

# CW3E Atmospheric River Outlook: 5 December 2022

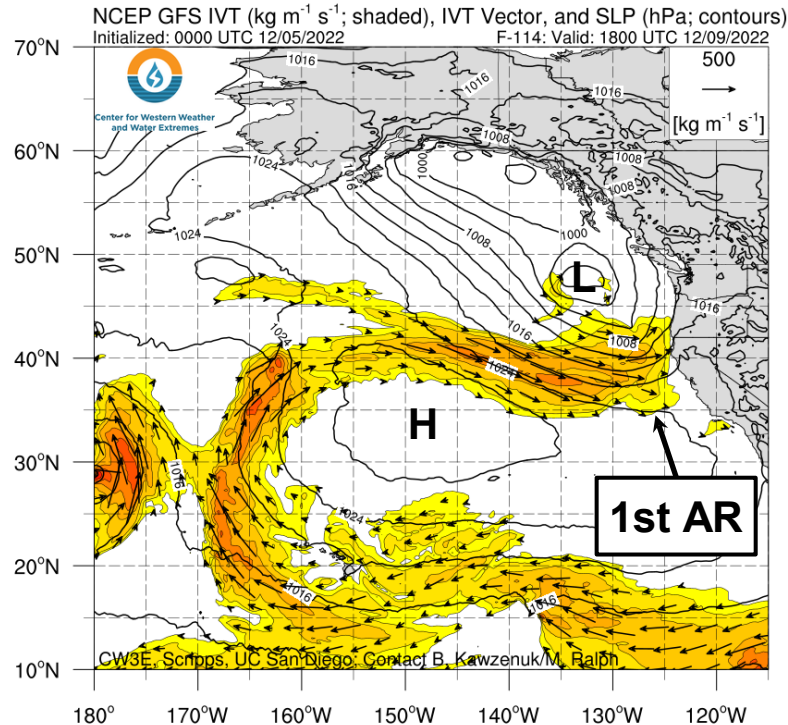
## Potential for Multiple Atmospheric Rivers to Impact the US West Coast During the Next 7 Days

- Two atmospheric rivers (ARs) are forecast to make landfall along the US West Coast on 9 Dec and 12 Dec
- The first AR is forecast to bring a short period of AR 1 conditions (based on the Ralph et al. 2019 AR Scale) to coastal Southern Oregon
- The deterministic GFS and ECMWF have drastically different solutions for a developing area of low-pressure associated with the second AR, making it difficult to pinpoint the timing, IVT intensity, and landfall location
- The 00Z deterministic GFS is forecasting the second AR to make landfall in coastal Northern California and bring AR conditions to most of California, while the 00Z deterministic ECMWF is forecasting the second AR to make landfall in coastal Washington about 20 hours later with limited AR conditions into coastal Northern California
- There is a large amount of uncertainty in forecast AR activity associated with both ARs in GEFS and ECMWF EPS
- In comparison to the 00Z ECMWF, the 00Z GFS is forecasting greater 7-day watershed precipitation total throughout the mountainous regions of California, Oregon, and Washington

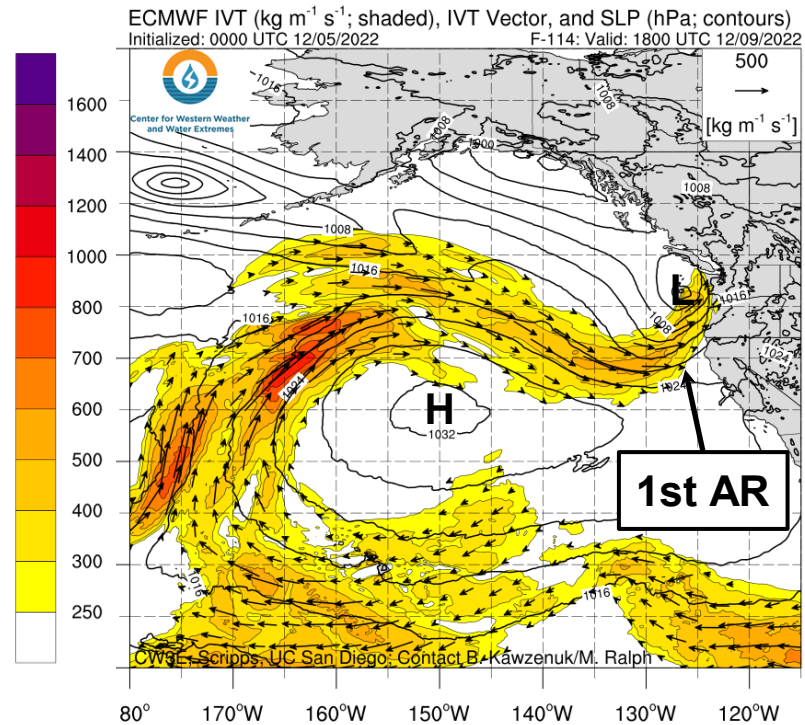
# CW3E AR Outlook: 5 December 2022

## Model IVT & SLP Forecasts – AR #1

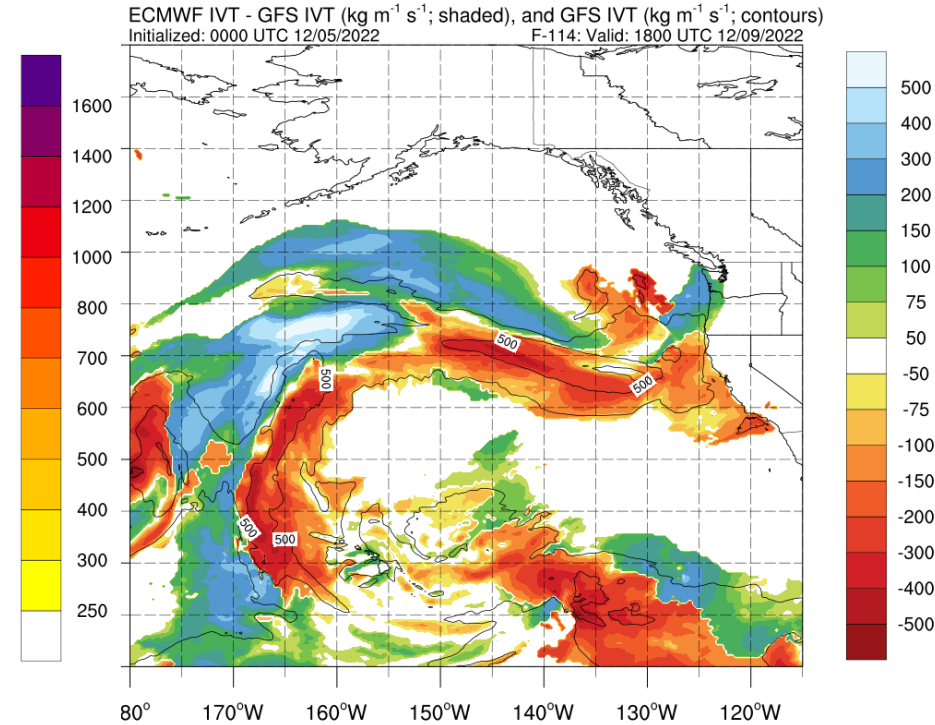
(A) GFS Valid: 10 AM PT 9 Dec (F-114)



(B) ECMWF Valid: 10 AM PT 9 Dec (F-114)



(C) ECMWF minus GFS  
Valid: 10 AM PT 9 Dec (F-114)



- The first AR is forecast to make landfall in the Pacific Northwest on 9 Dec. There is substantial disagreement between the GFS and ECMWF deterministic models in the timing, IVT intensity, and landfall location (Figures A and B)
- The 00Z ECMWF is forecasting an area of low-pressure, and associated AR conditions ( $IVT > 250 \text{ kg m}^{-1} \text{ s}^{-1}$ ), into the Pacific Northwest by 10 AM PT 9 Dec while the same area of low-pressure in the 00Z GFS is much further offshore. (Figures A and B)
- As compared to the 00Z ECMWF, the 00Z GFS is forecasting AR conditions much further south into coastal Northern and Central California. (Figure C)

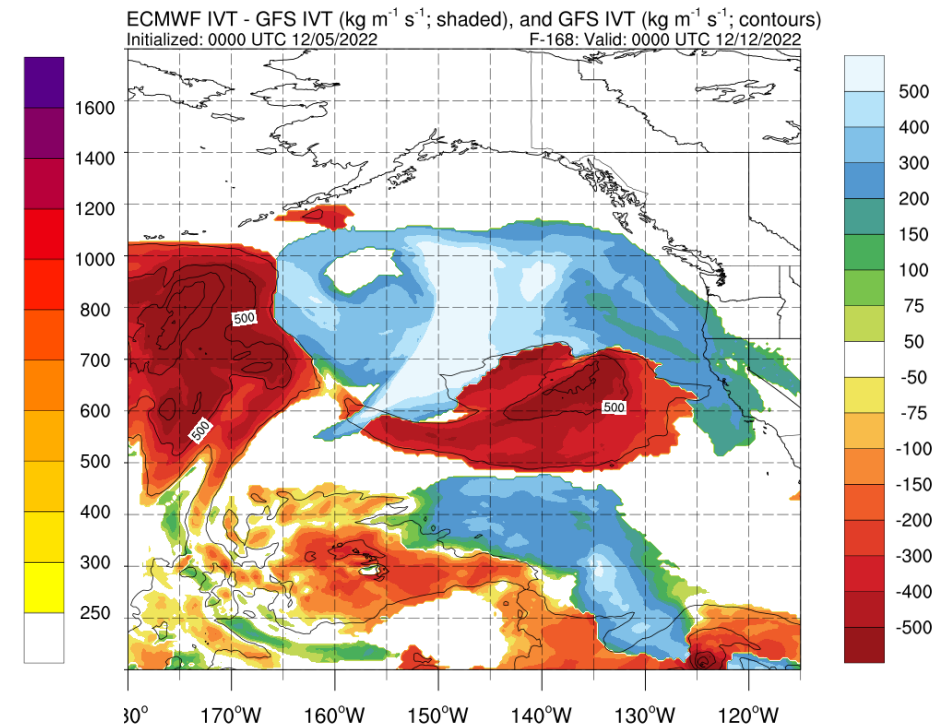
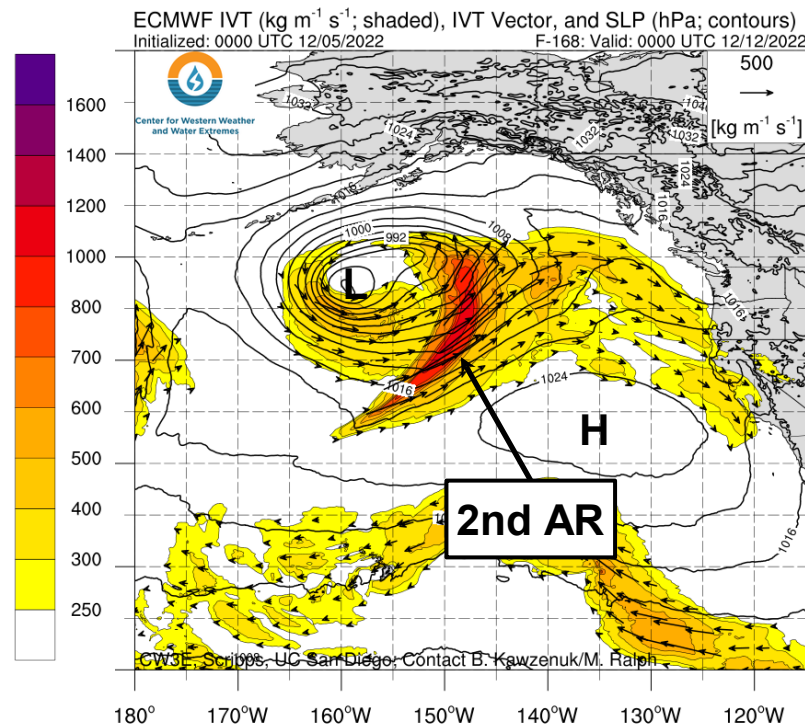
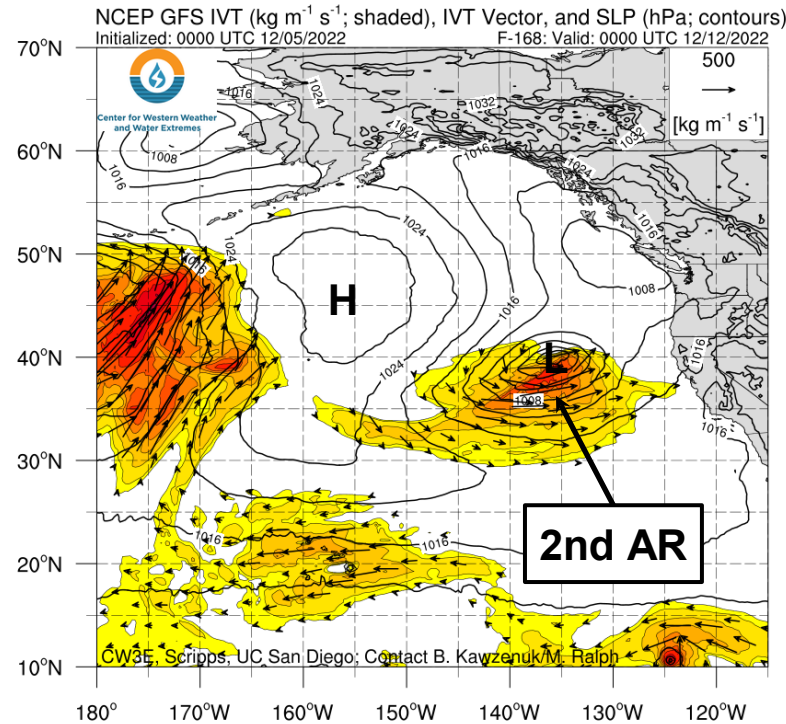
# CW3E AR Outlook: 5 December 2022

## Model IVT & SLP Forecasts – AR #2

(A) GFS Valid: 4 PM PT 11 Dec (F-168)

(B) ECMWF Valid: 4 PM PT 11 Dec (F-168)

(C) ECMWF minus GFS  
Valid: 4 PM PT 11 Dec (F-168)

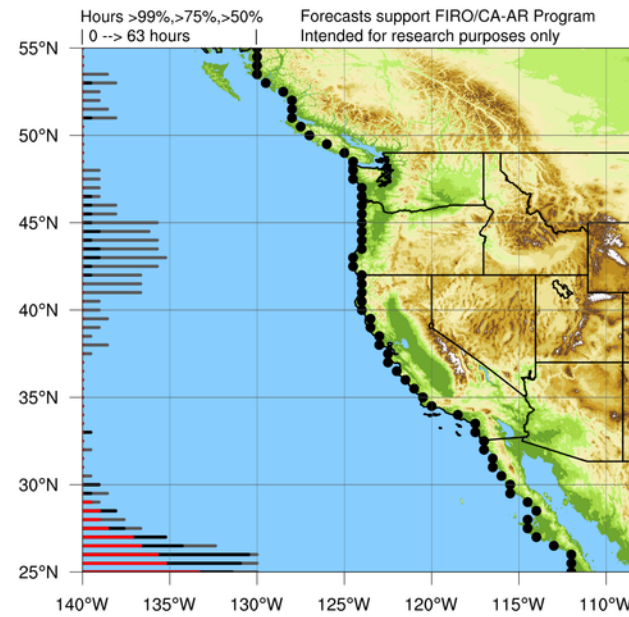
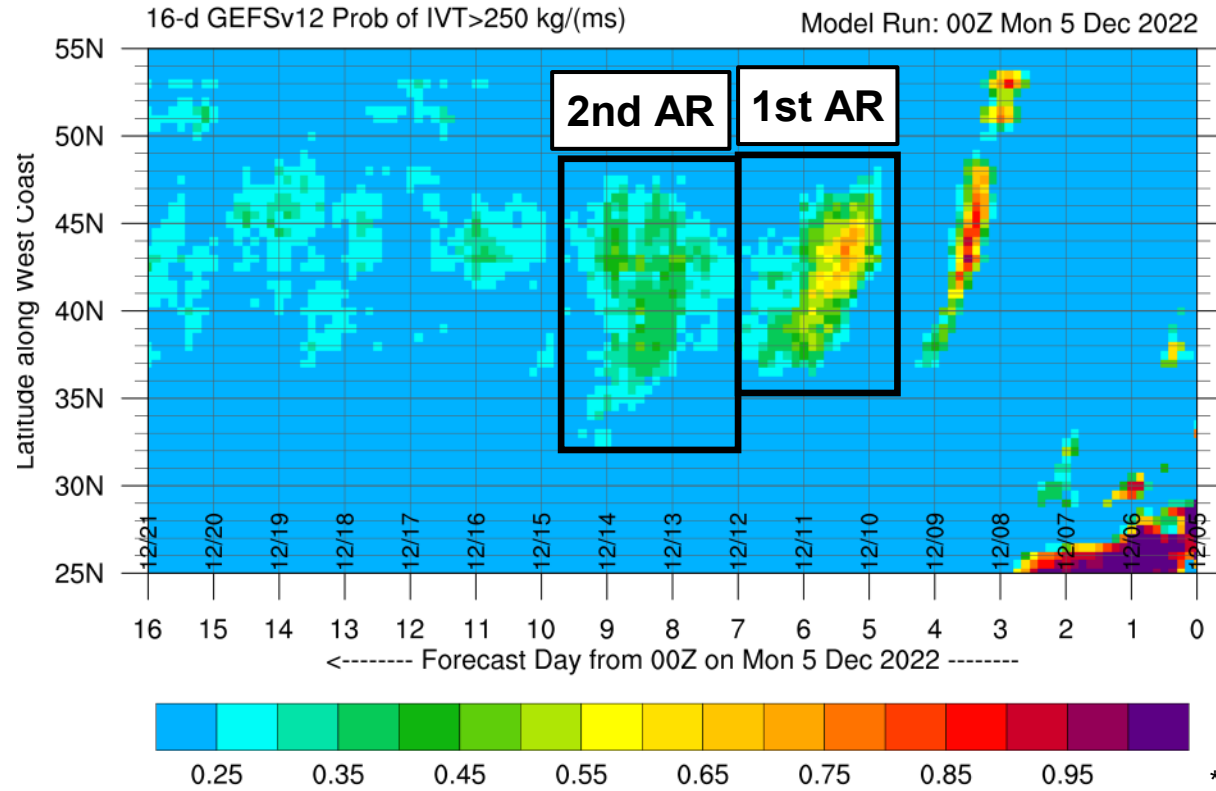


- There are major model-to-model differences in the evolution of the second AR (Figures A and B)
- The centers of low-pressure in each deterministic model are substantially different, leading to widely varying landfall locations
- The 00Z GFS is forecasting an area of low-pressure with AR conditions much further to the southeast than the 00Z ECMWF
- At 4 AM PT 12 Dec, not shown, the 00Z GFS is forecasting a landfalling AR in coastal Northern California while the 00Z ECMWF has a landfalling AR at 10 PM PT 12 Dec in coastal Washington



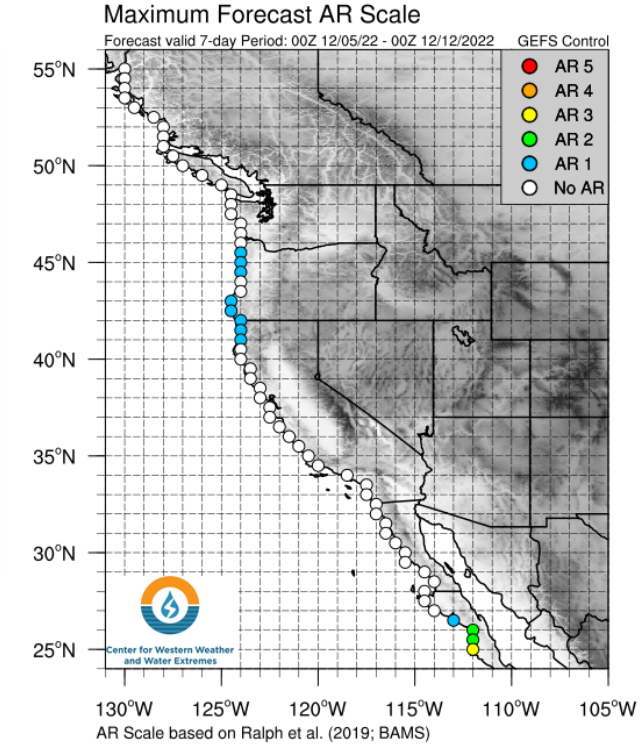
# CW3E AR Outlook: 5 December 2022

## Probability of AR Conditions Along Coast (GEFS)



\*GEFS = NCEP Global Ensemble Forecast System (United States)

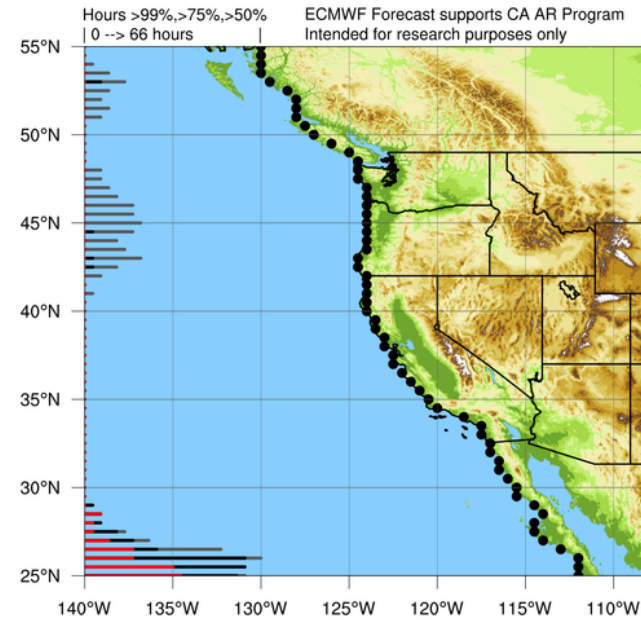
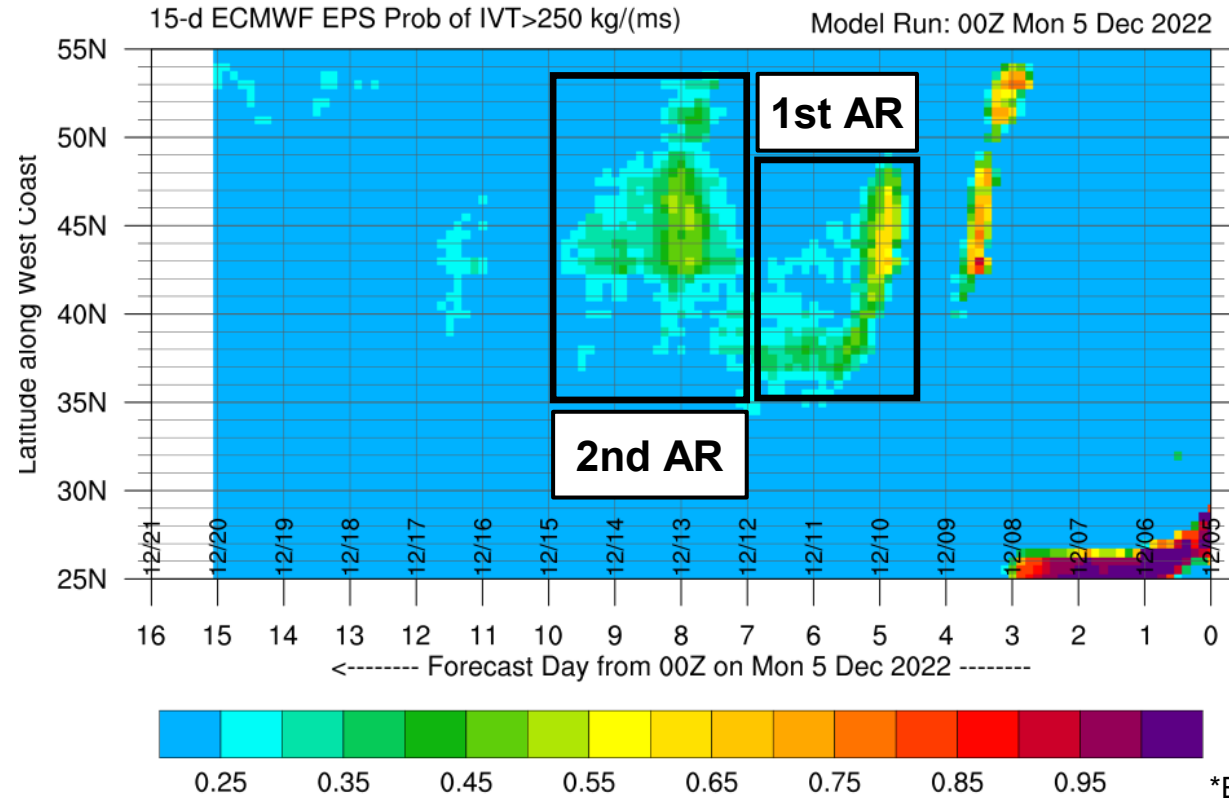
## AR Scale



- The 00Z GEFS is showing medium confidence (55-80% probability) in a period of AR conditions (IVT > 250 m<sup>-1</sup> s<sup>-1</sup>) over coastal Oregon and coastal Northern California with the first AR. Confidence decreases (< 55% probability) into coastal Central California
- For the second AR, the 00Z GEFS is showing low confidence (< 40% probability) in a period of AR conditions from coastal Washington to coastal Southern California
- There is large uncertainty in the location and duration of AR conditions during each AR
- The GEFS control member is forecasting AR1 conditions in coastal Oregon and Northern California

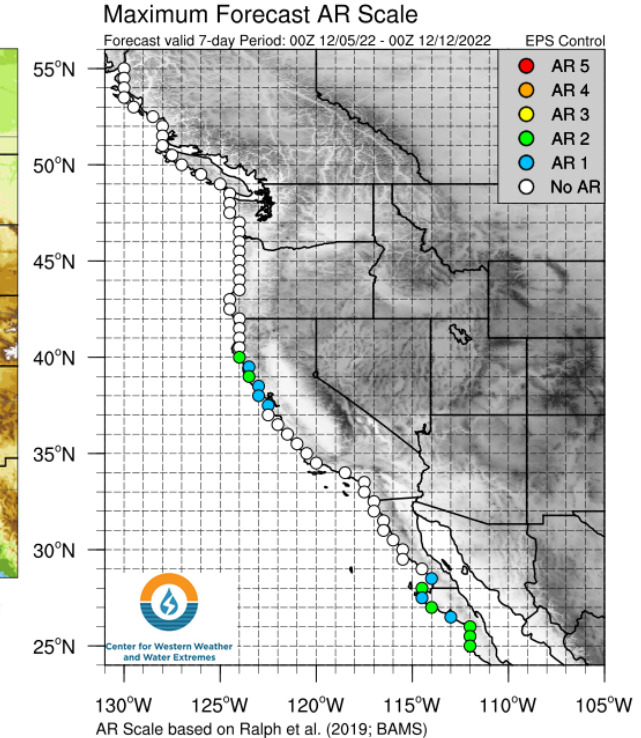
# CW3E AR Outlook: 5 December 2022

## Probability of AR Conditions Along Coast (ECMWF EPS)



\*ECMWF EPS = ECMWF Ensemble Prediction System (Europe)

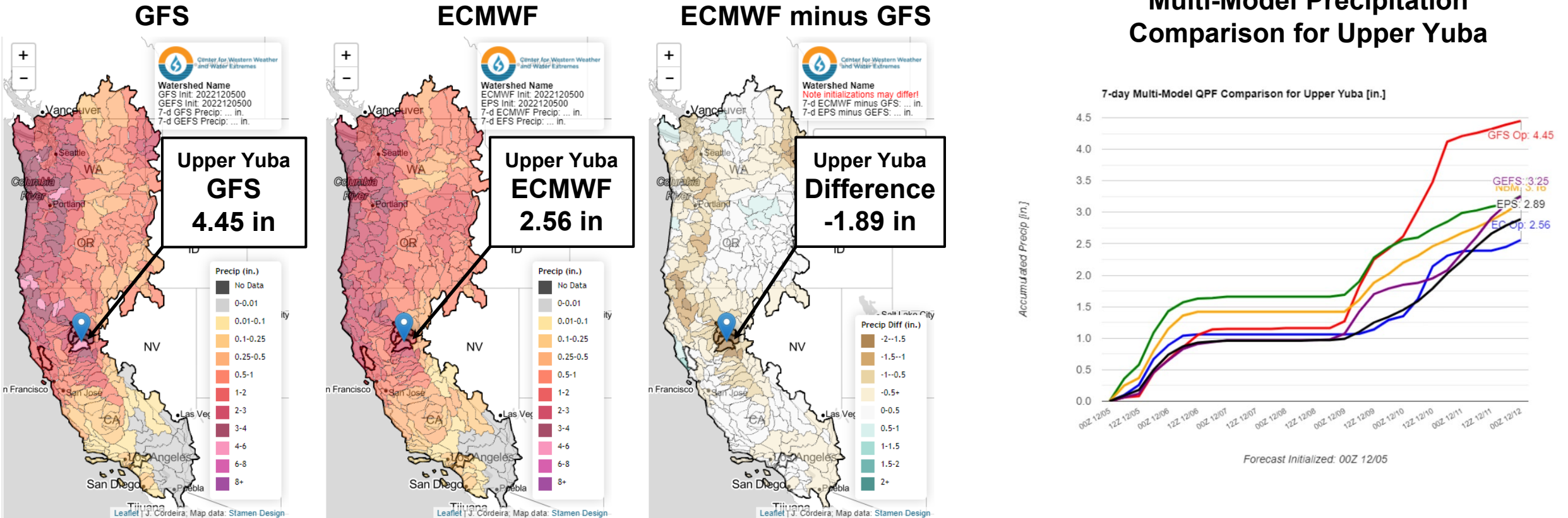
## AR Scale



- The 00Z ECMWF is showing medium confidence (~60% probability) in a period of AR conditions over coastal Washington and Oregon with the first AR. Confidence is lower (55% probability) for a period of AR conditions in coastal Northern California
- For the second AR, the 00Z ECMWF is showing medium to low confidence (< 60% probability) in a period of AR conditions for coastal Washington and Oregon
- Like within the GEFS, there is large uncertainty in the location and duration of AR conditions during each AR in the ECMWF EPS
- The EPS control member is forecasting AR1/AR2 conditions in coastal Northern California

# CW3E AR Outlook: 5 December 2022

## 7-day Watershed Precipitation Forecasts (Initialized 4 PM PT 4 Dec)



- The 00Z GFS is forecasting greater 7-day watershed precipitation totals throughout the mountainous regions of California, Oregon, and Washington than the 00Z ECMWF
- The 00Z GFS is forecasting 4.45 inches of mean areal precipitation in the Upper Yuba Watershed over the next 7 days, while the 00Z ECMWF is forecasting 2.56 inches over the same watershed.