CW3E Atmospheric River Outlook: 18 November 2024

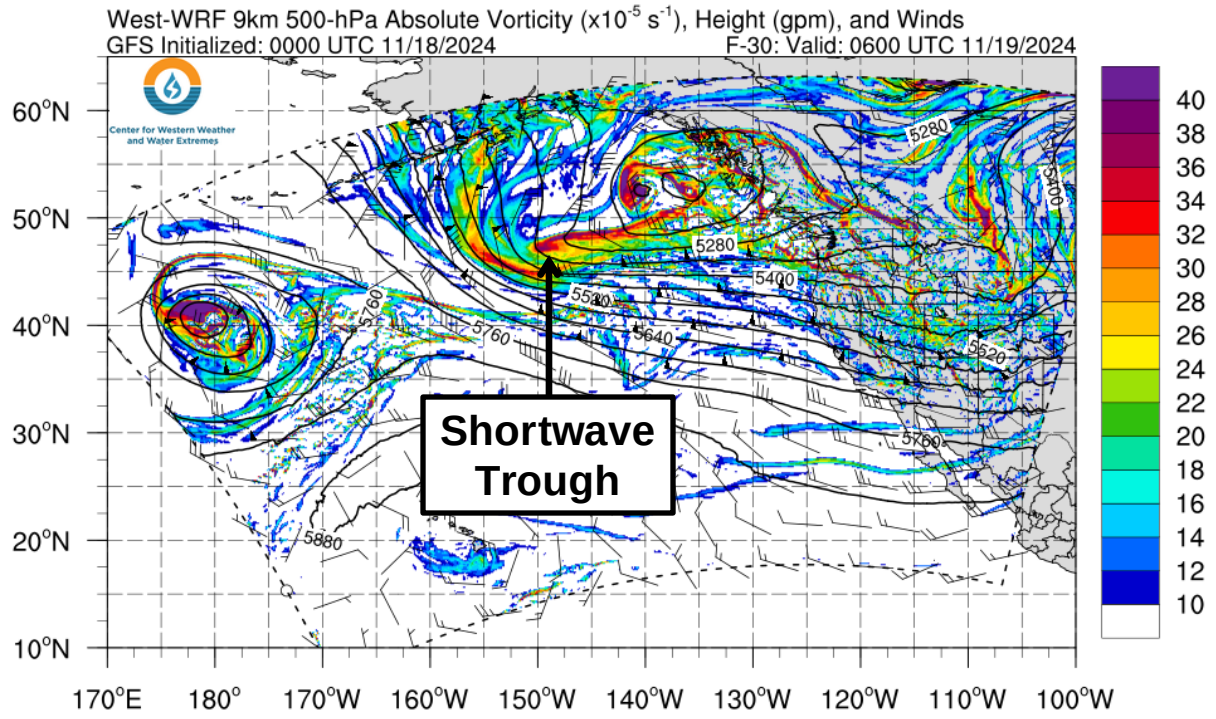
Long-Duration Atmospheric River Event to Bring Heavy Precipitation to California and Oregon

- A strong atmospheric river (AR) is forecast to make landfall over the US West Coast tomorrow (19 Nov) in association with a rapidly intensifying low-pressure system.
- After the initial AR landfall, the AR is forecast to stall over Northern California for several days.
- The location of AR landfall has continued to trend southward in recent model runs, with the strongest AR conditions and heaviest precipitation now expected in Northern California.
- Active weather is likely to continue across California this weekend into early next week, but there is considerable forecast uncertainty in the duration and exact location of AR activity beyond Fri 22 Nov.
- AR 4 conditions (based on the Ralph et al. 2019 AR Scale) are likely in coastal Northern California.
- Some locations may experience AR conditions for > 72 consecutive hours.
- The NWS Weather Prediction Center (WPC) is forecasting > 10 inches of total precipitation in portions of Northern California during the next 7 days.
- Some watersheds in Northern California could receive > 20% of their normal total water year precipitation during the next 10 days.
- Heavy rainfall will likely result in hydrologic impacts over portions of Northern California and southern Oregon.
- The WPC has issued a moderate risk excessive rainfall outlook for Del Norte and Humboldt Counties Thu 21 Nov into early Fri 22 Nov.
- Major winter storm impacts are likely in the Klamath Mountains, Southern Cascades, and Northern Sierra Nevada.

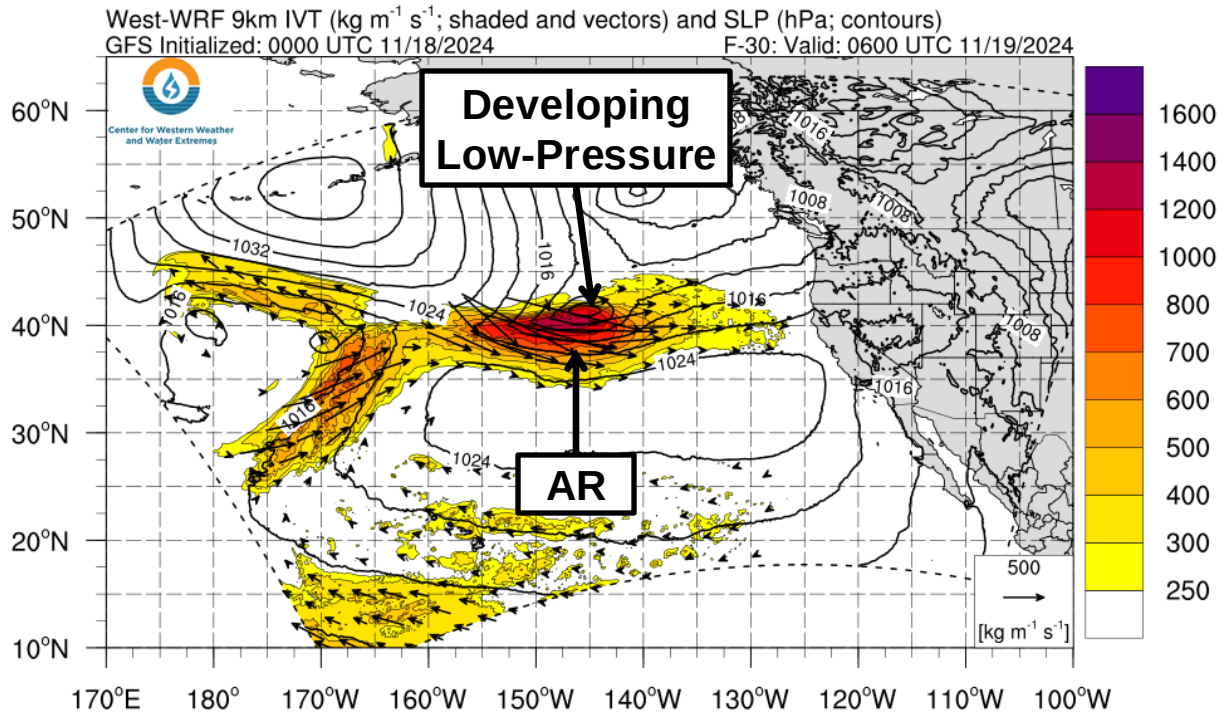
AR Outlook: 18 November 2024

West-WRF GFS Model Forecasts: Valid 10 PM PT 18 Nov (F-30)

500-hPa Vorticity, Height, and Wind



IVT and SLP

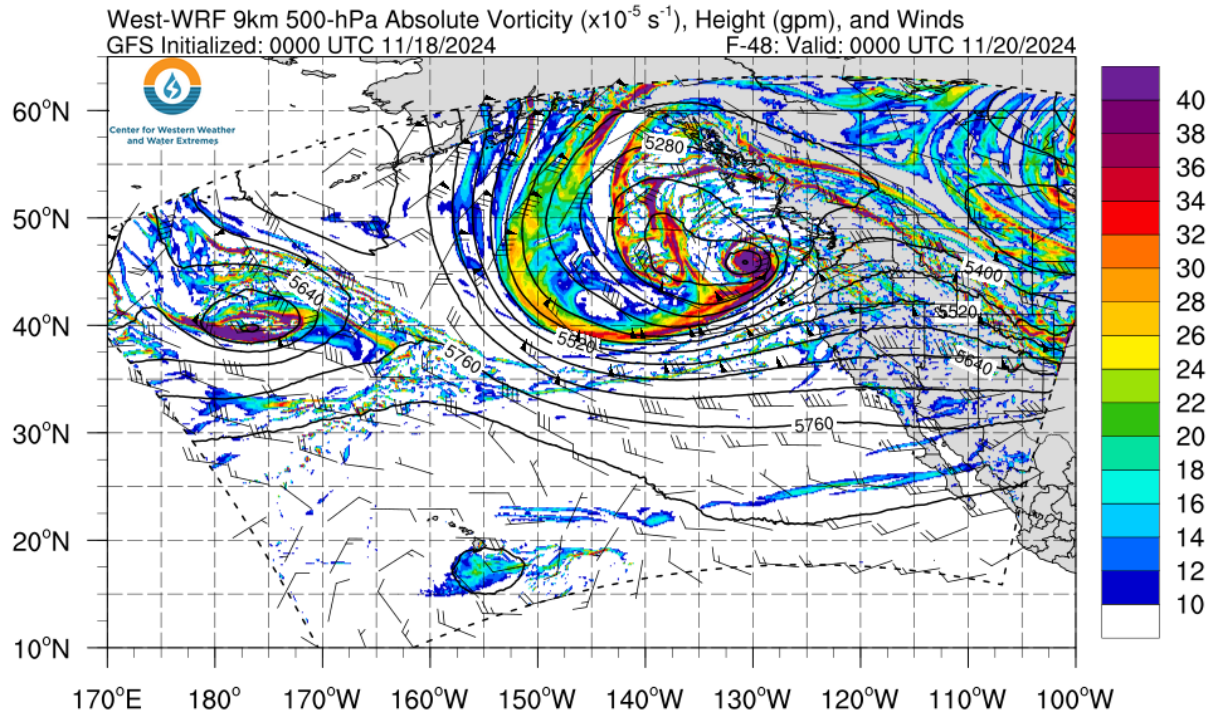


- An atmospheric river (AR) and a low-pressure system are forecast to develop over the Northeast Pacific Ocean during the next 24 hours and propagate eastward toward the US West Coast.
- The evolution of the AR and low-pressure system will be driven by a shortwave trough south of Alaska that is forecast to deepen and eventually stall off the West Coast of North America, setting the stage for a prolonged period of active weather.

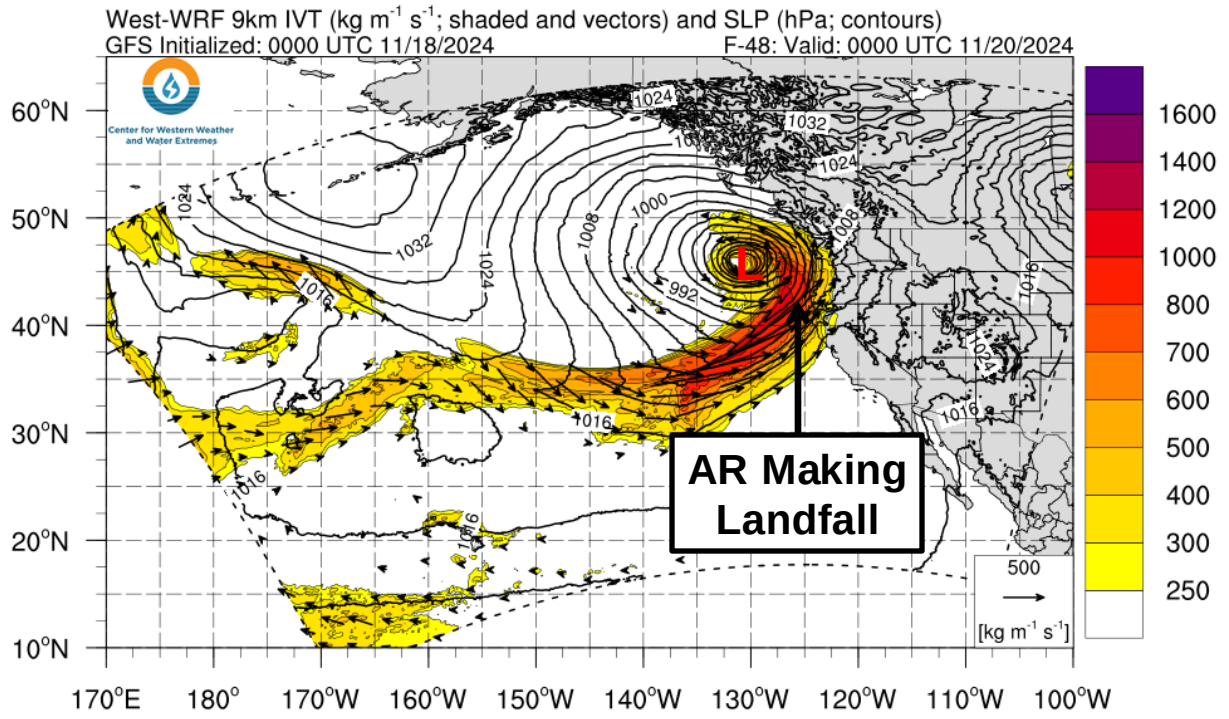
AR Outlook: 18 November 2024

West-WRF GFS Model Forecasts: Valid 4 PM PT 19 Nov (F-48)

500-hPa Vorticity, Height, and Wind



IVT and SLP

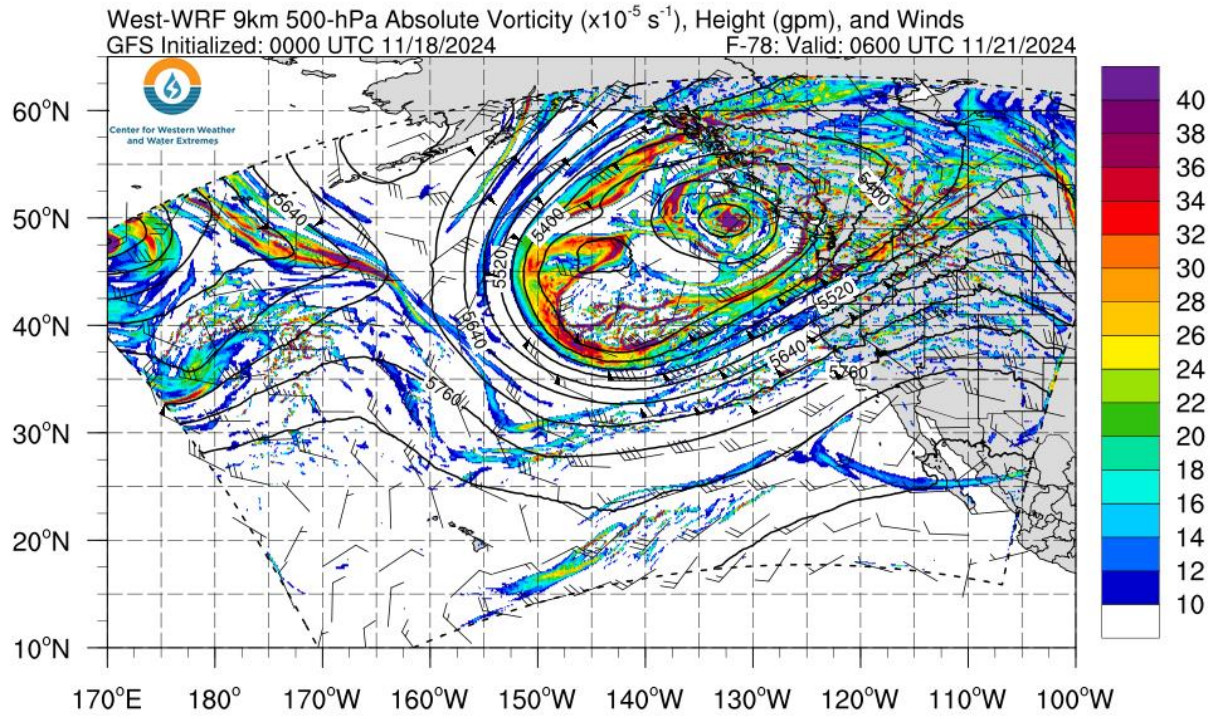


- As the upstream trough deepens, the low-pressure system is forecast to track northeastward and undergo rapid intensification, potentially reaching a minimum central pressure of 950 mb by Tue afternoon (19 Nov).
- The AR is forecast to make landfall on Tue, bringing moderate (IVT ≥ 500 kg m^{-1} s^{-1}) to potentially strong (IVT ≥ 750 kg m^{-1} s^{-1}) AR conditions to coastal Oregon and Northern California.

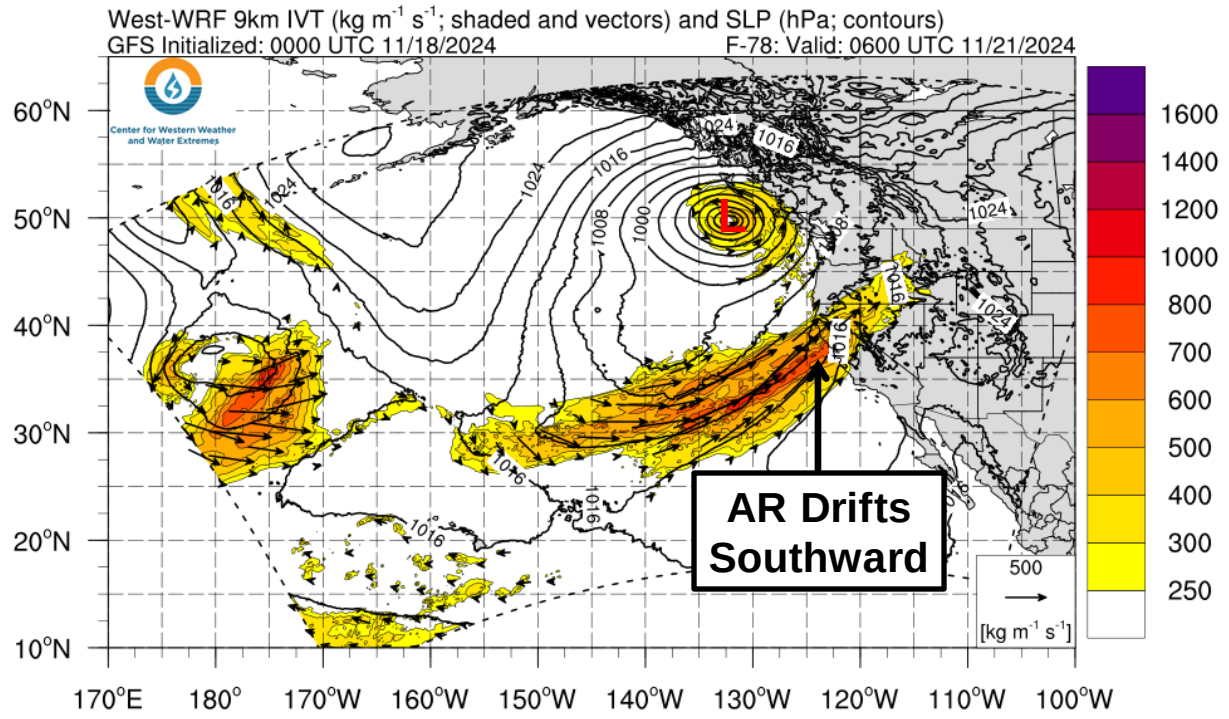
AR Outlook: 18 November 2024

West-WRF GFS Model Forecasts: Valid 4 PM PT 20 Nov (F-72)

500-hPa Vorticity, Height, and Wind



IVT and SLP

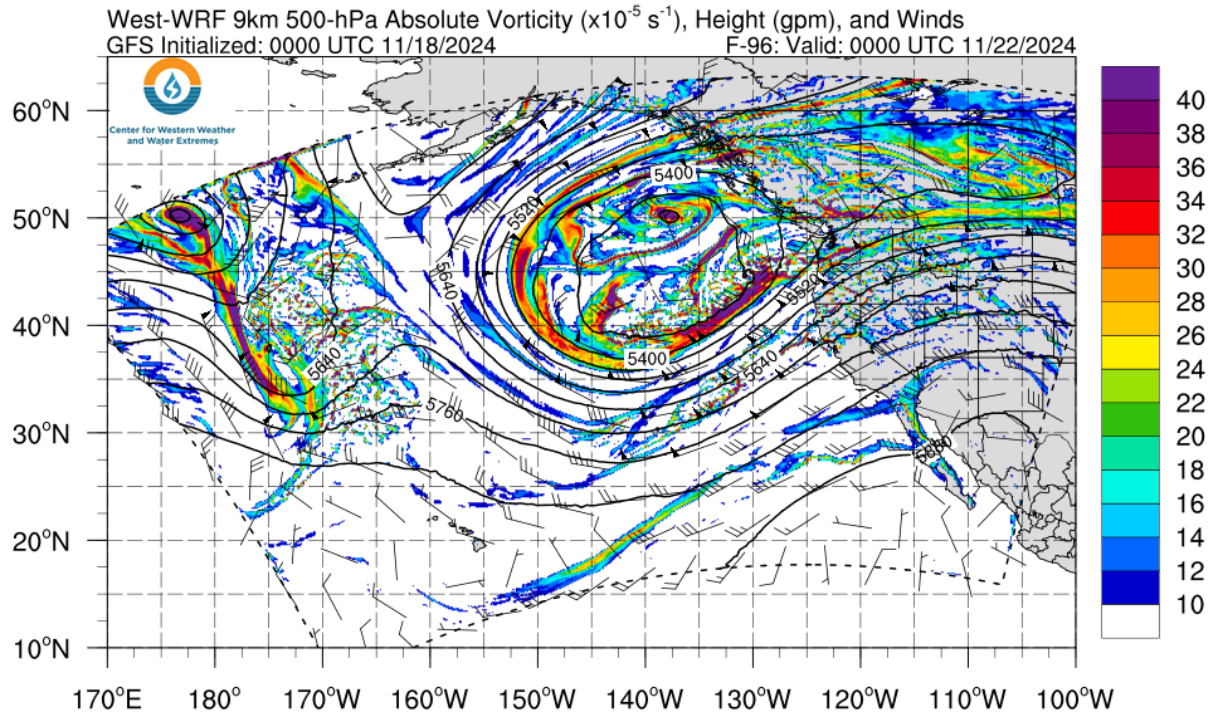


- After the initial landfall, the AR is forecast to drift southward over Northern California.
- The upstream trough is forecast to stall over the Northeast Pacific, setting up a favorable flow regime for a prolonged period of enhanced moisture transport from the subtropical North Pacific into California.

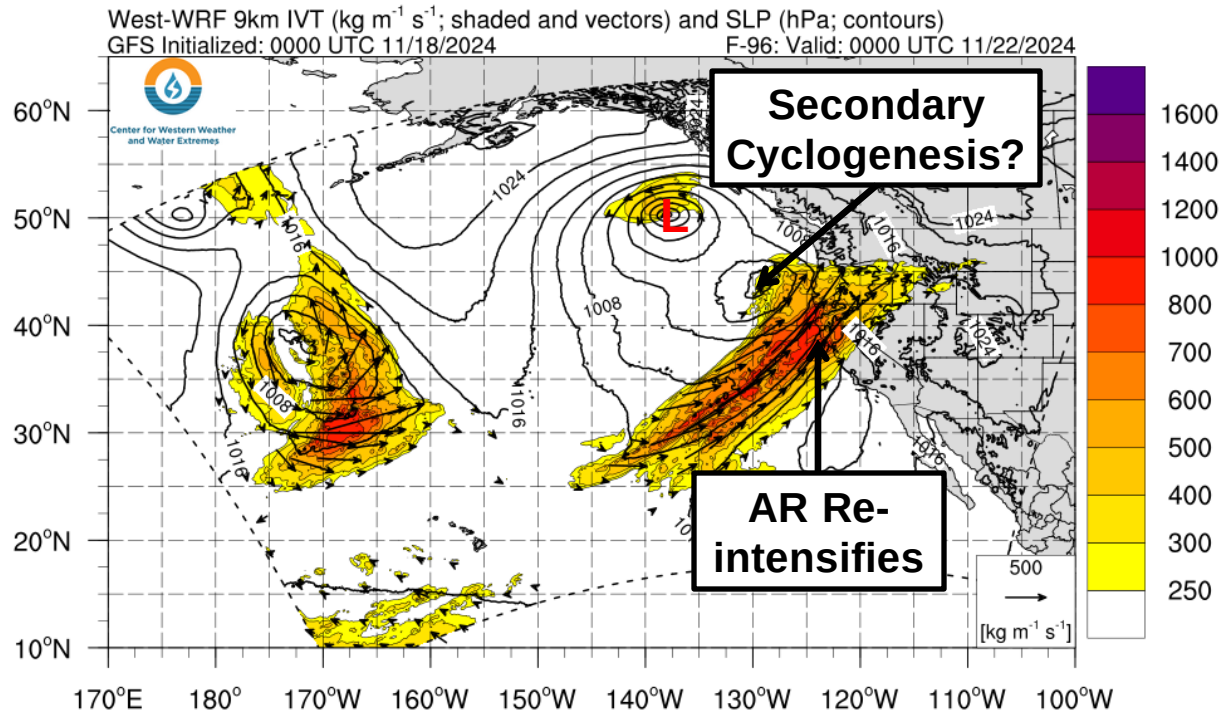
AR Outlook: 18 November 2024

West-WRF GFS Model Forecasts: Valid 4 PM PT 21 Nov (F-96)

500-hPa Vorticity, Height, and Wind



IVT and SLP

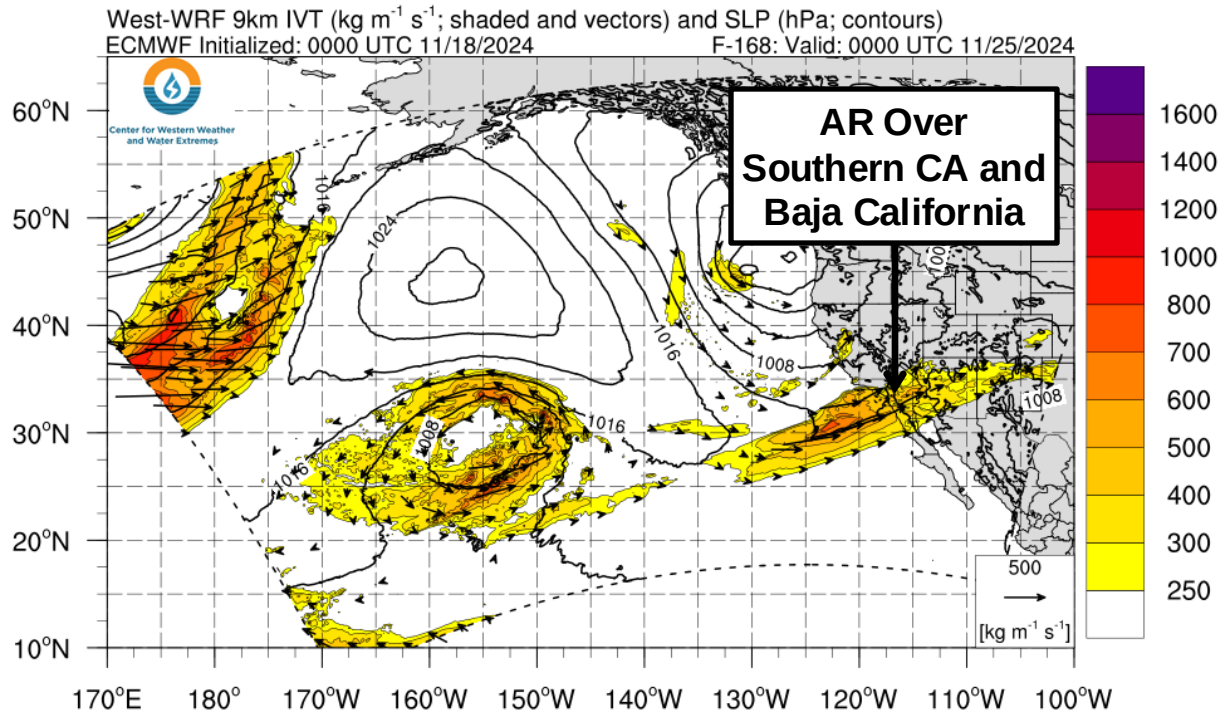


- As the upstream trough continues to sit over the Northeast Pacific, additional shortwaves rotating around the base of the trough may lead to secondary cyclogenesis on the northern periphery of the AR.
- This secondary cyclogenesis event would likely lead to a re-intensification of the AR, potentially bringing another period of strong AR conditions to southern Oregon and Northern California Thu 21 Nov into Fri 22 Nov.

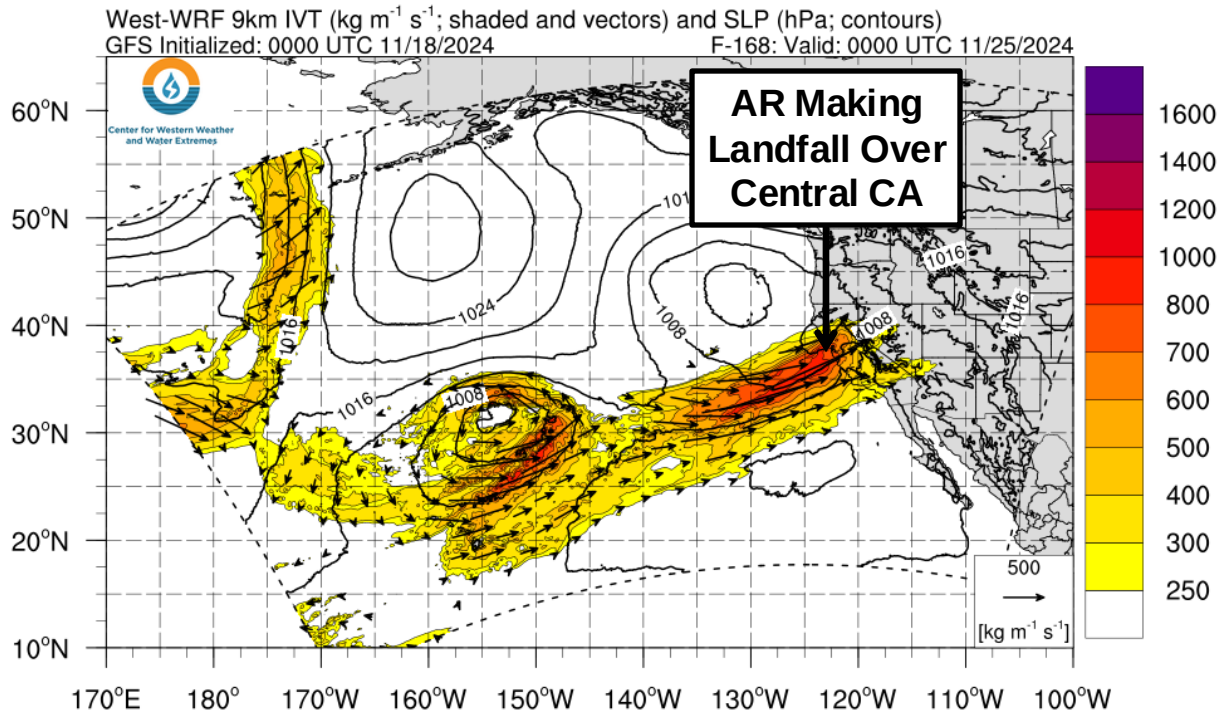
AR Outlook: 18 November 2024

West-WRF Model IVT Forecasts: Valid 4 PM PT 24 Nov (F-168)

West-WRF ECMWF



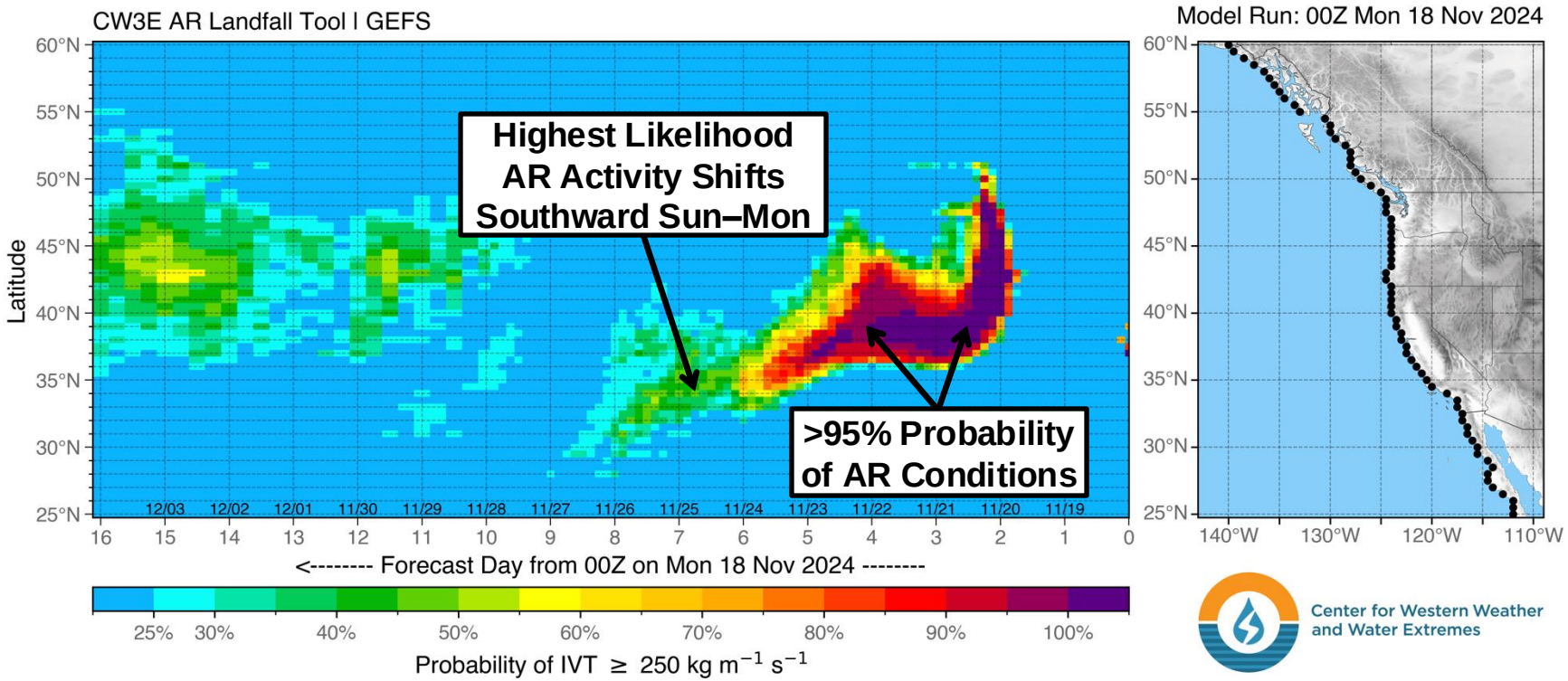
West-WRF GFS



- While the weather pattern is likely to remain active over California this weekend into early next week, there is considerable forecast uncertainty in the location of AR activity.
- The 00Z West-WRF initialized with ECMWF is forecasting AR activity to gradually shift southward into Southern California over the weekend (23–24 Nov).
- The 00Z West-WRF initialized with GFS is forecasting the initial AR to dissipate, followed by a second AR landfall in Central California on Sun 24 Nov.

AR Outlook: 18 November 2024

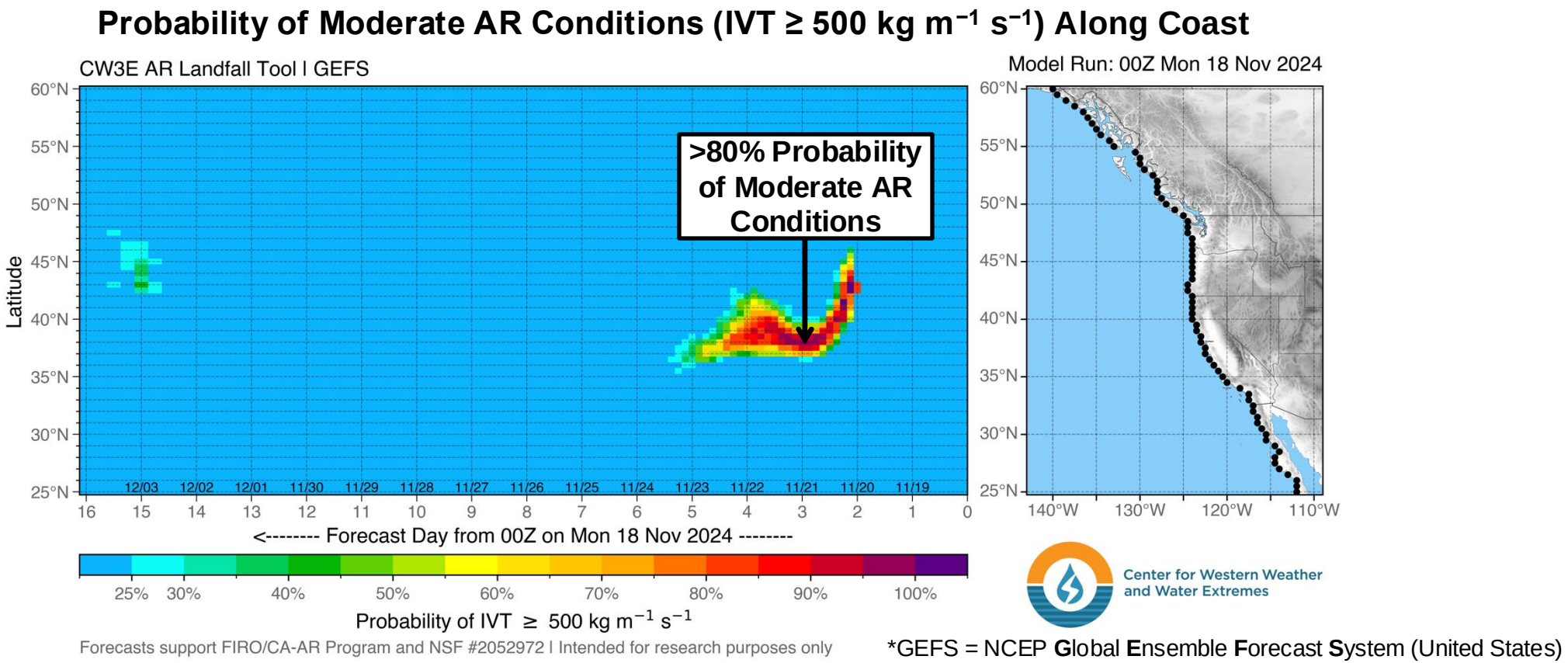
Probability of AR Conditions Along Coast



*GEFS = NCEP **G**lobal **E**nsemble **F**orecast **S**ystem (United States)

- The 00Z GEFS is showing very high confidence (> 95% probability) in a prolonged period of AR conditions (IVT ≥ 250 kg m^{-1} s^{-1}) over coastal Northern California Tue–Fri (19–22 Nov).
- There is some uncertainty regarding the northward extent of AR conditions Thu 21 Nov into Fri 22 Nov in association with the possible secondary cyclogenesis event.
- The greatest likelihood of landfalling AR activity is forecast to shift southward this weekend into early next week, with AR conditions potentially continuing over Central and Southern California through next Mon 25 Nov.

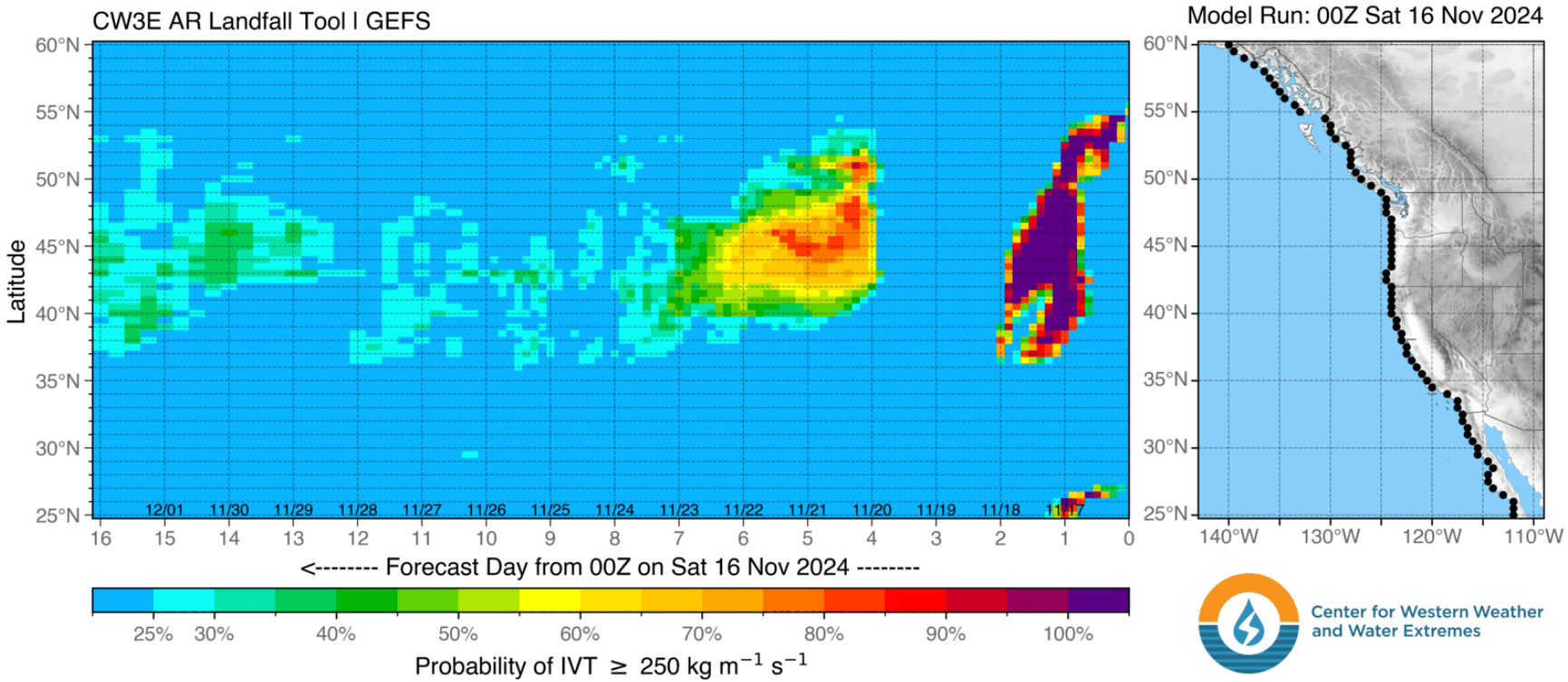
AR Outlook: 18 November 2024



- The 00Z GEFS is also showing high confidence (> 80% probability) in a period of moderate AR conditions (IVT ≥ 500 kg m^{-1} s^{-1}) over coastal Northern California Wed–Thu (20–21 Nov).
- There is considerable forecast uncertainty regarding the duration of moderate AR conditions over California, with some ensemble members showing moderate AR conditions persisting into Sat 23 Nov.

AR Outlook: 18 November 2024

Probability of AR Conditions Along Coast: DProg/Dt

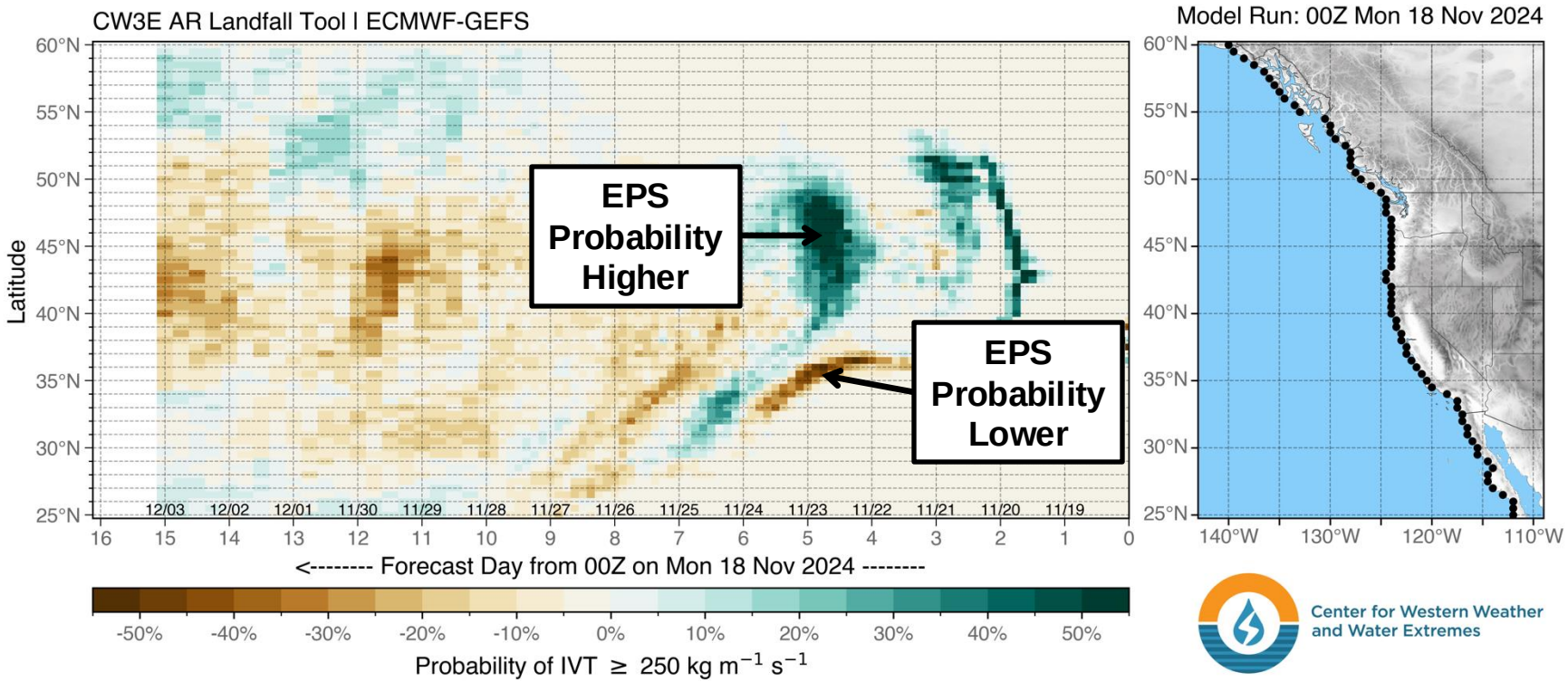


*GEFS = NCEP **G**lobal **E**nsemble **F**orecast **S**ystem (United States)

- Recent model runs have continued to trend toward a more southward AR landfall.
- As recently as 00Z 16 Nov, the GEFS was showing the highest likelihood of AR conditions over northern Oregon.

AR Outlook: 18 November 2024

Probability of AR Conditions Along Coast (EPS Minus GEFS)

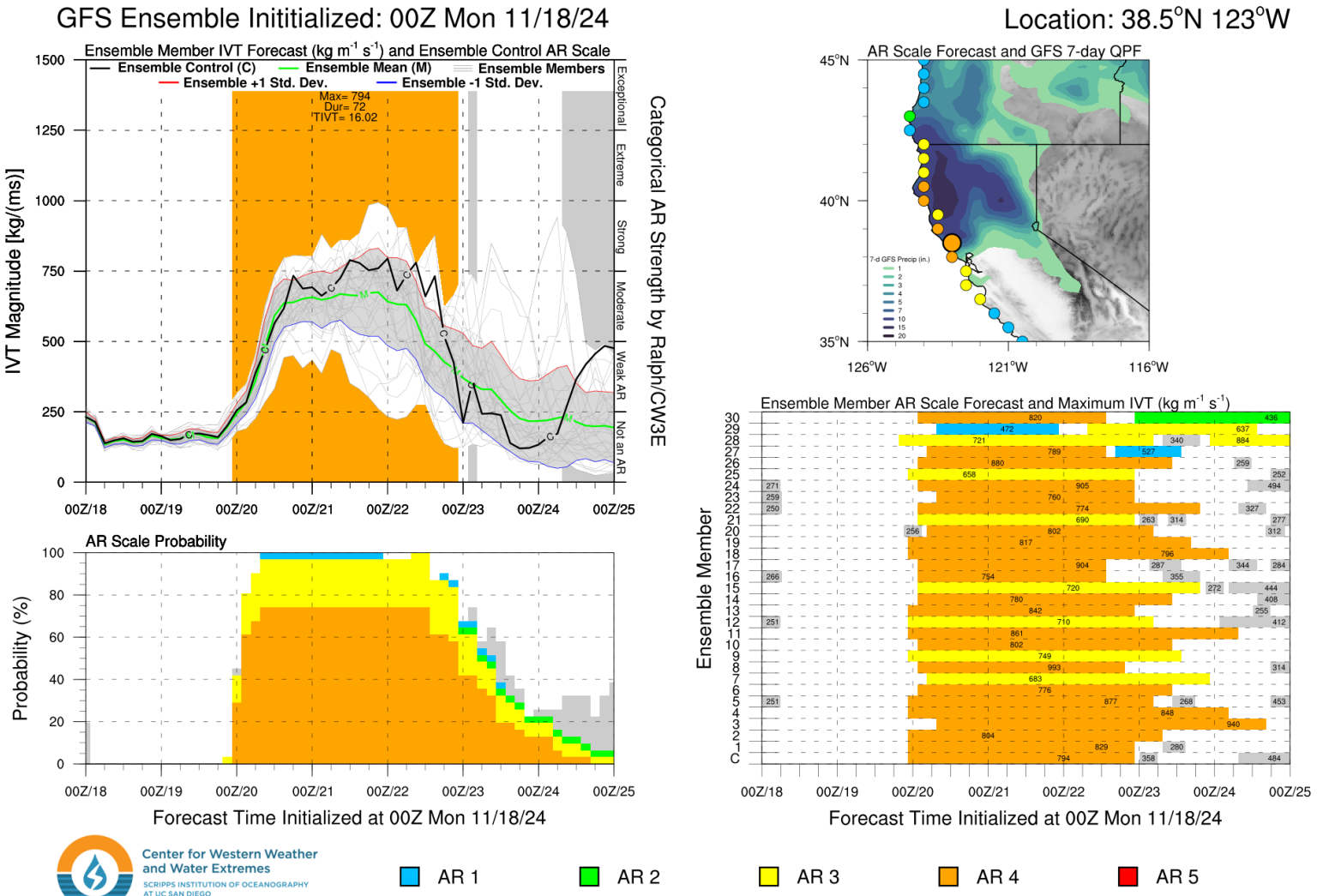


*ECMWF EPS = ECMWF **E**nsemble **P**rediction **S**ystem (Europe)

- Compared to the 00Z GEFS, the 00Z ECMWF EPS is showing a slightly earlier initial AR landfall on Tue 19 Nov.
- The EPS is indicating a higher likelihood of AR conditions over Oregon and Washington and a lower likelihood of AR activity over Central and Southern California on Fri 22 Nov following the secondary cyclogenesis event.
- There is also some disagreement between GEFS and EPS regarding the location and timing of additional AR activity over California this weekend into early next week.

AR Outlook: 18 November 2024

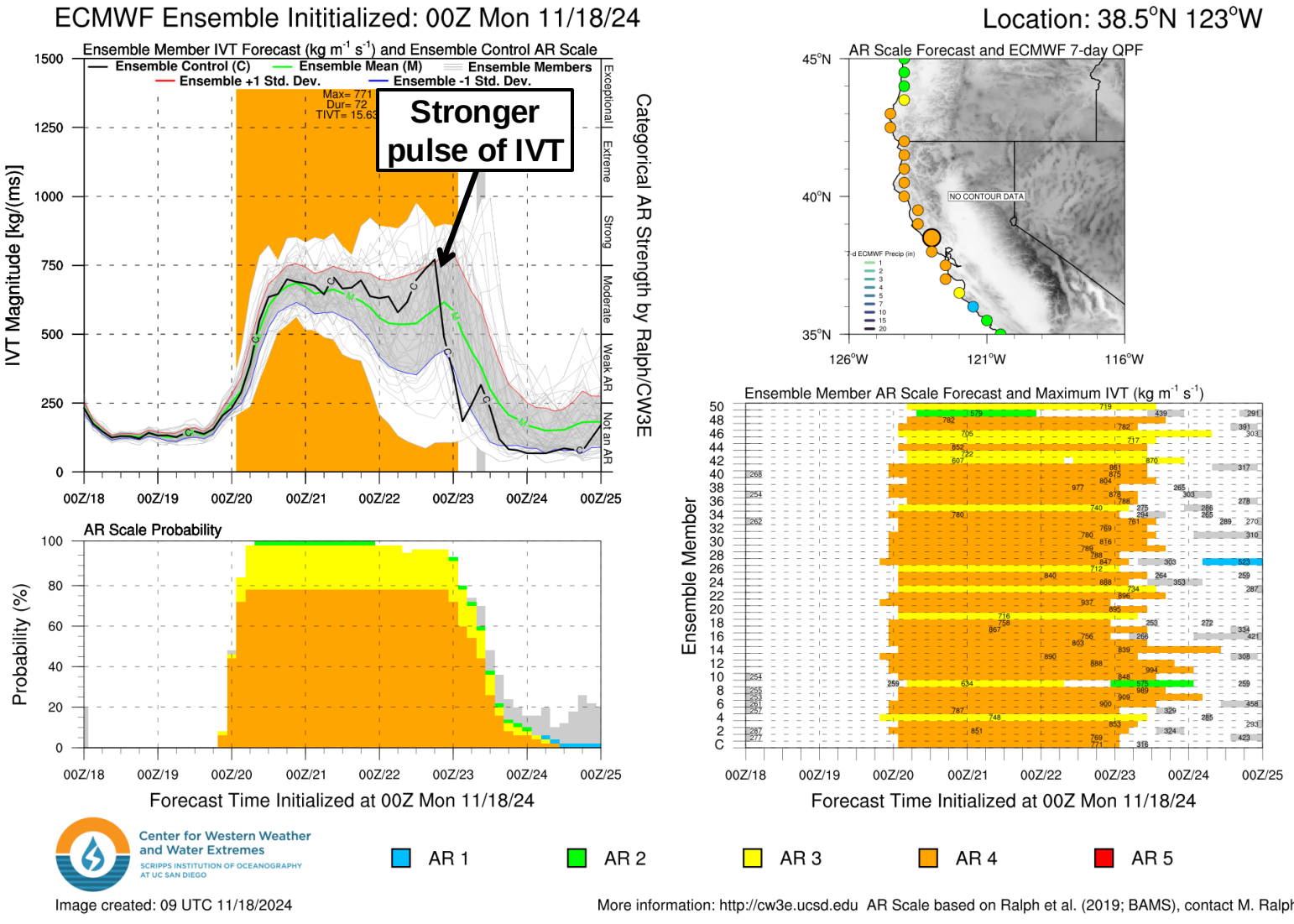
GEFS AR Scale and IVT Forecasts



- The 00Z GEFS control is forecasting AR 3–4 conditions between Monterey, CA, and the California–Oregon border.
- 23/31 (74%) ensemble members are predicting an AR 4 at 38.5°N, 123°W (Sonoma County, CA).
- Nearly all ensemble members are predicting AR conditions to persist for > 48 hours at this location, with several members predicting > 72 hours of AR conditions.
- There is still considerable forecast uncertainty in the duration and intensity of the AR, especially after 00Z 22 Nov.

AR Outlook: 18 November 2024

EPS AR Scale and IVT Forecasts

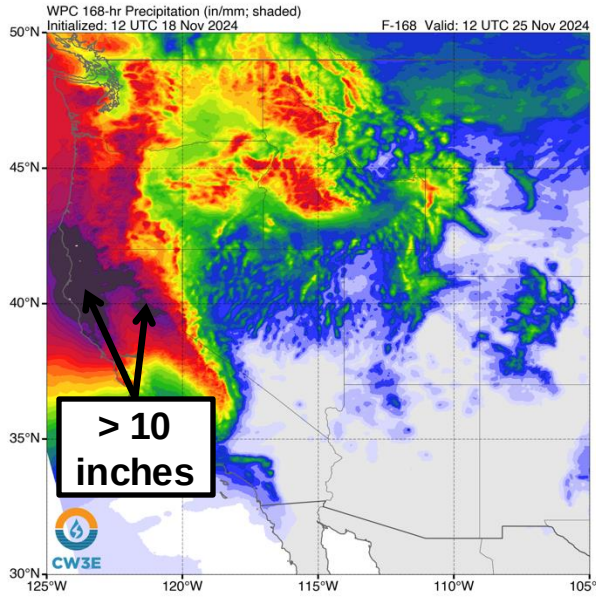


- The 00Z EPS control member is forecasting AR 4 conditions between Santa Cruz, CA, and southern coastal Oregon.
- Similar to the GEFS, 76% (39/51) of EPS members are forecasting an AR4 at 38.5°N, 123°W (Sonoma County, CA).
- The EPS is showing a higher likelihood of AR conditions lasting > 72 hours at this location, as well as a stronger pulse of IVT on Fri 22 Nov.

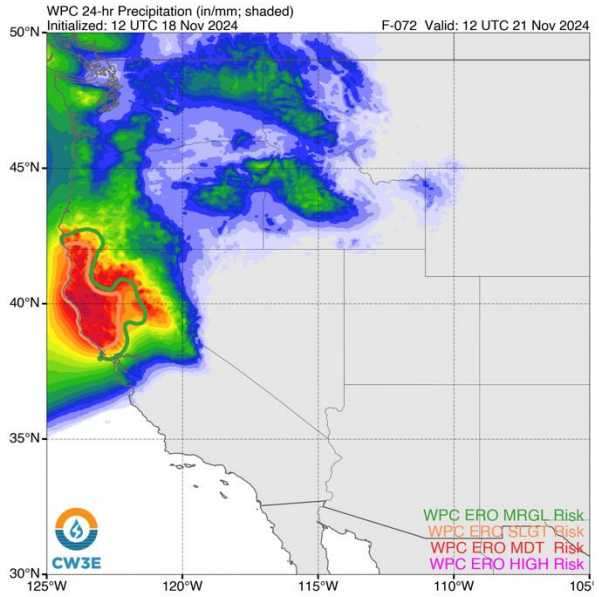
AR Outlook: 18 November 2024

Precipitation Forecasts

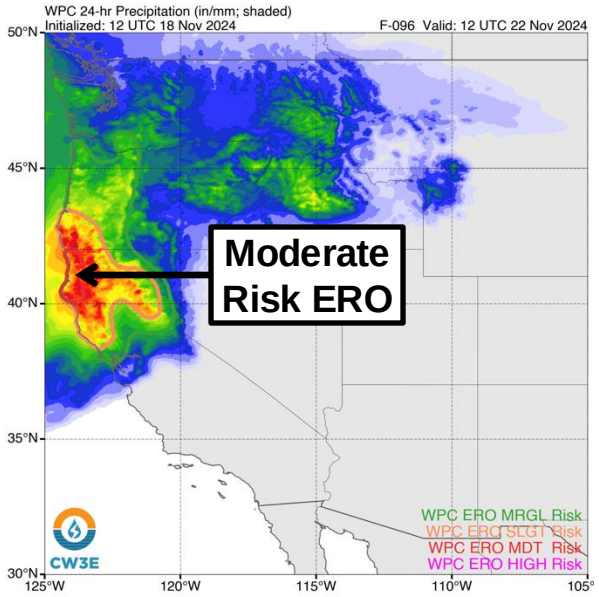
WPC 7-day QPF
Valid: Ending 4 AM PT 25 Nov



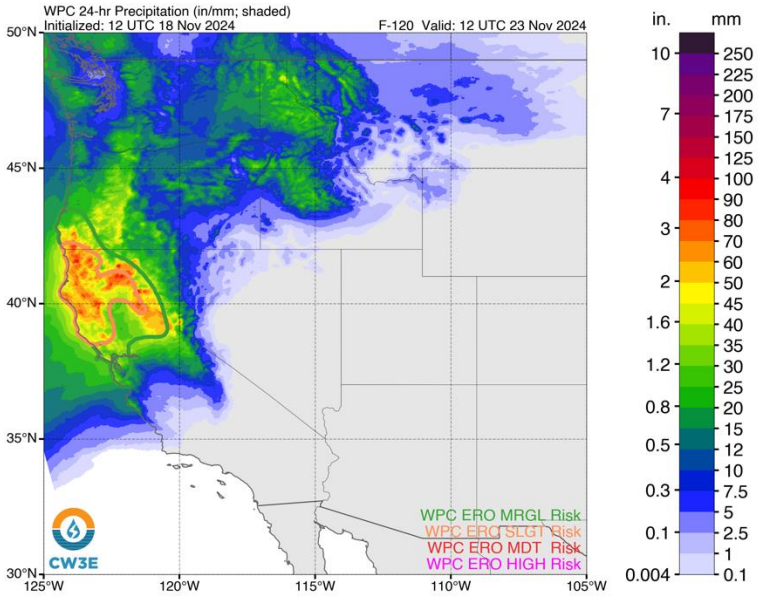
WPC Day 3 24-h QPF
Valid: Ending 4 AM PT 21 Nov



WPC Day 4 24-h QPF
Valid: Ending 4 AM PT 22 Nov



WPC Day 5 24-h QPF
Valid: Ending 4 AM PT 23 Nov



- The NWS Weather Prediction Center (WPC) is forecasting > 10 inches of total precipitation in the Northern California and Southern Oregon Coast Ranges, the Southern Cascades, and the Northern Sierra Nevada during the next 7 days.
- At least 3–7 inches of total precipitation are forecast across much of the rest of Northern California and Western Oregon.
- The WPC has issued a slight risk (≥ 15%; level 2 of 4) Excessive Rainfall Outlook (ERO) for the Northern California Coast Ranges Wed 20 Nov into early Thu 21 Nov, expanding further inland Thu 21 Nov into early Sat 23 Nov.
- The WPC has also issued a moderate risk (≥ 40%; level 3 of 4) ERO for Del Norte and Humboldt Counties Thu 21 Nov into early Fri 22 Nov.

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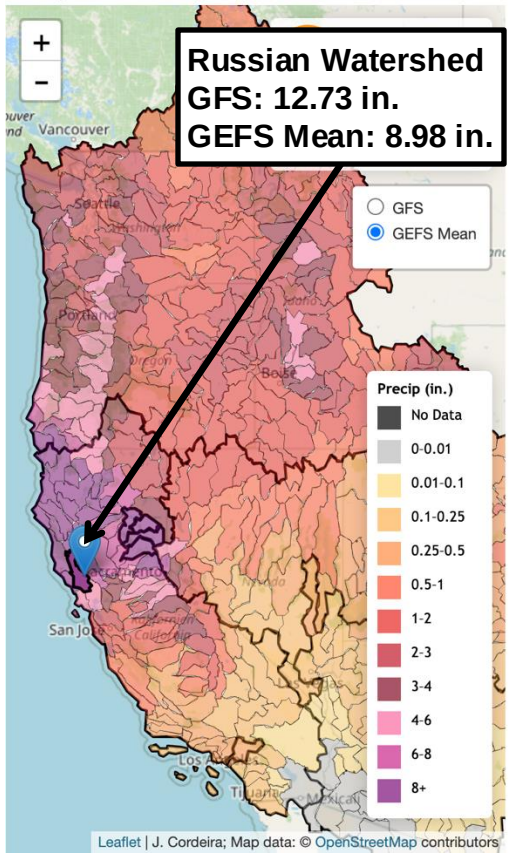
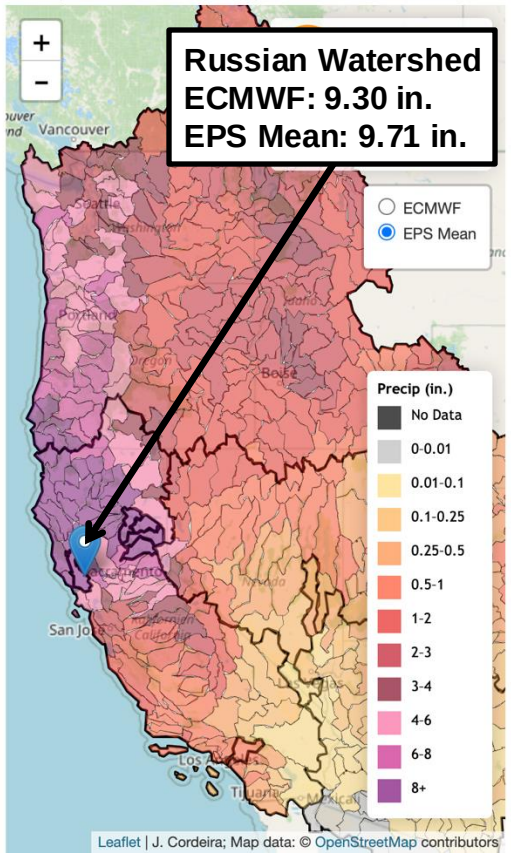
Watershed Precipitation Forecasts

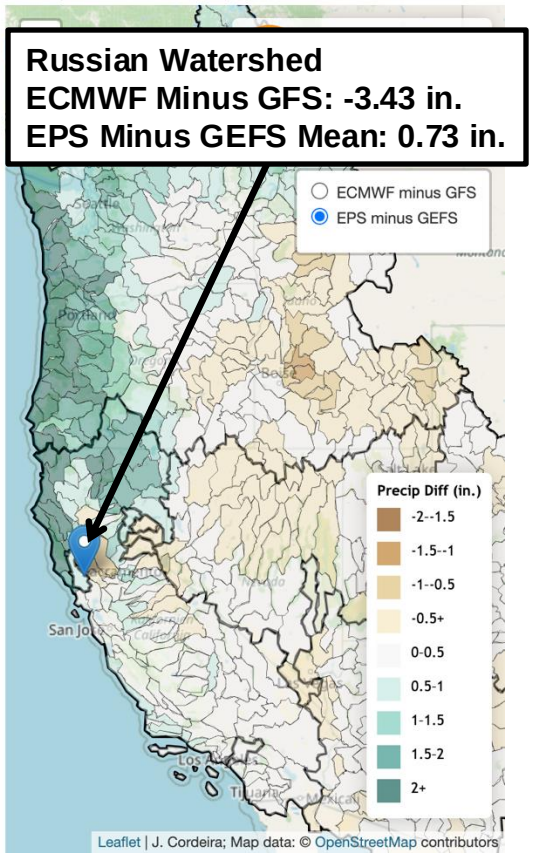
10-day GFS/GEFS Precipitation Forecasts

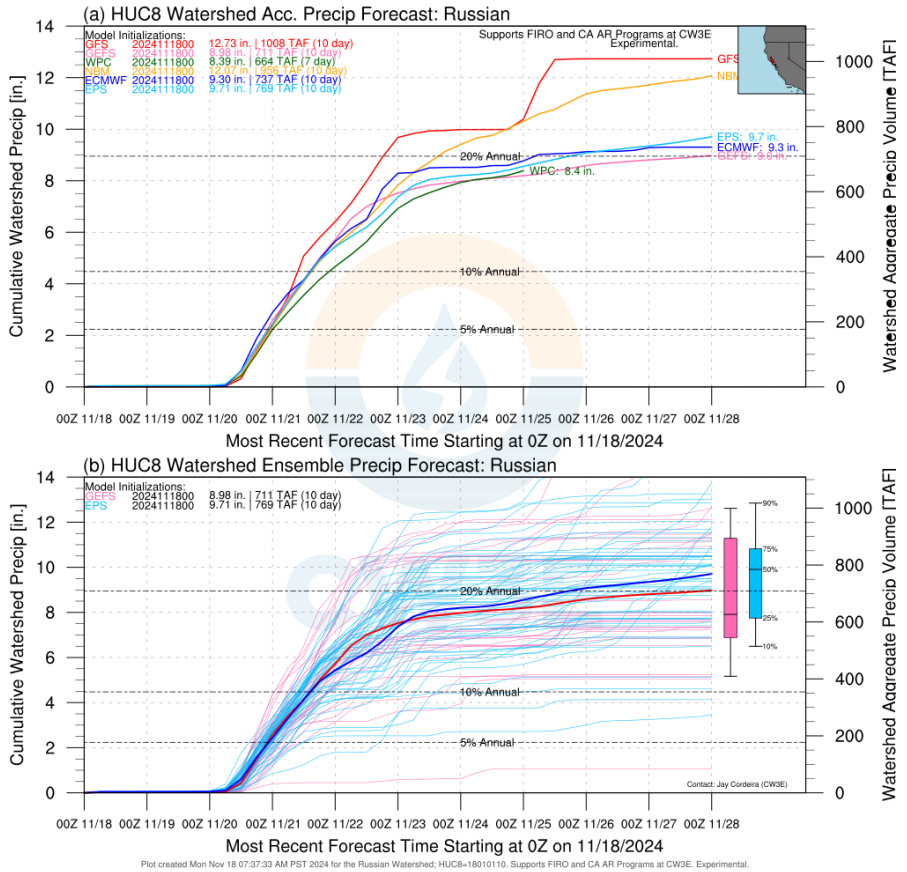


10-day ECMWF/EFS Precipitation Forecast



10-day Difference Precipitation Forecast

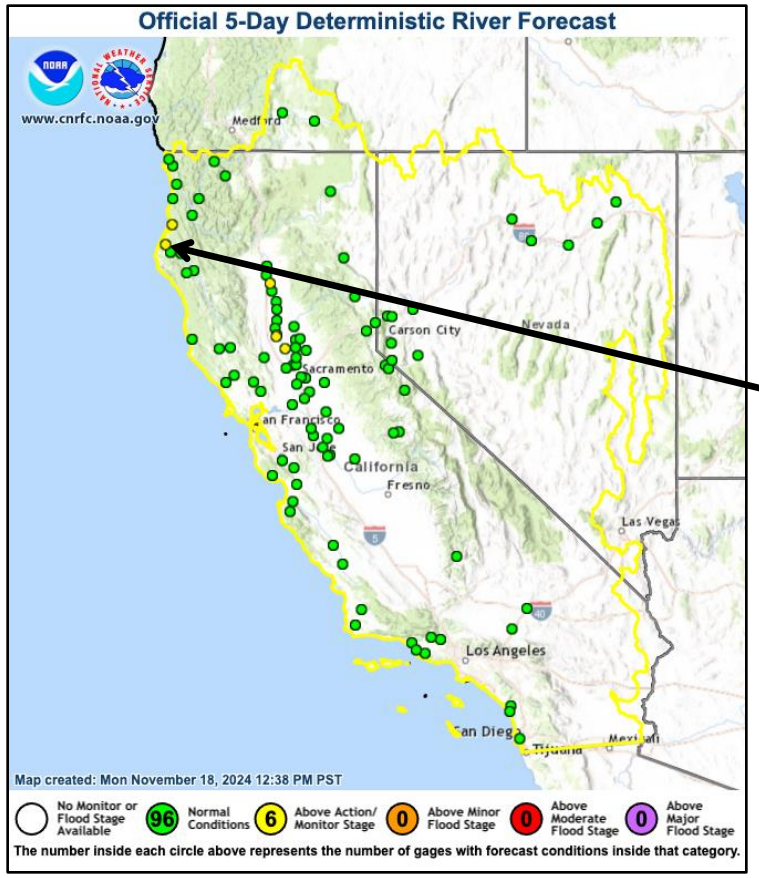


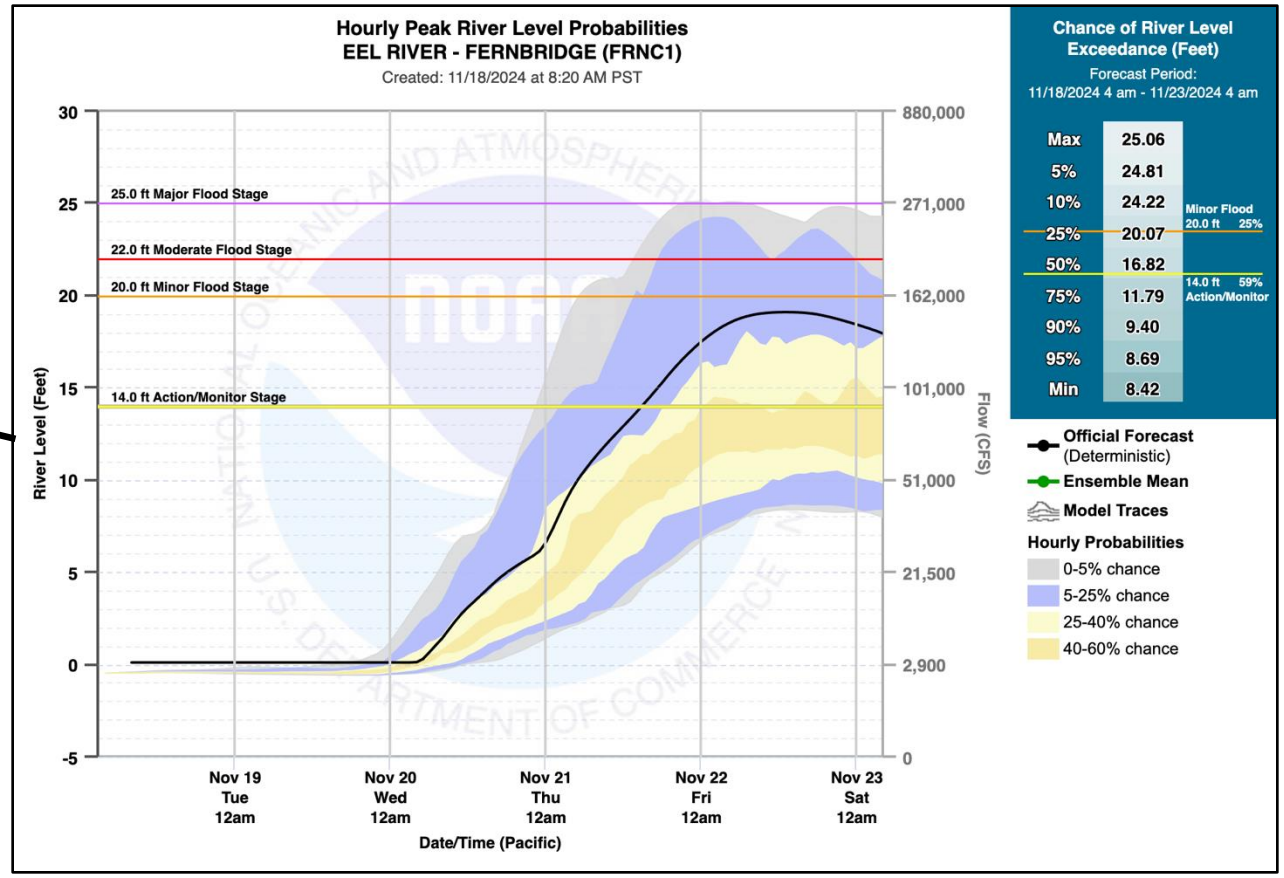


- Both NCEP and ECMWF model guidance indicate that some watersheds in Northern California may receive > 20% of their normal total water year precipitation during the next 10 days.
- While there is considerable spread in forecast precipitation, ~50% of GEFS members are predicting > 8 inches of mean areal precipitation in the Russian watershed, and ~50% of EPS members are predicting > 10 inches.
- In general, the EPS is forecasting higher 10-day precipitation totals over Western Washington, Western Oregon, and coastal Northern California.

AR Outlook: 18 November 2024

Hydrologic Impacts





Source: NOAA/NWS California – Nevada River Forecast Center (CNRFC)

- Five stream gages are forecast to rise above action/monitor stage in Northern California during the next 5 days.
- The California–Nevada River Forecast Center (CNFRC) is showing a 25% probability of the Eel River at Fernbridge to exceed minor flood stage.

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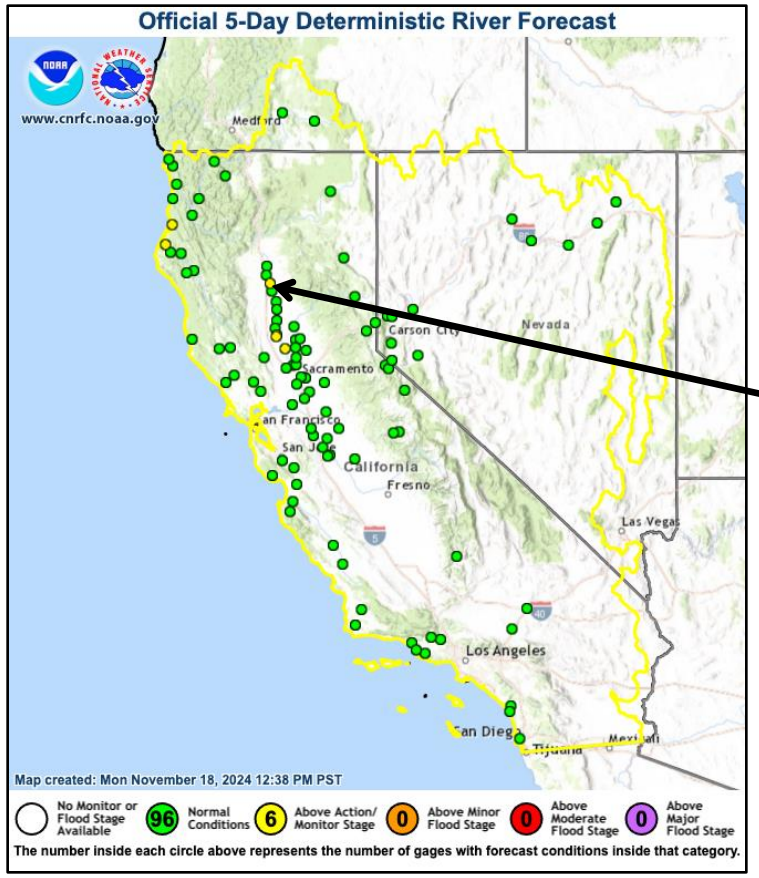
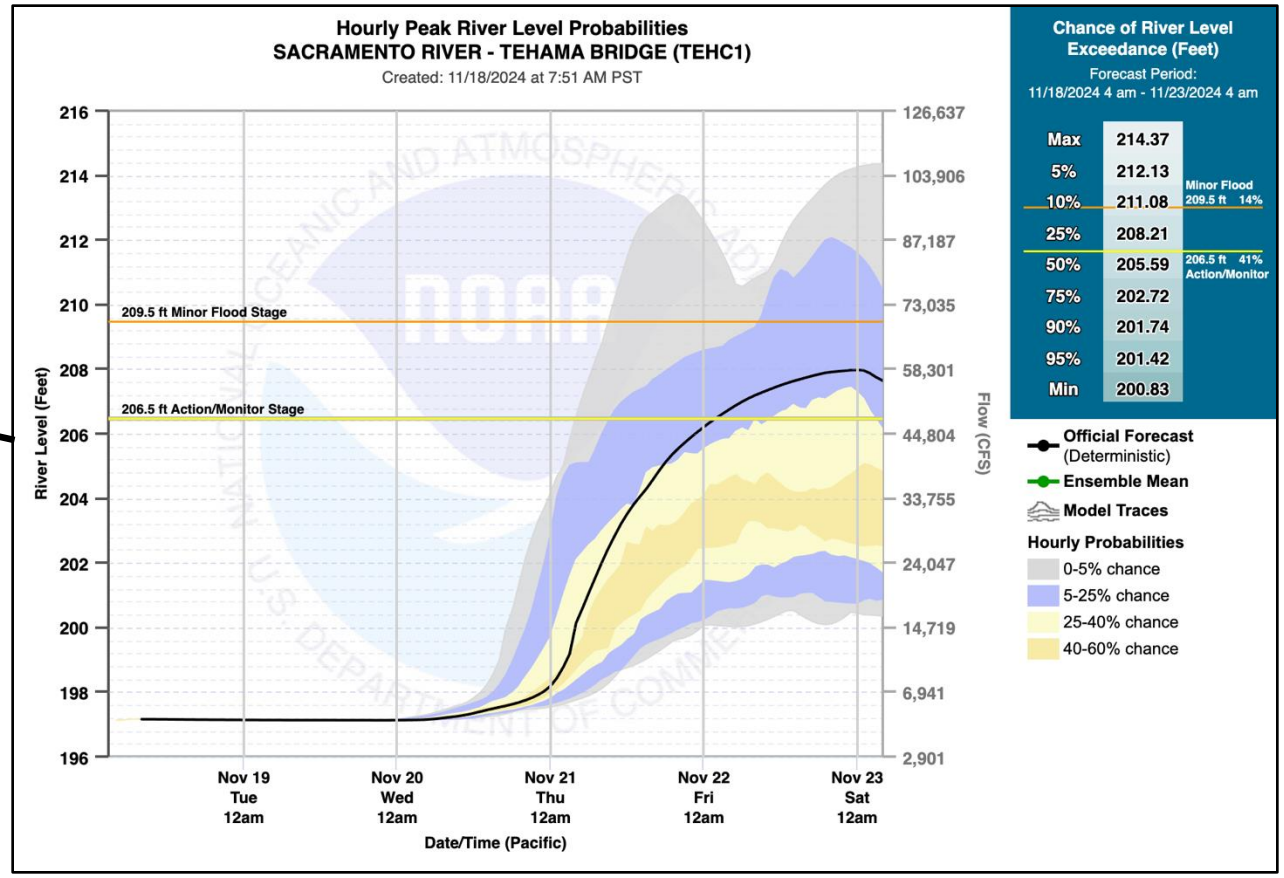
Hydrologic Impacts





Source: NOAA/NWS California – Nevada River Forecast Center (CNRFC)

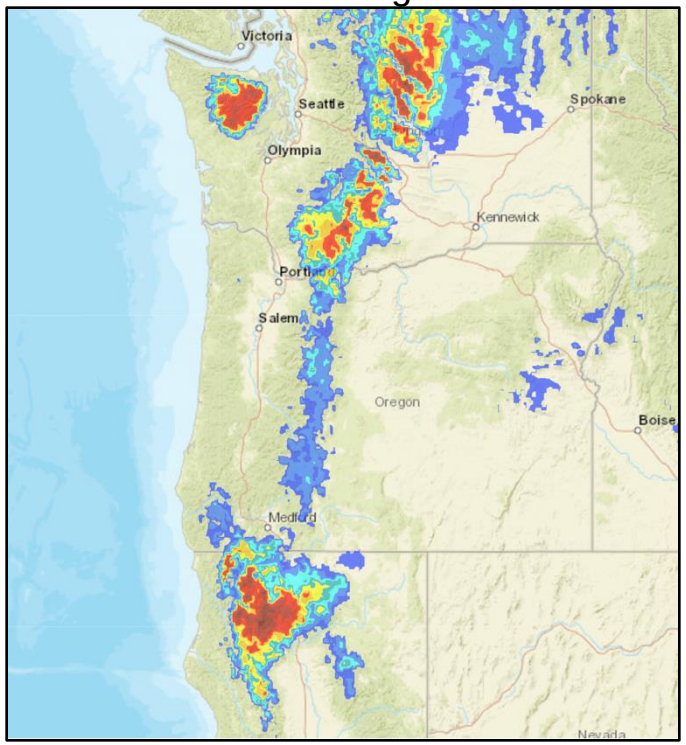
- The CNFRC is also showing a 14% probability of the Sacramento River at Tehama Bridge to exceed minor flood stage.

AR Outlook: 18 November 2024

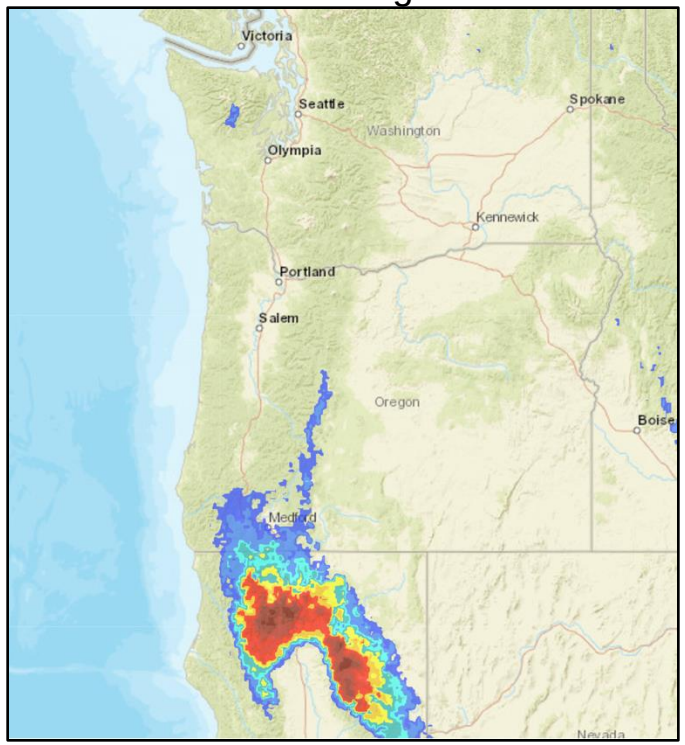
Winter Weather Hazards

Probabilistic Winter Storm Severity Index

Likelihood of Moderate Impacts
Valid: 24-h Period Ending 4 AM PT 20 Nov

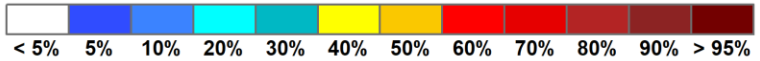


Likelihood of Major Impacts
Valid: 24-h Period Ending 4 AM PT 21 Nov



Potential Winter Storm Impacts	
	Minor Impacts **Expect a few inconveniences to daily life.** • Winter driving conditions. **Use caution while driving.**
	Moderate Impacts **Expect disruptions to daily life.** • Hazardous driving conditions. **Use extra caution while driving.** • Closures and disruptions to infrastructure may occur.
	Major Impacts **Expect considerable disruptions to daily life.** • Dangerous or impossible driving conditions. **Avoid travel if possible.** • Widespread closures and disruptions to infrastructure may occur.
	Extreme Impacts **Expect substantial disruptions to daily life.** • Extremely dangerous or impossible driving conditions. **Travel is not advised.** • Extensive and widespread closures and disruptions to infrastructure may occur. • Life-saving actions may be needed.

Likelihood of Impact



Source: NOAA/NWS Weather Prediction Center

- The WPC is showing > 70% likelihood of **moderate** winter storm impacts in the Olympic Mountains, Washington Cascades, and Klamath Mountains Tue 19 Nov into early Wed 20 Nov.
- More severe impacts are expected in the Klamath Mountains, Southern Cascades, and Northern Sierra Nevada Wed 20 Nov into early Thu 21 Nov, with the WPC showing > 70% likelihood of **major** winter storm impacts in these areas.