CW3E Atmospheric River Outlook

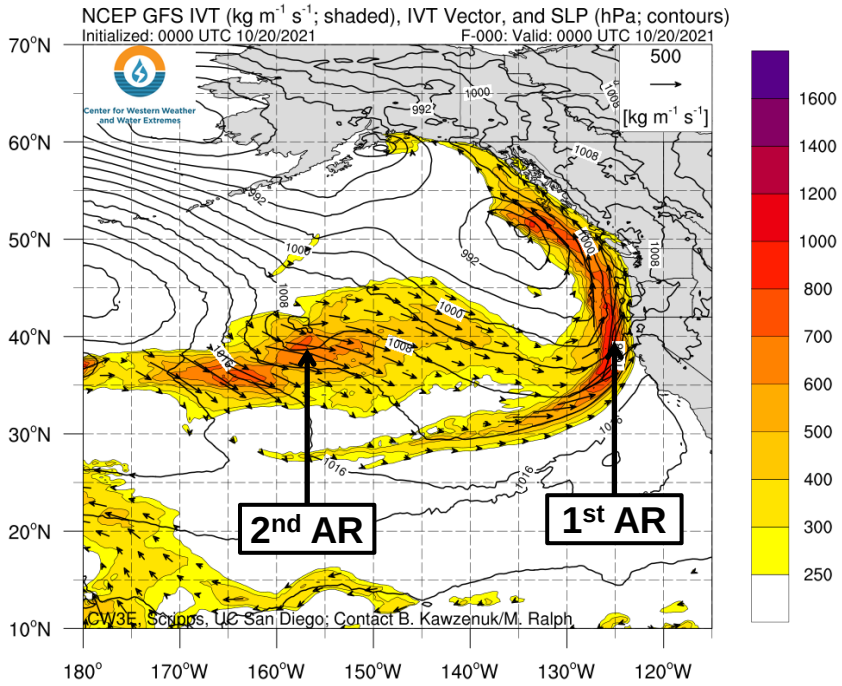
Multiple Atmospheric Rivers to Bring Heavy Precipitation to Northern California

- A series of landfalling atmospheric rivers (ARs) will impact the western US this week into early next week
- AR 4/AR 5 conditions (based on the Ralph et al. 2019 AR Scale) are expected in coastal southern Oregon in association with the first and second ARs today through Friday
- The strongest AR is forecasted to make landfall across Central and Northern California on Sunday, potentially bringing AR 4/AR 5 conditions to the San Francisco Bay Area
- Inland penetration of this AR may bring AR 2/AR 3 conditions to portions of the interior western US
- Yet another landfalling AR is forecasted to impact the US West Coast on 26–27 Oct
- The first two ARs are forecasted to produce 2–5 inches of rainfall in portions of Northern California and southern Oregon
- The fourth AR is forecasted to bring widespread precipitation to much of the western US, with the heaviest precipitation amounts in Northern California
- Significant snowfall accumulations are also possible in the Sierra Nevada in association with the fourth AR
- Portions of Northern California may receive more than 10 inches of total precipitation over the next 7 days

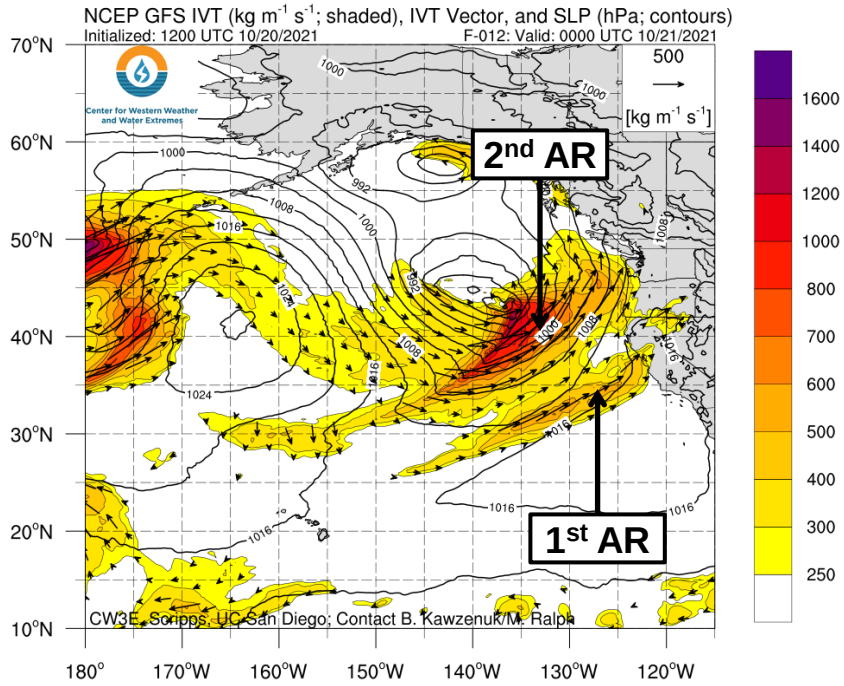
AR Outlook: 20 Oct 2021

GEFS IVT & IWV Forecasts

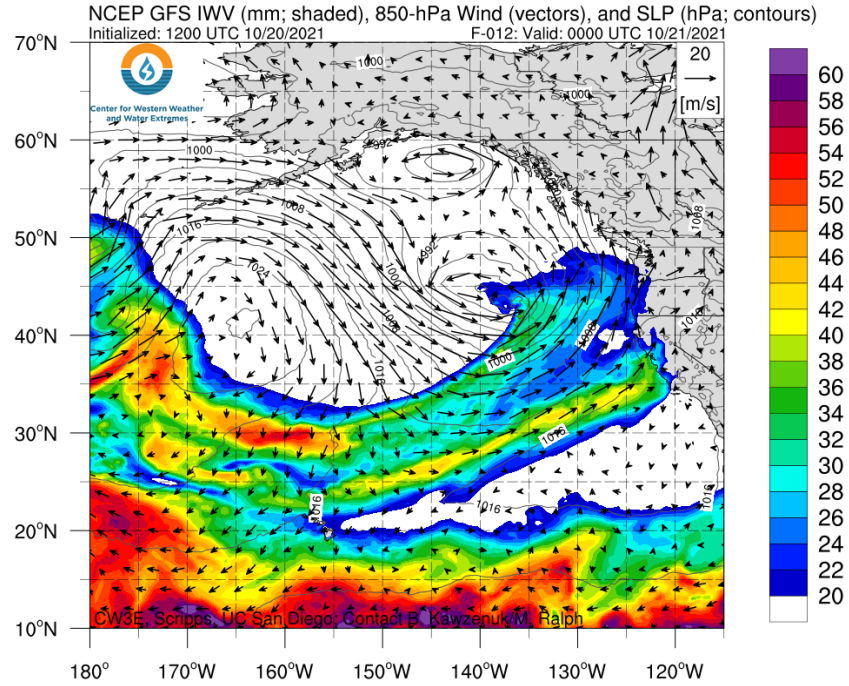
(A) Valid: 5 PM PT 19 Oct (Analysis)



(B) Valid: 5 PM PT 20 Oct (F-12)



(C) Valid: 5 PM PT 20 Oct (F-12)

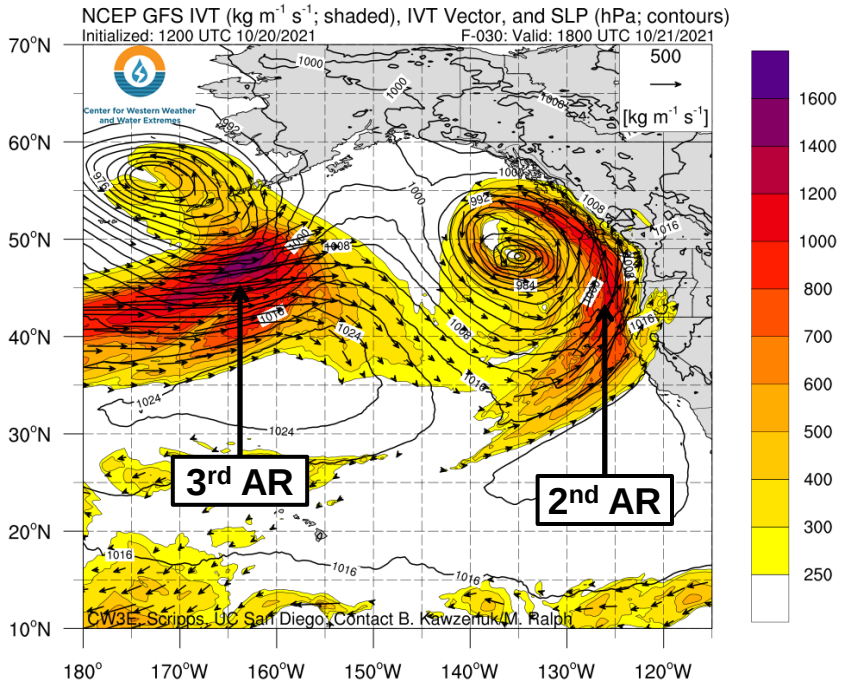


- The first AR made landfall along the US West Coast yesterday (Figure A)
- While this AR has already begun to dissipate over most of Washington and Oregon, it will continue to impact Northern California today, bringing IWV values > 30 mm to the San Francisco Bay Area (Figures B and C)
- The second AR will strengthen and make landfall in association with a rapidly intensifying surface cyclone later today (Figure B)

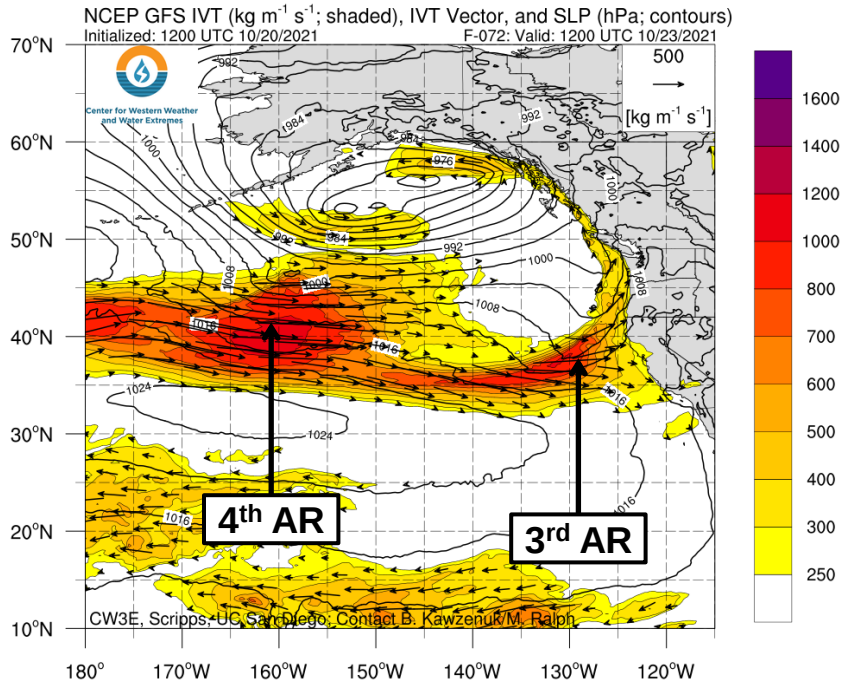
AR Outlook: 20 Oct 2021

GEFS IVT & IWV Forecasts

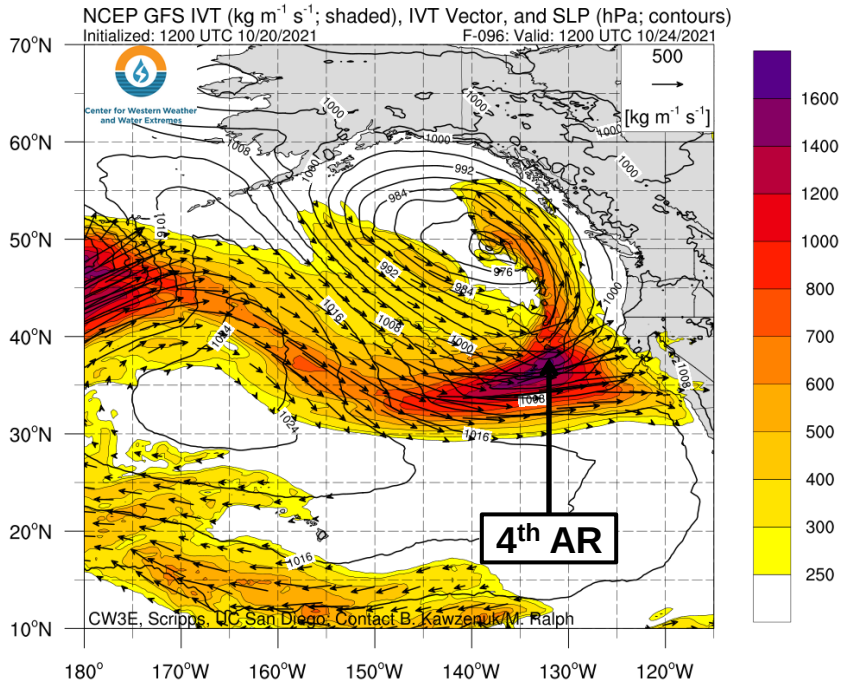
(A) Valid: 11 AM PT 21 Oct (F-30)



(B) Valid: 5 AM PT 23 Oct (F-72)



(C) Valid: 5 AM PT 24 Oct (F-96)

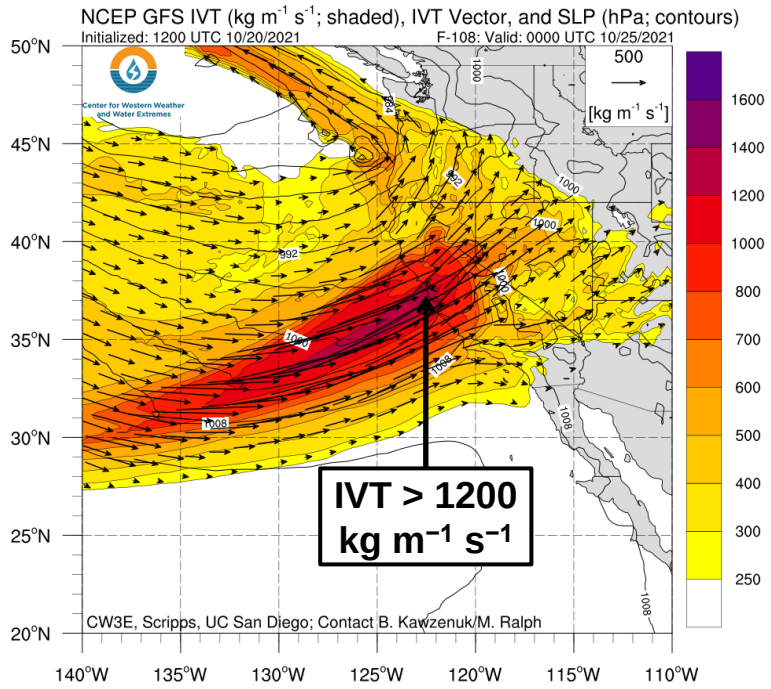


- The strongest moisture transport during the second AR is forecasted to occur around noon tomorrow, with IVT values > 1000 kg m^{-1} s^{-1} possible along the Oregon coast (Figure A)
- A third AR will approach the US West Coast on Friday, but this AR is expected to rapidly dissipate and produce little precipitation (Figure B)
- The fourth and strongest AR is forecast to make landfall in California on Sunday (Figure C)

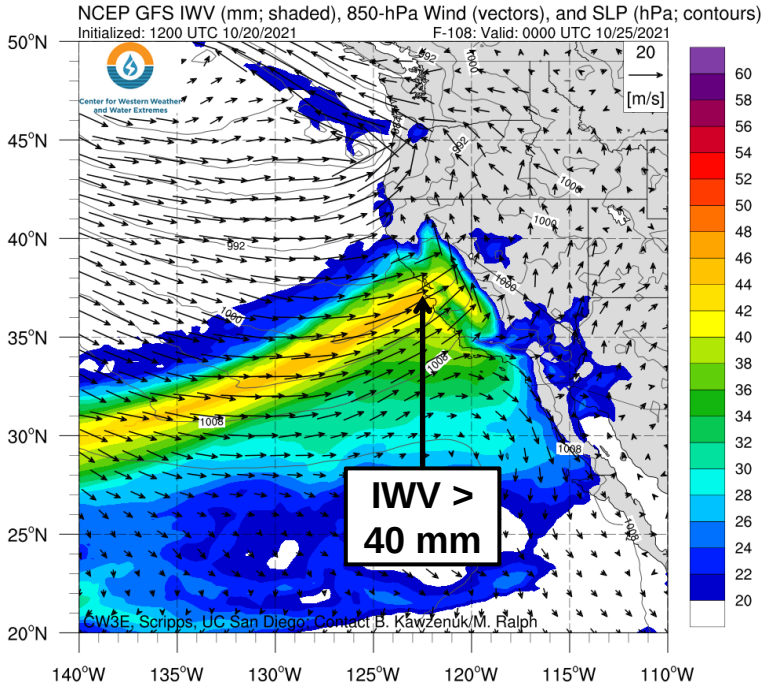
AR Outlook: 20 Oct 2021

GEFS IVT & IWV Forecasts

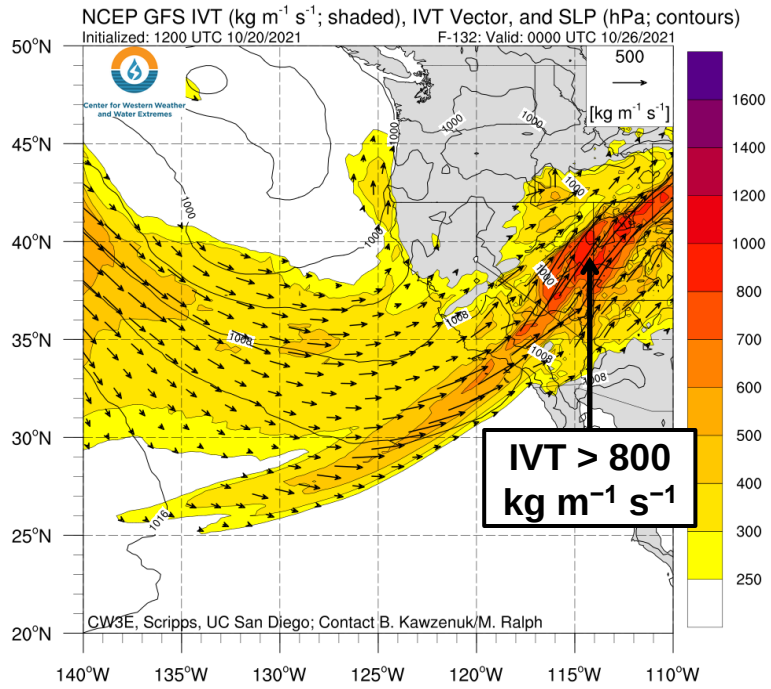
(A) Valid: 5 PM PT 24 Oct (F-108)



(B) Valid: 5 PM PT 24 Oct (F-108)



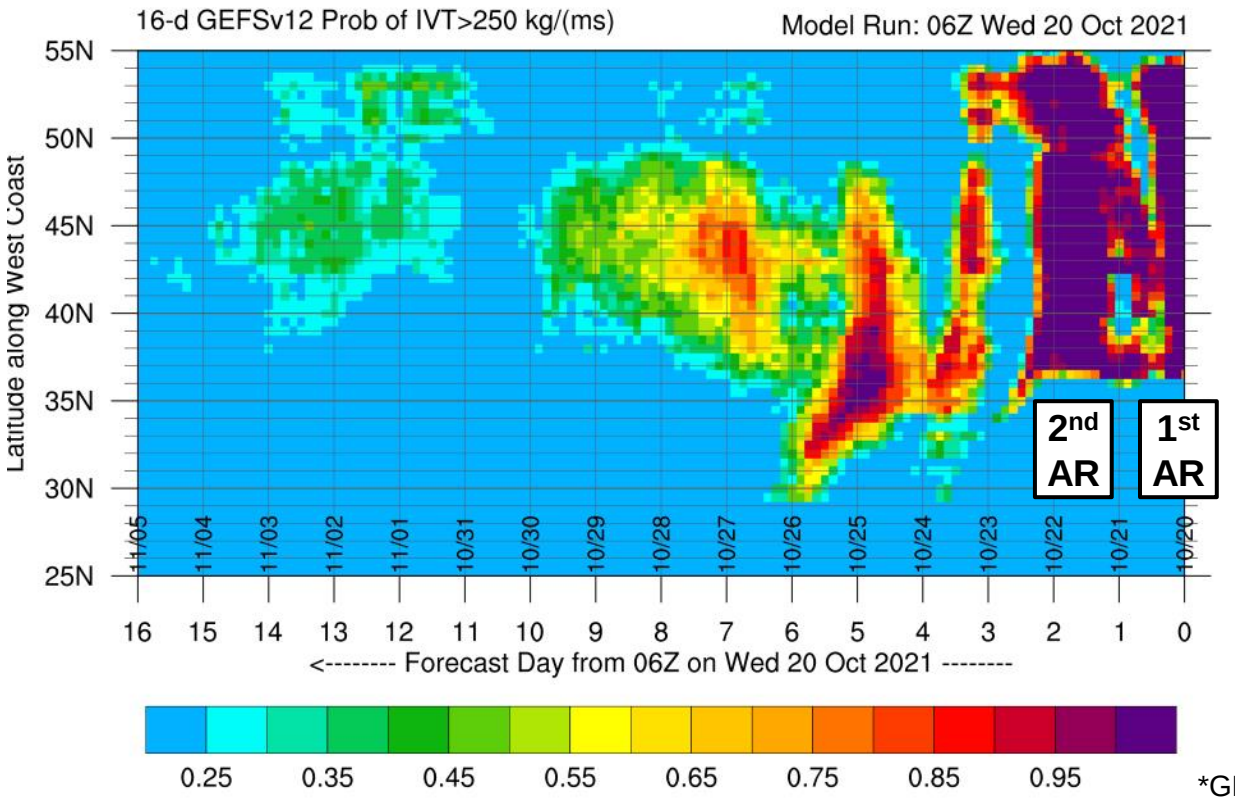
(C) Valid: 5 PM PT 25 Oct (F-132)



- The 12Z GFS deterministic model is forecasting maximum IVT values > 1200 kg m^{-1} s^{-1} and maximum IWV values > 40 mm over the San Francisco Bay Area in association with the fourth AR (Figures A and B)
- Given the southwesterly orientation of the IVT vectors, strong upslope moisture flux will likely result in orographic enhancement of precipitation across the California Coast Ranges and the Sierra Nevada
- Significant inland penetration of this AR is forecasted to bring strong moisture transport to interior portions of the western US (Figure C)

AR Outlook: 20 Oct 2021

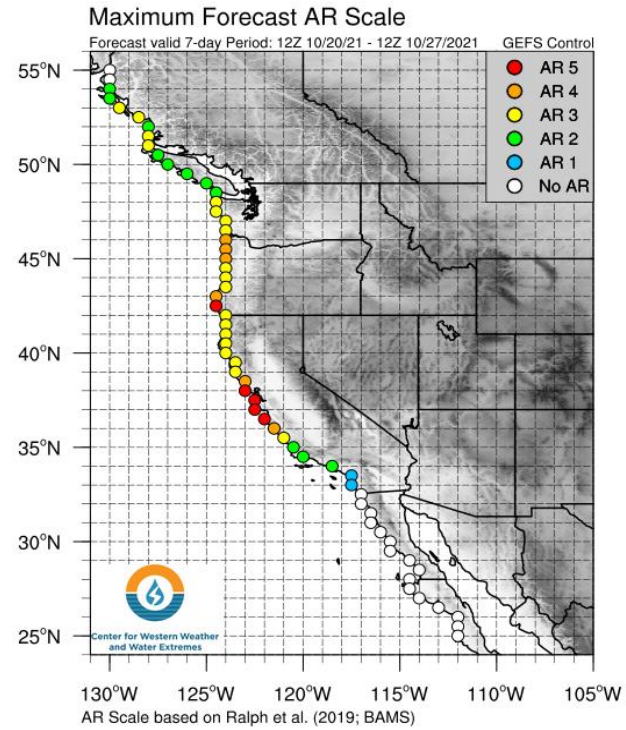
Probability of AR Conditions Along Coast



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

PLYMOUTH STATE METEOROLOGY

AR Scale

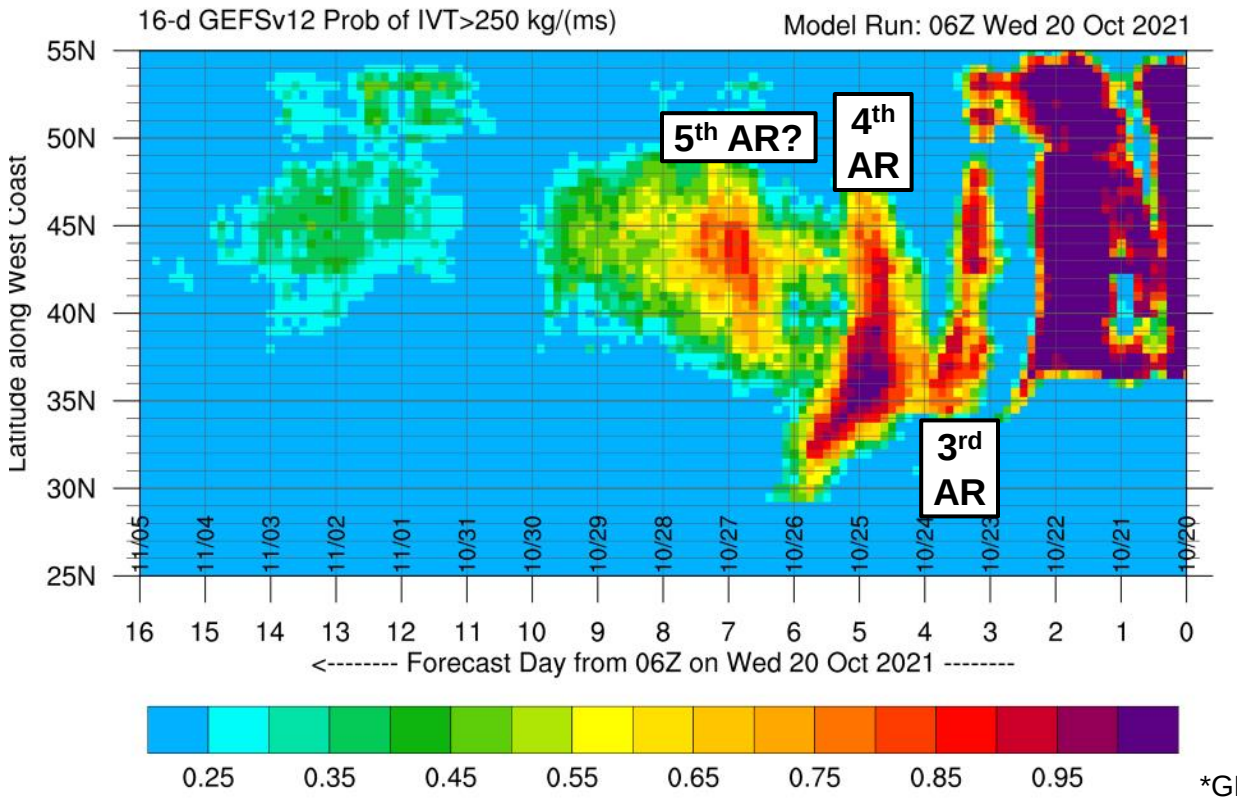


*GEFS = NCEP **G**lobal **E**nsemble **F**orecast **S**ystem (United States)

- The 06Z GEFS is showing very high confidence (> 95% probability) in AR conditions (IVT > 250 kg m^{-1} s^{-1}) over Northern California, Oregon, and Washington in association with the first and second ARs
- Some areas in coastal Oregon and Northern California may not experience a break in AR conditions between the first and second ARs
- AR 5 conditions (based on the Ralph et al. 2019 AR Scale) are possible in southwestern Oregon during the first two ARs, with AR 3/AR 4 conditions expected elsewhere in coastal Northern California, Oregon, and Washington

AR Outlook: 20 Oct 2021

Probability of AR Conditions Along Coast



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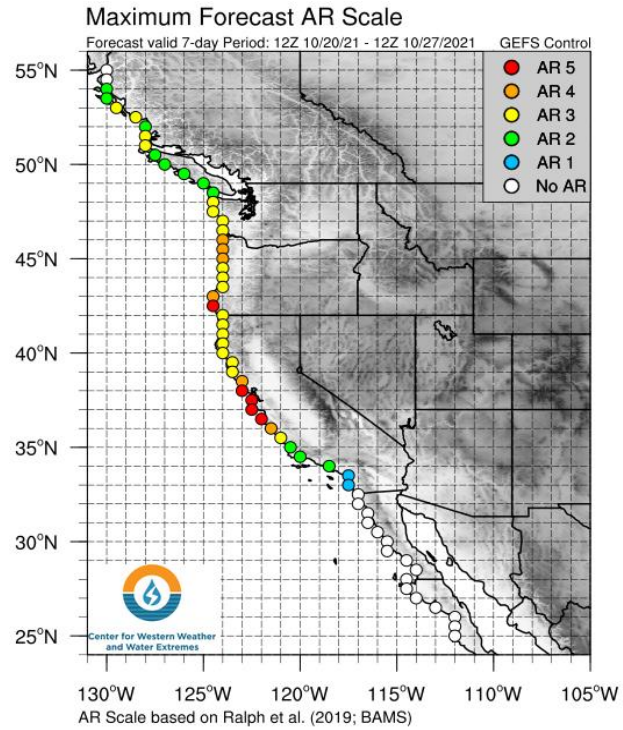
PLYMOUTH STATE METEOROLOGY

AR Scale

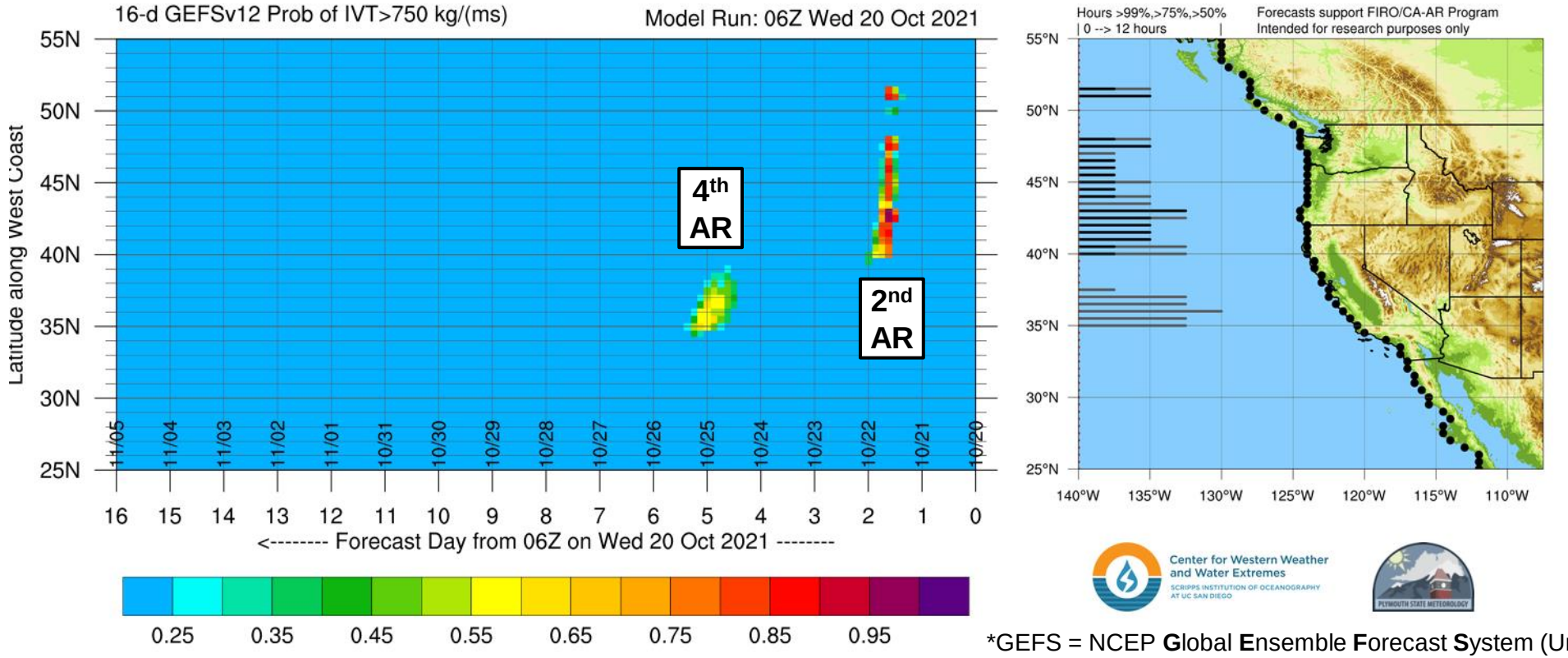


*GEFS = NCEP **G**lobal **E**nsemble **F**orecast **S**ystem (United States)

- The 06Z GEFS is also showing high confidence (> 95% probability) in AR conditions over coastal Central and Northern California in association with the fourth AR
- Some areas in coastal California may not experience a break in AR conditions between the third and fourth ARs
- The 06Z GEFS control run is predicting AR 5 conditions near the San Francisco Bay Area in association with the third and fourth ARs
- Yet another landfalling AR is now likely (> 75% probability) to impact the US West Coast on 26–27 Oct

AR Outlook: 20 Oct 2021

Probability of Strong AR Conditions Along Coast

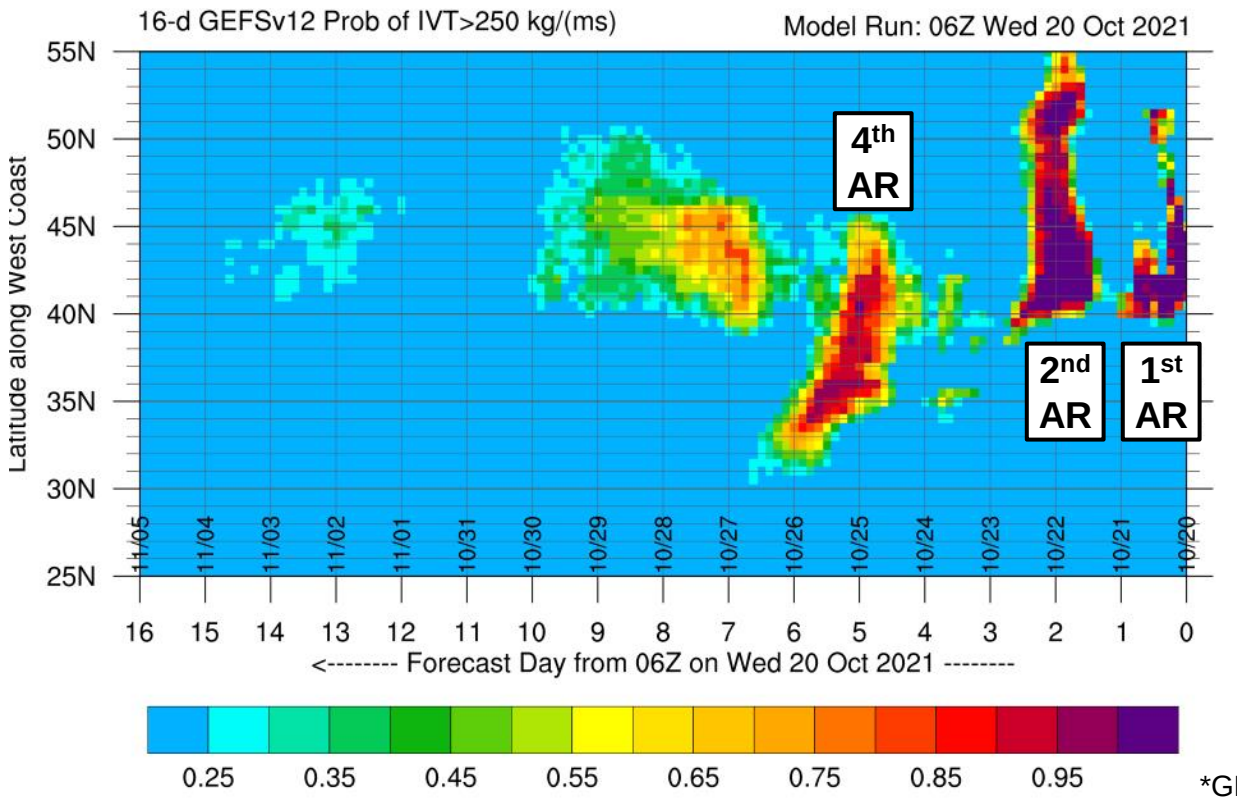


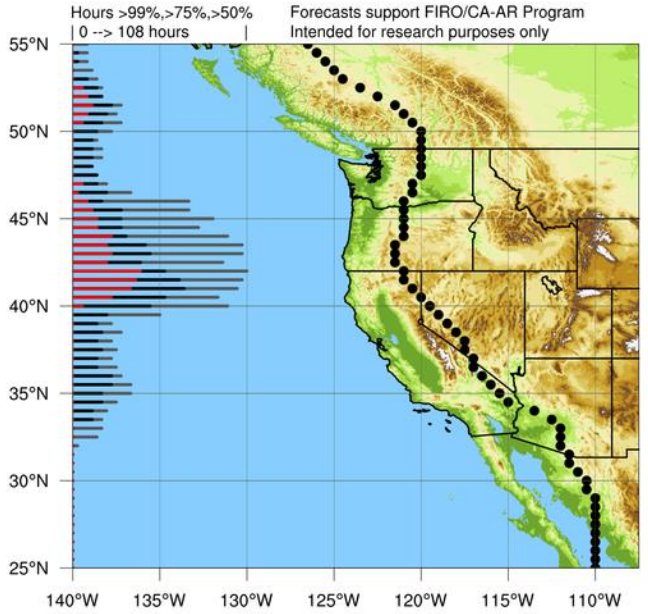
*GEFS = NCEP **G**lobal **E**nsemble **F**orecast **S**ystem (United States)

- The 06Z GEFS is showing high confidence (> 80% probability) in a brief period of strong AR conditions (IVT > 750 kg m^{-1} s^{-1}) over coastal Northern California, Oregon, and Washington during the second AR
- There is also increasing forecast confidence (now > 50% probability) that the fourth AR will bring strong AR conditions to coastal California

AR Outlook: 20 Oct 2021

Probability of AR Conditions Inland





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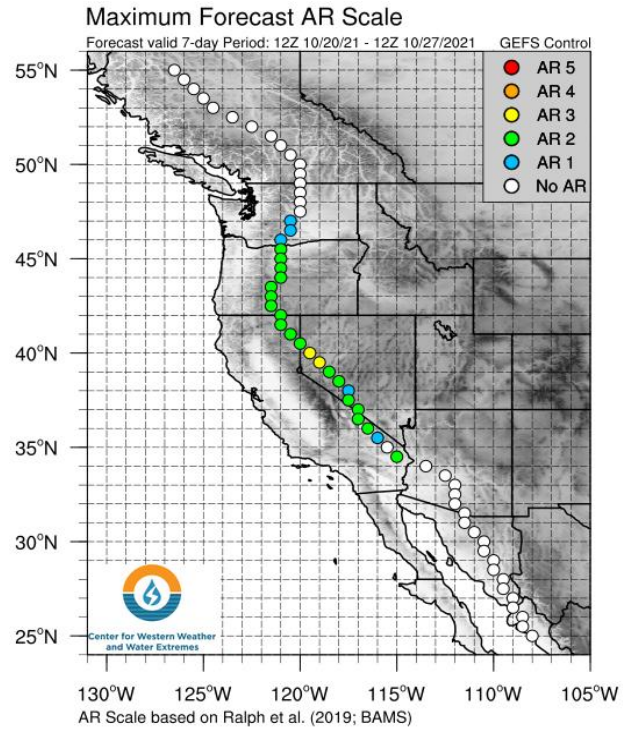
PLYMOUTH STATE METEOROLOGY

AR Scale

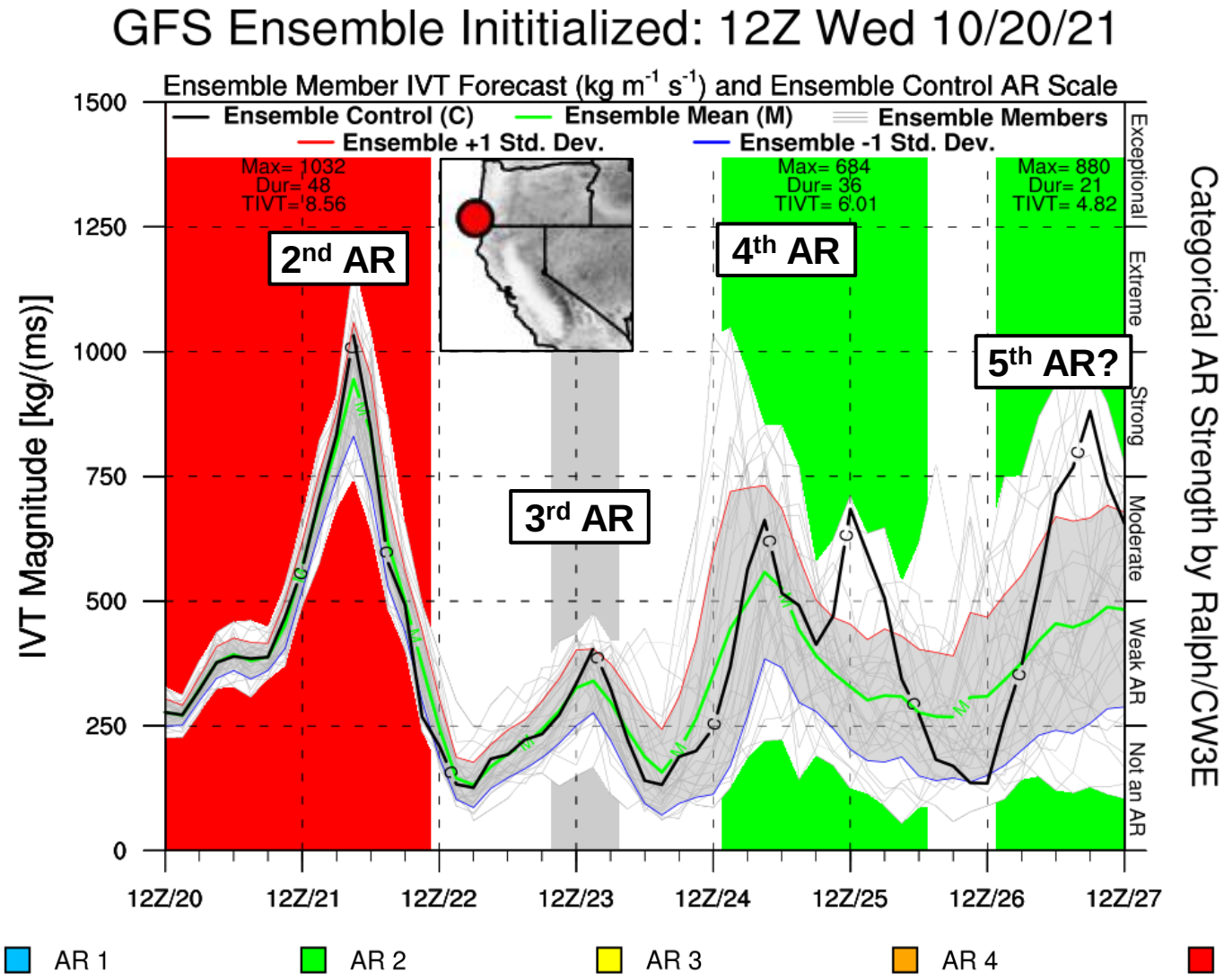


*GEFS = NCEP **G**lobal **E**nsemble **F**orecast **S**ystem (United States)

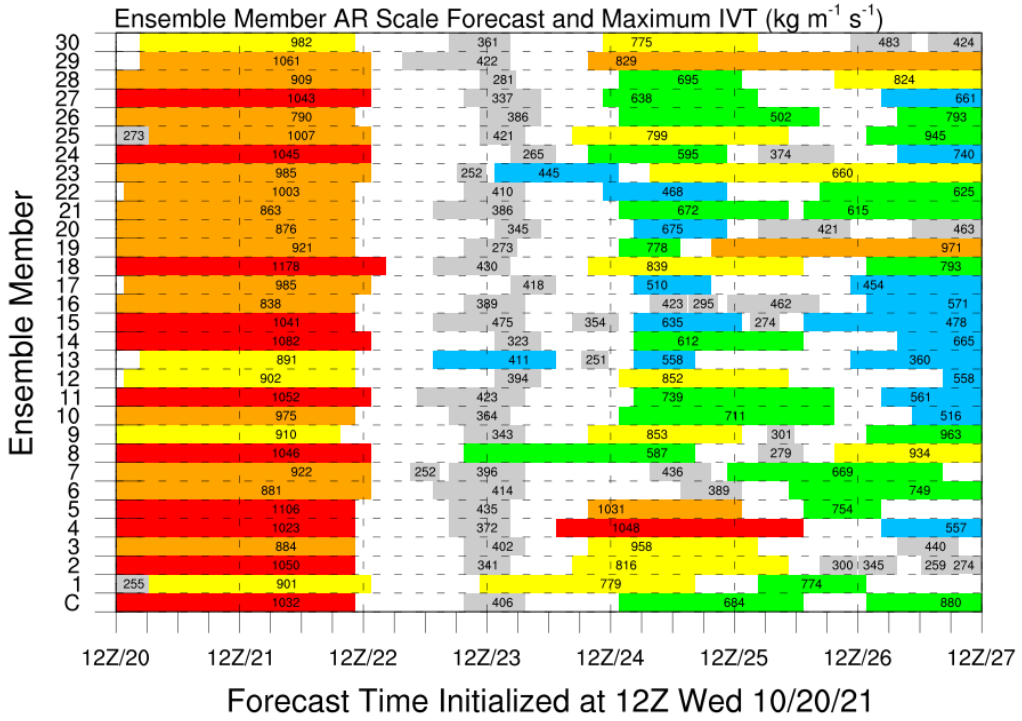
- The 06Z GEFS is also showing high confidence (> 90% probability) in AR conditions over interior portions of the western US in association with the first, second, and fourth ARs
- Inland penetration of higher IVT values may lead to AR 2/AR 3 conditions east of the Cascades and Sierra Nevada, particularly during the fourth AR

AR Outlook: 20 Oct 2021

GEFS AR Scale and IVT Forecasts

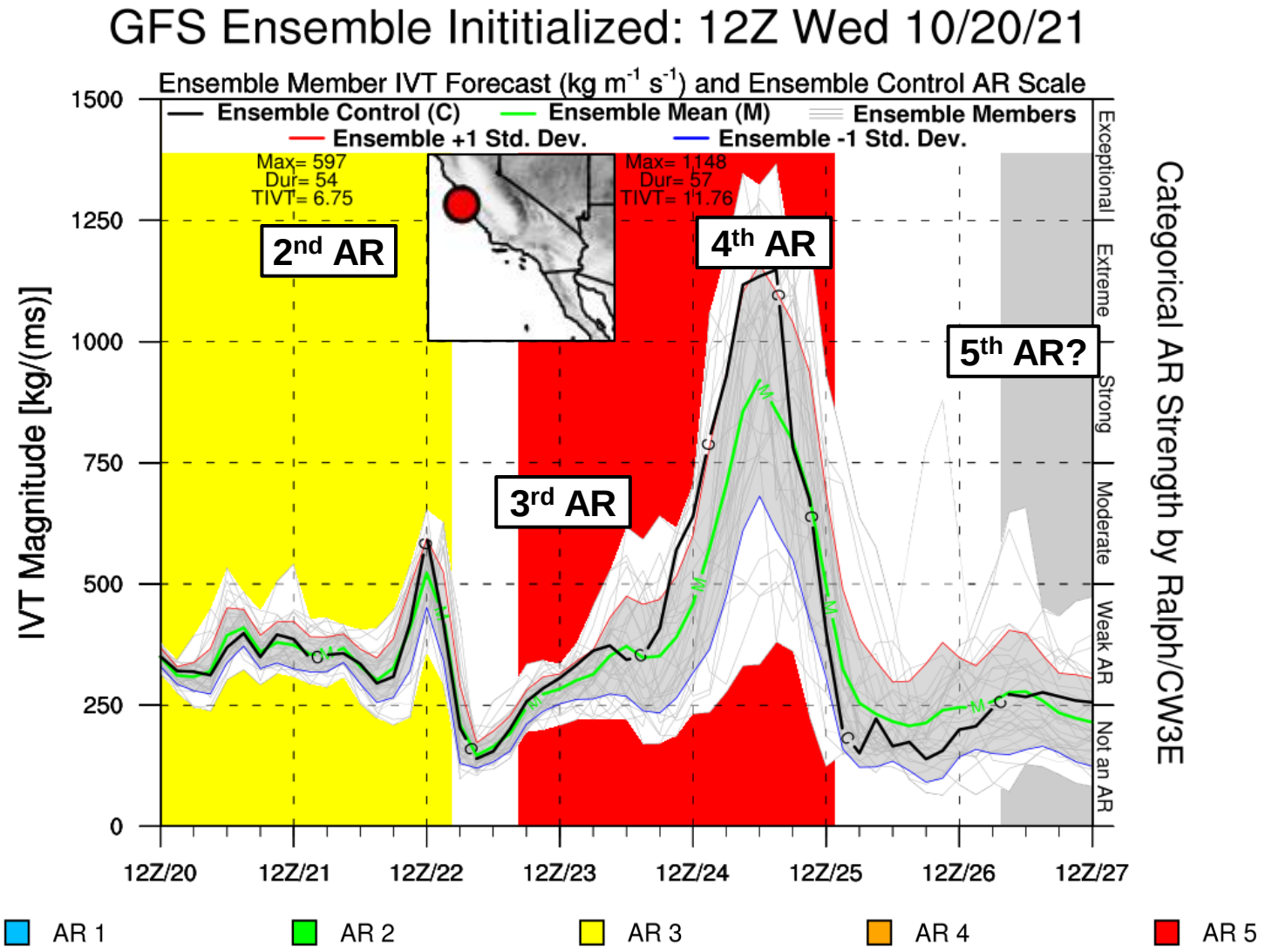


- The 12Z GEFS control run is forecasting an AR 5 at 42.5°N, 124.5°W (Curry County, OR) in association with the first two ARs
- 15/31 (48%) ensemble members are forecasting an AR 4 and 11/31 (35%) are forecasting an AR 5 at this location
- There is still some uncertainty in the maximum IVT magnitude during the second AR

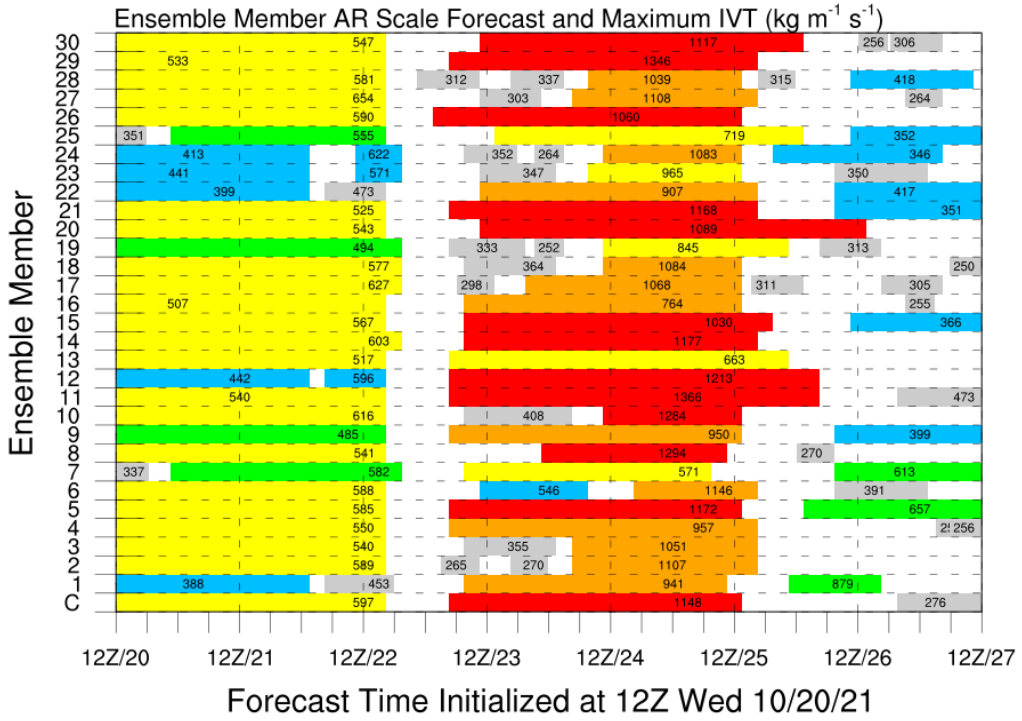


AR Outlook: 20 Oct 2021

GEFS AR Scale and IVT Forecasts

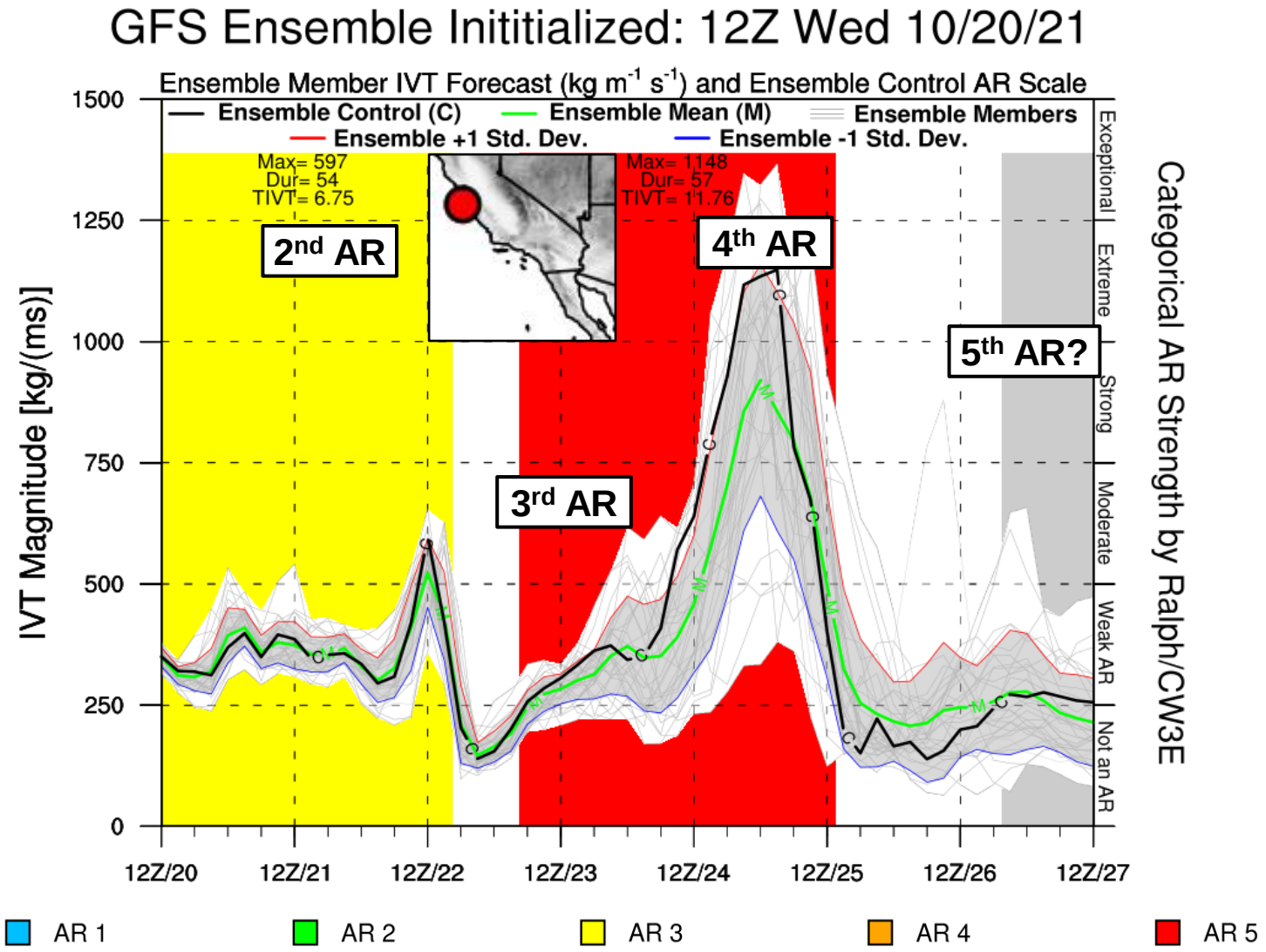


- The 12Z GEFS control run is forecasting an AR 3 at 37°N, 122.5°W (west of Santa Cruz, CA) in association with the first two ARs
- 23/31 (74%) ensemble members are forecasting an AR 3 at this location
- There is still some uncertainty in the AR duration, with several models predicting a brief interruption in AR conditions

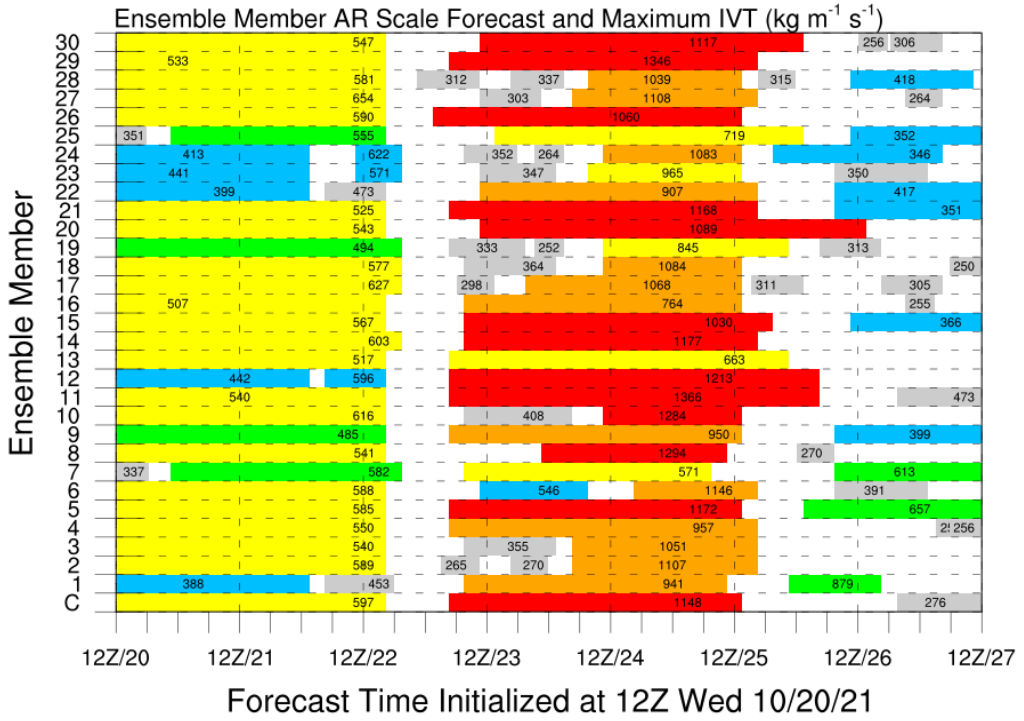


AR Outlook: 20 Oct 2021

GEFS AR Scale and IVT Forecasts



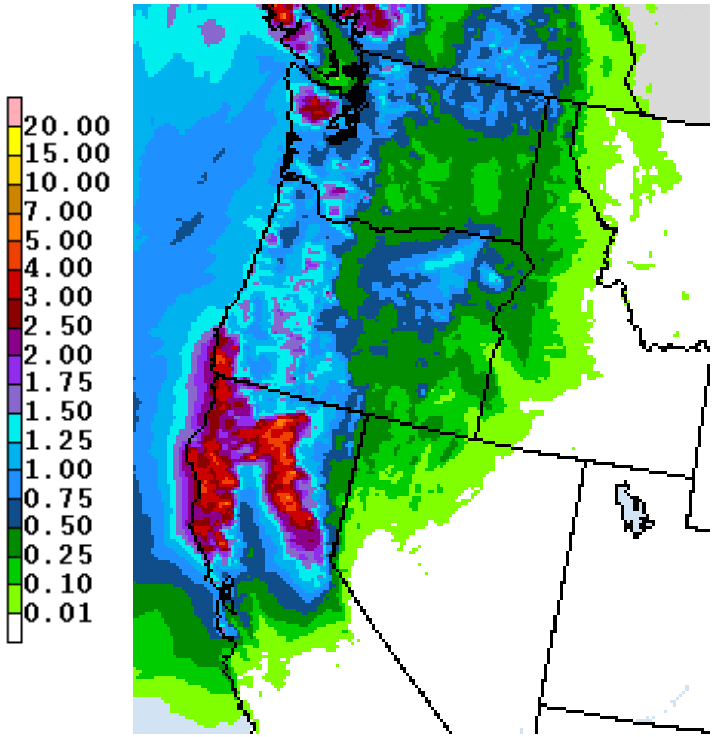
- The 12Z GEFS control run is also forecasting an AR 5 at 37°N, 122.5°W (west of Santa Cruz, CA) in association with the third and fourth ARs
- 26/31 (84%) ensemble members are forecasting an AR 4 or an AR 5 at this location
- There is considerable uncertainty in the maximum IVT and duration of AR conditions



AR Outlook: 20 Oct 2021

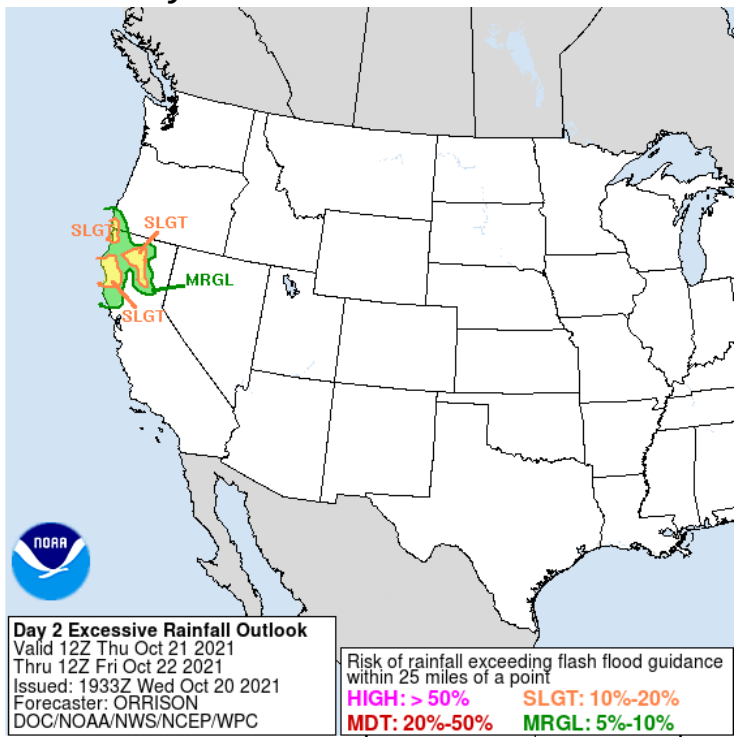
Precipitation Impacts

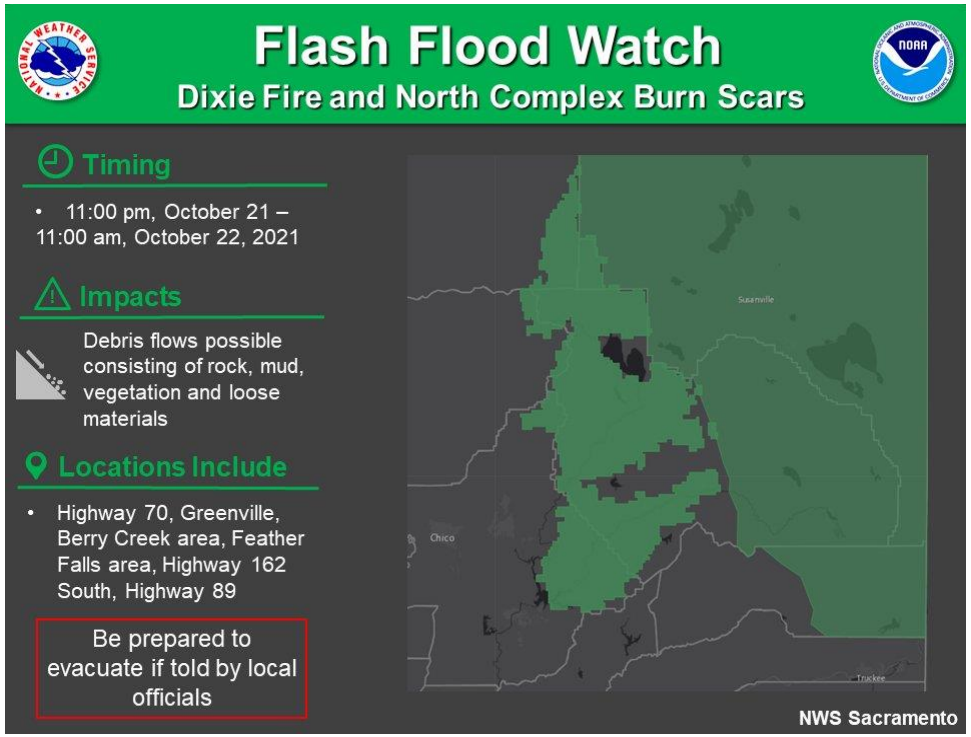
WPC 48-h QPF:
Valid 5 PM PT 20–22 Oct



Source: NOAA/NWS WPC, https://www.wpc.ncep.noaa.gov/

WPC Day 2 Excessive Rainfall Outlook





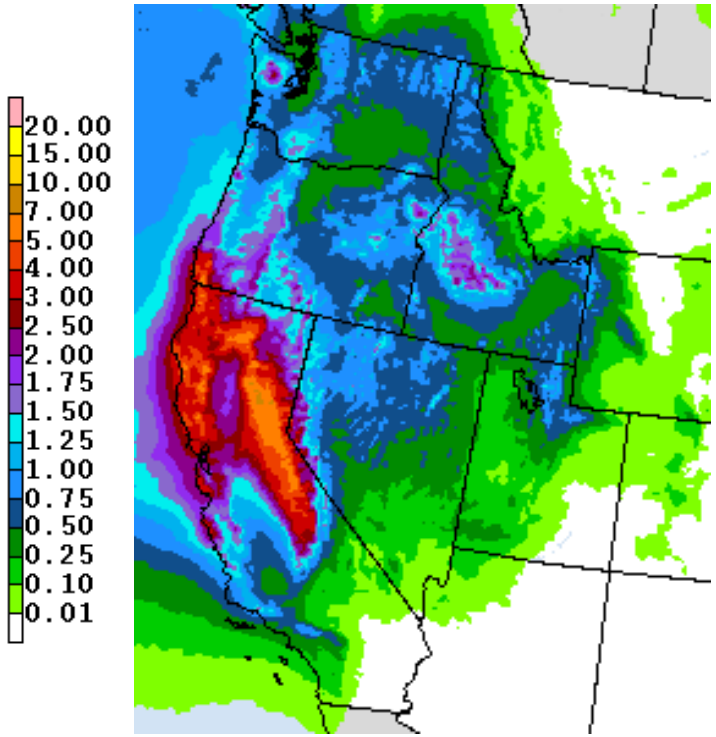
Source: NWS Sacramento, https://www.weather.gov/sto/

- The first two ARs are forecasted to bring an additional 2–5 inches of precipitation to portions of Northern California and southern Oregon
- The NWS Weather Prediction Center (WPC) has issued a slight risk of flash flooding in these areas due to higher rainfall intensities associated with the second AR
- NWS Sacramento has issued a flash flood watch due to the possibility of post-fire debris flows near the Dixie Fire and North Complex burn scars

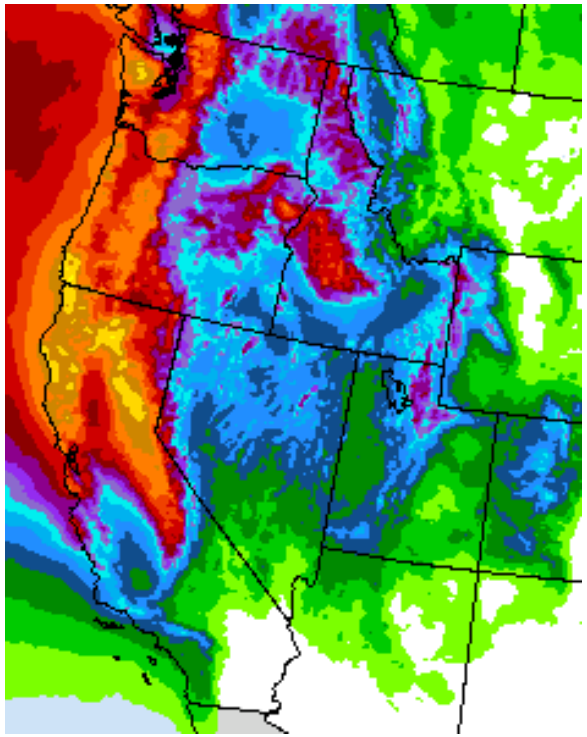
AR Outlook: 20 Oct 2021

Precipitation Impacts

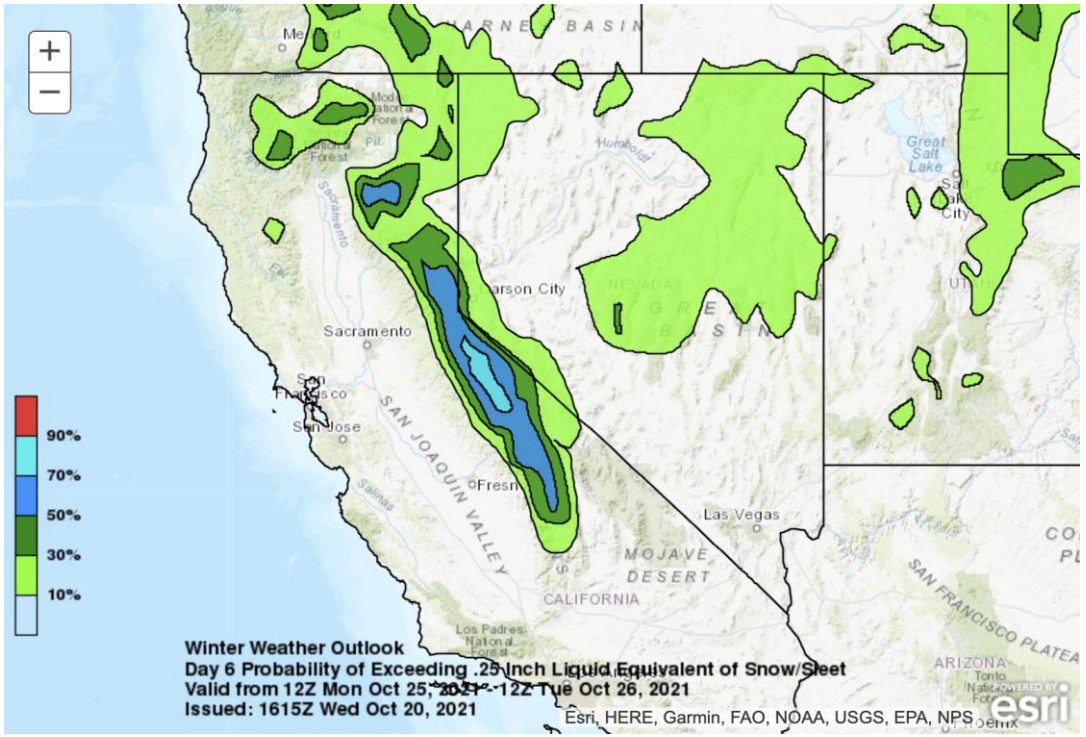
WPC 48-h QPF:
Valid 5 PM PT 23–25 Oct



WPC 7-day QPF:
Valid 5 PM PT 20–27 Oct



WPC Probability of > 0.25” Liquid Equivalent of Snow/Sleet
Valid 5 AM PT 25–26 Oct

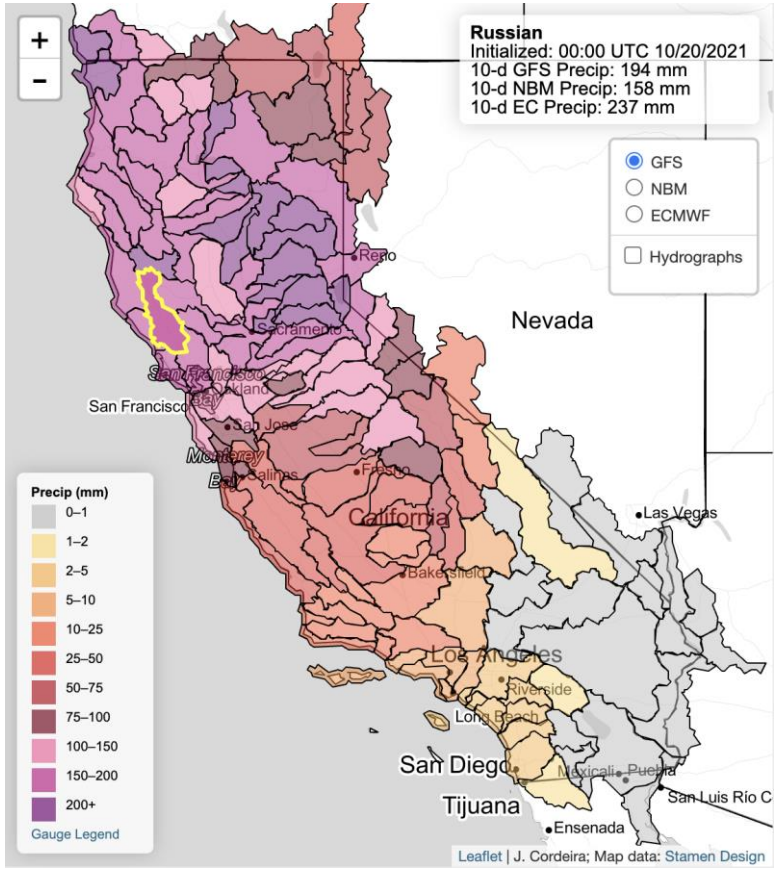


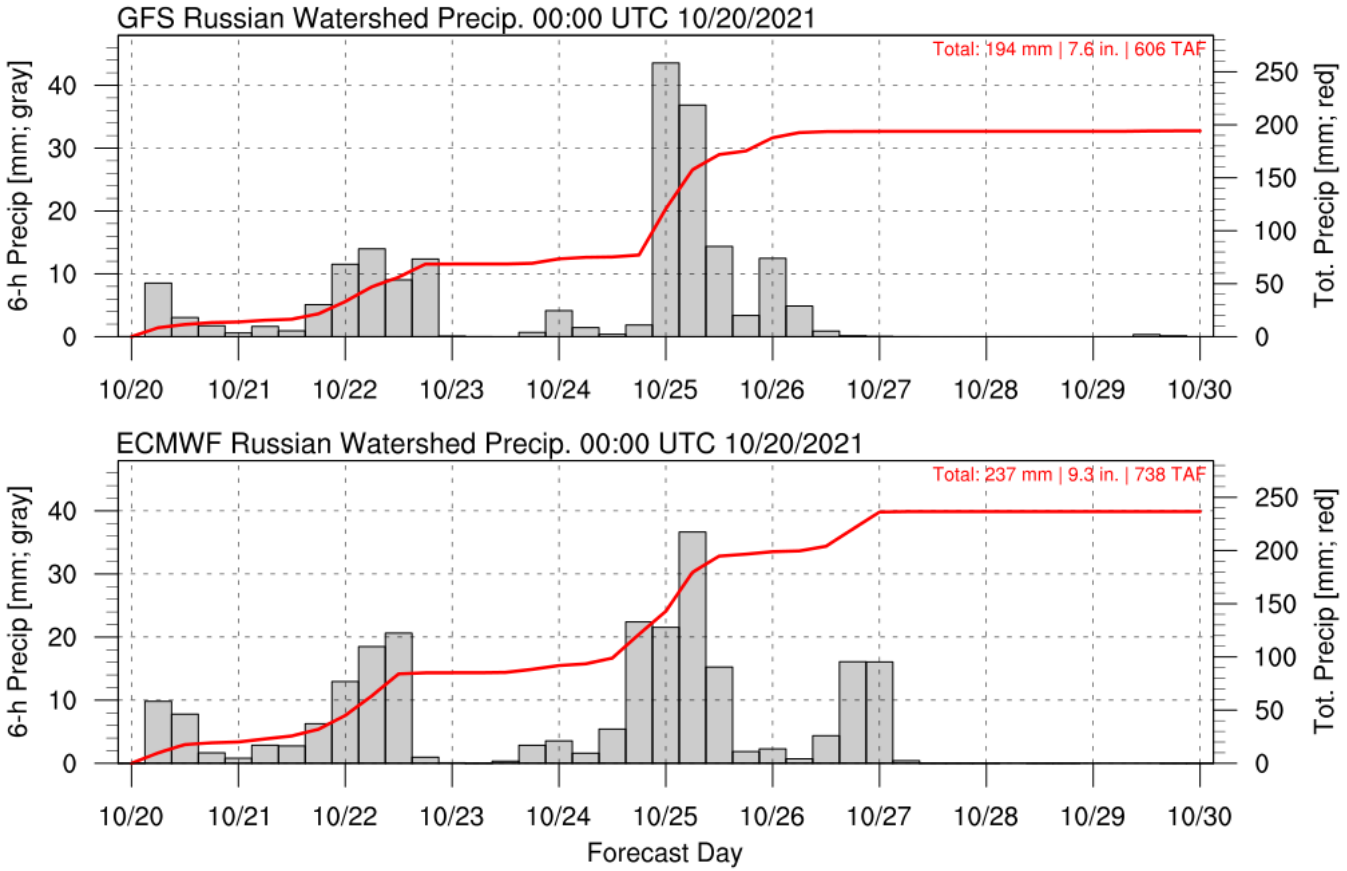
Source: NOAA/NWS WPC, https://www.wpc.ncep.noaa.gov/

- The fourth AR is forecasted to bring widespread moderate-to-heavy precipitation to the western U.S.
- The heaviest precipitation (at least 3–7 inches) is forecasted in the Northern California and southern Oregon Coast Ranges, the Klamath Mountains, and the Sierra Nevada
- Significant snowfall accumulations are also possible in the higher elevations of the Sierra Nevada
- The WPC is forecasting 10–15 inches of total precipitation in some areas during the next 7 days, with locally higher amounts possible

AR Outlook: 20 Oct 2021

10-day Watershed Precipitation Forecasts: Russian River Watershed

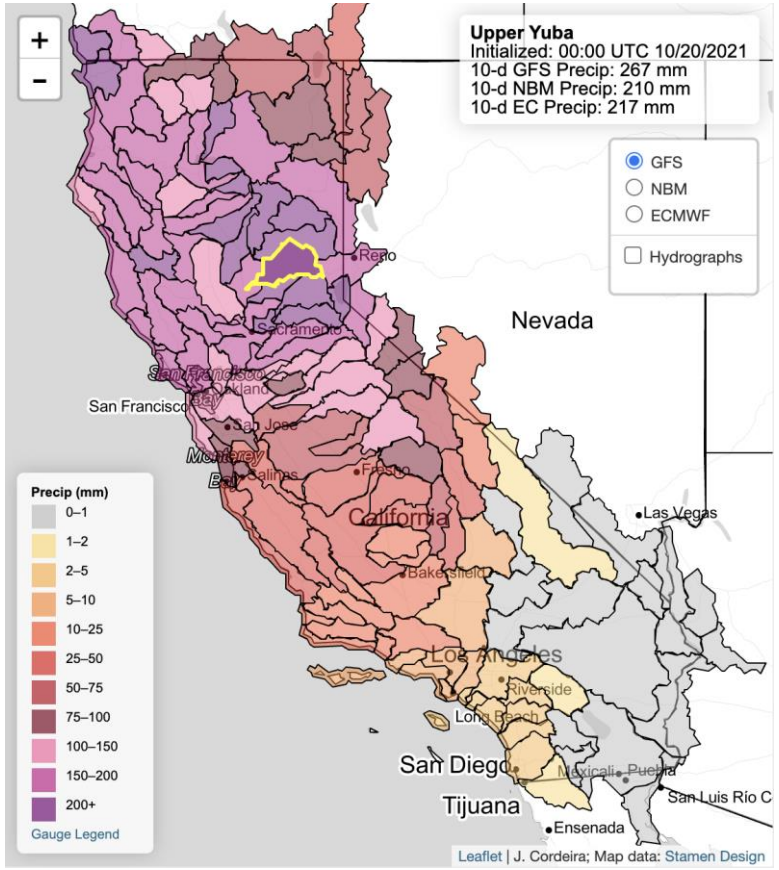


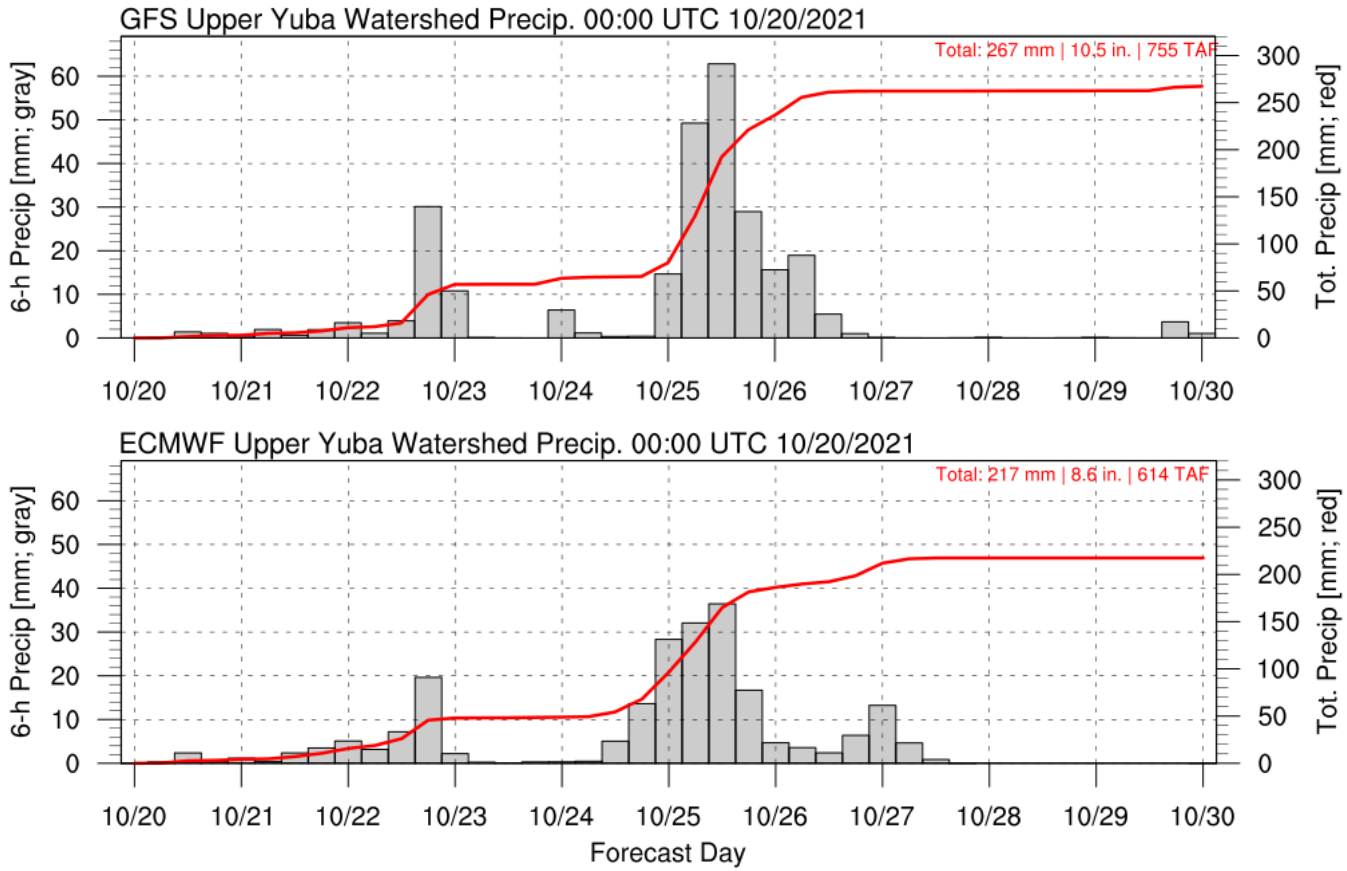


- The 00Z 21 Oct GFS and ECMWF models are forecasting 7.6 inches (606 TAF) and 9.3 inches (738 TAF) of total areal mean precipitation, respectively, in the Russian River watershed over the next 10 days

AR Outlook: 20 Oct 2021

10-day Watershed Precipitation Forecasts: Upper Yuba Watershed





- The 00Z 21 Oct GFS and ECMWF models are forecasting 10.5 inches (755 TAF) and 8.6 inches (614 TAF) of total areal mean precipitation, respectively, in the Upper Yuba watershed over the next 10 days