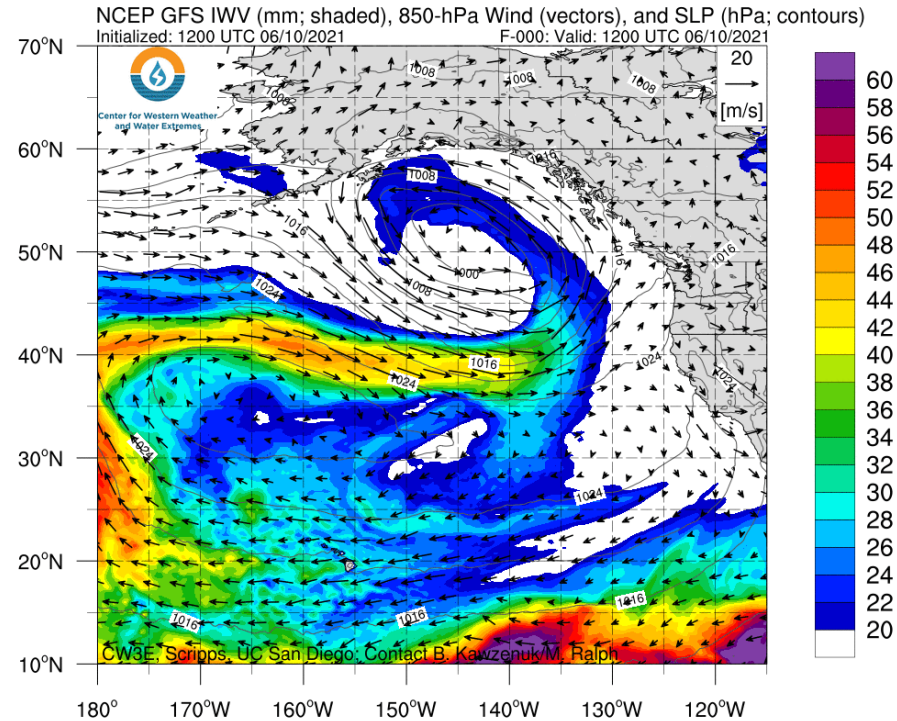
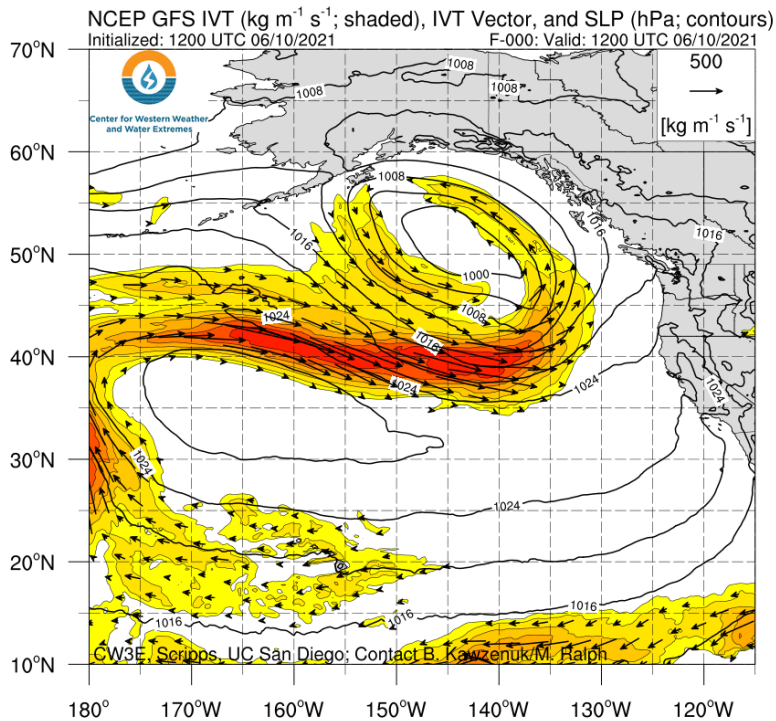


Multiple Late Season Atmospheric Rivers are Forecast to Impact Northern California and the PNW this Weekend

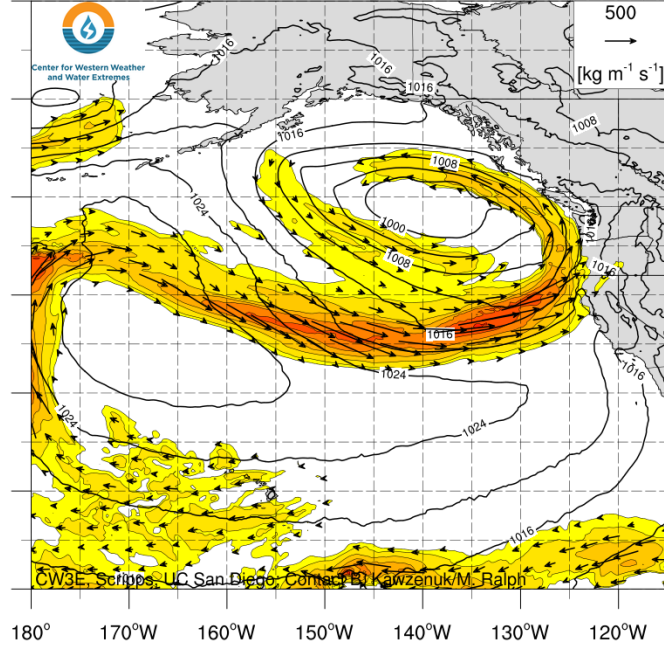
- This first AR is forecast to make landfall on Friday while the second and potentially stronger AR is forecast to make landfall late on Saturday
- The first AR is forecast to bring weak to moderate AR conditions to far Northern California and Southern Oregon
- Several GEFS ensemble members suggest the second AR could bring strong AR conditions (IVT $>750 \text{ kg m}^{-1} \text{ s}^{-1}$) to Coastal OR, but there is higher forecast uncertainty surrounding this AR compared to the first
- The WPC is forecasting as much as 2–4 inches of precipitation over some of the higher elevation locations in Northern CA, OR, and WA
- While these ARs are forecast to bring impressive IVT magnitudes to the USWC for June, they are likely to be less productive than an AR of similar magnitude during the Winter
- Due to the extremely dry conditions across the U.S. West, any precipitation produced by these ARs will be beneficial with little to no hazards, though the precipitation will not be enough to mitigate the extensive drought conditions.



GFS IVT Forecasts

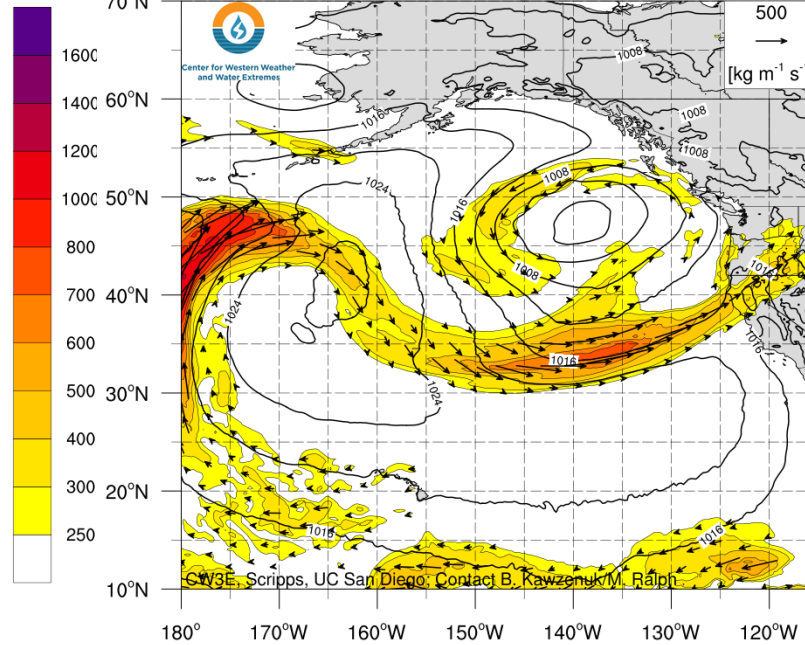
(A) Valid: 0900 UTC 11 June (F-21)

NCEP GFS IVT ($\text{kg m}^{-1} \text{s}^{-1}$; shaded), IVT Vector, and SLP (hPa; contours)
Initialized: 1200 UTC 06/10/2021 F-021: Valid: 0900 UTC 06/11/2021



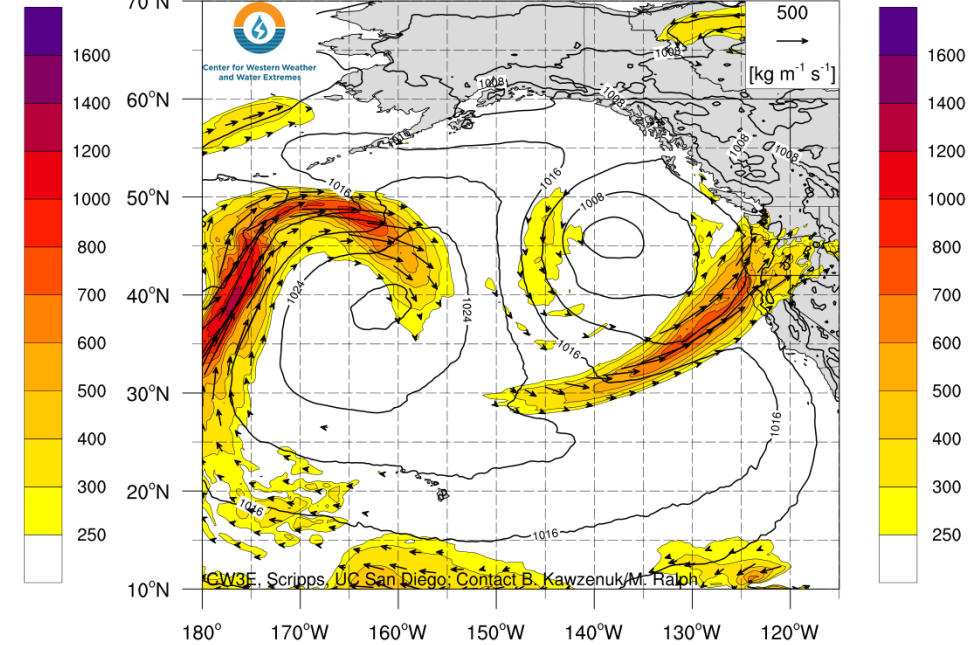
(B) Valid: 0600 UTC 12 June (F-42)

NCEP GFS IVT ($\text{kg m}^{-1} \text{s}^{-1}$; shaded), IVT Vector, and SLP (hPa; contours)
Initialized: 1200 UTC 06/10/2021 F-042: Valid: 0600 UTC 06/12/2021



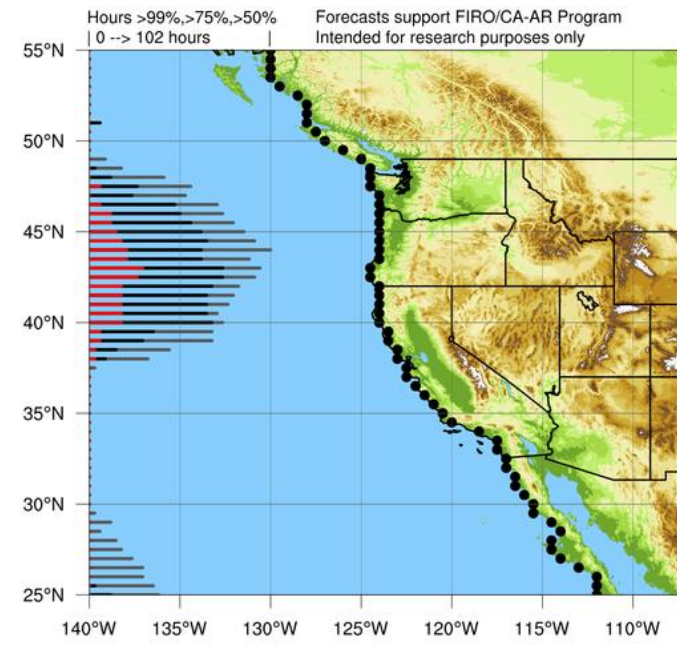
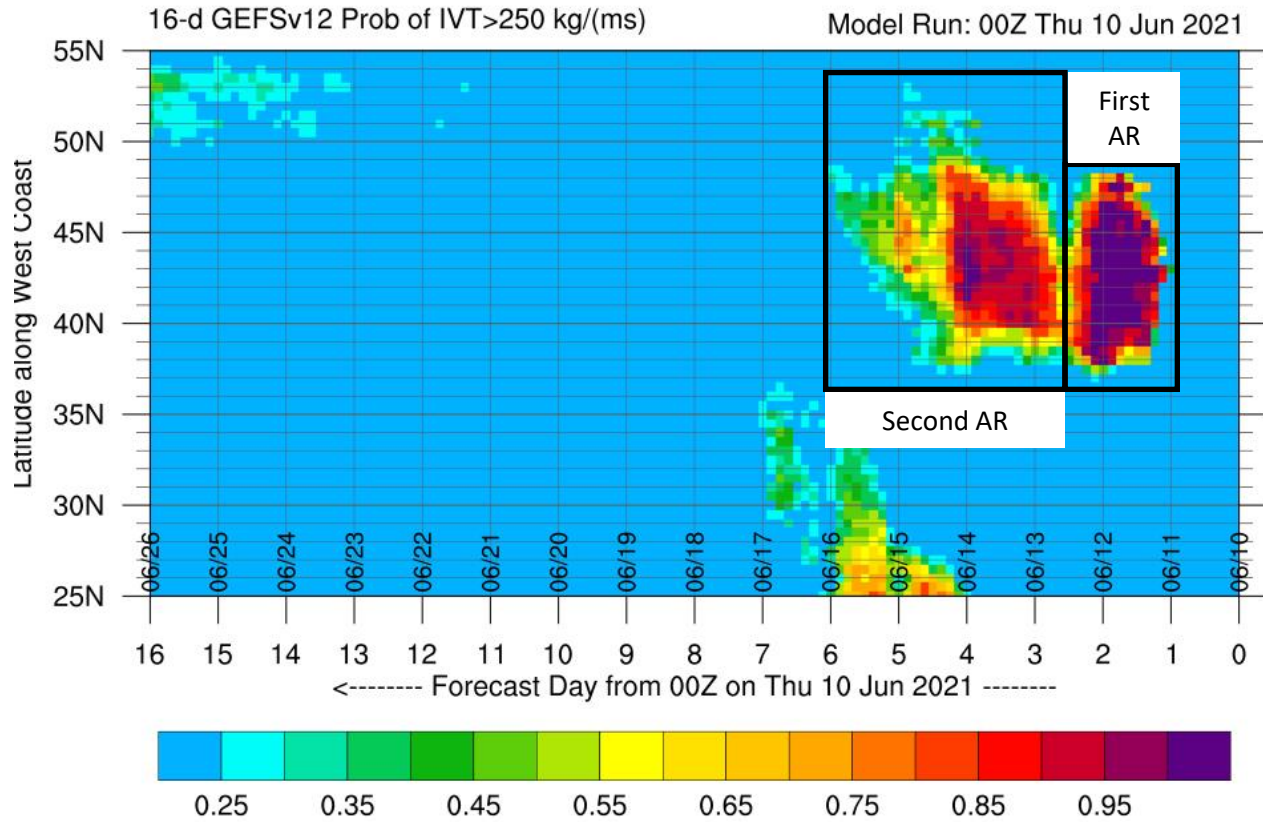
(C) Valid: 0000 UTC 13 June (F-060)

NCEP GFS IVT ($\text{kg m}^{-1} \text{s}^{-1}$; shaded), IVT Vector, and SLP (hPa; contours)
Initialized: 1200 UTC 06/10/2021 F-060: Valid: 0000 UTC 06/13/2021



- The first AR is forecast to make landfall at ~9Z on 11 June (2 AM PT) over Northern California and Oregon, bringing potentially moderate AR conditions ($\text{IVT} > 500 \text{ kg m}^{-1} \text{ s}^{-1}$) to the region (Figure A)
- As the first AR is weakening over Northern California a second AR begins to form and strengthen over the Eastern Pacific at ~6Z on 12 June (11 PM 11 June PT; Figure B)
- The second AR is then forecast to propagate east/northeastward before making landfall and bringing potentially strong AR conditions ($\text{IVT} > 750 \text{ kg m}^{-1} \text{ s}^{-1}$) to Northern California and Southern Oregon at ~00Z on 13 June (5 PM 12 June PT; Figure C)

Probability of AR Conditions Along Coast



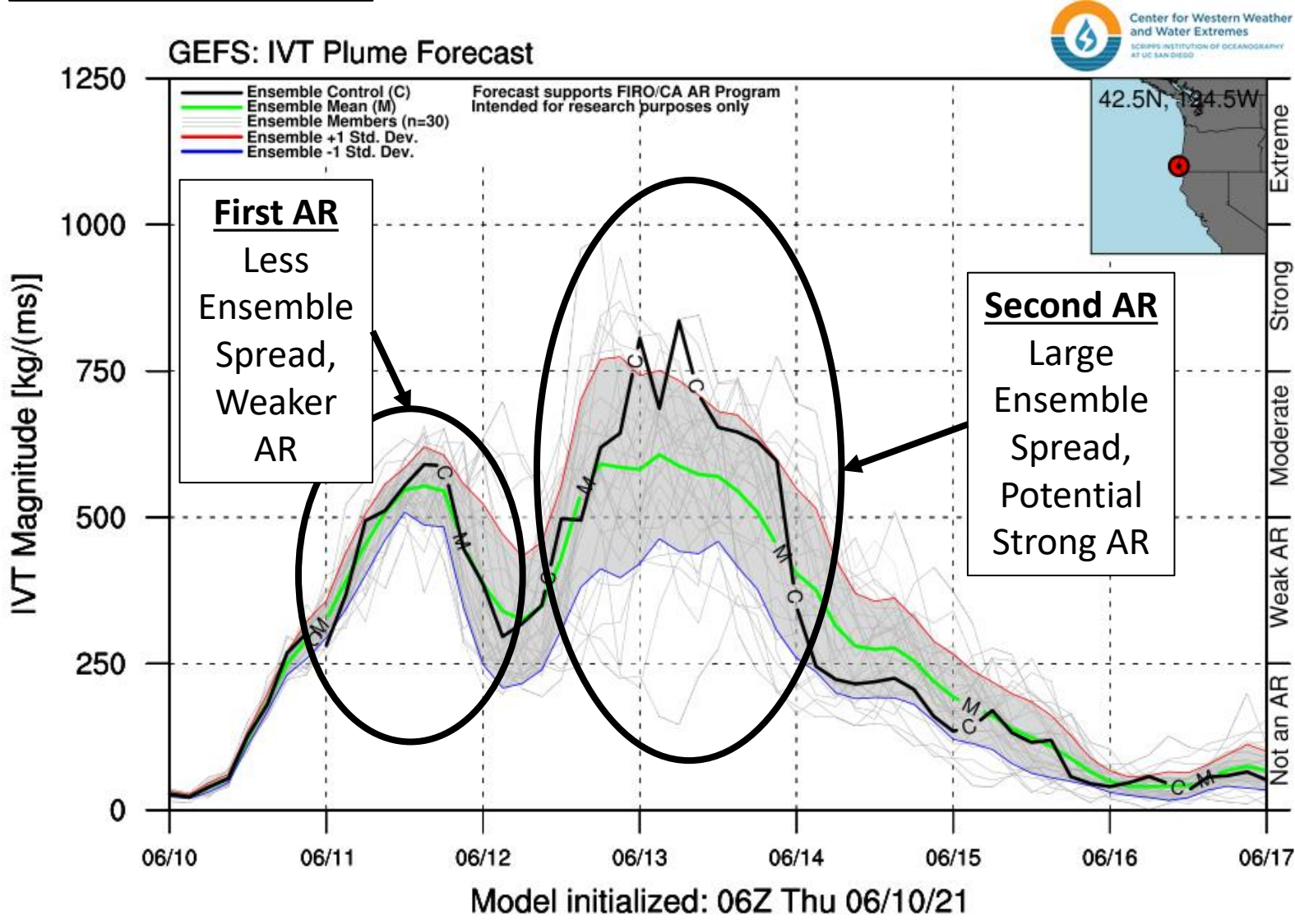
*GEFS = NCEP Global Ensemble Forecast System (United States)

- The GEFS is currently exhibiting high ensemble probabilities (>95%) of AR conditions ($IVT > 250 \text{ kg m}^{-1} \text{ s}^{-1}$) in association with the first AR over coastal locations from Northern California to Northern Washington (38°N to 48°N)
- There is currently less ensemble agreement in overall timing and duration associated with the second AR where <95% of ensembles are predicting AR conditions throughout the event

AR Outlook: 10 June 2021

For California DWR's AR Program

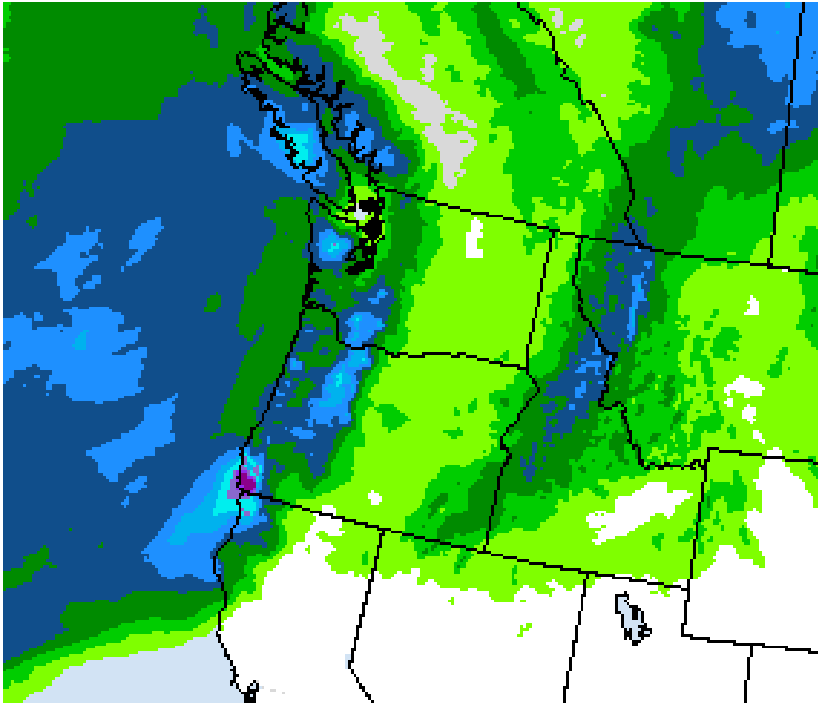
GEFS IVT Plume



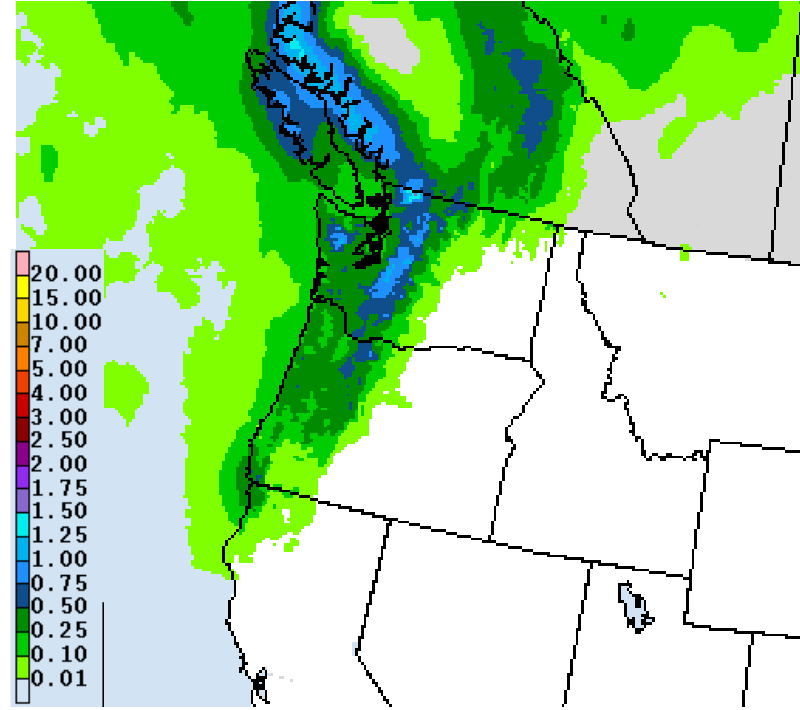
Categorical AR Strength by Ralph/CW3E

- The GEFS is forecasting weak to moderate IVT magnitudes over South-Coastal Oregon for ~24 hours in association with the first AR.
- There is currently large uncertainty in the forecast of the onset, timing, and magnitude of the second AR, with several ensemble members and the control member forecasting strong IVT magnitudes.

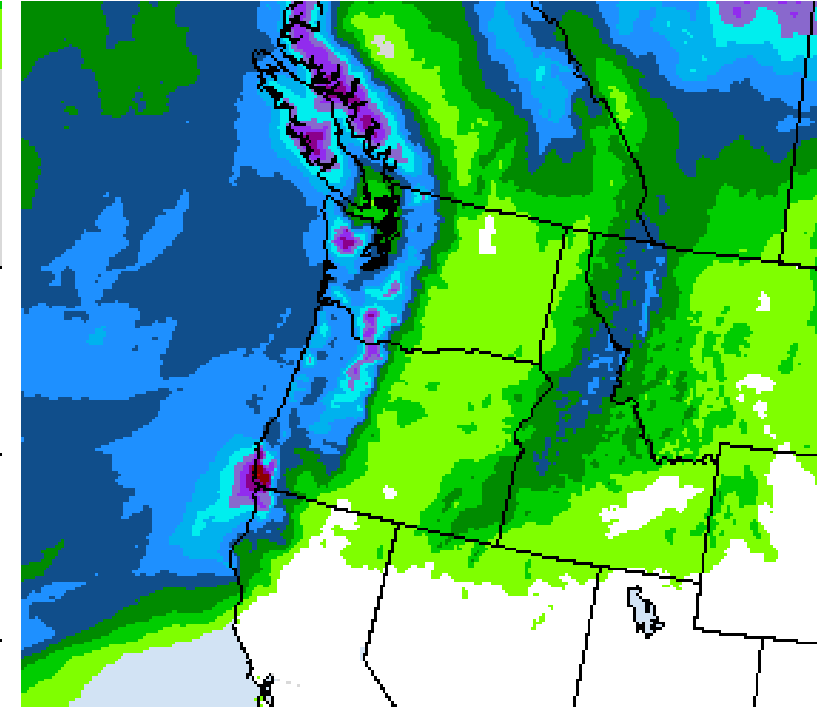
WPC 1-3 Day QPF:
Valid 12Z 10–13 June



WPC 4 & 5 Day QPF:
Valid 00Z 14–16 June



WPC 1-7 Day QPF:
Valid 12Z 10–17 June



- The NOAA WPC is predicting the highest precip. accumulations >1 inch over the Coastal, Cascade, and Olympic Mountains of Northern CA, Oregon and Washington during the first AR

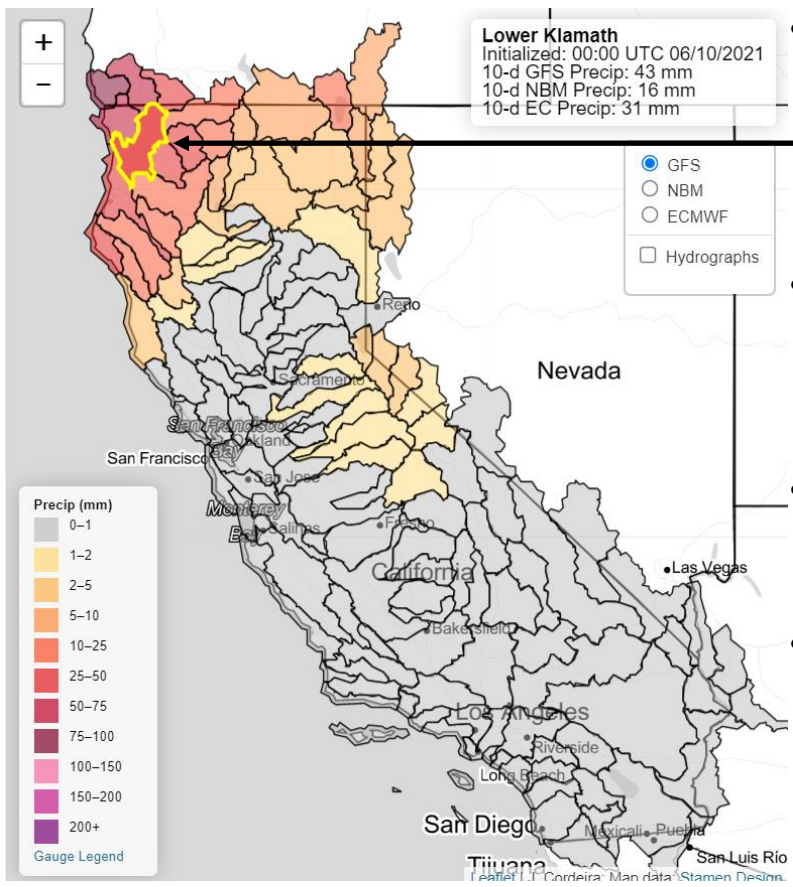
- The second AR is forecast to produce an additional 1–1.5 inches over the Cascade and Olympic Mountains of Washington

- In total, as much as 4 inches of precipitation could fall over Northwestern California and Southwestern Oregon with other high elevation locations in OR and WA receiving 1.5 to 2 inches

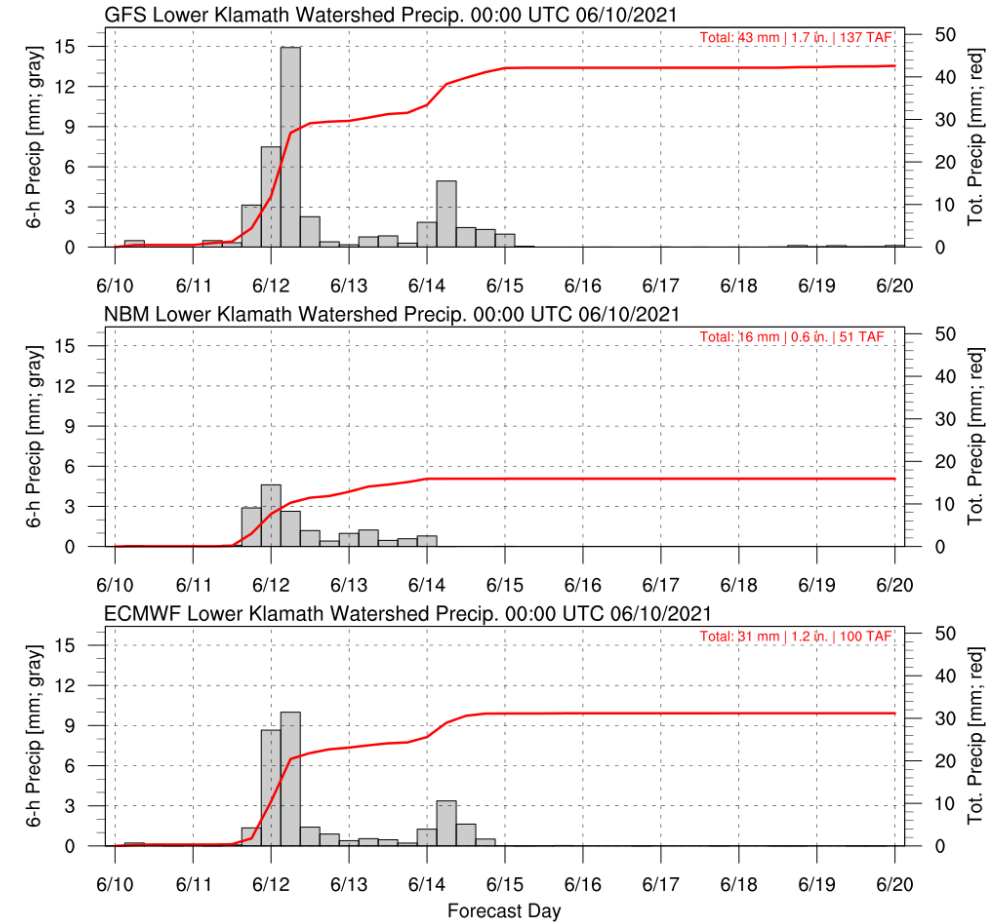
Source: NOAA/NWS WPC, <https://www.wpc.ncep.noaa.gov/>

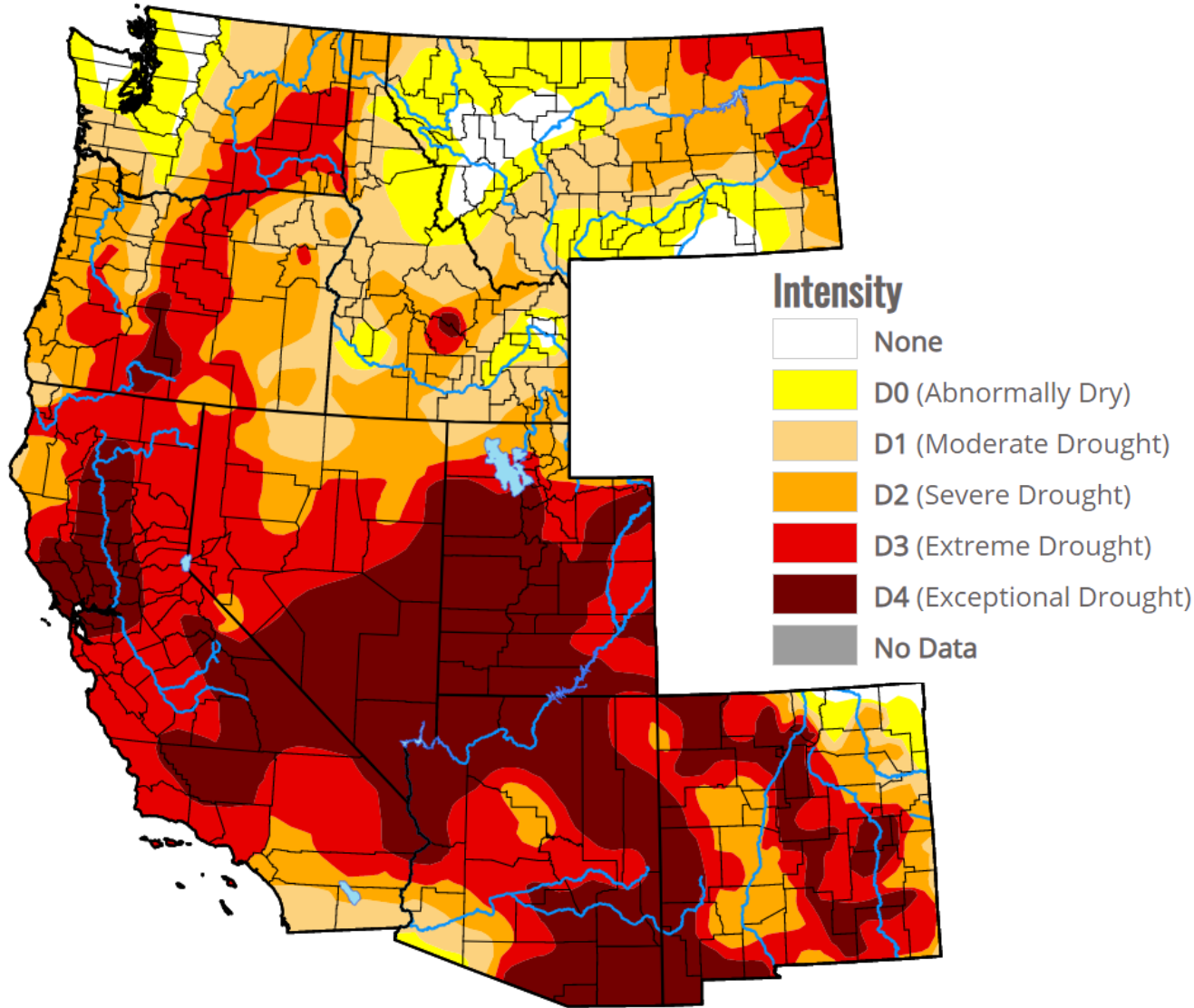
AR Outlook: 10 June 2021

For California DWR's AR Program



- The Lower Klamath Watershed in Northern California is forecast to receive 1.7 and 1.2 inches of watershed average precipitation by the GFS and ECMWF, respectively
- The GFS is currently forecasting the first AR to produce 1.2 inches of watershed average precipitation while the ECMWF is forecasting ~1 inch
- Both the EC and GFS suggest the second AR will be less productive due to the more northern landfall of the AR
- Due to the ensemble spread in landfall location, magnitude, and duration surrounding the second AR, there is currently high uncertainty pertaining to the precipitation produced by the second AR





- Due to the extensive drought conditions across the US West, any precipitation produced by these ARs will bring beneficial precipitation with minimal to no hazards
- While these ARs will be primarily beneficial, it is unlikely that the precipitation will do much to alleviate the drought conditions across most of CA, OR, and WA
- While these ARs are forecast to bring impressive IVT magnitudes to the PNW, they are likely to produce less precipitation of an AR of similar magnitude that makes landfall in the winter months

Source: USDM, <https://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?West>