CW3E Atmospheric River Outlook: 28 Nov 2023

Multiple Atmospheric Rivers Forecast to Impact Pacific Northwest and Northern California

- Several low pressure systems will spin out of the Asian continent and into the Northeast Pacific Ocean heading into the weekend.
- As these systems approach the West Coast of North America, multiple atmospheric rivers (ARs) are forecast to develop and make landfall over the Pacific Northwest.
- The first AR is forecast to arrive by Sat Dec 2, with two stronger ARs to follow on Sun Dec 3 possibly through Wed Dec 6. IVT values may exceed 750 kg/(ms) with the third AR.
- While there is high confidence on the development of the ARs, large uncertainty in the timing, duration, and intensity remain.
- Moderate/heavy precipitation is very likely from far northwest CA into southern BC.
- Rises on area rivers could push them above action stage or even flood stage.
- Freezing levels may initially fall to ~2000’ in northern WA and to 5000’ in central CA during the first (weak) AR before rising with subsequent ARs.
- Significant mountain snow is possible.

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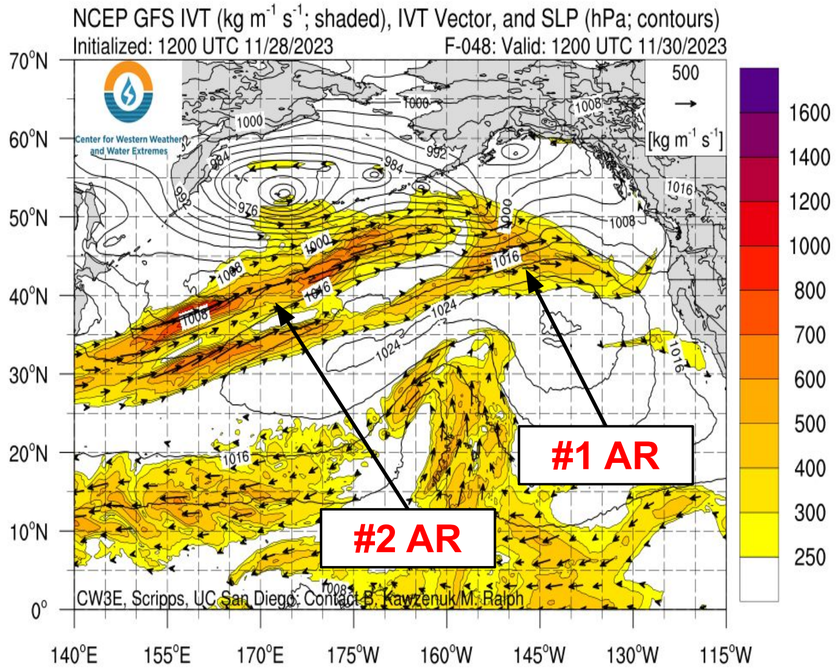
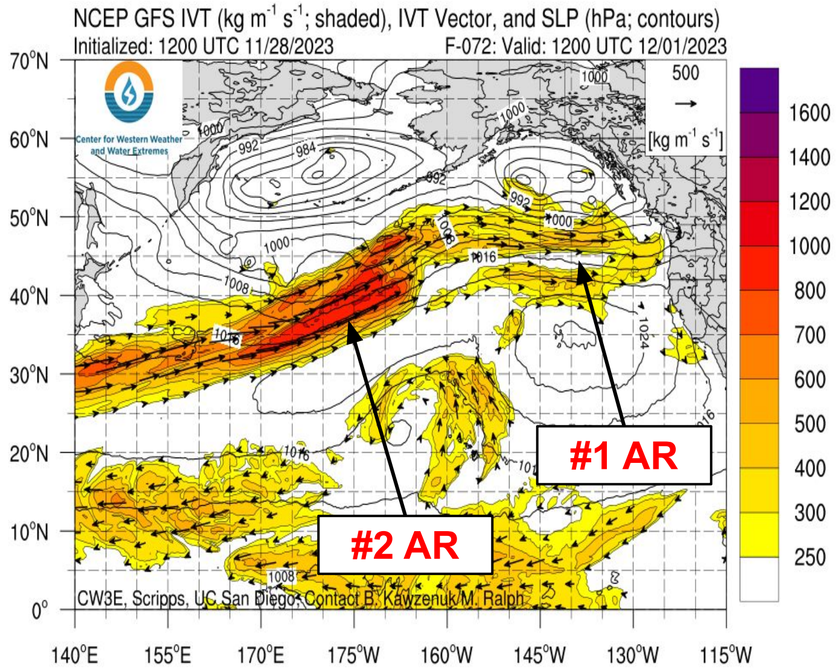
GFS Init 12Z Thu 28 Nov 2023

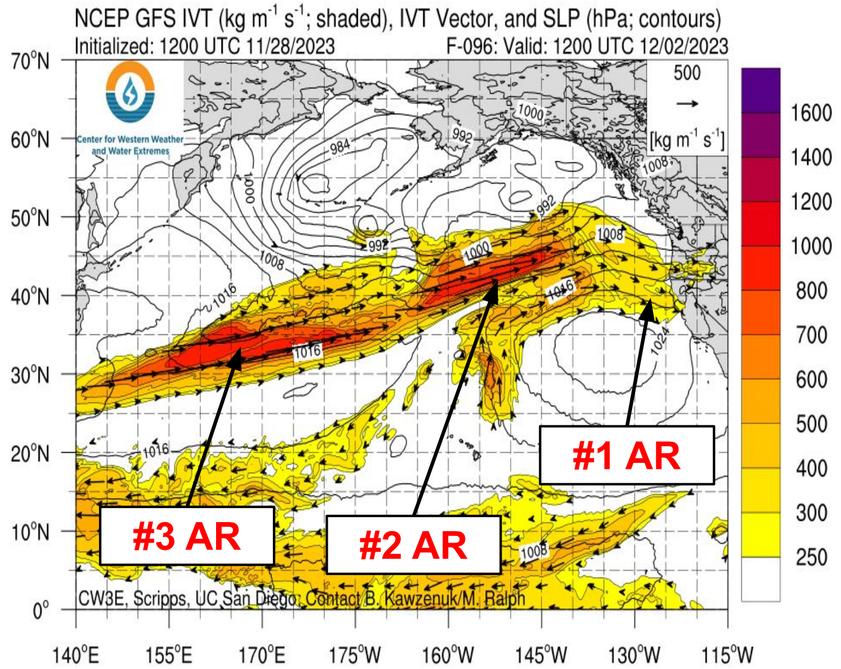
4 AM PT Thu 30 Nov 2023



4 AM PT Fri 1 Dec 2023



4 AM PT Sat 2 Dec 2023



Several low pressure systems will travel across the North Pacific Ocean during the coming days, with atmospheric river (AR) conditions developing with them. Per the GFS (shown), the first AR is likely to arrive Friday into Saturday along the WA/OR coast with weak conditions (see next slide).

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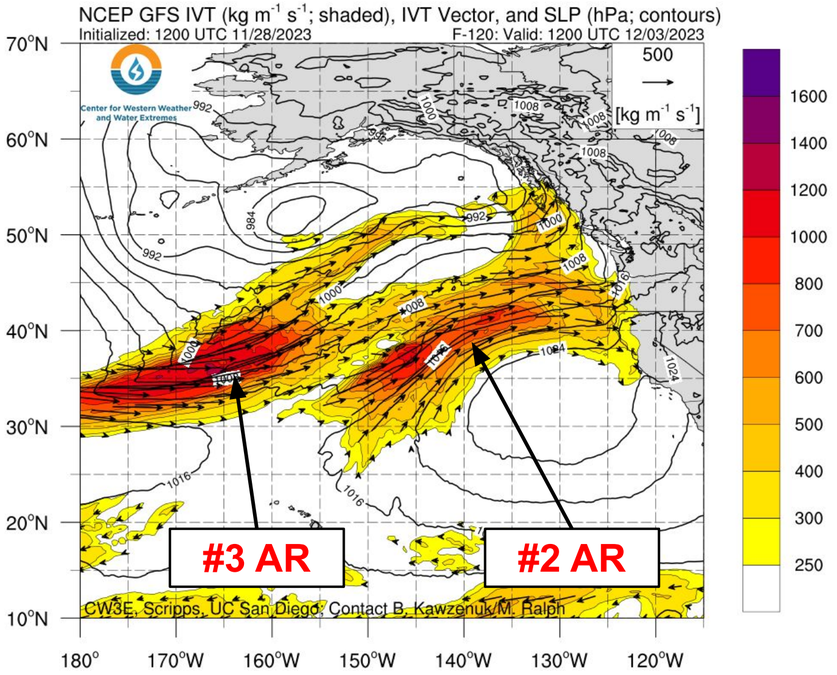
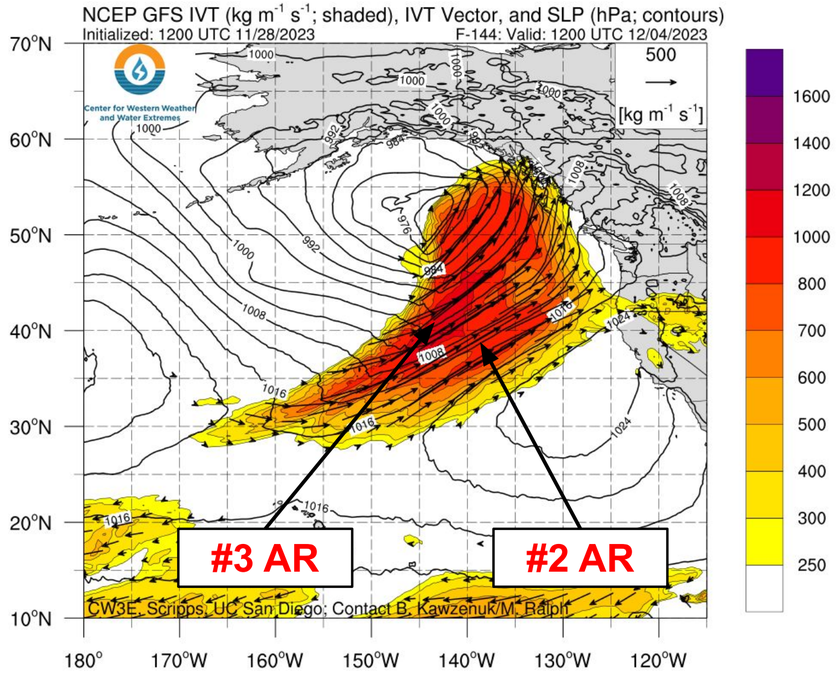
GFS Init 12Z Sun 28 Nov 2023

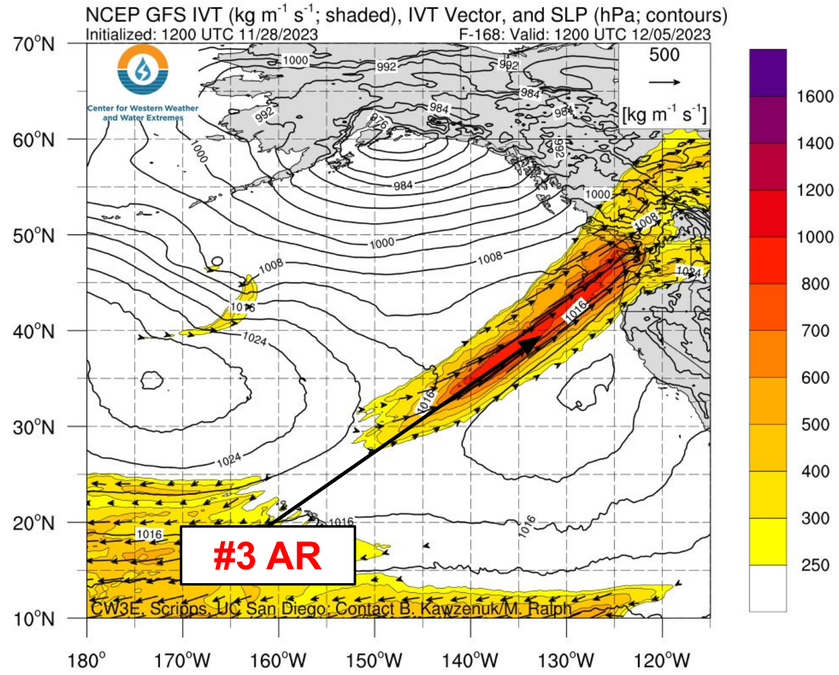
4 AM PT Sun 3 Dec 2023



4 AM PT Mon 4 Dec 2023



4 AM PT Tue 5 Dec 2023



The second and third ARs will approach the Pacific Northwest late in the weekend, with landfall possible early next week. Notably, much of the forecast data at this time suggests the two stronger ARs will merge prior to landfall.

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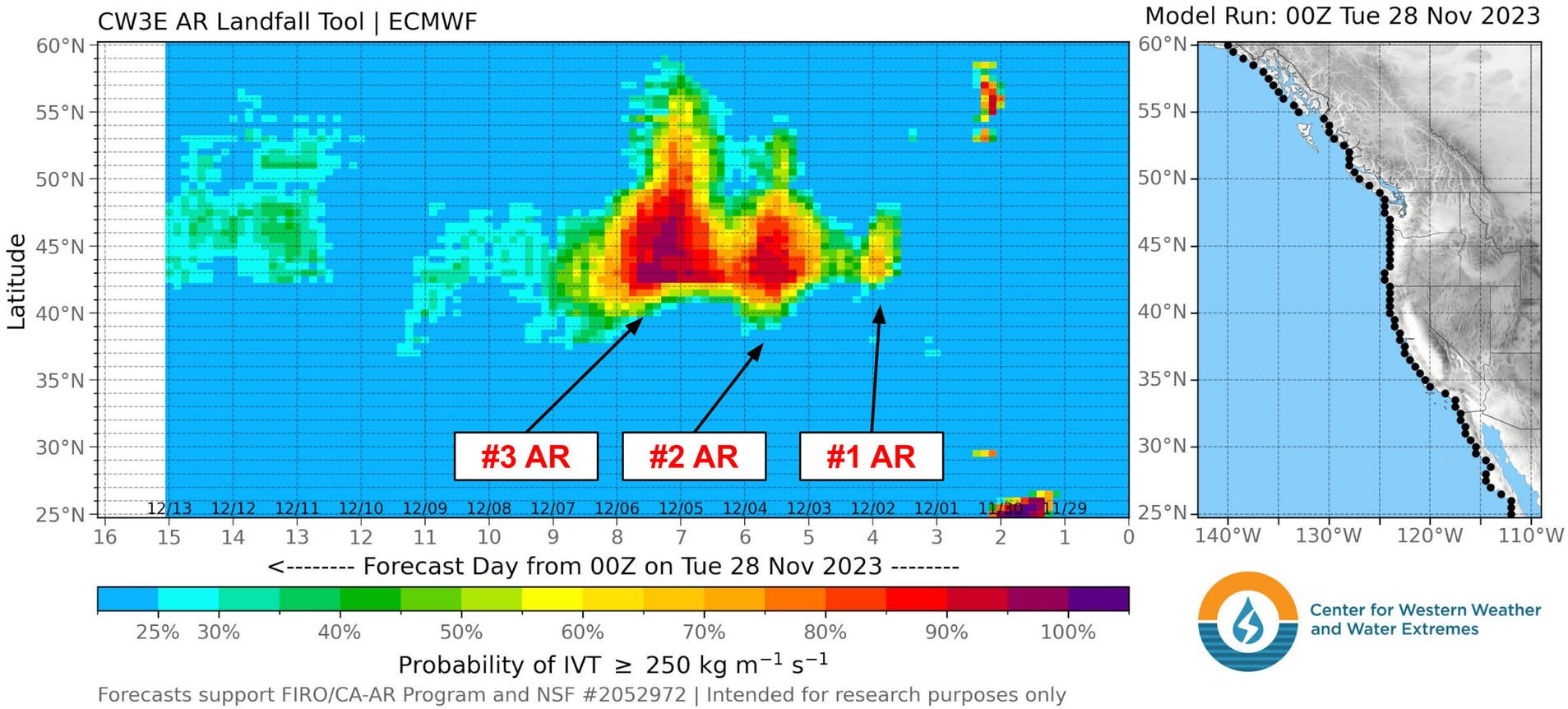

The ECMWF Ensemble Prediction System (EPS) is indicating a very high (90%) chance for AR conditions along the OR and far N CA coast Sun Dec 3. High (80%+) chances for AR conditions are also seen centered on Mon Dec 4 to Tue Dec 5 for a larger area (far N CA to S BC coast).

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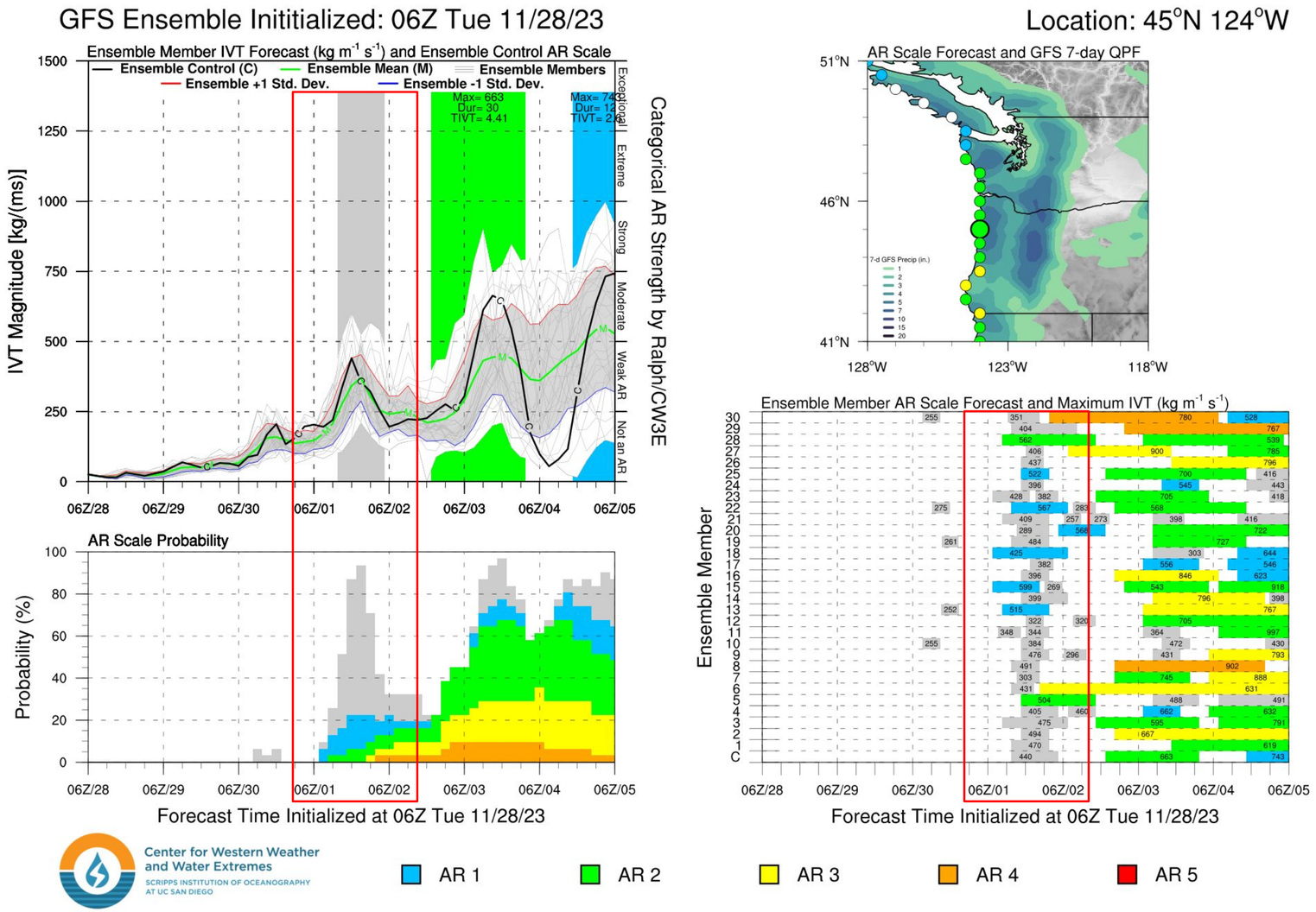
Data from the GFS Ensemble Forecast System (GEFS) for a point along the north Oregon coast demonstrate the timing and intensity uncertainty with the first AR (denoted red box).

Most members suggest AR conditions with a low (20%) probability of an AR1 or greater (based on Ralph et al AR Scale).

Two stronger ARs are forecast to follow as discussed in the next slide.



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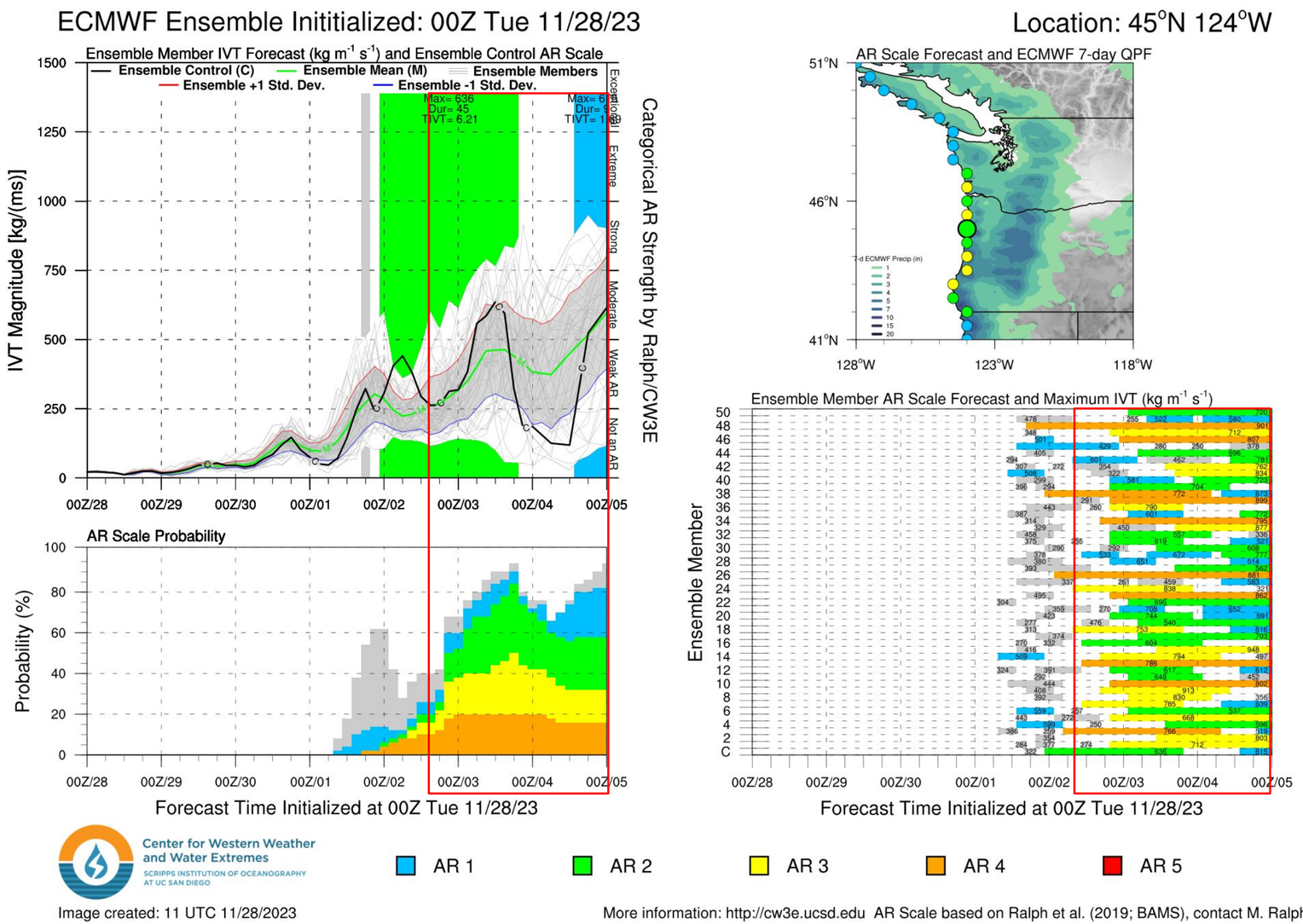
Data from the EPS for the same point show similar values for the first AR.

The second/third AR are forecast to be much stronger (red box). The probability for an AR1+ exceeds 80% with AR3+ roughly 40%. Note the potential for a long duration of AR conditions along with peak IVT values exceeding 750 kg/(ms).



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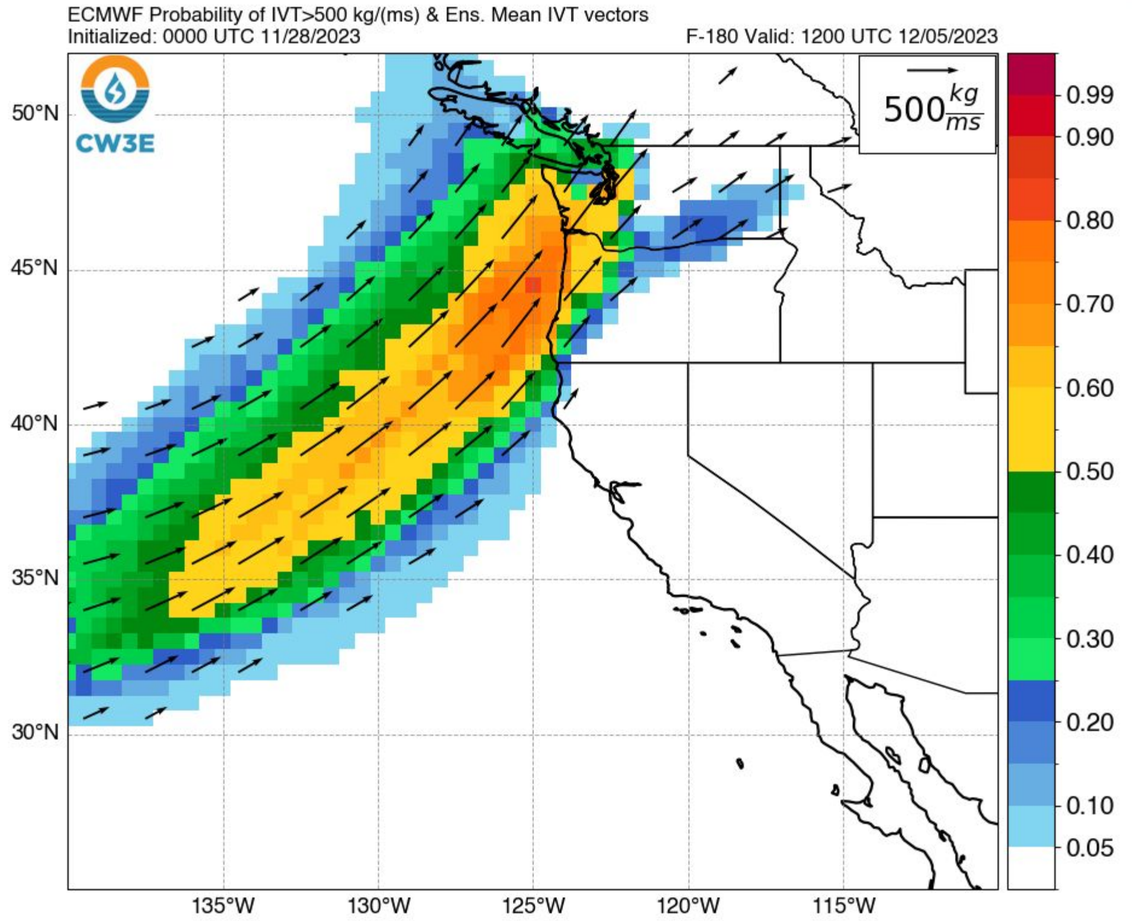

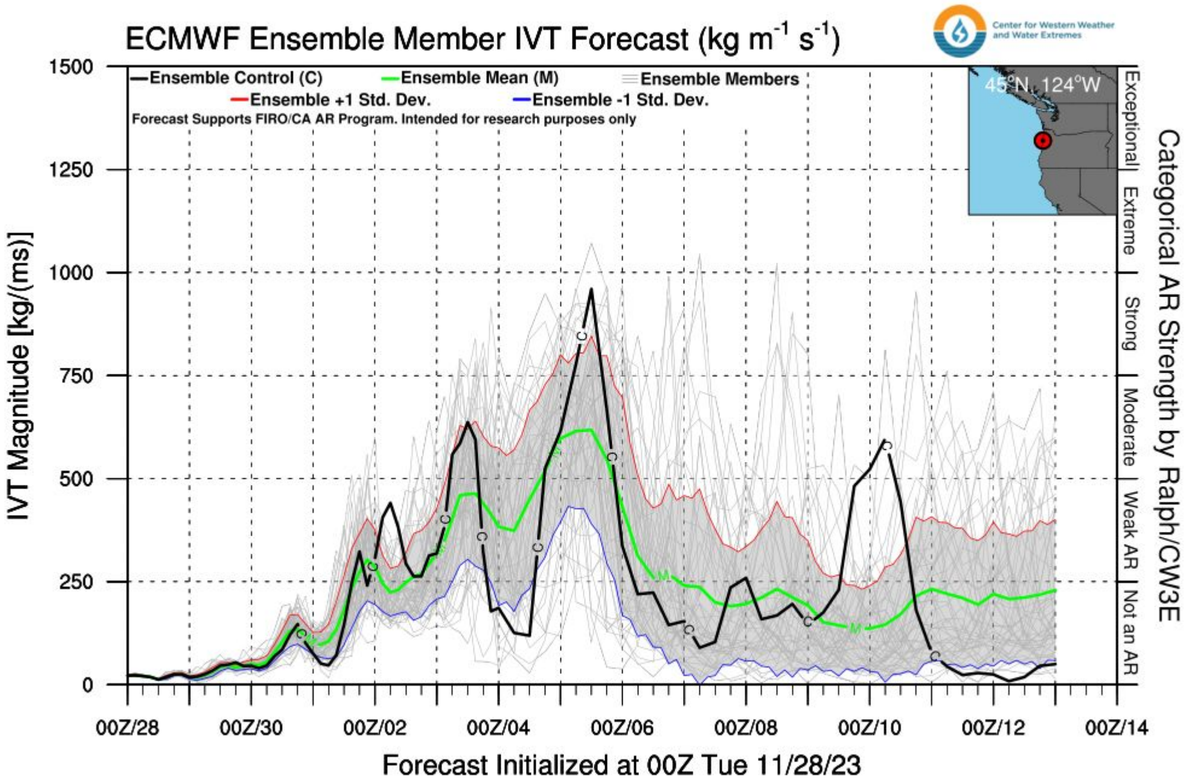

[Left] There is a high (80%) probability (EPS-based) for integrated vapor transport (IVT) of 500+ kg/(ms) at forecast hour 180 (4 AM PT Tue 5 Dec 2023) off the Oregon coast. [Right] Data suggest prolonged AR conditions will be possible for the Oregon coast.

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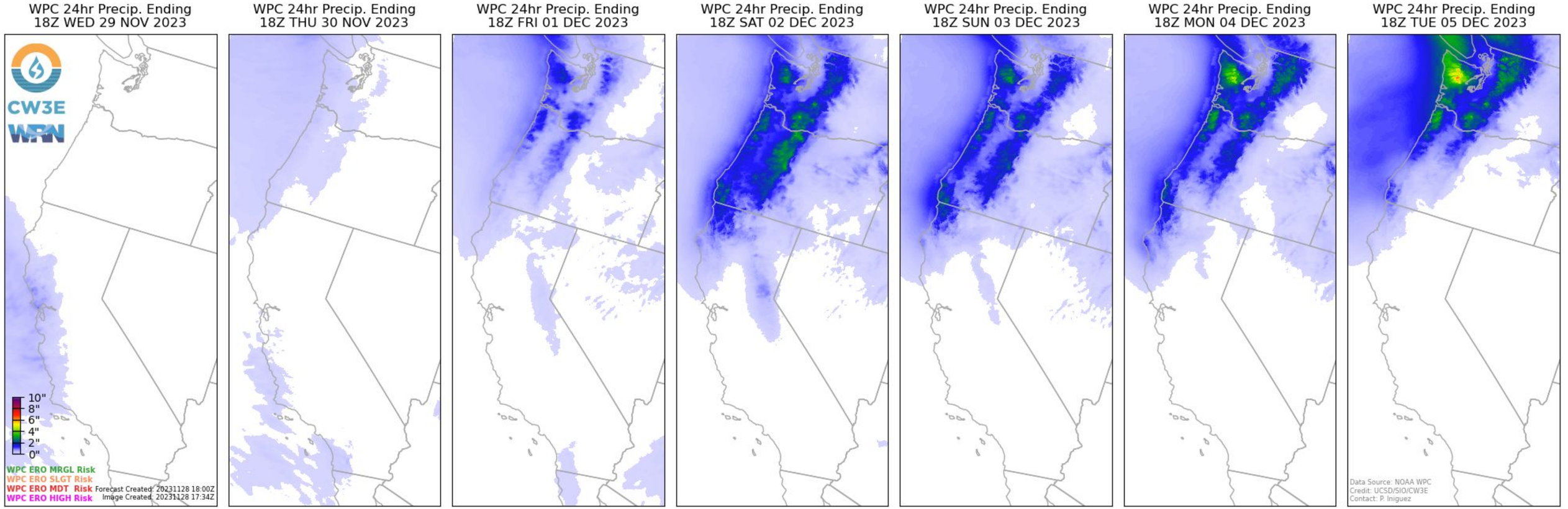

The NOAA WPC indicates generally dry conditions today and tomorrow, with precipitation arriving late Thu Nov 30 with the first AR. Precipitation then increases in intensity through the weekend and into next week.

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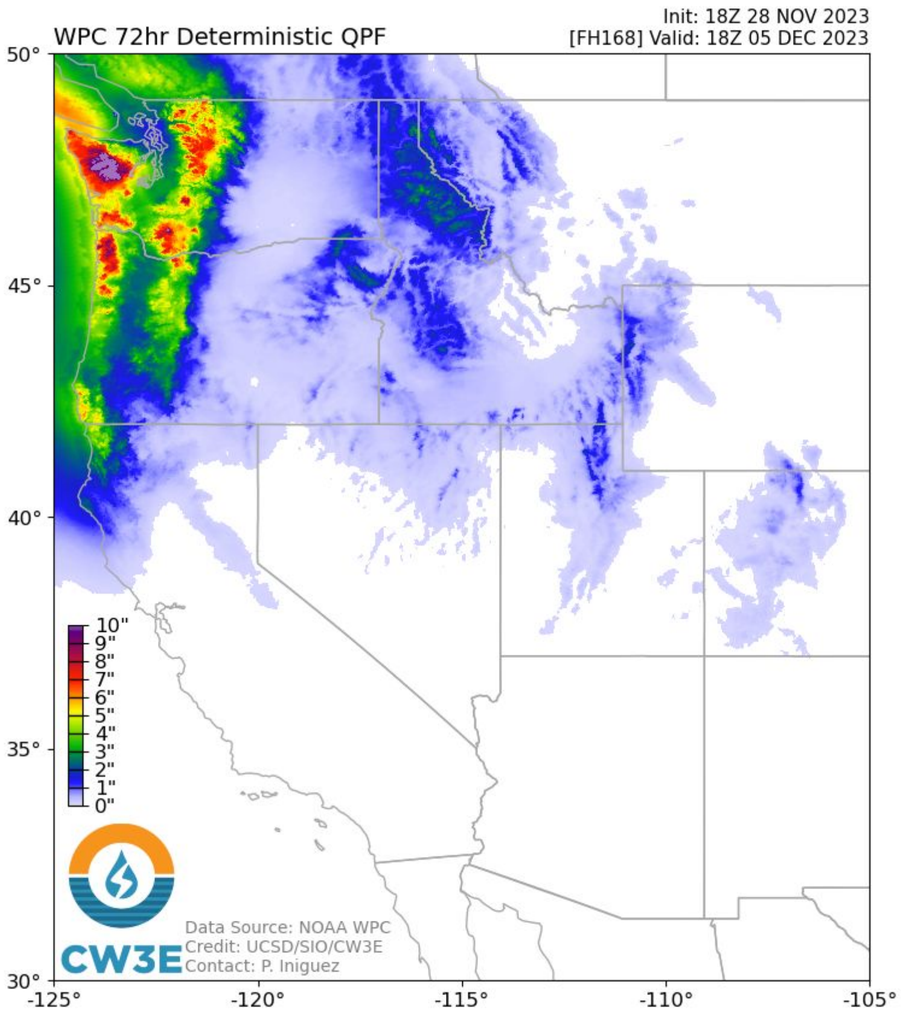
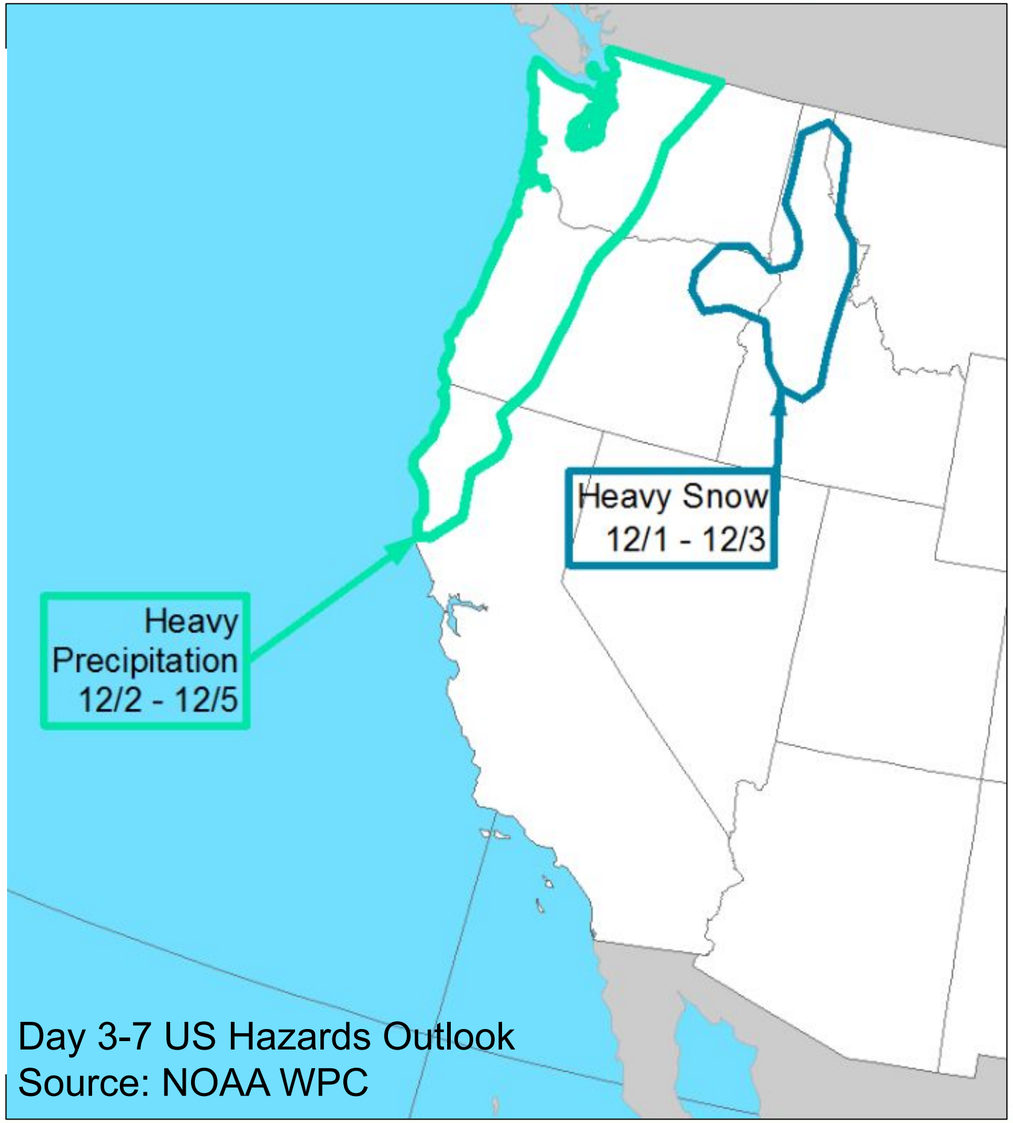
For the three day period ending in the AM on Tue Dec 5, the NOAA WPC is forecasting 1-5” of precipitation (liquid equivalent) for lower valley locations with 4-10” in the mountains.





Day 3-7 US Hazards Outlook
Source: NOAA WPC

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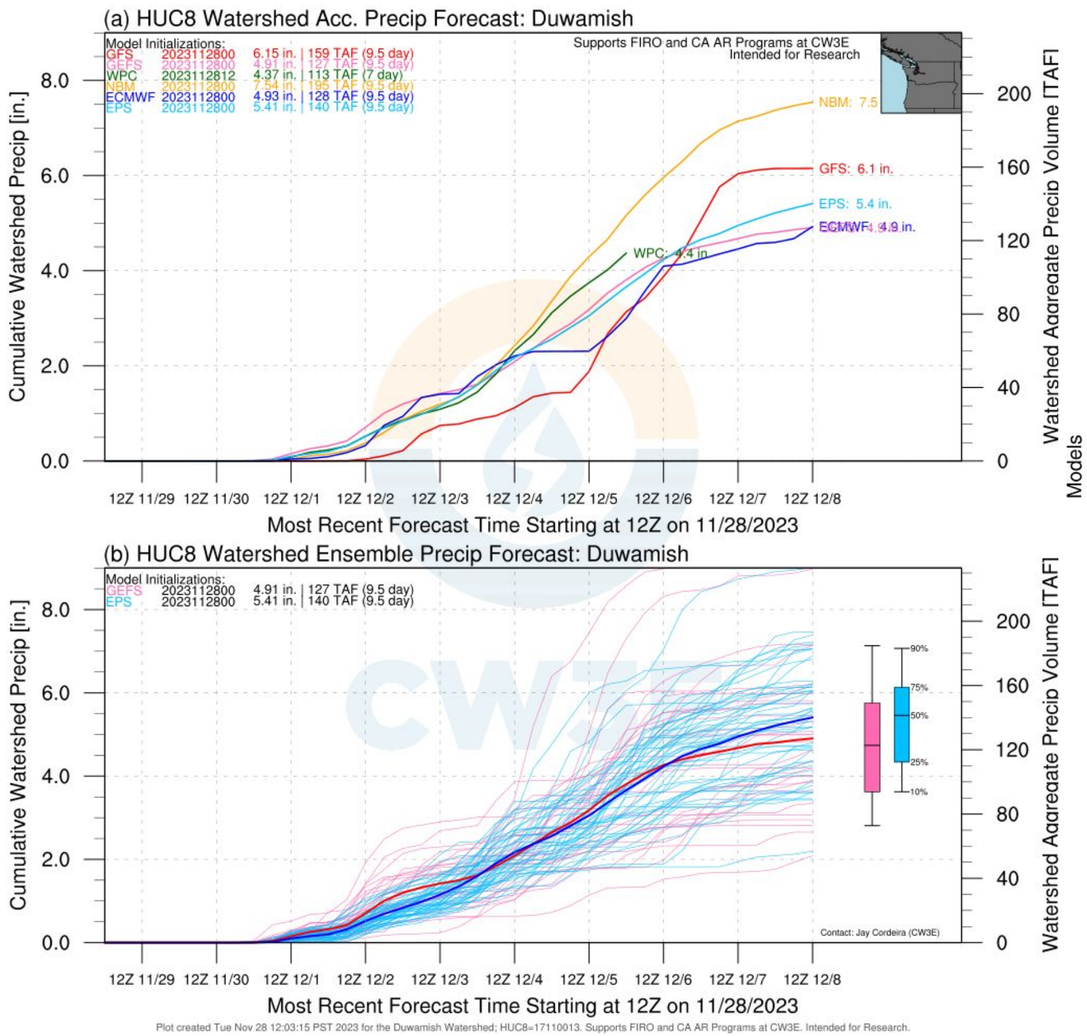
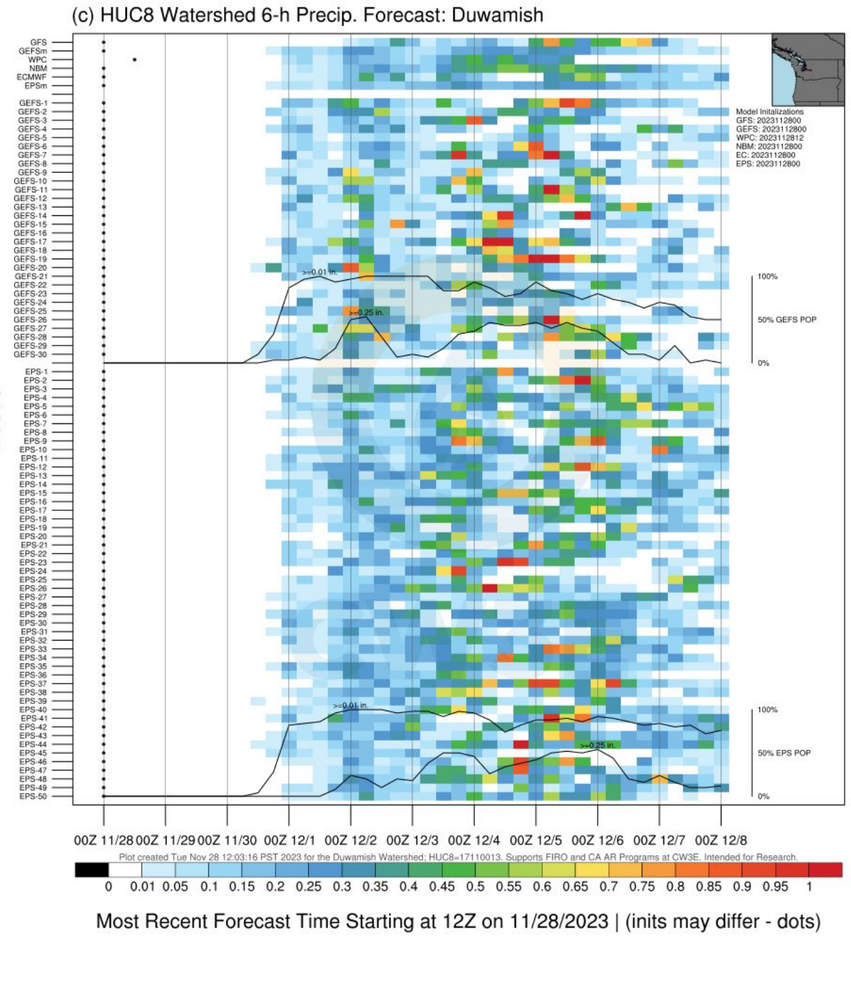
For the Duwamish watershed, there is tight clustering around 4-6” for total precipitation, though values could range from 2” on the low end to approaching 8” on the high end.

Embedded periods of heavy rain will be possible primarily with the third AR.





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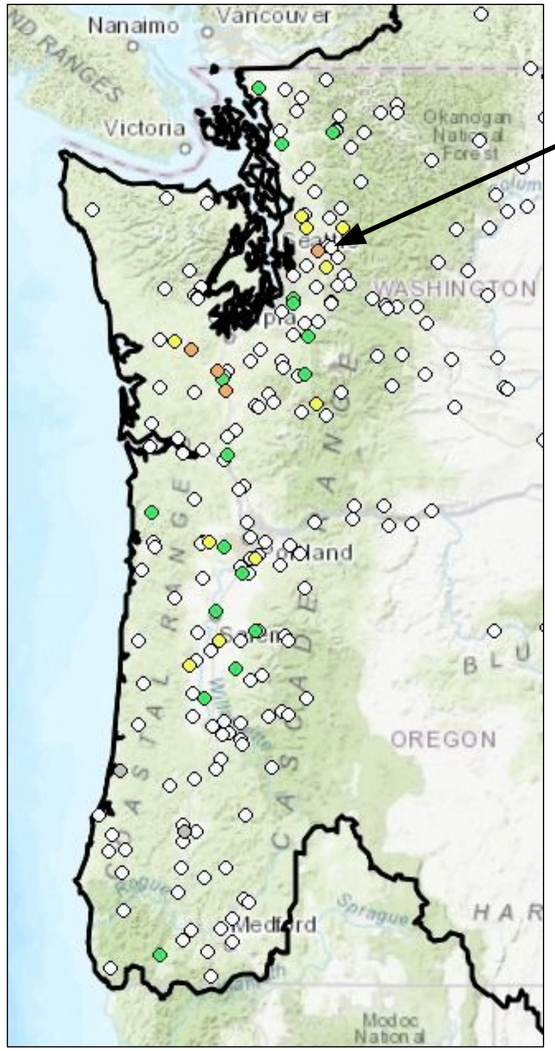
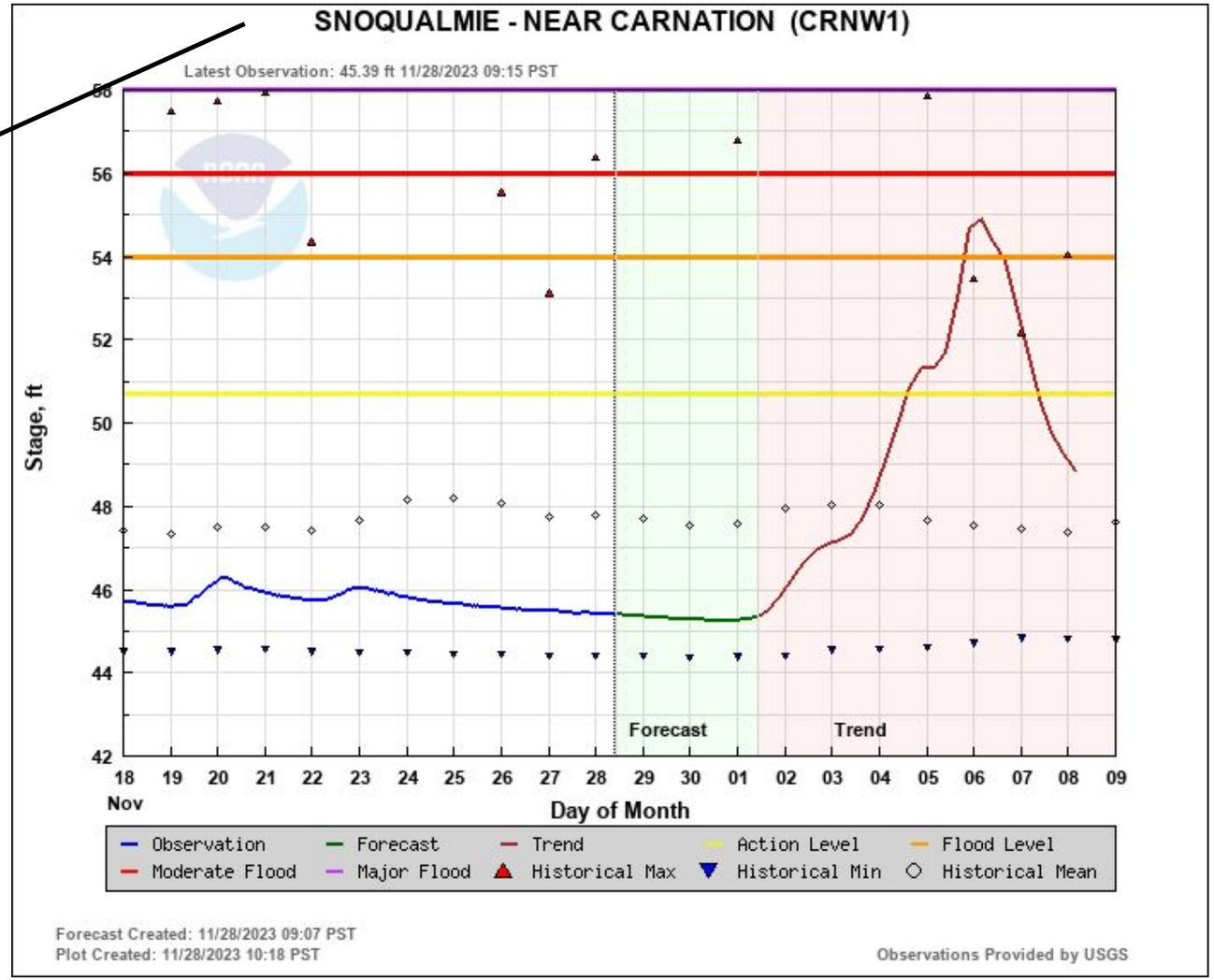
Precipitation amounts may be high enough to cause some flooding. The NOAA Northwest River Forecast Center currently forecasts several rivers to exceed action and/or flood stage next week.

Please check the NWRFC website (nwrfc.noaa.gov) for the latest forecasts.





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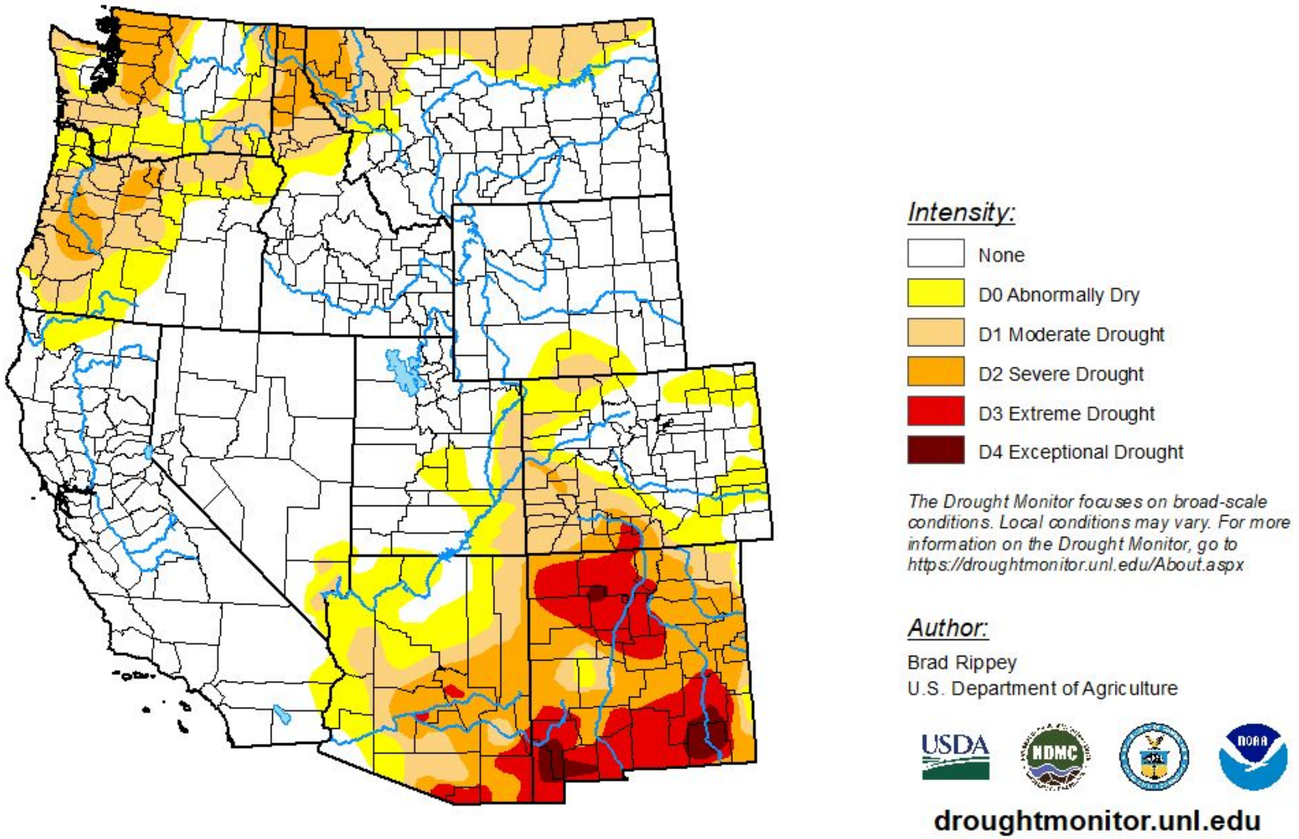
Precipitation will be beneficial for drought conditions, as much of western WA and OR, along with portions of northern ID and MT, are currently in Moderate to Severe Drought.



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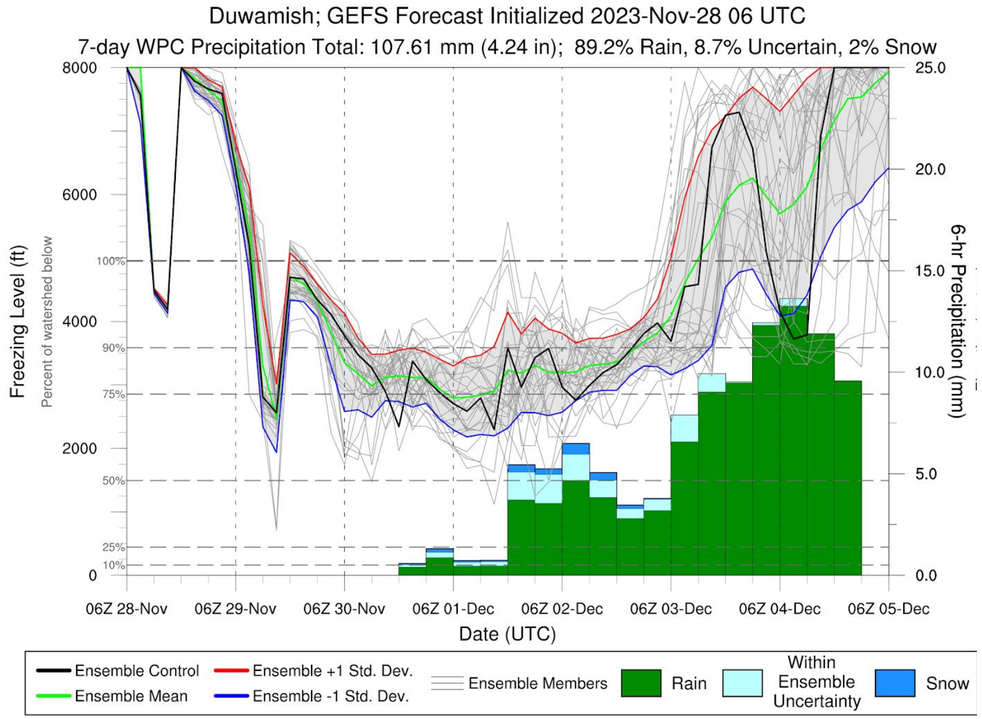

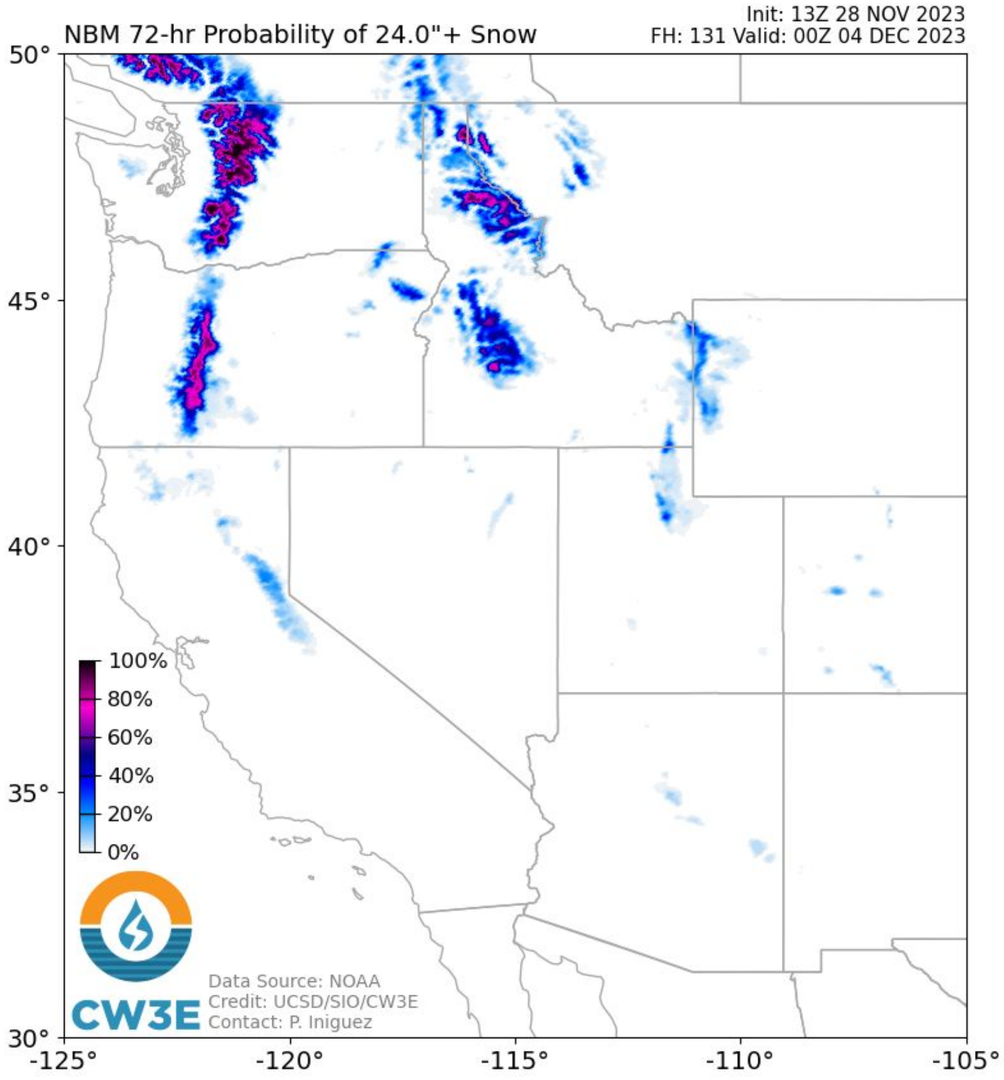

The freezing level will drop with the first AR, perhaps reaching 2000’ (shown above east of Tacoma, WA). However, the stronger second and third ARs will result in warmer air and higher freezing levels. Still, the NBM (right) indicates high chances for 2’+ of snow in the Cascades and the Bitterroots.

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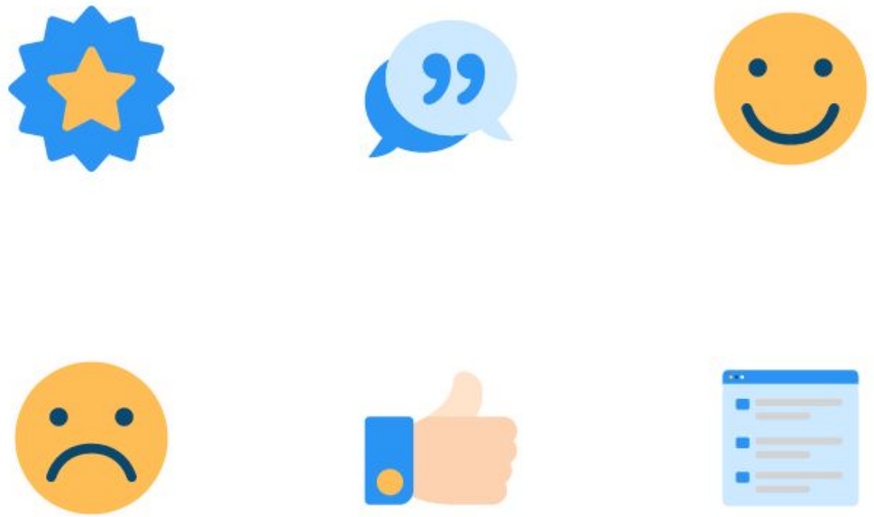

We value your feedback! Please complete this short survey to help us improve these outlooks.