

CW3E Atmospheric River Outlook: 1 February 2023

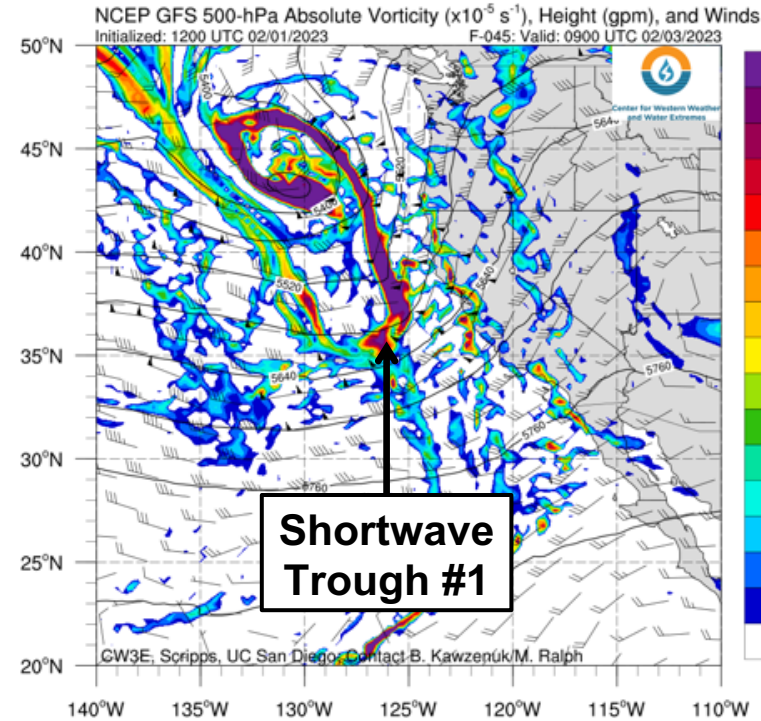
Multiple Atmospheric Rivers Forecast to Bring Precipitation to the US West Coast

- Two atmospheric rivers (ARs) are forecast to make landfall along the US West Coast over the next several days
- Impacts from these ARs are expected to be relatively minor due to weak upslope moisture flux
- An AR 2 (based on the Ralph et al. 2019 AR Scale) is currently forecast in southern coastal Oregon, where weak AR conditions may persist for more than 48 hours across both storms
- The NWS Weather Prediction Center is forecasting 2–4 inches of total precipitation in the Pacific Coast Ranges, Cascades, and Sierra Nevada during the next 5 days, with higher amounts possible in the Olympic Mountains
- Significant snowfall accumulations are possible in the Olympic Mountains and North Cascades during the first storm, as well as in the Sierra Nevada during the second storm
- Freezing levels in the Sierra Nevada are forecast to drop during the second AR, allowing for accumulating snowfall below 5,000 feet

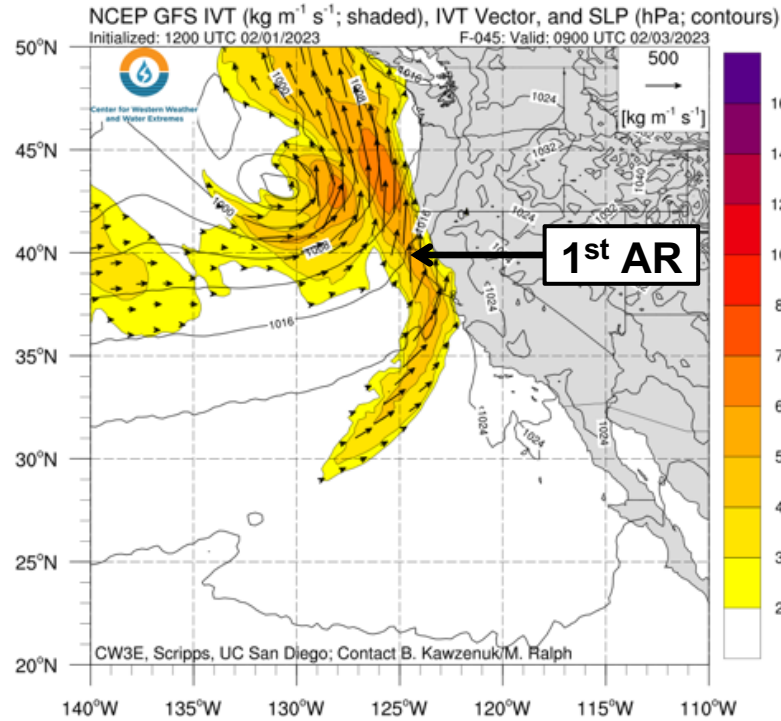
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GFS Model Forecasts: Valid 1 AM PT 3 Feb (F-45)

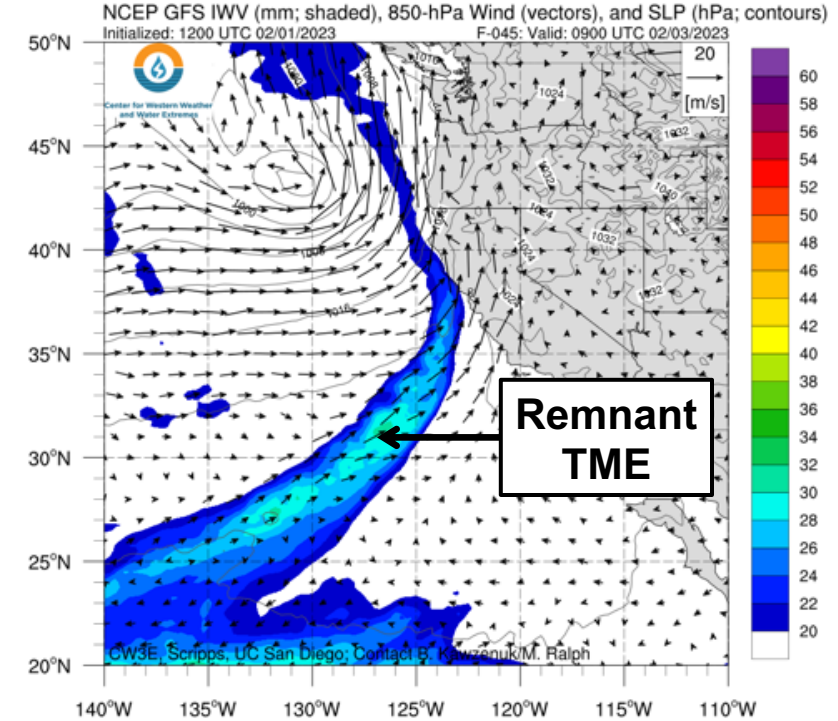
500-hPa Vorticity, Height, and Wind



IVT and SLP



IWV, SLP, and 850-hPa Wind

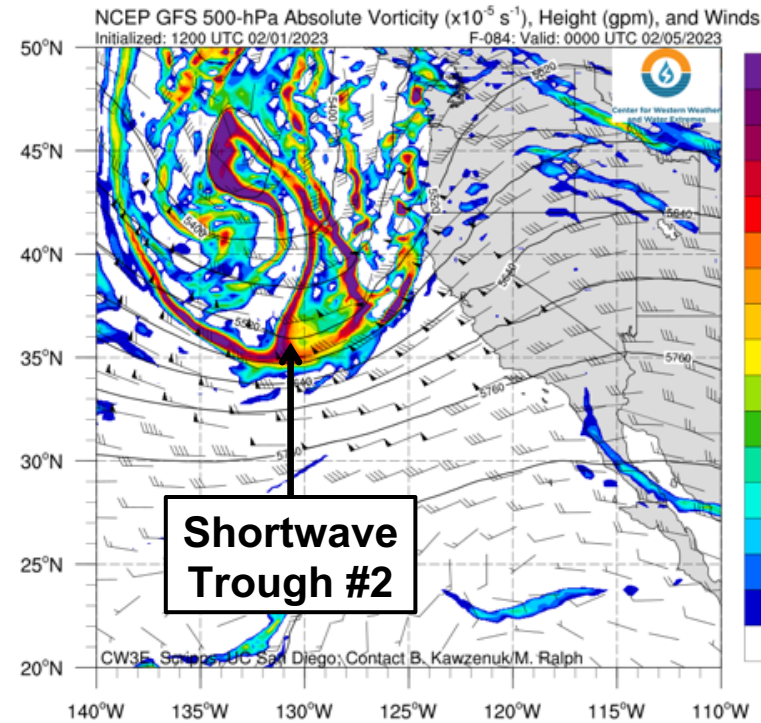


- The first AR is forecast to make landfall late tomorrow night in association with a weakening upper-level shortwave trough and the remnants of a tropical moisture export (TME) originating near Hawaii
- This AR will be relatively weak upon landfall, with IVT magnitudes $< 500 \text{ kg m}^{-1} \text{ s}^{-1}$ and IWV values around 20 mm along the coast of Northern California
- Southerly moisture transport and will likely limit precipitation totals in most areas, except for the Olympic Mountains

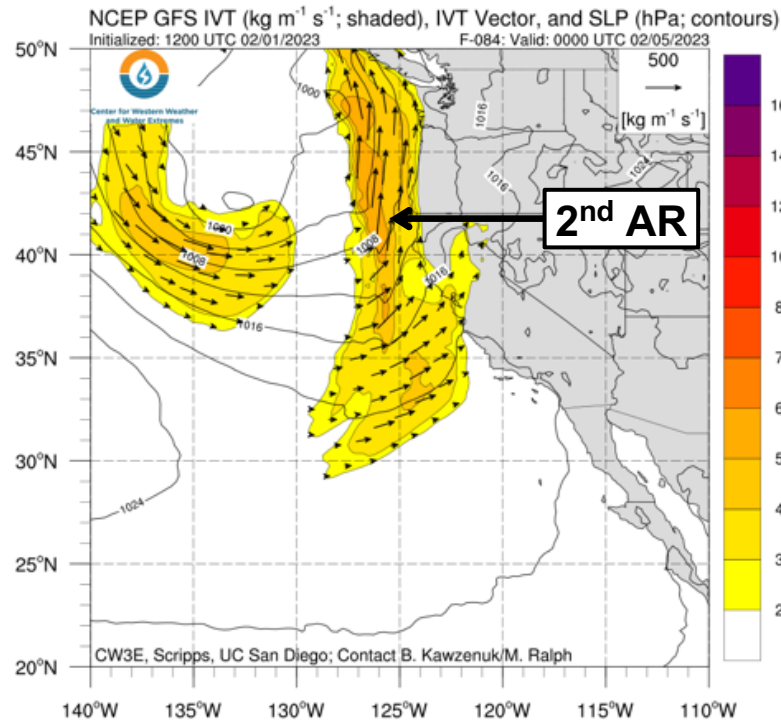
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GFS Model Forecasts: Valid 4 PM PT 4 Feb (F-84)

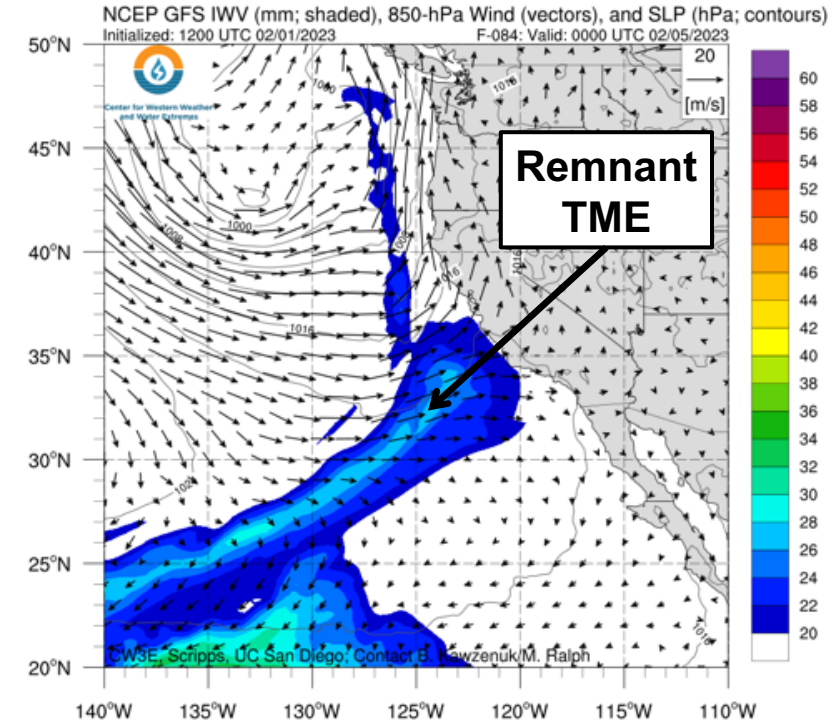
500-hPa Vorticity, Height, and Wind



IVT and SLP

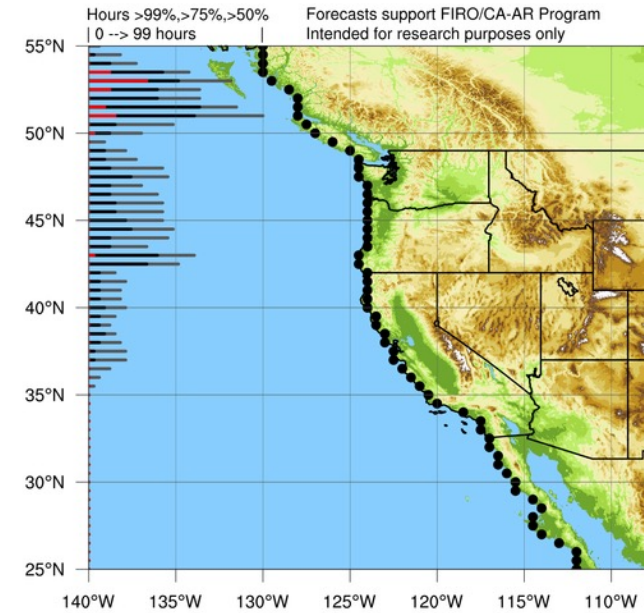
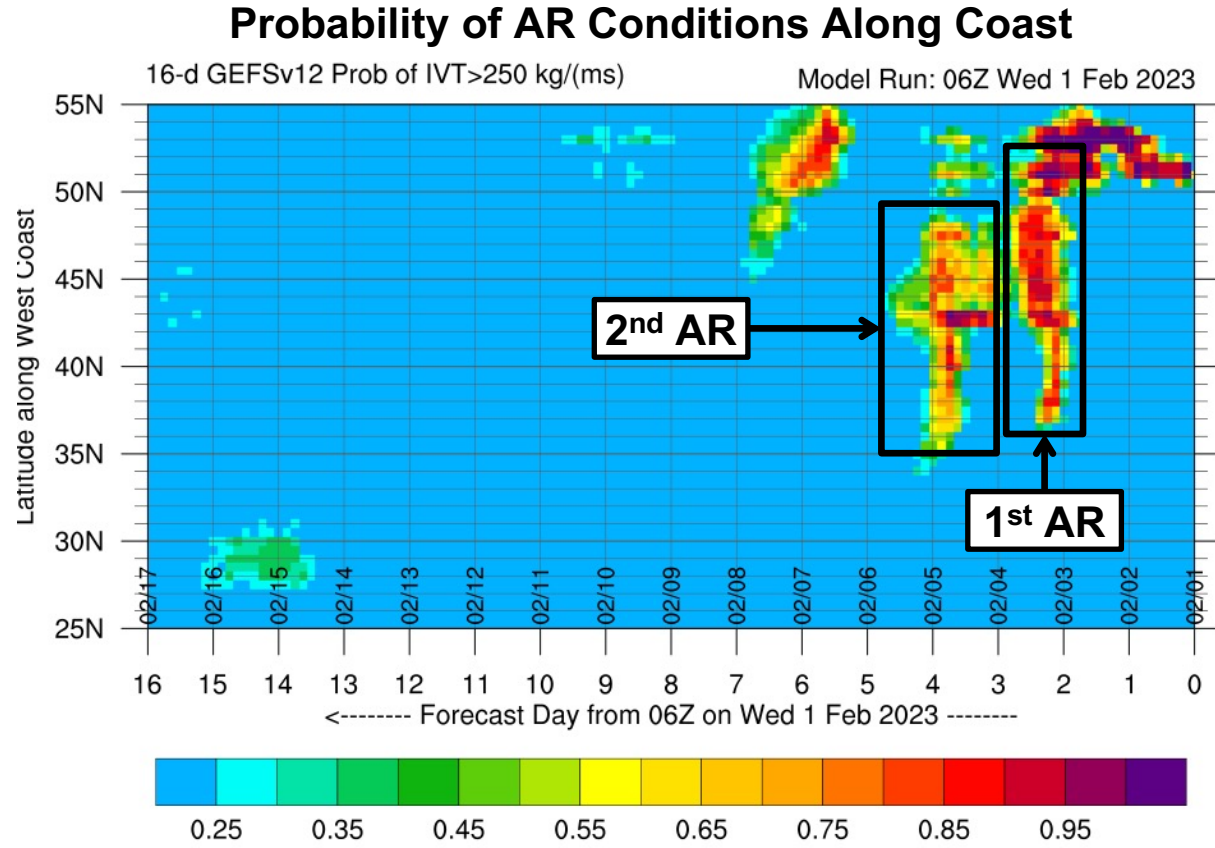


IWV, SLP, and 850-hPa Wind



- The second AR is forecast to make landfall on Saturday and bring another period of weak AR conditions ($\text{IVT} < 500 \text{ kg m}^{-1} \text{ s}^{-1}$) to the US West Coast
- This storm is forecast to feature a more amplified shortwave trough off the California coast, which will likely support greater synoptic-scale forcing for ascent over interior Northern California

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

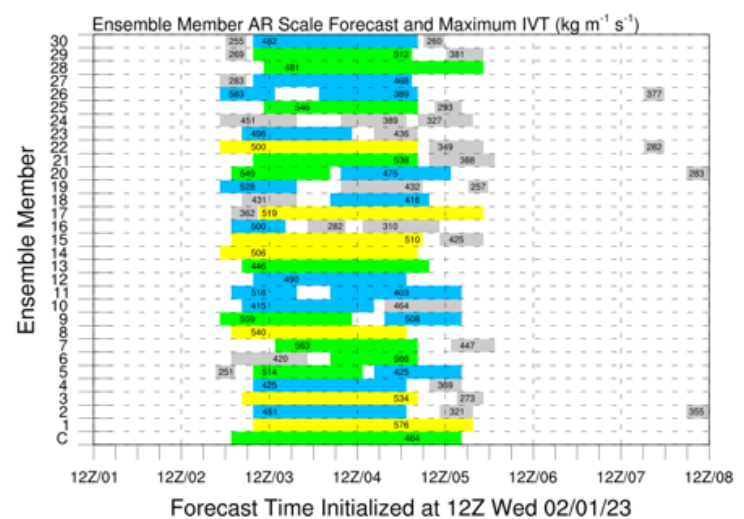
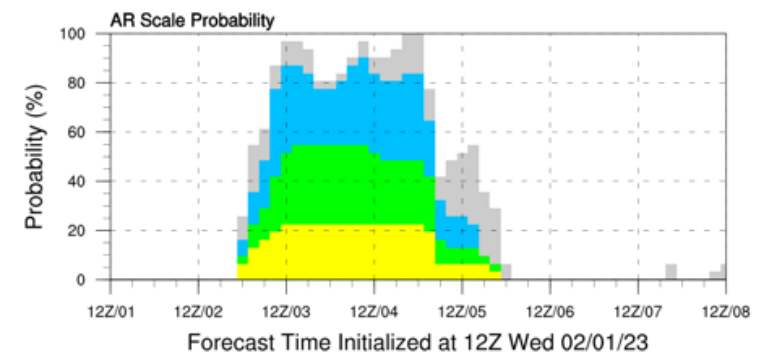
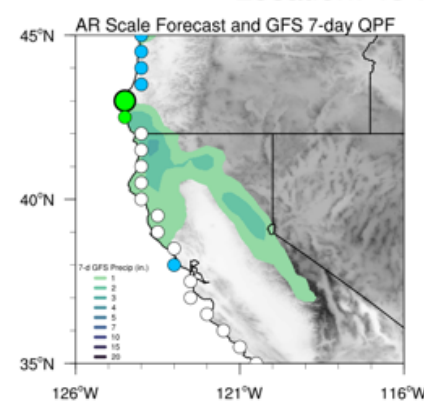
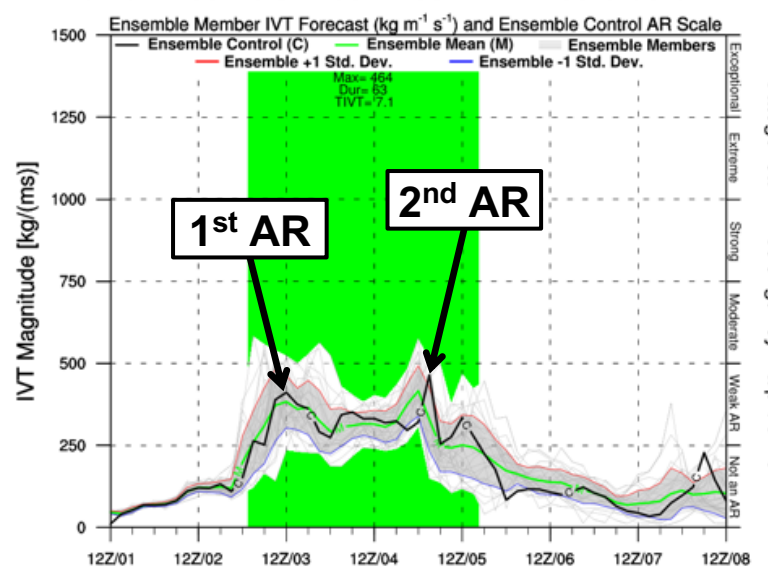
- The 06Z GEFS is showing moderate-to-high confidence (60–90% probability) in two periods of AR conditions ($IVT > 250 \text{ kg m}^{-1} \text{ s}^{-1}$) along the US West Coast in association with these ARs
- There is more forecast uncertainty regarding the timing, duration, and location of the second AR landfall
- The 06Z GEFS is suggesting a prolonged period of little-to-no landfalling AR activity after the second AR

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GEFS AR Scale and IVT Forecasts

GFS Ensemble Initialized: 12Z Wed 02/01/23

Location: 43°N 124.5°W



- The 12Z GEFS control is forecasting an AR 2 over southern coastal Oregon due to a prolonged period of AR conditions spanning both ARs
- 18/31 (58%) ensemble members are predicting an AR 2 or an AR 3 at 43°N, 124.5°W
- 10/31 (32%) ensemble members are predicting AR conditions to persist for at least consecutive 48 hours at this location
- There is still considerable forecast uncertainty in the timing and duration of AR conditions



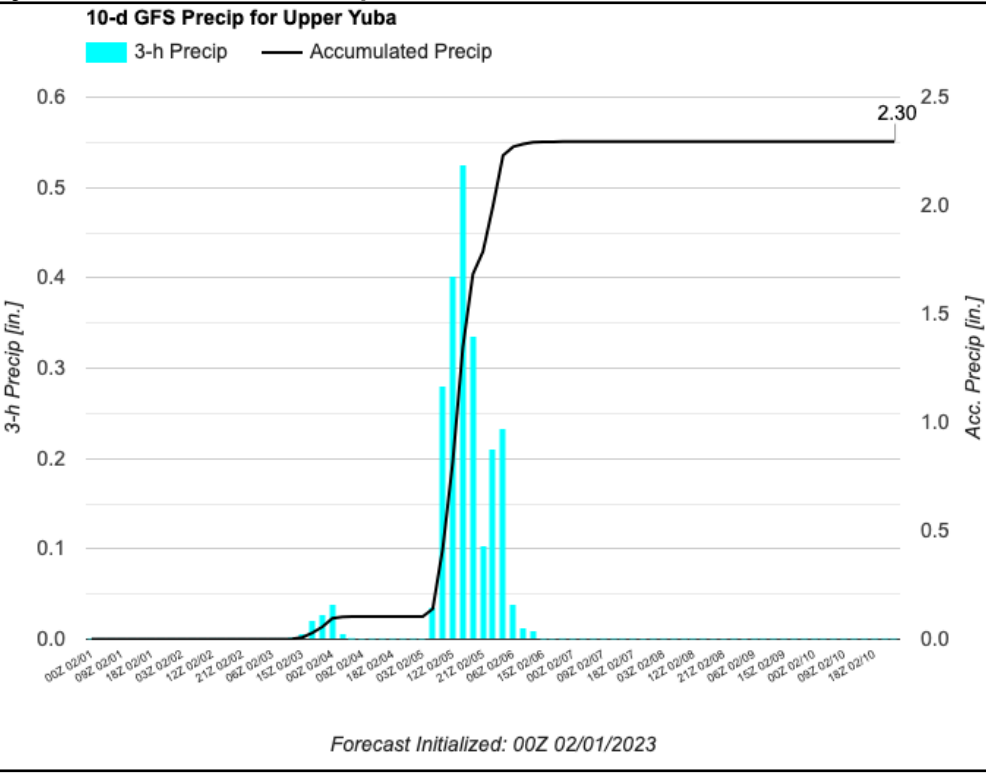
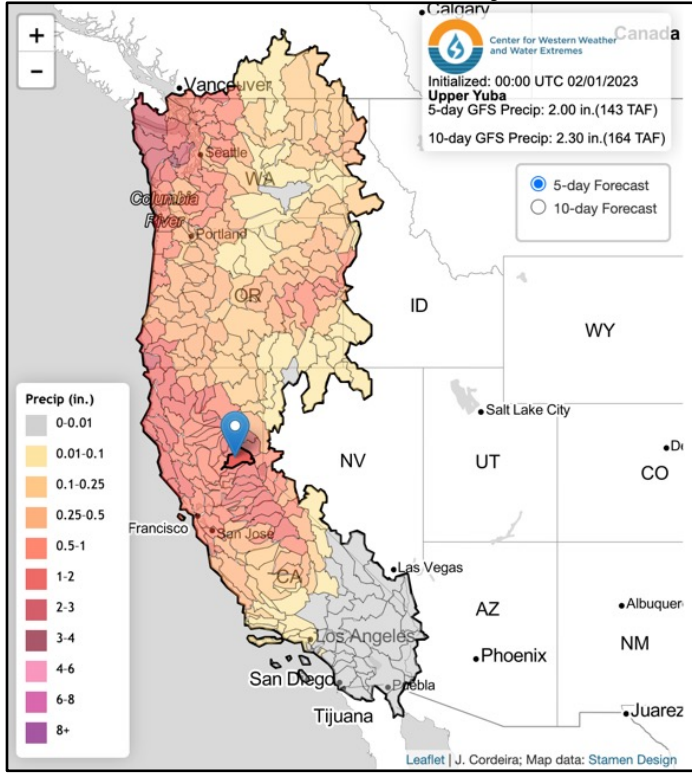
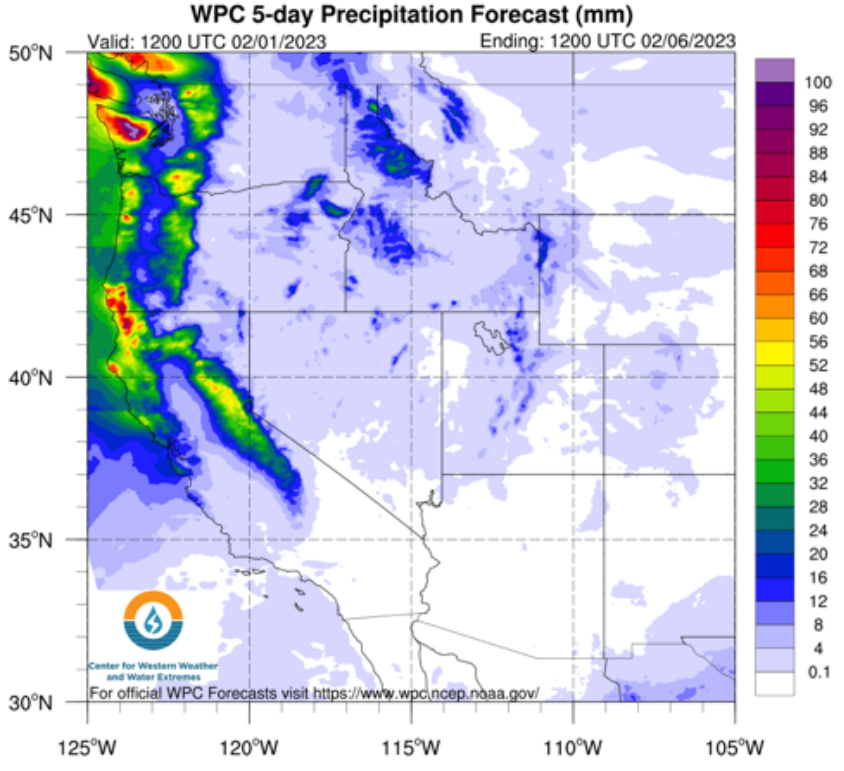
AR 1 AR 2 AR 3 AR 4 AR 5

Image created: 17 UTC 02/01/2023

More information: <http://cw3e.ucsd.edu> AR Scale based on Ralph et al. (2019; BAMS), contact M. Ralph

Precipitation Forecasts

GFS 5-day and 10-day Watershed Precipitation Forecasts



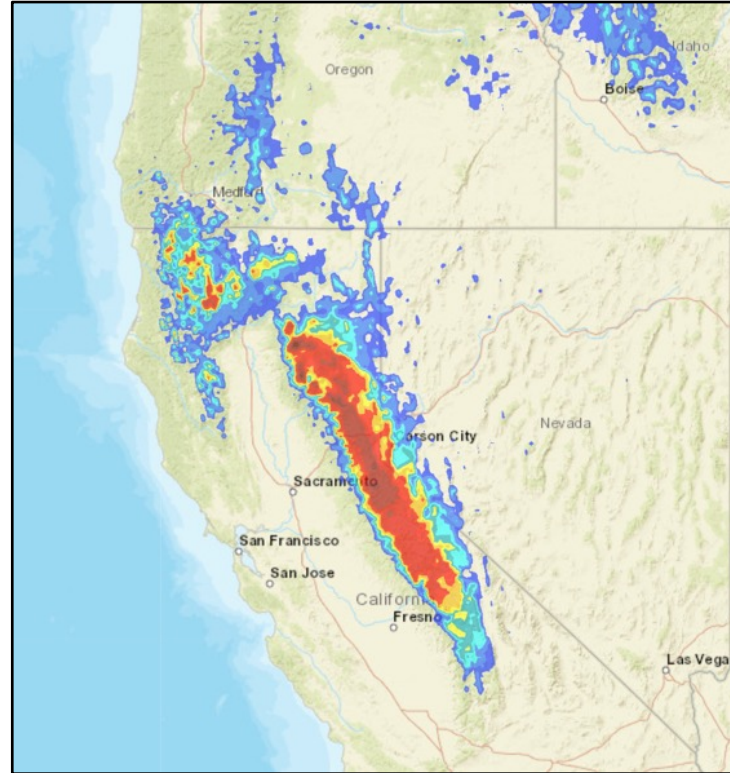
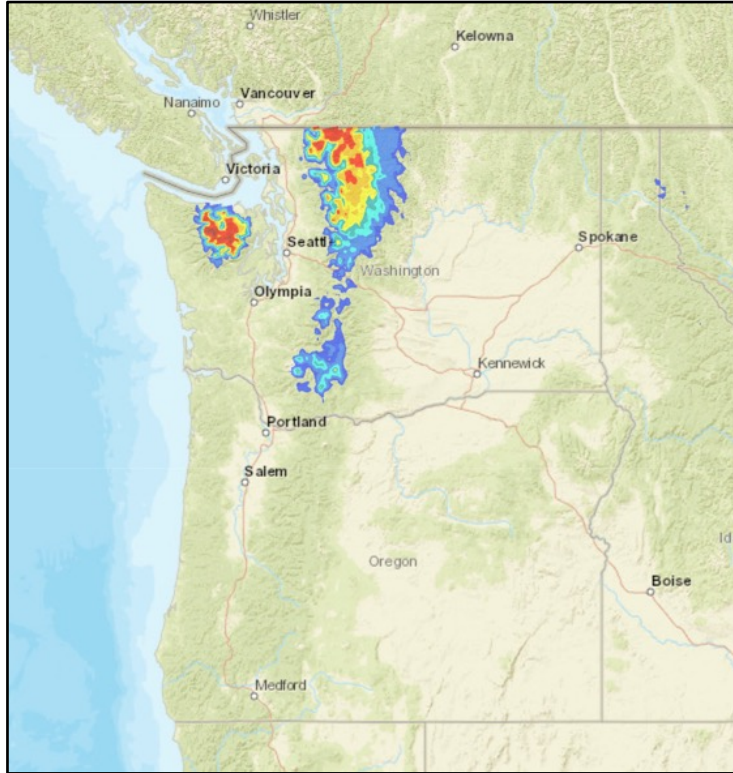
- These two storms are forecast to produce 2–4 inches of total precipitation in the Pacific Coast Ranges, Cascades, and Northern Sierra Nevada, with higher amounts possible in the Olympic Mountains
- The 00Z deterministic GFS is forecasting 2 inches of watershed mean precipitation in the Upper Yuba watershed during the next 5 days, with nearly all of this precipitation occurring during the second storm

Winter Weather Hazards

Experimental Probabilistic Winter Storm Severity Index

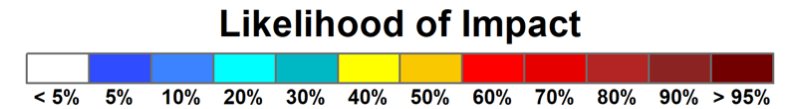
Valid: 10 AM PT 3 Feb – 10 AM PT 4 Feb

Valid: 10 PM PT 4 Feb – 10 PM PT 5 Feb



Source: NOAA/NWS Weather Prediction Center

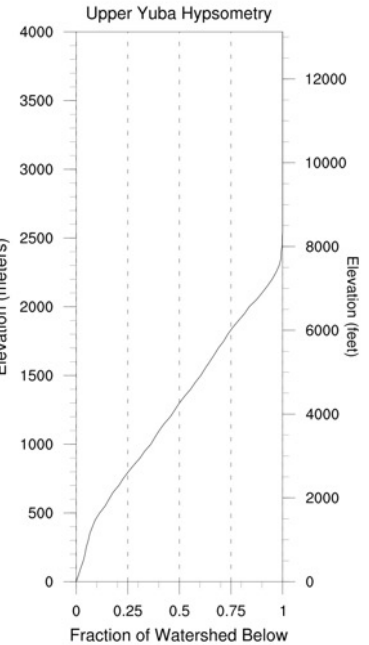
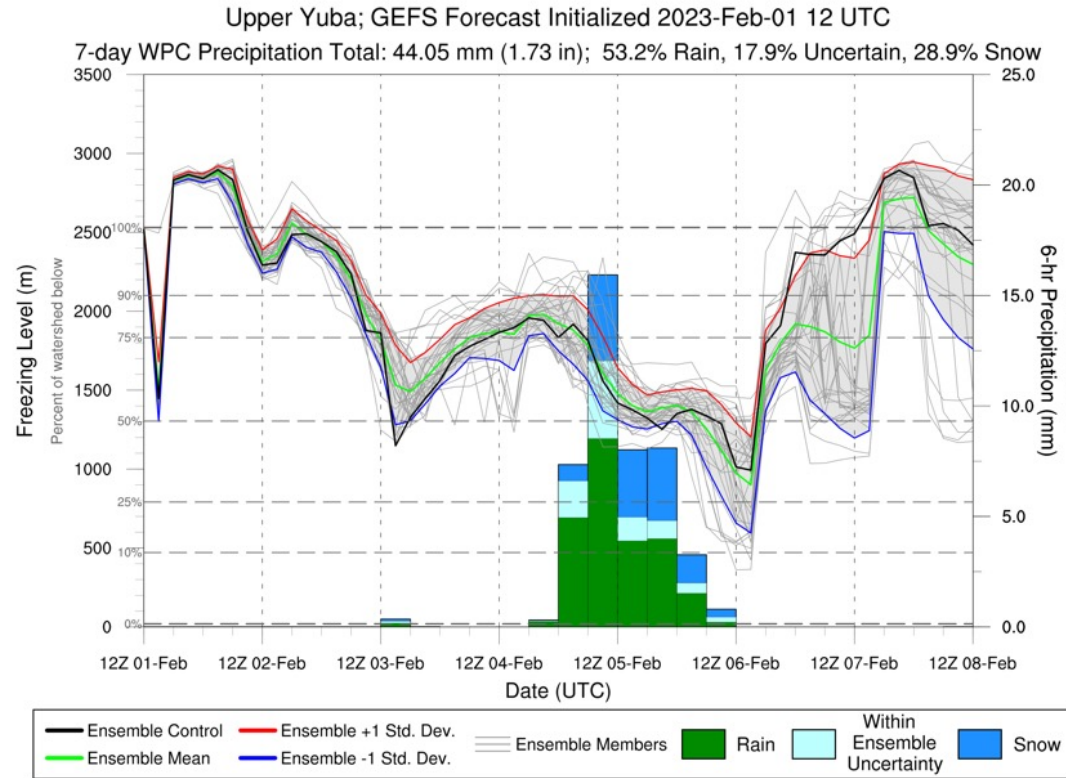
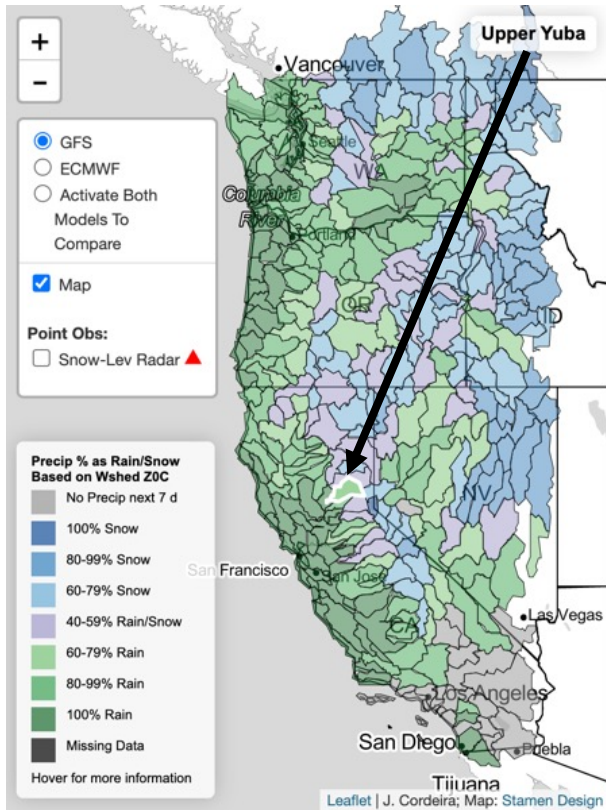
Potential Winter Storm Impacts	
Minor Impacts	<p>Expect a few inconveniences to daily life.</p> <ul style="list-style-type: none"> Winter driving conditions. Use caution while driving.
Moderate Impacts	<p>Expect disruptions to daily life.</p> <ul style="list-style-type: none"> Hazardous driving conditions. Use extra caution while driving. Closures and disruptions to infrastructure may occur.
Major Impacts	<p>Expect considerable disruptions to daily life.</p> <ul style="list-style-type: none"> Dangerous or impossible driving conditions. Avoid travel if possible. Widespread closures and disruptions to infrastructure may occur.
Extreme Impacts	<p>Expect substantial disruptions to daily life.</p> <ul style="list-style-type: none"> 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.



- The NWS Weather Prediction Center is forecasting a greater than 60% probability of **moderate** winter storm impacts (i.e., hazardous travel conditions, disruptions to infrastructure) in the Olympic Mountains and North Cascades during the first storm
- There is a greater than 70% likelihood of **moderate** winter storm impacts in the Sierra Nevada during the second storm

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Watershed Freezing Level Forecasts



- Freezing levels in the Northern Sierra Nevada are forecast to steadily drop during the second AR, allowing for accumulating snowfall below 5,000 ft
- The CW3E watershed freezing level tool is forecasting 29% of the total precipitation over the next 7 days to fall in the form of snow in the Upper Yuba Watershed