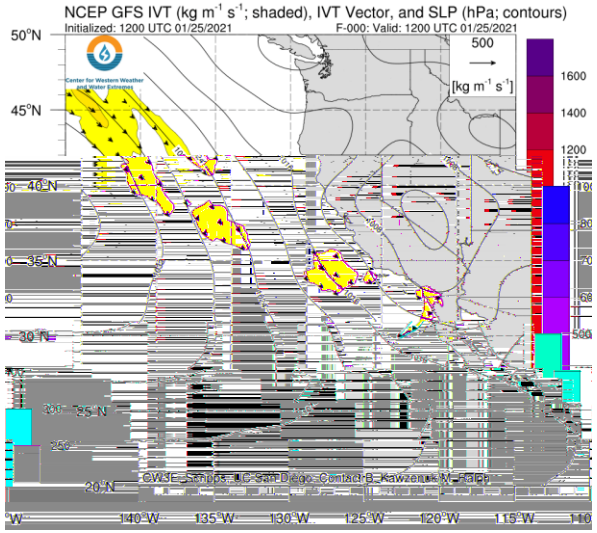
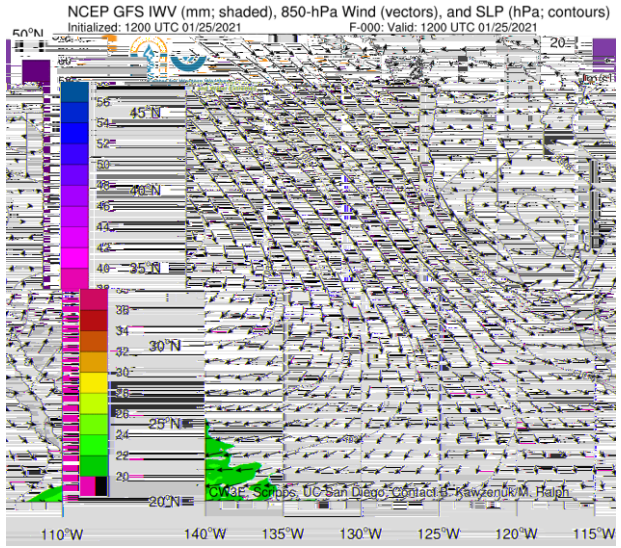
CW3E Atmospheric River Outlook

For California DWR's AR Program

Strong atmospheric river may bring several hydrologic impacts to large portion of California early this week

- A strong atmospheric river (AR) is forecast to make landfall around 4 PM PST tomorrow, 26 January 2021
- The AR is then forecast to propagate down the coast, bringing AR 1 to potentially 3 conditions to a large stretch of the Central CA Coast.
- Several locations across the Central Coast and the high elevations of the Sierra could receive more than 10 inches of precipitation.
- Low freezing levels (<4000 feet) associated with this system could result in 2+ feet of snow over the Coastal and Sierra Nevada Mountains
- While storm total precipitation could result in numerous impacts, mesoscale models are currently highlighting the potential development of a narrow cold frontal rainband, which could produce high-intensity, short duration, precipitation, a driver of post-fire debris flows.



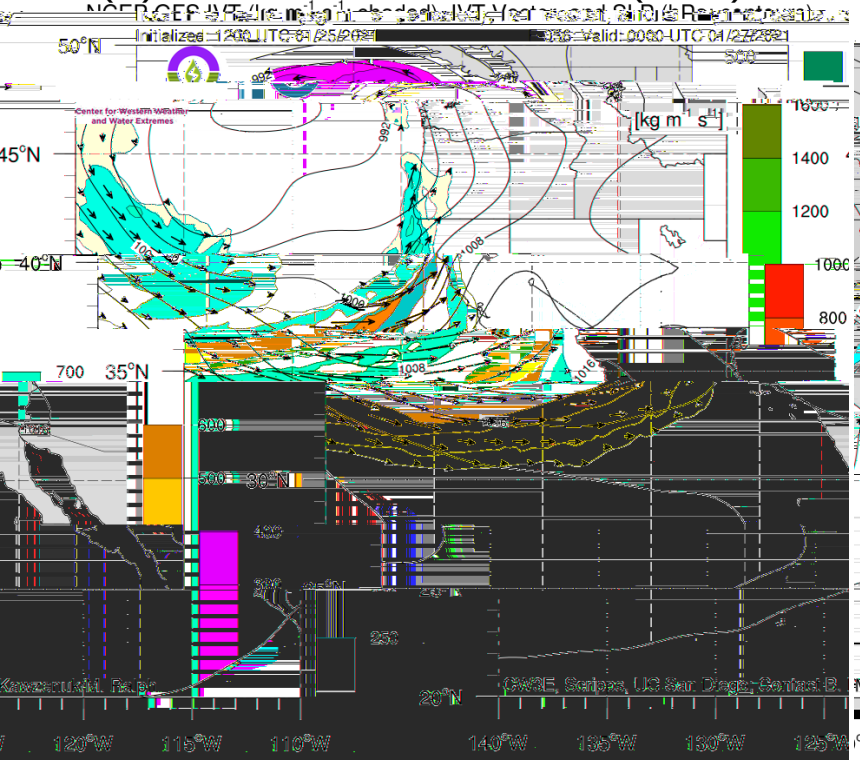


AR Outlook: 25 Jan 2021

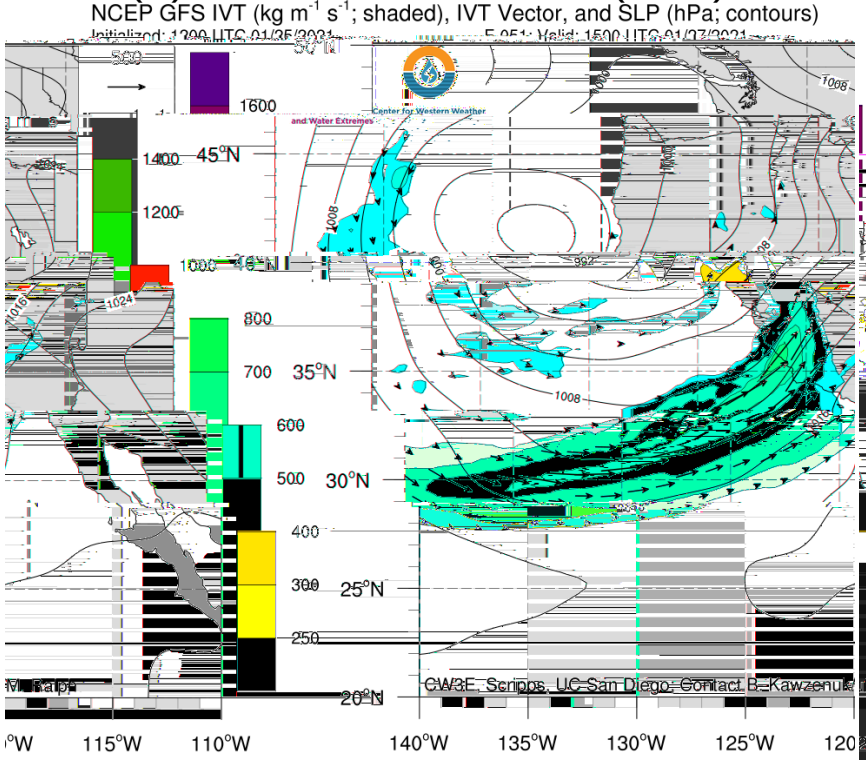
For California DWR's AR Program

GFS IVT/IWV Analyses and Forecasts

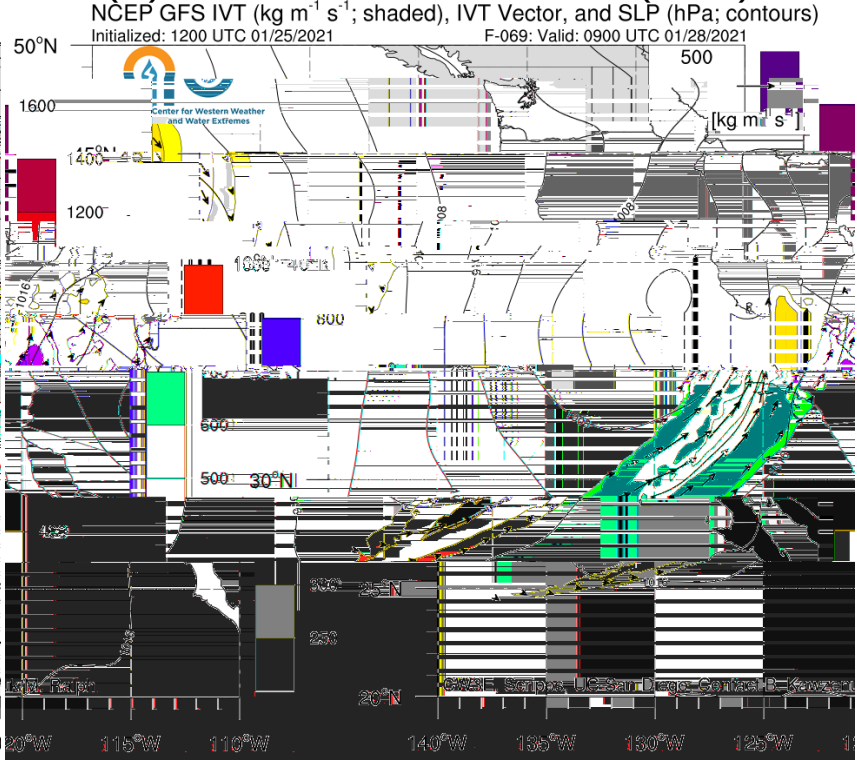
(A) Valid: 0000 UTC 27 Jan (F-36)



(B) Valid: 15 UTC 27 Jan (F-51)



(C) Valid: 0900 UTC 28 Jan (F-69)

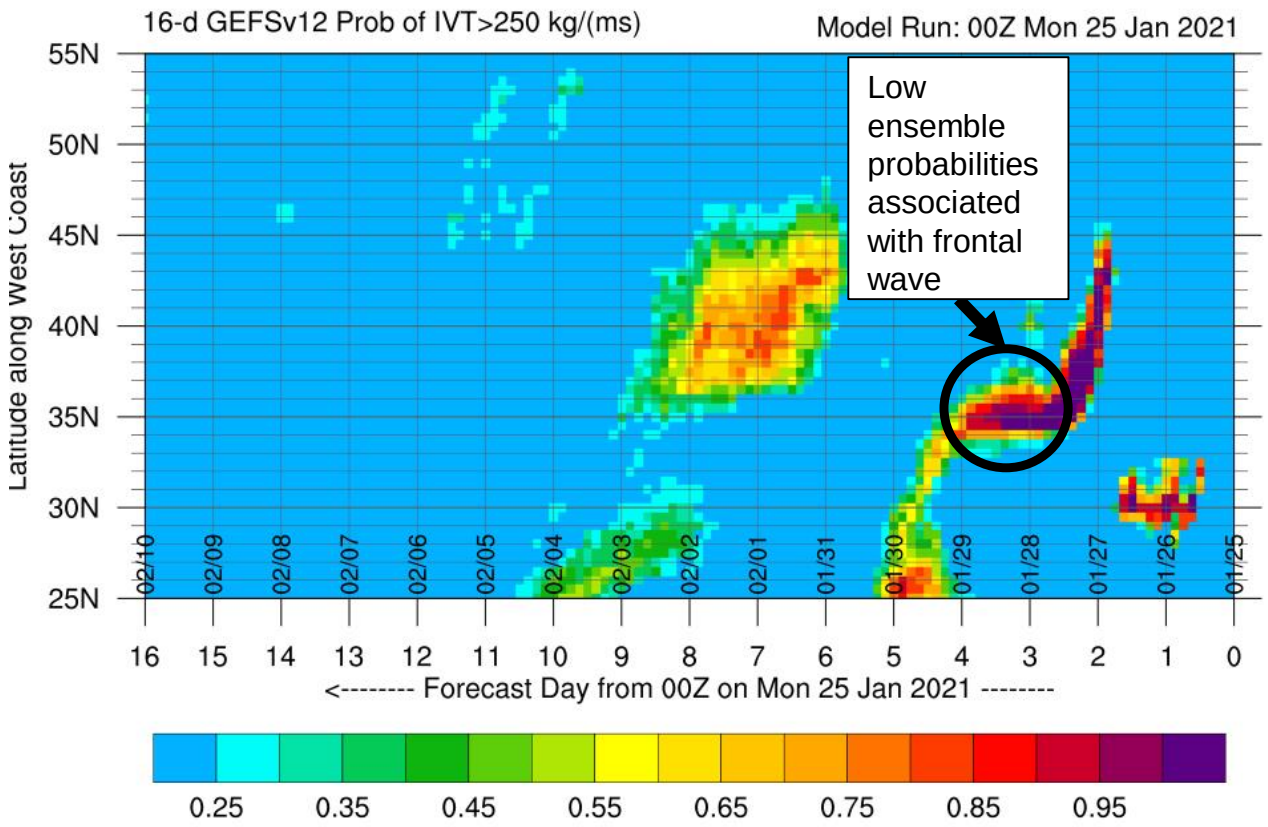


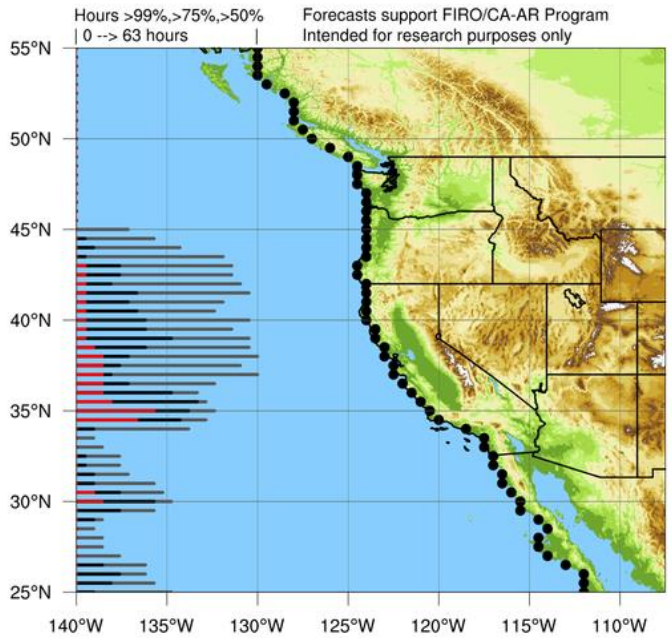
- The AR is currently forecast by the GFS to make landfall at ~00 UTC 27 January 2021 (4 PM PST 26 January) over Northern CA (Figure A)
- The AR is forecast to propagate down the coast, bringing IVT magnitudes >600 kg m^{-1} s^{-1} to the central CA Coast at 15 UTC 27 Jan (Figure B)
- An upper-level shortwave trough is then forecast to interact with the AR, causing the main corridor to rotate counterclockwise at a location near Point Conception, resulting in extended AR condition durations (Figure C)
- The interaction with the upper-level shortwave may also result in a mesoscale frontal wave, which could shift the AR core northward before propagating back southward.

AR Outlook: 25 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

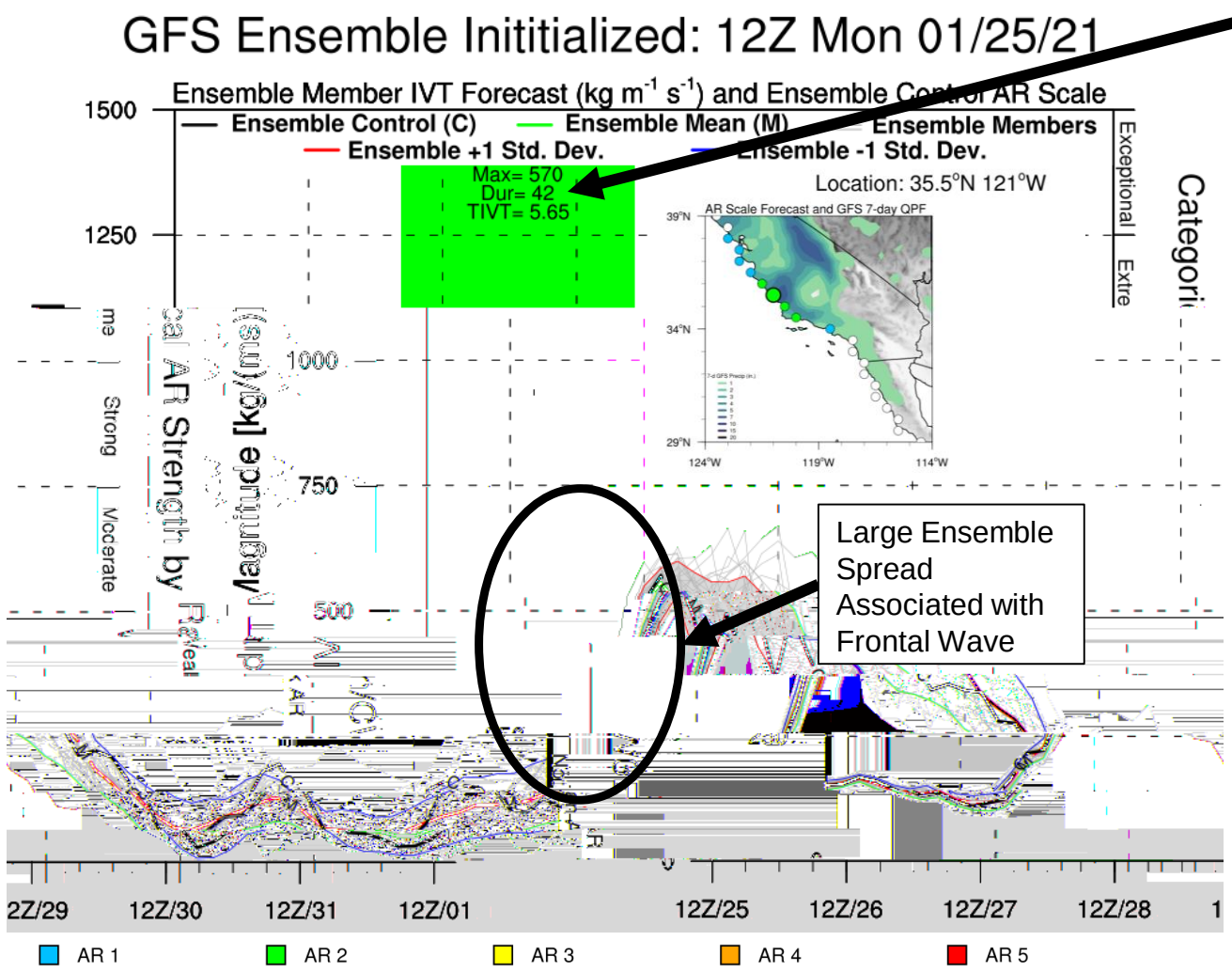
*GEFS = NCEP **G**lobal **E**nsemble **F**orecast **S**ystem (United States)

- The GEFS is currently exhibiting high ensemble agreement (>95% of ensembles) in the probability AR conditions (IVT >250 kg m^{-1} s^{-1}) during the initial landfall of the AR from 34°N to 43°N along the Coast.
- The largest ensemble uncertainty is currently associated with the frontal wave from ~00 UTC 28 to 00 UTC 29 January
- The GEFS is currently showing low ensemble probabilities associated with how far north the wave will propagate the core of the AR and how quickly that AR will shift back southward, resulting in uncertainties in overall AR duration from 34°N to 37°N (Point Conception to the Monterey Bay)

AR Outlook: 25 Jan 2021

For California DWR's AR Program

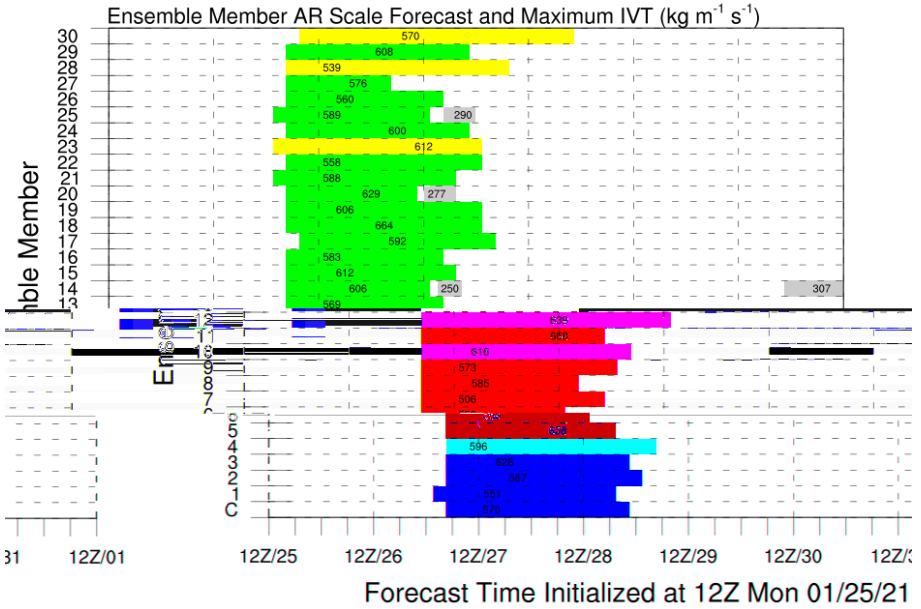
GEFS IVT/AR Scale Forecasts



˚C 01/25/2021

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

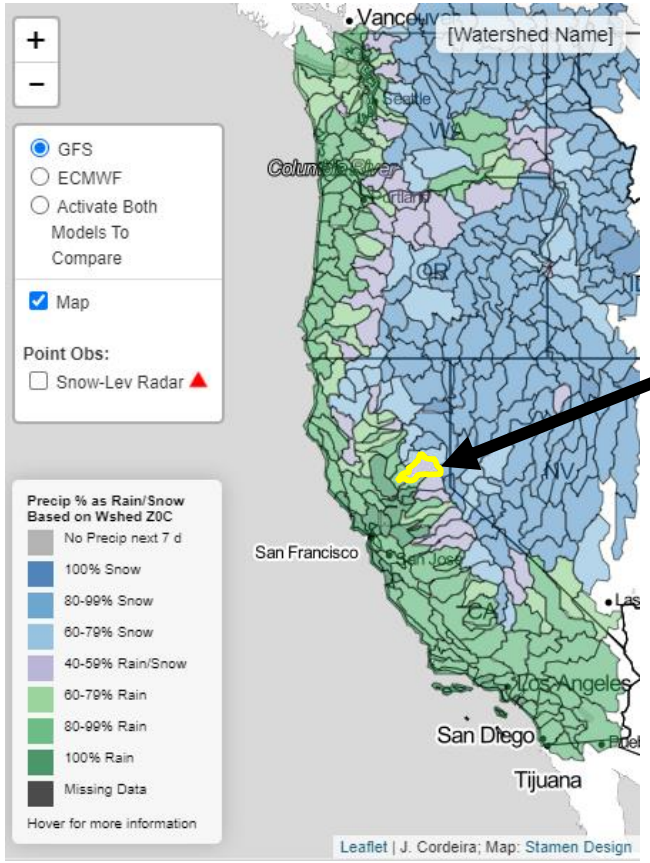
- The GEFS control is currently forecasting AR 2 conditions over the south-central Coast of California, where the frontal wave is forecast to extend AR duration
- The GEFS is also highlighting large uncertainty associated with the overall strength and timing associated with the frontal wave, resulting in uncertainty in overall duration and, therefore, AR Scale.
- Currently, 25 ensemble members are forecasting AR 2 conditions, while 6 members are forecasting AR 3 conditions due to either longer duration or higher max IVT.

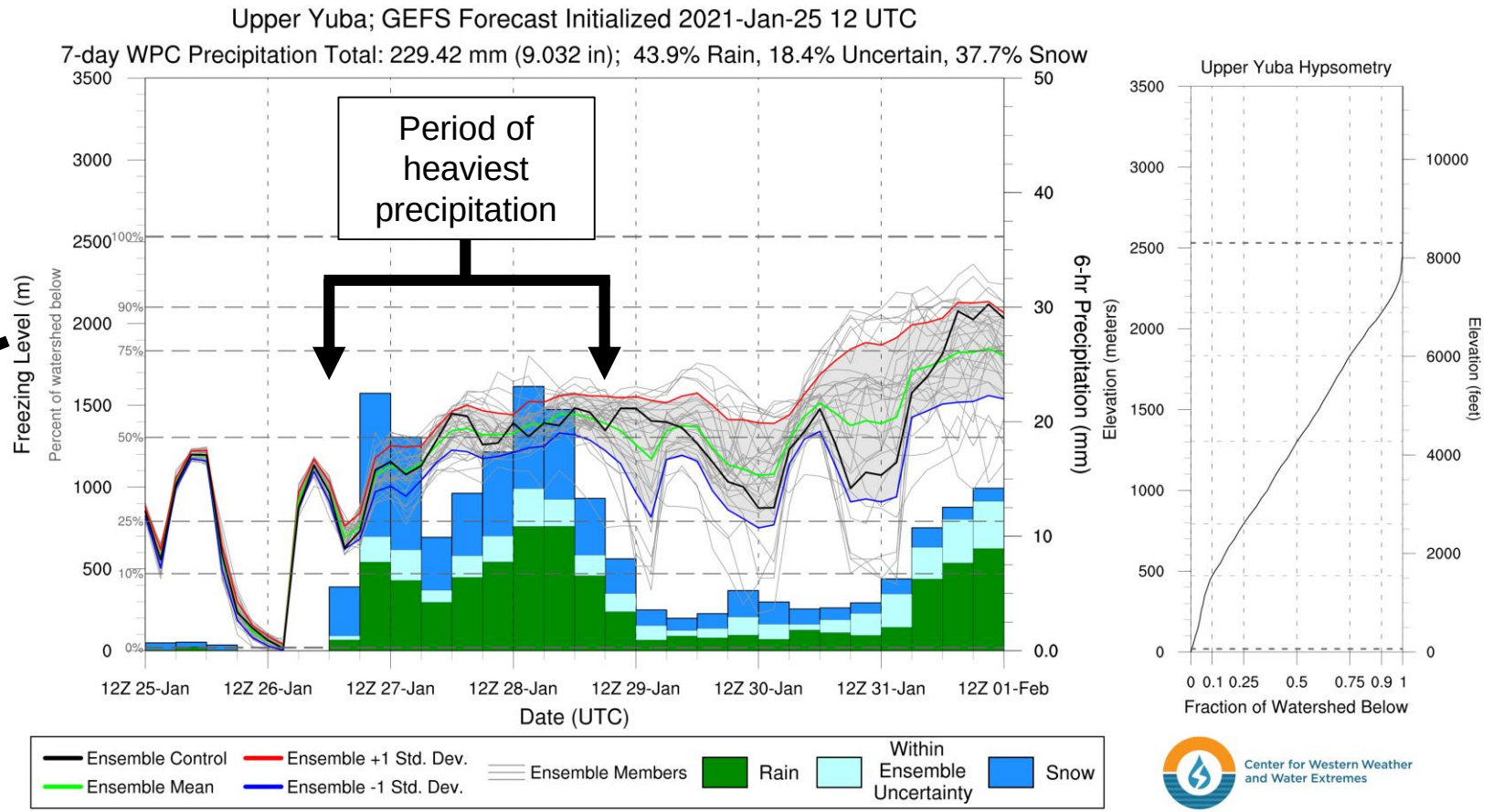


AR Outlook: 25 Jan 2021

For California DWR's AR Program

7-day Watershed Freezing Level Forecasts: Upper Yuba Watershed





- The WPC is currently forecasting ~9 inches of mean areal precipitation over the Upper Yuba watershed over the next 7 days
- During the period 00Z 27 Jan – 12Z 29 Jan, ~6 inches of precipitation is forecasted to occur with ~42% (~45%) of the watershed forecasted to experience rain (snow)
- Ensemble uncertainty of the forecasted freezing level during the heaviest period of precipitation is ~+/- 150 meters

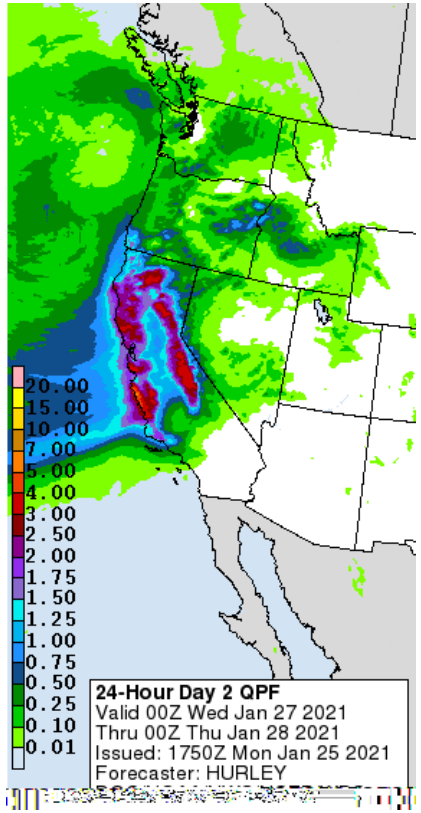
AR Outlook: 25 Jan 2021

For California DWR's AR Program

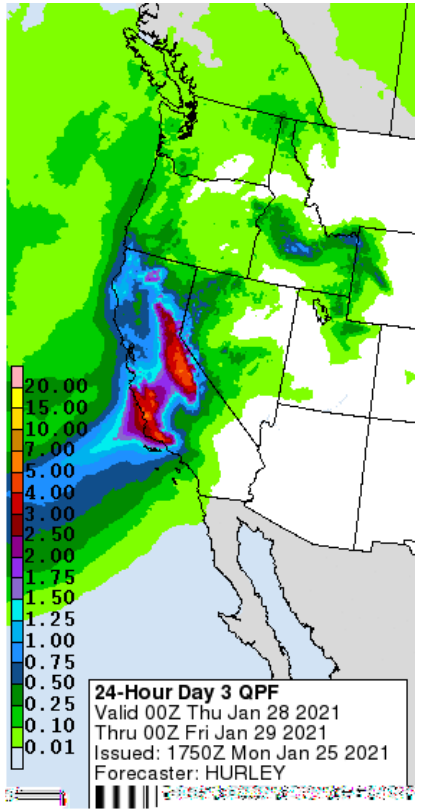
NWS WPC Quantitative Precipitation Forecasts

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

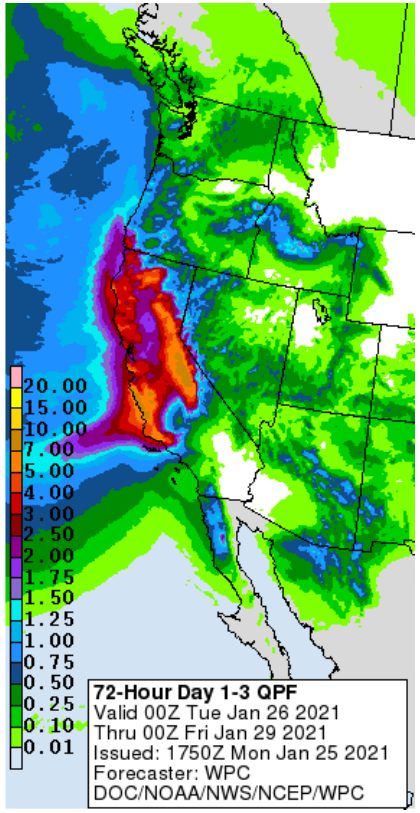
Day 2: Valid 00Z 27–28 Jan



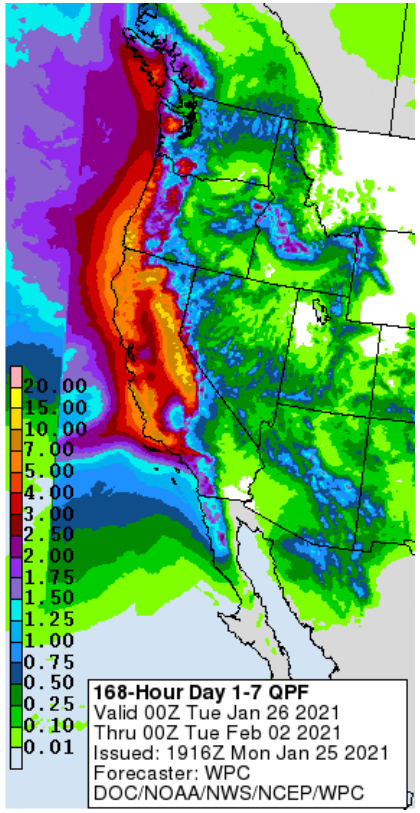
Day 3: Valid 00Z 28–29 Jan



Days 1–3: Valid 00Z 26–29 Jan



Days 1–7: Valid 00Z 26 Jan–2 Feb

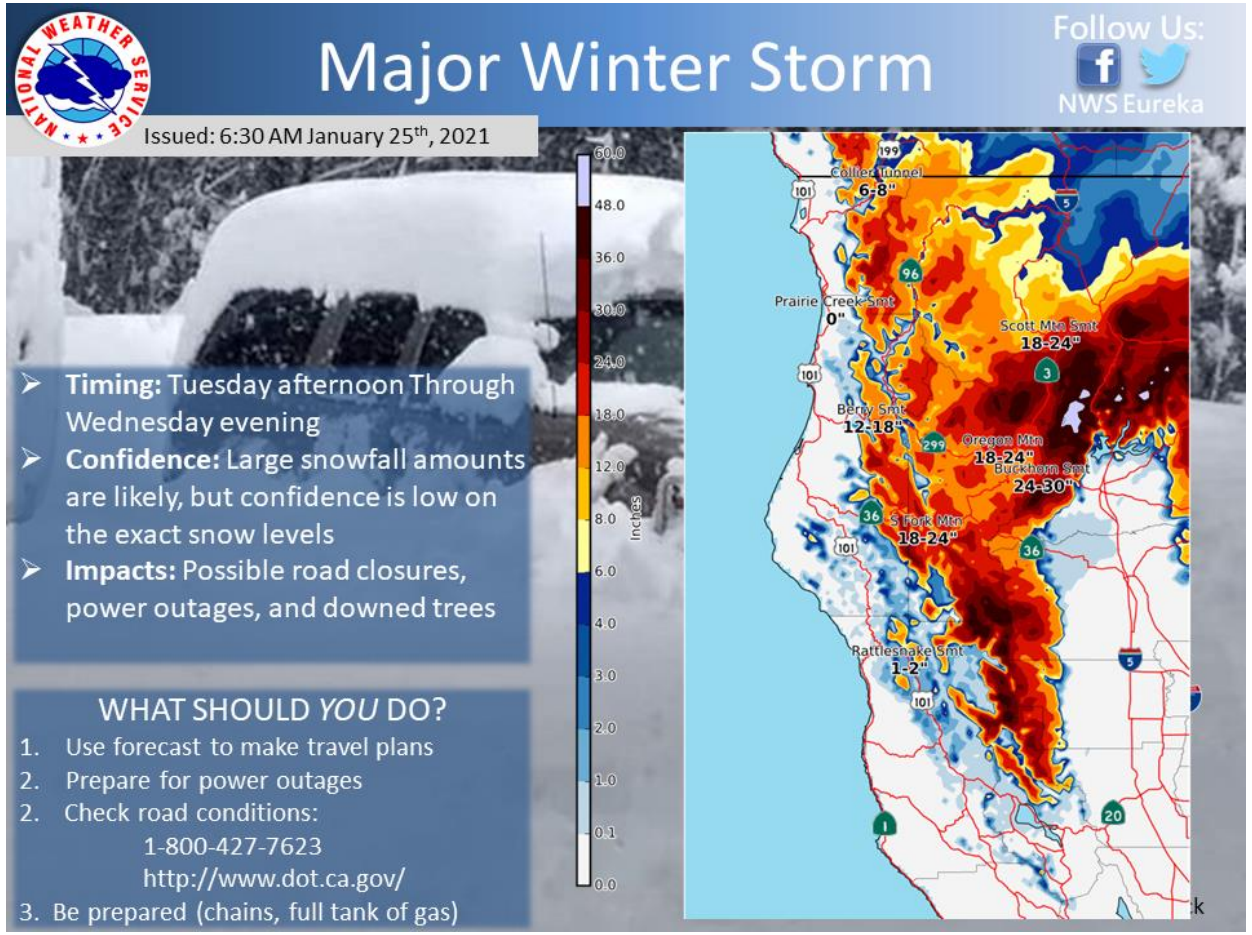


- The Weather Prediction Center (WPC) is forecasting at up to 10 inches precipitation over the Sierra Nevada and coastal CA over the next three days
- The heaviest precipitation associated with the AR is forecasted to occur over the California Coast Ranges and the Sierra Nevada on days 2-3
- The WPC is forecasting more than 15 inches of total precipitation is in some areas during the next 7 days

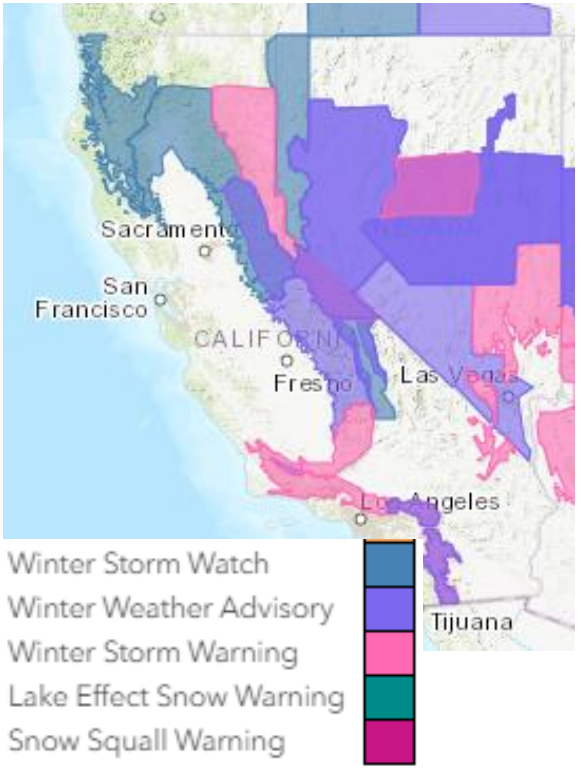
AR Outlook: 25 Jan 2021

AMBASSADOR™ WRN WEATHER-READY NATION

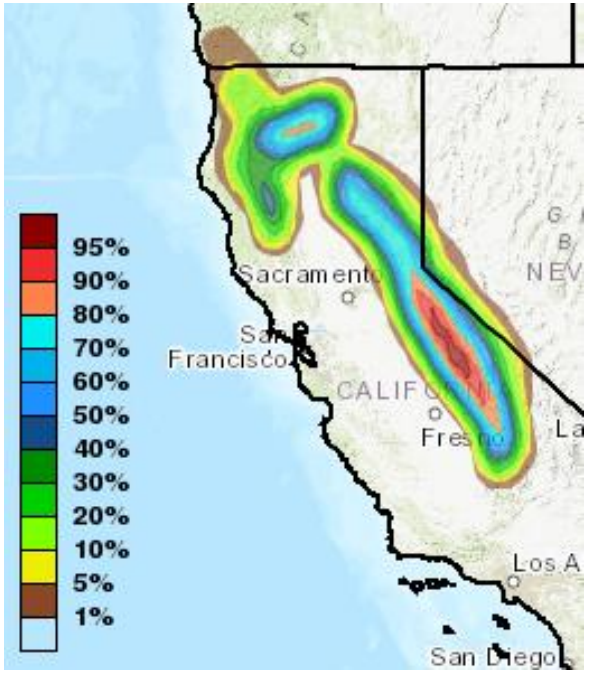
For California DWR's AR Program



Current Winter Weather WAAs



72-hr Probability of >=24 inches of Snowfall



Source: NWS Eureka, https://www.weather.gov/eka/

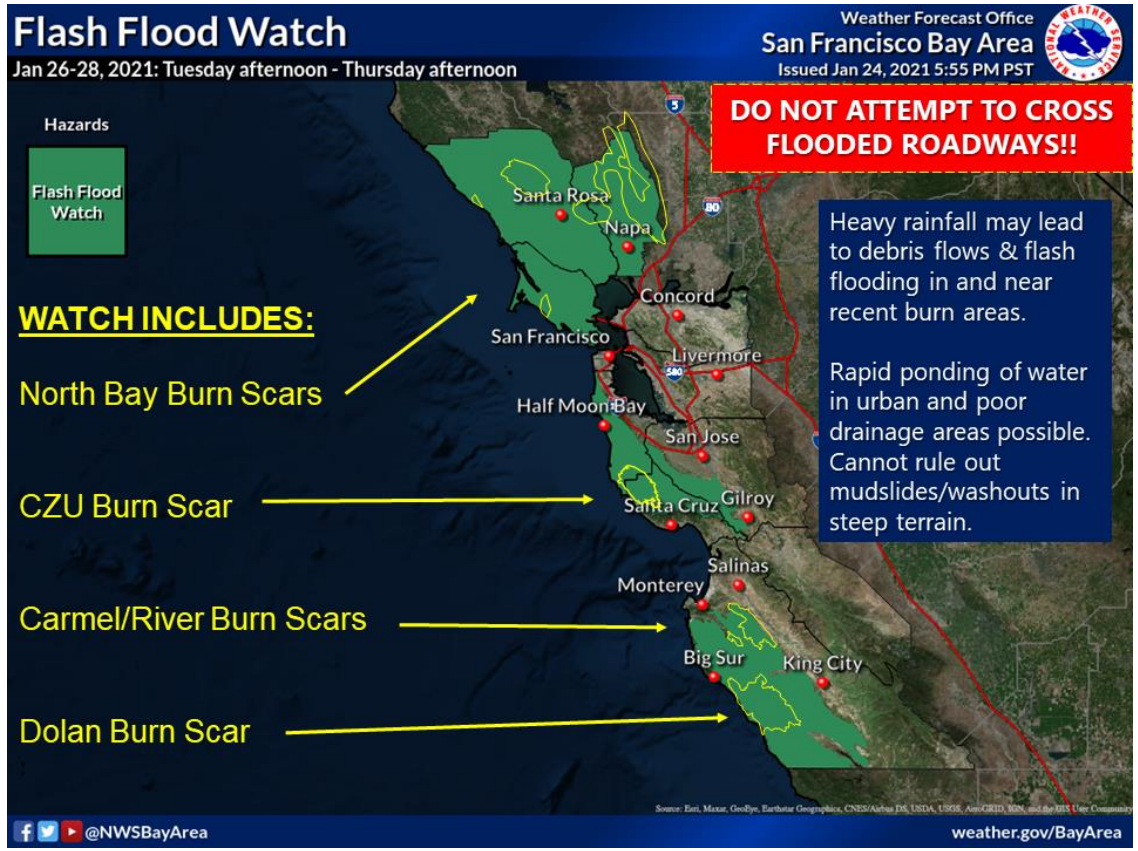
- Significant snowfall accumulations are expected over the higher terrain of northern California
- Forecast confidence in exact snowfall amounts is still low but there are high probabilities of >24 inches of snowfall over much of the Sierra Nevada
- The National Weather Service has issues winter weather advisories, watches, and warnings for much of northern CA

AR Outlook: 25 January 2021

AMBASSADOR™ WRN WEATHER-READY NATION

For California DWR's AR Program

- While storm-total precipitation is a concern, impacts related to *high-intensity* rainfall are also possible associated with this AR
- Flash flooding and/or debris flows on recent burn scars are associated with *short duration* (e.g. <=30 min), *high-intensity* rainfall
- Several factors in this storm create a scenario favorable for short-duration, high-intensity rainfall: a deepening cyclone northwest of CA, an intensifying cold front off the northern CA coast, favorable upper-level jet characteristics, and moisture associated with the AR
- This high-intensity rainfall may occur in concert with or in the absence of orographic (mountain) forcing



CAL FIRE NEWS RELEASE

Department of Forestry and Fire Protection

MEDIA CONTACT:
Jason Hoppin
jason.hoppin@santacruzcounty.us

RELEASE DATE: January 24, 2021
8:00 p.m.

EVACUATION WARNING ISSUED FOR AREA OF SANTA CRUZ COUNTY

WHEN: Effective Immediately

WHERE: Davenport (Zone: CRZ-E006B)

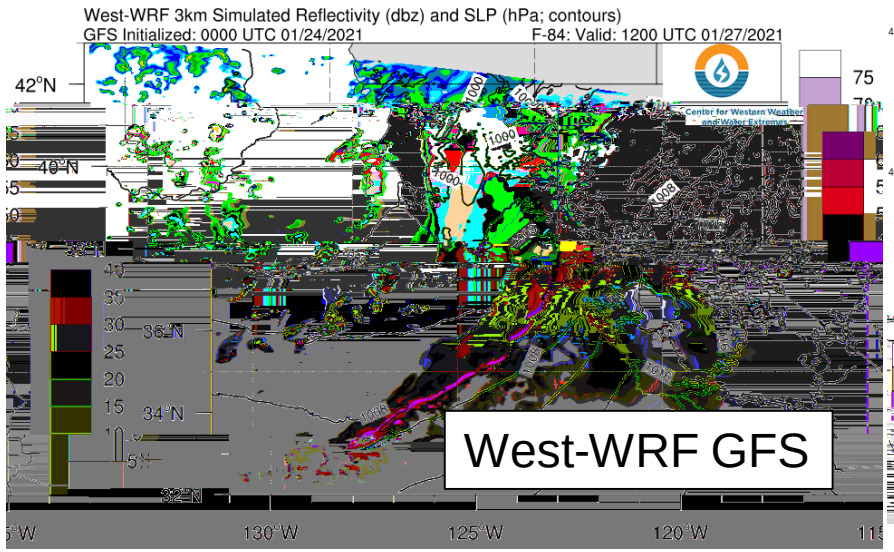
NOTES: With the upcoming atmospheric river and potential for debris flow, areas of the San Lorenzo Valley are now under evacuation warning. Late Tuesday night into early Wednesday morning we are expecting a high wind and heavy rain event. The National Weather Service is expecting anywhere from 8-12 inches over the course of the storm for the Santa Cruz Mountains.

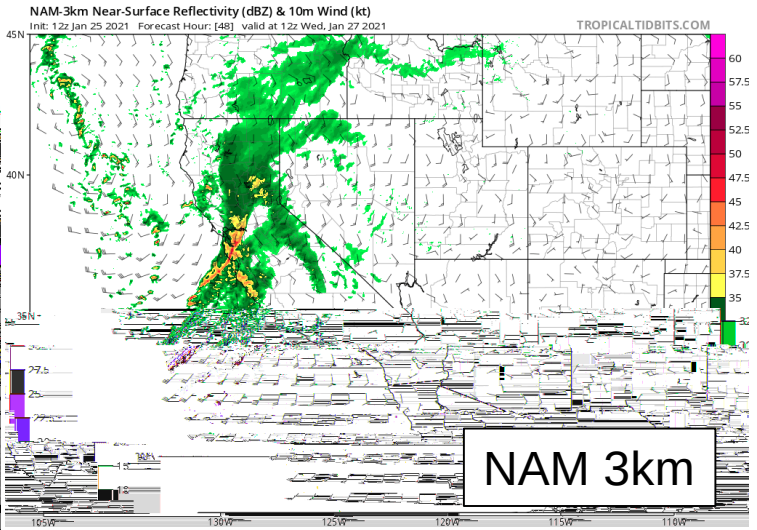
Evacuation warnings were issued by Cal Fire the evening of January 24 for areas in/around the CZU Burn Scar in Santa Cruz County, one of CA's 2020 burn areas with high debris flow potential. For more info on burn scar hazards, visit: *landslides.usgs.gov/hazards/postfire_debrisflow/*

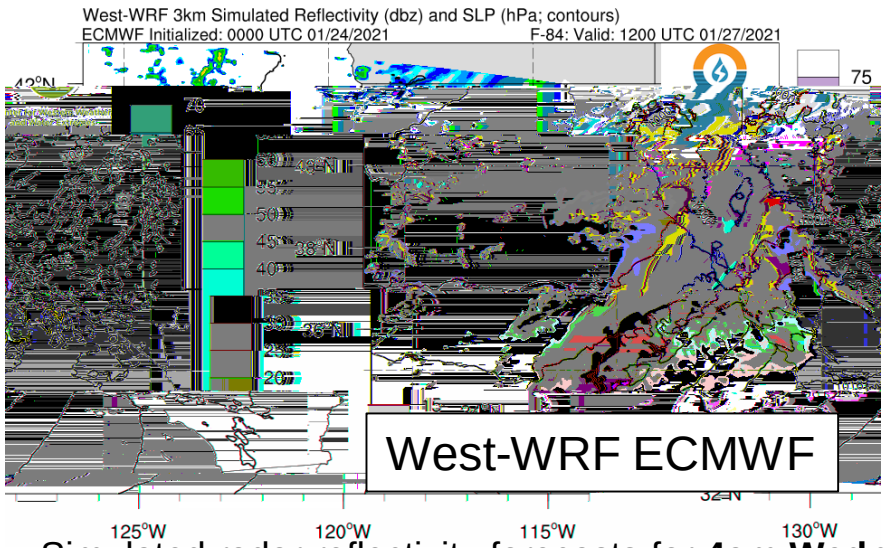
AR Outlook: 25 Jan 2021

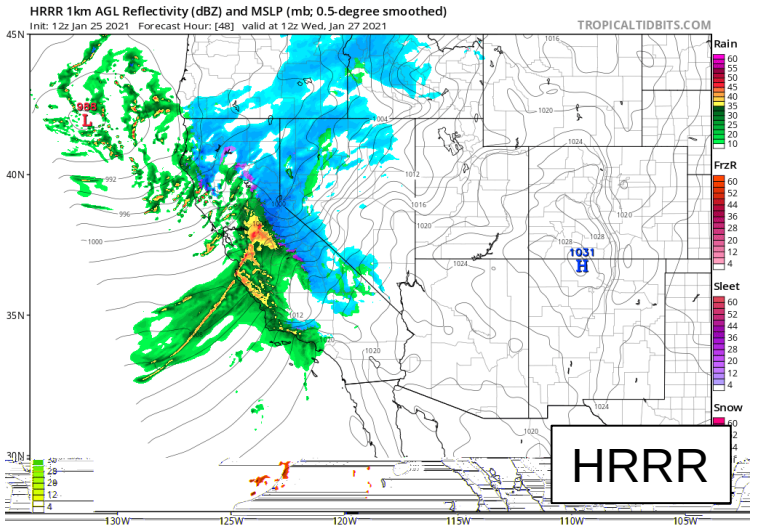
For California DWR's AR Program

- Mesoscale models generally agree on the formation of a narrow band of moderate-to-high intensity rainfall along the storm's cold front, though differ in timing, location, orientation, and intensity of rain band.
- Front forecast to make landfall in N. CA Tuesday evening and propagating southeastward along the coast, impacting central CA coastal mountains Tuesday night through Wednesday.
- Models suggest the front will drift northward again Wednesday night (driven by the frontal wave), creating additional chances for high-intensity rainfall in Central CA.
- Areas in the Southern CA Bight could potentially see high-intensity rainfall as the cold front passes through that region Thursday into Friday morning though models are more uncertain on timing over this region.



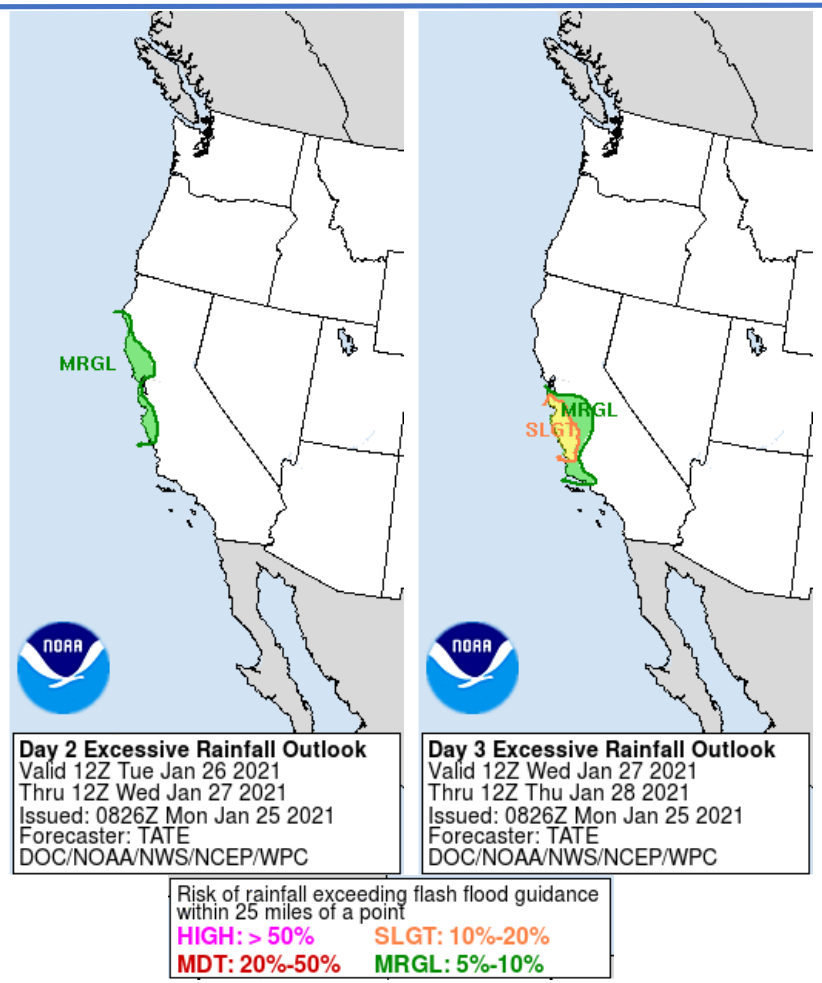






Simulated radar reflectivity forecasts for **4am Wednesday**. Orange-to-red colors indicate moderate-to-high-intensity rainfall. Details are likely to evolve as the event nears.

AR Outlook: 25 Jan 2021



WPC suggests marginal risk for rainfall exceeding flash flood guidance on Tuesday for the Central CA Coast (left), increasing to slight risk on Wednesday (right) for parts of Santa Cruz, Monterey, and San Luis Obispo counties (Santa Cruz and Santa Lucia Mtns).

AMBASSADOR™ WRN WEATHER-READY NATION

For California DWR's AR Program

- There is high uncertainty as to the timing, location, and intensity of rainfall with respect to burn scars, though this event presents high potential for exceeding debris flow thresholds.
- Stay tuned to your local National Weather Service office and local authorities for guidance as the situation evolves.

Impacts of a post-fire debris flow in Big Sur, April 7th 2009. Impactful post-fire debris flows are less common in central/northern CA than southern CA though still pose a threat to communities within/downstream of recent burn areas.

AR Outlook: 25 January 2021

For California DWR's AR Program

- As part of Atmospheric River Reconnaissance, in collaboration with the US Air Force 53rd Weather Reconnaissance Squadron and the National Oceanic and Atmospheric Administration (NOAA) Aircraft Operations Center, there have been three successive days of aircraft operations that have sampled this system as it has evolved
- Three additional flights are planned over the next several days, resulting in a total of six consecutive days of Intensive Operations
- These data will be assimilated into the global atmospheric models in an effort to improve what has been a very uncertain forecast.
- For more information on Atmospheric River Reconnaissance, visit https://cw3e.ucsd.edu/arrecon_overview/