



Center for Western Weather
and Water Extremes

SCRIPPS INSTITUTION OF OCEANOGRAPHY
AT UC SAN DIEGO

CW3E S2S Outlook: 8 Dec 2021

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UC San Diego



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Summary

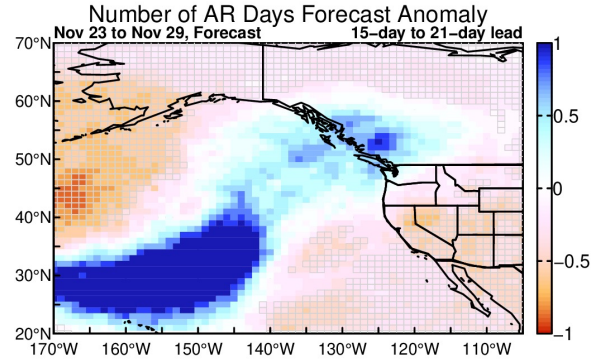
- NCEP Global Ensemble Forecast System (GEFS) and ECMWF Ensemble Prediction System (EPS) are both showing a moderate probability (40–60%) of landfalling AR activity in Central and Southern California on 14 Dec
- NCEP GEFSBS model predicts the MJO is in this western Pacific phase in the next two weeks which is consistent with the above normal probability of AR activity near CA
- Both NCEP and ECMWF are predicting below-normal AR activity along the US West Coast and above-normal AR activity over the Baja Peninsula during Week 3 (21–27 Dec)
- Current forecasts suggest that persistent ridging is unlikely to occur in the vicinity of the US West Coast during the next several weeks
- CW3E machine learning models based on October SST/global weather conditions and statistical model based on November SST are predicting drier than normal conditions in the southwestern U.S. for the next few months, and roughly equal odds for above or below normal conditions in Northern California. The CCA outlook favors wetter than normal conditions over the Rocky Mountains.



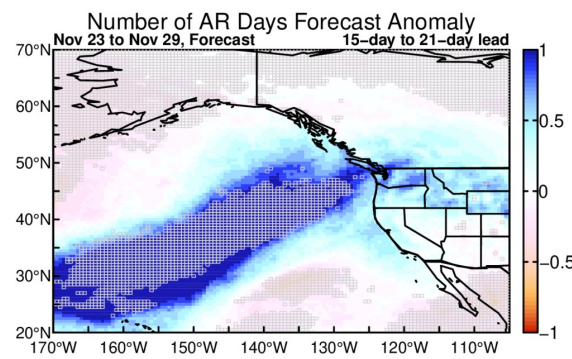
Looking Back: Week 3 AR Activity Forecasts

Valid: 23–29 Nov 2021

NCEP Experimental Forecast Initialized: Nov 08, 2021



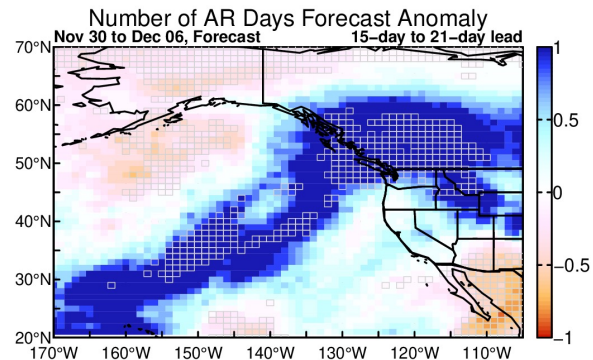
ECMWF Experimental Forecast Initialized: Nov 08, 2021



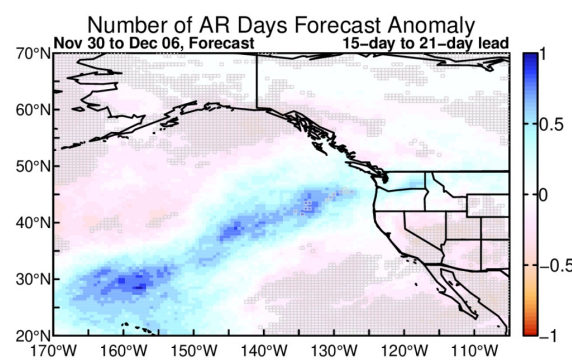
- NCEP: Above-normal AR activity over British Columbia; below-normal AR activity over California
- ECMWF: Above-normal AR activity over southern British Columbia and Washington; near-normal AR activity over California

Valid: 30 Nov – 6 Dec 2021

NCEP Experimental Forecast Initialized: Nov 15, 2021



ECMWF Experimental Forecast Initialized: Nov 15, 2021

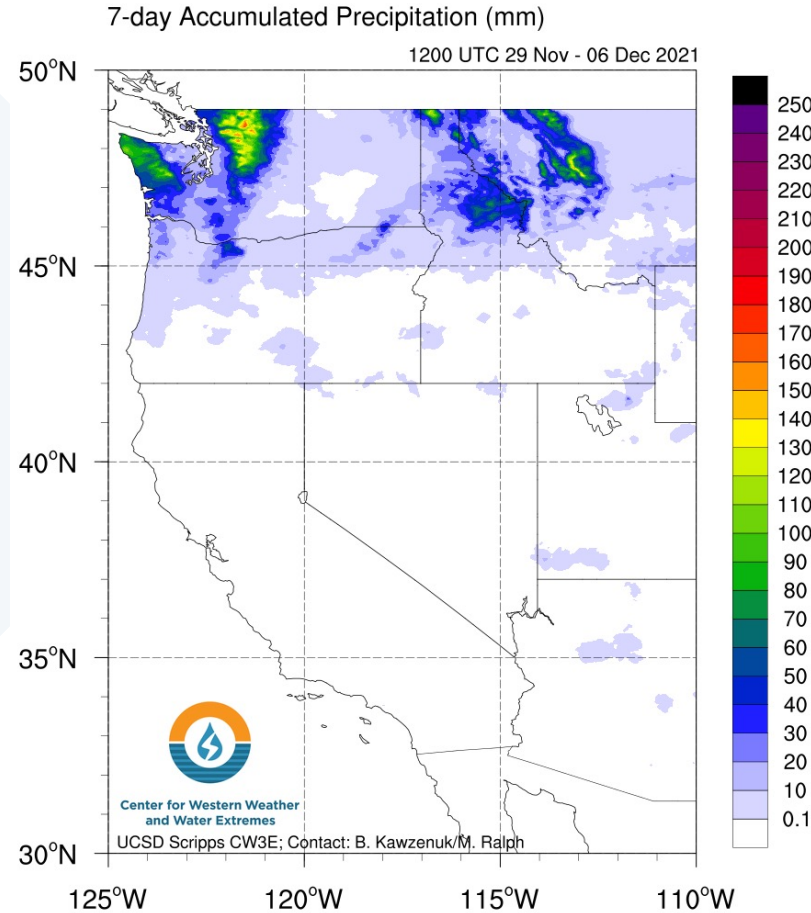
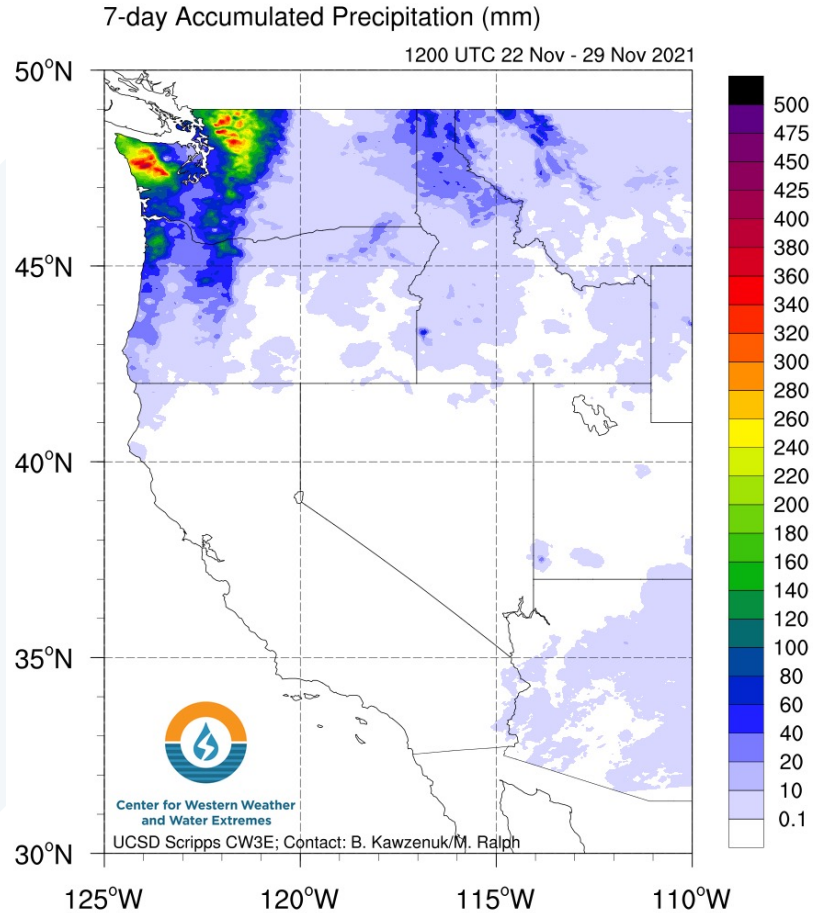


- NCEP: Significantly above-normal AR activity over British Columbia and northern Washington
- ECMWF: Near-normal AR activity over the Pacific Northwest; below-normal AR activity over California



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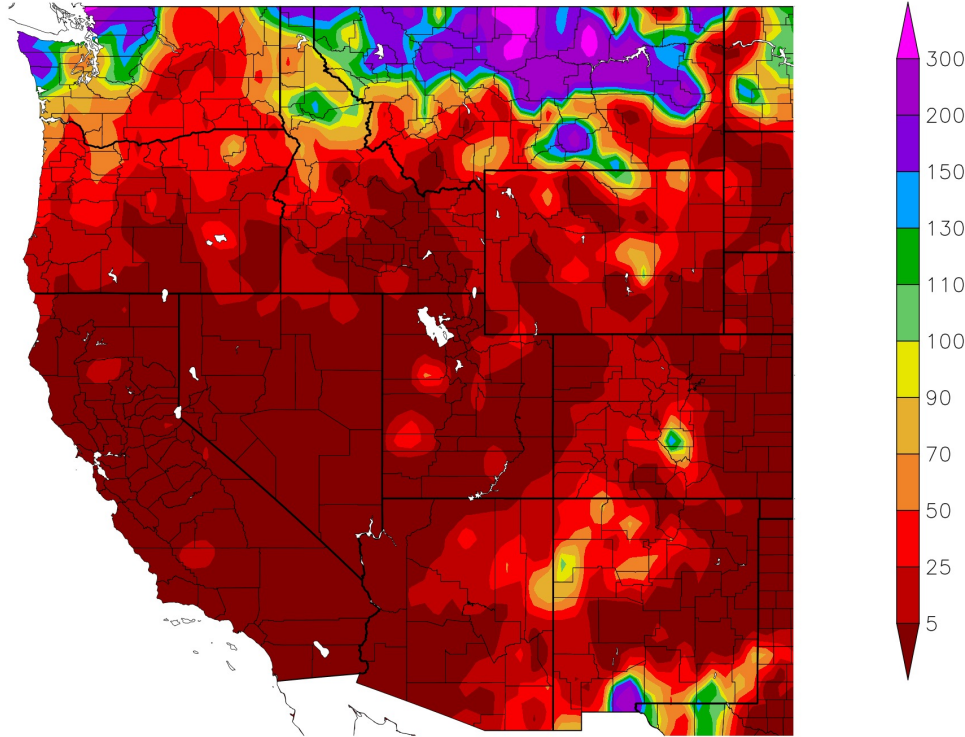
Looking Back: Accumulated Precipitation (23 Nov - 6 Dec)



- Heavy precipitation (> 10 inches) fell over the Olympic Peninsula and North Cascades during the previous 2 weeks
- Light-to-moderate precipitation (2–6 inches) was observed over the higher terrain in northwestern Oregon, northern Idaho, and northwestern Montana
- Much of this precipitation was associated with landfalling ARs
- Generally dry conditions were observed elsewhere

Looking Back: 14-day Precipitation Anomaly (23 Nov – 6 Dec)

Percent of Normal Precipitation (%)
11/23/2021 – 12/6/2021



- Below-normal precipitation over much of the western US during the past two weeks
- Significantly above-normal precipitation in parts of Washington and Montana

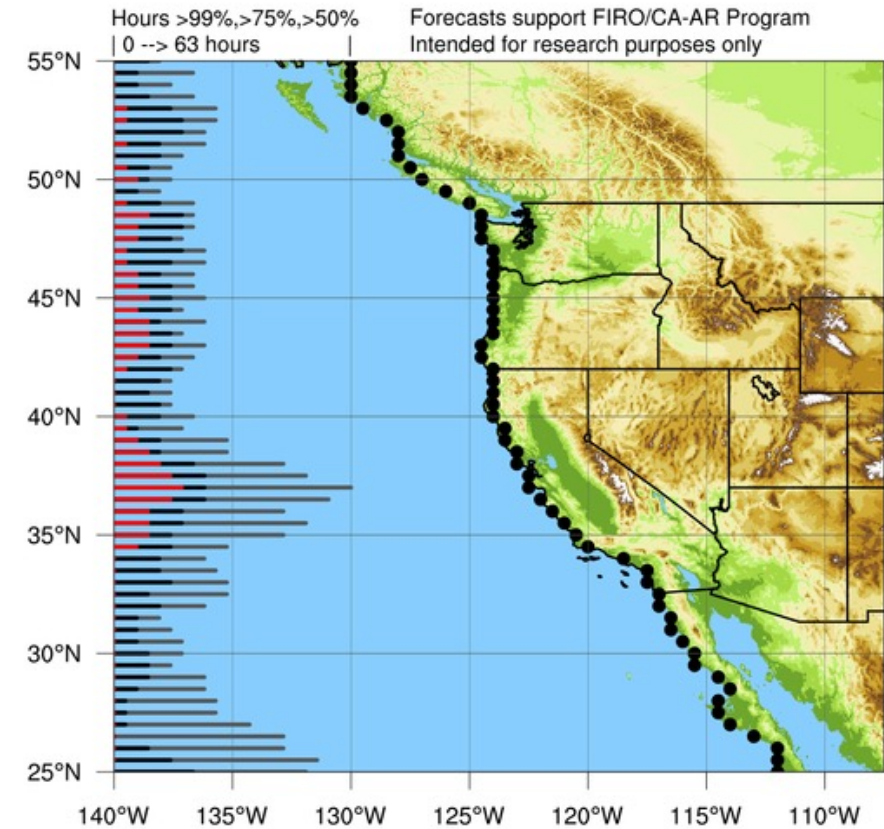
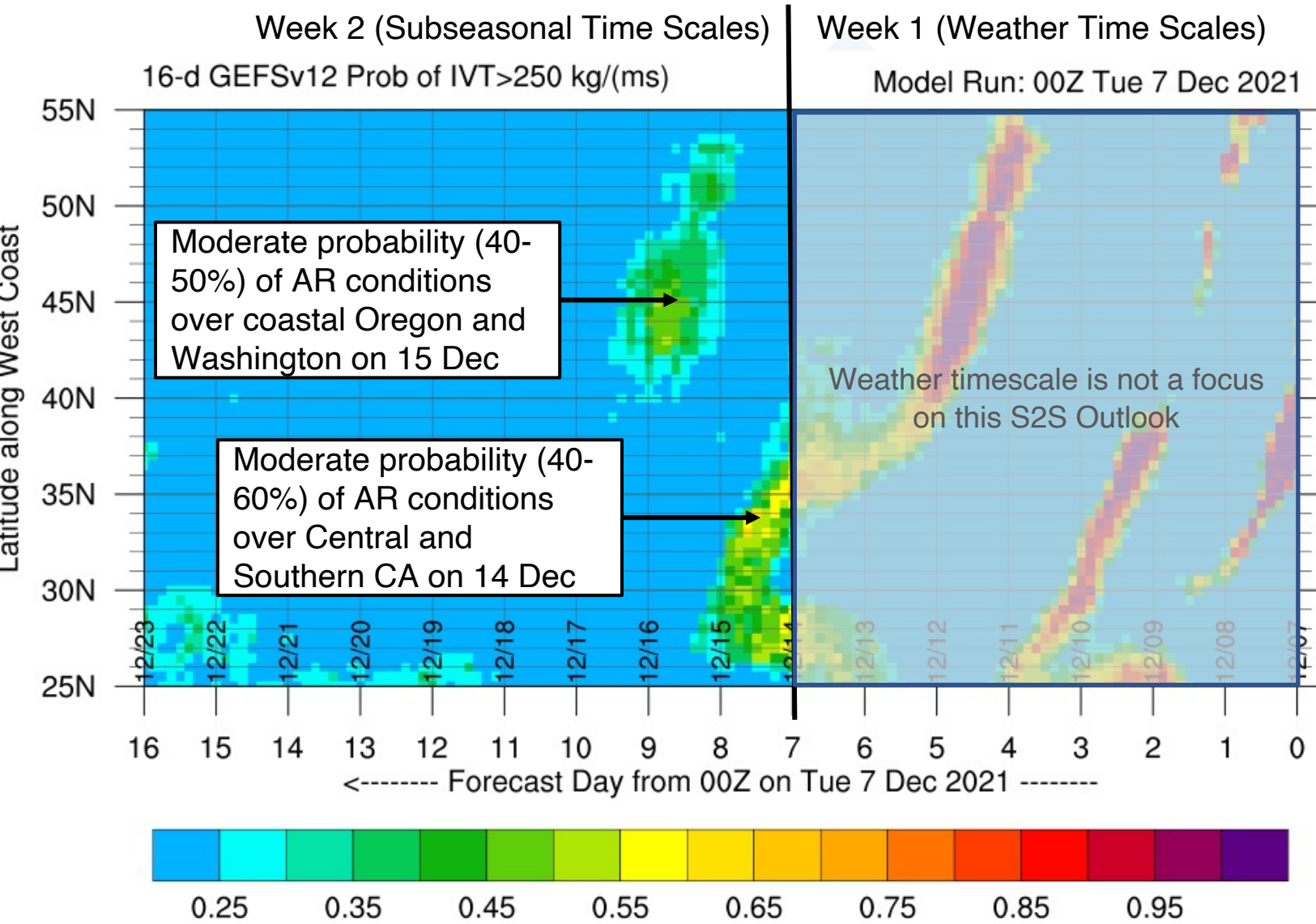
Generated 12/7/2021 at HPRCC using provisional data.

NOAA Regional Climate Centers

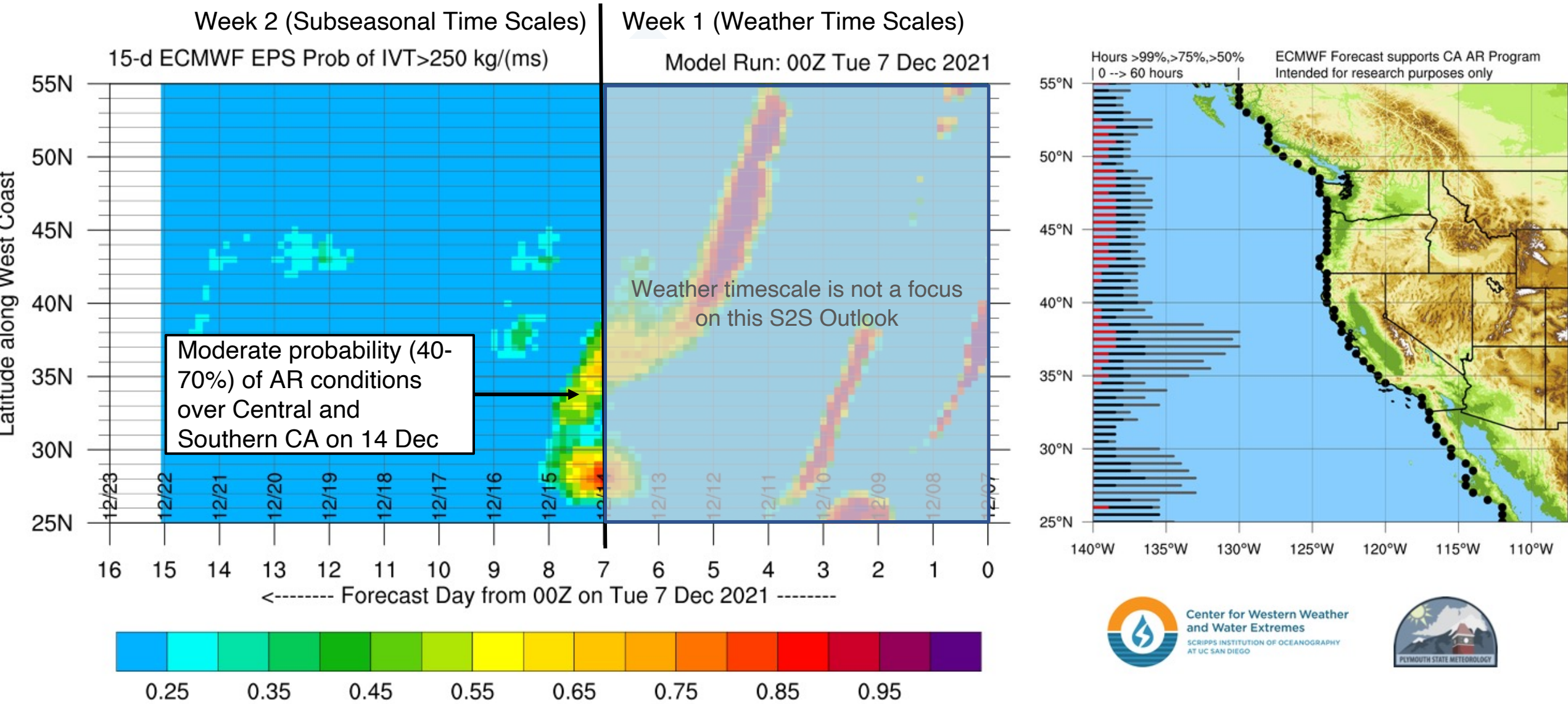


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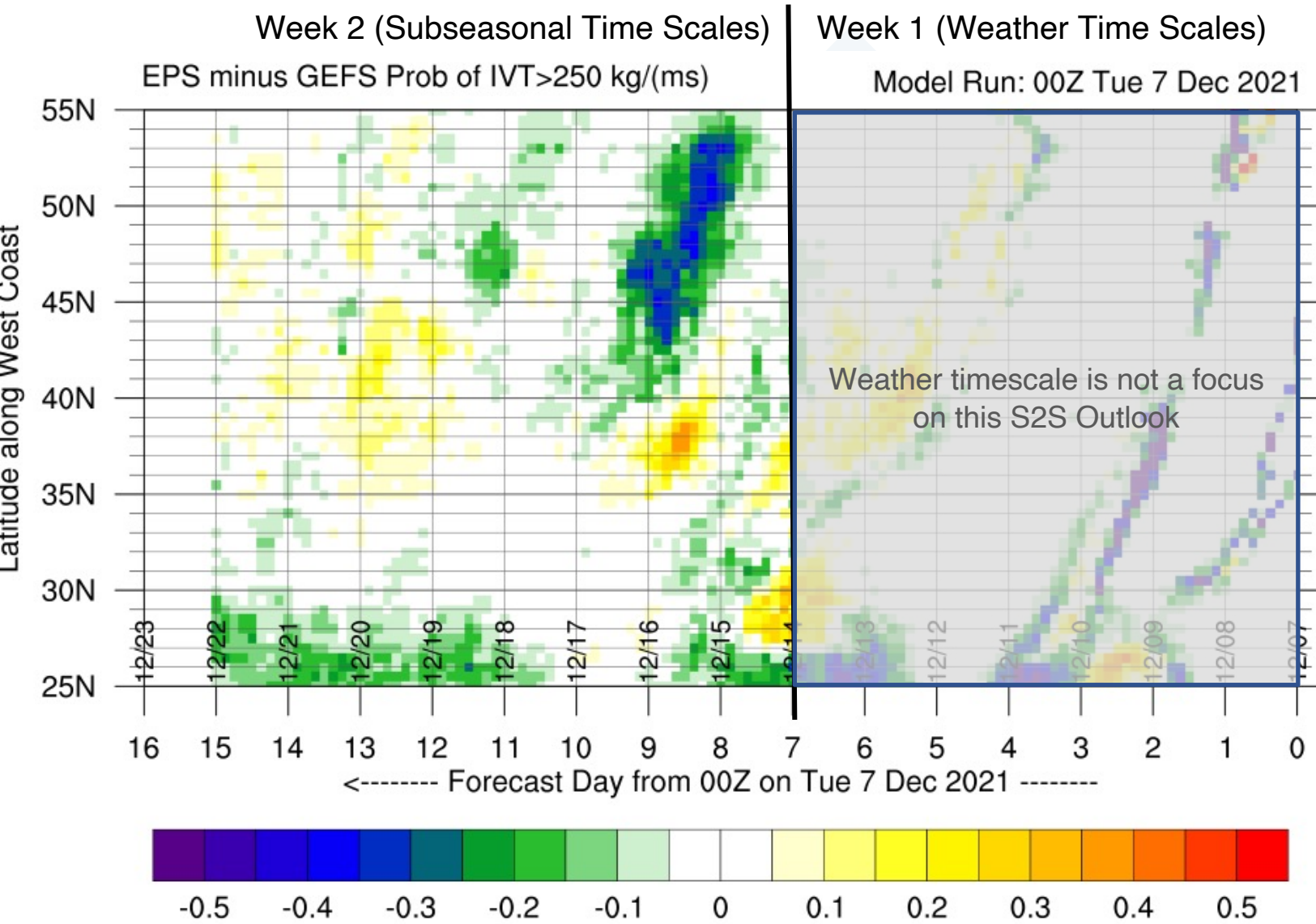
GEFS AR Landfall Tool: Valid 00Z 7–23 Dec



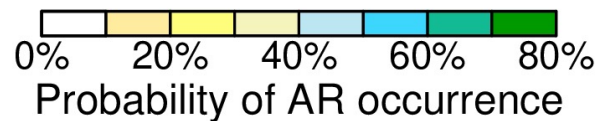
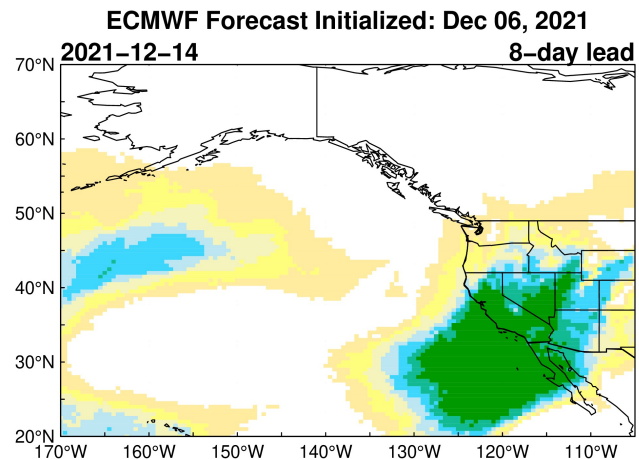
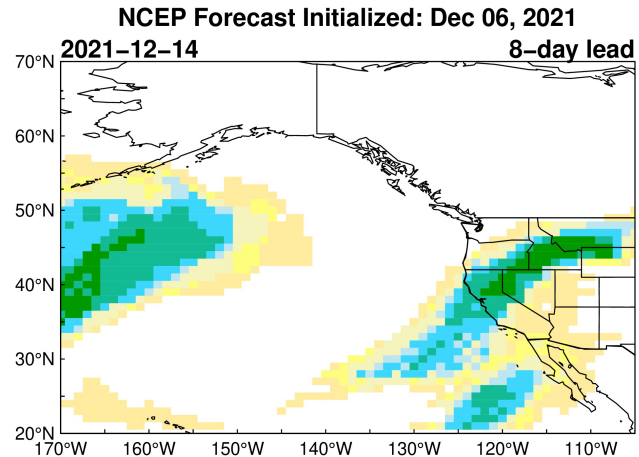
ECMWF EPS AR Landfall Tool: Valid 00Z 7–22 Dec



ECMWF Minus GEFS AR Landfall Tool: Valid 00Z 7–22 Dec



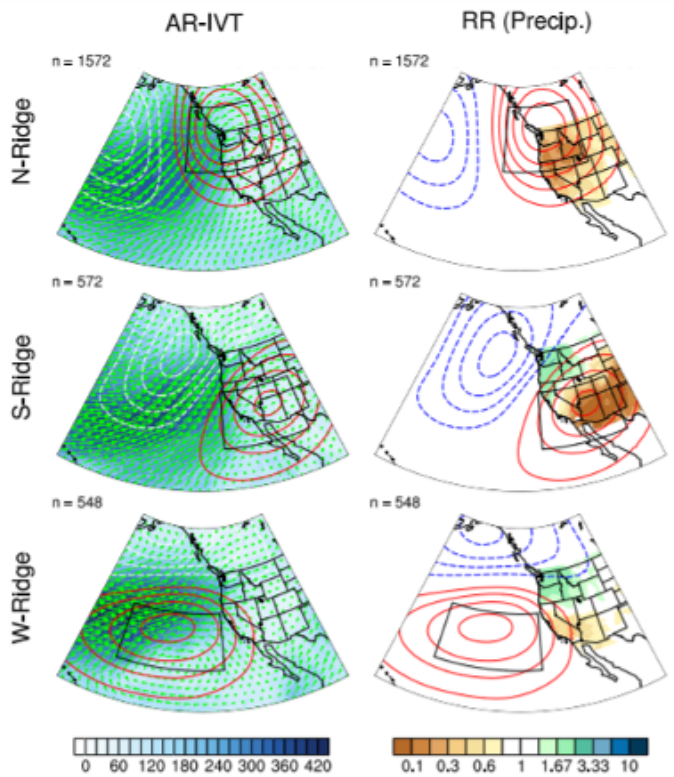
Subseasonal Outlooks: Week 2 AR Activity (NCEP vs. ECMWF)



- NCEP model is showing moderate-to-high probabilities (60–80%) of AR activity over Northern California and portions of the interior northwestern US on 14 Dec
- ECMWF model is showing high probabilities ($> 70\%$) of AR activity over California and Baja California on 14 Dec

There is multiple model agreement on AR activity on 14 Dec, but the location of the AR differs between the models

Subseasonal Outlooks: Weeks 1–2 Ridging Forecasts (NCEP)

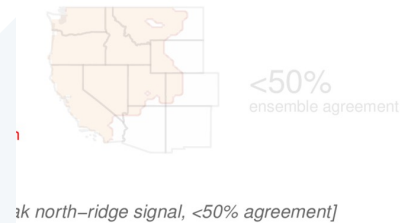


How each ridge type typically influences precipitation

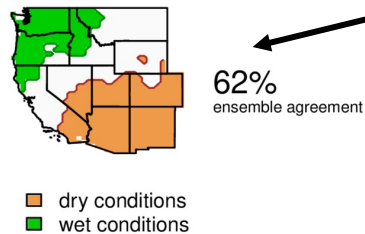
Left: Maps showing the average influence of each ridge type (red contours) on integrated vapor transport (IVT, blue shading indicates greater moisture transport, arrows indicate direction) during atmospheric river events

Right: Maps showing the 'Relative Risk' (RR) of precipitation under each ridge type. Brown shading indicates a reduced chance of precipitation when ridging occurs. For example, a RR value of 0.2 indicates a 5-fold reduction in the likelihood of precipitation

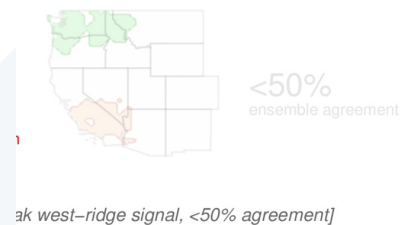
North-Ridge



South-Ridge



West-Ridge

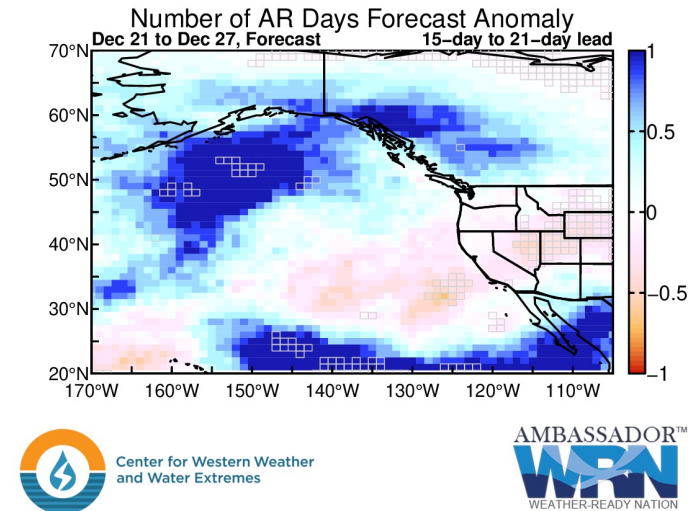


- NCEP model shows low confidence (< 50% ensemble agreement) in the occurrence of the North- and West-ridge types during Weeks 1–2 (6–20 Dec)
- There is somewhat higher confidence (> 60% ensemble agreement) in the occurrence of the South-ridge type, which is typically associated with wet conditions in the Pacific Northwest and dry conditions in Southern California and the Colorado River Basin
- ECMWF model shows low confidence ($\leq 50\%$ ensemble agreement) in the occurrence of ridging during Weeks 1–2 (*not shown*)

There is low confidence overall between models in the ridging forecasts

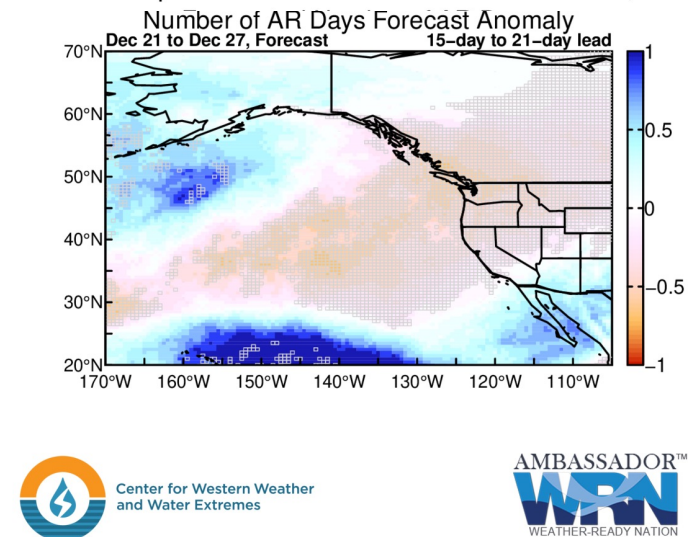
Subseasonal Outlooks: Week 3 AR Activity (NCEP vs. ECMWF)

NCEP Experimental Forecast Initialized: Dec 06, 2021



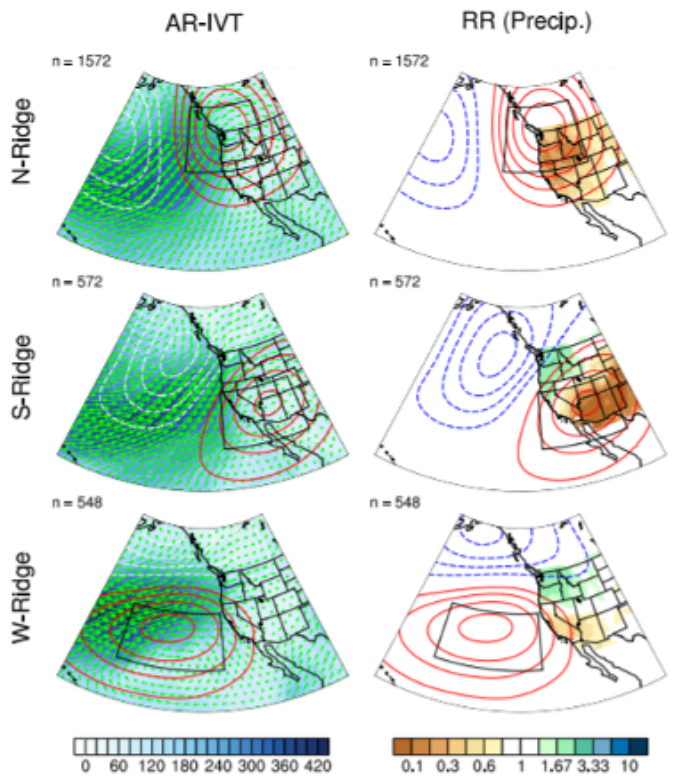
- NCEP and ECMWF models are both predicting below-normal AR activity along the US West Coast and above-normal AR activity over the southern Baja Peninsula during Week 3 (21–27 Dec)
- ECMWF model is also predicting below-normal AR activity over British Columbia during Week 3

ECMWF Experimental Forecast Initialized: Dec 06, 2021



There is more certainty that there will be lower AR Activity along the US West Coast during 21–27 Dec because both models are showing it.

Subseasonal Outlooks: Weeks 3–4 Ridging Forecasts (NCEP)

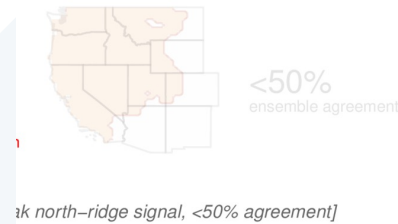


How each ridge type typically influences precipitation

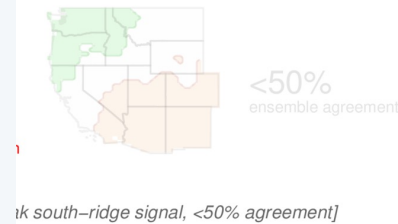
Left: Maps showing the average influence of each ridge type (red contours) on integrated vapor transport (IVT, blue shading indicates greater moisture transport, arrows indicate direction) during atmospheric river events

Right: Maps showing the 'Relative Risk' (RR) of precipitation under each ridge type. Brown shading indicates a reduced chance of precipitation when ridging occurs. For example, a RR value of 0.2 indicates a 5-fold reduction in the likelihood of precipitation

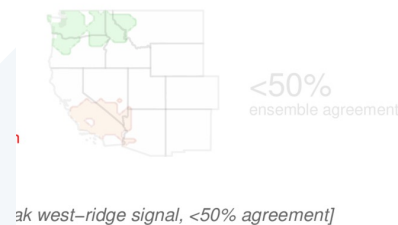
North-Ridge



South-Ridge



West-Ridge



- NCEP model shows low confidence (< 50% ensemble agreement) in the occurrence of ridging near the US West Coast during Weeks 3–4 (20 Dec – 3 Jan)

- ECMWF model also shows low confidence (< 50% ensemble agreement) in the occurrence of ridging near the US West Coast during Weeks 3–4 (*not shown*)

There is low confidence overall between models in the ridging forecasts

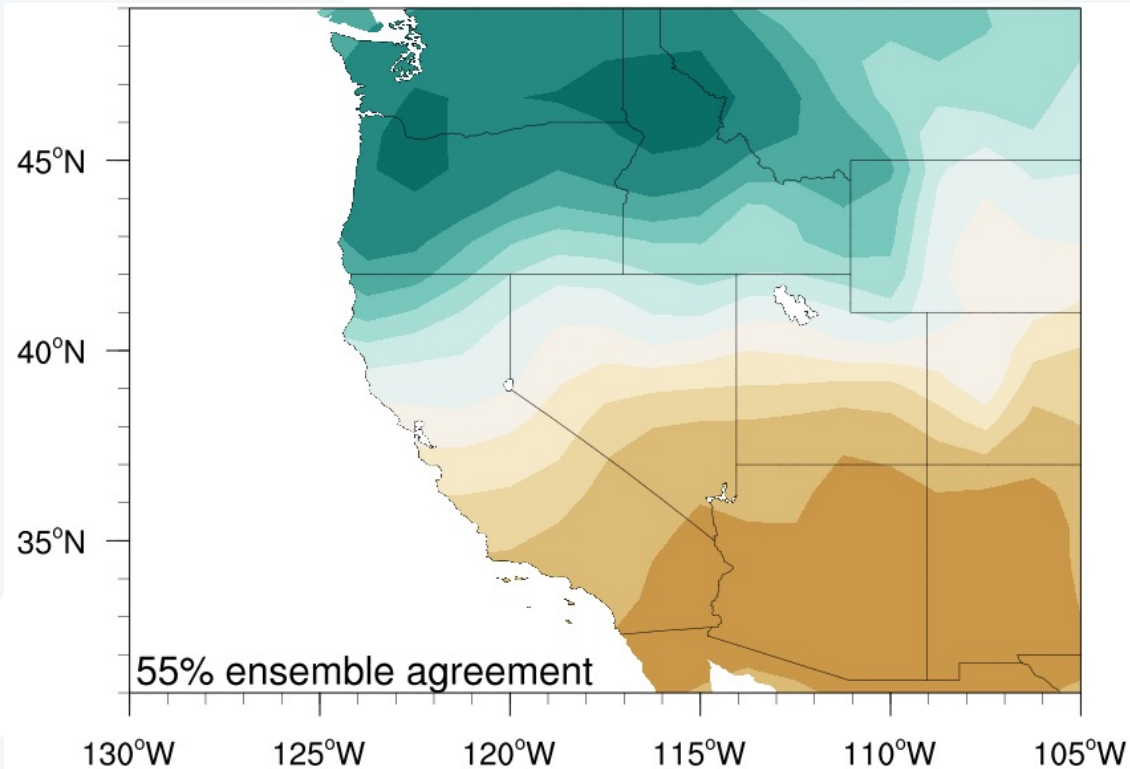


Seasonal Machine Learning Outlooks: Nov 2021 – Jan 2022 Precipitation

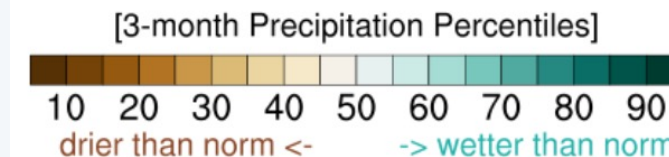
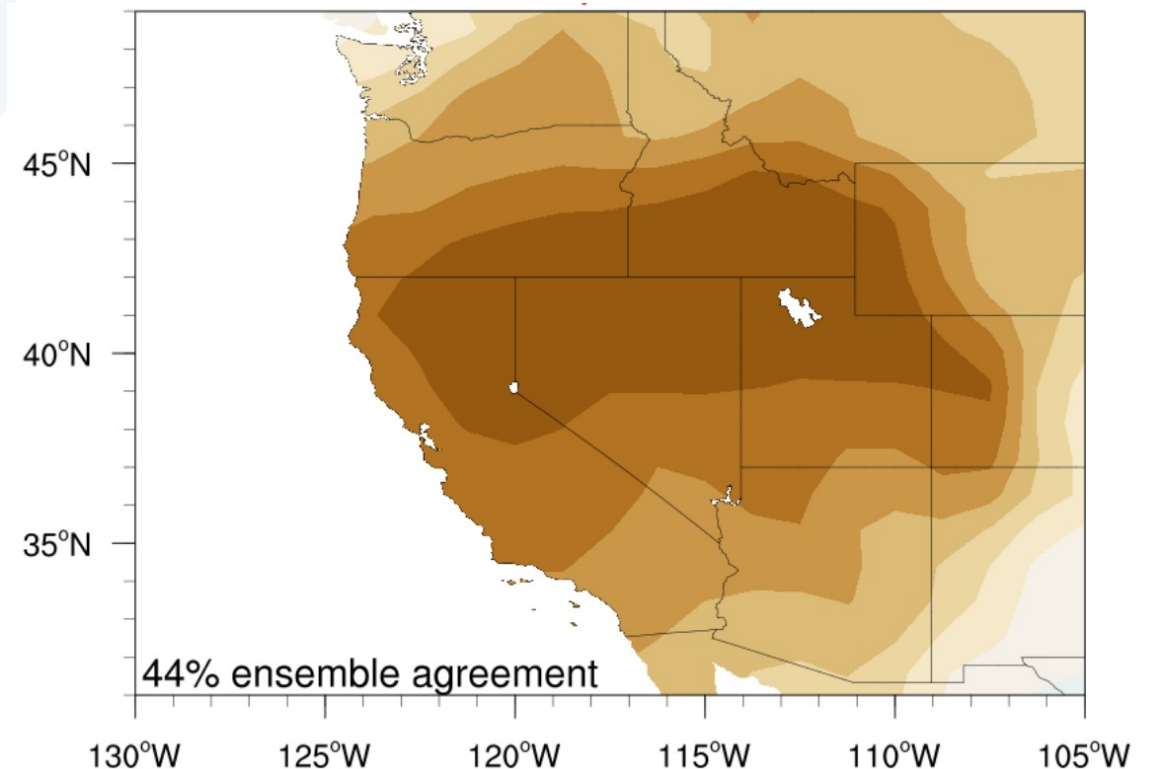
- CW3E machine learning models based on October SST/global weather patterns are predicting drier than normal conditions for southwest U.S.
- Northern California could see near normal or drier than normal conditions during NDJ

CW3E Machine Learning Models: Nov – Jan Forecast

55% chance for wet Pac NW, dry SW



45% chance for widespread dry



Skill assessment: Gibson et al. 2021



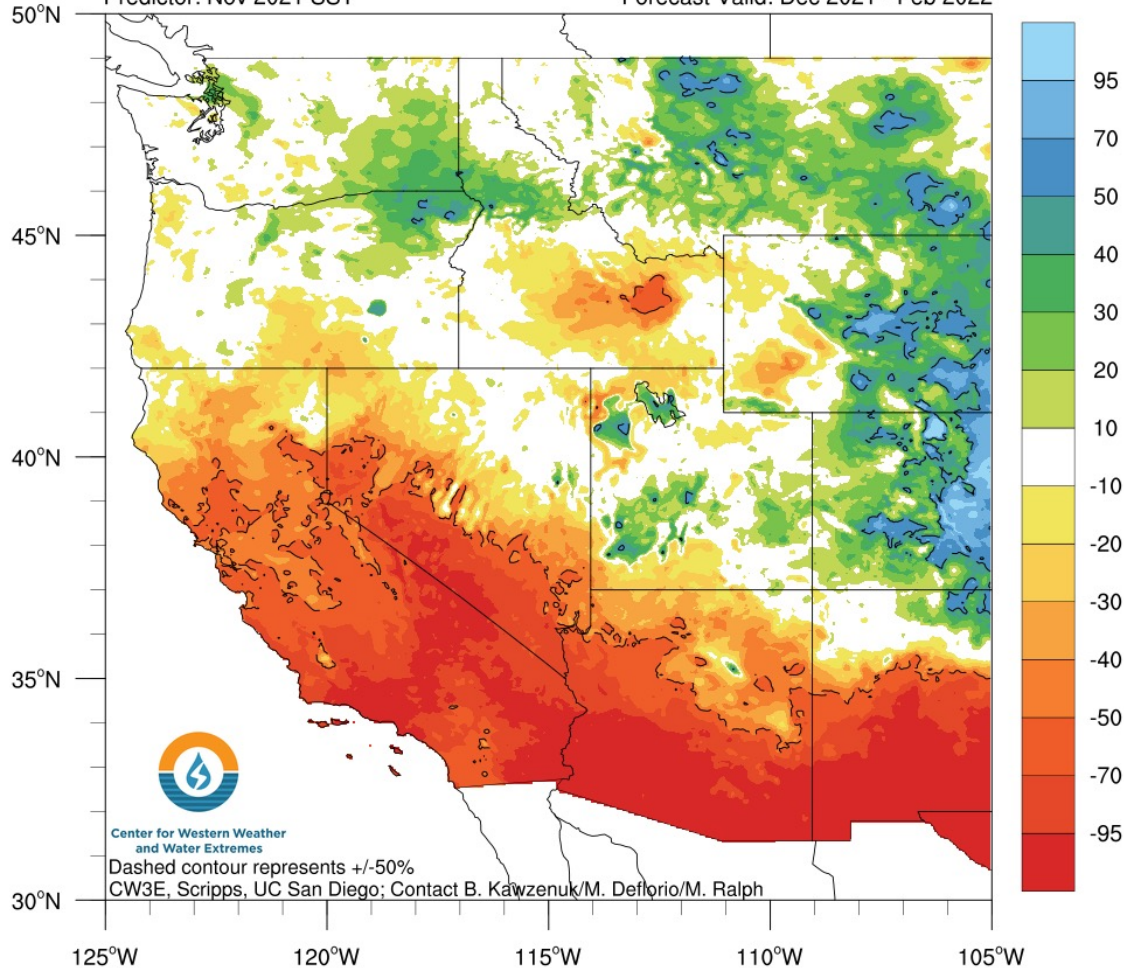
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Seasonal CCA Outlooks: Dec 2021 – Feb 2022 Precipitation

Total Precipitation Relative Anomaly (%)

Predictor: Nov 2021 SST

Forecast Valid: Dec 2021 - Feb 2022

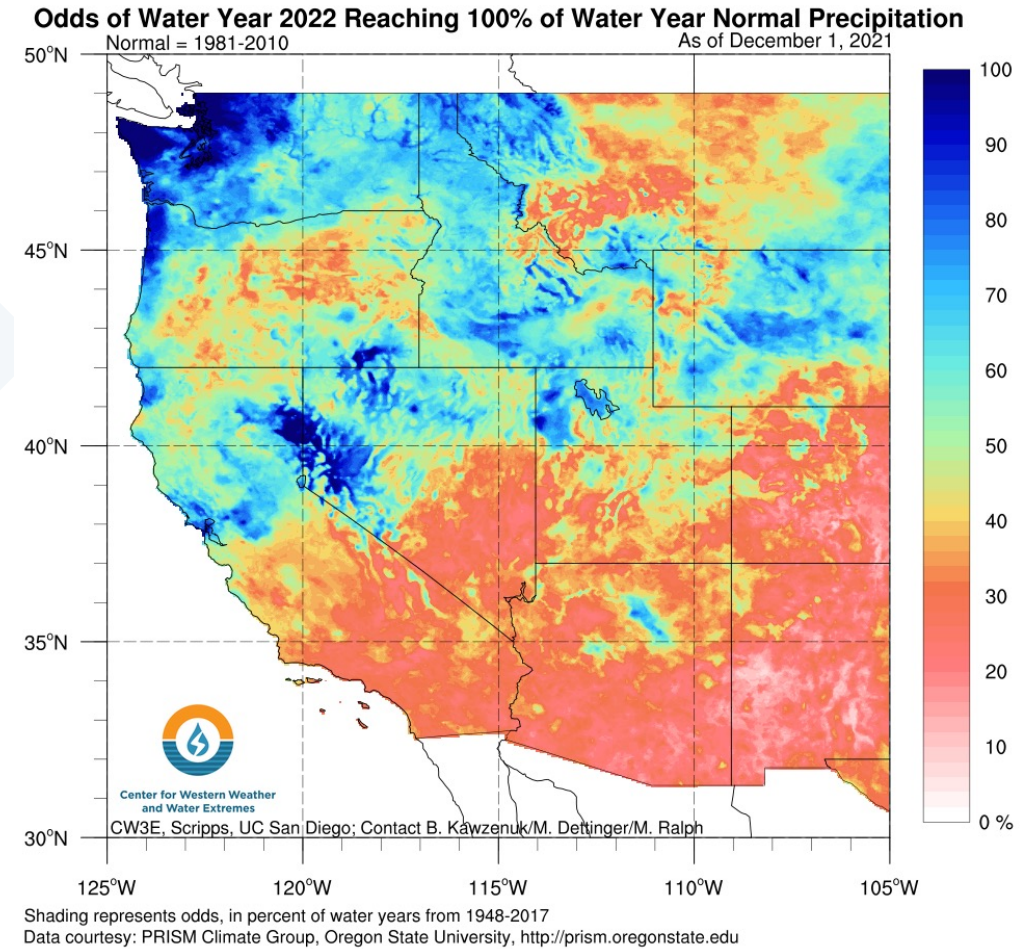
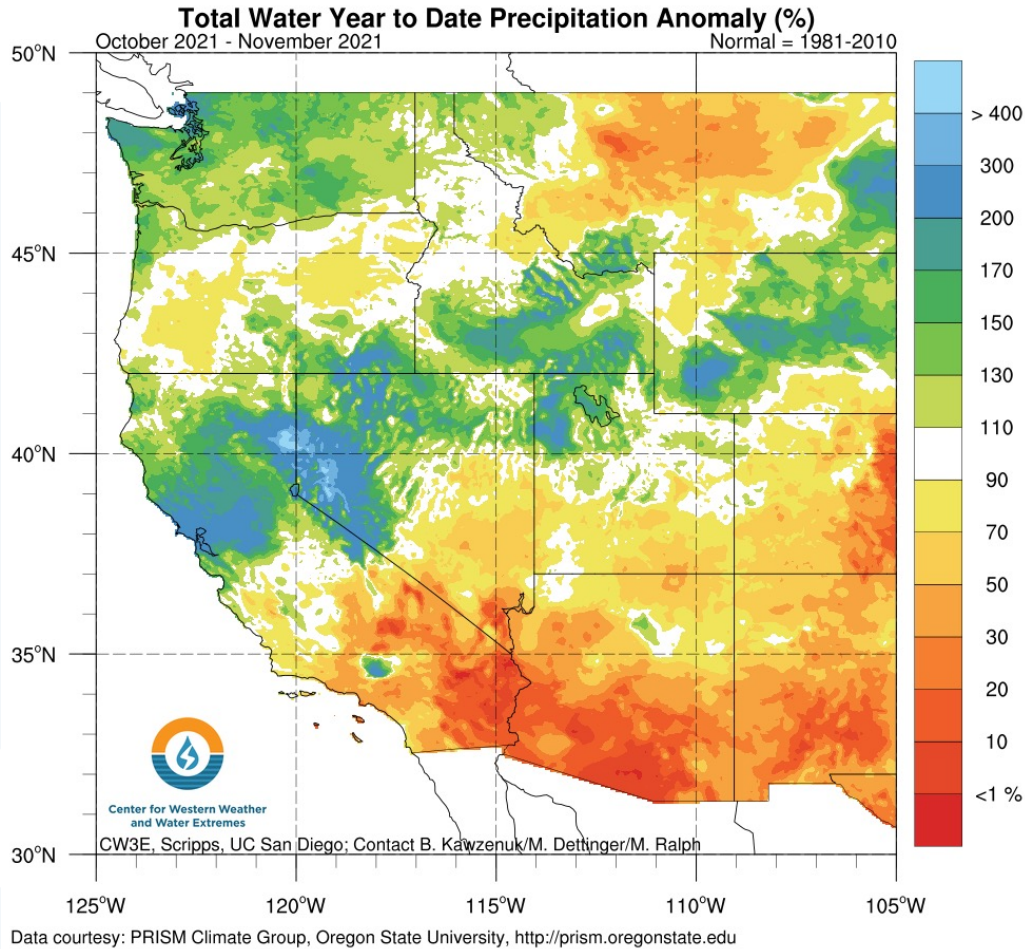


- CW3E statistical model based on November SST is predicting significantly below-normal (> 50% below normal) Dec–Feb precipitation across much of the southwestern US
- Above-normal Dec–Feb precipitation is predicted across portions of the Rocky Mountains



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Seasonal Outlooks: Odds of Reaching Normal Water Year Precipitation



Note: Map is based on historical data rather than forecast data

- As of 1 Dec, total water-year-to-date precipitation was running well below the climatological normal in much of Southern California, southern Nevada, Arizona, New Mexico, and Colorado
- Based on historical precipitation data, the probability of reaching normal water year precipitation by the end of Sep 2021 in these areas is less than 30%