

# CW3E Atmospheric River Outlook: 17 February 2023

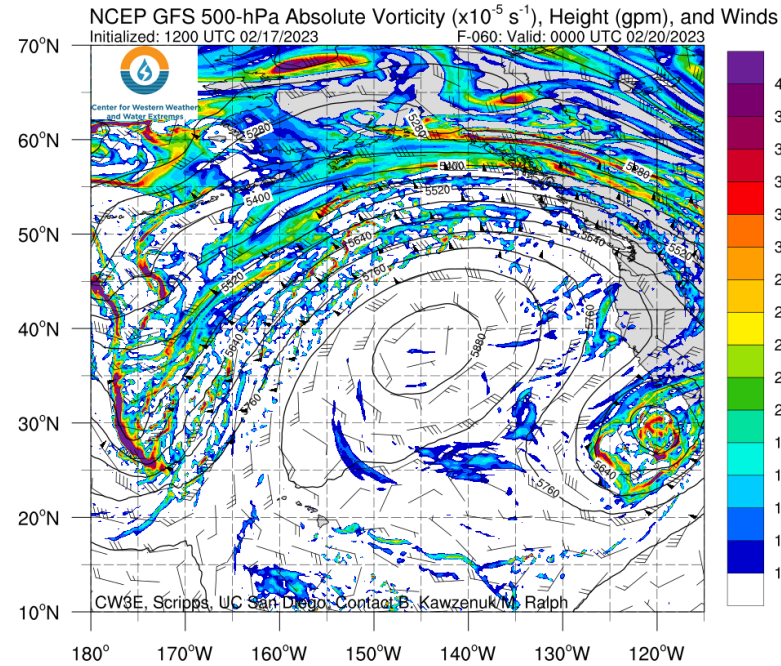
## Atmospheric River Forecast to Bring Precipitation to the Pacific Northwest and Northern California

- An atmospheric river (AR) is forecast to make landfall in the Pacific Northwest on Sunday and bring precipitation to Washington, Oregon, and Northern California through mid-day on Wednesday
- IVT  $> 600 \text{ kg m}^{-1} \text{ s}^{-1}$  is forecast during landfall along the coast of Washington, bringing AR 2 conditions (based on the Ralph et al. 2019 AR Scale) to coastal locations of the Pacific Northwest
- This AR is forecast propagate over the ridge positioned in the eastern North Pacific, bringing primarily northwesterly/westerly IVT to the US West Coast, eventually dissipating along the coast of California by late Wednesday
- A weak mesoscale frontal wave is forecast to occur during the mid-stage of this AR over the Gulf of Alaska, which will have weak secondary cyclogenesis in association with a mid-level shortwave trough
- The 00Z GFS is forecasting a stronger and longer duration period of AR conditions for points along the coast as compared to the ECWMF, with the GFS bringing AR conditions south to coastal locations in Northern California
- The 00Z GFS is forecasting greater 7-day watershed precipitation totals throughout northern California, Oregon, and Washington than the 00Z ECMWF, especially within coastal watersheds along the CA/OR border and the Oregon Cascades
- The 12Z GEFS ensemble is forecasting snow levels to fall dramatically from  $> 3,000 \text{ m}$  to near sea level by 12Z 22 Feb for much of Northern California and the Sierra Nevada Mountains, resulting in the potential for snowfall accumulation at lower elevations than usual elevations

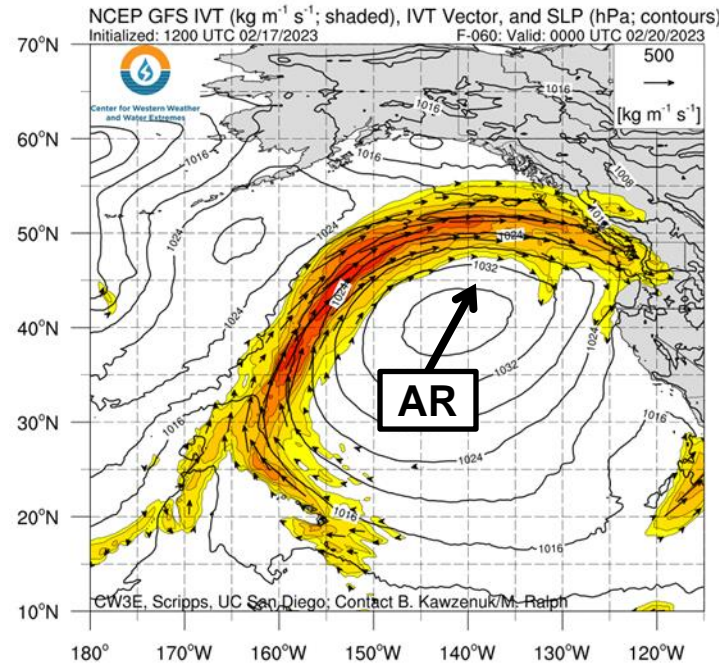
# CW3E AR Outlook: 17 February 2023

## GFS Model Forecast: Valid 4 PM PST 19 Feb (F-60)

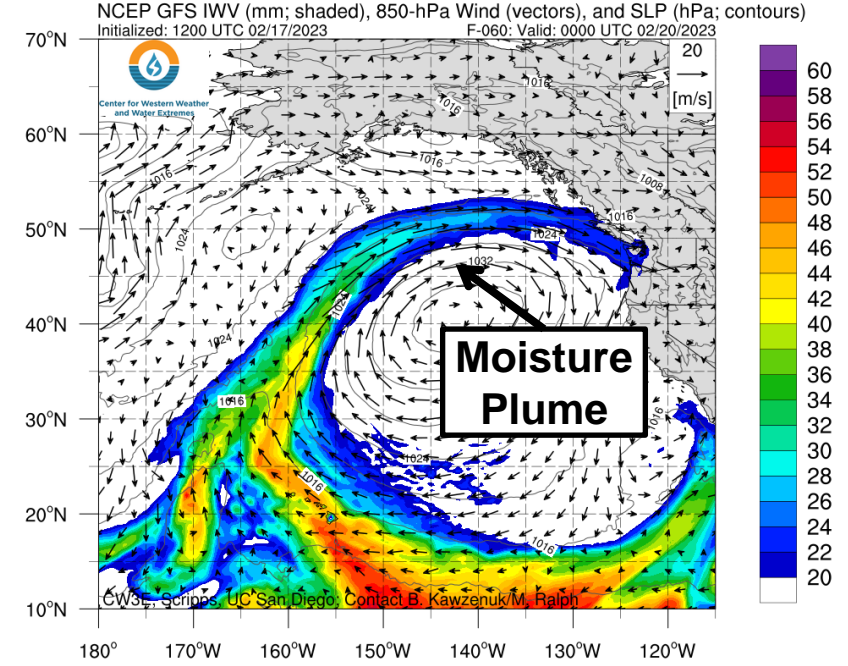
### 500-hPa Vorticity, Height, and Wind



### IVT and SLP



### IWV and 850-hPa Wind



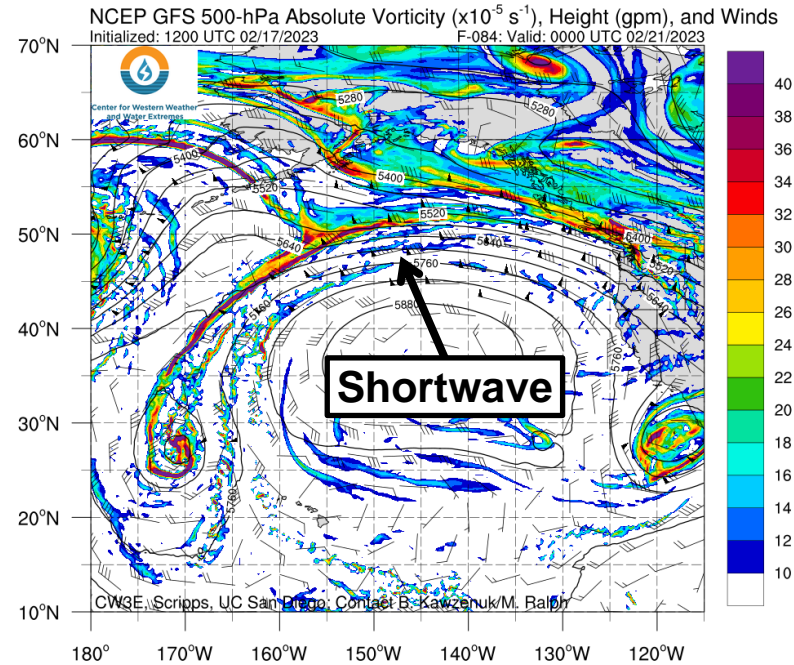
- A broad mid-level ridge is forecast over the eastern North Pacific, off the US West Coast
- The AR is forecast to develop in the central North Pacific and propagate to the east, riding up and over the region of high pressure, and make landfall on Saturday afternoon along the coast of British Columbia with  $\text{IVT} > 600 \text{ kg m}^{-1} \text{ s}^{-1}$
- This AR is associated with a narrow plume of moisture wrapped up around the surface high pressure, with IWV values  $> 26 \text{ mm}$  extending from the subtropics to the coast of the Pacific Northwest



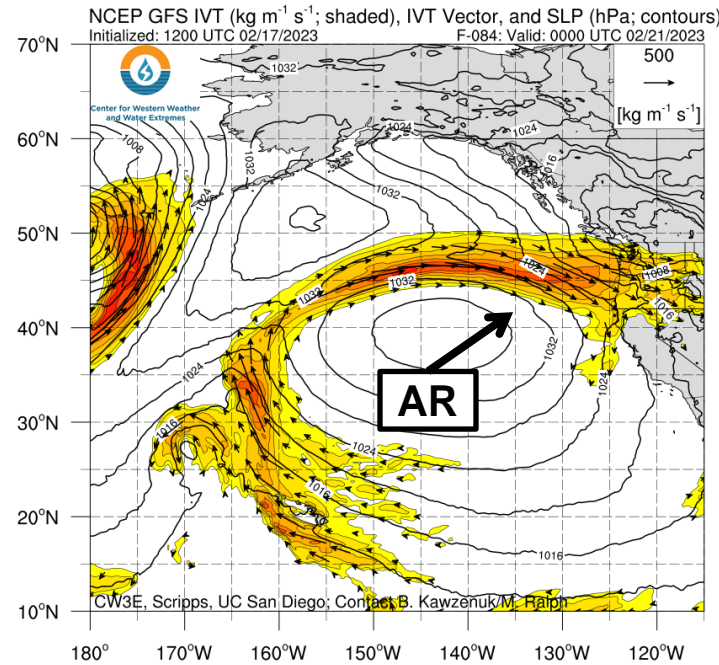
# CW3E AR Outlook: 17 February 2023

## GFS Model Forecast: Valid 4 PM PST 20 Feb (F-84)

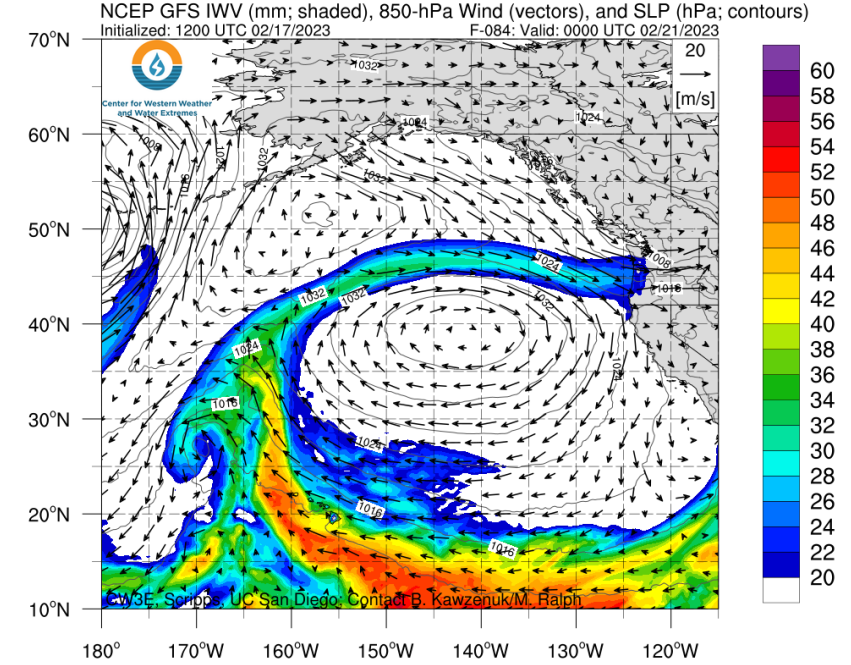
### 500-hPa Vorticity, Height, and Wind



### IVT and SLP



### IWV and 850-hPa Wind

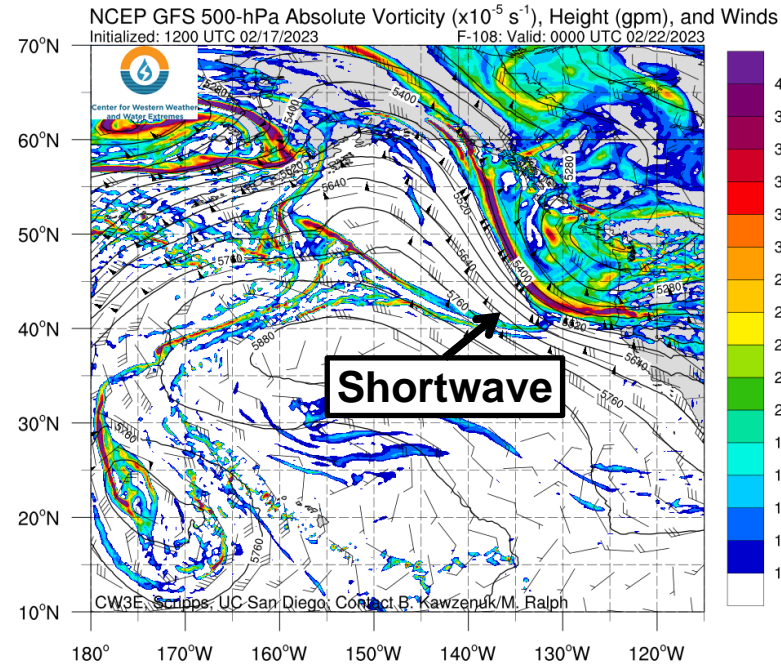


- A mid-level shortwave will develop over the Gulf of Alaska and propagate towards the Pacific Northwest
- The AR is forecast to make landfall in Washington and Oregon on Sunday, with northwesterly IVT  $> 700 \text{ kg m}^{-1} \text{ s}^{-1}$  in the core of the IVT plume during landfall
- The associated plume of moisture is forecast to continue to wrap up, with IWV  $> 30 \text{ mm}$  approaching the US West Coast

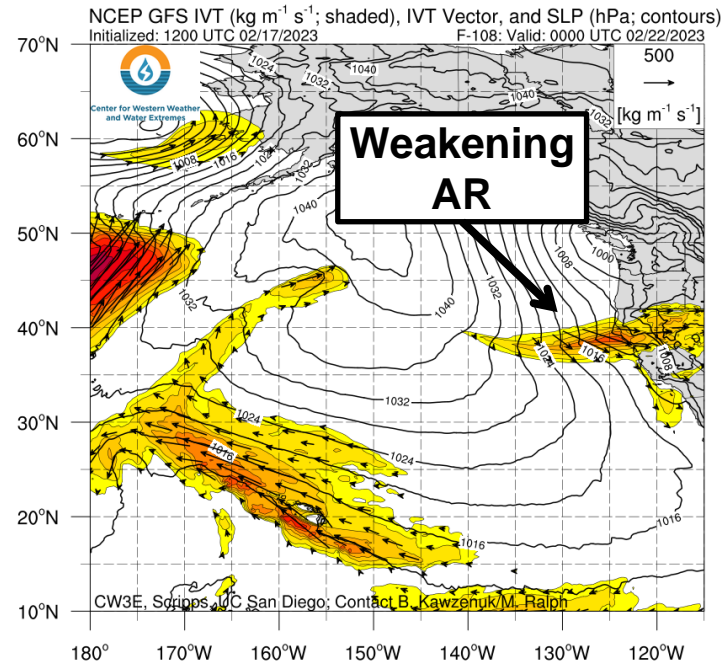
# CW3E AR Outlook: 17 February 2023

## GFS Model Forecast: Valid 4 PM PST 21 Feb (F-108)

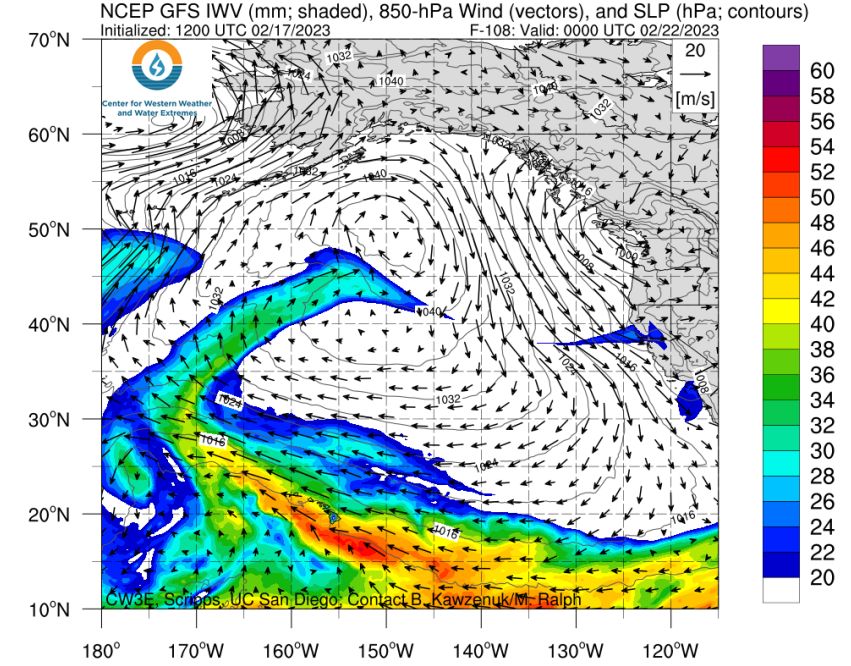
### 500-hPa Vorticity, Height, and Wind



### IVT and SLP



### IWV and 850-hPa Wind

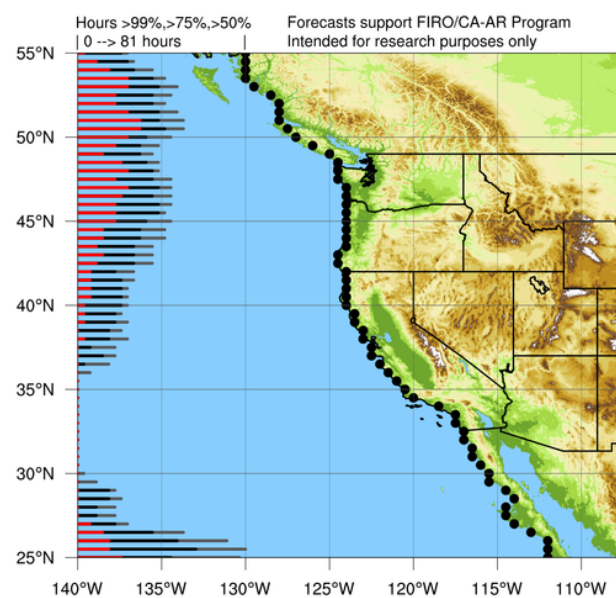
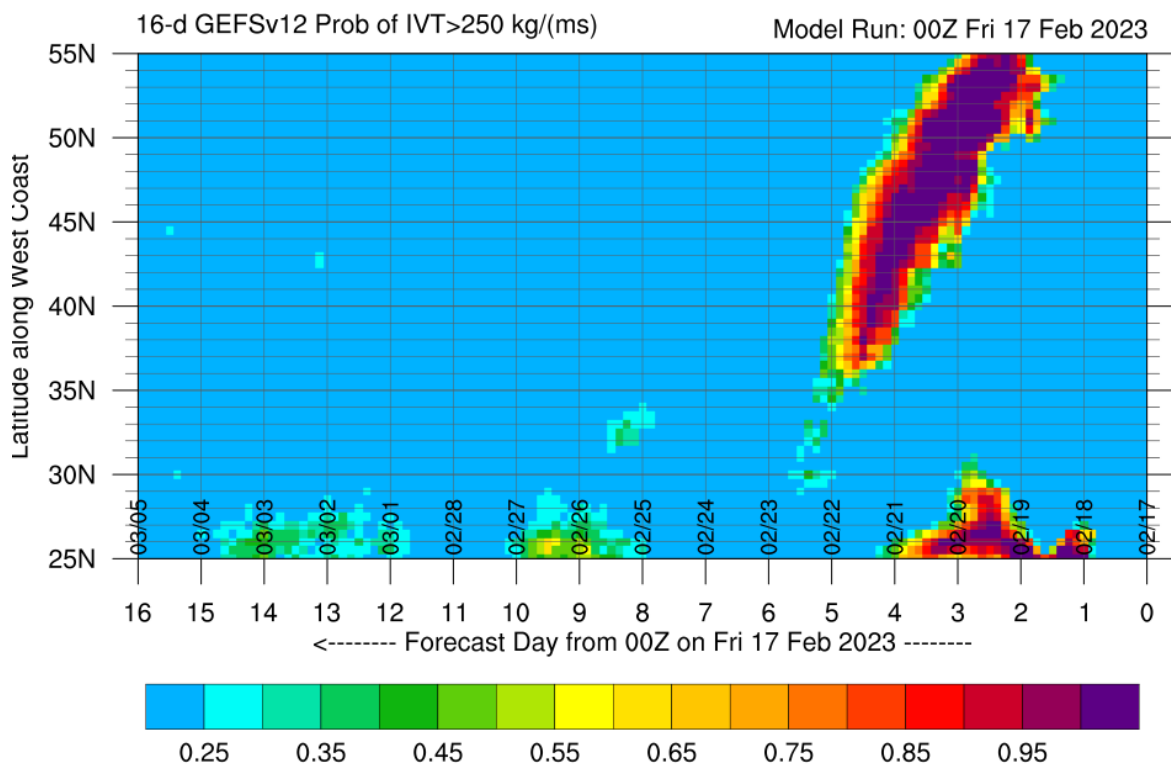


- As the shortwave trough deepens and shifts to the east, over the Pacific Northwest, weak secondary cyclogenesis will occur over land in Washington and Oregon.
- As the AR shifts to the south along the coast of Oregon and California, the IVT plume will become primarily westerly with  $> 600 \text{ kg m}^{-1} \text{ s}^{-1}$  of IVT forecast into Northern California on Tuesday into Wednesday
- The AR is forecast to dissipate along the coast of Northern California as it loses support from the extended moisture plume



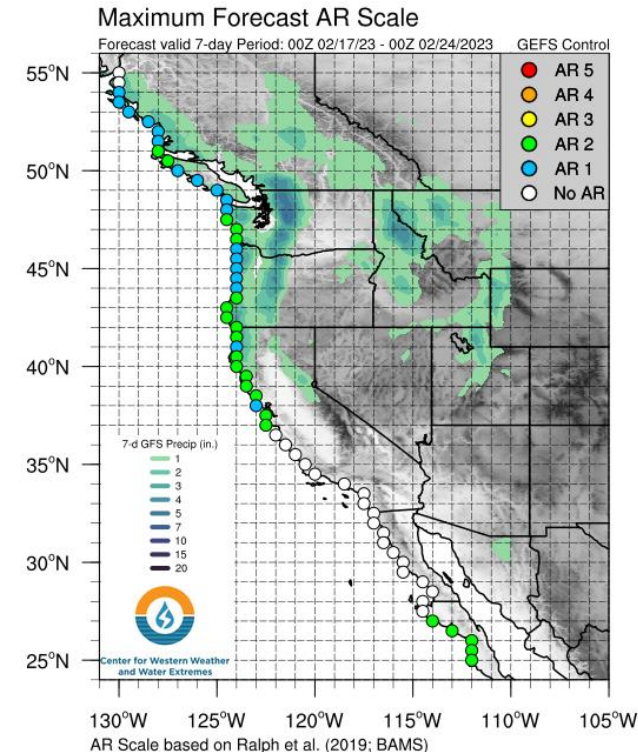
# CW3E AR Outlook: 17 February 2023

## Probability of AR Conditions Along Coast (GEFS)



Center for Western Weather and Water Extremes  
SCRIPPS INSTITUTION OF OCEANOGRAPHY  
AT UC SAN DIEGO

## AR Scale



- The 00Z GEFS is showing high confidence ( $> 95\%$ ) in a period of AR conditions ( $IVT > 250 \text{ kg m}^{-1} \text{ s}^{-1}$ ) beginning Saturday along the coast of British Columbia, into Washington and Oregon from Sunday through Tuesday, extending into coastal Northern California Tuesday into Wednesday
- The GEFS ensemble control member is forecasting AR 2 conditions for multiple coastal locations between the Olympic Peninsula and the Bay Area

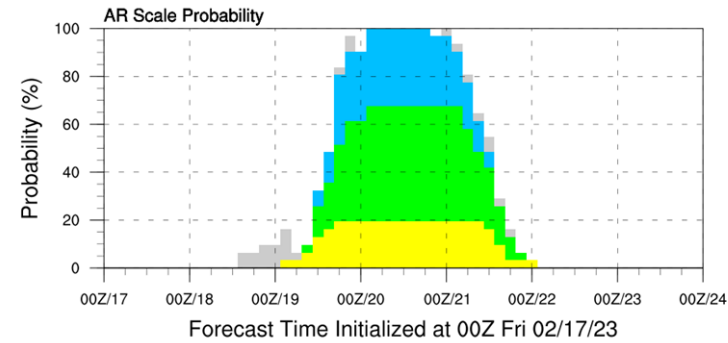
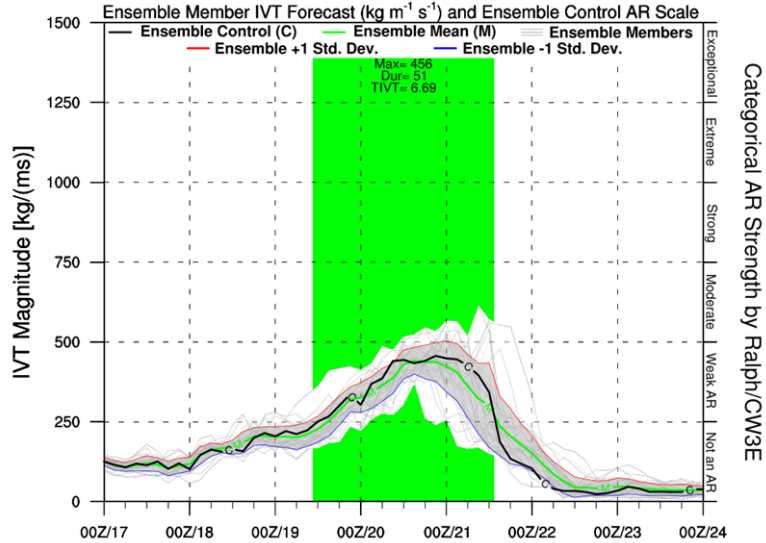
# CW3E AR Outlook: 17 February 2023

## 7-day AR Scale and IVT Forecast: 00Z GFS & ECMWF Ensemble

Landfall Point: 46.5°N, 124.0°W

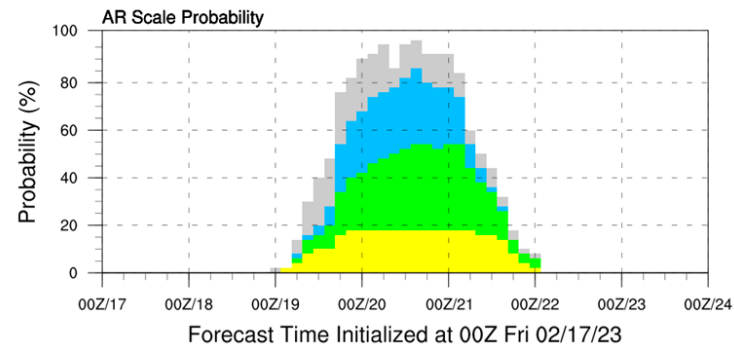
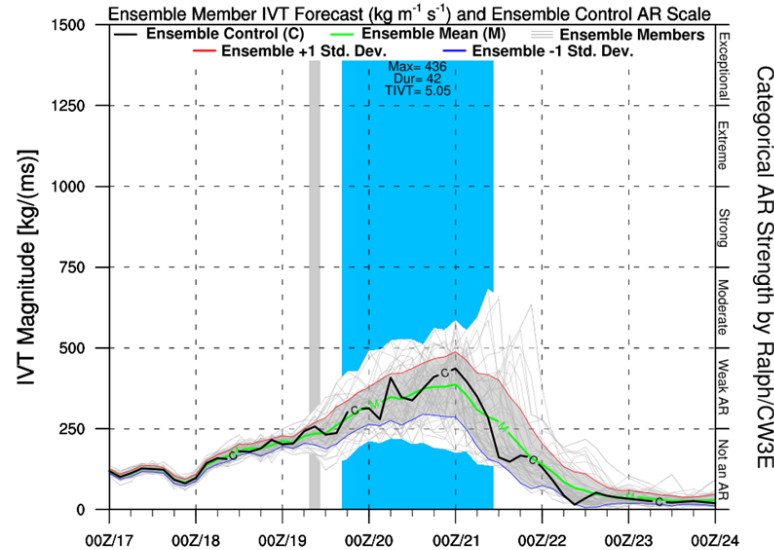
### GEFS Ensemble

GFS Ensemble Initialized: 00Z Fri 02/17/23



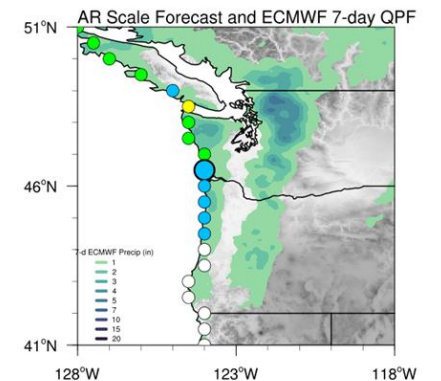
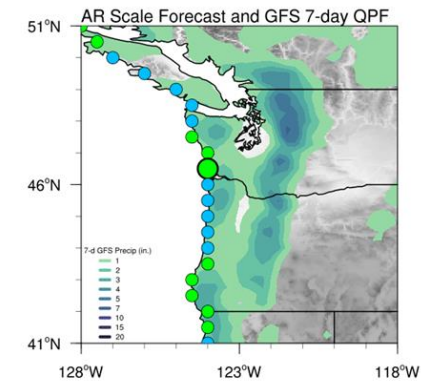
### ECMWF Ensemble

ECMWF Ensemble Initialized: 00Z Fri 02/17/23



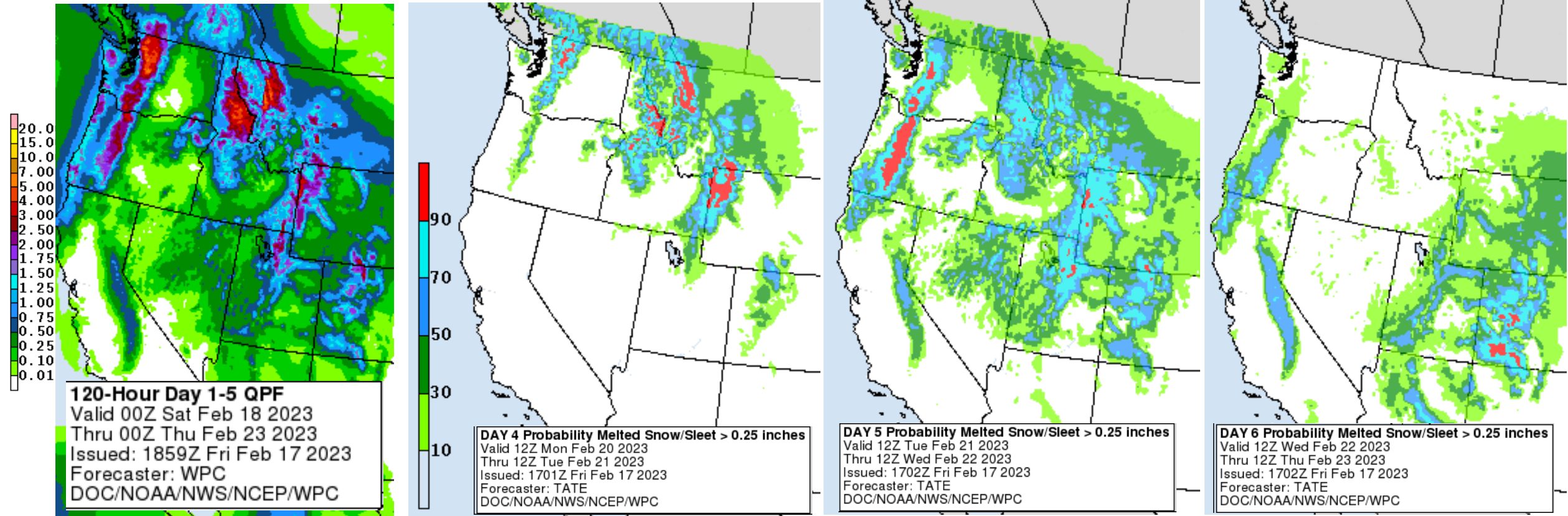
### AR Ensemble Forecast

- 21/31 (68%) **GEFS ensemble** members are forecasting at least AR 2 conditions at this location.
- 24/51 (47%) **ECMWF ensemble** members are forecasting at least AR 2 conditions at this location
- The 00Z GEFS ensemble is forecasting a higher intensity and longer duration event compared to the ECMWF, resulting in more coastal locations with AR 2 conditions extending south into coastal Northern California



# CW3E AR Outlook: 17 February 2023

## WPC Quantitative Precipitation Forecasts and Winter Weather Probability

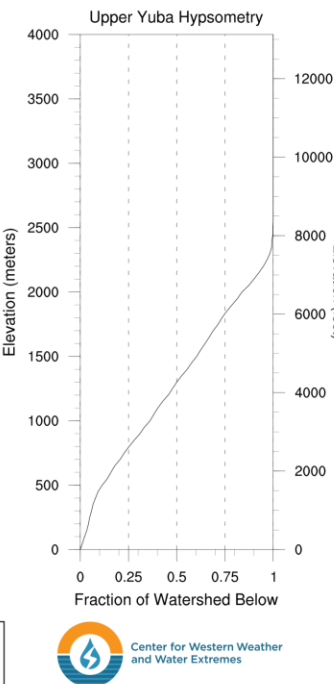
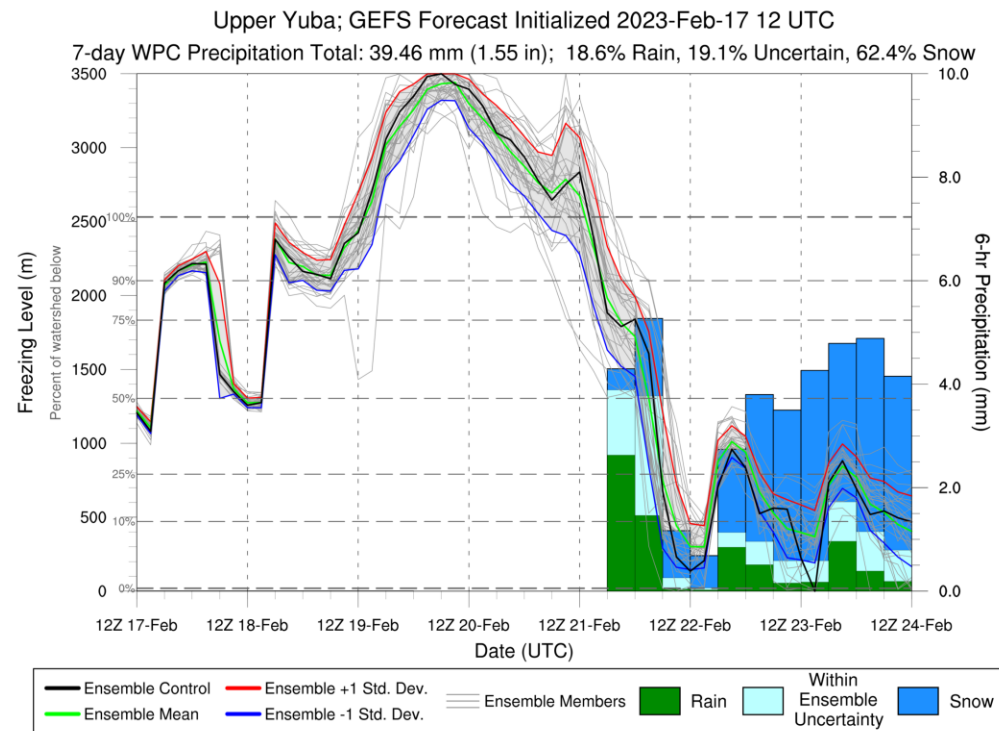
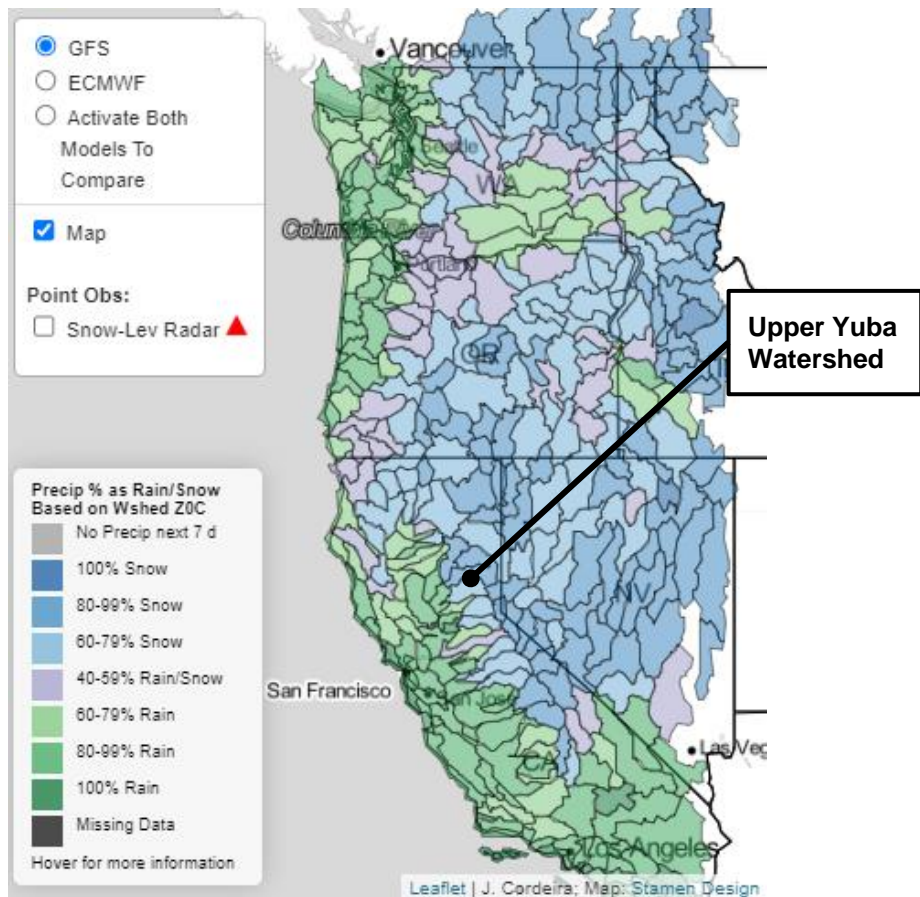


- NWS WPC is forecasting > 4 inches of precipitation over the next 5 days for locations in the northern Cascades, 1-3 inches in the Coast Ranges of Washington & Oregon and the Southern Cascades, and < 1 inch for low elevations in the Pacific Northwest and the Sierra Nevada.
- Forecast probabilities for melted snow/sleet accumulation > 0.25 are highest (>70%) along the Cascades from Monday through Wednesday, with a secondary region of moderate probabilities (50–70%) along the Sierra Nevada from Tuesday into Wednesday
- Additionally, there is potential for significant frozen precipitation over much of the Intermountain West during this period



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## Freezing Level Forecast



- The 12Z GEFS ensemble is forecasting snow levels to fall dramatically from > 3,000 m to near sea level by 12Z 22 Feb for much of Northern California and the Sierra Nevada Mountains
- Freezing levels are expected to remain very low through at least 12Z 24 Feb



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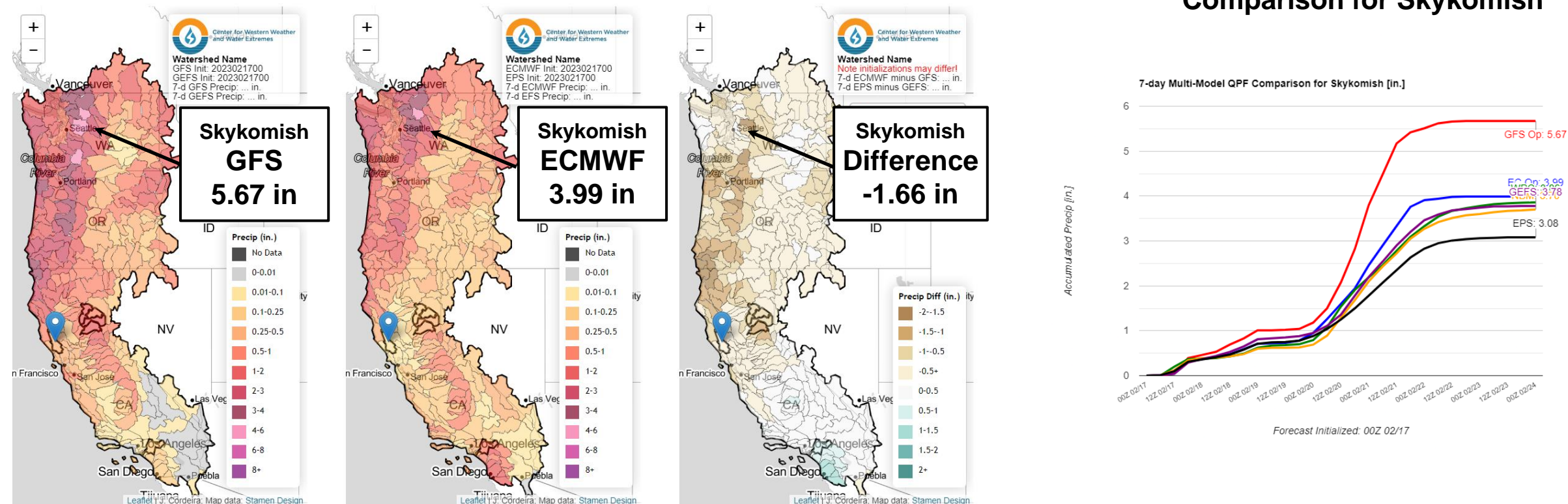
## 7-day Watershed Precipitation Forecasts (Initialized 4 PM PT 16 Feb)

### GFS

### ECMWF

### ECMWF minus GFS

### Multi-Model Precipitation Comparison for Skykomish



- The 00Z GFS is forecasting greater 7-day watershed precipitation totals throughout northern California, Oregon, and Washington than the 00Z ECMWF, especially within coastal watersheds along the CA/OR border and the Oregon Cascades
- The 00Z GFS is forecasting 5.67 inches of mean areal precipitation in the Skykomish Watershed over the next 7 days, while the 00Z ECMWF is forecasting 3.99 inches over the same watershed