

Actuarial Weather Extreme Series

California Precipitation February 3 - 7 2024

Authors:

Michael Reis, FSA, CERA, JD
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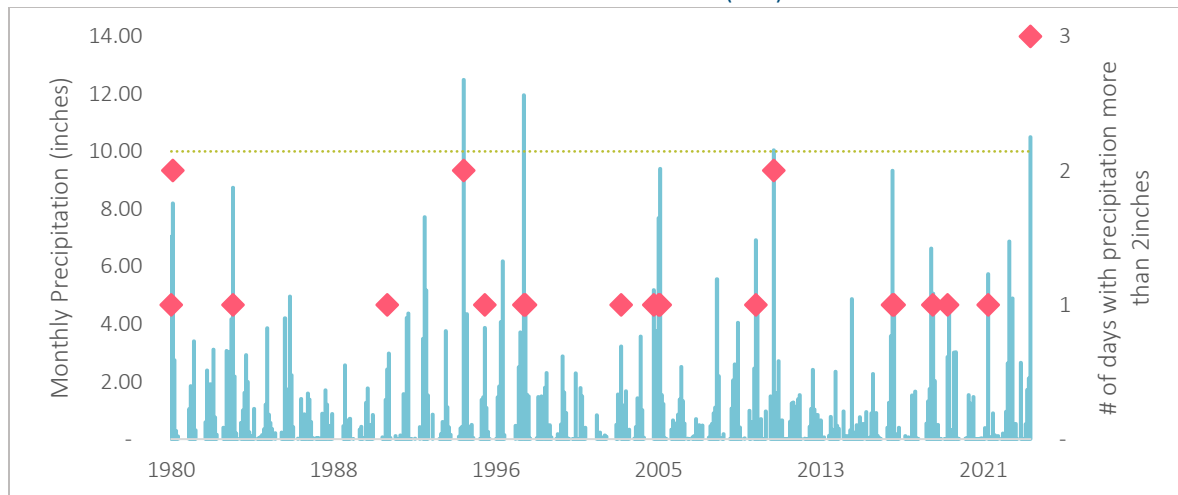
Aadit Sheth, FSA, CERA, FCIA
Oliver Wyman

Atmospheric River Impacts

Last week, between February 3rd and February 7th, 2024, a series of atmospheric rivers brought flash floods, mudslides and intense hurricane-like wind gusts to the state of California. The extreme weather event resulted in a state of emergency being proclaimed in various Southern California counties including Los Angeles. The storm also left more than 800,000 customers without power¹.

FIGURE 1

HISTORICAL PRECIPITATION RECORDED AT LONG BEACH AIRPORT (LGB)



¹ <https://www.cnn.com/2024/02/04/us/california-atmospheric-river-flooding/index.html>

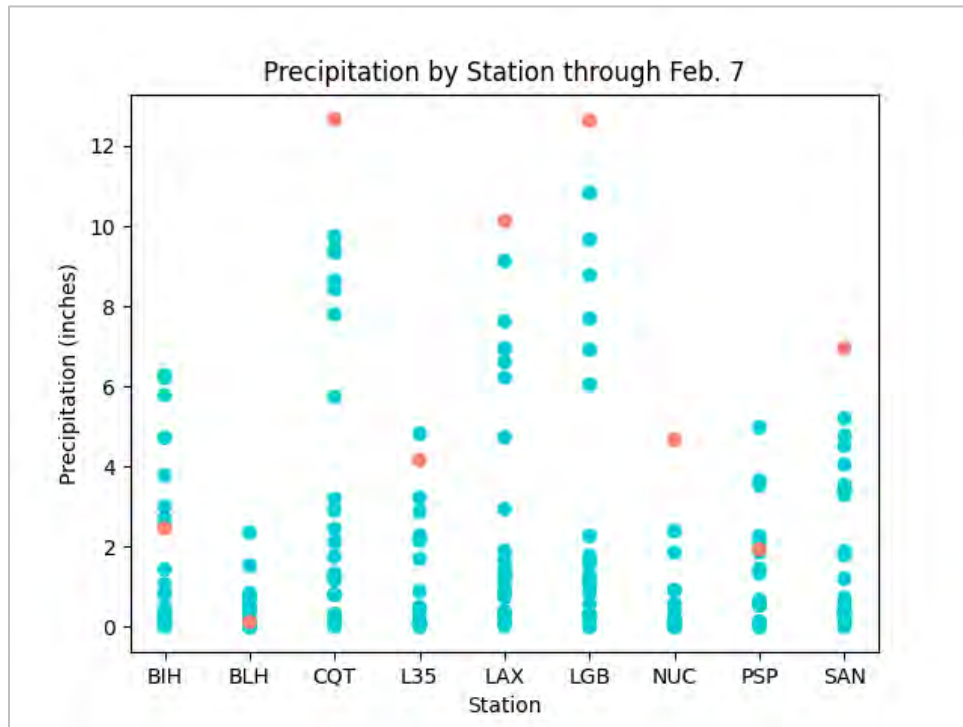
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Data from ASOS: https://mesonet.agron.iastate.edu/request/asos/hourlyprecip.phtml?network=CA_ASOS

Figure 1 above illustrates historical monthly precipitation at Long Beach Airport; the last bar for February illustrates that around 10.5² inches of rain that fell in the first week of February- this is more than half of the total rainfall the same station received in the whole of 2023. In addition, February 2024 was the first month in the history since 1980 where there were three days of rainfall above 2 inches. Per the National Weather Service (NWS), 4.1 inches of rain fell in downtown Los Angeles on Sunday February 4th, and this surpassed the previous record of 2.5in set in 1927³.

FIGURE 2
YTD PRECIPITATION² (UP TO FEB 7TH) BY STATION AND YEAR, 2000-2024



Data from ASOS: https://mesonet.agron.iastate.edu/request/asos/hourlyprecip.phtml?network=CA_ASOS

Using hourly precipitation data from ASOS for 10 key California stations, Figure 2 above shows the YTD precipitation through February 7th compared to YTD from years 2000-2023, with 2024 represented with a red dot. The graph shows that many of these stations have experienced the most precipitation than they have experienced this century.

Figure 3 shows the California weather stations that experienced a top 25 heaviest precipitation 6-day event this February 2024 compared with historical 6-day periods going back to 1980. The color of the dots corresponds with the percentile rank.

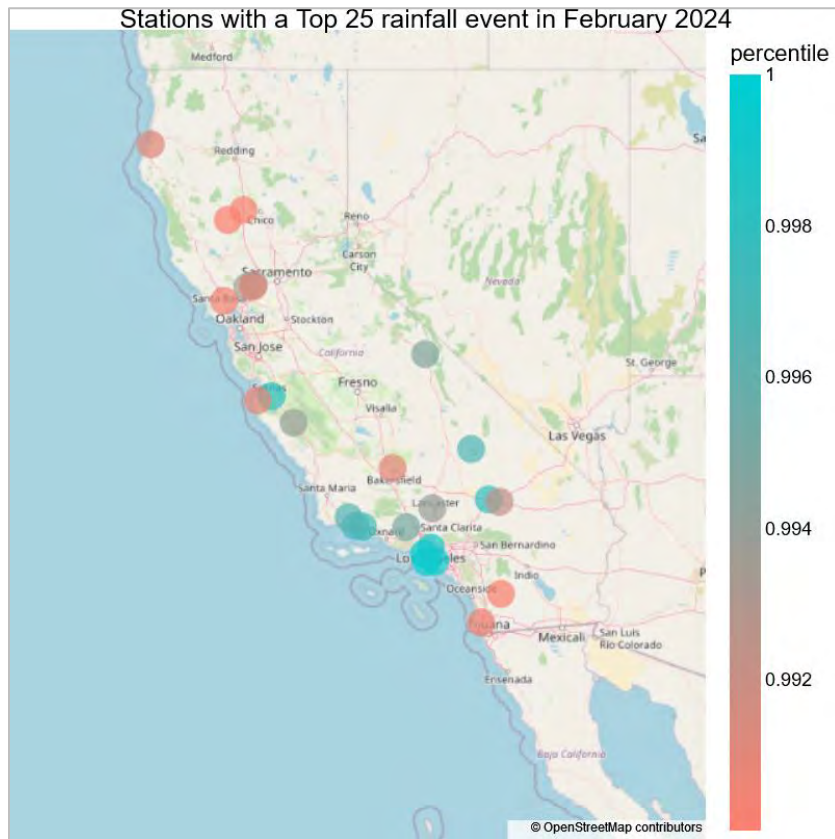
² https://mesonet.agron.iastate.edu/request/asos/hourlyprecip.phtml?network=CA_ASOS

³ <https://www.bbc.com/news/world-us-canada-68202944>

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FIGURE 3
FEBRUARY 2024 EXTREME RAINFALL LOCATIONS



Data from GHCN: <https://www.ncei.noaa.gov/pub/data/ghcn/daily/?C=S;O=D>

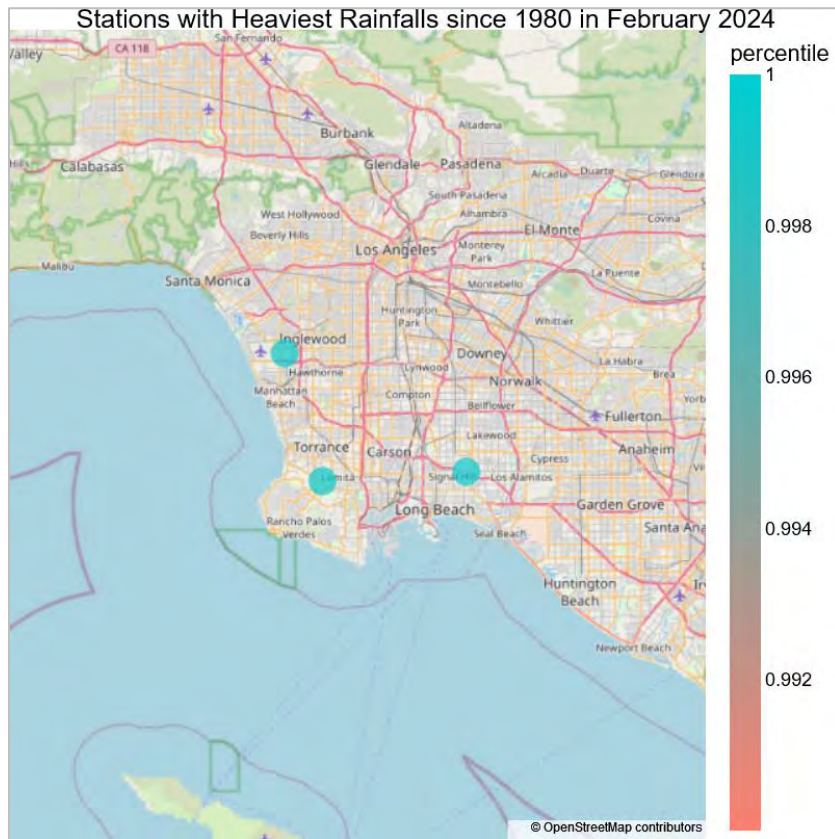
From this figure, we can see that precipitation extremes were not concentrated in one area of California, but extended all the way up the coast to Northern California. However, by looking at the percentiles, we can see that Los Angeles had the most extreme weather.

The following figure, Figure 4, shows three weather stations that experienced their heaviest rainfall event since 1980 using the GHCN daily rainfall data. They are centered in Los Angeles: LAX, Torrance, and Long Beach. Considering that this is also one of the densest populated areas of California, this event looks to have been very significant in terms of population exposure.

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FIGURE 4
MOST EXTREME RAINFALL SINCE 1980 IN LOS ANGELES



Data from GHCN: <https://www.ncei.noaa.gov/pub/data/ghcn/daily/?C=S;O=D>

Below is the list of the most extreme rainfalls in California (top 10 most extreme rainfall amount in a 6-day period since 1980):

TABLE 1
TOP 10 MOST EXTREME RAINFALLS IN A 6-DAY PERIOD IN CALIFORNIA SINCE 1980

Station Name	Time Period	Six Day Precipitation (in)	Historical Rank
LONG BEACH DAUGHERTY FLD	2024-02-01 to 2024-02-06	9.752	1
TORRANCE AP	2024-02-01 to 2024-02-06	9.177	1
LOS ANGELES INTL AP	2024-02-01 to 2024-02-06	8.001	1
LOS ANGELES DWTN USC CAMPUS	2024-02-01 to 2024-02-06	10.196	2
SALINAS MUNICIPAL AP	2024-01-31 to 2024-02-05	3.319	4
BARSTOW	2024-02-03 to 2024-02-08	2.237	5
SANTA BARBARA	2024-02-01 to 2024-02-06	8.279	6
SANTA BARBARA MUNI AP	2024-01-31 to 2024-02-05	6.933	7
CACHUMA LAKE	2024-02-01 to 2024-02-06	10.739	8
TRONA	2024-02-03 to 2024-02-08	2.324	8

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Economic Impacts

According to the Guardian, last week's storms killed nine people and caused an estimated \$11 billion in damage and economic loss⁴. The previous California flooding (December 2022; reported here: [Actuarial Weather Extremes Series, California Precipitation: December 30-31, 2022](#)) led to around \$5bn to \$7bn in economic losses according to Moody's⁵. Moreover, a small portion of the economic losses from flooding will be covered by insurance due to the lack of flood insurance within a typical homeowner's policy in California. Data from the National Flood Insurance Program (NFIP) shows that less than 1% of the 7.7 million affected households in the eight counties that declared an emergency have flood insurance coverage⁶.

⁴ <https://www.theguardian.com/science/2024/feb/11/atmospheric-river-pacific-storms-climate-crisis>

⁵ <https://www.rms.com/newsroom/press-releases/press-detail/2023-01-25/moodys-rms-estimates-us5-7-billion-in-total-us-economic-losses-from-california-flooding>

⁶ <https://www.cnn.com/2024/02/05/business/flood-insurance-california-storms/index.html>

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