Lake Havasu City 2014 Annual Weather Summary

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Introduction

2014 may have been the world's warmest year on record, but it was not that way in typically one of the hottest spots in the Western Hemisphere. Lake Havasu City did experience a few record temperatures and a record breaking month, but not the extreme 120°F+ temperatures for which the city is known. The city saw its first haboob in a long time and on the last day of the year, the city also experienced its first significant snowfall in 27 years (not Massachusetts significant, but snowflakes to the lake level is different!).

Temperatures

Though no record temperatures were recorded in January, as a blocking high pressure dome settled over the southwest, there was one high record temperature tied on January 22nd and this January was the second warmest on record with a 71.2°F average. The warmest was in 2003 at 72.7°F. February got even warmer with two record high temperatures (17th (86°F) and 18th (89°F) and tied one the record high for the 14th (84°F). Clear skies for almost the entire month also helped to make this February the warmest on record at an average of 76.7°F, eclipsing 1995's 74.9°F.

March continued the theme with the highest low temperature average for this month on record at 56.3°F, though no single daily records were reached. As in many other years, some cold fronts came through the evening hours creating low daily temperatures that were only a few hours apart. For example, March 30th's low temperature occurred at midnight after the day was done, only 6 hours before the low temperature for the 31st. Even stranger, the low temperature for August 12th was only 30 minutes before the low temperature for the 13th. This was caused by the presence over the city of a monsoon thunderstorm (more on the monsoon below). Other examples occurred in September through December.

What was a little bit unusual was that April did not have any official (the official station that reports to the National Weather Service is the Operations Maintenance Facility (OMF) station – formerly named PWMF) 100°F+ readings, though the Fire Station #5 weather station did record 100.7°F and 101.7°F on April 9th and 10th, respectively. One record low temperature was recorded on April 25th at 52°F, replacing the old record of 53°F set in 1990.

The first official 100°F+ day occurred on May 3rd and was 102°F. The first official 110°F+ day occurred on June 9th at 111°F, but the first unofficial day was back on May 27th at Fire Station #5

at 110.7°F. As June wore on, the expected super heat up at the end of the month did not produce 120°F+ temperatures. Instead, the highest official temperature in June occurred on the 9th. This cooler than normal trend continued through August. The highest official temperature of the year occurred on July 24th at 117°F, though the Fire Station #5 station recorded 119.3°F that day. This August was the coolest overall on record. Both high (103.2°F) and low temperature (82°F) averages were at record low levels, replacing records set in 2005. Embedded in the averages were four daily record low temperatures and two that tied record lows (please see chart below for details).

There were no 100°F days in October, same as in 2013. Only one other daily high temperature record was set, on November 29th at 79°F. The lowest high temperature of the year was on the last day, December 31st at 47°F, which tied a record minimum high temperature for that date set in 2010. The high temperature occurred as the day started at midnight and it progressively got cooler with the official lowest temperature of the year, at 34°F, occurring a few hours later. Unofficially, the station at City Hall reached 32.2°F. The winds with this storm varied from 25 to 30 mph, producing a wind chill of 24°F at one point. December's average overnight low temperature over four stations (MCC was not recording) was 47.7°F, the third warmest since records began in 1977. The average high daily temperature was typical for a December.

Date	Temperature	Previous Record	Weather Station	Comments
1/22/14	75°F	tied	OMF	Record daily high temp.
2/17/14	86°F	82°F in 1981	OMF	Record daily high temp.
2/18/14	89°F	85°F in 1981	OMF	Record daily high temp.
4/25/2014	52°F	53°F in 1990	OMF	Record low daily temp.
8/2/2014	77°F	77°F - tied	OMF	Record low daily temp.
8/3/2014	75°F	80°F in 1985	OMF	Record low daily temp.
8/4/2014	75°F	76°F in 1987	OMF	Record low daily temp.
8/5/2014	74°F	76°F in 2011	OMF	Record low daily temp.
8/6/2014	74°F	75°F in 1985	OMF	Record low daily temp.
8/21/2014	73°F	73°F - tied	OMF	Record low daily temp.
9/29/2014	65°F	65°F - tied	OMF	Record low daily temp
11/27/2014	76°F	76°F - tied	OMF	Record daily high temp.
11/29/2014	79°F	78°F in 2012	OMF	Record daily high temp.
12/31/2014	47°F	tied	OMF	Minimum high temperature

OMF – Operations Maintenance Facility

Overall, there were officially 120 days at or above 100°F and 23 days at or above 110°F. The first number is not too unusual; however, only 23 days above 110°F is the lowest number since record keeping began in 1977. The year with the next fewest days above 110°F was 2005 at 24

days. When averaging the daily high temperatures over the five weather stations, there were only 19 days with 110°F + temperatures. There were also officially 5 days with low daily temperatures at 90°F or above and none above 92°F. Unofficially, at the Fire Station #5 weather station recorded that July 25th had an overnight low of 96.6°F and recorded 17 total days with lows of 90°F or more. Officially, eight days had overnight lows under 40°F. The average high and low daily temperatures for 2014 are compared with 36-year averages and the all-time records in Figures 1 and 2.

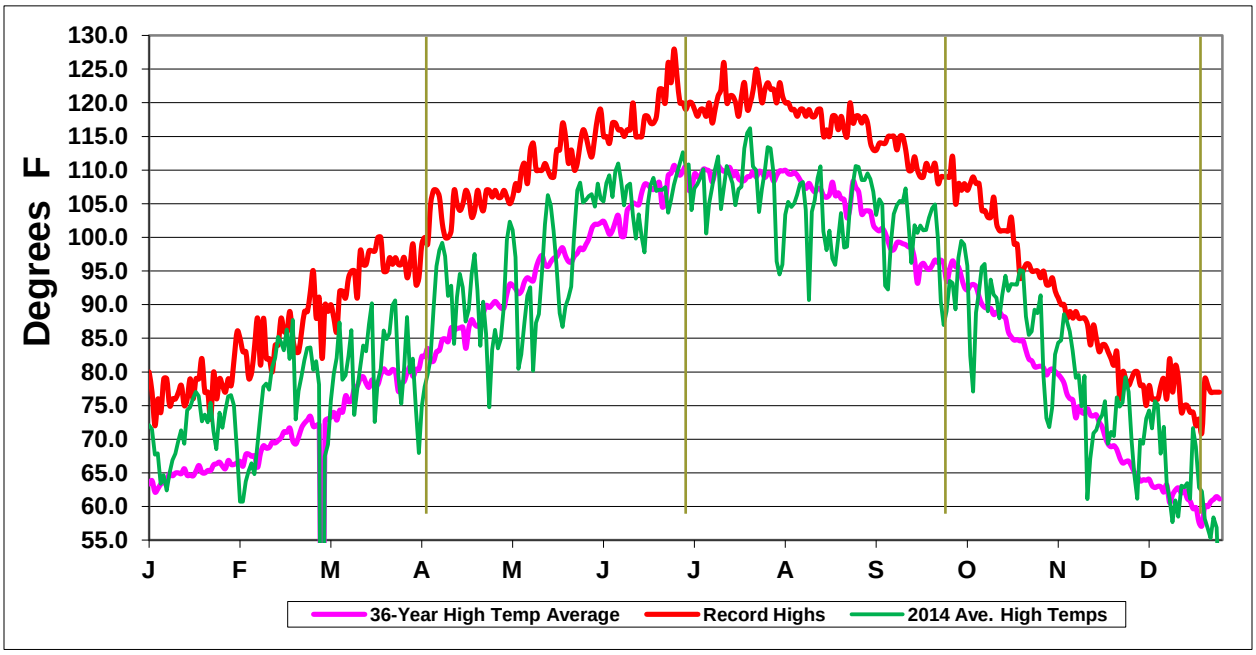

Figure 1: Average high temperatures over five weather stations for 2014 compared to the 36 year average and record high temperatures. Note that January, February, the first part of June, October and December sit a little higher than the average and July and August are at and below average, respectively.

Precipitation

Due to the sporadic distribution of rain in Lake Havasu City during the 2014 monsoon season, the total precipitation for the year varied from the official OMF station at 4.69 inches to 2.79 inches at the Fire Station #5 station and 2.92 inches at the City Hall station. The airport and MCC stations had incomplete annual precipitation records so their totals cannot be reported. The main difference between these stations occurred in September with the OMF station recording 1.78 inches compared to 0.44 inches and 0.32 inches at the Fire Station #5 and City Hall stations,

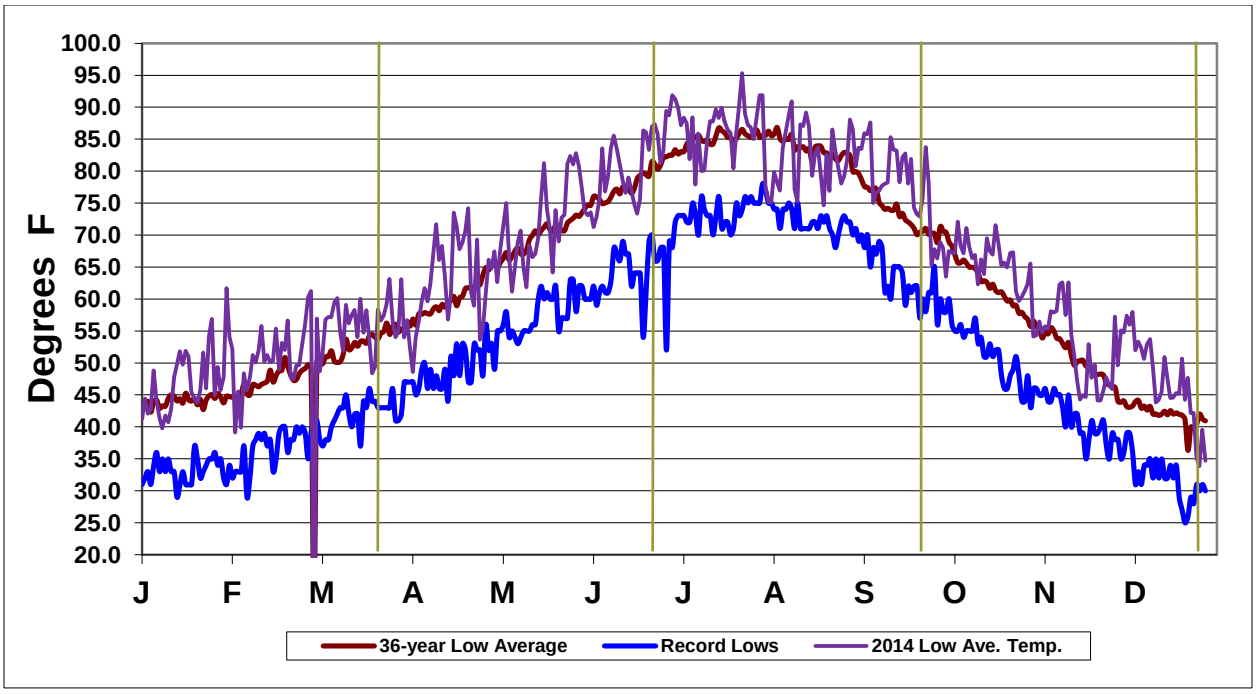

Figure 2: Average low temperatures over five weather stations for 2014 compared to the 36 year average and record high temperatures. Note that January, April, parts of June, October and particularly December sit higher than the 36-year average and July and August are at and below average. Note: The spike at the end of February is the 29th and did not occur in 2014.

respectively. This difference highlights the hit and miss phenomenon of monsoon thunderstorms. The OMF station's value is the most in any month; however, August was not far behind at 1.56 inches. All stations recording for August had close to or over 1.5 inches.

These numbers indicate a very active monsoon season. The difference though between this year and many other monsoon periods is that there were at least five eastern Pacific Ocean hurricanes positioned near Baja California that donated tropical moisture into the desert southwest. In some years, remnants of hurricanes drift over the lower Colorado River area providing some precipitation. This year's storms did not move into Arizona, but either moved further northwest into the Pacific Ocean (Lowell (August 18 to 24), Marie (August 22 to 28) and Norbert (September 2 to 8)) or moved into mainland Mexico (Odile (September 10 to 17)) and Simon (Oct. 1 to 7)) and dissipated after providing moisture to the southwest. Marie was the first category 5 hurricane in the region since 2010 and later Odile (another category 5 storm) became to strongest hurricane in historical times to make landfall on the Baja Peninsula and drifted northward close to Arizona. Lake Havasu City recorded rainfall associated with Norbert, Odile (Figure 8) and Simon. Though moisture from Lowell did not make it rain in our area, it did to the south and east of us and it provided a great visual demonstration on satellite imagery of its contribution to the northward monsoonal wind pattern (Figures 3 to 5). What our area did

experience from Lowell on August 21st, was a rare haboob that formed on the California side of the lake and drifted northward over the lake and side-swiping the lower elevations of the city (Figure 6).

The monsoon season was very beneficial to our area since the winter precipitation was far below average with no rain in January, only a couple hundredths of an inch in February (on the last day of the month) (Figure 7) and about 0.1 inch in March (first day of the month). There was only one storm in April, producing and 0.02 to 0.06 inches. After the April showers, there were almost 100 days before measurable rain was recorded again, that includes the rest of April, May, June (not surprisingly) and first week of July. Until the July storm, only 0.19 inches of rain were officially recorded for the year. Monsoonal winds (from the south) began the last week of June and finally, a storm on July 6th, kicked off the wet monsoon season, producing 0.3 inches of rain. December had a couple of storms producing as much as 0.72 inches at the OMF station, which brought the official total to average annual rainfall amounts. Those storms came from the tropics rather from the arctic region typically expected in the winter. There was one other very impressive looking cold front on satellite imagery that moved through our area on December 8th, but did not produce rain in Lake Havasu City. This frontal system was very long, extending several thousand miles from our area westward to the tropical region of the central Pacific Ocean (Figure 9). These systems are not usually this long.

The one other significant event at the end of December was snowfall, which produce a couple of inches at the higher elevations of the city and more in the Mohave Mountains. Snow flurries occurred down to the lake elevation, but melted on contact at that elevation. According to long-time residents, this was the first significant snow in the city since 1987, and this event produced more snow. The storm system responsible for the snow was not predicted to bring snow this far south and radar showed a small spike from the low pressure system that developed over the lower Colorado River (Figure 10). The accumulated snow lasted only a couple days as the temperatures did not get to freezing, except possibly the higher sections of the city. The snow was pretty while it lasted (Figure 11).

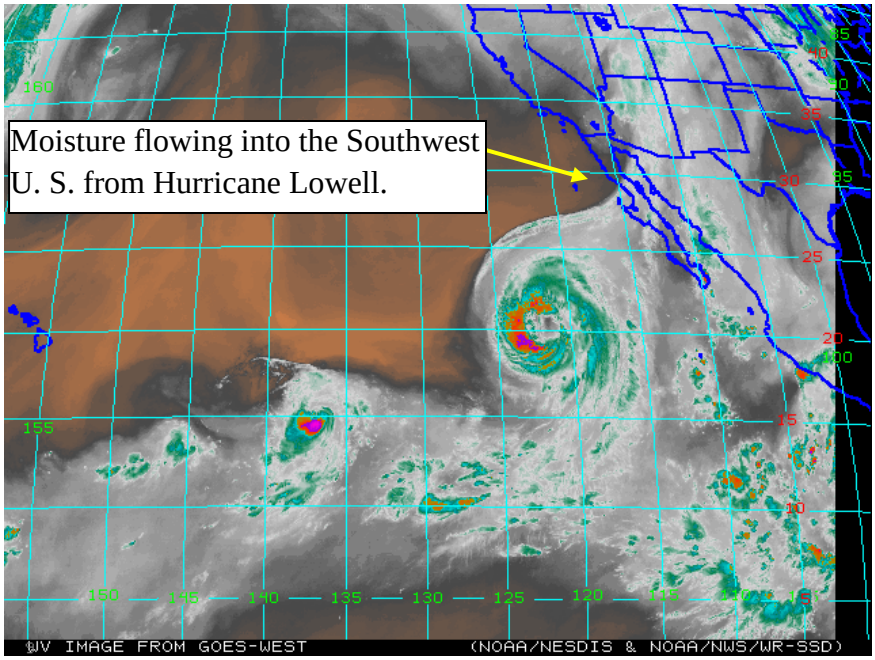

Figure 3: Water vapor image on 8-21-2014 of Hurricane Lowell feeding moisture into Arizona (yellow arrow).

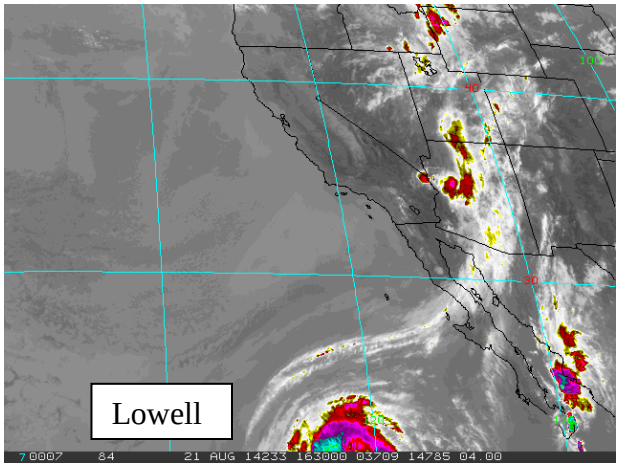

Figure 4: Infrared image, which reveals clouds and rain areas (colored), showing a closer view of the moisture caught-up in the monsoon flow northward to Arizona from Hurricane Lowell (bottom) on 8-21-2014.

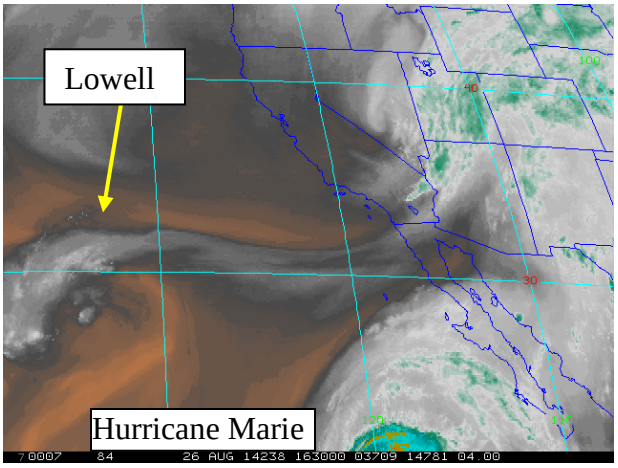

Figure 5: Water vapor image of the remnants of Hurricane Lowell still feeding moisture into Arizona on 8-26-2014. Hurricane Marie is at bottom right.

Figure 6: Dust storm (haboob) in the late afternoon of 8-21-2014 traveling north along the lake/river. Well developed dust fronts such as this are rare in the Lake Havasu area. Energy from this dust storm was provided by well developed cumulonimbus clouds whose moisture was at least partially fed by Hurricane Lowell (see Figure 4).

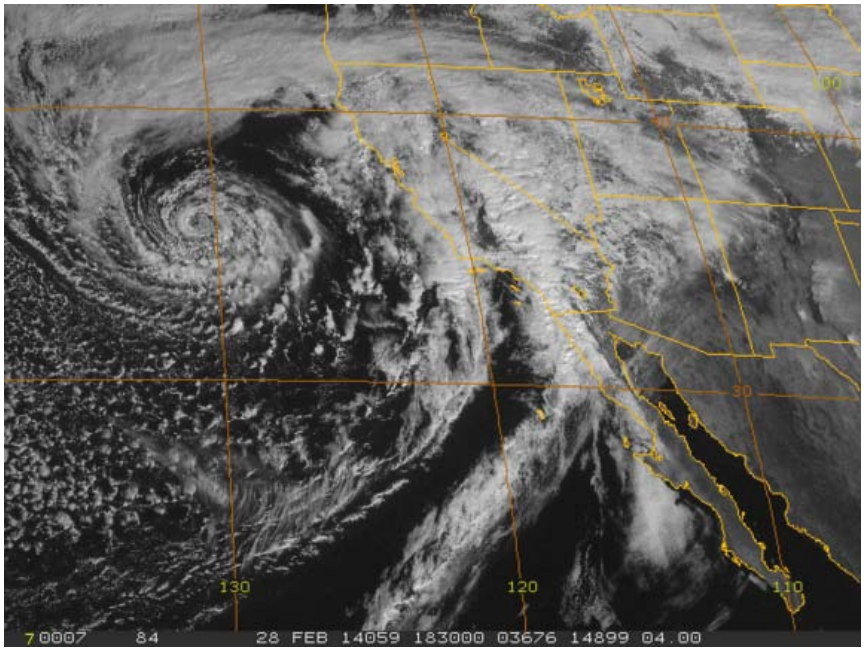

Figure 7: Classic cold front at the end of February that produced several inches of rain in California and at least an inch in Phoenix, but seemed to virtually skip over the Colorado River area with only a few hundredths of an inch in Lake Havasu City.

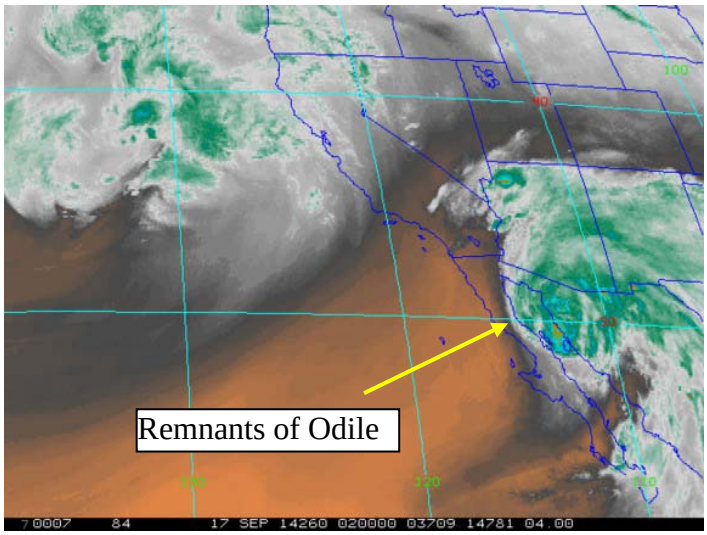

Figure 8: Water vapor image showing remnants of Hurricane Odile providing moisture to Lake Havasu City on September 16th.

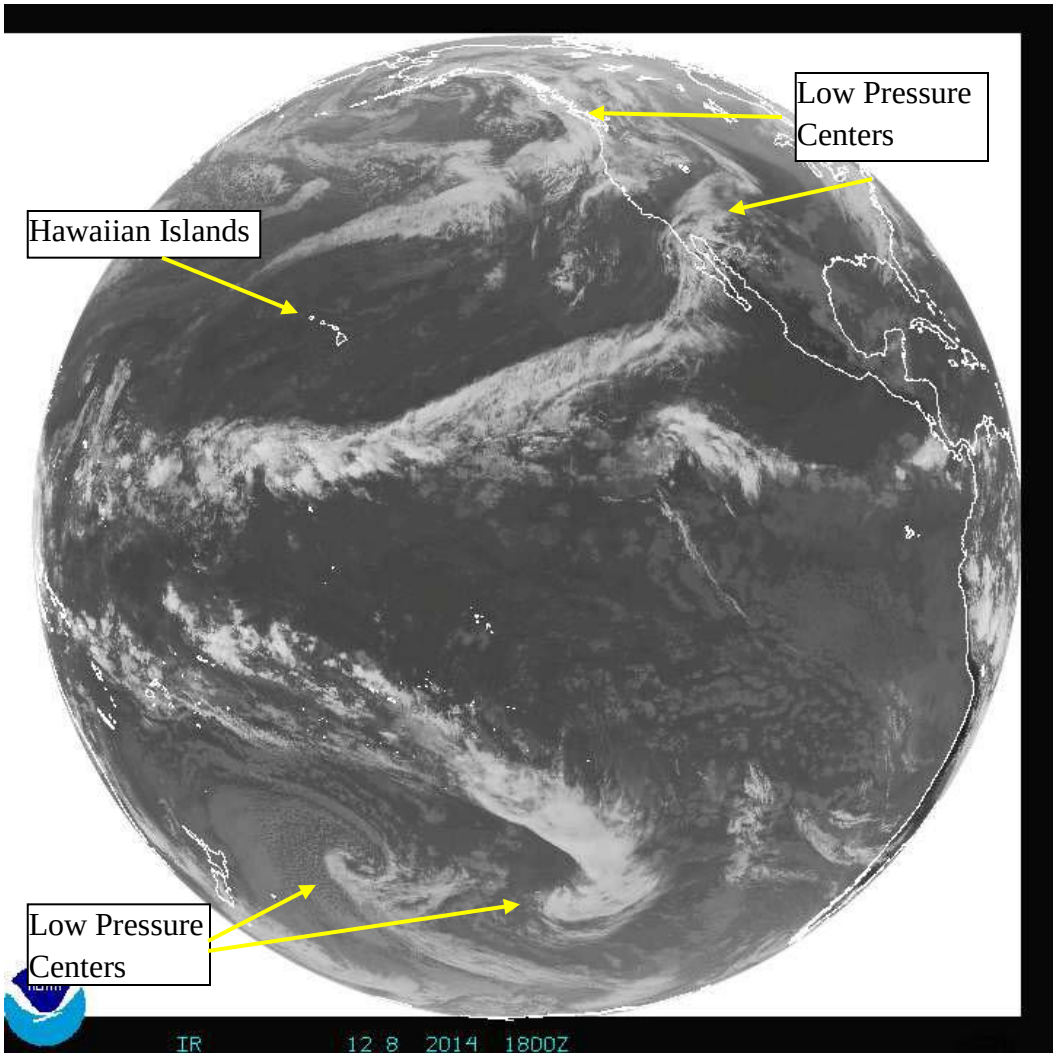

Figure 9: Very extensive cold front on 12-8-2014 extending from Arizona westward into the central Pacific Ocean. There is also a cold front in the southern hemisphere that almost mirrors the one in our area. Note that due to the Coriolis Effect, spin on the low pressure centers associated with each front is opposite – counterclockwise in the northern hemisphere and clockwise in the southern hemisphere.

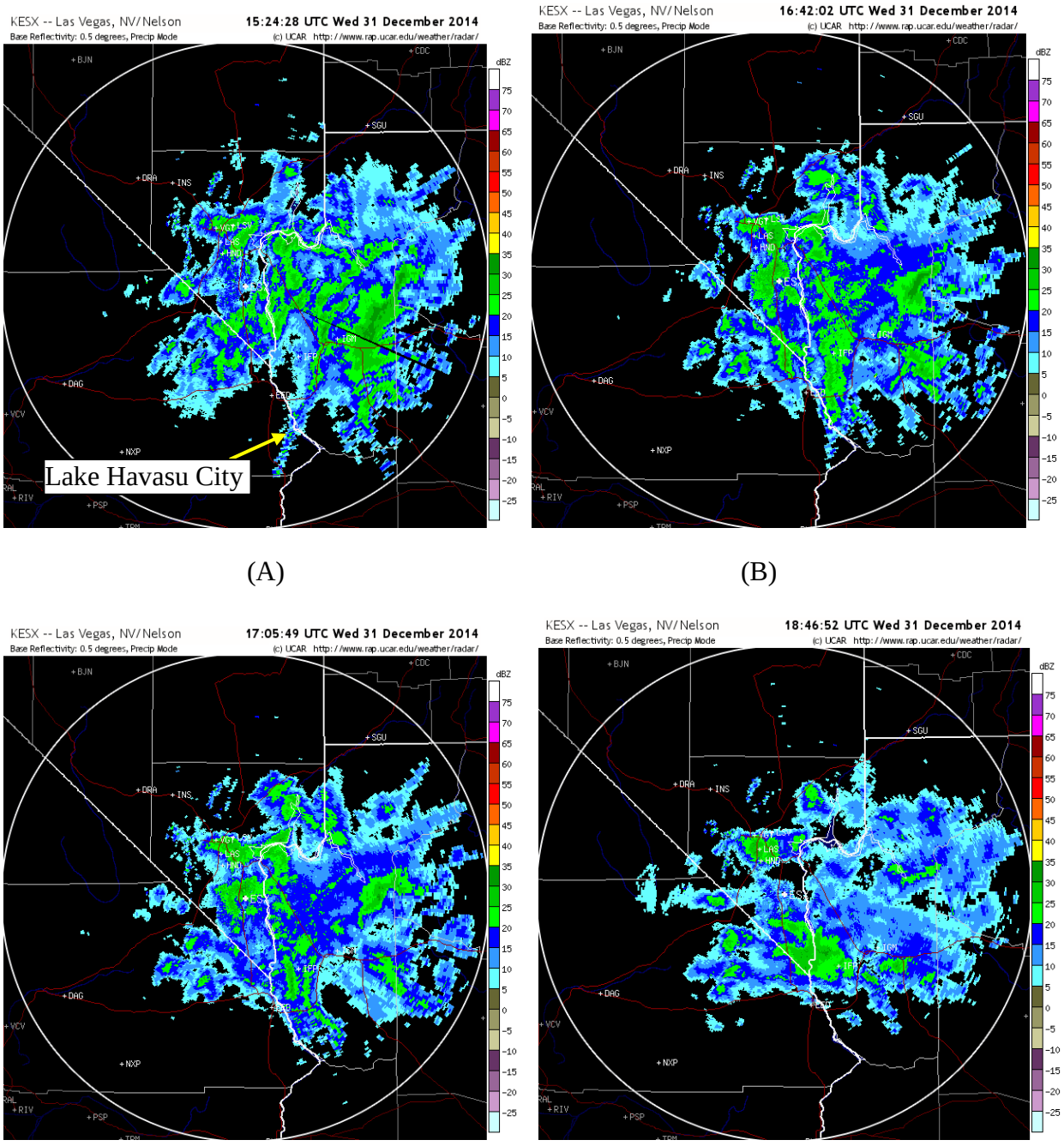

Figure 10: Progression of the 12-31-2014 snow storm in Lake Havasu City from radar images. Note the "spike" like southward extension of the clouds and precipitation through Lake Havasu City in (A) and its development and eventual dissipation in the succeeding images. The time span is about 3 hrs and 22 min.

Figure 11: Snow on saguaro cactuses from the 12-31-2014 snow event in Lake Havasu City.

Humidity – Dew Point Temperatures

The monsoon season brought its typical humidity and dew point temperatures, but a rare phenomenon occurred during the first weeks of May and June. Extremely dry air moved over the area, which itself is not too uncommon that time of year, but the relative humidity dipped to 1% for a couple hours at a time from May 3rd to May 5th. The corresponding lowest dew point temperatures calculated at 1% humidity were -21.6°F on the 4th and -21.2°F on the 5th at the MCC weather station and -20°F at the airport on the 5th. On May 5th, the MCC station recorded under 1% for 1.5 hours between 3:00-4:30pm. When the relative humidity is under 1%, which has not been recorded before since the MCC or Fire Station #5 stations were installed in 2003 and 2006, respectively, dew point temperature cannot be calculated. This also means that the air

has only a trace of water vapor (is essentially dry). The relative humidity at the Fire Station #5 station did not get below 3% during the same period. As a reminder, the OMF station does not record relative humidity.

Humidities returned to 1% and under the first week of June with percentages under 1% for three to four hours on the 1st, eight hours on the 3rd, and two hours on the 5th. June 13th also experienced humidity under 1% for a couple half-hour intervals. The lowest dew point temperatures during the first week in June were -16.3°F and -18.9°F.

Peak Winds

The high winds for 2014 averaged over the year, the lowest wind speed (averaged over four stations) since records began in 2003, at 8.73 miles per hour (mph). February and October broke records for the lowest average peak winds at 6.52 and 6.23 mph. The 10-year averages for these months are 8.81 and 8.42 mph, respectively. October's average was actually the lowest for any month ever recorded at the four stations that track peak winds. December also averaged 6.79 mph, but that was not quite a record low. 2005 averaged 6.61 mph in December. Only the months of August and November had peak winds above the 10-year average for these months, but neither broke high peak wind records. There were a few windy periods associated with storms. March, April, May, July, September and November had peak gusts over 40 mph, with the highest wind speed recorded at the airport in November at 51 mph. Gusts over 50 mph are rarely recorded in Lake Havasu City. Several dry cold fronts moved through the area at the end of April and in May produced very gusty conditions and a dusty haze (poor air quality).

Lastly, this area of the country can have pretty impressive sunrises and sunsets, but this past August produced one of the best sunsets in my 15 years in town (Figure 12) and a memorable super moon caught between clouds at sunrise (Figure 13). Without weather (clouds), sunrise and sunset would be rather bland.

Figure 12: Cirrus clouds reflect the sunset on August 25. Chemehuevi Mountain peaks cast shadows below the clouds.

Figure 13: Supermoon (when the full moon is closer to the Earth than normal) at sunrise on August 11th.