

The Mojave Desert Severe Weather Event of July 10, 2008

Overview

Monsoonal moisture moving northwestward into the Mojave Desert helped set the stage for a severe weather event during the afternoon and evening hours of July 10, 2008. During this time, the National Weather Service Office in Las Vegas issued a total of 9 Severe Thunderstorm Warnings and 3 Flash Flood Warnings. In addition, the Storm Prediction Center in Norman, OK issued a Severe Thunderstorm Watch for San Bernardino, Mohave and Clark Counties.

A surge of deeper moisture worked northwestward beginning on the night of July 9th and through the day on July 10th and was evidenced in the VAD wind profile from the Yuma Doppler Radar which showed southerly flow in the low levels. A very sharp dewpoint gradient was noted with this northwestward advance of moisture and this boundary seemed to mark the western and northern limit of convective development during the afternoon and evening hours of the 10th. This dewpoint gradient was oriented roughly from Northern Clark County through extreme southern Nye County and then southwestward across the western fringes of San Bernardino County. The GFS model at 00Z on July 11th initialized precipitable water values as high as 0.75 inches near Las Vegas (See Image 1).

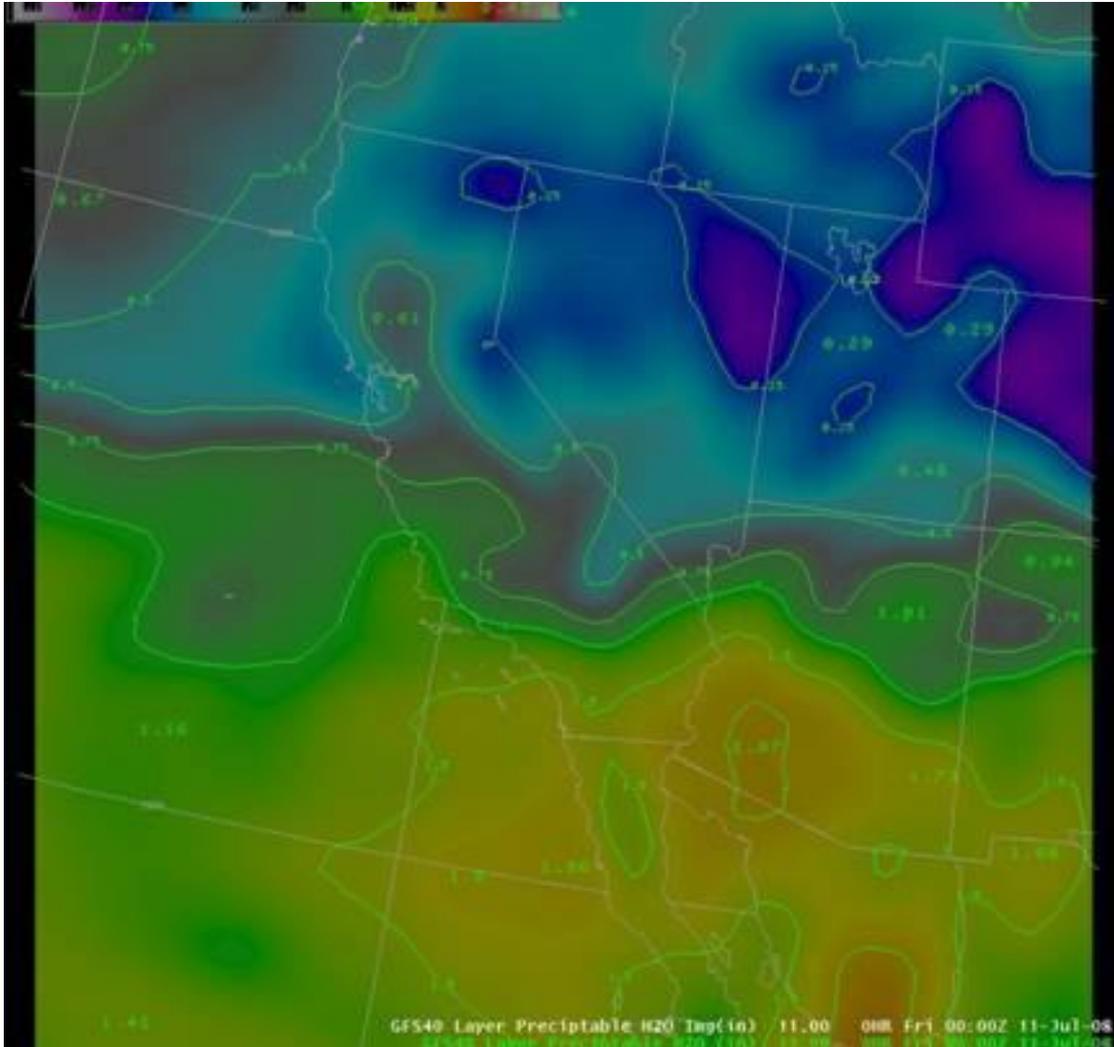


Image 1 - Precipitable Water Values at 00Z 7-11-2008 across the area (initialized by the GFS).

In addition to having a sufficient surge of moisture into the area, instability parameters and shear were also supportive of severe thunderstorm development across much of the Mojave Desert. The 12Z July 10th Flagstaff sounding showed a most unstable CAPE of 2448 J/Kg, a surface CAPE of 2169 J/Kg (substantial CAPE in the hail growth zone was also evident) and a forecast surface Lifted Index of -8 along with vertical wind shear of 30-35 knots. By contrast, the 12Z July 10th sounding from Desert Rock showed very minimal CAPE in the hail growth zone and had most unstable CAPE of 16 J/Kg, a surface CAPE of 56 J/Kg and a forecasted surface Lifted Index of -1. The height of the -20C level (a critical level looked at for hail) during the afternoon hours of the 10th looks to have been between 24,500 and 27,500 feet based on the 00Z July 11th soundings from Flagstaff and Desert Rock.

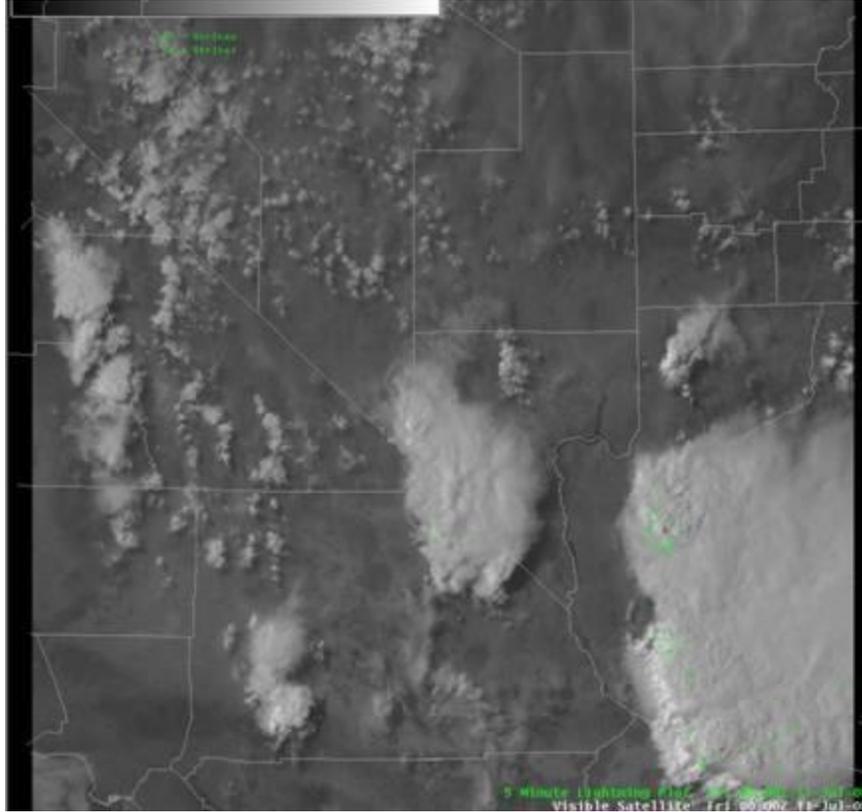


Image 2- Visible satellite image with observed lightning (in lime green) at 00z 7-11-2008. Note the large area of thunderstorms over Mohave County and a smaller area in eastern San Bernardino County.

Thunderstorms initially developed across Mohave County during the mid-afternoon hours. These storms produced several reports of wind damage and flash flooding in the Kingman area as well as penny-sized hail on the Hualapai Reservation. Storms then developed across eastern San Bernardino County and also in central and southern Clark County and extreme southern Nye County near Pahrump. Thunderstorms did not develop in the Las Vegas Valley but several weak outflow boundaries did migrate into the area, affecting wind and temperature.

Although some of the storms that did develop remained over rural areas, the Colorado River Valley communities from Laughlin southward were affected as the evening progressed and outflow boundaries from storms that developed across Mohave County moved westward. The outflow boundaries from the Mohave County storms eventually collided with outflow boundaries from storms that developed in eastern San Bernardino County creating a convergence zone in the vicinity of the Colorado River. Several reports of wind damage were received from communities along the Colorado River in Mohave County. Low visibility from blowing dust, with reports as low as 100 feet in Laughlin, developed in association with thunderstorm outflow winds.

Another likely severe storm developed north of Barstow in the evening. The most intense portion of the storm was over the open desert but on the periphery a 54 mph wind gust was recorded. Radar imagery also showed a three body scatter spike with this storm, indicative large hail production. This storm also unleashed heavy rains that caused flash flooding at the Calico Ghost Town Campground.

Radar Imagery

Below are some radar images of storms from this event.

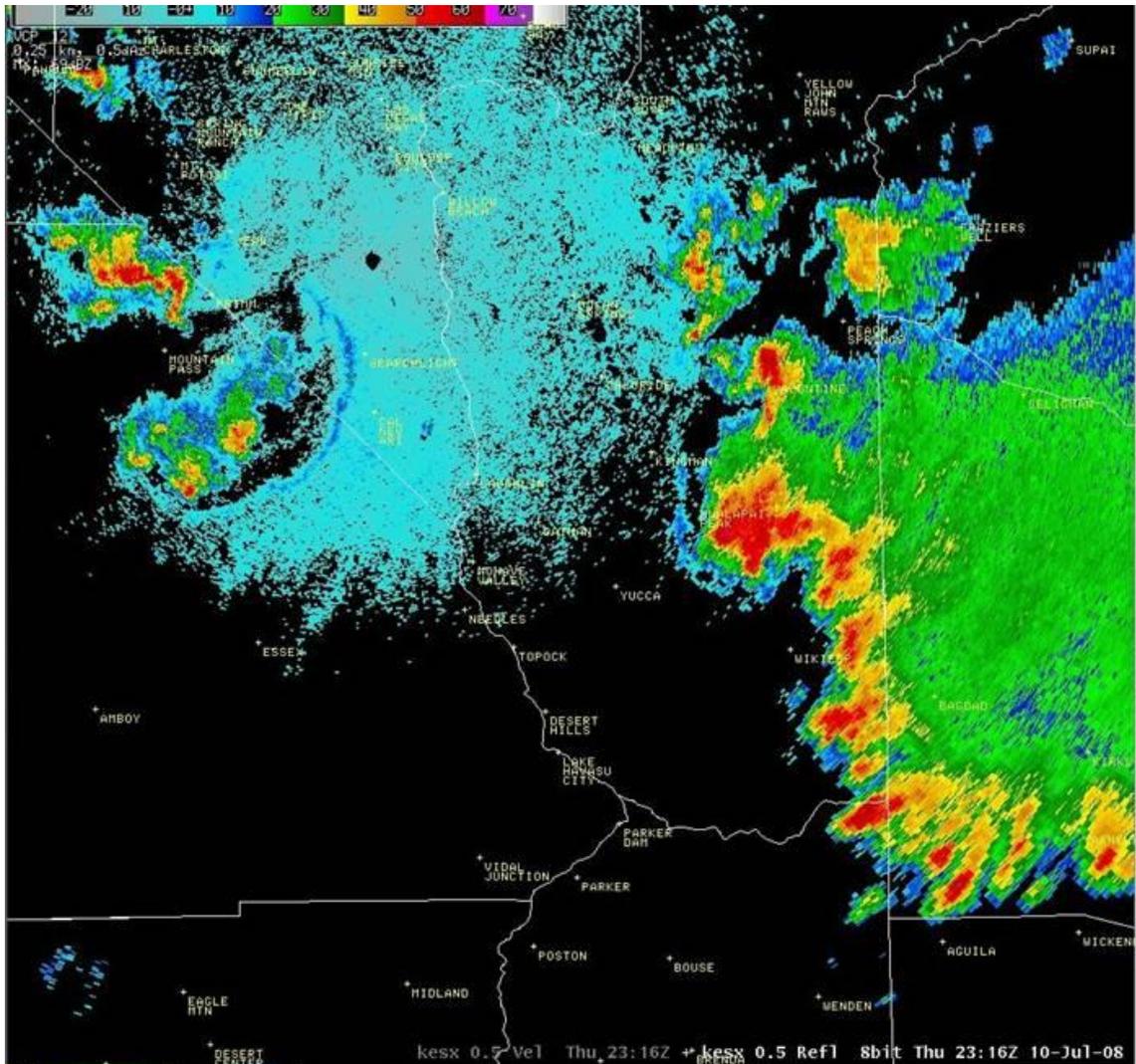


Image 3 - KESX 0.5 degree Reflectivity showing Severe Thunderstorm over Mohave County just east of Hualapai Peak that produced penny size hail on eastern side of the Hualapai Reservation. Also, note the outflow boundary pushing east from this storm towards Kingman. A second outflow boundary is clearly evident moving eastward from the thunderstorms south of Mountain Pass, California.

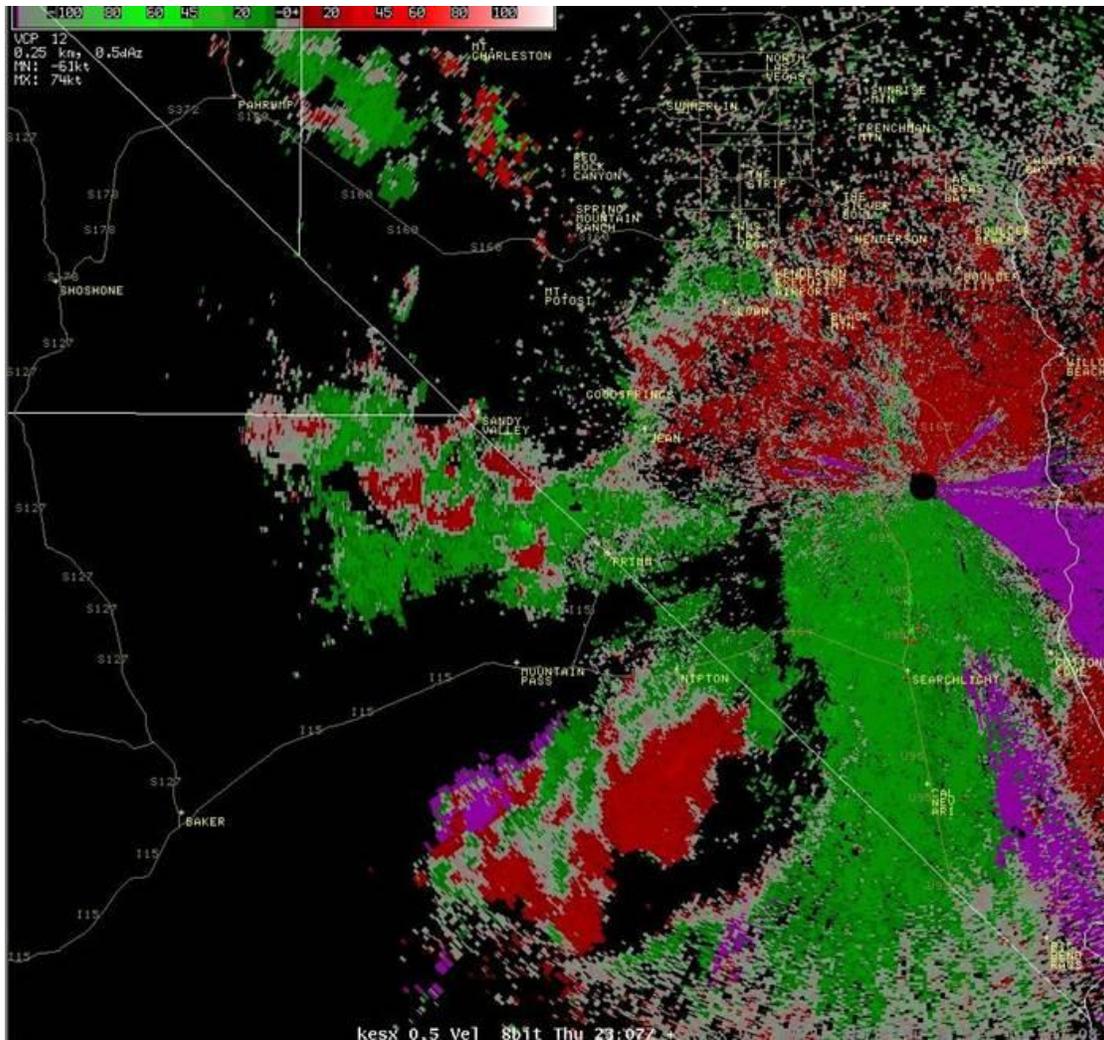


Image 4 - KESX 0.5 degree Velocity showing a small area of rotation north of Mountain Pass, CA that prompted a severe thunderstorm warning for that cell. This storm remained over a rural area.

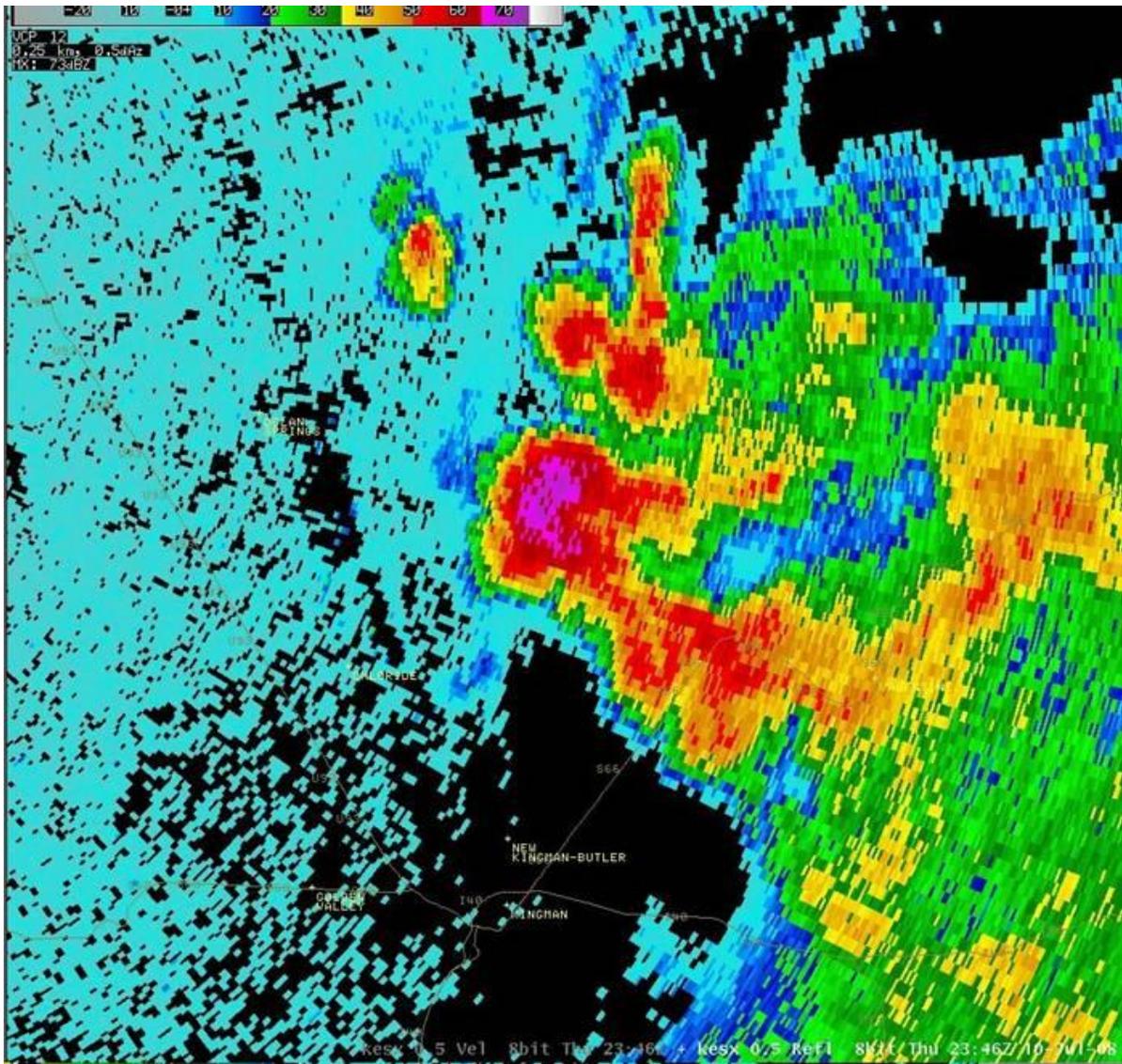


Image 5 - Radar image of storm that prompted several warnings near Dolan Springs, but remained over a rural mountain area. Note the base reflectivity was around 70 dBZ with this storm.

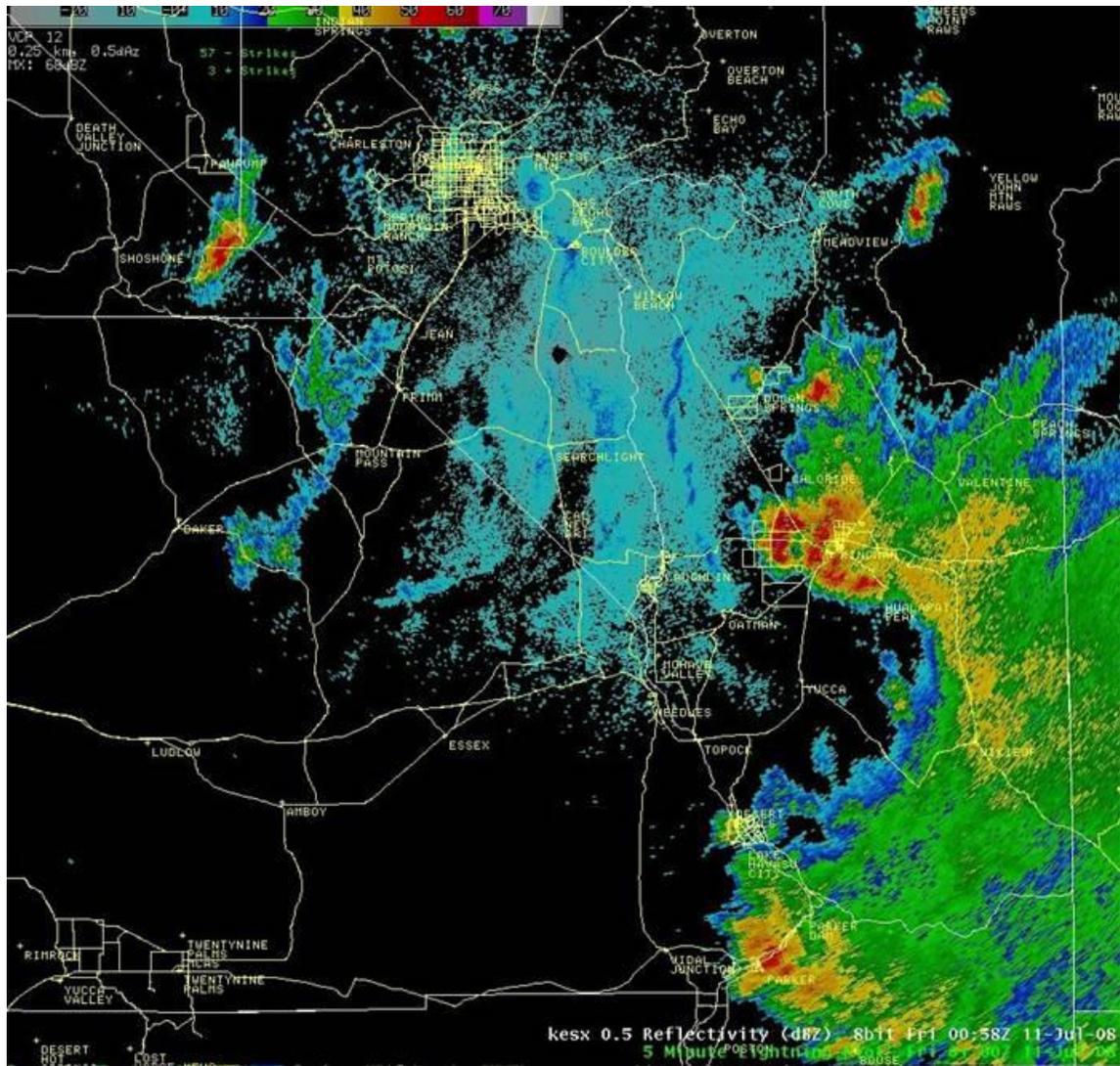


Image 6 - KSEX 0.5 degree reflectivity showing storms moving through the Kingman area. Note the outflow boundaries moving towards the Colorado River from the west and east.

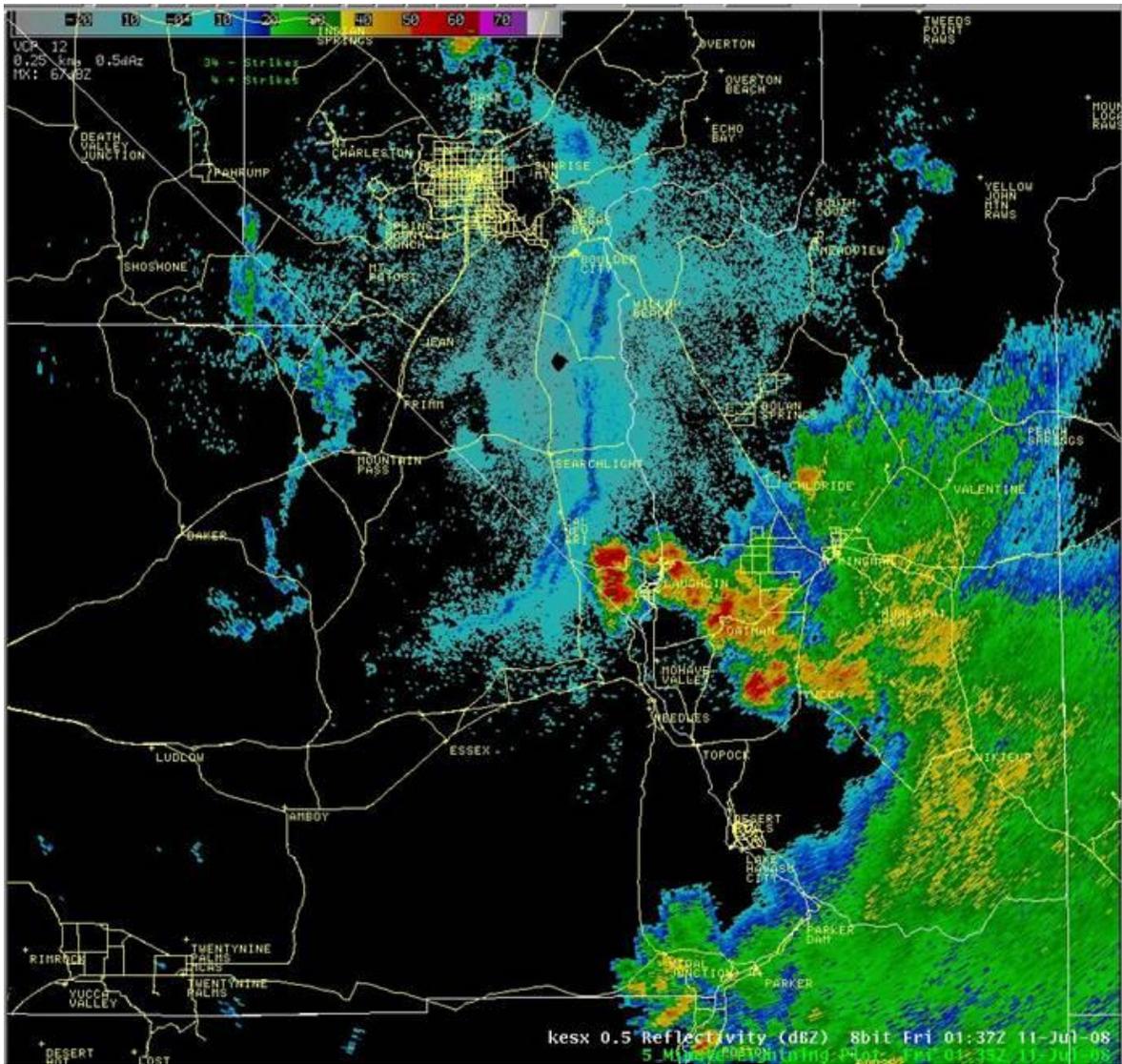


Image 7 - KESX 0.5 degree Reflectivity showing storms moving through Laughlin and heading towards the Colorado River. Note the colliding outflow boundaries further north along the river.

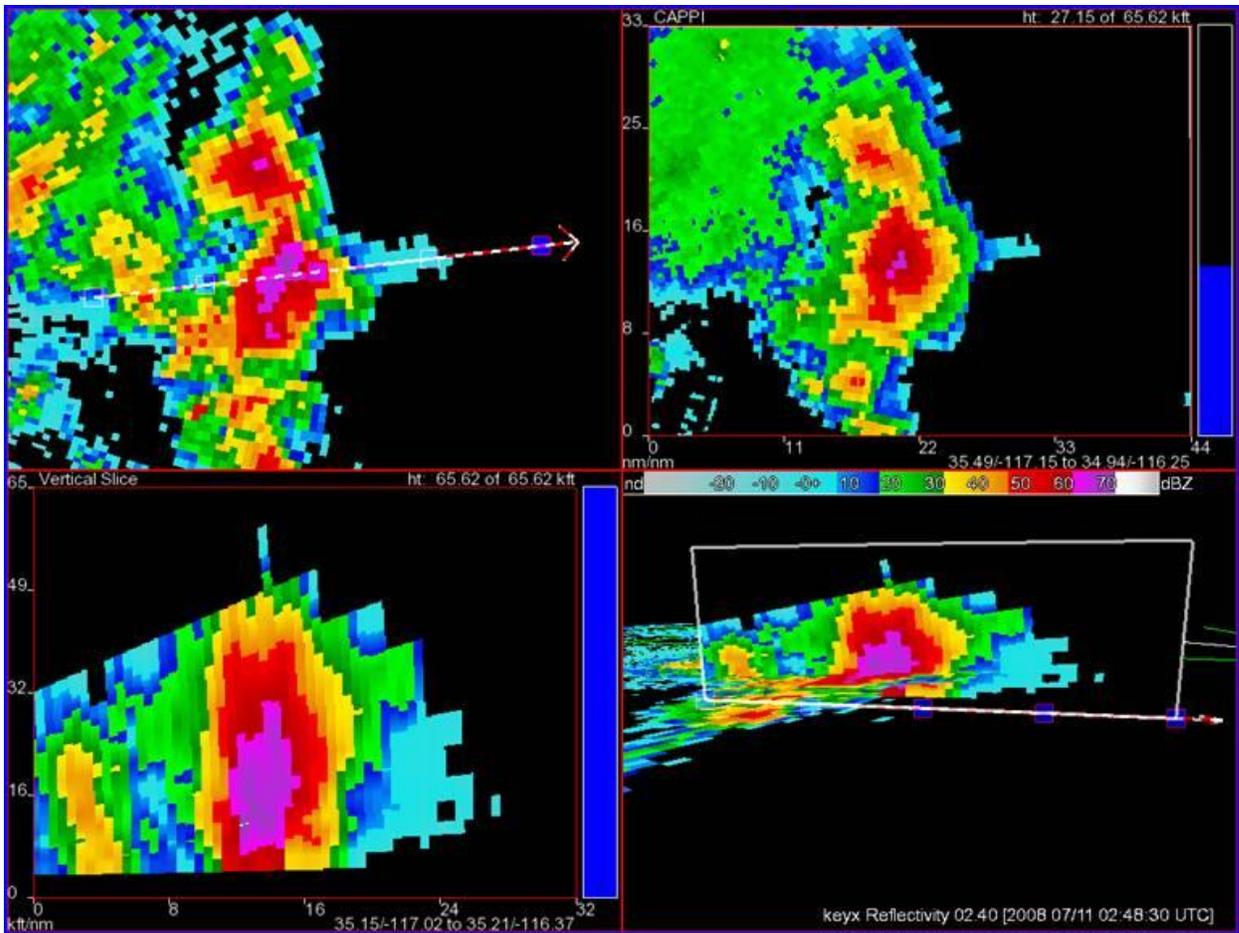


Image 8 - KEYX WSR88-D Radar reflectivity images for a thunderstorm northeast of Barstow over a rural area. A TBSS was observed at several elevation slices. This is a cross section using FSI at the lowest slice 2.4 deg. The CAPPI was set near 27 kft, 70 dBZ above the -20 deg C. level. (Special thanks to Barry Pierce for this image).

Storm Reports

This is a preliminary list of storm reports from this event. A special thanks to our spotters and HAM Radio members for many of these reports!

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NWUS55 KVEF 121630

LSRVEF

PRELIMINARY LOCAL STORM REPORT...SUMMARY
NATIONAL WEATHER SERVICE LAS VEGAS NV
930 AM PDT SAT JUL 12 2008

..TIME...	...EVENT...	...CITY LOCATION...	...LAT.LON...
..DATE...MAG....	..COUNTY LOCATION..ST..	...SOURCE.....
	..REMARKS..		

0245 PM	HAIL	15 SSE PEACH SPRINGS	35.33N 113.33W
07/10/2008	E0.25 INCH	MOHAVE AZ	TRAINED SPOTTER

PEA SIZE HAIL WAS REPORTED BY A SPOTTER AT THE DIAMOND M. RANCH.

0355 PM	HAIL	2 NE PEACH SPRINGS	35.55N 113.40W
07/10/2008	E0.25 INCH	MOHAVE AZ	TRAINED SPOTTER

PEA SIZE HAIL AND HEAVY RAIN ACCOMPANIED BY BLOWING DUST WAS REPORTED BY A SPOTTER.

0358 PM	HAIL	8 E HUALAPAI PEAK	35.07N 113.76W
07/10/2008	E0.75 INCH	MOHAVE AZ	PUBLIC

PENNY SIZE HAIL FELL ON THE EASTERN SIDE OF THE HUALAPAI TRIBE RESERVATION. THE TIME WAS ESTIMATED BASED ON RADAR.

0416 PM	TSTM WND GST	KINGMAN	35.21N 114.03W
07/10/2008	M46.00 MPH	MOHAVE AZ	ASOS

A 46 MPH WIND GUST WAS REPORTED AT THE KINGMAN AIRPORT FROM A THUNDERSTORM OUTFLOW BOUNDARY.

0419 PM	LIGHTNING	HUALAPAI PEAK	35.07N 113.90W
07/10/2008		MOHAVE AZ	TRAINED SPOTTER

A SPOTTER REPORTED THAT LIGHTNING HAD STARTED 2 FIRES IN THE HUALAPAI MOUNTAIN RANGE.

0455 PM	HAIL	PAHRUMP	36.21N 115.99W
07/10/2008	E0.25 INCH	NYE NV	TRAINED SPOTTER

0505 PM	LIGHTNING	PAHRUMP	36.21N 115.99W
07/10/2008		NYE NV	TRAINED SPOTTER

A SPOTTER REPORTED POWER LINES WERE STRUCK AND KNOCKED DOWN BY LIGHTNING IN PAHRUMP.

0520 PM HAIL KINGMAN 35.21N 114.03W
07/10/2008 E0.50 INCH MOHAVE AZ AMATEUR RADIO

DIME SIZE HAIL WAS REPORTED AT THE KINGMAN AIRPORT.

0530 PM TSTM WND GST KINGMAN 35.21N 114.03W
07/10/2008 E60.00 MPH MOHAVE AZ AMATEUR RADIO

AN ESTIMATED 60 MPH WIND GUST WAS REPORTED IN KINGMAN.

0530 PM TSTM WND DMG KINGMAN 35.21N 114.03W
07/10/2008 MOHAVE AZ TRAINED SPOTTER

THUNDERSTORM WINDS BLEW DOWN WOODEN FENCES IN KINGMAN ALONG WALNUT CREEK ROAD AND ALSO BLEW DOWN A 200 POUND SATELLITE DISH. IN ADDITION, THUNDERSTORM WINDS RIPPED THE ROOF OF A MOBILE HOME GARAGE. A 54MPH WIND GUST WAS MEASURED IN DOWNTOWN KINGMAN. THE TIME OF THESE EVENTS WERE ESTIMATED.

0545 PM TSTM WND GST GOLDEN VALLEY 35.22N 114.22W
07/10/2008 M54.00 MPH MOHAVE AZ TRAINED SPOTTER

A SPOTTER MEASURED A 54 MPH WIND GUST IN GOLDEN VALLEY.

0545 PM FLASH FLOOD KINGMAN 35.21N 114.03W
07/10/2008 MOHAVE AZ AMATEUR RADIO

ROADS WERE REPORTED FLOODED IN THE KINGMAN AREA.

0600 PM TSTM WND DMG LAKE HAVASU CITY 34.45N 114.33W
07/10/2008 MOHAVE AZ NEWSPAPER

THUNDERSTORM WINDS KNOCKED DOWN A LARGE TREE IN LAKE HAVASU CITY. THE TIME OF THIS EVENT WAS ESTIMATED.

0605 PM TSTM WND DMG BULLHEAD CITY 35.15N 114.56W
07/10/2008 MOHAVE AZ TRAINED SPOTTER

SIGNS WERE BLOWN DOWN OFF OF SEVERAL BUSINESSES IN BULLHEAD CITY.

0615 PM TSTM WND GST BULLHEAD CITY 35.15N 114.56W
07/10/2008 M64.00 MPH MOHAVE AZ TRAINED SPOTTER

A SPOTTER MEASURED SUSTAINED WINDS OF 50 MPH WITH A GUST OF 64 MPH IN BULLHEAD CITY.

0620 PM TSTM WND GST BULLHEAD CITY 35.15N 114.56W
07/10/2008 E60.00 MPH MOHAVE AZ TRAINED SPOTTER

A SPOTTER ESTIMATED A 60 MPH WIND GUST IN BULLHEAD CITY IN ASSOCIATION WITH A THUNDERSTORM OUTFLOW BOUNDARY. THE WIND WAS STRONG ENOUGH TO KNOCK DOWN HIS NEIGHBOR WHO WAS OUTSIDE TRYING TO COLLECT HIS TRASH CANS.

0628 PM FLASH FLOOD KINGMAN 35.21N 114.03W
07/10/2008 MOHAVE AZ AMATEUR RADIO

BANK STREET WAS REPORTED FLOODED IN THE BUTLER AREA OF KINGMAN. THE MOUNT BULL ALERT GAGE RECORDED 1.16 INCHES OF RAIN IN THE PAST 2 HOURS.

0635 PM TSTM WND DMG 8 S BULLHEAD CITY 35.03N 114.56W
07/10/2008 MOHAVE AZ TRAINED SPOTTER

THUNDERSTORM WINDS BLEW AN AWNING AS WELL AS SOME SHINGLES OFF A HOUSE.

0637 PM TSTM WND GST LAUGHLIN 35.16N 114.58W
07/10/2008 E50.00 MPH CLARK NV TRAINED SPOTTER

0703 PM TSTM WND GST NEEDLES 34.81N 114.61W
07/10/2008 M51.00 MPH SAN BERNARDINO CA ASOS

A 51 MPH WIND GUST WAS MEASURED AT THE NEEDLES AIRPORT.

0800 PM TSTM WND GST 18 SSE TRONA 35.51N 117.27W
07/10/2008 M54.00 MPH SAN BERNARDINO CA MESONET

A 54 MPH WIND GUST WAS MEASURED AT THE CLR05 MESONET SITE.

0915 PM LIGHTNING 9 ENE BARSTOW 34.93N 116.92W
07/10/2008 SAN BERNARDINO CA NEWSPAPER

THE SAN BERNARDINO COUNTY DEPARTMENT OF PUBLIC WORKS REPORTED LIGHTNING DOWNED A NUMBER OF POWER LINES IN THE YERMO AREA CAUSING SOME ROAD CLOSURES. THE TIME OF THIS EVENT WAS ESTIMATED.

0915 PM FLASH FLOOD 10 ENE BARSTOW 34.93N 116.90W
07/10/2008 SAN BERNARDINO CA NEWSPAPER

HEAVY RAINS CAUSED FLASH FLOODING AT THE CALICO GHOST TOWN AND WASHED OUT MOST OF THE CAMPGROUND. ROADS AT THE CAMGROUND WERE COVERED IN MUD AND DEBRIS. THE CALICO GHOST TOWN PARK LOST POWER DUE TO THE STORM. THE TIME OF THIS EVENT WAS ESTIMATED.

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THIS IS AN UPDATED SUMMARY OF REPORTS FROM THE THUNDERSTORMS THAT OCCURRED IN PARTS OF THE MOJAVE DESERT THURSDAY AFTERNOON AND EVENING.

A final thanks is extended to the staff at the National Weather Service who worked up to and during this event for information used in this report and to staff members who reviewed it.