

CW3E Atmospheric River Outlook: 12 February 2025

Atmospheric River Forecast to Bring Heavy Precipitation to US West Coast

AR Summary:

- The first pulse of moisture has made landfall over Central and Southern California today. The second, more substantial pulse is forecast to make landfall over Central California tomorrow, Thu 13 Feb, and propagate down the coast throughout the day.
- The second pulse is currently forecast to be an AR1-2 on the Ralph et al. (2019) AR Scale.

Precipitation Forecasts:

- There are still significant model differences in forecast precipitation over California. Compared to the GFS model, the ECMWF model is forecasting lower precipitation amounts in the Northern California Coast Ranges and Sierra Nevada, and higher amounts in the San Joaquin Valley, Central California Coast Ranges, and Southern California.
- The NWS Weather Prediction Center (WPC) is forecasting 6+ inches of precipitation over the California Coast Ranges, Sierra Nevada and Transverse Ranges over the next 3 days.
- Snowfall accumulations are expected to exceed 48 inches over much of the Sierra Nevada above 7,000 feet. Extreme impacts are expected across the Sierra Nevada as a result of the heavy snowfall and strong winds.

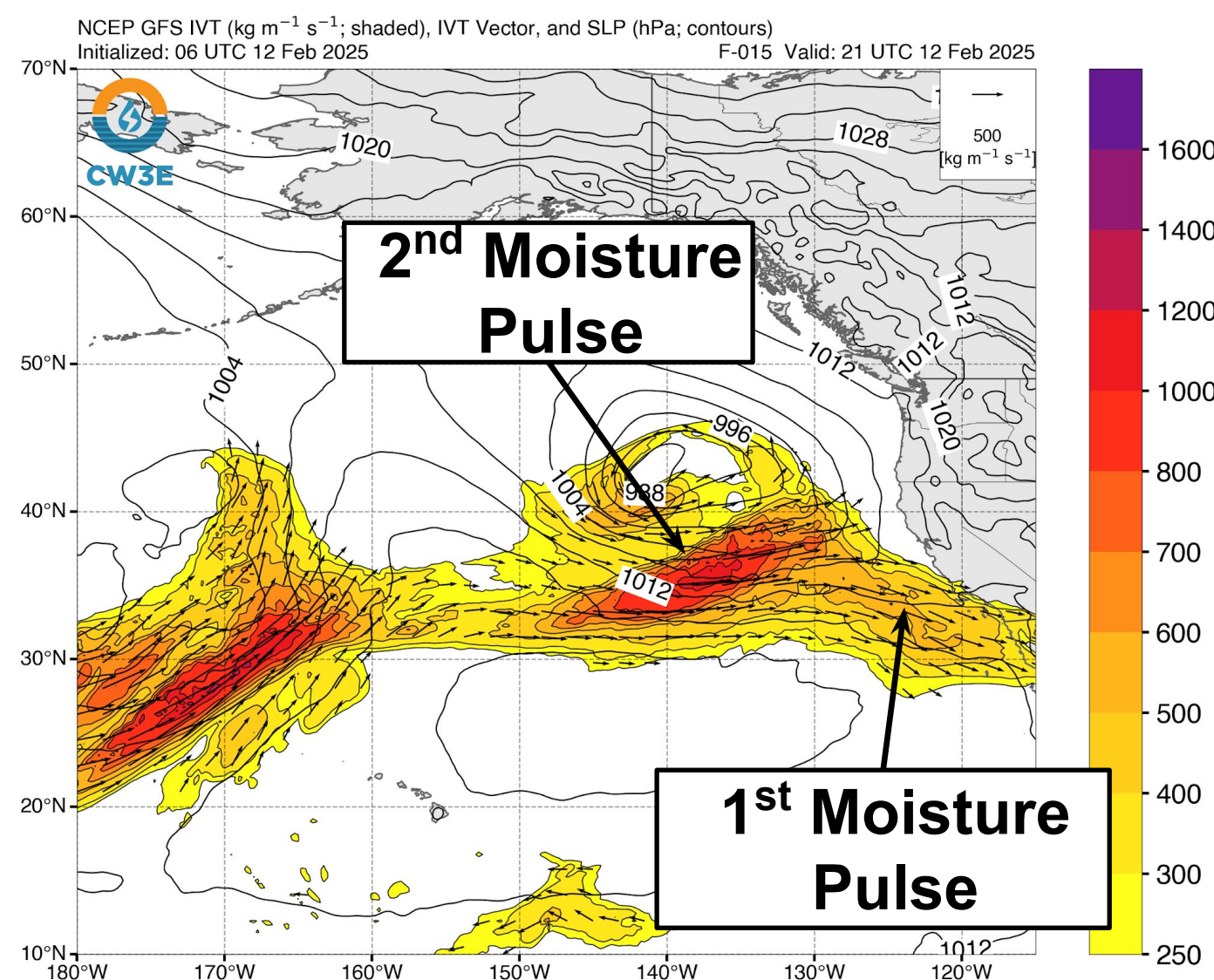
Flooding and Streamflow:

- The NWS WPC has issued a moderate risk Excessive Rainfall Outlook (level 3 of 4; 40% chance of flooding) over the Transverse Ranges on day 2 (period ending 4 AM PT Fri 14 Feb).
- Stream levels are forecast to rise over much of California, with locations along the Sacramento River potentially experiencing minor flood conditions.

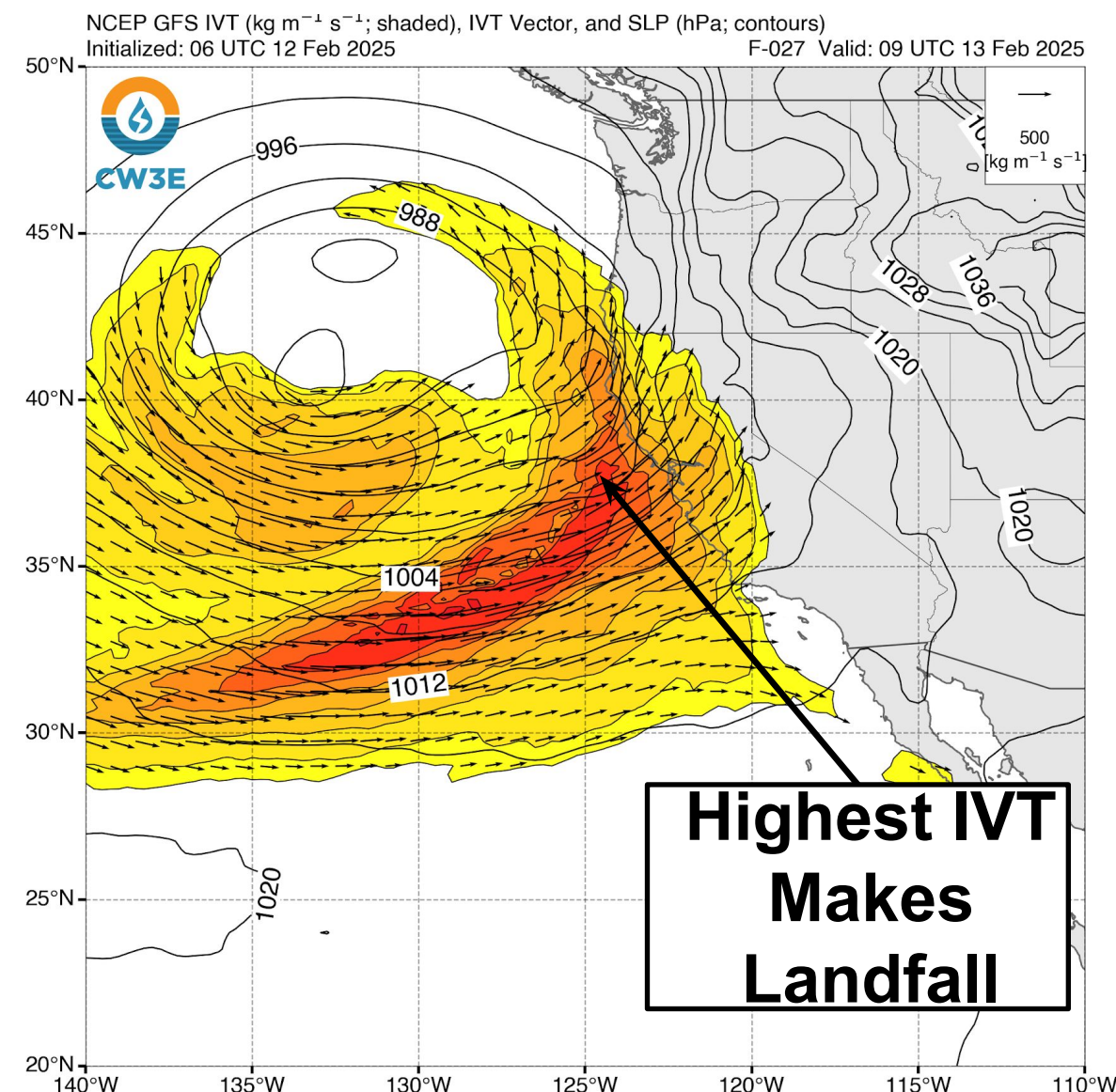
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GFS IVT & SLP Forecasts

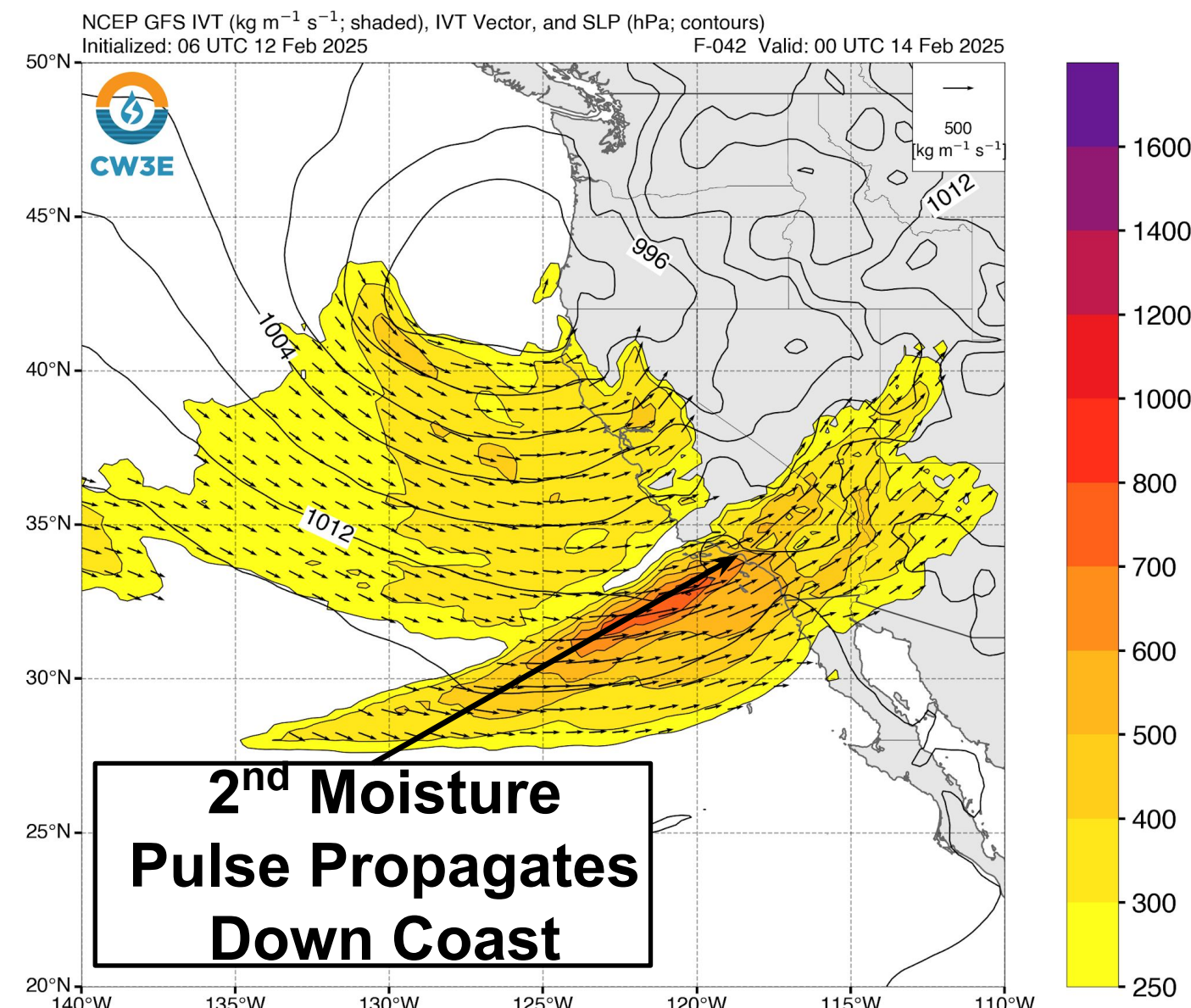
Valid: 1 PM PST 12 Feb (F-021)



Valid: 1 AM PST 13 Feb (F-027)



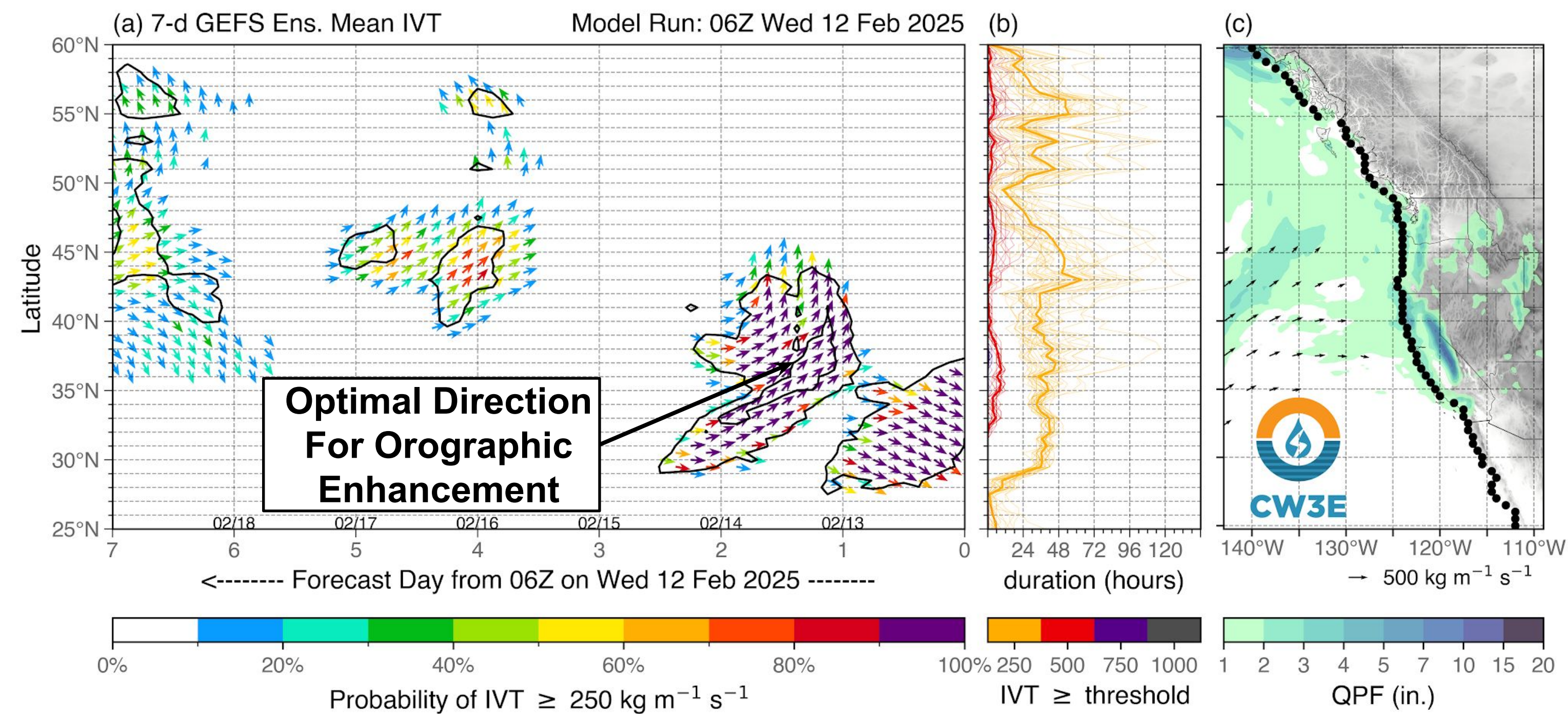
Valid: 4 PM PST 13 Feb (F-42)



- The first of two moisture pulses has brought short duration AR conditions to Central and Southern California today as the second pulse propagates toward the USWC alongside a low-pressure system.
- The second moisture pulse with the highest IVT is forecast to make landfall over the San Francisco Bay Area early tomorrow, Thu 13 Feb.
- The second pulse is forecast to progress down the California coast through 13 Feb bringing precipitation to Southern California.

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CW3E AR Landfall Tool: GEFS IVT with Landfall Vectors

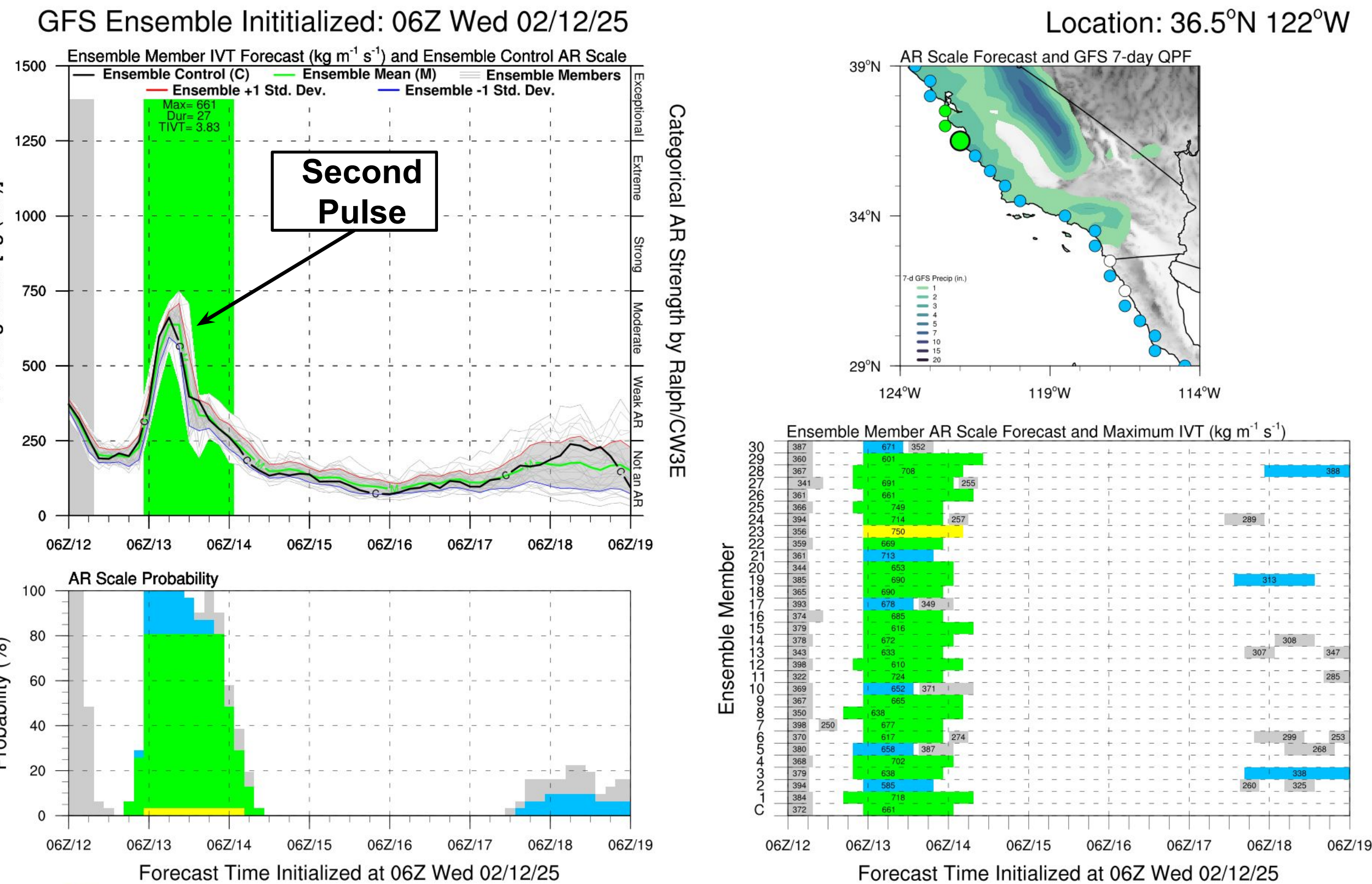


Forecasts support FIRO/CA-AR Program and NSF #2052972 | Intended for research purposes only

- CW3E’s Landfall Tool based on the GEFS shows the two periods of AR conditions that will impact California today and tomorrow.
- The landfall direction of the second pulse of IVT (southwesterly) is optimal for orographic enhancement over the Transverse Ranges, Sierra Nevada and California Coast Ranges increasing the likelihood of higher precipitation amounts over these regions.

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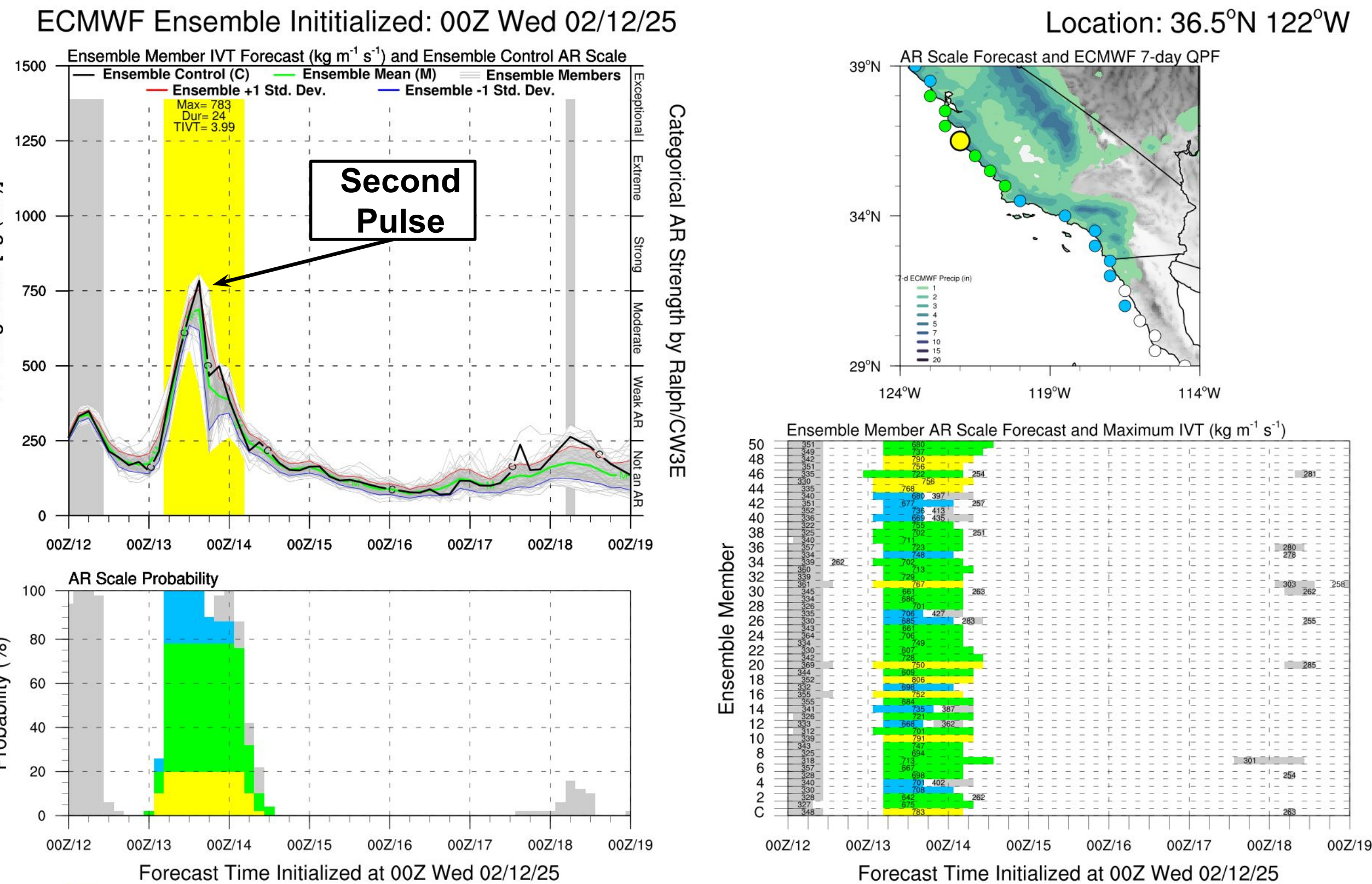
GEFS AR Scale and IVT Forecasts



- The 06Z GEFS control member is forecasting **AR1-AR2 conditions** (based on the Ralph et al. 2019 AR Scale) over coastal California.
- 26/31 GEFS members are forecasting at least AR2 conditions for a coastal point at 36.5°N, 122°W (near Monterey, CA).
- There is good agreement in the onset of AR conditions and the timing of maximum IVT at this point. Some members are showing a break in AR conditions late on 13 Feb, impacting the AR scale due to shorter duration.

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ECMWF EPS AR Scale and IVT Forecasts



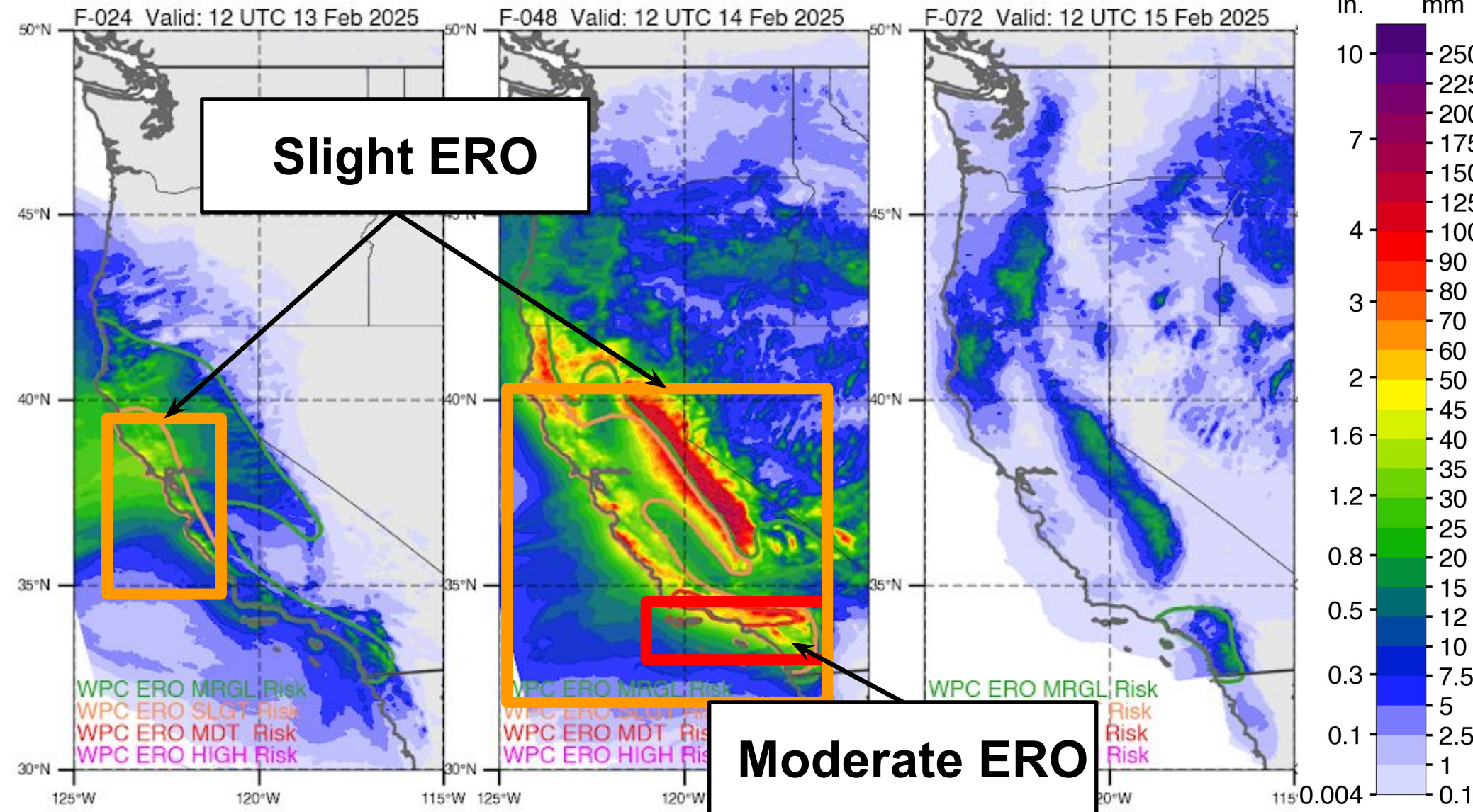
- The 00Z EPS control member is forecasting **AR1-AR2 conditions** (based on the Ralph et al. 2019 AR Scale) over much of coastal California, except for a coastal point at 36.5°N, 122°W (near Monterey, CA), where it is forecasting **AR3 conditions**.
- 39/51 GEFS members are forecasting at least AR2 conditions at this point for the second pulse.
- Much like the GEFS, there good agreement in the timing of onset and maximum IVT. Several members also show the break in AR conditions late on 13 Feb resulting in lower AR scale values.

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WPC Precipitation Forecasts

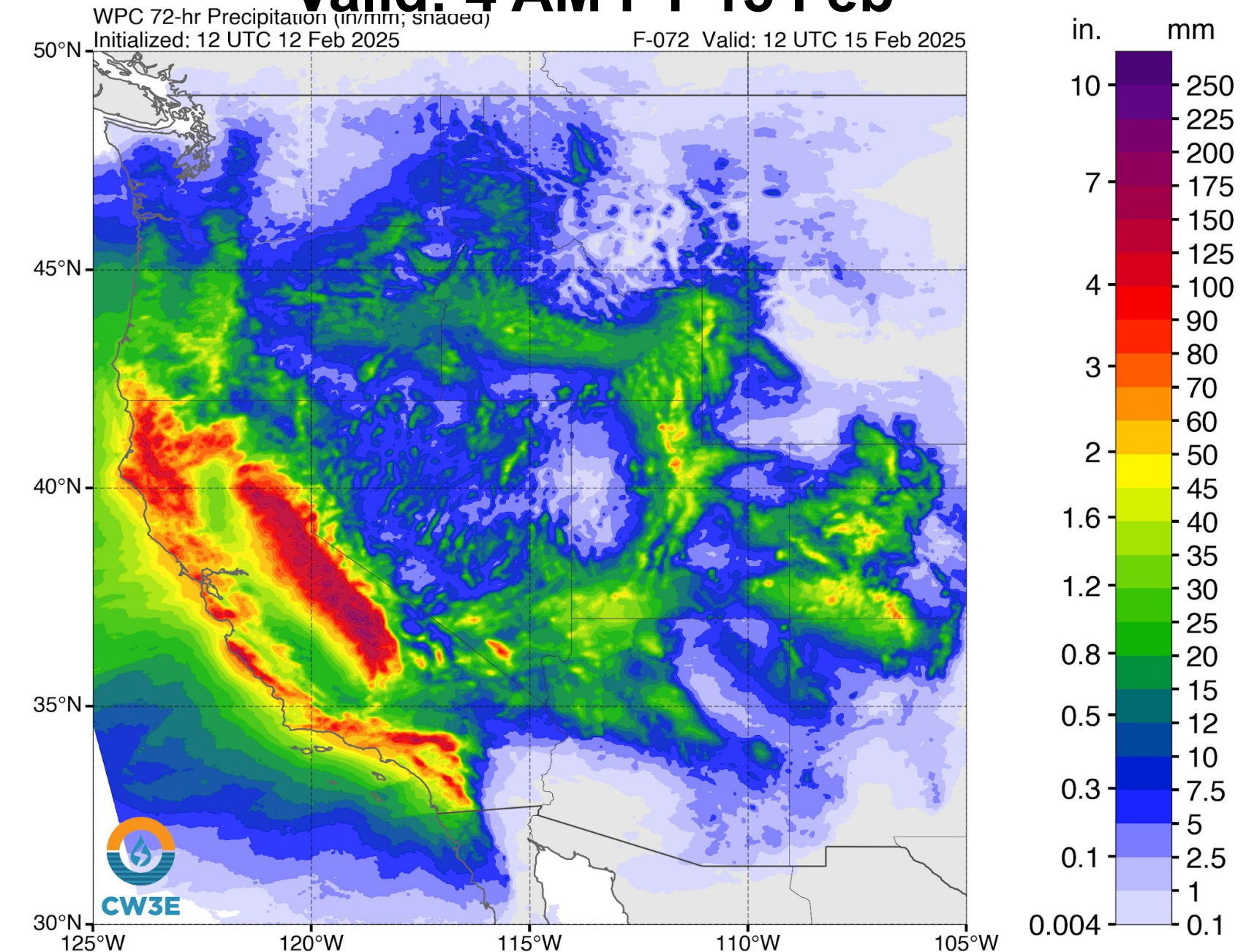
WPC 24-h Forecasts for Days 1-3

Valid: 4 AM PT 13-15 Feb



WPC 72-h QPF

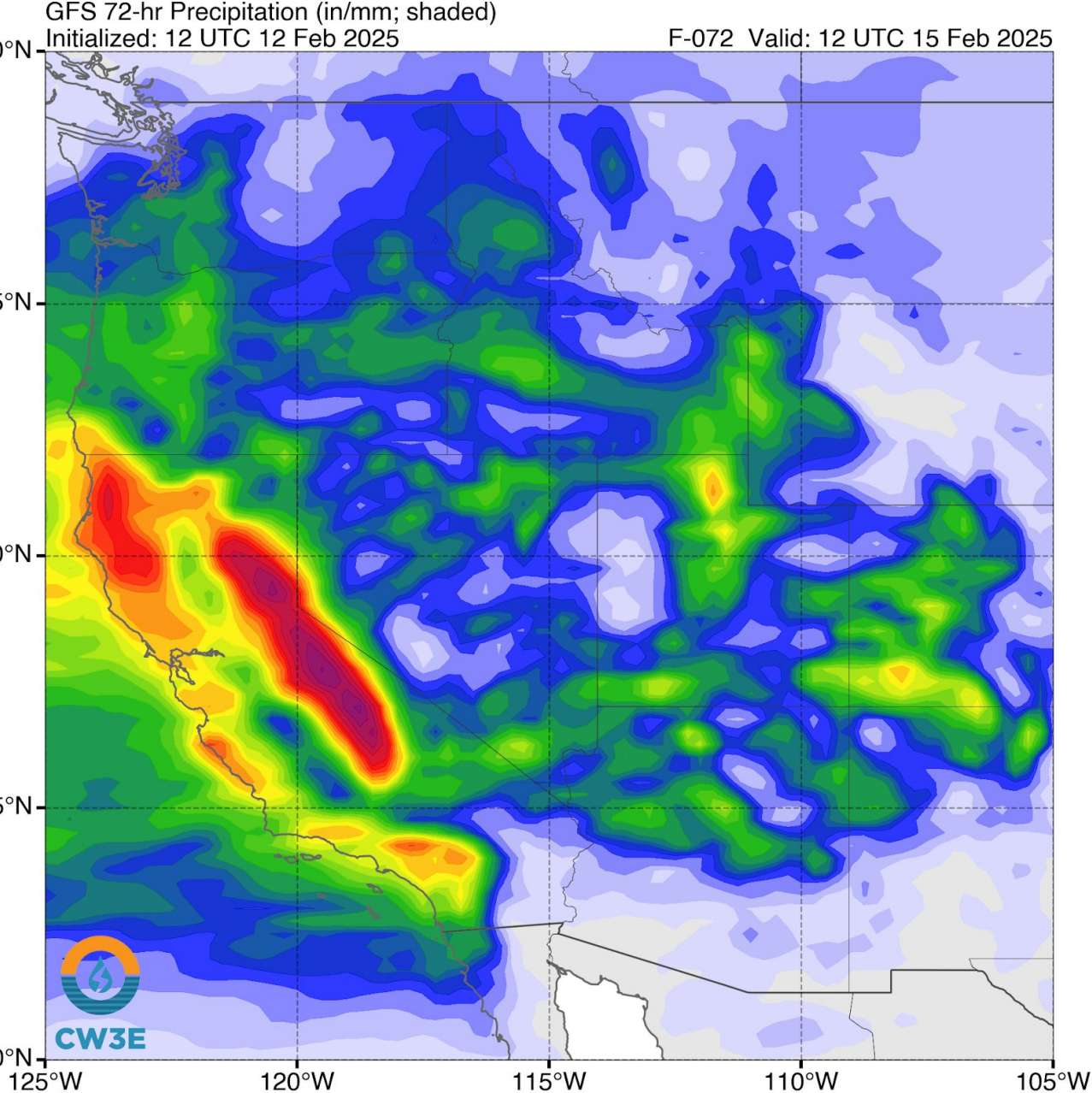
Valid: 4 AM PT 15 Feb



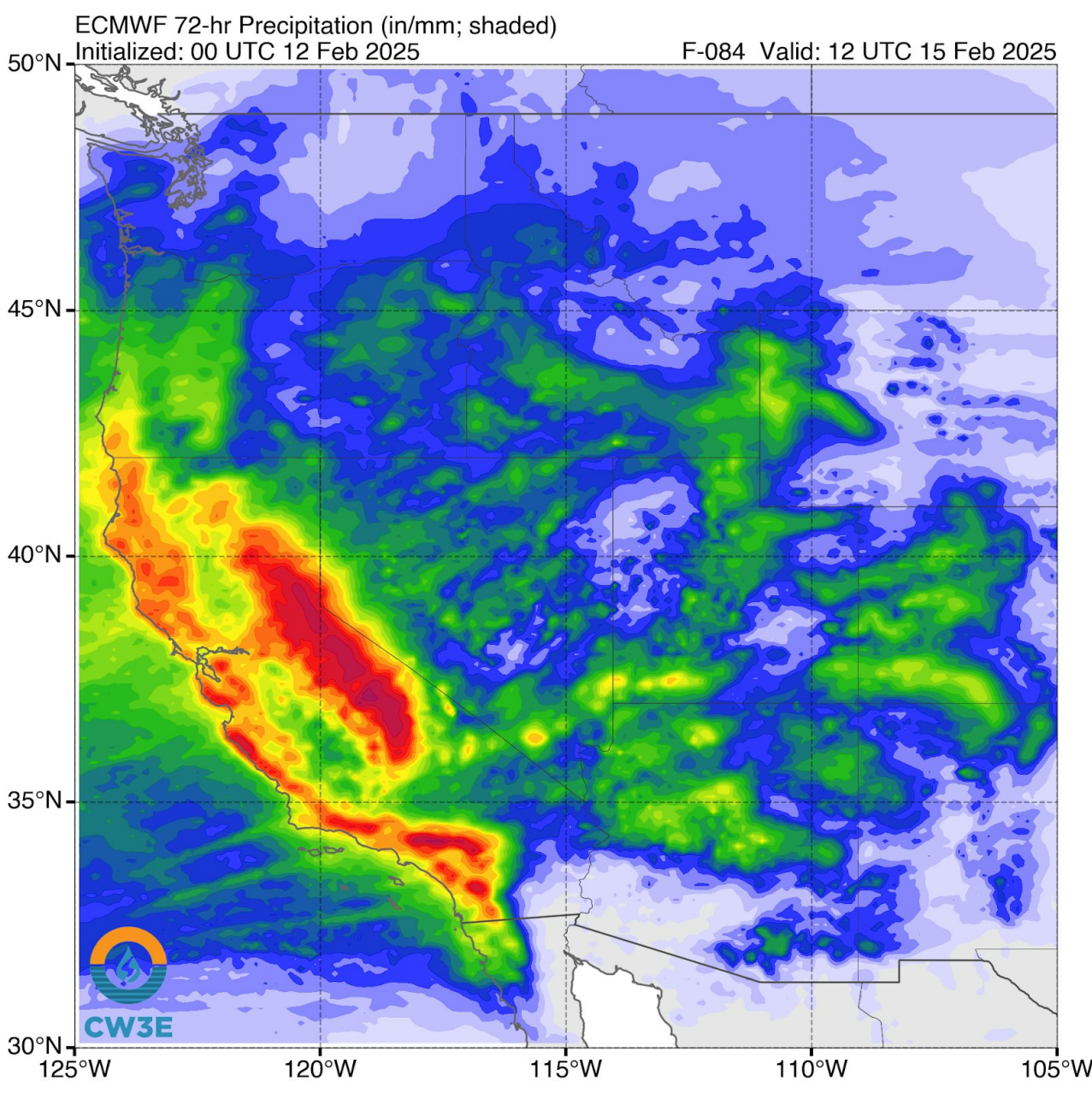
- The highest 3-day precipitation totals are expected over the Sierra Nevada, California Coast Ranges and Transverse Ranges where **at least 5 inches are expected**.
- A moderate risk Excessive Rainfall Outlook (ERO) (level 3 of 4, 40% chance of flooding) has been issued over the Transverse Ranges on day 2 (period ending 4 AM PT Fri 14 Feb).
- A slight risk ERO (level 2 of 4, 15% chance of flooding) has been issued over coastal California and in the Sierra Nevada foothills in days 1 and 2 (periods ending 4 AM PT 13 and 14 Feb).

Precipitation Forecasts Comparison

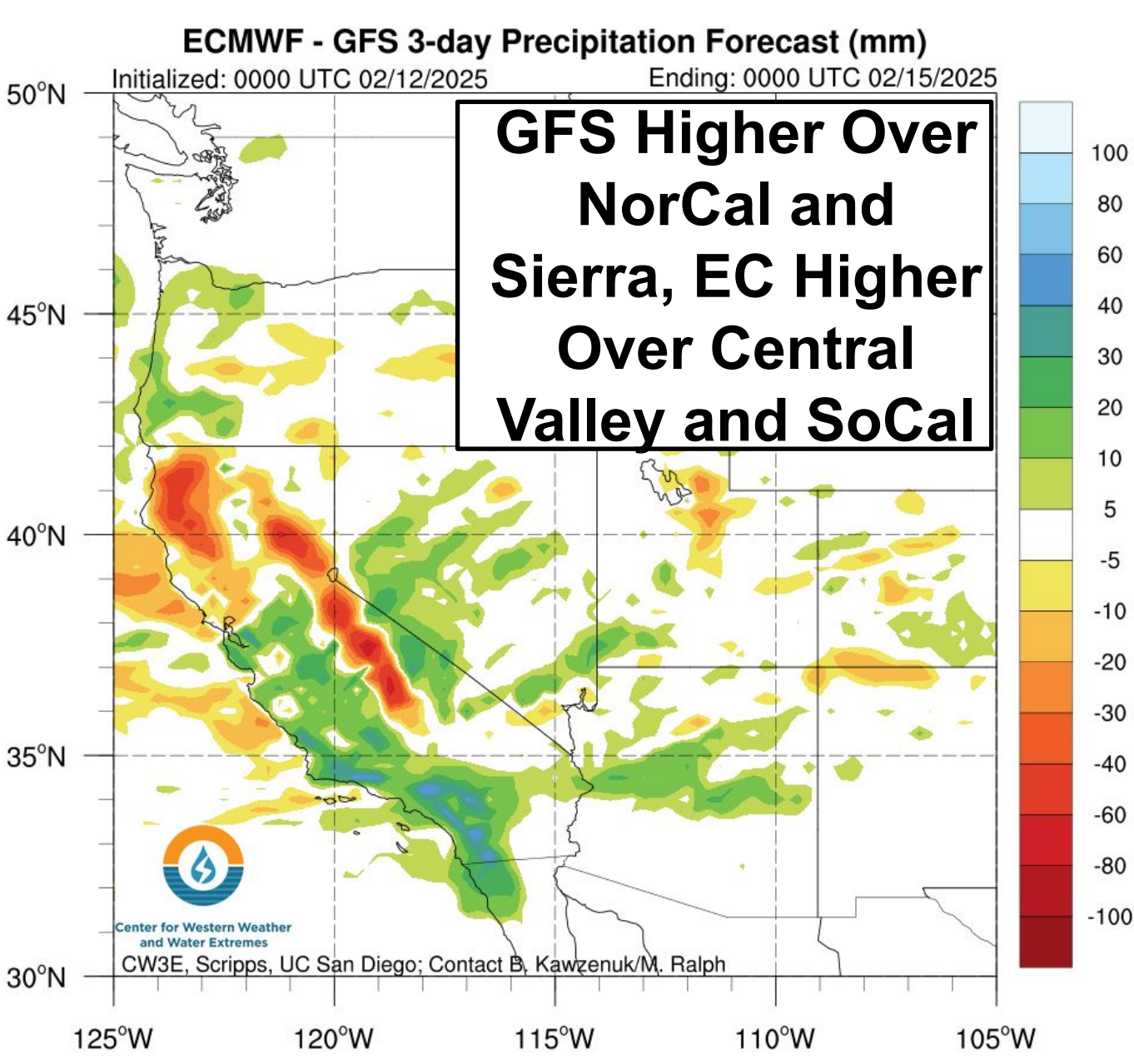
GFS 72-h QPF
Valid: 4 AM PT 15 Feb



ECMWF 72-h QPF
Valid: 4 AM PT 15 Feb

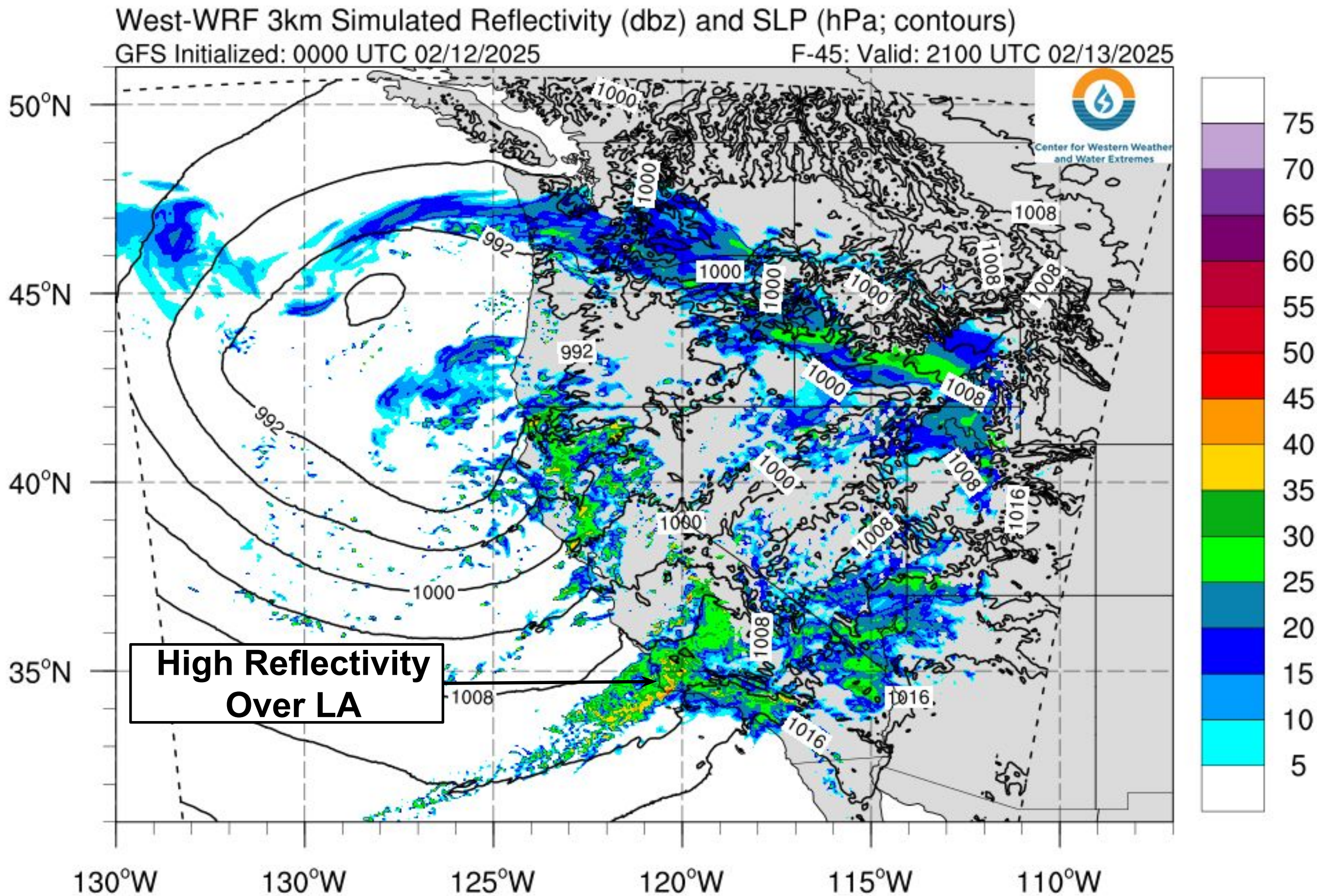


ECMWF-GFS 72-h QPF
Valid: 4 AM PT 15 Feb



- ECMWF and GFS precipitation totals vary across California for the duration of this system.
- The GFS is higher in Northern California and over the Sierra Nevada while the ECMWF is higher over Southern California.

West-WRF Simulated Reflectivity



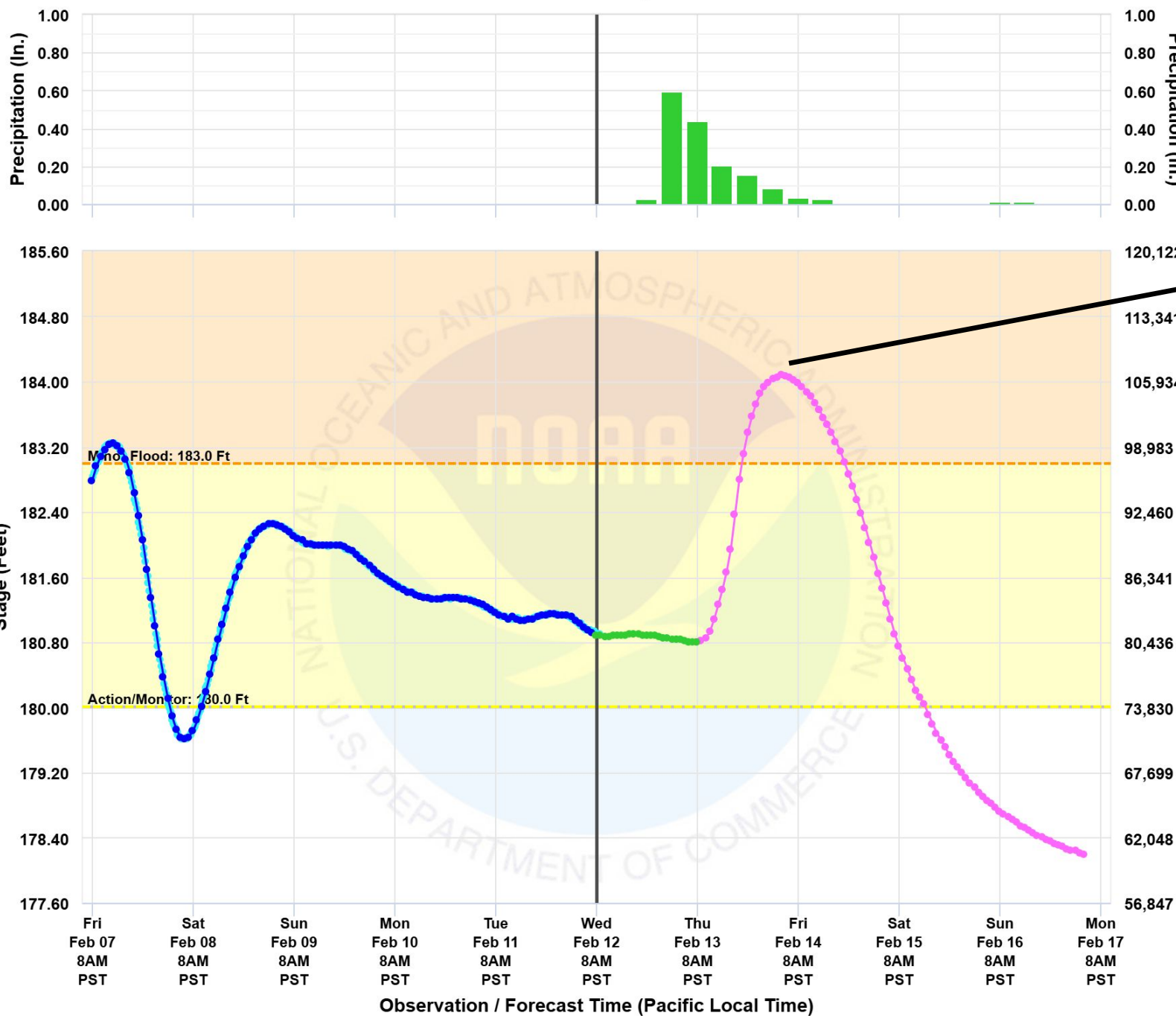
- The West-WRF simulated reflectivity is showing the possibility for localized heavy precipitation over Southern California with the potential for development of a narrow cold-frontal rainband (NCFR).
- This would bring short-duration, high-intensity precipitation to burn scar regions, heightening the potential for flash flooding and debris flows.

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Hydrologic Forecasts: California

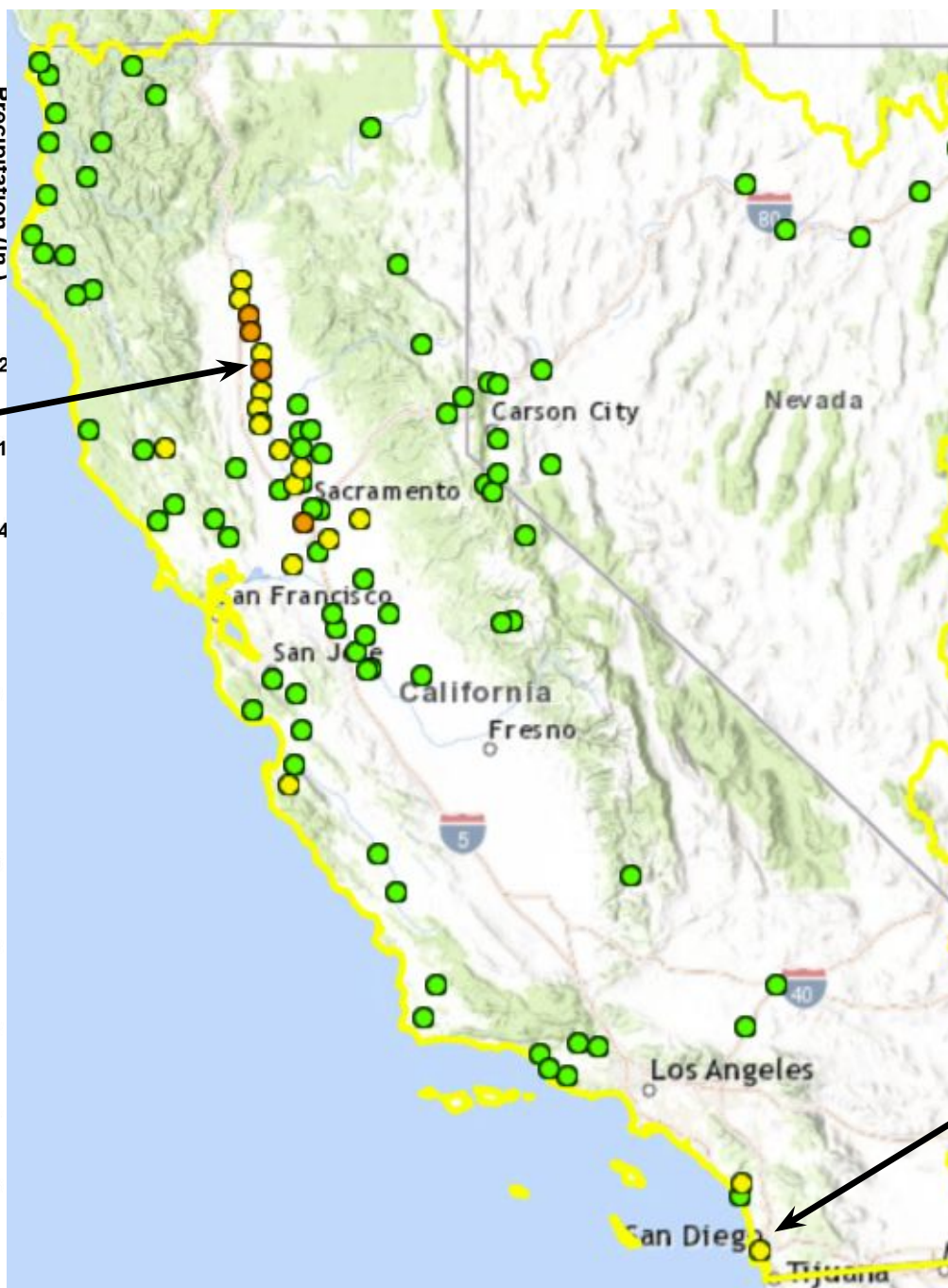
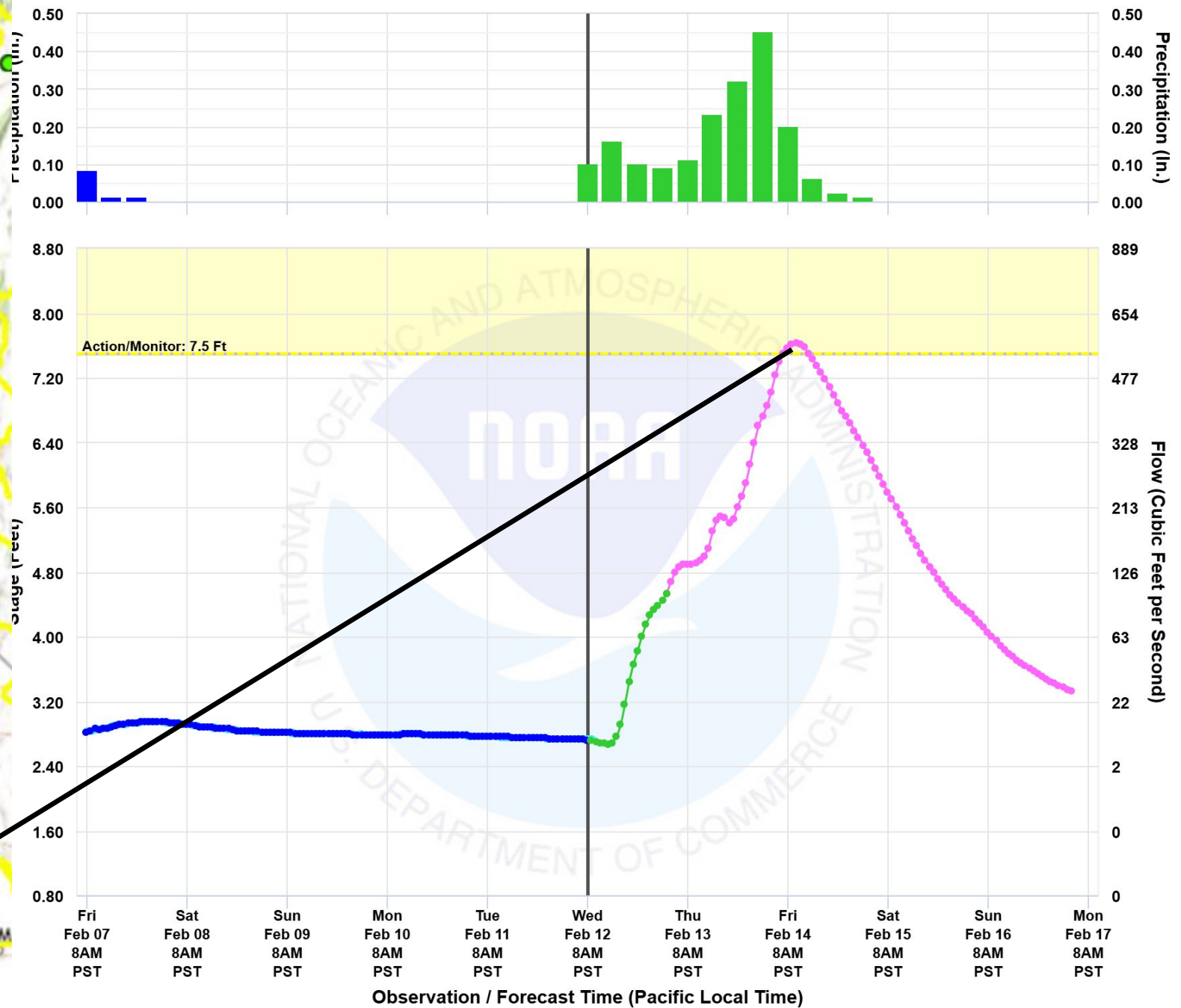
Sacramento River - Vina Woodson Bridge (VWBC1)
River Forecast Plot

Forecast Posted: 02/12/2025 at 7:53 AM PST • Graphic Created: 02/12/2025 at 8:01 AM PST



San Diego River - Fashion Valley (FSNC1)
River Forecast Plot

Forecast Posted: 02/12/2025 at 8:09 AM PST • Graphic Created: 02/12/2025 at 8:14 AM PST

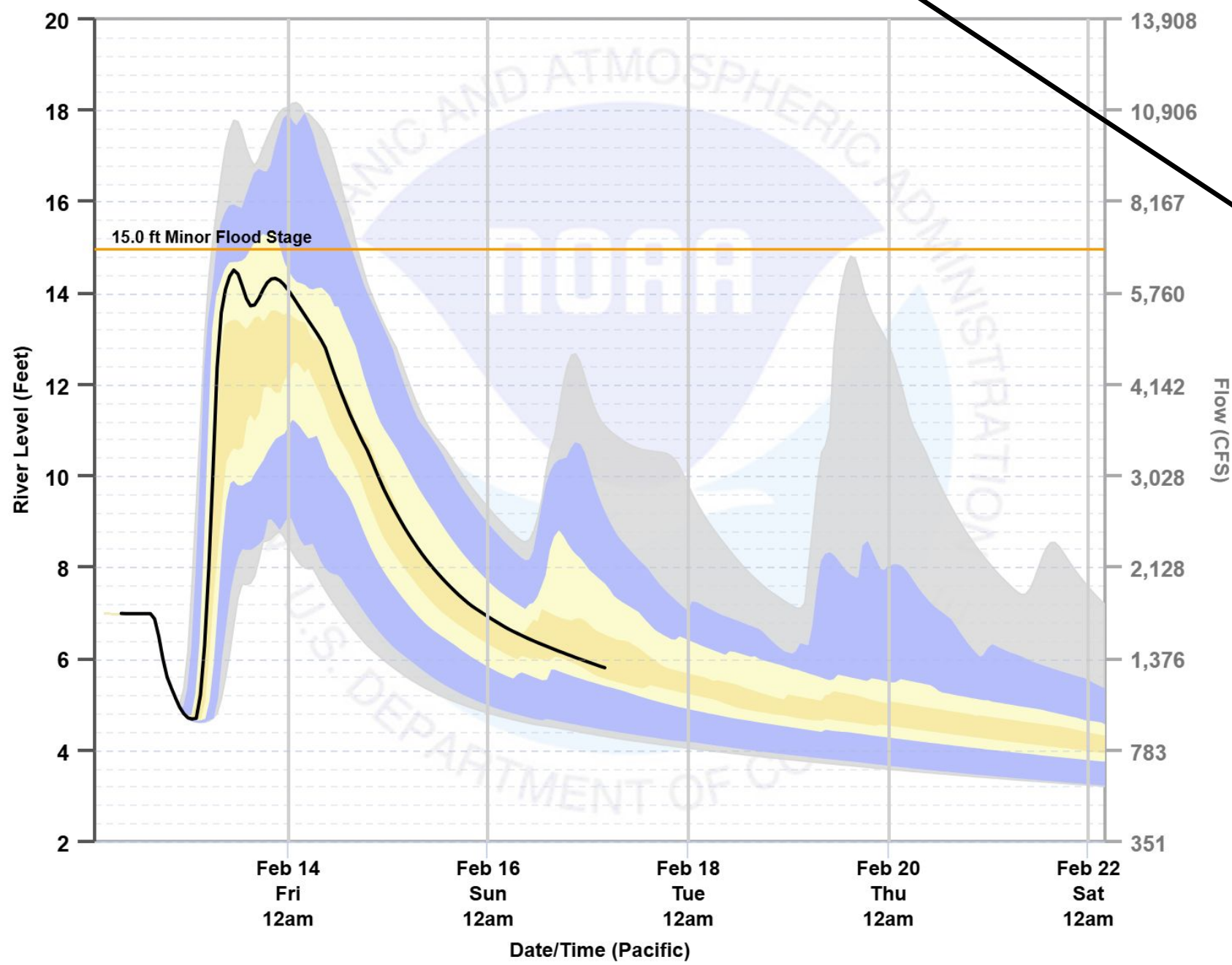


- The NWS California-Nevada River Forecast Center (CNRFC) is forecasting four stations to rise above minor flood stage (e.g., Sacramento River at Vina Woodson Bridge (left)) and 17 stations to rise above action/bankfull stage (e.g., San Diego River at Fashion Valley (right)) over the next three days.

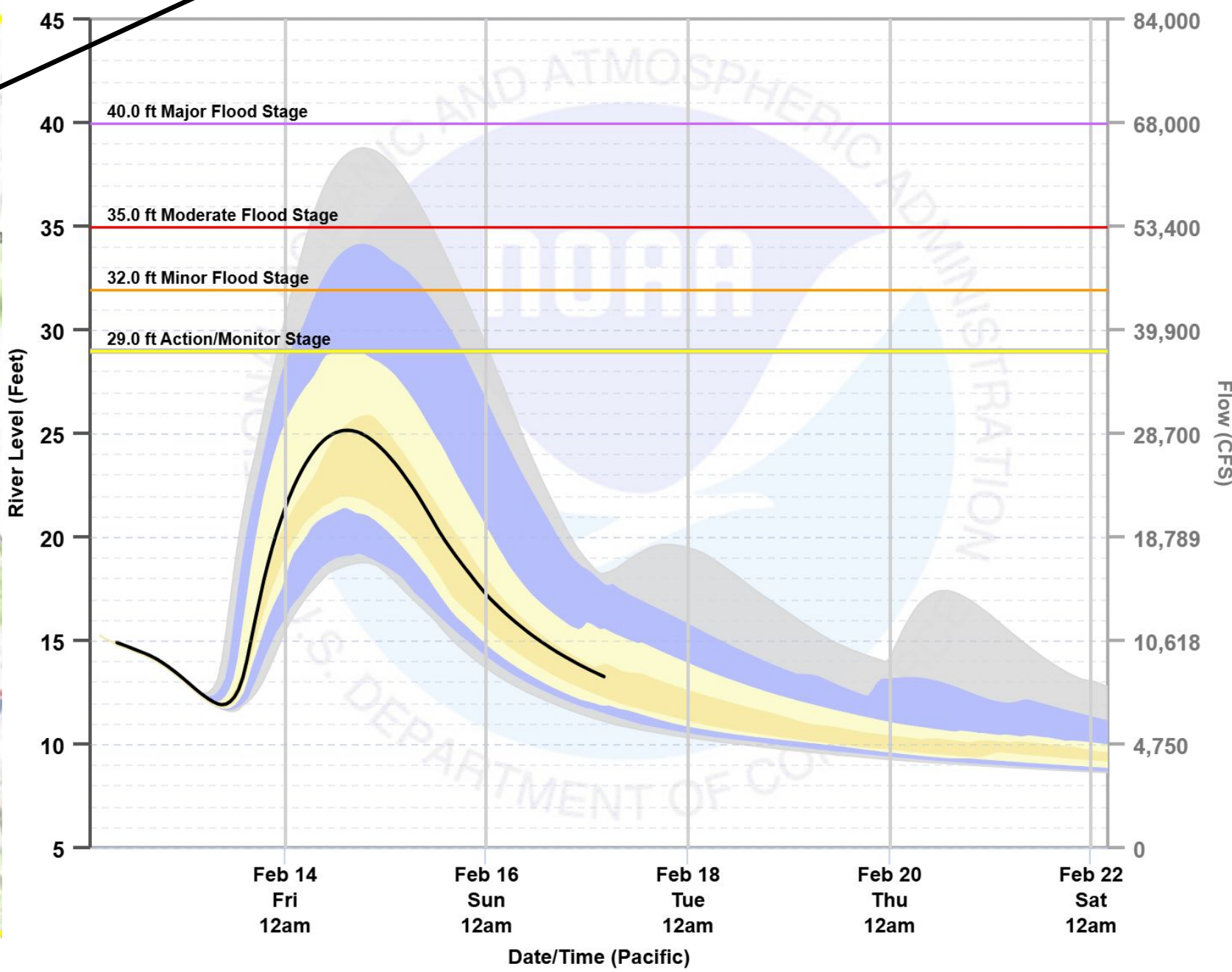
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Hydrologic Forecasts: California

Hourly Peak River Level Probabilities
RUSSIAN RIVER - HOPLAND (HOPC1)
Created: 02/12/2025 at 9:12 AM PST

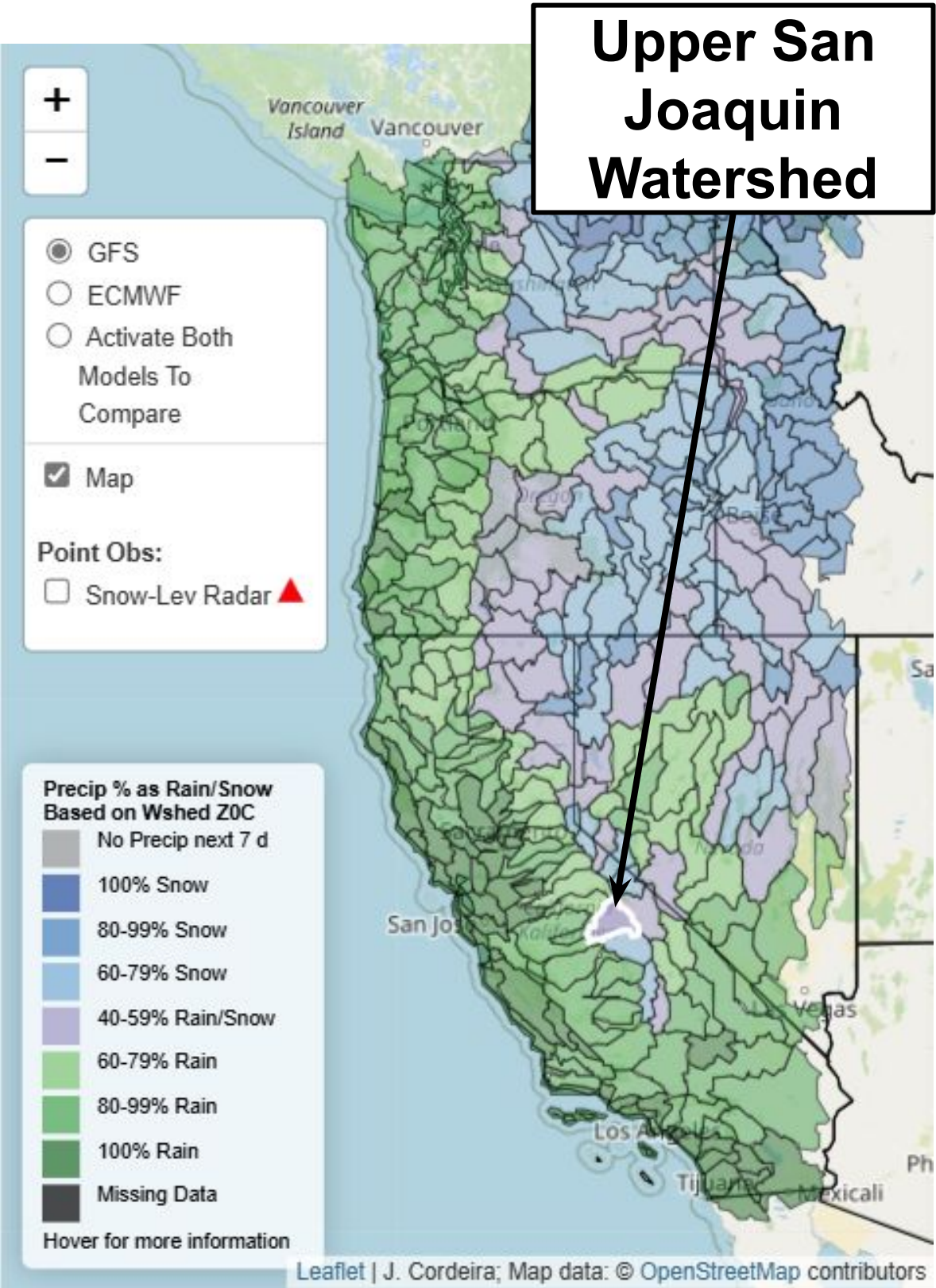
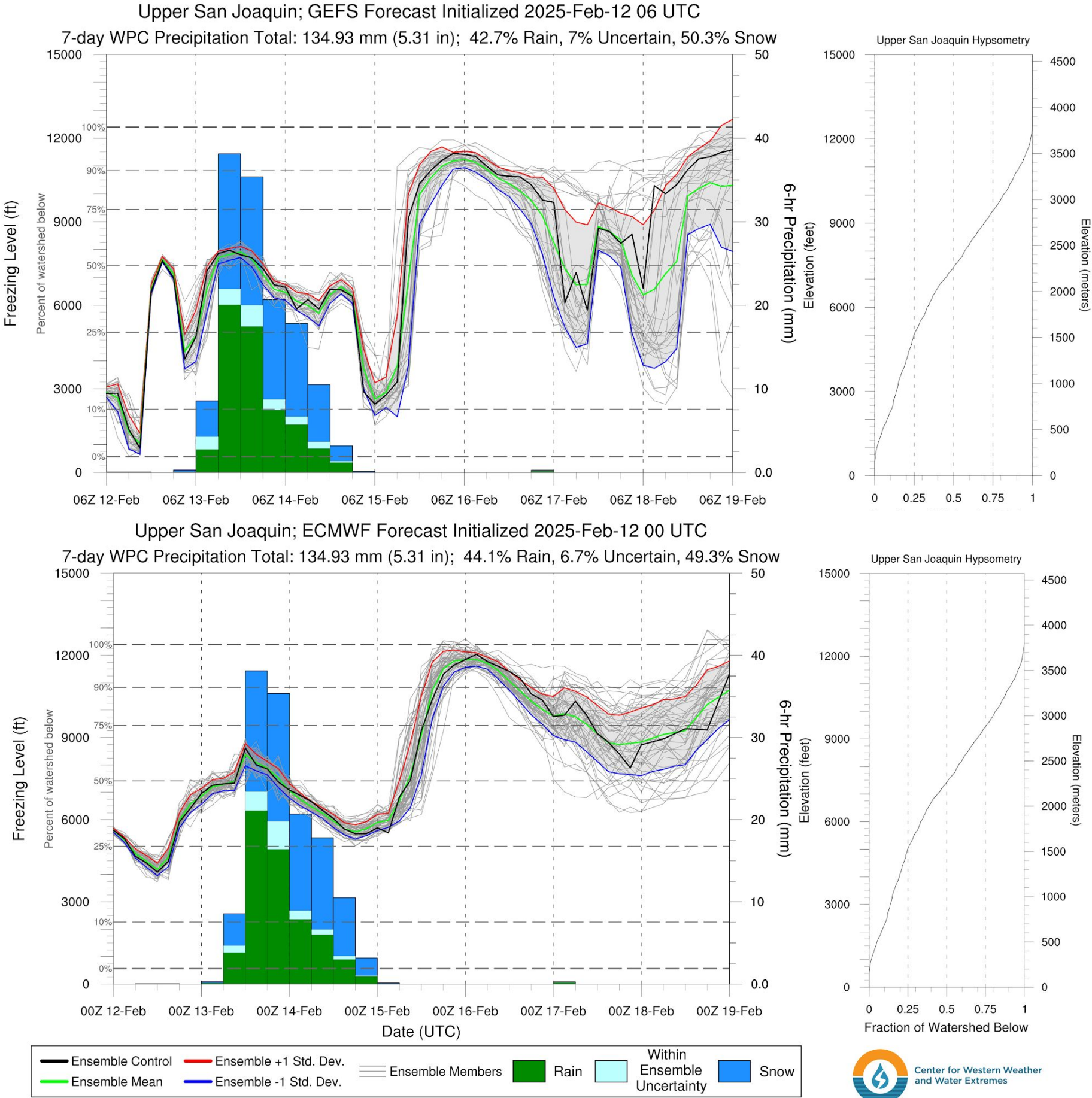


Hourly Peak River Level Probabilities
RUSSIAN RIVER - GUERNEVILLE (GUEC1)
Created: 02/12/2025 at 9:12 AM PST



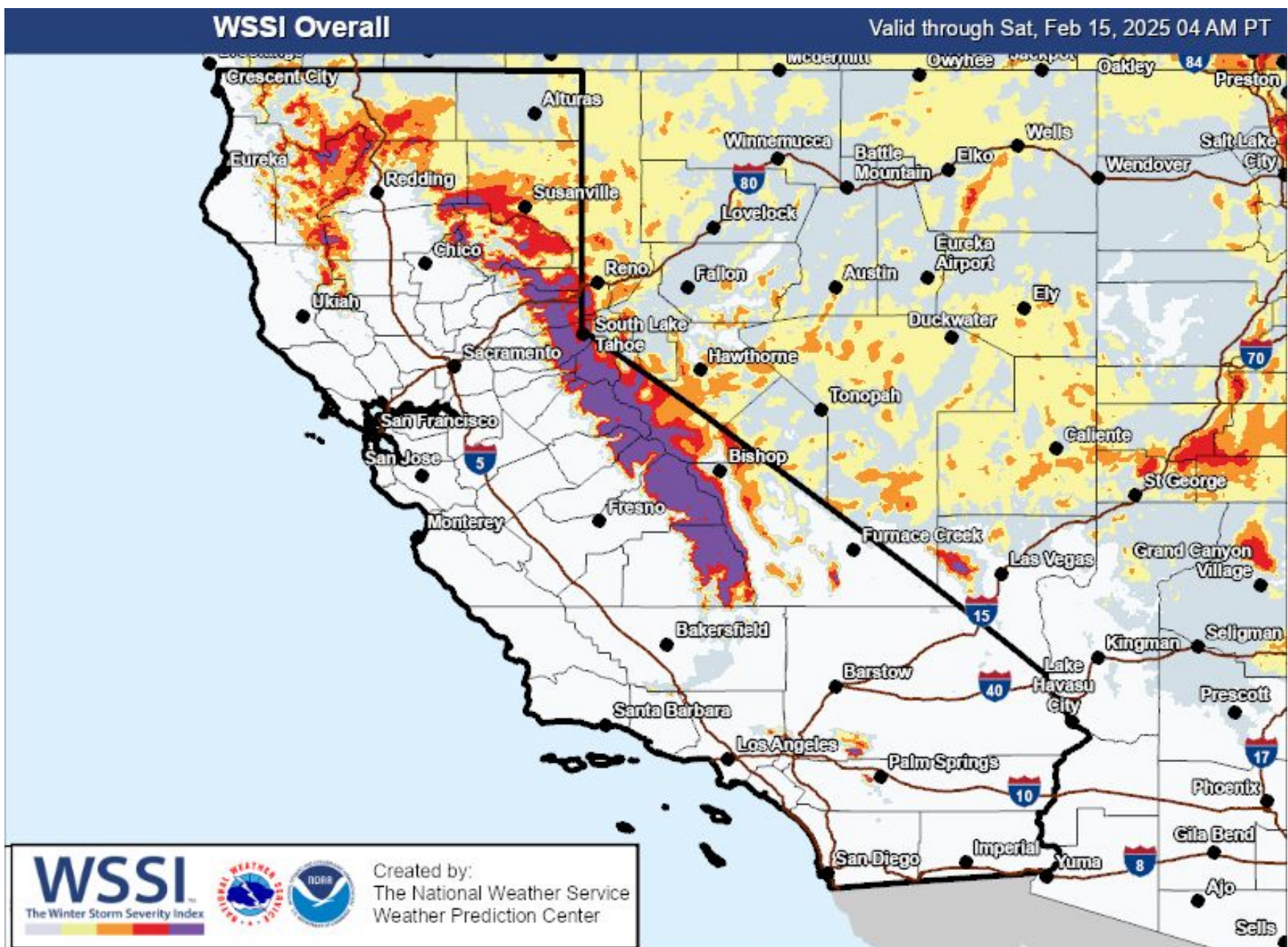
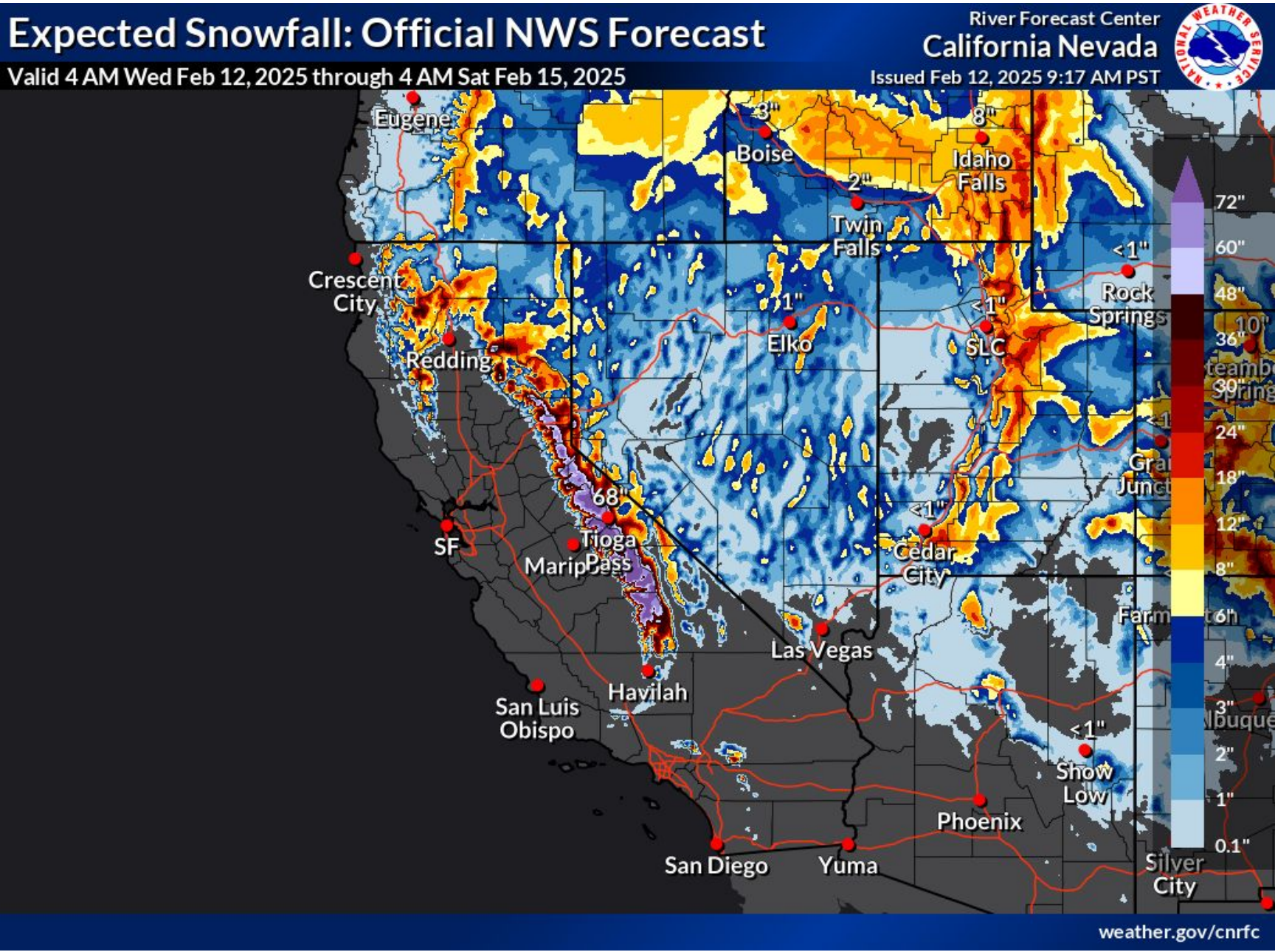
- The NWS CNRFC 5-day ensemble forecast is showing at least 25% probability of the Russian River exceeding minor flood stage at Hopland and action/monitor stage at Guerneville.

Watershed Freezing Level Forecast Comparison



- Freezing levels are forecast to rise to ~8,000 feet at the onset of the AR before falling to around ~6,000 feet as the AR propagates south.
- The GEFS and EPS are both forecasting ~50% of the precipitation to fall as snow in the Upper San Joaquin watershed, specifically at the highest elevations.

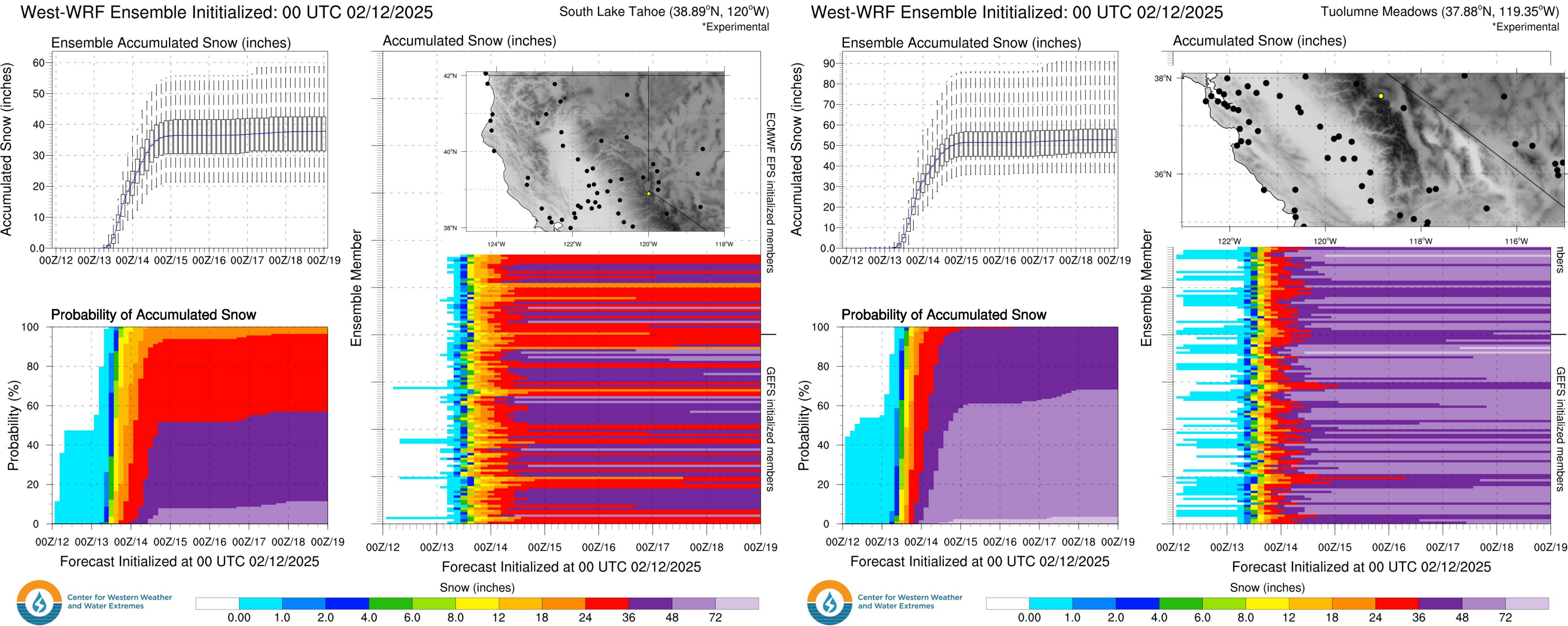
Winter Weather Hazards



Potential Winter Storm Impacts	
	Winter Weather Area Expect Winter Weather. • Winter driving conditions. Drive carefully.
	Minor Impacts Expect a few inconveniences to daily life. • Winter driving conditions. Use caution while driving.
	Moderate Impacts Expect disruptions to daily life. • Hazardous driving conditions. Use extra caution while driving. • Closures and disruptions to infrastructure may occur.
	Major Impacts Expect considerable disruptions to daily life. • Dangerous or impossible driving conditions. Avoid travel if possible. • Widespread closures and disruptions to infrastructure may occur.
	Extreme Impacts Expect substantial disruptions to daily life. • 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.

- Snowfall accumulations of 48+ inches are expected over the highest elevations of the Sierra Nevada in the next three days. This snowfall is expected to be beneficial to regions that have received below average snowfall this water year, particularly in the Central and Southern Sierra Nevada.
- WPC’s Winter Storm Severity Index (WSSI) is showing extreme winter storm impacts across the Sierra Nevada.

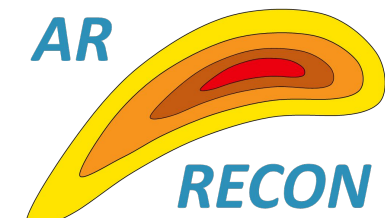
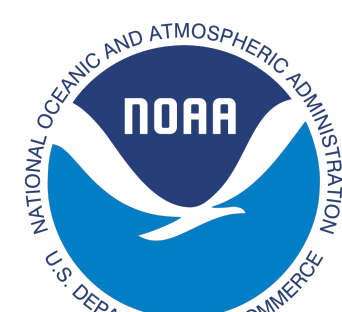
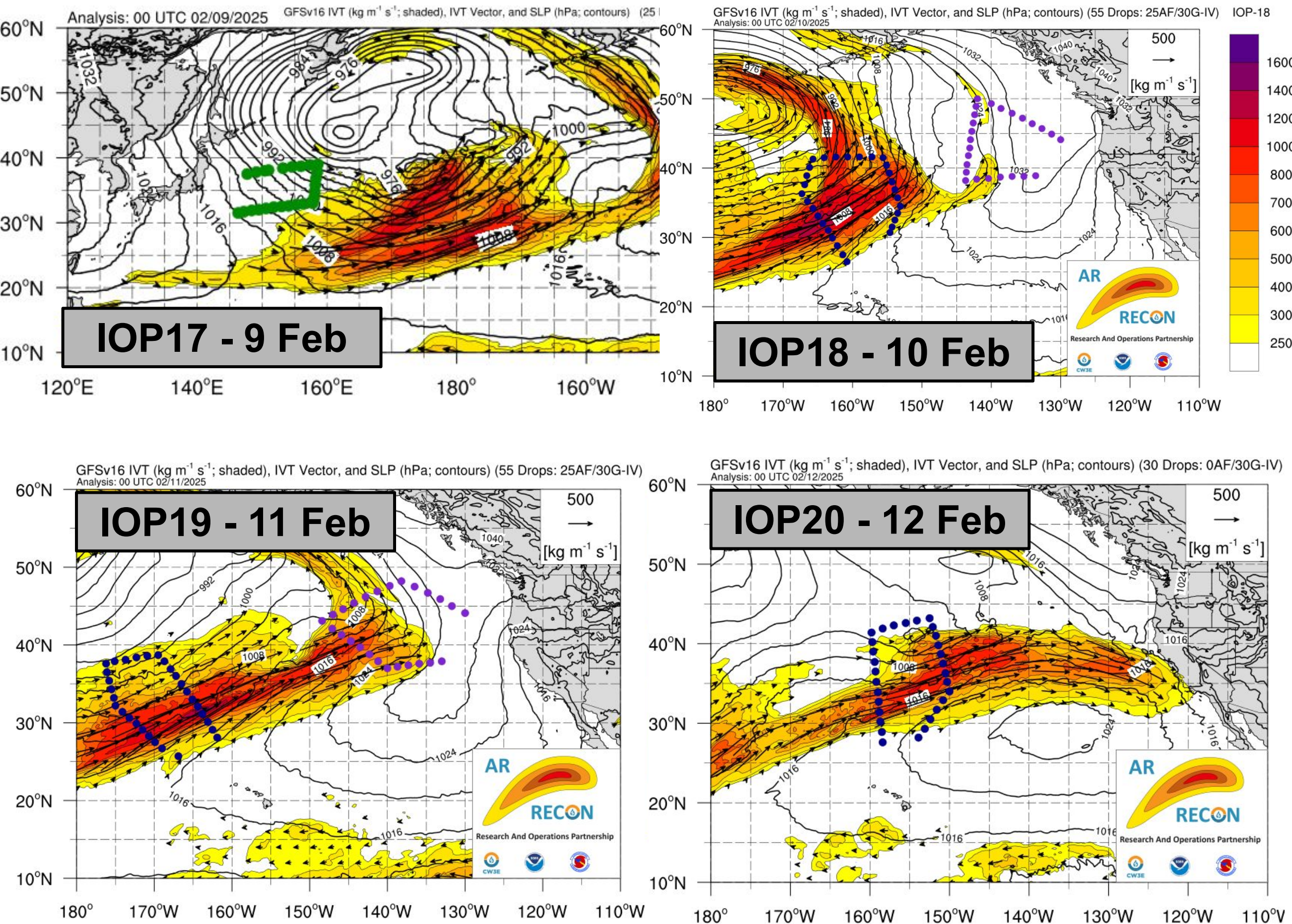
West-WRF Ensemble: Total Snow Accumulation



- The West-WRF ensemble is showing high probabilities of at least 24 inches of snow over Northern Sierra Nevada (left, ~90%) and at least 48 inches over Central Sierra Nevada (right, ~60%%).

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Current AR Recon Flight Sequence



- CW3E's AR Reconnaissance (AR Recon) field campaign continues in WY2025, with the most recent sequence of flights focusing on the development of the current AR storms.
- AR Recon completed 4 IOPs, departing from Yokota, Japan, Sacramento, CA and Honolulu, HI to fly over and around ARs in across the N. Pacific; the team continues to meet and plan flights for this sequence
- These missions provide data in near real-time to the global forecast models to improve weather forecasts. Data from these missions are archived for future AR research.
- Flights sample the atmosphere and its essential atmospheric structures, in addition to regions of forecast sensitivity.