Atmospheric River Impacts California

- The major storm that struck California on 13–14 February 2019 was an atmospheric river storm.
- At landfall, the new AR Category Scale characterized it as an “AR Cat 4” along the San Diego California Coast using the Ralph et al (2019) AR impacts scale. It reached “extreme” intensity.
- The strong AR brought heavy precipitation (>10 inches in 24 hours over some locations) and created numerous impacts.
- Several highways and interstates throughout the state were closed due to flooding, snow, and high winds.
- Several evacuations were ordered near the Holy Fire Burn area due to flooding.
- A shallow landslide in Marin County resulted in the destruction of 3 homes.
NCEP GFS Analysis 00 UTC 11 February to 12 UTC 15 February 2019

AR Event Summary: 13-14 February 2019

For California DWR’s AR Program
Coastal San Diego County (33N, 117.5W; Approximately Oceanside California) experienced a max IVT of 1077 kg/m/s and AR conditions lasted 42 hours, which is an Atmospheric River Category 4 (Based on GFS Analysis) using the Ralph et al scale.

A large portion of other Coastal California locations experienced AR-Cat 3 conditions with a few experiencing AR-Cat 2 or lower.

The AR Category scale was developed by CW3E director F. Martin Ralph (lead) with J. Rutz, M. Anderson, J. Cordeira, M. Dettinger, D. Reynolds, L. Schick and C. Smallcomb. (Ralph et al. 2019)
The San Diego National Weather Service observed the highest winter integrated water vapor ever recorded of 1.68 inches (42.7 mm) during the 12Z 14 February 2019 radiosonde launch (indicated via dot on plot).

The only times San Diego has recorded a higher IWV was during the summer and early fall months from July through early October.
The strong onshore flow combined with the surface convergence around the parent low-pressure system of the AR produced a slight storm surge over Northern California.

The sea-level at San Francisco rose to >125 cm above present day mean sea-level, ~50 cm above the predicted sea-level based on normal tides.
Numerous high elevation locations across California received greater than 6 inches of precipitation from 12Z 13 through 12Z 15 February 2019 (4 AM to 4 AM PST)

Statewide Maxima
Northern Sierra: 8.75 inches
Sonoma/Mendocino Coast: 8.85 inches
Big Sur: 6.7 inches
Palomar Mountain (Southern CA): 10.16 inches

Palomar Observatory in northern San Diego County received 10.1 inches of rain in 24-hours, a record for 14 February (Previous Record: 9.58 in 1901)

Other low elevation locations, such as the Central Valley, the Los Angeles Basin, San Francisco Bay Area, Orange County, and San Diego County received 1.5–4.5 inches or precipitation

NWS CNRFC Quantitative Precipitation Estimates available at https://cnrfc.noaa.gov/
San Diego saw a 1-day change of total WY precipitation percent of normal of 18.76%, which is almost double the 99th percentile of 1-day increases since records began.

While 18.76% 1-day change is well above the 99th percentile, the record 1-day change of total WY precipitation percent of normal is 31.75%.

California averaged a 1-day change of total WY precipitation of 5.4%, which is greater than the 99th percentile 1-day increase.

This 1-day increase of 18.76% of normal WY Precipitation brought WY 2019 to 85.7%, well above normal for WY to date precipitation (Water Year begins October 1).
The high precipitation accumulations and high winds produced by this event led to numerous impacts across the state of California.

Flooding associated with the Holy Fire burn area in Riverside led to several evacuations and damage/destruction to several homes (as reported by CalFire).

Numerous roadways throughout the state were closed due to flooding, snow, high winds, and damage:
- I-80 over Donner Summit due to snow and high winds
- I-5 northbound in Colusa County due to flooding
- HWY 50 in Sierra due to avalanche mitigation
- HWY 243 in Lake Fulmore due to collapsed roadway
- Visit CalTrans for a more thorough list of roadway impacts

The saturated soils in many areas across the state and intense rainfall created conditions conducive to slope failure:
- A shallow landslide that mobilized into a debris flow in Sausalito (Marin County) destroyed three homes