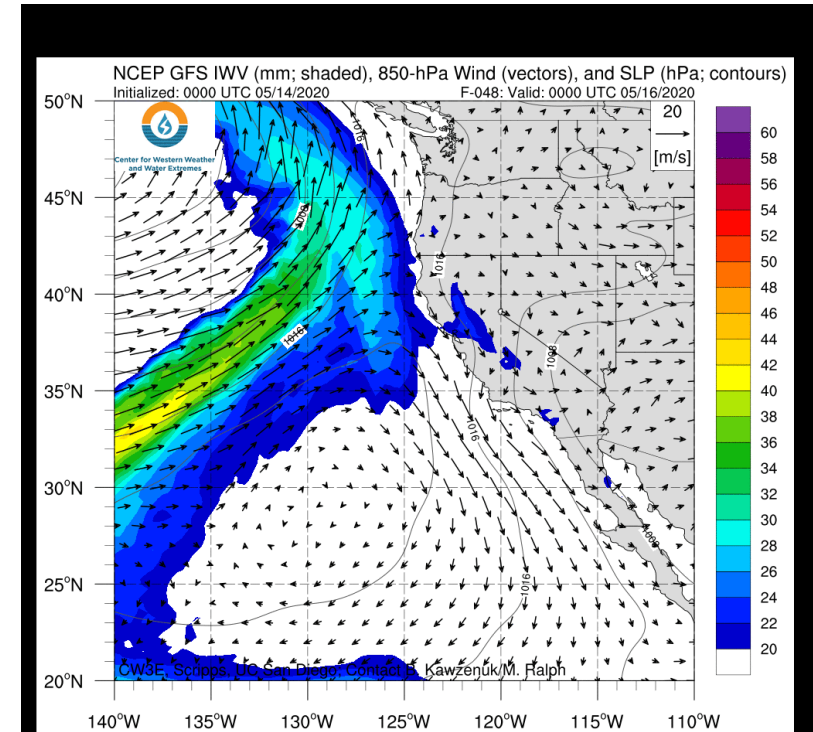
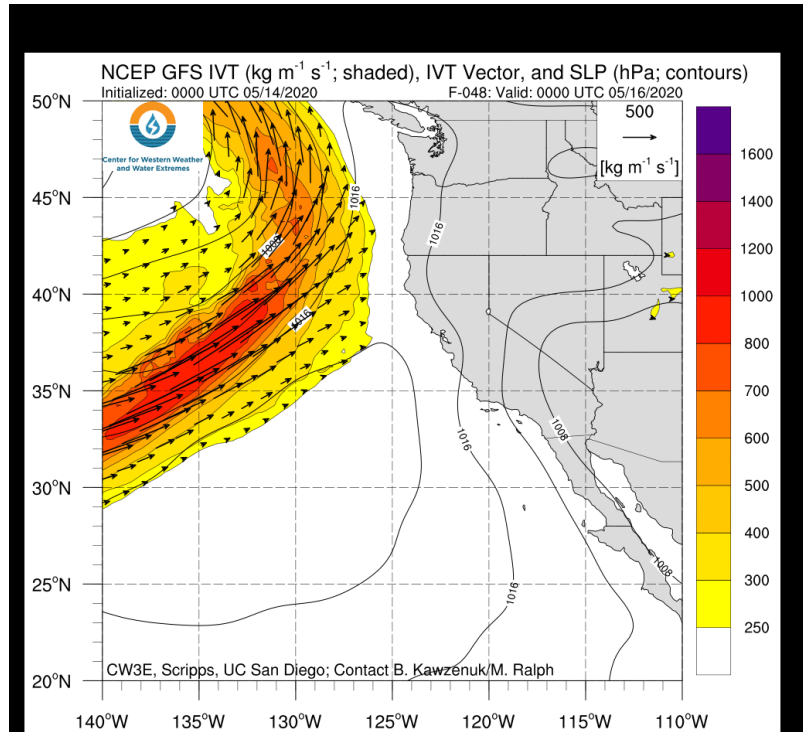




## A landfalling AR is expected to bring precipitation to portions of California, Oregon, and the interior Northwestern US

- An AR associated with a closed upper-level low is forecast to make landfall along the coast of Northern California and Oregon over the next couple of days
- Interior portions of the western U.S. are expected to experience AR conditions for more than 24 hours
- The highest precipitation amounts (2–5 inches) are forecast in the Oregon Cascades, the southern Oregon Coast Ranges, the Northern California Coast Ranges, the Klamath Mountains, and the Northern Sierra Nevada
- More than 2 inches of precipitation are also possible over the higher terrain in North Central Idaho and western Montana



# AR Outlook: 14 May 2020

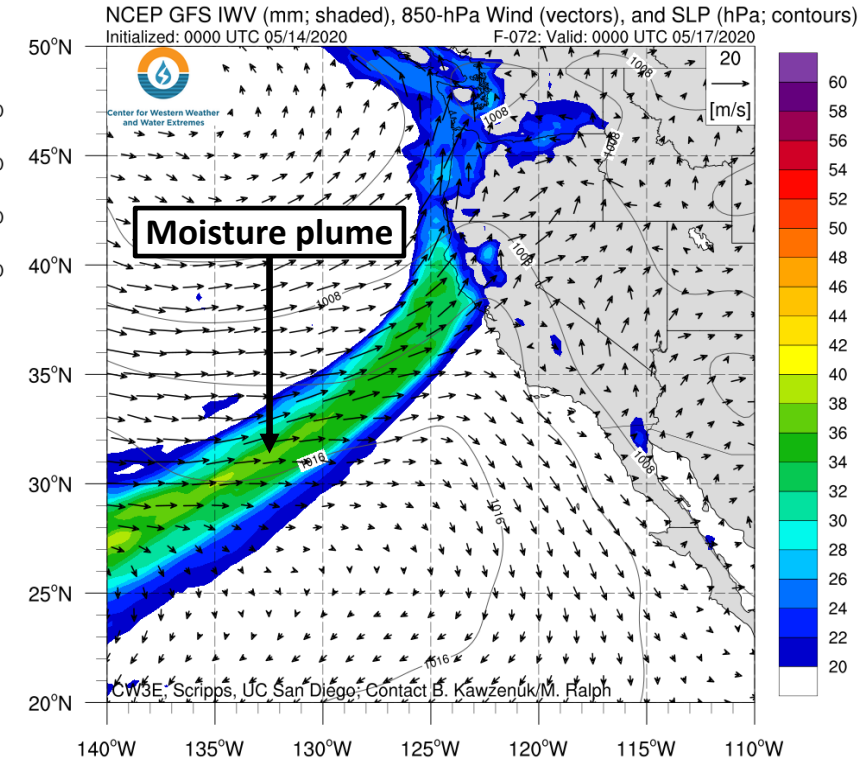
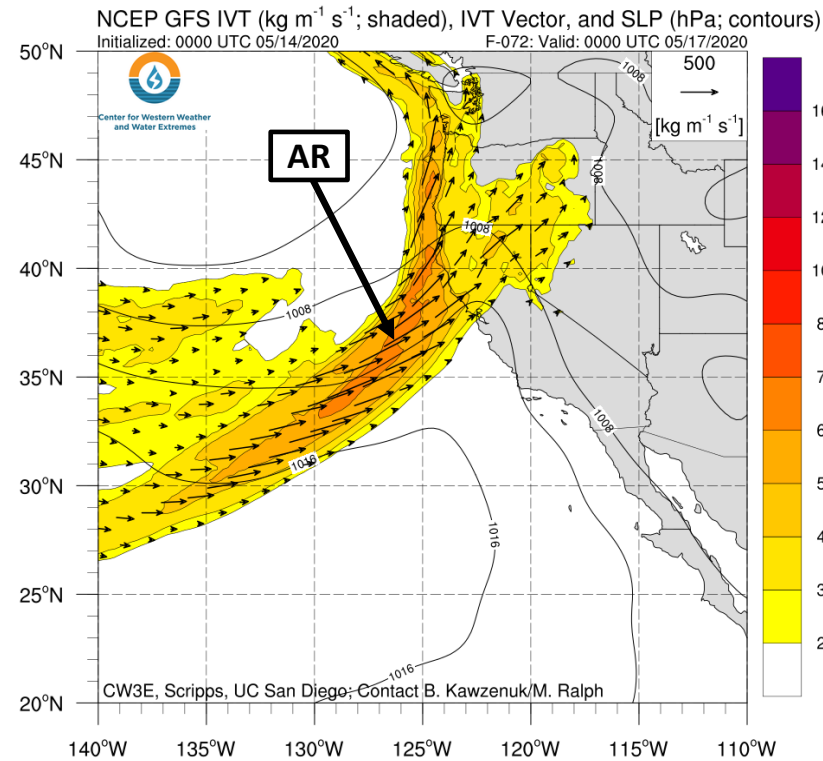
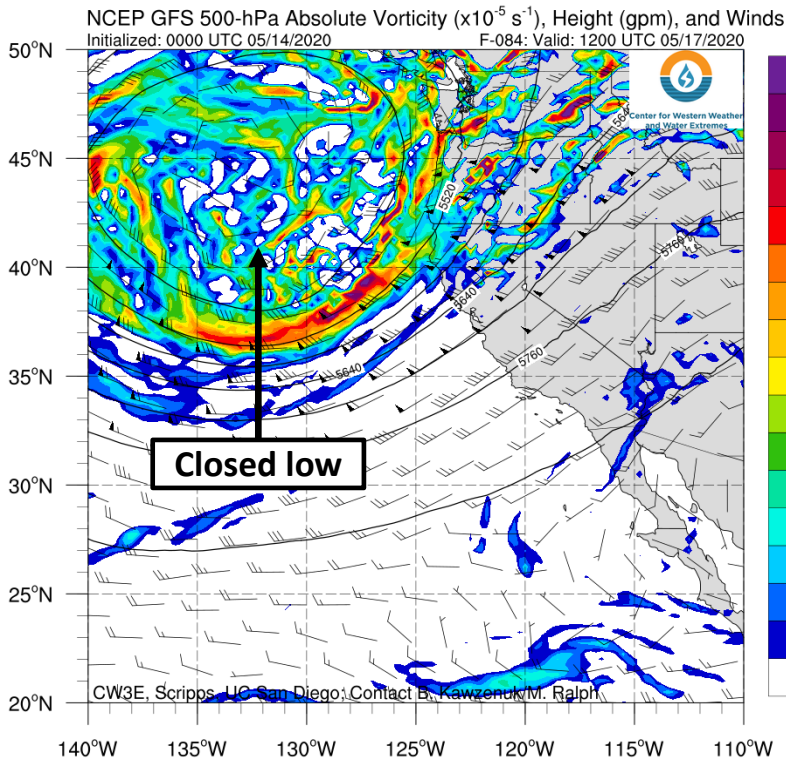
For California DWR's AR Program



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## GFS Forecasts: Valid 0000 UTC 17 May



- Over the next 72 hours, a large closed low south of Alaska will slowly move eastward toward the West Coast of North America
- An AR associated with the cutoff low is forecast to make landfall along the coast of Northern California and Oregon on 16 May
- This AR will be co-located with a long, narrow plume of moist air (IWV > 30 mm) extending from the subtropical Northeast Pacific Ocean (north of Hawaii)

# AR Outlook: 14 May 2020

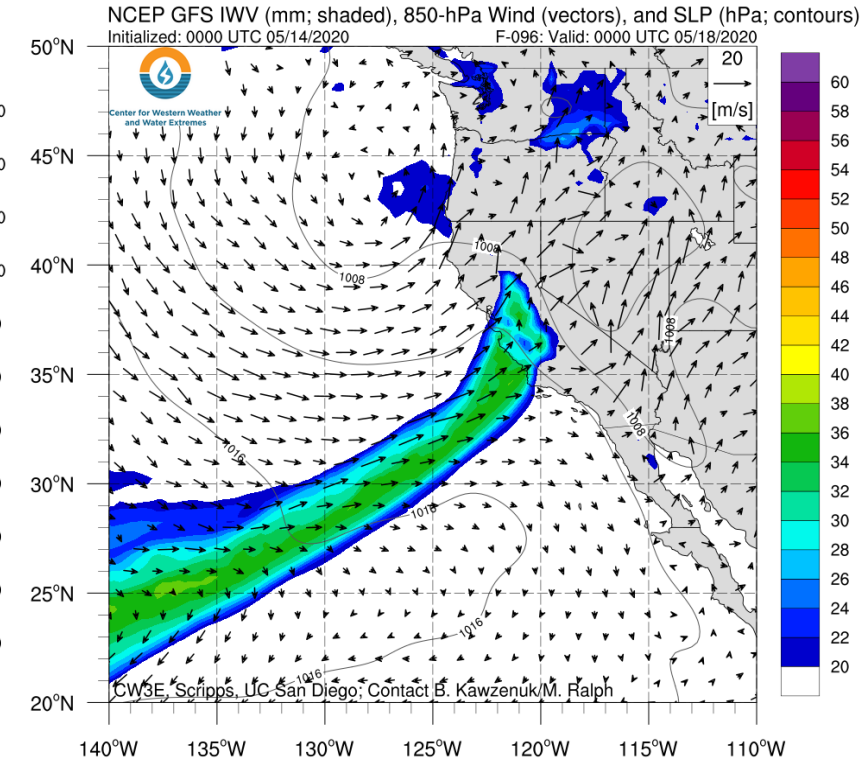
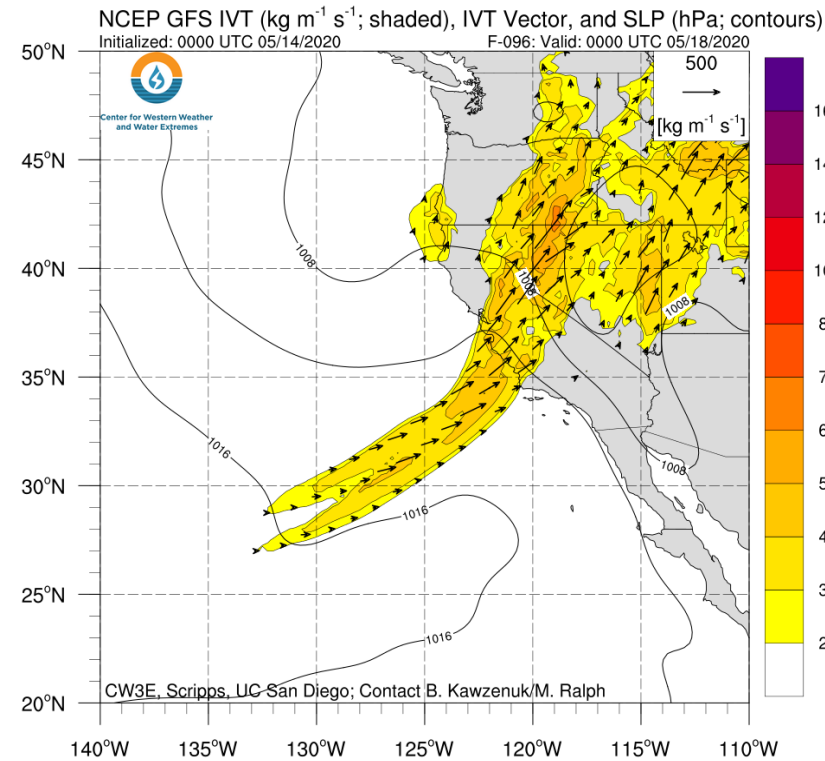
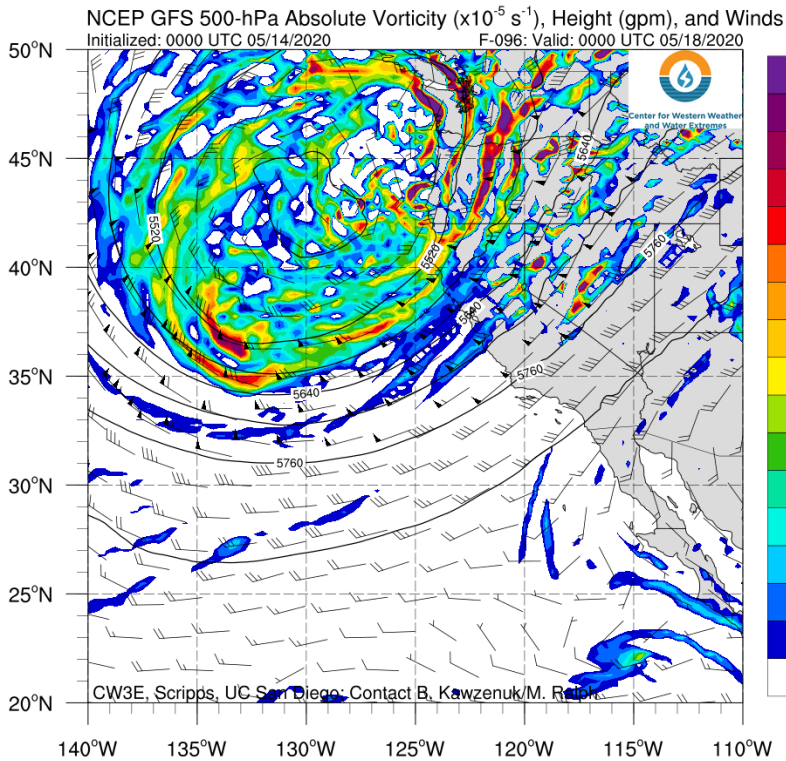
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## GFS Forecasts: Valid 0000 UTC 18 May



- As time progresses, the AR will propagate eastward and weaken, but high values of IVT ( $> 250 \text{ kg m}^{-1} \text{ s}^{-1}$ ) are forecast to persist over interior Oregon and Northern California, and spread across the Intermountain West
- Given the southwesterly orientation of the IVT vectors, upslope moisture flux will likely result in orographic enhancement of precipitation over the Northern Sierra and the Northern Rocky Mountains



# AR Outlook: 14 May 2020

For California DWR's AR Program

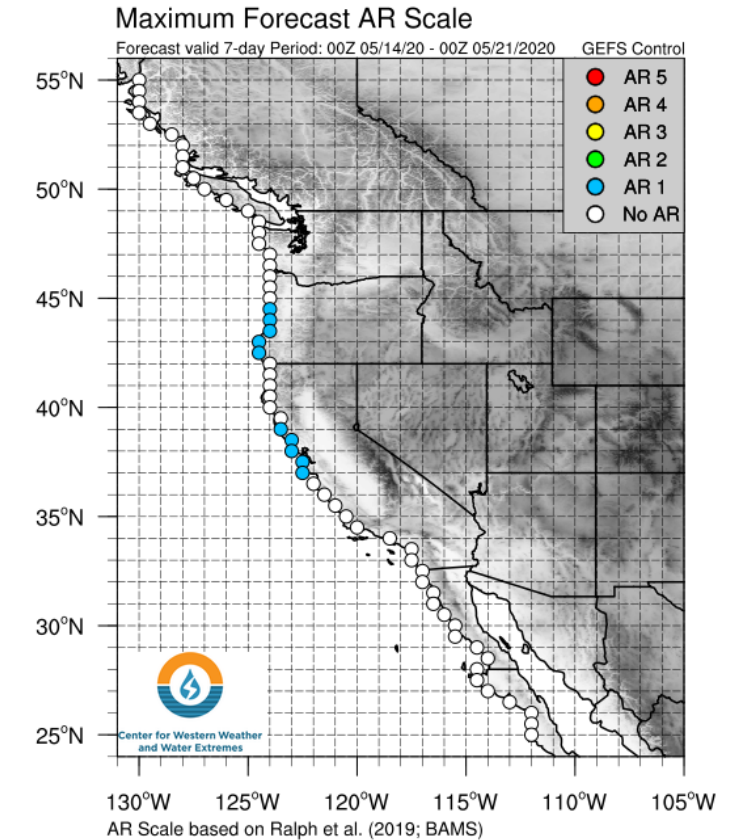
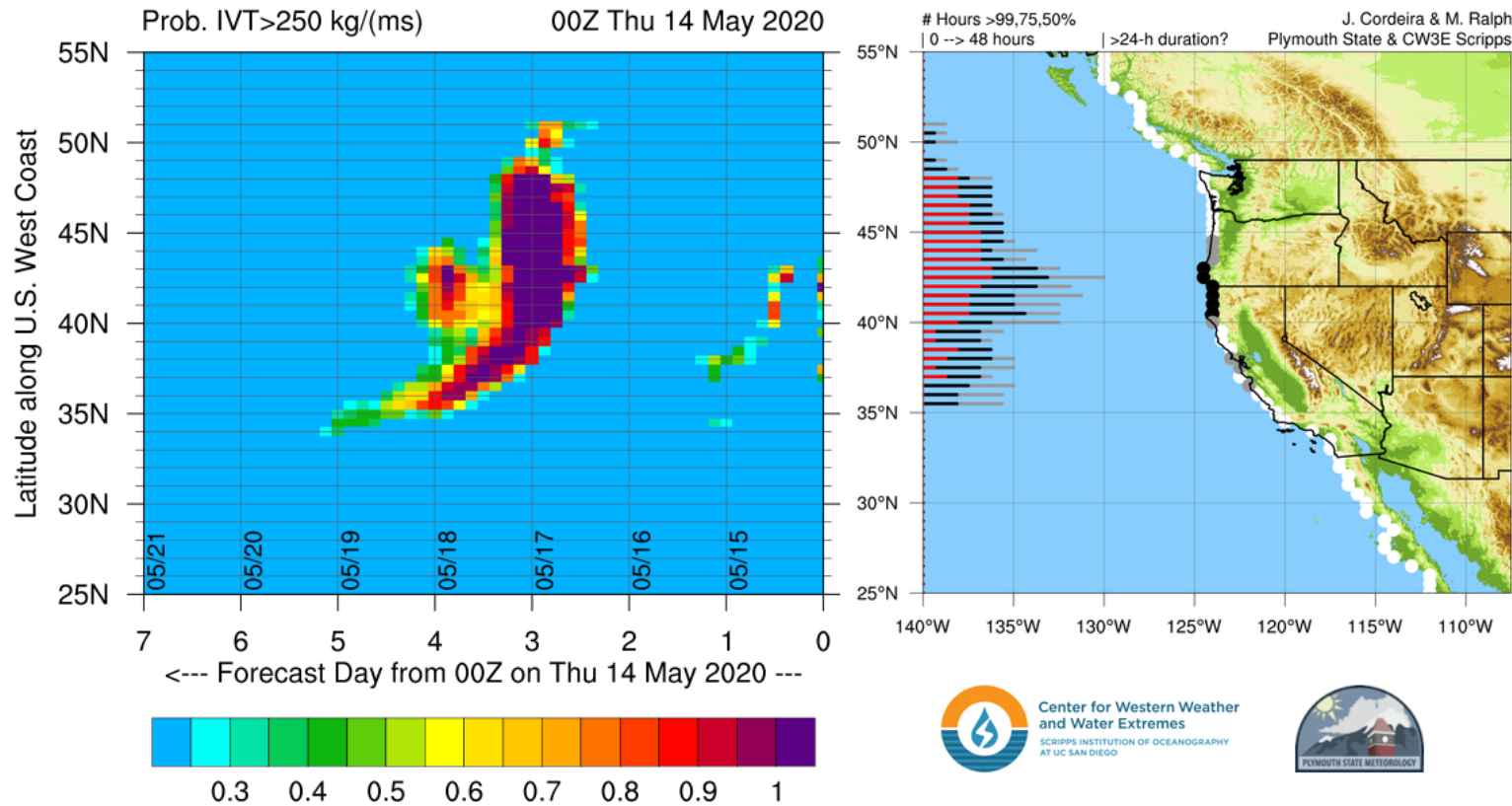


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## GEFS AR Landfall Probabilities & AR Scale (Coastal)

\*GEFS = Global Ensemble Forecast System



- Coastal AR landfall tool shows high confidence (> 90%) in a period of AR conditions ( $IVT \geq 250 \text{ kg m}^{-1} \text{ s}^{-1}$ ) along the U.S. West Coast between the San Francisco Bay Area and the Olympic Peninsula
- Although the period of AR conditions is expected to be relatively short-lived (< 24 hours), the GEFS control run is currently forecasting AR1 conditions over the Bay Area



# AR Outlook: 14 May 2020

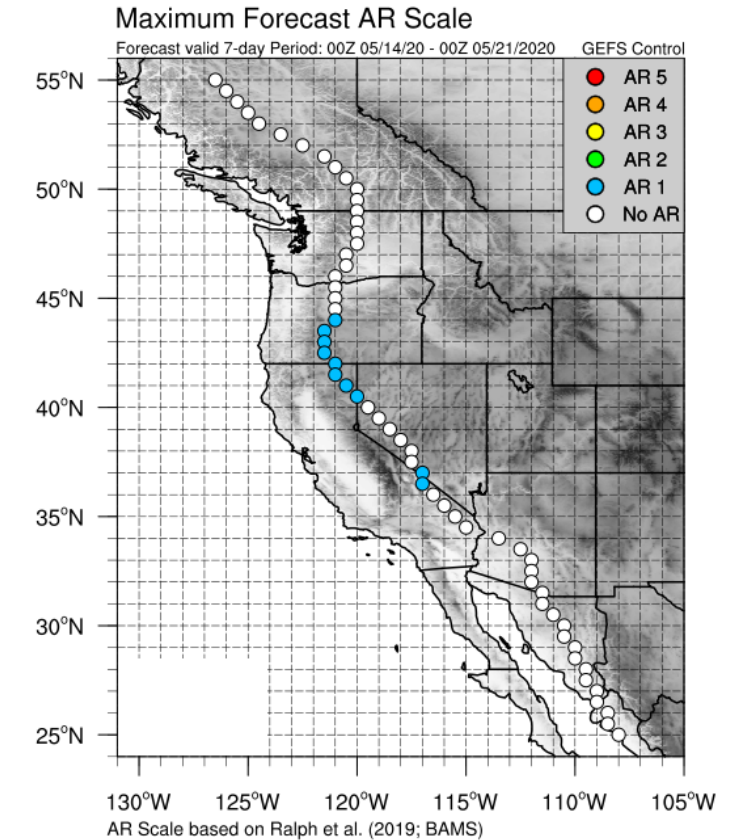
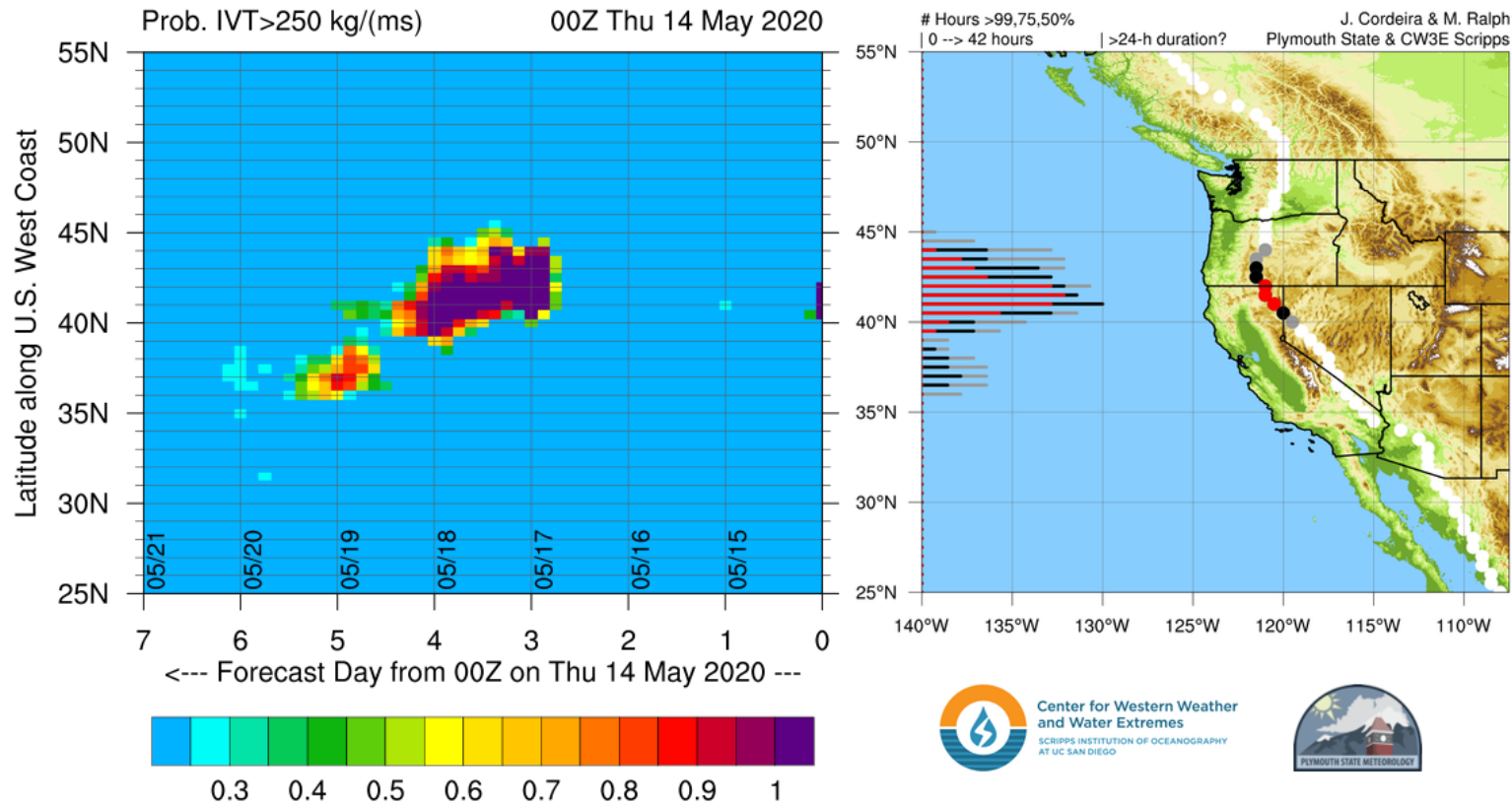
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## GEFS AR Landfall Probabilities & AR Scale (Inland)



- Inland AR landfall tool shows high confidence (> 90%) in the inland penetration of AR conditions ( $IVT \geq 250 \text{ kg m}^{-1} \text{ s}^{-1}$ ) over interior southern Oregon and northeastern California
- GEFS control run is currently forecasting AR1 conditions over these areas

# AR Outlook: 14 May 2020

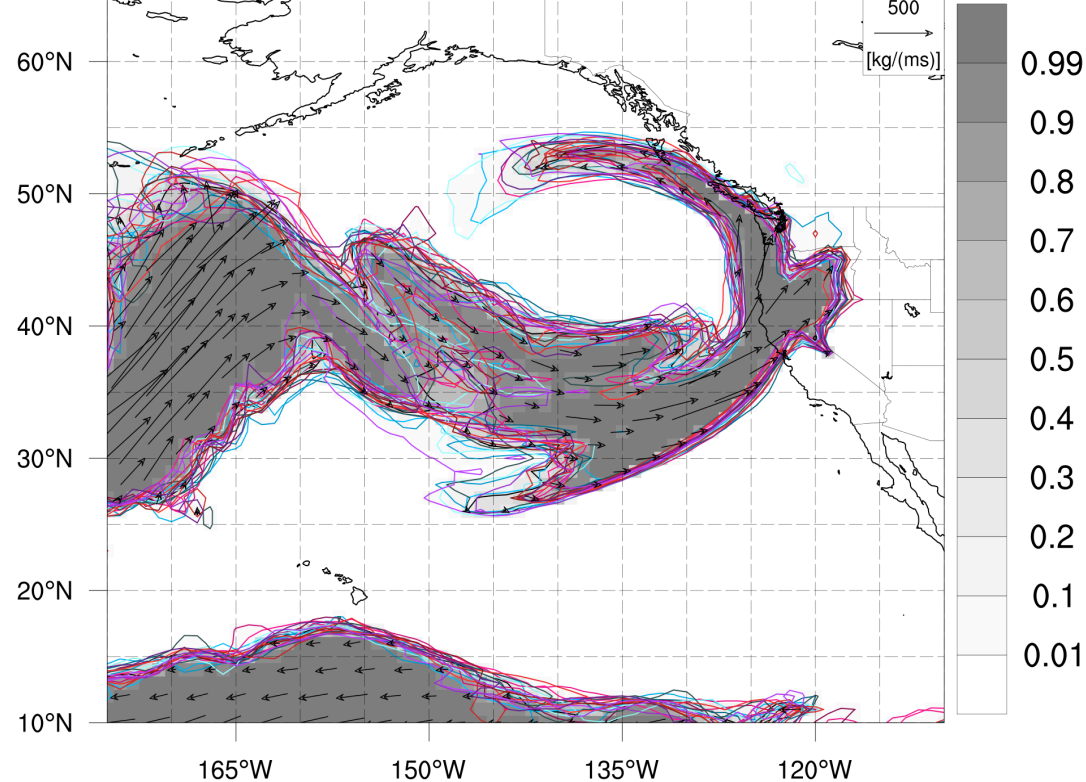
For California DWR's AR Program



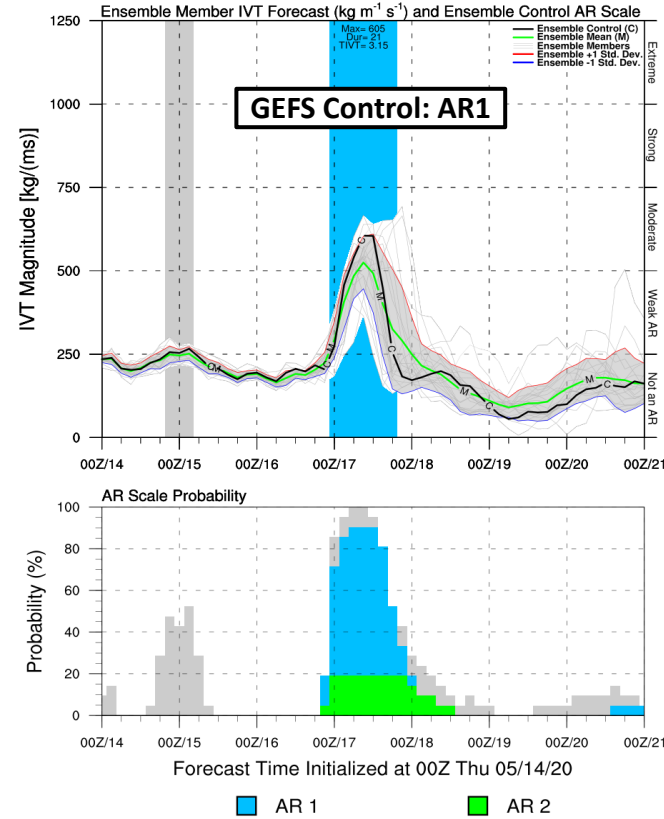
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## GEFS IVT Forecast Plumes

NCEP GEFS Prob IVT > 250 kg/(ms) + 250 kg/(ms) Contours  
 Initialized: 00Z Thu 05/14/20, Verifies: F+72h at 0Z Sun 05/17/20



GFS Ensemble Initialized: 00Z Thu 05/14/20



Location: 38°N 123°W

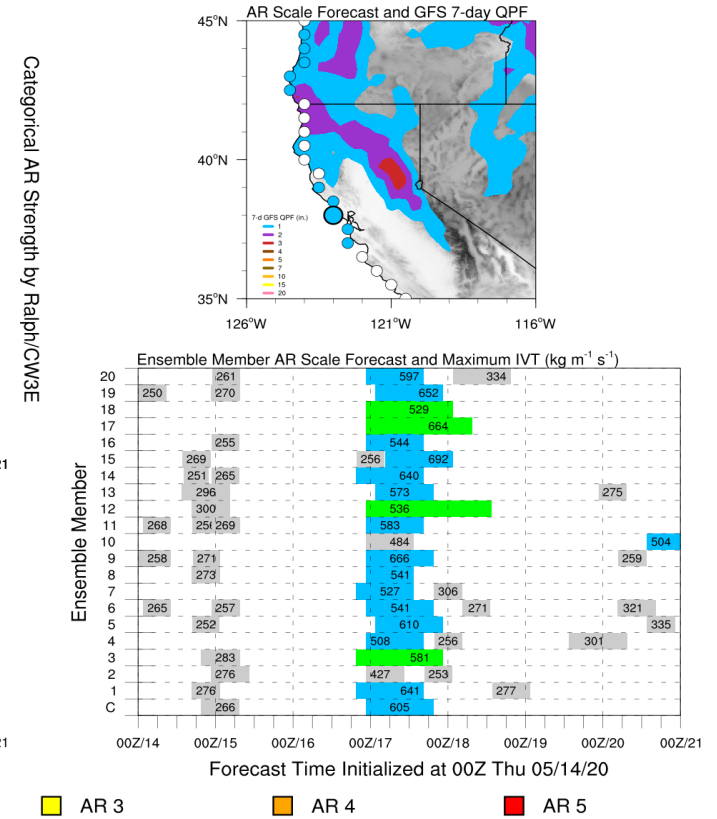


Image created: 09 UTC 05/14/2020

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

- 00Z 14 May GFS control run is forecasting AR1 conditions (max IVT = 605 kg m<sup>-1</sup> s<sup>-1</sup>; duration = 21 h) at 38°N, 123°W
- 15/21 (71%) GFS members are predicting AR1 conditions, but there is some uncertainty in the maximum IVT and duration of AR conditions

# AR Outlook: 14 May 2020

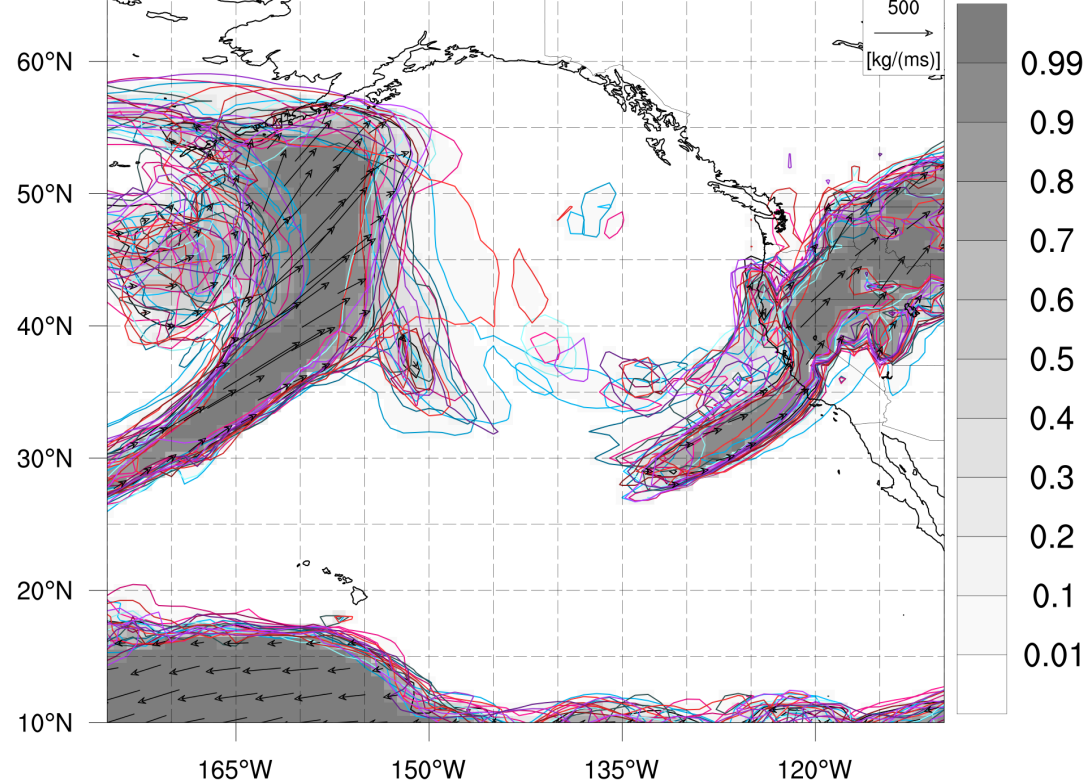
For California DWR's AR Program



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## GEFS IVT Forecast Plumes

NCEP GEFS Prob IVT > 250 kg/(ms) + 250 kg/(ms) Contours  
Initialized: 00Z Thu 05/14/20, Verifies: F+96h at 0Z Mon 05/18/20



GFS Ensemble Initialized: 00Z Thu 05/14/20

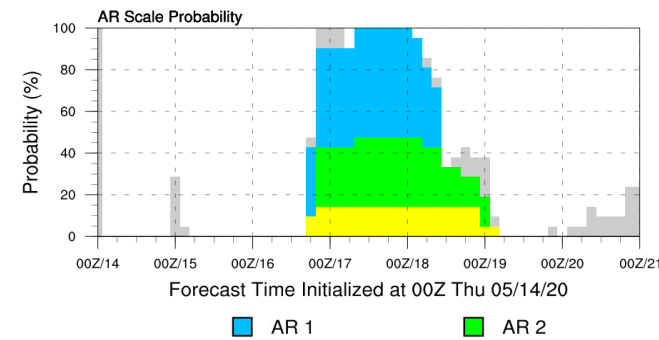
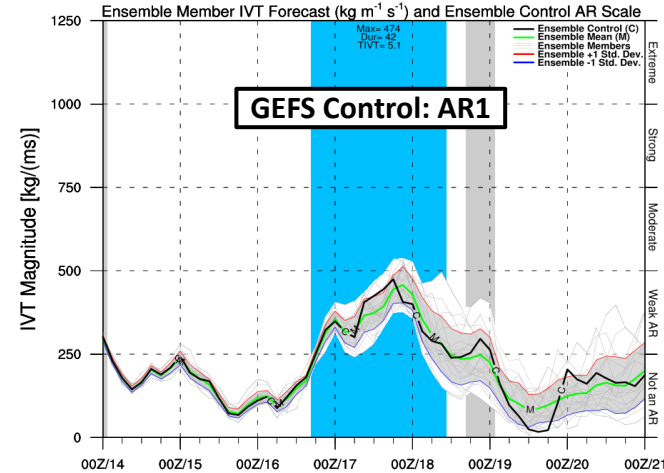
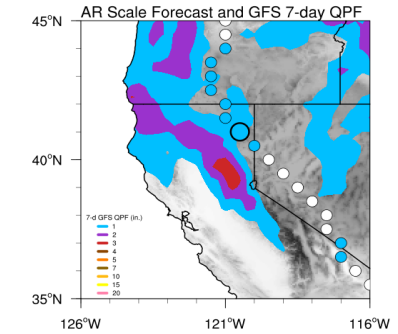
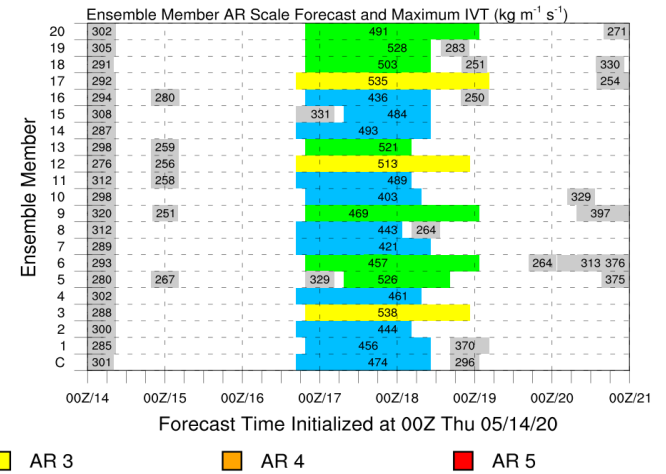


Image created: 09 UTC 05/14/2020

Location: 41°N 120.5°W



Categorical AR Strength by Ralph/CW3E



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

- 00Z 14 May GEFS control run is forecasting more than 24 hours of weak AR conditions [AR1 based on the *Ralph et al. (2019)* AR Scale] at 41°N, 120.5°W
- 10/21 (48%) of GEFS members are predicting AR2/AR3 conditions, with several members suggesting that AR conditions may persist for more than 48 hours

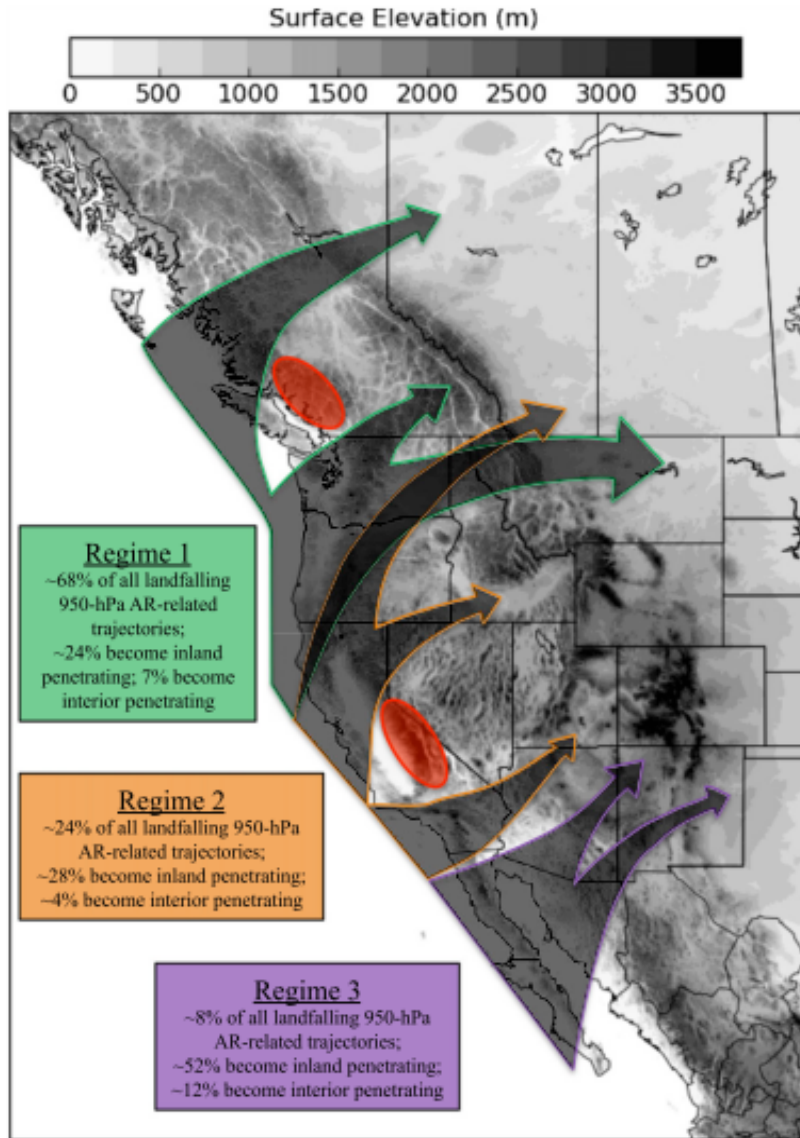


# AR Outlook: 14 May 2020

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## The Inland Penetration of Atmospheric Rivers over Western North America: A Lagrangian Analysis

J.J. Rutz, J. W. Steenburgh and F.M. Ralph  
*Mon. Wea. Rev.*, 2015

- Work by Rutz et al. 2015 identified that southwesterly oriented ARs that make landfall over the Mexican Baja are able to penetrate inland through gaps of lower terrain and bring AR conditions and impacts to Arizona
- While landfalling ARs are rare over the Mexican Baja compared to northern West Coast ARs, they tend to be more efficient at penetrating inland and impacting the Desert Southwestern States
- ~52% and ~12% of ARs that make landfall over the Mexican Baja become inland and interior penetrating respectively, a proportion much higher (~2 times more) than ARs that make landfall at higher latitudes along the North American coast (Regime 1; Green and Regime 2; Orange)

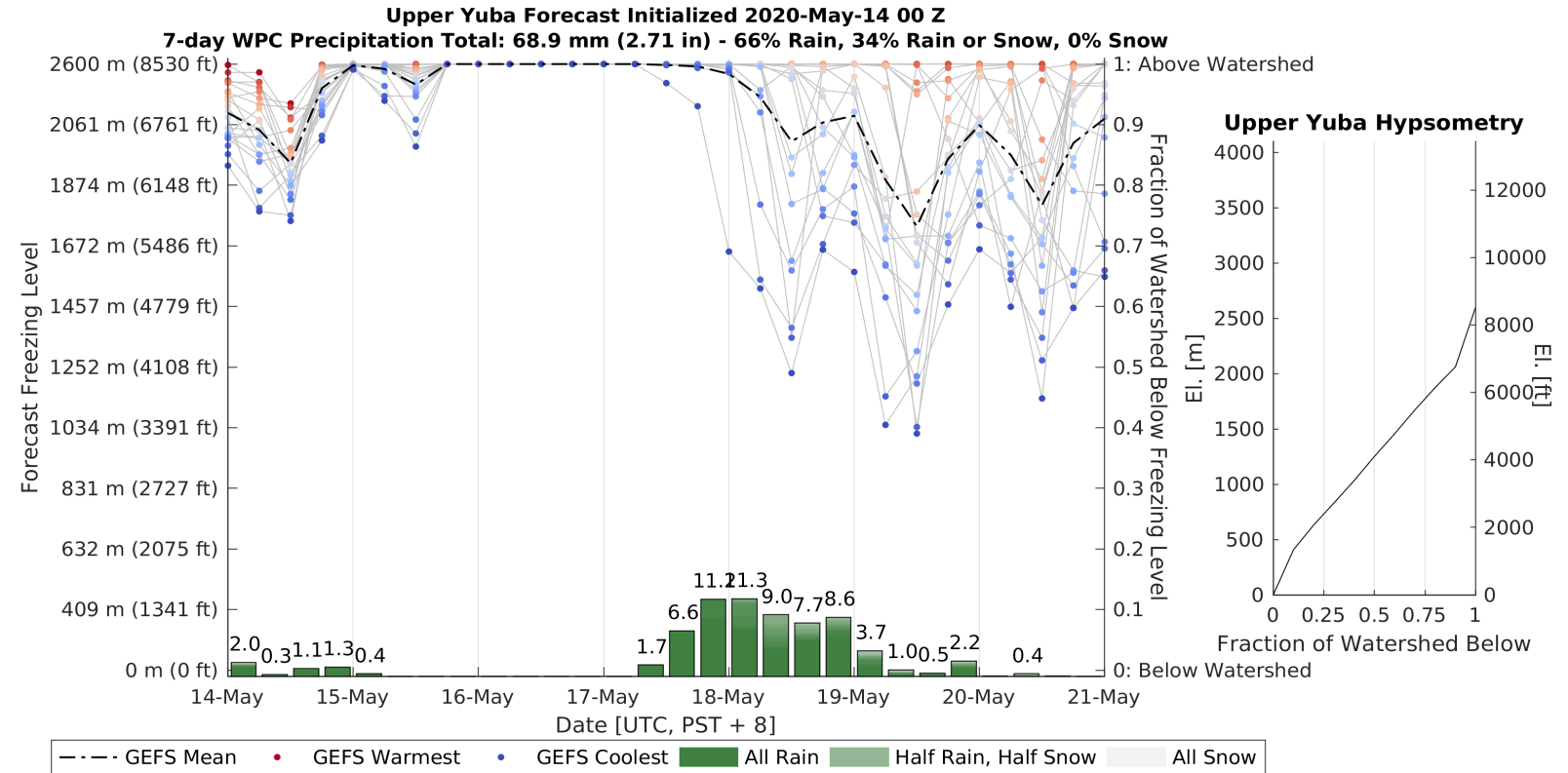
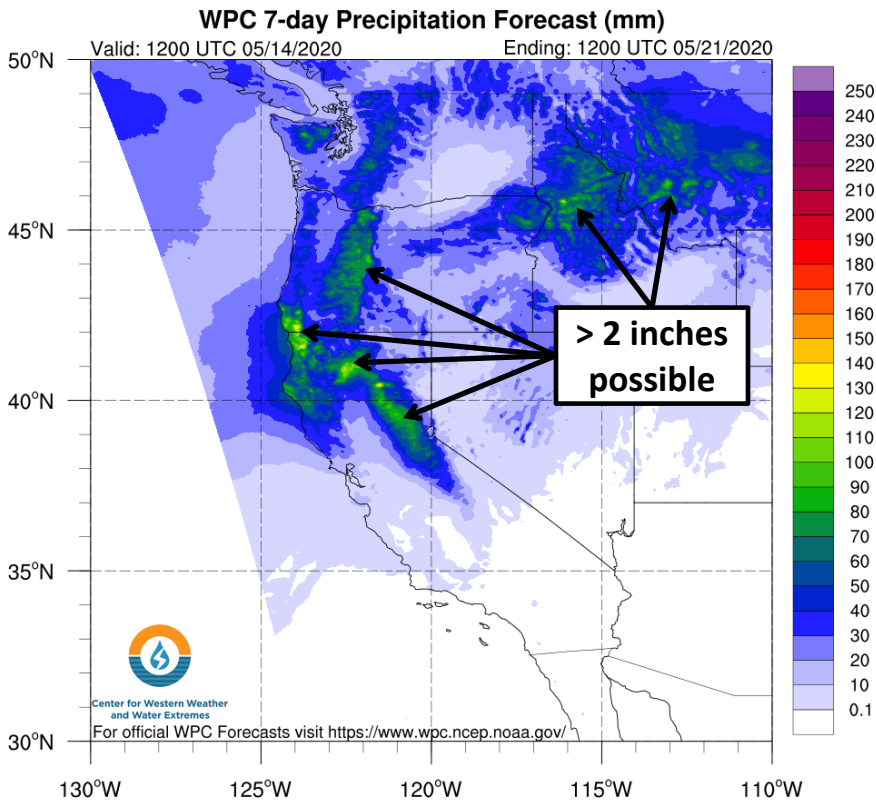
# AR Outlook: 14 May 2020

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- More than 2 inches of precipitation are possible in the Oregon Cascades, the southern Oregon Coast Ranges, the Northern California Coast Ranges, the Klamath Mountains, and the Northern Sierra Nevada over the next 7 days
- More than 2 inches of precipitation are also possible over the higher terrain in North Central Idaho and western Montana due to the inland penetration of AR conditions
- Given the high initial freezing levels, most of the precipitation falling within the watersheds on the western side of the Sierra Nevada will likely be in the form of rain rather than snow

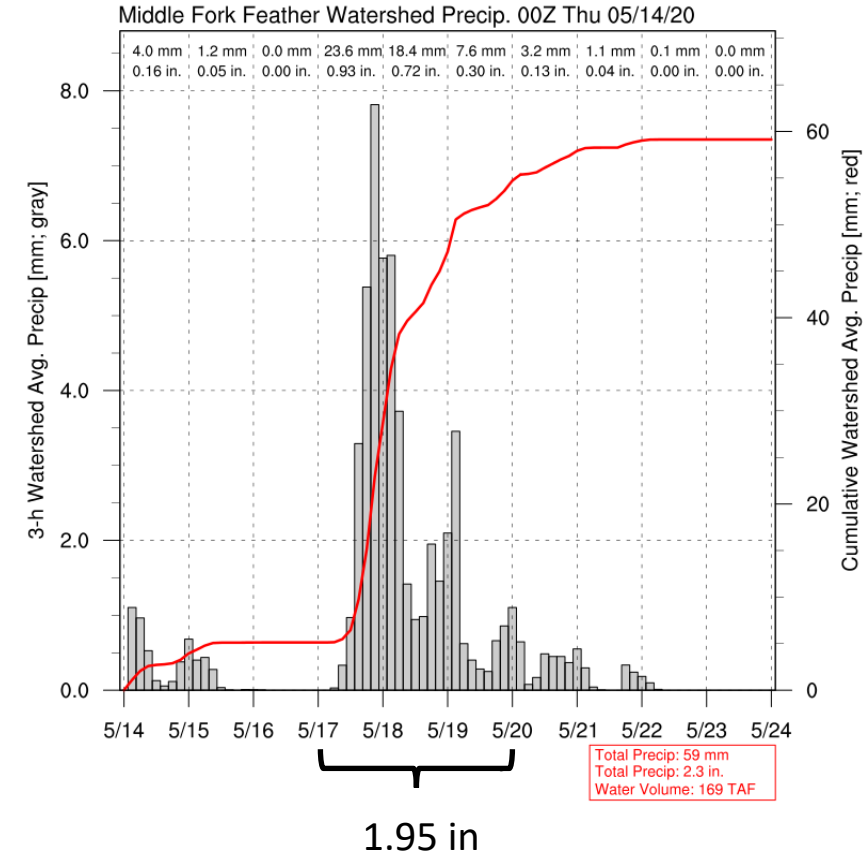
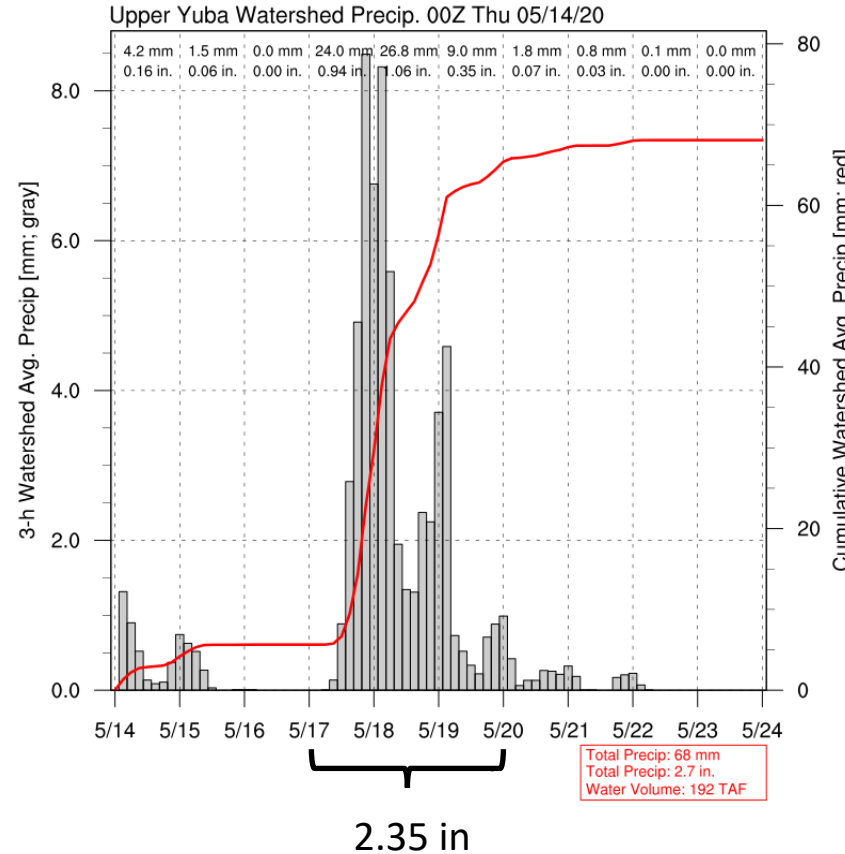
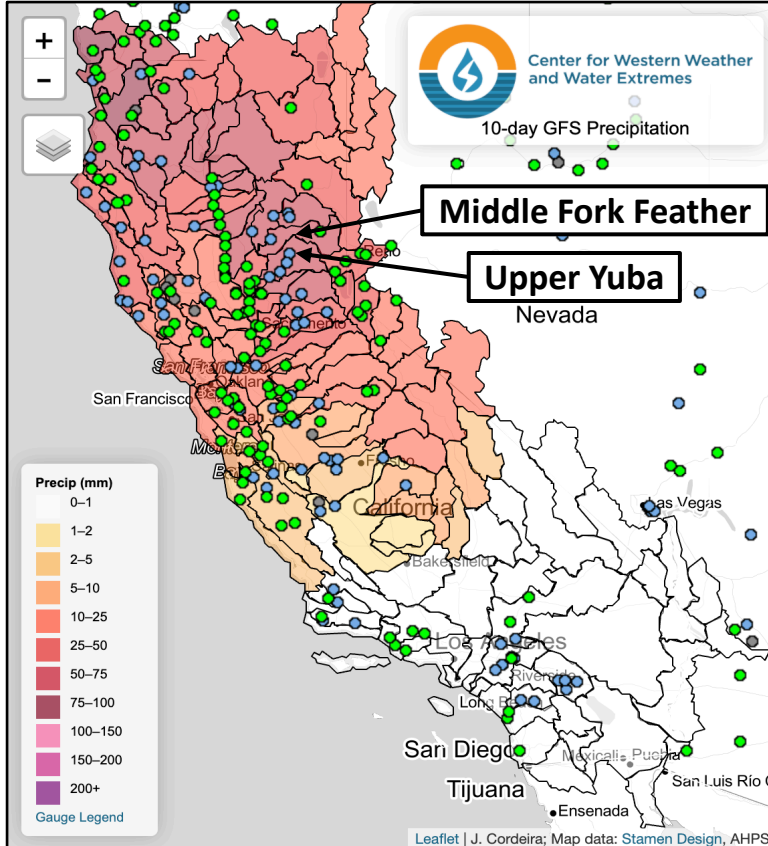
# AR Outlook: 14 May 2020

For California DWR's AR Program



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## GFS 10-day Watershed Precipitation Forecasts



- 00Z 14 May GFS run is forecasting 2.35 inches and 1.95 inches of areal mean precipitation, respectively, in the Upper Yuba and Middle Fork Feather watersheds between 0000 UTC 17 May and 0000 UTC 20 May



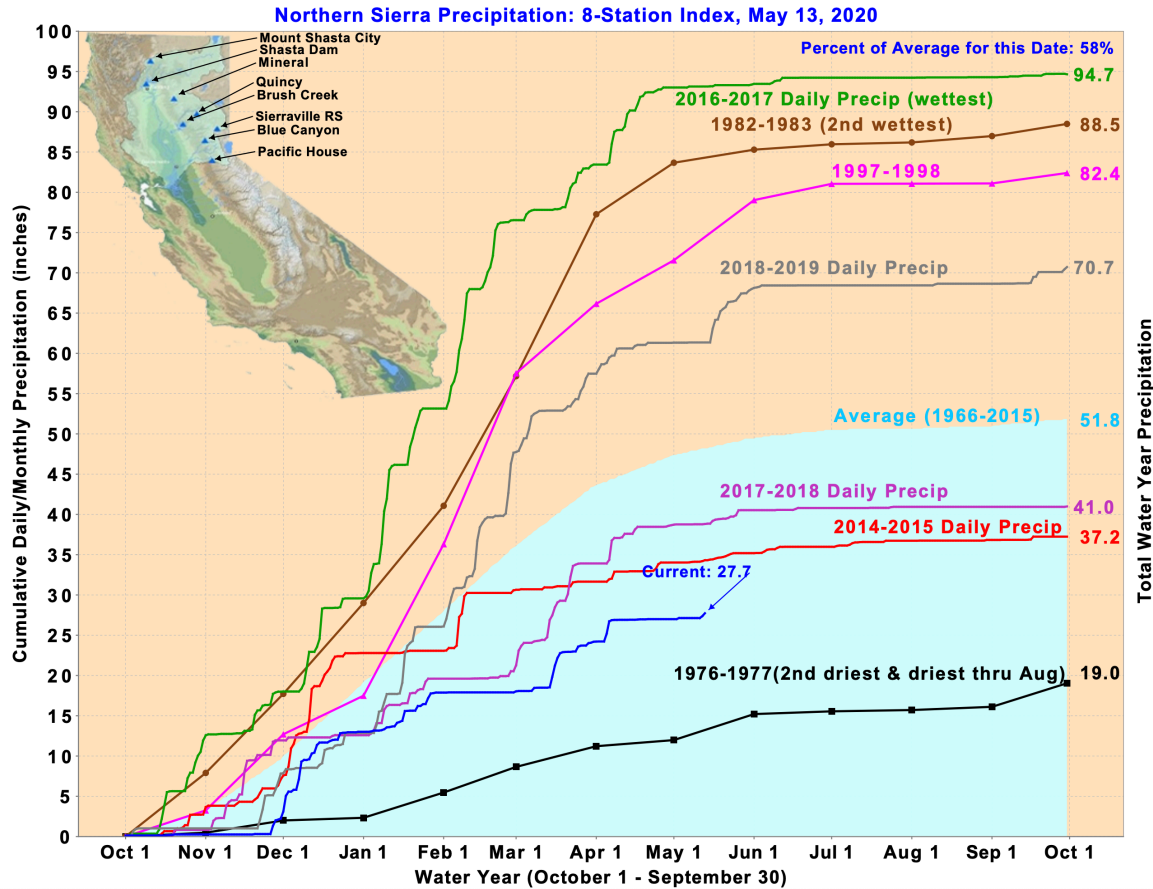
# AR Outlook: 14 May 2020

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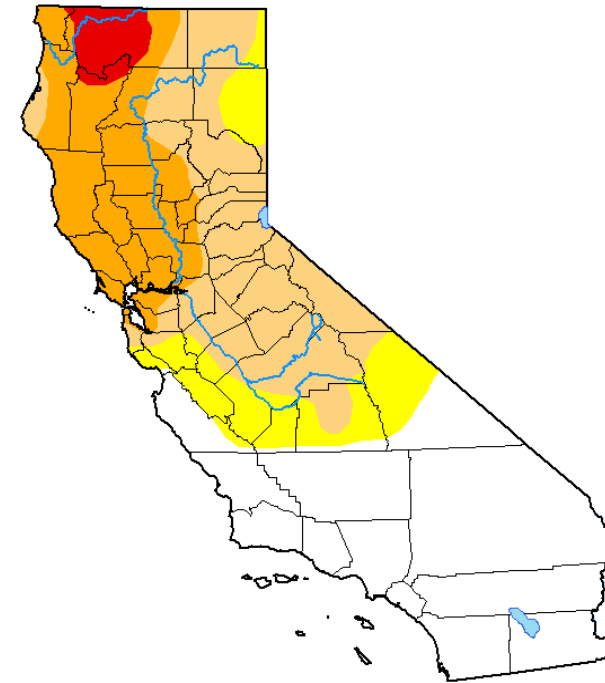


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## U.S. Drought Monitor California



**May 12, 2020**  
(Released Thursday, May 14, 2020)  
Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	41.80	58.20	46.67	20.84	2.99	0.00
<b>Last Week</b> 05-05-2020	41.80	58.20	42.87	19.56	3.94	0.00
<b>3 Months Ago</b> 02-11-2020	53.85	46.15	9.54	0.00	0.00	0.00
<b>Start of Calendar Year</b> 12-31-2019	96.43	3.57	0.00	0.00	0.00	0.00
<b>Start of Water Year</b> 10-01-2019	95.29	4.71	2.06	0.00	0.00	0.00
<b>One Year Ago</b> 05-14-2019	94.03	5.97	0.00	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:**

Richard Tinker  
CPC/NOAA/NWS/NCEP



[droughtmonitor.unl.edu](https://droughtmonitor.unl.edu)

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

- As of 13 May, the Northern Sierra 8-station precipitation index is significantly below normal (only 58% of normal water year-to-date)
- Much of the Central and Northern Sierra are currently under moderate drought conditions, while severe-to-extreme drought conditions have developed over northwestern California