

CW3E Atmospheric River Outlook: 20 October 2025

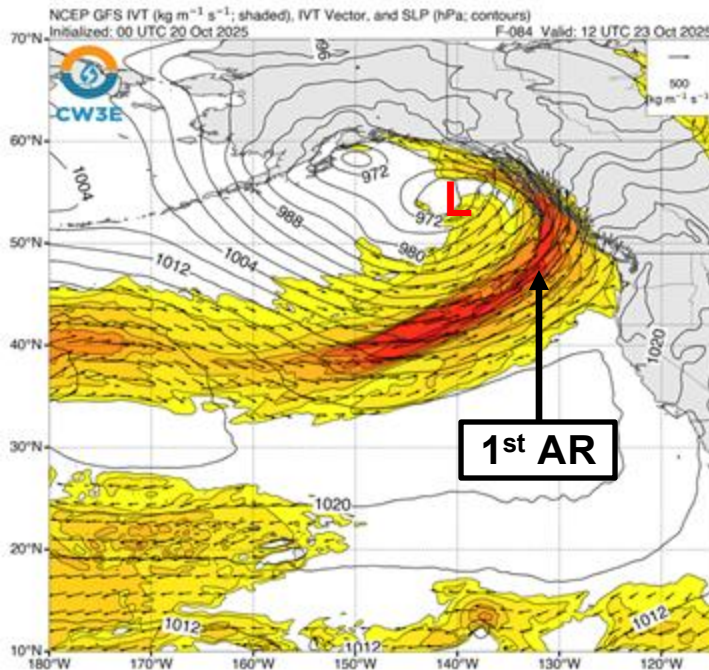
Multiple Atmospheric Rivers Forecast to Impact US West Coast Later This Week into This Weekend

- A strong atmospheric river (AR) is forecast to make landfall over the Pacific Northwest late Thu 23 Oct and move southward into northern California on Fri 24 Oct.
- A second, weaker AR is forecast to make landfall over southern Oregon and northern California this weekend, but there is considerable uncertainty in its timing and strength. The ECMWF model is favoring an earlier AR landfall and stronger IVT magnitudes compared to the GFS model.
- The unsettled weather pattern may continue through the end of October, with additional landfalling AR activity possible over the region next week.
- About 80% of GEFS and ECMWF ensemble members are forecasting at least an AR 3 (based on the Ralph et al. 2019 AR Scale) over northern coastal Oregon in association with the first AR.
- The NWS Weather Prediction Center (WPC) is forecasting at least 2–6 inches of precipitation in much of western Washington, western Oregon, and northern California during the next 7 days, with higher amounts expected in the Olympic Peninsula and North Cascades.
- The WPC has issued a **marginal risk** excessive rainfall outlook (ERO) for coastal Washington, Oregon, and northern California, and the Washington Cascades due to the potential for heavy precipitation from the first AR.
- Most of the precipitation during the first AR is expected to fall as rain, but lower freezing levels during the second AR may support significant snowfall accumulations in the higher terrain of the Oregon Cascades.
- Model differences in the forecasts of the second AR are driving differences in forecast precipitation over the next 10 days. Overall, the ECMWF ensemble is forecasting higher precipitation totals in western Washington, western Oregon, and northern California compared to the GEFS ensemble.

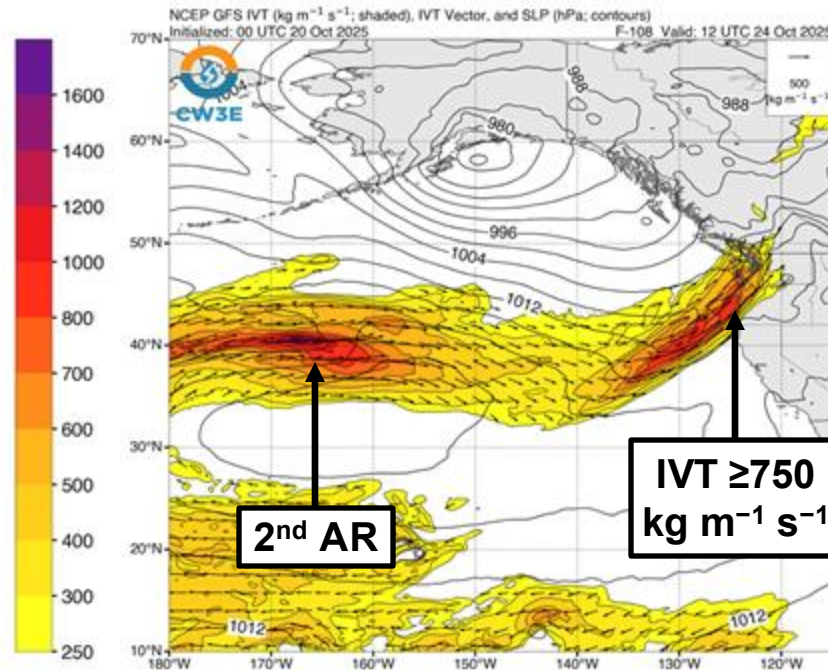
AR Outlook: 20 October 2025

GFS IVT Forecasts

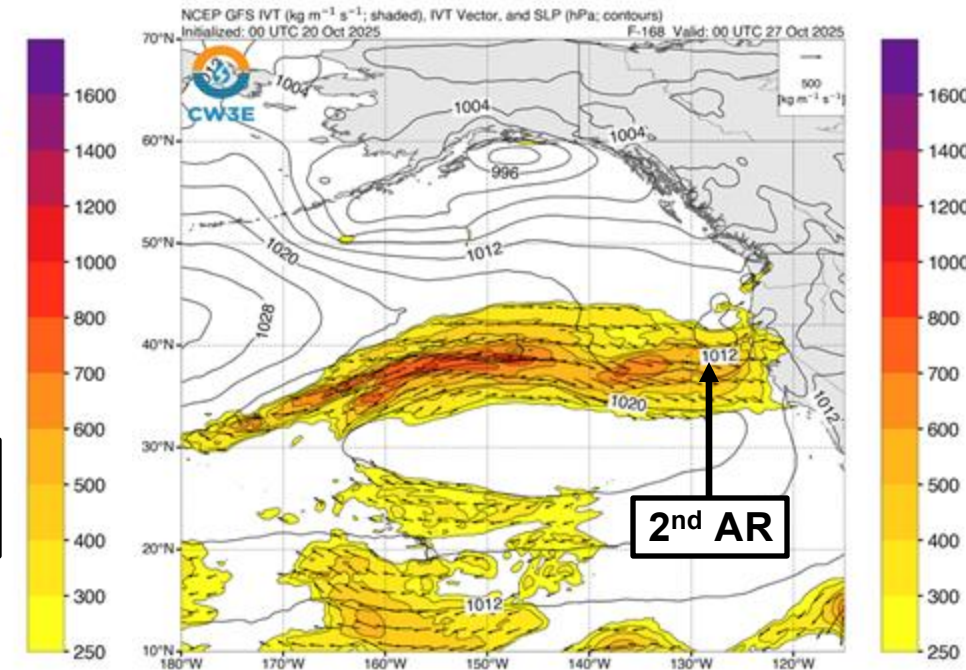
Valid: 5 AM PDT 23 Oct (F-084)



Valid: 5 AM PDT 24 Oct (F-108)



Valid: 5 PM PDT 26 Oct (F-168)

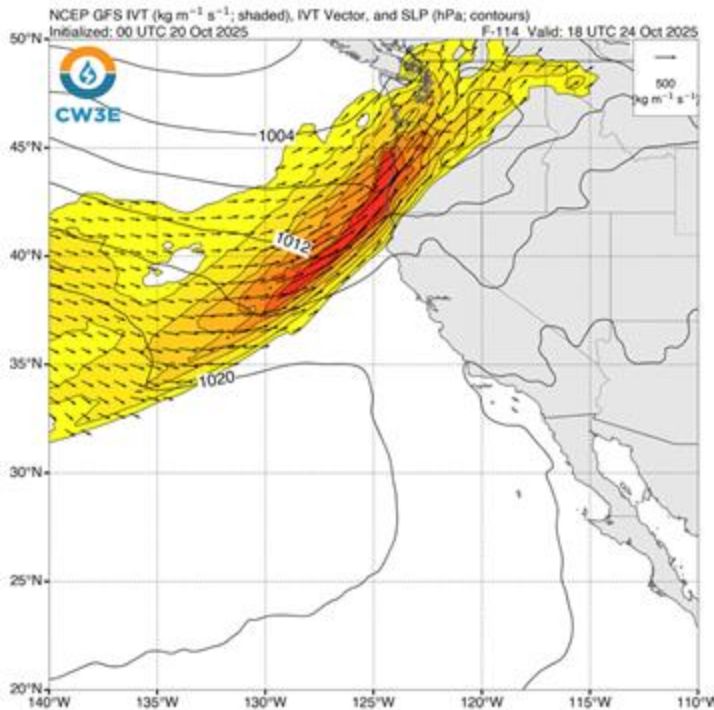


- A strong atmospheric river (AR) is forecast to make landfall over southeastern Alaska and British Columbia on Thu 23 Oct in association with a deep low-pressure system in the Gulf of Alaska.
- The AR will move southward down the US West Coast on Fri 24 Oct, potentially bringing strong AR conditions ($\text{IVT} \geq 750 \text{ kg m}^{-1} \text{ s}^{-1}$) to coastal Washington and Oregon and moderate AR conditions to far Northern California ($\text{IVT} \geq 500 \text{ kg m}^{-1} \text{ s}^{-1}$).
- After the first AR dissipates, a second, weaker AR is forecast to approach the US West Coast and make landfall between southern Oregon and central California this weekend.

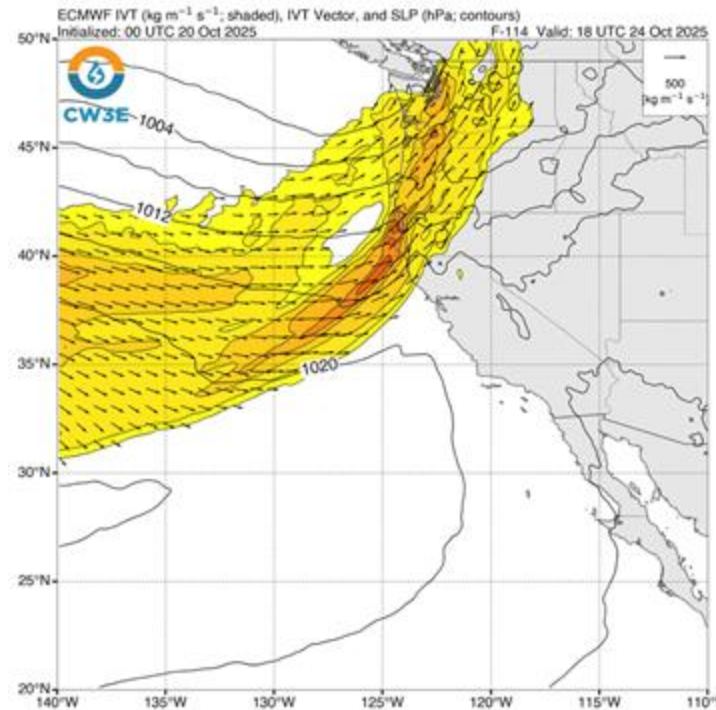
AR Outlook: 20 October 2025

GFS & ECMWF IVT Forecasts of First AR: Valid 11 AM PT 24 Oct (F-114)

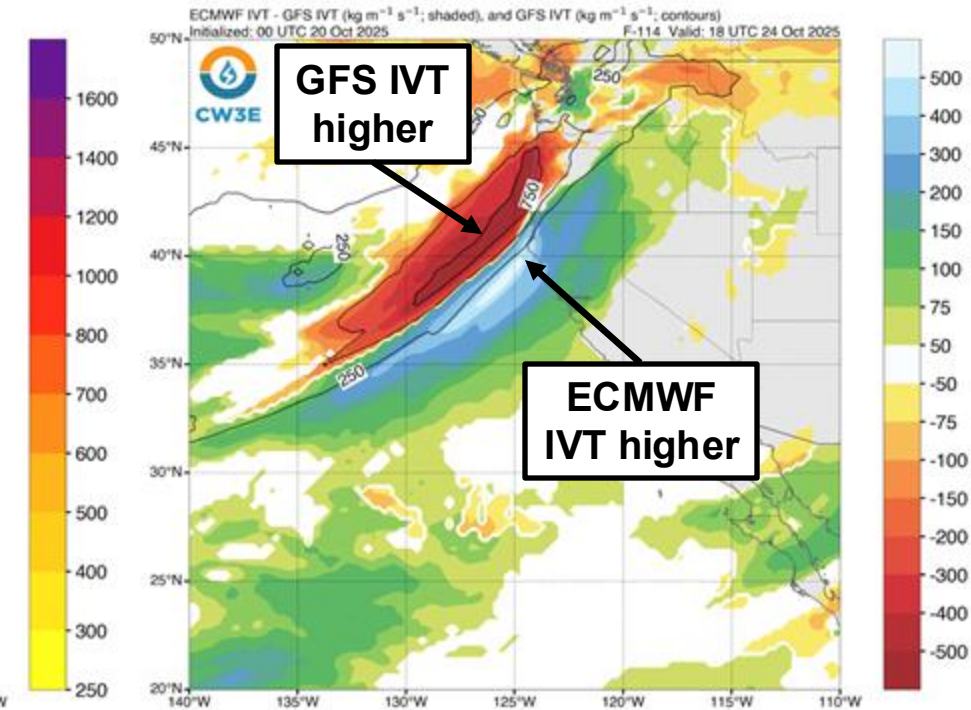
GFS



ECMWF



Difference (ECMWF Minus GFS)

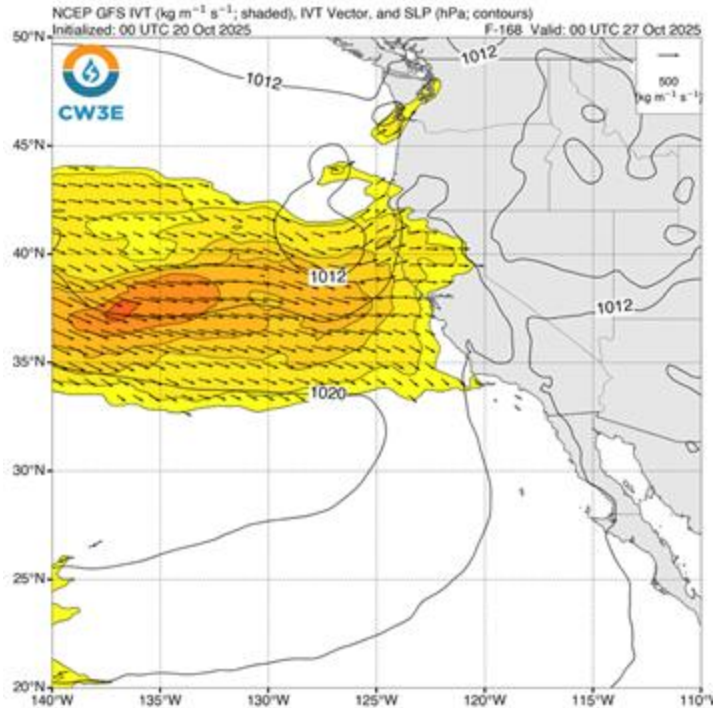


- There are subtle model-to-model differences in the forecast evolution of the first AR as it moves down the US West Coast.
- Compared to the 00Z ECMWF, the 00Z GFS is forecasting a slightly slower progression and weakening of the AR.
- Both models are forecasting southwesterly IVT within the core of the AR, which is a favorable direction for orographic precipitation enhancement along the southern slopes of the Olympic Mountains, North Cascades, and Coast Ranges in Oregon and northern California.

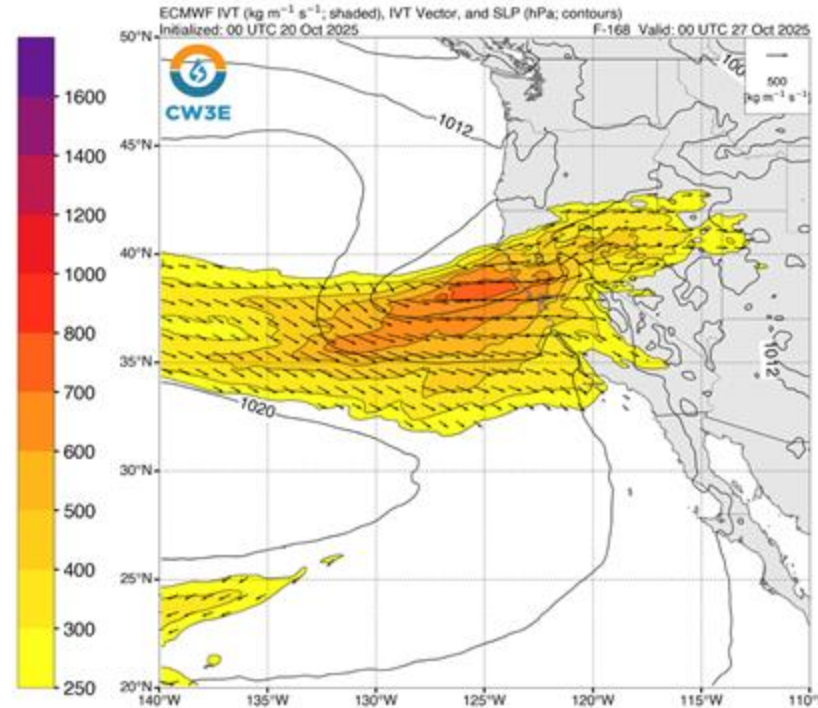
AR Outlook: 20 October 2025

GFS & ECMWF IVT Forecasts of Second AR: Valid 5 PM PT 26 Oct (F-168)

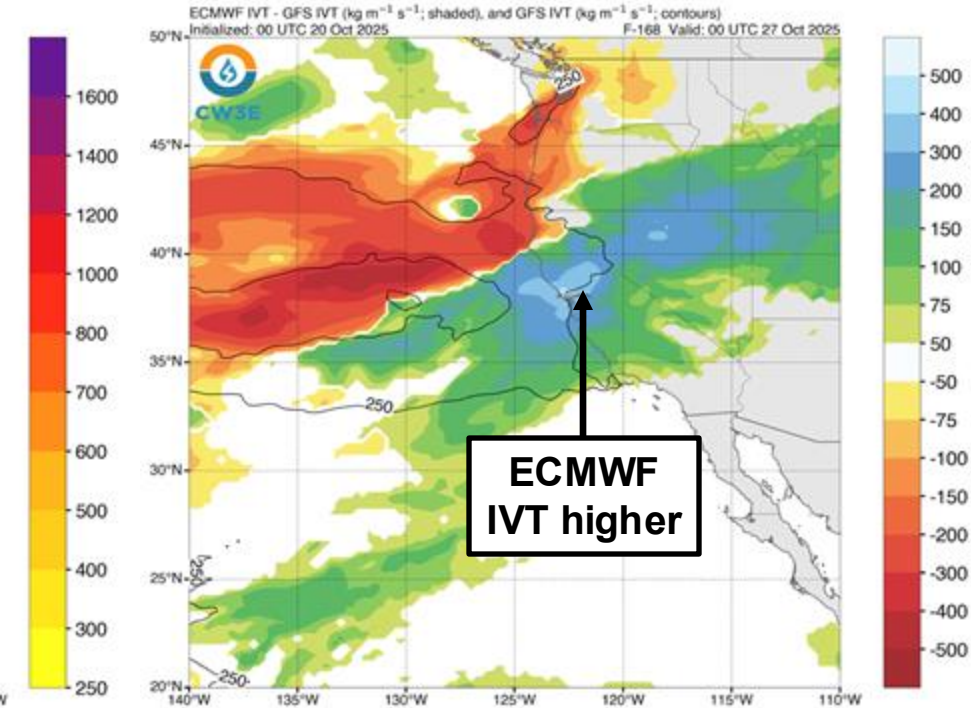
GFS



ECMWF



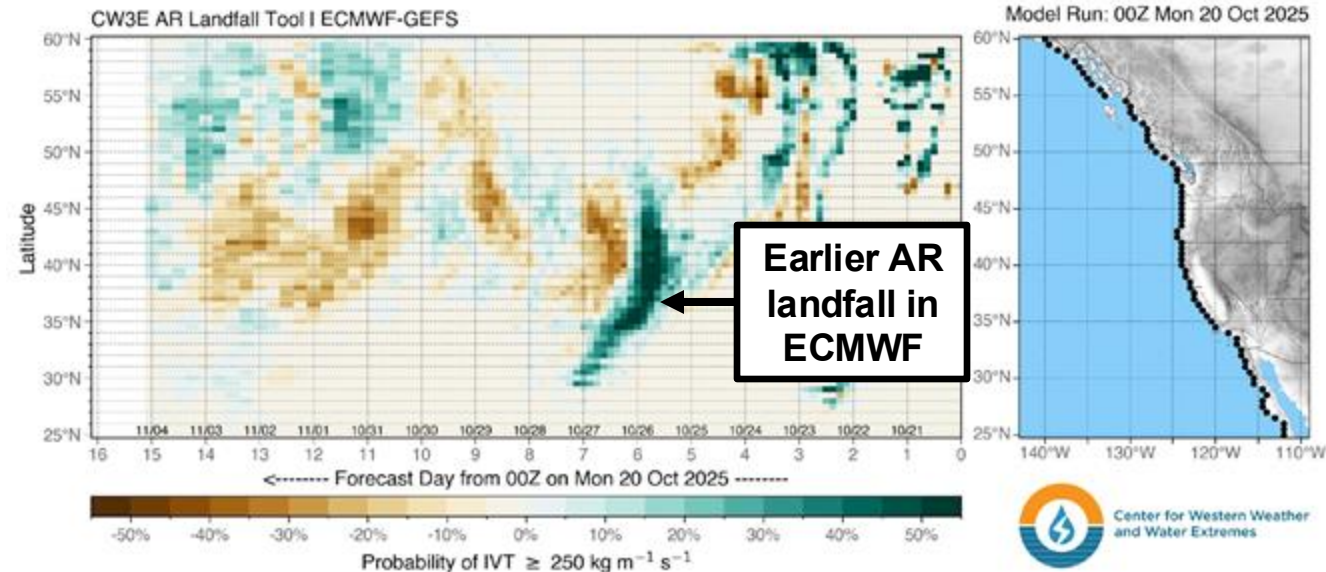
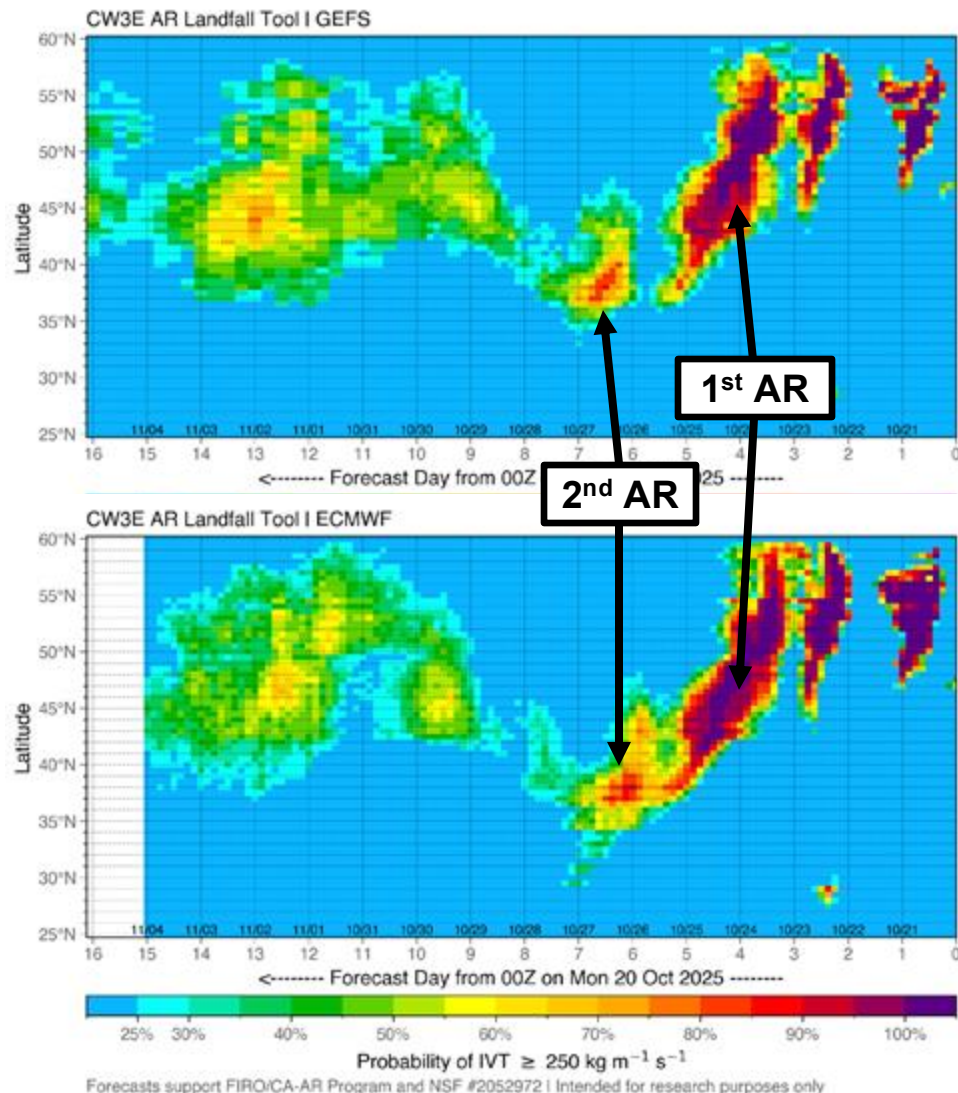
Difference (ECMWF Minus GFS)



- There is considerable uncertainty in the forecast evolution of the second AR as it approaches the US West Coast this weekend.
- Compared to the 00Z GFS, the 00Z ECMWF is forecasting an earlier AR landfall (Sat 25 Oct vs. Sun 26 Oct), stronger IVT magnitudes over northern California, and greater inland penetration of AR conditions.

AR Outlook: 20 October 2025

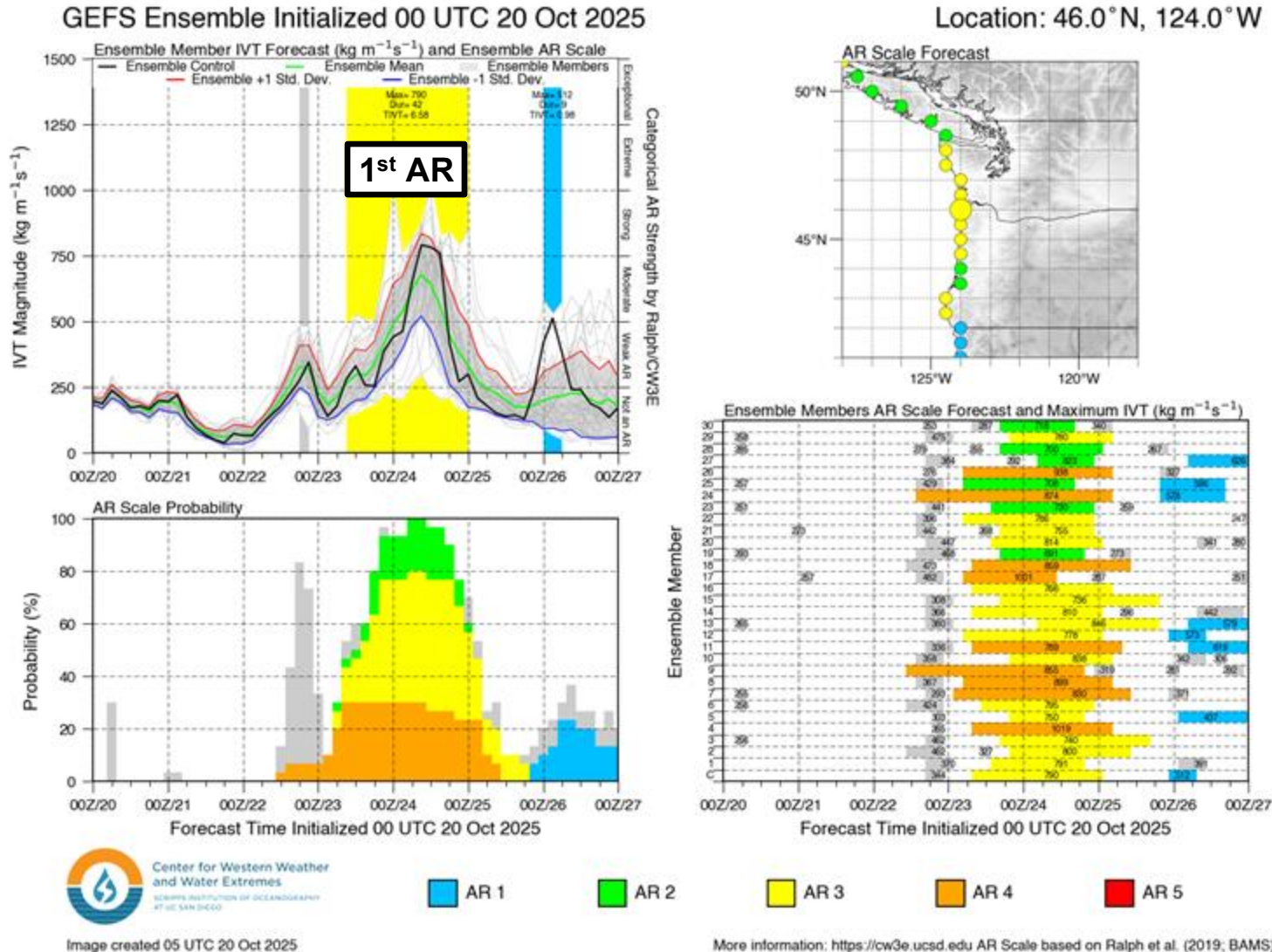
GEFS vs. ECMWF Coastal AR Landfall Tool



- The 00Z GEFS and ECMWF ensembles are both showing very high confidence ($>90\%$ probability) in AR conditions ($IVT \geq 250 \text{ kg m}^{-1} \text{ s}^{-1}$) between Washington and northern California on 23–24 Oct in association with the first AR.
- Both models are showing moderate-to-high confidence (60–90% probability) in AR conditions over southern Oregon and northern California on 25–26 Oct in association with the second AR, but the ECMWF is generally forecasting an earlier AR landfall and higher probabilities south of the Bay Area.
- Both models are also showing potential for additional landfalling AR activity over the Pacific Northwest through the end of October and into the first week of November.

AR Outlook: 20 October 2025

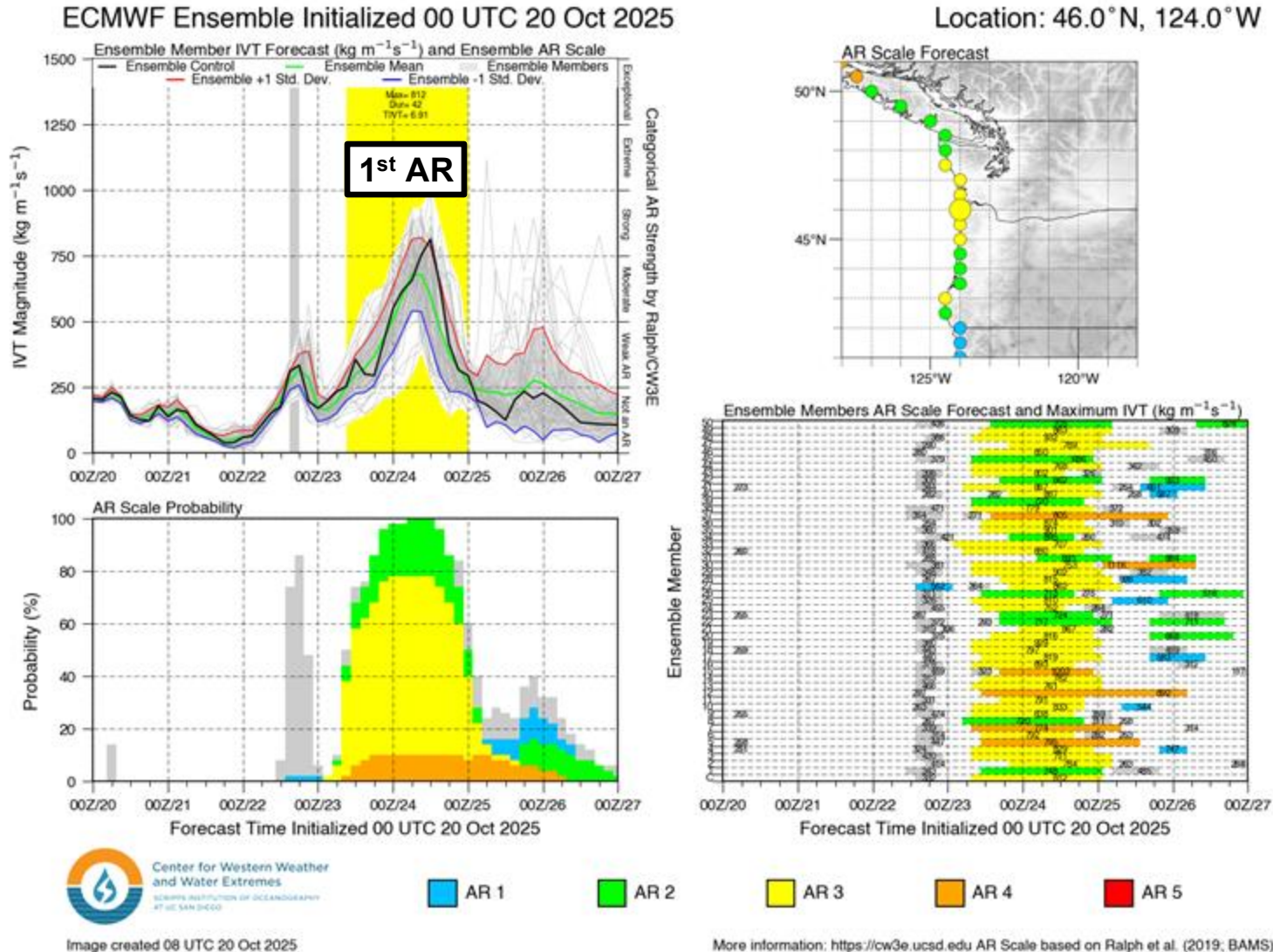
GEFS AR Scale and IVT Forecasts



- The 00Z GEFS control member is forecasting an AR 3 (based on the Ralph et al. 2019 AR Scale) over coastal Washington and northern Oregon during the first AR.
- About 80% (25/31) of GEFS members are forecasting an AR 3 or greater at 46°N, 124°W (Clatsop County, OR), and ~30% (9/31) are forecasting an AR 4.
- There is still considerable uncertainty in the timing, duration, and peak IVT magnitude during the first AR.
- About 30% (9/31) of GEFS members are forecasting an AR duration ≥ 48 hours and ~75% (23/31) are forecasting strong AR conditions ($\text{IVT} \geq 750 \text{ kg m}^{-1} \text{s}^{-1}$) at this location.

AR Outlook: 20 October 2025

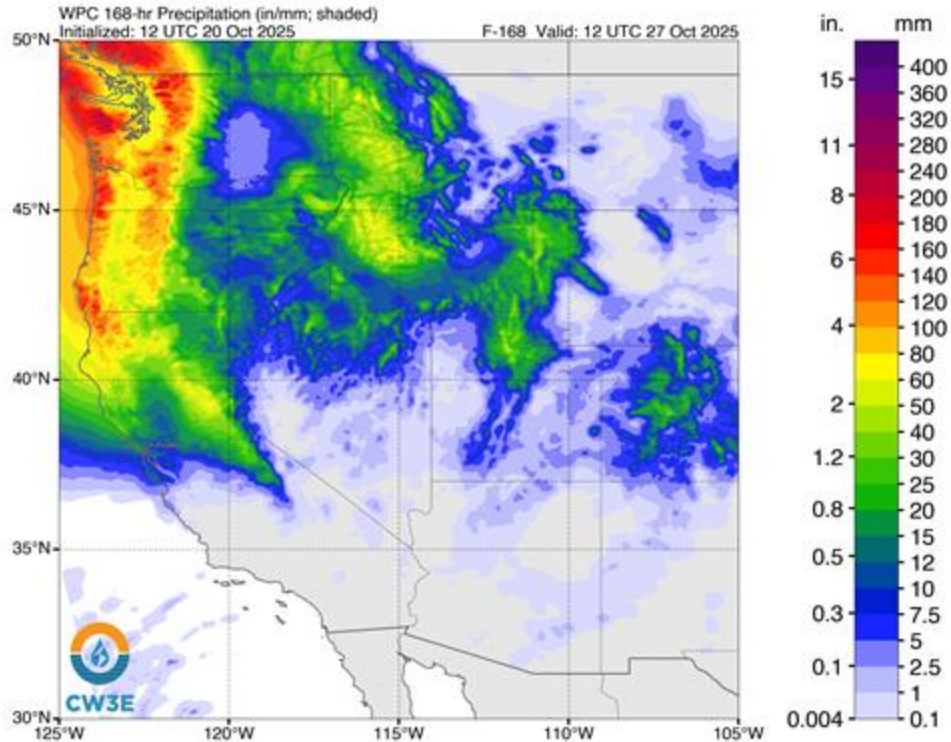
ECMWF AR Scale and IVT Forecasts



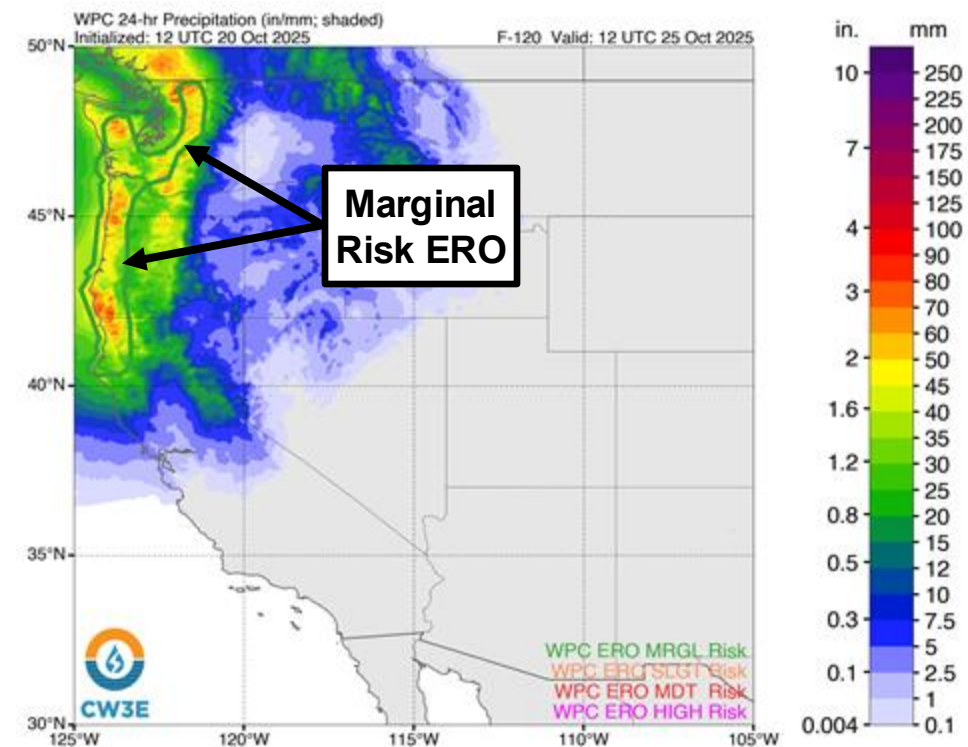
- The ECMWF control member is also forecasting an AR 3 over coastal Washington and northern Oregon during the first AR.
- Only ~10% of ECMWF (5/51) ensemble members are forecasting an AR 4 at 46°N, 124°W.
- The lower probability of an AR 4 in ECMWF compared to GEFS is primarily due to only ~10% of ECMWF ensemble members forecasting an AR duration ≥ 48 hours.
- While there is considerable uncertainty in the peak IVT magnitude and duration of AR conditions, there is generally better agreement in the timing of peak IVT magnitude compared to the GEFS ensemble.

WPC Precipitation Forecasts

WPC 7-day Total QPF
Valid: 5 AM PDT 27 Oct



WPC Day 5 24-h QPF
Valid: 5 AM PDT 25 Oct



- The NWS Weather Prediction Center (WPC) is forecasting 2–6 inches of total precipitation over much of western Washington, western Oregon, and northern California during the next 7 days, with higher amounts possible over the Olympic Peninsula and North Cascades.
- A **marginal risk** (level 1 of 4; $\geq 5\%$ probability of flooding) excessive rainfall outlook (ERO) has been issued for coastal portions of Washington, Oregon, and far northern California, as well as in the vicinity of the Washington Cascades on Day 5 (24-hour period ending 5 AM PDT Sat 25 Oct) due to the potential for heavy precipitation during the first AR.

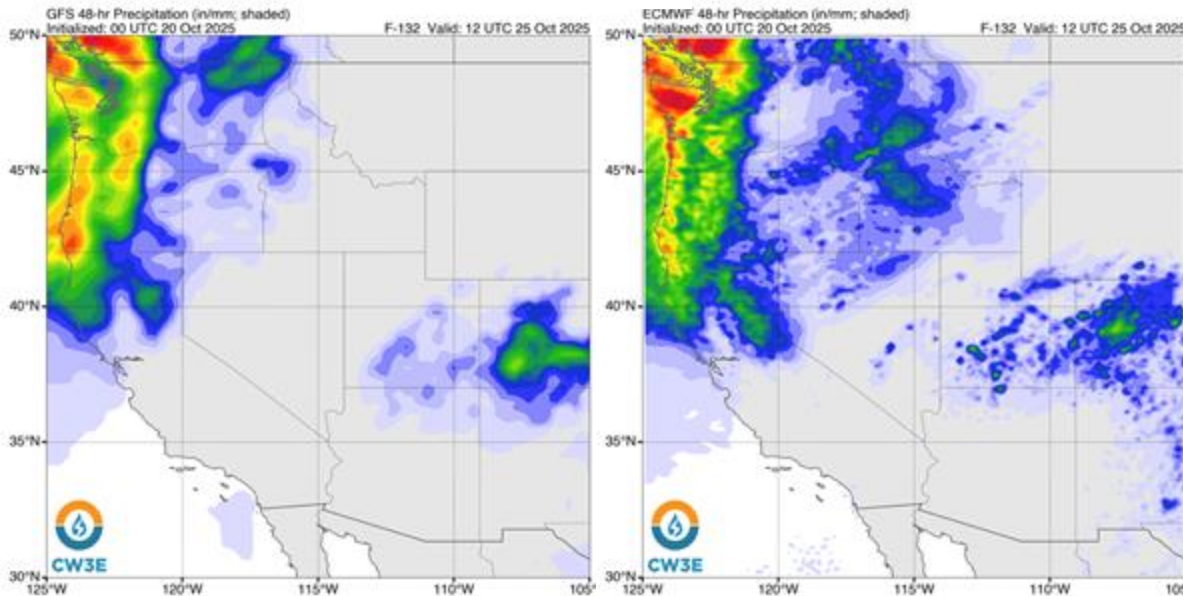
GFS vs. ECMWF Precipitation Forecasts

WPC 48-h Total QPF
Valid: 5 AM PDT 25 Oct

GFS

1st AR

ECMWF

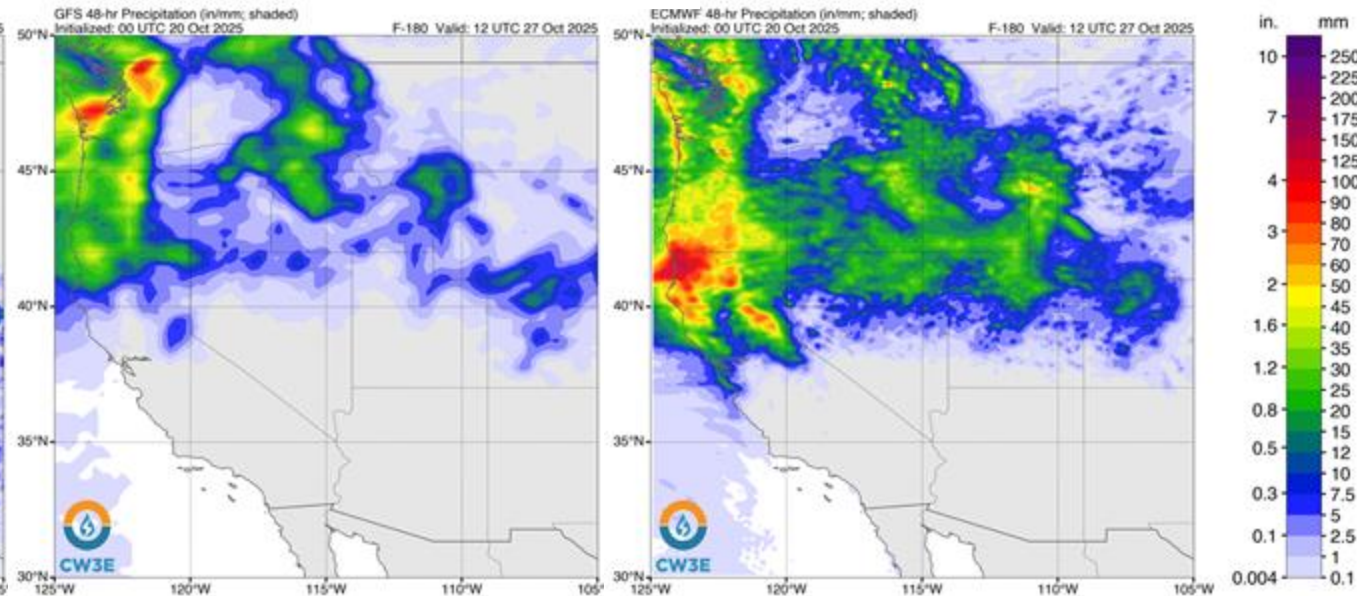


WPC 48-h Total QPF
Valid: 5 AM PDT 27 Oct

GFS

2nd AR

ECMWF

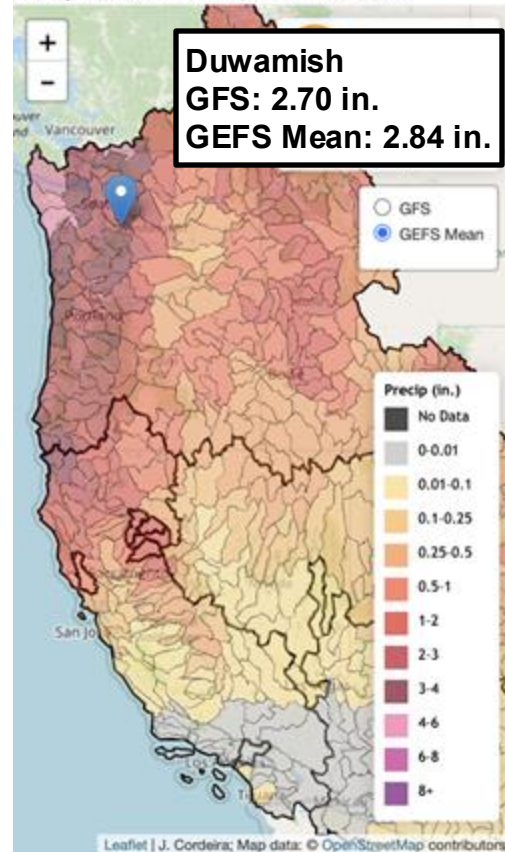


- Compared to the 00Z deterministic GFS, the 00Z deterministic ECMWF is forecasting higher precipitation amounts during the second AR over the Olympic Peninsula and slightly lower precipitation amounts over the southern and central Oregon Coast Ranges.
- The deterministic ECMWF is also forecasting much heavier precipitation from the second AR over southern Oregon and northern California.

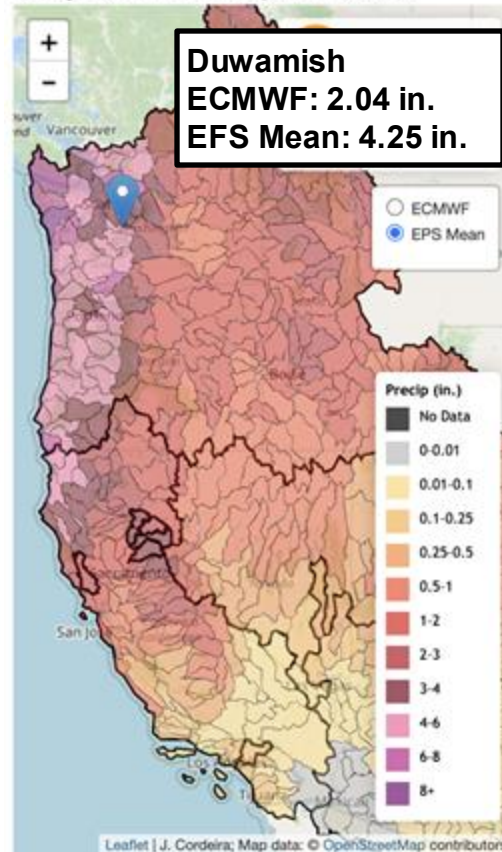
AR Outlook: 20 October 2025

Watershed Precipitation Forecasts

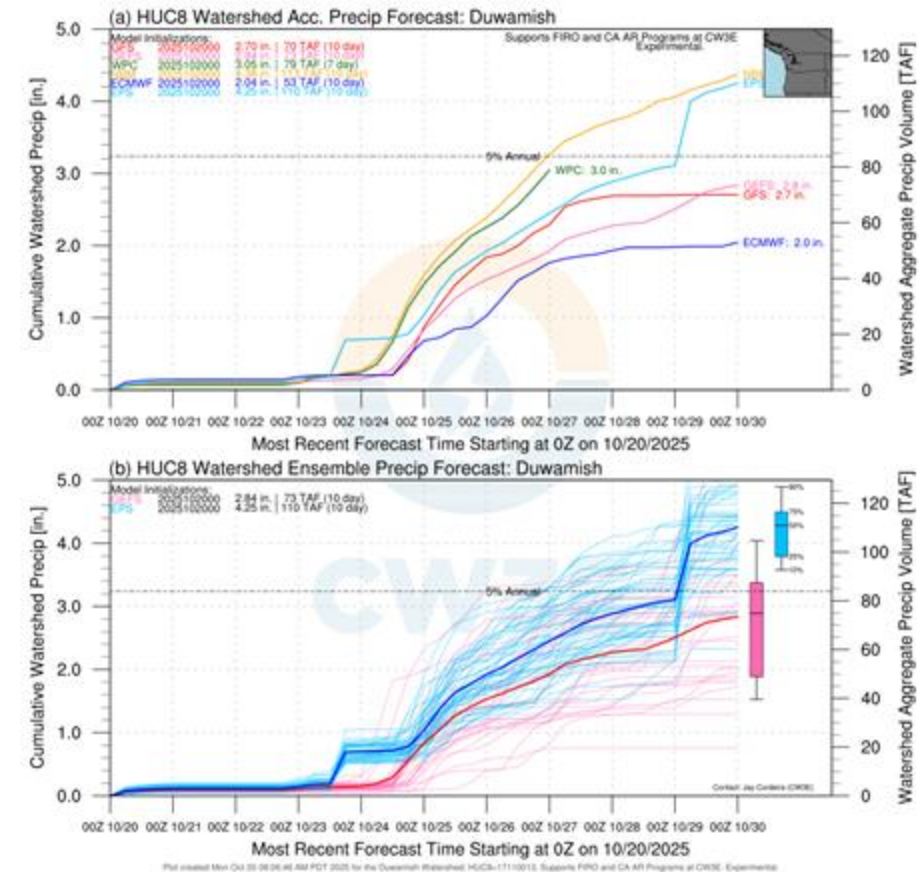
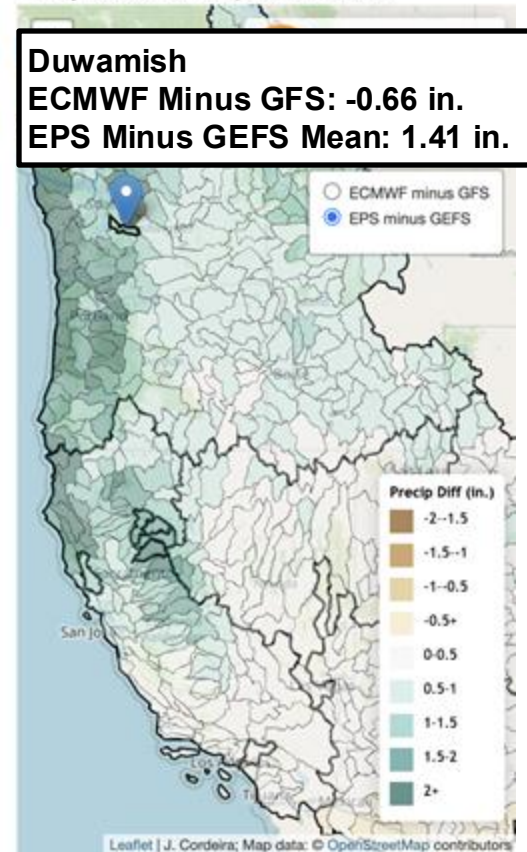
10-day GFS/GEFS Precipitation Forecasts



10-day ECMWF/EFS Precipitation Forecast



10-day Difference Precipitation Forecast

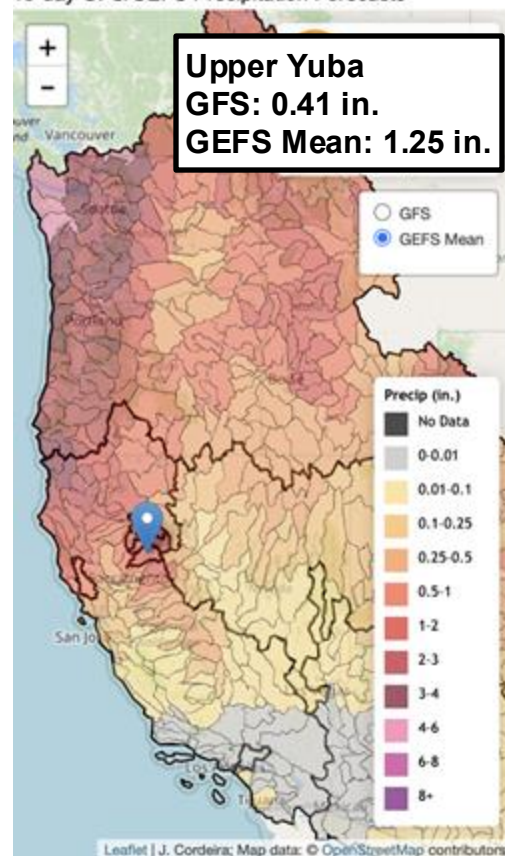


- Overall, the ECMWF ensemble is forecasting higher precipitation totals than the GEFS ensemble over western Washington, western Oregon, and northern California during the next 10 days.
- In the Duwamish watershed, ~90% of ECMWF members (ensemble mean of 4.25 inches) and only ~50% GEFS members (ensemble mean of 2.84 inches) are forecasting at least 3 inches over the next 10 days.

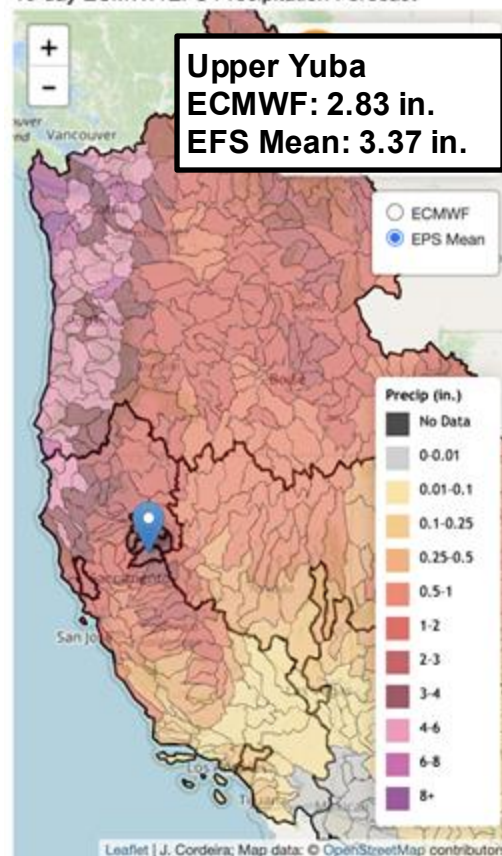
AR Outlook: 20 October 2025

Watershed Precipitation Forecasts

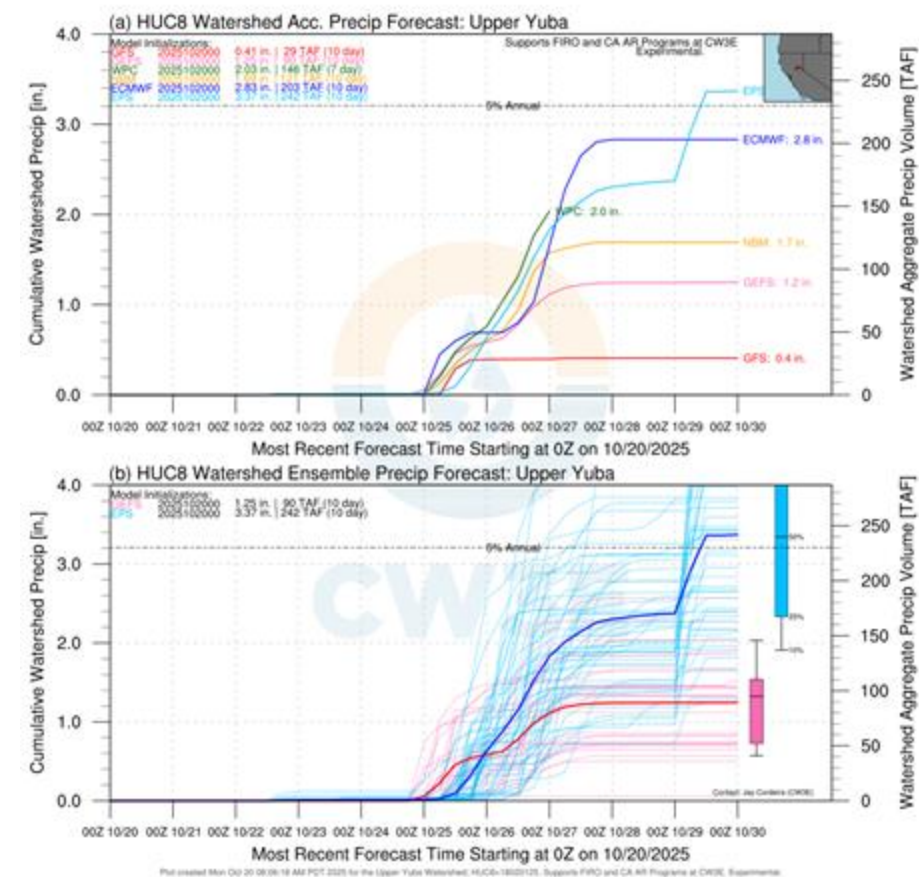
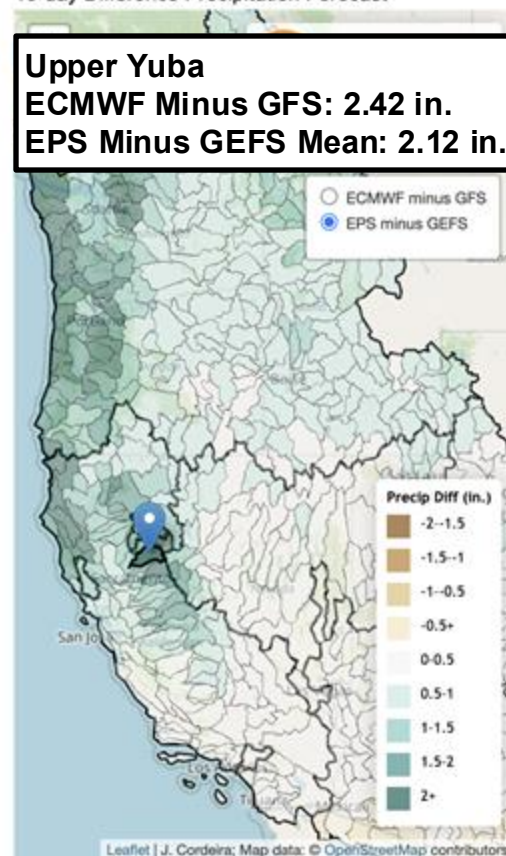
10-day GFS/GEFS Precipitation Forecasts



10-day ECMWF/EFS Precipitation Forecast



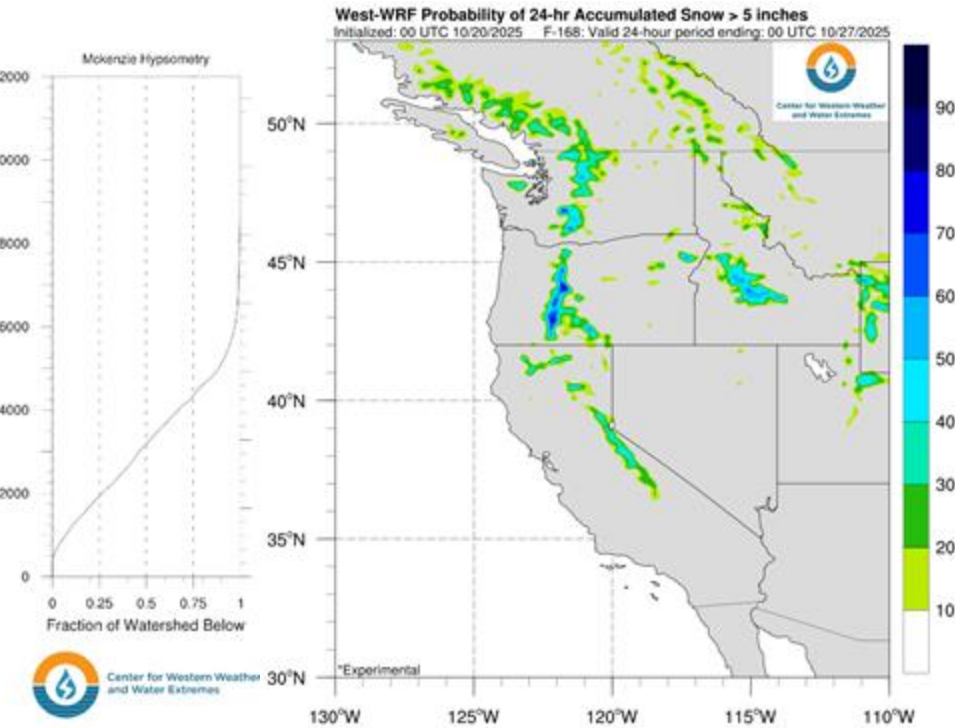
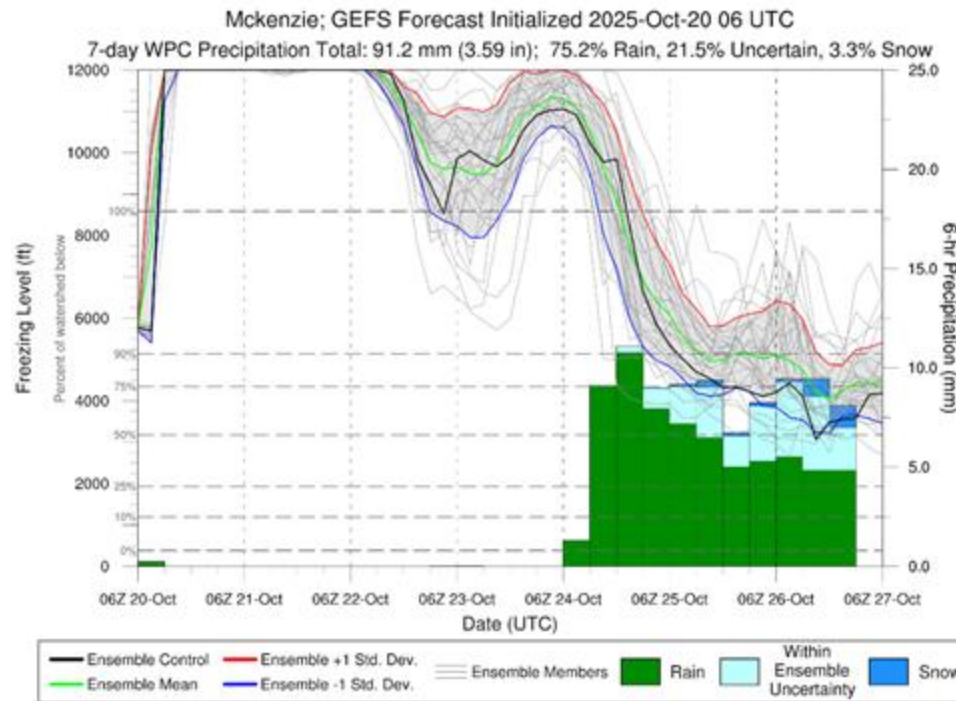
10-day Difference Precipitation Forecast



- In the Upper Yuba watershed, >50% of ECMWF members are forecasting at least 3 inches and only 10% of GEFS members are forecasting at least 2 inches over the next 10 days.
- ECMWF ensemble spread is quite large, with >25% of members forecasting at least 4 inches over the next 10 days.
- Differences in forecast precipitation over northern California are largely driven by differences in forecasts of the second AR.

AR Outlook: 20 October 2025

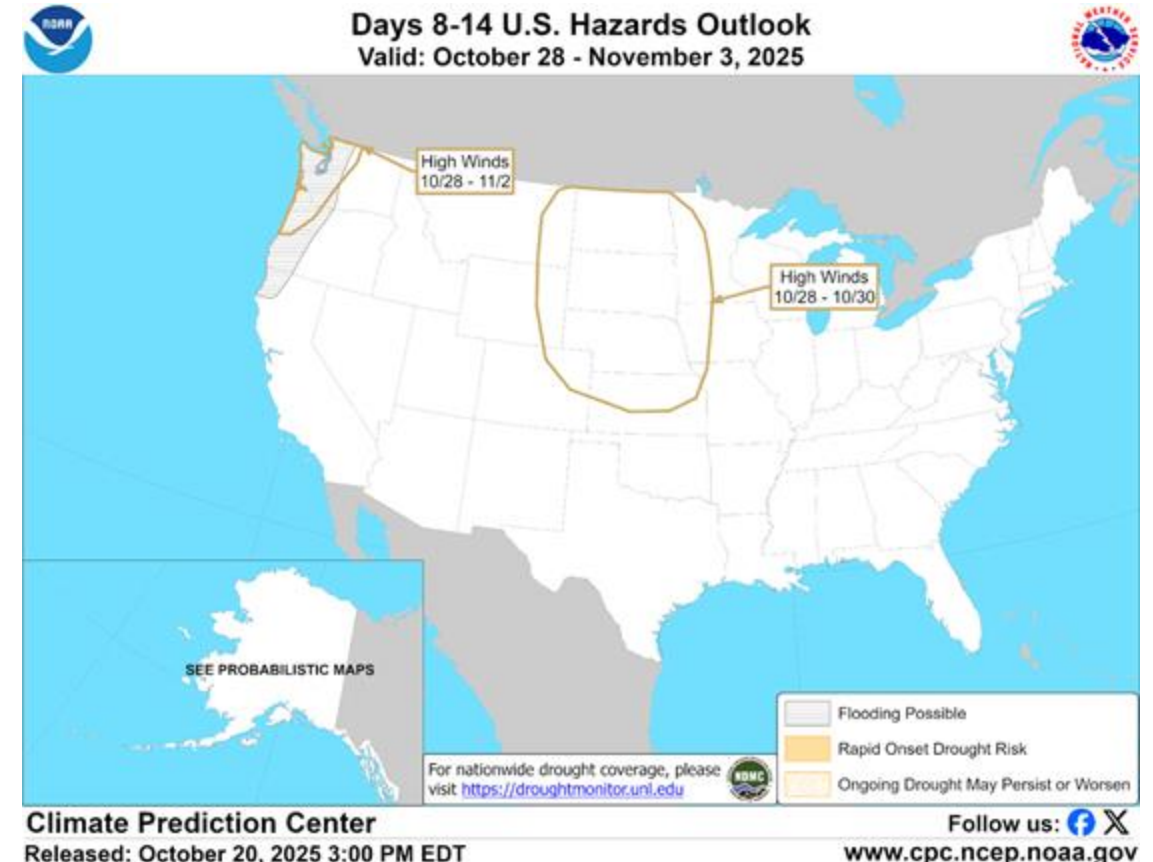
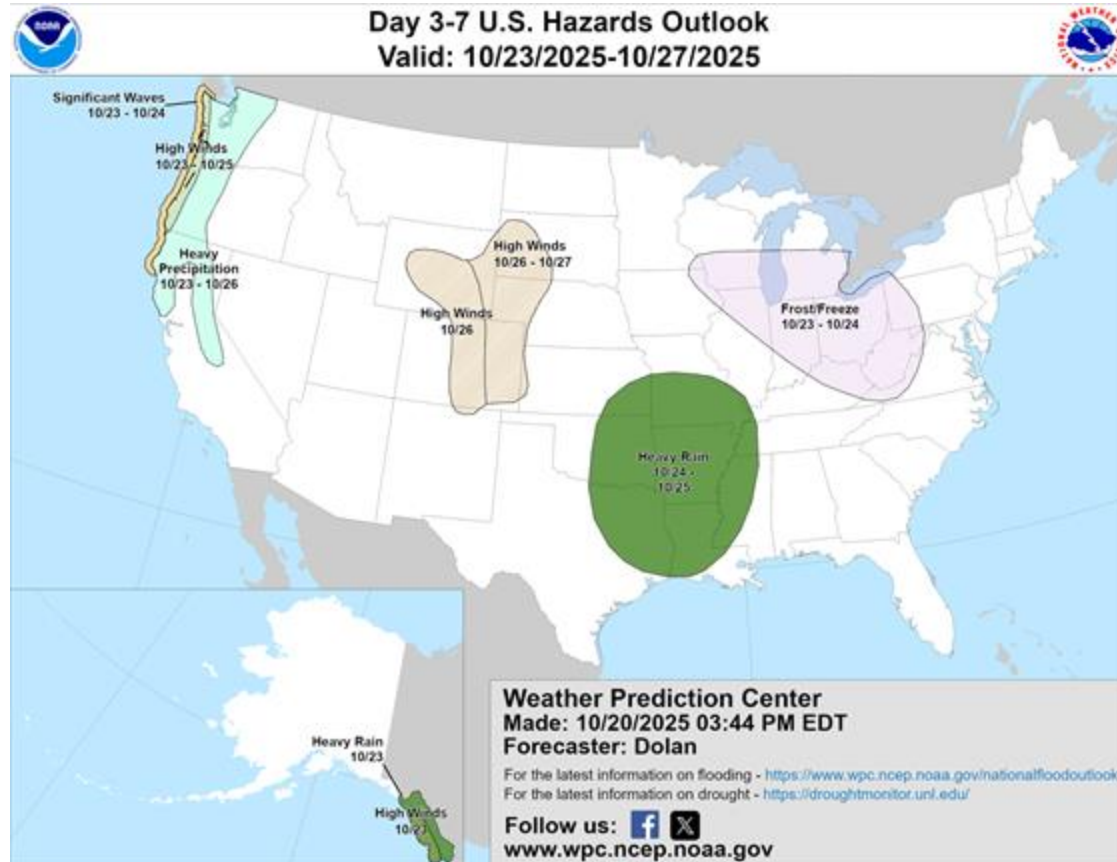
GEFS Freezing Level & West-WRF Snowfall Forecasts



- Most of the precipitation from the first AR in the watersheds along the Cascades and Sierra Nevada is forecast to fall as rain due to very high freezing levels (>8,000 feet) at the time of AR landfall.
- Freezing levels over the Cascades are forecast drop below 5,000 feet by Sat 25 Oct. Lower freezing levels during the second AR may support significant snowfall accumulations at higher elevations this weekend.
- CW3E's West-WRF ensemble is showing >70% likelihood of 5+ inches of snowfall in portions of the Oregon Cascades during the 24-hour period ending 5 PM PT Sun 26 Oct.

AR Outlook: 20 October 2025

Days 3–7 and 8–14 Hazards Outlooks



- The WPC Days 3–7 Hazards Outlook is highlighting the potential for heavy precipitation over western Washington, western Oregon, the Northern California Coast Ranges, and the Sierra Nevada later this week.
- The Climate Prediction Center (CPC) Days 8–14 Hazards Outlook is highlighting the potential for flooding over western Washington, western Oregon, and northwestern California next week due to cumulative precipitation from multiple ARs.