

CW3E Atmospheric River Outlook

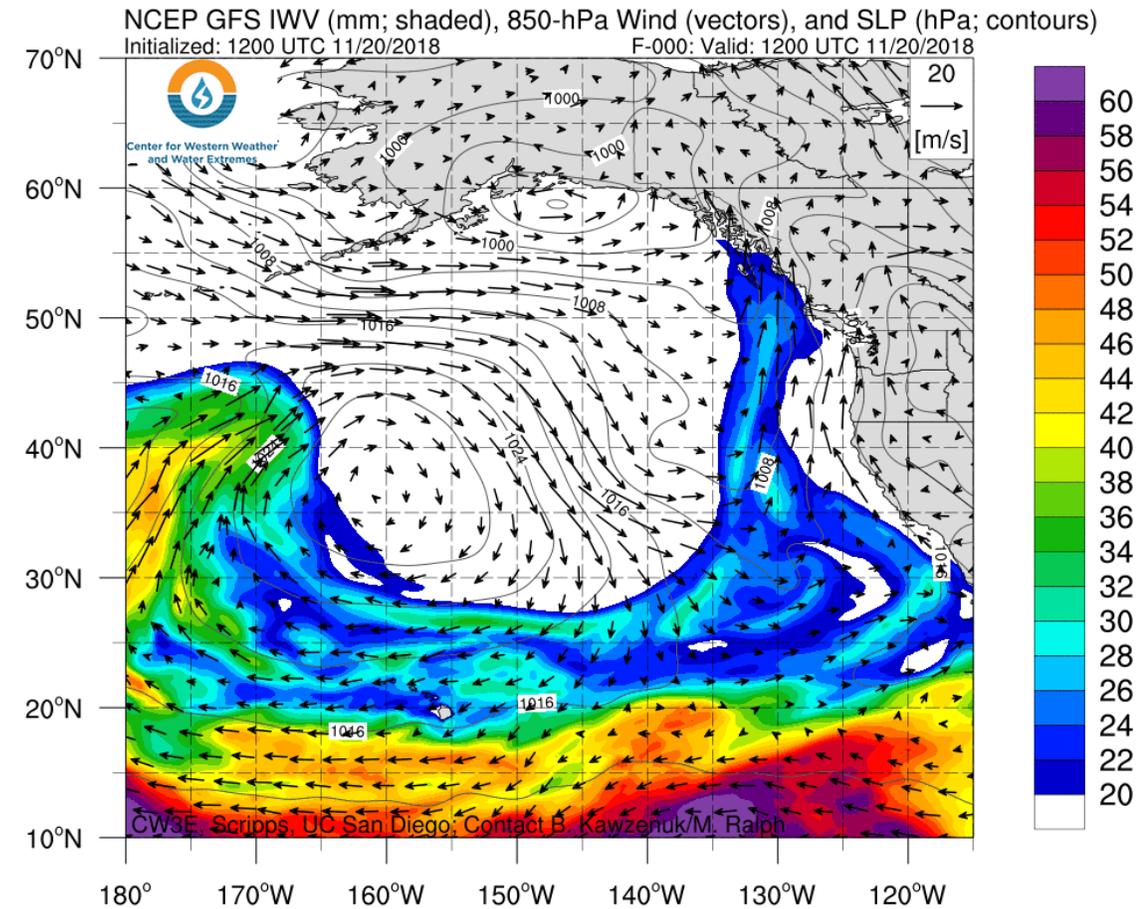
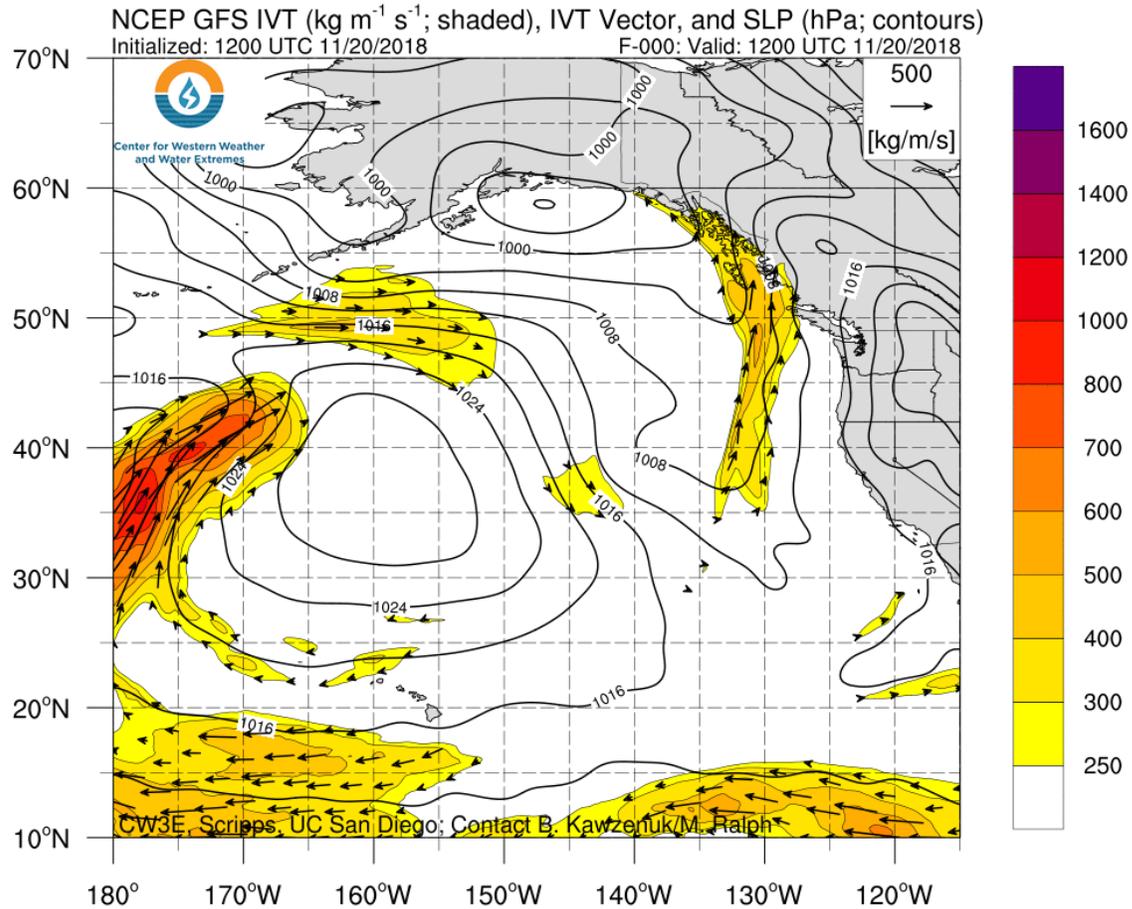
For California DWR's AR Program



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AT UC SAN DIEGO

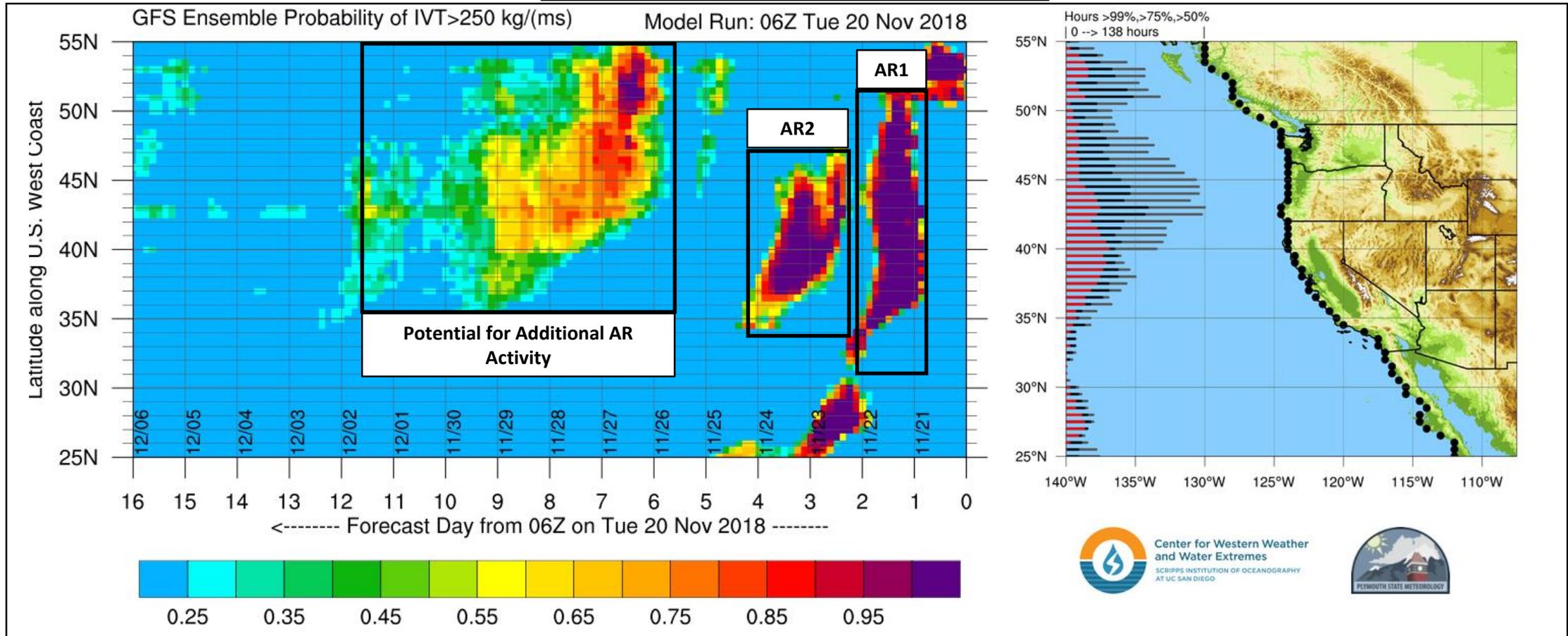
Update on the ARs forecast to Impact California this Week

- Forecast confidence within the GEF5 has continued to increase for the two ARs forecast to impact CA over next few days
- There is potential for development of a mesoscale frontal wave associated with AR 2, which could lead to stalling of the AR
- NOAA WPC 1–3 day precipitation forecasts are as high as 5–7 inches over the N. CA Coastal Mountains and N. Sierra
- While precipitation will bring relief from the currently active fires and smoke across California, there is the potential for high precipitation rates, which are conducive to the triggering of debris flows





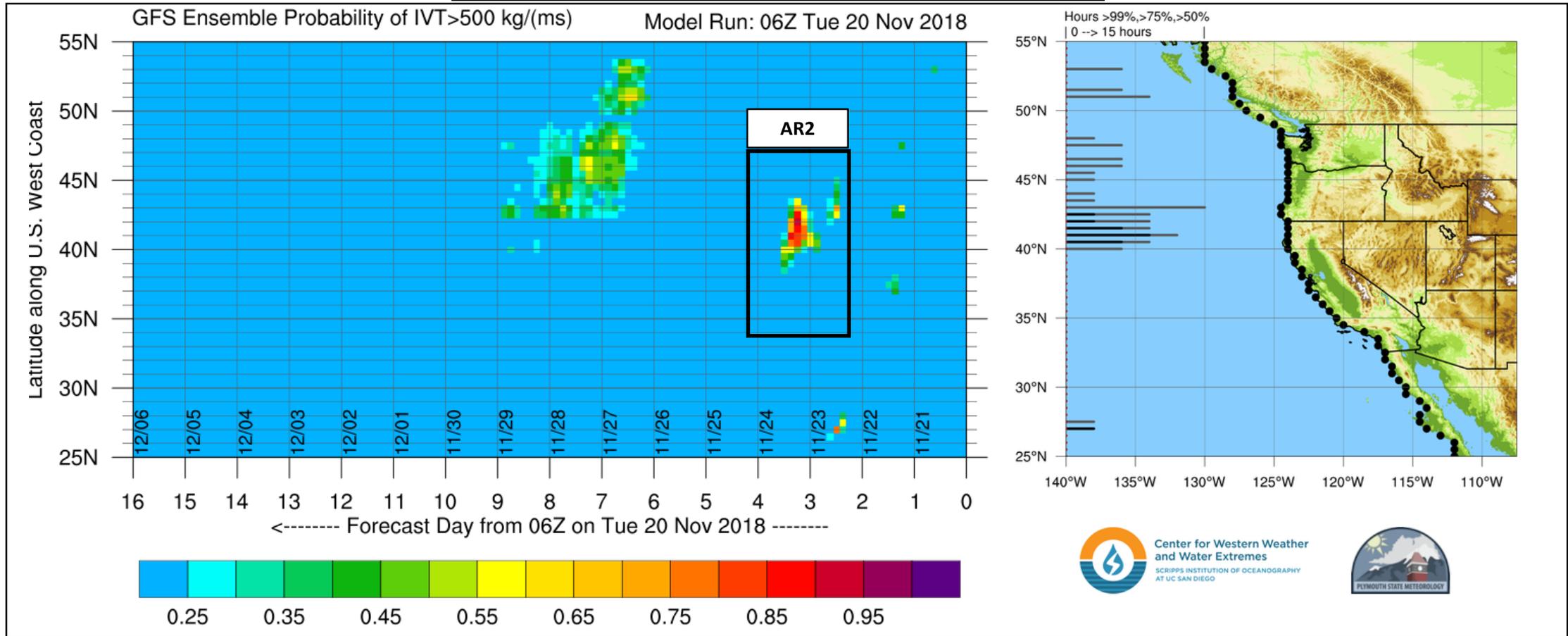
Odds of AR Conditions Along Coast



- Forecast confidence of AR conditions over the Coast have continued to increase within both AR 1 and AR 2
- AR 2 will likely be associated with a longer duration of AR conditions but will impact less area along the coast than AR 1
- More ensemble members (55–95%) are suggesting that there will be AR activity between 11/26 and 11/30 over the Pacific Northwest and Northern California



Odds of Moderate AR Conditions Along Coast



- The GFS Ensemble is currently predicting a ~85% chance of moderate AR conditions (IVT 500–750 kg m⁻¹ s⁻¹) between 40°N and 44°N for 3–12 hours in association with AR 2 between 6Z (10 PM PT on 22nd) and 18Z (10 AM PT) on the 23rd of November

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Forecast confidence in onset, duration, and magnitude of AR conditions has continued to increase since yesterday's outlook

Magnitude of Potential AR 1 (21 November)

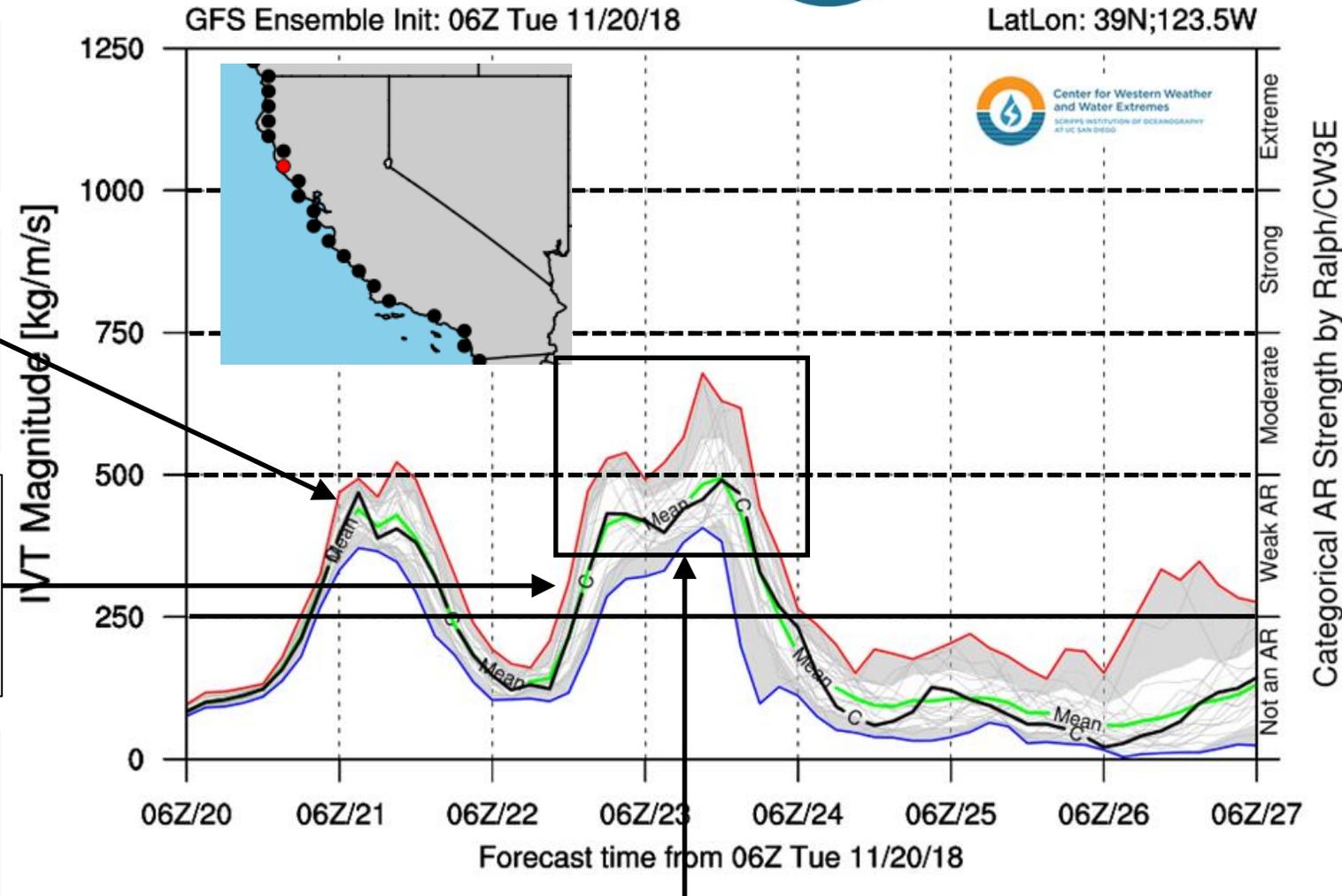
- Maximum predicted IVT $\sim 510 \text{ kg m}^{-1} \text{ s}^{-1}$
- Mean IVT $\sim 450 \text{ kg m}^{-1} \text{ s}^{-1}$
- Minimum IVT $\sim 350 \text{ kg m}^{-1} \text{ s}^{-1}$

Magnitude of Potential AR 2 (23 November)

- Maximum predicted IVT $\sim 700 \text{ kg m}^{-1} \text{ s}^{-1}$
- Mean IVT $\sim 500 \text{ kg m}^{-1} \text{ s}^{-1}$
- Minimum IVT $\sim 400 \text{ kg m}^{-1} \text{ s}^{-1}$

Forecast Duration of AR Conditions

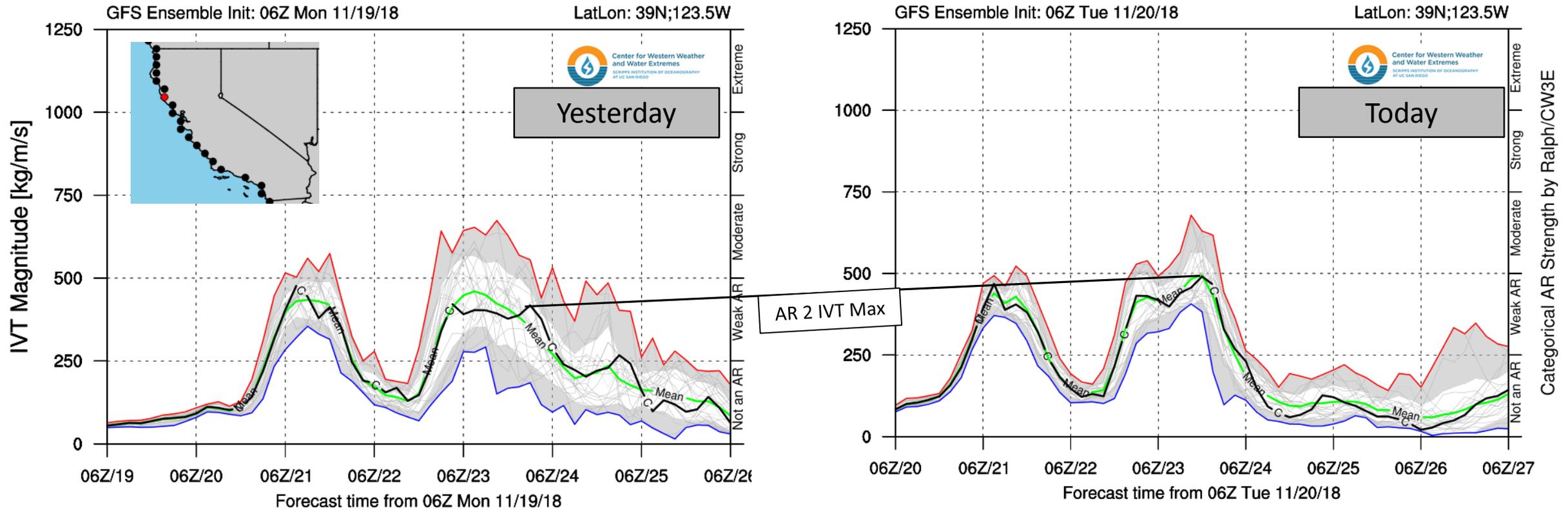
- AR 1 18 hours \pm 6
- AR 2 36 hours \pm 12



- Multiple maxima of IVT magnitudes within AR 2 suggest the potential for a mesoscale frontal wave
- Forecast confidence is lower within the second pulse of IVT



Changes in GFS Ensemble IVT Forecast



Changes in forecast IVT since last outlook:

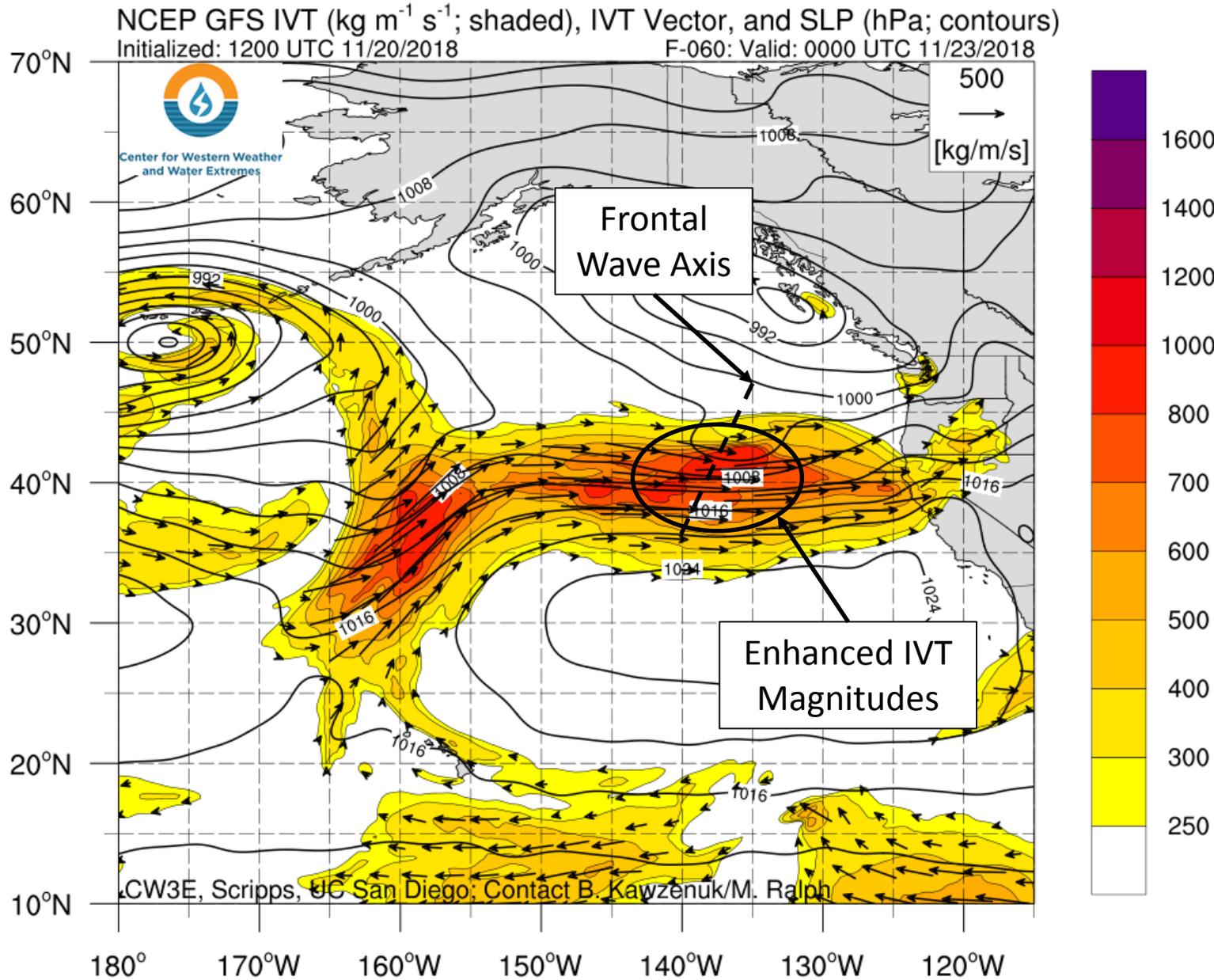
- Little to no change in the control forecast IVT associated with AR 1
- Ensemble members have converged closer to the control forecast within AR 1
- Control forecast IVT magnitude has increased to $\sim 500 \text{ kg m}^{-1} \text{ s}^{-1}$, $\sim 20\%$ increase, within AR 2
- Presence of a second IVT maxima within AR 2 is now present in ensemble mean (only seen in control yesterday)

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The GFS is suggesting the development of a frontal wave during AR 2, which would potentially result in a second pulse of IVT leading to longer duration of AR conditions but less forecast confidence of AR magnitude and duration

This second pulse of higher IVT magnitudes is forecast to make landfall at ~9Z (1 AM) on 23 November over Southern OR and Northern California

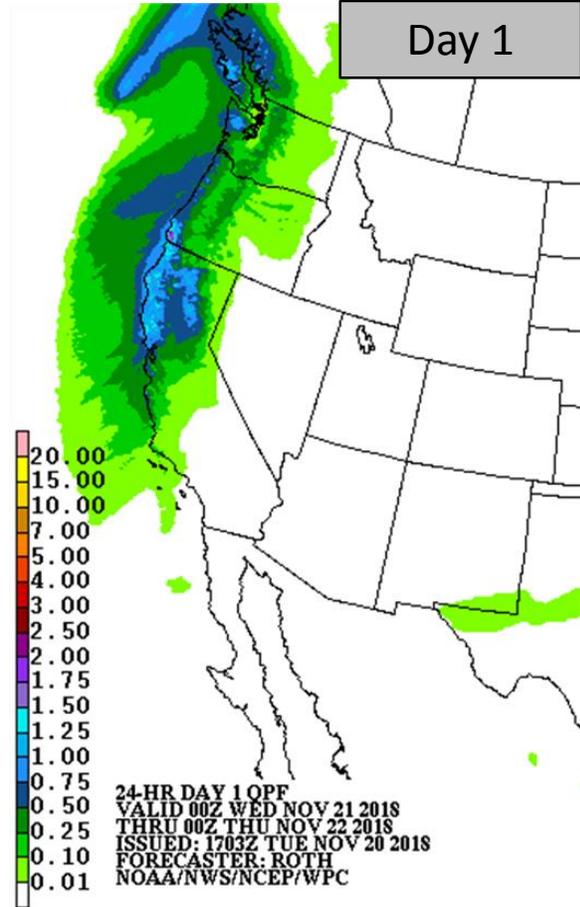
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NOAA WPC QPF available at wpc.ncep.noaa.gov



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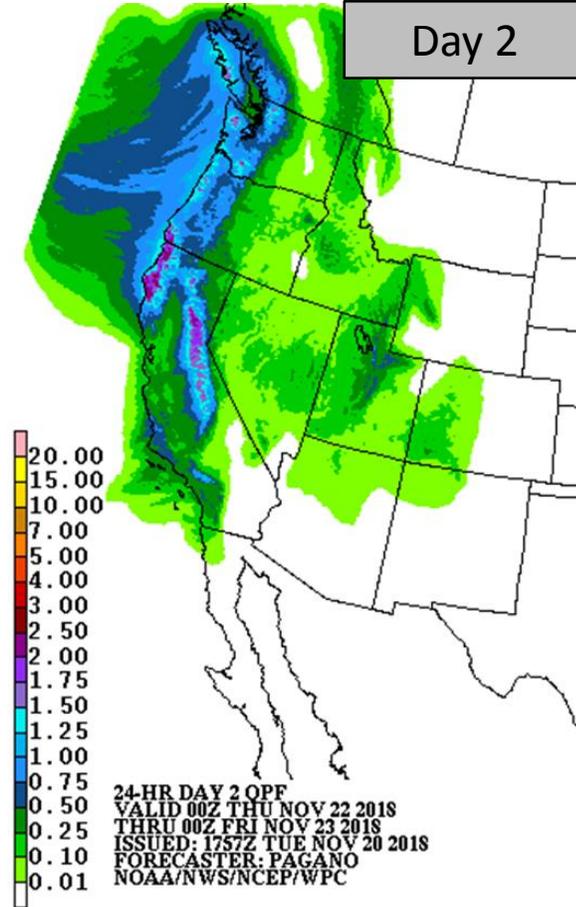
Day 1



24-HR DAY 1 QPF
VALID 00Z WED NOV 21 2018
THRU 00Z THU NOV 22 2018
ISSUED: 1703Z TUE NOV 20 2018
FORECASTER: ROTH
NOAA/NWS/NCEP/WPC

Precip. forecasts for day 1 (AR 1) range from .75–1.5 in. over North-Coastal CA/OR to .5–1 in. over the Northern Sierra and Bay Area

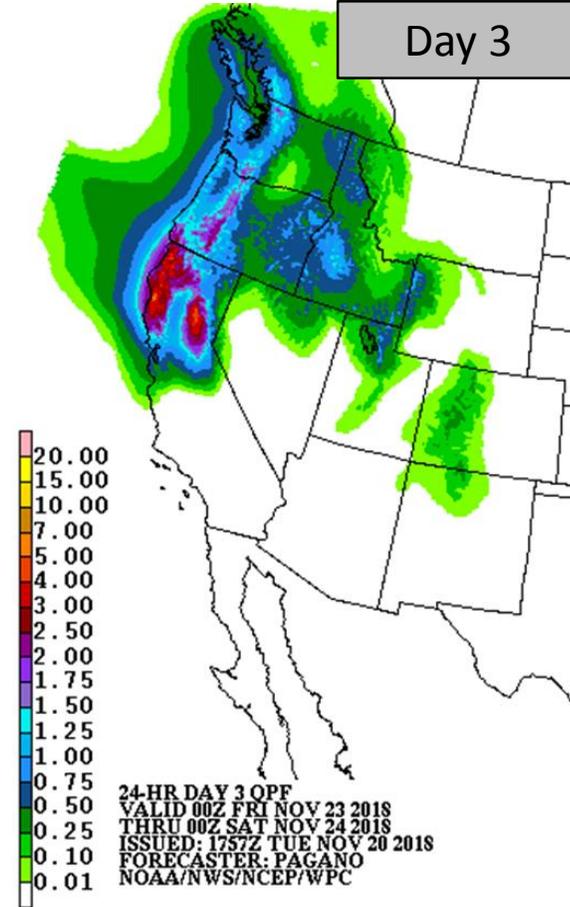
Day 2



24-HR DAY 2 QPF
VALID 00Z THU NOV 22 2018
THRU 00Z FRI NOV 23 2018
ISSUED: 1757Z TUE NOV 20 2018
FORECASTER: PAGANO
NOAA/NWS/NCEP/WPC

Precip. forecasts for day 2 (AR 1 and 2) range from .5–2 in. over the Coastal and Sierra Mts. . To .1–.75 over SoCal

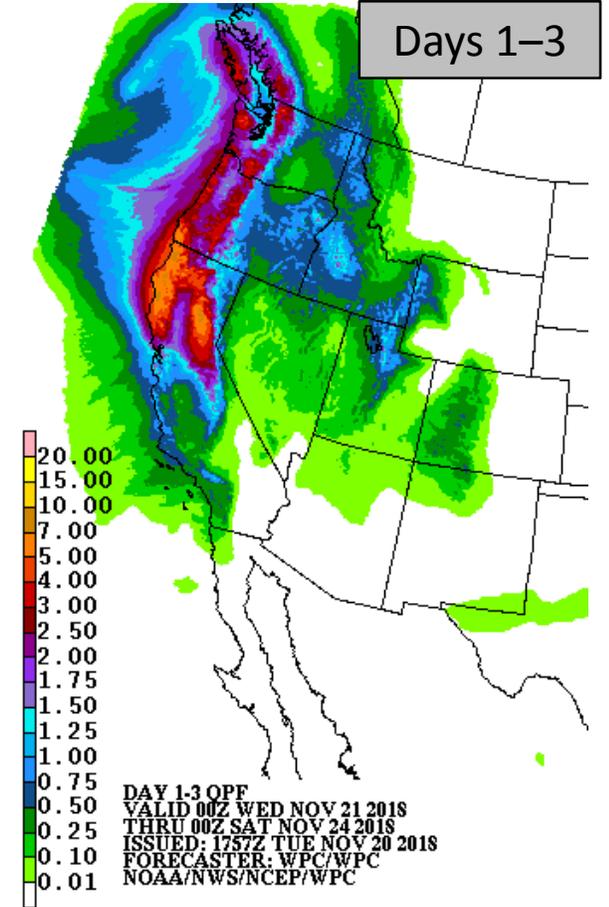
Day 3



24-HR DAY 3 QPF
VALID 00Z FRI NOV 23 2018
THRU 00Z SAT NOV 24 2018
ISSUED: 1757Z TUE NOV 20 2018
FORECASTER: PAGANO
NOAA/NWS/NCEP/WPC

Forecast precip. for day 3 (AR 2) range from 1.5–3 inches over the Northern CA Coast Range, Trinity Alps, And Sierra-Nevada Mts.

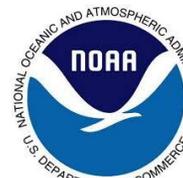
Days 1–3



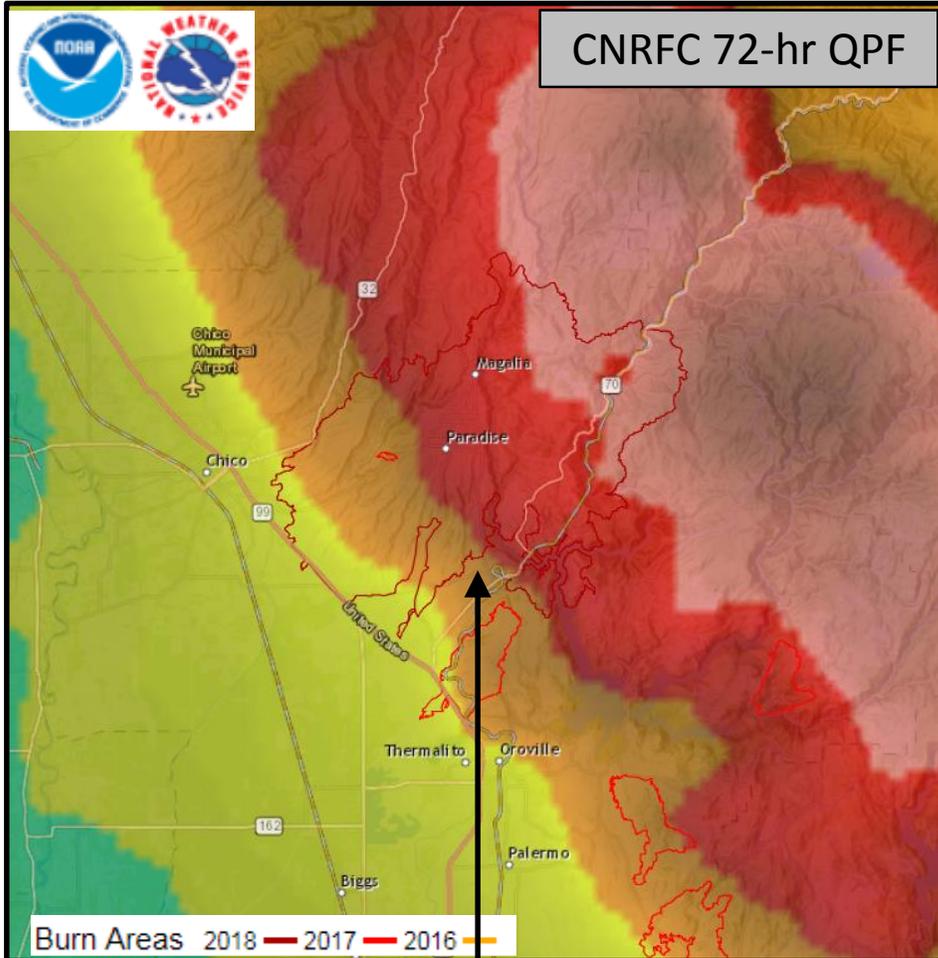
DAY 1-3 QPF
VALID 00Z WED NOV 21 2018
THRU 00Z SAT NOV 24 2018
ISSUED: 1757Z TUE NOV 20 2018
FORECASTER: WPC/WPC
NOAA/NWS/NCEP/WPC

Max. accumulated forecast precip. for the next 1–3 days range from 5–7 in. over North-Coastal CA and N. Sierra to .25–1 in over SoCal

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The precipitation that is currently forecast to fall over the active Camp fire will assist in fire relief but raises concern for debris flows with the potential for higher precip. rates

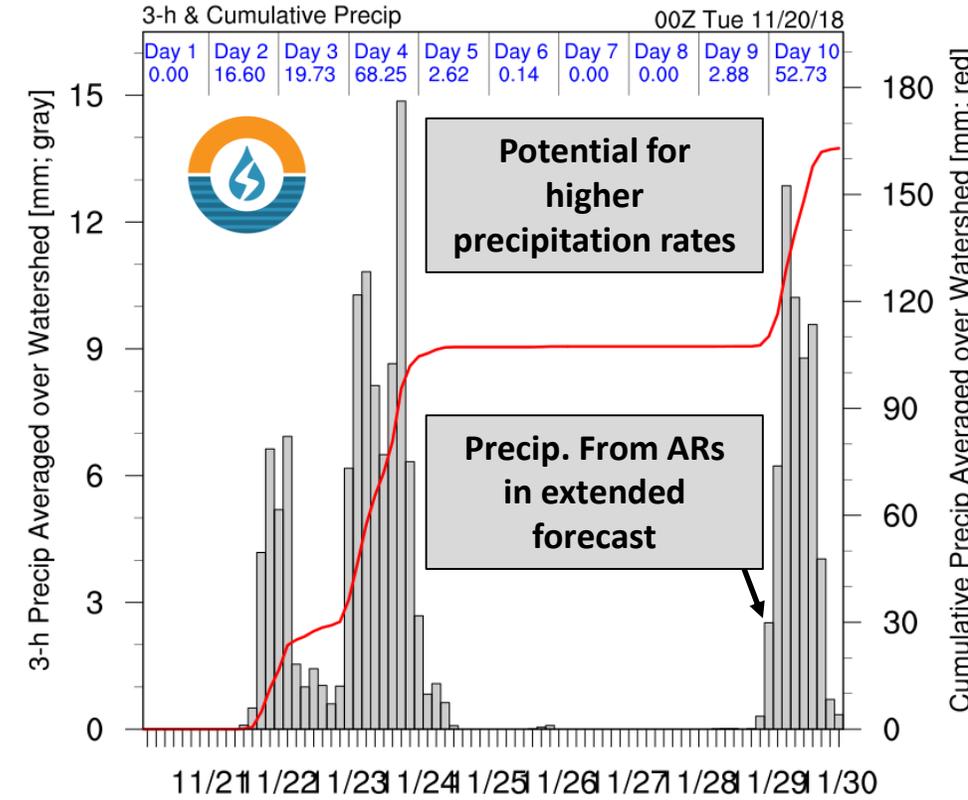
NWS California Nevada River Forecast Center forecast products are located at cnrfc.noaa.gov

CW3E Watershed forecast products at cw3e.ucsd.edu/DSMaps/D_S_watershed.html

Visit weather.gov for location specific watches and warnings

The NWS CNRFC is currently forecasting 2.5–7.75 inches of precipitation over the next 6-days for the Camp fire near Paradise, CA

North Fork Feather Watershed



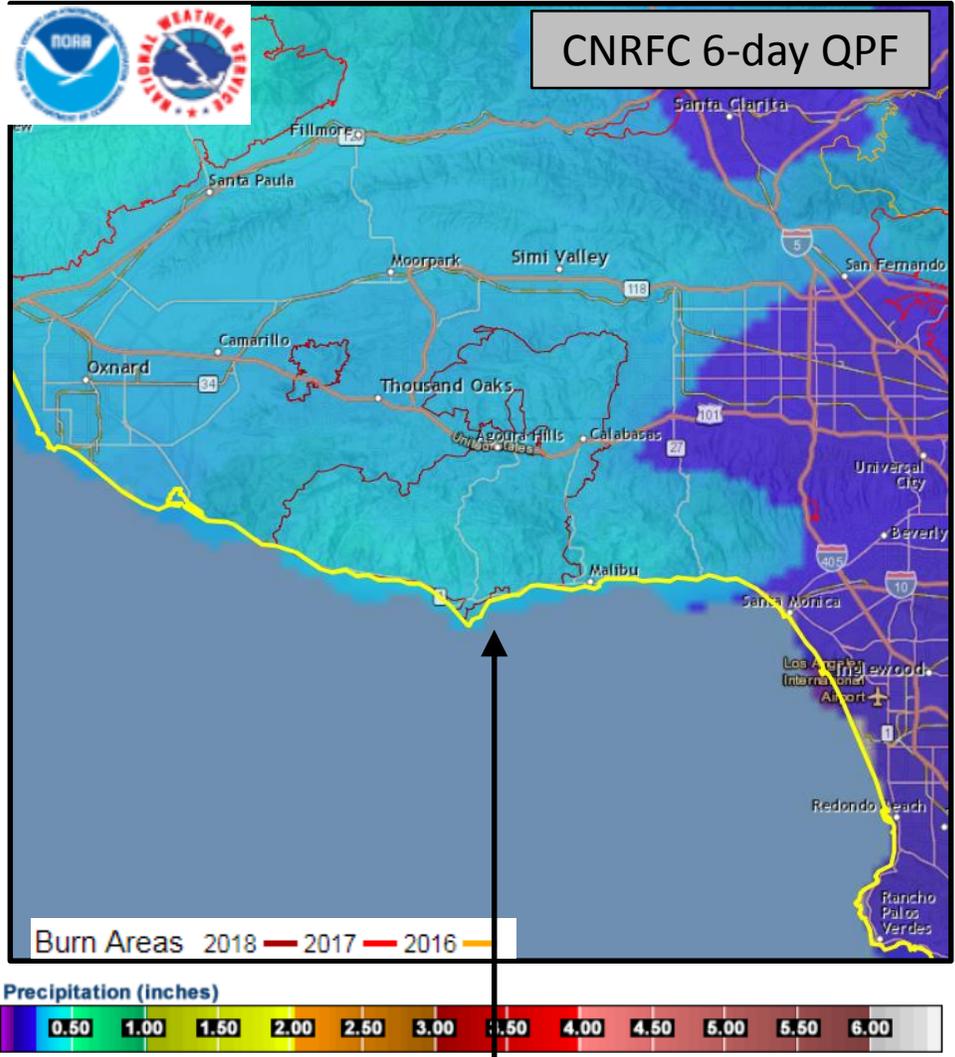
Total: 163 mm | 403151 AcreFeet

With additional precipitation in the extended forecast, the GFS is currently forecasting 163 mm (6.4 in.) averaged over the North Fork Feather Watershed for the next 10 days

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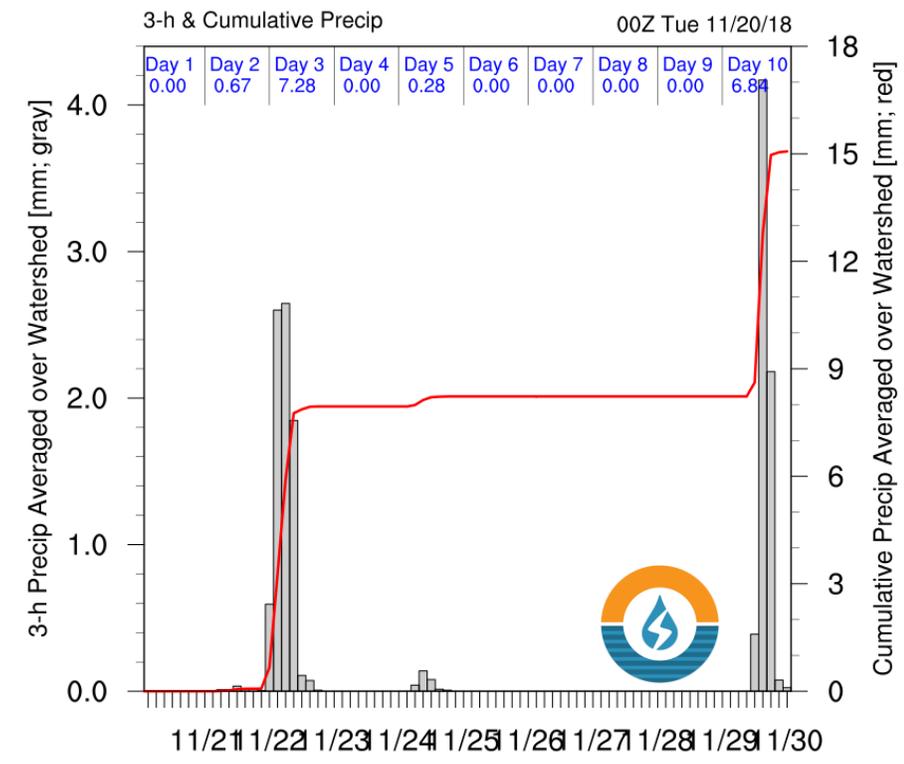


The CNRFC 6-day precipitation for the Woolsey fire near Thousand Oaks, CA has not changed much since yesterday

NWS California Nevada River Forecast Center forecast products are located at cnrfc.noaa.gov

CW3E Watershed forecast products at cw3e.ucsd.edu/DSMaps/D_S_watershed.html

Santa Barbara Coastal Watershed



Total: 15 mm | 21218 AcreFeet

The NWS CNRFC is currently forecasting .5–.65 in. of precipitation for the next 6-days over the active Woolsey fire near Thousand Oaks, CA

The NCEP GFS is forecasting less precipitation for the next 10 days over the Santa Barbara Coastal Watershed than it was yesterday (15 mm vs. 19 mm)