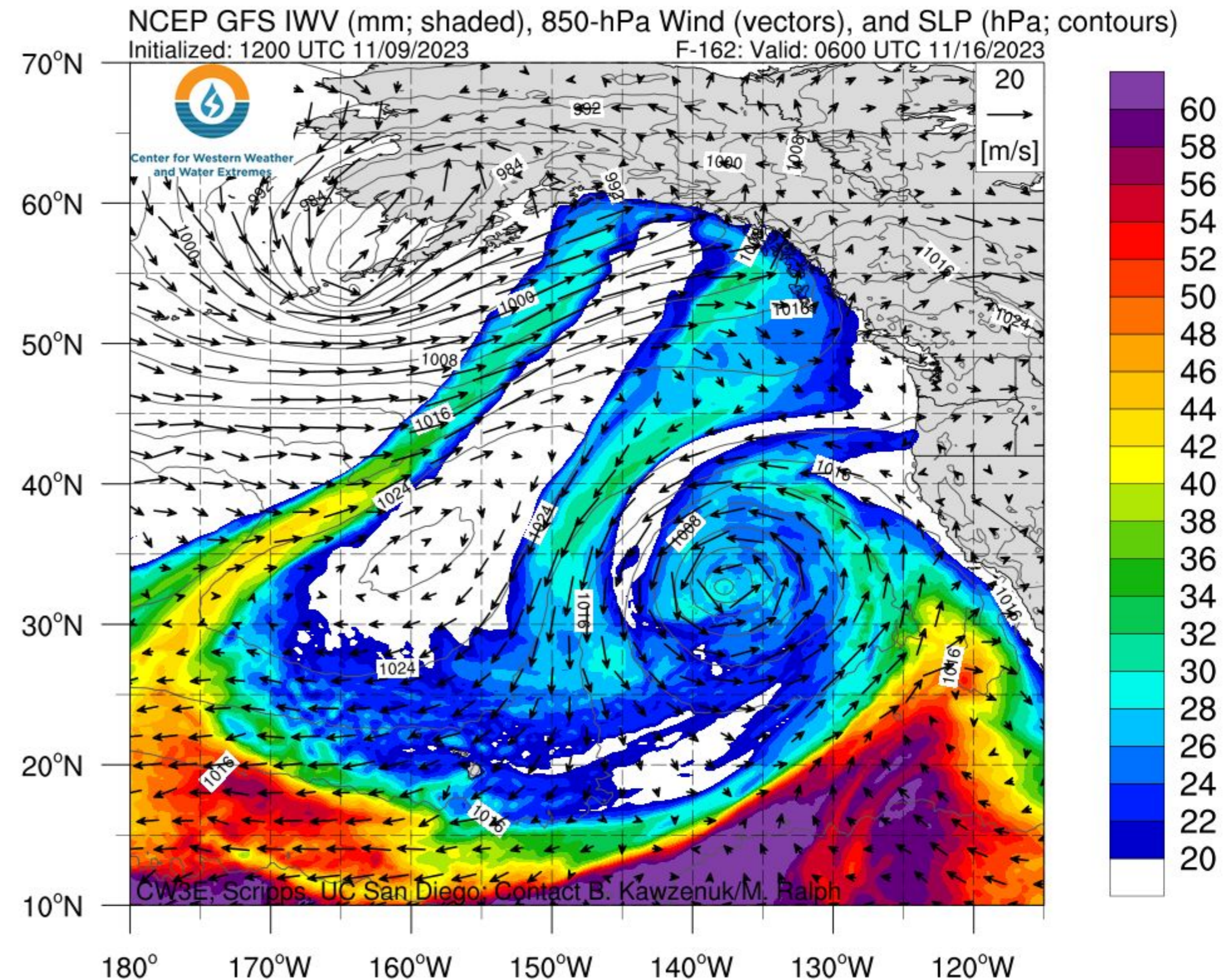


CW3E Atmospheric River Outlook: 9 Nov 2023

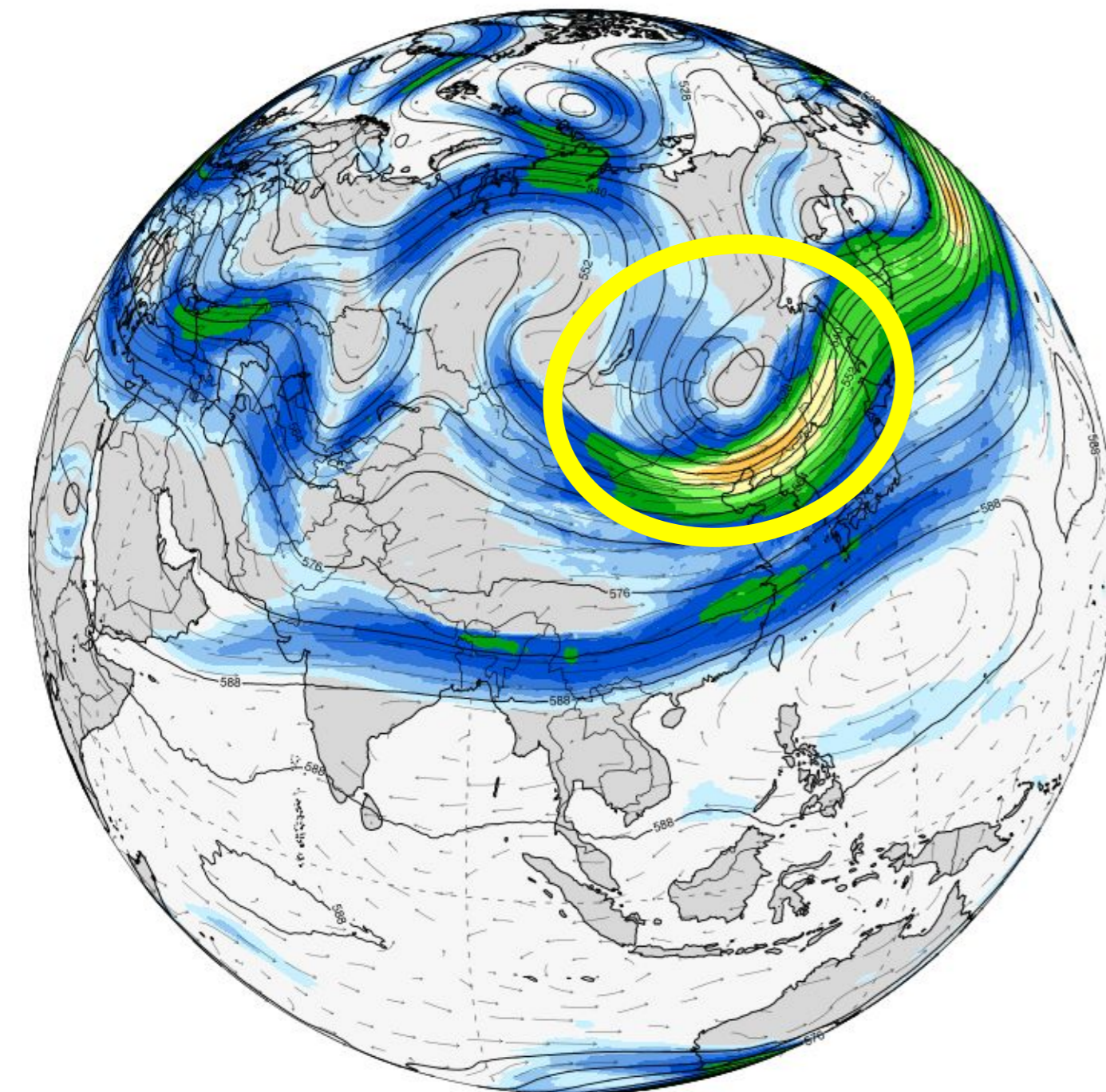
- Several low pressure systems will interact across the Northeast Pacific Ocean this weekend.
- As they do, they will evolve into a deep storm system off the California coast.
- Significant amounts of moisture will be drawn northward into the system.
- As the system advances onshore, at least one atmospheric river will develop and very likely bring widespread rain and snow to the West Coast and inland areas.
- The Atmospheric River Reconnaissance field campaign has been tracking these systems and is planning sampling flights coming up.



CW3E AR Outlook: 9 Nov 2023

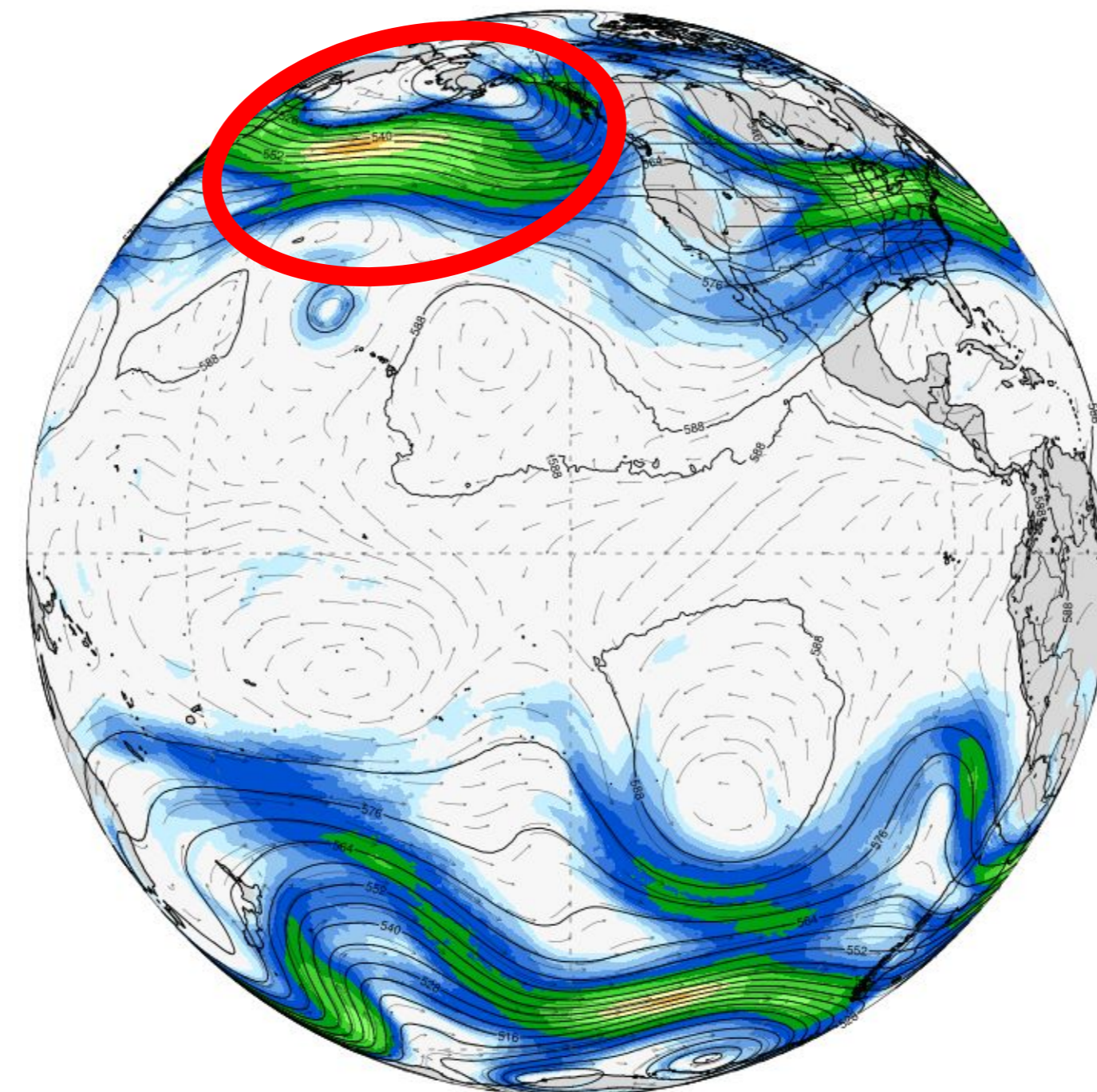
GFS 500hPa Jetstream (kt) & Height (dam)
1-day Avg | Thu, Nov 09, 2023

ClimateReanalyzer.org
Climate Change Institute | University of Maine



GFS 500hPa Jetstream (kt) & Height (dam)
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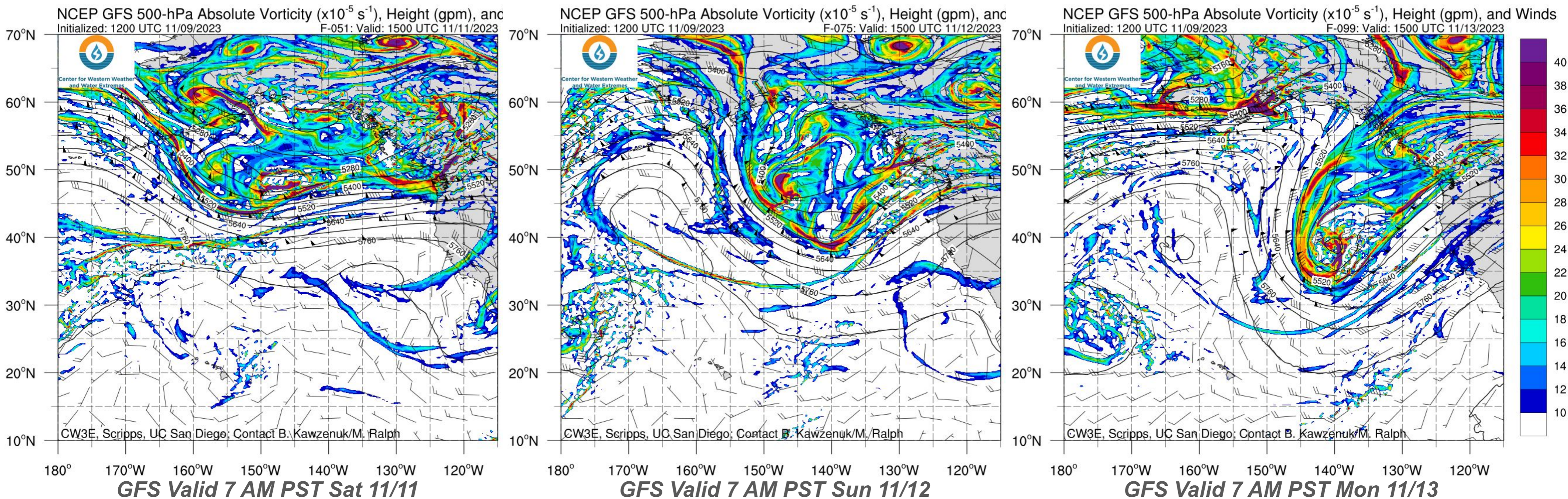


Currently across the North Pacific Ocean, two weather systems are noted. The first (red circle) is moving through the Gulf of Alaska while a second (yellow circle) system is close behind as it moves off East Asia.

These two systems will begin interacting over the Northeast Pacific Ocean this weekend.

CW3E AR Outlook: 9 Nov 2023

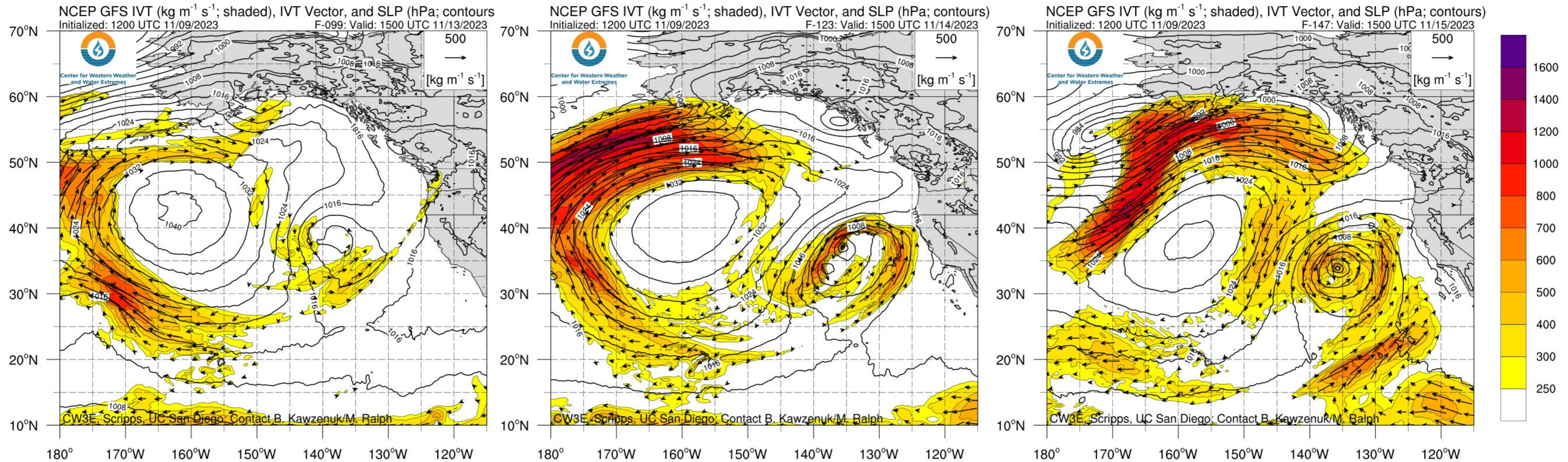
GFS Init 12Z 9 Nov 2023



As the two storm systems move east, they will influence one another. (Note there remains considerably uncertainty in the forecast with this interaction.) The trailing system will amplify the wave pattern, leading to anti-cyclonic wave breaking causing the leading system to buckle and push south.

CW3E AR Outlook: 9 Nov 2023

GFS Init 12Z 9 Nov 2023



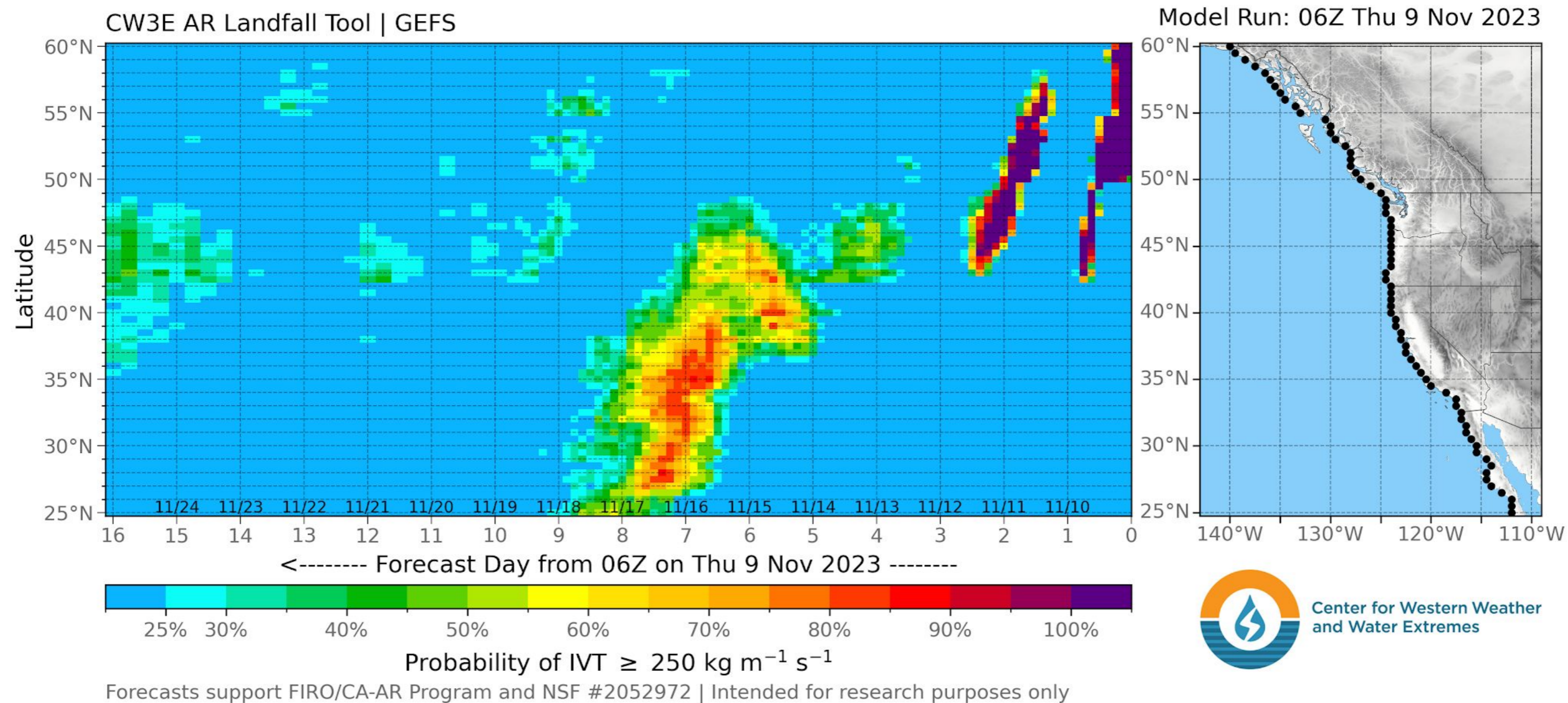
GFS Valid 7 AM PST Mon 11/13

GFS Valid 7 AM PST Tue 11/14

GFS Valid 7 AM PST Wed 11/15

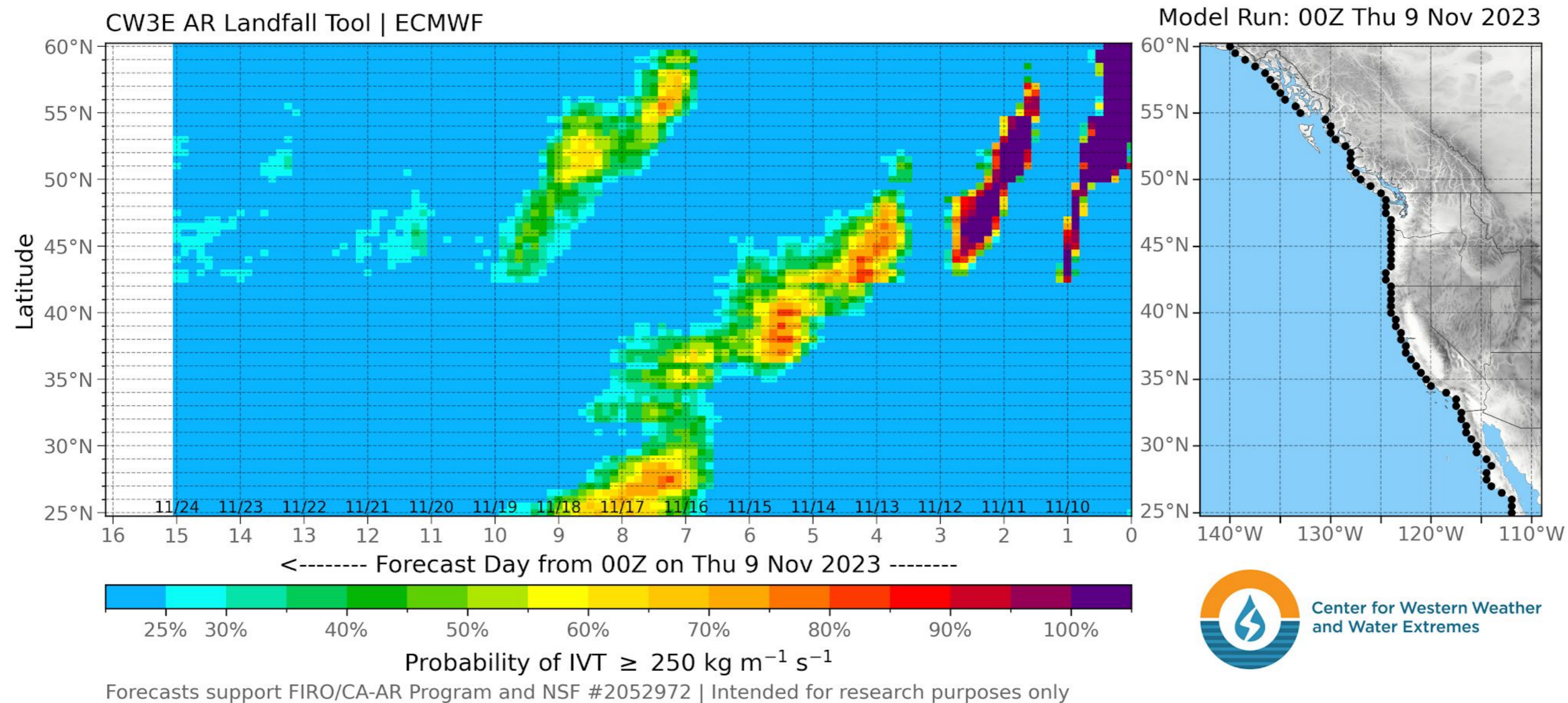
Ahead of the first system, southerly winds will increase leading to increasing moisture advection and the potential gradual development of an Atmospheric River (AR). Forecast uncertainty increases around Tue 11/14 and thereafter as a variety of solutions are possible - the storm may form into a cut-off low and stall off the coast, take a progressive track and move inland, or something inbetween.

CW3E AR Outlook: 9 Nov 2023



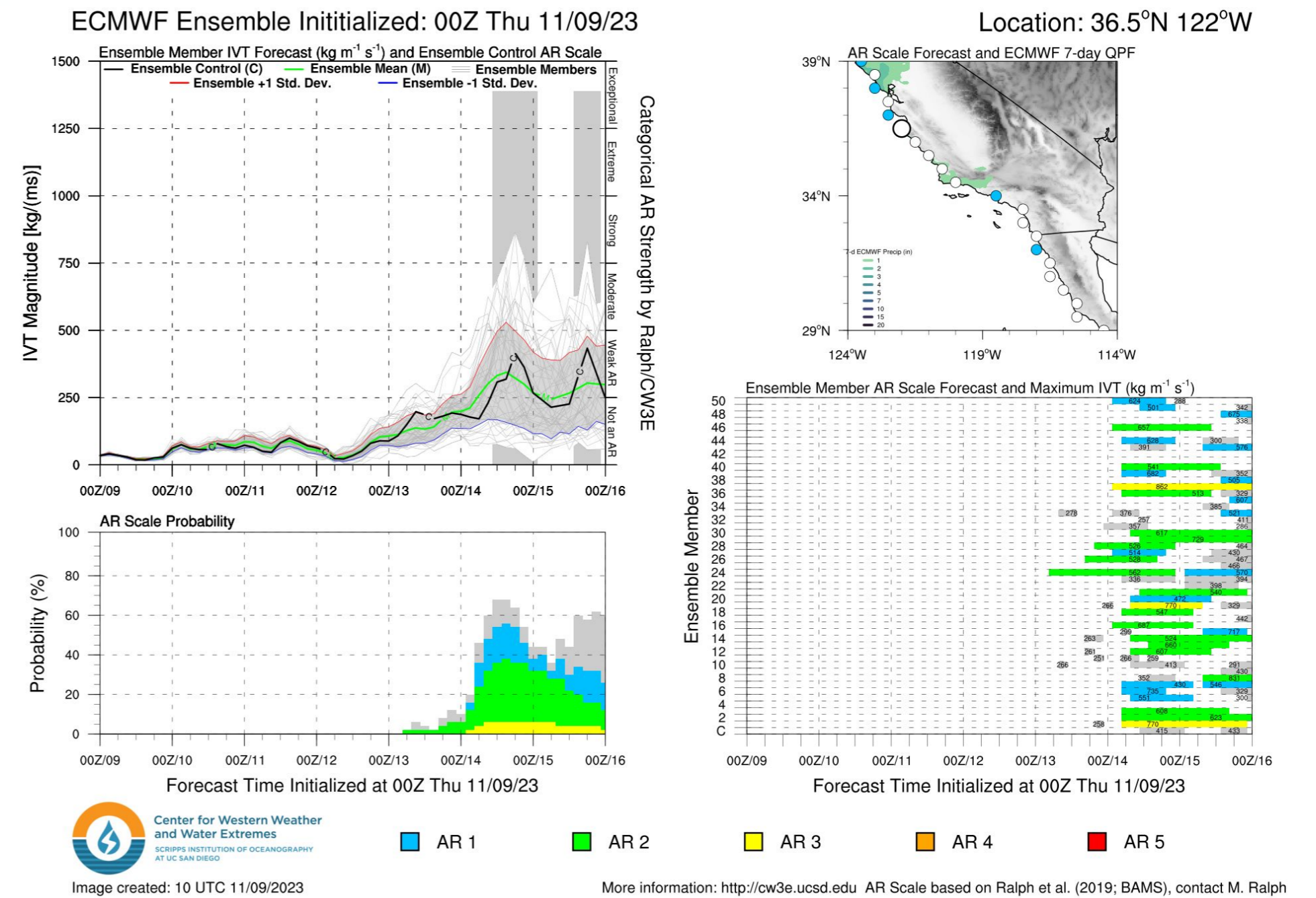
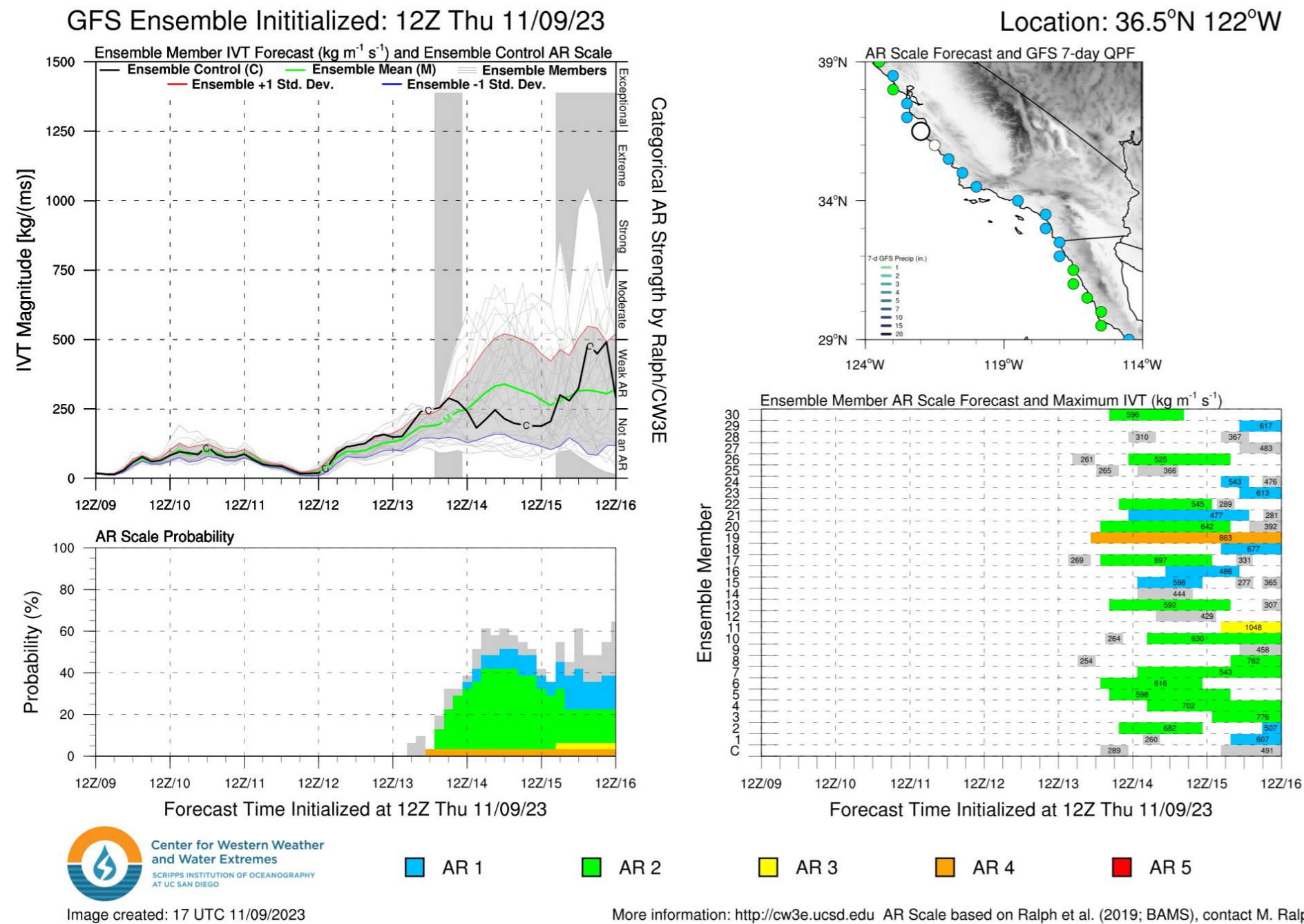
Data from the GFS Ensemble Forecast System (GEFS) indicate a high probability (60%+) of AR conditions (integrated water vapor transport [IVT] of 250+ kg/(ms)) along the OR and N CA coast centered on Tues 11/14. Those chances shift south towards C CA and S CA peaking Thu 11/16. Note the chances do stretch from 11/15 through 11/17, indicating timing and evolution uncertainty. It is possible that multiple ARs develop during this time.

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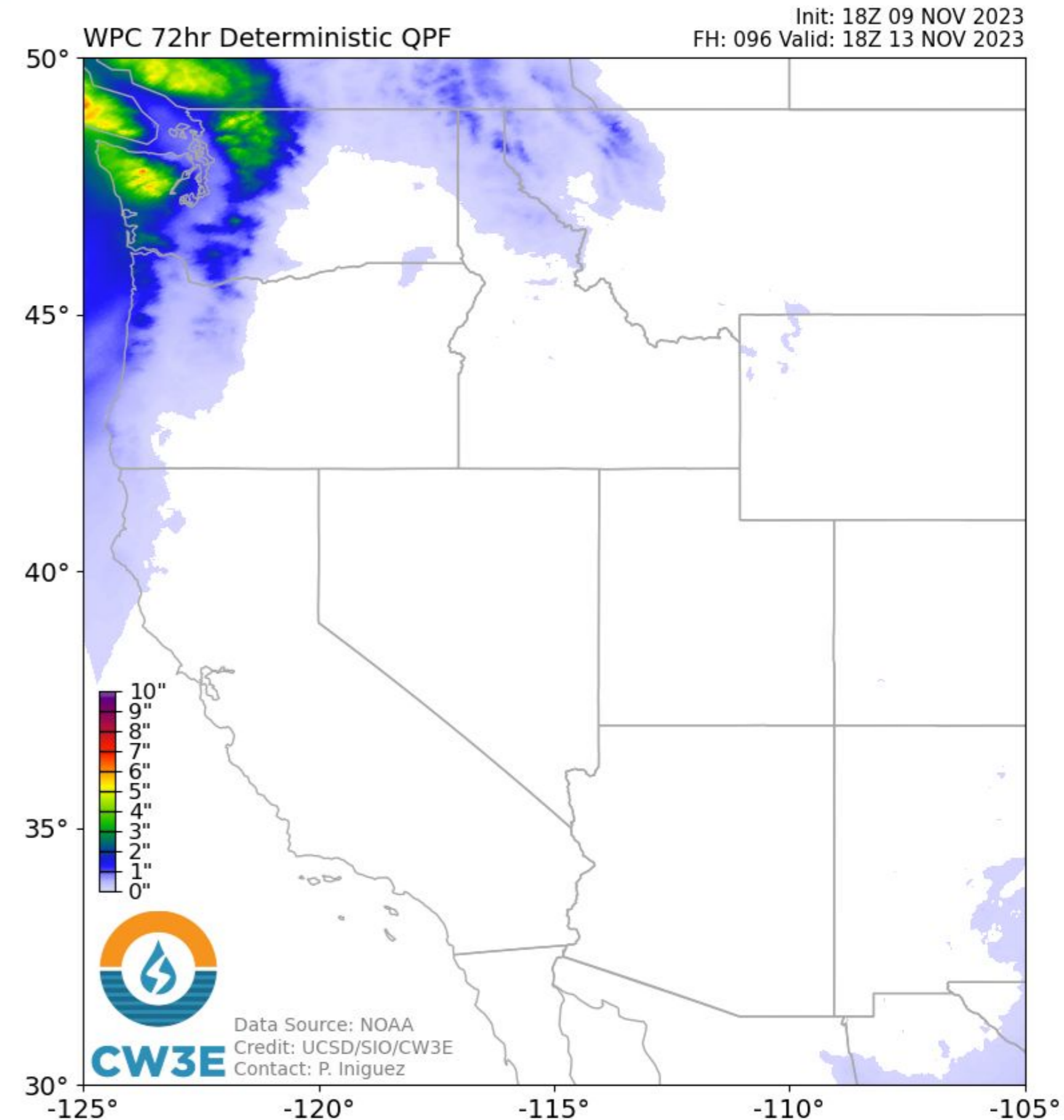
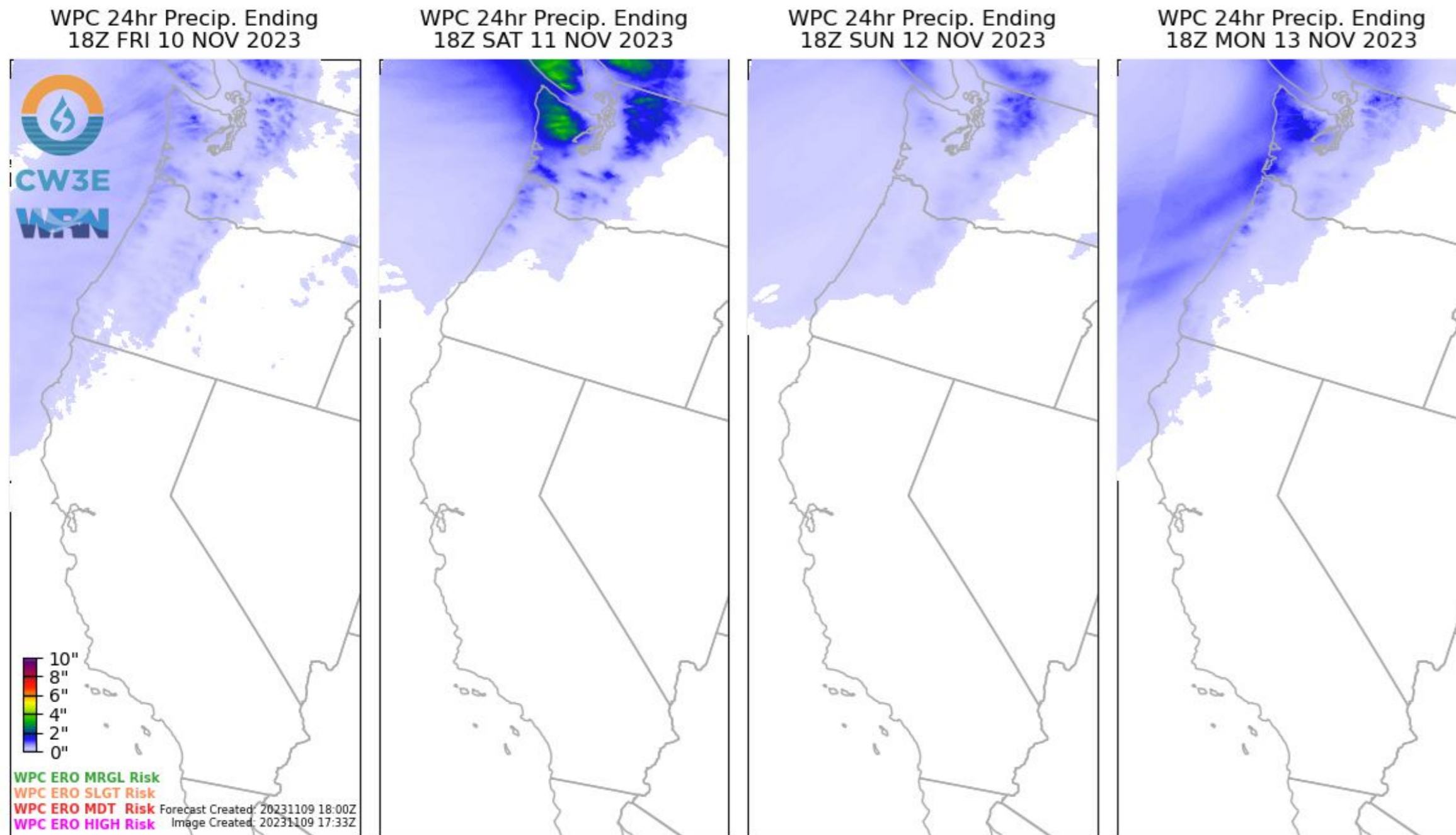
Data from the ECMWF Ensemble Prediction System (EPS) show some general agreement with the GEFs regarding AR conditions for N CA on Tue 11/14 though they are lower overall. Considerable differences are noted in position, timing, and probability for AR conditions for C CA and S CA for the Wed 11/15 through Fri 11/17 timeframe. With additional observations and model data in the days ahead, this spread will decrease.

CW3E AR Outlook: 9 Nov 2023



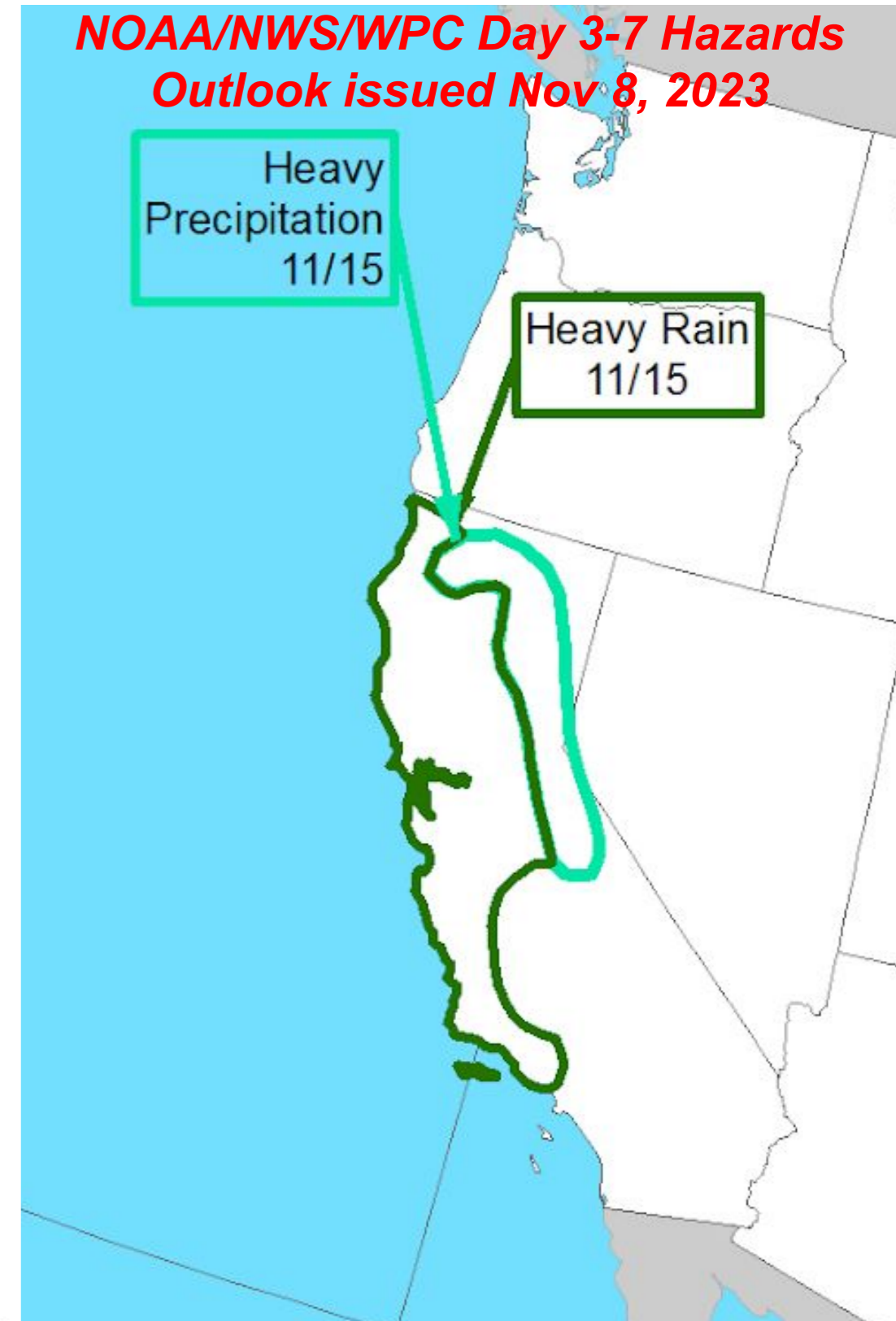
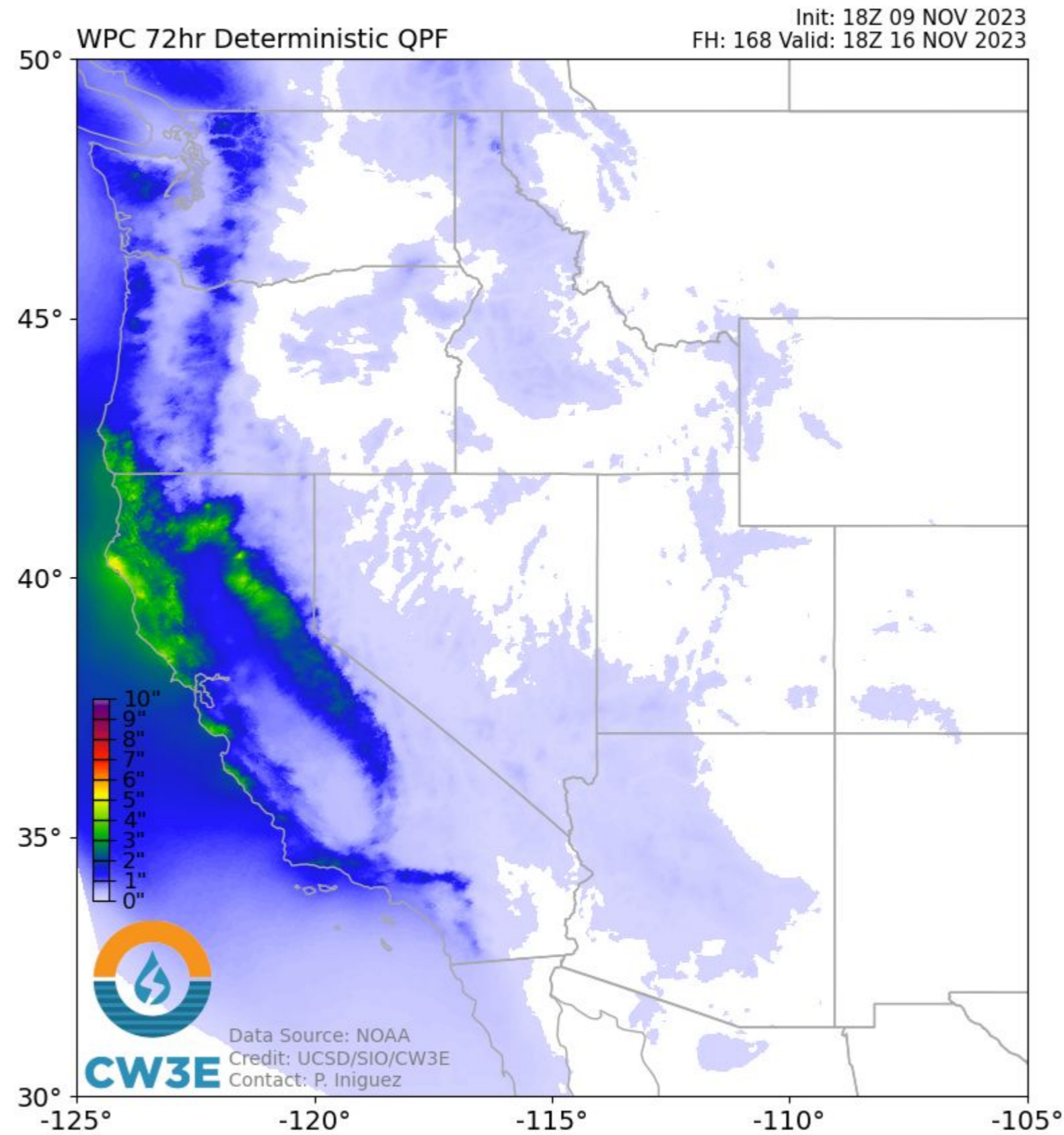
Looking at Monterey, CA, both the GEFS and EPS show a ~50% chance for AR1+ conditions (based on the Ralph et al. 2019 AR scale) to develop, though considerable uncertainty can be seen. Both the GEFS and EPS also show a 50% chance that AR conditions will not develop. (Note the absence of an AR does not mean an absence of rainfall.)

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Forecasts from the NOAA/NWS Weather Prediction Center (WPC) show precipitation remaining generally along the coastal areas of Oregon and Washington through the weekend (Fri 11/10 to Mon 11/13). Total amounts of 1-2" across the lower elevations and 2-6" across higher elevations are possible.

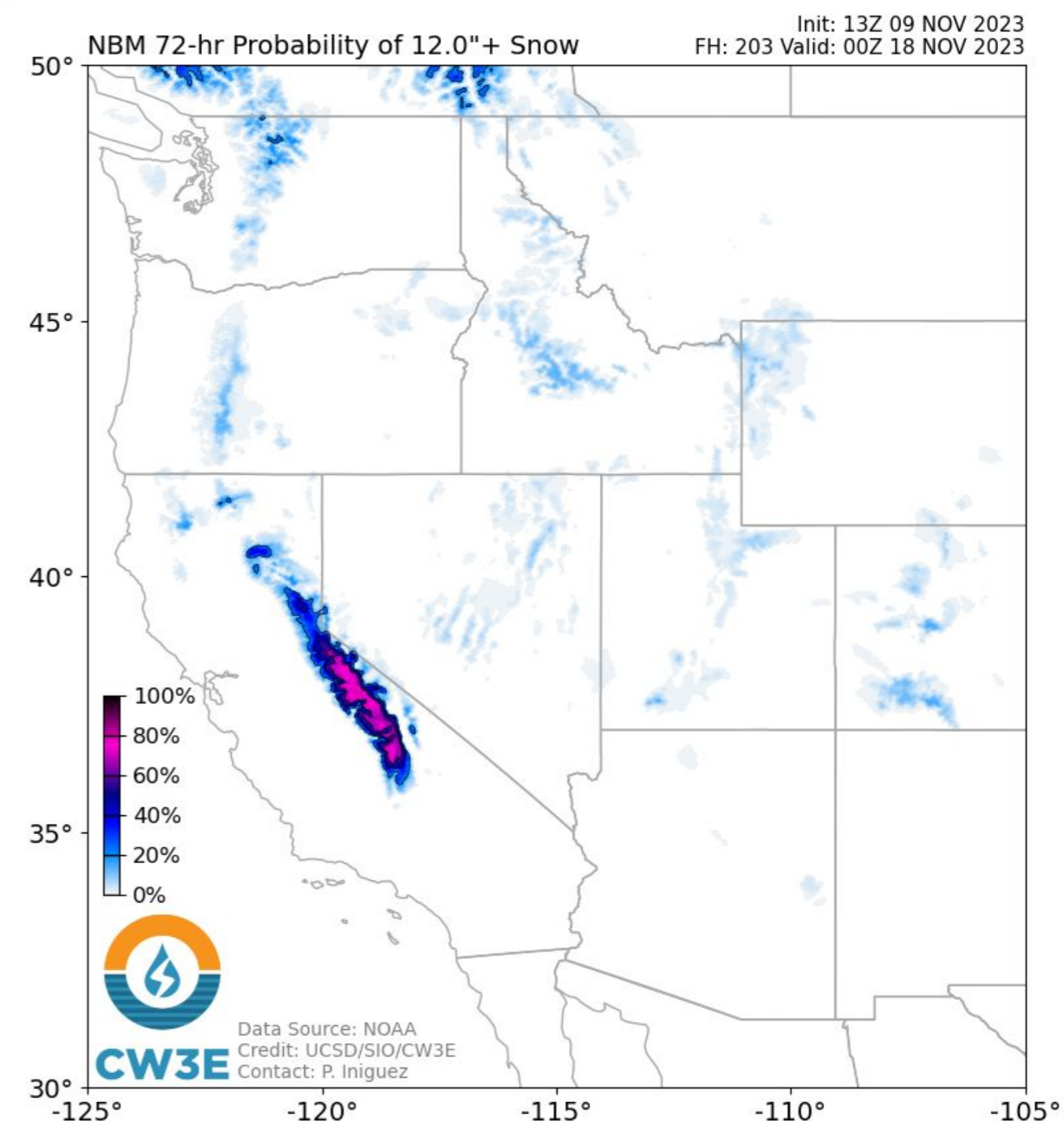
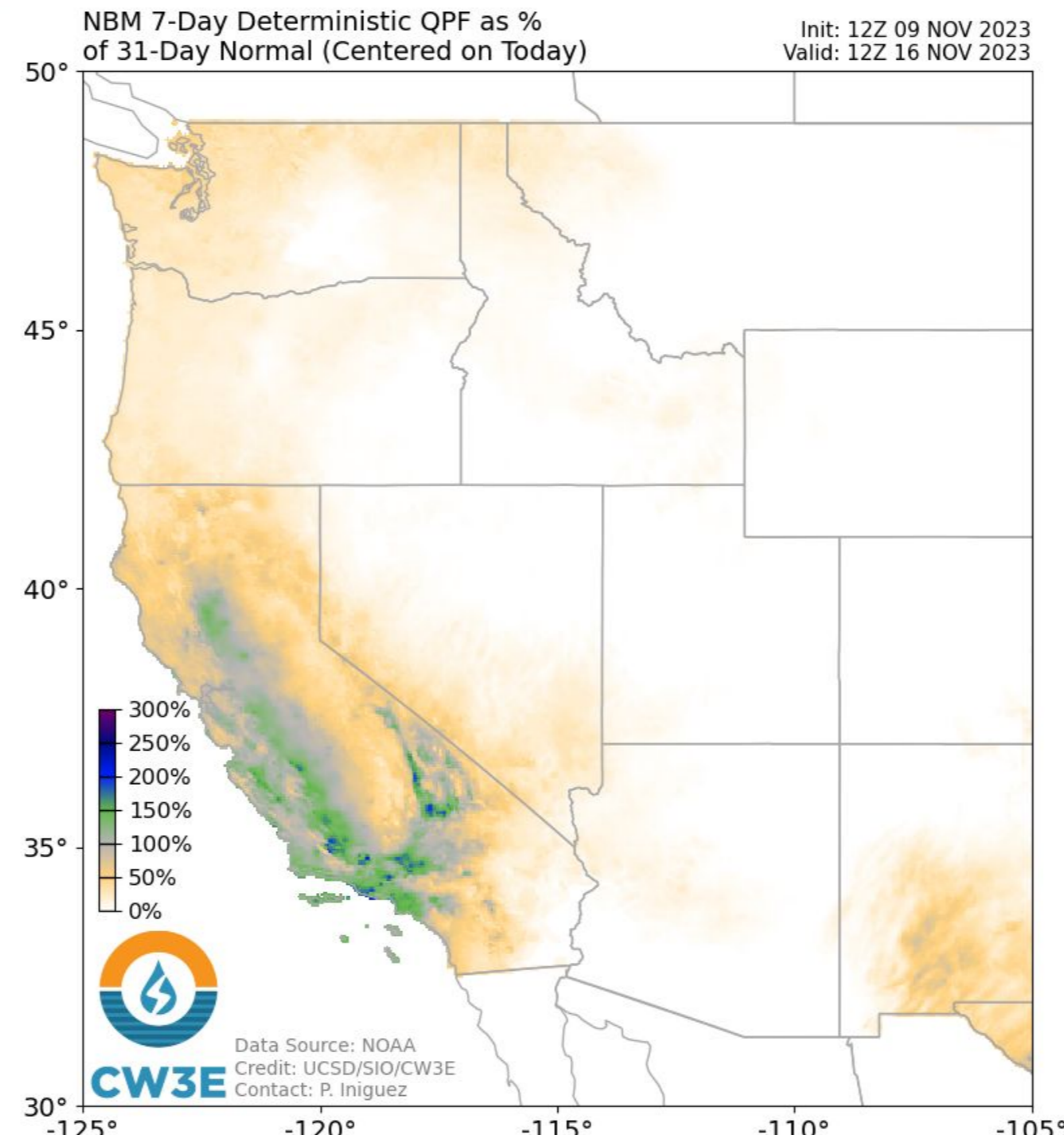
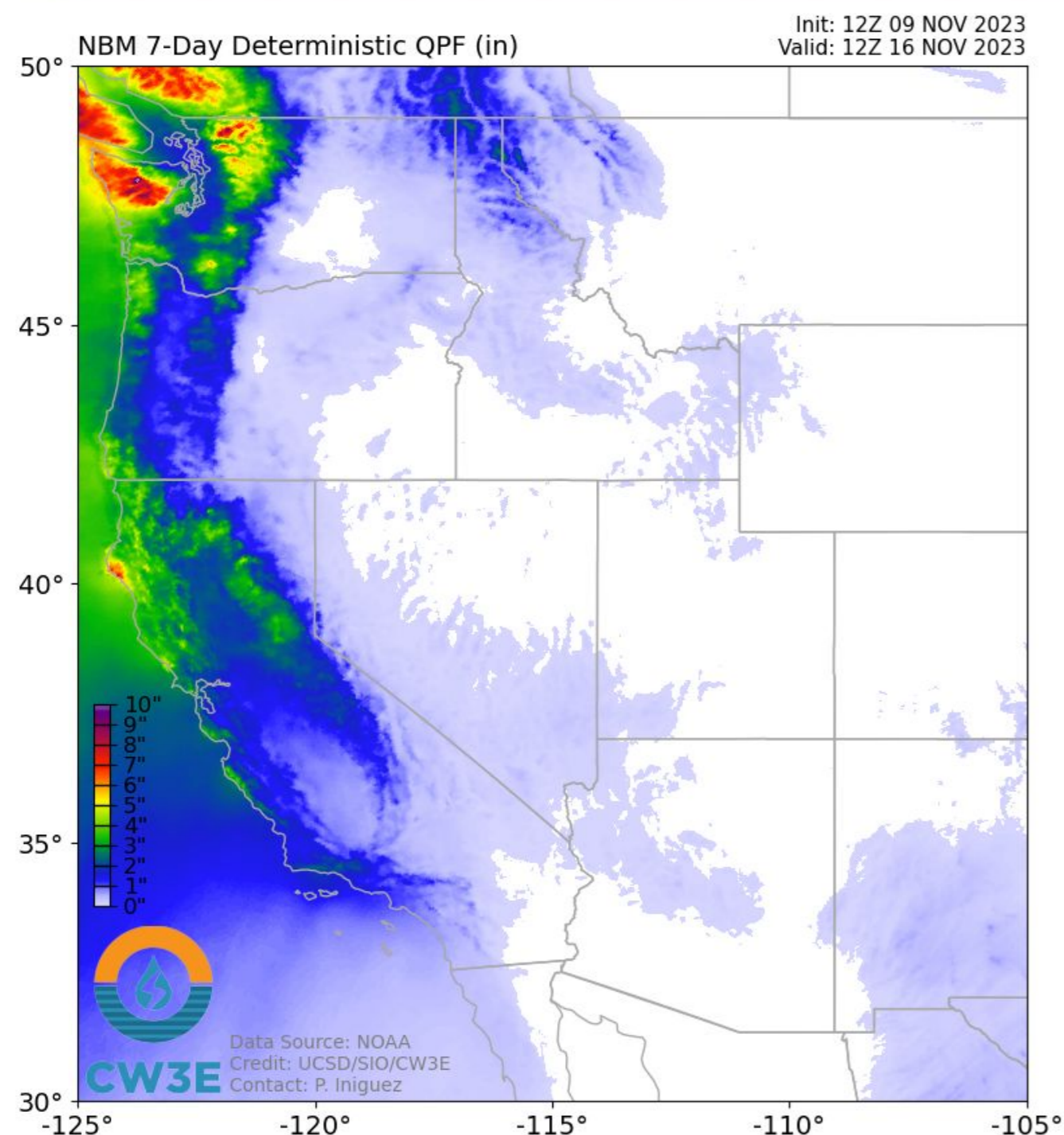
CW3E AR Outlook: 9 Nov 2023



Precipitation will spread into California midweek (left image) as the storm system begins to move onshore and AR conditions likely increase.

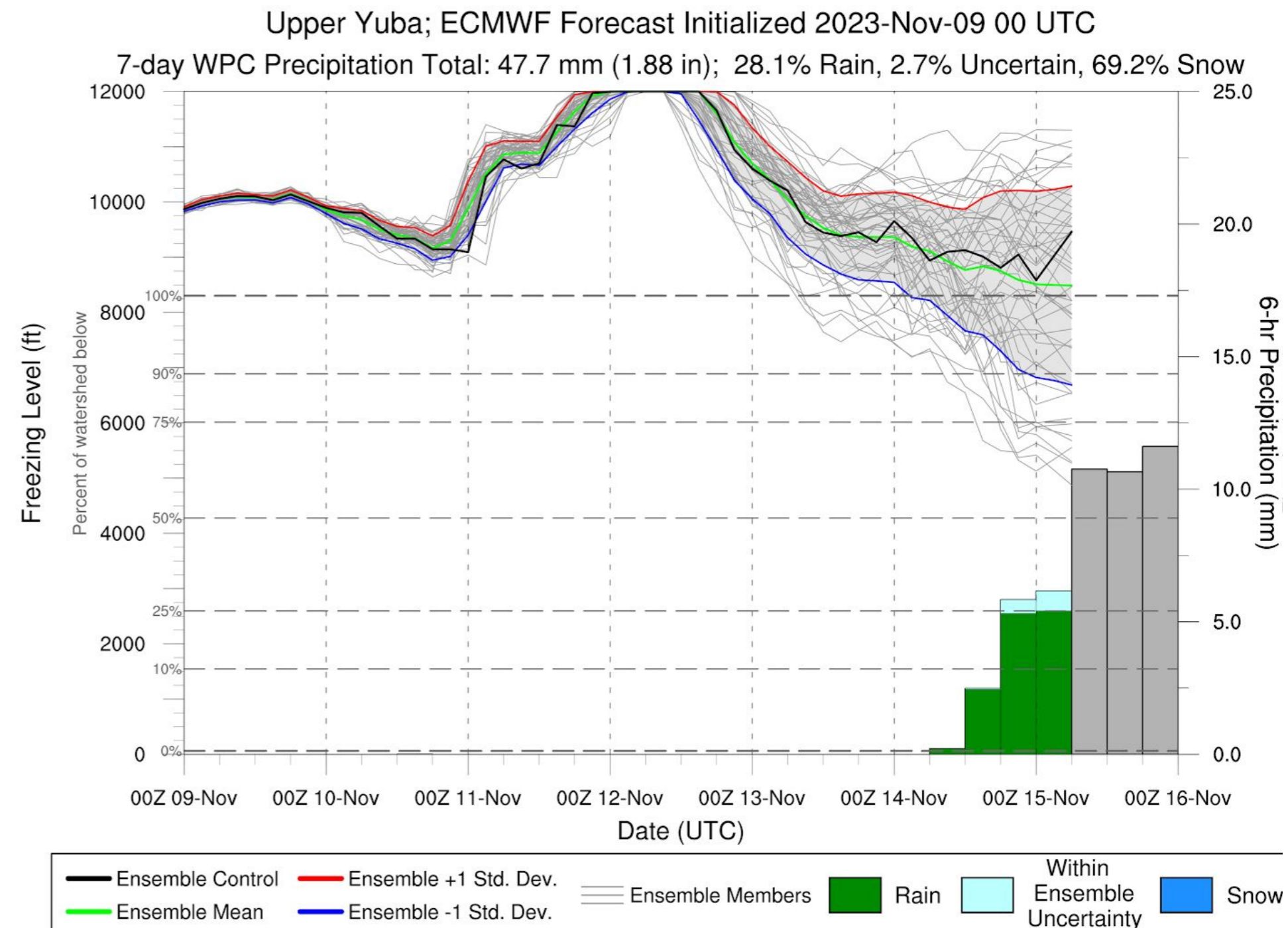
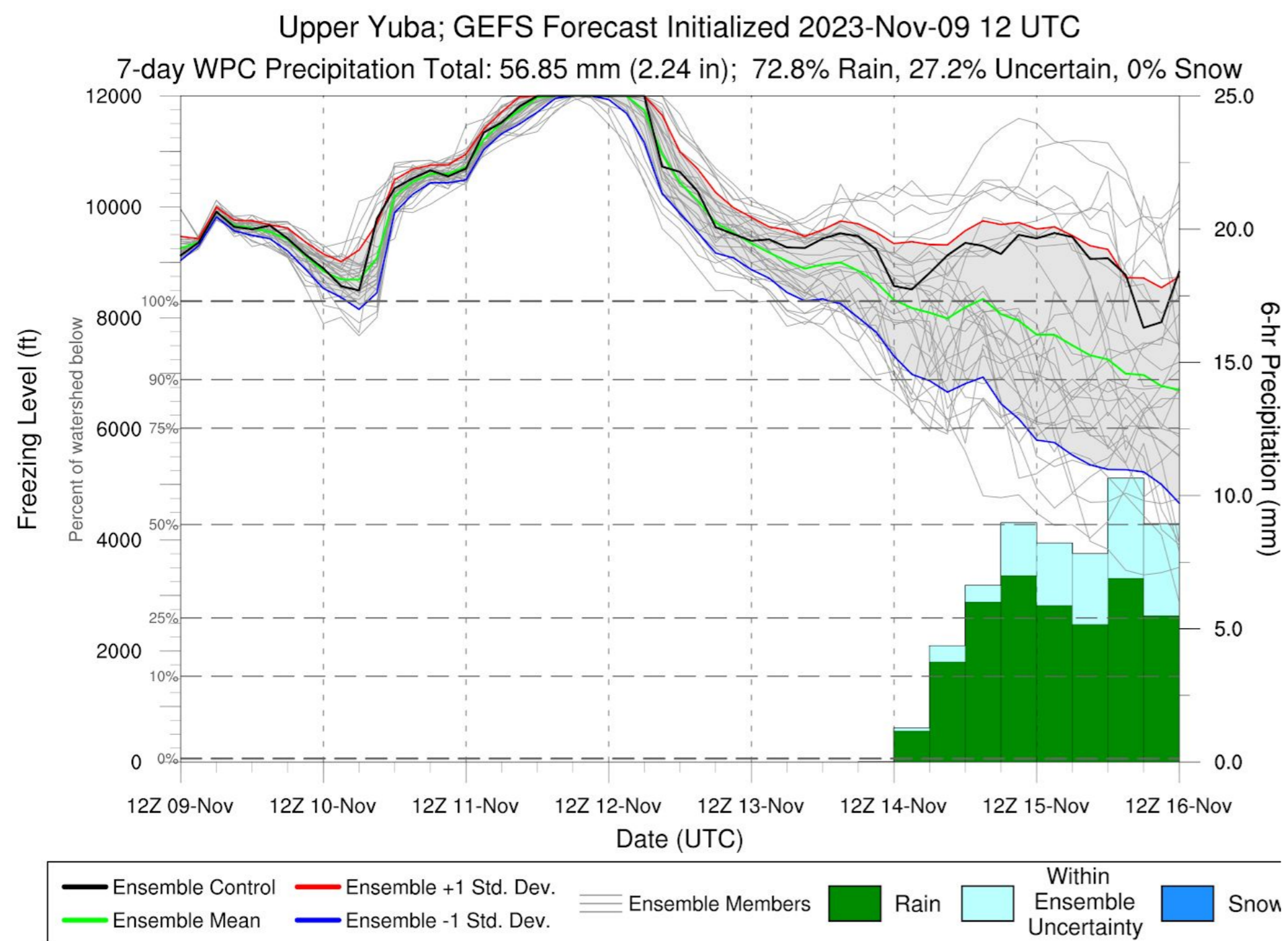
The WPC is highlighting the potential for heavy rain and high elevation snow in the latest Hazards Outlook (right image).

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The NOAA National Blend of Models (NBM) provides calibrated precipitation forecasts and through the next 7 days is indicating the potential for up to 5" in total across Northern and Central CA (left image). Precipitation towards Southern CA could push 2", which would be ~200% of monthly precip for this time of year (center image). The NBM data also currently indicate a 60%+ chance for 12"+ of snow along the Sierras (right image).

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Even though there are robust chances for mountain snow, there is low certainty for snow levels. For the Upper Yuba River watershed, both the GEFS (left) and EPS (right) indicate dropping snow levels but considerable spread is seen among the individual members at this time. **Watch for updates from CW3E in the days ahead and follow local NOAA/NWS offices for official forecast updates.**