

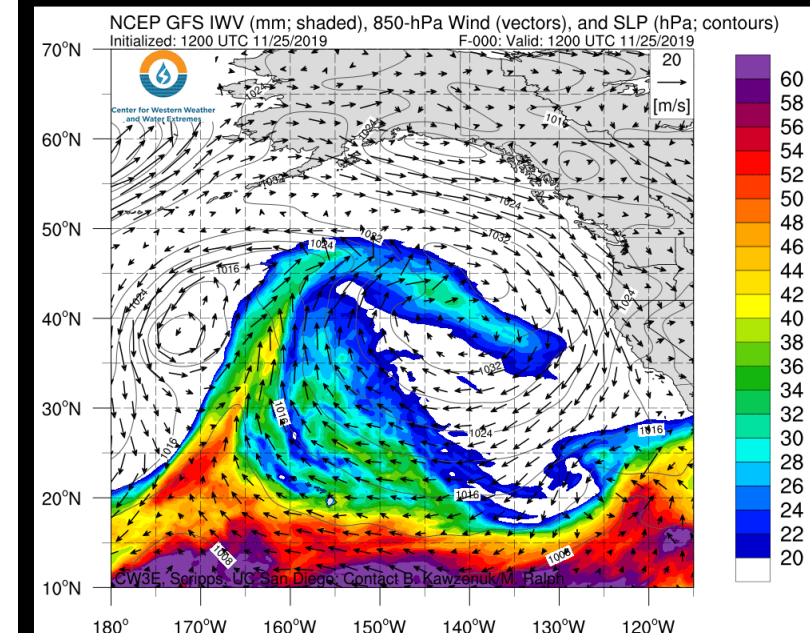
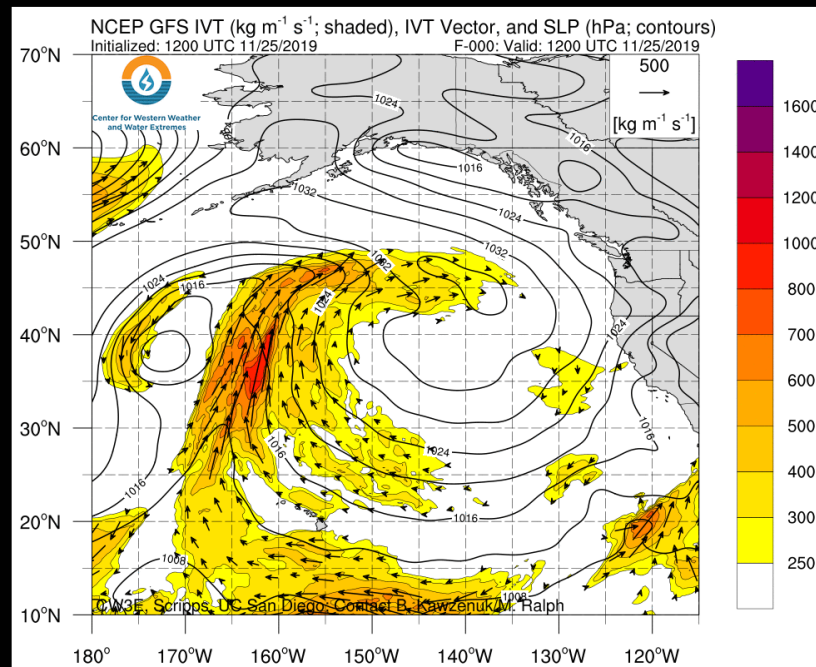
CW3E Atmospheric River Outlook



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Period of active weather will bring impacts to majority of the Western United States

- A cyclone is forecast to undergo rapid intensification over the northeastern Pacific before moving inland over Northern CA
- The deep cyclone is forecast to bring impacts, from high winds to heavy snow, to a large portion of the U.S. West
- While the parent cyclone associated with this event is forecast to be strong, the AR is forecast to be fast moving and of relatively low moisture content, which will result in primarily beneficial instead of hazardous rainfall
- The primary impacts associated with this event will be strong winds over North-Coastal California (gusts >50 mph) and heavy snow (>3 feet) over the high elevations of California
- A second cyclone is forecast to intensify over Southern CA and bring additional AR activity to Southern CA and AZ
- As much as 2–3 feet of snow could fall above 3,000 ft. (4 feet over the highest elevations) in the Sierra Nevada Mountains where Southern California meets the Sierra Nevada Mountains over the next 5 days.

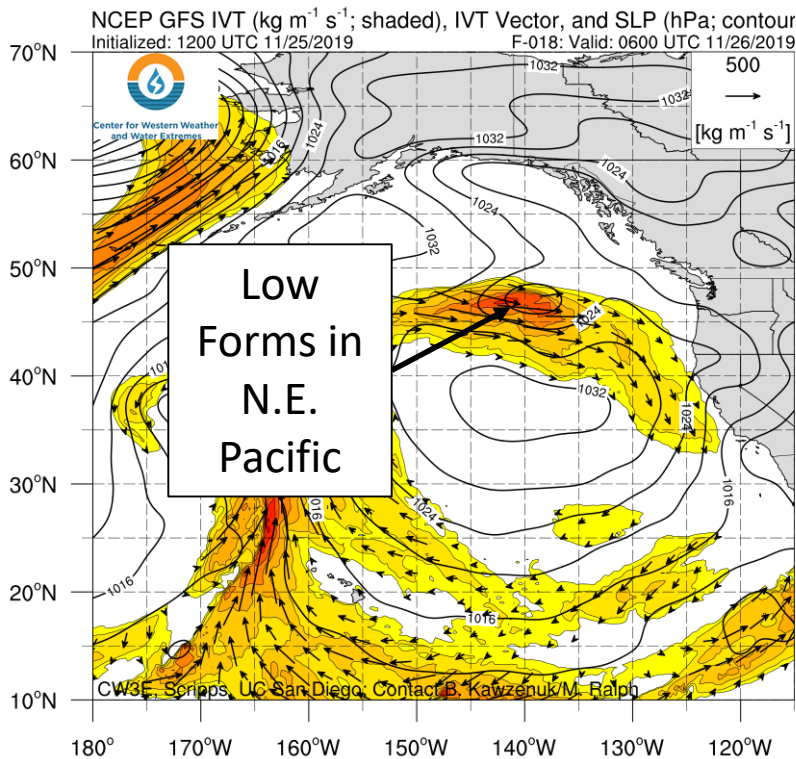


AR Outlook: 25 November 2019

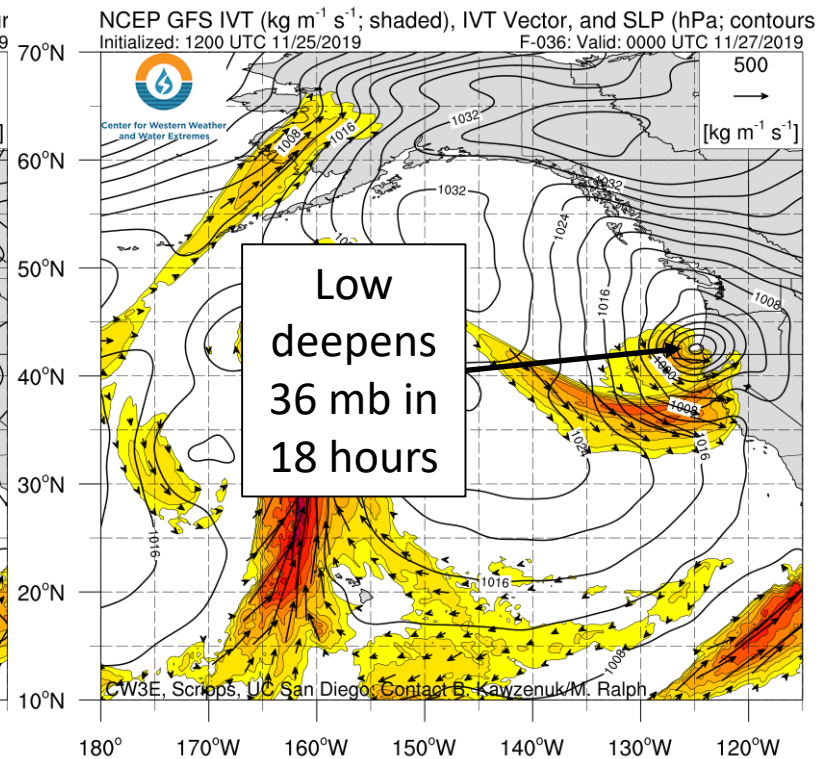


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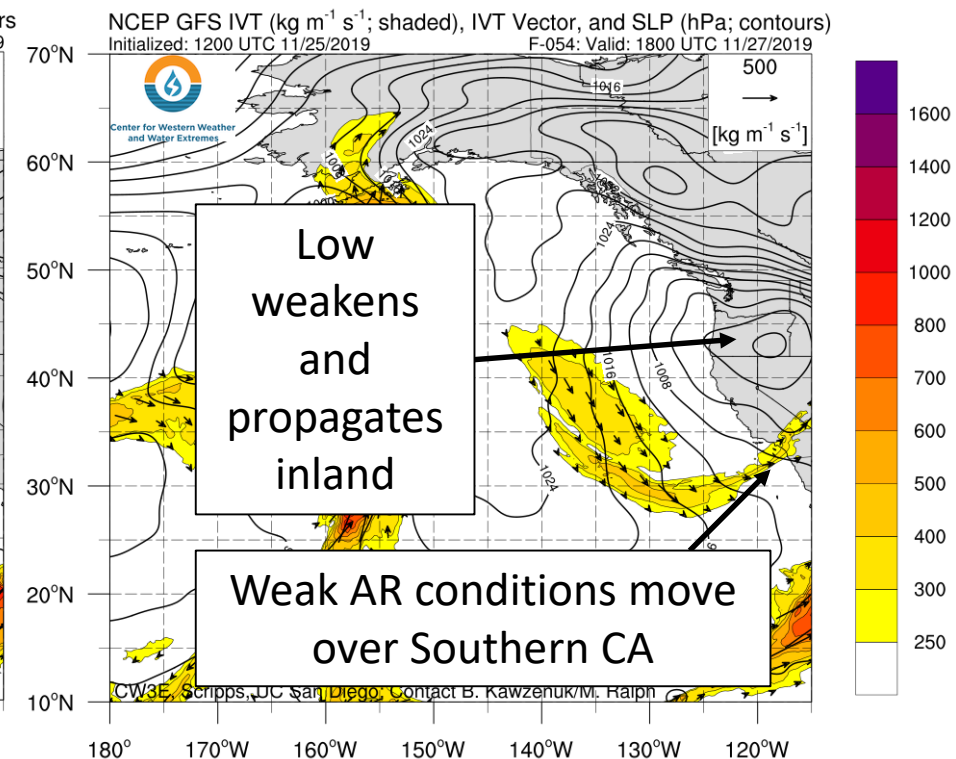
06 UTC 26 November



00 UTC 27 November



18 UTC 27 November

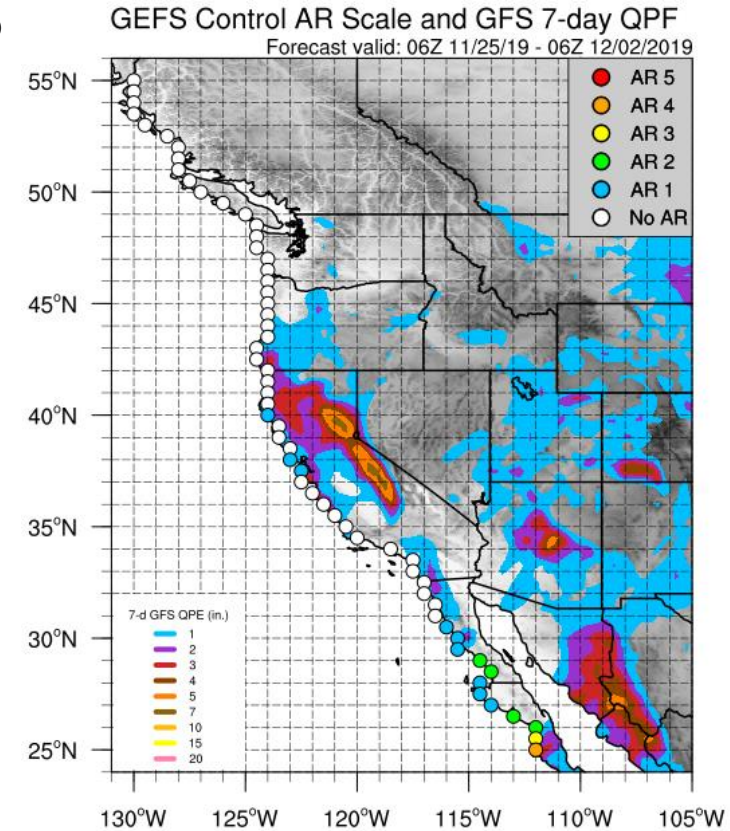
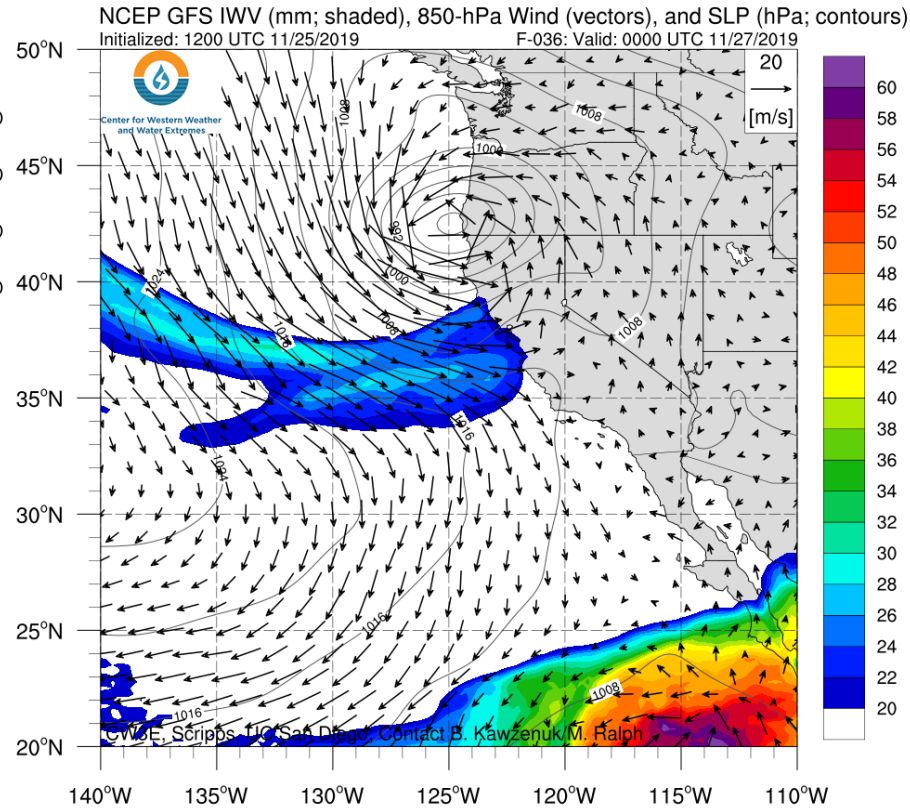
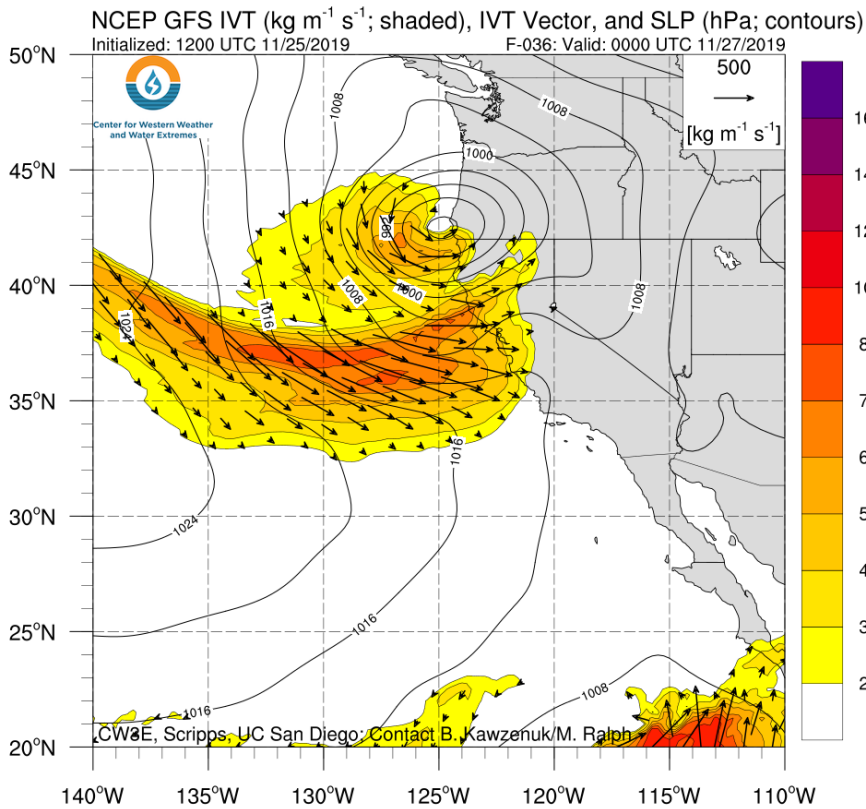


- A weak low is forecast to form over the Northeast Pacific in a region of enhanced IVT late on the 25th of November
- This low is forecast to undergo rapid cyclogenesis/intensification deepening more than >30 mb in <18 hours
- The low is then forecast to weaken and propagate inland bringing precipitation and impacts to the Intermountain West
- As the low weakens and moves inland the associated cold front and accompanying AR are forecast to propagate down the coast and bring brief AR conditions to much of California

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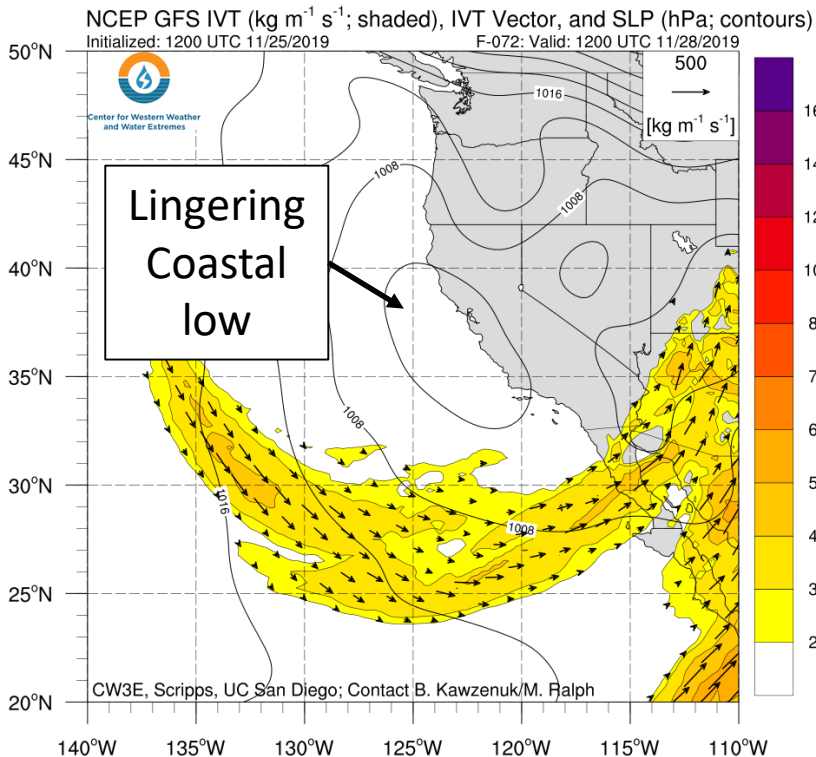
- While the parent cyclone associated with this event is forecast to be strong, the moderate strength IVT is forecast to be of short duration (<12 hours) and IWV content of the AR is forecast to be relatively low (<26 mm)
- The short duration and relatively low moisture content of the AR results in this event being forecast to be an AR1 (Ralph et al. 2019) over a few locations in North-Coastal CA while the other Coastal locations are forecast to experience AR conditions <AR1
- Therefore, this AR is forecast to be primarily beneficial in terms of precipitation along North-Coastal California

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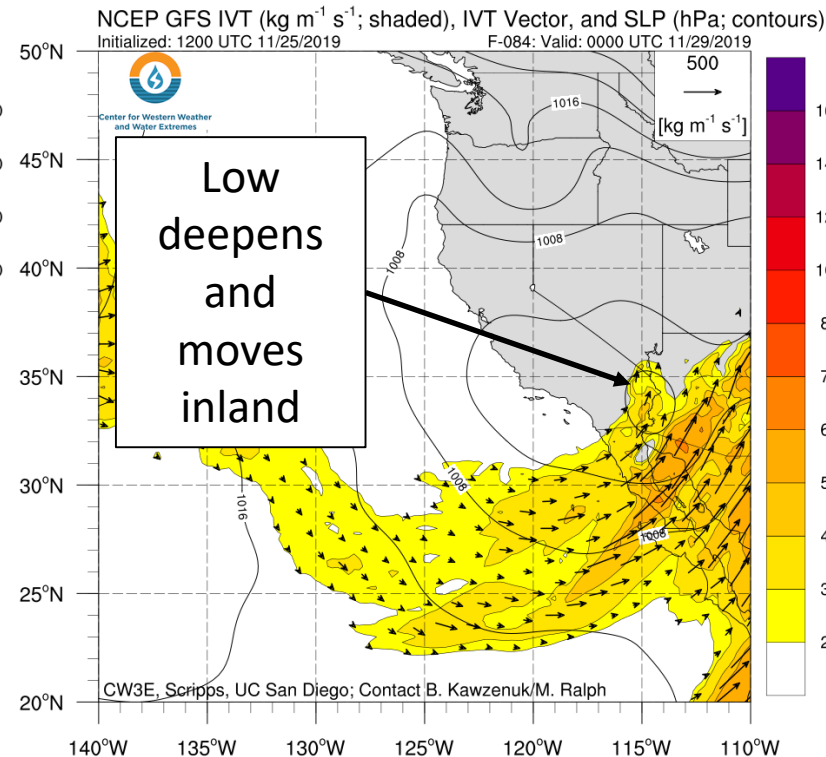


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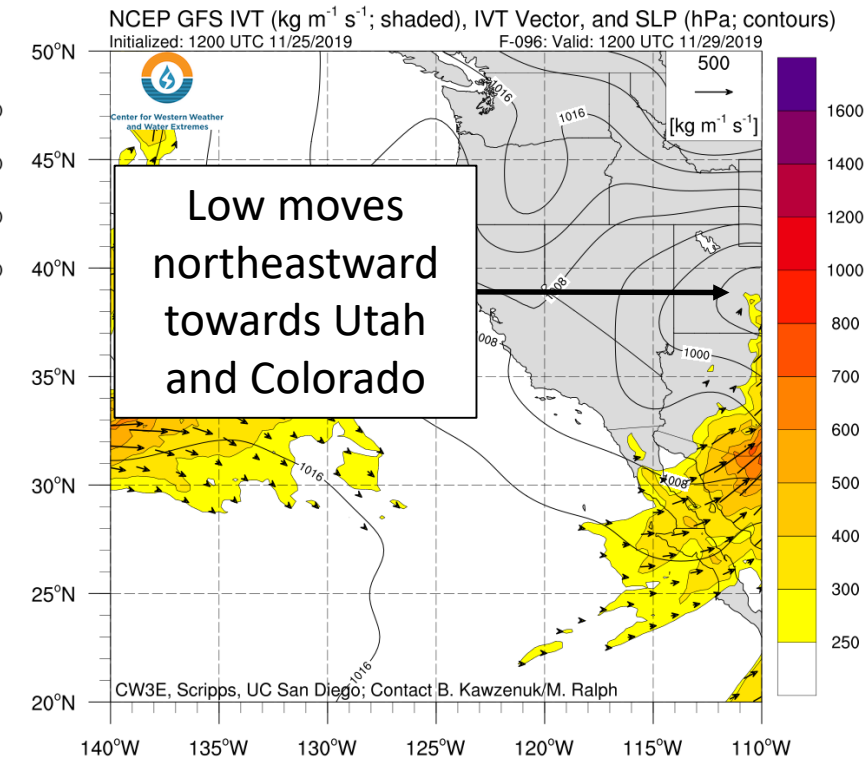
12 UTC 28 November



00 UTC 29 November



12 UTC 29 November



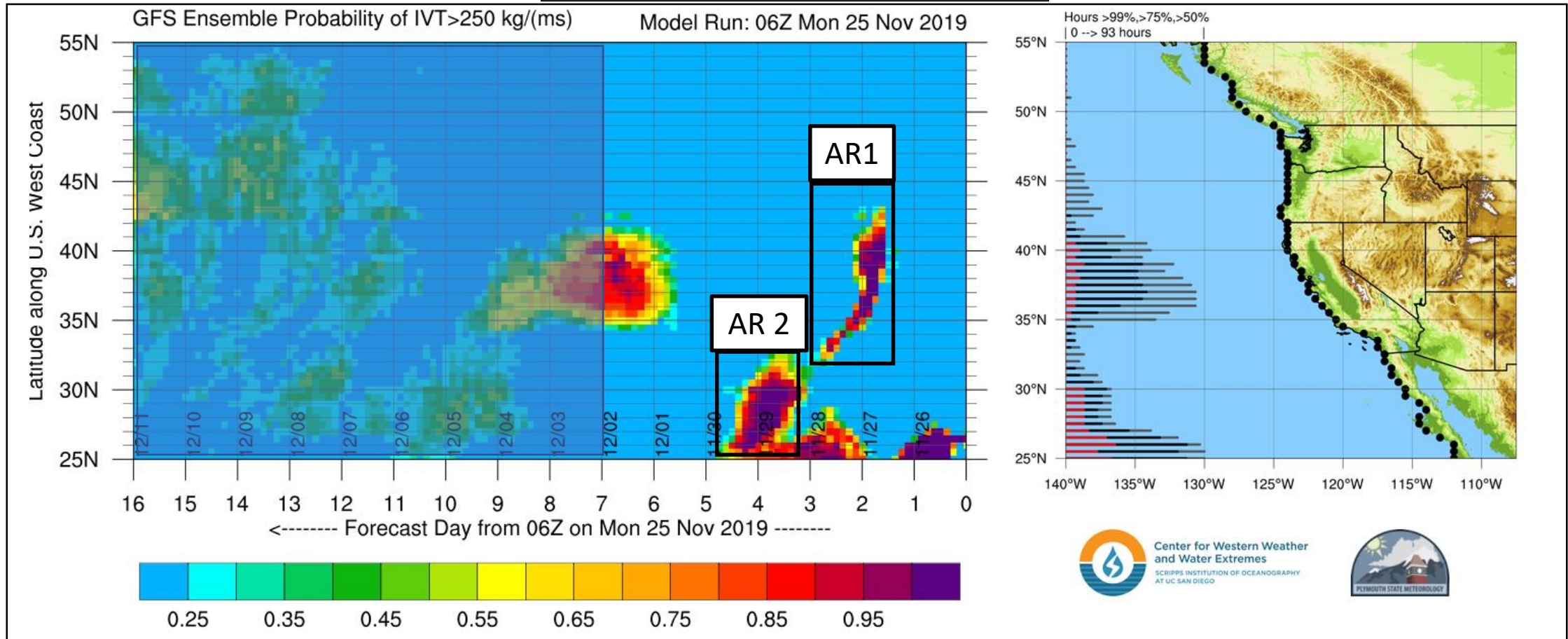
- As the initial/strong system moves inland, a weaker low is forecast to linger and move southward down the coast
- This low is forecast to slightly strengthen and move inland bringing potentially moderate strength IVT (>500 units) to AZ
- The low is then forecast to propagate northeastward bringing additional impacts to the Intermountain West

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Odds of AR Conditions Along Coast



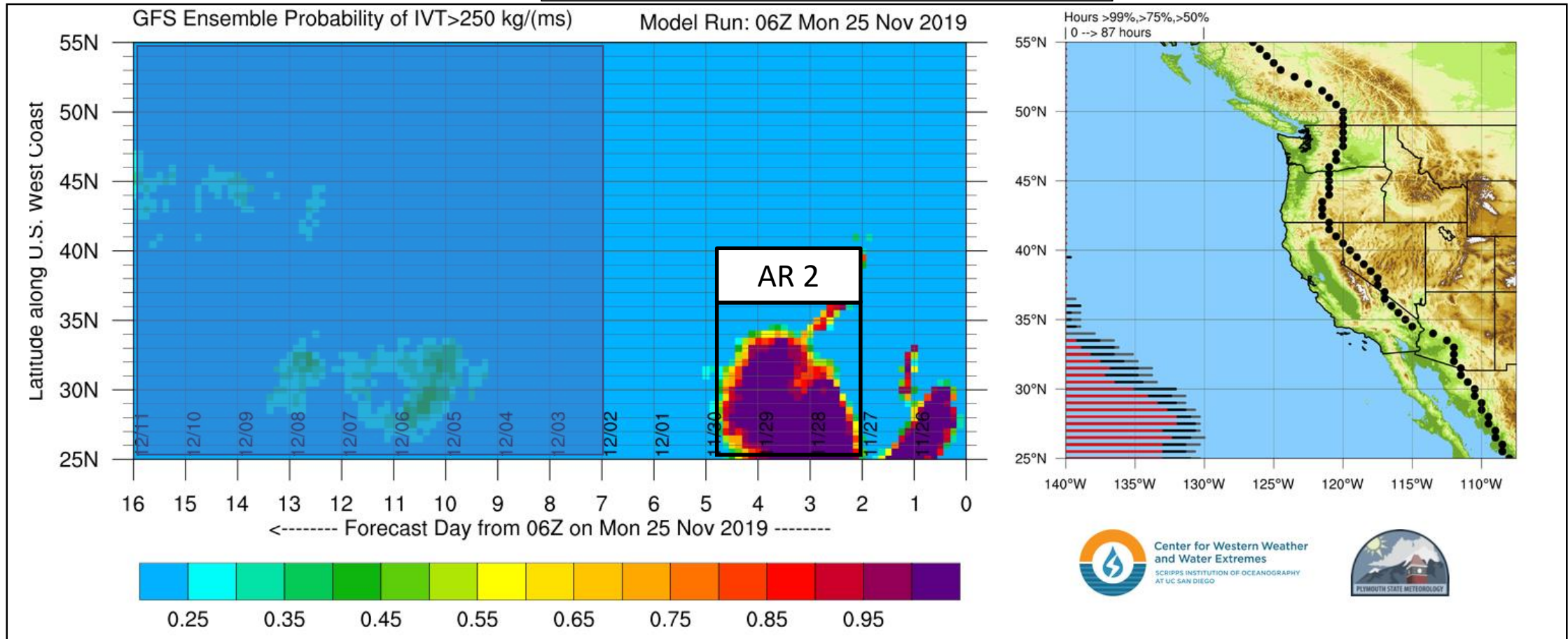
- The GEFS is currently confident (>95% of ensemble members) that there will be a short burst (3–6 hours) of AR conditions across a majority of California (IVT > 250 kg m⁻¹ s⁻¹) in association with the cyclone that undergoes rapid intensification (AR 1)
- Additionally, the GEFS is indicating high confidence in coastal AR conditions associated with the second AR that could bring impacts to Southern CA and AZ

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Odds of AR Conditions Inland Locations



- The GEFS is also forecasting high confidence in a potentially long duration AR in Southwestern AZ
- >95% of ensemble members are currently suggesting AR conditions could last longer than 24 hours in southwest AZ in association with the second AR that is forecast to make landfall over Baja California Norte, Mexico on 28 November 2019

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The GEFS is currently suggesting potentially moderate AR conditions for a short period of time over northern CA in association with the rapidly intensifying low

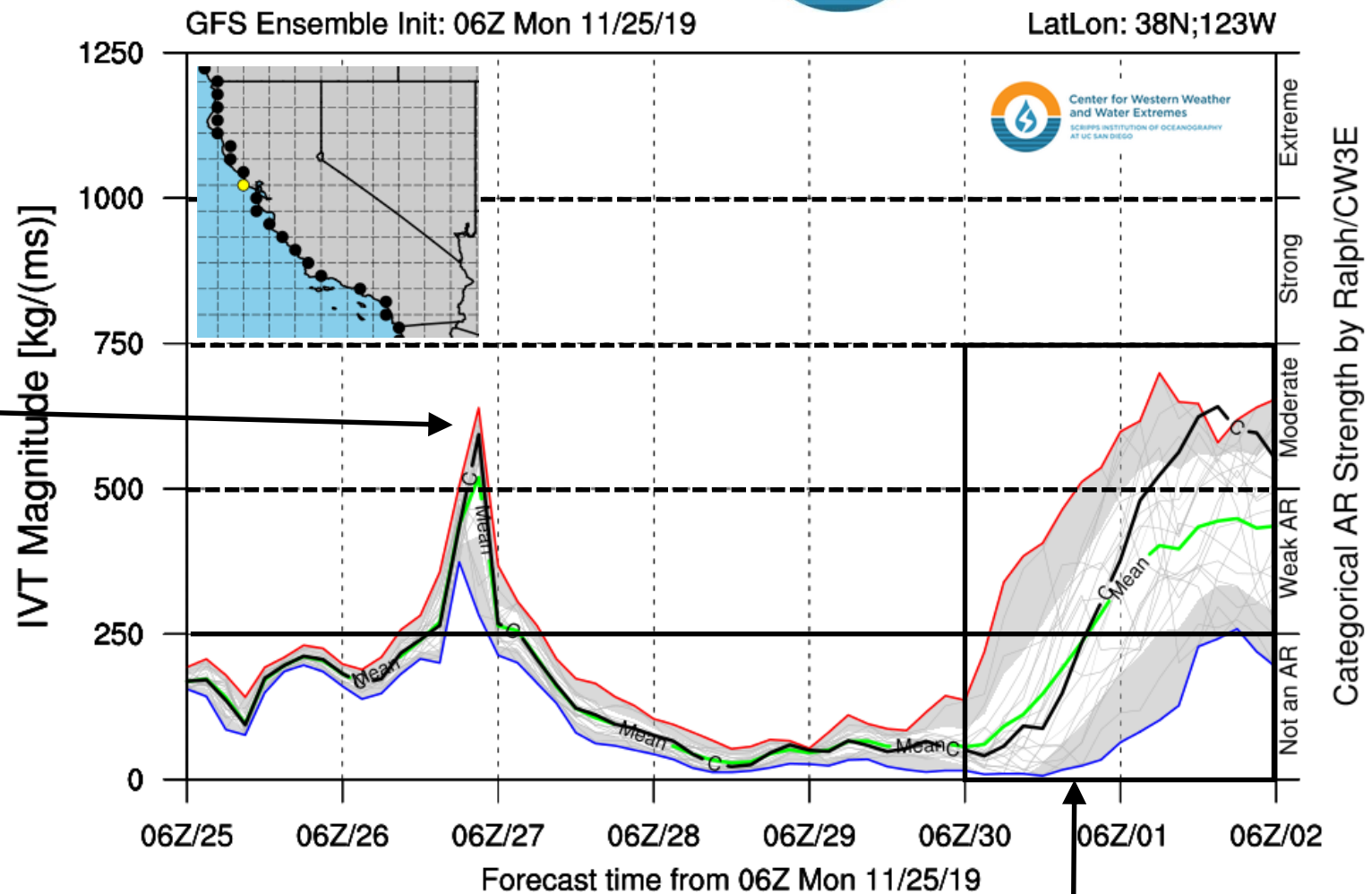
Magnitude of potential AR

- Maximum predicted IVT $\sim 593 \text{ kg m}^{-1} \text{ s}^{-1}$
- Mean IVT $\sim 510 \text{ kg m}^{-1} \text{ s}^{-1}$
- Minimum IVT $\sim 400 \text{ kg m}^{-1} \text{ s}^{-1}$

Forecast duration of AR conditions

- Weak 12 hours \pm 4
- Moderate 3 hours \pm 3

Due to the short duration of AR conditions and relatively low moisture content of the AR, overall impacts from rainfall accumulations will likely be minimized for coastal locations



- There is the potential for additional AR activity during the first week of December but forecast uncertainty is currently high due to large lead time

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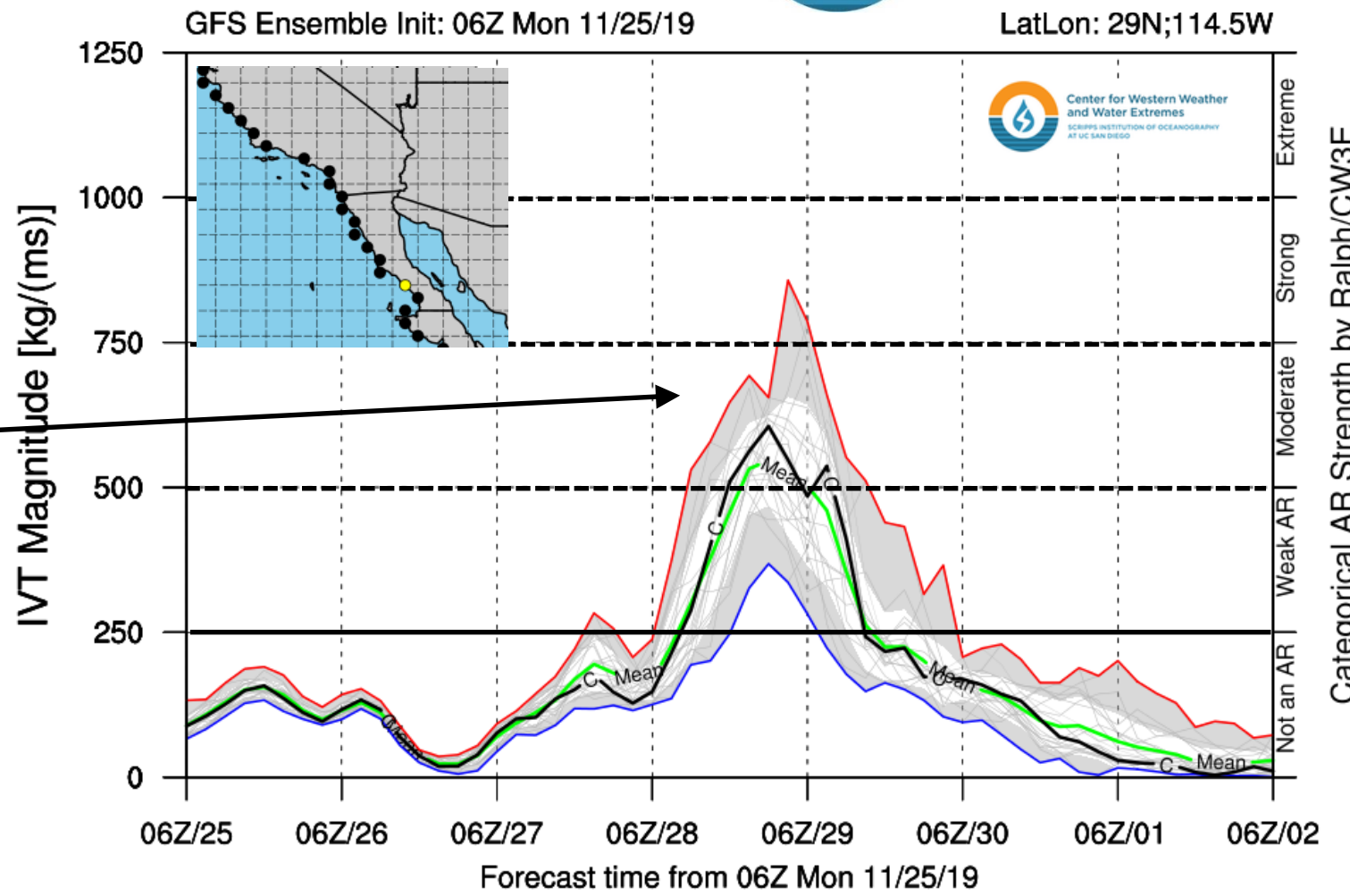
The GEFS is currently less confident in the onset, magnitude, and duration of AR conditions associated with the second AR over Baja California Norte, that could lead to inland impacts over Arizona

Magnitude of potential AR over Coastal Baja California Norte, Mexico

- Maximum predicted IVT $\sim 850 \text{ kg m}^{-1} \text{ s}^{-1}$
- Mean IVT $\sim 550 \text{ kg m}^{-1} \text{ s}^{-1}$
- Minimum IVT $\sim 490 \text{ kg m}^{-1} \text{ s}^{-1}$

Forecast duration of AR conditions

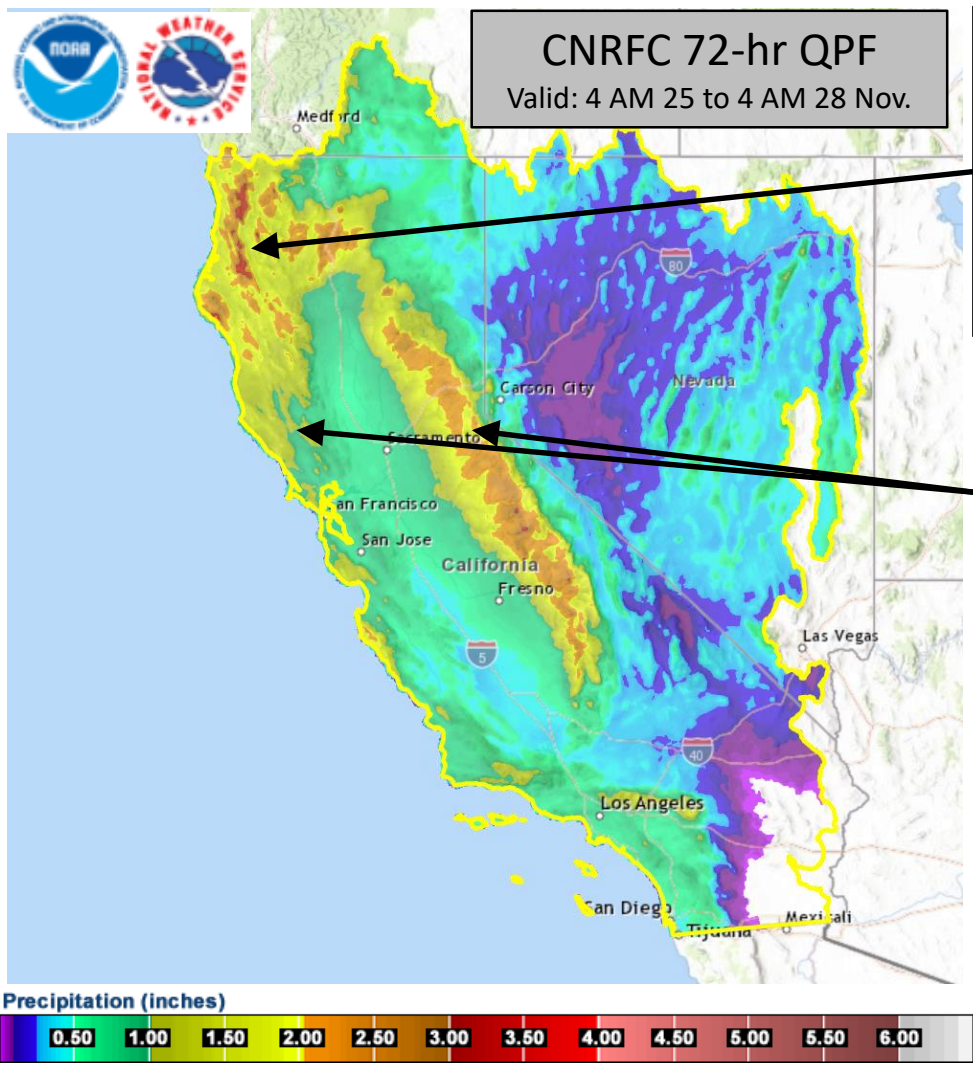
- Weak 30 hours \pm 18
- Moderate 18 hours \pm 12
- Strong 3 hours \pm 3



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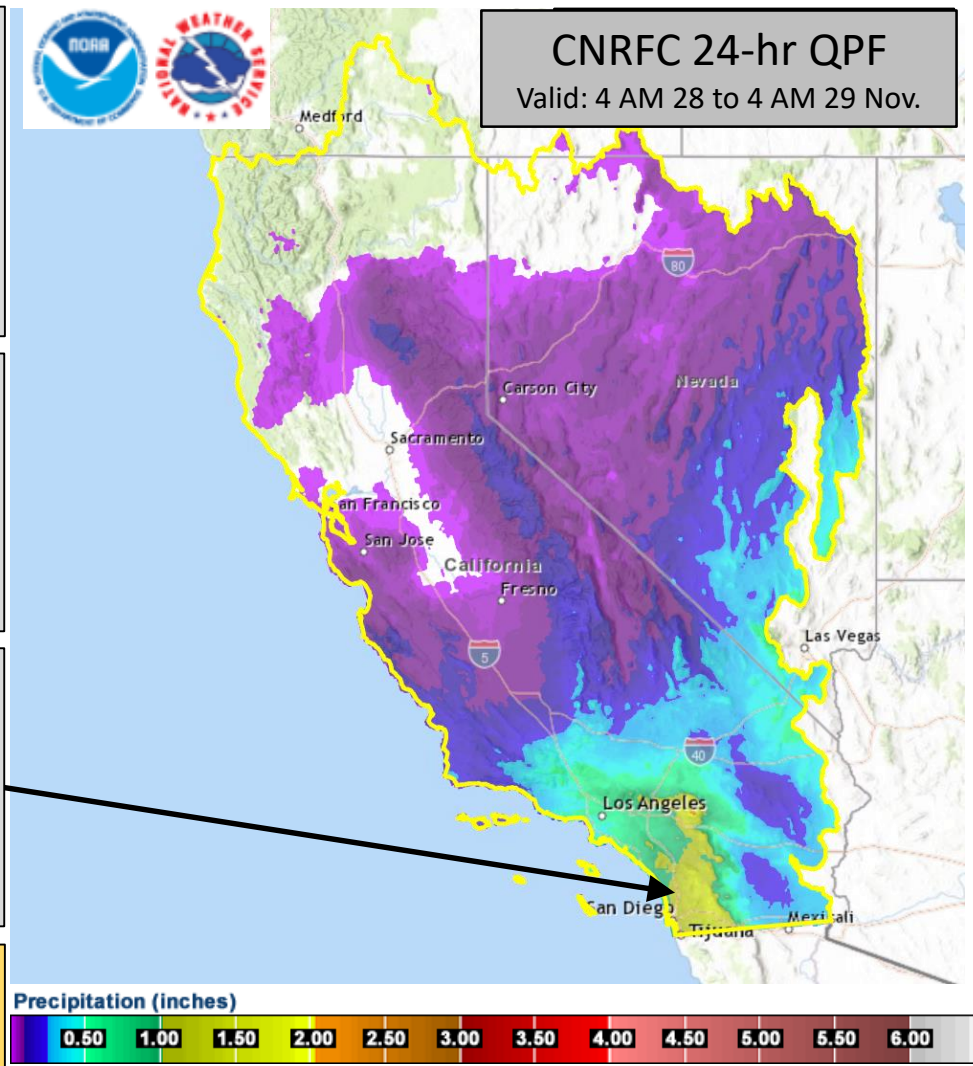
CNRFC 72-hr QPF
Valid: 4 AM 25 to 4 AM 28 Nov.

The CNRFC is currently forecasting >3 in of precipitation over the higher elevations of the Northern Coastal Mts. during the next 72-hrs

Other mountainous locations across CA are forecast to receive 1.5 to 3.25 inches of precip. with lower elevations receiving .25 to .75 in.

On Thursday, portions of S. CA are forecast to receive .5 to 1.75 in. of precip. in association with the landfall of the next AR

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

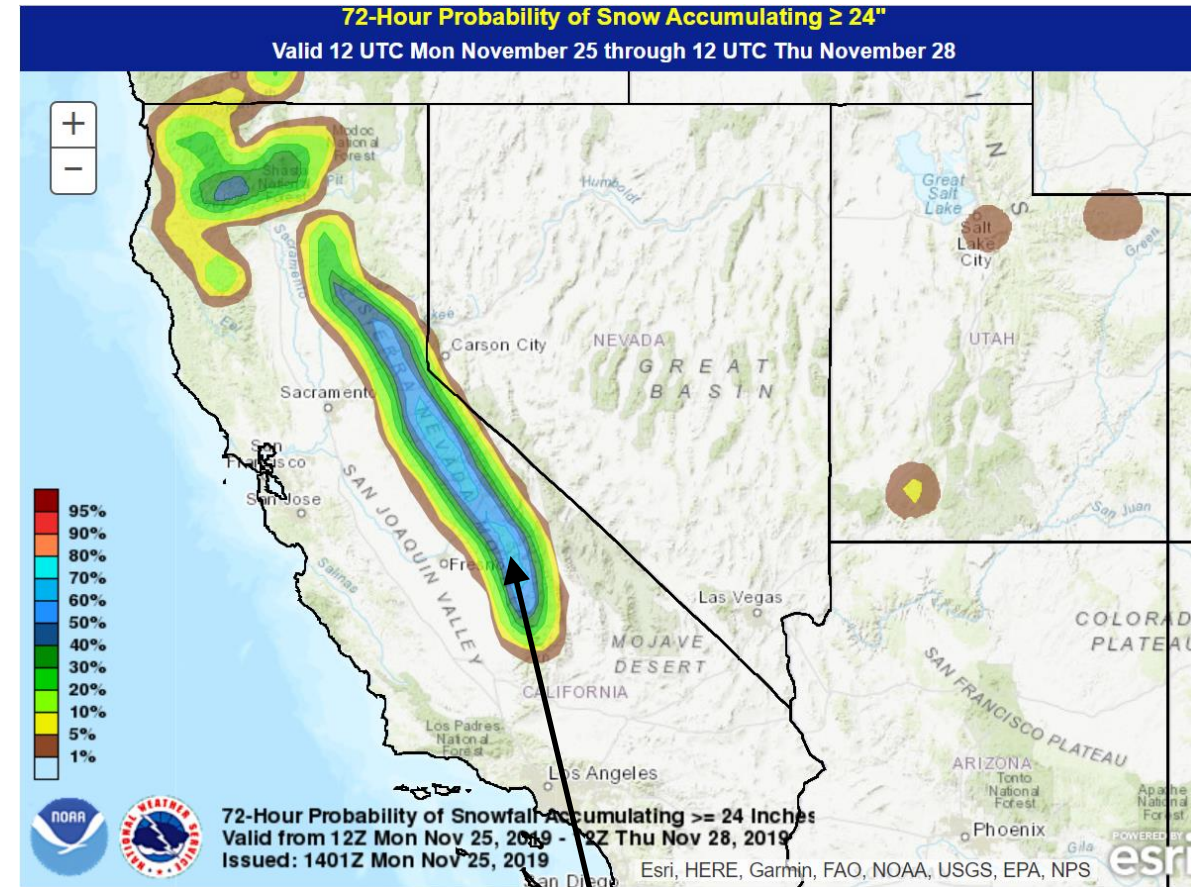
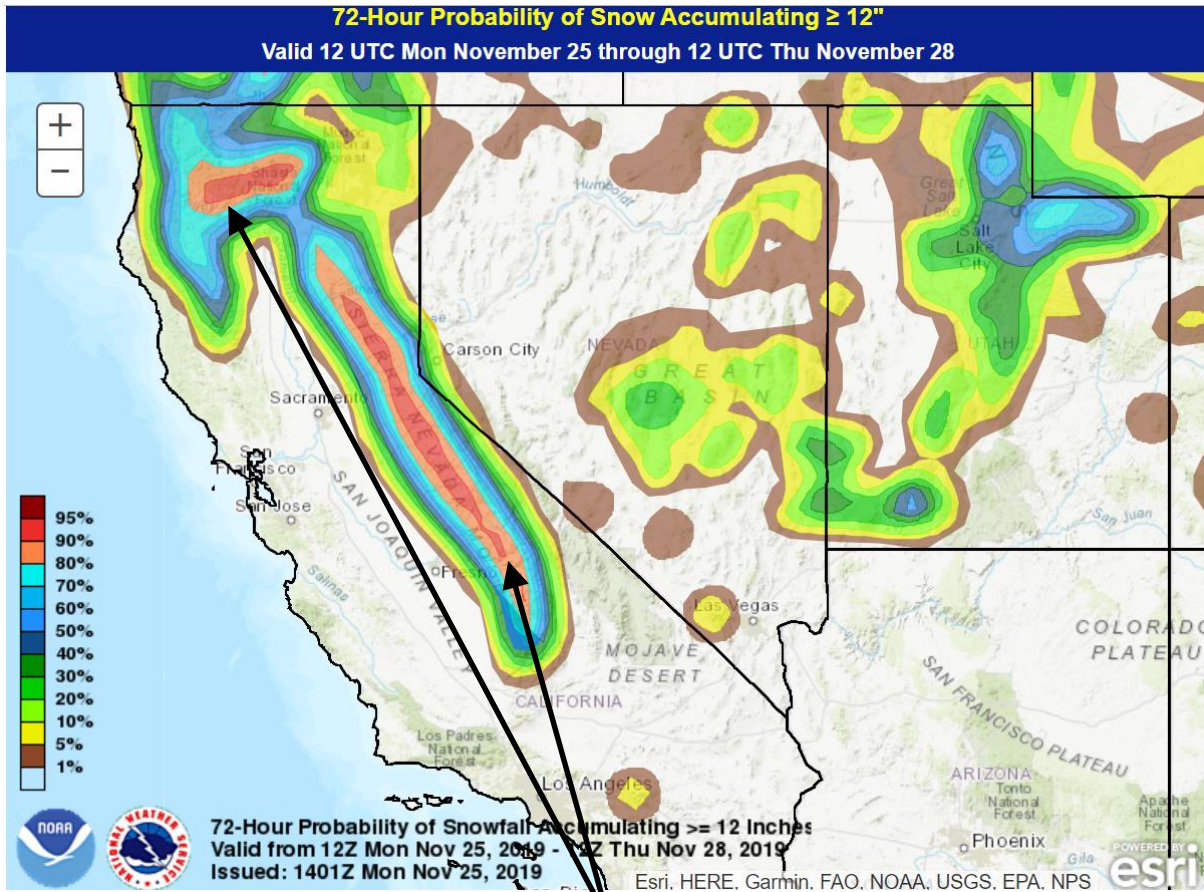


CNRFC 24-hr QPF
Valid: 4 AM 28 to 4 AM 29 Nov.

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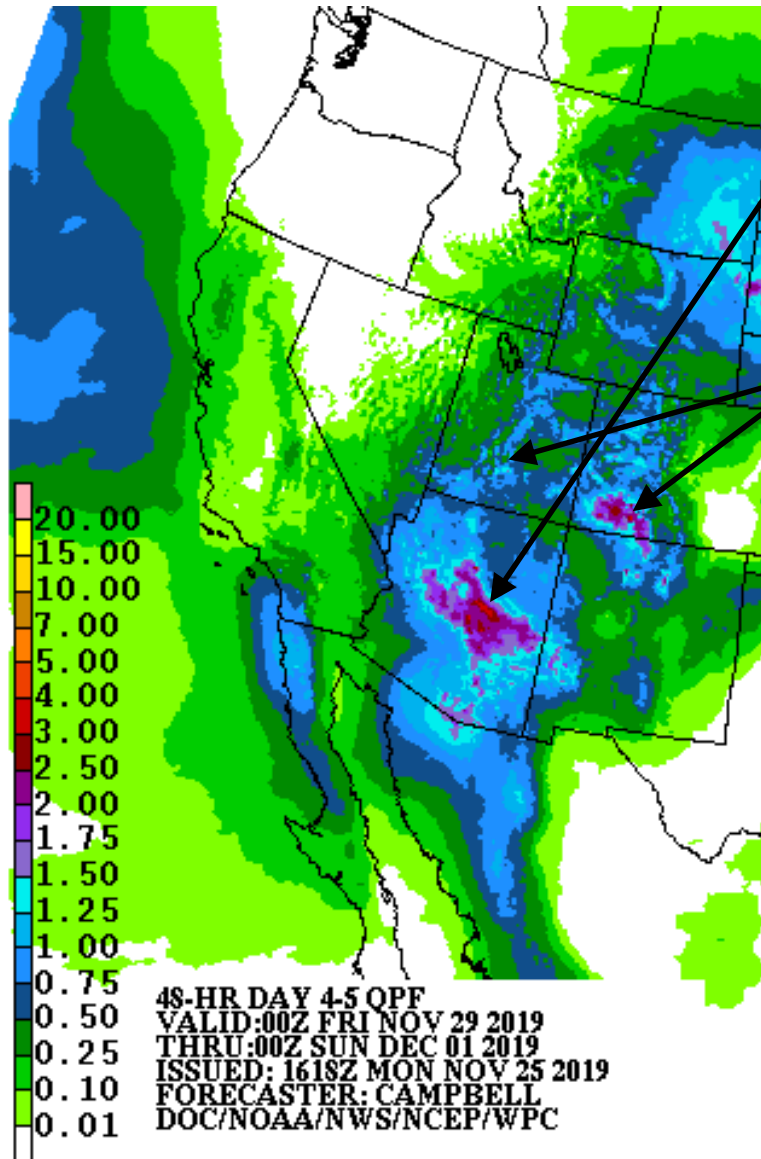
Due to the potential for low snow levels associated with the rapidly intensifying cyclone, the NWS is currently suggesting a high likelihood ($>80\%$) that numerous locations across the west could receive >12 inches of snow between 12 UTC 25 and 12 UTC 28 November

Additionally, the NWS is forecasting a 50–70% chance that some locations in the Sierra Nevada Mountains could receive >24 inches of snow

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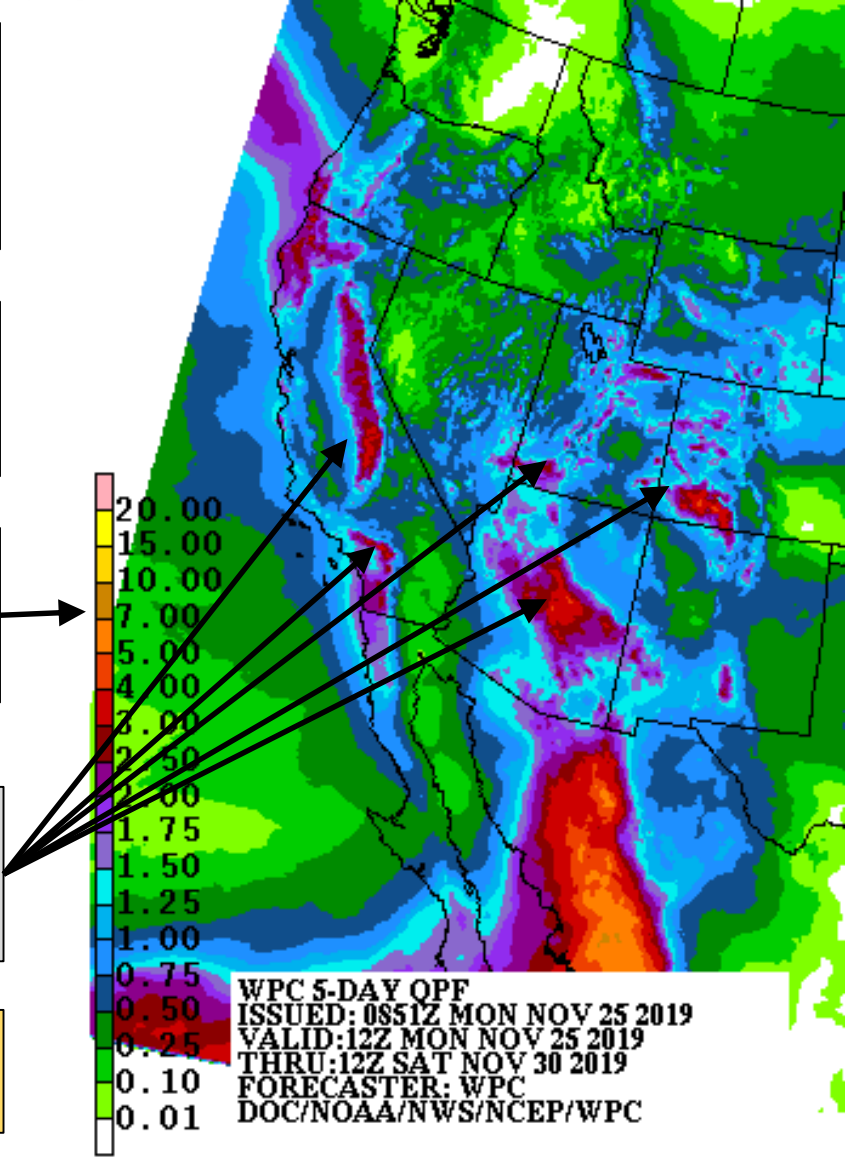
The second AR that could bring AR conditions to AZ, is currently forecast to produce >1.5 inches of precipitation across a large portion of AZ

Additional locations throughout Utah and Western Colorado could receive 1 to 4 inches of precipitation

Due to this period of active weather, a majority of the Western U.S. is forecast to receive precipitation over the next 5 days

Higher elevations in California, Arizona, Utah, and Southern Colorado are forecast to receive 5-day accumulations >3 inches

NWS WPC precipitation forecasts are located at wpc.noaa.gov



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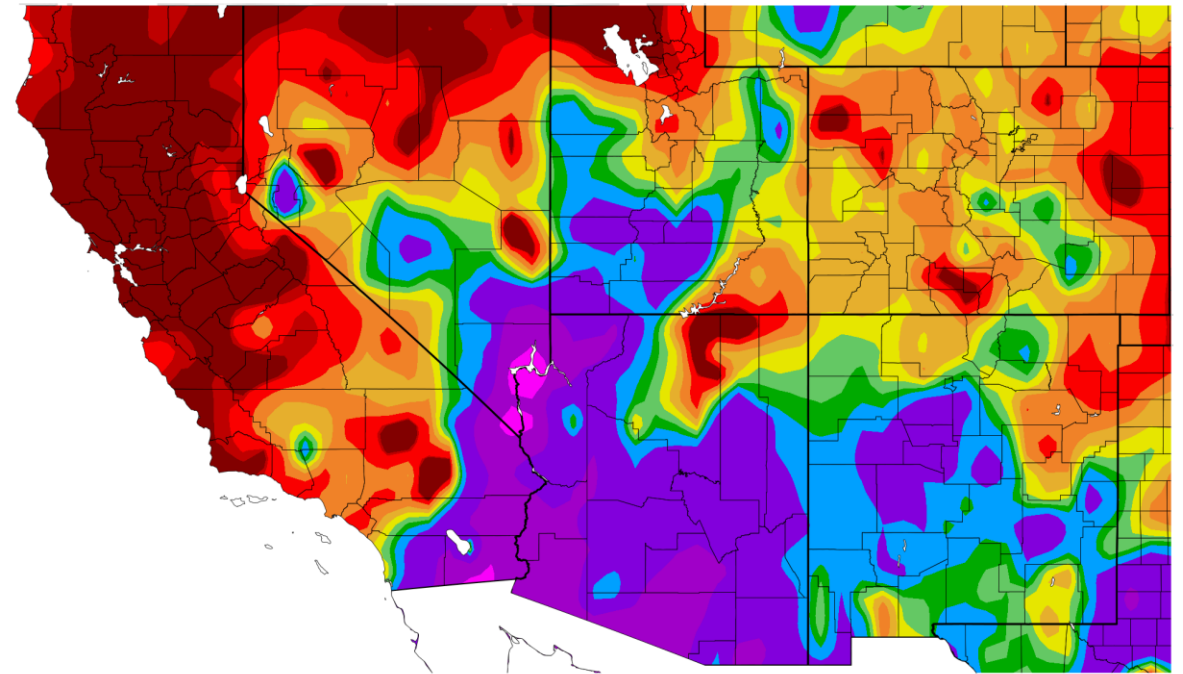
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Percent of Normal Precipitation (%)
11/1/2019 – 11/24/2019

Due to a period of active weather earlier in the month, Southwestern Arizona had received 200–800% of its normal precipitation from 11/1 to 11/24

Any additional precipitation that Arizona receives during the next event will only add to the anomalously wet start to the water year

Conversely, a large portion of California received <2% of its normal precipitation during that same period and any precipitation it receives will help to alleviate the abnormally dry start to the water year



Generated 11/25/2019 at HPRCC using provisional data.

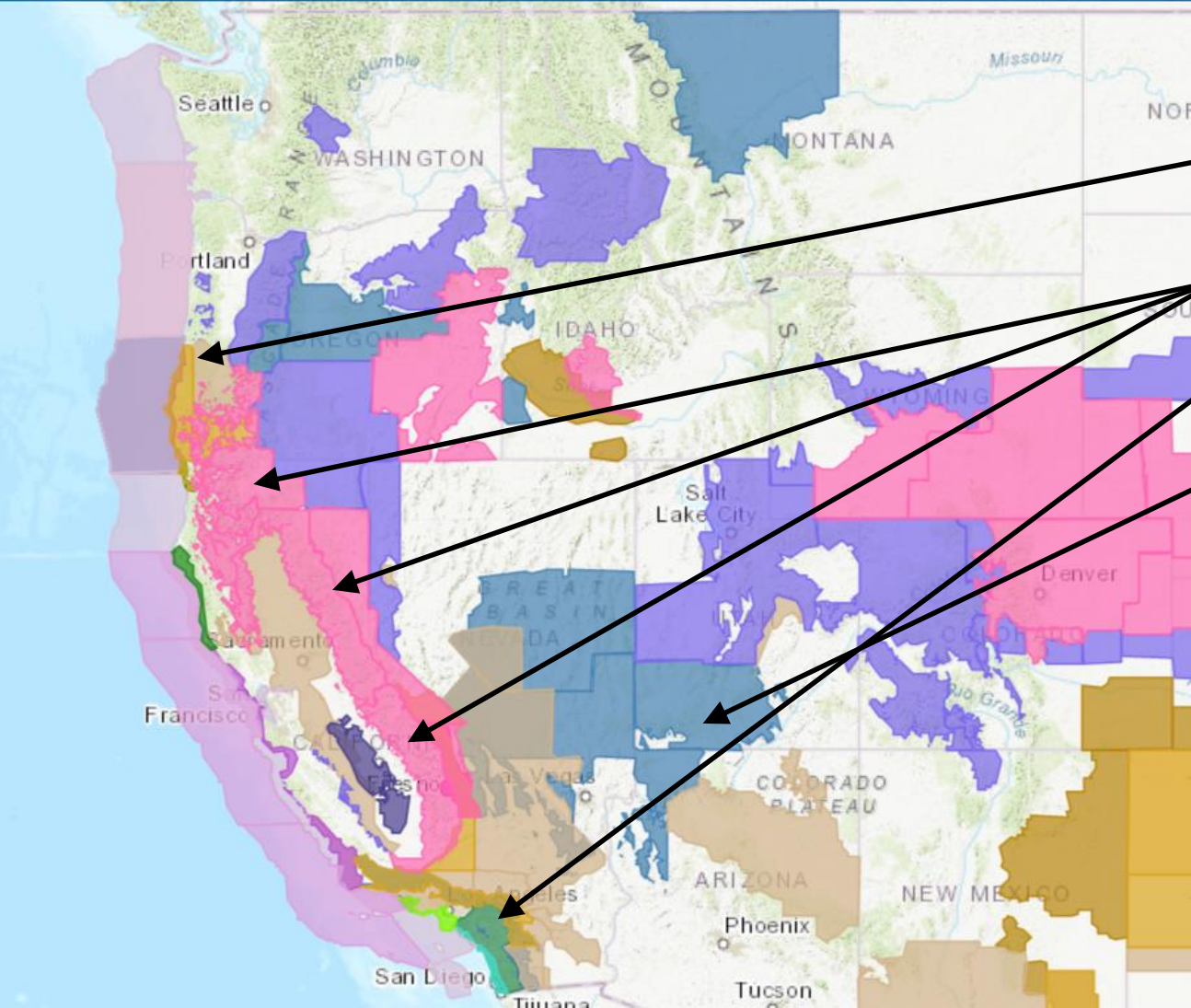
NOAA Regional Climate Centers

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National Weather Service
National Oceanic and Atmospheric Admin. | WEATHER & HAZARDS DATA VIEWER



The National Weather Service has issued numerous watches, warnings, and advisories throughout the U.S. West due to the incoming systems

High Wind Warning in North-Coastal CA due to proximity to deep cyclone

Winter Storm Warning for a large portion of high elevations across California due to potential for heavy snow

Flash Flood Watch over portions of Southern CA

Winter Weather Watch for portions of Southern NV and Utah and Northern AZ

Visit weather.gov for point specific forecasts, watches, warnings, and advisories

- | | | | |
|------------------------------|---|------------------------------------|---------------------------|
| Hurricane Force Wind Warning | Freeze Warning | Small Craft Advisory For Rough Bar | Hazardous Seas Watch |
| Winter Storm Warning | Red Flag Warning | Small Craft Advisory | Coastal Flood Watch |
| High Wind Warning | Storm Watch | Brisk Wind Advisory | Lakeshore Flood Watch |
| Storm Warning | Winter Weather Advisory | Lake Wind Advisory | High Wind Watch |
| Coastal Flood Warning | Flood Advisory | Wind Advisory | Fire Weather Watch |
| Flood Warning | Coastal Flood Advisory | Rip Current Statement | Coastal Flood Statement |
| High Surf Warning | High Surf Advisory | Beach Hazards Statement | Special Weather Statement |
| Flash Flood Watch | Heavy Freezing Spray Warning | Gale Watch | Hydrologic Outlook |
| Gale Warning | Small Craft Advisory For Hazardous Seas | Winter Storm Watch | |