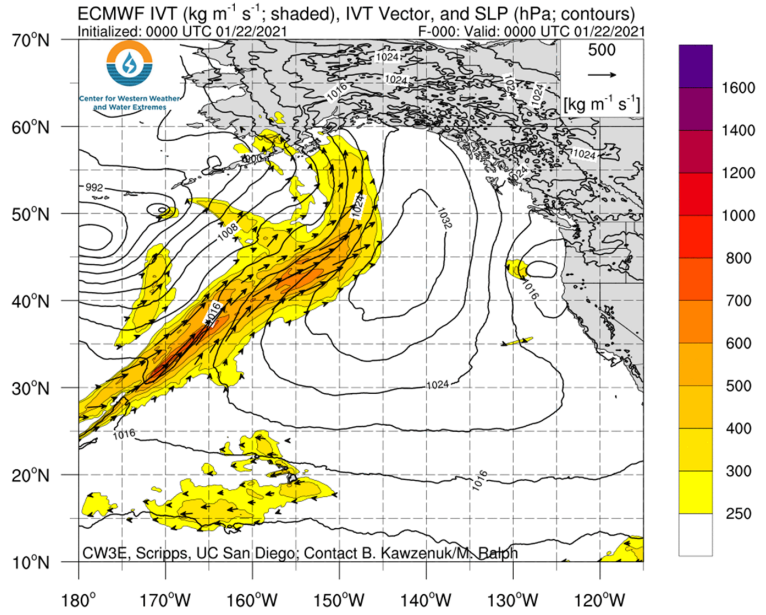
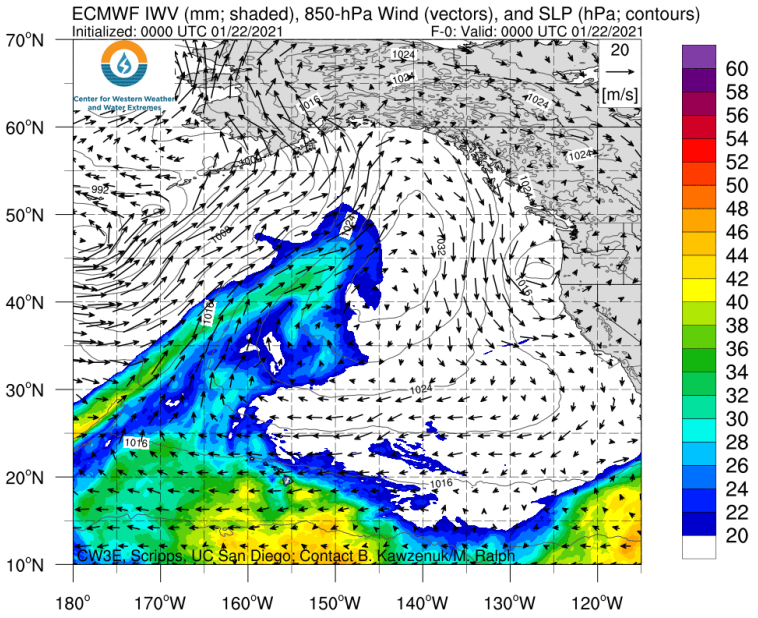
CW3E Atmospheric River Outlook: 22 Jan 2021

For California DWR's AR Program

Active Weather Pattern Forecast Across the Western U.S. this Weekend through Next Week

- A series of upper-level shortwave disturbances will bring multiple episodes of precipitation to the southwestern U.S. this weekend into early next week
- At least 1–3 inches of precipitation are forecasted in the Southern Sierra, coastal Southern California, and Central Arizona in association with these shortwave disturbances
- Significant snowfall accumulations are possible over the higher terrain in the southwestern U.S.
- There is increasing forecast confidence in a landfalling AR and major precipitation event next week over California
- However, there is still considerable uncertainty in the location, duration, and intensity of this landfalling AR
- More than 5 inches of total precipitation are possible over the California Coast Ranges, Sierra Nevada, and Southern California Transverse Ranges during the next 7 days





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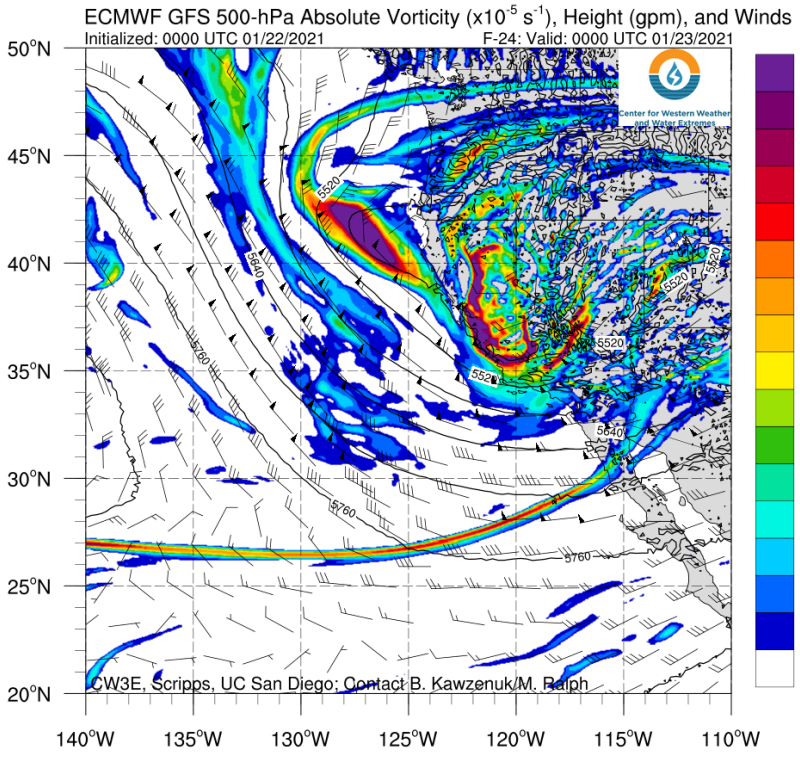
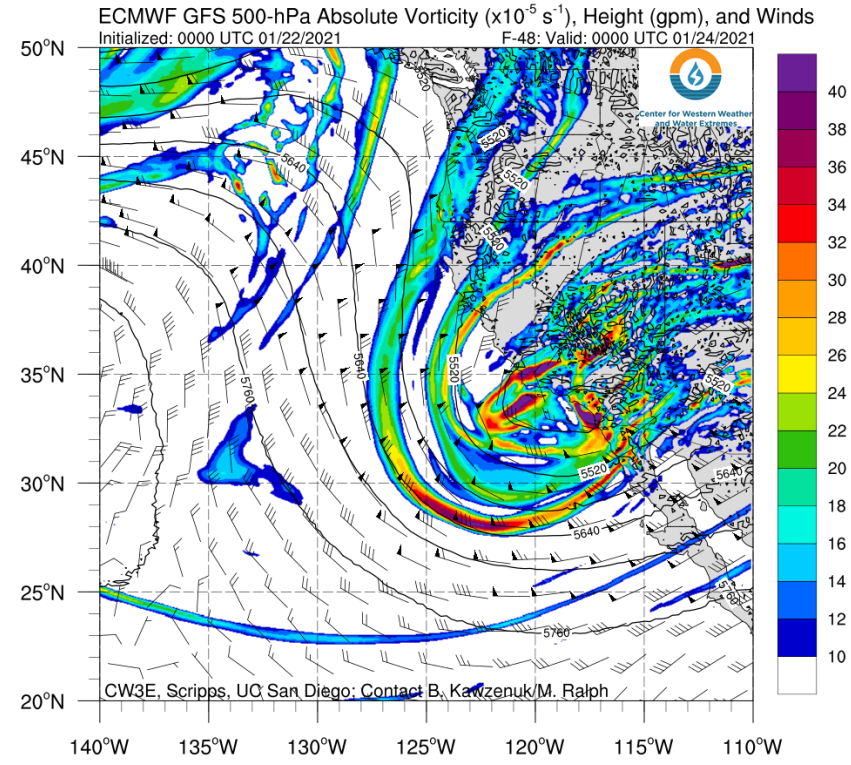
For California DWR's AR Program

ECMWF 500-hPa Geopotential Heights and Absolute Vorticity

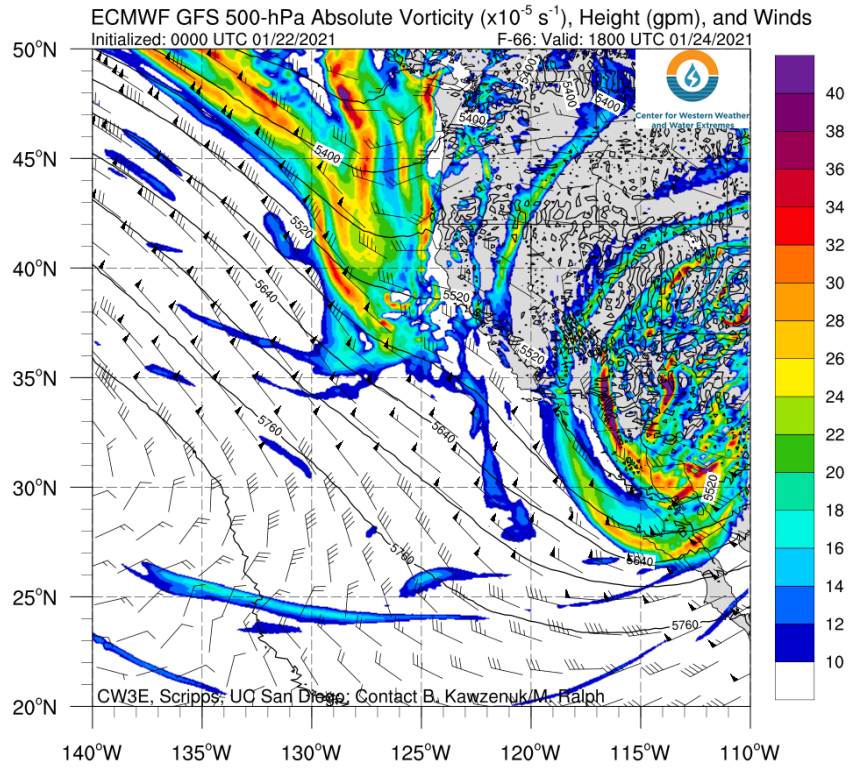
(A) Valid: 00 UTC 23 January (F-24)



(B) Valid: 00 UTC 24 January (F-48)



(C) Valid: 18 UTC 24 January (F-66)



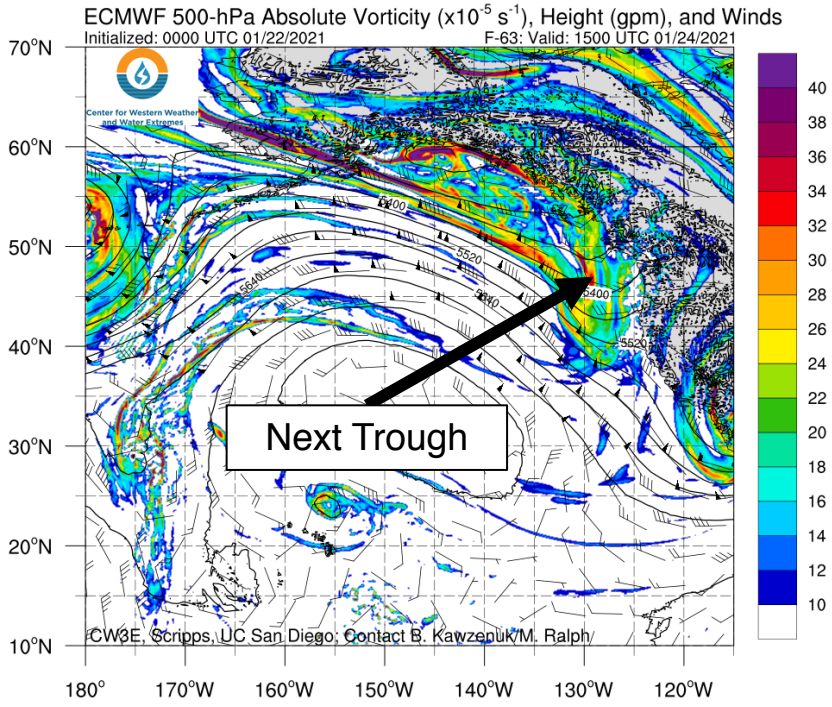
- A shortwave trough is currently propagating down the U.S. West Coast bringing light-to-moderate precipitation to much of California (Figure A)
- The shortwave is forecast to continue propagating down the coast to Southern California by 00 UTC 24 January before moving inland (Figure B)
- The shortwave will likely bring precipitation and low freezing levels to the Desert Southwest as it moves inland around 18 UTC 24 January (Figure C)
- As the current shortwave begins to move inland on the 24th, another upper-level disturbance is forecast to propagate towards the U.S. West Coast from the Northwest (Figure C).

AR Outlook: 22 Jan 2021

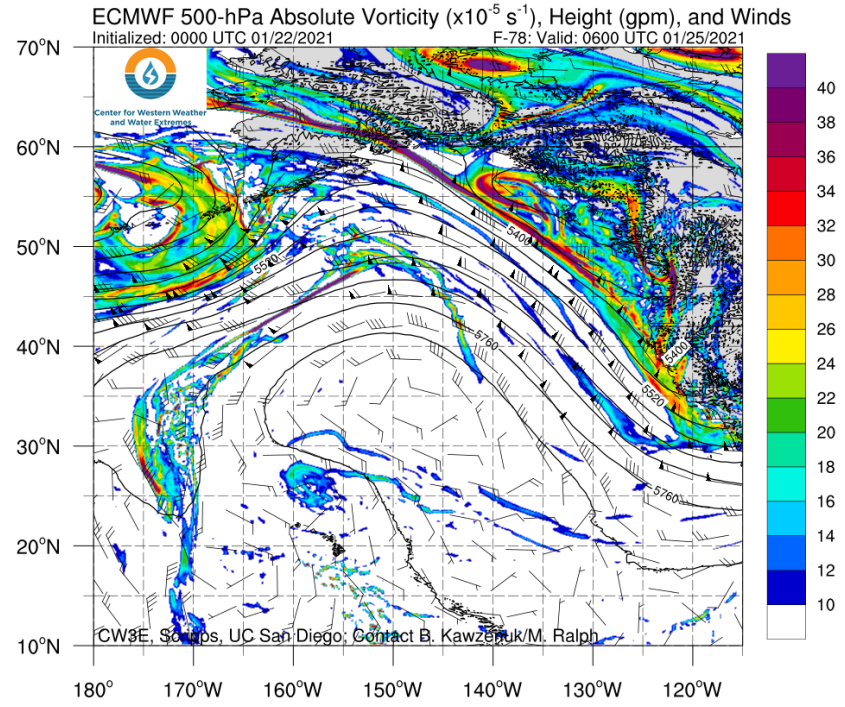
For California DWR's AR Program

ECMWF 500-hPa Geopotential Heights and Absolute Vorticity

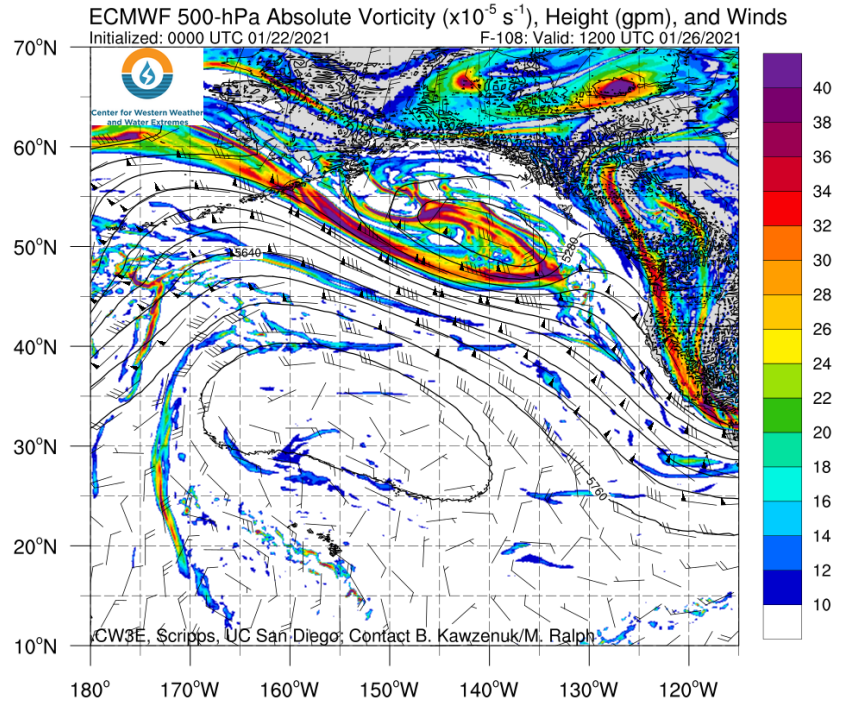
(A) Valid: 15 UTC 24 January (F-63)



(B) Valid: 06 UTC 25 January (F-78)



(C) Valid: 18 UTC 24 January (F-108)



- The next disturbance will come in the form of a digging trough from the Gulf of Alaska (Figure A)
- The trough is forecast to continue propagating down the coast while bringing another round of precipitation to much of the U.S. West Coast (Figure B)
- The trough then becomes semi-stationary for ~24 hours over Southern California and the Desert Southwest before continuing to move inland (Figure C)

AR Outlook: 22 Jan 2021

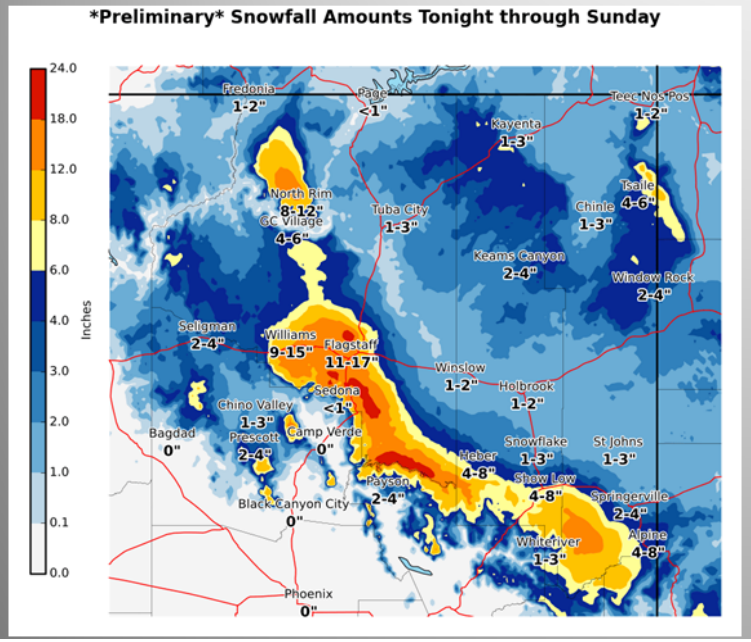
AMBASSADOR™ WRN WEATHER-READY NATION

For California DWR's AR Program

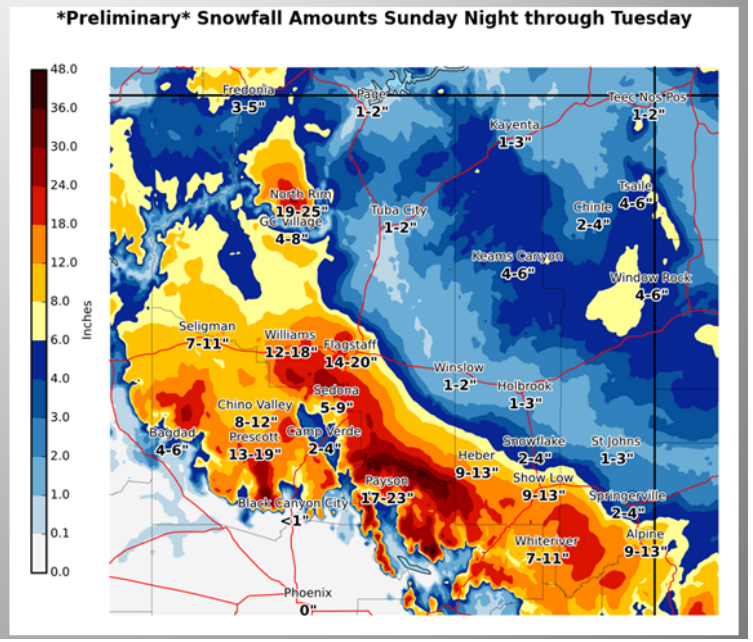
FLAGSTAFF, AZ
NATIONAL WEATHER SERVICE

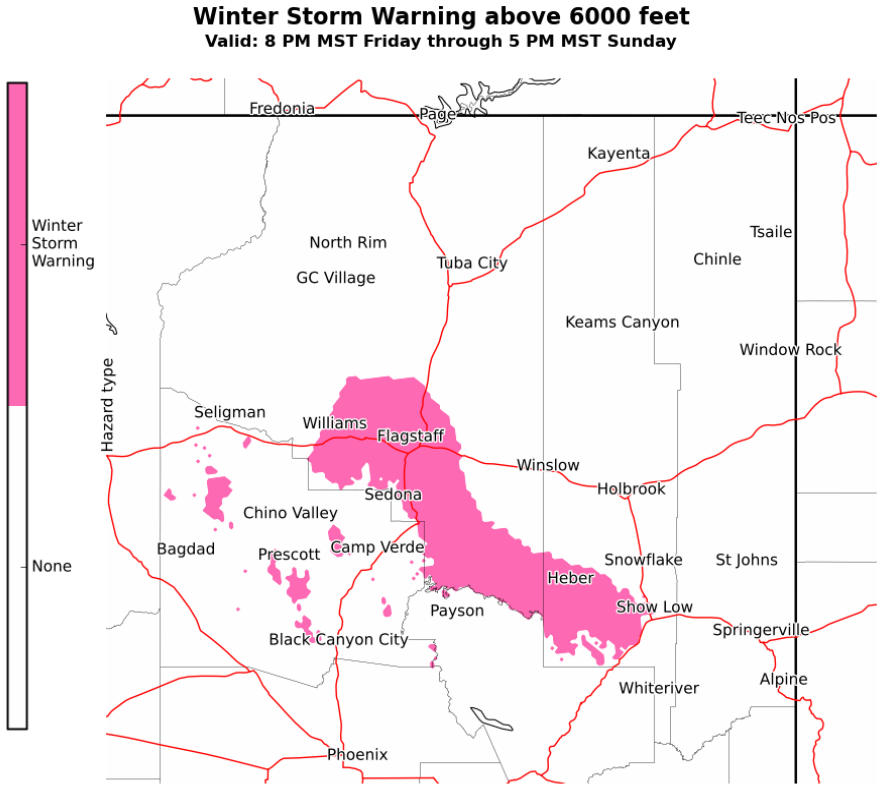
Winter Weather Returns

This weekend



Monday and Tuesday





Source: NWS Flagstaff, https://www.weather.gov/fgz/

- Significant snowfall accumulations are expected over the higher terrain of the southwestern U.S. in association with these shortwave disturbances
- NWS Flagstaff is currently forecasting 1–3 feet of total snowfall in portions of Central Arizona

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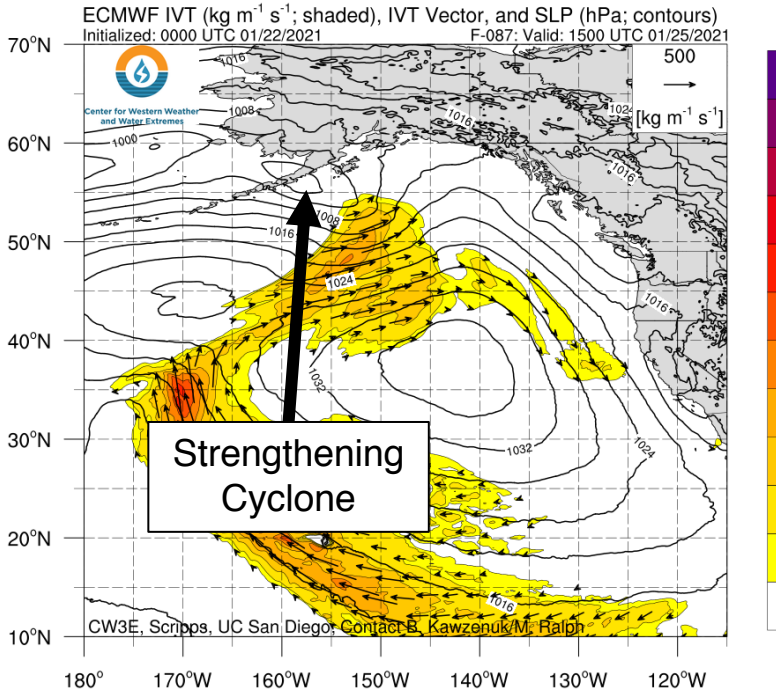
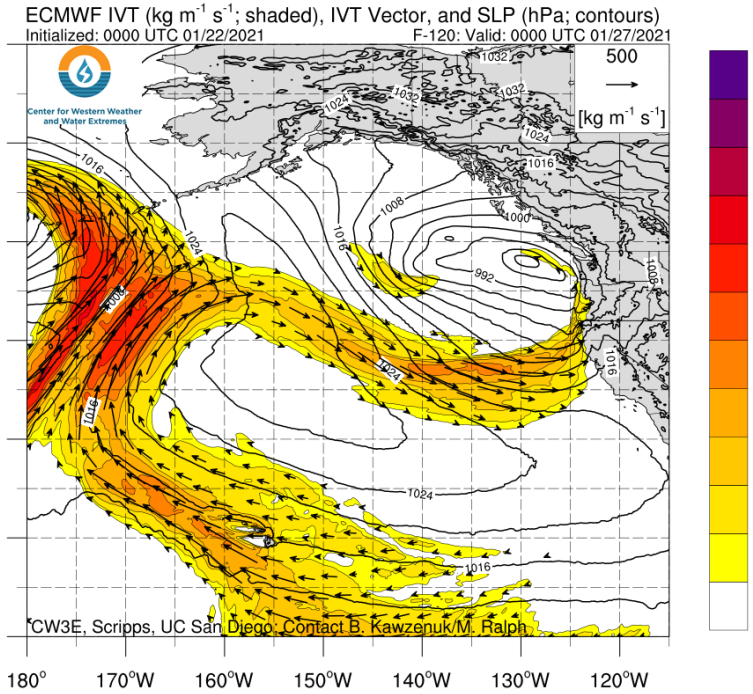
For California DWR's AR Program

ECMWF IVT and SLP Forecasts

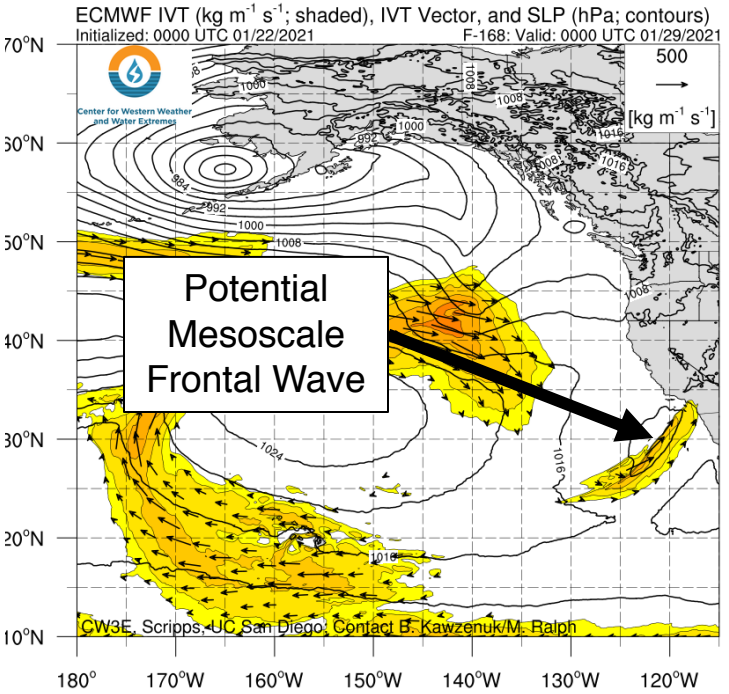
(A) Valid: 15 UTC 25 January (F-87)



(B) Valid: 00 UTC 27 January (F-120)



(C) Valid: 00 UTC 29 January (F-168)

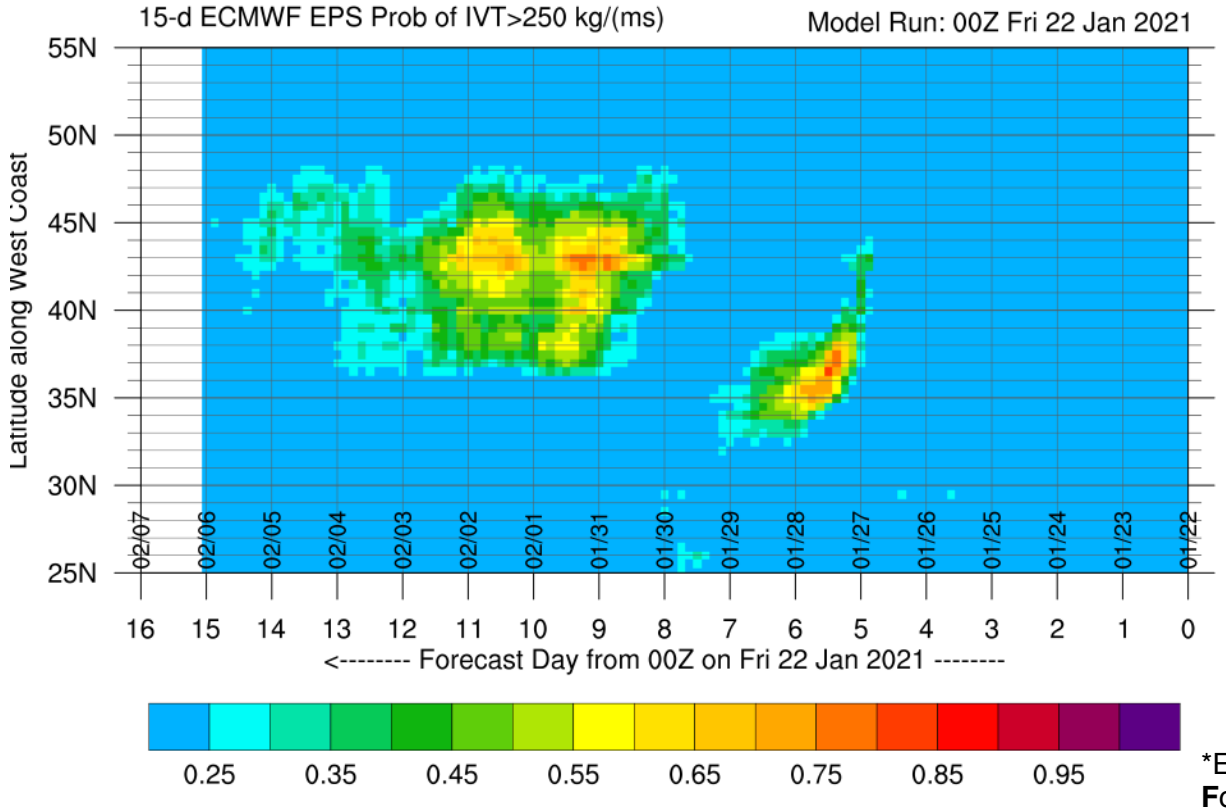


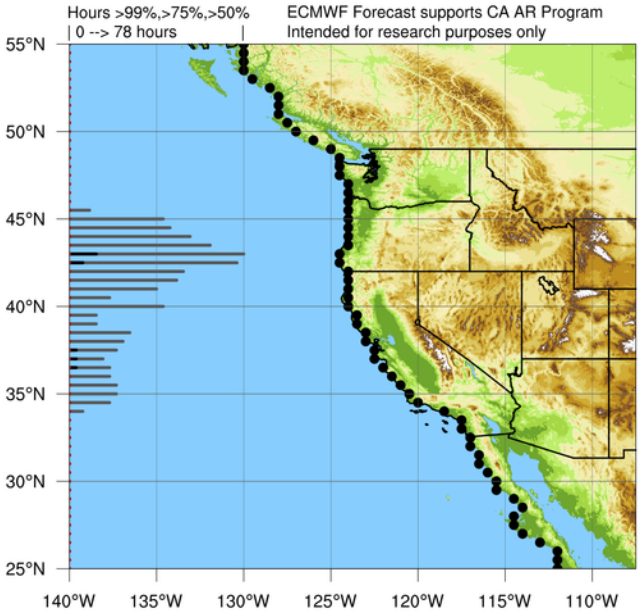
- A low-pressure system is forecast to undergo cyclogenesis near the Gulf of Alaska at ~15 UTC on 25 January 2021, developing an AR as it strengthens (Figure A)
- The system is then forecast to propagate southeastward, over high pressure towards the U.S. West Coast before the AR makes landfall over Northern California at ~00 UTC 27 January (figure B)
- As the AR propagates down the California Coast, the ECMWF is currently suggesting the potential for the development of a Mesoscale Frontal Wave, which could lead to a secondary pulse of high IVT magnitudes and a prolonging of overall event duration over Southern California (Figure C)

AR Outlook: 22 Jan 2021

For California DWR's AR Program

Probability of AR Conditions Along Coast





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

PLYMOUTH STATE METEOROLOGY

*ECMWF EPS = **E**uropean **C**enter for **M**edium-Range **W**eather **F**orecasts **E**nsemble **P**rediction **S**ystem

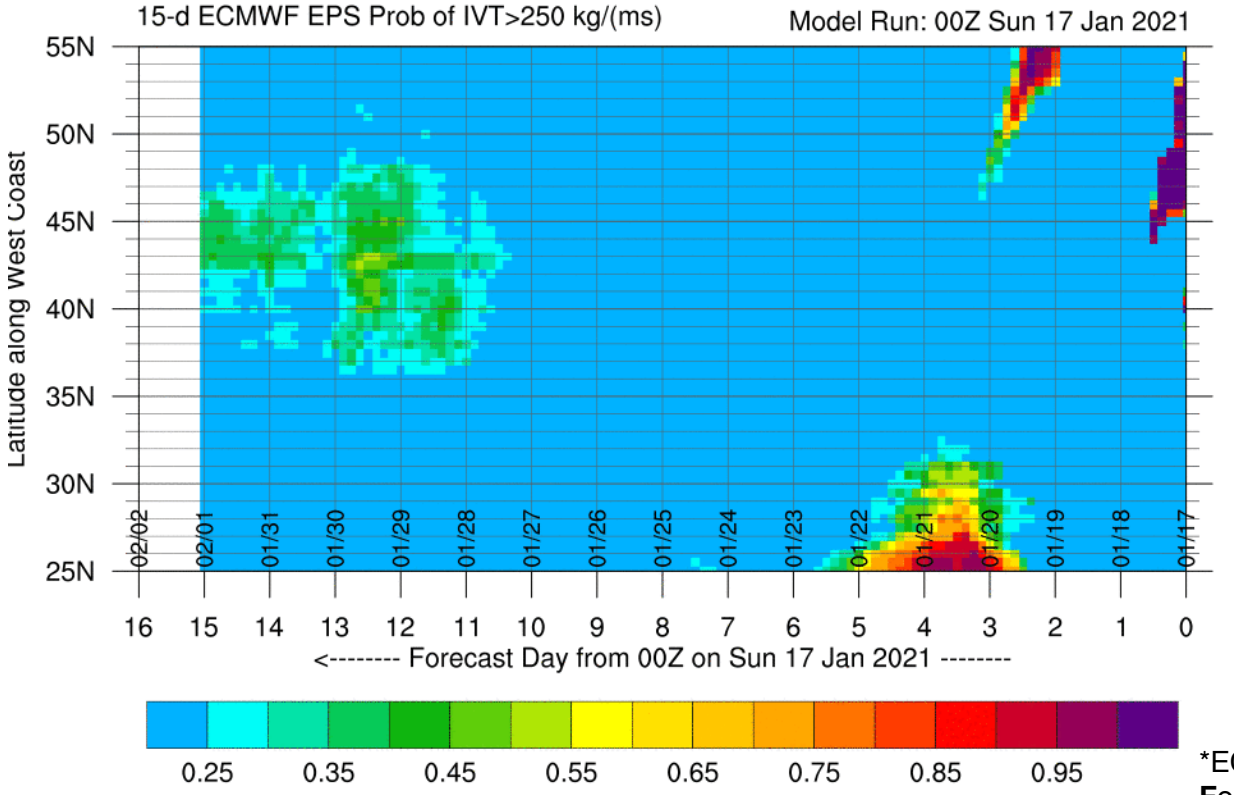
- The 00Z ECWMF EPS is showing elevated probabilities (> 60%) of AR conditions (IVT > 250 kg m^{-1} s^{-1}) along the Central California coast on 27 Jan
- The ECWMF EPS is showing the potential for additional AR activity along the U.S. West Coast between 30 Jan and 2 Feb

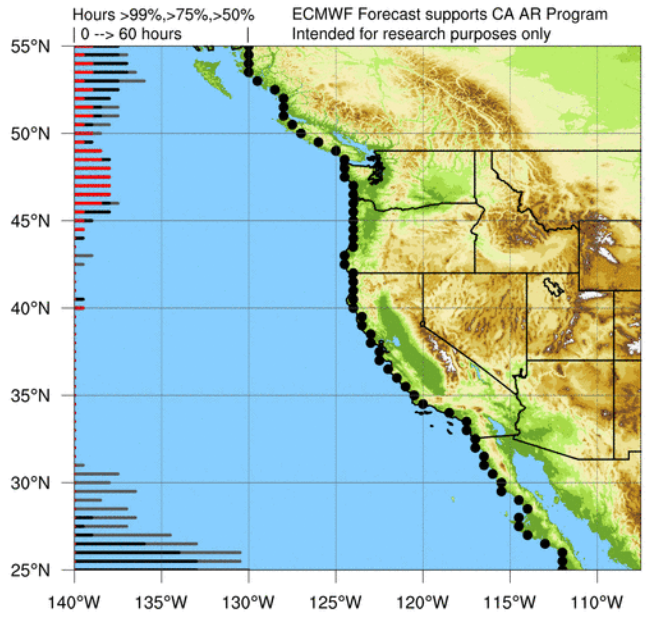
AR Outlook: 22 Jan 2021

For California DWR's AR Program

Probability of AR Conditions Along Coast

This loop shows how the forecast probability of AR conditions has changed since 00Z 17 Jan (every 12 hours)





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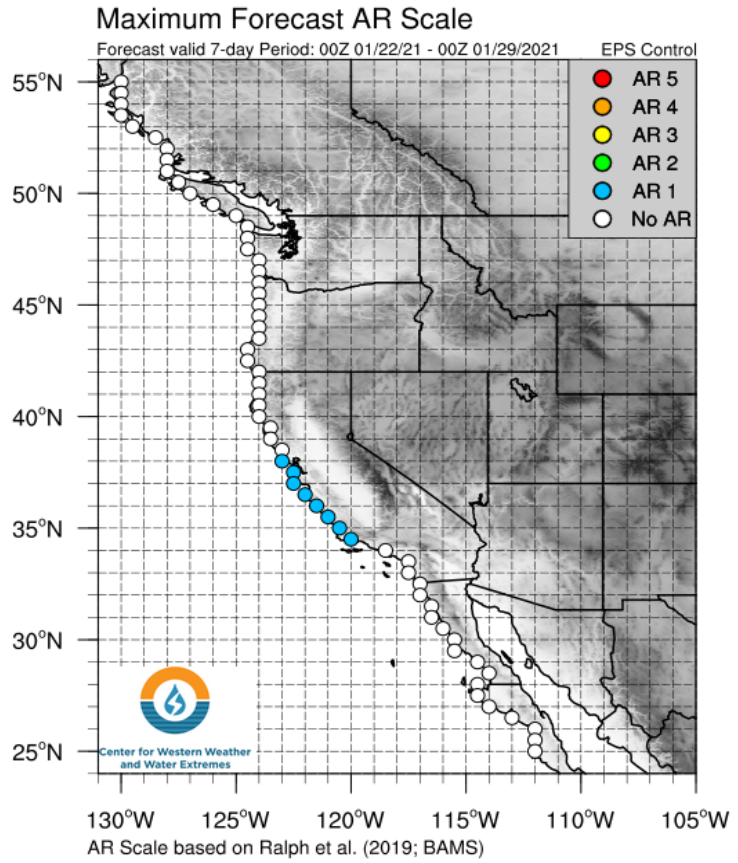
*ECMWF EPS = **E**uropean **C**enter for **M**edium-Range **W**eather **F**orecasts **E**nsemble **P**rediction **S**ystem

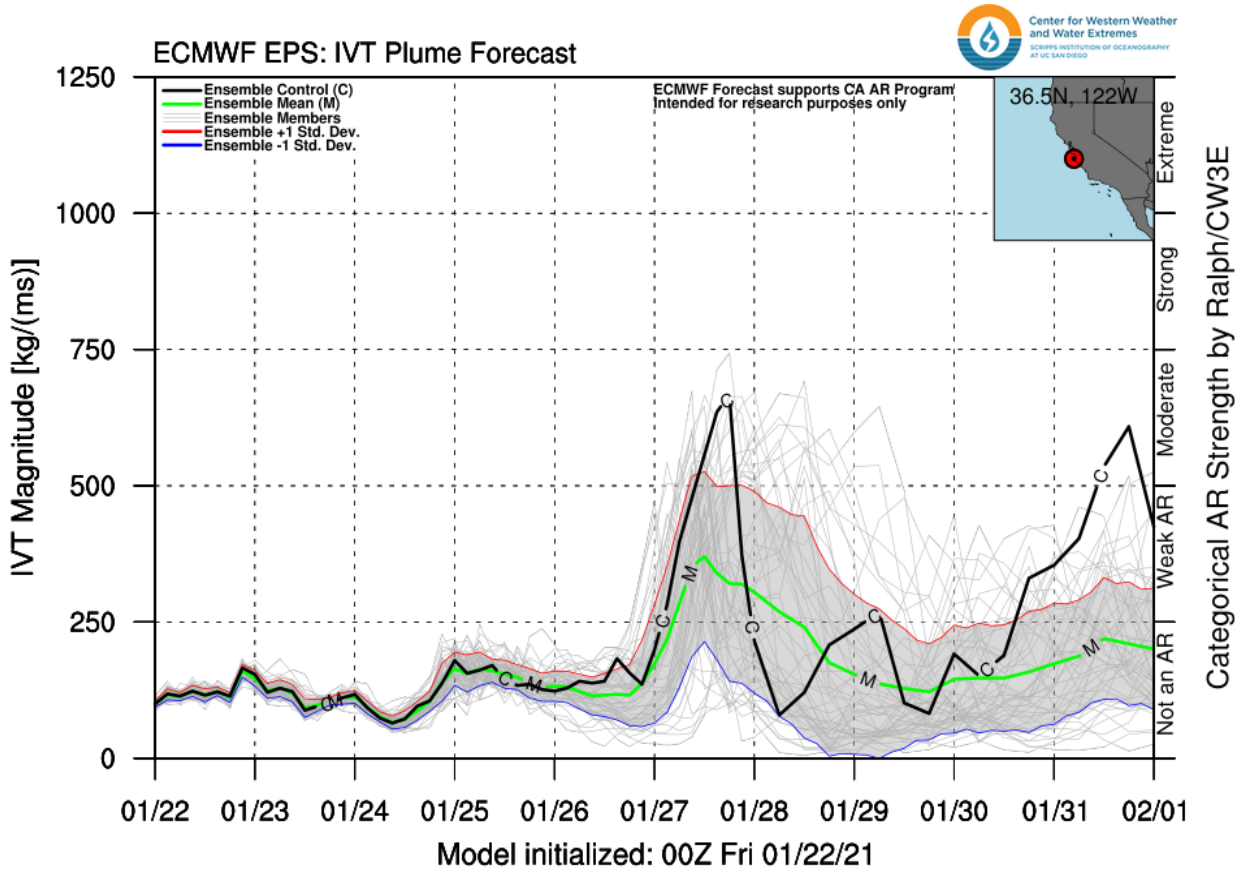
- The forecast probability of AR conditions in coastal California on 27 Jan has increased substantially over the past few days
- As recently as 00Z 20 Jan, fewer than 30% of ECMWF ensemble members (50 total) were forecasting AR conditions along the Central California coast

AR Outlook: 22 Jan 2021

For California DWR's AR Program

AR Scale & IVT Forecasts





- The 00Z ECMWF EPS control run is forecasting AR 1 conditions over portions of coastal California
- The highest IVT magnitudes are currently forecast near 36.5 N, 122 W (Monterey Bay), with several ensemble members (including the control run) forecasting maximum IVT values > 500 kg m^{-1} s^{-1}
- However, there is still a large degree of uncertainty in the magnitude and duration of AR conditions

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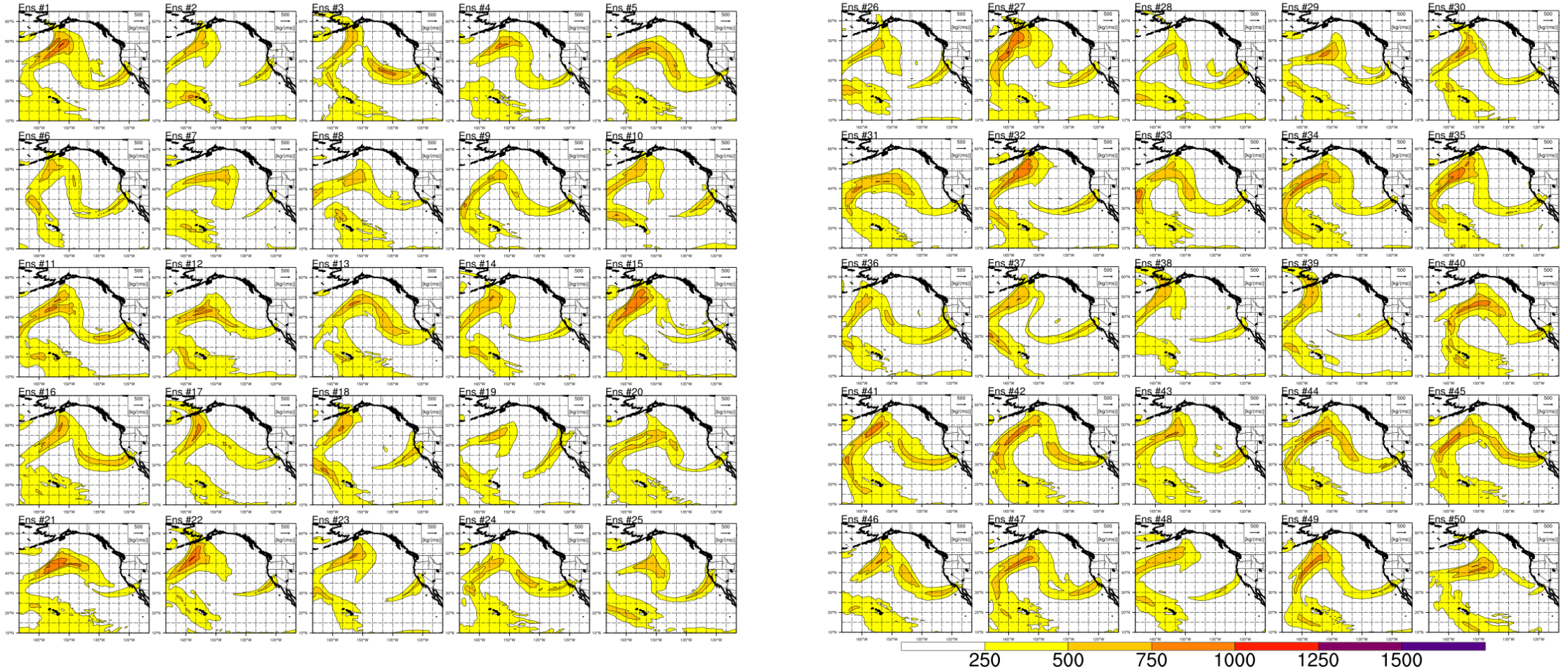
For California DWR's AR Program

ECMWF EPS IVT Forecasts: Valid 00Z 28 Jan 2021 (F-144)

These thumbnail plots show the IVT forecasts from all 50 members of the ECMWF Ensemble Prediction System (EPS)



- All members of the ECMWF EPS are showing AR conditions (IVT > 250 kg m^{-1} s^{-1}) along the coast of California at 00Z 28 Jan
- However, there are still significant differences in the forecast AR landfall location and IVT magnitude

AR Outlook: 22 Jan 2021

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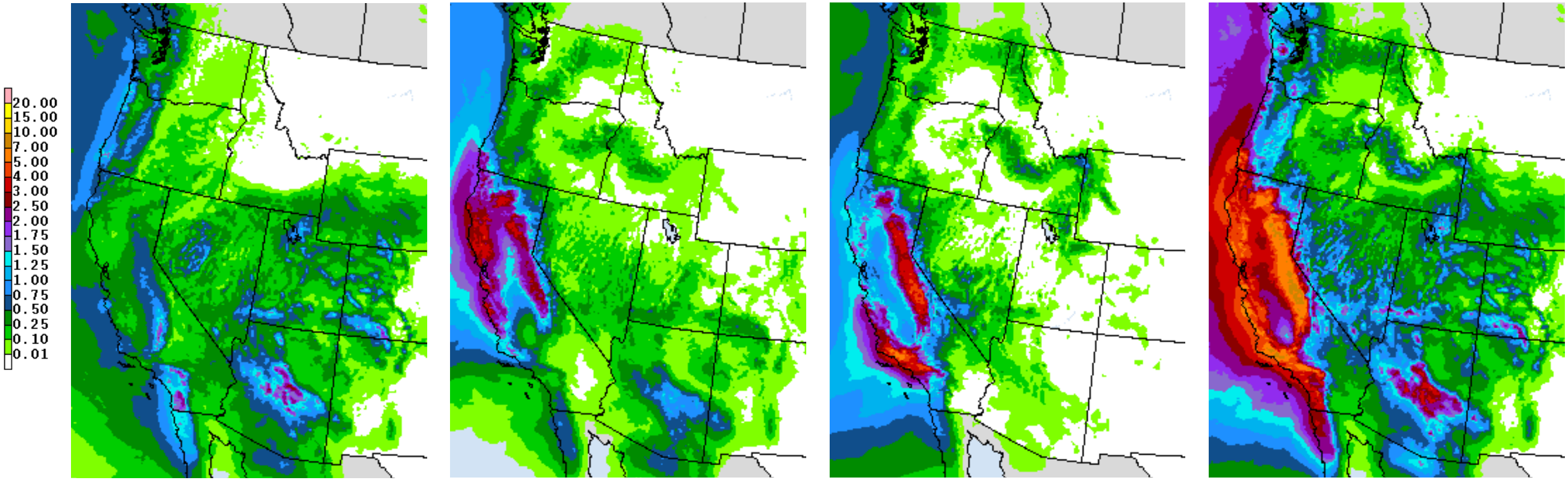
For California DWR's AR Program

NWS WPC Quantitative Precipitation Forecasts

Days 1–3: Valid 00Z 23–26 Jan | Days 4–5: Valid 00Z 26–28 Jan | Days 6–7: Valid 00Z 28–30 Jan | Days 1–7: Valid 00Z 23–30 Jan



Source: NOAA/NWS Weather Prediction Center, https://www.wpc.ncep.noaa.gov/

- The Weather Prediction Center (WPC) is forecasting at least 1–3 inches precipitation over the Southern Sierra, coastal Southern California, and central Arizona during the next 5 days in association with the first two shortwaves
- The heaviest precipitation associated with the AR is forecasted to occur over the California Coast Ranges, the Sierra Nevada, and the western Transverse Ranges on Days 4–5 and 6–7
- The WPC is forecasting more than 7 inches of total precipitation is in some areas during the next 7 days

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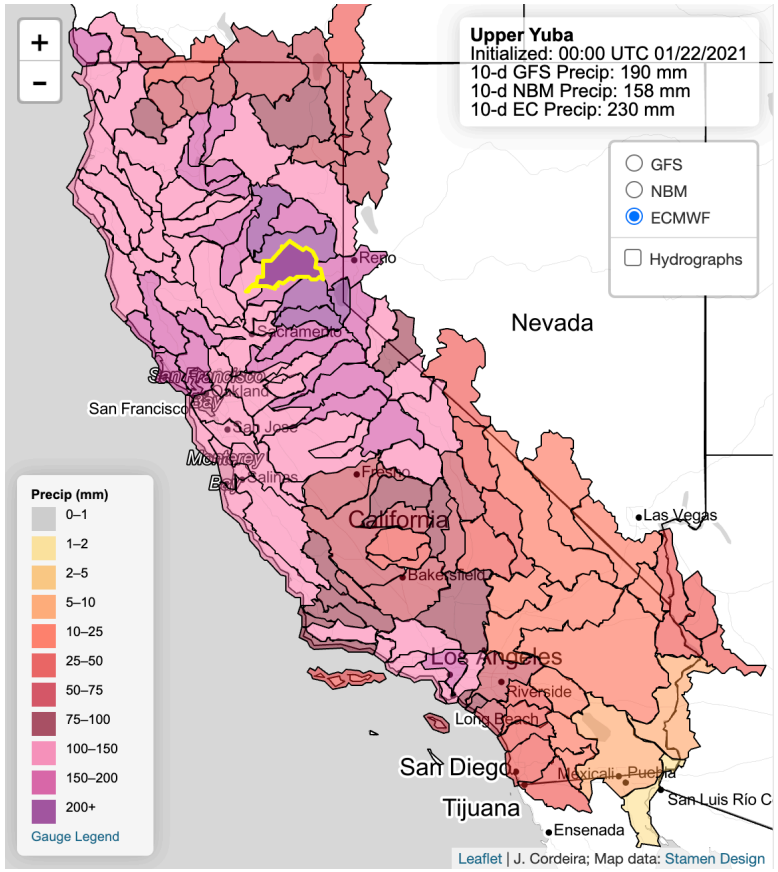
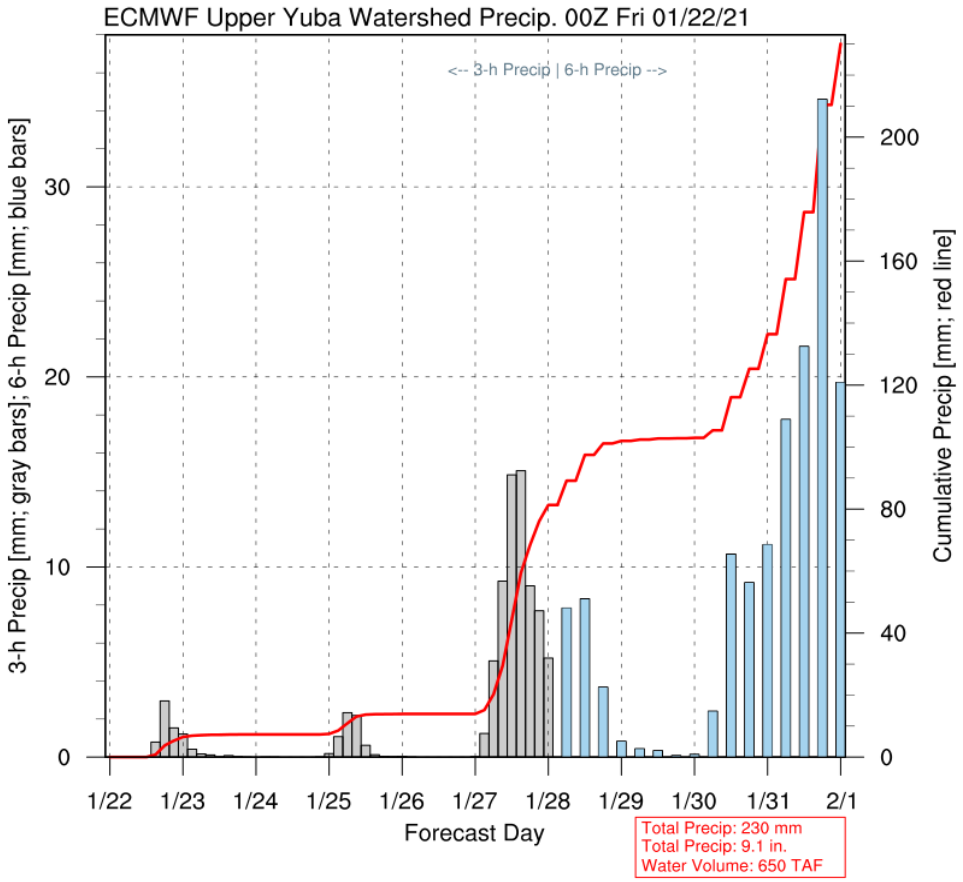
For California DWR's AR Program

10-day Watershed Precipitation Forecasts: Upper Yuba Watershed





- The 00Z ECMWF is forecasting 9.1 inches of mean areal precipitation in the Upper Yuba watershed during the 10-day period ending 00Z 1 Feb
- About 3.5 inches of precipitation is currently forecasted in association with the landfalling AR between 00Z 27 Jan and 00Z 29 Jan
- A potentially more significant precipitation event is possible after 00Z 30 Jan, but uncertainty is high given the long lead time

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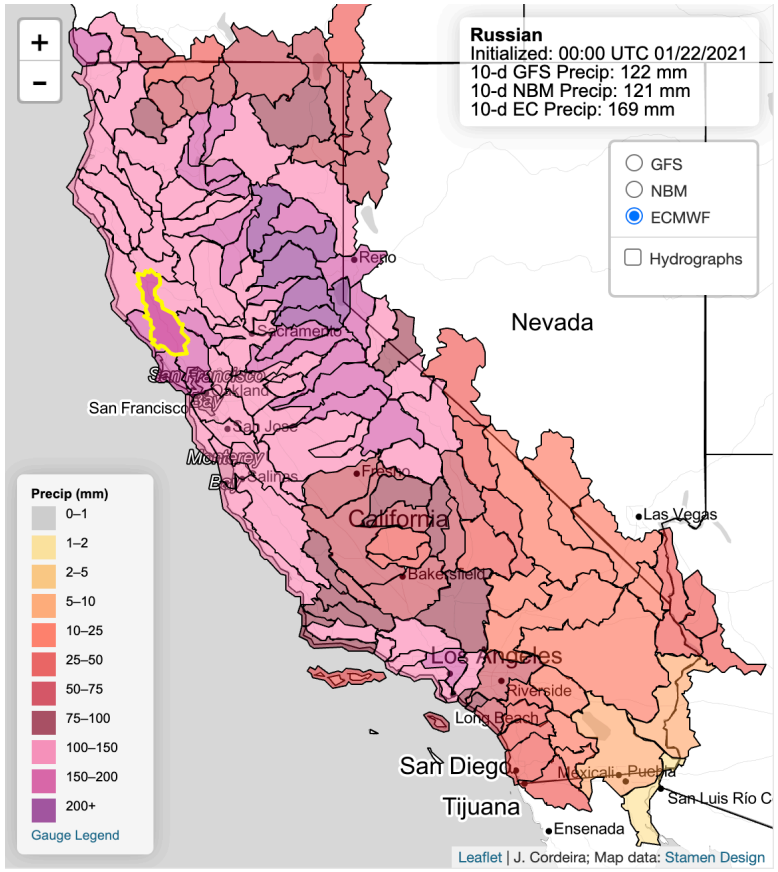
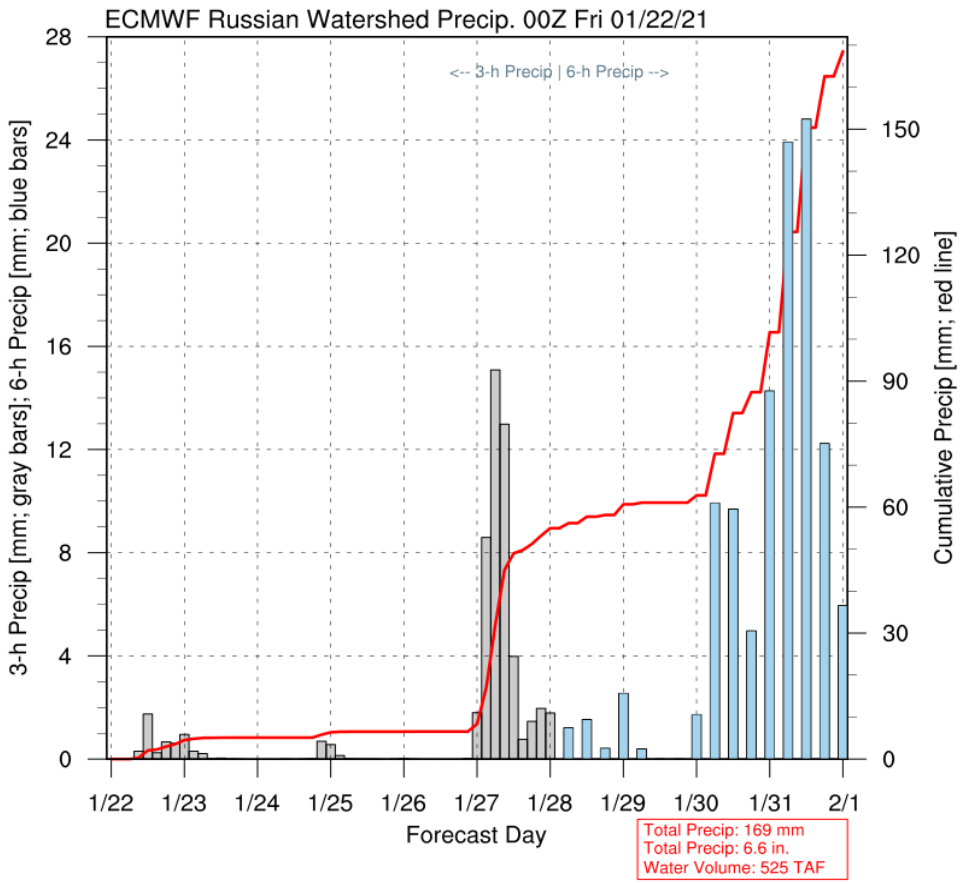
10-day Watershed Precipitation Forecasts: Russian River Watershed





- The 00Z ECMWF is forecasting 6.6 inches of mean areal precipitation in the Russian River watershed during the 10-day period ending 00Z 1 Feb
- About 2.2 inches of precipitation is currently forecasted in association with the landfalling AR between 00Z 27 Jan and 00Z 29 Jan
- Similar to the Upper Yuba watershed, a potentially more significant precipitation event is possible after this AR