2018

Summaries were written by Miguel Miller, editor of the NWS San Diego's quarterly newsletter *Coast to Cactus Weather Examiner.*

January

High pressure remained in control of the region's weather during the early portion of January.

A powerful winter storm system took aim at Southern California from the 8th to the 10th of January, resulting in areas of heavy rainfall, mountain snow and gusty winds. Most locations received between 1 to 2 inches of rain, with isolated amounts of 6-8 inches along favored coastal slopes. Flooding hit Lakeside, Menifee, Hemet, Wrightwood, Cabazon, Highgrove, and Chino. Snowfall was 2 to 8 inches above 6,000 feet with up to 12 inches on the higher peaks. Wind caused major damage to a structure in San Diego. Around 10 swift water rescues were reported in the Inland Empire and San Bernardino County Mountains around Lytle Creek. Three people and a dog were rescued by helicopter from the Santa Ana River Channel in Colton. Several other individuals were swept downstream and rescued in the Riverside area.



Lytle Creek got flowing and even flooding after eight inches of rain fell on the slopes upstream on 9 January. Photo ABC7/Twitter.

Weather conditions remained on the cool side between the 10th to the 12th even though it was dry.

The 13th to the 18th was warmer than normal and dry due to upper level high pressure.

Light rainfall occurred on the 20th and 21st as a Pacific storm system mainly affected locations in Central/Northern California. This storm did bring rough seas (6-9 feet) and gusty winds (20-30 knots and locally to 40) to the coastal waters between the 16th to the 20th. Winds and seas resulted in ten boats being beached near Zuñiga Point (entrance to San Diego Bay) after the boats pulled from their moorings. Two rounds of large long-period northwest swell accompanied the storm and arrived at the beaches between the 16th and 20th of January. This brought high surf to west and northwest facing beaches with peak sets occurring in southern San Diego County. Significant beach erosion was reported along with isolated coastal flooding.

Weak low pressure brought cooler weather and very light spotty rain to the region on the 24th and 25th.

A surface high built over the Great Basin, resulting in offshore pressure gradients and Santa Ana Winds on the 27th, 28th and 29th. The persistent high pressure and offshore flow brought above normal temperatures to the region through the end of the month. The east/west nature of the gradients favored San Diego County for the strongest winds. A peak wind gust of 89 mph was reported at Sill Hill.

Even with the significant storm system early in the month, January precipitation ranged from 50% of normal to 125% of normal. Water year-to-date precipitation ranged from 25% to 50% of normal. This also brought continued above normal temperatures for much of the month across the region. All stations recorded mean temperatures between 4 to 7 degrees above normal, including San Diego Lindbergh Field which was 4.4 degrees above normal.

February

High pressure brought dry and mild weather from the 1st to the 11th.

A weak frontal system on the 12th and 13th brought mainly light scattered showers to all areas.

Although no precipitation occurred from the 14th to the 18th, conditions remained on the cool side due to persistent low pressure trough patterns along the West Coast.

Another couple of light showery rain events occurred on February 19th into the 20th, and again on the 23rd and 24th.

The final event of the month was on the 26th and 27th when light rain and showers were the norm, although some heavy snow occurred in the mountains. Only one flood event occurred during the month, on the 27th near Bonita where a road was closed due to flooding.



Showers off the coast of the Huntington Beach Pier were quite photogenic on 21 February. Photo Bill Cramond.

February precipitation ranged from 50% to 125% of normal. Water year-to-date precipitation ranged from 25% to 50% of normal.

Temperatures ended up slightly above normal region-wide. All stations recorded mean temperatures between 0 to 2 degrees above normal, including San Diego Lindbergh Field which was 1.5 degrees above normal.

March

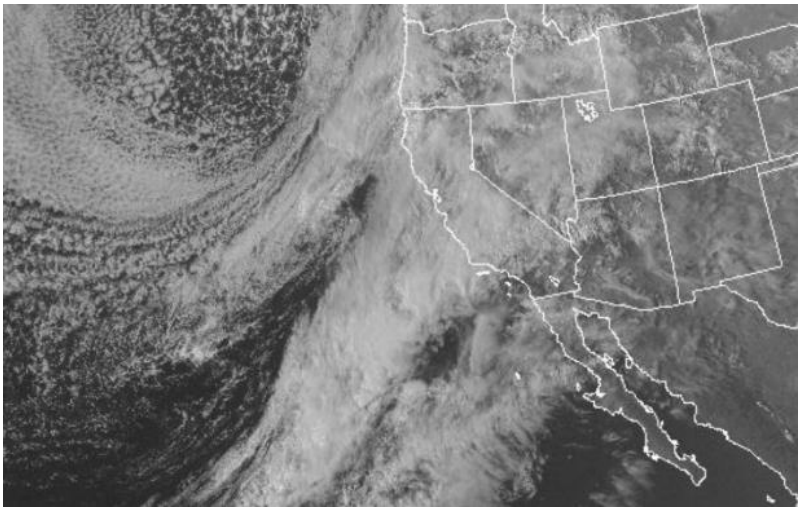
Two distinct precipitation events occurred during the month across the region. Some locations received near to above normal precipitation during the month, although some sites continued the trend of below normal precipitation from previous months.

A slow moving Pacific Storm System dropped south across California on the 1st through the 3rd, but was not a significant storm.

A zonal west to east flow became established on the 4th and continued through the 9th across Southern California. This pattern brought cool but generally dry weather conditions with periods of gusty winds.

On the 10th and 11th a weak front brought scattered light precipitation to the area.

A wet pattern developed between the 13th and 17th as a series of wet troughs passed through the region. These systems brought heavy precipitation to locations in Central and Northern California but mainly the tail end of these storms which brought widespread moderate precipitation to the San Diego forecast area. The mountains received beneficial precipitation of 2 to 6 inches from this series of storms. A colder storm on the 15th brought up to 8 inches of snow to the San Bernardino Mountains.



Satellite image on 21 March of the decaying atmospheric river as it stumbled into Southern California. NOAA image.

A weak high pressure ridge dominated the weather scene from the 18th to the 20th with milder and dry weather conditions during this period.

A very intense atmospheric river (also colloquially known as a Pineapple Express) impacted Northern and Central California and eventually brought widespread precipitation to Southern California between the 21st to the 23rd. Amounts were heaviest in the northern areas, especially the San Bernardino Mountains and the Northern Inland Empire where 1 to 3 inches of rain fell in spots. San Diego County, however, mostly missed out (a trace at San Diego).

A persistent trough (low pressure) pattern occurred from the 24th to the 28th, with cooler than normal conditions and a deep marine layer, but no precipitation, along with several windy periods during this time.

A ridge of high pressure developed between the 29th to the 31st which brought a much milder and dry pattern to the region.

March precipitation was highly variable across the region. Big Bear Lake managed 183% of normal precipitation, while some sites in the deserts ended up near zero. Water year-to-date precipitation continued to be significantly below normal at the end of March, ranging from just 32% to 54% of normal.

Temperatures trended slightly above normal, with mean temperatures between 0 to 2 degrees above normal, including San Diego which was 1.4 degrees above normal.

April

A benign weather pattern gave the region seasonal weather and no precipitation through the first week of the month.

High pressure and weak offshore flow led to above-average temperatures from the 9th through the 17th, which included San Diego's highest temperature for the month at 85 degrees on the 10th.

A low-pressure trough rolled through the West Coast from the 18th through the 20th, bringing very light rain to the region on the 19th.

The alternating trough-ridge pattern continued, with a ridge from the 20th to the 27th, followed by a trough to finish the month. That final trough brought very light rain again on the 30th.

April finished 1.8 degrees above average for temperature in San Diego, and well below average for precipitation.

May

The trough of late April continued in early May, with light rain measured across the region on the 1st and 2nd. It also brought strong winds to the mountains and deserts.

High pressure and some offshore flow sent temperatures soaring from the 3rd through the 6th, with San Diego reaching its monthly high of 80 degrees on the 4th.

A weak pattern brought seasonal weather for several days until a new trough came in on the 12th, and brought very light rain to the region and strong winds to the mountains and deserts. The trough weakened in the middle of the month, but continued to bring temperatures below average for several days. In fact, the trough hung around with varying strengths for the rest of the month.

The result of the persistent trough was the first month in San Diego since October 2013 to have a monthly average temperature below average. That ended a span of 54 consecutive months with above average temperatures!

June

June was unremarkable in practically every weather element. No strong high-pressure ridges or low-pressure troughs brought any remarkable or extreme weather this month.

Some high pressure brought above average temperatures from the 8th to the 15th. That was followed by a weak low-pressure trough through the 19th that brought below average temperatures. Trace amounts of drizzle were recorded at San Diego on the 16th, 21st and 23rd.

High pressure reasserted itself on the 20th and 21st to boost temperatures again before weak low pressure finished out the month. There was probably never a June on record in San Diego that came so close to seasonal averages in both temperature and precipitation as June of 2018.

The temperature range felt for the entire month in San Diego was 18 degrees, from a low of 60 on the 2nd to a high of 78 on the 14th.



Muscular crepusculars! These gorgeous crepuscular rays shown through breaks in the morning coastal clouds in Rancho Bernardo on June 29th. The view looks east toward Mt. Woodson. Cue the angel choir!

July

Precipitation appeared during portions of the month, although rainfall amounts were spotty, which is to be expected with monsoonal showers and thunderstorms. The most impressive totals occurred in the higher mountains and in the deserts on July 11th, with isolated spots receiving up to two inches.

Several locations received around one inch of rainfall during the month, including Idyllwild, Palm Springs, Big Bear Lake, Campo, and Palomar Mountain. Most other areas of the region saw very little rainfall during July.



Highway 18 landslide with numerous rocks on 11 July, near Big Bear Lake, between Big Bear Dam and Snow Valley. Photo courtesy of Victor Valley News.

Mud flows occurred due to heavy rain on recent burn scars near Yucaipa on July 7th, closing Highway 38 near Valley Of The Falls Drive.

On July 11th, Highway 18 was closed near Big Bear Lake, between Big Bear Dam and Snow Valley due to numerous rock slides in the Arctic Circle area. Local flash flooding also occurred on the 11th near Desert Hot Springs.

Average temperatures during July continued well above normal, with most stations four to eight degrees above normal. San Diego managed 5.1 degrees above normal. Sea surface temperatures also approached all-time record highs at the end of the month.

August

August began broiling hot under a strong high pressure ridge over the Southwest. Daily high temperature records were broken often, and high sea surface temperatures led to record high minimum temperatures, particularly near the coast. Slight variations on the strength and location of this high pressure ridge continued to bring above average warmth to the region through the middle of the month.





This landspout tornado (above left) was hard to miss in Anza on 16 August. Photo from Henny Deckmann. Thunderstorms around the Cranston Burn Scar triggered this debris flow (above right) in the Hurkey Creek drainage on 17 August. Photo Alex Tardy.

The monsoon flow was in full swing most days with some number of thunderstorms occurring in the mountains and parts of the desert. Several flash floods resulted from heavy thunderstorms during the afternoons of the 15th through the 17th, including a destructive debris flow in Hurkey Creek within the Cranston Fire's burn scar. A landspout tornado was observed near Anza on the 16th. The ridge relented during the latter third of the month, allowing for drier southwesterly flow to bring an end to precipitation and temperatures to return closer to normal.

August 2018 was the warmest August in San Diego history, and the city's second warmest month overall (September 1984 warmest). The city finished the month averaging 6.5 degrees above average. Many stations across the region experienced one of the warmest Augusts on record. Across the region, average temperature ranged from two to five degrees above average.

September

The month began a little cooler than normal under a weak trough over the western U.S. The marine layer was in full control, creating almost June-like weather.

A ridge of high pressure built into California for the second week, bringing above average temperatures for a few days.

A West Coast trough redeveloped mid-month and reinforced the cooler weather. Troughs of low pressure continued to march across the West, north of Southern California for the rest of the month, bringing neither precipitation nor strong winds. Temperatures fluctuated between slightly above and slightly below normal.

Precipitation was almost non-existent across the entire region during September. A few thunderstorms popped on the last day of the month. One above Forest Falls put rushing water in Mill Creek. Strangely, the driest place in the region was the only station to get measurable rainfall: Thermal got 0.02 inch.

Temperatures across the region ranged from being exactly normal up to four degrees above normal for the month.

Hot Summer Summary

The summer of 2018 will be remembered as one of the hottest in Southern California history. Strong high pressure, persistent during most of July and August, coupled with some of the highest sea-surface temperatures on record, resulted in the hottest July-August period at many long-time climate stations, even near the coast. The strong high pressure aloft brought sinking, compressing and warming air to the surface. The high sea-surface temperatures kept dew points (i.e., the humidity) up, which prevented nights from cooling off. That steamy combination persisted through much of July and August. Even though the beginning of July and the last third of August came in with near average temperatures, the seven weeks in between were oppressive.

In San Diego, August 2018 was the warmest August in history, dating back to 1874. It was also the second hottest month in history overall, trailing only the incredible month of September 1984.

Station	July-August average *Max* Temperature 2018 (warmest rank)	July-August average temperature 2018 (warmest rank)	July-August average *Min* Temperature 2018 (warmest rank)
San Diego	81.9 (1st)	76.6 (2nd)	71.4 (2nd)
Palm Springs	109.6 (11th)	96.7 (1st)	83.9 (1st)
Riverside	97.4 (6th)	82.8 (1st)	68.2 (1st)
Santa Ana	88.4 (4th)	78.8 (1st)	69.2 (1st)
Big Bear Lake	80.4 (24th)	66.9 (3rd)	53.4 (1st)
Escondido	92.8 (3rd)	80.7 (1st)	68.6 (1st)
Victorville	99.9 (15th)	84.1 (1st)	68.1 (2nd)

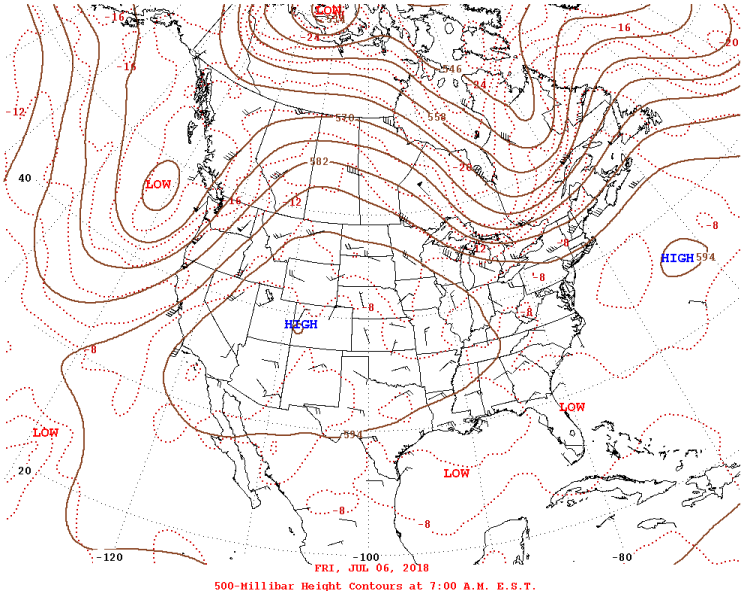
July 6th was one of the hottest days in Southern California history. Among the superlatives: Chino Airport reported 120 degrees on that day, the highest non-desert temperature on record in Southern California. Riverside hit 118, matching their all-time high reached on only two other days in history. Ramona hit an incredible 117, which shattered their all-time record by six degrees. Fullerton reached 116, which was the highest in their short history (since 1998). El Cajon reached 112, which was their second highest reading in history. Escondido's 112 was their third highest. UCLA got to 111 degrees, the highest in its 85-year record. In Idyllwild, the mercury soared to 103 degrees, their highest all-time temperature, beating the old mark by two degrees. Even coastal San Diego reached 96 degrees, which turned out to be their fourth hottest day in July or August history.

Station	6 July *Max* Temperature	All-Time Highest Temperature Rank	All-Time Highest July Temperature Rank
UCLA	111	1	1
Riverside	118	1	1
Ramona	117	1	1
Idyllwild	103	1	1
El Cajon	112	2	2
Escondido	112	3	1 (tied)

A hot August followed the hot July, with persistent, long heat waves that seemed to begin as soon as the previous one ended. No August day made as many headlines as did the 6th of July.

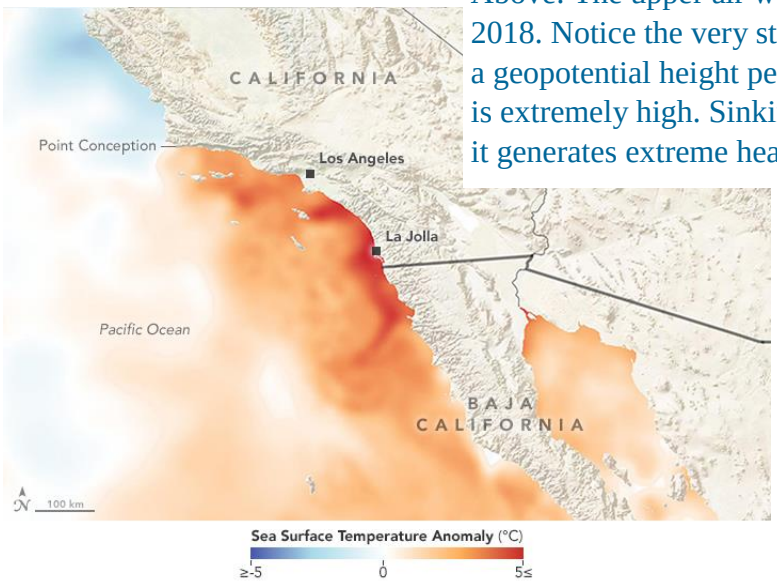
In addition, numerous daily high minimum temperature records were broken this summer. During a stretch from 9 to 11 August, San Diego recorded the three warmest August nights on record, and three of the ten warmest nights for any day on record. That included a low temperature of 78 degrees on 10 August, tying the highest minimum on record. The overnight low was 79, which would have been an all-time record before the temperature dipped to 78 just before midnight. It was the warmest night in history; and it came that close to being the all-time

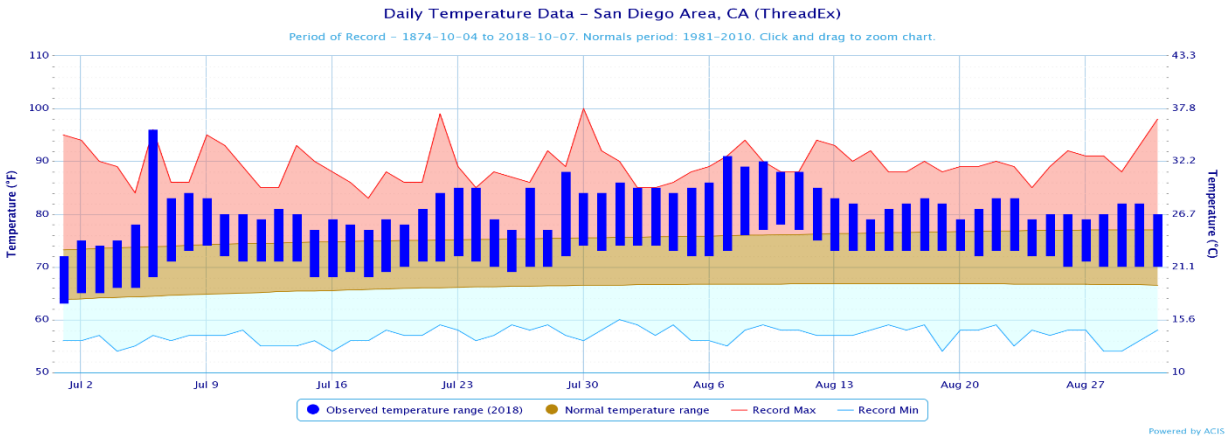
warmest minimum on record. On 25 August, San Diego completed 28 consecutive days in which the mercury never fell below 72 degrees, the longest run of that sort on record.



Above: The upper air weather pattern as observed on 6 July 2018. Notice the very strong upper high over the West, with a geopotential height peaking at about 6,000 meters, which is extremely high. Sinking and compressing air underneath it generates extreme heat.

Below: The SST anomaly in Southern California on 2 August 2018. NOAA data.





July-August temperatures in San Diego (blue bars). Compare with normal (brown bar).

October

The month began warm, but a trough of low pressure soon brought cooler weather and light rain to the region on the 4th and 5th. A cool trough pattern continued over the West for several days.

A low pressure trough closed off the California coast and interacted with copious subtropical moisture from former Tropical Cyclone Sergio on the 12th and 13th. The result was a wet, unseasonal storm that included thunderstorms that brought rainfall up to 1.50 inches in the mountains and in isolated desert locations. A half inch to one inch amounts were common elsewhere.



A weak trough pattern over the Southwest kept the weather cool and the marine layer healthier than usual for October through the 17th.

Offshore flow brought Santa Ana conditions from the 15th to the 20th, and temperatures in the high 80s near the coast. Winds on the 15th were strong, with many foothill locations gusting over 60 mph. Orange County was particularly hard hit, with one fatality a result of a falling tree. Other trees were downed in the county. Gusts topped out at 82 mph at Fremont Canyon.



Borrego Springs (above, Kevin Key) and La Jolla (right, social media) were both lit up beautifully by lightning on 12 October.

Low pressure strengthened the marine layer and brought cool weather through the 24th. High pressure boosted inland temperatures from the 25th to the 30th, before a weak trough brought cooler weather for Halloween.

Precipitation was precisely normal at San Diego at 0.57 inch. Average precipitation over the entire hydrological region for Southern California was 77% of normal.

Temperatures across the region averaged 0.6 degrees above normal for the month. In the lower desert the temperature averaged 0.7 degrees below normal.

November

November began warm and dry under strong high pressure along the West Coast and light offshore flow.

The high pressure broke down from the 4th to the 8th as a trough of low pressure dove into the interior West.

As that trough departed, the northerly flow aloft combined with the offshore surface flow to bring very dry and fire-critical conditions from the 8th to the 13th, peaking on the 12-13th. Some offshore wind gusts in the foothills exceeded 60 mph, including one top gust reaching 86 mph at Sill Hill. Humidity plummeted to the single digits across most of Southern California for a couple days.

High pressure rebounded to bring very warm weather through the middle of the month.

Low pressure returned heading into the third week with a trough of low pressure that eventually brought widespread rain on Thanksgiving Day. Widespread rain totaled up to one half inch in the coastal basin and as high as 1.50 inch in the San Bernardino Mountains. Rainfall was generally beneficial.



The Valley Fire burn scar near Forest Falls couldn't handle the heavy rain on 29-30 November. (Stan Lim) Nor could the Holy Fire burn scar (below) in this Glen Ivy neighborhood. (CalFire Riverside)



A weak pattern for several days gave way to a vigorous trough of low pressure from the Pacific, which brought copious precipitation on the 29th and 30th. This powerful Pacific storm tapped into subtropical moisture. Two-day rainfall totals were as high as six inches at Palomar Mountain, with numerous mountain gauges logging over three

inches. Across the lowlands, generally one half inch to two inches were recorded, but less than a third inch in the deserts. It was still a relatively warm storm so the snow levels remained high, but the mountains received their first meaningful snowfall of the season. Several inches of snow were reported above 6,000 feet, and up to eight inches above 8,000 feet. Flash floods containing debris flows resulted from the Holy Fire burn scar, mostly on the eastern side flowing into Lake Elsinore. Many of the flows were contained in drainage channels engineered to capture these flows, but many flows moved across streets and into neighborhoods. A flash flood containing mud and rocks revisited the Valley Fire burn scar near Forest Falls, closing Highway 38 for the second time since the summer fire.

December

December began fair and seasonal through the 4th under weak high pressure.

A vigorous low-pressure trough swept in from the Pacific Ocean on the 5th and brought heavy rain and high mountain snow through the 7th. Precipitation totaled over three inches for some Orange County locations and the San Bernardino Mountains. The top spot was Lytle Creek, receiving four and a half inches. Snowfall above 8,000 feet totaled over a foot, while several inches fell as low as 5,000 feet. Numerous flooding impacts resulted from the heavy rain, including deep water in parts of central Orange County from Fullerton to Santa Ana, and through Costa Mesa and Laguna Beach. Debris flows exited the canyons draining the Holy Fire burn scar. While most of the debris and flooding stayed within the channels designed to capture the flows, some mud and debris found its way into a Lake Elsinore neighborhood. San Diego was hard hit with heavy rain and flooding, which displaced a homeless





A Lake Elsinore neighborhood (above, CalFire Riverside) received mud and debris while flooding swamped cars, homes and businesses in San Diego (below, Fox5San Diego.com) on 6 December.

shelter, damaged businesses and swamped cars.

High pressure followed for several days. After a weak low pressure trough on the 11th, stronger high pressure took hold on the region from the 12th to the 14th. The 13th was particularly warm, boosted by offshore winds, and was one of the warmest days of the month with high 70s and lower 80s.

Weak low pressure aloft followed before strong high pressure returned over California from the 18th to the 20th. 70s and 80s were common those days. The high pressure broke down the next few days, with zonal flow that opened the storm door.

A storm moved into the region on Christmas as a trough of low pressure brought widespread rain and mountain snow. Top rainfall was measured in the mountains, where 1.5 inches fell. Snowfall was highest at the ski resorts, where about five inches fell, with light snow as low as 4,000 feet. Most of the precipitation was beneficial and only isolated flooding was observed. I-15 was partially closed because of a major multi-vehicle accident at Cajon Summit, possibly caused by snow pellets and dense fog.

A cold northerly flow set up during the last week of the month, with several inside slider troughs reinforcing the push of cold air from the north. Temperatures plummeted to produce frost and freezes in many areas from the 28th through the 30th.

The month and year ended on a wet note, especially in San Diego County. A low-pressure trough coming from the north dipped out over the ocean to grab just enough moisture for rain and mountain snow focused on San Diego County. Rainfall was highest in San Diego County's mountains, with a few spots over 0.75 inch. Lower elevations received less than a half inch. Julian topped the snowfall category with 2.5 inches. A funnel cloud was observed in Carlsbad and another was spotted in San Diego's University Heights.

Average temperatures across the region were calculated one to three degrees above average for the month. Precipitation for the month varied from around 60% of normal to 200% of normal.