CW3E Atmospheric River Outlook: 22 October 2025

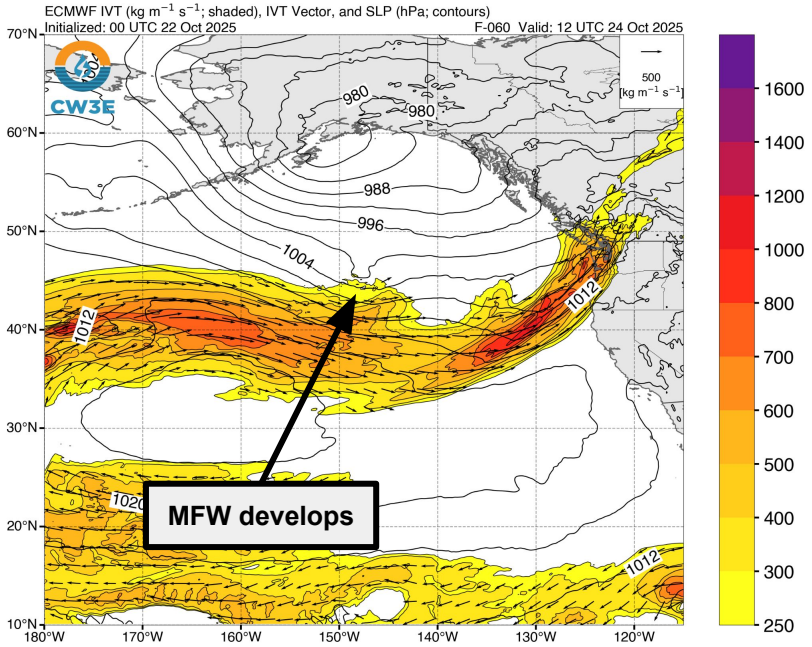
Atmospheric Rivers Forecast to Bring Precipitation to the Pacific Northwest and Northern California

- A strong atmospheric river (AR) is forecast to move over the Pacific Northwest late Thu 23 Oct/early Fri 24 Oct and shift southward along the coast into Northern California through early Sun 26 Oct.
- A mesoscale frontal wave is forecast to develop within the first AR, resulting in the development of a secondary low pressure region and notable dual peak in the maximum IVT forecast for coastal points in the Pacific Northwest.
- A second weak, zonally oriented AR is forecast to move onshore over Oregon and Northern California on Sun 26 Oct, resulting in AR conditions over this region through early in the day on Mon 27 Oct.
- CW3E's AR Landfall tool is highlighting the potential for additional AR activity next week, beginning after 1 Nov.
- Roughly 82% of GEFS and ECMWF ensemble members are forecasting an AR 3 or greater (based on the Ralph et al. 2019 AR Scale) for a point along the southern coast of Oregon, with 16% forecasting AR 4 conditions. There is still significant uncertainty as to the AR Scale forecast associated with the second AR at this time.
- The NWS Weather Prediction Center (WPC) is forecasting a broad region of 2–4 in. of rain over coastal Washington, Oregon, and Northern California with the highest totals >5 in. forecast over the Olympic Peninsula, the Cascades, and coastal terrain in Oregon and Northern California.
- Freezing levels are forecast to begin relatively high with this event resulting in primarily rainfall over terrain initially, but falling freezing levels later in the event may lead to significant snowfall along high elevation.
- The NWS WPC has issued **marginal risk** (at least 5%) excessive rainfall outlooks highlighting the potential for high-impact rain in coastal Washington, Oregon, and Northern California for 5 AM Fri 24 Oct–5 AM Sun 26 Oct.
- NWS Weather Forecast Offices have begun messaging the potential hazard associated with the first AR, namely the coastal beach hazards, high winds forecasts, possibility for heavy rainfall, and significant high elevation snow.

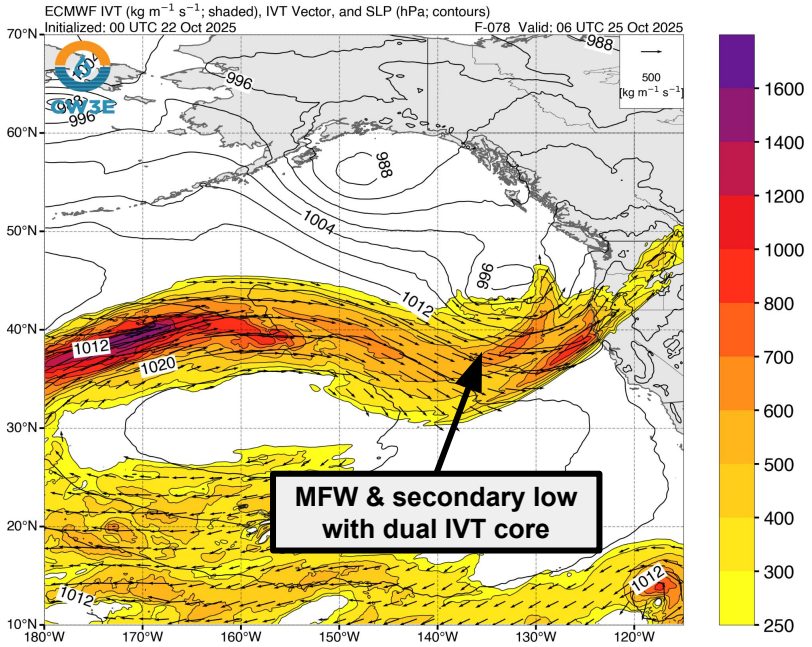
CW3E AR Outlook: 22 October 2025

ECMWF Model Forecast: Initialized 00 UTC 22 Oct 2025

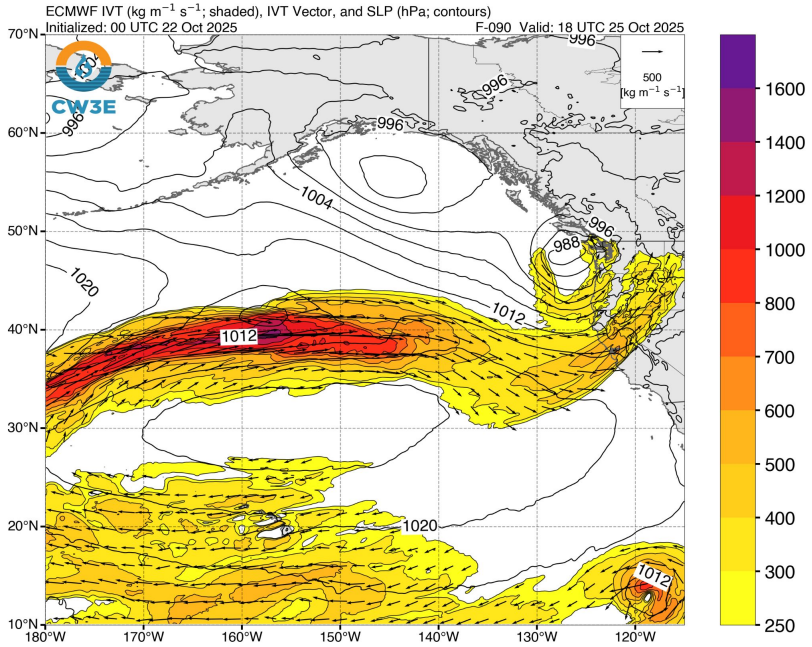
5 AM Fri 24 Oct



11 PM Fri 24 Oct



11 AM Sat 25 Oct

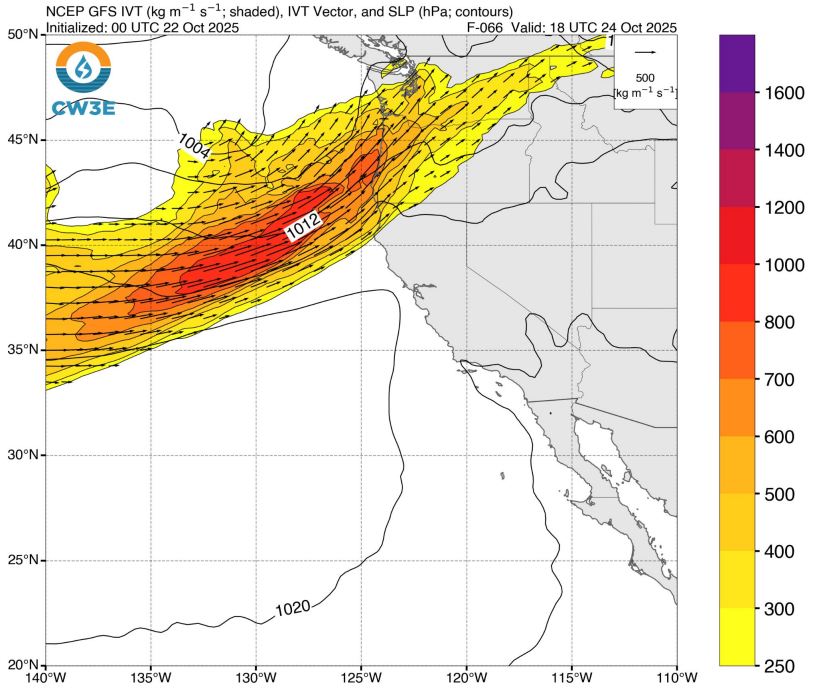


- A strong atmospheric river is forecast to move over the Pacific Northwest early in the day on Fri 24 Oct, with southwesterly flow and IVT >800 kg m^{-1} s^{-1} moving onshore over Washington (*Left*).
- A mesoscale frontal wave (MFW) is forecast to develop along the AR over the N. Pacific, resulting in a secondary low pressure forming along the AR, and a secondary pulse of IVT developing and moving onshore during the AR (*center*).
- The AR is forecast to shift south along the coast, eventually dissipating over Northern California early on Sun 26 Oct (*right*).

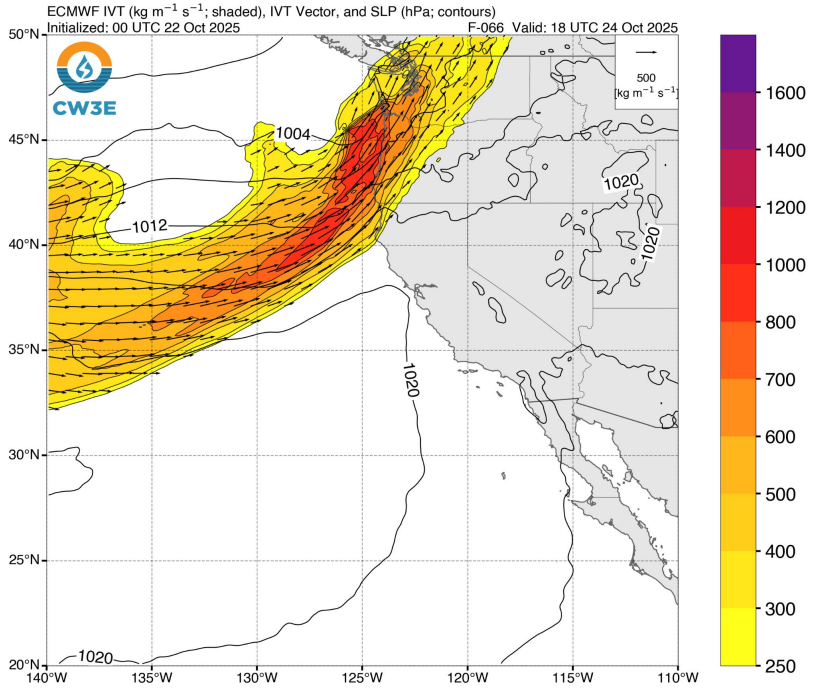
CW3E AR Outlook: 22 October 2025

GFS vs ECMWF Comparison: Valid 11 AM PT 24 Oct 2025 (F-066)

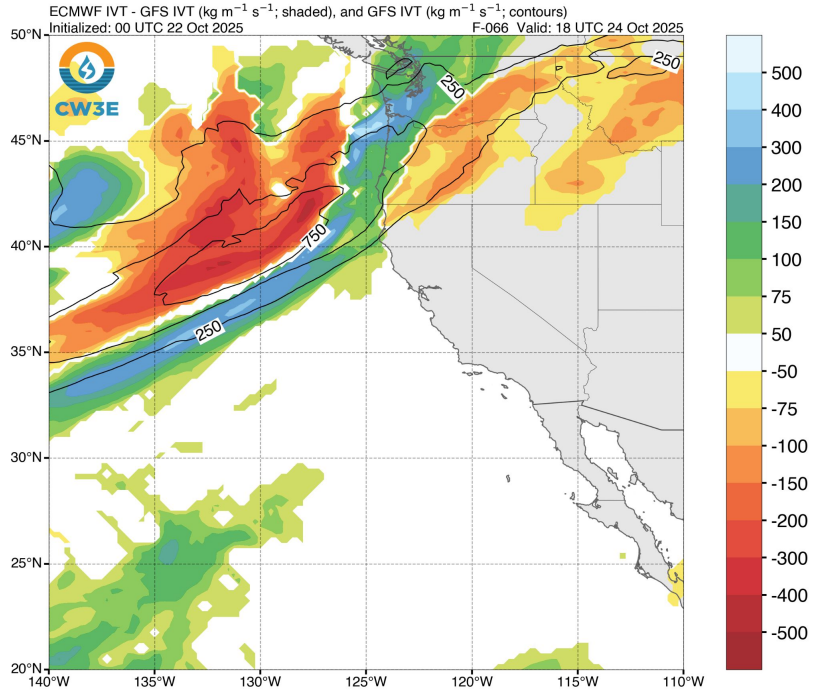
GFS IVT & SLP



ECMWF IVT & SLP



ECMWF minus GFS

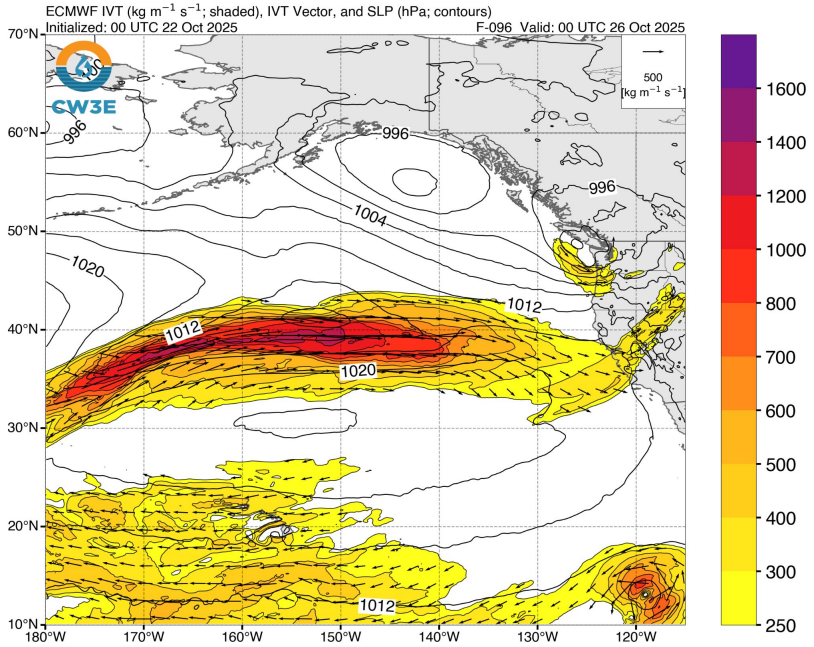


- There is still some uncertainty as to the timing and intensity of AR conditions over the Pacific Northwest in association with the first AR, with the ECMWF forecasting higher, south-southwesterly IVT values over the PNW earlier in the period (center) as compared to the GFS which is forecasting slightly later southwesterly IVT later in the period (left).
- These differences are evident in the ECMWF minus GFS comparison (*right*), which shows higher values in the ECMWF over the PNW at 11 AM Fri 24 Oct.

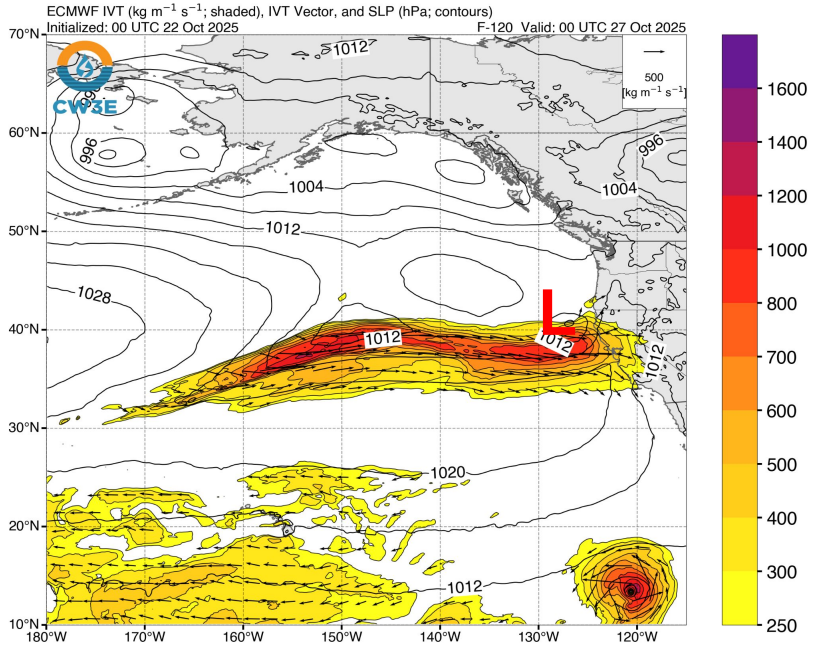
CW3E AR Outlook: 22 October 2025

ECMWF Model Forecast: Initialized 00 UTC 22 Oct 2025

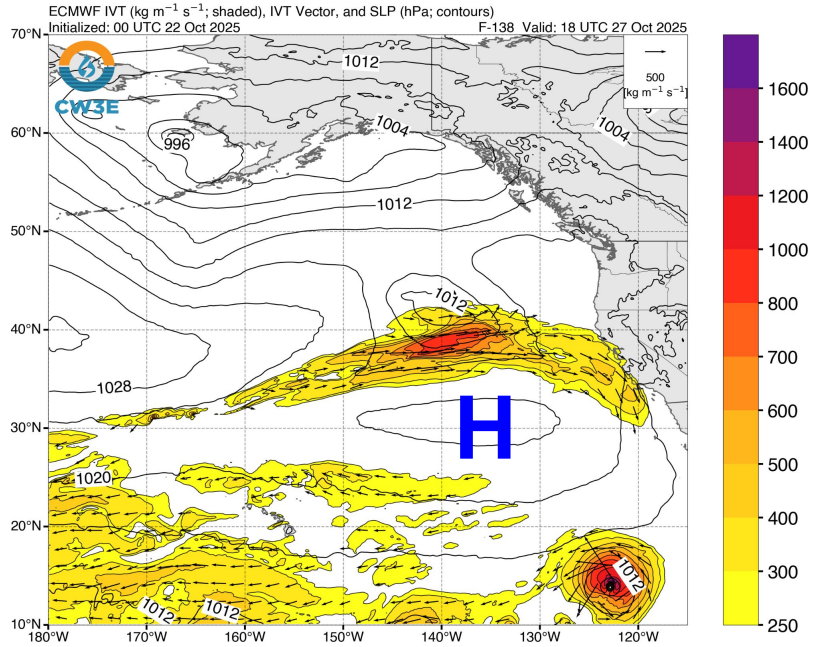
5 PM Sat 25 Oct



5 PM Sun 26 Oct



11 AM Mon 27 Oct

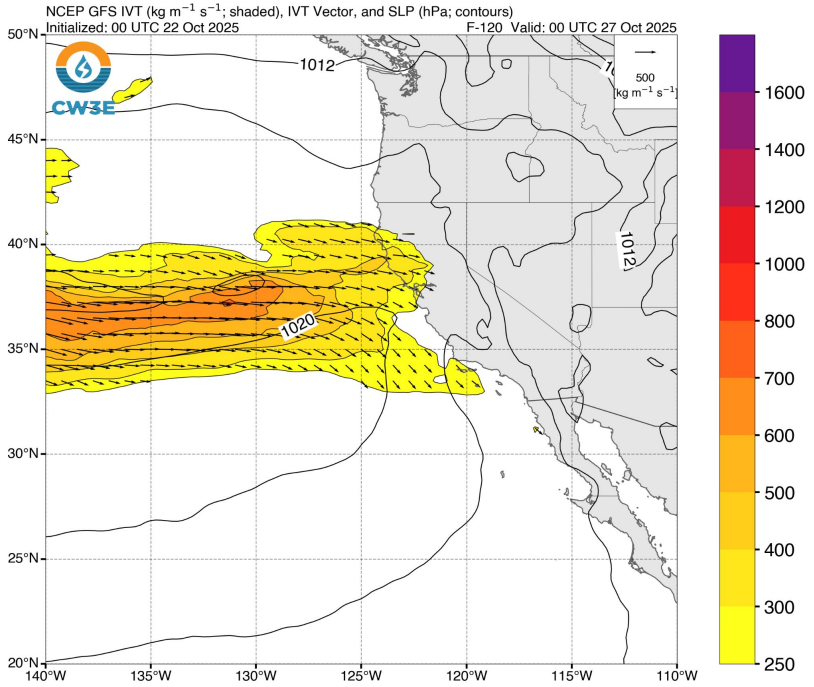


- A second weak, zonally oriented AR is forecast to develop over the North Pacific and move towards the US West Coast with with IVT >400 kg m^{-1} s^{-1} forecast over southern Oregon and Northern California beginning early on 26 Oct. as the feature moves onshore.
- The 00Z ECMWF is forecasting the development of a surface low pressure just offshore of California, leading to a stronger system as compared to the GFS (*additional discussion in following slides*)
- This AR is forecast to dissipate quickly over Northern California as flow is forecast to shift to northwesterly around a broad high.

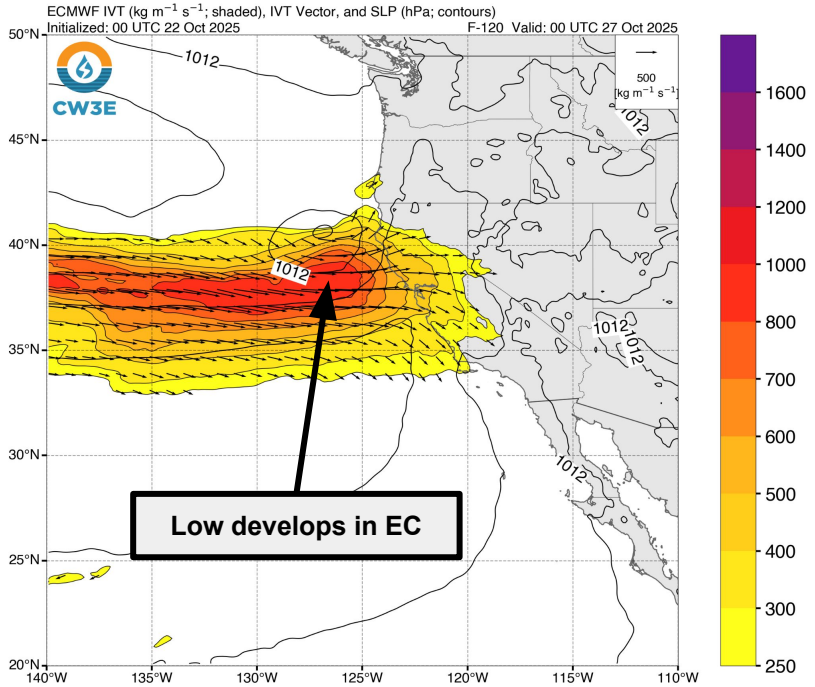
CW3E AR Outlook: 22 October 2025

GFS vs ECMWF Comparison: Valid 5 PM PT 26 Oct 2025 (F-120)

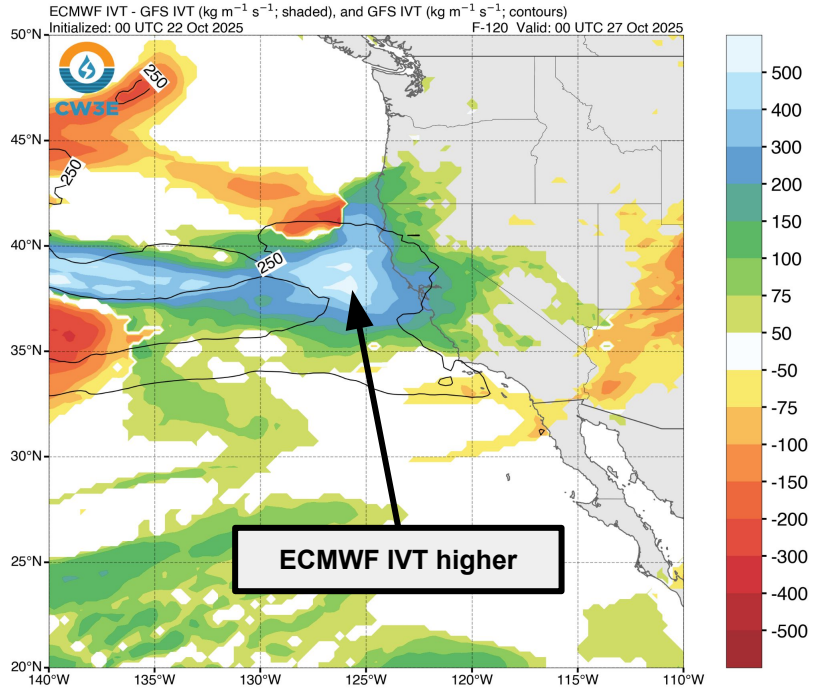
GFS IVT & SLP



ECMWF IVT & SLP



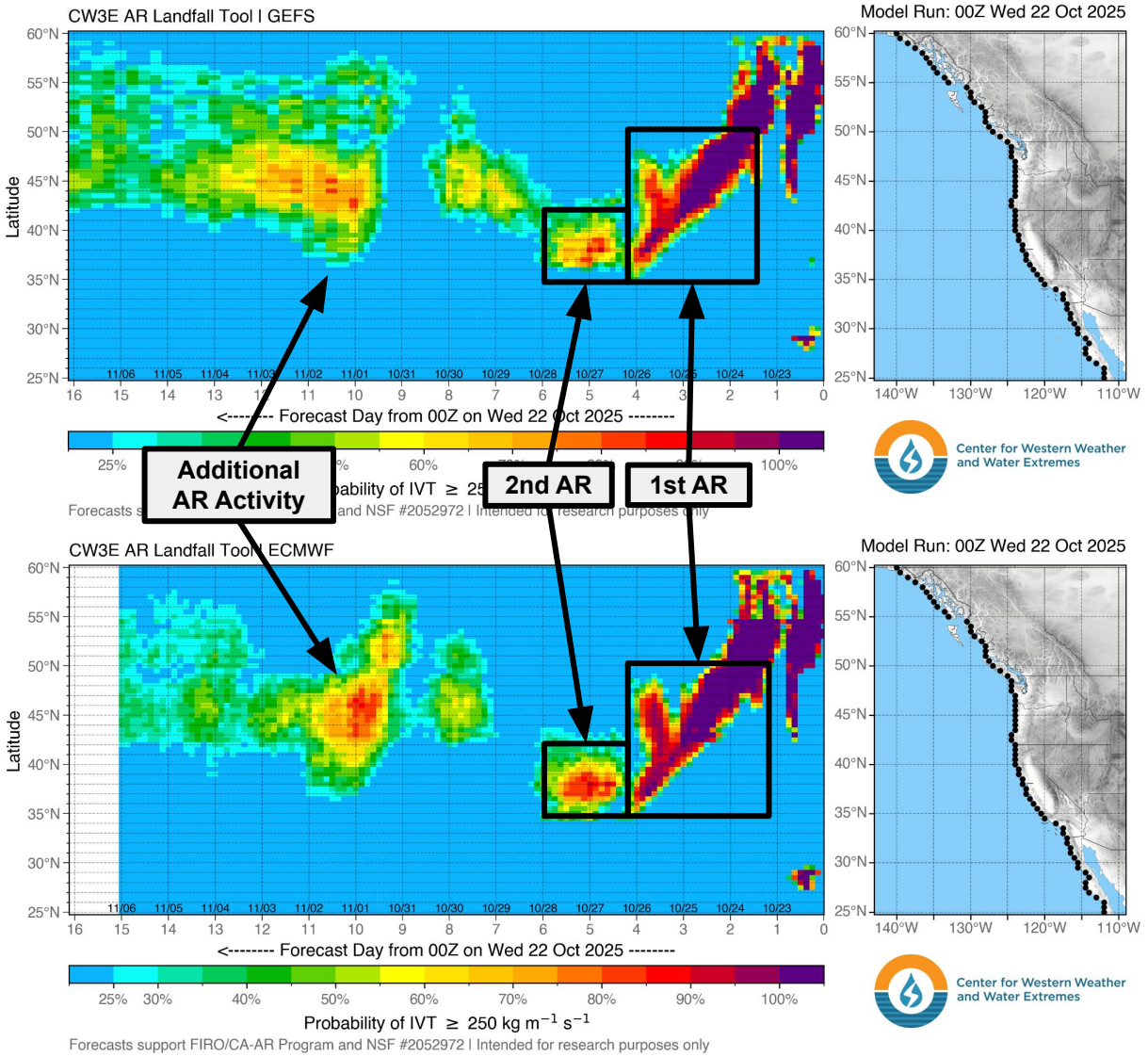
ECMWF minus GFS IVT



- There are also significant model uncertainties as to the duration, intensity, and duration of IVT over northern California in association with the second AR.
- The GFS is forecasting a weaker AR feature to develop offshore, with weak IVT forecast to move onshore over northern California (*left*) as compared to the ECMWF which is forecasting an area of higher IVT to move onshore over northern California with a defined surface low pressure (*center*).
- These differences are evident in the model comparison of the GFS and ECMWF (*right*), showing higher ECMWF IVT over N. CA.

CW3E AR Outlook: 22 October 2025

Probability of AR Conditions Along Coast: GEFS (*top*) and ECMWF (*bottom*) Ensembles



- CW3E's AR Lanfall tool for both the 00Z GEFS (*top*) and 00Z ECMWF (*bottom*) ensembles are both indicating high probabilities (90–100%) of AR conditions (IVT > 250 kg m^{-1} s^{-1}) over WA, OR, and N. CA on 23–24 Oct.

- There are also high probabilities (80–90%) for a secondary period of AR conditions over coastal Oregon and Northern California on 25–26 Oct in association with the mesoscale frontal wave forecast to develop.

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- The AR landfall tool is also indicating high probability (70–85%) for a short period of AR conditions over S. OR and N. CA. on 26–27 Oct, although the EPS is indicating higher probabilities as compared the GEFS.

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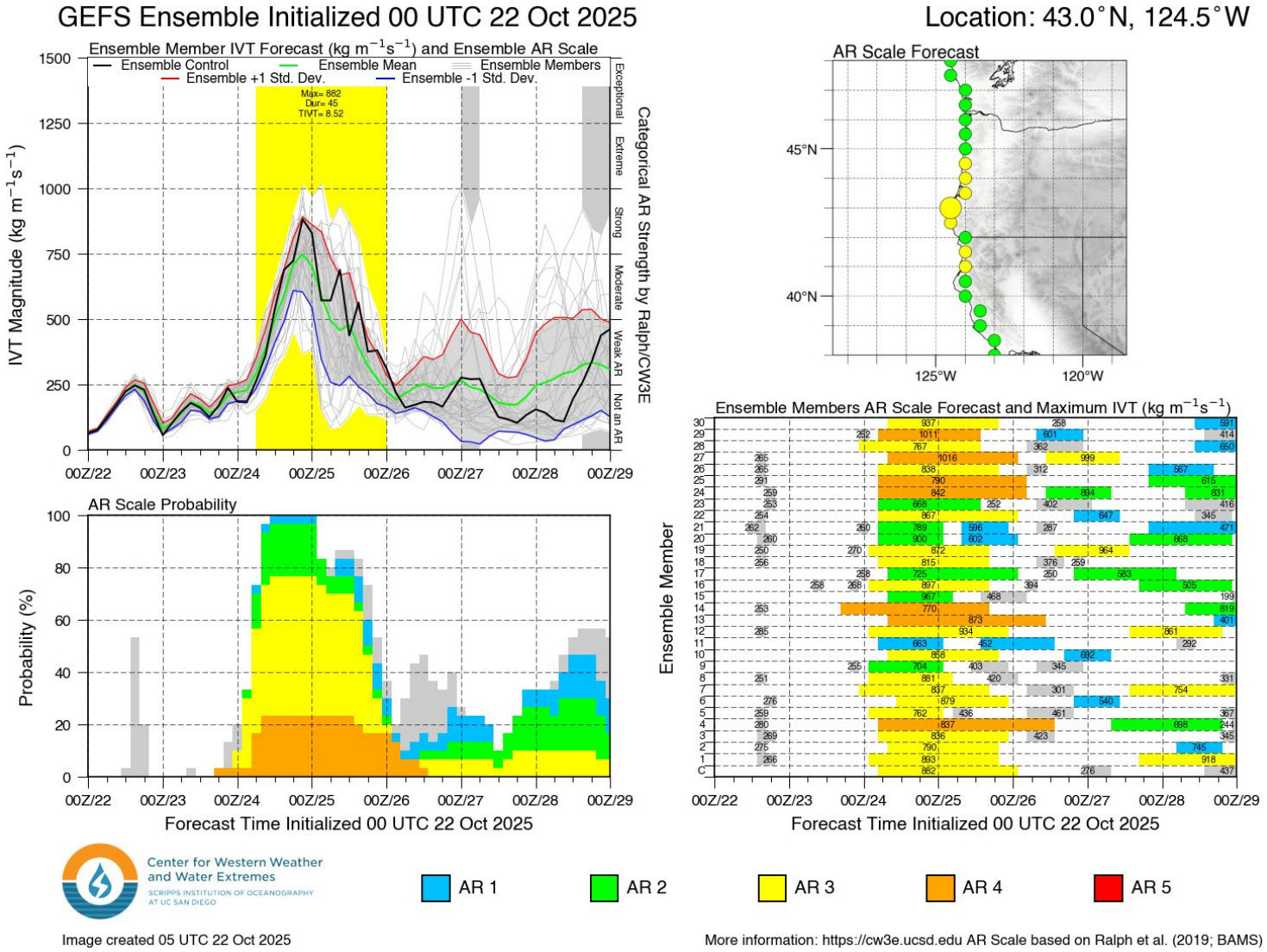
- The AR Landfall Tools is also showing the potential for AR activity next week, beginning 31 Oct/1 Nov over the Pacific Northwest and Northern California.

CW3E AR Outlook: 22 October 2025

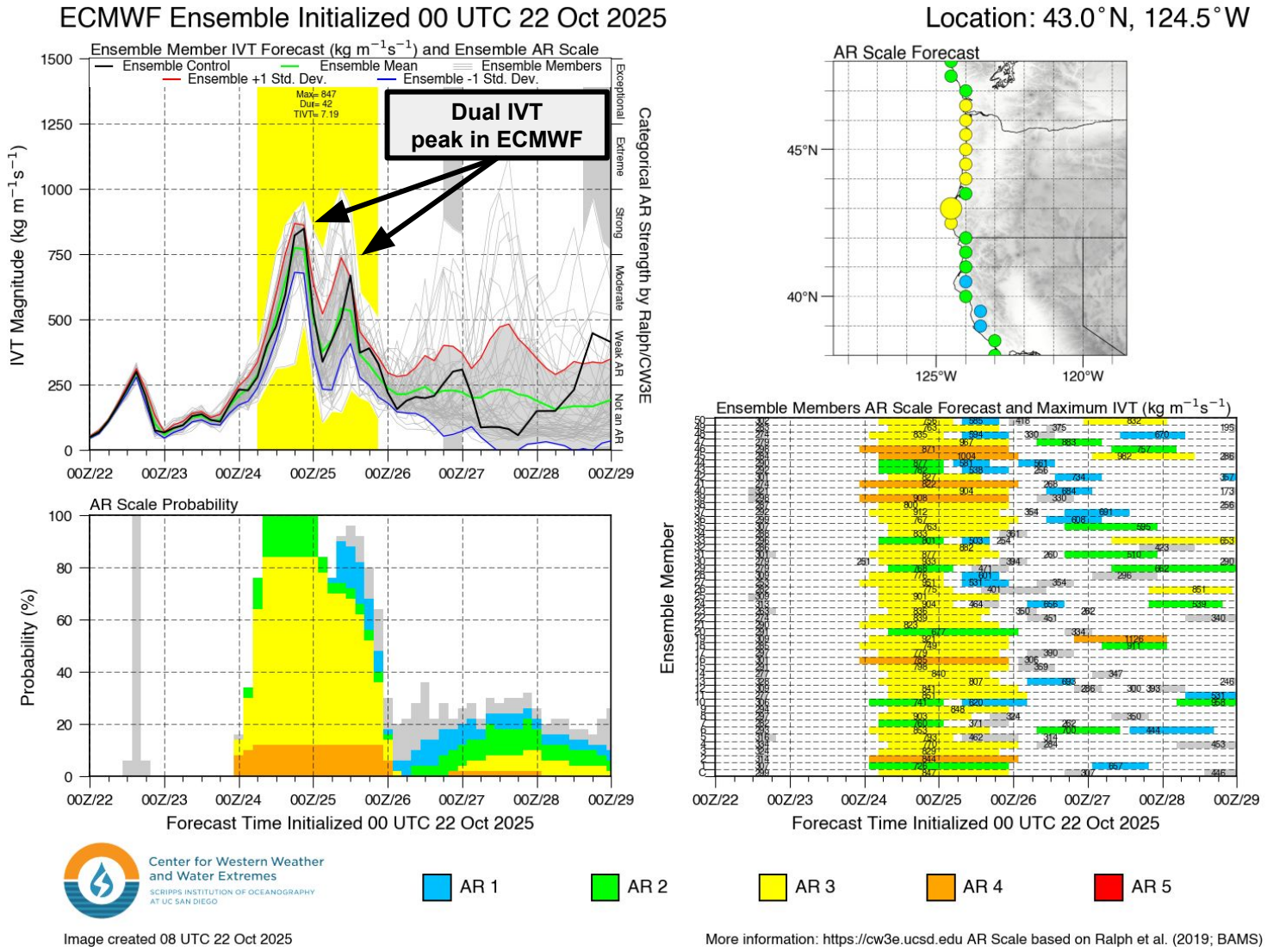
7-day AR Scale and IVT Forecast: 00Z GEFS Ensemble



- The 00Z GEFS control member is forecasting an AR 3 (based on the Ralph et al. 2019 AR Scale) over coastal southern Oregon and northern Washington during the first AR.
- 24/31 (77%) GEFS ensemble members are forecasting at least AR3 conditions for at a coastal point in southern Oregon, with 7/31 (20%) forecasting at least AR4 conditions
- There is still uncertainty as to the magnitude of IVT during the later portions of the AR, indicated by the spread in ensemble member IVT forecasts around 12Z 26 Oct.

CW3E AR Outlook: 22 October 2025

7-day AR Scale and IVT Forecast: 00Z EPS Ensemble

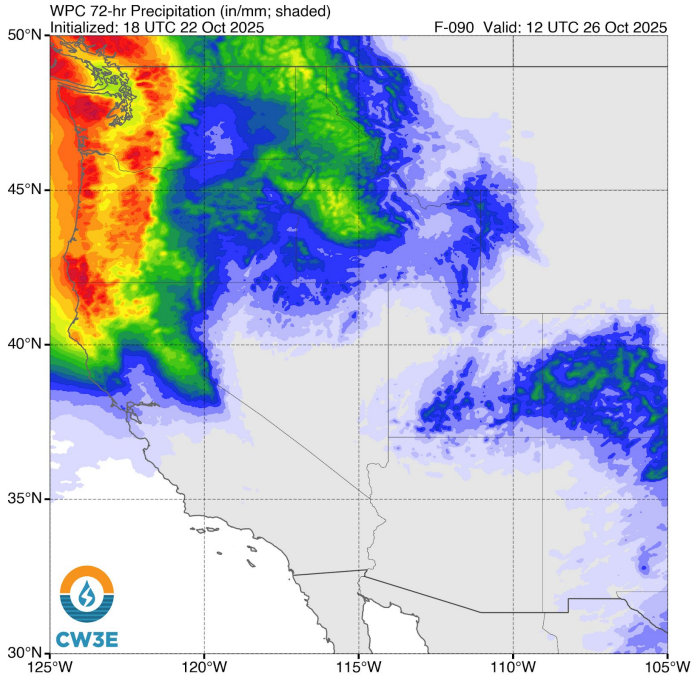


- The 00Z EPS control member is also forecasting an AR 3 (based on the Ralph et al. 2019 AR Scale) over coastal Oregon during the first AR.
- 43/51 (84%) EPS ensemble members are forecasting at least AR3 conditions for at a coastal point in southern Oregon, with 6/51 (12%) forecasting at least AR4 conditions
- The dual peak of IVT in the ECMWF IVT plume demonstrates the impacts of the potential mesoscale frontal wave coastal IVT, resulting in a secondary maximum and potentially influence additional precipitation.

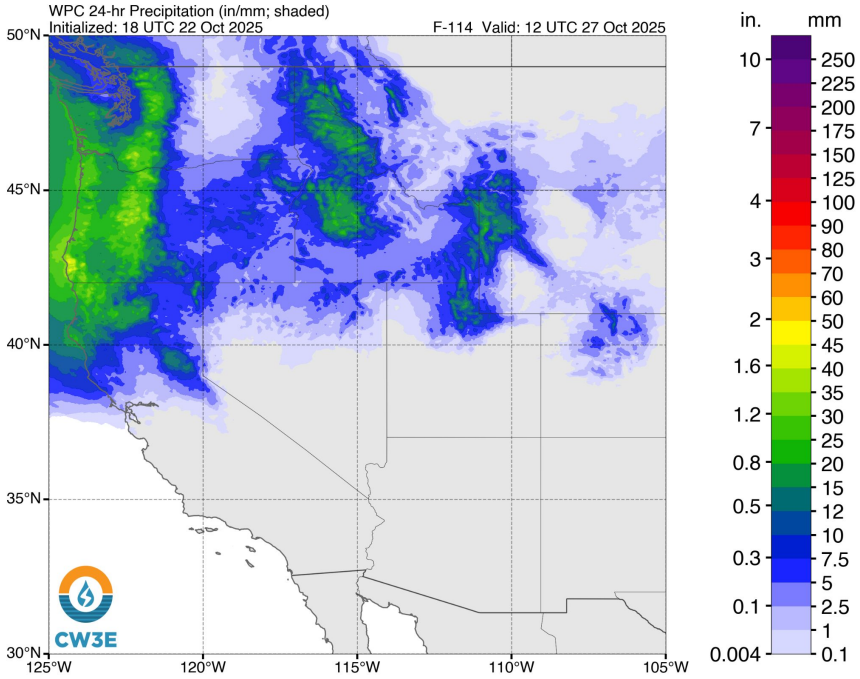
CW3E AR Outlook: 22 October 2025

WPC Quantitative Precipitation Forecasts and Excessive Rainfall Outlooks

WPC 72-Hr Precip
Valid: 5 AM PT Sun 26 Oct



WPC 24-Hr Precip
Valid: 5 AM PT Mon 27 Oct



Day 3 and 4 EROs
Valid: 5 AM PT 24-26 Oct

Day 3 Excessive Rainfall Outlook
Valid 12Z Fri Oct 24 2025
Thru 12Z Sat Oct 25 2025
Issued: 0825Z Wed Oct 22 2025
Forecaster: HURLEY
DOC/NOAA/NWS/NCEP/WPC

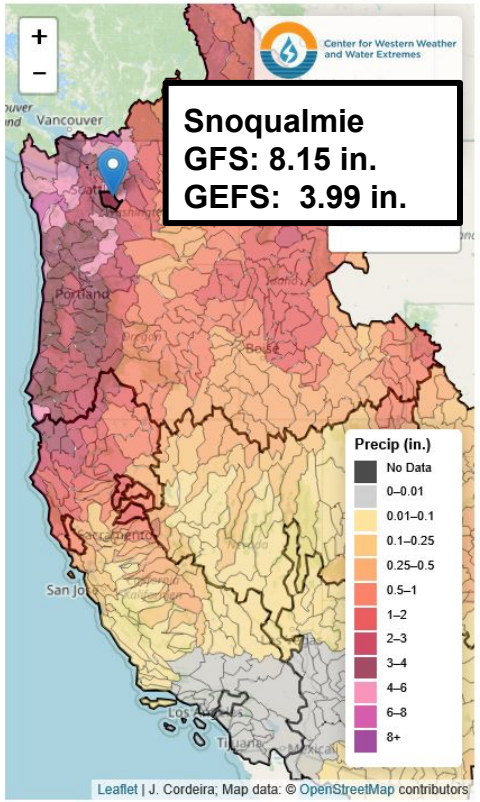
Day 4 Excessive Rainfall Outlook
Valid 12Z Sat Oct 25 2025
Thru 12Z Sun Oct 26 2025
Issued: 0735Z Wed Oct 22 2025
Forecaster: HAMRICK
DOC/NOAA/NWS/NCEP/WPC

- The NWS Weather Prediction Center (WPC) has forecast 72-hour precipitation totals of 2+ inches over the Washington/Oregon/NorCal coasts and over the Cascades associated with the first AR and MFW. The WPC is forecasting an additional ~0.5–1.5 inches of precipitation with the second AR through 5 AM PT Mon 27 Oct.
- The WPC issued **Marginal risk** (level 1 of 4; ≥5% probability of flooding) excessive rainfall outlooks (ERO) have been issued for the Washington/Oregon/NorCal coasts as well as inland to the Cascade and Northern Sierra foothills for 5 AM PT Fri 24 Oct through Sun 26 Oct.

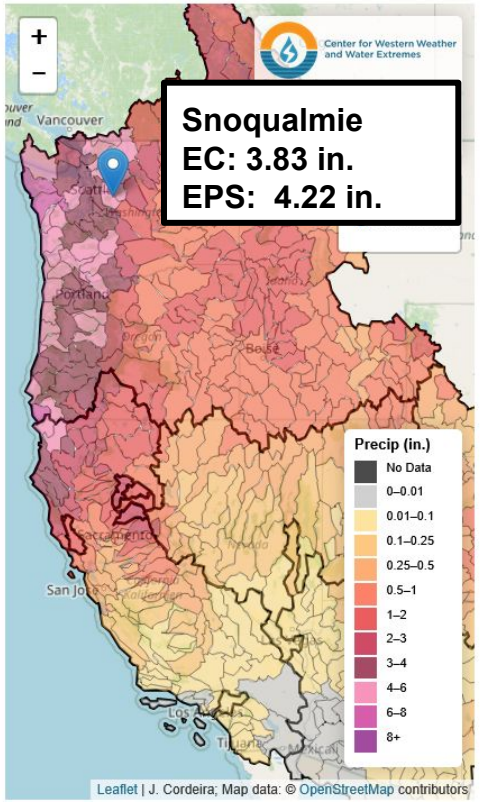
CW3E AR Outlook: 22 October 2025

Watershed Precipitation Forecasts: Snoqualmie

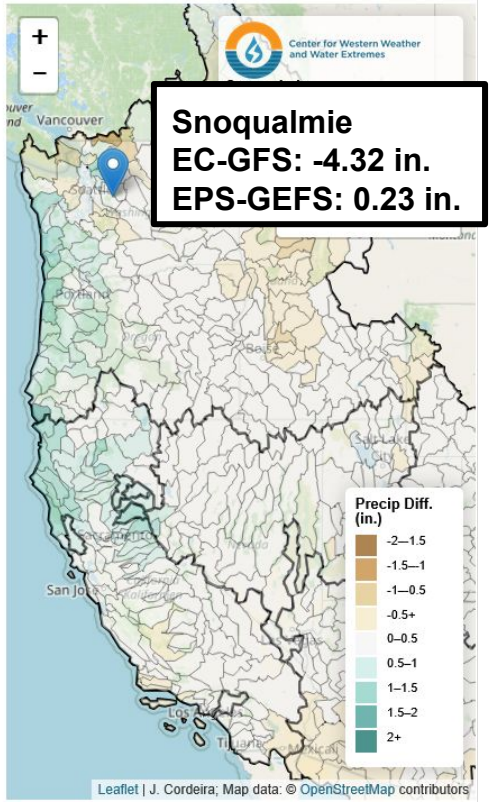
GEFS

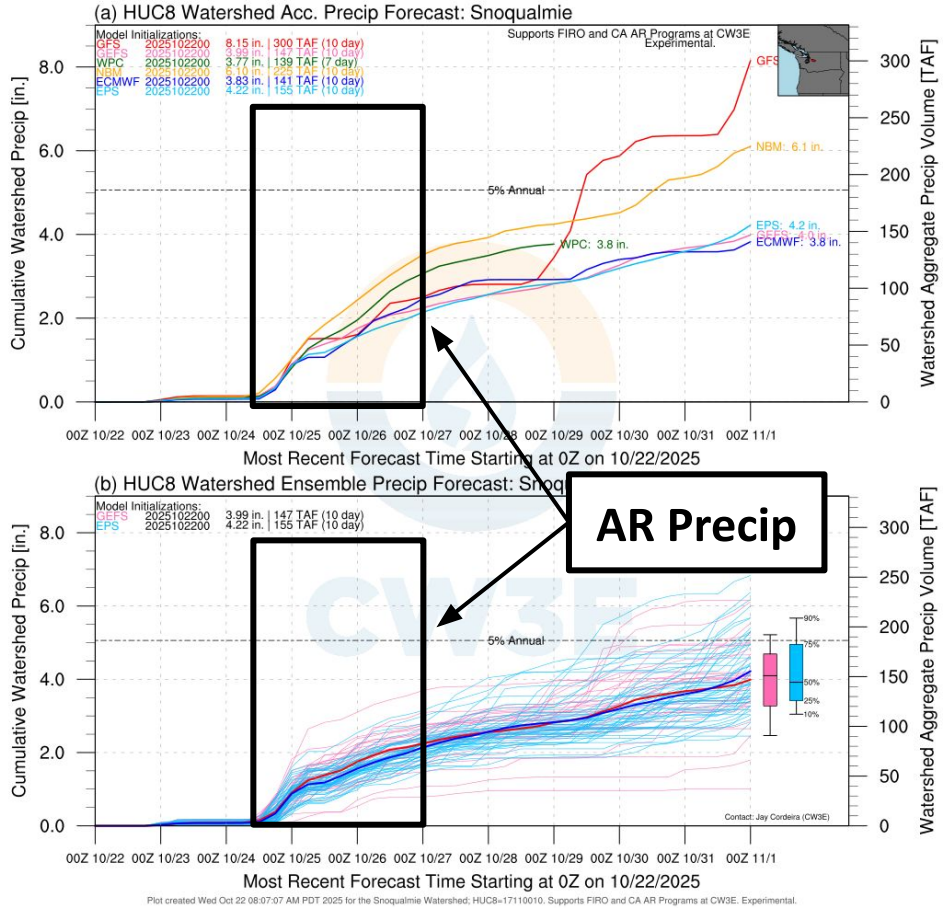


EPS



EPS minus GEFS





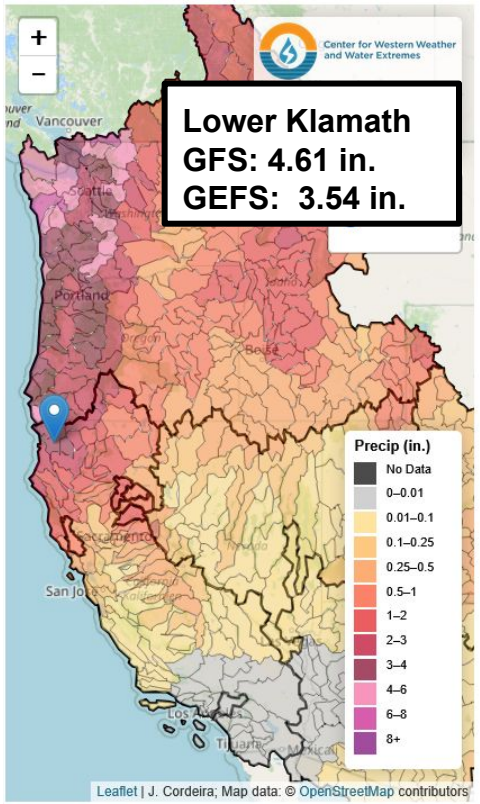
- The 00Z ECMWF and GFS ensembles are forecasting similar precipitation totals over the Snoqualmie watershed for 5 AM PT Fri 24 Oct through 5 PM PT Sun 26 Oct, with both ensemble means totaling ~2 inches.

- Only two GEFS members and one EPS member are forecasting 3+ inches of precipitation by 5 PM PT Sun 26 Oct, showing high confidence in totals around 2+ inches for the Snoqualmie.

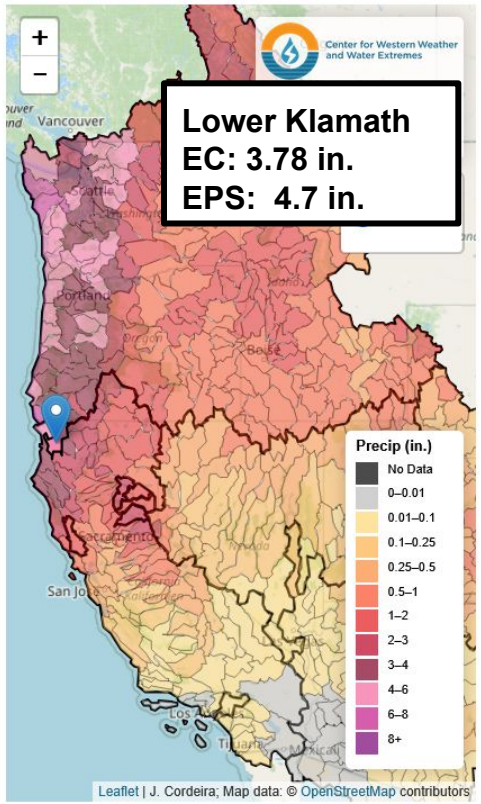
CW3E AR Outlook: 22 October 2025

Watershed Precipitation Forecasts: Lower Klamath

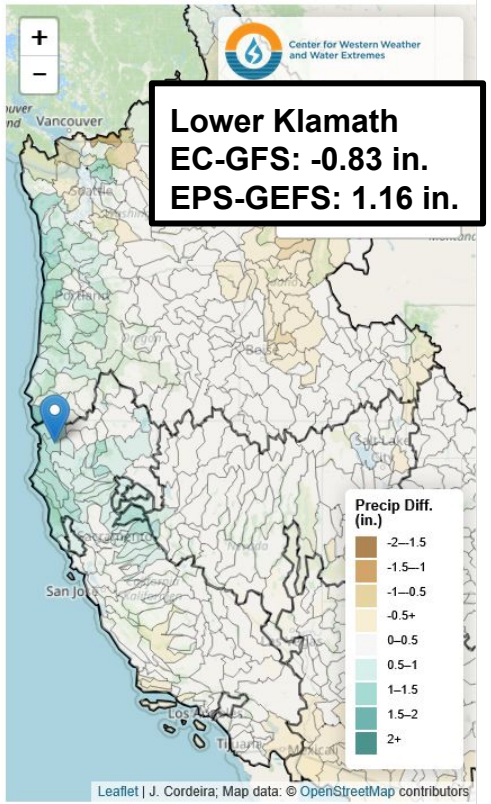
GEFS

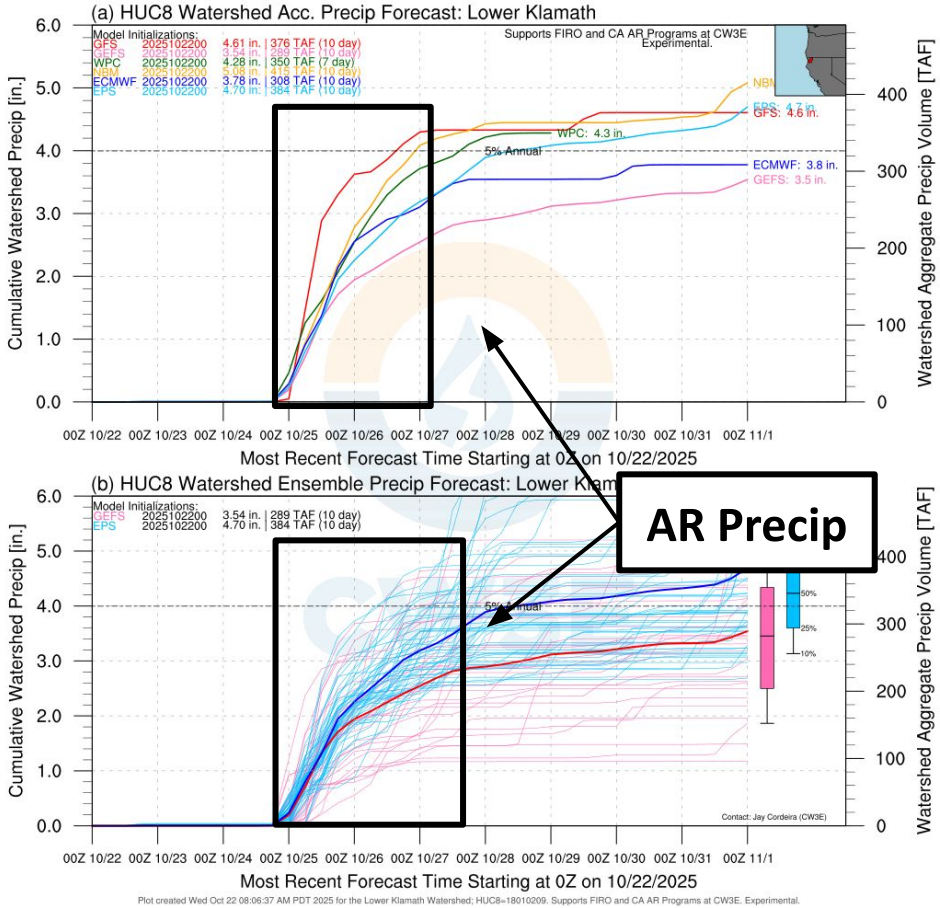


EPS



EPS minus GEFS

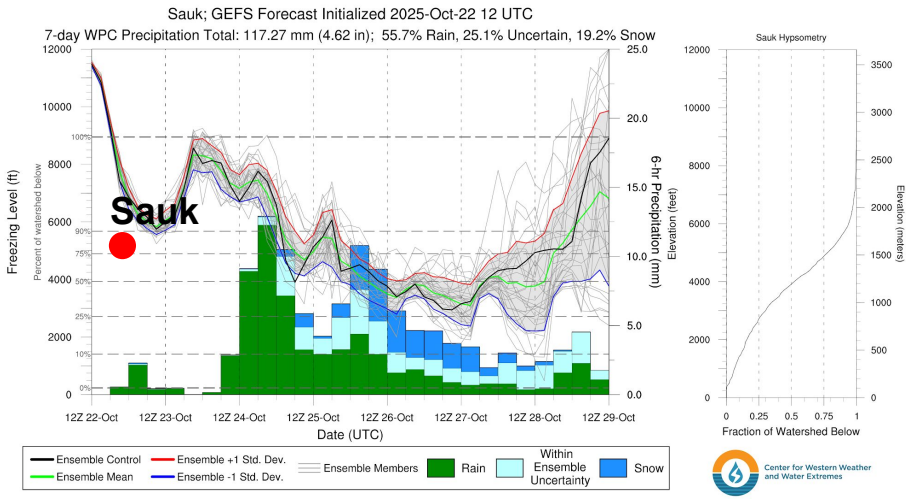


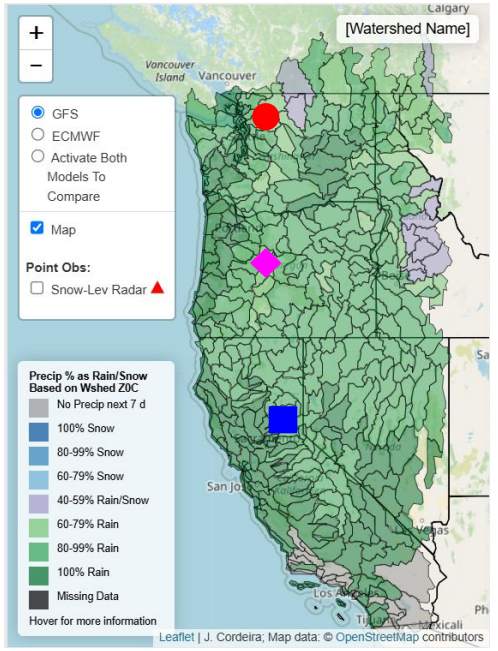


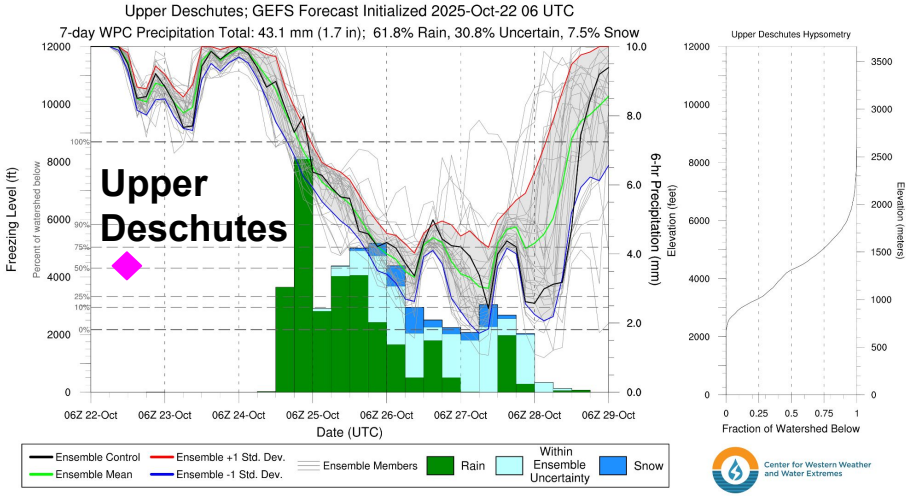
- The 00Z ECMWF and GFS ensembles are showing greater variability in precipitation forecasts over Northern California. The EPS mean precipitation by 5 AM PT Mon 27 Oct is 3.6 in. while the GEFS is at 2.8 in. over the Lower Klamath watershed.
- This largest difference comes at the lower end of the forecast. 7 (of 31) GEFS members are forecast <2 inches of precipitation over the Lower Klamath by 5 AM PT Mon 27 Oct, while no EPS members are forecasting <2.5 inches by that time.
- Additionally, 12 EPS and 5 GEFS members are forecasting >5% normal annual precipitation (4.0 in.) by 5 AM PT Mon 27 Oct.

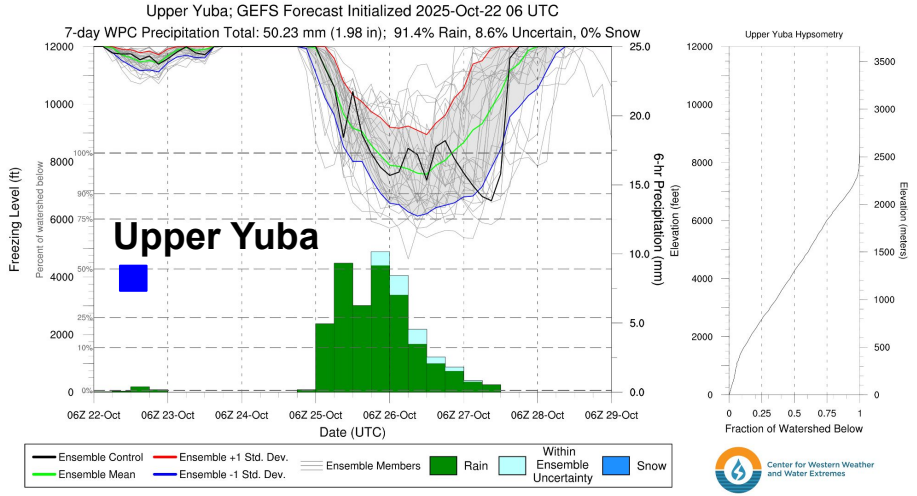
CW3E AR Outlook: 22 October 2025

Watershed Freezing Level Forecast Comparison





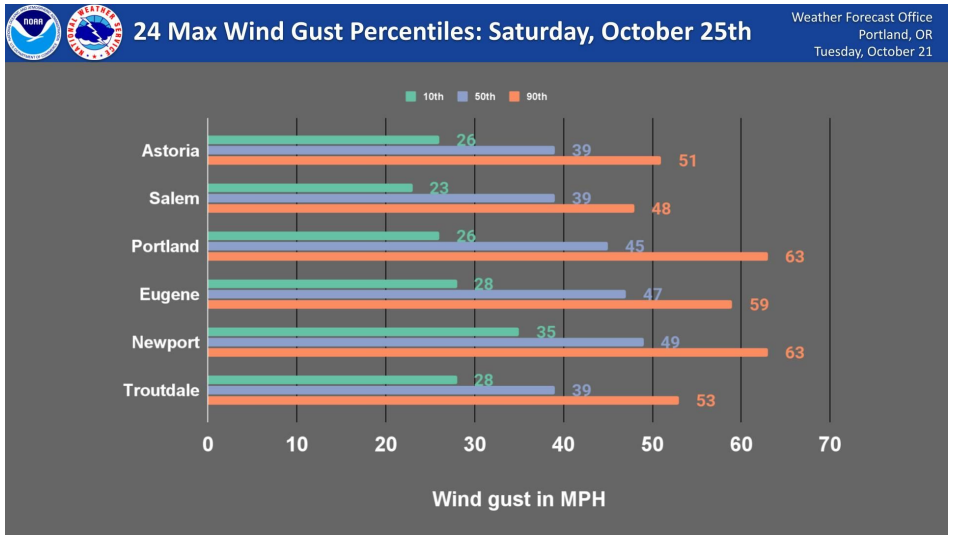


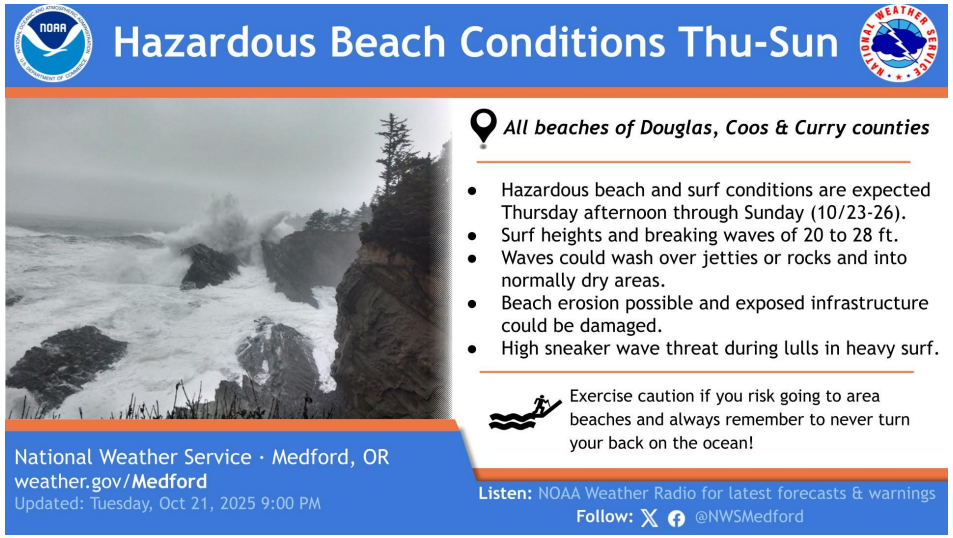


- Freezing levels over the Pacific Northwest are initially forecast to be above 8,000 feet, but will fall as this system moves through the region
- In the Cascades, freezing levels are forecast to fall below 4,000 feet on Sun 26 Oct, leading to the chance for significant snowfall at high elevations
- Higher freezing levels are forecast for watersheds to the south in the Sierra Nevada, where the passing ARs will likely result in primarily rainfall.
- Precipitation falling mostly as rain increases the potential for runoff, especially as rain-on-snow if there is snow cover at higher elevations.

CW3E AR Outlook: 22 October 2025

NWS Weather Forecast Office Key Messages





- NWS Portland is forecasting the possibility of strong winds along the Pacific Northwest Coast this weekend prompting many Gale Watches along the coast.
- NWS Medford noted hazardous beach conditions with the possibility of sneaker waves
- NWS Medford also note that 16” or more of snow are possible over the Cascades.