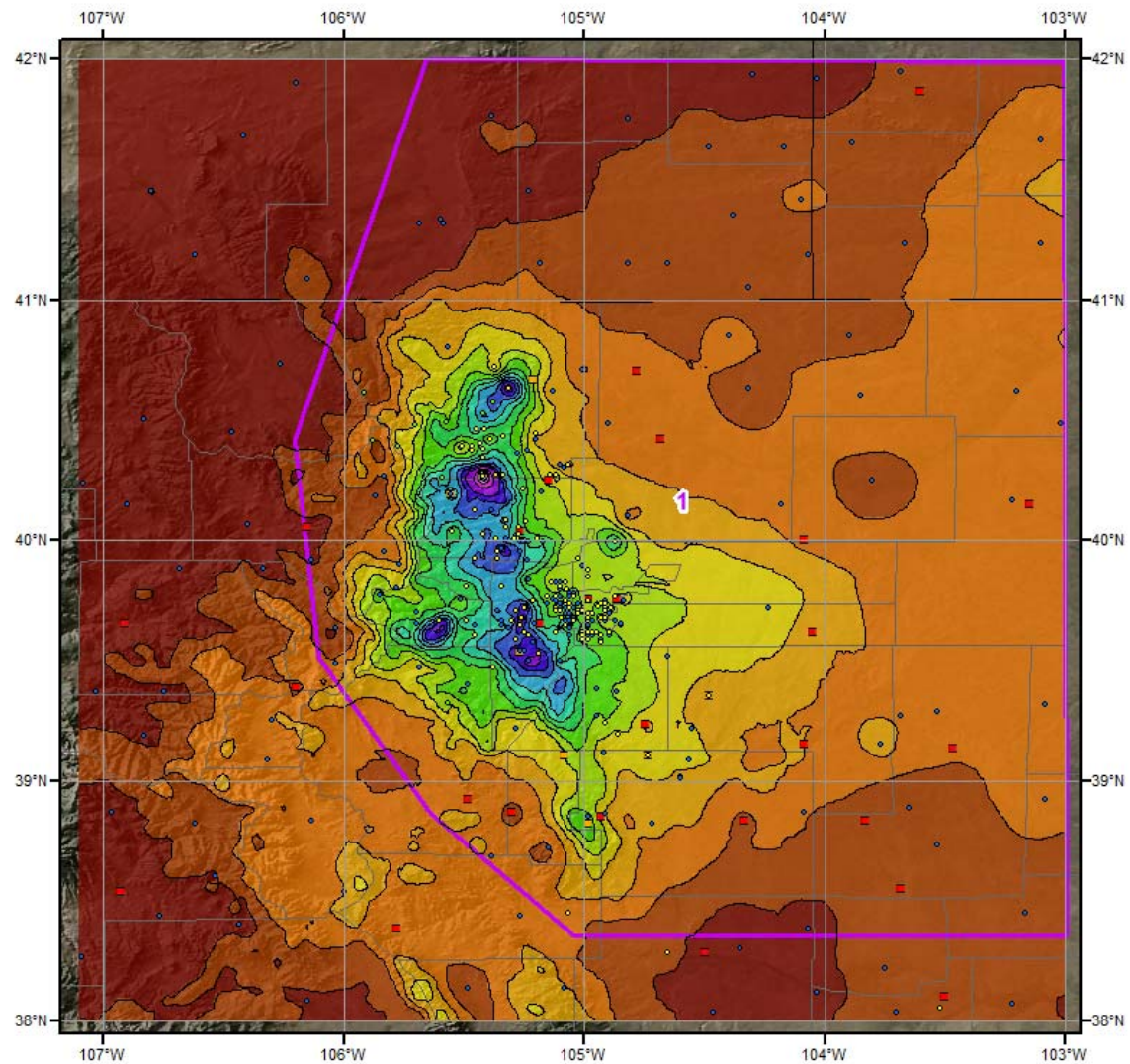
SPAS 1253 - May 3 (800 UTC) - May 9 (700 UTC), 1969												
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)												
Area (mi ²)	Duration (hours)											
	1	3	6	12	18	24	36	48	72	96	120	Total
0.3	0.97	1.82	3.56	6.00	8.34	10.64	13.13	16.21	19.41	19.97	20.01	20.01
1	0.94	1.77	3.50	5.90	8.20	10.46	12.92	15.94	19.09	19.65	19.69	19.69
10	0.80	1.65	2.97	5.06	7.09	9.08	11.26	13.83	16.57	17.10	17.12	17.16
25	0.75	1.47	2.55	4.29	6.27	8.13	10.04	12.25	14.70	15.32	15.58	15.64
50	0.71	1.30	2.11	3.82	5.57	7.42	9.14	11.22	13.51	13.93	14.01	14.28
100	0.67	1.25	2.06	3.55	5.10	6.36	8.00	9.49	11.53	12.37	13.41	13.46
150	0.65	1.22	1.91	3.42	4.87	6.27	7.81	9.48	11.40	11.73	13.01	13.11
200	0.63	1.19	1.86	3.32	4.60	6.21	7.63	9.29	11.21	11.36	12.61	12.76
300	0.57	1.14	1.74	3.17	4.43	5.67	7.25	8.36	11.00	11.32	11.80	12.06
400	0.56	1.09	1.66	2.93	4.18	5.50	6.80	7.97	10.63	11.26	11.27	11.36
500	0.53	1.05	1.66	2.92	4.13	5.38	6.70	7.94	9.54	10.54	11.14	11.14
1,000	0.48	0.91	1.52	2.66	3.77	4.77	5.98	7.11	9.43	10.07	10.38	10.38
2,000	0.39	0.75	1.29	2.37	3.35	4.06	5.21	6.30	8.65	8.87	9.20	9.23
5,000	0.27	0.60	1.04	1.86	2.42	3.15	4.20	4.72	6.44	7.05	7.27	7.35
10,000	0.19	0.47	0.85	1.57	1.97	2.38	3.25	3.52	4.44	5.54	5.87	5.93
20,000	0.11	0.32	0.65	1.18	1.50	1.79	2.38	2.73	3.12	4.06	4.08	4.18
38,492	0.08	0.21	0.39	0.72	0.93	1.15	1.47	1.95	2.58	2.82	2.86	2.86



CO-NM Regional Extreme Precipitation Study



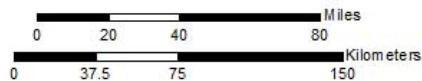
CO-NM Regional Extreme Precipitation Study



Total Precipitation (144-hours)
SPAS 1253 - Big Elk Meadows, CO
5/3/1969 0800 GMT - 5/9/1969 0700 GMT

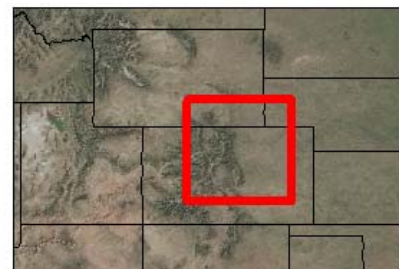
Gauges

- Daily
- Hourly
- Hourly Pseudo
- Supplemental
- Supplemental Estimated



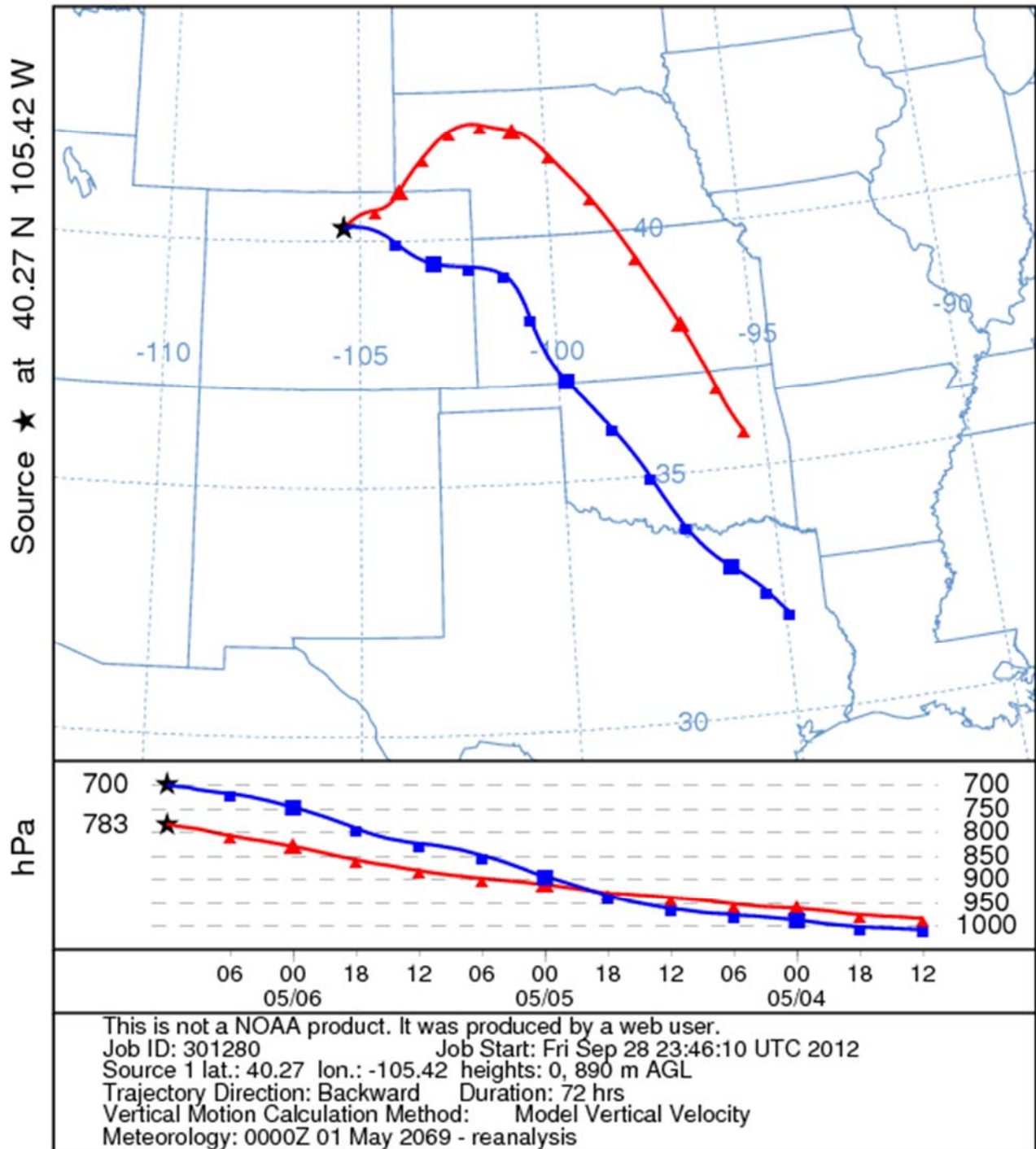
Precipitation (inches)

0.00 - 1.00	4.01 - 5.00	8.01 - 9.00	12.01 - 14.00
1.01 - 2.00	5.01 - 6.00	9.01 - 10.00	14.01 - 16.00
2.01 - 3.00	6.01 - 7.00	10.01 - 11.00	16.01 - 18.00
3.01 - 4.00	7.01 - 8.00	11.01 - 12.00	18.01 - 20.00

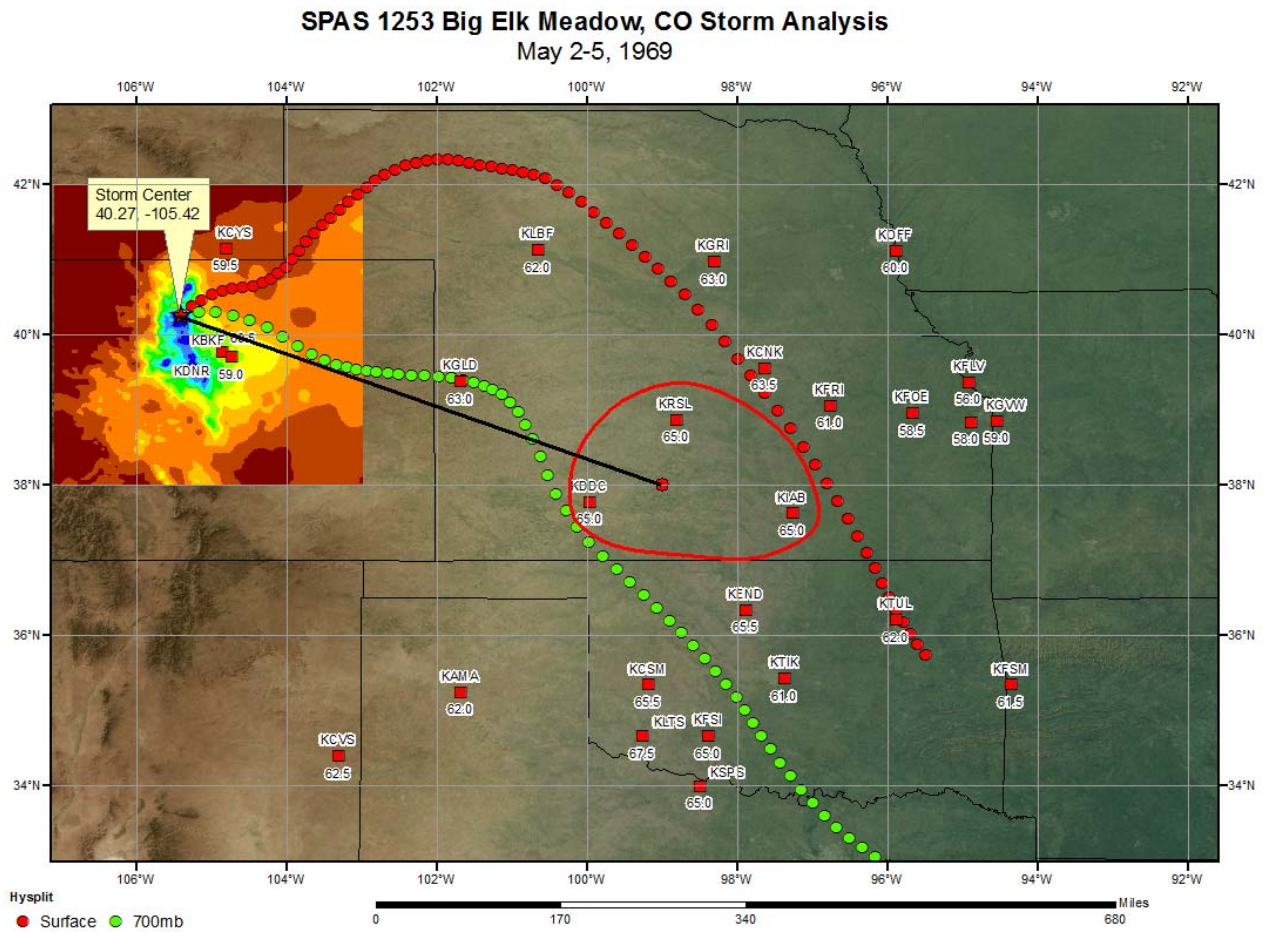


9/26/2012

NOAA HYSPLIT MODEL
Backward trajectories ending at 1200 UTC 06 May 69
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study



Bear Spring, AZ
February 27 – March 3, 1978
Storm Type: General Frontal

Storm Precipitation Analysis System (SPAS) For Storm #1150_2

General Storm Location: Workman Creek, Arizona

Storm Dates: February 27 (0700Z), 1978 - March 3 (0700), 1978

Event: Large synoptic storm

DAD Zone 2: Mogollon Rim

Latitude: 34.0375

Longitude: -111.4875

Max. Grid/Radar Rainfall Amount: 15.52"

Max. Observed Rainfall Amount: 14.80" (Workman Cr, AZ)

Number of Stations: 368 (288 Daily, 58 hourly, 2 Hourly Pseudo, 15 Supplemental, and 5 Supplemental Pseudo)

SPAS Version: 7.0

Base Map Used: PRISM Mean (71-00) March Precipitation

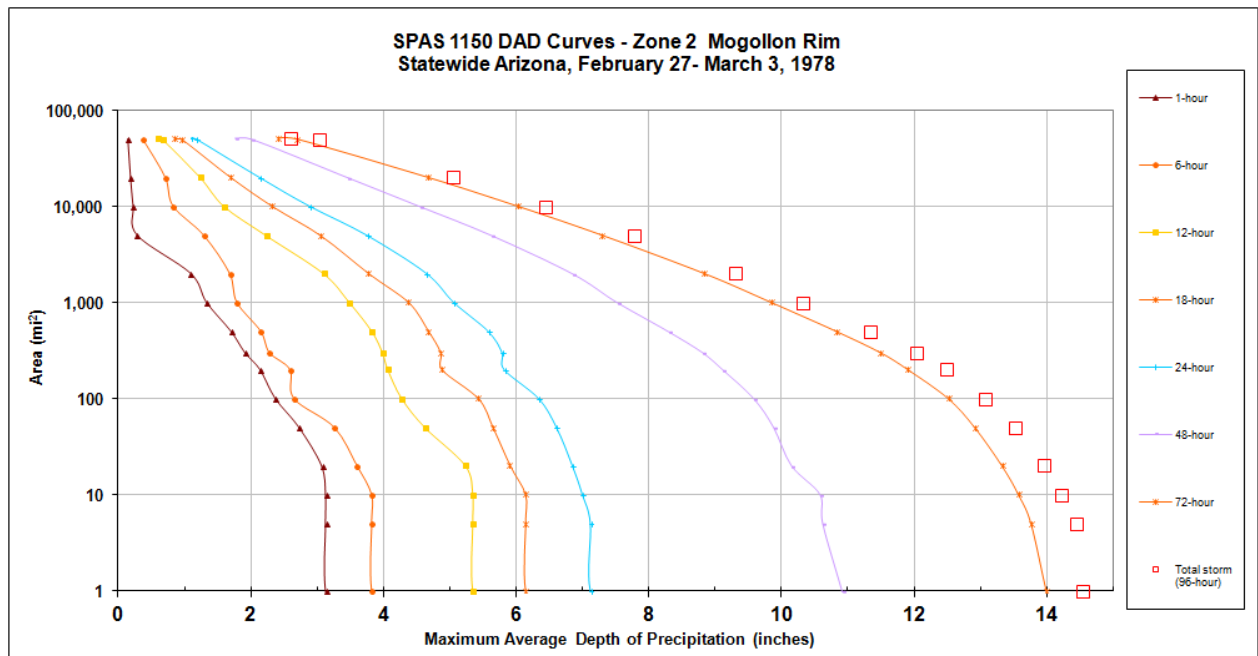
Spatial resolution: 30-sec

Radar Included: No

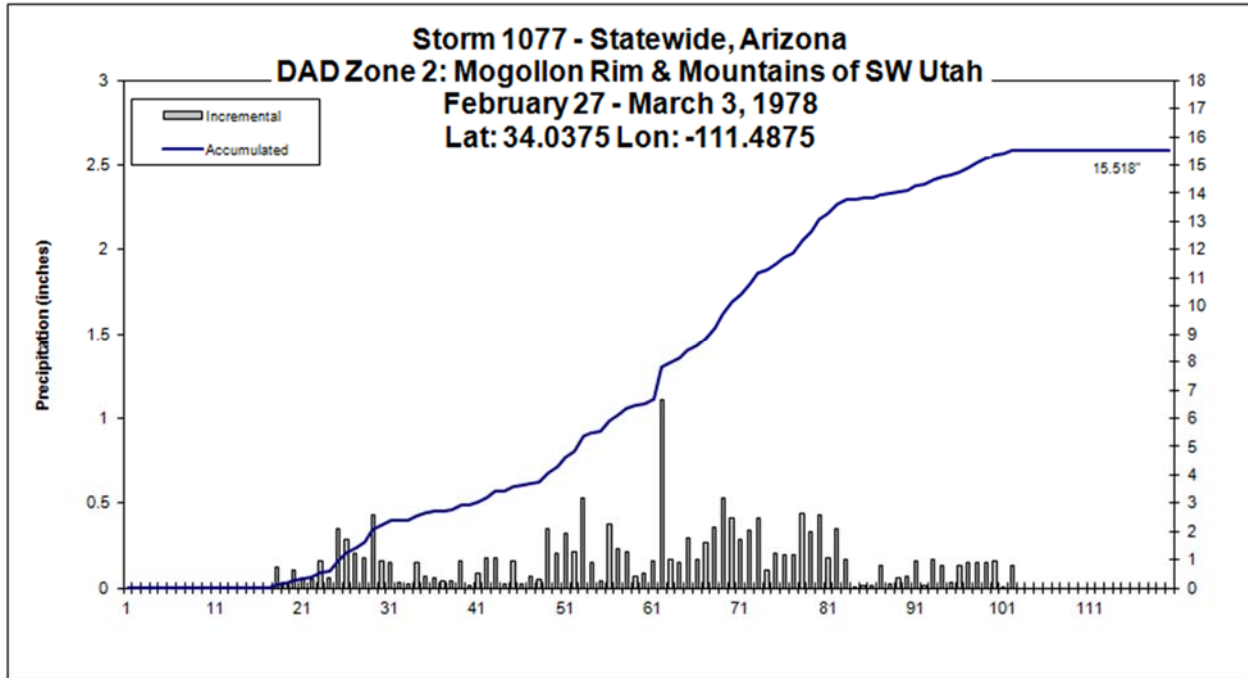
Depth-Area-Duration (DAD) analysis: Yes

CO-NM Regional Extreme Precipitation Study

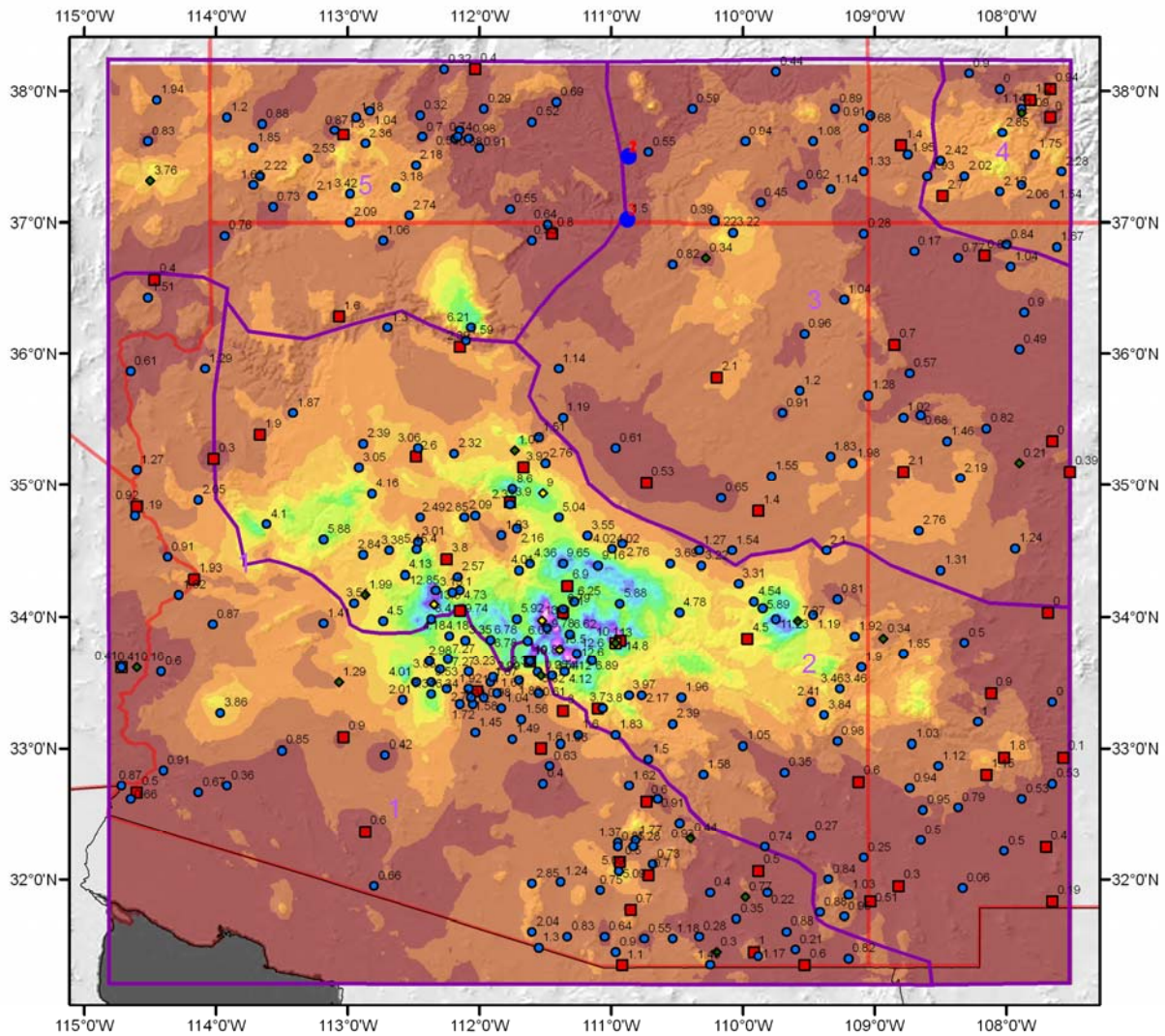
	MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
	Duration (hours)														
Area (mi ²)	1	2	3	4	5	6	12	18	24	36	48	72	96		Total
0.27	3.35					4.06	5.6	6.43	7.49		11.15	14.22	14.77		14.77
1	3.13					3.82	5.34	6.14	7.12		10.92	14	14.54		14.54
5	3.13					3.82	5.34	6.14	7.12		10.63	13.77	14.45		14.45
10	3.13					3.82	5.34	6.14	7		10.59	13.58	14.22		14.22
20	3.07					3.6	5.23	5.91	6.85		10.16	13.33	13.96		13.96
50	2.73					3.26	4.62	5.65	6.61		9.89	12.92	13.53		13.53
100	2.37					2.65	4.27	5.43	6.34		9.59	12.52	13.08		13.08
200	2.14					2.59	4.06	4.88	5.82		9.12	11.91	12.49		12.49
300	1.91					2.28	3.98	4.86	5.79		8.82	11.5	12.04		12.04
500	1.7					2.15	3.82	4.68	5.58		8.3	10.83	11.35		11.35
1000	1.33					1.79	3.48	4.38	5.06		7.53	9.85	10.33		10.33
2000	1.09					1.68	3.09	3.78	4.65		6.85	8.84	9.31		9.31
5000	0.28					1.29	2.22	3.05	3.75		5.63	7.3	7.78		7.78
10000	0.22					0.83	1.59	2.33	2.89		4.55	6.03	6.44		6.44
20000	0.18					0.71	1.23	1.7	2.13		3.46	4.67	5.05		5.05
50000	0.14					0.37	0.66	0.96	1.18		2.02	2.7	3.04		3.04
51059							0.59	0.85	1.11		1.77	2.41	2.6		2.60



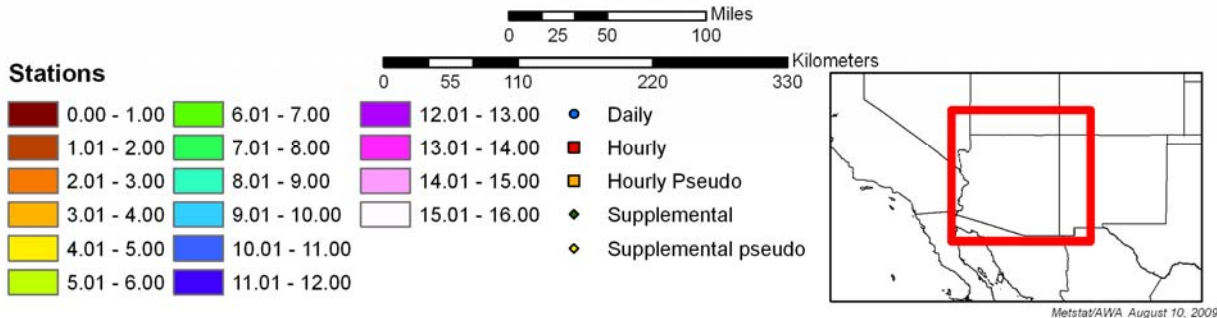
CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study

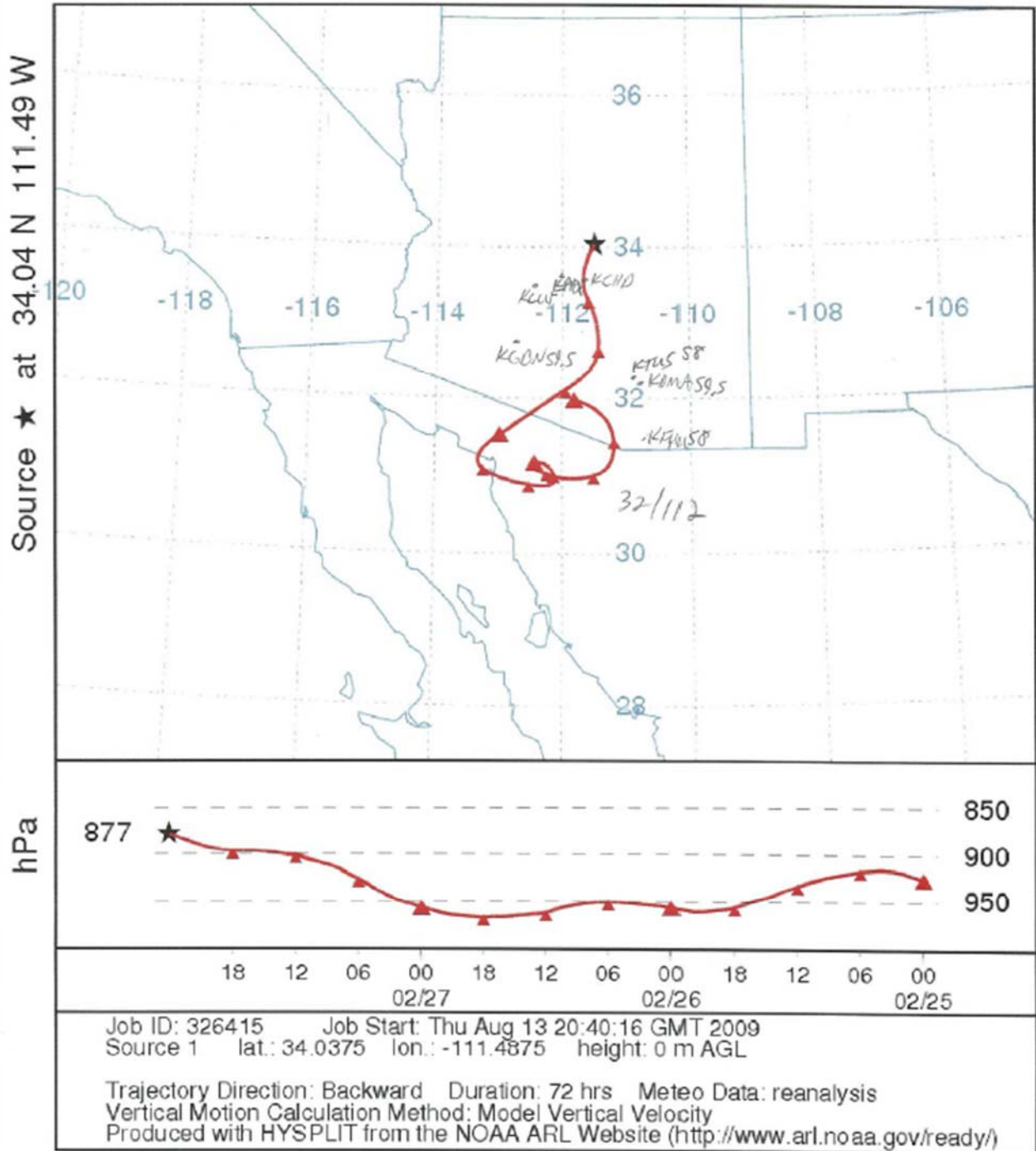


SPAS storm number: 1150
 Lat/Lon box: 38.2 -114.8 31.2 -107.5
 Begin date: 02/27/1978 for hourly stations, 2/28/1978 for daily
 End date: 03/03/1973
 Number of hours (for hourly data): 120

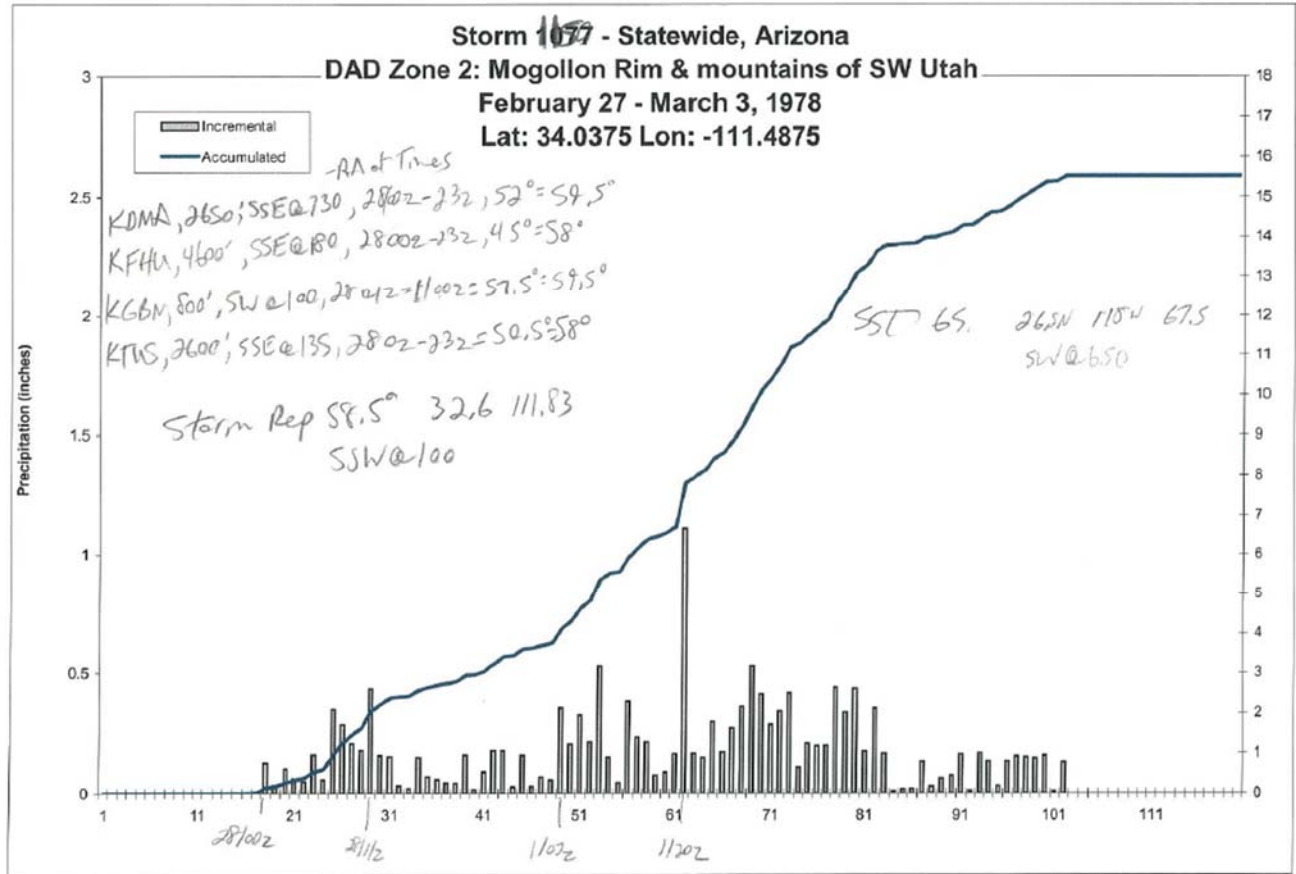


Metstat/AWA August 10, 2009

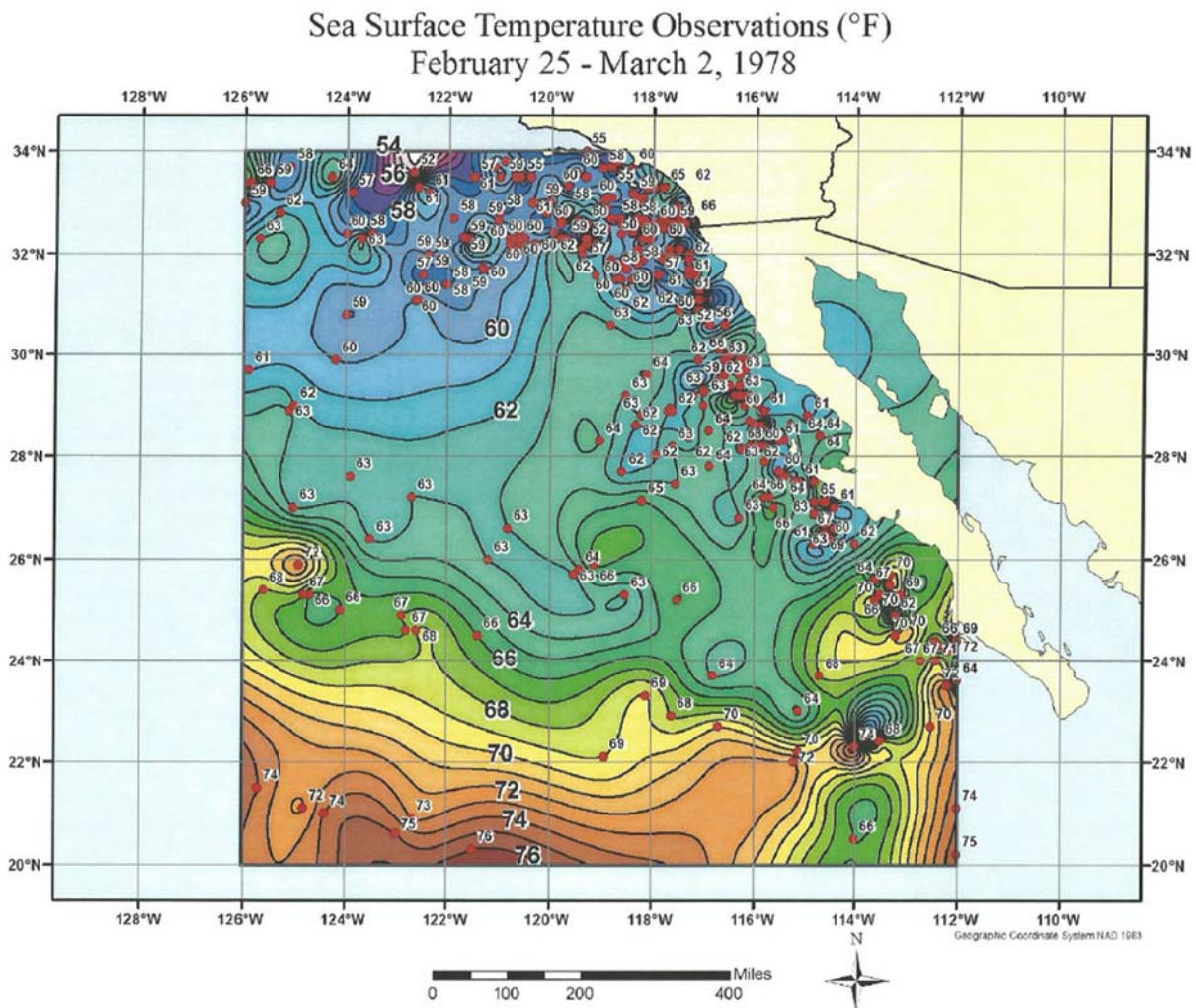
NOAA HYSPLIT MODEL
Backward trajectory ending at 0000 UTC 28 Feb 78
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



Conrad Ranch, UT

October 18-20, 1979

Storm Type: General

Storm Precipitation Analysis System (SPAS) For Storm #1266_1

General Storm Location: Conrad Ranch, UT

Storm Dates: October 18–20, 1979

Event: Synoptic

DAD Zone 1

Latitude: 40.5854

Longitude: -111.5896

Max. Grid Rainfall Amount: 5.78” in 72 hours

Max. Observed Rainfall Amount: 5.30” – Silver Lake Brighton, UT

Number of Stations: 85 (65 Daily, 6 Hourly, 11 Hourly Pseudo, and 3 Supplemental)

SPAS Version: 9.5

Basemap: PRISM October 1971-2000 Precipitation

Spatial resolution: 00:00:15

Radar Included: No

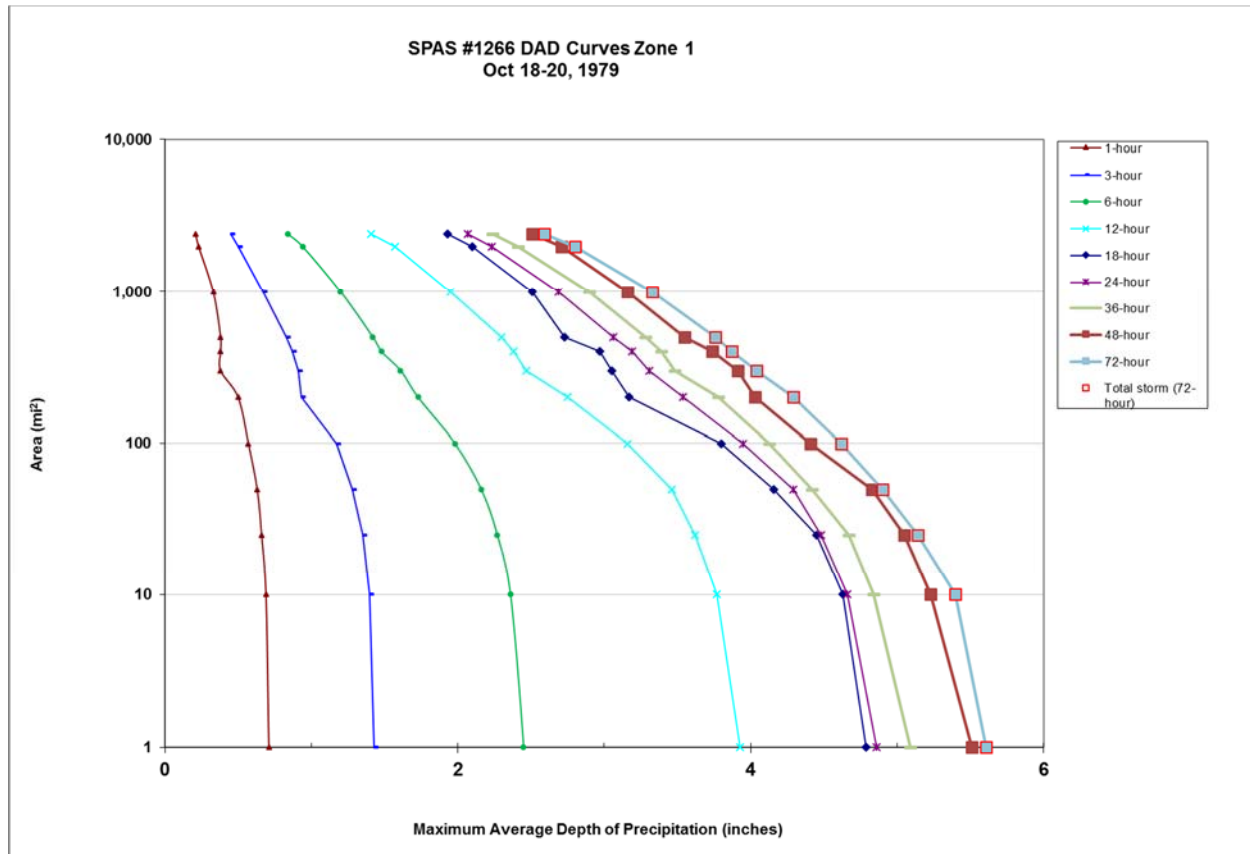
Depth-Area-Duration (DAD) analysis: Yes

Reliability of results:

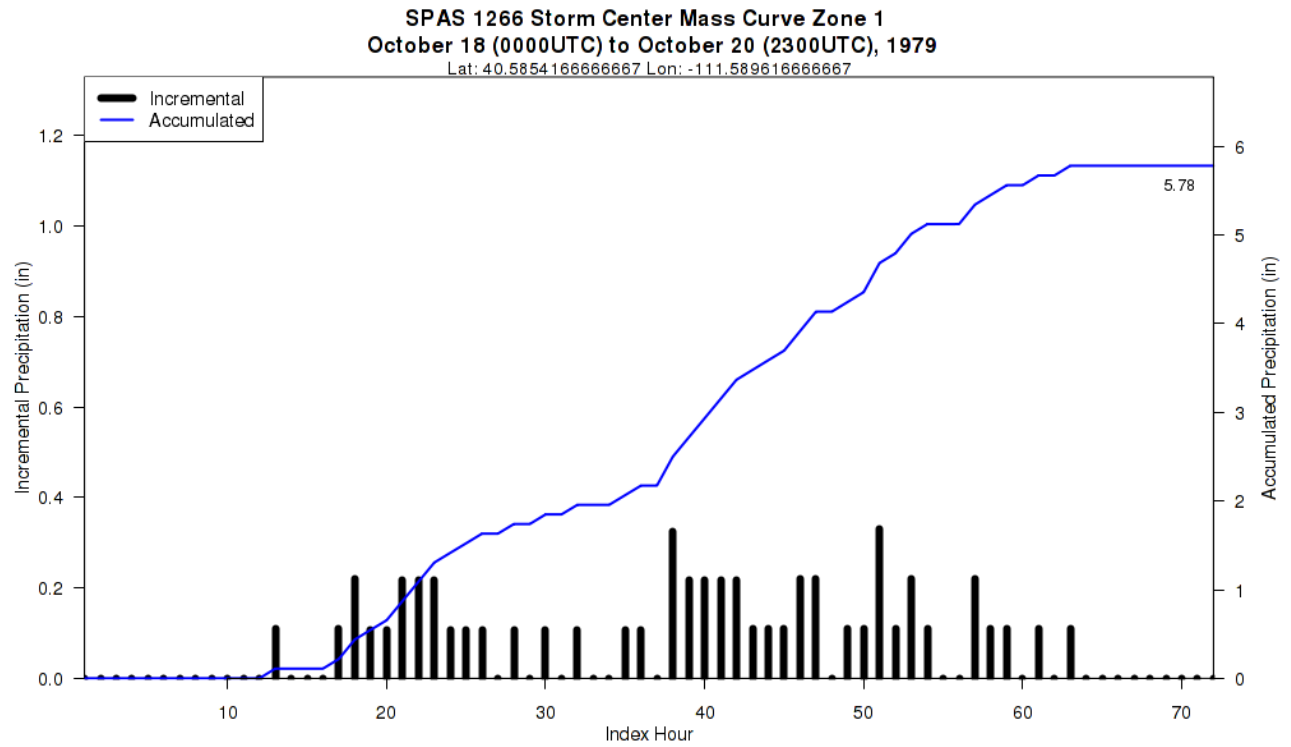
This analysis was based on hourly data, daily data and supplemental station data. We have a good degree of confidence for the station based storm total results and the spatial pattern dependent on the basemap. We have a fair degree of confidence with the timing of the hourly and hourly pseudo precipitation (see below).

CO-NM Regional Extreme Precipitation Study

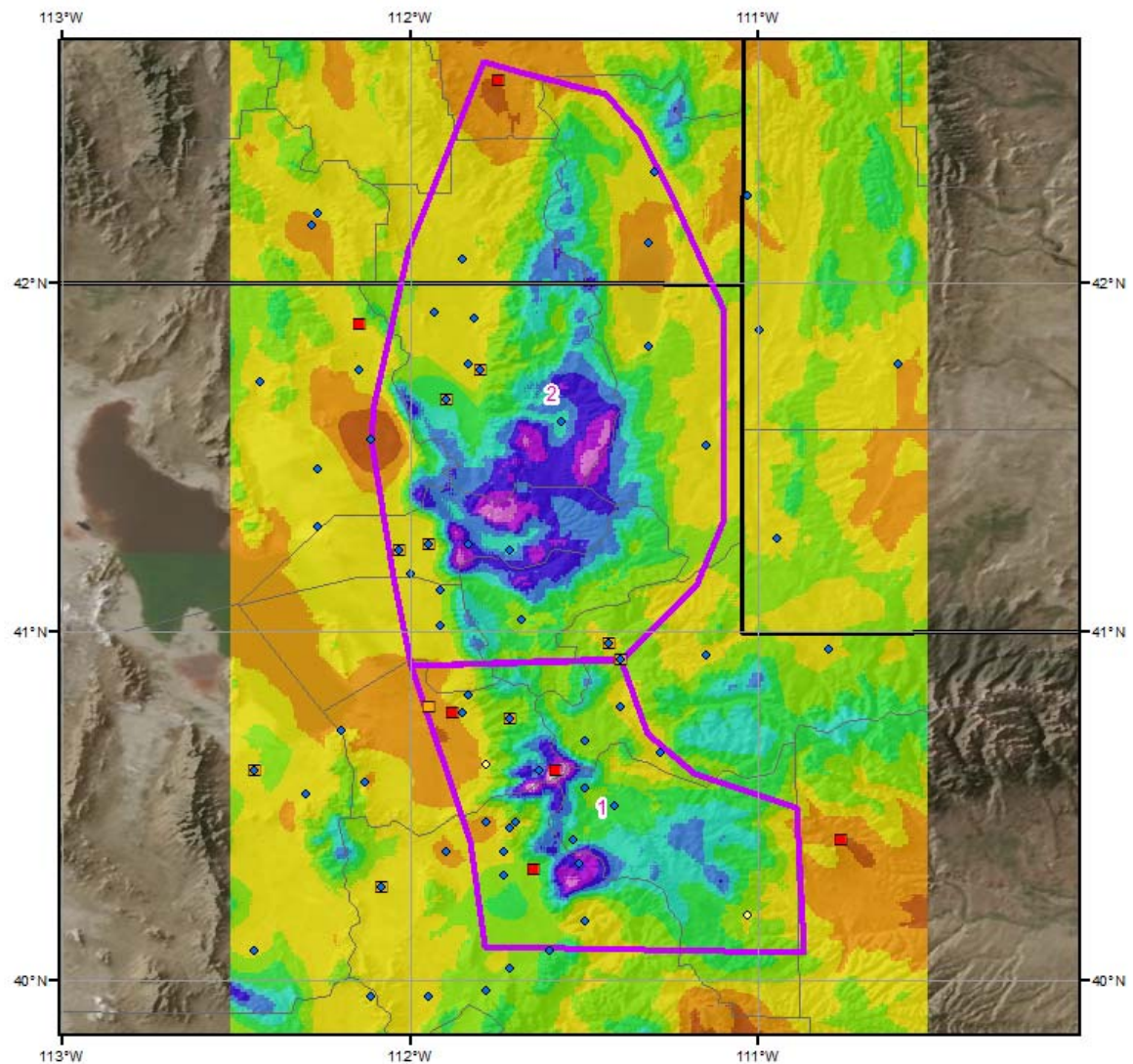
Storm 1266 Zone 1 - Oct. 18 (0000 UTC) - Oct. 20 (2300 UTC), 1979										
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)										
areasqmi	Duration (hours)									
	1	3	6	12	18	24	36	48	72	Total
0.1	0.73	1.49	2.51	4.02	4.93	4.97	5.21	5.67	5.78	5.78
1	0.71	1.43	2.45	3.93	4.79	4.86	5.09	5.51	5.61	5.61
10	0.69	1.40	2.36	3.77	4.63	4.66	4.84	5.23	5.40	5.40
25	0.66	1.35	2.27	3.62	4.45	4.48	4.67	5.05	5.14	5.14
50	0.63	1.28	2.16	3.46	4.16	4.29	4.42	4.83	4.90	4.90
100	0.57	1.17	1.98	3.16	3.80	3.95	4.13	4.41	4.62	4.62
200	0.50	0.93	1.73	2.75	3.17	3.54	3.78	4.03	4.29	4.29
300	0.38	0.91	1.61	2.47	3.05	3.31	3.48	3.91	4.04	4.04
400	0.38	0.87	1.48	2.38	2.97	3.19	3.39	3.74	3.87	3.87
500	0.38	0.83	1.42	2.30	2.73	3.06	3.28	3.55	3.76	3.76
1,000	0.33	0.67	1.20	1.95	2.51	2.69	2.90	3.16	3.33	3.33
2,000	0.23	0.50	0.94	1.57	2.10	2.23	2.41	2.71	2.80	2.80
2,412	0.21	0.45	0.84	1.41	1.93	2.07	2.24	2.51	2.59	2.59



CO-NM Regional Extreme Precipitation Study



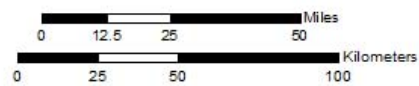
CO-NM Regional Extreme Precipitation Study



Total Storm (72-hours) Precipitation (inches)
October 18 - 20, 1979
SPAS 1266

Gauges

- ◆ Daily
- Hourly
- Hourly Pseudo
- ◇ Supplemental



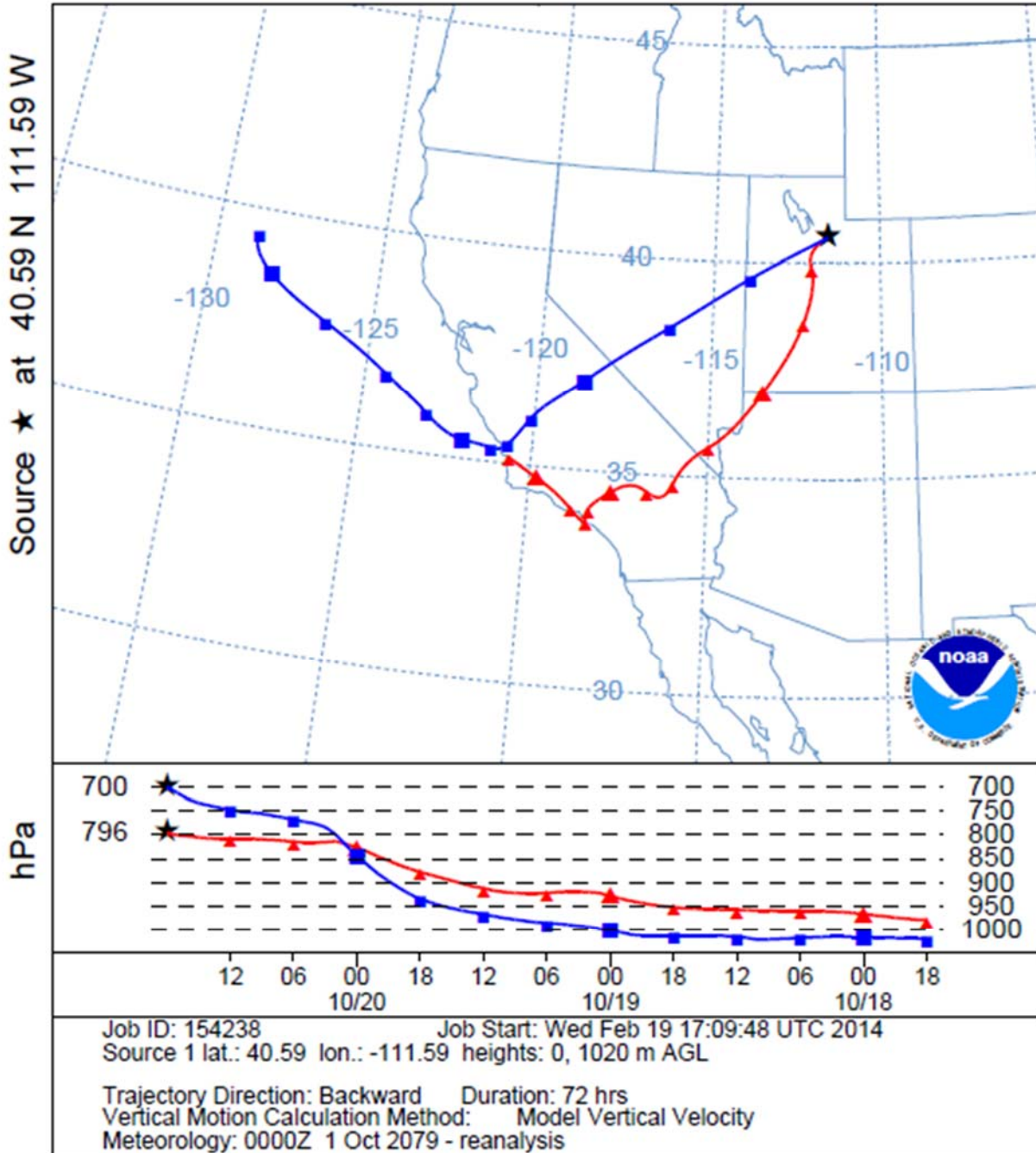
Precipitation (inches)

0.00 - 0.50	1.51 - 2.00	3.01 - 3.50	4.51 - 5.00
0.51 - 1.00	2.01 - 2.50	3.51 - 4.00	5.01 - 5.50
1.01 - 1.50	2.51 - 3.00	4.01 - 4.50	5.51 - 6.00

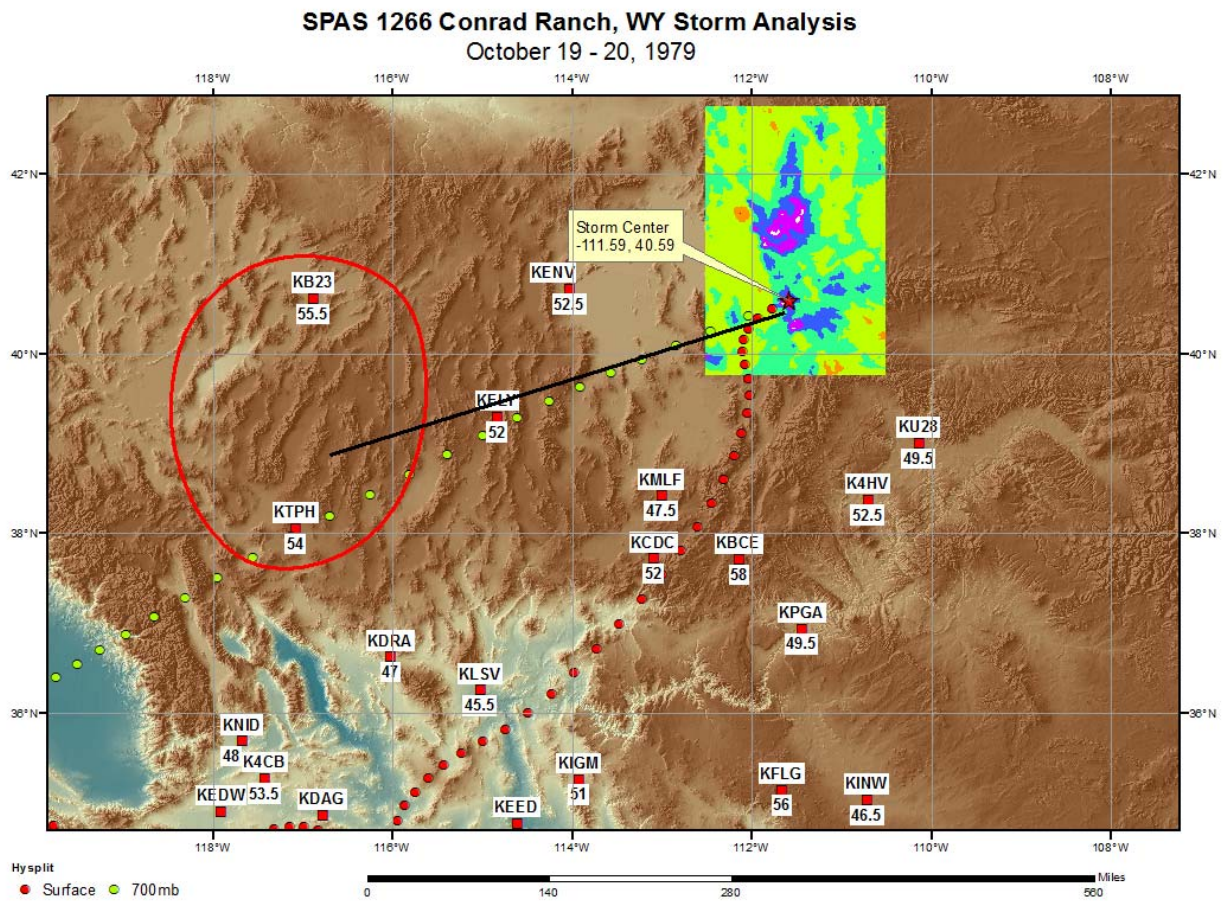


1/21/2014

NOAA HYSPLIT MODEL
Backward trajectories ending at 1800 UTC 20 Oct 79
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study



Rock Springs, AZ

February 13-22, 1980

Storm Type: General Frontal

Storm Precipitation Analysis System (SPAS) For Storm #1138_1

General Storm Location: Crown King, Arizona

Storm Dates: February 13 (0800Z) – 22 (0800Z), 1980

Event: General Storm

DAD Zone 1

Latitude: 34.2208

Longitude: -112.3458

Max. Grid/Radar Rainfall Amount: 17.63”

Max. Observed Rainfall Amount: 16.41”

Number of Stations: 239 (177-daily, 30-hourly, 7-hourly pseudo, 25-supplemental)

SPAS Version: 7.0

Base Map Used: Yes, conus_prism_ppt_in_1971_2000_02_mx

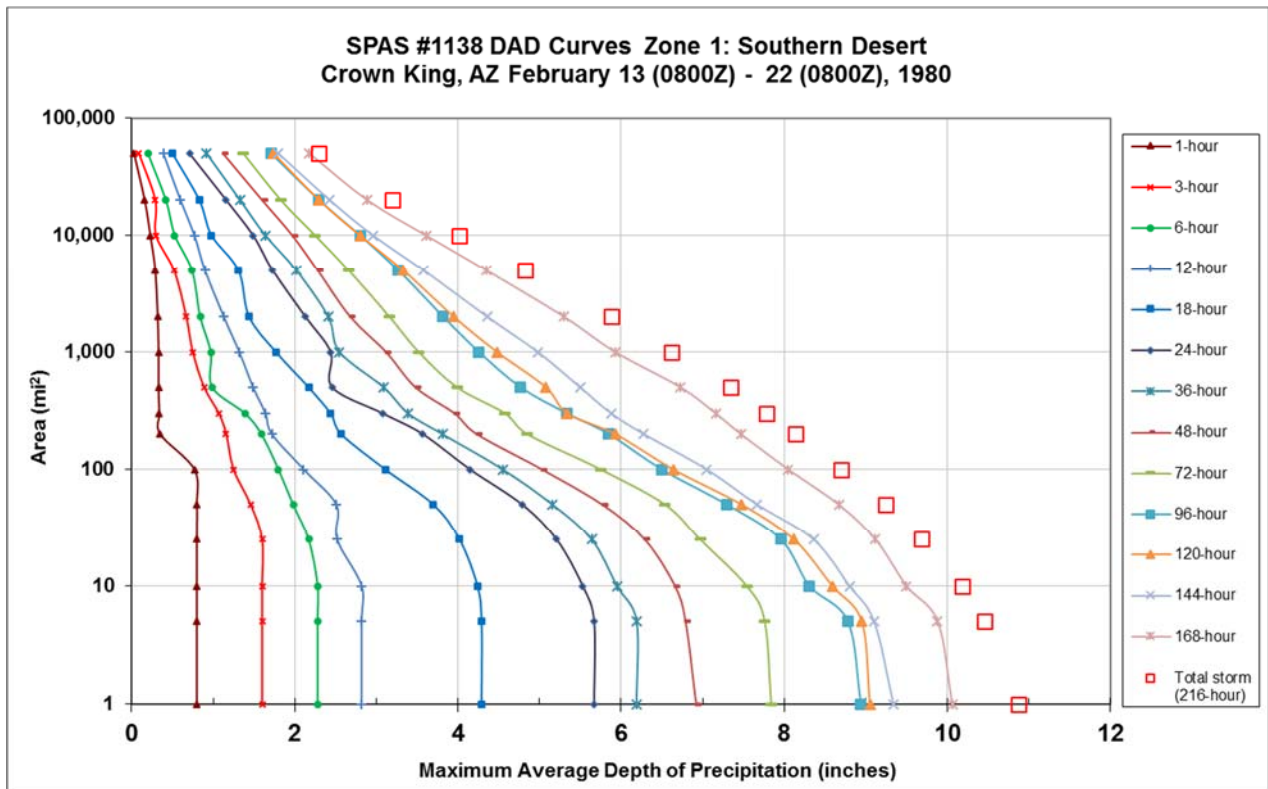
Spatial resolution: 0.27 mi²

Radar Included: No

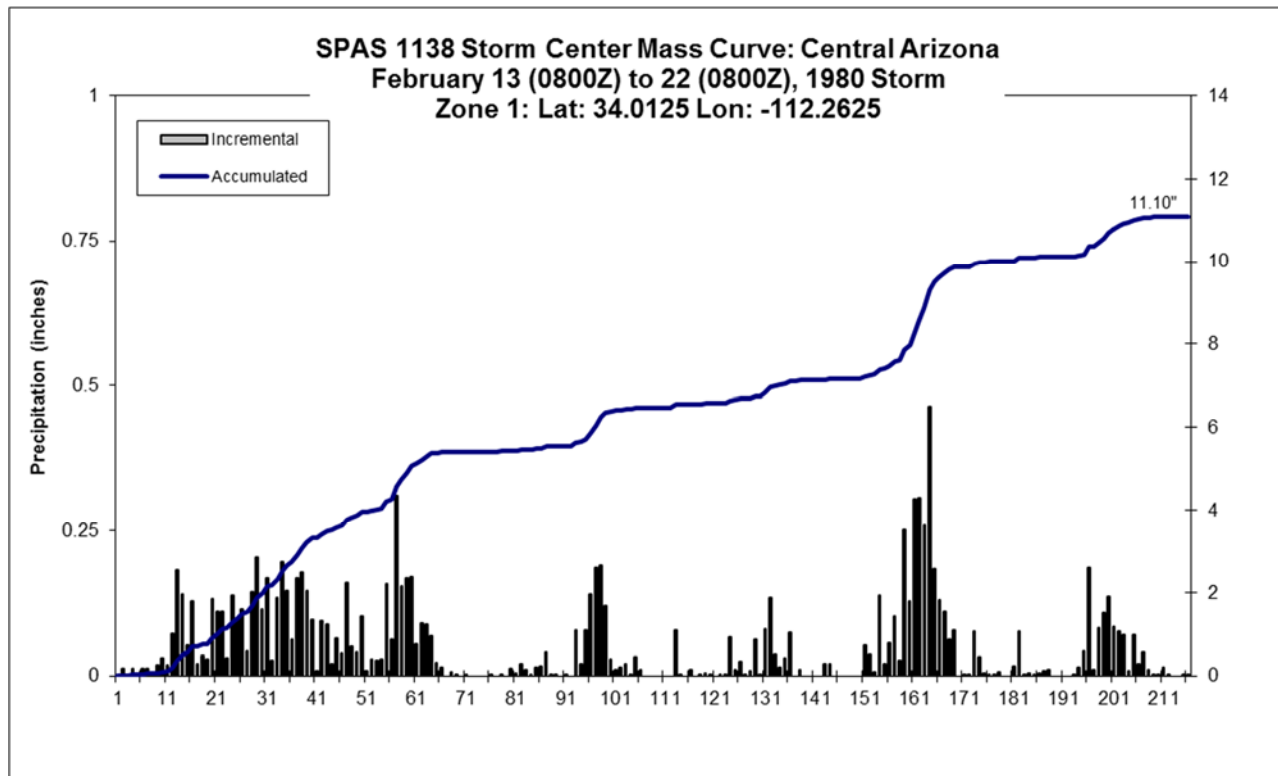
Depth-Area-Duration (DAD) analysis: Yes, 1, 3, 6, 12, 18, 24, 36, 48, 72, 96, 120, 144, 168, and 216-hours

CO-NM Regional Extreme Precipitation Study

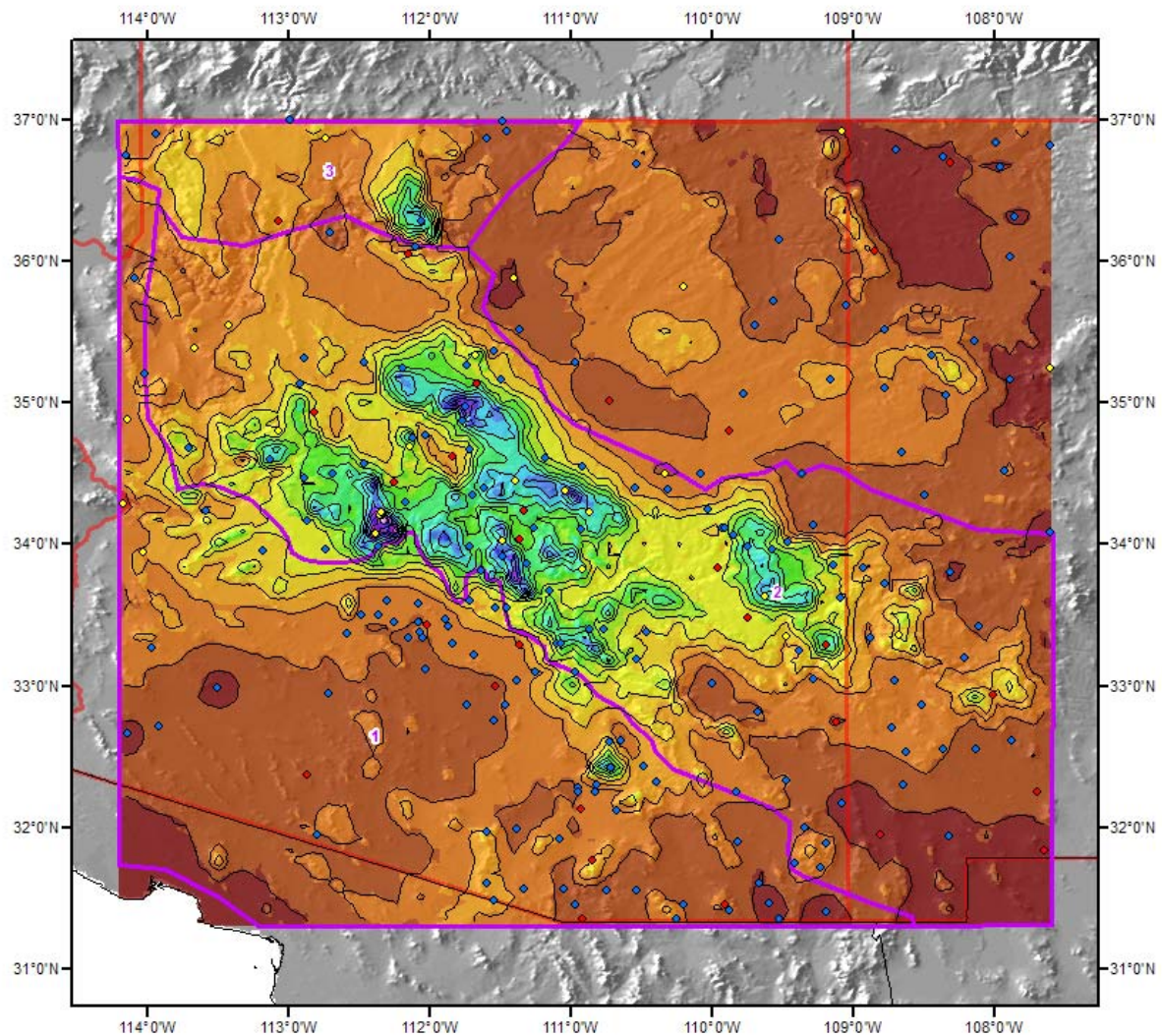
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)													
Area (mi ²)	Duration (hours)												
	1	3	6	12	18	24	36	48	72	96	120	144	total
0.27	1.12	1.90	2.55	3.14	4.61	5.98	6.50	7.16	8.09	9.18	9.33	9.60	11.10
1	0.80	1.60	2.28	2.82	4.29	5.67	6.19	6.92	7.84	8.94	9.05	9.34	10.87
5	0.80	1.60	2.28	2.82	4.29	5.67	6.19	6.79	7.76	8.78	8.95	9.10	10.46
10	0.80	1.60	2.28	2.82	4.24	5.53	5.95	6.66	7.54	8.31	8.59	8.80	10.18
25	0.80	1.60	2.17	2.52	4.02	5.21	5.64	6.29	6.97	7.96	8.12	8.36	9.68
50	0.80	1.46	1.98	2.51	3.70	4.79	5.16	5.77	6.54	7.30	7.48	7.67	9.24
100	0.77	1.25	1.80	2.11	3.11	4.15	4.55	5.03	5.75	6.50	6.64	7.05	8.70
200	0.35	1.16	1.59	1.72	2.57	3.57	3.81	4.23	4.85	5.85	5.93	6.28	8.14
300	0.34	1.07	1.39	1.64	2.44	3.08	3.39	3.96	4.58	5.34	5.34	5.88	7.78
500	0.33	0.89	0.99	1.49	2.17	2.46	3.09	3.48	3.99	4.77	5.08	5.50	7.34
1,000	0.33	0.75	0.97	1.32	1.77	2.44	2.55	3.12	3.52	4.26	4.48	4.98	6.62
2,000	0.32	0.67	0.84	1.13	1.44	2.13	2.41	2.68	3.16	3.82	3.95	4.36	5.88
5,000	0.29	0.52	0.74	0.90	1.31	1.73	2.02	2.28	2.66	3.27	3.33	3.58	4.82
10,000	0.23	0.30	0.53	0.77	0.98	1.49	1.64	1.97	2.25	2.80	2.80	2.96	4.02
20,000	0.16	0.29	0.42	0.60	0.83	1.16	1.33	1.60	1.83	2.30	2.30	2.43	3.20
50,000	0.03	0.09	0.20	0.39	0.50	0.71	0.92	1.12	1.37	1.71	1.74	1.80	2.30



CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



Total Rainfall (216-hours)
Crown King 1980 Storm
Storm #1138 February 13 (0800 Z) to 22 (0700 Z), 1980

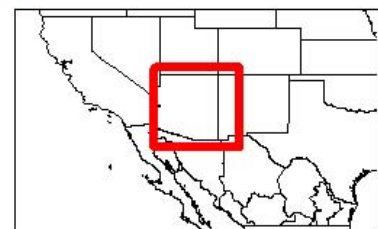
Guages

- ◆ Daily
- ◆ Hourly Pseudo
- ◆ Hourly
- ◆ Supplemental



Precip.

0.18 - 1.00	5.01 - 6.00	10.01 - 11.00	15.01 - 16.00
1.01 - 2.00	6.01 - 7.00	11.01 - 12.00	16.01 - 17.00
2.01 - 3.00	7.01 - 8.00	12.01 - 13.00	17.01 - 18.00
3.01 - 4.00	8.01 - 9.00	13.01 - 14.00	
4.01 - 5.00	9.01 - 10.00	14.01 - 15.00	

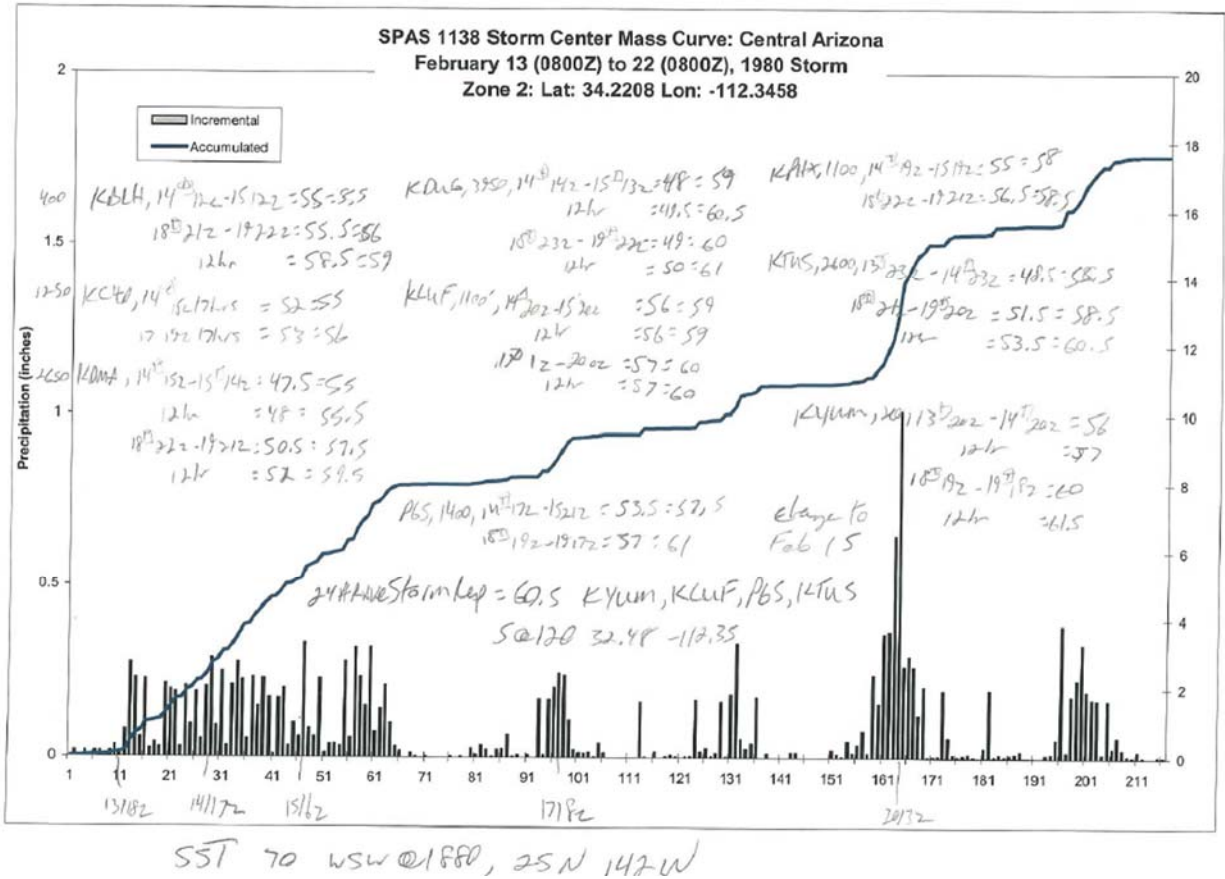


Coordinate system: GCS North American 1983
 Scale: 1:4,417,755

Mktstb/AVR September 10, 2009

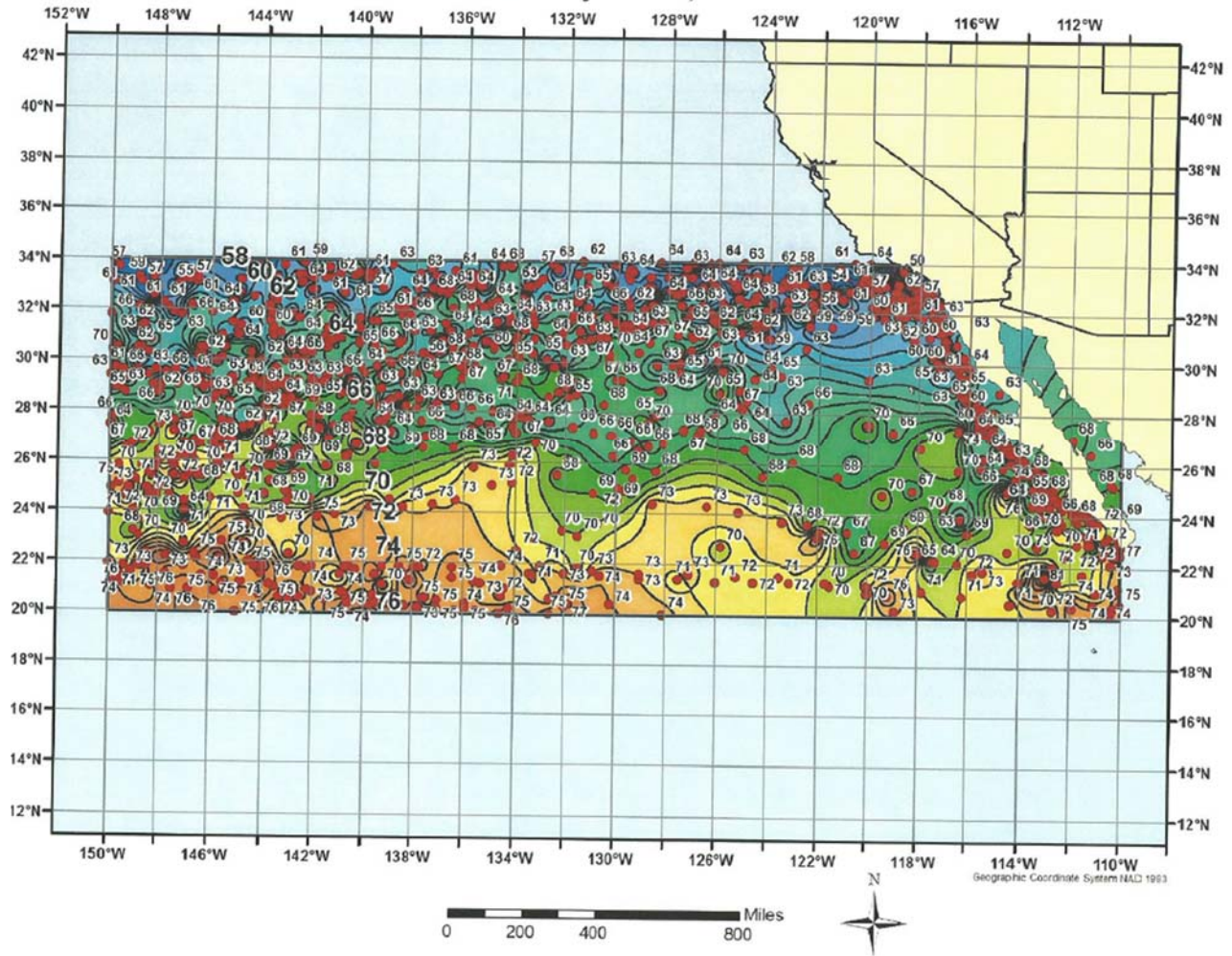


CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study

Sea Surface Temperature Observations (°F) February 10-20, 1980



Crown King, AZ

February 13-22, 1980

Storm Type: General Frontal

Storm Precipitation Analysis System (SPAS) For Storm #1138_2

General Storm Location: Crown King, Arizona

Storm Dates: February 13 (0800Z) – 22 (0800Z), 1980

Event: General Storm

DAD Zone 2

Latitude: 34.2208

Longitude: -112.3458

Max. Grid/Radar Rainfall Amount: 17.63”

Max. Observed Rainfall Amount: 16.41”

Number of Stations: 239 (177-daily, 30-hourly, 7-hourly pseudo, 25-suppleemntal)

SPAS Version: 7.0

Base Map Used: Yes, conus_prism_ppt_in_1971_2000_02_mx

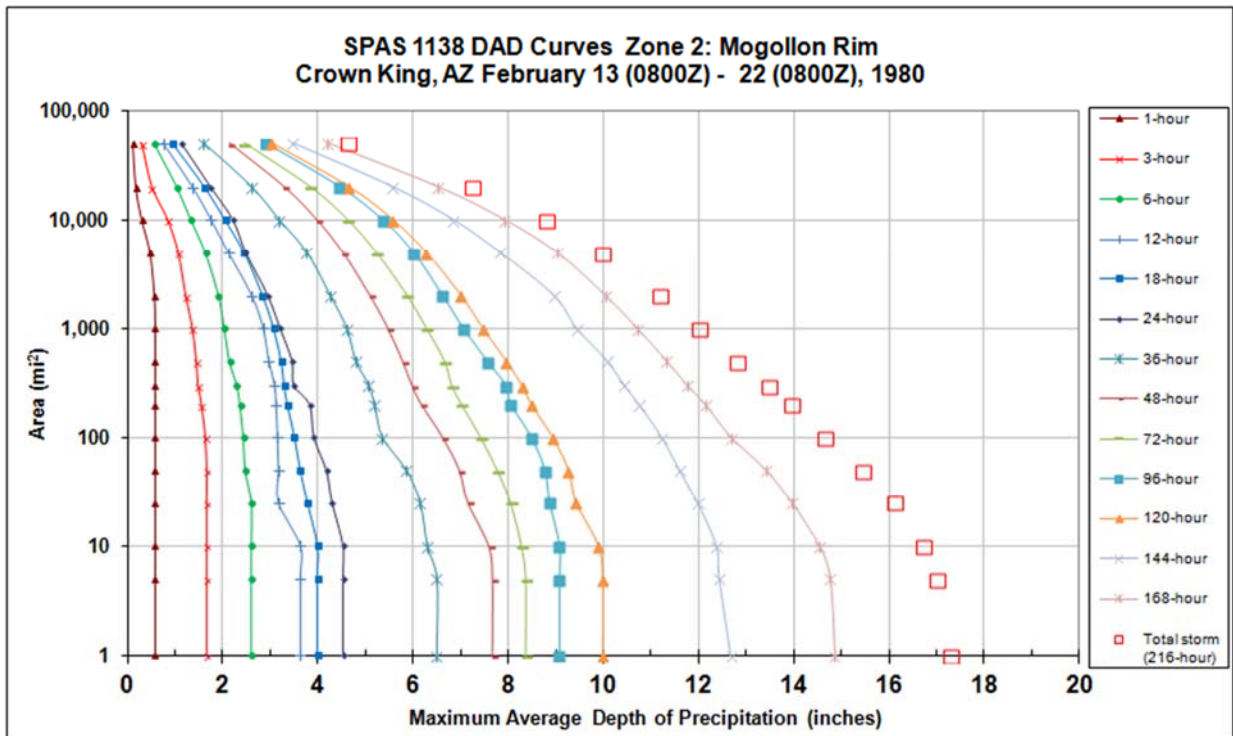
Spatial resolution: 0.27 mi²

Radar Included: No

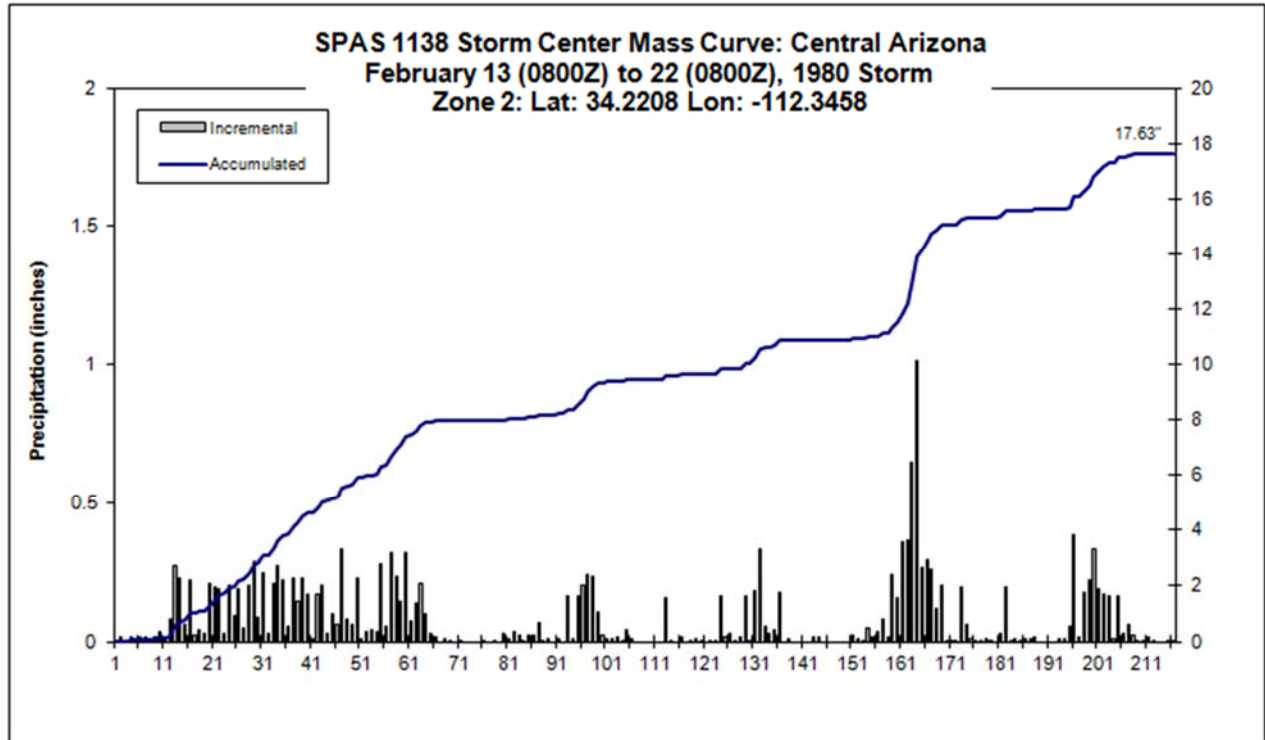
Depth-Area-Duration (DAD) analysis: Yes, 1, 3, 6, 12, 18, 24, 36, 48, 72, 96, 120, 144, 168, and 216-hours

CO-NM Regional Extreme Precipitation Study

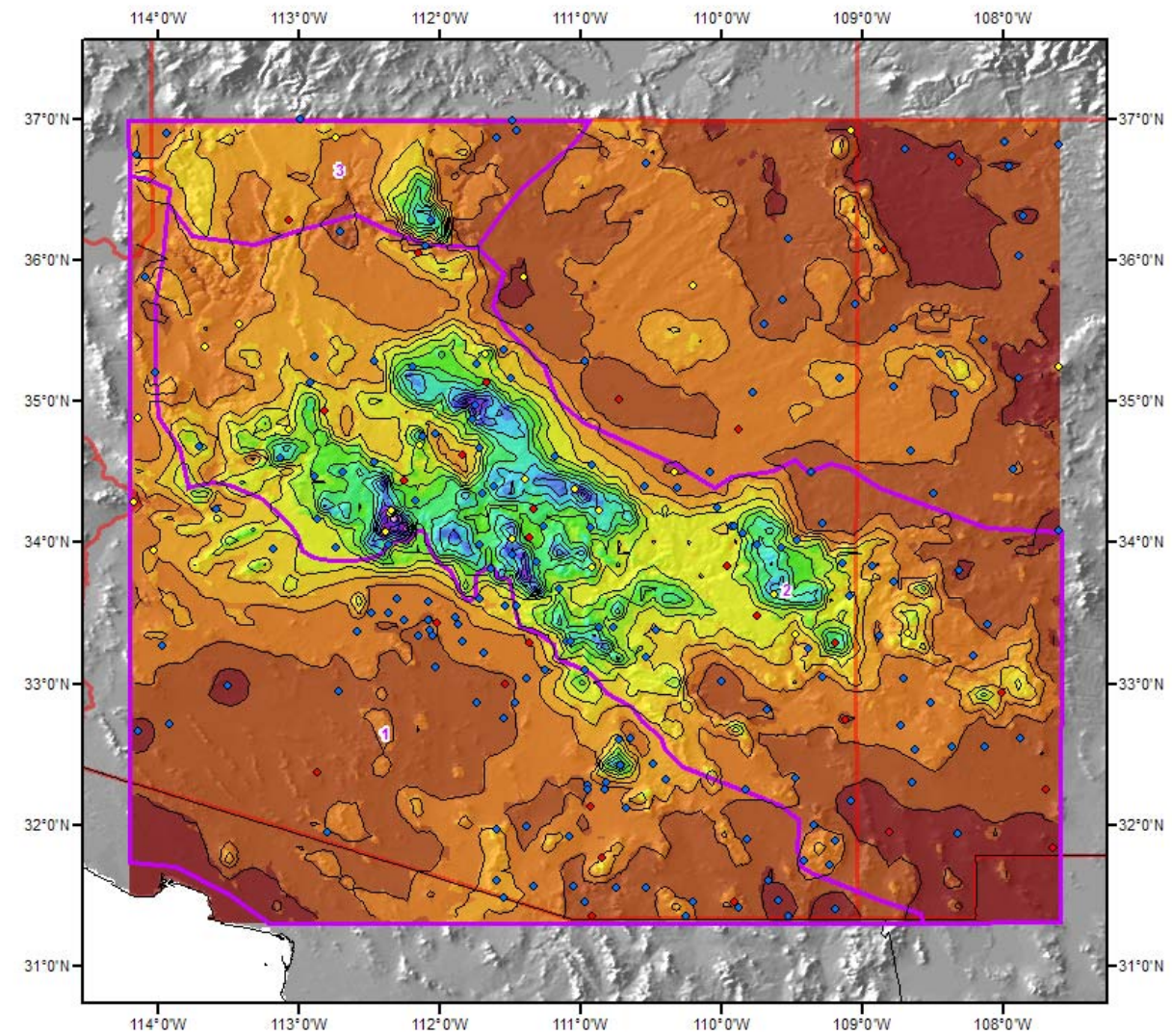
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
Area (mi ²)	Duration (hours)													
	1	3	6	12	18	24	36	48	72	96	120	144	168	total
0.27	1.01	2.02	2.94	3.94	4.28	4.77	6.75	7.98	8.65	9.45	10.33	13.02	15.24	17.63
1	0.57	1.67	2.59	3.62	3.98	4.52	6.49	7.68	8.37	9.07	9.98	12.68	14.86	17.30
5	0.57	1.67	2.59	3.62	3.98	4.52	6.49	7.68	8.37	9.07	9.98	12.44	14.76	17.00
10	0.57	1.67	2.59	3.62	3.98	4.52	6.29	7.60	8.28	9.07	9.89	12.38	14.53	16.72
25	0.57	1.67	2.59	3.16	3.77	4.29	6.14	7.16	8.05	8.86	9.42	11.98	13.95	16.11
50	0.57	1.67	2.46	3.16	3.62	4.17	5.85	6.98	7.77	8.76	9.26	11.60	13.41	15.45
100	0.57	1.64	2.42	3.14	3.50	3.91	5.35	6.63	7.42	8.48	8.93	11.23	12.68	14.67
200	0.57	1.56	2.35	3.11	3.35	3.82	5.18	6.18	7.02	8.05	8.48	10.75	12.13	13.95
300	0.57	1.49	2.28	3.08	3.28	3.49	5.06	5.98	6.81	7.94	8.28	10.44	11.75	13.48
500	0.57	1.45	2.13	2.96	3.22	3.45	4.79	5.78	6.66	7.55	7.95	10.08	11.32	12.83
1,000	0.57	1.37	2.02	2.84	3.06	3.20	4.60	5.47	6.28	7.05	7.46	9.44	10.70	12.02
2,000	0.55	1.23	1.90	2.60	2.83	2.94	4.25	5.09	5.87	6.61	7.00	8.96	10.03	11.19
5,000	0.46	1.07	1.62	2.11	2.44	2.48	3.76	4.52	5.22	6.00	6.27	7.83	9.01	9.98
10,000	0.29	0.85	1.32	1.75	2.04	2.21	3.18	3.97	4.62	5.35	5.57	6.85	7.91	8.81
20,000	0.17	0.52	1.02	1.36	1.61	1.74	2.60	3.28	3.83	4.45	4.65	5.57	6.51	7.26
50,000	0.11	0.31	0.55	0.75	0.94	1.13	1.60	2.13	2.45	2.90	3.03	3.48	4.20	4.64



CO-NM Regional Extreme Precipitation Study



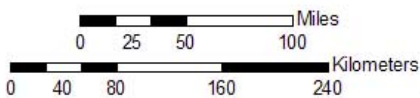
CO-NM Regional Extreme Precipitation Study



Total Rainfall (216-hours)
Crown King 1980 Storm
Storm #1138 February 13 (0800 Z) to 22 (0700 Z), 1980

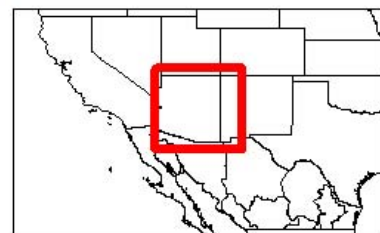
Gauges

- ◆ Daily
- ◆ Hourly Pseudo
- ◆ Hourly
- ◆ Supplemental



Precip.

0.18 - 1.00	5.01 - 6.00	10.01 - 11.00	15.01 - 16.00
1.01 - 2.00	6.01 - 7.00	11.01 - 12.00	16.01 - 17.00
2.01 - 3.00	7.01 - 8.00	12.01 - 13.00	17.01 - 18.00
3.01 - 4.00	8.01 - 9.00	13.01 - 14.00	
4.01 - 5.00	9.01 - 10.00	14.01 - 15.00	



Coordinate system: GCS North American 1983
 Scale: 1:4,417,755
 Metdata/VIA September 10, 2009



SPAS 1138 Storm Center Mass Curve: Central Arizona
February 13 (0800Z) to 22 (0800Z), 1980 Storm
Zone 2: Lat: 34.2208 Lon: -112.3458

Legend: Incremental (Gray bars), Accumulated (Blue line)

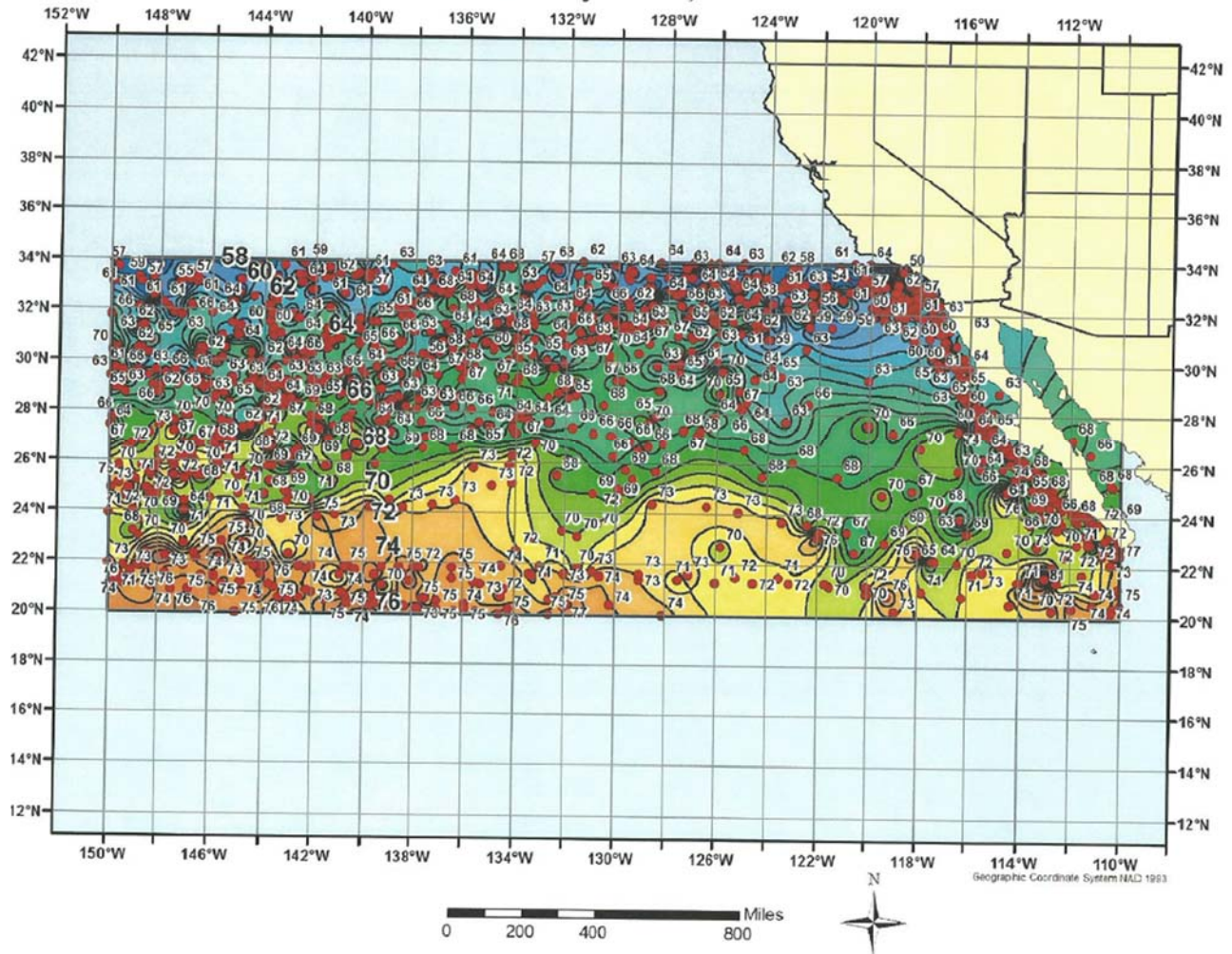
Handwritten notes on the graph:

- KBLH, 14⁰⁰ 12Z-15⁰⁰ 12Z = 55.5 = 58.5**
- 18⁰⁰ 21Z-19⁰⁰ 22Z = 55.5 = 58.5**
- 12hr = 58.5 = 59**
- KDLG, 14⁰⁰ 12Z-15⁰⁰ 13Z = 48 = 59**
- 12hr = 48 = 60.5**
- 18⁰⁰ 22Z-19⁰⁰ 22Z = 49 = 60**
- 12hr = 50 = 61**
- KATX, 1100, 14⁰⁰ 12Z-15⁰⁰ 12Z = 55 = 58**
- 18⁰⁰ 22Z-19⁰⁰ 22Z = 56.5 = 58.5**
- 12hr = 56.5 = 59**
- KRUS, 2400, 15⁰⁰ 23Z-14⁰⁰ 32Z = 48.5 = 58.5**
- 18⁰⁰ 21Z-19⁰⁰ 20Z = 51.5 = 58.5**
- 12hr = 53.5 = 60.5**
- KC40, 14⁰⁰ 12Z-15⁰⁰ 12Z = 52 = 55**
- 17 17Z 17hr = 53 = 56**
- KLUF, 1100, 14⁰⁰ 20Z-15⁰⁰ 20Z = 56 = 59**
- 12hr = 56 = 59**
- 18⁰⁰ 12Z-20⁰⁰ 20Z = 57.5 = 60**
- 12hr = 57 = 60**
- KAMA, 14⁰⁰ 15Z-15⁰⁰ 14Z = 47.5 = 55**
- 12hr = 48 = 56.5**
- 18⁰⁰ 22Z-19⁰⁰ 21Z = 50.5 = 57.5**
- 12hr = 52 = 59.5**
- PBS, 1400, 14⁰⁰ 17Z-15⁰⁰ 21Z = 53.5 = 57.5**
- 18⁰⁰ 19Z-19⁰⁰ 17Z = 57 = 61**
- KYUM, 2000, 13⁰⁰ 20Z-14⁰⁰ 20Z = 56**
- 12hr = 57**
- 18⁰⁰ 19Z-19⁰⁰ 17Z = 60**
- 12hr = 61.5**
- 24hr Average Storm Imp = 60.5**
- S @ 120 32.48 -112.35**
- change to Feb 15**

Bottom text: SST 70 WSW @ 1880, 25N 142W

CO-NM Regional Extreme Precipitation Study

Sea Surface Temperature Observations (°F) February 10-20, 1980



Mt. Timpanogos, UT

September 24-29, 1982

Storm Type: General

Storm Precipitation Analysis System (SPAS) For Storm #1265_1

General Storm Location: Cottonwood, Utah

Storm Dates: September 24-29, 1982

Event: Synoptic

DAD Zone 1

Latitude: 40.4042

Longitude: -111.6375

Max. Grid Rainfall Amount: 10.13" in 144 hours

Max. Observed Rainfall Amount: Timpanogos Divide, UT – 9.2"

Number of Stations: 94 (72 Daily, 13 Hourly, 3 Hourly Pseudo, and 6 Supplemental Estimated)

SPAS Version: 9.5

Basemap: PRISM September 1971-2000.

Spatial resolution: 00:00:30

Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

Reliability of results: This analysis was based on hourly data, daily data, and supplemental data. We have a good level of confidence in the station based results. We have a fair degree of confidence with the timing of precipitation in each zone. Ben Lomond Trail (SNOTEL; 333; DAD Zone 3) ended up being removed from the final SPAS run. Although temporally, the mass curve looked okay, the magnitude was very high spatially. After the removal of Ben Lomond Trail, the Zone 3 bulls-eye becomes topographically driven. Zone 2 contains no hourly data, so temporally it may not be accurate. Looking at the mass curves, it seems there is a lot of moisture in the air with precipitation falling the whole period. Although precipitation falls over the 144 hour period, the main convective event to focus on occurs between ~60 and 70 hours (~20-80 hours for the entire event).

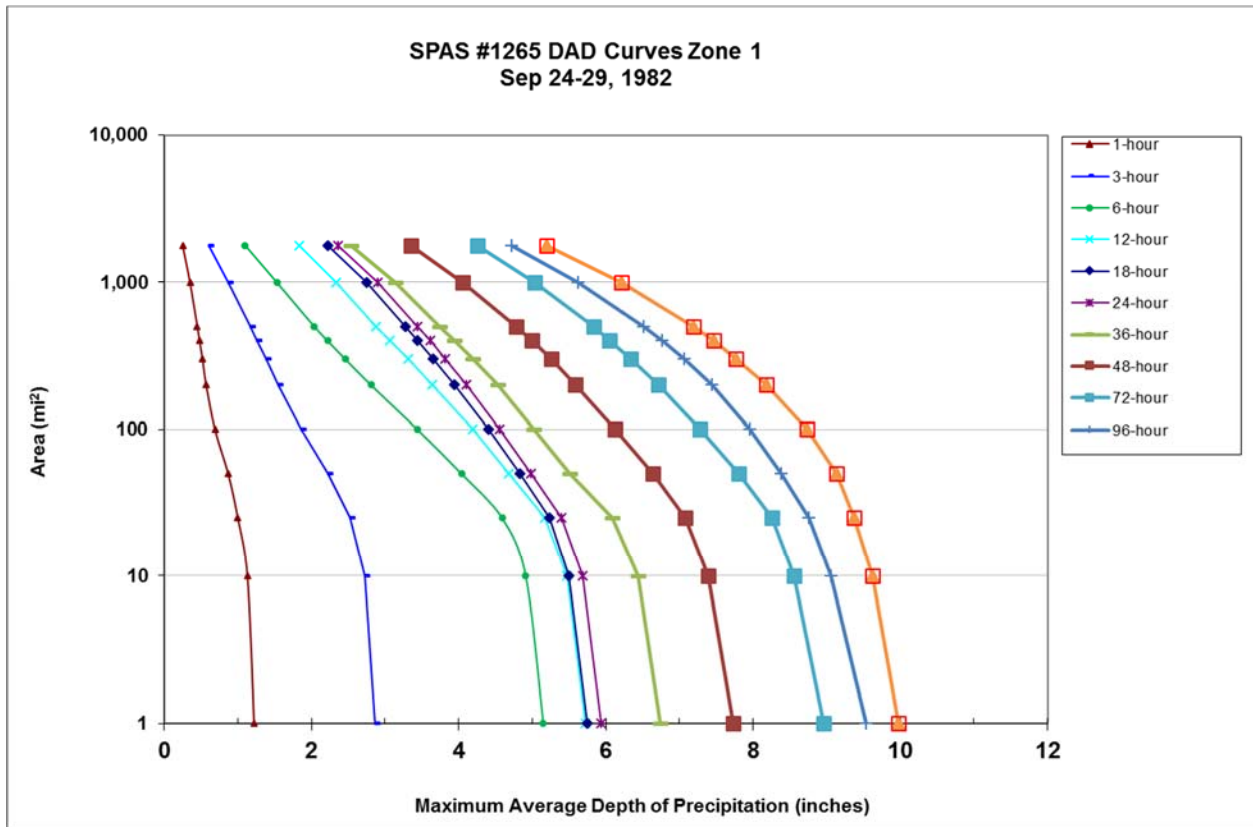
The ratio between the basemap (conus_prism_ppt_in_1971-2000_09) and observations around the bulls-eye in Zone 1 was also calculated due to the storm center being 11.35" and the observed stations around the storm center being ~2.0 inches less. Cottonwood Weir: $2.13/8.3=0.26$; Argenta: $2.23/6.6=0.34$; Silver Lake Brighton: $2.64/5.6=0.47$; Alta: $2.84/7.91=0.36$; Mtn Dell Dam: $2.1/5.2=0.40$; Timpanogos Divide: $2.64/9.2=0.29$ creating an average ratio of 0.35. Using this average ratio and the PRISM basemap value of 3.97, the storm center is estimated to be 11.34 inches. Due to this high precipitation amount, a supplemental station was created at the

CO-NM Regional Extreme Precipitation Study

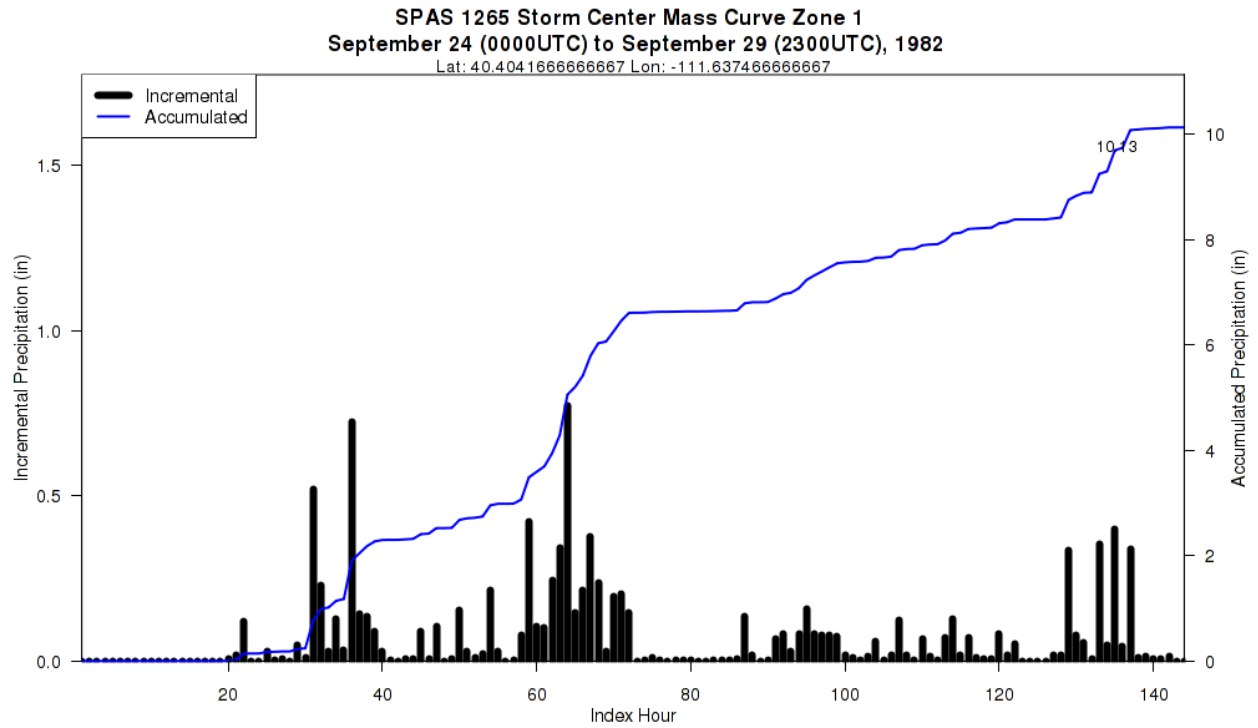
storm center to decrease the magnitude (being driven by PRISM). The supplemental station was set to 9.0 inches and the final run looked spatially similar with a decreased magnitude.

CO-NM Regional Extreme Precipitation Study

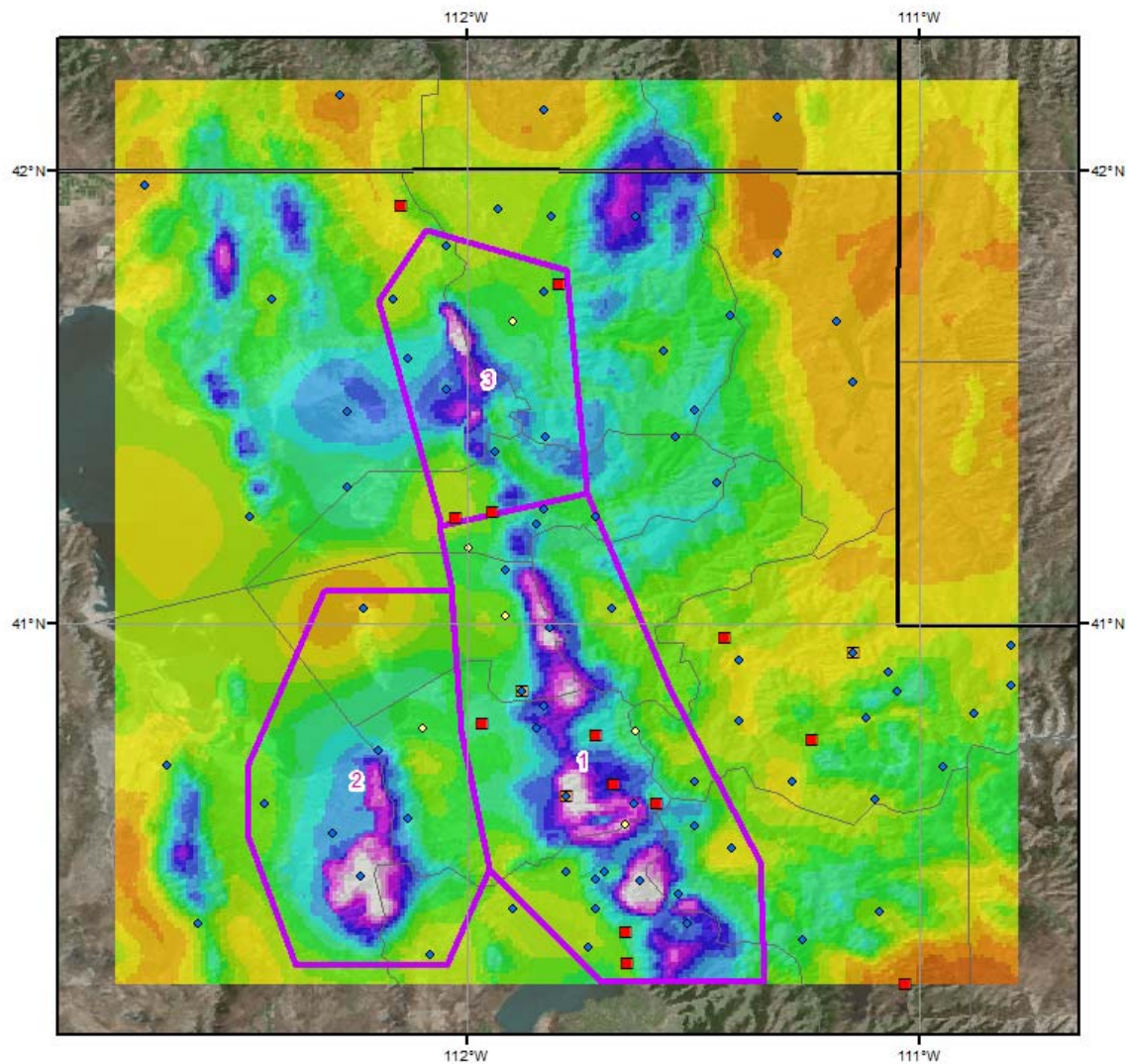
Storm 1265 Zone 1 - Sep. 24 (0000 UTC) - Sep. 29 (2300 UTC), 1982												
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)												
areasqmi	Duration (hours)											
	1	3	6	12	18	24	36	48	72	96	120	Total
0.4	1.23	2.91	5.24	5.81	5.83	6.02	6.84	7.85	9.07	9.59	10.06	10.06
1	1.22	2.86	5.15	5.72	5.75	5.94	6.74	7.73	8.96	9.53	9.97	9.97
10	1.13	2.72	4.91	5.47	5.50	5.68	6.44	7.39	8.56	9.06	9.62	9.62
25	1.00	2.53	4.59	5.17	5.23	5.40	6.08	7.08	8.25	8.75	9.37	9.37
50	0.87	2.22	4.04	4.68	4.83	4.98	5.51	6.64	7.80	8.38	9.13	9.13
100	0.69	1.86	3.44	4.19	4.41	4.55	5.02	6.12	7.28	7.95	8.73	8.73
200	0.57	1.55	2.81	3.64	3.94	4.10	4.53	5.59	6.71	7.44	8.18	8.18
300	0.52	1.38	2.46	3.31	3.65	3.82	4.19	5.26	6.34	7.06	7.77	7.77
400	0.48	1.26	2.22	3.06	3.44	3.62	3.94	4.99	6.05	6.76	7.46	7.46
500	0.45	1.17	2.04	2.88	3.28	3.44	3.74	4.78	5.83	6.51	7.19	7.19
1,000	0.35	0.87	1.53	2.34	2.75	2.90	3.14	4.06	5.03	5.62	6.21	6.21
1,789	0.25	0.61	1.10	1.83	2.23	2.36	2.54	3.35	4.25	4.72	5.20	5.20



CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



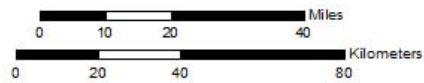
Total Storm (144-hours) Precipitation (inches)
September 24 - 29, 1982
SPAS 1265 - Cottonwood, UT

Gauges

- ◆ Daily
- Hourly
- Hourly/Pseudo
- ◇ Supplemental

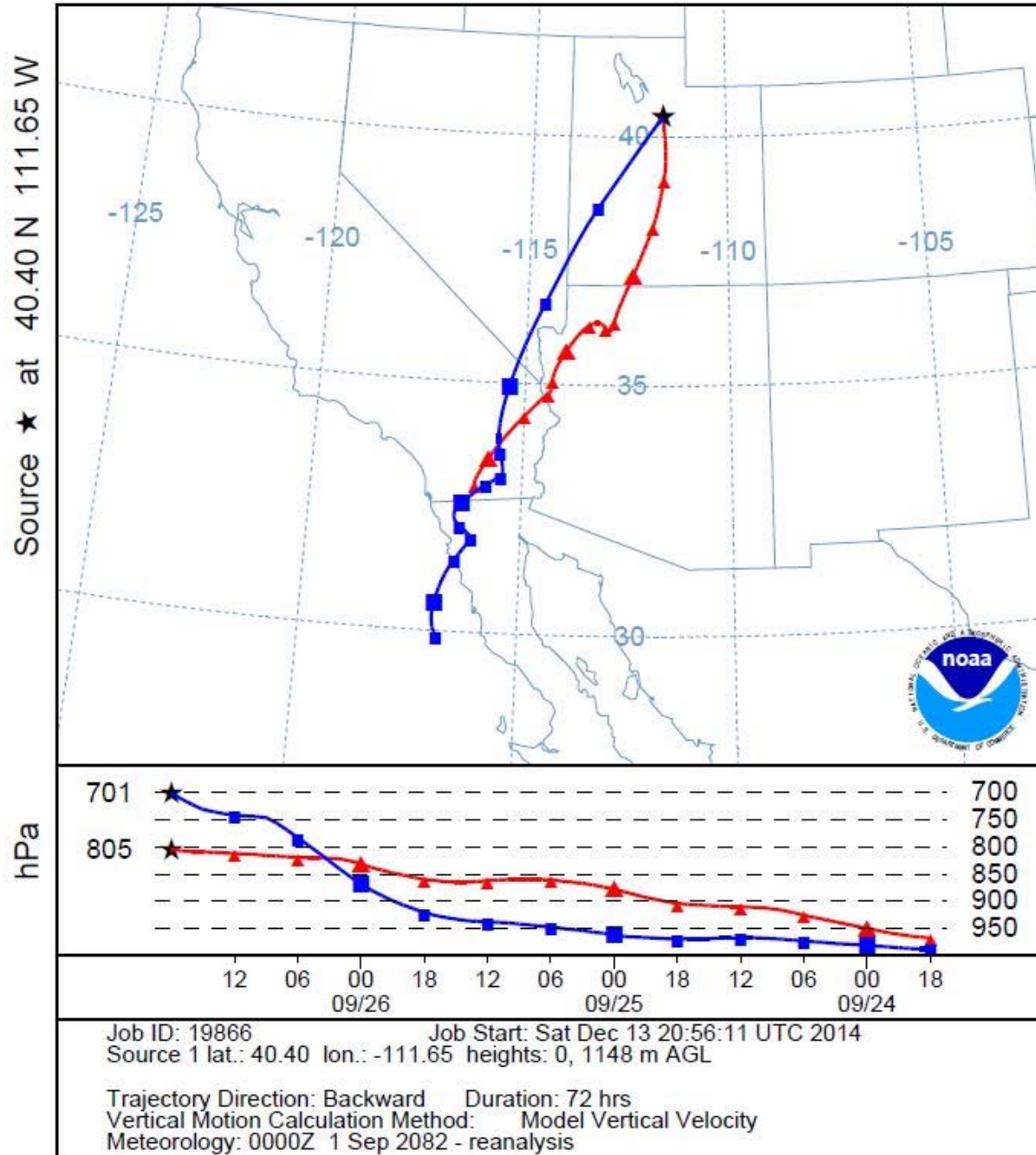
Precipitation (inches)

0.00 - 0.50	2.51 - 3.00	5.01 - 5.50	7.51 - 8.00
0.51 - 1.00	3.01 - 3.50	5.51 - 6.00	8.01 - 8.50
1.01 - 1.50	3.51 - 4.00	6.01 - 6.50	8.51 - 9.00
1.51 - 2.00	4.01 - 4.50	6.51 - 7.00	9.01 - 9.50
2.01 - 2.50	4.51 - 5.00	7.01 - 7.50	

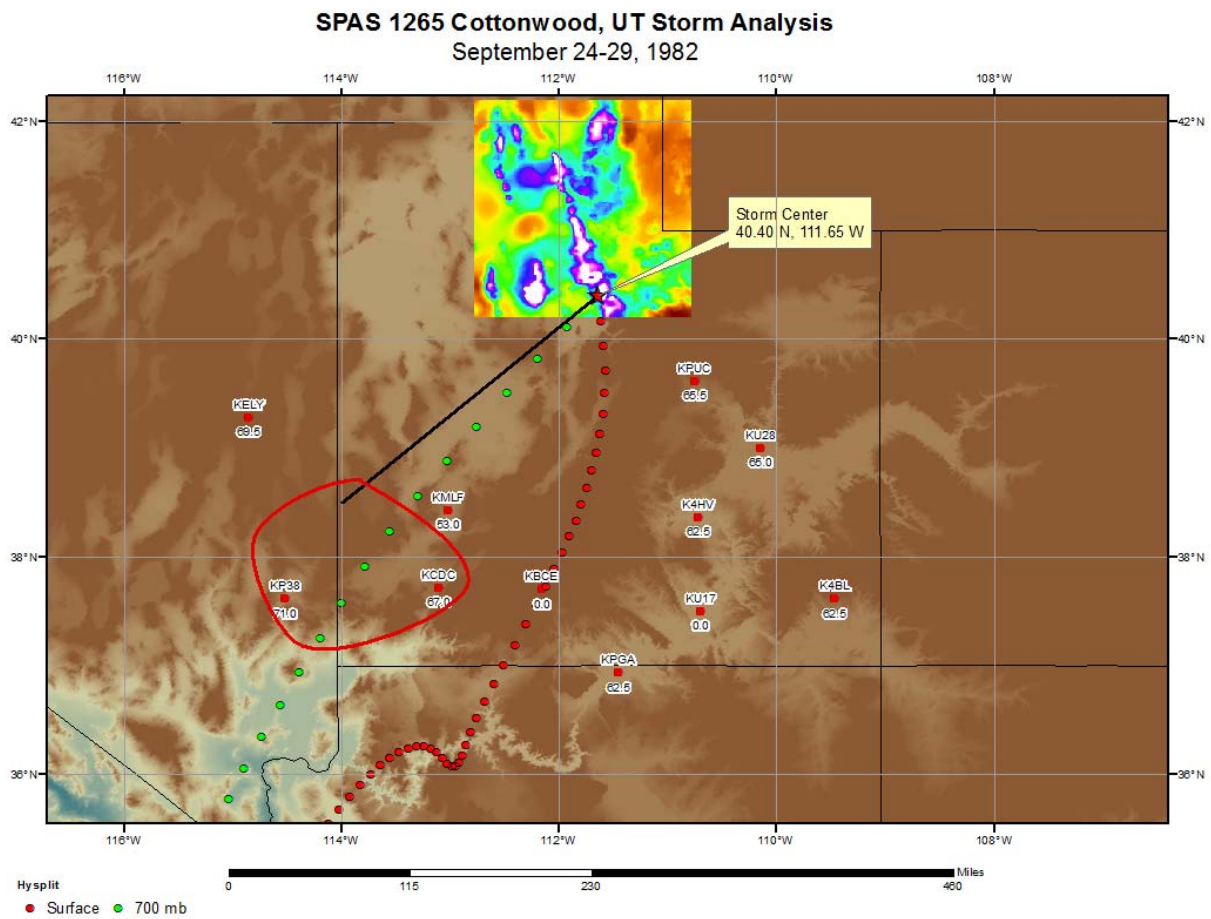


1/21/2014

NOAA HYSPLIT MODEL
Backward trajectories ending at 1800 UTC 26 Sep 82
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study



Flat Top Mountain, UT

September 24-29, 1982

Storm Type: General

Storm Precipitation Analysis System (SPAS) For Storm #1265_2

General Storm Location: Cottonwood, Utah

Storm Dates: September 24-29, 1982

Event: Synoptic

DAD Zone 2

Latitude: 40.3792

Longitude: -112.2041

Max. Grid Rainfall Amount: 10.02" in 144 hours

Max. Observed Rainfall Amount: Rocky Basin-Settlement, UT – 9.2"

Number of Stations: 94 (72 Daily, 13 Hourly, 3 Hourly Pseudo, and 6 Supplemental Estimated)

SPAS Version: 9.5

Basemap: PRISM September 1971-2000.

Spatial resolution: 00:00:30

Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

Reliability of results: This analysis was based on hourly data, daily data, and supplemental data. We have a good level of confidence in the station based results. We have a fair degree of confidence with the timing of precipitation in each zone. Ben Lomond Trail (SNOTEL; 333; DAD Zone 3) ended up being removed from the final SPAS run. Although temporally, the mass curve looked okay, the magnitude was very high spatially. After the removal of Ben Lomond Trail, the Zone 3 bulls-eye becomes topographically driven. Zone 2 contains no hourly data, so temporally it may not be accurate. Looking at the mass curves, it seems there is a lot of moisture in the air with precipitation falling the whole period. Although precipitation falls over the 144 hour period, the main convective event to focus on occurs between ~60 and 70 hours (~20-80 hours for the entire event).

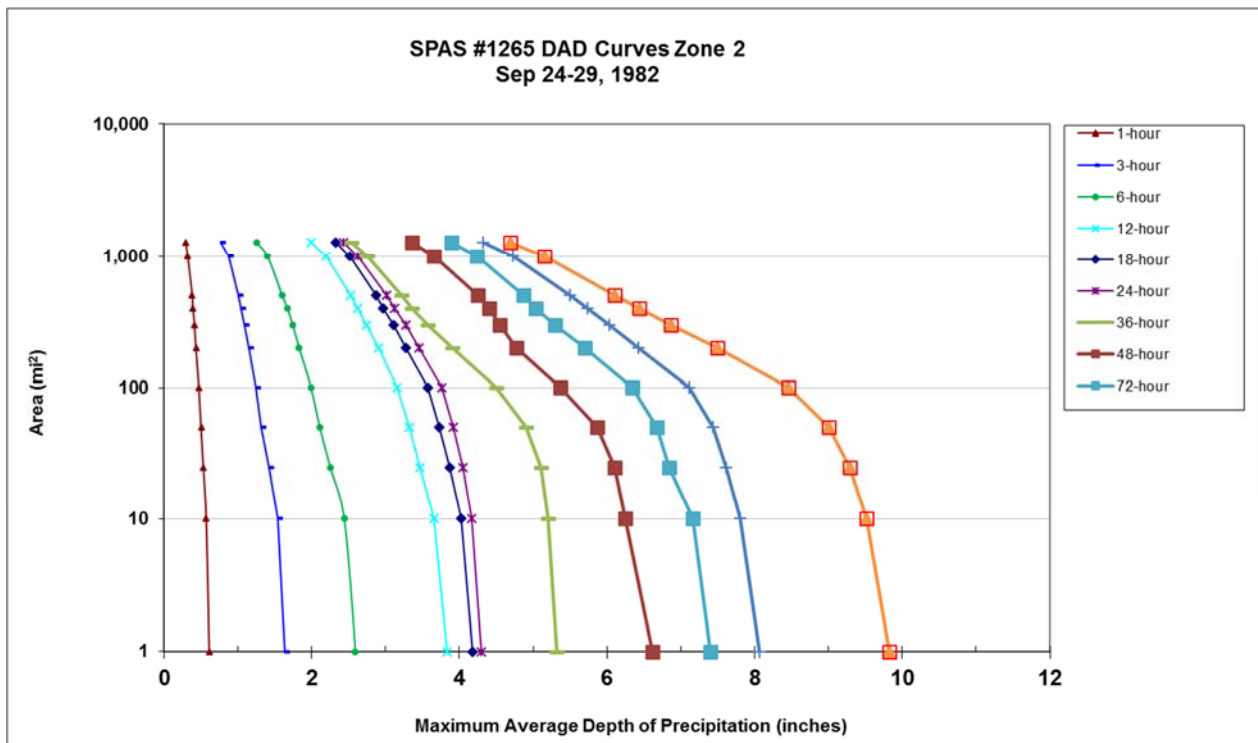
The ratio between the basemap (conus_prism_ppt_in_1971-2000_09) and observations around the bulls-eye in Zone 1 was also calculated due to the storm center being 11.35" and the observed stations around the storm center being ~2.0 inches less. Cottonwood Weir: $2.13/8.3 = 0.26$; Argenta: $2.23/6.6 = 0.34$; Silver Lake Brighton: $2.64/5.6 = 0.47$; Alta: $2.84/7.91 = 0.36$; Mtn Dell Dam: $2.1/5.2 = 0.40$; Timpanogos Divide: $2.64/9.2 = 0.29$ creating an average ratio of 0.35. Using this average ratio and the PRISM basemap value of 3.97, the storm center is estimated to be 11.34 inches. Due to this high precipitation amount, a supplemental station was created at the

CO-NM Regional Extreme Precipitation Study

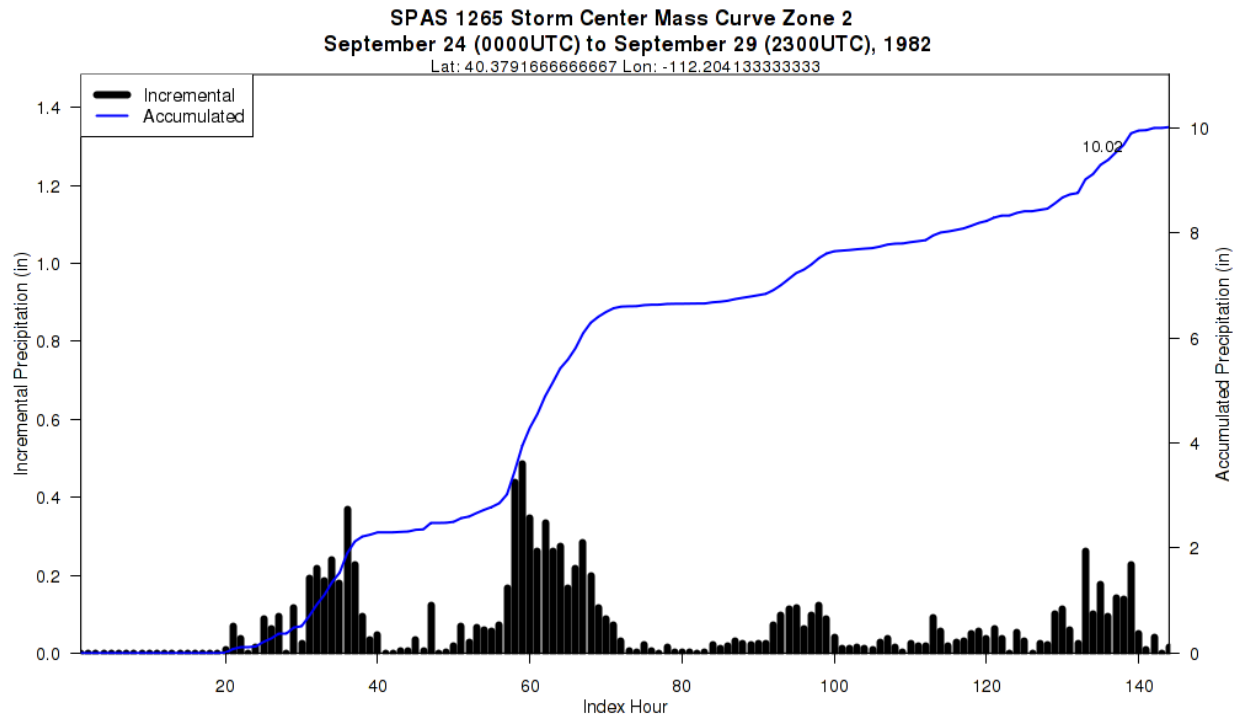
storm center to decrease the magnitude (being driven by PRISM). The supplemental station was set to 9.0 inches and the final run looked spatially similar with a decreased magnitude.

CO-NM Regional Extreme Precipitation Study

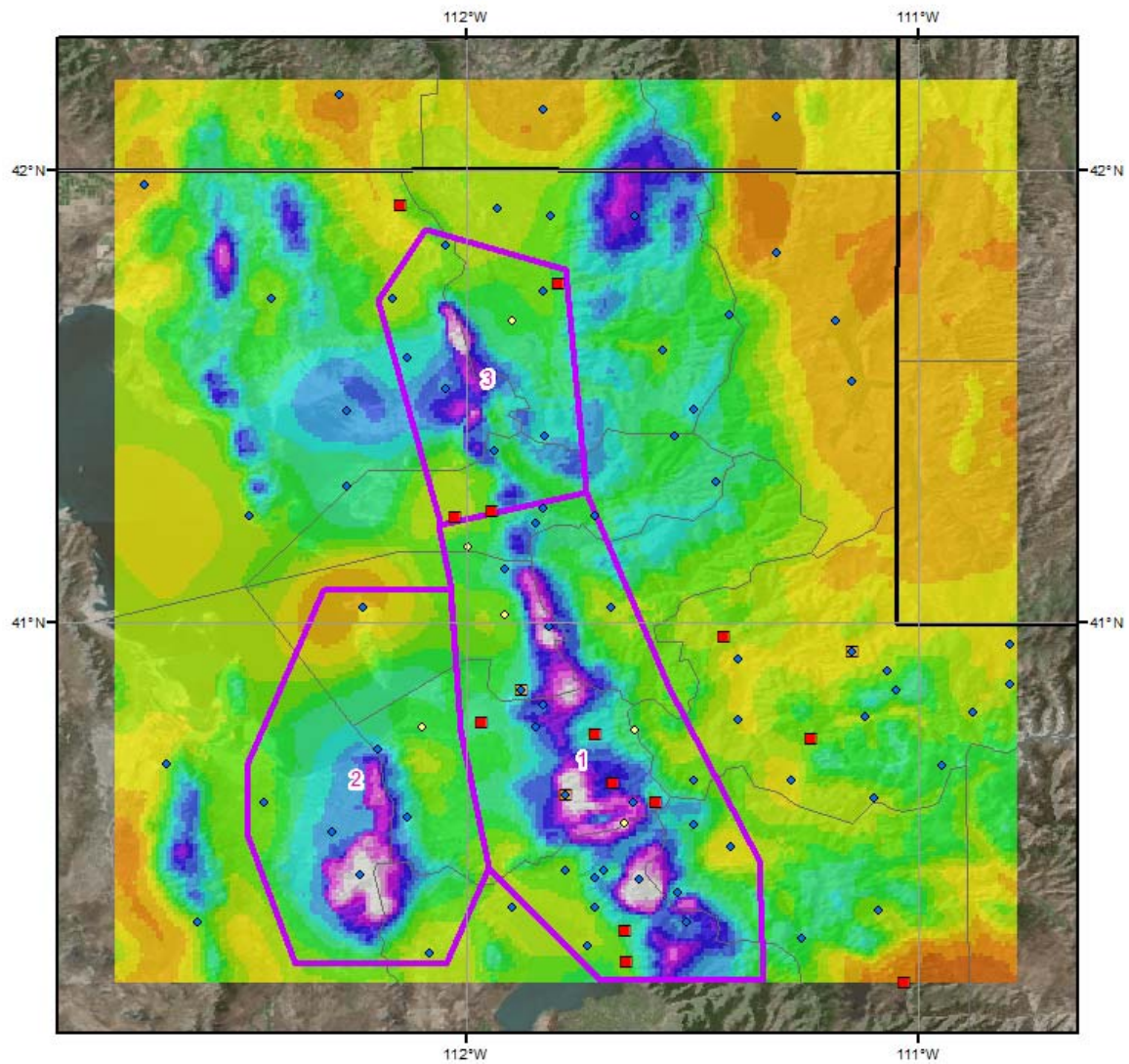
Storm 1265 Zone 2 - Sep. 24 (0000 UTC) - Sep. 29 (2300 UTC), 1982												
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)												
areasqmi	Duration (hours)											
	1	3	6	12	18	24	36	48	72	96	120	Total
0.4	0.62	1.65	2.61	3.86	4.21	4.33	5.37	6.66	7.45	8.13	9.90	9.90
1	0.61	1.63	2.59	3.83	4.18	4.30	5.32	6.62	7.40	8.06	9.83	9.83
10	0.57	1.54	2.44	3.66	4.02	4.17	5.20	6.25	7.16	7.80	9.51	9.51
25	0.53	1.42	2.25	3.46	3.87	4.05	5.10	6.10	6.84	7.61	9.29	9.29
50	0.50	1.32	2.11	3.32	3.73	3.92	4.90	5.87	6.67	7.44	9.00	9.00
100	0.47	1.24	1.99	3.16	3.57	3.76	4.50	5.37	6.34	7.12	8.46	8.46
200	0.43	1.15	1.83	2.91	3.28	3.45	3.91	4.77	5.70	6.42	7.49	7.49
300	0.41	1.09	1.74	2.74	3.11	3.27	3.57	4.55	5.30	6.03	6.87	6.87
400	0.39	1.04	1.67	2.62	2.97	3.12	3.36	4.40	5.03	5.73	6.44	6.44
500	0.38	1.00	1.60	2.53	2.87	3.01	3.21	4.25	4.87	5.50	6.11	6.11
1,000	0.32	0.87	1.40	2.19	2.51	2.62	2.75	3.66	4.24	4.72	5.15	5.15
1,283	0.29	0.77	1.25	1.99	2.32	2.43	2.54	3.36	3.89	4.32	4.69	4.69



CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



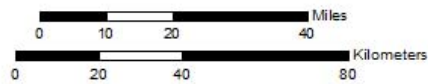
Total Storm (144-hours) Precipitation (inches)
September 24 - 29, 1982
SPAS 1265 - Cottonwood, UT

Gauges

- ◆ Daily
- Hourly
- Hourly Pseudo
- ◆ Supplemental

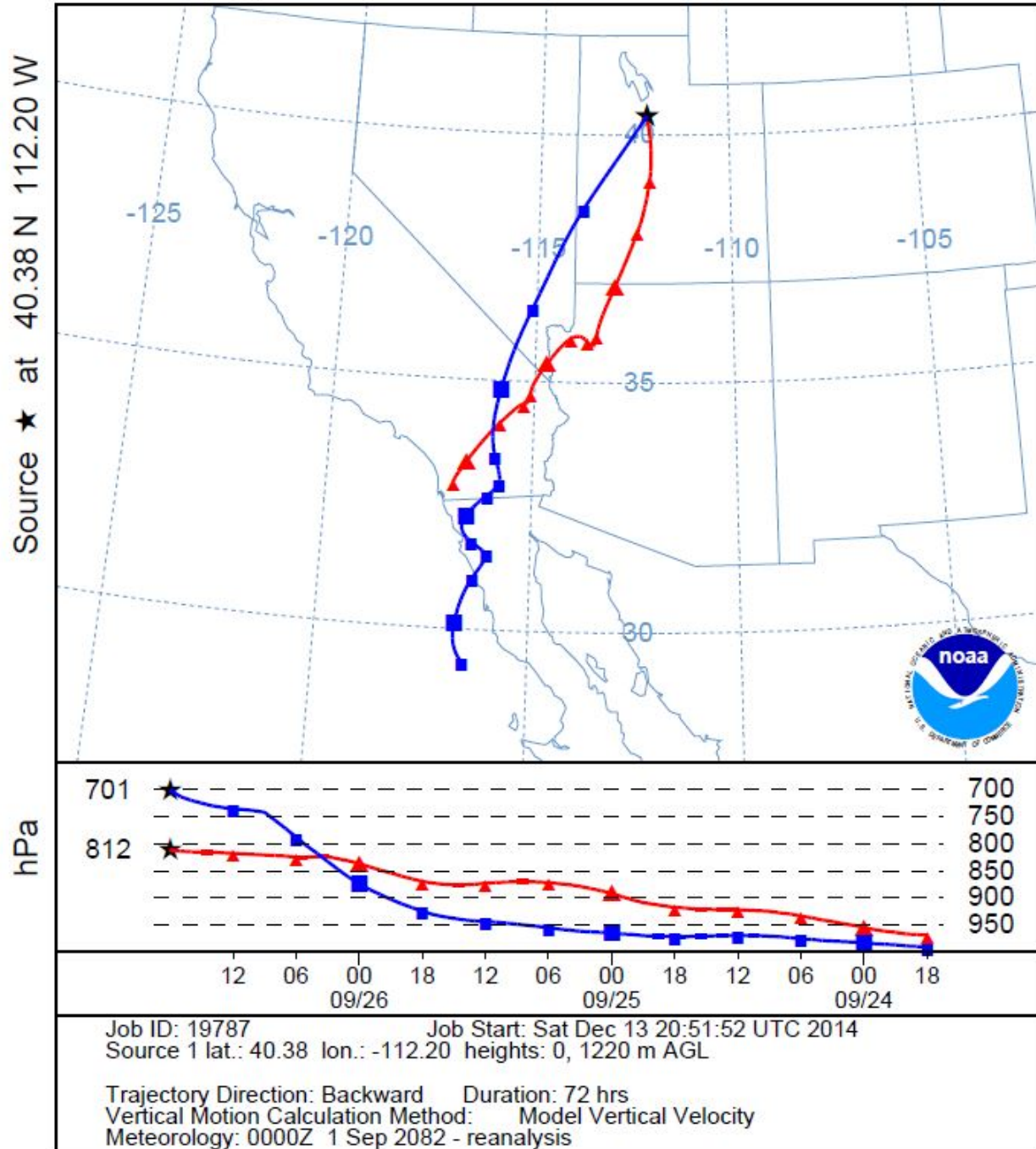
Precipitation (inches)

0.00 - 0.50	2.51 - 3.00	5.01 - 5.50	7.51 - 8.00
0.51 - 1.00	3.01 - 3.50	5.51 - 6.00	8.01 - 8.50
1.01 - 1.50	3.51 - 4.00	6.01 - 6.50	8.51 - 9.00
1.51 - 2.00	4.01 - 4.50	6.51 - 7.00	9.01 - 9.50
2.01 - 2.50	4.51 - 5.00	7.01 - 7.50	

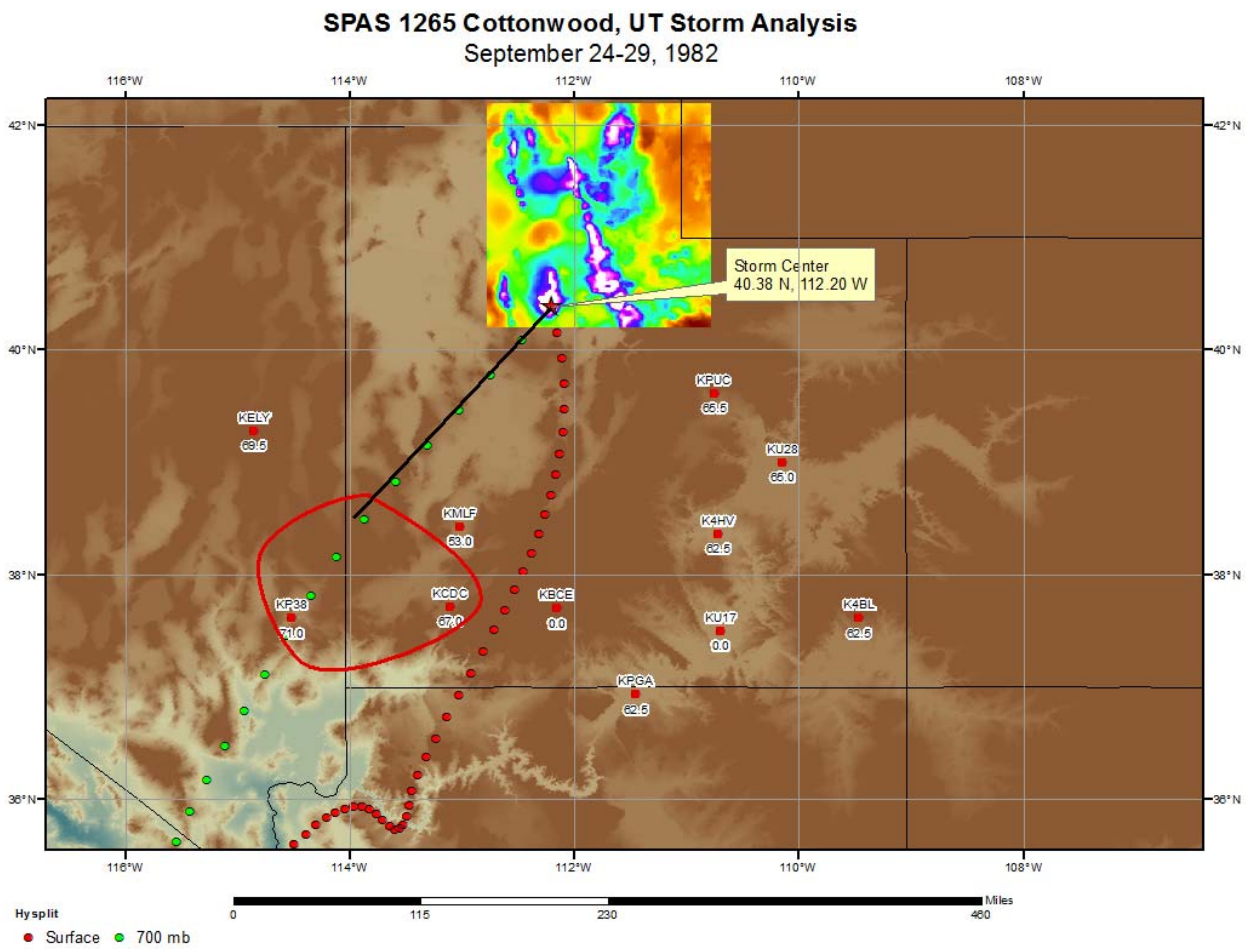


1/21/2014

NOAA HYSPLIT MODEL
Backward trajectories ending at 1800 UTC 26 Sep 82
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study



Cottonwood, UT

September 24-29, 1982

Storm Type: General

Storm Precipitation Analysis System (SPAS) For Storm #1265_3

General Storm Location: Cottonwood, Utah

Storm Dates: September 24-29, 1982

Event: Synoptic

DAD Zone 3

Latitude: 41.6042

Longitude: -112.0125

Max. Grid Rainfall Amount: 9.71" in 144 hours

Max. Observed Rainfall Amount: Brigham City Waste Plant, UT – 6.13"

Number of Stations: 94 (72 Daily, 13 Hourly, 3 Hourly Pseudo, and 6 Supplemental Estimated)

SPAS Version: 9.5

Basemap: PRISM September 1971-2000.

Spatial resolution: 00:00:30

Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

Reliability of results: This analysis was based on hourly data, daily data, and supplemental data. We have a good level of confidence in the station based results. We have a fair degree of confidence with the timing of precipitation in each zone. Ben Lomond Trail (SNOTEL; 333; DAD Zone 3) ended up being removed from the final SPAS run. Although temporally, the mass curve looked okay, the magnitude was very high spatially. After the removal of Ben Lomond Trail, the Zone 3 bulls-eye becomes topographically driven. Zone 2 contains no hourly data, so temporally it may not be accurate. Looking at the mass curves, it seems there is a lot of moisture in the air with precipitation falling the whole period. Although precipitation falls over the 144 hour period, the main convective event to focus on occurs between ~60 and 70 hours (~20-80 hours for the entire event).

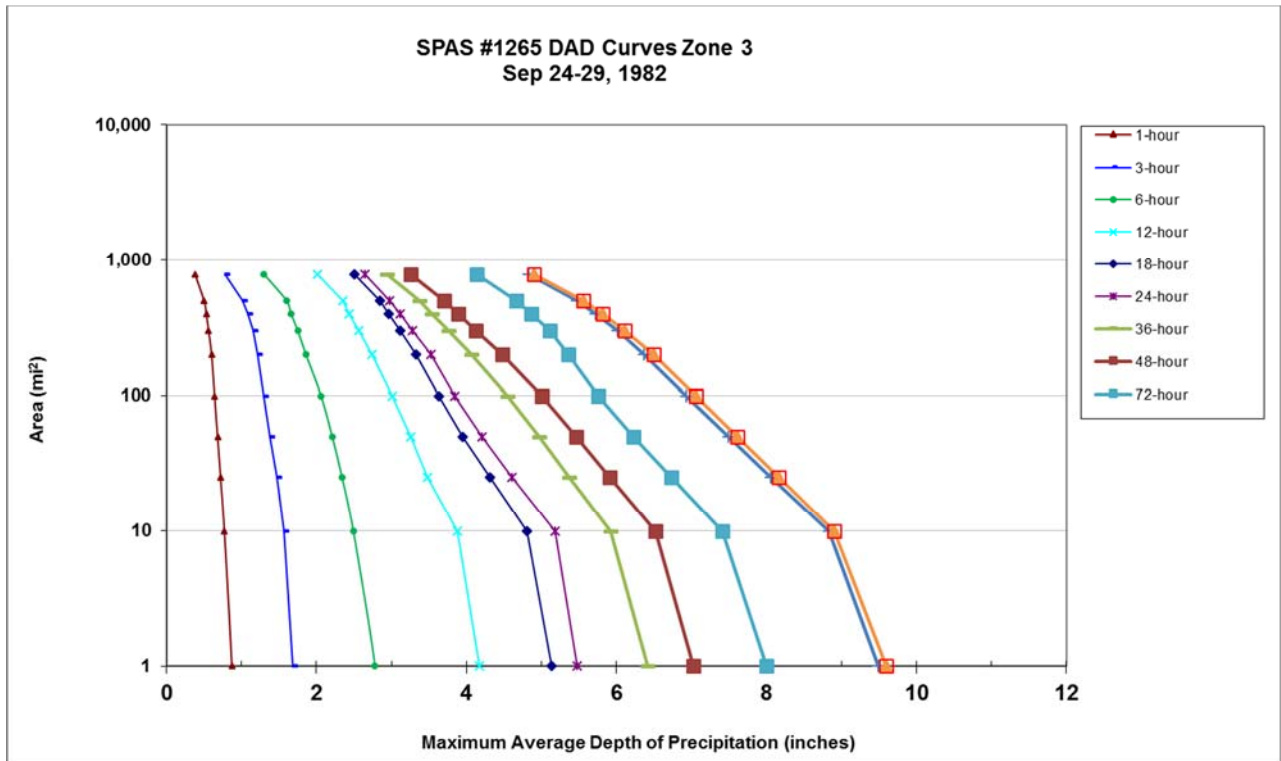
The ratio between the basemap (conus_prism_ppt_in_1971-2000_09) and observations around the bulls-eye in Zone 1 was also calculated due to the storm center being 11.35" and the observed stations around the storm center being ~2.0 inches less. Cottonwood Weir: $2.13/8.3=0.26$; Argenta: $2.23/6.6=0.34$; Silver Lake Brighton: $2.64/5.6=0.47$; Alta: $2.84/7.91=0.36$; Mtn Dell Dam: $2.1/5.2=0.40$; Timpanogos Divide: $2.64/9.2=0.29$ creating an average ratio of 0.35. Using this average ratio and the PRISM basemap value of 3.97, the storm center is estimated to be 11.34 inches. Due to this high precipitation amount, a supplemental station was created at the

CO-NM Regional Extreme Precipitation Study

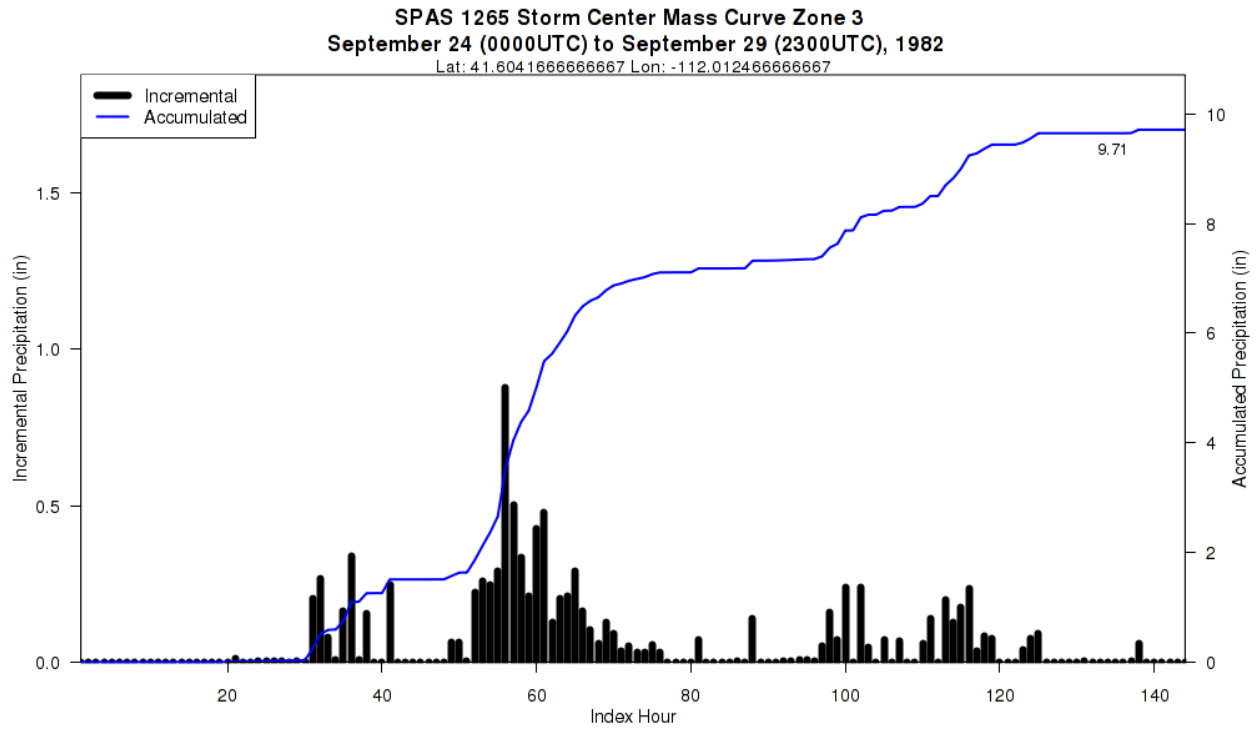
storm center to decrease the magnitude (being driven by PRISM). The supplemental station was set to 9.0 inches and the final run looked spatially similar with a decreased magnitude.

CO-NM Regional Extreme Precipitation Study

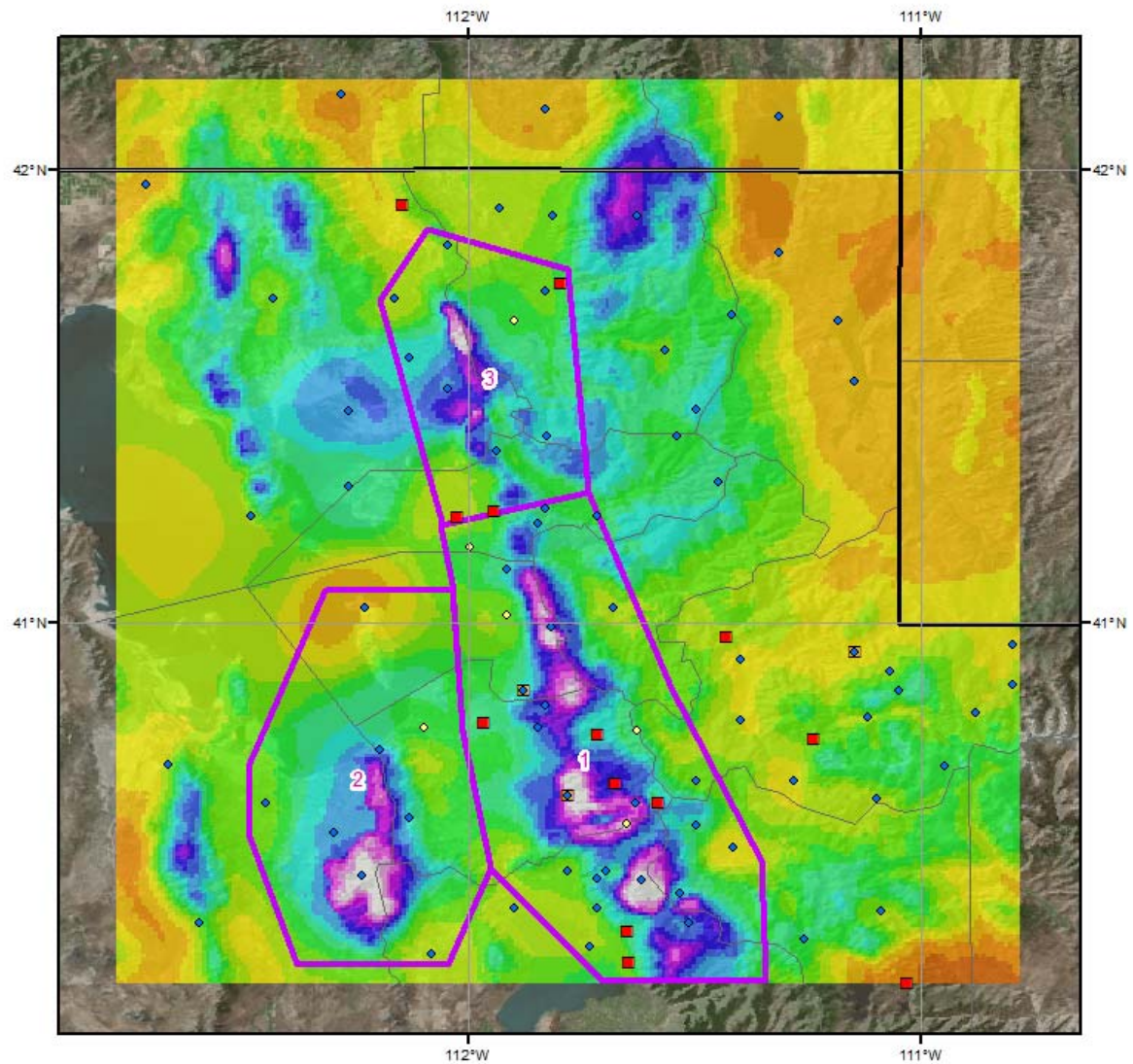
Storm 1265 Zone 3 - Sep. 24 (0000 UTC) - Sep. 29 (2300 UTC), 1982												
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)												
areasqmi	Duration (hours)											
	1	3	6	12	18	24	36	48	72	96	120	Total
0.4	0.88	1.70	2.81	4.19	5.18	5.52	6.46	7.07	8.06	9.57	9.67	9.67
1	0.87	1.68	2.78	4.17	5.14	5.48	6.41	7.02	8.00	9.49	9.60	9.60
10	0.77	1.57	2.49	3.88	4.80	5.18	5.92	6.52	7.41	8.83	8.90	8.90
25	0.72	1.47	2.34	3.48	4.31	4.61	5.37	5.91	6.73	8.06	8.16	8.16
50	0.68	1.38	2.21	3.26	3.95	4.21	4.97	5.46	6.23	7.49	7.61	7.61
100	0.64	1.30	2.06	3.01	3.63	3.84	4.55	5.00	5.76	6.93	7.06	7.06
200	0.60	1.21	1.86	2.74	3.33	3.53	4.07	4.48	5.36	6.37	6.49	6.49
300	0.56	1.15	1.75	2.56	3.12	3.28	3.76	4.13	5.11	6.01	6.11	6.11
400	0.53	1.08	1.66	2.44	2.96	3.11	3.54	3.89	4.87	5.72	5.81	5.81
500	0.50	1.01	1.60	2.35	2.84	2.98	3.37	3.70	4.66	5.47	5.56	5.56
785	0.38	0.78	1.30	2.01	2.50	2.65	2.94	3.26	4.14	4.83	4.90	4.90



CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



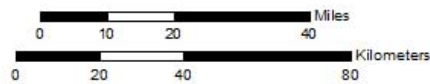
Total Storm (144-hours) Precipitation (inches)
September 24 - 29, 1982
SPAS 1265 - Cottonwood, UT

Gauges

- ◆ Daily
- Hourly
- Hourly Pseudo
- ◇ Supplemental

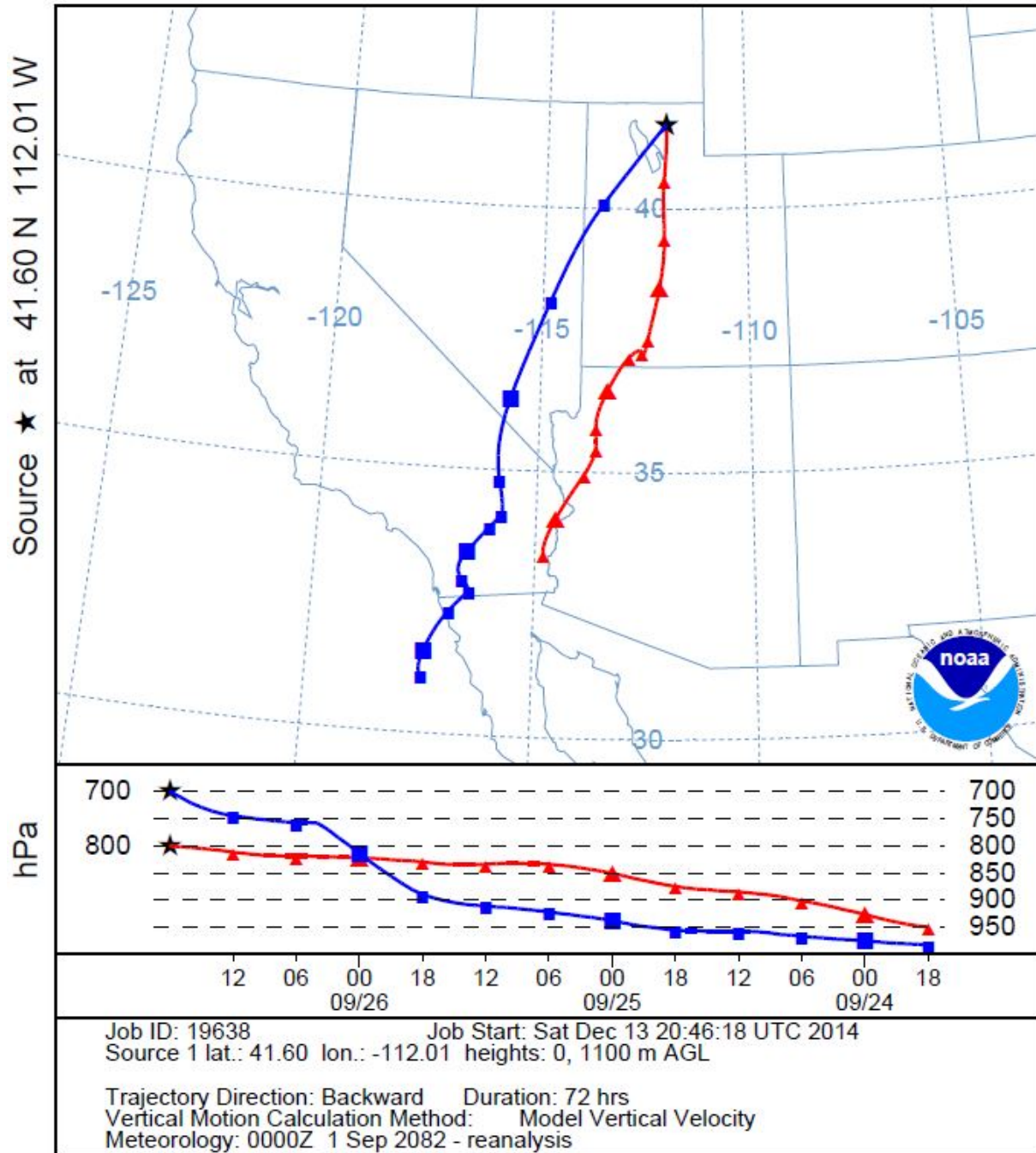
Precipitation (inches)

0.00 - 0.50	2.51 - 3.00	5.01 - 5.50	7.51 - 8.00
0.51 - 1.00	3.01 - 3.50	5.51 - 6.00	8.01 - 8.50
1.01 - 1.50	3.51 - 4.00	6.01 - 6.50	8.51 - 9.00
1.51 - 2.00	4.01 - 4.50	6.51 - 7.00	9.01 - 9.50
2.01 - 2.50	4.51 - 5.00	7.01 - 7.50	

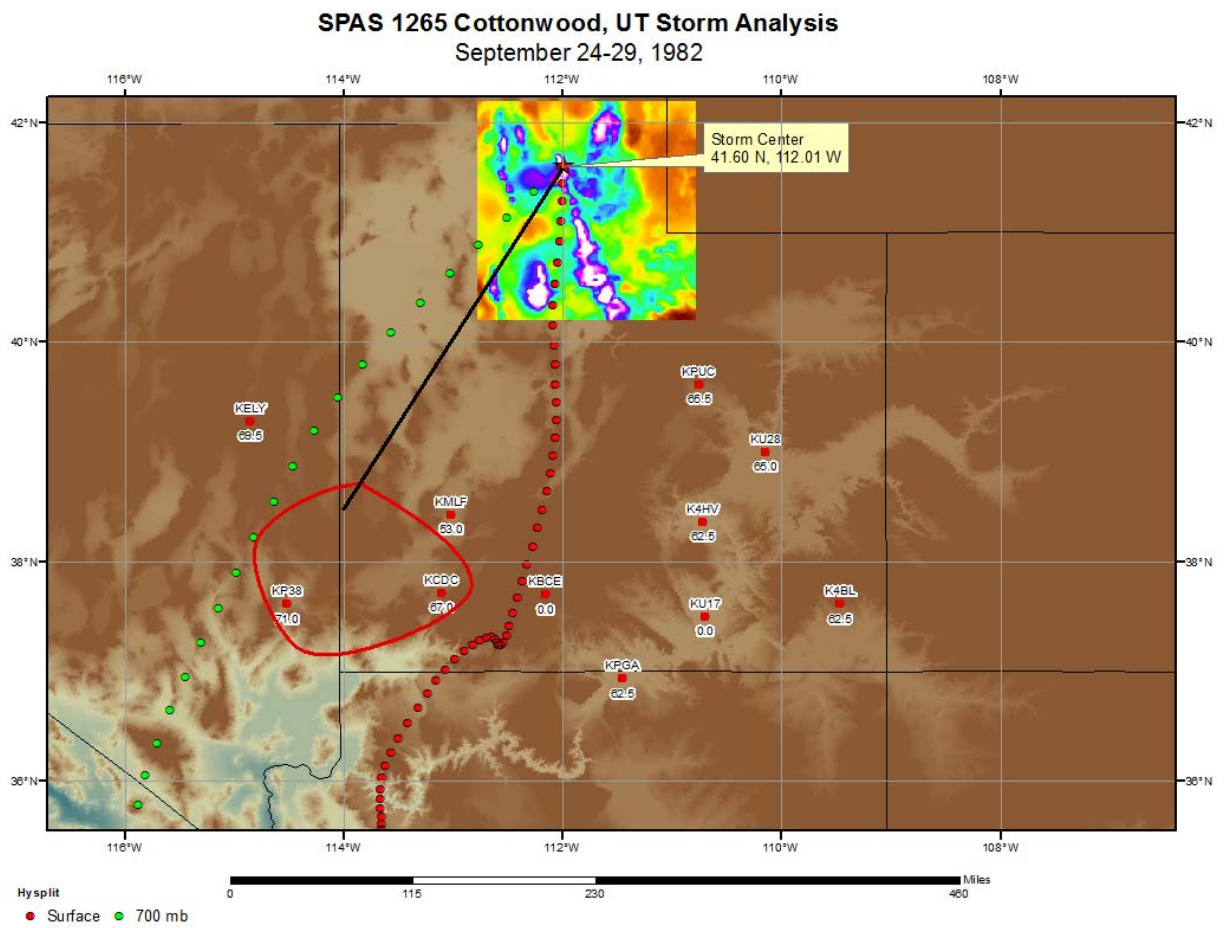


1/21/2014

NOAA HYSPLIT MODEL
Backward trajectories ending at 1800 UTC 26 Sep 82
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study



Knoles Hole Spring, AZ

January 5-10, 1993

Storm Type: General Frontal

Storm Precipitation Analysis System (SPAS) For Storm #1139_2

General Storm Location: Central Arizona

Storm Dates: January 5-10, 1993

Event: General Storm

DAD Zone 2 – Mogollon Rim

Latitude: 33.8292

Longitude: -110.9125

Max. Grid/Radar Rainfall Amount: 13.36"

Max. Observed Rainfall Amount: 11.60" (Workman Cr, AZ)

Number of Stations: 504 (186-daily, 256-hourly, 1-hourly estimated, 61-supplemental)

SPAS Version: 7.0

Base Map Used: Yes, conus_prism_ppt_in_1971_2000_01_mx

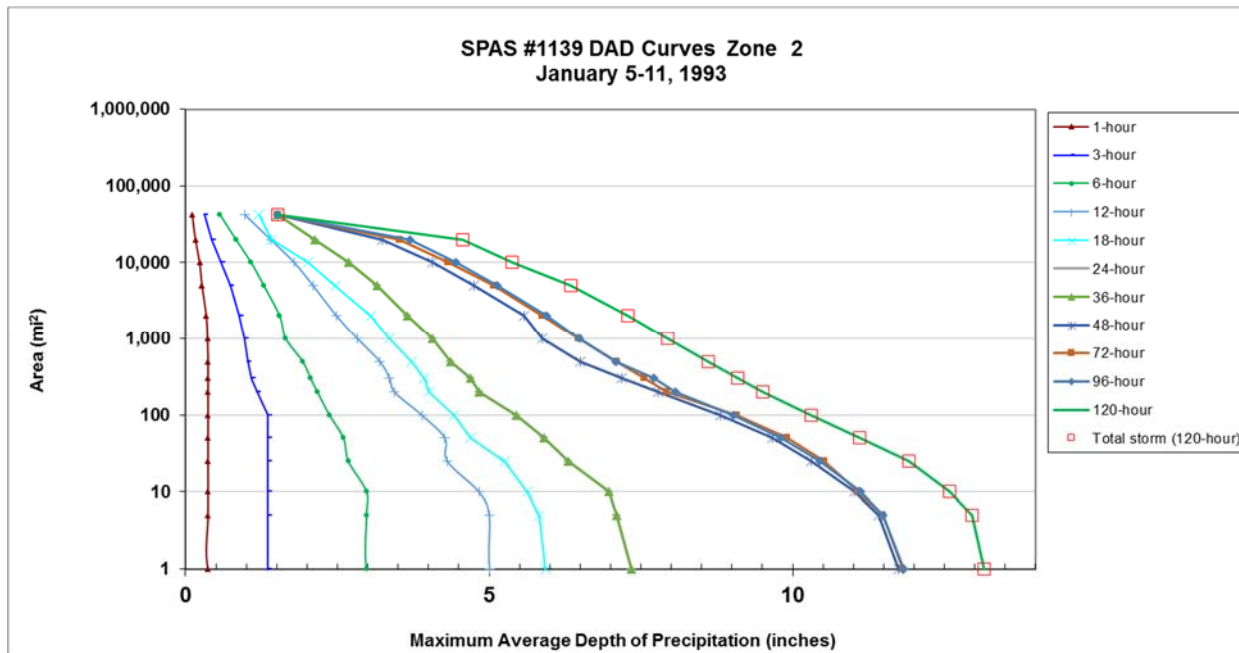
Spatial resolution: 0.27 mi²

Radar Included: No

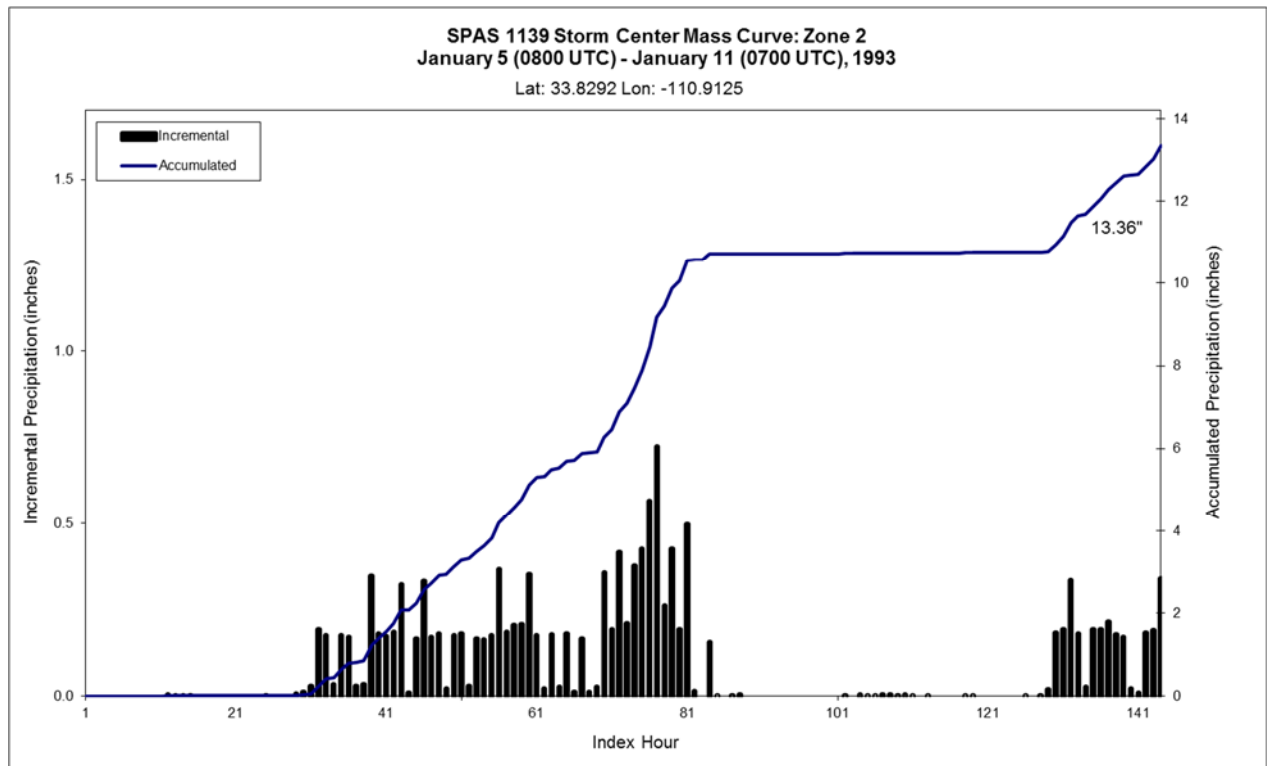
Depth-Area-Duration (DAD) analysis: Yes, 1, 3, 6, 12, 18, 24, 36, 48, 72, 96, 120, &
144

CO-NM Regional Extreme Precipitation Study

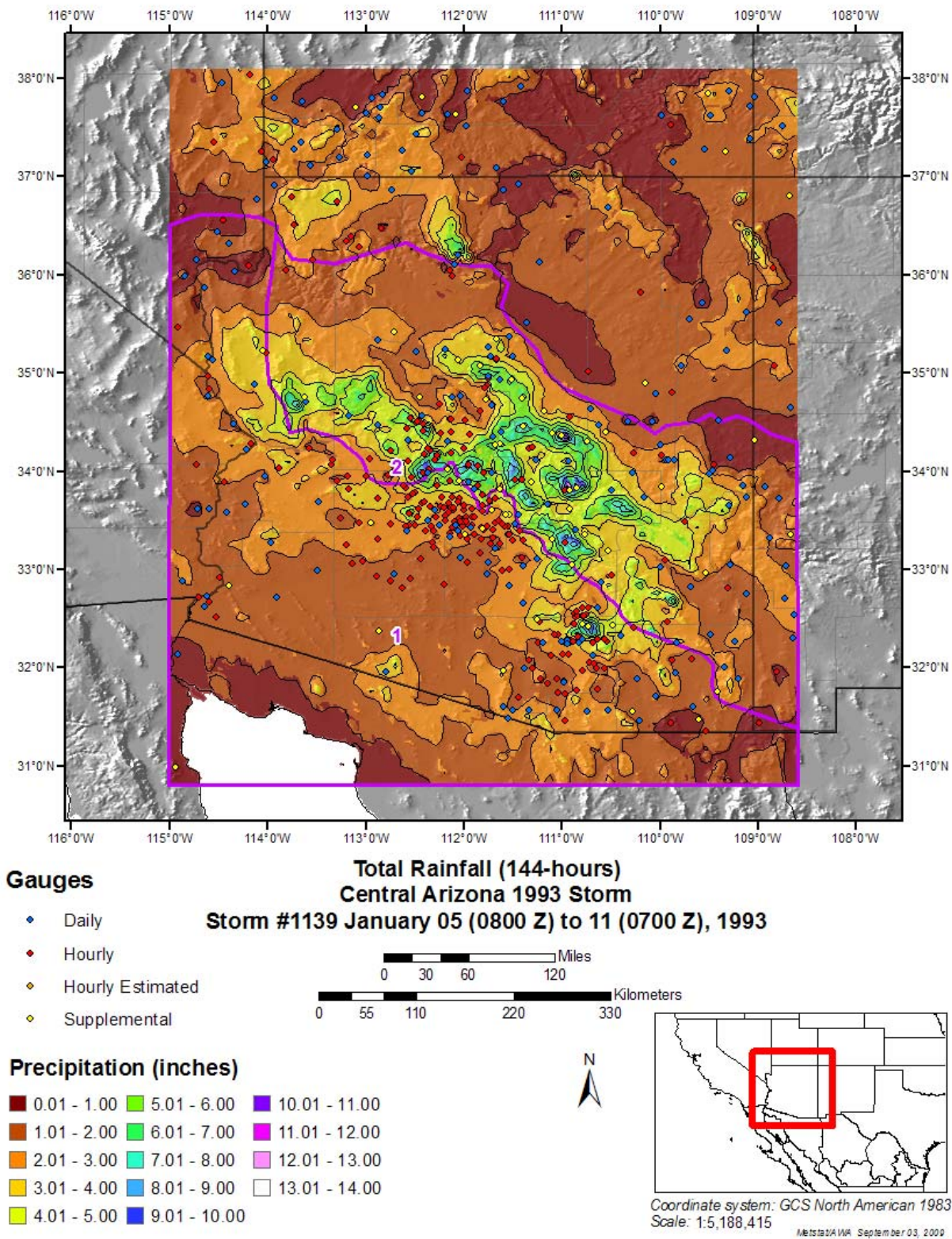
Storm 1139 - January 5 (0800 UTC) - January 11 (0700 UTC), 1993												
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)												
Area (mi ²)	Duration (hours)											
	1	3	6	12	18	24	36	48	72	96	120	Total
0.27	0.76	1.71	3.27	5.27	6.12	7.60	7.60	12.04	12.11	12.12	13.36	13.36
1	0.37	1.36	2.98	5.01	5.93	7.34	7.34	11.74	11.81	11.83	13.16	13.16
5	0.37	1.36	2.98	5.00	5.82	7.10	7.10	11.41	11.48	11.49	12.96	12.96
10	0.37	1.36	2.98	4.83	5.63	6.97	6.97	11.01	11.07	11.11	12.58	12.58
25	0.37	1.36	2.68	4.31	5.26	6.30	6.30	10.31	10.52	10.45	11.92	11.92
50	0.37	1.36	2.60	4.27	4.70	5.90	5.90	9.67	9.90	9.81	11.10	11.10
100	0.37	1.36	2.37	3.89	4.42	5.45	5.45	8.81	9.08	9.02	10.30	10.30
200	0.37	1.18	2.17	3.44	4.01	4.83	4.83	7.78	7.93	8.07	9.51	9.51
300	0.37	1.09	2.06	3.36	3.93	4.70	4.70	7.18	7.56	7.71	9.10	9.10
500	0.37	1.02	1.93	3.20	3.72	4.36	4.36	6.50	7.10	7.09	8.61	8.61
1,000	0.36	0.97	1.65	2.83	3.36	4.07	4.07	5.88	6.48	6.49	7.94	7.94
2,000	0.34	0.89	1.55	2.49	3.05	3.66	3.66	5.58	5.88	5.94	7.29	7.29
5,000	0.27	0.74	1.29	2.10	2.47	3.16	3.16	4.75	5.08	5.13	6.34	6.34
10,000	0.23	0.59	1.08	1.79	2.02	2.69	2.69	4.06	4.33	4.45	5.38	5.38
20,000	0.16	0.43	0.83	1.40	1.41	2.13	2.13	3.24	3.52	3.70	4.57	4.57
41,776	0.11	0.31	0.57	0.98	1.21	1.52	1.52	1.52	1.52	1.52	1.52	1.52

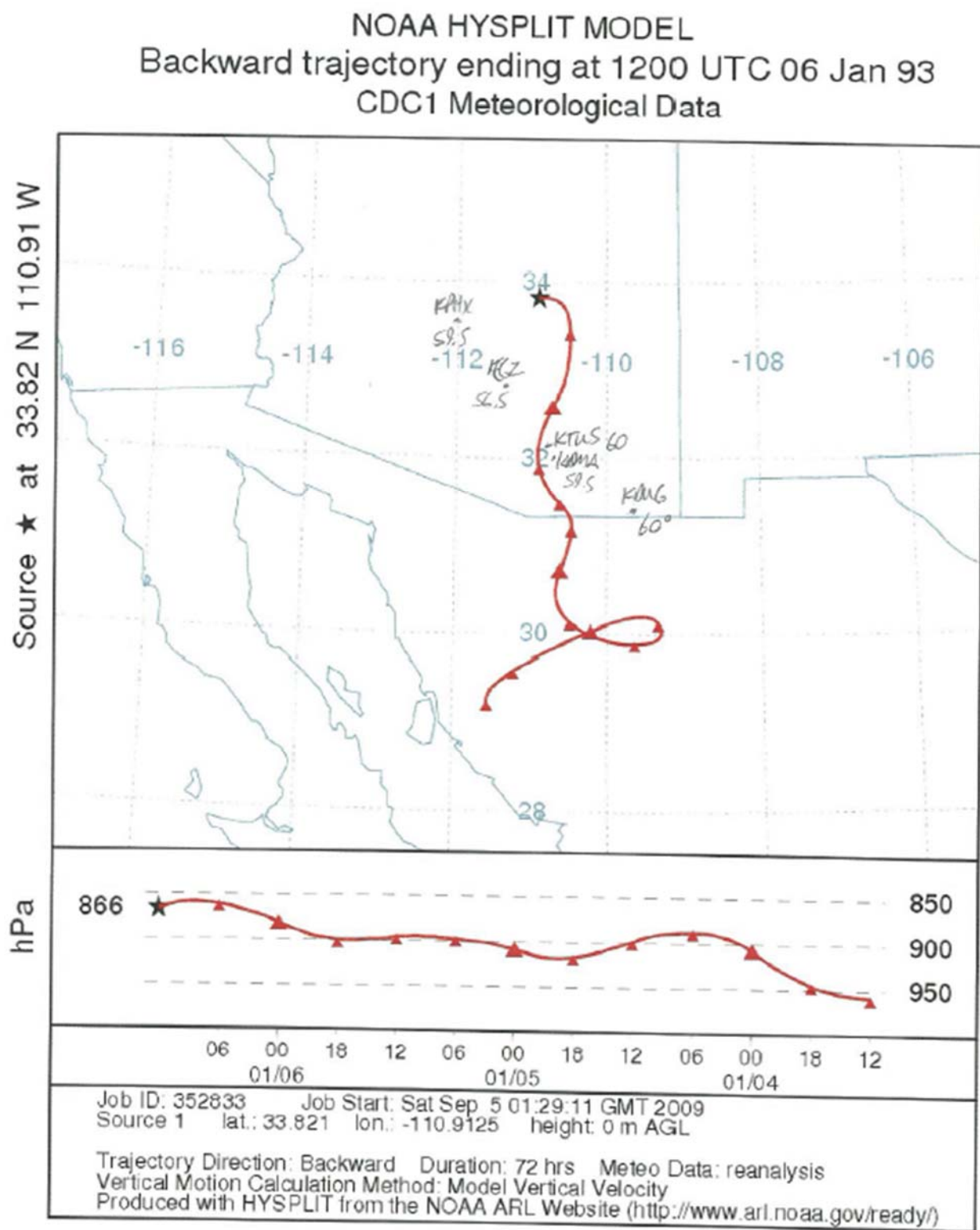


CO-NM Regional Extreme Precipitation Study

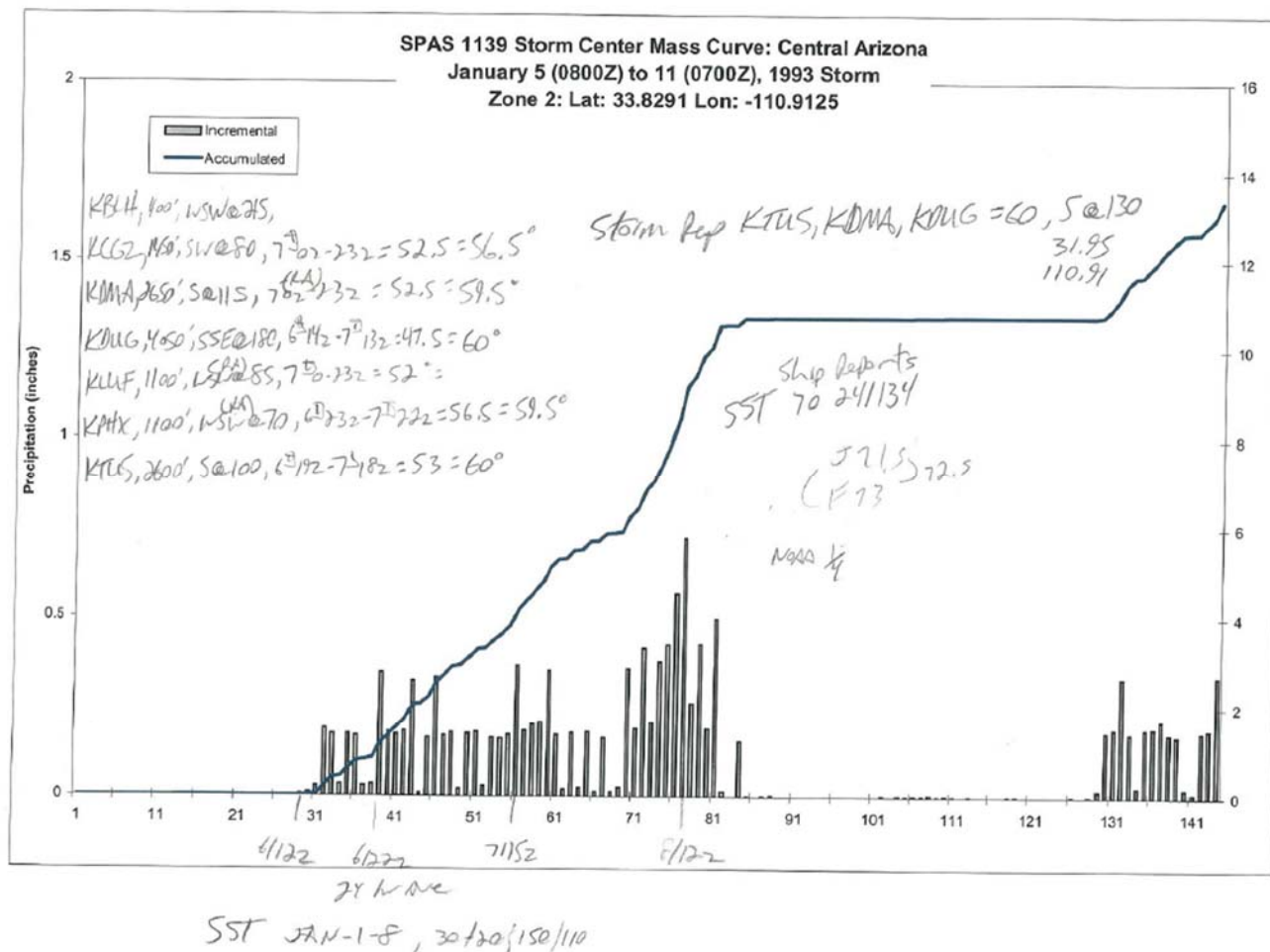


CO-NM Regional Extreme Precipitation Study



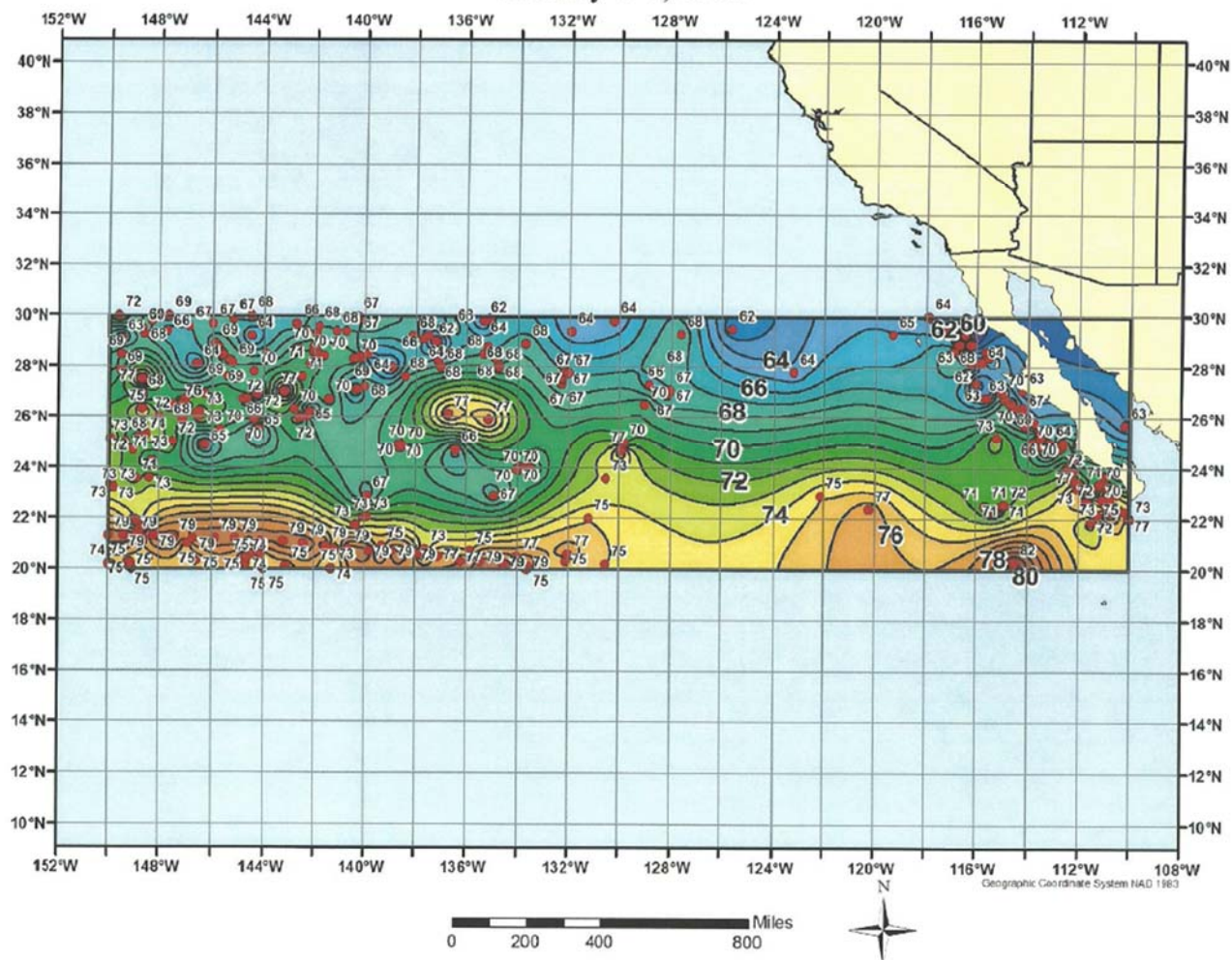


CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study

Sea Surface Temperature Observations (°F) January 1-8, 1993



Spencer Canyon, AZ

January 5-10, 1993

Storm Type: General Frontal

Storm Precipitation Analysis System (SPAS) For Storm #1139_3

General Storm Location: Central Arizona

Storm Dates: January 5-10, 1993

Event: General Storm

DAD Zone 3 – Southeastern AZ

Latitude: 32.4125

Longitude: -110.7458

Max. Grid/Radar Rainfall Amount: 11.15"

Max. Observed Rainfall Amount: 11.34" (White Tail, AZ)

Number of Stations: 504 (186-daily, 256-hourly, 1-hourly estimated, 61-supplemental)

SPAS Version: 7.0

Base Map Used: Yes, conus_prism_ppt_in_1971_2000_01_mx

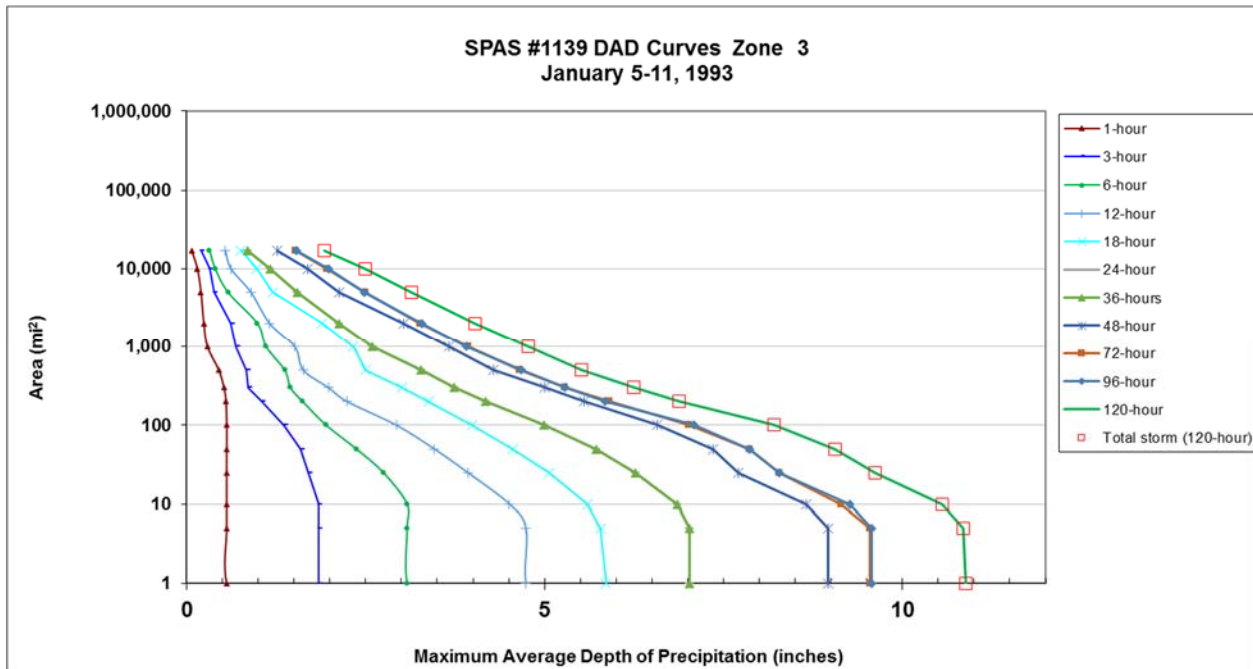
Spatial resolution: 0.27 mi²

Radar Included: No

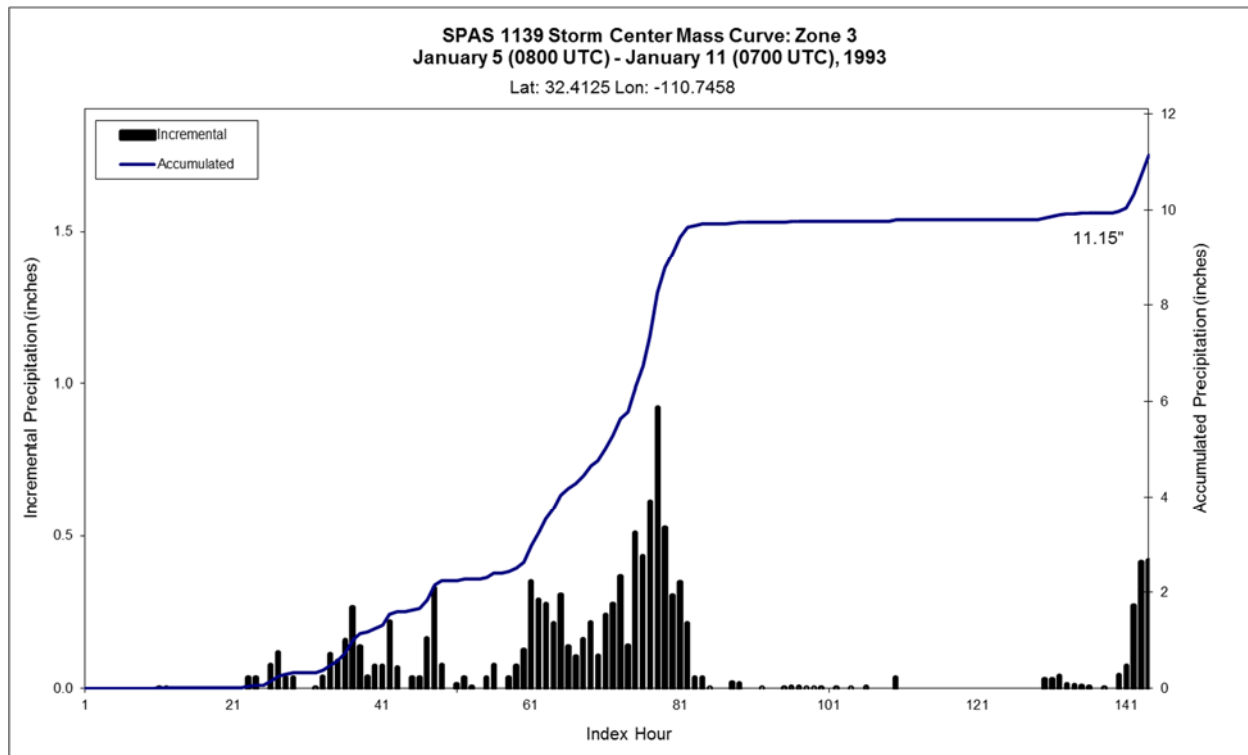
Depth-Area-Duration (DAD) analysis: Yes, 1, 3, 6, 12, 18, 24, 36, 48, 72, 96, 120, &
144

CO-NM Regional Extreme Precipitation Study

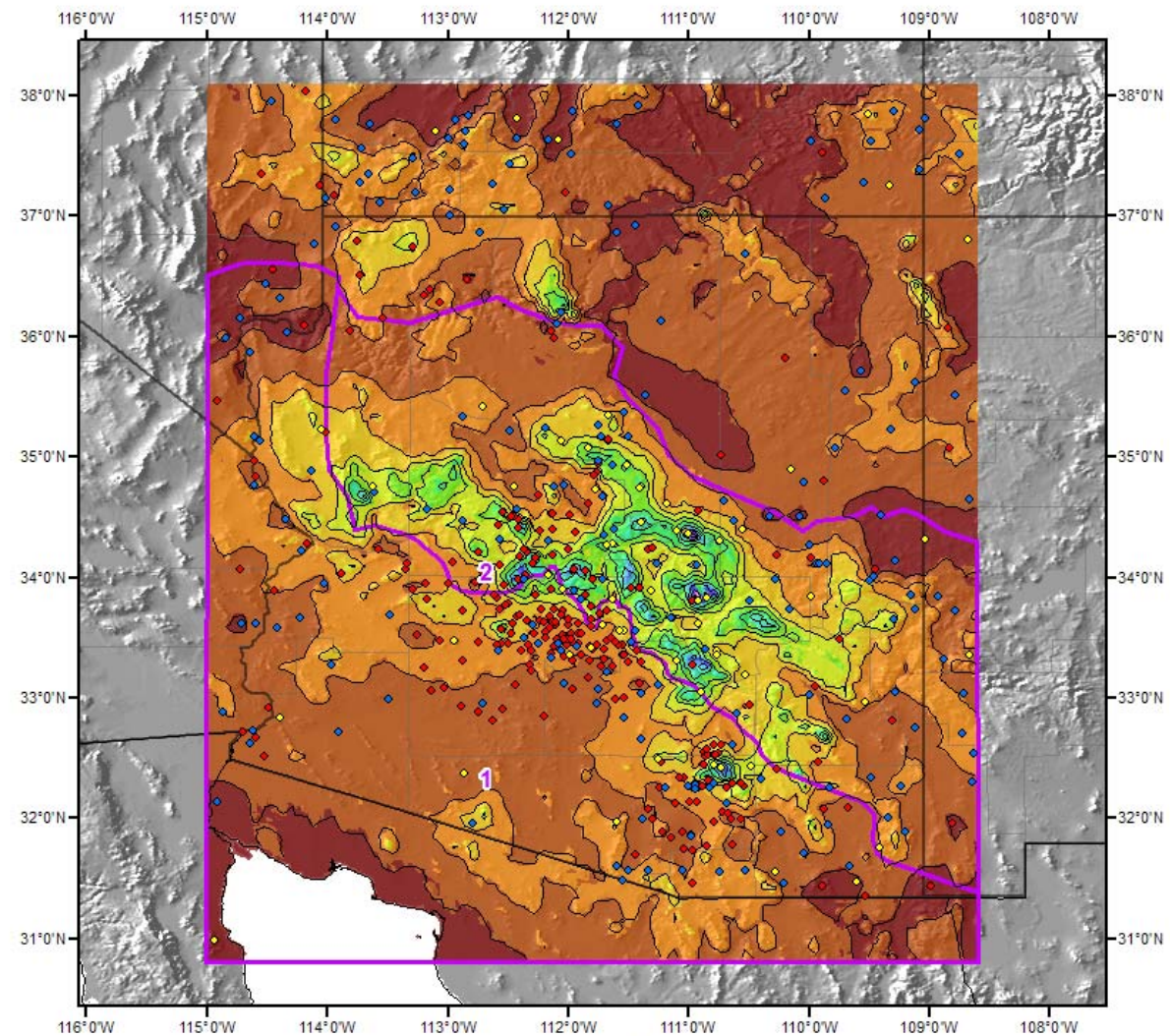
Storm 1139 - January 5 (0800 UTC) - January 11 (0700 UTC), 1993												
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)												
Area (mi ²)	Duration (hours)											
	1	3	6	12	18	24	36	48	72	96	120	Total
0.27	0.92	2.07	3.35	4.98	5.96	7.25	7.25	9.17	9.76	9.81	11.08	11.08
1	0.56	1.84	3.08	4.74	5.86	7.03	7.03	8.96	9.55	9.57	10.88	10.88
5	0.56	1.84	3.08	4.74	5.78	7.03	7.03	8.96	9.55	9.57	10.85	10.85
10	0.56	1.84	3.08	4.51	5.60	6.85	6.85	8.66	9.15	9.27	10.56	10.56
25	0.56	1.70	2.75	3.93	5.06	6.27	6.27	7.71	8.28	8.28	9.62	9.62
50	0.56	1.59	2.37	3.46	4.55	5.72	5.72	7.36	7.86	7.87	9.06	9.06
100	0.56	1.36	1.95	2.93	3.99	4.99	4.99	6.58	7.01	7.09	8.21	8.21
200	0.55	1.05	1.62	2.24	3.38	4.18	4.18	5.55	5.91	5.85	6.88	6.88
300	0.52	0.86	1.45	1.98	3.01	3.74	3.74	5.00	5.28	5.28	6.25	6.25
500	0.45	0.84	1.37	1.63	2.50	3.28	3.28	4.29	4.65	4.67	5.52	5.52
1,000	0.29	0.69	1.11	1.51	2.33	2.59	2.59	3.66	3.93	3.91	4.77	4.77
2,000	0.24	0.62	0.99	1.16	1.89	2.13	2.13	3.03	3.26	3.29	4.03	4.03
5,000	0.20	0.38	0.58	0.90	1.20	1.55	1.55	2.13	2.49	2.48	3.14	3.14
10,000	0.15	0.32	0.40	0.62	0.98	1.17	1.17	1.69	1.96	1.98	2.50	2.50
17,159	0.07	0.20	0.32	0.54	0.76	0.85	0.85	1.27	1.52	1.53	1.92	1.92



CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



Gauges

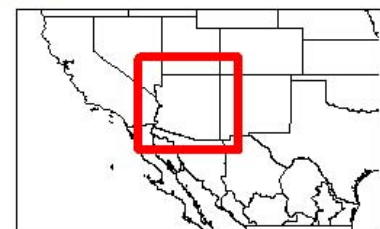
- ◆ Daily
- ◆ Hourly
- ◆ Hourly Estimated
- ◆ Supplemental

Total Rainfall (144-hours)
Central Arizona 1993 Storm
Storm #1139 January 05 (0800 Z) to 11 (0700 Z), 1993



Precipitation (inches)

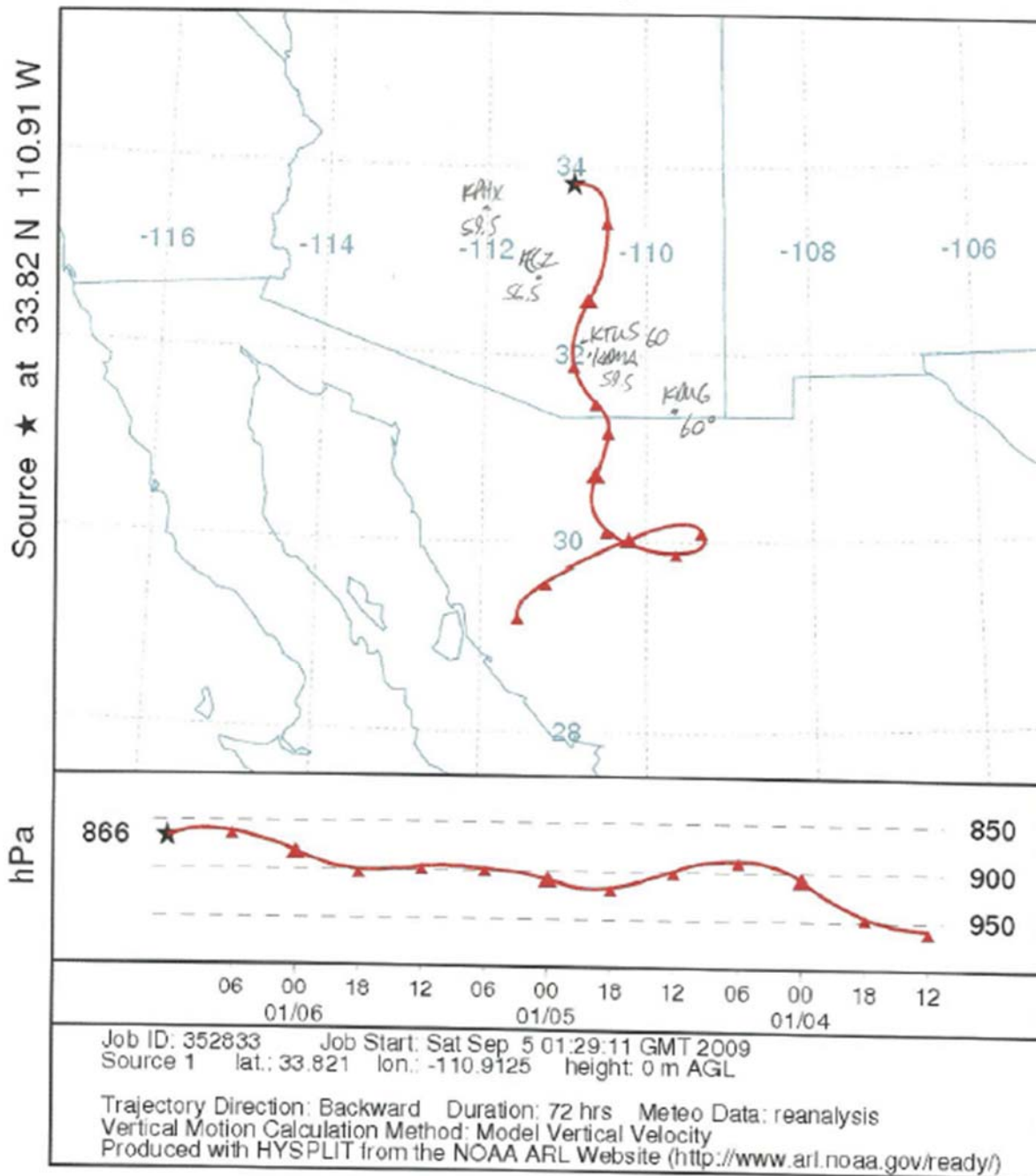
- | | | |
|-------------|--------------|---------------|
| 0.01 - 1.00 | 5.01 - 6.00 | 10.01 - 11.00 |
| 1.01 - 2.00 | 6.01 - 7.00 | 11.01 - 12.00 |
| 2.01 - 3.00 | 7.01 - 8.00 | 12.01 - 13.00 |
| 3.01 - 4.00 | 8.01 - 9.00 | 13.01 - 14.00 |
| 4.01 - 5.00 | 9.01 - 10.00 | |



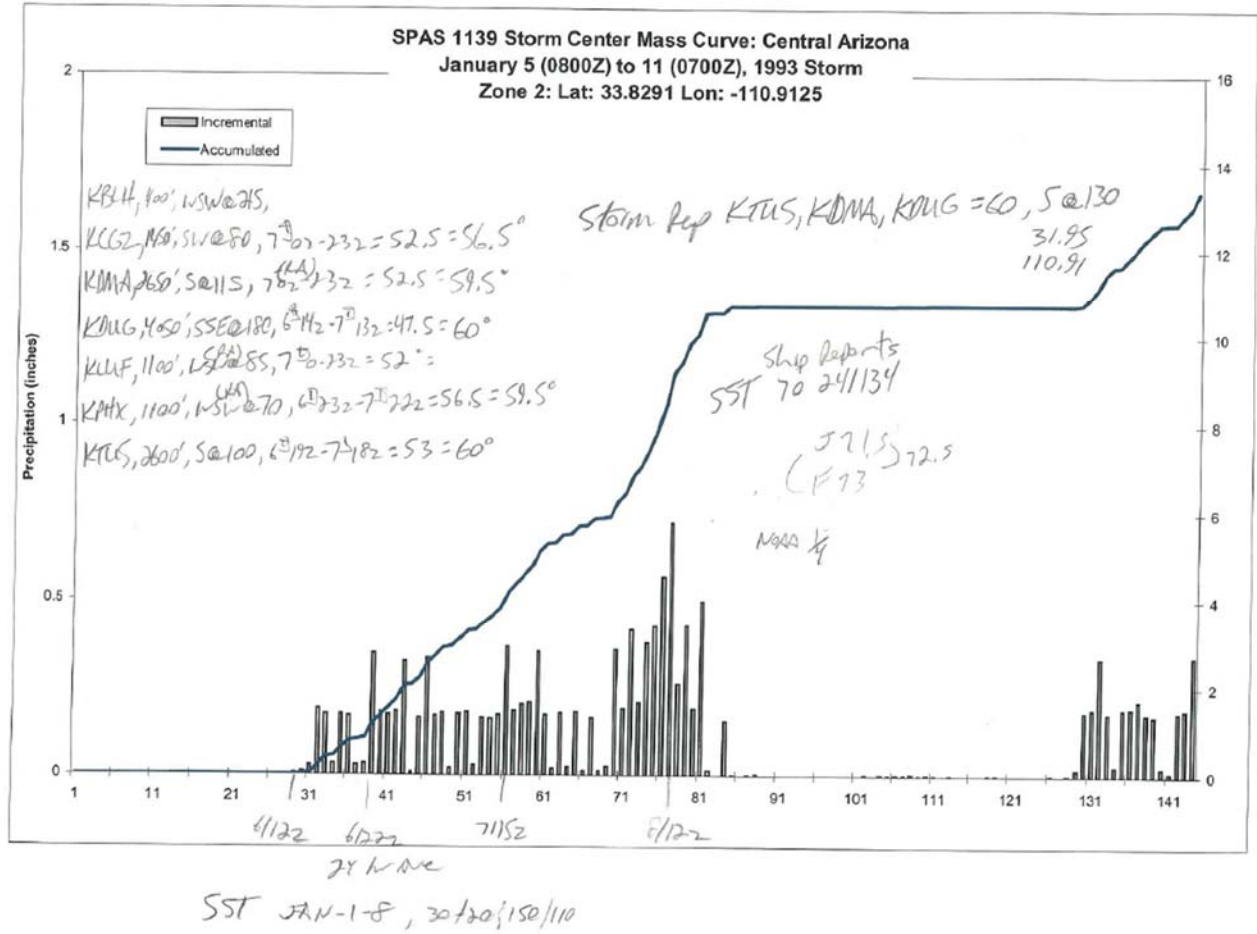
Coordinate system: GCS North American 1983
 Scale: 1:5,188,415

Metsoft/VAIWA September 03, 2000

NOAA HYSPLIT MODEL
Backward trajectory ending at 1200 UTC 06 Jan 93
CDC1 Meteorological Data

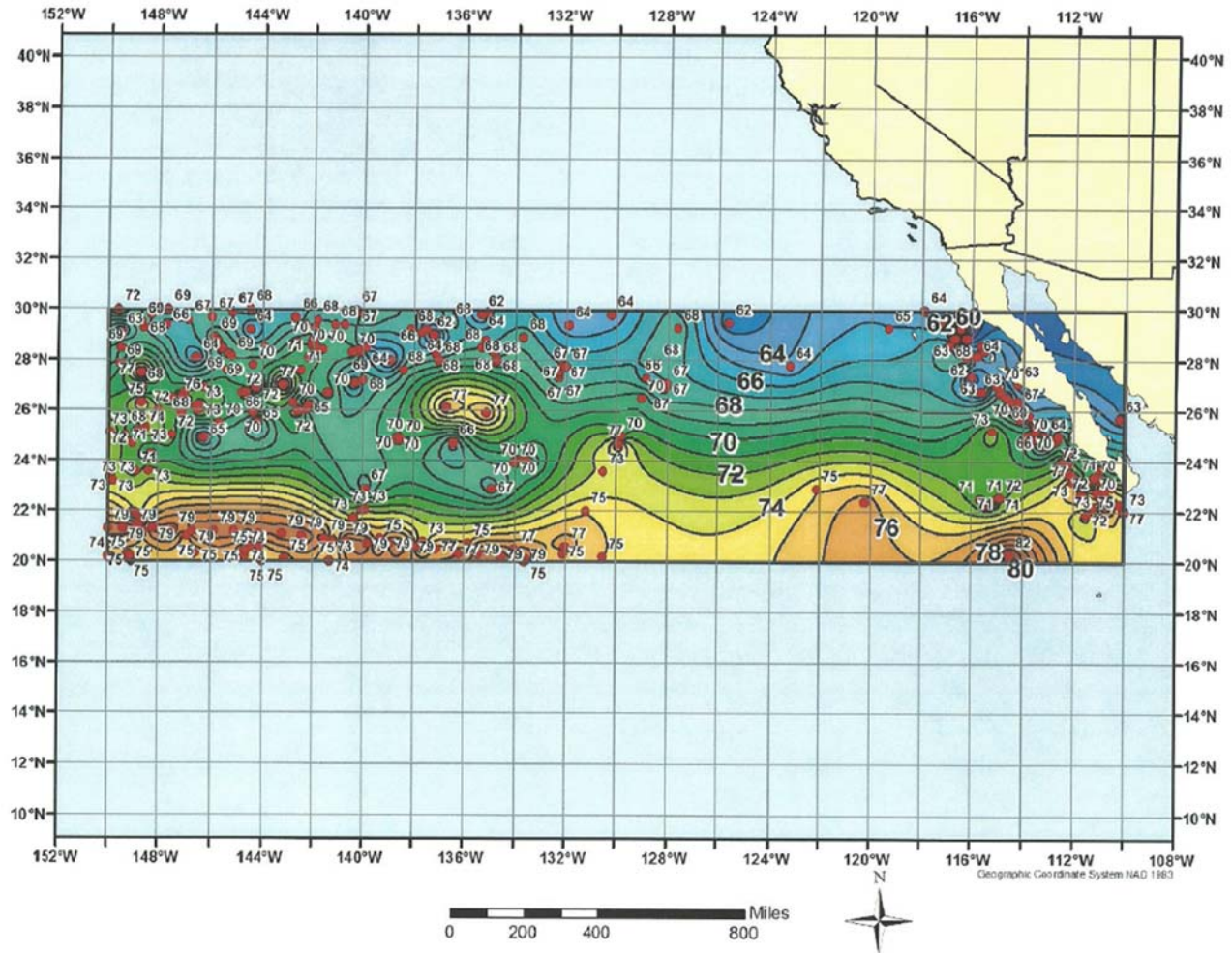


CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study

Sea Surface Temperature Observations (°F) January 1-8, 1993



Wolf Creek, CO

August 26-30, 1993

Storm Type: General

Storm Precipitation Analysis System (SPAS) For Storm #1653_1

General Storm Location: Wolf Creek, CO

Storm Dates: August 26-30, 1993

Event: General storm

DAD Zone 1* – southeastern Idaho and extreme northern Utah

Latitude: 37.4625

Longitude: -106.7208

Max. Grid Rainfall Amount: 6.05"

Max. Observed Rainfall Amount: 6.05"

Number of Stations: 92

SPAS Version: 10.0

Basemap: "blend_sm" is blend of 1653_isohyetal map and PRISM monthly climo

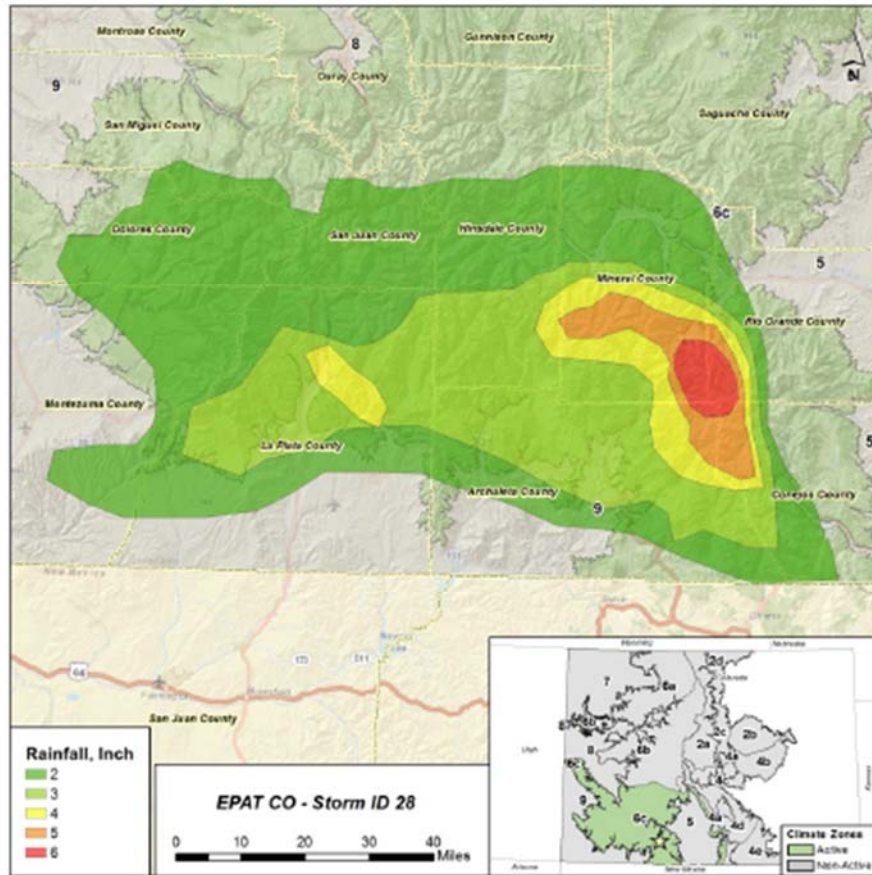
Spatial resolution: 0.2630

Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

Reliability of results: This analysis was based on 92 hourly stations, daily data, and supplemental station data. We have a good degree of confidence for the station based storm total results. The spatial pattern is fully dependent on the blended basemap created from the total storm isohyetal image from the EPAT CO technical report for Storm ID 28 and the PRISM monthly climatology for August. Timing is based on the hourly stations and hourly estimated pseudo station created from the "Wolf Creek" mass curve from the same EPAT CO technical report. Several daily stations were moved to supplemental due to timing issues and to ensure data consistency.

CO-NM Regional Extreme Precipitation Study



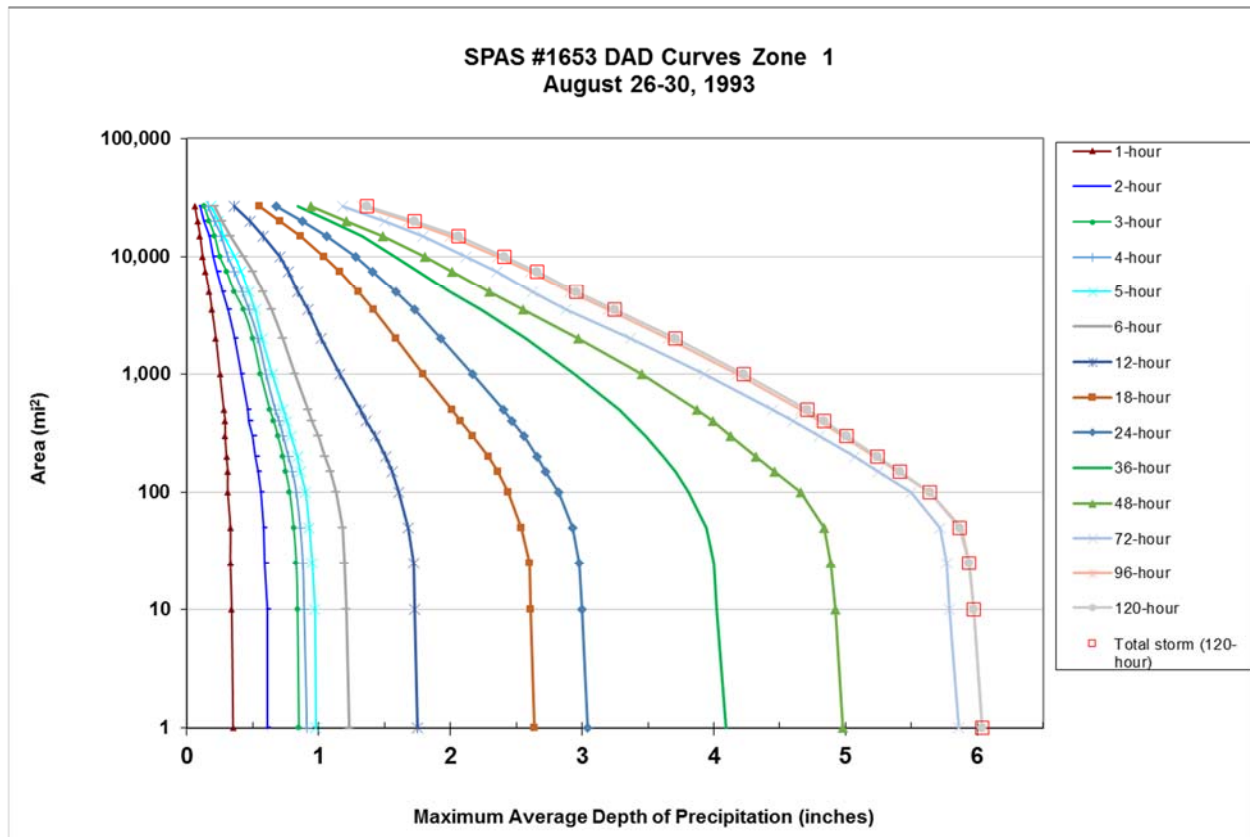
Synopsis and Climate Zone Classification:

Storm ID 28, Climate Zone 6c: This monsoonally driven event was very significant for a high altitude storm. Strong, continuous low level moisture was orographically lifted up the south facing escarpment of the eastern San Juan range for several days. Daytime heating of the ridgeline helped promote convection/precipitation at this extreme altitude. This storm is attributable to only climate zone 6c as the San Juan range provides a significant barrier to northward moving moisture and the topography associated with zone 6c was necessary for precipitation production.

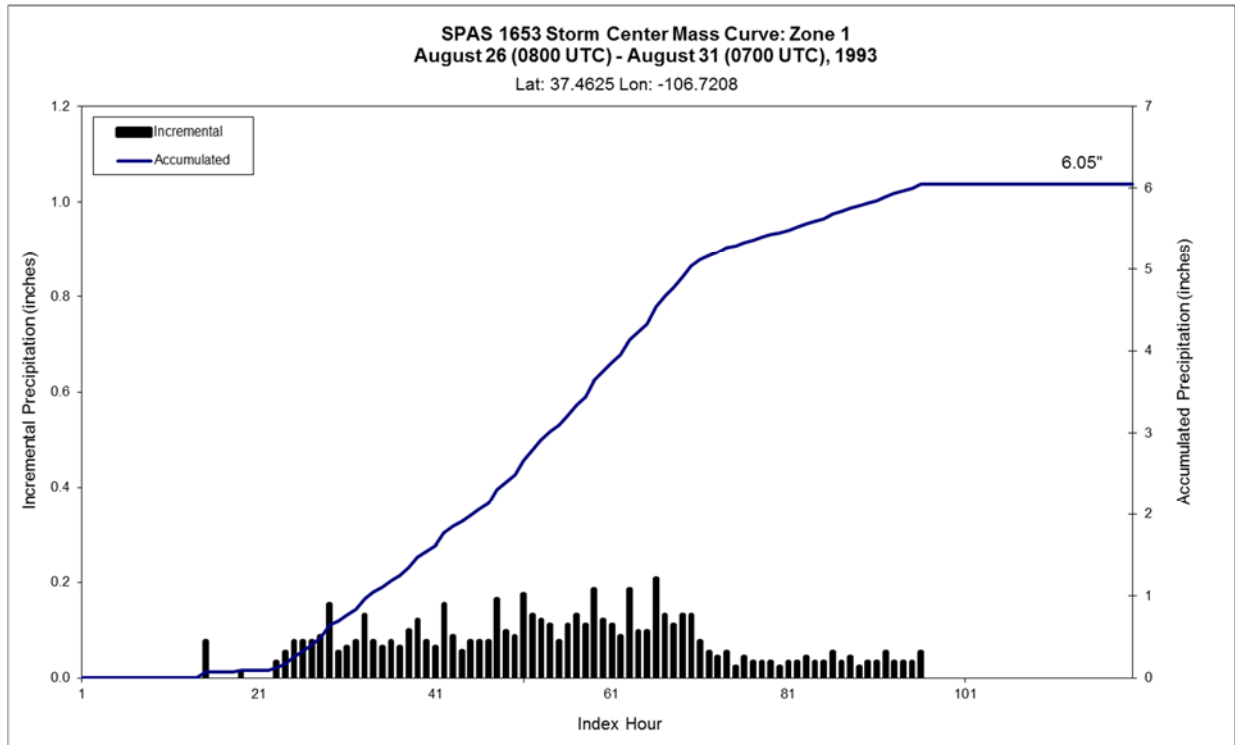
Start Date-End Date	August 27, 1993 – August 30, 1993
Storm ID/Name	STORM ID 28 – SW CO/Wolf Creek
Storm Type	General Storm
State/Climate Zone Attribution	Colorado/Climate Zone 6c
Max Precipitation/Duration	6.00"/72 hours
Originator/Storm source	CSU Report/HMR (HDR temporal)
Low Level Wind	215 degrees
Upper Level Wind	215 degrees
Seasonal Max.PWI /-1000mb Td/In-Place Max. Fctr. (source Td /location ID)	2.71" / 68.5F / 1.21 (57F @ KCEZ 12 hr. avg.)
Elevation of Peak Precipitation	10704 ft.

CO-NM Regional Extreme Precipitation Study

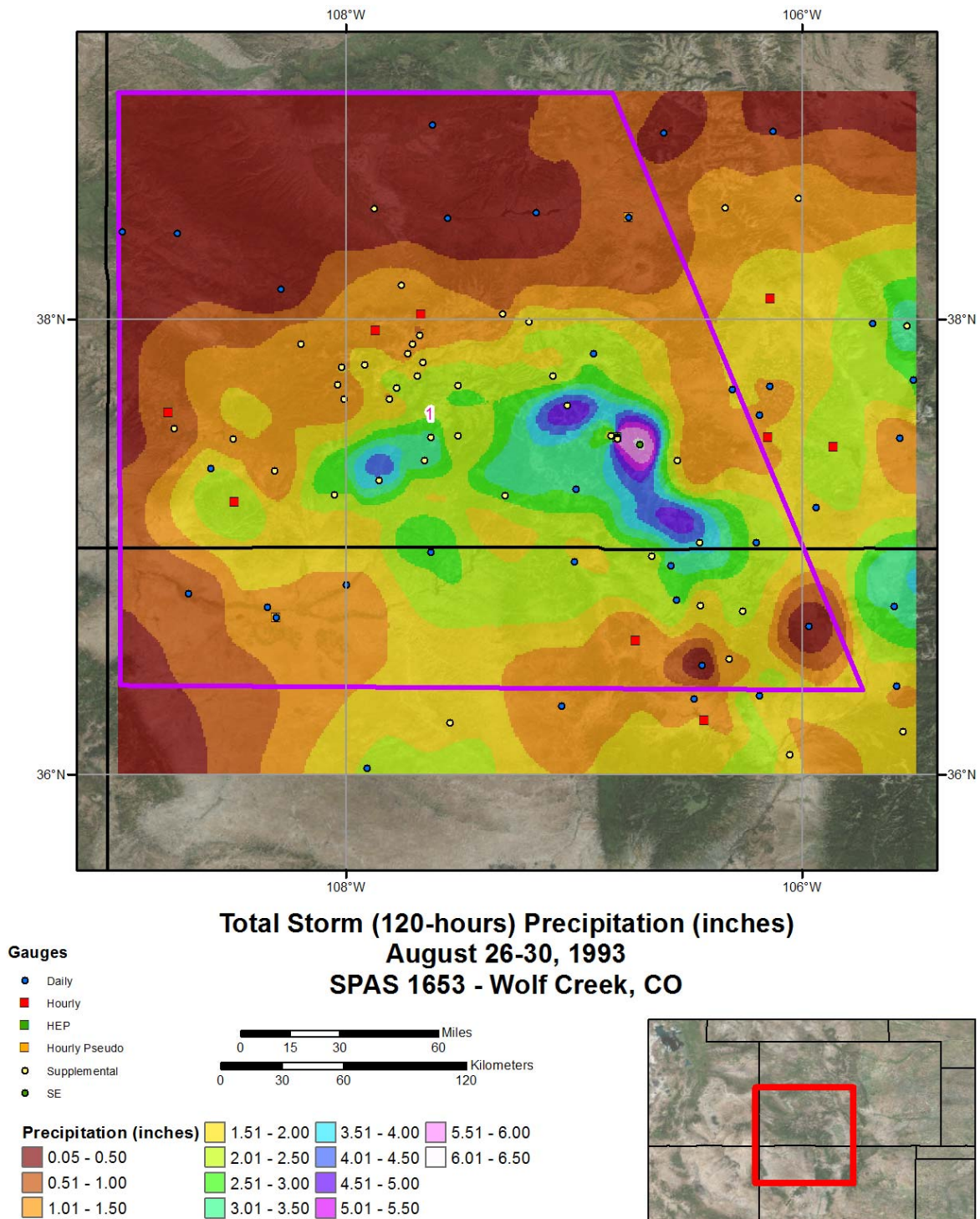
Storm 1653 - August 26 (0800 UTC) - August 31 (0700 UTC), 1993															
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)															
Area (mi ²)	Duration (hours)														
	1	2	3	4	5	6	12	18	24	36	48	72	96	120	Total
0.4	0.35	0.61	0.86	0.91	0.98	1.23	1.76	2.66	3.06	4.11	4.99	5.88	6.05	6.05	6.05
1	0.35	0.61	0.85	0.91	0.98	1.23	1.75	2.64	3.04	4.09	4.98	5.86	6.04	6.04	6.04
10	0.34	0.61	0.84	0.89	0.97	1.21	1.73	2.61	3.00	4.02	4.92	5.79	5.97	5.97	5.97
25	0.33	0.59	0.83	0.88	0.95	1.20	1.72	2.60	2.98	4.00	4.89	5.77	5.94	5.94	5.94
50	0.33	0.58	0.81	0.86	0.93	1.18	1.68	2.54	2.93	3.94	4.84	5.72	5.88	5.87	5.87
100	0.31	0.56	0.78	0.83	0.90	1.13	1.61	2.44	2.82	3.81	4.66	5.50	5.64	5.64	5.64
150	0.31	0.54	0.75	0.80	0.86	1.09	1.56	2.36	2.72	3.71	4.46	5.25	5.40	5.41	5.41
200	0.30	0.52	0.73	0.77	0.84	1.05	1.51	2.29	2.66	3.62	4.32	5.07	5.22	5.24	5.24
300	0.29	0.50	0.69	0.73	0.79	1.00	1.43	2.17	2.56	3.48	4.13	4.80	4.98	5.01	5.01
400	0.29	0.47	0.66	0.70	0.76	0.95	1.36	2.08	2.47	3.37	3.99	4.60	4.80	4.84	4.84
500	0.28	0.46	0.63	0.67	0.73	0.92	1.32	2.01	2.40	3.28	3.87	4.45	4.66	4.71	4.71
1,000	0.25	0.41	0.56	0.60	0.65	0.82	1.16	1.79	2.17	2.94	3.45	3.93	4.18	4.23	4.23
2,000	0.22	0.36	0.50	0.54	0.57	0.73	1.02	1.59	1.93	2.57	2.97	3.37	3.65	3.71	3.71
3,500	0.19	0.31	0.43	0.47	0.52	0.64	0.92	1.42	1.73	2.23	2.55	2.88	3.20	3.25	3.25
5,000	0.17	0.27	0.36	0.42	0.47	0.58	0.84	1.30	1.59	2.00	2.30	2.62	2.91	2.96	2.96
7,500	0.14	0.23	0.30	0.36	0.41	0.50	0.77	1.16	1.41	1.76	2.01	2.35	2.61	2.66	2.66
10,000	0.12	0.20	0.25	0.31	0.36	0.43	0.71	1.04	1.28	1.58	1.81	2.12	2.36	2.41	2.41
15,000	0.10	0.17	0.21	0.26	0.28	0.33	0.58	0.86	1.06	1.33	1.49	1.79	2.00	2.06	2.06
20,000	0.08	0.13	0.17	0.21	0.24	0.27	0.48	0.71	0.88	1.09	1.21	1.50	1.68	1.73	1.73
26,775	0.06	0.10	0.13	0.16	0.18	0.21	0.36	0.55	0.68	0.84	0.94	1.18	1.33	1.37	1.37



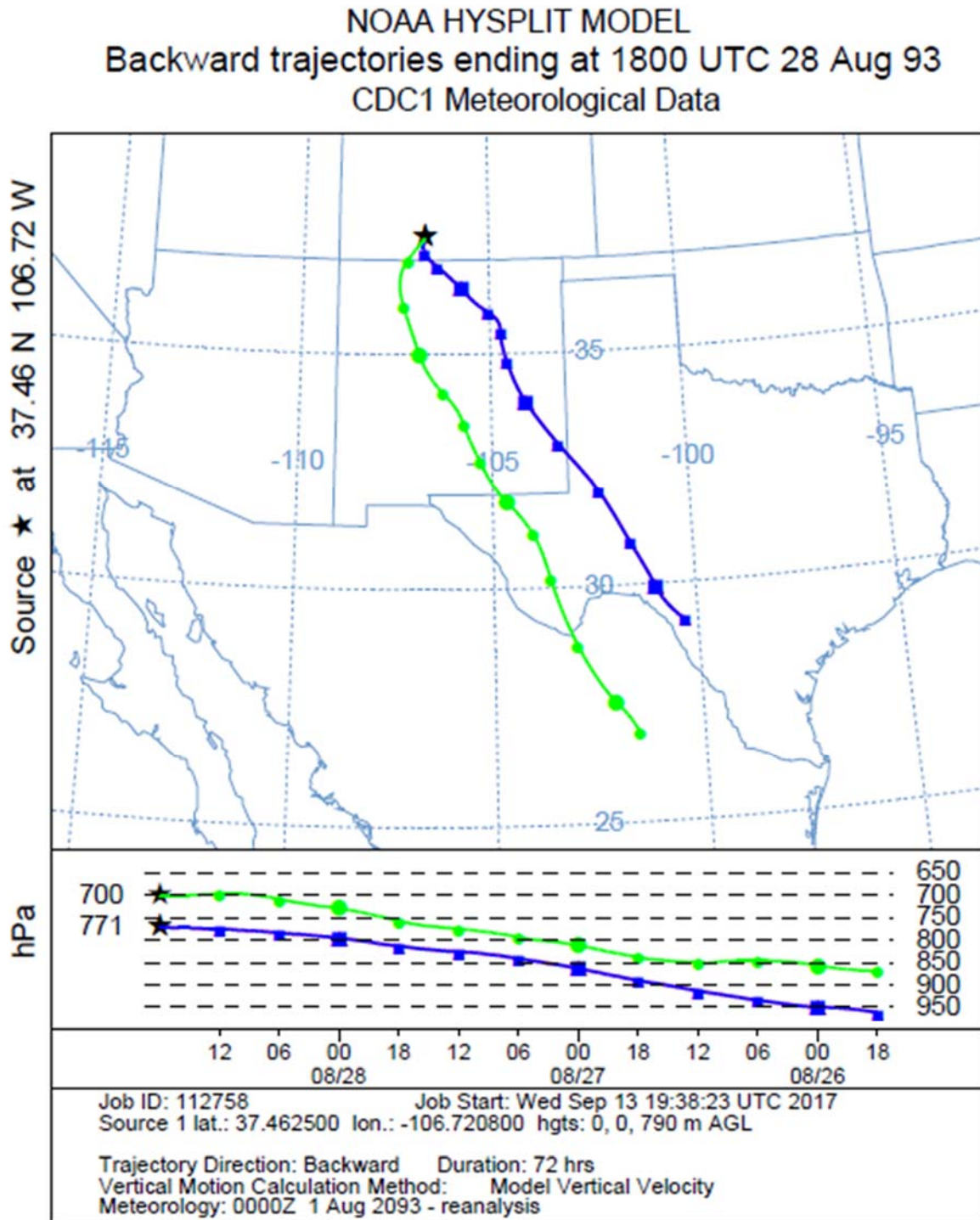
CO-NM Regional Extreme Precipitation Study



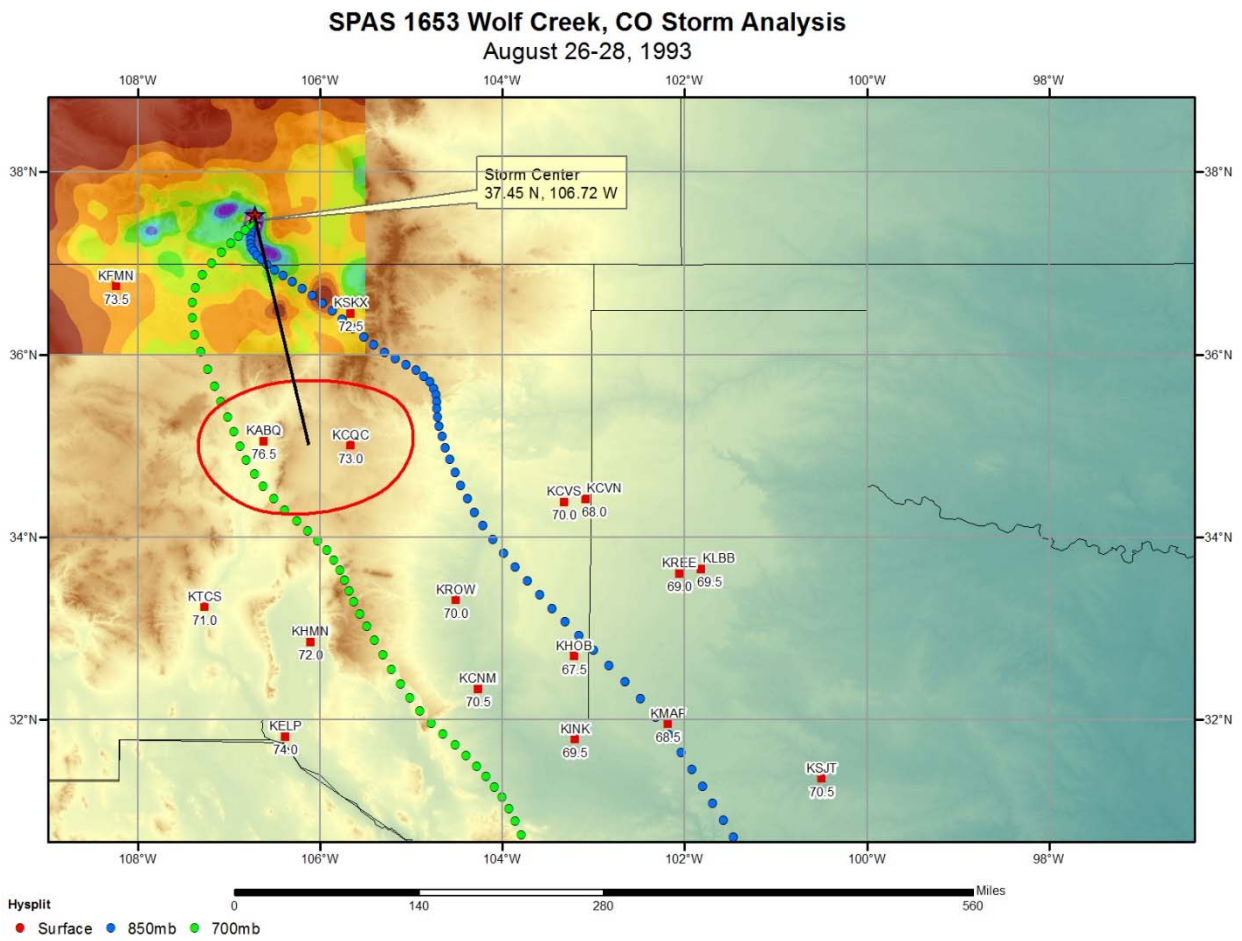
CO-NM Regional Extreme Precipitation Study



4/3/2015



CO-NM Regional Extreme Precipitation Study



Cooks Mesa, AZ
November 30 – December 2, 2007
Storm Type: General Frontal

Storm Precipitation Analysis System (SPAS) For Storm #1149_2

General Storm Location: Cooks Mesa, Arizona

Storm Dates: November 30-December 2, 2007

Event: Winter Storm

DAD Zone 2 – Mogollon Rim

Longitude: -111.23

Latitude: 34.46

Max. Grid/Radar Rainfall Amount: 8.60"

Max. Observed Rainfall Amount: n/a

Number of Stations: 1126 (395 daily, 666 hourly, 19 hourly pseudo, 43 supplemental and 3 supplemental estimated)

SPAS Version: 7.0

Base Map Used: Mean December PRISM

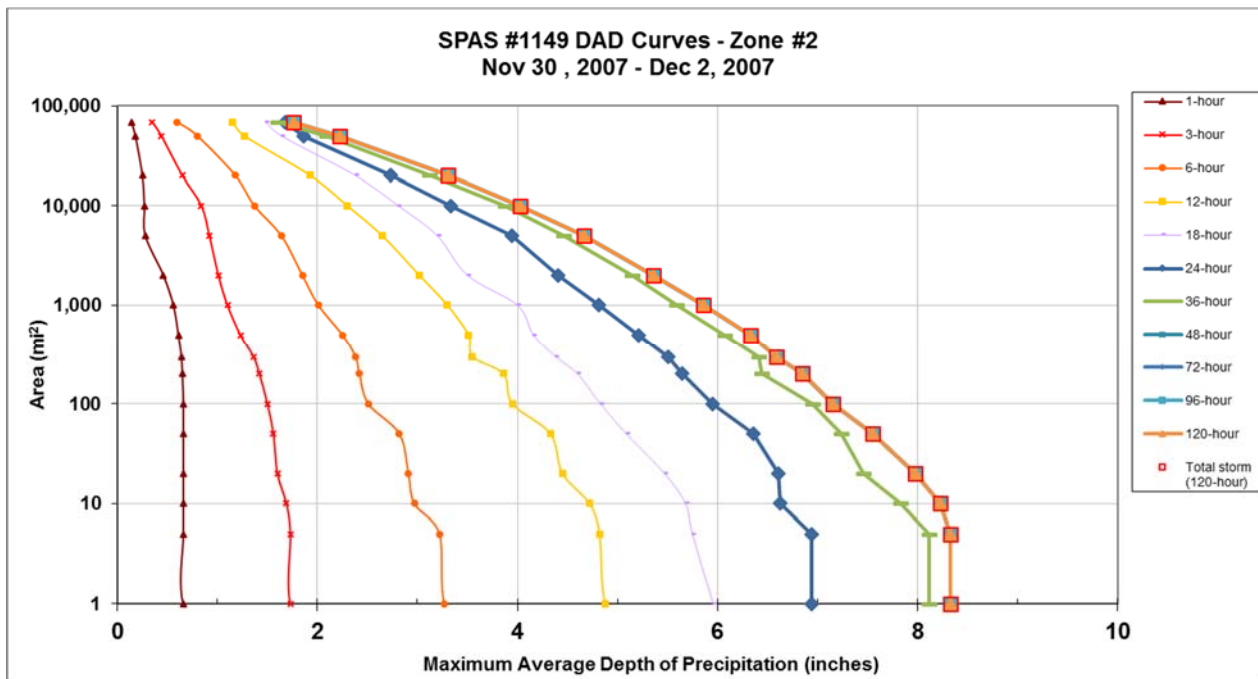
Spatial resolution: 36-sec.

Radar Included: Yes

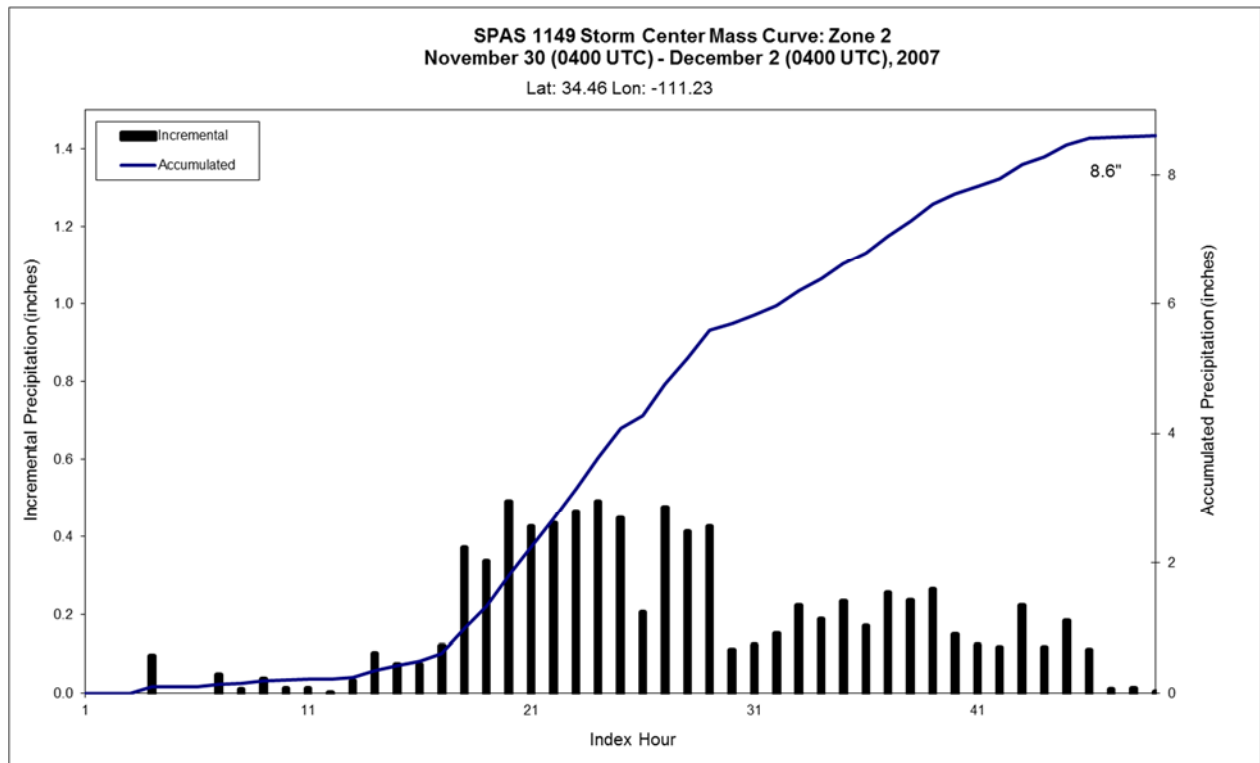
Depth-Area-Duration (DAD) analysis: Yes

CO-NM Regional Extreme Precipitation Study

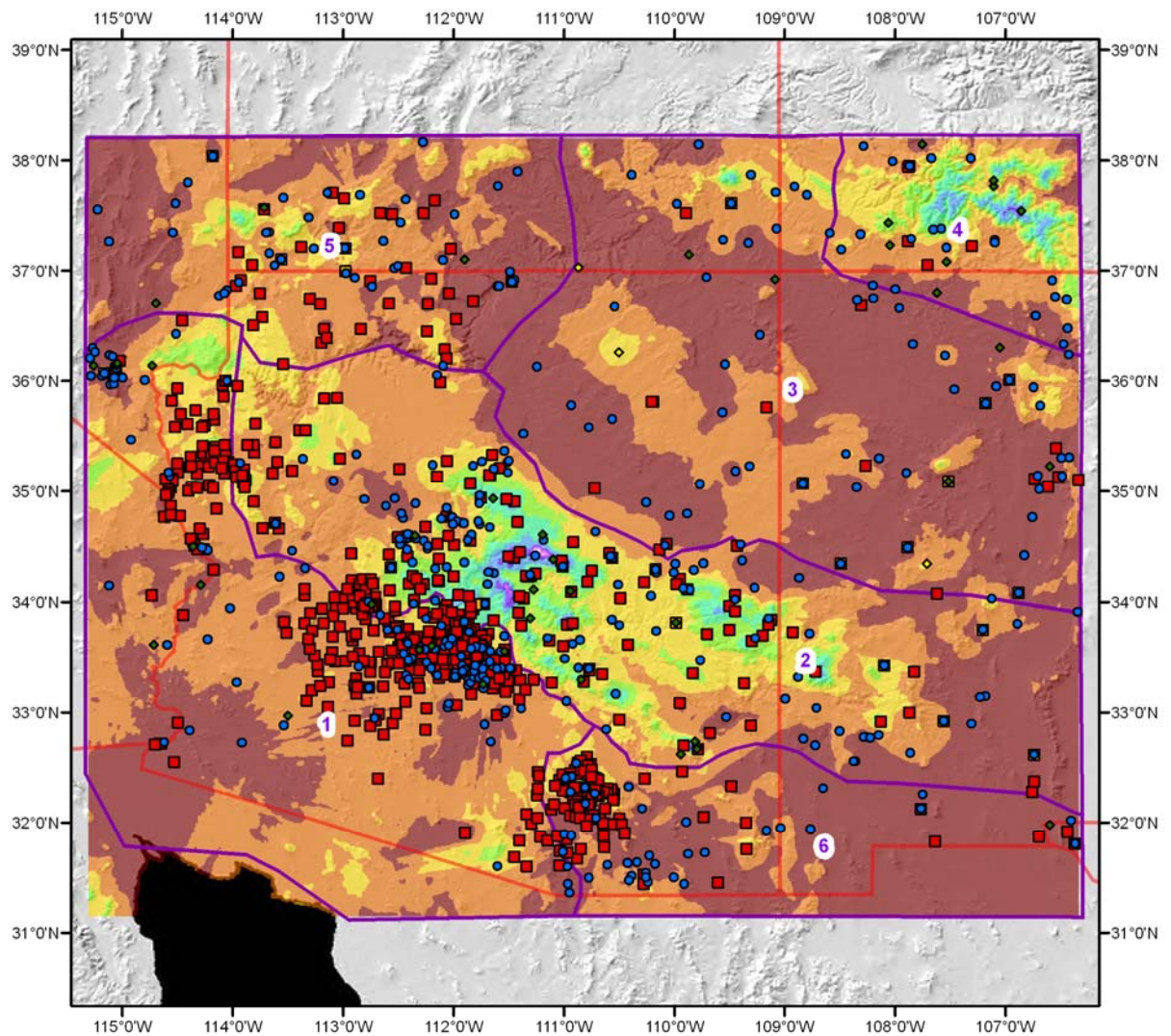
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)												
Area (mi ²)	Duration (hours)											
	1	3	6	12	18	24	36	48	72	96	120	Total (120-hr)
0.39	1.02	2.02	3.55	5.15	6.13	7.24	8.38	8.62	8.62	8.62	8.62	8.62
1	0.66	1.73	3.27	4.88	5.96	6.94	8.12	8.33	8.33	8.33	8.33	8.33
5	0.66	1.73	3.22	4.82	5.75	6.94	8.12	8.33	8.33	8.33	8.33	8.33
10	0.66	1.69	2.97	4.72	5.68	6.63	7.83	8.23	8.23	8.23	8.23	8.23
20	0.66	1.60	2.91	4.45	5.47	6.61	7.46	7.98	7.98	7.98	7.98	7.98
50	0.66	1.56	2.82	4.33	5.09	6.36	7.24	7.55	7.55	7.55	7.55	7.55
100	0.66	1.50	2.51	3.95	4.83	5.95	6.95	7.15	7.15	7.15	7.15	7.15
200	0.65	1.42	2.42	3.86	4.60	5.65	6.44	6.85	6.85	6.85	6.85	6.85
300	0.64	1.36	2.38	3.55	4.38	5.51	6.41	6.59	6.59	6.59	6.59	6.59
500	0.61	1.23	2.25	3.51	4.16	5.21	6.07	6.33	6.33	6.33	6.33	6.33
1,000	0.56	1.10	2.01	3.30	4.00	4.81	5.59	5.86	5.86	5.86	5.86	5.86
2,000	0.46	1.01	1.85	3.02	3.50	4.41	5.15	5.36	5.36	5.36	5.36	5.36
5,000	0.28	0.92	1.64	2.65	3.20	3.94	4.46	4.67	4.67	4.67	4.67	4.67
10,000	0.27	0.84	1.37	2.30	2.81	3.33	3.88	4.03	4.03	4.03	4.03	4.03
20,000	0.25	0.65	1.18	1.93	2.38	2.73	3.12	3.31	3.31	3.31	3.31	3.31
50,000	0.18	0.44	0.80	1.27	1.64	1.86	2.09	2.22	2.22	2.22	2.22	2.22
68,948	0.14	0.35	0.60	1.15	1.48	1.68	1.60	1.76	1.76	1.76	1.76	1.76



CO-NM Regional Extreme Precipitation Study



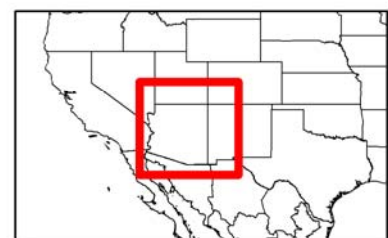
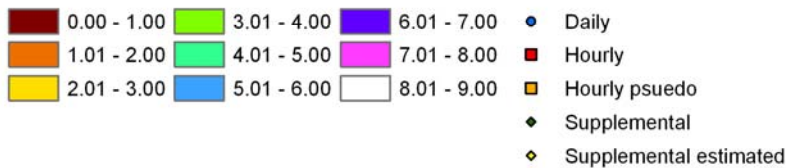
CO-NM Regional Extreme Precipitation Study



Total Storm Precipitation
SPAS Storm #1149
Nov. 30, 2007 - Dec. 2, 2007

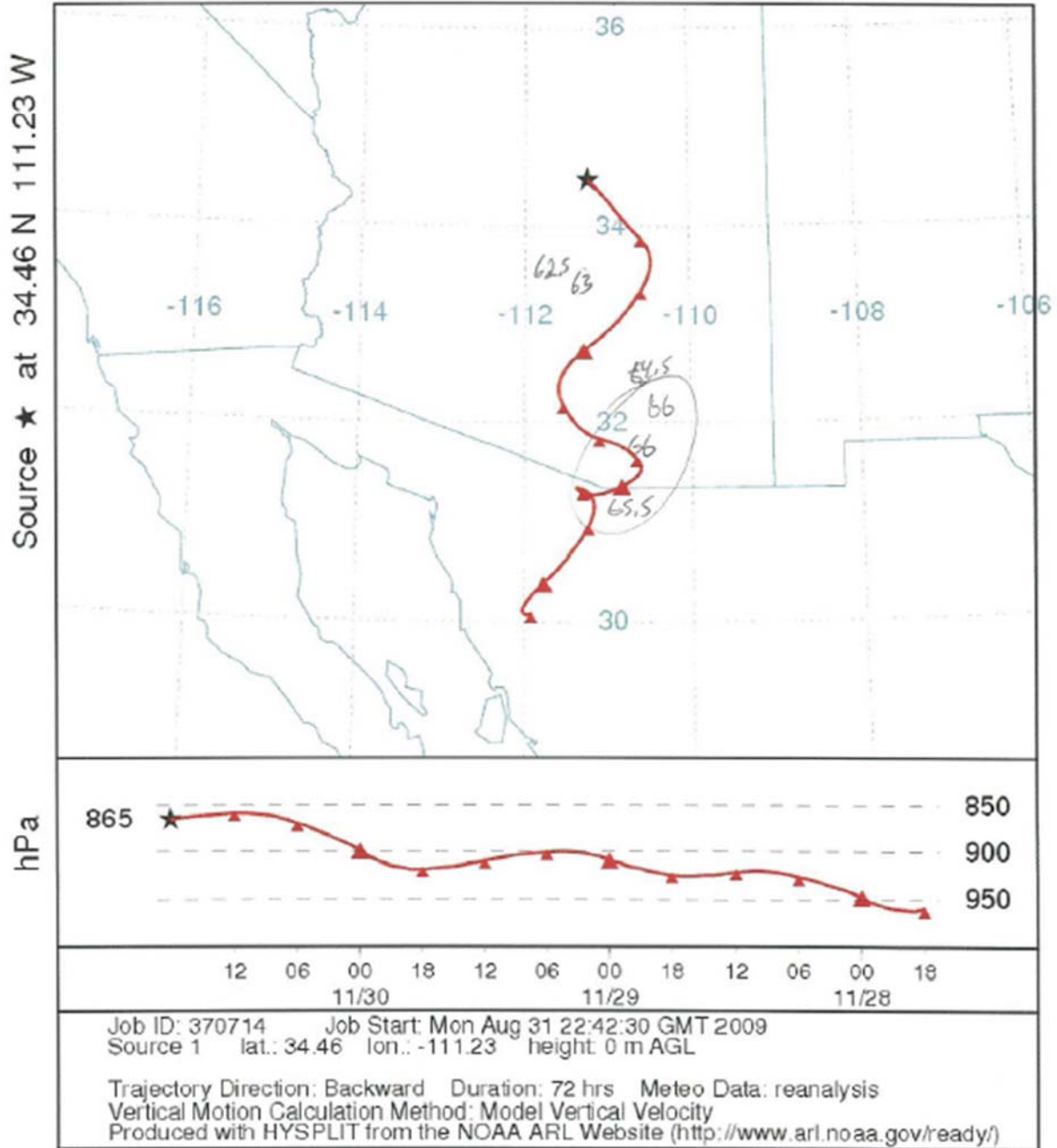


Precipitation (inches)

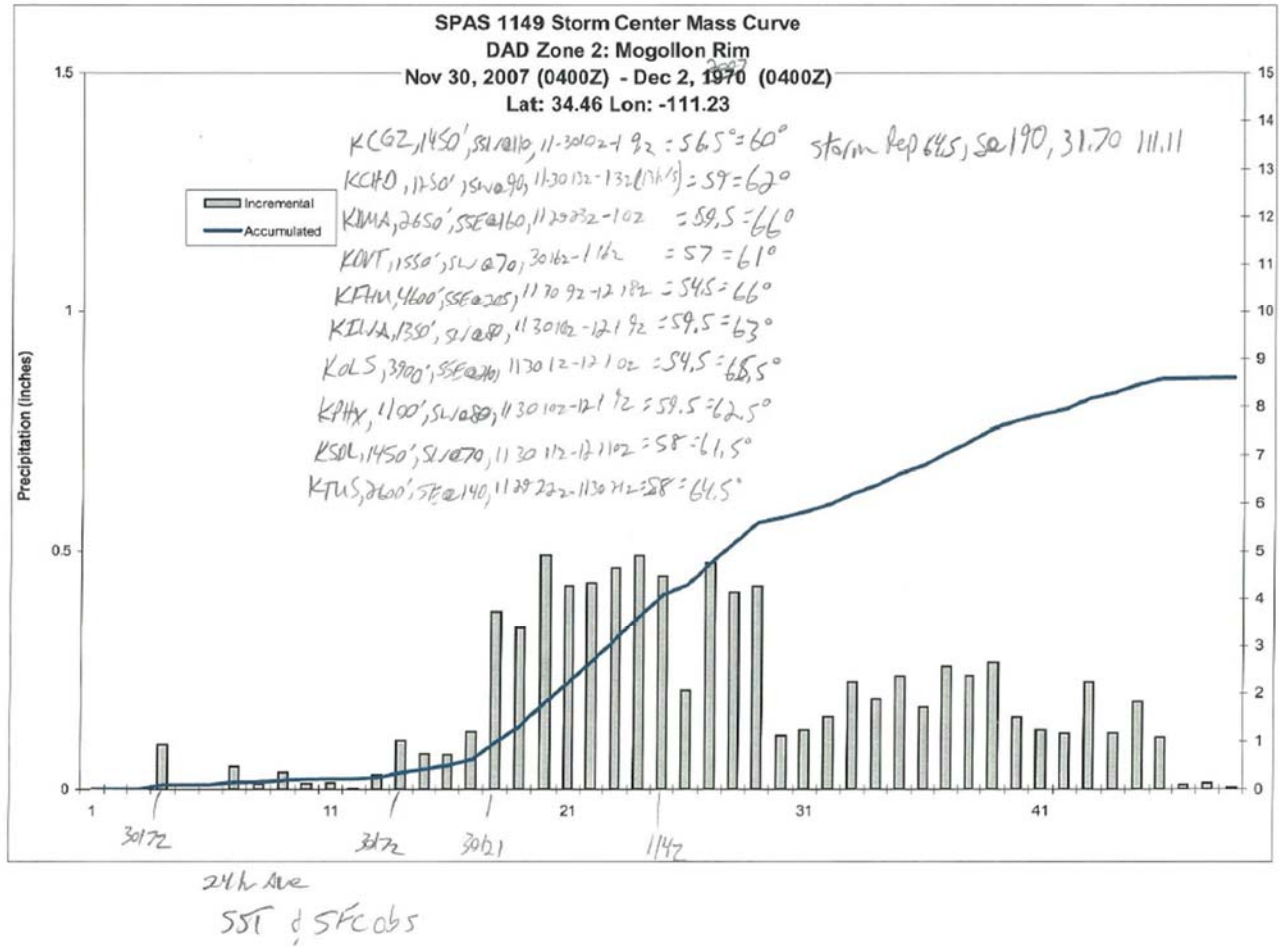


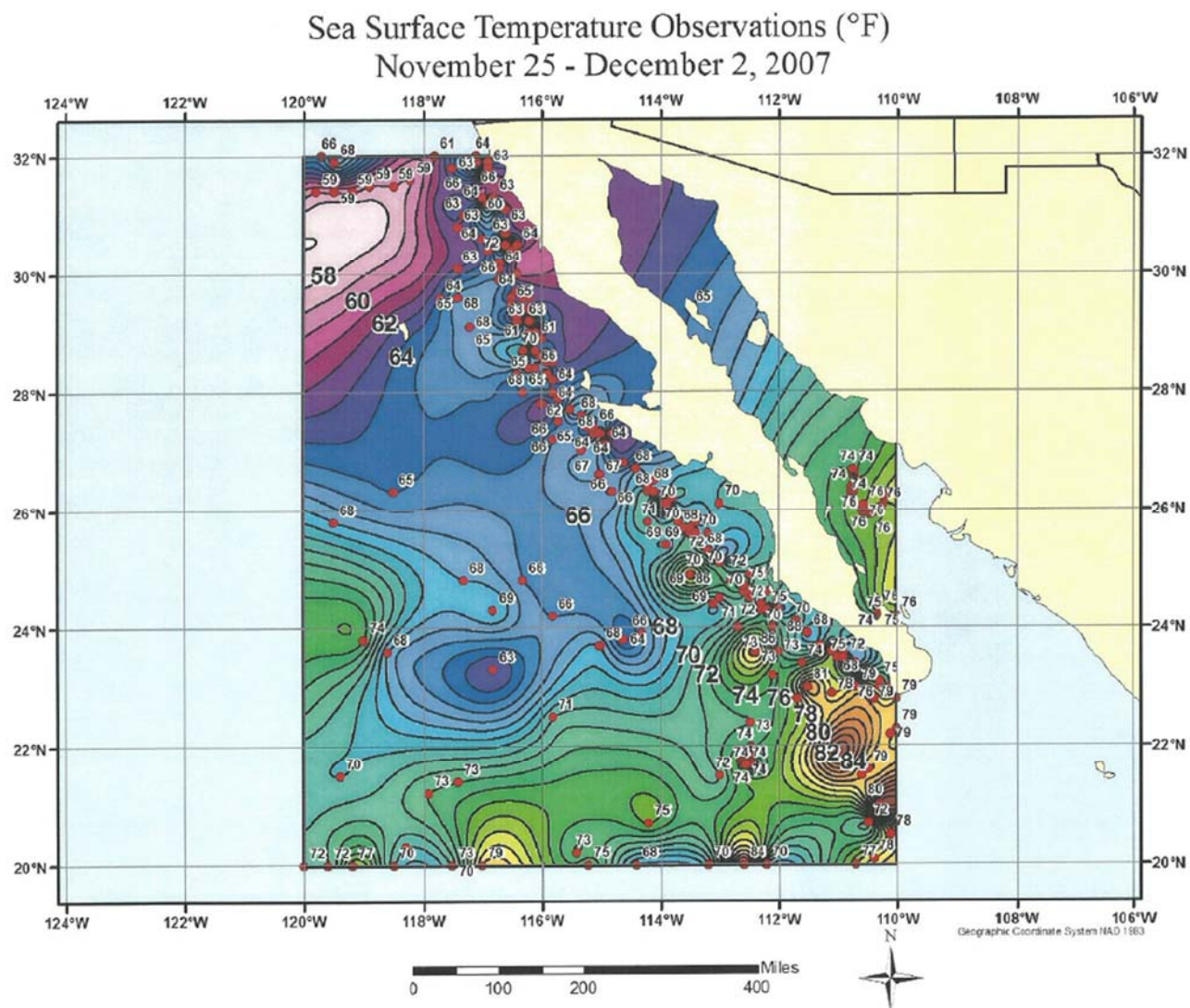
Metstat/AWA October 16, 2009

NOAA HYSPLIT MODEL
Backward trajectory ending at 1800 UTC 30 Nov 07
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study





Marshall Saddle, AZ

November 30 – December 2, 2007

Storm Type: General Frontal

Storm Precipitation Analysis System (SPAS) For Storm #1149_3

General Storm Location: Cooks Mesa, Arizona

Storm Dates: November 30-December 2, 2007

Event: Winter Storm

DAD Zone 3 – Southeastern Arizona and southwestern NM (basin and range)

Longitude: -110.78

Latitude: 32.44

Max. Grid/Radar Rainfall Amount: 6.54"

Max. Observed Rainfall Amount: 8.55" (Mt. Lemmon)

Max. Observed Rainfall Amount: n/a

Number of Stations: 1126 (395 daily, 666 hourly, 19 hourly pseudo, 43 supplemental and 3 supplemental estimated)

SPAS Version: 7.0

Base Map Used: Mean December PRISM

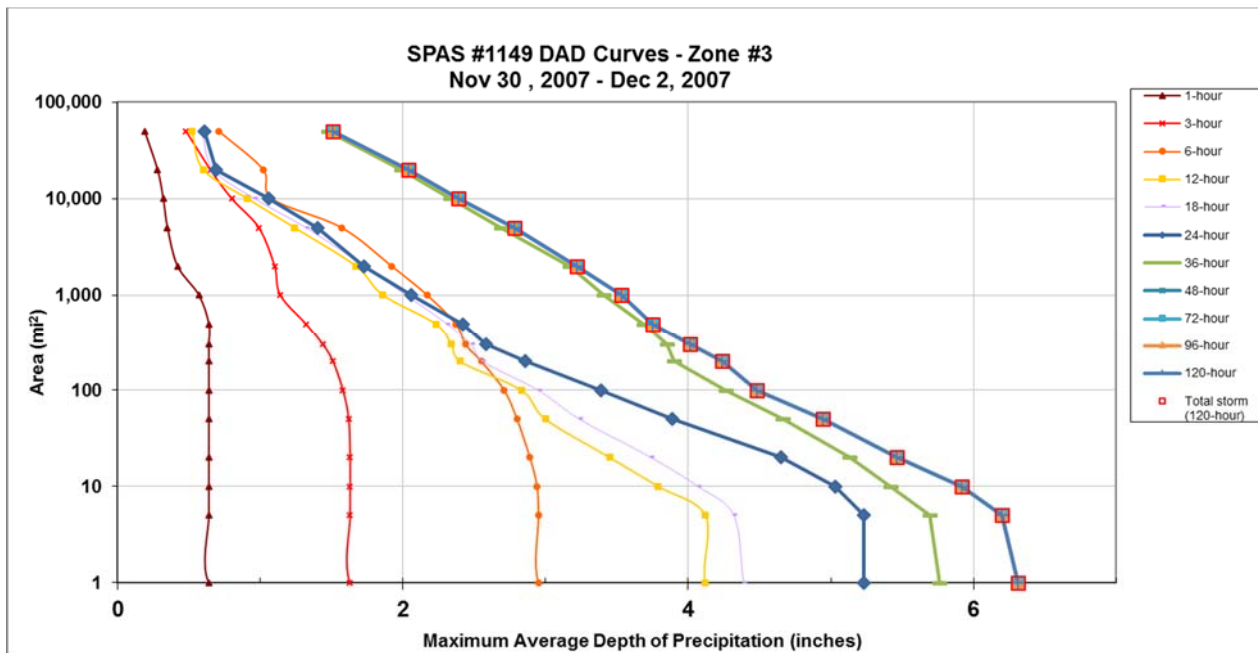
Spatial resolution: 36-sec.

Radar Included: Yes

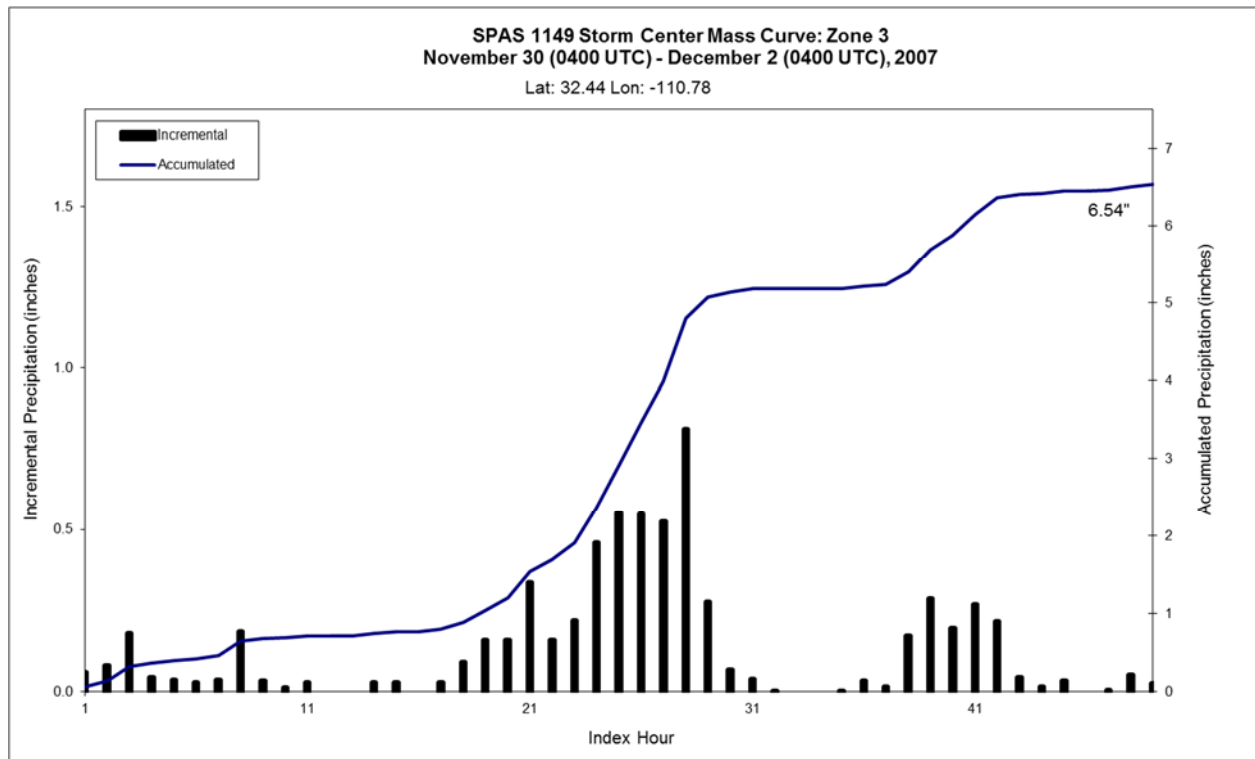
Depth-Area-Duration (DAD) analysis: Yes

CO-NM Regional Extreme Precipitation Study

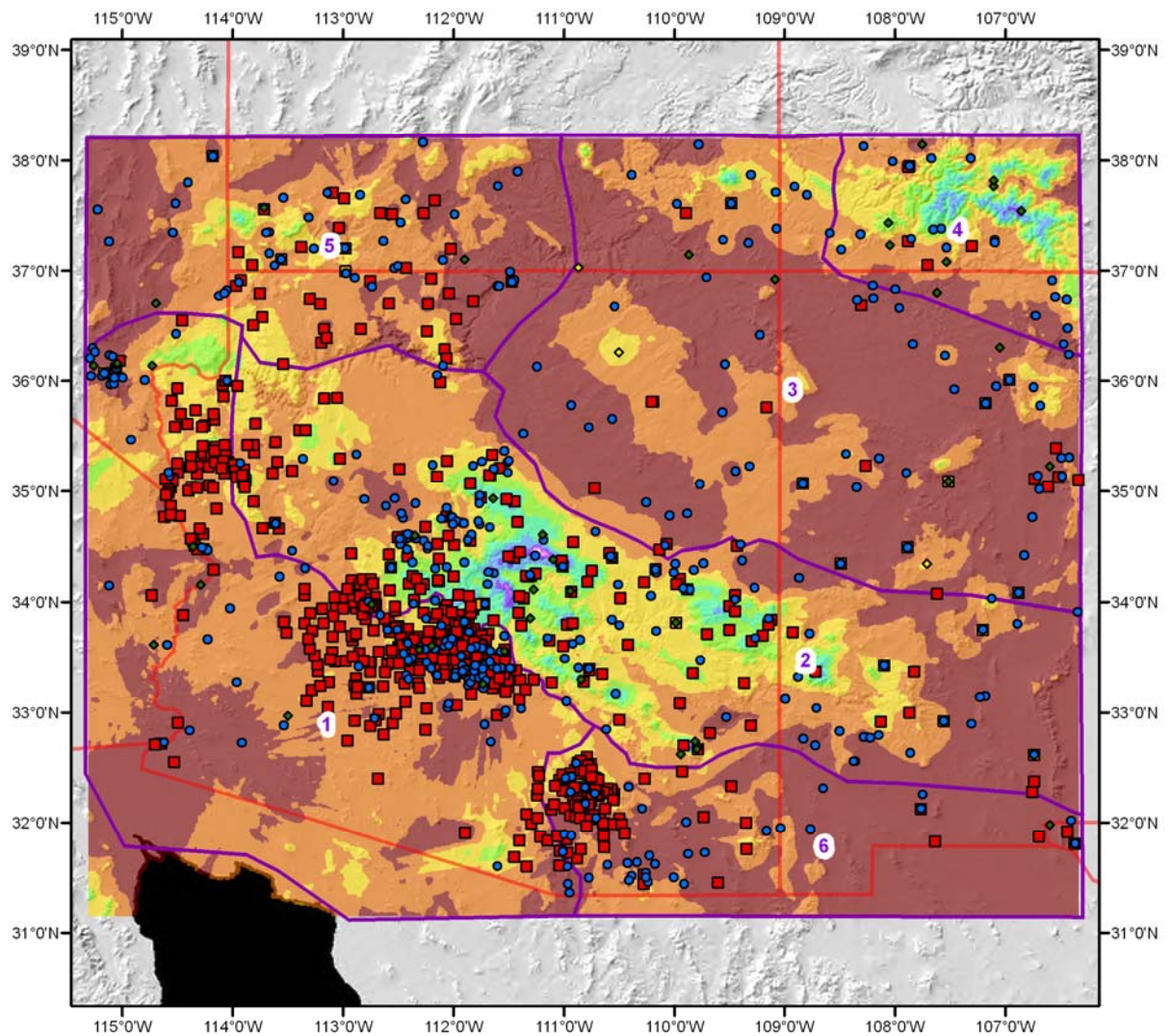
Storm 1149- Arizona Nov 30, 2007 - Dec 3, 2007												
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)												
Area (mi ²)	Duration (hours)											
	1	3	6	12	18	24	36	48	72	96	120	Total (120-hr)
0.39	1.02	1.96	3.21	4.32	4.48	5.48	5.95	6.51	6.51	6.51	6.51	6.51
1	0.64	1.63	2.95	4.12	4.39	5.23	5.76	6.31	6.31	6.31	6.31	6.31
5	0.64	1.63	2.95	4.12	4.32	5.23	5.69	6.20	6.20	6.20	6.20	6.20
10	0.64	1.63	2.94	3.79	4.07	5.03	5.42	5.92	5.92	5.92	5.92	5.92
20	0.64	1.63	2.89	3.45	3.74	4.65	5.13	5.46	5.46	5.46	5.46	5.46
50	0.64	1.62	2.80	3.00	3.24	3.89	4.66	4.94	4.94	4.94	4.94	4.94
100	0.64	1.58	2.71	2.83	2.95	3.39	4.26	4.48	4.48	4.48	4.48	4.48
200	0.64	1.51	2.55	2.40	2.56	2.86	3.90	4.24	4.24	4.24	4.24	4.24
300	0.64	1.44	2.44	2.34	2.48	2.58	3.85	4.01	4.01	4.01	4.01	4.01
500	0.64	1.32	2.37	2.23	2.31	2.42	3.69	3.75	3.75	3.75	3.75	3.75
1,000	0.57	1.14	2.17	1.86	2.02	2.06	3.41	3.53	3.53	3.53	3.53	3.53
2,000	0.42	1.10	1.92	1.67	1.73	1.73	3.17	3.22	3.22	3.22	3.22	3.22
5,000	0.35	0.99	1.57	1.24	1.32	1.40	2.69	2.78	2.78	2.78	2.78	2.78
10,000	0.32	0.80	1.08	0.91	0.96	1.06	2.33	2.39	2.39	2.39	2.39	2.39
20,000	0.28	0.65	1.02	0.60	0.67	0.69	1.99	2.04	2.04	2.04	2.04	2.04
50,000	0.19	0.48	0.71	0.52	0.59	0.61	1.48	1.51	1.51	1.51	1.51	1.51



CO-NM Regional Extreme Precipitation Study



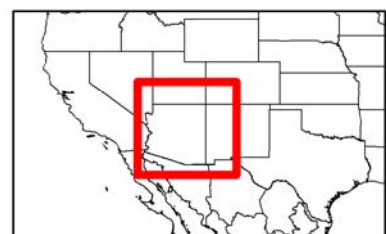
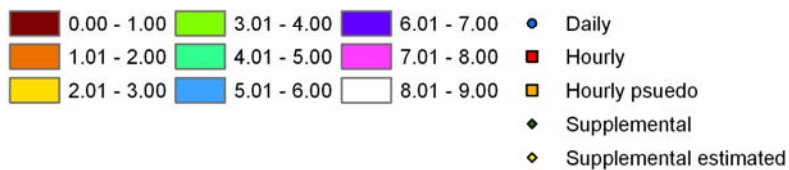
CO-NM Regional Extreme Precipitation Study



Total Storm Precipitation
SPAS Storm #1149
Nov. 30, 2007 - Dec. 2, 2007

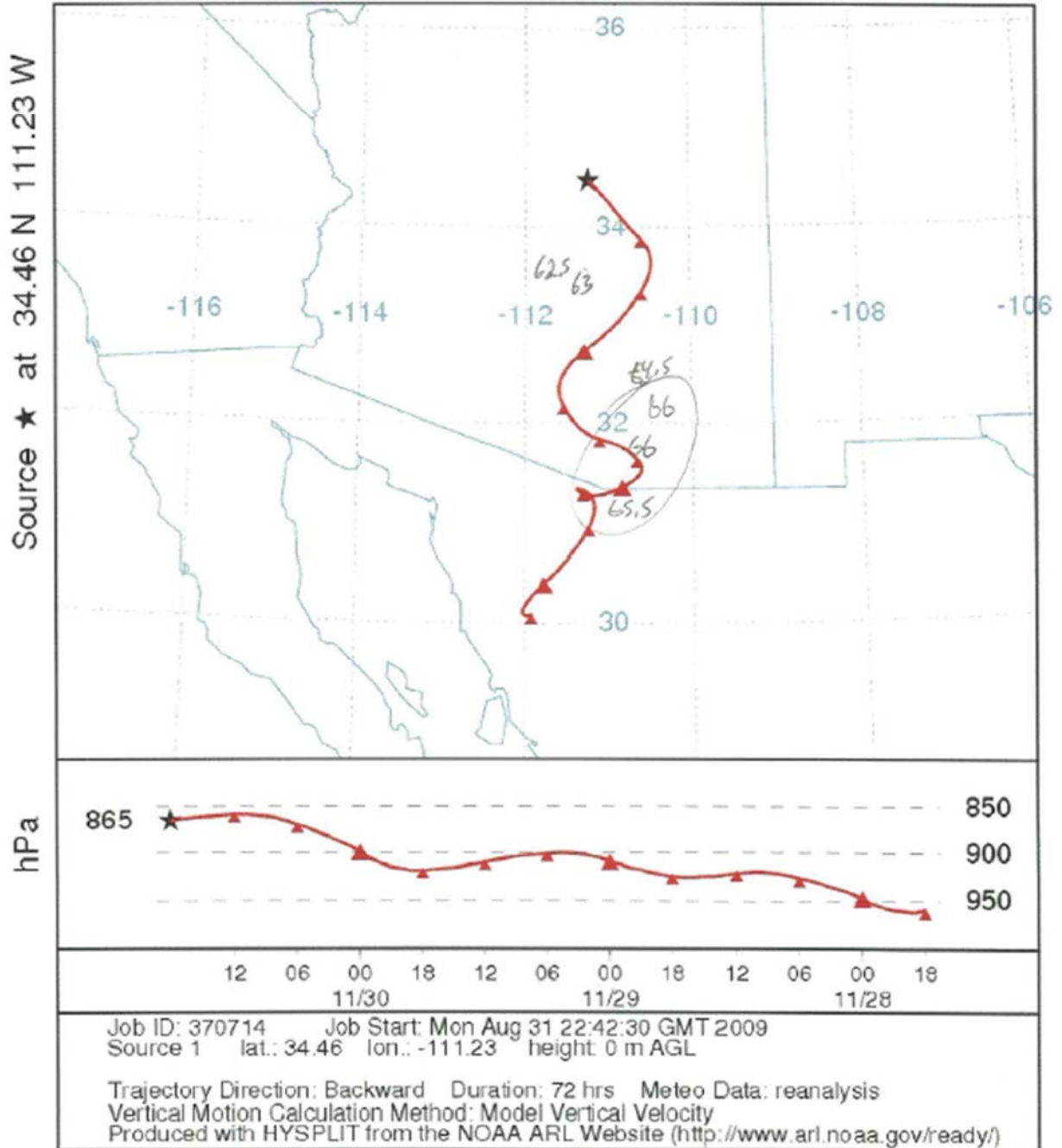


Precipitation (inches)

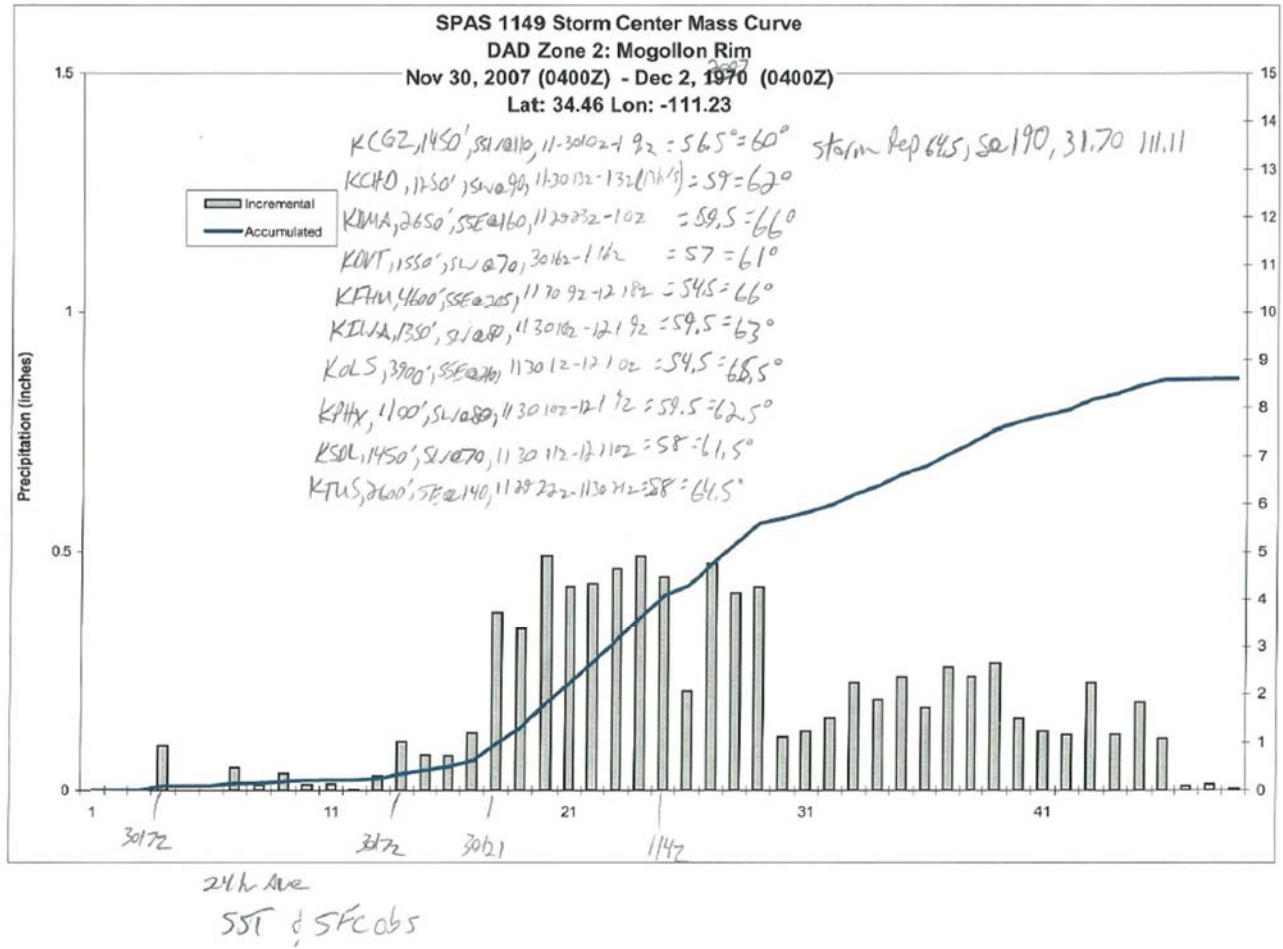


Metstat/AWA October 16, 2009

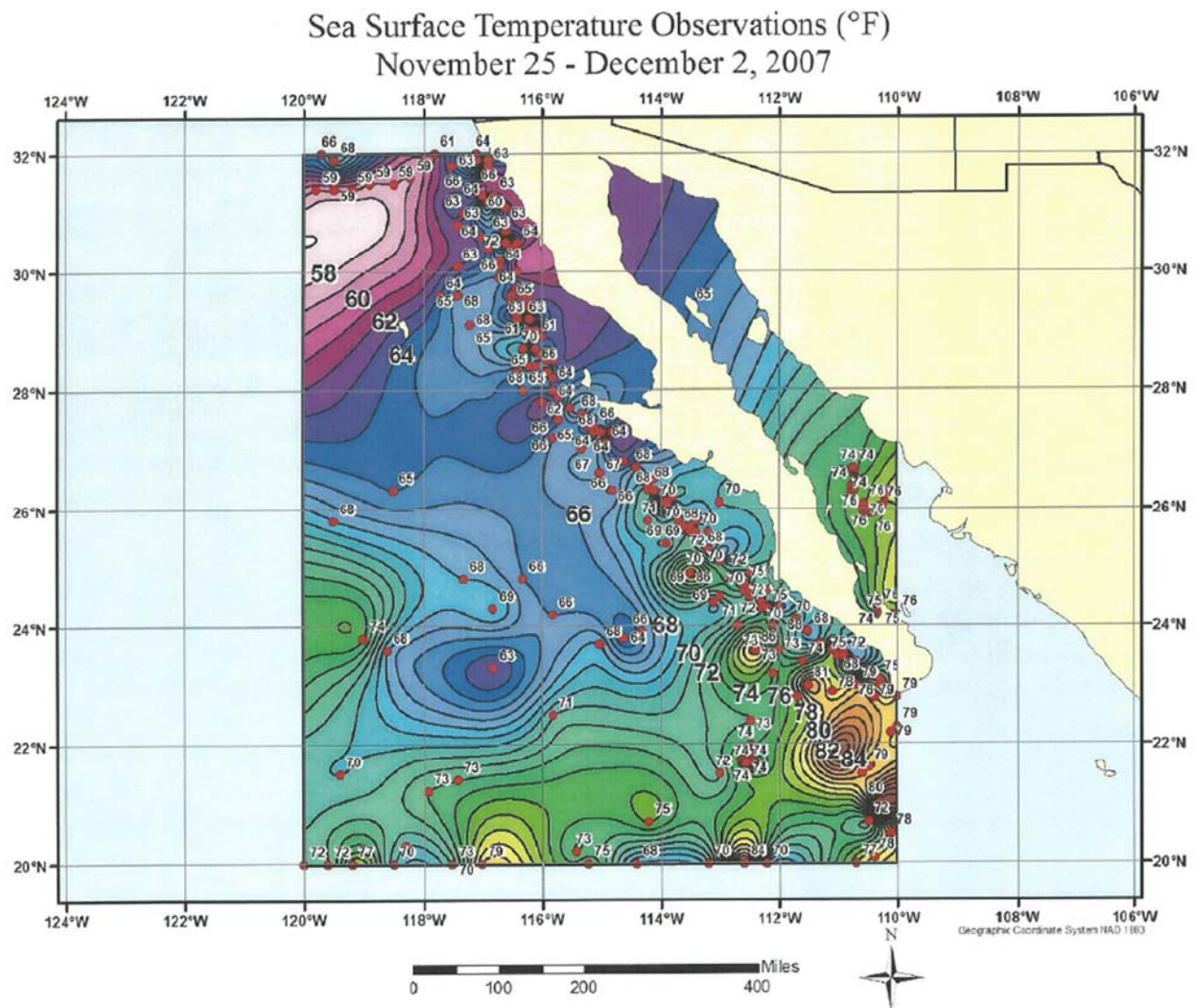
NOAA HYSPLIT MODEL
Backward trajectory ending at 1800 UTC 30 Nov 07
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



Marshall Saddle, AZ

November 30 – December 2, 2007

Storm Type: General Frontal

Storm Precipitation Analysis System (SPAS) For Storm #1149_4

General Storm Location: Cooks Mesa, Arizona

Storm Dates: November 30-December 2, 2007

Event: Winter Storm

DAD Zone 4 – SW Colorado Mountains

Longitude: -106.87

Latitude: 37.54

Max. Grid/Radar Rainfall Amount: 6.69"

Max. Observed Rainfall Amount: n/a

Max. Observed Rainfall Amount: n/a

Number of Stations: 1126 (395 daily, 666 hourly, 19 hourly pseudo, 43 supplemental and 3 supplemental estimated)

SPAS Version: 7.0

Base Map Used: Mean December PRISM

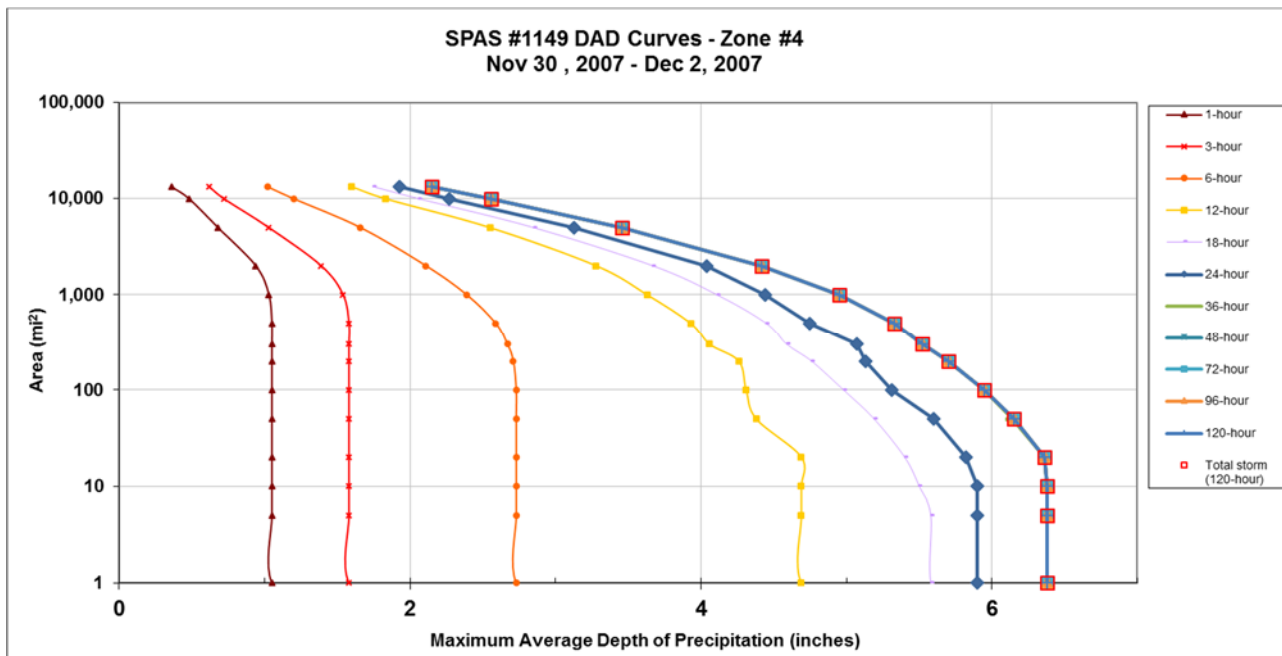
Spatial resolution: 36-sec.

Radar Included: Yes

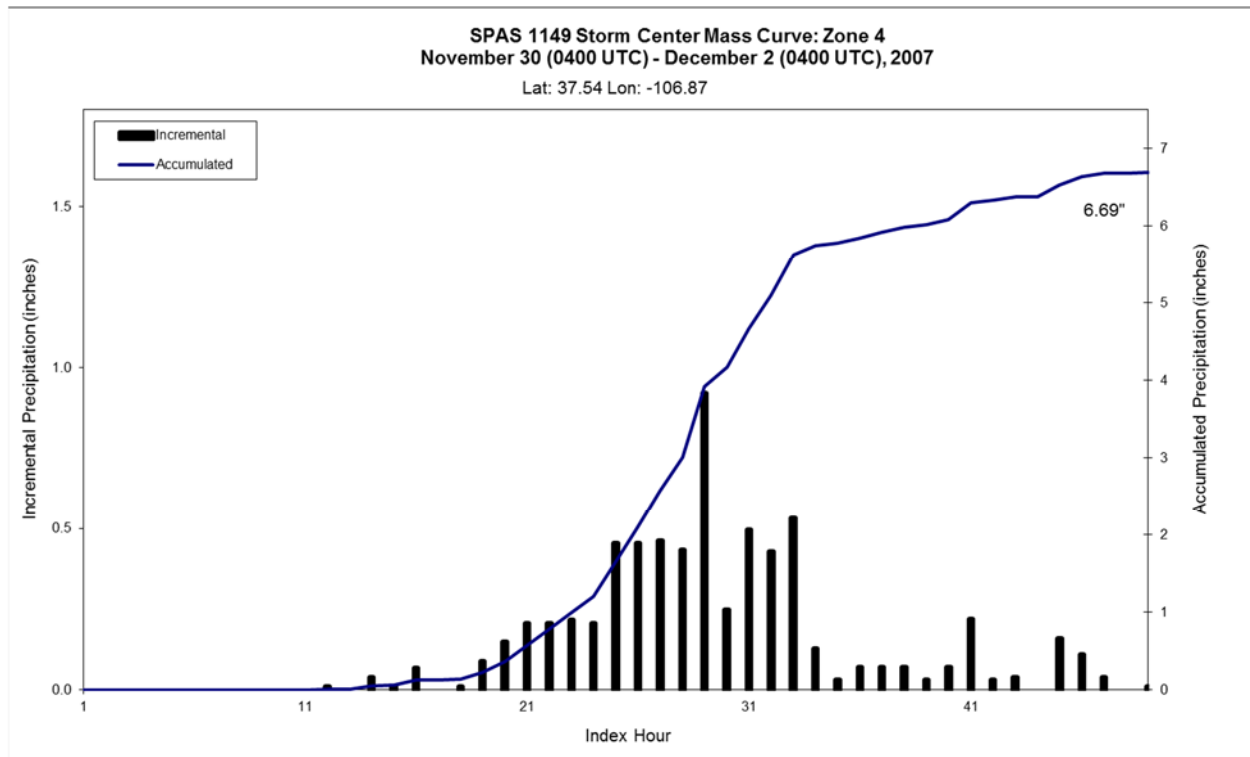
Depth-Area-Duration (DAD) analysis: Yes

CO-NM Regional Extreme Precipitation Study

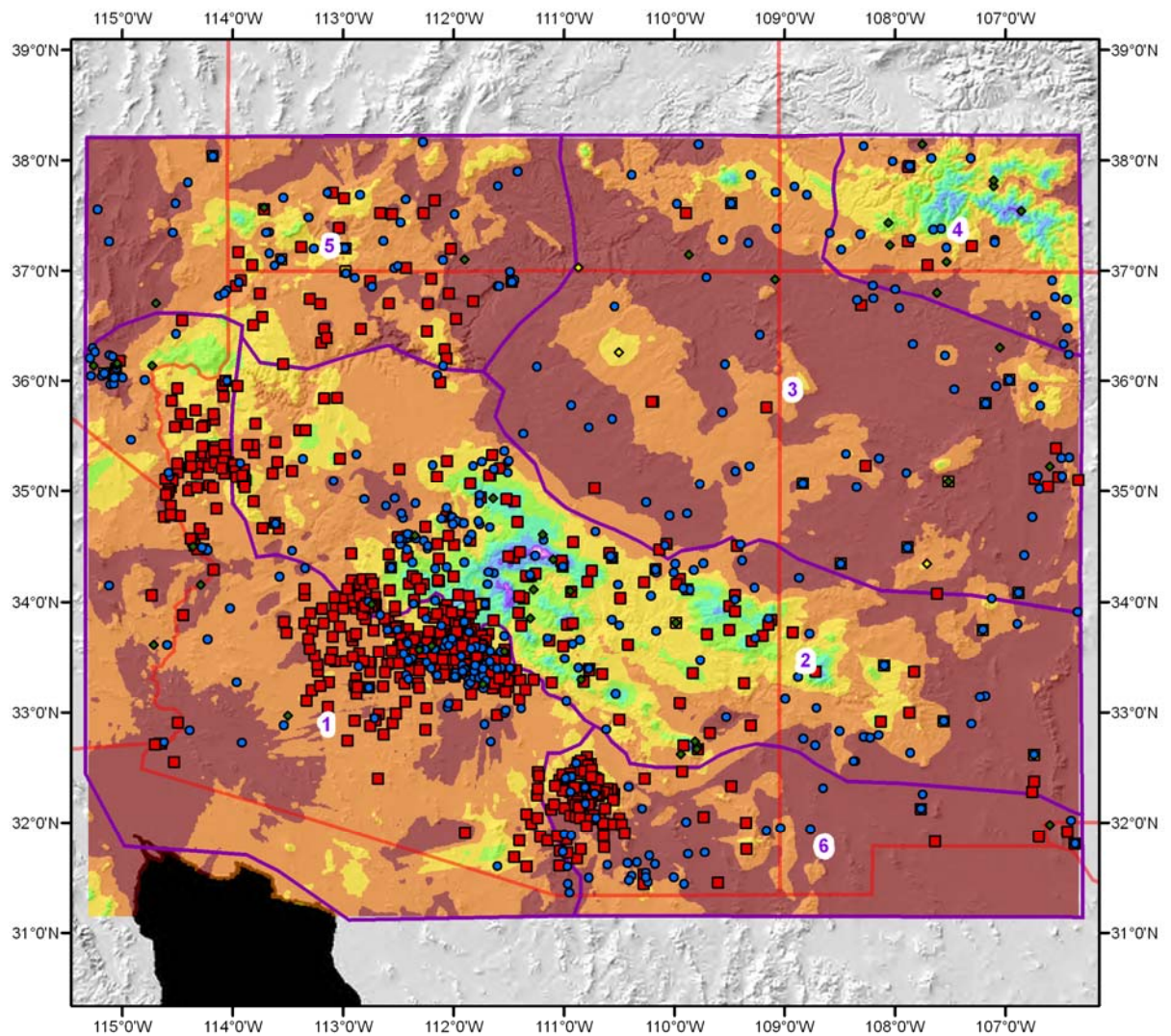
Storm 1149- Arizona Nov 30, 2007 - Dec 3, 2007												
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)												
Area (mi ²)	Duration (hours)											
	1	3	6	12	18	24	36	48	72	96	120	Total (120hr)
0.39	1.39	1.94	3.06	5.05	5.72	6.20	6.69	6.69	6.69	6.69	6.69	6.69
1	1.05	1.58	2.73	4.69	5.58	5.90	6.38	6.38	6.38	6.38	6.38	6.38
5	1.05	1.58	2.73	4.69	5.58	5.90	6.38	6.38	6.38	6.38	6.38	6.38
10	1.05	1.58	2.73	4.69	5.50	5.90	6.38	6.38	6.38	6.38	6.38	6.38
20	1.05	1.58	2.73	4.69	5.40	5.82	6.36	6.36	6.36	6.36	6.36	6.36
50	1.05	1.58	2.73	4.38	5.19	5.60	6.14	6.15	6.15	6.15	6.15	6.15
100	1.05	1.58	2.73	4.31	4.98	5.31	5.95	5.95	5.95	5.95	5.95	5.95
200	1.05	1.58	2.71	4.26	4.76	5.13	5.70	5.70	5.70	5.70	5.70	5.70
300	1.05	1.58	2.67	4.06	4.59	5.07	5.52	5.52	5.52	5.52	5.52	5.52
500	1.05	1.58	2.59	3.93	4.45	4.75	5.33	5.33	5.33	5.33	5.33	5.33
1,000	1.03	1.54	2.39	3.63	4.11	4.44	4.95	4.95	4.95	4.95	4.95	4.95
2,000	0.94	1.39	2.11	3.28	3.67	4.04	4.42	4.42	4.42	4.42	4.42	4.42
5,000	0.68	1.03	1.66	2.55	2.85	3.13	3.46	3.46	3.46	3.46	3.46	3.46
10,000	0.48	0.72	1.20	1.83	2.06	2.27	2.56	2.56	2.56	2.56	2.56	2.56
13,299	0.36	0.62	1.02	1.60	1.75	1.93	2.15	2.15	2.15	2.15	2.15	2.15



CO-NM Regional Extreme Precipitation Study



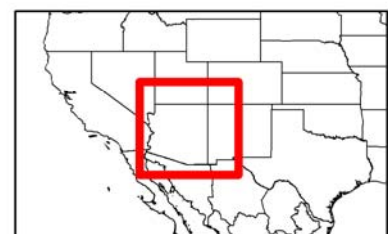
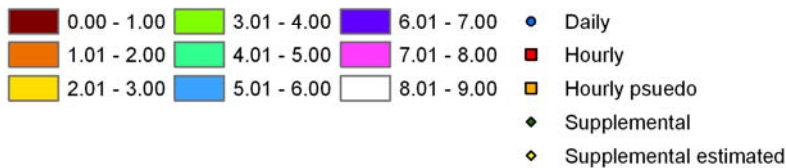
CO-NM Regional Extreme Precipitation Study



Total Storm Precipitation
SPAS Storm #1149
Nov. 30, 2007 - Dec. 2, 2007

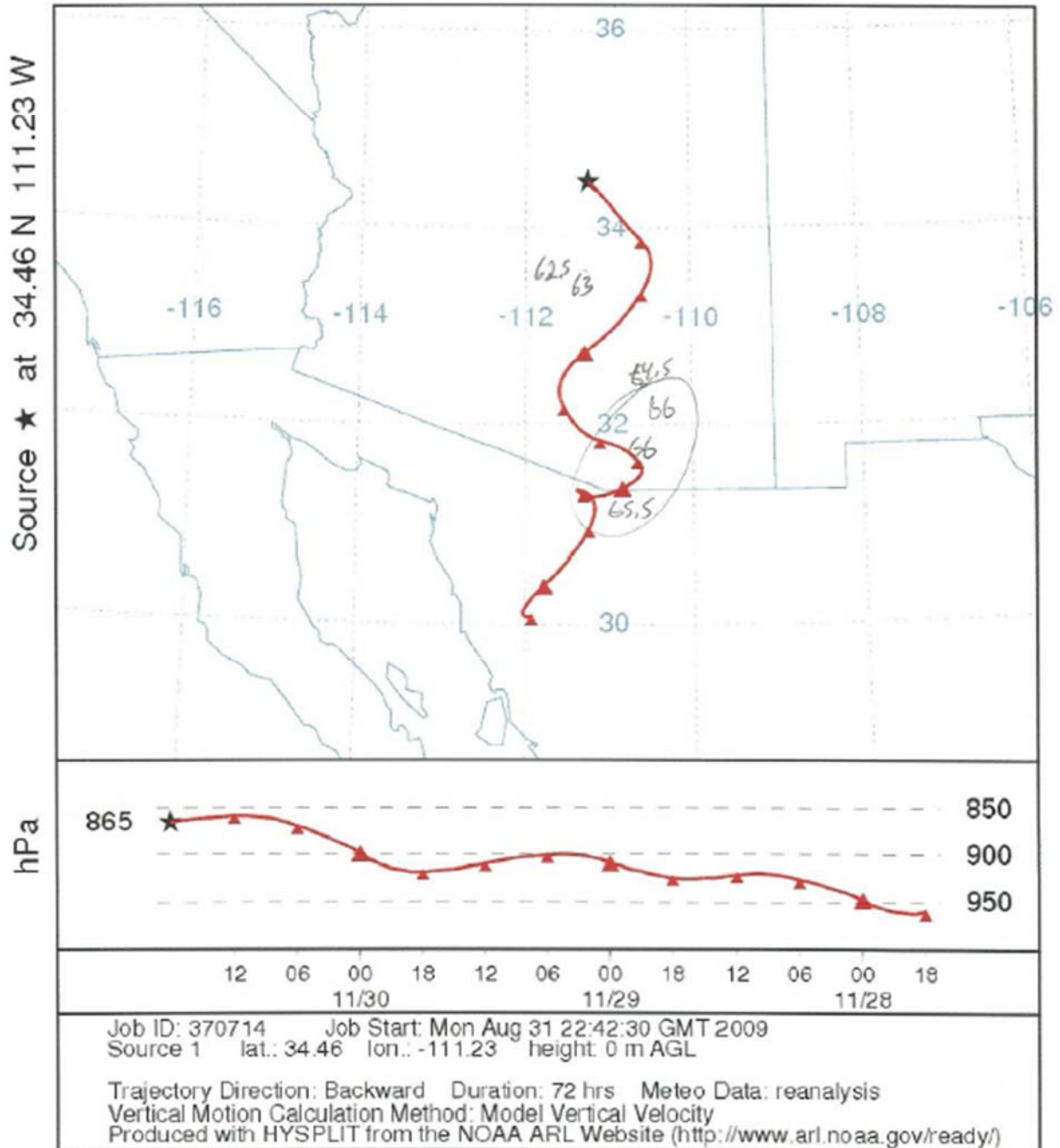


Precipitation (inches)

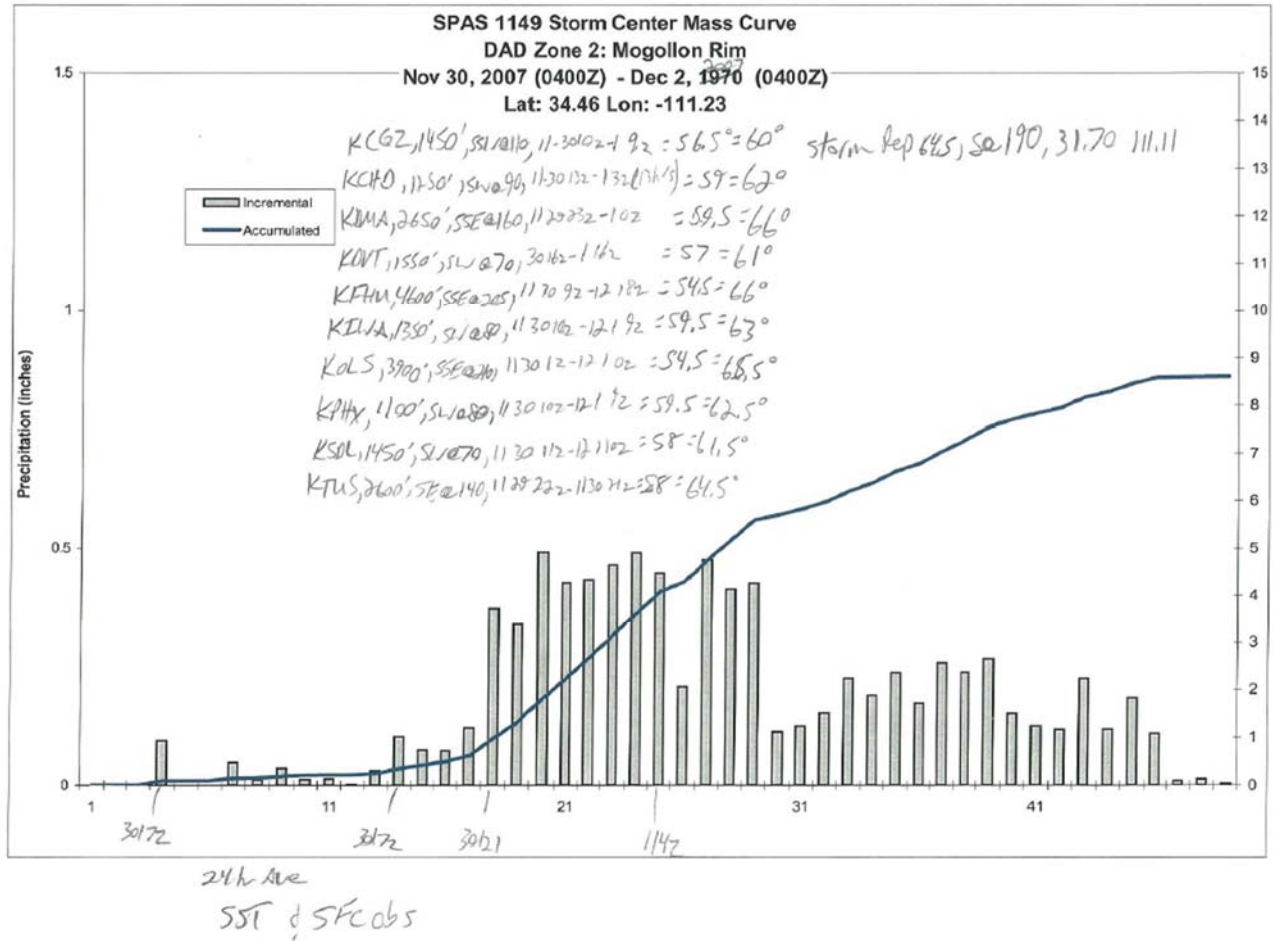


Metstat/AWA October 16, 2009

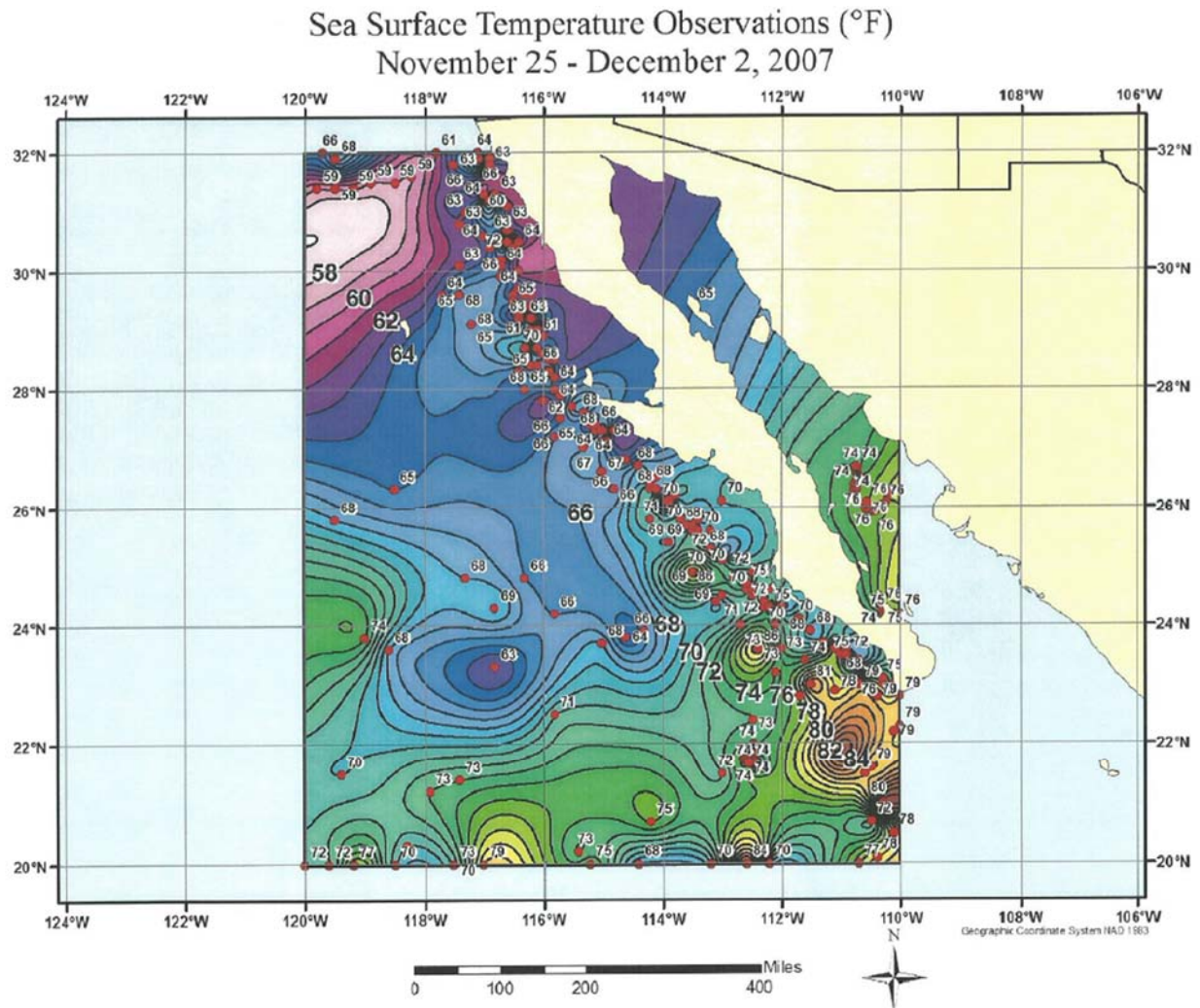
NOAA HYSPLIT MODEL
Backward trajectory ending at 1800 UTC 30 Nov 07
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



Peterson Ranch, AZ

January 19-22, 2010

Storm Type: General Frontal

Storm Precipitation Analysis System (SPAS) For Storm #1200_2

General Storm Location: Arizona

Storm Dates: January 19 0100 UTC – January 22, 2010 2300 UTC (95 hours)

Event: Synoptic/Winter Storm

DAD Zone 2 – Mogollon Rim

Latitude: 33.81

Longitude: -110.91

Max. Grid Rainfall Amount: 14.93"

Number of Stations: 1228 (362 Daily, 503 Hourly, 47 Hourly Estimated, 10 Hourly Estimated Pseudo, 108 Hourly Pseudo, 181 Supplemental, and 17 Supplemental Estimated)

SPAS Version: 8.5

Base Map Used: Mean (1971-2000) PRISM January Precipitation

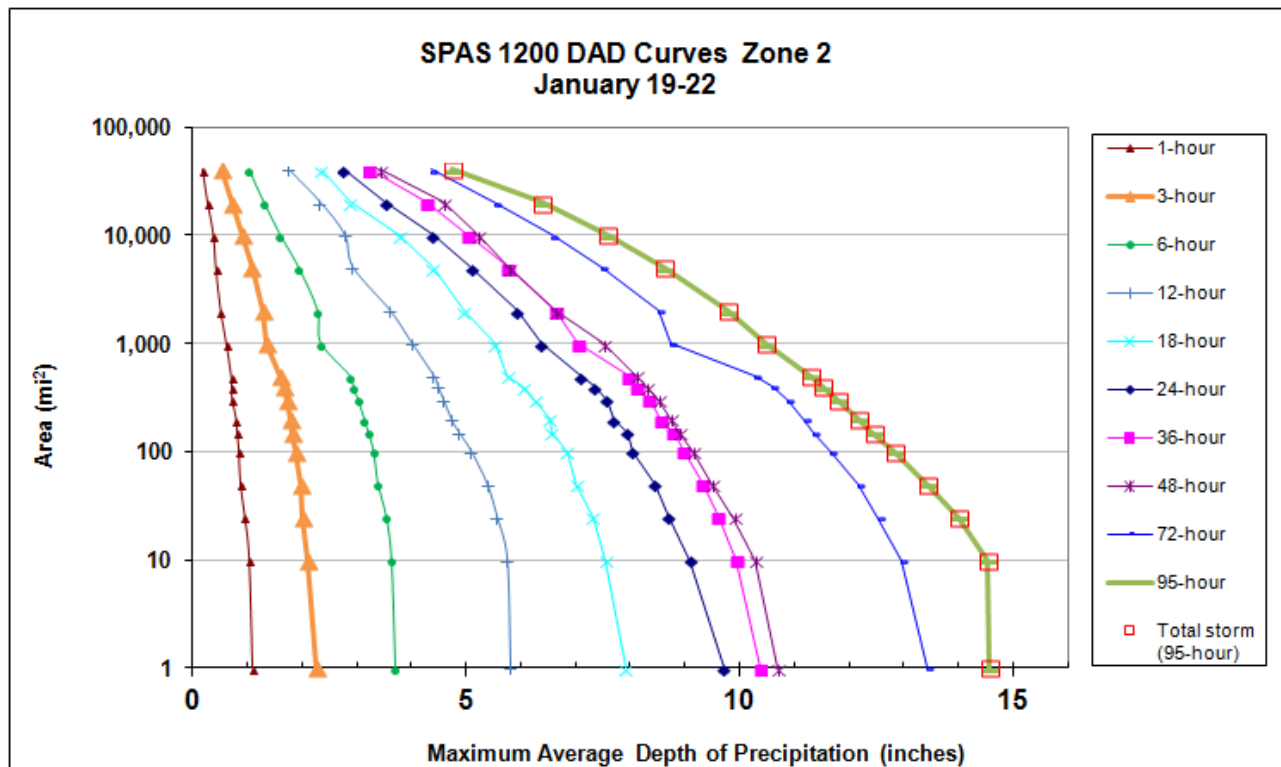
Spatial resolution: 36 seconds (0.4 sq-mi grid cells)

Radar Included: Yes

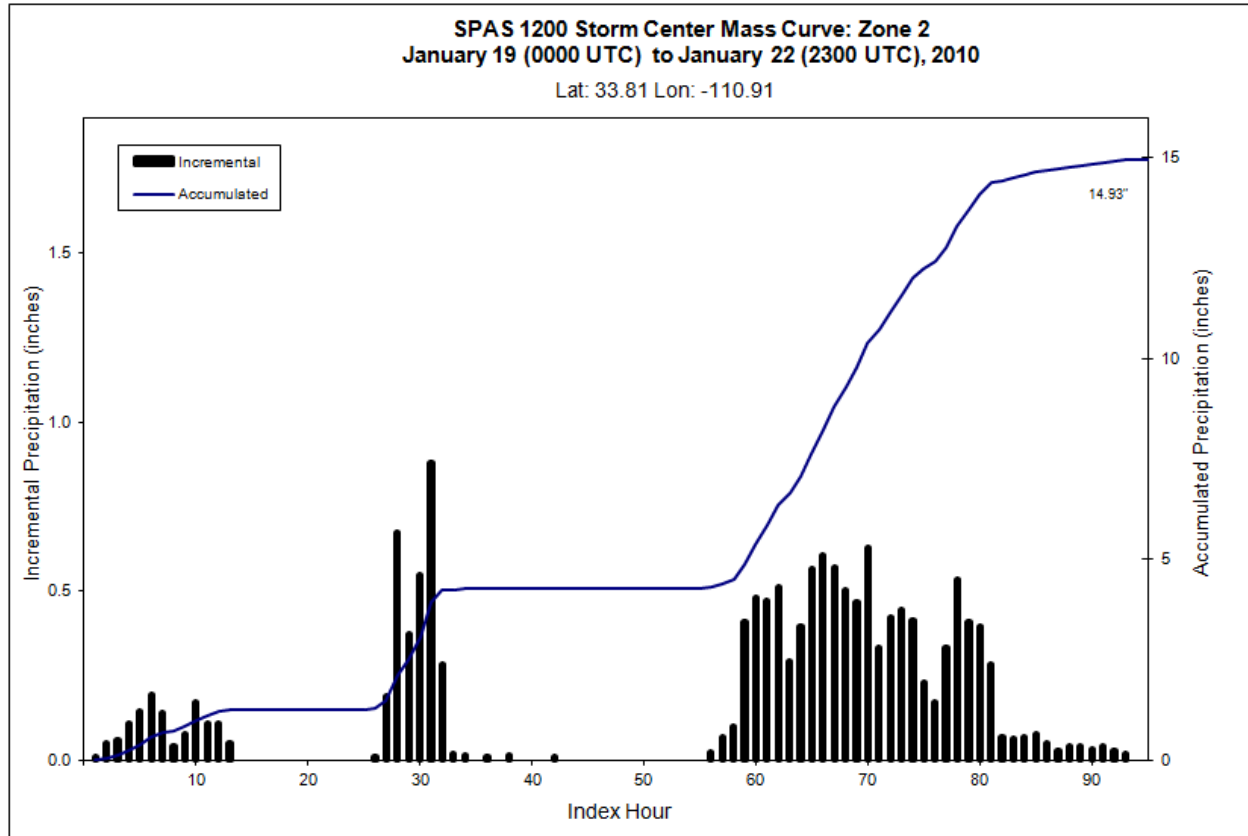
Depth-Area-Duration (DAD) analysis: Yes

CO-NM Regional Extreme Precipitation Study

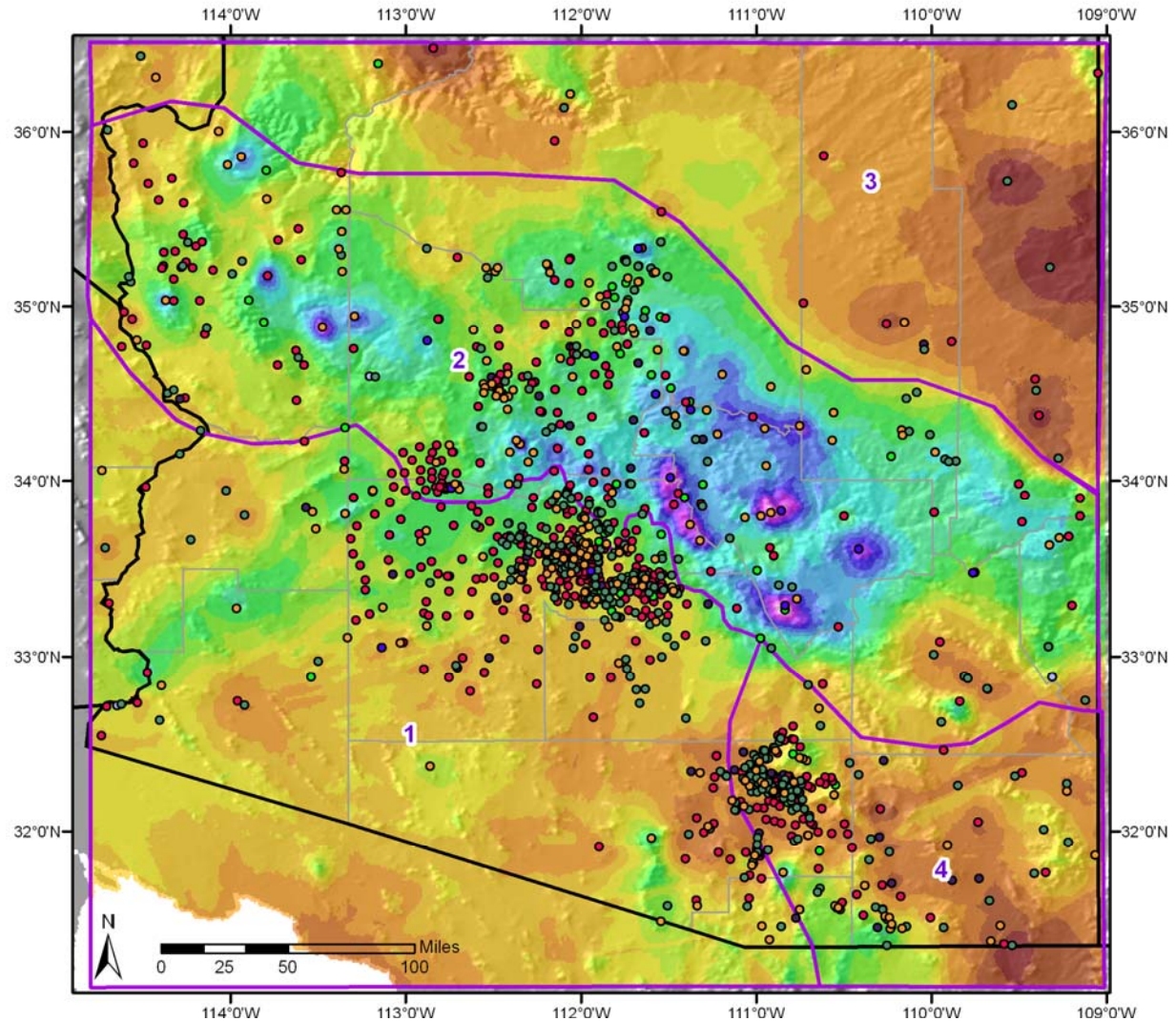
Storm 1200 - January 19, 2010 (0000 UTC) - January 22, 2010 (0400 UTC)											
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)											
Area (mi ²)	Duration (hours)										
	1	3	6	12	18	24	36	48	72	95	Total
0	1.15	2.33	3.8	6.03	8.09	9.98	10.6	10.99	13.66	14.93	14.93
1	1.1	2.26	3.71	5.81	7.92	9.72	10.39	10.7	13.43	14.57	14.57
10	1.04	2.09	3.64	5.75	7.56	9.1	9.94	10.27	12.95	14.52	14.52
25	0.96	2.01	3.54	5.56	7.31	8.7	9.62	9.89	12.53	13.99	13.99
50	0.88	1.97	3.39	5.38	7.02	8.46	9.33	9.51	12.16	13.44	13.44
100	0.85	1.89	3.31	5.09	6.84	8.05	8.98	9.15	11.67	12.82	12.82
150	0.82	1.83	3.21	4.86	6.57	7.95	8.79	8.9	11.34	12.44	12.44
200	0.8	1.79	3.14	4.72	6.53	7.7	8.56	8.73	11.18	12.18	12.18
300	0.73	1.72	3.02	4.58	6.26	7.57	8.36	8.52	10.89	11.79	11.79
400	0.72	1.66	2.94	4.48	6.04	7.36	8.14	8.31	10.6	11.51	11.51
500	0.71	1.61	2.87	4.4	5.76	7.1	7.97	8.12	10.29	11.28	11.28
1,000	0.62	1.34	2.34	4	5.53	6.37	7.05	7.51	8.75	10.48	10.48
2,000	0.52	1.29	2.28	3.6	4.95	5.93	6.64	6.64	8.51	9.78	9.78
5,000	0.43	1.08	1.93	2.92	4.4	5.1	5.78	5.78	7.49	8.6	8.60
10,000	0.39	0.9	1.59	2.77	3.78	4.39	5.04	5.21	6.57	7.58	7.58
20,000	0.28	0.71	1.29	2.32	2.88	3.53	4.28	4.59	5.51	6.37	6.37
40,231	0.19	0.53	1.02	1.74	2.35	2.77	3.23	3.43	4.36	4.74	4.74



CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



Hourly and daily station data extraction information:

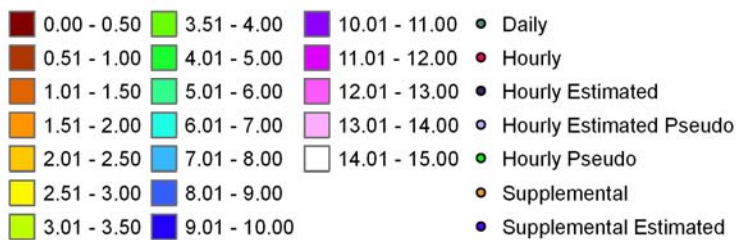
SPAS storm number: 1200

Begin: 01/19/2010 0000Z

End: 01/22/2010 2359Z

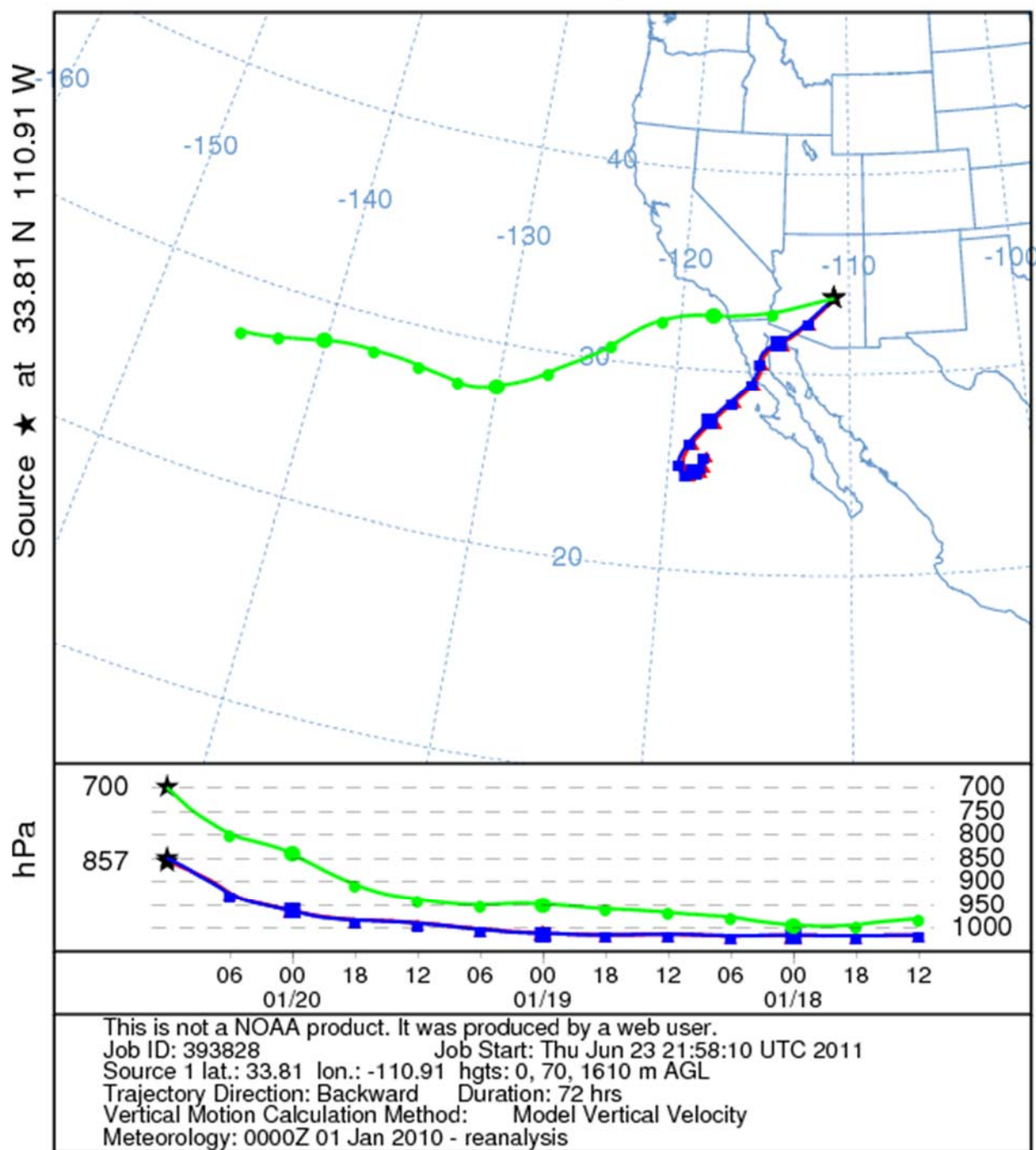
Domain: 36.5 -114.8 31.1 -109.0

Precipitation (inches)

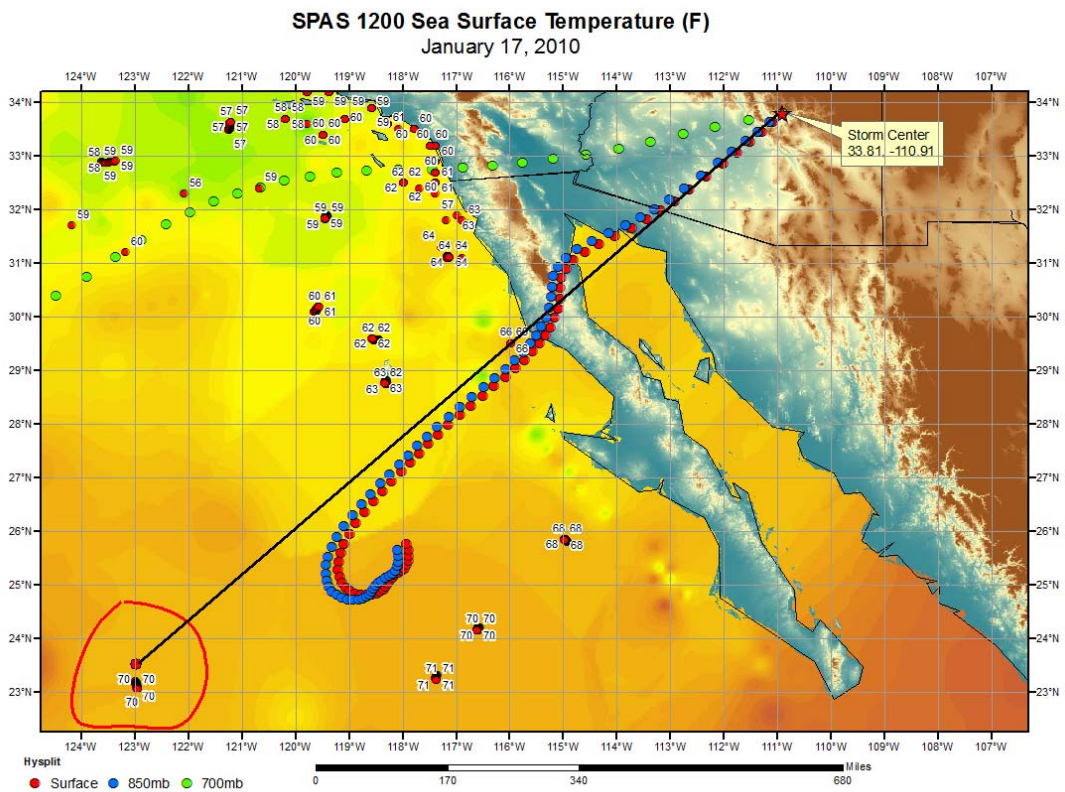
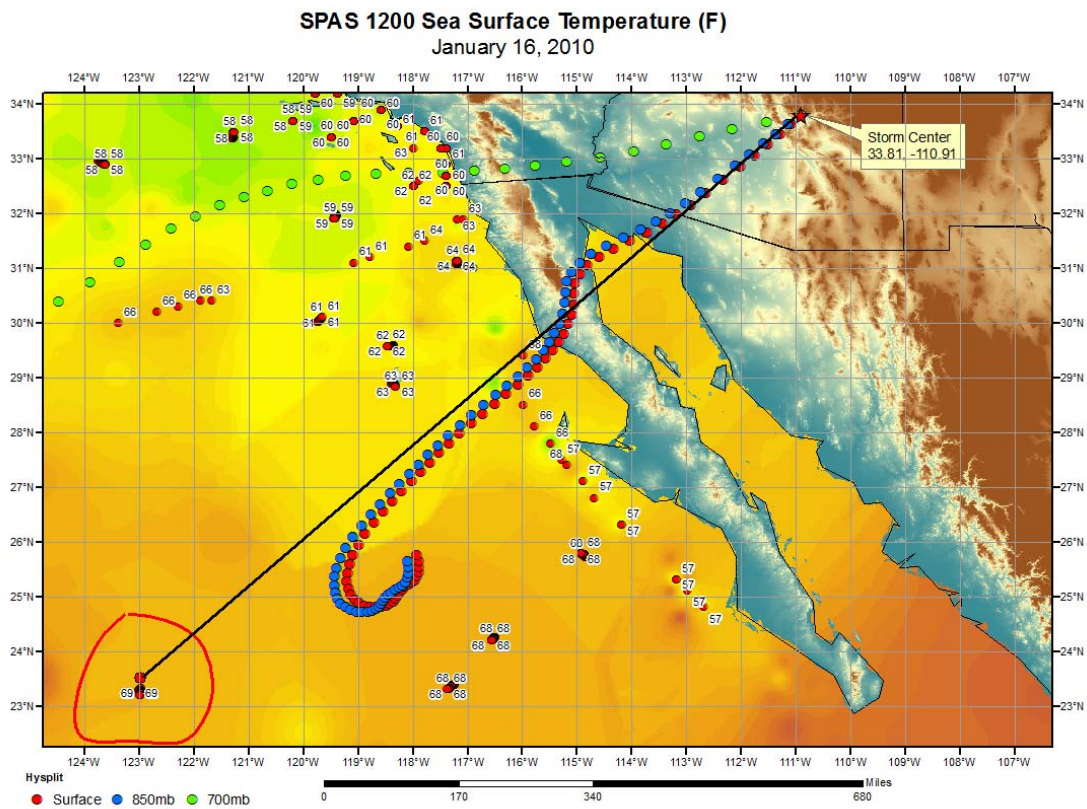


METSTAT 1/3/2011

NOAA HYSPLIT MODEL
Backward trajectories ending at 1200 UTC 20 Jan 10
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study



Santa Rita Exp Range, AZ

January 19-22, 2010

Storm Type: General Frontal

Storm Precipitation Analysis System (SPAS) For Storm #1200_4

General Storm Location: Arizona

Storm Dates: January 19 0100 UTC – January 22, 2010 2300 UTC (95 hours)

Event: Synoptic/Winter Storm

DAD Zone 4 – Southeastern Arizona Basin and Range

Latitude: 31.76

Longitude: -110.84

Max. Grid Rainfall Amount: 6.63"

Number of Stations: 1228 (362 Daily, 503 Hourly, 47 Hourly Estimated, 10 Hourly Estimated Pseudo, 108 Hourly Pseudo, 181 Supplemental, and 17 Supplemental Estimated)

SPAS Version: 8.5

Base Map Used: Mean (1971-2000) PRISM January Precipitation

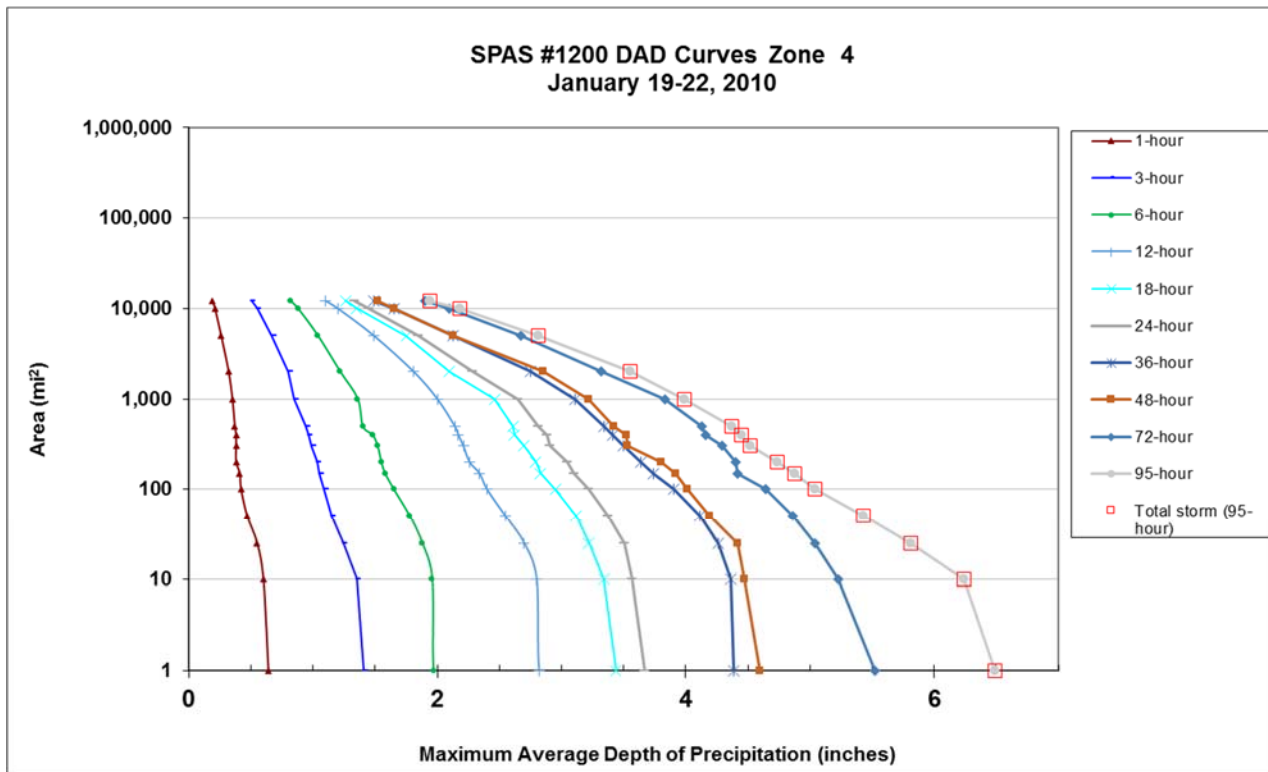
Spatial resolution: 36 seconds (0.4 sq-mi grid cells)

Radar Included: Yes

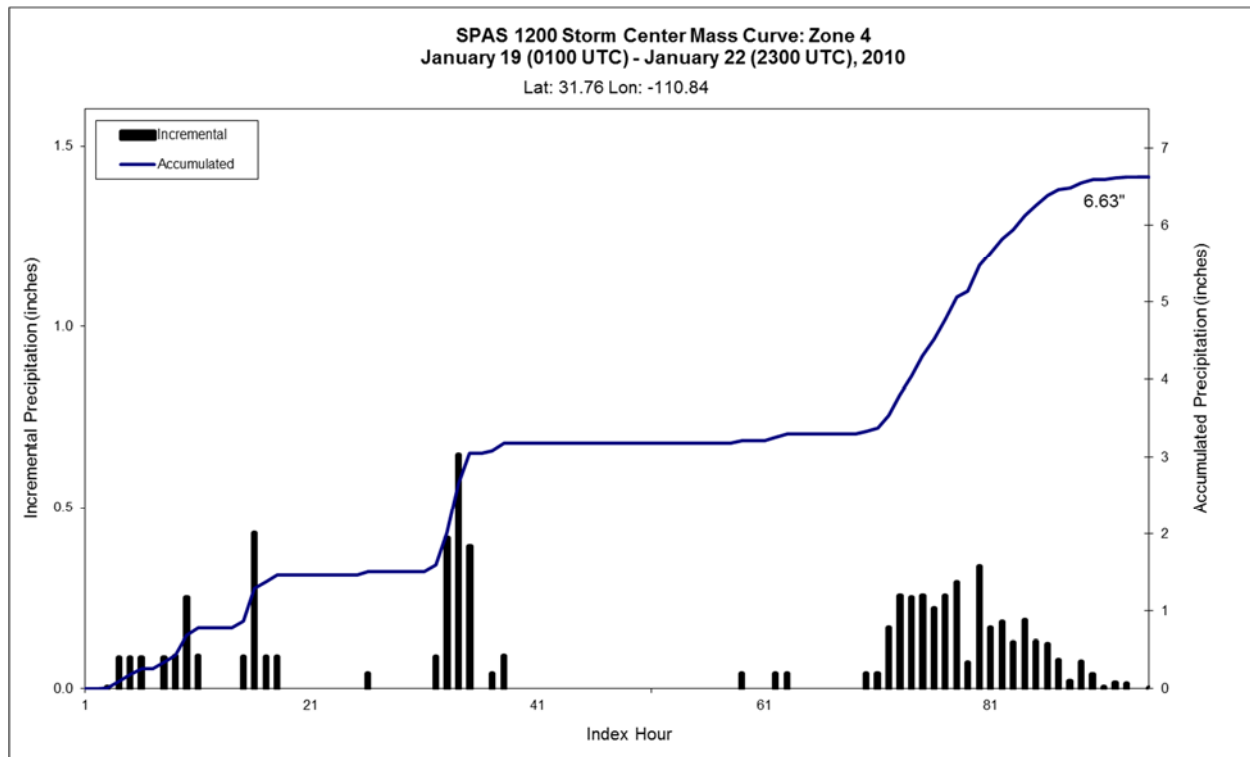
Depth-Area-Duration (DAD) analysis: Yes

CO-NM Regional Extreme Precipitation Study

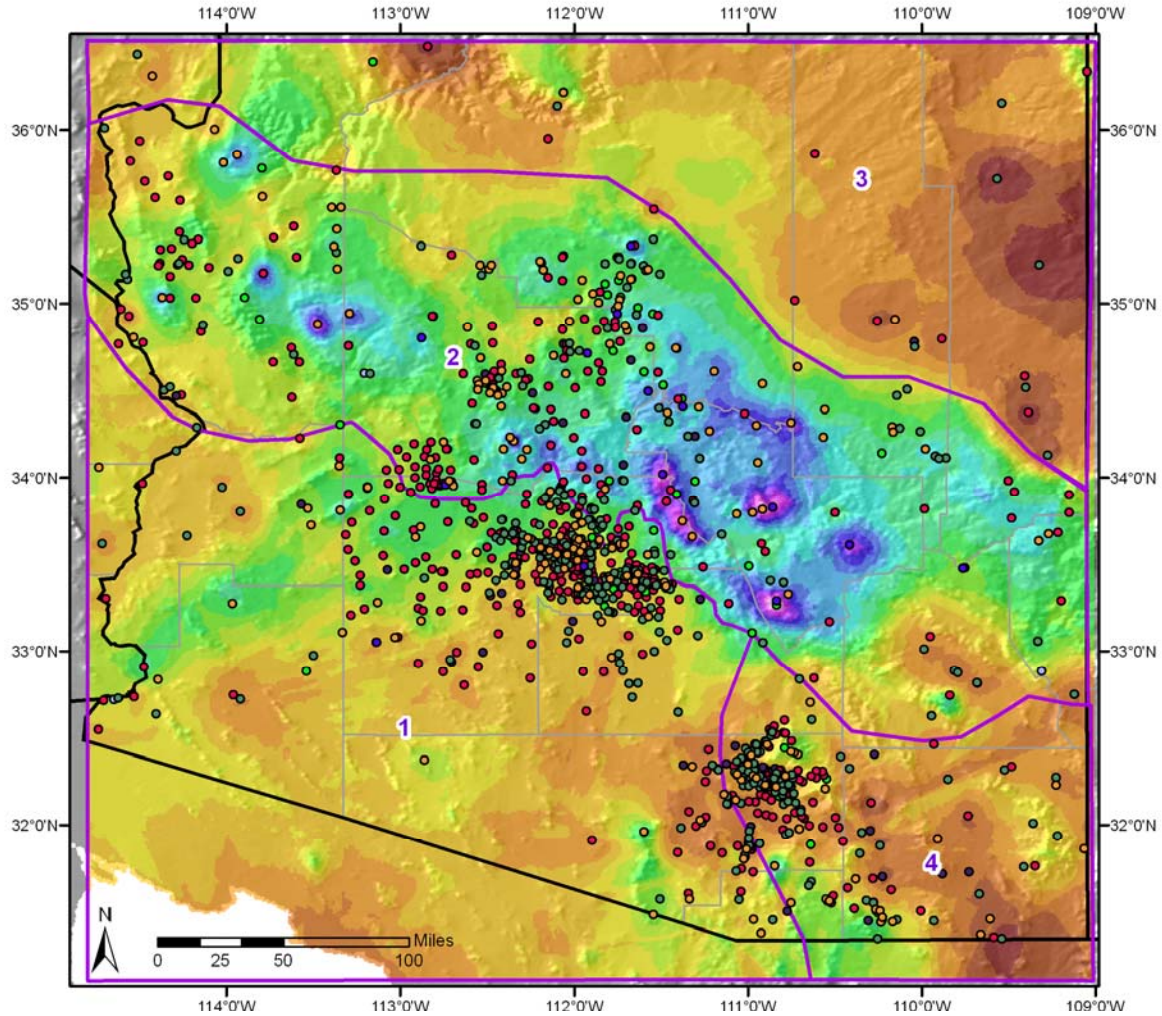
Storm 1200 - January 19 (0100 UTC) - January 22 (2300 UTC), 2010											
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)											
Area (mi ²)	Duration (hours)										
	1	3	6	12	18	24	36	48	72	95	Total
0.4	0.65	1.45	2.04	2.92	3.51	3.80	4.50	4.74	5.61	6.63	6.63
1	0.64	1.41	1.97	2.82	3.44	3.67	4.39	4.60	5.52	6.49	6.49
10	0.60	1.35	1.96	2.80	3.34	3.57	4.36	4.47	5.23	6.24	6.24
25	0.55	1.24	1.88	2.70	3.22	3.51	4.26	4.42	5.04	5.81	5.81
50	0.47	1.15	1.78	2.55	3.12	3.37	4.11	4.19	4.86	5.43	5.43
100	0.42	1.09	1.65	2.40	2.95	3.22	3.90	4.01	4.64	5.04	5.04
150	0.41	1.05	1.58	2.34	2.83	3.10	3.74	3.92	4.42	4.88	4.88
200	0.38	1.03	1.55	2.26	2.79	3.05	3.64	3.80	4.40	4.74	4.74
300	0.38	0.99	1.52	2.21	2.70	2.91	3.50	3.53	4.29	4.52	4.52
400	0.38	0.96	1.48	2.17	2.62	2.88	3.41	3.52	4.16	4.45	4.45
500	0.37	0.94	1.40	2.14	2.61	2.81	3.34	3.42	4.13	4.37	4.37
1,000	0.35	0.85	1.36	2.00	2.46	2.65	3.11	3.22	3.83	3.99	3.99
2,000	0.32	0.80	1.22	1.81	2.10	2.28	2.75	2.85	3.32	3.55	3.55
5,000	0.26	0.67	1.04	1.49	1.75	1.85	2.13	2.13	2.67	2.81	2.81
10,000	0.21	0.55	0.88	1.20	1.35	1.45	1.65	1.65	2.10	2.18	2.18
12,193	0.19	0.50	0.82	1.10	1.26	1.33	1.49	1.52	1.90	1.94	1.94



CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



Hourly and daily station data extraction information:

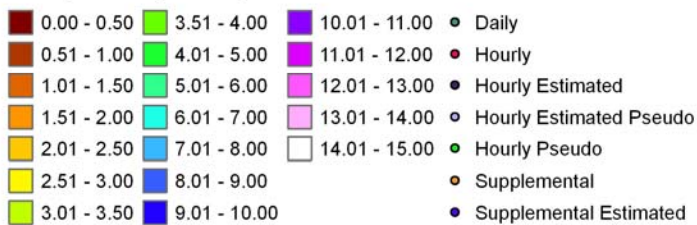
SPAS storm number: 1200

Begin: 01/19/2010 0000Z

End: 01/22/2010 2359Z

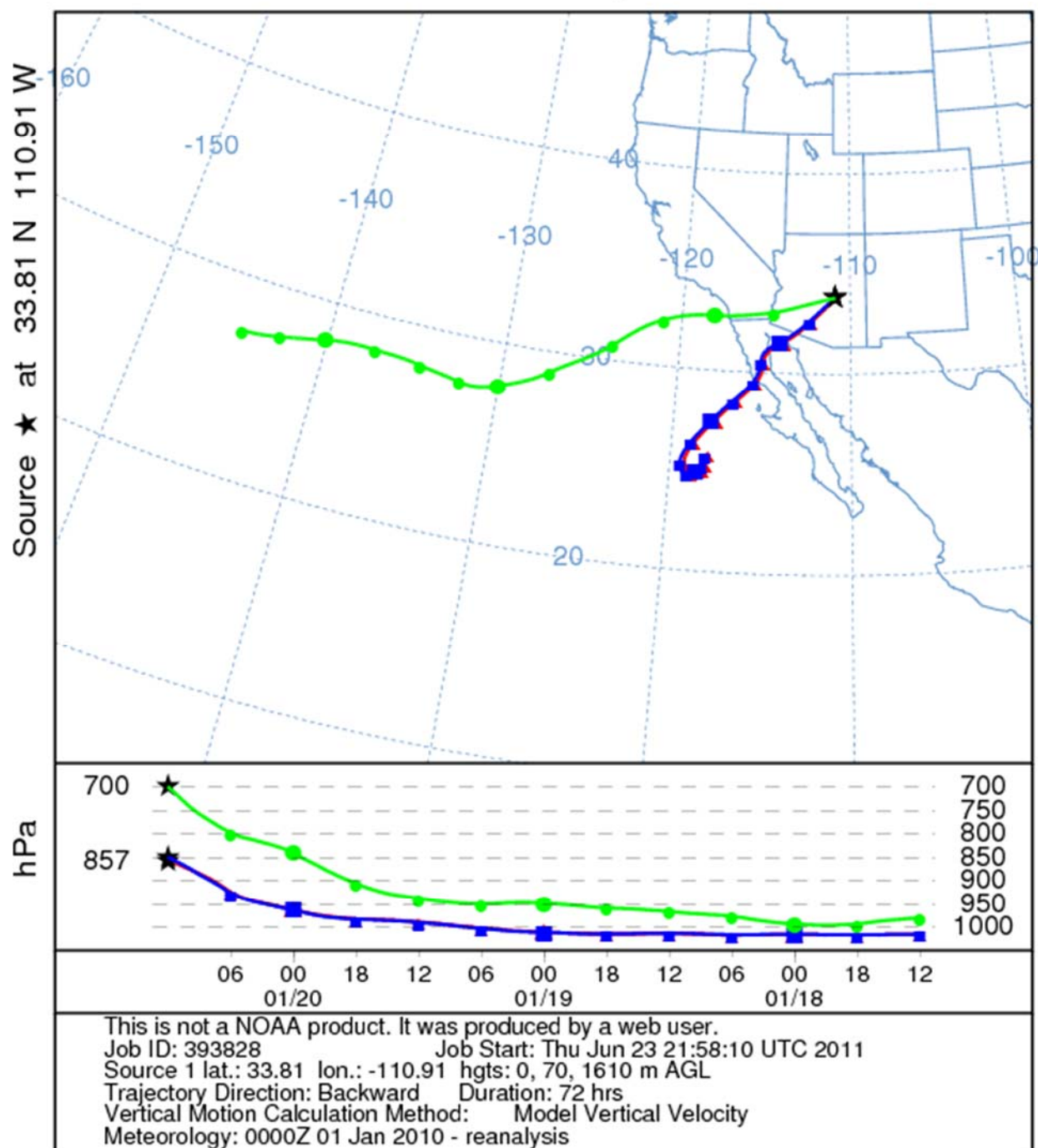
Domain: 36.5 -114.8 31.1 -109.0

Precipitation (inches)

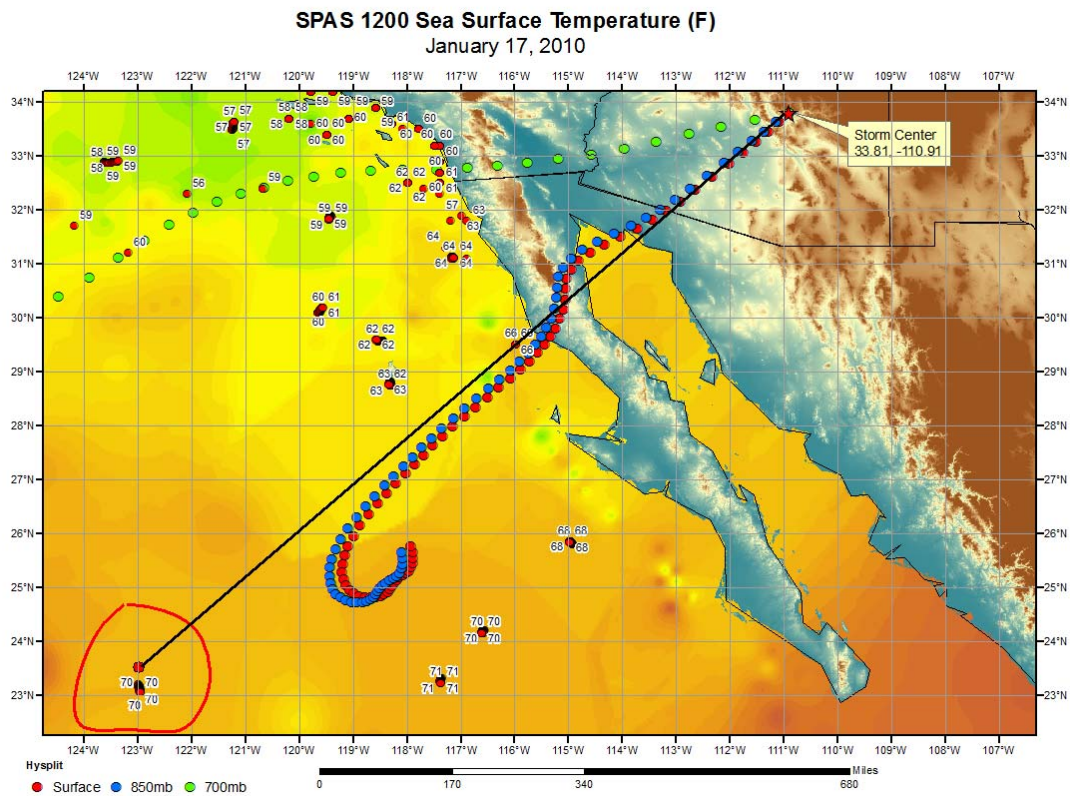
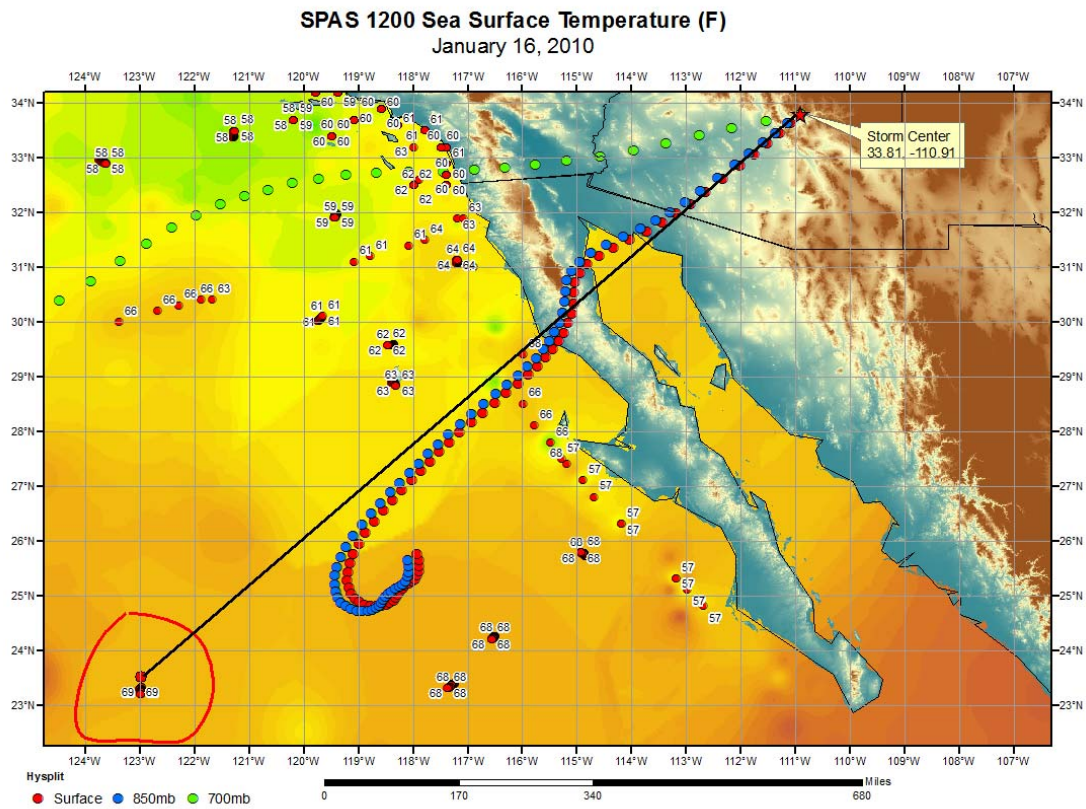


METSTAT 1/3/2011

NOAA HYSPLIT MODEL
Backward trajectories ending at 1200 UTC 20 Jan 10
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study



Andrew Nyman Mountain, UT

October 23-26, 2010

Storm Type: General

Storm Precipitation Analysis System (SPAS) For Storm #1241_1

General Storm Location: Northern Utah, southwestern Wyoming and southeastern Idaho

Storm Dates: October 23-26, 2010

Event: General storm

DAD Zone 1* – southeastern Idaho and extreme northern Utah

Latitude: 42.05

Longitude: -111.62

Max. Grid Rainfall Amount: 4.39"

Number of Stations: 306

SPAS Version: 9.5

Basemap: PRISM Mean (1981-2010) October precipitation

Spatial resolution: 36 seconds (~ 0.36 mi²)

Radar Included: Yes (No missing data)

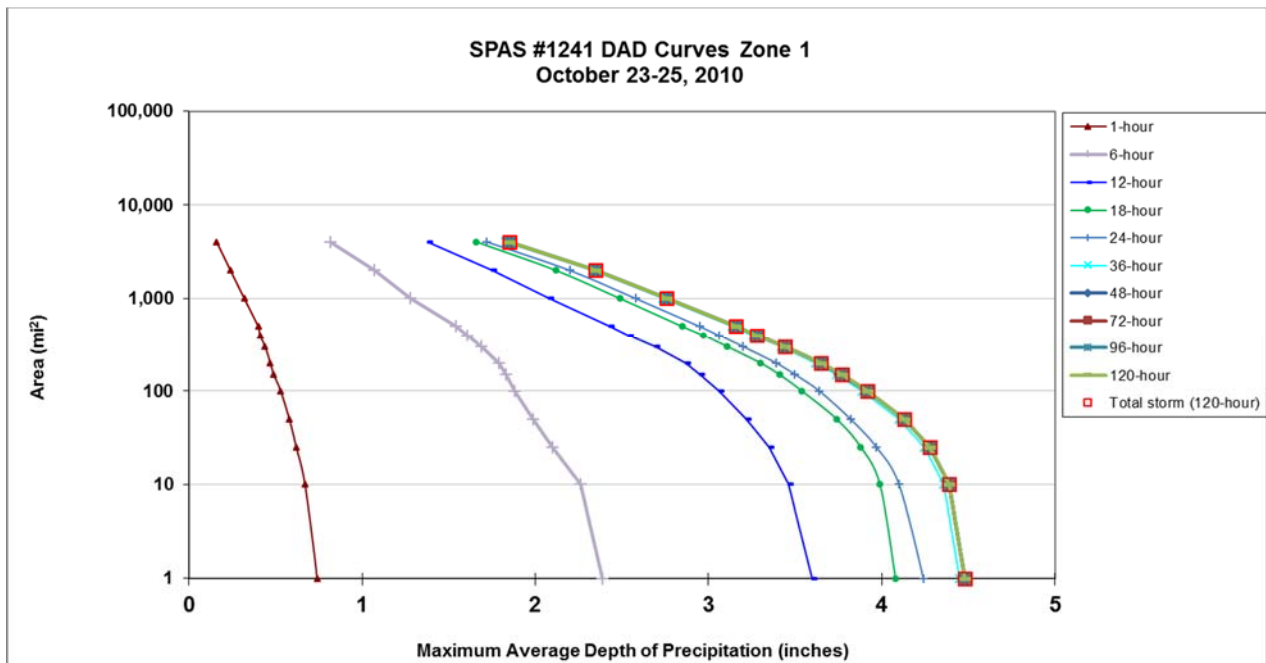
Depth-Area-Duration (DAD) analysis: Yes, 3 zones. The DAD zones were dictated by confidence in the results, radar extents, storm similarities, storm centers and likelihood of the precipitation co-occurring in space. All of the centers had similar timing.

***NOTE:** *In order for the DAD results to represent liquid precipitation, the DAD analysis was constrained to hours 1-50, when the dominate precipitation type was rain.*

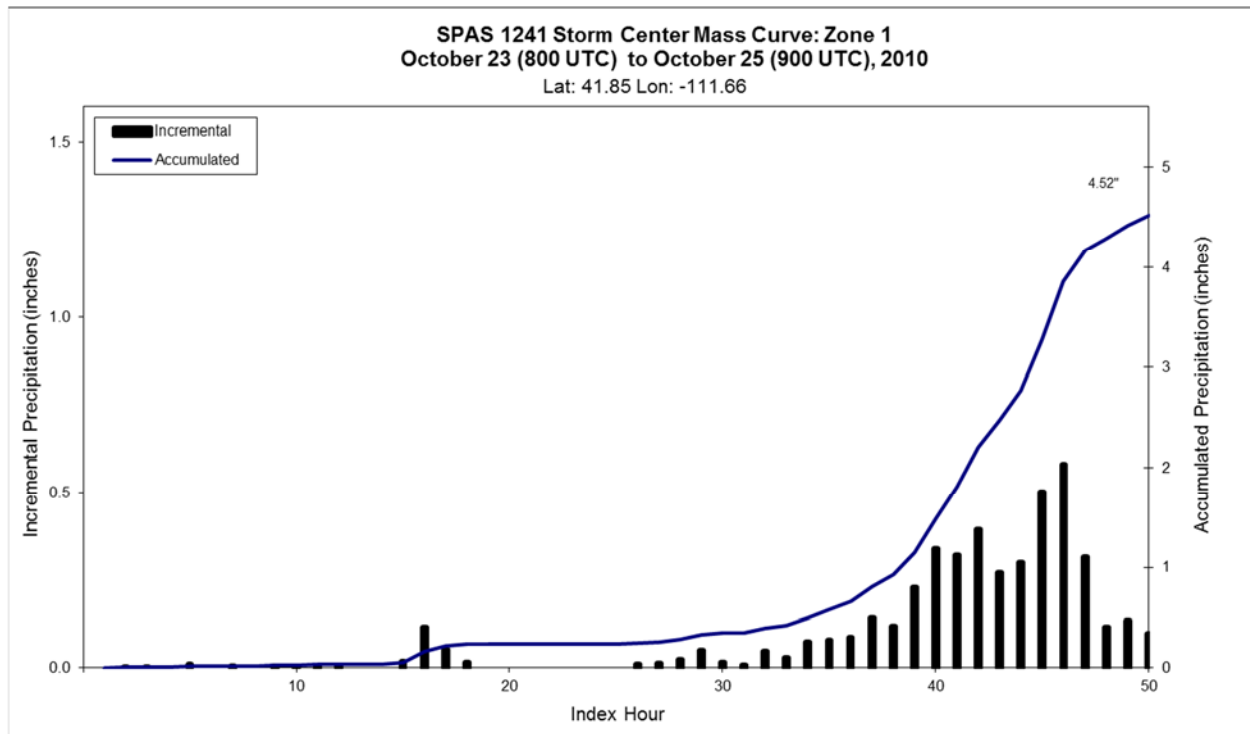
Reliability of results: Although this relatively recent storm had a good deal of ground truth data, data still lacked in the some of the mountainous areas in/around the three main storm centers. The storm started off vigorously with thunderstorms, hail and heavy rain, but then transitioned into a winter storm with snow generally at/above 4,500 feet elevation which introduced error into the rain gauge measurements. No radar data was missing from the QC'd mosaic, but beam blockage occurred at many areas in the mountains. Overall, confidence in this analysis is good, but not great.

CO-NM Regional Extreme Precipitation Study

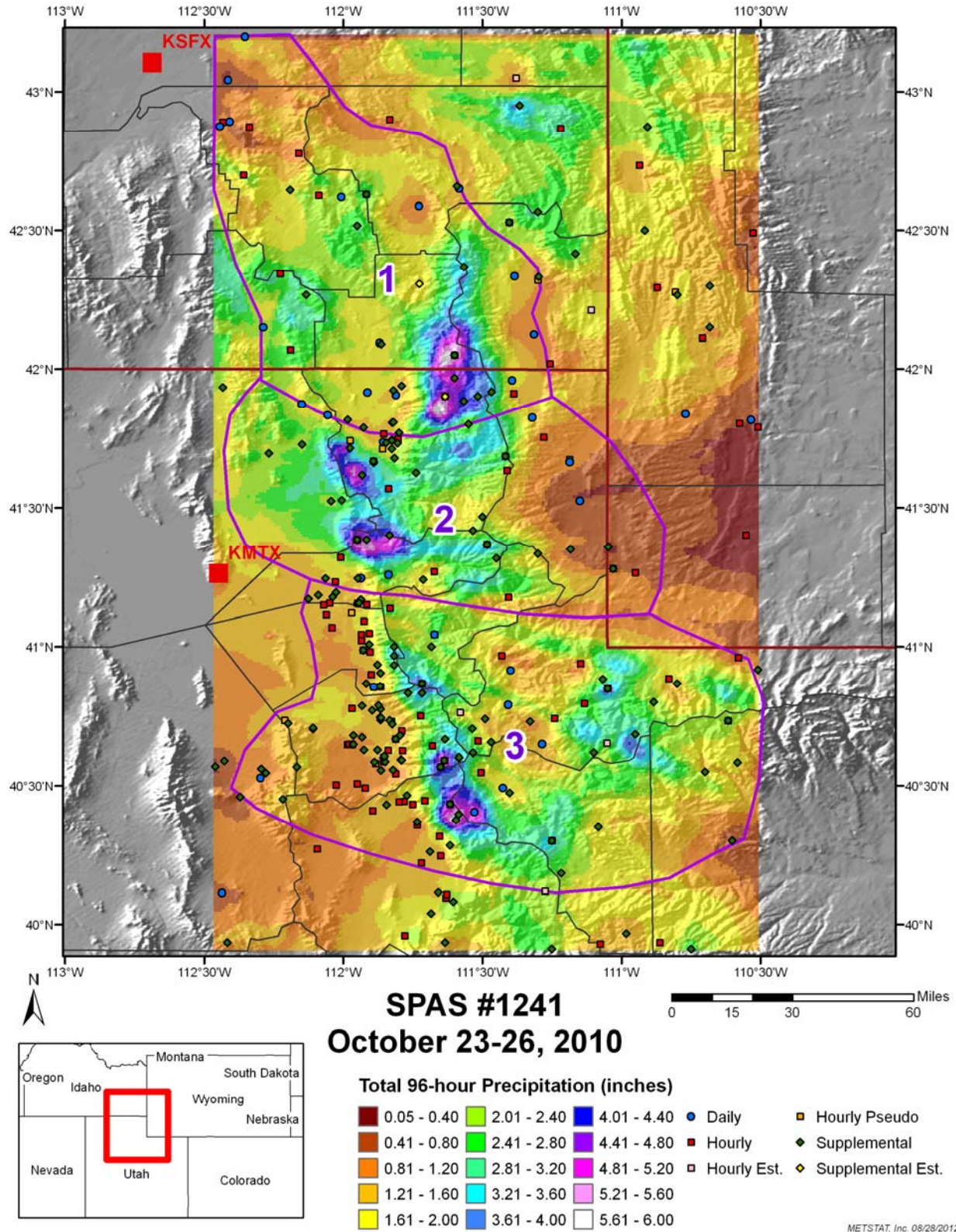
Storm 1241 - October 23 (800 UTC) - October 25 (900 UTC), 2010											
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)											
Area (mi ²)	Duration (hours)										
	1	6	12	18	24	36	48	72	96	120	Total
0.4	0.75	2.41	3.62	4.11	4.27	4.48	4.51	4.51	4.51	4.51	4.51
1	0.74	2.39	3.60	4.08	4.24	4.45	4.48	4.48	4.48	4.48	4.48
10	0.67	2.26	3.46	3.99	4.10	4.36	4.39	4.39	4.39	4.39	4.39
25	0.62	2.10	3.35	3.88	3.97	4.25	4.28	4.28	4.28	4.28	4.28
50	0.58	1.99	3.22	3.74	3.82	4.10	4.13	4.13	4.13	4.13	4.13
100	0.53	1.88	3.06	3.54	3.64	3.89	3.92	3.92	3.92	3.92	3.92
150	0.49	1.83	2.95	3.41	3.50	3.74	3.76	3.77	3.77	3.77	3.77
200	0.47	1.79	2.87	3.30	3.39	3.62	3.65	3.65	3.65	3.65	3.65
300	0.44	1.69	2.69	3.11	3.20	3.42	3.44	3.44	3.44	3.44	3.44
400	0.41	1.61	2.54	2.97	3.06	3.26	3.28	3.28	3.28	3.28	3.28
500	0.40	1.54	2.43	2.85	2.95	3.14	3.16	3.16	3.16	3.16	3.16
1,000	0.32	1.28	2.08	2.49	2.58	2.74	2.76	2.76	2.76	2.76	2.76
2,000	0.24	1.07	1.75	2.12	2.20	2.33	2.35	2.35	2.35	2.35	2.35
4,055	0.16	0.82	1.38	1.66	1.72	1.83	1.85	1.85	1.85	1.85	1.85



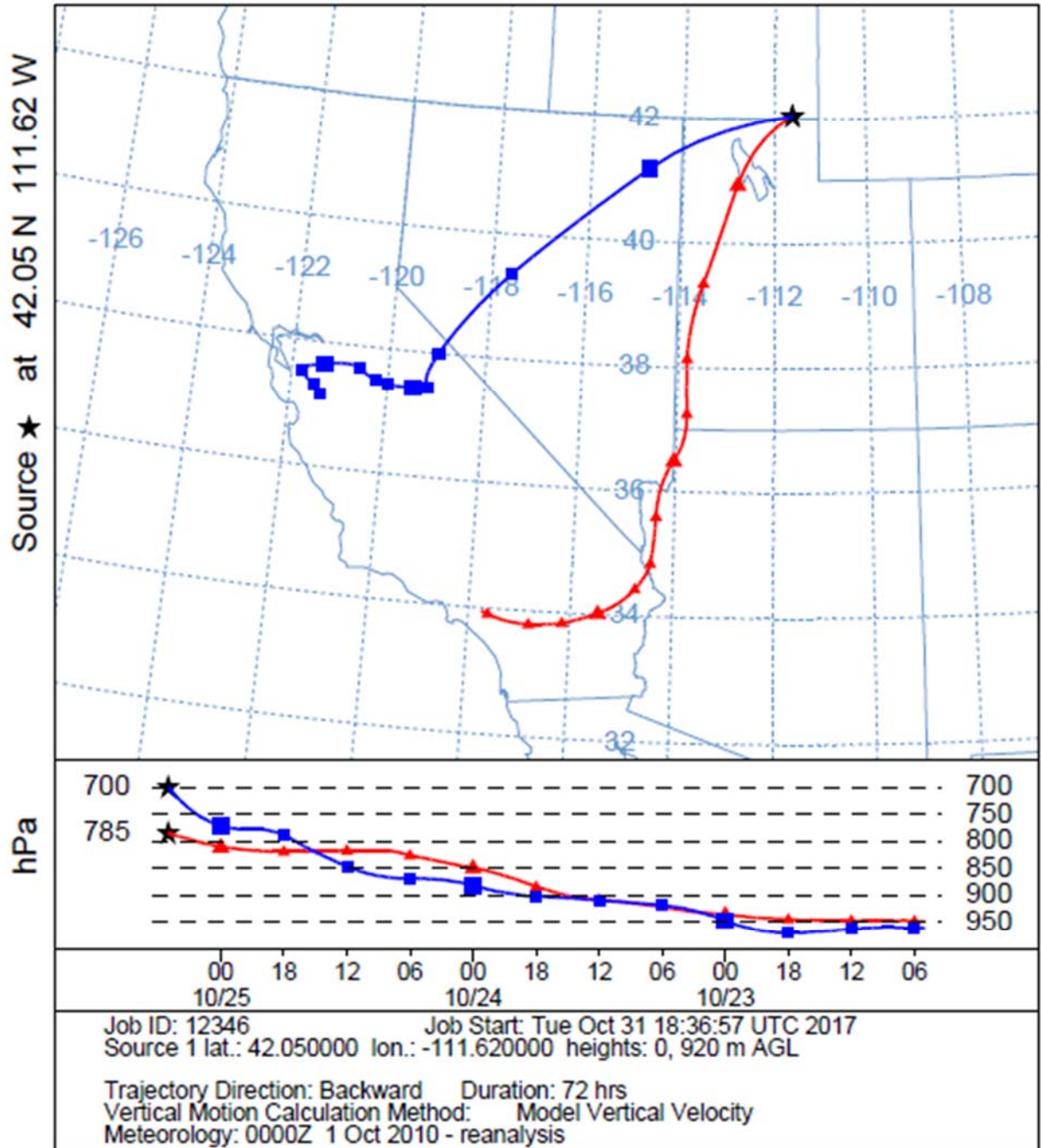
CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study

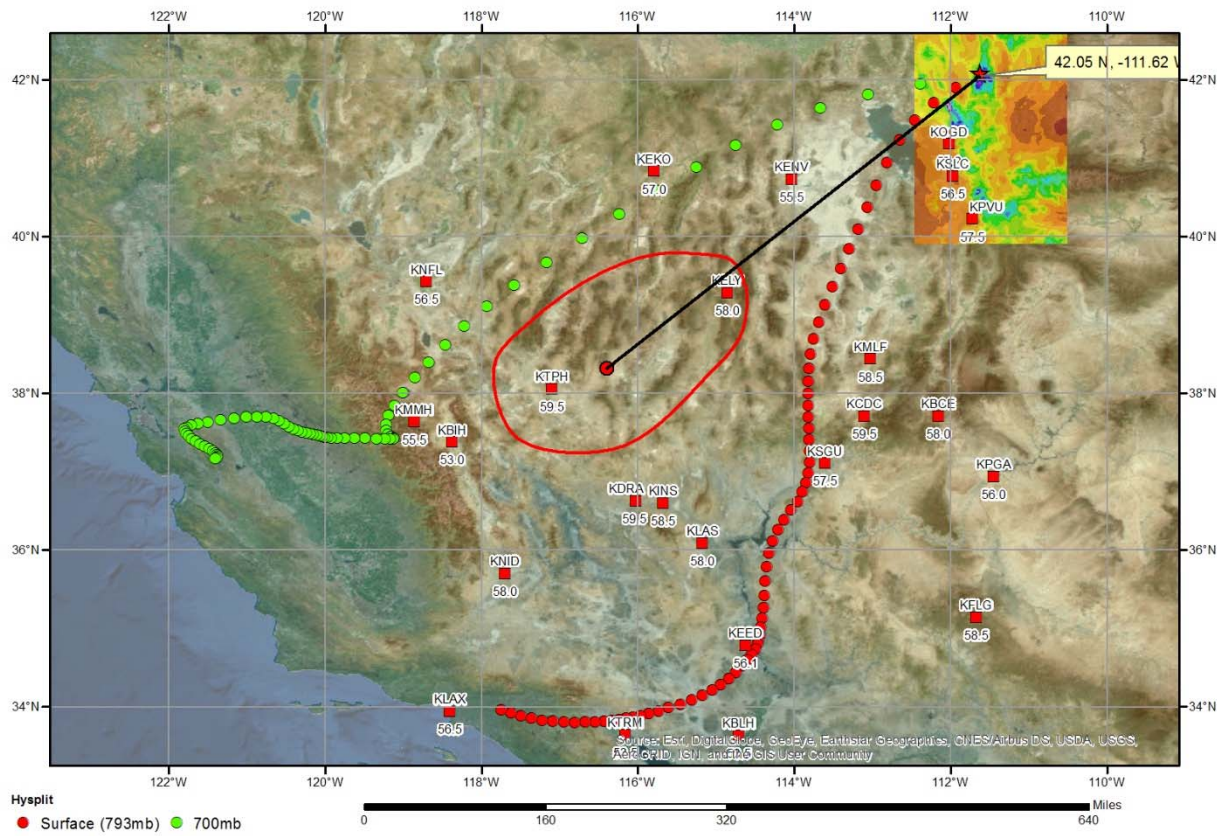


NOAA HYSPLIT MODEL
Backward trajectories ending at 0500 UTC 25 Oct 10
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study

SPAS 1241 Andrew Nyman Mtn, UT Storm Analysis October 22-24, 2010



Deer Creek Dam, UT

October 23-26, 2010

Storm Type: General

Storm Precipitation Analysis System (SPAS) For Storm #1241_2

General Storm Location: Northern Utah, southwestern Wyoming and southeastern Idaho

Storm Dates: October 23-26, 2010

Event: General storm

DAD Zone 2* – Northern Utah Mountains

Latitude: 41.63

Longitude: -111.97

Max. Grid Rainfall Amount: 5.09"

Number of Stations: 306

SPAS Version: 9.5

Basemap: PRISM Mean (1981-2010) October precipitation

Spatial resolution: 36 seconds (~ 0.36 mi²)

Radar Included: Yes (No missing data)

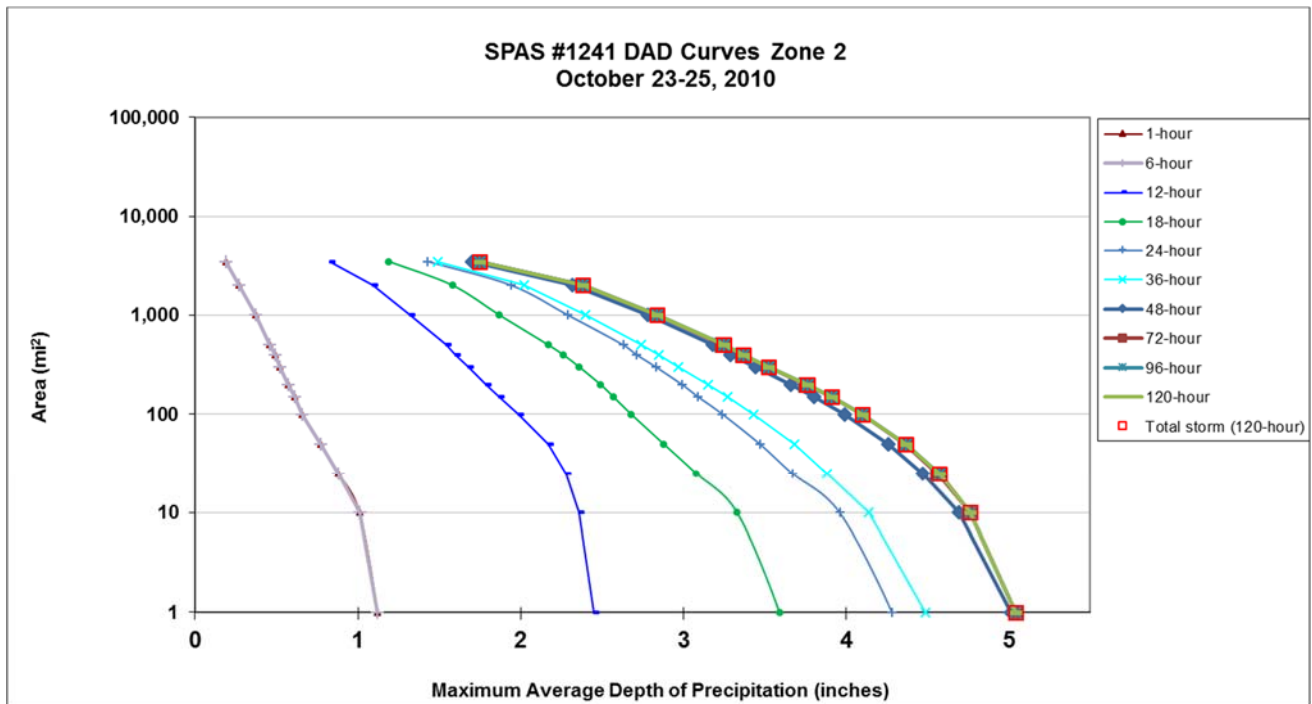
Depth-Area-Duration (DAD) analysis: Yes, 3 zones. The DAD zones were dictated by confidence in the results, radar extents, storm similarities, storm centers and likelihood of the precipitation co-occurring in space. All of the centers had similar timing.

***NOTE:** *In order for the DAD results to represent liquid precipitation, the DAD analysis was constrained to hours 1-50, when the dominate precipitation type was rain.*

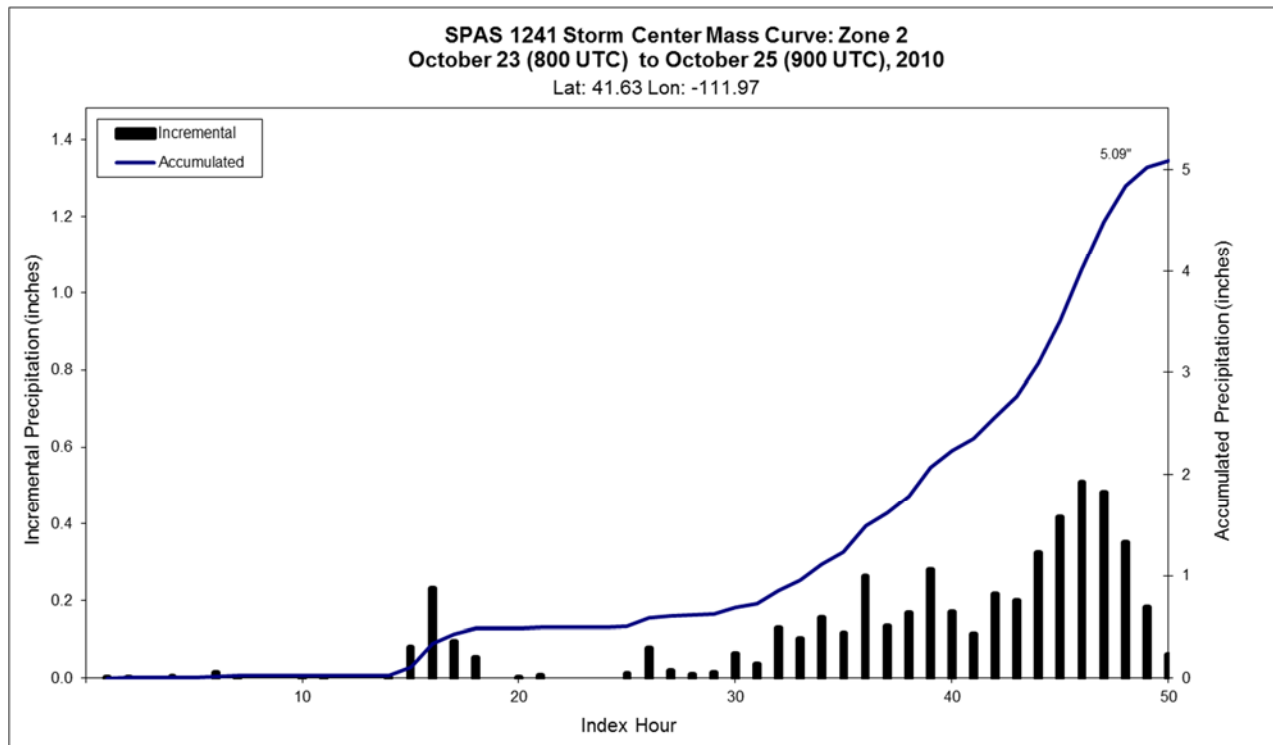
Reliability of results: Although this relatively recent storm had a good deal of ground truth data, data still lacked in some of the mountainous areas in/around the three main storm centers. The storm started off vigorously with thunderstorms, hail and heavy rain, but then transitioned into a winter storm with snow generally at/above 4,500 feet elevation which introduced error into the rain gauge measurements. No radar data was missing from the QC'd mosaic, but beam blockage occurred at many areas in the mountains. Overall, confidence in this analysis is good, but not great.

CO-NM Regional Extreme Precipitation Study

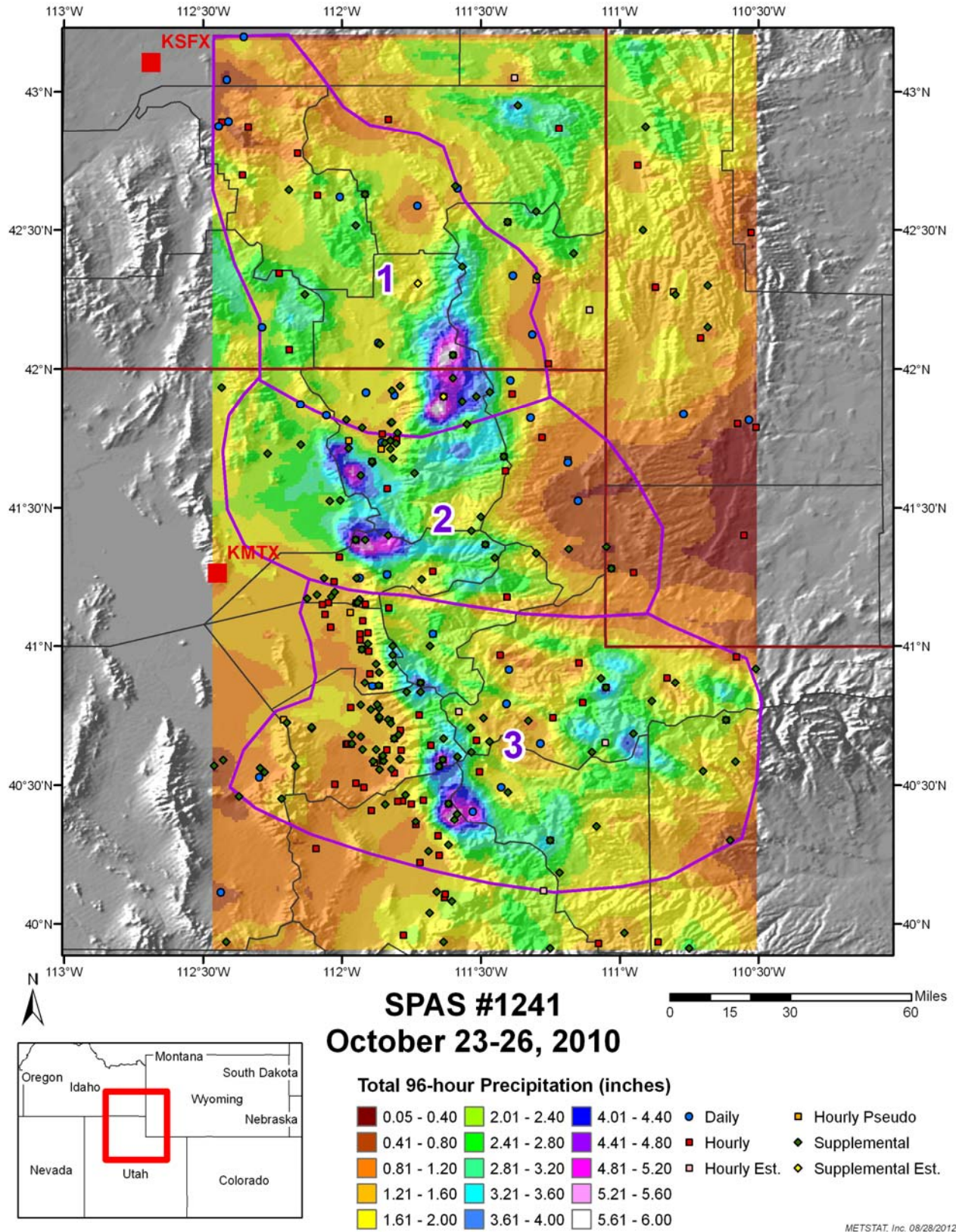
Storm 1241 - October 23 (800 UTC) - October 25 (900 UTC), 2010											
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)											
Area (mi ²)	Duration (hours)										
	1	6	12	18	24	36	48	72	96	120	Total
0.4	1.14	1.14	2.48	3.63	4.32	4.53	5.05	5.08	5.08	5.08	5.08
1	1.12	1.12	2.45	3.59	4.28	4.49	5.01	5.04	5.04	5.04	5.04
10	1.01	1.01	2.36	3.33	3.96	4.14	4.69	4.76	4.76	4.76	4.76
25	0.88	0.88	2.28	3.08	3.67	3.88	4.47	4.56	4.57	4.57	4.57
50	0.77	0.77	2.17	2.88	3.47	3.68	4.26	4.36	4.37	4.37	4.37
100	0.66	0.66	1.99	2.68	3.24	3.43	3.99	4.10	4.10	4.10	4.10
150	0.61	0.61	1.87	2.57	3.09	3.27	3.80	3.91	3.91	3.91	3.91
200	0.57	0.57	1.79	2.49	2.99	3.15	3.66	3.75	3.76	3.76	3.76
300	0.52	0.52	1.68	2.36	2.83	2.97	3.44	3.52	3.52	3.52	3.52
400	0.49	0.49	1.60	2.26	2.71	2.85	3.29	3.36	3.37	3.37	3.37
500	0.46	0.46	1.54	2.17	2.63	2.74	3.18	3.24	3.25	3.25	3.25
1,000	0.37	0.37	1.32	1.87	2.29	2.40	2.78	2.84	2.84	2.84	2.84
2,000	0.27	0.27	1.09	1.58	1.94	2.02	2.32	2.38	2.38	2.38	2.38
3,467	0.19	0.19	0.83	1.19	1.43	1.49	1.70	1.75	1.75	1.75	1.75



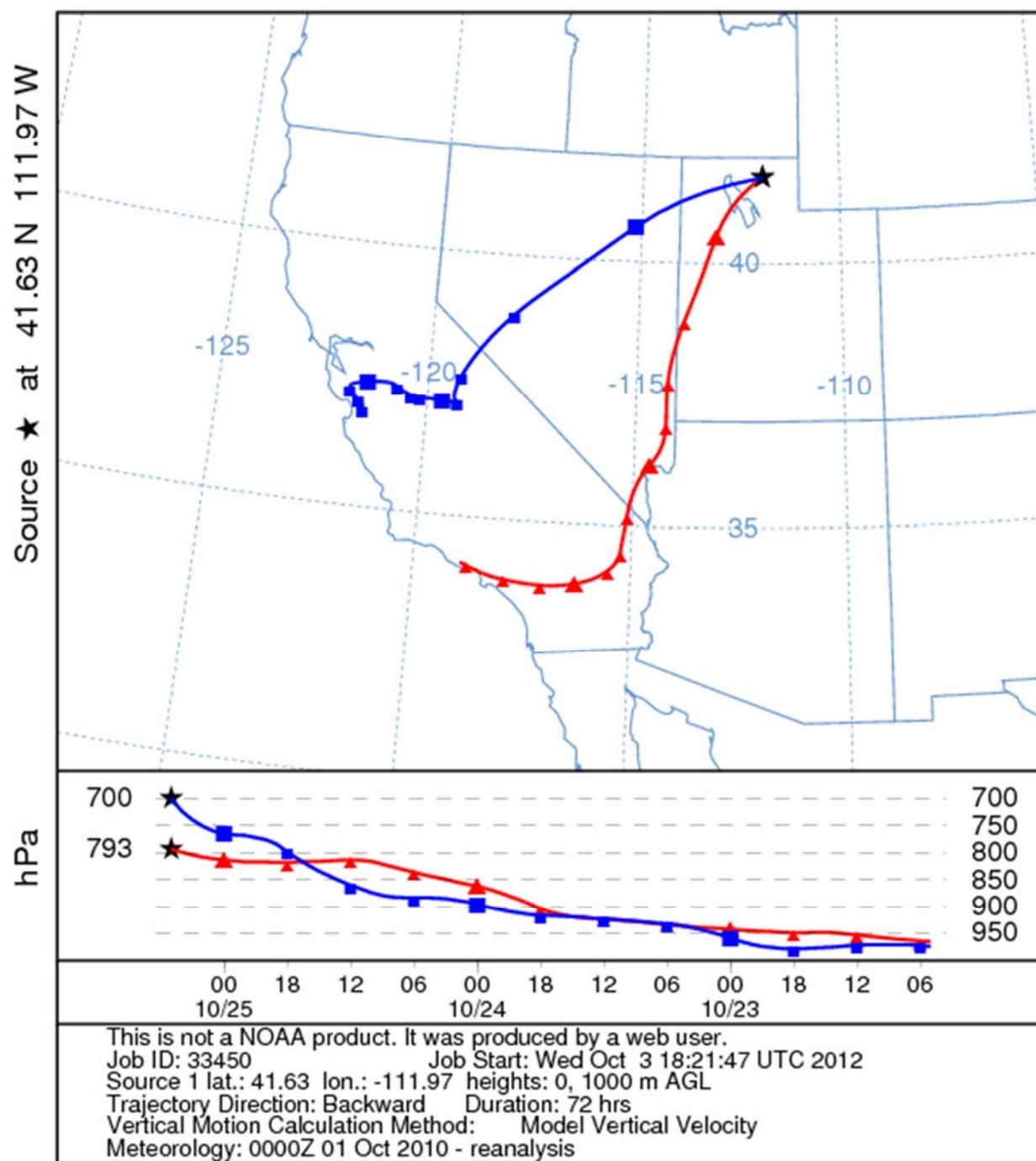
CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study

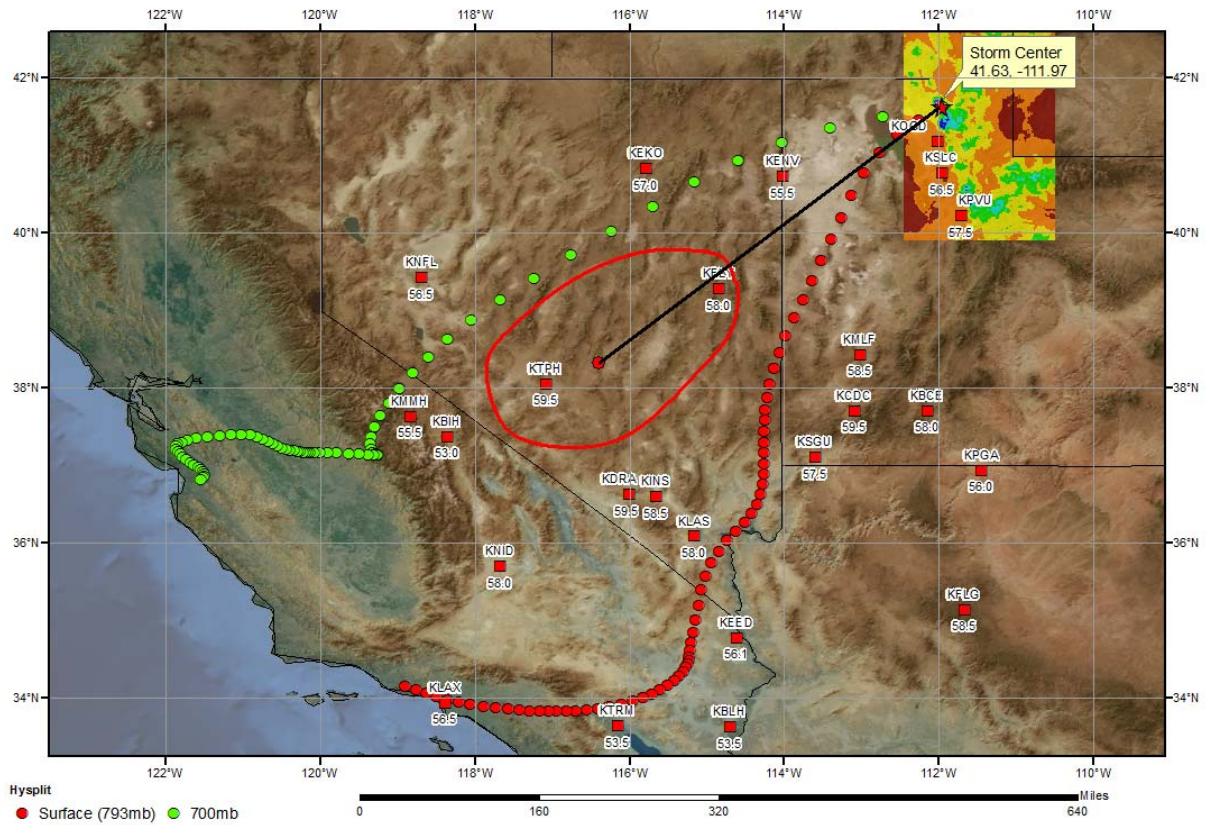


NOAA HYSPLIT MODEL
Backward trajectories ending at 0500 UTC 25 Oct 10
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study

SPAS 1241 Deer Creek, UT Storm Analysis October 22-24, 2010



Alta, UT
October 23-26, 2010
Storm Type: General

Storm Precipitation Analysis System (SPAS) For Storm #1241_3

General Storm Location: Northern Utah, southwestern Wyoming and southeastern Idaho

Storm Dates: October 23-26, 2010

Event: General storm

DAD Zone 3* – Central Utah mountains and western Uinta Mountains

Latitude: 40.59

Longitude: -111.64

Max. Grid Rainfall Amount: 3.04"

Number of Stations: 306

SPAS Version: 9.5

Basemap: PRISM Mean (1981-2010) October precipitation

Spatial resolution: 36 seconds (~ 0.36 mi²)

Radar Included: Yes (No missing data)

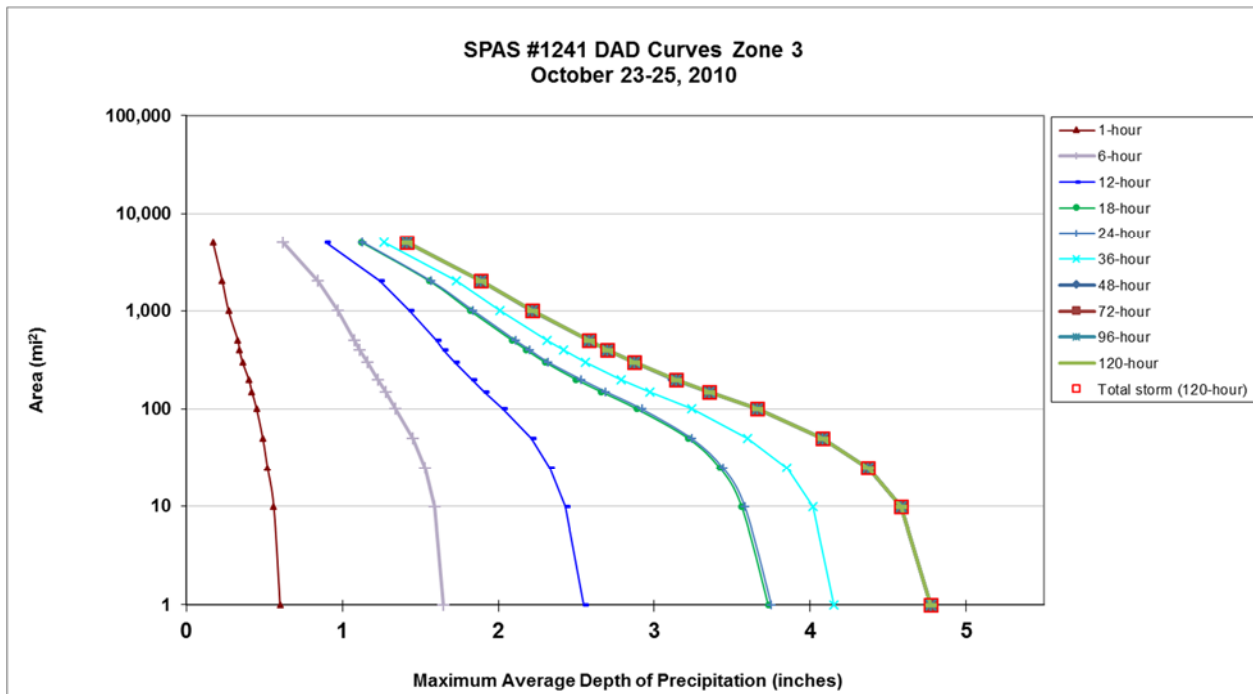
Depth-Area-Duration (DAD) analysis: Yes, 3 zones. The DAD zones were dictated by confidence in the results, radar extents, storm similarities, storm centers and likelihood of the precipitation co-occurring in space. All of the centers had similar timing.

***NOTE:** *In order for the DAD results to represent liquid precipitation, the DAD analysis was constrained to hours 1-50, when the dominate precipitation type was rain.*

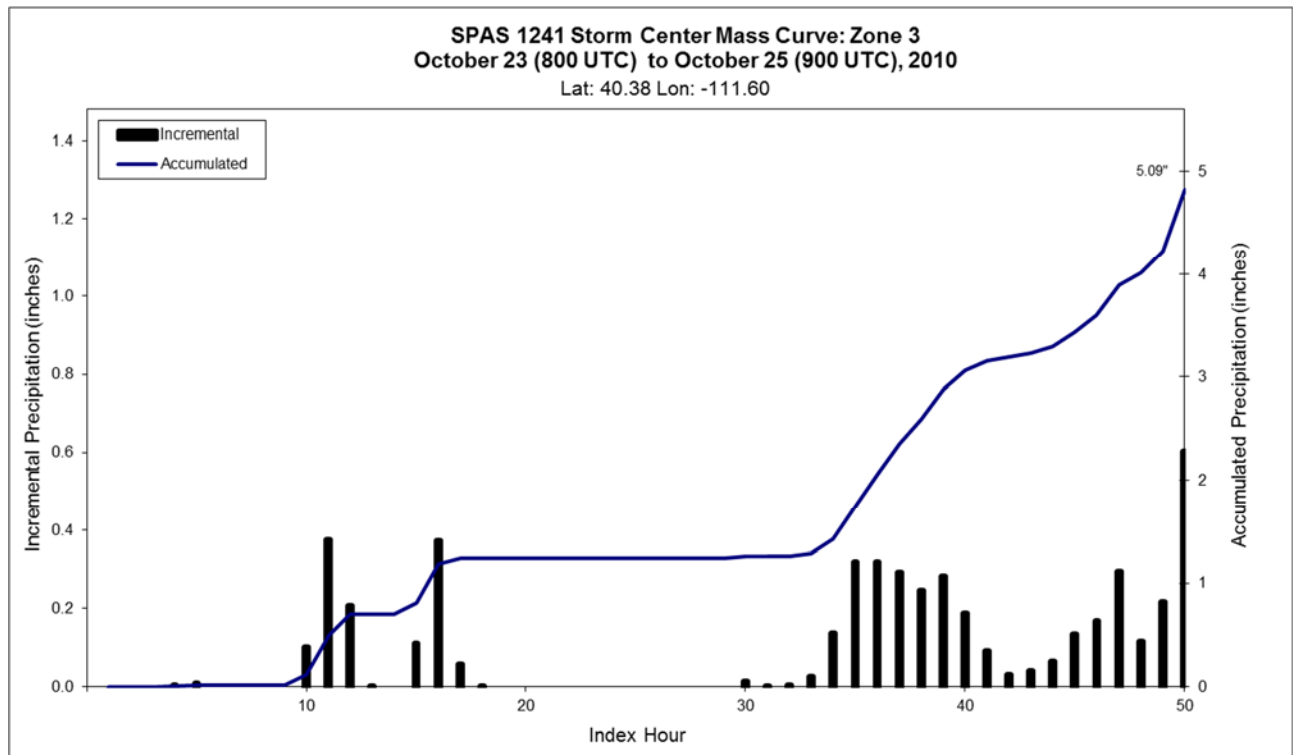
Reliability of results: Although this relatively recent storm had a good deal of ground truth data, data still lacked in some of the mountainous areas in/around the three main storm centers. The storm started off vigorously with thunderstorms, hail and heavy rain, but then transitioned into a winter storm with snow generally at/above 4,500 feet elevation which introduced error into the rain gauge measurements. No radar data was missing from the QC'd mosaic, but beam blockage occurred at many areas in the mountains. Overall, confidence in this analysis is good, but not great.

CO-NM Regional Extreme Precipitation Study

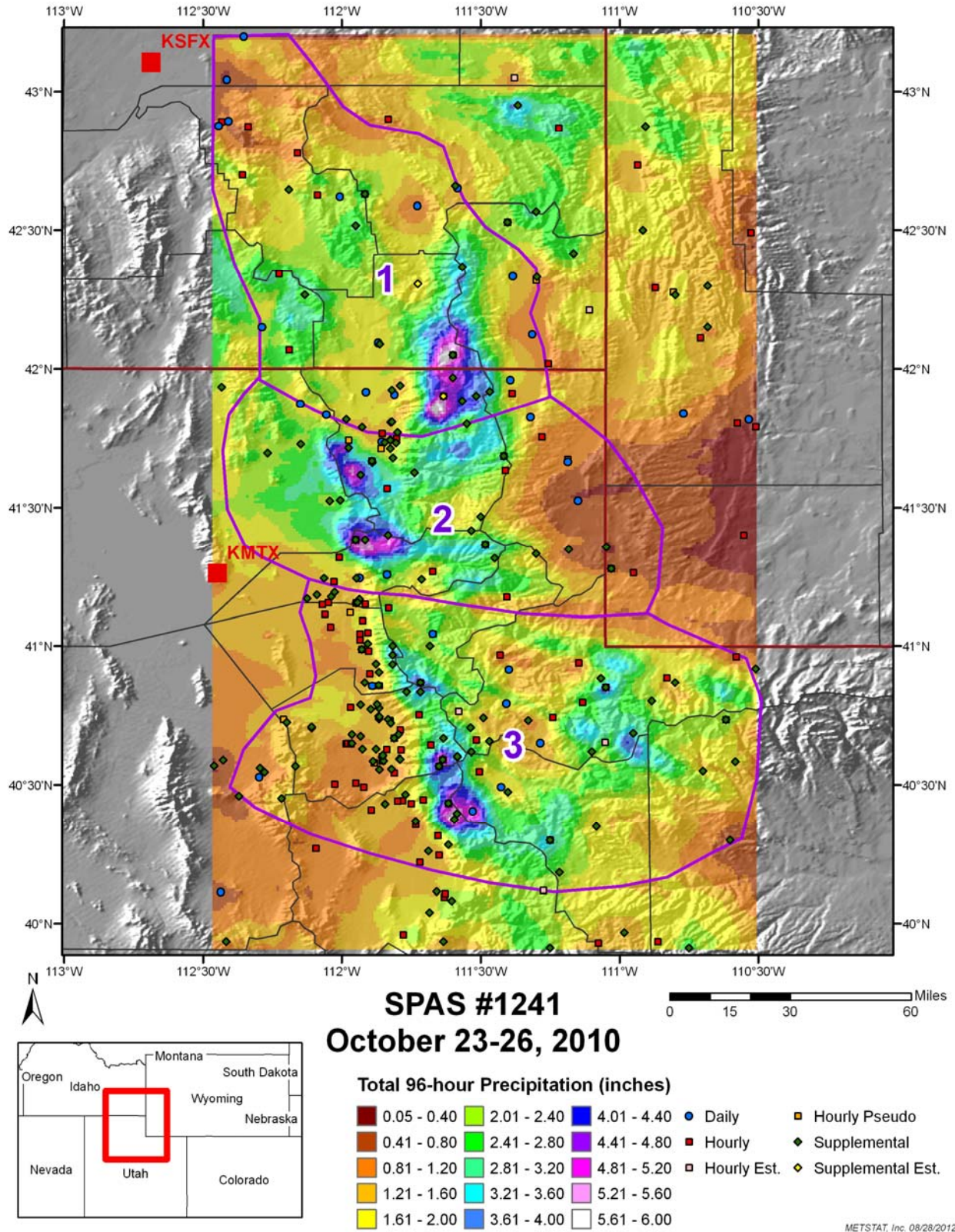
Storm 1241 - October 23 (800 UTC) - October 25 (900 UTC), 2010											
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)											
Area (mi ²)	Duration (hours)										
	1	6	12	18	24	36	48	72	96	120	Total
0.4	0.61	1.66	2.59	3.78	3.8	4.18	4.82	4.82	4.82	4.82	4.82
1	0.6	1.65	2.55	3.73	3.75	4.15	4.77	4.77	4.77	4.77	4.77
10	0.56	1.59	2.43	3.56	3.58	4.02	4.58	4.58	4.58	4.58	4.58
25	0.52	1.53	2.33	3.42	3.44	3.85	4.37	4.37	4.37	4.37	4.37
50	0.49	1.45	2.21	3.22	3.24	3.6	4.08	4.08	4.08	4.08	4.08
100	0.45	1.34	2.03	2.89	2.92	3.24	3.66	3.66	3.66	3.66	3.66
150	0.42	1.28	1.91	2.66	2.69	2.97	3.35	3.35	3.35	3.35	3.35
200	0.4	1.23	1.83	2.5	2.53	2.79	3.13	3.14	3.14	3.14	3.14
300	0.36	1.16	1.72	2.3	2.32	2.56	2.87	2.87	2.87	2.87	2.87
400	0.34	1.11	1.65	2.18	2.2	2.42	2.7	2.7	2.7	2.7	2.70
500	0.33	1.08	1.6	2.09	2.11	2.31	2.58	2.58	2.58	2.58	2.58
1,000	0.27	0.97	1.43	1.82	1.84	2.01	2.21	2.22	2.22	2.22	2.22
2,000	0.23	0.84	1.24	1.56	1.57	1.73	1.89	1.89	1.89	1.89	1.89
5,000	0.17	0.62	0.89	1.12	1.13	1.27	1.41	1.41	1.41	1.41	1.41



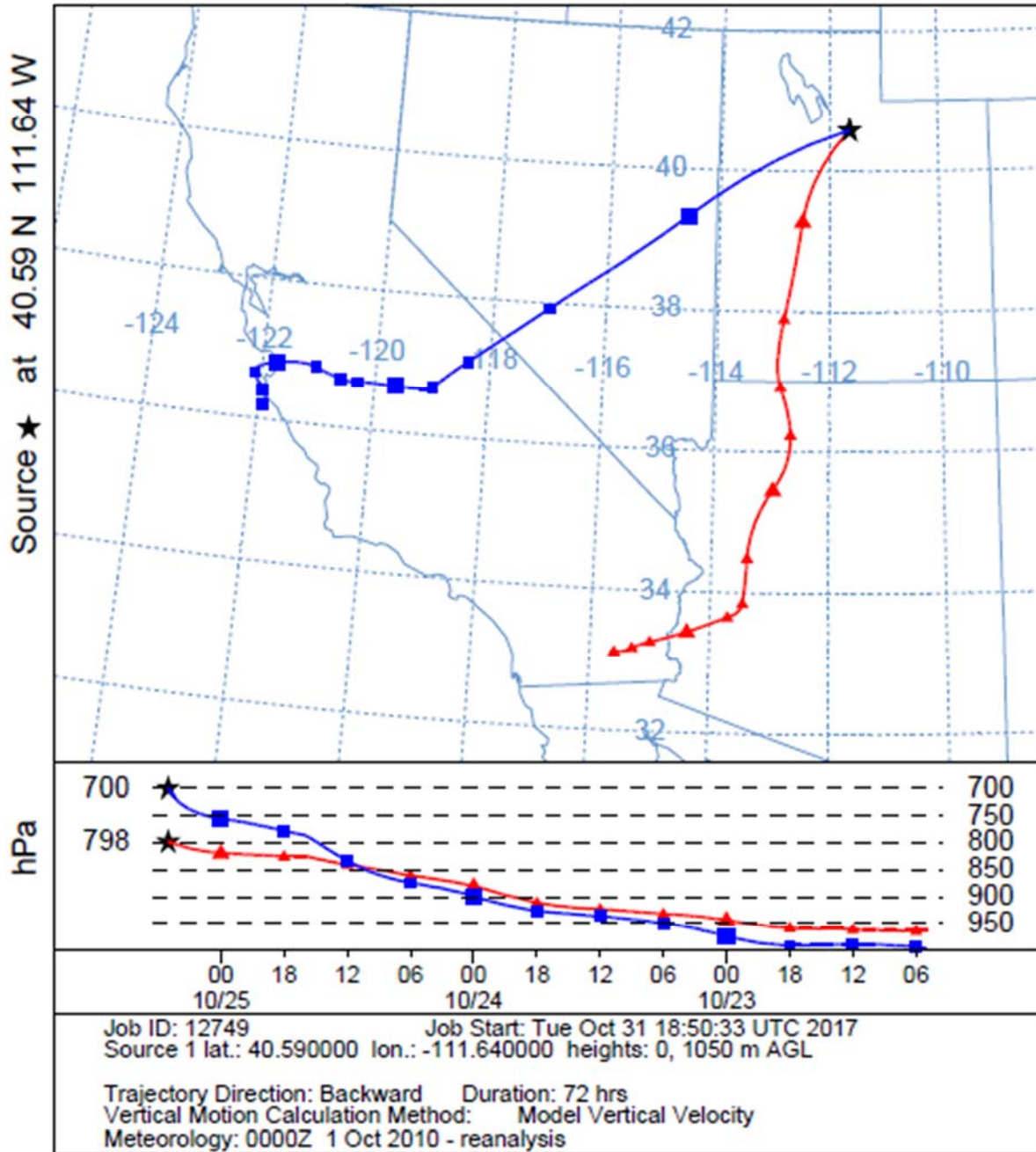
CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study

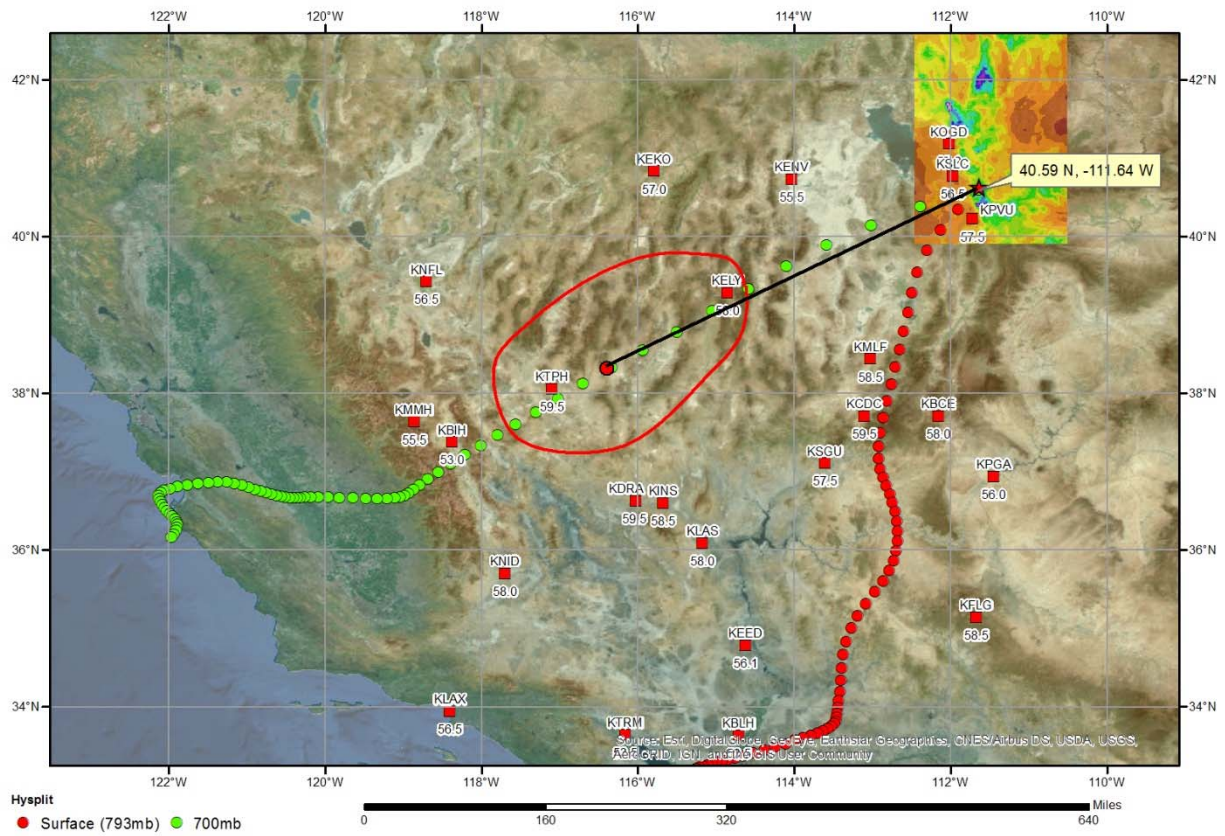


NOAA HYSPLIT MODEL
Backward trajectories ending at 0500 UTC 25 Oct 10
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study

SPAS 1241 Alta, UT Storm Analysis October 22-24, 2010



Boulder, CO

September 8-17, 2013

Storm Type: General

Storm Precipitation Analysis System (SPAS) Storm #1302_1

General Storm Location: Northeast Colorado and adjacent portions of bordering states

Storm Dates: September 8-17, 2013

Event: Synoptic

DAD Zone 1 – northern Foothills and Mountains

Latitude: 40.015

Longitude: -105.265

Max. Grid Rainfall Amount: 20.41”

Number of Stations: 2,635

SPAS Version: 9.5

Base Map Used: 9-day (9/9-9/17) Stage 4 Precipitation

Spatial resolution: 36 seconds (0.37 sq-mi)

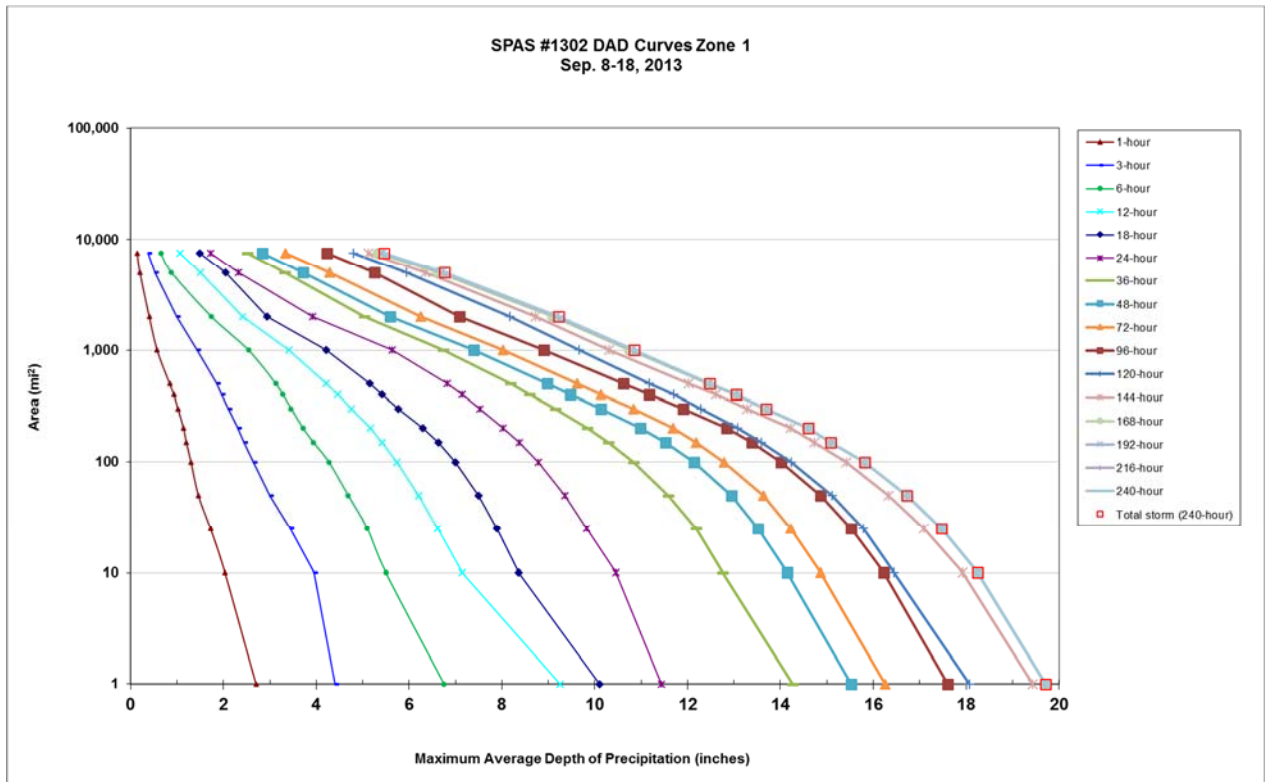
Radar Included: Yes (WDT composite reflectivity from CONUS mosaic)

Depth-Area-Duration (DAD) analysis: Yes.

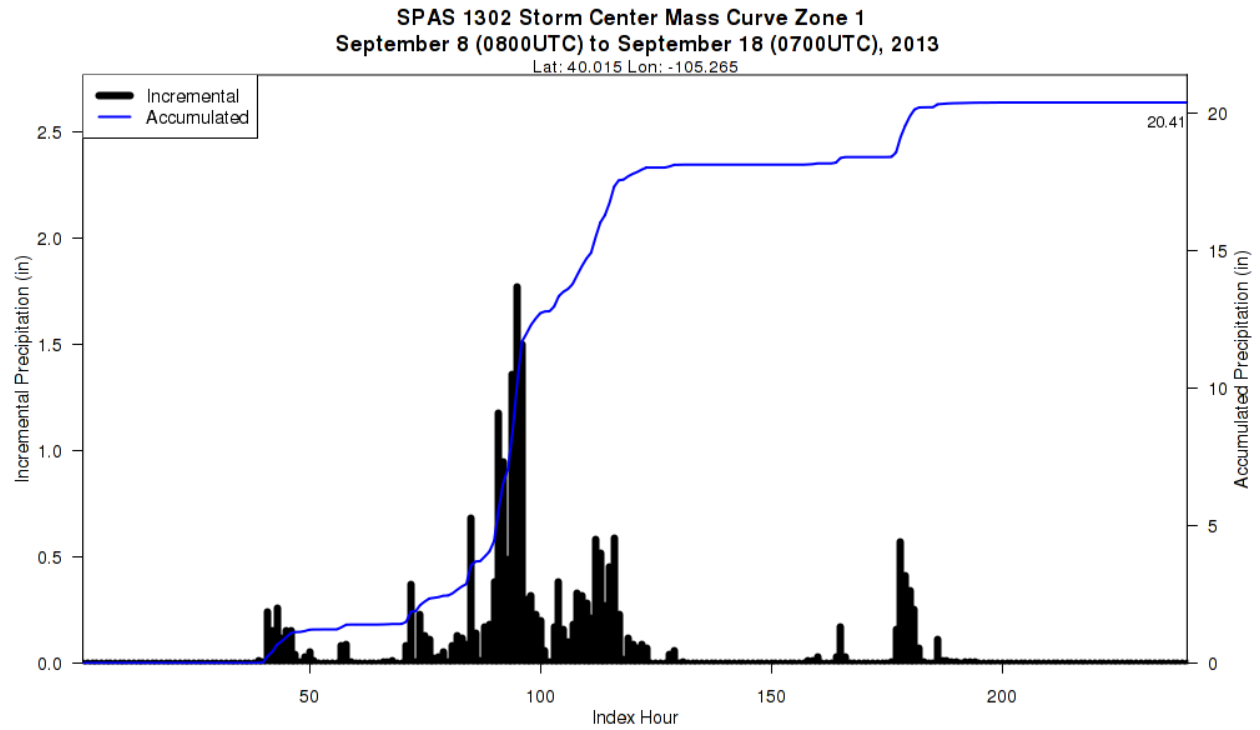
Reliability of Results: We have a great deal of confidence in the results given the phenomenal amount of rain gauge data and QC'd radar data. The Denver radar was down from 16Z on September 13th through 14Z on September 14th (index hours 129-151), casting less confidence during this time frame in/around Denver and Boulder.

CO-NM Regional Extreme Precipitation Study

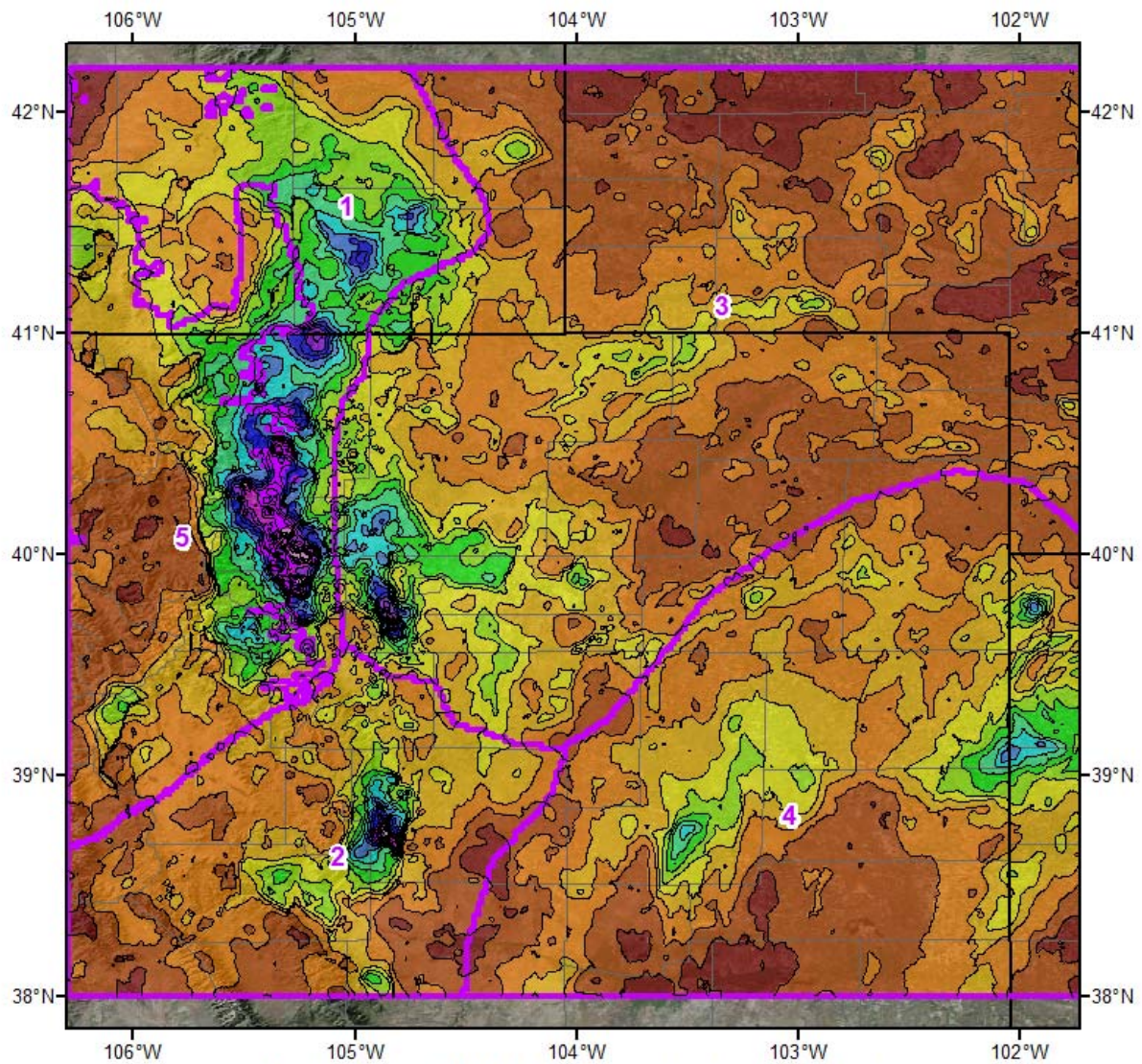
Storm 1302 - Sep. 8 (800 UTC) - Sep. 18 (700 UTC), 2013																
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)																
Area (mi ²)	Duration (hours)															
	1	3	6	12	18	24	36	48	72	96	120	144	168	192	216	240
0.4	2.78	4.61	7.22	9.45	10.30	11.93	14.97	16.15	16.80	18.09	18.88	20.15	20.34	20.34	20.34	20.34
1	2.70	4.41	6.75	9.26	10.11	11.43	14.27	15.52	16.25	17.61	18.08	19.44	19.71	19.71	19.71	19.71
10	2.03	3.95	5.50	7.15	8.36	10.45	12.75	14.15	14.87	16.23	16.45	17.92	18.25	18.25	18.25	18.25
25	1.72	3.44	5.10	6.62	7.89	9.83	12.18	13.51	14.22	15.52	15.79	17.09	17.47	17.47	17.47	17.47
50	1.46	3.00	4.69	6.21	7.49	9.36	11.59	12.94	13.64	14.86	15.12	16.33	16.73	16.73	16.73	16.73
100	1.30	2.64	4.27	5.74	7.00	8.79	10.83	12.14	12.78	14.01	14.24	15.42	15.82	15.82	15.82	15.82
150	1.20	2.44	3.94	5.42	6.63	8.38	10.30	11.52	12.18	13.39	13.59	14.74	15.09	15.09	15.09	15.09
200	1.14	2.31	3.72	5.16	6.30	8.02	9.84	10.98	11.68	12.85	13.08	14.22	14.59	14.60	14.60	14.60
300	1.02	2.10	3.46	4.76	5.77	7.53	9.15	10.14	10.84	11.91	12.29	13.29	13.66	13.68	13.69	13.69
400	0.93	1.96	3.28	4.47	5.41	7.15	8.60	9.47	10.14	11.18	11.70	12.61	13.02	13.03	13.05	13.05
500	0.84	1.85	3.13	4.22	5.15	6.82	8.18	8.98	9.62	10.62	11.18	12.02	12.43	12.46	12.47	12.48
1,000	0.57	1.43	2.54	3.41	4.21	5.63	6.74	7.39	8.02	8.90	9.66	10.31	10.75	10.81	10.84	10.85
2,000	0.40	0.99	1.74	2.41	2.94	3.92	5.04	5.59	6.25	7.08	8.17	8.72	9.10	9.16	9.21	9.22
5,000	0.20	0.52	0.88	1.50	2.04	2.32	3.32	3.71	4.29	5.25	5.95	6.36	6.62	6.71	6.74	6.76
7,472	0.14	0.38	0.65	1.07	1.49	1.73	2.51	2.84	3.33	4.23	4.80	5.12	5.33	5.42	5.45	5.46



CO-NM Regional Extreme Precipitation Study

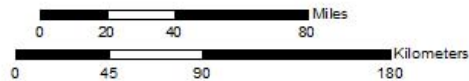


CO-NM Regional Extreme Precipitation Study

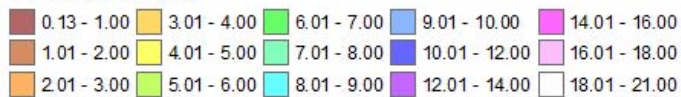


Total Storm (240-hr) Precipitation (inches)
9/8/2013 0800 UTC - 9/18/2013 0700 UTC
SPAS #1302

Gauges

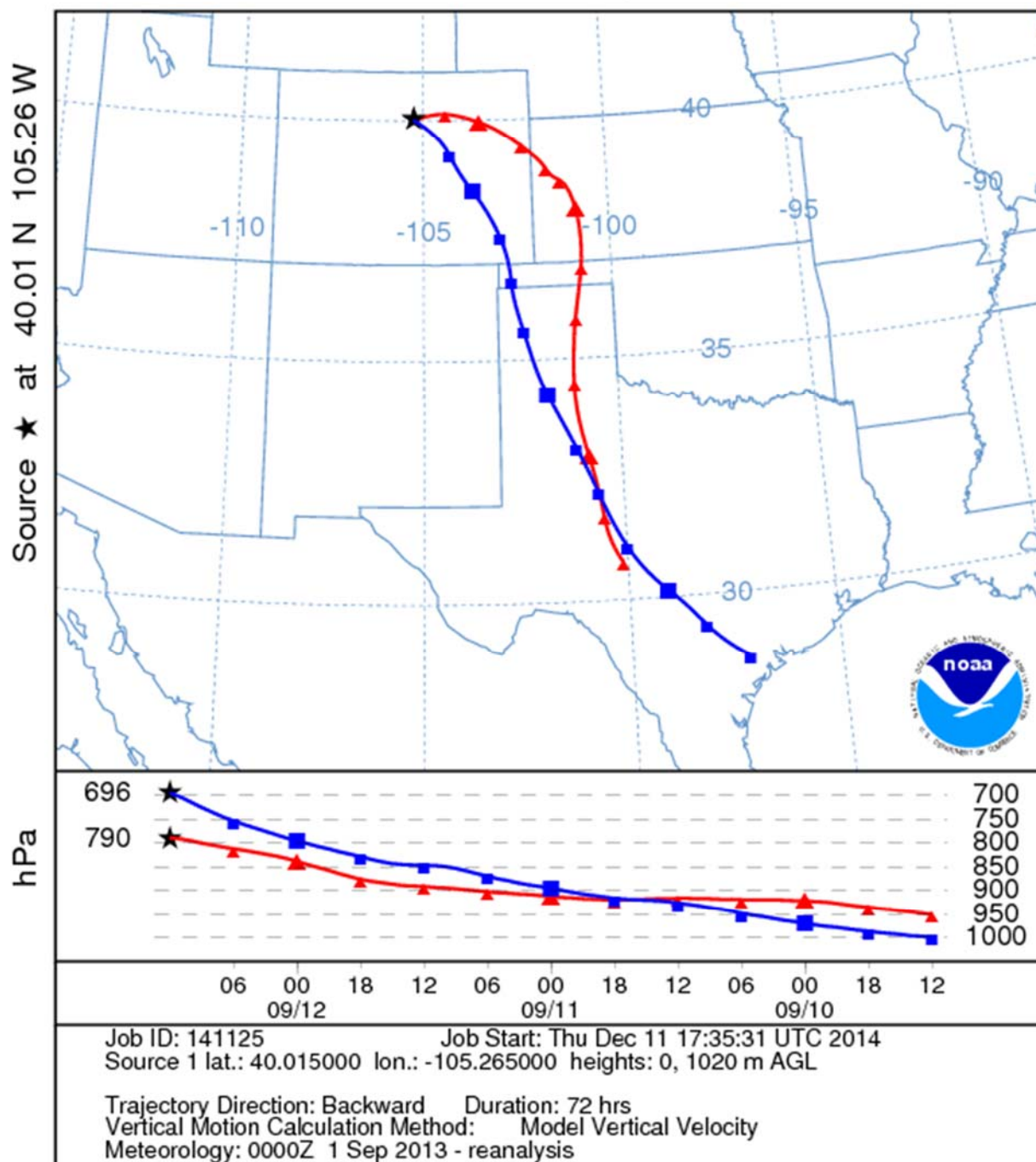


Precipitation (inches)

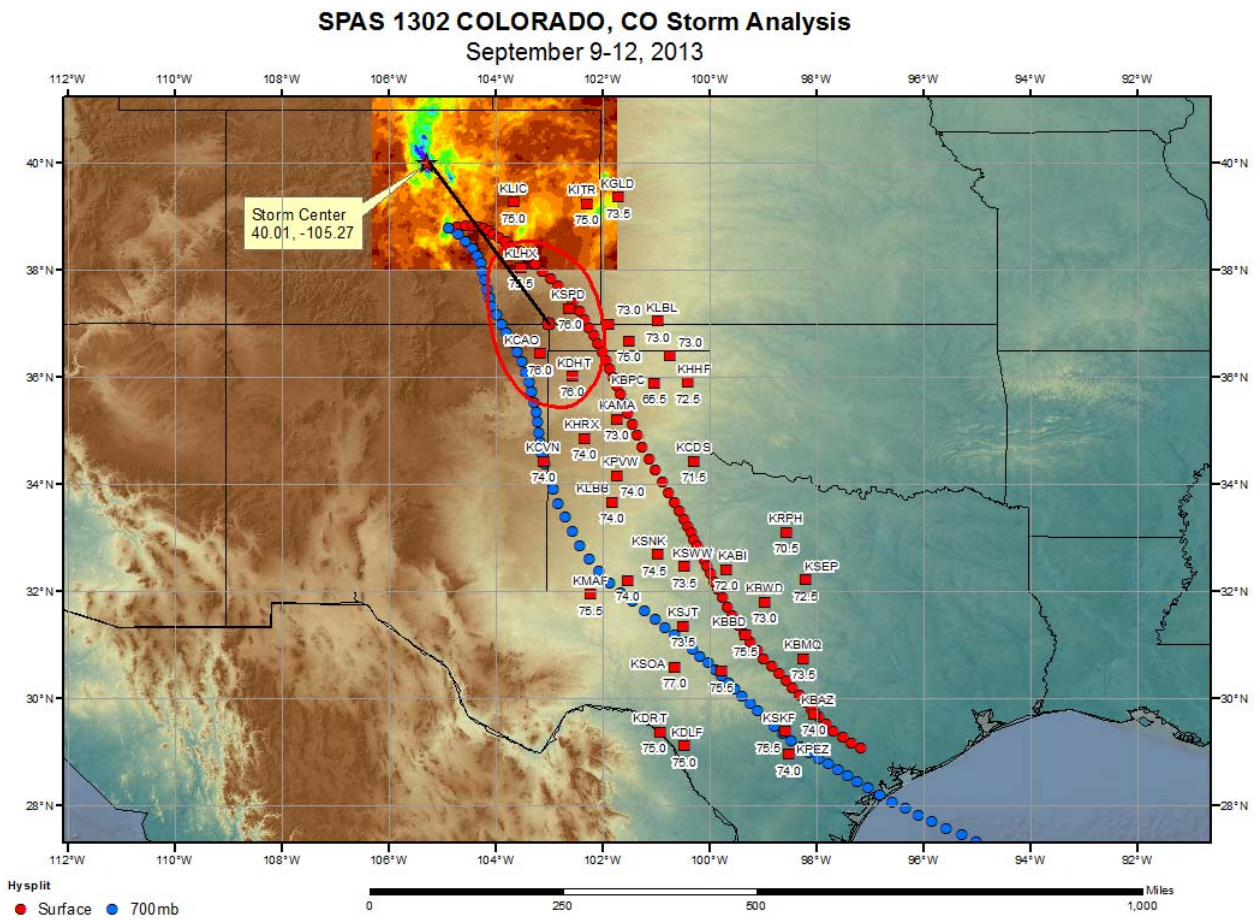


3/3/2018

NOAA HYSPLIT MODEL
Backward trajectories ending at 1200 UTC 12 Sep 13
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study



Cheyenne Mountain, CO

September 8-17, 2013

Storm Type: General

Storm Precipitation Analysis System (SPAS) Storm #1302_2

General Storm Location: Northeast Colorado and adjacent portions of bordering states

Storm Dates: September 8-17, 2013

Event: Synoptic

DAD Zone 2 – southern Foothills and Mountains

Latitude: 38.745

Longitude: -104.865

Max. Grid Rainfall Amount: 18.92”

Number of Stations: 2,635

SPAS Version: 9.5

Base Map Used: 9-day (9/9-9/17) Stage 4 Precipitation

Spatial resolution: 36 seconds (0.37 sq-mi)

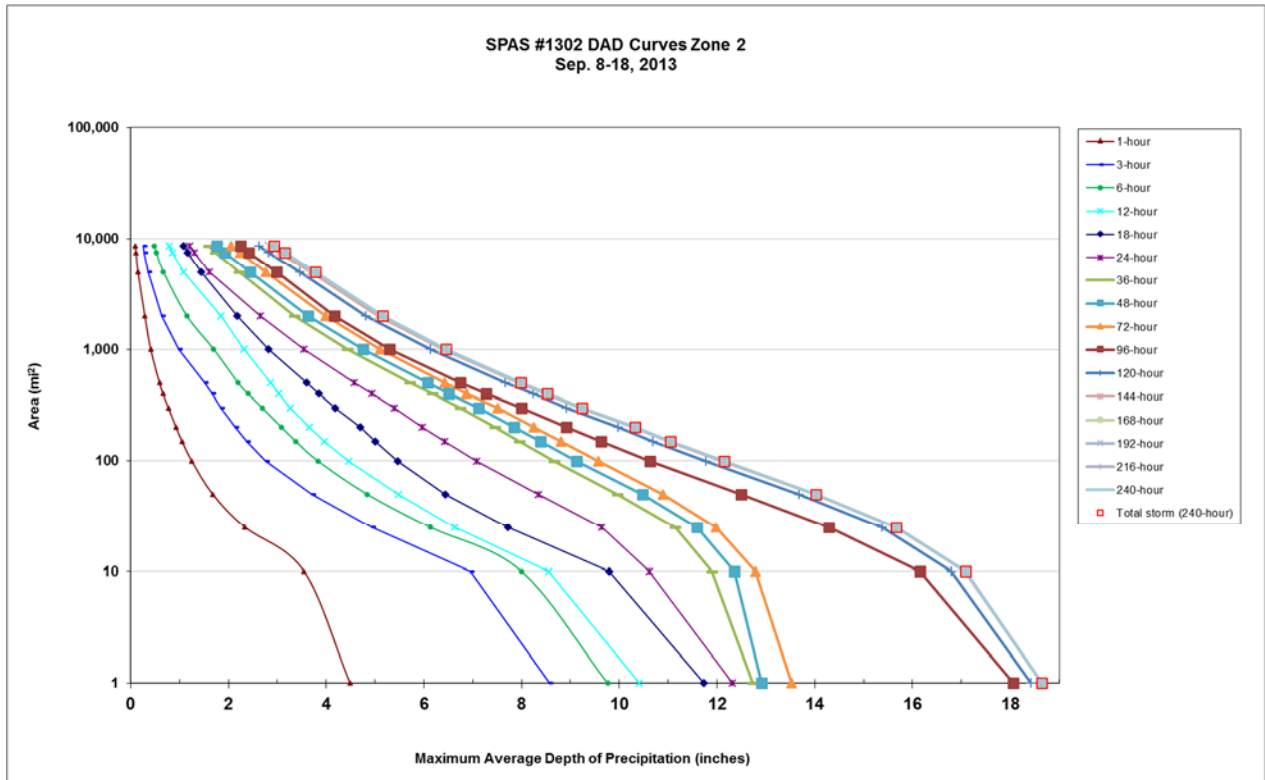
Radar Included: Yes (WDT composite reflectivity from CONUS mosaic)

Depth-Area-Duration (DAD) analysis: Yes.

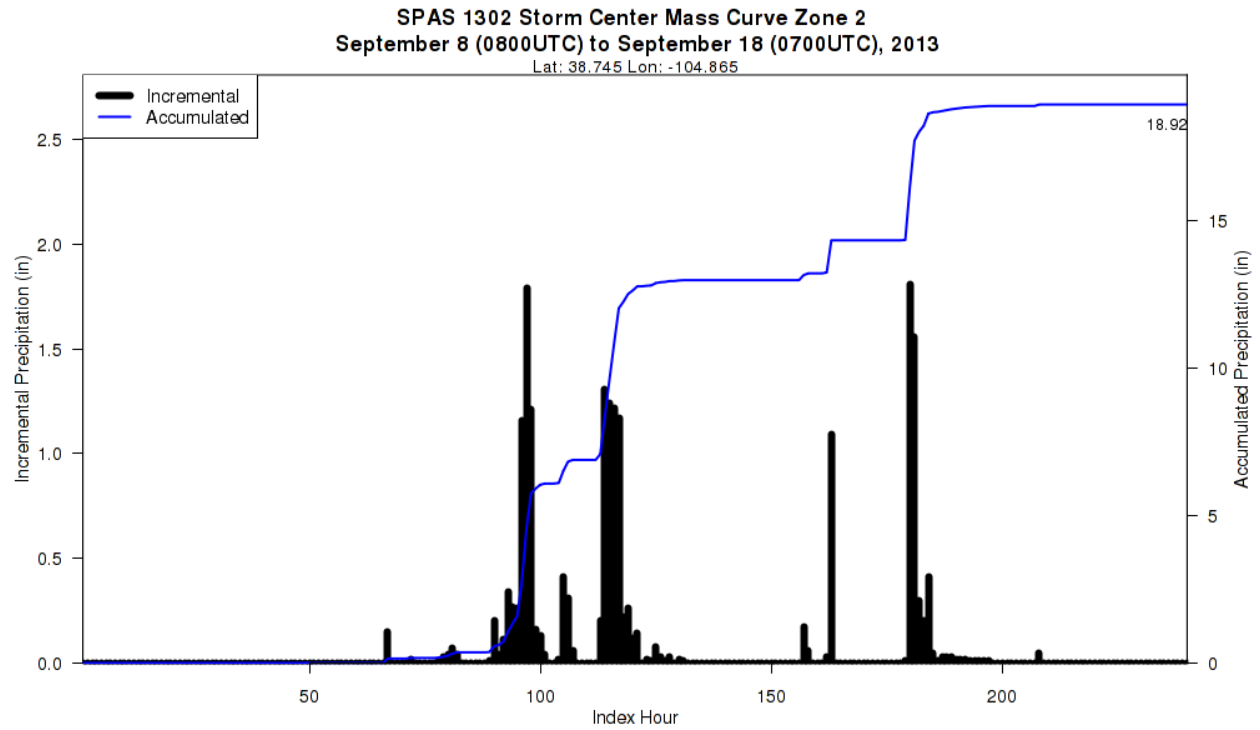
Reliability of Results: We have a great deal of confidence in the results given the phenomenal amount of rain gauge data and QC'd radar data. The Denver radar was down from 16Z on September 13th through 14Z on September 14th (index hours 129-151), casting less confidence during this time frame in/around Denver and Boulder.

CO-NM Regional Extreme Precipitation Study

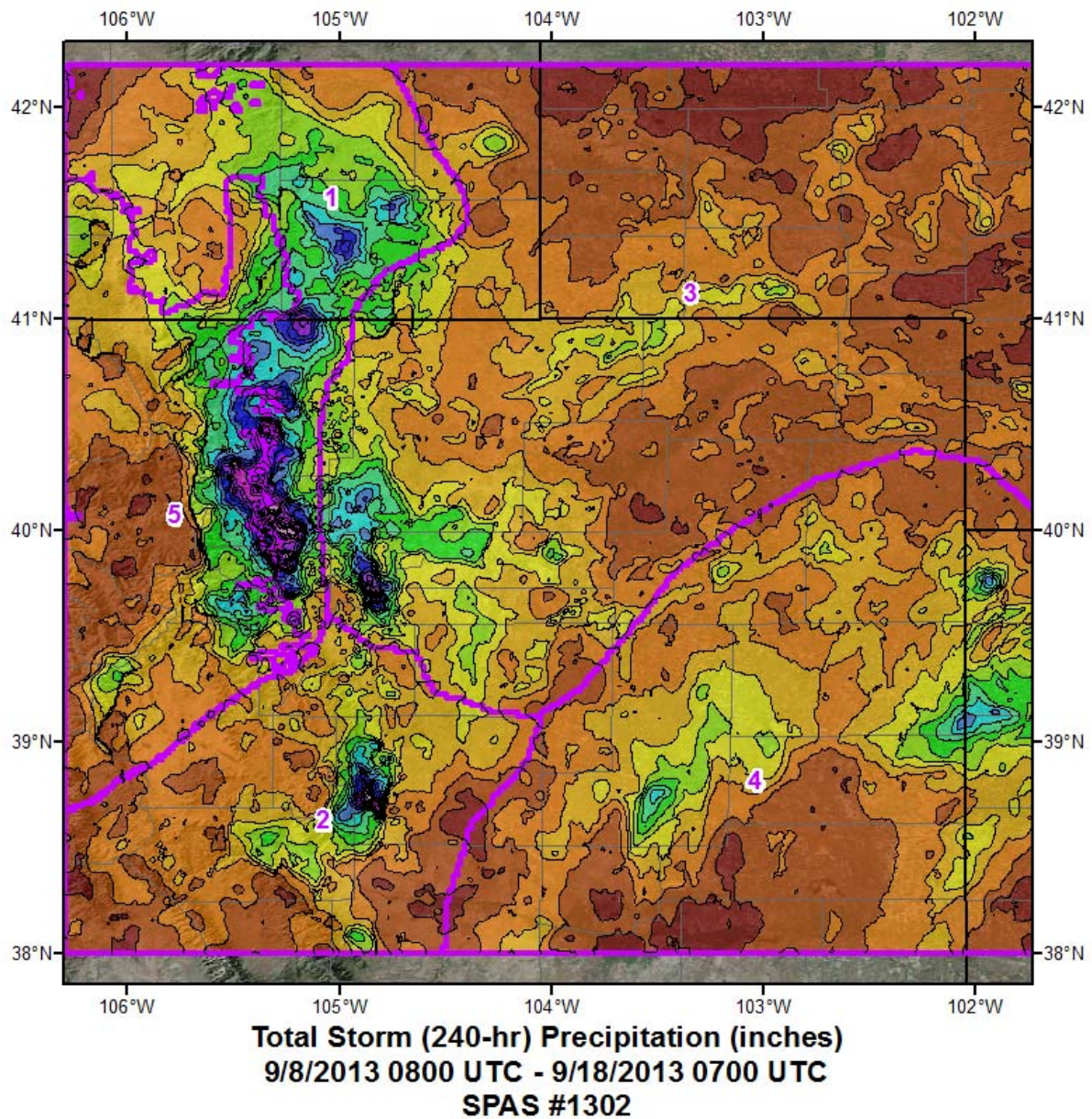
Storm 1302 - Sep. 8 (800 UTC) - Sep. 18 (700 UTC), 2013																
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)																
Area (mi ²)	Duration (hours)															
	1	3	6	12	18	24	36	48	72	96	120	144	168	192	216	240
0.4	4.51	8.71	9.84	10.51	11.88	12.45	12.92	13.07	13.69	18.27	18.68	18.90	18.90	18.90	18.90	18.90
1	4.49	8.57	9.76	10.41	11.73	12.31	12.73	12.91	13.52	18.06	18.42	18.64	18.64	18.64	18.64	18.64
10	3.55	6.95	8.00	8.55	9.80	10.61	11.89	12.35	12.78	16.15	16.80	17.07	17.08	17.08	17.08	17.08
25	2.34	4.94	6.13	6.64	7.72	9.64	11.14	11.59	11.98	14.29	15.38	15.65	15.67	15.67	15.67	15.67
50	1.68	3.71	4.84	5.48	6.44	8.35	9.96	10.47	10.89	12.50	13.67	14.01	14.03	14.03	14.03	14.03
100	1.25	2.76	3.83	4.46	5.47	7.08	8.67	9.13	9.57	10.63	11.77	12.11	12.14	12.14	12.14	12.14
150	1.05	2.38	3.38	3.96	5.01	6.42	7.96	8.39	8.80	9.62	10.68	11.01	11.04	11.04	11.04	11.04
200	0.93	2.14	3.09	3.65	4.70	5.97	7.45	7.85	8.25	8.92	9.98	10.29	10.32	10.32	10.32	10.32
300	0.77	1.85	2.69	3.27	4.18	5.39	6.74	7.12	7.51	8.00	8.92	9.20	9.23	9.24	9.24	9.24
400	0.66	1.66	2.40	3.03	3.85	4.94	6.17	6.51	6.87	7.28	8.24	8.49	8.52	8.52	8.52	8.52
500	0.59	1.51	2.20	2.86	3.60	4.58	5.72	6.08	6.42	6.74	7.67	7.93	7.97	7.98	7.98	7.98
1,000	0.41	0.98	1.70	2.32	2.82	3.55	4.43	4.75	5.11	5.30	6.14	6.38	6.43	6.44	6.45	6.45
2,000	0.29	0.64	1.15	1.85	2.18	2.66	3.35	3.63	3.99	4.17	4.81	5.06	5.13	5.15	5.16	5.16
5,000	0.15	0.36	0.67	1.08	1.45	1.61	2.22	2.44	2.77	2.99	3.46	3.69	3.75	3.77	3.78	3.78
7,500	0.11	0.28	0.53	0.86	1.17	1.31	1.74	1.93	2.23	2.42	2.82	3.05	3.13	3.15	3.16	3.16
8,659	0.09	0.26	0.48	0.79	1.08	1.21	1.60	1.77	2.06	2.25	2.62	2.84	2.90	2.92	2.93	2.93



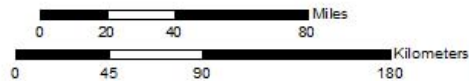
CO-NM Regional Extreme Precipitation Study



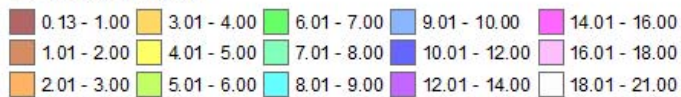
CO-NM Regional Extreme Precipitation Study



Gauges

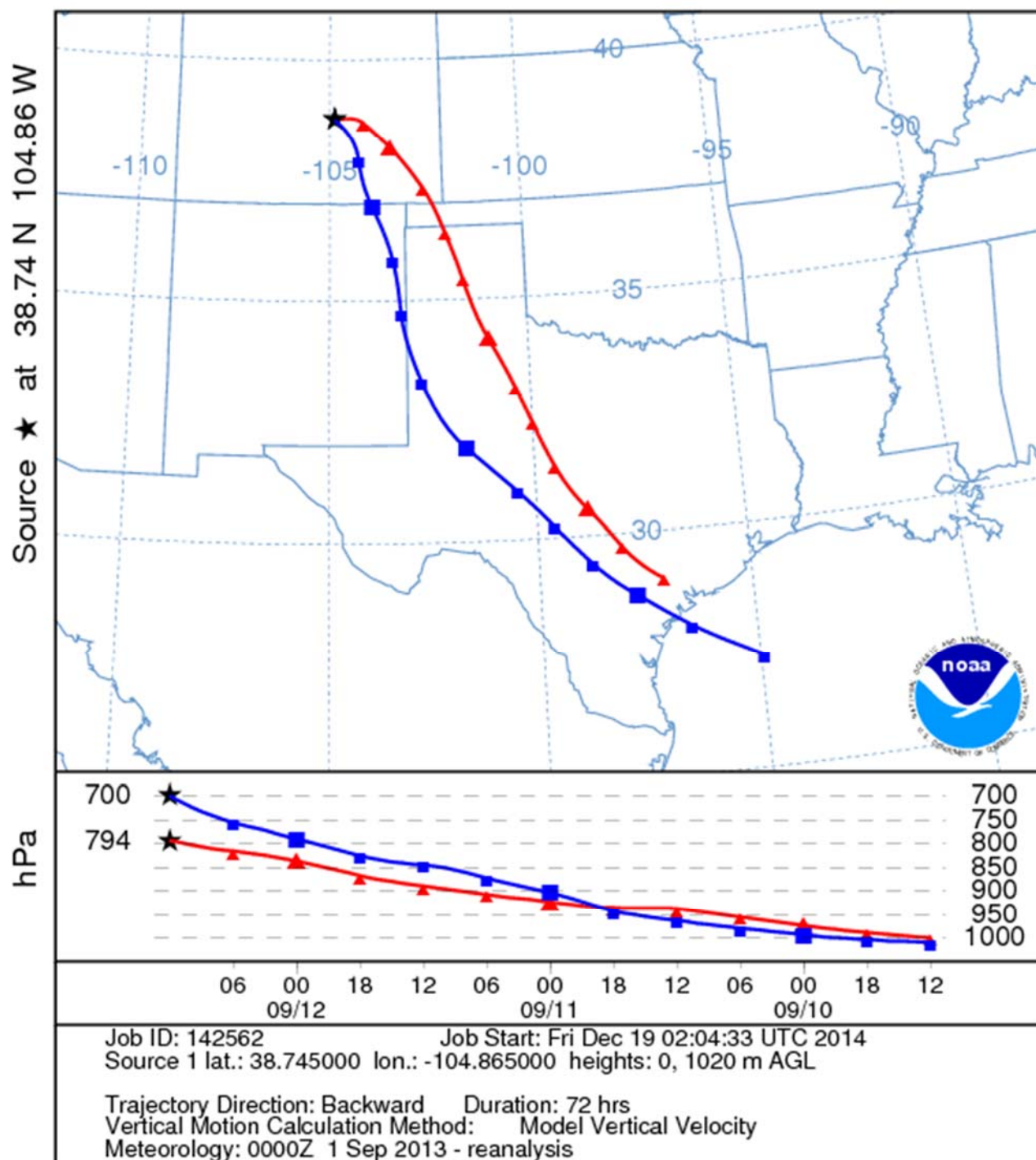


Precipitation (inches)

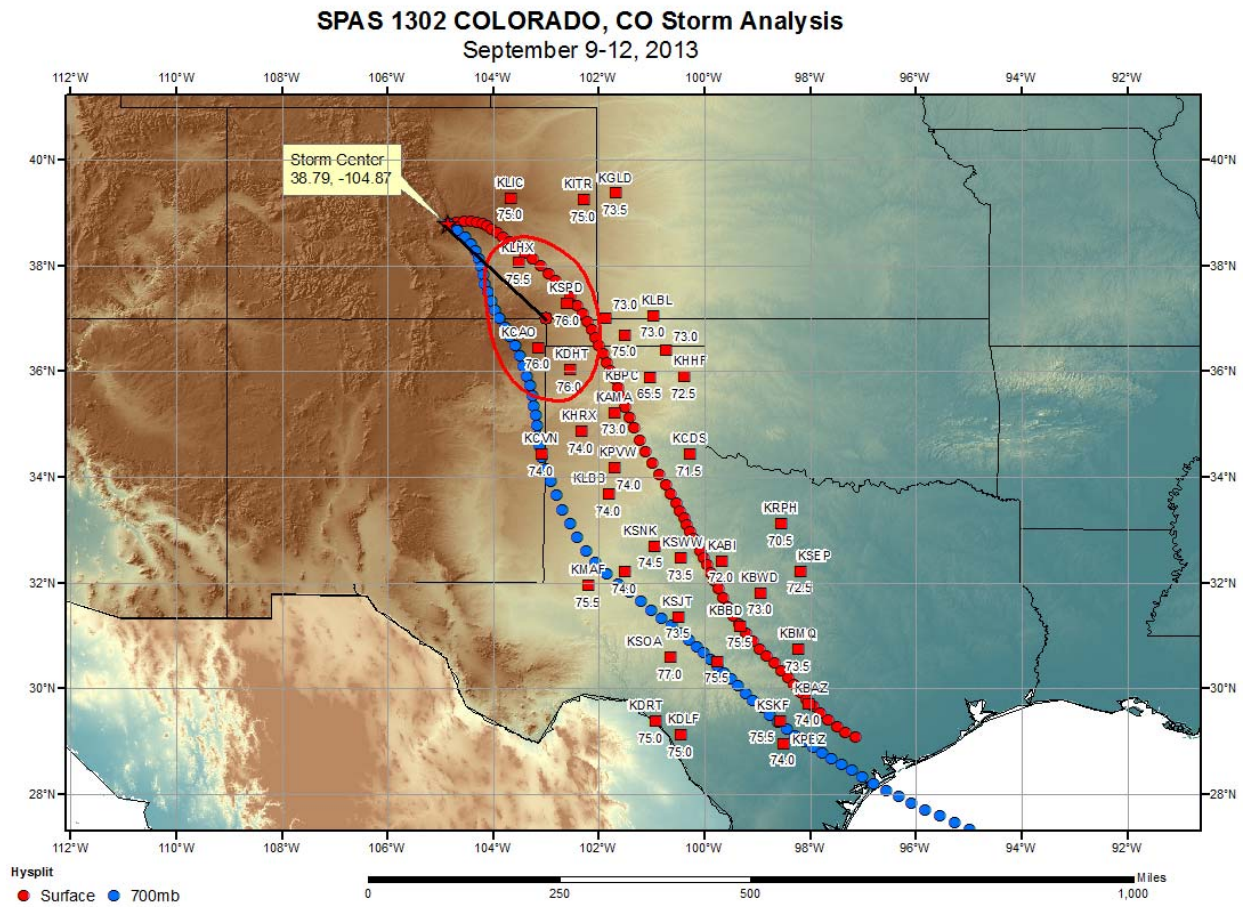


3/3/2018

NOAA HYSPLIT MODEL
Backward trajectories ending at 1200 UTC 12 Sep 13
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study



Aurora, CO
September 8-17, 2013
Storm Type: General
Storm Precipitation Analysis System (SPAS) Storm #1302_3

General Storm Location: Northeast Colorado and adjacent portions of bordering states

Storm Dates: September 8-17, 2013

Event: Synoptic

DAD Zone 3 – Northeastern Plains

Latitude: 39.705

Longitude: -104.835

Max. Grid Rainfall Amount: 15.45”

Number of Stations: 2,635

SPAS Version: 9.5

Base Map Used: 9-day (9/9-9/17) Stage 4 Precipitation

Spatial resolution: 36 seconds (0.37 sq-mi)

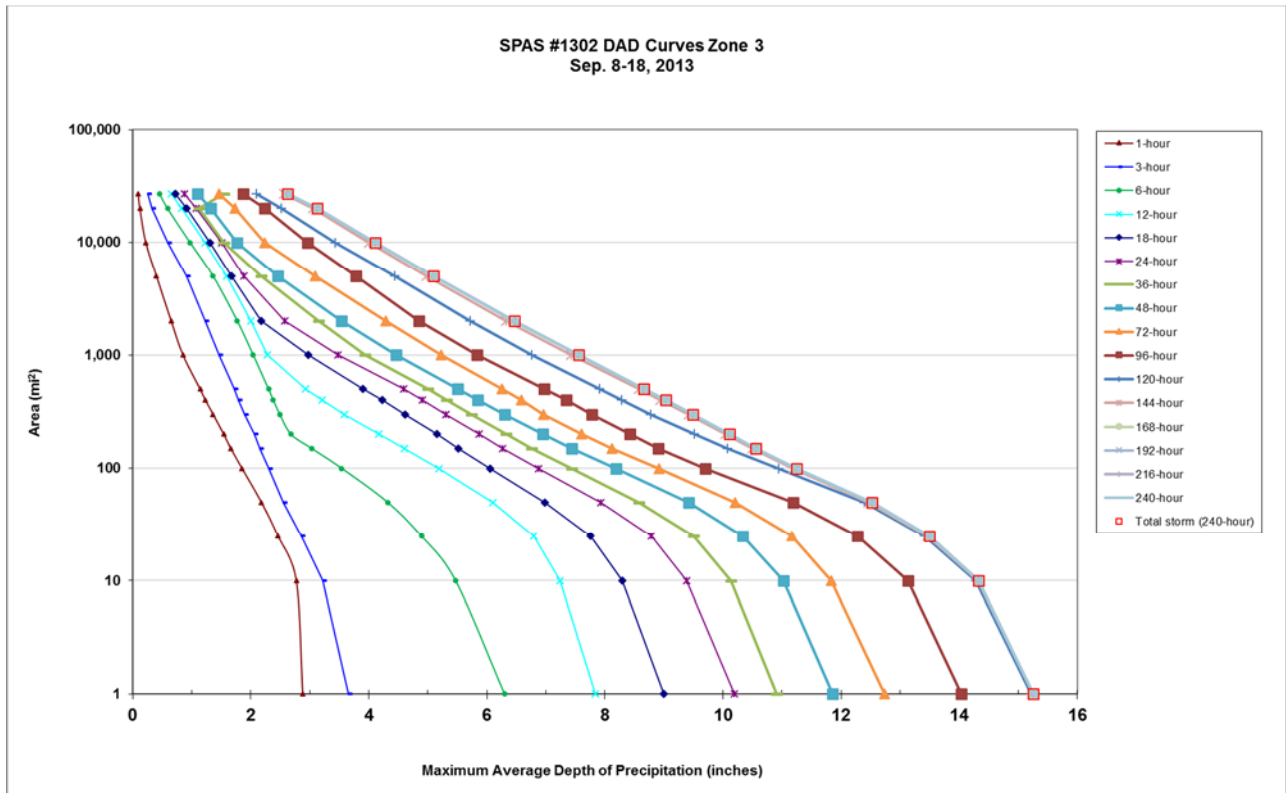
Radar Included: Yes (WDT composite reflectivity from CONUS mosaic)

Depth-Area-Duration (DAD) analysis: Yes.

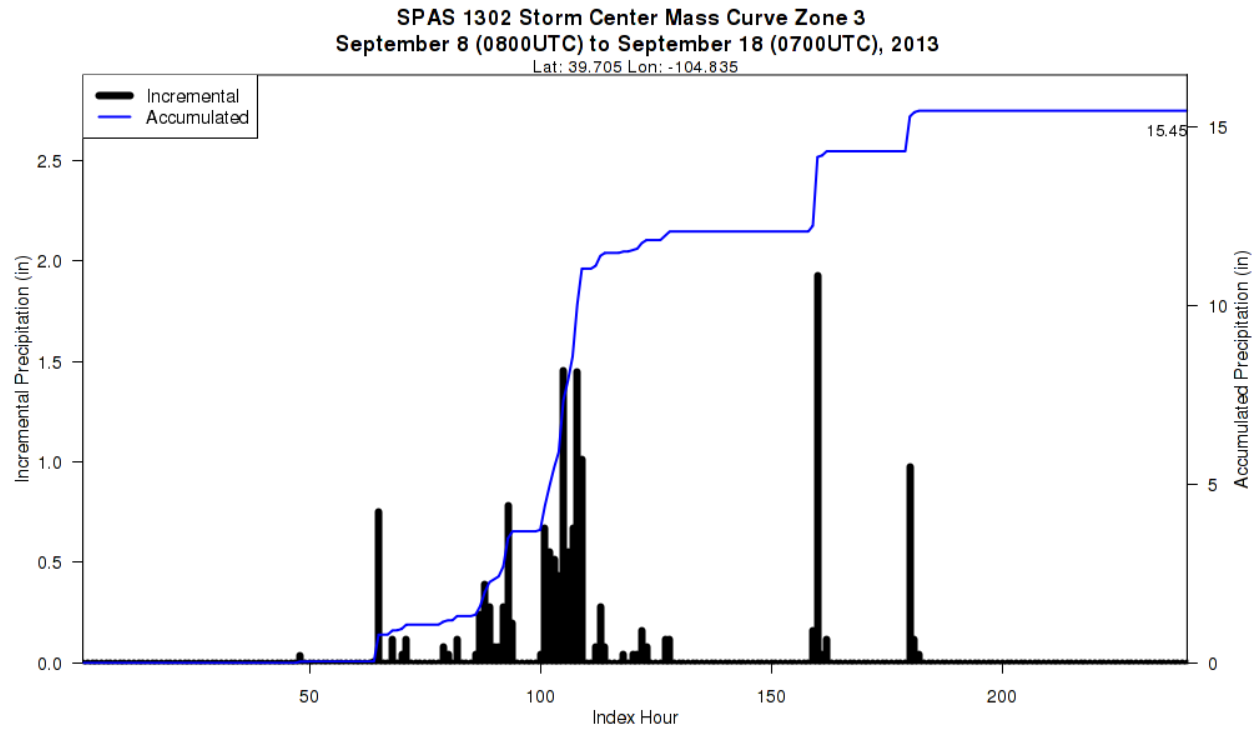
Reliability of Results: We have a great deal of confidence in the results given the phenomenal amount of rain gauge data and QC'd radar data. The Denver radar was down from 16Z on September 13th through 14Z on September 14th (index hours 129-151), casting less confidence during this time frame in/around Denver and Boulder.

CO-NM Regional Extreme Precipitation Study

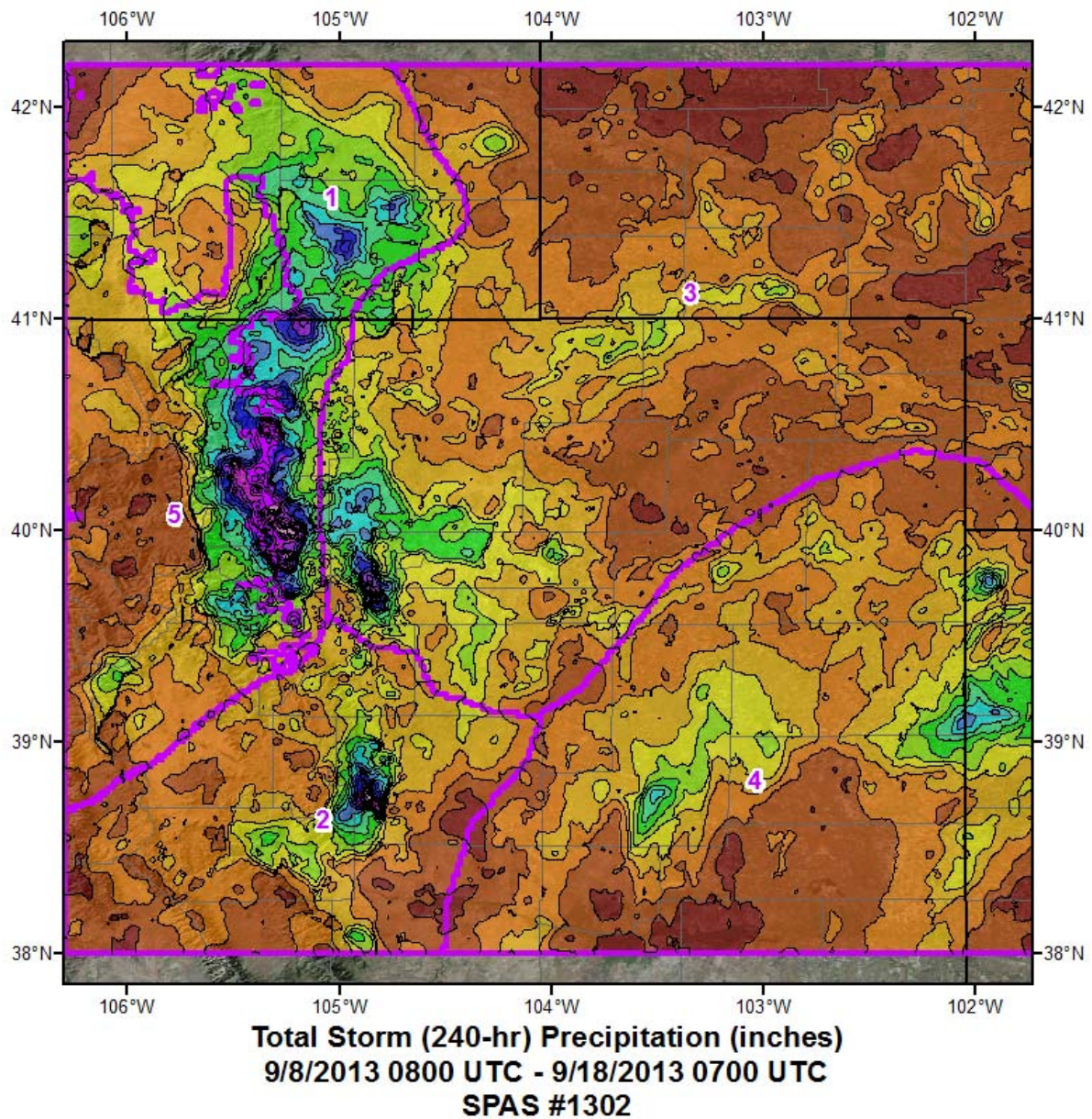
Storm 1302 - Sep. 8 (800 UTC) - Sep. 18 (700 UTC), 2013																
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)																
Area (mi ²)	Duration (hours)															
	1	3	6	12	18	24	36	48	72	96	120	144	168	192	216	240
0.4	2.90	3.78	6.58	7.97	9.23	10.48	11.22	12.21	12.95	14.26	15.39	15.43	15.43	15.43	15.43	15.43
1	2.88	3.65	6.30	7.84	9.00	10.19	10.91	11.86	12.73	14.04	15.22	15.26	15.26	15.26	15.26	15.26
10	2.77	3.22	5.47	7.24	8.29	9.38	10.13	11.03	11.83	13.13	14.28	14.32	14.33	14.33	14.33	14.33
25	2.46	2.96	4.89	6.79	7.76	8.79	9.50	10.33	11.17	12.28	13.42	13.46	13.49	13.50	13.50	13.50
50	2.18	2.55	4.32	6.10	6.98	7.93	8.58	9.42	10.21	11.19	12.40	12.47	12.51	12.52	12.52	12.53
100	1.85	2.30	3.54	5.19	6.06	6.88	7.44	8.19	8.92	9.70	10.94	11.19	11.24	11.25	11.25	11.25
150	1.66	2.15	3.03	4.60	5.52	6.27	6.76	7.44	8.12	8.90	10.08	10.50	10.56	10.56	10.56	10.56
200	1.54	2.06	2.68	4.17	5.15	5.87	6.32	6.95	7.60	8.42	9.51	10.04	10.10	10.10	10.10	10.11
300	1.36	1.90	2.49	3.58	4.61	5.31	5.74	6.30	6.96	7.78	8.77	9.42	9.48	9.49	9.49	9.49
400	1.23	1.79	2.38	3.21	4.23	4.91	5.32	5.84	6.58	7.35	8.28	8.94	9.02	9.03	9.03	9.03
500	1.14	1.72	2.30	2.93	3.90	4.59	5.00	5.50	6.25	6.97	7.91	8.57	8.65	8.66	8.66	8.66
1,000	0.85	1.46	2.04	2.28	2.97	3.48	3.94	4.46	5.22	5.83	6.76	7.43	7.55	7.56	7.56	7.56
2,000	0.65	1.23	1.77	2.00	2.18	2.58	3.15	3.53	4.29	4.85	5.71	6.32	6.44	6.45	6.46	6.46
5,000	0.40	0.91	1.36	1.59	1.67	1.88	2.18	2.46	3.09	3.78	4.44	4.98	5.09	5.10	5.10	5.10
10,000	0.22	0.59	0.97	1.23	1.31	1.51	1.54	1.77	2.23	2.96	3.43	4.01	4.10	4.11	4.11	4.11
20,000	0.12	0.33	0.59	0.83	0.91	1.08	1.12	1.32	1.73	2.24	2.52	3.06	3.12	3.13	3.13	3.13
27,170	0.09	0.25	0.45	0.65	0.72	0.87	1.54	1.10	1.46	1.87	2.10	2.56	2.61	2.62	2.62	2.62



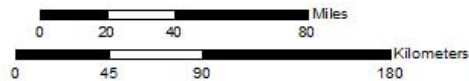
CO-NM Regional Extreme Precipitation Study



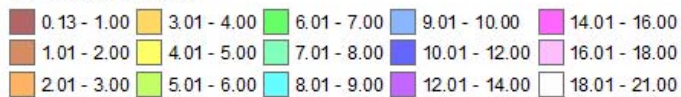
CO-NM Regional Extreme Precipitation Study



Gauges

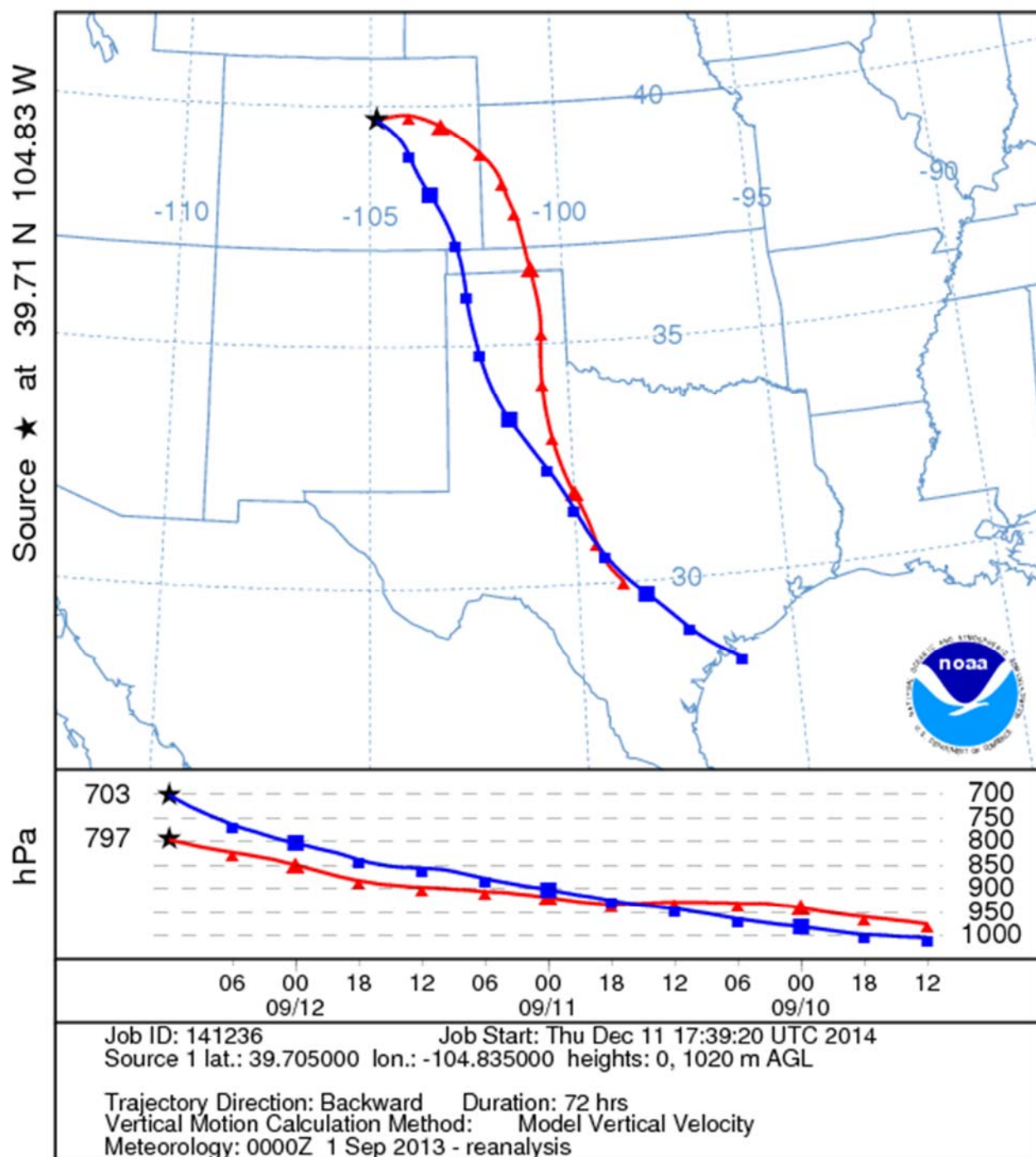


Precipitation (inches)

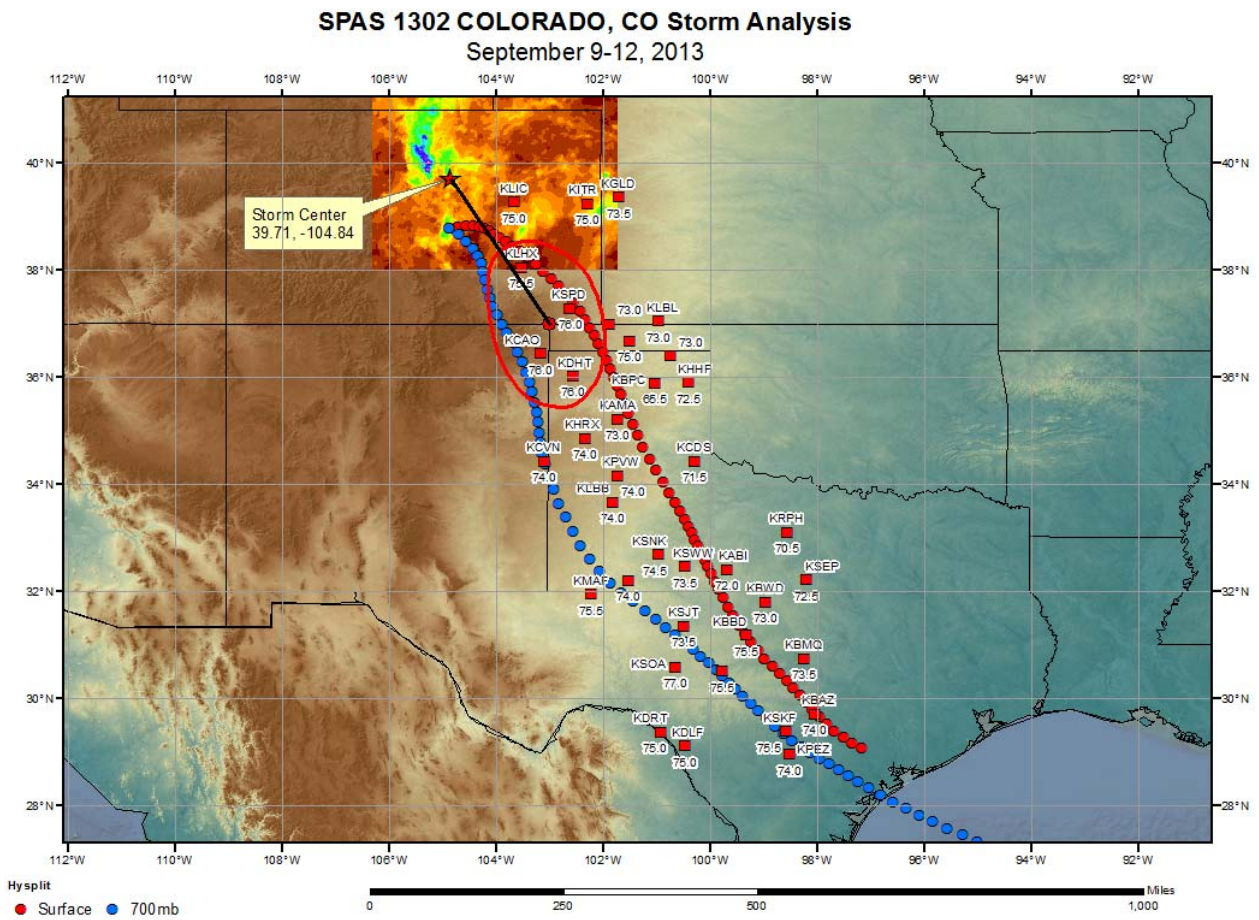


3/3/2018

NOAA HYSPLIT MODEL
Backward trajectories ending at 1200 UTC 12 Sep 13
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study



Coal Creek, CO

September 8-17, 2013

Storm Type: General

Storm Precipitation Analysis System (SPAS) Storm #1302_5

General Storm Location: Northeast Colorado and adjacent portions of bordering states

Storm Dates: September 8-17, 2013

Event: Synoptic

DAD Zone 5

Latitude: 39.865

Longitude: -105.285

Max. Grid Rainfall Amount: 18.13"

Number of Stations: 2,635

SPAS Version: 9.5

Base Map Used: 9-day (9/9-9/17) Stage 4 Precipitation

Spatial resolution: 36 seconds (0.37 sq-mi)

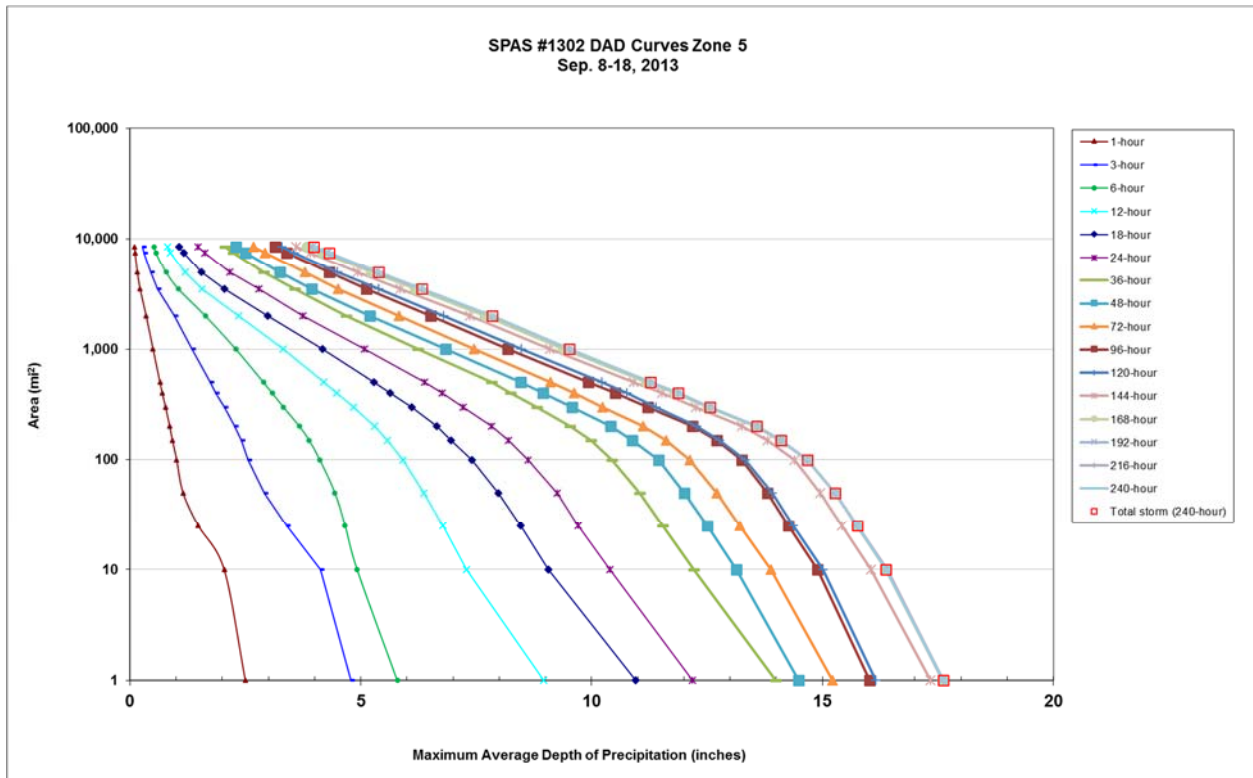
Radar Included: Yes (WDT composite reflectivity from CONUS mosaic)

Depth-Area-Duration (DAD) analysis: Yes.

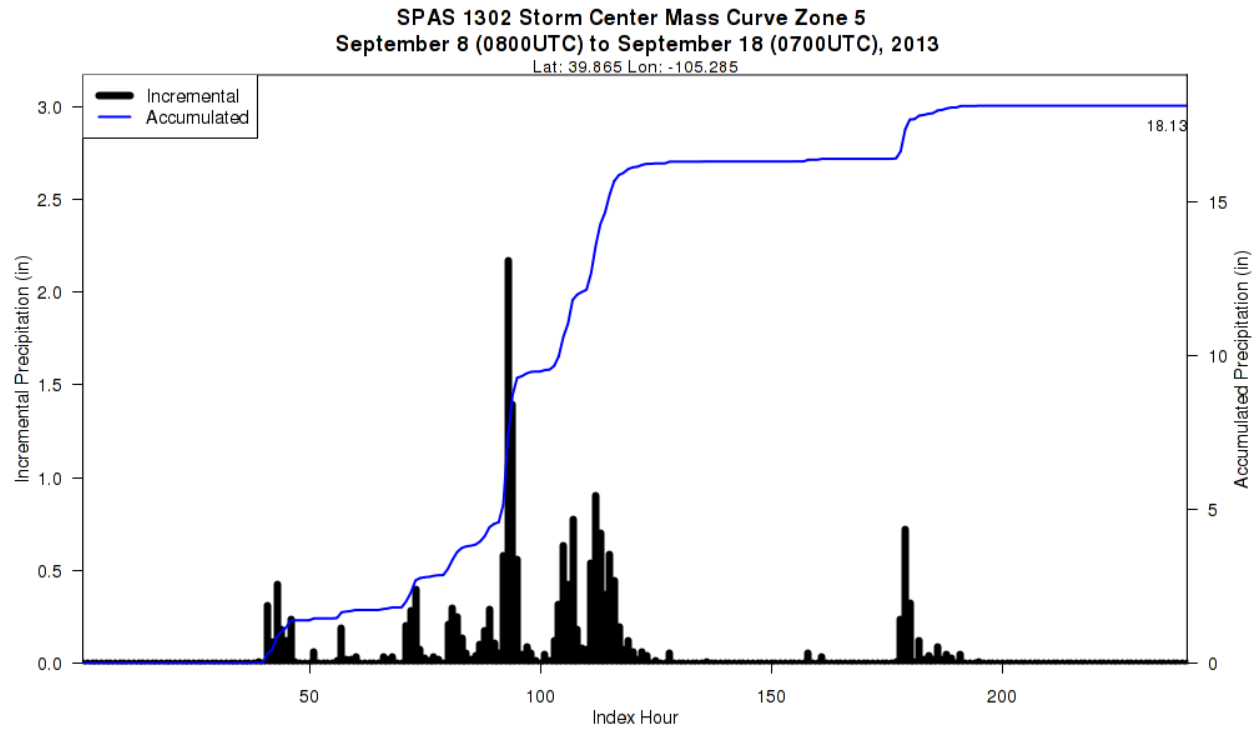
Reliability of Results: We have a great deal of confidence in the results given the phenomenal amount of rain gauge data and QC'd radar data. The Denver radar was down from 16Z on September 13th through 14Z on September 14th (index hours 129-151), casting less confidence during this time frame in/around Denver and Boulder.

CO-NM Regional Extreme Precipitation Study

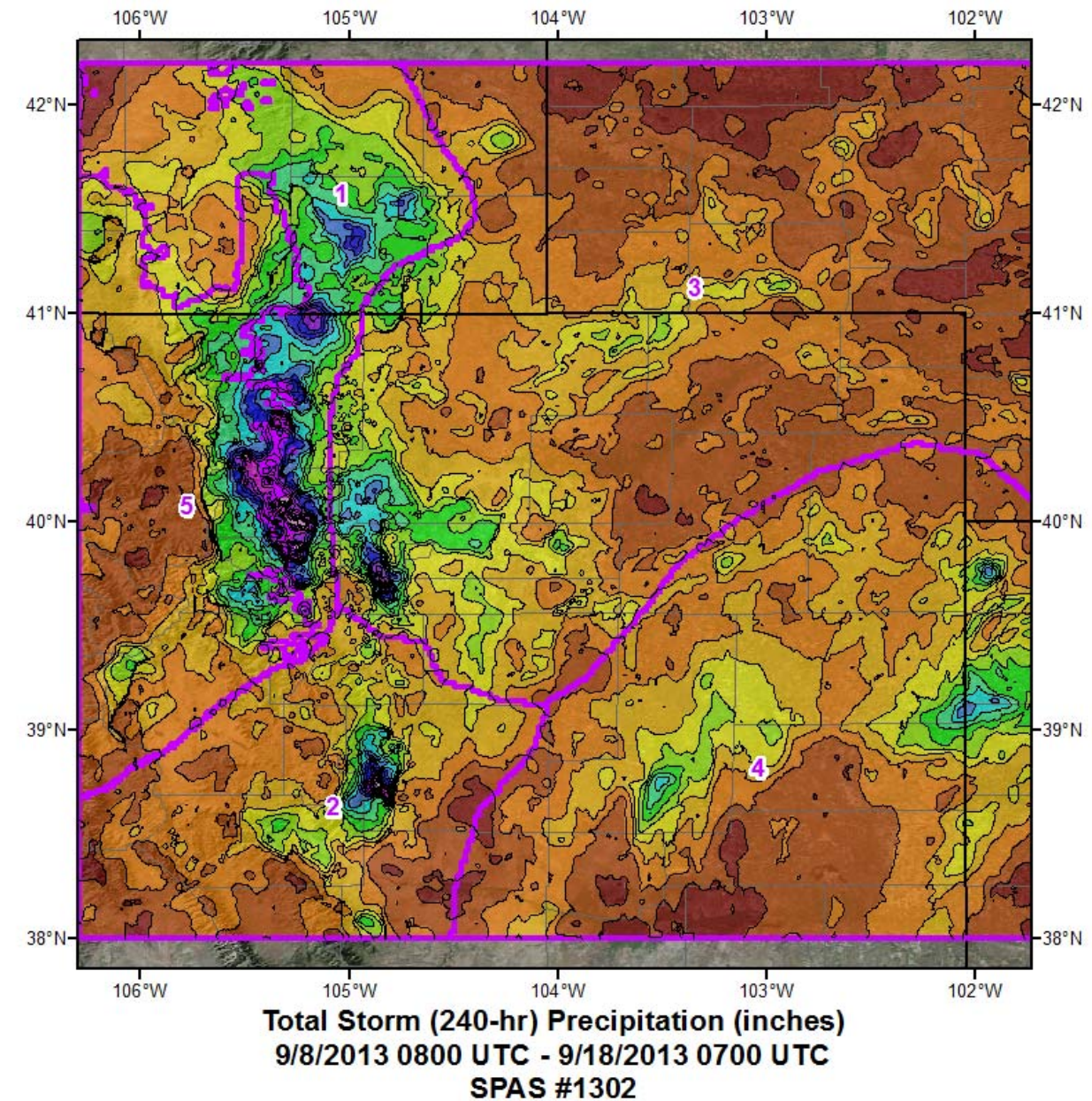
Storm 1302 - Sep. 8 (800 UTC) - Sep. 18 (700 UTC), 2013																
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)																
Area (mi ²)	Duration (hours)															
	1	3	6	12	18	24	36	48	72	96	120	144	168	192	216	240
0.4	2.60	4.90	5.92	9.16	11.18	12.41	14.20	14.70	15.43	16.28	16.34	17.81	18.08	18.08	18.08	18.08
1	2.50	4.79	5.79	8.96	10.96	12.18	13.98	14.48	15.21	16.02	16.16	17.34	17.61	17.61	17.62	17.62
10	2.04	4.12	4.92	7.29	9.07	10.39	12.21	13.14	13.88	14.89	15.01	16.05	16.38	16.39	16.40	16.38
25	1.48	3.40	4.66	6.78	8.47	9.71	11.54	12.50	13.21	14.26	14.37	15.42	15.74	15.75	15.76	15.76
50	1.15	2.91	4.44	6.37	7.98	9.26	11.04	12.01	12.71	13.81	13.91	14.96	15.28	15.28	15.28	15.28
100	1.01	2.56	4.11	5.92	7.41	8.62	10.44	11.45	12.13	13.26	13.33	14.39	14.67	14.68	14.67	14.67
150	0.92	2.41	3.88	5.58	6.96	8.20	9.99	10.88	11.62	12.71	12.77	13.81	14.08	14.11	14.11	14.11
200	0.86	2.27	3.67	5.30	6.64	7.83	9.53	10.41	11.11	12.19	12.27	13.25	13.54	13.57	13.57	13.57
300	0.77	2.04	3.32	4.85	6.10	7.22	8.82	9.57	10.24	11.21	11.39	12.25	12.52	12.57	12.57	12.57
400	0.70	1.86	3.08	4.48	5.64	6.77	8.25	8.94	9.62	10.51	10.76	11.53	11.81	11.88	11.88	11.88
500	0.65	1.74	2.89	4.20	5.28	6.38	7.83	8.46	9.11	9.93	10.22	10.91	11.19	11.28	11.28	11.28
1,000	0.50	1.35	2.29	3.32	4.17	5.08	6.23	6.84	7.45	8.18	8.48	9.10	9.39	9.51	9.52	9.52
2,000	0.35	0.96	1.63	2.35	2.98	3.75	4.69	5.20	5.82	6.51	6.80	7.36	7.69	7.83	7.84	7.85
3,500	0.22	0.60	1.05	1.57	2.04	2.80	3.57	3.94	4.51	5.12	5.39	5.85	6.18	6.30	6.32	6.33
5,000	0.16	0.45	0.78	1.19	1.55	2.17	2.90	3.25	3.79	4.31	4.50	4.93	5.22	5.34	5.36	5.38
7,500	0.11	0.31	0.56	0.88	1.17	1.62	2.23	2.50	2.93	3.40	3.56	3.91	4.17	4.28	4.30	4.31
8,522	0.10	0.28	0.52	0.81	1.07	1.48	2.06	2.30	2.68	3.14	3.29	3.60	3.84	3.95	3.97	3.98



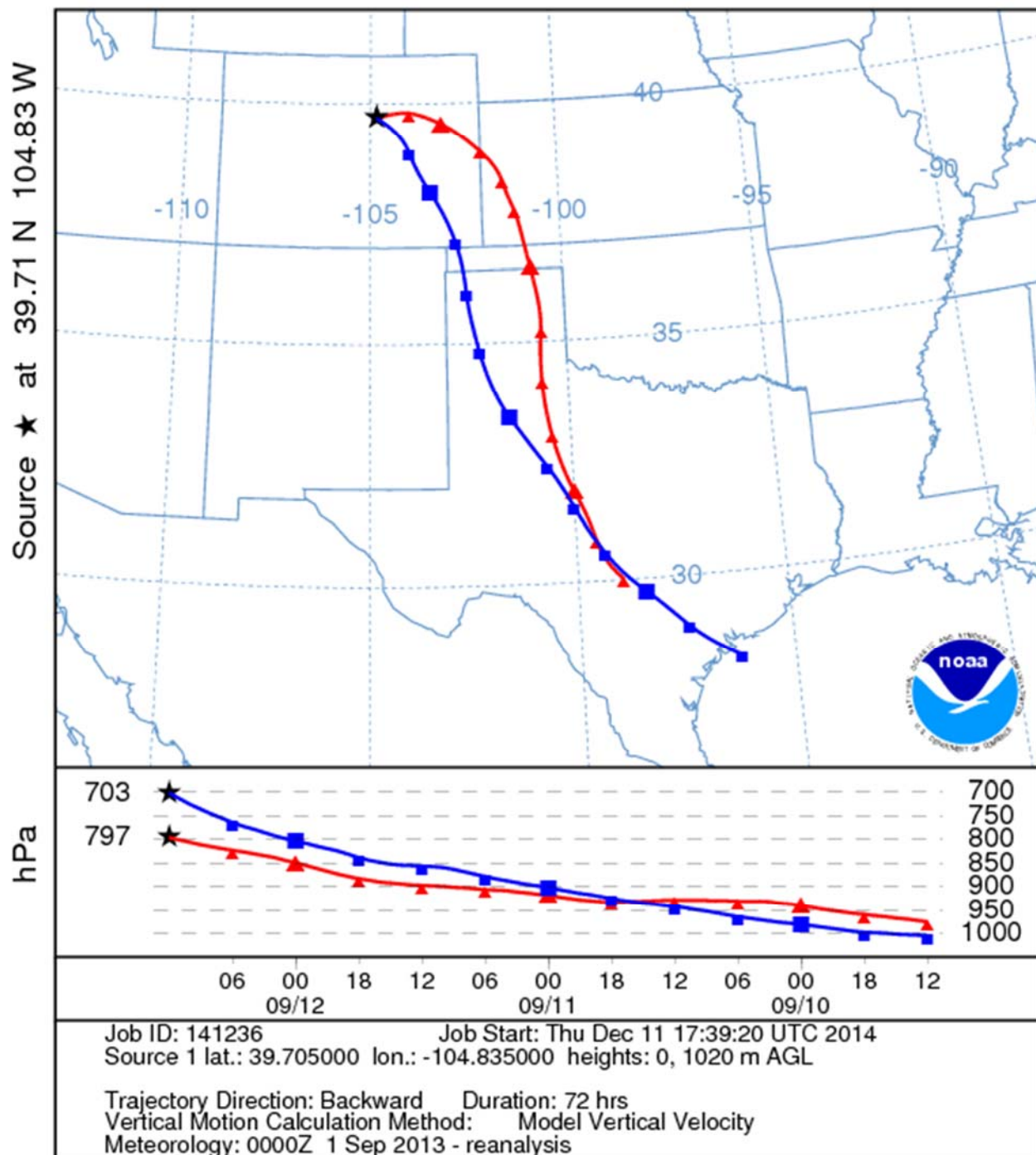
CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



NOAA HYSPLIT MODEL
Backward trajectories ending at 1200 UTC 12 Sep 13
CDC1 Meteorological Data



SPAS 1302 COLORADO, CO Storm Analysis_Zone5
September 9-12, 2013

Guadalupe Pass, TX

September 10-14, 2013

Storm Type: General

Storm Precipitation Analysis System (SPAS) Storm #1530_1

General Storm Location: Guadalupe Pass, TX (37.0, -108.0, 30.0, -102.0)

Storm Dates: September 10-14, 2013 (84-hours)

Event: Synoptic

DAD Zone 1

Latitude: 32.035

Longitude: -104.555

Max. Grid Rainfall Amount: 18.34"

Max. Observed Rainfall Amount: 15.76" Guadalupe Pass, TX

Number of Stations: 910

SPAS Version: 10

Base Map Used: us_ppt_in_map_1961_1990_usda_northamerica

Spatial resolution: 00:00:36

Radar Included: Yes

Depth-Area-Duration (DAD) analysis: Yes

Degree of confidence in results: This analysis was based on an abundance of hourly data, daily data, supplemental station data and one hourly estimated station at the storm center. We have a good degree of confidence for the station based storm total results. The spatial pattern is dependent on the basemap (us_ppt_in_map_1961_1990_usda_northamerica). There is a high degree of confidence with the timing based on the several hourly and hourly pseudo stations. Some daily stations were moved to supplemental due to timing issues or removed due to erroneous storm precipitation observations. Additional details can be found in the "Read_Me_1530.docx" file. The Guadalupe Pass hourly station had missing data at the beginning and end of the ippt 144 hour period, but captured the main precipitation event. After consideration and several runs, an hourly estimated pseudo (HEP) station was not used instead of the Guadalupe Pass station.

Due to beam blockage issues, some of the hourly precipitation intensities, at the storm center, were likely high. An hourly estimated (HE) station was created at the SPAS storm center from its mass curve with radar index hours 34, 42, 49 and 52 estimated from nearby stations (see below). Also, a supplemental station was created near the original SPAS created storm center in order to control the overall magnitude of the storm (highest observation near storm center was 15.76 inches; SPAS without supplemental at storm center was about 20 inches due to beam blockage

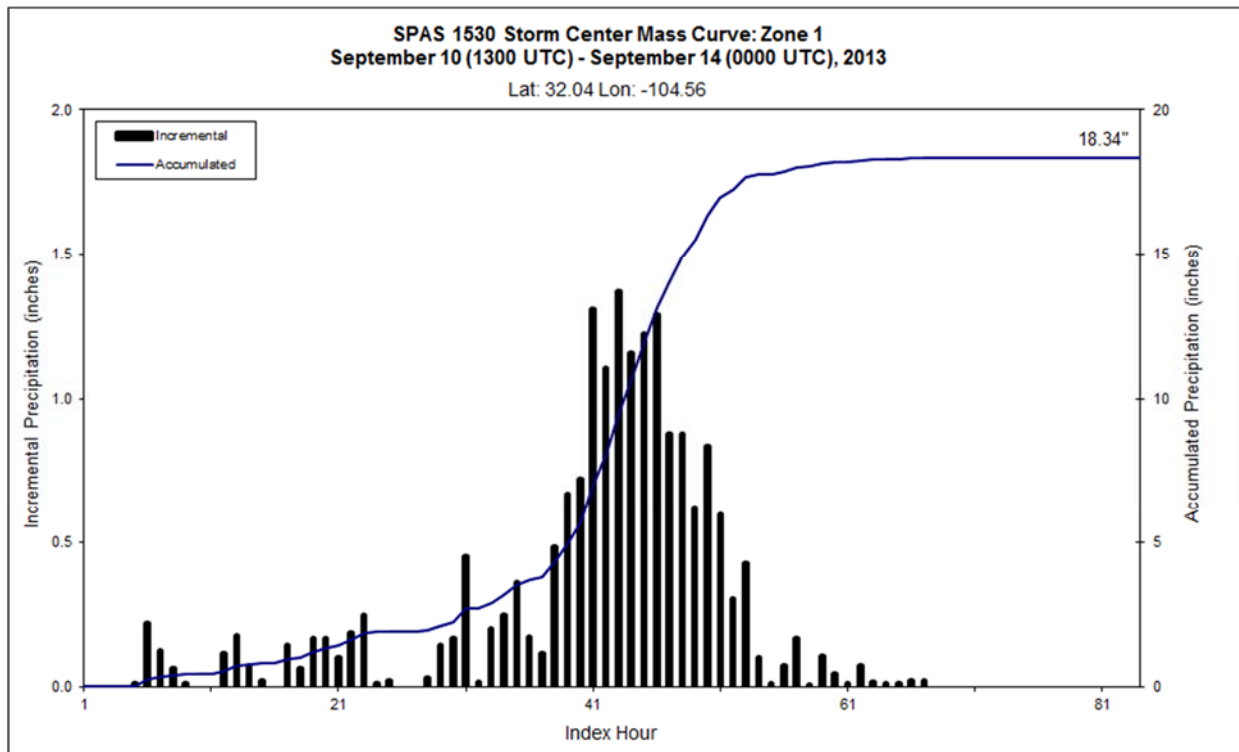
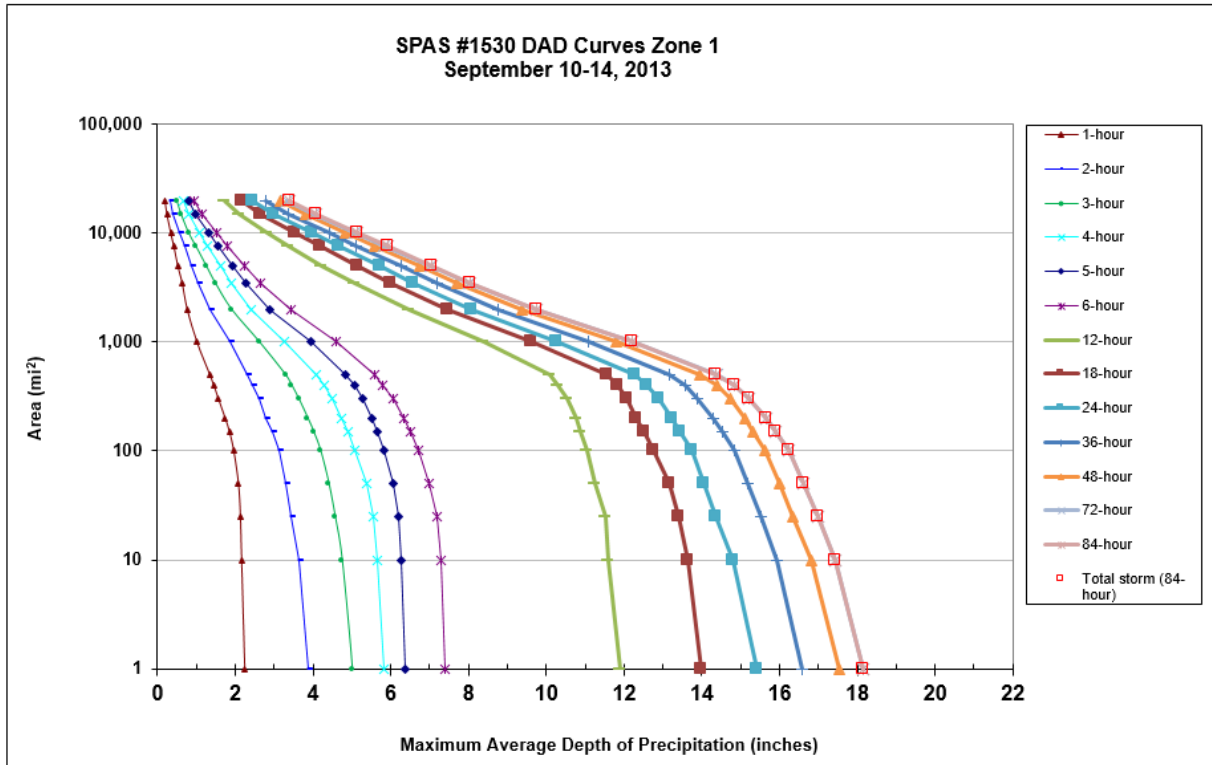
CO-NM Regional Extreme Precipitation Study

issues). This SPAS storm center supplemental station was set to 17.50 inches (over the radar period), which was the approximate difference between the 20 inch storm center and 15.76 inch highest observation.

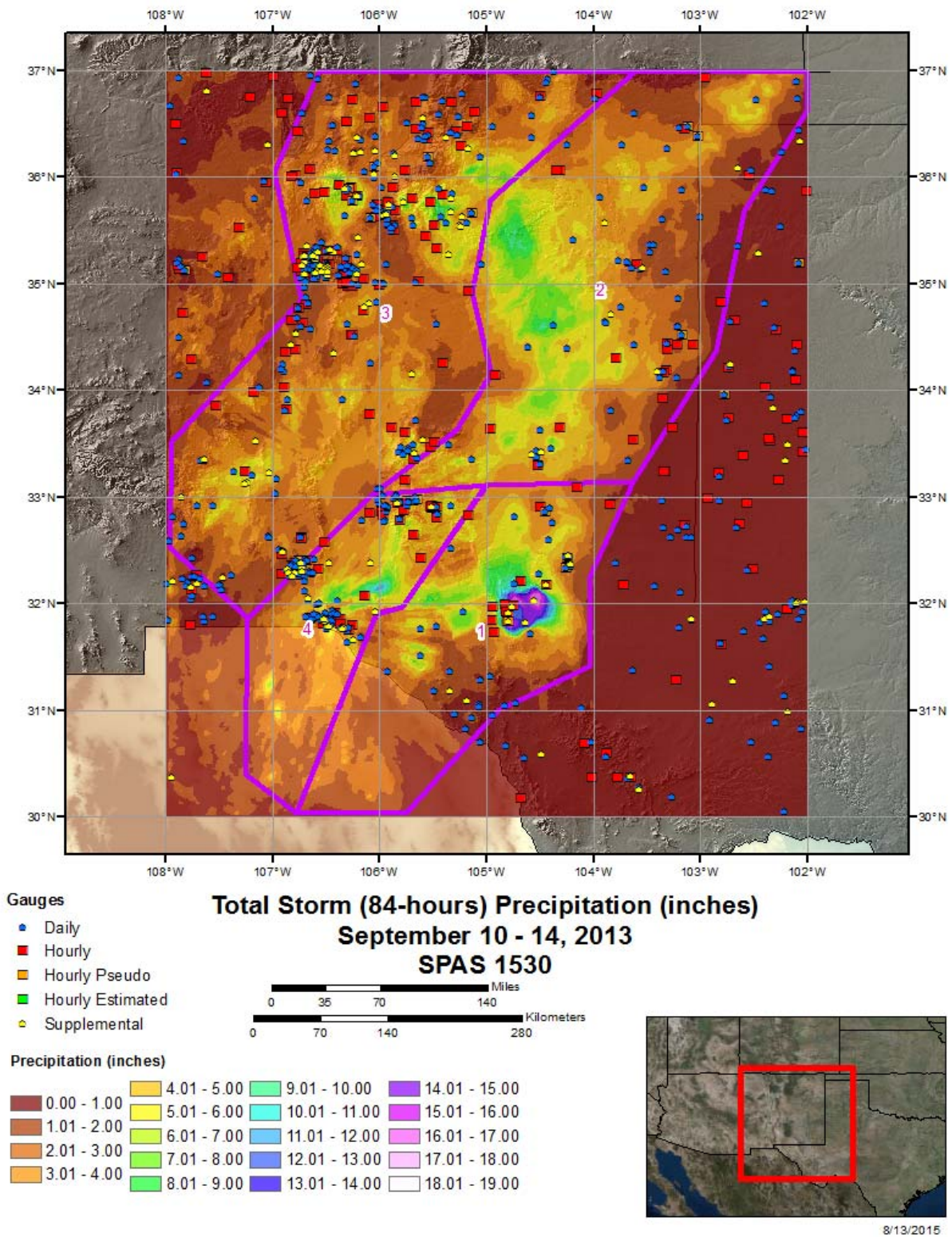
CO-NM Regional Extreme Precipitation Study

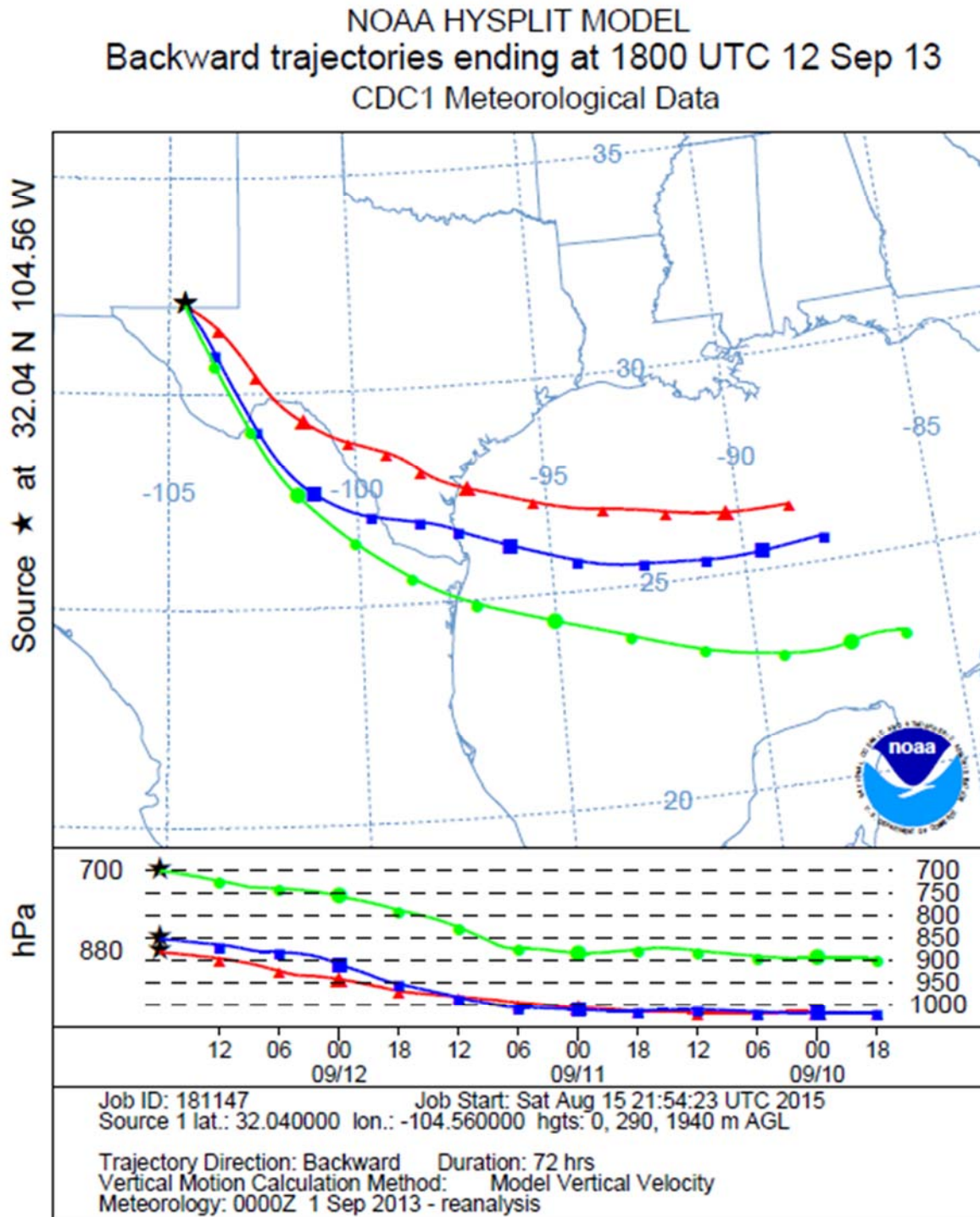
Storm 1530 Zone 1 - Sep. 10 (1300 UTC) - Sep. 14 (0000 UTC), 2013														
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
areasqmi	Duration (hours)													
	1	2	3	4	5	6	12	18	24	36	48	72	84	Total
0.4	2.27	3.93	5.06	5.89	6.43	7.46	12.05	14.15	15.59	16.76	17.71	18.34	18.34	18.34
1	2.24	3.88	5.00	5.83	6.38	7.41	11.91	14.00	15.42	16.59	17.54	18.15	18.15	18.15
10	2.16	3.63	4.74	5.64	6.28	7.29	11.61	13.65	14.81	15.93	16.83	17.44	17.44	17.44
25	2.13	3.43	4.56	5.56	6.21	7.20	11.52	13.41	14.37	15.52	16.35	16.98	16.98	16.98
50	2.08	3.31	4.40	5.39	6.07	7.00	11.25	13.15	14.07	15.18	15.99	16.62	16.62	16.62
100	1.96	3.12	4.19	5.09	5.84	6.70	11.04	12.74	13.73	14.85	15.63	16.24	16.24	16.24
150	1.85	2.95	4.01	4.89	5.67	6.51	10.88	12.51	13.44	14.54	15.32	15.90	15.90	15.90
200	1.74	2.80	3.86	4.73	5.53	6.33	10.76	12.32	13.22	14.31	15.10	15.65	15.65	15.65
300	1.57	2.60	3.63	4.49	5.29	6.05	10.52	12.08	12.88	13.90	14.73	15.21	15.21	15.21
400	1.45	2.45	3.45	4.30	5.07	5.80	10.30	11.82	12.59	13.56	14.38	14.83	14.83	14.83
500	1.35	2.32	3.29	4.10	4.85	5.59	10.08	11.56	12.27	13.17	13.94	14.40	14.36	14.36
1,000	1.02	1.86	2.62	3.28	3.94	4.60	8.38	9.62	10.27	11.07	11.79	12.21	12.21	12.21
2,000	0.77	1.35	1.90	2.41	2.90	3.44	6.48	7.48	8.09	8.77	9.39	9.75	9.75	9.75
3,500	0.64	1.03	1.48	1.90	2.29	2.66	5.06	5.98	6.57	7.18	7.71	8.01	8.04	8.04
5,000	0.53	0.88	1.25	1.62	1.94	2.23	4.22	5.14	5.71	6.26	6.74	7.01	7.05	7.05
7,500	0.43	0.69	0.99	1.30	1.55	1.79	3.38	4.18	4.65	5.12	5.59	5.84	5.94	5.94
10,000	0.35	0.55	0.80	1.08	1.31	1.52	2.81	3.53	3.98	4.43	4.85	5.07	5.15	5.15
15,000	0.25	0.41	0.60	0.81	0.98	1.14	2.10	2.65	2.99	3.37	3.81	4.02	4.09	4.09
19,842	0.20	0.34	0.49	0.66	0.80	0.93	1.72	2.17	2.45	2.78	3.17	3.33	3.39	3.39

CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study

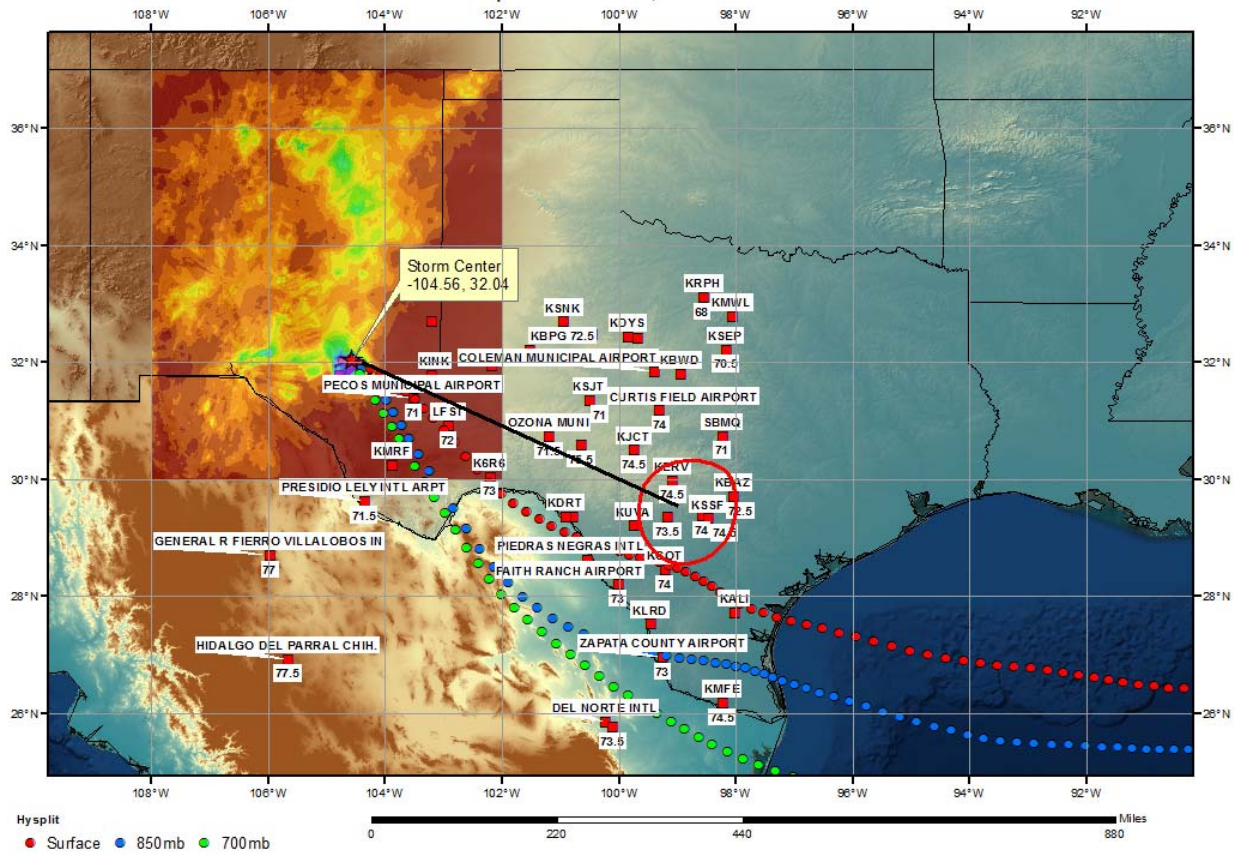




CO-NM Regional Extreme Precipitation Study

SPAS 1530 Guadalupe Pass, TX Storm Analysis Zone 1

September 11-12, 2013



Sumner Lake, NM

September 10-14, 2013

Storm Type: General

Storm Precipitation Analysis System (SPAS) Storm #1530_2

General Storm Location: Guadalupe Pass, TX (37.0, -108.0, 30.0, -102.0)

Storm Dates: September 10-14, 2013 (84-hours)

Event: Synoptic

DAD Zone 2

Latitude: 34.595

Longitude: -104.475

Max. Grid Rainfall Amount: 9.63"

Max. Observed Rainfall Amount: 8.29" Sumner Lake, NM

Number of Stations: 910

SPAS Version: 10

Base Map Used: us_ppt_in_map_1961_1990_usda_northamerica

Spatial resolution: 00:00:36

Radar Included: Yes

Depth-Area-Duration (DAD) analysis: Yes

Degree of confidence in results: This analysis was based on an abundance of hourly data, daily data, supplemental station data and one hourly estimated station at the storm center. We have a good degree of confidence for the station based storm total results. The spatial pattern is dependent on the basemap (us_ppt_in_map_1961_1990_usda_northamerica). There is a high degree of confidence with the timing based on the several hourly and hourly pseudo stations. Some daily stations were moved to supplemental due to timing issues or removed due to erroneous storm precipitation observations. Additional details can be found in the "Read_Me_1530.docx" file. The Guadalupe Pass hourly station had missing data at the beginning and end of the ippt 144 hour period, but captured the main precipitation event. After consideration and several runs, an hourly estimated pseudo (HEP) station was not used instead of the Guadalupe Pass station.

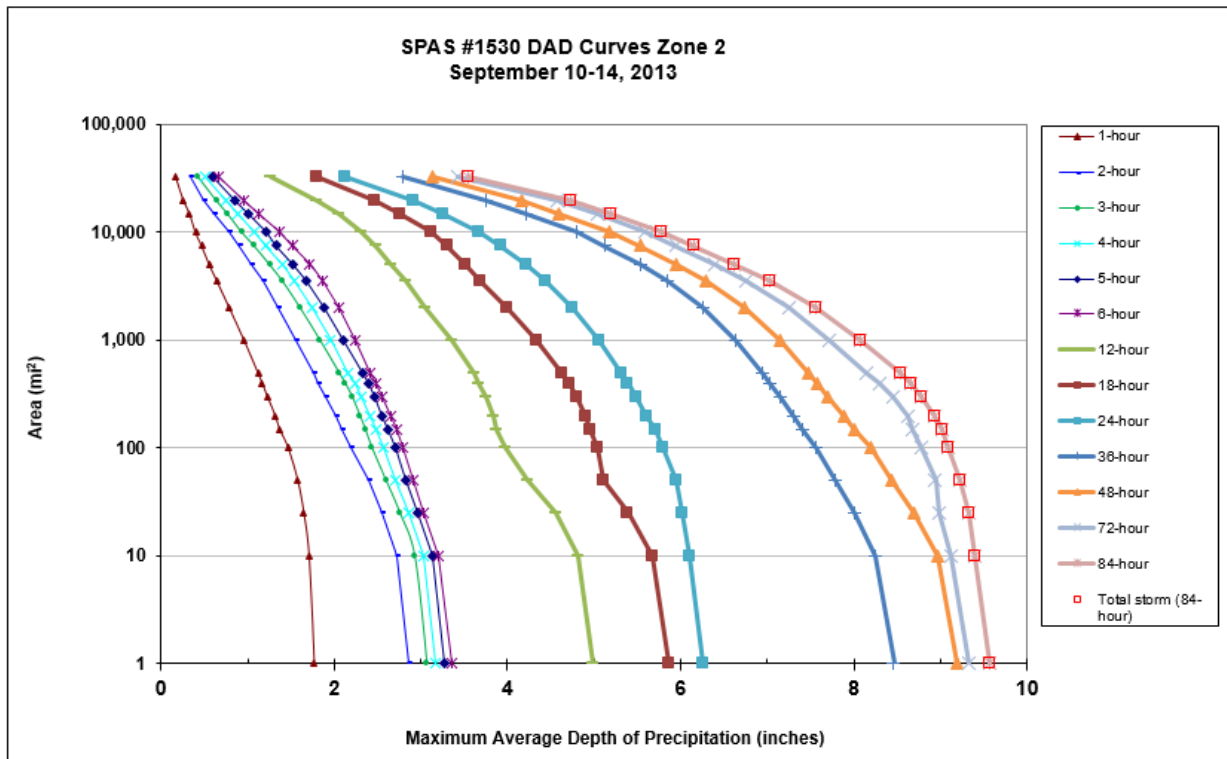
Due to beam blockage issues, some of the hourly precipitation intensities, at the storm center, were likely high. An hourly estimated (HE) station was created at the SPAS storm center from its mass curve with radar index hours 34, 42, 49 and 52 estimated from nearby stations (see below). Also, a supplemental station was created near the original SPAS created storm center in order to control the overall magnitude of the storm (highest observation near storm center was 15.76 inches; SPAS without supplemental at storm center was about 20 inches due to beam blockage issues). This SPAS storm center supplemental station was set to 17.50 inches (over the radar

CO-NM Regional Extreme Precipitation Study

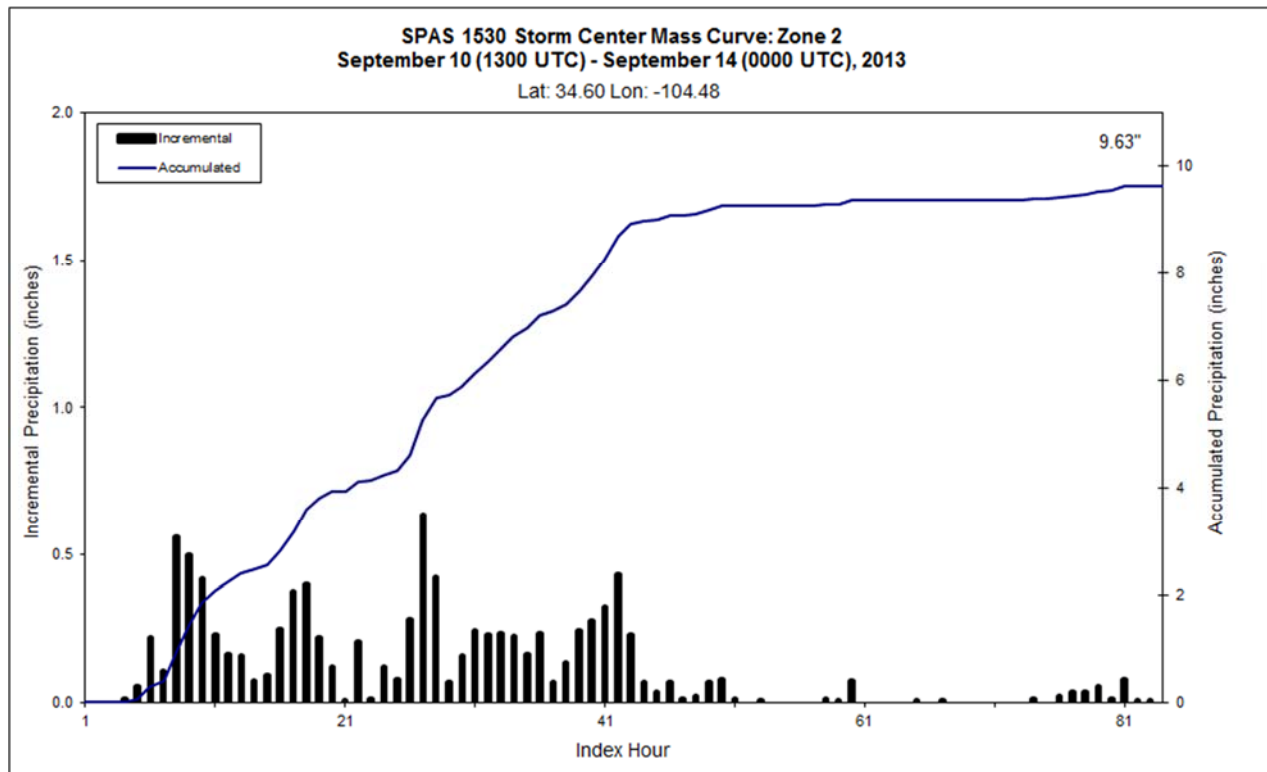
period), which was the approximate difference between the 20 inch storm center and 15.76 inch highest observation.

CO-NM Regional Extreme Precipitation Study

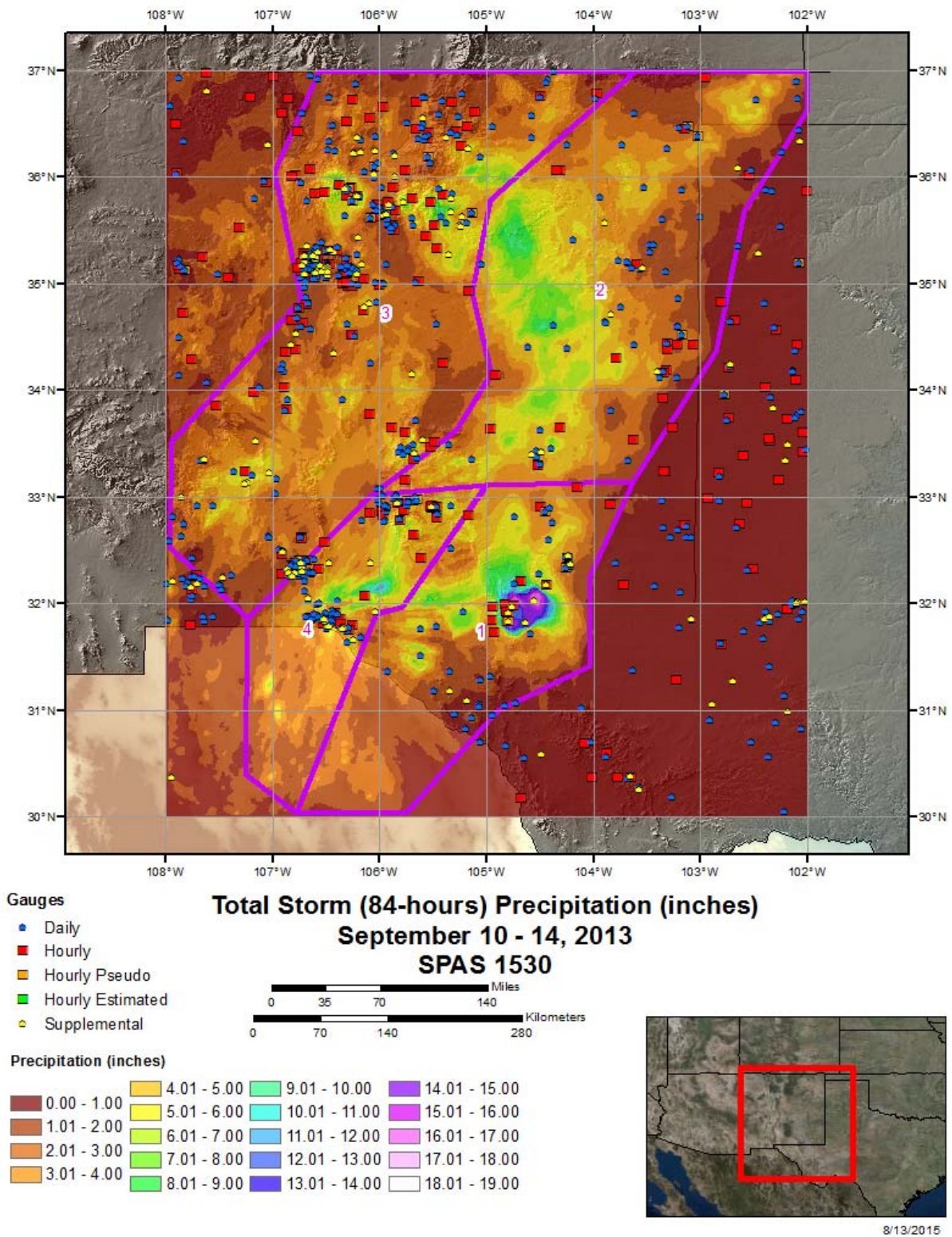
Storm 1530 Zone 2 - Sep. 10 (1300 UTC) - Sep. 14 (0000 UTC), 2013													
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)													
areasqmi	Duration (hours)												
	1	2	3	4	5	6	12	18	24	36	48	72	84
0.4	1.78	2.89	3.10	3.20	3.30	3.38	5.02	5.91	6.31	8.53	9.27	9.40	9.63
1	1.77	2.86	3.07	3.17	3.27	3.35	4.98	5.86	6.25	8.46	9.19	9.33	9.56
10	1.71	2.73	2.93	3.03	3.13	3.21	4.82	5.68	6.11	8.25	8.97	9.12	9.39
25	1.65	2.56	2.76	2.86	2.97	3.04	4.55	5.39	6.02	8.01	8.69	8.99	9.33
50	1.58	2.39	2.60	2.71	2.83	2.92	4.24	5.11	5.94	7.78	8.44	8.94	9.22
100	1.47	2.20	2.44	2.57	2.70	2.80	3.97	5.03	5.79	7.56	8.19	8.78	9.09
150	1.37	2.09	2.36	2.48	2.62	2.72	3.87	4.95	5.70	7.41	8.01	8.68	9.01
200	1.32	2.02	2.30	2.41	2.56	2.66	3.83	4.90	5.61	7.30	7.89	8.62	8.93
300	1.23	1.90	2.21	2.31	2.47	2.56	3.75	4.79	5.48	7.15	7.70	8.45	8.78
400	1.17	1.82	2.13	2.24	2.39	2.48	3.67	4.71	5.39	7.03	7.57	8.29	8.66
500	1.12	1.76	2.06	2.16	2.33	2.42	3.61	4.63	5.31	6.95	7.47	8.15	8.53
1,000	0.96	1.55	1.84	1.96	2.10	2.25	3.36	4.34	5.06	6.64	7.14	7.71	8.08
2,000	0.79	1.35	1.61	1.74	1.88	2.05	3.05	3.99	4.74	6.25	6.73	7.25	7.56
3,500	0.65	1.18	1.41	1.54	1.68	1.86	2.83	3.69	4.44	5.85	6.29	6.76	7.03
5,000	0.56	1.05	1.26	1.40	1.53	1.72	2.66	3.51	4.21	5.53	5.94	6.40	6.62
7,500	0.47	0.90	1.08	1.21	1.34	1.53	2.49	3.31	3.93	5.12	5.53	5.95	6.16
10,000	0.40	0.78	0.94	1.08	1.21	1.37	2.32	3.11	3.67	4.79	5.17	5.58	5.77
15,000	0.33	0.62	0.77	0.88	1.00	1.13	2.05	2.76	3.25	4.22	4.60	5.03	5.20
20,000	0.26	0.50	0.64	0.75	0.86	0.95	1.80	2.46	2.91	3.76	4.17	4.57	4.73
33,053	0.17	0.34	0.43	0.51	0.59	0.66	1.27	1.8	2.13	2.79	3.13	3.43	3.55

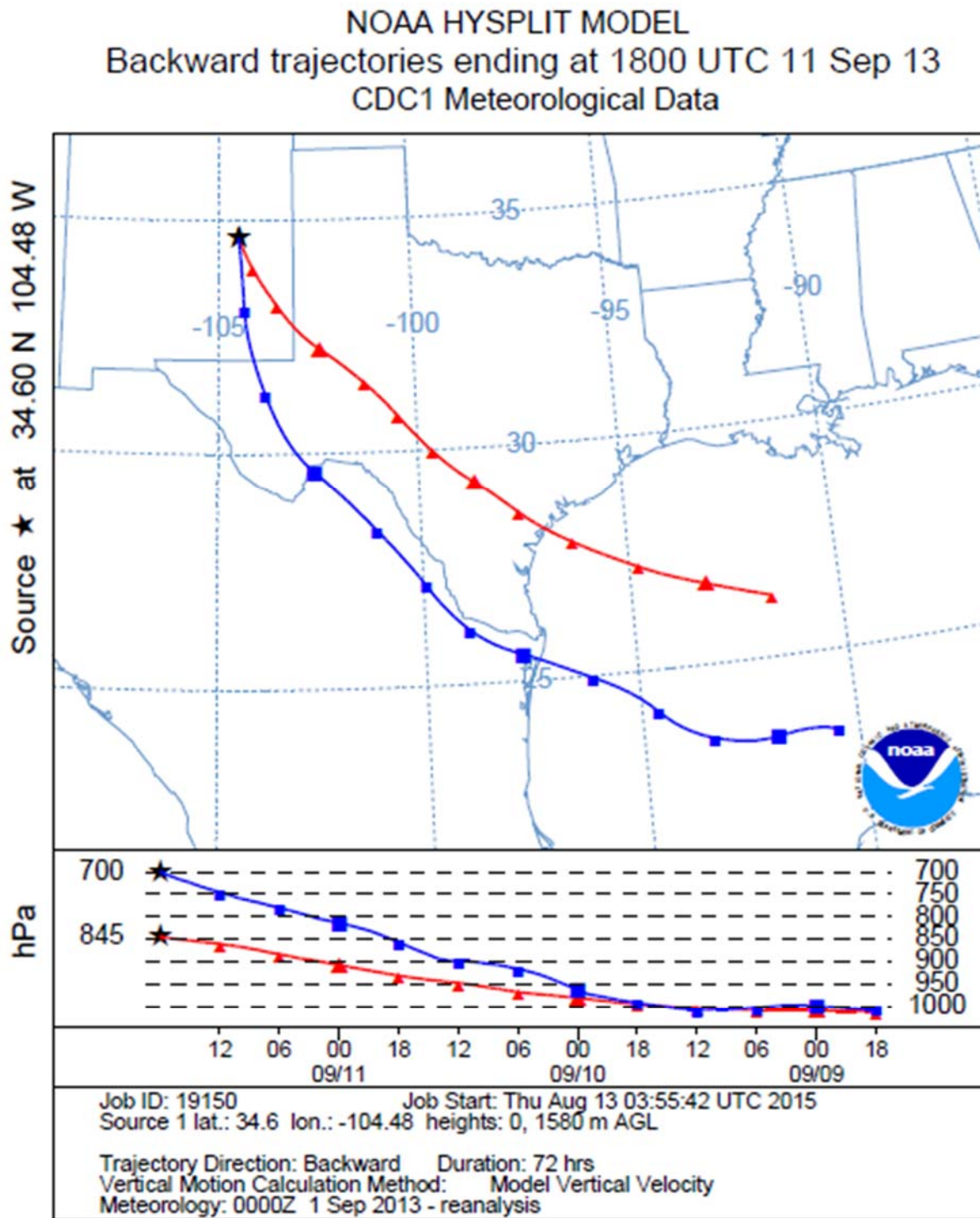


CO-NM Regional Extreme Precipitation Study

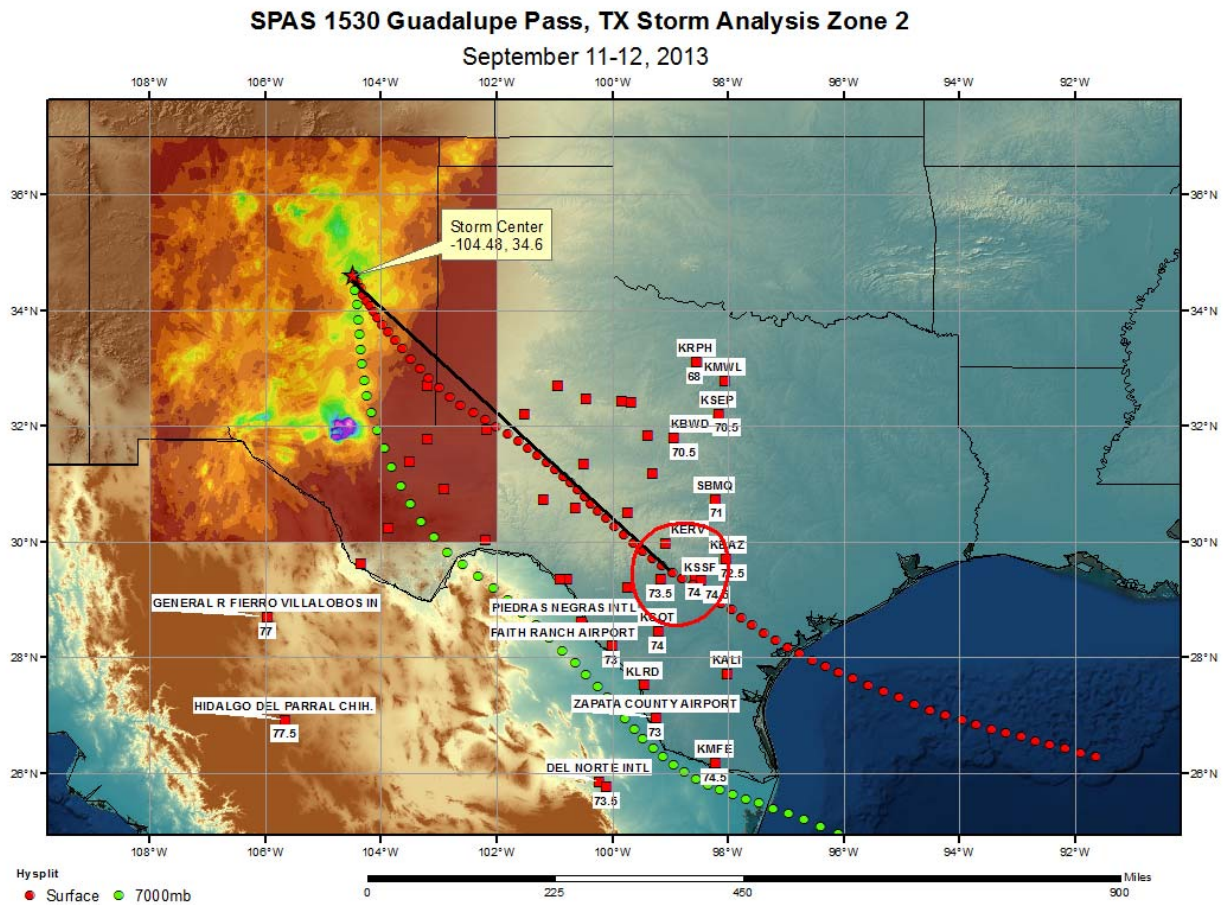


CO-NM Regional Extreme Precipitation Study





CO-NM Regional Extreme Precipitation Study



Chaparral, NM

September 10-14, 2013

Storm Type: General

Storm Precipitation Analysis System (SPAS) Storm #1530_4

General Storm Location: Guadalupe Pass, TX (37.0, -108.0, 30.0, -102.0)

Storm Dates: September 10-14, 2013 (84-hours)

Event: Synoptic

DAD Zone 4

Latitude: 32.145

Longitude: -105.995

Max. Grid Rainfall Amount: 11.94"

Max. Observed Rainfall Amount: 7.83" Chaparral, NM

Number of Stations: 910

SPAS Version: 10

Base Map Used: us_ppt_in_map_1961_1990_usda_northamerica

Spatial resolution: 00:00:36

Radar Included: Yes

Depth-Area-Duration (DAD) analysis: Yes

Degree of confidence in results: This analysis was based on an abundance of hourly data, daily data, supplemental station data and one hourly estimated station at the storm center. We have a good degree of confidence for the station based storm total results. The spatial pattern is dependent on the basemap (us_ppt_in_map_1961_1990_usda_northamerica). There is a high degree of confidence with the timing based on the several hourly and hourly pseudo stations. Some daily stations were moved to supplemental due to timing issues or removed due to erroneous storm precipitation observations. Additional details can be found in the "Read_Me_1530.docx" file. The Guadalupe Pass hourly station had missing data at the beginning and end of the ippt 144 hour period, but captured the main precipitation event. After consideration and several runs, an hourly estimated pseudo (HEP) station was not used instead of the Guadalupe Pass station.

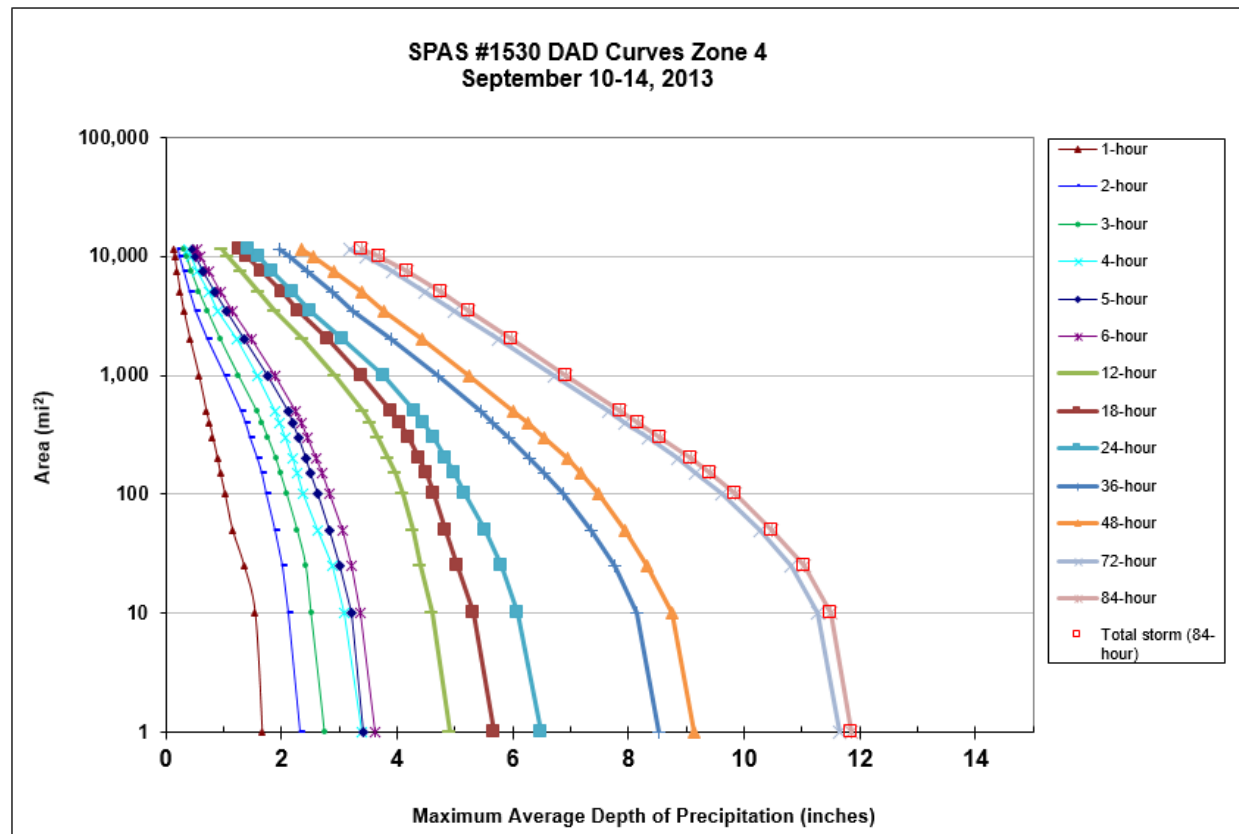
Due to beam blockage issues, some of the hourly precipitation intensities, at the storm center, were likely high. An hourly estimated (HE) station was created at the SPAS storm center from its mass curve with radar index hours 34, 42, 49 and 52 estimated from nearby stations (see below). Also, a supplemental station was created near the original SPAS created storm center in order to control the overall magnitude of the storm (highest observation near storm center was 15.76 inches; SPAS without supplemental at storm center was about 20 inches due to beam blockage

CO-NM Regional Extreme Precipitation Study

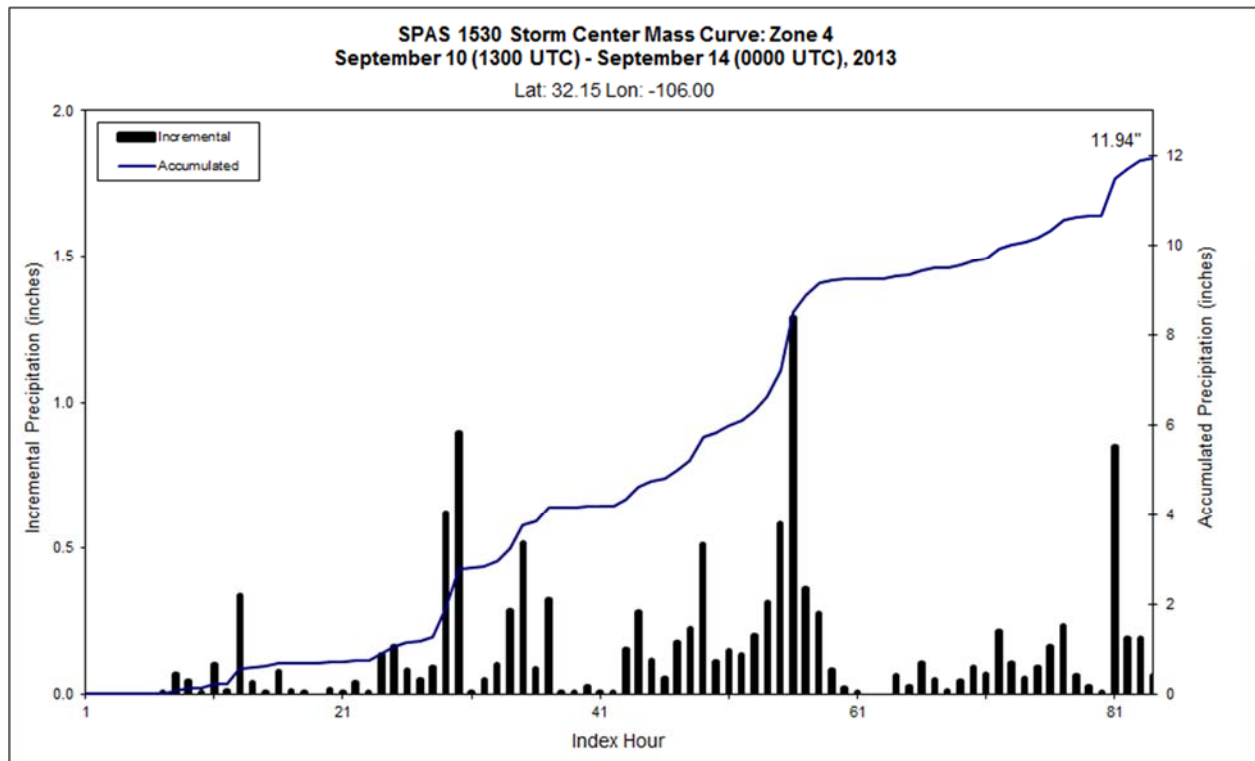
issues). This SPAS storm center supplemental station was set to 17.50 inches (over the radar period), which was the approximate difference between the 20 inch storm center and 15.76 inch highest observation.

CO-NM Regional Extreme Precipitation Study

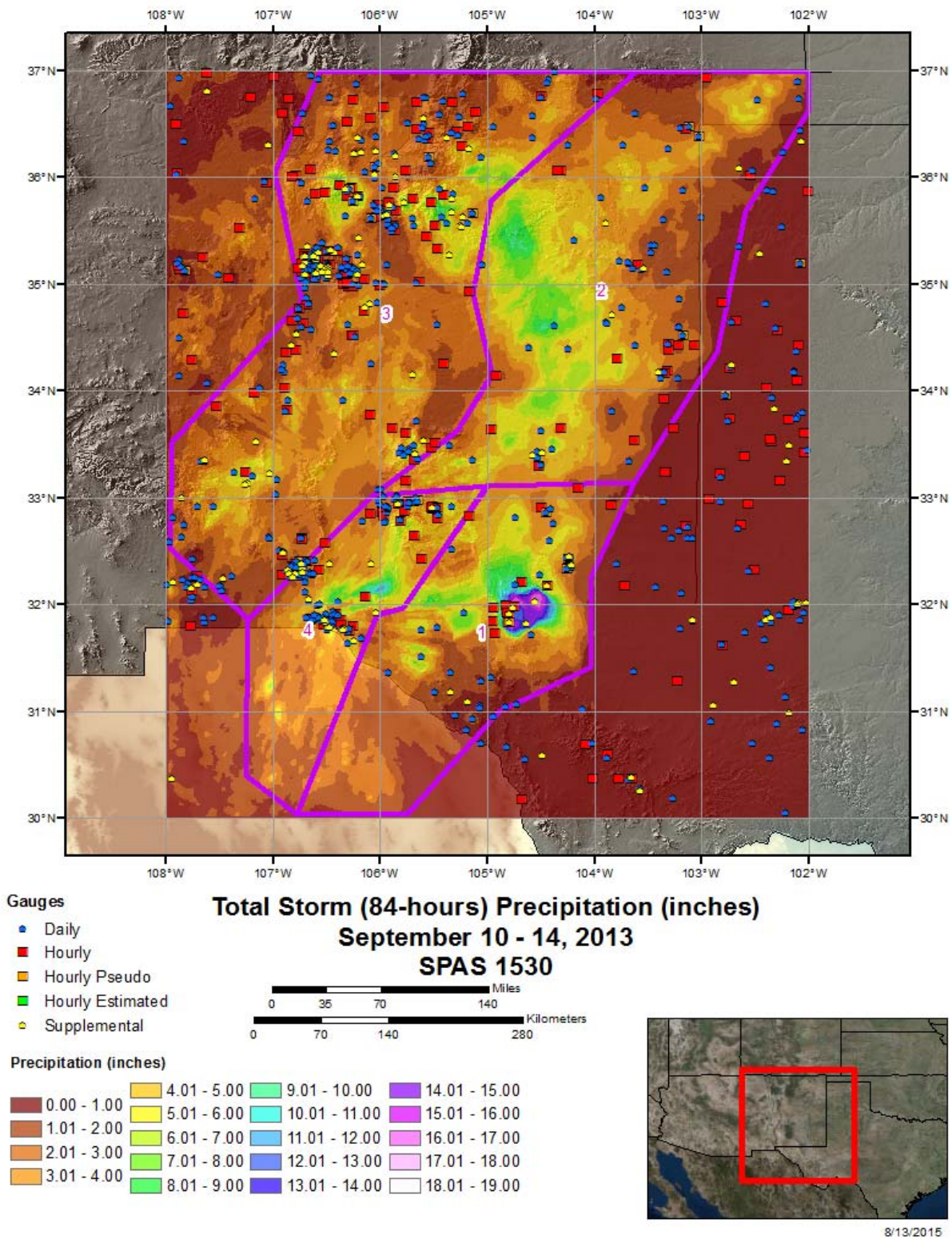
Storm 1530 Zone 4 - Sep. 10 (1300 UTC) - Sep. 14 (0000 UTC), 2013														
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
areasqmi	Duration (hours)													
	1	2	3	4	5	6	12	18	24	36	48	72	84	Total
0.4	1.67	2.36	2.79	3.44	3.46	3.67	4.97	5.73	6.55	8.61	9.23	11.71	11.94	11.94
1	1.66	2.33	2.75	3.38	3.41	3.61	4.92	5.68	6.50	8.53	9.14	11.64	11.86	11.86
10	1.54	2.12	2.52	3.08	3.20	3.36	4.60	5.31	6.09	8.15	8.75	11.28	11.50	11.50
25	1.35	2.02	2.43	2.87	3.02	3.21	4.41	5.04	5.81	7.75	8.32	10.82	11.05	11.05
50	1.15	1.90	2.28	2.63	2.84	3.05	4.28	4.85	5.52	7.35	7.94	10.27	10.49	10.49
100	1.02	1.74	2.10	2.38	2.62	2.83	4.11	4.64	5.18	6.87	7.48	9.61	9.84	9.84
150	0.94	1.65	1.99	2.27	2.51	2.70	3.97	4.50	5.00	6.54	7.17	9.17	9.41	9.41
200	0.89	1.58	1.91	2.19	2.42	2.60	3.85	4.38	4.85	6.30	6.94	8.85	9.08	9.08
300	0.81	1.47	1.77	2.07	2.30	2.46	3.68	4.20	4.63	5.93	6.55	8.35	8.56	8.56
400	0.75	1.37	1.67	1.97	2.19	2.34	3.54	4.05	4.47	5.65	6.25	7.95	8.17	8.17
500	0.70	1.30	1.58	1.89	2.11	2.25	3.42	3.90	4.31	5.45	6.02	7.66	7.87	7.87
1,000	0.57	1.02	1.26	1.58	1.76	1.89	2.94	3.39	3.76	4.70	5.24	6.72	6.93	6.93
2,000	0.42	0.73	0.95	1.22	1.36	1.49	2.38	2.80	3.07	3.89	4.43	5.76	5.99	5.99
3,500	0.31	0.53	0.72	0.91	1.04	1.15	1.90	2.30	2.51	3.24	3.77	4.99	5.24	5.24
5,000	0.25	0.42	0.58	0.75	0.85	0.95	1.61	2.01	2.20	2.87	3.39	4.49	4.75	4.75
7,500	0.19	0.31	0.44	0.55	0.64	0.74	1.31	1.65	1.83	2.44	2.90	3.92	4.17	4.17
10,000	0.15	0.25	0.36	0.45	0.52	0.60	1.08	1.40	1.60	2.15	2.55	3.47	3.69	3.69
11,534	0.13	0.22	0.31	0.40	0.46	0.54	0.97	1.27	1.44	1.97	2.34	3.18	3.40	3.40

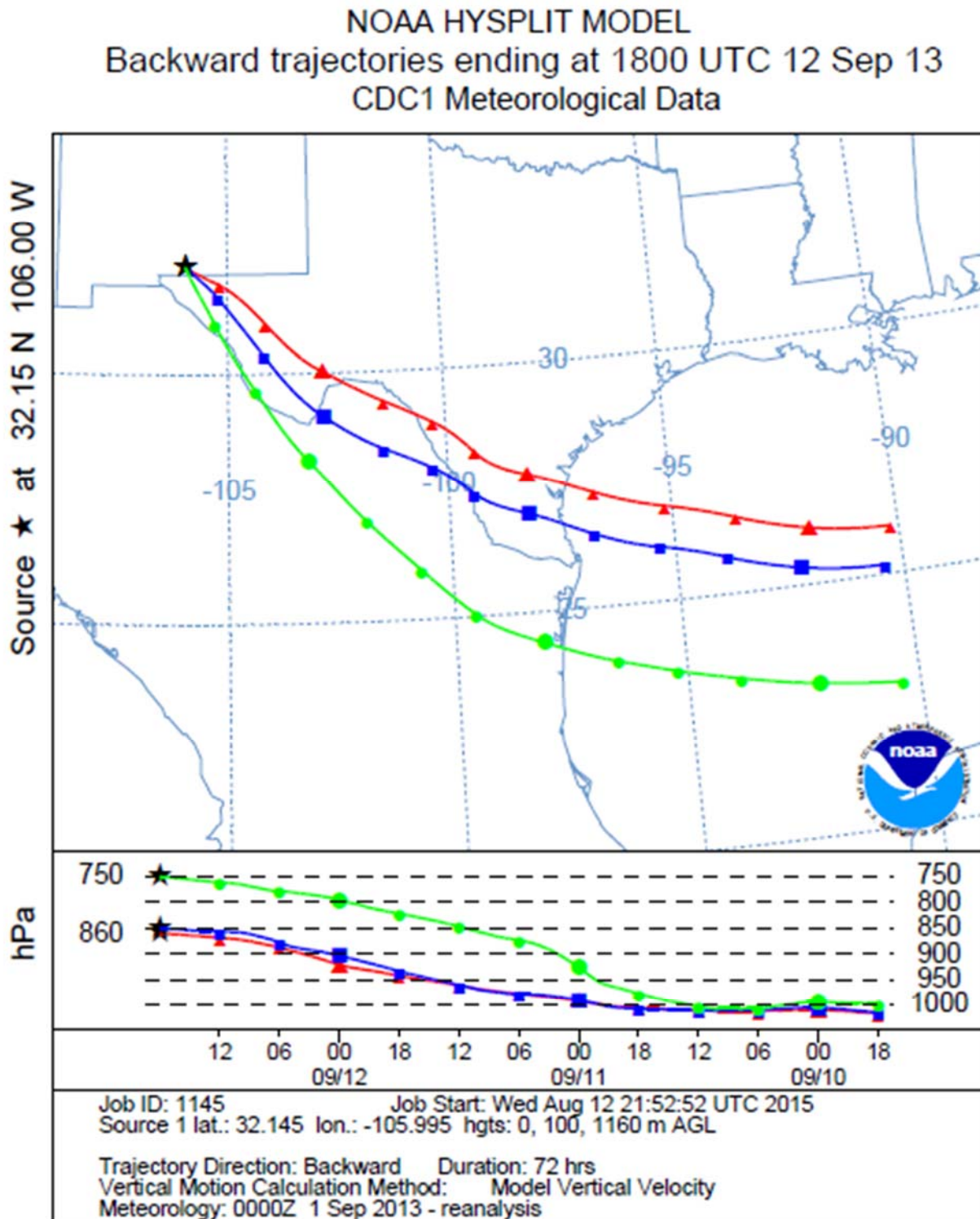


CO-NM Regional Extreme Precipitation Study

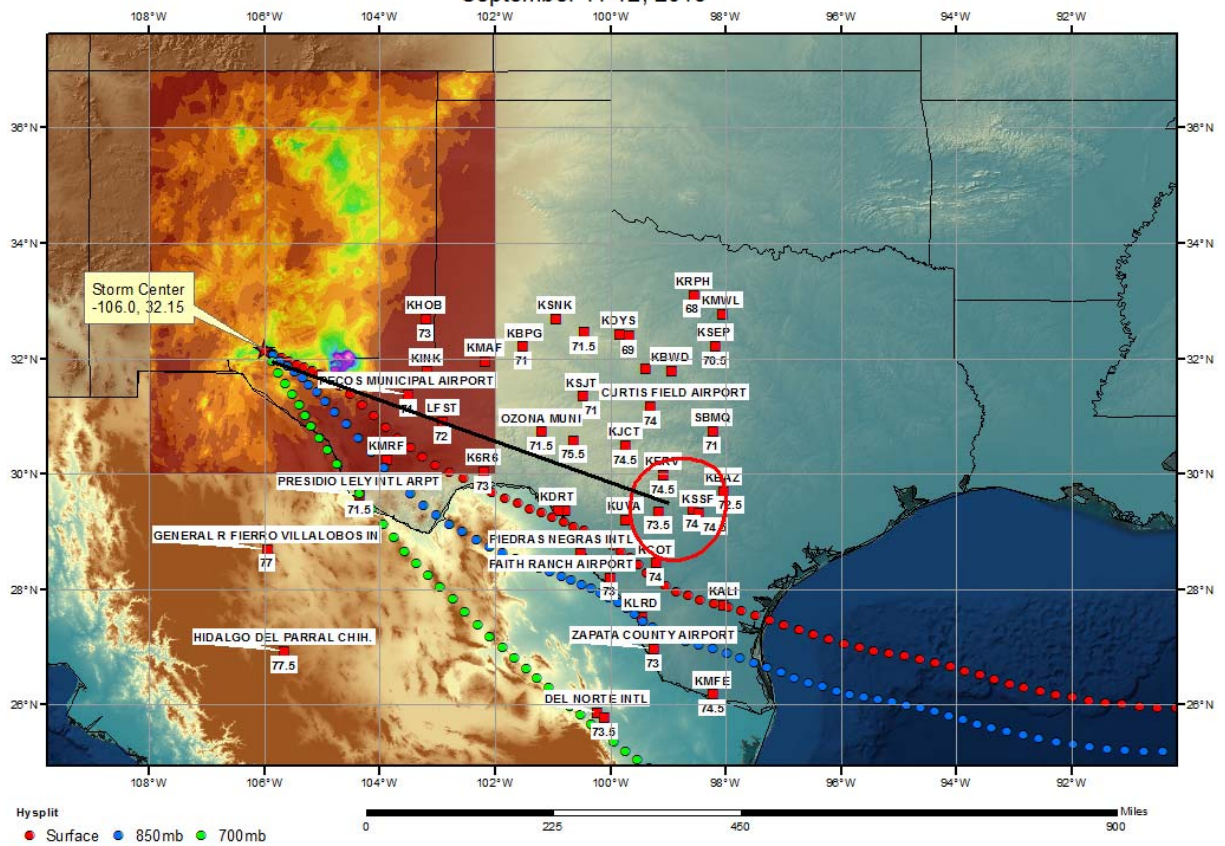


CO-NM Regional Extreme Precipitation Study





September 11-12, 2013



Local Storms

Penrose, CO

June 3-4, 1921

Storm Type: Local/Hybrid

Storm Precipitation Analysis System (SPAS) For Storm #1294_1 A re-run of SPAS #1008

*** Update addressed excess precipitation above 7500ft, created 2 DAD zones based on 7500ft elevation.

General Storm Location: Colorado Front Range, adjacent high plains and extreme northeastern New Mexico.

Storm Dates: June 3-4, 1921 (24-hours)

Event: Thunderstorm “cloudburst”

DAD Zone 1 (<7500ft)

Latitude: 38.4638

Longitude: -105.0705

Max. Grid Rainfall Amount: 12.19”

Max. Observed Rainfall Amount: 12.00” (Penrose, CO)

Number of Stations: 76 (0 Daily, 1 Hourly, 0 Hourly Estimated, 0 Hourly Pseudo, 65 Supplemental, and 10 Supplemental Estimated)

SPAS Version: 9.5

Basemap: Final SPAS #1008 Precip Map, which used June 1965 Total Precipitation PRISM Grid

Spatial resolution: 30 seconds

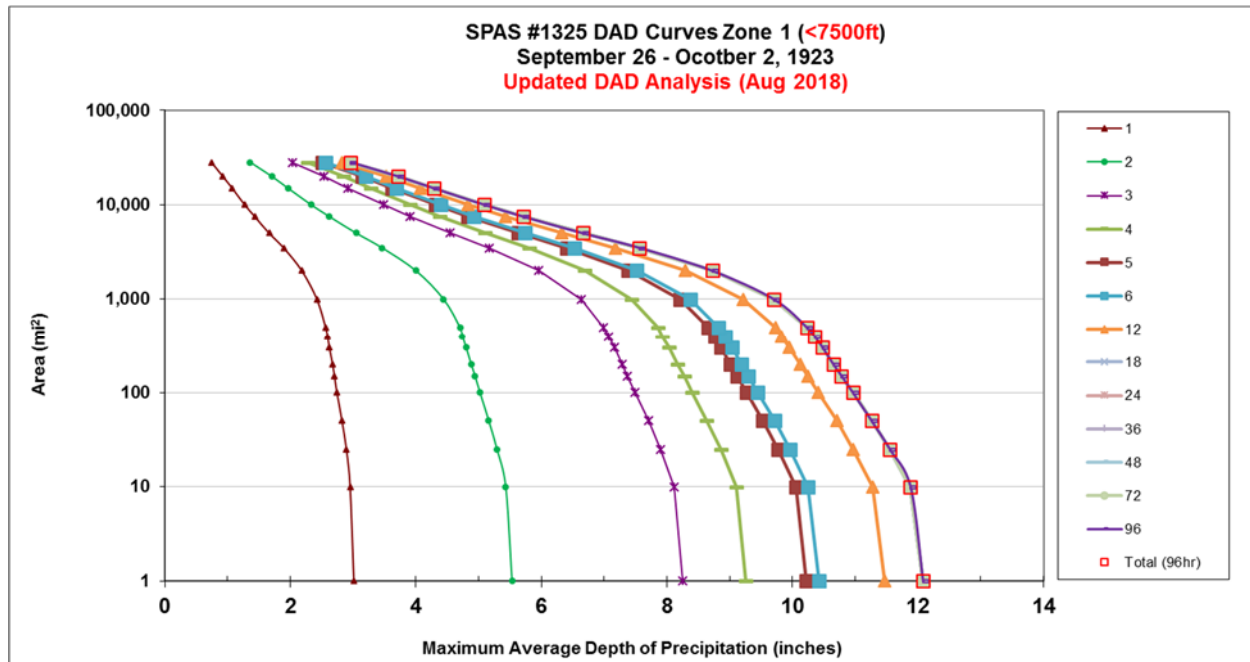
Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

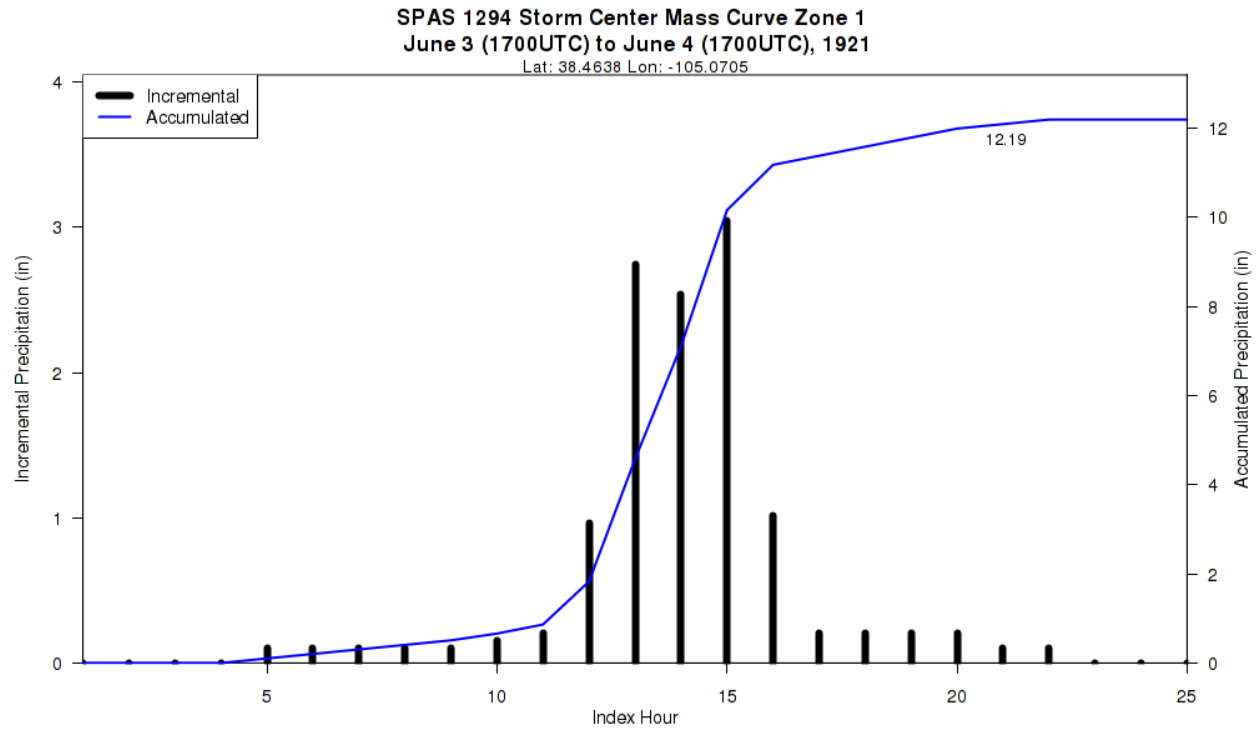
Reliability of results: This storm suffered from a severe lack of hourly data. In fact, only one hourly “station” was used at the storm center. The hourly data was gleamed from page 24 of HMR 55A; two other hourly stations were provided in the report, but were located beyond the analysis domain of this storm. Therefore, only the timing is reliable in/around the storm center. The storm magnitude is anchored by limited data, so it too is only reliable in/around the storm center.

CO-NM Regional Extreme Precipitation Study

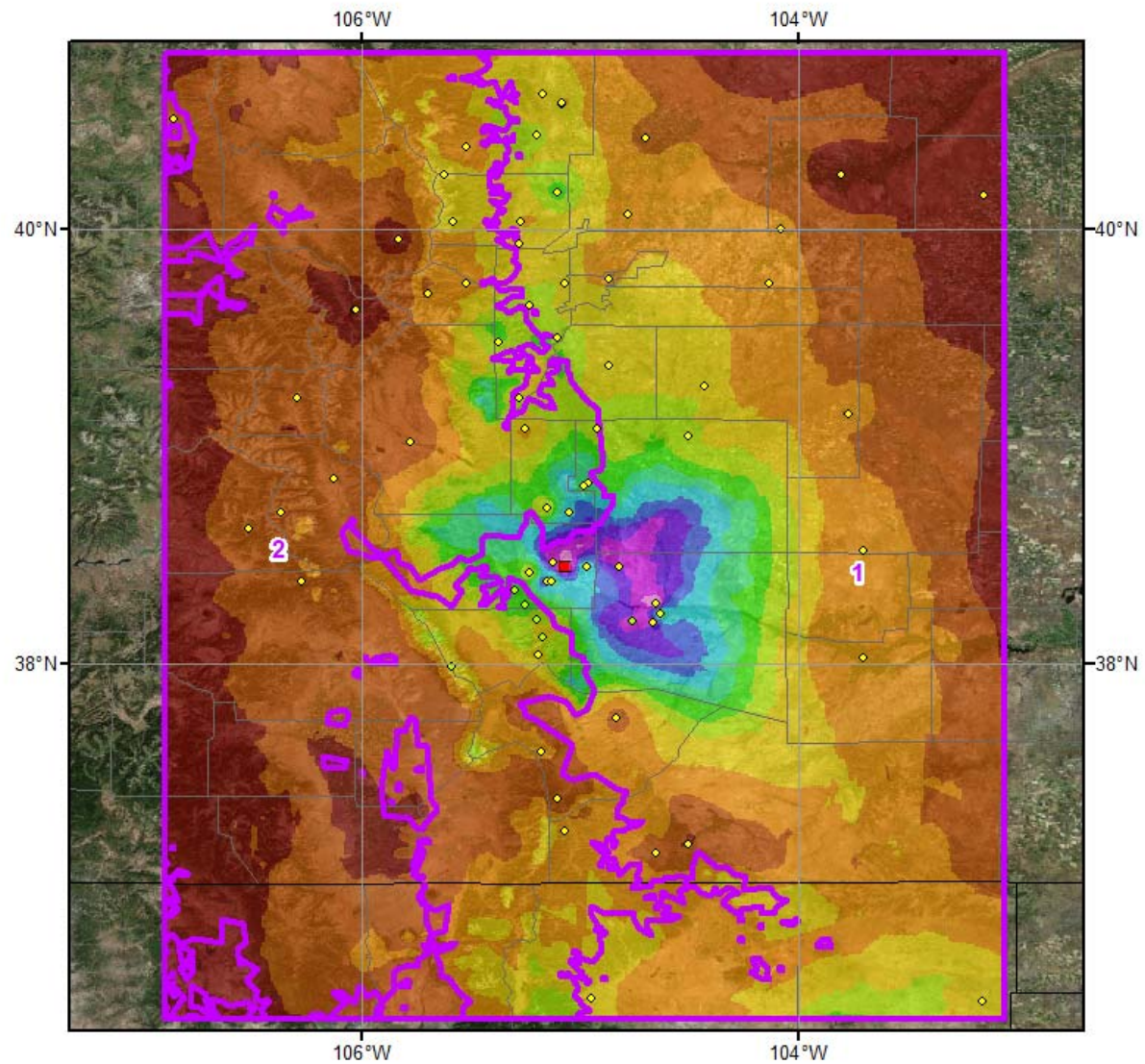
Storm 1294 Zone 1 - June 3 (1700 UTC) - June 4 (1700 UTC), 1921														
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES) Updated Analysis (<7500ft)														
areasqmi	Duration (hours)													
	1	2	3	4	5	6	12	18	24	36	48	72	96	Total (96hr)
0.4	3.04	5.57	8.31	9.32	10.28	10.49	11.55	12.16	12.16	12.16	12.16	12.16	12.16	12.16
1	3.01	5.53	8.25	9.26	10.22	10.42	11.47	12.08	12.08	12.08	12.08	12.08	12.08	12.08
10	2.95	5.43	8.12	9.10	10.05	10.25	11.27	11.88	11.88	11.88	11.88	11.88	11.88	11.88
25	2.89	5.29	7.89	8.86	9.77	9.96	10.97	11.55	11.55	11.55	11.55	11.55	11.55	11.55
50	2.82	5.16	7.70	8.63	9.53	9.71	10.70	11.26	11.26	11.26	11.26	11.26	11.26	11.26
100	2.74	5.02	7.49	8.40	9.27	9.45	10.41	10.96	10.96	10.96	10.96	10.96	10.96	10.96
150	2.70	4.94	7.37	8.27	9.12	9.30	10.24	10.78	10.78	10.78	10.78	10.78	10.78	10.78
200	2.67	4.88	7.28	8.17	9.01	9.19	10.12	10.65	10.65	10.65	10.65	10.65	10.65	10.65
300	2.62	4.80	7.16	8.03	8.86	9.04	9.95	10.48	10.48	10.48	10.48	10.48	10.48	10.48
400	2.59	4.74	7.07	7.93	8.76	8.93	9.83	10.35	10.35	10.35	10.35	10.35	10.35	10.35
500	2.56	4.70	6.99	7.85	8.66	8.82	9.73	10.23	10.23	10.23	10.23	10.23	10.23	10.23
1,000	2.42	4.44	6.63	7.44	8.21	8.37	9.21	9.70	9.70	9.70	9.70	9.70	9.70	9.70
2,000	2.18	4.00	5.96	6.69	7.38	7.52	8.29	8.72	8.72	8.72	8.72	8.72	8.72	8.72
3,500	1.89	3.46	5.17	5.80	6.40	6.53	7.18	7.56	7.56	7.56	7.56	7.56	7.56	7.56
5,000	1.66	3.05	4.55	5.10	5.63	5.74	6.32	6.66	6.66	6.66	6.66	6.66	6.66	6.66
7,500	1.43	2.62	3.90	4.38	4.83	4.93	5.43	5.71	5.71	5.71	5.71	5.71	5.71	5.71
10,000	1.27	2.33	3.48	3.90	4.31	4.39	4.83	5.09	5.09	5.09	5.09	5.09	5.09	5.09
15,000	1.07	1.96	2.92	3.28	3.62	3.69	4.07	4.28	4.28	4.28	4.28	4.28	4.28	4.28
20,000	0.92	1.70	2.54	2.85	3.14	3.20	3.52	3.71	3.71	3.71	3.71	3.71	3.71	3.71
28,202	0.74	1.36	2.03	2.27	2.51	2.56	2.82	2.96	2.96	2.96	2.96	2.96	2.96	2.96



CO-NM Regional Extreme Precipitation Study



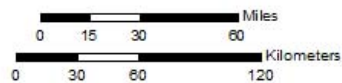
CO-NM Regional Extreme Precipitation Study



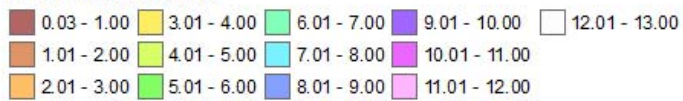
Total Storm (24-hr) Precipitation (in)
6/3/1921 1700 UTC - 6/04/1921 1800
SPAS #1294

Gauges

- Hourly
- ◆ Supplemental
- ◆ SE

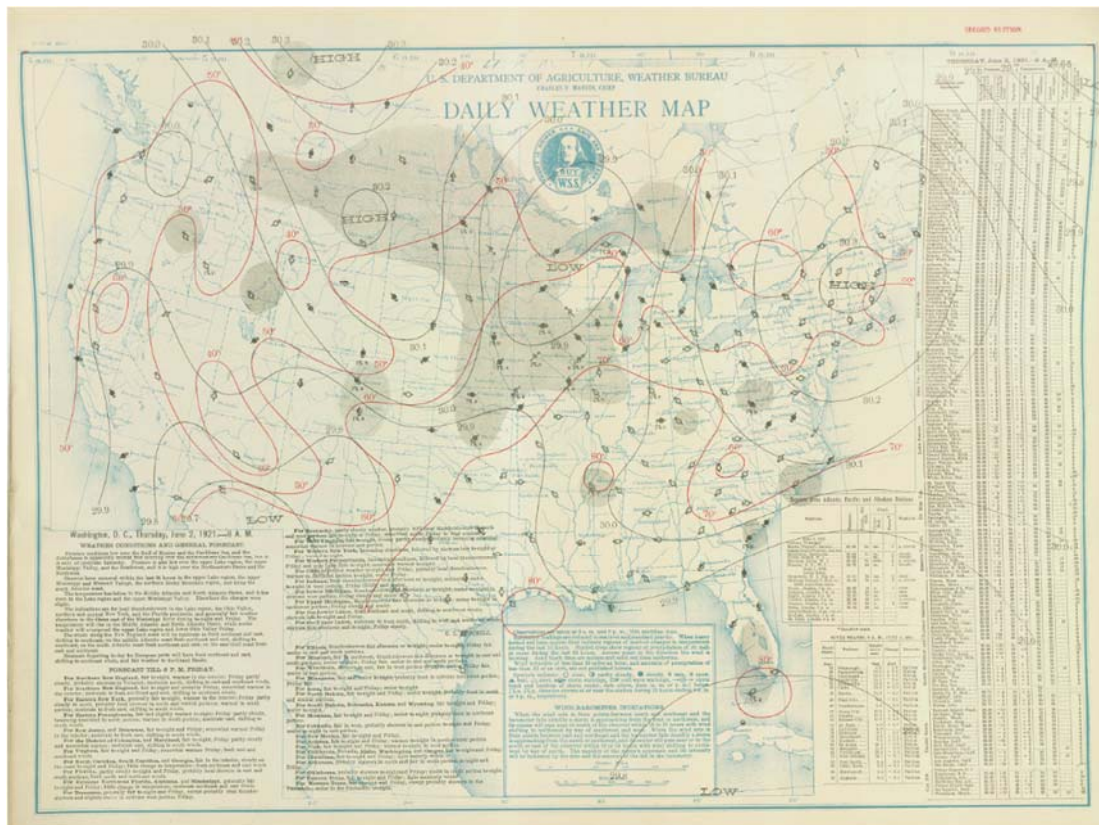
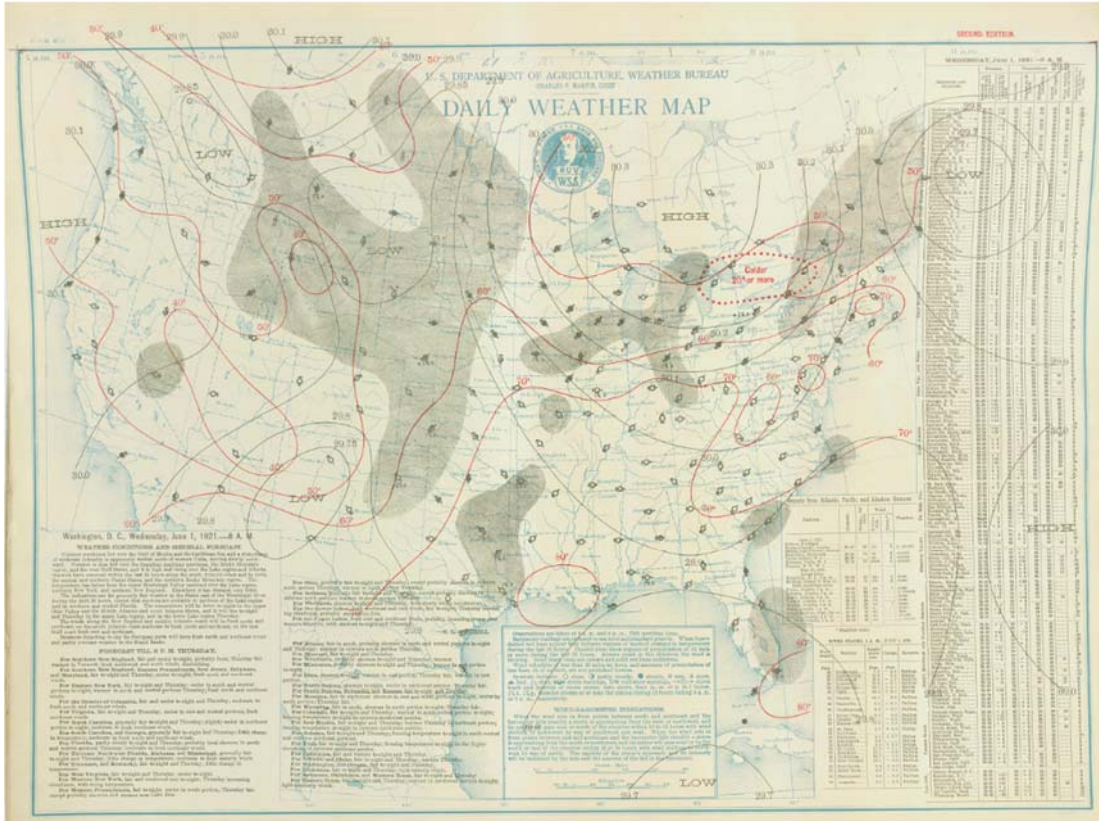


Precipitation (inches)

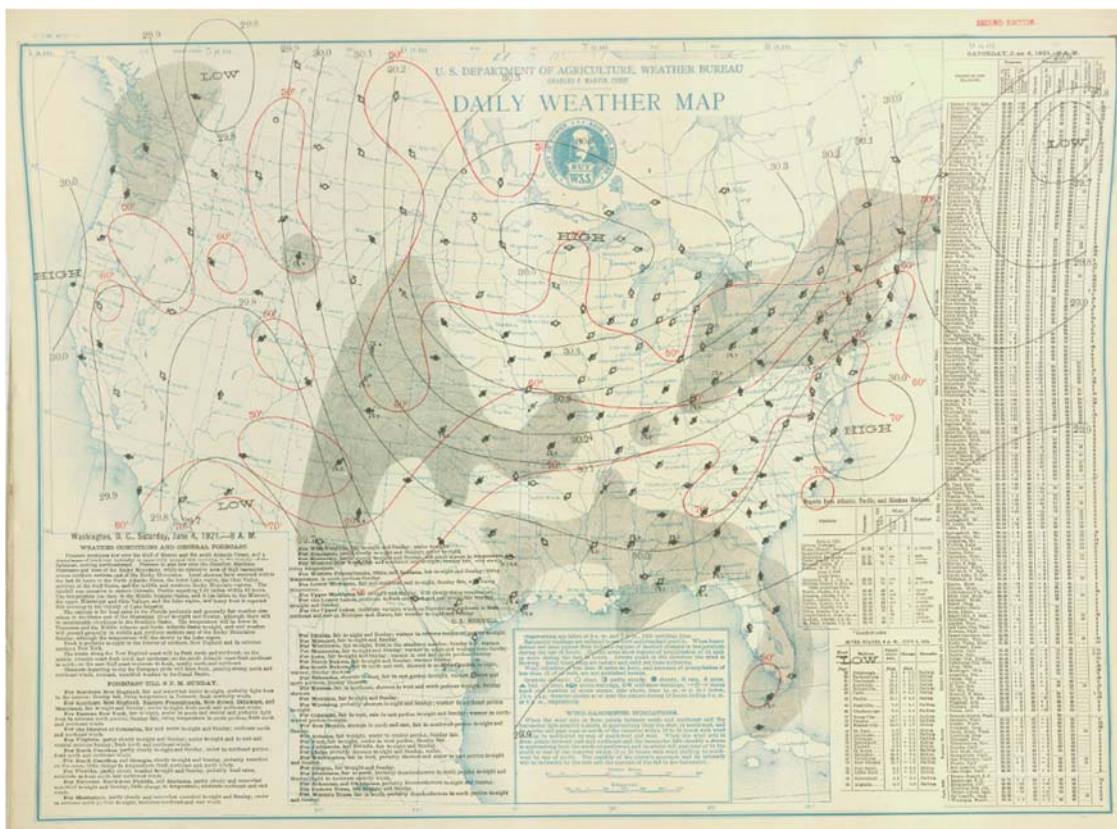
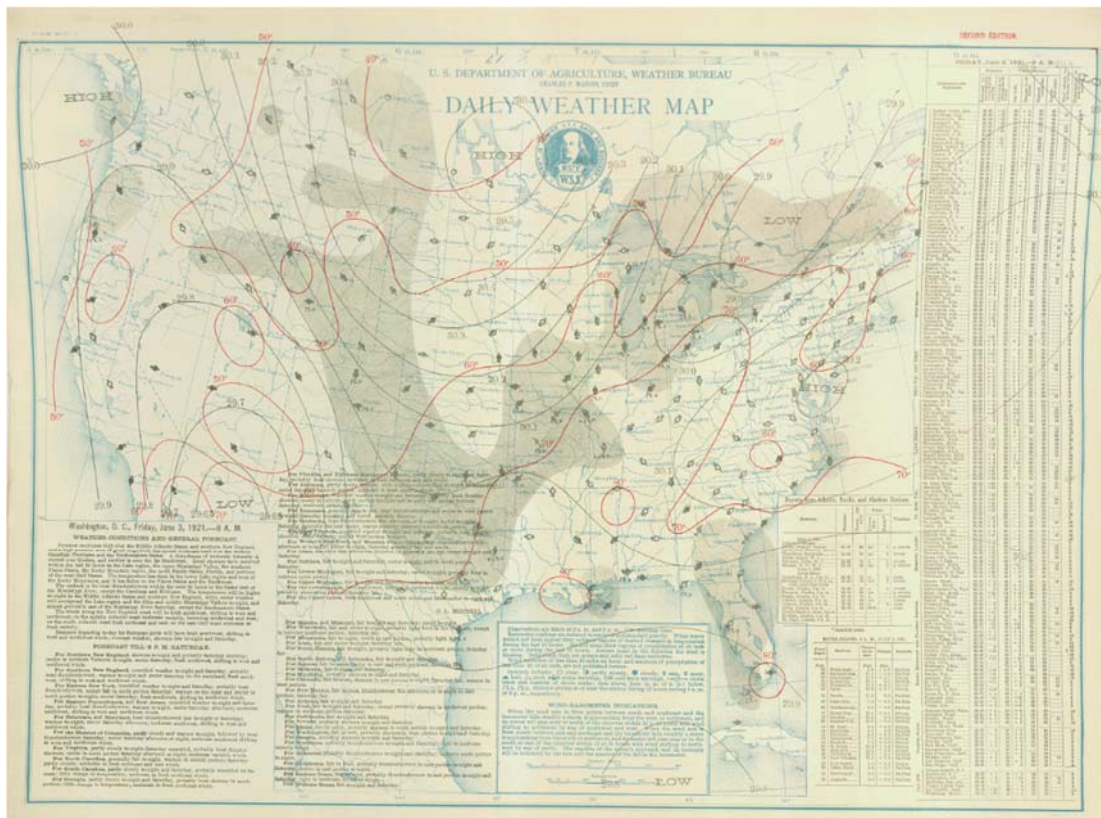


3/1/2018

CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study

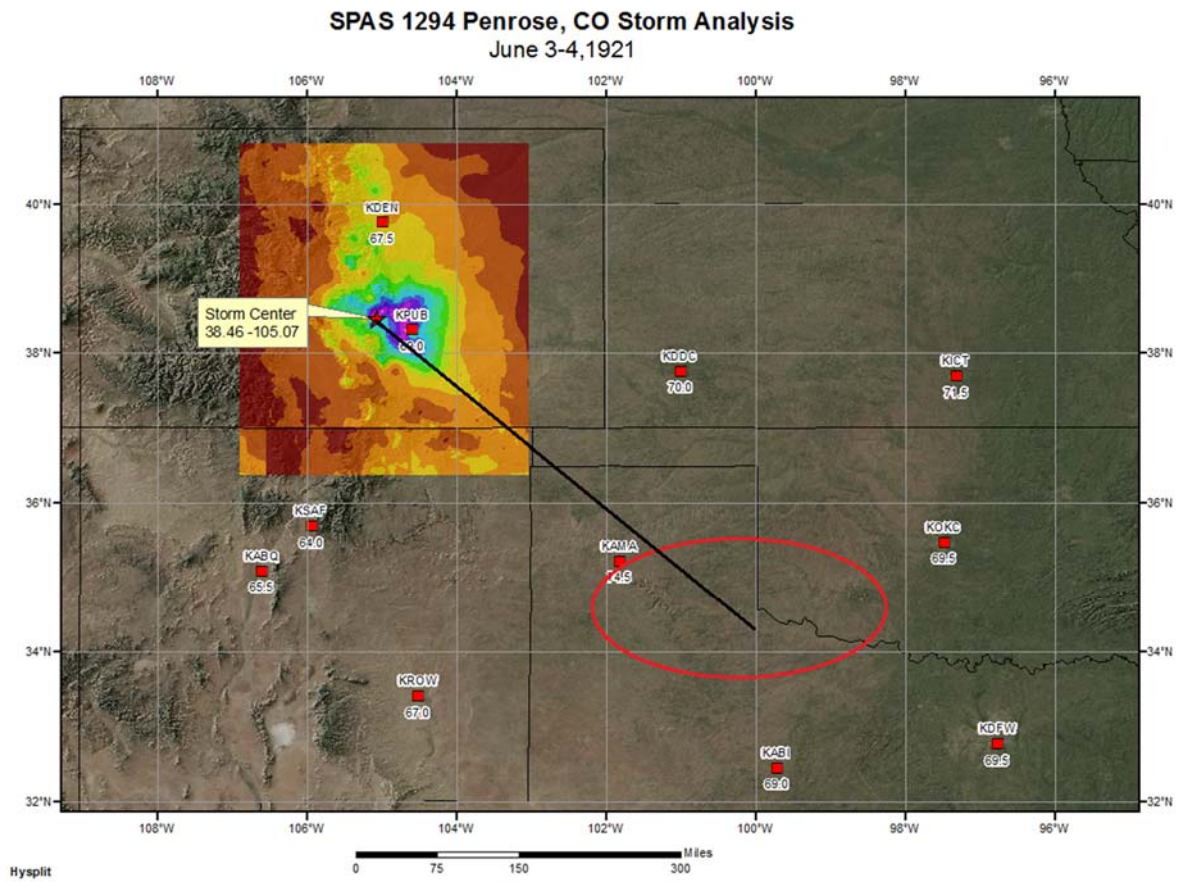


CO-NM Regional Extreme Precipitation Study

Table 5.1.--Representative persisting 12-hr 1000-mb storm and maximum dew points for important storms in and near study region

Storm		Storm T _d			Ref.	Loc.	Max. T _d		Stations
No.	Name	Old	New	Date+	Old	New	Old	New	
1.	Ward District, CO	62	64	30	325SE	350SE	75	77	AMA, DDC
6.	Boxelder, CO	60	60	4	350SE	320SE	72	74	DEN, PUB, DDC, OKC, ICT
8.	Rociada, NM	72	72	28	170SSE	300ESE	76	77	ABI, AMA
10.	Warrick, MT	64	64	6	380ESE	380ESE	73	75	ISN, PIR
13.	Evans, MT	65	65	4	510ESE	510ESE	75	76	BIS, RAP, PIR, VTN, HON
86.	May Valley, CO	67	67	18	450SSE	450SSE	76	76	AMA, ABI, FTW, SAT
20.	Clayton, NM	68	69	1	550SE	560SSE	76	77	SAT, DRT, CRP
23.	Tajique, NM	69	69	21	80SE	160SSE	77	78	ELP, ROW
25.	Lakewood, NM	-	76	7	-	350SE	-	79	DRT, SAT
27.	Meek, NM	72	72	15	390ESE	400ESE	78	79	AMA, ABI, FTW, OKC, SAT, GBK
30.	Fry's Ranch, CO	56	63	15	550ESE	700SE	71	74	FWH, DAL
31.	Penrose, CO	67	70	4	400SE	350SE	77	77	AMA, OKC
32.	Springbrook, MT	71	72	18	500ESE	370ESE	76	77	PIR, HON, FAR
35.	Virsylvania, NM (Cerro)	-	66	17	-	120SW	-	77	ABQ
38.	Savageton, WY	68	72	28	550SE	530SE	75	76	FRI, CNK
44.	Porter, NM	70	71	11	540SE	380SE	78	77	DRT, AUS, FTW, ABI
46.	Kassler, CO	71	66	10	440SE	420SE	77	77	OKC, DDC
47.	Cherry Creek, CO	72	71	30	540SE	560SE	76	79	ABI, ACT, FTW, SPS
101.	Hale, CO	72	71	30	540SE	560SE	76	79	ABI, ACT, FTW, SPS
48.	Las Cruces, NM*	-	71	30	-	-	-	78	ELP
105.	Broome, TX	77	77	14	350SSE	350SSE	78	80	CRP, BRO
53.	Loveland, CO	71	71	1	180SE	210SE	76	76	PUB, GLD
55.	Masonville, CO*	-	65	10	-	-	-	74	AKO
108.	Snyder, TX	73	75	19	100SE	340SSE	78	79	SAT, CRP
56.	Prairieview, NM	70	73	20	390SE	370SE	77	78	SAT, AUS
58.	McColleum Ranch, NM	72	72	21	50SE	300SE	77	79	ELP, DRT, SAT, CRP
60.	Rancho Grande, NM	74	75	31	250SE	250SE	77	78	LBB, BGS, ABI
66.	Ft. Collins, CO	66	67	30	570SE	600SE	78	78	GAG, TUL
67.	Golden, CO*	65	65	7	-	-	76	75	AMA

CO-NM Regional Extreme Precipitation Study



Adelaide, CO

June 3-4, 1921

Storm Type: Local/Hybrid

Storm Precipitation Analysis System (SPAS) For Storm #1294_2 A re-run of SPAS #1008

*** Update addressed excess precipitation above 7500ft, created 2 DAD zones based on 7500ft elevation.

General Storm Location: Colorado Front Range, adjacent high plains and extreme northeastern New Mexico.

Storm Dates: June 3-4, 1921 (24-hours)

Event: Thunderstorm “cloudburst”

DAD Zone 2 (>7500ft)

Latitude: 38.6304

Longitude: -104.9622

Max. Grid Rainfall Amount: 9.27”

Number of Stations: 76 (0 Daily, 1 Hourly, 0 Hourly Estimated, 0 Hourly Pseudo, 65 Supplemental, and 10 Supplemental Estimated)

SPAS Version: 9.5

Basemap: Final SPAS #1008 Precip Map, which used June 1965 Total Precipitation PRISM Grid

Spatial resolution: 30 seconds

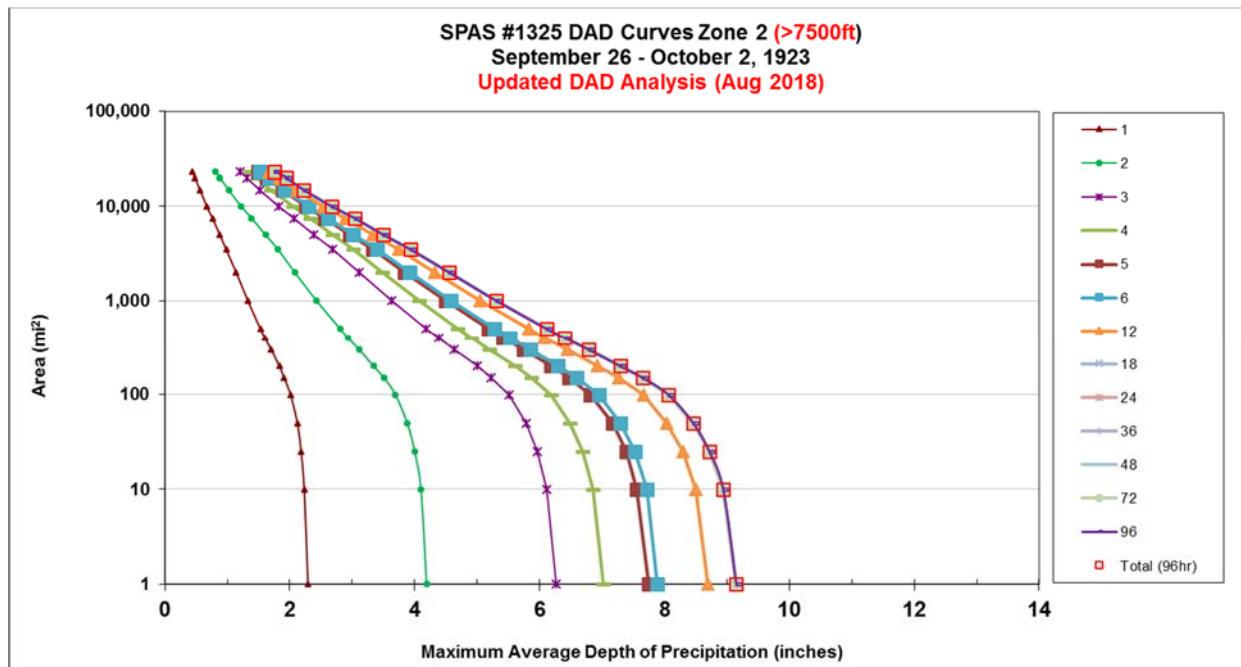
Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

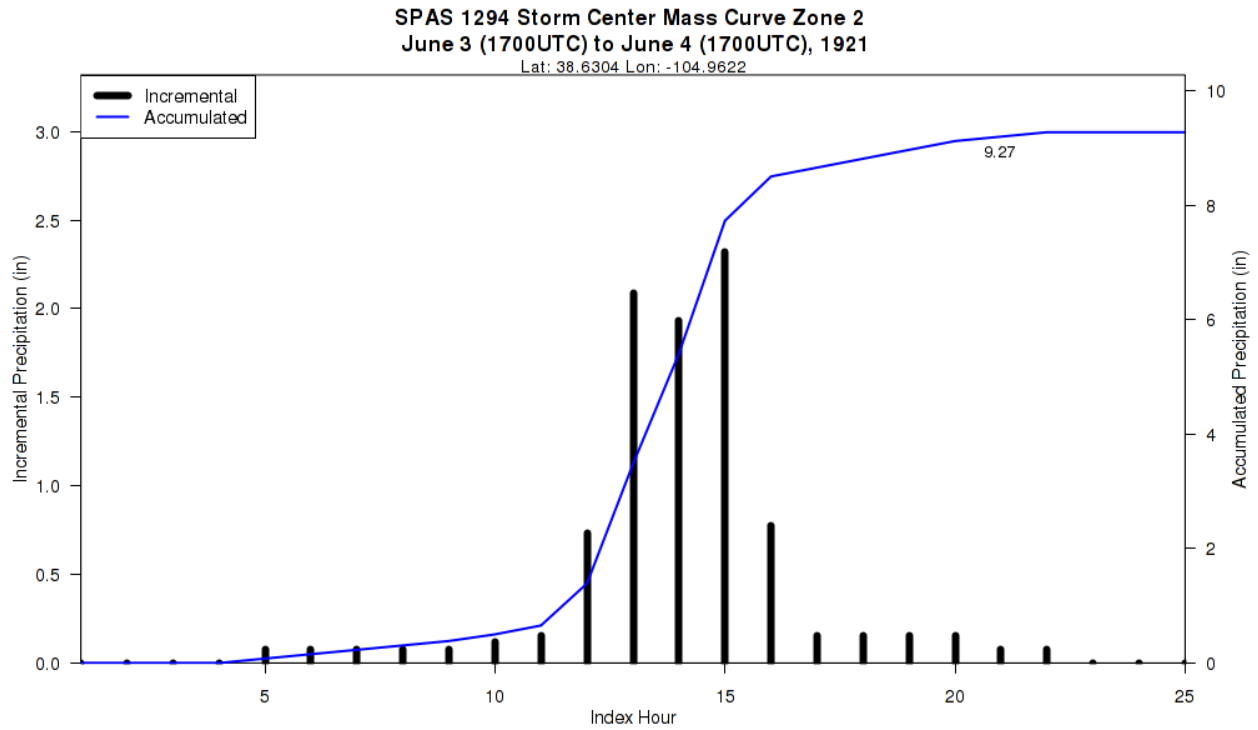
Reliability of results: This storm suffered from a severe lack of hourly data. In fact, only one hourly “station” was used at the storm center. The hourly data was gleamed from page 24 of HMR 55A; two other hourly stations were provided in the report, but were located beyond the analysis domain of this storm. Therefore, only the timing is reliable in/around the storm center. The storm magnitude is anchored by limited data, so it too is only reliable in/around the storm center.

CO-NM Regional Extreme Precipitation Study

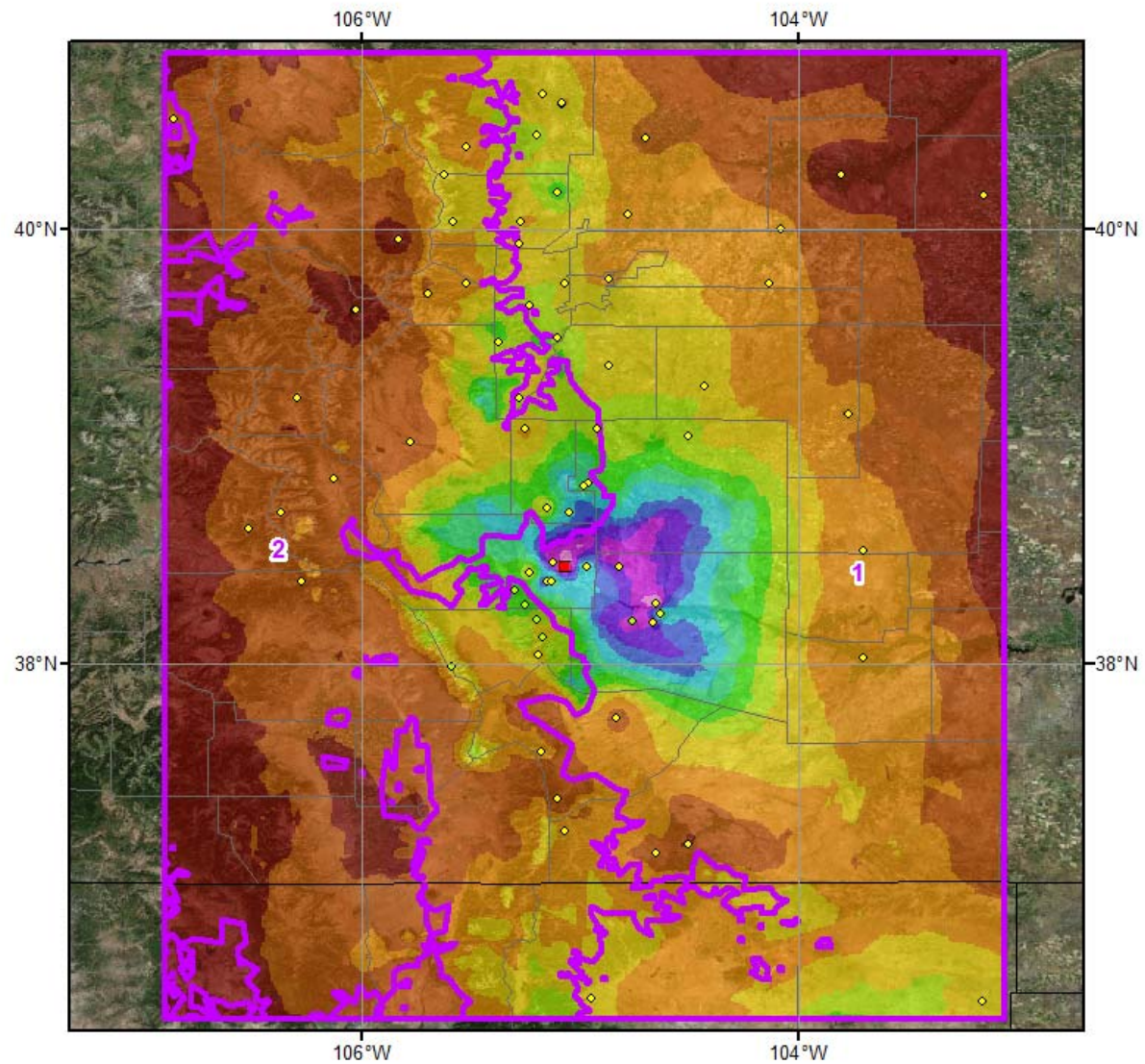
Storm 1294 Zone 2 - June 3 (1700 UTC) - June 4 (1700 UTC), 1921														
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES) Updated Analysis (>7500ft)														
areasqmi	Duration (hours)													
	1	2	3	4	5	6	12	18	24	36	48	72	96	Total (96hr)
0.4	2.31	4.23	6.31	7.08	7.81	7.97	8.77	9.23	9.23	9.23	9.23	9.23	9.23	9.23
1	2.29	4.19	6.26	7.02	7.75	7.89	8.69	9.15	9.15	9.15	9.15	9.15	9.15	9.15
10	2.23	4.10	6.12	6.86	7.55	7.72	8.50	8.94	8.94	8.94	8.94	8.94	8.94	8.94
25	2.18	4.00	5.97	6.69	7.39	7.53	8.29	8.72	8.72	8.72	8.72	8.72	8.72	8.72
50	2.12	3.88	5.79	6.49	7.17	7.30	8.04	8.46	8.46	8.46	8.46	8.46	8.46	8.46
100	2.01	3.69	5.51	6.18	6.82	6.95	7.66	8.06	8.06	8.06	8.06	8.06	8.06	8.06
150	1.91	3.51	5.23	5.87	6.47	6.60	7.27	7.65	7.65	7.65	7.65	7.65	7.65	7.65
200	1.83	3.34	5.00	5.61	6.19	6.29	6.93	7.29	7.29	7.29	7.29	7.29	7.29	7.29
300	1.70	3.11	4.64	5.20	5.74	5.85	6.45	6.78	6.78	6.78	6.78	6.78	6.78	6.78
400	1.60	2.93	4.38	4.91	5.41	5.52	6.08	6.40	6.40	6.40	6.40	6.40	6.40	6.40
500	1.53	2.81	4.18	4.69	5.18	5.28	5.82	6.12	6.12	6.12	6.12	6.12	6.12	6.12
1,000	1.33	2.43	3.63	4.07	4.49	4.58	5.05	5.31	5.31	5.31	5.31	5.31	5.31	5.31
2,000	1.14	2.08	3.11	3.48	3.84	3.92	4.32	4.55	4.55	4.55	4.55	4.55	4.55	4.55
3,500	0.98	1.81	2.69	3.02	3.33	3.40	3.74	3.93	3.93	3.93	3.93	3.93	3.93	3.93
5,000	0.88	1.61	2.39	2.68	2.96	3.02	3.33	3.50	3.50	3.50	3.50	3.50	3.50	3.50
7,500	0.76	1.39	2.07	2.33	2.56	2.62	2.89	3.04	3.04	3.04	3.04	3.04	3.04	3.04
10,000	0.67	1.22	1.82	2.05	2.26	2.30	2.54	2.67	2.67	2.67	2.67	2.67	2.67	2.67
15,000	0.56	1.02	1.52	1.70	1.89	1.92	2.11	2.22	2.22	2.22	2.22	2.22	2.22	2.22
20,000	0.48	0.88	1.32	1.48	1.63	1.67	1.84	1.94	1.94	1.94	1.94	1.94	1.94	1.94
23,121	0.44	0.81	1.20	1.35	1.49	1.52	1.67	1.76	1.76	1.76	1.76	1.76	1.76	1.76



CO-NM Regional Extreme Precipitation Study



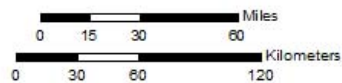
CO-NM Regional Extreme Precipitation Study



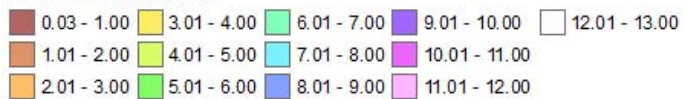
Total Storm (24-hr) Precipitation (in)
6/3/1921 1700 UTC - 6/04/1921 1800
SPAS #1294

Gauges

- Hourly
- ◆ Supplemental
- ◆ SE

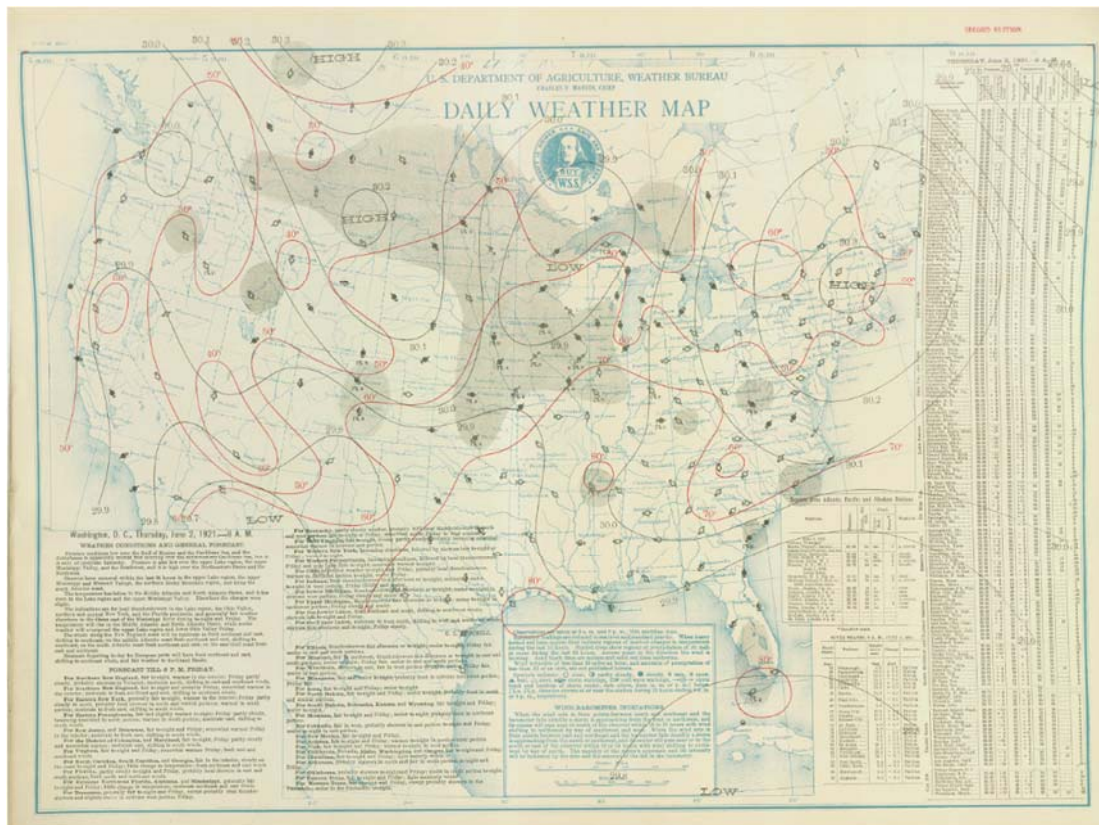
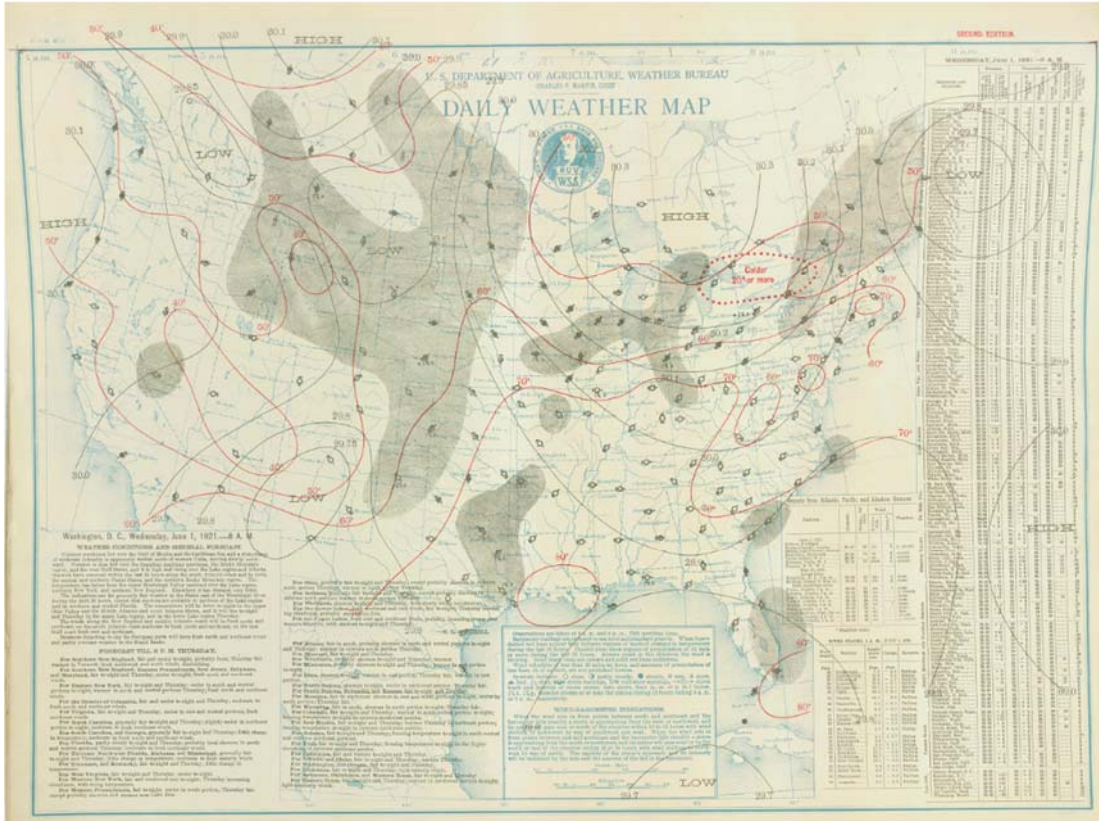


Precipitation (inches)

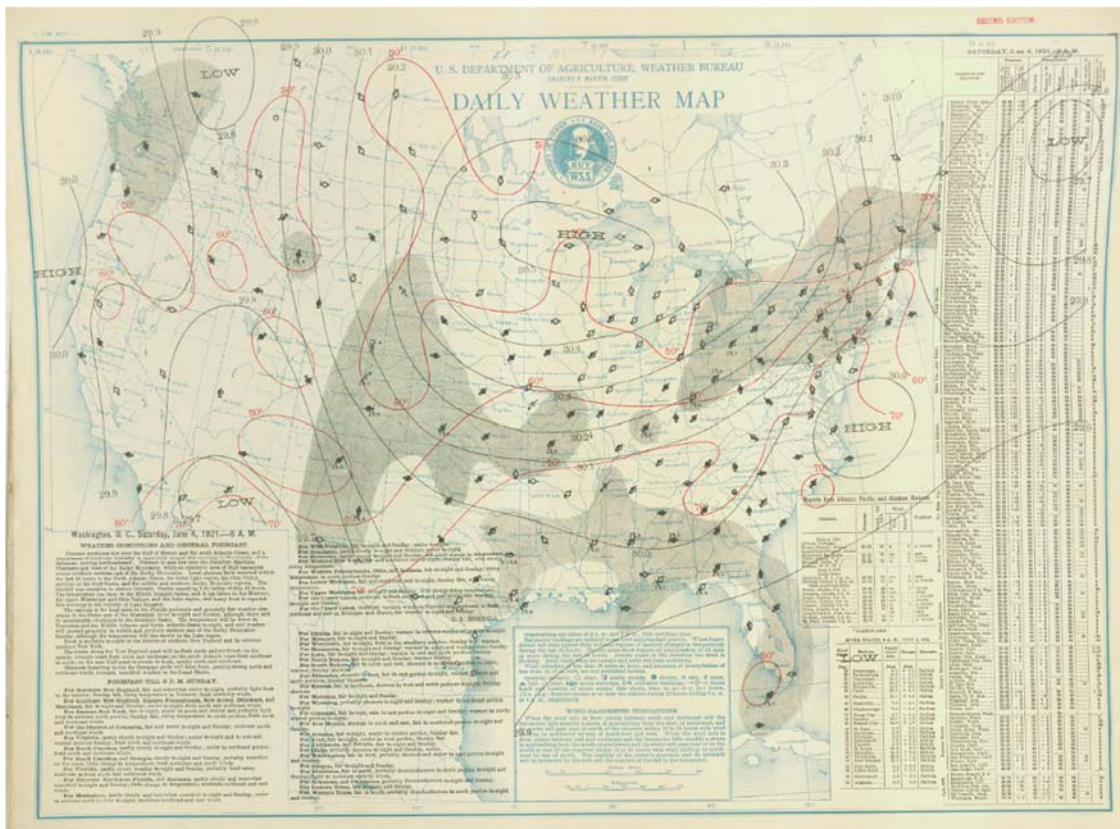
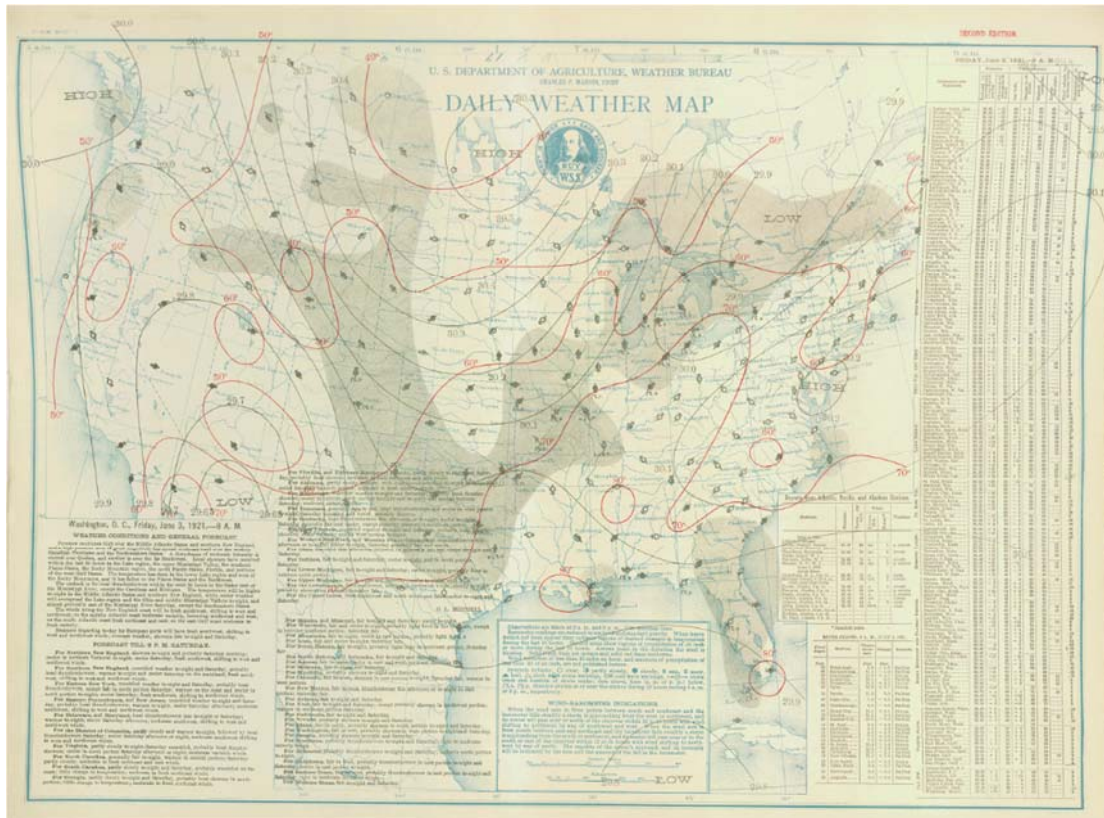


3/1/2018

CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study

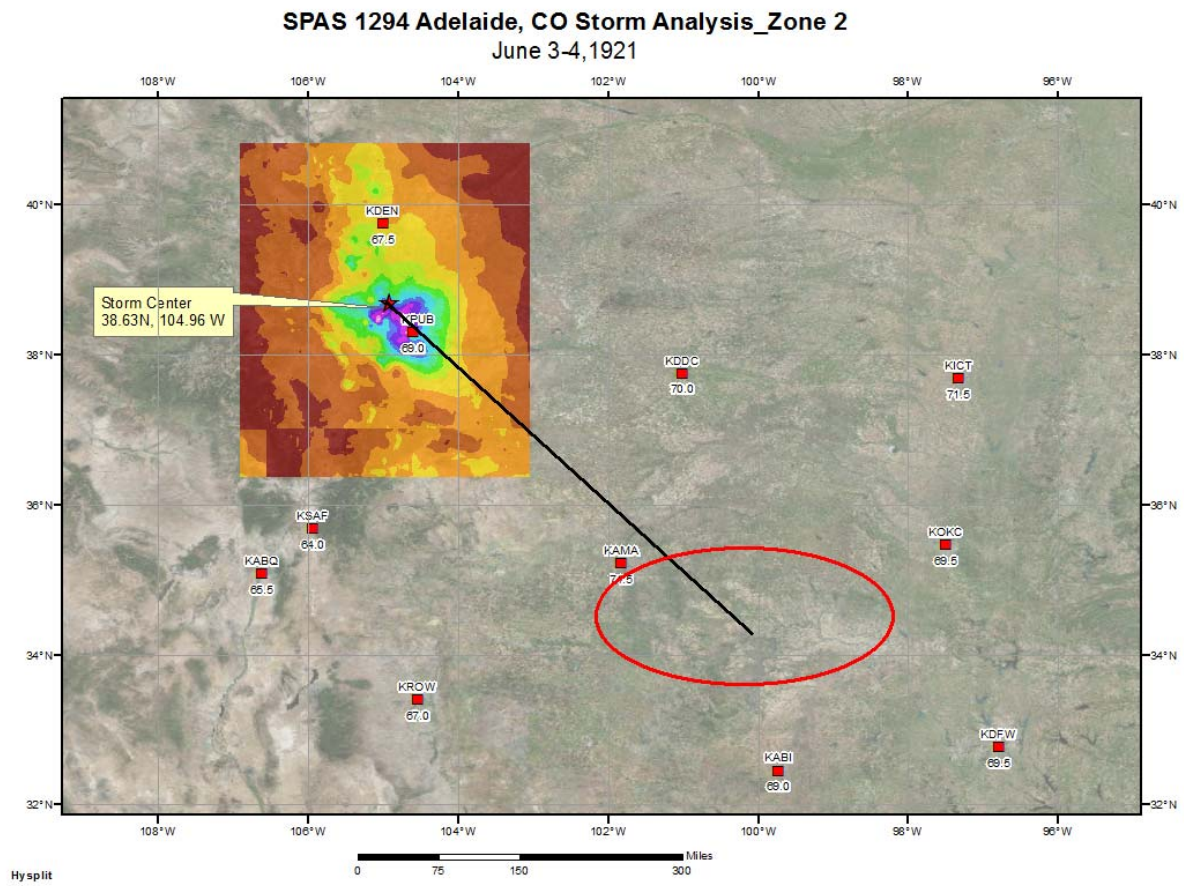


CO-NM Regional Extreme Precipitation Study

Table 5.1.--Representative persisting 12-hr 1000-mb storm and maximum dew points for important storms in and near study region

Storm		Storm T _d			Ref.	Loc.	Max. T _d		Stations
No.	Name	Old	New	Date+	Old	New	Old	New	
1.	Ward District, CO	62	64	30	325SE	350SE	75	77	AMA, DDC
6.	Boxelder, CO	60	60	4	350SE	320SE	72	74	DEN, PUB, DDC, OKC, ICT
8.	Rociada, NM	72	72	28	170SSE	300ESE	76	77	ABI, AMA
10.	Warrick, MT	64	64	6	380ESE	380ESE	73	75	ISN, PIR
13.	Evans, MT	65	65	4	510ESE	510ESE	75	76	BIS, RAP, PIR, VTN, HON
86.	May Valley, CO	67	67	18	450SSE	450SSE	76	76	AMA, ABI, FTW, SAT
20.	Clayton, NM	68	69	1	550SE	560SSE	76	77	SAT, DRT, CRP
23.	Tajique, NM	69	69	21	80SE	160SSE	77	78	ELP, ROW
25.	Lakewood, NM	-	76	7	-	350SE	-	79	DRT, SAT
27.	Meek, NM	72	72	15	390ESE	400ESE	78	79	AMA, ABI, FTW, OKC, SAT, GBK
30.	Fry's Ranch, CO	56	63	15	550ESE	700SE	71	74	FWH, DAL
31.	Penrose, CO	67	70	4	400SE	350SE	77	77	AMA, OKC
32.	Springbrook, MT	71	72	18	500ESE	370ESE	76	77	PIR, HON, FAR
35.	Virsylvania, NM (Cerro)	-	66	17	-	120SW	-	77	ABQ
38.	Savageton, WY	68	72	28	550SE	530SE	75	76	FRI, CNK
44.	Porter, NM	70	71	11	540SE	380SE	78	77	DRT, AUS, FTW, ABI
46.	Kassler, CO	71	66	10	440SE	420SE	77	77	OKC, DDC
47.	Cherry Creek, CO	72	71	30	540SE	560SE	76	79	ABI, ACT, FTW, SPS
101.	Hale, CO	72	71	30	540SE	560SE	76	79	ABI, ACT, FTW, SPS
48.	Las Cruces, NM*	-	71	30	-	-	-	78	ELP
105.	Broome, TX	77	77	14	350SSE	350SSE	78	80	CRP, BRO
53.	Loveland, CO	71	71	1	180SE	210SE	76	76	PUB, GLD
55.	Masonville, CO*	-	65	10	-	-	-	74	AKO
108.	Snyder, TX	73	75	19	100SE	340SSE	78	79	SAT, CRP
56.	Prairieview, NM	70	73	20	390SE	370SE	77	78	SAT, AUS
58.	McColleum Ranch, NM	72	72	21	50SE	300SE	77	79	ELP, DRT, SAT, CRP
60.	Rancho Grande, NM	74	75	31	250SE	250SE	77	78	LBB, BGS, ABI
66.	Ft. Collins, CO	66	67	30	570SE	600SE	78	78	GAG, TUL
67.	Golden, CO*	65	65	7	-	-	76	75	AMA

CO-NM Regional Extreme Precipitation Study



Virsylvania (Cerro), NM

August 16-18, 1922

Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1655_1

General Storm Location: Virsylvania (Cerro), NM

Storm Dates: August 16-18, 1922

Event: Local

DAD Zone 1

Latitude: 36.8042

Longitude: -105.6042

Max. Grid Rainfall Amount: 7.53"

Max. Observed Rainfall Amount: 7.51"

Number of Stations: 31

SPAS Version: 10

Base Map Used: 1655_isohyetal_sm

Spatial resolution: 0.2658

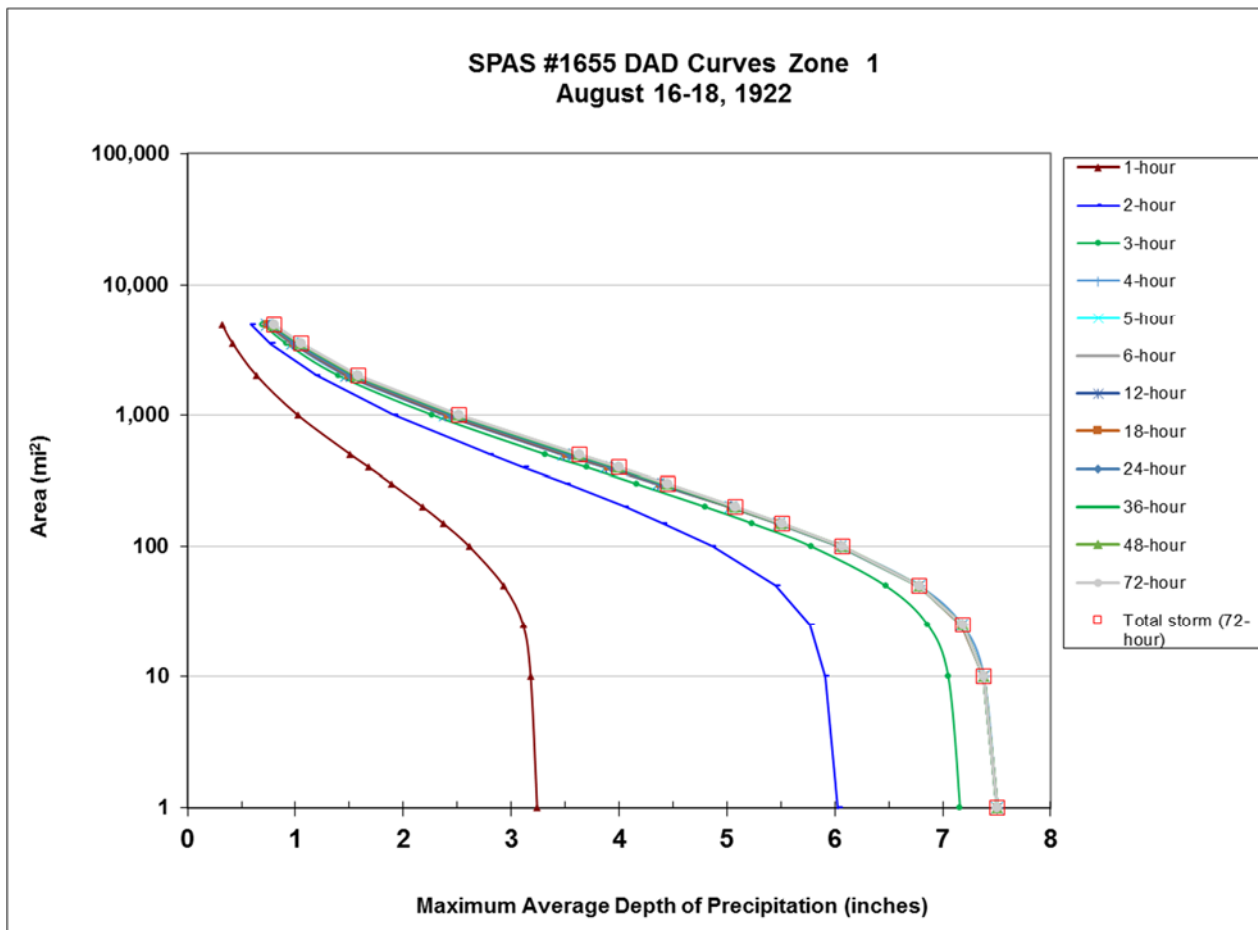
Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

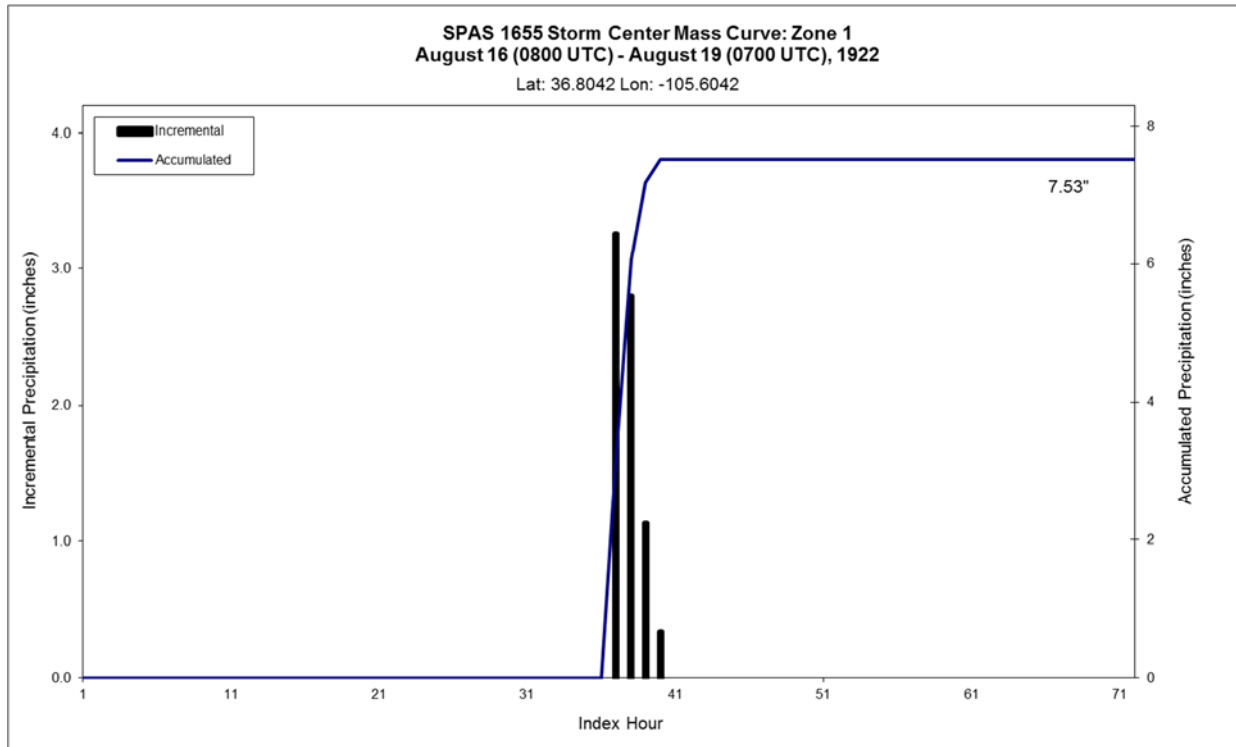
Degree of confidence in results: This analysis was based on 31 hourly stations, daily data, and supplemental station data. We have a good degree of confidence for the station based storm total results. The spatial pattern is fully dependent on the hand-drawn isohyetal basemap that was based off of the surrounding station data and PRISM monthly climatology for August 1922. Timing is based solely on the hourly station that was created for Virsylvania using NOAA Atlas 14 Volume 8 timing for a 6 hour storm. Several daily stations were moved to supplemental due to timing issues and to ensure data consistency.

CO-NM Regional Extreme Precipitation Study

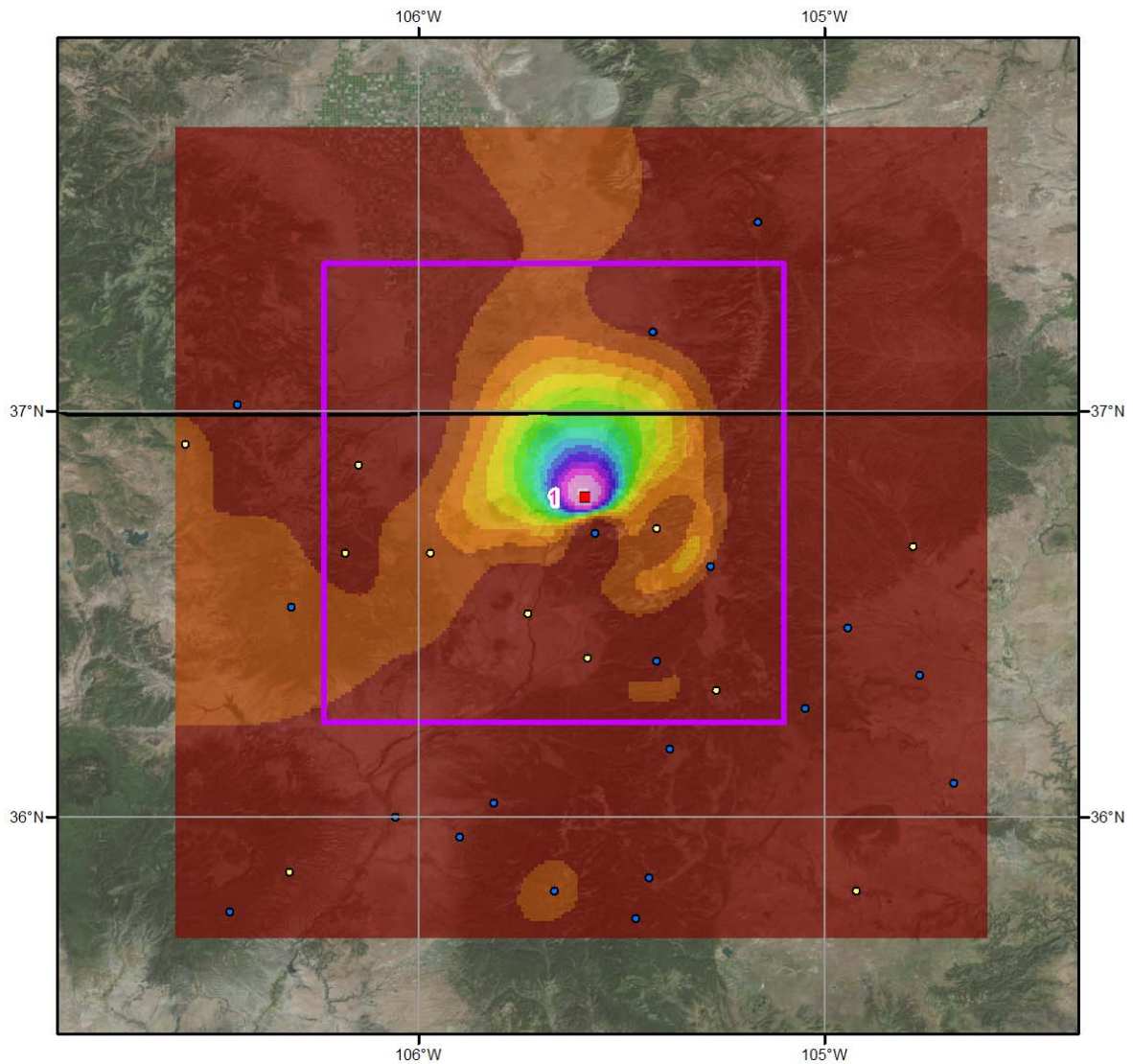
Storm 1655 - August 16 (0800 UTC) - August 19 (0700 UTC), 1922													
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)													
Area (mi ²)	Duration (hours)												
	1	2	3	4	5	6	12	18	24	36	48	72	Total
0.4	3.26	6.06	7.19	7.53	7.53	7.53	7.53	7.53	7.53	7.53	7.53	7.53	7.53
1	3.24	6.03	7.16	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50
10	3.18	5.91	7.05	7.38	7.38	7.38	7.38	7.38	7.38	7.38	7.38	7.38	7.38
25	3.11	5.77	6.86	7.18	7.18	7.18	7.18	7.18	7.19	7.19	7.19	7.19	7.19
50	2.93	5.45	6.47	6.78	6.78	6.78	6.78	6.78	6.78	6.78	6.78	6.78	6.78
100	2.61	4.86	5.78	6.05	6.05	6.05	6.05	6.06	6.06	6.06	6.07	6.07	6.07
150	2.37	4.40	5.23	5.48	5.48	5.48	5.48	5.49	5.49	5.50	5.50	5.51	5.51
200	2.18	4.05	4.80	5.03	5.03	5.03	5.04	5.04	5.05	5.06	5.07	5.08	5.08
300	1.89	3.51	4.16	4.36	4.36	4.36	4.37	4.38	4.39	4.42	4.44	4.45	4.45
400	1.68	3.12	3.70	3.87	3.87	3.87	3.88	3.90	3.93	3.97	3.99	4.00	4.00
500	1.51	2.80	3.32	3.48	3.48	3.48	3.49	3.52	3.55	3.60	3.62	3.63	3.63
1,000	1.02	1.91	2.27	2.38	2.38	2.38	2.39	2.42	2.45	2.49	2.51	2.52	2.52
2,000	0.64	1.19	1.40	1.47	1.47	1.47	1.48	1.50	1.52	1.55	1.56	1.58	1.58
3,500	0.42	0.77	0.92	0.97	0.97	0.97	0.98	0.99	1.00	1.03	1.04	1.05	1.05
4,911	0.32	0.59	0.70	0.74	0.74	0.74	0.74	0.75	0.76	0.78	0.79	0.80	0.80



CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study

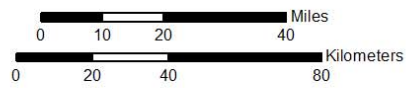


Total Storm (72-hours) Precipitation (inches)
August 16-18, 1922

SPAS 1655 - Virsylvia (Cerro), NM

Gauges

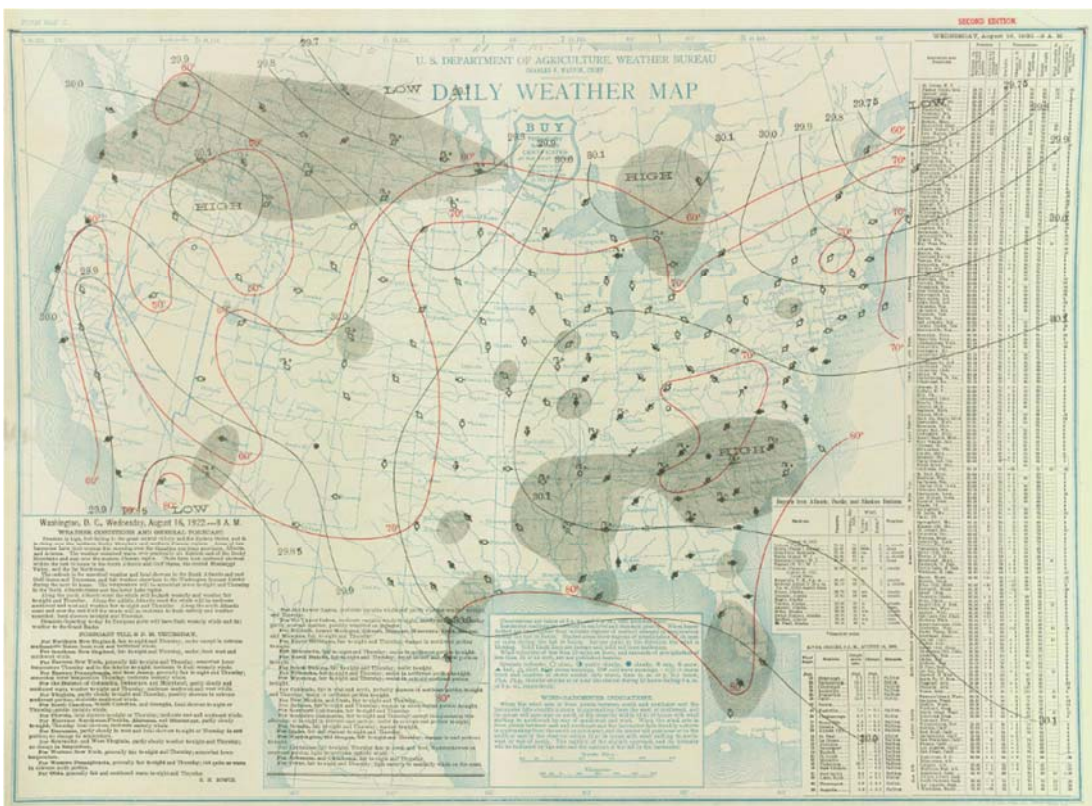
- Daily
- Hourly
- Hourly Pseudo
- Supplemental



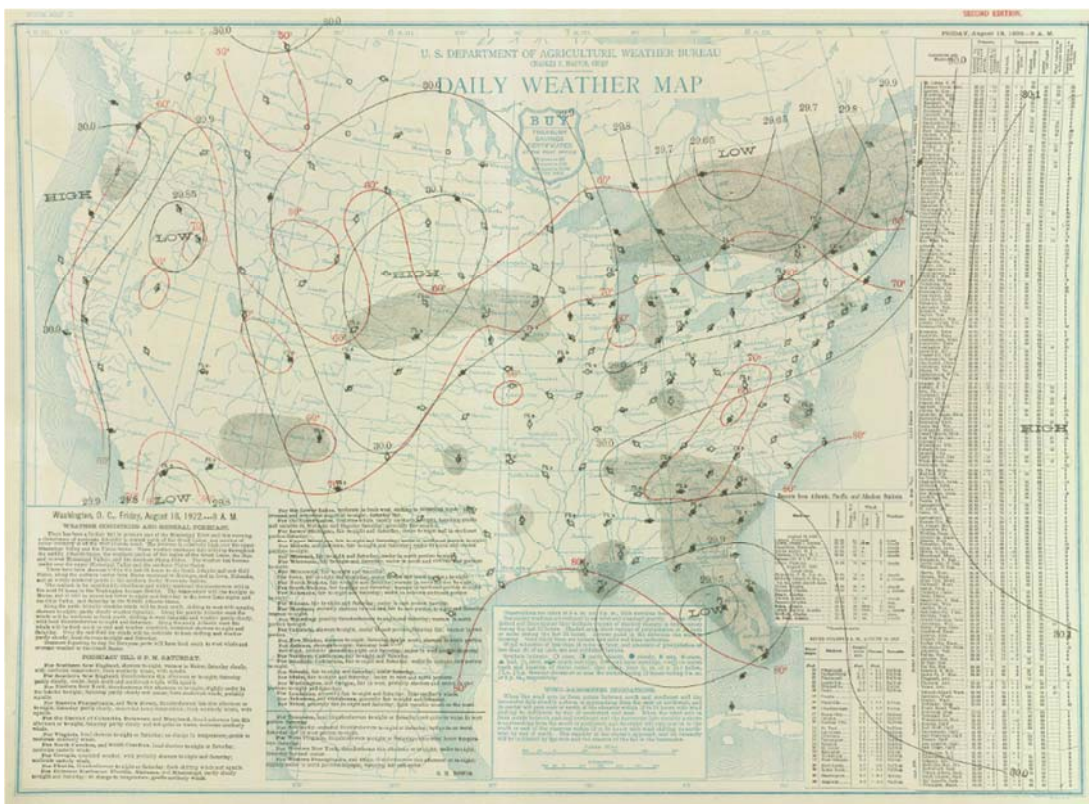
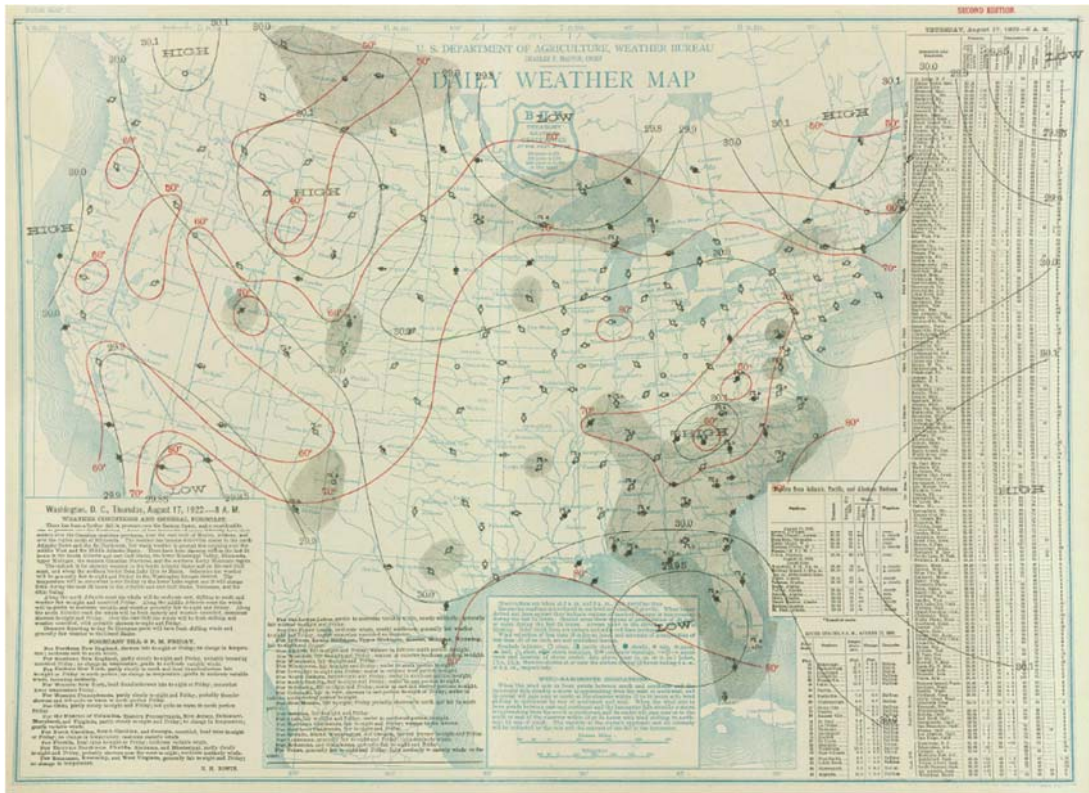
Precipitation (inches)	
0.00 - 0.50	1.51 - 2.00
0.51 - 1.00	2.01 - 2.50
1.01 - 1.50	2.51 - 3.00
	3.01 - 3.50
	3.51 - 4.00
	4.01 - 4.50
	4.51 - 5.00
	5.01 - 5.50
	5.51 - 6.00
	6.01 - 6.50
	6.51 - 7.00
	7.01 - 7.50
	7.51 - 8.00



4/3/2015



CO-NM Regional Extreme Precipitation Study

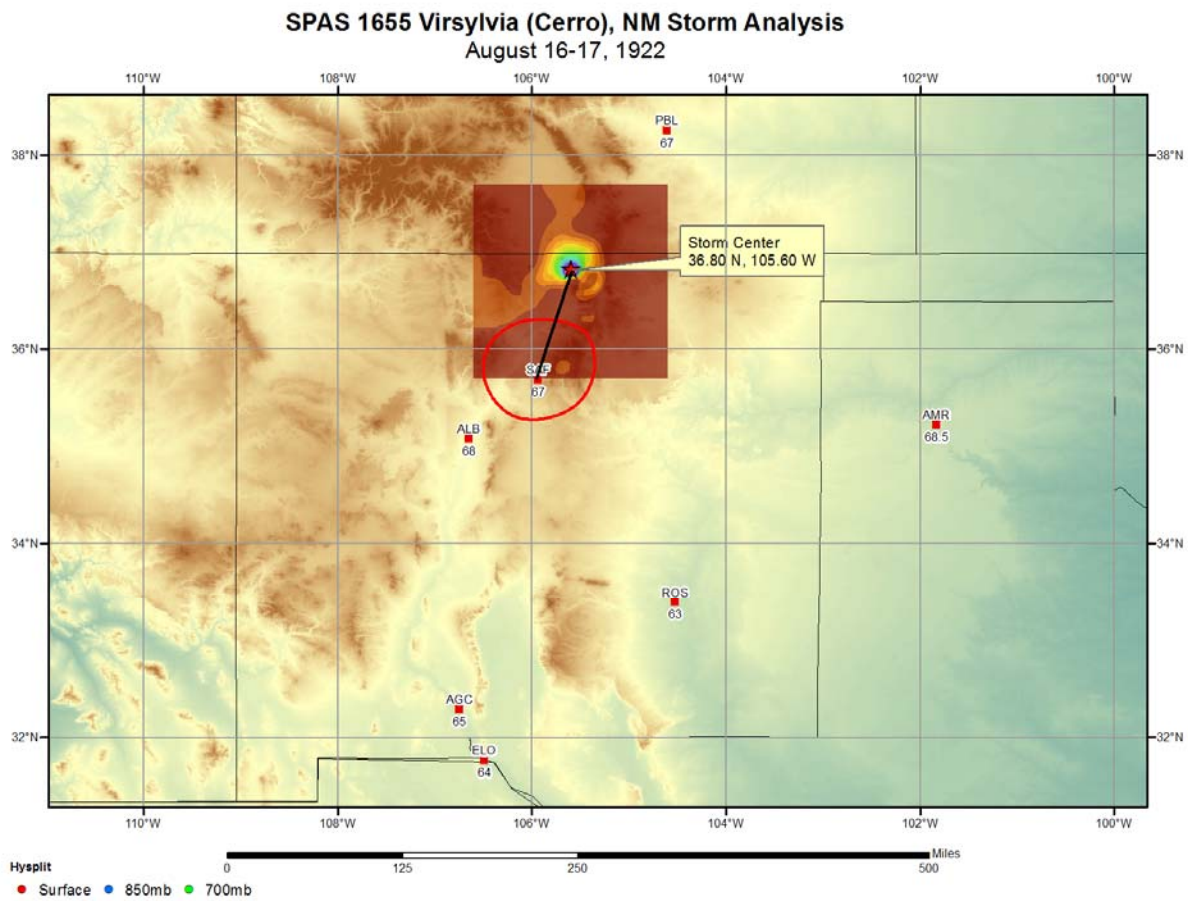


CO-NM Regional Extreme Precipitation Study

Table 5.1.--Representative persisting 12-hr 1000-mb storm and maximum dew points for important storms in and near study region

Storm		Storm T _d			Ref.	Loc.	Max. T _d		
No.	Name	Old	New	Date†	Old	New	Old	New	Stations
1.	Ward District, CO	62	64	30	325SE	350SE	75	77	AMA, DDC
6.	Boxelder, CO	60	60	4	350SE	320SE	72	74	DEN, PUB, DDC, OKC, ICT
8.	Rociada, NM	72	72	28	170SSE	300ESE	76	77	ABI, AMA
10.	Warrick, MT	64	64	6	380ESE	380ESE	73	75	ISN, PIR
13.	Evans, MT	65	65	4	510ESE	510ESE	75	76	BIS, RAP, PIR, VTN, HON
86.	May Valley, CO	67	67	18	450SSE	450SSE	76	76	AMA, ABI, FTW, SAT
20.	Clayton, NM	68	69	1	550SE	560SSE	76	77	SAT, DRT, CRP
23.	Tajique, NM	69	69	21	80SE	160SSE	77	78	ELP, ROW
25.	Lakewood, NM	-	76	7	-	350SE	-	79	DRT, SAT
27.	Meek, NM	72	72	15	390ESE	400ESE	78	79	AMA, ABI, FTW, OKC, SAT, GBK
30.	Fry's Ranch, CO	56	63	15	550ESE	700SE	71	74	FWH, DAL
31.	Penrose, CO	67	70	4	400SE	350SE	77	77	AMA, OKC
32.	Springbrook, MT	71	72	18	500ESE	370ESE	76	77	PIR, HON, FAR
35.	Virsylvania, NM (Cerro)	-	66	17	-	120SW	-	77	ABQ

CO-NM Regional Extreme Precipitation Study



Elbert-Cherry Creek, CO

May 29-31, 1935

Storm Type: Local/Hybrid

Storm Precipitation Analysis System (SPAS) For #1295_1 (re-run/expansion of Storm #1039)

General Storm Location: Eastern Colorado and southern Colorado Front Range

Storm Dates: May 29-31, 1935

Event: MCCs/Thunderstorms

DAD Zone 1

Latitude: 39.2375

Longitude: -104.4875

Max. Grid Rainfall Amount: 23.86"

Max. Observed Rainfall Amount: 24.00" ("estimated" via bucket survey in Elbert County, CO)

Number of Stations: 102

SPAS Version: 9.5

Basemap: Final SPAS #1008 Precip Map, which used June 1965 Total Precipitation PRISM Grid

Spatial resolution: 30 seconds

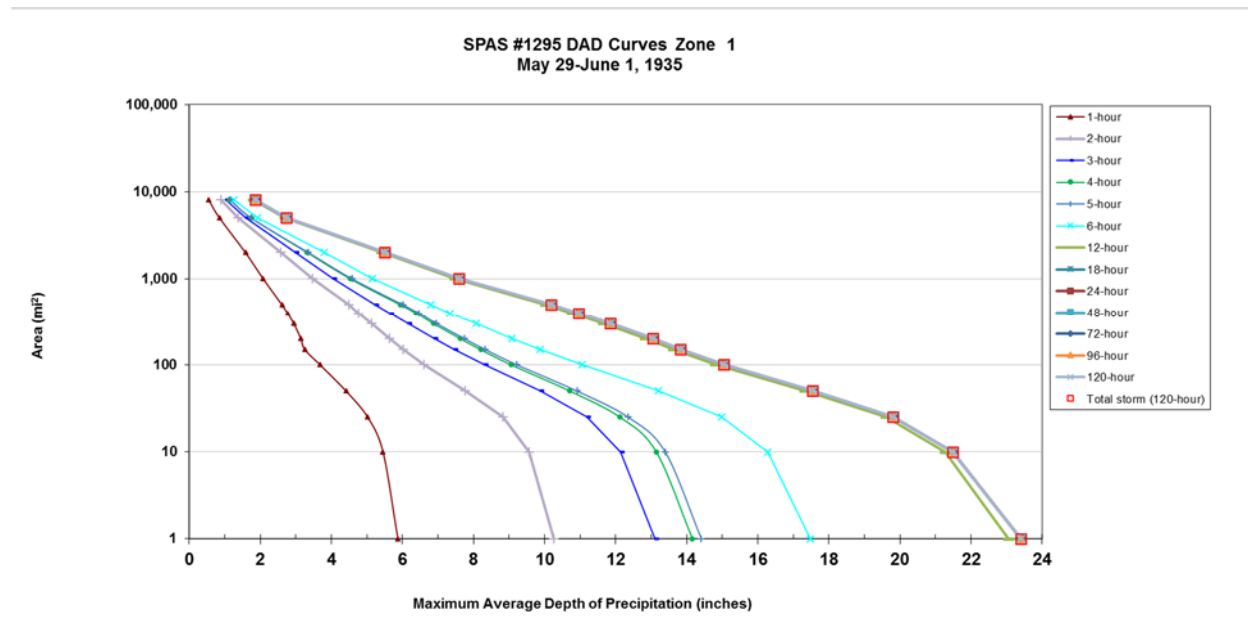
Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

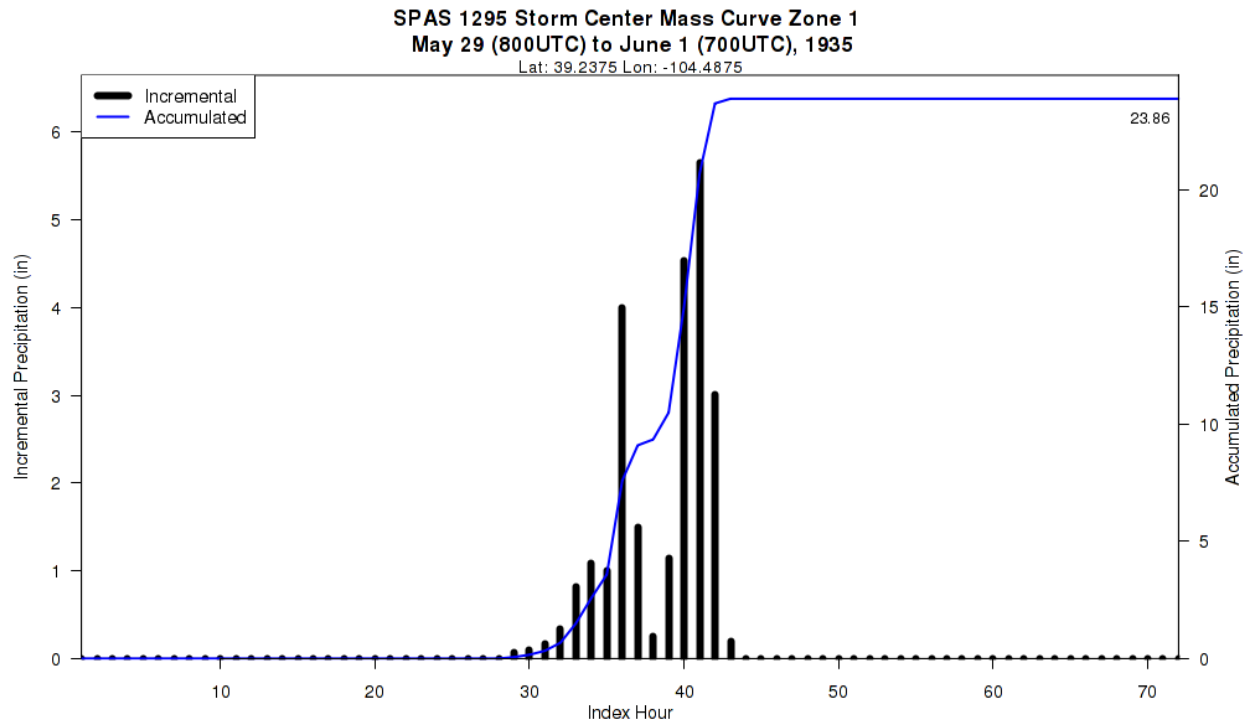
Reliability of results: This was a challenging storm to analyze given the lack of accurate measurements and hourly recording data. The storm analysis is consistent with the numerous other analyses of this storm by the USACE, USACE and NWS. Although we have a moderate degree of confidence in the magnitudes of precipitation; some areas reported heavy amounts of hail, which introduces error precipitation totals. We have low confidence in the precise precipitation patterns and temporal distributions given the lack of hourly data and radar data.

CO-NM Regional Extreme Precipitation Study

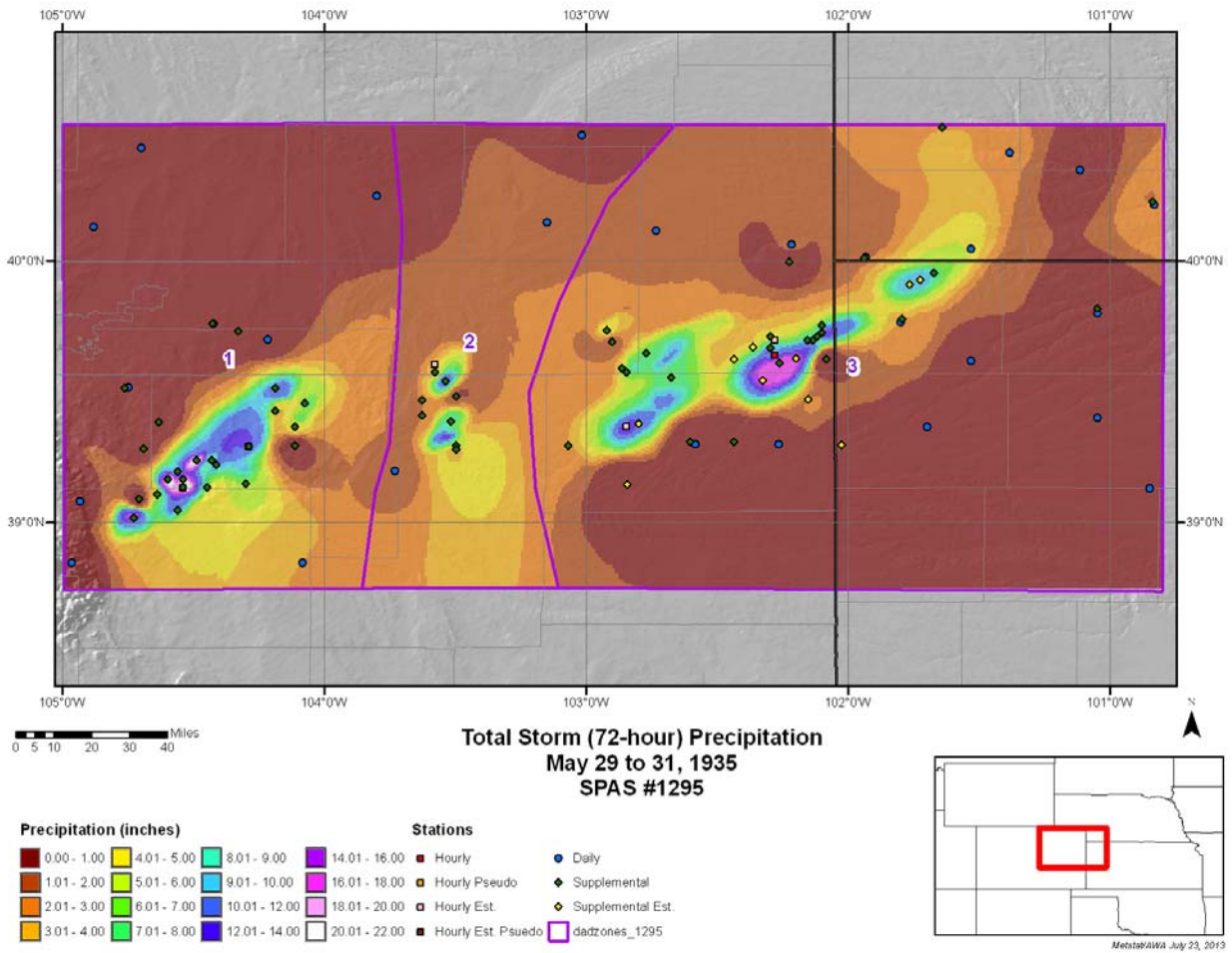
SPAS 1295 - May 29 (800 UTC) - June 1 (700 UTC), 1935														
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
Area (mi ²)	Duration (hours)													
	1	2	3	4	5	6	12	18	24	48	72	96	120	Total
0.3	5.95	10.39	13.26	14.31	14.58	17.72	23.38	23.71	23.71	23.71	23.71	23.71	23.71	23.71
1	5.87	10.26	13.11	14.16	14.41	17.49	23.06	23.40	23.40	23.40	23.40	23.40	23.40	23.40
10	5.45	9.57	12.13	13.14	13.39	16.28	21.27	21.49	21.49	21.49	21.49	21.49	21.49	21.49
25	5.02	8.82	11.19	12.12	12.35	14.99	19.61	19.81	19.81	19.81	19.81	19.81	19.81	19.81
50	4.41	7.77	9.88	10.71	10.91	13.20	17.33	17.53	17.53	17.53	17.53	17.53	17.53	17.53
100	3.68	6.60	8.31	9.06	9.22	11.06	14.81	15.04	15.04	15.04	15.04	15.04	15.04	15.04
150	3.25	6.02	7.46	8.20	8.33	9.88	13.62	13.83	13.83	13.83	13.83	13.83	13.83	13.83
200	3.14	5.64	6.89	7.63	7.75	9.08	12.83	13.04	13.04	13.04	13.04	13.04	13.04	13.04
300	2.94	5.13	6.15	6.87	6.96	8.07	11.65	11.84	11.84	11.84	11.84	11.84	11.84	11.84
400	2.76	4.76	5.65	6.38	6.46	7.34	10.78	10.95	10.95	10.95	10.95	10.95	10.95	10.95
500	2.61	4.50	5.22	5.95	6.02	6.80	10.02	10.18	10.19	10.19	10.19	10.19	10.19	10.19
1,000	2.08	3.46	4.05	4.53	4.58	5.16	7.47	7.59	7.59	7.59	7.59	7.59	7.59	7.59
2,000	1.58	2.58	2.98	3.32	3.35	3.80	5.42	5.49	5.49	5.49	5.49	5.49	5.49	5.49
5,000	0.85	1.37	1.59	1.74	1.74	1.92	2.70	2.72	2.73	2.73	2.73	2.73	2.73	2.73
8,125	0.54	0.90	1.03	1.13	1.14	1.26	1.81	1.85	1.86	1.86	1.86	1.86	1.86	1.86



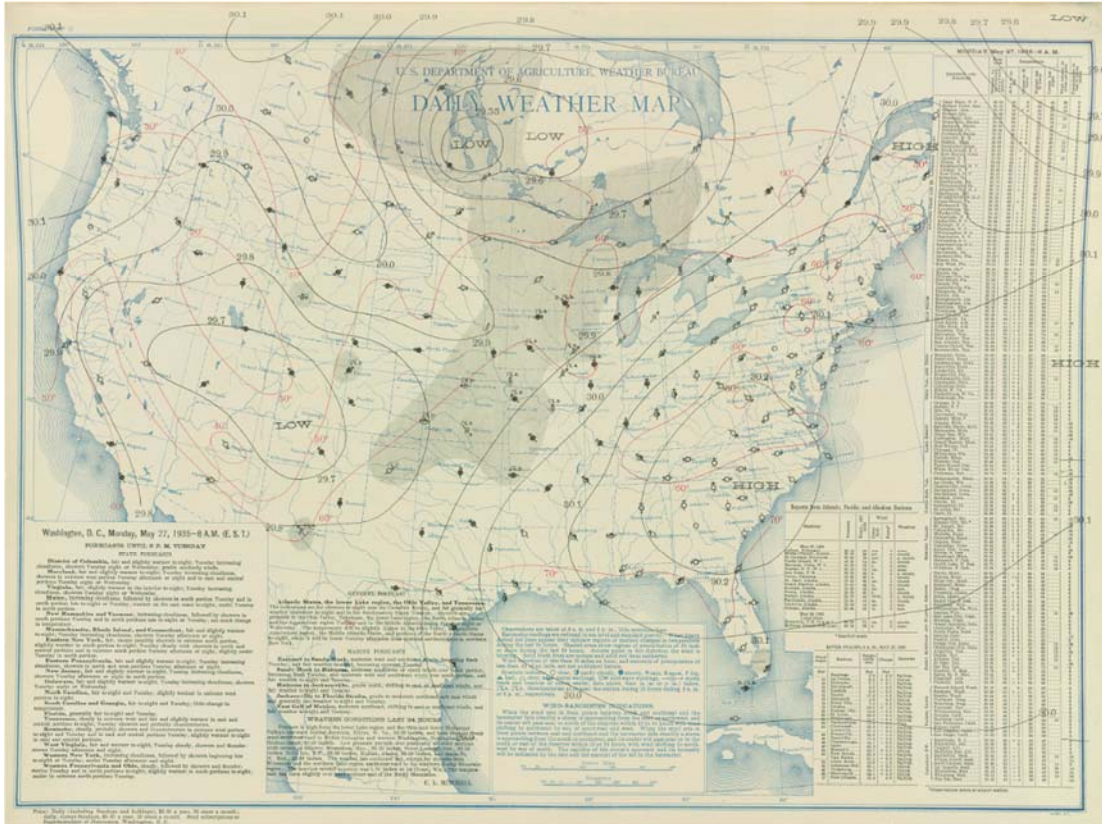
CO-NM Regional Extreme Precipitation Study

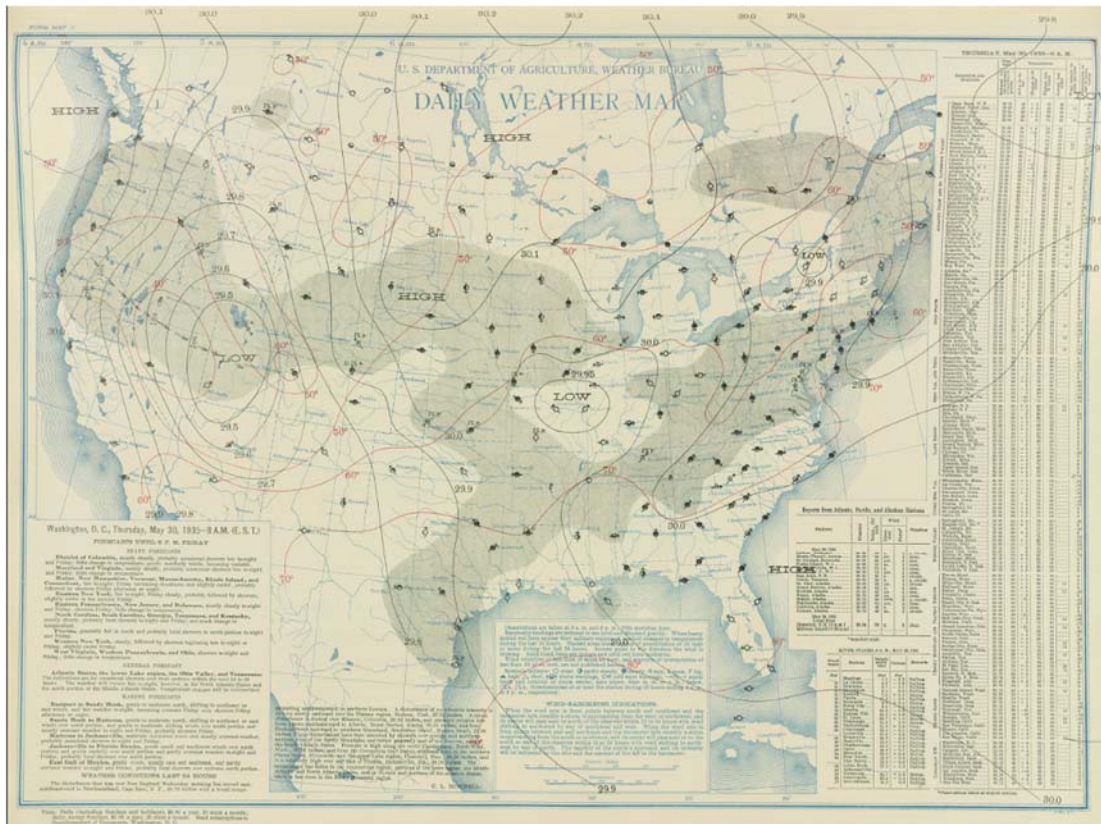


CO-NM Regional Extreme Precipitation Study

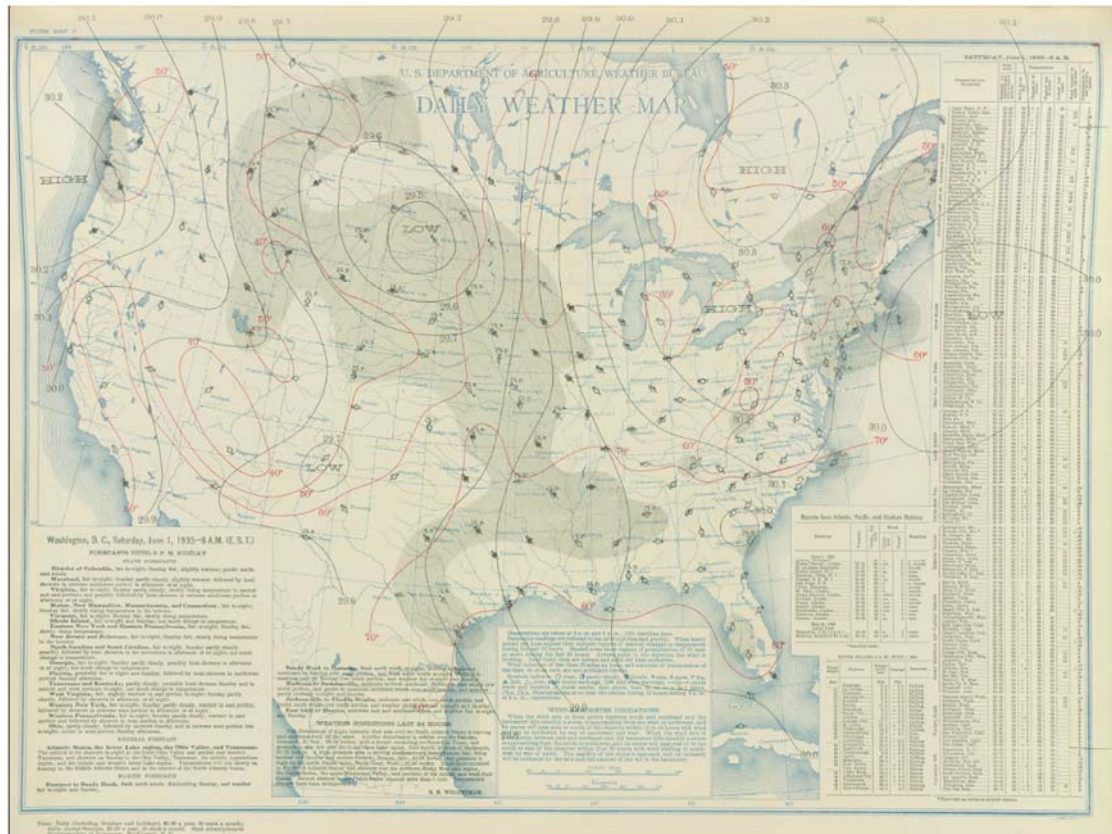
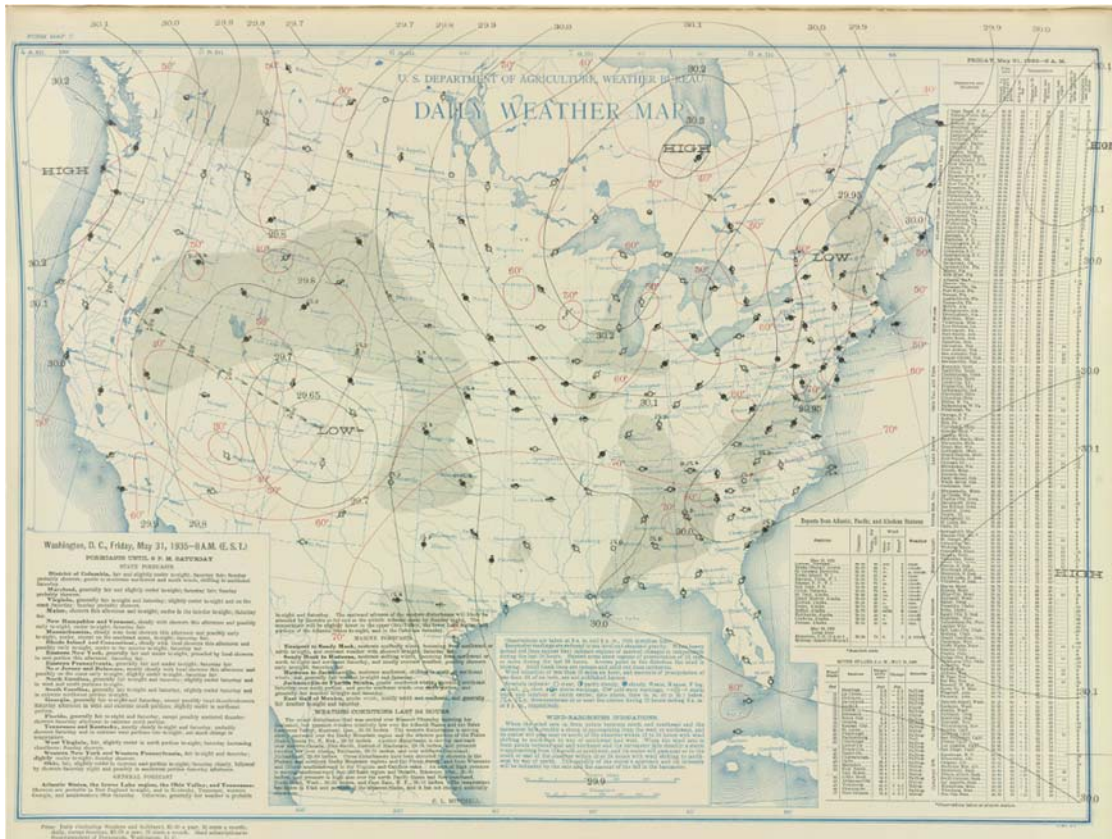


CO-NM Regional Extreme Precipitation Study

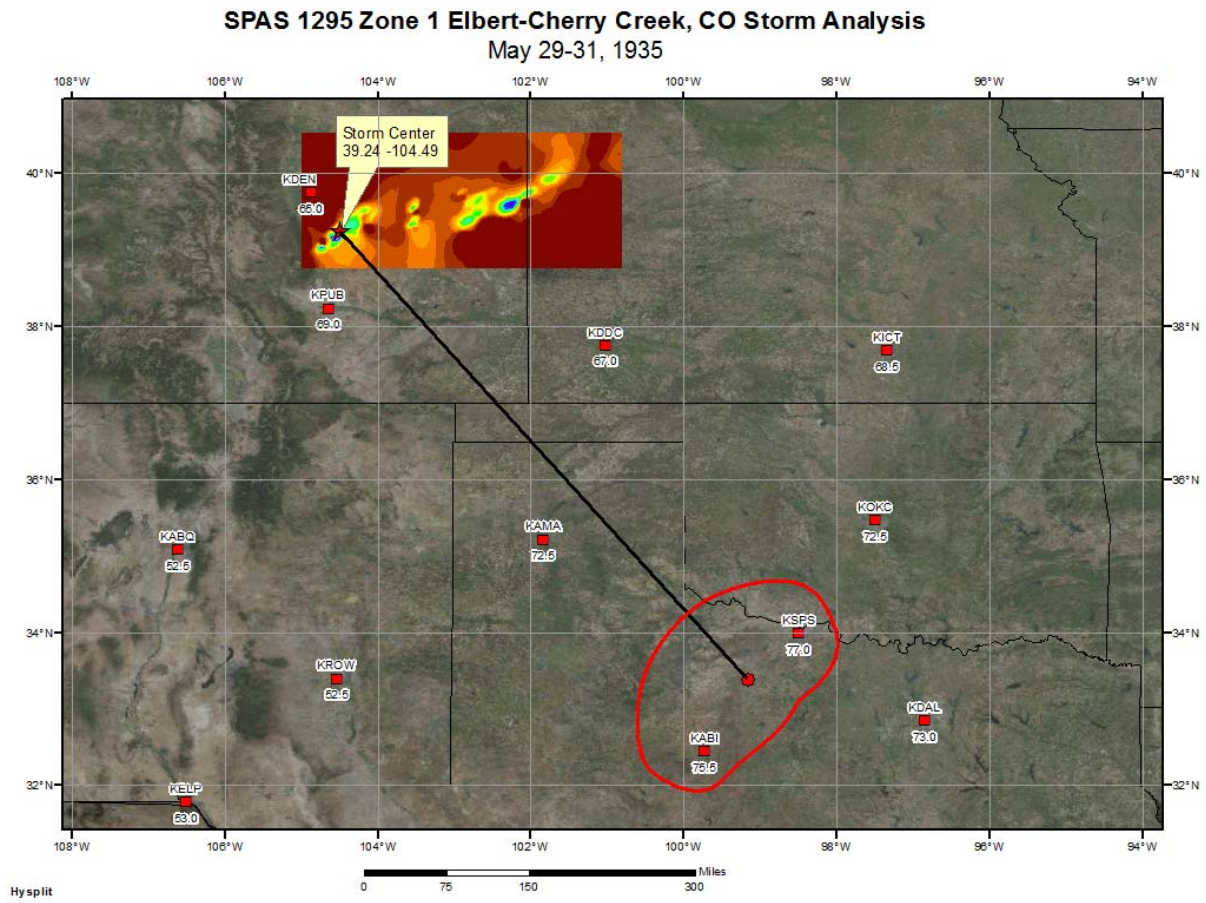


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CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



Genoa, CO

May 29-31, 1935

Storm Type: Local

Storm Precipitation Analysis System (SPAS) For #1295_2 (re-run/expansion of Storm #1039)

Metstat, Inc/AWA

08/12/2013

General Storm Location: Eastern Colorado and southern Colorado Front Range

Storm Dates: May 29-31, 1935

Event: MCCs/Thunderstorms

DAD Zone 2

Latitude: 39.32916

Longitude: -103.5375

Max. Grid Rainfall Amount: 12.65"

Max. Observed Rainfall Amount: 11.00" (Limon 19 NE)

Number of Stations: 102

SPAS Version: 9.5

Basemap: Final SPAS #1008 Precip Map, which used June 1965 Total Precipitation PRISM Grid

Spatial resolution: 30 seconds

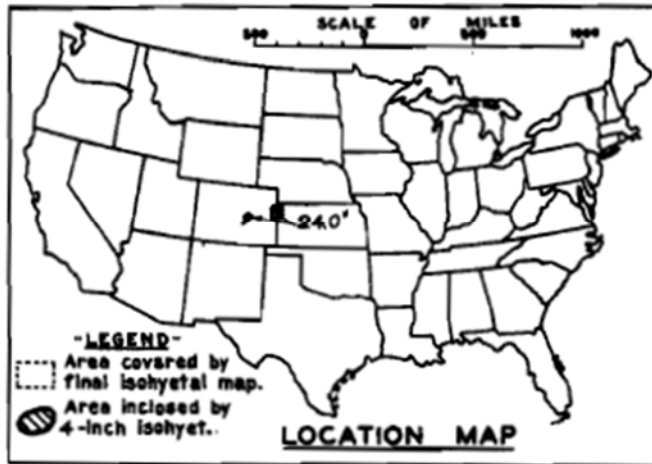
Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

Reliability of results: This was a challenging storm to analyze given the lack of accurate measurements and hourly recording data. The storm analysis is consistent with the numerous other analyses of this storm by the USACE, USACE and NWS. Although we have a moderate degree of confidence in the magnitudes of precipitation; some areas reported heavy amounts of hail, which introduces error precipitation totals. We have low confidence in the precise precipitation patterns and temporal distributions given the lack of hourly data and radar data.

WAR DEPARTMENT

CORPS OF ENGINEERS, U.S. ARMY

STORM STUDIES - PERTINENT DATA SHEET

Storm of May 30 - 31, 1935

Assignment M R 3 - 28 A

Location Eastern Colorado

Study Prepared by:

Missouri River Division

Kansas City District

Part I Reviewed by H. M. Sec. of

Weather Bureau, 11/16/42

Part II Approved by Office, Chief

of Engineers for Distribution

of Factual Data, 7/14/45

Remarks: Centers:

N.E. of Colorado Springs, Colo.
and N.E. of Burlington, Colo.**DATA AND COMPUTATIONS COMPILED****PART I**

Preliminary isohyetal map, in 1 sheet, scale 1 : 1,000,000

Precipitation data and mass curves:

(Number of Sheets)

Form 5001-C (Hourly precip. data)----- 29

Form 5001-B (24-hour " ")----- 64

Form 5001-D (" " ")----- 3

Misc. precip. records, meteorological data, etc.----- 37

Form 5002 (Mass rainfall curves)----- 63

PART II

Final isohyetal maps, in 2 sheet, scale 1 : 1,000,000 & 1 : 500,000

Data and computation sheets:

Form S-10 (Data from mass rainfall curves)----- 3

Form S-11 (Depth-area data from isohyetal map)----- 2

Form S-12 (Maximum depth-duration data)----- 7

Maximum duration-depth-area curves----- 1

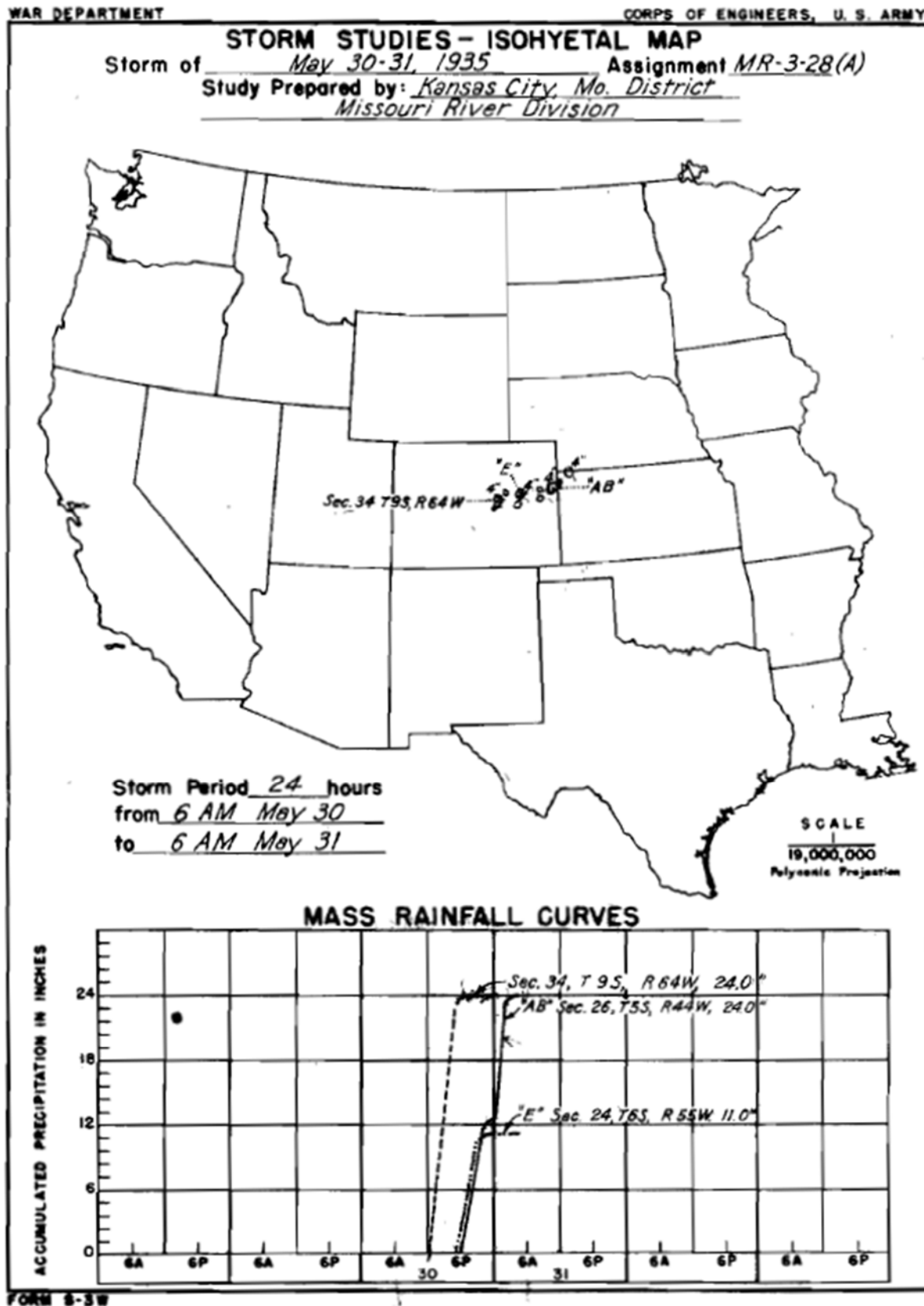
Data relating to periods of maximum rainfall----- 2

MAXIMUM AVERAGE DEPTH OF RAINFALL IN INCHES

Area in Sq. Mi.	Duration of Rainfall in Hours									
	6	12	18	24						
Max. Station	24.0	24.0	24.0	24.0						
5	22.1	23.3	23.3	23.3						
10	20.6	22.2	22.2	22.2						
20	18.8	20.7	20.7	20.7						
50	16.0	18.0	18.0	18.0						
100	13.7	15.4	15.4	15.4						
200	11.2	12.6	12.6	12.6						
500	7.8	9.3	9.3	9.3						
1,000	5.8	7.2	7.2	7.2						
2,000	4.1	5.3	5.5	5.5						
5,000	2.4	3.5	3.8	4.0						
6,300	2.1	3.1	3.6	3.8						

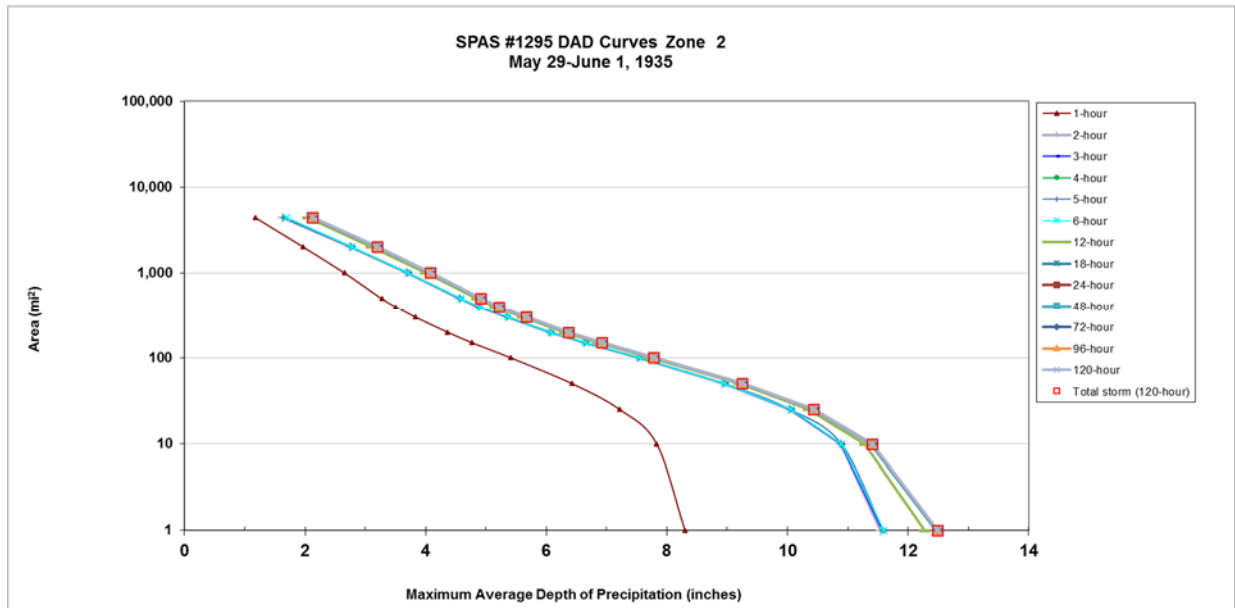
Form S-2

CO-NM Regional Extreme Precipitation Study

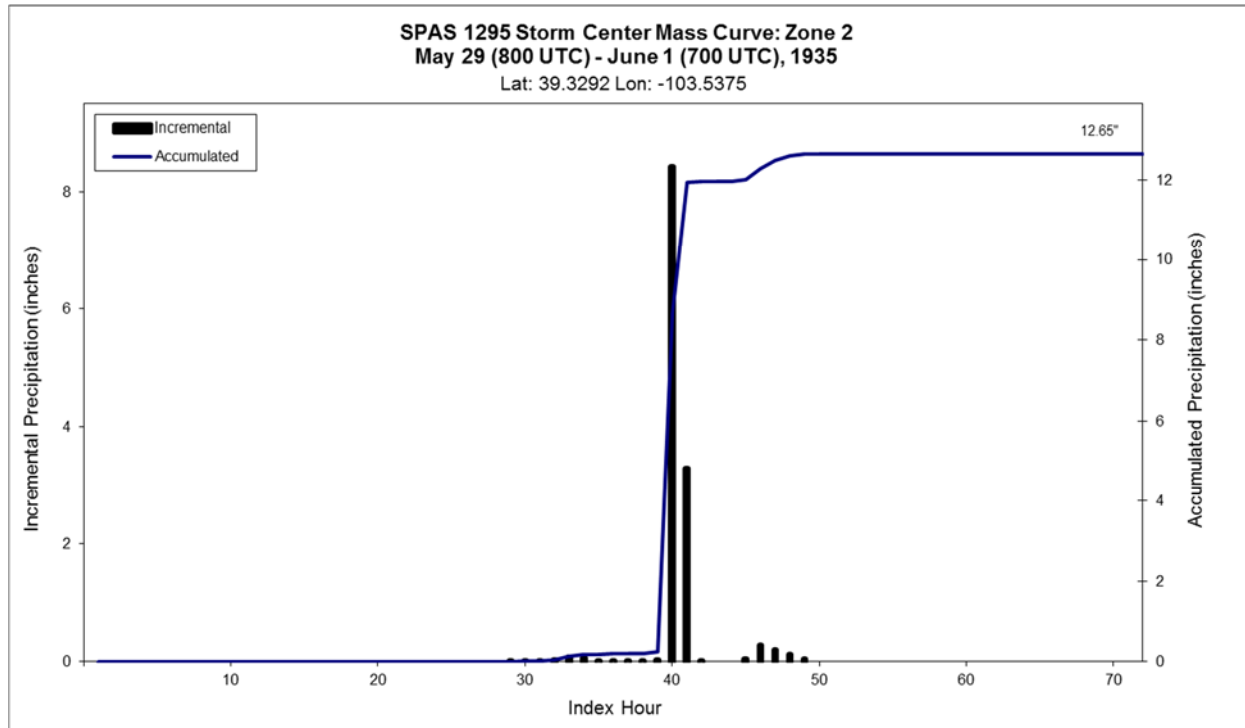


CO-NM Regional Extreme Precipitation Study

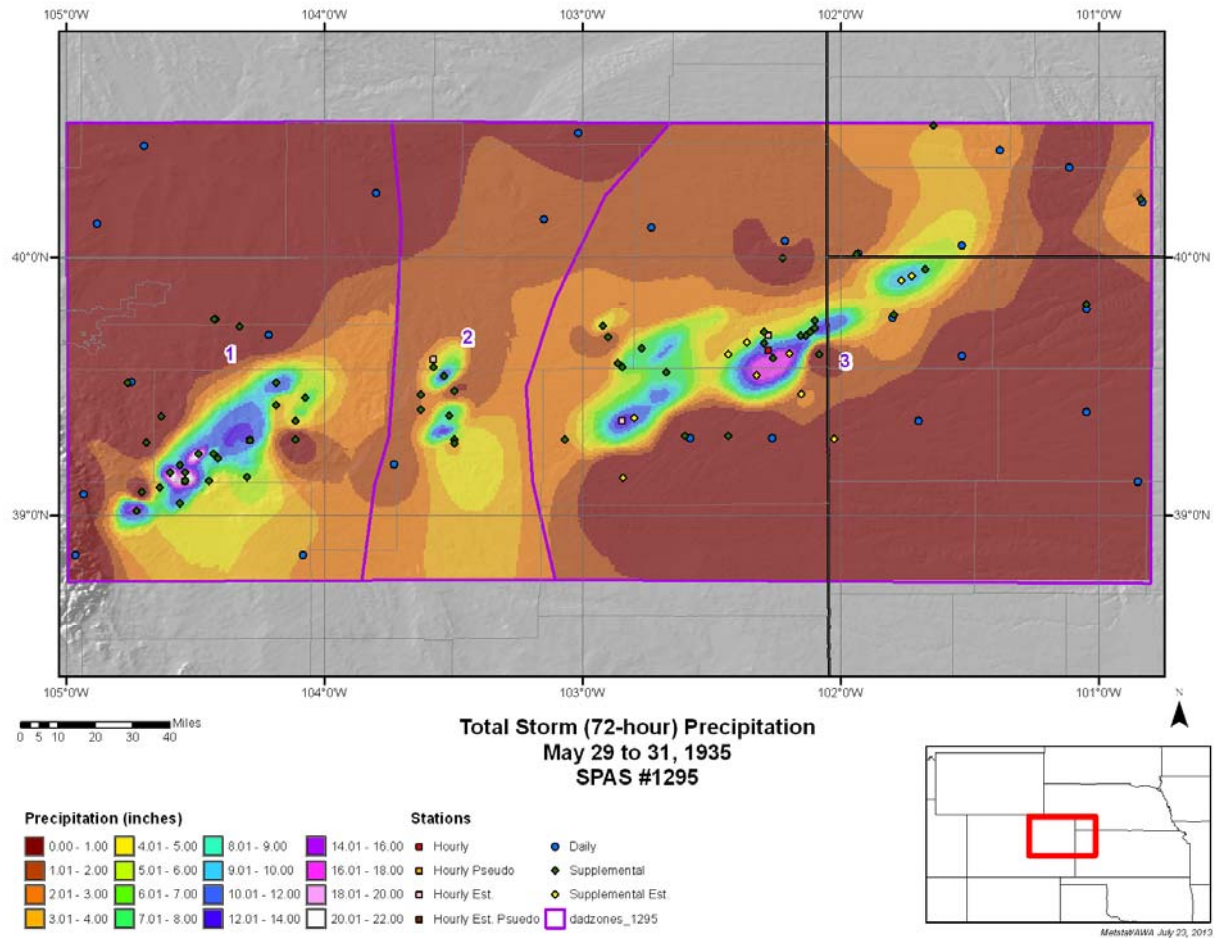
SPAS 1295 - May 29 (800 UTC) - June 1 (700 UTC), 1935														
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
Area (mi ²)	Duration (hours)													
	1	2	3	4	5	6	12	18	24	48	72	96	120	Total
0.3	8.38	11.66	11.69	11.70	11.70	11.71	12.39	12.58	12.60	12.60	12.60	12.60	12.60	12.60
1	8.30	11.54	11.57	11.59	11.59	11.60	12.28	12.47	12.49	12.49	12.49	12.49	12.49	12.49
10	7.83	10.89	10.89	10.89	10.89	10.90	11.28	11.38	11.40	11.40	11.40	11.40	11.40	11.40
25	7.22	10.03	10.05	10.05	10.05	10.06	10.34	10.42	10.43	10.43	10.43	10.43	10.43	10.43
50	6.43	8.93	8.96	8.96	8.96	8.96	9.19	9.25	9.25	9.25	9.25	9.25	9.25	9.25
100	5.41	7.52	7.53	7.53	7.53	7.54	7.71	7.77	7.78	7.78	7.78	7.78	7.78	7.78
150	4.77	6.63	6.64	6.64	6.64	6.65	6.85	6.91	6.92	6.92	6.92	6.92	6.92	6.92
200	4.36	6.06	6.06	6.07	6.07	6.08	6.30	6.36	6.37	6.37	6.37	6.37	6.37	6.37
300	3.83	5.34	5.34	5.35	5.35	5.36	5.60	5.66	5.67	5.67	5.67	5.67	5.67	5.67
400	3.50	4.88	4.88	4.89	4.89	4.90	5.15	5.22	5.22	5.22	5.22	5.22	5.22	5.22
500	3.27	4.56	4.56	4.57	4.57	4.58	4.84	4.90	4.91	4.91	4.91	4.91	4.91	4.91
1,000	2.65	3.68	3.70	3.70	3.71	3.71	4.00	4.07	4.08	4.08	4.08	4.08	4.08	4.08
2,000	1.97	2.74	2.77	2.77	2.77	2.78	3.09	3.18	3.20	3.20	3.20	3.20	3.20	3.20
4,425	1.17	1.63	1.64	1.65	1.65	1.69	2.04	2.10	2.12	2.12	2.12	2.12	2.12	2.12



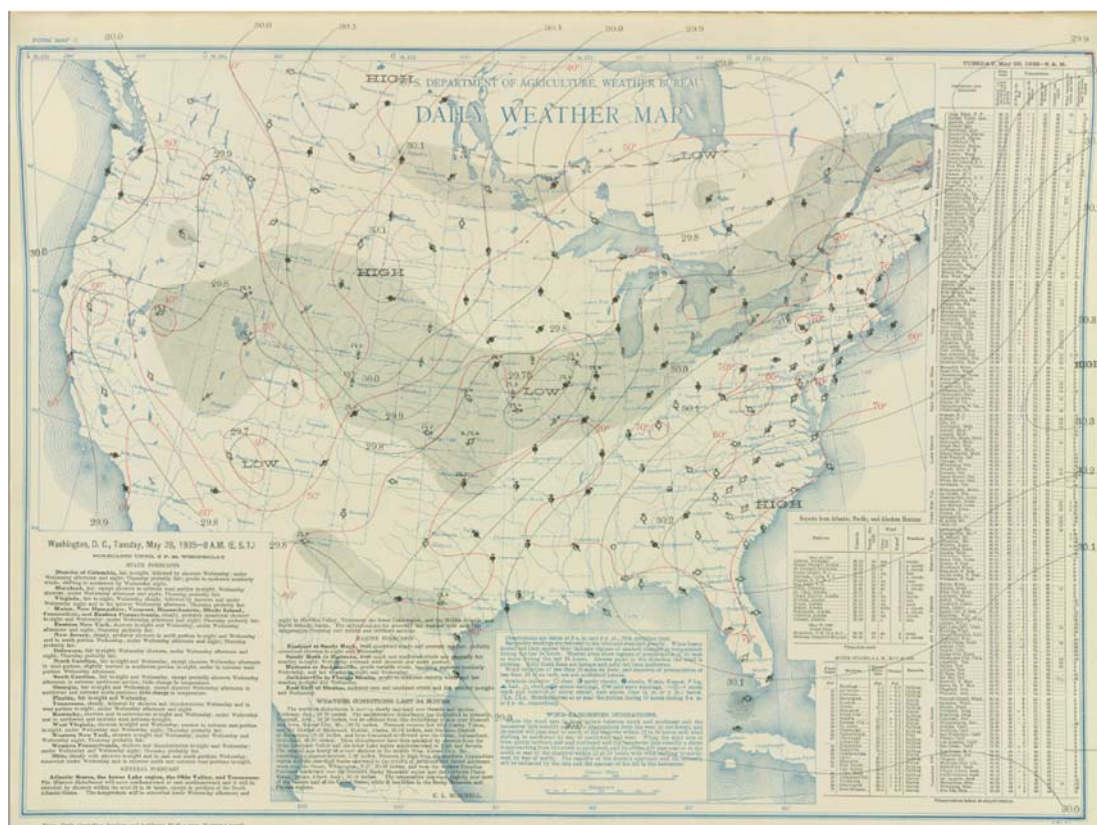
CO-NM Regional Extreme Precipitation Study



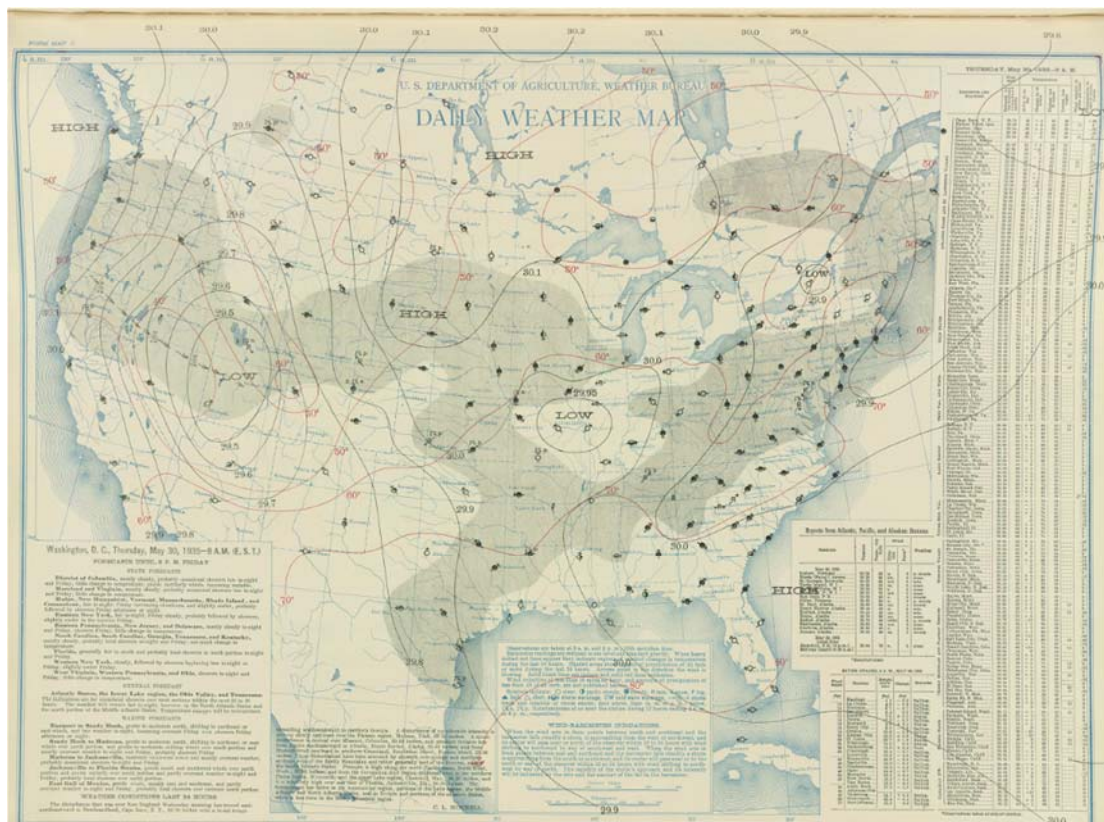
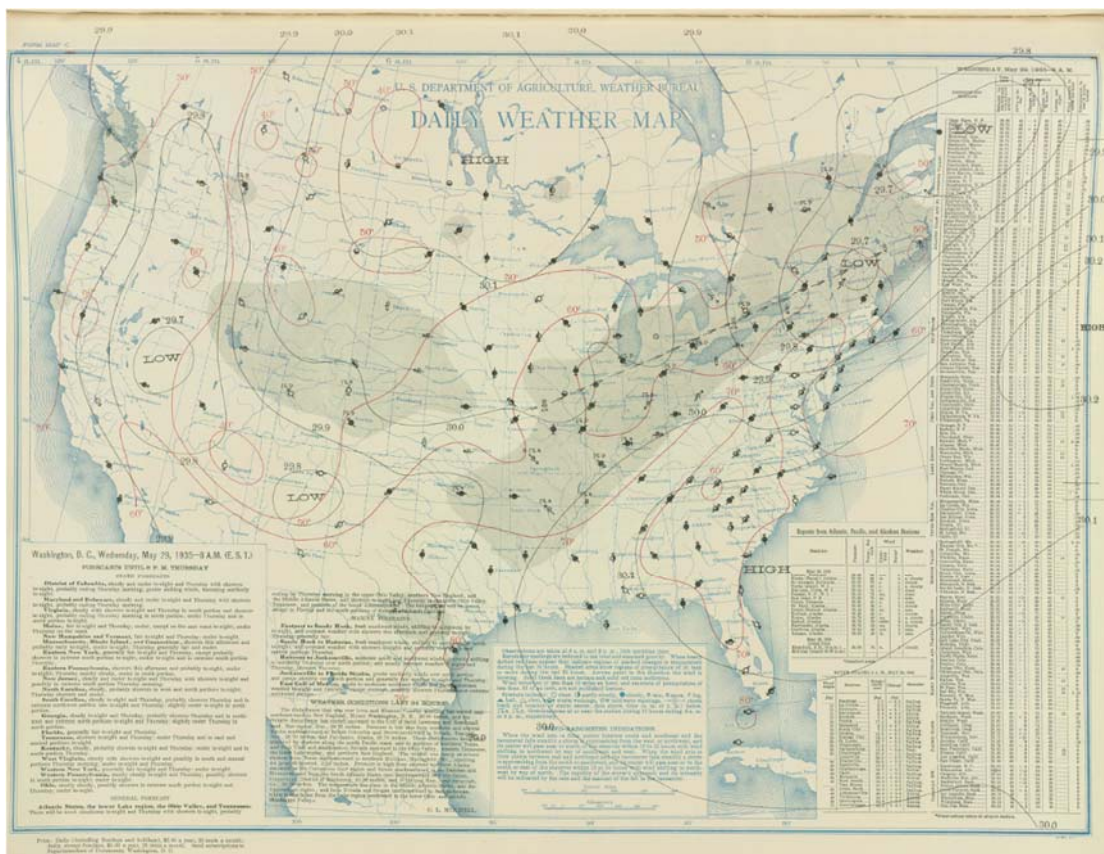
CO-NM Regional Extreme Precipitation Study

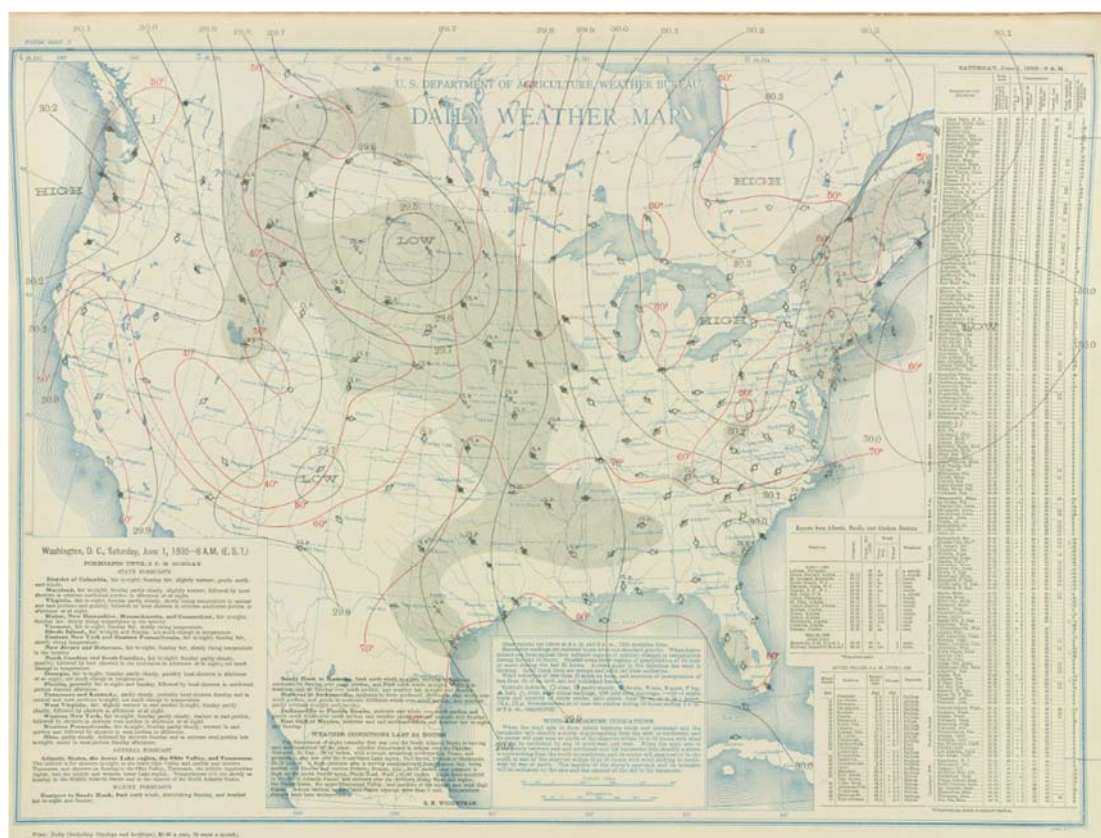


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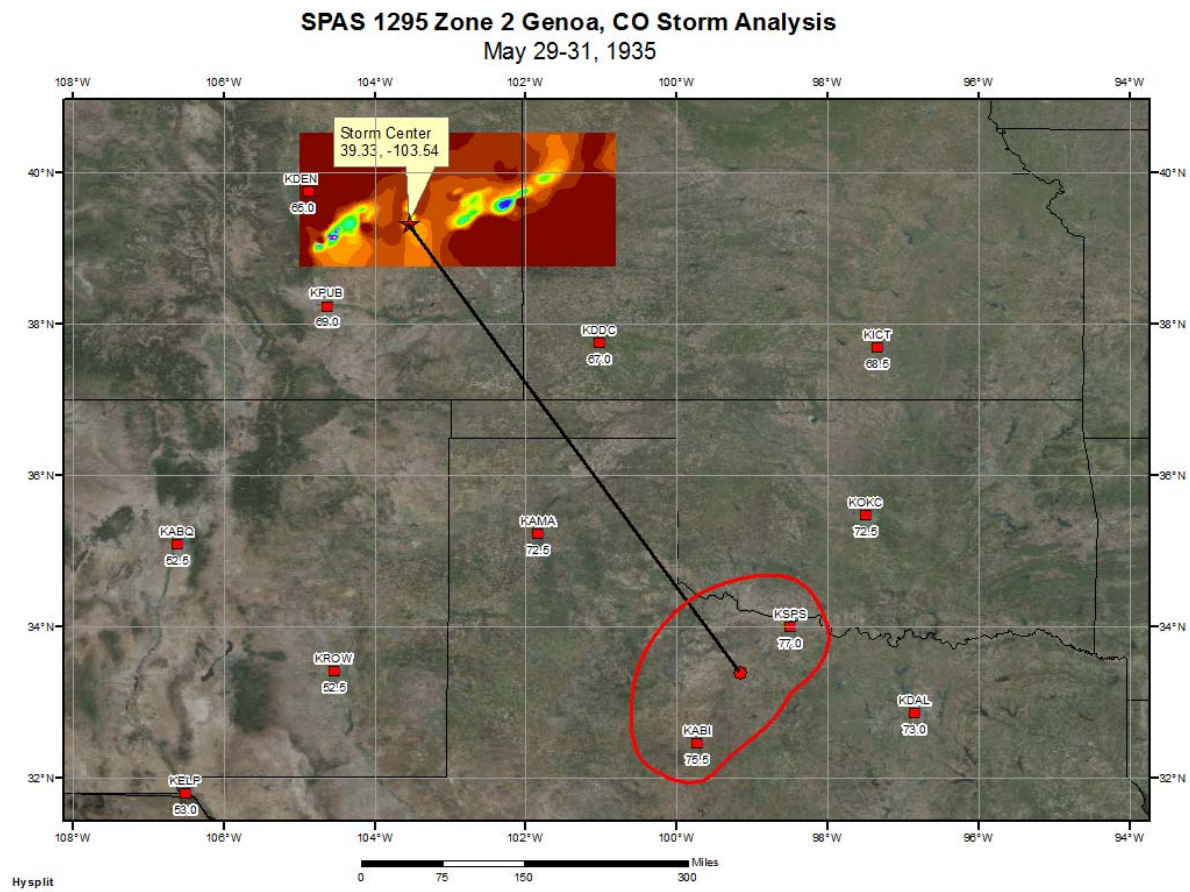


CO-NM Regional Extreme Precipitation Study



[illegible]

CO-NM Regional Extreme Precipitation Study



Hale, CO
May 29-31, 1935
Storm Type: Local

Storm Precipitation Analysis System (SPAS) For #1295_3
(re-run/expansion of Storm #1039)

Metstat, Inc/AWA
08/12/2013

General Storm Location: Eastern Colorado and southern Colorado Front Range

Storm Dates: May 29-31, 1935

Event: MCCs/Thunderstorms

DAD Zone 3

Latitude: 39.6125

Longitude: -102.2625

Max. Grid Rainfall Amount: 18.00"

Max. Observed Rainfall Amount: 18.00" (Idalia 5SE, CO near Holly; we excluded the highly unreliable reports of up to 24" in/around Holly)

Number of Stations: 102

SPAS Version: 9.5

Basemap: Final SPAS #1008 Precip Map, which used June 1965 Total Precipitation PRISM Grid

Spatial resolution: 30 seconds

Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

Reliability of results: This was a challenging storm to analyze given the lack of accurate measurements and hourly recording data. The storm analysis is consistent with the numerous other analyses of this storm by the USACE, USACE and NWS. Although we have a moderate degree of confidence in the magnitudes of precipitation; some areas reported heavy amounts of hail, which introduces error precipitation totals. We have low confidence in the precise precipitation patterns and temporal distributions given the lack of hourly data and radar data.

WAR DEPARTMENT

CORPS OF ENGINEERS, U.S. ARMY

STORM STUDIES - PERTINENT DATA SHEET

Storm of May 30 - 31, 1935

Assignment M R 3 - 28 A

Location Eastern Colorado

Study Prepared by:

Missouri River Division

Kansas City District

Part I Reviewed by H. M. Sec. of
Weather Bureau, 11/16/42Part II Approved by Office, Chief
of Engineers for Distribution
of Factual Data, 7/14/45

Remarks: Centers:

N.E. of Colorado Springs, Colo.
and N.E. of Burlington, Colo.**DATA AND COMPUTATIONS COMPILED****PART I**

Preliminary Isohyetal map, in 1 sheet, scale 1 : 1,000,000

Precipitation data and mass curves:

(Number of Sheets)

Form 5001-C (Hourly precip. data).....	29
Form 5001-B (24-hour " " " ").....	64
Form 5001-D (" " " " " ").....	3
Misc. precip. records, meteorological data, etc.....	37
Form 5002 (Mass rainfall curves).....	63

PART II

Final Isohyetal maps, in 2 sheet, scale 1 : 1,000,000 & 1 : 500,000

Data and computation sheets:

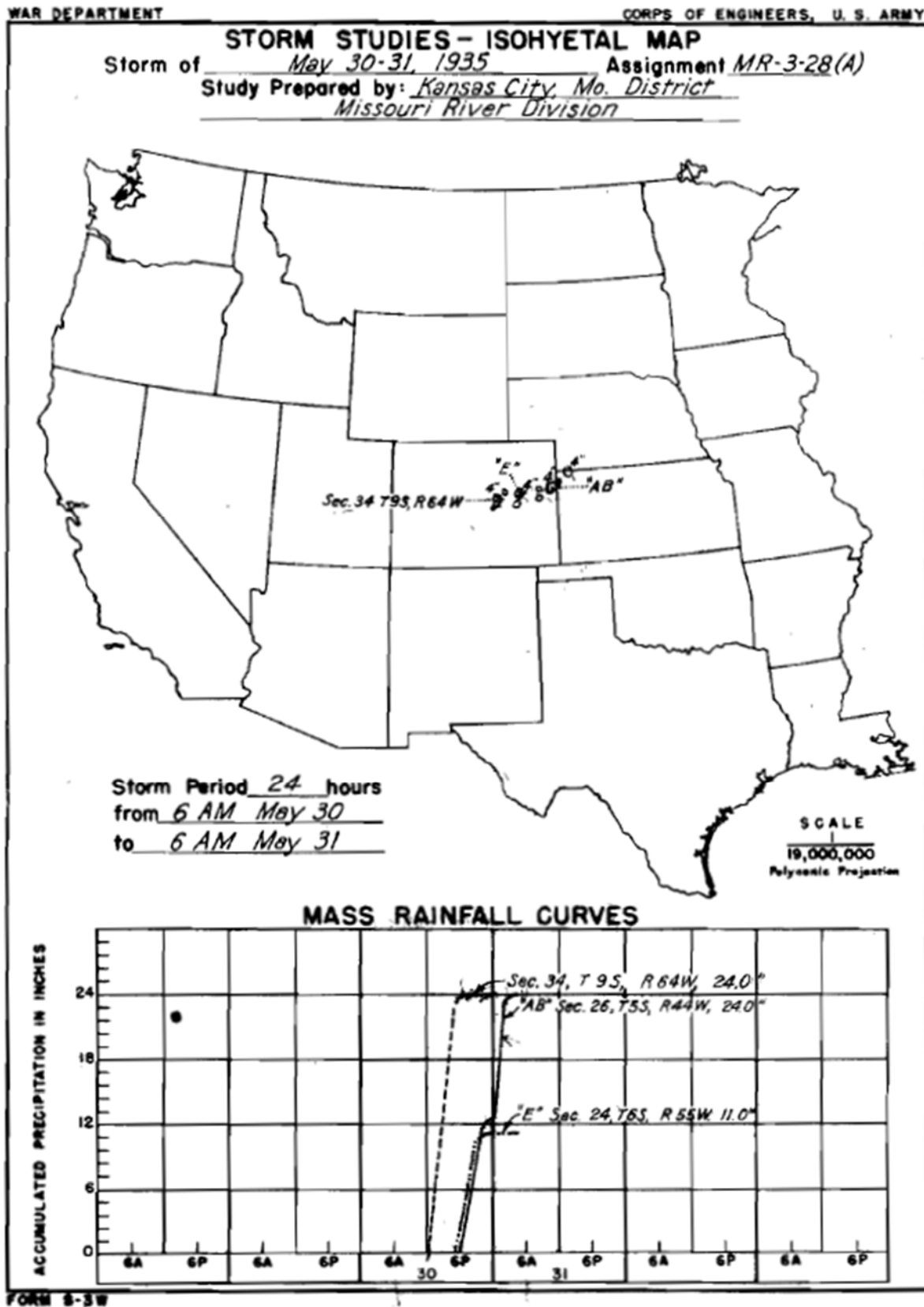
Form S-10 (Data from mass rainfall curves).....	3
Form S-11 (Depth-area data from isohyetal map).....	2
Form S-12 (Maximum depth-duration data).....	7
Maximum duration-depth-area curves.....	1
Data relating to periods of maximum rainfall.....	2

MAXIMUM AVERAGE DEPTH OF RAINFALL IN INCHES

Area in Sq. Mi.	Duration of Rainfall in Hours									
	6	12	18	24						
Max. Station	24.0	24.0	24.0	24.0						
5	22.1	23.3	23.3	23.3						
10	20.6	22.2	22.2	22.2						
20	18.8	20.7	20.7	20.7						
50	16.0	18.0	18.0	18.0						
100	13.7	15.4	15.4	15.4						
200	11.2	12.6	12.6	12.6						
500	7.8	9.3	9.3	9.3						
1,000	5.8	7.2	7.2	7.2						
2,000	4.1	5.3	5.5	5.5						
5,000	2.4	3.5	3.8	4.0						
6,300	2.1	3.1	3.6	3.8						

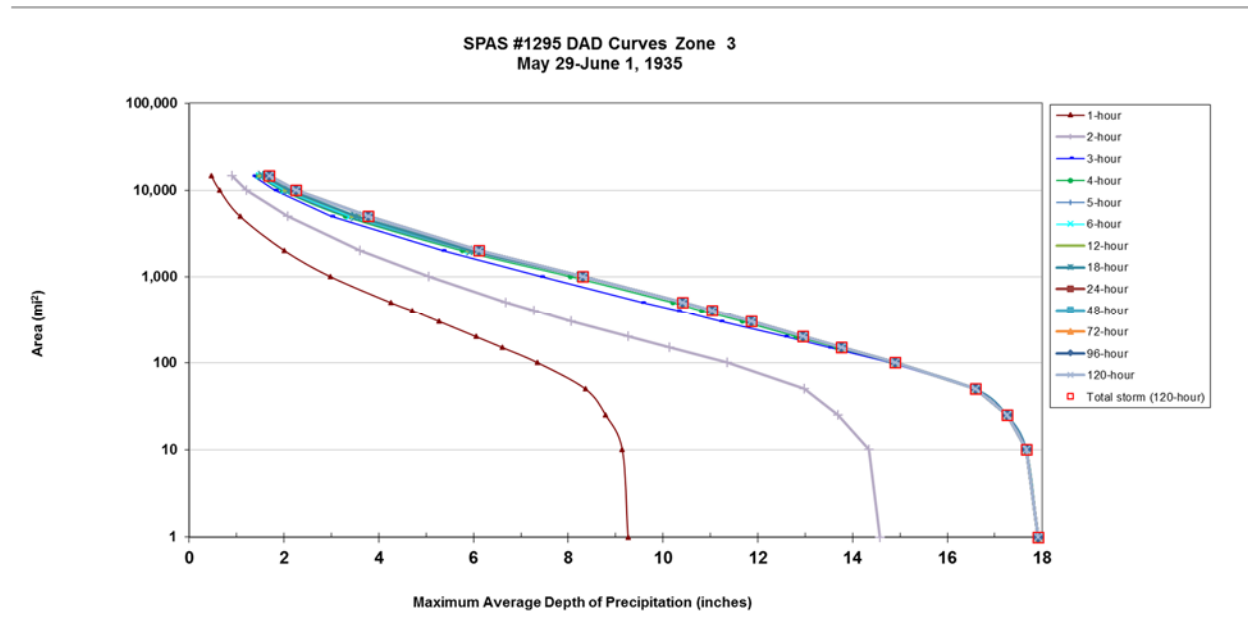
Form S-2

CO-NM Regional Extreme Precipitation Study

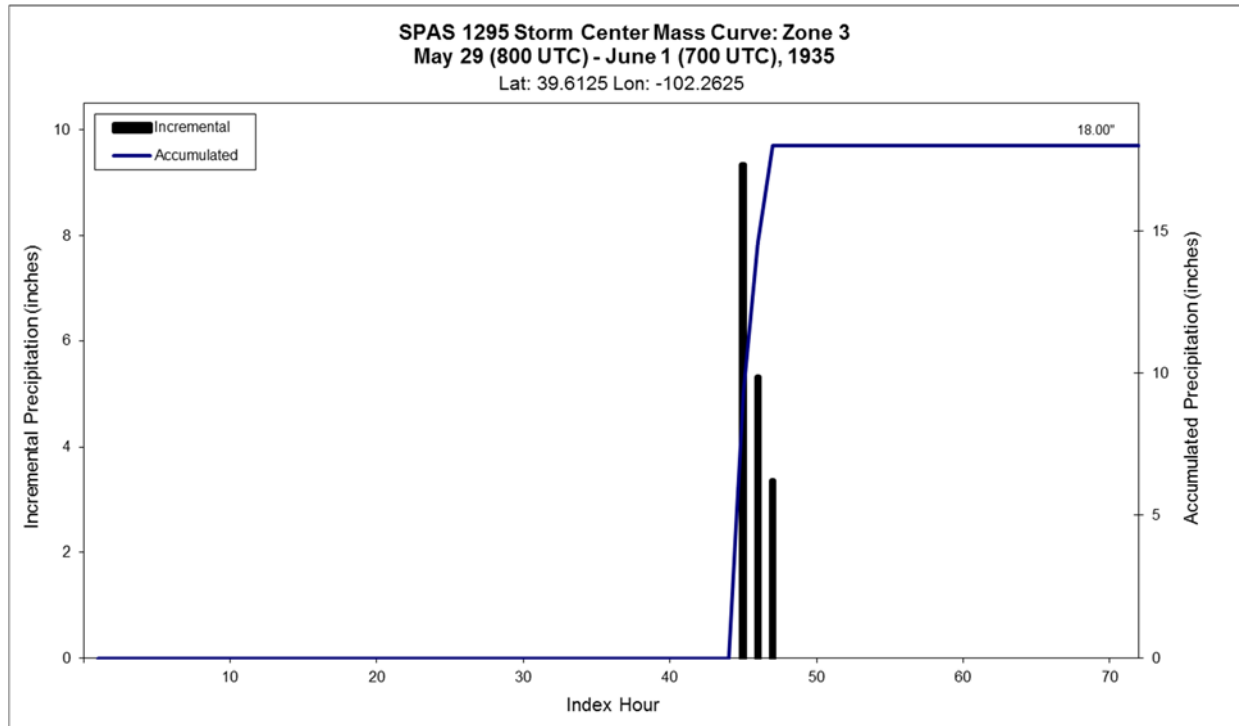


CO-NM Regional Extreme Precipitation Study

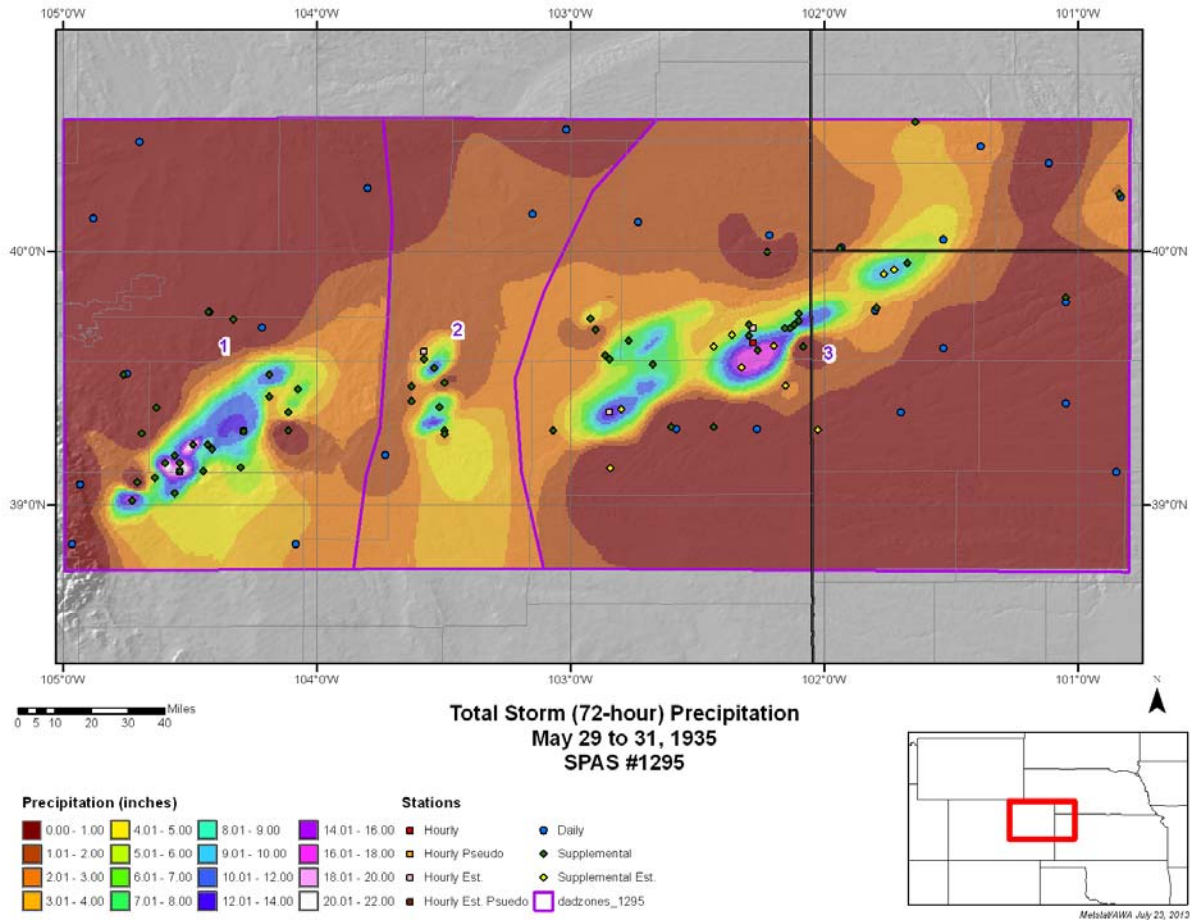
SPAS 1295 - May 29 (800 UTC) - June 1 (700 UTC), 1935														
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
Area (mi ²)	Duration (hours)													
	1	2	3	4	5	6	12	18	24	48	72	96	120	Total
0.3	9.31	14.64	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
1	9.26	14.58	17.92	17.92	17.92	17.92	17.92	17.92	17.92	17.92	17.92	17.92	17.92	17.92
10	9.14	14.35	17.67	17.67	17.67	17.67	17.67	17.67	17.67	17.67	17.67	17.67	17.67	17.67
25	8.79	13.69	17.26	17.26	17.26	17.26	17.26	17.26	17.26	17.26	17.26	17.26	17.26	17.26
50	8.36	12.98	16.60	16.60	16.60	16.60	16.60	16.60	16.60	16.60	16.60	16.60	16.60	16.60
100	7.35	11.35	14.80	14.83	14.89	14.89	14.89	14.89	14.89	14.89	14.89	14.89	14.89	14.89
150	6.60	10.13	13.51	13.66	13.77	13.77	13.77	13.77	13.77	13.77	13.77	13.77	13.77	13.77
200	6.05	9.26	12.57	12.80	12.95	12.95	12.95	12.95	12.95	12.95	12.95	12.95	12.95	12.95
300	5.27	8.06	11.21	11.67	11.85	11.85	11.86	11.86	11.86	11.86	11.86	11.86	11.86	11.86
400	4.71	7.28	10.31	10.82	11.01	11.01	11.03	11.03	11.03	11.03	11.03	11.03	11.03	11.03
500	4.25	6.68	9.56	10.20	10.39	10.39	10.41	10.41	10.41	10.41	10.41	10.41	10.41	10.41
1,000	2.98	5.05	7.42	8.05	8.25	8.25	8.28	8.28	8.31	8.31	8.31	8.31	8.31	8.31
2,000	2.01	3.60	5.34	5.76	5.90	5.90	5.95	5.95	6.12	6.12	6.12	6.12	6.12	6.12
5,000	1.07	2.08	2.99	3.29	3.38	3.38	3.50	3.51	3.77	3.77	3.77	3.77	3.77	3.77
10,000	0.64	1.21	1.80	1.96	2.00	2.00	2.09	2.10	2.25	2.25	2.25	2.25	2.25	2.25
14,855	0.46	0.90	1.35	1.45	1.48	1.48	1.56	1.56	1.68	1.68	1.68	1.68	1.68	1.68



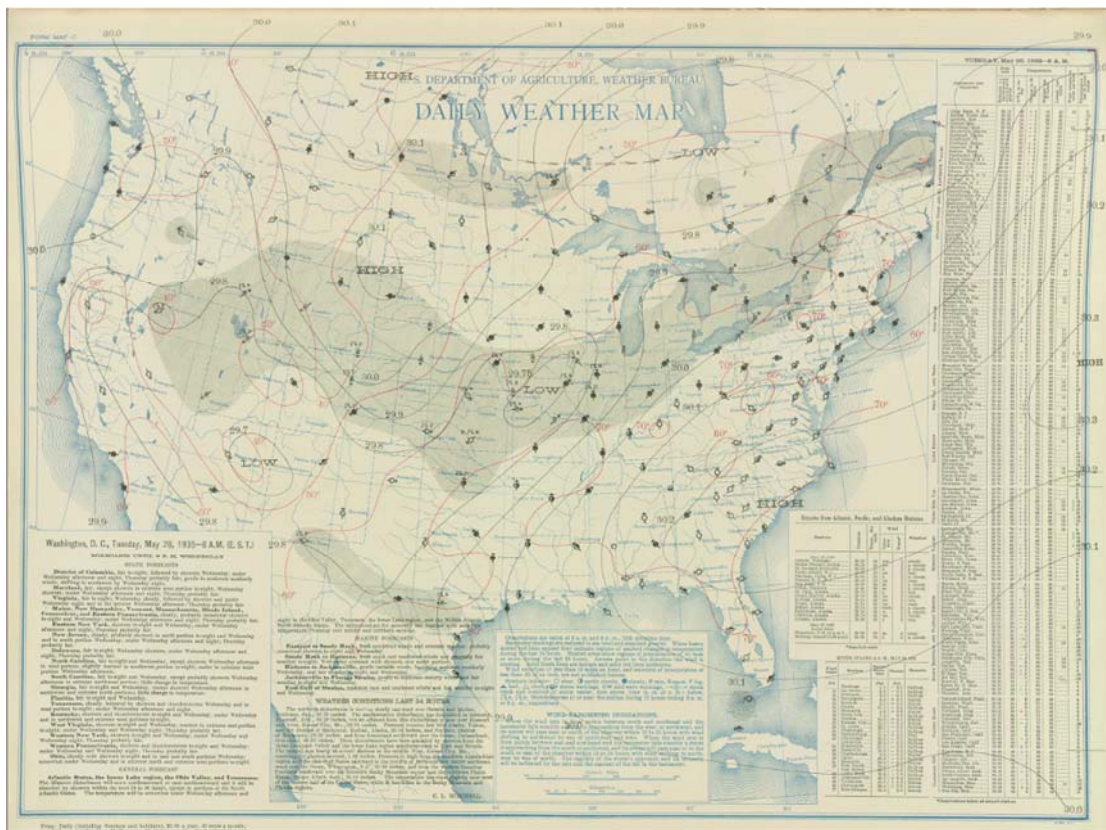
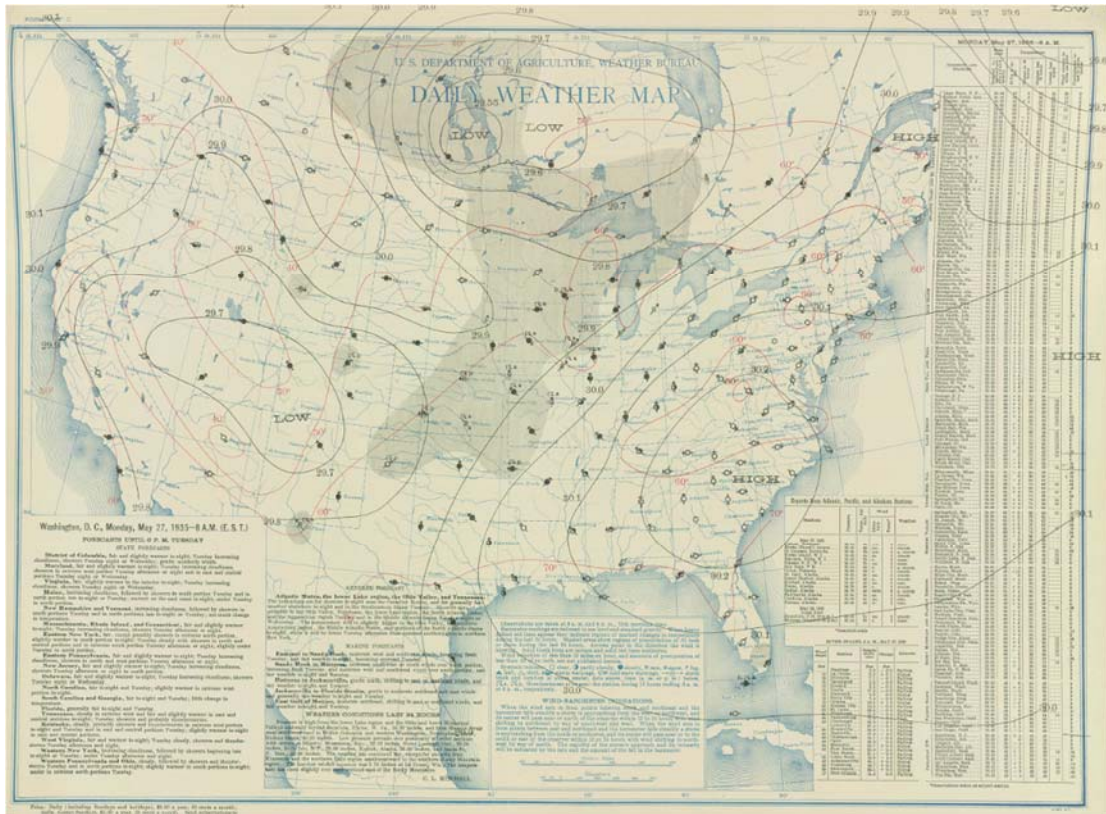
CO-NM Regional Extreme Precipitation Study



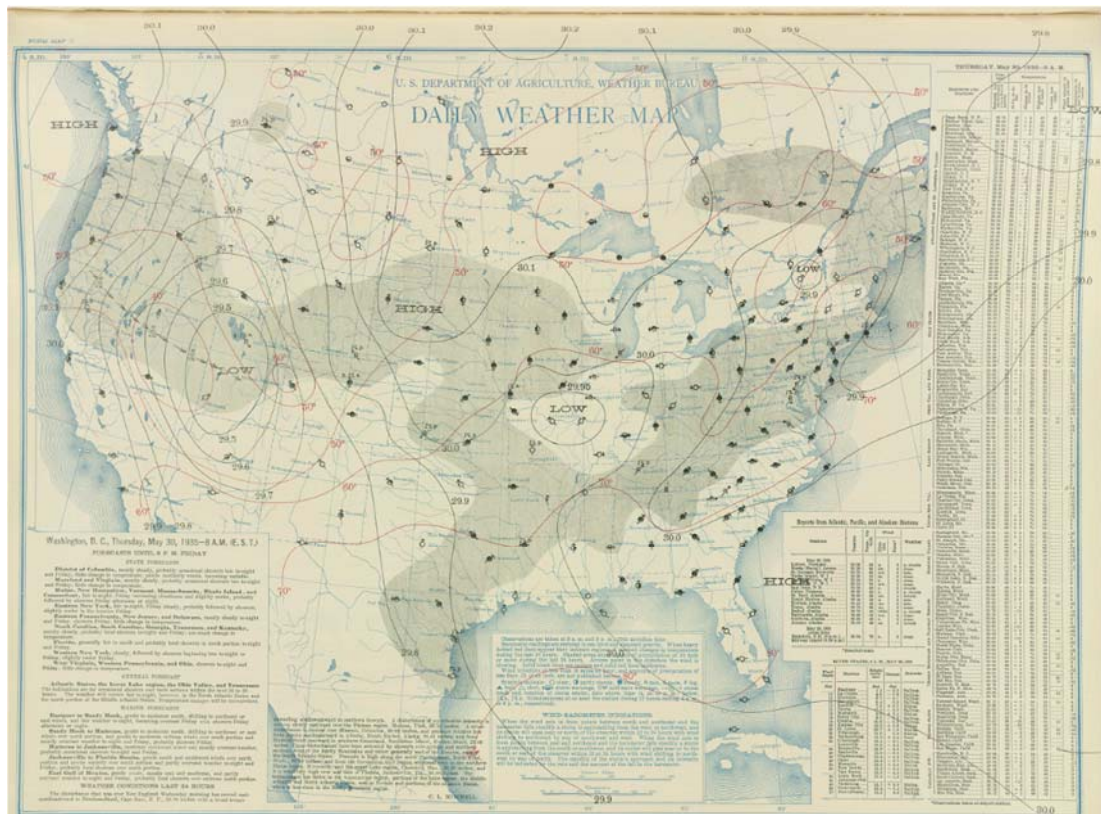
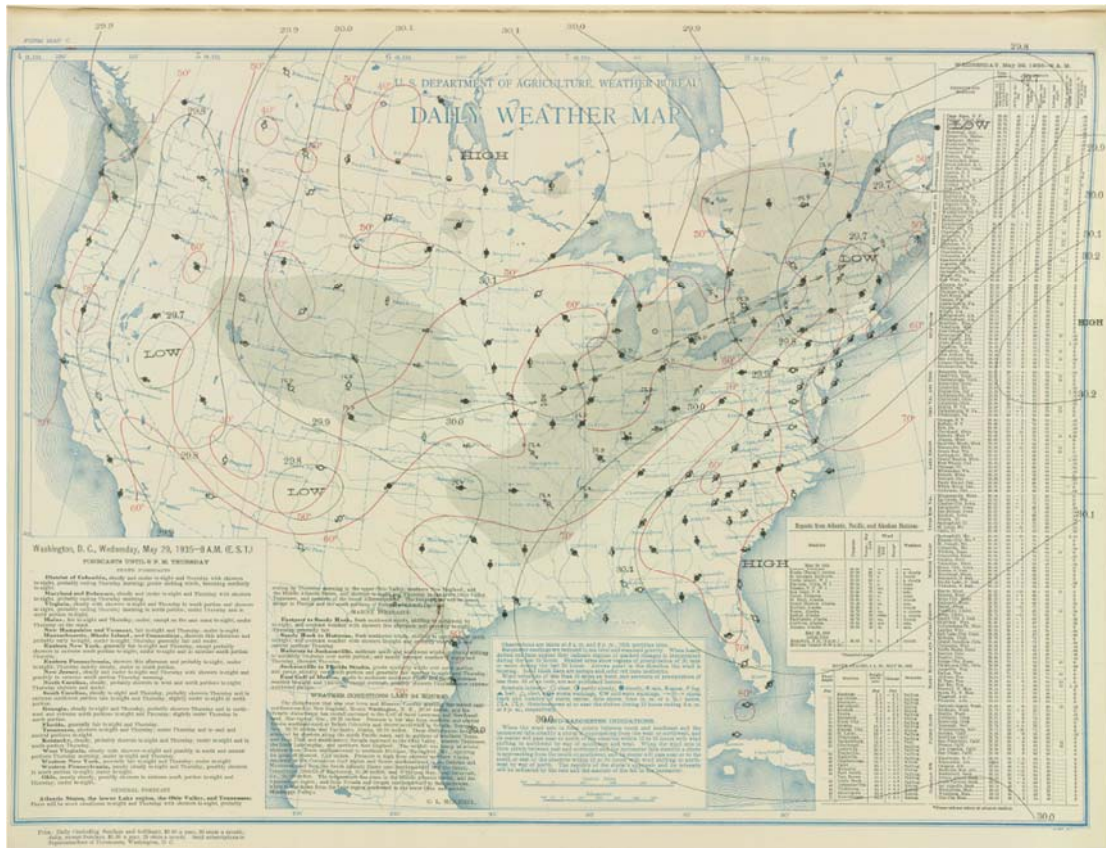
CO-NM Regional Extreme Precipitation Study



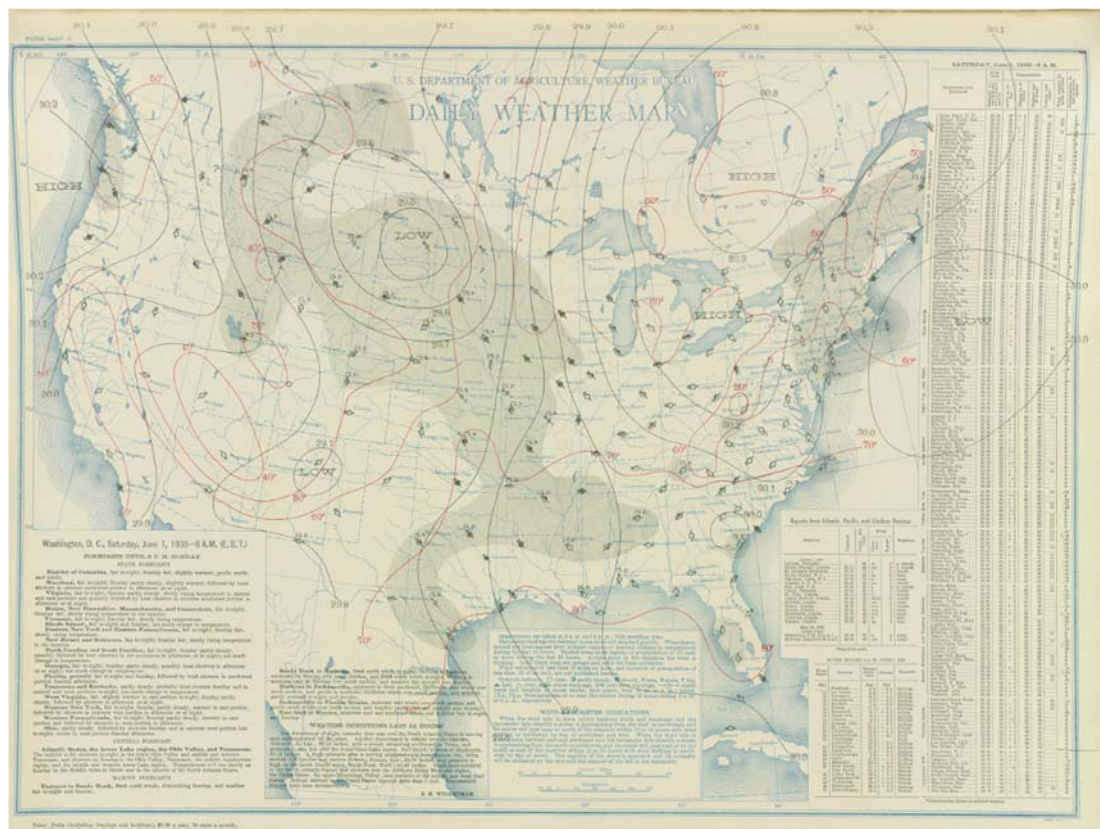
CO-NM Regional Extreme Precipitation Study



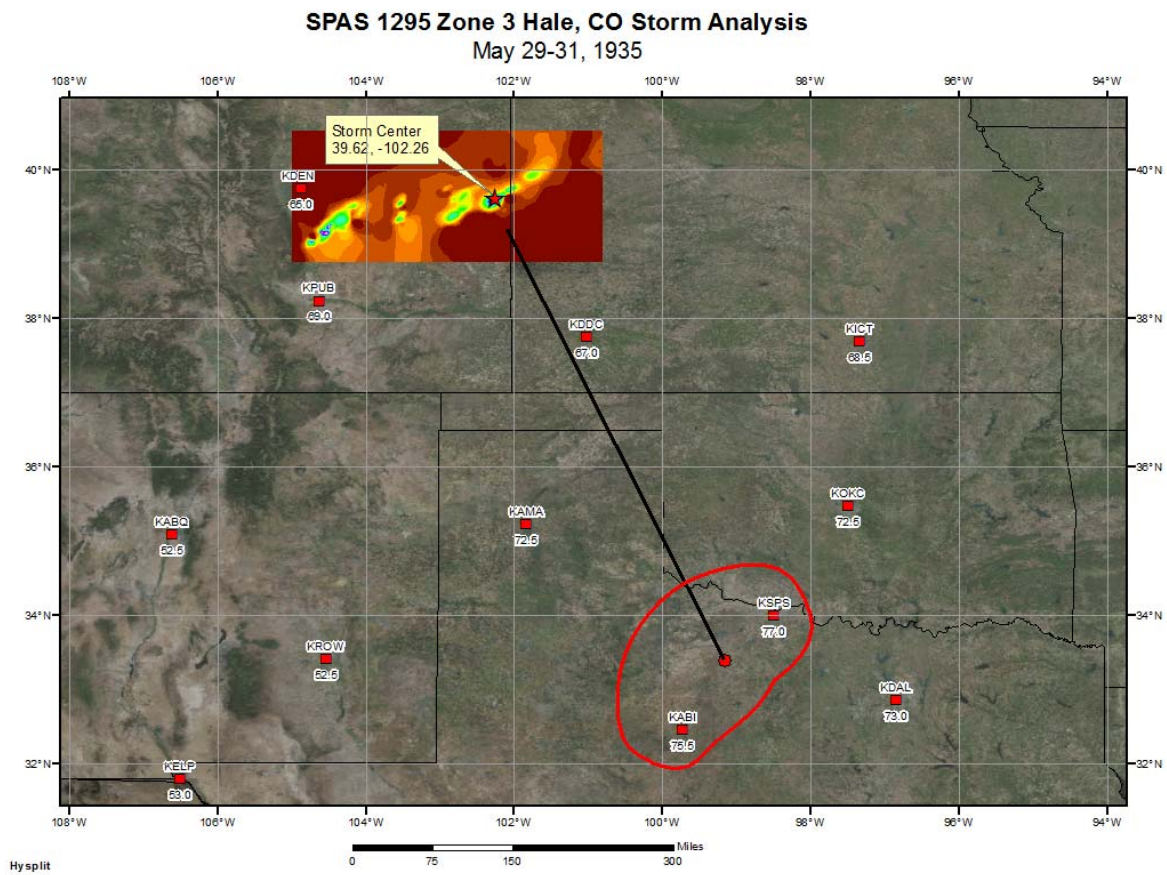
CO-NM Regional Extreme Precipitation Study



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CO-NM Regional Extreme Precipitation Study



Las Cruces, NM

August 30, 1935

Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1485_1

General Storm Location: Southwest New Mexico 33.8,-109.0,31.7,-105.9

Storm Dates: August 30, 1935

Event: Mesoscale convective event

DAD Zone 1

Latitude: 32.3042

Longitude: -106.7958

Max. Grid Rainfall Amount: 10.03"

Max. Observed Rainfall Amount: 10.00"

Number of Stations: 30

SPAS Version: 10

Base Map Used: Combination of manually digitized contours using isohyetal map from a report by Leopold on the storm and a two-year six-hour prism climatological basemap.

Spatial resolution: 0.2785

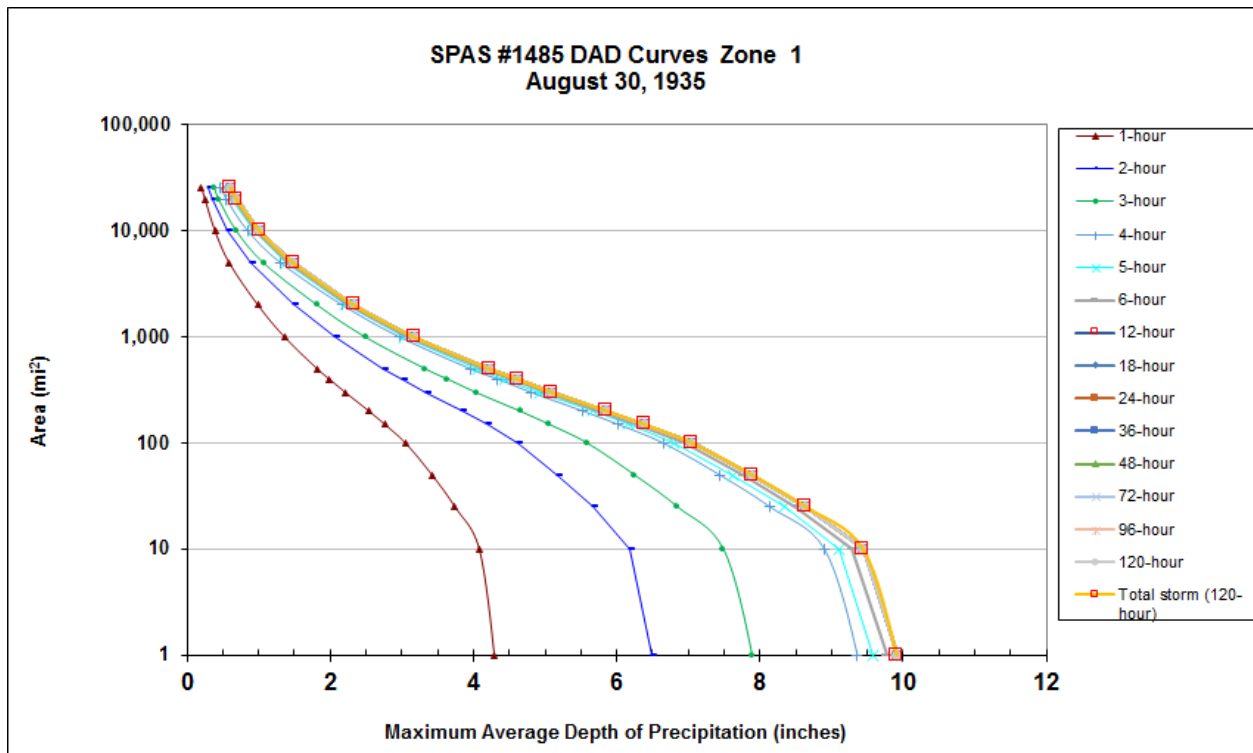
Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

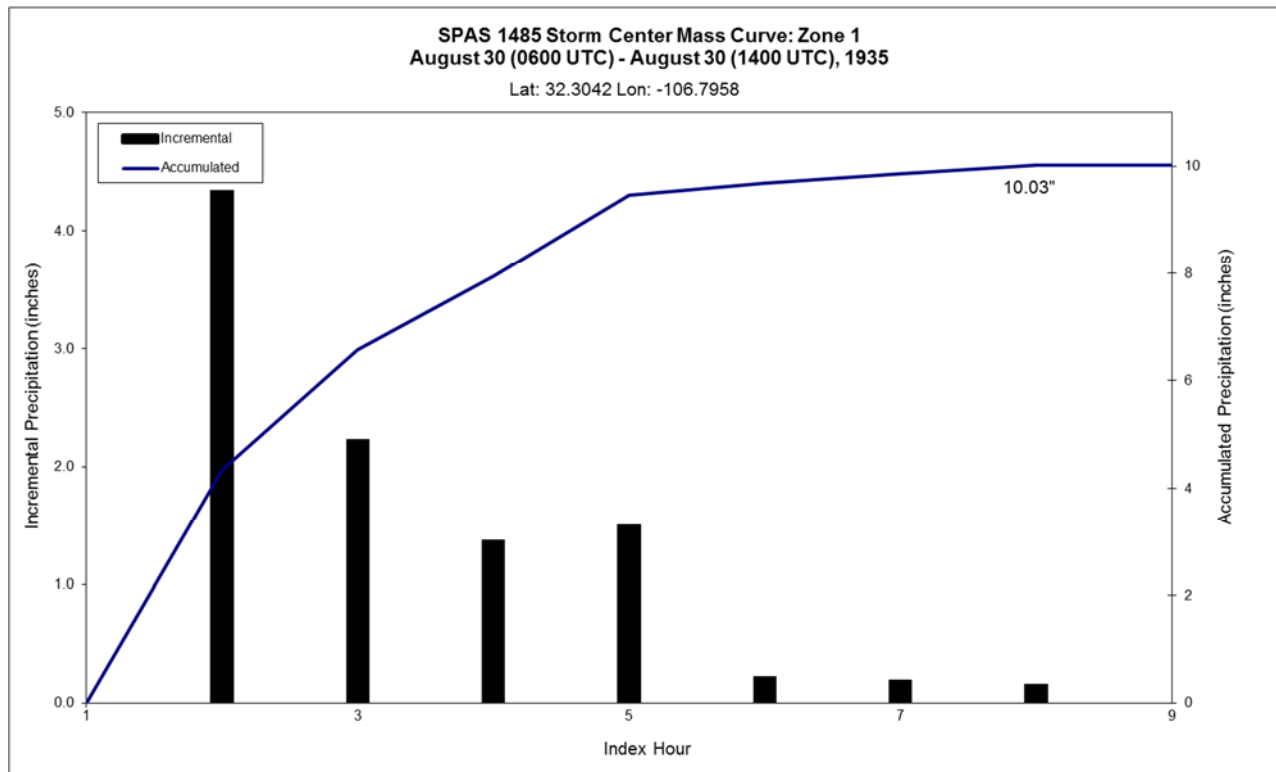
Degree of confidence in results: One of the two hourly stations used in this analysis was manually digitized from the L.B. Leopold report of the storm. The other hourly station was estimated based on timing provided by nearby daily cooperative reports. While not many hourly stations were used, the area and duration of the storm were both fairly small, so they are sufficient in providing a high degree of accuracy of the timing of this storm. Ten of the eleven supplemental stations were converted from daily station type due to uncertainty in observation time. The eleventh supplemental station was estimated based on a report from the PMP analysis of the storm. With all of the data being thoroughly inspected and the precipitation totals for various periods throughout the storm being consistent with previous reports, this analysis is considered to be reliable.

CO-NM Regional Extreme Precipitation Study

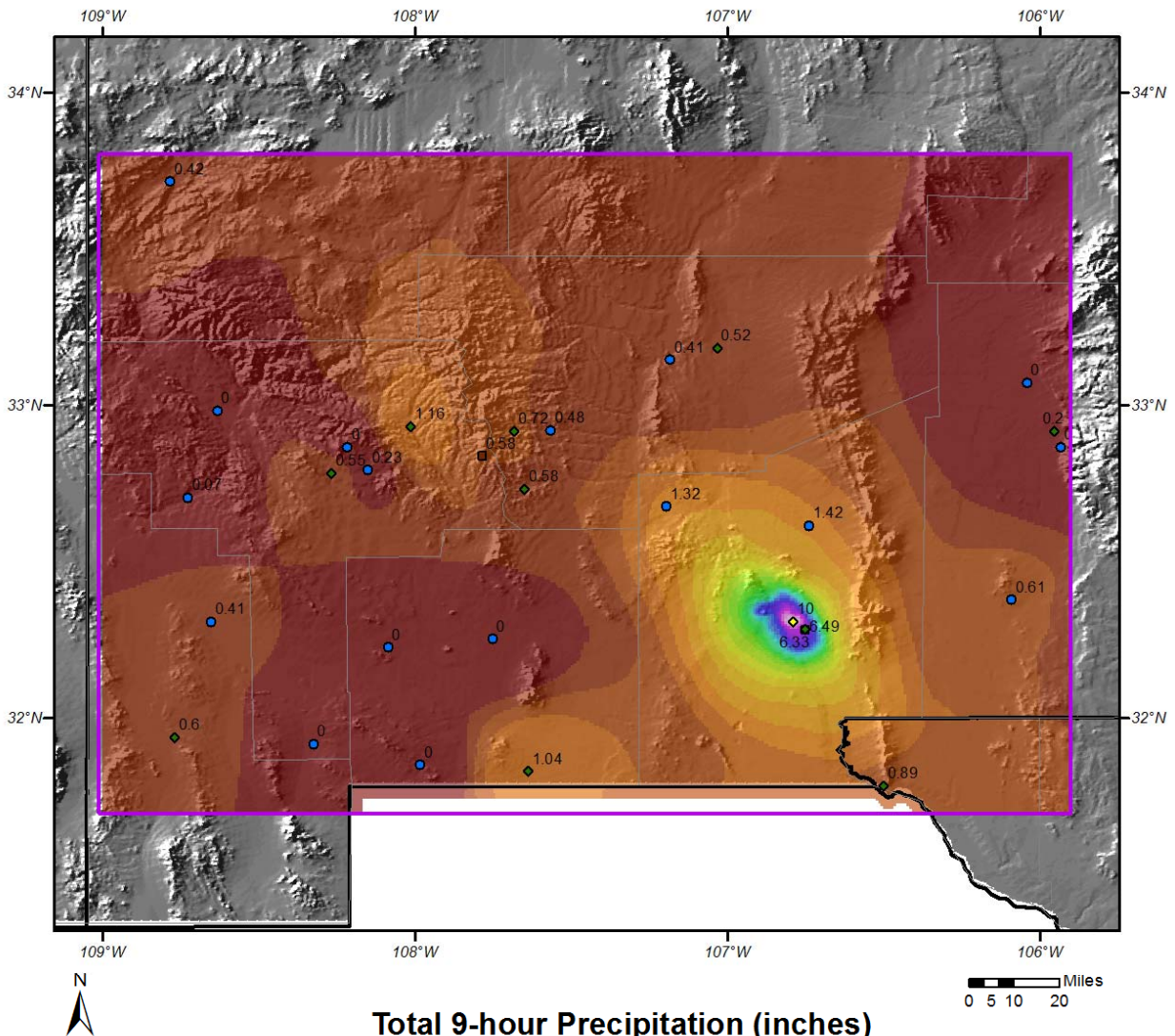
Storm 1485 - August 30 (0600 UTC) - August 30 (1400 UTC), 1935															
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)															
Area (mi ²)	Duration (hours)														
	1	2	3	4	5	6	12	18	24	36	48	72	96	120	Total
0.3	4.33	6.55	7.93	9.43	9.65	9.84	9.99	9.99	9.99	9.99	9.99	9.99	9.99	10.03	10.03
1	4.29	6.50	7.89	9.36	9.58	9.77	9.91	9.91	9.91	9.91	9.91	9.91	9.91	9.91	9.91
10	4.08	6.19	7.49	8.90	9.11	9.29	9.44	9.44	9.44	9.44	9.44	9.44	9.44	9.44	9.44
25	3.74	5.66	6.85	8.14	8.34	8.50	8.64	8.64	8.64	8.64	8.64	8.64	8.64	8.64	8.64
50	3.42	5.17	6.25	7.44	7.62	7.76	7.89	7.89	7.89	7.89	7.89	7.89	7.89	7.89	7.89
100	3.05	4.62	5.59	6.65	6.81	6.94	7.05	7.05	7.05	7.05	7.05	7.05	7.05	7.05	7.05
150	2.76	4.18	5.06	6.02	6.16	6.28	6.38	6.38	6.38	6.38	6.38	6.38	6.38	6.38	6.38
200	2.54	3.84	4.65	5.53	5.66	5.77	5.86	5.86	5.86	5.86	5.86	5.86	5.86	5.86	5.86
300	2.21	3.34	4.04	4.81	4.92	5.02	5.10	5.10	5.10	5.10	5.10	5.10	5.10	5.10	5.10
400	1.99	3.01	3.64	4.34	4.44	4.52	4.61	4.61	4.61	4.61	4.61	4.61	4.61	4.61	4.61
500	1.82	2.75	3.33	3.96	4.06	4.14	4.22	4.22	4.22	4.22	4.22	4.22	4.22	4.22	4.22
1,000	1.36	2.06	2.49	2.97	3.04	3.10	3.17	3.17	3.17	3.17	3.17	3.17	3.17	3.17	3.17
2,000	0.99	1.50	1.82	2.17	2.22	2.27	2.33	2.33	2.33	2.33	2.33	2.33	2.33	2.33	2.33
5,000	0.59	0.89	1.07	1.31	1.38	1.42	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48
10,000	0.39	0.56	0.69	0.85	0.93	0.96	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
20,000	0.25	0.36	0.44	0.55	0.62	0.65	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
25,836	0.20	0.30	0.38	0.47	0.54	0.56	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60



CO-NM Regional Extreme Precipitation Study

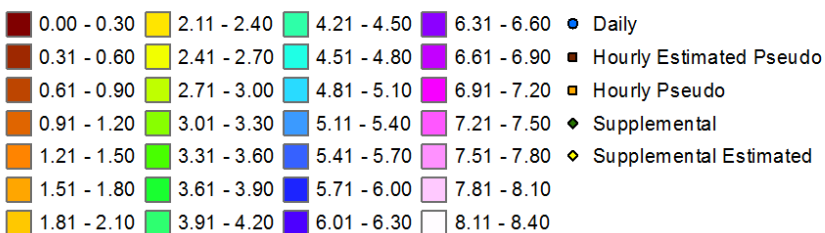


CO-NM Regional Extreme Precipitation Study

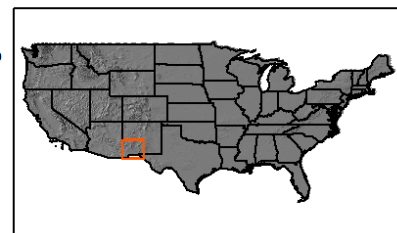
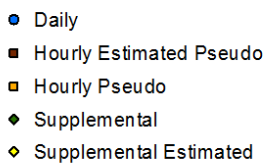


Total 9-hour Precipitation (inches)
August 30, 1935 0600 UTC - August 30, 1935 1400 UTC
SPAS #1485

Precipitation (inches)

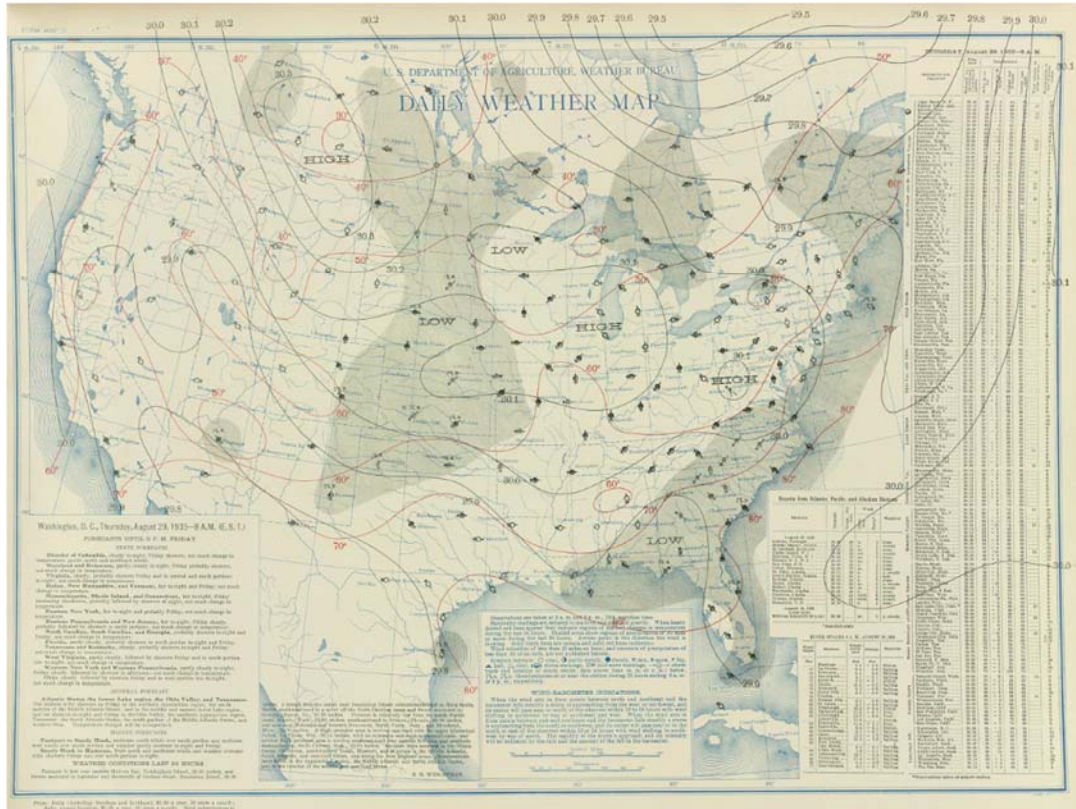
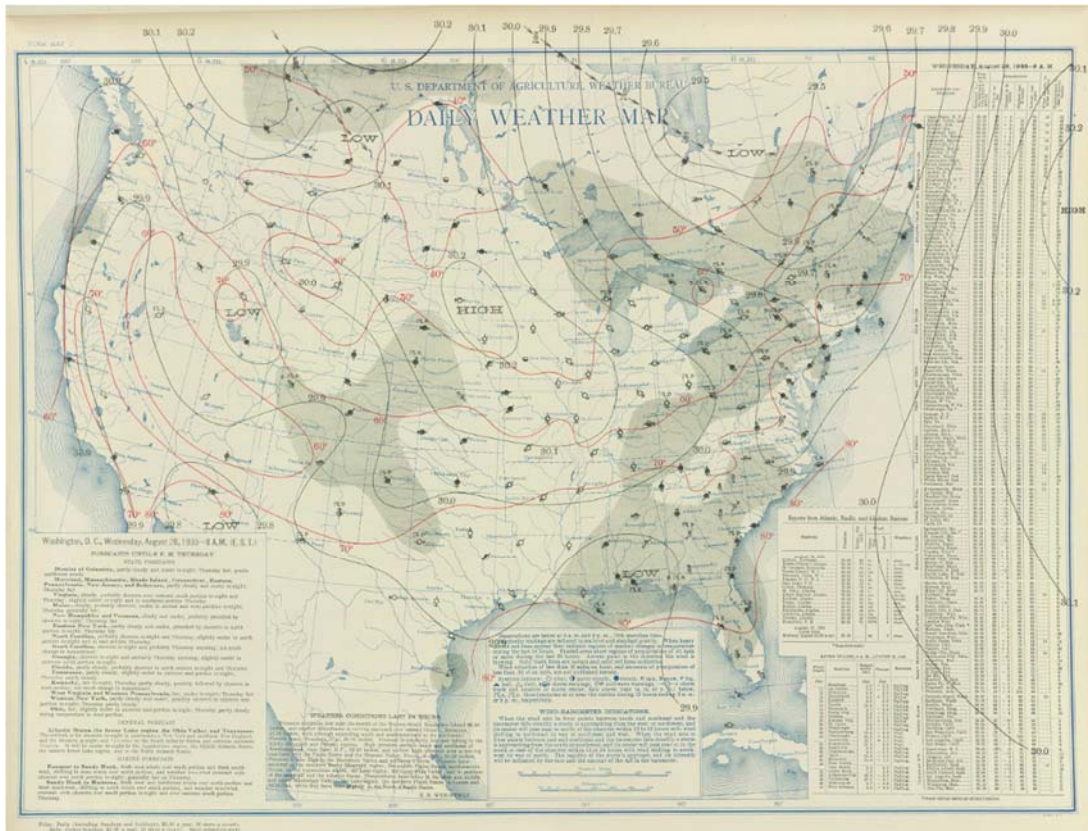


Stations

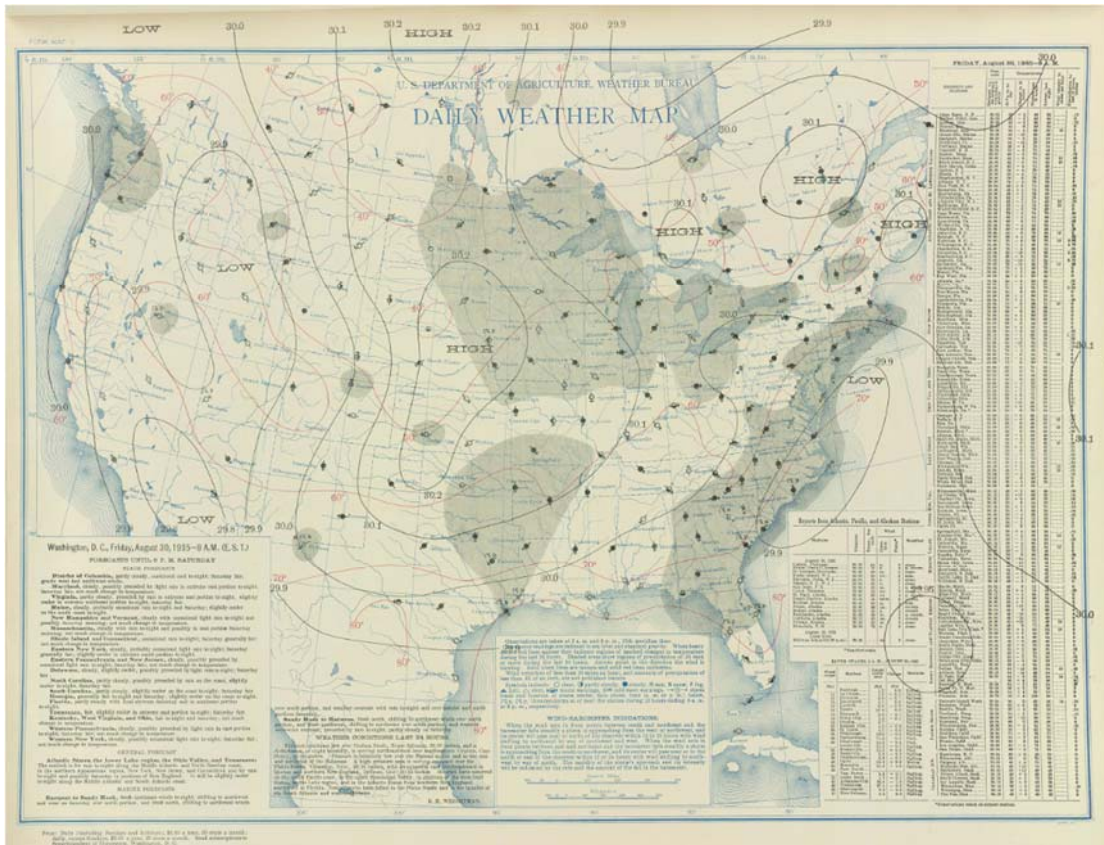


MetStat Inc. KLL 1/2/2015

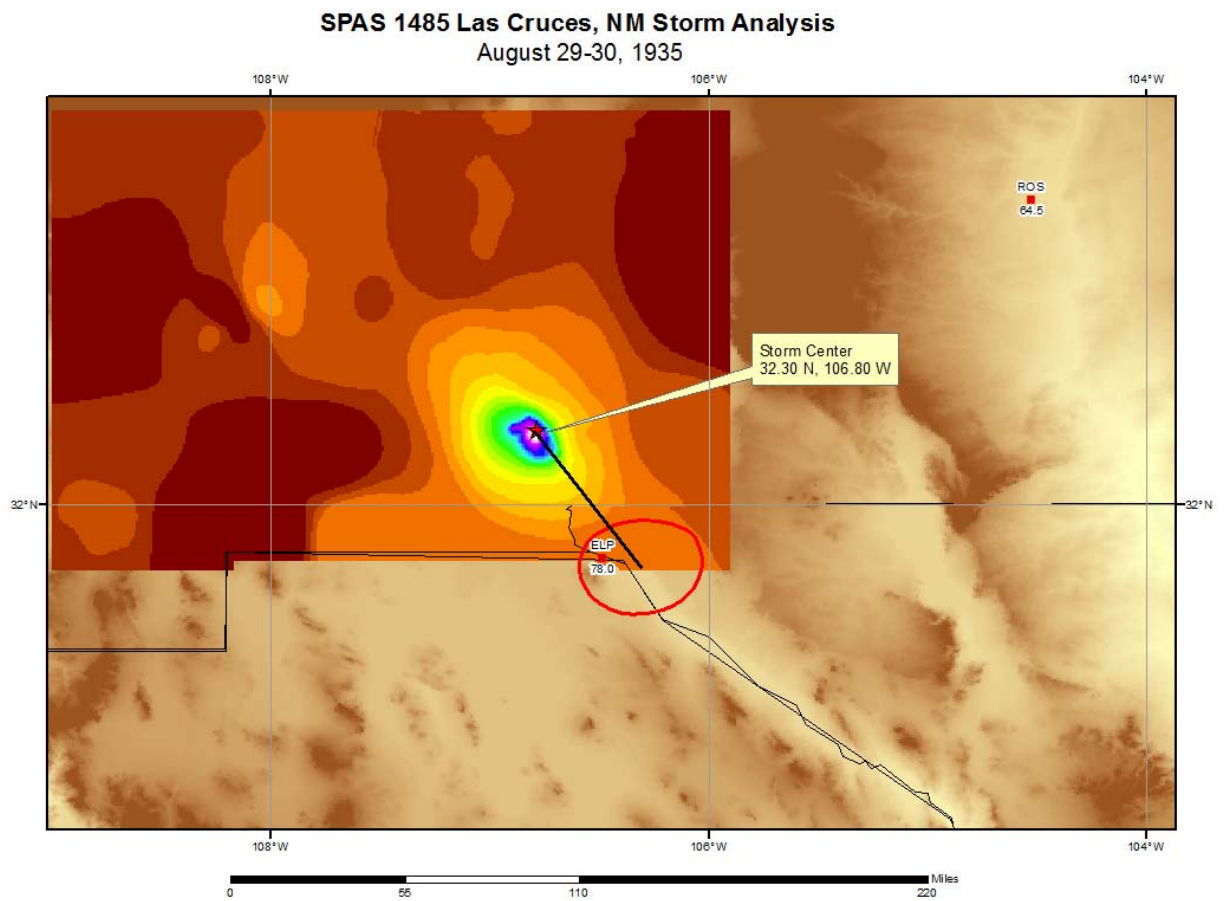
CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



Masonville, CO

September 9 – 11, 1938

Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1615_1

General Storm Location: Masonville, CO

Storm Dates: September 9-11, 1938

Event: Convective

DAD Zone 1

Latitude: 40.4542

Longitude: -105.1958-105.265

Max. Grid Rainfall Amount: 7.00"

Max. Observed Rainfall Amount: 7.03"

Number of Stations: 74

SPAS Version: 10.0

Basemap Used: Derived based on station data and PRISM Climatology

Spatial resolution: 0.254

Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes.

Reliability of Results: This analysis was based on 74 hourly stations, daily data, and supplemental station data. We have a good degree of confidence for the station based storm total results. The spatial pattern is dependent heavily on the basemap created, the spatial pattern at the storm center is good but the extent of the 1.00" contour is based on the basemap. Timing is based on the hourly stations at the storm center (HMR 55a and USGS WSP 997). Several daily stations were moved to supplemental stations due to timing issues and to ensure data consistency.

HMR 55a

12.2.2.2 Masonville, Colorado - 9/10/38 (55). The Masonville, CO storm on September 10, 1938 is the most important local storm in this study. This is because of the large amount of precipitation (7 in.) that fell in a relatively short period of time (1 hr) in this storm.

The storm actually occurred about 3 mi south of Masonville, near the Missouri Canyon in northern Colorado at an elevation of about 6,000 ft. It has been referred to as the Missouri Canyon storm in other literature (Hansen et al. 1978). The only records of this storm came from a handful of ranchers in the area. Of these, one rancher reported "...about 7 in. within a half hour." Another rancher, approximately one-half mile from the first, reported "...about 5 in., which occurred between 6 and 7 p.m., most of it within 20 minutes..." (Follansbee and Sawyer 1948). Words such as "about" and "most" make evaluating these reports difficult. In light of the fact that rain lasted approximately 1 hr only one-half mile from the 7-in. report and the vagueness surrounding the 7-in. amount, it was decided to accept the Masonville storm as 7 in. in 1 hr. The 1- to 30-min ratio from typical local storms in HMR No. 49 (see table 12.4) is 1.16 (1.0/0.86). On this basis, if the 7-in. depth actually accumulated in 30 min, a typical value for the 1-hr depth would be 8.1 in. This is 14 percent greater than the 1-hr value of 7 in. chosen for this storm. This would suggest that the decision to use 1 hr for this storm amount is not excessively conservative.

The representative persisting 12-hr storm dew points for the Masonville storm were sought using dew-point data from first-order reporting stations. Dew points were checked at Denver and Pueblo, CO, and Cheyenne, WY. Low representative storm dew points obtained from these cities prompted further investigation. Supplemental storm data were obtained for stations at Akron, Dover, Greeley, and Fort Collins, CO. All of these locations except Akron are within 50 mi of Masonville (Akron is about 100 mi east). Dew points at Fort Collins and Akron, CO, on the morning and afternoon of September 10 were several degrees (F) higher than those at other locations. Unfortunately, a gap of about 8 hr occurred in the Fort Collins data for the 10th. In light of this fact, and the favorable wind direction at Akron for advecting moisture towards the storm location, the Akron dew point (65°F) was accepted as most representative of the Masonville storm moisture. The Fort Collins dew point (64°F) supports the Akron dew point.

The geographic distribution of the rainfall surrounding the Masonville storm is shown in figure 12.2. The plotted data show the pattern as mostly disorganized on the 10th. Rainfall was scattered around the state in the form of numerous isolated storms, as shown by the large number of stations that reported no rainfall on the 10th. There were no reports of extreme or unusual amounts of rainfall other than for the Masonville storm (55).

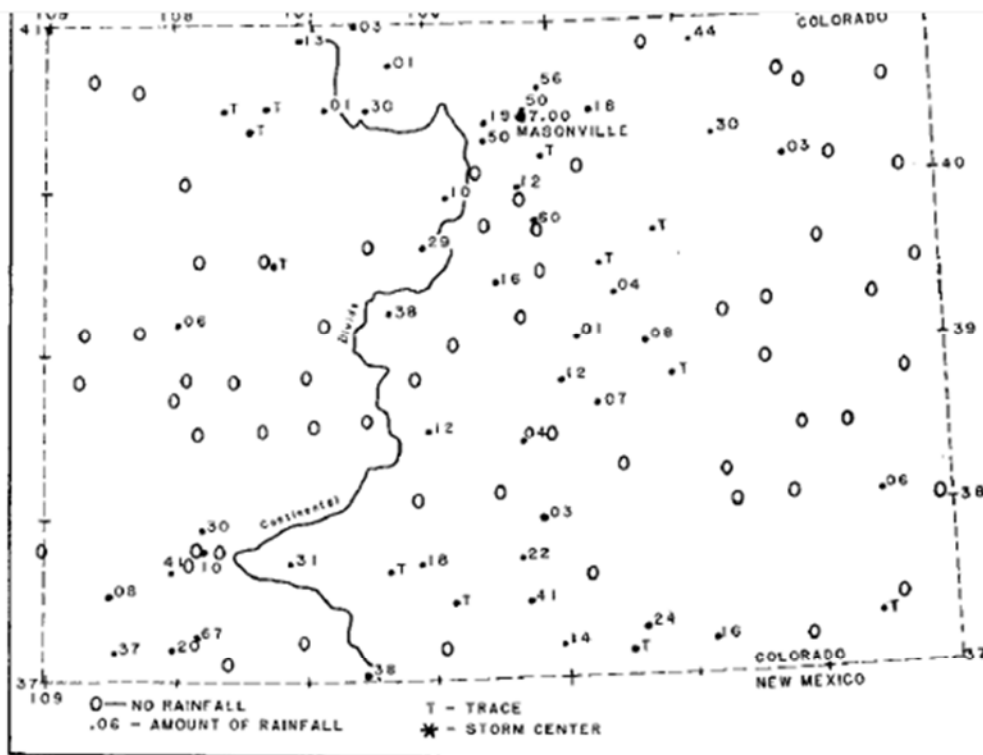
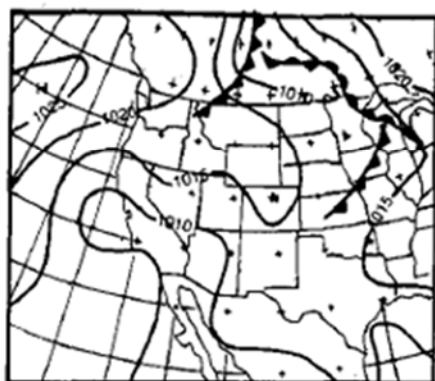
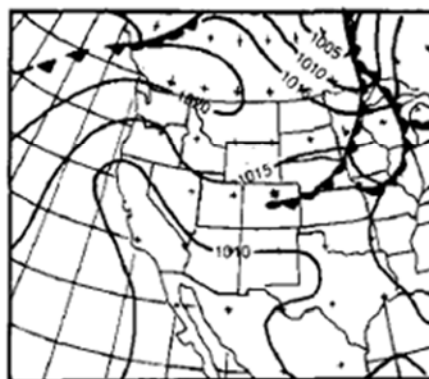


Figure 12.2.--Precipitation map, Masonville, CO storm (55) - September 10, 1938.



September 10 Surface 0600 MST



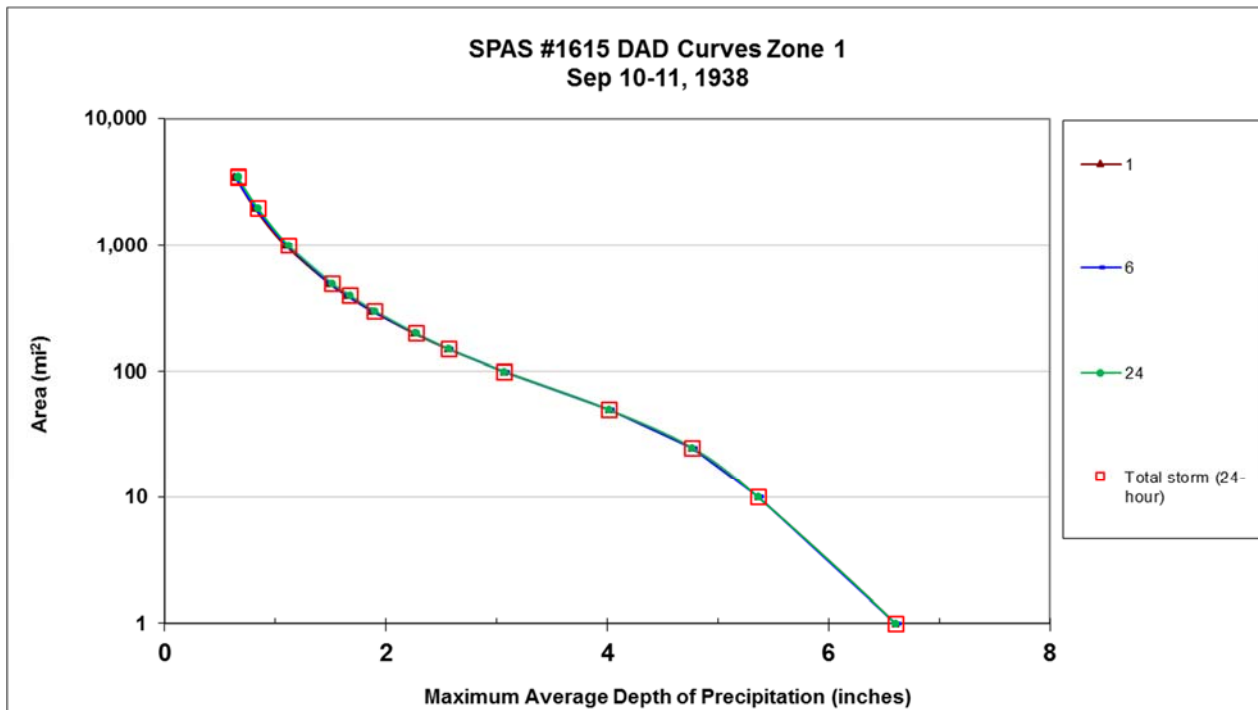
September 11 Surface 0600 MST

Figure 12.3.--Synoptic surface weather maps for September 10 and 11, 1938 - the Masonville, CO storm (55).

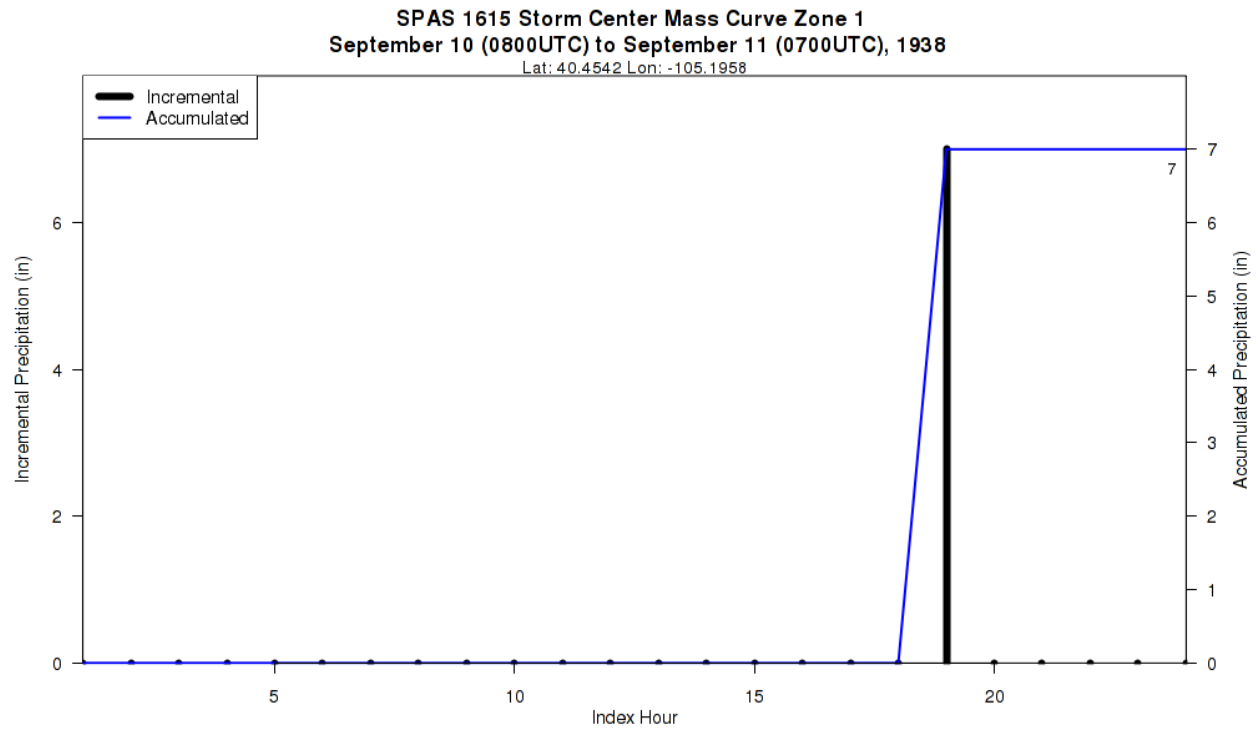
Only daily synoptic surface weather maps were produced in 1938. The 6:00 a.m. synoptic charts are shown in figure 12.3 for September 10 (approximately 12 hr prestorm) and September 11 (approximately 12 hr post storm). The analysis shows a front propagating rapidly southeastward from the northwest on the 10th to a position almost directly over Denver, CO, on the morning of the 11th. A linear interpolation between the two surface weather maps led to the conclusion that the Masonville storm occurred ahead of the approaching front. The interpolation shown in figure 12.4 is for 6:00 p.m. on the 11th, or about the time the Masonville storm ended. As can be seen in figure 12.4, the front was still a good distance to the northwest at the end of the storm, far enough away to conclude that the Masonville storm precipitation was not frontal in nature.

CO-NM Regional Extreme Precipitation Study

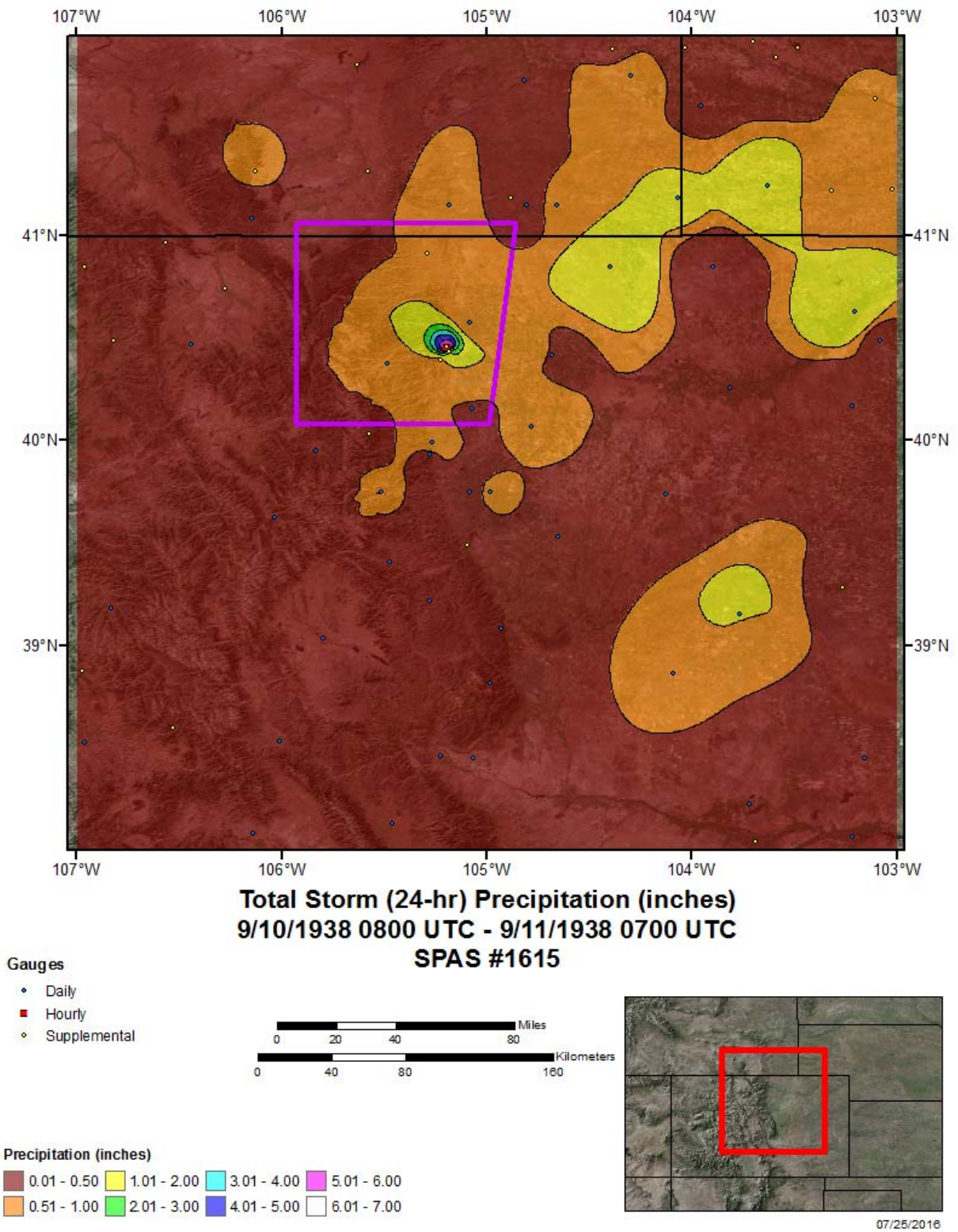
Storm 1615 Zone 1 - September 10 (0800 UTC) - September 11 (0700 UTC), 1938					
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)					
areasqmi	Duration (hours)				Total
	1	6	24		
0.4	6.94	6.94	6.94		6.94
1	6.60	6.60	6.60		6.60
10	5.36	5.36	5.36		5.36
25	4.76	4.76	4.76		4.76
50	4.01	4.01	4.01		4.01
100	3.07	3.07	3.07		3.07
150	2.56	2.56	2.57		2.57
200	2.25	2.25	2.27		2.27
300	1.87	1.87	1.90		1.90
400	1.64	1.64	1.67		1.67
500	1.48	1.49	1.51		1.51
1,000	1.09	1.10	1.12		1.12
2,000	0.81	0.82	0.84		0.84
3,500	0.64	0.64	0.66		0.66
3,561	0.63	0.64	0.66		0.66



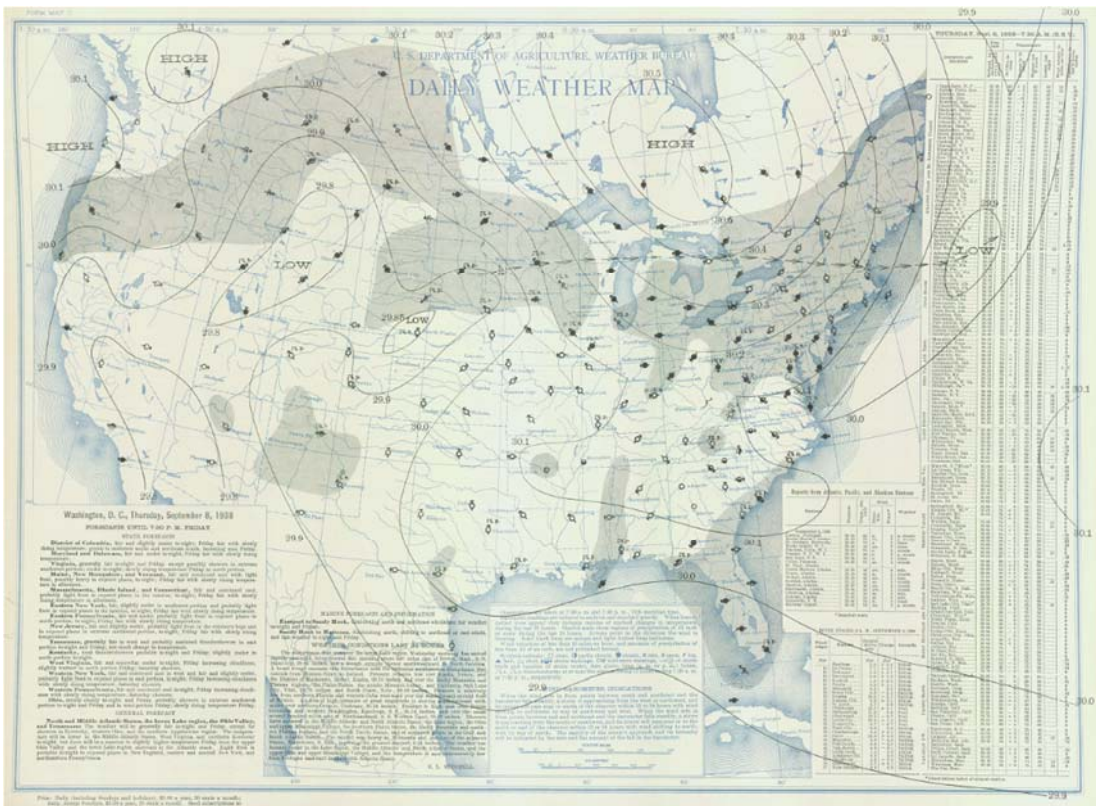
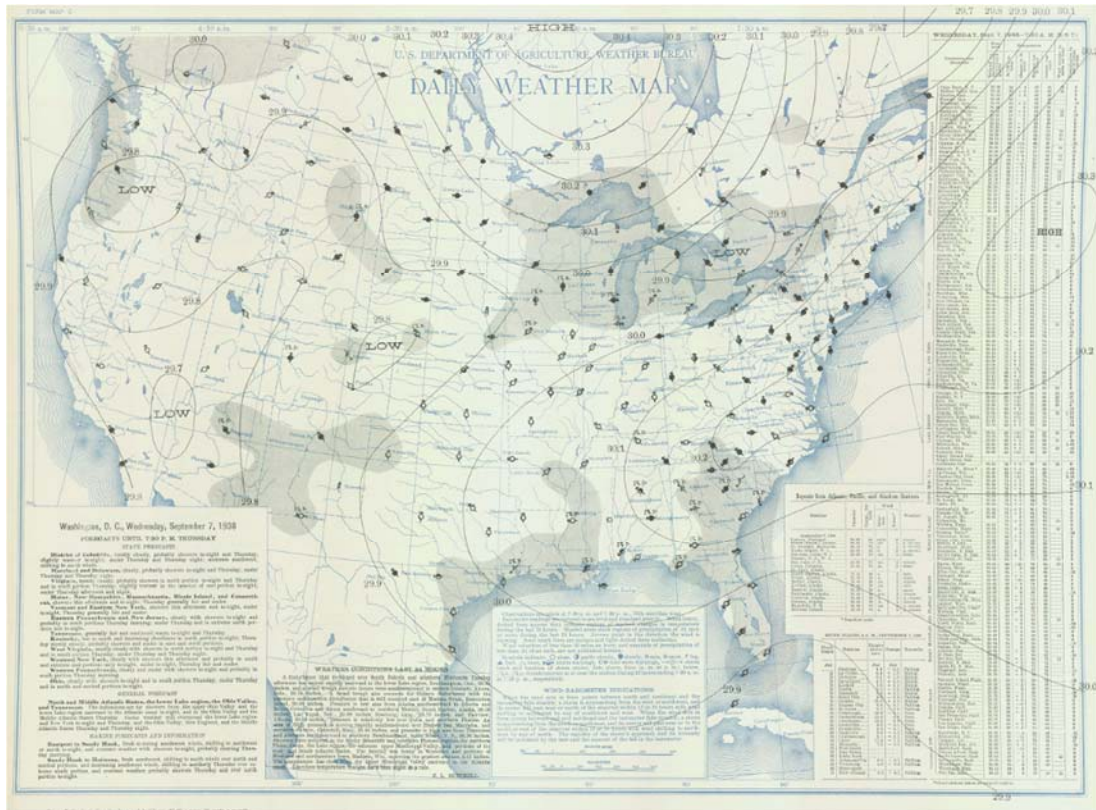
CO-NM Regional Extreme Precipitation Study



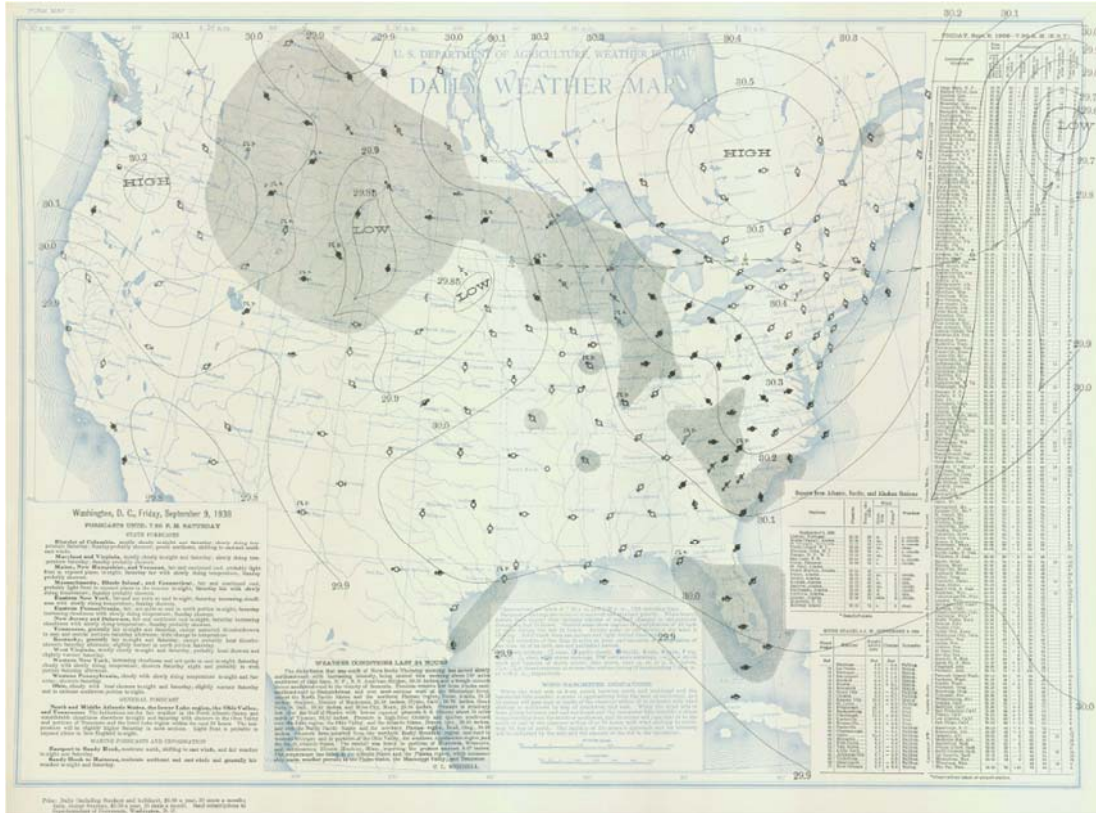
CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study

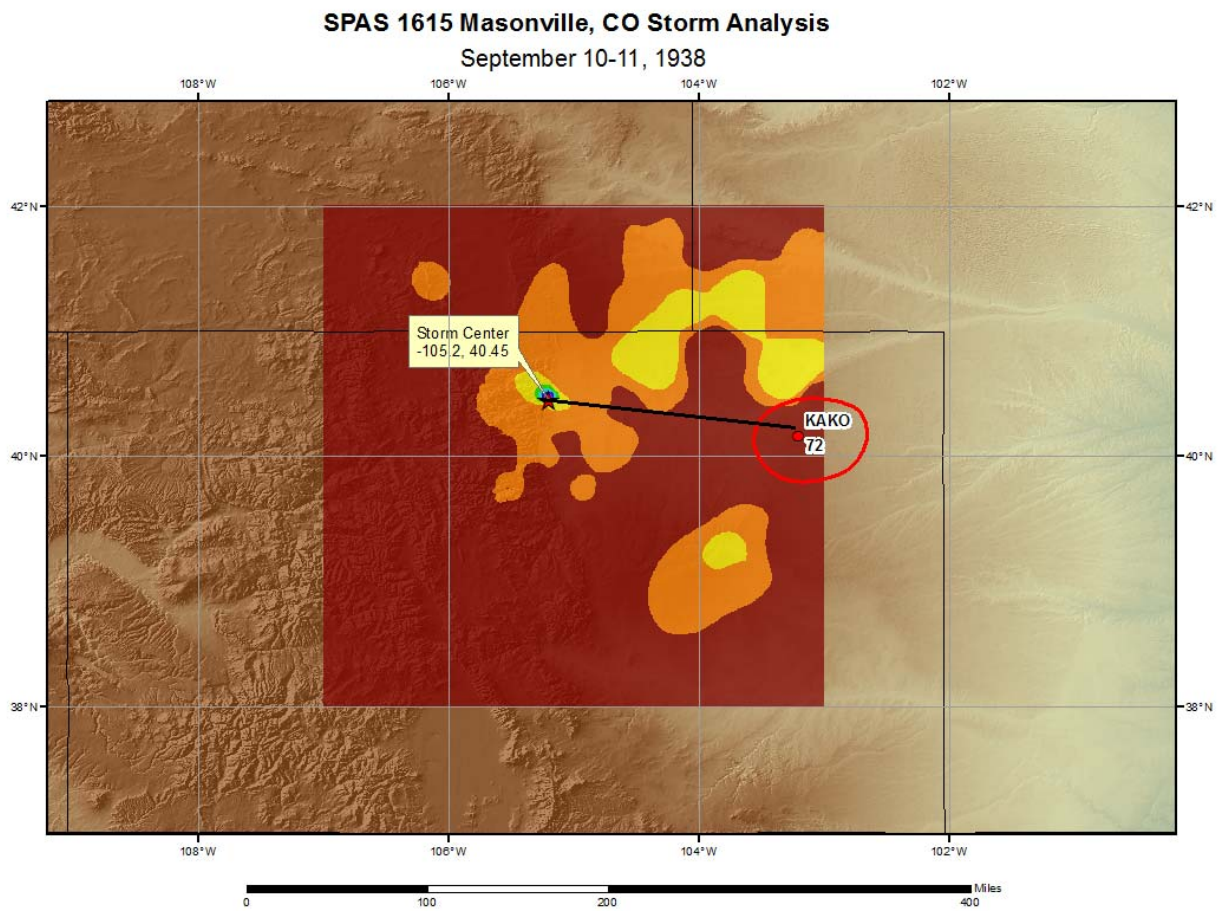


CO-NM Regional Extreme Precipitation Study



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CO-NM Regional Extreme Precipitation Study



Golden, CO

June 6 – 8, 1948

Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1613_1

General Storm Location: Northern Colorado

Storm Dates: June 6-8, 1948

Event: Local

DAD Zone 1

Latitude: 39.7875

Longitude: -105.2875

Max. Grid Rainfall Amount: 6.00"

Max. Observed Rainfall Amount: 6.00" (Golden, CO)

Number of Stations: 17

SPAS Version: 10.0

Basemap: USACE Isohyetal Map

Spatial resolution: 0.2549

Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

Reliability of results: This analysis was based on 17 hourly stations, daily data, and supplemental station data. We have a good degree of confidence for the station based storm total results. The spatial pattern is dependent heavily on the basemap created from the USGS Isohyetal image. Timing is based on the hourly pseudo station near the storm center. Several daily stations were moved to supplemental stations due to timing issues and to ensure data consistency.

DEPARTMENT OF THE ARMY

SCALE OF MILES
0 500 1000

6.0"

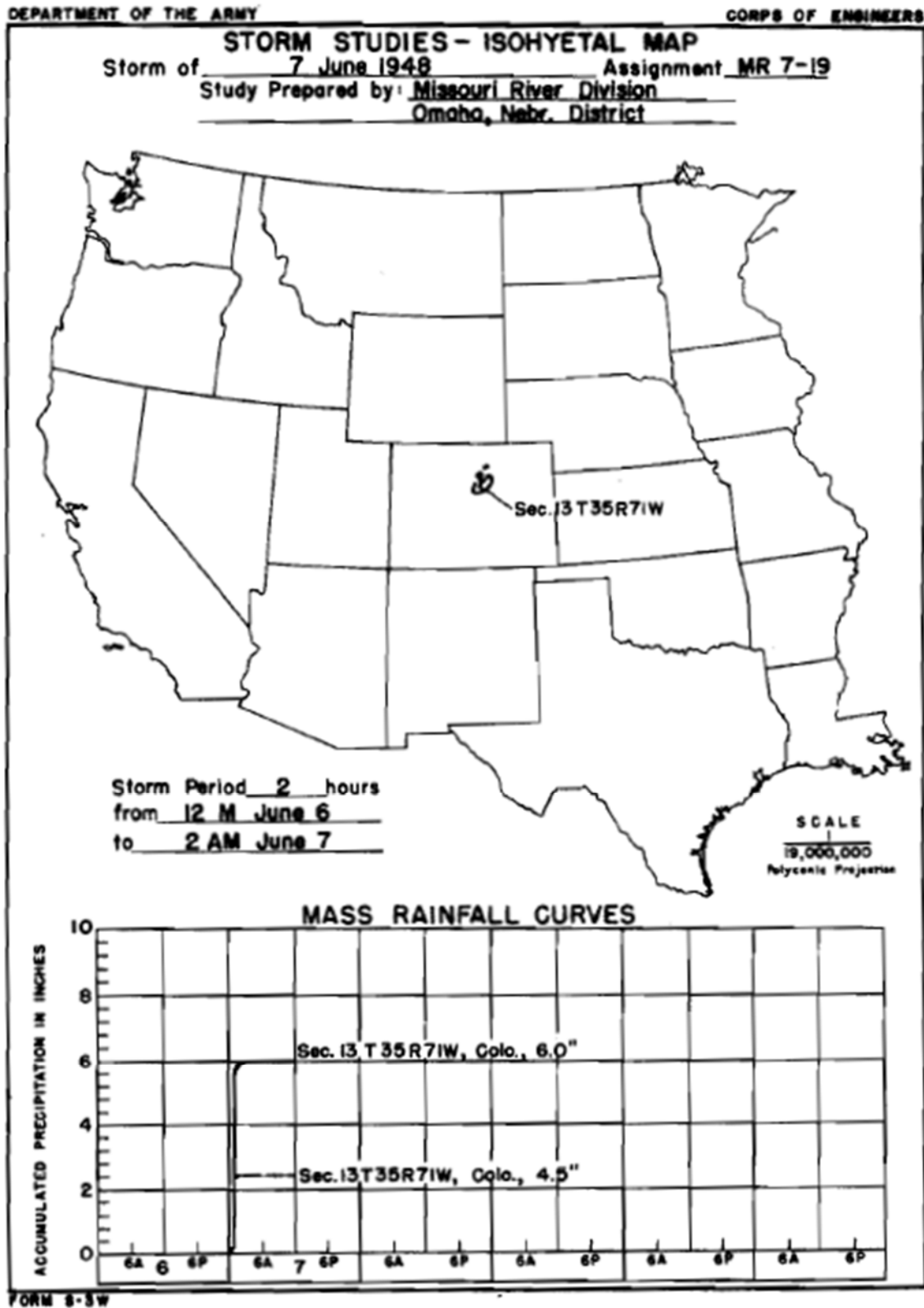
-LEGEND-
 [Dashed line] Area covered by final isohyetal map.
 [Solid line] Area enclosed by 2-inch isohyet.

LOCATION MAP

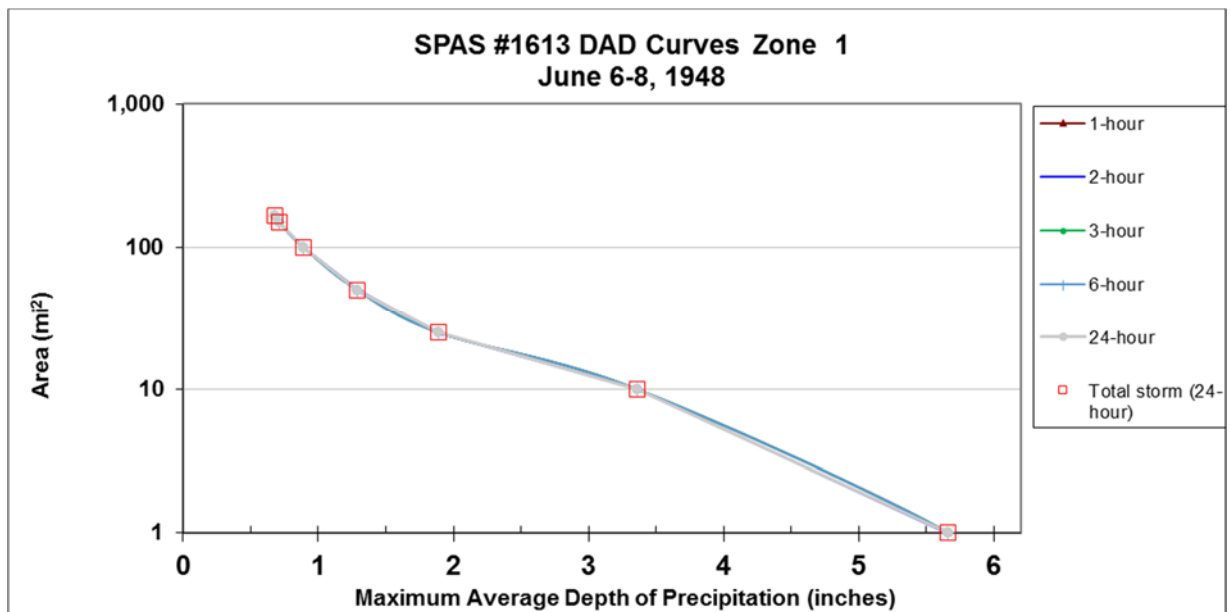
Area in Sq. Mi.	Duration of Rainfall in Hours							
	1	2						
Max. Station	6.0	6.0						
1	5.6	5.6						
2	4.9	4.9						
5	3.9	4.0						
8	3.3	3.6						

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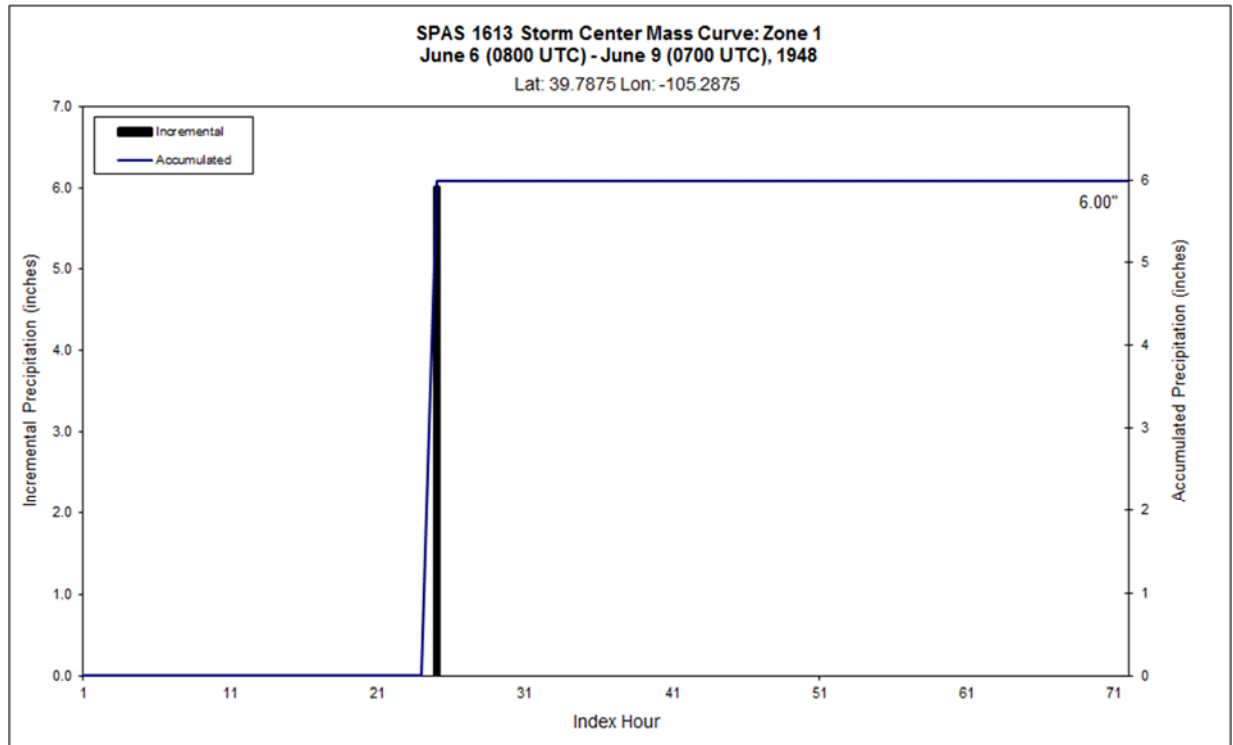
CO-NM Regional Extreme Precipitation Study



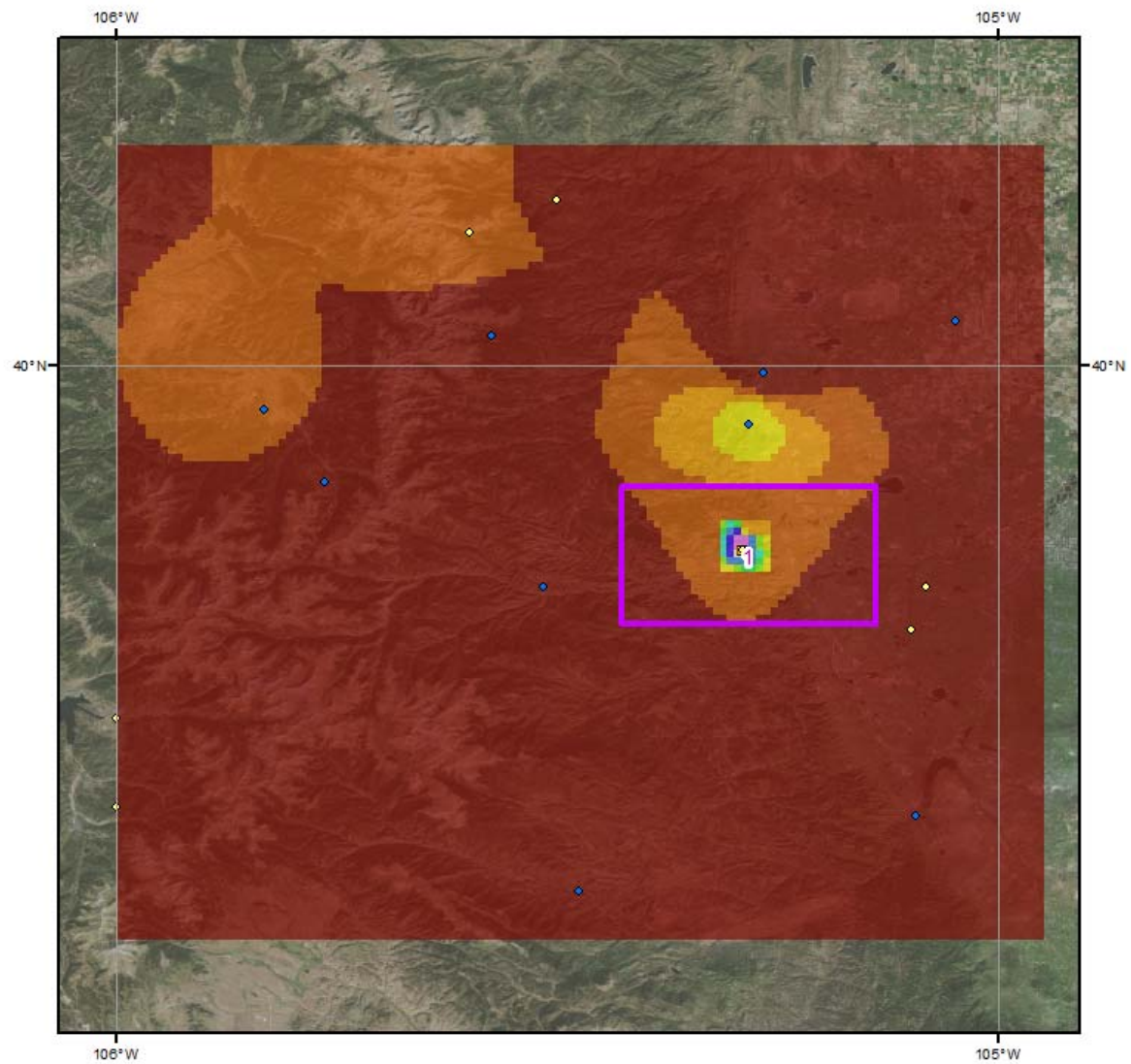
Storm 1613 - June 6 (0800 UTC) - June 9 (0700 UTC), 1948						
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)						
Area (mi²)	Duration (hours)					
	1	2	3	6	24	Total
0.4	5.89	5.89	5.89	5.89	5.89	5.89
1	5.66	5.66	5.66	5.66	5.66	5.66
10	3.36	3.36	3.36	3.36	3.36	3.36
25	1.89	1.89	1.89	1.89	1.89	1.89
50	1.29	1.29	1.29	1.29	1.29	1.29
100	0.89	0.89	0.89	0.89	0.89	0.89
150	0.71	0.71	0.71	0.71	0.71	0.71
165	0.68	0.68	0.68	0.68	0.68	0.68



CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



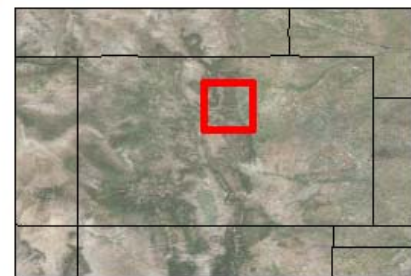
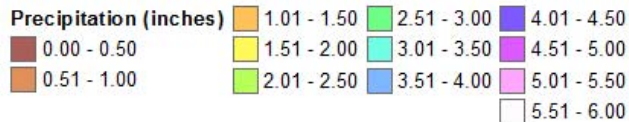
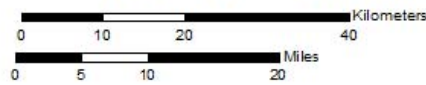
Total Storm (72-hours) Precipitation (inches)

June 6-8, 1948

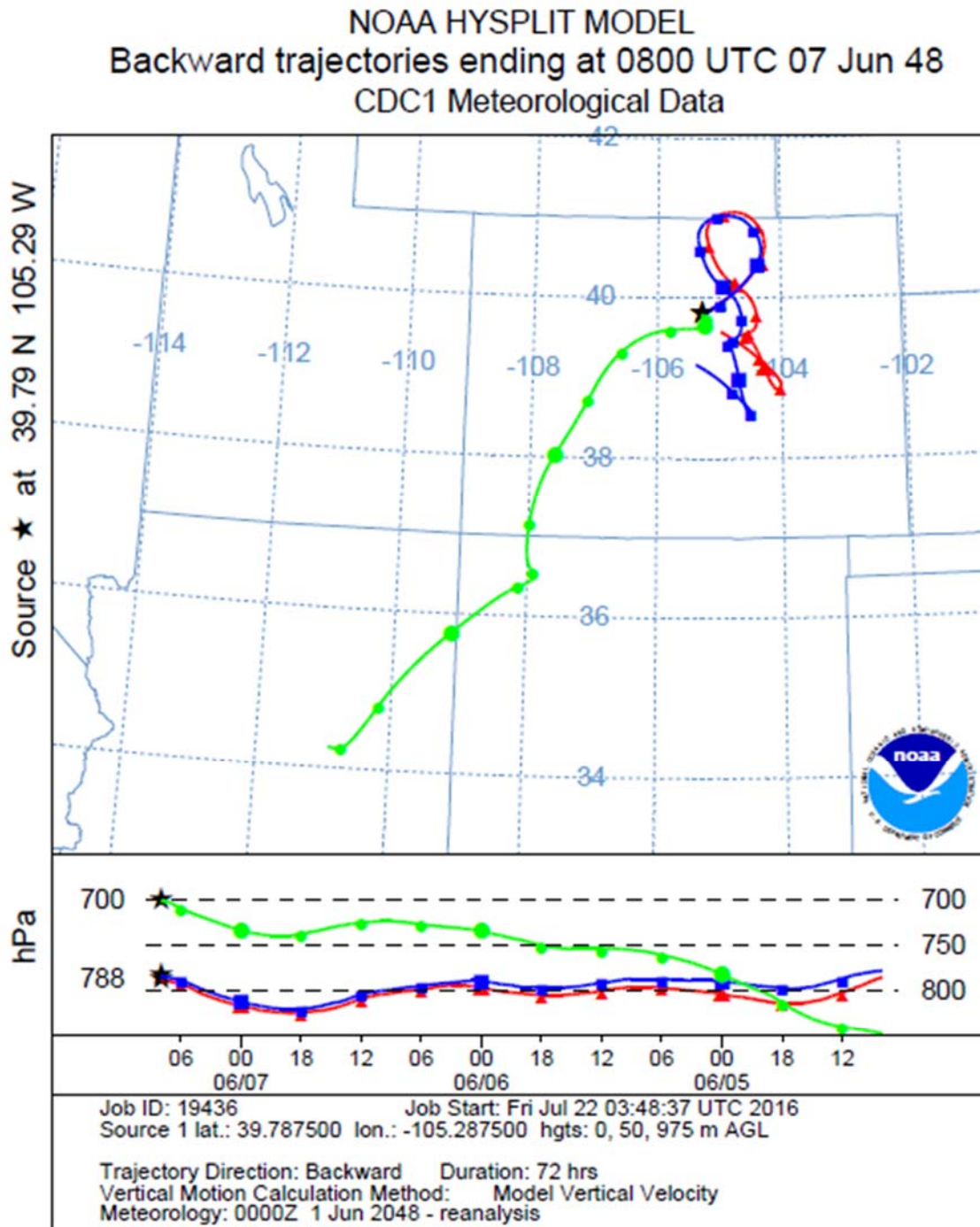
SPAS 1613 - Golden, CO

Gauges

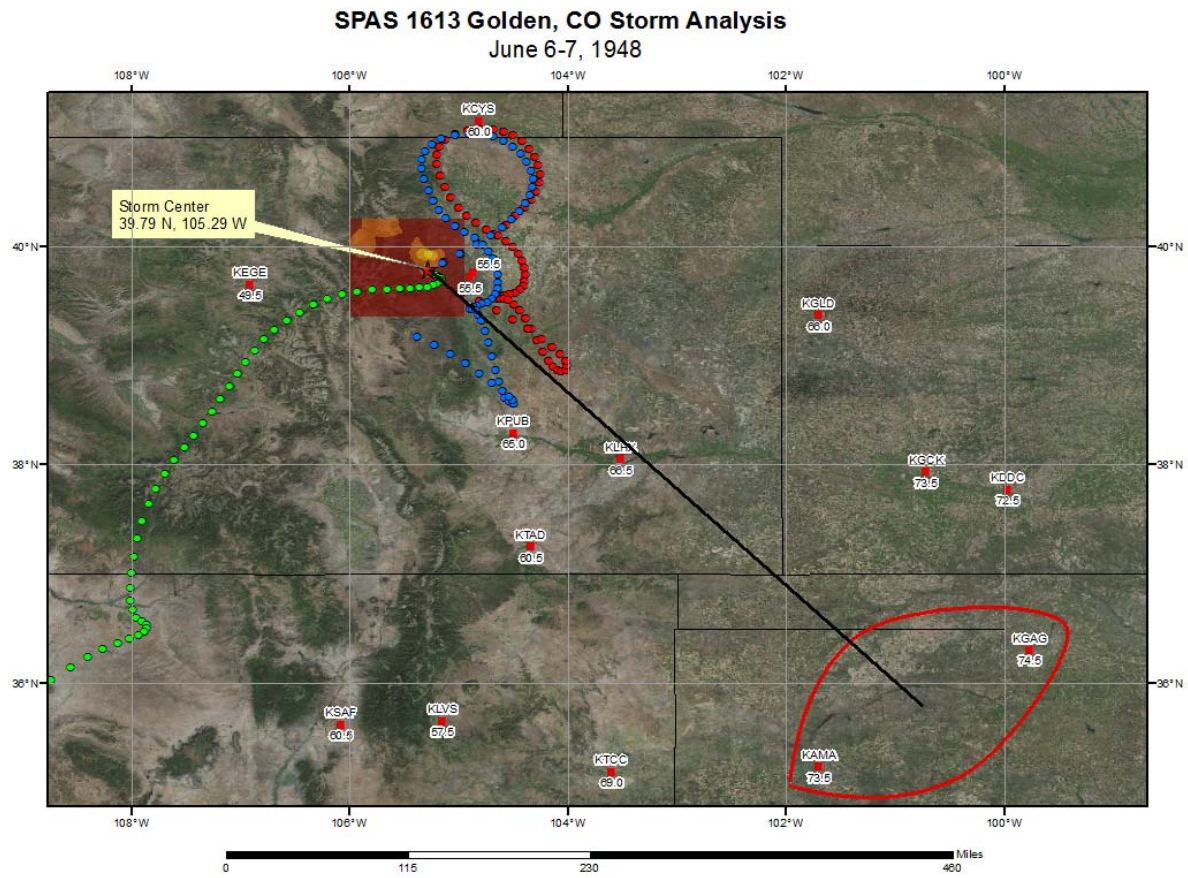
- ◆ Daily
- Hourly
- Hourly Pseudo
- ◆ Supplemental



7/21/2016



CO-NM Regional Extreme Precipitation Study



Conway, TX

May 13-19, 1951

Storm Type: Local/Hybrid

Storm Precipitation Analysis System (SPAS) For Storm #1560_1

General Storm Location: Texas/Oklahoma Panhandle (-103.5, 38.0, 33.5, -97.0)

Storm Dates: May 13-19, 1951

Event: Local

DAD Zone 1

Latitude: 35.2208

Longitude: -101.3958

Max. Grid Rainfall Amount: 15.21" Conway, TX

Max. Observed Rainfall Amount: 15.06"

Number of Stations: 393

SPAS Version: 10.0

Basemap: Blended Basemap of PRISM Mean May 1971-2000 Climatology and USGS Isohyetal Pattern

Spatial resolution: 0.2688

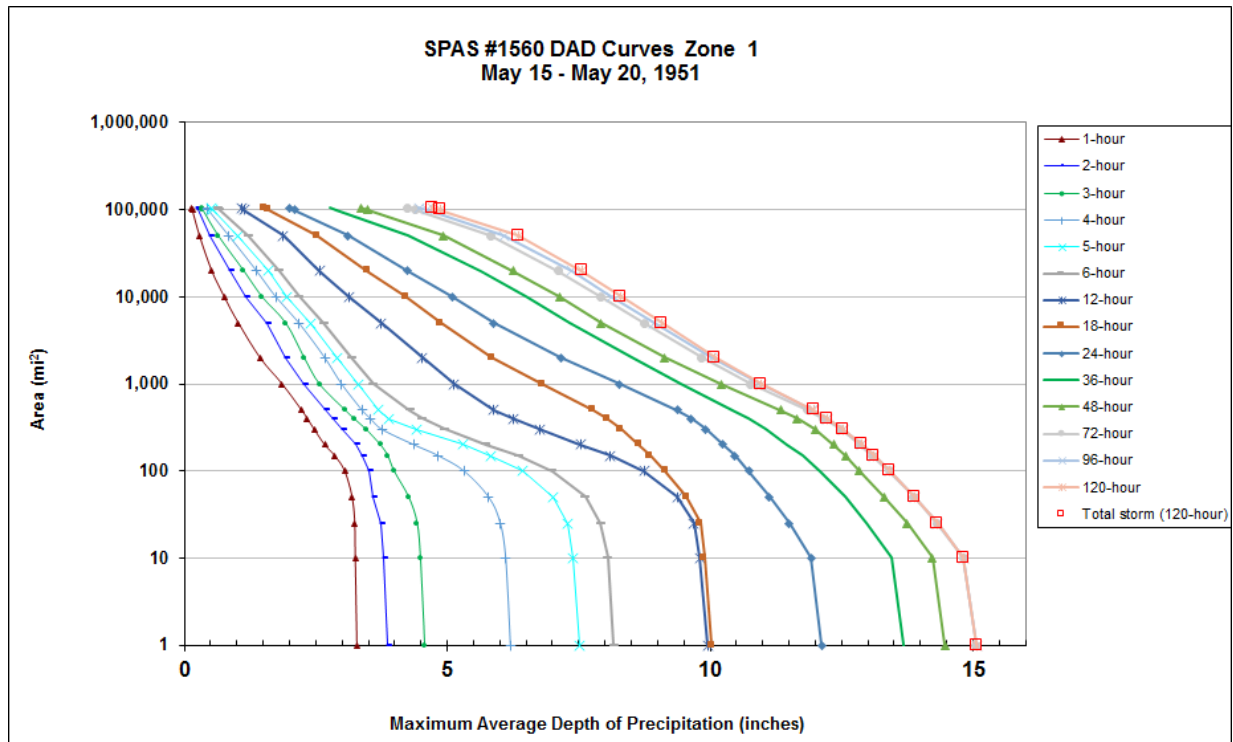
Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

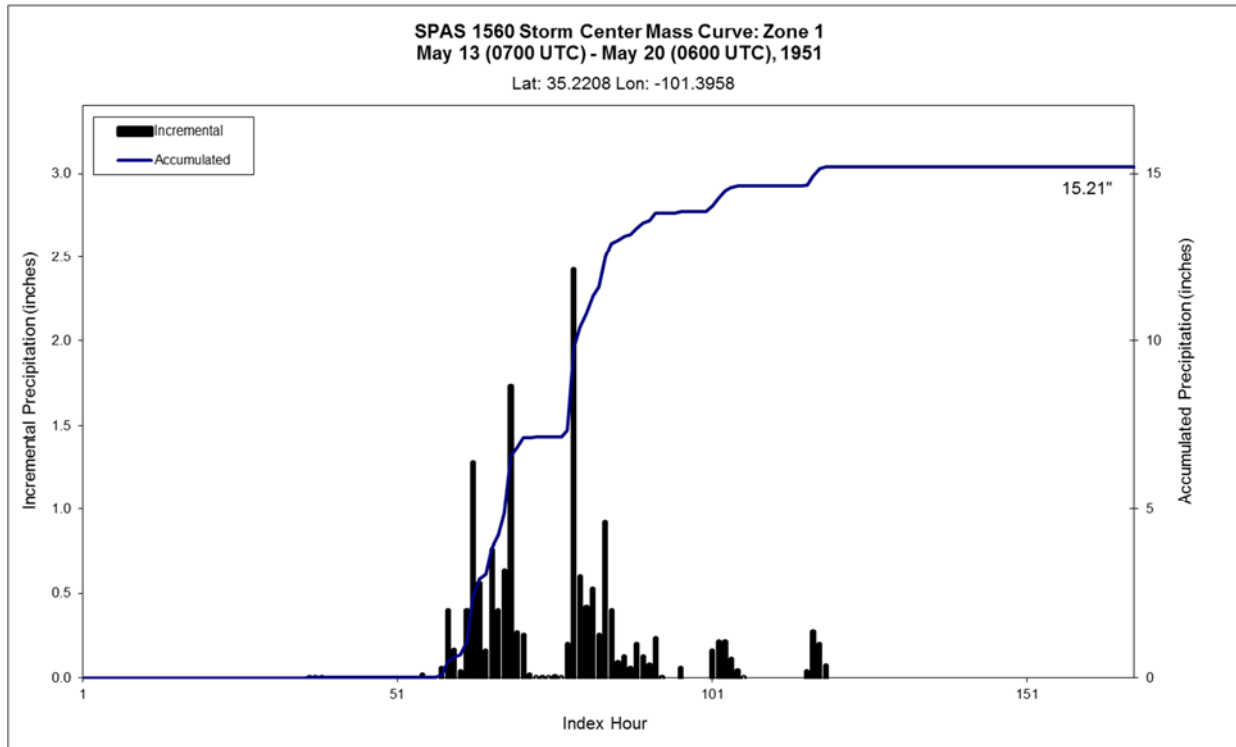
Reliability of results: This analysis was based on hourly data, daily data, and supplemental station data. We have a high degree of confidence in the station based storm total results. The spatial pattern is dependent on the blended basemap, and the timing is based on hourly and hourly pseudo stations. An additional 138 supplemental stations were created to ensure data consistency.

CO-NM Regional Extreme Precipitation Study

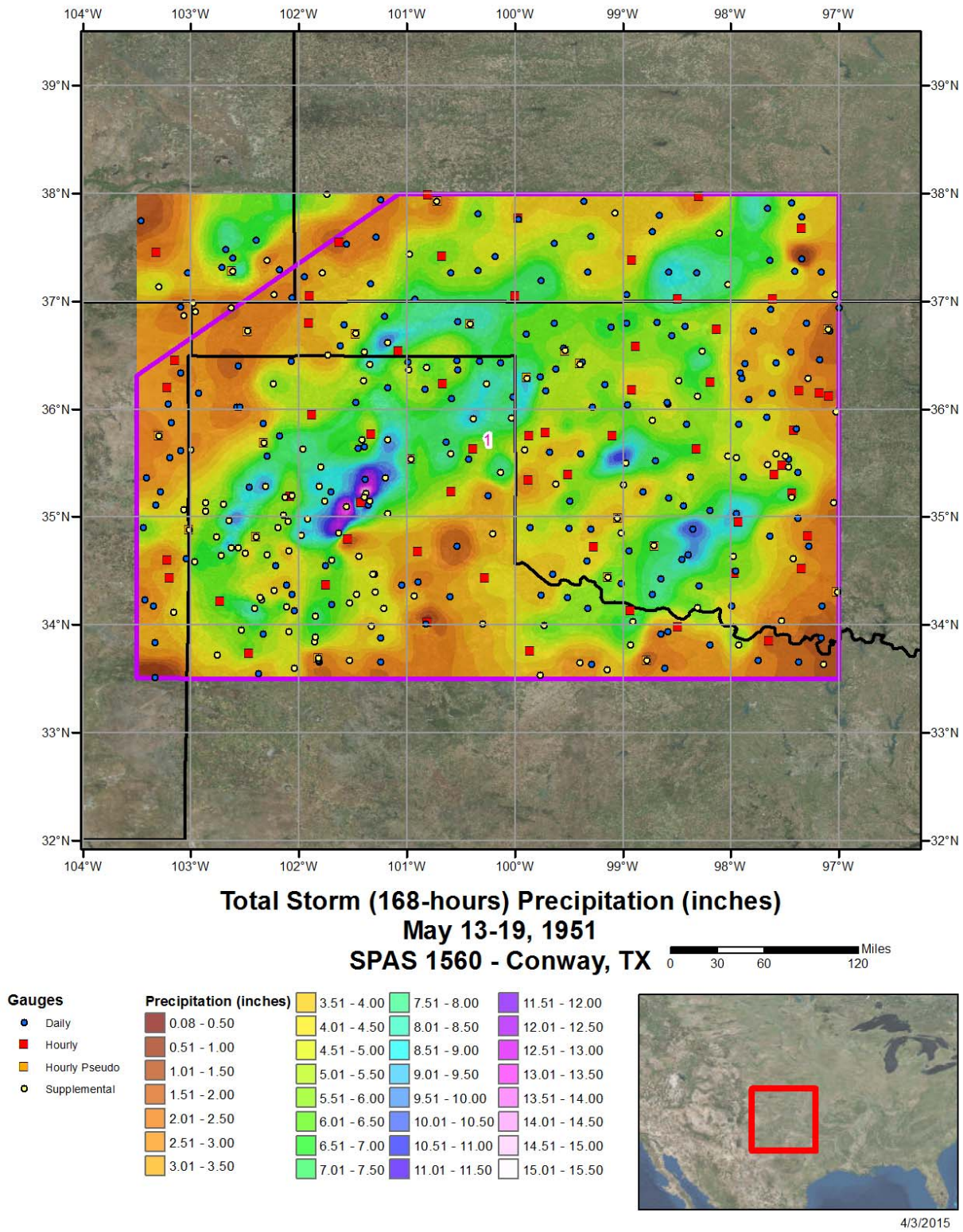
Storm 1560 - May 13 (0700 UTC) - May 20 (0600 UTC), 1951														
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
Area (mi ²)	Duration (hours)													
	1	2	3	4	5	6	12	18	24	36	48	72	96	120
0.3	3.29	3.88	4.60	6.24	7.56	8.21	10.01	10.09	12.20	13.76	14.56	15.16	15.17	15.21
1	3.28	3.86	4.57	6.20	7.51	8.16	9.95	10.03	12.12	13.67	14.47	15.06	15.07	15.07
10	3.25	3.80	4.49	6.11	7.40	8.05	9.80	9.89	11.92	13.45	14.23	14.82	14.82	14.82
25	3.24	3.74	4.43	6.01	7.28	7.91	9.69	9.81	11.50	12.97	13.74	14.31	14.32	14.32
50	3.19	3.60	4.27	5.79	7.01	7.62	9.37	9.55	11.13	12.56	13.31	13.87	13.89	13.89
100	3.05	3.51	3.99	5.32	6.44	7.00	8.74	9.15	10.73	12.08	12.84	13.40	13.42	13.42
150	2.86	3.39	3.87	4.83	5.84	6.35	8.10	8.86	10.47	11.75	12.57	13.08	13.11	13.11
200	2.67	3.27	3.73	4.37	5.29	5.74	7.53	8.64	10.25	11.47	12.35	12.84	12.89	12.89
300	2.47	3.02	3.46	3.76	4.43	4.95	6.75	8.31	9.92	11.05	11.99	12.48	12.53	12.53
400	2.34	2.83	3.23	3.54	3.89	4.53	6.25	8.04	9.64	10.73	11.65	12.15	12.22	12.22
500	2.23	2.69	3.06	3.38	3.68	4.29	5.89	7.78	9.38	10.42	11.34	11.86	11.96	11.97
1,000	1.86	2.27	2.57	2.99	3.30	3.60	5.13	6.81	8.28	9.45	10.21	10.77	10.96	10.98
2,000	1.44	1.92	2.28	2.67	2.90	3.18	4.52	5.85	7.16	8.51	9.14	9.84	10.03	10.09
5,000	1.03	1.57	1.93	2.18	2.41	2.65	3.75	4.88	5.89	7.34	7.93	8.74	8.94	9.08
10,000	0.76	1.17	1.48	1.74	1.96	2.18	3.13	4.21	5.09	6.49	7.13	7.91	8.12	8.30
20,000	0.52	0.87	1.13	1.37	1.59	1.81	2.57	3.48	4.25	5.64	6.25	7.11	7.37	7.56
50,000	0.29	0.48	0.65	0.85	1.01	1.21	1.88	2.52	3.11	4.25	4.93	5.82	6.07	6.35
100,000	0.15	0.26	0.35	0.45	0.55	0.67	1.14	1.60	2.10	2.89	3.49	4.40	4.63	4.86
105,430	0.14	0.24	0.33	0.43	0.52	0.64	1.09	1.53	2.00	2.76	3.36	4.24	4.46	4.71

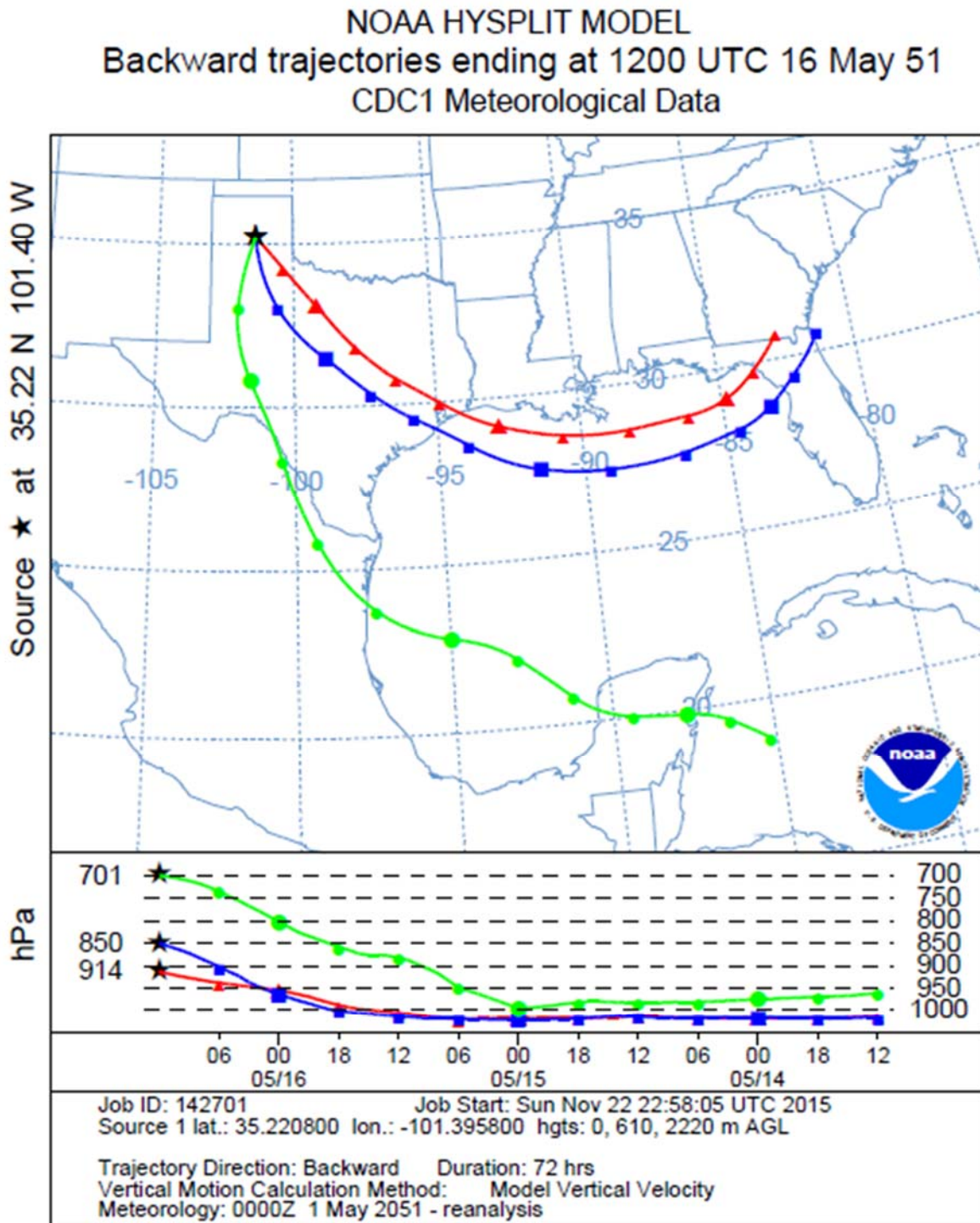


CO-NM Regional Extreme Precipitation Study

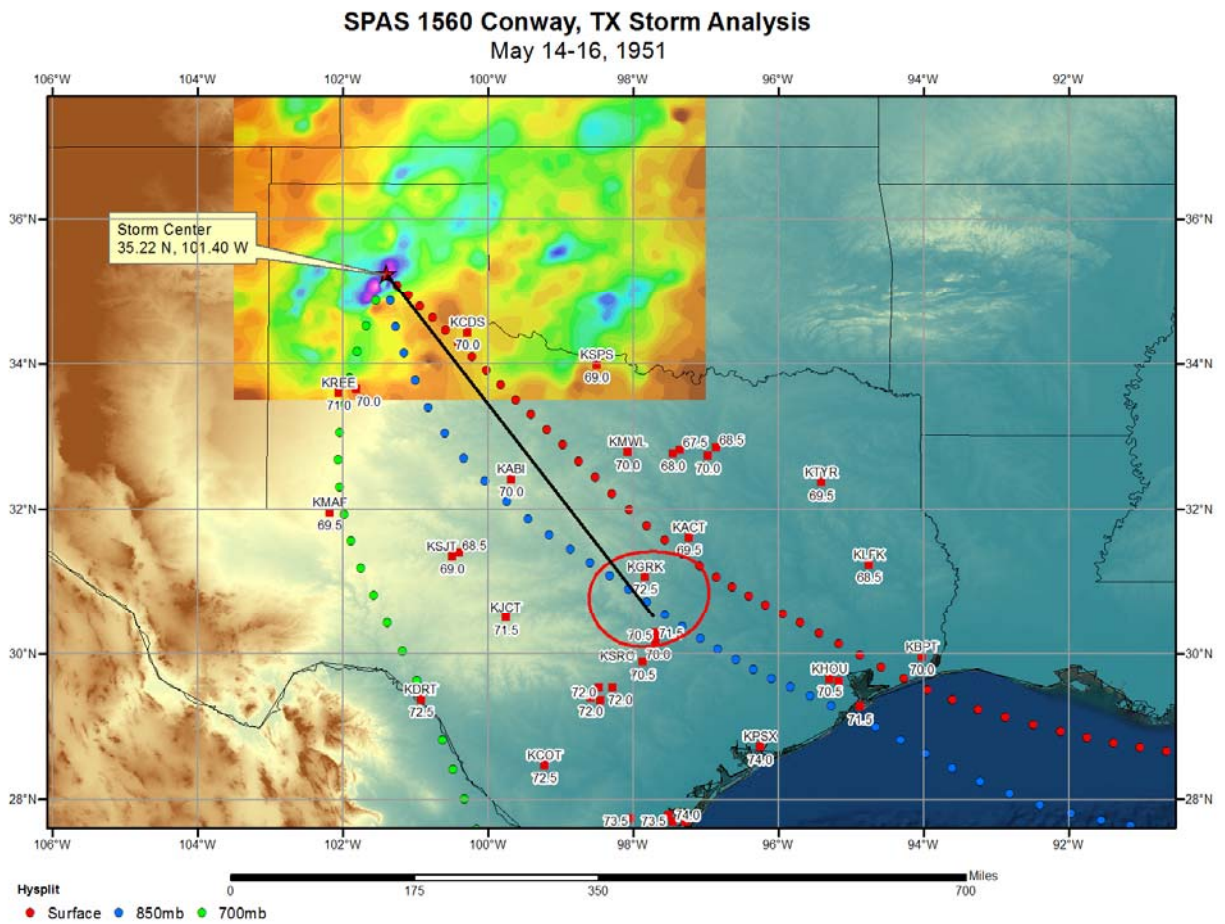


CO-NM Regional Extreme Precipitation Study





CO-NM Regional Extreme Precipitation Study



San Luis, CO

August 11-13, 1957

Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1656_1

General Storm Location: San Luis, CO

Storm Dates: August 11-13, 1957

Event: Local

DAD Zone 1

Latitude: 37.1792

Longitude: -105.4125

Maximum gridded rainfall amount: 3.03"

Maximum observed rainfall amount: 3.01"

Number of Stations: 40

SPAS Version: 10.0

Base Map Used: "1656_isohyetal_final_sm" (hand-drawn contours based off PRISM monthly climo and surface data)

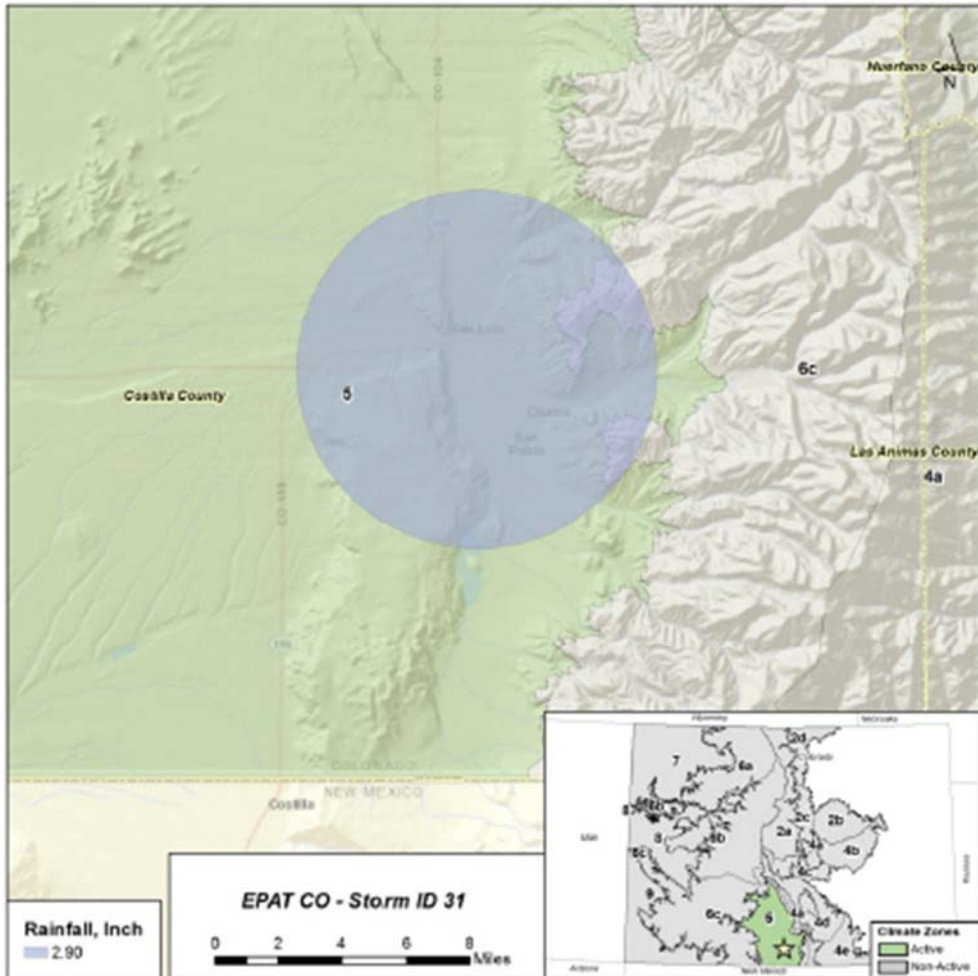
Spatial Resolution: 0.2641

Radar Included: Yes

Depth-Area-Duration (DAD) analysis: Yes

Reliability of Results: This analysis was based on 40 hourly stations, daily data, and supplemental station data. We have a good degree of confidence for the station based storm total results. The spatial pattern is fully dependent on the basemap created from hand-drawn contours based off the PRISM monthly climatology for August 1957 and the surface observations while considering the nearby terrain. Timing is based on the hourly stations and hourly pseudo stations. Several daily stations were moved to supplemental due to timing issues and to ensure data consistency.

CO-NM Regional Extreme Precipitation Study



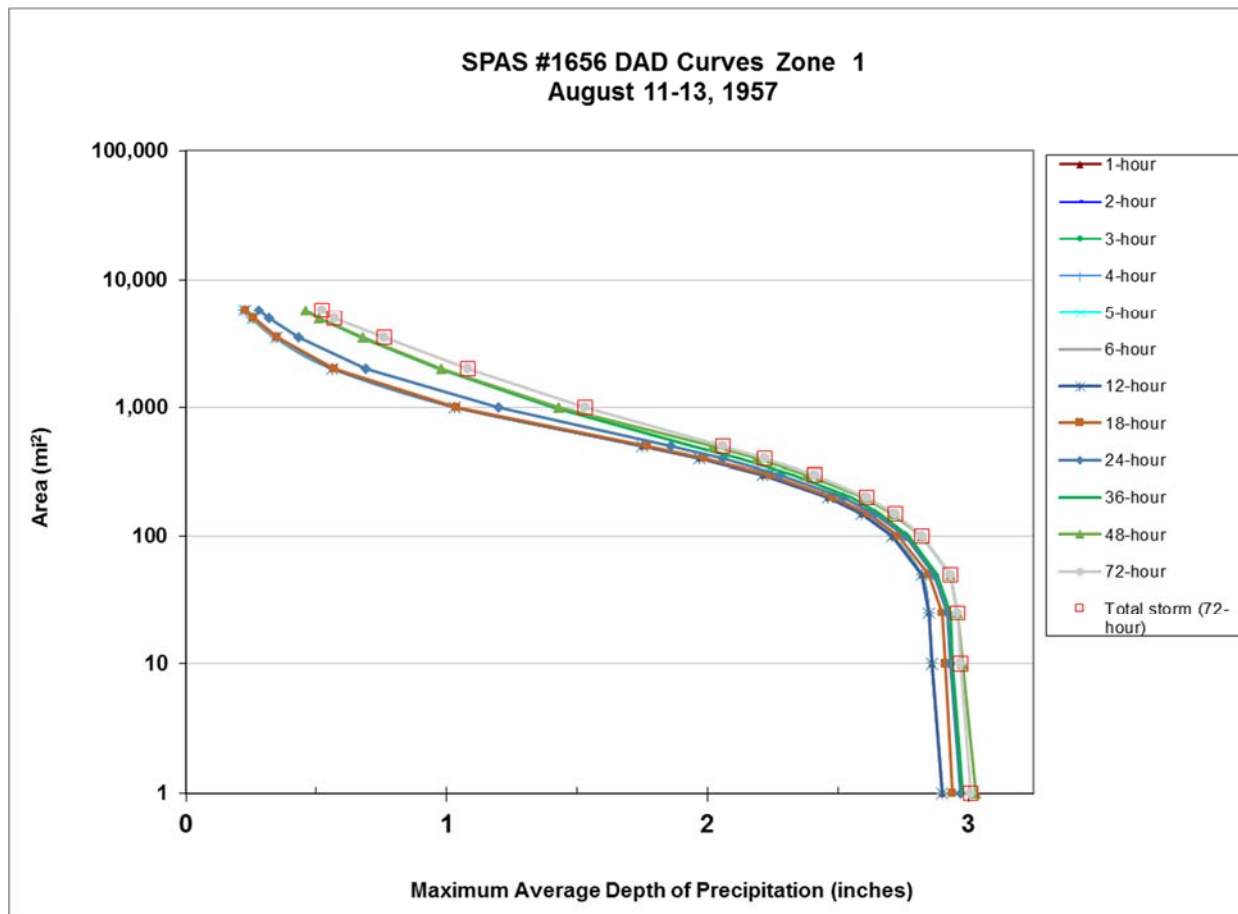
Synopsis and Climate Zone Classification:

Storm ID 31, Climate Zone 5: This local thunderstorm event along the eastern side of San Luis Valley was driven by daytime heating, enhanced dynamics provided by the 90° shear between lower and upper level winds, and ample moisture available due to monsoonal flow. Its attribution to climate zone 5 within the EPAT is commensurate with its elevation of occurrence and observed location.

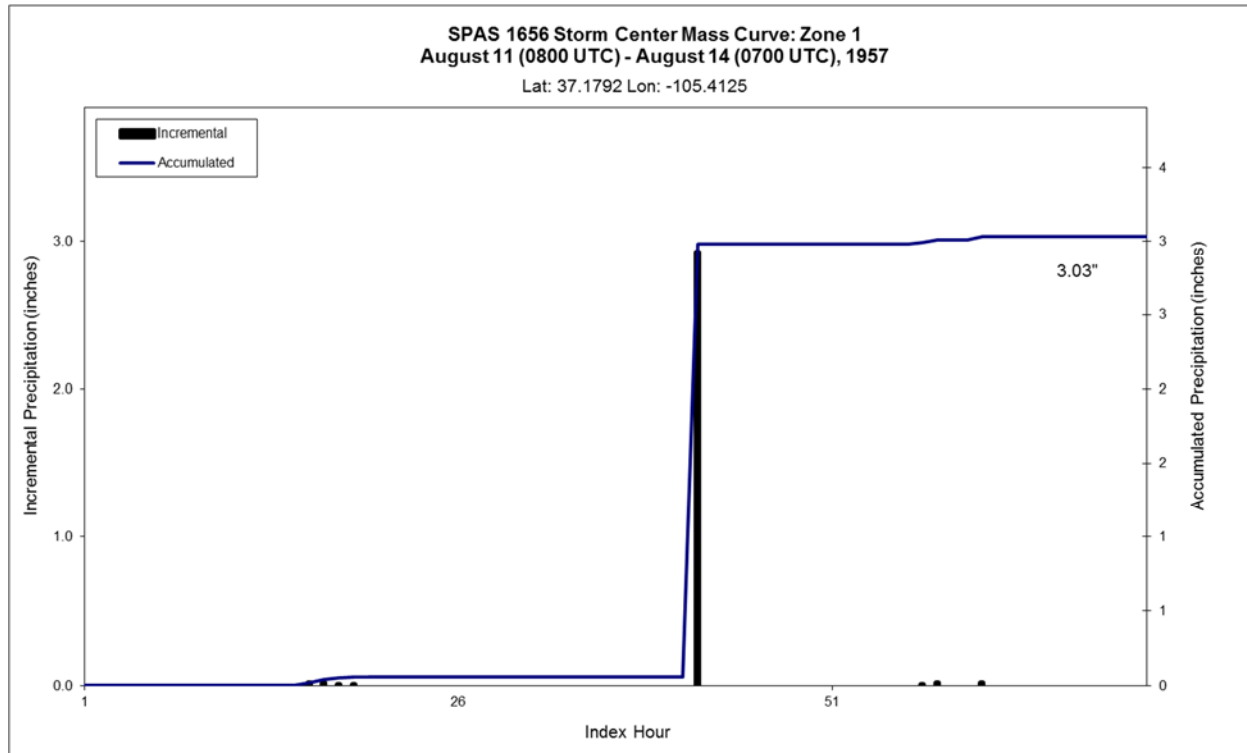
Start Date-End Date	August 12, 1957
Storm ID/Name	STORM ID 31 – San Luis
Storm Type	Local Storm
State/Climate Zone Attribution	Colorado/Climate Zone 5
Max Precipitation/Duration	2.90"/1 hour
Originator/Storm source	HDR/CCC (CSM temporal)
Low Level Wind	330 degrees
Upper Level Wind	240 degrees
Seasonal Max.PWf /-1000mb Td/In-Place Max. Fctr. (source Td /location ID)	3.09" / 76.6F / 1.47 (50 F @ KALS – 1 hour ob.)
Elevation of Peak Precipitation	8349 ft.

CO-NM Regional Extreme Precipitation Study

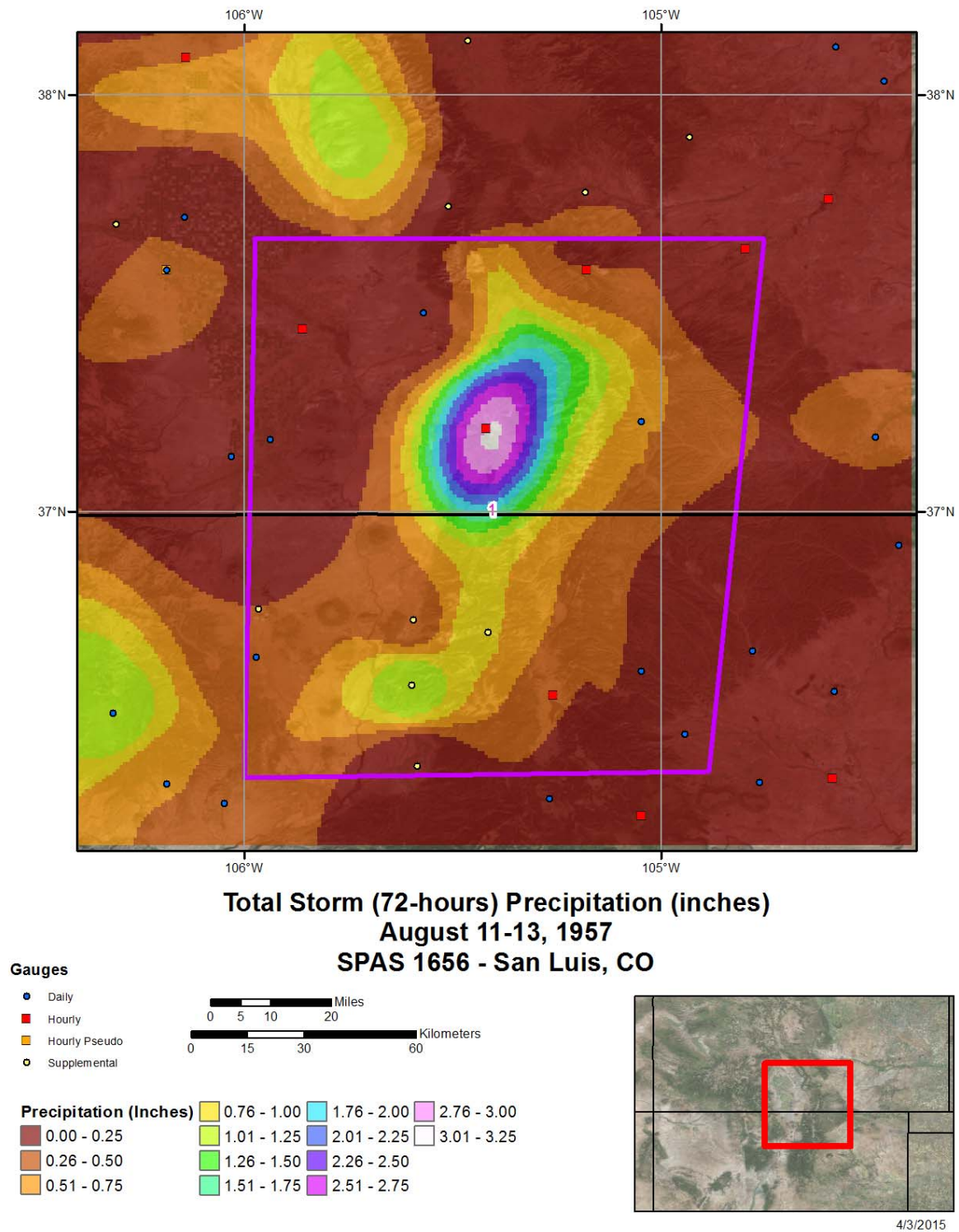
Storm 1656 - August 11 (0800 UTC) - August 14 (0700 UTC), 1957													
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)													
Area (mi ²)	Duration (hours)												
	1	2	3	4	5	6	12	18	24	36	48	72	Total
0.4	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.95	2.97	2.98	3.03	3.03	3.03
1	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.94	2.97	2.98	3.03	3.01	3.01
10	2.86	2.86	2.86	2.86	2.86	2.86	2.86	2.91	2.93	2.94	2.98	2.97	2.97
25	2.85	2.85	2.85	2.85	2.85	2.85	2.85	2.90	2.92	2.93	2.96	2.96	2.96
50	2.82	2.82	2.82	2.82	2.82	2.82	2.82	2.85	2.87	2.88	2.93	2.93	2.93
100	2.71	2.71	2.71	2.71	2.71	2.71	2.71	2.73	2.76	2.77	2.82	2.82	2.82
150	2.59	2.59	2.59	2.59	2.59	2.59	2.59	2.62	2.64	2.66	2.71	2.72	2.72
200	2.46	2.46	2.46	2.46	2.46	2.46	2.46	2.48	2.52	2.55	2.60	2.61	2.61
300	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.24	2.28	2.33	2.38	2.41	2.41
400	1.97	1.97	1.97	1.97	1.97	1.97	1.97	1.99	2.06	2.12	2.19	2.22	2.22
500	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.77	1.86	1.94	2.02	2.06	2.06
1,000	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.04	1.20	1.41	1.43	1.53	1.53
2,000	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.57	0.69	0.97	0.98	1.08	1.08
3,500	0.34	0.34	0.34	0.34	0.34	0.34	0.35	0.35	0.43	0.67	0.68	0.76	0.76
5,000	0.25	0.25	0.25	0.25	0.25	0.25	0.26	0.26	0.32	0.51	0.51	0.57	0.57
5,734	0.22	0.22	0.22	0.22	0.22	0.22	0.23	0.23	0.28	0.45	0.46	0.52	0.52

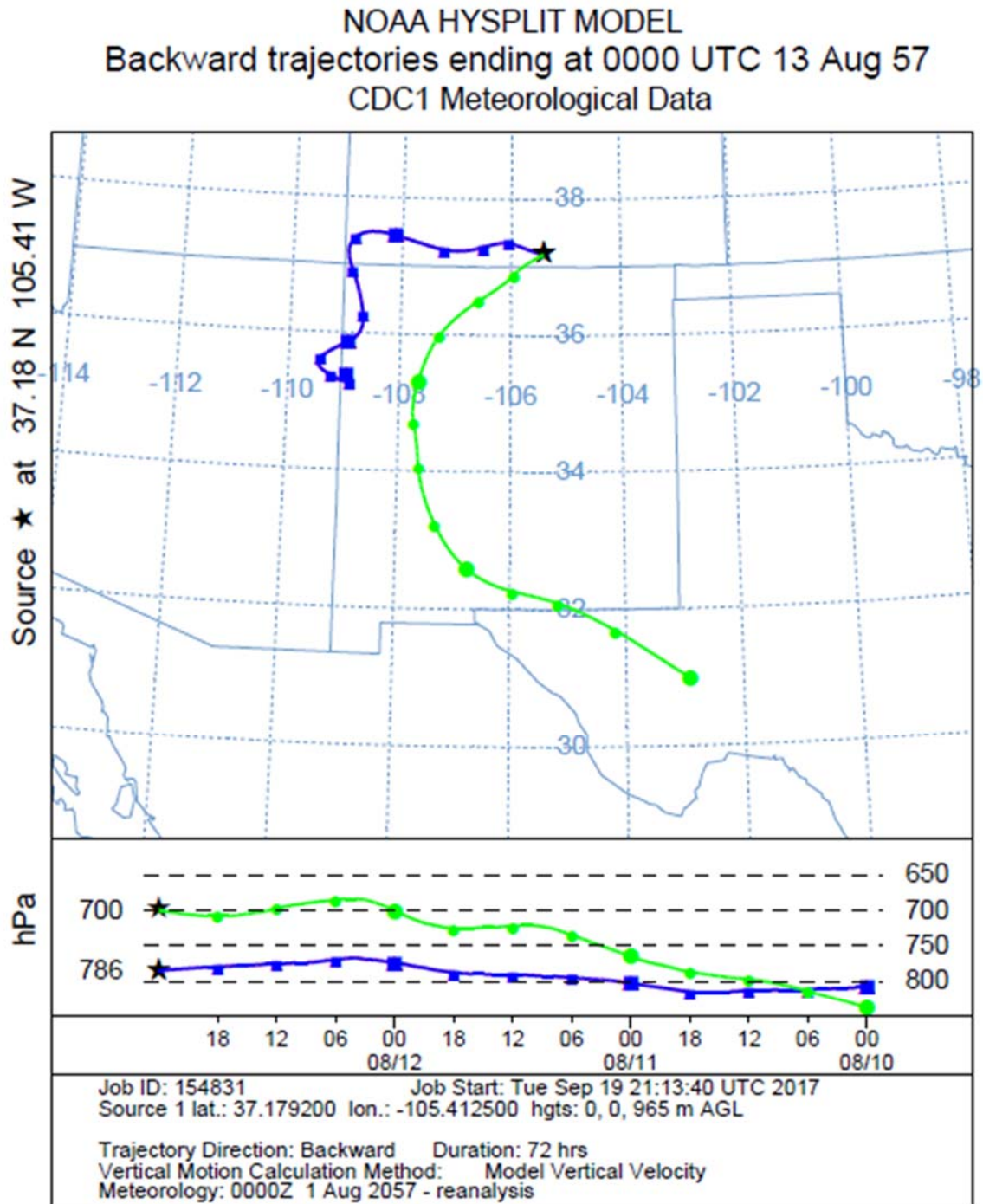


CO-NM Regional Extreme Precipitation Study

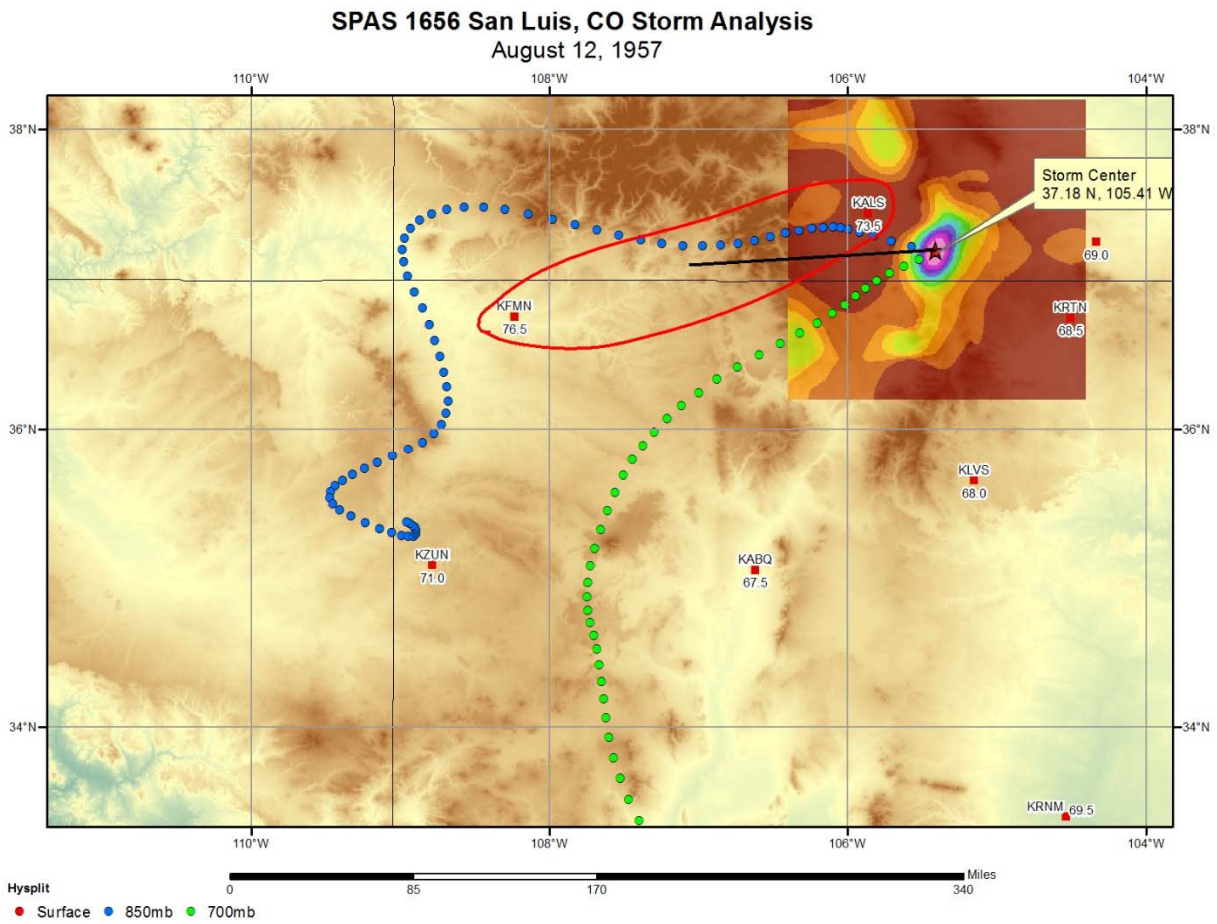


CO-NM Regional Extreme Precipitation Study





CO-NM Regional Extreme Precipitation Study



Morgan, UT

August 15-18, 1958

Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1248_1

General Storm Location: Utah

Storm Dates: August 15-18, 1958 *** note, this was a one hour event

Event: Convective

DAD Zone 1

Latitude: 41.079

Longitude: -111.654

Max. Grid Rainfall Amount: 7.01"

Max. Observed Rainfall Amount: 6.75"

Number of Stations: 68 (54 Daily, 14 Hourly, 0 Hourly Pseudo, and 0 Supplemental)

SPAS Version: 9.5

Basemap: PRISM mean (1971-2000) August precipitation

Spatial resolution: 00:00:30 (~ 0.30 mi²)

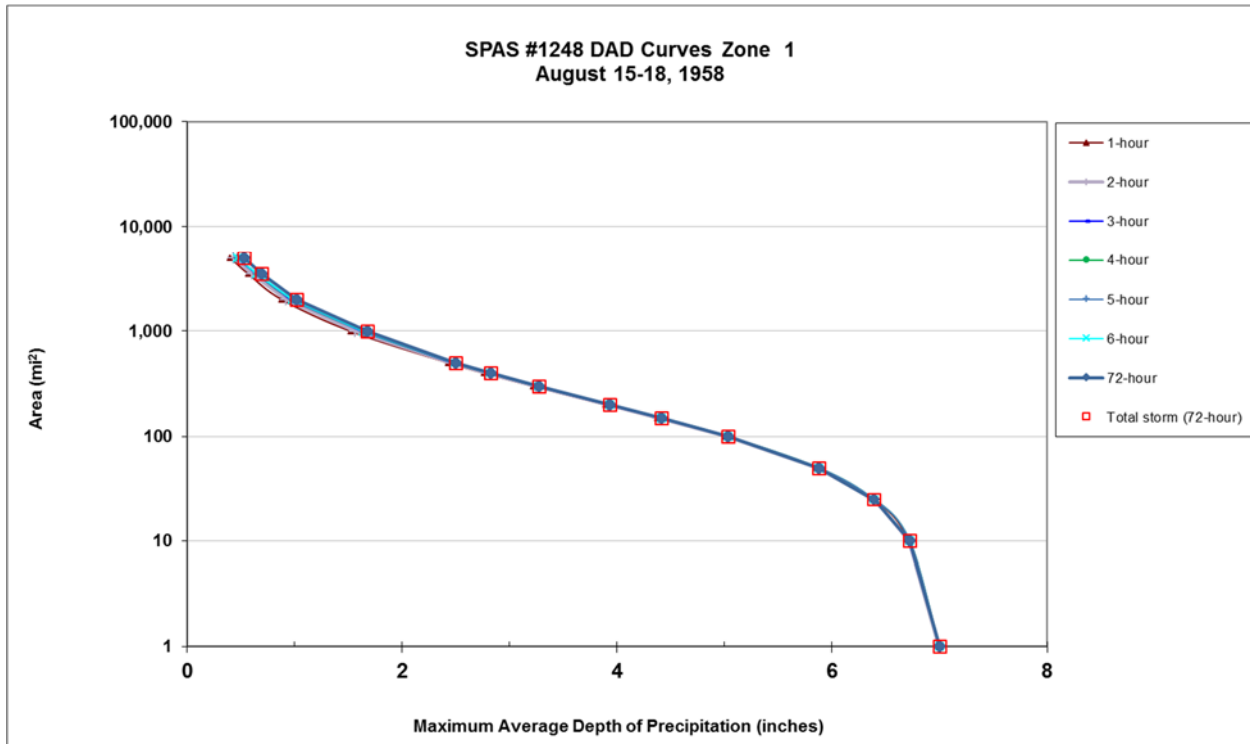
Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

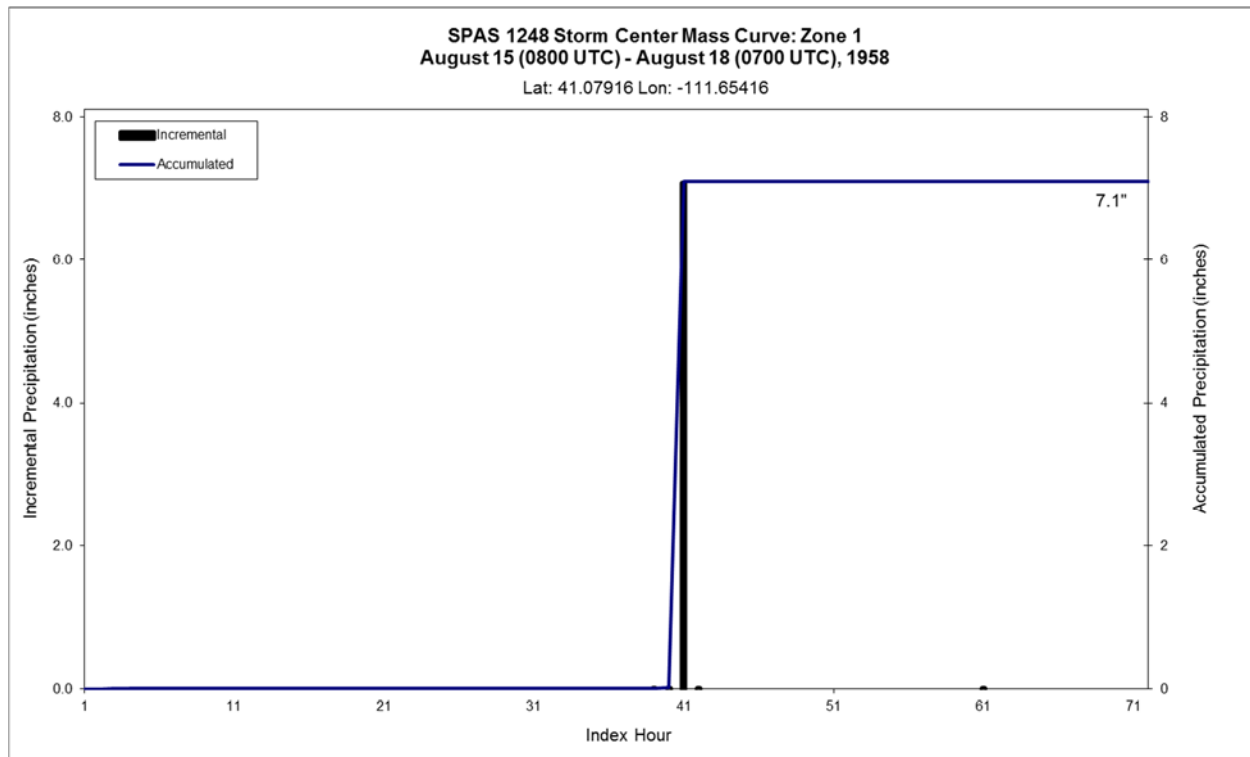
Reliability of results: This analysis was based on hourly data, daily data, and previously analyzed isohyetal pattern. An hourly station was placed at Morgan, UT based on timing and magnitude information from HNW Hydro-26 (Hansen, 1975) report. We have a high degree of confidence in the station based results, spatial pattern is dependent on PRISM basemap used.

CO-NM Regional Extreme Precipitation Study

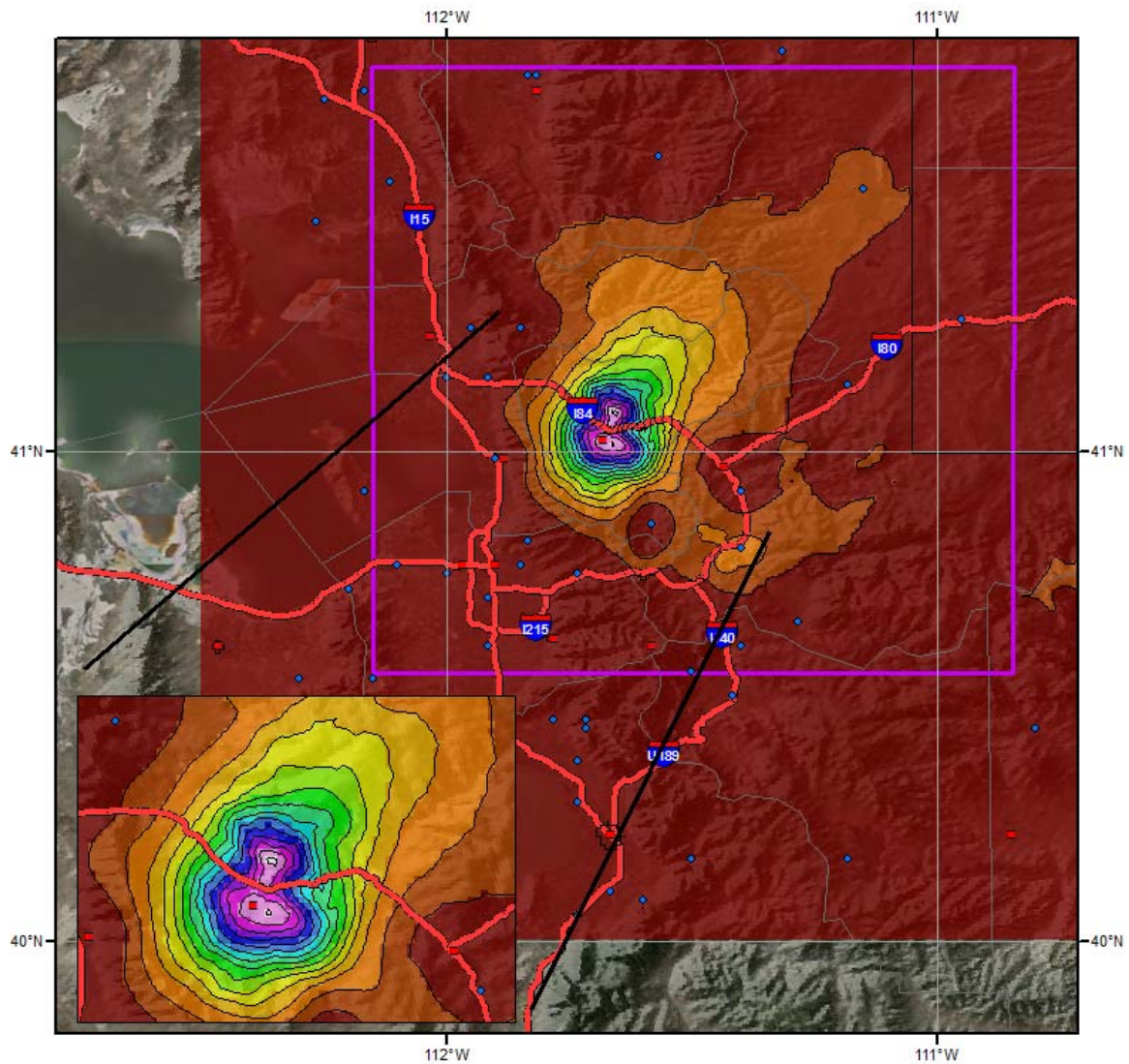
Storm 1248 - August 15 (800 UTC) - August 18 (700 UTC), 1958								
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)								
Area (mi ²)	Duration (hours)							
	1	2	3	4	5	6	72	Total
0.3	7.05	7.06	7.06	7.07	7.07	7.07	7.07	7.07
1	6.99	6.99	7.00	7.00	7.00	7.00	7.00	7.00
10	6.71	6.71	6.71	6.72	6.72	6.72	6.72	6.72
25	6.38	6.39	6.39	6.39	6.39	6.39	6.39	6.39
50	5.86	5.87	5.88	5.88	5.88	5.88	5.88	5.88
100	5.01	5.02	5.03	5.03	5.03	5.03	5.03	5.03
150	4.37	4.38	4.40	4.41	4.41	4.41	4.41	4.41
200	3.89	3.91	3.92	3.93	3.93	3.93	3.93	3.93
300	3.22	3.24	3.26	3.26	3.26	3.26	3.27	3.27
400	2.76	2.78	2.80	2.81	2.81	2.81	2.82	2.82
500	2.43	2.45	2.47	2.48	2.48	2.48	2.50	2.50
1,000	1.52	1.56	1.62	1.64	1.64	1.64	1.68	1.68
2,000	0.88	0.92	0.96	0.98	0.98	0.98	1.02	1.02
3,500	0.57	0.60	0.64	0.65	0.65	0.65	0.69	0.69
5,000	0.40	0.43	0.46	0.47	0.47	0.47	0.53	0.53



CO-NM Regional Extreme Precipitation Study



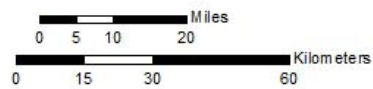
CO-NM Regional Extreme Precipitation Study



Total Precipitation (72-hours)
SPAS 1248 - Morgan, UT
8/15/1958 0800 GMT - 8/18/1958 0700 GMT

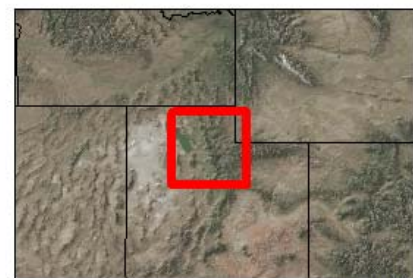
Gauges

- ◆ Daily
- Hourly



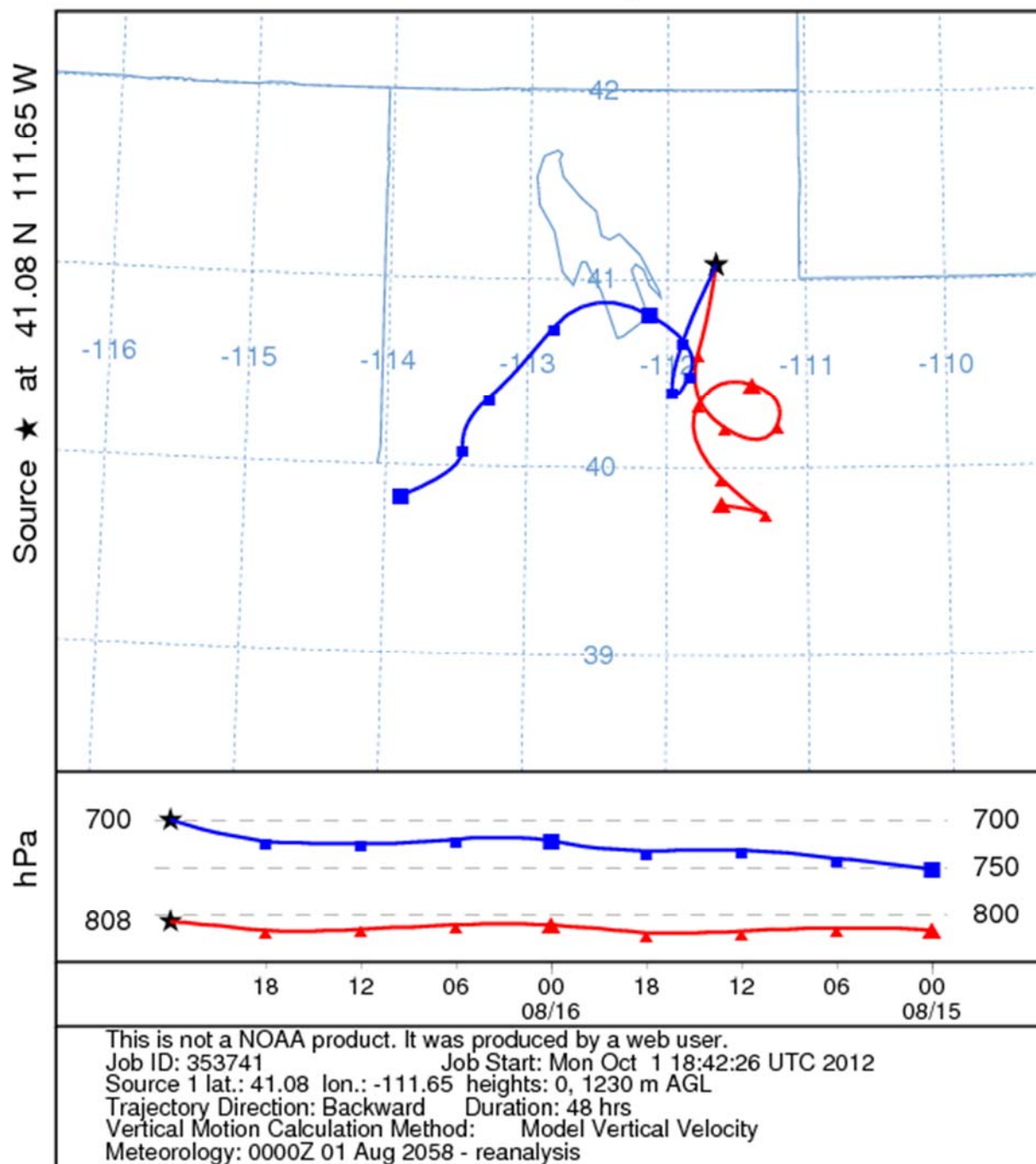
Precipitation (inches)

0.00 - 0.50	1.51 - 2.00	3.01 - 3.50	4.51 - 5.00	6.01 - 6.50
0.51 - 1.00	2.01 - 2.50	3.51 - 4.00	5.01 - 5.50	6.51 - 7.00
1.01 - 1.50	2.51 - 3.00	4.01 - 4.50	5.51 - 6.00	7.01 - 7.50



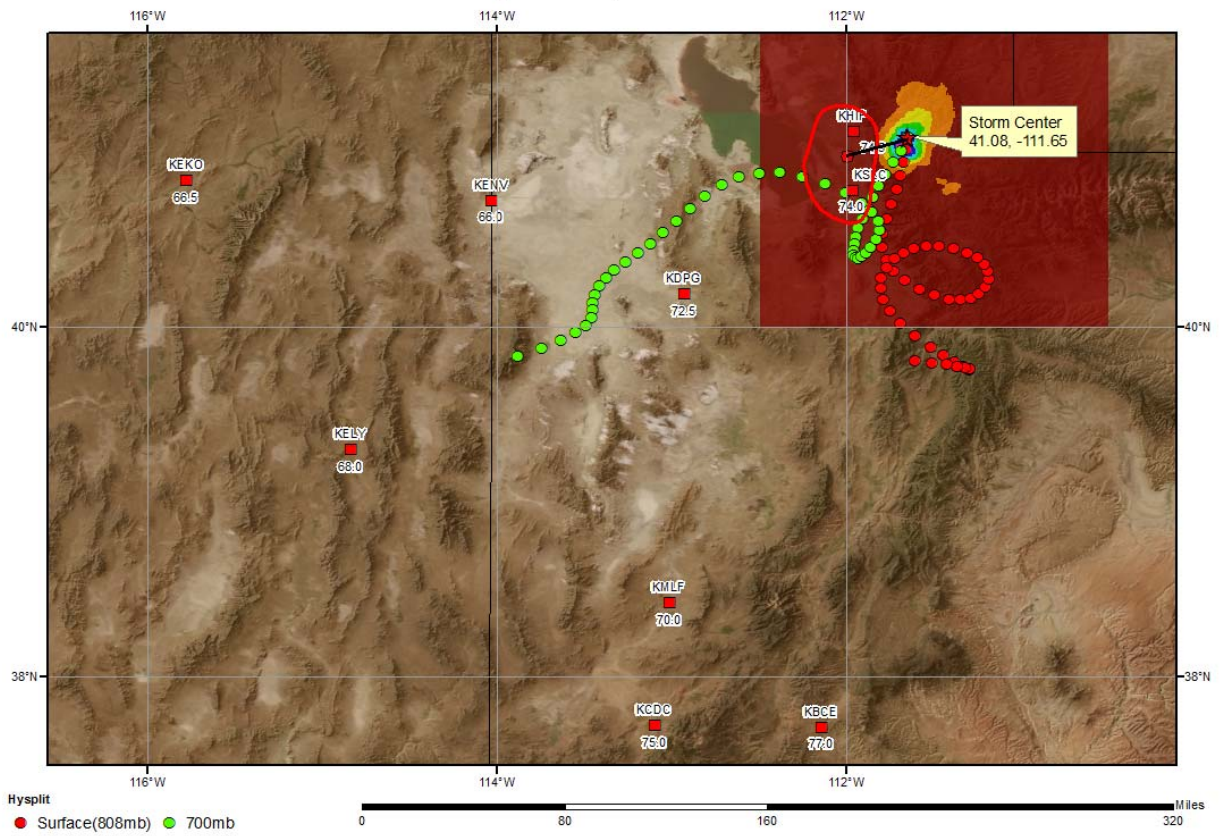
8/24/2012

NOAA HYSPLIT MODEL
Backward trajectories ending at 0000 UTC 17 Aug 58
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study

SPAS 1248 Morgan, UT Storm Analysis August 14-17, 1958



Holly, CO
June 14-19, 1965
Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1293_1
(Re-Run of SPAS #1009)

General Storm Location: Southeastern Colorado, extreme northeastern New Mexico and extreme eastern Kansas.

Storm Dates: June 14 – 19, 1965

Event: Thunderstorms and possible Mesoscale Convective Complex (MCC)

DAD Zone 1 (Holly/Two Buttes, CO)

Latitude: 37.7125

Longitude: -102.40416

Max. Grid Rainfall Amount: 19.18"

Max. Observed Rainfall Amount: 18.00"

Number of Stations: 414

SPAS Version: 9.5

Base Map Used: Modified USGS total precipitation map for the period June 13-20, 1965

Radar Included: No

Depth-Area-Duration (DAD) analysis: 1, 2, 3, 4, 5, 6, 12, 18, 24, 36, 48, 72, 96, 120, & 144 hr

Confidence in results: For reasons described below, the results of this analysis are markedly different than SPAS 1009, but are believed to be more accurate. A comprehensive bucket survey provides us with a moderate degree of confidence in the magnitudes; however exact storm patterns have a high degree of uncertainty. The temporal distributions are anchored on good, but sparse hourly data, therefore confidence is lower than normal with the timing.

Comments:

- This analysis was a re-analysis of SPAS #1009. Since then, several software enhancements have taken place. Plus, a large amount of additional data (Bucket Survey) was added, mainly to address the western storm centers (southeast of Denver). Also, a USGS isohyetal map was used as the basemap, which injected a great deal of information into the analysis versus the #1009 analysis. For these reasons, the results of this analysis are different than 1009, but are believed to be more accurate.
- 251 Bucket Survey amounts were added from the Colorado Climatological Data. After QC, a total of 224 remained in the data set.

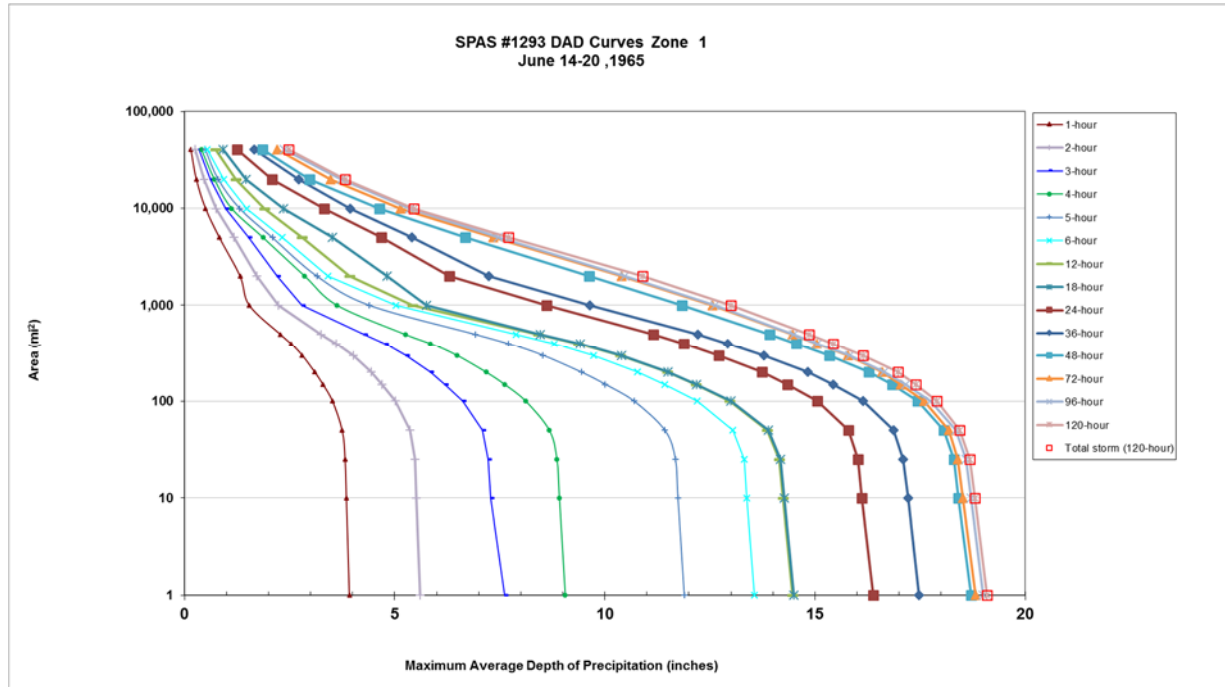
Unlike SPAS #1009 where the storm center was near Holly, SPAS #1293 has the storm center about 30 miles southwest of Holly (or 28 miles south –southeast of Lamar, CO). The USGS

CO-NM Regional Extreme Precipitation Study

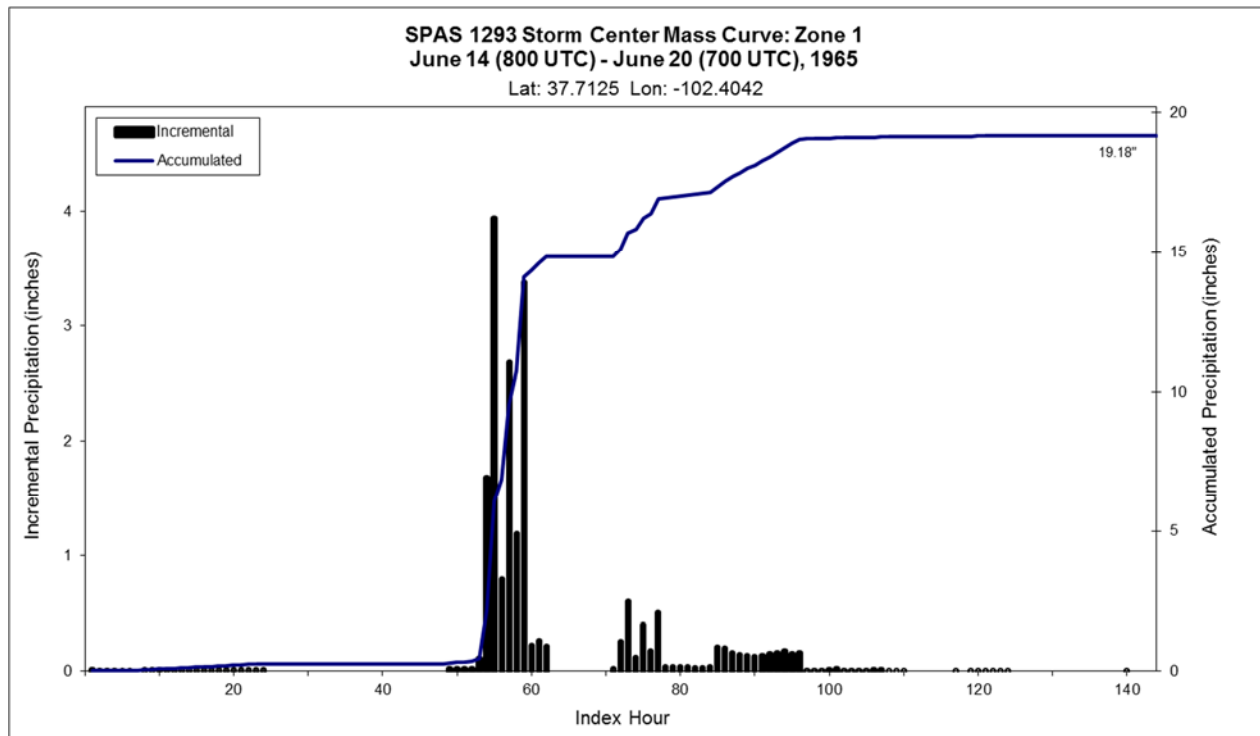
report stated intense rains began on June 16th in this area and dropped 15.5” of rain. Coupled with other rain showers during the June 14-19th period, the total storm center rainfall rose to 18” for the 144-hour period. Two Buttes, the closest hourly “station,” was based on a mass curve published in the USGS report (shown below). The USGS mass curve for Two Buttes looked to be estimated, so the final timing was also influenced by surrounding true hourly stations.

CO-NM Regional Extreme Precipitation Study

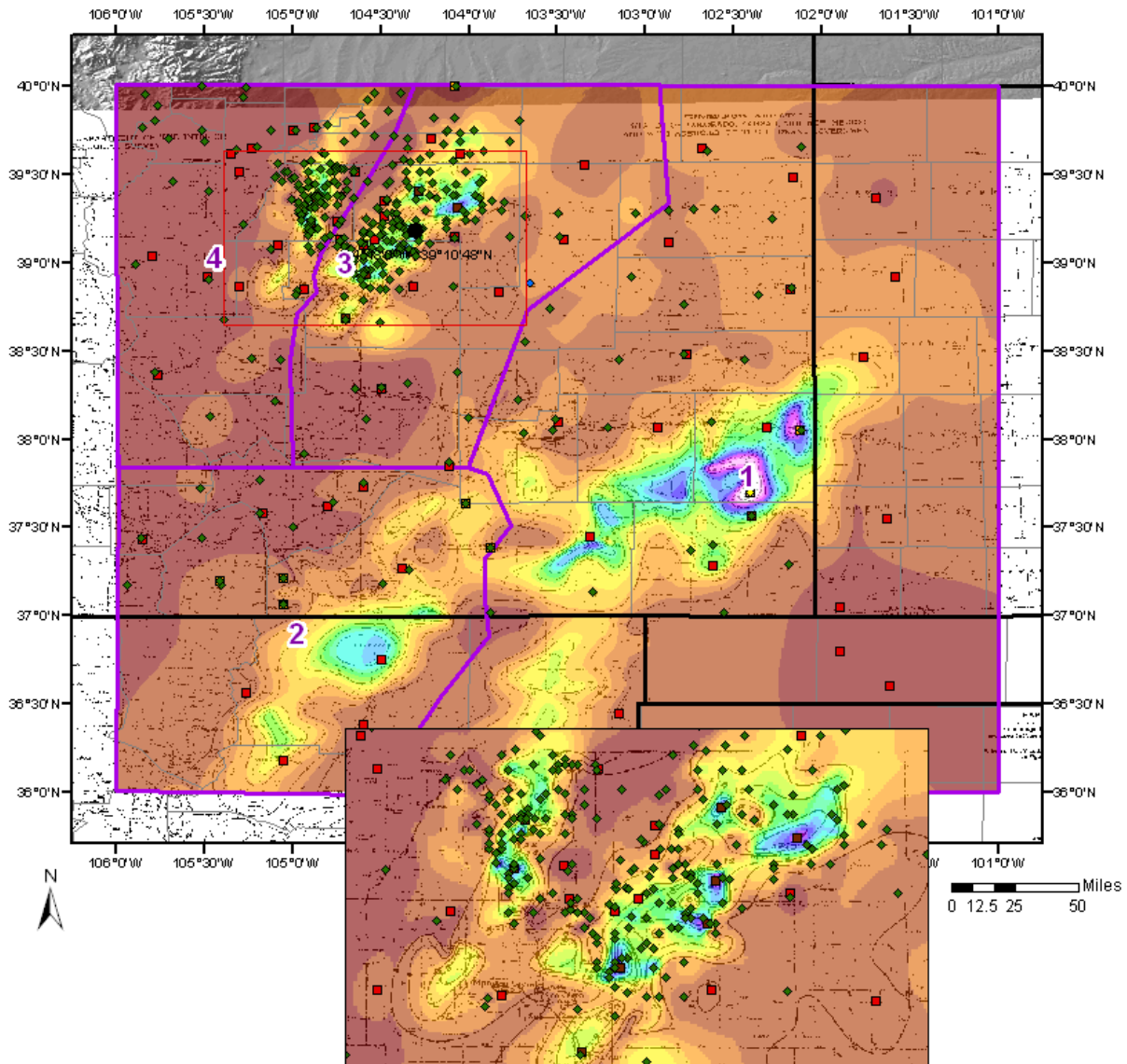
SPAS 1293 - June 14 (800 UTC) - June 20 (700 UTC), 1965															
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)															
Area (mi ²)	Duration (hours)														
	1	2	3	4	5	6	12	18	24	36	48	72	96	120	Total
0.4	3.94	5.62	7.69	9.10	11.95	13.63	14.52	14.55	16.45	17.55	18.80	18.90	19.09	19.18	19.18
1	3.92	5.60	7.62	9.06	11.89	13.56	14.46	14.49	16.38	17.47	18.71	18.82	19.00	19.09	19.09
10	3.85	5.52	7.28	8.92	11.74	13.38	14.24	14.27	16.12	17.21	18.41	18.52	18.71	18.80	18.80
25	3.82	5.49	7.23	8.86	11.68	13.31	14.15	14.18	16.02	17.10	18.30	18.40	18.60	18.69	18.69
50	3.75	5.36	7.08	8.68	11.43	13.04	13.86	13.89	15.80	16.87	18.07	18.18	18.35	18.44	18.44
100	3.52	5.02	6.62	8.12	10.70	12.20	12.97	13.00	15.06	16.14	17.44	17.59	17.74	17.90	17.90
150	3.29	4.70	6.20	7.61	10.01	11.42	12.16	12.18	14.34	15.44	16.84	17.04	17.16	17.40	17.40
200	3.10	4.44	5.85	7.18	9.45	10.77	11.48	11.50	13.74	14.83	16.28	16.60	16.64	16.97	16.97
300	2.80	4.01	5.28	6.48	8.53	9.73	10.37	10.40	12.71	13.79	15.34	15.78	15.82	16.15	16.15
400	2.53	3.61	4.77	5.85	7.70	8.79	9.37	9.41	11.88	12.93	14.55	15.04	15.06	15.44	15.44
500	2.28	3.24	4.28	5.25	6.92	7.89	8.42	8.46	11.15	12.22	13.92	14.46	14.49	14.86	14.86
1,000	1.54	2.23	2.80	3.63	4.40	5.03	5.42	5.76	8.61	9.64	11.83	12.56	12.62	13.00	13.00
2,000	1.32	1.72	2.20	2.86	3.15	3.41	3.92	4.82	6.30	7.24	9.62	10.40	10.48	10.89	10.89
5,000	0.83	1.18	1.52	1.87	2.09	2.32	2.79	3.52	4.69	5.41	6.68	7.34	7.47	7.71	7.71
10,000	0.50	0.75	0.98	1.12	1.31	1.48	1.90	2.35	3.32	3.94	4.64	5.13	5.36	5.45	5.45
20,000	0.28	0.47	0.62	0.71	0.80	0.94	1.22	1.46	2.08	2.72	2.98	3.47	3.73	3.82	3.82
40,556	0.15	0.25	0.35	0.40	0.49	0.54	0.74	0.92	1.25	1.66	1.86	2.20	2.37	2.47	2.47



CO-NM Regional Extreme Precipitation Study

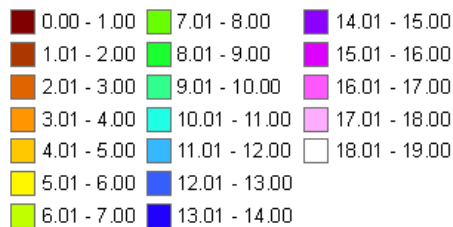


CO-NM Regional Extreme Precipitation Study

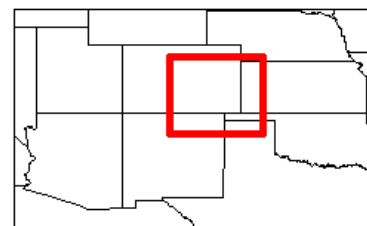
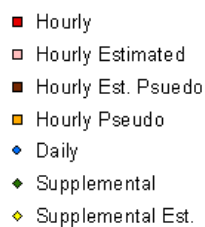


Total 144-hour Precipitation (inches)
06/14/1965 08 UTC - 06/20/1965 07 UTC
SPAS #1293

Precipitation (inches)

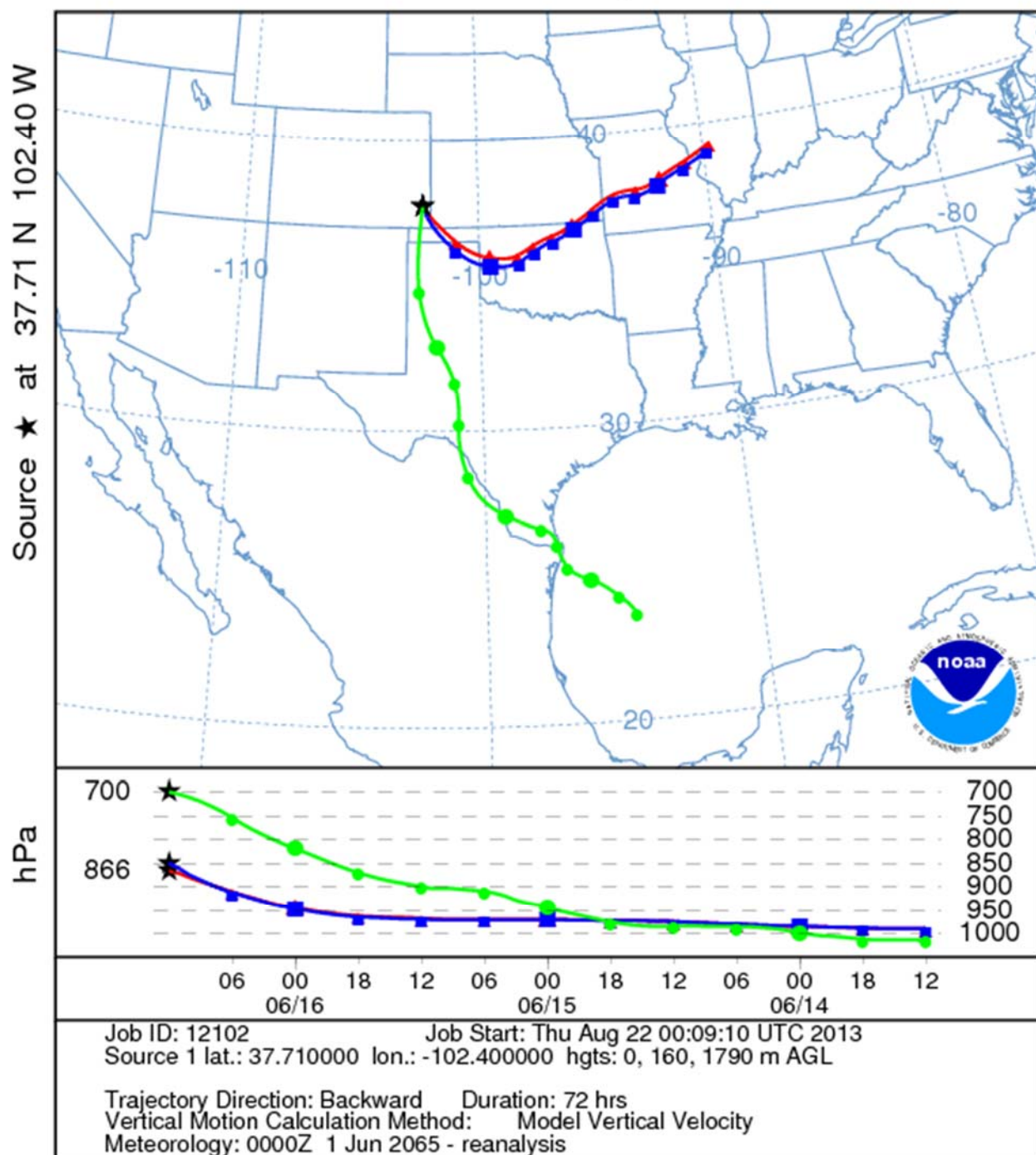


Stations



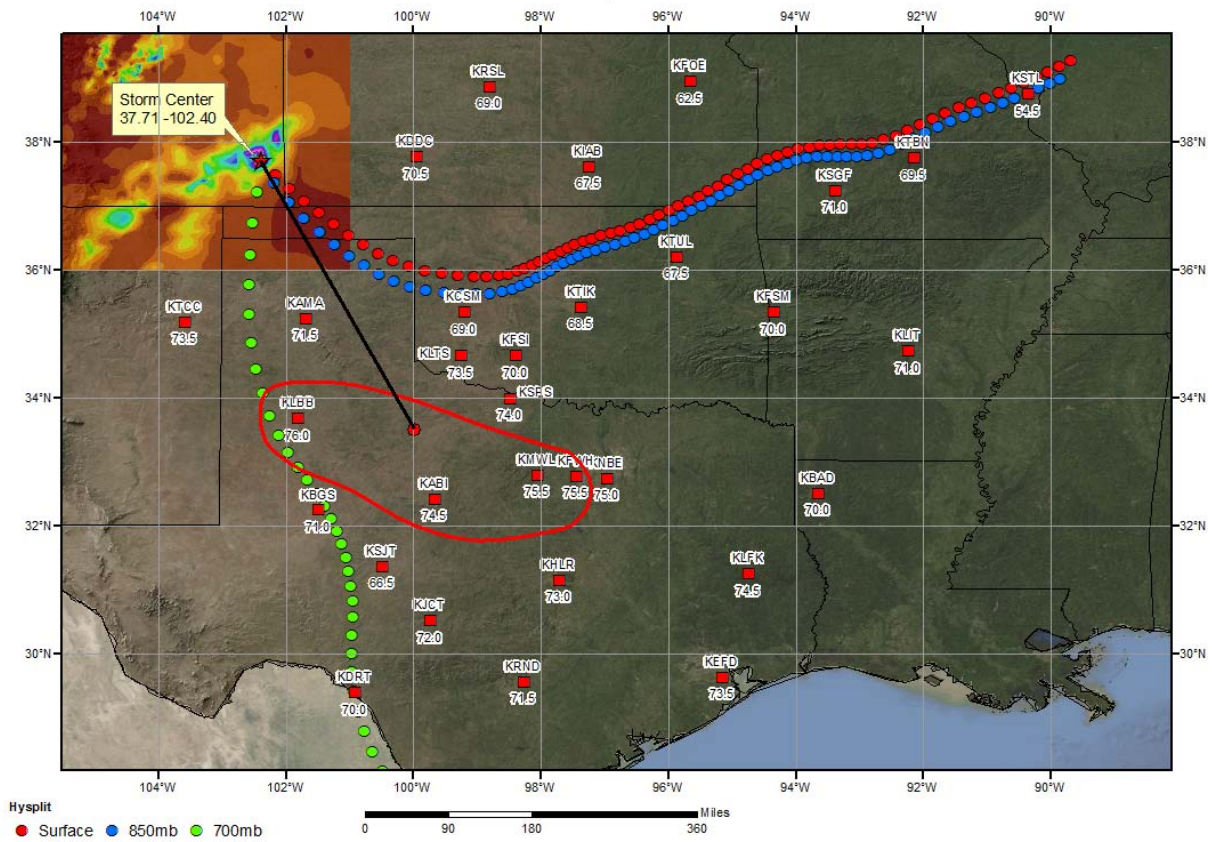
08/20/2013 p:\data\12/9/13

NOAA HYSPLIT MODEL
Backward trajectories ending at 1200 UTC 16 Jun 65
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study

SPAS 1293 Holly, CO Storm Analysis June 13-16, 1965



Raton, NM

June 14-19, 1965

Storm Type: Local/ Hybrid

Storm Precipitation Analysis System (SPAS) For Storm #1293_2 (Re-Run of SPAS #1009)

General Storm Location: Southeastern Colorado, extreme northeastern New Mexico and extreme eastern Kansas.

Storm Dates: June 14 – 19, 1965

Event: Thunderstorms and possible Mesoscale Convective Complex (MCC)

DAD Zone 2 (near Raton, NM)

Latitude: 36.754166

Longitude: -104.5375

Max. Grid Rainfall Amount: 11.04"

Max. Observed Rainfall Amount: 10.73"

Number of Stations: 414

SPAS Version: 9.5

Base Map Used: Modified USGS total precipitation map for the period June 13-20, 1965

Radar Included: No

Depth-Area-Duration (DAD) analysis: 1, 2, 3, 4, 5, 6, 12, 18, 24, 36, 48, 72, 96, 120, & 144 hr

Confidence in results: For reasons described below, the results of this analysis are markedly different than SPAS 1009, but are believed to be more accurate. A comprehensive bucket survey provides us with a moderate degree of confidence in the magnitudes; however exact storm patterns have a high degree of uncertainty. The temporal distributions are anchored on good, but sparse hourly data, therefore confidence is lower than normal with the timing.

Comments:

- This analysis was a re-analysis of SPAS #1009. Since then, several software enhancements have taken place. Plus, a large amount of additional data (Bucket Survey) was added, mainly to address the western storm centers (southeast of Denver). Also, a USGS isohyetal map was used as the basemap, which injected a great deal of information into the analysis versus the #1009 analysis. For these reasons, the results of this analysis are different than 1009, but are believed to be more accurate.
- 251 Bucket Survey amounts were added from the Colorado Climatological Data. After QC, a total of 224 remained in the data set.

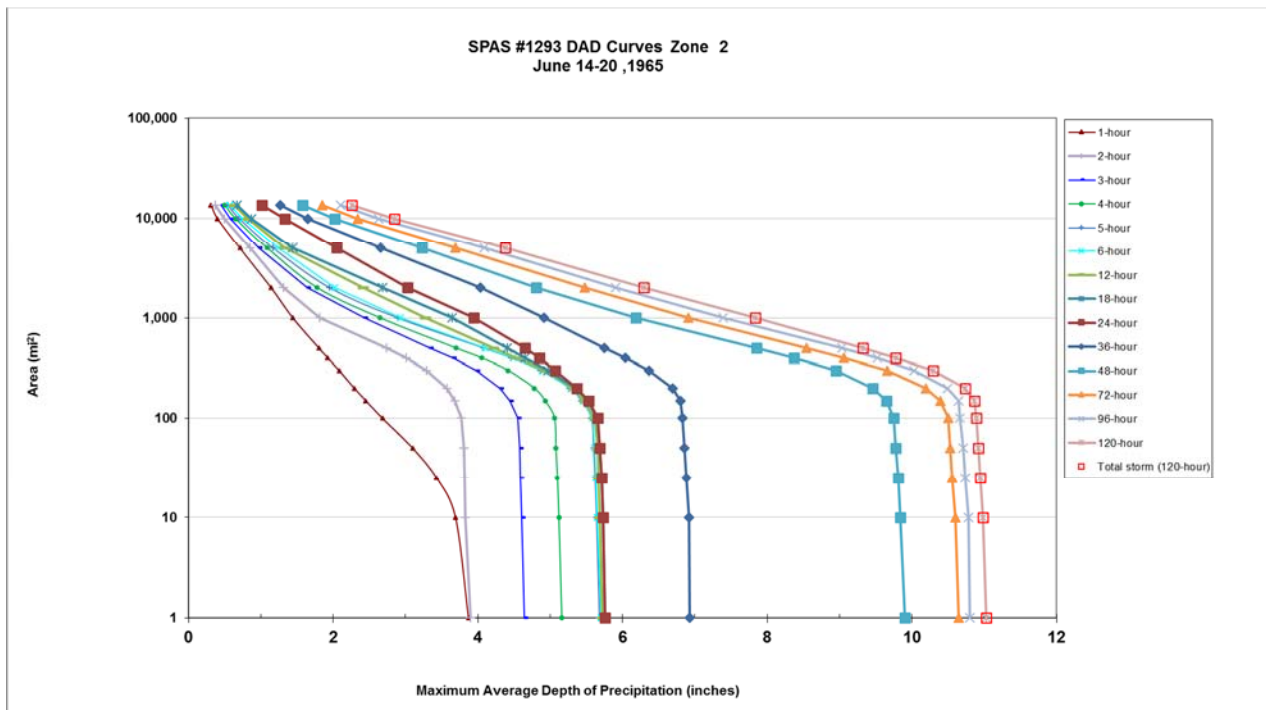
Unlike SPAS #1009 where the storm center was near Holly, SPAS #1293 has the storm center about 30 miles southwest of Holly (or 28 miles south –southeast of Lamar, CO). The USGS

CO-NM Regional Extreme Precipitation Study

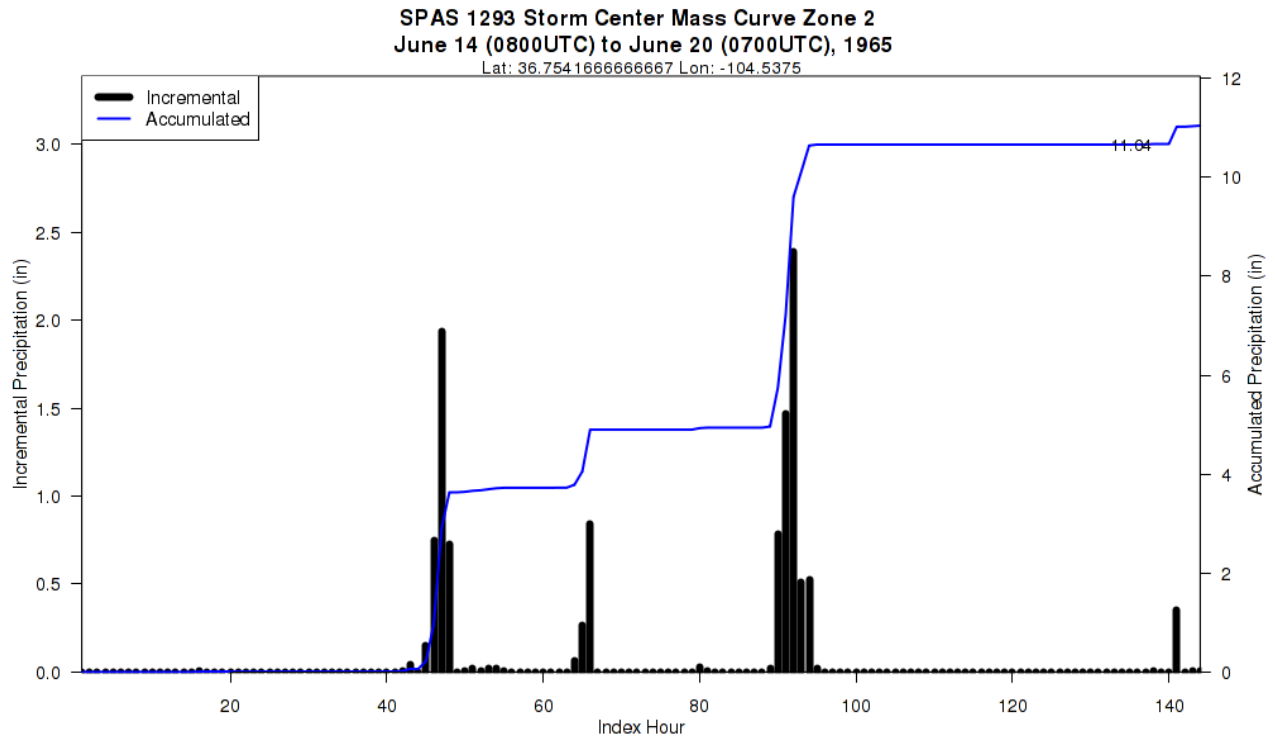
report stated intense rains began on June 16th in this area and dropped 15.5” of rain. Coupled with other rain showers during the June 14-19th period, the total storm center rainfall rose to 18” for the 144-hour period. Two Buttes, the closest hourly “station,” was based on a mass curve published in the USGS report (shown below). The USGS mass curve for Two Buttes looked to be estimated, so the final timing was also influenced by surrounding true hourly stations.

CO-NM Regional Extreme Precipitation Study

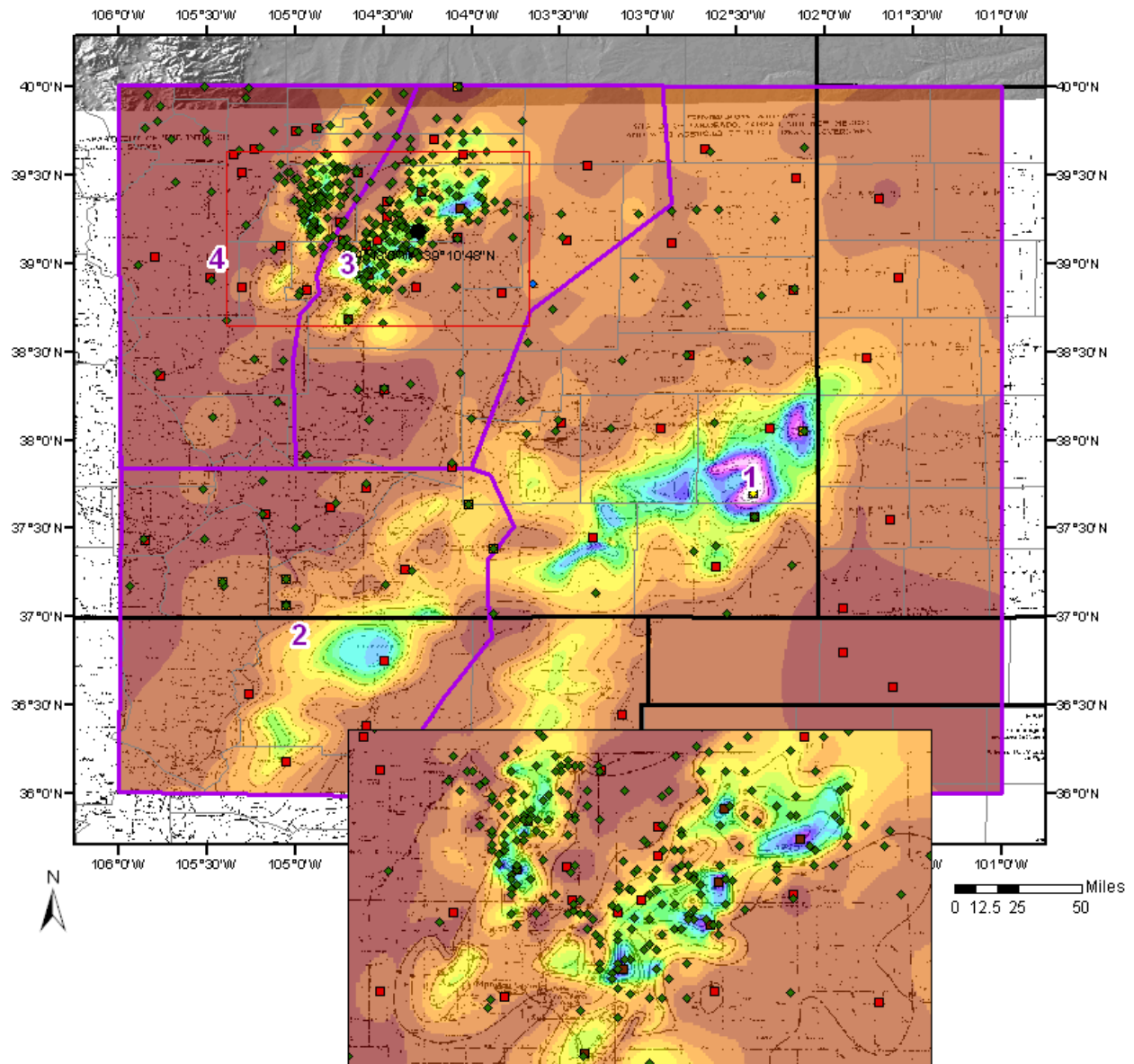
SPAS 1293 - June 14 (800 UTC) - June 20 (700 UTC), 1965															
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)															
Area (mi ²)	Duration (hours)														
	1	2	3	4	5	6	12	18	24	36	48	72	96	120	Total
0.4	3.91	3.93	4.64	5.16	5.68	5.7	5.72	5.76	5.76	6.93	9.9	10.65	10.8	11.03	11.03
1	3.87	3.9	4.64	5.16	5.68	5.7	5.72	5.76	5.76	6.93	9.9	10.65	10.8	11.03	11.03
10	3.69	3.83	4.61	5.12	5.64	5.65	5.69	5.73	5.73	6.92	9.84	10.6	10.78	10.98	10.98
25	3.43	3.82	4.59	5.1	5.62	5.63	5.67	5.71	5.71	6.88	9.81	10.56	10.74	10.95	10.95
50	3.1	3.81	4.58	5.08	5.6	5.61	5.66	5.69	5.69	6.86	9.78	10.53	10.71	10.92	10.92
100	2.68	3.77	4.55	5.06	5.57	5.59	5.61	5.65	5.66	6.83	9.75	10.5	10.67	10.89	10.89
150	2.45	3.68	4.44	4.93	5.43	5.46	5.48	5.52	5.53	6.8	9.65	10.39	10.65	10.87	10.87
200	2.29	3.57	4.31	4.78	5.27	5.29	5.32	5.36	5.37	6.69	9.46	10.19	10.49	10.74	10.74
300	2.08	3.29	3.98	4.42	4.87	4.89	4.93	4.97	5.07	6.37	8.95	9.66	10.03	10.29	10.29
400	1.92	3.01	3.65	4.05	4.46	4.49	4.53	4.65	4.85	6.04	8.37	9.06	9.52	9.78	9.78
500	1.8	2.74	3.34	3.7	4.08	4.1	4.22	4.41	4.65	5.75	7.85	8.54	9.03	9.32	9.32
1,000	1.44	1.81	2.43	2.65	2.89	2.93	3.27	3.64	3.94	4.91	6.18	6.91	7.39	7.84	7.84
2,000	1.14	1.31	1.64	1.78	1.95	2.02	2.41	2.68	3.03	4.03	4.81	5.48	5.9	6.29	6.29
5,000	0.71	0.85	0.97	1.09	1.17	1.24	1.33	1.44	2.05	2.66	3.23	3.69	4.09	4.38	4.38
10,000	0.4	0.5	0.58	0.65	0.7	0.75	0.82	0.87	1.33	1.65	2.02	2.34	2.63	2.85	2.85
13,749	0.31	0.37	0.45	0.5	0.54	0.57	0.63	0.67	1.01	1.27	1.58	1.85	2.1	2.26	2.26



CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



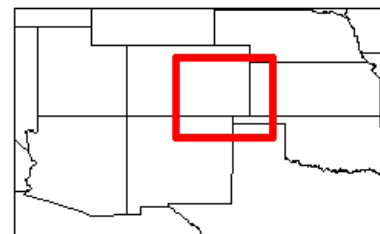
Total 144-hour Precipitation (inches)
06/14/1965 08 UTC - 06/20/1965 07 UTC
SPAS #1293

Precipitation (inches)

0.00 - 1.00	7.01 - 8.00
1.01 - 2.00	8.01 - 9.00
2.01 - 3.00	9.01 - 10.00
3.01 - 4.00	10.01 - 11.00
4.01 - 5.00	11.01 - 12.00
5.01 - 6.00	12.01 - 13.00
6.01 - 7.00	13.01 - 14.00
14.01 - 15.00	15.01 - 16.00
16.01 - 17.00	17.01 - 18.00
18.01 - 19.00	

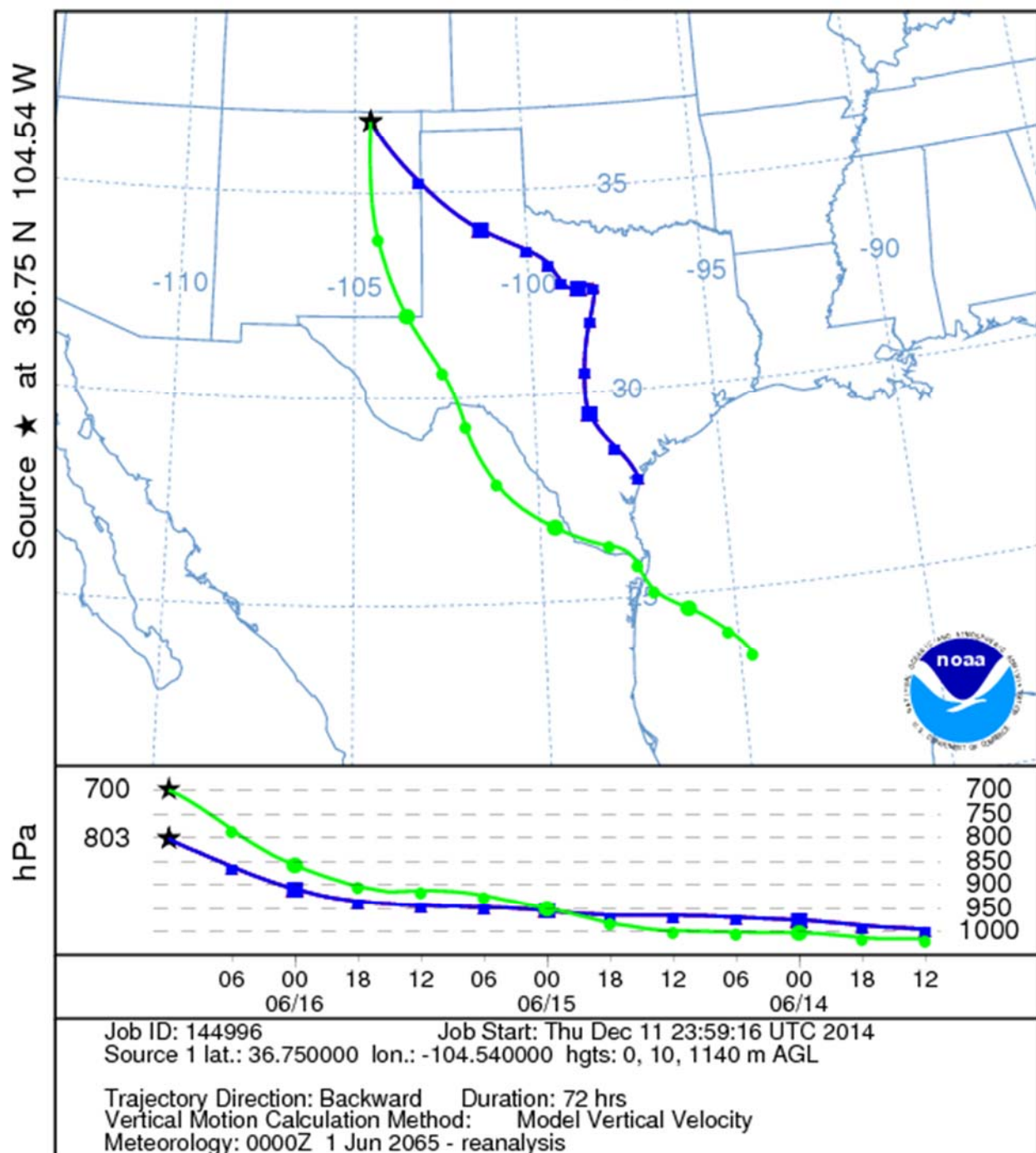
Stations

Hourly
Hourly Estimated
Hourly Est. Pseudo
Hourly Pseudo
Daily
Supplemental
Supplemental Est.

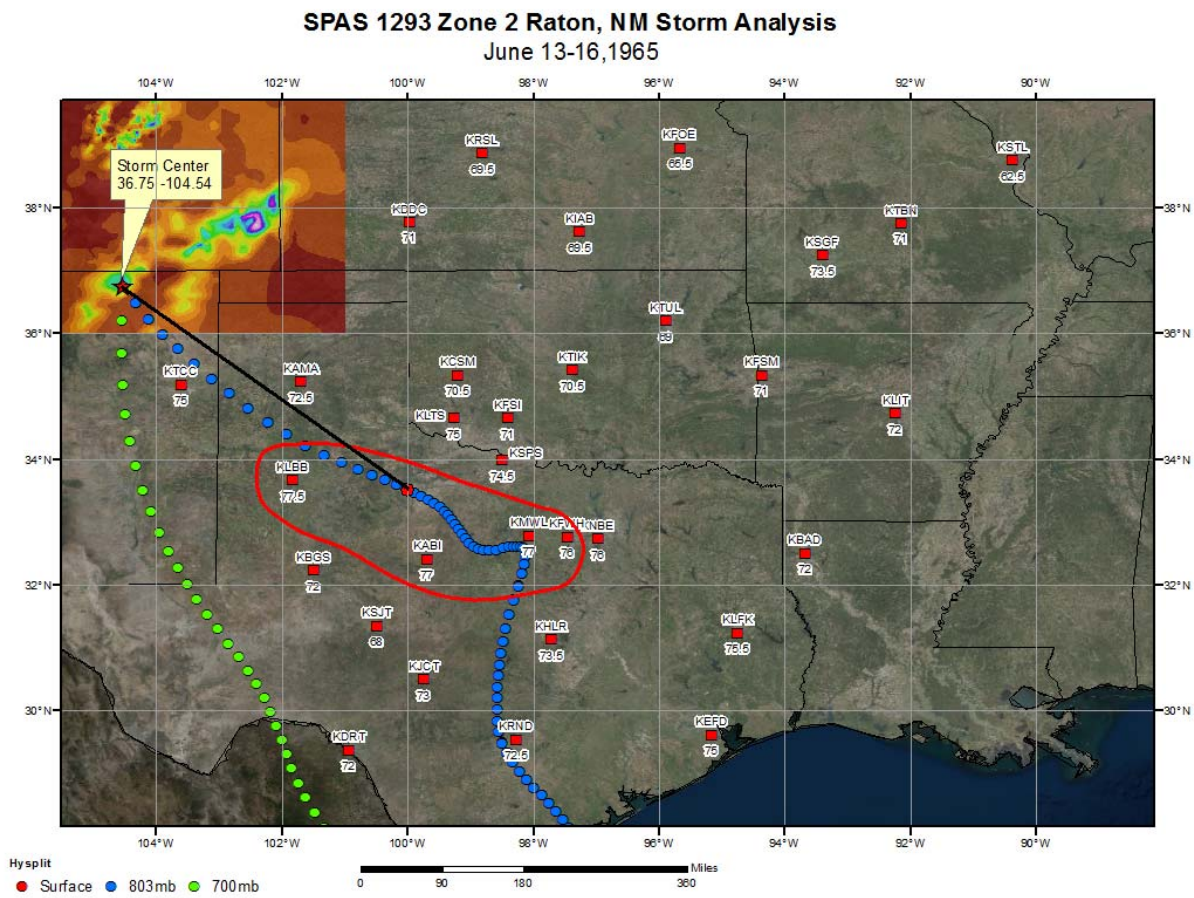


08/20/2013 (updated 12/01/13)

NOAA HYSPLIT MODEL
Backward trajectories ending at 1200 UTC 16 Jun 65
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study



Elbert, CO

June 14-19, 1965

Storm Type: Local/Hybrid

Storm Precipitation Analysis System (SPAS) For Storm #1293_3 (Re-Run of SPAS #1009)

General Storm Location: Southeastern Colorado, extreme northeastern New Mexico and extreme eastern Kansas.

Storm Dates: June 14 – 19, 1965

Event: Thunderstorms and possible Mesoscale Convective Complex (MCC)

DAD Zone 3 (South of Denver, CO – Elbert, eastern El Paso, Teller, western Adams & eastern Arapahoe Counties)

Latitude: 39.1875

Longitude: -104.29583

Max. Grid Rainfall Amount: 16.28”

Max. Observed Rainfall Amount: 14.00”

Number of Stations: 414

SPAS Version: 9.5

Base Map Used: Modified USGS total precipitation map for the period June 13-20, 1965

Radar Included: No

Depth-Area-Duration (DAD) analysis: 1, 2, 3, 4, 5, 6, 12, 18, 24, 36, 48, 72, 96, 120, & 144 hr

Confidence in results: For reasons described below, the results of this analysis are markedly different than SPAS 1009, but are believed to be more accurate. A comprehensive bucket survey provides us with a moderate degree of confidence in the magnitudes; however exact storm patterns have a high degree of uncertainty. The temporal distributions are anchored on good, but sparse hourly data, therefore confidence is lower than normal with the timing.

Comments:

- This analysis was a re-analysis of SPAS #1009. Since then, several software enhancements have taken place. Plus, a large amount of additional data (Bucket Survey) was added, mainly to address the western storm centers (southeast of Denver). Also, a USGS isohyetal map was used as the basemap, which injected a great deal of information into the analysis versus the #1009 analysis. For these reasons, the results of this analysis are different than 1009, but are believed to be more accurate.
- 251 Bucket Survey amounts were added from the Colorado Climatological Data. After QC, a total of 224 remained in the data set.

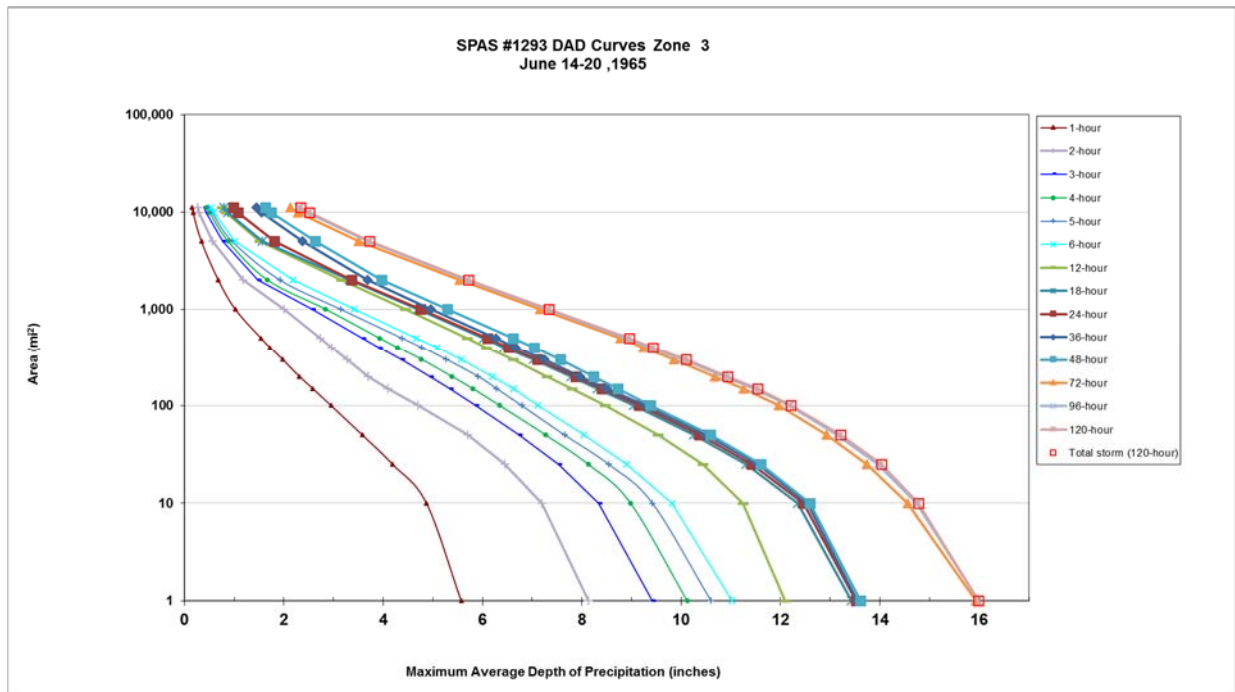
Unlike SPAS #1009 where the storm center was near Holly, SPAS #1293 has the storm center about 30 miles southwest of Holly (or 28 miles south –southeast of Lamar, CO). The USGS

CO-NM Regional Extreme Precipitation Study

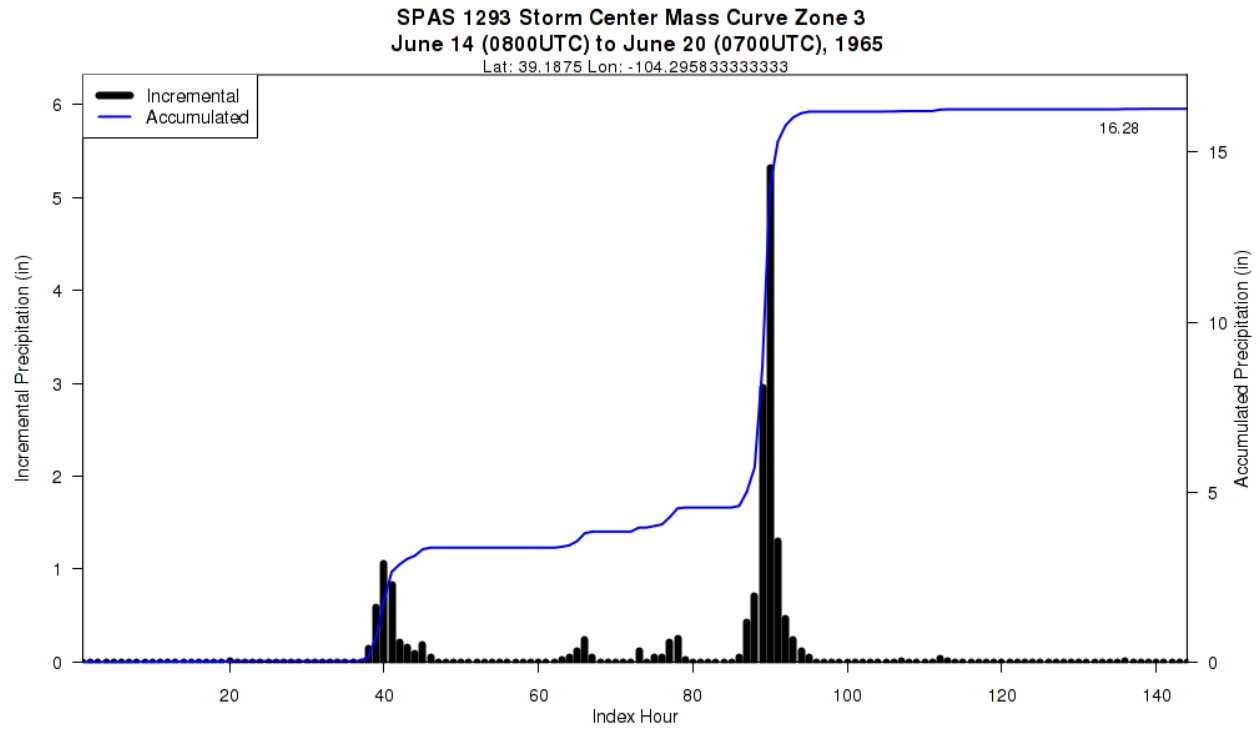
report stated intense rains began on June 16th in this area and dropped 15.5” of rain. Coupled with other rain showers during the June 14-19th period, the total storm center rainfall rose to 18” for the 144-hour period. Two Buttes, the closest hourly “station,” was based on a mass curve published in the USGS report (shown below). The USGS mass curve for Two Buttes looked to be estimated, so the final timing was also influenced by surrounding true hourly stations.

CO-NM Regional Extreme Precipitation Study

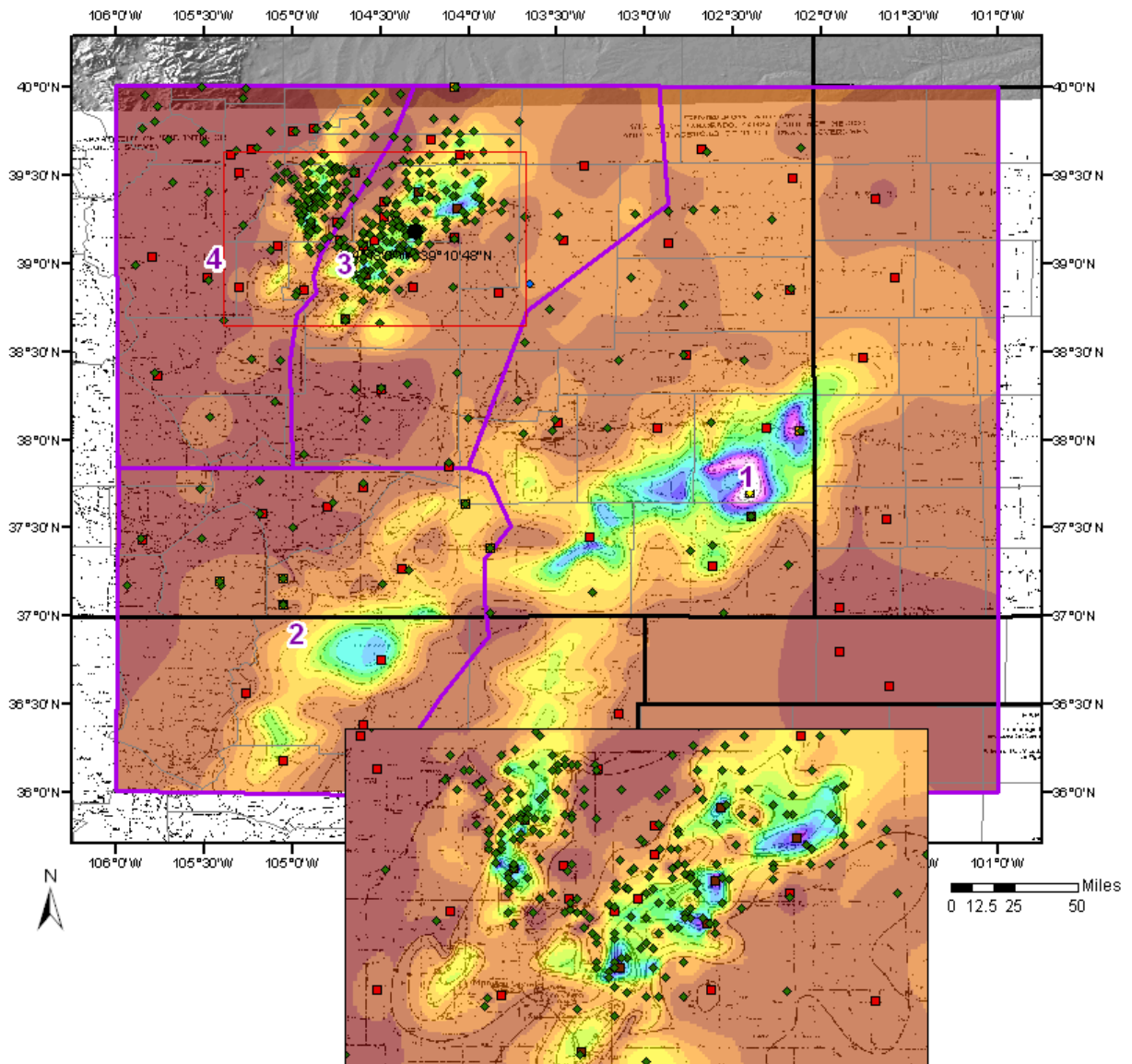
SPAS 1293 - June 14 (800 UTC) - June 20 (700 UTC), 1965															
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)															
Area (mi ²)	Duration (hours)														
	1	2	3	4	5	6	12	18	24	36	48	72	96	120	Total
0.4	5.65	8.23	9.53	10.24	10.71	11.14	12.25	13.61	13.71	13.73	13.76	16.1	16.16	16.17	16.17
1	5.57	8.13	9.42	10.12	10.6	11.02	12.09	13.43	13.52	13.54	13.61	15.93	15.99	15.99	15.99
10	4.87	7.19	8.34	8.98	9.42	9.81	11.24	12.35	12.46	12.54	12.59	14.56	14.74	14.78	14.78
25	4.19	6.45	7.53	8.13	8.54	8.9	10.43	11.3	11.42	11.54	11.6	13.74	13.96	14.03	14.03
50	3.58	5.7	6.73	7.27	7.65	8.04	9.53	10.25	10.37	10.48	10.59	12.92	13.13	13.21	13.21
100	2.95	4.7	5.86	6.35	6.79	7.12	8.47	9.05	9.16	9.27	9.38	11.96	12.17	12.21	12.21
150	2.58	4.09	5.34	5.8	6.28	6.63	7.8	8.31	8.4	8.51	8.72	11.25	11.46	11.54	11.54
200	2.31	3.7	4.95	5.38	5.91	6.21	7.3	7.78	7.87	7.96	8.24	10.68	10.86	10.93	10.93
300	1.97	3.27	4.37	4.77	5.27	5.57	6.62	7.02	7.1	7.24	7.56	9.86	10.02	10.1	10.10
400	1.72	2.97	3.91	4.29	4.78	5.09	6.08	6.44	6.52	6.67	7.04	9.24	9.37	9.43	9.43
500	1.54	2.73	3.58	3.93	4.38	4.66	5.69	6.03	6.1	6.27	6.62	8.78	8.89	8.95	8.95
1,000	1.02	2	2.57	2.84	3.14	3.41	4.44	4.7	4.75	4.96	5.29	7.15	7.29	7.33	7.33
2,000	0.68	1.18	1.48	1.67	1.92	2.18	3.16	3.33	3.36	3.68	3.97	5.53	5.68	5.71	5.71
5,000	0.34	0.56	0.77	0.88	0.96	1.01	1.51	1.57	1.81	2.37	2.63	3.5	3.69	3.72	3.72
10,000	0.17	0.29	0.43	0.5	0.55	0.59	0.83	0.87	1.07	1.55	1.75	2.29	2.47	2.52	2.52
11,201	0.15	0.26	0.39	0.45	0.49	0.54	0.75	0.79	0.98	1.45	1.63	2.13	2.3	2.34	2.34



CO-NM Regional Extreme Precipitation Study

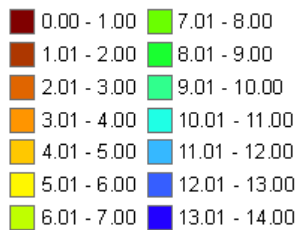


CO-NM Regional Extreme Precipitation Study

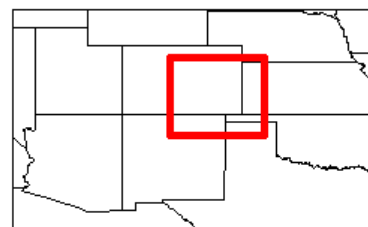
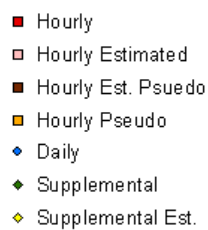


Total 144-hour Precipitation (inches)
06/14/1965 08 UTC - 06/20/1965 07 UTC
SPAS #1293

Precipitation (inches)

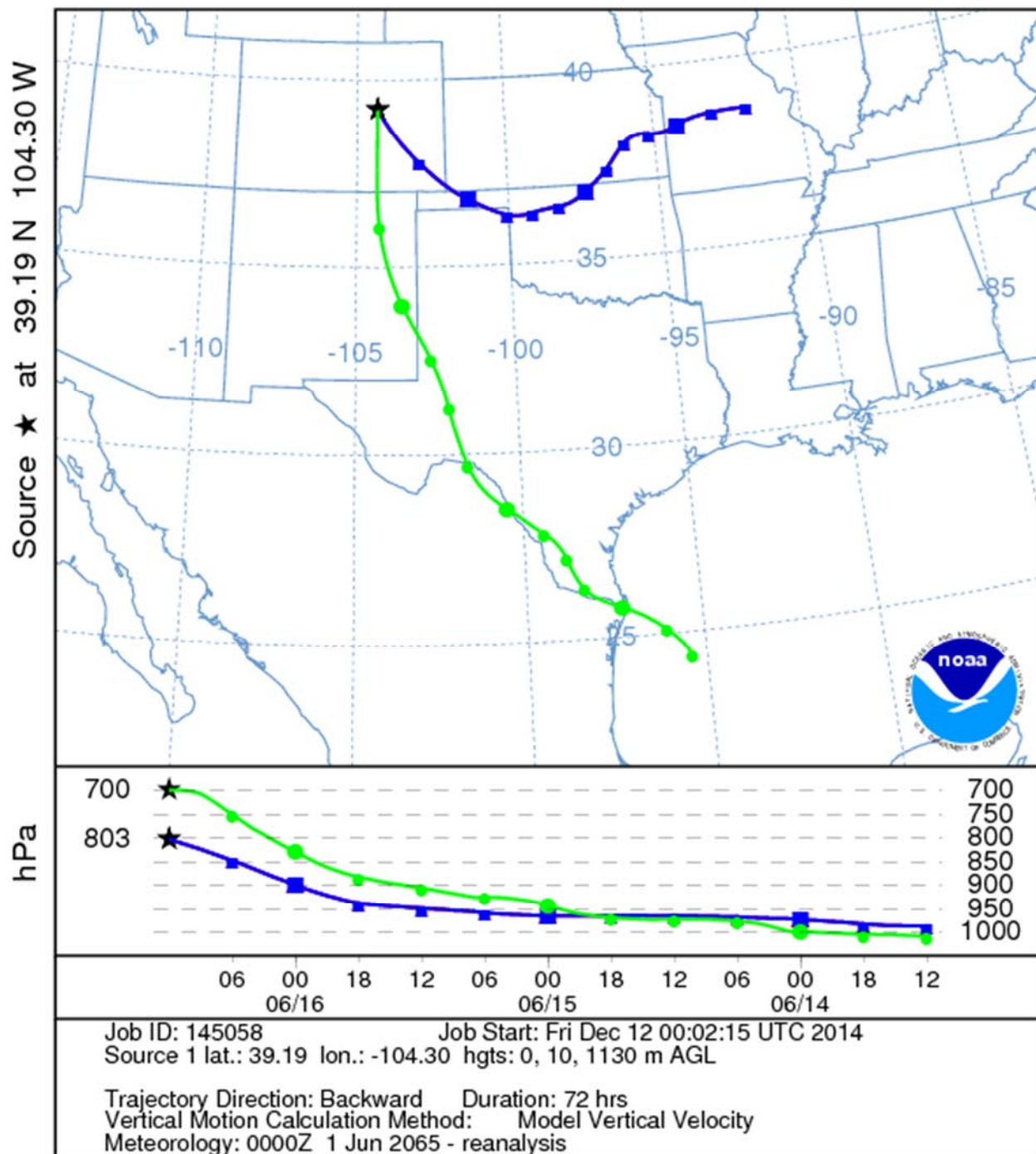


Stations

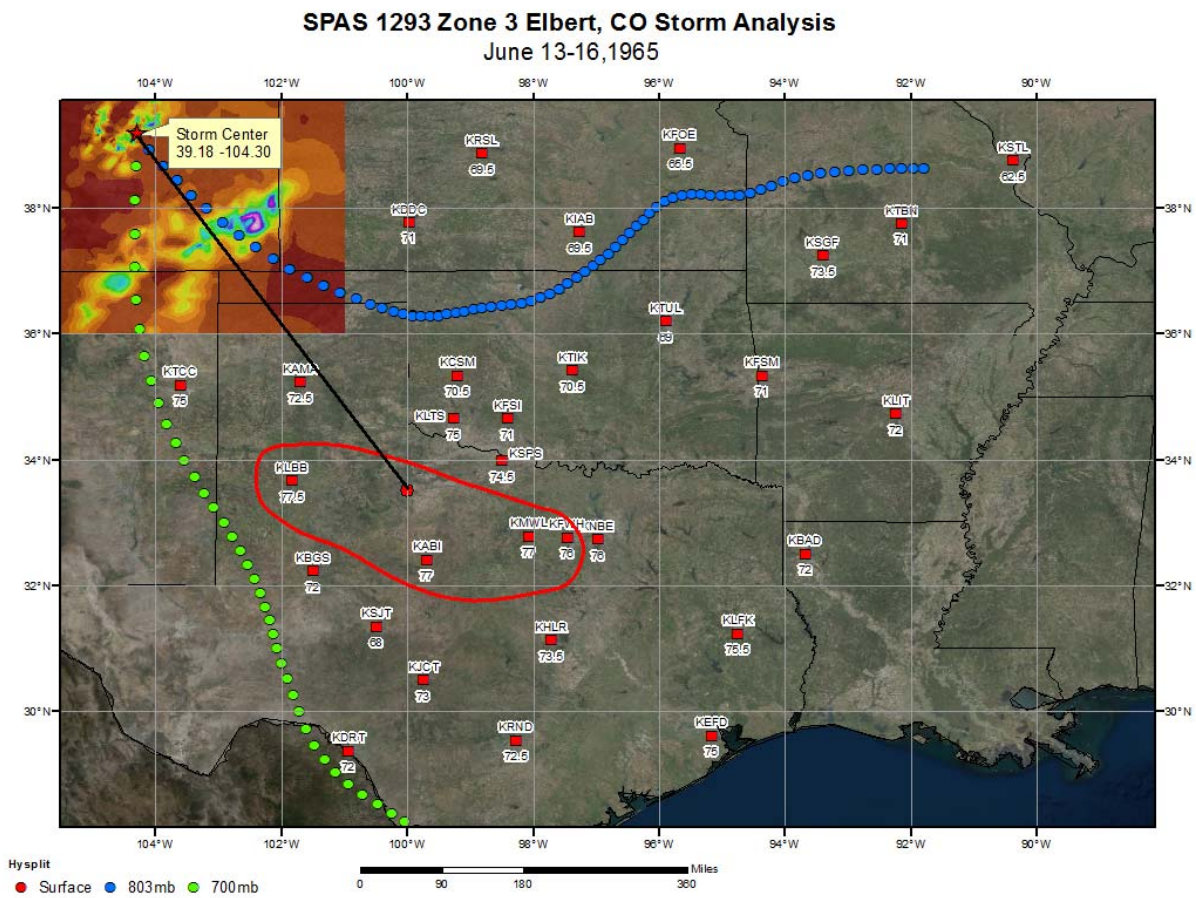


08/20/2013 (updated 12/9/13)

NOAA HYSPLIT MODEL
Backward trajectories ending at 1200 UTC 16 Jun 65
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study



Plum Creek, CO

June 14-19, 1965

Storm Type: Local/Hybrid

Storm Precipitation Analysis System (SPAS) For Storm #1293_4 (Re-Run of SPAS #1009)

General Storm Location: Southeastern Colorado, extreme northeastern New Mexico and extreme eastern Kansas.

Storm Dates: June 14 – 19, 1965

Event: Thunderstorms and possible Mesoscale Convective Complex (MCC)

DAD Zone 4 (Southeast of Denver, CO – Douglas, western El Paso, eastern Adams, eastern Arapahoe Counties)

Latitude: 39.2208

Longitude: -104.8958

Max. Grid Rainfall Amount: 14.25"

Max. Observed Rainfall Amount: 12.30"

Number of Stations: 414

SPAS Version: 9.5

Base Map Used: Modified USGS total precipitation map for the period June 13-20, 1965

Radar Included: No

Depth-Area-Duration (DAD) analysis: 1, 2, 3, 4, 5, 6, 12, 18, 24, 36, 48, 72, 96, 120, & 144 hr

Confidence in results: For reasons described below, the results of this analysis are markedly different than SPAS 1009, but are believed to be more accurate. A comprehensive bucket survey provides us with a moderate degree of confidence in the magnitudes; however exact storm patterns have a high degree of uncertainty. The temporal distributions are anchored on good, but sparse hourly data, therefore confidence is lower than normal with the timing.

Comments:

- This analysis was a re-analysis of SPAS #1009. Since then, several software enhancements have taken place. Plus, a large amount of additional data (Bucket Survey) was added, mainly to address the western storm centers (southeast of Denver). Also, a USGS isohyetal map was used as the basemap, which injected a great deal of information into the analysis versus the #1009 analysis. For these reasons, the results of this analysis are different than 1009, but are believed to be more accurate.
- 251 Bucket Survey amounts were added from the Colorado Climatological Data. After QC, a total of 224 remained in the data set.

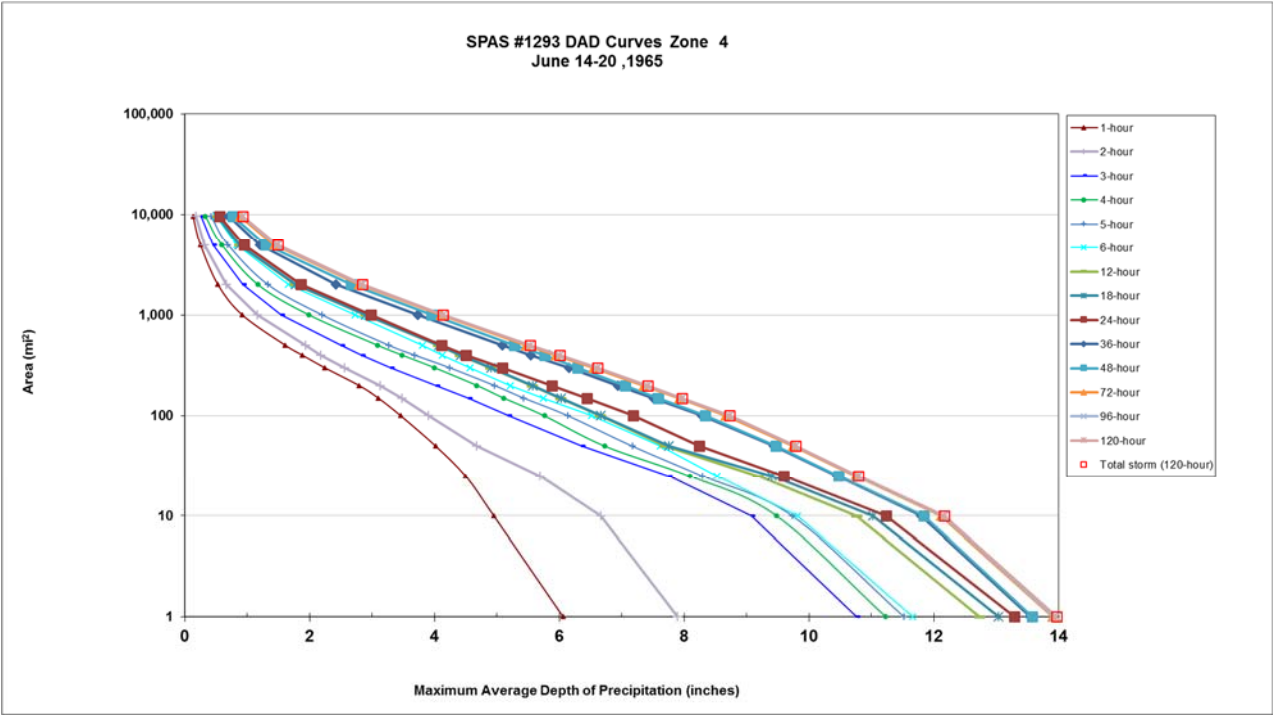
Unlike SPAS #1009 where the storm center was near Holly, SPAS #1293 has the storm center about 30 miles southwest of Holly (or 28 miles south –southeast of Lamar, CO). The USGS

CO-NM Regional Extreme Precipitation Study

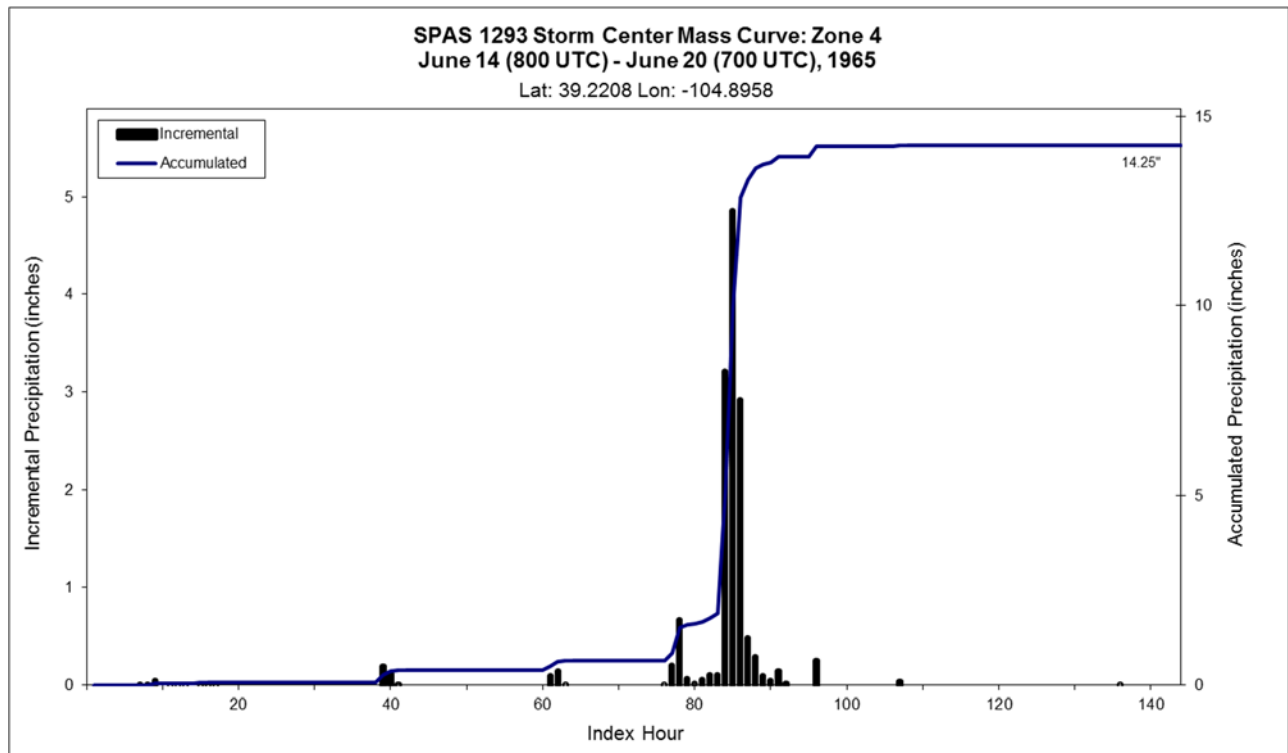
report stated intense rains began on June 16th in this area and dropped 15.5” of rain. Coupled with other rain showers during the June 14-19th period, the total storm center rainfall rose to 18” for the 144-hour period. Two Buttes, the closest hourly “station,” was based on a mass curve published in the USGS report (shown below). The USGS mass curve for Two Buttes looked to be estimated, so the final timing was also influenced by surrounding true hourly stations.

CO-NM Regional Extreme Precipitation Study

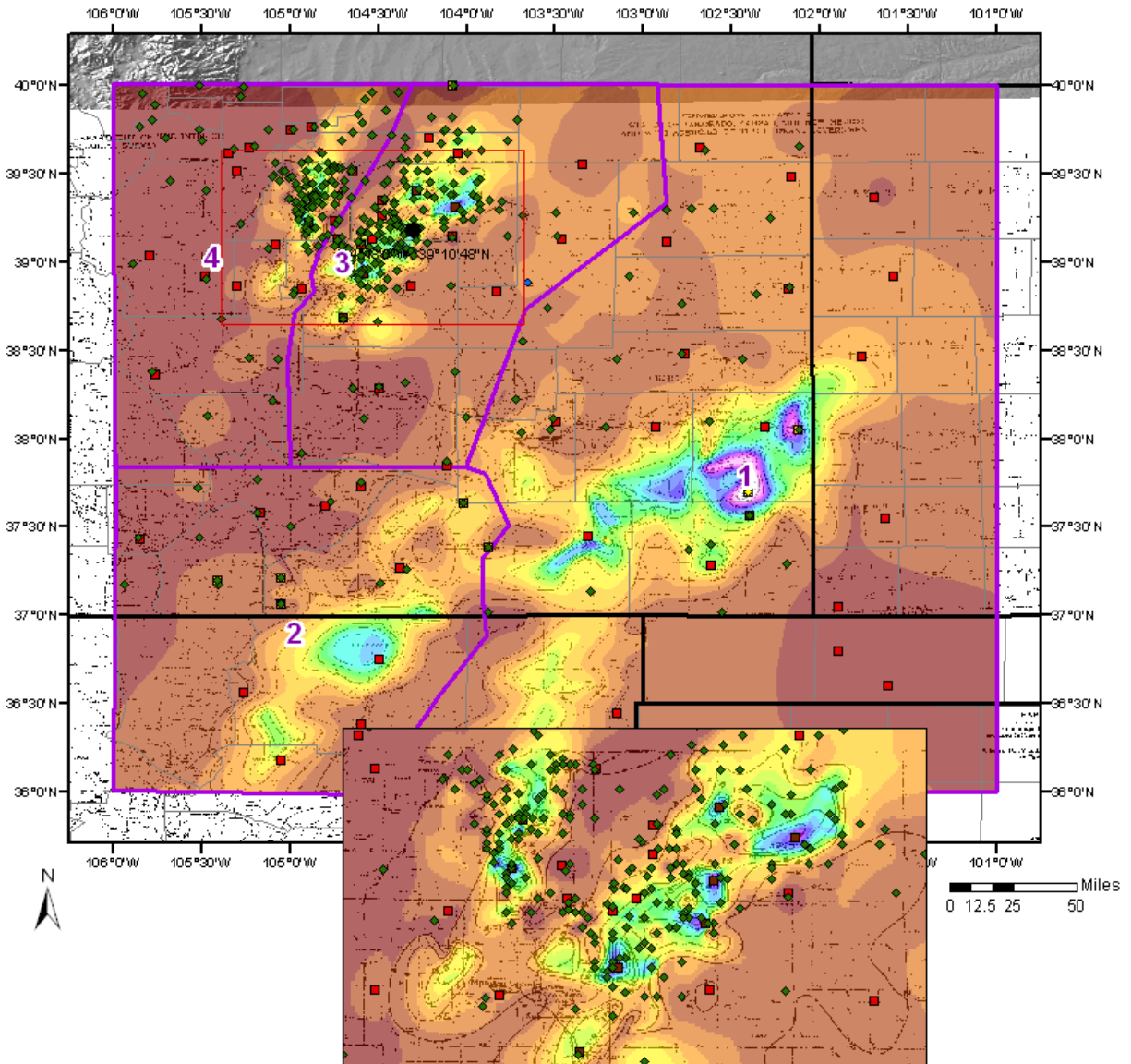
SPAS 1293 - June 14 (800 UTC) - June 20 (700 UTC), 1965															
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)															
Area (mi ²)	Duration (hours)														
	1	2	3	4	5	6	12	18	24	36	48	72	96	120	Total
0.4	6.11	8.03	10.91	11.39	11.68	11.81	12.9	13.24	13.47	13.72	13.77	14.09	14.11	14.16	13.97
1.0	6.06	7.89	10.76	11.23	11.52	11.66	12.73	13.04	13.29	13.54	13.58	13.9	13.93	13.97	13.97
10.0	4.95	6.67	9.08	9.48	9.73	9.82	10.76	11.03	11.24	11.8	11.84	12.12	12.15	12.17	12.17
25.0	4.5	5.69	7.75	8.09	8.3	8.53	9.18	9.41	9.6	10.45	10.48	10.75	10.77	10.79	10.79
50.0	4.02	4.67	6.36	6.73	7.17	7.62	7.69	7.76	8.24	9.44	9.47	9.74	9.78	9.79	9.79
100.0	3.46	3.9	5.18	5.76	6.14	6.52	6.65	6.66	7.18	8.28	8.34	8.67	8.72	8.73	8.73
150.0	3.1	3.48	4.55	5.11	5.43	5.74	6.02	6.03	6.44	7.51	7.59	7.92	7.96	7.97	7.97
200.0	2.79	3.13	4.03	4.68	4.96	5.21	5.56	5.57	5.88	6.94	7.06	7.35	7.41	7.42	7.42
300.0	2.24	2.56	3.3	4	4.24	4.57	4.9	4.91	5.09	6.16	6.29	6.55	6.6	6.61	6.61
400.0	1.88	2.18	2.83	3.48	3.68	4.12	4.41	4.42	4.51	5.54	5.76	5.94	6	6.01	6.01
500.0	1.61	1.93	2.51	3.09	3.27	3.81	4.06	4.07	4.11	5.09	5.28	5.47	5.52	5.53	5.53
1,000.0	0.92	1.16	1.54	1.99	2.2	2.73	2.9	2.9	2.98	3.73	3.96	4.1	4.14	4.14	4.14
2,000.0	0.53	0.66	0.93	1.17	1.33	1.66	1.76	1.77	1.86	2.42	2.66	2.79	2.82	2.84	2.84
5,000.0	0.25	0.31	0.45	0.59	0.69	0.83	0.88	0.88	0.95	1.2	1.3	1.44	1.47	1.49	1.49
9,695.0	0.13	0.18	0.26	0.33	0.42	0.5	0.53	0.53	0.56	0.71	0.77	0.89	0.92	0.93	0.93



CO-NM Regional Extreme Precipitation Study

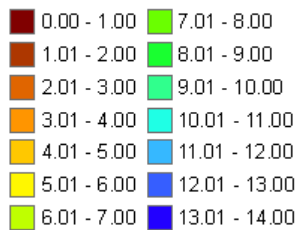


CO-NM Regional Extreme Precipitation Study

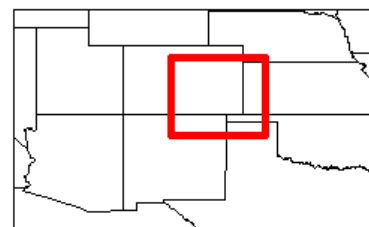
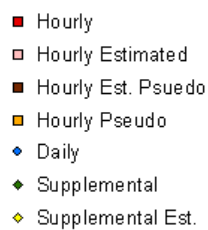


Total 144-hour Precipitation (inches)
06/14/1965 08 UTC - 06/20/1965 07 UTC
SPAS #1293

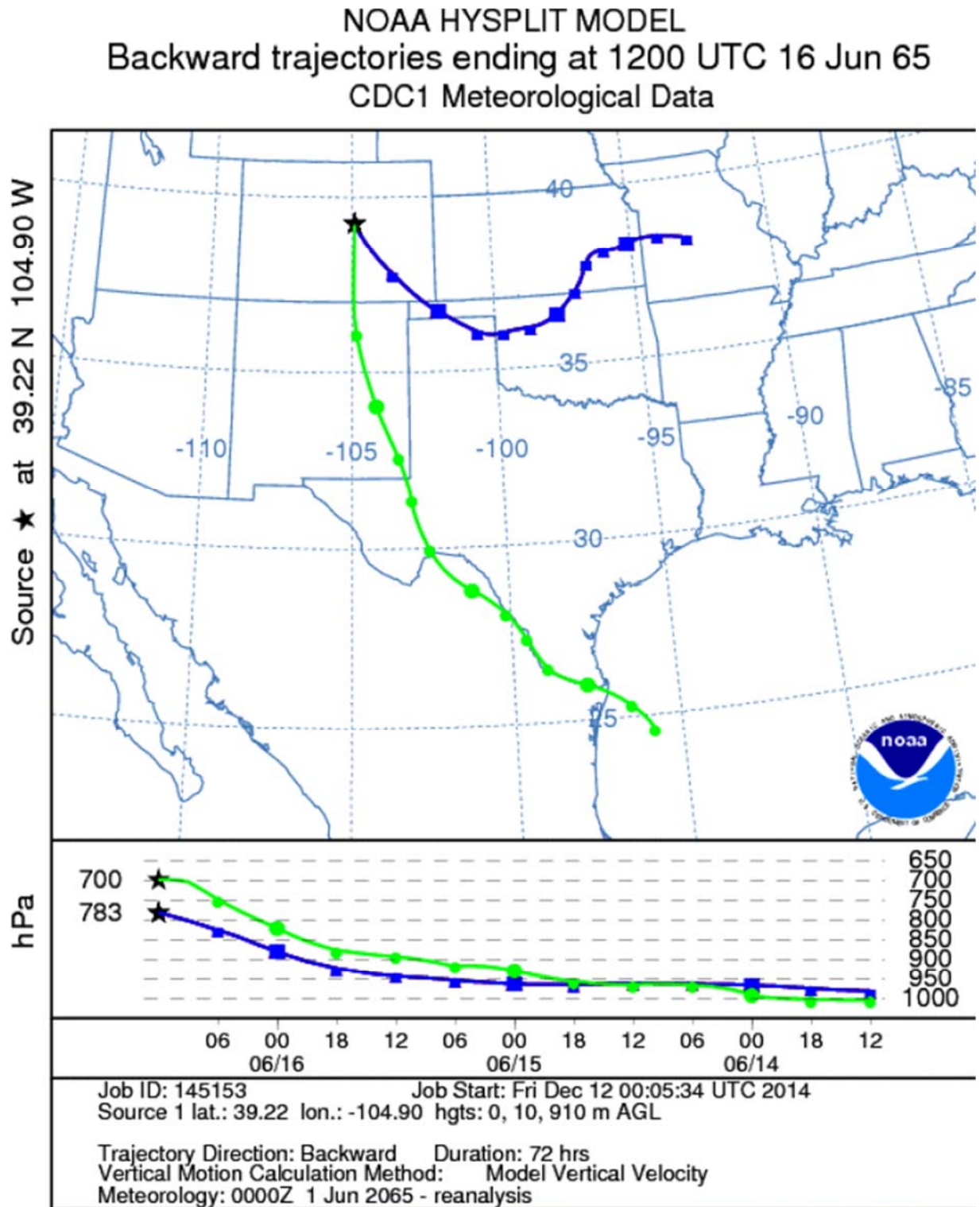
Precipitation (inches)



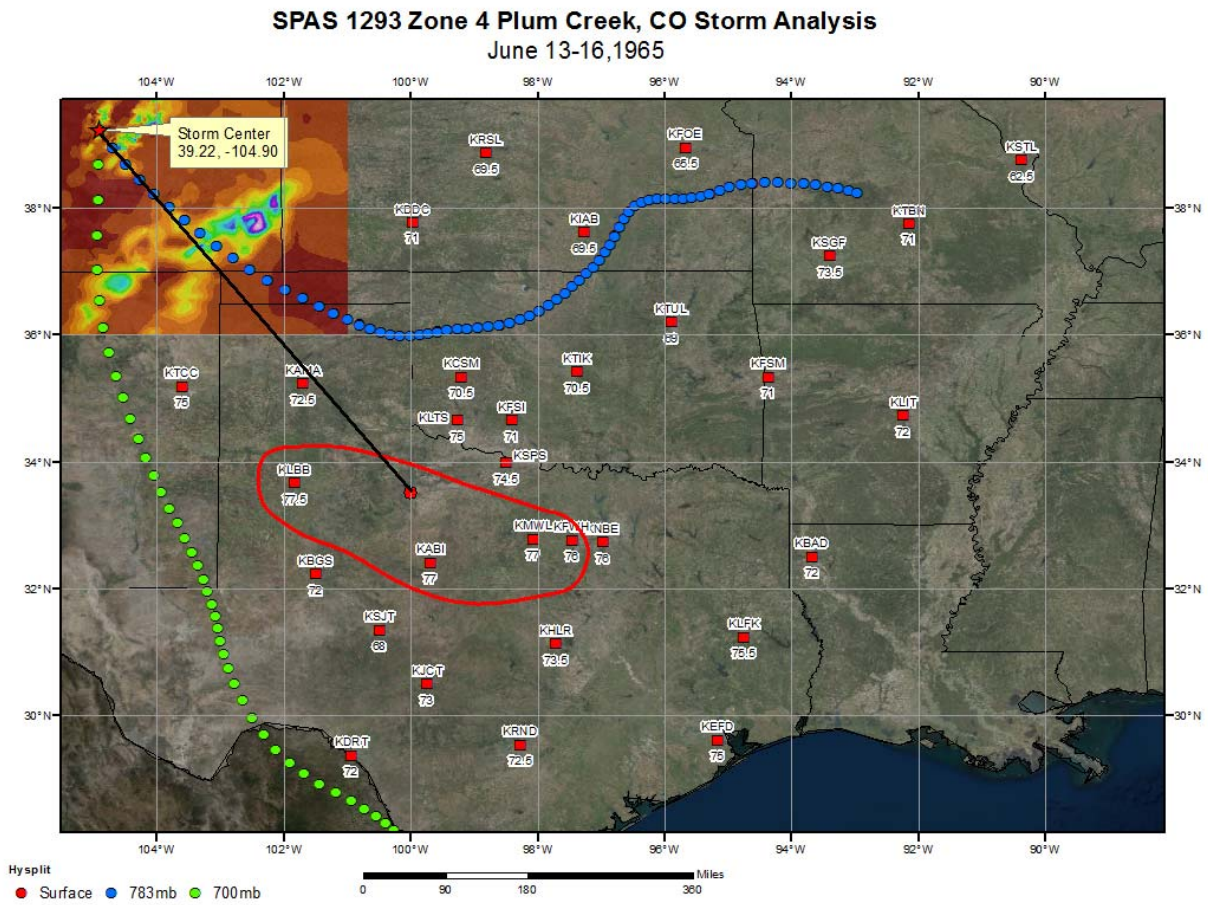
Stations



08/20/2013 (updated 12/9/13)



CO-NM Regional Extreme Precipitation Study



Carlsbad, NM
August 21-24, 1966
Storm Type: Local/Hybrid

Storm Precipitation Analysis System (SPAS) For Storm #1568_1

General Storm Location: Southeastern New Mexico/Southwestern Texas (33.25,-106.5,30.0,-103.25)

Storm Dates: August 21-24, 1966

Event: Synoptic

DAD Zone 1

Latitude: 32.2542

Longitude: -104.6125

Max. Grid Rainfall Amount: 17.35" Carlsbad, NM

Max. Observed Rainfall Amount: 17.00"

Number of Stations: 64

SPAS Version: 10.0

Basemap: Blended Basemap of PRISM Mean August 1971-2000 Climatology and USACE Isohyetal Pattern.

Spatial resolution: 0.2819

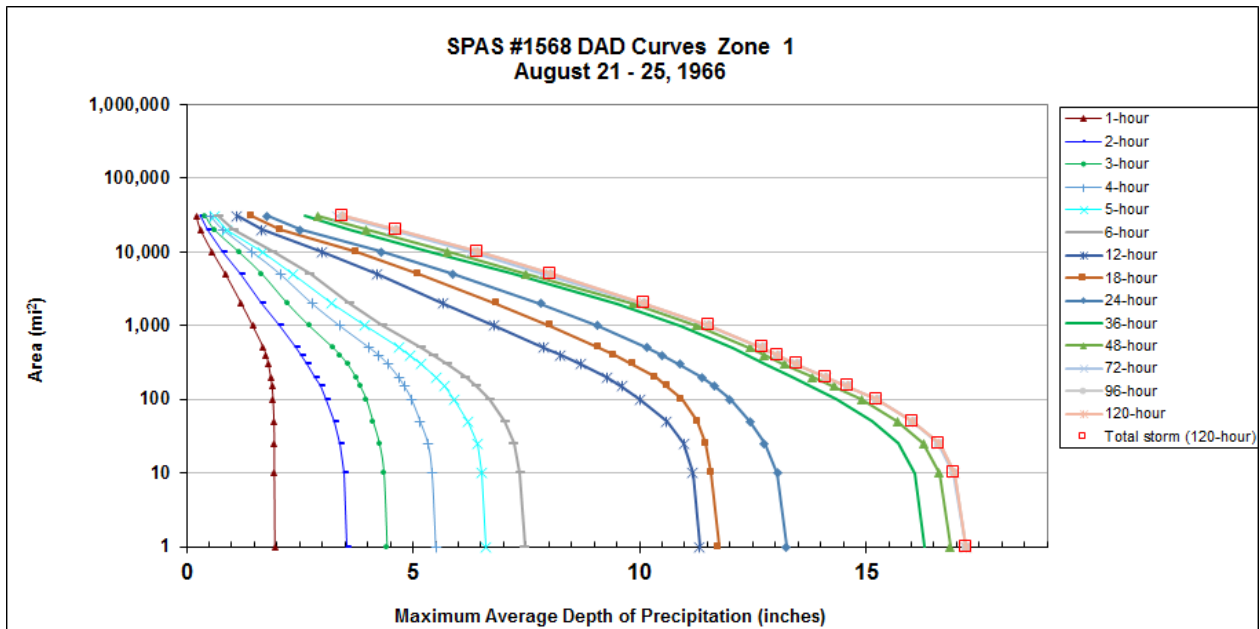
Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

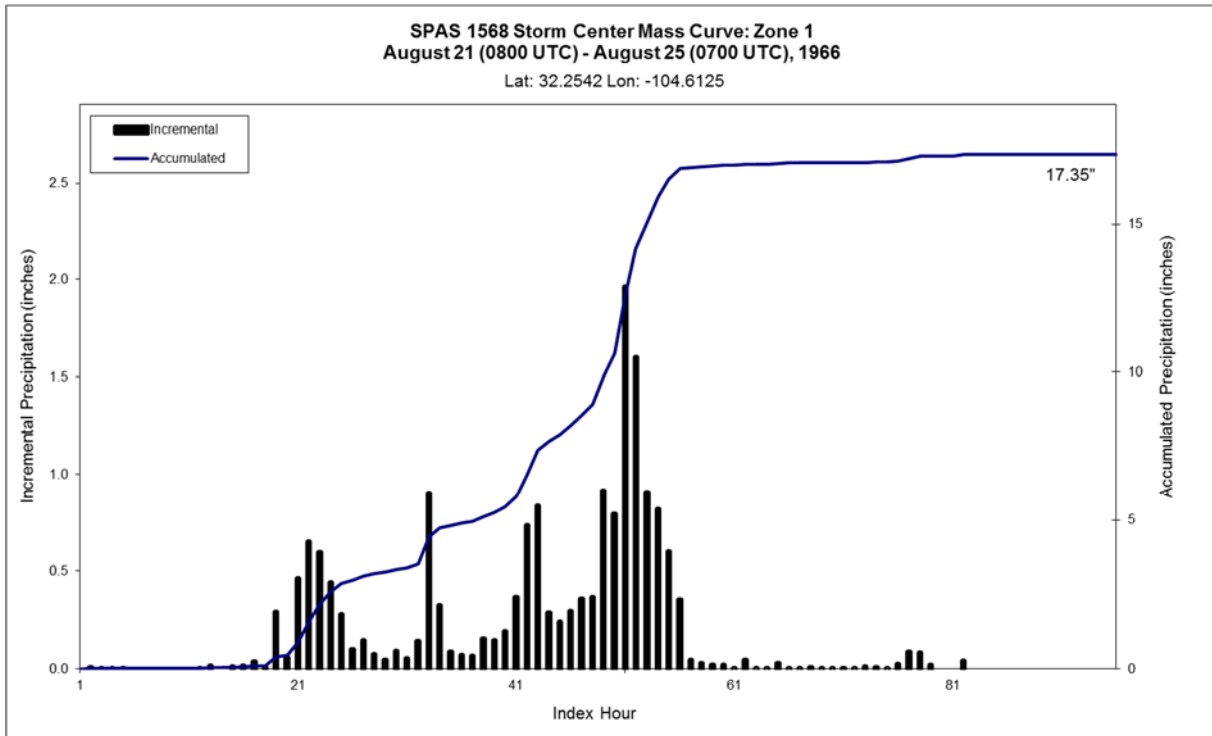
Reliability of results: This analysis was based on hourly data, daily data, and supplemental station data. We have a high degree of confidence in the station based storm total results. The spatial pattern is dependent on the blended basemap, and the timing is based on hourly and hourly pseudo stations. An additional 22 supplemental stations were created to ensure data consistency.

CO-NM Regional Extreme Precipitation Study

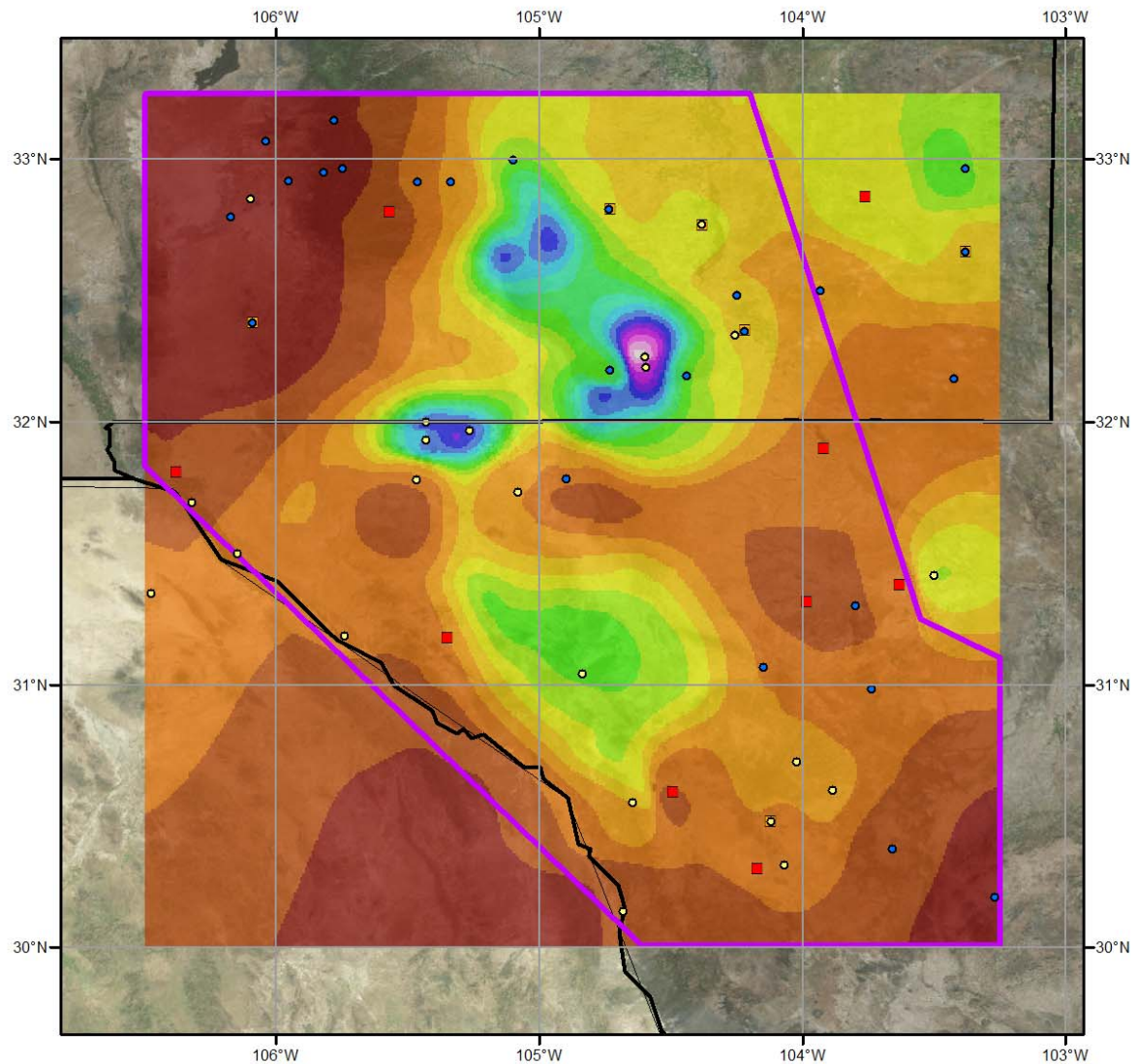
Storm 1568 - August 21 (0800 UTC) - August 25 (0700 UTC), 1966															
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)															
Area (mi ²)	Duration (hours)														
	1	2	3	4	5	6	12	18	24	36	48	72	96	120	Total
0.3	1.96	3.56	4.46	5.53	6.66	7.50	11.40	11.81	13.32	16.38	16.95	17.29	17.31	17.35	17.35
1	1.95	3.53	4.43	5.50	6.62	7.46	11.33	11.75	13.24	16.29	16.85	17.19	17.21	17.21	17.21
10	1.94	3.48	4.36	5.42	6.52	7.36	11.17	11.59	13.05	16.07	16.62	16.94	16.95	16.95	16.95
25	1.94	3.40	4.26	5.33	6.42	7.22	10.97	11.47	12.75	15.70	16.26	16.59	16.61	16.61	16.61
50	1.93	3.27	4.12	5.16	6.22	7.02	10.60	11.28	12.44	15.14	15.69	16.01	16.02	16.02	16.02
100	1.91	3.09	3.97	4.97	5.92	6.69	10.01	10.93	11.99	14.35	14.90	15.21	15.23	15.23	15.23
150	1.89	2.95	3.84	4.81	5.70	6.40	9.61	10.62	11.66	13.80	14.29	14.58	14.59	14.59	14.59
200	1.86	2.84	3.74	4.68	5.51	6.16	9.27	10.36	11.37	13.38	13.82	14.10	14.11	14.11	14.11
300	1.81	2.66	3.56	4.45	5.18	5.77	8.71	9.86	10.88	12.80	13.19	13.45	13.47	13.47	13.47
400	1.76	2.53	3.39	4.24	4.93	5.45	8.26	9.44	10.49	12.38	12.76	13.02	13.04	13.04	13.04
500	1.70	2.41	3.24	4.04	4.68	5.19	7.90	9.11	10.17	12.06	12.43	12.69	12.71	12.71	12.71
1,000	1.46	2.05	2.71	3.38	3.92	4.34	6.80	8.03	9.08	10.90	11.26	11.52	11.54	11.54	11.54
2,000	1.21	1.67	2.23	2.77	3.21	3.61	5.68	6.84	7.81	9.52	9.87	10.10	10.11	10.11	10.11
5,000	0.86	1.21	1.67	2.07	2.37	2.73	4.20	5.12	5.87	7.20	7.48	7.85	8.04	8.04	8.04
10,000	0.57	0.81	1.16	1.45	1.68	1.91	2.99	3.75	4.31	5.36	5.76	6.27	6.44	6.44	6.44
20,000	0.31	0.47	0.62	0.81	0.91	1.04	1.67	2.07	2.51	3.58	3.97	4.50	4.63	4.63	4.63
30,587	0.22	0.31	0.42	0.53	0.62	0.71	1.11	1.44	1.78	2.62	2.90	3.34	3.45	3.45	3.45



CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



Total Storm (96-hours) Precipitation (inches)

August 21-24, 1966

SPAS 1568 - Carlsbad, NM

Gauges

- Daily
- Hourly
- Hourly Pseudo
- Supplemental

0 15 30 60 Miles

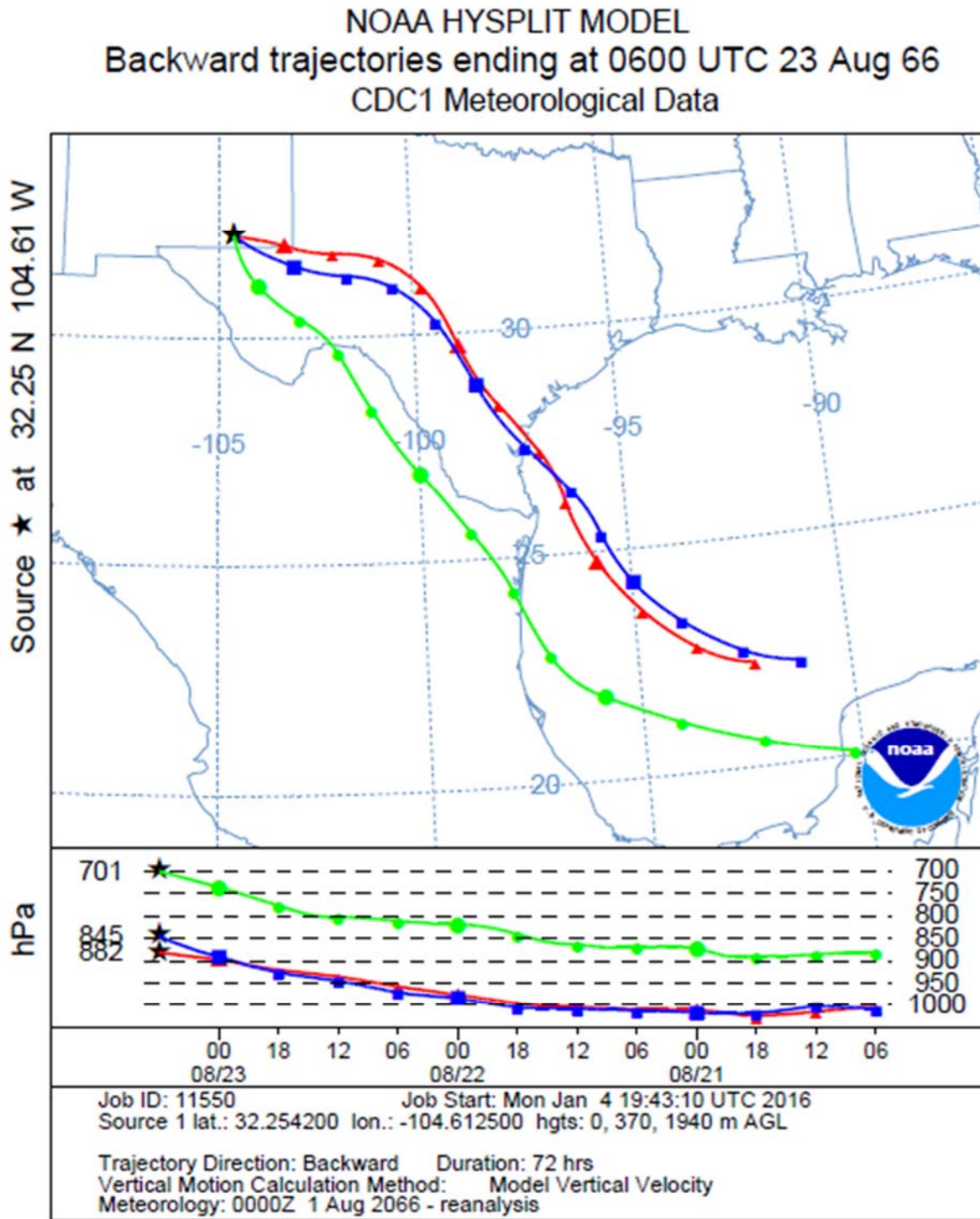
0 30 60 120 Kilometers

Precipitation (inches)

0.00 - 1.00	4.01 - 5.00	9.01 - 10.00	14.01 - 15.00
1.01 - 2.00	5.01 - 6.00	10.01 - 11.00	15.01 - 16.00
2.01 - 3.00	6.01 - 7.00	11.01 - 12.00	16.01 - 17.00
3.01 - 4.00	7.01 - 8.00	12.01 - 13.00	17.01 - 18.00
	8.01 - 9.00	13.01 - 14.00	

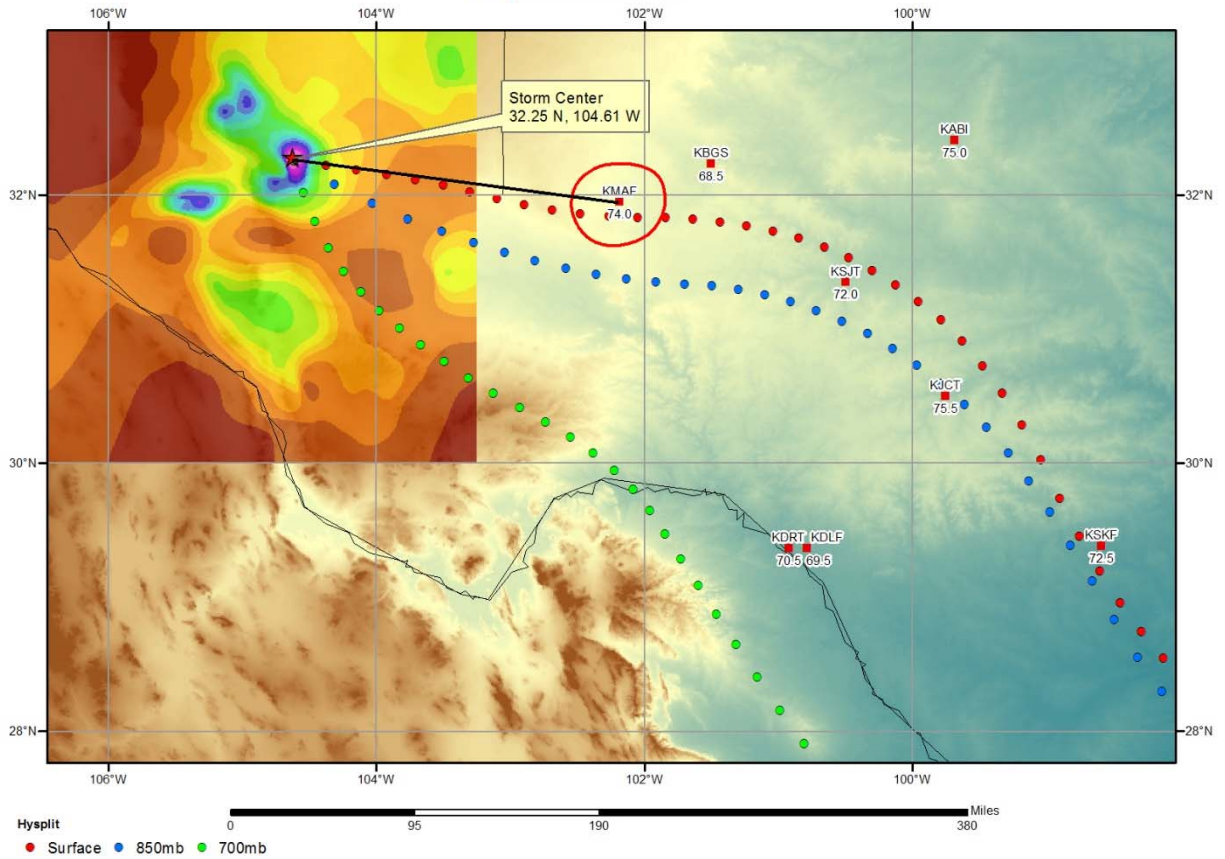


4/3/2015



CO-NM Regional Extreme Precipitation Study

SPAS 1568 Carlsbad, NM Storm Analysis August 20-23, 1966



Grants, NM
September 7-9, 1967
Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1657_1

General Storm Location: Grants, NM

Storm Dates: September 7-9, 1967

Event: Local

DAD Zone 1

Latitude: 35.1875

Longitude: -107.7542

Maximum Grid Precipitation Amount: 4.32"

Maximum Observed Precipitation Amount: 4.00"

Number of Stations: 28

SPAS Version: 10.0

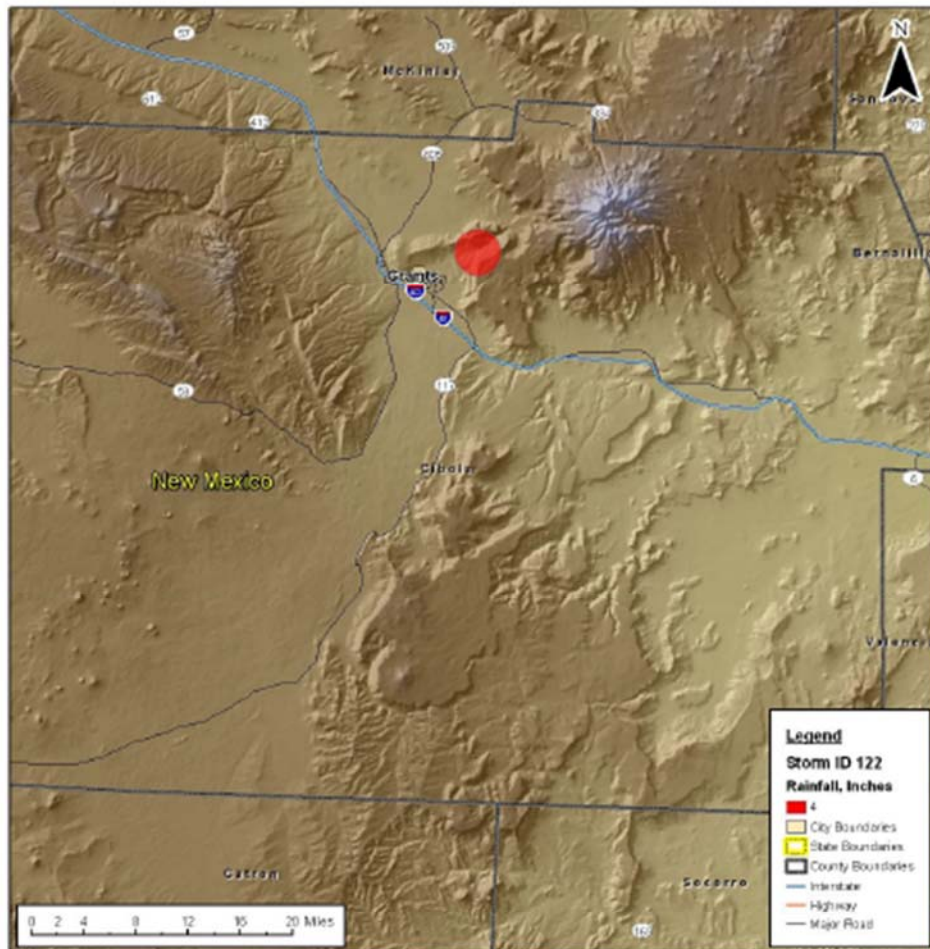
Base Map Used: 1657_isohyetal_sm

Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

Reliability of Results: This analysis was based on 28 hourly stations, daily data, and supplemental station data. We have a good degree of confidence for the station based storm total results. The spatial pattern is fully dependent on the hand-drawn isohyetal basemap that was based off of the surrounding station data, PRISM monthly climatology for September 1967, and nearby terrain. Timing is based on the hourly and hourly pseudo stations, specifically the hourly station at the storm center created from the information in the NM EPAT Report for storm ID 122. Several daily stations were moved to supplemental due to timing issues and to ensure data consistency.

CO-NM Regional Extreme Precipitation Study



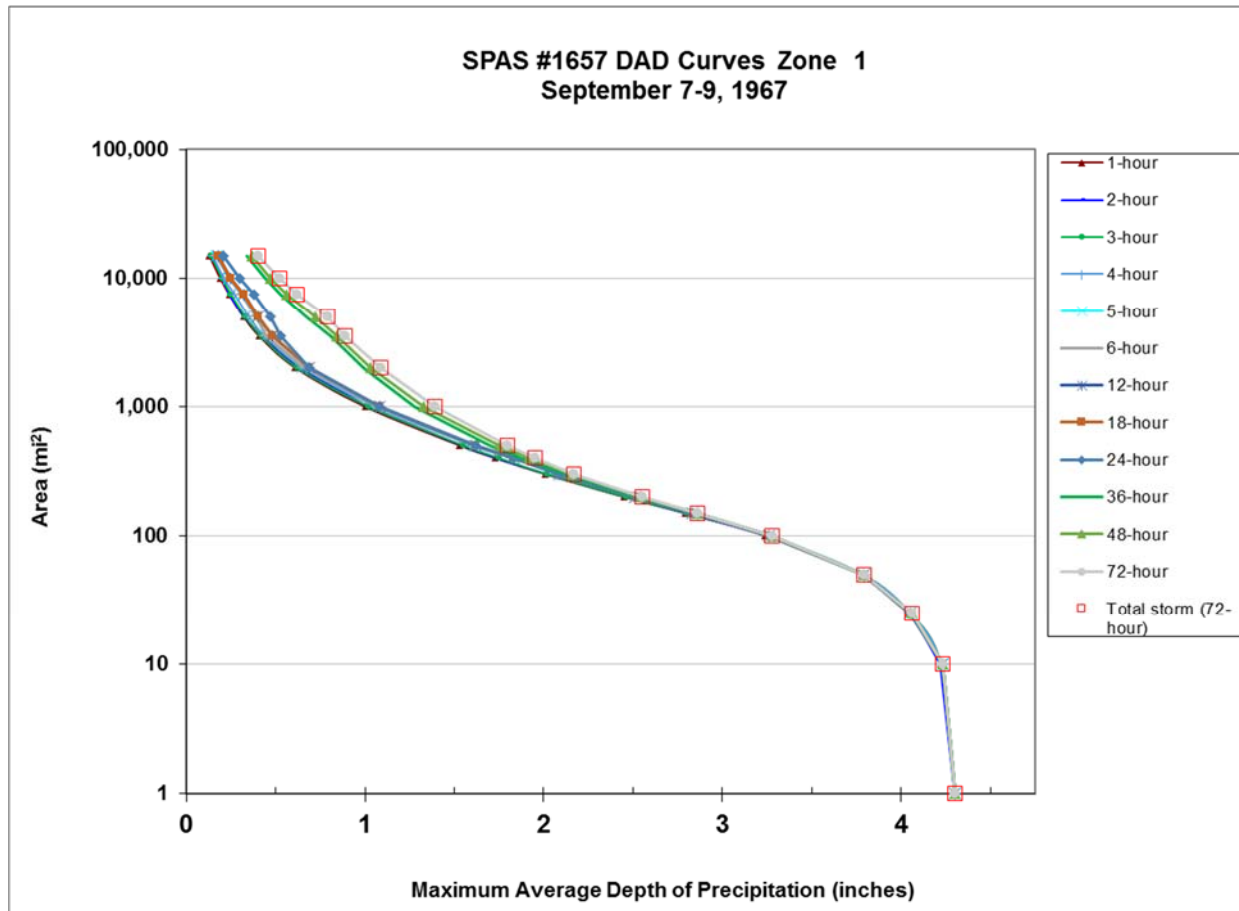
Storm Synopsis and Climate Zone Classification:

Storm ID 122 Climate Zones – 9, 10: The event as IDed by StormData was a very substantial rainfall event. 4" of rain in 1 hour is well in excess of a 1000 year event for this location. No known spatial analysis was found with any agencies. Given storm occurred in subtly sloping terrain feature, it is believed that this storm should be allowed in Zones 9 and 10 given low barrier to Cont. Divide and moisture for a storm of this type.

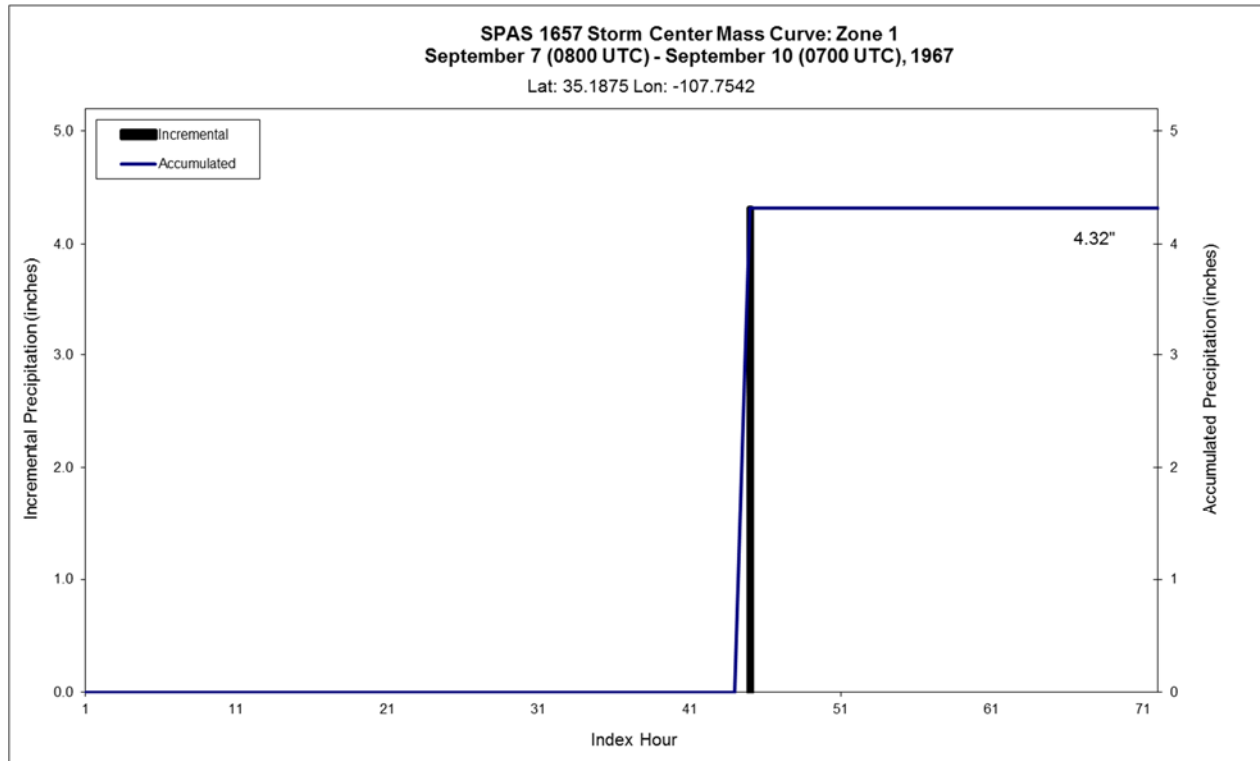
Start Date/End Date	September 8, 1967
Storm Name/Status	Grants - STORM ID 122 / Active
Storm Type	Local Storm – Convective Simple
State/Climate Zone	New Mexico / Climate Zones 9, 10
Duration/Max Precipitation	1 hour / 4"
Originator	COE
Low Level Wind	200 degrees
Upper Level Wind	280 degrees
PWI /1000mb Dewpoint	1.68" / 64F
Storm Source	COE
Temporal	Point rainfall; Observationally-based synthetic

CO-NM Regional Extreme Precipitation Study

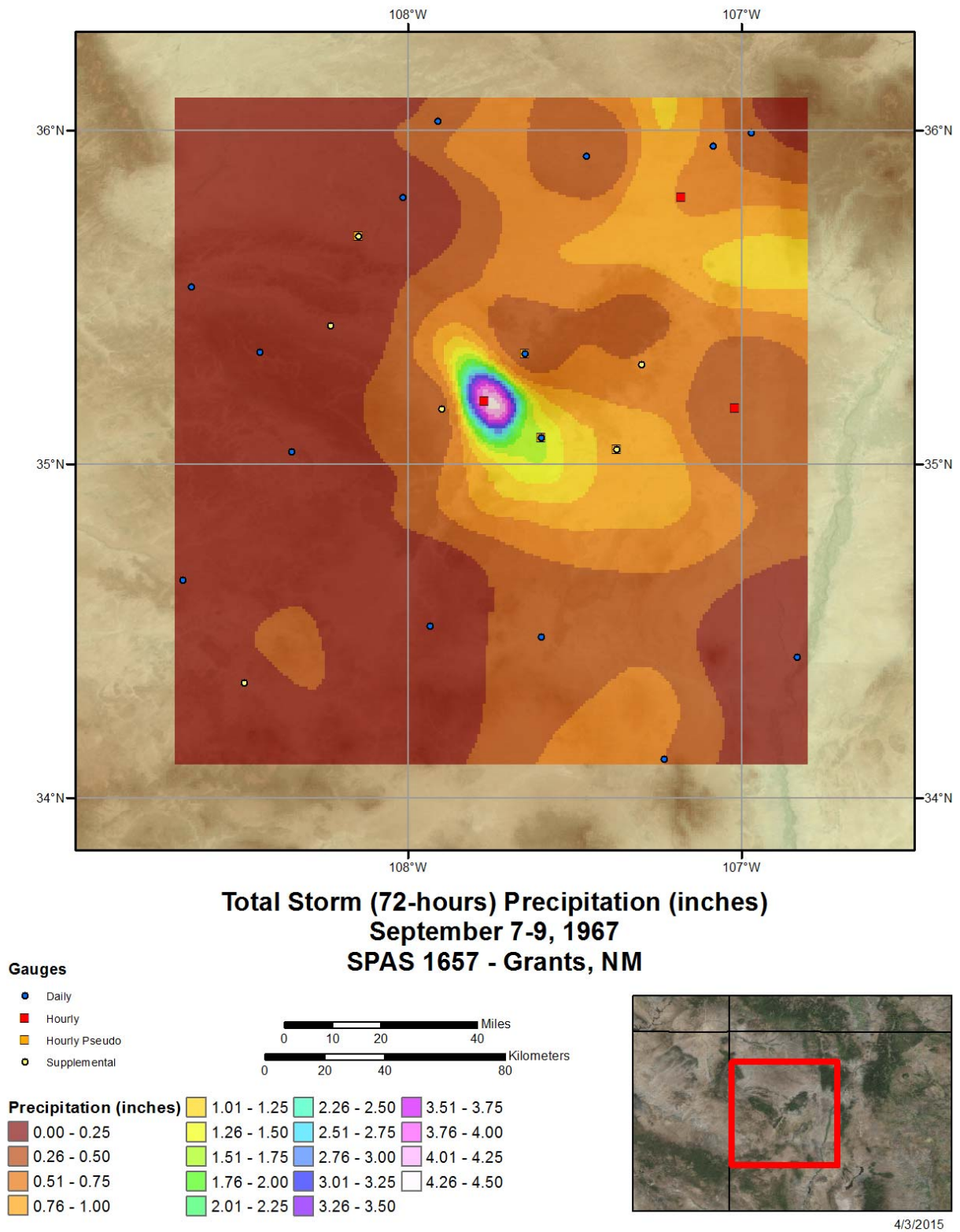
Storm 1657 - September 7 (0800 UTC) - September 10 (0700 UTC), 1967													
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)													
Area (mi ²)	Duration (hours)												
	1	2	3	4	5	6	12	18	24	36	48	72	Total
0.4	4.32	4.32	4.32	4.32	4.32	4.32	4.32	4.32	4.32	4.32	4.32	4.32	4.32
1	4.30	4.30	4.30	4.30	4.30	4.30	4.30	4.30	4.30	4.30	4.30	4.30	4.30
10	4.22	4.22	4.22	4.22	4.23	4.23	4.23	4.23	4.23	4.23	4.23	4.23	4.23
25	4.05	4.05	4.05	4.05	4.05	4.05	4.05	4.05	4.05	4.06	4.06	4.06	4.06
50	3.78	3.78	3.78	3.79	3.79	3.79	3.79	3.79	3.79	3.79	3.79	3.79	3.79
100	3.24	3.25	3.25	3.26	3.26	3.26	3.26	3.26	3.26	3.28	3.28	3.28	3.28
150	2.79	2.79	2.80	2.82	2.83	2.83	2.83	2.83	2.83	2.86	2.86	2.86	2.86
200	2.45	2.45	2.46	2.50	2.51	2.51	2.51	2.51	2.51	2.53	2.54	2.55	2.55
300	2.01	2.01	2.02	2.08	2.09	2.09	2.09	2.09	2.09	2.13	2.16	2.17	2.17
400	1.73	1.74	1.75	1.82	1.83	1.83	1.83	1.83	1.83	1.87	1.92	1.95	1.95
500	1.53	1.54	1.55	1.60	1.61	1.62	1.62	1.62	1.62	1.70	1.75	1.80	1.80
1,000	1.00	1.01	1.02	1.06	1.06	1.07	1.08	1.08	1.08	1.28	1.33	1.39	1.39
2,000	0.61	0.62	0.62	0.65	0.65	0.66	0.69	0.69	0.69	0.99	1.03	1.09	1.09
3,500	0.41	0.42	0.42	0.44	0.45	0.45	0.48	0.48	0.53	0.81	0.84	0.89	0.89
5,000	0.32	0.32	0.33	0.35	0.39	0.39	0.40	0.40	0.47	0.67	0.72	0.79	0.79
7,500	0.24	0.24	0.25	0.27	0.31	0.31	0.32	0.32	0.38	0.53	0.56	0.62	0.62
10,000	0.19	0.20	0.20	0.21	0.24	0.24	0.25	0.25	0.30	0.44	0.47	0.52	0.52
14,840	0.13	0.14	0.14	0.15	0.17	0.17	0.18	0.18	0.21	0.34	0.37	0.40	0.40



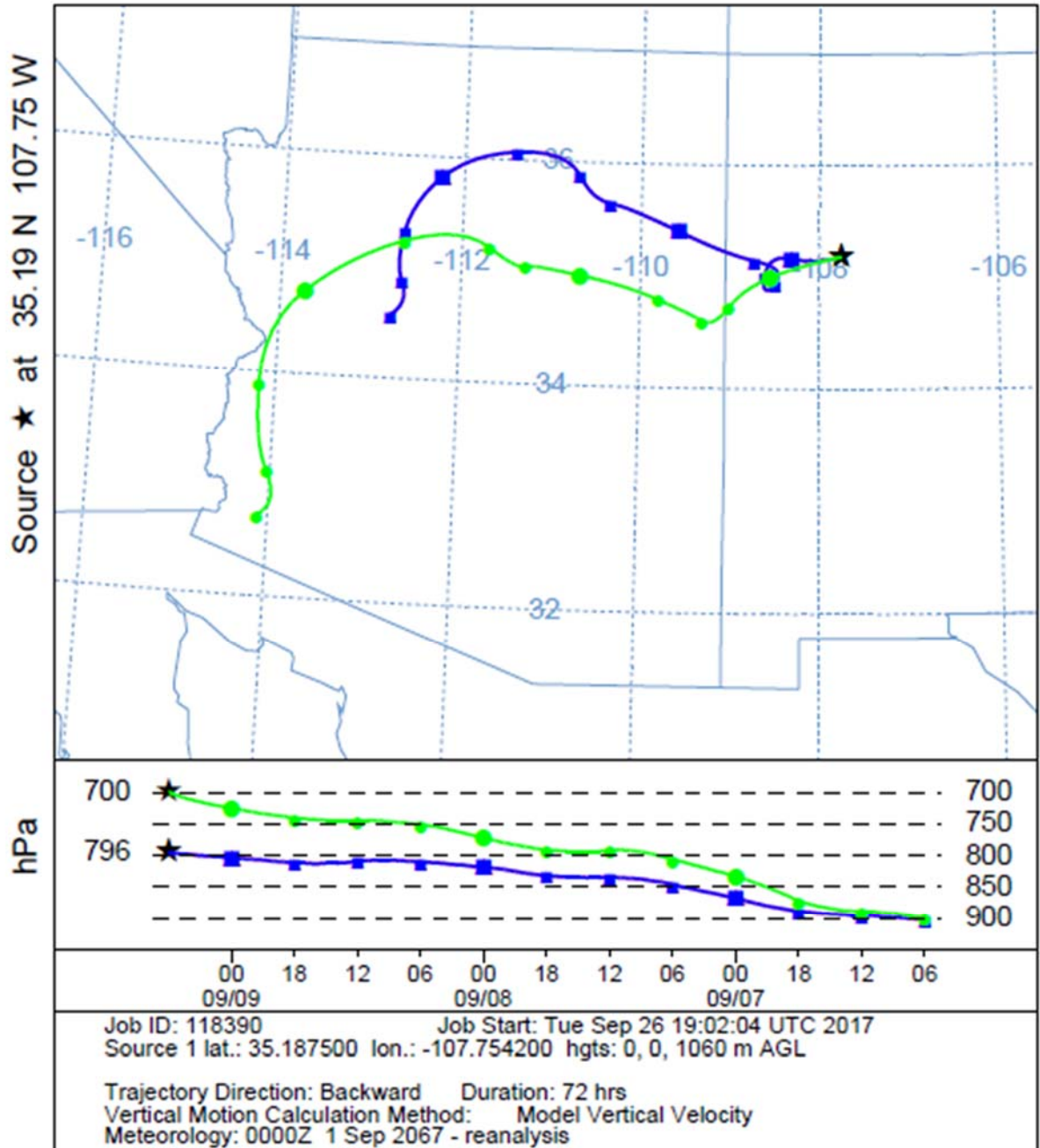
CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study

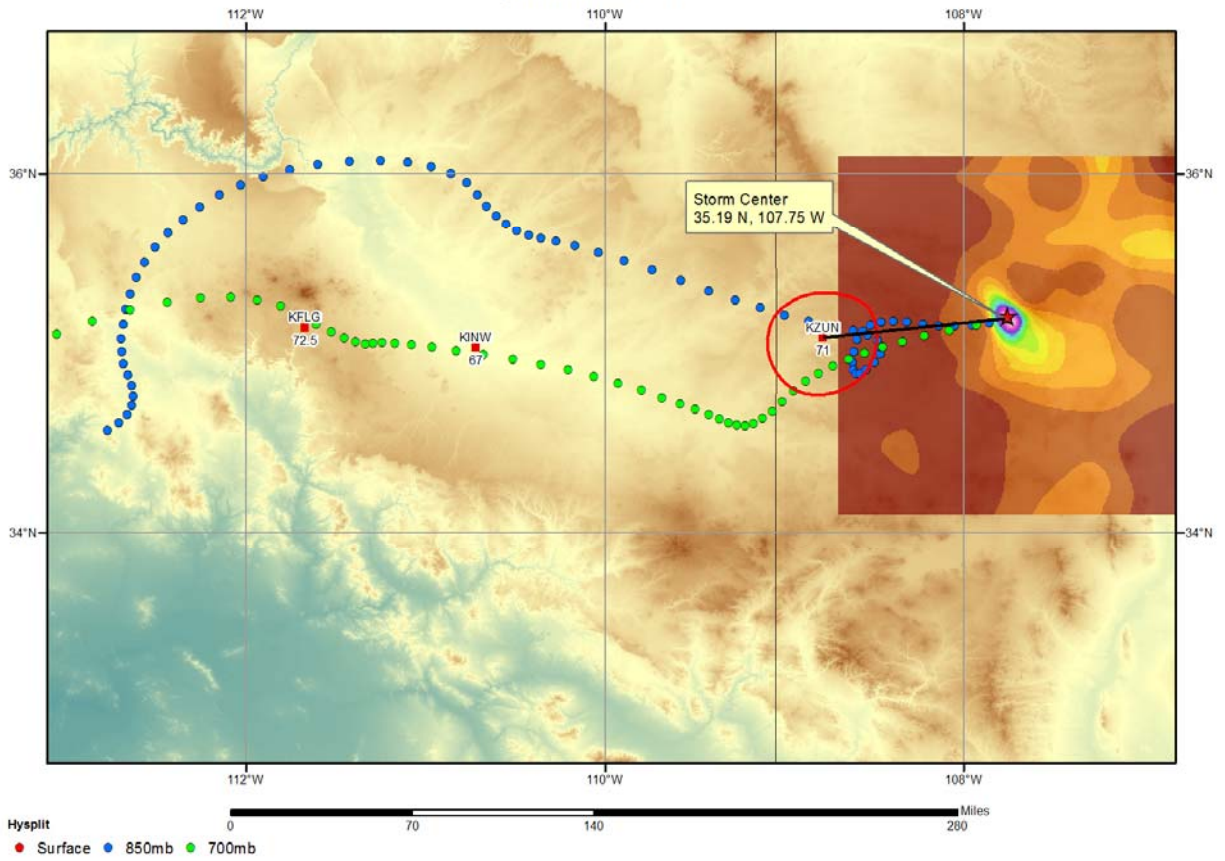


NOAA HYSPLIT MODEL
Backward trajectories ending at 0600 UTC 09 Sep 67
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study

SPAS 1657 Grants, NM Storm Analysis September 8, 1967



Blanding, UT
July 31 – August 3, 1968
Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1249_1

General Storm Location: Utah

Storm Dates: July 31 - August 3, 1968

Event: Convective

DAD Zone 1

Latitude: 37.8258

Longitude: -109.5425

Max. Grid Rainfall Amount: 6.67"

Max. Observed Rainfall Amount: 4.73"

Number of Stations: 27 (21 Daily, 3 Hourly, 1 Hourly Pseudo, and 2 Supplemental)

SPAS Version: 9.5

Basemap: PRISM mean (1981-2010) August precipitation

Spatial resolution: 00:00:30 (~ 0.30 mi²)

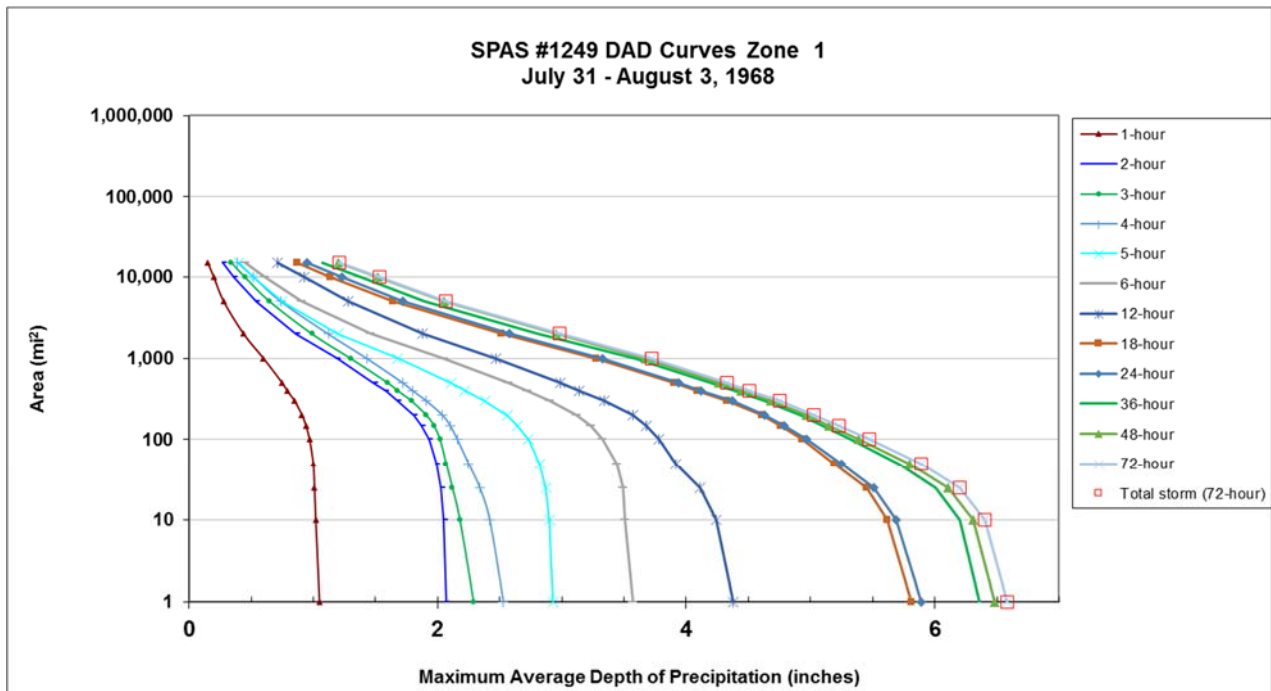
Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

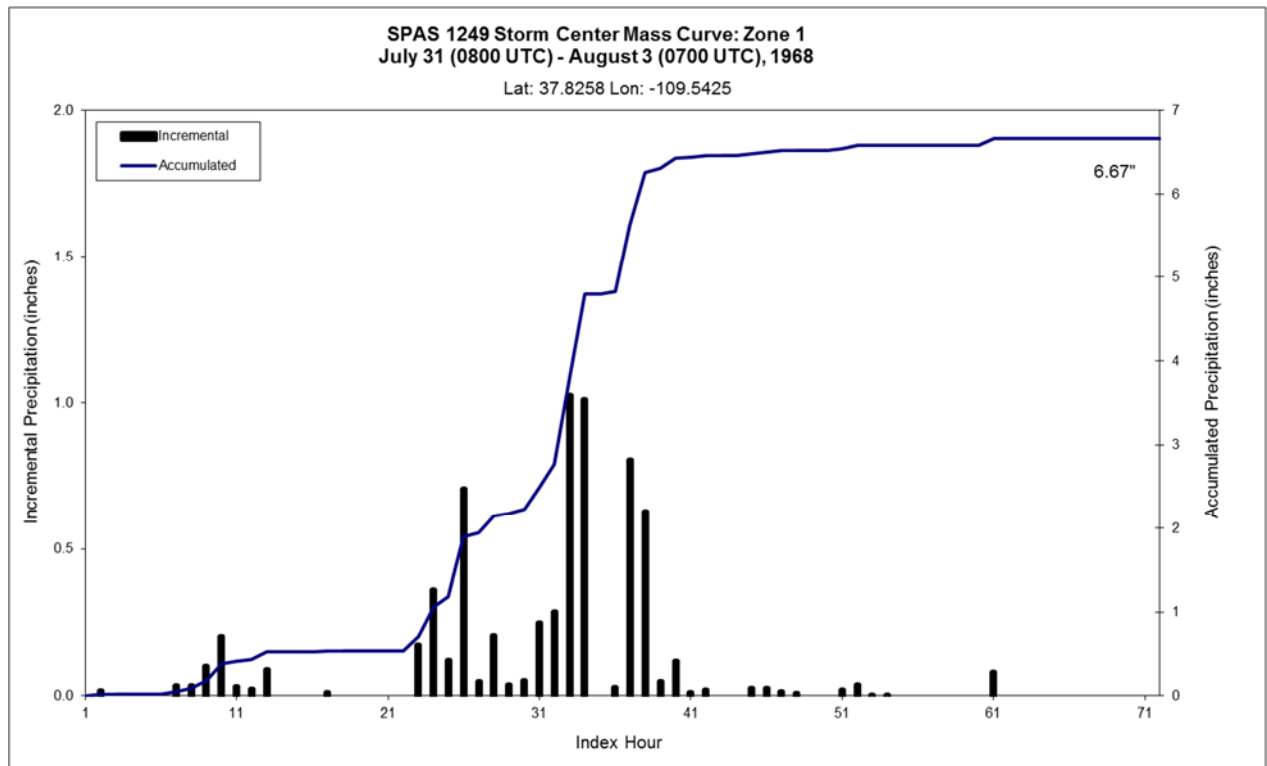
Reliability of results: This analysis was based on hourly data, daily data, and previously analyzed isohyetal pattern. An hourly station was placed at Blanding, UT based on timing and magnitude information from NCDC Utah Hourly Precipitation Data report. We have a high degree of confidence in the station based results, and spatial pattern is dependent on PRISM basemap (similar to USGS isohyetal). Note, a report by Utah State University "Flood Damage Mitigation in Utah" and USGS state that Utah has a record amount of 2.10" for 1-hour at Blanding for August 1968. The Blanding hourly data from NCDC has 1.03" for maximum 1-hr duration during August 1, 1968 (Figure 1). Difference looks to be a result of the incremental window of recorded data, NCDC is hourly and USGS reported is in minute increments.

CO-NM Regional Extreme Precipitation Study

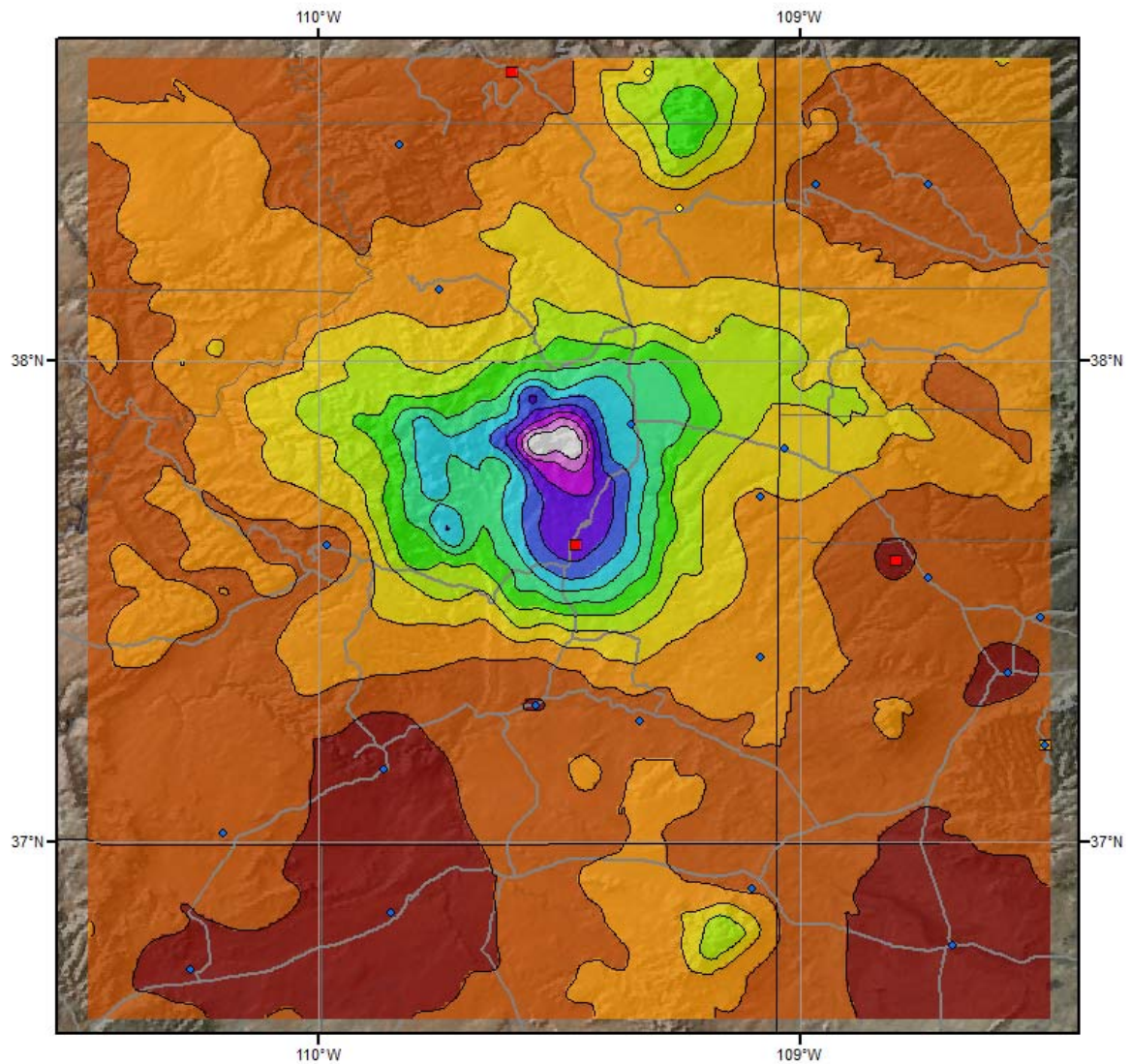
Storm 1249 - July 31 (0800 UTC) - August 3 (0700 UTC), 1968													
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)													
Area (mi ²)	Duration (hours)												
	1	2	3	4	5	6	12	18	24	36	48	72	Total
0.3	1.06	2.08	2.31	2.56	2.94	3.59	4.43	5.87	5.95	6.41	6.54	6.64	6.64
1	1.05	2.07	2.29	2.53	2.93	3.57	4.38	5.81	5.89	6.36	6.48	6.58	6.58
10	1.02	2.05	2.18	2.42	2.90	3.51	4.24	5.62	5.69	6.20	6.31	6.40	6.40
25	1.01	2.03	2.12	2.34	2.87	3.49	4.11	5.45	5.51	6.01	6.11	6.20	6.20
50	1.00	1.99	2.07	2.25	2.82	3.44	3.92	5.19	5.25	5.71	5.80	5.89	5.89
100	0.97	1.93	2.02	2.16	2.73	3.33	3.78	4.93	4.97	5.32	5.39	5.47	5.47
150	0.94	1.87	1.97	2.10	2.64	3.23	3.68	4.76	4.79	5.10	5.15	5.23	5.23
200	0.91	1.81	1.91	2.04	2.56	3.12	3.57	4.61	4.63	4.92	4.97	5.03	5.03
300	0.85	1.68	1.79	1.91	2.38	2.90	3.34	4.33	4.37	4.63	4.68	4.75	4.75
400	0.79	1.58	1.68	1.80	2.22	2.72	3.14	4.09	4.12	4.39	4.44	4.51	4.51
500	0.75	1.49	1.60	1.72	2.11	2.57	2.99	3.90	3.94	4.20	4.26	4.33	4.33
1000	0.60	1.19	1.30	1.43	1.68	2.05	2.47	3.28	3.33	3.59	3.67	3.72	3.72
2000	0.44	0.86	0.99	1.12	1.20	1.46	1.88	2.51	2.58	2.80	2.95	2.98	2.98
5000	0.28	0.54	0.65	0.74	0.75	0.91	1.28	1.64	1.72	1.89	2.05	2.07	2.07
10000	0.20	0.36	0.45	0.52	0.52	0.61	0.93	1.14	1.23	1.38	1.52	1.53	1.53
15130	0.15	0.27	0.34	0.39	0.40	0.45	0.71	0.87	0.95	1.07	1.20	1.21	1.21



CO-NM Regional Extreme Precipitation Study



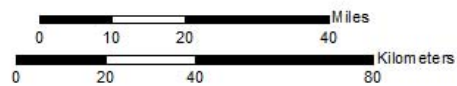
CO-NM Regional Extreme Precipitation Study



Total Precipitation (72-hours)
SPAS1249 - Blanding, UT
7/31/1968 0800 GMT - 8/3/1968 0700 GMT

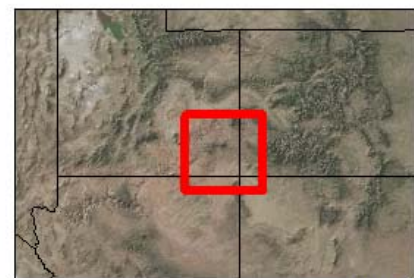
Gauges

- ◆ Daily
- Hourly
- Hourly Pseudo
- ◇ Supplemental

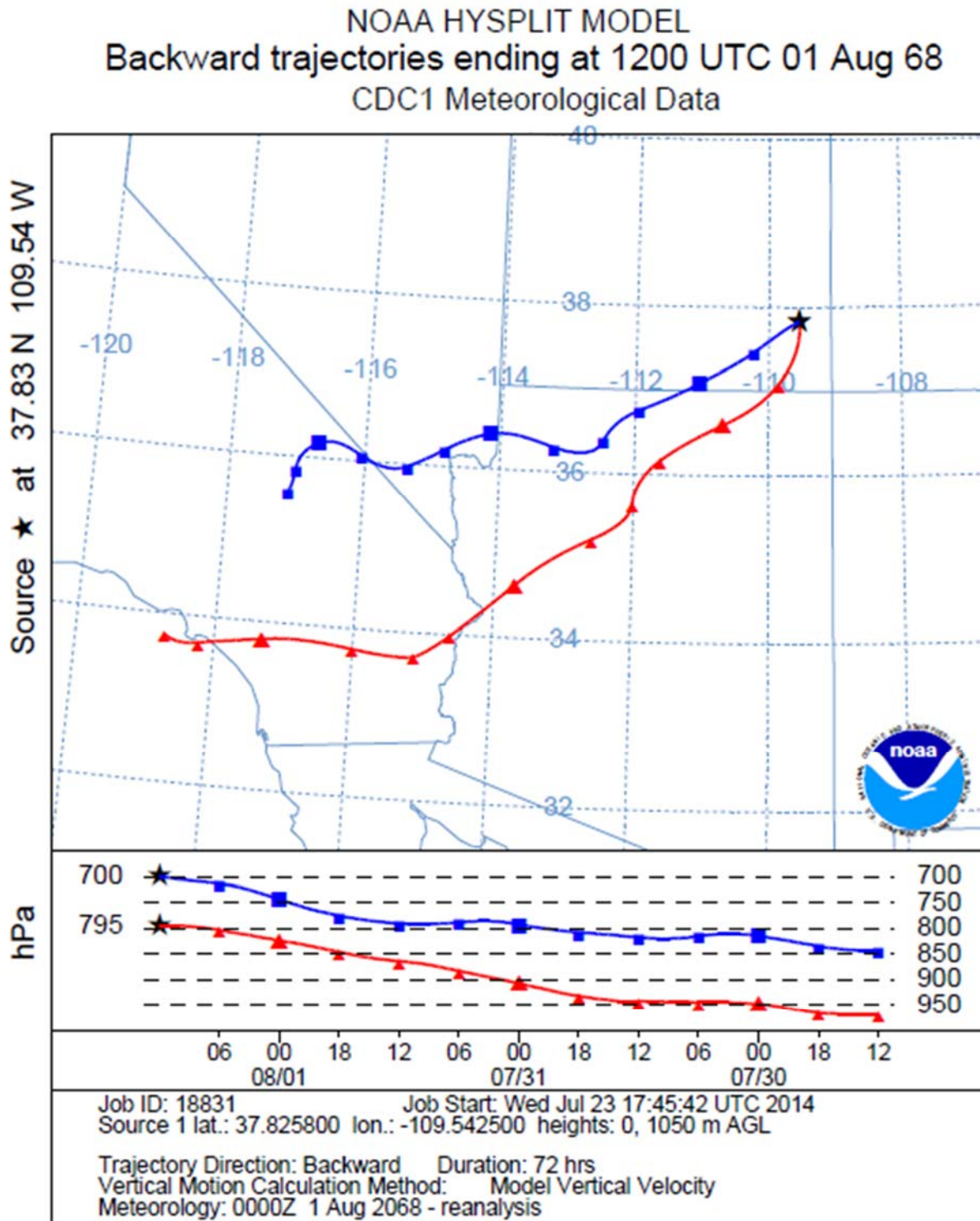


Precipitation (inches)

0.09 - 0.50	1.51 - 2.00	3.01 - 3.50	4.51 - 5.00	6.01 - 7.00
0.51 - 1.00	2.01 - 2.50	3.51 - 4.00	5.01 - 5.50	
1.01 - 1.50	2.51 - 3.00	4.01 - 4.50	5.51 - 6.00	

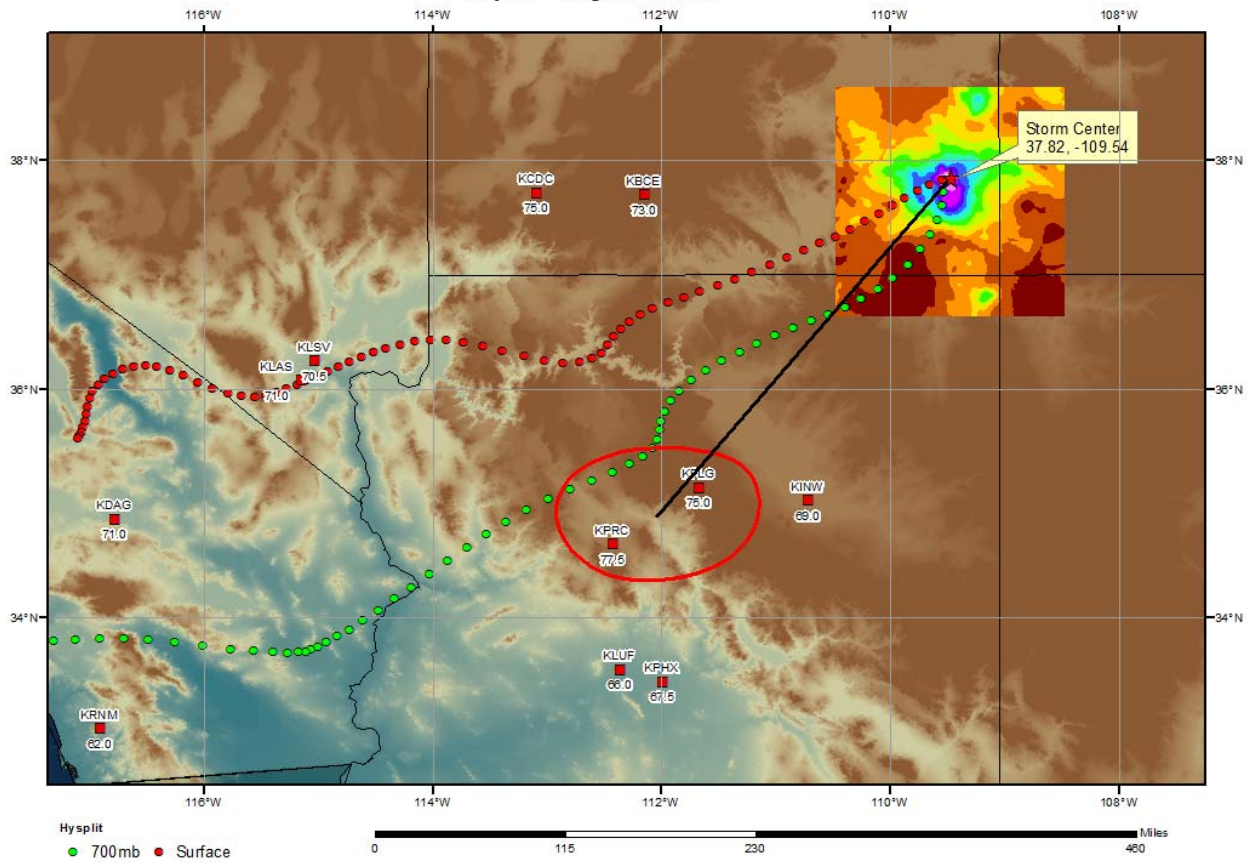


8/31/2012



CO-NM Regional Extreme Precipitation Study

SPAS 1249 Blanding, UT Storm Analysis July 29 - August 1, 1968



Sweetwater, CO

July 11-13, 1976

Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1511_1

General Storm Location: Sweetwater, CO

Storm Dates: July 11-13, 1976

Event: Extreme Precipitation Event

DAD Zone 1

Latitude: 39.7208

Longitude: -107.0375

Maximum Grid Precipitation Amount: 6.00"

Maximum Observed Precipitation Amount: 6.00"

Number of Stations: 121

SPAS Version: 10.0

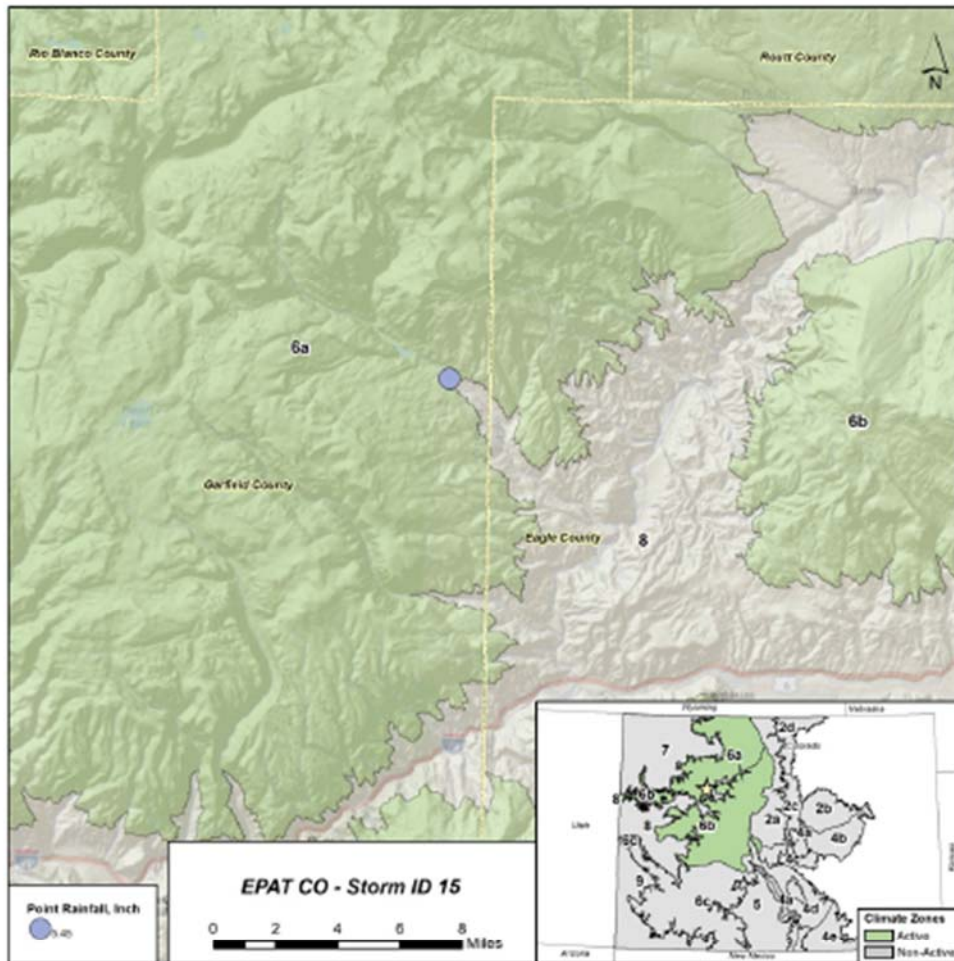
Base Map Used: No

Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

Reliability of Results: Nine supplemental stations were added to ensure data consistency. Due to the amount and integrity of the data, one supplemental estimated station was added based off of flood reports provided by Extreme Precipitation Analysis Tool (EPAT) group. Extensive work was performed to verify the storm total within the Sweetwater Creek basin. Initial reports of the flood suggested "over a foot of rain" but was reduced to 6 inches of precipitation falling by surveyor teams. No official rain gauge was present to confidentially state how much rain fell. Further research was applied to correctly identify a time span to the precipitation event. Eyewitness accounts mention that a drizzle occurred around 5:30 PM on the July 12, 1976 with a heavy rainfall period around the 7:00 PM hour. United States Geological Survey (USGS) members studied this flood and looking at the flooding patterns put this event during a time frame of 90 minutes. From the previous information, the time duration was set for 6 inches of precipitation falling at Anderson Camps on Sweetwater Creek, CO from the time period of 6 PM to 8 PM on July 12, 1976 With the density of stations available and the consistency of the resulting SPAS analysis to the various reports produced by USGS and EPAT, this analysis is deemed quite reliable.

CO-NM Regional Extreme Precipitation Study



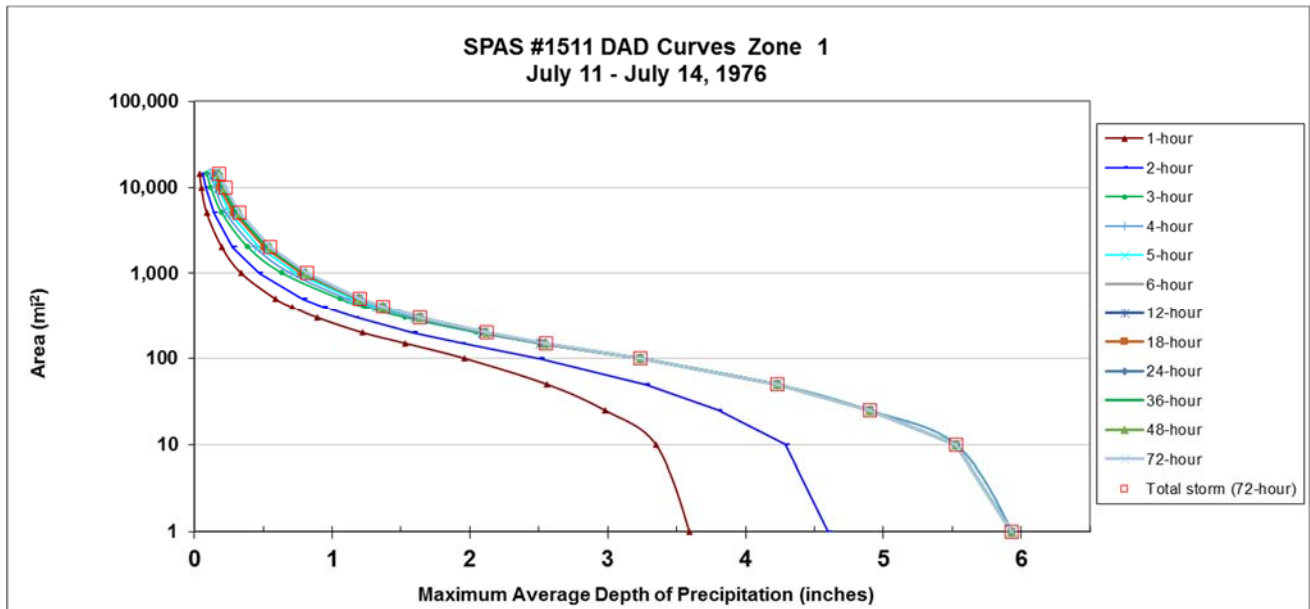
Synopsis and Climate Zone Classification:

Storm ID 15, Climate Zones 6a and 6b: Not much was known about this point rainfall storm other than 24 hour value of ~6.00". Much of this storm is believed to have fallen in 2 hours. This monsoon event thunderstorm event was attributable to zones 6a and 6b as it occurred in the raised terrain on the cusp of zone 8. The storm database within the EPAT indicates the storm elevation of this event to be 7200 ft., which would, actually, indicate that the storm's origin was in climate zone 8, and, thus, this storm should only be attributable to that climate zone.

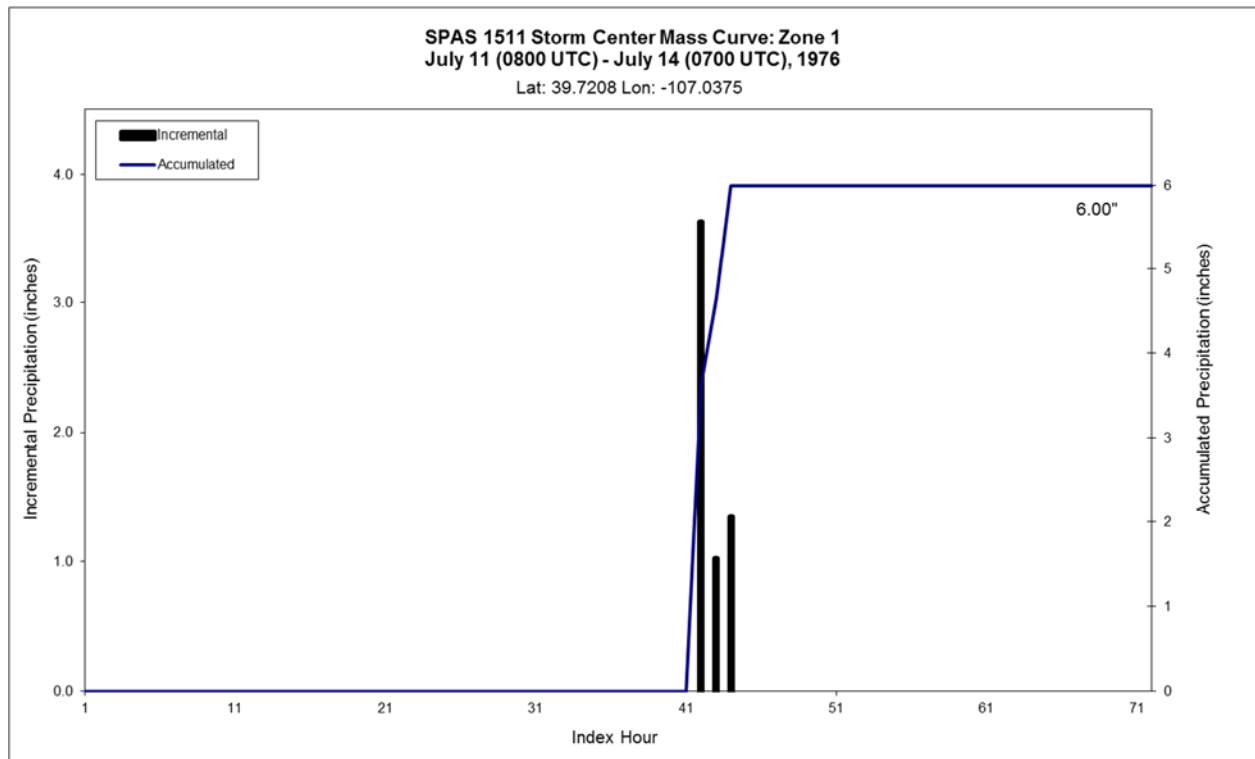
Start Date-End Date	July 12, 1976
Storm ID/Name	STORM ID 15 – Sweetwater
Storm Type	Local Storm
State/Climate Zone Attribution	Colorado/Climate Zones 6a and 6b
Max Precipitation/Duration	>6.00" in 24 hours, Most of event in ~2 hours
Originator/Storm source	CSU Report/HMR (CSM temporal)
Low Level Wind	200 degrees
Upper Level Wind	220 degrees
Seasonal Max.PWI /-1000mb Td/In-Place Max. Fctr. (source Td /location ID)	2.94" / 75.7F / 1.50* (50 F @ KEGE 2-hour avg.)
Elevation of Peak Precipitation	7200 ft.

CO-NM Regional Extreme Precipitation Study

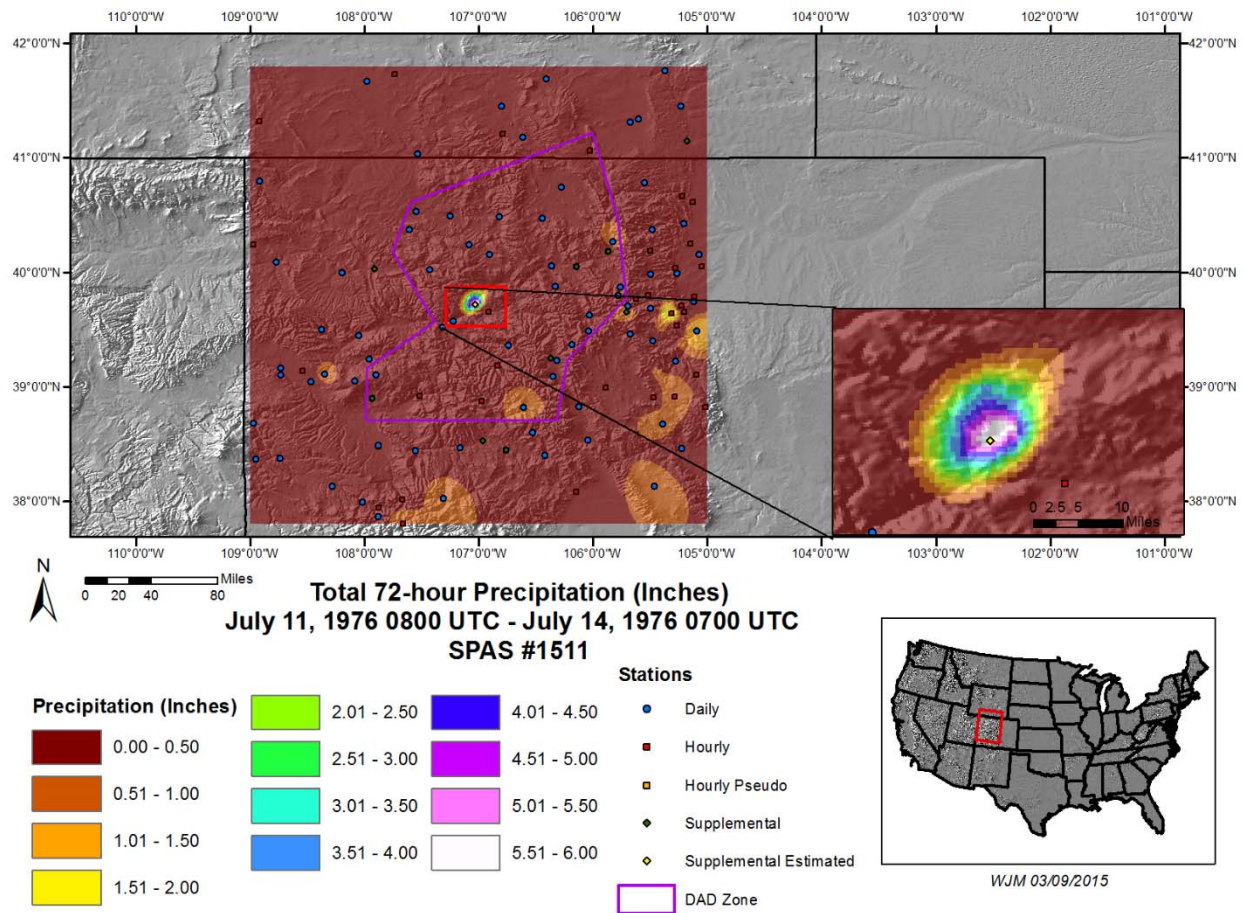
Storm 1511 - July 11 (0800 UTC) - July 14 (0700 UTC), 1976													
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)													
Area (mi ²)	Duration (hours)												
	1	2	3	4	5	6	12	18	24	36	48	72	Total
0.3	3.62	4.64	5.98	5.98	5.98	5.98	5.98	5.98	5.98	5.98	5.98	5.98	5.98
1	3.59	4.60	5.93	5.93	5.93	5.93	5.93	5.93	5.93	5.93	5.93	5.93	5.93
10	3.35	4.29	5.53	5.53	5.53	5.53	5.53	5.53	5.53	5.53	5.53	5.53	5.53
25	2.98	3.80	4.90	4.90	4.90	4.90	4.90	4.90	4.90	4.90	4.90	4.90	4.90
50	2.56	3.28	4.23	4.23	4.23	4.23	4.23	4.23	4.23	4.23	4.23	4.23	4.23
100	1.96	2.51	3.24	3.24	3.24	3.24	3.24	3.24	3.24	3.24	3.24	3.24	3.24
150	1.53	1.94	2.52	2.52	2.52	2.52	2.52	2.52	2.52	2.54	2.55	2.55	2.55
200	1.22	1.59	2.05	2.07	2.09	2.10	2.10	2.10	2.10	2.11	2.12	2.12	2.12
300	0.89	1.17	1.53	1.58	1.61	1.64	1.64	1.64	1.64	1.63	1.64	1.64	1.64
400	0.71	0.94	1.24	1.30	1.33	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37
500	0.59	0.79	1.06	1.11	1.16	1.19	1.19	1.19	1.20	1.20	1.20	1.20	1.20
1,000	0.34	0.47	0.64	0.70	0.74	0.78	0.78	0.78	0.80	0.80	0.81	0.82	0.82
2,000	0.20	0.28	0.39	0.44	0.47	0.51	0.51	0.51	0.53	0.53	0.55	0.55	0.55
5,000	0.09	0.14	0.20	0.23	0.26	0.29	0.29	0.29	0.31	0.31	0.33	0.33	0.33
10,000	0.05	0.08	0.12	0.15	0.17	0.19	0.19	0.19	0.21	0.21	0.22	0.23	0.23
14,256	0.04	0.06	0.09	0.11	0.13	0.15	0.15	0.16	0.17	0.17	0.18	0.18	0.18



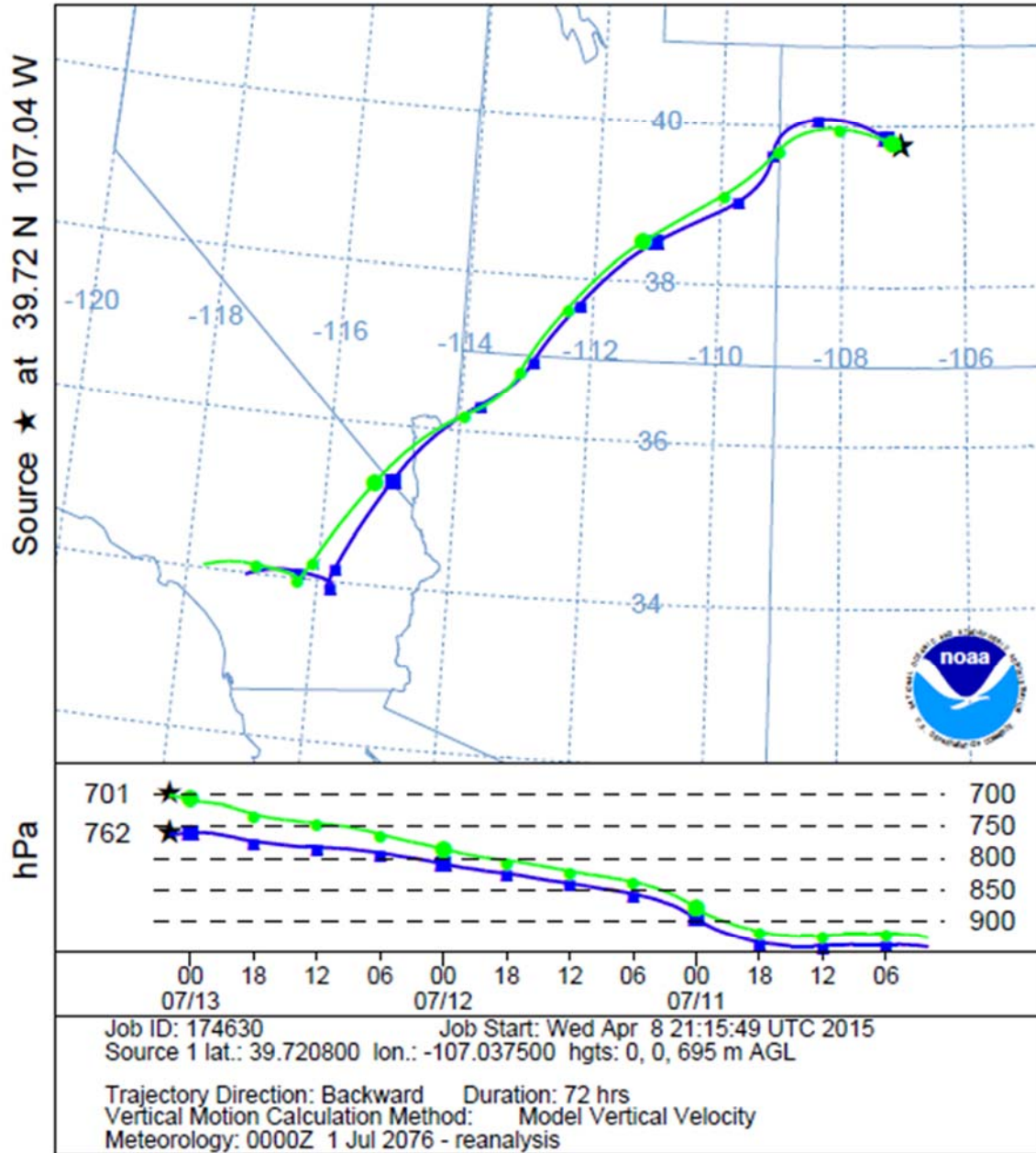
CO-NM Regional Extreme Precipitation Study



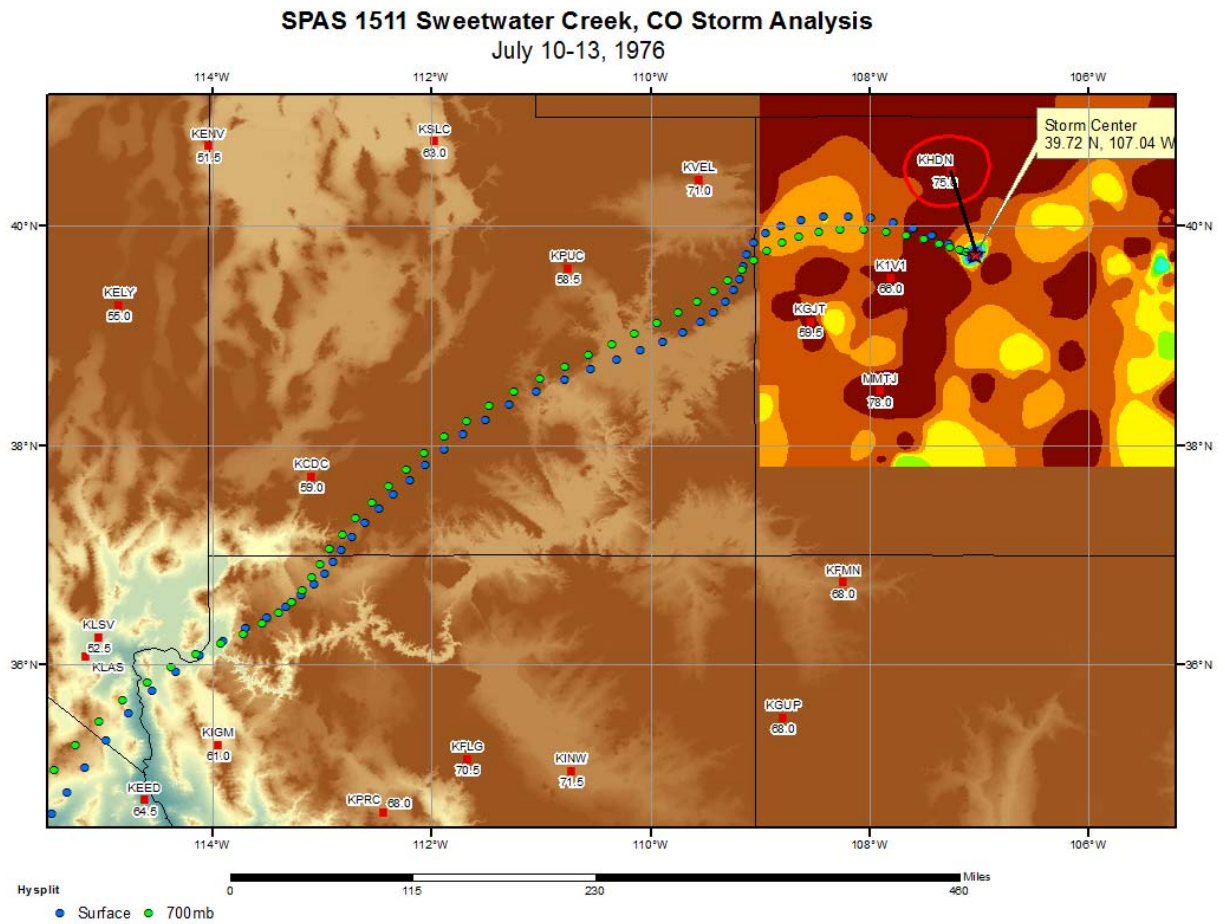
CO-NM Regional Extreme Precipitation Study



NOAA HYSPLIT MODEL
Backward trajectories ending at 0200 UTC 13 Jul 76
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study



Big Thompson Canyon, CO

July 31 – August 3, 1976

Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1231_1

General Storm Location: Big Thompson Canyon, Colorado

Storm Dates: July 31, 1976 2300 UTC – August 3, 1976 0400 UTC

Event: Thunderstorm

DAD Zone 1 (Main storm center over Big Thompson Canyon on July 31, 1976 – August 1, 1976)

Latitude: 40.47916

Longitude: -105.42916

Max. Grid Rainfall Amount: 12.52"

Max. Observed Rainfall Amount: 12 inches (Larimer_cty45, Bucket Survey, 40.4742,-105.4322 and Larimer_cty47, Bucket Survey, 40.4597,-105.4511)

****Other less reliable bucket survey amounts of 12 inches also reported.****

Number of Stations: 119 (5 Daily, 7 Hourly, 2 Hourly Estimated, 0 Hourly Estimated Pseudo, 95 Supplemental, and 10 Supplemental Estimated)

SPAS Version: 9.0

Basemap: PRISM Mean (1971-2000) July precipitation

Spatial resolution: 30 seconds (~0.26 mi²)

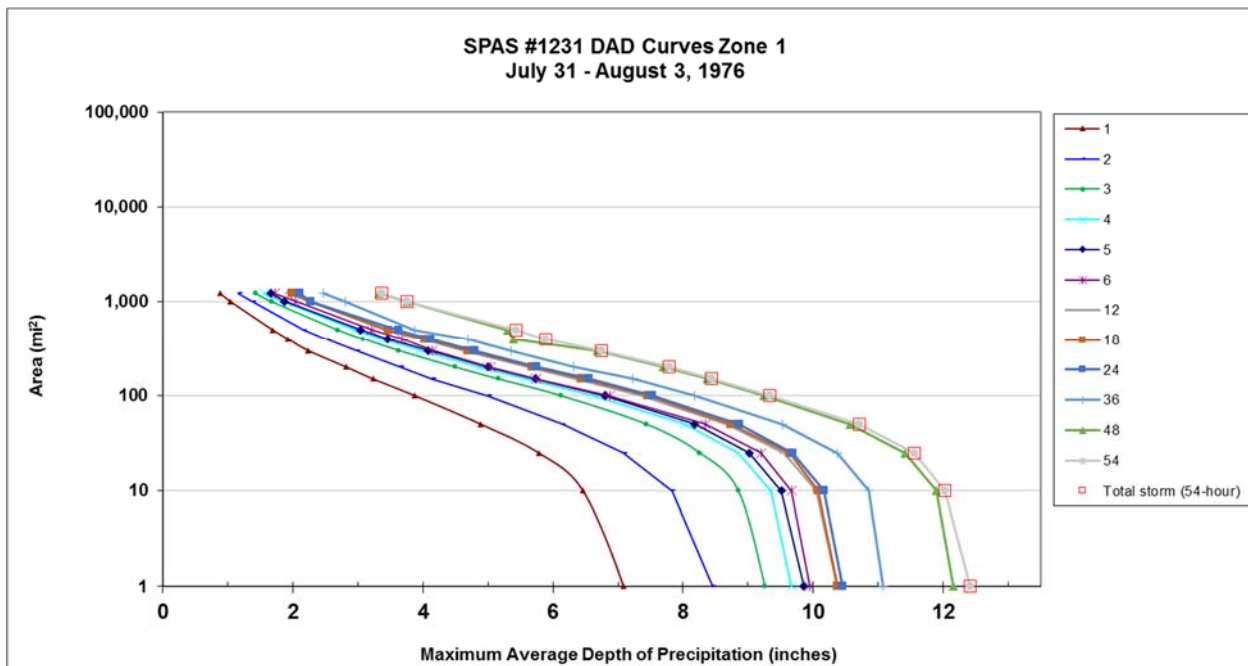
Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

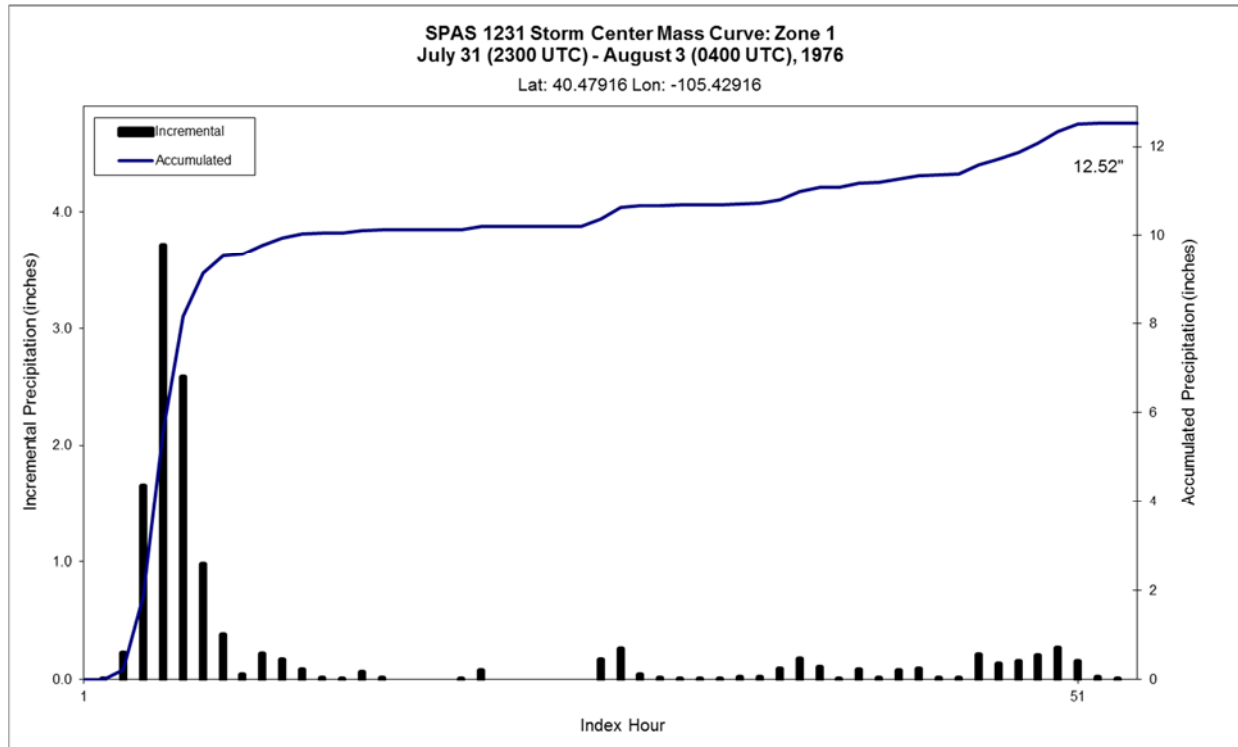
Reliability of results: The lack of any hourly recording rain gauges in the storm center casts some doubt on the exact intensities, however radar data and eyewitness accounts provide a “fair” description of the temporal distribution of rainfall. The “bucket survey” provided generally reliable information of the rainfall magnitude, particularly in DAD Zone 1, therefore we have moderate-to high confidence in the magnitudes of rainfall in DAD Zone 1. We have moderate confidence in DAD results for small area sizes DAD 2, but low confidence in the large area sizes in DAD Zone 2 due to low density station data and very limited hourly data. Our results are consistent with previously published results regarding this famous storm.

CO-NM Regional Extreme Precipitation Study

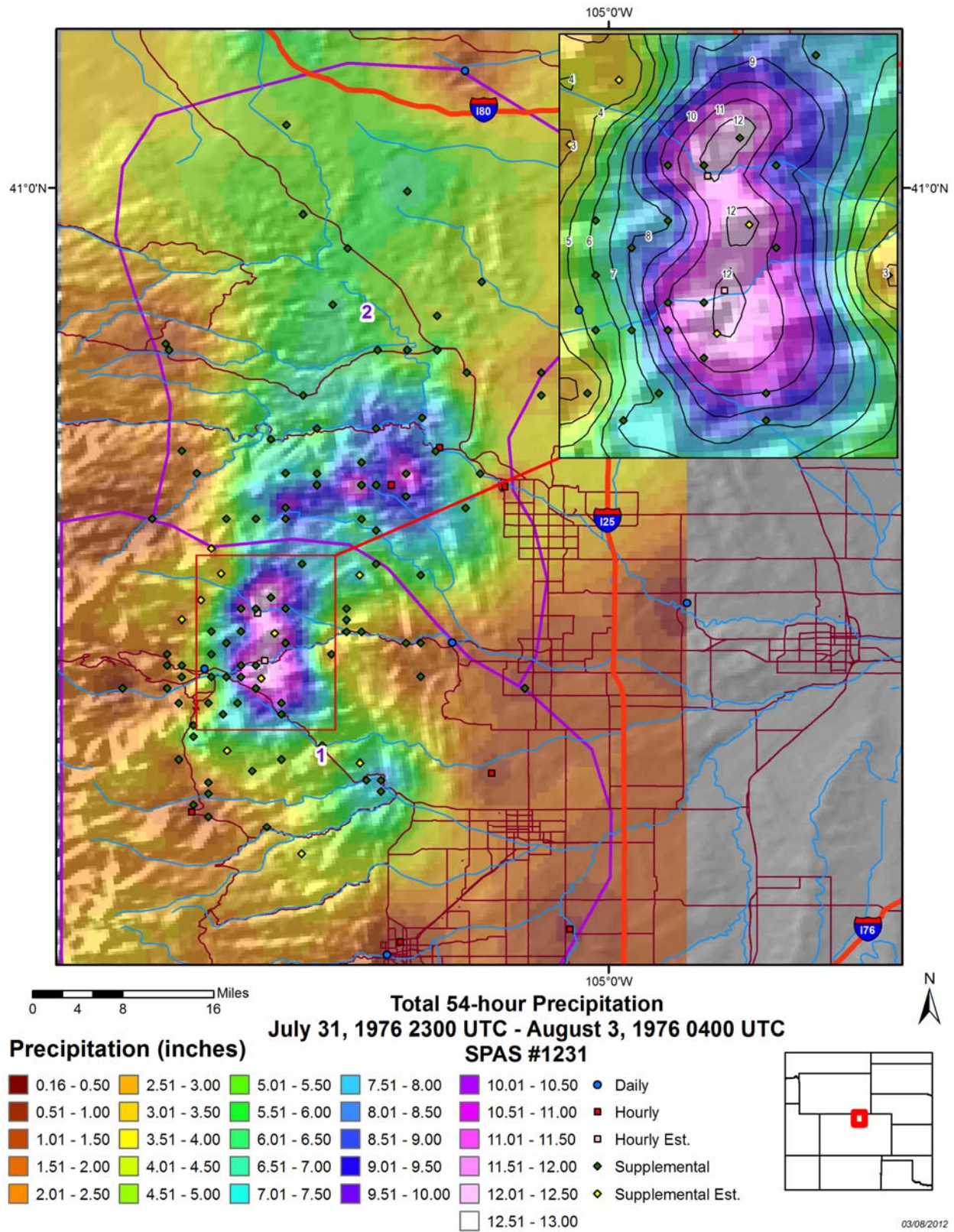
Storm 1231 Zone 1 - July 31 (2300 UTC) - August 3 (0400 UTC), 1976													
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)													
areasqmi	Duration (hours)												
	1	2	3	4	5	6	12	18	24	36	48	54	Total
0.3	7.16	8.58	9.41	9.82	9.95	10.12	10.50	10.55	10.62	11.28	12.34	12.52	12.52
1	7.08	8.45	9.26	9.67	9.86	9.95	10.38	10.38	10.45	11.07	12.15	12.41	12.41
10	6.46	7.83	8.85	9.35	9.51	9.67	10.05	10.08	10.17	10.85	11.90	12.03	12.03
25	5.78	7.08	8.26	8.84	9.02	9.20	9.56	9.64	9.69	10.38	11.42	11.56	11.56
50	4.89	6.14	7.44	8.02	8.18	8.34	8.68	8.74	8.87	9.53	10.57	10.71	10.71
100	3.87	5.00	6.12	6.63	6.80	6.87	7.36	7.46	7.53	8.17	9.24	9.33	9.33
150	3.23	4.14	5.16	5.60	5.73	5.75	6.34	6.43	6.55	7.23	8.37	8.43	8.43
200	2.82	3.65	4.50	4.87	5.00	5.04	5.61	5.68	5.75	6.32	7.70	7.79	7.79
300	2.23	2.97	3.63	3.95	4.08	4.15	4.64	4.69	4.79	5.36	6.68	6.75	6.75
400	1.92	2.50	3.08	3.36	3.45	3.67	4.00	4.03	4.12	4.69	5.39	5.89	5.89
500	1.69	2.16	2.69	2.95	3.04	3.21	3.44	3.47	3.63	3.87	5.30	5.43	5.43
1,000	1.04	1.37	1.67	1.83	1.87	2.04	2.27	2.27	2.27	2.81	3.75	3.75	3.75
1,220	0.88	1.16	1.42	1.56	1.66	1.72	1.94	1.99	2.10	2.47	3.33	3.37	3.37



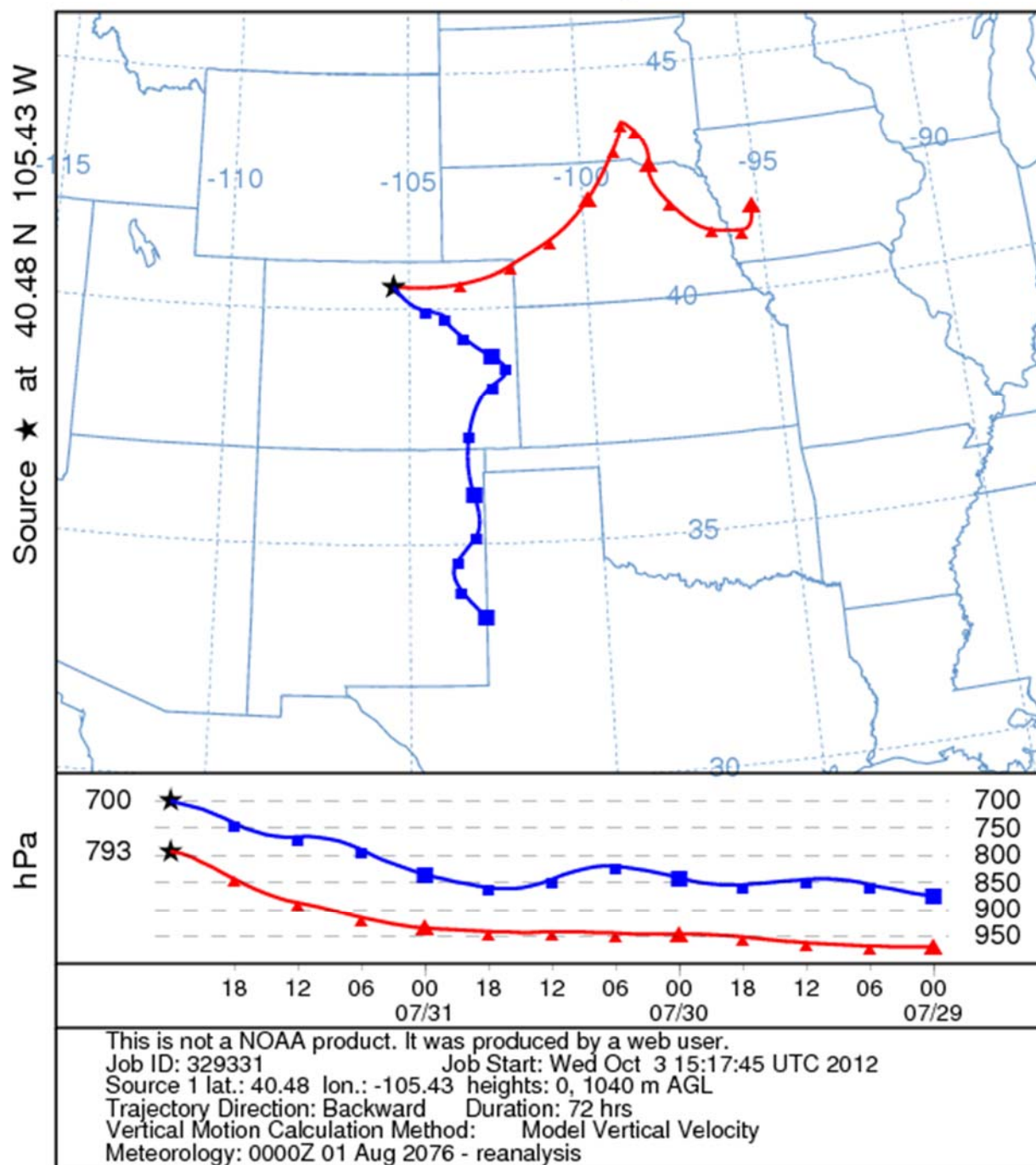
CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study

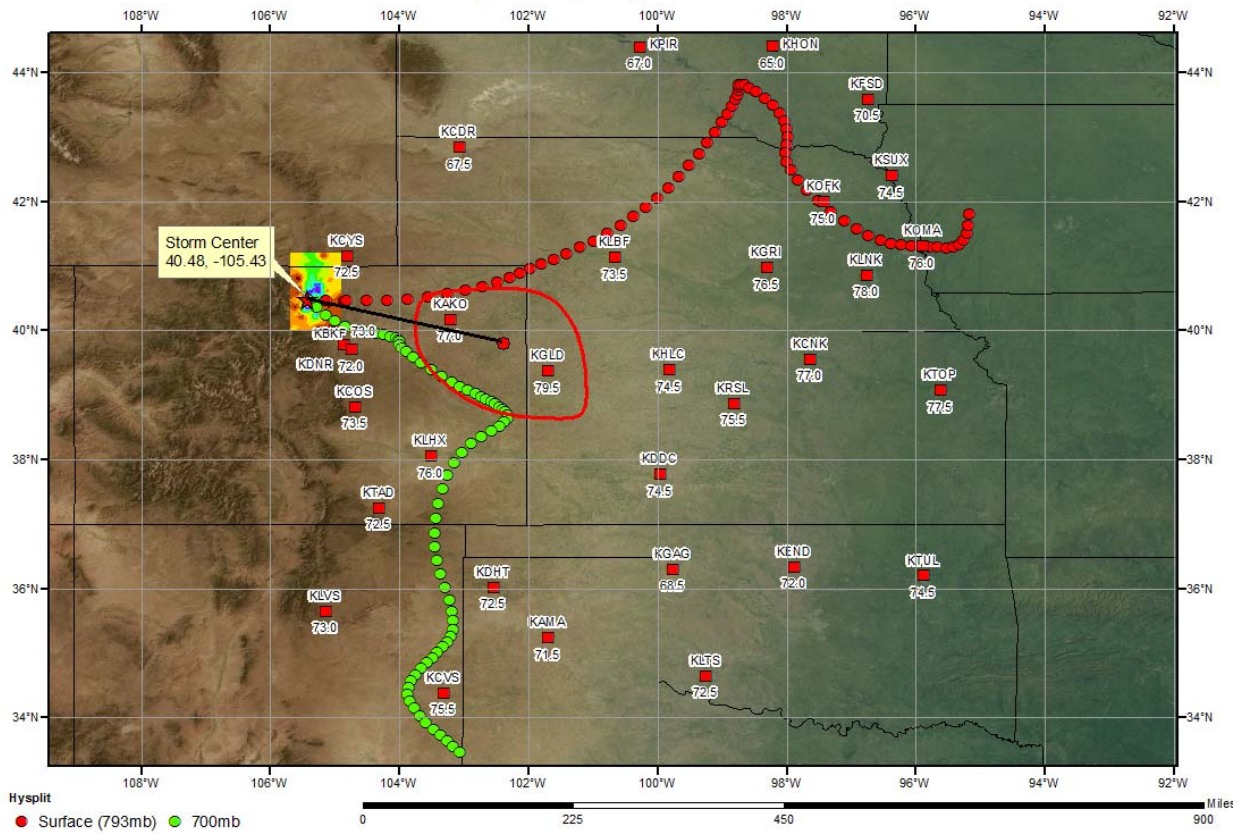


NOAA HYSPLIT MODEL
Backward trajectories ending at 0000 UTC 01 Aug 76
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study

SPAS 1231 Big Thompson, CO Storm Analysis July 29 - August 1, 1976



Pena Blanca, NM

July 7-10, 1977

Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1658_1

General Storm Location: Pena Blanca, NM

Storm Dates: July 7-10, 1977

Event: Convective Thunderstorm

DAD Zone 1

Latitude: 35.5958

Longitude: -106.4292

Maximum Grid Precipitation Amount: 4.65"

Maximum Observed Precipitation Amount: 4.00"

Number of Stations: 74

SPAS Version: 10.0

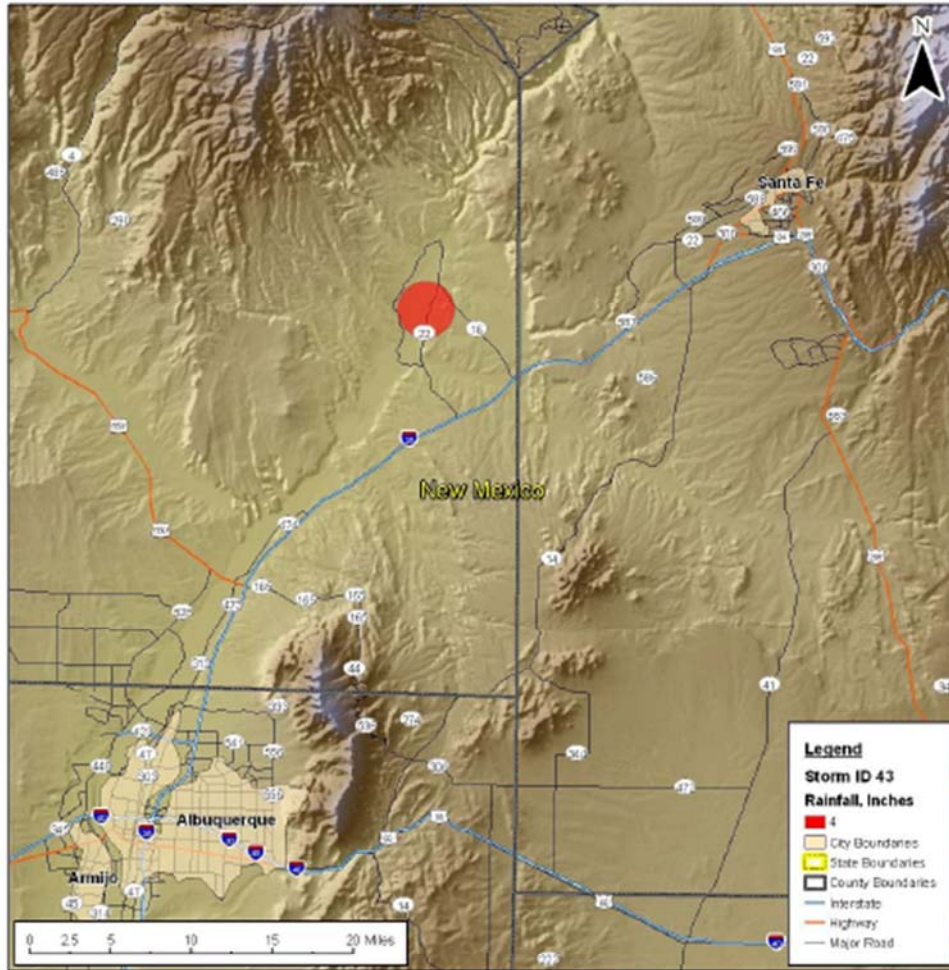
Base Map Used: Yes

Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

Reliability of Results: In addition to the NCDC stations, one supplemental station was added to ensure the data matches what can actually occur and that the data more closely resemble what was reported in storm reports. With the density of stations available for this storm and with how closely the resulting SPAS analysis was to the storm reports, this analysis is deemed quite reliable.

CO-NM Regional Extreme Precipitation Study



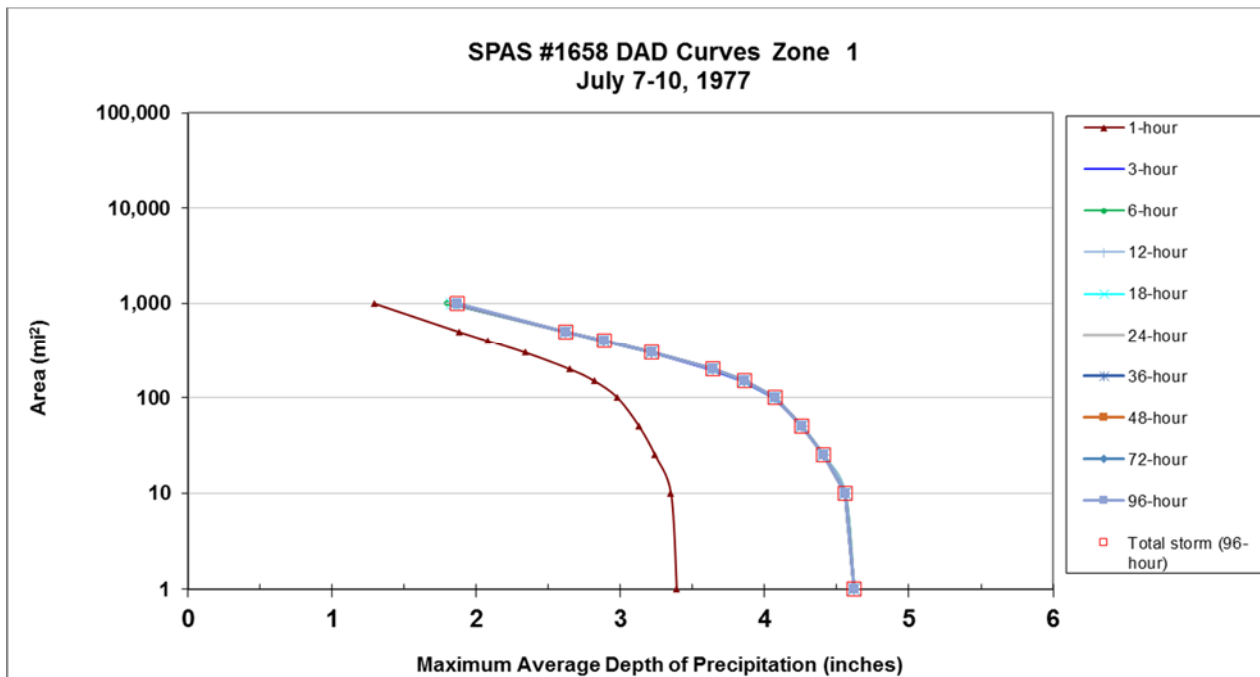
Storm Synopsis and Climate Zone Classification:

Storm ID 43 Climate Zones 4, 5: This point rainfall observed storm produced precipitation well in exceedance of the 1000 year event for this region. Low level winds from the SE drove ample moisture into the raised terrain of the Pena Blanca region of Sandoval county. The disposition of the low level wind vector combined with the time of year and region of impact indicate that this storm could of occurred in zone 4 or 5.

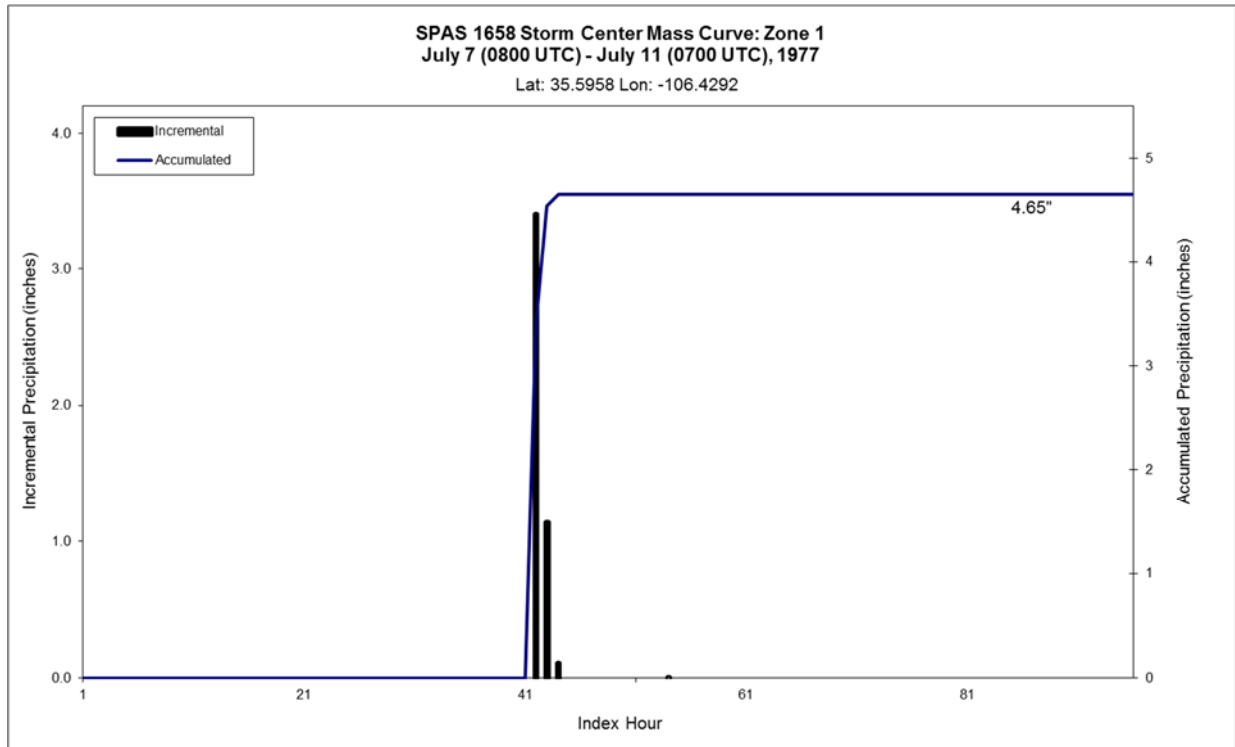
Start Date/End Date	July 8, 1977
Storm Name/Status	Pena Blanca - Sandoval Co. - STORM ID 43 / Active
Storm Type	Local Storm – Convective Simple
State/Climate Zone	New Mexico / Climate Zones 4, 5
Duration/Max Precipitation	1.25 hours / 4"
Originator	NWS
Low Level Wind	130 degrees
Upper Level Wind	270 degrees
PWI /1000mb Dewpoint	2.05" / 68F
Storm Source	StormData
Temporal	Point rainfall; Observationally-based synthetic

CO-NM Regional Extreme Precipitation Study

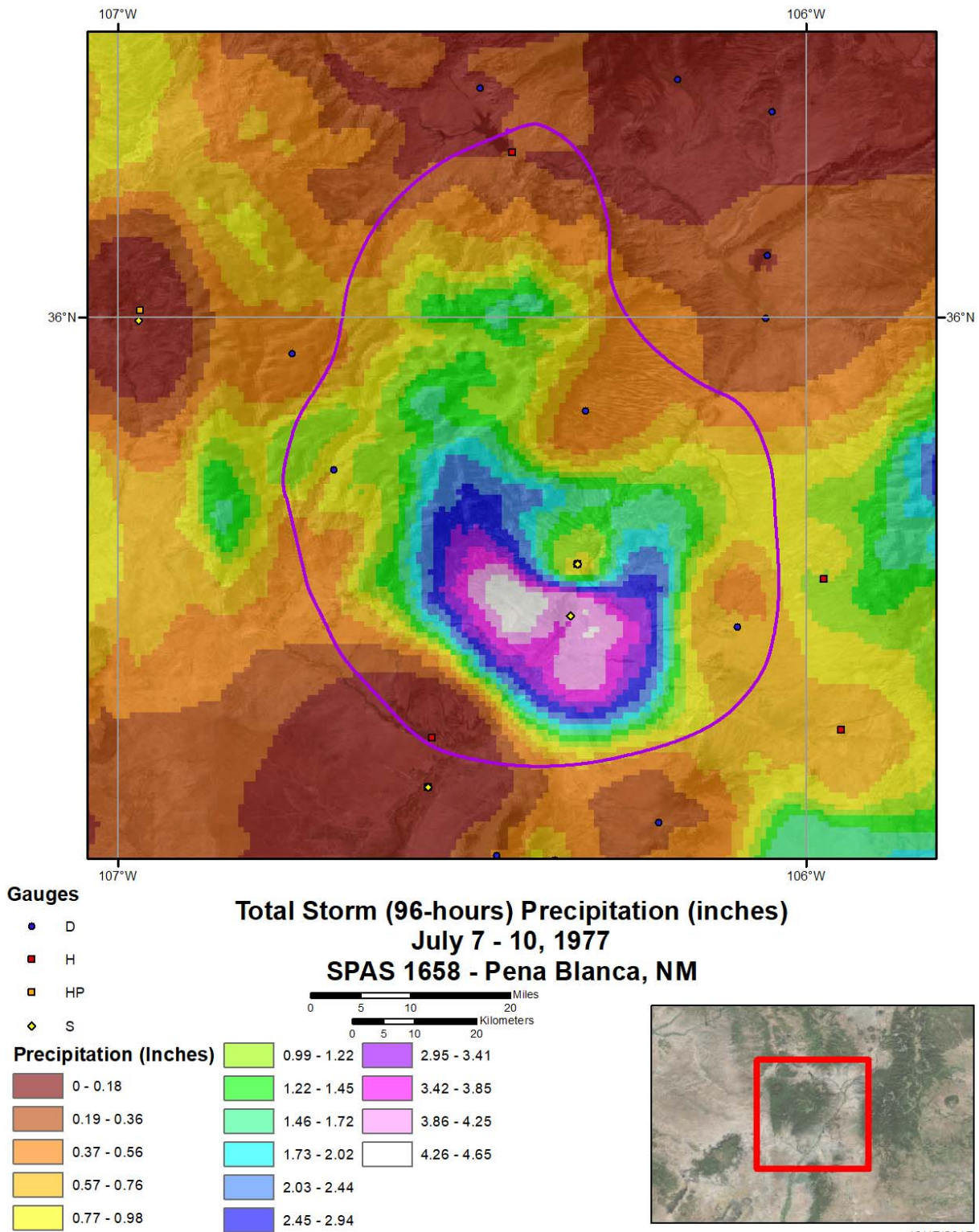
Storm 1658 - July 7 (0800 UTC) - July 11 (0700 UTC), 1977											
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)											
Area (mi ²)	Duration (hours)										
	1	3	6	12	18	24	36	48	72	96	Total
0.4	3.40	4.64	4.64	4.64	4.64	4.64	4.64	4.64	4.64	4.64	4.64
1	3.39	4.62	4.62	4.62	4.62	4.62	4.62	4.62	4.62	4.62	4.62
10	3.35	4.56	4.56	4.56	4.56	4.56	4.56	4.56	4.56	4.56	4.56
25	3.24	4.41	4.41	4.41	4.41	4.41	4.41	4.41	4.41	4.41	4.41
50	3.13	4.26	4.26	4.26	4.26	4.26	4.26	4.26	4.26	4.26	4.26
100	2.98	4.06	4.06	4.06	4.07	4.07	4.07	4.07	4.07	4.07	4.07
150	2.82	3.84	3.85	3.85	3.85	3.85	3.86	3.86	3.86	3.86	3.86
200	2.65	3.62	3.63	3.63	3.64	3.64	3.64	3.64	3.64	3.64	3.64
300	2.34	3.21	3.21	3.21	3.22	3.22	3.22	3.22	3.22	3.22	3.22
400	2.08	2.87	2.87	2.87	2.88	2.88	2.88	2.89	2.89	2.89	2.89
500	1.88	2.60	2.61	2.61	2.62	2.62	2.62	2.62	2.62	2.62	2.62
1,000	1.29	1.79	1.80	1.82	1.83	1.83	1.85	1.86	1.87	1.87	1.87



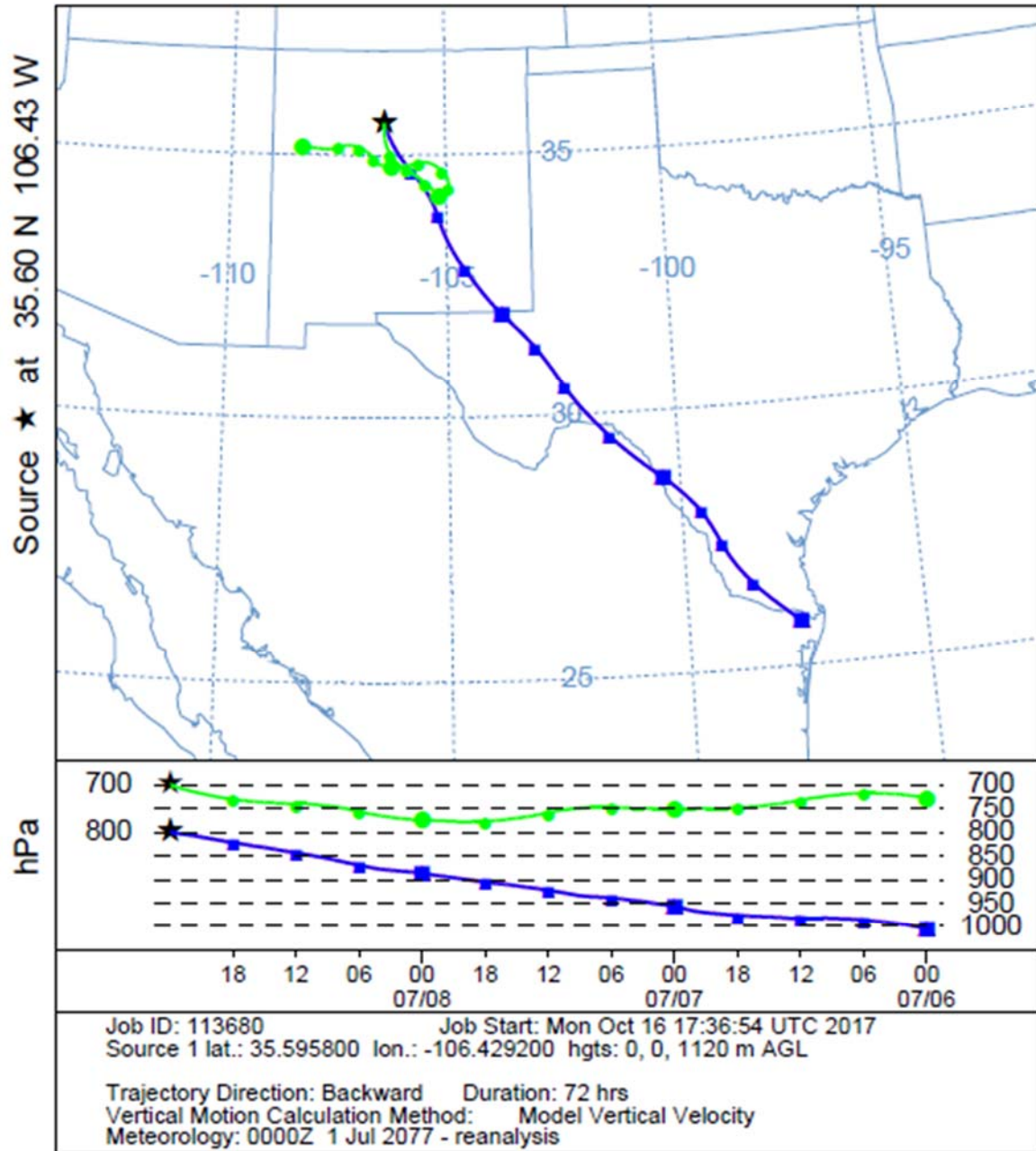
CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study

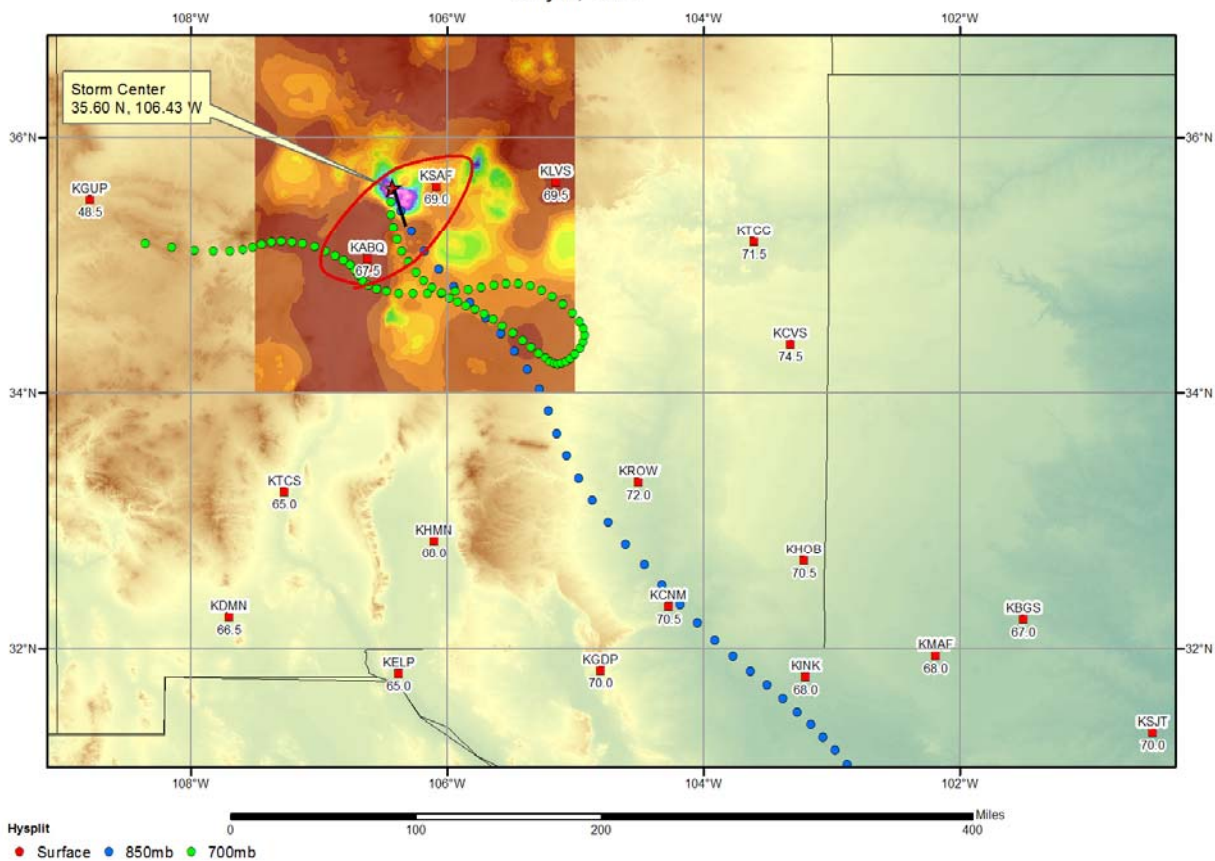


NOAA HYSPLIT MODEL
Backward trajectories ending at 0000 UTC 09 Jul 77
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study

SPAS 1658 Pena Blanca, NM Storm Analysis
July 8, 1977



White Sands, NM

August 18-20, 1978

Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1487_1

General Storm Location: White Sands, NM

Storm Dates: August 18-20, 1978

Event: Localized Extreme Precipitation Event

DAD Zone 1

Latitude: 32.3875

Longitude: -106.5292

Maximum Grid Precipitation Amount: 10.43"

Maximum Observed Precipitation Amount: 10.00"

Number of Stations: 105

SPAS Version: 10.0

Base Map Used: Monthly PRISM Map – August 1978

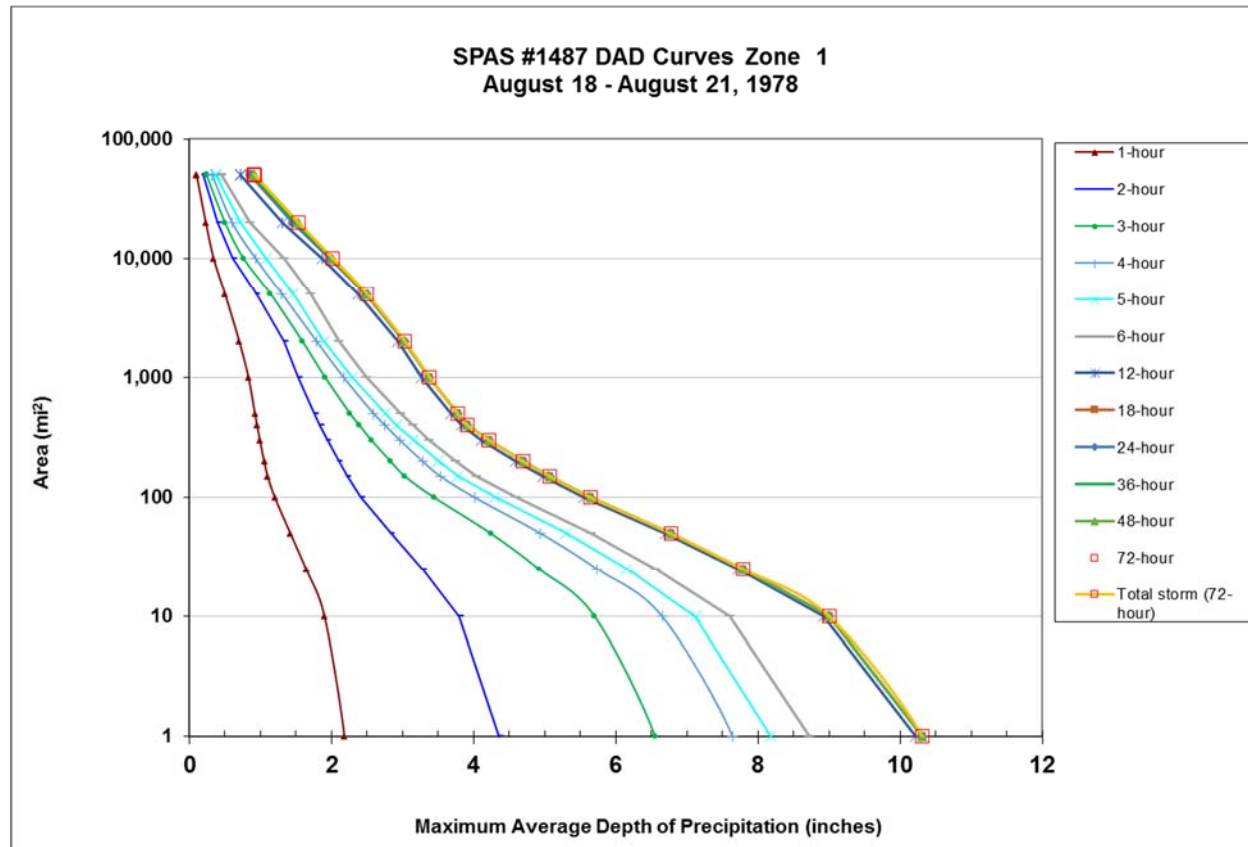
Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

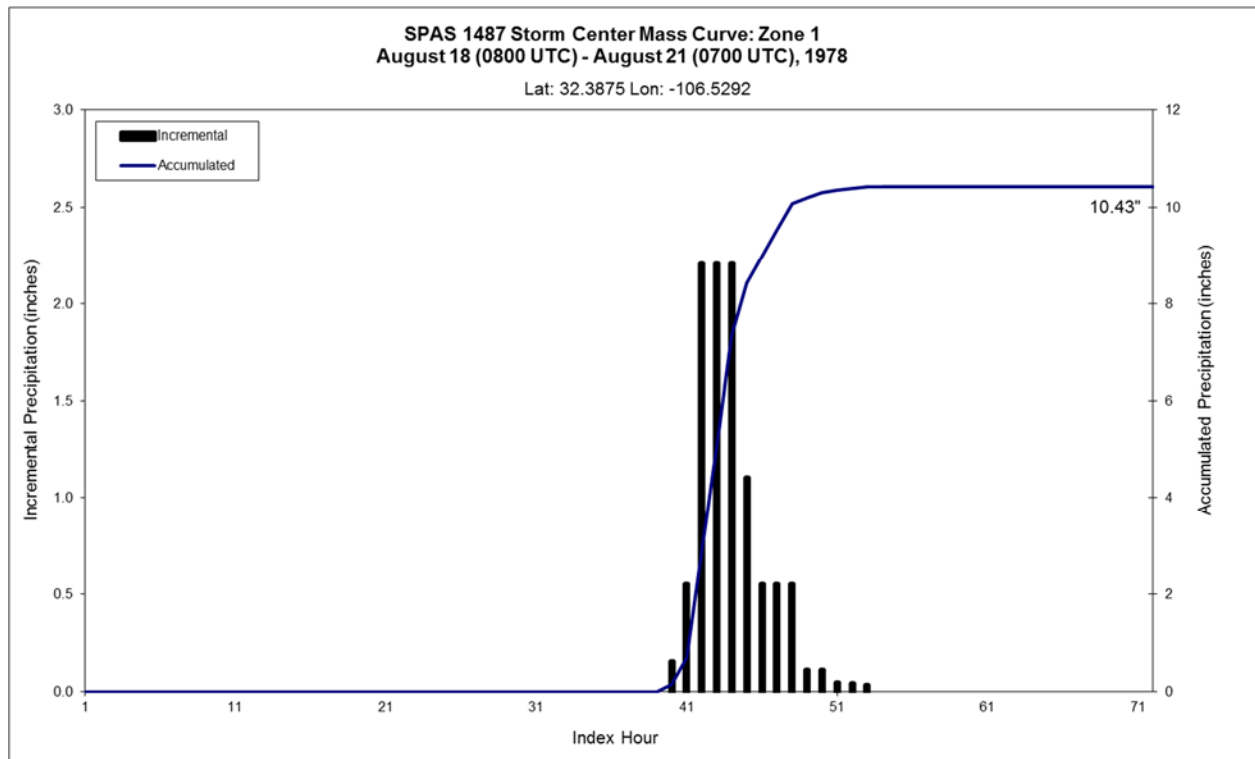
Reliability of Results: In addition to the NCDC hourly stations, an isohyetal map from the U.S. Army Corp of Engineers (USACE) was digitized and used to locate supplemental stations and provide insight on the overall spatial pattern at White Sands Missile Range (WSMR); 12 total supplemental stations were added from the USACE Report. In order to contain the storm center, 11 estimated stations were also added in a north-south transect and surrounding the added WSMR Stations. A majority of the precipitation at WSMR fell in a four-hour time period from 1700-2100 MST on August 19. Due to the density of observations and well reported timing, the storm center reliability is quite high. While precipitation did fall outside of this time period as well as outside of the small storm center location, there is less information to determine rainfall pattern and timing as accurately.

CO-NM Regional Extreme Precipitation Study

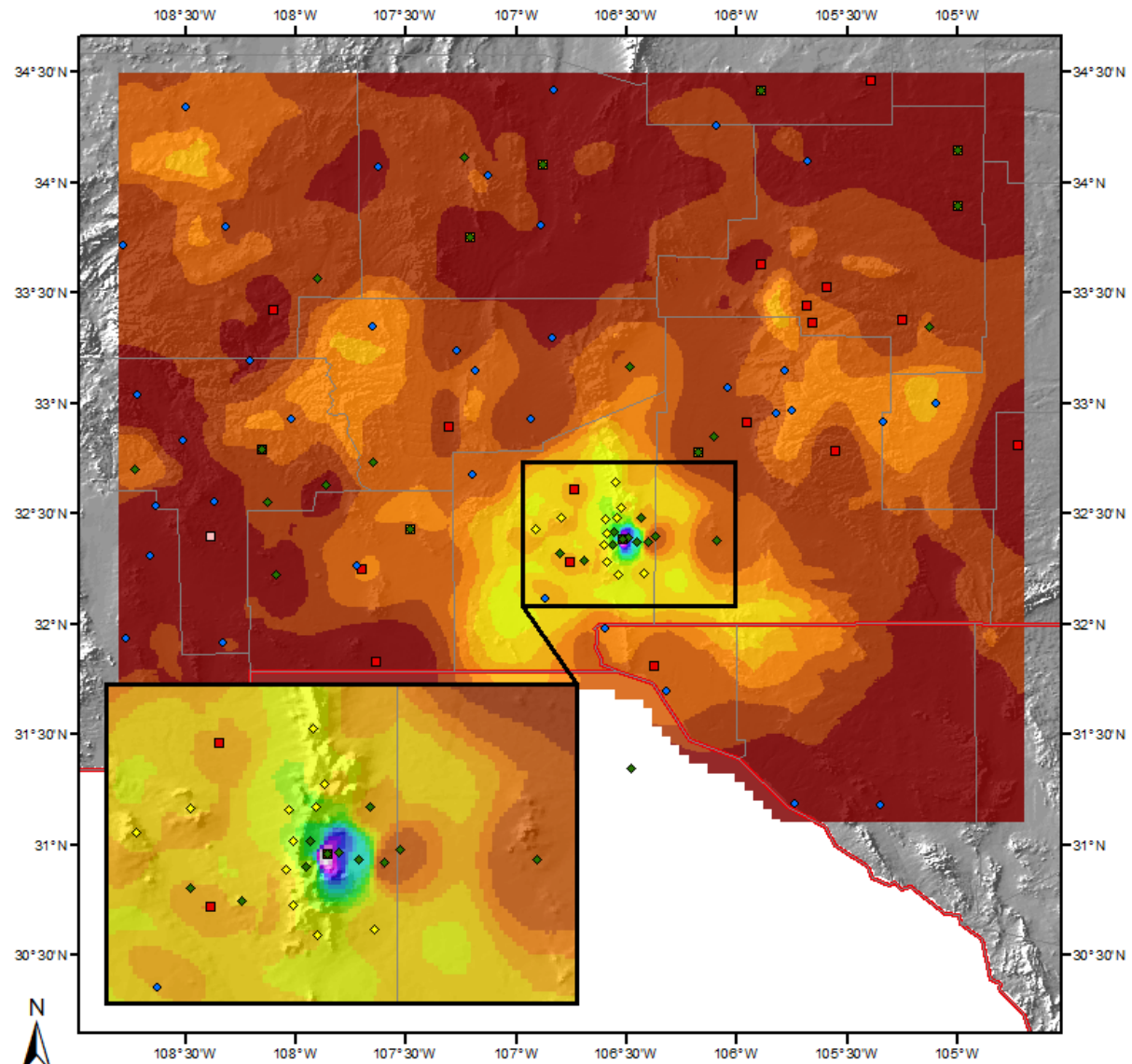
Storm 1487 - August 18 (0800 UTC) - August 21 (0700 UTC), 1978													
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)													
Area (mi ²)	Duration (hours)												
	1	2	3	4	5	6	12	18	24	36	48	72	Total
0.3	2.20	4.40	6.60	7.70	8.25	8.80	10.32	10.40	10.40	10.40	10.40	10.40	10.40
1	2.18	4.36	6.55	7.64	8.18	8.73	10.22	10.31	10.31	10.31	10.31	10.31	10.31
10	1.90	3.80	5.70	6.65	7.12	7.60	8.93	9.00	9.00	9.00	9.00	9.00	9.00
25	1.64	3.28	4.92	5.74	6.15	6.56	7.72	7.79	7.79	7.79	7.79	7.79	7.79
50	1.42	2.83	4.24	4.94	5.30	5.65	6.70	6.77	6.77	6.77	6.77	6.77	6.77
100	1.20	2.41	3.44	4.01	4.30	4.60	5.55	5.64	5.64	5.64	5.64	5.64	5.64
150	1.10	2.22	3.03	3.53	3.78	4.04	4.97	5.07	5.07	5.07	5.07	5.07	5.07
200	1.05	2.10	2.83	3.28	3.50	3.75	4.59	4.69	4.69	4.69	4.69	4.69	4.69
300	0.99	1.94	2.56	2.96	3.15	3.38	4.11	4.22	4.22	4.22	4.22	4.22	4.22
400	0.95	1.84	2.39	2.75	2.92	3.15	3.83	3.91	3.91	3.91	3.91	3.91	3.91
500	0.92	1.76	2.26	2.59	2.75	2.97	3.68	3.77	3.77	3.77	3.77	3.77	3.77
1,000	0.83	1.53	1.91	2.17	2.29	2.49	3.27	3.38	3.38	3.38	3.38	3.38	3.38
2,000	0.70	1.33	1.59	1.79	1.89	2.11	2.94	3.02	3.03	3.03	3.03	3.03	3.03
5,000	0.50	0.94	1.14	1.30	1.46	1.71	2.37	2.48	2.49	2.49	2.50	2.50	2.50
10,000	0.34	0.61	0.76	0.93	1.08	1.34	1.87	1.98	1.99	2.01	2.02	2.02	2.02
20,000	0.23	0.39	0.50	0.60	0.71	0.85	1.31	1.45	1.46	1.50	1.53	1.53	1.53
50,000	0.10	0.19	0.24	0.32	0.37	0.45	0.72	0.86	0.88	0.90	0.92	0.92	0.92
50,653	0.10	0.19	0.24	0.32	0.37	0.45	0.72	0.85	0.86	0.89	0.91	0.91	0.91



CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



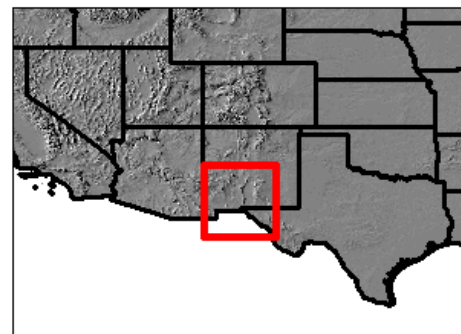
Total 72-hour Precipitation (inches)
August 18, 1978 (0800 UTC) - August 20, 1978 (0700 UTC)
SPAS #1487

Precipitation (inches)

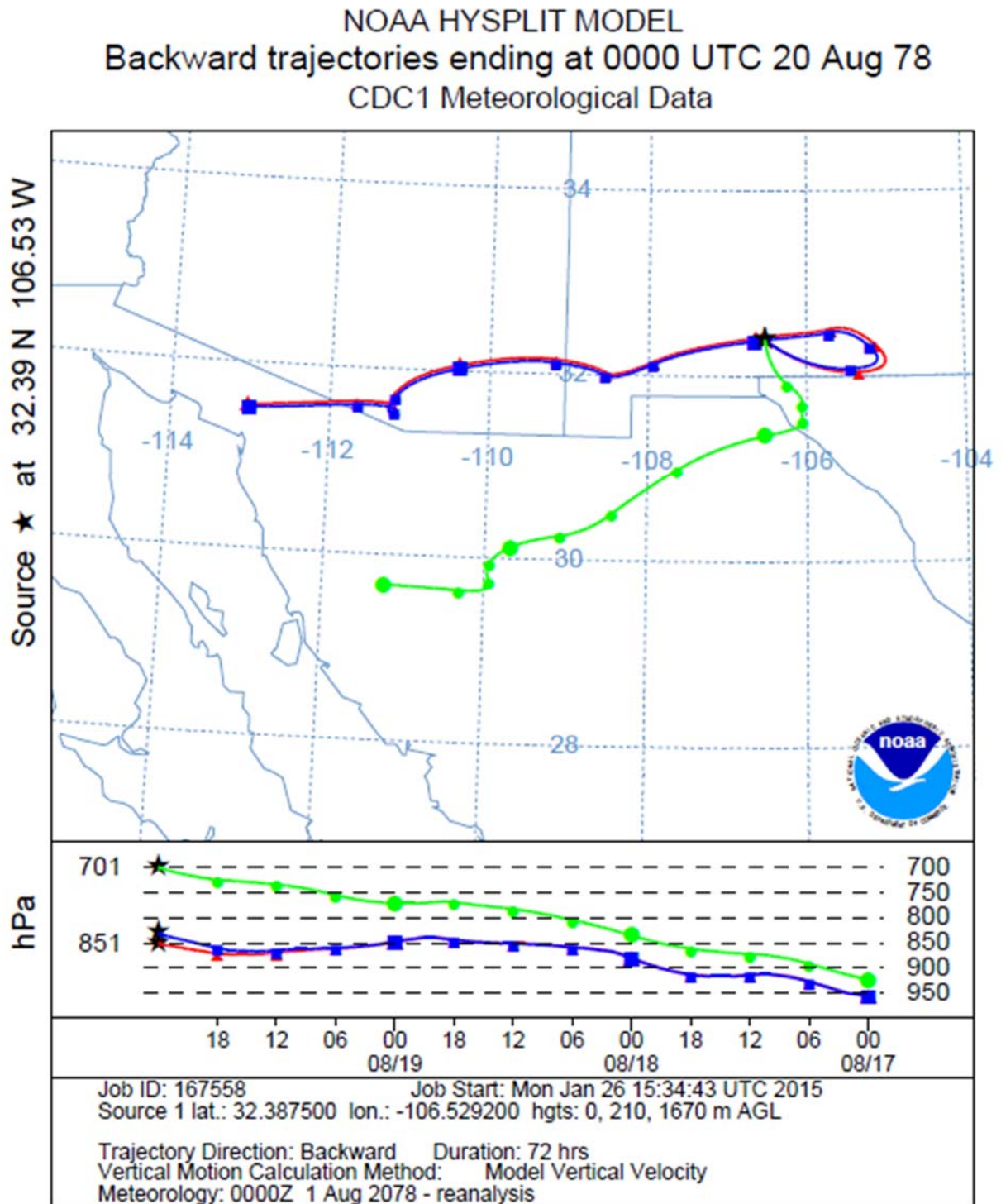
0.00 - 0.50	3.51 - 4.00	7.01 - 7.50
0.51 - 1.00	4.01 - 4.50	7.51 - 8.00
1.01 - 1.50	4.51 - 5.00	8.01 - 8.50
1.51 - 2.00	5.01 - 5.50	8.51 - 9.00
2.01 - 2.50	5.51 - 6.00	9.01 - 9.50
2.51 - 3.00	6.01 - 6.50	9.51 - 10.00
3.01 - 3.50	6.51 - 7.00	10.01 - 10.50

Stations

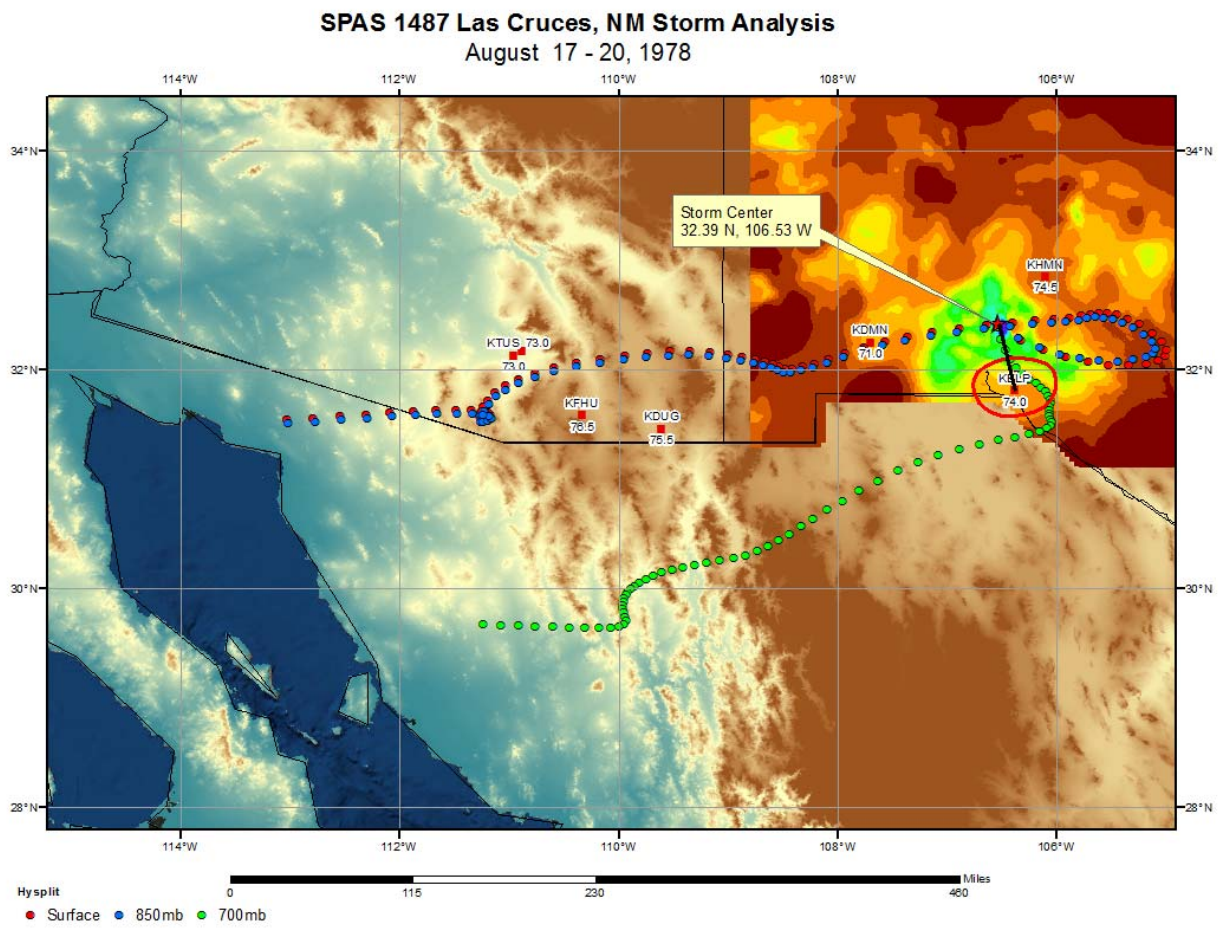
D
H
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ADH 1/13/2015



CO-NM Regional Extreme Precipitation Study



Belen, NM
June 8-11, 1980
Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1659_1

General Storm Location: Belen, NM

Storm Dates: June 8-11, 1980

Event: Convective

DAD Zone 1

Latitude: 34.6542

Longitude: -106. 8208

Maximum Grid Precipitation Amount: 4.21"

Maximum Observed Precipitation Amount: 3.70"

Number of Stations: 51

SPAS Version: 10.0

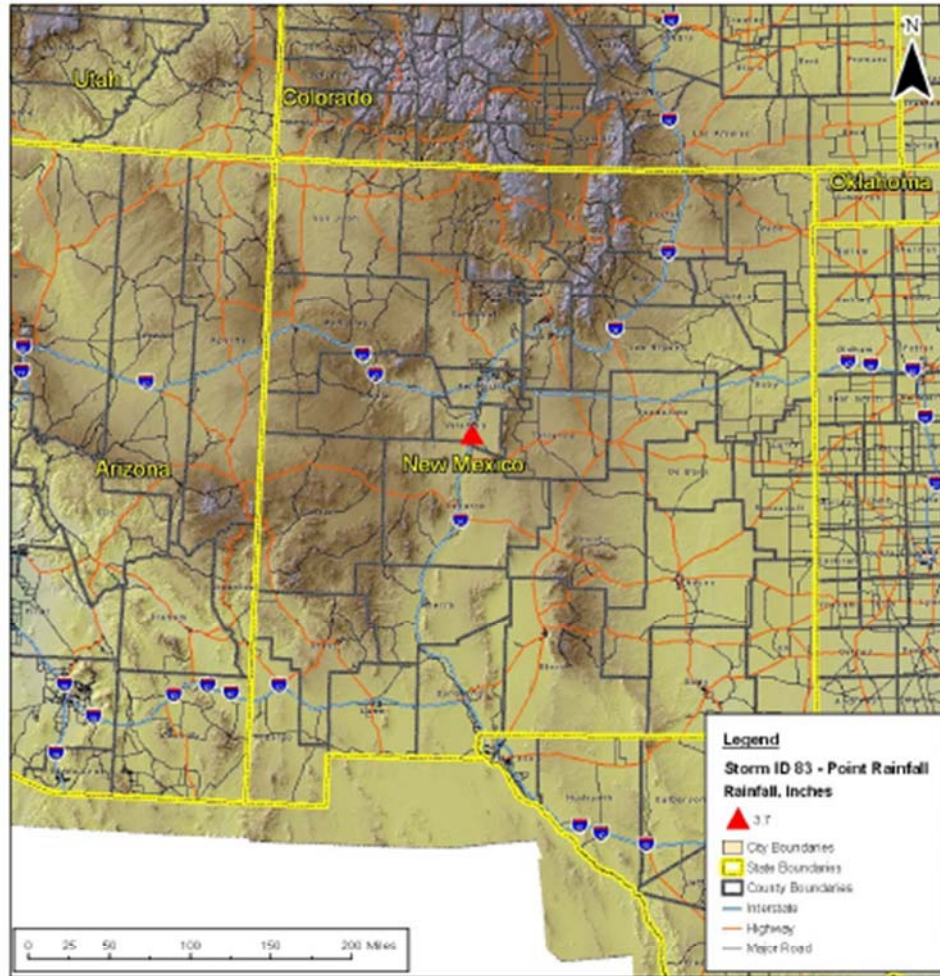
Base Map Used: Yes

Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

Reliability of Results: In addition to the NCDC stations, one supplemental station was added to ensure the data matches what can actually occur and that the data more closely resemble what was reported in storm reports. With the density of stations available for this storm and with how closely the resulting SPAS analysis was to the storm reports, this analysis is deemed quite reliable.

CO-NM Regional Extreme Precipitation Study



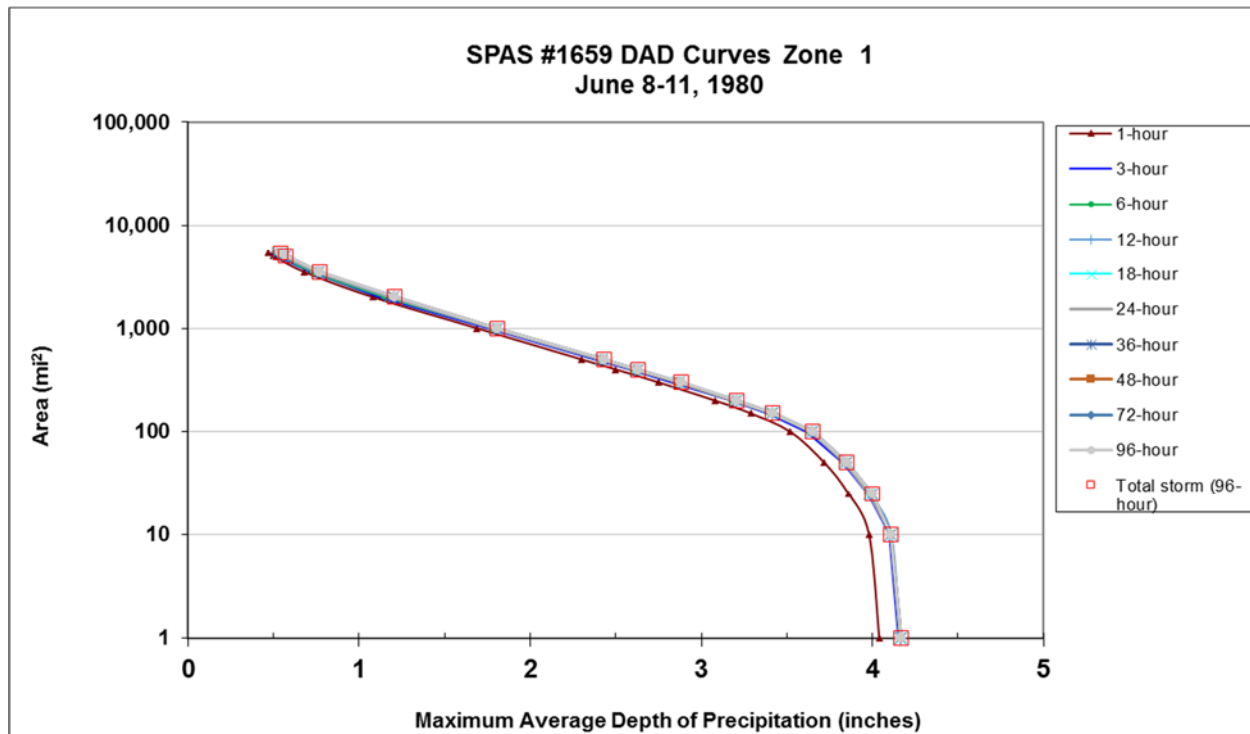
Storm Synopsis and Climate Zone Classification:

Storm ID 83 Climate Zones – 4, 5: A strong flow of moisture forced northward up the valley of the Rio Grande by an attendant synoptic situation produced a short duration rainfall that approached the 5000 year event level. The trajectory of the moisture indicated that this event could have occurred in climate zone 4 or 5.

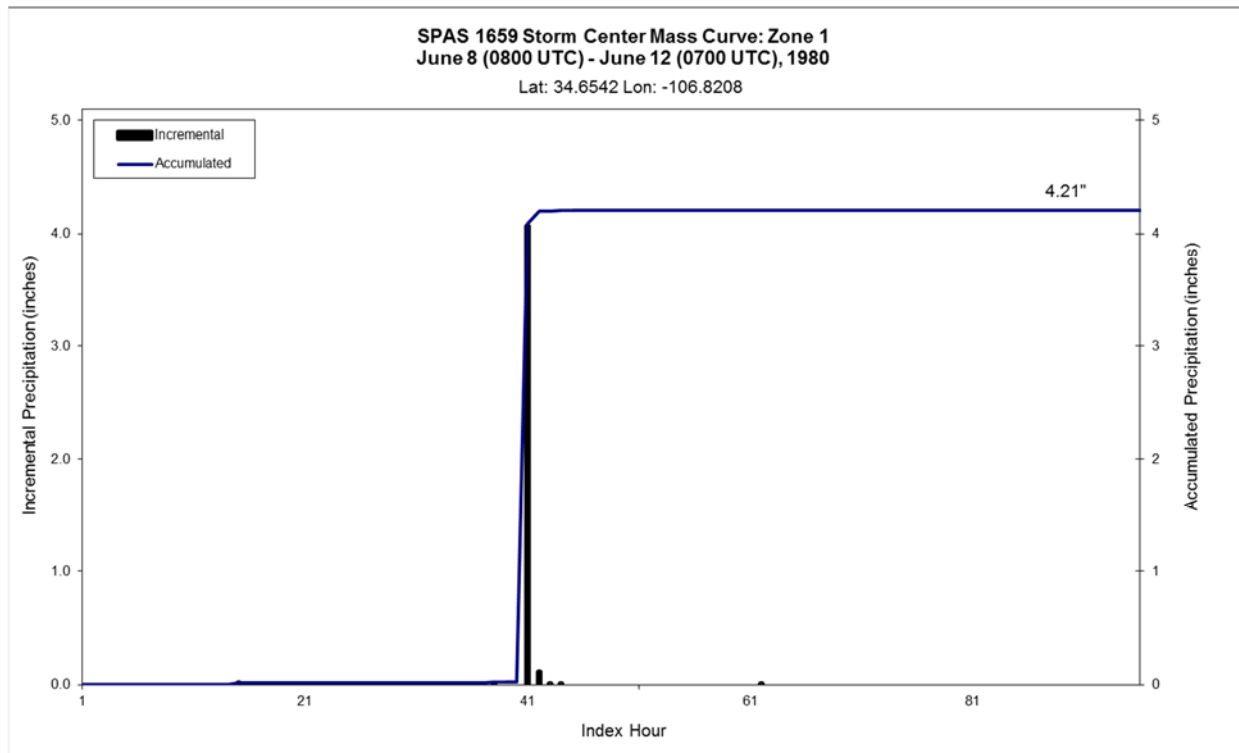
Start Date/End Date	June 9, 1980
Storm Name/Status	Belen – STORM ID 83 / Active
Storm Type	Local Storm – Convective Simple
State/Climate Zone	New Mexico / Climate Zones 4, 5
Duration/Max Precipitation	1.25 hours / 3.7"
Originator	COE
Low Level Wind	120 degrees
Upper Level Wind	270 degrees
PW1 /1000mb Dewpoint	1.68" / 64F
Storm Source	COE
Temporal	Point Rainfall; Observationally-based synthetic

CO-NM Regional Extreme Precipitation Study

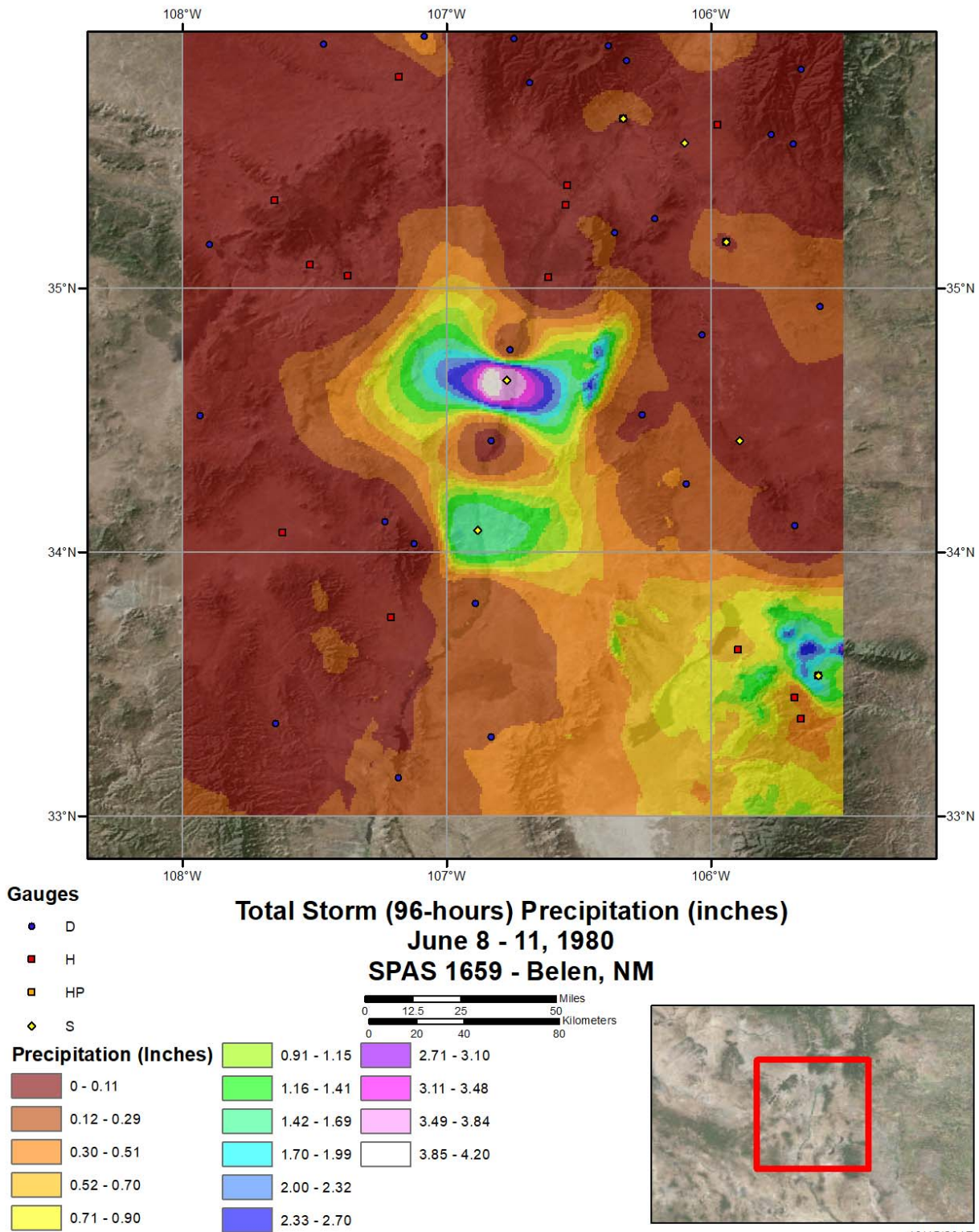
Storm 1659 - June 8 (0800 UTC) - June 12 (0700 UTC), 1980											
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)											
Area (mi ²)	Duration (hours)										
	1	3	6	12	18	24	36	48	72	96	Total
0.4	4.06	4.17	4.18	4.18	4.18	4.18	4.20	4.20	4.20	4.20	4.20
1	4.04	4.15	4.16	4.16	4.16	4.16	4.17	4.17	4.17	4.17	4.17
10	3.98	4.10	4.10	4.11	4.11	4.11	4.11	4.11	4.11	4.11	4.11
25	3.86	3.97	3.98	3.98	3.98	3.98	4.00	4.00	4.00	4.00	4.00
50	3.72	3.83	3.83	3.84	3.84	3.84	3.85	3.85	3.85	3.85	3.85
100	3.52	3.62	3.63	3.64	3.64	3.64	3.65	3.65	3.65	3.65	3.65
150	3.29	3.39	3.40	3.41	3.41	3.41	3.42	3.42	3.42	3.42	3.42
200	3.08	3.17	3.18	3.19	3.19	3.19	3.21	3.21	3.21	3.21	3.21
300	2.75	2.83	2.85	2.86	2.86	2.86	2.87	2.87	2.88	2.88	2.88
400	2.50	2.58	2.60	2.61	2.61	2.61	2.63	2.63	2.63	2.63	2.63
500	2.30	2.37	2.40	2.41	2.41	2.41	2.42	2.43	2.43	2.43	2.43
1,000	1.69	1.75	1.78	1.79	1.79	1.79	1.81	1.81	1.81	1.81	1.81
2,000	1.08	1.12	1.15	1.18	1.18	1.18	1.20	1.21	1.21	1.21	1.21
3,500	0.68	0.71	0.73	0.75	0.75	0.75	0.76	0.77	0.77	0.77	0.77
5,000	0.50	0.52	0.54	0.55	0.55	0.55	0.57	0.57	0.57	0.57	0.57
5,333	0.47	0.49	0.51	0.52	0.52	0.52	0.54	0.54	0.54	0.54	0.54



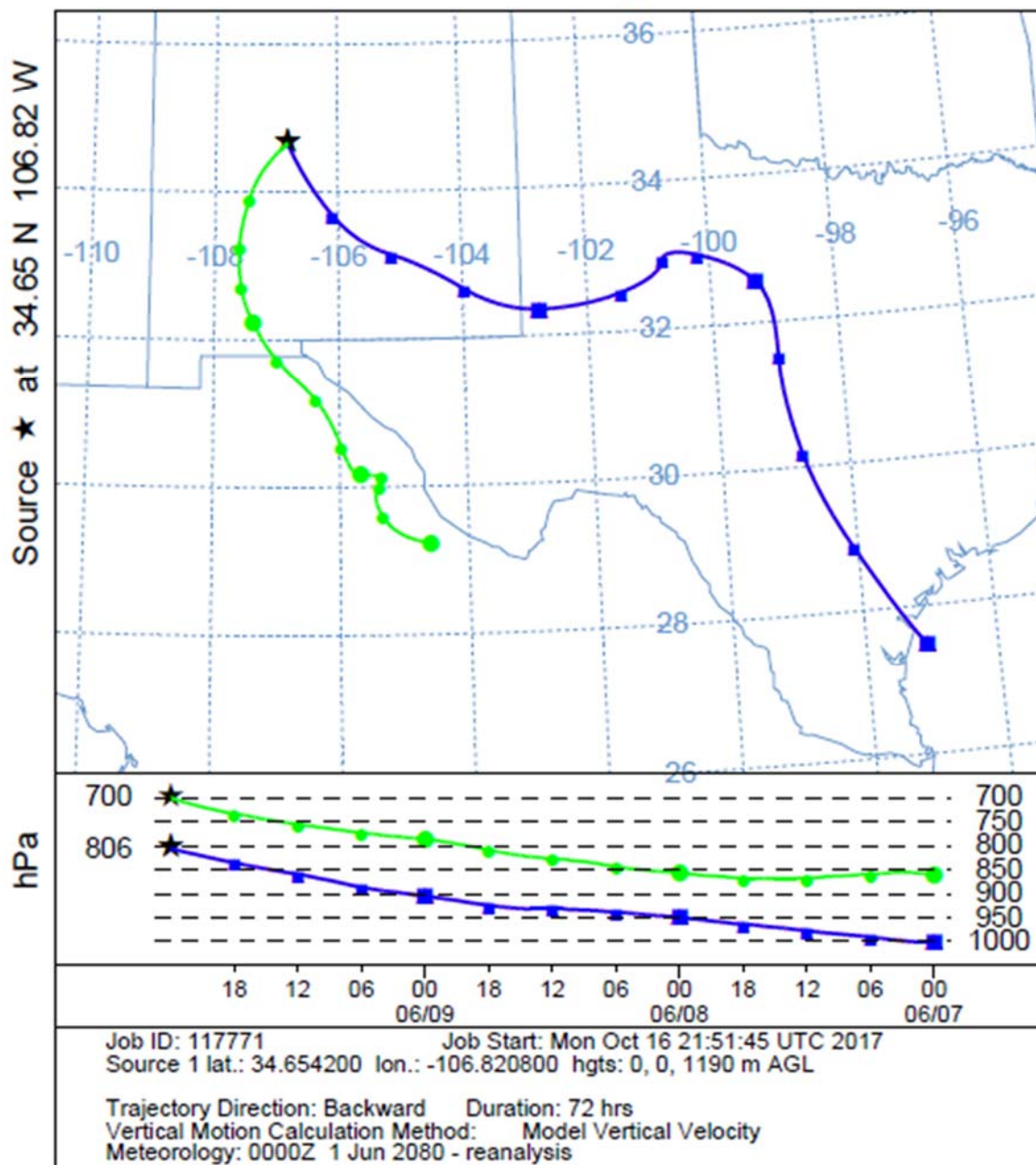
CO-NM Regional Extreme Precipitation Study



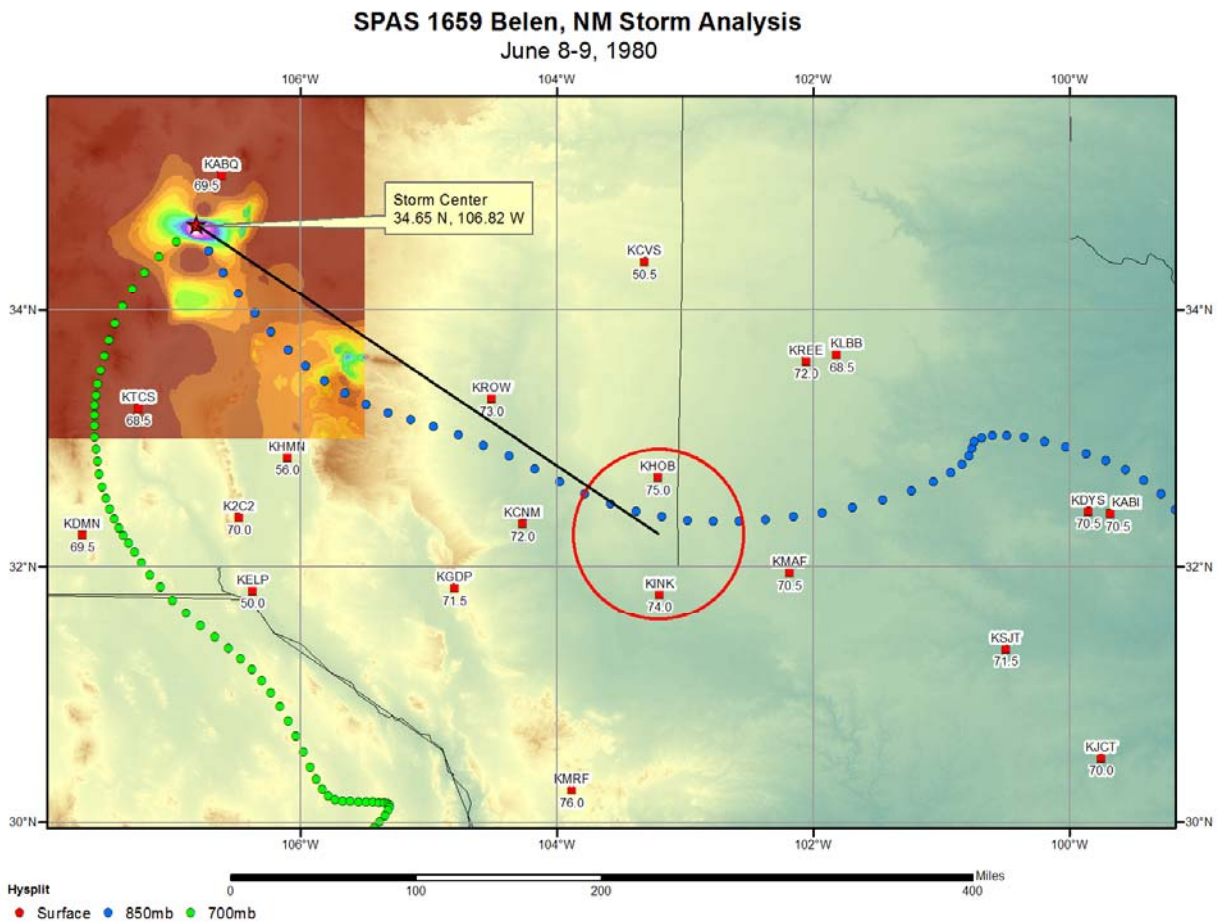
CO-NM Regional Extreme Precipitation Study



NOAA HYSPLIT MODEL
Backward trajectories ending at 0000 UTC 10 Jun 80
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study



Frijole Creek, CO

July 2-5, 1981

Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1247_1

General Storm Location: Colorado

Storm Dates: July 2-5, 1981

Event: Thunderstorm

DAD Zone 1

Latitude: 37.096

Longitude: -104.379

Max. Grid Rainfall Amount: 16.33"

Max. Observed Rainfall Amount: 16.00"

Number of Stations: 54 (23 Daily, 8 Hourly, 2 Hourly Pseudo, and 21 Supplemental)

SPAS Version: 9.5

Basemap: Blend of isohyetal from Bishop report and PRISM July 1981 precipitation

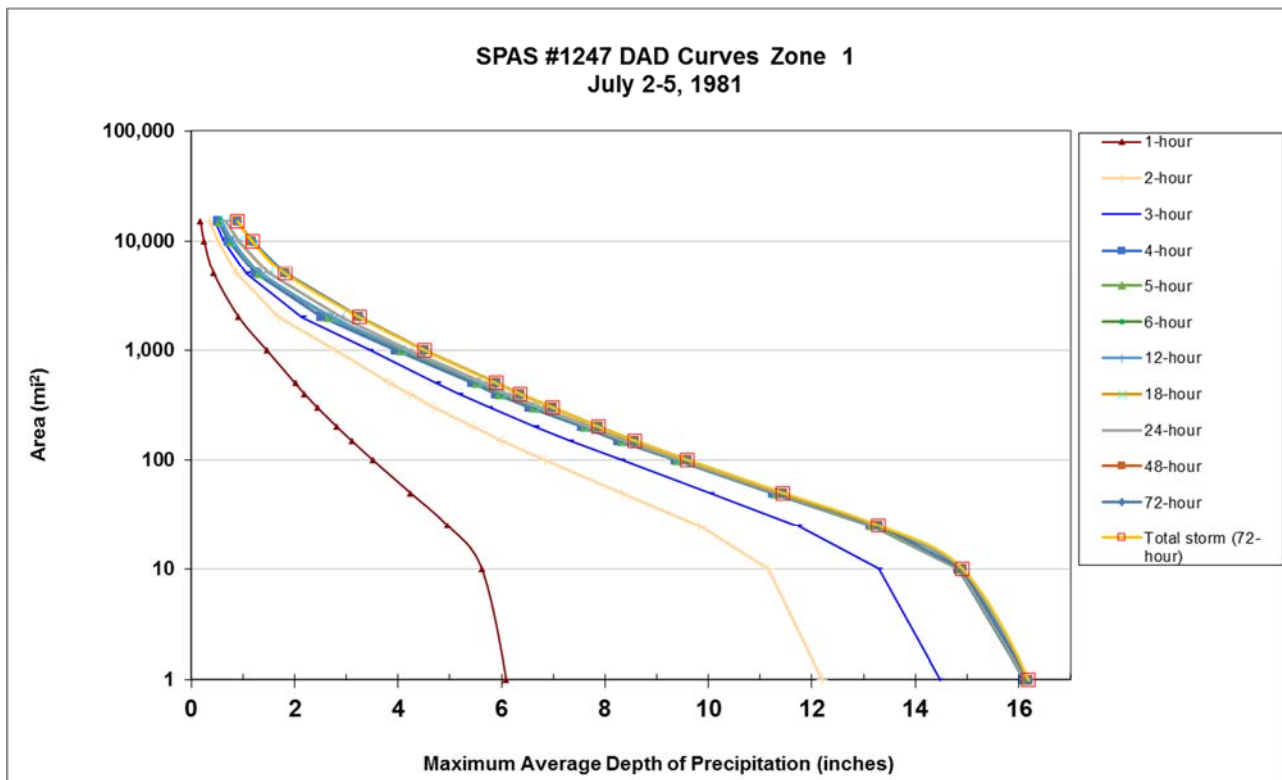
Spatial resolution: 00:00:30 (~ 0.30 mi²)

Radar Included: No

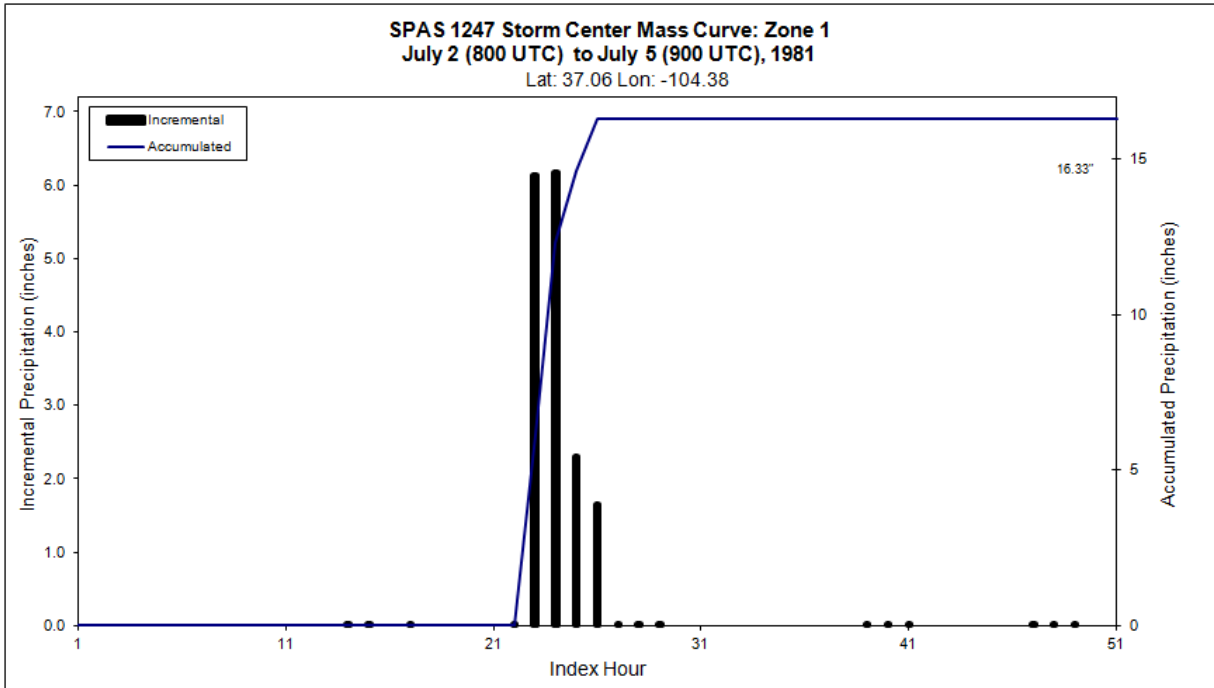
Depth-Area-Duration (DAD) analysis: Yes

CO-NM Regional Extreme Precipitation Study

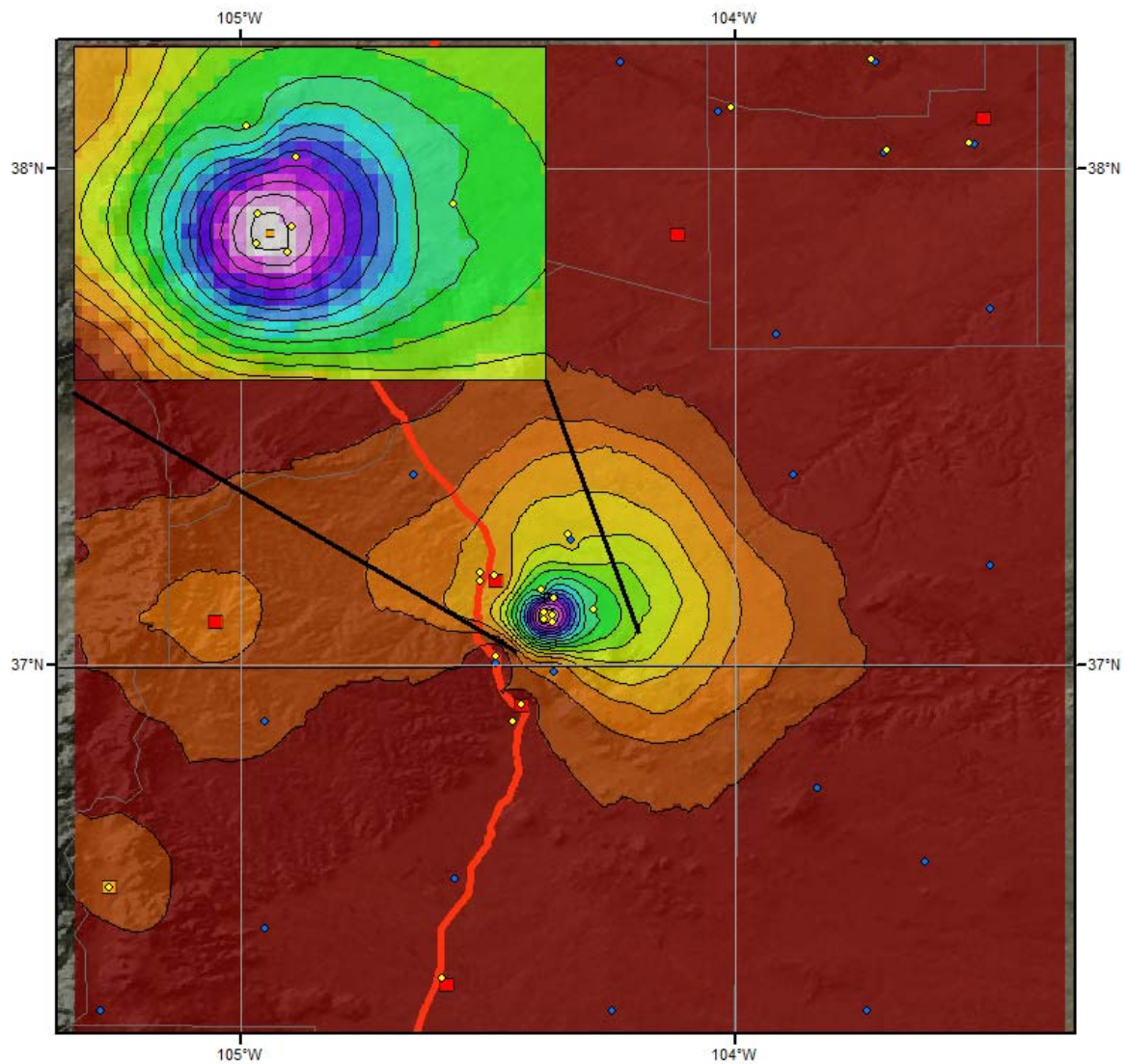
Storm 1247 - July 2 (8 UTC) - July 5 (7 UTC), 1981												
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)												
Area (mi ²)	Duration (hours)											
	1	2	3	4	5	6	12	18	24	48	72	Total
0.3	6.14	12.26	14.56	16.21	16.22	16.23	16.23	16.25	16.25	16.28	16.28	16.28
1	6.09	12.19	14.47	16.11	16.12	16.12	16.13	16.14	16.14	16.18	16.18	16.18
10	5.62	11.16	13.29	14.83	14.85	14.85	14.86	14.87	14.87	14.91	14.91	14.91
25	4.96	9.82	11.73	13.13	13.16	13.17	13.18	13.22	13.22	13.29	13.29	13.29
50	4.24	8.34	10.03	11.26	11.30	11.30	11.32	11.34	11.34	11.44	11.44	11.44
100	3.51	6.84	8.31	9.37	9.41	9.42	9.44	9.48	9.48	9.59	9.59	9.59
150	3.10	6.00	7.31	8.27	8.33	8.35	8.37	8.41	8.41	8.57	8.57	8.57
200	2.82	5.45	6.66	7.55	7.62	7.63	7.66	7.71	7.71	7.88	7.88	7.88
300	2.44	4.70	5.75	6.55	6.64	6.66	6.70	6.76	6.76	6.99	6.99	6.99
400	2.19	4.23	5.17	5.89	5.98	6.01	6.05	6.11	6.11	6.35	6.35	6.35
500	2.01	3.83	4.75	5.43	5.52	5.54	5.59	5.66	5.66	5.90	5.90	5.90
1,000	1.46	2.79	3.45	3.96	4.06	4.08	4.13	4.21	4.21	4.51	4.51	4.51
2,000	0.92	1.69	2.14	2.52	2.66	2.70	2.74	2.88	2.88	3.23	3.25	3.25
5,000	0.44	0.87	1.07	1.25	1.32	1.34	1.36	1.50	1.50	1.82	1.82	1.82
10,000	0.25	0.52	0.63	0.73	0.78	0.79	0.81	0.92	0.93	1.17	1.18	1.18
15,206	0.18	0.35	0.46	0.53	0.56	0.57	0.59	0.67	0.67	0.90	0.90	0.90



CO-NM Regional Extreme Precipitation Study



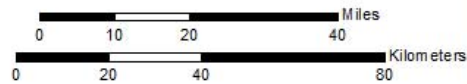
CO-NM Regional Extreme Precipitation Study



Total Precipitation (72-hours)
SPAS-Lite 1247 - Frijole Creek, CO
7/02/1981 0800 GMT - 7/05/1981 0700 GMT

Gauges

- ◆ Daily
- Hourly
- Hourly Pseudo
- ◇ Supplemental

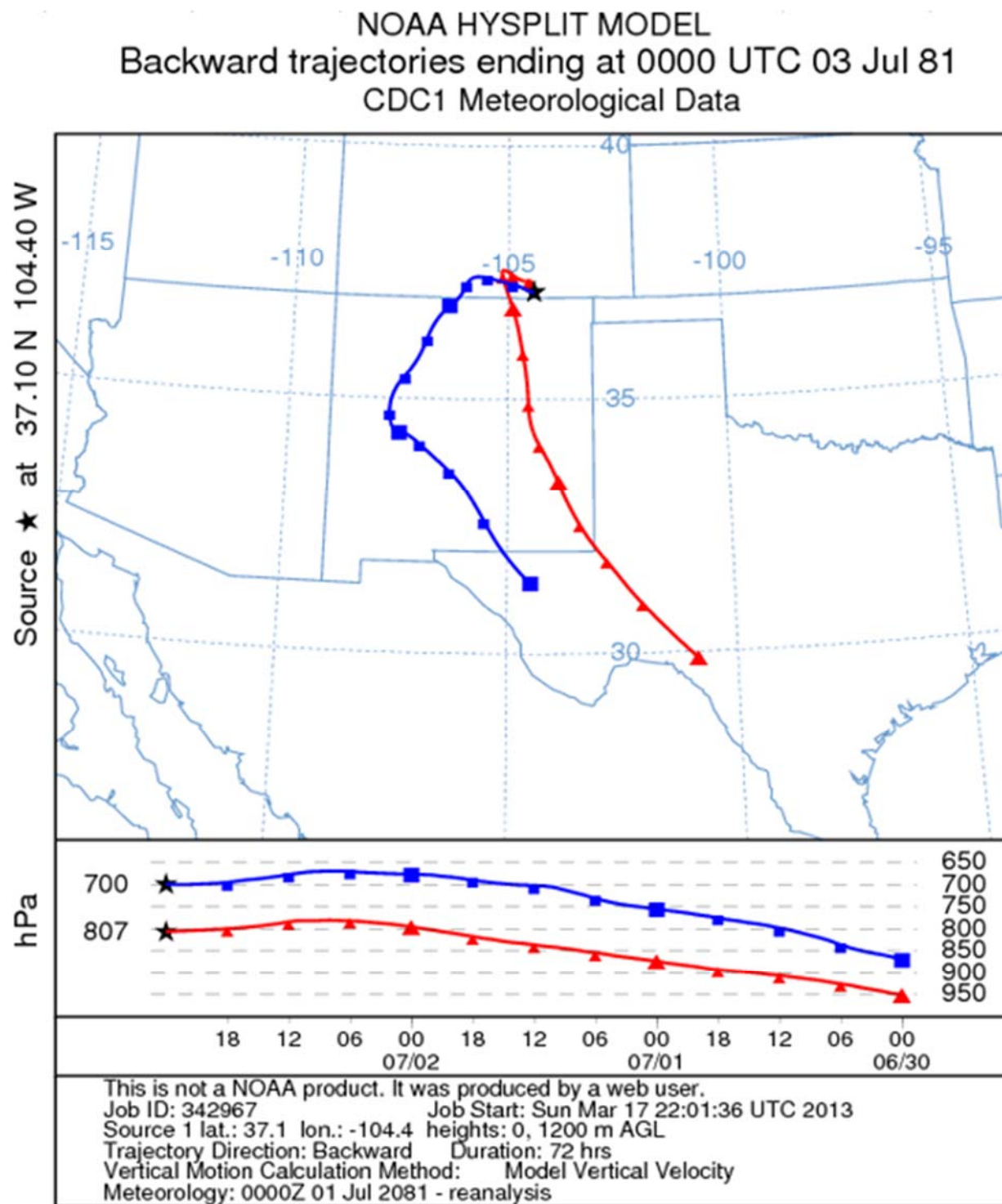


Precipitation (inches)

0.00 - 1.00	4.01 - 5.00	8.01 - 9.00	12.01 - 13.00	16.01 - 17.00
1.01 - 2.00	5.01 - 6.00	9.01 - 10.00	13.01 - 14.00	
2.01 - 3.00	6.01 - 7.00	10.01 - 11.00	14.01 - 15.00	
3.01 - 4.00	7.01 - 8.00	11.01 - 12.00	15.01 - 16.00	

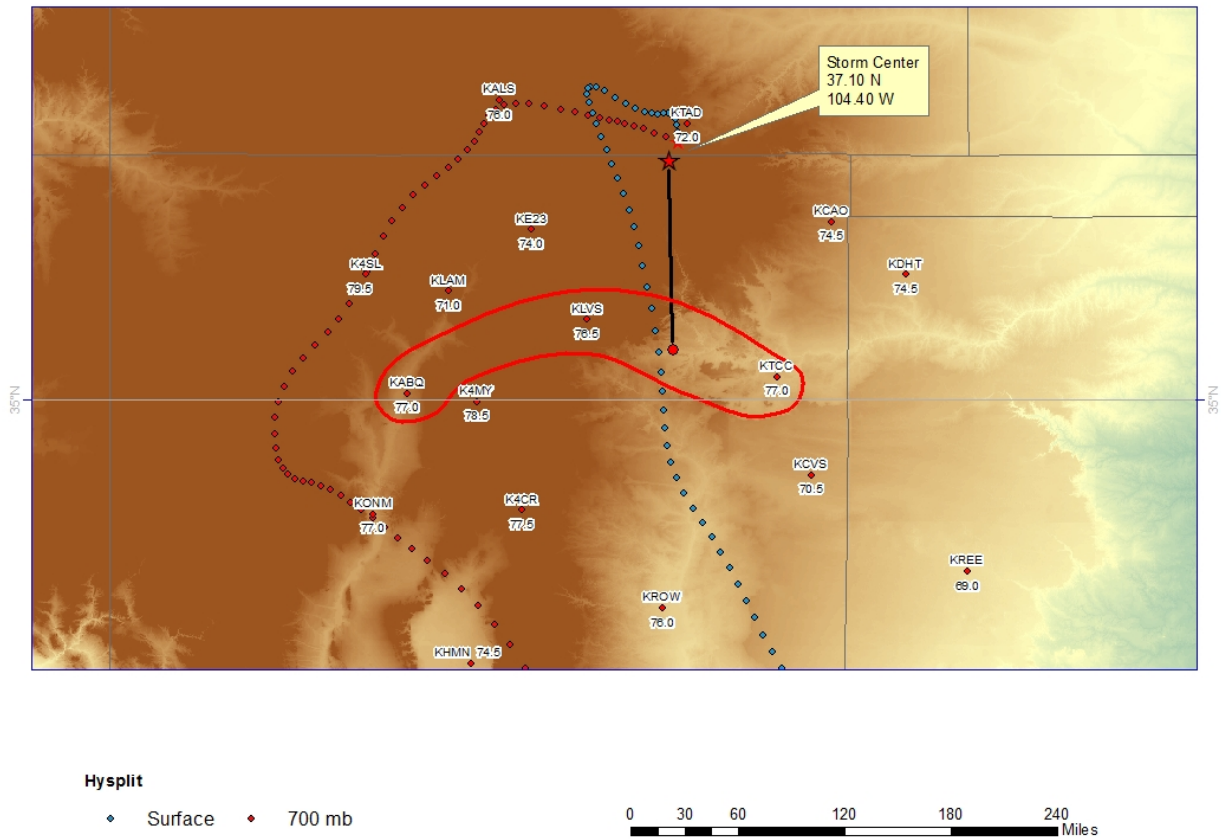


8/20/2012



CO-NM Regional Extreme Precipitation Study

SPAS 1247
July 2-5, 1981



Prescott, AZ
September 22-25, 1983
Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1063_1

General Storm Location: Prescott, AZ

Storm Dates: 09/22/1983 0800Z – 09/25/1983 0800Z

Event: Convective

DAD Zone 1

Latitude: 34.6208

Longitude: -112.5541

Max. Grid/Radar Rainfall Amount: 17.80” (Grid/Pixel Point)

Max. Observed Rainfall Amount: 17.95” (Granite Basin Campground,
type=supplemental)

Number of Stations: 91 (6-hourly, 4-hourly pseudo, 19-daily, 62-supplemental) gauging
stations within the defined search domain.

SPAS Version: 7.0

Base Map Used: Yes, us_ppt_1983_09_30sec_in

Spatial resolution: 0.27 mi²

Radar Included: No

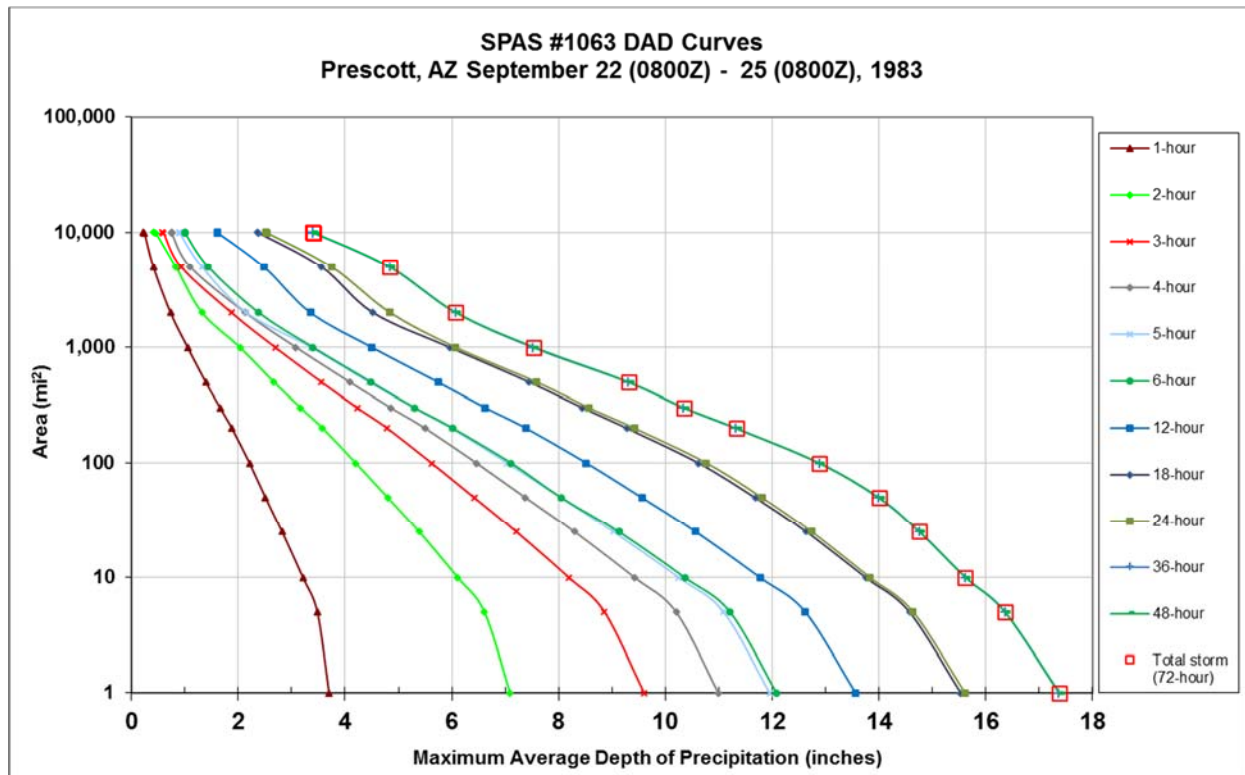
Depth-Area-Duration (DAD) analysis: Yes: 1, 2, 3, 4, 5, 6, 12, 18, 24, 36, 48 & 72 hours

CO-NM Regional Extreme Precipitation Study

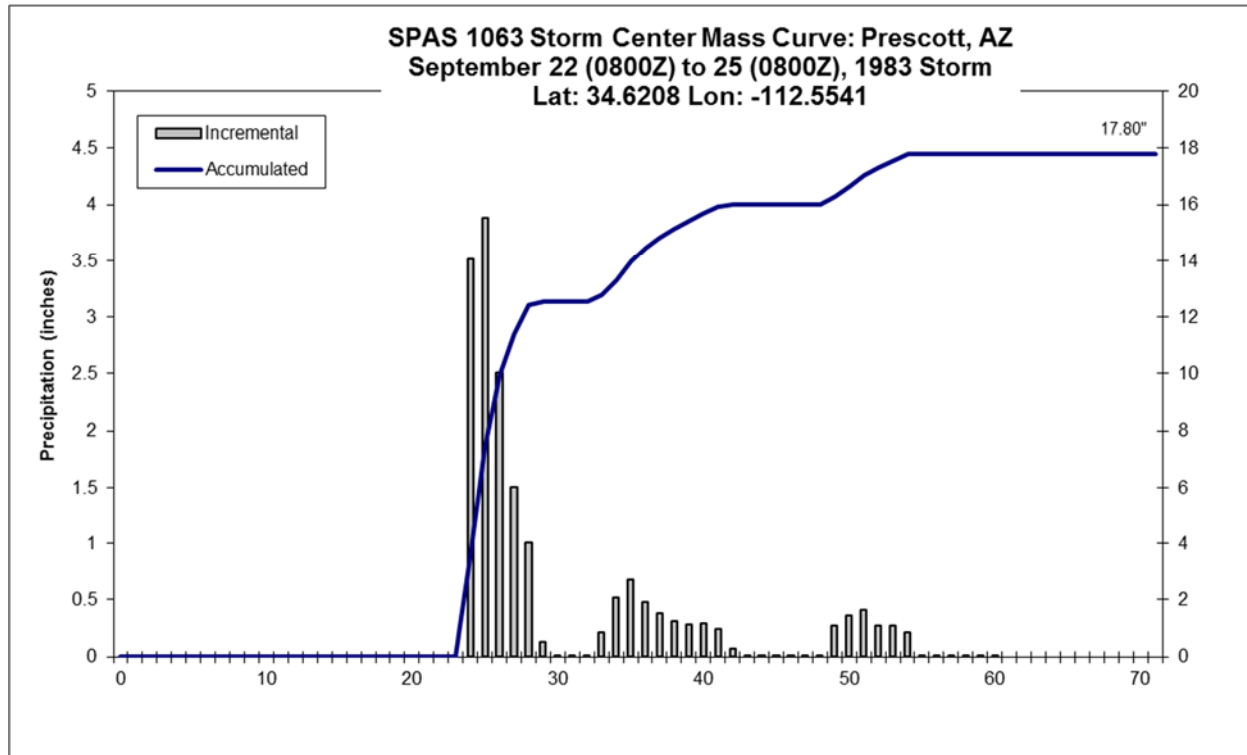
Storm 1063 - Prescott, AZ September 22 (0800Z) - 25 (0800Z), 1983

MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)

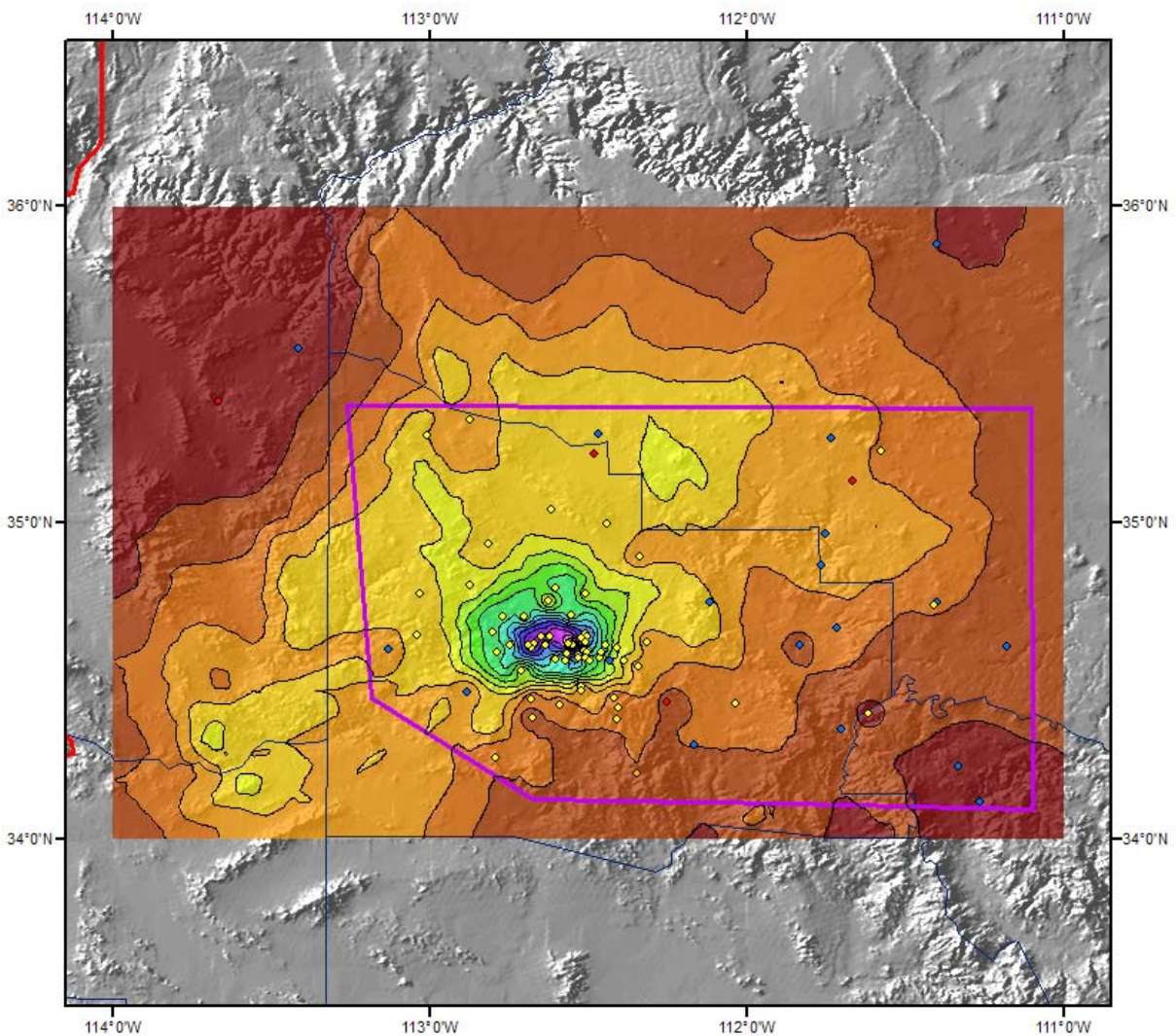
Area (mi ²)	Duration (hours)											
	1	2	3	4	5	6	12	18	24	36	48	total
0.27	3.88	7.39	9.90	11.40	12.40	12.53	13.96	15.94	16.01	17.80	17.80	17.80
1	3.70	7.09	9.60	10.99	11.95	12.08	13.56	15.53	15.61	17.37	17.38	17.38
5	3.48	6.61	8.86	10.20	11.09	11.21	12.62	14.57	14.64	16.36	16.36	16.36
10	3.21	6.11	8.19	9.42	10.25	10.36	11.77	13.75	13.83	15.62	15.62	15.62
25	2.82	5.39	7.21	8.30	9.03	9.13	10.57	12.64	12.74	14.76	14.76	14.76
50	2.51	4.80	6.42	7.38	8.04	8.05	9.56	11.68	11.81	13.99	14.00	14.00
100	2.21	4.20	5.62	6.46	7.04	7.11	8.52	10.62	10.77	12.88	12.88	12.88
200	1.88	3.58	4.79	5.50	5.99	6.02	7.39	9.28	9.42	11.31	11.33	11.33
300	1.66	3.17	4.23	4.86	5.29	5.31	6.63	8.45	8.57	10.34	10.35	10.35
500	1.39	2.67	3.56	4.09	4.45	4.49	5.74	7.45	7.59	9.30	9.31	9.31
1,000	1.05	2.03	2.69	3.08	3.36	3.40	4.50	5.96	6.07	7.51	7.54	7.54
2,000	0.73	1.32	1.87	2.13	2.15	2.38	3.35	4.52	4.84	6.07	6.07	6.07
5,000	0.41	0.83	0.93	1.10	1.32	1.44	2.48	3.56	3.75	4.83	4.84	4.84
10,000	0.24	0.45	0.60	0.75	0.90	1.00	1.61	2.37	2.53	3.40	3.41	3.41
10,032	0.21	0.41	0.58	0.75	0.90	1.00	1.61	2.36	2.52	3.39	3.39	3.39



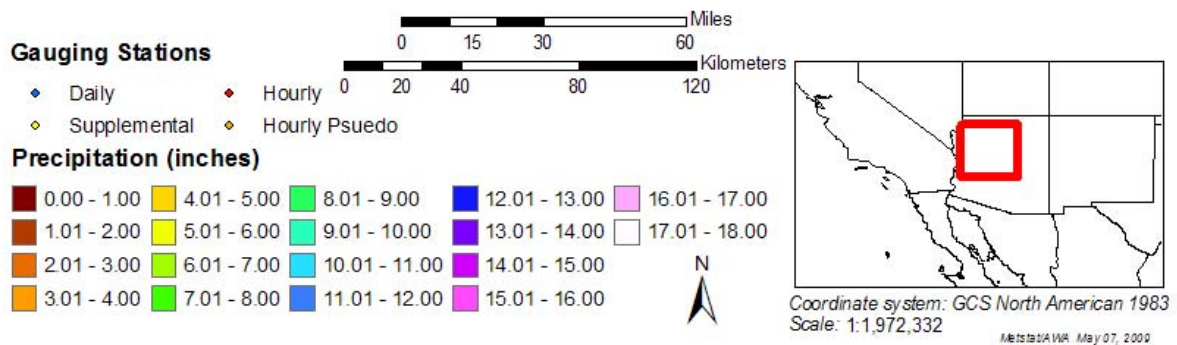
CO-NM Regional Extreme Precipitation Study



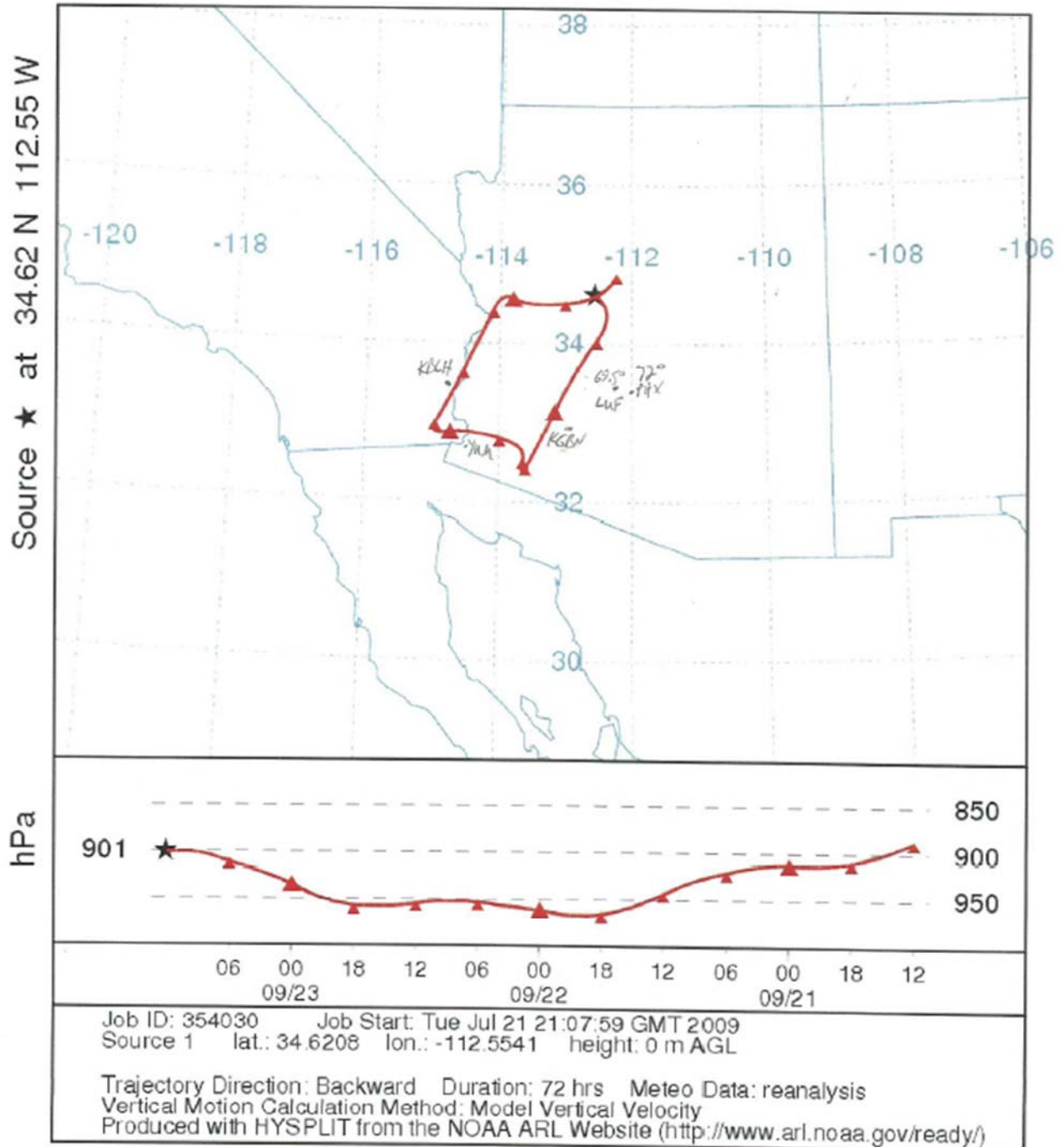
CO-NM Regional Extreme Precipitation Study



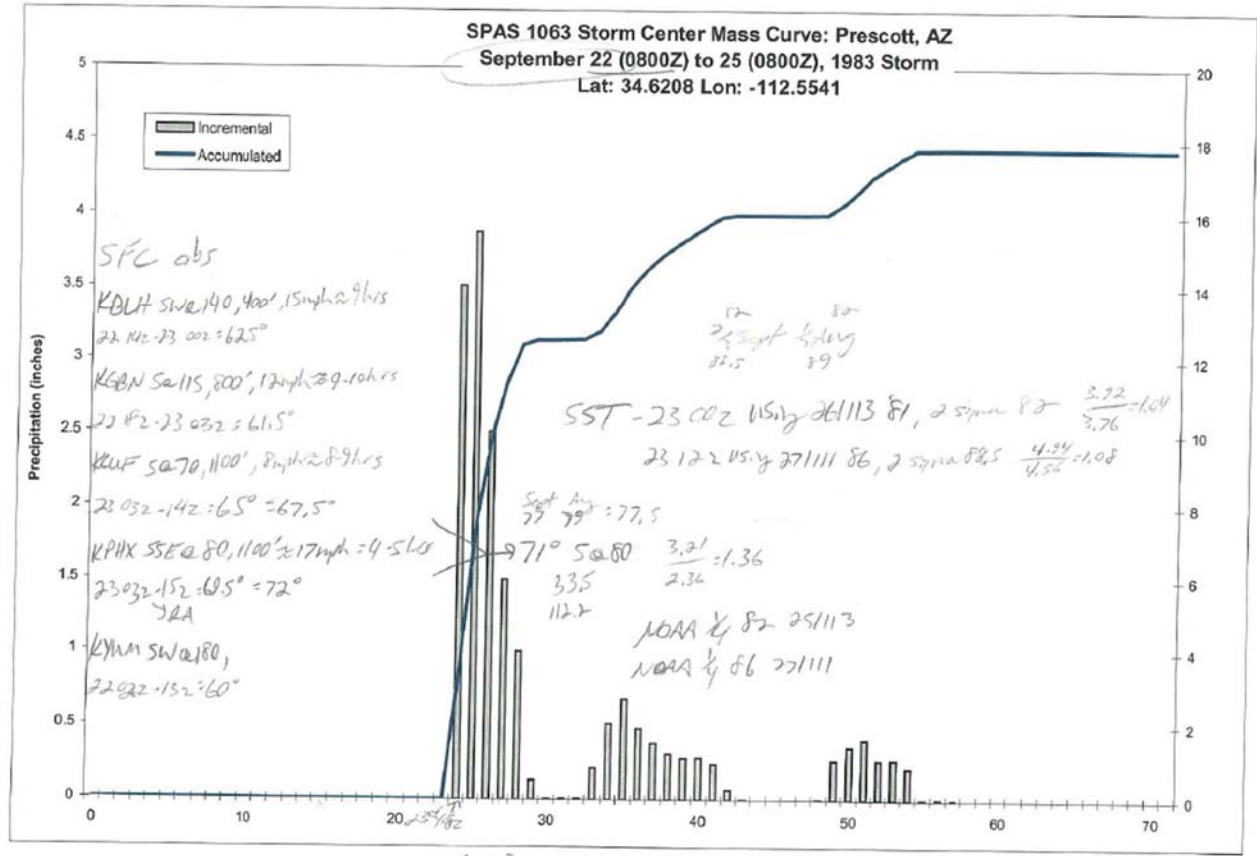
Total Rainfall (72-hours)
Prescott, AZ 1983 Storm
Storm #1063 September 22 (0800 Z) to 25 (0800 Z), 1983



NOAA HYSPLIT MODEL
Backward trajectory ending at 1200 UTC 23 Sep 83
CDC1 Meteorological Data



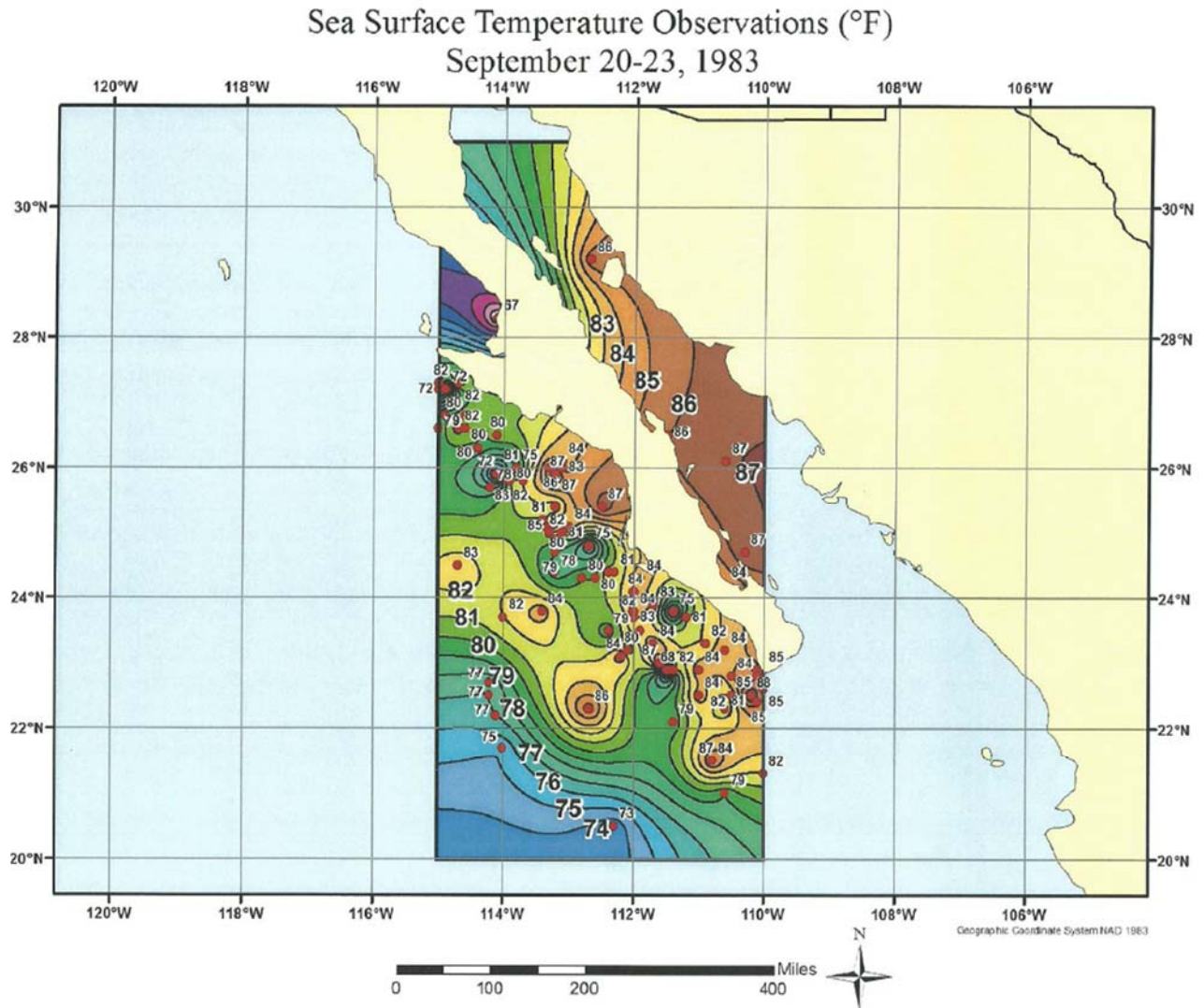
CO-NM Regional Extreme Precipitation Study



- Use 1 hr Ave or 3 hr Ave?

- Tropical Feed g Moisture at 700mb, with local convection - Terrain enhanced - compare to USAR analysis

CO-NM Regional Extreme Precipitation Study



Albuquerque, NM

July 8-10, 1988

Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1660_1

General Storm Location: Albuquerque, NM

Storm Dates: July 8-10, 1988

Event: Local

DAD Zone 1

Latitude: 35.0958

Longitude: -106.4792

Max. Grid/Radar Rainfall Amount: 5.77"

Max. Observed Rainfall Amount: 5.00"

Number of Stations: 31

SPAS Version: 10.0

Base Map Used: "blend" PRISM monthly climo from 07/1988 and 1660_isohyetal

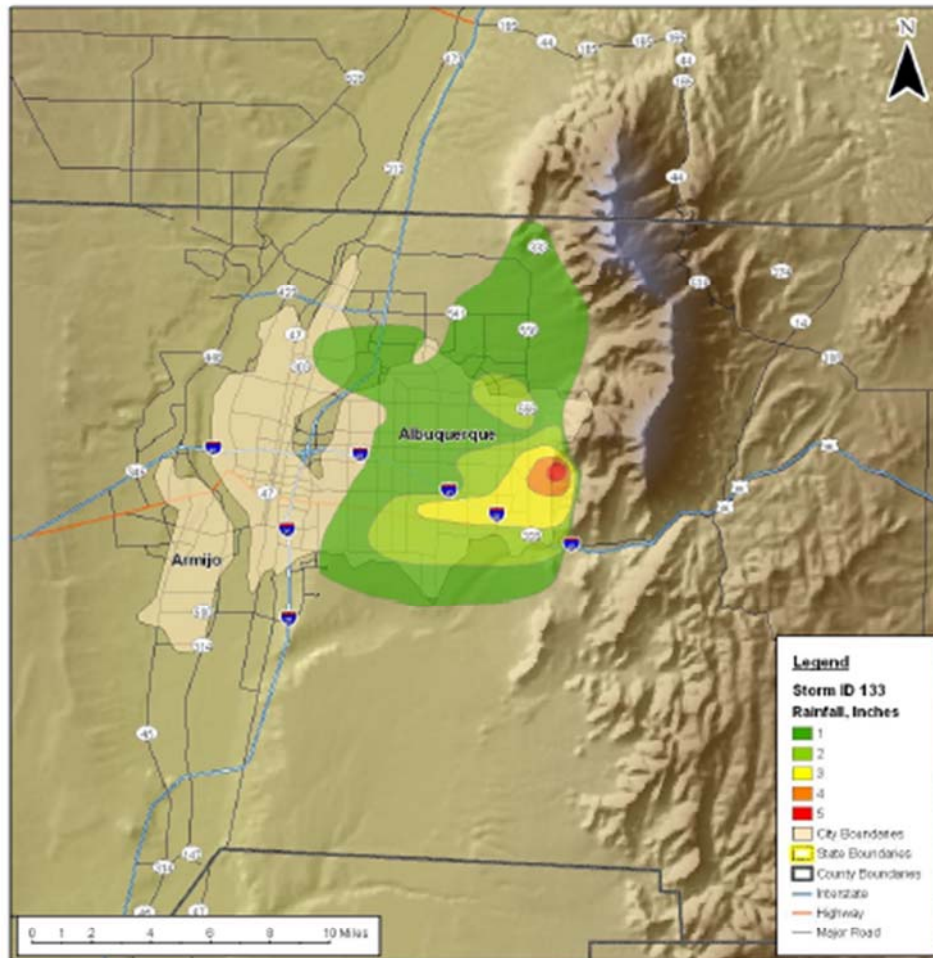
Spatial resolution: 0.2709

Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

Reliability of Results: This analysis was based on 31 hourly stations, daily data, and supplemental station data. We have a good degree of confidence for the station based storm total results. The spatial pattern is fully dependent on the blended basemap created from the total storm isohyetal image from the NM EPAT technical report for Storm ID 133 and the PRISM monthly climatology for July 1988. Timing is based on the hourly and hourly pseudo stations, specifically HRLY 1 created from the information given in the NM EPAT report. Several daily stations were moved to supplemental due to timing issues and to ensure data consistency.

CO-NM Regional Extreme Precipitation Study



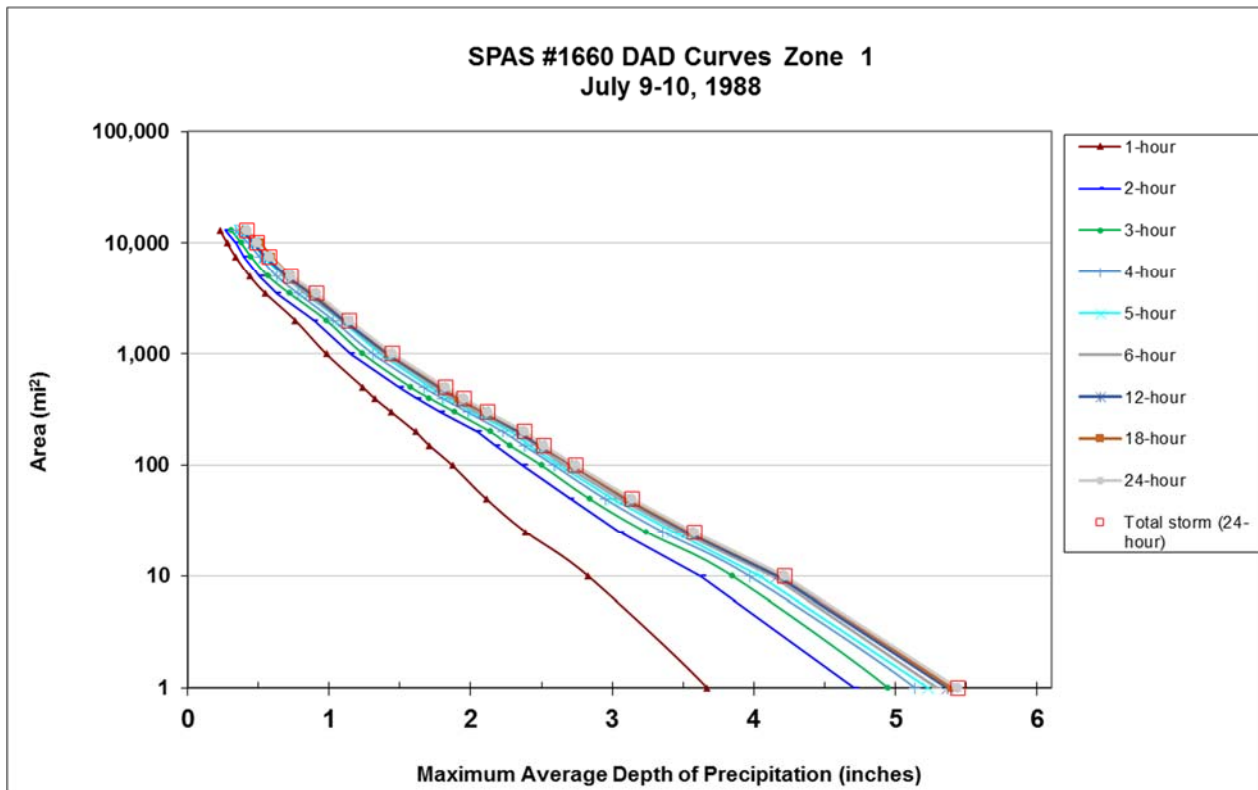
Storm Synopsis and Climate Zone Classification:

Storm ID 133 Climate Zones – 4, 5: This event typifies what makes up an EPE. A coming together of just the right amount of moisture, sufficient daytime heating and a raised heat source along the Sandia Mountains. 5" of rain in 2 hours represents well in excess of a 1000 year event for this location. This infiltration of moisture northward along the Rio Grande Valley could have produced a like event in either zone 4 or 5.

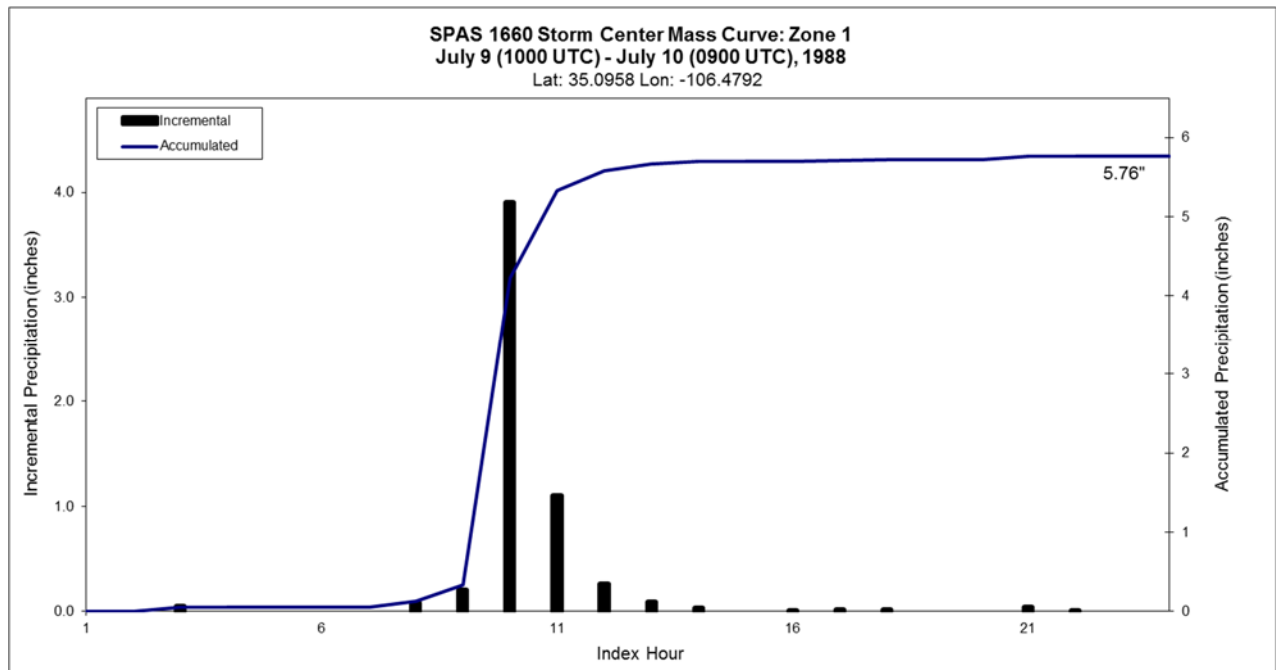
Start Date/End Date	July 9, 1988
Storm Name/Status	Albuquerque - STORM ID 133 / Active
Storm Type	Local Storm – Convective Simple
State/Climate Zone	New Mexico / Climate Zones 4, 5
Duration/Max Precipitation	2 hours / 5"
Originator	COE
Low Level Wind	0 degrees
Upper Level Wind	200 degrees
PWI /1000mb Dewpoint	1.86" / 66F
Storm Source	COE
Temporal	Observationally-based synthetic

CO-NM Regional Extreme Precipitation Study

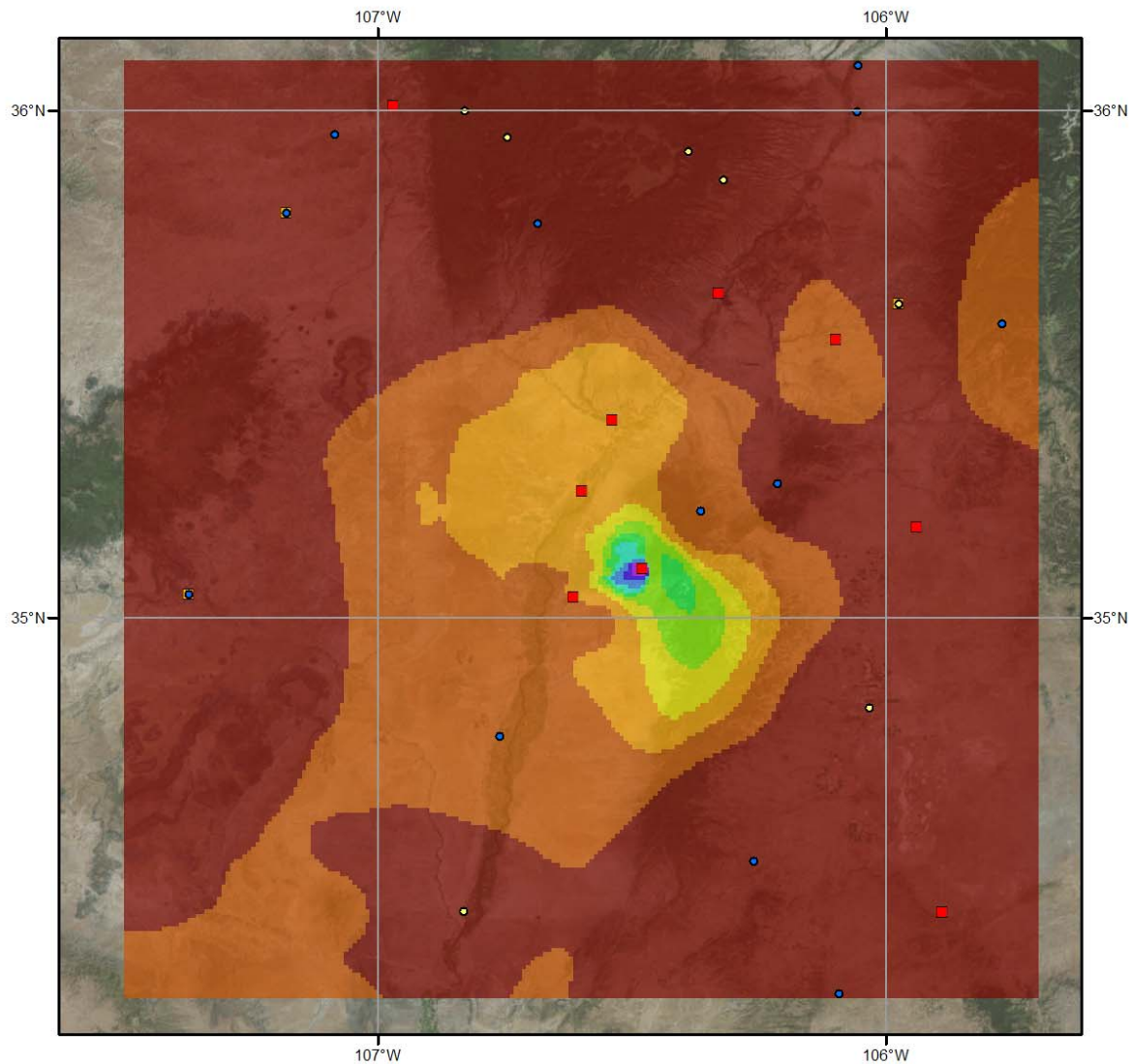
Storm 1660 - July 9 (1000 UTC) - July 10 (0900 UTC), 1988										
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)										
Area (mi ²)	Duration (hours)									
	1	2	3	4	5	6	12	18	24	Total
0.4	3.84	4.92	5.19	5.38	5.47	5.54	5.62	5.65	5.69	5.69
1	3.67	4.71	4.95	5.14	5.23	5.30	5.37	5.40	5.44	5.44
10	2.83	3.63	3.85	3.97	4.05	4.13	4.17	4.21	4.22	4.22
25	2.39	3.05	3.24	3.36	3.43	3.49	3.53	3.56	3.58	3.58
50	2.11	2.70	2.84	2.95	3.00	3.05	3.10	3.11	3.14	3.14
100	1.87	2.37	2.50	2.59	2.63	2.66	2.71	2.72	2.74	2.74
150	1.71	2.18	2.28	2.38	2.42	2.46	2.49	2.50	2.52	2.52
200	1.61	2.05	2.14	2.23	2.29	2.32	2.34	2.37	2.38	2.38
300	1.44	1.79	1.89	1.98	2.02	2.05	2.09	2.10	2.12	2.12
400	1.32	1.62	1.71	1.80	1.84	1.87	1.91	1.92	1.95	1.95
500	1.24	1.50	1.58	1.67	1.72	1.75	1.78	1.80	1.82	1.82
1,000	0.98	1.15	1.24	1.31	1.36	1.39	1.41	1.43	1.45	1.45
2,000	0.76	0.89	0.98	1.03	1.08	1.10	1.11	1.14	1.14	1.14
3,500	0.55	0.63	0.72	0.78	0.83	0.84	0.87	0.89	0.91	0.91
5,000	0.44	0.51	0.57	0.63	0.68	0.69	0.70	0.73	0.73	0.73
7,500	0.34	0.40	0.45	0.51	0.54	0.56	0.55	0.59	0.58	0.58
10,000	0.28	0.34	0.38	0.43	0.47	0.48	0.46	0.51	0.49	0.49
12,993	0.23	0.27	0.31	0.34	0.37	0.38	0.39	0.41	0.42	0.42



CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



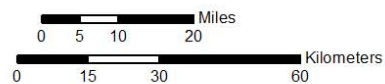
Total Storm (24-hours) Precipitation (inches)

July 9-10, 1988

SPAS 1660 - Albuquerque, NM

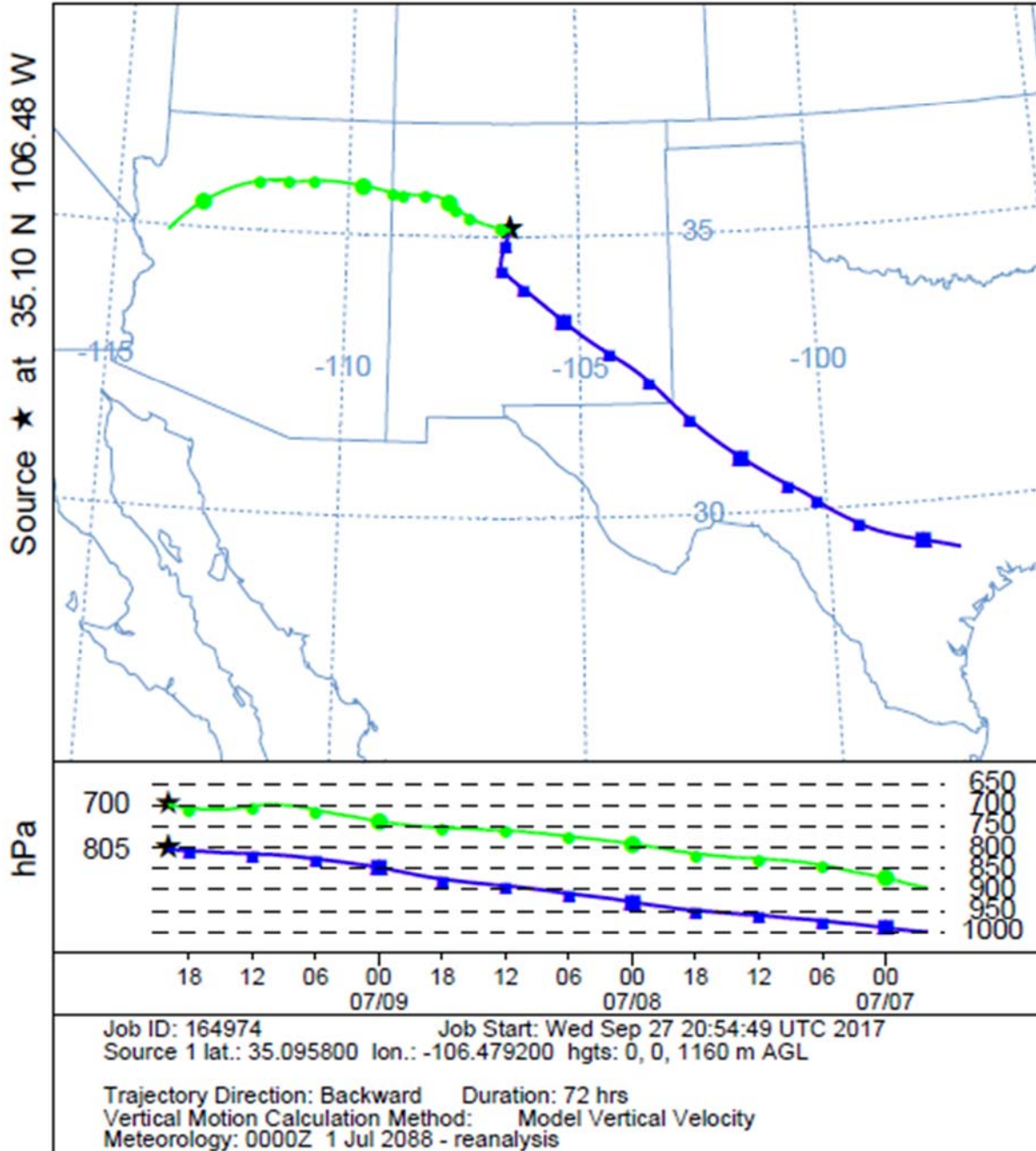
Gauges

- Daily
- Hourly
- Hourly Pseudo
- Supplemental

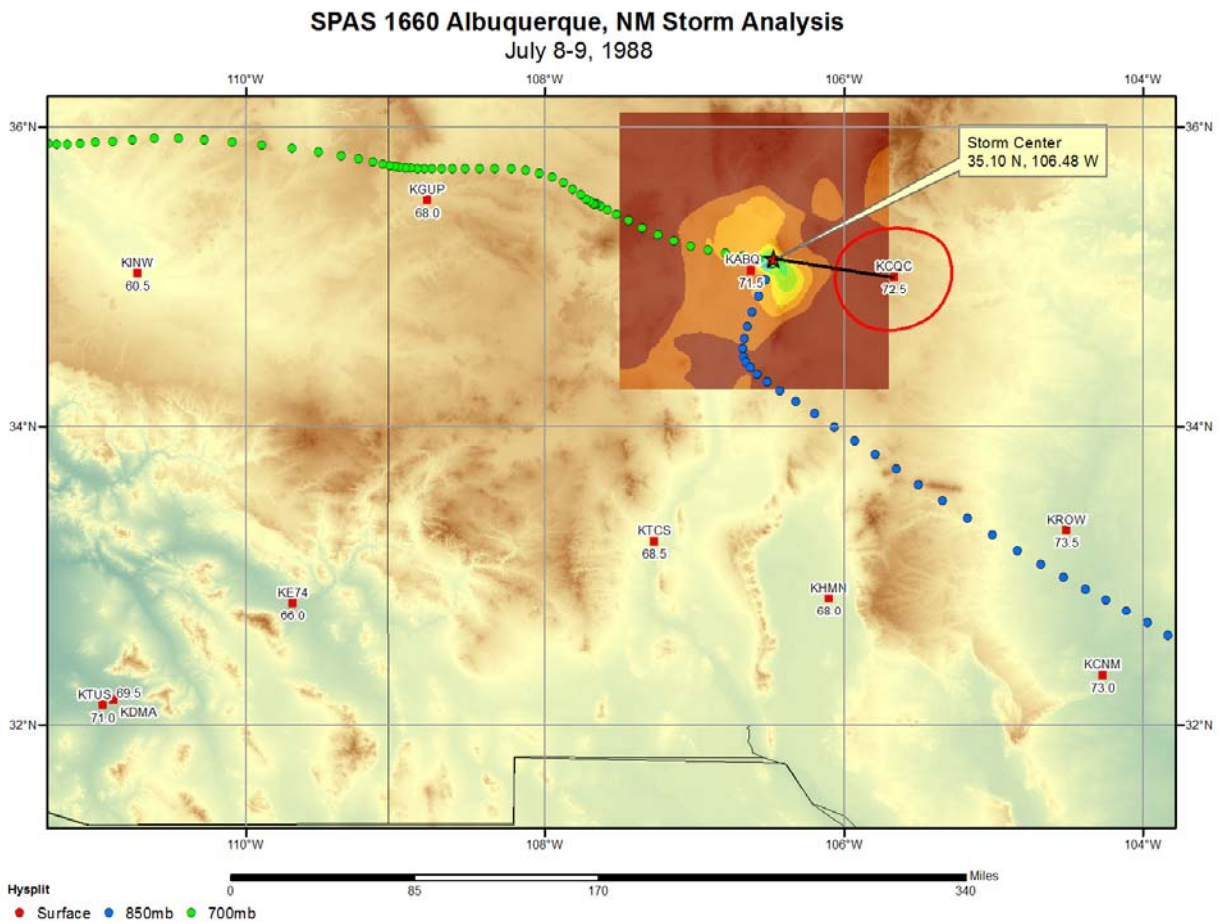


4/3/2015

NOAA HYSPLIT MODEL
Backward trajectories ending at 2000 UTC 09 Jul 88
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study



Opal, WY
August 15-18, 1990
Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1264_1

General Storm Location: Wyoming

Storm Dates: August 15-18, 1990

Event: Convective

DAD Zone 1

Latitude: 41.7375

Longitude: -110.2458

Max. Grid Rainfall Amount: 7.16"

Max. Observed Rainfall Amount: 7.00"

Number of Stations: 22 (16 Daily, 5 Hourly, 1 Hourly Pseudo, 0 Supplemental, and 0 Supplemental Estimated)

SPAS Version: 9.5

Basemap: PRISM August 1981-2010 precipitation

Spatial resolution: 00:00:30 (~ 0.30 mi²)

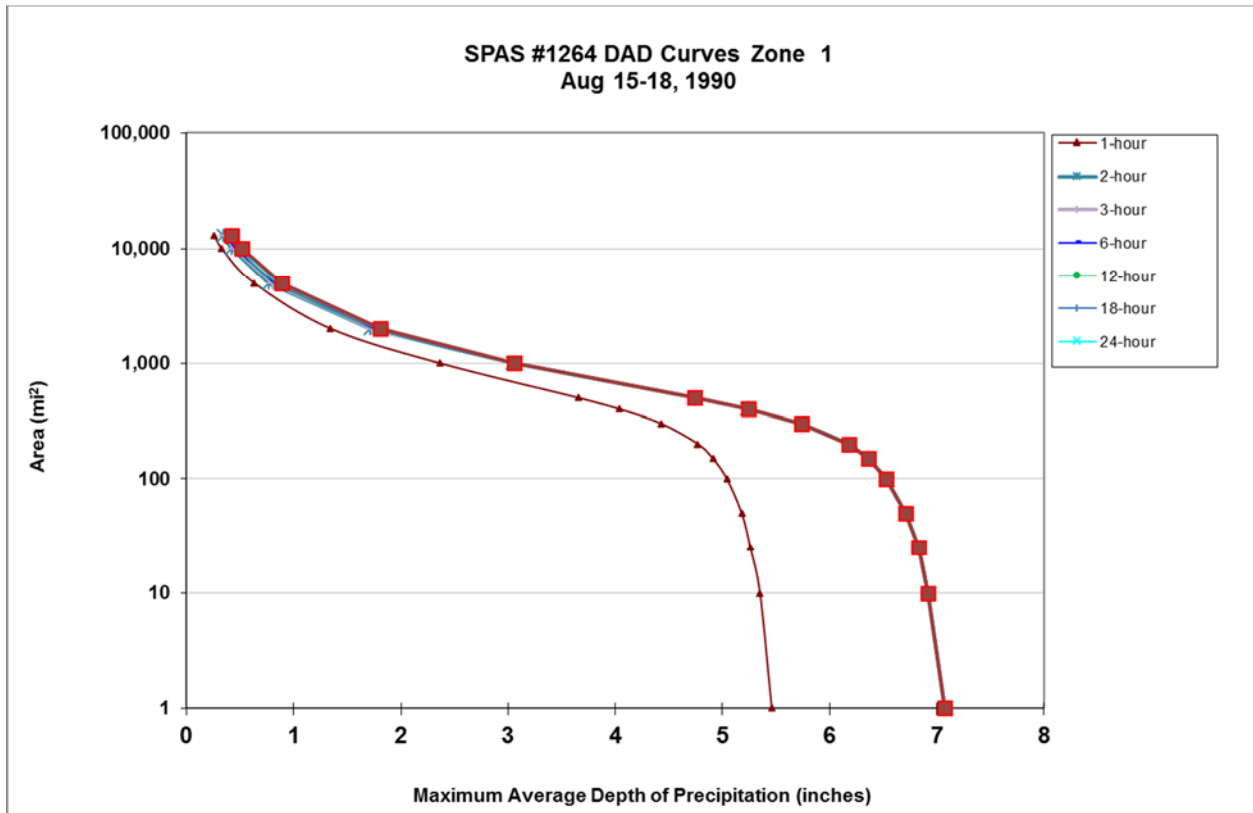
Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

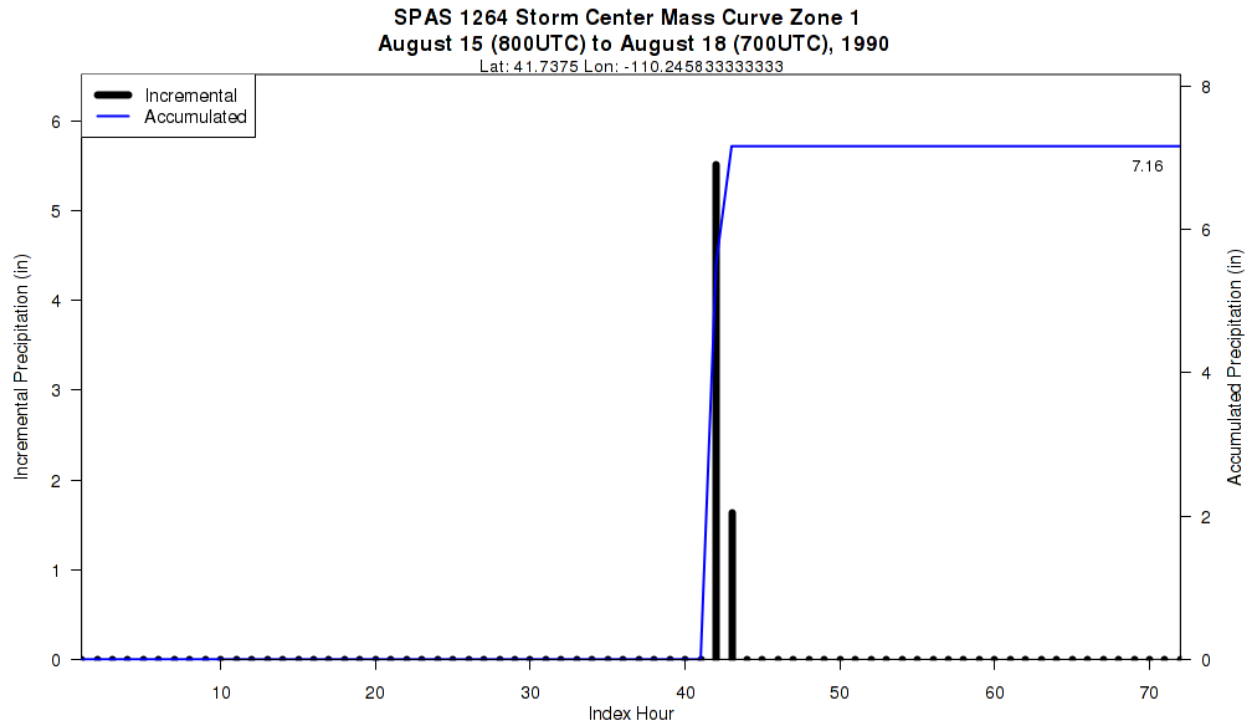
Reliability of results: This analysis was based on hourly data, daily data, and supplemental bucket survey data (Corrigan and Vogel). We have a high degree of confidence in the station magnitudes but limited confidence in the spatial pattern, which is dependent on the PRISM basemap (basemap results generate large area of precipitation, convective storms precipitation tend to reduce significantly with larger area size, this is not really seen with this storm). Several basemaps were tested, and the August 1981-2010 30-yr climatology was selected for use (August 1990 basemap inflated values and moved center westward toward mountains). An hourly station at Opal, WY was created based on observation report (timing and magnitude) and NOAA Atlas 14 temporal distribution.

CO-NM Regional Extreme Precipitation Study

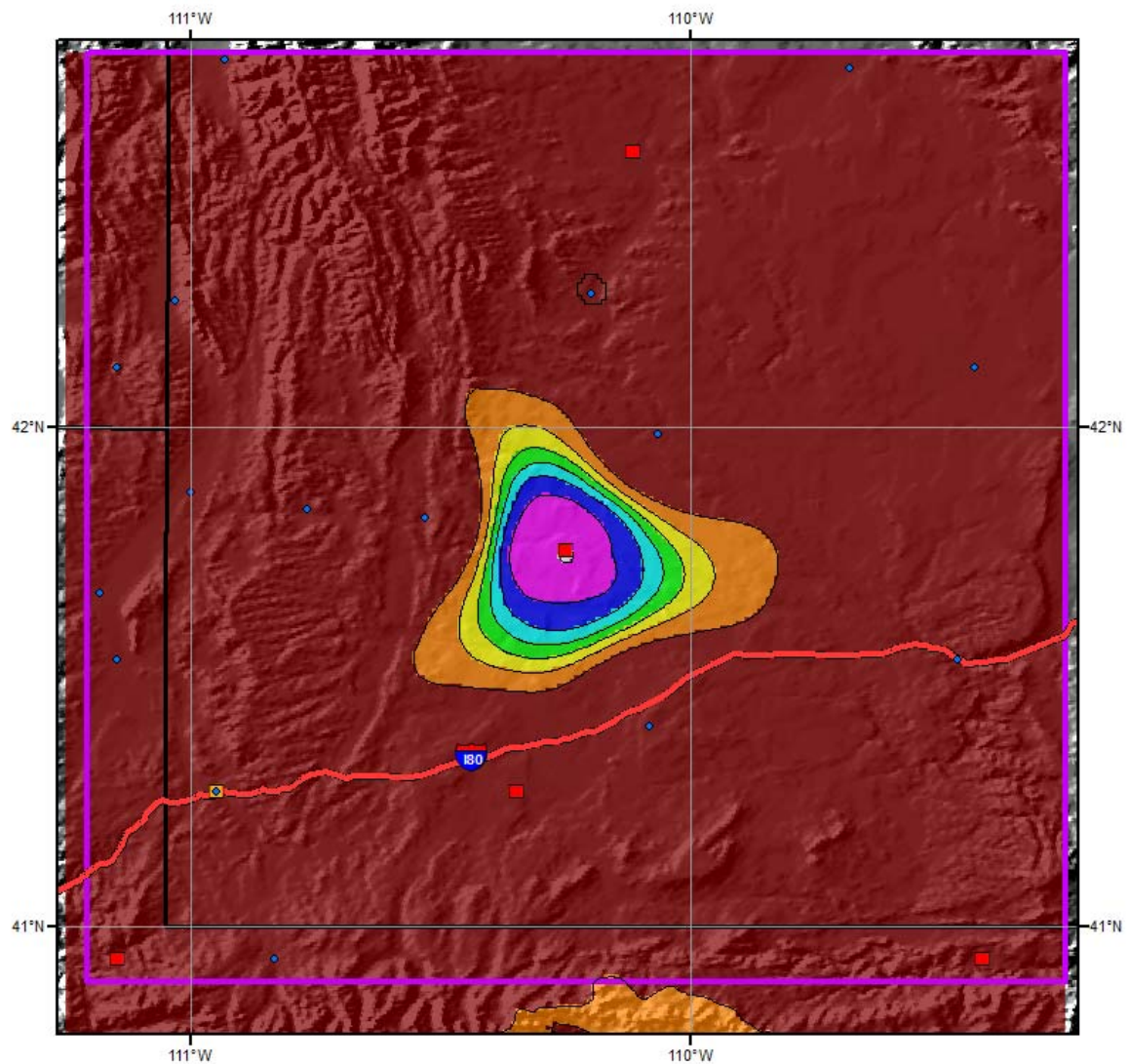
SPAS 1264 - August 15 (800 UTC) - August 18 (700 UTC), 1990									
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)									
Area (mi ²)	Duration (hours)								
	1	2	3	6	12	18	24	72	Total
0.2	5.50	7.13	7.13	7.13	7.13	7.13	7.13	7.13	7.13
1	5.46	7.07	7.07	7.07	7.07	7.07	7.07	7.07	7.07
10	5.35	6.92	6.92	6.92	6.92	6.92	6.92	6.92	6.92
25	5.26	6.83	6.83	6.83	6.83	6.83	6.83	6.83	6.83
50	5.18	6.71	6.71	6.71	6.71	6.71	6.71	6.71	6.71
100	5.04	6.53	6.53	6.53	6.53	6.53	6.53	6.53	6.53
150	4.91	6.36	6.36	6.36	6.36	6.36	6.36	6.36	6.36
200	4.77	6.18	6.18	6.18	6.18	6.18	6.18	6.18	6.18
300	4.43	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74
400	4.04	5.23	5.23	5.24	5.24	5.24	5.24	5.24	5.24
500	3.66	4.74	4.74	4.74	4.74	4.74	4.74	4.74	4.74
1,000	2.36	3.04	3.04	3.05	3.05	3.05	3.05	3.06	3.06
2,000	1.34	1.71	1.73	1.75	1.78	1.79	1.79	1.81	1.81
5,000	0.63	0.77	0.80	0.82	0.85	0.86	0.86	0.89	0.89
10,000	0.33	0.42	0.45	0.46	0.49	0.49	0.49	0.52	0.52
13,025	0.26	0.34	0.36	0.37	0.40	0.40	0.40	0.42	0.42



CO-NM Regional Extreme Precipitation Study



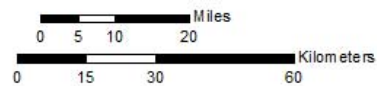
CO-NM Regional Extreme Precipitation Study



Total Precipitation (72-hours)
SPAS 1264 - Opal, WY
8/15/1990 0800 GMT - 8/18/1990 0700 GMT

Gauges

- ◆ Daily
- Hourly
- Hourly Pseudo



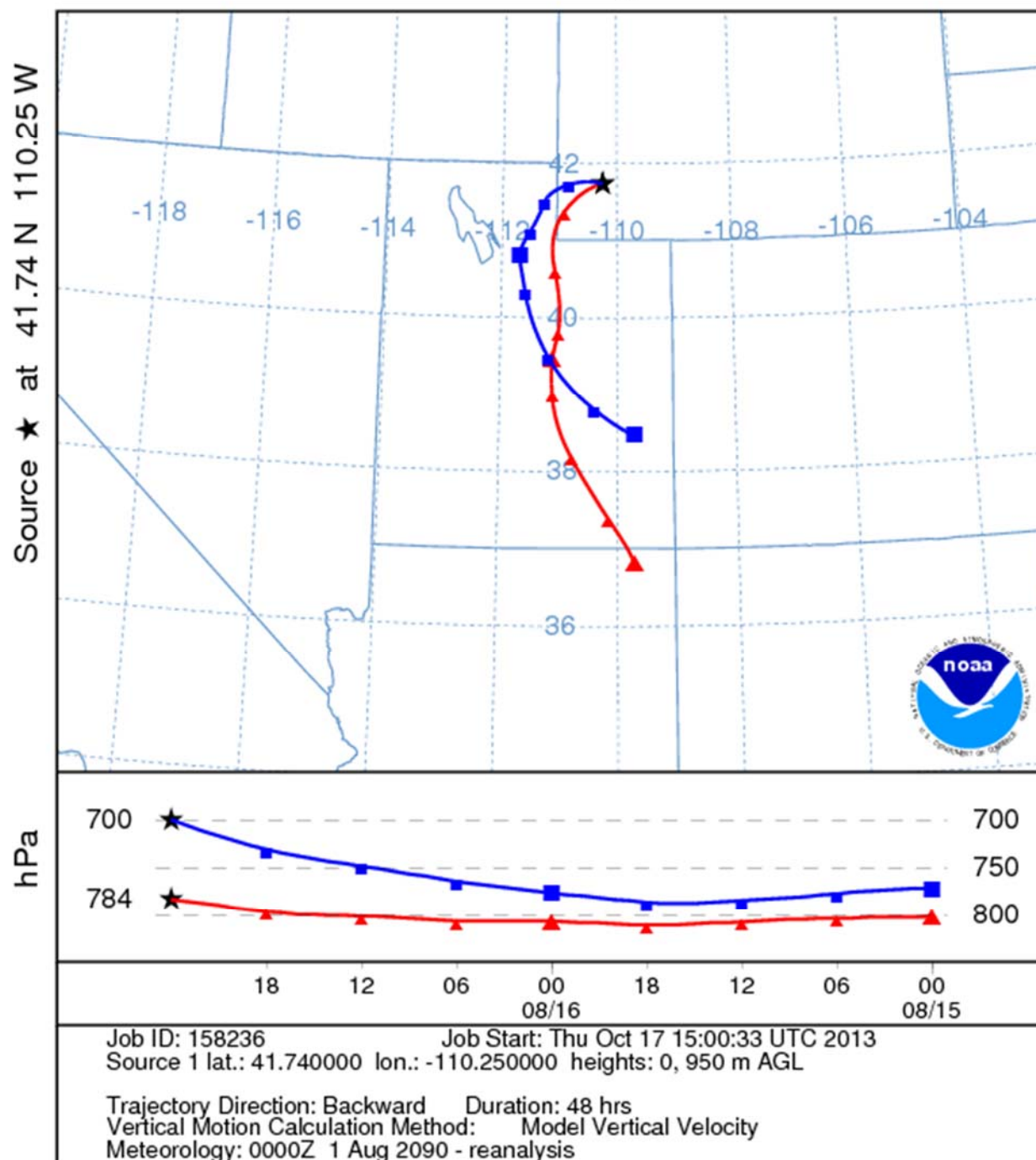
Precipitation (inches)

- | | | | |
|---------------|---------------|---------------|---------------|
| ■ 0.00 - 1.00 | ■ 2.01 - 3.00 | ■ 4.01 - 5.00 | ■ 6.01 - 7.00 |
| ■ 1.01 - 2.00 | ■ 3.01 - 4.00 | ■ 5.01 - 6.00 | ■ 7.01 - 8.00 |

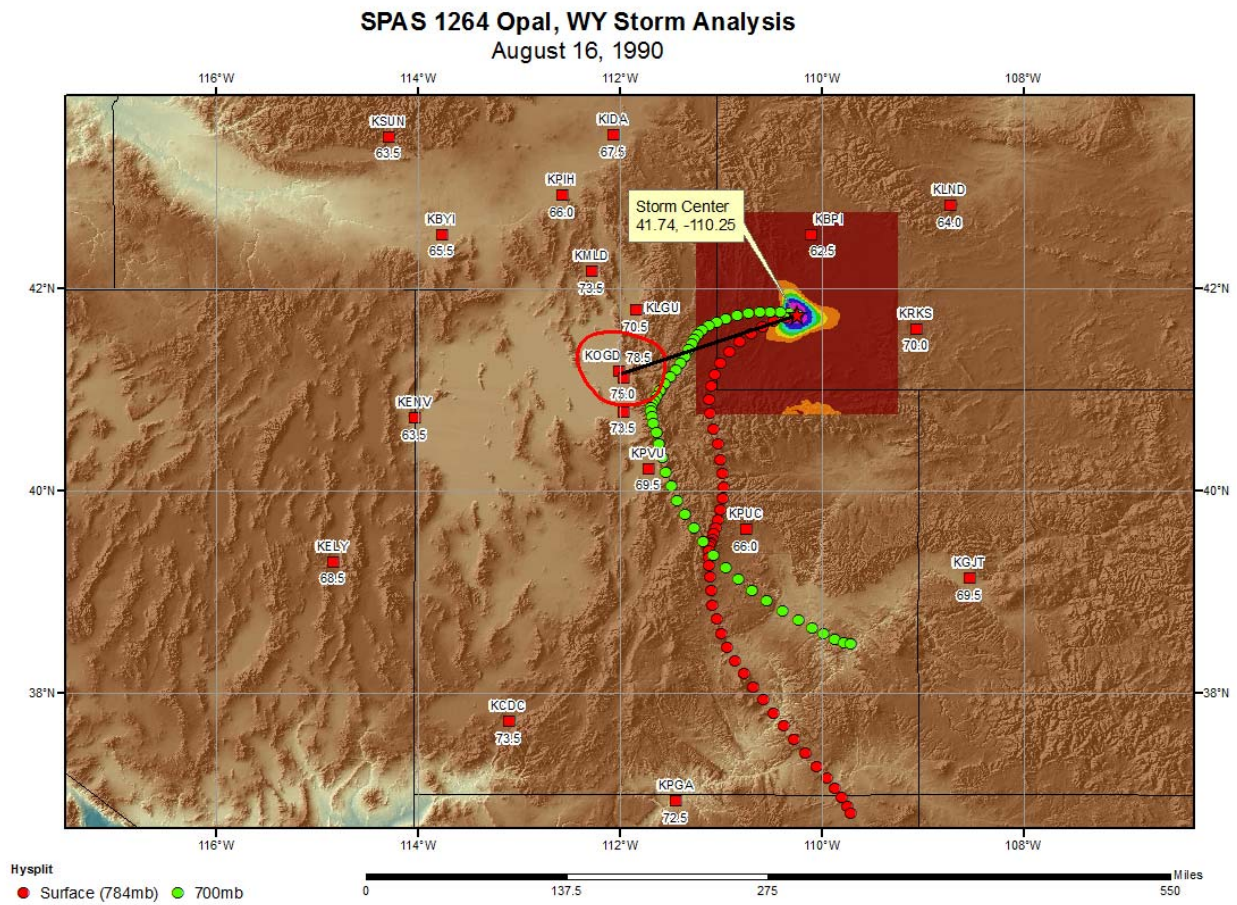


2/26/2013

NOAA HYSPLIT MODEL
Backward trajectories ending at 0000 UTC 17 Aug 90
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study



Cotopaxi, CO

August 1, 1996

Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1661_1

General Storm Location: Cotopaxi, CO

Storm Dates: August 1, 1996

Event: Local

DAD Zone 1

Latitude: 38.4550

Longitude: -105.5950

Maximum Grid Precipitation Amount: 2.03"

Maximum Observed Precipitation Amount: 1.50"

Number of Stations: 39

SPAS Version: 10.0

Grid Cell Resolution: 0.3737

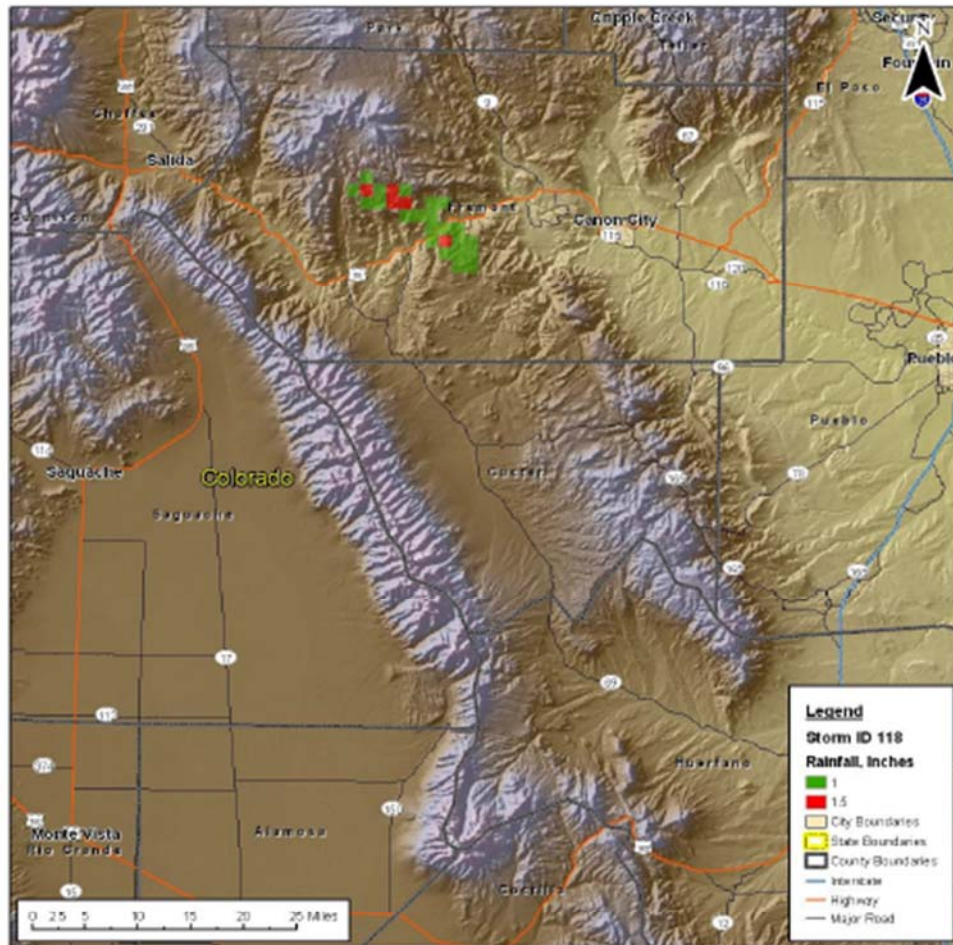
Base Map Used: "default" (created from ippt_allsites_1661_sum_in)

Radar Included: Yes

Depth-Area-Duration (DAD) analysis: Yes

Reliability of Results: This analysis was based on 39 hourly stations, daily data, and supplemental station data and NEXRAD Radar. We have a good degree of confidence for the radar/station based storm total results. The spatial pattern is dependent on the radar data and basemap. Timing is based on the hourly stations, specifically HRLY 1 created from the information given in the NM EPAT report for storm ID 118. Several daily stations were moved to supplemental due to timing issues and to ensure data consistency.

CO-NM Regional Extreme Precipitation Study



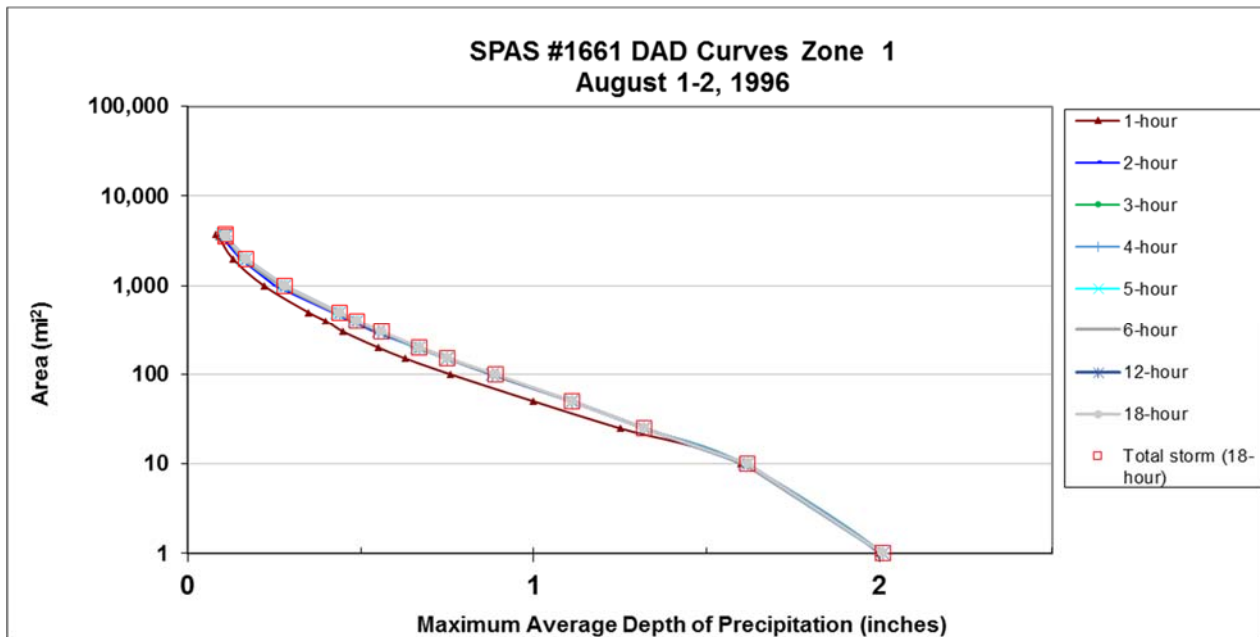
Storm Synopsis and Climate Zone Classification:

Storm ID 118 Climate Zones – 1, 2, 6: Small, short and intense storm in area where moist, easterly low-level flow can contribute to strong thunderstorm activity. Given location of event in SE Colorado (up Arkansas River valley) this storm is only allowed as far south as the northern zones in the Cimarron/Pecos River basins.

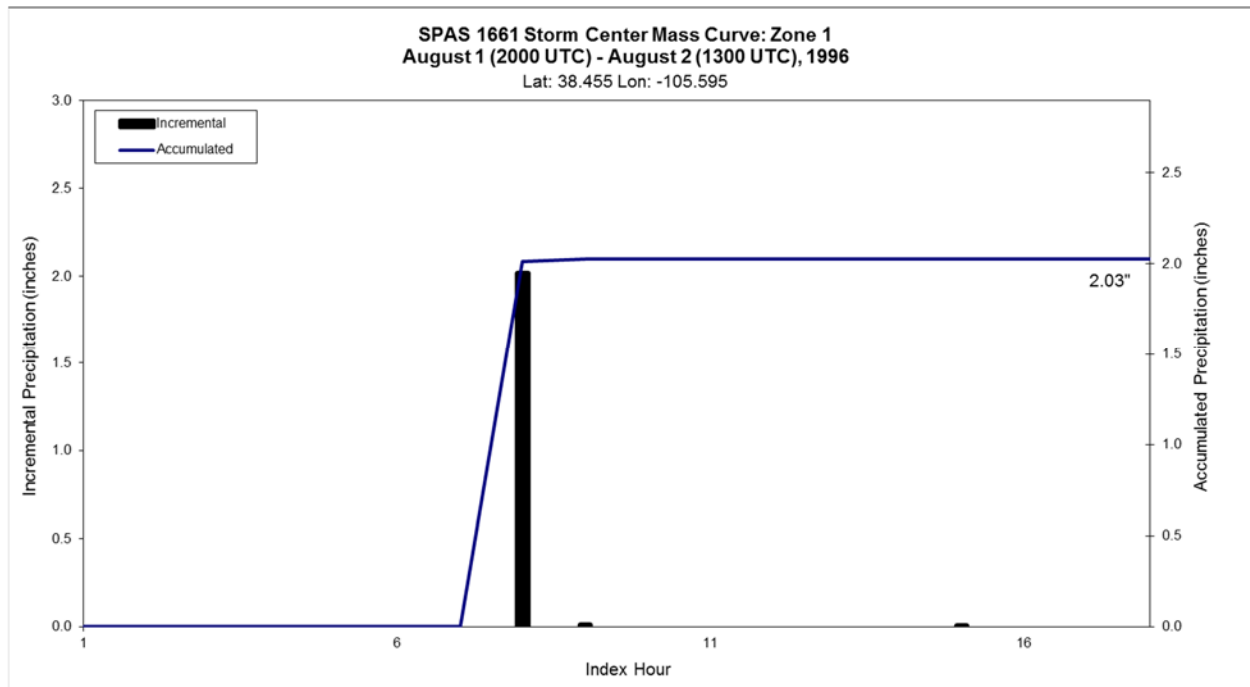
Start Date/End Date	August 1, 1996
Storm Name/Status	Western Fremont County - STORM ID 118 / Active
Storm Type	Local Storm – Convective Simple
State/Climate Zone	Colorado / Climate Zones 1, 2, 6
Duration/Max Precipitation	0.5 hours / 1.5"
Originator	NSD
Low Level Wind	120 degrees
Upper Level Wind	295 degrees
PWI /1000mb Dewpoint	3.01" / 76.1F
Storm Source	Radar
Temporal	Radar observed

CO-NM Regional Extreme Precipitation Study

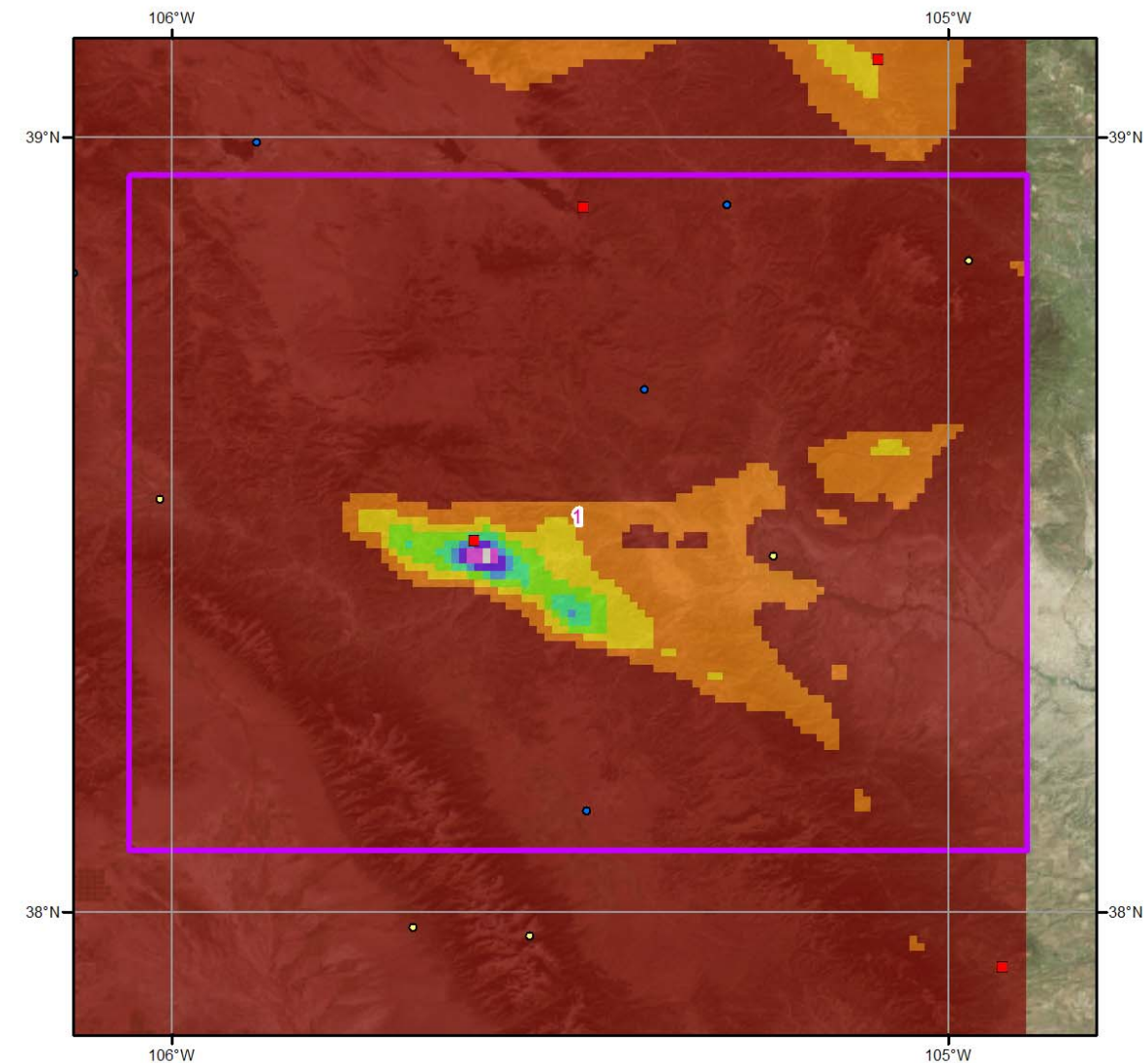
Storm 1661- August 1 (2000 UTC) - August 2 (1300 UTC), 1996									
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)									
Area (mi ²)	Duration (hours)								
	1	2	3	4	5	6	12	18	Total
0.4	2.01	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03
1	2.00	2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01
10	1.60	1.61	1.61	1.61	1.61	1.61	1.62	1.62	1.62
25	1.25	1.32	1.32	1.32	1.32	1.32	1.32	1.32	1.32
50	1.00	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11
100	0.76	0.88	0.88	0.88	0.88	0.88	0.88	0.89	0.89
150	0.63	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
200	0.55	0.66	0.66	0.66	0.66	0.67	0.67	0.67	0.67
300	0.45	0.54	0.55	0.55	0.55	0.55	0.55	0.56	0.56
400	0.40	0.47	0.48	0.48	0.48	0.48	0.49	0.49	0.49
500	0.35	0.42	0.43	0.43	0.43	0.43	0.44	0.44	0.44
1,000	0.22	0.25	0.27	0.27	0.27	0.27	0.28	0.28	0.28
2,000	0.13	0.15	0.16	0.16	0.16	0.16	0.17	0.17	0.17
3,500	0.09	0.10	0.11	0.11	0.11	0.11	0.11	0.11	0.11
3,772	0.08	0.09	0.10	0.10	0.10	0.10	0.11	0.11	0.11



CO-NM Regional Extreme Precipitation Study



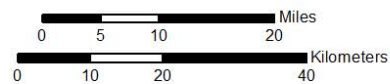
CO-NM Regional Extreme Precipitation Study



Total Storm (18-hours) Precipitation (inches)
08/01/1996 2000 UTC - 08/02/1996 1300 UTC
SPAS NEXRAD 1661 - Cotopaxi, CO

Gauges

- Daily
- Hourly
- Hourly Pseudo
- Supplemental

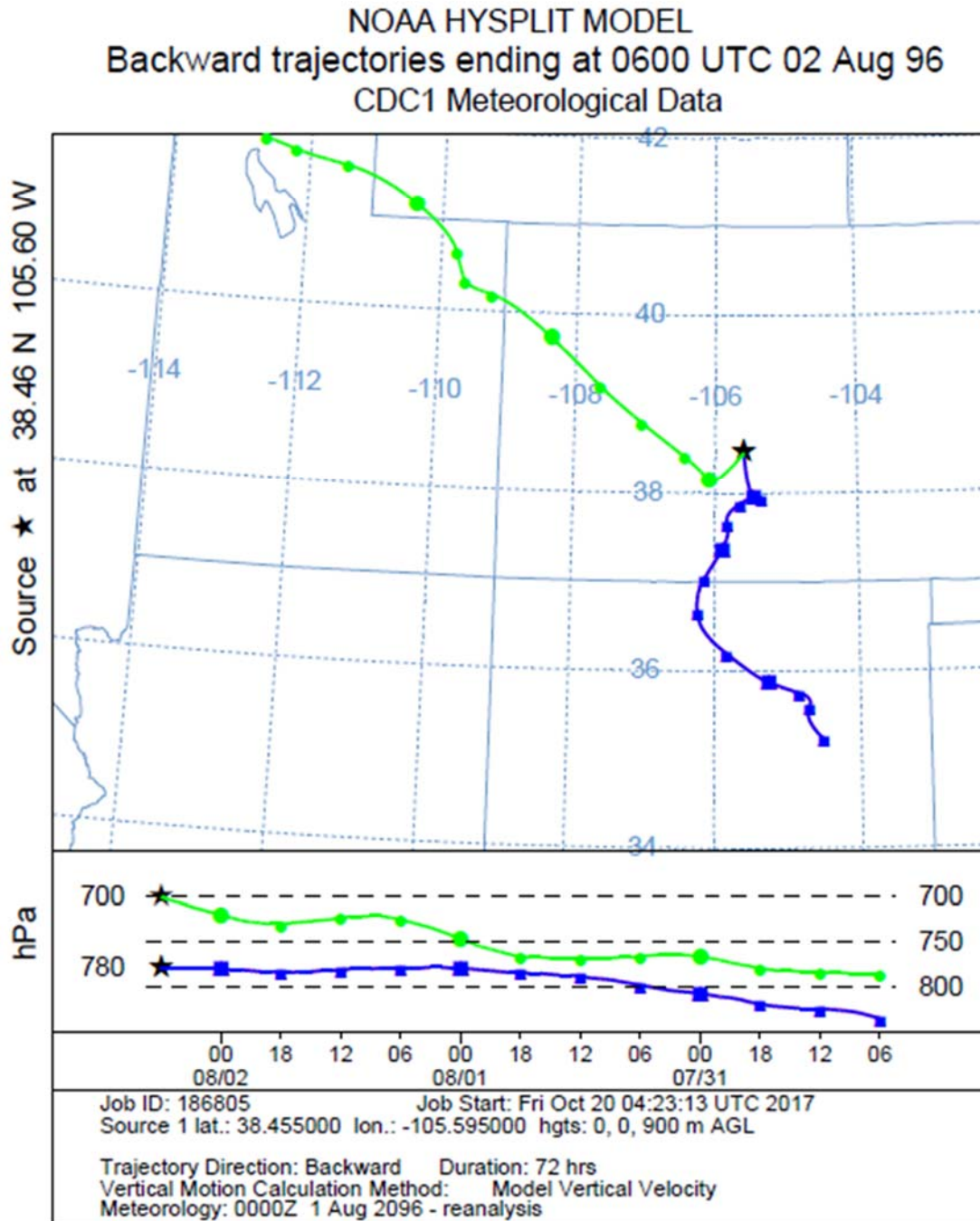


Precipitation (inches)

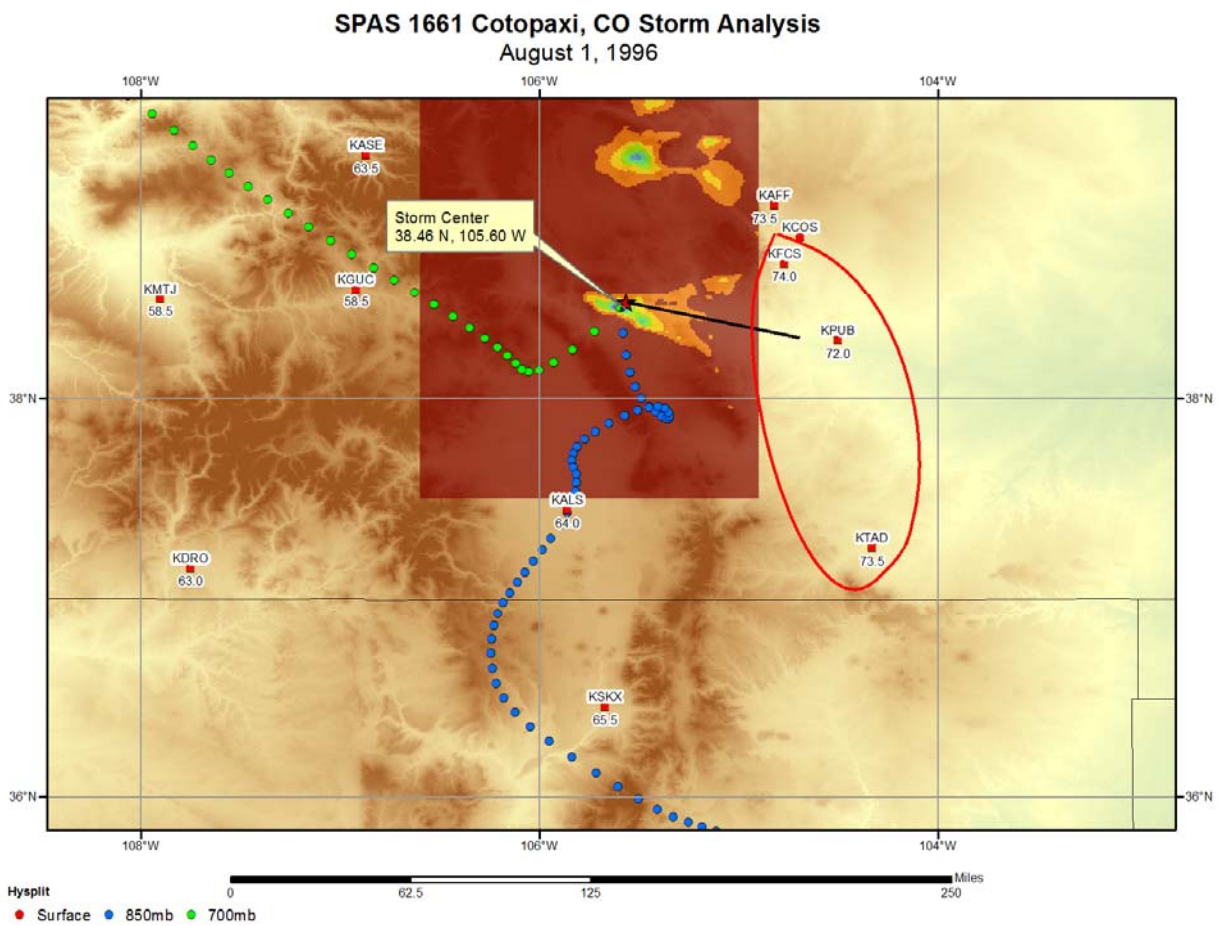
0.00 - 0.25	1.01 - 1.25
0.26 - 0.50	1.26 - 1.50
0.51 - 0.75	1.51 - 1.75
0.76 - 1.00	1.76 - 2.00
	2.01 - 2.25



4/3/2015



CO-NM Regional Extreme Precipitation Study



Tuscon, AZ
September 3-4, 1996
Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1086_1

General Storm Location: Tucson, Arizona

Storm Dates: September 3-4, 1996

Event: Thunderstorm

DAD Zone 1

Latitude: 32.3899

Longitude: -110.8000

Max. Grid/Radar Rainfall Amount: 7.37"

Max. Observed Rainfall Amount: 3.67" (reports of 5")

Number of Stations: 109 (23 daily, 74 hourly, 1 hourly estimated, 9 supplemental and 2 supplemental estimated)

SPAS Version: 7.0

Base Map Used: Yes, Mean September Precipitation

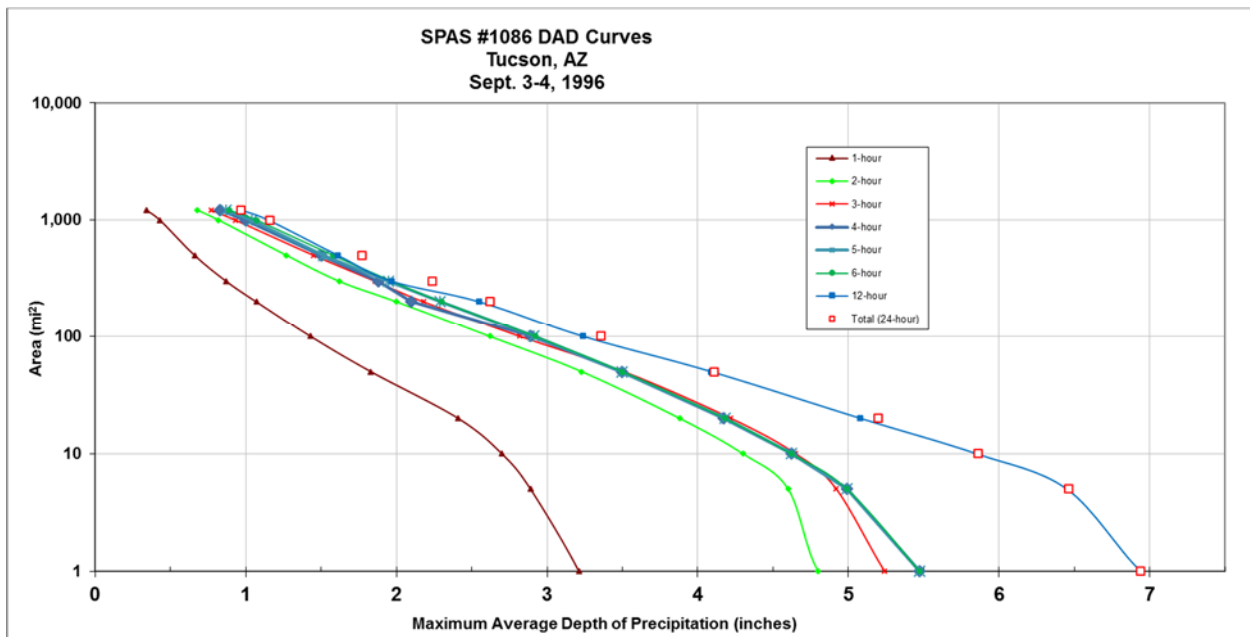
Spatial resolution: 36-sec

Radar Included: Y

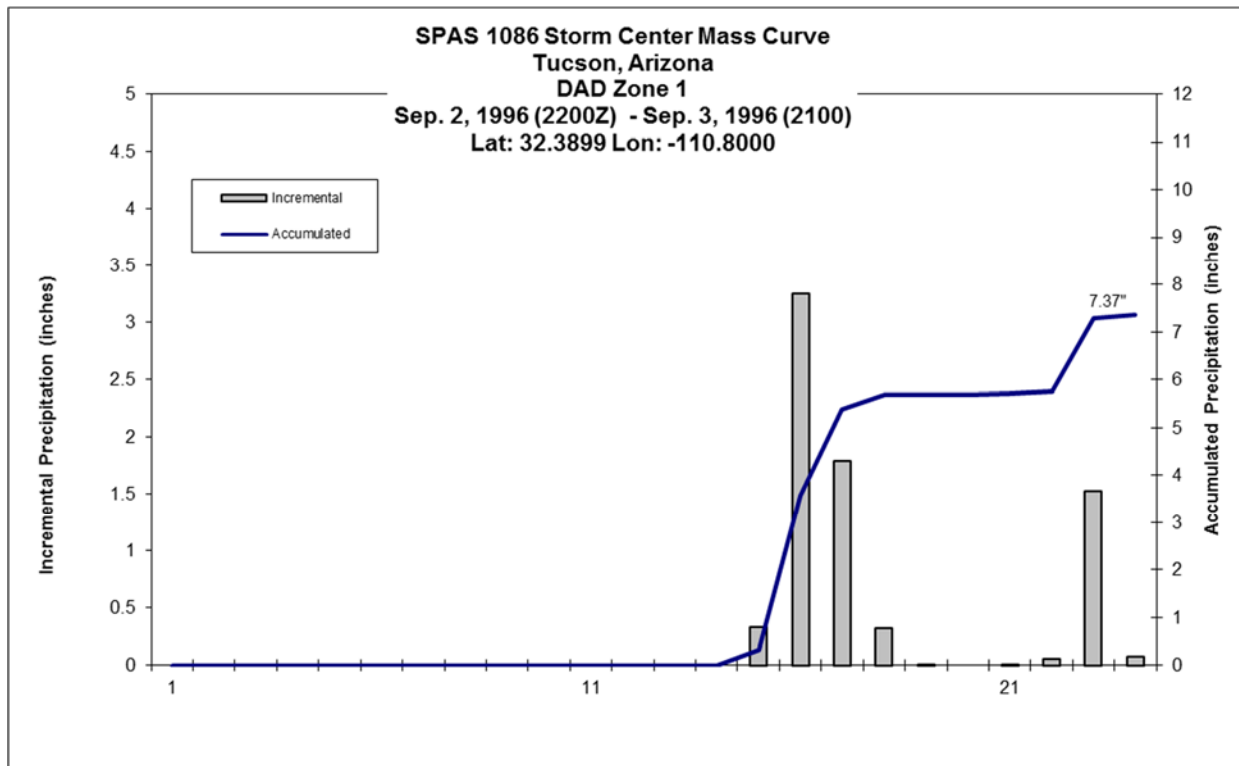
Depth-Area-Duration (DAD) analysis: Y, but results considered somewhat unreliable

CO-NM Regional Extreme Precipitation Study

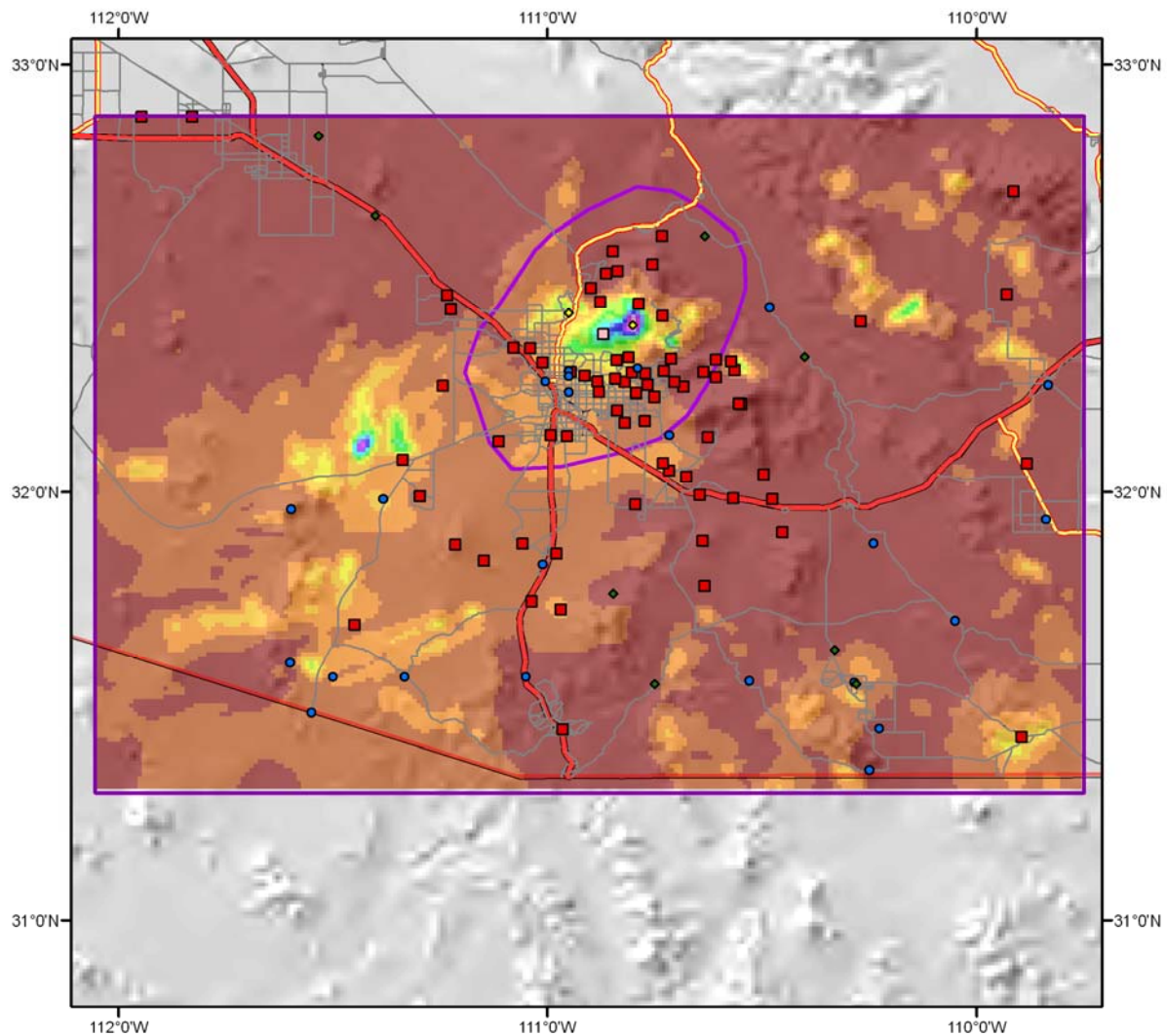
SPAS Storm 1086 - Tucson, AZ Sept. 3-4, 1996												
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)												
Area (mi ²)	Duration (hours)											
	1	2	3	4	5	6	12					total (24-hr)
0.4	3.31	5.13	5.47	5.70	5.70	5.70	7.37					7.37
1	3.21	4.80	5.24	5.47	5.47	5.47	6.94					6.94
5	2.89	4.60	4.92	4.99	4.99	4.99	6.45					6.46
10	2.70	4.30	4.65	4.62	4.62	4.62	5.85					5.86
20	2.41	3.88	4.22	4.17	4.18	4.18	5.08					5.20
50	1.83	3.23	3.51	3.50	3.50	3.50	4.09					4.11
100	1.43	2.62	2.82	2.89	2.91	2.92	3.24					3.36
200	1.07	2.00	2.18	2.10	2.29	2.30	2.55					2.62
300	0.87	1.62	1.86	1.88	1.95	1.97	1.97					2.24
500	0.66	1.27	1.45	1.50	1.52	1.58	1.61					1.77
1,000	0.43	0.82	0.93	1.00	1.04	1.07	1.15					1.16
1,213	0.34	0.68	0.77	0.83	0.87	0.89	0.97					0.97



CO-NM Regional Extreme Precipitation Study



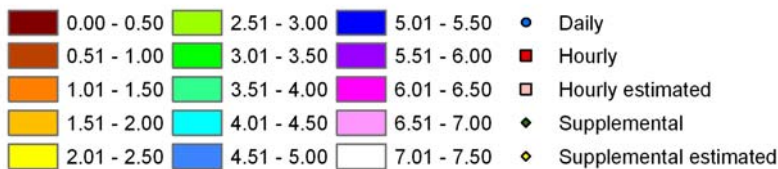
CO-NM Regional Extreme Precipitation Study



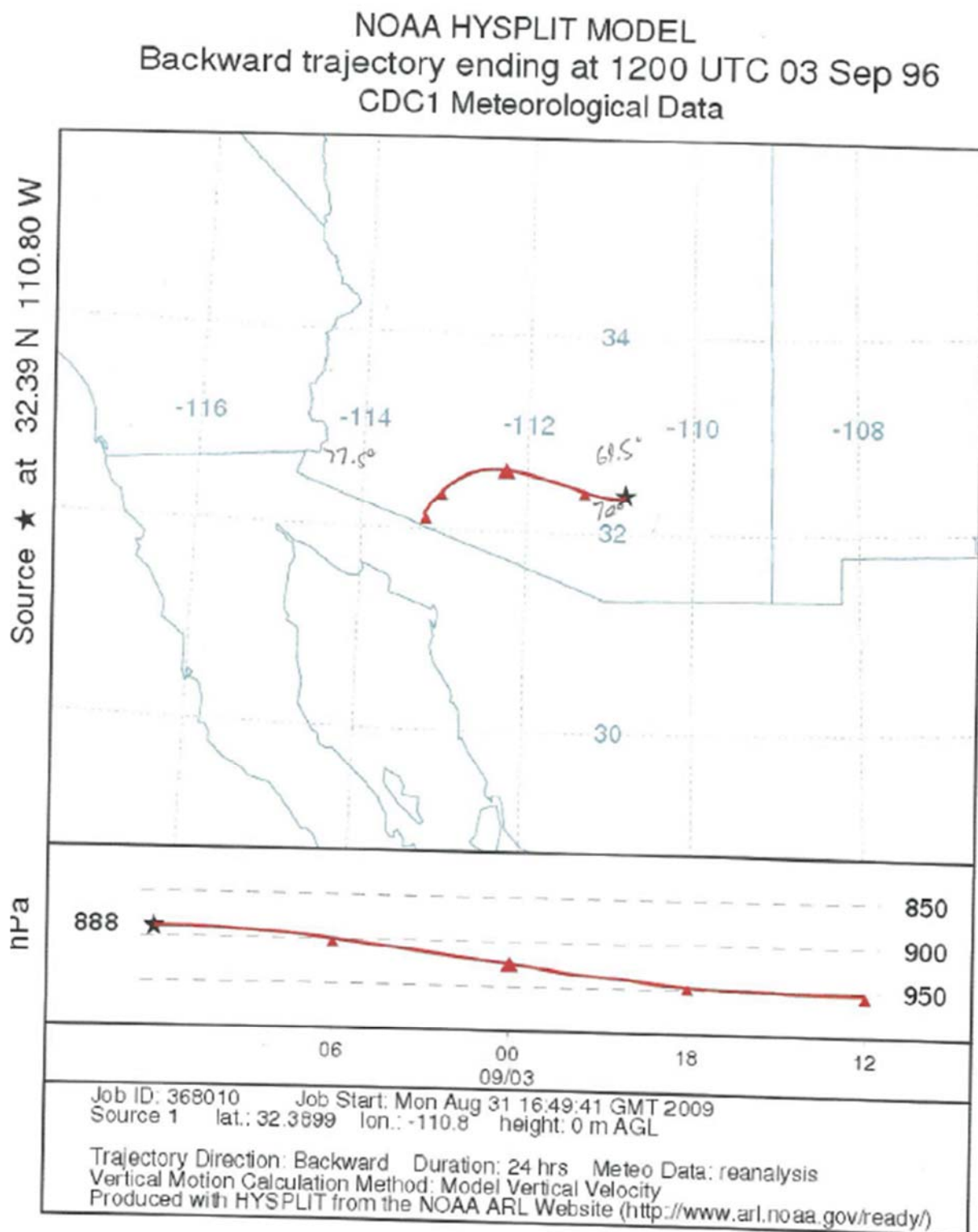
Total Precipitation
SPAS Storm #1086
Sep. 2, 1996 (2200Z) - Sep. 3, 1996 (2100)



Stations



Metstat/AWA August 24, 2009



SPAS 1086 Storm Center Mass Curve
Tucson, Arizona
DAD Zone 1
Sep. 2, 1996 (2200Z) - Sep. 3, 1996 (2100)
Lat: 32.3899 Lon: -110.8000

KCGZ, 1450', NW @ 70, 345-72 = 66° = 69.5°
KDMA, 2650', SW @ 15, 345-192 = 63.5° = 70°
KYUM, 200', W @ 220, 249-172 = 77° = 77.5°

Storm Rep 77.5°, 32.65° 114.60 W @ 220

The graph displays two data series: Incremental Precipitation (inches) represented by grey bars and Accumulated Precipitation (inches) represented by a blue line. The x-axis represents time, with labels for 3/1/22 and 3/2/22. The left y-axis ranges from 0 to 5 inches, and the right y-axis ranges from 0 to 12 inches. The accumulated precipitation line shows a sharp increase on 3/1/22, reaching approximately 3.2 inches, followed by a plateau and a final increase on 3/2/22.

Date	Time	Incremental Precipitation (inches)	Accumulated Precipitation (inches)
3/1/22	1450	0.3	0.3
3/1/22	192	3.2	3.5
3/1/22	249	1.7	5.2
3/1/22	272	0.3	5.5
3/2/22	000	0.0	5.5
3/2/22	020	0.0	5.5
3/2/22	040	0.0	5.5
3/2/22	060	0.0	5.5
3/2/22	080	0.0	5.5
3/2/22	100	0.0	5.5
3/2/22	120	0.0	5.5
3/2/22	140	0.0	5.5
3/2/22	160	0.0	5.5
3/2/22	180	0.0	5.5
3/2/22	200	0.0	5.5
3/2/22	220	0.0	5.5
3/2/22	240	0.0	5.5
3/2/22	260	0.0	5.5
3/2/22	280	0.0	5.5
3/2/22	300	0.0	5.5
3/2/22	320	0.0	5.5
3/2/22	340	0.0	5.5
3/2/22	360	0.0	5.5
3/2/22	380	0.0	5.5
3/2/22	400	0.0	5.5
3/2/22	420	0.0	5.5
3/2/22	440	0.0	5.5
3/2/22	460	0.0	5.5
3/2/22	480	0.0	5.5
3/2/22	500	0.0	5.5
3/2/22	520	0.0	5.5
3/2/22	540	0.0	5.5
3/2/22	560	0.0	5.5
3/2/22	580	0.0	5.5
3/2/22	600	0.0	5.5
3/2/22	620	0.0	5.5
3/2/22	640	0.0	5.5
3/2/22	660	0.0	5.5
3/2/22	680	0.0	5.5
3/2/22	700	0.0	5.5
3/2/22	720	0.0	5.5
3/2/22	740	0.0	5.5
3/2/22	760	0.0	5.5
3/2/22	780	0.0	5.5
3/2/22	800	0.0	5.5
3/2/22	820	0.0	5.5
3/2/22	840	0.0	5.5
3/2/22	860	0.0	5.5
3/2/22	880	0.0	5.5
3/2/22	900	0.0	5.5
3/2/22	920	0.0	5.5
3/2/22	940	0.0	5.5
3/2/22	960	0.0	5.5
3/2/22	980	0.0	5.5
3/2/22	1000	0.0	5.5

Ruxton Park, CO

June 6, 1997

Storm Type: Local/Hybrid

Storm Precipitation Analysis System (SPAS) For Storm #1654_1

General Storm Location: Ruxton Park, CO

Storm Dates: June 6, 1997

Event: General Storm

DAD Zone 1

Latitude: 38.8550

Longitude: -104.9650

Max. Grid Rainfall Amount: 5.04"

Max. Observed Rainfall Amount: 4.39"

Number of Stations: 144

Basemap: ippt_allsites_1654_sum_in

Spatial resolution: 0.3717

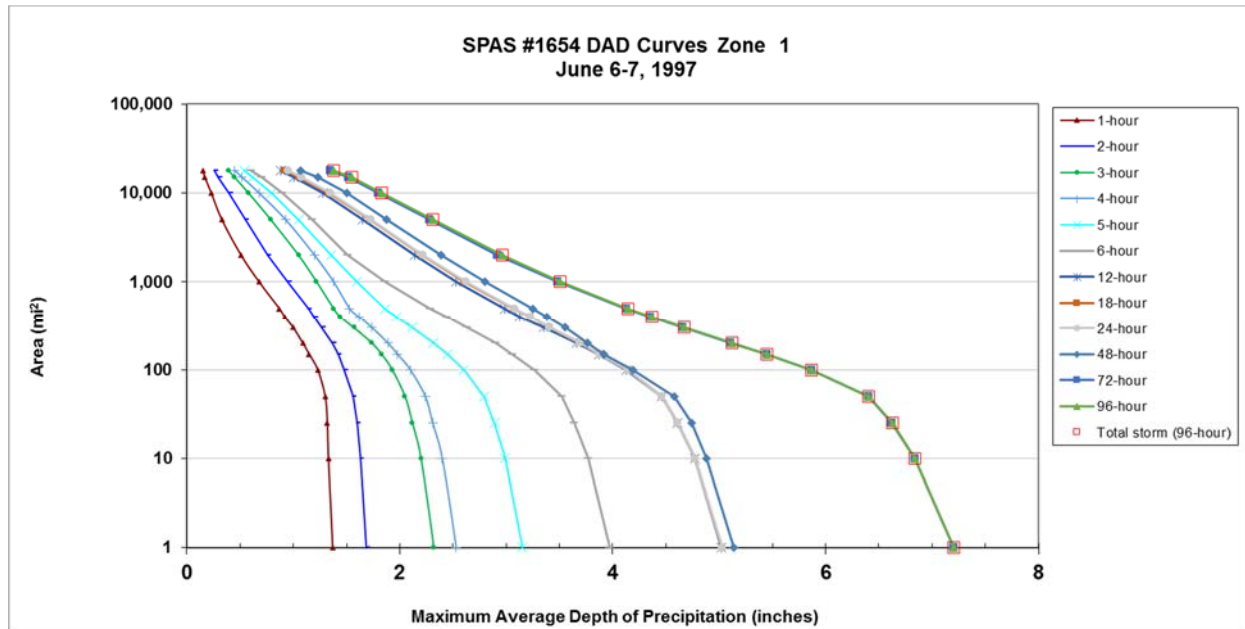
Radar Included: Yes

Depth-Area-Duration (DAD) analysis: Yes

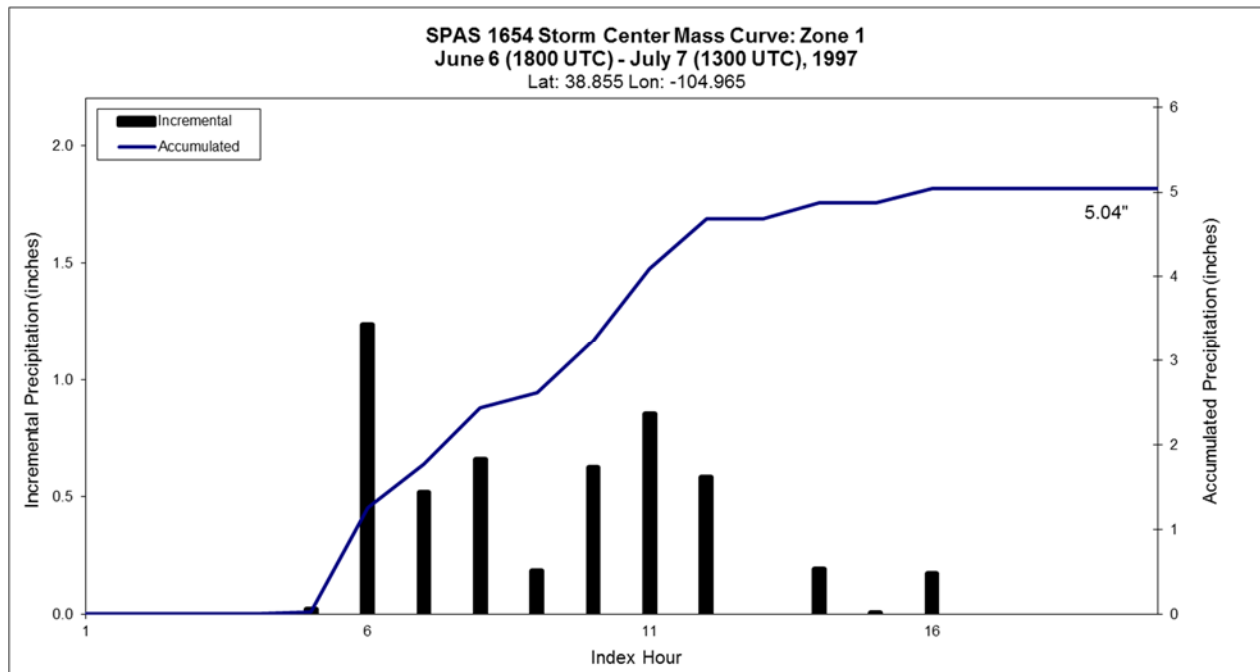
Reliability of results: This analysis was based on 144 hourly stations, daily data, and supplemental station data and NEXRAD Radar. We have a good degree of confidence for the radar/station based storm total results. The spatial pattern is dependent on the radar data and basemap. Timing is based on the hourly stations and hourly pseudo station. Several daily stations were moved to supplemental due to timing issues and to ensure data consistency.

CO-NM Regional Extreme Precipitation Study

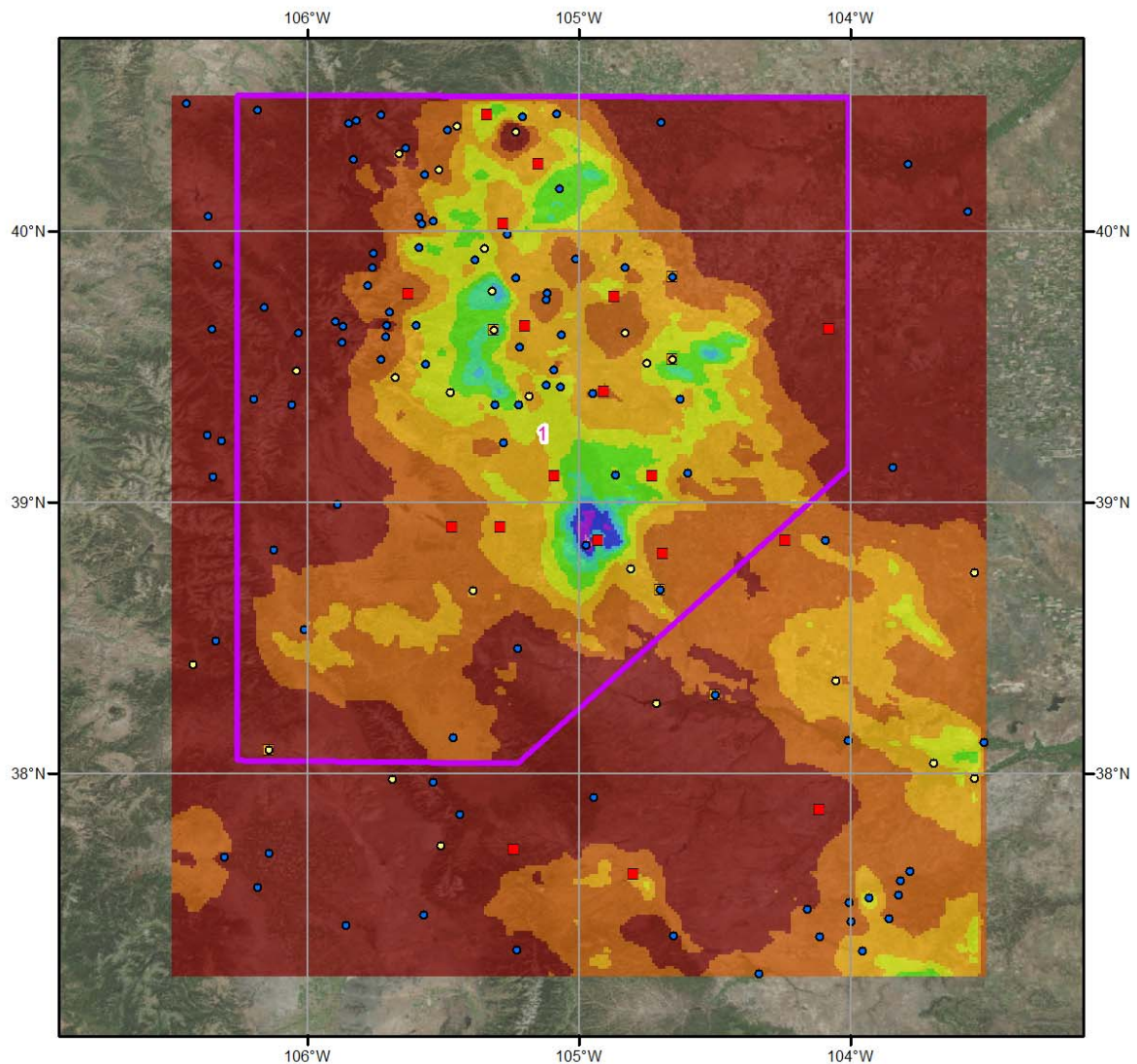
Storm 1654 - June 6 (1800 UTC) - June 7 (1300 UTC), 1997													
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)													
Area (mi ²)	Duration (hours)												
	1	2	3	4	5	6	12	18	24	48	72	96	Total
0.4	1.38	1.71	2.35	2.56	3.19	4.02	5.09	5.09	5.09	5.20	7.28	7.29	7.29
1	1.37	1.69	2.32	2.53	3.15	3.97	5.02	5.03	5.03	5.14	7.20	7.20	7.20
10	1.33	1.63	2.20	2.40	2.99	3.77	4.77	4.77	4.77	4.88	6.84	6.84	6.84
25	1.32	1.60	2.12	2.31	2.89	3.64	4.61	4.61	4.61	4.74	6.62	6.63	6.63
50	1.30	1.56	2.05	2.24	2.79	3.52	4.46	4.46	4.46	4.58	6.40	6.40	6.40
100	1.23	1.48	1.93	2.10	2.60	3.27	4.13	4.14	4.14	4.19	5.87	5.87	5.87
150	1.15	1.42	1.83	1.98	2.45	3.06	3.87	3.88	3.88	3.92	5.45	5.45	5.45
200	1.09	1.37	1.74	1.89	2.32	2.90	3.66	3.69	3.69	3.76	5.11	5.12	5.12
300	1.00	1.27	1.57	1.74	2.12	2.63	3.35	3.41	3.41	3.55	4.66	4.67	4.67
400	0.92	1.20	1.44	1.62	1.97	2.44	3.13	3.23	3.23	3.38	4.35	4.37	4.37
500	0.87	1.14	1.38	1.53	1.86	2.29	2.99	3.07	3.08	3.25	4.13	4.14	4.14
1,000	0.68	0.95	1.22	1.38	1.60	1.86	2.53	2.61	2.62	2.80	3.48	3.51	3.51
2,000	0.51	0.76	1.05	1.20	1.36	1.51	2.14	2.21	2.22	2.39	2.92	2.96	2.96
5,000	0.33	0.55	0.79	0.93	1.05	1.18	1.65	1.72	1.73	1.88	2.28	2.31	2.31
10,000	0.23	0.40	0.58	0.68	0.80	0.90	1.28	1.33	1.35	1.50	1.80	1.83	1.83
15,000	0.17	0.30	0.45	0.52	0.62	0.70	1.01	1.05	1.08	1.23	1.52	1.55	1.55
17,987	0.15	0.26	0.39	0.45	0.54	0.60	0.88	0.91	0.95	1.07	1.35	1.38	1.38



CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study

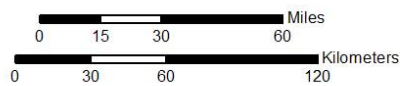


Total Storm (20-hours) Precipitation (inches)
06/06/1997 1800 UTC - 06/07/1997 1300 UTC
SPAS NEXRAD 1654 - Ruxton Park, CO

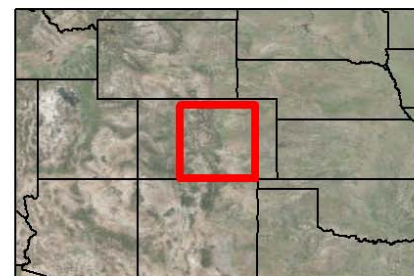
Gauges

Type

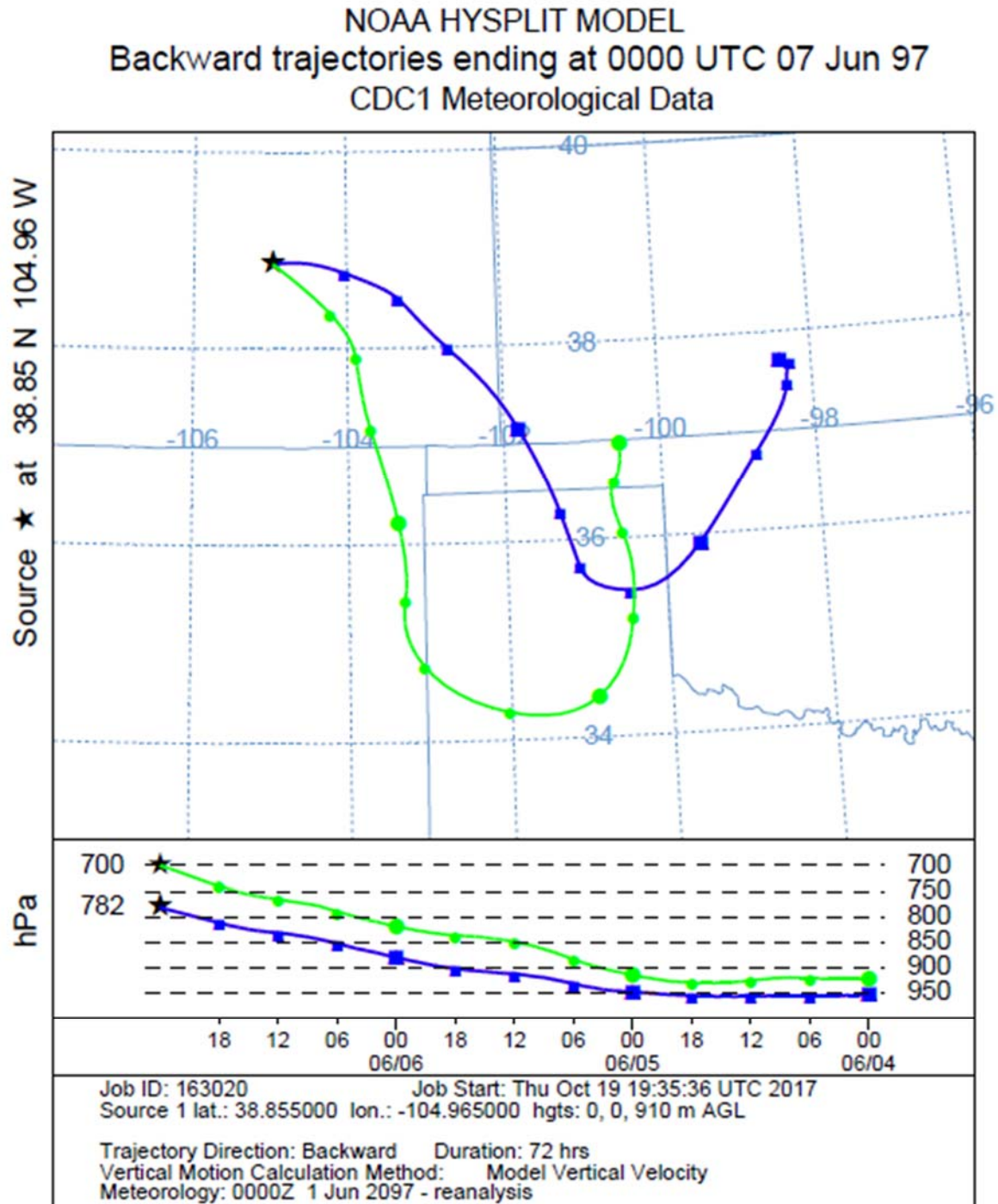
- Daily
- Hourly
- Hourly Pseudo
- Supplemental



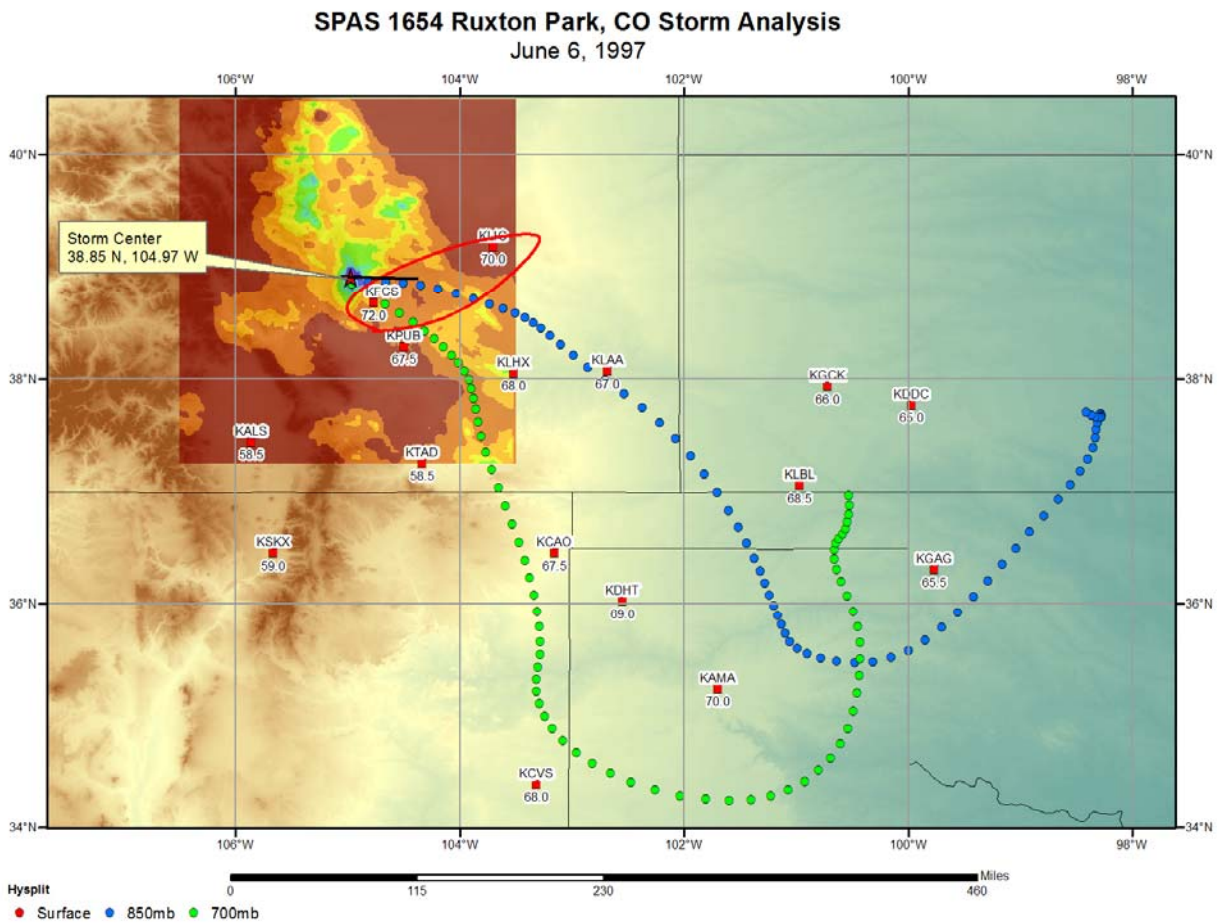
Precipitation (inches)	
0.00 - 0.50	1.01 - 1.50
0.51 - 1.00	1.51 - 2.00
	2.01 - 2.50
	2.51 - 3.00
	3.01 - 3.50
	3.51 - 4.00
	4.01 - 4.50
	4.51 - 5.00
	5.01 - 5.50



4/3/2015



CO-NM Regional Extreme Precipitation Study



Fort Collins, CO

July 27-29, 1997

Storm Type: Local/Hybrid

Storm Precipitation Analysis System (SPAS) For Storm #1230_1

General Storm Location: Fort Collins, Colorado

Storm Dates: July 27-29, 1997

Event: Thunderstorm

DAD Zone 1

Latitude: 40.5475

Longitude: -105.1325

Max. Grid Rainfall Amount: 14.48"

Max. Observed Rainfall Amount: 14.50"

Number of Stations: 278 (8 Daily, 7 Hourly, 0 Hourly Estimated, 0 Hourly Estimated Pseudo, 20 Hourly Pseudo, 224 Supplemental, and 19 Supplemental Estimated)

SPAS Version: 9.0

Basemap: PRISM Mean (1971-2000) July precipitation

Spatial resolution:** 18 seconds (~0.16 mi²)

**Given the small size of this storm and the very high-density rain gauge data, it was decided to resample the radar grids to a higher spatial resolution -- from 36 seconds (~0.36 mi²) to 18 seconds (~0.16 mi²)

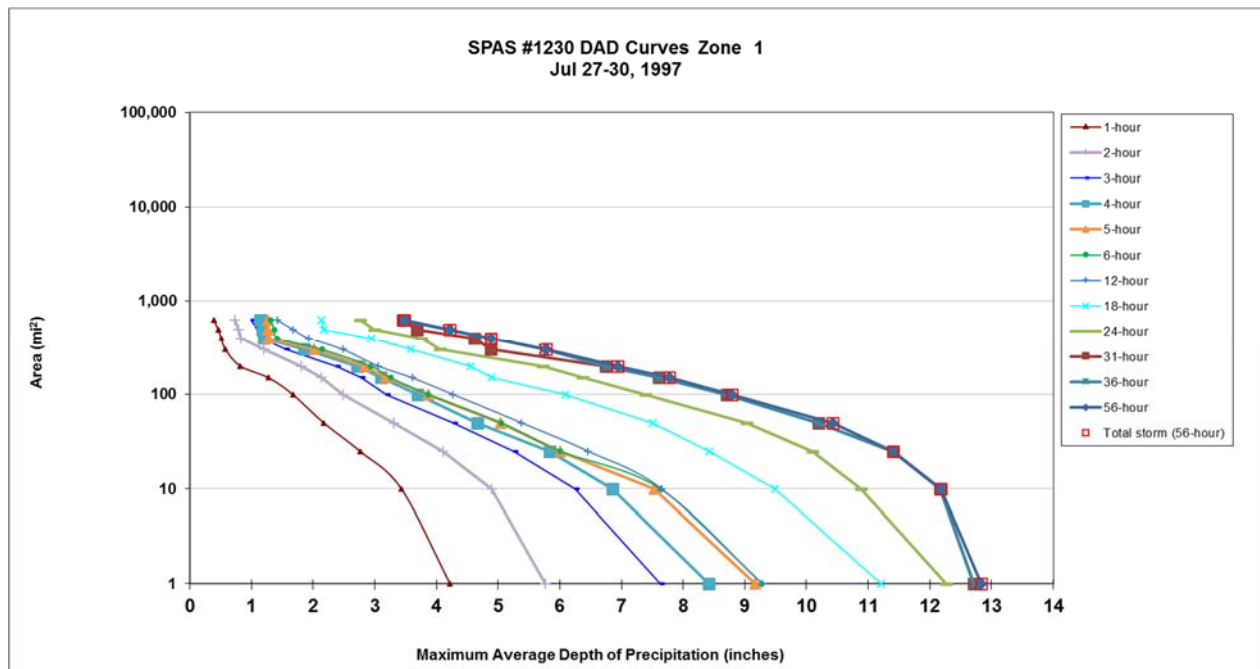
Radar Included: Yes (no outages)

Depth-Area-Duration (DAD) analysis: Yes

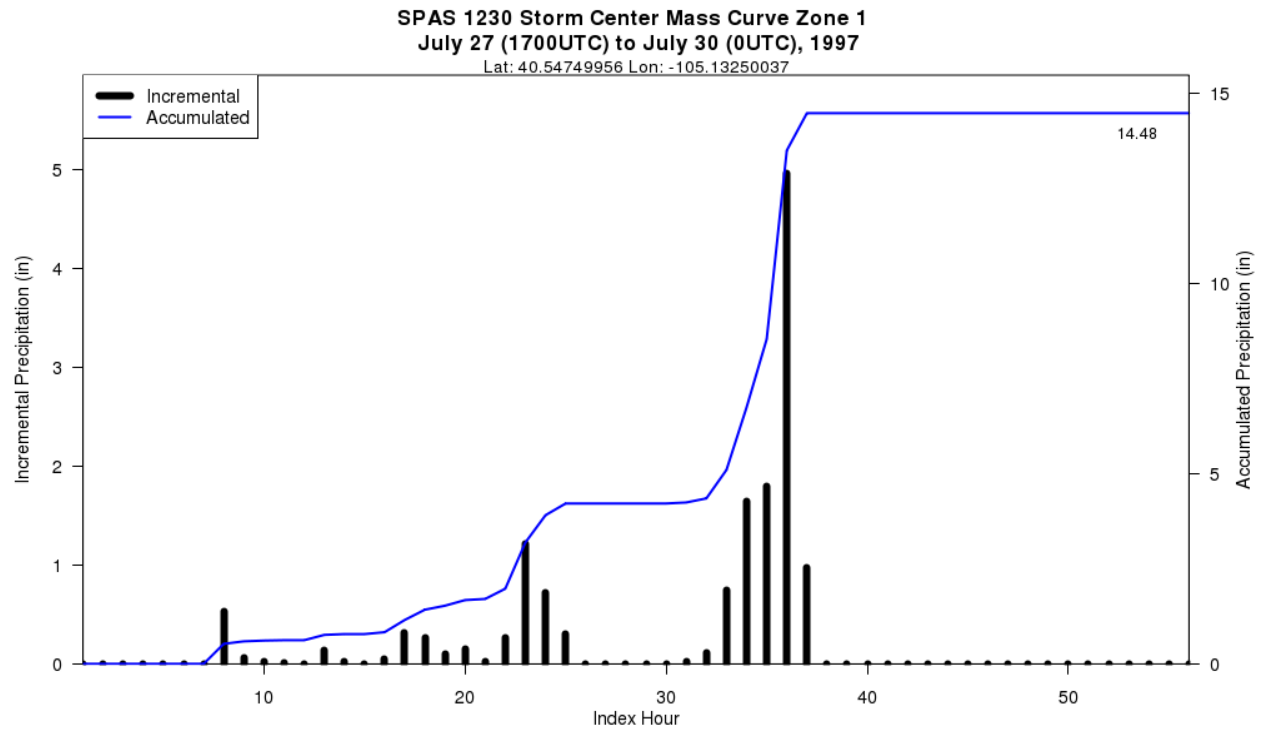
Reliability of results: Given the unblocked, clean and QC'ed radar (Denver and Cheyenne) data coupled with high-density gauge data in/near the storm center, we have a very high degree of confidence in the results, particularly in/around the storm center (Fort Collins, CO). A few well-founded radar-based supplemental estimated stations were warranted in this analysis, but they did not drive influence the storm center magnitudes. Given the lack of gauge data across Wyoming, we have moderate confidence in these areas.

CO-NM Regional Extreme Precipitation Study

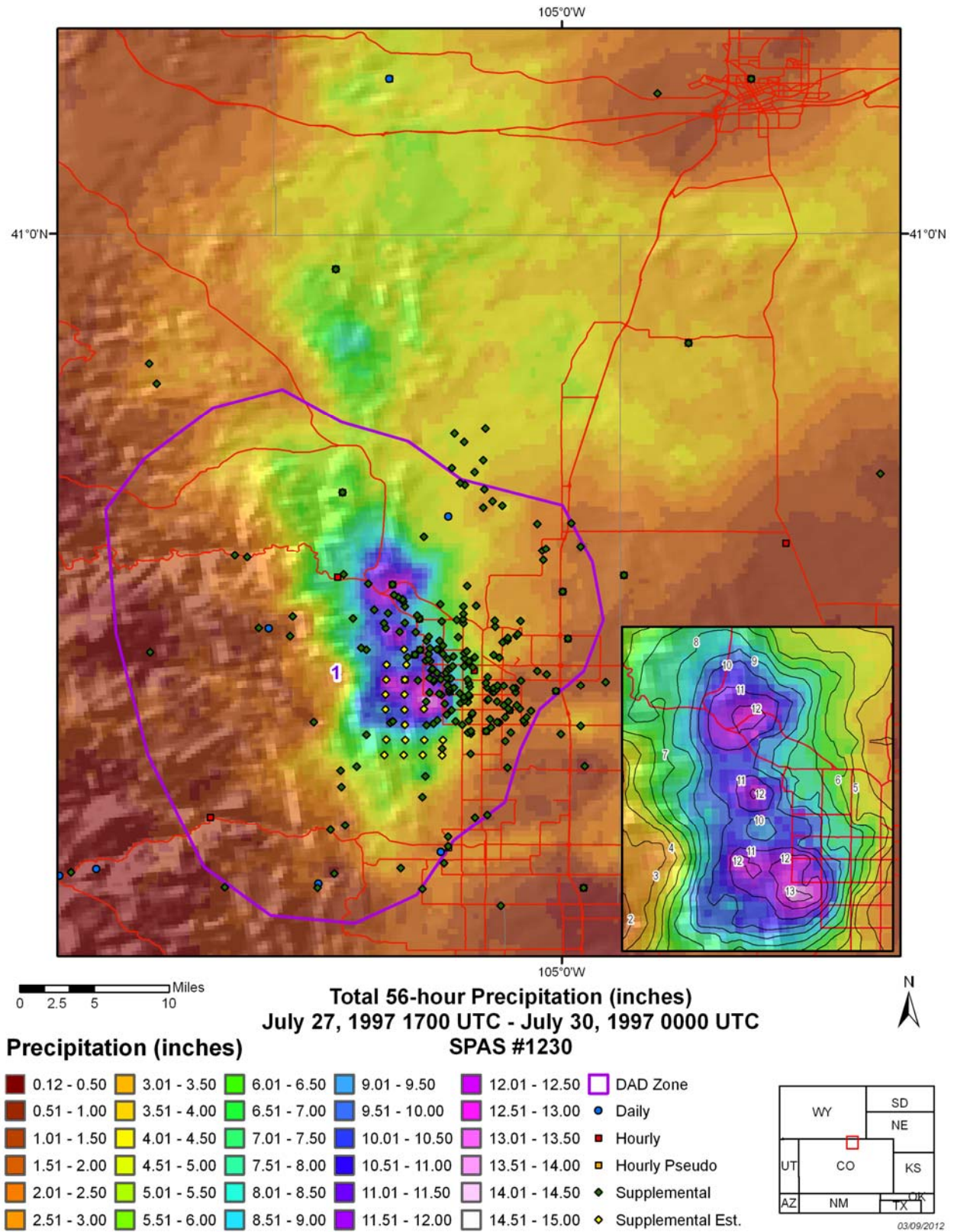
Storm 1230 - July 27 (1700 UTC) - July 30 (0000 UTC), 1997													
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)													
Area (mi ²)	Duration (hours)												
	1	2	3	4	5	6	12	18	24	31	36	56	Total
0.1	4.96	6.76	8.4	9.38	10.13	10.24	10.26	12.95	13.72	14.48	14.48	14.48	14.48
1	4.22	5.76	7.63	8.41	9.17	9.28	9.28	11.21	12.26	12.71	12.71	12.83	12.83
10	3.43	4.9	6.25	6.86	7.53	7.63	7.65	9.49	10.89	12.17	12.17	12.18	12.18
25	2.76	4.11	5.26	5.84	6.01	6.01	6.46	8.43	10.1	11.4	11.4	11.4	11.40
50	2.17	3.31	4.28	4.66	5.04	5.05	5.38	7.51	9.03	10.19	10.19	10.43	10.43
100	1.67	2.48	3.19	3.7	3.86	3.87	4.27	6.09	7.39	8.71	8.71	8.79	8.79
150	1.28	2.14	2.78	3.1	3.18	3.26	3.61	4.89	6.37	7.61	7.61	7.78	7.78
200	0.82	1.81	2.38	2.72	2.84	2.93	3.06	4.55	5.73	6.74	6.74	6.94	6.94
300	0.58	1.2	1.56	1.86	2.01	2.15	2.49	3.59	4.06	4.88	5.74	5.78	5.78
400	0.51	0.83	1.17	1.2	1.27	1.42	1.93	2.95	3.76	4.62	4.88	4.88	4.88
500	0.46	0.79	1.09	1.18	1.26	1.37	1.67	2.17	3	3.68	4.18	4.22	4.22
627	0.39	0.73	1	1.14	1.26	1.31	1.42	2.14	2.77	3.45	3.45	3.48	3.48



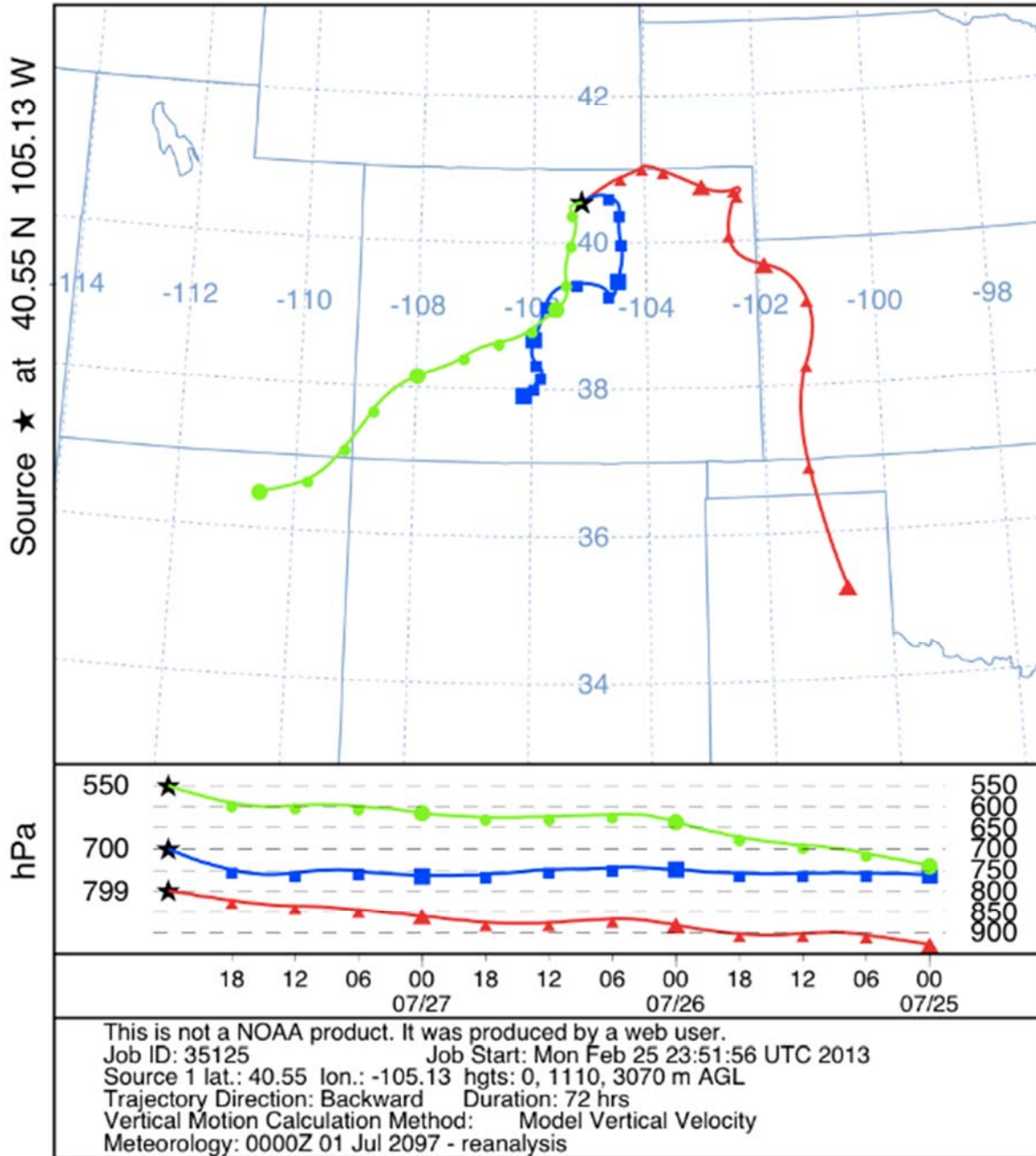
CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study

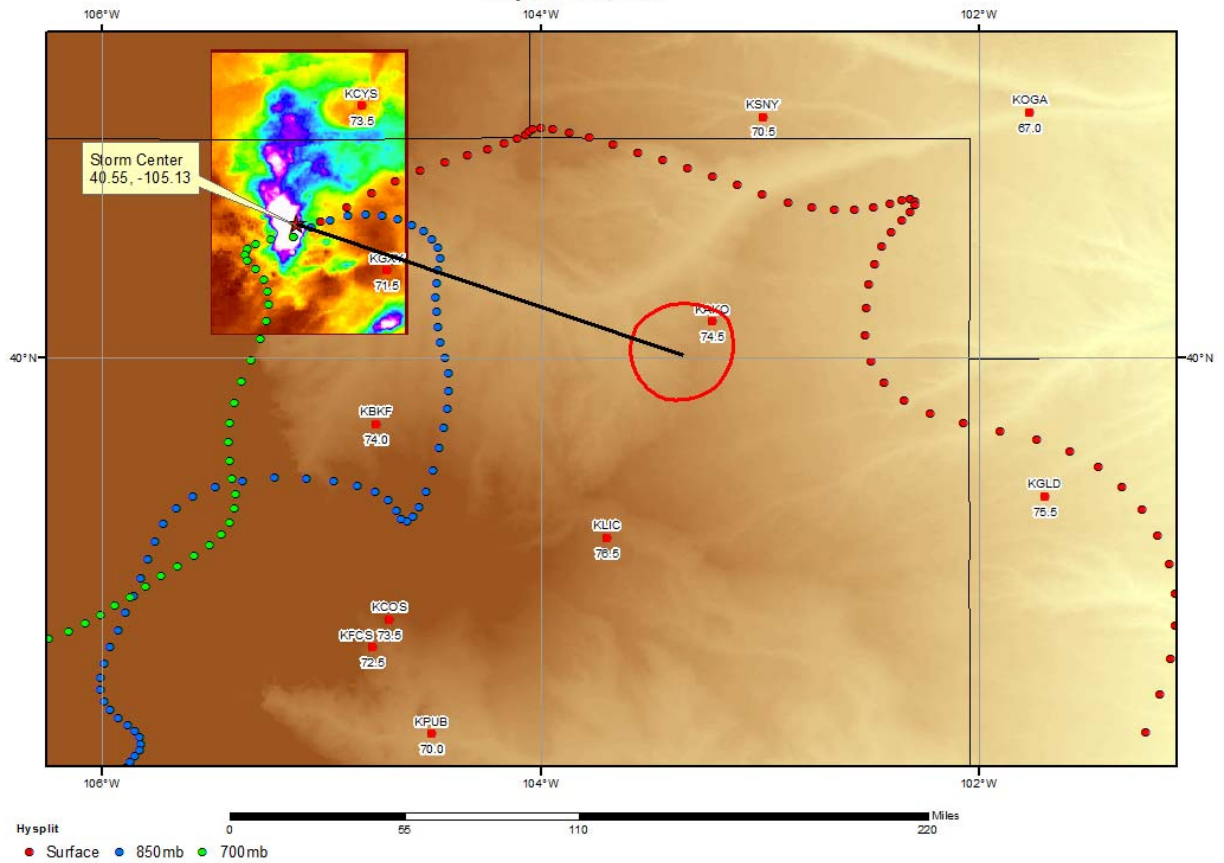


NOAA HYSPLIT MODEL
Backward trajectories ending at 0000 UTC 28 Jul 97
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study

SPAS 1230 Fort Collins, CO Storm Analysis July 27 - 29, 1997



Pawnee Creek, CO

July 29-30, 1997

Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1036_1

General Storm Location: Pawnee Creek, CO

Storm Dates: July 29 (2000 Z) – 30 (1300 Z), 1997

Event: Convective Thunderstorm

DAD Zone 1

Latitude: 40.7752

Longitude: -103.6253

Rainfall Amount: 13.58” (Grid/Pixel Point) in 12hours (but the total analysis window was 17hrs)

Number of Stations: 96 (15-hourly, 1-hourly pseudo, 24-daily, and 56-supplemental) gauging stations within the define search domain. 77 (6-hourly, 0-hourly pseudo, 15-daily, and 56-supplemental) stations within radar domain.

SPAS Version: 2.0

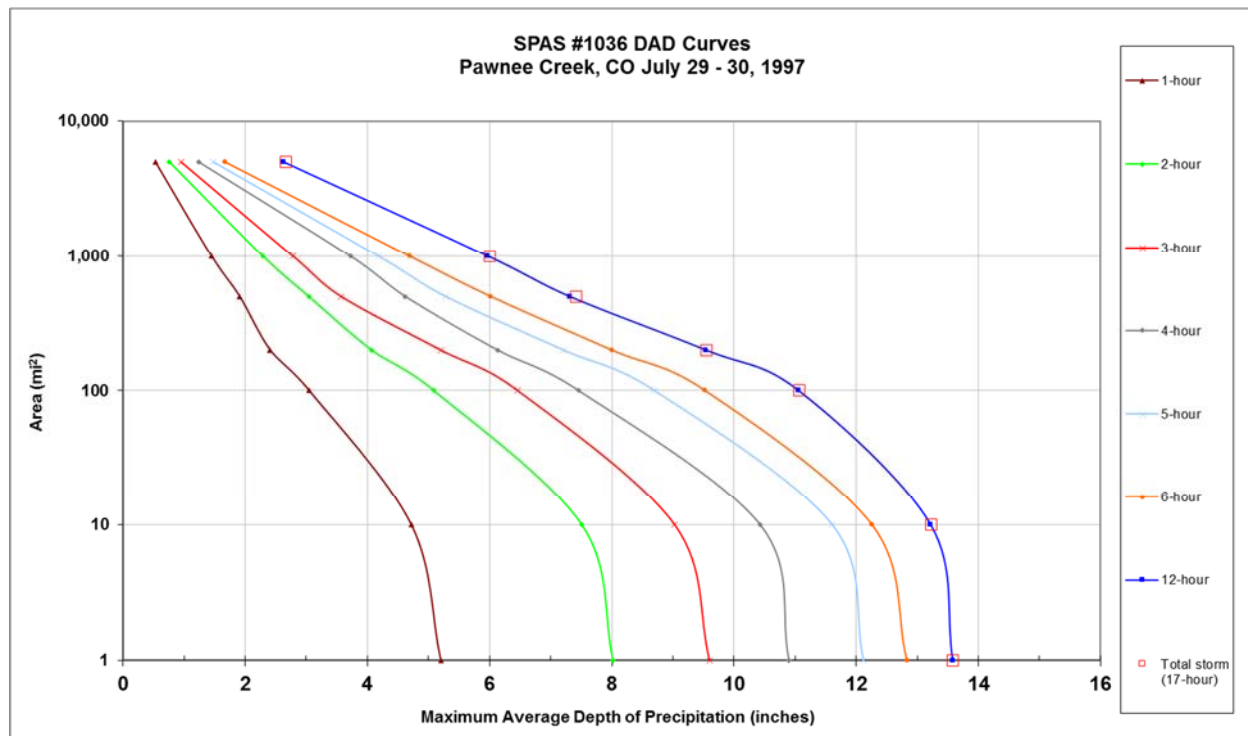
Base Map Used: No

Radar Included: Yes

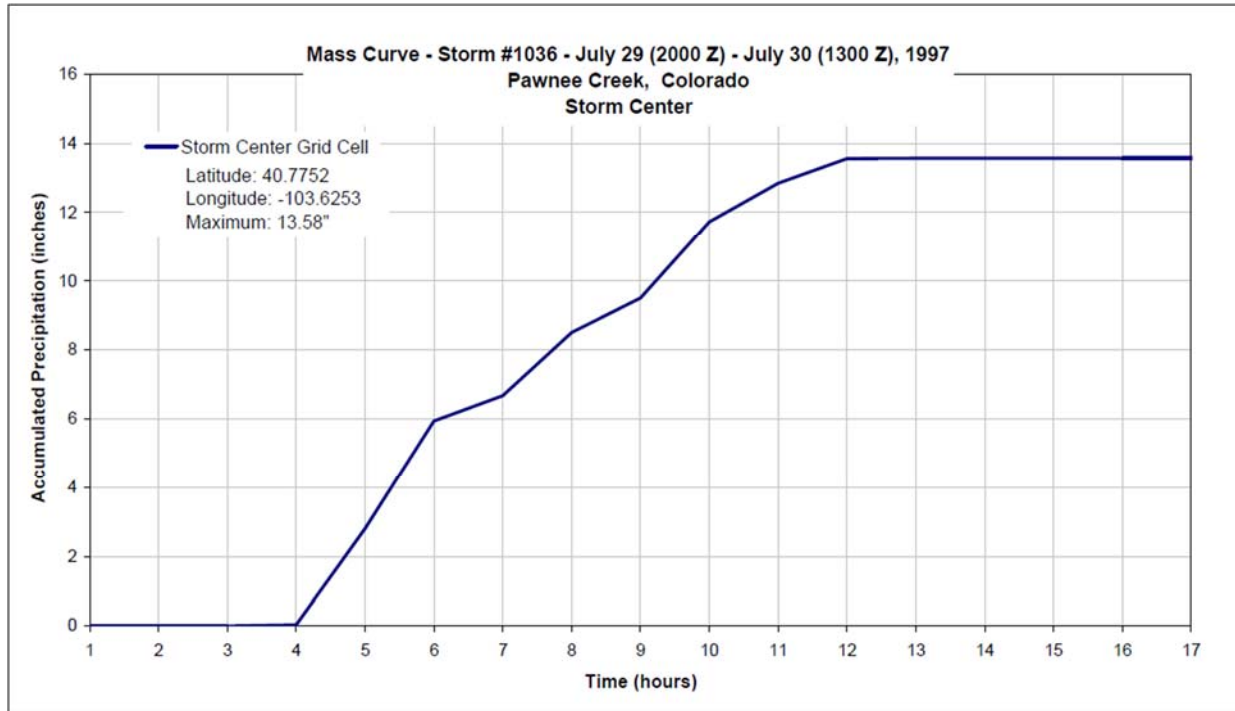
Depth-Area-Duration (DAD) analysis: Yes, 1, 2, 3, 4, 5, 6, 12, and 17 hours.

CO-NM Regional Extreme Precipitation Study

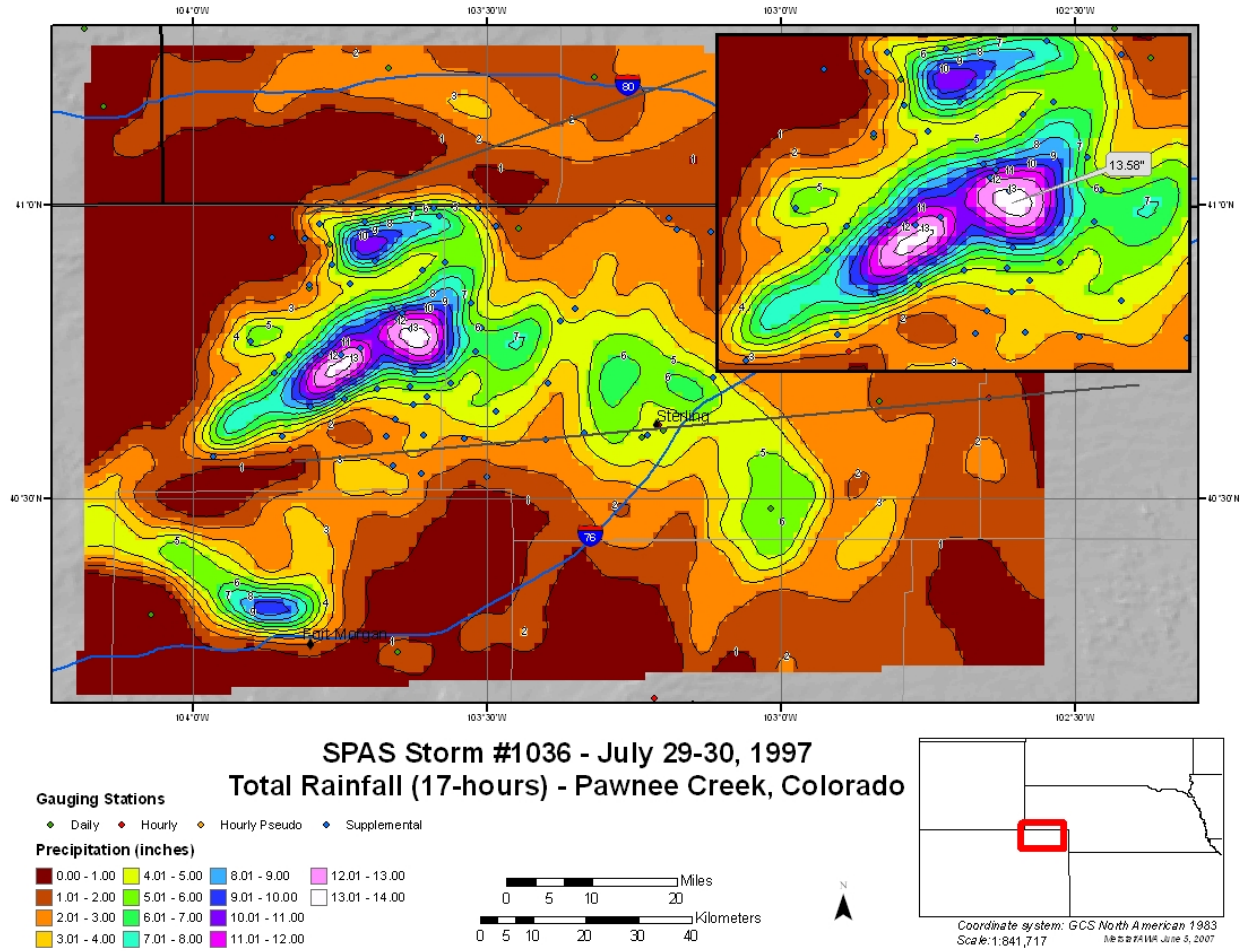
Storm 1036 - Pawnee Creek, CO July 29 - 30, 1997									
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)									
Area (mi ²)	Duration (hours)								
	1	2	3	4	5	6	12	17	total
1	5.20	8.02	9.60	10.90	12.12	12.83	13.58	13.58	13.58
10	4.72	7.51	9.03	10.43	11.61	12.26	13.22	13.23	13.23
100	3.05	5.09	6.46	7.46	8.70	9.53	11.06	11.07	11.07
200	2.41	4.07	5.20	6.13	7.21	8.00	9.54	9.55	9.55
500	1.91	3.04	3.57	4.62	5.28	6.02	7.31	7.42	7.42
1,000	1.45	2.29	2.78	3.72	4.18	4.69	5.97	6.01	6.01
5,000	0.53	0.76	0.95	1.24	1.48	1.67	2.63	2.67	2.67



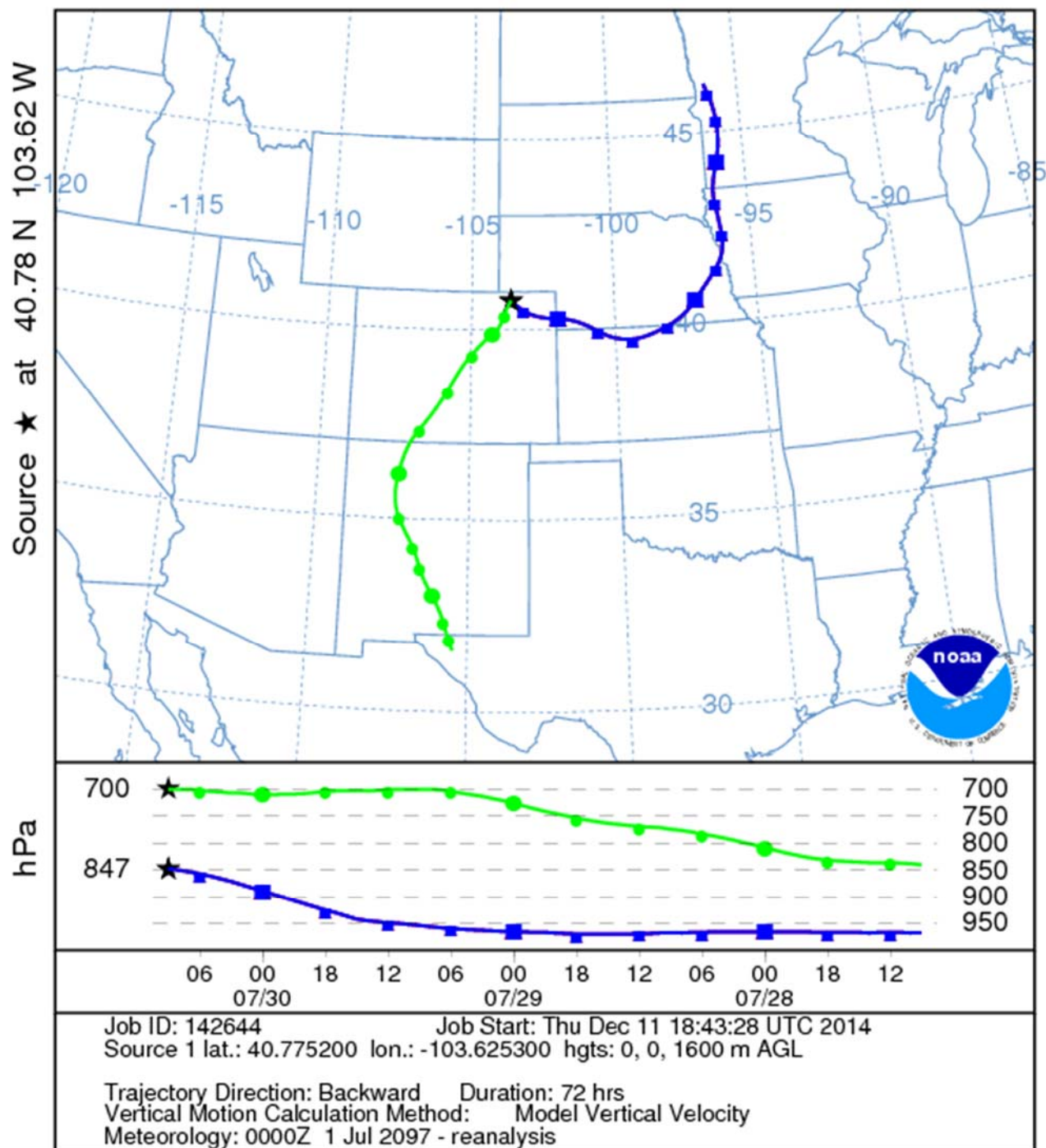
CO-NM Regional Extreme Precipitation Study



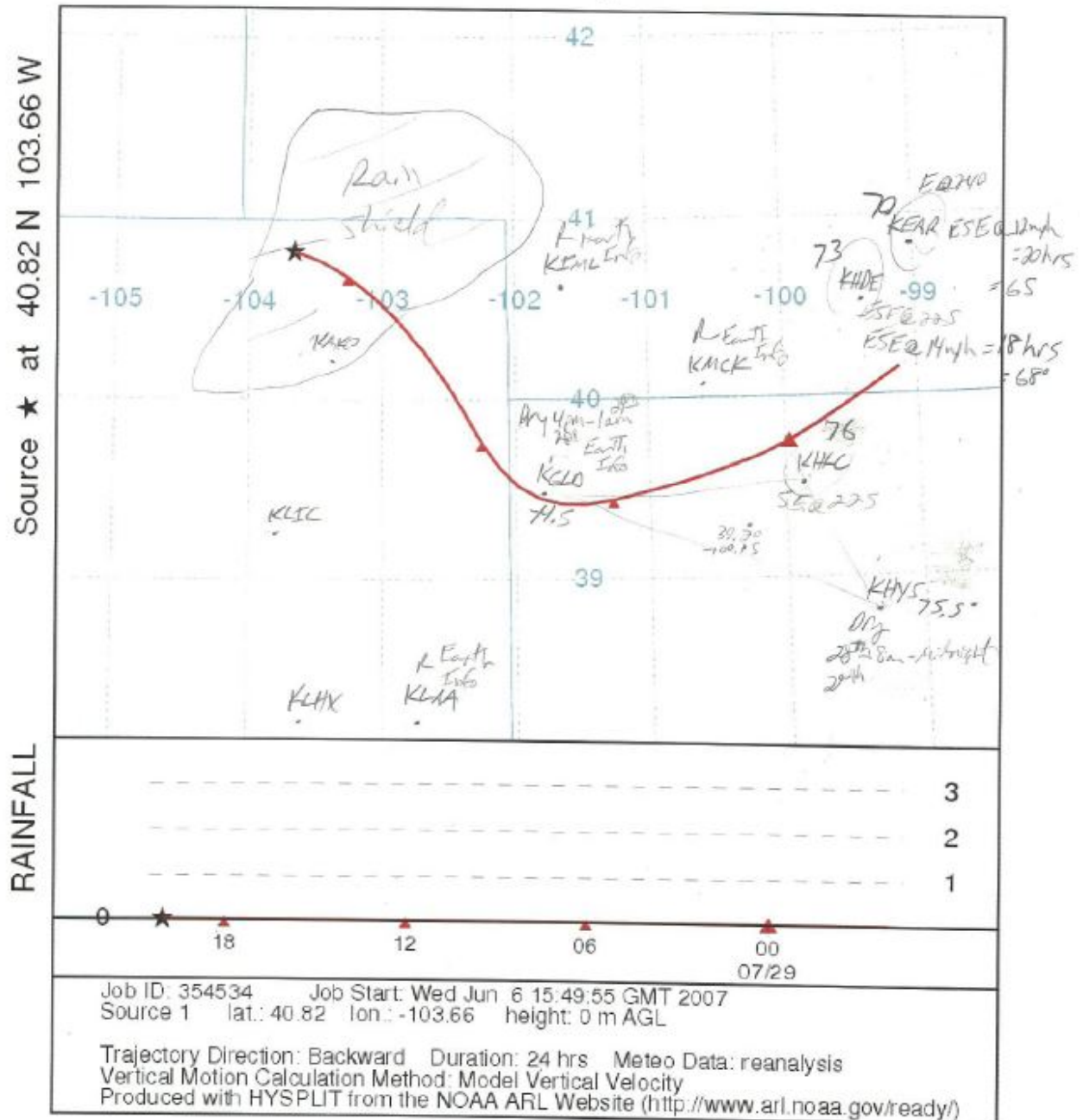
CO-NM Regional Extreme Precipitation Study



NOAA HYSPLIT MODEL
Backward trajectories ending at 0900 UTC 30 Jul 97
CDC1 Meteorological Data



NOAA HYSPLIT MODEL
Backward trajectory ending at 20 UTC 29 Jul 97
CDC1 Meteorological Data



Joseph City, AZ

July 31, 1998

Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1115_1

General Storm Location: Joseph City, Arizona

Storm Dates: July 31, 1998

Event: Convective

DAD Zone 1

Latitude: 34.945

Longitude: -110.355

Max. Grid/Radar Rainfall Amount: 4.20"

Max. Observed Rainfall Amount: 4.00"

Number of Stations: 37 (daily-21, hourly-8, hourly estimated-3, hourly pseudo-1, supplemental-4)

SPAS Version: 8.0

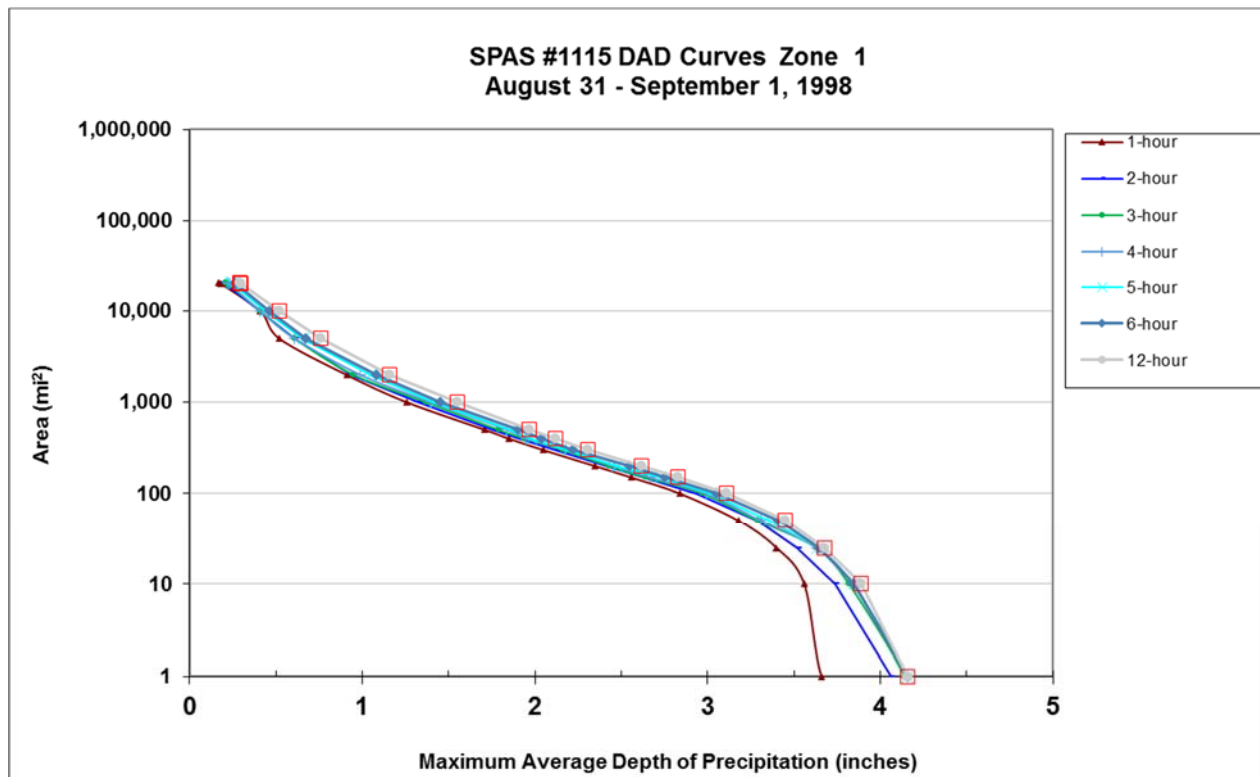
Base Map Used: Yes, defaultZR

Spatial resolution: 0.39 mi²

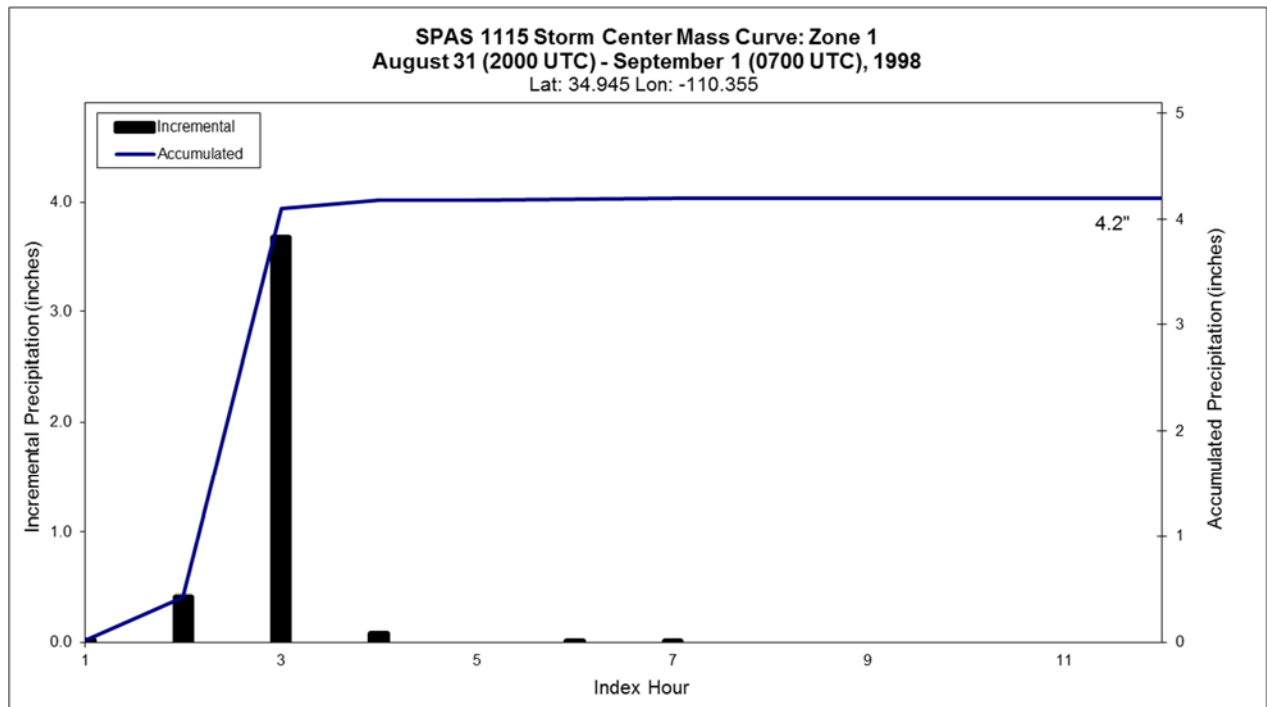
Radar Included: Yes

Depth-Area-Duration (DAD) analysis: Yes, 1, 2, 3, 4, 5, 6, and 12- hour

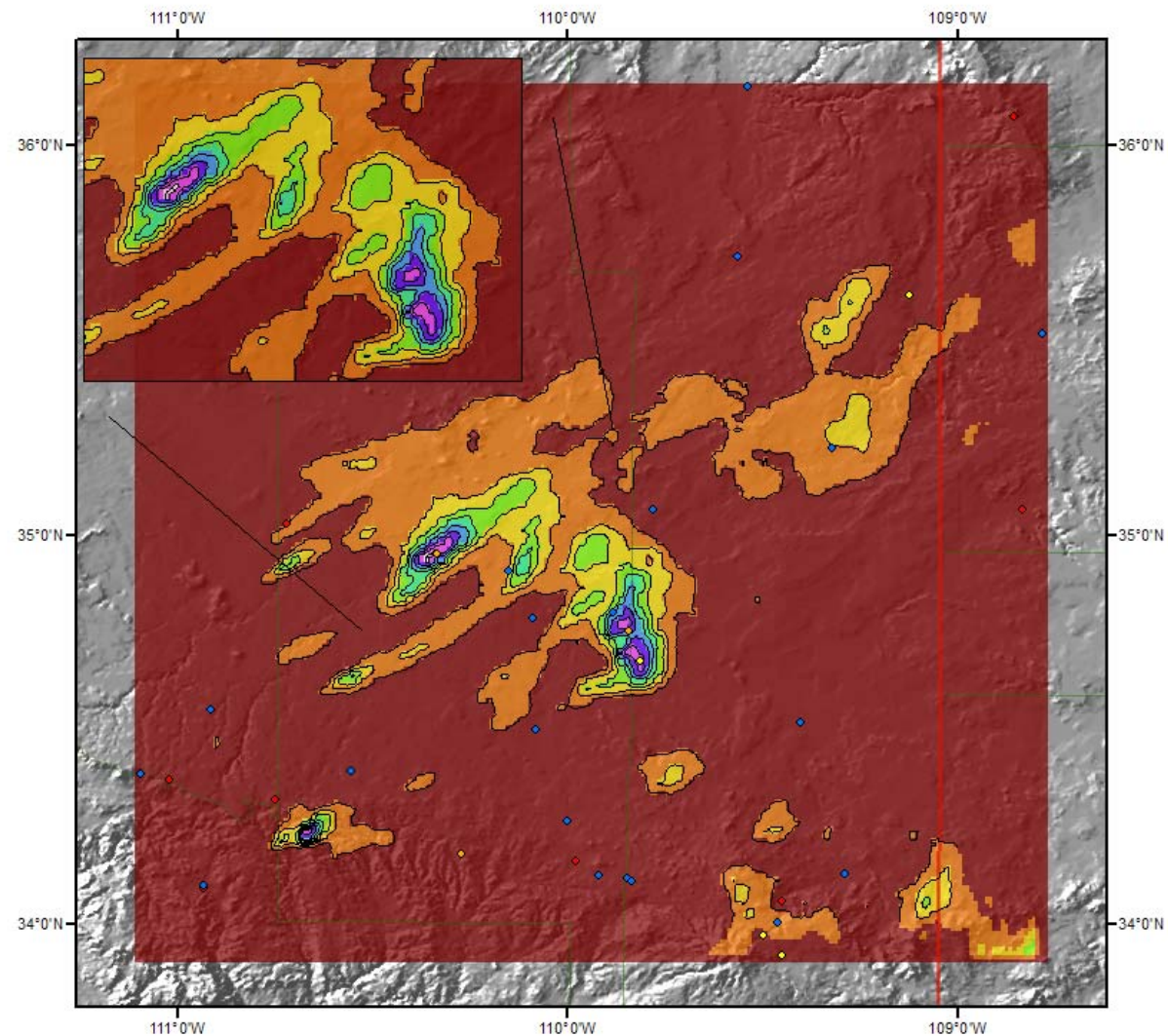
Storm 1115 - August 31 (2000 UTC) - September 1 (0700 UTC), 1998								
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)								
Area (mi²)	Duration (hours)							
	1	2	3	4	5	6	12	Total
0.39	3.82	4.09	4.17	4.19	4.19	4.19	4.20	4.20
1	3.66	4.06	4.14	4.16	4.16	4.16	4.16	4.16
10	3.56	3.74	3.82	3.84	3.85	3.85	3.89	3.89
25	3.40	3.52	3.63	3.63	3.64	3.65	3.68	3.68
50	3.18	3.29	3.29	3.31	3.36	3.41	3.45	3.45
100	2.84	2.94	2.97	2.99	3.02	3.05	3.11	3.11
150	2.56	2.63	2.64	2.67	2.73	2.75	2.83	2.83
200	2.35	2.42	2.43	2.46	2.48	2.55	2.62	2.62
300	2.05	2.12	2.16	2.18	2.19	2.22	2.31	2.31
400	1.85	1.92	1.94	1.95	1.98	2.04	2.12	2.12
500	1.71	1.76	1.79	1.84	1.86	1.90	1.97	1.97
1,000	1.26	1.33	1.37	1.40	1.42	1.45	1.55	1.55
2,000	0.91	0.94	0.95	0.99	1.05	1.08	1.16	1.16
5,000	0.52	0.61	0.61	0.61	0.66	0.67	0.76	0.76
10,000	0.41	0.41	0.41	0.41	0.44	0.46	0.52	0.52
20,000	0.18	0.20	0.22	0.23	0.25	0.27	0.30	0.30
20,670	0.17	0.19	0.21	0.22	0.24	0.26	0.29	0.29



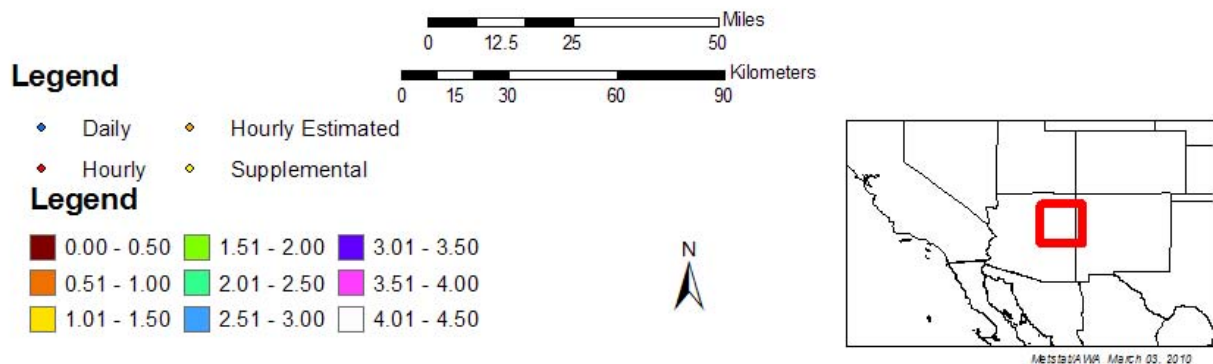
CO-NM Regional Extreme Precipitation Study



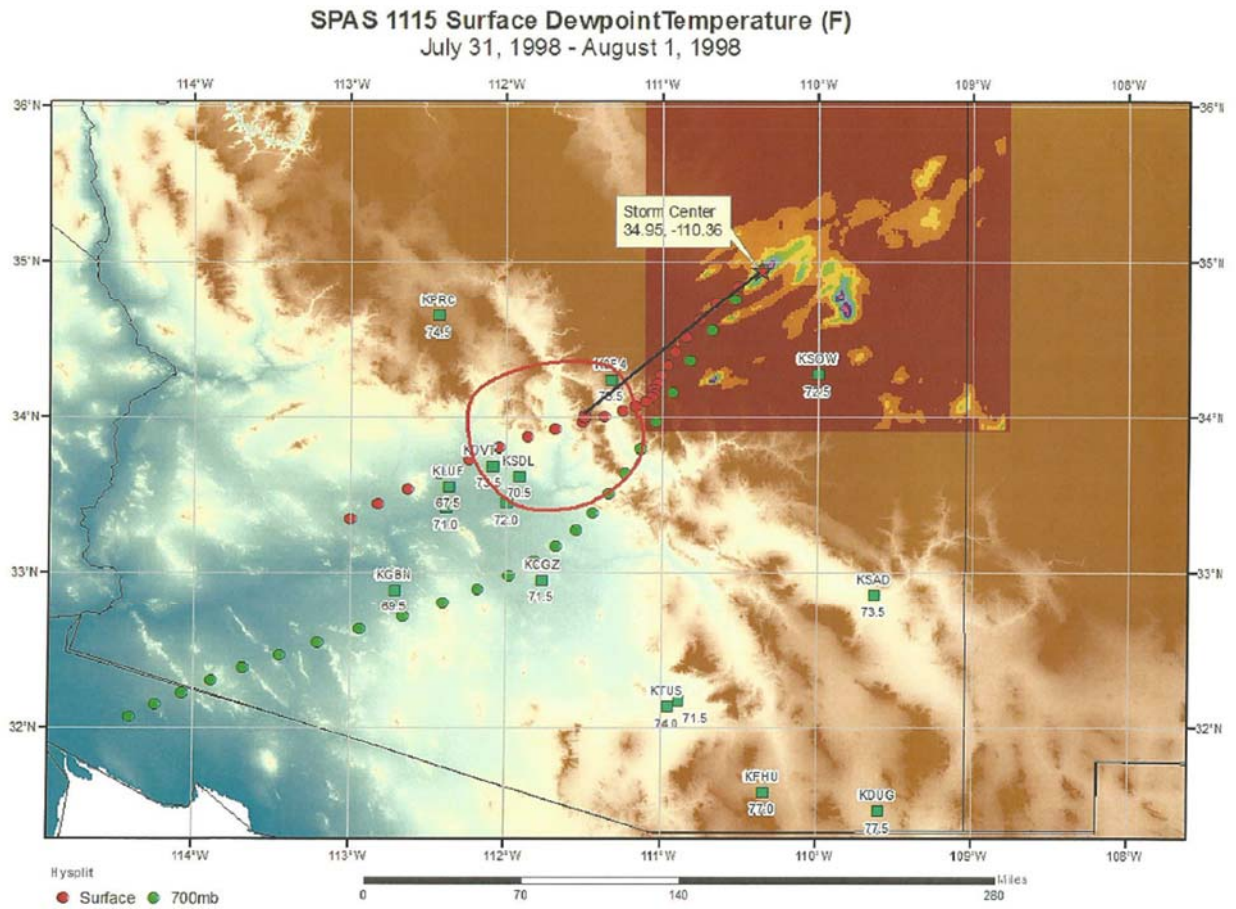
CO-NM Regional Extreme Precipitation Study



Total Rainfall (12-hours)
Joseph City, AZ 1998 Storm
SPAS # 1115 July 31 (2000 UTC) to August 1 (0700 UTC), 1998



CO-NM Regional Extreme Precipitation Study



Sabino Canyon, AZ

July 14-15, 1999

Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1087_1

General Storm Location: Sabino Canyon, Arizona

Storm Dates: July 14-15, 1999

Event: Convective Local

DAD Zone 1

Latitude: 32.3850

Longitude: -110.7050

Max. Grid/Radar Rainfall Amount: 7.87"

Max. Observed Rainfall Amount: 6.82"

Number of Stations: 149 (34-daily, 99-hourly, 16-supplemental)

SPAS Version: 7.0

Base Map Used: Yes, conus_prism_ppt_in_1971_2000_07

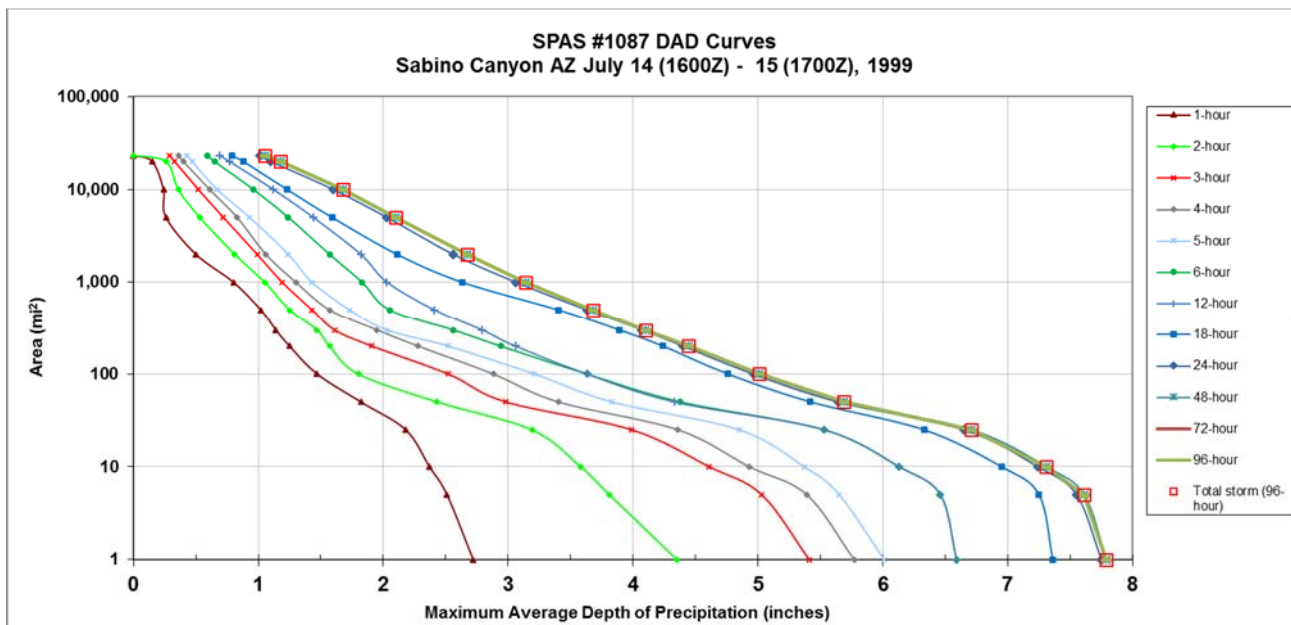
Spatial Resolution: 0.40 mi²

Radar Included: Yes

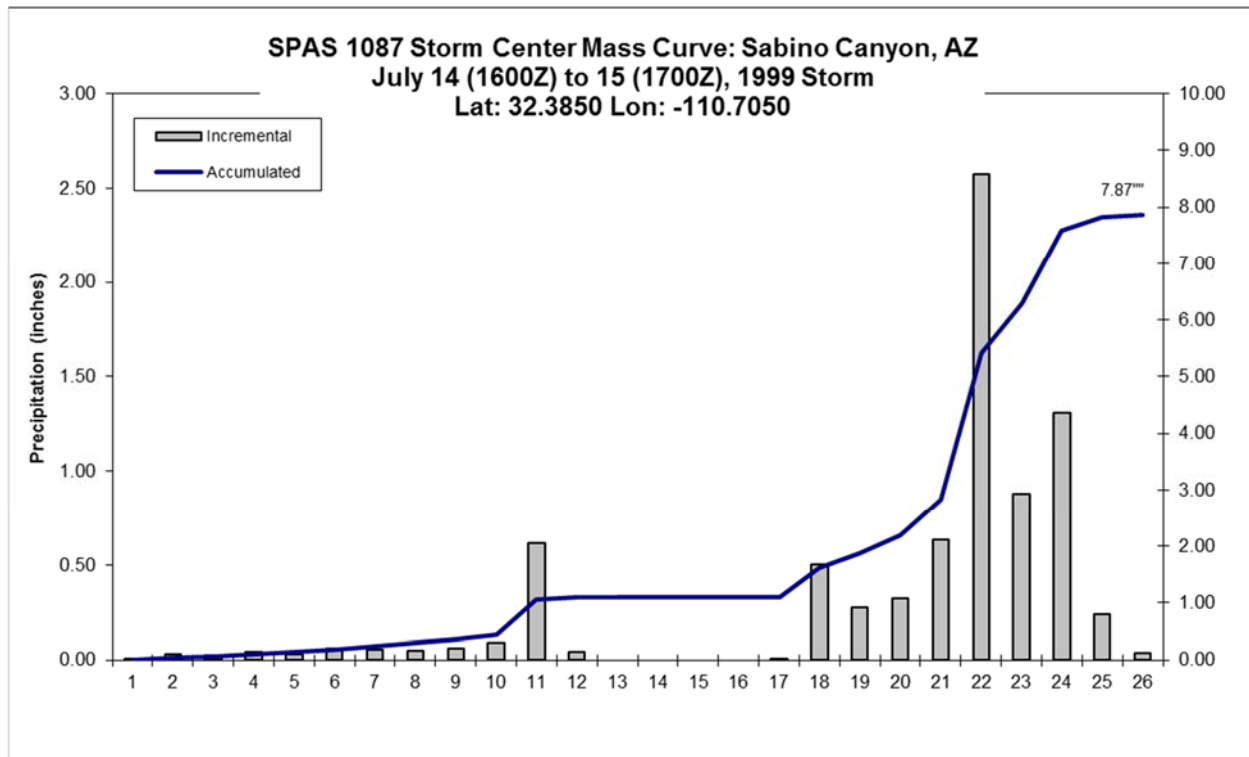
Depth-Area-Duration (DAD) analysis: Yes, 1, 2, 3, 4, 5, 6, 9, 12, 18, & 24-hour

CO-NM Regional Extreme Precipitation Study

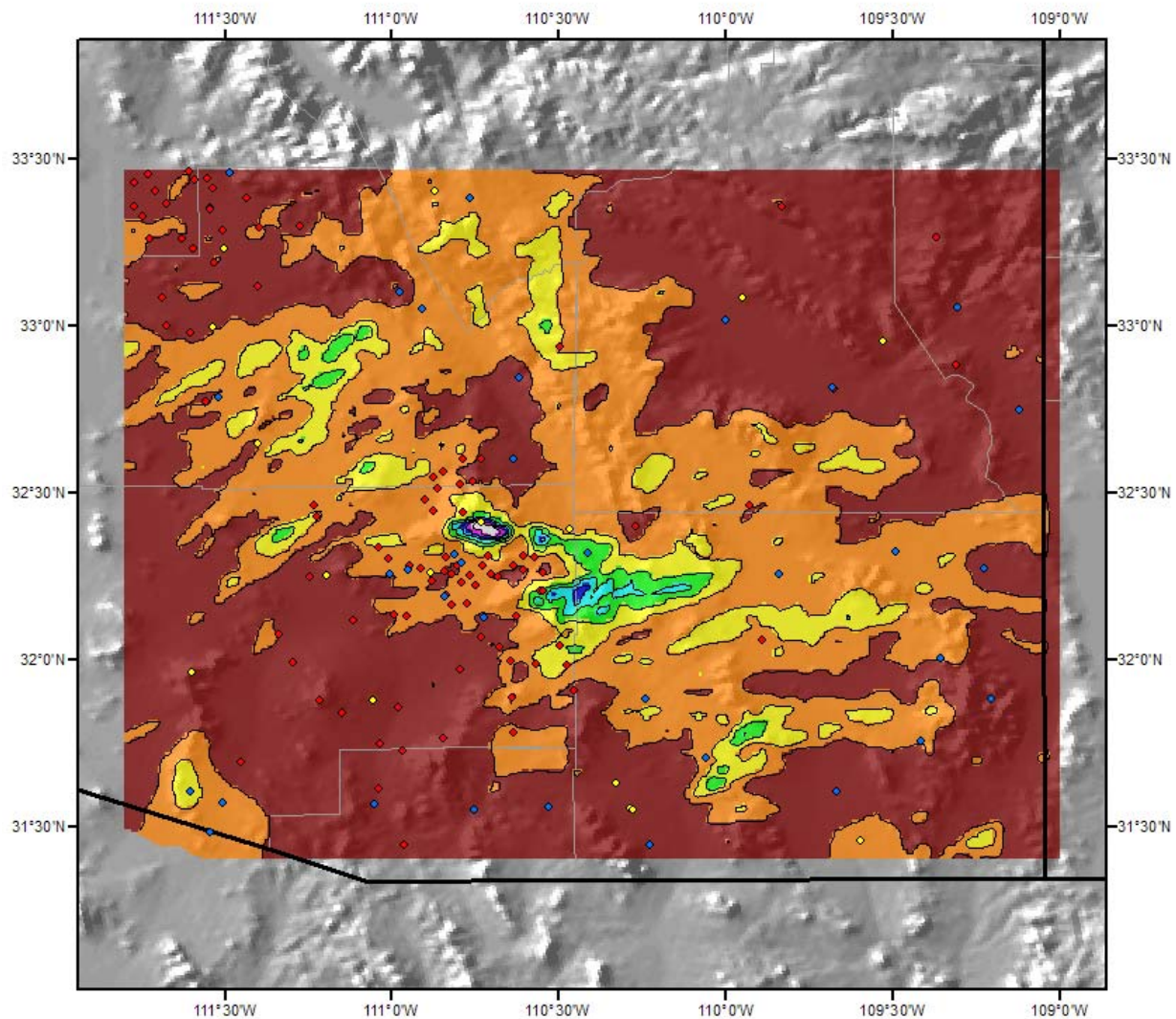
Storm 1087 - Sabino Canyon, AZ July 14 (1600Z) - 15 (1700Z), 1999													
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)													
Area (mi ²)	Duration (hours)												
	1	2	3	4	5	6	12	18	24	48	72	96	total
0.4	2.80	4.48	5.55	5.96	6.12	6.77	6.77	7.59	7.84	7.87	7.87	7.87	7.87
1	2.72	4.35	5.41	5.77	6.01	6.59	6.59	7.36	7.75	7.79	7.79	7.79	7.79
5	2.51	3.81	5.03	5.39	5.65	6.46	6.46	7.25	7.55	7.61	7.61	7.61	7.61
10	2.37	3.58	4.61	4.93	5.37	6.13	6.13	6.95	7.24	7.31	7.31	7.31	7.31
25	2.18	3.19	3.99	4.36	4.85	5.53	5.53	6.33	6.65	6.71	6.71	6.71	6.71
50	1.82	2.43	2.98	3.40	3.83	4.38	4.33	5.42	5.64	5.69	5.69	5.69	5.69
100	1.47	1.80	2.52	2.88	3.21	3.63	3.63	4.76	4.96	5.01	5.01	5.01	5.01
200	1.25	1.57	1.91	2.28	2.52	2.94	3.06	4.24	4.40	4.44	4.44	4.44	4.44
300	1.14	1.47	1.61	1.95	2.03	2.56	2.79	3.89	4.07	4.10	4.10	4.10	4.10
500	1.02	1.25	1.43	1.57	1.73	2.05	2.41	3.40	3.63	3.68	3.68	3.68	3.68
1,000	0.80	1.05	1.19	1.30	1.43	1.83	2.03	2.63	3.06	3.14	3.14	3.14	3.14
2,000	0.50	0.81	0.99	1.06	1.24	1.57	1.82	2.11	2.56	2.67	2.67	2.67	2.67
5,000	0.26	0.53	0.72	0.83	0.93	1.24	1.44	1.59	2.03	2.10	2.10	2.10	2.10
10,000	0.24	0.36	0.52	0.61	0.67	0.96	1.12	1.23	1.60	1.68	1.68	1.68	1.68
20,000	0.15	0.26	0.33	0.40	0.47	0.65	0.77	0.88	1.10	1.18	1.18	1.18	1.18
23,292	0.00	0.00	0.29	0.36	0.43	0.59	0.69	0.79	1.01	1.05	1.05	1.05	1.05



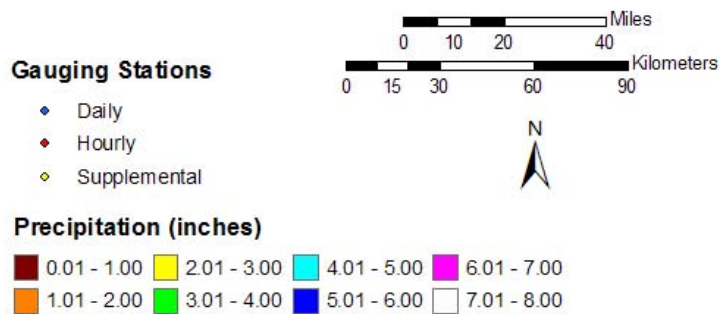
CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study

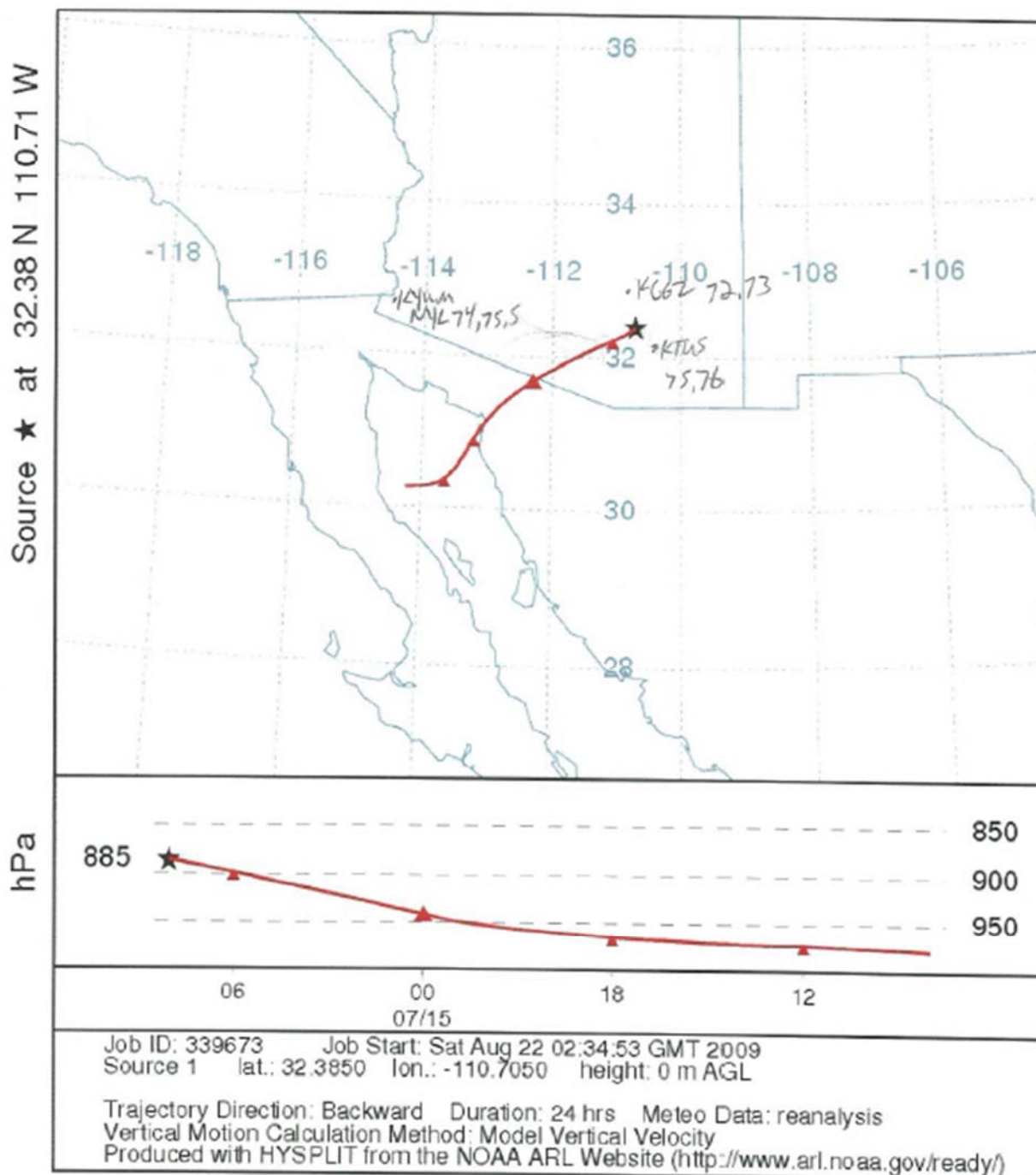


Total Rainfall (24-hours)
Sabino Canyon, AZ 1999 Storm
Storm #1087 July 14 (1600 Z) to 15 (1700 Z), 1999



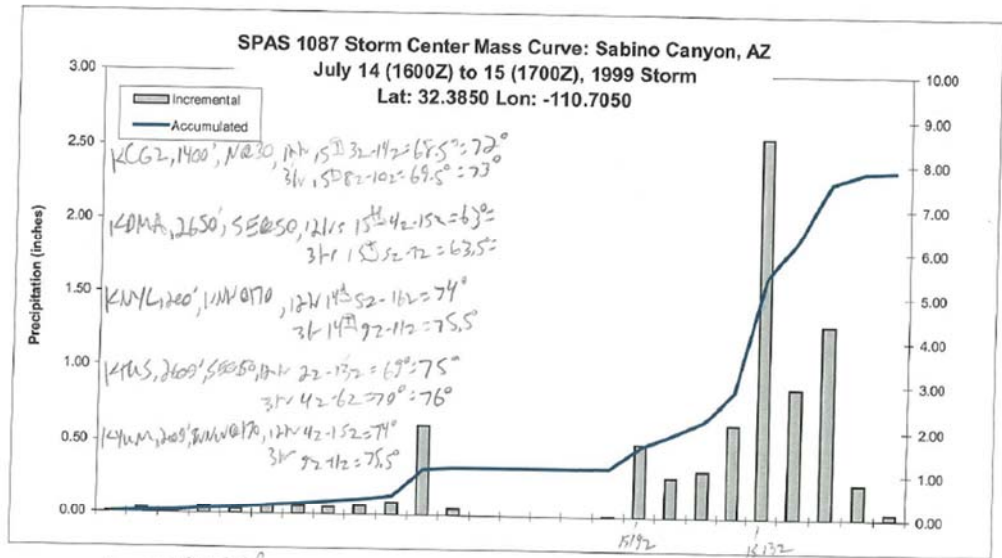
Coordinate system: GCS North American 1983
 Scale: 1:1,840,917
 MetStat/AWR August 21, 2009

NOAA HYSPLIT MODEL
Backward trajectory ending at 0800 UTC 15 Jul 99
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study

day	hour	ppt	accum
14	1600	0.01	0.01
14	1700	0.03	0.04
14	1800	0.02	0.06
14	1900	0.05	0.10
14	2000	0.03	0.13
14	2100	0.06	0.19
14	2200	0.05	0.24
14	2300	0.05	0.29
15	0	0.06	0.35
15	100	0.09	0.44
15	200	0.61	1.05
15	300	0.05	1.10
15	400	0.00	1.10
15	500	0.00	1.10
15	600	0.00	1.10
15	700	0.00	1.10
15	800	0.01	1.11
15	900	0.50	1.60
15	1000	0.27	1.88
15	1100	0.32	2.20
15	1200	0.64	2.84
15	1300	2.57	5.41
15	1400	0.88	6.28
15	1500	1.31	7.59
15	1600	0.24	7.83
15	1700	0.039	7.872



3hr or 12hr AVE?

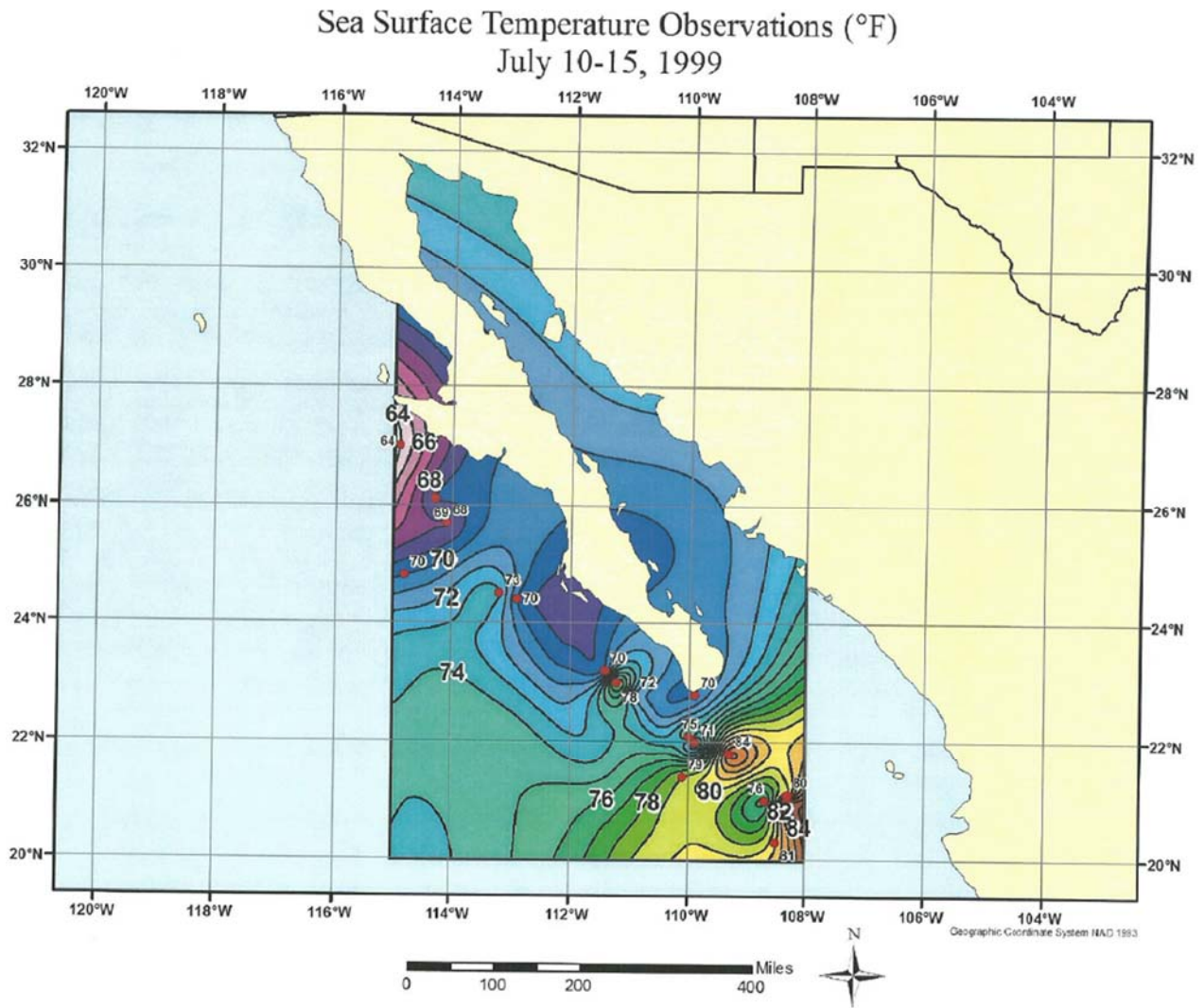
use 12hr storm rep rkr 75 RTUS

No. Guff g CA SST
 y Get from file

change SW 25 32.12 110.93
 215 147
 341 147

Storm rep 3hr 76°, WSW 100

CO-NM Regional Extreme Precipitation Study



Saguache, CO

July 25-26, 1999

Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1662_1

General Storm Location: Saguache, CO

Storm Dates: July 25-26, 1999

Event: Local

DAD Zone 1

Latitude: 38.2150

Longitude: -106.2950

Max. Grid/Radar Rainfall Amount: 6.68"

Max. Observed Rainfall Amount: 5.00"

Number of Stations: 47

SPAS Version: 10.0

Base Map Used: "defaultP" (created from ippt_allsites_1662_sum_in)

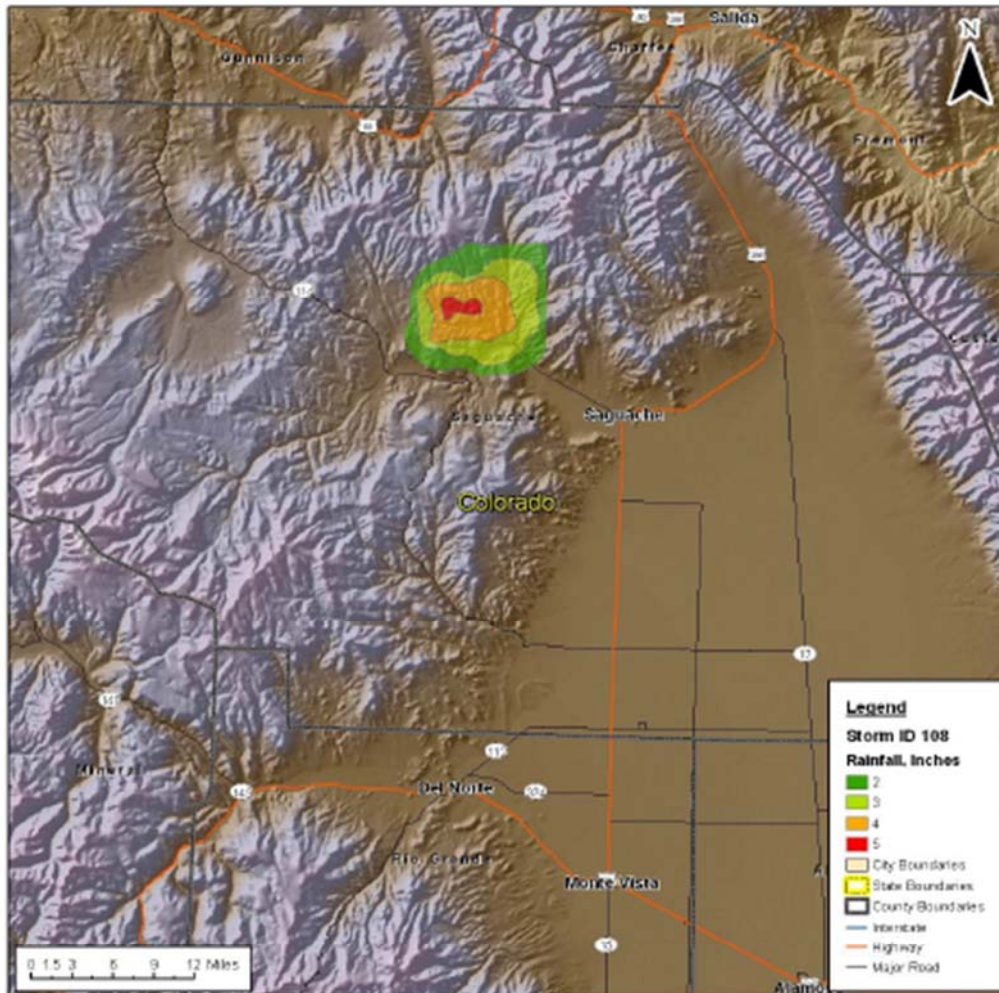
Spatial resolution: 0.3752

Radar Included: Yes

Depth-Area-Duration (DAD) analysis: Yes

Reliability of Results: This analysis was based on 47 hourly stations, daily data, and supplemental station data and NEXRAD Radar. We have a good degree of confidence for the radar/station based storm total results. The spatial pattern is dependent on the radar data and basemap. Timing is based on the hourly and hourly pseudo stations, specifically HRLY 1 created from the information given in the NM EPAT report for storm ID 108. Several daily stations were moved to supplemental due to timing issues and to ensure data consistency.

CO-NM Regional Extreme Precipitation Study



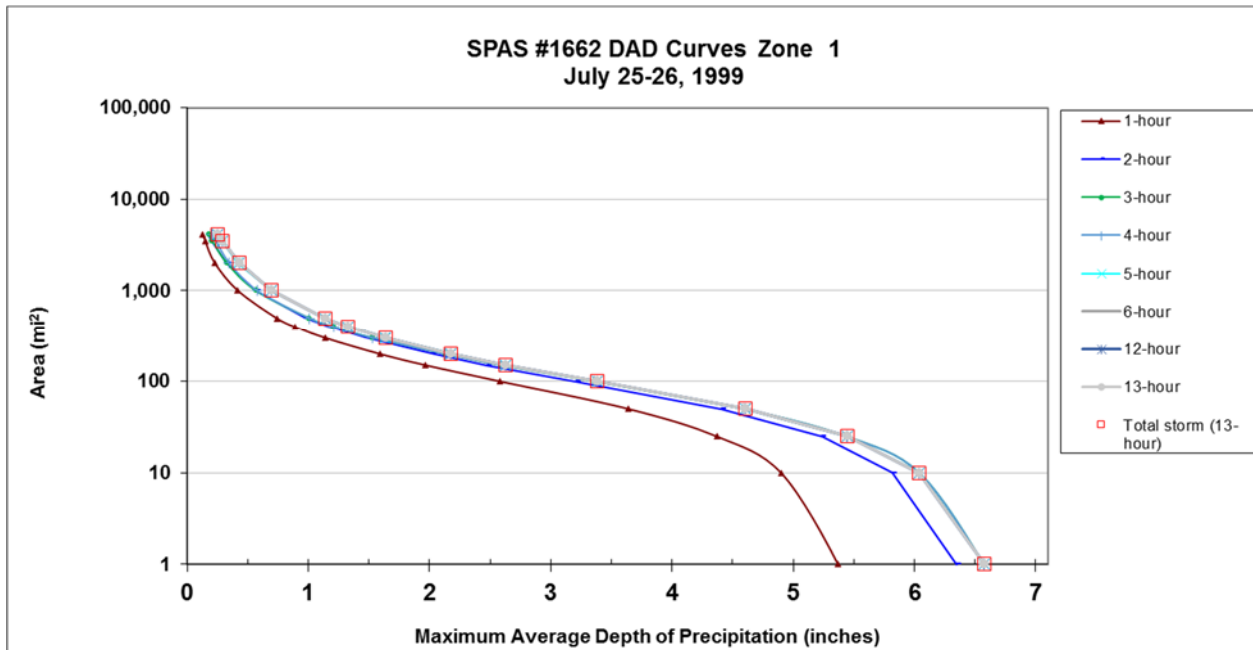
Storm Synopsis and Climate Zone Classification:

Storm ID 108 Climate Zone – Zones 1, 3, 9, 10: Storm event driven during monsoonal period and given location along south-facing terrain just north of flat reach of San Luis Valley. Given this storm location storm allowed in Zones 1, 3, 9 and 10.

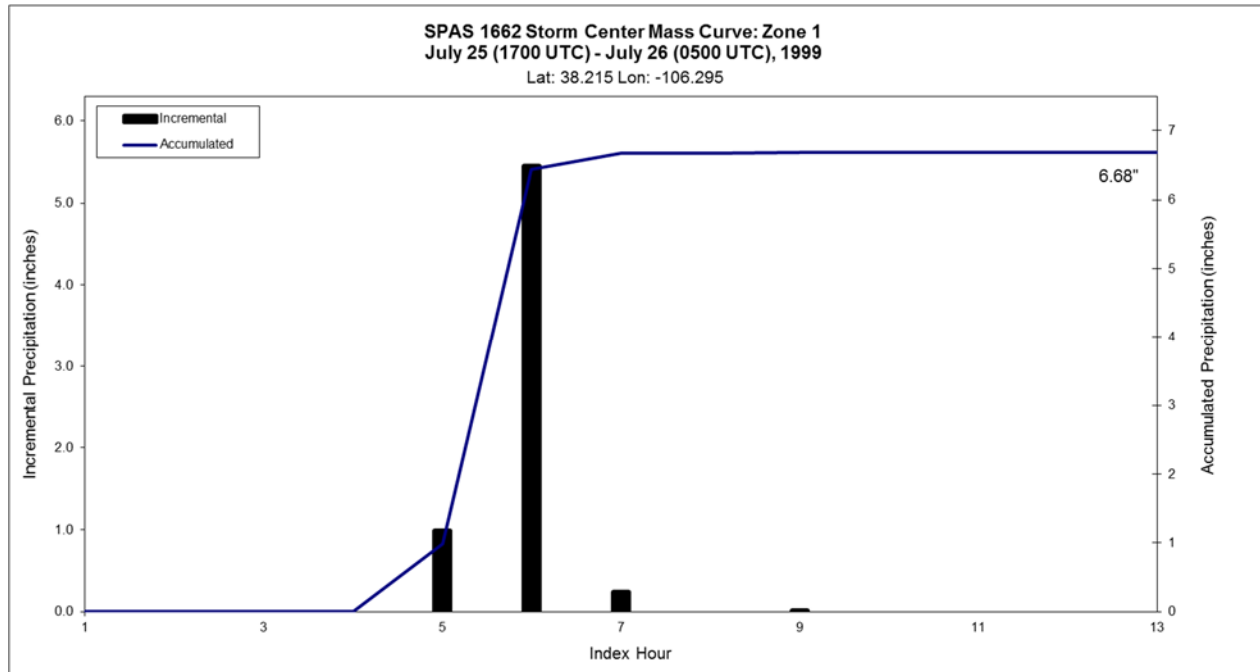
Start Date/End Date	July 25, 1999
Storm Name/Status	Saguache - STORM ID 108 / Active
Storm Type	Local Storm – Convective Simple
State/Climate Zone	Colorado / Climate Zones 1, 3, 9, 10
Duration/Max Precipitation	2 hours / 5"
Originator	Henz
Low Level Wind	140 degrees
Upper Level Wind	220 degrees
PWI /1000mb Dewpoint	3.03" / 76.3F
Storm Source	EPAT
Temporal	Radar observed

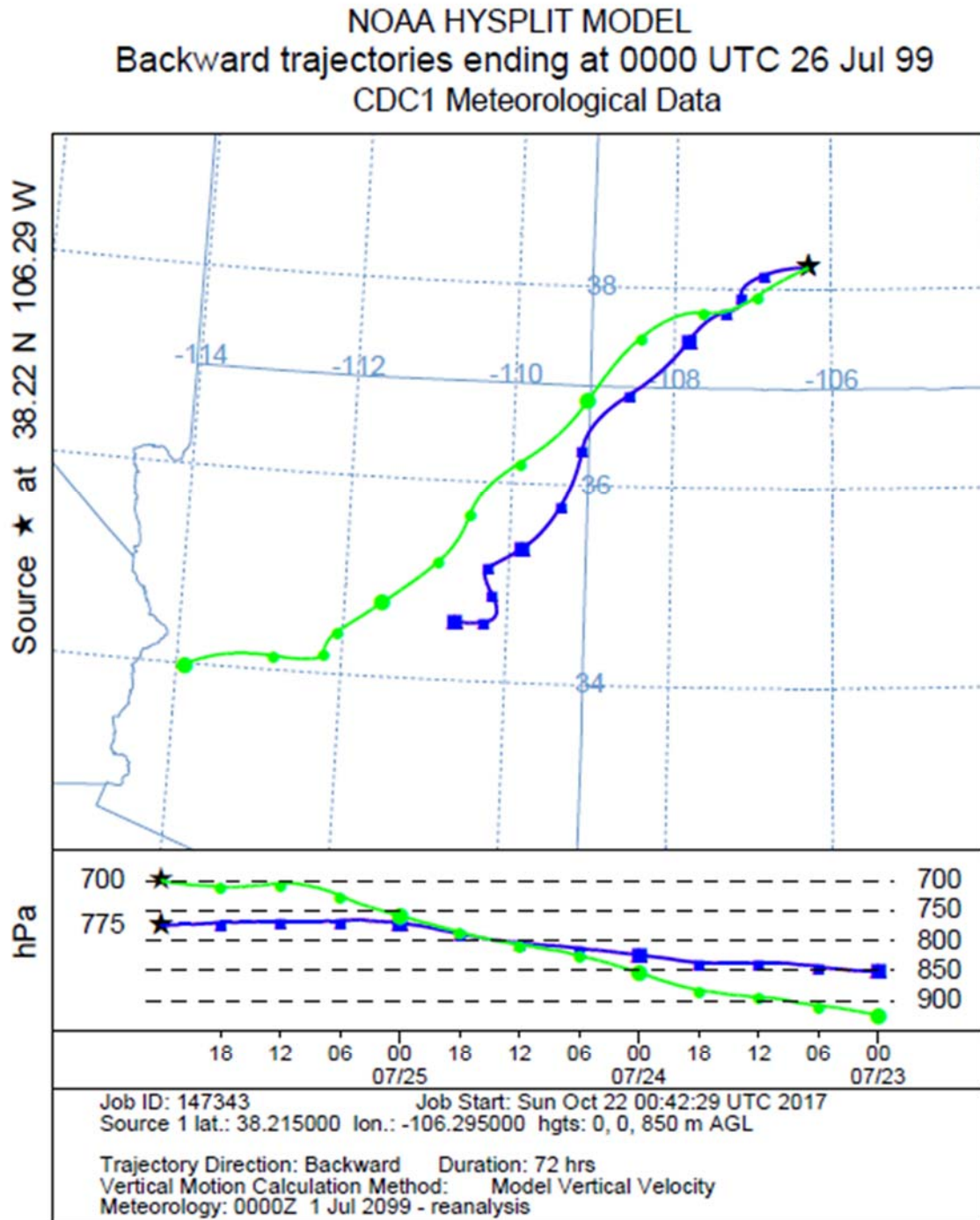
CO-NM Regional Extreme Precipitation Study

Storm 1662 - July 25 (1700 UTC) - July 26 (0500 UTC), 1999									
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)									
Area (mi ²)	Duration (hours)								
	1	2	3	4	5	6	12	13	Total
0.4	5.44	6.43	6.66	6.66	6.67	6.67	6.67	6.67	6.67
1	5.37	6.35	6.57	6.57	6.58	6.58	6.58	6.58	6.58
10	4.90	5.82	6.04	6.04	6.04	6.04	6.04	6.04	6.04
25	4.37	5.24	5.44	5.44	5.45	5.45	5.45	5.45	5.45
50	3.64	4.41	4.59	4.59	4.61	4.61	4.61	4.61	4.61
100	2.58	3.21	3.36	3.36	3.38	3.38	3.38	3.38	3.38
150	1.97	2.48	2.59	2.59	2.63	2.63	2.63	2.63	2.63
200	1.59	2.02	2.13	2.13	2.18	2.18	2.18	2.18	2.18
300	1.14	1.47	1.53	1.53	1.63	1.64	1.64	1.64	1.64
400	0.89	1.17	1.21	1.21	1.33	1.33	1.33	1.33	1.33
500	0.74	0.98	1.01	1.01	1.14	1.14	1.14	1.14	1.14
1,000	0.42	0.57	0.57	0.58	0.70	0.70	0.70	0.70	0.70
2,000	0.23	0.33	0.33	0.35	0.42	0.43	0.43	0.43	0.43
3,500	0.15	0.20	0.21	0.24	0.29	0.29	0.29	0.29	0.29
4,137	0.13	0.17	0.18	0.21	0.25	0.25	0.25	0.25	0.25

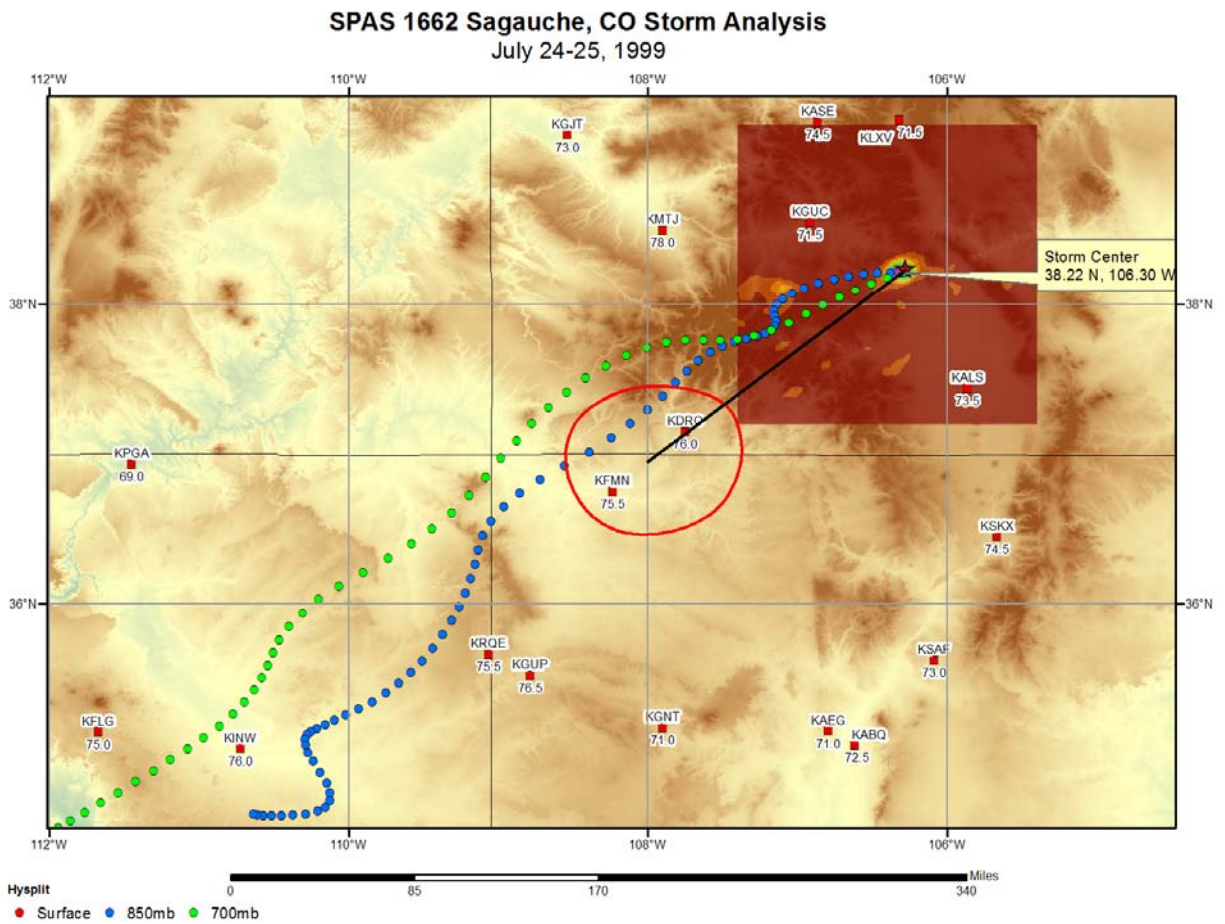


CO-NM Regional Extreme Precipitation Study





CO-NM Regional Extreme Precipitation Study



Dallas Creek, CO

July 31 – August 1, 1999

Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1509_1

General Storm Location: Western Colorado

Storm Dates: July 31 – August 1, 1999

Event: Extreme Precipitation Event

DAD Zone 1

Latitude: 38.0950

Longitude: -107.9150

Max. Grid/Radar Rainfall Amount: 5.07"

Max. Observed Rainfall Amount: 5.00"

Number of Stations: 174

SPAS Version: 10.0

Base Map Used: Combined EPAT isohyet and Continental United States 2 year 6 hour
(conus_0002yr06h)

Spatial resolution: 0.3761

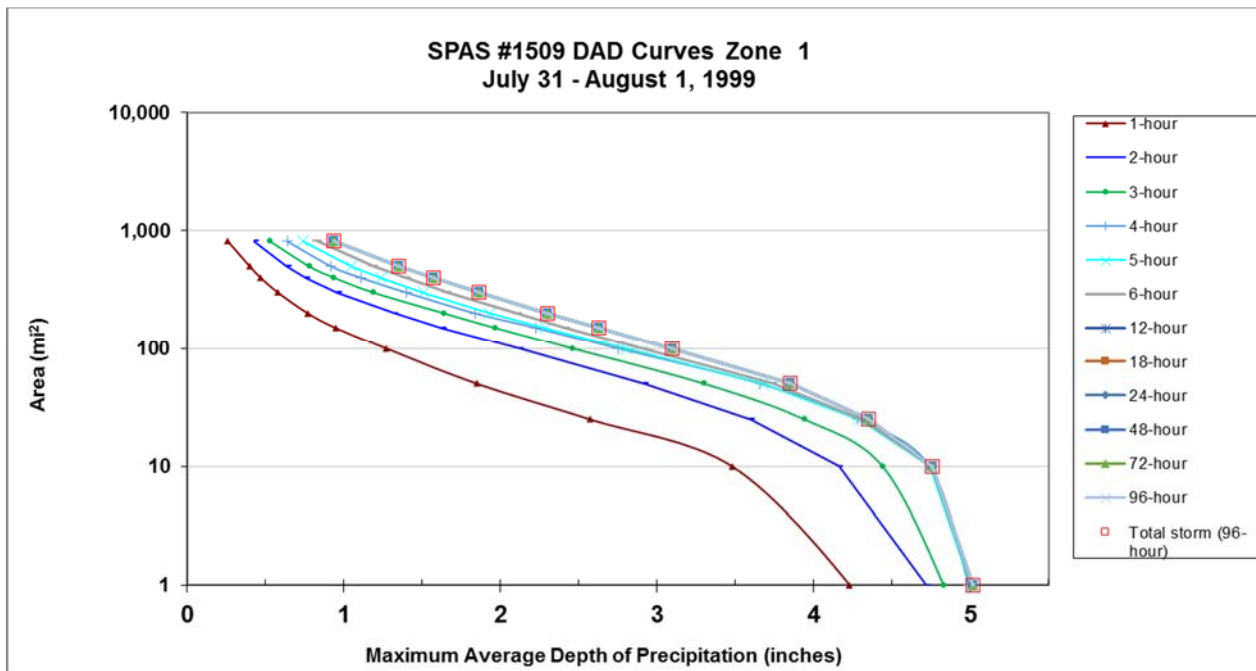
Radar Included: Yes

Depth-Area-Duration (DAD) analysis: No

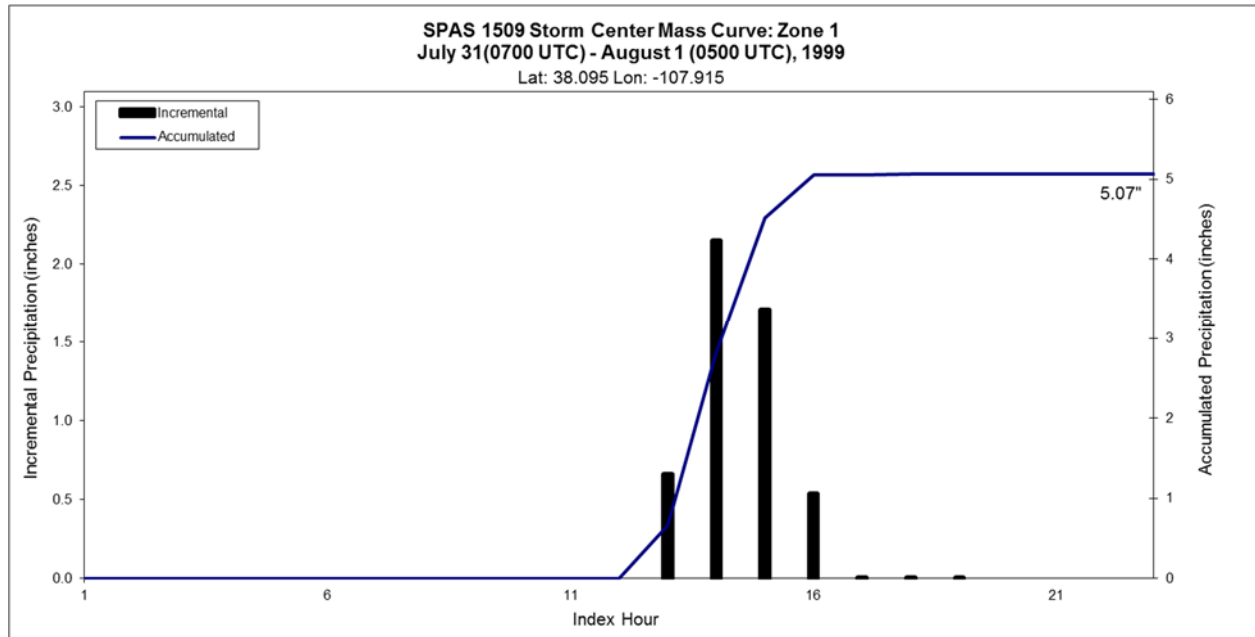
Reliability of Results: Radar data from Grand Junction (KGJT) was used from the hours of 0700 UTC (00:00 MST) on July 31 to 0500 UTC on August 1 (22:00 MST, July 31). KGJT is approximately 65 miles away from the storm center and is in mountainous terrain. In addition to the NCDC stations, two hourly stations were adapted from mass curves from NWS/NWA documentation (included below). These stations only provided precipitation timing for the time period beginning on July 30 around 00:00 MST to 00:00 MST on August 1. Data mining produced an additional hourly station at Gothic, CO and several supplemental stations around the storm center. The Extreme Precipitation Analysis Tool (EPAT) was previously used to analyze this storm (HDR Engineering, Inc.) over a much smaller domain and the resulting isohyetal map was implemented in this analysis for defining precipitation patterns and determining storm center total precipitation. To resolve timing issues six radar estimated hourly pseudo stations were added at locations of daily stations near the storm center.

CO-NM Regional Extreme Precipitation Study

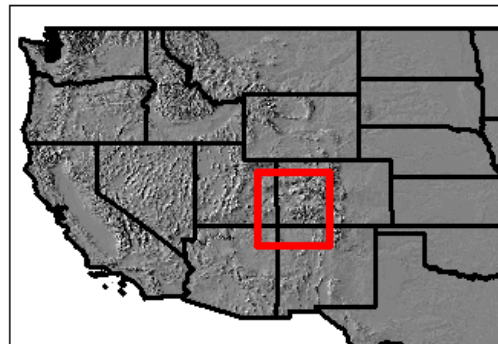
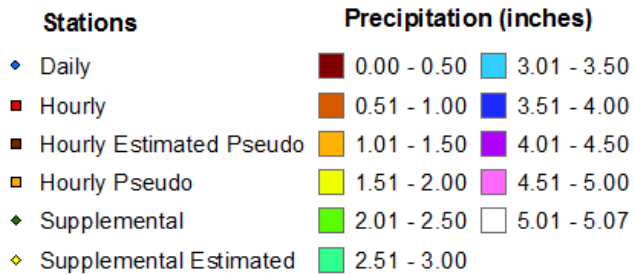
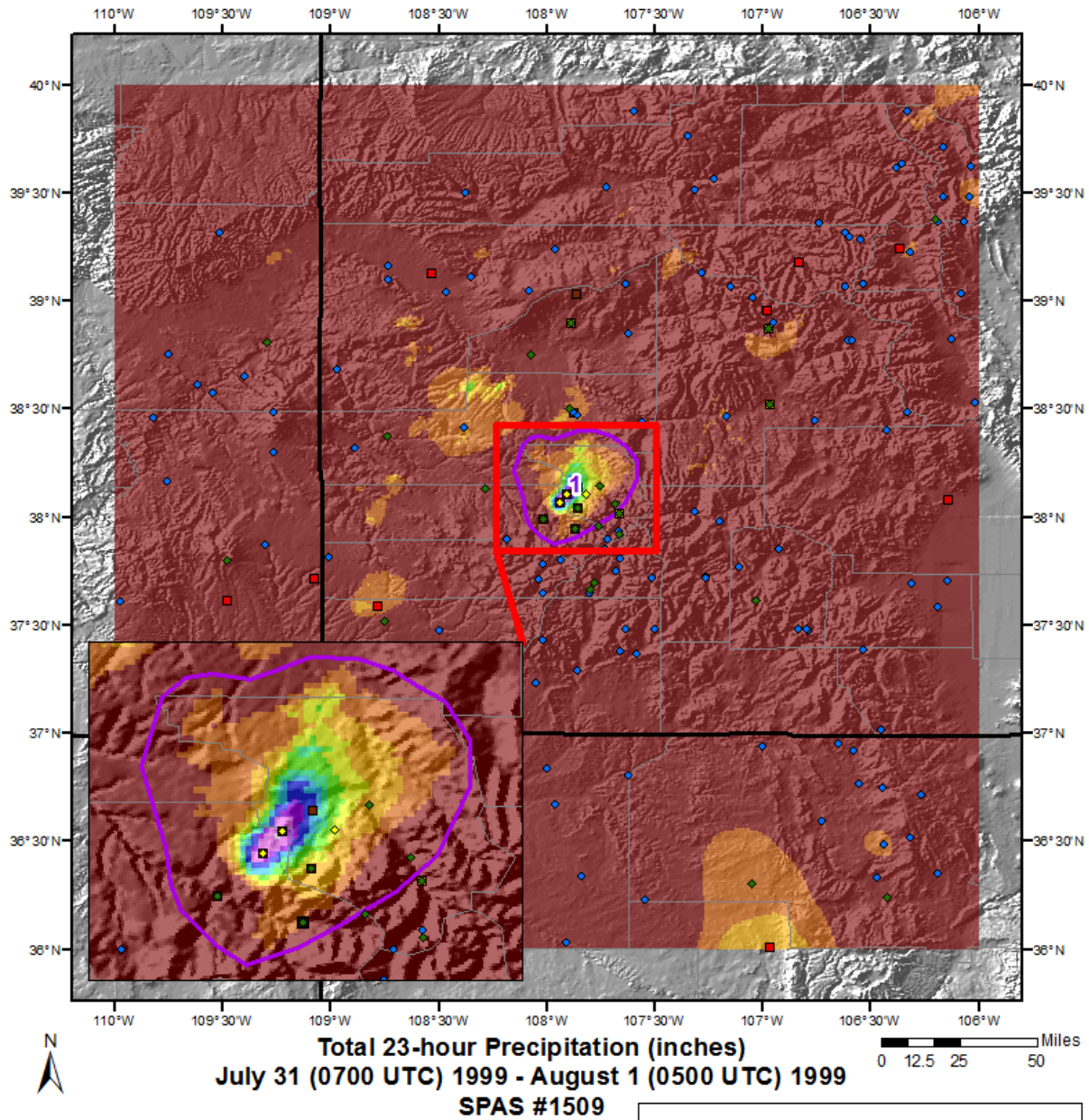
Storm 1509 - July 31 (0700 UTC) - August 1 (0500 UTC), 1999													
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)													
Area (mi ²)	Duration (hours)												
	1	2	3	4	5	6	12	18	24	48	72	96	Total
0.4	4.33	4.80	4.91	5.05	5.06	5.06	5.07	5.07	5.07	5.07	5.07	5.07	5.07
1	4.23	4.72	4.83	4.99	5.00	5.01	5.02	5.02	5.02	5.02	5.02	5.02	5.02
10	3.48	4.16	4.44	4.74	4.74	4.76	4.76	4.76	4.76	4.76	4.76	4.76	4.76
25	2.57	3.60	3.94	4.28	4.29	4.31	4.35	4.35	4.35	4.35	4.35	4.35	4.35
50	1.85	2.92	3.30	3.66	3.68	3.74	3.85	3.85	3.85	3.85	3.85	3.85	3.85
100	1.27	2.12	2.46	2.75	2.80	2.91	3.10	3.10	3.10	3.10	3.10	3.10	3.10
150	0.95	1.63	1.97	2.23	2.29	2.42	2.63	2.63	2.63	2.63	2.63	2.63	2.63
200	0.77	1.32	1.64	1.84	1.93	2.11	2.30	2.30	2.30	2.30	2.30	2.30	2.30
300	0.58	0.96	1.19	1.40	1.51	1.66	1.86	1.86	1.86	1.86	1.86	1.86	1.86
400	0.47	0.76	0.94	1.11	1.24	1.40	1.57	1.57	1.57	1.57	1.57	1.57	1.57
500	0.40	0.64	0.78	0.92	1.05	1.19	1.35	1.35	1.35	1.35	1.35	1.35	1.35
813	0.26	0.43	0.53	0.64	0.74	0.83	0.94	0.94	0.94	0.94	0.94	0.94	0.94



CO-NM Regional Extreme Precipitation Study

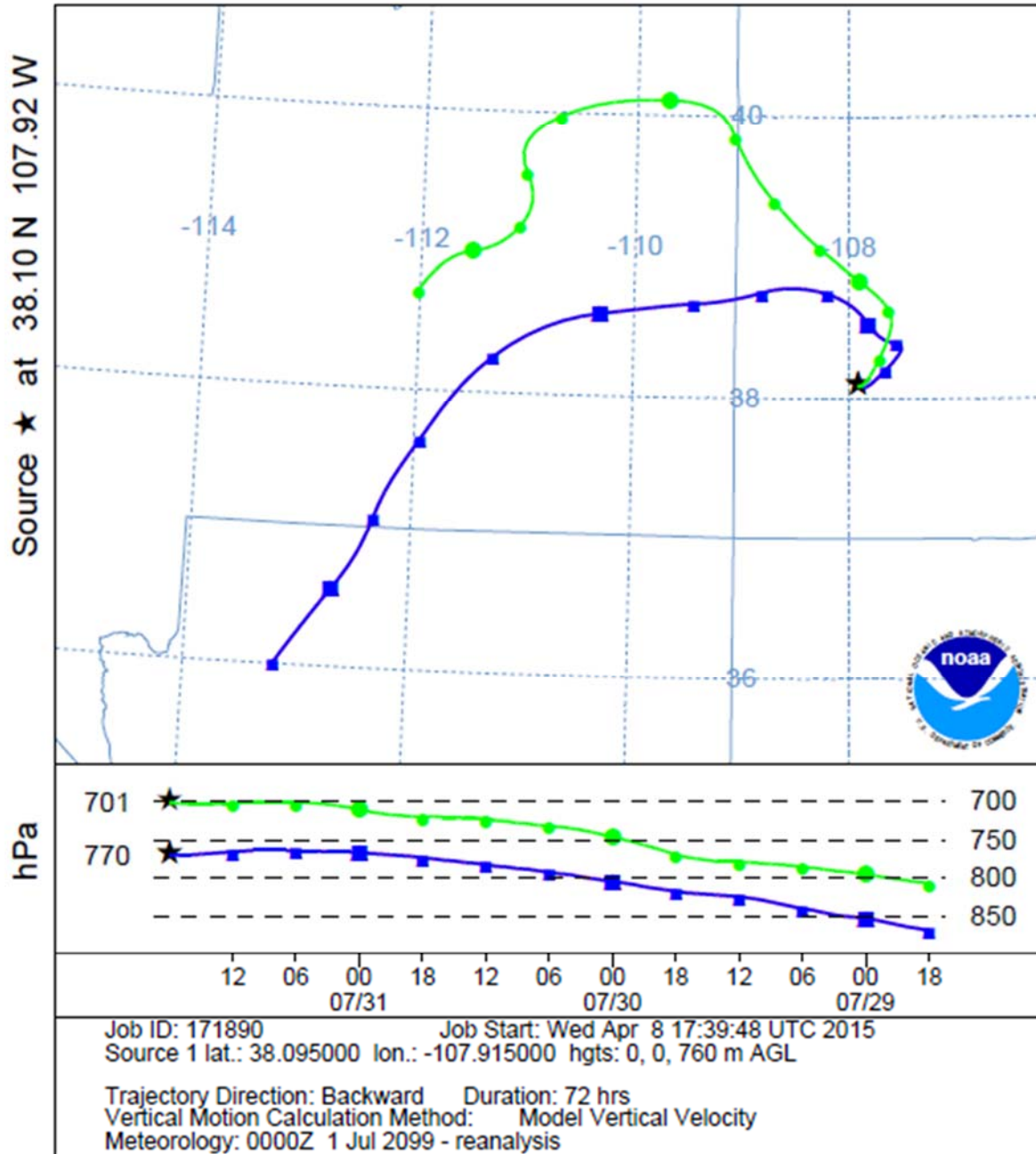


CO-NM Regional Extreme Precipitation Study

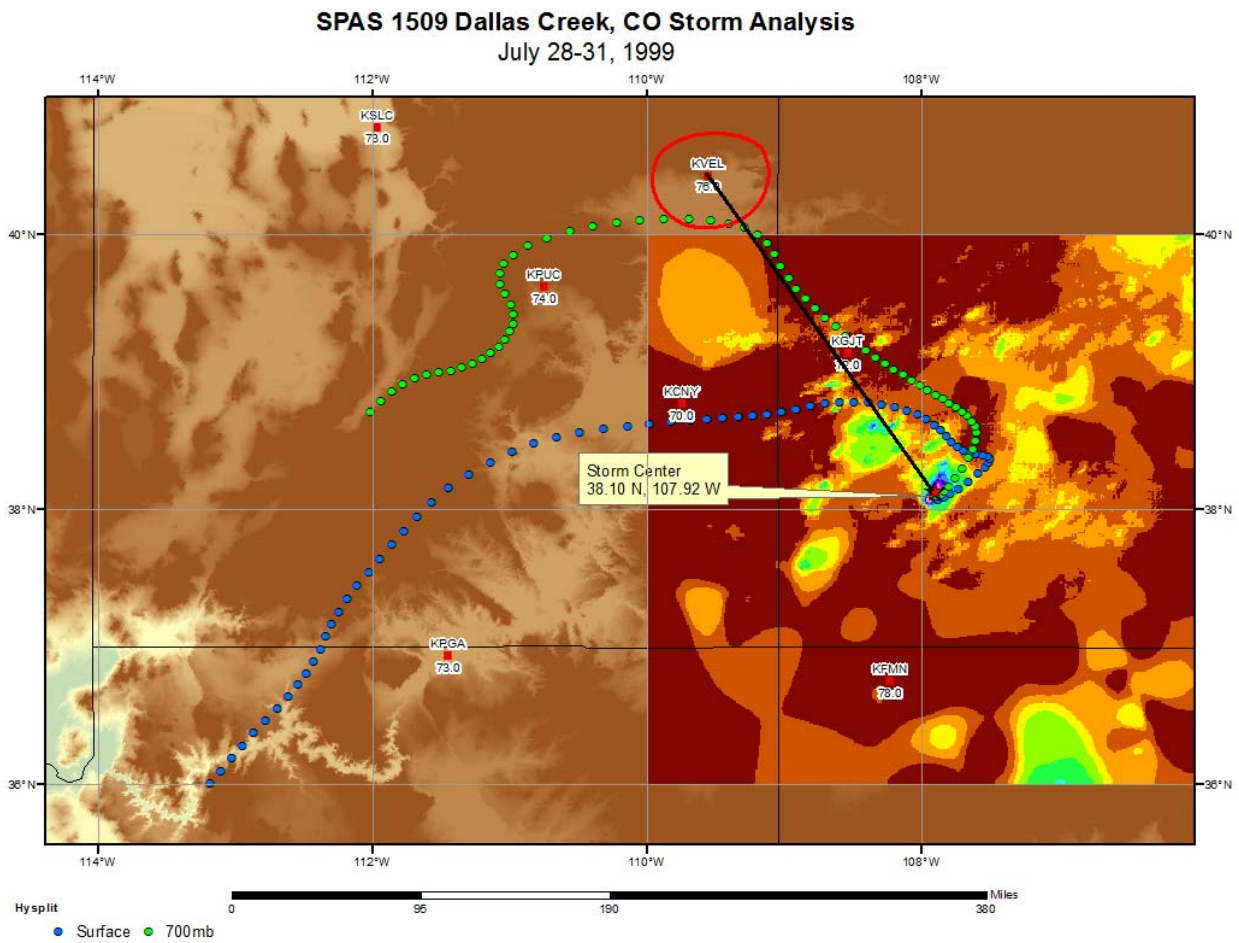


ADH 03/24/15

NOAA HYSPLIT MODEL
Backward trajectories ending at 1800 UTC 31 Jul 99
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study



Placerville, CO

August 8-9, 2001

Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1508_1

General Storm Location: Southwest CO

Storm Dates: August 8 – August 9, 2001

Event: EPAT ID 1 – Placerville, CO / SPAS Lite 5756

DAD Zone 1

Latitude: 38.0050

Longitude: -107.9550

Max. Grid Rainfall Amount: 5.66"

Max. Observed Rainfall Amount: 5.50" (Placerville, CO)

Number of Stations: 159

SPAS Version: 10.0

Base Map Used: Combination of manually digitized contours from the EPAT report and the prism two-year six-hour climatological basemap.

Spatial resolution: 0.3761

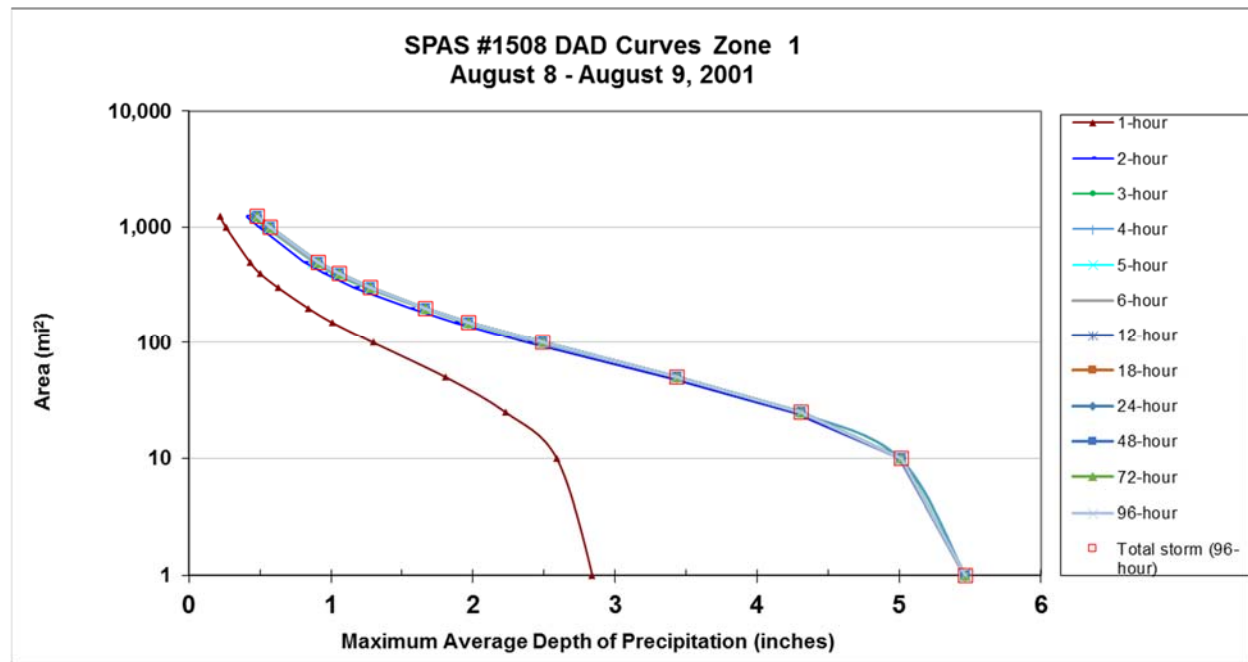
Radar Included: Yes

Depth-Area-Duration (DAD) analysis: No

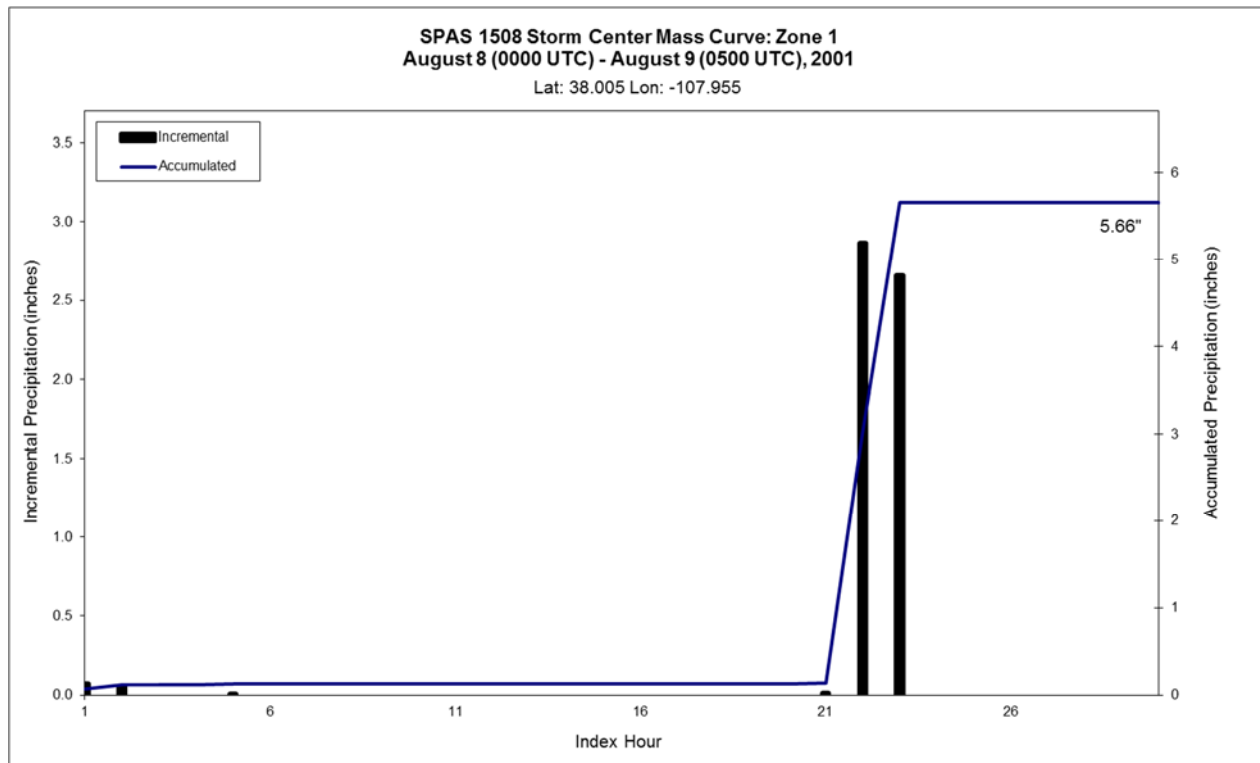
Reliability of results: There were five hourly pseudo stations co-located with supplemental stations and 19 remaining hourly gauge stations. An additional five hourly estimated pseudo stations were generated from gauge adjusted radar grids for a total of 29 hourly stations to time this storm. One supplemental station, which had reports of 5.5 inches, was added as there was no available data for this location. Three of the remaining eight supplemental stations were converted from daily stations as their timing was questionable. With all of the data being thoroughly inspected, the precipitation pattern following reasonably close to the EPAT report, the DAD being representative of this event, and the precipitation totals for various periods throughout the storm being consistent with previous reports, this analysis is considered to be reliable.

CO-NM Regional Extreme Precipitation Study

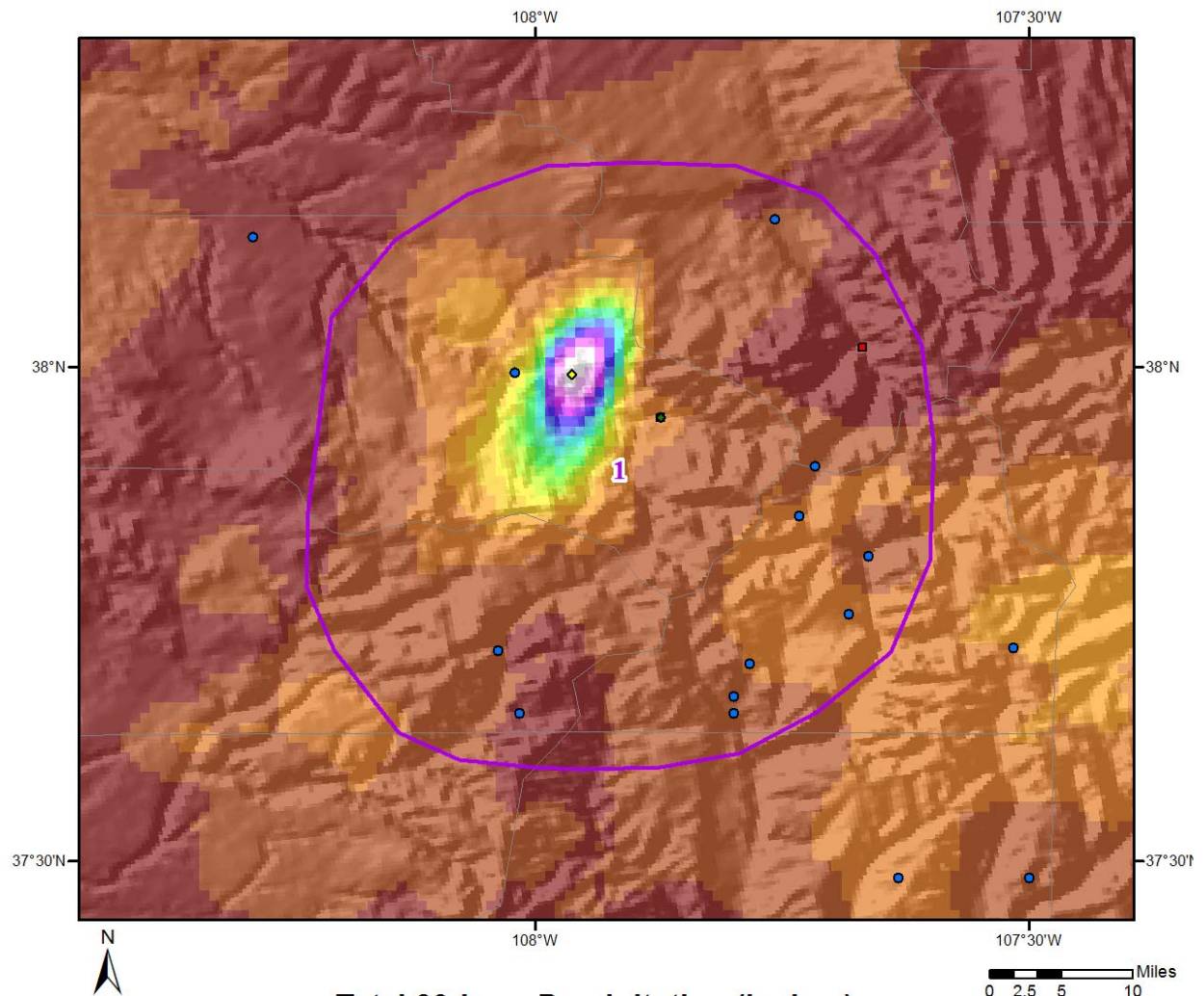
Storm 1508 - August 8 (0000 UTC) - August 9 (0500 UTC), 2001													
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)													
Area (mi ²)	Duration (hours)												
	1	2	3	4	5	6	12	18	24	48	72	96	Total
0.4	2.87	5.52	5.53	5.53	5.53	5.53	5.53	5.53	5.53	5.53	5.53	5.53	5.53
1	2.84	5.46	5.46	5.46	5.46	5.46	5.47	5.47	5.47	5.47	5.47	5.47	5.47
10	2.59	5.00	5.00	5.01	5.01	5.01	5.02	5.02	5.02	5.02	5.02	5.02	5.02
25	2.23	4.26	4.28	4.29	4.30	4.30	4.31	4.31	4.31	4.31	4.31	4.31	4.31
50	1.81	3.37	3.42	3.43	3.43	3.43	3.44	3.44	3.44	3.44	3.44	3.44	3.44
100	1.30	2.39	2.47	2.47	2.48	2.48	2.49	2.49	2.49	2.49	2.49	2.49	2.49
150	1.01	1.88	1.95	1.96	1.96	1.96	1.97	1.97	1.97	1.97	1.97	1.97	1.97
200	0.84	1.56	1.65	1.65	1.66	1.66	1.67	1.67	1.67	1.67	1.67	1.67	1.67
300	0.63	1.17	1.25	1.26	1.26	1.26	1.28	1.28	1.28	1.28	1.28	1.28	1.28
400	0.50	0.95	1.02	1.03	1.03	1.04	1.06	1.06	1.06	1.06	1.06	1.06	1.06
500	0.43	0.81	0.88	0.88	0.88	0.89	0.91	0.91	0.91	0.91	0.91	0.91	0.91
1,000	0.26	0.49	0.54	0.55	0.55	0.55	0.57	0.57	0.57	0.57	0.57	0.57	0.57
1,231	0.22	0.41	0.45	0.46	0.46	0.47	0.48	0.48	0.48	0.48	0.48	0.48	0.48



CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



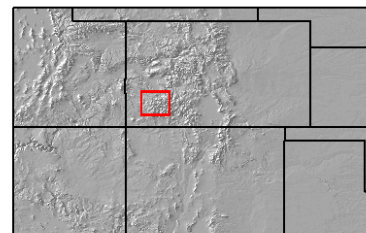
Total 30-hour Precipitation (inches)
August 08, 2001 0000 UTC - August 09, 2001 0500 UTC
SPAS #1508

Precipitation (inches)

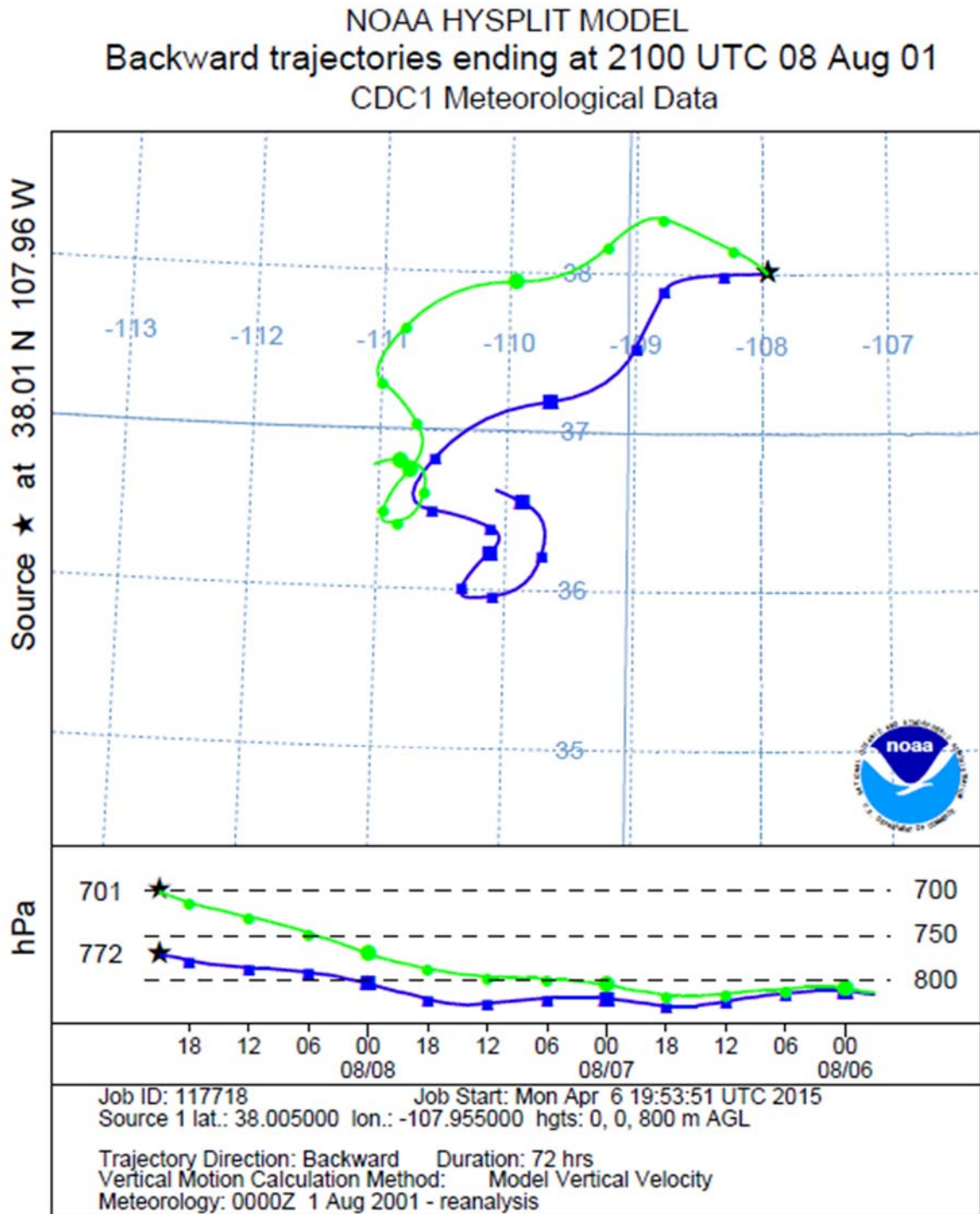
0.00 - 0.300	2.11 - 2.40	4.21 - 4.50
0.301 - 0.600	2.41 - 2.70	4.51 - 4.80
0.601 - 0.900	2.71 - 3.00	4.81 - 5.10
0.901 - 1.20	3.01 - 3.30	5.11 - 5.40
1.21 - 1.50	3.31 - 3.60	5.41 - 5.66
1.51 - 1.80	3.61 - 3.90	
1.81 - 2.10	3.91 - 4.20	

Stations

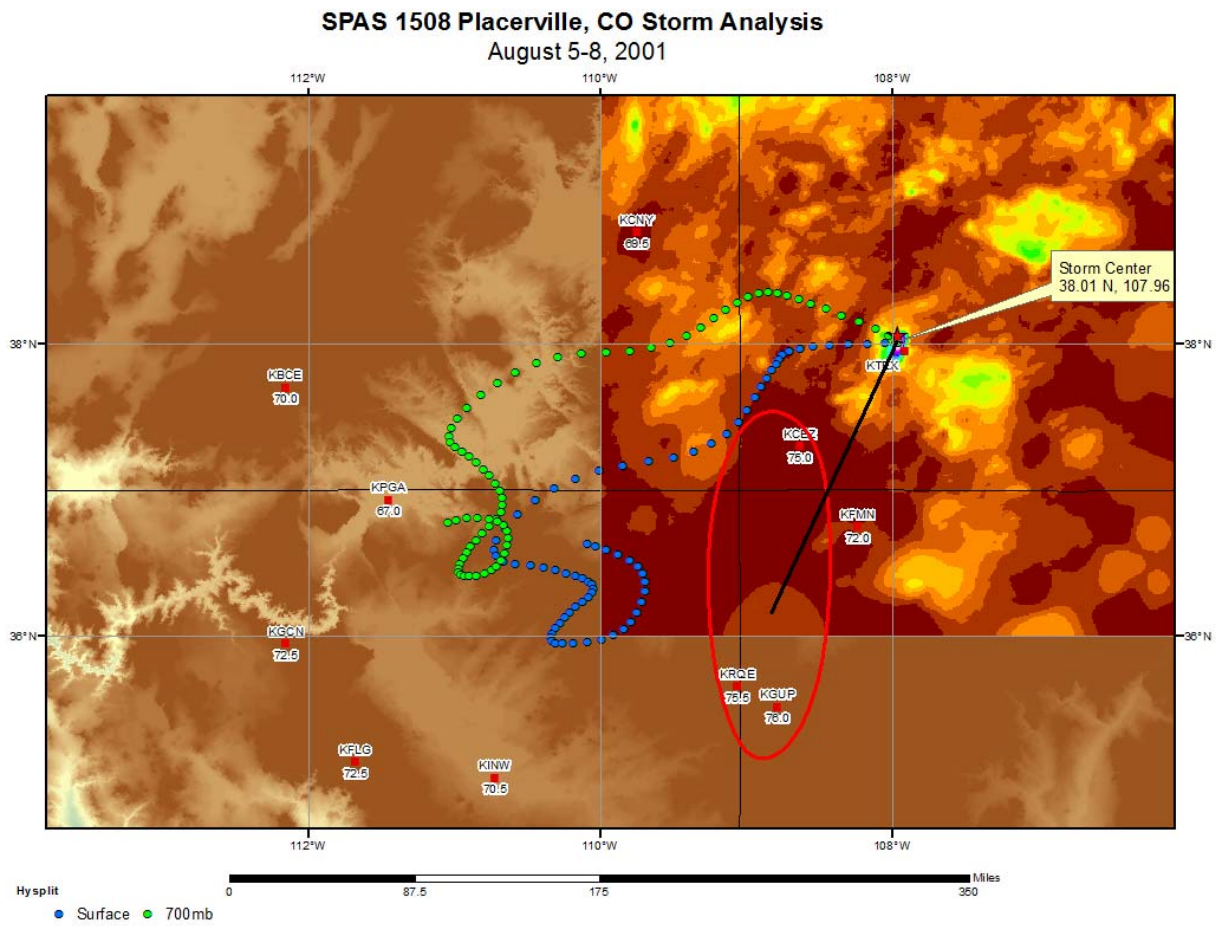
Daily
Hourly
Hourly Pseudo
Supplemental
Supplemental Estimated



KLL 03/10/2015



CO-NM Regional Extreme Precipitation Study



Bluff, UT
August 14, 2001
Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1131_1

General Storm Location: Bluff, Utah

Storm Dates: August 14, 2001

Event: Convective Storm

DAD Zone 1

Latitude: 37.255

Longitude: -109.575

Max. Grid/Radar Rainfall Amount: 6.29"

Max. Observed Rainfall Amount: 3.50" (Bluff, UT)

Number of Stations: 27 (12-daily, 10-hourly, 4-hourly estimated, 1-supplemental)

SPAS Version: 85

Base Map Used: Yes

Spatial resolution: 0.38 mi²

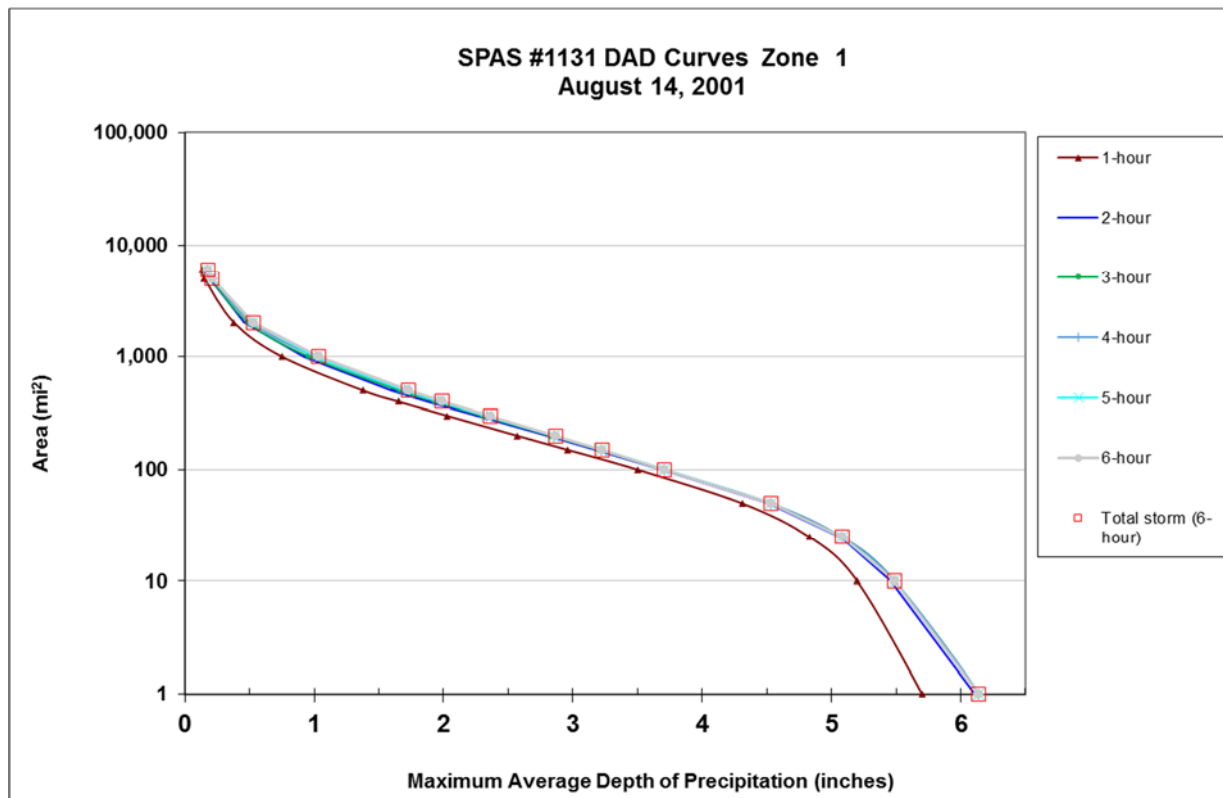
Radar Included: Yes, but data reflectivity was low (see discussions below)

Depth-Area-Duration (DAD) analysis: Yes, 1, 2, 3, 4, 5, and 6-hr

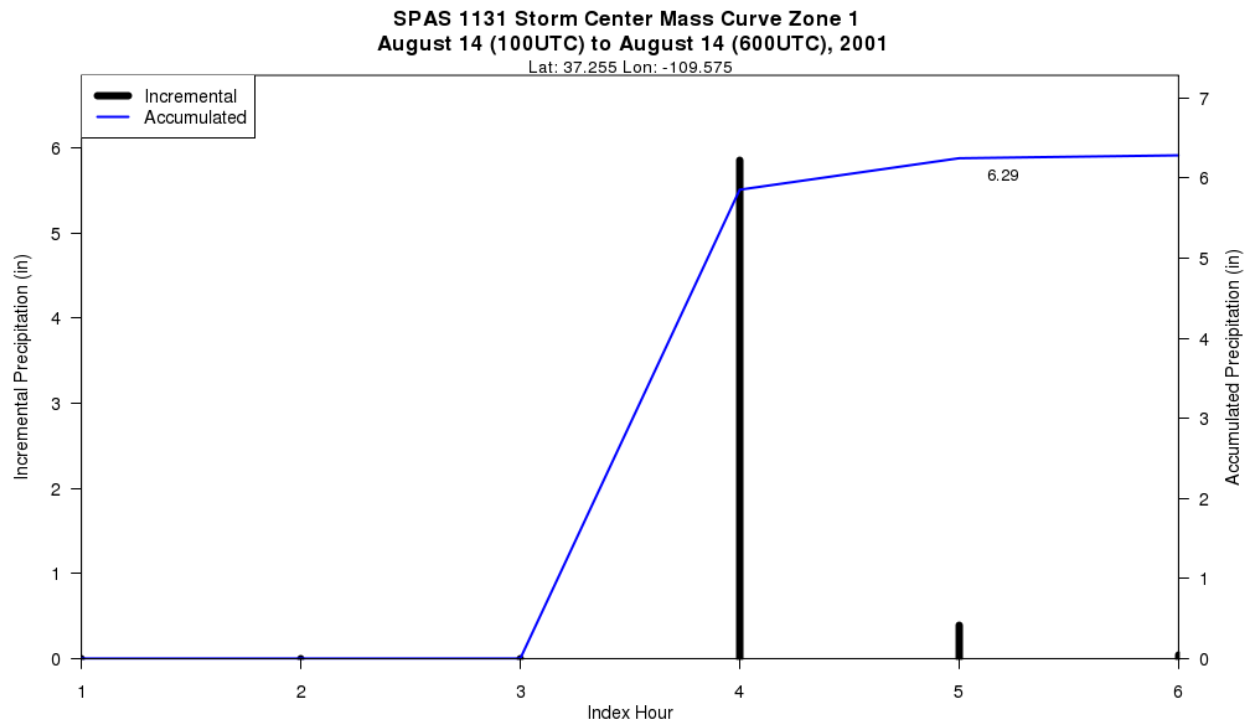
Reliability of Results: Overall the results are reliable considering the issues overcome with the low radar reflectivity and the Excel derived ZR relationships implemented in SPAS (See discussion below).

CO-NM Regional Extreme Precipitation Study

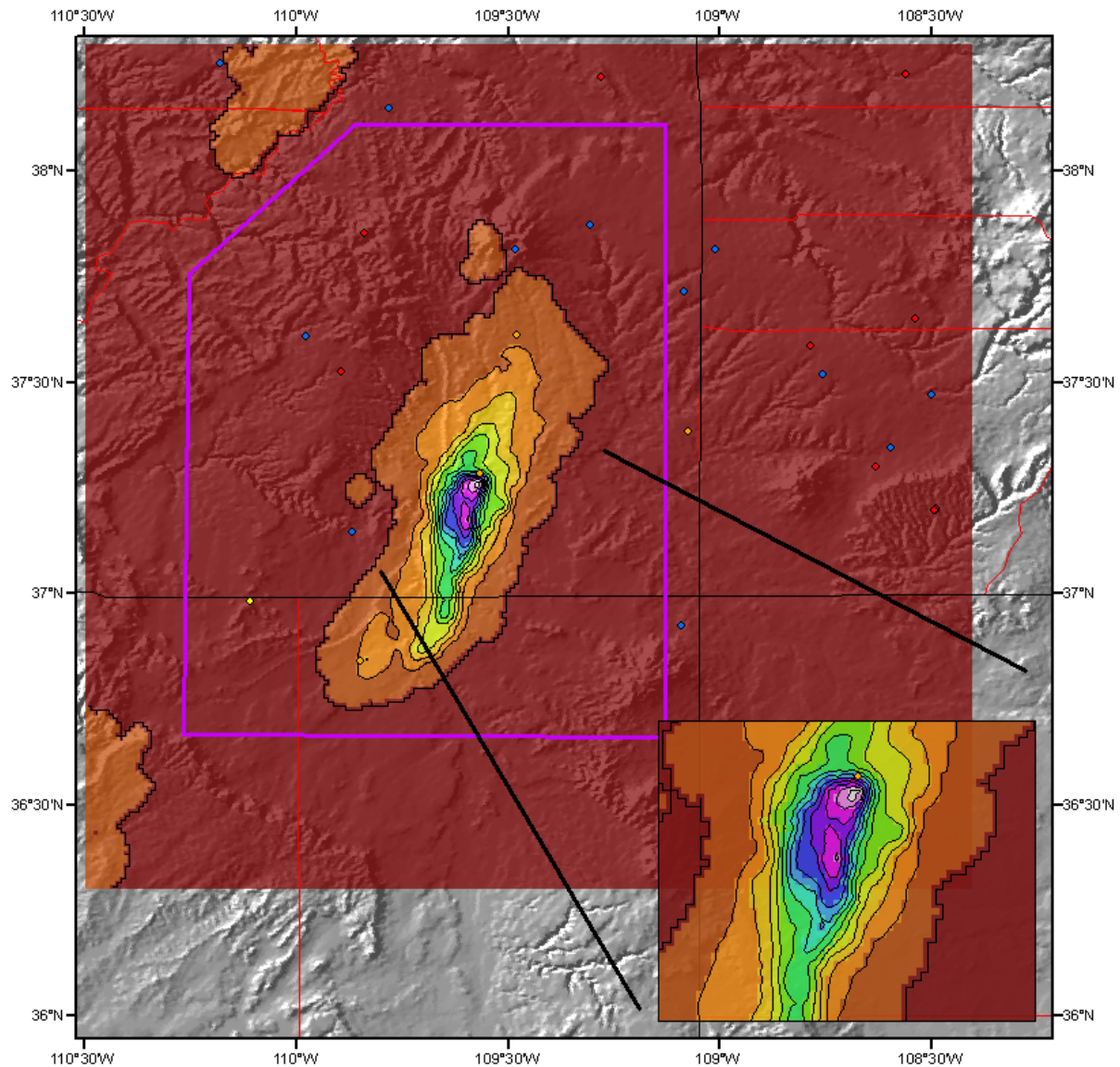
Storm 1131 - August 14 (0100 UTC) - August 14 (0600 UTC), 2001							
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)							
Area (mi ²)	Duration (hours)						Total
	1	2	3	4	5	6	
0.4	5.85	6.24	6.28	6.28	6.28	6.28	6.28
1	5.70	6.11	6.14	6.14	6.14	6.14	6.14
10	5.20	5.46	5.49	5.49	5.49	5.49	5.49
25	4.83	5.07	5.08	5.08	5.08	5.08	5.08
50	4.31	4.51	4.53	4.53	4.53	4.53	4.53
100	3.50	3.68	3.70	3.71	3.71	3.71	3.71
150	2.96	3.17	3.20	3.22	3.22	3.23	3.23
200	2.57	2.80	2.83	2.85	2.85	2.87	2.87
300	2.03	2.26	2.30	2.33	2.33	2.36	2.36
400	1.65	1.88	1.93	1.96	1.96	1.99	1.99
500	1.38	1.60	1.66	1.70	1.70	1.73	1.73
1,000	0.75	0.92	0.96	1.01	1.01	1.03	1.03
2,000	0.38	0.46	0.49	0.52	0.52	0.53	0.53
5,000	0.15	0.19	0.20	0.21	0.21	0.21	0.21
5,952	0.13	0.16	0.17	0.17	0.17	0.18	0.18



CO-NM Regional Extreme Precipitation Study

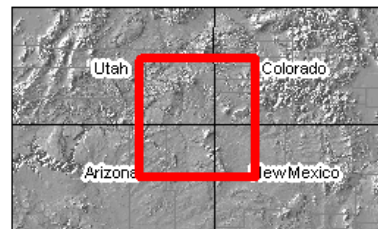
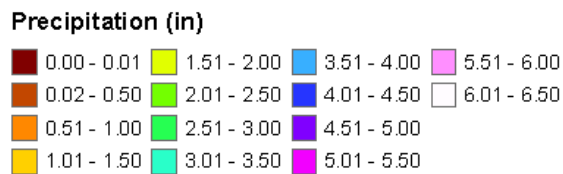


CO-NM Regional Extreme Precipitation Study



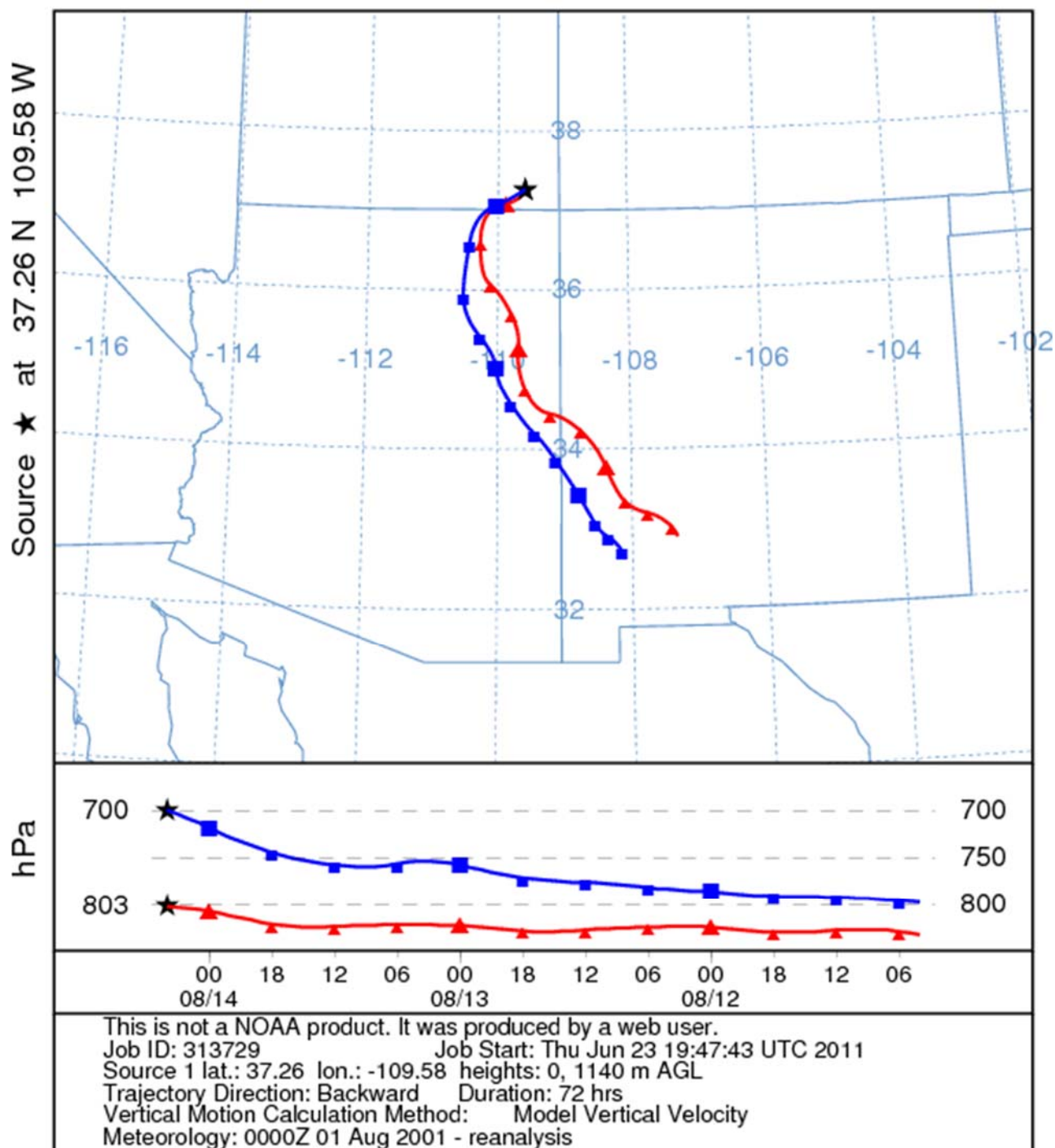
Total Rainfall (6-hrs)
SPAS # 1131 Bluff, UT 2001 Storm
August 14 (0100 UTC) to 14 (0600 UTC), 2001

- Gauges**
- Daily
 - Hourly
 - Hourly Estimated
 - Supplemental

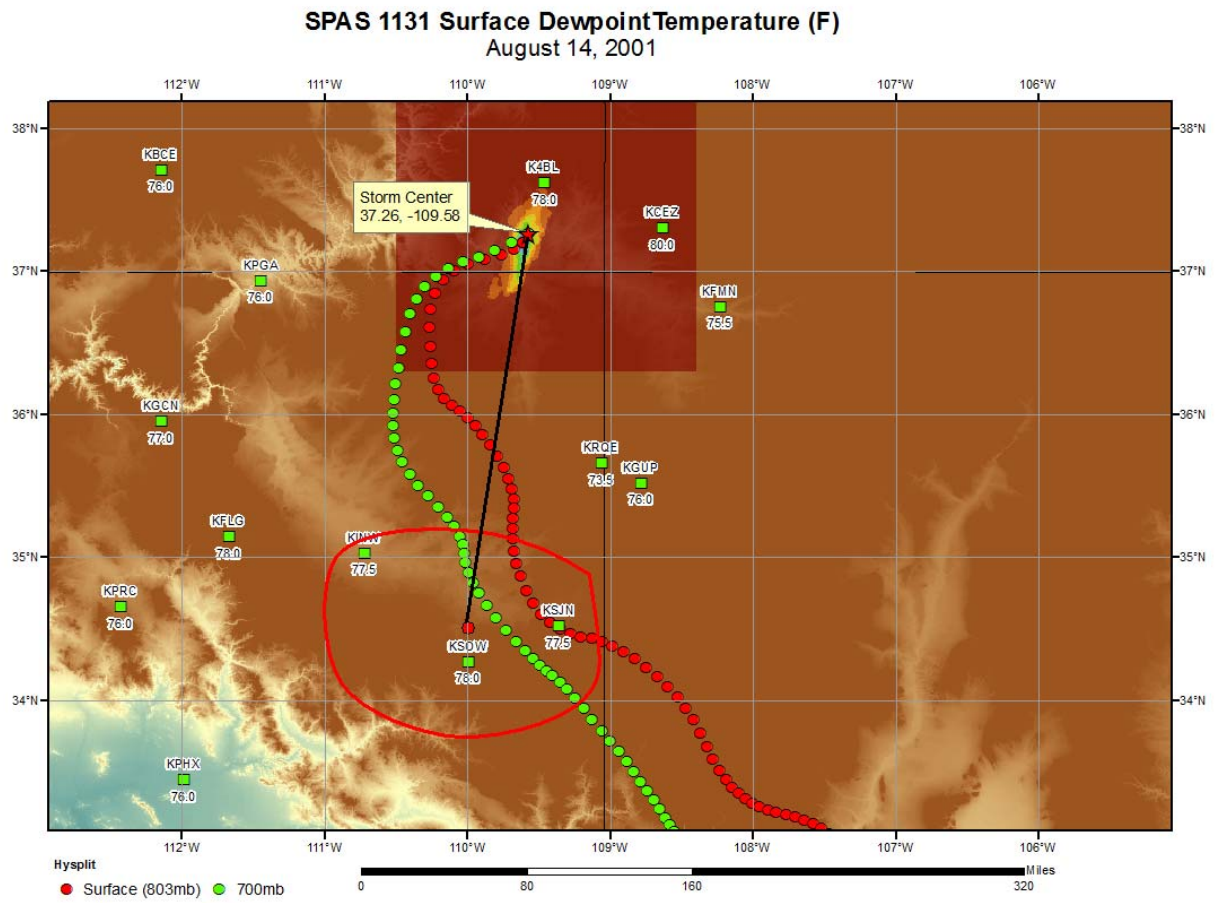


10/25/01/10C /AWA Dec8, 2010

NOAA HYSPLIT MODEL
Backward trajectories ending at 0400 UTC 14 Aug 01
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study



Ogallala, NE

July 6-7, 2002

Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1033_1

General Storm Location: Ogallala, NE

Storm Dates: July 6 (300Z, 2100 MDT) – 7 (600Z, 0000 MDT), 2002

Event: Convective Thunderstorm

DAD Zone 1

Latitude: 41.03

Longitude: -101.78

Rainfall Amount: 14.92” (Grid/Pixel Point)

Number of Stations: 80 (19-hourly, 3-hourly pseudo, 56-daily, and 2-supplemental) gauging stations within the define search domain. 35 (7-hourly, 2-hourly pseudo, 24-daily, and 2-supplemental) stations within radar domain.

SPAS Version: 2.0

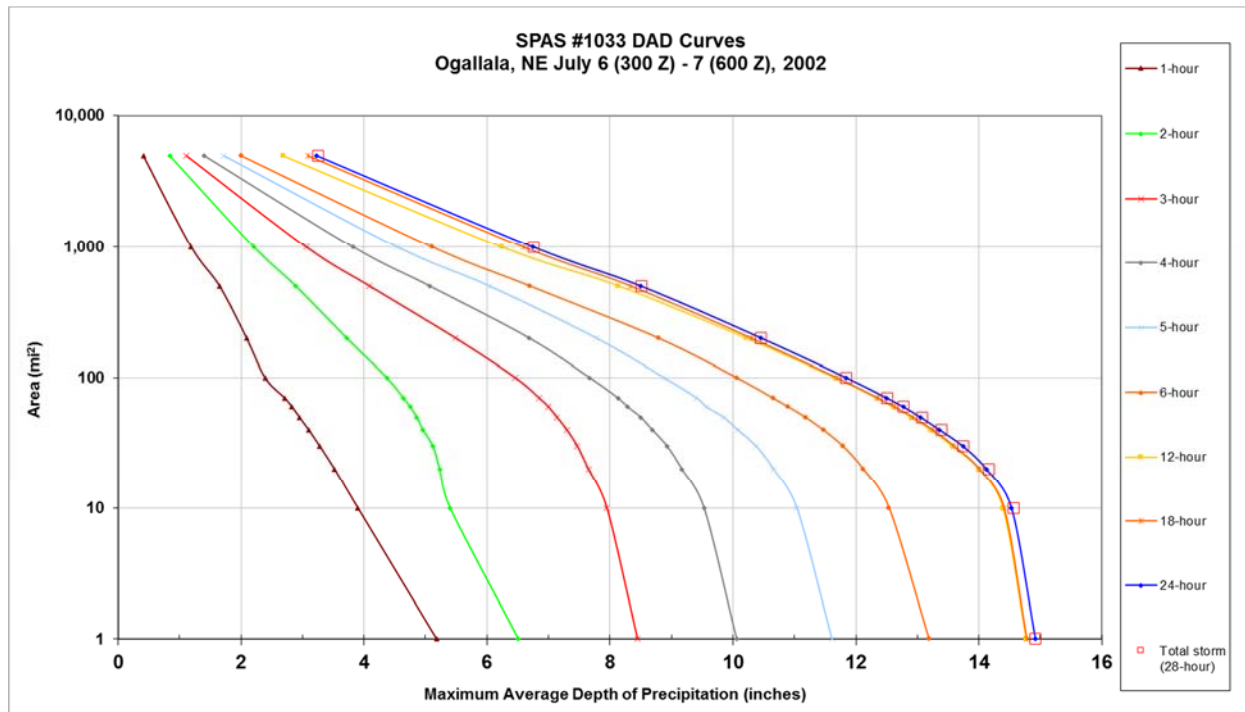
Base Map Used: No

Radar Included: Yes

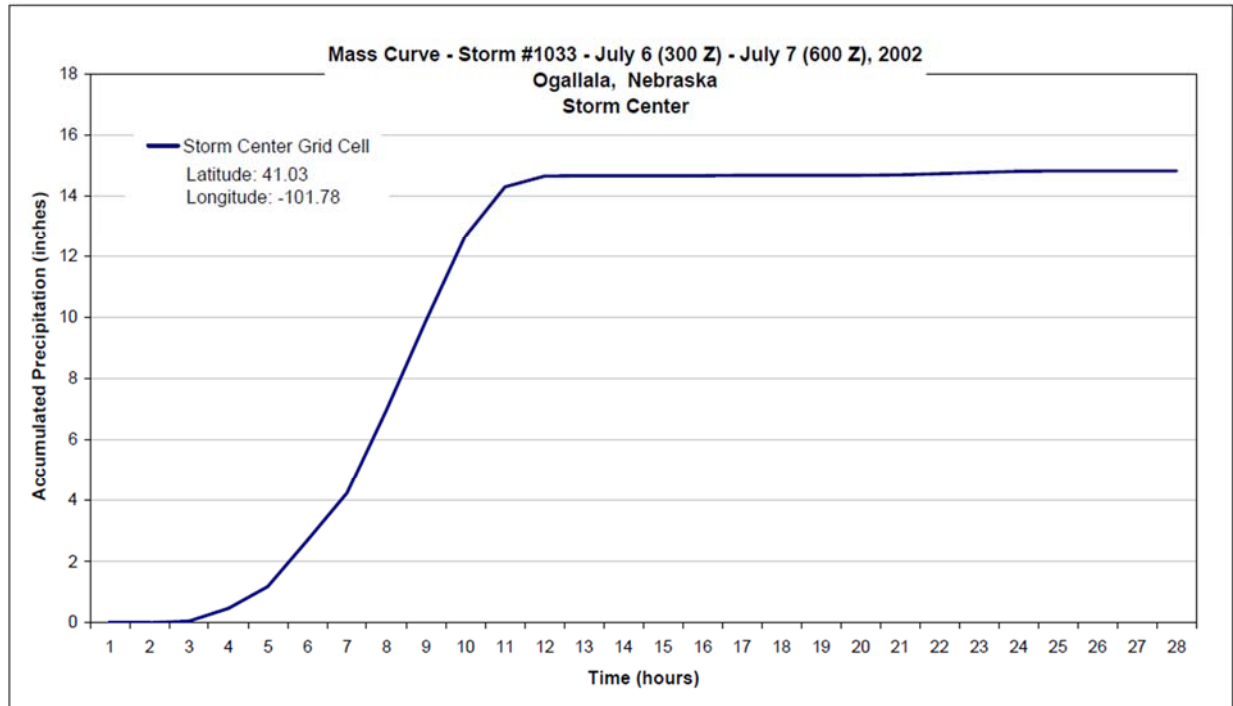
Depth-Area-Duration (DAD) analysis: Yes, 1, 2, 3, 4, 5, 6, 12, 18, 24, and 28 hours.

CO-NM Regional Extreme Precipitation Study

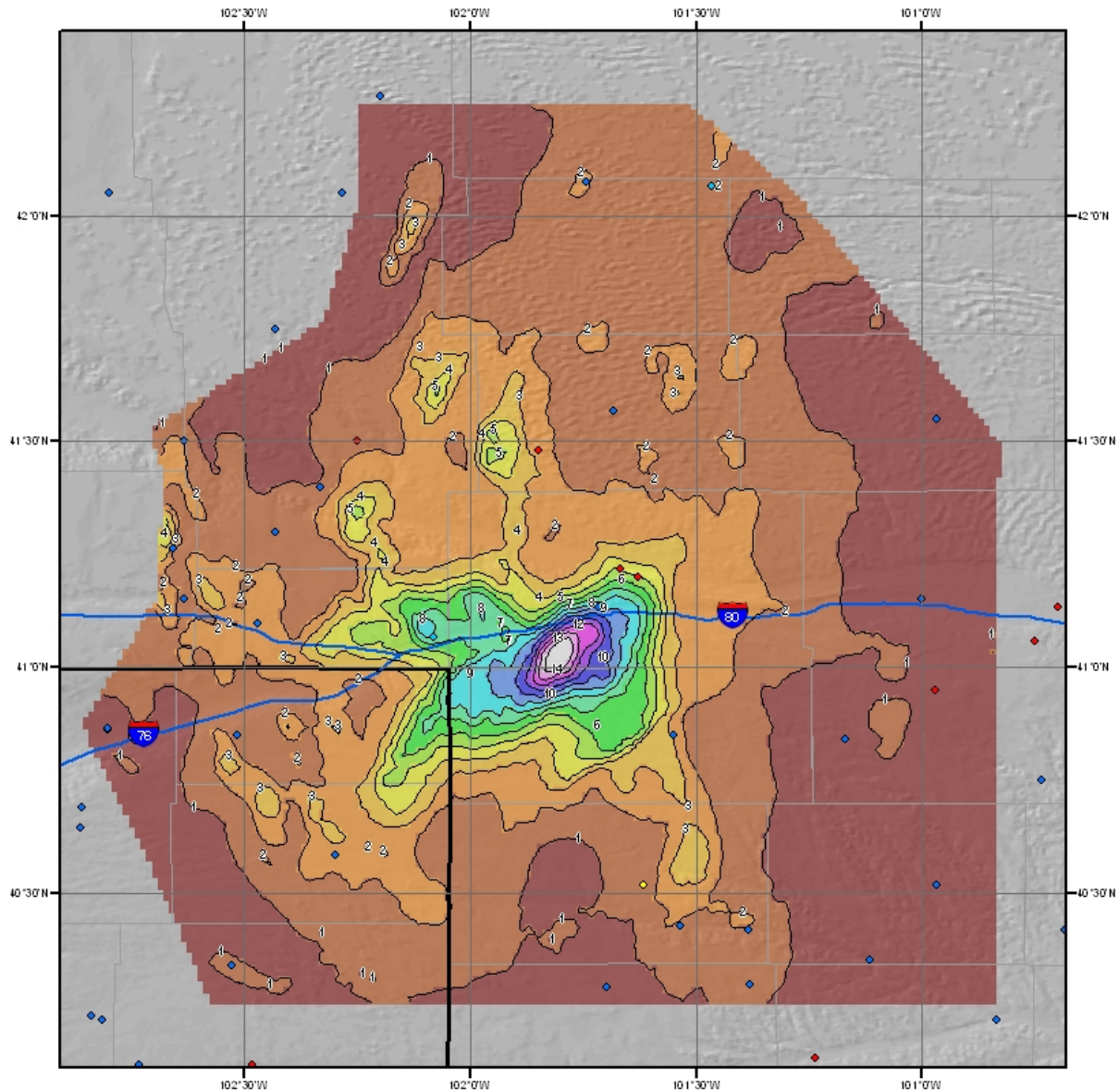
Storm 1033 - Ogallala, NE July 6 (300 Z) - July 7 (600 Z), 2002											
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)											
Area (mi ²)	Duration (hours)										
	1	2	3	4	5	6	12	18	24	28	total
1	5.18	6.51	8.45	10.06	11.61	13.19	14.77	14.78	14.92	14.92	14.92
10	3.90	5.40	7.95	9.53	11.04	12.54	14.39	14.41	14.53	14.57	14.57
20	3.52	5.23	7.65	9.17	10.66	12.12	14.00	14.01	14.12	14.16	14.16
30	3.28	5.12	7.47	8.93	10.38	11.79	13.57	13.60	13.74	13.74	13.74
40	3.10	4.96	7.30	8.69	10.08	11.47	13.22	13.25	13.36	13.39	13.39
50	2.95	4.86	7.14	8.50	9.85	11.18	12.90	12.93	13.05	13.08	13.08
60	2.83	4.75	7.00	8.29	9.57	10.90	12.61	12.63	12.77	12.78	12.78
70	2.71	4.64	6.85	8.13	9.41	10.65	12.34	12.36	12.50	12.51	12.51
100	2.39	4.37	6.46	7.67	8.88	10.06	11.66	11.69	11.84	11.84	11.84
200	2.09	3.72	5.49	6.69	7.78	8.79	10.22	10.30	10.46	10.46	10.46
500	1.65	2.89	4.09	5.07	6.04	6.70	8.14	8.34	8.50	8.51	8.51
1,000	1.19	2.21	3.06	3.82	4.54	5.11	6.24	6.59	6.75	6.76	6.76
5,000	0.41	0.84	1.11	1.40	1.72	2.00	2.68	3.09	3.23	3.25	3.25



CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study

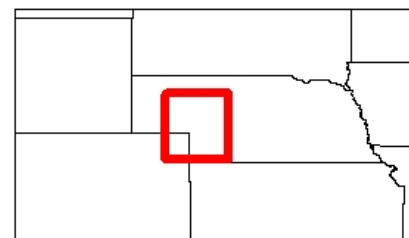
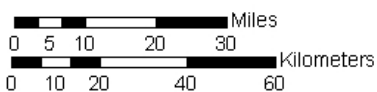


SPAS Storm #1033 - July 6 to 7, 2002
Total Rainfall (28-hours) - Ogallala, Nebraska

Precipitation (inches)

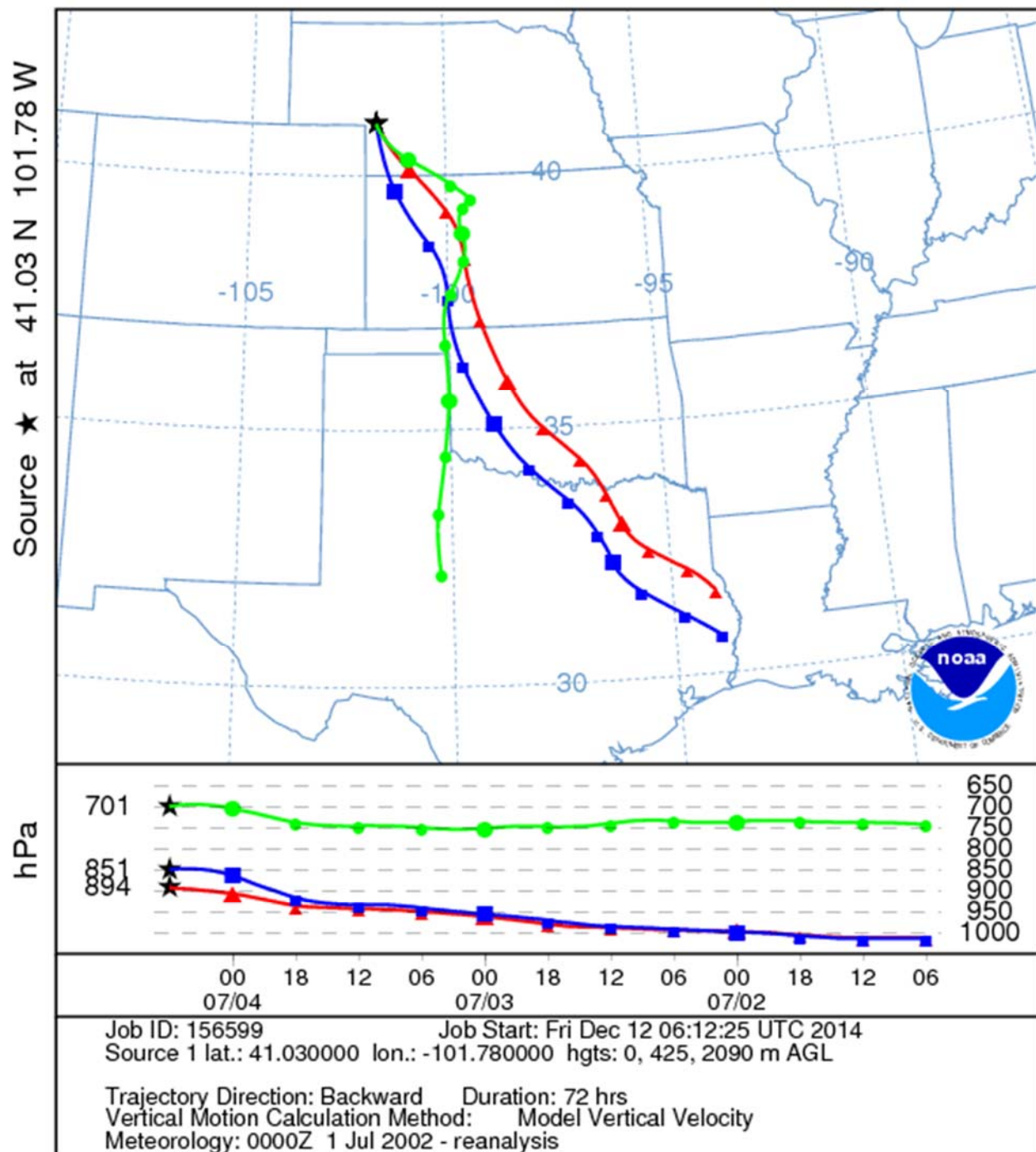


Gauging Stations



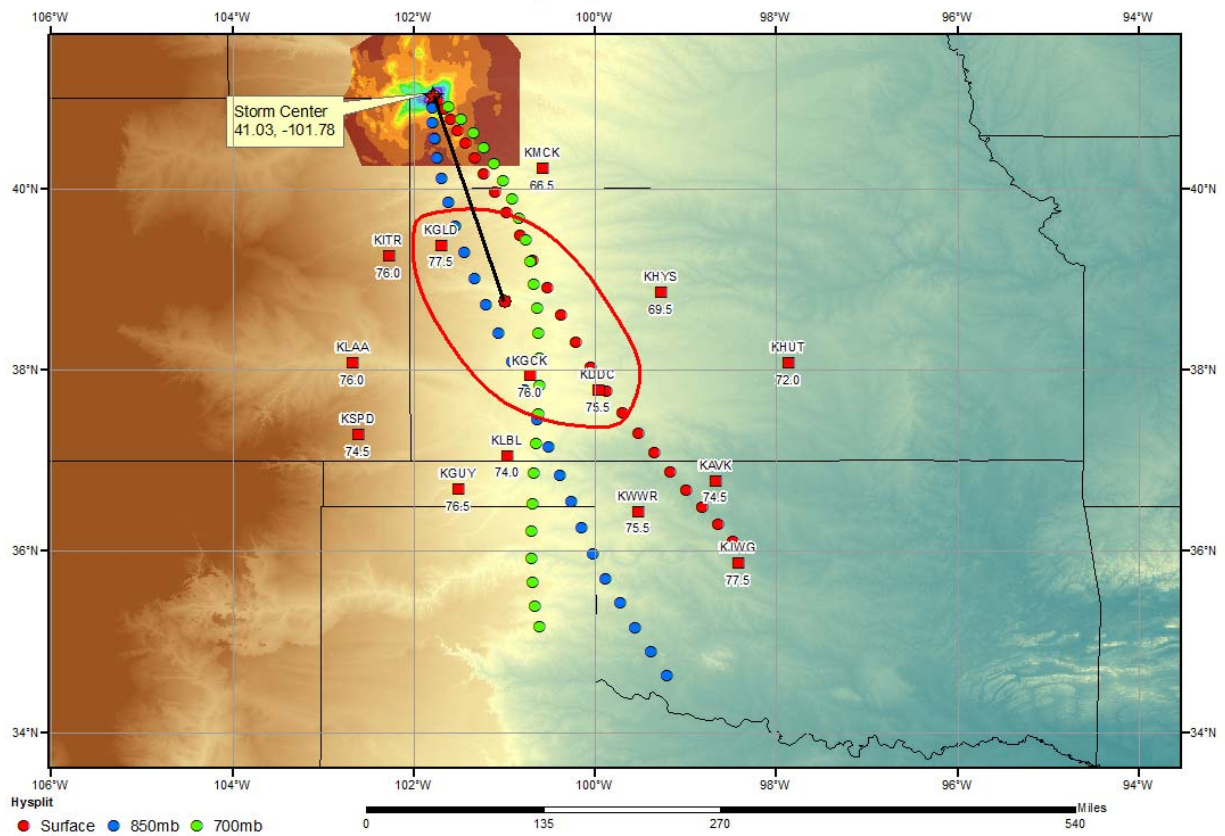
Coordinate system: GCS North American 1983
 Scale: 1:1,321,161
 NEGIS/ANR April 25, 2007

NOAA HYSPLIT MODEL
Backward trajectories ending at 0600 UTC 04 Jul 02
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study

SPAS 1033- Ogallala, NE Storm Analysis July 5-6, 2002



Collbran, CO

August 14-16, 2003

Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1510_1

General Storm Location: Collbran, CO

Storm Dates: August 14-16, 2003

Event: Extreme Precipitation Event

DAD Zone 1

Latitude: 39.2850

Longitude: -107.8950

Max. Grid Rainfall Amount: 4.27"

Max. Observed Rainfall Amount: 4.25"

Number of Stations: 196

SPAS Version: 10.0

Base Map Used: Continental United States 2-year 24-hr precipitation basemap
(conus_0002y24h)

Spatial resolution: 0.3736

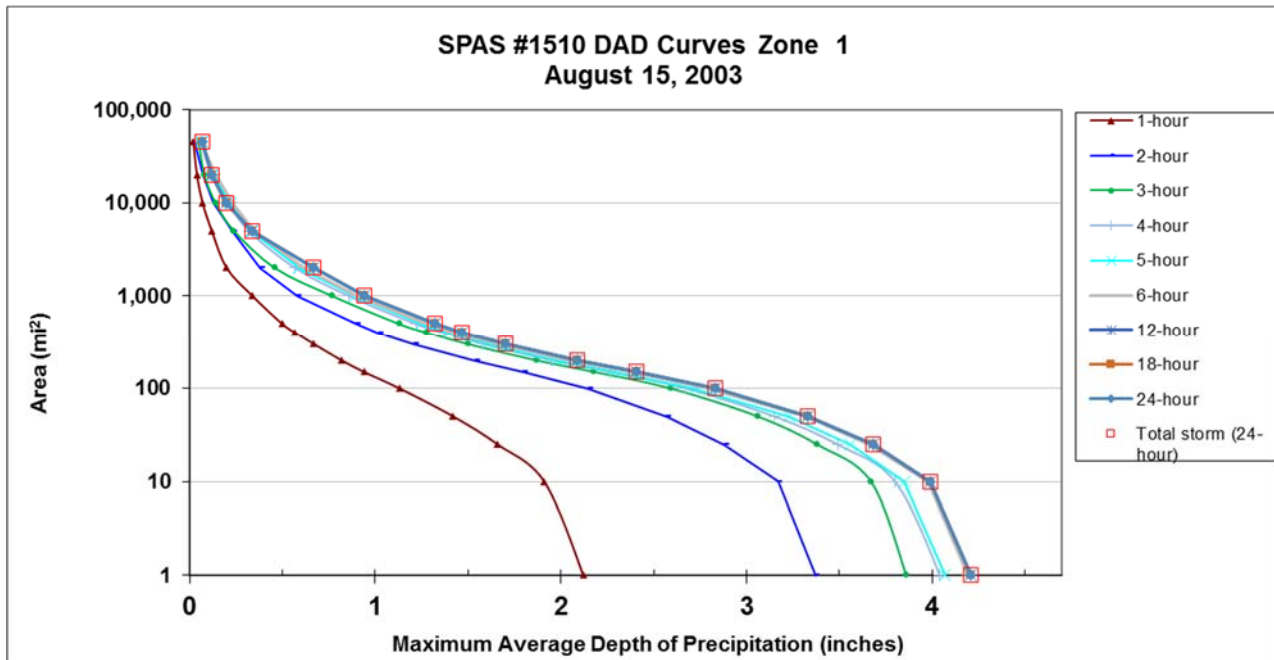
Radar Included: Yes

Depth-Area-Duration (DAD) analysis: Yes

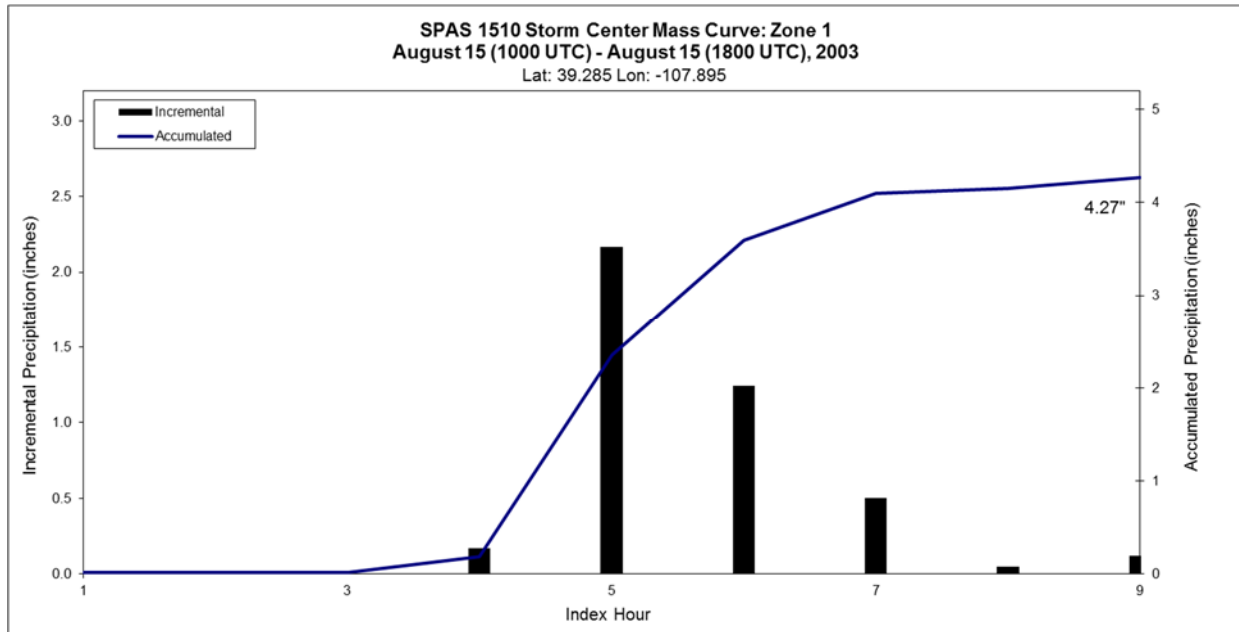
Reliability of results: Eleven supplemental stations were added to ensure data consistency. Due to the amount and integrity of the data, one supplemental estimated station was added based off of flood reports provided by Extreme Precipitation Analysis Tool (EPAT) group. Extensive work was performed to verify the storm total within the Collbran, CO area. Radar estimated precipitation near Collbran, CO was established as 4.25" in 6 hours. Radar data was collected from the period of 10 UTC to 19 UTC on August 15. The availability for radar data after that point in time is not available. The 1-hr precipitation radar product shows precipitation values between 2.75" and 3.00" of rainfall agreeing well with the DAD analysis. With the density of stations available and the consistency of the resulting SPAS analysis to the report written by EPAT, this analysis is deemed quite reliable.

CO-NM Regional Extreme Precipitation Study

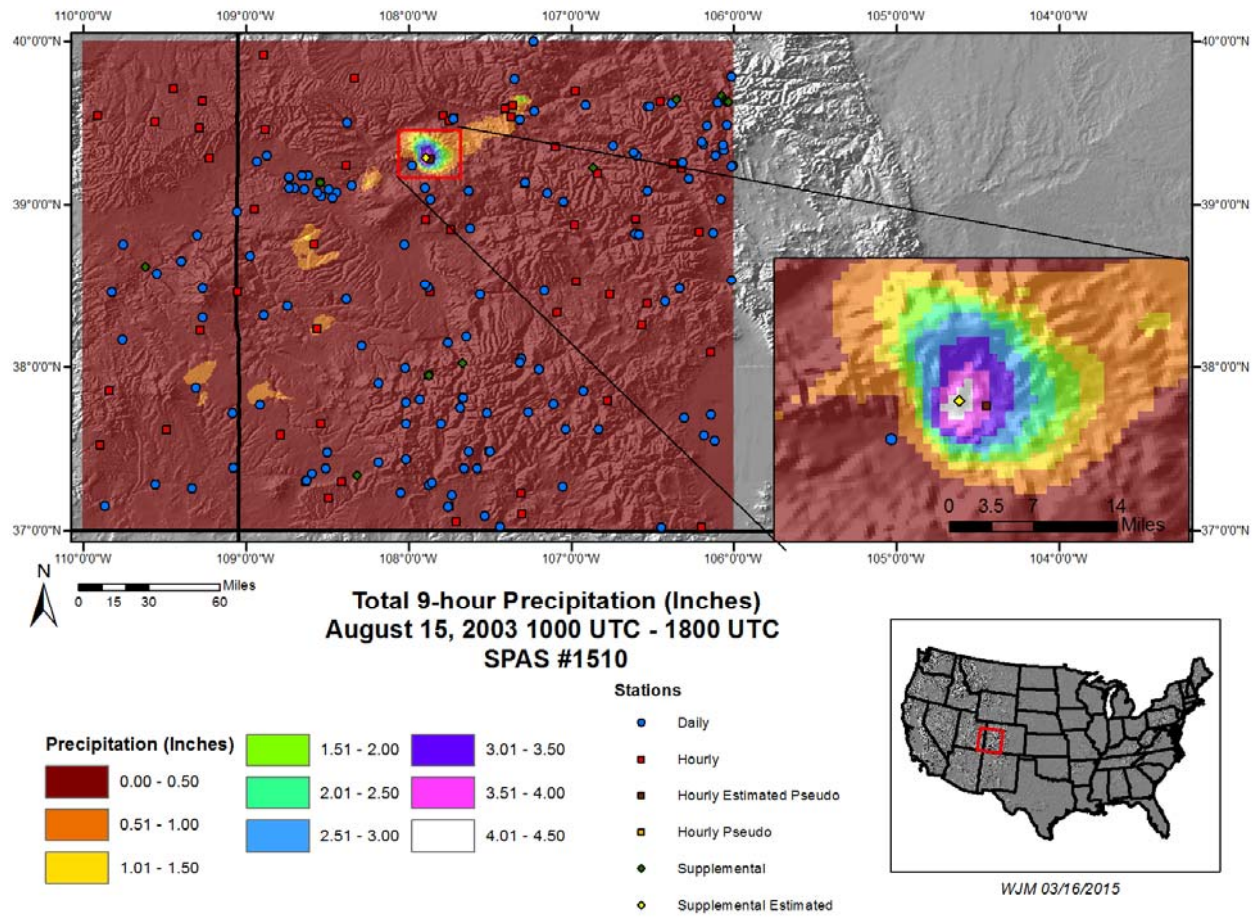
Storm 1510 - August 15 (1000 UTC) - August 15 (1800 UTC), 2003										
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)										
Area (mi ²)	Duration (hours)									
	1	2	3	4	5	6	12	18	24	Total
0.4	2.16	3.41	3.91	4.08	4.13	4.25	4.26	4.26	4.26	4.26
1	2.12	3.37	3.86	4.04	4.07	4.19	4.21	4.21	4.21	4.21
10	1.91	3.17	3.67	3.80	3.85	3.98	3.99	3.99	3.99	3.99
25	1.66	2.88	3.38	3.49	3.56	3.66	3.68	3.68	3.68	3.68
50	1.42	2.57	3.06	3.15	3.23	3.32	3.33	3.33	3.33	3.33
100	1.13	2.15	2.59	2.67	2.72	2.79	2.83	2.83	2.83	2.83
150	0.94	1.80	2.18	2.26	2.29	2.36	2.41	2.41	2.41	2.41
200	0.82	1.54	1.87	1.95	1.98	2.03	2.09	2.09	2.09	2.09
300	0.67	1.21	1.50	1.58	1.61	1.65	1.70	1.70	1.70	1.70
400	0.57	1.02	1.28	1.37	1.40	1.42	1.47	1.47	1.47	1.47
500	0.50	0.90	1.13	1.22	1.25	1.27	1.32	1.32	1.32	1.32
1,000	0.34	0.58	0.77	0.86	0.89	0.90	0.94	0.94	0.94	0.94
2,000	0.20	0.38	0.46	0.57	0.59	0.61	0.67	0.67	0.67	0.67
5,000	0.12	0.23	0.24	0.32	0.33	0.35	0.34	0.34	0.34	0.34
10,000	0.07	0.13	0.14	0.21	0.22	0.23	0.20	0.20	0.20	0.20
20,000	0.04	0.07	0.08	0.12	0.13	0.14	0.12	0.12	0.12	0.12
44,860	0.02	0.03	0.05	0.06	0.06	0.06	0.07	0.07	0.07	0.07

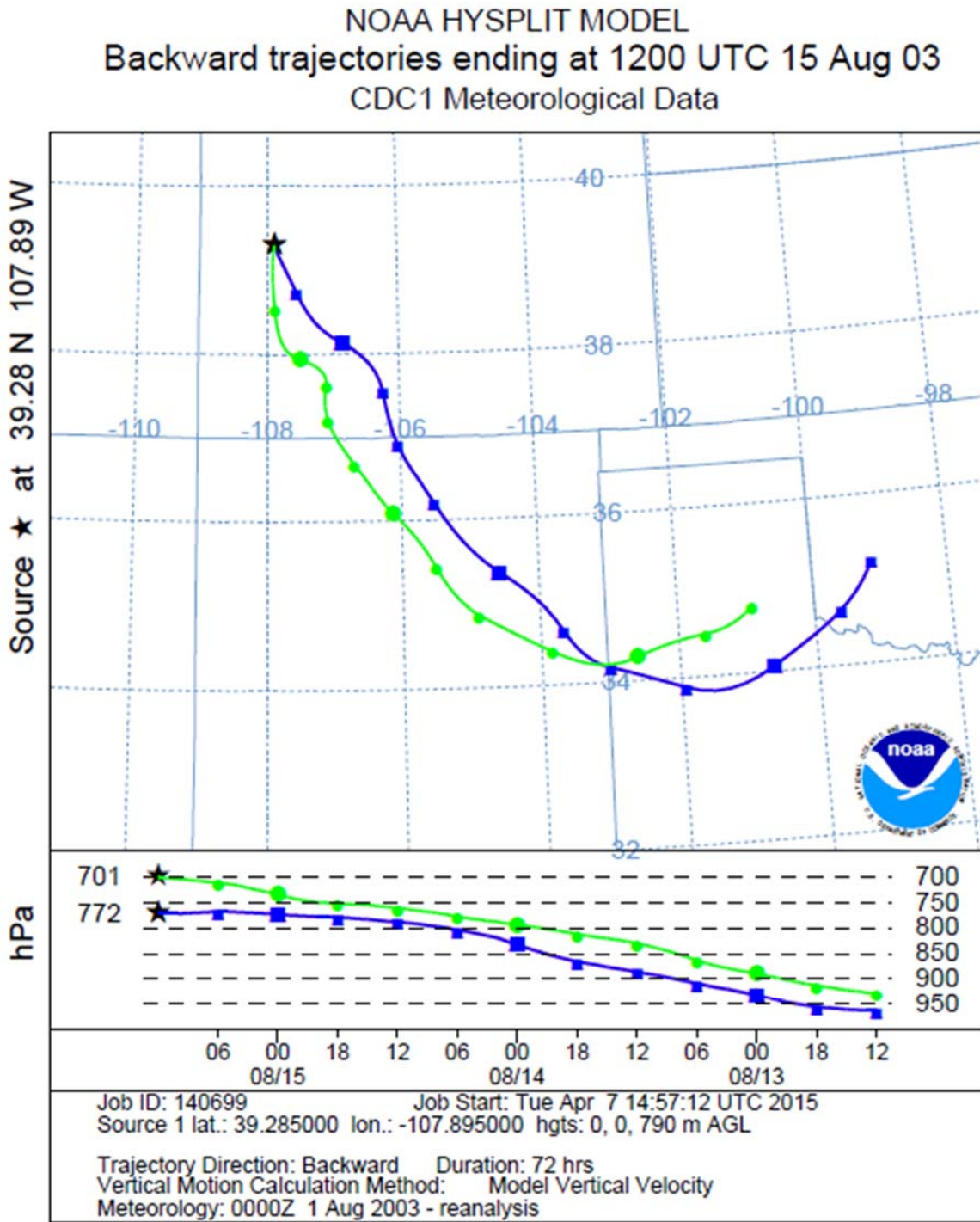


CO-NM Regional Extreme Precipitation Study

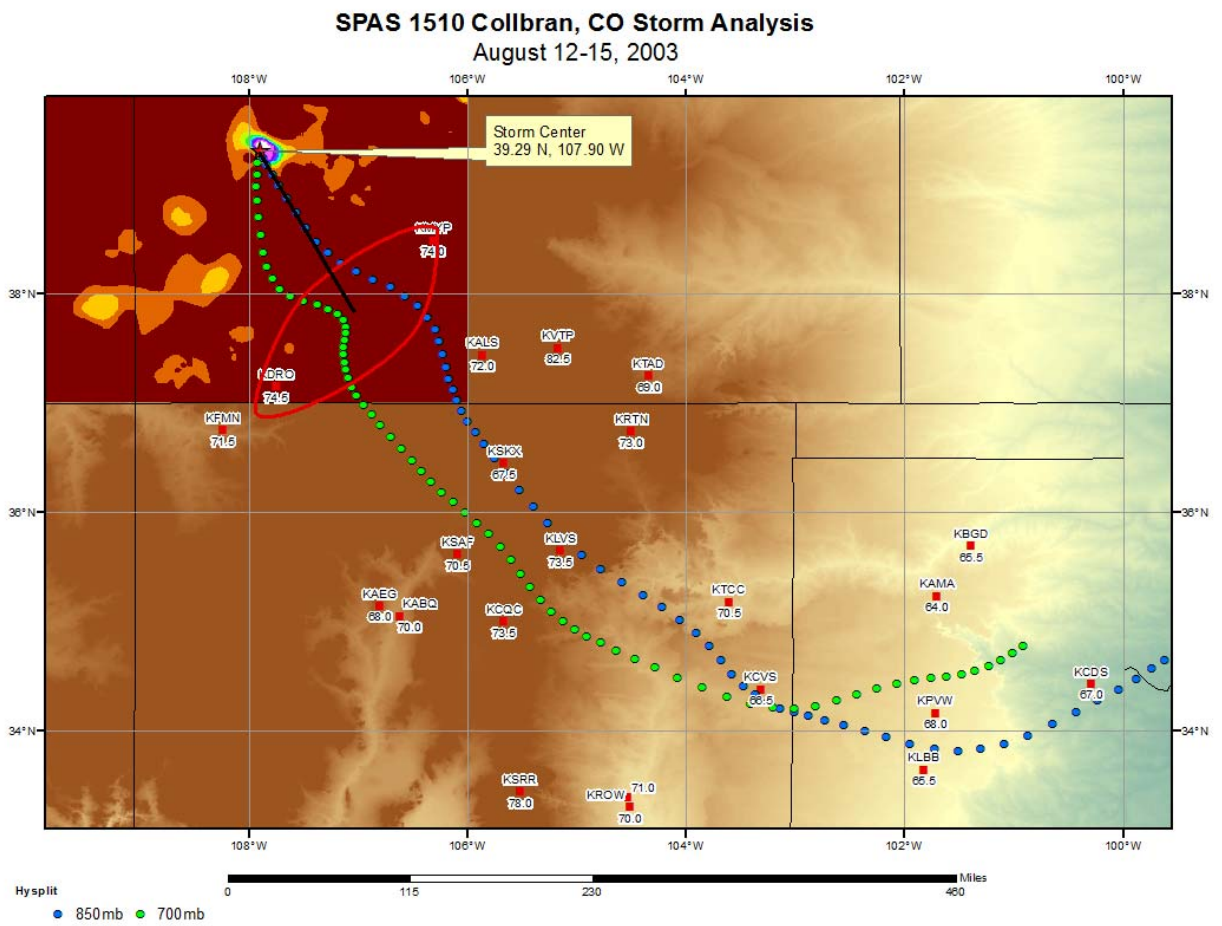


CO-NM Regional Extreme Precipitation Study





CO-NM Regional Extreme Precipitation Study



Roosevelt Lake, AZ

September 9, 2003

Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1109_1

General Storm Location: Roosevelt Lakes, Arizona

Storm Dates: September 9 (0100 to 1200 UTC), 2003

Event: Convective

DAD Zone 1

Latitude: 33.595

Longitude: -111.065

Max. Grid/Radar Rainfall Amount: 11.19"

Max. Observed Rainfall Amount: 10.0"

Number of Stations: 64 (51-hourly, 10-daily, 3-supplemental)

SPAS Version: 8.0

Base Map Used: Yes, Default ZR precipitation (default_basemap)

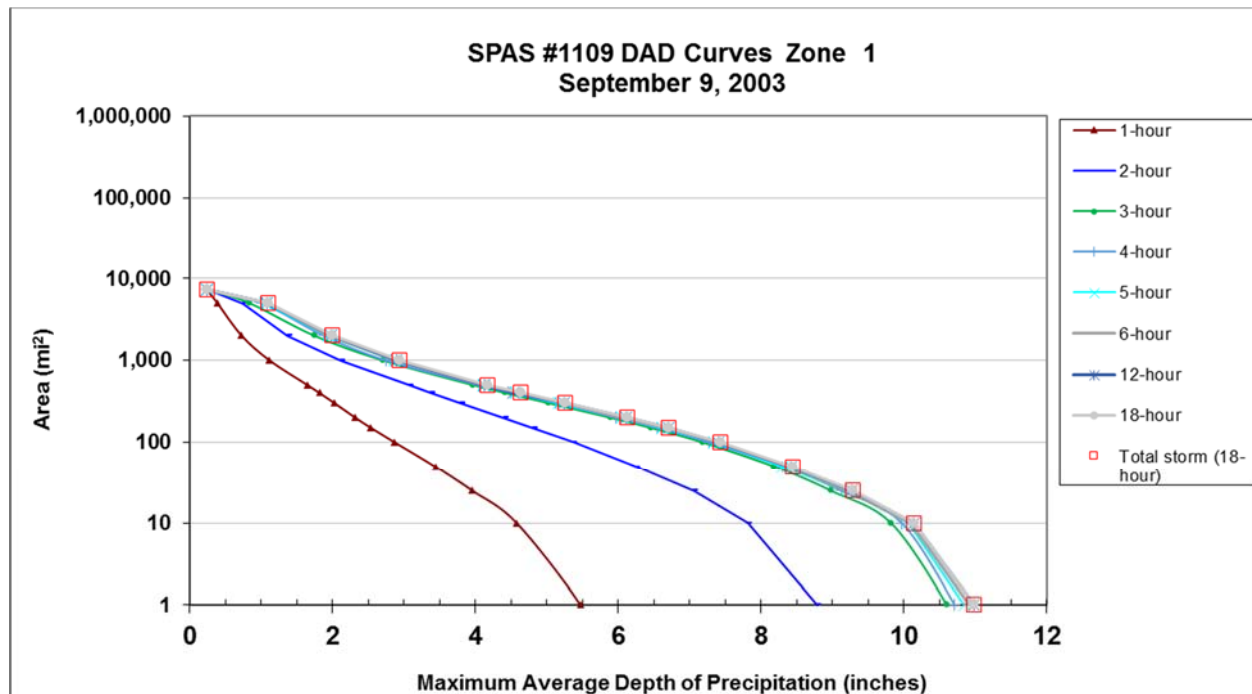
Spatial resolution: 0.01

Radar Included: Yes

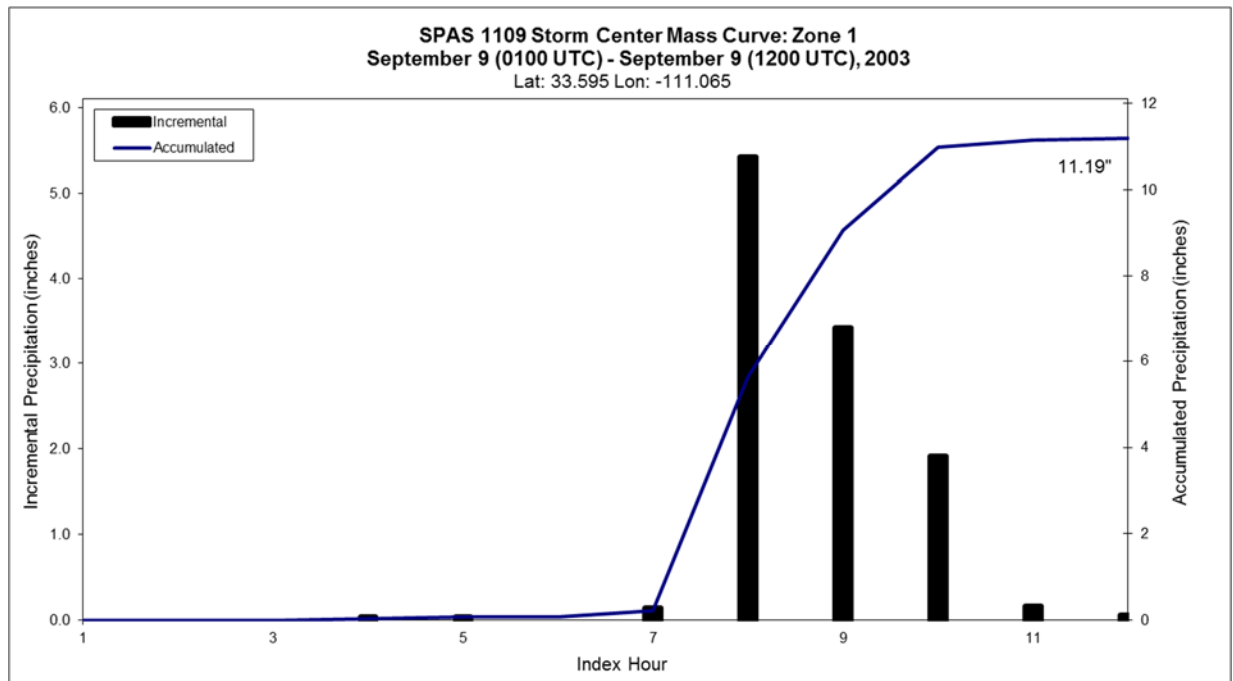
Depth-Area-Duration (DAD) analysis: Yes, 1, 2, 3, 4, 5, 6, 9, and 12-hours

CO-NM Regional Extreme Precipitation Study

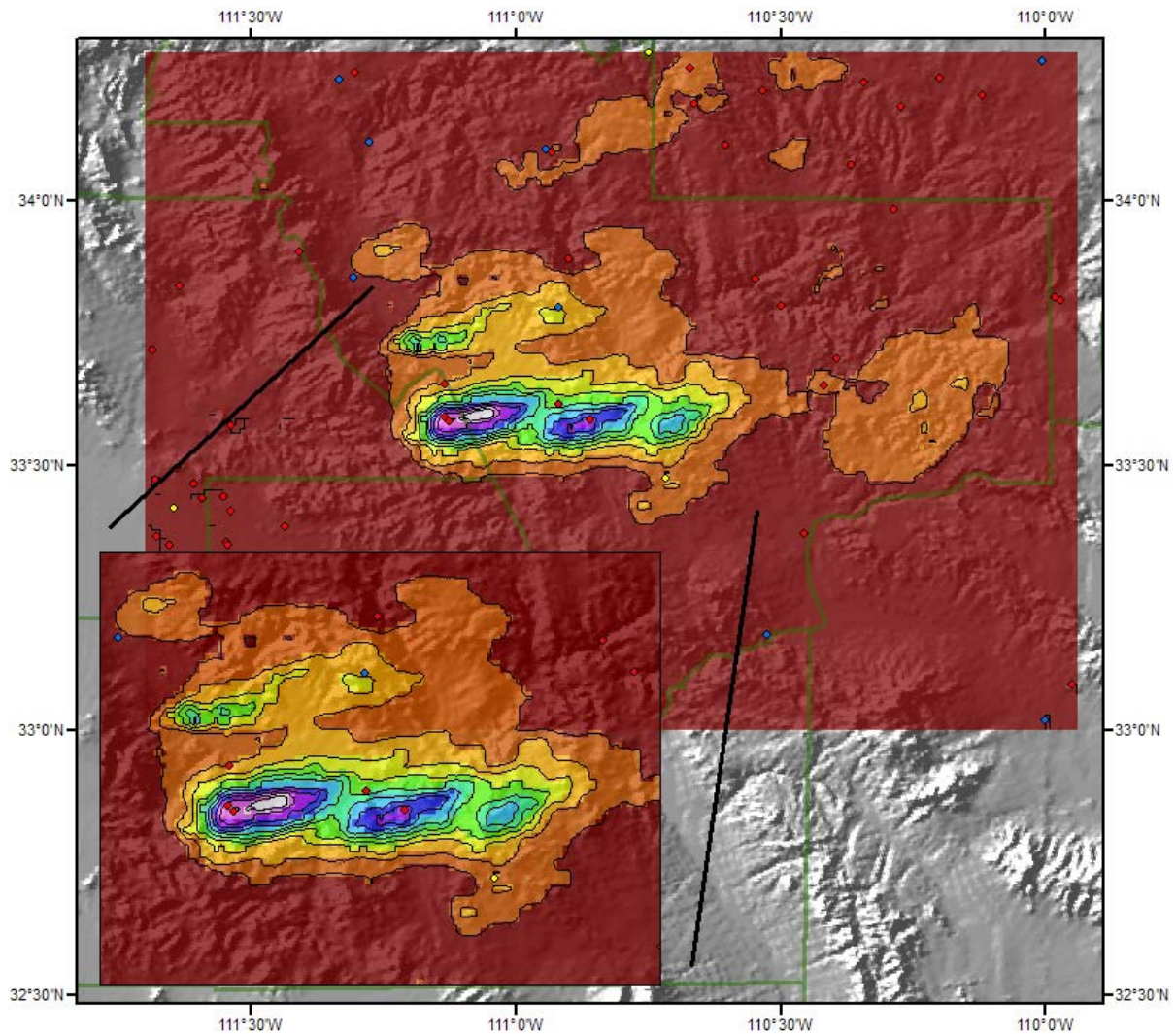
Storm 1109 - September 9 (0100 UTC) - September 9 (1200 UTC), 2003									
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)									
Area (mi ²)	Duration (hours)								
	1	2	3	4	5	6	12	18	Total
0.4	5.57	8.84	10.75	10.91	11.05	11.11	11.19	11.19	11.19
1	5.47	8.78	10.60	10.71	10.85	10.91	10.98	10.98	10.98
10	4.58	7.81	9.82	9.97	10.06	10.09	10.14	10.14	10.14
25	3.96	7.06	8.98	9.12	9.20	9.20	9.27	9.28	9.28
50	3.44	6.25	8.19	8.30	8.30	8.40	8.42	8.45	8.45
100	2.87	5.36	7.18	7.27	7.35	7.40	7.40	7.43	7.43
150	2.54	4.81	6.46	6.55	6.62	6.68	6.70	6.70	6.70
200	2.32	4.40	5.89	5.97	6.05	6.02	6.11	6.13	6.13
300	2.03	3.80	5.03	5.13	5.17	5.23	5.24	5.26	5.26
400	1.82	3.38	4.42	4.51	4.56	4.61	4.53	4.64	4.64
500	1.65	3.07	3.97	4.05	4.11	4.12	4.13	4.17	4.17
1,000	1.12	2.12	2.71	2.75	2.87	2.88	2.89	2.94	2.94
2,000	0.73	1.37	1.75	1.88	1.94	1.94	1.99	2.00	2.00
5,000	0.39	0.75	0.84	1.01	1.06	1.10	1.08	1.10	1.10
7,332	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24



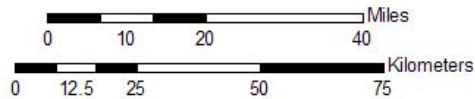
CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



Total Rainfall (12-hours)
Roosevelt Lakes, AZ 2003 Storm
SPAS #1109 September 9 (0100 to 1200 U TC), 2003



Precipitation Gauges

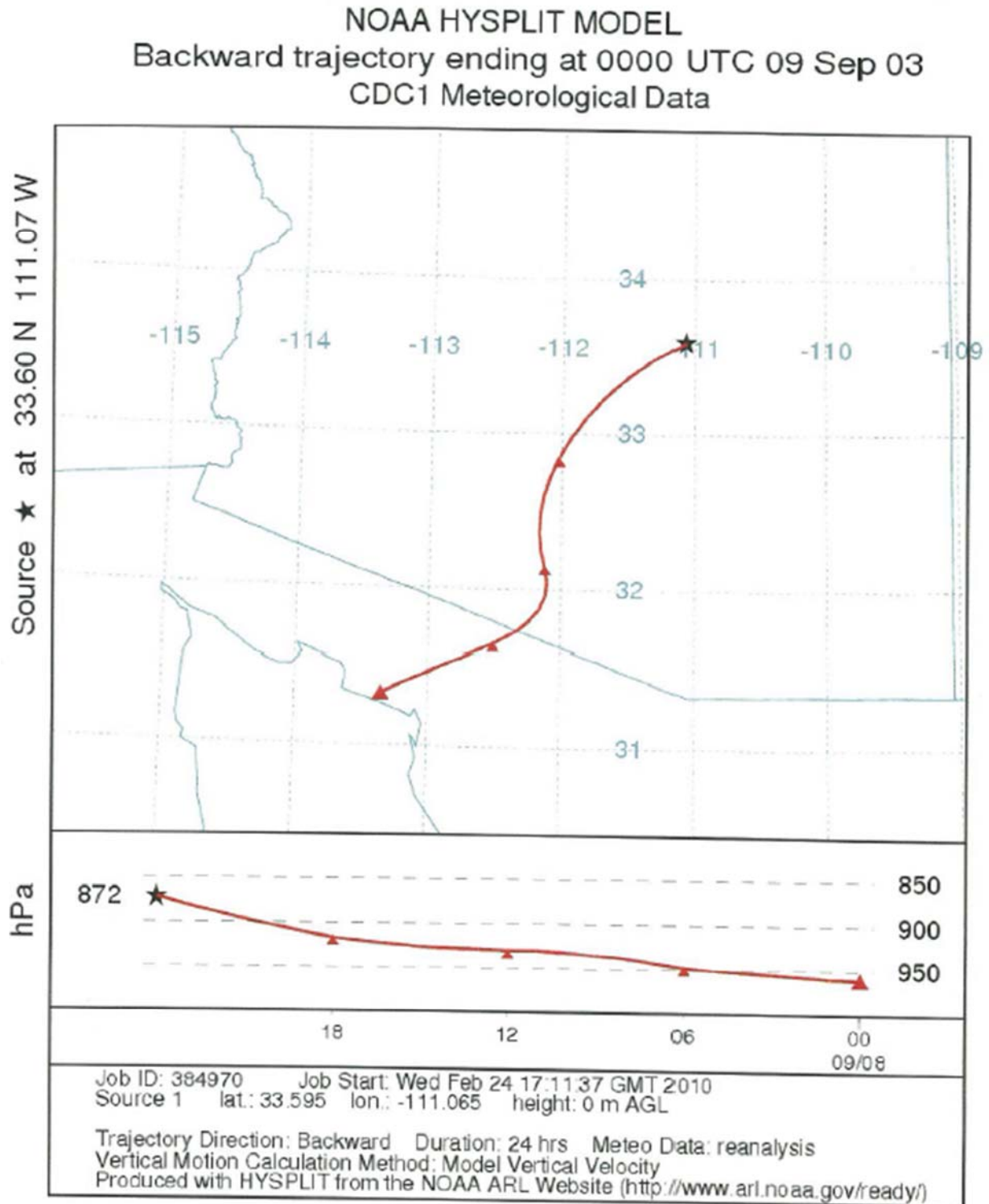
- ◆ Daily
- ◆ Supplemental
- ◆ Hourly

Precipitation (inches)

- | | | | |
|-------------|-------------|-------------|--------------|
| 0.00 - 1.00 | 3.01 - 4.00 | 6.01 - 7.00 | 9.01 - 10.00 |
| 1.01 - 2.00 | 4.01 - 5.00 | 7.01 - 8.00 | >10.00" |
| 2.01 - 3.00 | 5.01 - 6.00 | 8.01 - 9.00 | |



MetState/AWR February 10, 2010



CO-NM Regional Extreme Precipitation Study

SPAS HOURLY PRECIPITATION

Lat: 33.595 Lon: -111.065 SPAS Storm No: 1109

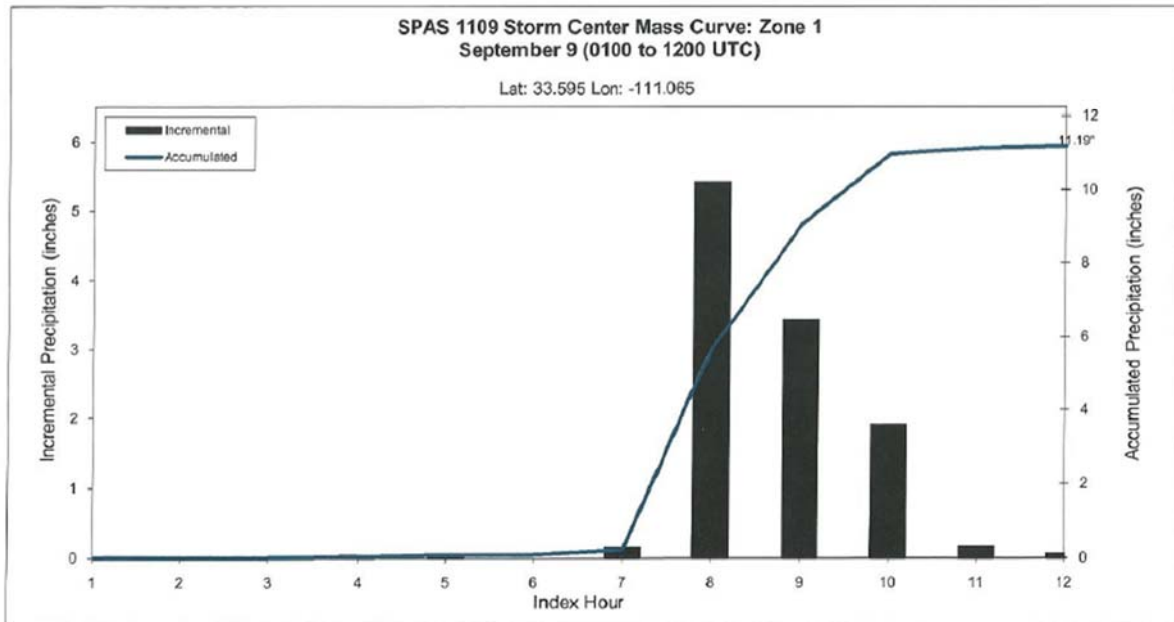
Storm Date (YYYY MM DD): 2003 09 09

Time zone: UTC

Process de Inc.

Precipitation units: inches

n	year	month	day	hour	ppt	accum	n - 1
1	2003	9	9	100	0	0	0
2	2003	9	9	200	0	0	1
3	2003	9	9	300	0	0	2
4	2003	9	9	400	0.04	0.04	3
5	2003	9	9	500	0.04	0.081	4
6	2003	9	9	600	0	0.081	5
7	2003	9	9	700	0.144	0.224	6
8	2003	9	9	800	5.415	5.64	7
9	2003	9	9	900	3.425	9.064	8
10	2003	9	9	1000	1.909	10.974	9
11	2003	9	9	1100	0.16	11.134	10
12	2003	9	9	1200	0.059	11.193	11



Cedar City, UT

July 31, 2006

Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1120_2

General Storm Location: Cedar City, Utah

Storm Dates: July 31 (0000 UTC) - July 31 (1100 UTC), 2006

Event: Convective

Zone 2

Latitude: 37.375

Longitude: -113.075

Max. Grid Rainfall Amount: 5.69"

Max. Observed Rainfall Amount: 3.04" (Lava Point, UT)

Number of Stations: 137 (70 Daily, 57 Hourly, 2 Hourly Estimated, 6 Hourly Pseudo, 2 Supplemental)

SPAS Version: 8.5

Base Map Used: Mean (1971-2000) PRISM July Precipitation

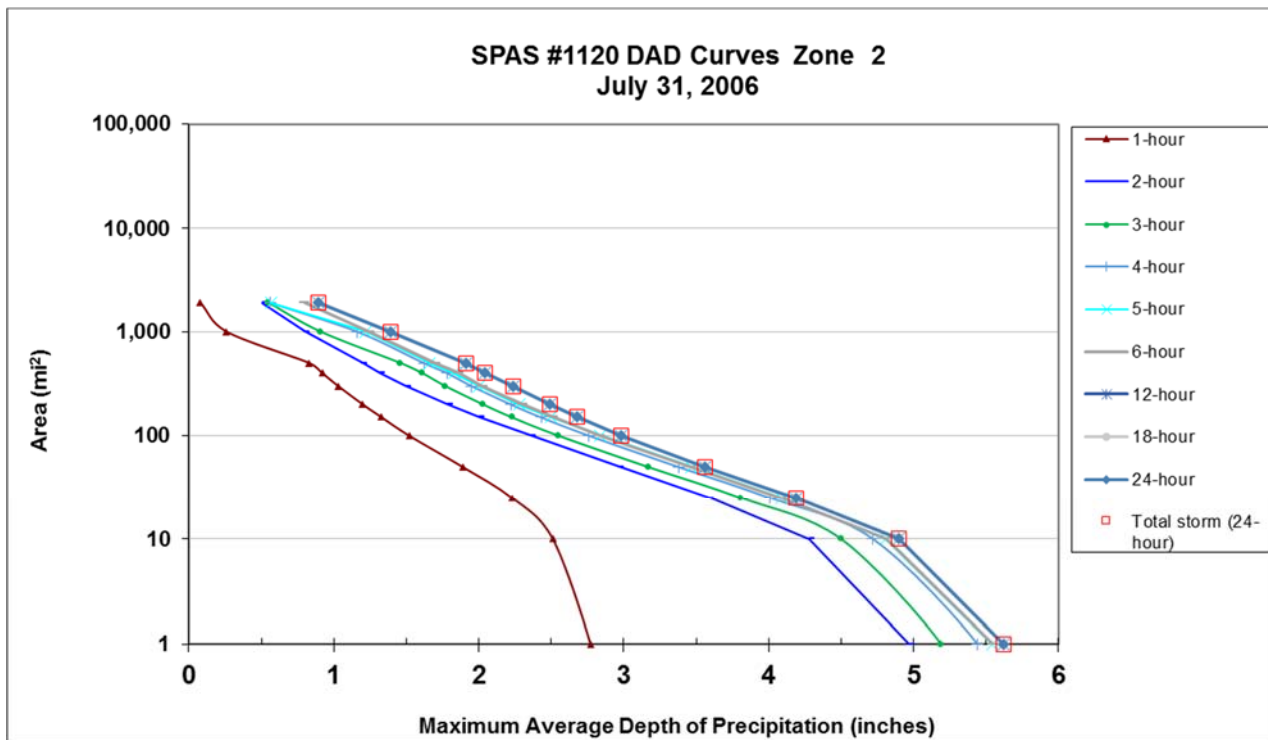
Spatial resolution: 0.39 sq-mi

Radar Included: Yes

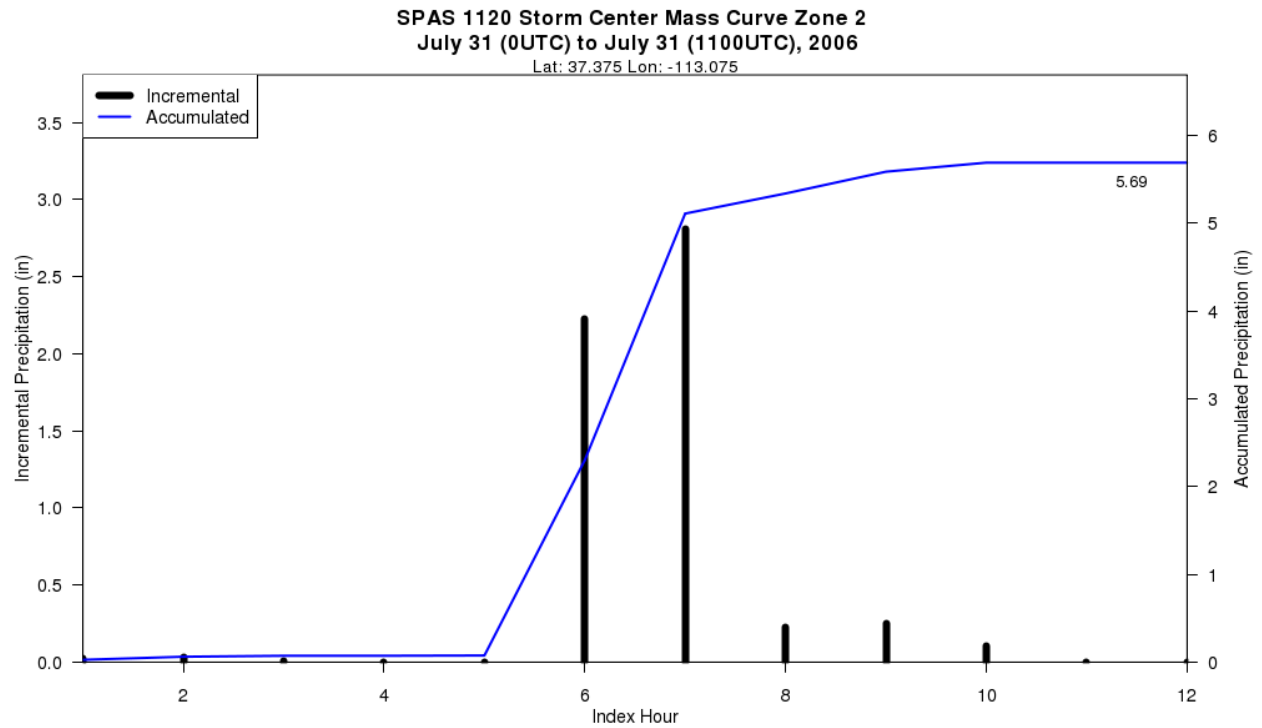
Depth-Area-Duration (DAD) analysis: Yes

CO-NM Regional Extreme Precipitation Study

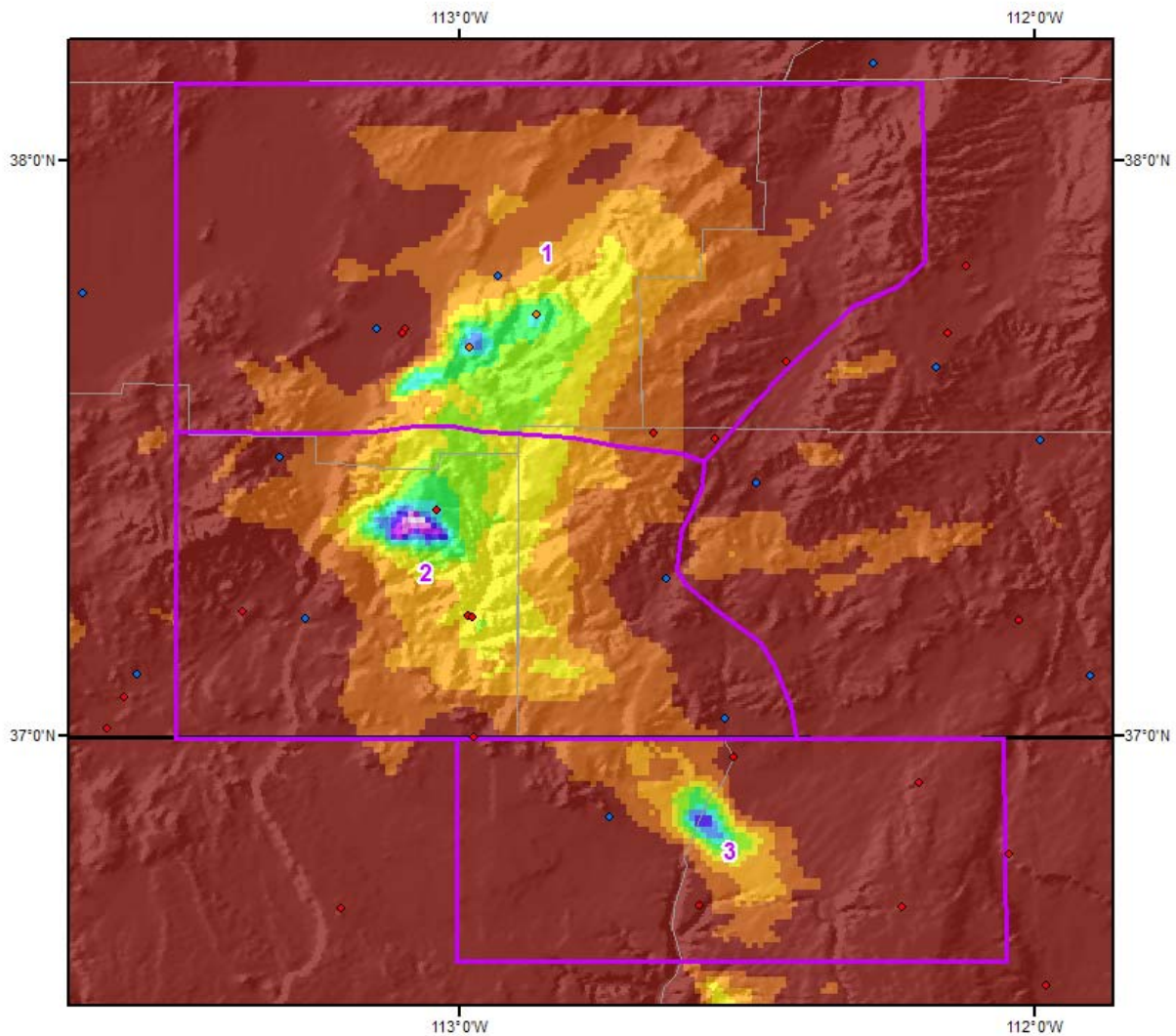
Storm 1120 - July 31 (0000 UTC) - July 31 (1100 UTC), 2006										
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)										
Area (mi ²)	Duration (hours)									
	1	2	3	4	5	6	12	18	24	Total
0.4	2.81	5.03	5.26	5.51	5.61	5.61	5.69	5.69	5.69	5.69
1	2.77	4.97	5.19	5.44	5.54	5.55	5.62	5.62	5.62	5.62
10	2.51	4.28	4.50	4.72	4.81	4.81	4.90	4.90	4.90	4.90
25	2.23	3.59	3.81	4.01	4.09	4.09	4.19	4.19	4.19	4.19
50	1.89	2.97	3.17	3.38	3.47	3.47	3.56	3.56	3.56	3.56
100	1.52	2.36	2.55	2.76	2.84	2.84	2.98	2.98	2.98	2.98
150	1.33	2.01	2.23	2.43	2.50	2.51	2.68	2.68	2.68	2.68
200	1.20	1.79	2.03	2.22	2.28	2.30	2.49	2.49	2.49	2.49
300	1.03	1.50	1.77	1.95	2.00	2.03	2.24	2.24	2.24	2.24
400	0.92	1.32	1.61	1.78	1.83	1.86	2.04	2.04	2.04	2.04
500	0.83	1.20	1.46	1.62	1.66	1.70	1.91	1.91	1.91	1.91
1,000	0.26	0.80	0.91	1.16	1.22	1.25	1.39	1.39	1.39	1.39
1,895	0.08	0.51	0.55	0.56	0.57	0.80	0.89	0.89	0.89	0.89



CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



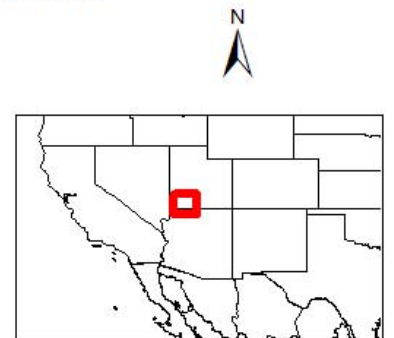
Total 12-hour Precipitation
SPAS # 1120 (Cedar City July 2006 Storm)
July 31, 2006 0000 UTC - July 31, 2006 1100 UTC

Gauges

- ◆ Daily
- ◆ Hourly
- ◆ Hourly Estimated
- ◆ Hourly Pseudo
- ◆ Supplemental

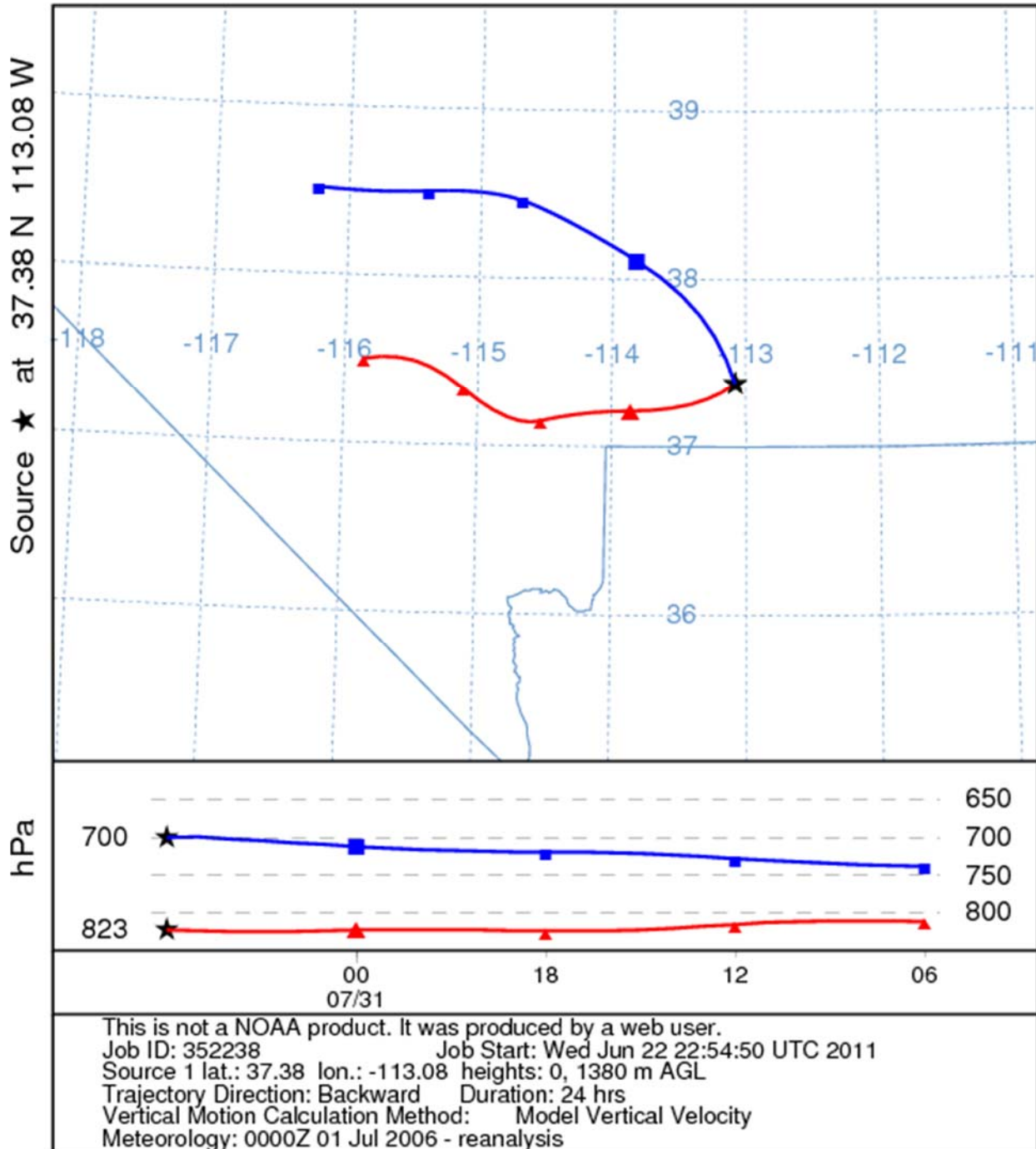
Precipitation (inches)

0.00 - 0.50	2.01 - 2.50	4.01 - 4.50
0.51 - 1.00	2.51 - 3.00	4.51 - 5.00
1.01 - 1.50	3.01 - 3.50	5.01 - 5.50
1.51 - 2.00	3.51 - 4.00	5.51 - 6.00

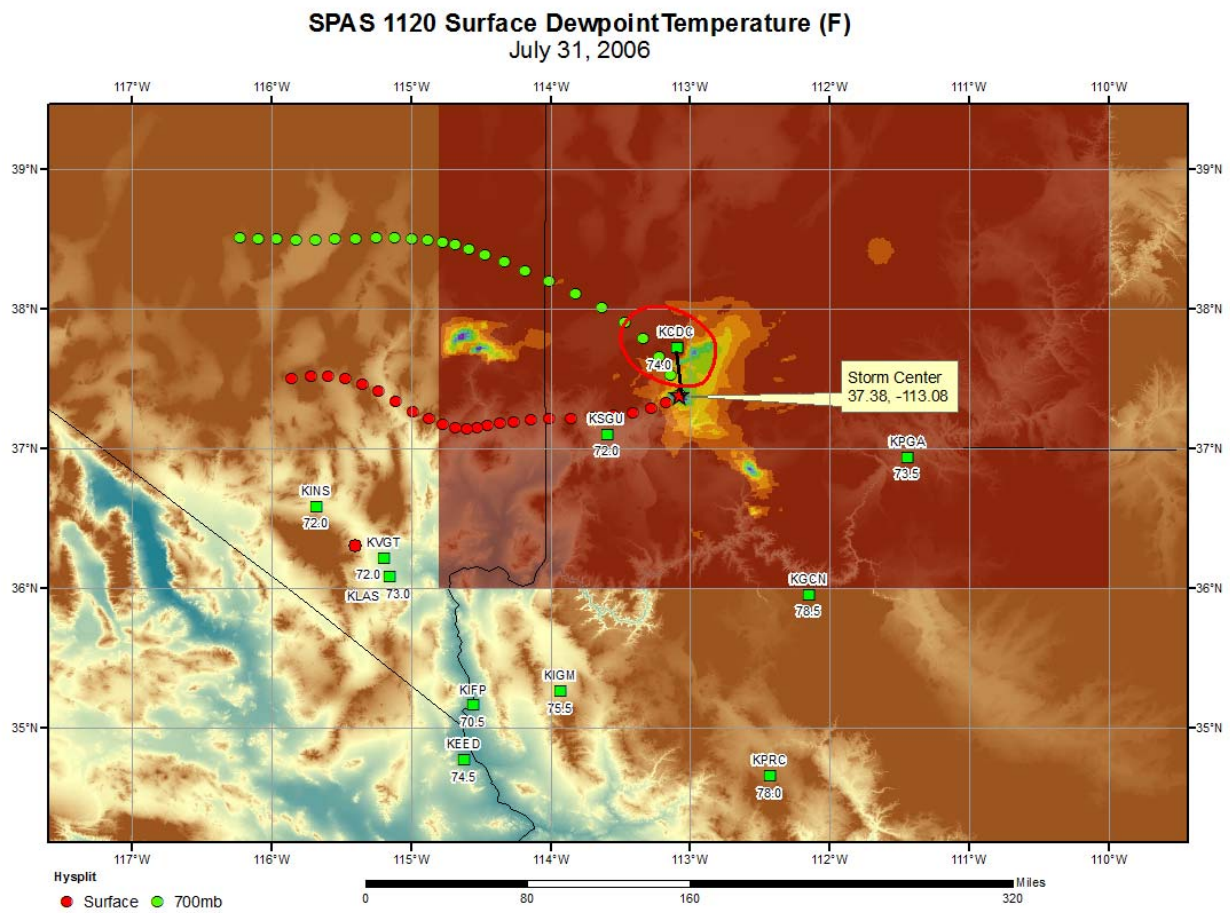


MetStat V4.0A September 9, 2010

NOAA HYSPLIT MODEL
Backward trajectories ending at 0600 UTC 31 Jul 06
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study



El Paso, TX

August 1, 2006

Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1528_1

General Storm Location: El Paso, TX

Storm Dates: August 1, 2006

Event: Convective

DAD Zone 1

Latitude: 31.935

Longitude: -106.515

Max. Grid Rainfall Amount: 10.25"

Max. Observed Rainfall Amount: 10.00"

SPAS Version: 10.0

Basemap: Blended PRISM August (1981-2010) precipitation and Default ZR Estimated Rainfall

Spatial resolution: 0.01 (~ 0.40 mi²)

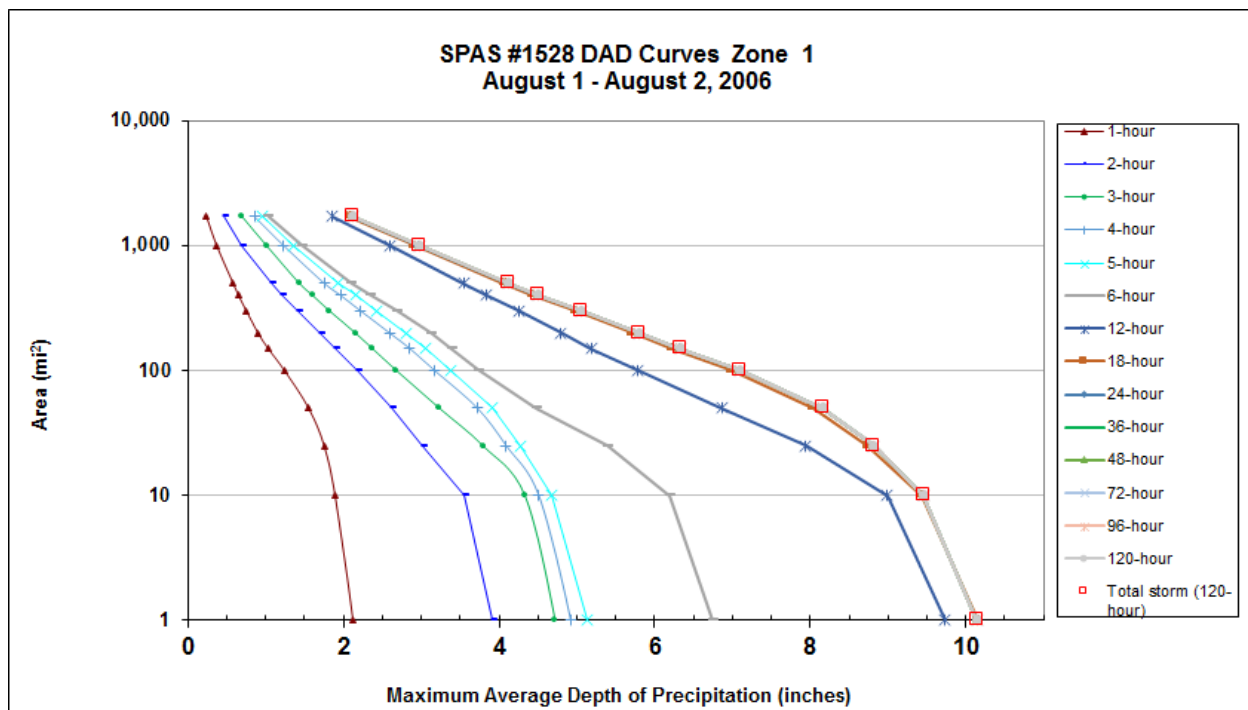
Radar Included: Yes

Depth-Area-Duration (DAD) analysis: Yes

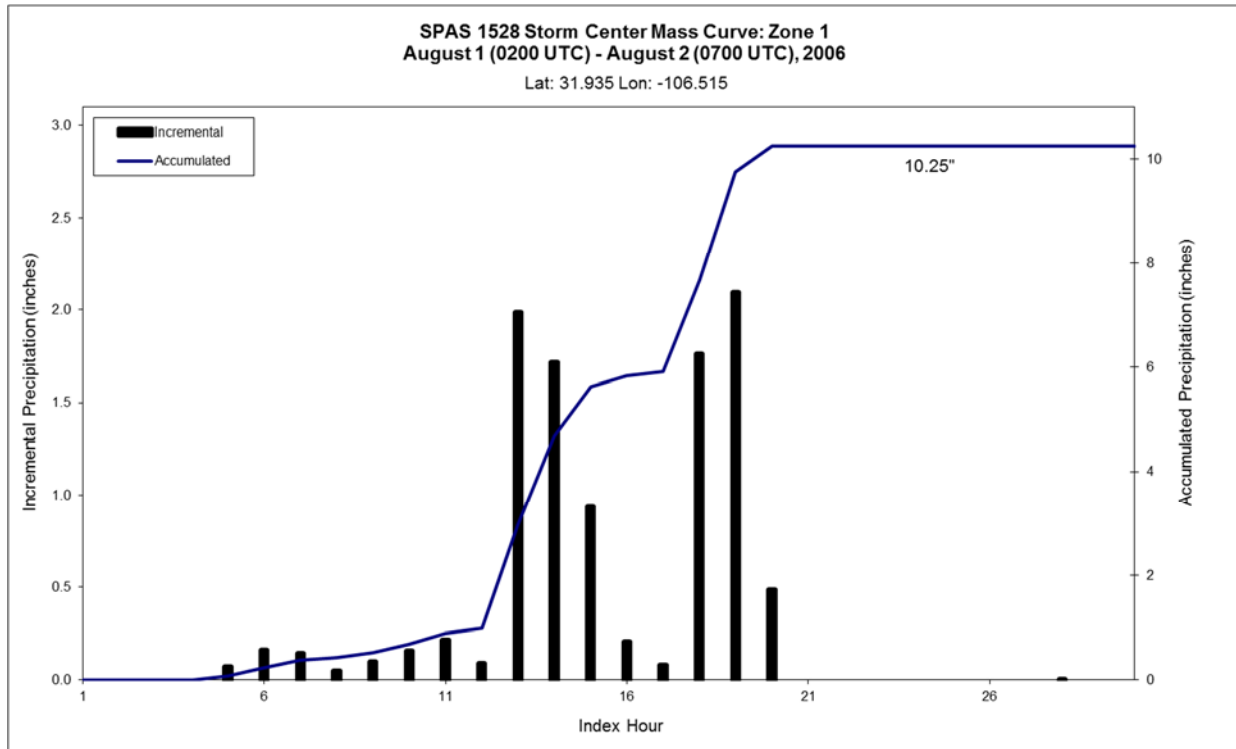
Reliability of results: This analysis was based on hourly data, daily data, supplemental station data and NEXRAD Radar. We have a high degree of confidence in the radar/station based storm total results, the spatial pattern is dependent on the radar data and basemap, and the timing is based on hourly, hourly pseudo stations, and radar data.

CO-NM Regional Extreme Precipitation Study

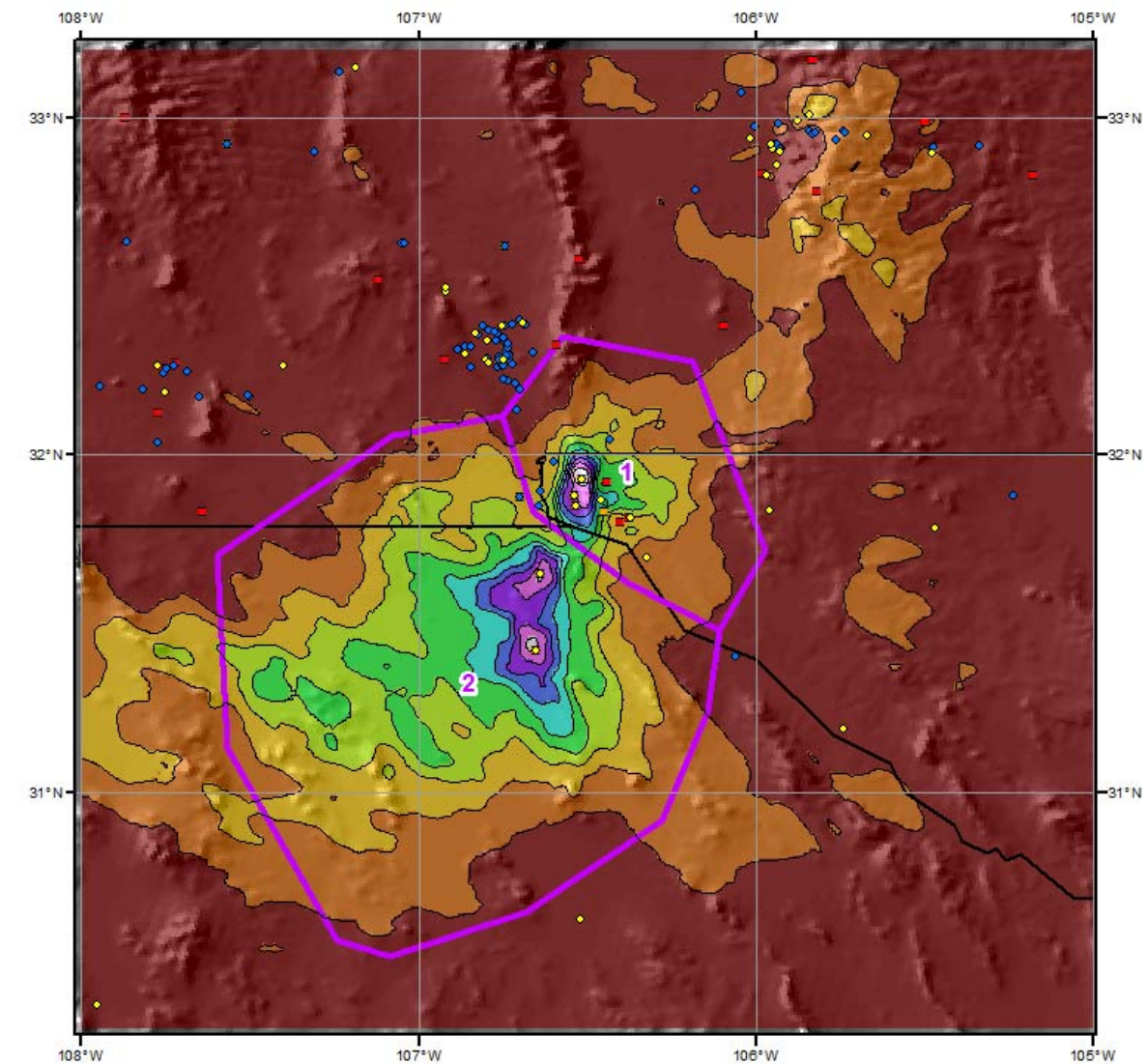
Storm 1528 - August 1 (0200 UTC) - August 2 (0700 UTC), 2006														
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
Area (mi ²)	Duration (hours)													
	1	2	3	4	5	6	12	18	24	36	48	72	96	120
0.4	2.16	3.95	4.77	4.98	5.18	6.83	9.83	10.25	10.25	10.25	10.25	10.25	10.25	10.25
1	2.12	3.91	4.72	4.92	5.13	6.75	9.73	10.15	10.14	10.14	10.14	10.14	10.14	10.14
10	1.89	3.56	4.33	4.51	4.68	6.20	8.99	9.44	9.46	9.46	9.46	9.46	9.46	9.46
25	1.75	3.02	3.79	4.09	4.28	5.40	7.94	8.73	8.82	8.82	8.82	8.82	8.82	8.82
50	1.55	2.62	3.23	3.72	3.92	4.48	6.86	8.04	8.16	8.16	8.16	8.16	8.16	8.16
100	1.24	2.17	2.68	3.17	3.38	3.74	5.78	6.98	7.09	7.09	7.09	7.09	7.09	7.09
150	1.03	1.89	2.37	2.85	3.05	3.39	5.19	6.23	6.32	6.33	6.33	6.33	6.33	6.33
200	0.90	1.70	2.15	2.59	2.81	3.13	4.80	5.71	5.80	5.80	5.80	5.80	5.80	5.80
300	0.75	1.42	1.82	2.22	2.43	2.69	4.25	4.98	5.05	5.05	5.05	5.05	5.05	5.05
400	0.65	1.21	1.60	1.96	2.15	2.35	3.84	4.43	4.50	4.51	4.51	4.51	4.51	4.51
500	0.58	1.07	1.43	1.75	1.93	2.11	3.55	4.06	4.12	4.13	4.13	4.13	4.13	4.13
1,000	0.37	0.69	1.01	1.23	1.35	1.47	2.59	2.91	2.96	2.97	2.97	2.97	2.97	2.97
1,697	0.24	0.46	0.70	0.86	0.95	1.04	1.86	2.08	2.12	2.13	2.13	2.13	2.13	2.13



CO-NM Regional Extreme Precipitation Study

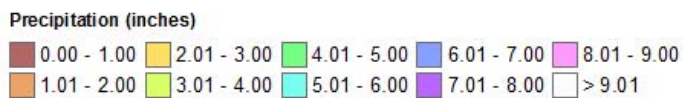
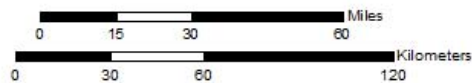


CO-NM Regional Extreme Precipitation Study

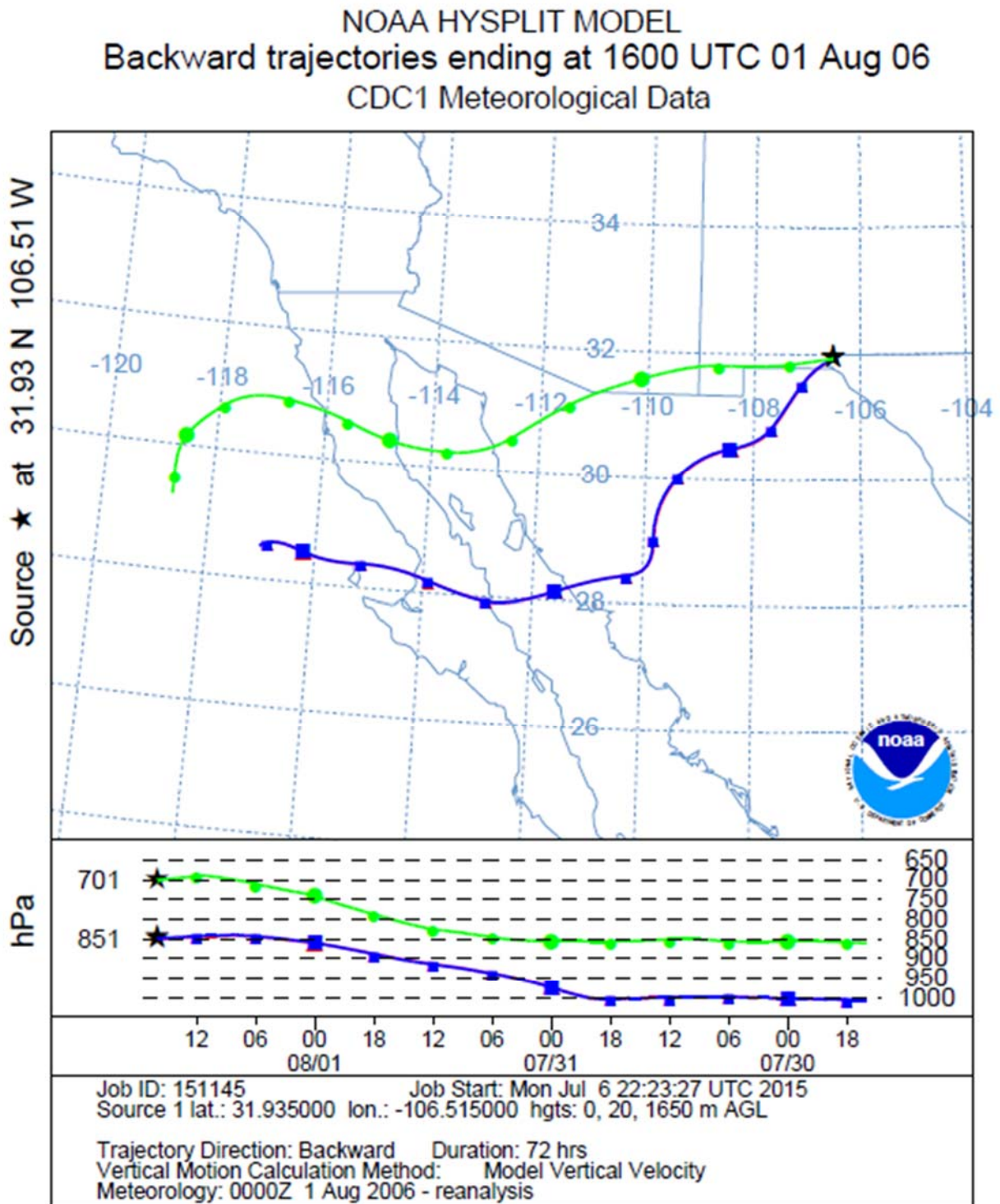


Total Storm (30-hr) Precipitation (inches)
8/1/2006 0105 UTC- 8/2/2006 0700 UTC
SPAS-NEXRAD 1528

- Gauges**
- ◆ Daily
 - Hourly
 - Hourly Est. Pseudo
 - Hourly Pseudo
 - ◆ Supplemental

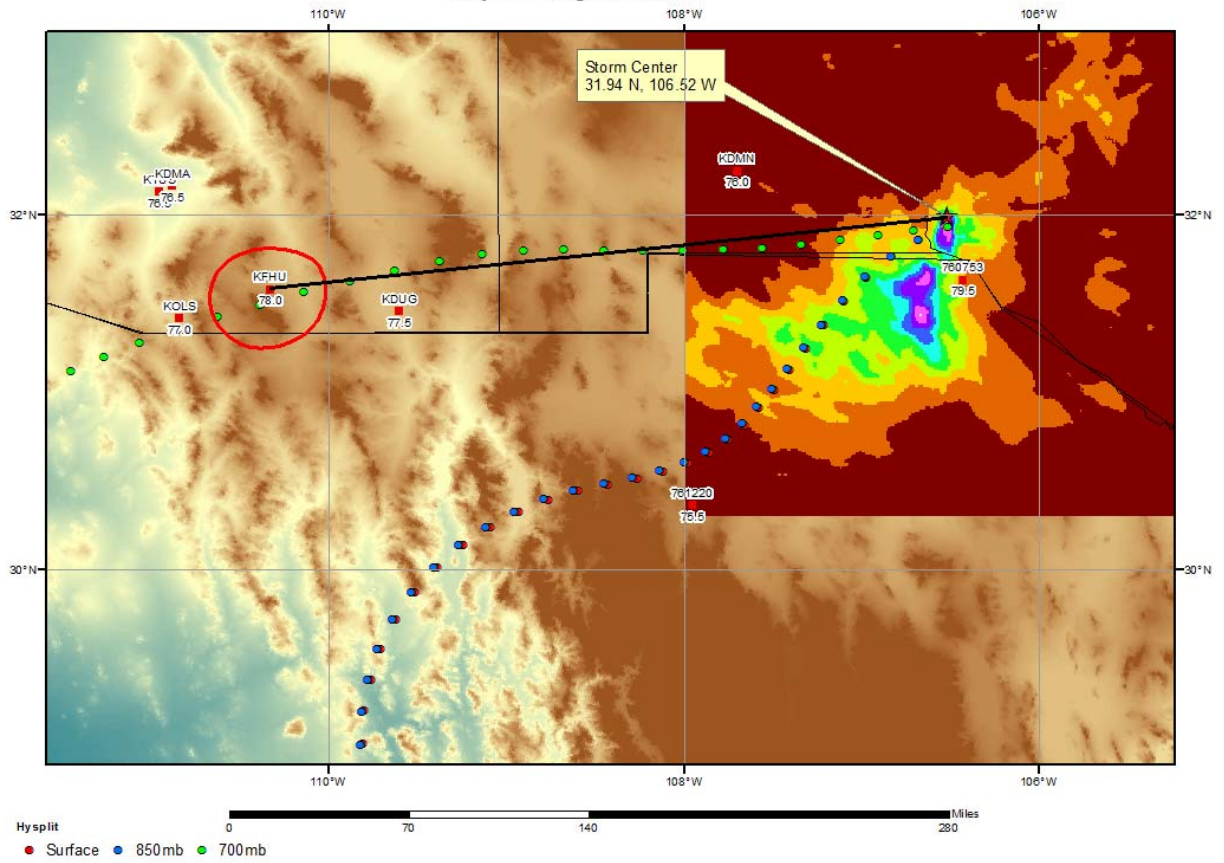


6/21/2015



CO-NM Regional Extreme Precipitation Study

SPAS 1528 El Paso, TX Storm Analysis July 29 - August 1, 2006



San Luis Valley, CO

July 19-20, 2007

Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1663_1

General Storm Location: San Luis Valley, CO

Storm Dates: July 19-20, 2007

Event: Local

DAD Zone 1

Latitude: 37.5250

Longitude: -105.9450

Max. Grid Rainfall Amount: 2.11"

Max. Observed Rainfall Amount: 2.001"

Number of Stations: 71

Basemap: ippt_allsites_1663_sum_in

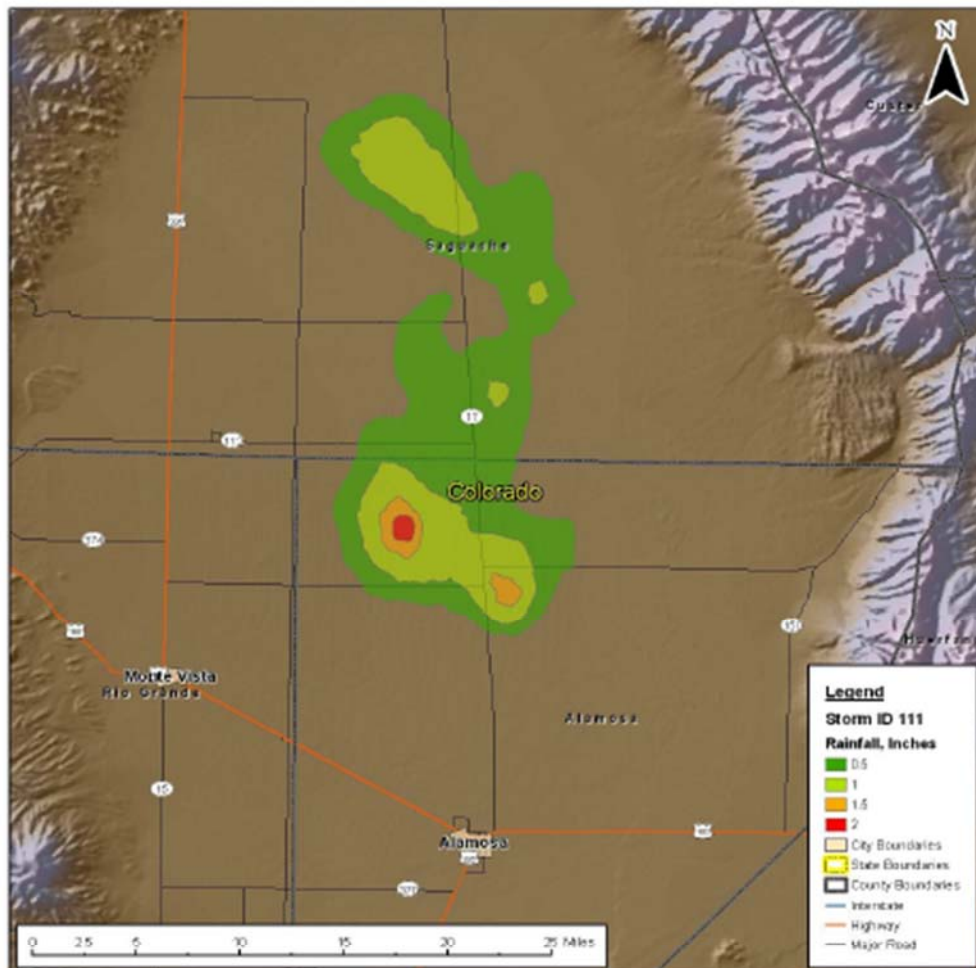
Spatial resolution: 0.3780

Radar Included: Yes

Depth-Area-Duration (DAD) analysis: Yes

Reliability of results: This analysis was based on 71 hourly stations, daily data, and supplemental station data and NEXRAD Radar. We have a good degree of confidence for the radar/station based storm total results. The spatial pattern is dependent on the radar data and basemap. Timing is based on the hourly and hourly pseudo stations, specifically HRLY 1 and HRLY 2 created from the information given in the NM EPAT report for storm IDs 111 and 112 (San Luis Valley North, San Luis Valley South). Several daily stations were moved to supplemental due to timing issues and to ensure data consistency.

CO-NM Regional Extreme Precipitation Study



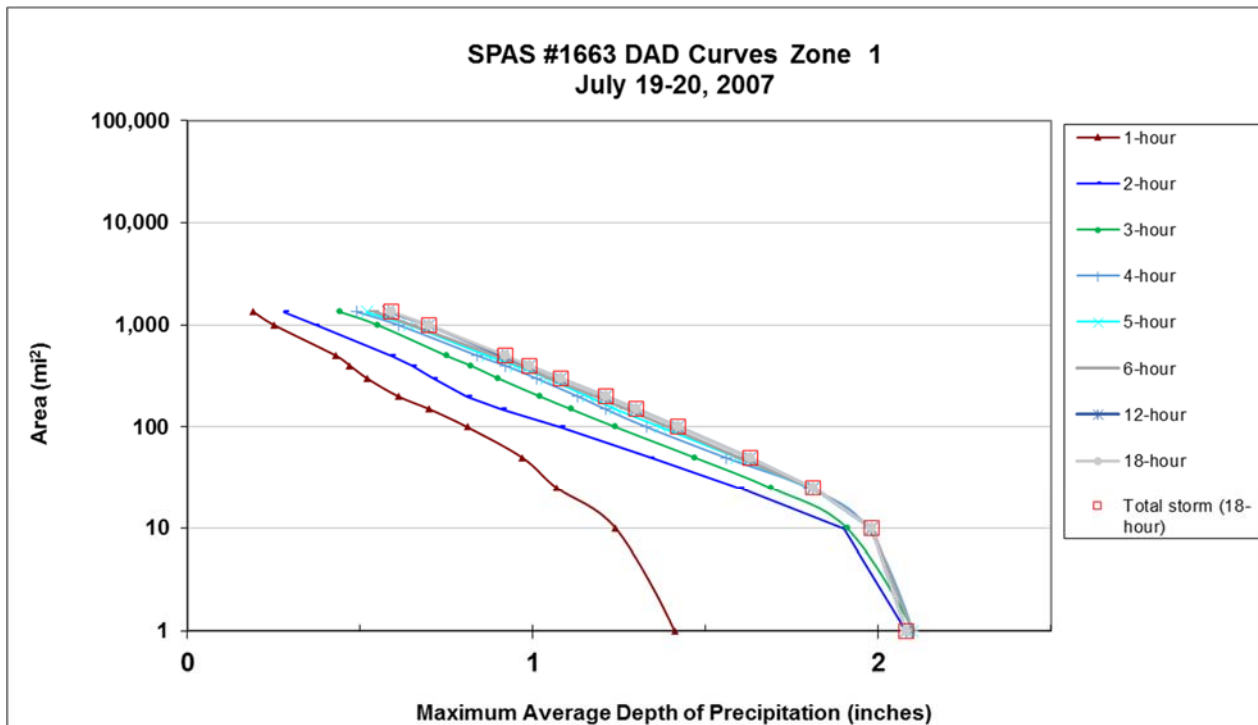
Storm Synopsis and Climate Zone Classification:

Storm ID 111 Climate Zone – 3: This event (measured by CoCoRaHS observers) is fairly impressive given location in central (flat) area of San Luis Valley. Review of radar confirmed short duration of event however details of surface rainfall is complicated by distance of location from nearest Nexrad location. Given that storm was not near terrain, storm only allowed in relatively flat Zone 3 of far Northern New Mexico.

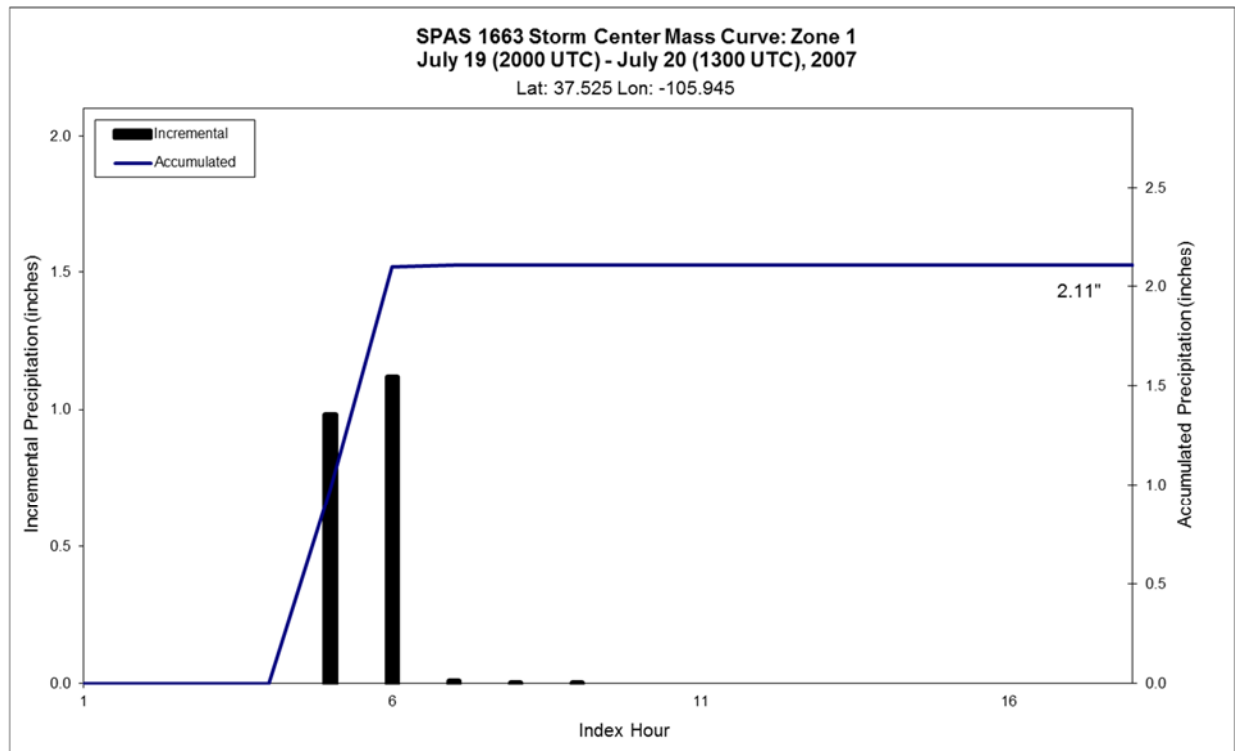
Start Date/End Date	July 19, 2007
Storm Name/Status	San Luis Valley - North - STORM ID 111 / Active
Storm Type	Local Storm – Convective Simple
State/Climate Zone	Colorado / Climate Zone 3
Duration/Max Precipitation	3.25 hours / 2"
Originator	HDR
Low Level Wind	135 degrees
Upper Level Wind	140 degrees
PW1 /1000mb Dewpoint	3.04" / 76.3F
Storm Source	EPAT
Temporal	Radar observed

CO-NM Regional Extreme Precipitation Study

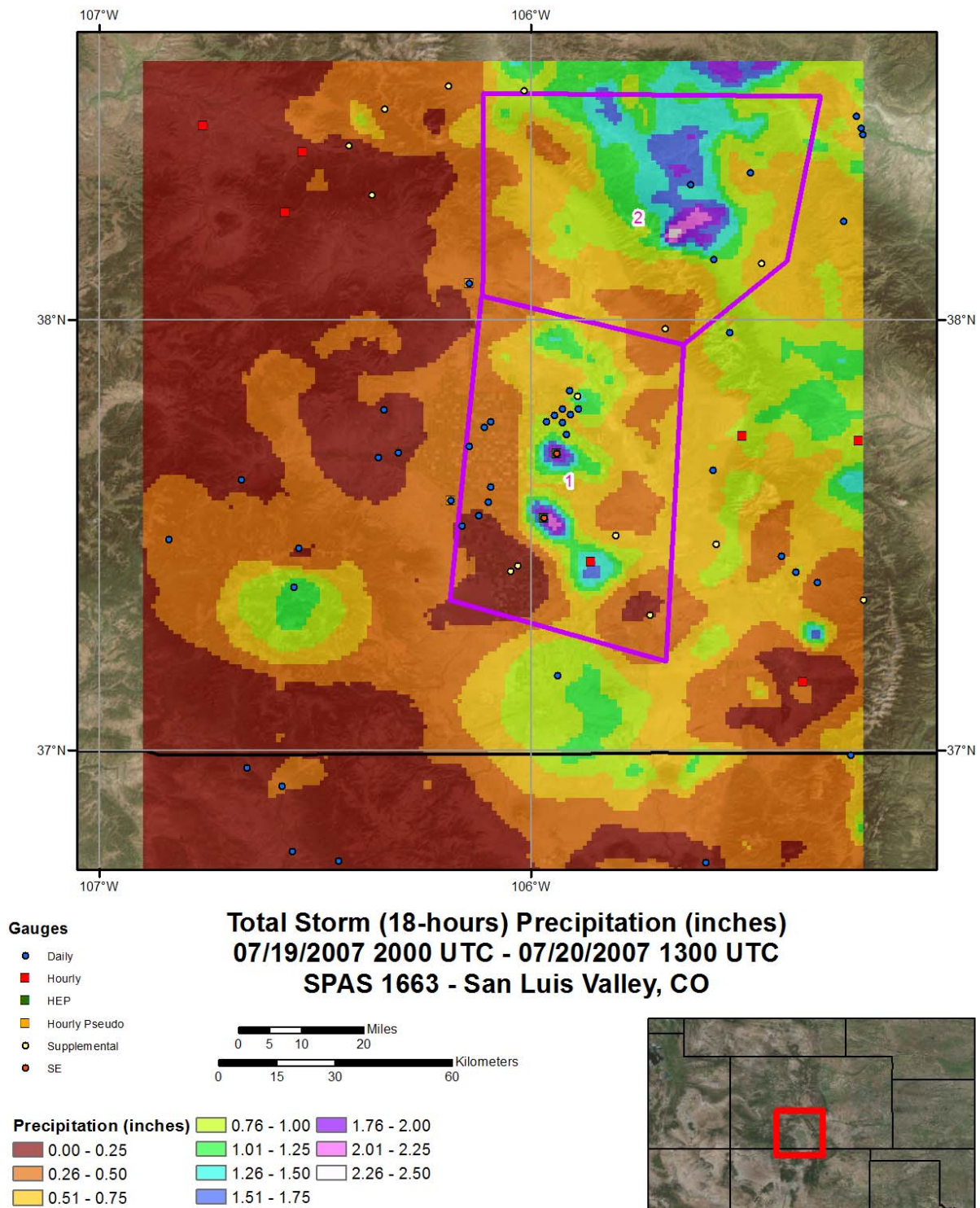
Storm 1663 - July 19 (2000 UTC) - July 20 (1300 UTC), 2007									
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)									
Area (mi ²)	Duration (hours)								
	1	2	3	4	5	6	12	18	Total
0.4	1.42	2.10	2.10	2.10	2.11	2.11	2.11	2.11	2.11
1	1.41	2.08	2.10	2.10	2.10	2.10	2.08	2.08	2.08
10	1.24	1.90	1.91	1.97	1.98	1.98	1.98	1.98	1.98
25	1.07	1.60	1.69	1.80	1.81	1.81	1.81	1.81	1.81
50	0.97	1.34	1.47	1.56	1.59	1.60	1.63	1.63	1.63
100	0.81	1.08	1.24	1.33	1.37	1.39	1.42	1.42	1.42
150	0.70	0.91	1.11	1.21	1.24	1.27	1.30	1.30	1.30
200	0.61	0.81	1.02	1.13	1.16	1.18	1.21	1.21	1.21
300	0.52	0.71	0.90	1.01	1.04	1.05	1.08	1.08	1.08
400	0.47	0.65	0.82	0.92	0.95	0.97	0.99	0.99	0.99
500	0.43	0.59	0.75	0.84	0.87	0.89	0.91	0.92	0.92
1,000	0.25	0.37	0.55	0.61	0.64	0.65	0.70	0.70	0.70
1,348	0.19	0.28	0.44	0.49	0.52	0.54	0.58	0.59	0.59



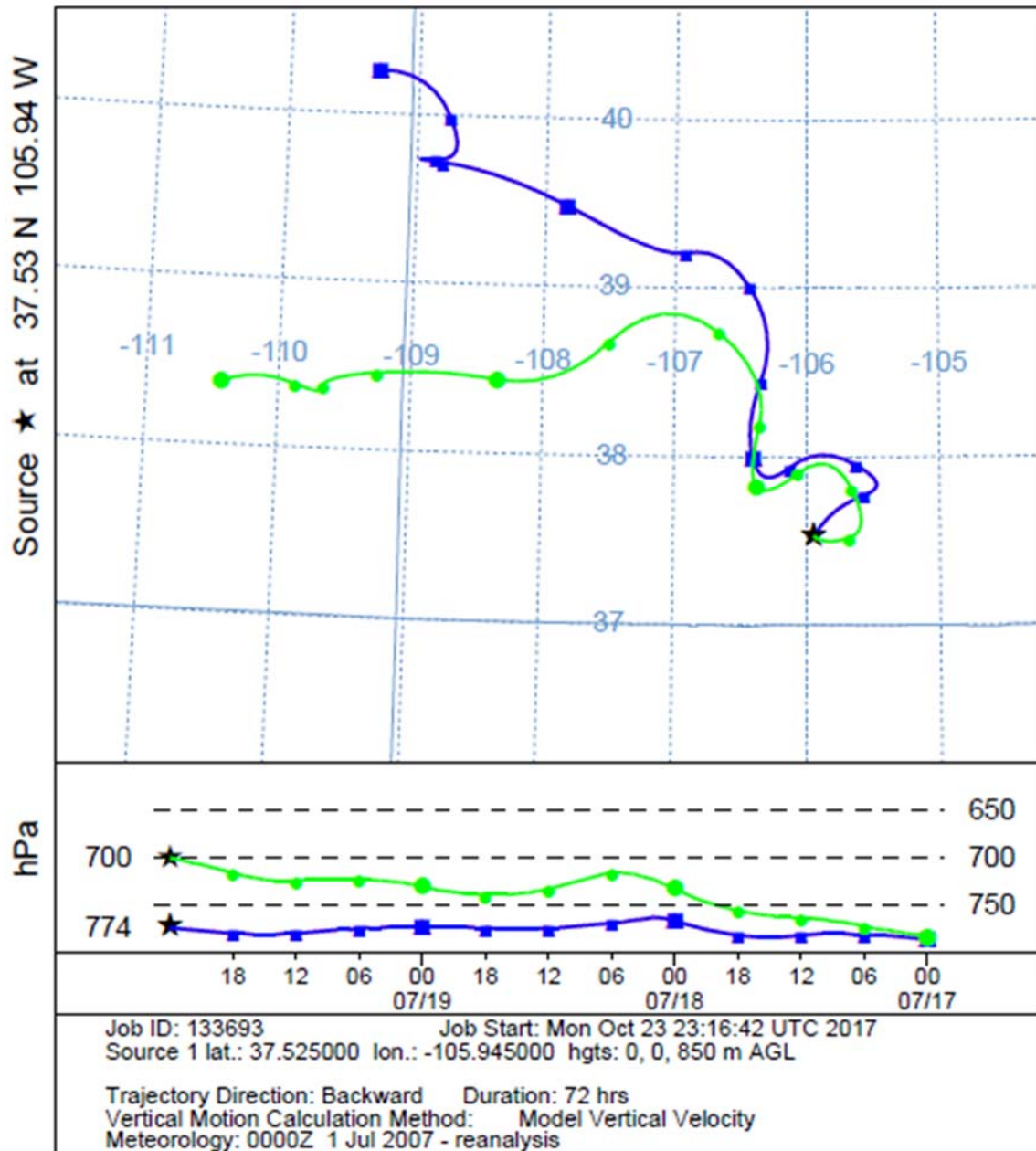
CO-NM Regional Extreme Precipitation Study



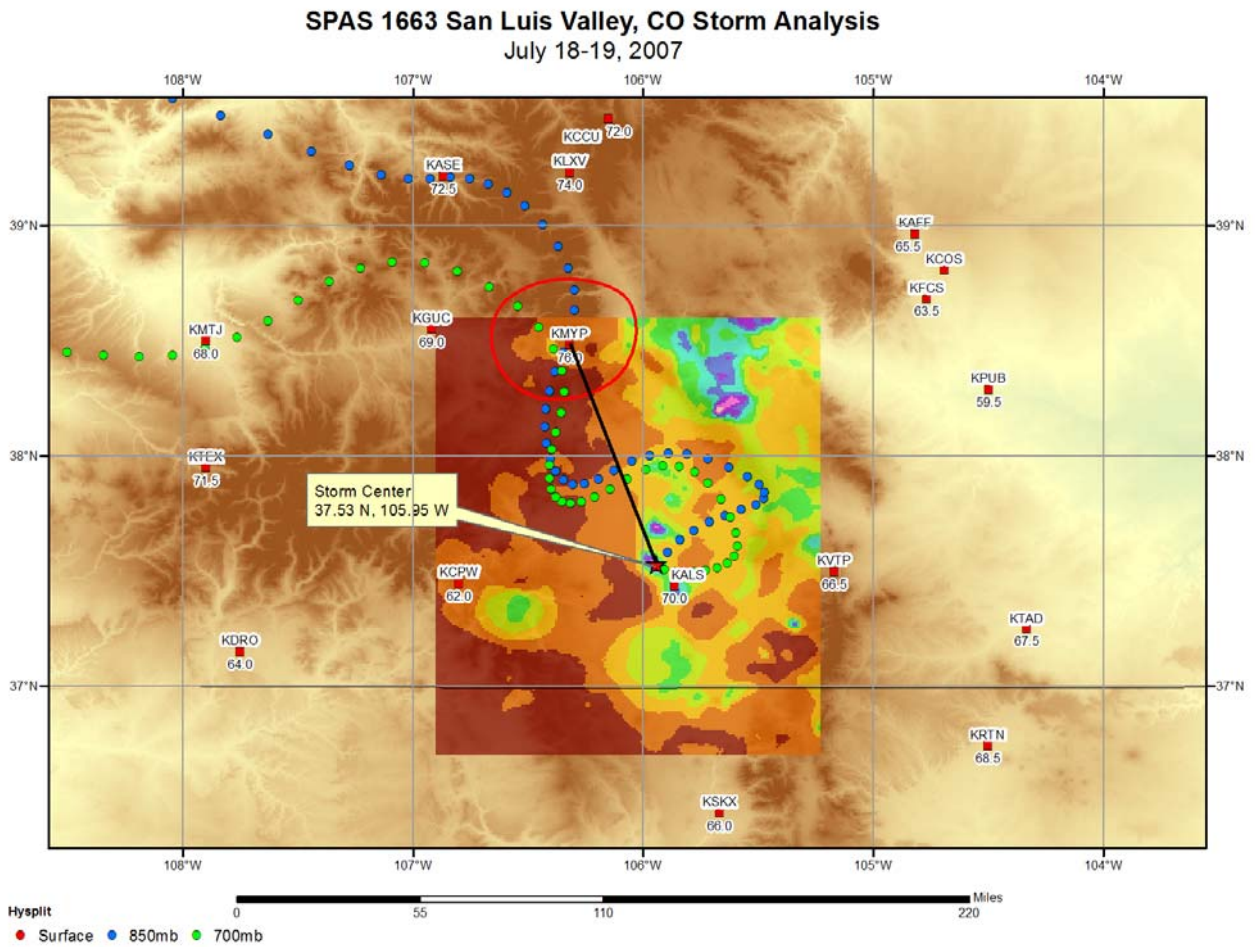
CO-NM Regional Extreme Precipitation Study



NOAA HYSPLIT MODEL
Backward trajectories ending at 0000 UTC 20 Jul 07
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study



Petrified Forest, AZ

July 27-28, 2007

Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1113_1

General Storm Location: Petrified Forest, Arizona

Storm Dates: July 27 (0000) - July 28 (0900), 2007

Event: Convective

DAD Zone 1

Latitude: 34.7250

Longitude: -109.6450

Max. Grid/Radar Rainfall Amount: 7.18"

Max. Observed Rainfall Amount: 4.76"

Number of Stations: 80 (27 Daily, 44 Hourly, 3 Hourly Estimated, 1 Hourly Pseudo, 5 Supplemental)

SPAS Version: 8.5

Base Map Used: Mean (1971-2000) PRISM July Precipitation

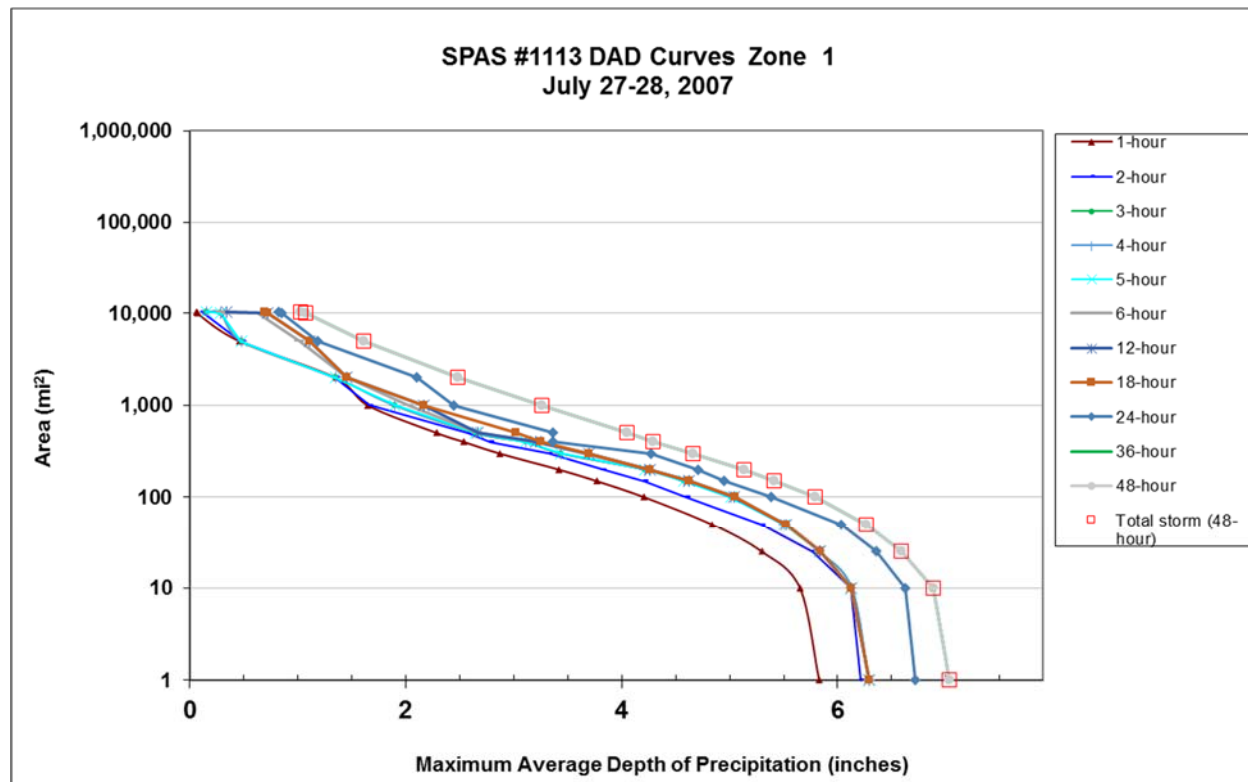
Spatial resolution: 0.39 sq-mi

Radar Included: Yes

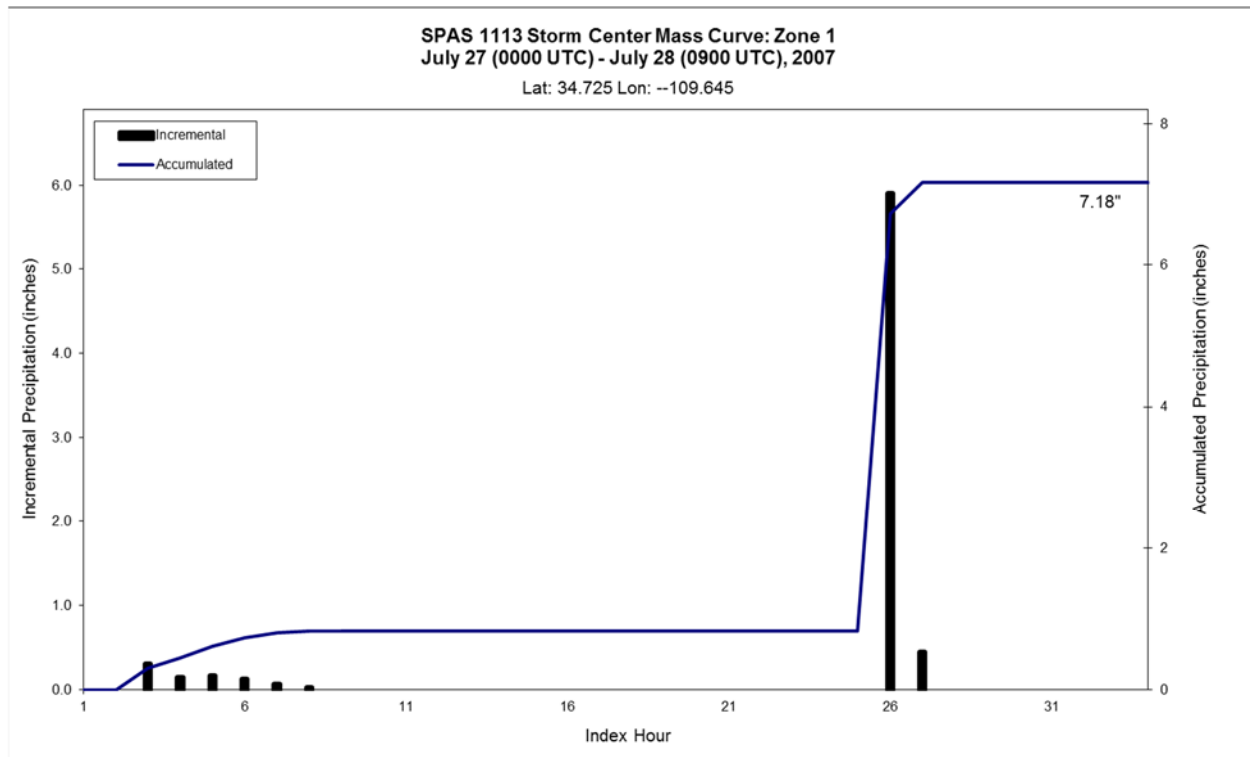
Depth-Area-Duration (DAD) analysis: Yes

CO-NM Regional Extreme Precipitation Study

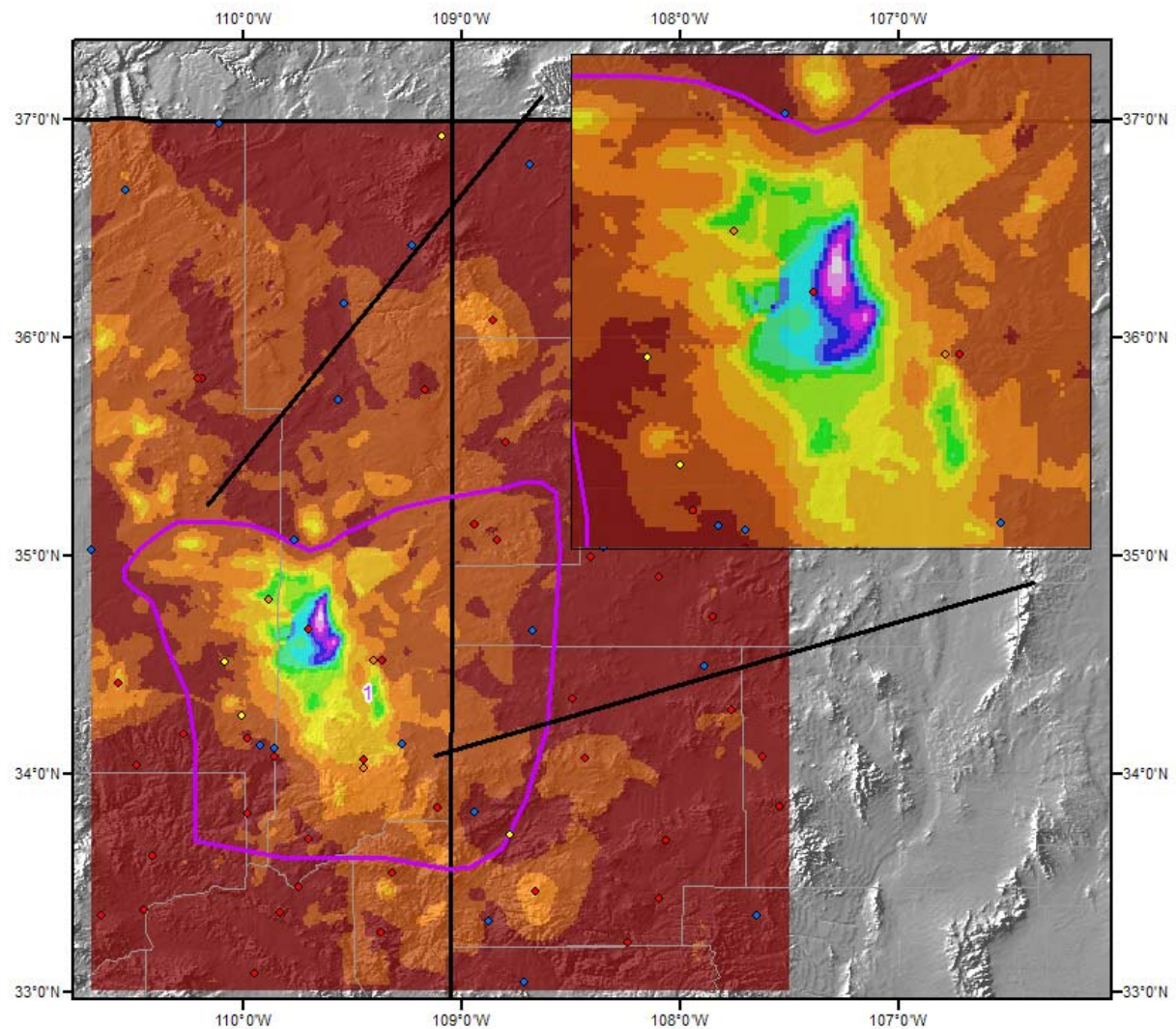
Storm 1113 - July 27 (0000 UTC) - July 28 (0900 UTC), 2007												
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)												
Area (mi ²)	Duration (hours)											
	1	2	3	4	5	6	12	18	24	36	48	Total
0.4	5.94	6.39	6.39	6.39	6.39	6.39	6.39	6.39	6.89	7.18	7.18	7.18
1	5.83	6.21	6.29	6.29	6.29	6.29	6.29	6.29	6.72	7.03	7.03	7.03
10	5.65	6.12	6.13	6.13	6.13	6.13	6.13	6.13	6.63	6.89	6.89	6.89
25	5.30	5.77	5.83	5.83	5.83	5.84	5.84	5.84	6.36	6.59	6.59	6.59
50	4.84	5.29	5.50	5.50	5.50	5.52	5.52	5.52	6.03	6.26	6.26	6.26
100	4.21	4.60	5.01	5.01	5.01	5.03	5.04	5.05	5.38	5.79	5.79	5.79
150	3.77	4.21	4.58	4.58	4.58	4.62	4.62	4.62	4.95	5.41	5.41	5.41
200	3.42	3.82	4.22	4.22	4.22	4.25	4.26	4.26	4.71	5.13	5.13	5.13
300	2.87	3.32	3.44	3.44	3.44	3.66	3.70	3.70	4.27	4.66	4.66	4.66
400	2.54	2.78	3.11	3.11	3.11	3.20	3.21	3.25	3.36	4.29	4.29	4.29
500	2.29	2.58	2.65	2.65	2.65	2.67	2.67	3.02	3.36	4.05	4.05	4.05
1,000	1.65	1.66	1.90	1.90	1.90	2.03	2.17	2.17	2.45	3.26	3.26	3.26
2,000	1.35	1.35	1.35	1.35	1.35	1.45	1.45	1.45	2.10	2.48	2.48	2.48
5,000	0.46	0.48	0.48	0.48	0.48	1.02	1.11	1.11	1.19	1.61	1.61	1.61
10,000	0.07	0.13	0.29	0.29	0.29	0.63	0.72	0.72	0.85	1.07	1.07	1.07
10,451	0.06	0.11	0.16	0.16	0.16	0.30	0.34	0.69	0.82	1.03	1.03	1.03



CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



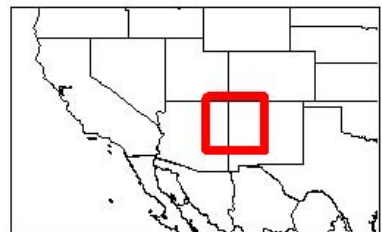
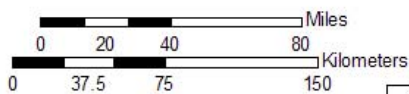
Total 34-hour Precipitation
SPAS # 1113 (Petrified Forest July 2007 Storm)
July 27, 2007 0000 UTC - July 28, 2007 0900 UTC

Gauges

- ◆ Daily
- ◆ Hourly
- ◆ Hourly Estimated
- ◆ Hourly Pseudo
- ◆ Supplemental

Precipitation (inches)

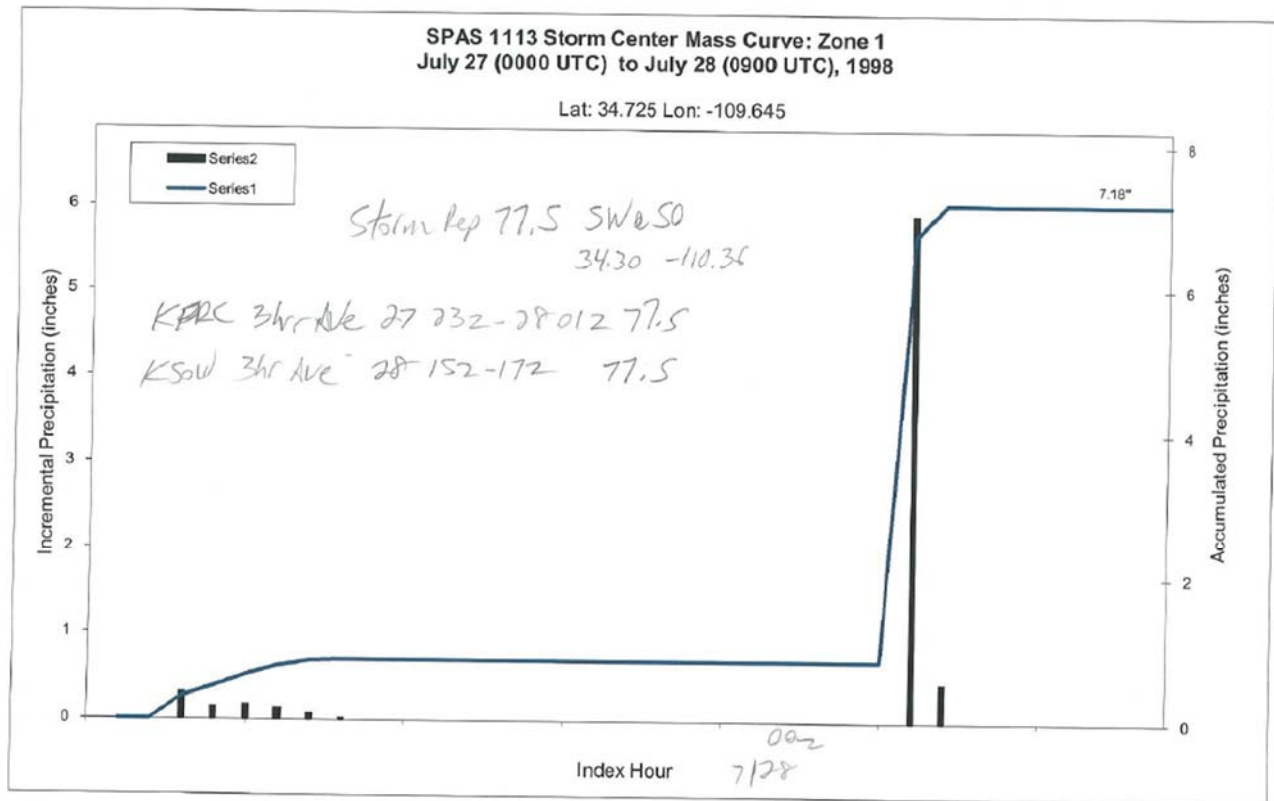
0.00 - 0.50	2.51 - 3.00	5.01 - 5.50
0.51 - 1.00	3.01 - 3.50	5.51 - 6.00
1.01 - 1.50	3.51 - 4.00	6.01 - 6.50
1.51 - 2.00	4.01 - 4.50	6.51 - 7.00
2.01 - 2.50	4.51 - 5.00	7.01 - 7.50



MetastatA VWR September 9, 2010



CO-NM Regional Extreme Precipitation Study



Havasupi, AZ

August 15-18, 2008

Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1128_2

General Storm Location: Havasupai, Arizona

Storm Dates: August 15 (2100) -18 (0000), 2008

Event: Thunderstorms

DAD Zone 2:

Latitude: 35.155

Longitude: -112.575

Max. Grid/Radar Rainfall Amount: 4.49"

Max. Observed Rainfall Amount: NA

Number of Stations: 154 (39-daily, 108-hourly, 7-supplemental)

SPAS Version: 8.5

Base Map Used: Yes, dynamic hourly ZR precipitation based on default ZR relationship

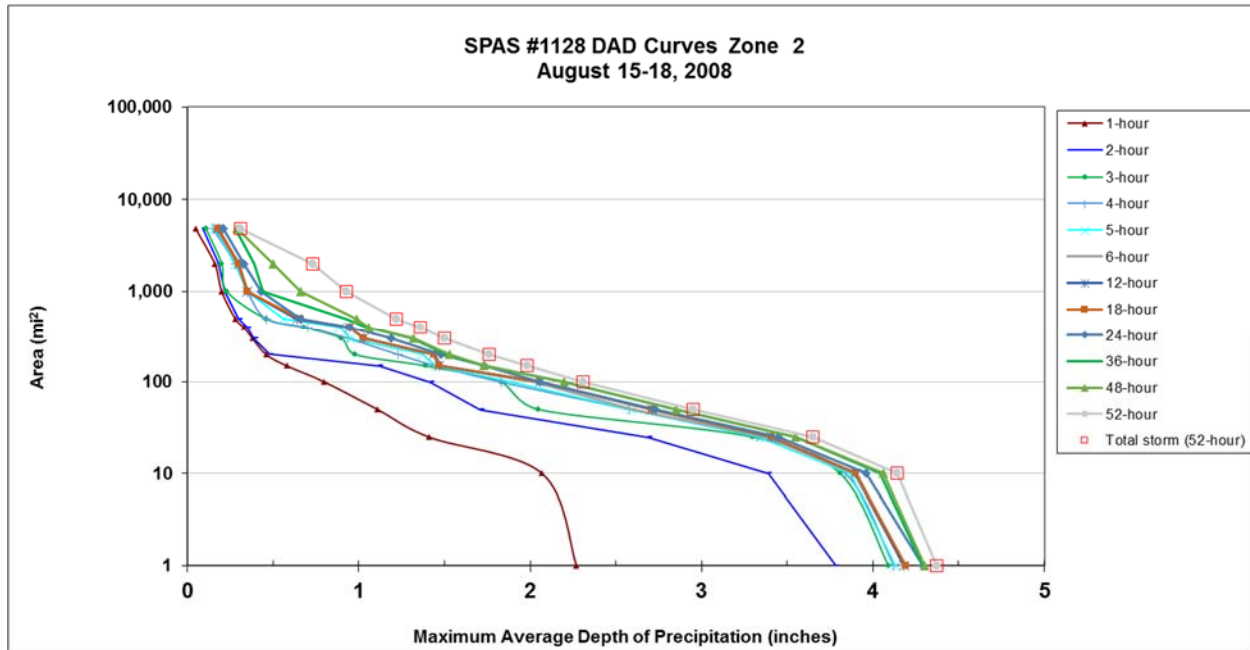
Spatial resolution: 0.39 mi²

Radar Included: Yes

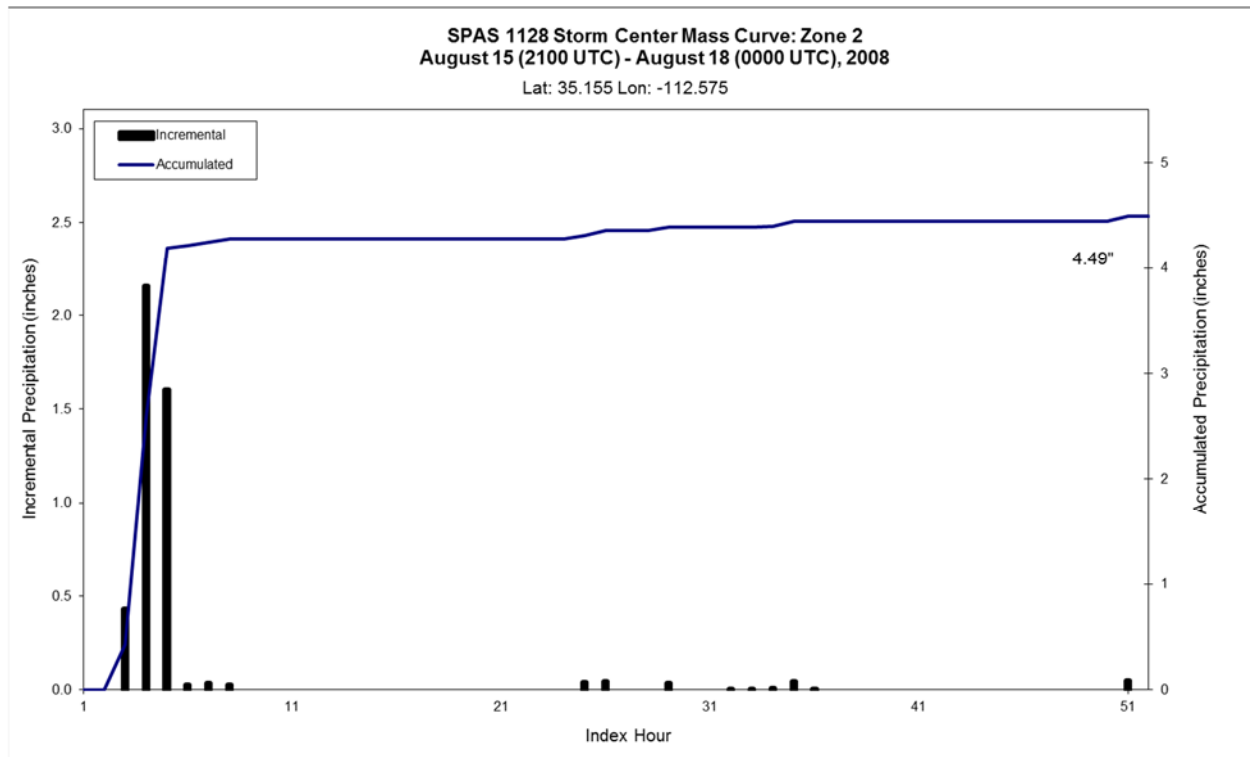
Depth-Area-Duration (DAD) analysis: Yes, 1, 2, 3, 4, 5, 6 12, 18, 24, 36, 48, and 52 –hours

CO-NM Regional Extreme Precipitation Study

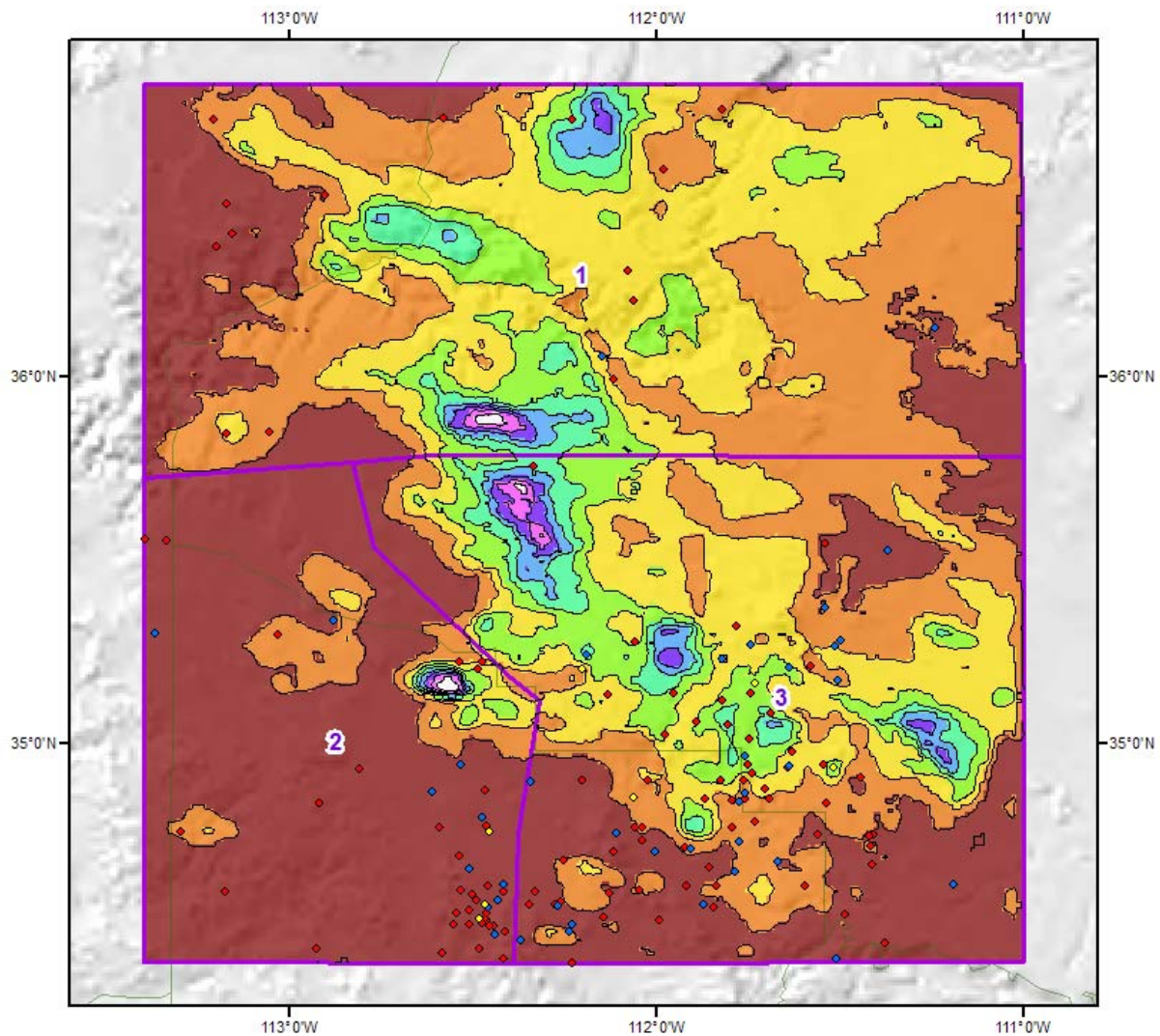
Storm 1128 - August 15 (2100 UTC) - August 18 (0000 UTC), 2008													
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)													
Area (mi ²)	Duration (hours)												
	1	2	3	4	5	6	12	18	24	36	48	52	Total
0.39	2.33	3.89	4.19	4.22	4.25	4.28	4.28	4.28	4.36	4.45	4.45	4.49	4.49
1	2.27	3.78	4.09	4.12	4.13	4.18	4.18	4.19	4.29	4.29	4.30	4.37	4.37
10	2.07	3.39	3.81	3.84	3.87	3.89	3.90	3.90	3.96	4.04	4.06	4.14	4.14
25	1.41	2.69	3.30	3.33	3.34	3.38	3.41	3.41	3.45	3.55	3.55	3.65	3.65
50	1.11	1.71	2.05	2.58	2.59	2.60	2.71	2.71	2.73	2.85	2.85	2.95	2.95
100	0.80	1.42	1.83	1.83	1.90	2.03	2.06	2.06	2.06	2.20	2.20	2.31	2.31
150	0.58	1.12	1.39	1.45	1.45	1.47	1.47	1.47	1.73	1.73	1.73	1.98	1.98
200	0.46	0.48	0.98	1.23	1.37	1.44	1.44	1.44	1.48	1.51	1.53	1.76	1.76
300	0.38	0.39	0.90	0.94	0.95	1.03	1.03	1.03	1.19	1.31	1.32	1.50	1.50
400	0.33	0.35	0.68	0.70	0.89	0.95	0.95	0.95	0.95	1.05	1.06	1.36	1.36
500	0.28	0.30	0.46	0.46	0.56	0.64	0.64	0.66	0.66	0.93	0.99	1.22	1.22
1,000	0.20	0.22	0.23	0.35	0.35	0.35	0.35	0.35	0.43	0.44	0.66	0.93	0.93
2,000	0.16	0.18	0.20	0.28	0.28	0.29	0.30	0.30	0.33	0.39	0.50	0.73	0.73
4,768	0.05	0.09	0.11	0.15	0.16	0.17	0.18	0.18	0.21	0.28	0.29	0.31	0.31



CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



Total Rainfall (52-hours)
SPAS Storm # 1128
August 15 (2100 UTC) to 18 (0000 UTC), 2008

Gauges

- ◆ Daily
- ◆ Hourly
- ◆ Supplemental



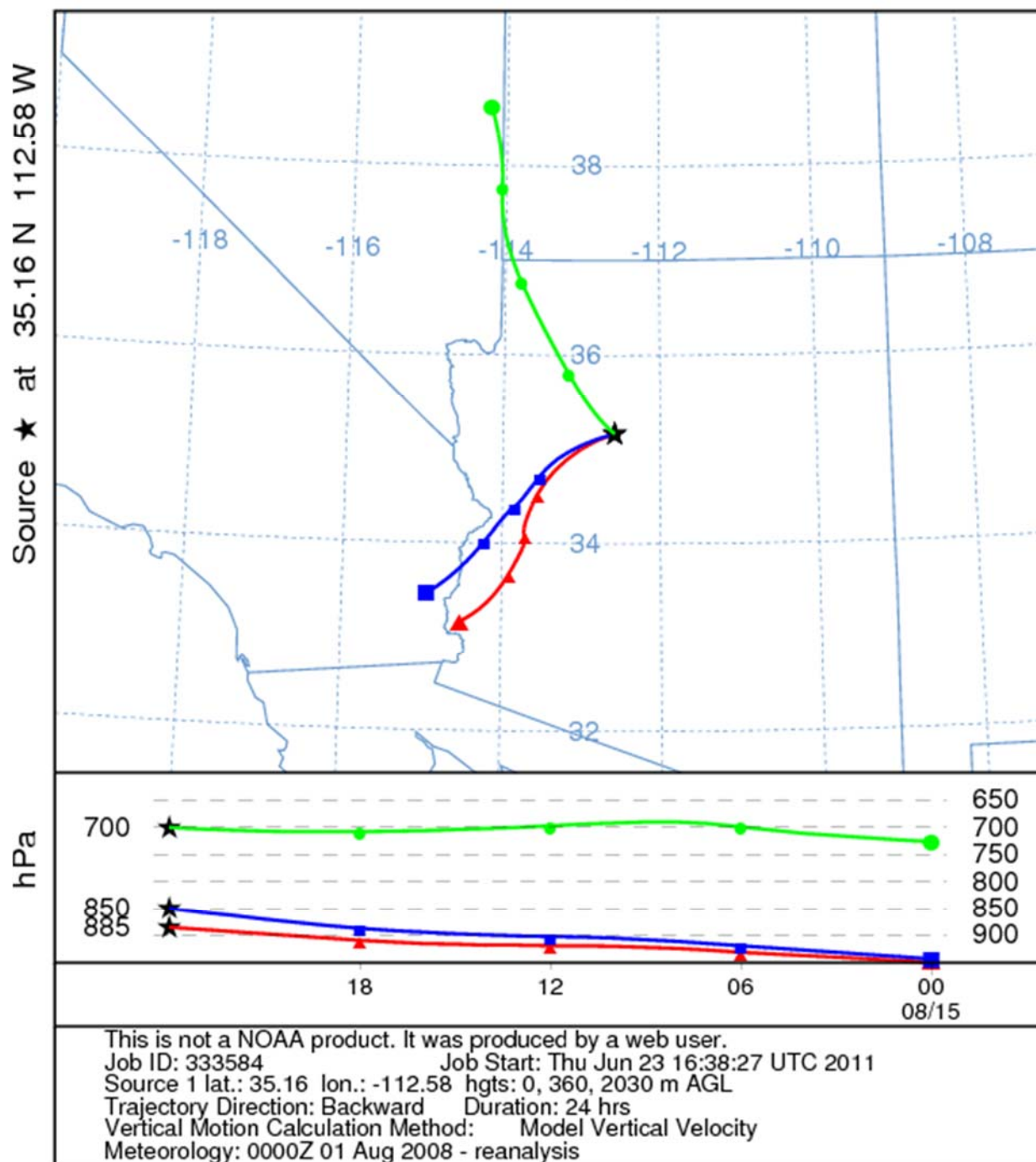
Precipitation (inches)

- | | | |
|-------------|-------------|-------------|
| 0.00 - 0.50 | 1.51 - 2.00 | 3.01 - 3.50 |
| 0.51 - 1.00 | 2.01 - 2.50 | 3.51 - 4.00 |
| 1.01 - 1.50 | 2.51 - 3.00 | 4.01 - 4.50 |

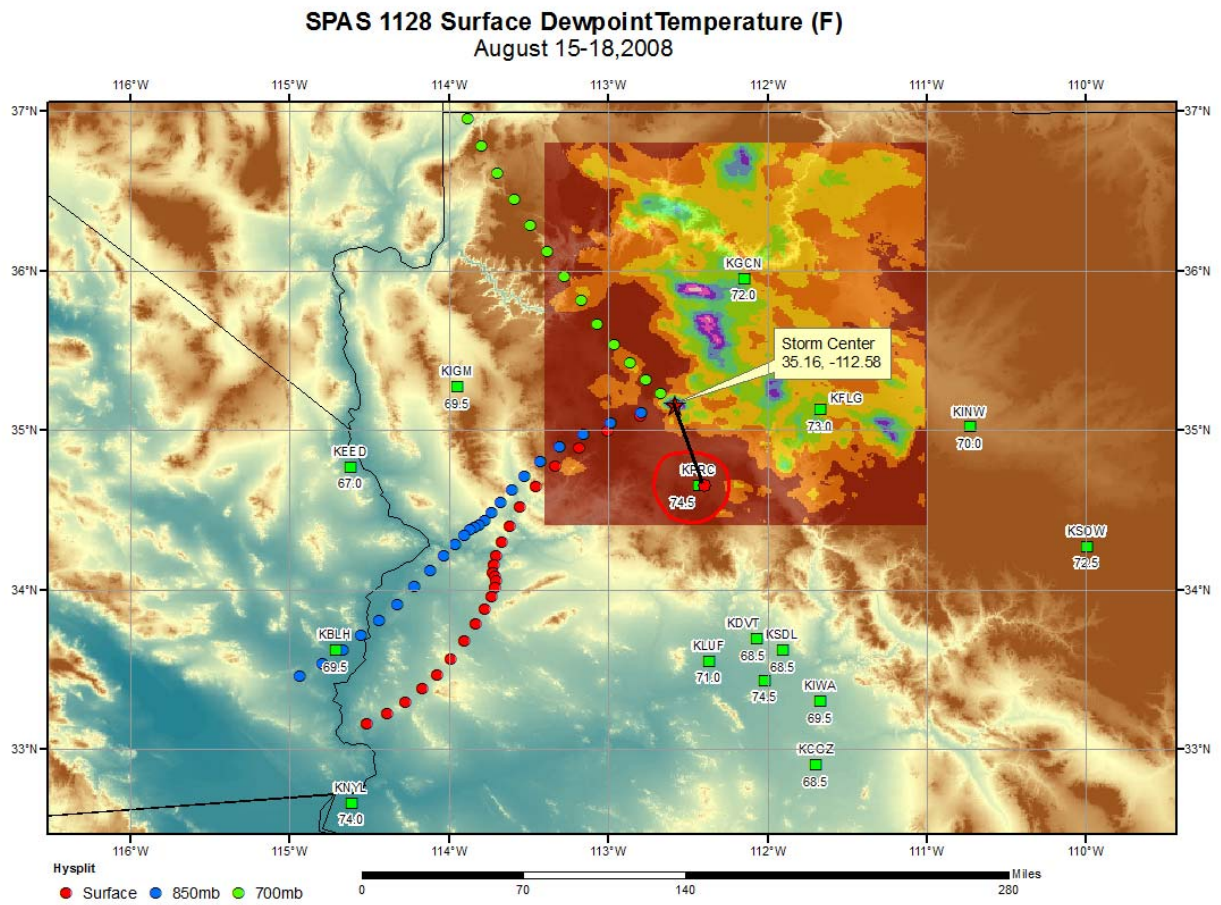


MetSIS/AVR March 10, 2010

NOAA HYSPLIT MODEL
Backward trajectories ending at 0000 UTC 16 Aug 08
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study



Spearman, TX

June 12-13, 2010

Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1595_1

General Storm Location: Spearman, Texas (38.2, -103.0, 35.0, -99.4)

Storm Dates: June 12-13, 2010 (48-hours)

Event: Convective

DAD Zone 1

Latitude: 36.1350

Longitude: -101.4950

Max. Grid Rainfall Amount: 13.89" Gruver, TX

Max. Observed Rainfall Amount: 9.72"

Number of Stations: 196

SPAS Version: 10.0

Basemap: conus_prism_ppt_in_1981_2010_06

Spatial resolution: 0.01 decimal degree (0.403-sqmi)

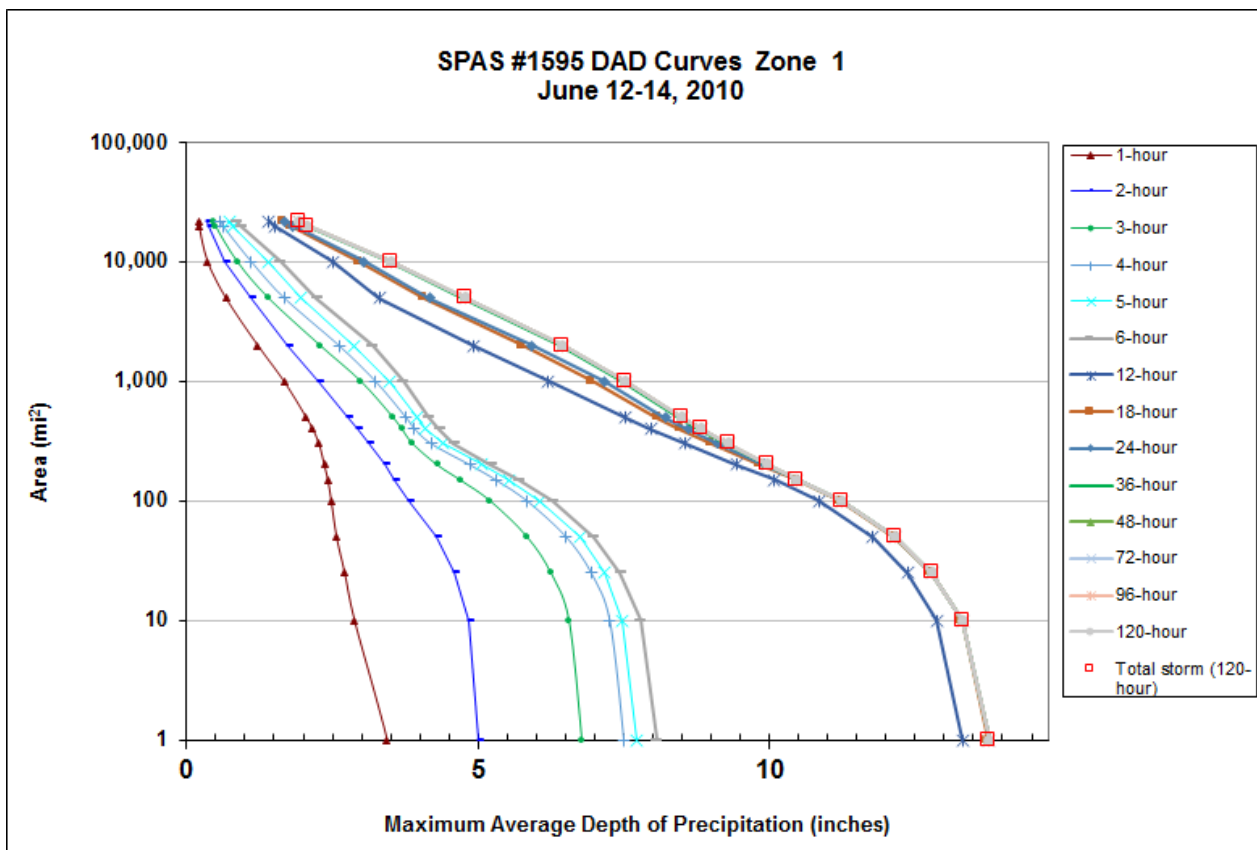
Radar Included: Yes

Depth-Area-Duration (DAD) analysis: Yes

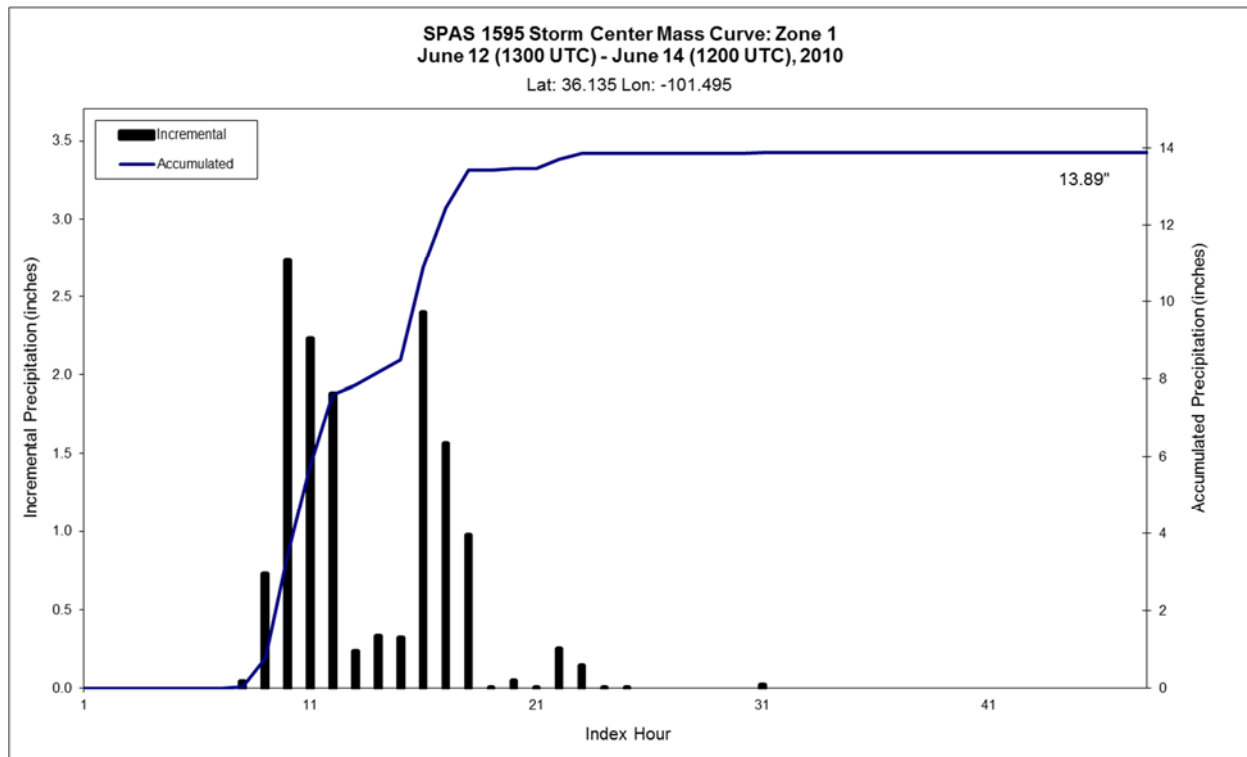
Reliability of results: This analysis was based on 196 hourly stations, daily data, supplemental station data, and radar data. We have a good degree of confidence for the station based storm total results. The spatial pattern is dependent on the radar data, gauge data, and basemap. There is a good degree of confidence with the timing based on the hourly stations near the storm center. Some daily stations were moved to supplemental due to timing issues.

CO-NM Regional Extreme Precipitation Study

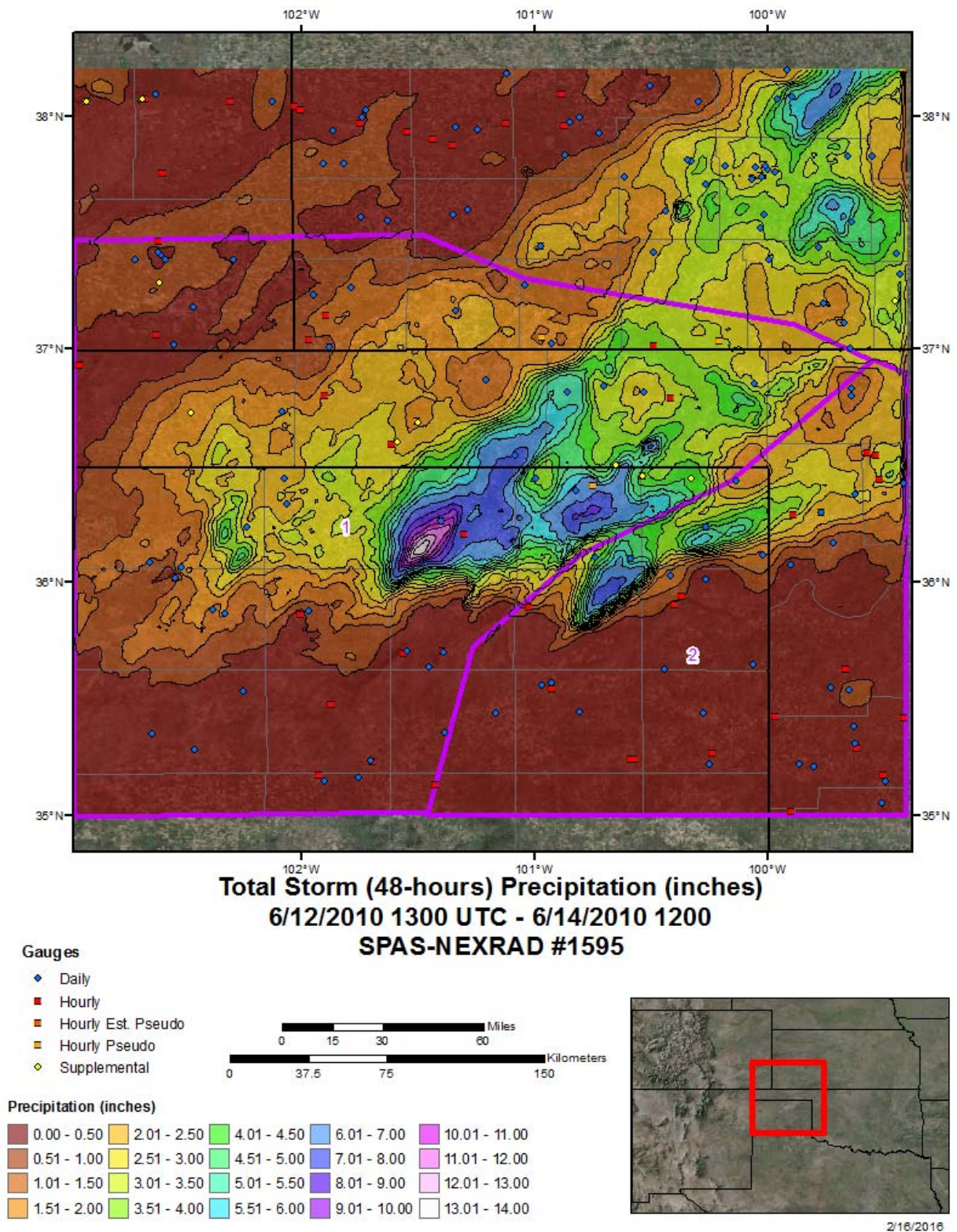
Storm 1595 - June 12 (1300 UTC) - June 14 (1200 UTC), 2010														
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
Area (mi ²)	Duration (hours)													
	1	2	3	4	5	6	12	18	24	36	48	72	96	120
0.4	3.55	5.06	6.84	7.56	7.80	8.13	13.43	13.87	13.89	13.89	13.89	13.89	13.89	13.89
1	3.44	5.02	6.78	7.50	7.73	8.06	13.31	13.75	13.77	13.77	13.77	13.77	13.77	13.77
10	2.88	4.83	6.56	7.26	7.48	7.79	12.87	13.30	13.32	13.32	13.32	13.32	13.32	13.32
25	2.71	4.59	6.25	6.94	7.16	7.44	12.37	12.77	12.79	12.79	12.79	12.79	12.79	12.79
50	2.57	4.28	5.84	6.51	6.75	6.98	11.78	12.15	12.16	12.16	12.16	12.16	12.16	12.16
100	2.48	3.81	5.21	5.84	6.06	6.28	10.85	11.20	11.23	11.23	11.23	11.23	11.23	11.23
150	2.42	3.57	4.69	5.30	5.52	5.69	10.08	10.46	10.48	10.48	10.48	10.48	10.48	10.48
200	2.36	3.41	4.30	4.86	5.07	5.22	9.44	9.83	9.91	9.96	9.97	9.97	9.97	9.97
300	2.27	3.12	3.88	4.20	4.41	4.58	8.56	9.00	9.12	9.27	9.29	9.29	9.29	9.29
400	2.16	2.92	3.69	3.91	4.08	4.33	7.97	8.47	8.60	8.80	8.84	8.84	8.84	8.84
500	2.05	2.76	3.54	3.76	3.94	4.15	7.54	8.08	8.22	8.46	8.50	8.50	8.50	8.50
1,000	1.67	2.25	2.99	3.24	3.48	3.71	6.21	6.95	7.16	7.46	7.52	7.52	7.52	7.52
2,000	1.22	1.73	2.29	2.61	2.88	3.18	4.92	5.76	5.93	6.40	6.46	6.46	6.46	6.46
5,000	0.67	1.09	1.40	1.67	1.96	2.23	3.31	4.07	4.17	4.74	4.79	4.79	4.79	4.79
10,000	0.36	0.66	0.87	1.11	1.39	1.60	2.51	2.95	3.04	3.47	3.50	3.50	3.50	3.50
20,000	0.21	0.37	0.49	0.62	0.80	0.93	1.51	1.79	1.82	2.05	2.07	2.07	2.07	2.07
21,710	0.20	0.34	0.45	0.58	0.74	0.86	1.41	1.65	1.69	1.92	1.94	1.94	1.94	1.94



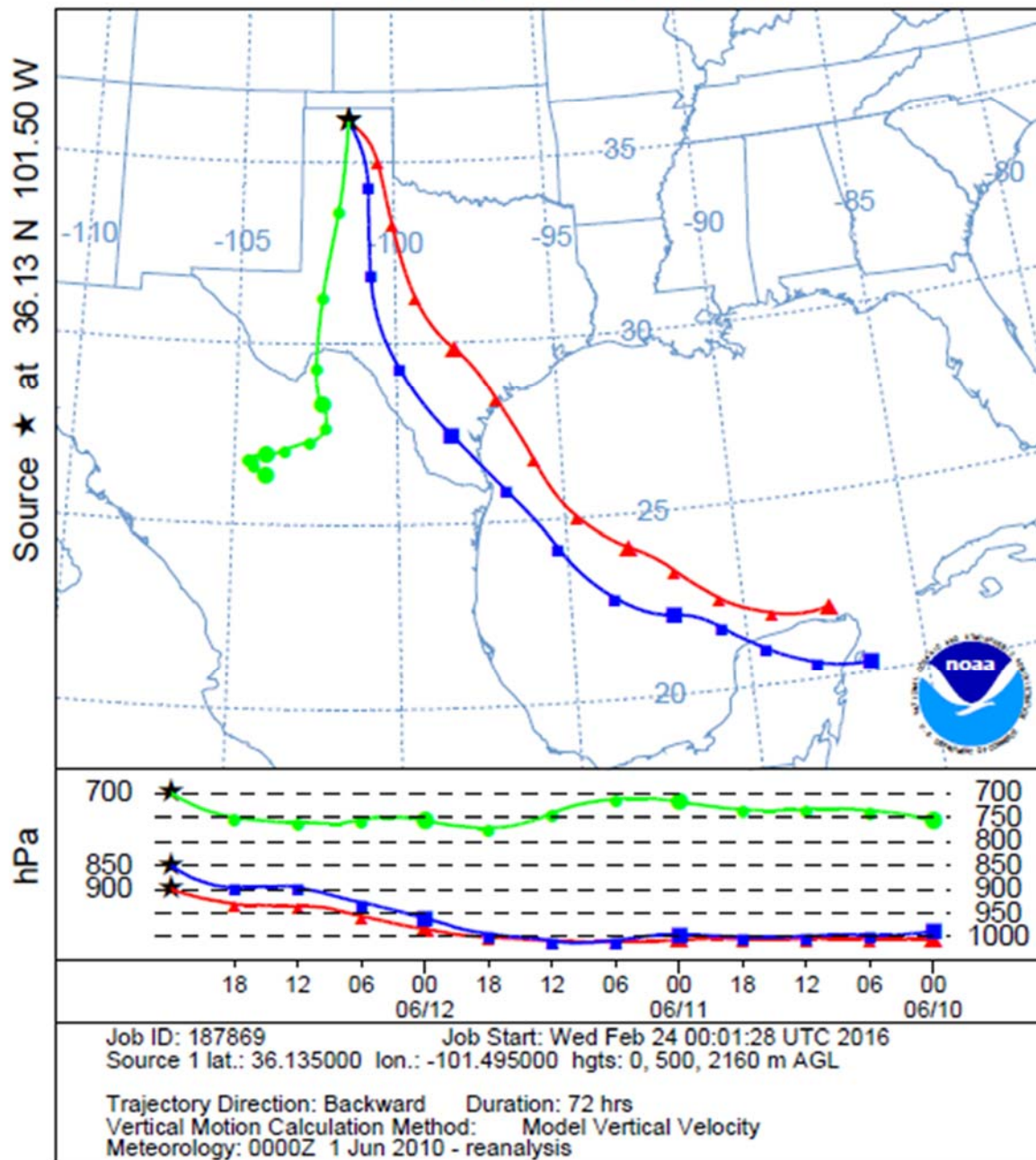
CO-NM Regional Extreme Precipitation Study



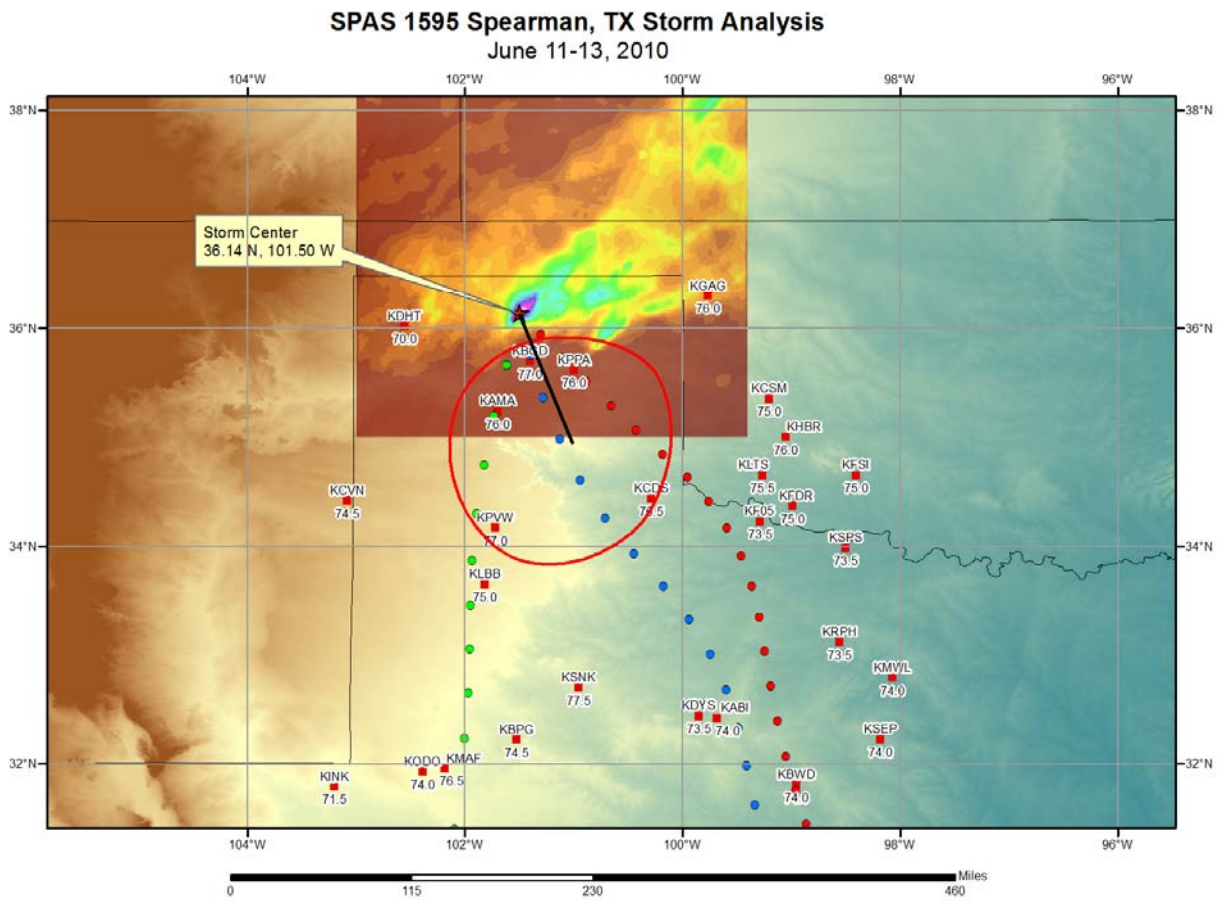
CO-NM Regional Extreme Precipitation Study



NOAA HYSPLIT MODEL
Backward trajectories ending at 0000 UTC 13 Jun 10
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study



Gail, TX
September 20-21, 2014
Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1557_1

General Storm Location: Gail, Texas (34.2, -103.0, 31.4, -100.0)

Storm Dates: September 20-21, 2014 (24-hours)

Event: Convective

DAD Zone 1

Latitude: 32.7250

Longitude: -101.4050

Max. Grid Rainfall Amount: 13.96"

Max. Observed Rainfall Amount: 10.82" Gail, TX

Number of Stations: 176

SPAS Version: 10.0

Basemap: Blended basemap based on default ZR precipitation and
conus_prism_ppt_in_1981_2010_09

Spatial resolution: 0.01 decimal degree (0.403-sqmi)

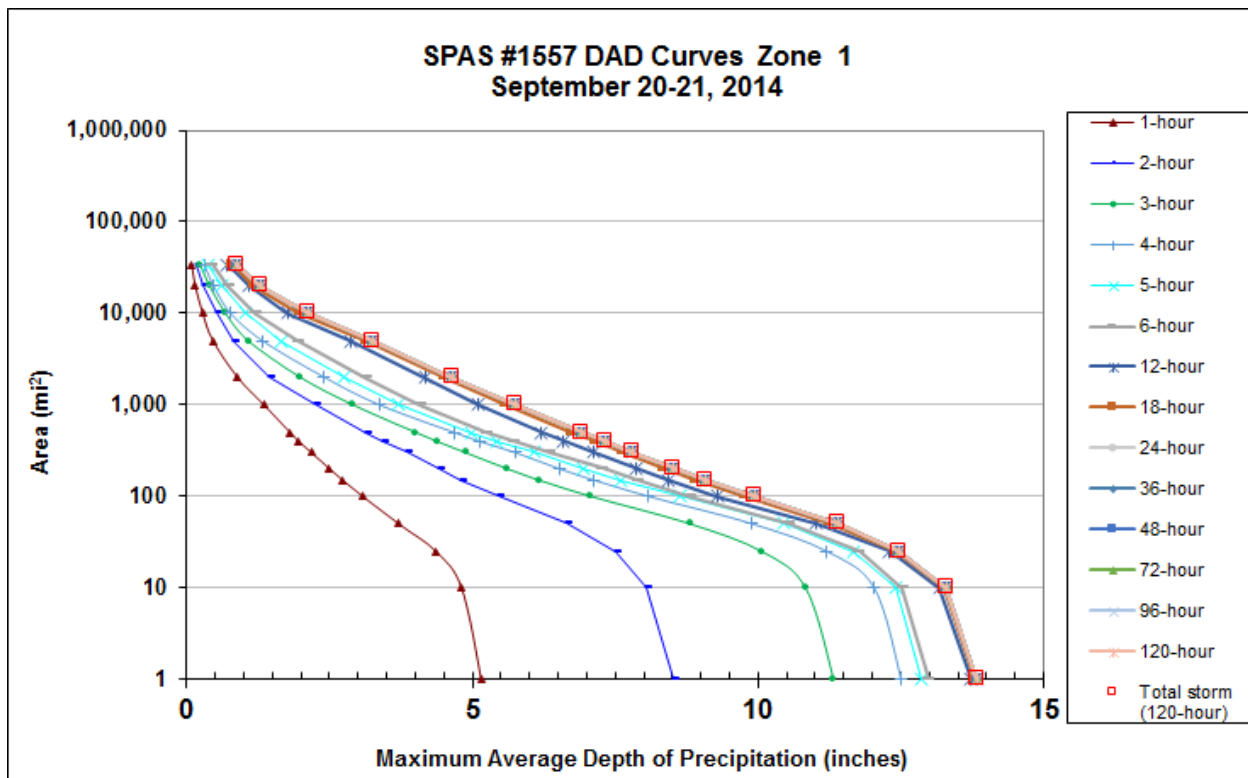
Radar Included: Yes

Depth-Area-Duration (DAD) analysis: Yes

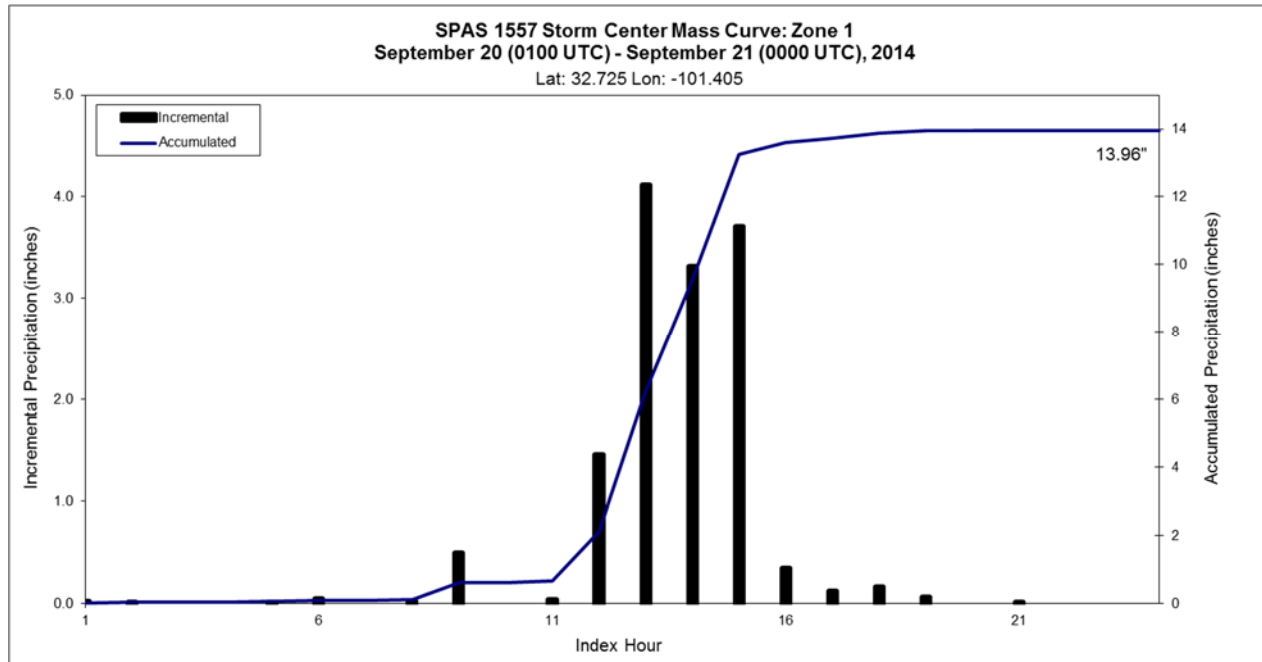
Reliability of results: This analysis was based on 176 hourly stations, daily data, supplemental station data, and radar data. We have a good degree of confidence for the station based storm total results. The spatial pattern is dependent on the radar data, gauge data, and basemap. There is a good degree of confidence with the timing based on the hourly stations near the storm center. Some daily stations were moved to supplemental due to timing issues.

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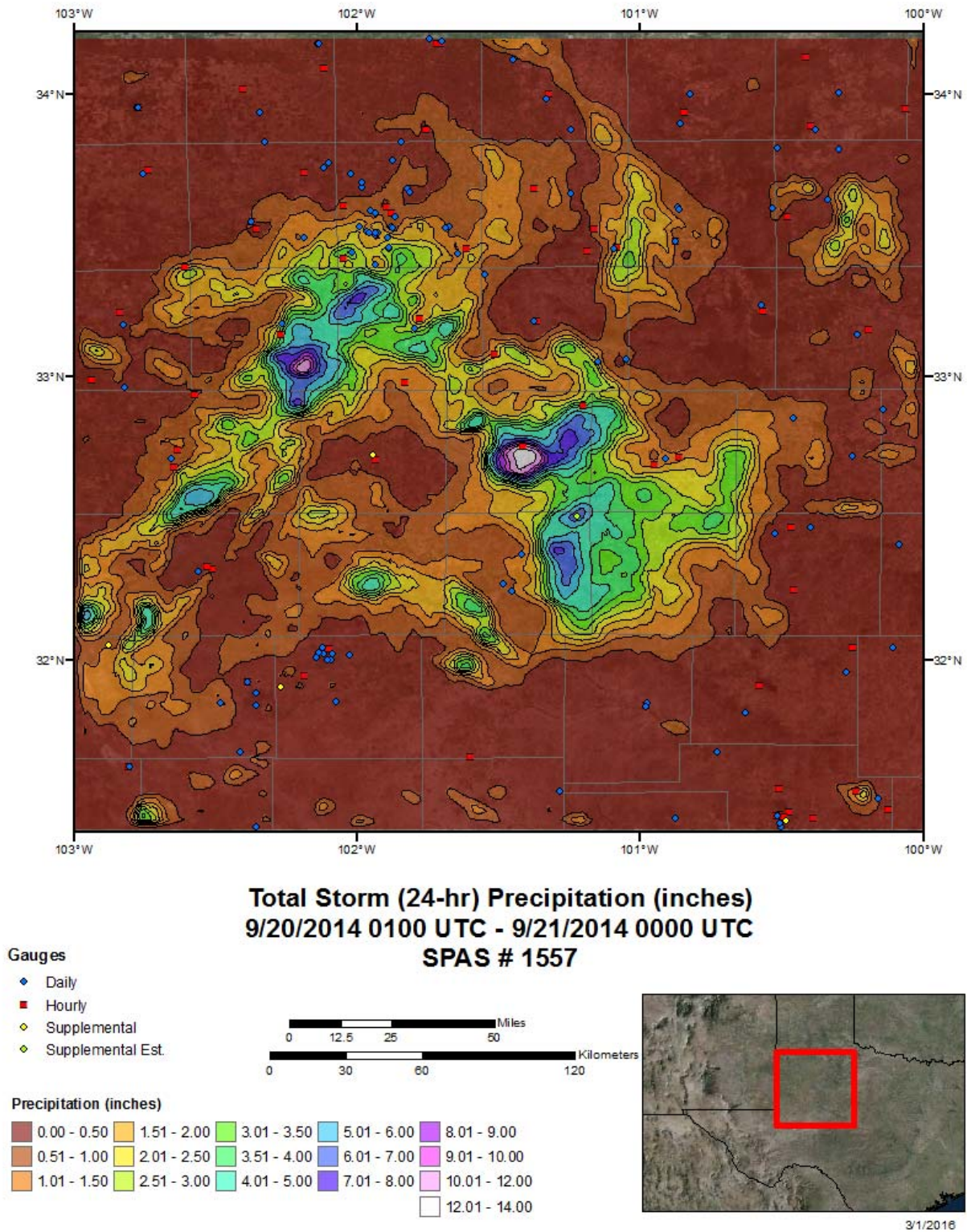
Storm 1557 - September 20 (0100 UTC) - September 21 (0000 UTC), 2014															
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)															
Area (mi ²)	Duration (hours)														
	1	2	3	4	5	6	12	18	24	36	48	72	96	120	Total
0.4	5.21	8.60	11.44	12.60	12.96	13.07	13.84	13.92	13.96	13.96	13.96	13.96	13.96	13.96	13.96
1	5.15	8.51	11.32	12.50	12.87	12.98	13.72	13.78	13.83	13.83	13.83	13.83	13.83	13.83	13.83
10	4.81	8.04	10.83	12.03	12.42	12.52	13.18	13.26	13.30	13.30	13.30	13.30	13.30	13.30	13.30
25	4.36	7.52	10.06	11.20	11.66	11.76	12.30	12.40	12.47	12.47	12.47	12.47	12.47	12.47	12.47
50	3.71	6.66	8.81	9.90	10.45	10.55	11.03	11.26	11.41	11.41	11.41	11.41	11.41	11.41	11.41
100	3.08	5.45	7.07	8.08	8.65	8.81	9.29	9.77	9.95	9.95	9.95	9.95	9.95	9.95	9.95
150	2.73	4.82	6.17	7.13	7.60	7.89	8.42	8.90	9.07	9.07	9.07	9.07	9.07	9.07	9.07
200	2.50	4.41	5.61	6.52	6.93	7.28	7.86	8.34	8.52	8.52	8.52	8.52	8.52	8.52	8.52
300	2.18	3.86	4.88	5.75	6.08	6.36	7.13	7.63	7.80	7.80	7.80	7.80	7.80	7.80	7.80
400	1.96	3.44	4.38	5.12	5.44	5.72	6.60	7.14	7.32	7.32	7.32	7.32	7.32	7.32	7.32
500	1.81	3.15	4.01	4.68	4.98	5.25	6.21	6.73	6.92	6.92	6.92	6.92	6.92	6.92	6.92
1,000	1.35	2.26	2.91	3.37	3.71	4.08	5.11	5.58	5.77	5.77	5.77	5.77	5.77	5.77	5.77
2,000	0.89	1.46	1.99	2.41	2.77	3.13	4.17	4.52	4.65	4.65	4.65	4.65	4.65	4.65	4.65
5,000	0.46	0.81	1.08	1.33	1.66	1.94	2.87	3.13	3.26	3.26	3.26	3.26	3.26	3.26	3.26
10,000	0.28	0.52	0.68	0.77	1.02	1.20	1.76	1.97	2.14	2.14	2.14	2.14	2.14	2.14	2.14
20,000	0.15	0.28	0.40	0.47	0.62	0.73	1.10	1.17	1.29	1.29	1.29	1.29	1.29	1.29	1.29
33,686	0.09	0.17	0.24	0.31	0.37	0.44	0.71	0.80	0.88	0.88	0.88	0.88	0.88	0.88	0.88



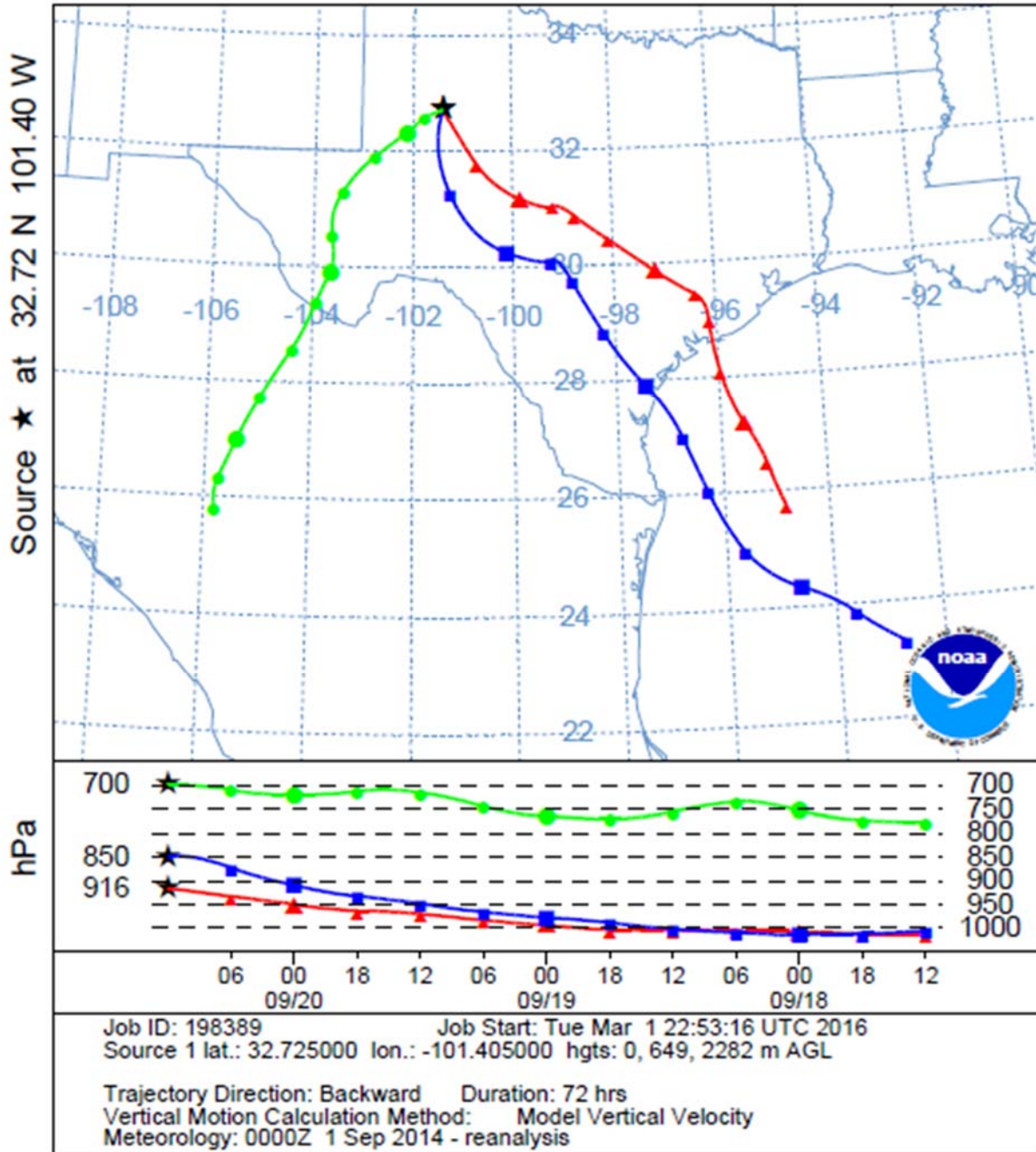
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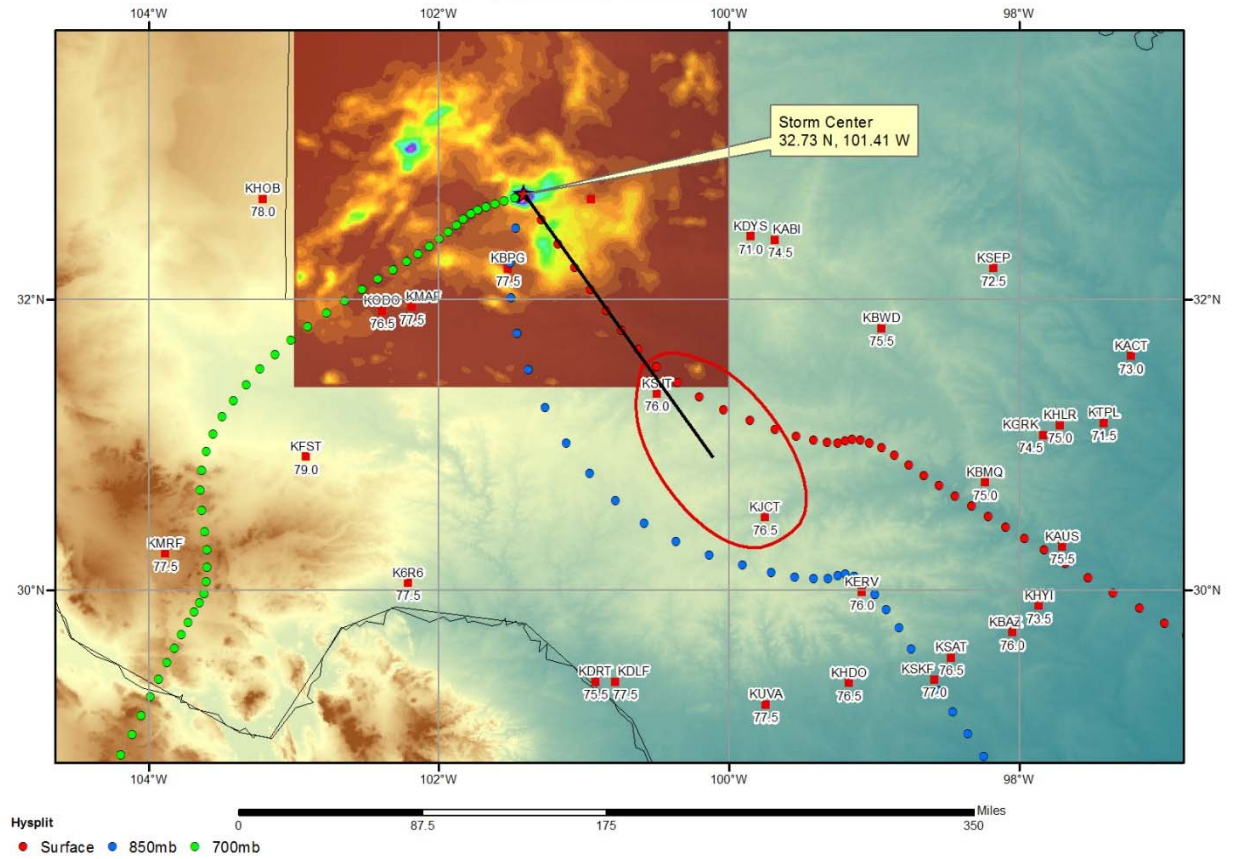


NOAA HYSPLIT MODEL
Backward trajectories ending at 1200 UTC 20 Sep 14
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study

SPAS 1557 Gail, TX Storm Analysis September 18-20, 2014



Tahoka, TX

May 4-6, 2015

Storm Type: Local

Storm Precipitation Analysis System (SPAS) For Storm #1588_1

General Storm Location: Tahoka, Texas (36.0, -104.0, 32.0, -99.5)

Storm Dates: May 4-6, 2015 (36-hours)

Event: Convective

DAD Zone 1

Latitude: 33.105

Longitude: -101.825

Max. Grid Rainfall Amount: 10.51" Tahoka, TX

Max. Observed Rainfall Amount: 9.23"

Number of Stations: 280

SPAS Version: 10.0

Basemap: Blended basemap based on default ZR precipitation and

conus_prism_ppt_in_1981_2010_05

Spatial resolution: 0.01 decimal degree (0.395-sqmi)

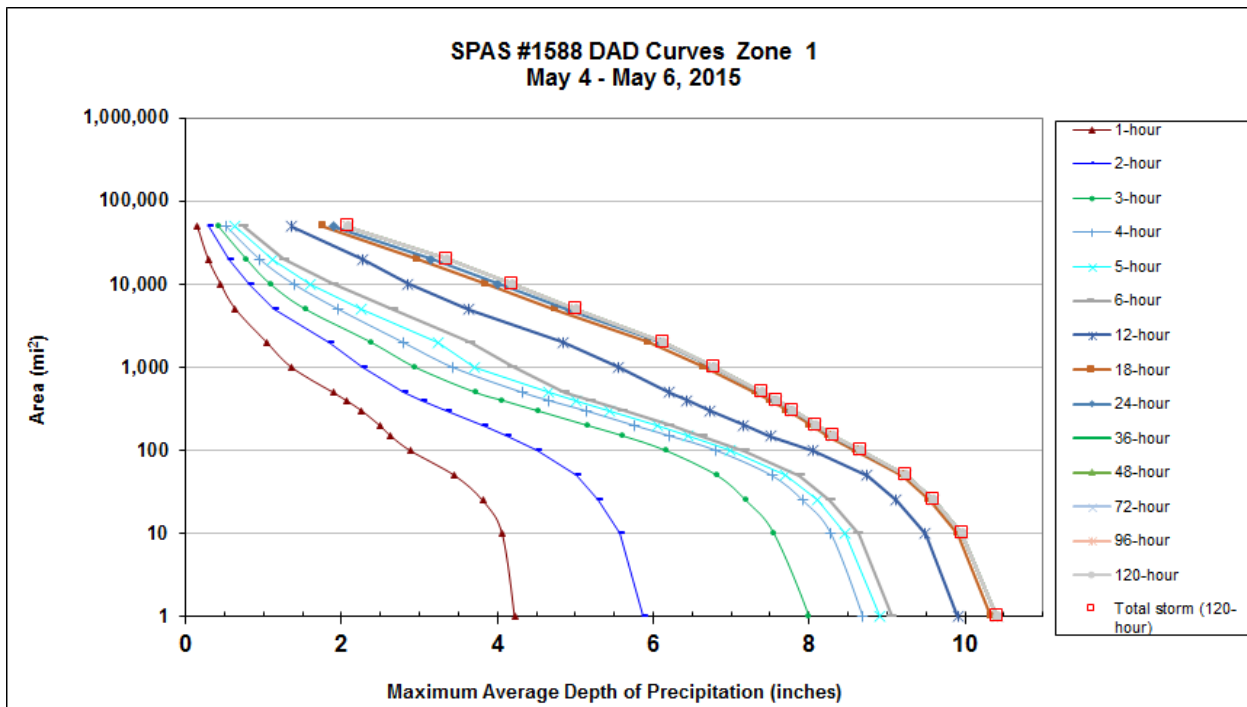
Radar Included: Yes

Depth-Area-Duration (DAD) analysis: Yes

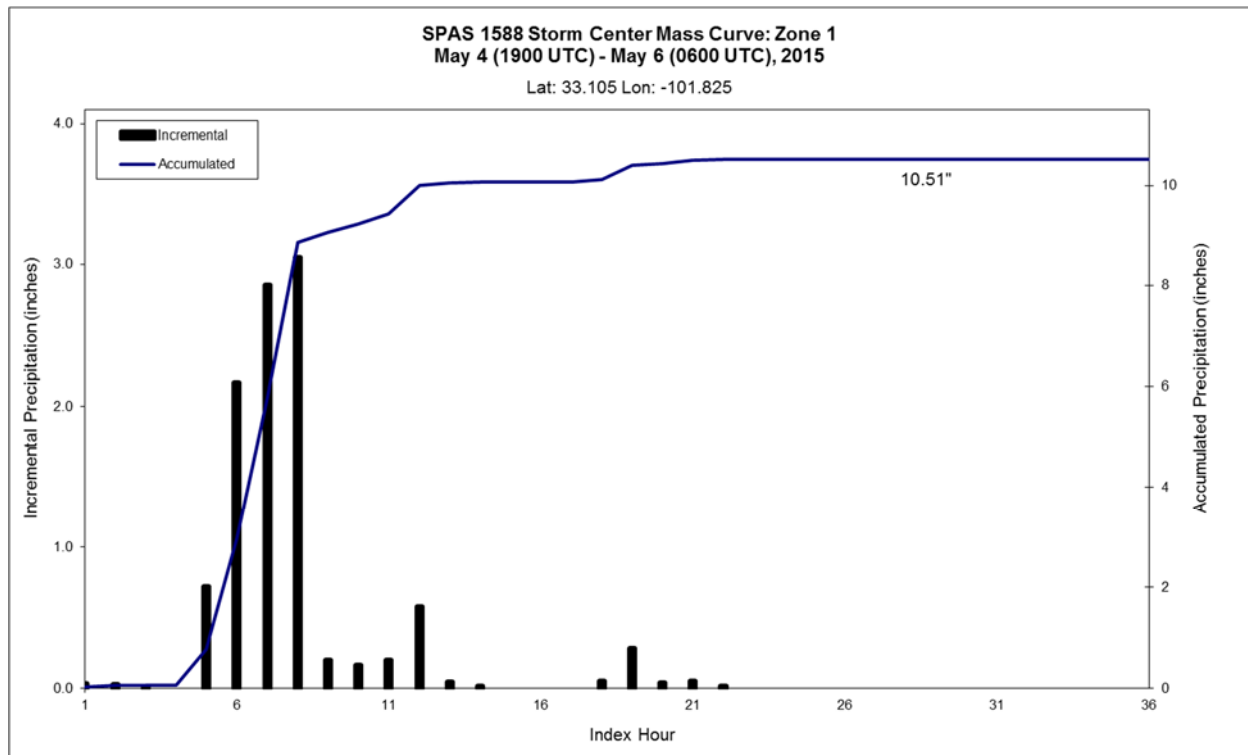
Reliability of results: This analysis was based on 280 hourly stations, daily data, supplemental station data, and radar data. We have a good degree of confidence for the station based storm total results. The spatial pattern is dependent on the radar data, gauge data, and basemap. There is a good degree of confidence with the timing based on the hourly stations near the storm center. Some daily stations were moved to supplemental due to timing issues.

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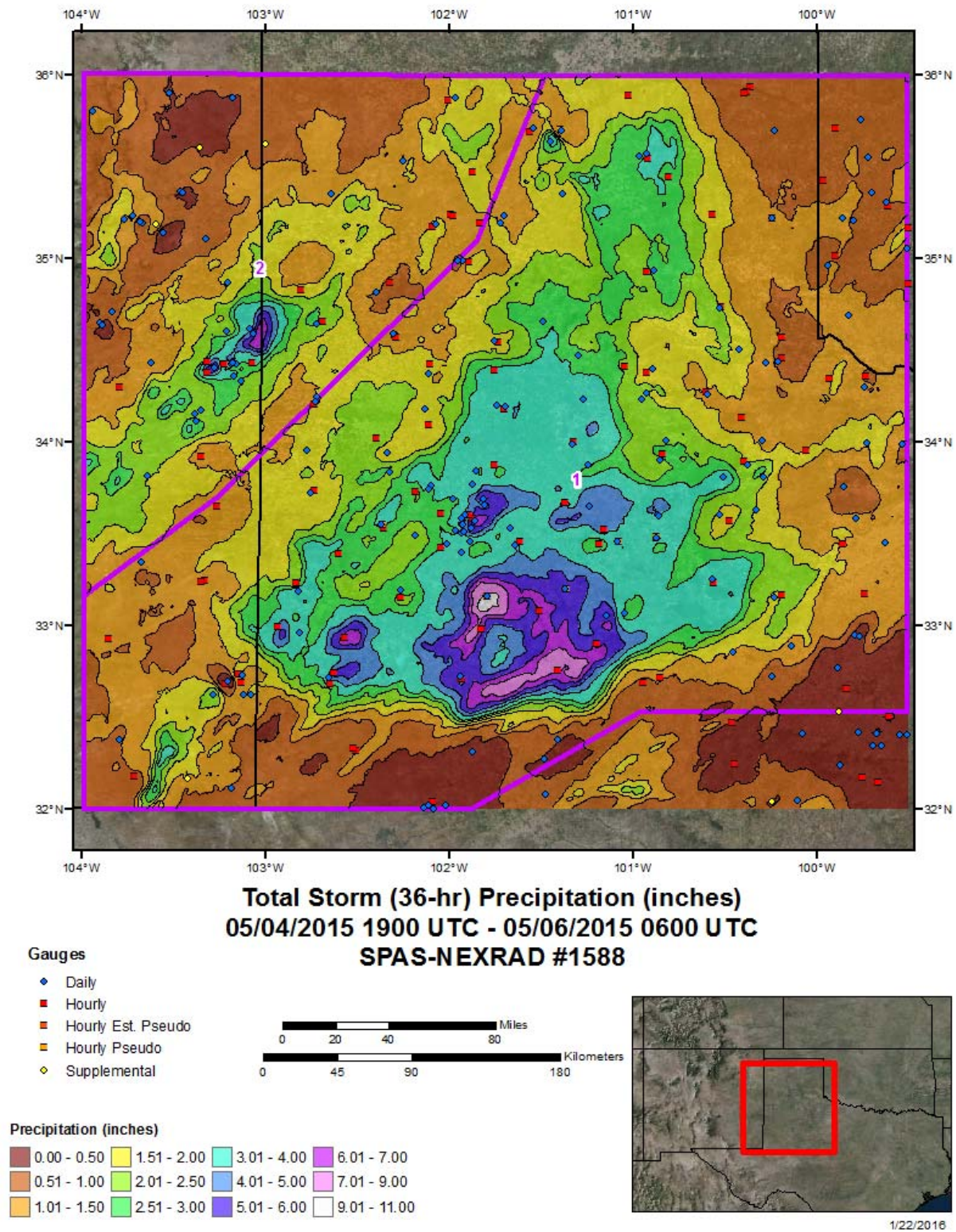
Storm 1588 - May 4 (1900 UTC) - May 6 (0600 UTC), 2015														
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
Area (mi ²)	Duration (hours)													
	1	2	3	4	5	6	12	18	24	36	48	72	96	120
0.4	4.26	5.94	8.08	8.80	9.00	9.16	10.02	10.45	10.51	10.51	10.51	10.51	10.51	10.51
1	4.22	5.87	8.00	8.69	8.90	9.06	9.91	10.34	10.41	10.41	10.41	10.41	10.41	10.41
10	4.06	5.58	7.55	8.28	8.47	8.63	9.49	9.91	9.97	9.97	9.97	9.97	9.97	9.97
25	3.81	5.30	7.19	7.92	8.10	8.27	9.12	9.55	9.60	9.60	9.60	9.60	9.60	9.60
50	3.45	5.02	6.82	7.52	7.69	7.88	8.75	9.20	9.25	9.25	9.25	9.25	9.25	9.25
100	2.88	4.51	6.16	6.81	6.99	7.17	8.06	8.61	8.66	8.67	8.67	8.67	8.67	8.67
150	2.63	4.12	5.61	6.21	6.45	6.63	7.51	8.25	8.31	8.32	8.32	8.32	8.32	8.32
200	2.49	3.82	5.16	5.76	6.05	6.21	7.16	8.02	8.08	8.09	8.09	8.09	8.09	8.09
300	2.26	3.36	4.52	5.14	5.45	5.61	6.72	7.72	7.78	7.79	7.79	7.79	7.79	7.79
400	2.06	3.04	4.07	4.66	5.02	5.19	6.43	7.51	7.57	7.59	7.59	7.59	7.59	7.59
500	1.89	2.79	3.72	4.32	4.66	4.87	6.21	7.32	7.39	7.40	7.40	7.40	7.40	7.40
1,000	1.36	2.27	2.95	3.43	3.71	4.20	5.55	6.65	6.76	6.78	6.78	6.78	6.78	6.78
2,000	1.04	1.84	2.38	2.79	3.24	3.65	4.84	5.94	6.09	6.13	6.13	6.13	6.13	6.13
5,000	0.64	1.14	1.54	1.96	2.26	2.67	3.64	4.75	4.91	5.02	5.02	5.02	5.02	5.02
10,000	0.45	0.82	1.09	1.39	1.61	1.89	2.85	3.85	4.01	4.19	4.19	4.19	4.19	4.19
20,000	0.29	0.56	0.78	0.95	1.11	1.26	2.27	2.98	3.15	3.36	3.36	3.36	3.36	3.36
49,831	0.15	0.29	0.42	0.52	0.63	0.75	1.36	1.77	1.90	2.08	2.08	2.08	2.08	2.08

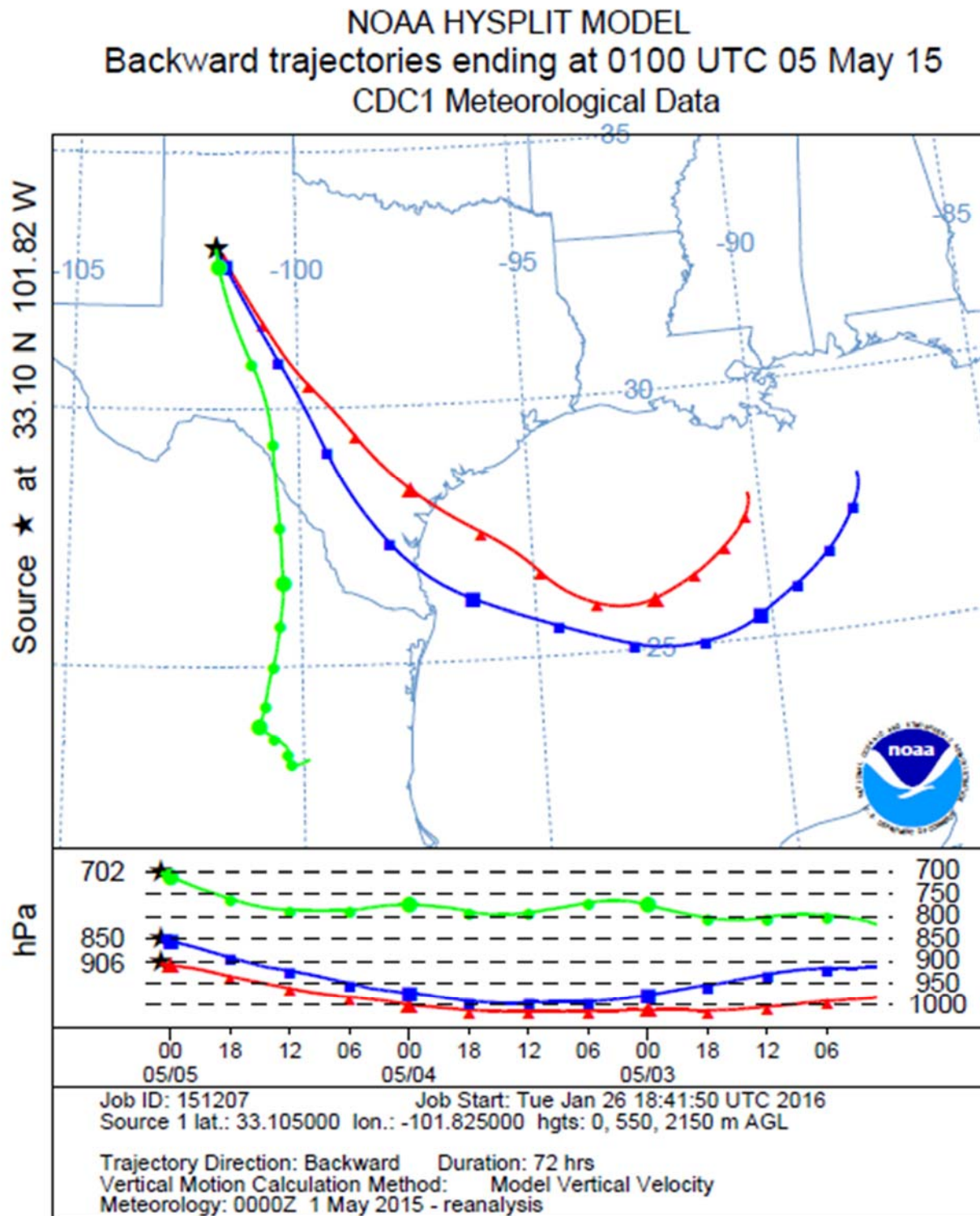


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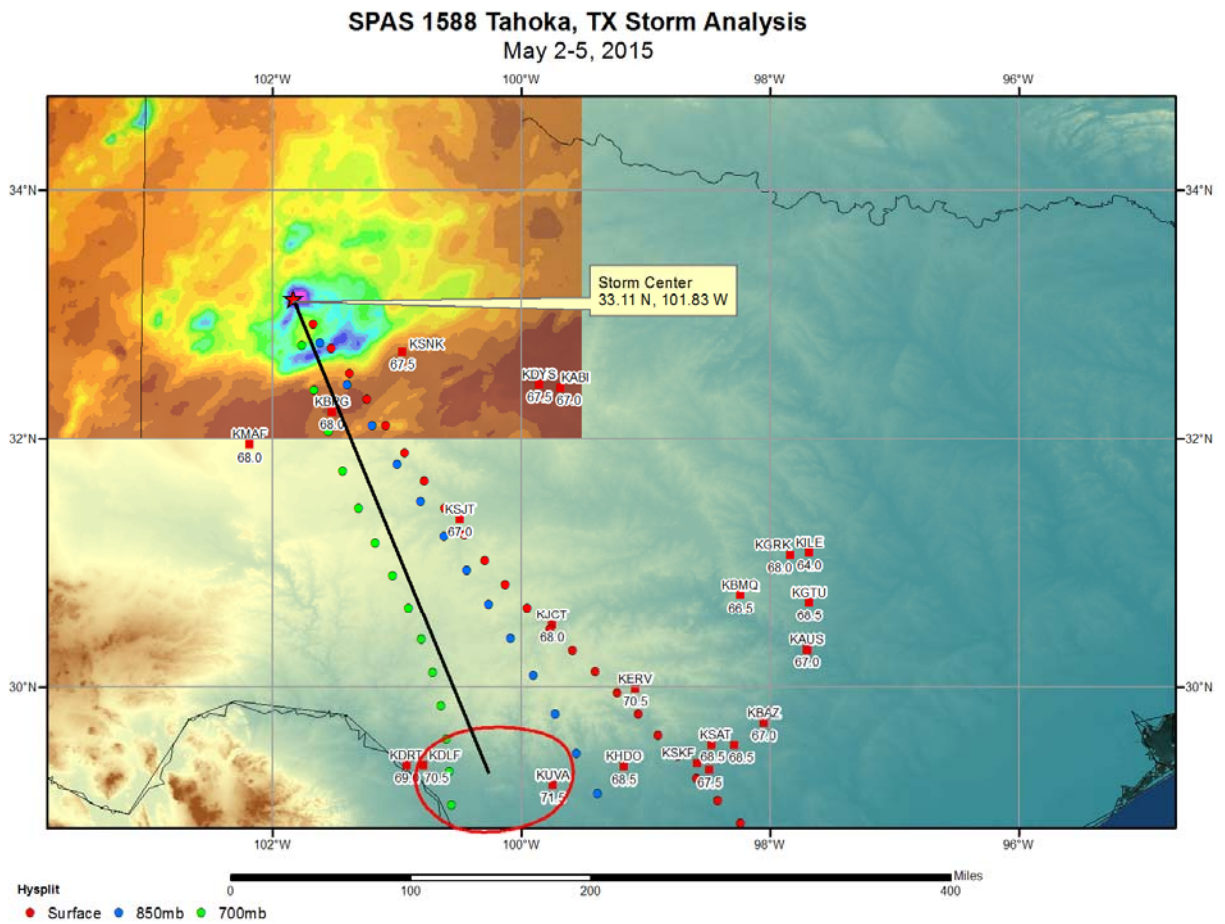


CO-NM Regional Extreme Precipitation Study





CO-NM Regional Extreme Precipitation Study



Tropical Storms

Wagon Wheel, CO

October 3-7, 1911

Storm Type: Tropical

Storm Precipitation Analysis System (SPAS) For Storm #1107_1

General Storm Location: near (SW) of Wagon Wheel, CO (Previously known as the Gladstone, CO storm of 1911)

Storm Dates: October 3-7, 1911

Event: Remnants of unnamed tropical storm

DAD Zone 1

Latitude: 37.6625

Longitude: -106.9375

Max. Grid/Radar Rainfall Amount: 7.88"

Max. Observed Rainfall Amount: 5.08"

Number of Stations: 126 (55 daily, 12 hourly, and 59 supplemental)

SPAS Version: 7.0

Base Map Used: 1971-2000 Mean September Precip (PRISM)**

Spatial resolution: 30-sec

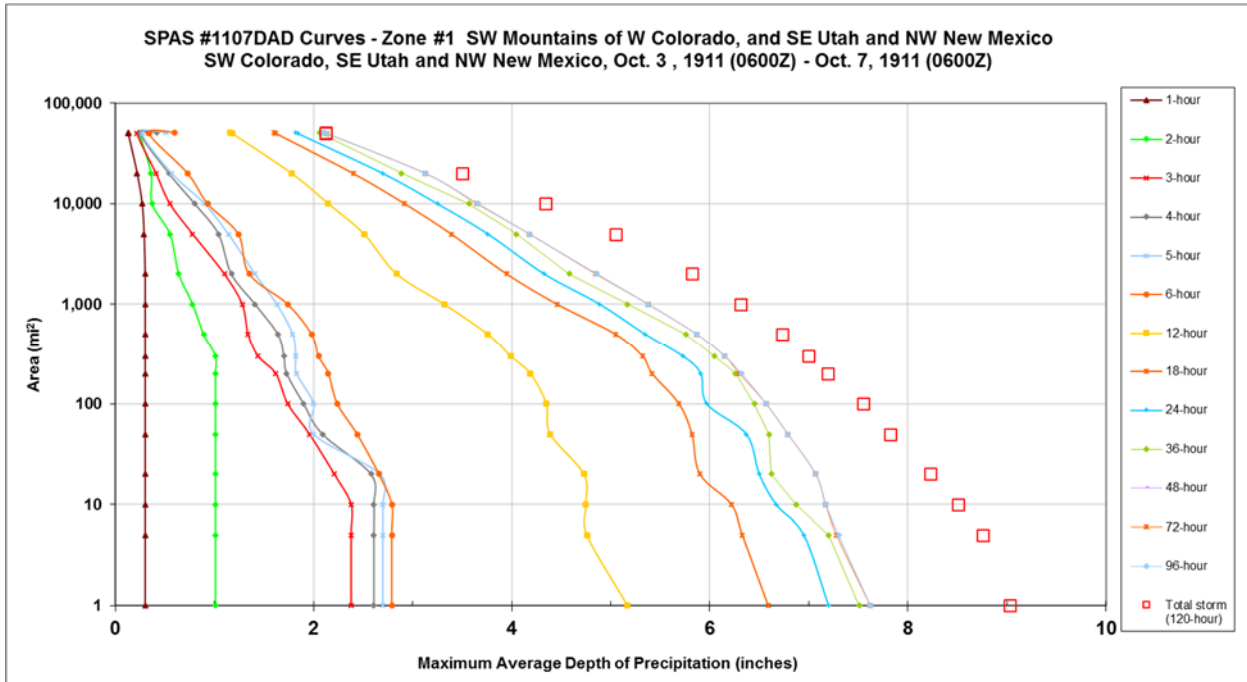
Radar Included: N

Depth-Area-Duration (DAD) analysis: Y

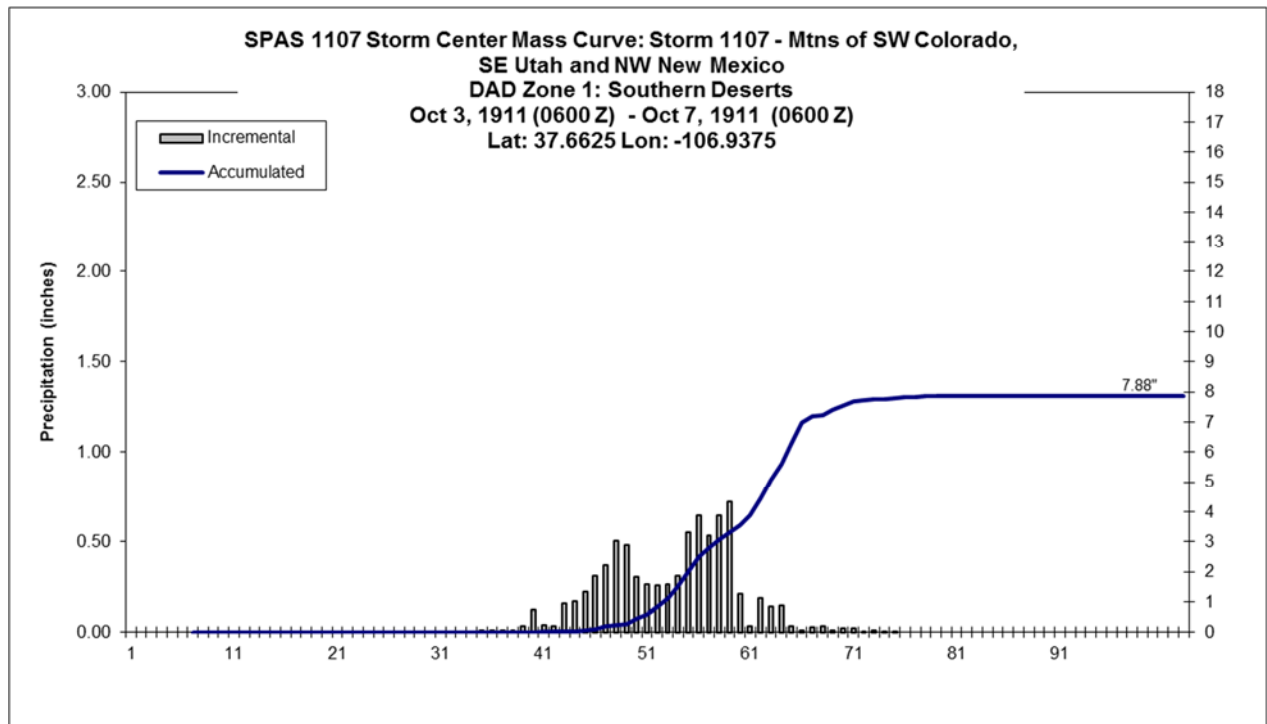
** The September PRISM basemap was found to better represent the spatial characteristics of an influx of tropical moisture than the more winter-like patterns of October.

CO-NM Regional Extreme Precipitation Study

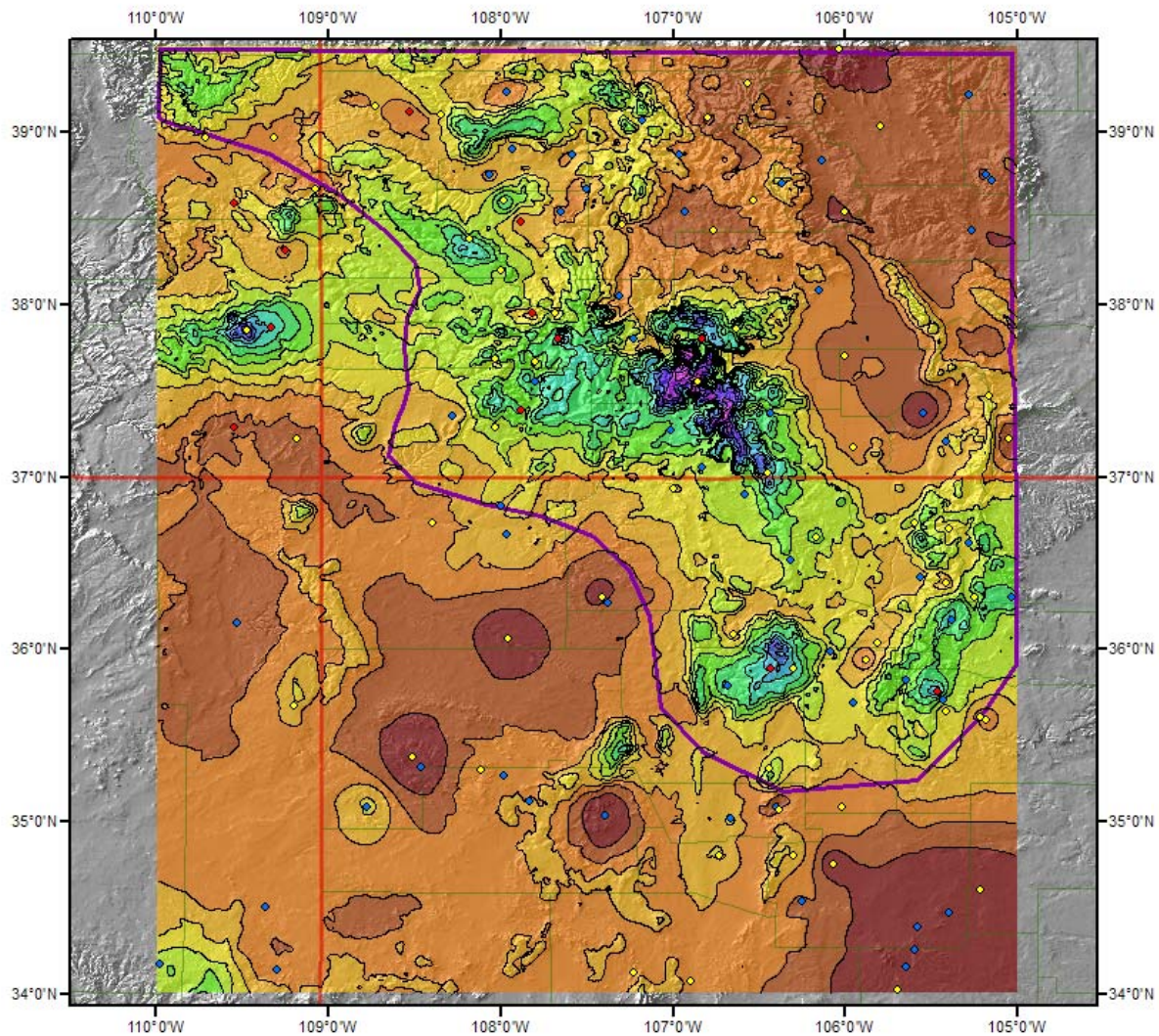
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
Area (mi ²)	Duration (hours)													
	1	2	3	4	5	6	12	18	24	36	48	72	96	Total
0.27	0.72	1.37	2.66	2.93	3.03	3.10	5.49	6.92	7.50	7.84	7.88	7.88	7.88	9.31
1	0.30	1.01	2.38	2.61	2.70	2.79	5.17	6.59	7.20	7.51	7.62	7.62	7.62	9.03
5	0.30	1.01	2.38	2.61	2.70	2.79	4.76	6.33	6.95	7.20	7.27	7.28	7.30	8.76
10	0.30	1.01	2.38	2.61	2.70	2.79	4.75	6.22	6.67	6.87	7.05	7.17	7.17	8.51
20	0.30	1.01	2.21	2.58	2.67	2.66	4.73	5.90	6.50	6.62	6.98	7.07	7.07	8.23
50	0.30	1.01	1.96	2.09	2.00	2.44	4.39	5.82	6.37	6.60	6.76	6.79	6.79	7.82
100	0.30	1.01	1.74	1.90	2.00	2.24	4.35	5.69	5.97	6.45	6.45	6.57	6.57	7.55
200	0.30	1.01	1.62	1.73	1.83	2.15	4.19	5.42	5.91	6.26	6.28	6.30	6.32	7.19
300	0.30	1.01	1.44	1.70	1.82	2.05	3.99	5.32	5.73	6.05	6.07	6.15	6.15	7.00
500	0.30	0.89	1.34	1.64	1.79	1.98	3.76	5.05	5.35	5.76	5.78	5.87	5.87	6.73
1000	0.30	0.78	1.28	1.41	1.63	1.74	3.32	4.46	4.89	5.17	5.25	5.38	5.38	6.31
2000	0.30	0.64	1.10	1.17	1.41	1.35	2.84	3.95	4.33	4.58	4.65	4.85	4.86	5.82
5000	0.29	0.55	0.78	1.04	1.14	1.24	2.51	3.39	3.76	4.05	4.14	4.18	4.18	5.05
10000	0.27	0.37	0.55	0.80	0.90	0.93	2.15	2.92	3.25	3.57	3.65	3.65	3.66	4.34
20000	0.22	0.36	0.41	0.54	0.57	0.73	1.78	2.40	2.70	2.89	2.91	3.13	3.13	3.50
50000	0.13	0.24	0.22	0.25	0.27	0.34	1.18	1.62	1.84	2.08	2.11	2.13	2.13	2.12
51059	0.13	0.24	0.33	0.42	0.51	0.60	1.16	1.60	1.82	2.06	2.09	2.09	2.09	2.12



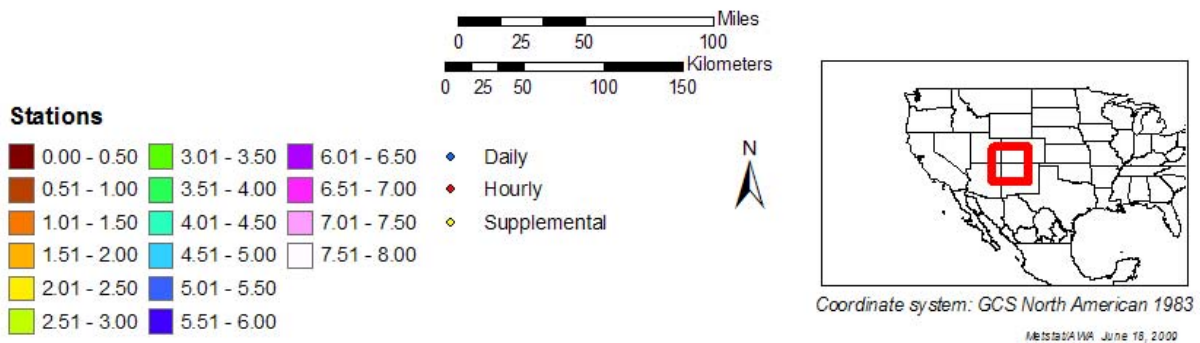
CO-NM Regional Extreme Precipitation Study



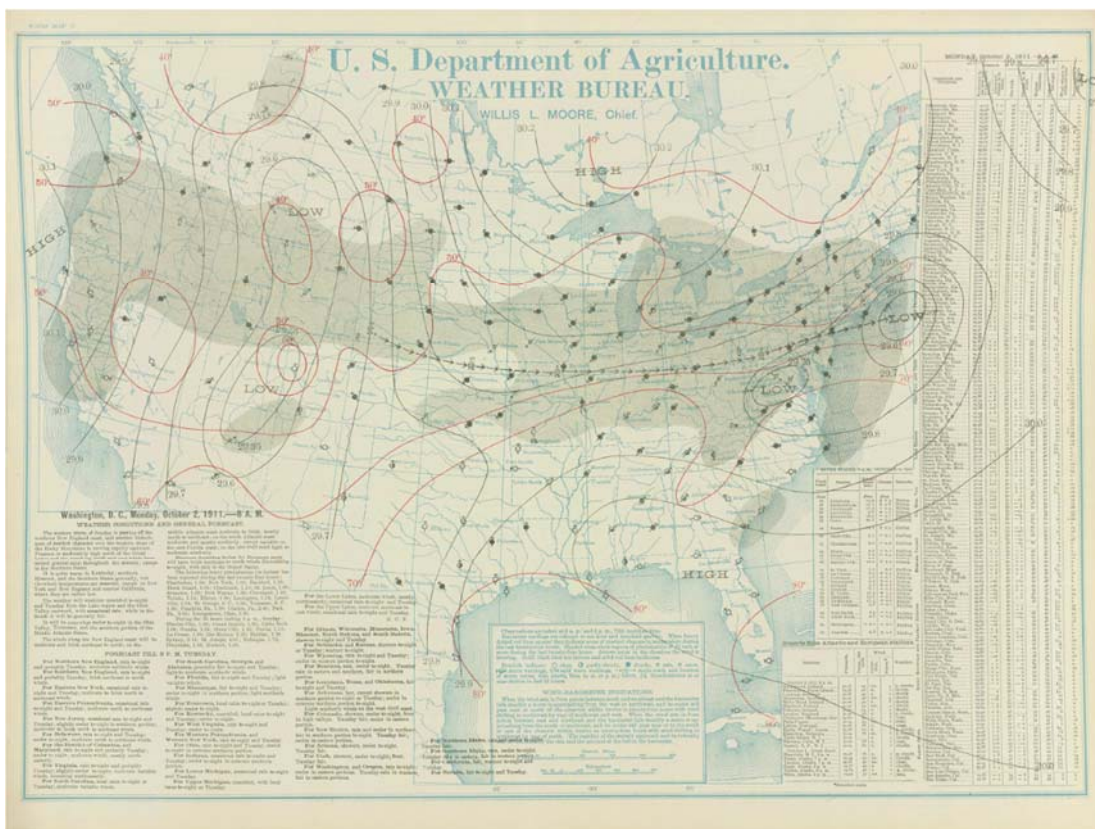
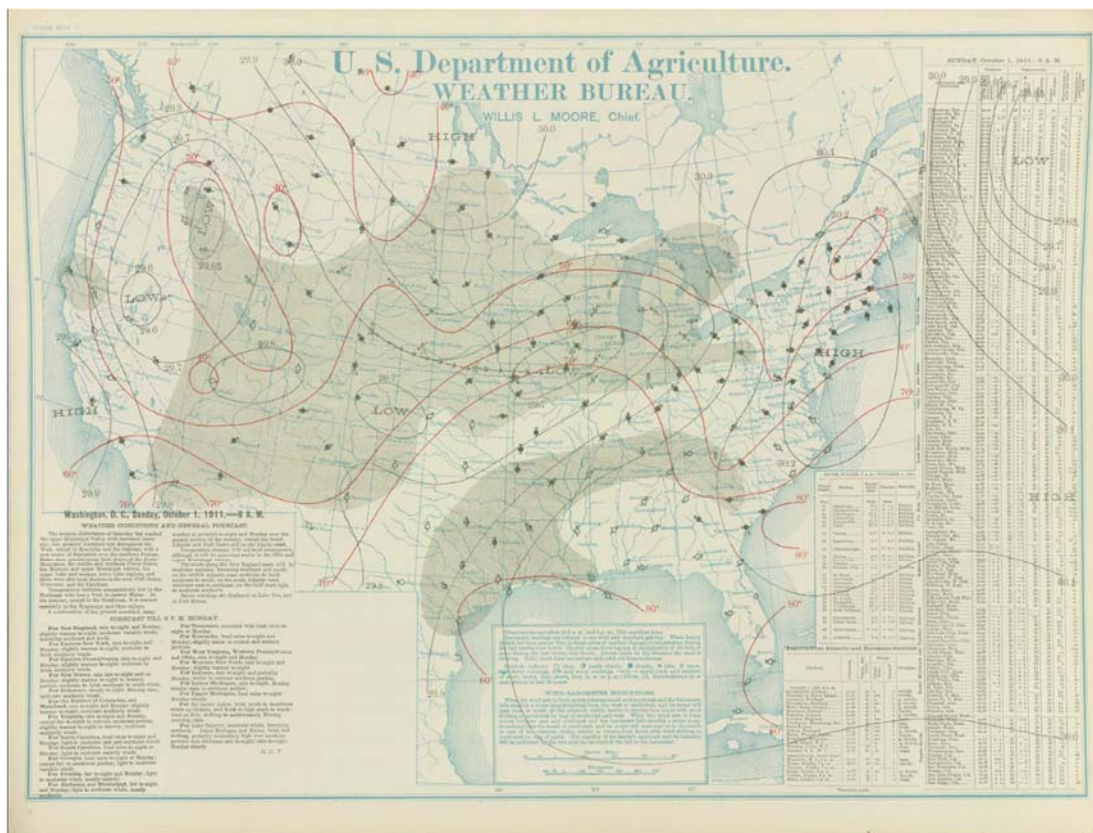
CO-NM Regional Extreme Precipitation Study



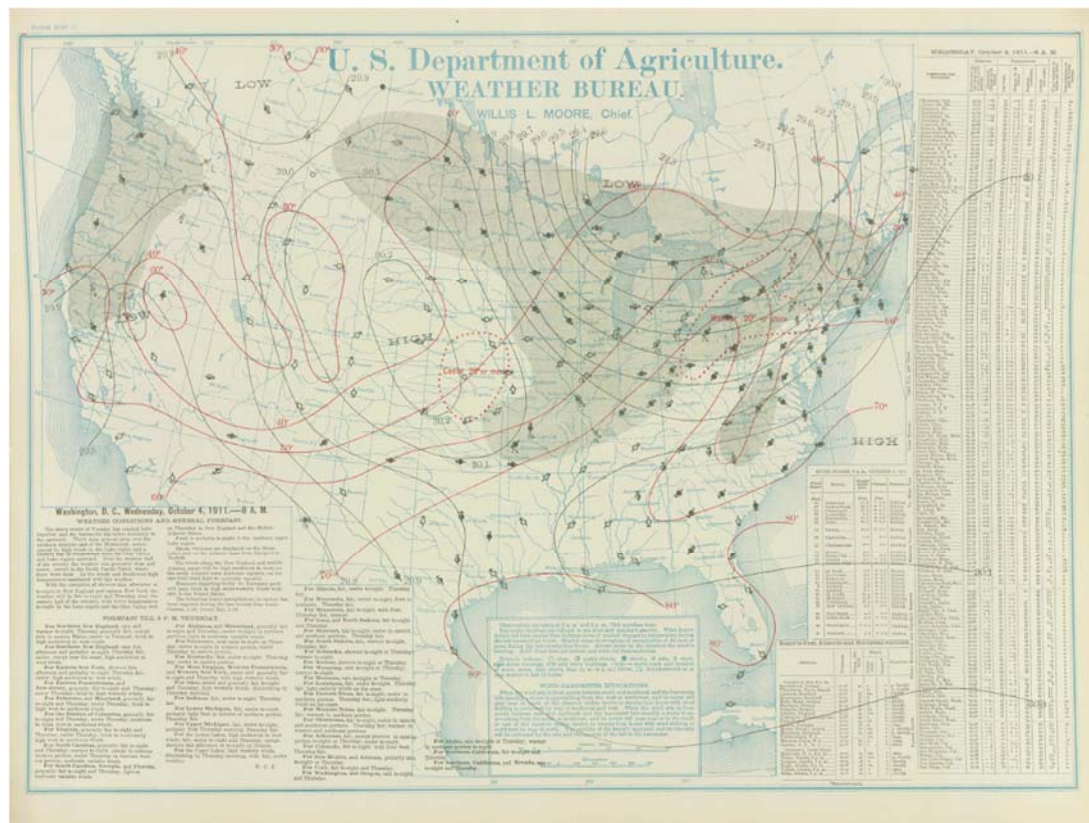
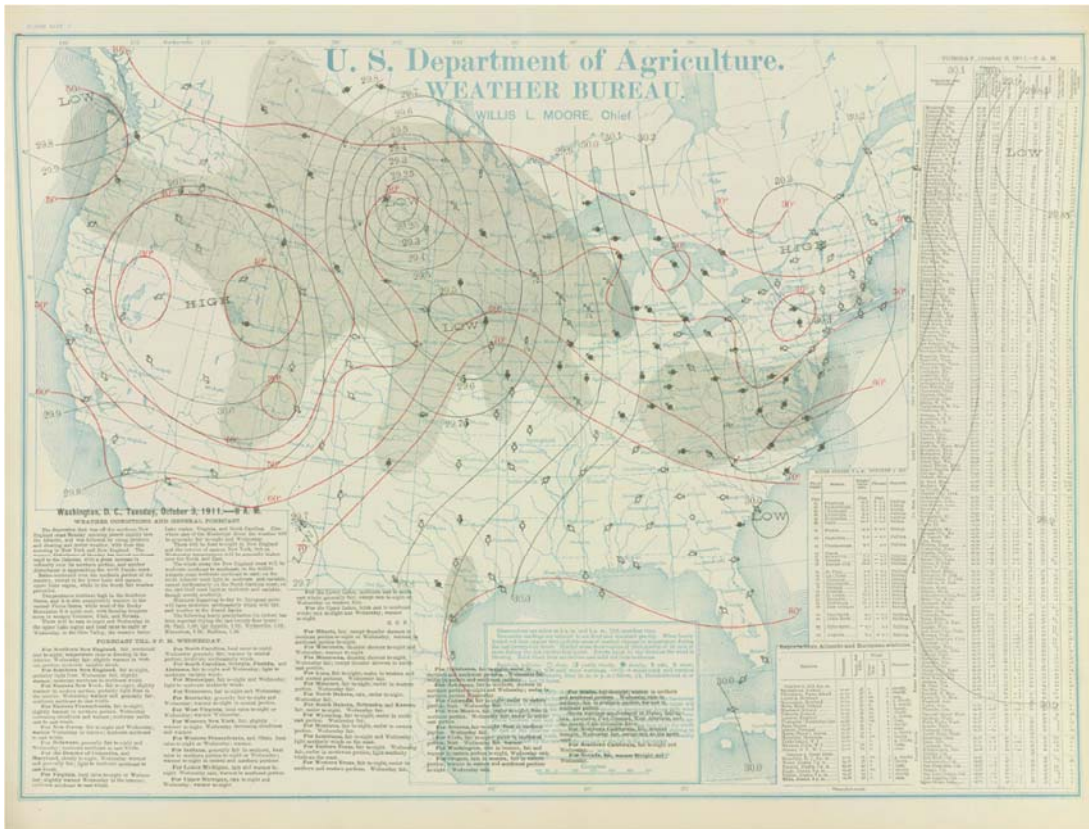
Total Precipitation
SPAS 1107
Oct 3, 1911 (0600 Z) - Oct 7, 1911 (0600 Z)



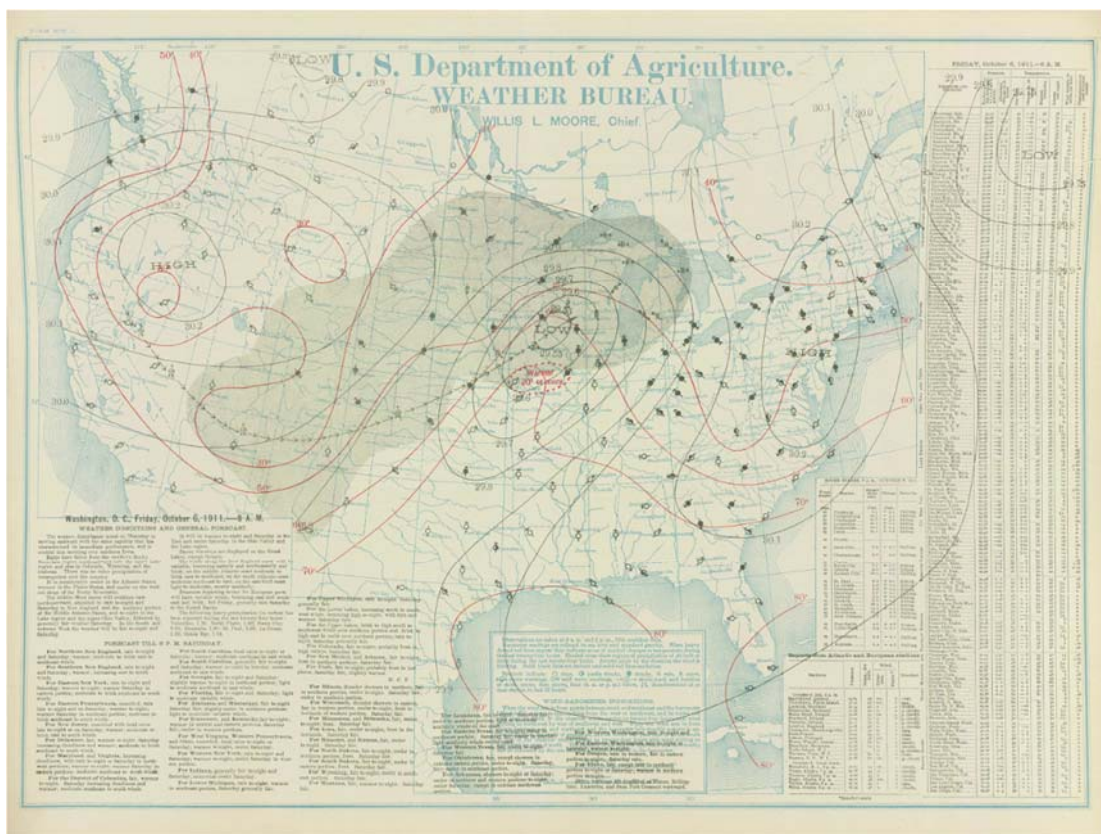
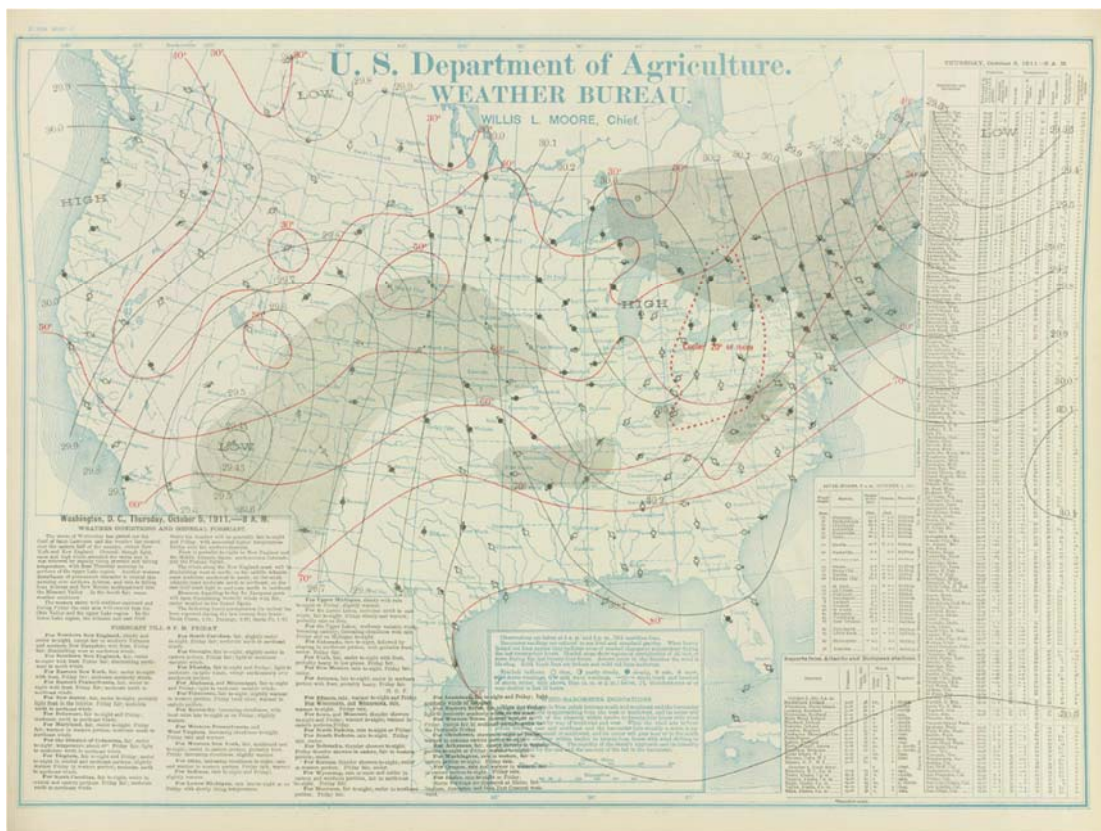
CO-NM Regional Extreme Precipitation Study



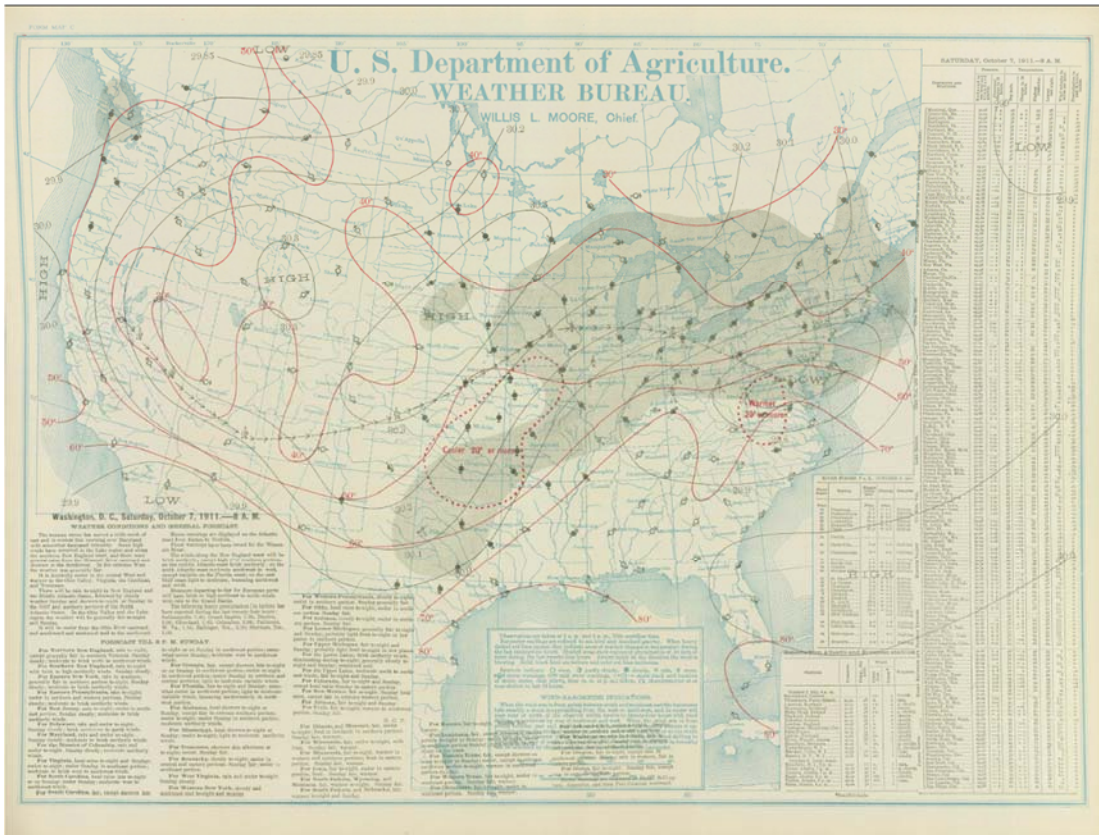
CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study

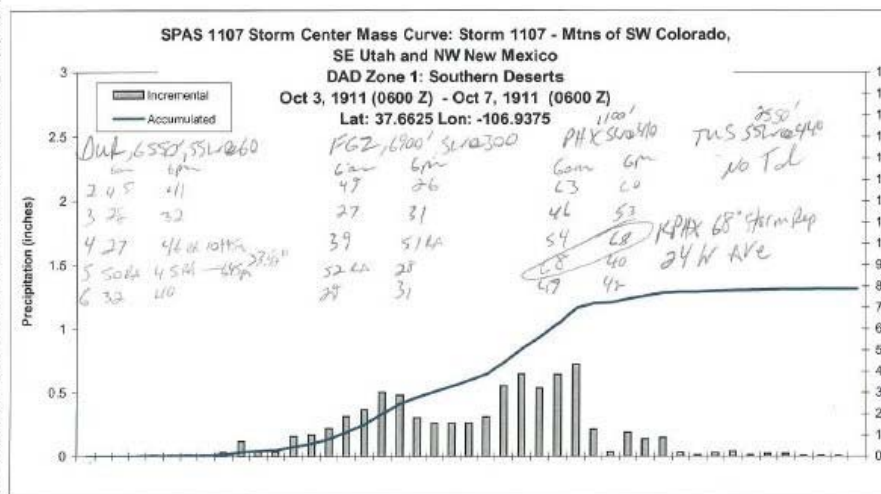


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4	1300	0	0
4	1400	0	0
4	1500	0.005	0.005
4	1600	0.004	0.009
4	1700	0.01	0.018
4	1800	0.009	0.027
4	1900	0.012	0.039
4	2000	0.012	0.05
4	2100	0.033	0.083
4	2200	0.119	0.203
4	2300	0.04	0.242
5	0	0.033	0.275
5	100	0.157	0.431
5	200	0.171	0.602
5	300	0.219	0.822
5	400	0.313	1.135
5	500	0.387	1.502
5	600	0.503	2.005
5	700	0.481	2.486
5	800	0.302	2.788
5	900	0.261	3.049
5	1000	0.26	3.309
5	1100	0.264	3.573
5	1200	0.309	3.882
5	1300	0.554	4.436
5	1400	0.648	5.084
5	1500	0.536	5.621
5	1600	0.844	6.264
5	1700	0.723	6.988
5	1800	0.213	7.2
5	1900	0.033	7.234
5	2000	0.188	7.422
5	2100	0.138	7.56
5	2200	0.146	7.706
5	2300	0.031	7.737
6	0	0.009	7.746
6	100	0.027	7.772
6	200	0.036	7.808
6	300	0.009	7.817
6	400	0.02	7.837
6	500	0.021	7.859
6	600	0.007	7.865
6	700	0.008	7.873
6	800	0.002	7.875
6	900	0.001	7.877



-24 H AVE

-compare USBR Analysis 1/1 Previous AWA max & storm track for Td storm 2

Yuma 150, 51A 550
San San
1 66 62
2 39 31
3 30 43
4 42 65
5 61 41

CO-NM Regional Extreme Precipitation Study

Table 3-1.—Representative persisting 12-hour, 1000-mbar dew-point data for storms critical for development of ULLDGS for Colorado River Basin above Hoover Dam.

Storm No.	Dates of Storm	Storm Center			Persisting 12-Hour, 1000-mbar Dew Point				Direction and Distance from Rainfall Center to Dew-Point Location		Stations Used
		Maximum Station	Lat.	Long.	° F	Date and Hour (m.s.t.) at Start of 12-Hour Period	Lat.	Long.	Direction, degrees	Distance, miles	
1	Oct. 4-6, 1911	Gladstone, CO	37°53'	107°39'	68	Oct. 4, 6 p.m.	34°19'	111°54'	224	525	Flagstaff and Phoenix, AZ
2	Sept. 11-13, 1927	Natural Bridge, AZ	34°19'	111°27'	70	Sept. 11, 6 p.m.	33°47'	112°51'	247	90	Flagstaff, Phoenix, and Yuma, AZ
3	Sept. 3-7, 1939	Wikieup, AZ	34°35'	113°37'	72	Sept. 4, 7:30 p.m.	33°10'	113°50'	186	106	Phoenix and Yuma AZ; Blythe, CA
4	Sept. 8-13, 1939	Bryce Canyon, UT	37°38'	112°11'	72	Sept. 8, 9 p.m.	33°05'	112°38'	182	320	Phoenix and Tucson, AZ; Blythe, CA
5	May 30-June 3, 1943	Silver Lake Brighton, UT	40°36'	111°35'	54	May 31, 11 p.m.	37°48'	113°06'	230	276	Las Vegas and Tonopah, NV; Milford, UT
6	Oct. 10-15, 1947	Pinedale, AZ	34°18'	110°15'	58	Oct. 11, 11 p.m.	32°50'	111°30'	215	125	Phoenix and Tucson, AZ
7	Aug. 26-30, 1951	Crown King, AZ	34°12'	112°20'	73	Aug. 26, 5 a.m.	31°38'	112°00'	170	177	Douglas, Tucson, and Yuma, AZ; Punta Penasco and Altar, Mexico
8	Sept. 4-7, 1970	Workman Creek 1, AZ	33°49'	110°55'	73	Sept. 4, 8 p.m.	32°48'	112°28'	227	113	Phoenix, Tucson, and Yuma, AZ
9	Oct. 3-7, 1972	Sierra Ancha, AZ	33°48'	110°58'	67	Oct. 3, 11 p.m.	33°42'	112°03'	258	65	Lake AFB, Phoenix, and Prescott, AZ
10	Oct. 17-21, 1972	Junipine, AZ	33°37'	109°06'	65	Oct. 17, 8 p.m.	32°50'	111°30'	248	155	Phoenix and Tucson, AZ
11	Sept. 7-12, 1980	—	38°38'	111°44'	69	Sept. 8, 8 p.m.	34°06'	109°30'	157	345	Douglas and Tucson, AZ; Farmington and Gallup, NM
12	Sept. 26-Oct. 1, 1982	—	39°47'	111°37'	66	Sept. 25, 11 p.m.	36°50'	115°45'	221	345	Desert Rock, Las Vegas, Nellis AFB, and Tonopah, NV
13	July 20-23, 1984	Elgin, NV	37°19'	114°30'	71	July 21, 8 p.m.	34°30'	113°06'	160	204	Lake AFB, Phoenix, and Prescott, AZ; Las Vegas, NV

Bradshaw City, AZ

August 26-31, 1951

Storm Type: Tropical

Storm Precipitation Analysis System (SPAS) For Storm #1076_2

General Storm Location: Crown King, Arizona

Storm Dates: Aug 26, 1951 (0700 Z) - Aug 31, 1951 (0600 Z)

Event: Remnants of a hurricane

DAD Zone 2 (Mogollon Rim, Arizona):

Latitude: 34.2041

Longitude: -112.3541

Max. Grid/Radar Rainfall Amount: 14.99"

Max. Observed Rainfall Amount: 13.56" at Crown King

Number of Stations: 366 (244 daily, 61 hourly, 3 hourly estimated, 3 hourly pseudo, 55 supplemental)

SPAS Version: 7.0

Base Map Used: Yes, mean (1971-2000) August precipitation

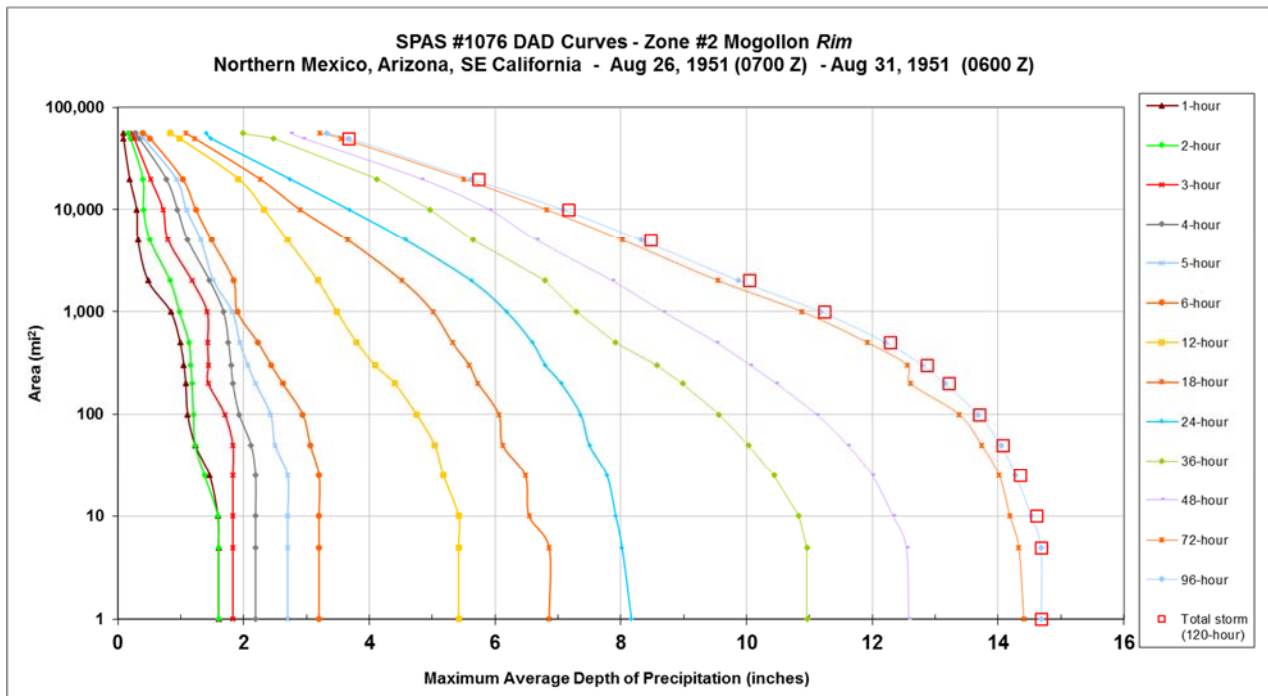
Spatial resolution: 30-seconds

Radar Included: No.

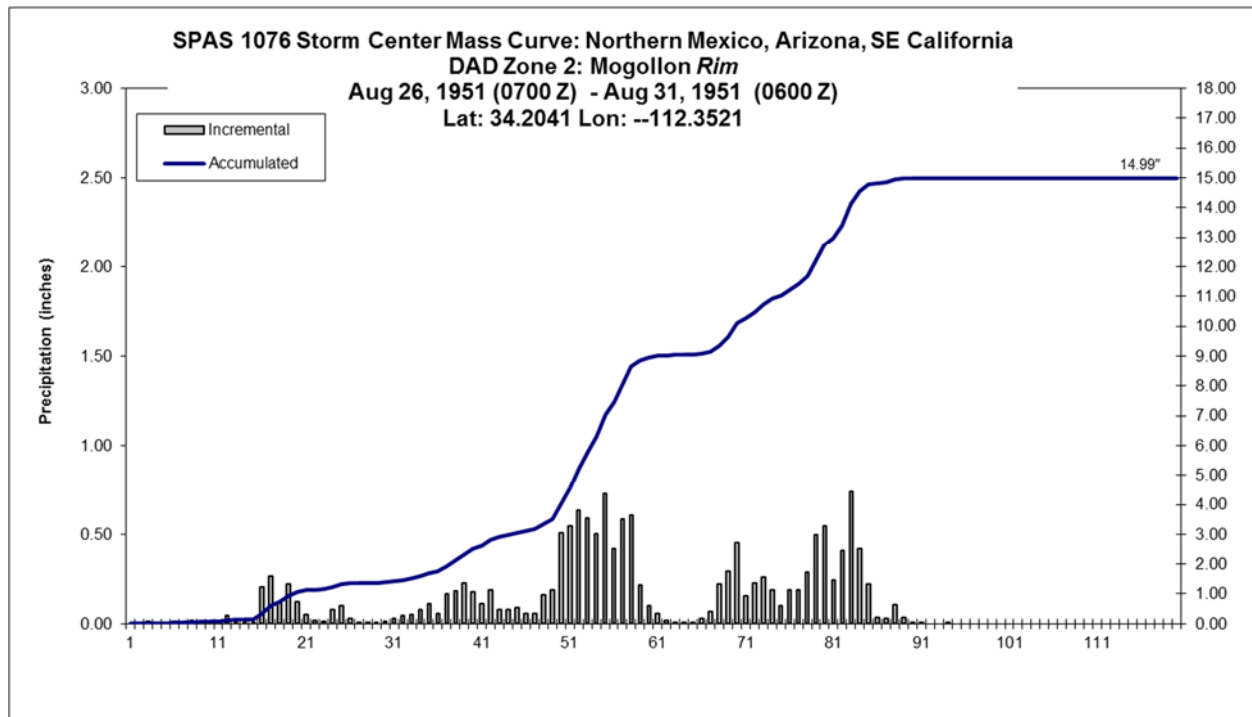
Depth-Area-Duration (DAD) analysis: Yes.

CO-NM Regional Extreme Precipitation Study

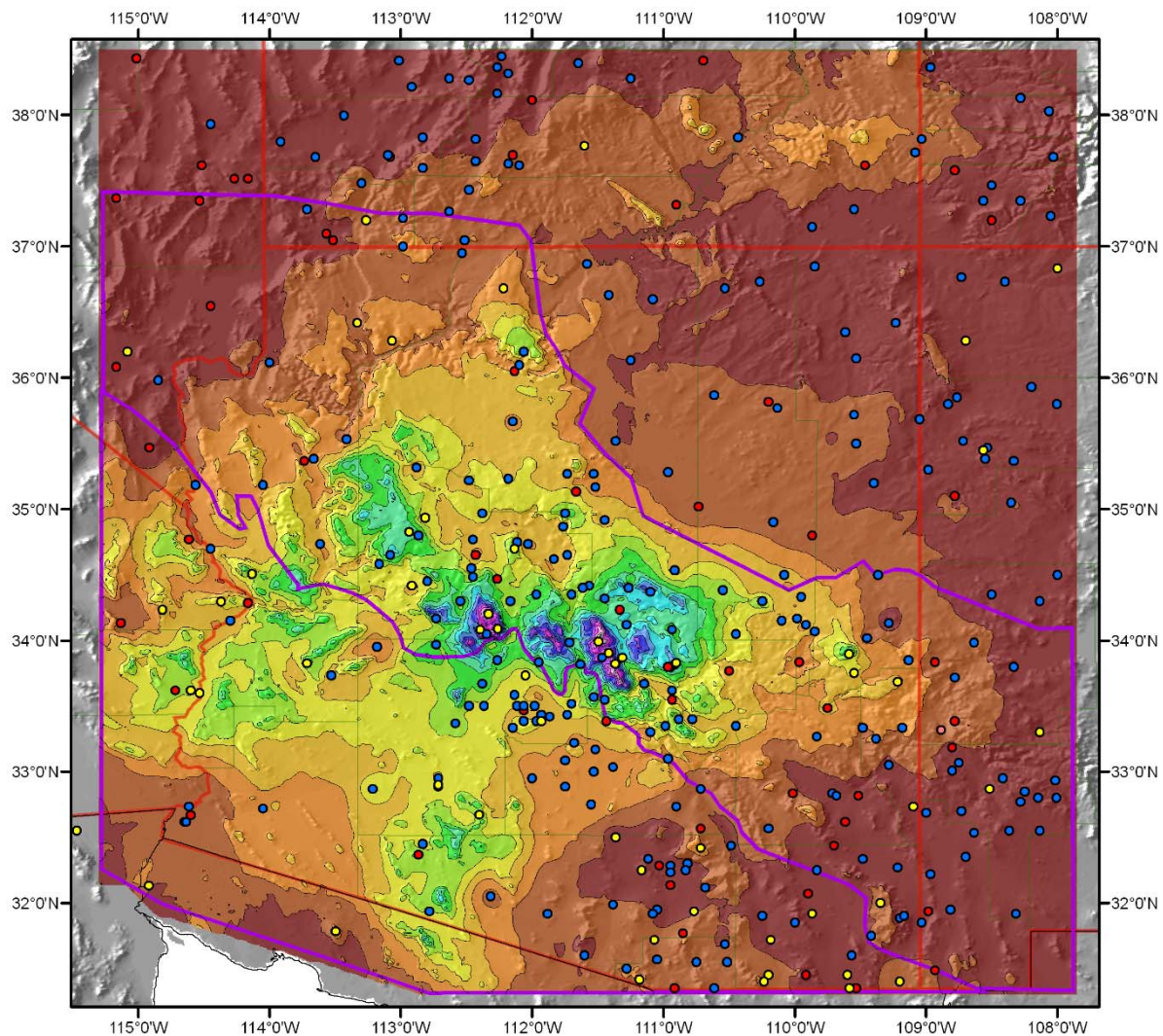
Storm 1076 - Northern Mexico, Arizona, SE California Aug 26, 1951 (0700 Z) - Aug 31, 1951 (0600 Z)															
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)															
Area (mi ²)	Duration (hours)														
	1	2	3	4	5	6	12	18	24	36	48	72	96	120	Total
0.27	1.88	1.88	2.21	2.49	3.00	3.51	5.68	7.19	8.49	11.26	12.85	14.75	14.99	14.99	14.99
1	1.60	1.60	1.83	2.19	2.70	3.20	5.42	6.86	8.17	10.96	12.58	14.41	14.69	14.68	14.68
5	1.60	1.60	1.83	2.19	2.70	3.20	5.42	6.86	8.02	10.96	12.54	14.33	14.68	14.68	14.68
10	1.59	1.59	1.83	2.19	2.70	3.20	5.42	6.54	7.92	10.83	12.33	14.19	14.53	14.61	14.61
25	1.46	1.38	1.83	2.19	2.70	3.20	5.18	6.48	7.78	10.44	12.00	14.02	14.28	14.35	14.35
50	1.23	1.23	1.83	2.12	2.50	3.06	5.04	6.12	7.50	10.03	11.61	13.74	14.05	14.07	14.07
100	1.11	1.20	1.70	1.93	2.43	2.94	4.75	6.06	7.36	9.56	11.11	13.38	13.68	13.70	13.70
200	1.08	1.18	1.44	1.83	2.19	2.62	4.40	5.73	7.05	8.98	10.47	12.61	13.15	13.22	13.22
300	1.05	1.16	1.44	1.80	2.07	2.44	4.09	5.59	6.80	8.58	10.06	12.56	12.80	12.87	12.87
500	0.99	1.13	1.43	1.76	1.94	2.23	3.80	5.32	6.59	7.92	9.52	11.92	12.21	12.29	12.29
1,000	0.84	0.98	1.42	1.68	1.82	1.90	3.48	5.01	6.18	7.29	8.67	10.88	11.17	11.24	11.24
2,000	0.48	0.83	1.18	1.46	1.52	1.84	3.18	4.52	5.62	6.80	7.86	9.55	9.87	10.04	10.04
5,000	0.32	0.51	0.80	1.11	1.32	1.49	2.70	3.66	4.58	5.65	6.66	8.03	8.32	8.47	8.47
10,000	0.30	0.41	0.72	0.95	1.09	1.24	2.33	2.90	3.68	4.96	5.91	6.82	7.08	7.17	7.17
20,000	0.19	0.40	0.52	0.77	0.93	1.03	1.92	2.26	2.74	4.12	4.83	5.50	5.62	5.74	5.74
50,000	0.09	0.20	0.26	0.34	0.41	0.51	0.98	1.22	1.48	2.47	2.95	3.55	3.67	3.67	3.67
56,112	0.09	0.16	0.23	0.29	0.38	0.40	0.83	1.08	1.41	1.99	2.75	3.21	3.32	3.37	3.37



CO-NM Regional Extreme Precipitation Study



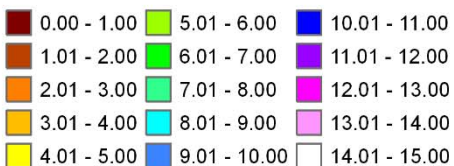
CO-NM Regional Extreme Precipitation Study



Storm #1076
Hurricane Remnants
Aug 26, 1951 (0700 Z) - Aug 31, 1951 (0600 Z)

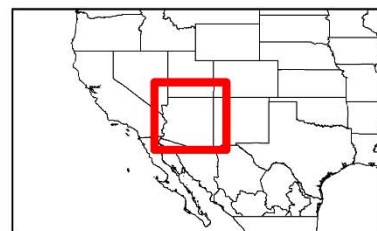


Precipitation (inches)



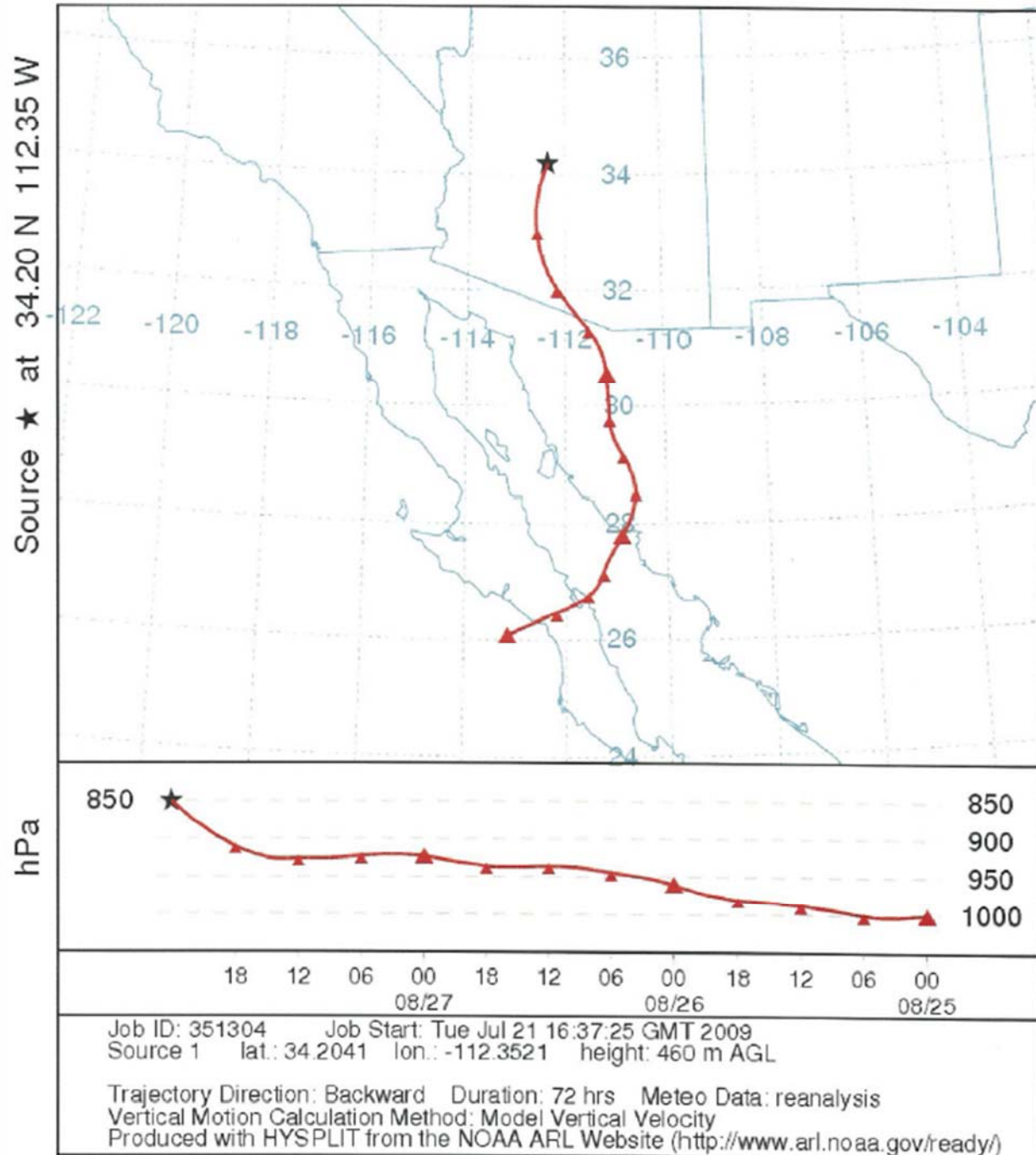
Station Type

- Daily
- Hourly
- Hourly estimated
- Hourly pseudo
- Supplemental

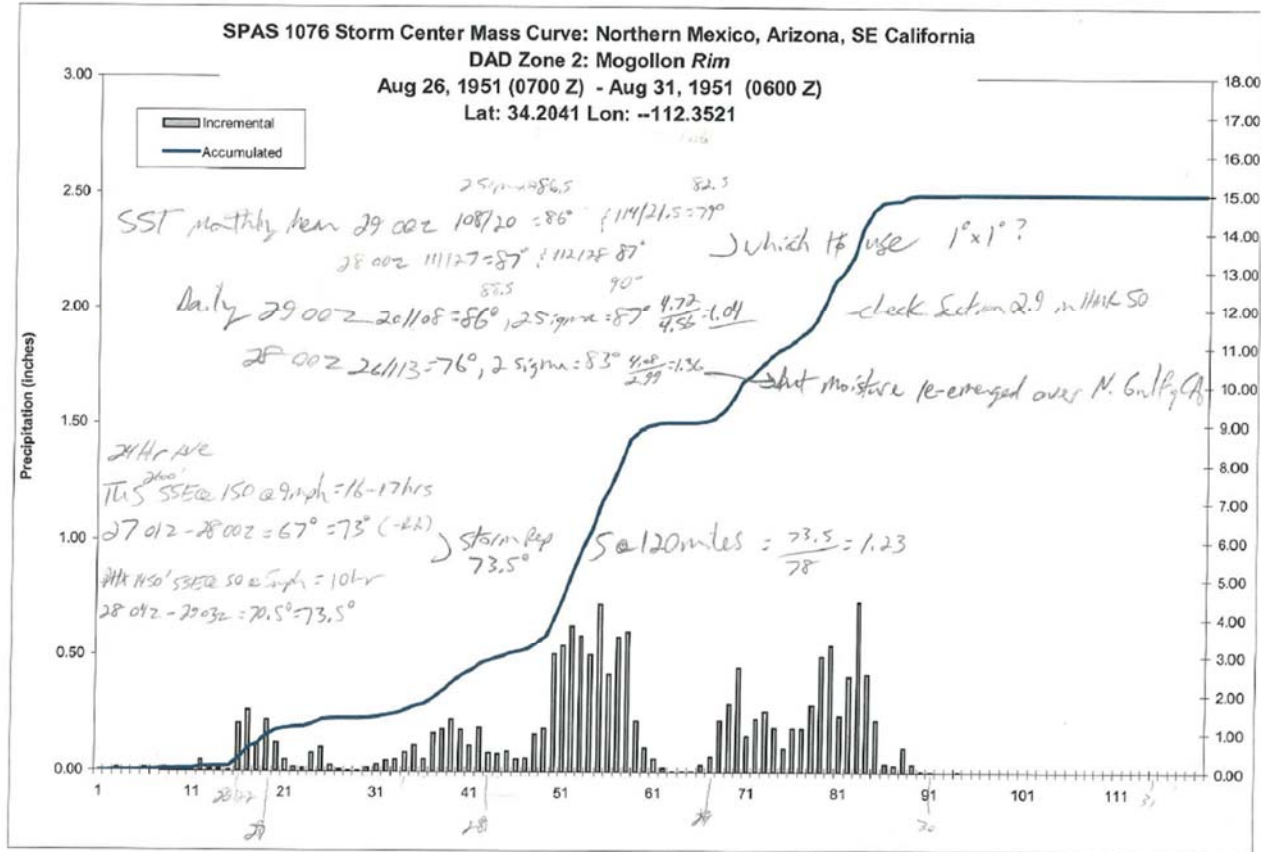


Coordinate system: GCS North American 1983
 Metstat/AWA May 27, 2009

NOAA HYSPLIT MODEL
Backward trajectory ending at 0000 UTC 28 Aug 51
CDC1 Meteorological Data

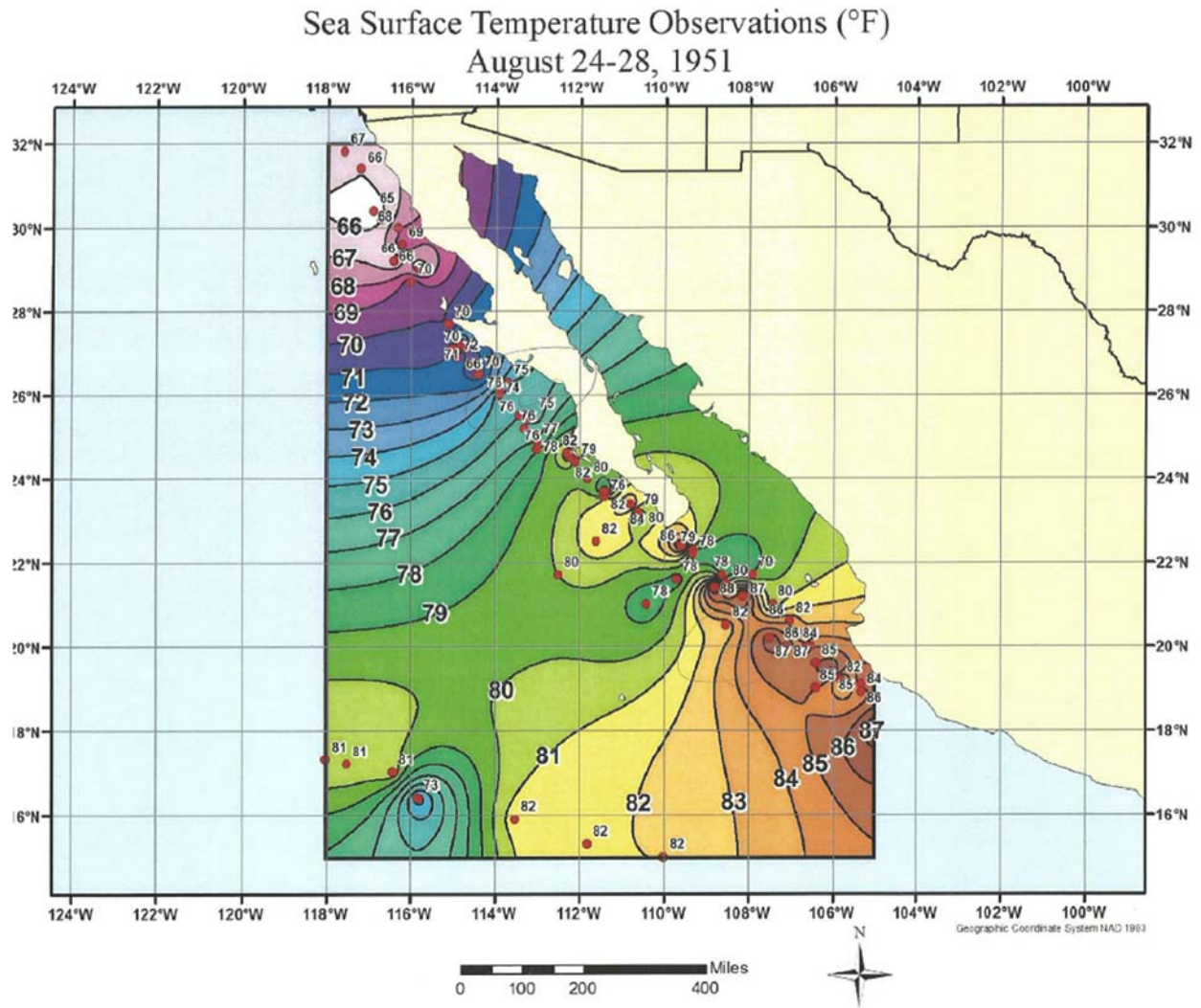


CO-NM Regional Extreme Precipitation Study



- use 28 II at 00Z Hysplit - compare inflow to usbt analysis → 70° @ 177 miles $\frac{73}{78} = 1.28$
- Get SST Daily Data
- use 24 Hr Ave

CO-NM Regional Extreme Precipitation Study



Mt. Lemmon, AZ

September 3-8, 1970

Storm Type: Tropical

Storm Precipitation Analysis System (SPAS) For Storm #1075_1

General Storm Location: Northern Mexico, Arizona, Colorado and Utah

Storm Dates: September 3 (0700Z), 1970 - September 8 (0700Z), 1970

Event: Tropical remnants of Hurricane

DAD Zone 1: Southern Deserts

Lat: 32.4111

Lon: -110.7208

Max. Grid/Radar Rainfall Amount: 9.31"

Max. Observed Rainfall Amount: n/a

Number of Stations: 740 (148-hourly, 4-hourly pseudo, 6-hourly estimated, 372-daily, 205-supplemental, 4 supplemental estimated and 1 supplemental pseudo)

SPAS Version: 7.0

Base Map Used: Yes, "conus_prism_ppt_in_1971_2000_09"

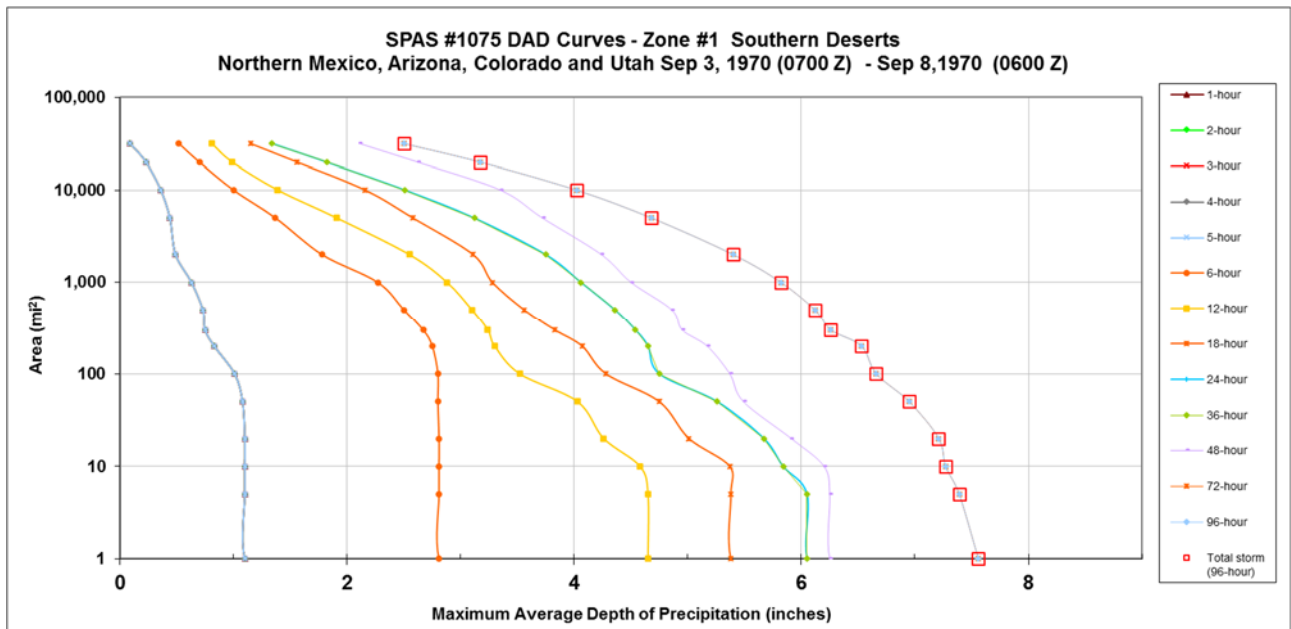
Spatial resolution: 0.27 mi²

Radar Included: No

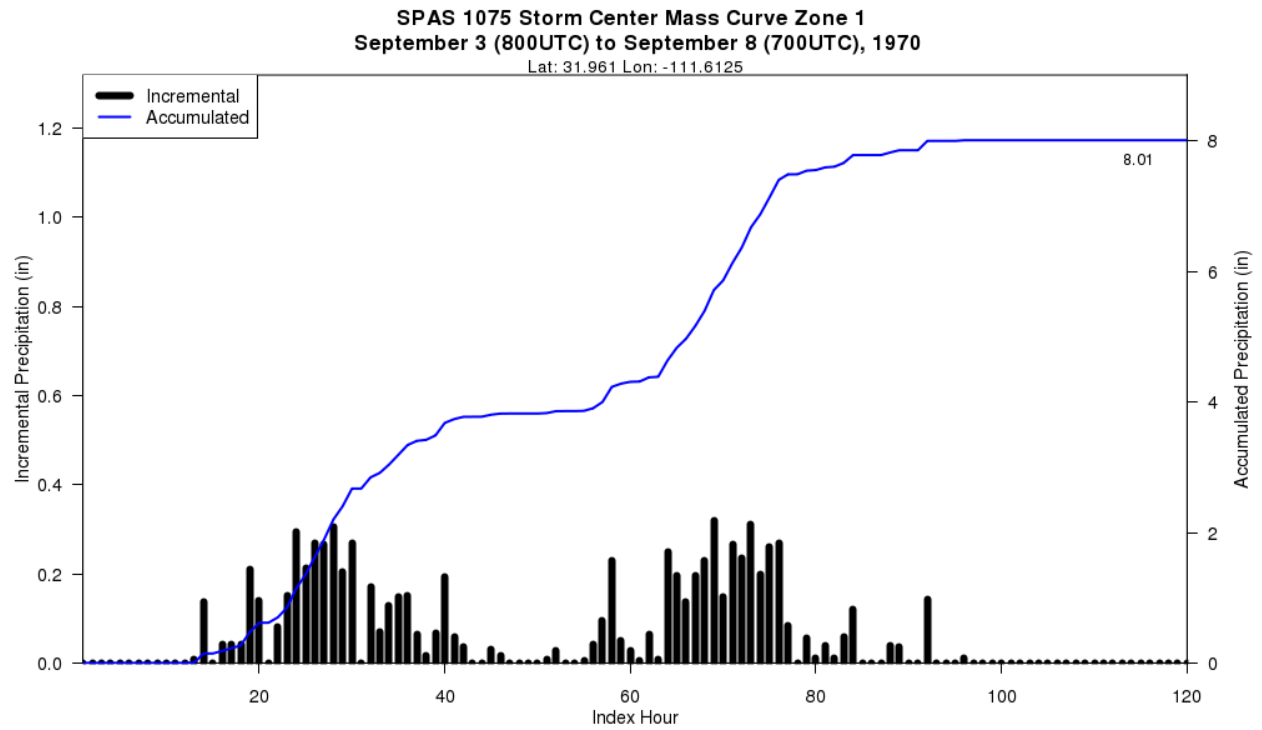
Depth-Area-Duration (DAD) analysis: Yes: 1, 2, 3, 4, 5, 6, 12, 18, 24, 36, 48, 72, 96, 120 hours

CO-NM Regional Extreme Precipitation Study

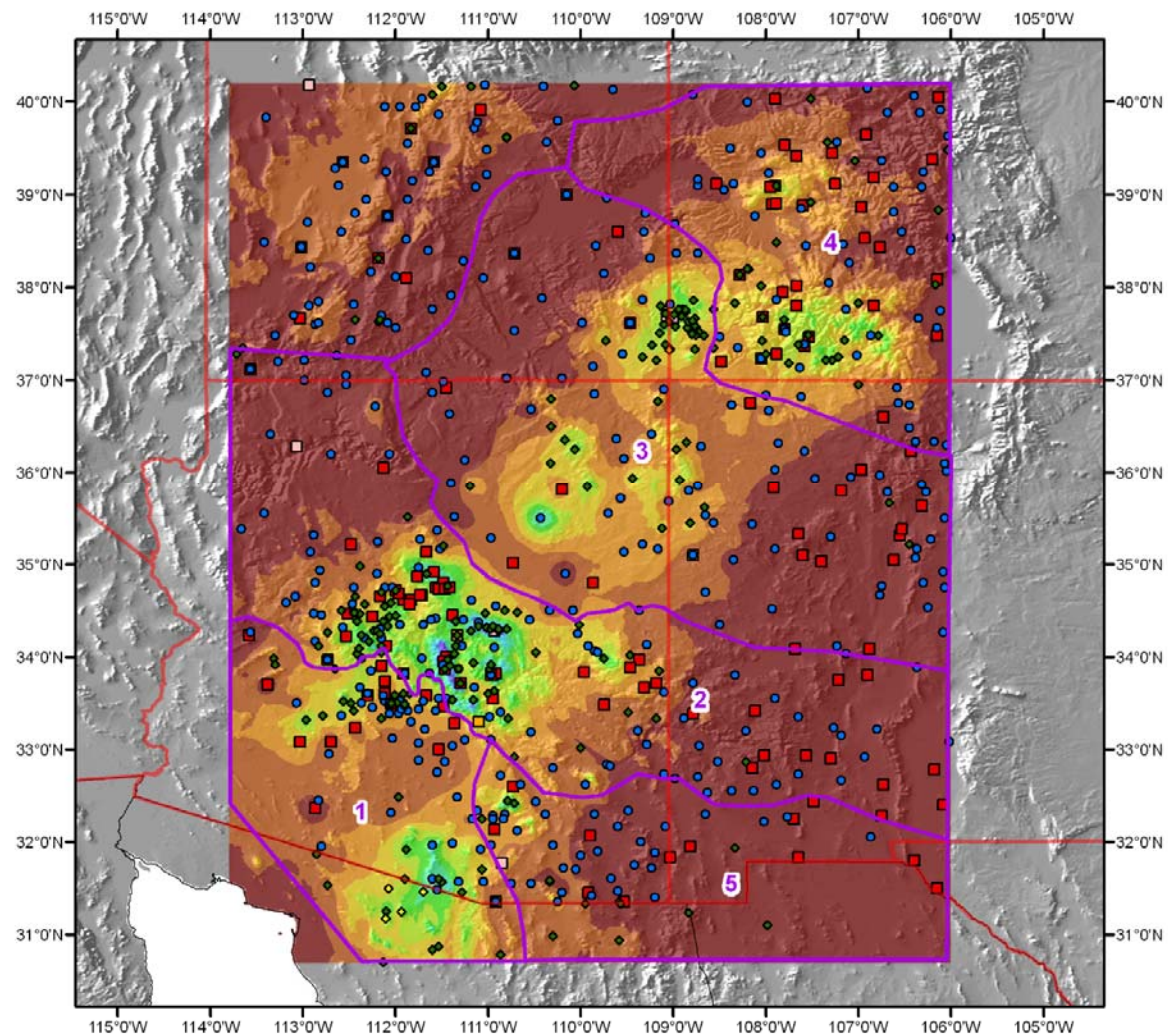
Storm 1075 - Northern Mexico, Arizona, Colorado and Utah Sep 3, 1970 (0700 Z) - Sep 8, 1970 (0600 Z)														
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
Area (mi ²)	Duration (hours)													
	1	2	3	4	5	6	12	18	24	36	48	72	96	Total
0.27	1.36	1.36	1.36	1.36	1.36	3.07	4.86	5.64	6.26	6.26	6.47	7.79	7.79	7.79
1	1.10	1.10	1.10	1.10	1.10	2.81	4.65	5.38	6.05	6.05	6.25	7.56	7.56	7.56
5	1.10	1.10	1.10	1.10	1.10	2.81	4.65	5.38	6.05	6.05	6.25	7.39	7.39	7.39
10	1.10	1.10	1.10	1.10	1.10	2.81	4.58	5.37	5.84	5.84	6.20	7.27	7.27	7.27
20	1.10	1.10	1.10	1.10	1.10	2.81	4.26	5.01	5.67	5.67	5.91	7.21	7.21	7.21
50	1.08	1.08	1.08	1.08	1.08	2.80	4.03	4.75	5.26	5.26	5.49	6.95	6.95	6.95
100	1.01	1.01	1.01	1.01	1.01	2.80	3.52	4.28	4.75	4.75	5.37	6.66	6.66	6.66
200	0.83	0.83	0.83	0.83	0.83	2.75	3.30	4.07	4.65	4.65	5.17	6.53	6.53	6.53
300	0.75	0.75	0.75	0.75	0.75	2.67	3.24	3.83	4.54	4.54	4.95	6.26	6.26	6.26
500	0.73	0.73	0.73	0.73	0.73	2.50	3.10	3.56	4.36	4.36	4.86	6.12	6.12	6.12
1,000	0.63	0.63	0.63	0.63	0.63	2.27	2.88	3.28	4.06	4.06	4.50	5.82	5.82	5.82
2,000	0.49	0.49	0.49	0.49	0.49	1.78	2.55	3.11	3.75	3.75	4.24	5.40	5.40	5.40
5,000	0.44	0.44	0.44	0.44	0.44	1.37	1.91	2.58	3.12	3.12	3.72	4.68	4.68	4.68
10,000	0.36	0.36	0.36	0.36	0.36	1.00	1.39	2.16	2.51	2.51	3.35	4.02	4.02	4.02
20,000	0.23	0.23	0.23	0.23	0.23	0.70	0.99	1.56	1.82	1.82	2.62	3.17	3.17	3.17
31,725	0.09	0.09	0.09	0.09	0.09	0.52	0.81	1.15	1.34	1.34	2.11	2.50	2.50	2.50



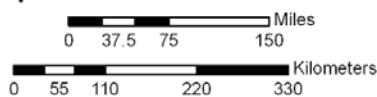
CO-NM Regional Extreme Precipitation Study



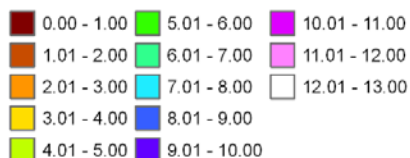
CO-NM Regional Extreme Precipitation Study



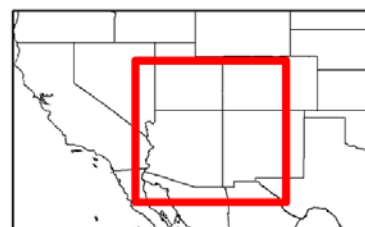
SPAS Storm #1075
Total Rainfall (120-hours)
Sep 3, 1970 (0700 Z) - Sep 8, 1970 (0600 Z)
Tropical Storm Norma Remnants



Precipitation (inches)

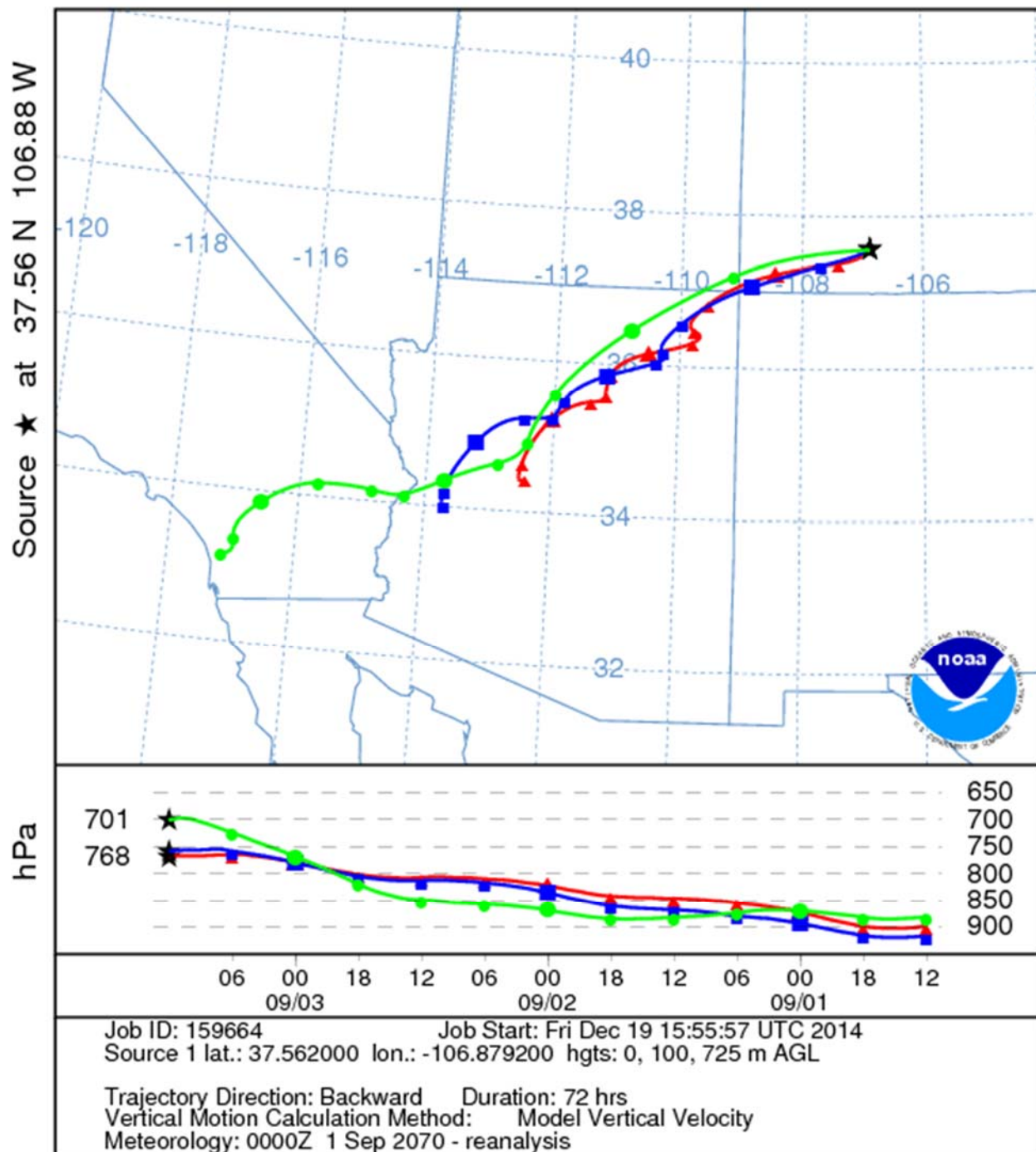


Station Type

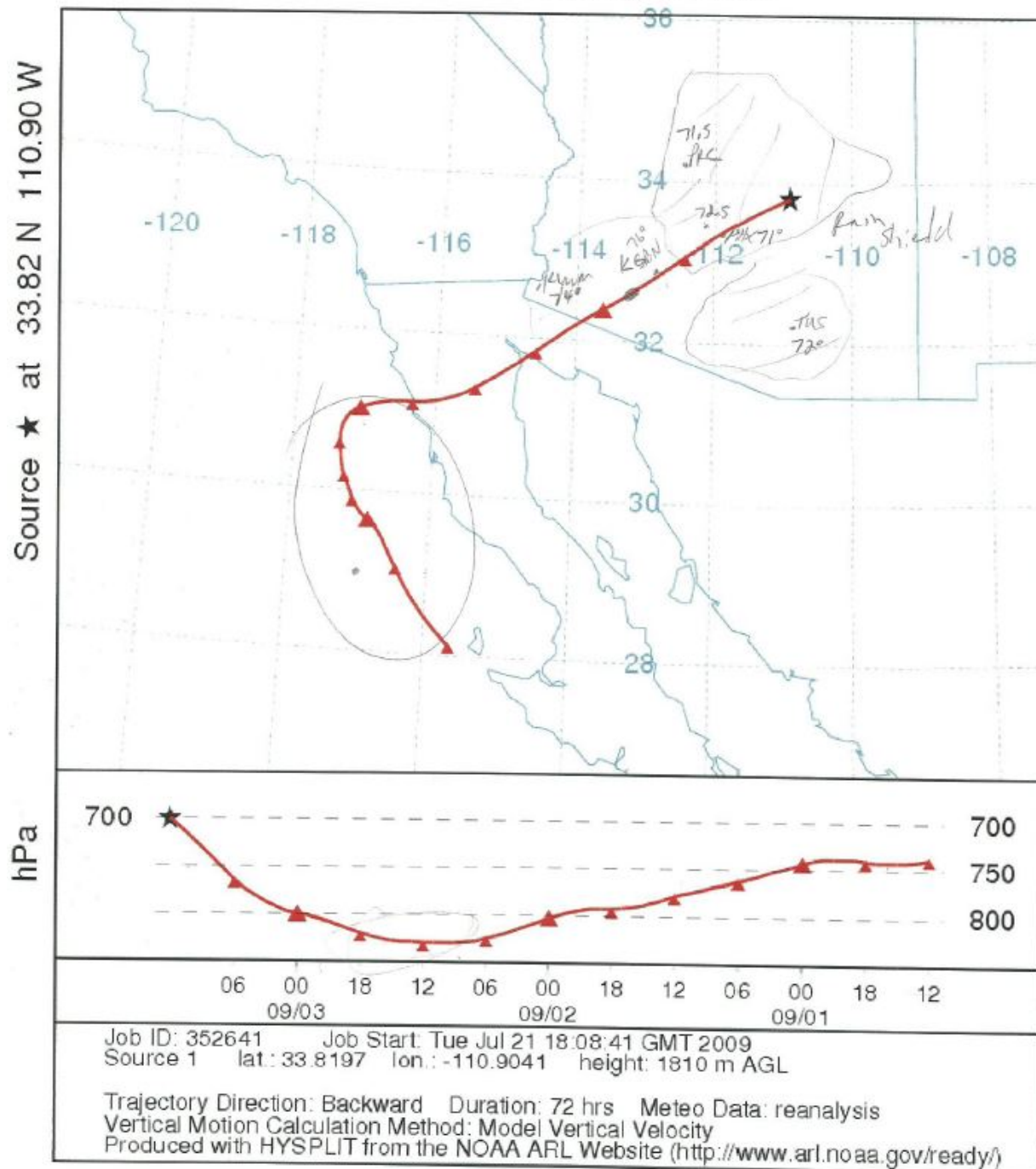


MetStat/AWA, October 16, 2009

NOAA HYSPLIT MODEL
Backward trajectories ending at 1200 UTC 03 Sep 70
CDC1 Meteorological Data



NOAA HYSPLIT MODEL
Backward trajectory ending at 1200 UTC 03 Sep 70
CDC1 Meteorological Data



Workman Creek, AZ

September 3-8, 1970

Storm Type: Tropical

Storm Precipitation Analysis System (SPAS) For Storm #1075_2

General Storm Location: Northern Mexico, Arizona, Colorado and Utah

Storm Dates: September 3 (0700Z), 1970 - September 8 (0700Z), 1970

Event: Tropical remnants of Hurricane

DAD Zone 2: Mogollon Rim

Lat: 33.8197

Lon: -110.9041

Max. Grid/Radar Rainfall Amount: 12.13"

Max. Observed Rainfall Amount: n/a

Number of Stations: 740 (148-hourly, 4-hourly pseudo, 6-hourly estimated, 372-daily, 205-supplemental, 4 supplemental estimated and 1 supplemental pseudo)

SPAS Version: 7.0

Base Map Used: Yes, "conus_prism_ppt_in_1971_2000_09"

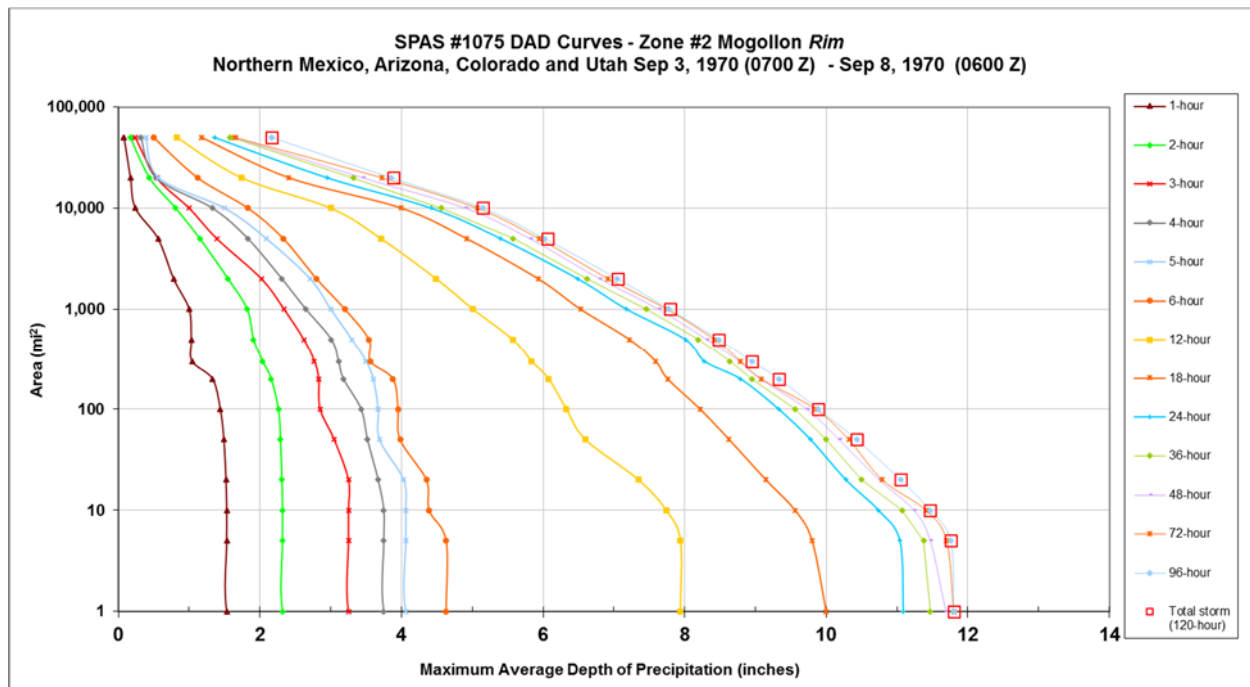
Spatial resolution: 0.27 mi²

Radar Included: No

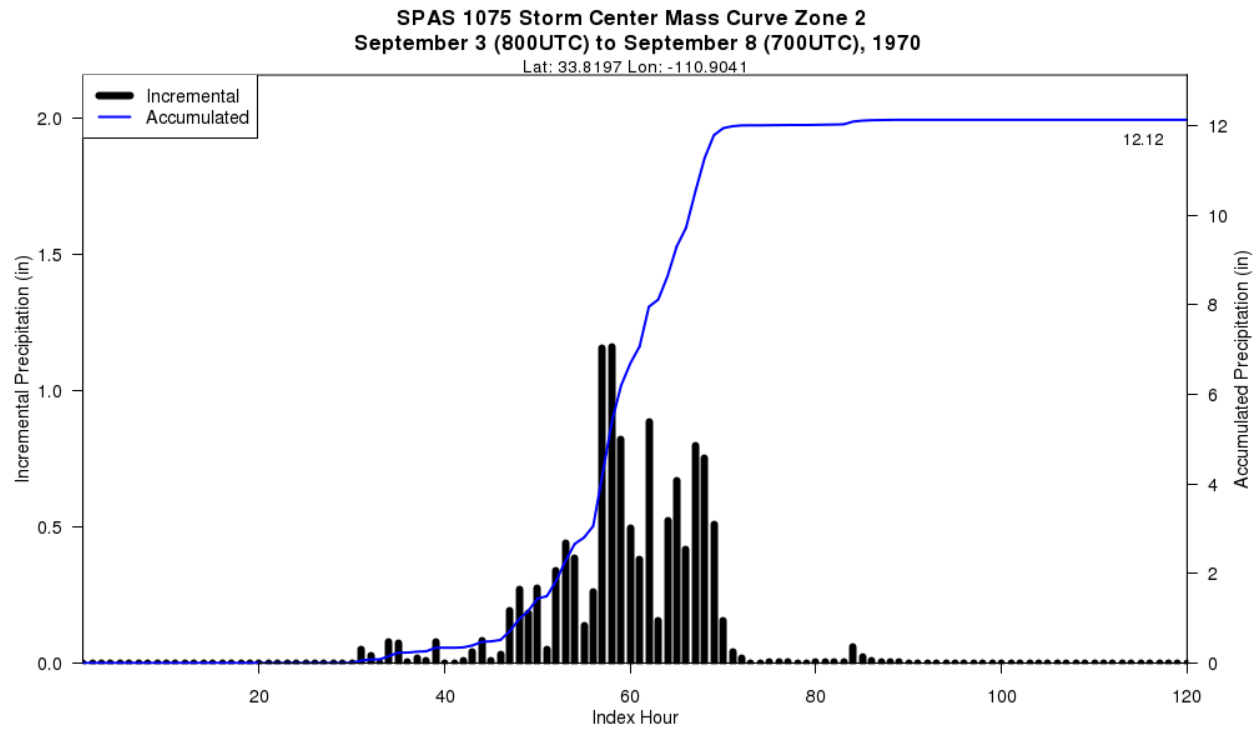
Depth-Area-Duration (DAD) analysis: Yes: 1, 2, 3, 4, 5, 6, 12, 18, 24, 36, 48, 72, 96, 120 hours

CO-NM Regional Extreme Precipitation Study

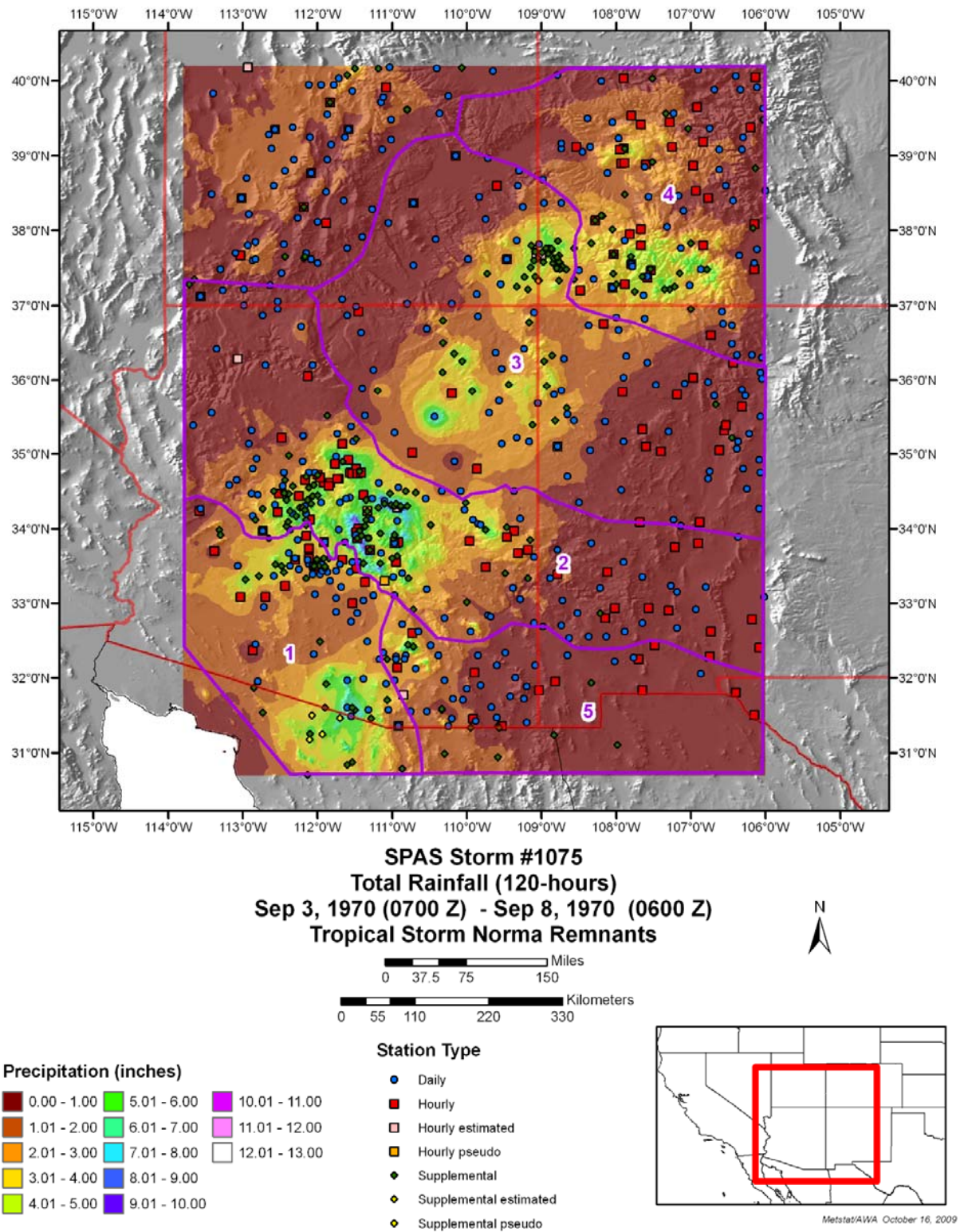
Storm 1075 - Northern Mexico, Arizona, Colorado and Utah Sep 3, 1970 (0700 Z) - Sep 8, 1970 (0600 Z)														
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
Area (mi ²)	Duration (hours)													Total
	1	2	3	4	5	6	12	18	24	36	48	72	96	
0.27	1.83	2.63	3.56	4.07	4.44	4.90	8.21	10.29	11.42	11.78	12.01	12.12	12.12	12.12
1	1.53	2.32	3.25	3.75	4.06	4.63	7.94	10.00	11.09	11.47	11.69	11.80	11.80	11.80
5	1.53	2.32	3.25	3.75	4.06	4.63	7.94	9.80	11.04	11.38	11.47	11.70	11.76	11.76
10	1.53	2.32	3.25	3.75	4.06	4.39	7.74	9.56	10.74	11.07	11.24	11.41	11.47	11.47
20	1.52	2.31	3.25	3.67	4.03	4.35	7.35	9.15	10.28	10.50	10.75	10.79	11.05	11.05
50	1.49	2.29	3.05	3.52	3.69	3.98	6.60	8.63	9.78	10.00	10.18	10.32	10.43	10.43
100	1.44	2.26	2.85	3.43	3.67	3.95	6.33	8.22	9.33	9.56	9.73	9.85	9.89	9.89
200	1.33	2.16	2.83	3.18	3.60	3.88	6.08	7.76	8.79	8.95	9.07	9.08	9.33	9.33
300	1.04	2.04	2.77	3.11	3.50	3.56	5.84	7.59	8.28	8.64	8.77	8.79	8.95	8.95
500	1.03	1.91	2.62	3.01	3.30	3.54	5.57	7.22	8.01	8.19	8.31	8.42	8.48	8.48
1,000	1.00	1.82	2.34	2.65	3.00	3.20	5.01	6.53	7.18	7.46	7.63	7.75	7.78	7.80
2,000	0.78	1.55	2.02	2.31	2.71	2.80	4.49	5.93	6.49	6.62	6.80	6.92	7.05	7.06
5,000	0.56	1.15	1.39	1.83	2.09	2.33	3.71	4.92	5.40	5.58	5.81	5.94	6.02	6.06
10,000	0.24	0.81	1.00	1.33	1.50	1.83	3.00	4.00	4.42	4.56	4.90	5.07	5.15	5.15
20,000	0.17	0.44	0.54	0.53	0.57	1.12	1.74	2.41	2.95	3.32	3.45	3.72	3.85	3.89
50,000	0.08	0.17	0.24	0.32	0.39	0.50	0.83	1.18	1.36	1.58	1.65	1.65	2.17	2.17
50,140	0.08	0.17	0.24	0.32	0.39	0.50	0.83	1.17	1.36	1.58	1.64	1.64	2.17	2.17



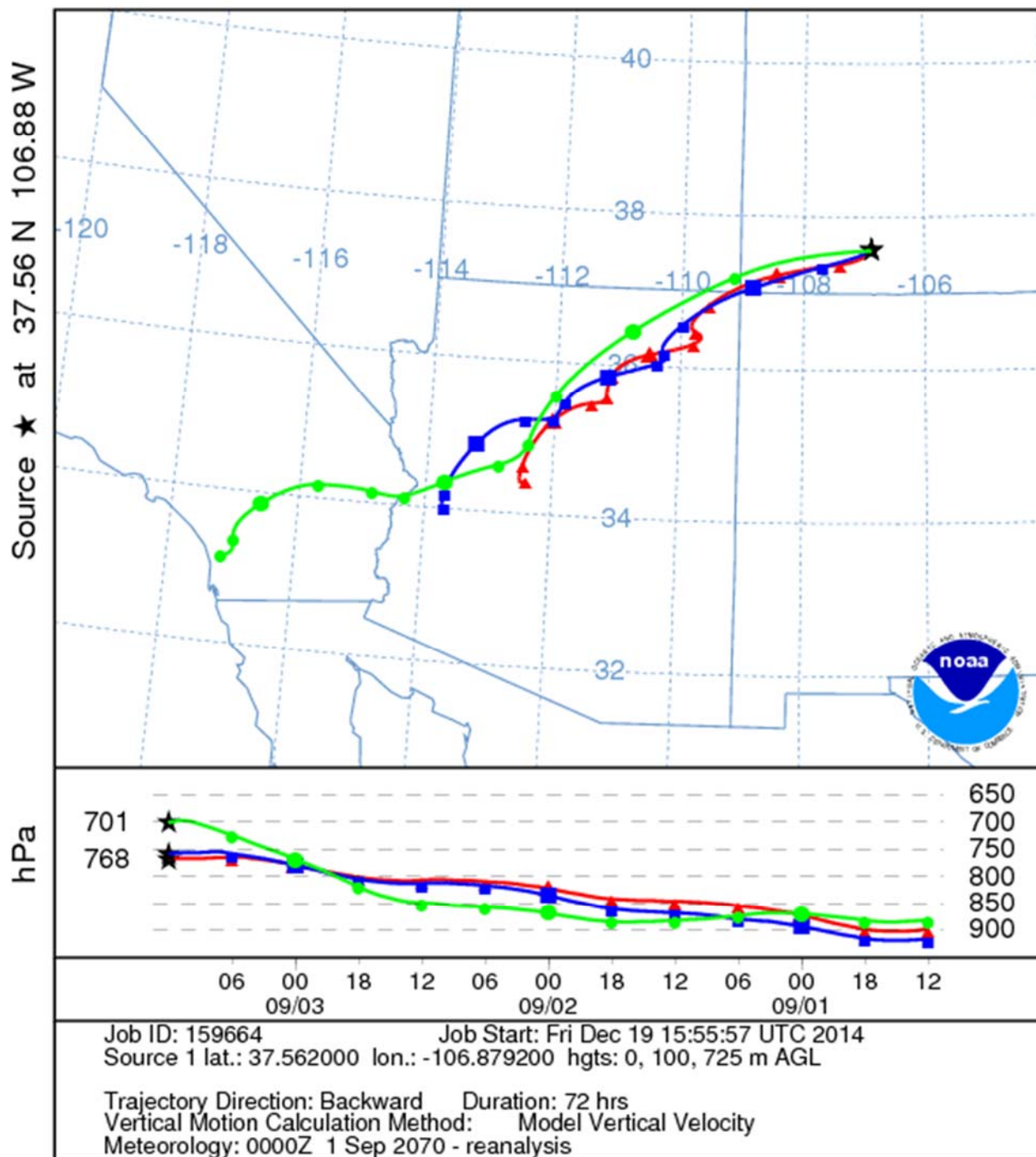
CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



NOAA HYSPLIT MODEL
Backward trajectories ending at 1200 UTC 03 Sep 70
CDC1 Meteorological Data





Indian Wells, AZ

September 3-8, 1970

Storm Type: Tropical

Storm Precipitation Analysis System (SPAS) For Storm #1075_3

General Storm Location: Northern Mexico, Arizona, Colorado and Utah

Storm Dates: September 3 (0700Z), 1970 - September 8 (0700Z), 1970

Event: Tropical remnants of Hurricane

DAD Zone 3: Colorado Plateau

Lat: 35.4950

Lon: -110.4208

Max. Grid/Radar Rainfall Amount: 7.00"

Max. Observed Rainfall Amount: n/a

Number of Stations: 740 (148-hourly, 4-hourly pseudo, 6-hourly estimated, 372-daily, 205-supplemental, 4 supplemental estimated and 1 supplemental pseudo)

SPAS Version: 7.0

Base Map Used: Yes, "conus_prism_ppt_in_1971_2000_09"

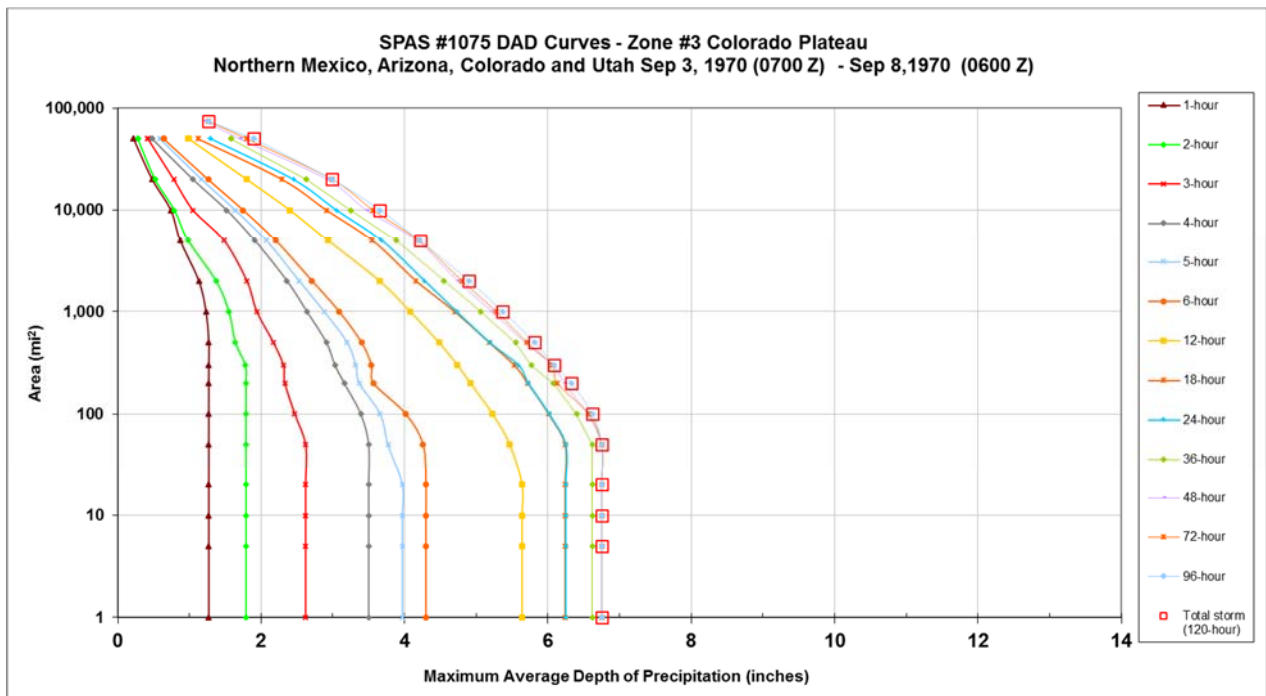
Spatial resolution: 0.27 mi²

Radar Included: No

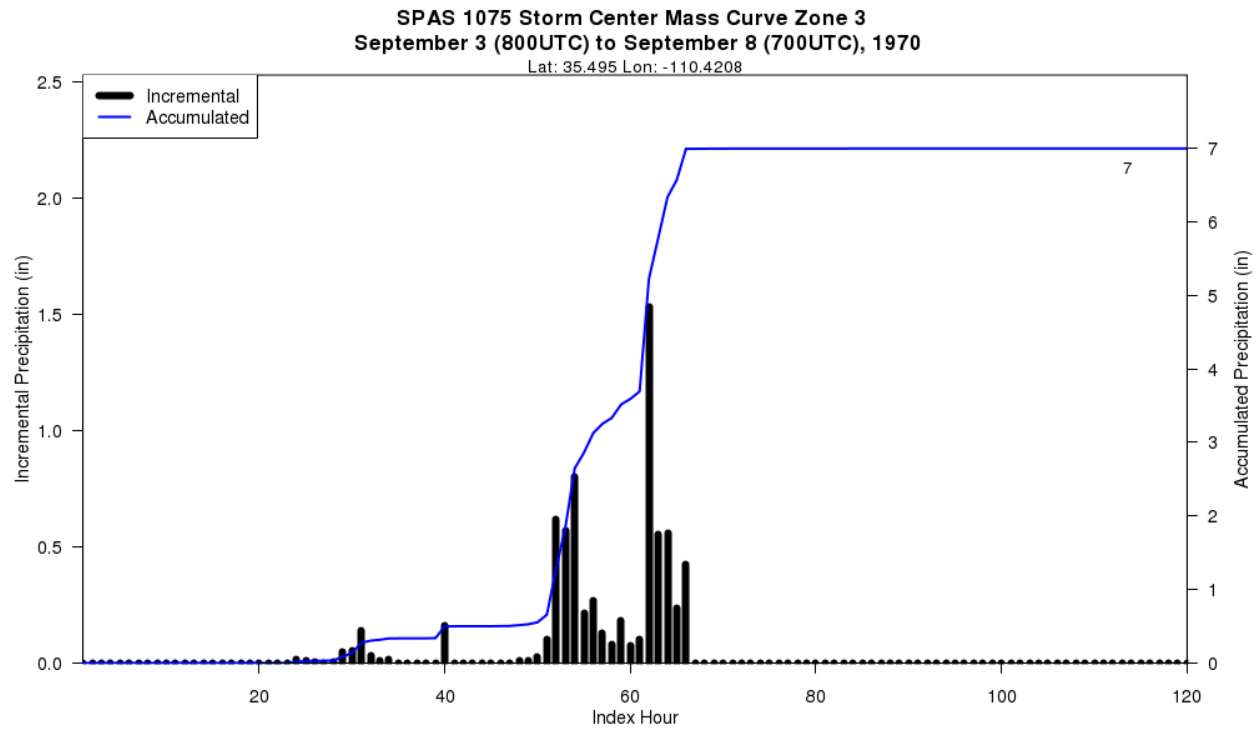
Depth-Area-Duration (DAD) analysis: Yes: 1, 2, 3, 4, 5, 6, 12, 18, 24, 36, 48, 72, 96, 120 hours

CO-NM Regional Extreme Precipitation Study

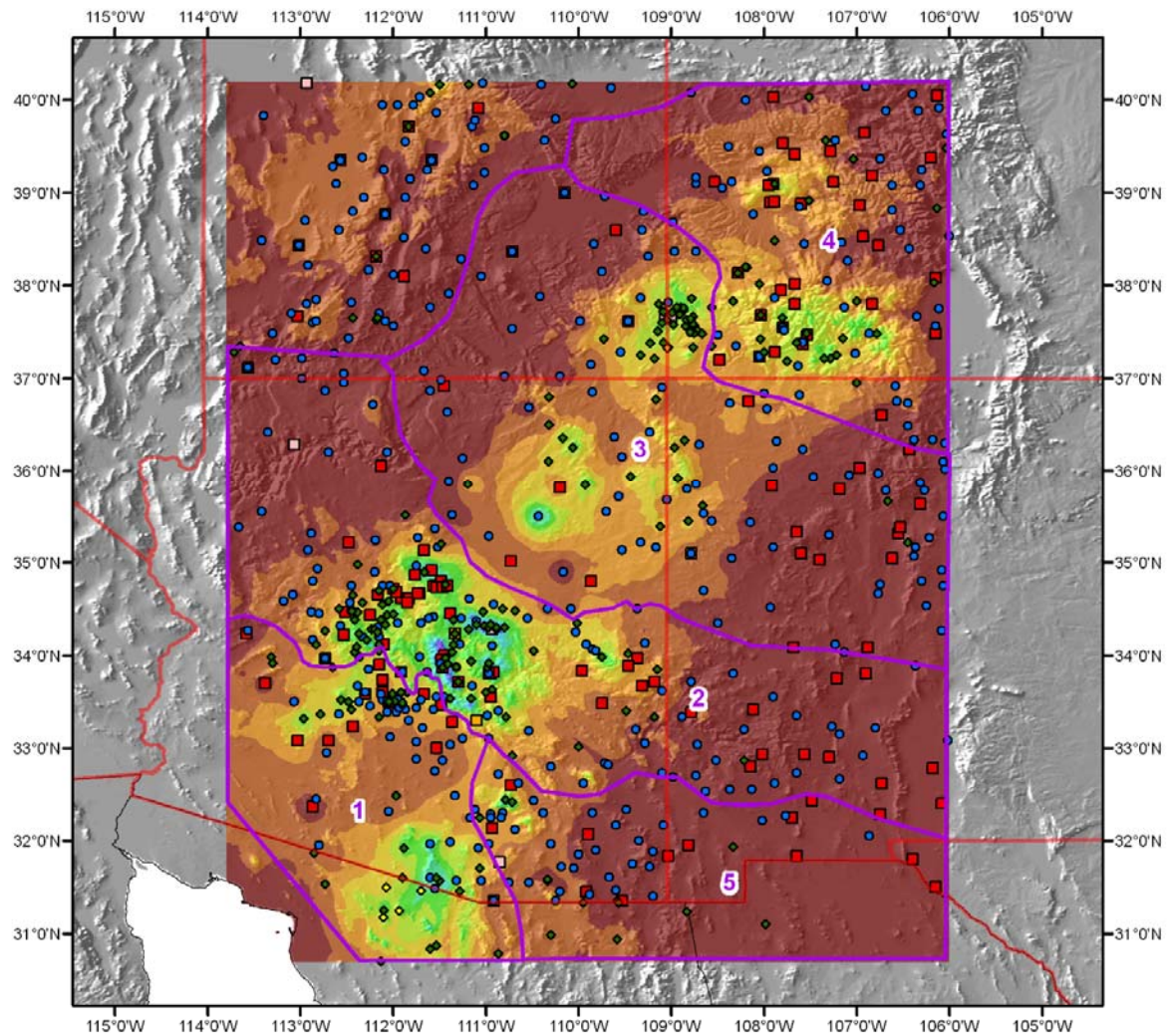
Storm 1075 - Northern Mexico, Arizona, Colorado and Utah Sep 3, 1970 (0700 Z) - Sep 8, 1970 (0600 Z)														
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
Area (mi ²)	Duration (hours)													
	1	2	3	4	5	6	12	18	24	36	48	72	96	Total
0.27	1.56	2.08	2.98	3.84	4.30	4.59	5.95	6.48	6.50	6.86	7.00	7.00	7.00	7.00
1	1.27	1.79	2.62	3.50	3.97	4.30	5.64	6.24	6.25	6.62	6.75	6.75	6.75	6.75
5	1.27	1.79	2.62	3.50	3.97	4.30	5.64	6.24	6.25	6.62	6.75	6.75	6.75	6.75
10	1.27	1.79	2.62	3.50	3.97	4.30	5.64	6.24	6.25	6.62	6.75	6.75	6.75	6.75
20	1.27	1.79	2.62	3.50	3.97	4.30	5.64	6.24	6.25	6.62	6.75	6.75	6.75	6.75
50	1.27	1.79	2.62	3.50	3.77	4.26	5.47	6.24	6.25	6.62	6.75	6.75	6.75	6.75
100	1.27	1.79	2.47	3.39	3.66	4.02	5.23	6.01	6.02	6.40	6.55	6.57	6.62	6.62
200	1.27	1.79	2.33	3.16	3.37	3.57	4.92	5.72	5.73	6.08	6.23	6.13	6.33	6.33
300	1.27	1.78	2.31	3.03	3.32	3.54	4.74	5.53	5.59	5.77	6.07	6.06	6.09	6.09
500	1.27	1.64	2.17	2.91	3.20	3.40	4.48	5.18	5.19	5.55	5.68	5.71	5.82	5.82
1,000	1.23	1.55	1.94	2.64	2.88	3.09	4.08	4.70	4.73	5.06	5.22	5.28	5.37	5.37
2,000	1.13	1.37	1.80	2.36	2.53	2.71	3.65	4.16	4.28	4.55	4.74	4.80	4.90	4.90
5,000	0.87	0.98	1.48	1.91	2.07	2.20	2.93	3.55	3.68	3.88	4.17	4.20	4.21	4.22
10,000	0.74	0.79	1.05	1.52	1.64	1.75	2.40	2.91	3.05	3.25	3.47	3.56	3.66	3.66
20,000	0.48	0.52	0.78	1.05	1.17	1.26	1.80	2.29	2.45	2.63	2.92	2.99	2.99	2.99
50,000	0.22	0.28	0.42	0.48	0.59	0.64	0.99	1.12	1.30	1.58	1.70	1.80	1.90	1.90
50,140	0.22	0.28	0.41	0.48	0.59	0.64	0.98	1.12	1.29	1.58	1.70	1.80	1.90	1.90
74,650											1.21	1.26	1.26	1.26



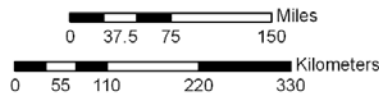
CO-NM Regional Extreme Precipitation Study



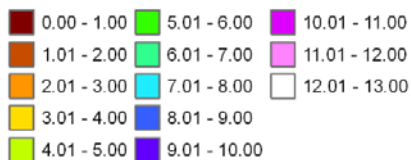
CO-NM Regional Extreme Precipitation Study



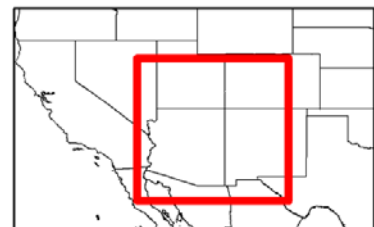
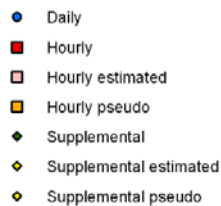
SPAS Storm #1075
Total Rainfall (120-hours)
Sep 3, 1970 (0700 Z) - Sep 8, 1970 (0600 Z)
Tropical Storm Norma Remnants



Precipitation (inches)

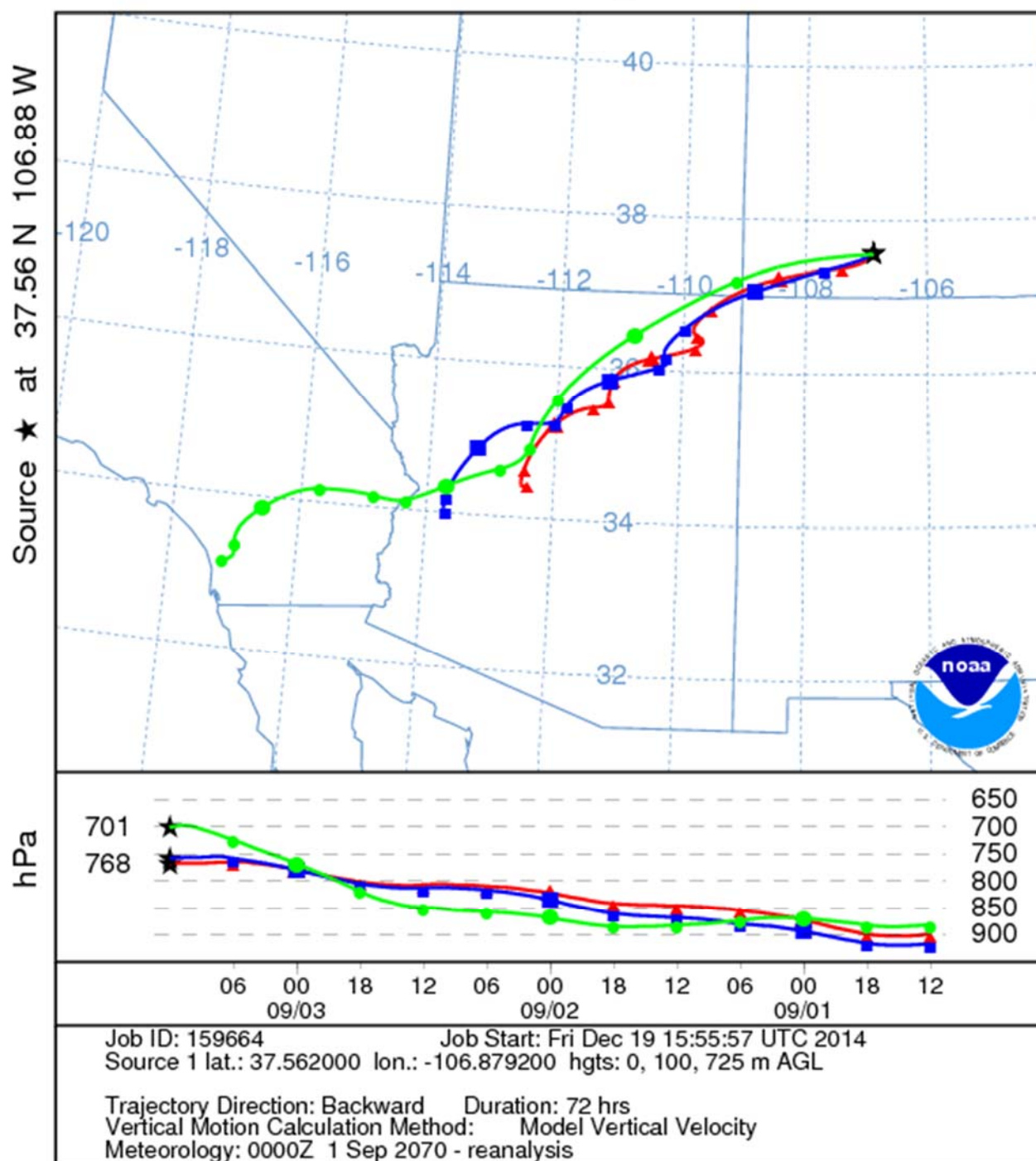


Station Type



Metstat/AWA, October 16, 2009

NOAA HYSPLIT MODEL
Backward trajectories ending at 1200 UTC 03 Sep 70
CDC1 Meteorological Data





Bayfield, CO
September 3-8, 1970
Storm Type: Tropical

Storm Precipitation Analysis System (SPAS) For Storm #1075_4

General Storm Location: Northern Mexico, Arizona, Colorado and Utah

Storm Dates: September 3 (0700Z), 1970 - September 8 (0700Z), 1970

Event: Tropical remnants of Hurricane

DAD Zone 4: SW Colorado Mtns

Lat: 37.5620

Lon: -106.8792

Max. Grid/Radar Rainfall Amount: 5.95"

Max. Observed Rainfall Amount: n/a

Number of Stations: 740 (148-hourly, 4-hourly pseudo, 6-hourly estimated, 372-daily, 205-supplemental, 4 supplemental estimated and 1 supplemental pseudo)

SPAS Version: 7.0

Base Map Used: Yes, "conus_prism_ppt_in_1971_2000_09"

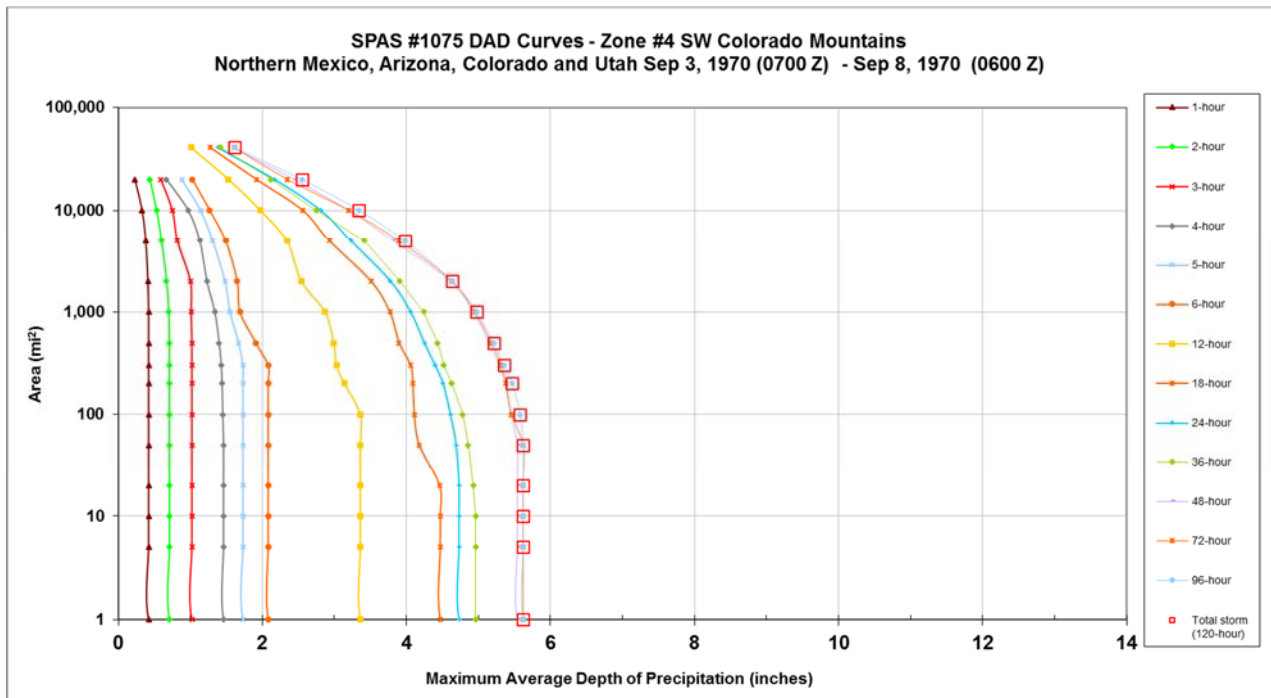
Spatial resolution: 0.27 mi²

Radar Included: No

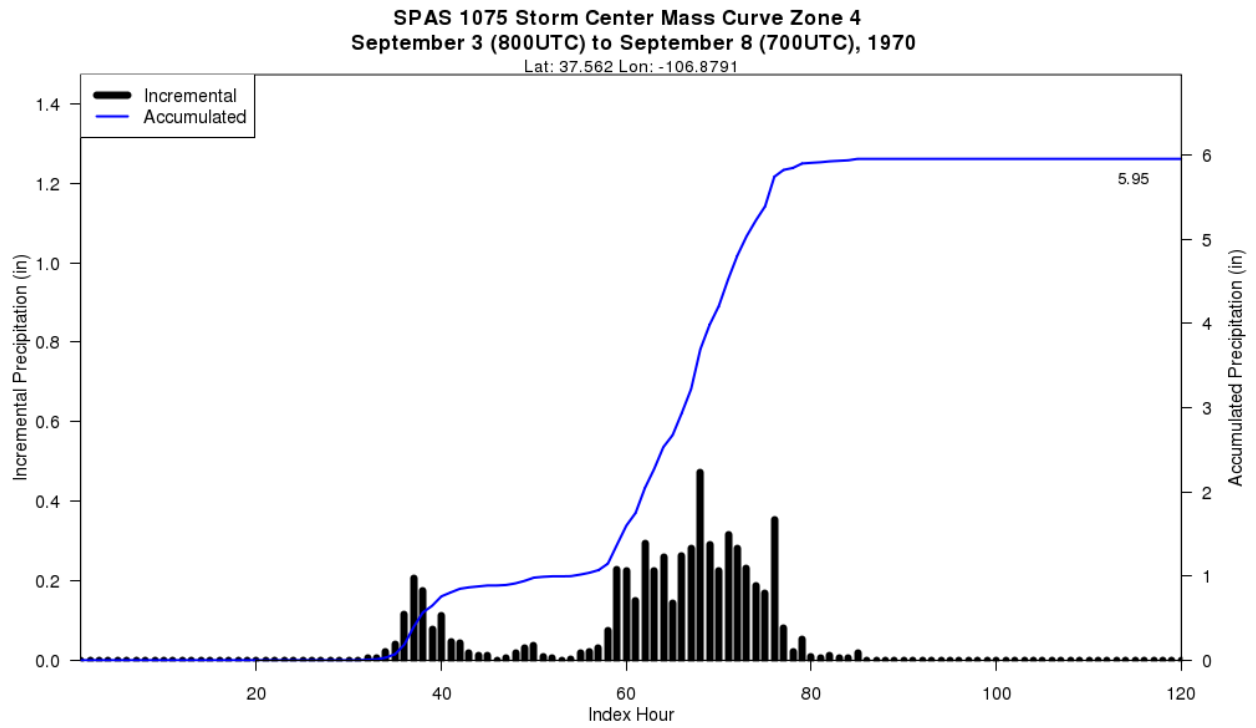
Depth-Area-Duration (DAD) analysis: Yes: 1, 2, 3, 4, 5, 6, 12, 18, 24, 36, 48, 72, 96, 120 hours

CO-NM Regional Extreme Precipitation Study

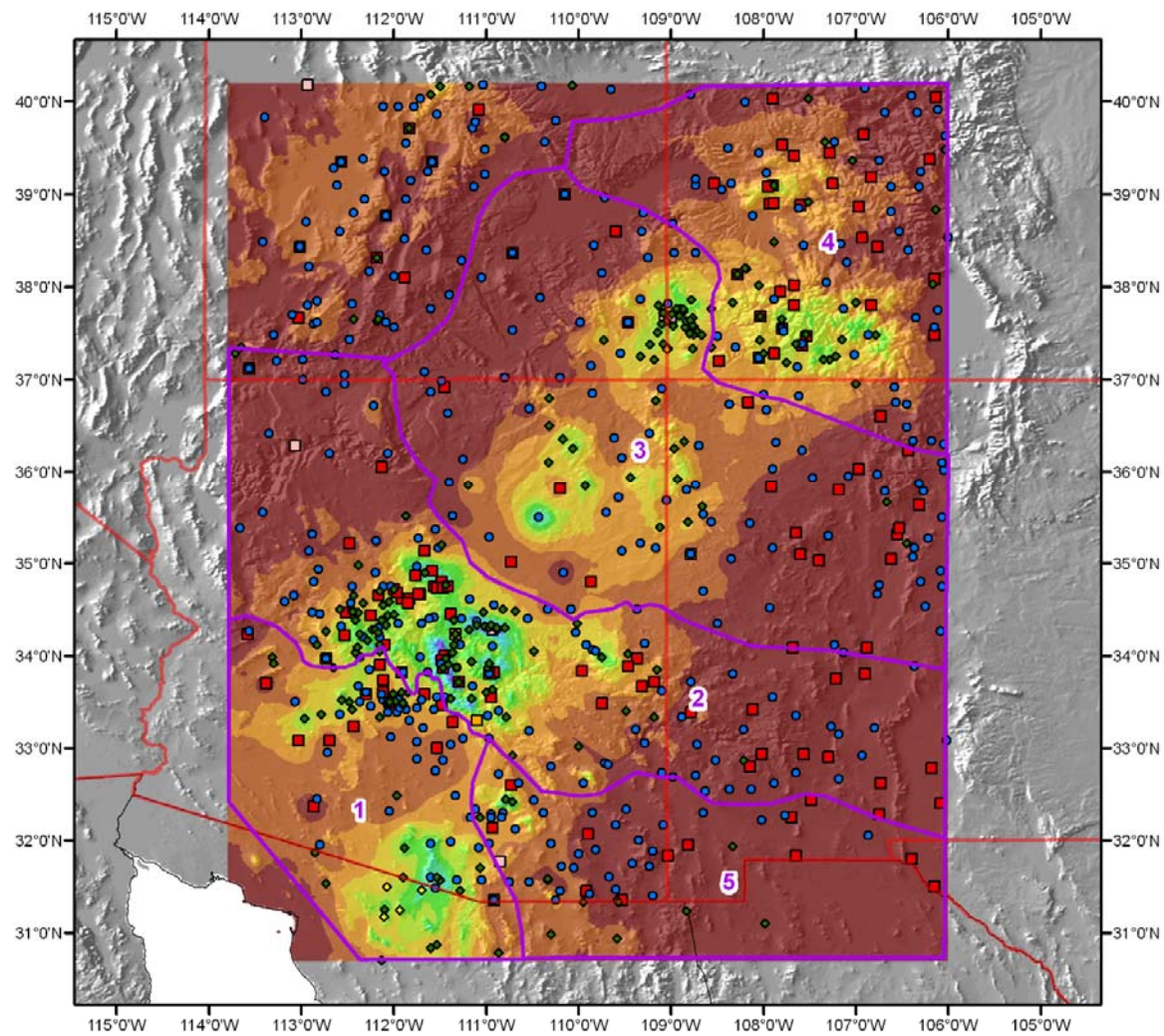
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)															
Area (mi ²)	Duration (hours)														
	1	2	3	4	5	6	12	18	24	36	48	72	96		Total
0.27	0.82	1.07	1.4	1.77	2.12	2.37	3.71	4.83	5.07	5.27	5.9	5.95	5.95		5.95
1	0.42	0.71	1.02	1.46	1.73	2.08	3.36	4.47	4.73	4.96	5.54	5.62	5.62		5.62
5	0.42	0.71	1.02	1.46	1.73	2.08	3.36	4.47	4.73	4.96	5.54	5.62	5.62		5.62
10	0.42	0.71	1.02	1.46	1.73	2.08	3.36	4.47	4.73	4.96	5.54	5.62	5.62		5.62
20	0.42	0.71	1.02	1.46	1.73	2.08	3.36	4.46	4.73	4.93	5.54	5.62	5.62		5.62
50	0.42	0.71	1.02	1.46	1.73	2.08	3.36	4.18	4.69	4.86	5.54	5.62	5.62		5.62
100	0.42	0.71	1.02	1.45	1.73	2.08	3.36	4.11	4.61	4.78	5.45	5.46	5.58		5.58
200	0.42	0.71	1.02	1.44	1.73	2.08	3.14	4.09	4.51	4.63	5.37	5.38	5.47		5.47
300	0.42	0.71	1.02	1.43	1.73	2.08	3.03	4.06	4.4	4.52	5.29	5.32	5.36		5.36
500	0.42	0.71	1.02	1.4	1.67	1.91	2.99	3.9	4.25	4.43	5.15	5.18	5.21		5.21
1,000	0.42	0.7	1.01	1.34	1.55	1.69	2.87	3.77	4.06	4.24	4.93	4.95	4.98		4.98
2,000	0.41	0.67	1	1.23	1.48	1.65	2.54	3.51	3.78	3.91	4.61	4.63	4.64		4.64
5,000	0.38	0.6	0.82	1.13	1.31	1.49	2.34	2.93	3.23	3.42	3.82	3.9	3.98		3.98
10,000	0.33	0.53	0.75	0.97	1.14	1.27	1.97	2.56	2.81	2.75	3.2	3.2	3.34		3.34
20,000	0.23	0.44	0.59	0.67	0.88	1.03	1.53	1.92	2.17	2.12	2.44	2.35	2.55		2.55
40,779							1.01	1.28	1.38	1.42	1.59	1.61	1.61		1.61



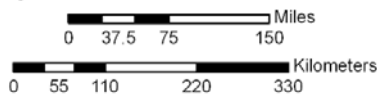
CO-NM Regional Extreme Precipitation Study



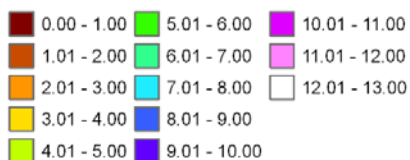
CO-NM Regional Extreme Precipitation Study



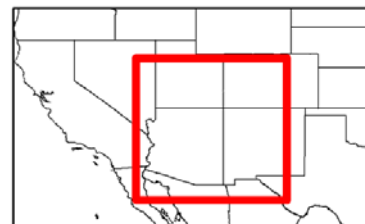
SPAS Storm #1075
Total Rainfall (120-hours)
Sep 3, 1970 (0700 Z) - Sep 8, 1970 (0600 Z)
Tropical Storm Norma Remnants



Precipitation (inches)

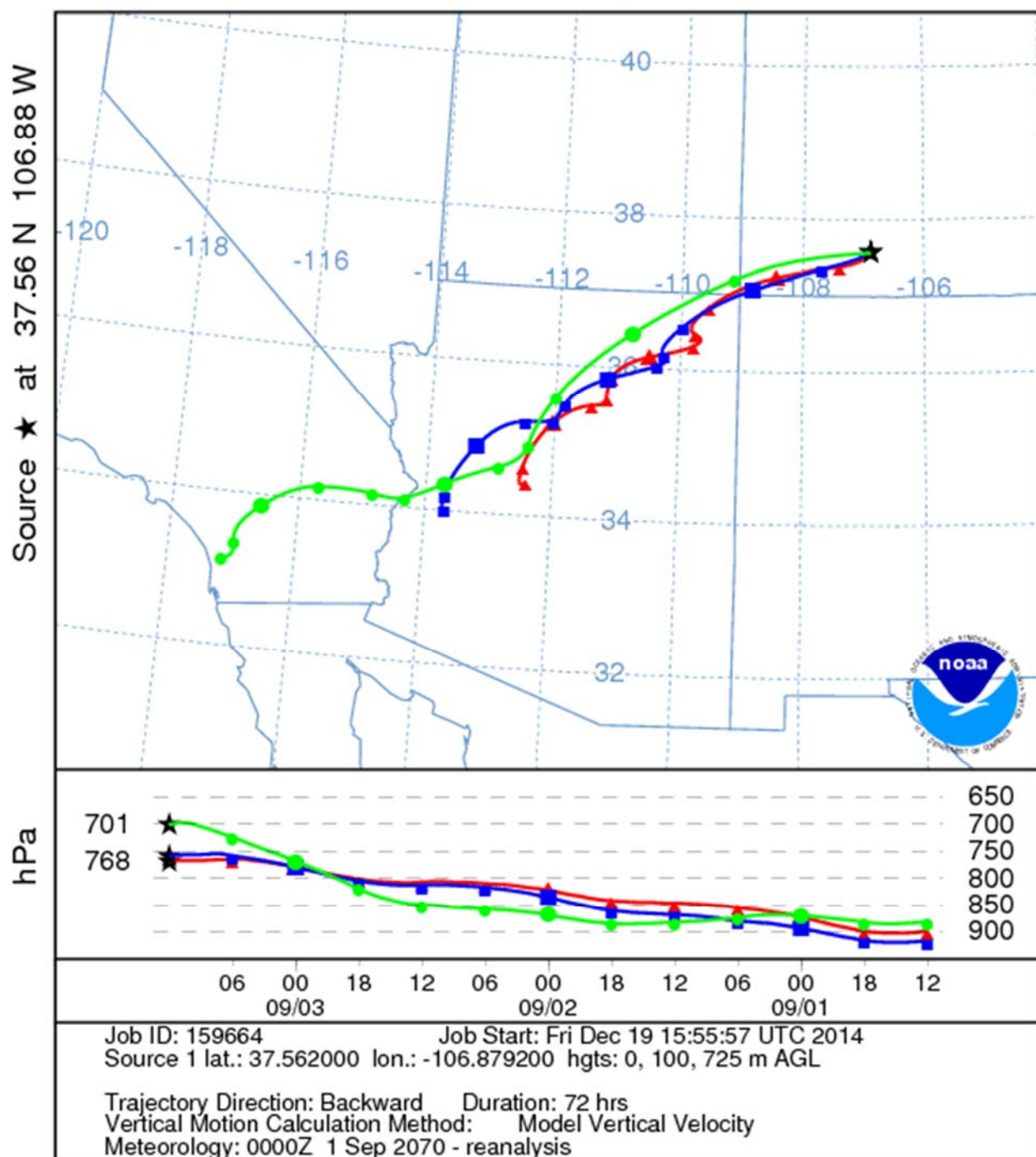


Station Type



Metstat/AWA October 16, 2009

NOAA HYSPLIT MODEL
Backward trajectories ending at 1200 UTC 03 Sep 70
CDC1 Meteorological Data





Joanne, AZ
October 3-7, 1972
Storm Type: Tropical

Storm Precipitation Analysis System (SPAS) For Storm #1102_2

General Storm Location: Workman Creek, Arizona

Storm Dates: October 3 (0700Z) – October 7 (0700Z), 1972

Event: Remnants of Hurricane Joanne

DAD Zone 2: Mogollon Rim

Latitude: 33.8208

Longitude: -110.9208

Max. Grid/Radar Rainfall Amount: 11.66”

Max. Observed Rainfall Amount: 11.70” at Workman Cr, AZ

Number of Stations: 601 (439 Daily, 64 Hourly, 34 Hourly Pseudo, 64 Supplemental)

SPAS Version: 7.0

Base Map Used: PRISM Mean (71-00) October Precipitation

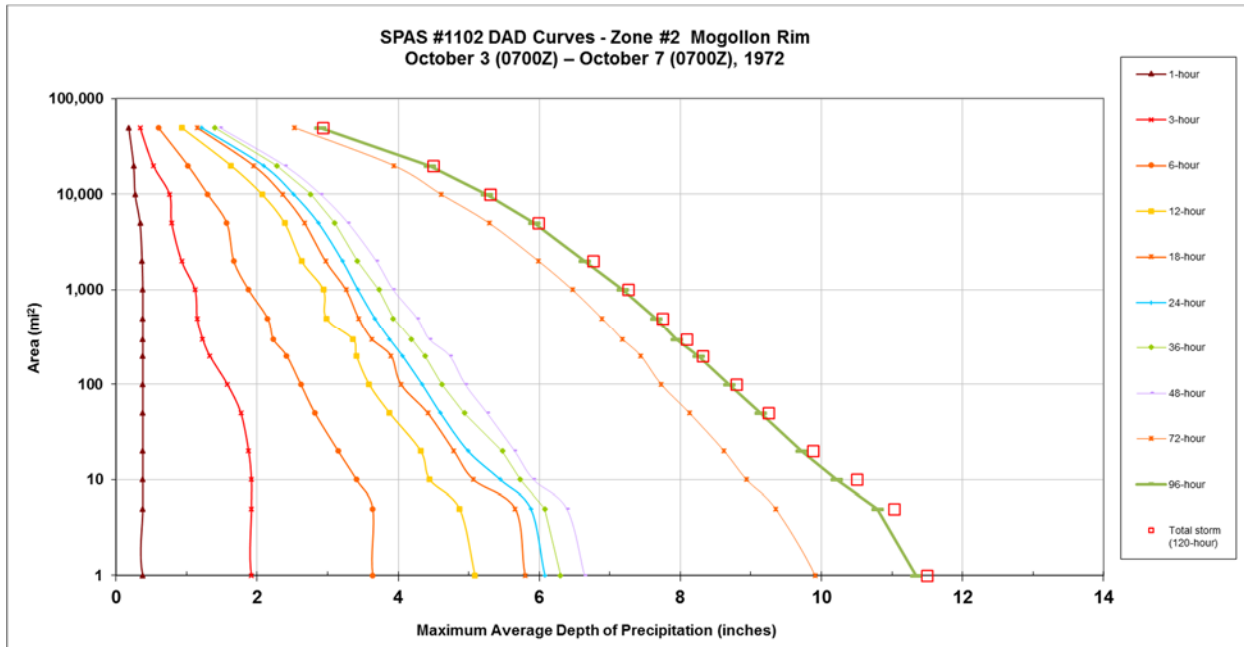
Spatial resolution: 30 sec.

Radar Included: N

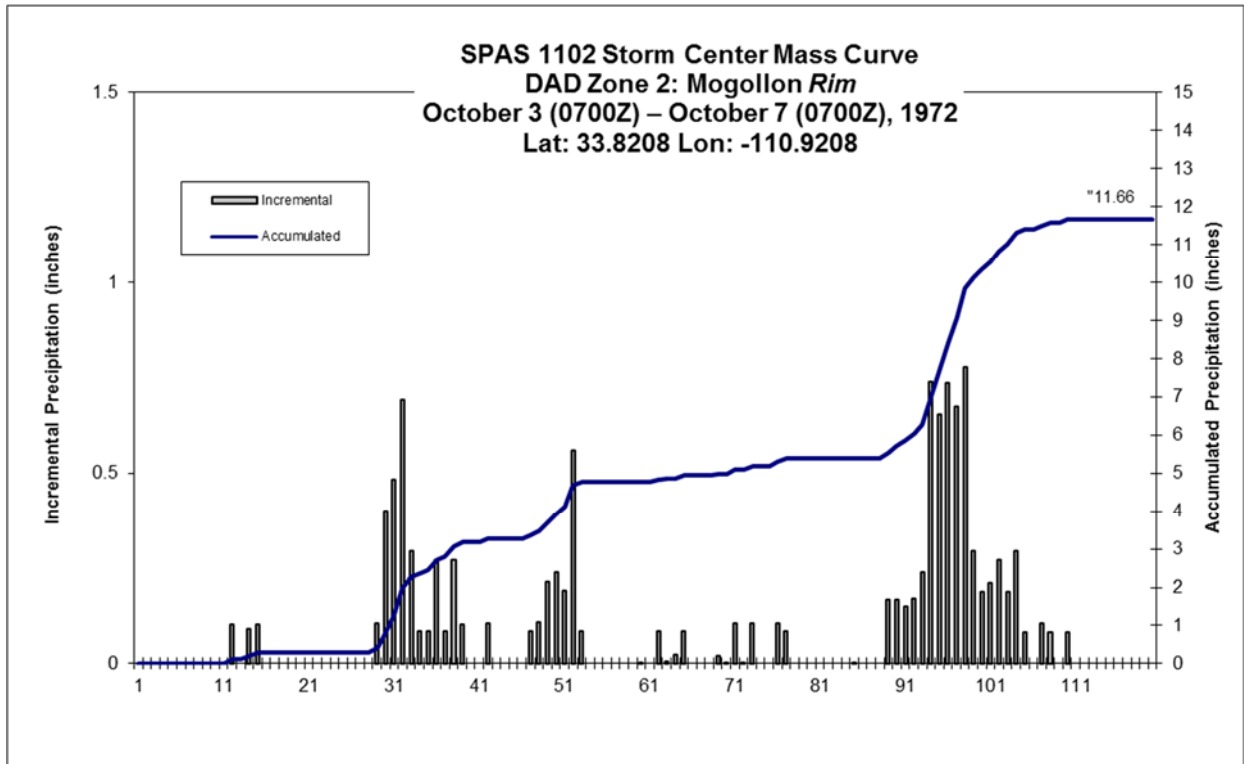
Depth-Area-Duration (DAD) analysis: Y

CO-NM Regional Extreme Precipitation Study

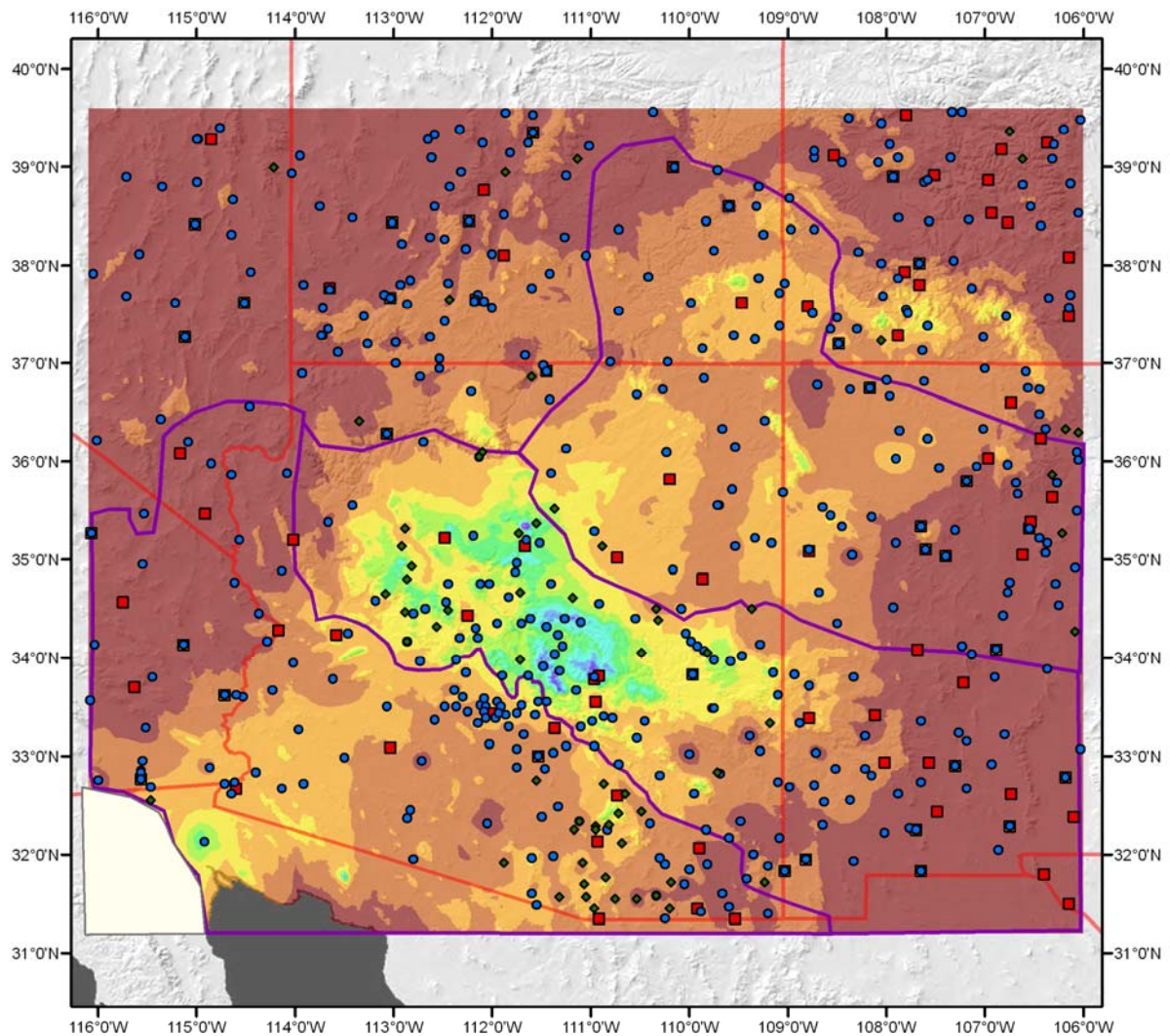
Storm 1102 - SW Utah, SE California and western Arizona, October 3 (0700Z) – October 7 (0700Z), 1972														
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
Area (mi ²)	Duration (hours)													
	1	2	3	4	5	6	12	18	24	36	48	72	96	Total
0.27	0.78		2.19			3.88	5.27	6.01	6.28	6.49	6.81	10.14	11.49	11.65
1	0.38		1.92			3.64	5.09	5.80	6.08	6.30	6.64	9.91	11.34	11.50
5	0.38		1.92			3.64	4.87	5.66	5.88	6.08	6.39	9.35	10.79	11.03
10	0.38		1.92			3.41	4.45	5.07	5.45	5.73	5.92	8.94	10.21	10.50
20	0.38		1.88			3.15	4.32	4.79	4.99	5.48	5.65	8.62	9.72	9.88
50	0.38		1.77			2.82	3.88	4.42	4.60	4.94	5.26	8.13	9.13	9.25
100	0.38		1.58			2.62	3.59	4.04	4.34	4.62	4.95	7.73	8.69	8.79
200	0.38		1.33			2.42	3.41	3.90	4.06	4.38	4.73	7.44	8.25	8.32
300	0.38		1.23			2.23	3.36	3.63	3.88	4.19	4.44	7.18	7.94	8.09
500	0.38		1.15			2.15	2.98	3.44	3.67	3.93	4.27	6.89	7.65	7.75
1000	0.38		1.12			1.88	2.94	3.26	3.43	3.73	3.93	6.47	7.18	7.26
2000	0.37		0.93			1.67	2.63	2.97	3.21	3.42	3.69	5.99	6.64	6.76
5000	0.34		0.79			1.57	2.39	2.67	3.10	3.29	3.59	5.29	5.93	5.99
10000	0.27		0.76			1.30	2.07	2.36	2.52	2.76	2.90	4.61	5.25	5.30
20000	0.25		0.53			1.02	1.63	1.95	2.09	2.28	2.39	3.94	4.45	4.50
50000	0.18		0.34			0.60	0.93	1.15	1.21	1.40	1.47	2.53	2.89	2.93



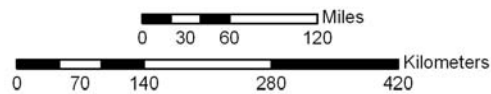
CO-NM Regional Extreme Precipitation Study



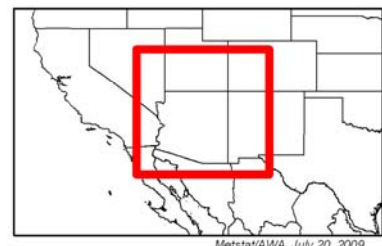
CO-NM Regional Extreme Precipitation Study



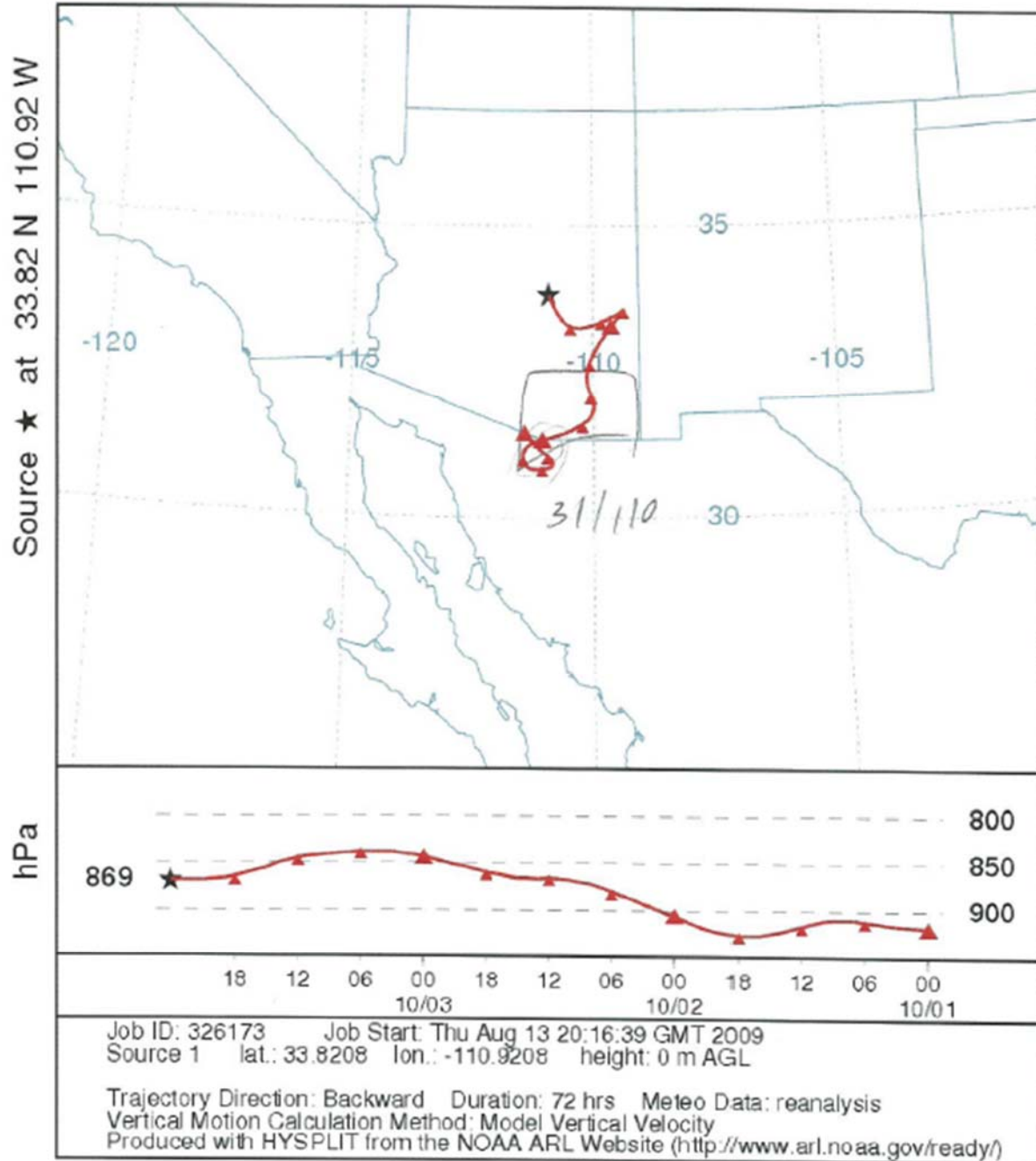
Total Storm Precipitation
SPAS Storm #1102
October 3 (0700Z) – October 7 (0700Z), 1972



Precipitation (inches)



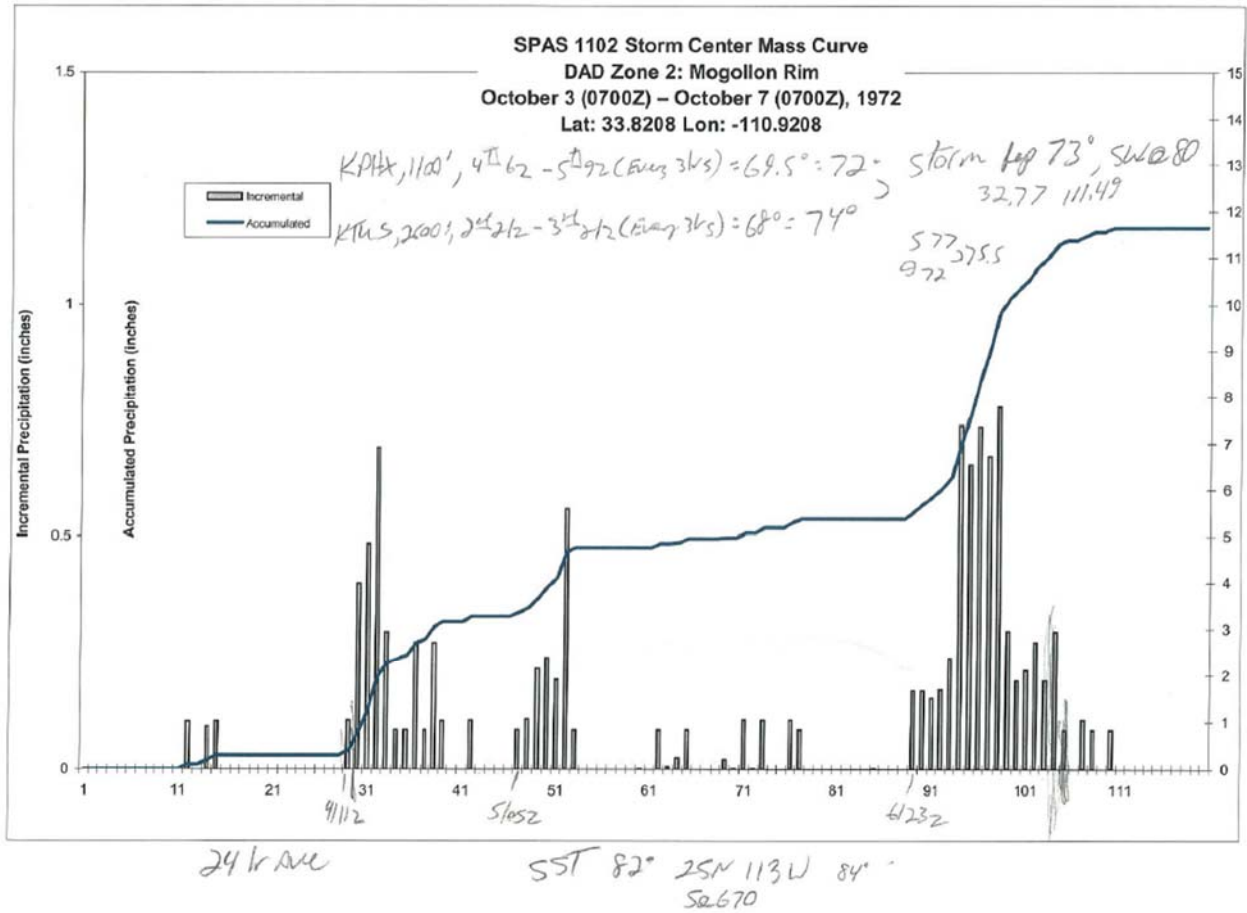
NOAA HYSPLIT MODEL
Backward trajectory ending at 0000 UTC 04 Oct 72
CDC1 Meteorological Data



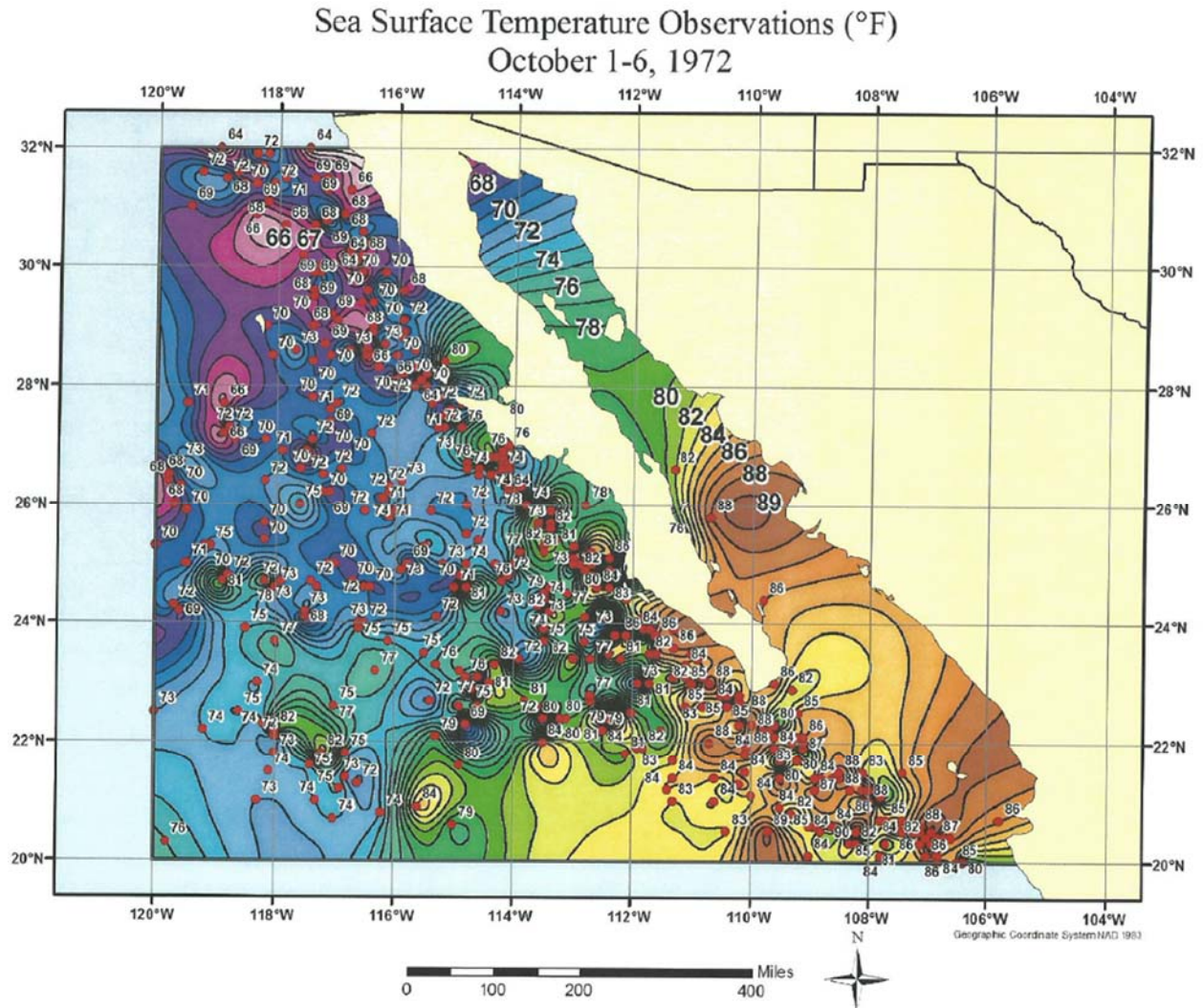
CO-NM Regional Extreme Precipitation Study

SFC obs 10-1-6 31N/108 31/113
SST Daily 10-1-6 30/105 20/110 - Ceoff

68.5



CO-NM Regional Extreme Precipitation Study



Nogales, AZ
October 6-10, 1977
Storm Type: Tropical

Storm Precipitation Analysis System (SPAS) For Storm #1097_1

General Storm Location: Nogales, Arizona

Storm Dates: October 6-10, 1977

Event: Tropical storm remnants

Zone 1

Latitude: 31.1042

Longitude: -110.7875

Max. Grid Rainfall Amount: 15.97"

Max. Observed Rainfall Amount: 14.00" at FIGURE 14 STATION 5 MX

Number of Stations: 184 (31 Daily, 6 Hourly, 1 Hourly Estimated Pseudo, 4 Hourly Pseudo, 140 Supplemental, and 2 Supplemental Estimated)

SPAS Version: 8.0

Base Map Used: Yes, conus_prism_ppt_in_1971_2000_10_mx

Spatial resolution: 00:00:30 (0.28 sq. miles)

Radar Included: No

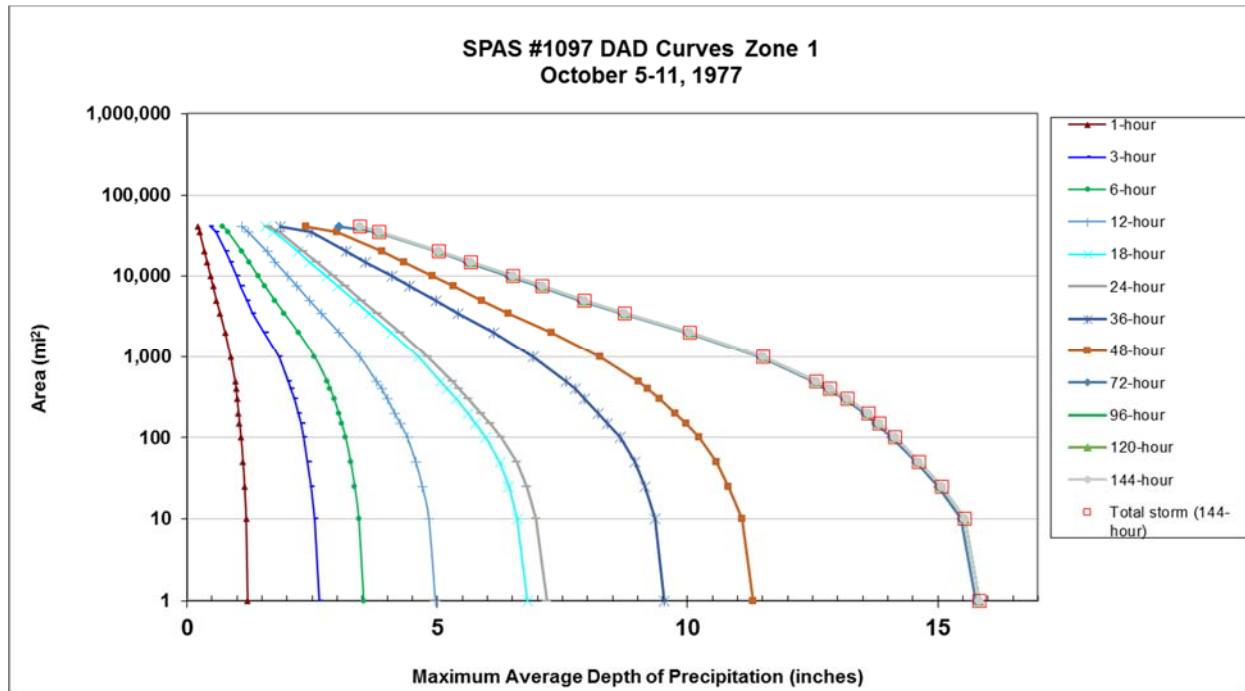
Depth-Area-Duration (DAD) analysis: Yes

Comments:

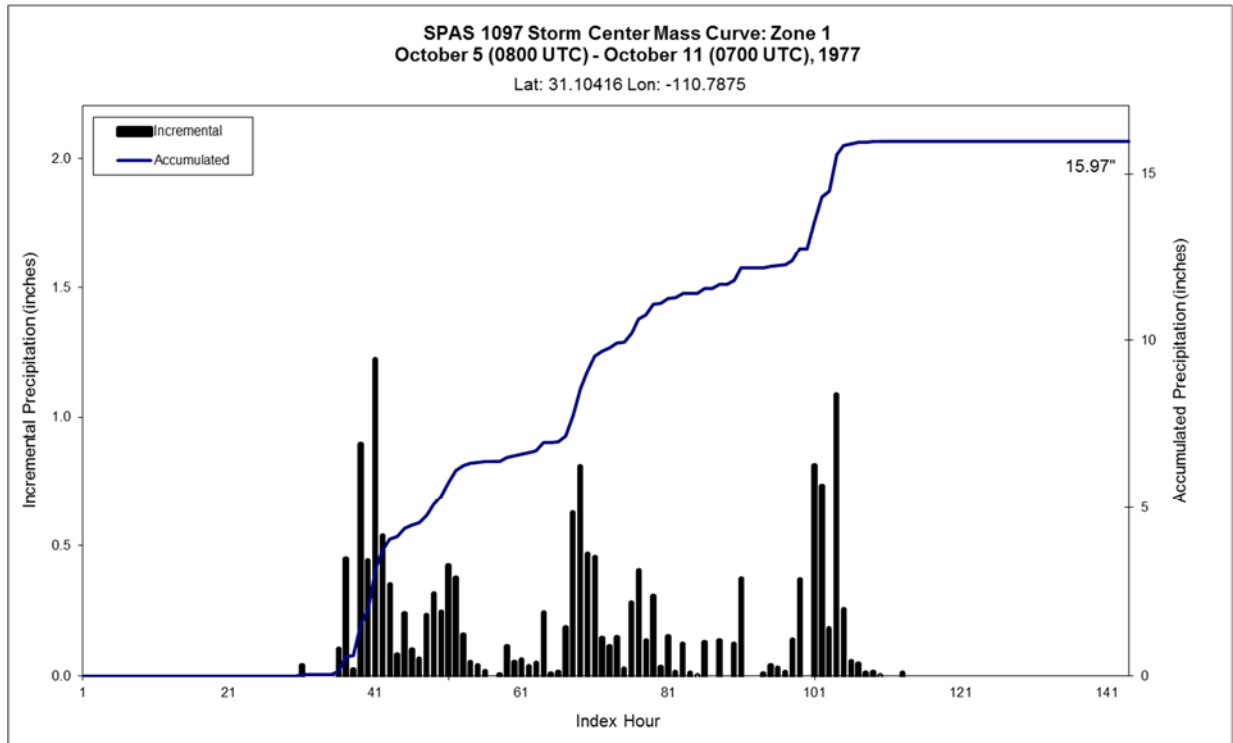
Adjusted station FIG 14 STATION 2 MX up by 4% to bring the SPAS precipitation value closer to the observed value.

CO-NM Regional Extreme Precipitation Study

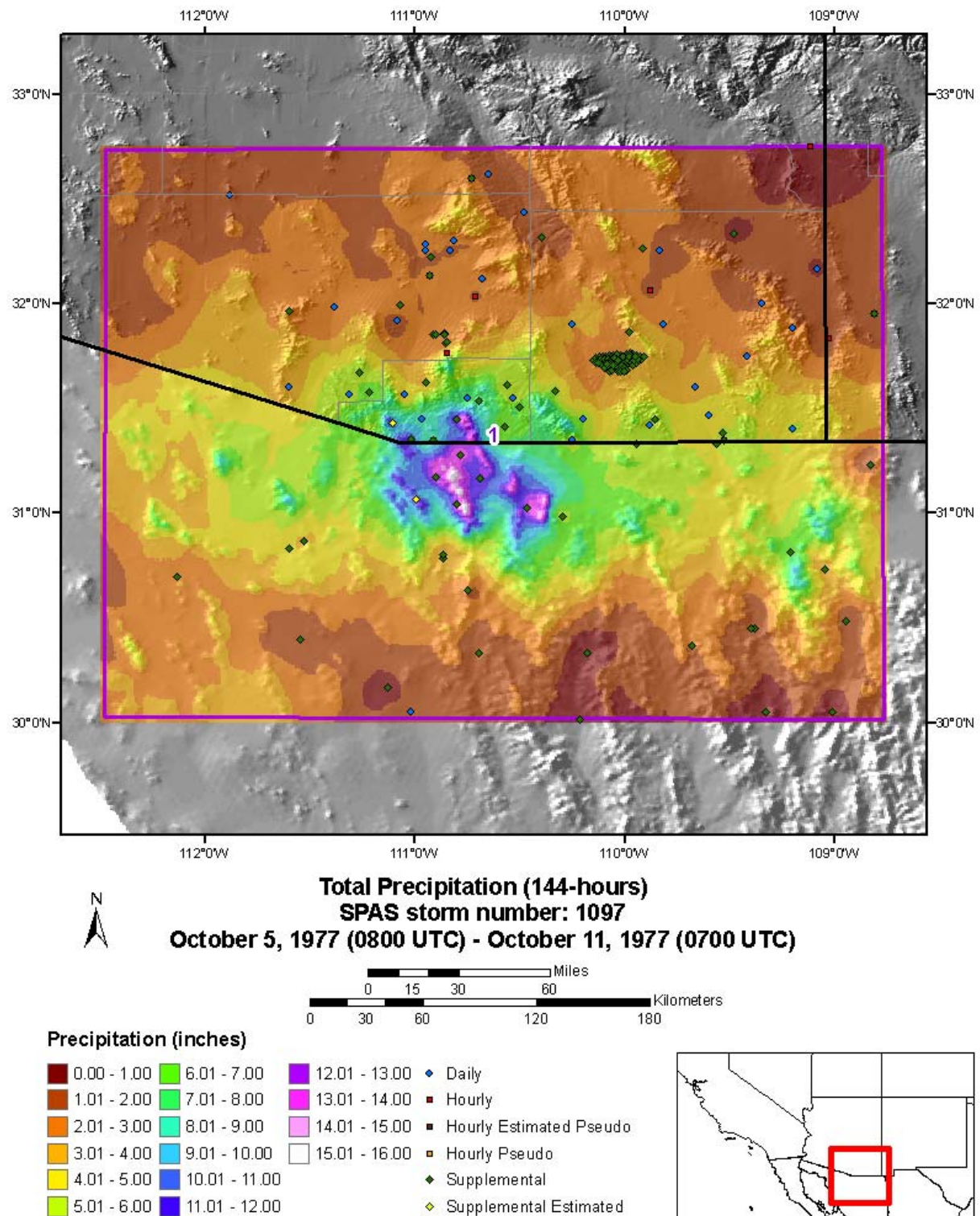
Storm 1097 - October 5 (0800 UTC) - October 11 (0700 UTC), 1977													
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)													
Area (mi ²)	Duration (hours)												
	1	3	6	12	18	24	36	48	72	96	120	144	Total
0.4	1.22	2.66	3.57	5.01	6.86	7.25	9.61	11.39	15.86	15.93	15.93	15.93	15.93
1	1.21	2.64	3.53	4.96	6.80	7.19	9.53	11.31	15.75	15.83	15.83	15.83	15.83
10	1.18	2.55	3.43	4.83	6.60	6.97	9.35	11.09	15.47	15.53	15.53	15.53	15.53
25	1.15	2.47	3.35	4.70	6.43	6.78	9.14	10.82	15.01	15.08	15.08	15.08	15.08
50	1.12	2.41	3.27	4.57	6.25	6.59	8.94	10.57	14.56	14.63	14.63	14.63	14.63
100	1.08	2.33	3.17	4.40	5.97	6.27	8.65	10.23	14.08	14.14	14.14	14.14	14.14
150	1.05	2.28	3.09	4.26	5.76	6.05	8.40	9.97	13.77	13.83	13.83	13.83	13.83
200	1.03	2.22	3.03	4.15	5.61	5.88	8.22	9.75	13.54	13.61	13.61	13.61	13.61
300	1.00	2.14	2.94	4.00	5.38	5.62	7.95	9.45	13.13	13.19	13.19	13.19	13.19
400	0.98	2.07	2.86	3.89	5.20	5.44	7.75	9.21	12.79	12.85	12.85	12.85	12.85
500	0.96	2.02	2.80	3.78	5.06	5.30	7.58	9.03	12.51	12.58	12.58	12.58	12.58
1,000	0.87	1.83	2.55	3.45	4.62	4.82	6.92	8.26	11.45	11.51	11.51	11.51	11.51
2,000	0.76	1.55	2.23	3.04	4.09	4.27	6.12	7.28	9.99	10.05	10.05	10.05	10.05
3,500	0.66	1.30	1.94	2.68	3.64	3.81	5.41	6.43	8.69	8.75	8.75	8.75	8.75
5,000	0.59	1.19	1.76	2.45	3.34	3.50	4.97	5.89	7.87	7.94	7.94	7.94	7.94
7,500	0.52	1.07	1.56	2.20	3.02	3.17	4.44	5.32	7.02	7.10	7.10	7.10	7.10
10,000	0.47	0.99	1.42	2.02	2.79	2.92	4.09	4.91	6.43	6.51	6.51	6.51	6.51
15,000	0.40	0.86	1.24	1.76	2.45	2.59	3.56	4.33	5.60	5.67	5.67	5.67	5.67
20,000	0.35	0.77	1.10	1.60	2.23	2.33	3.19	3.89	4.99	5.04	5.04	5.04	5.04
35,000	0.25	0.57	0.82	1.22	1.74	1.85	2.49	3.00	3.79	3.85	3.85	3.85	3.85
41,042	0.22	0.46	0.72	1.09	1.57	1.62	1.86	2.37	3.03	3.46	3.46	3.46	3.46



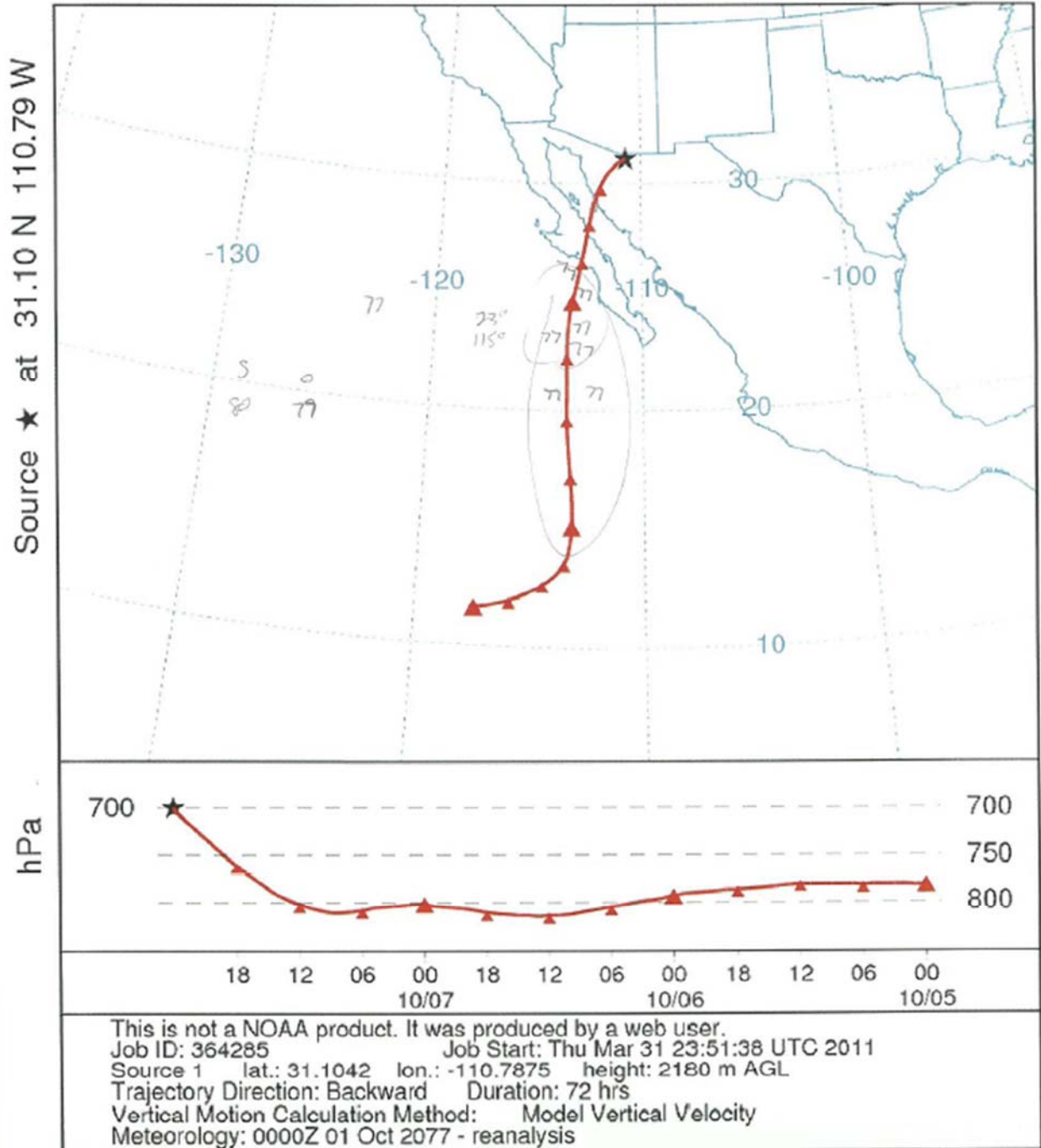
CO-NM Regional Extreme Precipitation Study



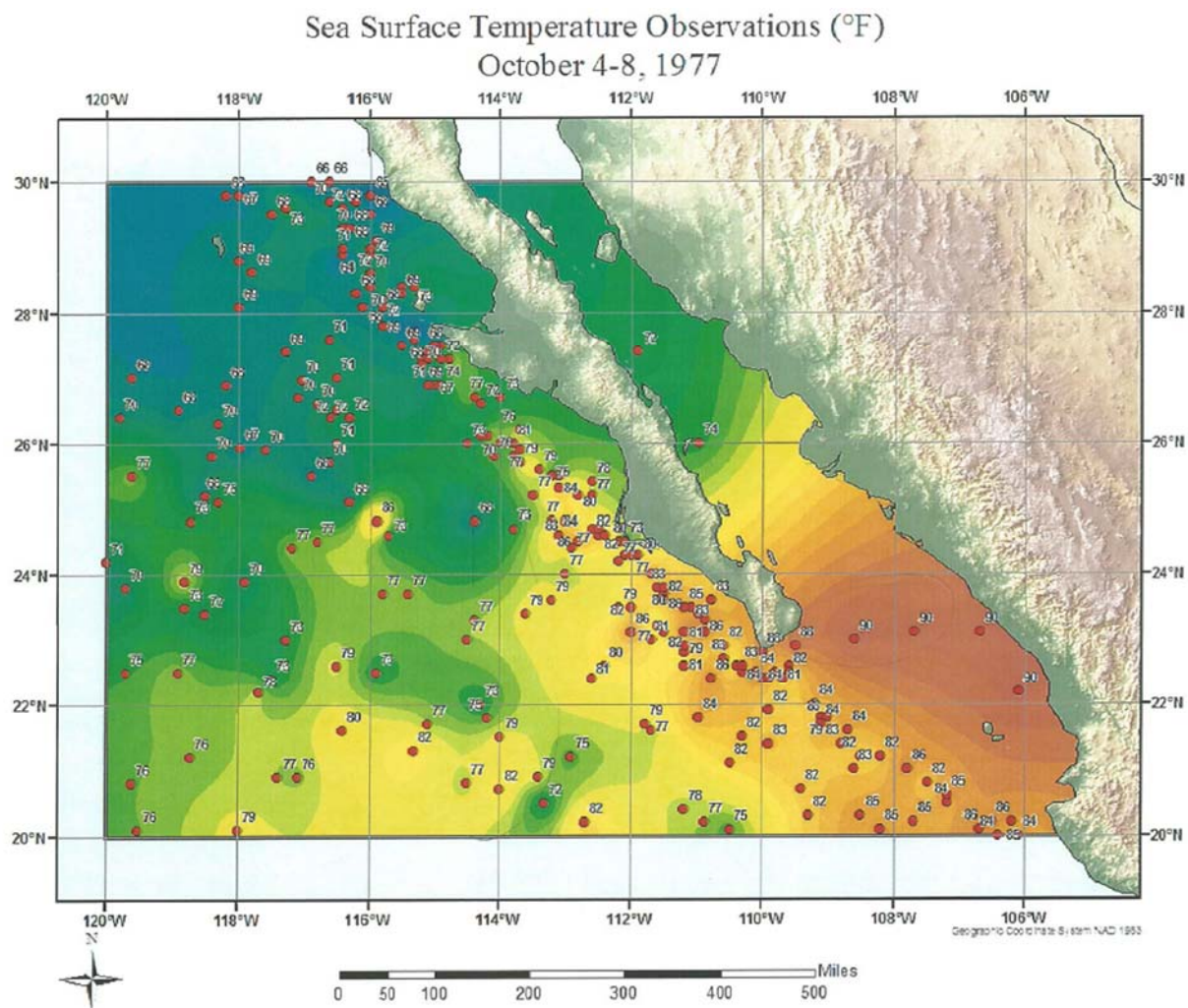
CO-NM Regional Extreme Precipitation Study



NOAA HYSPLIT MODEL
Backward trajectory ending at 0000 UTC 08 Oct 77
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study



Clyde, TX
October 10-14, 1981
Storm Type: Tropical

Storm Precipitation Analysis System (SPAS) For Storm #1184_1

General Storm Location: North-central Texas and southeastern Oklahoma

Storm Dates: October 10 1400 UTC - October 14, 1981 1100 UTC (CPP: 93 hours)

Event: Synoptic + hurricane Norma remnants

DAD Zone 1

Latitude: 32.479

Longitude: -99.479

Max. Grid Rainfall Amount: 23.00"

Max. Observed Rainfall Amount: 23.00"

Number of Stations: 500 (205 Daily, 93 Hourly, 1 Hourly Estimated, 25 Hourly Pseudo, and 170 Supplemental, 6 Supplemental estimated)

SPAS Version: 8.5

Base Map Used: Yes, conus_prism_ppt_in_1971_2000_10

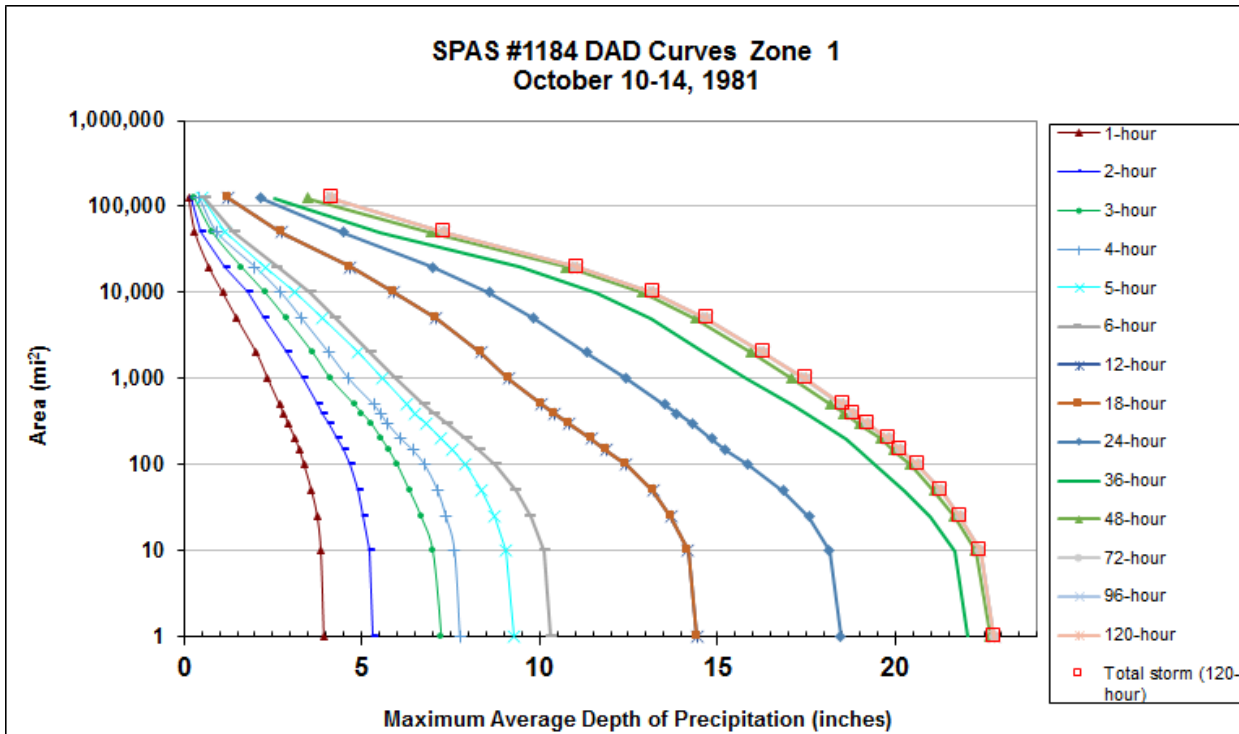
Spatial resolution: 00:00:30 decimal degrees

Radar Included: No

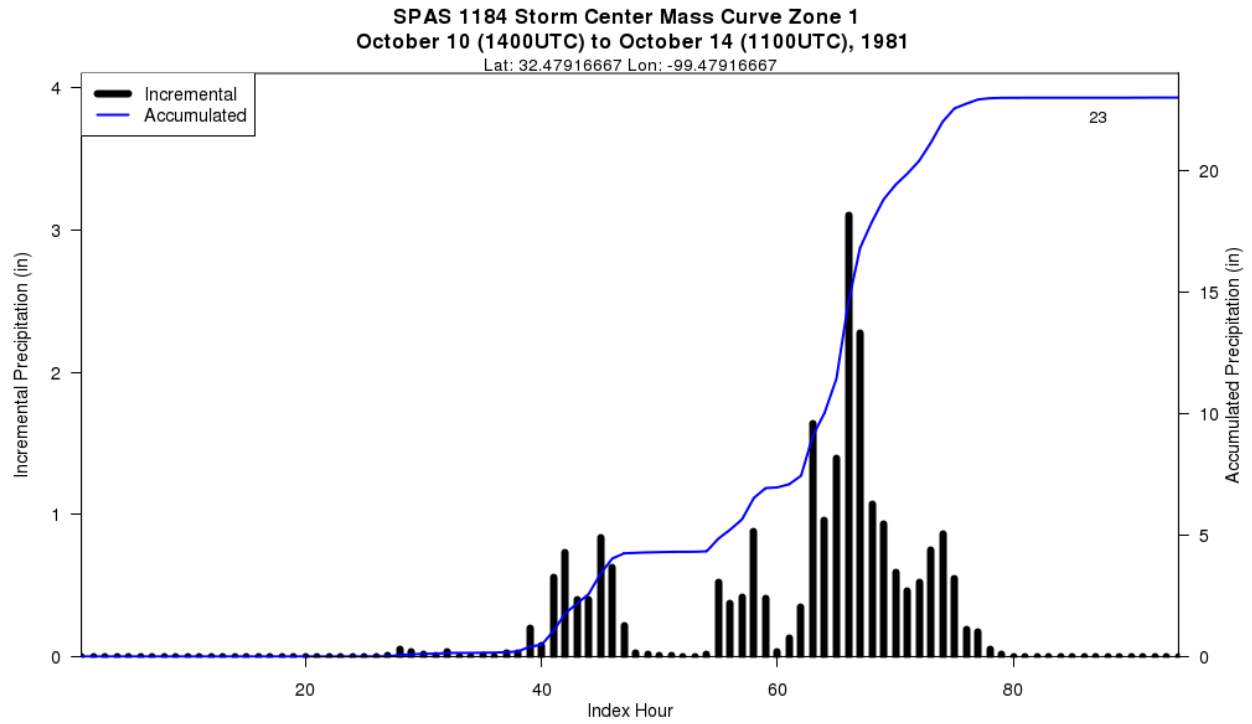
Depth-Area-Duration (DAD) analysis: Yes (1,2,3,4,5,6,12,24,36,48,72,93 hours)

CO-NM Regional Extreme Precipitation Study

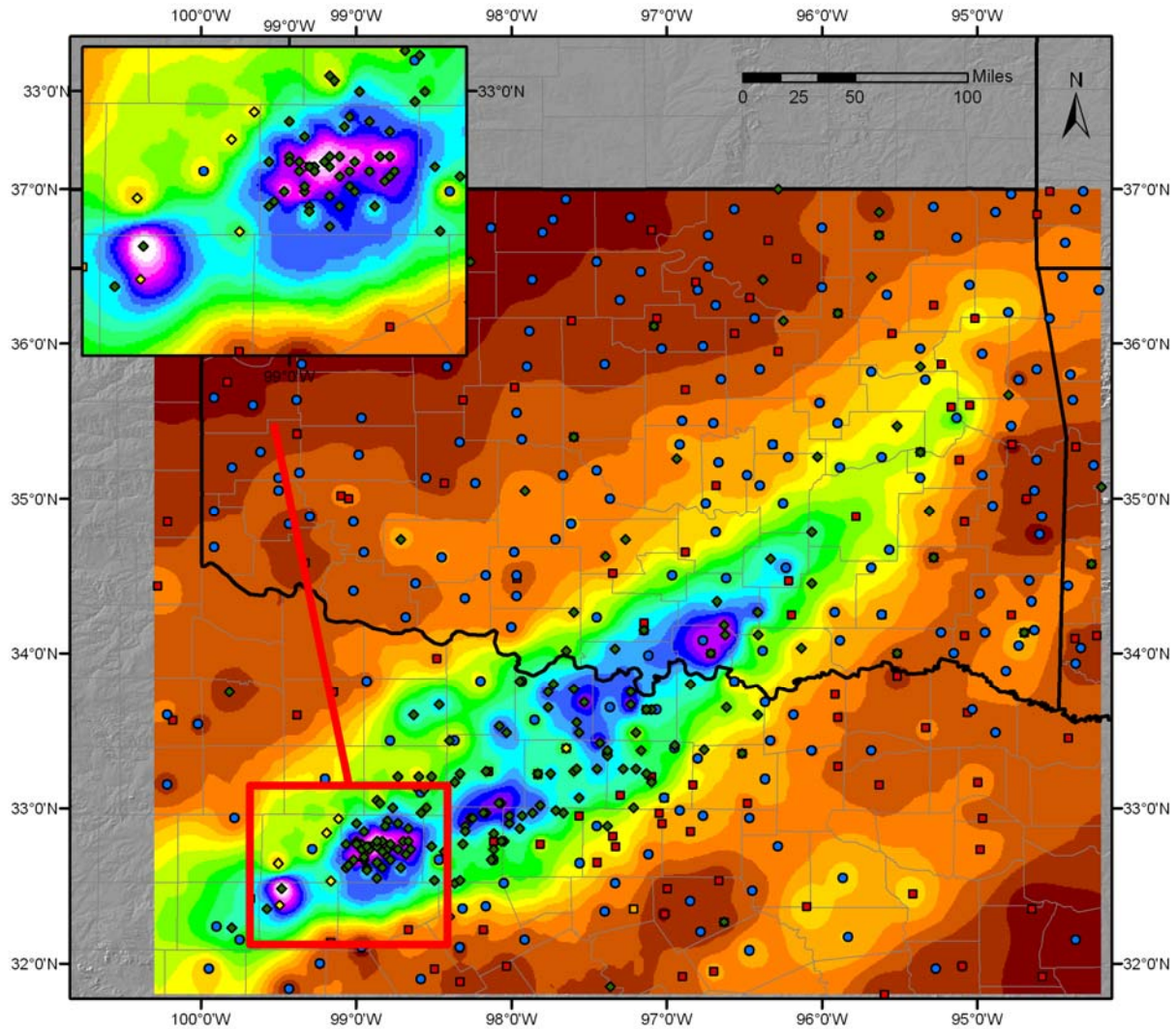
Storm 1184 - October 10 (1400 UTC) - October 14 (1100 UTC), 1981														
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
Area (mi ²)	Duration (hours)													
	1	2	3	4	5	6	12	18	24	36	48	72	96	120
0.3	3.96	5.36	7.30	7.82	9.35	10.41	14.53	14.53	18.59	22.21	22.81	22.94	22.94	23.00
1	3.93	5.33	7.24	7.76	9.29	10.33	14.43	14.43	18.46	22.06	22.66	22.79	22.79	22.79
10	3.85	5.21	7.00	7.61	9.07	10.13	14.18	14.18	18.14	21.69	22.27	22.40	22.40	22.40
25	3.75	5.05	6.67	7.37	8.75	9.75	13.71	13.71	17.58	20.99	21.66	21.82	21.82	21.82
50	3.59	4.90	6.35	7.14	8.38	9.34	13.20	13.20	16.85	20.28	21.09	21.29	21.29	21.29
100	3.38	4.65	6.00	6.77	7.91	8.78	12.44	12.44	15.86	19.46	20.44	20.63	20.63	20.63
150	3.25	4.47	5.76	6.43	7.54	8.31	11.87	11.87	15.24	18.99	19.96	20.15	20.15	20.15
200	3.13	4.31	5.56	6.11	7.23	7.95	11.47	11.47	14.85	18.61	19.61	19.81	19.81	19.81
300	2.94	4.07	5.28	5.73	6.83	7.42	10.84	10.84	14.31	18.00	18.99	19.22	19.24	19.24
400	2.80	3.91	5.01	5.52	6.52	7.04	10.41	10.41	13.86	17.50	18.56	18.81	18.84	18.84
500	2.69	3.77	4.80	5.34	6.28	6.77	10.08	10.08	13.51	17.12	18.20	18.49	18.53	18.53
1,000	2.36	3.34	4.13	4.64	5.58	5.98	9.13	9.13	12.45	15.83	17.11	17.44	17.48	17.48
2,000	2.04	2.88	3.63	4.08	4.89	5.25	8.36	8.36	11.33	14.64	15.97	16.28	16.31	16.31
5,000	1.49	2.27	2.88	3.32	3.88	4.27	7.11	7.11	9.85	13.12	14.38	14.67	14.70	14.70
10,000	1.09	1.79	2.29	2.73	3.12	3.56	5.92	5.92	8.59	11.60	12.90	13.18	13.20	13.20
20,000	0.70	1.16	1.62	2.00	2.32	2.64	4.68	4.68	7.00	9.46	10.75	11.04	11.05	11.05
50,000	0.31	0.49	0.81	0.94	1.17	1.43	2.75	2.75	4.48	5.51	6.94	7.33	7.34	7.34
124,877	0.14	0.19	0.30	0.44	0.53	0.59	1.26	1.26	2.18	2.56	3.48	4.14	4.15	4.15



CO-NM Regional Extreme Precipitation Study

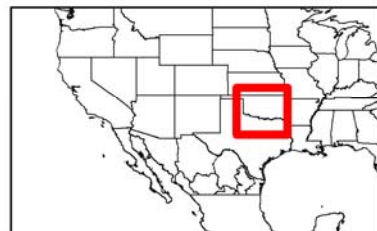
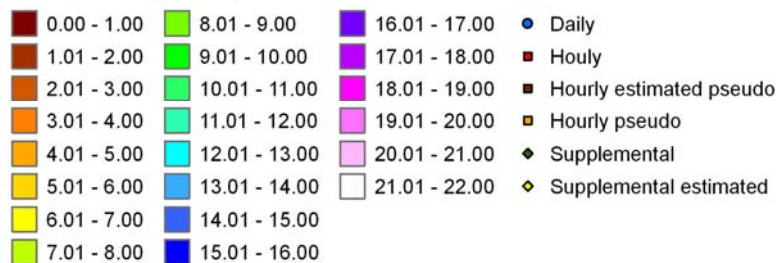


CO-NM Regional Extreme Precipitation Study



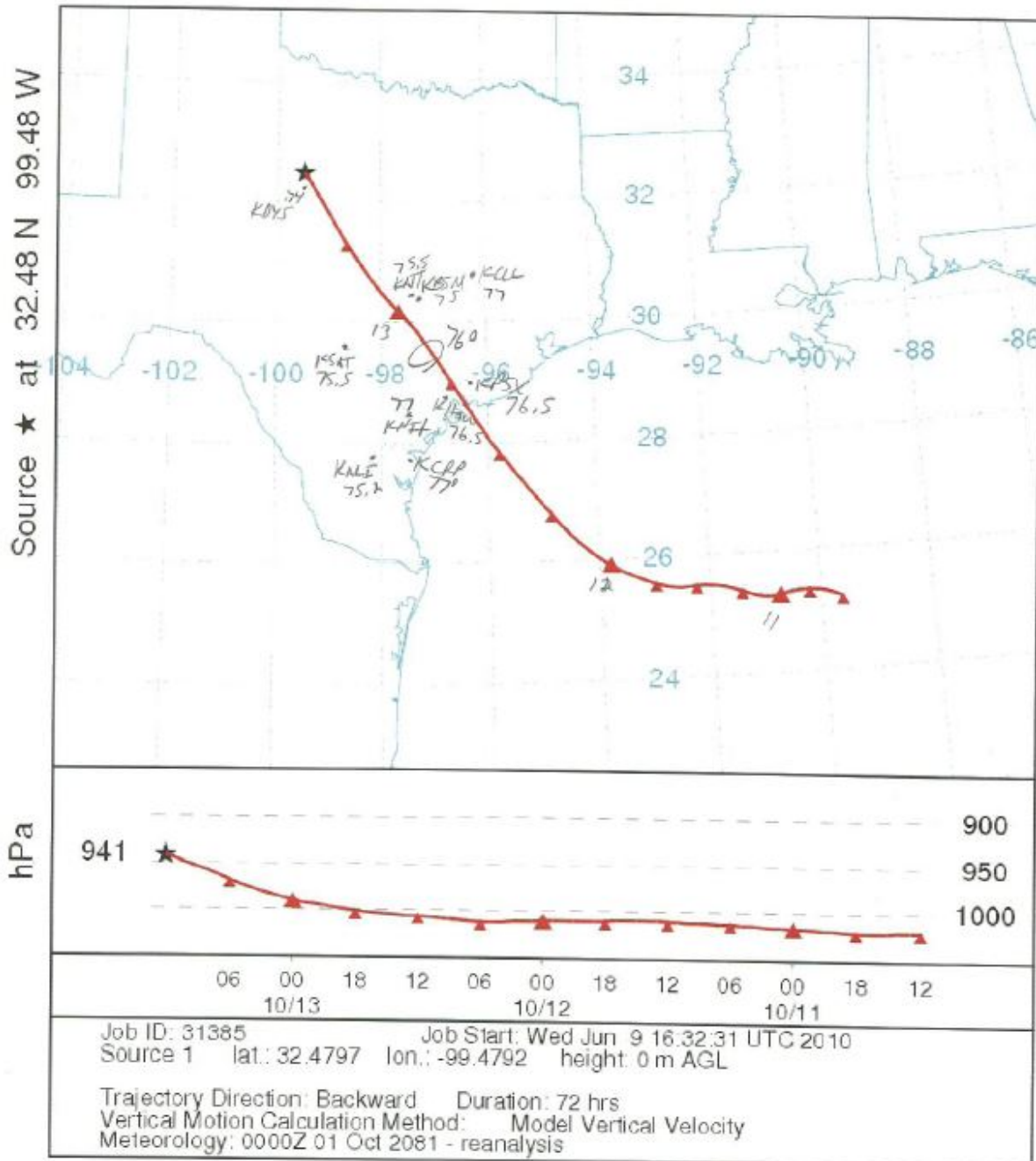
Total Precipitation (inches)
SPAS storm number: 1184 - Breckenridge, TX
Lat/Lon box: 37.0 -100.3 31.8 -94.2
October 10 1400 UTC - October 14, 1981 1100 UTC (CPP: 93 hours)

Precipitation (inches)



Metstat/AWA May 13, 2010

NOAA HYSPLIT MODEL
Backward trajectory ending at 1200 UTC 13 Oct 81
CDC1 Meteorological Data



Altar, MX
September 27 - October 4, 1983
Storm Type: Tropical

Storm Precipitation Analysis System (SPAS) For Storm #1074_1

General Storm Location: Mount Graham, Arizona

Storm Dates: September 27 - October 4, 1983

Event: Tropical Storm Remnants

DAD Zone 1

Latitude: 30.6458

Longitude: -111.7708

Max. Grid Rainfall Amount: 13.86"

Max. Observed Rainfall Amount: 12.66" at ALTAR, MX

Number of Stations: 309 (171 Daily, 19 Hourly, 23 Hourly Pseudo, 85 Supplemental, and 11 Supplemental Pseudo)

SPAS Version: 8.0

Base Map Used: Yes, conus_prism_ppt_in_1971_2000_09_mx

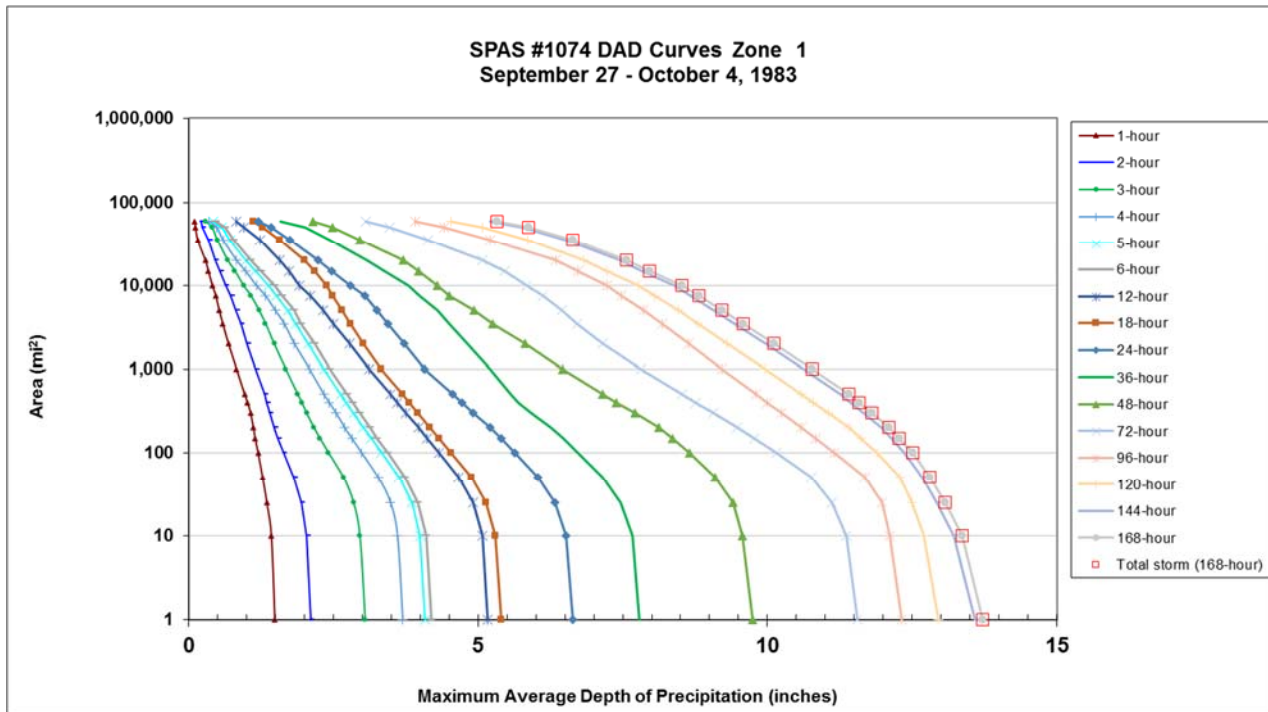
Spatial resolution: 00:00:30 (0.28 sq. miles)

Radar Included: No

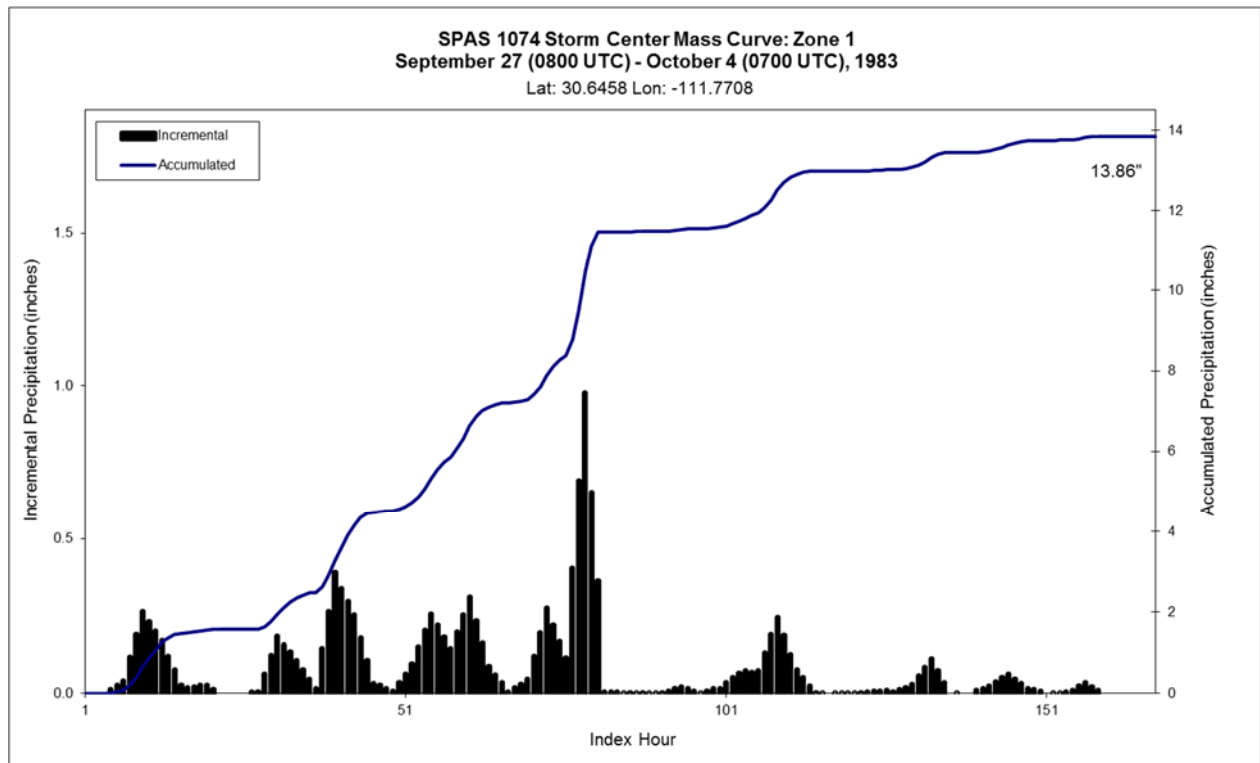
Depth-Area-Duration (DAD) analysis: Yes

CO-NM Regional Extreme Precipitation Study

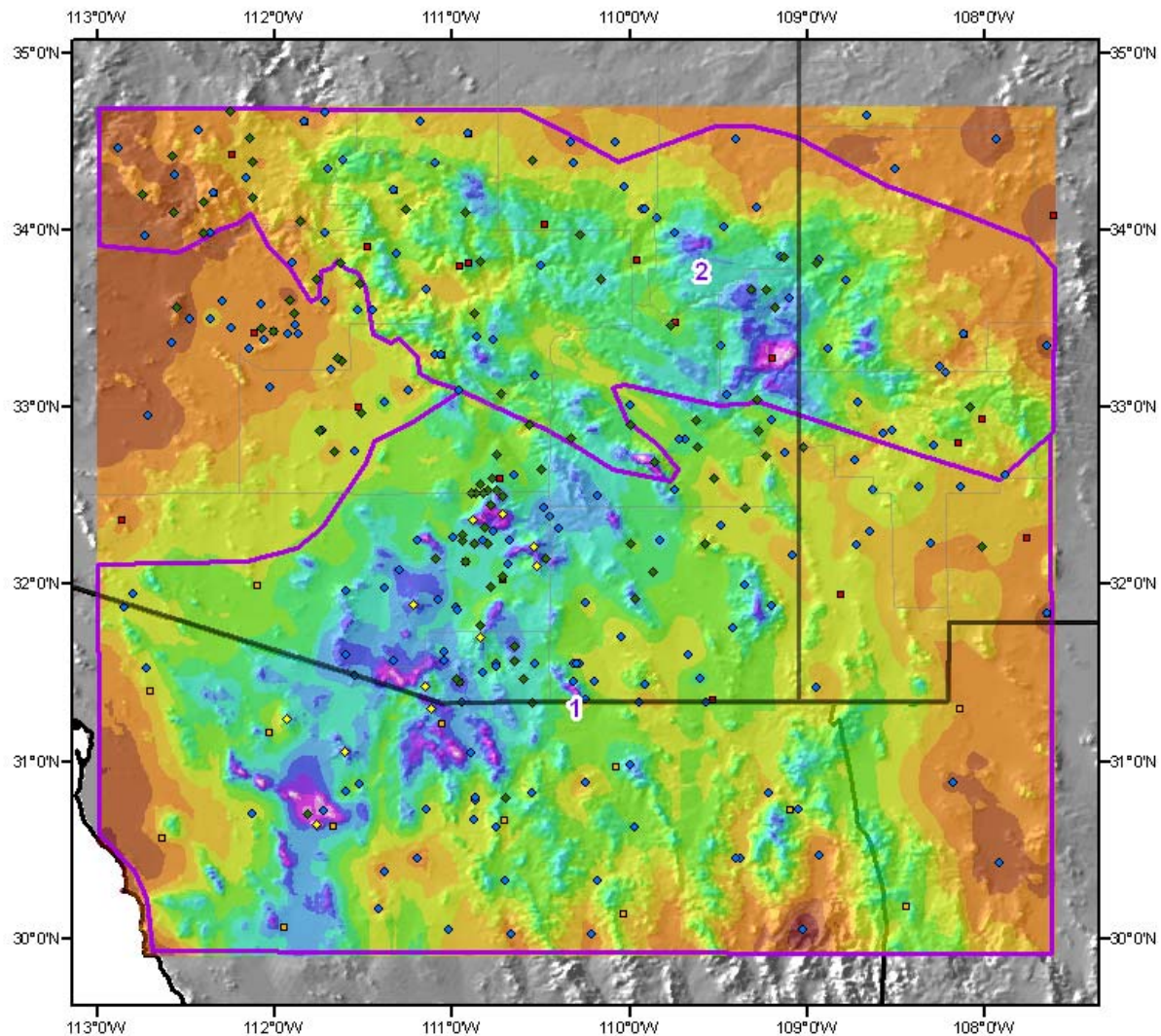
Storm 1074 - September 27 (0800 UTC) - October 4 (0700 UTC), 1983																	
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)																	
Area (mi ²)	Duration (hours)																
	1	2	3	4	5	6	12	18	24	36	48	72	96	120	144	168	Total
0.4	1.51	2.14	3.07	3.73	4.12	4.23	5.21	5.44	6.69	7.84	9.82	11.64	12.40	13.07	13.69	13.82	13.82
1	1.49	2.11	3.05	3.70	4.09	4.19	5.17	5.40	6.64	7.79	9.74	11.56	12.32	12.96	13.58	13.72	13.72
10	1.43	2.04	2.96	3.61	4.00	4.11	5.08	5.30	6.52	7.67	9.57	11.36	12.12	12.70	13.22	13.36	13.36
25	1.35	1.95	2.85	3.49	3.86	3.96	4.92	5.14	6.33	7.46	9.40	11.12	11.98	12.50	12.93	13.07	13.07
50	1.28	1.82	2.68	3.28	3.64	3.74	4.67	4.88	6.04	7.15	9.10	10.76	11.68	12.29	12.68	12.81	12.81
100	1.20	1.64	2.42	2.99	3.33	3.44	4.32	4.53	5.64	6.73	8.65	10.16	11.16	11.90	12.37	12.51	12.51
150	1.15	1.54	2.27	2.82	3.15	3.25	4.12	4.32	5.40	6.47	8.36	9.77	10.84	11.62	12.14	12.27	12.27
200	1.12	1.48	2.17	2.70	3.02	3.13	3.97	4.17	5.21	6.26	8.12	9.48	10.59	11.40	11.96	12.10	12.10
300	1.07	1.40	2.04	2.55	2.85	2.96	3.76	3.96	4.92	5.91	7.71	9.07	10.25	11.05	11.66	11.81	11.81
400	1.02	1.35	1.96	2.43	2.72	2.84	3.61	3.81	4.72	5.69	7.39	8.76	10.00	10.79	11.44	11.58	11.58
500	0.97	1.31	1.89	2.34	2.63	2.74	3.49	3.69	4.57	5.57	7.16	8.52	9.81	10.59	11.26	11.40	11.40
1,000	0.83	1.16	1.68	2.09	2.34	2.45	3.12	3.32	4.08	5.21	6.46	7.82	9.22	9.96	10.63	10.78	10.78
2,000	0.69	1.01	1.48	1.83	2.07	2.18	2.78	3.02	3.72	4.82	5.82	7.16	8.64	9.30	9.97	10.11	10.11
3,500	0.59	0.90	1.33	1.65	1.85	1.95	2.50	2.79	3.45	4.50	5.26	6.71	8.19	8.80	9.44	9.58	9.58
5,000	0.53	0.82	1.22	1.50	1.72	1.82	2.33	2.65	3.26	4.30	4.93	6.44	7.86	8.46	9.07	9.21	9.21
7,500	0.47	0.73	1.08	1.33	1.52	1.62	2.10	2.49	3.04	3.99	4.50	6.13	7.48	8.05	8.67	8.81	8.81
10,000	0.41	0.64	0.95	1.17	1.38	1.48	1.92	2.38	2.80	3.79	4.30	5.84	7.23	7.77	8.39	8.52	8.52
15,000	0.34	0.54	0.80	0.98	1.15	1.25	1.74	2.18	2.47	3.38	3.97	5.46	6.73	7.23	7.83	7.96	7.96
20,000	0.29	0.46	0.68	0.83	1.00	1.07	1.58	2.00	2.23	3.07	3.71	5.08	6.34	6.83	7.45	7.57	7.57
35,000	0.16	0.35	0.50	0.60	0.72	0.78	1.23	1.57	1.75	2.45	2.96	4.14	5.21	5.86	6.52	6.64	6.64
50,000	0.12	0.24	0.41	0.49	0.58	0.63	0.95	1.28	1.43	2.01	2.49	3.47	4.41	5.08	5.77	5.88	5.88
59,841	0.11	0.21	0.30	0.36	0.42	0.47	0.82	1.12	1.21	1.59	2.15	3.06	3.91	4.54	5.21	5.33	5.33



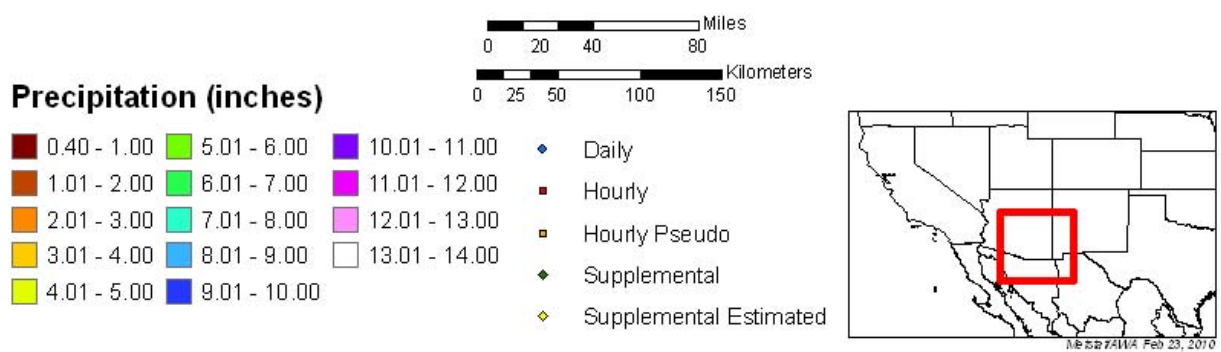
CO-NM Regional Extreme Precipitation Study



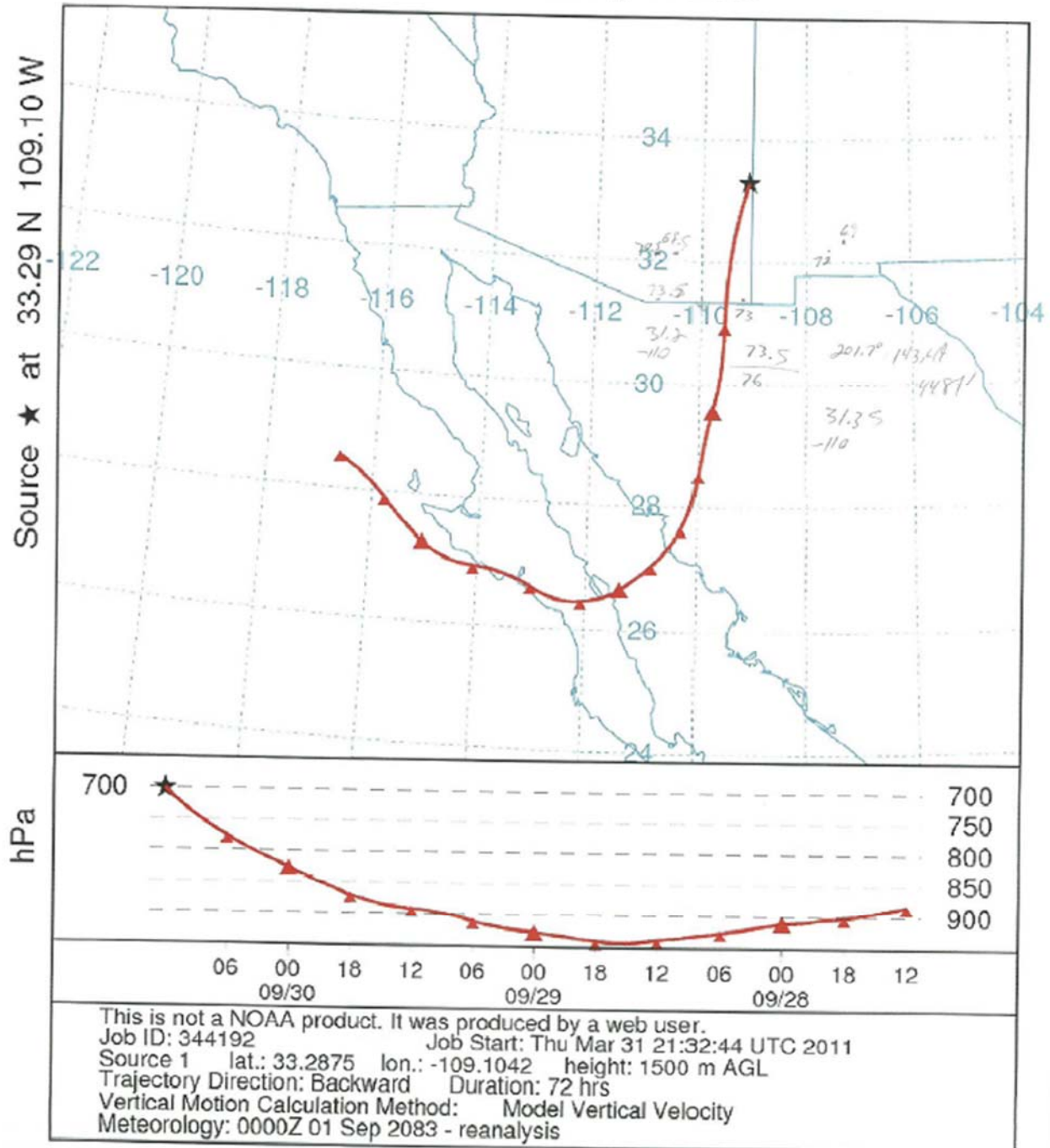
CO-NM Regional Extreme Precipitation Study



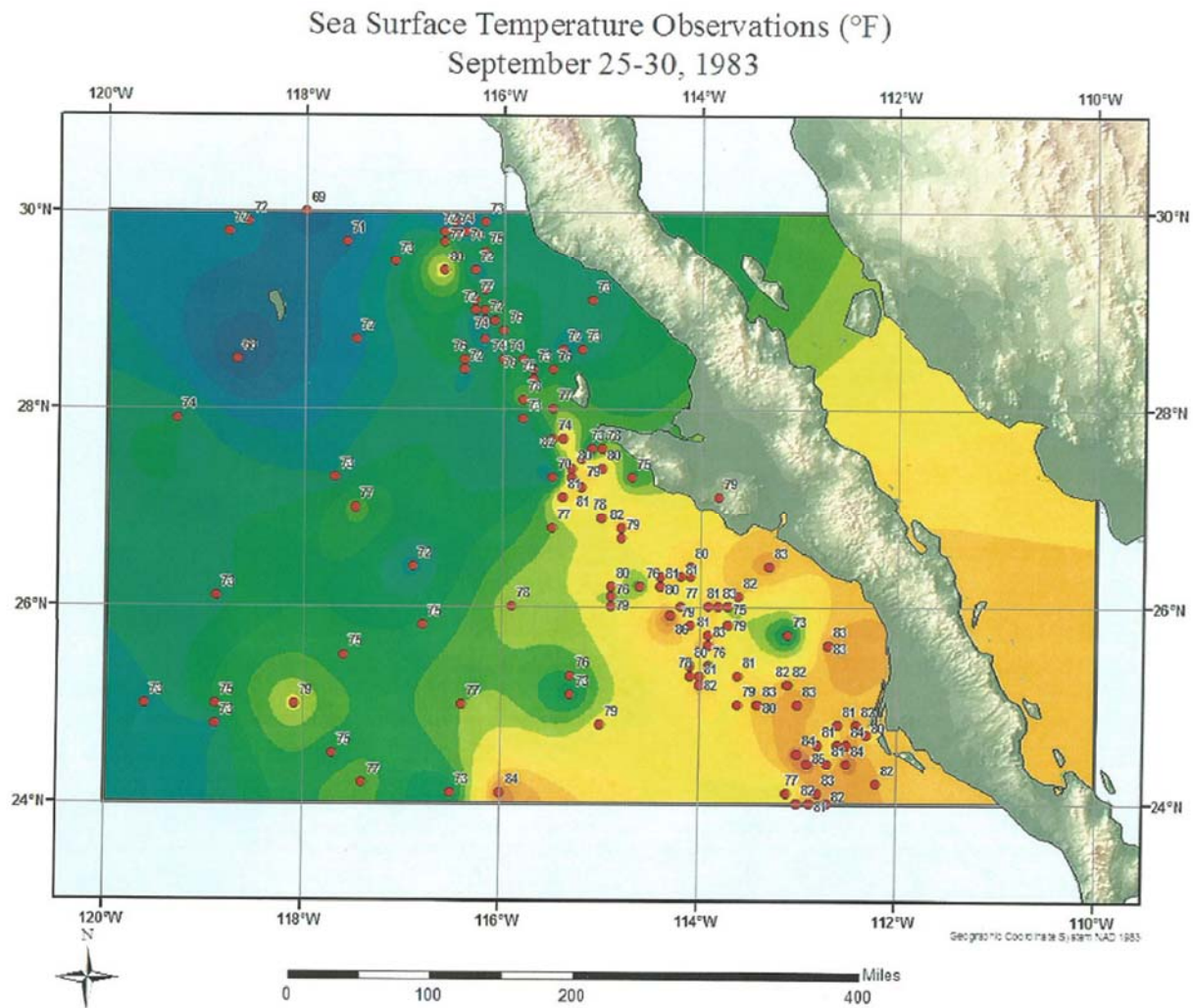
Total Precipitation (168-hours)
SPAS storm number: 1074
September 27, 1983 (0800 UTC) - October 4, 1983 (0700 UTC)



NOAA HYSPLIT MODEL
Backward trajectory ending at 1200 UTC 30 Sep 83
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study



Mt Graham, AZ
September 27 - October 4, 1983
Storm Type: Tropical

Storm Precipitation Analysis System (SPAS) For Storm #1074_2

General Storm Location: Mount Graham, Arizona

Storm Dates: September 27 - October 4, 1983

Event: Tropical Storm Remnants

DAD Zone 2

Latitude: 33.2875

Longitude: -109.1042

Max. Grid Rainfall Amount: 13.99"

Max. Observed Rainfall Amount: N/A

Number of Stations: 309 (171 Daily, 19 Hourly, 23 Hourly Pseudo, 85 Supplemental, and 11 Supplemental Pseudo)

SPAS Version: 8.0

Base Map Used: Yes, conus_prism_ppt_in_1971_2000_09_mx

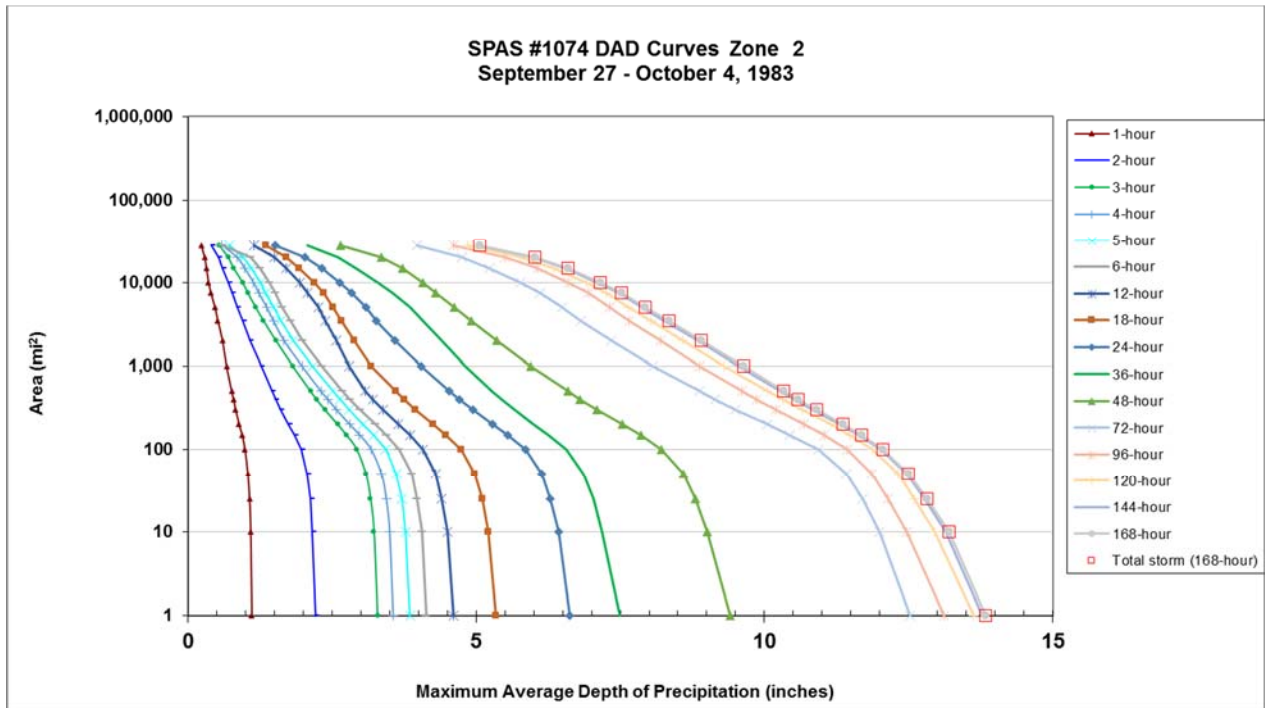
Spatial resolution: 00:00:30 (0.28 sq. miles)

Radar Included: No

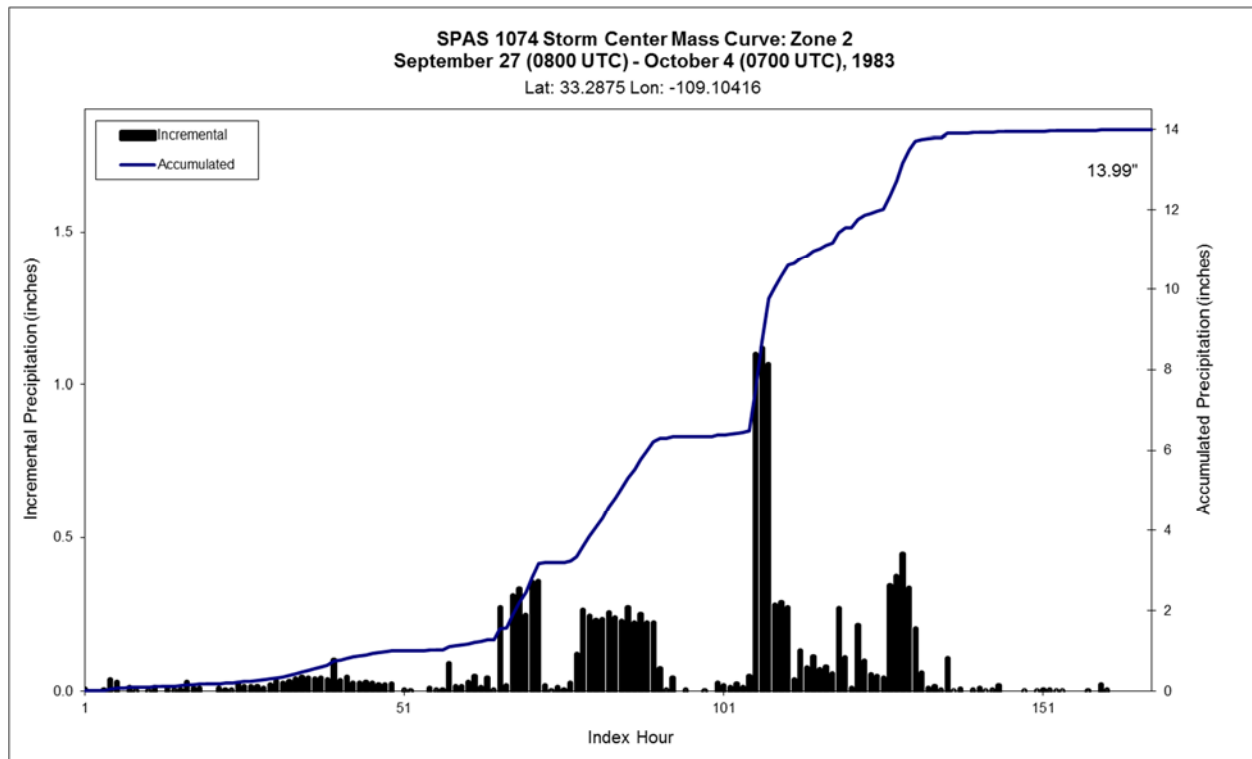
Depth-Area-Duration (DAD) analysis: Yes

CO-NM Regional Extreme Precipitation Study

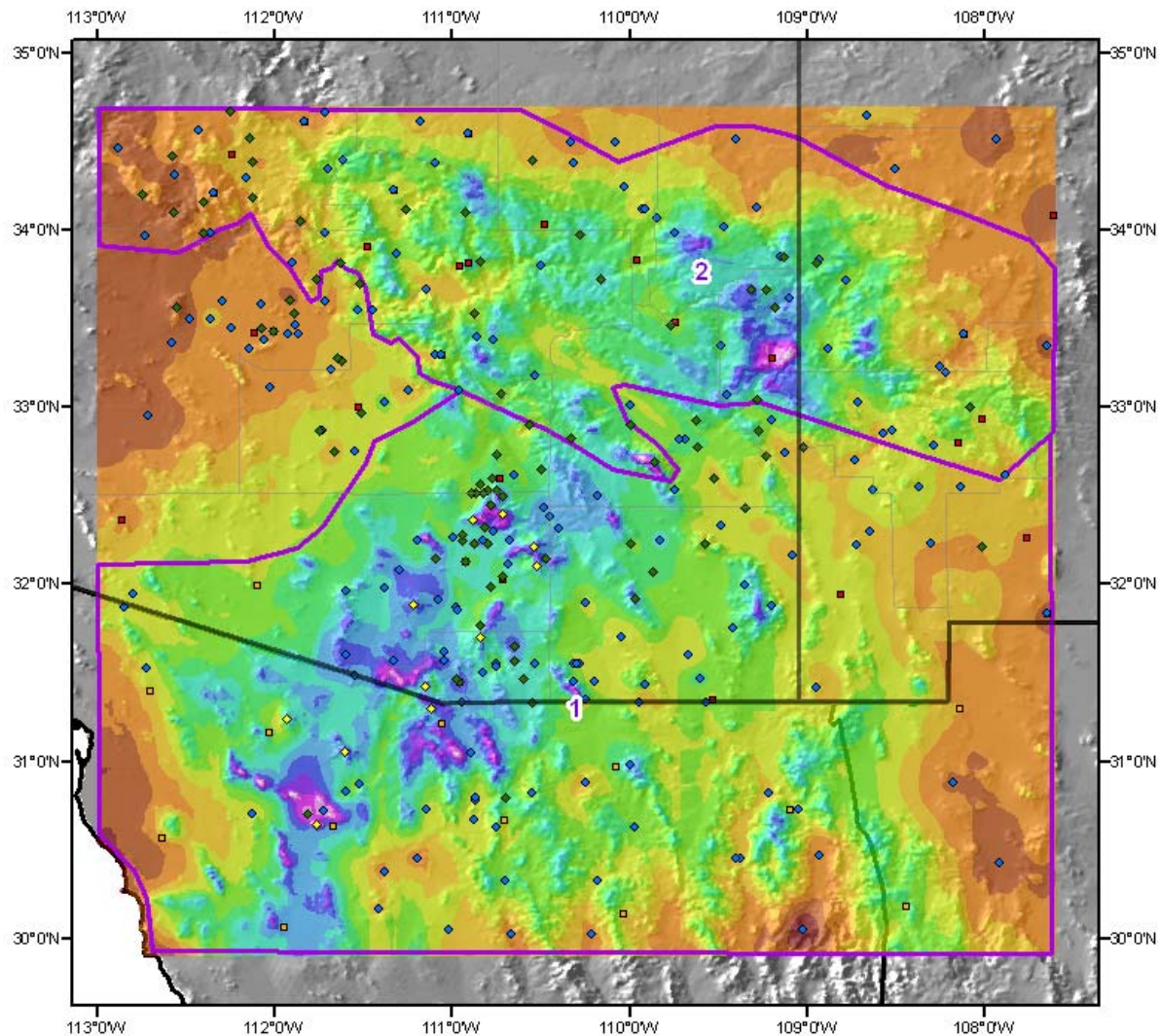
Storm 1074 - September 27 (0800 UTC) - October 4 (0700 UTC), 1983																	
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)																	
Area (mi ²)	Duration (hours)																
	1	2	3	4	5	6	12	18	24	36	48	72	96	120	144	168	Total
0.4	1.12	2.23	3.31	3.59	3.88	4.16	4.65	5.40	6.70	7.55	9.49	12.62	13.21	13.73	13.90	13.95	13.95
1	1.11	2.21	3.29	3.56	3.85	4.13	4.61	5.35	6.62	7.49	9.41	12.52	13.11	13.63	13.77	13.83	13.83
10	1.09	2.16	3.23	3.50	3.78	4.06	4.50	5.21	6.43	7.19	9.01	11.99	12.47	12.95	13.14	13.20	13.20
25	1.07	2.13	3.17	3.44	3.71	3.97	4.40	5.10	6.29	7.04	8.80	11.70	12.14	12.60	12.77	12.82	12.82
50	1.04	2.07	3.09	3.36	3.62	3.88	4.30	4.98	6.14	6.86	8.59	11.42	11.87	12.32	12.46	12.49	12.49
100	0.99	1.97	2.93	3.18	3.43	3.67	4.08	4.74	5.86	6.56	8.22	10.93	11.44	11.88	12.03	12.06	12.06
150	0.94	1.85	2.75	2.98	3.22	3.44	3.85	4.48	5.55	6.25	7.86	10.44	11.04	11.48	11.65	11.69	11.69
200	0.89	1.75	2.60	2.81	3.04	3.26	3.65	4.25	5.29	5.99	7.54	10.05	10.69	11.15	11.31	11.36	11.36
300	0.83	1.61	2.38	2.58	2.80	2.99	3.38	3.95	4.94	5.66	7.10	9.50	10.20	10.65	10.84	10.90	10.90
400	0.79	1.52	2.23	2.43	2.64	2.81	3.21	3.75	4.71	5.44	6.80	9.14	9.86	10.32	10.52	10.58	10.58
500	0.76	1.46	2.13	2.31	2.52	2.68	3.08	3.61	4.54	5.27	6.59	8.87	9.61	10.06	10.28	10.34	10.34
1,000	0.67	1.27	1.82	1.98	2.16	2.32	2.80	3.18	4.05	4.82	5.95	8.07	8.88	9.30	9.55	9.64	9.64
2,000	0.60	1.08	1.53	1.67	1.83	1.99	2.57	2.89	3.59	4.40	5.36	7.35	8.20	8.58	8.84	8.91	8.91
3,500	0.52	0.95	1.31	1.48	1.61	1.78	2.38	2.67	3.27	4.07	4.92	6.81	7.65	8.03	8.26	8.34	8.34
5,000	0.47	0.86	1.18	1.37	1.49	1.64	2.26	2.52	3.09	3.85	4.62	6.49	7.32	7.64	7.88	7.94	7.94
7,500	0.40	0.77	1.04	1.23	1.35	1.51	2.08	2.35	2.84	3.54	4.30	6.11	6.95	7.25	7.47	7.52	7.52
10,000	0.36	0.70	0.95	1.14	1.26	1.42	1.95	2.19	2.64	3.29	4.08	5.77	6.60	6.92	7.10	7.15	7.15
15,000	0.32	0.60	0.79	0.98	1.10	1.25	1.71	1.93	2.32	2.92	3.73	5.23	6.07	6.34	6.55	6.60	6.60
20,000	0.29	0.53	0.70	0.86	0.96	1.09	1.50	1.71	2.03	2.61	3.36	4.75	5.50	5.77	5.98	6.02	6.02
28,228	0.23	0.41	0.54	0.59	0.72	0.80	1.15	1.36	1.52	2.07	2.65	3.98	4.61	4.86	5.03	5.07	5.07



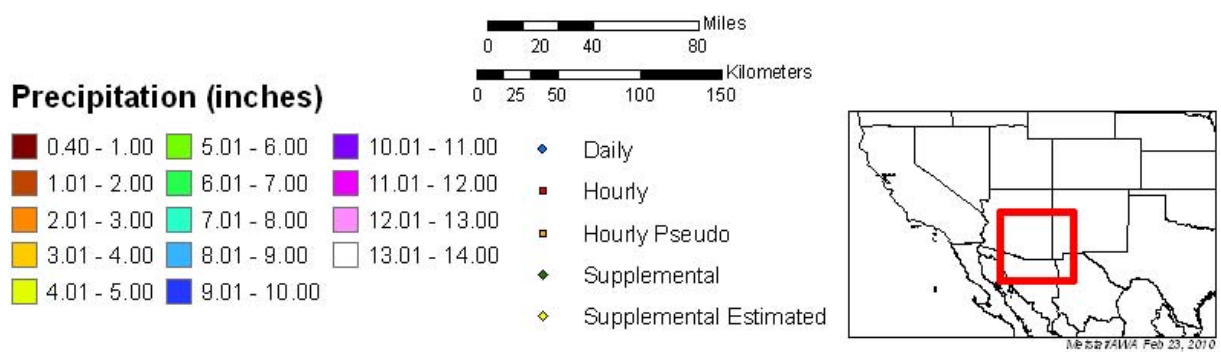
CO-NM Regional Extreme Precipitation Study



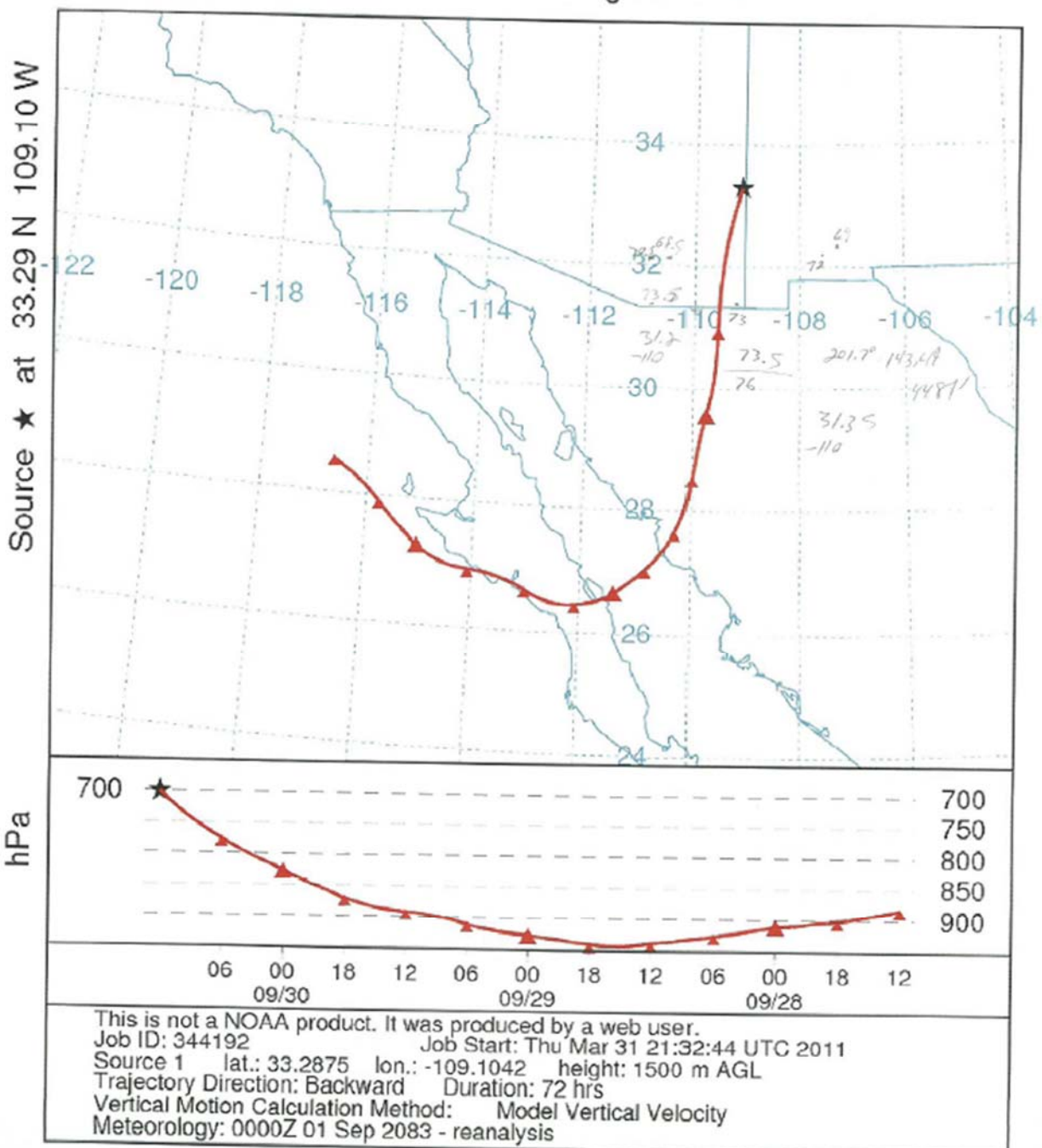
CO-NM Regional Extreme Precipitation Study



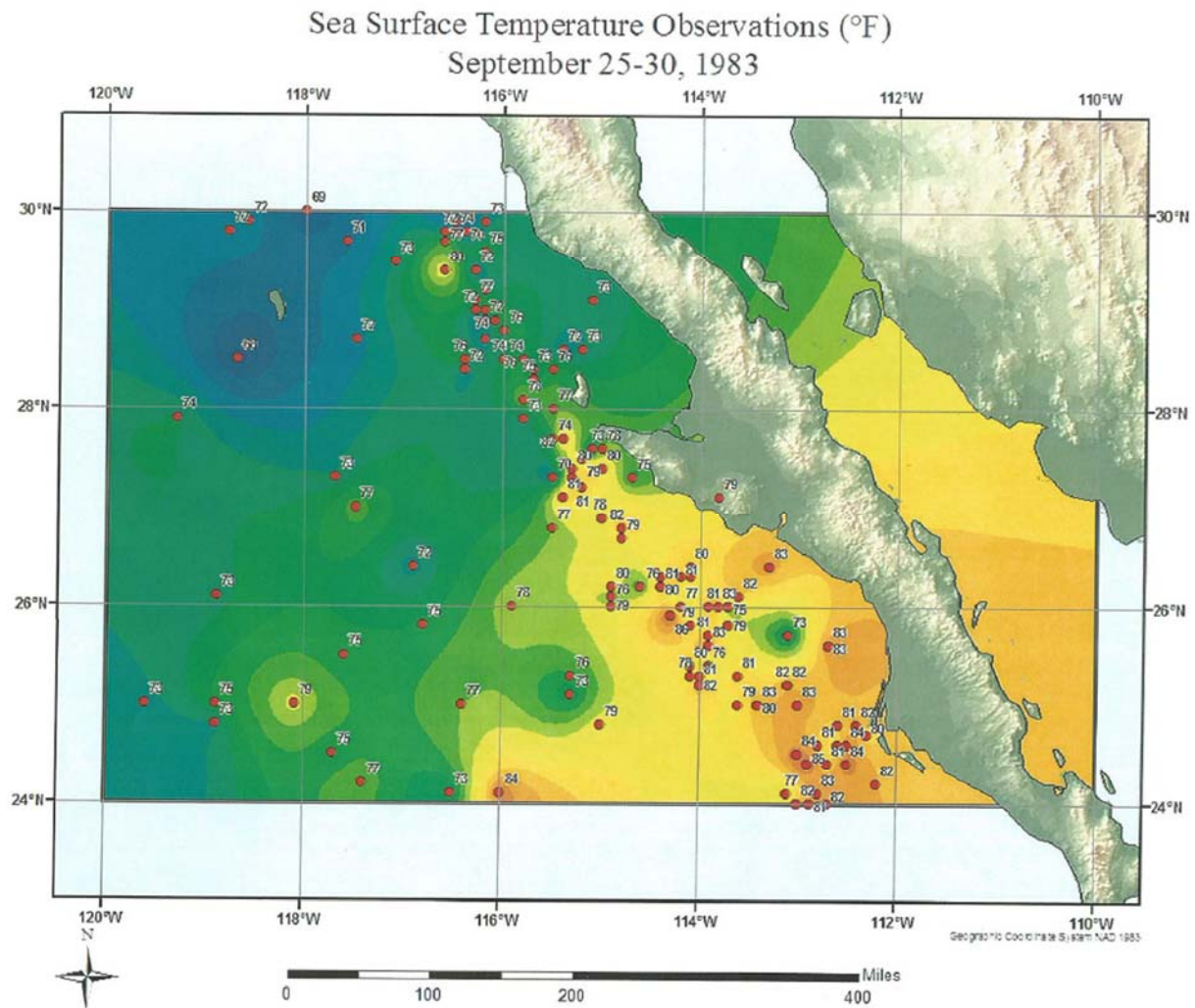
Total Precipitation (168-hours)
SPAS storm number: 1074
September 27, 1983 (0800 UTC) - October 4, 1983 (0700 UTC)



NOAA HYSPLIT MODEL
Backward trajectory ending at 1200 UTC 30 Sep 83
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study



Javier, AZ
September 18-20, 2004
Storm Type: Tropical

Storm Precipitation Analysis System (SPAS) For Storm #1088_2

General Storm Location: Queen Valley, Arizona

Storm Dates: September 18-20, 2004

Event: Widespread thunderstorms

DAD Zone 2 – Mogollon Rim Deserts

Latitude: 34.73

Longitude: -113.02

Max. Grid/Radar Rainfall Amount: 10.10”

Max. Observed Rainfall Amount: 5.00”

Number of Stations: 634 (111 daily, 499 hourly and 14 supplemental, 8 hourly pseudo, 1 hourly estimated and 1 supplemental estimated)

SPAS Version: 7.0

Base Map Used: PRISM Mean September

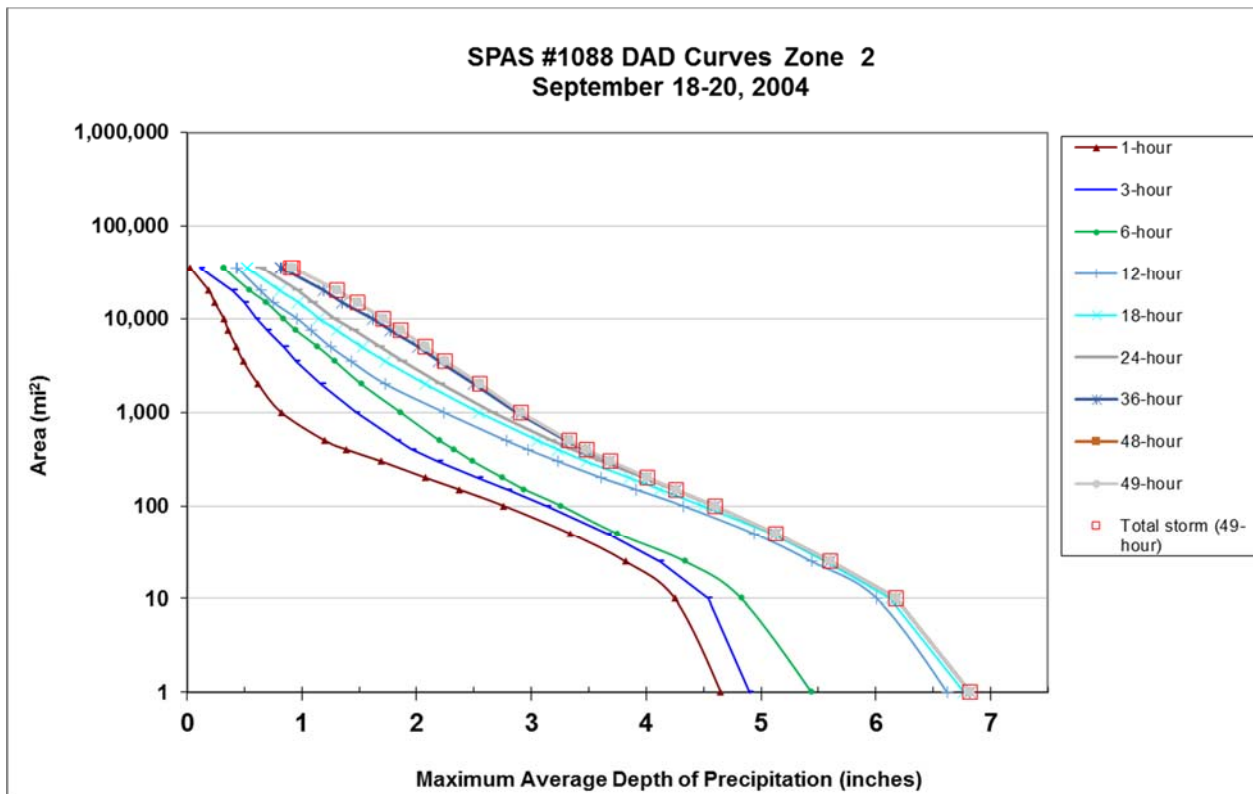
Spatial resolution: 0.39 sq-mi

Radar Included: Y

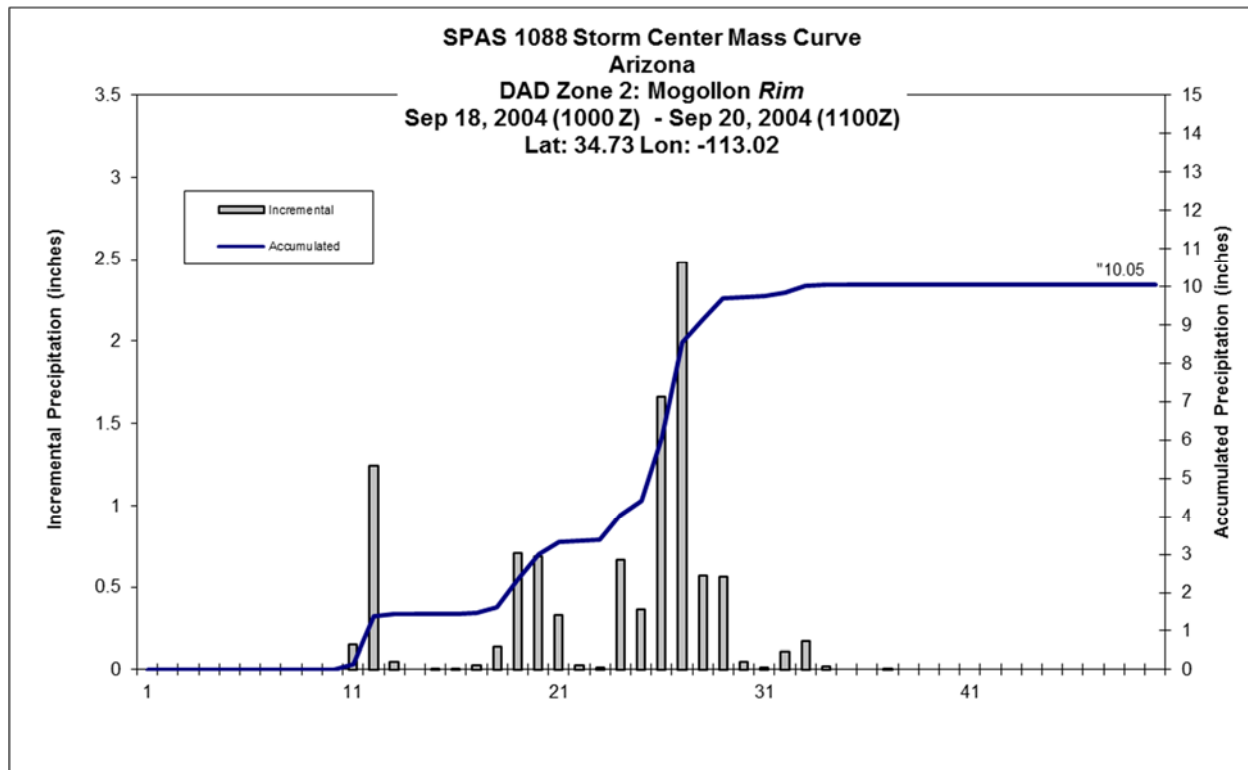
Depth-Area-Duration (DAD) analysis: Y

CO-NM Regional Extreme Precipitation Study

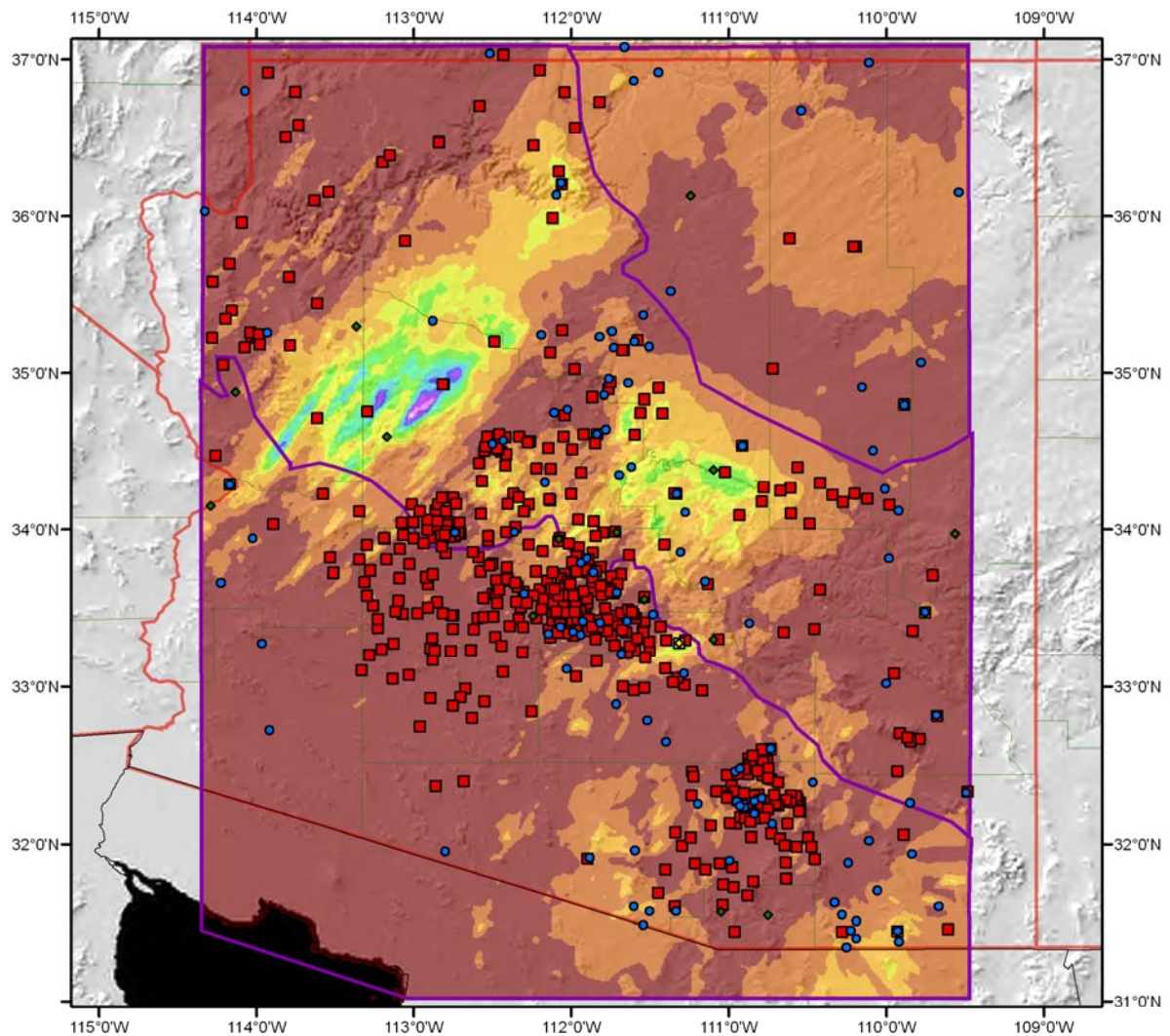
Storm 1088 - September 18 (0100 UTC) - September 20 (1100 UTC), 2004										
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)										
Area (mi ²)	Duration (hours)									
	1	3	6	12	18	24	36	48	49	Total
0.4	4.74	4.98	5.63	6.76	6.94	6.98	6.98	6.98	6.98	6.98
1	4.65	4.90	5.44	6.62	6.77	6.82	6.82	6.82	6.82	6.82
10	4.25	4.54	4.83	6.01	6.13	6.18	6.18	6.18	6.18	6.18
25	3.82	4.12	4.34	5.44	5.56	5.60	5.60	5.60	5.60	5.60
50	3.34	3.66	3.75	4.94	5.09	5.13	5.13	5.13	5.13	5.13
100	2.76	3.13	3.26	4.32	4.49	4.60	4.60	4.60	4.60	4.60
150	2.37	2.79	2.94	3.91	4.12	4.25	4.26	4.26	4.26	4.26
200	2.08	2.54	2.75	3.61	3.86	3.98	4.00	4.01	4.01	4.01
300	1.69	2.19	2.49	3.23	3.48	3.61	3.68	3.69	3.69	3.69
400	1.39	1.96	2.33	2.97	3.23	3.37	3.46	3.48	3.48	3.48
500	1.20	1.83	2.20	2.78	3.05	3.18	3.30	3.33	3.33	3.33
1,000	0.82	1.47	1.86	2.24	2.54	2.67	2.87	2.91	2.91	2.91
2,000	0.62	1.17	1.52	1.73	2.08	2.21	2.50	2.55	2.55	2.55
3,500	0.49	0.95	1.29	1.43	1.73	1.88	2.19	2.25	2.25	2.25
5,000	0.43	0.85	1.14	1.25	1.53	1.68	2.01	2.08	2.08	2.08
7,500	0.36	0.70	0.95	1.08	1.31	1.46	1.77	1.86	1.86	1.86
10,000	0.32	0.60	0.84	0.96	1.15	1.29	1.62	1.71	1.71	1.71
15,000	0.24	0.50	0.69	0.75	0.97	1.10	1.35	1.49	1.49	1.49
20,000	0.19	0.40	0.55	0.64	0.81	0.97	1.19	1.31	1.31	1.31
35,000	0.03	0.12	0.32	0.44	0.53	0.65	0.82	0.92	0.92	0.92
35,699	0.03	0.12	0.32	0.43	0.52	0.64	0.81	0.90	0.90	0.90



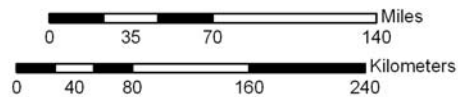
CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



**Total Precipitation
SPAS Storm 1088
09/17/2004 - 09/20/2004**



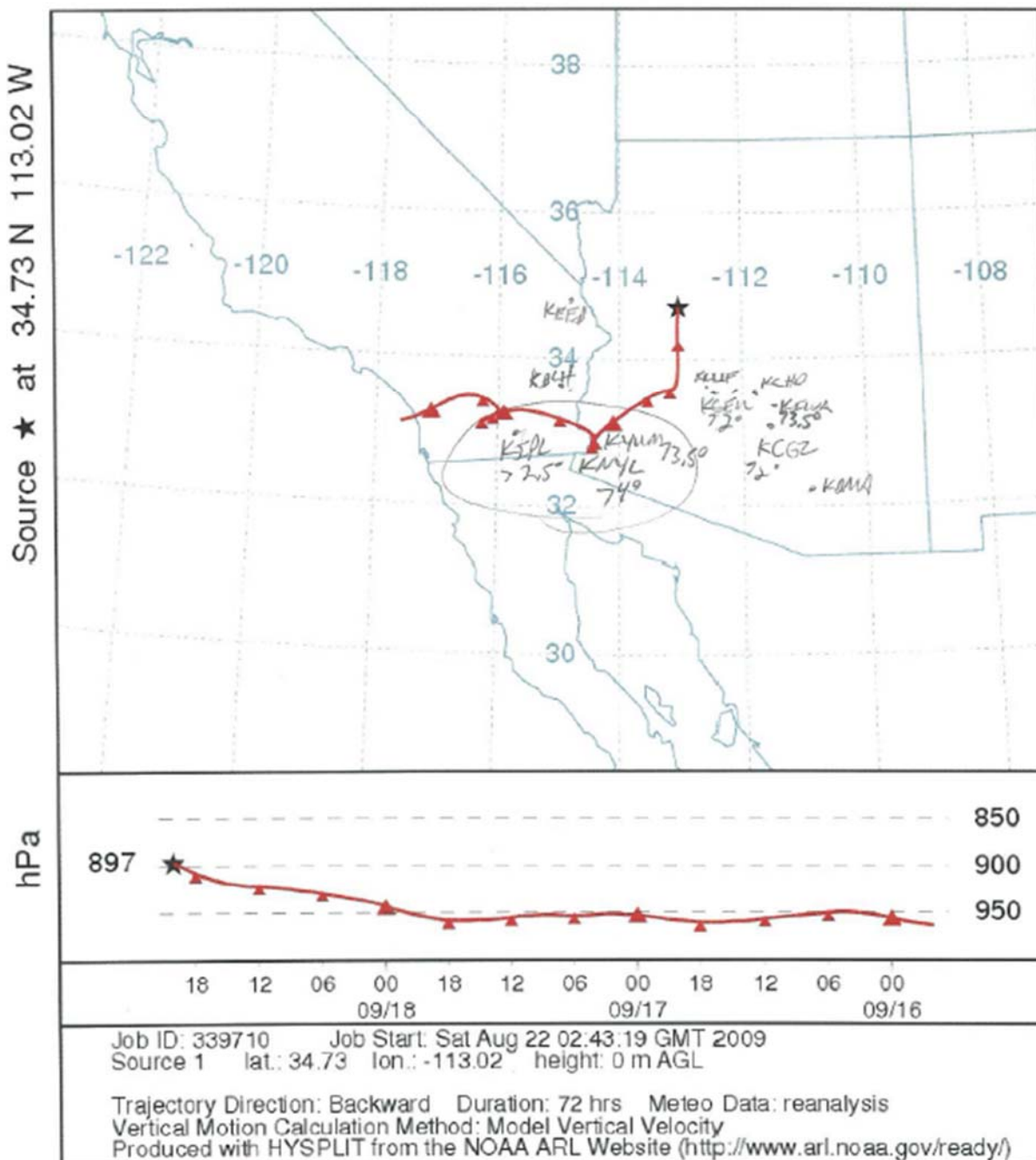
Precipitation (inches)



- Daily
- Hourly
- Hourly estimated
- Hourly pseudo
- ◆ Supplemental
- ◆ Supplemental estimated

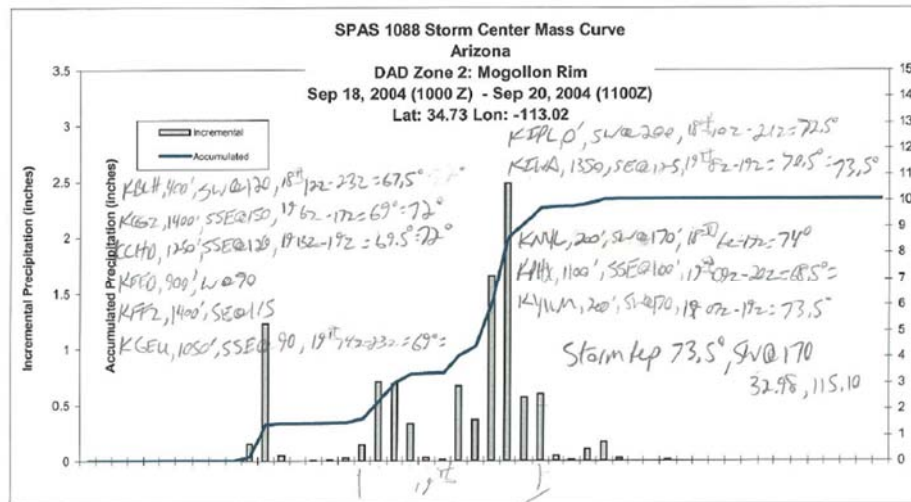


NOAA HYSPLIT MODEL
 Backward trajectory ending at 2000 UTC 18 Sep 04
 CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study

day	hour	ppt	accum
18	1900	0	0
18	2000	0.152	0.152
18	2100	1.229	1.381
18	2200	0.05	1.432
18	2300	0	1.432
19	0	0.003	1.434
19	100	0.006	1.44
19	200	0.025	1.464
19	300	0.14	1.604
19	400	0.705	2.309
19	500	0.689	2.998
19	600	0.33	3.328
19	700	0.027	3.354
19	800	0.011	3.365
19	900	0.668	4.033
19	1000	0.366	4.399
19	1100	1.662	6.061
19	1200	2.485	8.546
19	1300	0.565	9.111
19	1400	0.596	9.707
19	1500	0.046	9.753
19	1600	0.01	9.763
19	1700	0.107	9.869
19	1800	0.168	10.037
19	1900	0.023	10.06
19	2000	0	10.06
19	2100	0	10.06
19	2200	0.009	10.069

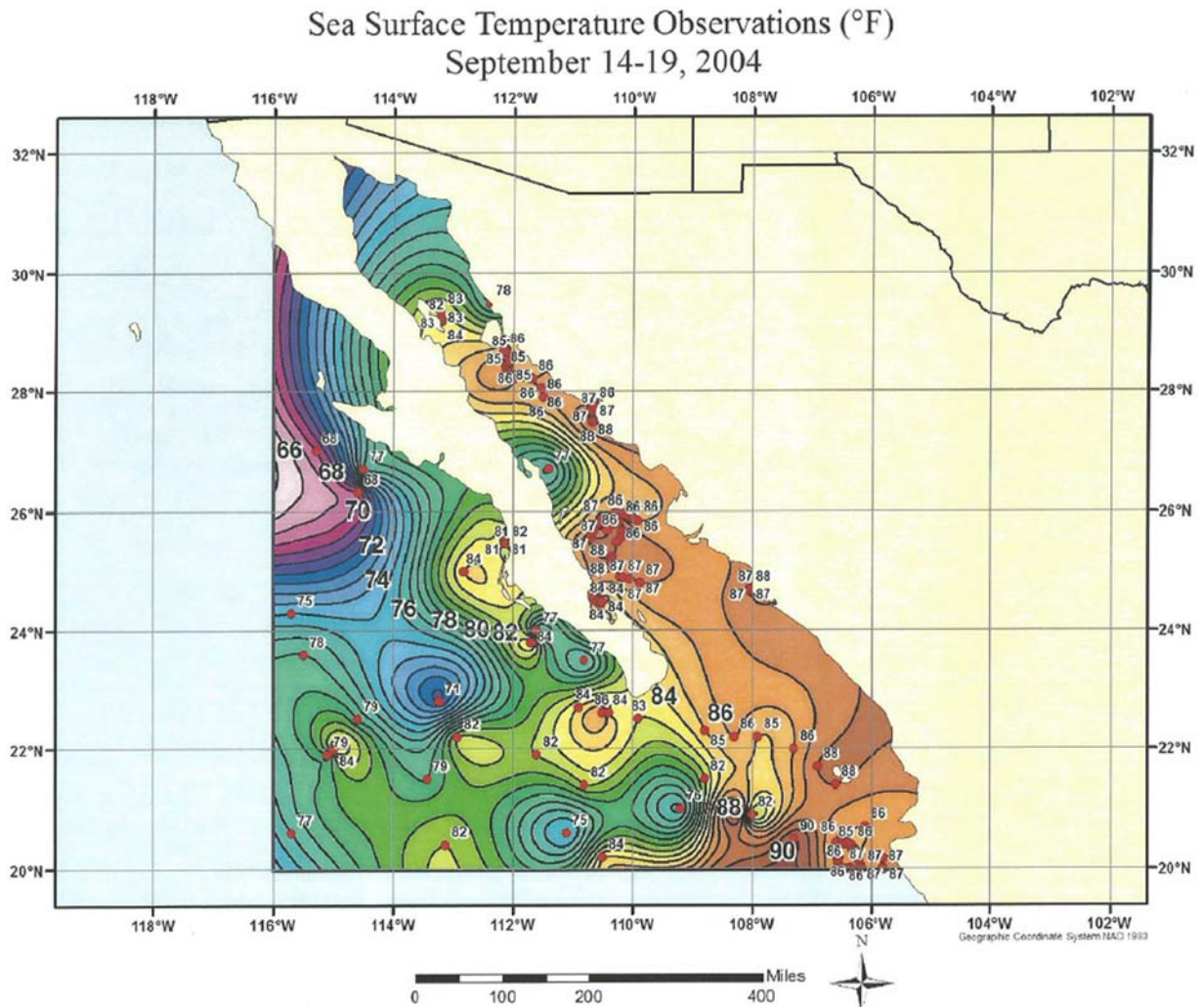


12 hr Ave or 24 hr?
or
daily SST?

12 hr

SST 86° 26N 110W Aug 28.5 Sept 08
SSE @ 62.5

CO-NM Regional Extreme Precipitation Study



Sunspot, NM
July 26-27, 2008
Storm Type: Tropical

Storm Precipitation Analysis System (SPAS) For Storm #1529_1

General Storm Location: Sunspot, NM (Ruidoso, NM)

Storm Dates: July 26-27, 2008

Event: Remnants of Hurricane Dolly

DAD Zone 1

Latitude: 33.335

Longitude: -105.795

Max. Grid Rainfall Amount: 8.81"

Max. Observed Rainfall Amount: 8.53"

Number of Stations: 378 (216 Daily, 97 Hourly, 14 Hourly Pseudo, 51 Supplemental, and 0 Supplemental Estimated)

SPAS Version: 10.0

Basemap: NWS Stage IV precipitation and PRISM July (1981-2010) precipitation

Spatial resolution: 0.01 (~ 0.40 mi²)

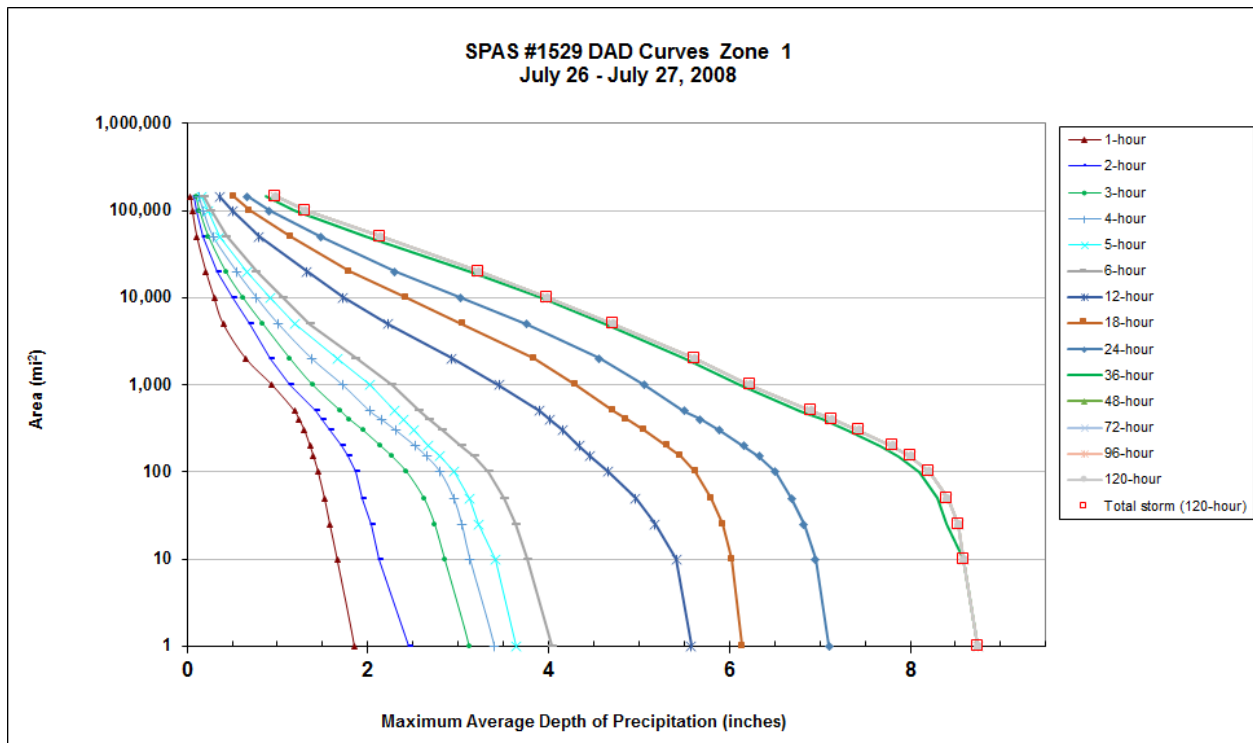
Radar Included: Yes

Depth-Area-Duration (DAD) analysis: Yes

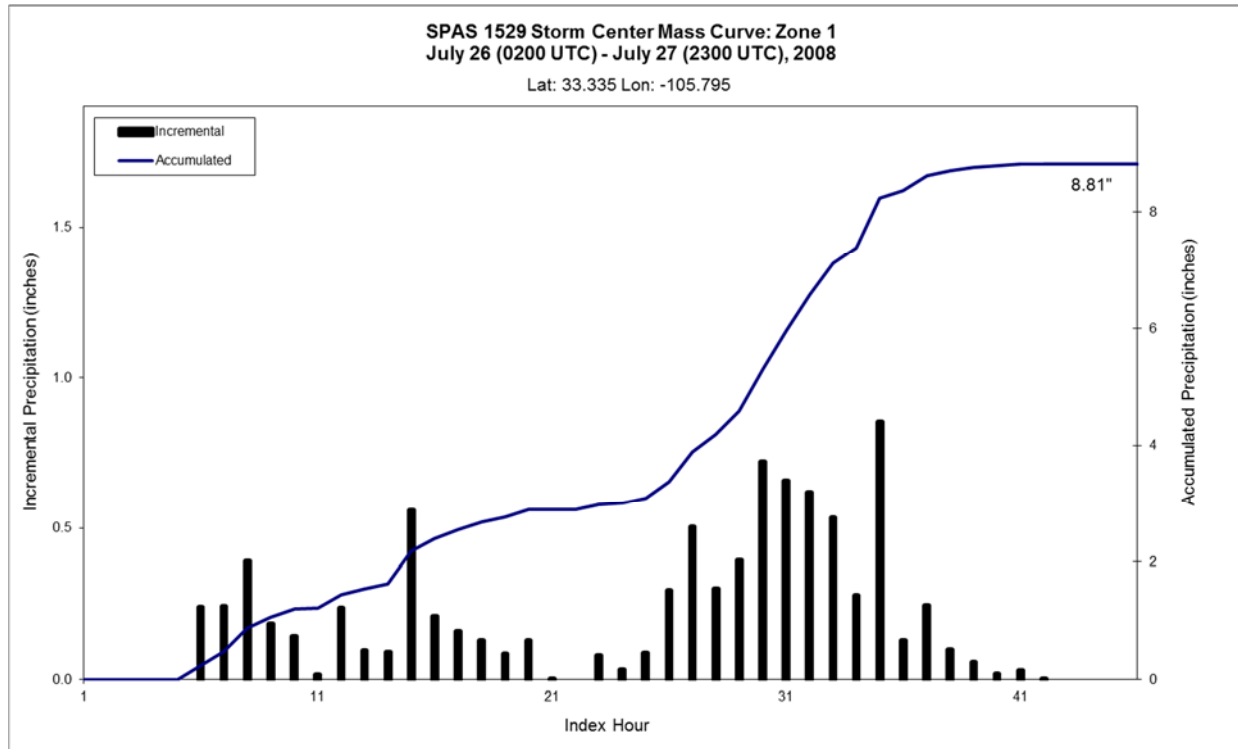
Reliability of results: This analysis was based on hourly data, daily data, supplemental station data and NEXRAD Radar. We have a high degree of confidence in the radar/station based storm total results, the spatial pattern is dependent on the radar data and basemap, and the timing is based on hourly, hourly pseudo stations, and radar data.

CO-NM Regional Extreme Precipitation Study

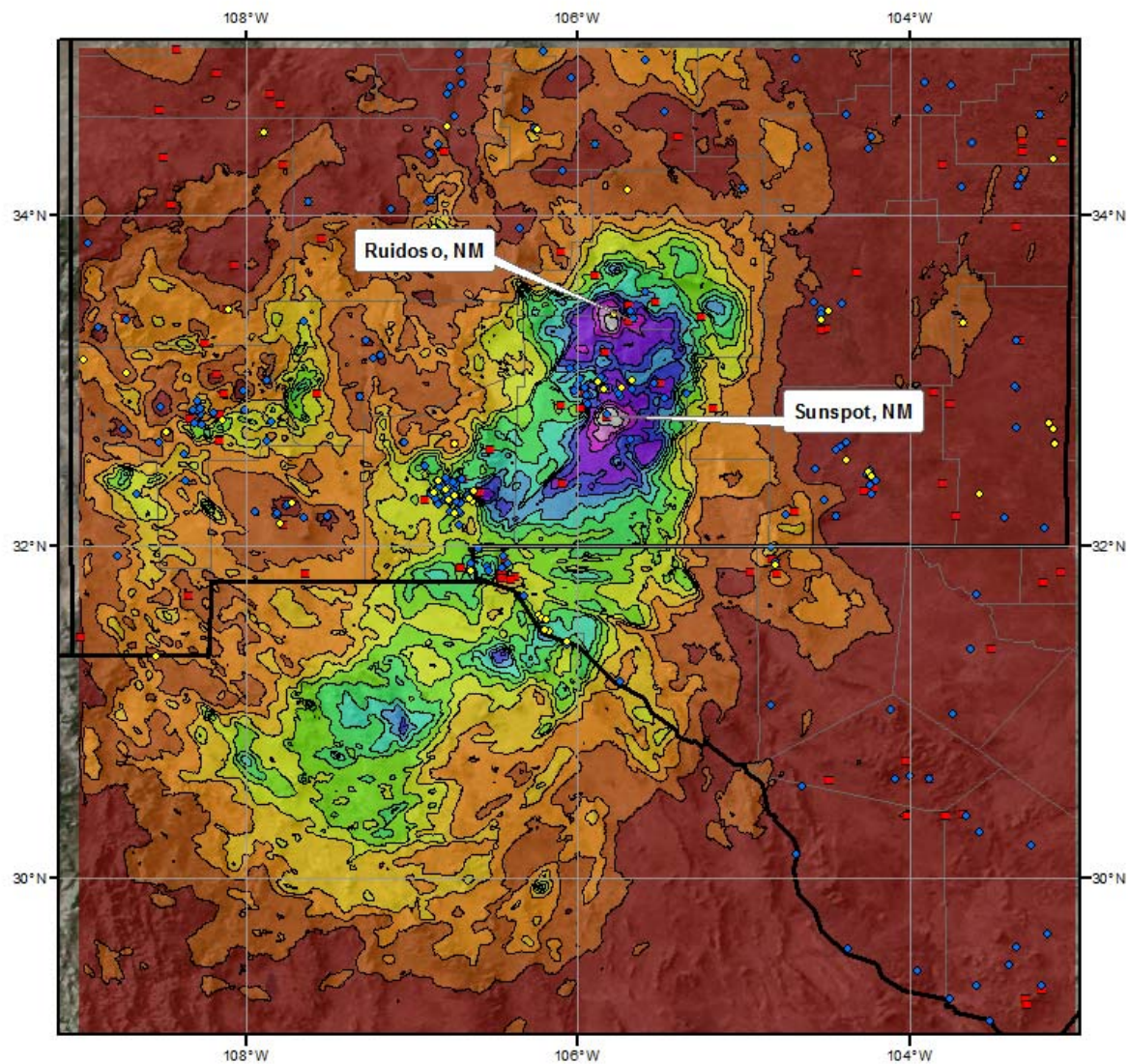
Storm 1529 - July 26 (0200 UTC) - July 27 (2300 UTC), 2008															
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)															
Area (mi ²)	Duration (hours)														
	1	2	3	4	5	6	12	18	24	36	48	72	96	120	Total
0.4	1.89	2.51	3.16	3.44	3.69	4.08	5.61	6.18	7.16	8.81	8.81	8.81	8.81	8.81	8.81
1	1.85	2.46	3.12	3.40	3.64	4.04	5.58	6.14	7.10	8.75	8.75	8.75	8.75	8.75	8.75
10	1.66	2.13	2.85	3.13	3.41	3.77	5.41	6.03	6.95	8.59	8.59	8.59	8.59	8.59	8.59
25	1.58	2.04	2.74	3.04	3.23	3.64	5.18	5.93	6.82	8.40	8.53	8.53	8.53	8.53	8.53
50	1.52	1.94	2.62	2.95	3.12	3.51	4.96	5.80	6.69	8.30	8.41	8.41	8.41	8.41	8.41
100	1.45	1.86	2.43	2.80	2.95	3.34	4.66	5.63	6.51	8.10	8.21	8.21	8.21	8.21	8.21
150	1.40	1.78	2.27	2.65	2.80	3.18	4.46	5.46	6.33	7.87	8.00	8.00	8.00	8.00	8.00
200	1.36	1.71	2.14	2.52	2.67	3.04	4.34	5.31	6.16	7.67	7.80	7.80	7.80	7.80	7.80
300	1.30	1.58	1.95	2.31	2.51	2.83	4.16	5.06	5.89	7.31	7.43	7.43	7.43	7.43	7.43
400	1.24	1.50	1.80	2.15	2.39	2.68	4.01	4.86	5.68	7.02	7.14	7.14	7.14	7.14	7.14
500	1.19	1.42	1.70	2.02	2.30	2.57	3.90	4.72	5.50	6.79	6.91	6.91	6.91	6.91	6.91
1,000	0.94	1.14	1.39	1.72	2.02	2.27	3.45	4.30	5.06	6.13	6.23	6.23	6.23	6.23	6.23
2,000	0.65	0.92	1.14	1.38	1.67	1.87	2.93	3.84	4.56	5.50	5.61	5.61	5.61	5.61	5.61
5,000	0.40	0.69	0.84	1.01	1.19	1.36	2.23	3.05	3.76	4.63	4.72	4.72	4.72	4.72	4.72
10,000	0.30	0.50	0.62	0.77	0.92	1.06	1.73	2.42	3.02	3.90	3.98	3.98	3.98	3.98	3.98
20,000	0.21	0.33	0.43	0.55	0.67	0.77	1.33	1.80	2.30	3.12	3.23	3.23	3.23	3.23	3.23
50,000	0.11	0.18	0.24	0.29	0.37	0.44	0.80	1.15	1.48	1.97	2.14	2.14	2.14	2.14	2.14
100,000	0.06	0.10	0.14	0.18	0.23	0.27	0.50	0.70	0.91	1.19	1.31	1.31	1.31	1.31	1.31
145,575	0.04	0.08	0.10	0.13	0.16	0.19	0.36	0.52	0.67	0.87	0.98	0.98	0.98	0.98	0.98



CO-NM Regional Extreme Precipitation Study



CO-NM Regional Extreme Precipitation Study



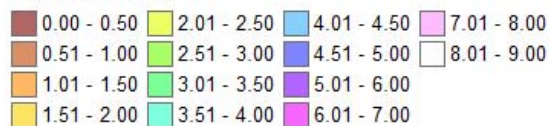
Total Storm (46-hr) Precipitation (inches)
7/26/2008 0105 UTC - 7/27/2008 2300 UTC
SPAS-NEXRAD 1529

Gauges

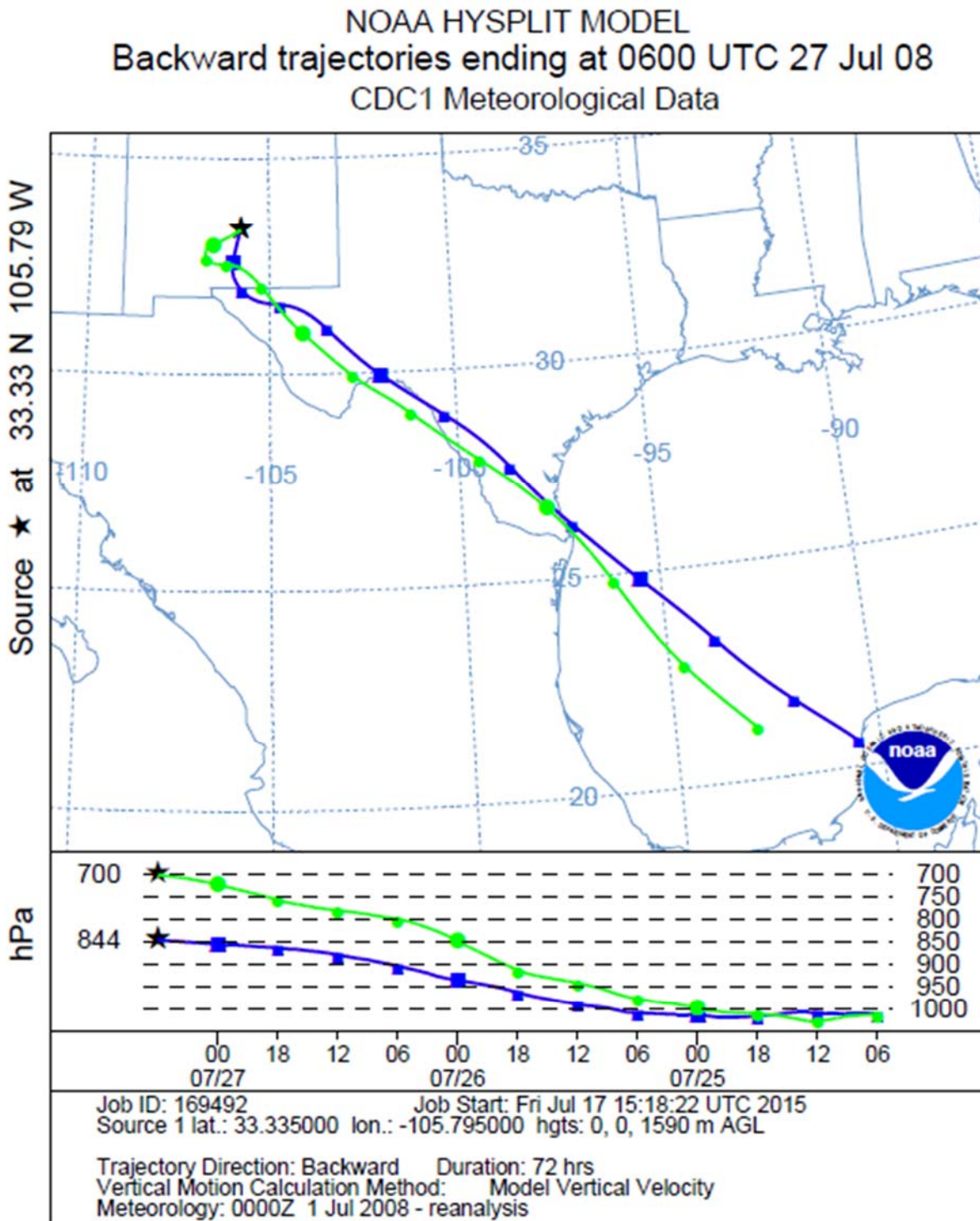
- ◆ Daily
- Hourly
- Hourly Pseudo
- ◆ Supplemental



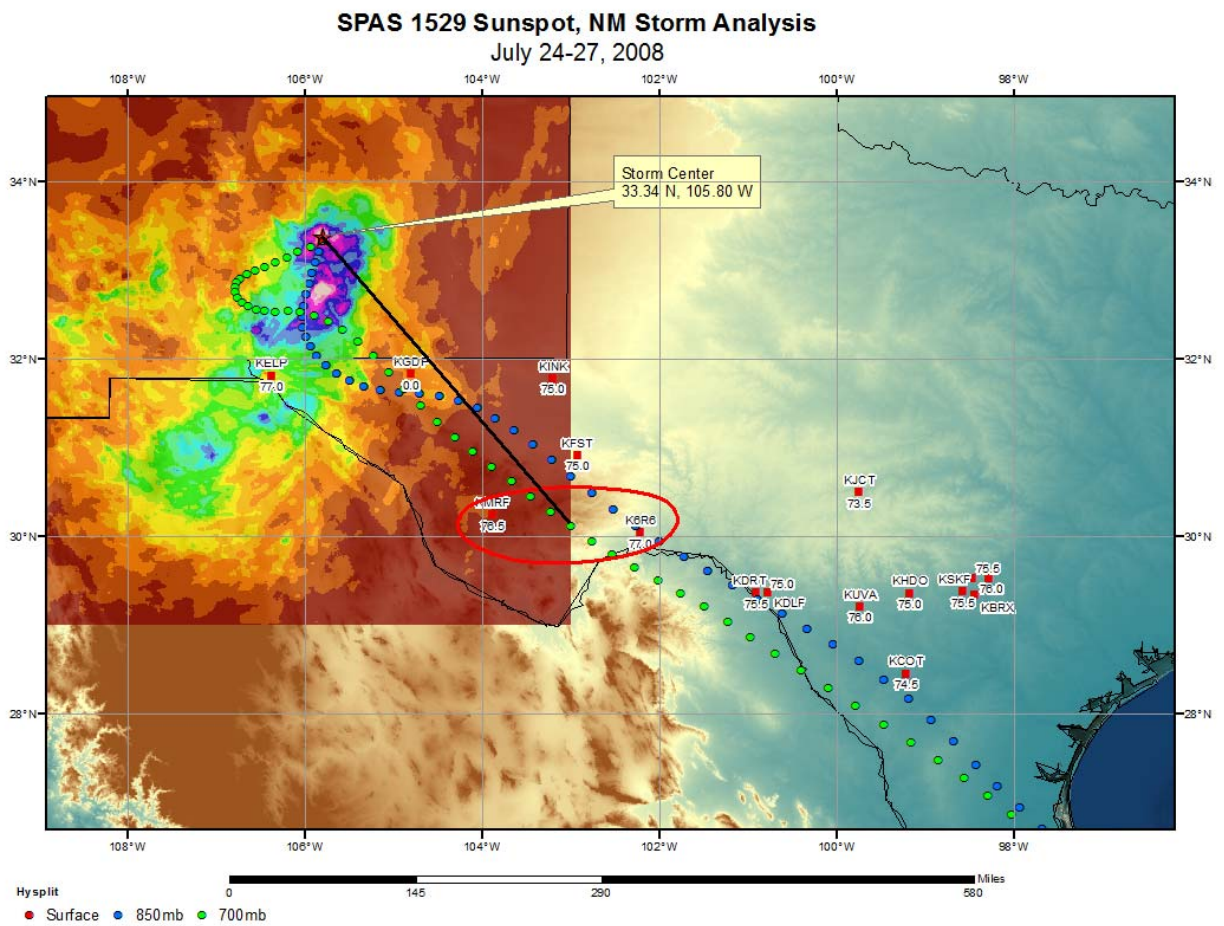
Precipitation (inches)



7/07/2015



CO-NM Regional Extreme Precipitation Study



The Bowl, TX
September 21-23, 2014
Storm Type: Tropical

Storm Precipitation Analysis System (SPAS) For Storm #1531_1

General Storm Location: The Bowl, TX

Storm Dates: September 21-23, 2014

Event: Synoptic, Remnants of Hurricane Odile

DAD Zone 1

Latitude: 31.935

Longitude: -104.825

Max. Grid Rainfall Amount: 10.83"

Max. Observed Rainfall Amount: 10.80"

Number of Stations: 204 (93 Daily, 78 Hourly, 2 Hourly Pseudo, 31 Supplemental, and 0 Supplemental Estimated)

SPAS Version: 10.0

Basemap: PRISM September 1981-2010 precipitation climatology

Spatial resolution: 0.01 (~ 0.40 mi²)

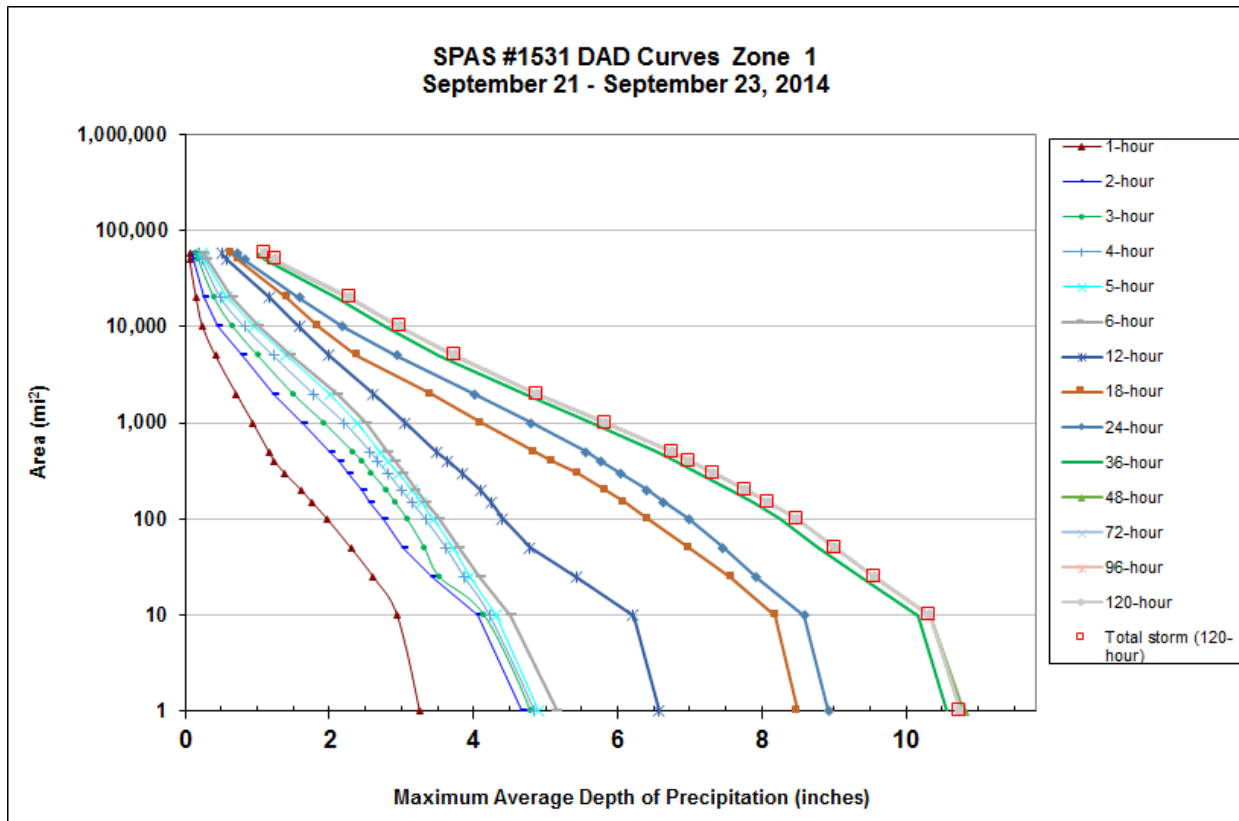
Radar Included: Yes

Depth-Area-Duration (DAD) analysis: Yes

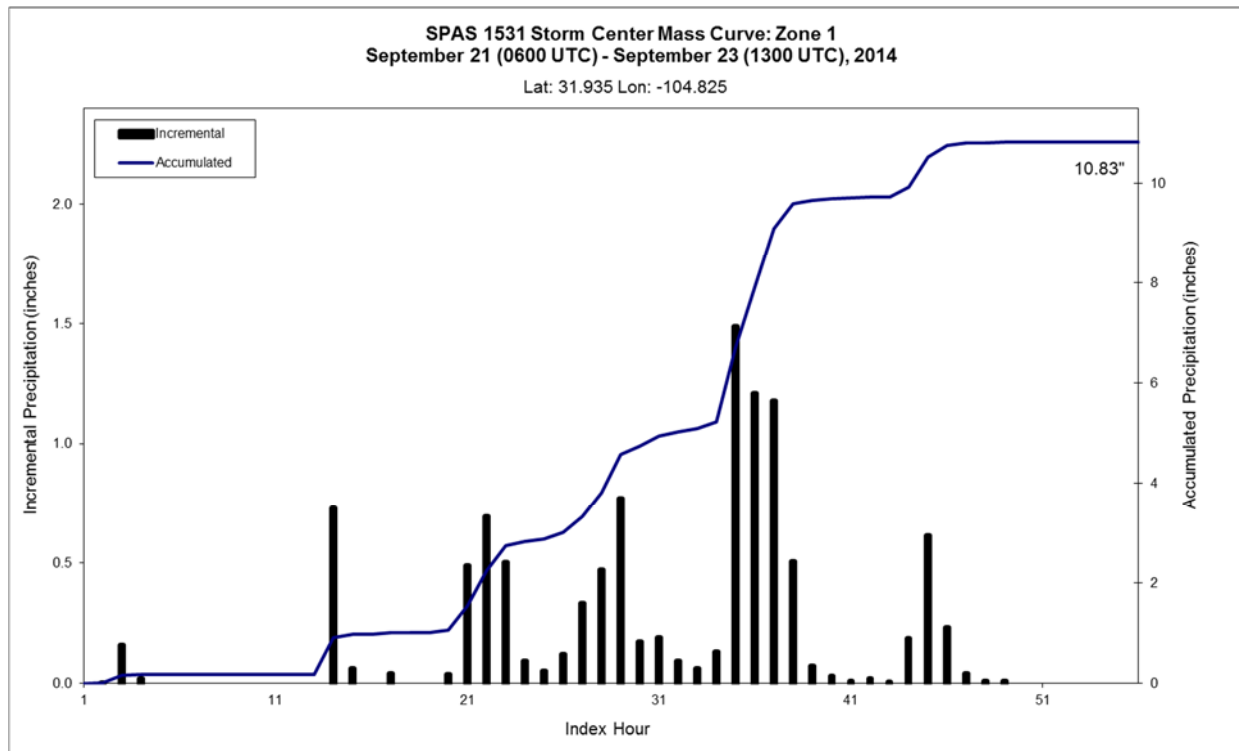
Reliability of results: This analysis was based on hourly data, daily data, supplemental station data and NEXRAD Radar. We have a high degree of confidence in the radar/station based storm total results, the spatial pattern is dependent on the radar data and basemap, and the timing is based on hourly, hourly pseudo stations, and radar data.

CO-NM Regional Extreme Precipitation Study

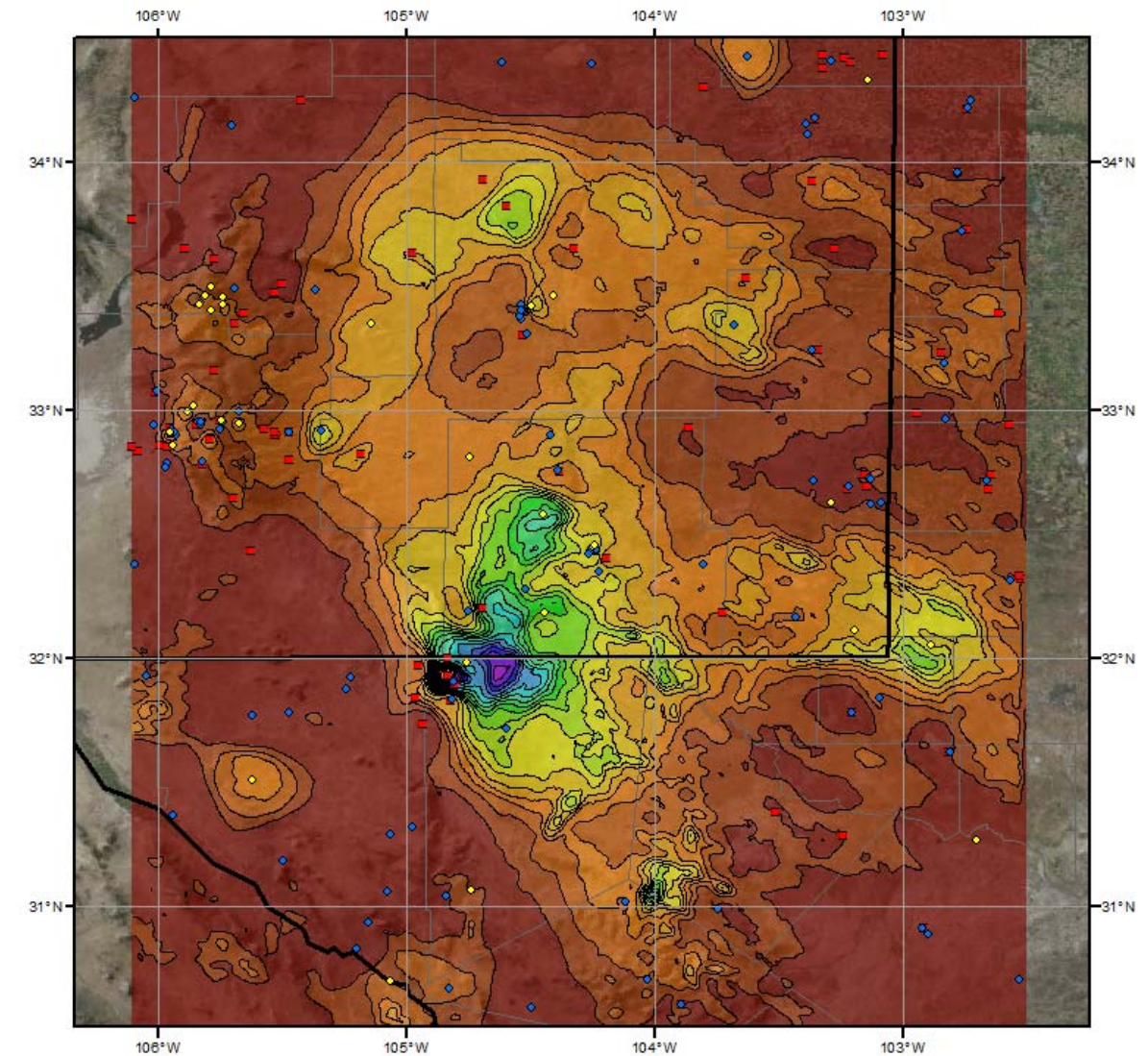
Storm 1531 - September 21 (0600 UTC) - September 23 (1300 UTC), 2014														
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
Area (mi ²)	Duration (hours)													
	1	2	3	4	5	6	12	18	24	36	48	72	96	120
0.4	3.30	4.75	4.86	4.91	4.98	5.24	6.62	8.56	9.00	10.65	10.83	10.83	10.83	10.83
1	3.25	4.68	4.79	4.84	4.91	5.16	6.57	8.49	8.93	10.57	10.80	10.75	10.75	10.75
10	2.94	4.05	4.15	4.22	4.31	4.52	6.22	8.19	8.59	10.16	10.33	10.33	10.33	10.33
25	2.61	3.42	3.53	3.87	3.96	4.09	5.43	7.58	7.92	9.38	9.57	9.57	9.57	9.57
50	2.30	3.02	3.32	3.62	3.71	3.80	4.78	6.99	7.46	8.77	9.00	9.01	9.01	9.01
100	1.97	2.74	3.08	3.33	3.45	3.52	4.40	6.42	6.99	8.25	8.48	8.48	8.48	8.48
150	1.76	2.57	2.91	3.14	3.27	3.33	4.24	6.09	6.64	7.86	8.08	8.08	8.08	8.08
200	1.61	2.45	2.79	3.00	3.14	3.20	4.09	5.83	6.40	7.56	7.77	7.78	7.78	7.78
300	1.38	2.27	2.59	2.81	2.96	3.03	3.84	5.45	6.04	7.10	7.33	7.32	7.32	7.32
400	1.24	2.13	2.46	2.67	2.82	2.91	3.64	5.09	5.76	6.78	6.99	7.00	7.00	7.00
500	1.16	2.01	2.33	2.57	2.71	2.81	3.48	4.84	5.56	6.53	6.74	6.75	6.75	6.75
1,000	0.94	1.63	1.93	2.21	2.40	2.51	3.05	4.10	4.80	5.64	5.82	5.84	5.84	5.84
2,000	0.71	1.24	1.50	1.78	2.02	2.11	2.61	3.41	4.01	4.70	4.88	4.88	4.88	4.88
5,000	0.42	0.79	1.01	1.22	1.39	1.47	2.00	2.39	2.93	3.51	3.74	3.75	3.75	3.75
10,000	0.24	0.44	0.66	0.82	0.95	1.03	1.58	1.85	2.18	2.79	2.98	2.98	2.98	2.98
20,000	0.15	0.27	0.40	0.49	0.58	0.66	1.17	1.42	1.58	2.11	2.28	2.29	2.29	2.29
50,000	0.06	0.12	0.18	0.23	0.27	0.31	0.58	0.74	0.82	1.12	1.23	1.25	1.25	1.25
57,931	0.06	0.11	0.16	0.20	0.24	0.27	0.51	0.64	0.72	1.00	1.10	1.11	1.11	1.11



CO-NM Regional Extreme Precipitation Study



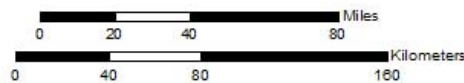
CO-NM Regional Extreme Precipitation Study



Total Storm (56-hr) Precipitation (inches)
9/21/2014 0505 UTC - 9/23/2014 1300 UTC
SPAS-NEXRAD 1531

Gauges

- ◆ Daily
- Hourly
- Hourly Pseudo
- ◆ Supplemental



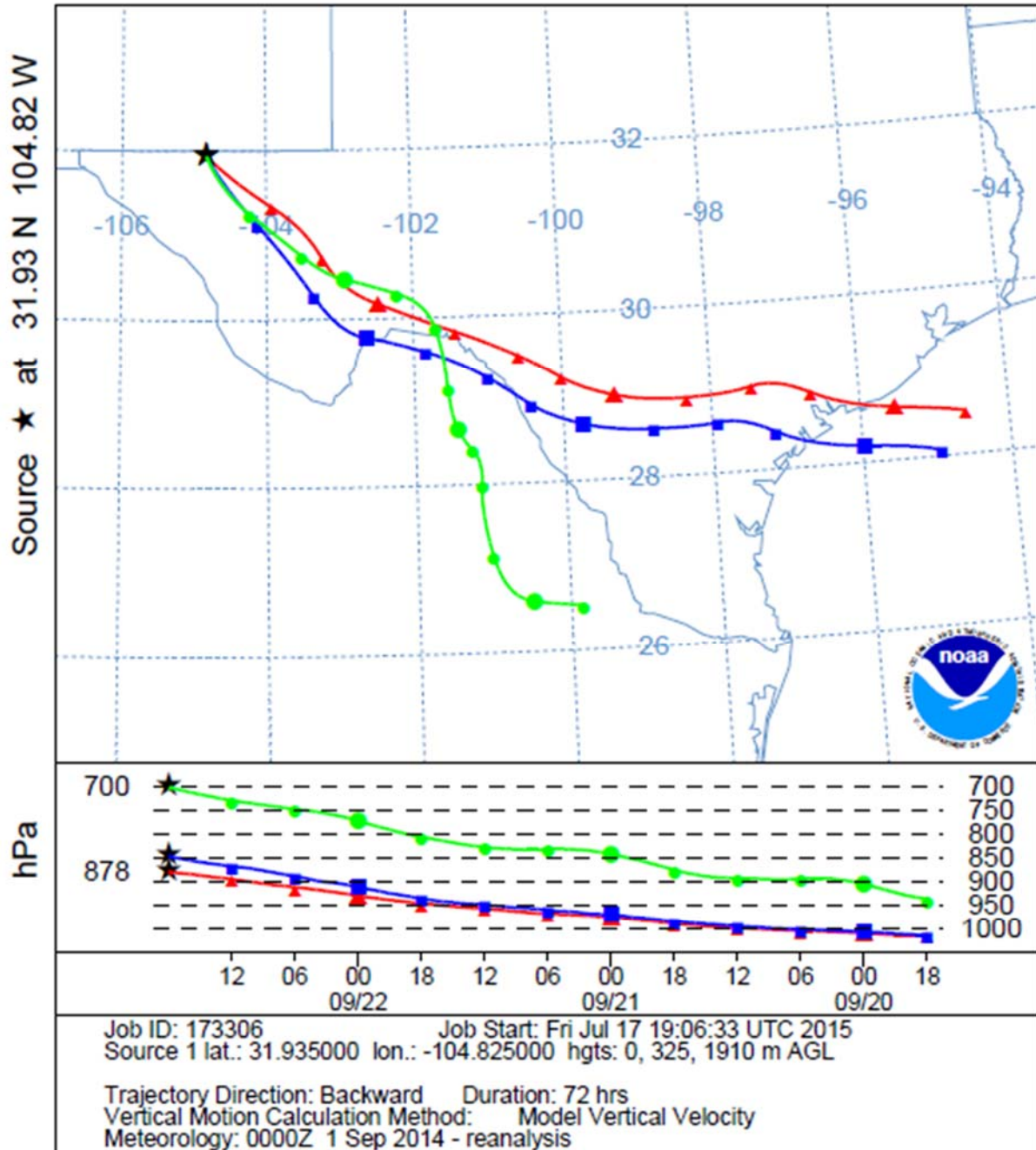
Precipitation (inches)

0.00 - 0.50	2.51 - 3.00	5.01 - 5.50	7.51 - 8.00	10.01 - 10.50
0.51 - 1.00	3.01 - 3.50	5.51 - 6.00	8.01 - 8.50	10.51 - 11.00
1.01 - 1.50	3.51 - 4.00	6.01 - 6.50	8.51 - 9.00	
1.51 - 2.00	4.01 - 4.50	6.51 - 7.00	9.01 - 9.50	
2.01 - 2.50	4.51 - 5.00	7.01 - 7.50	9.51 - 10.00	



7/15/2015

NOAA HYSPLIT MODEL
Backward trajectories ending at 1800 UTC 22 Sep 14
CDC1 Meteorological Data



CO-NM Regional Extreme Precipitation Study

