

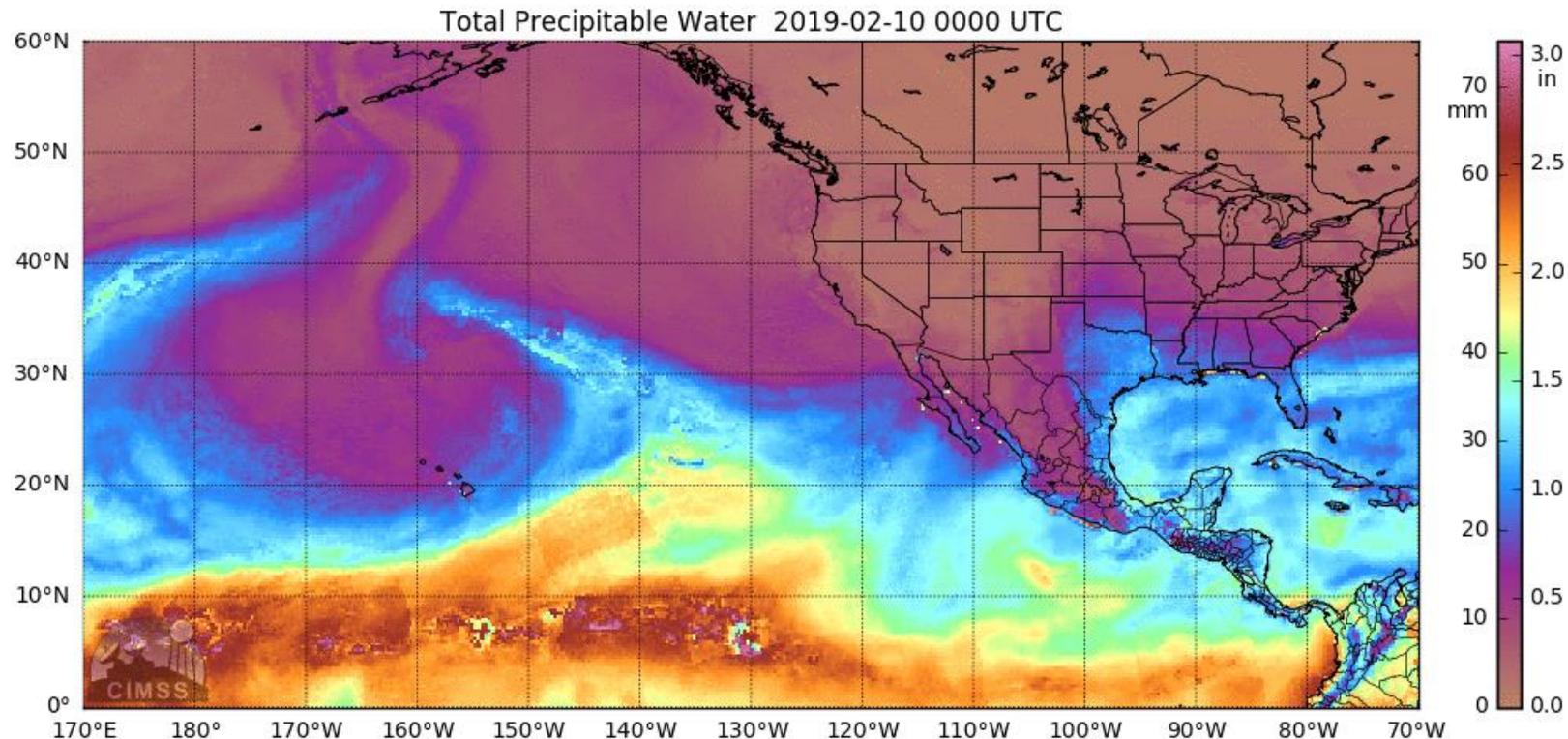
CW3E Post Event Summary: 13–15 Feb. 2019 AR



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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



For California DWR's
AR Program

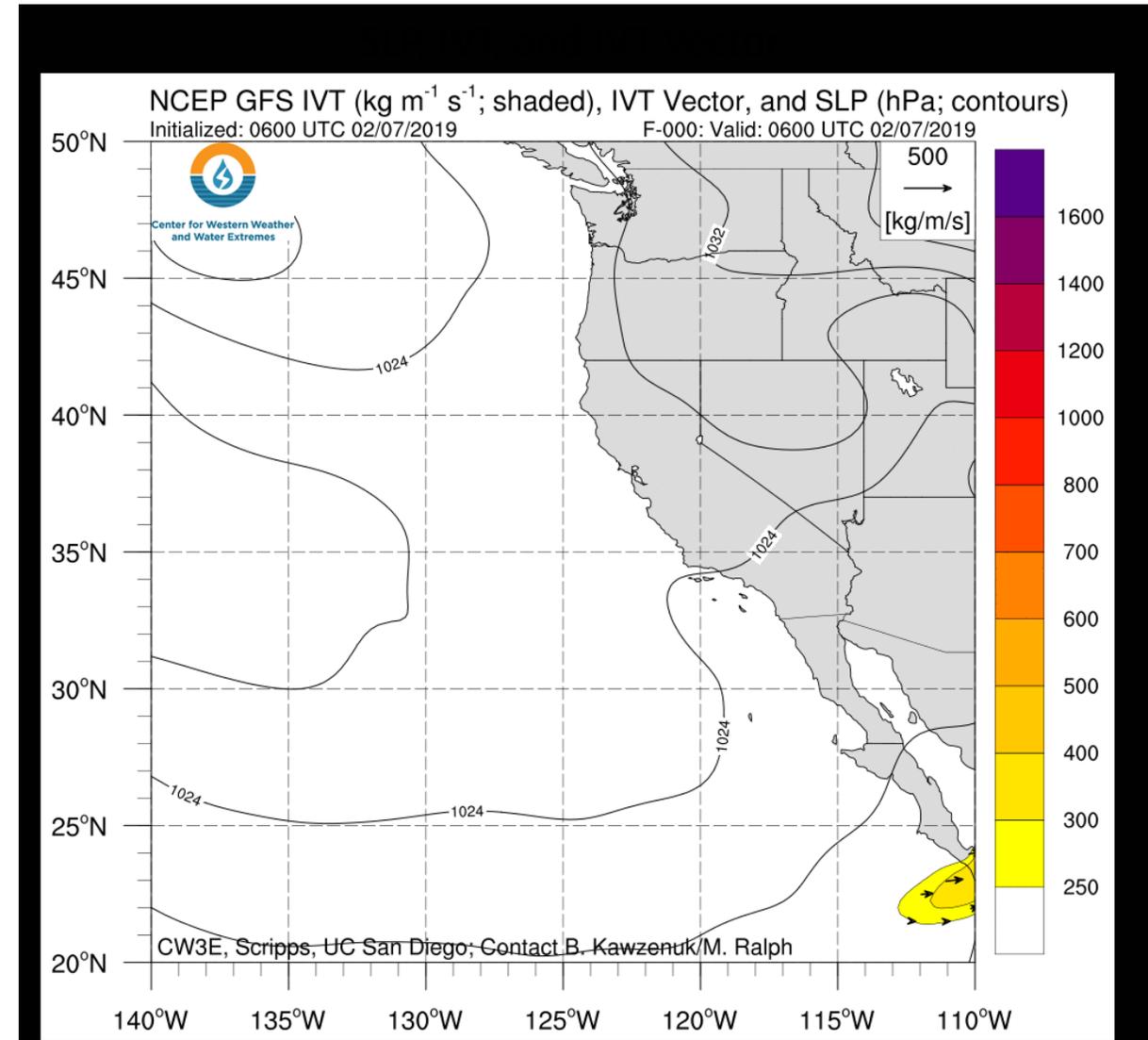
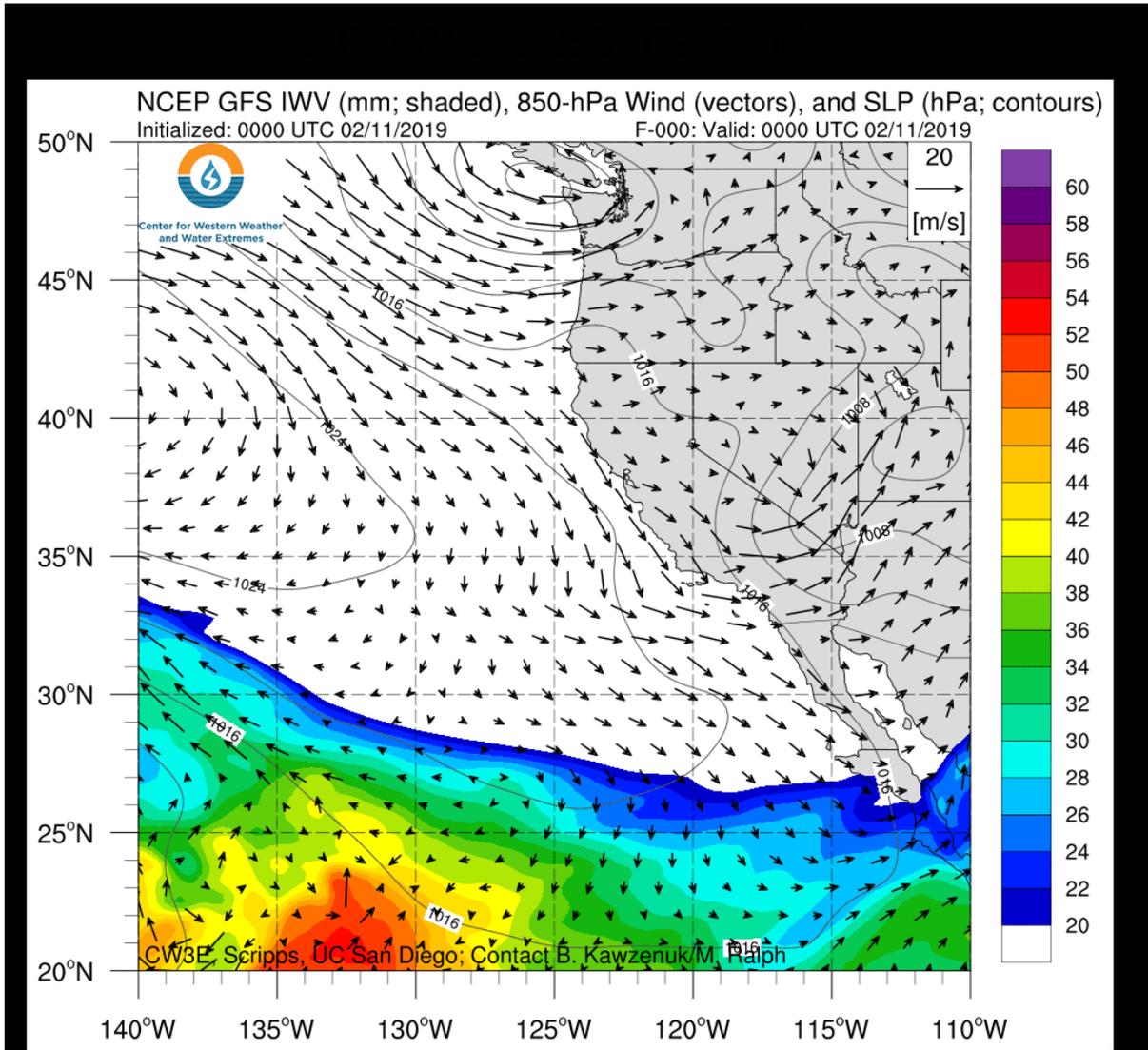
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NCEP GFS Analysis 00 UTC 11 February to 12 UTC 15 February 2019



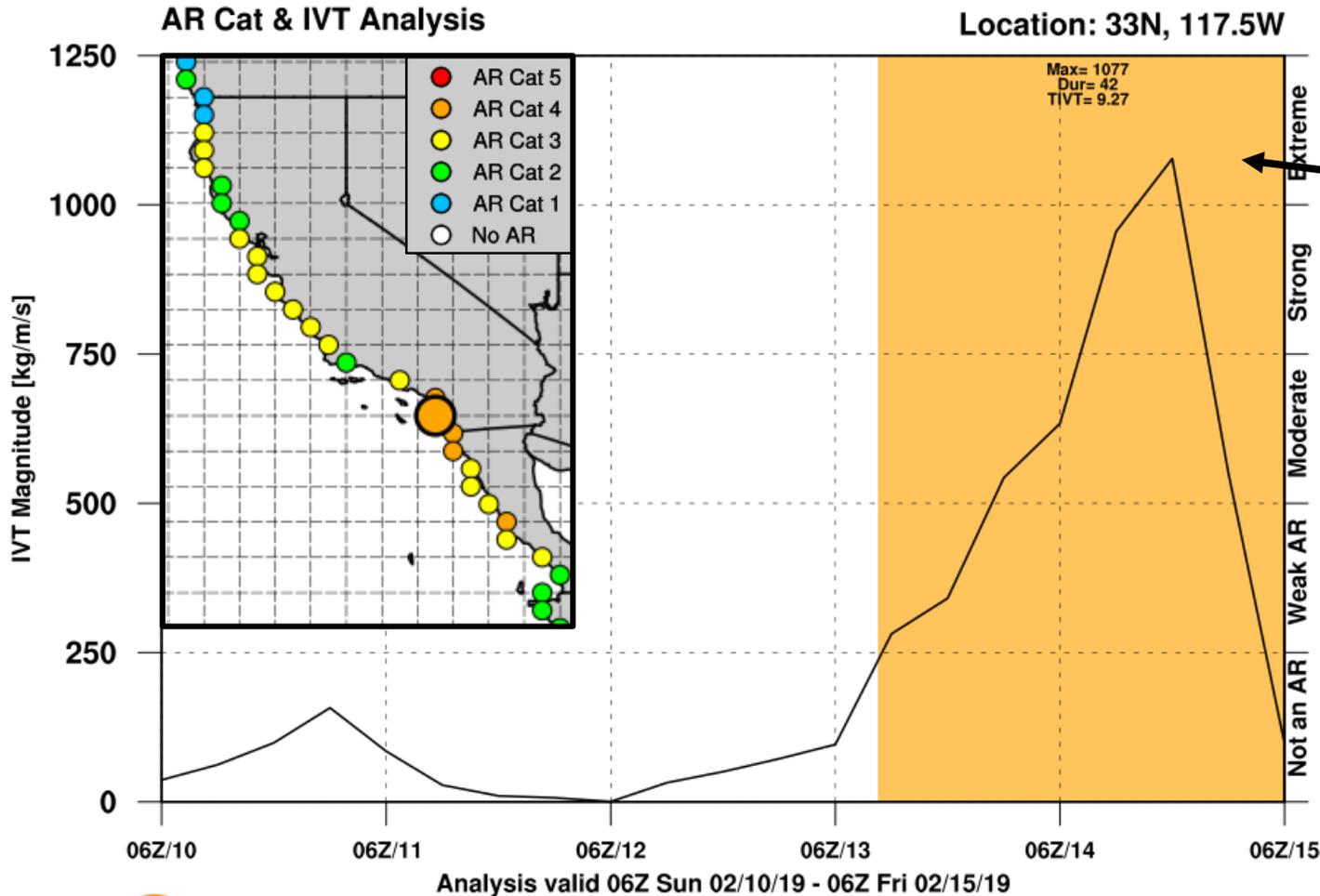
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A scale for atmospheric river intensity and impacts was published in the *Bulletin of the American Meteorological Society* on 5 February 2019. This is its first application to a current event.



AR Intensity (kg/m/s) // Ralph et al.

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.

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*)

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

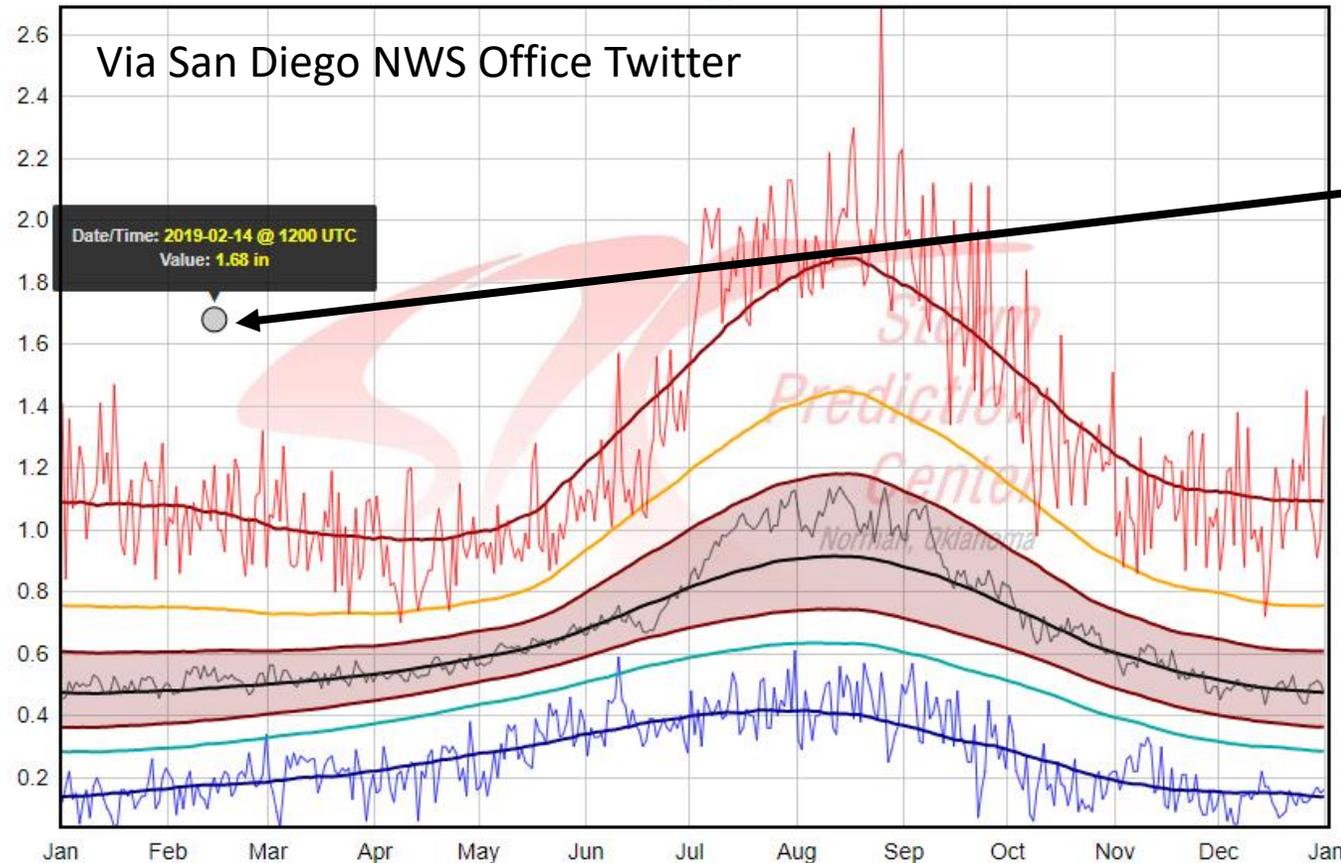
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12Z Soundings for NKX



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

13 Feb 12 UTC

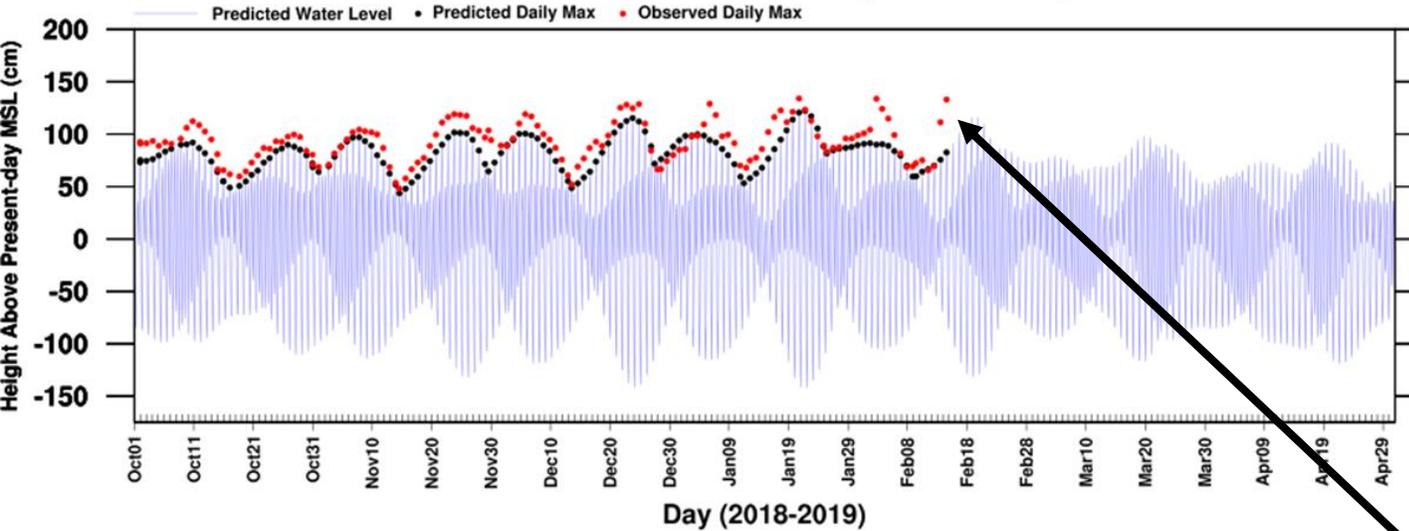
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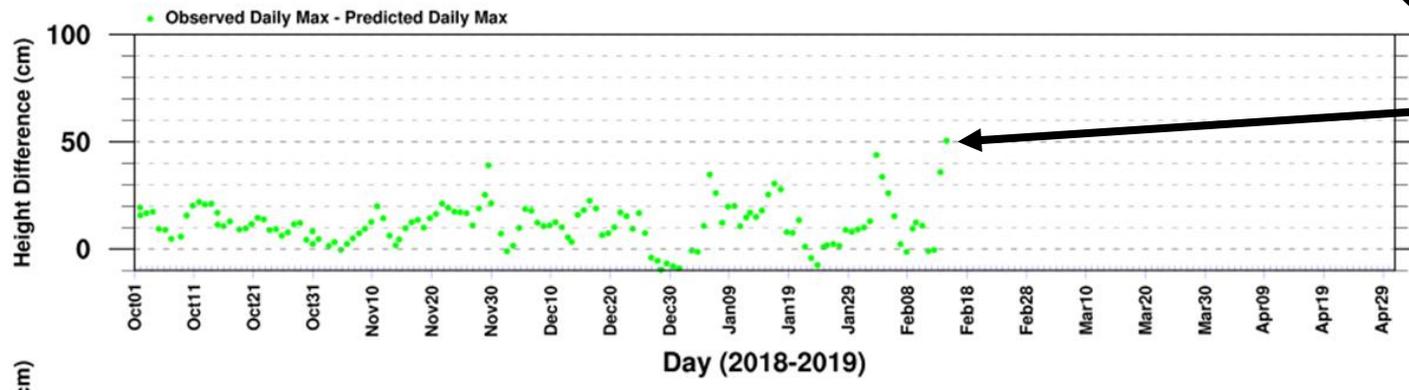


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Sea Level: San Francisco (Stn 9414290)



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

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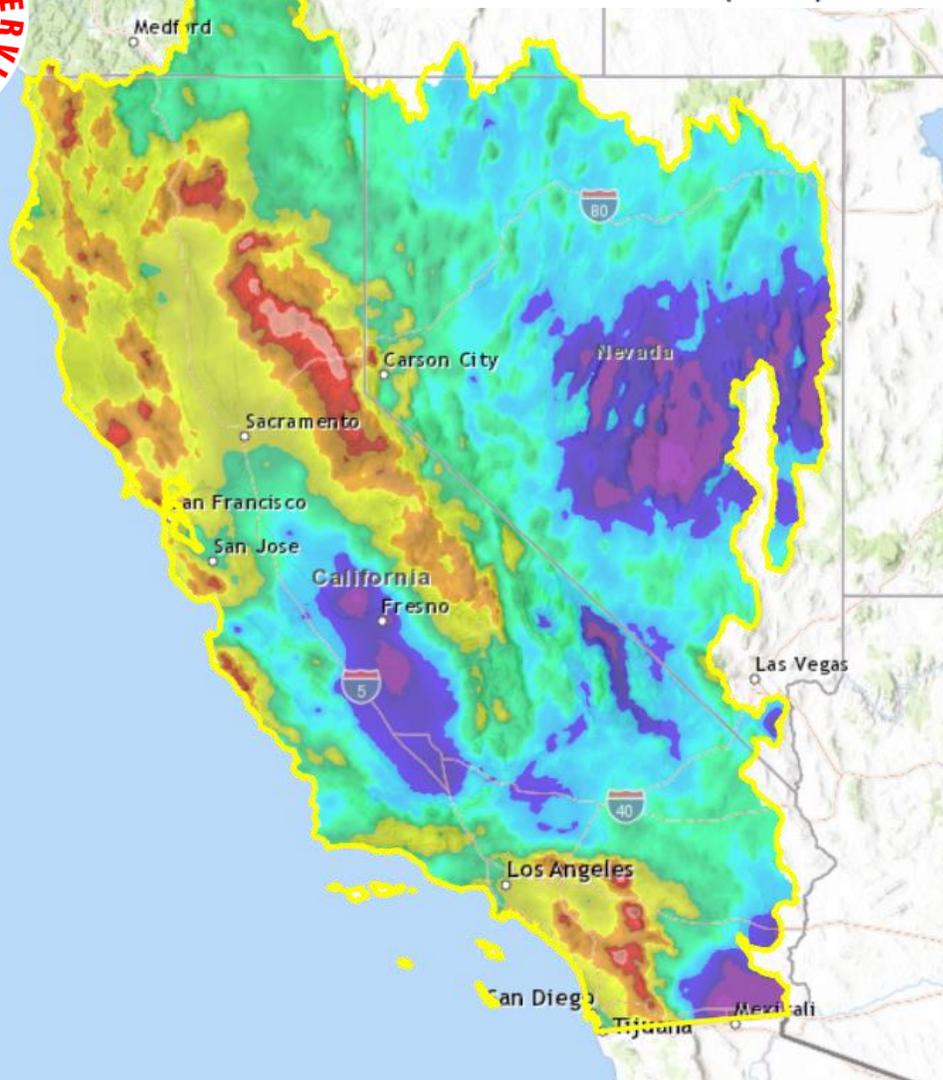
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48-Hourly Observed Precip
Wed Feb 13 04 AM PST (13/12Z) through
Fri Feb 15 04 AM PST (15/12Z)



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/>

Precipitation (inches)

1.00 2.00 3.00 4.00 5.00 6.00 7.00 8.00 9.00 10.00 11.00 12.00

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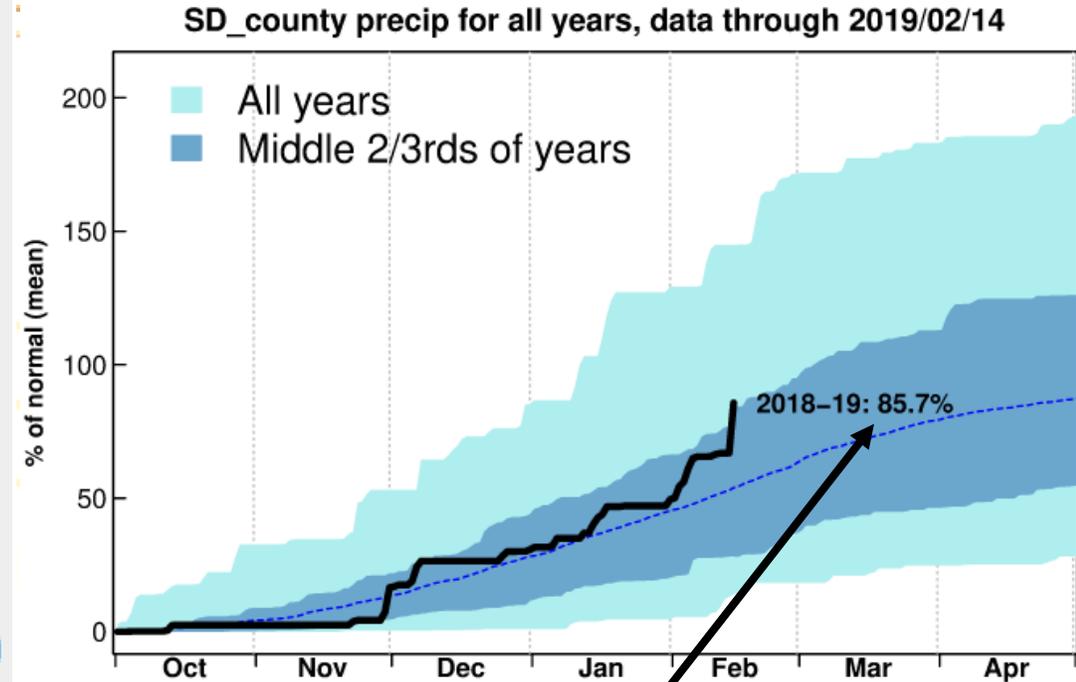
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Current:	85.7%	1-day Δ :	18.76%

	(2000/02/14)		
Rec_low:	14.1%	50-ptile:	0.63%
Typ_low:	28.2%	90-ptile:	4.39%
Mean:	53.9%	95-ptile:	5.96%
Typ_high:	83.0%	99-ptile:	9.79%
Rec_high:	144.9%	Record:	31.75%
	(1993/02/14)		(1927/02/16)



- 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)

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CAL FIRE Riverside @CALFIRERRU · 11h
#HolyFloodWatch - Photos of the Alvarado area in Lake Elsinore. Credit: CAL FIRE/Riverside County Fire Department @CityLakeElsinore @RivCoReady

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Highway 243 near Lake Fulmore

Photo: Caltrans



I-80 Donner Summit

Photo: Caltrans

Sausalito landslide



Photo Credit: Noah Berger/ San Francisco Chronicle

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