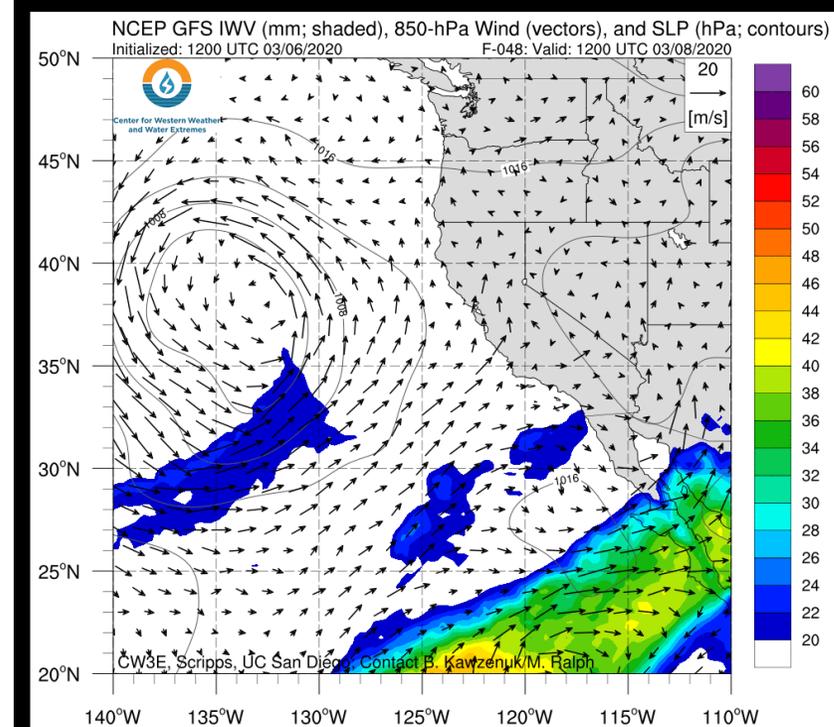
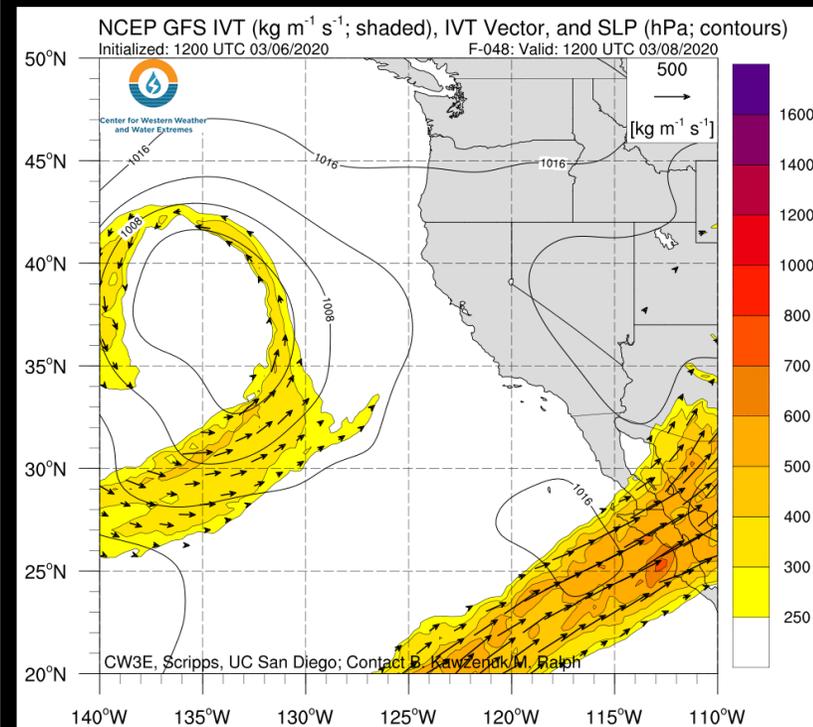




A cutoff low and landfalling AR is forecast to bring moderate-to-heavy rainfall to portions of the southwestern U.S.

- The interaction between a cutoff low off the California coast and tropical moisture over the Eastern Pacific is expected to result in a landfalling atmospheric river (AR) over Southern California and Arizona early next week
- Some areas in coastal Southern California may experience at least AR2 conditions
- The highest precipitation amounts are expected in Southern California, with 1–2 inches forecast over coastal and inland valley areas, and more than 2.5 inches possible over the Transverse and Peninsular Ranges



AR Outlook: 6 Mar 2020

For California DWR's AR Program

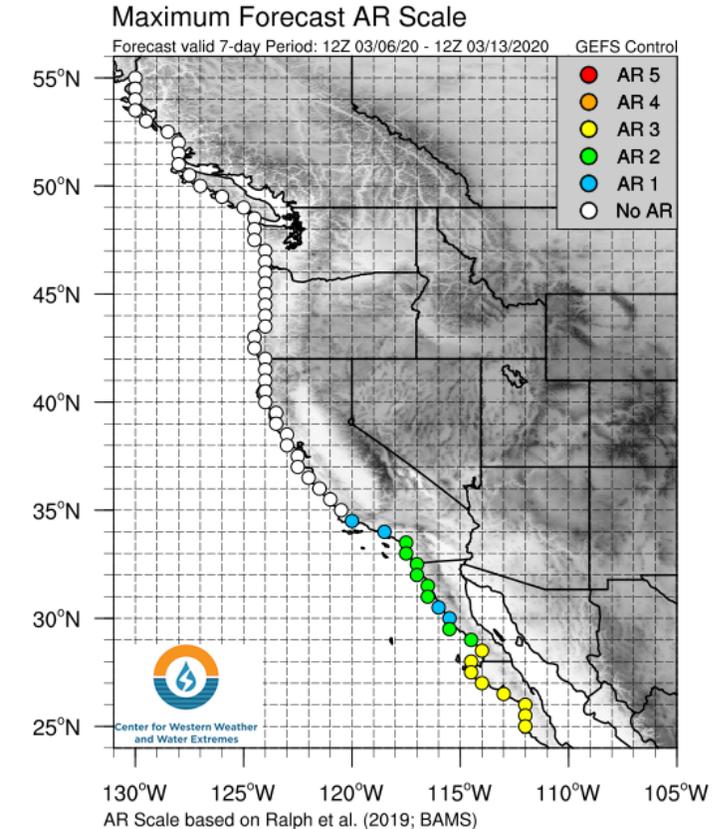
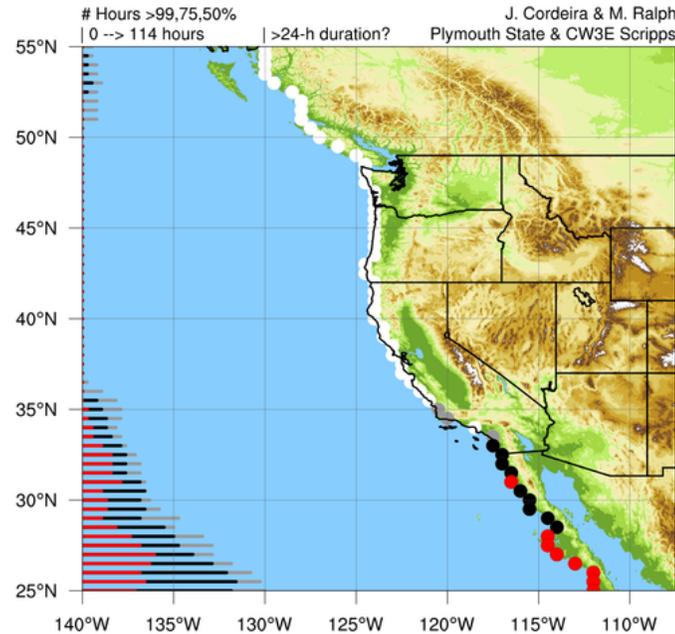
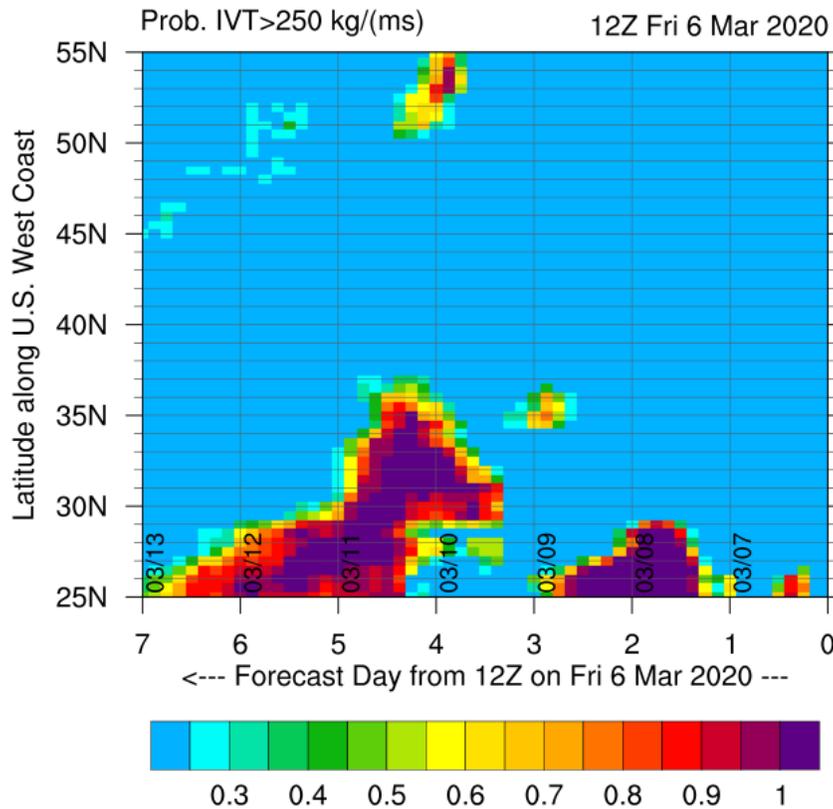


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GEFS AR Landfall Probabilities & AR Scale

*GEFS = Global Ensemble Forecast System



- AR landfall tool shows high confidence (> 90%) in AR conditions along the coast of Baja California and Southern California during 10–11 Mar (Days 4–5)
- There is still some uncertainty in the timing, duration, and northward extent of AR conditions
- GEFS control run is currently predicting AR1/AR2 conditions over Southern California [based on the *Ralph et al. (2019)* AR Scale]

AR Outlook: 6 Mar 2020

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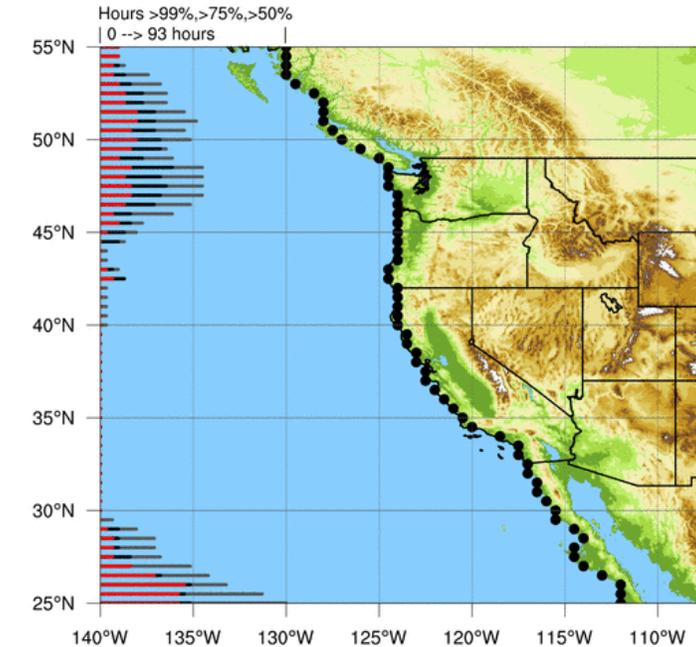
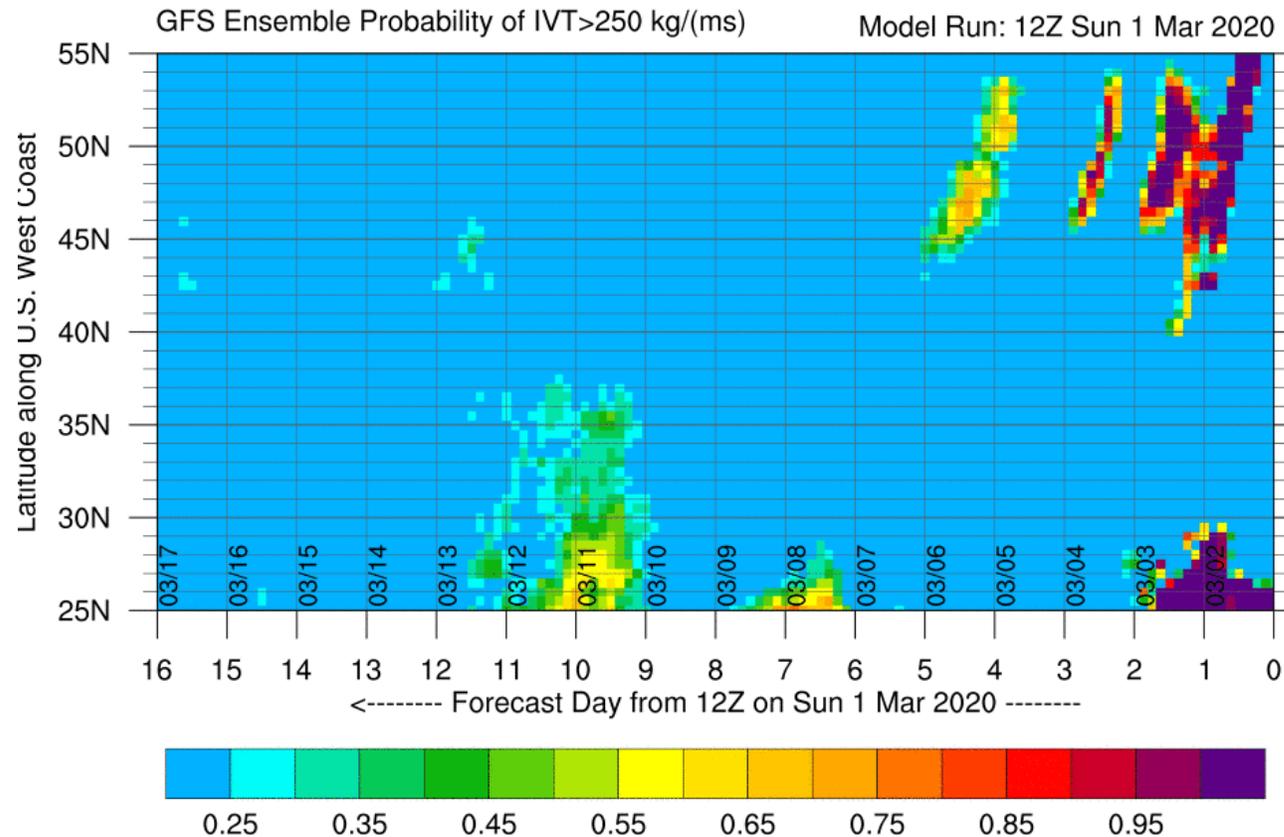


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GEFS AR Landfall Probabilities: dProg/dT

*GEFS = Global Ensemble Forecast System



- Confidence in the probability of AR conditions along the Southern California coast has increased substantially over the past 5 days
- As the loop demonstrates, run-to-run differences in forecast AR landfall probability were quite large until ~ 12Z 5 Mar
- High uncertainty in AR conditions was driven primarily by uncertainty in the evolution of a cutoff low that will form over the Northeast Pacific Ocean during the next 48 hours

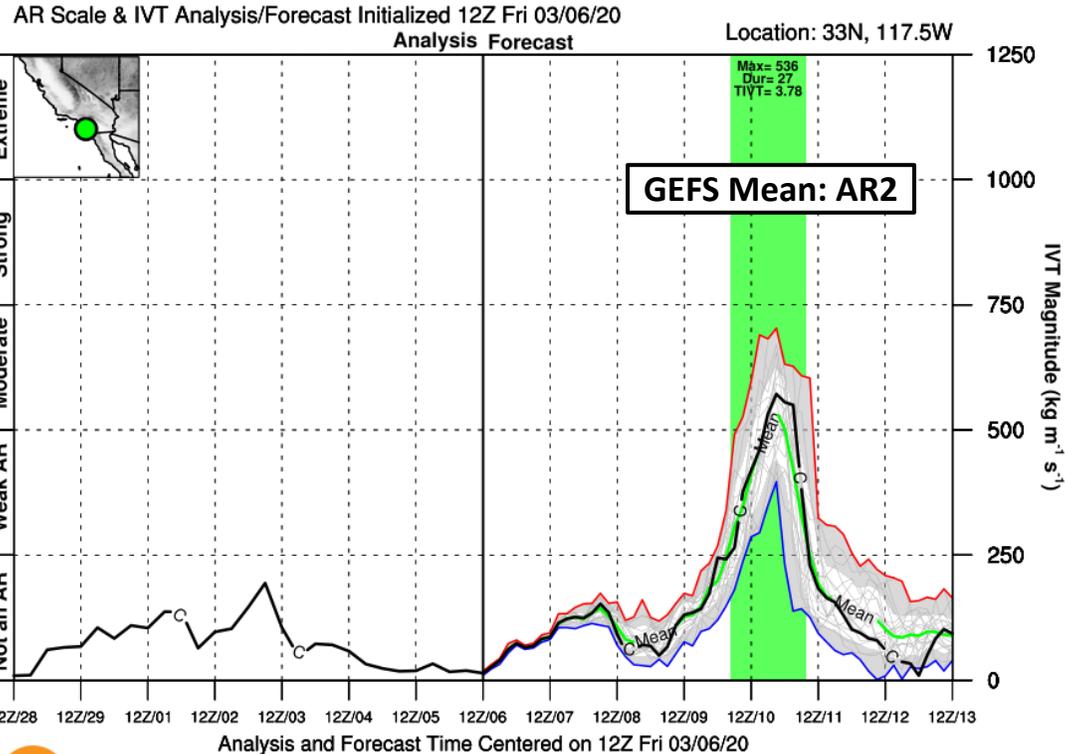
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GEFS IVT Forecast Plumes



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Image created: 22 UTC 03/06/2020
More information: <http://cw3e.ucsd.edu> AR Scale based on Ralph et al. (2019; BAMS), contact M. Ralph

GFS Ensemble Initialized: 12Z Fri 03/06/20

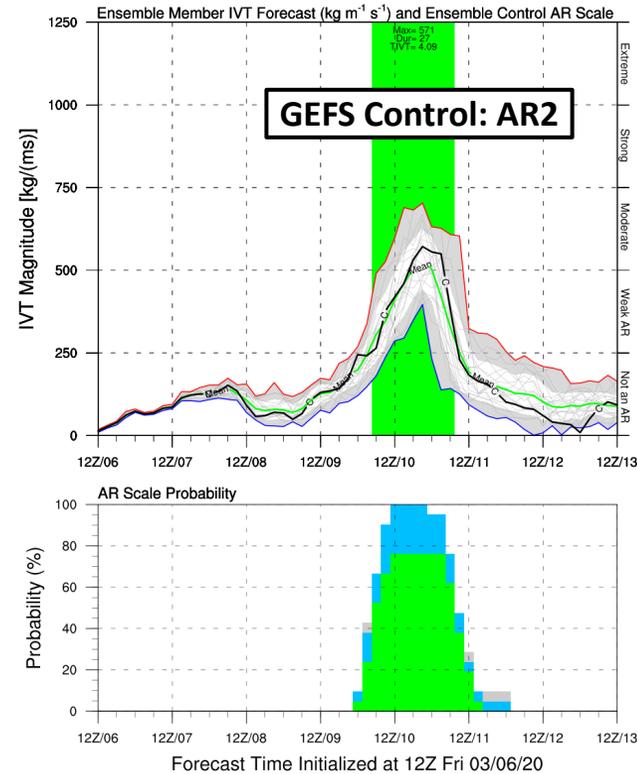
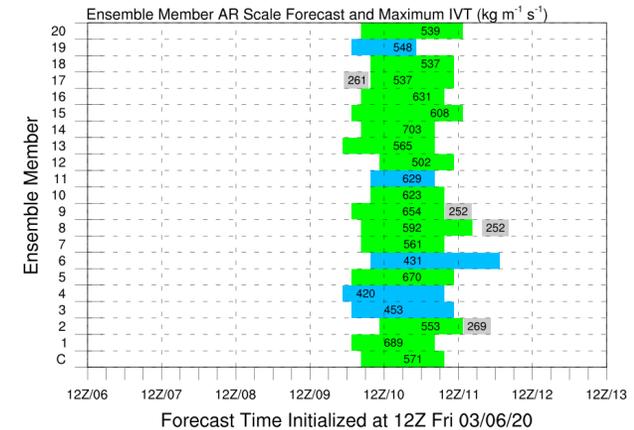
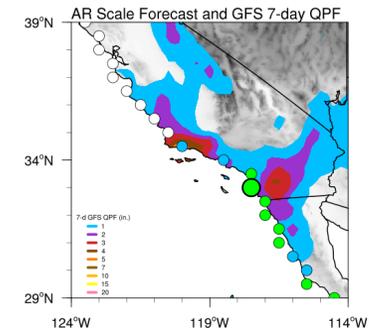


Image created: 22 UTC 03/06/2020

Location: 33°N 117.5°W



More information: <http://cw3e.ucsd.edu> AR Scale based on Ralph et al. (2019; BAMS), contact M. Ralph

- GEFS control run (duration = 27 hours; max IVT = 571 kg m⁻¹ s⁻¹) and ensemble mean (duration = 27 hours; max IVT = 536 kg m⁻¹ s⁻¹) are suggesting the possibility of AR2 conditions near San Diego, CA
- There is still some uncertainty in the timing, duration, and magnitude of AR conditions, but 16/21 (76%) GEFS members are now predicting AR2 conditions

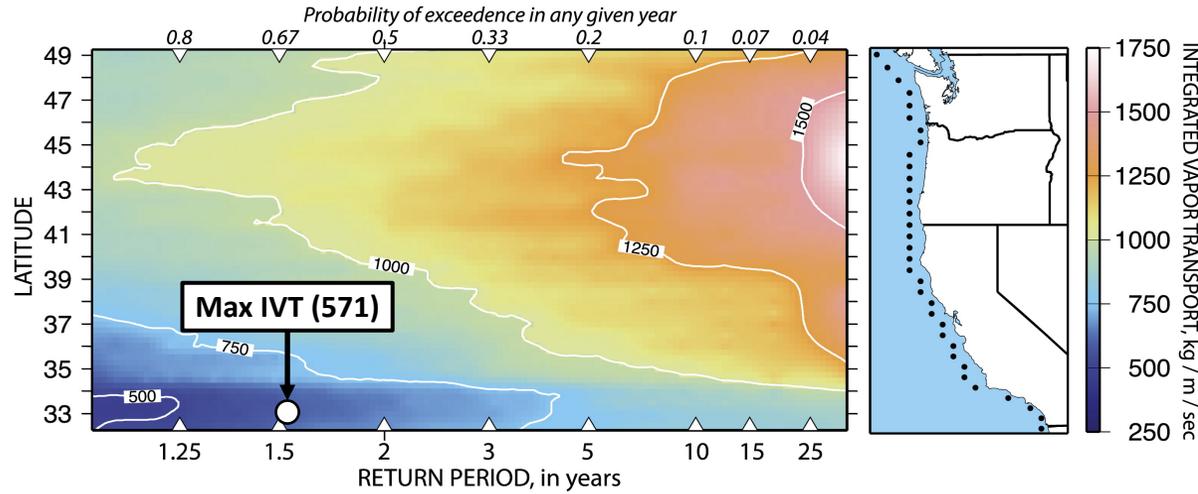
AR Outlook: 6 Mar 2020

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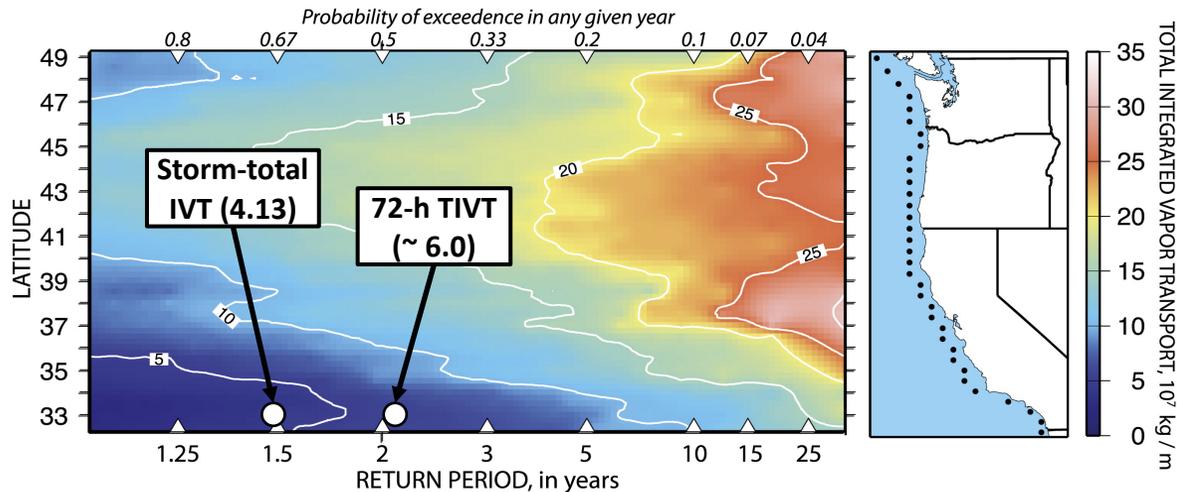


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a) RETURN PERIODS OF ANNUAL-MAXIMUM 3-HOURLY IVT IN LANDFALLING ATMOSPHERIC RIVERS

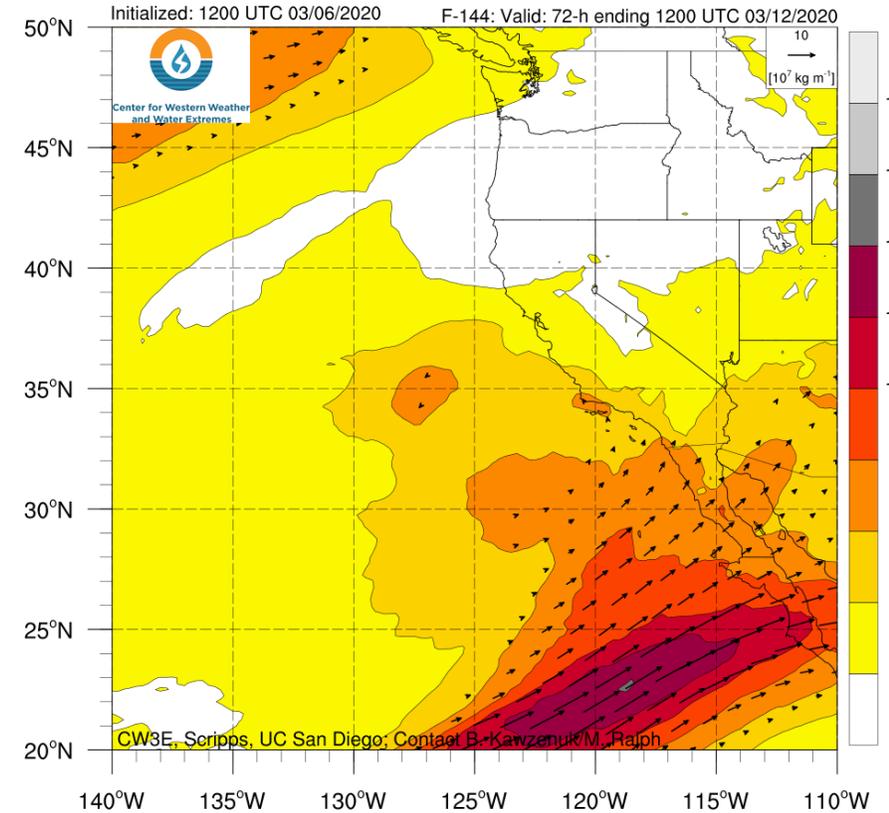


b) RETURN PERIODS OF ANNUAL-MAXIMUM STORM-TOTAL IVT IN LANDFALLING ATMOSPHERIC RIVERS



Source: Figure 7 from Dettinger et al. (2018)

NCEP GFS 72-h Time-Integrated IVT (10⁷ kg m⁻¹) and Vector



- Based on a study by *Dettinger et al. (2018)*, the maximum forecast IVT near San Diego, CA, can be expected once every 1.5 years
- The storm-total (only the continuous period of AR conditions) and 72-hour TIVT can be expected every 1.5 and 2 years, respectively

AR Outlook: 6 Mar 2020

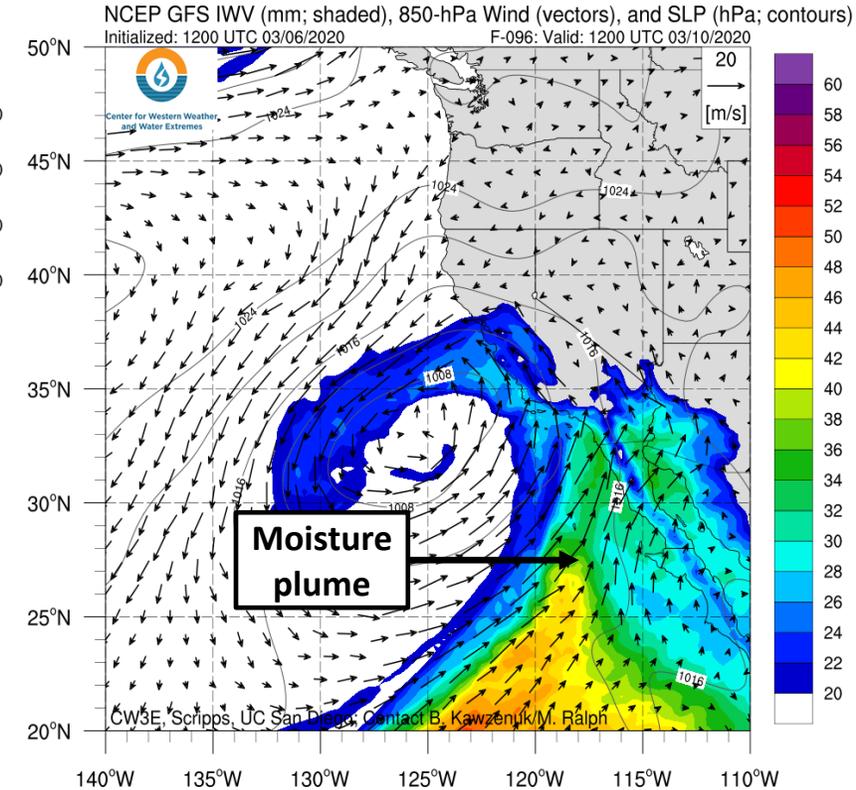
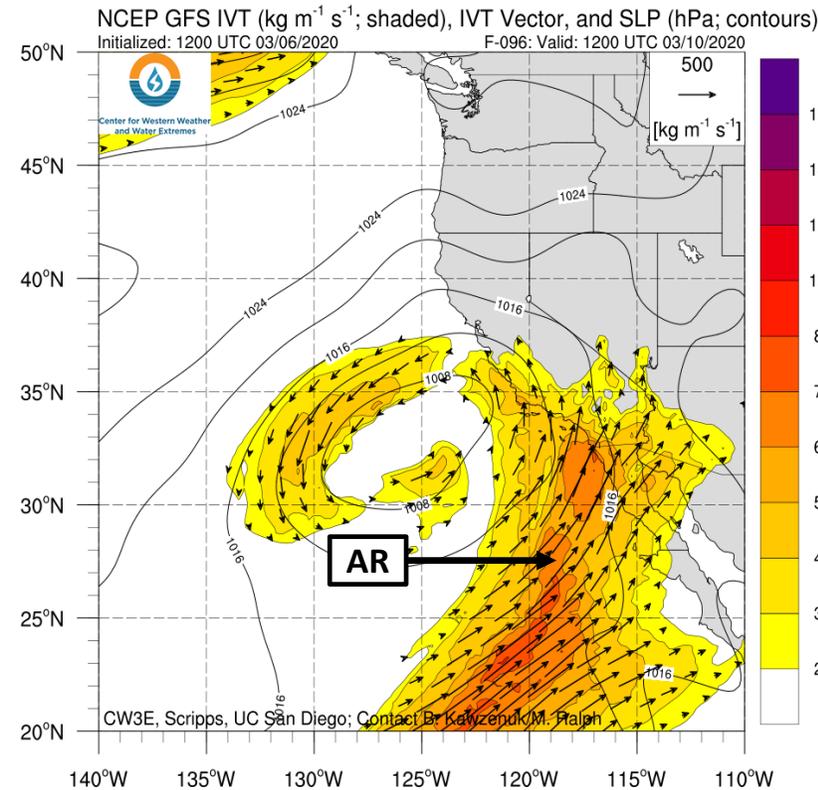
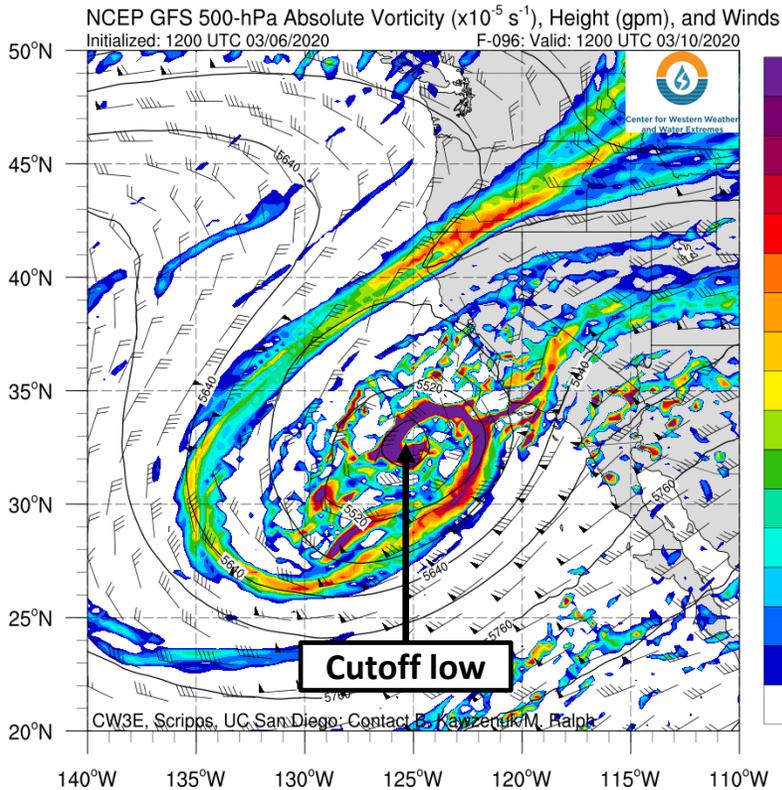
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GFS Forecasts: Valid 1200 UTC 10 Mar



- Over the next few days, a cutoff low will develop off the U.S. West Coast and slowly propagate southeastward
- The cutoff low will eventually interact with a region of deep tropical moisture over the Eastern Pacific Ocean
- Strengthening mid-level southwesterly flow will lead to the development of a region of enhanced IVT and an associated moisture plume extending into Southern California and Southern Arizona
- The orientation of the IVT vectors suggests that upslope moisture flux may play a role in enhancing precipitation amounts over the Transverse Ranges

AR Outlook: 6 Mar 2020

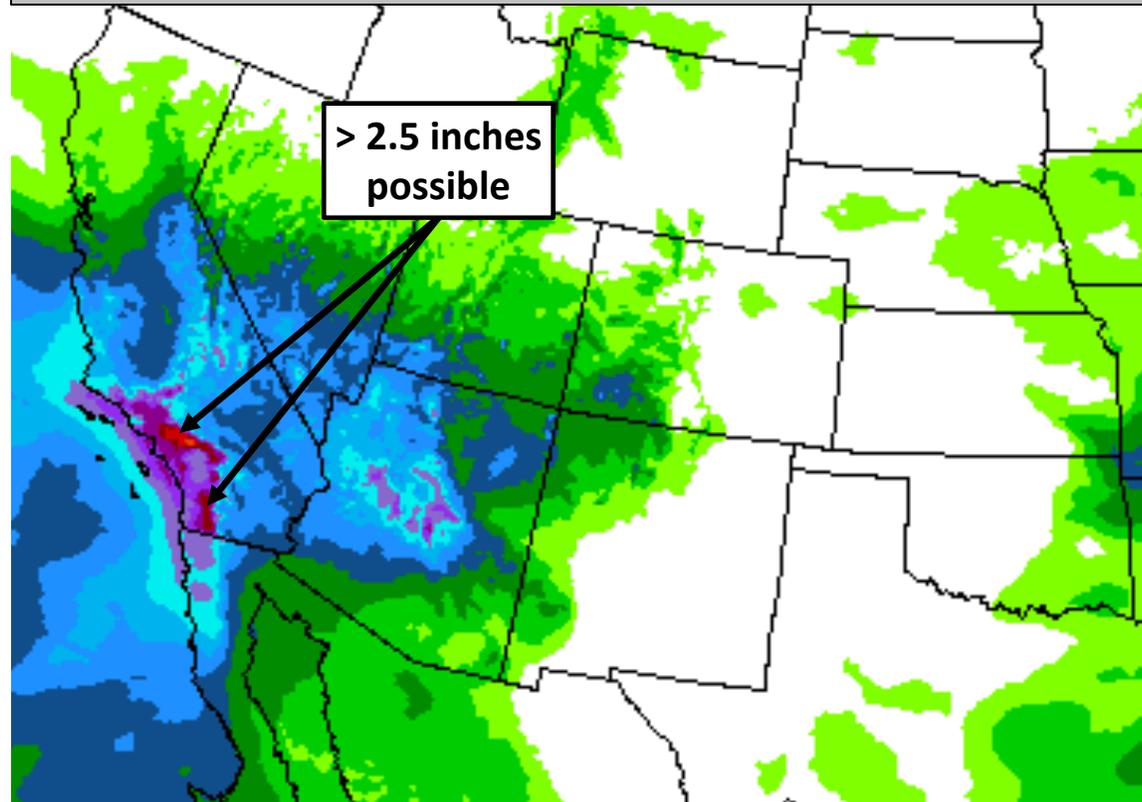
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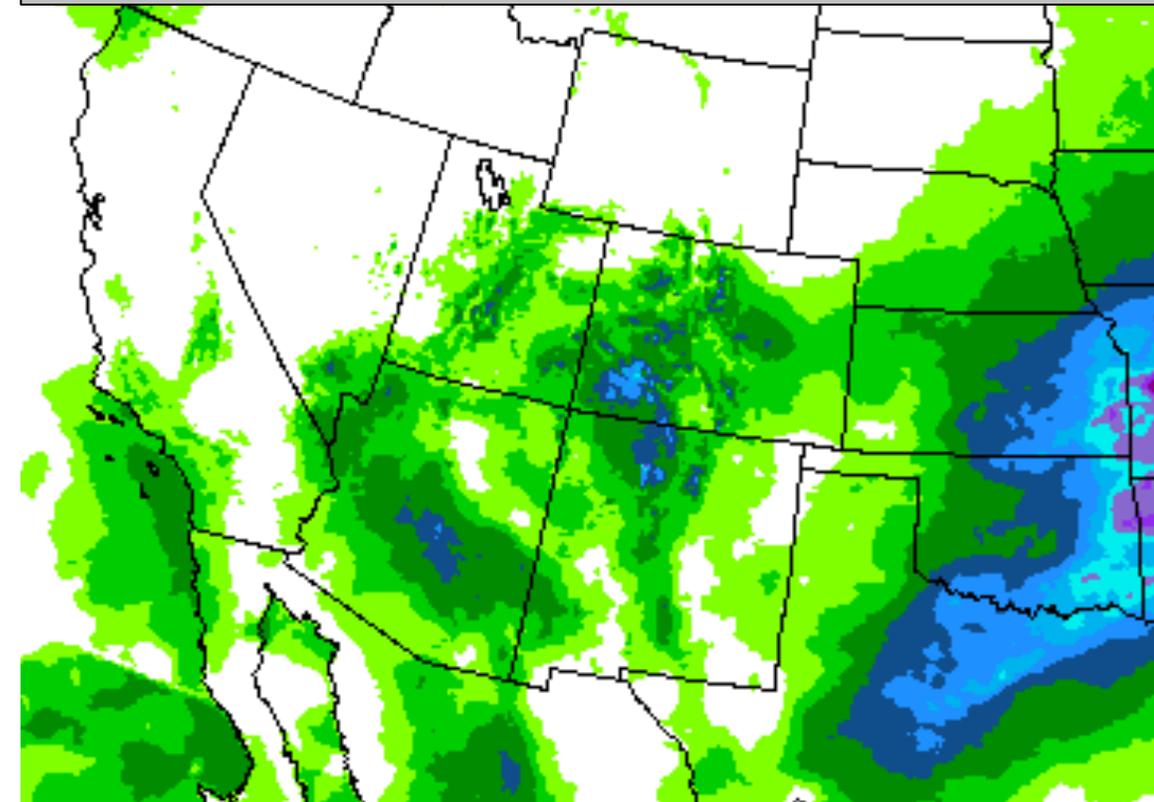
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WPC Days 4–5 QPF: Valid 0000 UTC 10–12 Mar



WPC Days 6–7 QPF: Valid 0000 UTC 12–14 Mar



Source: NOAA/NWS Weather Prediction Center (WPC), <https://www.wpc.ncep.noaa.gov/>

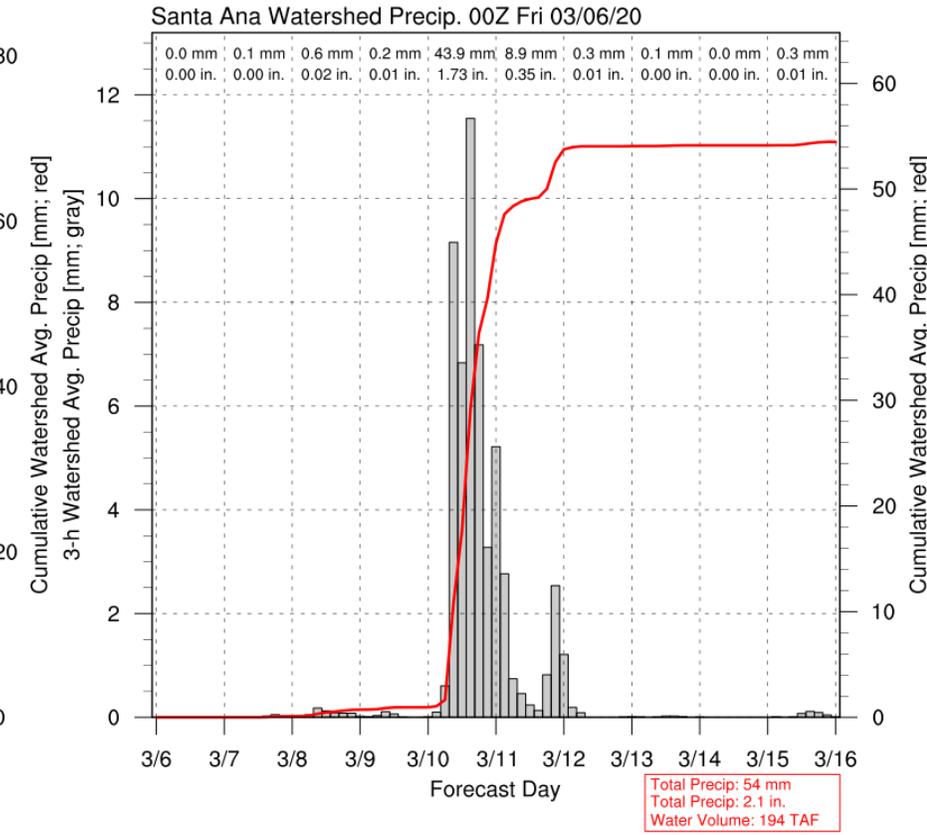
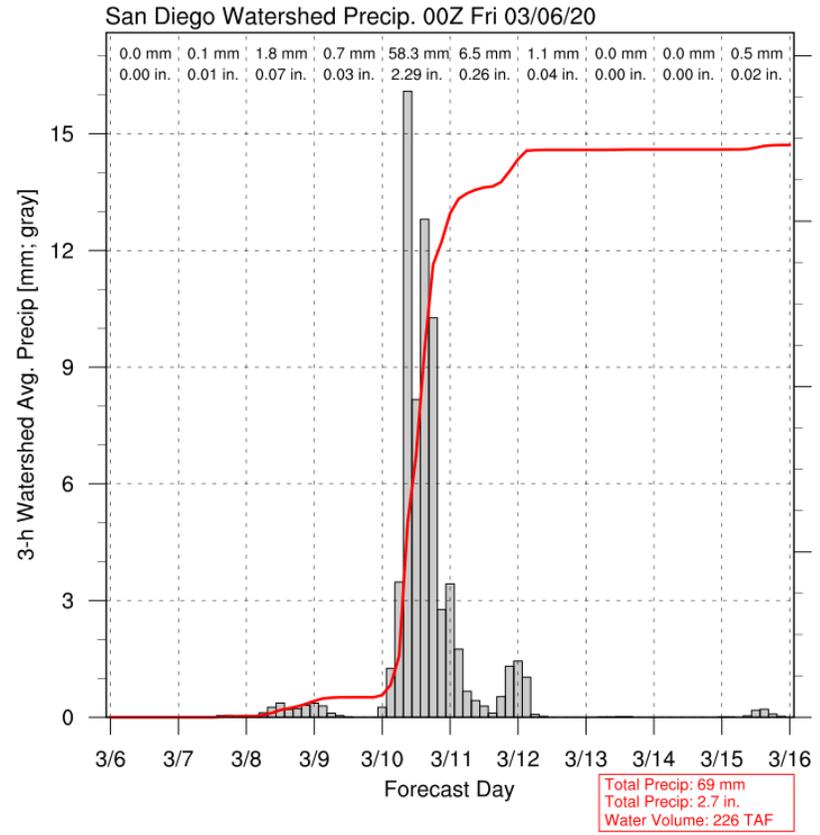
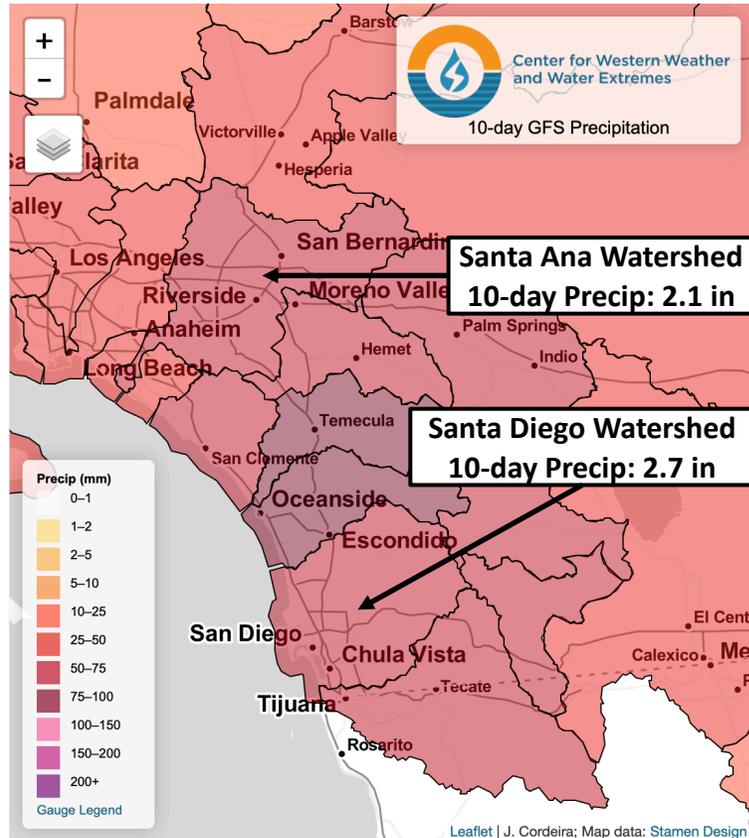
- Widespread precipitation is forecast across the southwestern U.S., with the heaviest precipitation expected in Southern California and central Arizona during Days 4–5
- Coastal and inland valley sections of Southern California are forecast to receive 1–2 inches of precipitation
- More than 2.5 inches of precipitation are possible over the Transverse and Peninsular Ranges
- Additional lighter precipitation amounts are forecast over the Four Corners Region during Days 6–7

AR Outlook: 6 Mar 2020

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- This event is expected to bring significant precipitation to the San Diego and Santa Ana Watersheds
- 00Z 6 Mar GFS is forecasting mean aerial (averaged across the entire watershed) precipitation amounts > 2 inches during the 48-hour period ending 0000 UTC 12 Mar
- Given the lack of recent rainfall, little or no river flooding is expected in Southern California

AR Outlook: 6 Mar 2020

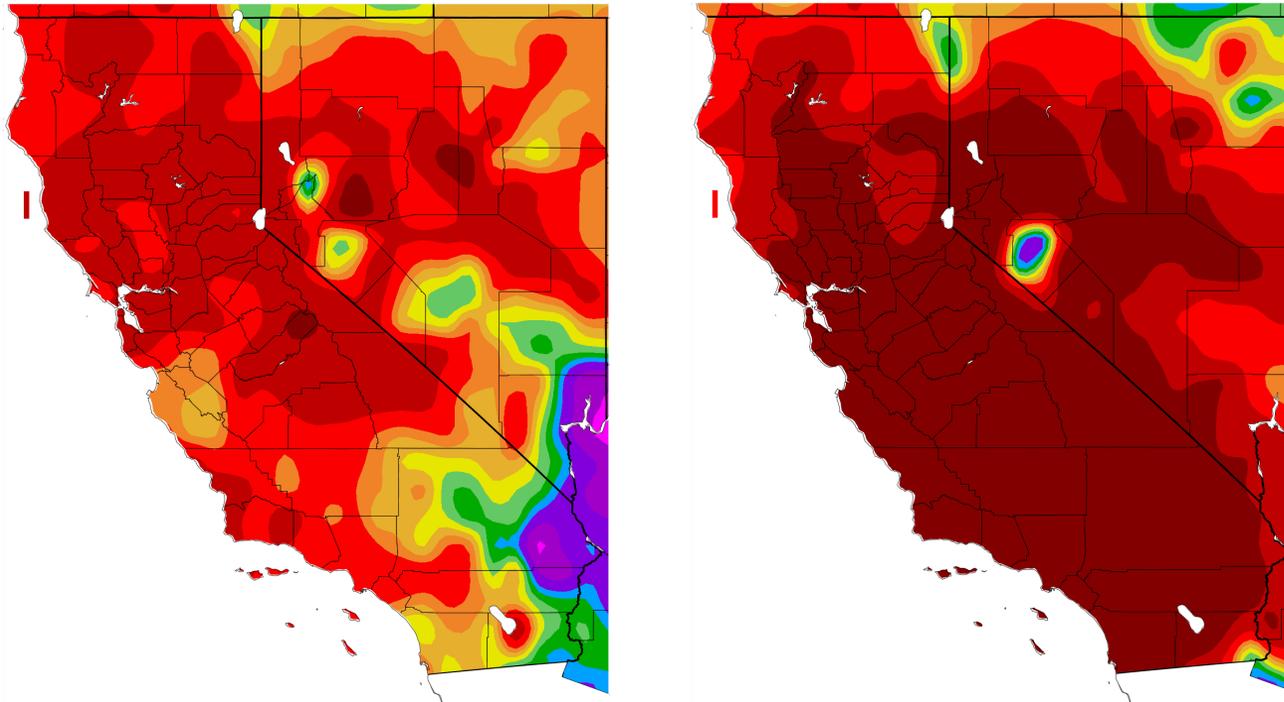
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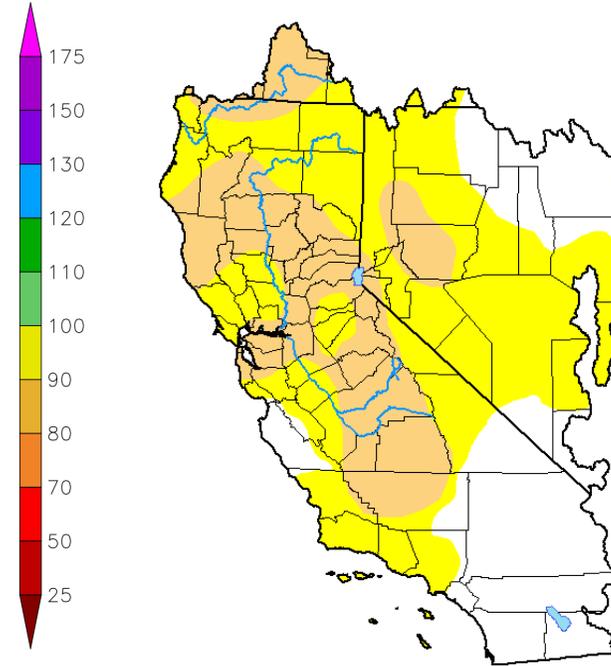
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Percent of Normal Precipitation (%) 10/1/2019 – 3/5/2020
Percent of Normal Precipitation (%) 1/1/2020 – 3/5/2020



Source: High Plains Regional Climate Center, <https://hprcc.unl.edu>

U.S. Drought Monitor California Nevada RFC



Source: National Drought Mitigation Center, UNL, <https://droughtmonitor.unl.edu>

March 3, 2020

(Released Thursday, Mar. 5, 2020)

Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0	D1	D2	D3	D4
Current	27.93	45.25	26.83	0.00	0.00	0.00
Last Week 02-25-2020	28.24	53.43	18.34	0.00	0.00	0.00
3 Months Ago 12-03-2019	18.79	81.14	0.07	0.00	0.00	0.00
Start of Calendar Year 12-31-2019	94.60	5.40	0.00	0.00	0.00	0.00
Start of Water Year 10-01-2019	97.03	2.61	0.36	0.00	0.00	0.00
One Year Ago 03-05-2019	67.70	18.38	13.92	0.00	0.00	0.00

Intensity:

None	D2 Severe Drought
D0 Abnormally Dry	D3 Extreme Drought
D1 Moderate Drought	D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <https://droughtmonitor.unl.edu/About.aspx>

Author:

Adam Hartman
NOAA/NWS/NCEP/CPC



droughtmonitor.unl.edu

- Current water year precipitation is below normal across much of California and Nevada, especially over the Sierra Nevada and western Great Basin
- Year-to-date precipitation is less than 25% of normal throughout Southern and Central California, as well as much of western Nevada
- A prolonged period of dry conditions has resulted in the spread of short-term drought across portions of Central and Northern California
- As of 3 Mar, 27% of the California–Nevada RFC domain was experiencing D1 (moderate drought) conditions