CW3E Atmospheric River Outlook: 10 November 2025

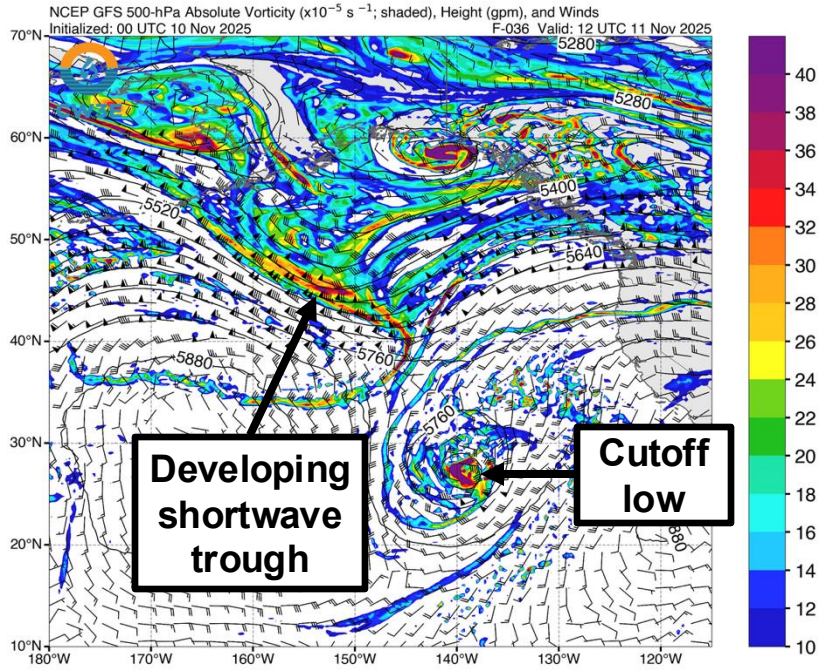
Atmospheric River Forecast to Bring Heavy Rain and Snow to California This Week

- An amplifying shortwave south of Alaska is forecast to interact with a cutoff low and a region of poleward moisture transport in the subtropical Northeast Pacific, eventually leading to the formation of a strong atmospheric river (AR) along the US West Coast late Wed 12 Nov.
- This AR is forecast to bring strong AR conditions (IVT ≥750 kg m^{-1} s^{-1}) to the Bay Area and then quickly move through southern California on Thu 13 Nov.
- The GEFS and ECMWF ENS control members are forecasting an AR 2/AR 3 (based on the Ralph et al. 2019 AR Scale) over portions of coastal northern and central California. Overall, the ECMWF ENS is forecasting a higher peak IVT magnitude and a slightly longer duration of AR conditions over much of coastal California.
- **Marginal risk** excessive rainfall outlooks (EROs) have been issued for the Klamath Mountains, Northern Sierra Nevada, Northern California Coast Ranges, and much of coastal central and southern California due to the potential for high rainfall rates in the core of the AR.
- The NWS Weather Prediction Center is forecasting 2–4 inches of storm-total precipitation in portions of the Klamath Mountains, southern Cascades, Sierra Nevada, California Coast Ranges, and Transverse Ranges, and 1–2 inches elsewhere in coastal California and the Central Valley.
- Decreasing freezing levels will likely facilitate significant snowfall accumulations in the higher terrain of the central and southern Sierra Nevada. Moderate winter storm impacts are expected in these areas.
- These ARs will likely bring beneficial precipitation to areas that are currently experiencing moderate-to-severe drought in southern California.

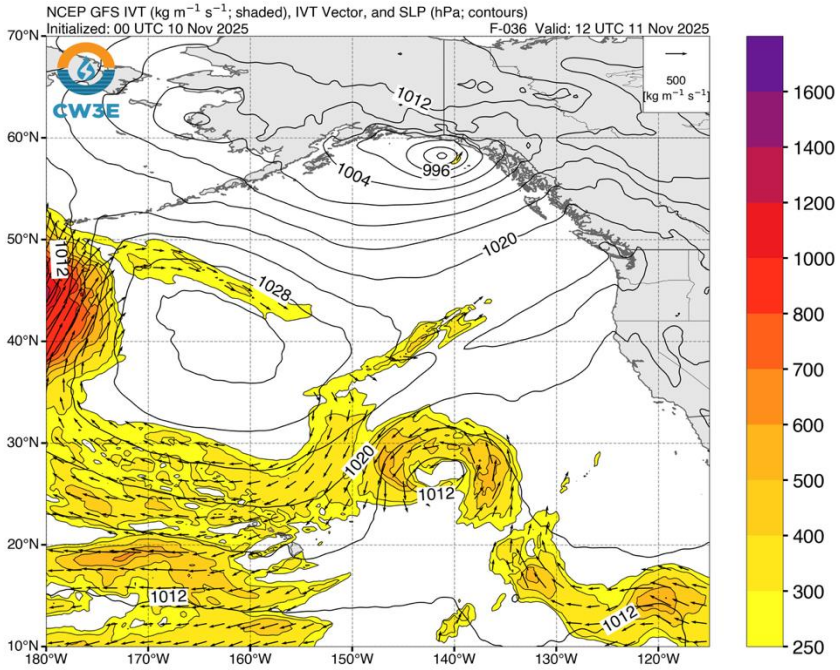
AR Outlook: 10 November 2025

GFS Forecasts: Valid 4 AM PT 11 Nov (F-036)

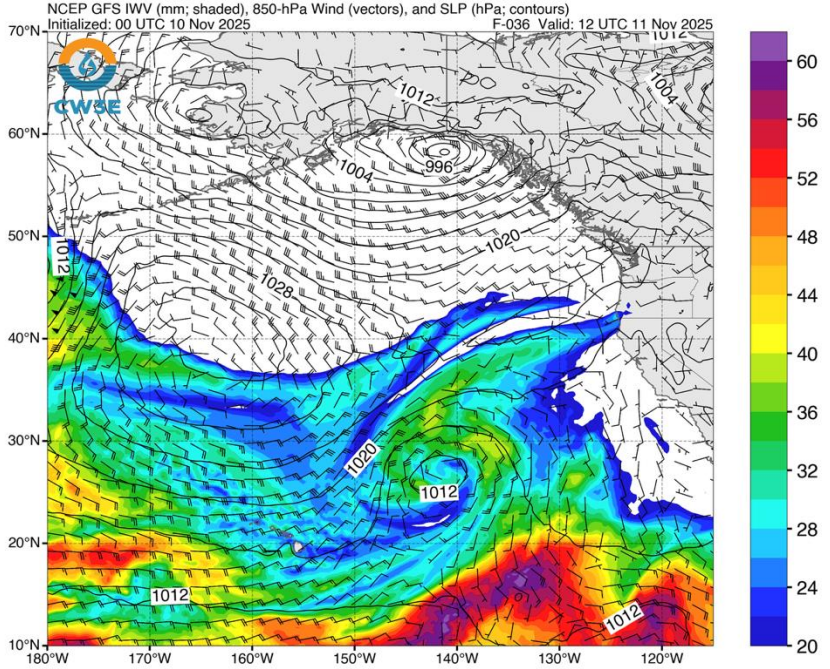
500-hPa Height & Vorticity



IVT & SLP



IWV, SLP & 850-hPa Wind

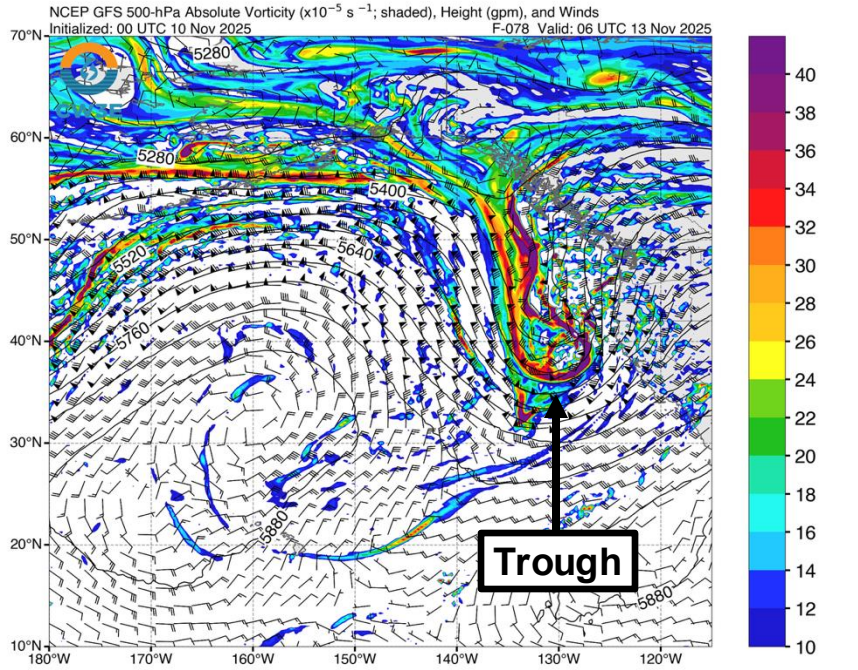


- A cutoff low and an associated weak surface low are forecast to form over the subtropical Northeast Pacific later today.
- As the cutoff low begins to drift northward and draw subtropical moisture poleward, an upper-level shortwave trough is forecast to develop south of Alaska and propagate southeastward.

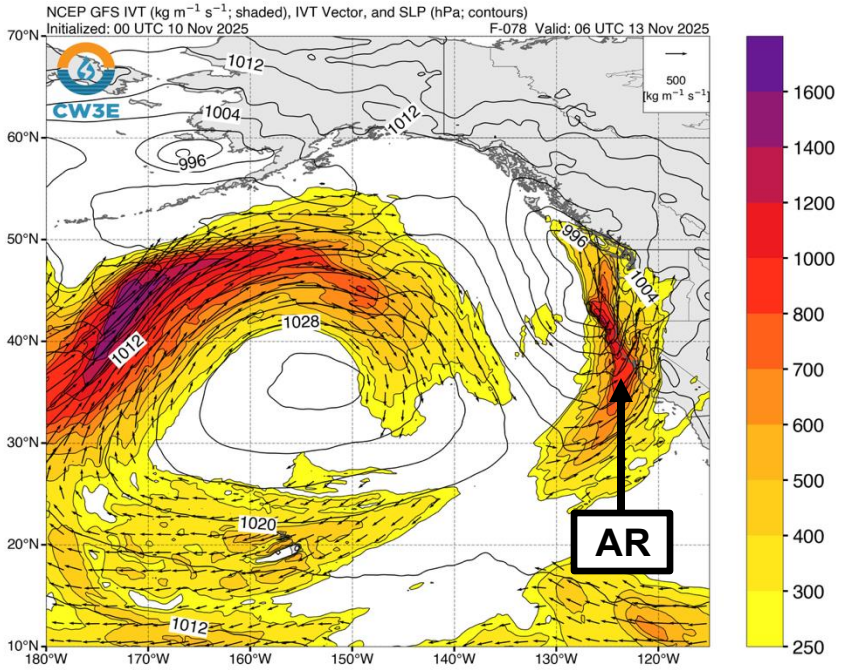
AR Outlook: 10 November 2025

GFS Forecasts: Valid 10 PM PT 12 Nov (F-078)

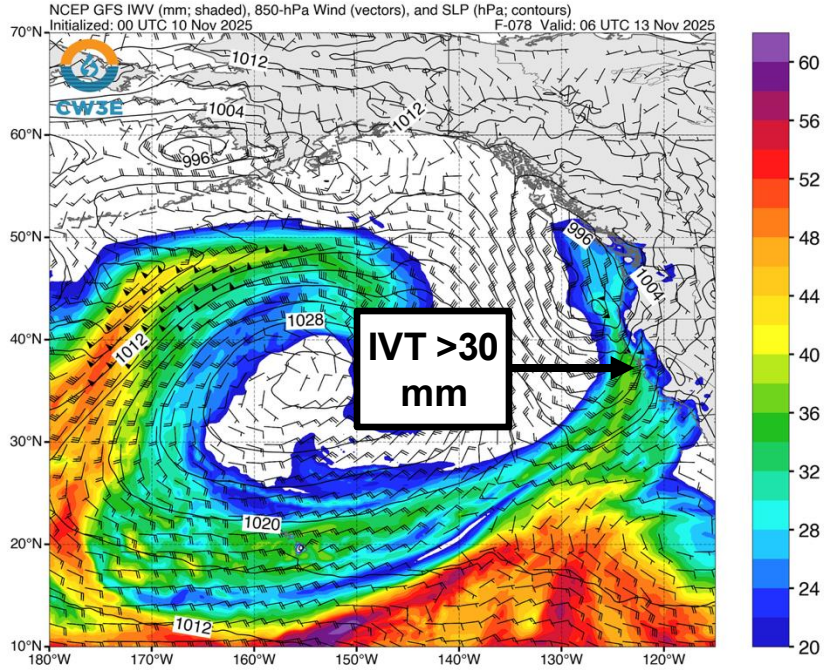
500-hPa Height & Vorticity



IVT & SLP



IWV, SLP & 850-hPa Wind

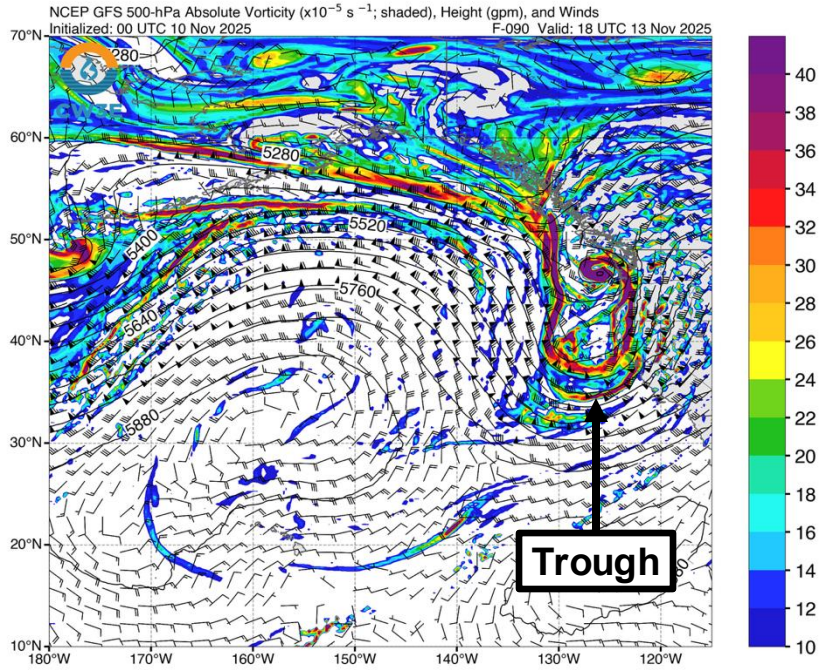


- As the trough continues to amplify and propagate eastward, it is forecast to phase with the weakening cutoff low and its associated region of moisture transport.
- Strengthening southerly flow downstream of the trough will lead to the development of a strong AR along the US West Coast on Wed 12 Nov.
- IVT magnitudes ≥750 kg m^{-1} s^{-1}, IWV >30 mm, and south-to-southwesterly low-level winds >40 kt are forecast in the vicinity of the Bay Area as the core of the AR moves onshore.

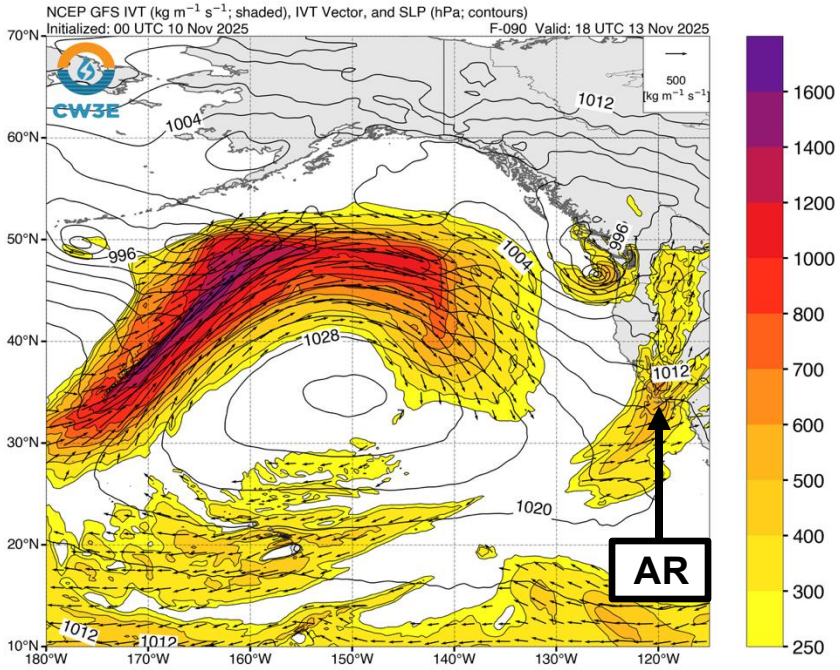
AR Outlook: 10 November 2025

GFS Forecasts: Valid 10 AM PT 13 Nov (F-090)

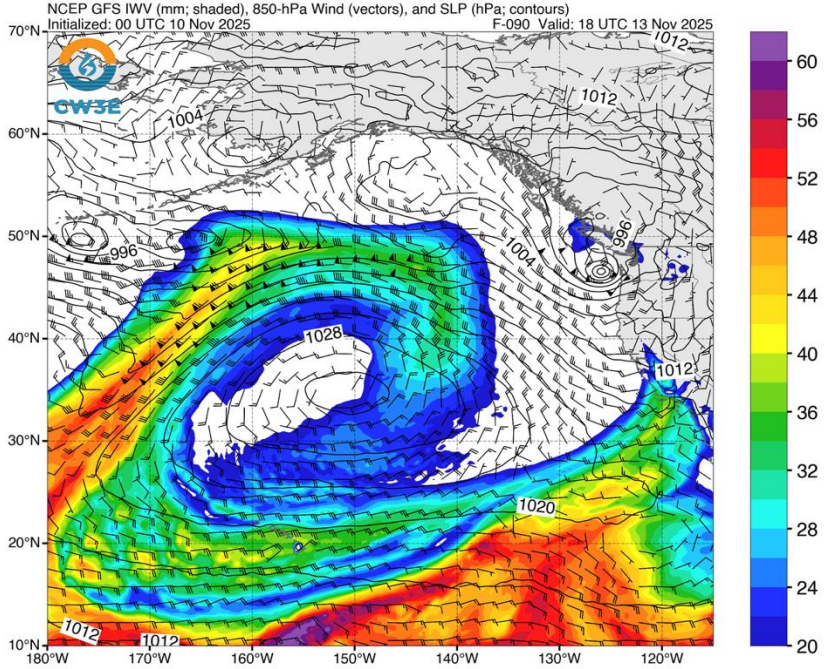
500-hPa Height & Vorticity



IVT & SLP



IWV, SLP & 850-hPa Wind

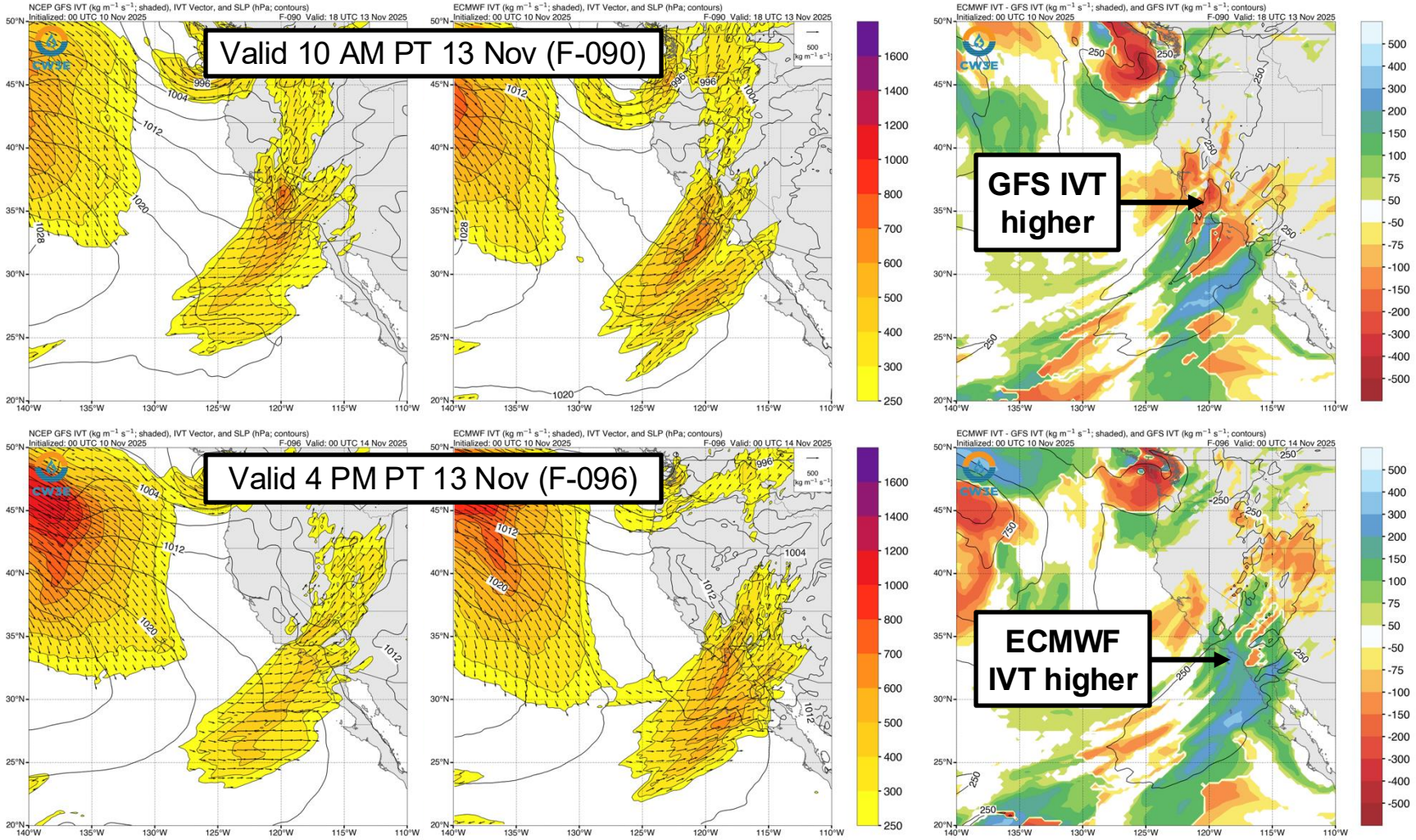


- As the trough begins to move onshore on Thu 13 Nov, the AR is forecast to quickly propagate eastward and bring a brief period of moderate AR conditions (IVT ≥500 kg m^{-1} s^{-1}) to southern California.

AR Outlook: 10 November 2025

GFS & ECMWF IVT Forecasts

GFS | ECMWF | Difference (ECMWF Minus GFS)



- There are subtle model-to-model differences in the forecasts of the AR after it makes landfall.
- Compared to the deterministic ECMWF, the deterministic GFS is forecasting higher IVT magnitudes over interior central California and lower IVT magnitudes over coastal southern California as the core of the AR moves through the state.
- The orientation of the IVT vectors over southern California is also more southerly in the ECMWF, which is more optimal for orographic precipitation enhancement in the Transverse Ranges.

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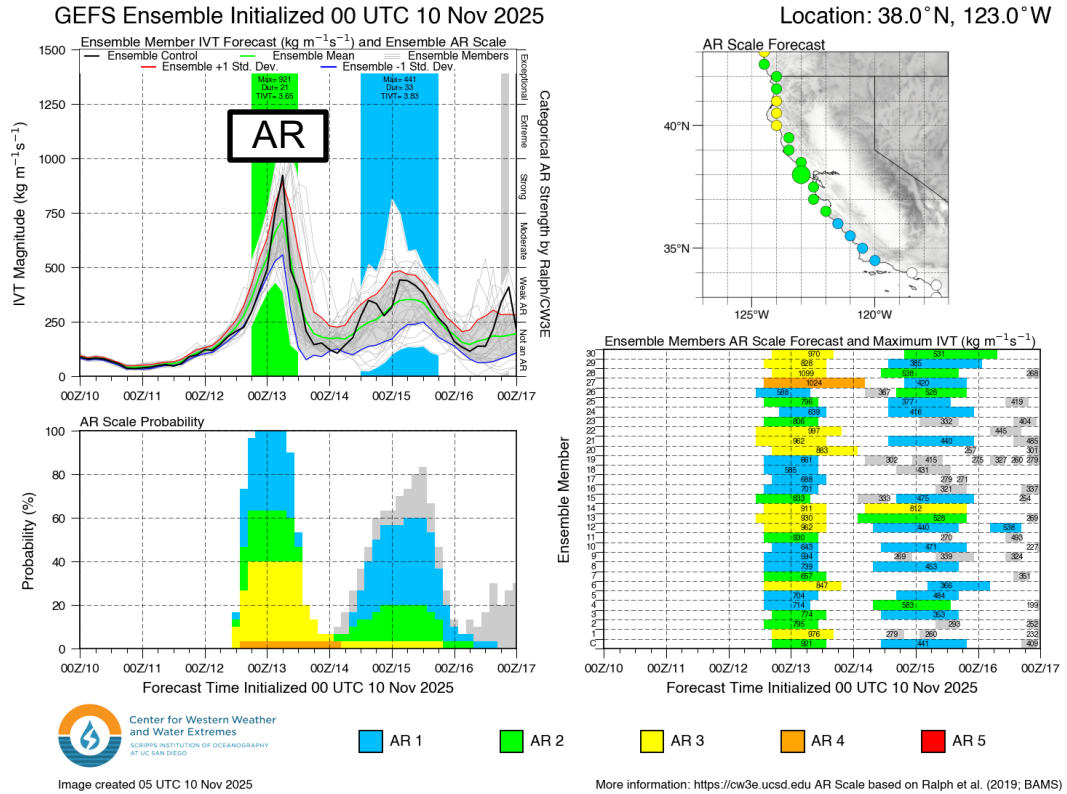
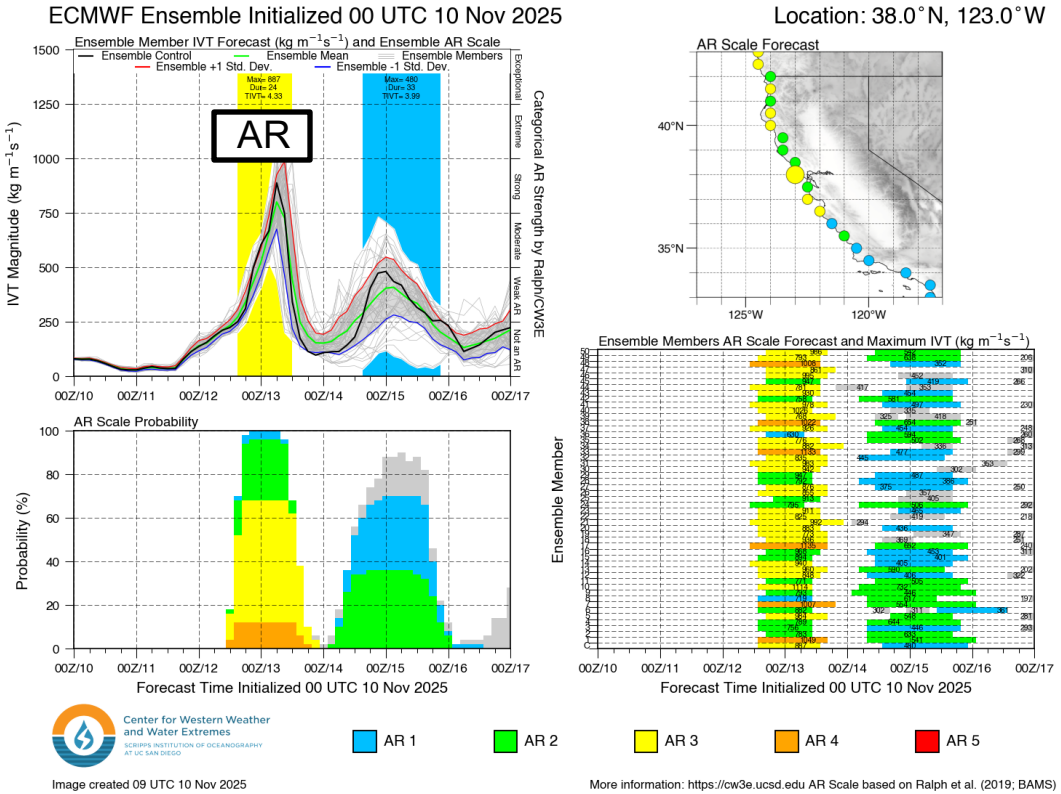
GEFS vs ECMWF AR Scale and IVT Forecasts: Northern CA

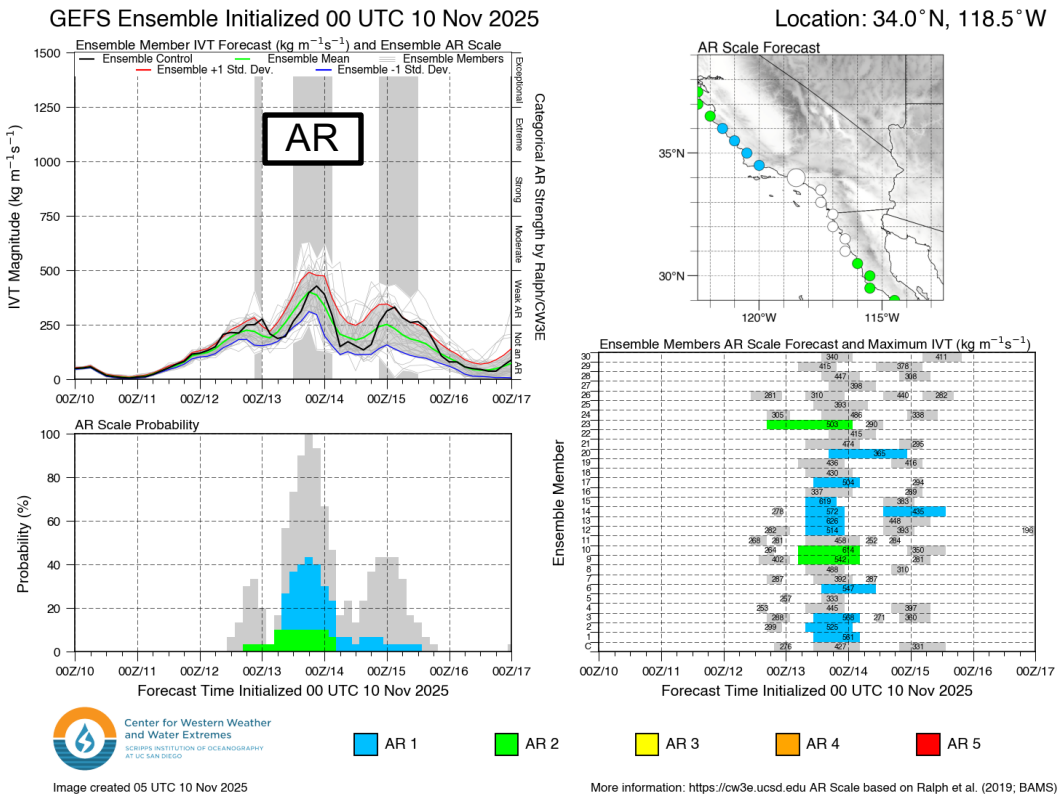


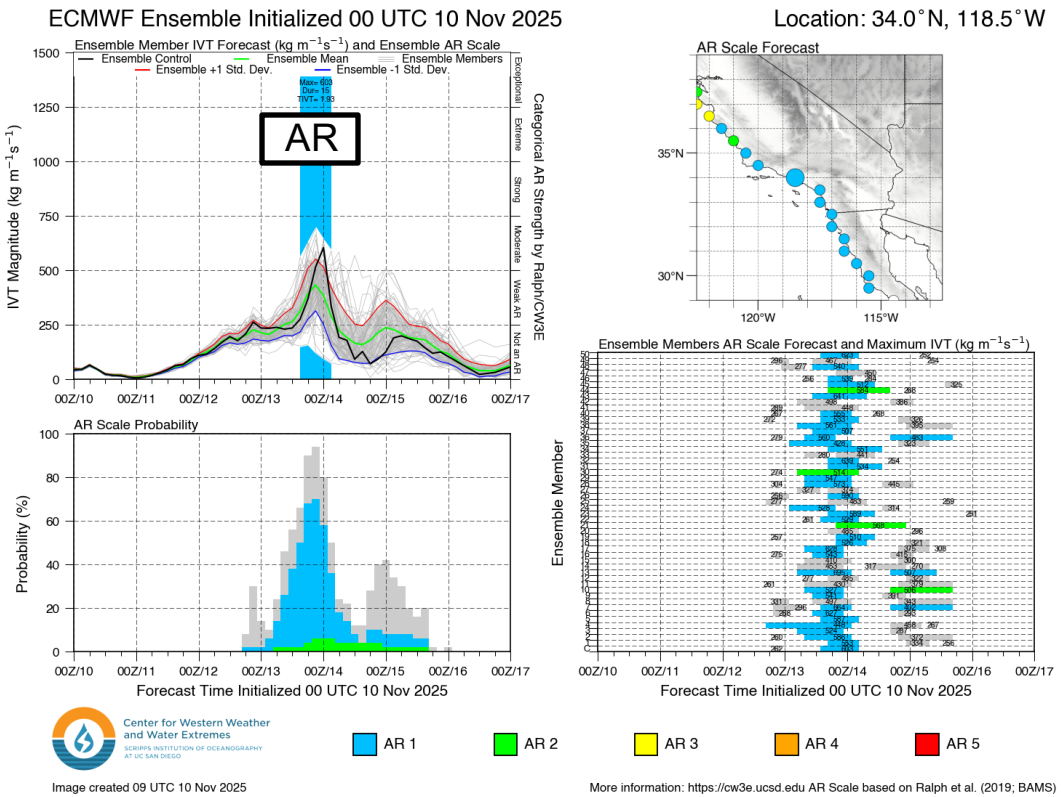


- The GEFS and ECMWF ENS control members are forecasting an AR 2/AR 3 (based on the Ralph et al. 2019 AR Scale) between the Oregon/California border and the Monterey Peninsula.
- Compared to GEFS, the ECMWF ENS is showing higher confidence (68% probability vs 39% probability) in an AR 3 at 38.0°N, 123.0°W (Marin County). Overall, the ECMWF ENS members are forecasting higher maximum IVT magnitudes and slightly longer AR durations.
- Both ensembles are showing large spread in forecast IVT magnitudes at this location as the AR makes landfall late Wed 12 Nov.
- There is also some uncertainty in the timing of maximum IVT and the duration of AR conditions.

AR Outlook: 10 November 2025

GEFS vs ECMWF AR Scale and IVT Forecasts: Southern CA





- The ECMWF ENS control member is forecasting an AR 1 over all of coastal southern California, whereas the GEFS control member is not forecasting AR Scale conditions from Los Angeles County southward.
- Compared to GEFS, the ECMWF ENS is showing higher confidence (75% probability vs 42% probability) in an AR 1 at 34.0°N, 118.5°W (Los Angeles County).
- Both ensembles are showing considerable uncertainty in forecast IVT magnitudes and the timing and duration of AR conditions at this location.

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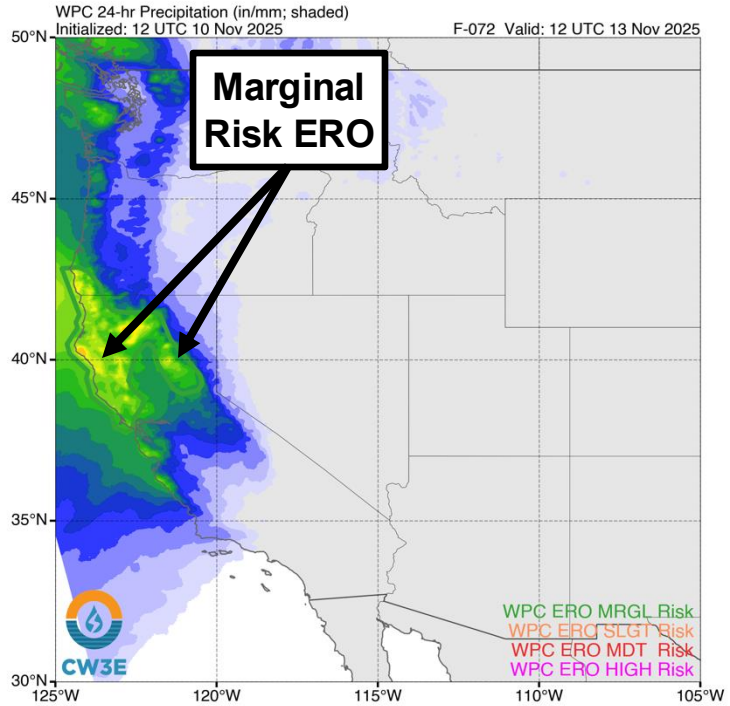
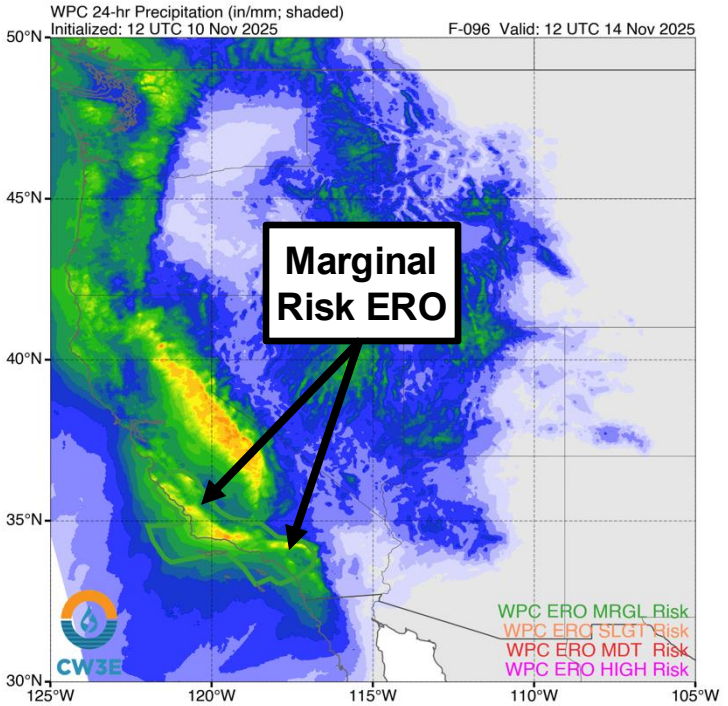
WPC Precipitation Forecasts

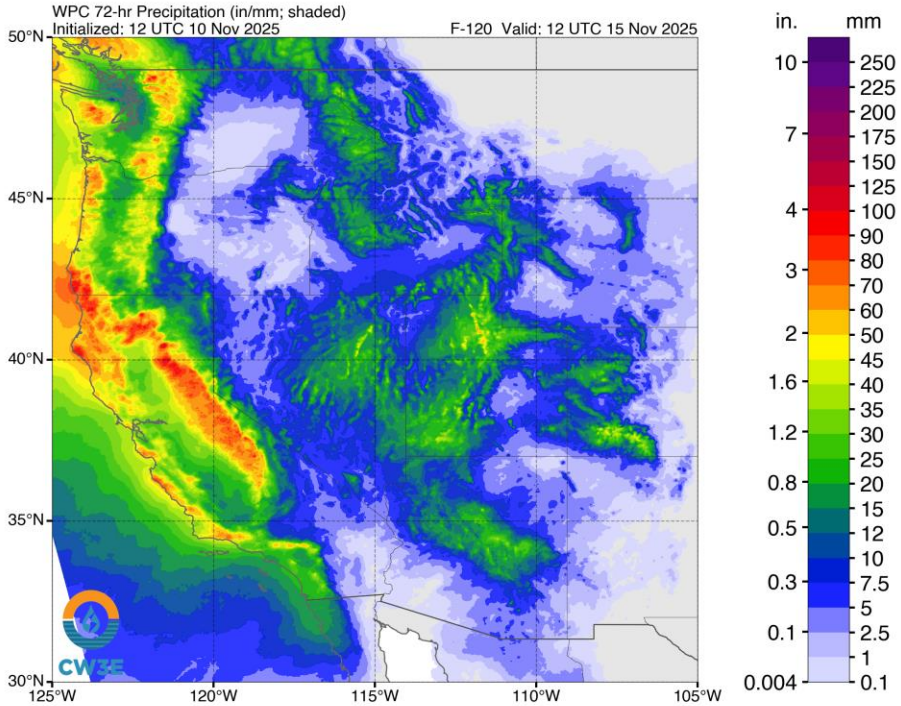
Day 3 24-h QPF: Valid 4 AM PT 13 Nov



Day 4 24-h QPF: Valid 4 AM PT 14 Nov



72-h Total QPF: Valid 4 AM PT 15 Nov



- The NWS Weather Prediction Center (WPC) has issued **marginal risk** (level 1 of 4; ≥5% probability of flooding) excessive rainfall outlooks (EROs) for the Klamath Mountains, Northern Sierra Nevada, Northern California Coast Ranges, and much of coastal central and southern California due to the potential for high rainfall rates (>0.5 inches/hour) in the core of the AR.
- Flash flood risk in the vicinity of the Transverse Ranges may be exacerbated by the presence of recent burn scars.
- The AR and trough are forecast to produce 2–4 inches of total precipitation in portions of the Klamath Mountains, southern Cascades, Sierra Nevada, California Coast Ranges, and Transverse Ranges. About 1–2 inches are forecast elsewhere in coastal California and the Central Valley.

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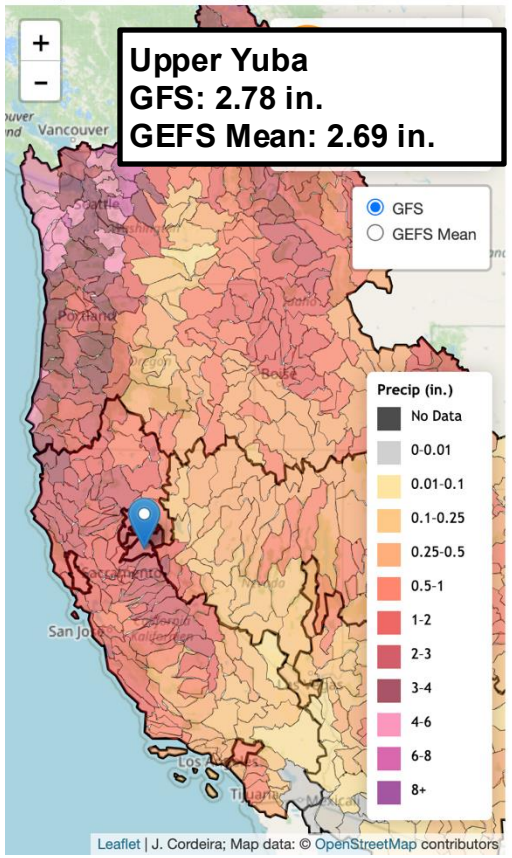
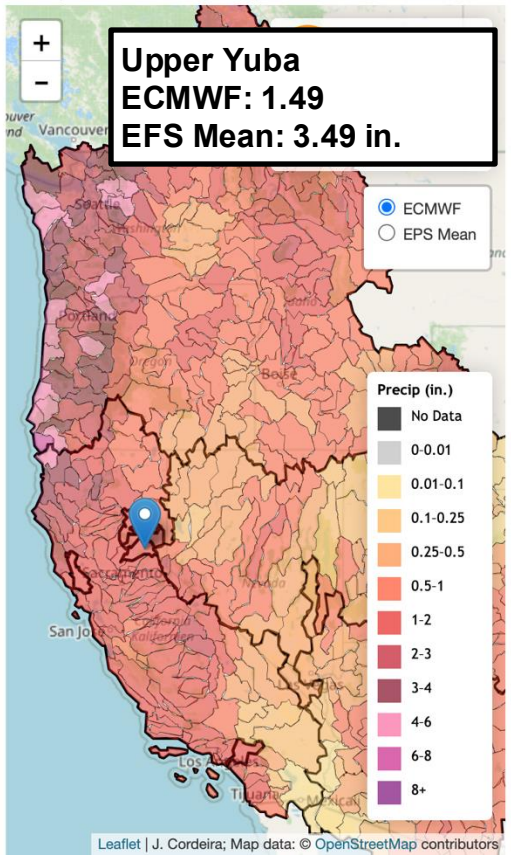
Watershed Precipitation Forecasts

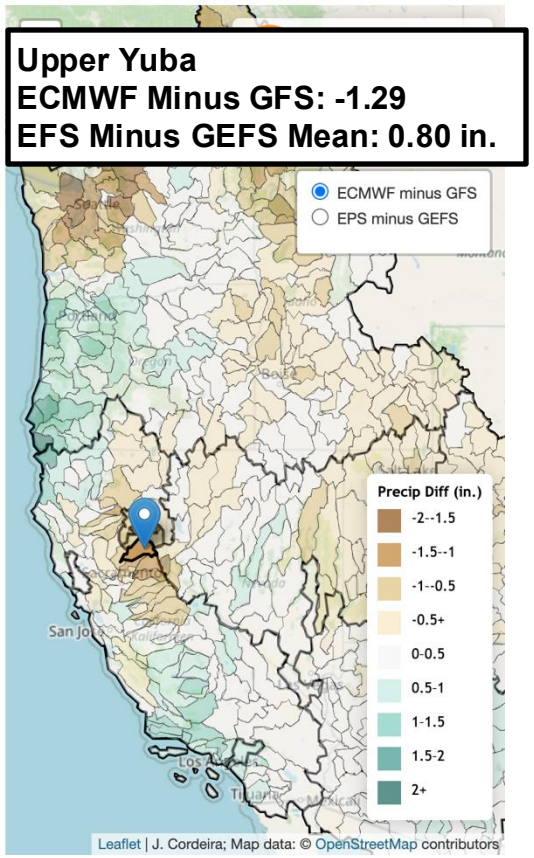
10-day GFS/GEFS Precipitation Forecasts

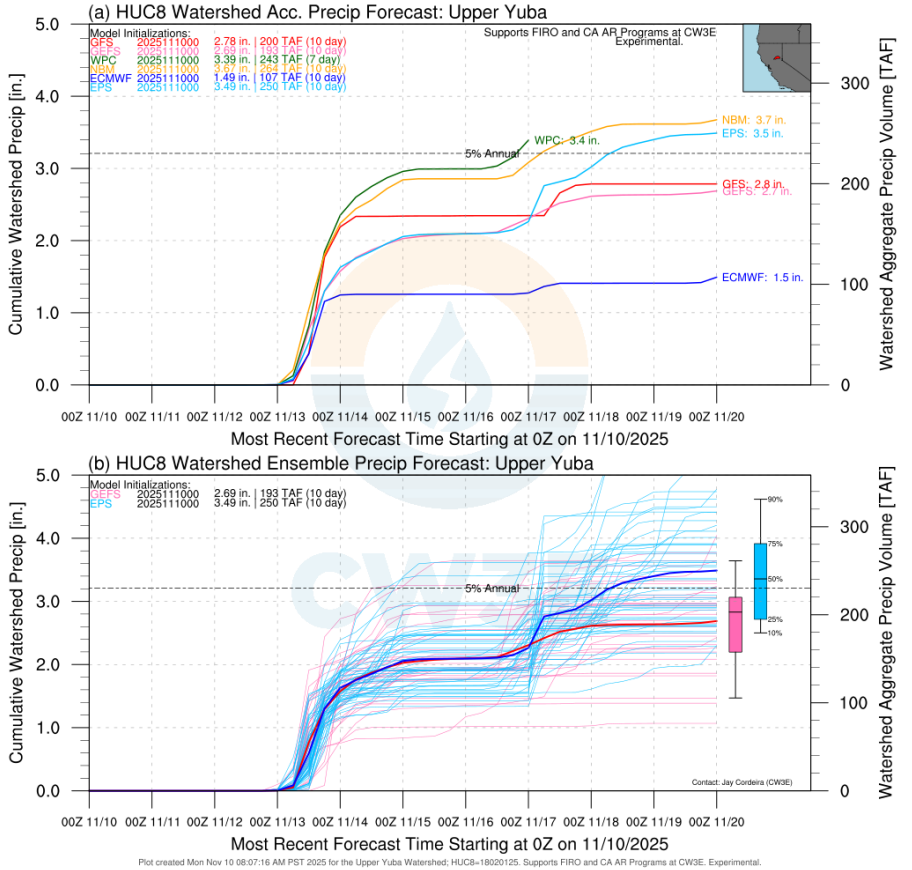


10-day ECMWF/EFS Precipitation Forecast



10-day Difference Precipitation Forecast





- Compared to the deterministic GFS, the deterministic ECMWF is forecasting lower precipitation amounts from this event in the Northern and Central Sierra Nevada and higher precipitation amounts in coastal southern California.
- In the Upper Yuba watershed, the deterministic GFS is forecasting ~2.3 inches of mean areal precipitation by 4 PM PT Fri 14 Nov, whereas the deterministic ECMWF is only forecasting ~1.2 inches.

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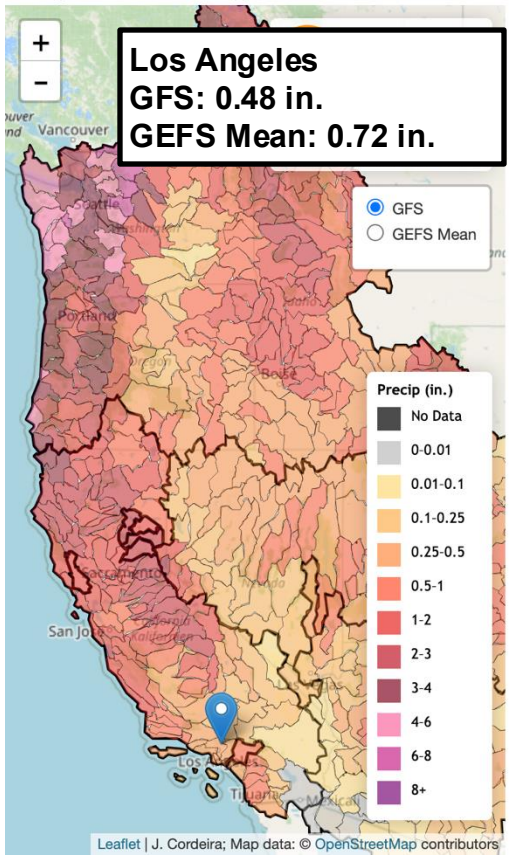
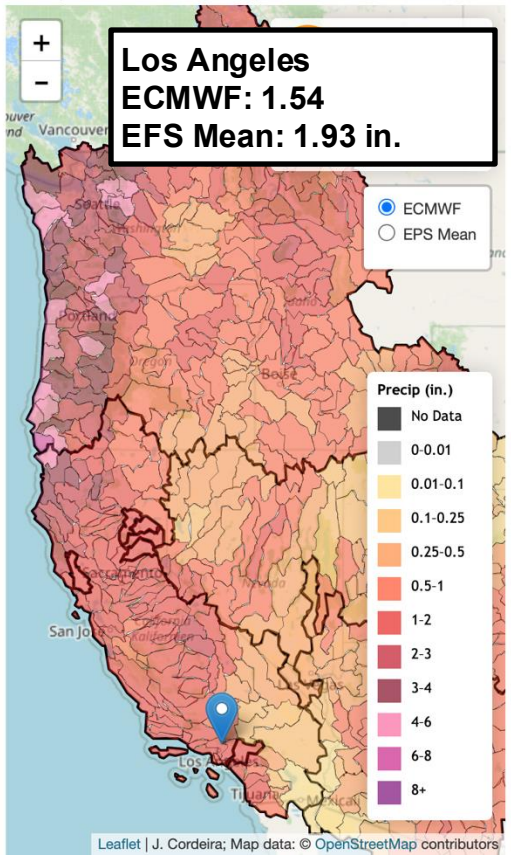
Watershed Precipitation Forecasts

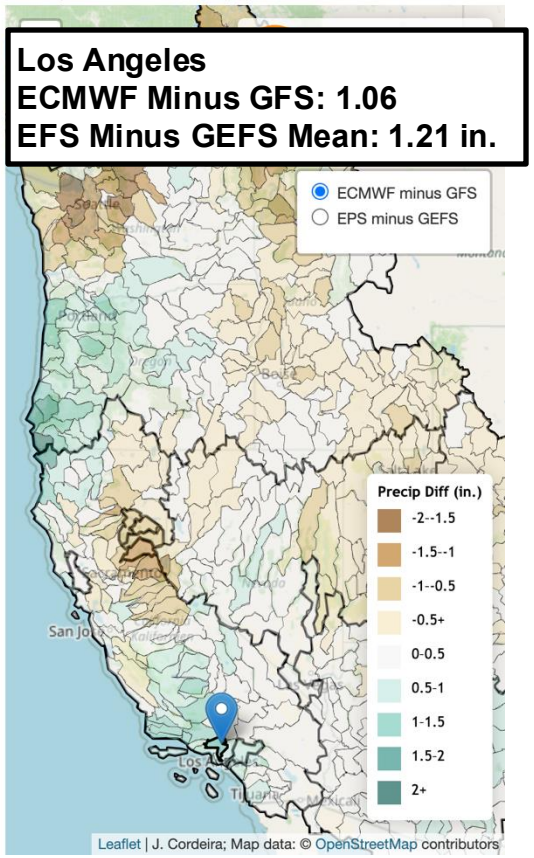
10-day GFS/GEFS Precipitation Forecasts

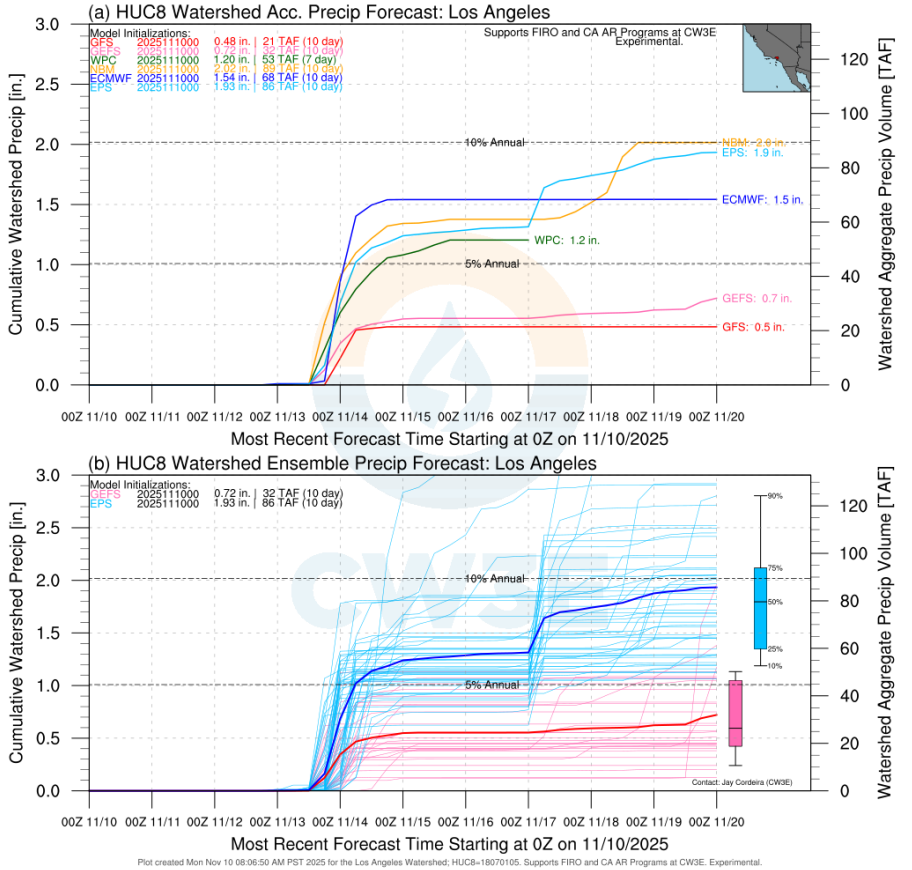


10-day ECMWF/EFS Precipitation Forecast



10-day Difference Precipitation Forecast





- In the Los Angeles watershed, the deterministic ECMWF is forecasting ~1.5 inches of mean areal precipitation by 4 PM PT Fri 14 Nov, whereas the deterministic GFS is only forecasting ~0.5 inches.
- A majority of ECMWF EFS ensemble members are forecasting this event to produce >5% of normal annual precipitation (~1 inch) in the Los Angeles watershed.

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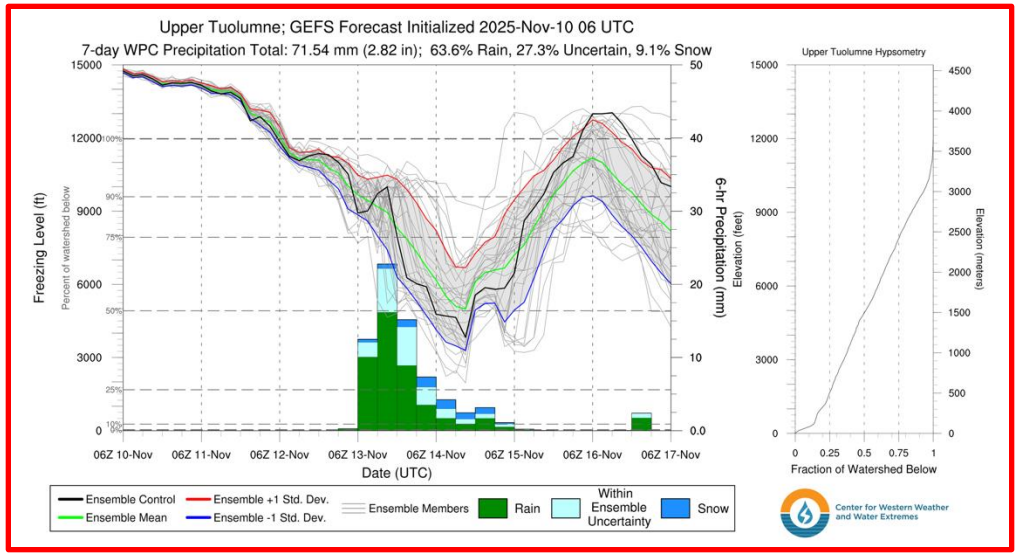
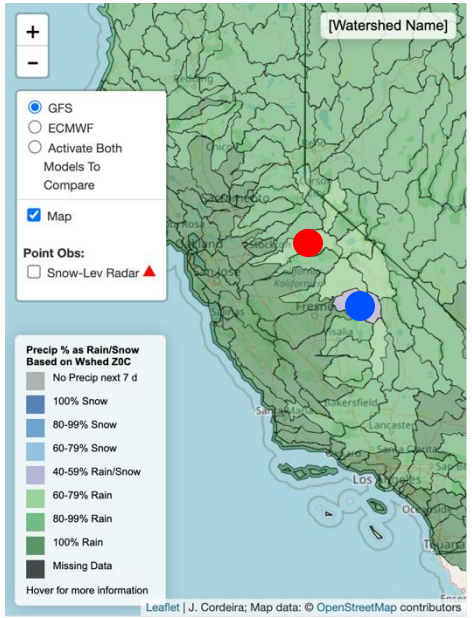
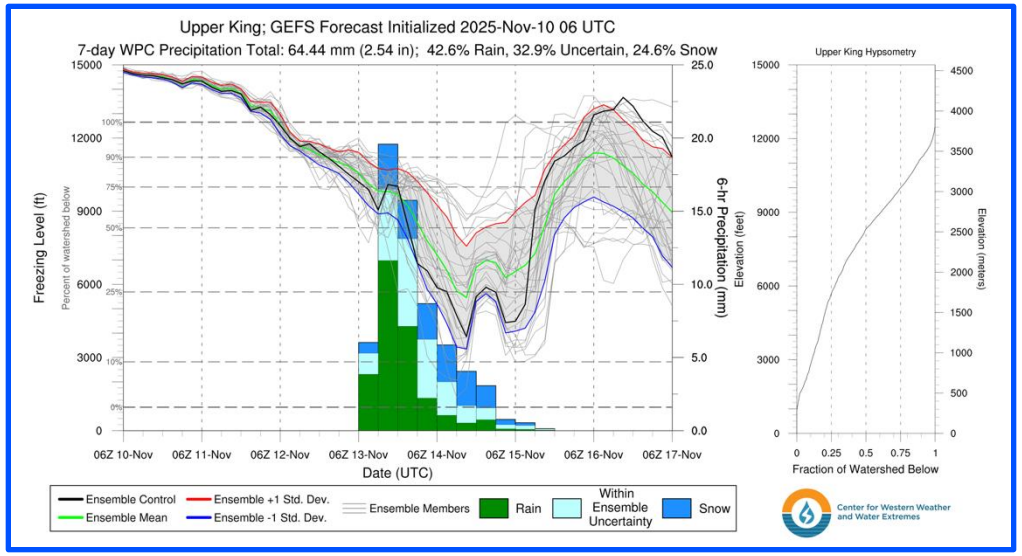
Watershed Freezing Level Forecasts (GEFS)

Upper Tuolumne





Upper King



- Freezing levels in the central and southern Sierra Nevada are forecast to gradually decrease from ~14,000 feet today to ~10,000 feet at the time of AR landfall late Wed 12 Nov.
- As the upstream trough approaches California and colder air spreads into the region, freezing levels are forecast to rapidly drop on Thu 13 Nov, potentially falling below 5,000 feet by early morning Fri 14 Nov.
- Decreasing freezing levels will likely facilitate significant snowfall accumulations above 7,000 feet, but there is still a large amount of ensemble spread in freezing levels after the AR moves onshore.

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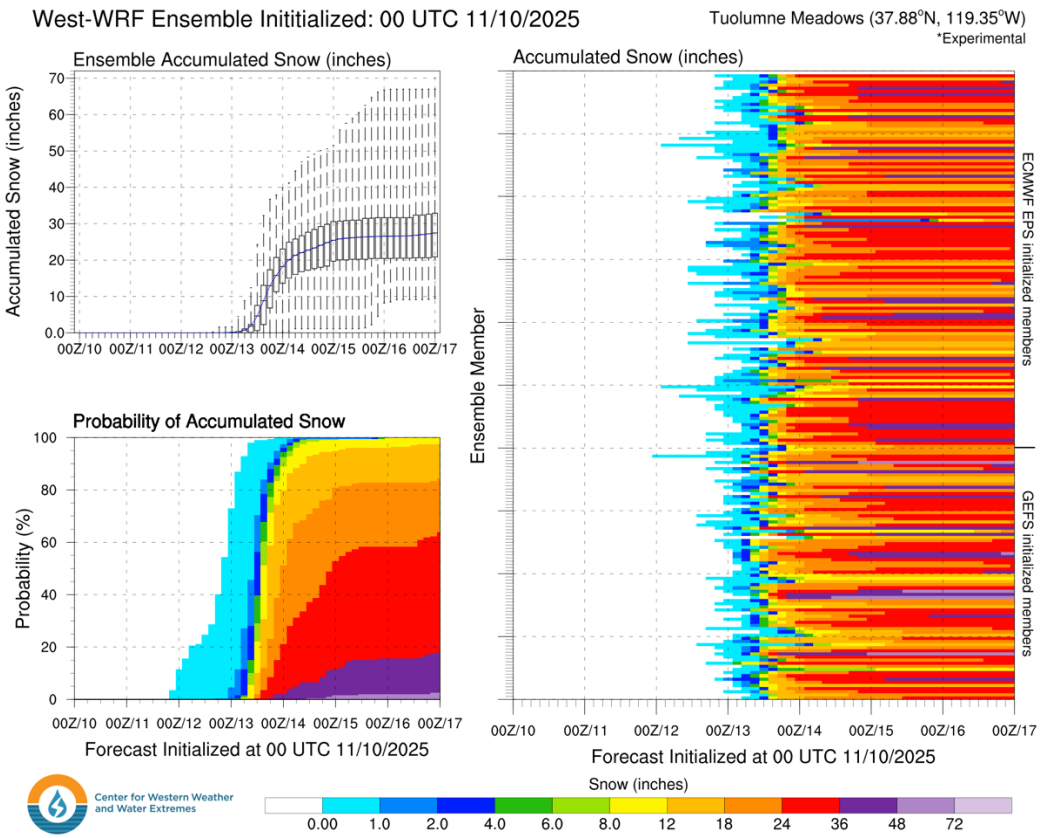
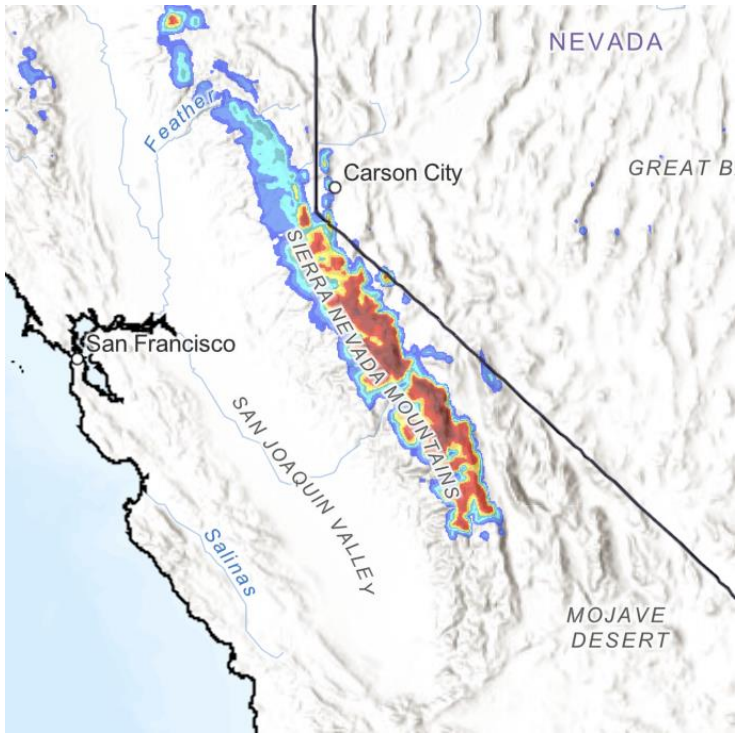
Winter Weather Hazards



Probabilistic Winter Storm Severity Index
Valid: 4 AM PT 13 Nov – 4 AM PT 14 Nov



Source: NOAA/NWS Weather Prediction Center

Potential Winter Storm Impacts

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.

Likelihood of Impact

< 5% 5% 10% 20% 30% 40% 50% 60% 70% 80% 90% > 95%

- There is potential for significant snowfall accumulations in the higher terrain of the central and southern Sierra Nevada. CW3E's West-WRF ensemble is showing >50% probability of >24 inches of snow at Tuolumne Meadows by early morning Sat 15 Nov.
- The NWS Weather Prediction Center is forecasting >70% likelihood of **moderate** winter storm impacts in portions of the central and southern Sierra Nevada for the 24-hour period ending 4 AM PT Fri 14 Nov.

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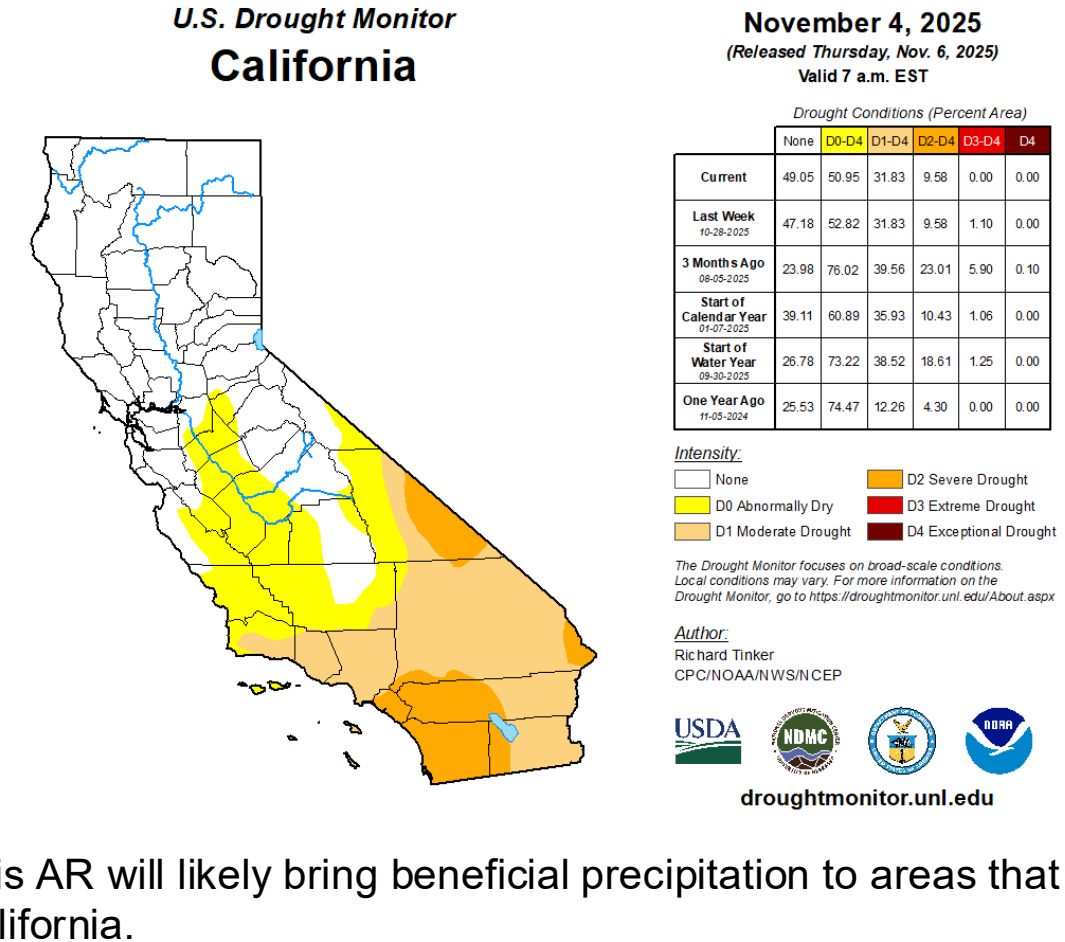
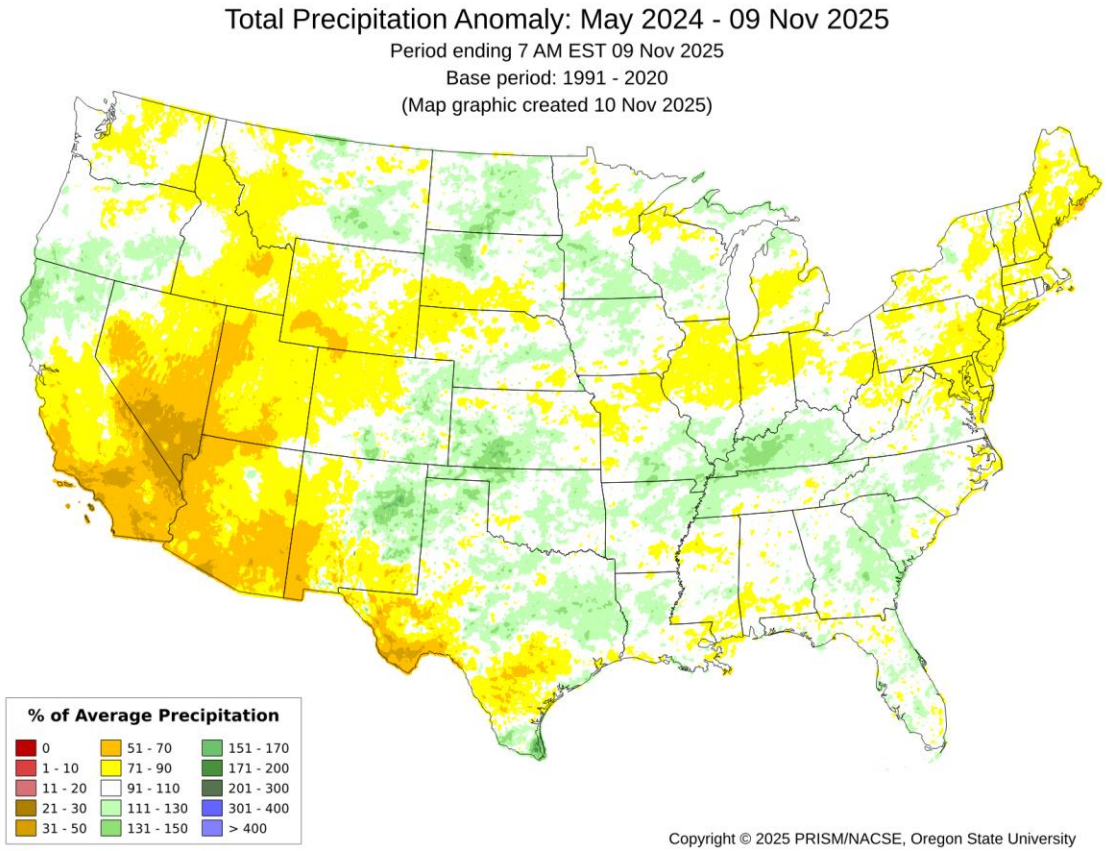
Drought Conditions





- This AR will likely bring beneficial precipitation to areas that are currently experiencing moderate-to-severe drought in southern California.
- Conditions have been abnormally dry in southern California over the past 18 months, with most of the region receiving <70% of normal precipitation since the beginning of May 2024.