



Center for Western Weather
and Water Extremes

SCRIPPS INSTITUTION OF OCEANOGRAPHY
AT UC SAN DIEGO

CW3E S2S Outlook: 22 Dec 2021

Prepared by: C. Castellano, M. DeFlorio, J. Kalansky, J. Wang

UC San Diego



SCRIPPS INSTITUTION OF
OCEANOGRAPHY

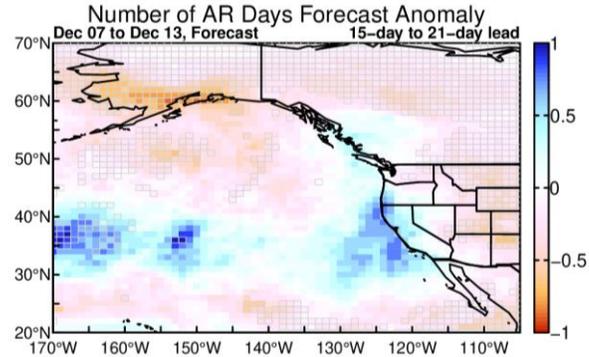
Summary

- **Week 2 forecasts (28 Dec – 3 Jan):** NCEP and ECMWF both indicate a likelihood of landfalling AR activity over western North America, but the location differs significantly
 - NCEP is forecasting high probability (> 70%) of AR activity over Southern CA, Arizona, and Baja California
 - ECMWF is forecasting the highest probabilities (50–70%) of AR activity farther south in Baja California Sur
- NCEP GEFS model predicts the MJO will remain in the western-to-central Pacific during the next two weeks, which may contribute to the increased probability of AR activity near California
- **Week 3 forecasts (4–10 Jan):** Greater uncertainty because the model forecasts do not agree on AR activity over the western US
 - NCEP is predicting above-normal AR activity over the southwestern US, with AR activity penetrating inland into the Great Basin and the Upper Colorado River Basin
 - ECMWF is predicting below-normal AR activity over the western US, with much of the AR activity remaining farther south over the Baja Peninsula
- Current forecasts suggest that persistent ridging in near the US West Coast is not very likely during the next several weeks, but the NCEP model is showing higher confidence in the occurrence of the South-Ridge type
- The lack of persistent ridging in the forecasts suggests that there may be more opportunities for storms to bring precipitation to California over the next several weeks (persistent ridging typically leads to dry conditions in CA)

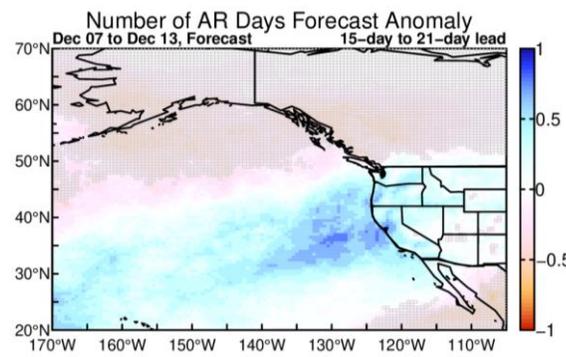
Looking Back: Week 3 AR Activity Forecasts

Valid: 7–13 Dec 2021

NCEP Experimental Forecast Initialized: Nov 08, 2021



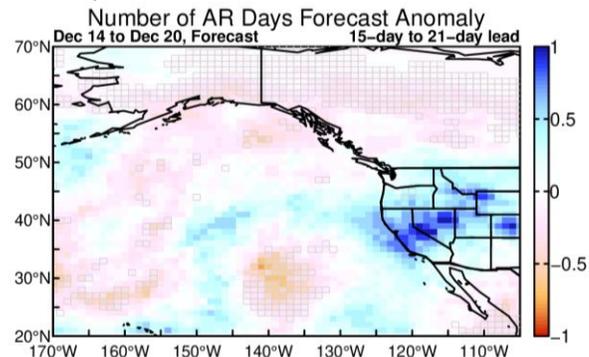
ECMWF Experimental Forecast Initialized: Nov 08, 2021



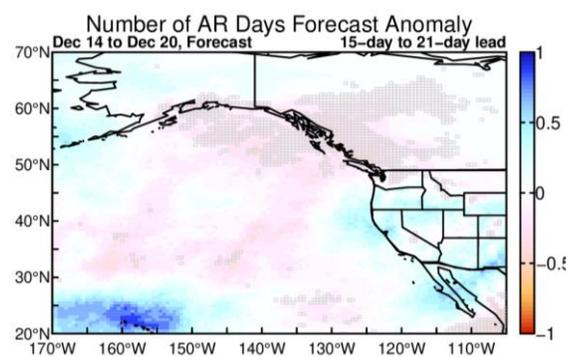
- NCEP: Above-normal AR activity along the coast of California and Oregon
- ECMWF: Above-normal AR activity along the US West Coast; below-normal AR activity over British Columbia

Valid: 14–20 Dec 2021

NCEP Experimental Forecast Initialized: Nov 15, 2021

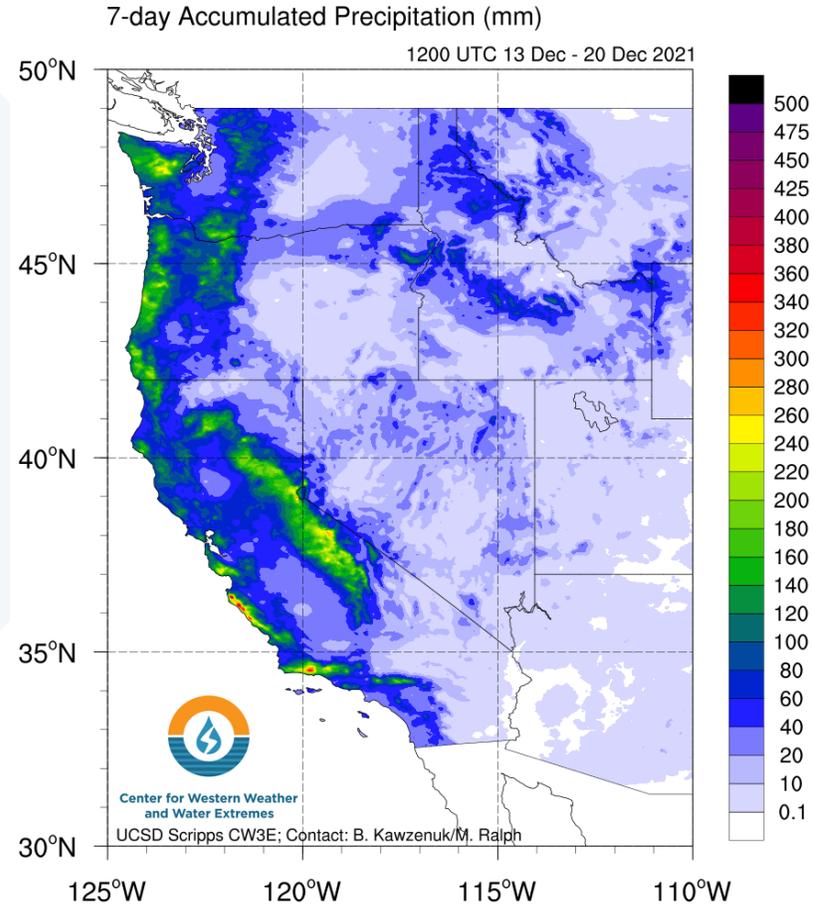
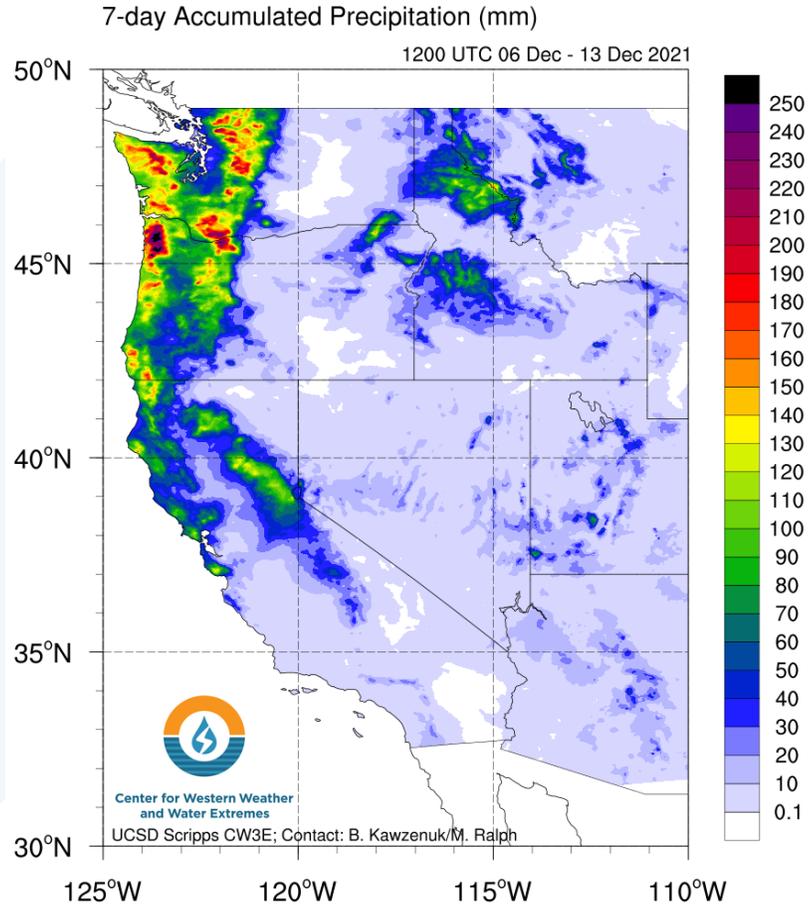


ECMWF Experimental Forecast Initialized: Nov 15, 2021



- NCEP: Above-normal AR activity over the western US, especially California and Nevada
- ECMWF: Near-normal AR activity over the western US

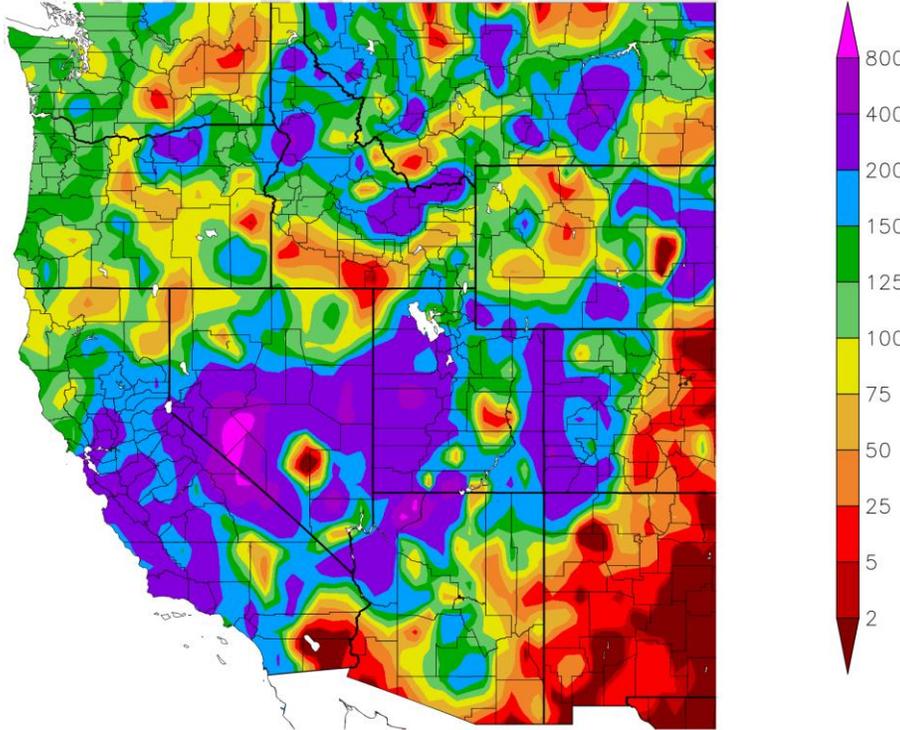
Looking Back: Accumulated Precipitation (6–20 Dec)



- An AR brought widespread heavy precipitation to the US West Coast during 10–14 Dec
- A weak system produced moderate precipitation in Northern and Central California during 15–16 Dec
- Another AR brought heavy precipitation to the Pacific Northwest during 18–20 Dec
- Portions of the Pacific Coast Ranges, Cascades, and Sierra Nevada have received more than 10 inches of precipitation over the past two weeks

Looking Back: 14-day Precipitation Anomaly (6–20 Dec)

Percent of Normal Precipitation (%)
12/7/2021 – 12/20/2021

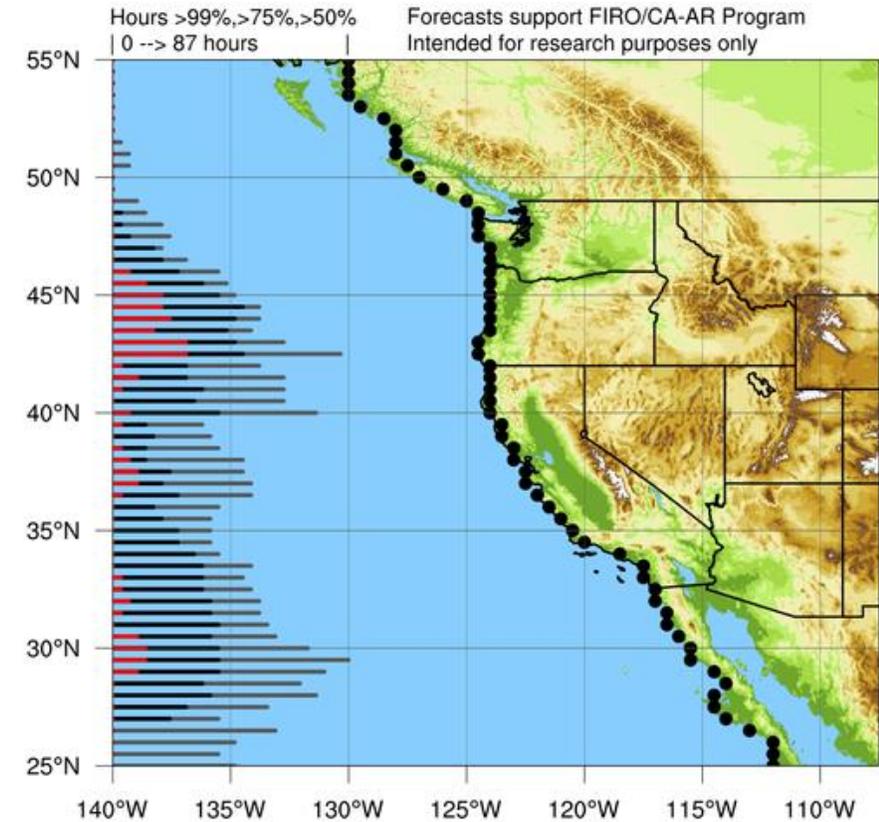
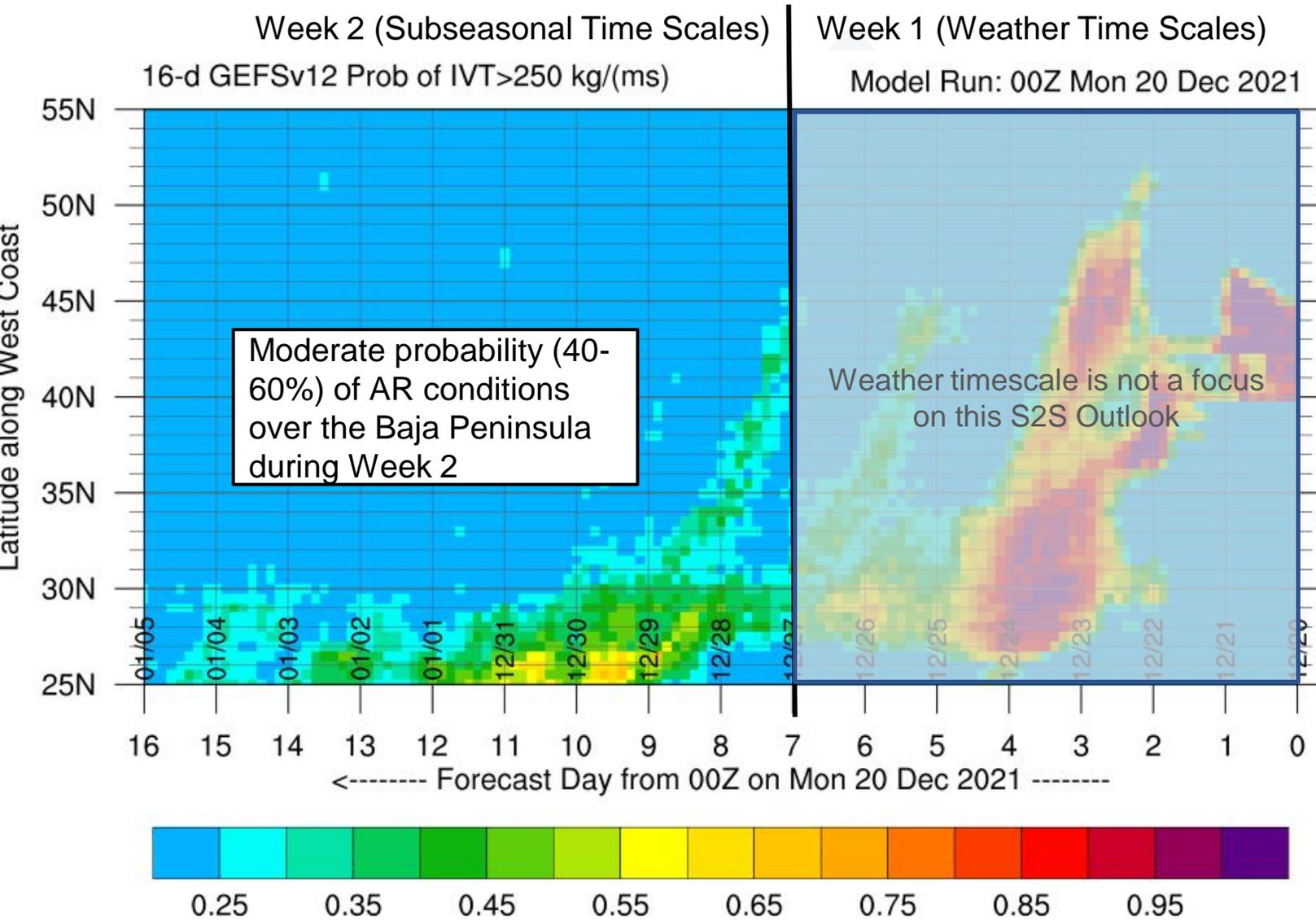


- Above-normal precipitation over much of the western US during the past two weeks
- Portions of California, Nevada, Arizona, and Utah received more than 200% of the normal precipitation for this 2-week period

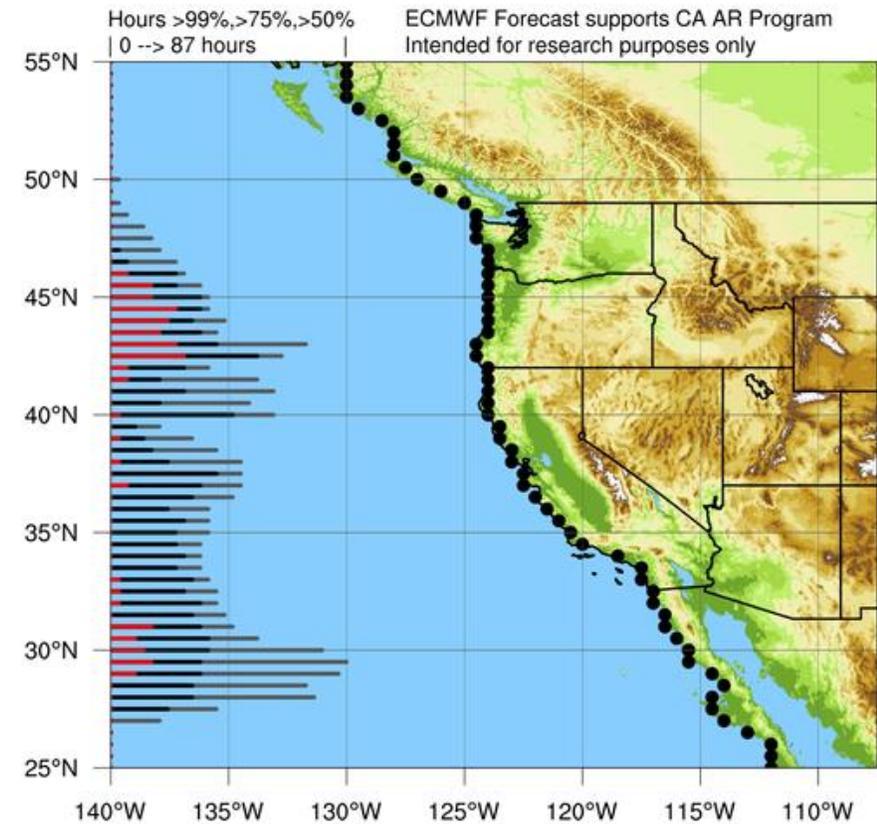
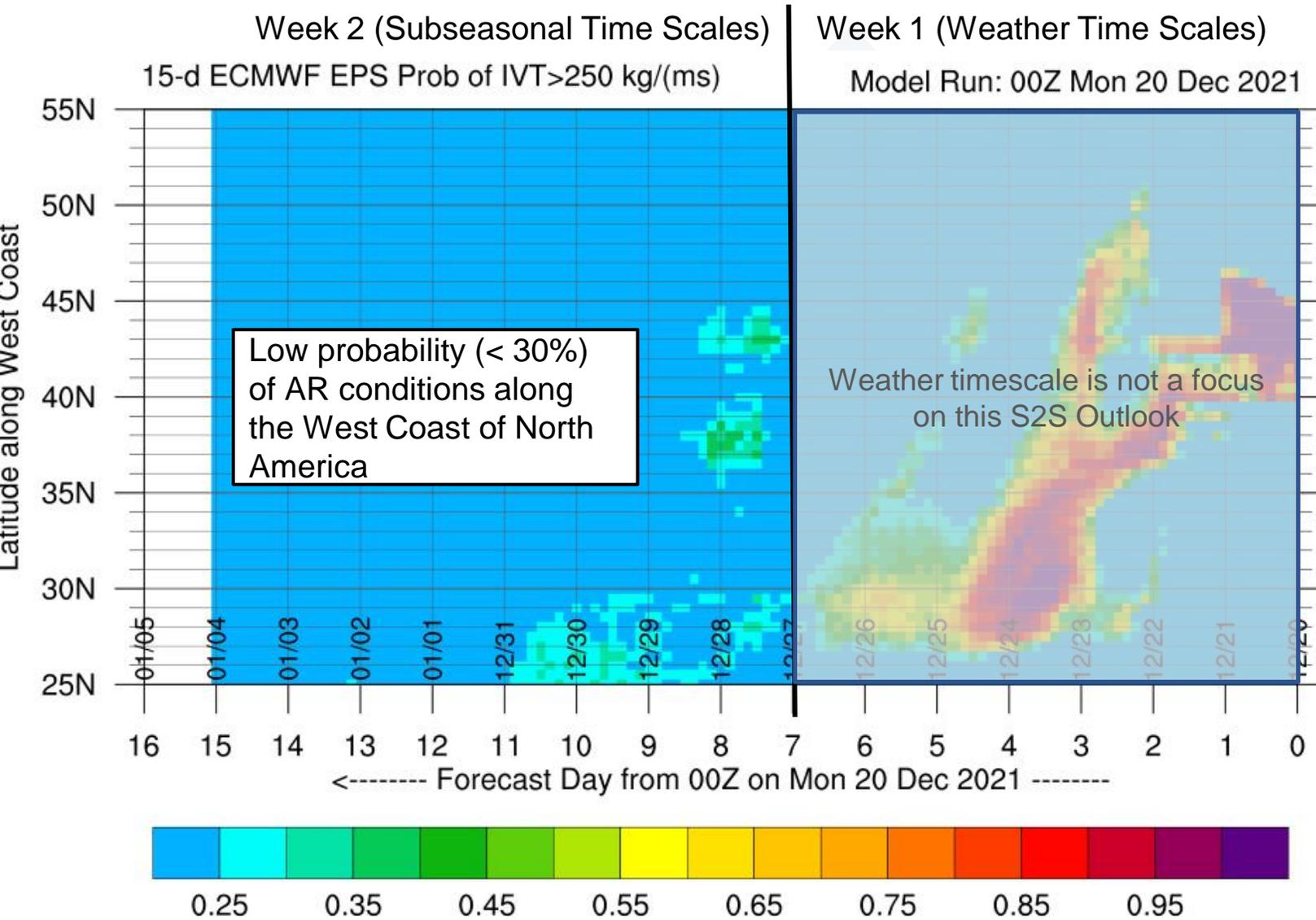
Generated 12/21/2021 at HPRCC using provisional data.

NOAA Regional Climate Centers

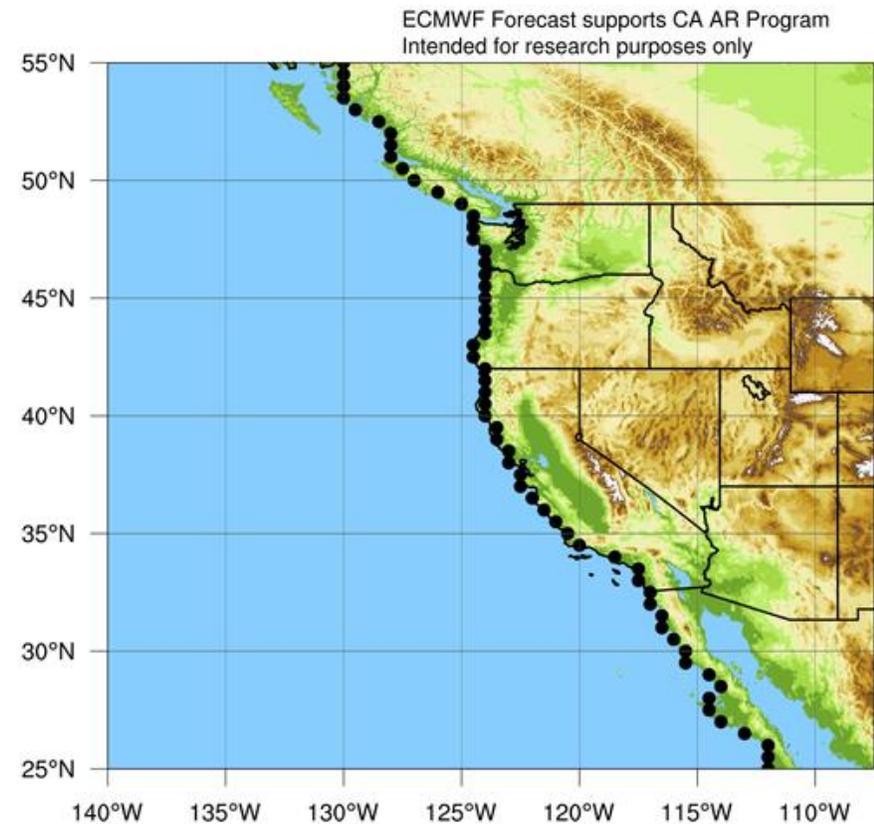
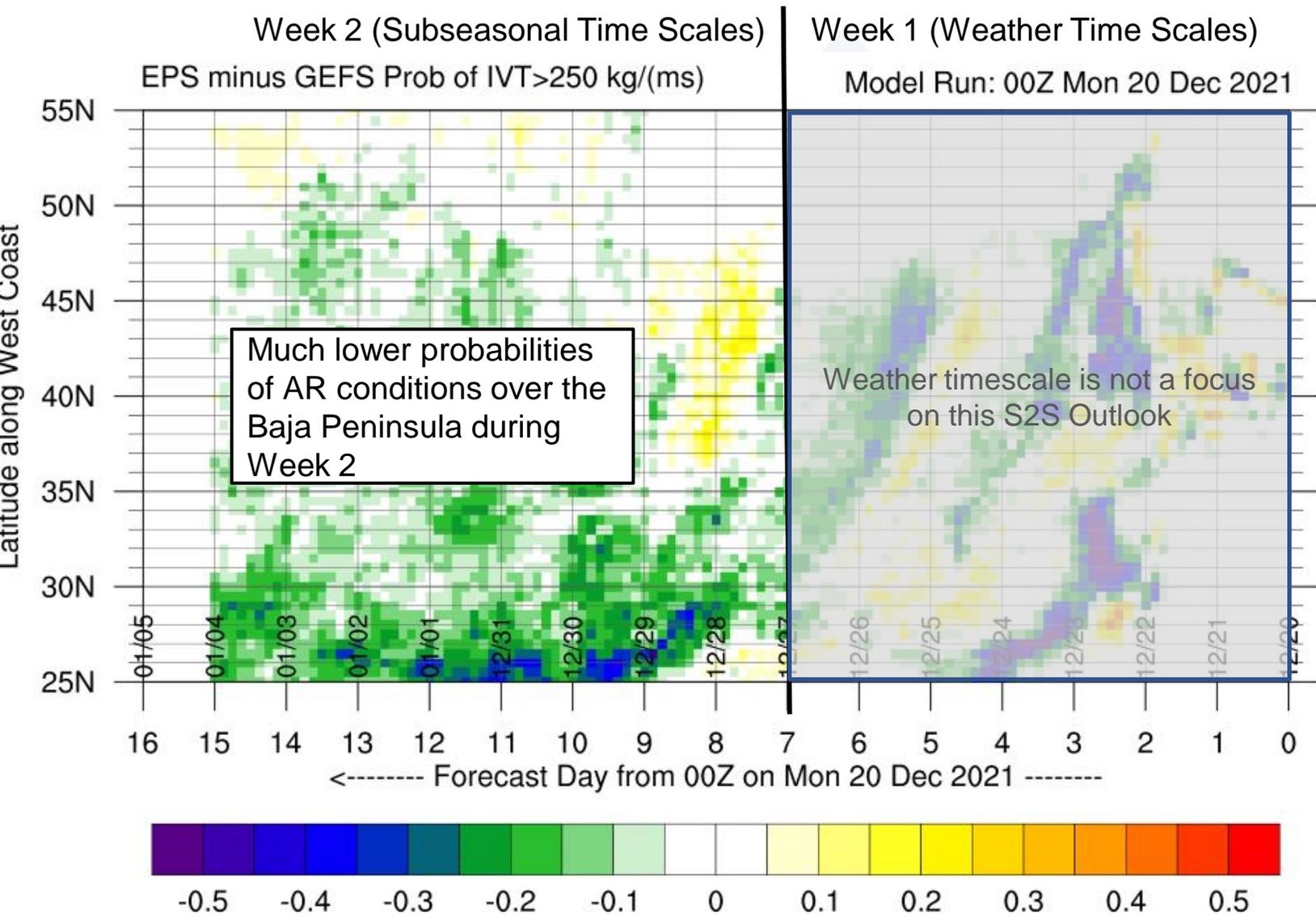
GEFS AR Landfall Tool: Valid 00Z 20 Dec – 5 Jan



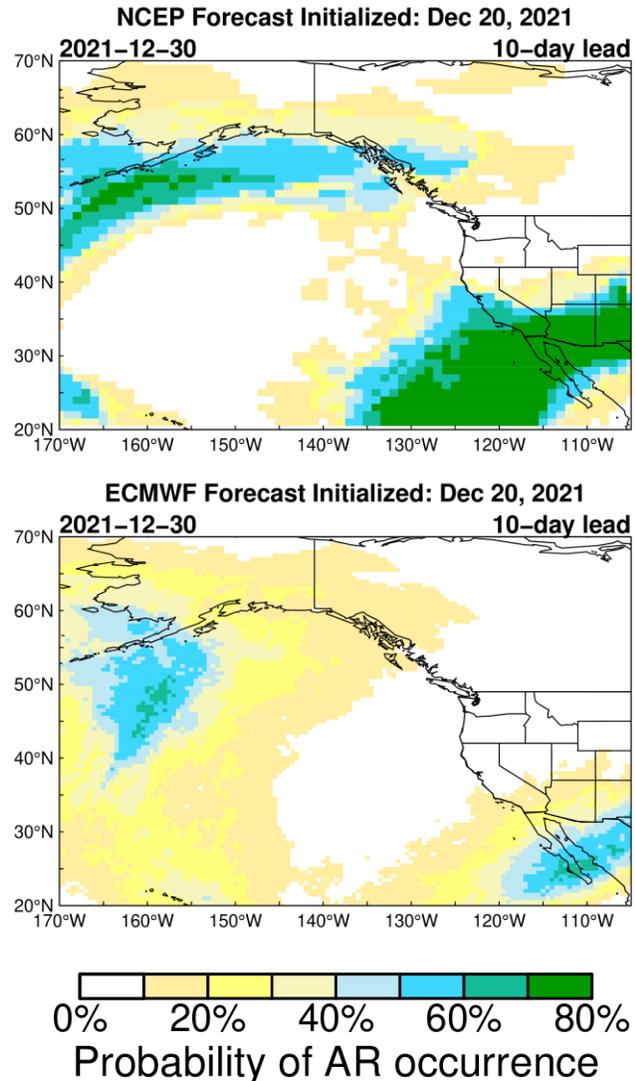
ECMWF EPS AR Landfall Tool: Valid 00Z 20 Dec – 4 Jan



ECMWF Minus GEFS AR Landfall Tool: Valid 00Z 20 Dec – 4 Jan



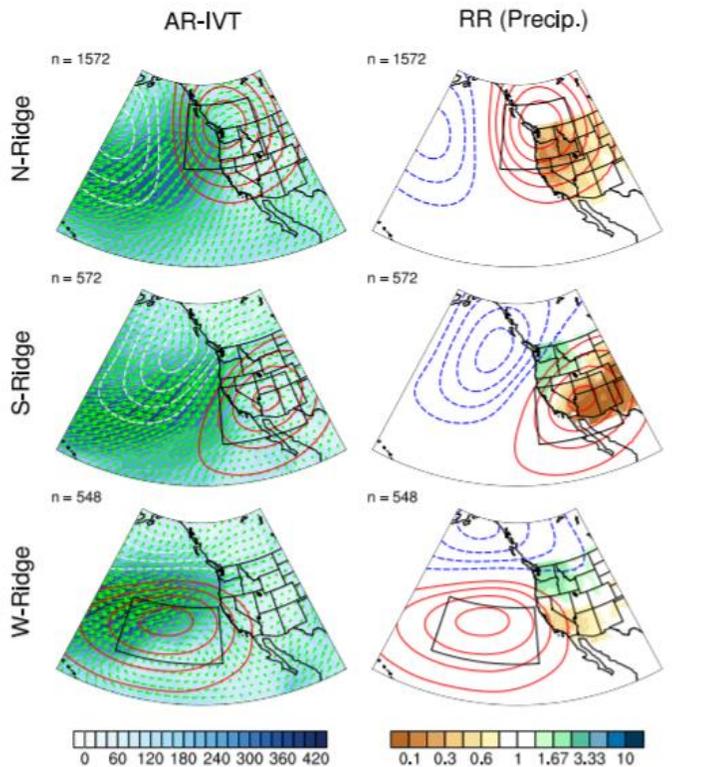
Subseasonal Outlooks: Week 2 AR Activity (NCEP vs. ECMWF)



- NCEP model is showing high probabilities ($> 70\%$) of AR activity over Southern California, Arizona, and Baja California on 30 Dec
- ECMWF model is showing much lower probabilities ($< 40\%$) of AR activity over Southern California and Arizona, and moderate probabilities (50–70%) of AR activity over Baja California Sur on 30 Dec

Both models are showing the possibility of a landfalling AR along the West Coast of North America on 30 Dec, but the location of the AR differs between the models, and the NCEP model is showing higher forecast confidence in AR conditions

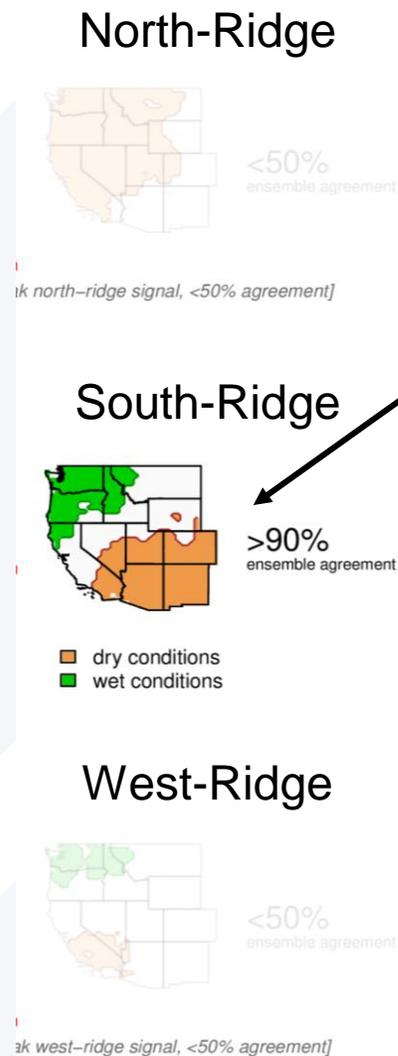
Subseasonal Outlooks: Weeks 1–2 Ridging Forecasts (NCEP)



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

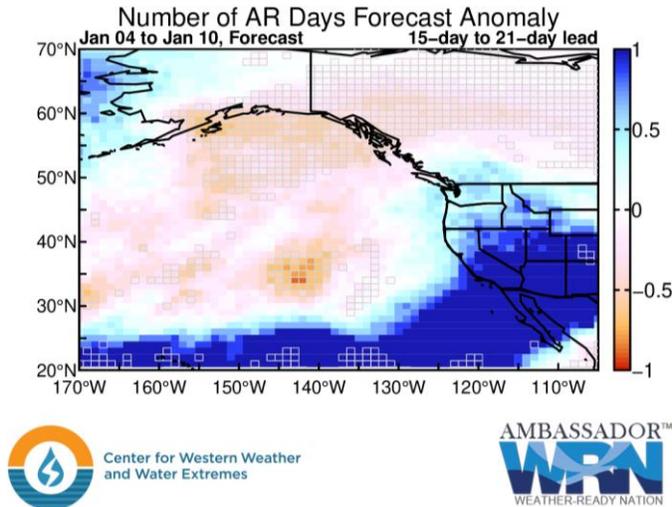
Right: Maps showing the 'Relative Risk' (RR) of precipitation under each ridge type. Brown shading indicates a reduced chance of precipitation when ridging occurs. For example, a RR value of 0.2 indicates a 5-fold reduction in the likelihood of precipitation



- NCEP model shows high confidence (> 90% ensemble agreement) in the occurrence of the South-Ridge type during Weeks 1–2 (20 Dec – 3 Jan)
- The South-Ridge type is typically associated with wet conditions in the Pacific Northwest and dry conditions in Southern California and the Colorado River Basin
- NCEP model shows low confidence (< 50% ensemble agreement) in the occurrence of the North- and West-ridge types
- ECMWF model shows low confidence < 50% ensemble agreement) in the occurrence of ridging near the US West Coast during Weeks 1–2 (not shown)

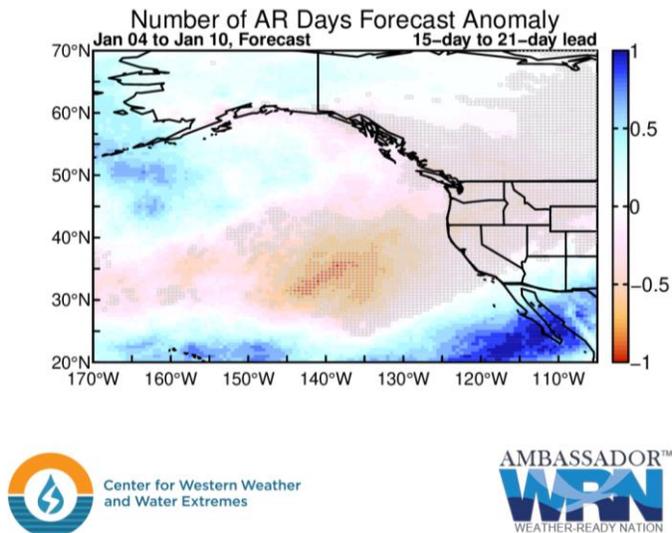
Subseasonal Outlooks: Week 3 AR Activity (NCEP vs. ECMWF)

NCEP Experimental Forecast Initialized: Dec 20, 2021



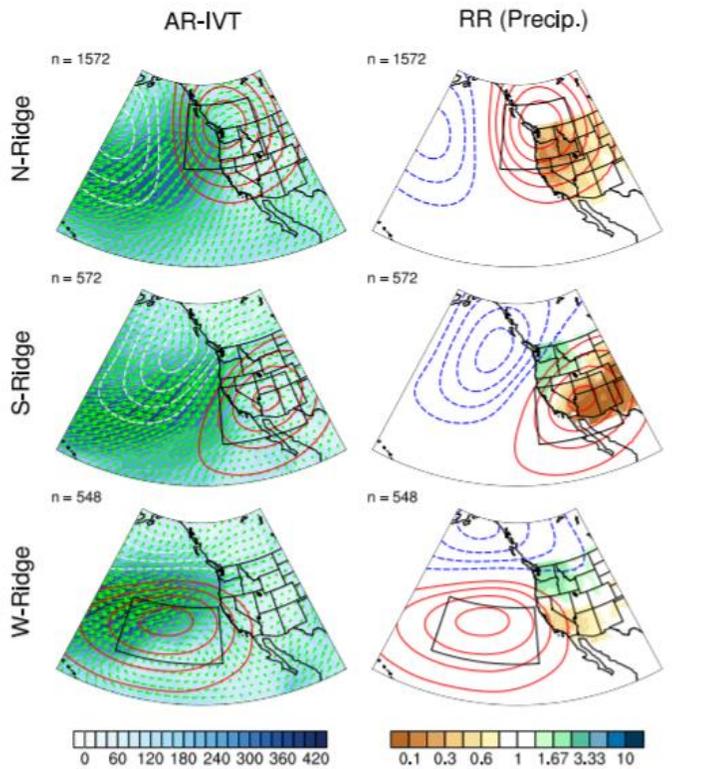
- NCEP model is predicting significantly above-normal AR activity over the southwestern US and the Baja Peninsula during Week 3 (4–10 Jan)
- ECMWF model is predicting below-normal AR activity over much of the western US and above-normal AR activity over Baja California Sur during Week 3

ECMWF Experimental Forecast Initialized: Dec 20, 2021



Both models are showing a north–south dipole pattern in the Northeast Pacific Ocean, with decreased AR activity around 30–40°N, and increased AR activity south of 25°N. However, there is significant disagreement on how far north the AR activity will extend over western North America.

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

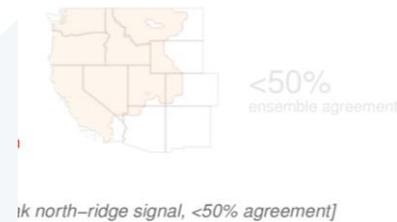


How each ridge type typically influences precipitation

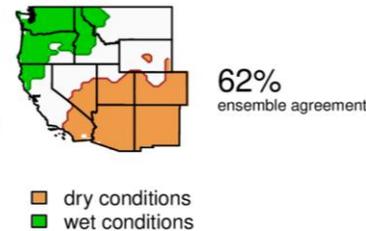
Left: Maps showing the average influence of each ridge type (red contours) on integrated vapor transport (IVT, blue shading indicates greater moisture transport, arrows indicate direction) during atmospheric river events

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

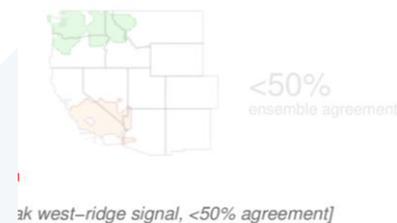
North-Ridge



South-Ridge



West-Ridge



- NCEP model shows low confidence (< 50% ensemble agreement) in the occurrence of the North- and West-Ridge types during Weeks 3–4 (3–20 Jan)
- NCEP model shows slightly higher confidence (> 60% ensemble agreement) in the occurrence of the South-Ridge type
- ECMWF model shows low confidence in the occurrence of ridging near the US West Coast during Weeks 3–4 (not shown)

There is low confidence overall in persistent ridging during Weeks 3–4