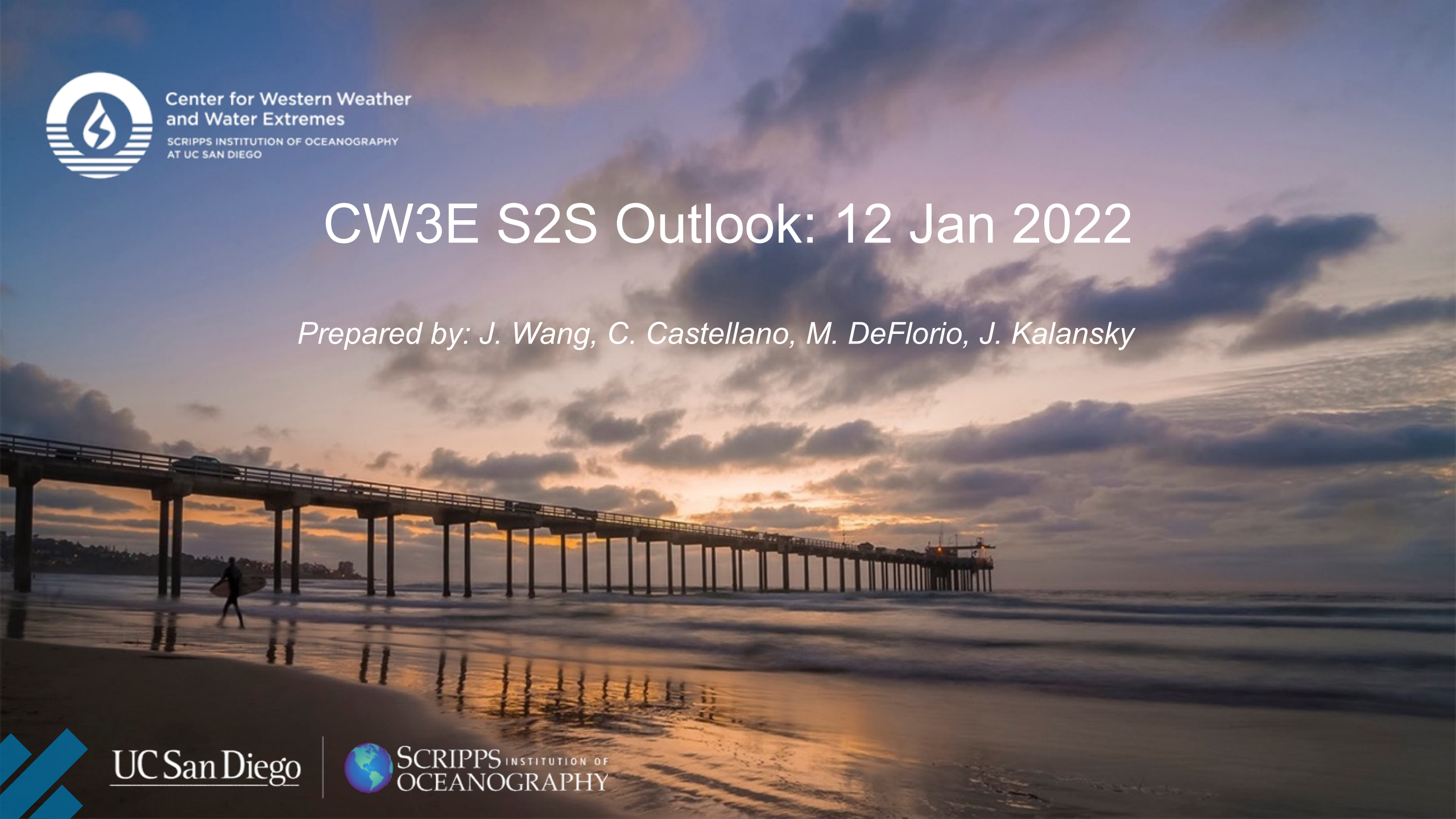


CW3E S2S Outlook: 12 Jan 2022

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

Summary

- **Week 2 forecasts (18–24 Jan):** Large model-to-model differences in the likelihood of landfalling AR activity near the West Coast
  - NCEP is forecasting moderate-to-high probability (50–80%) of AR activity over Washington and Oregon
  - ECMWF is forecasting low probabilities (< 10%) of AR activity in Washington and Oregon

- NCEP GEFS model predicts the MJO will be in the central Pacific during the next week, which is consistent with the above normal probability of AR activity near Oregon

- **Week 3 forecasts (25–31 Jan):** Models continue to show considerable disagreement in AR activity forecasts
  - NCEP is predicting above-normal AR activity along the coast of British Columbia and the northwestern US
  - ECMWF is predicting below-normal AR activity over the western US, with much of the AR activity remaining over the Baja Peninsula

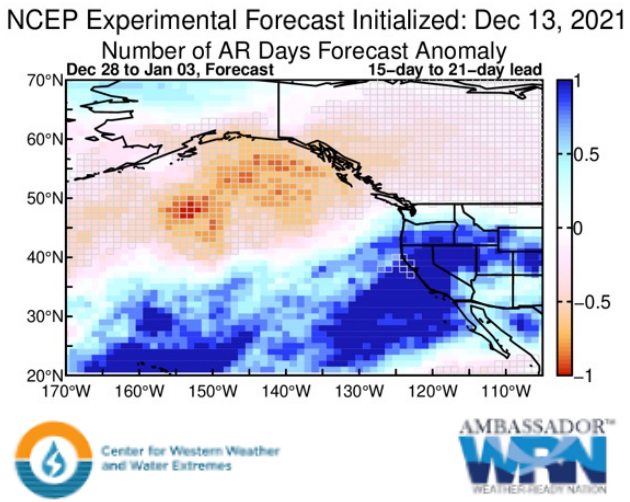
- Both models show high confidence in the occurrence of the North-Ridge type during Weeks 1–2 and low confidence in persistent ridging near the US West Coast during Weeks 3–4

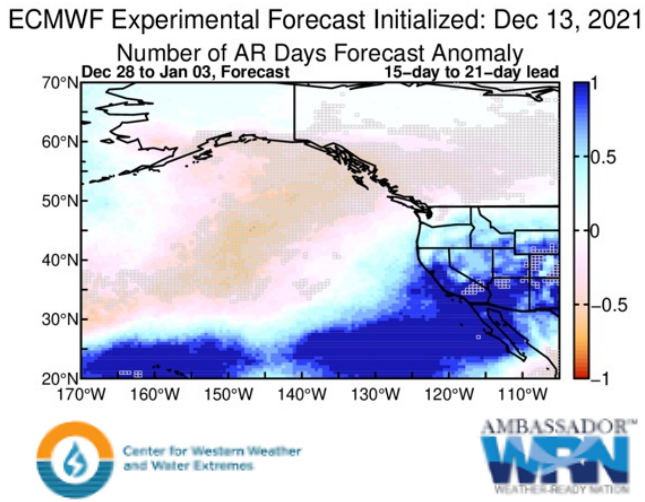
- CW3E machine learning models and statistical model based on December SST/global weather conditions are predicting a dipole pattern of rainfall with drier than normal conditions in the southwestern US and wetter than normal conditions in the northwestern US during Jan–Mar

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

Looking Back: Week 3 AR Activity Forecasts

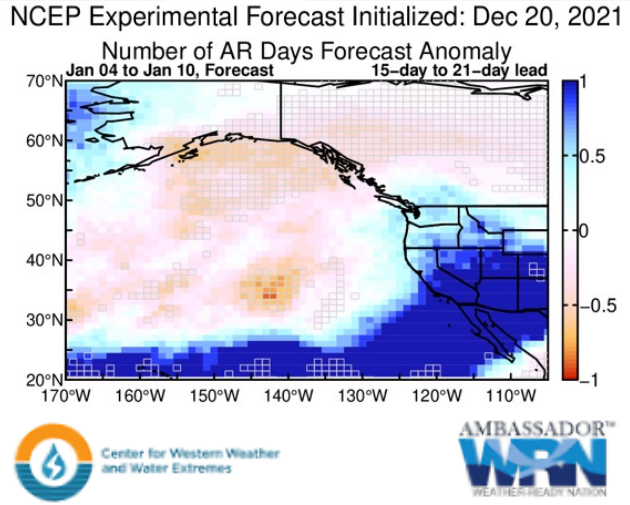
Valid: 28 Dec 2021 – 3 Jan 2022

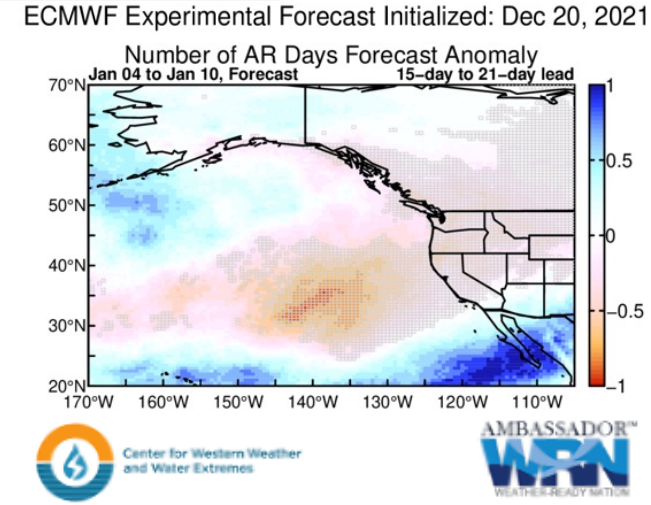




- NCEP: Below-normal AR activity over British Columbia; above-normal AR activity over the western US
- ECMWF: Below-normal AR activity over British Columbia; above-normal AR activity over the southwestern US and the Baja Peninsula

Valid: 4 Jan – 10 Jan 2022

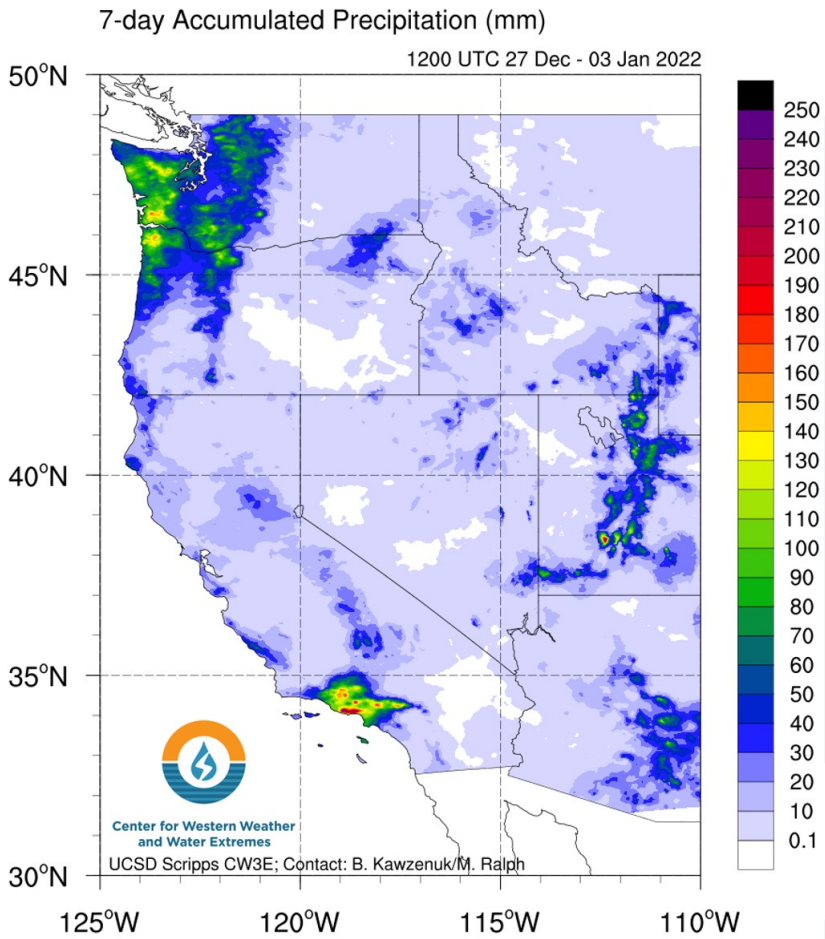


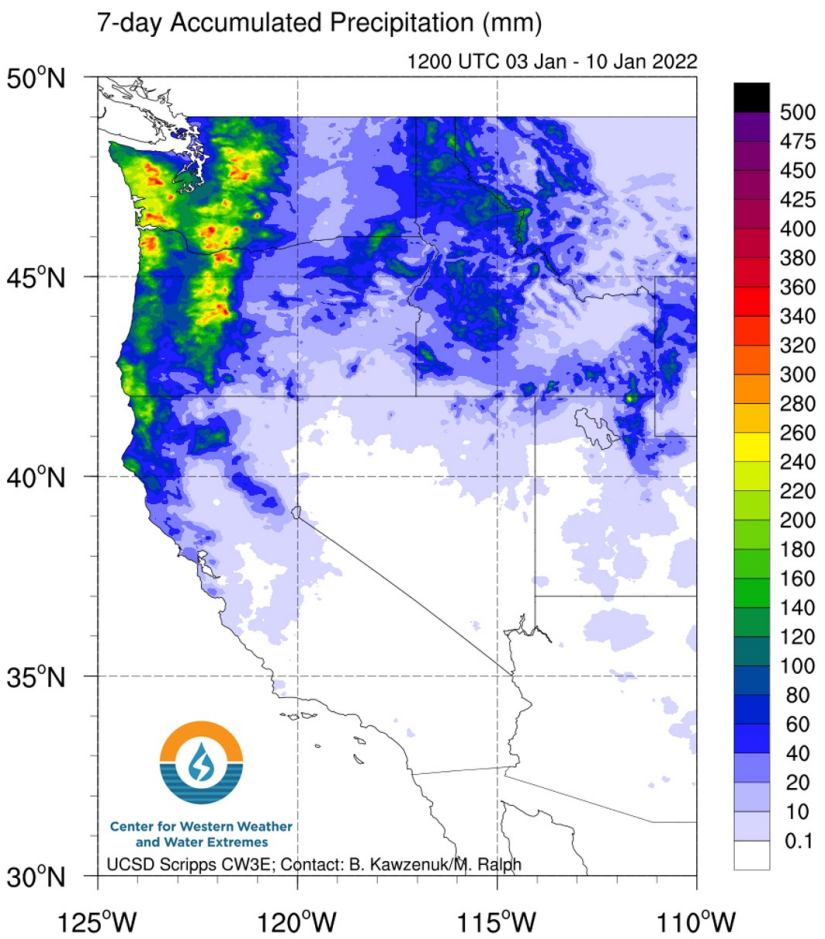


- NCEP: Below-normal AR activity over much of British Columbia; above-normal AR activity over the southwestern US and the Baja Peninsula
- ECMWF: Below-normal AR activity over British Columbia and the western US

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

Looking Back: Accumulated Precipitation (27 Dec 2021 – 10 Jan 2022)

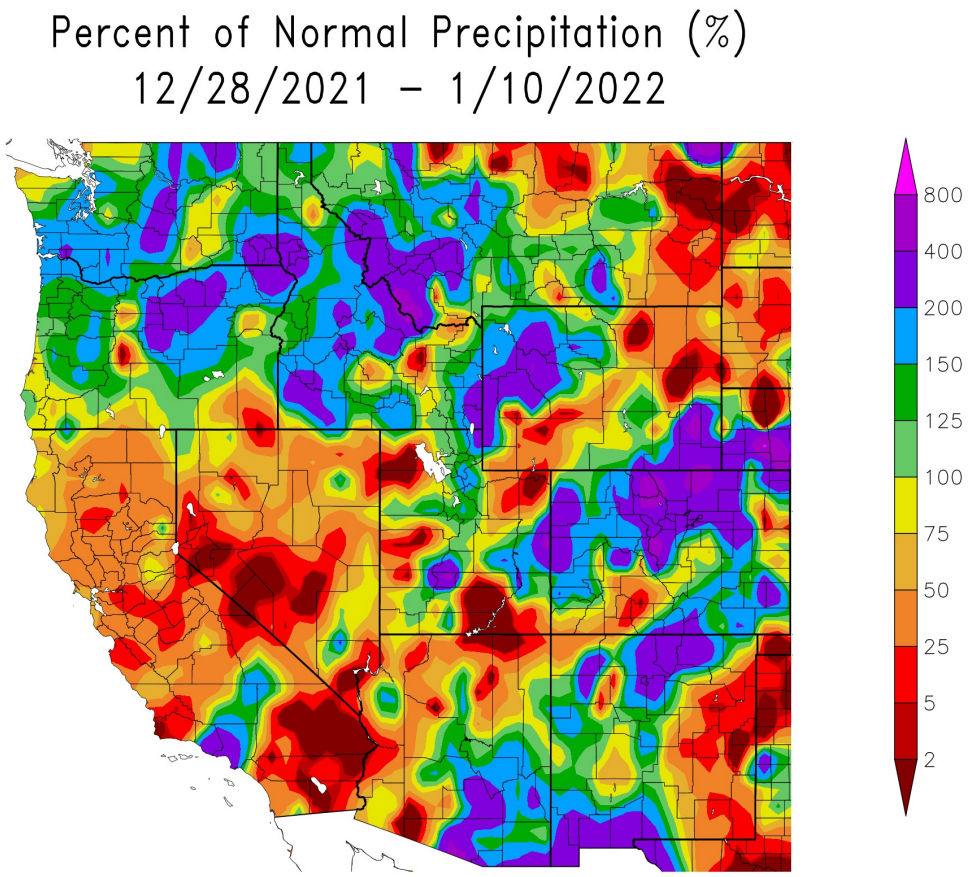




- Upper-level shortwaves brought heavy precipitation and snow to Washington, Oregon, and Northern California during 25–28 Dec
- The other shortwaves brought heavy precipitation to Los Angeles and heavy mountain snow to southern California during 29–31 Dec
- An AR brought widespread heavy precipitation to Oregon, Washington, and snow to the Cascade Mountains during Jan 2–6

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

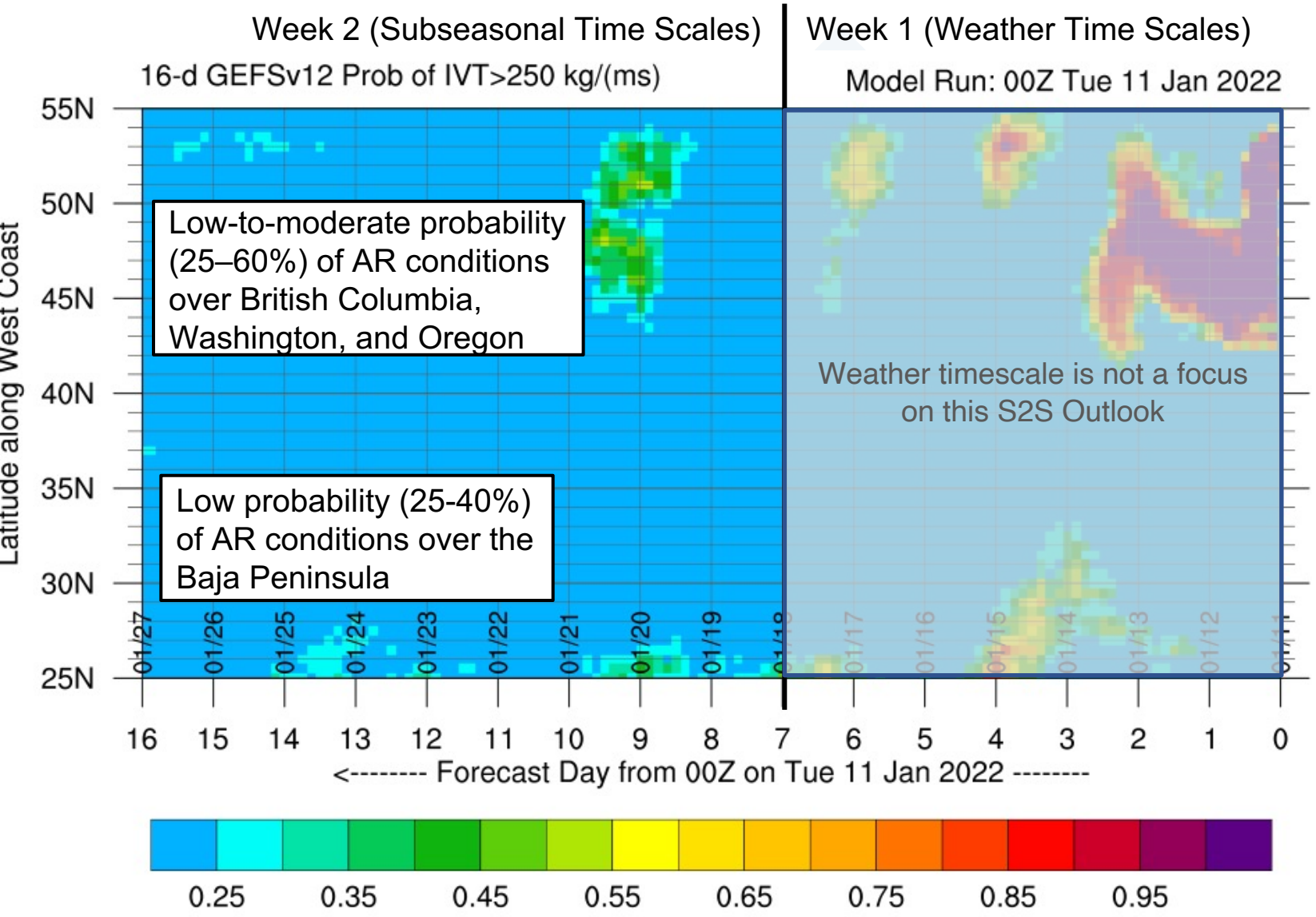
Looking Back: 14-day Precipitation Anomaly (28 Dec 2021 – 10 Jan 2022)

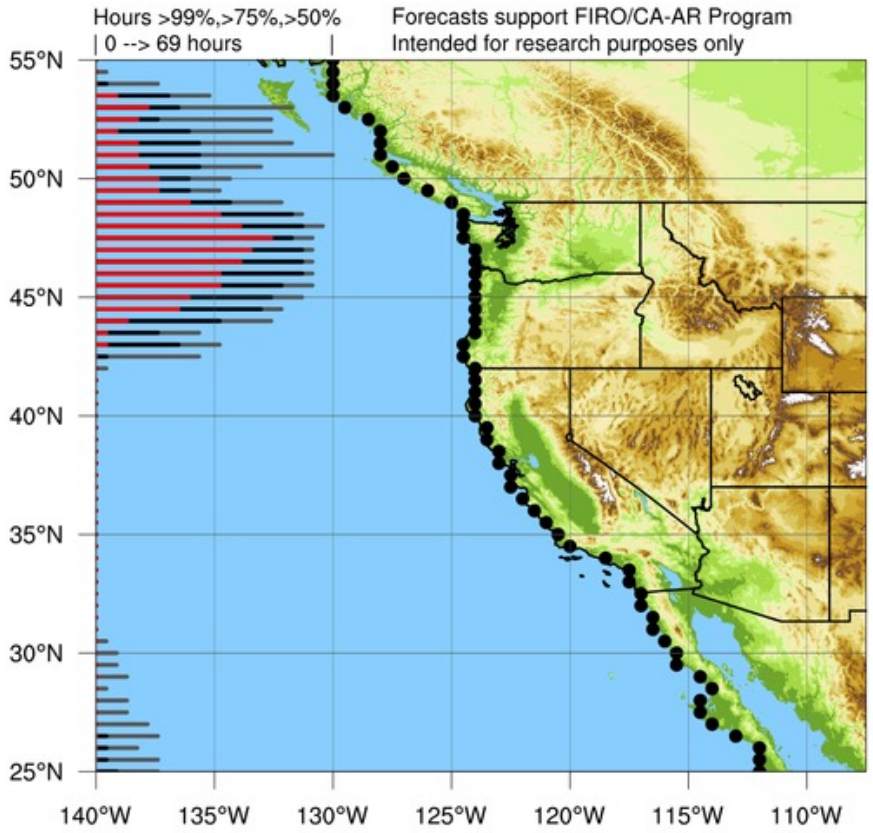


- Above-normal precipitation over the northwestern US and the Los Angeles area (some regions received >200% of the normal precipitation) during the past two weeks
- Below-normal precipitation over much of California and Nevada

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

GEFS AR Landfall Tool: Valid 00Z 11–27 Jan

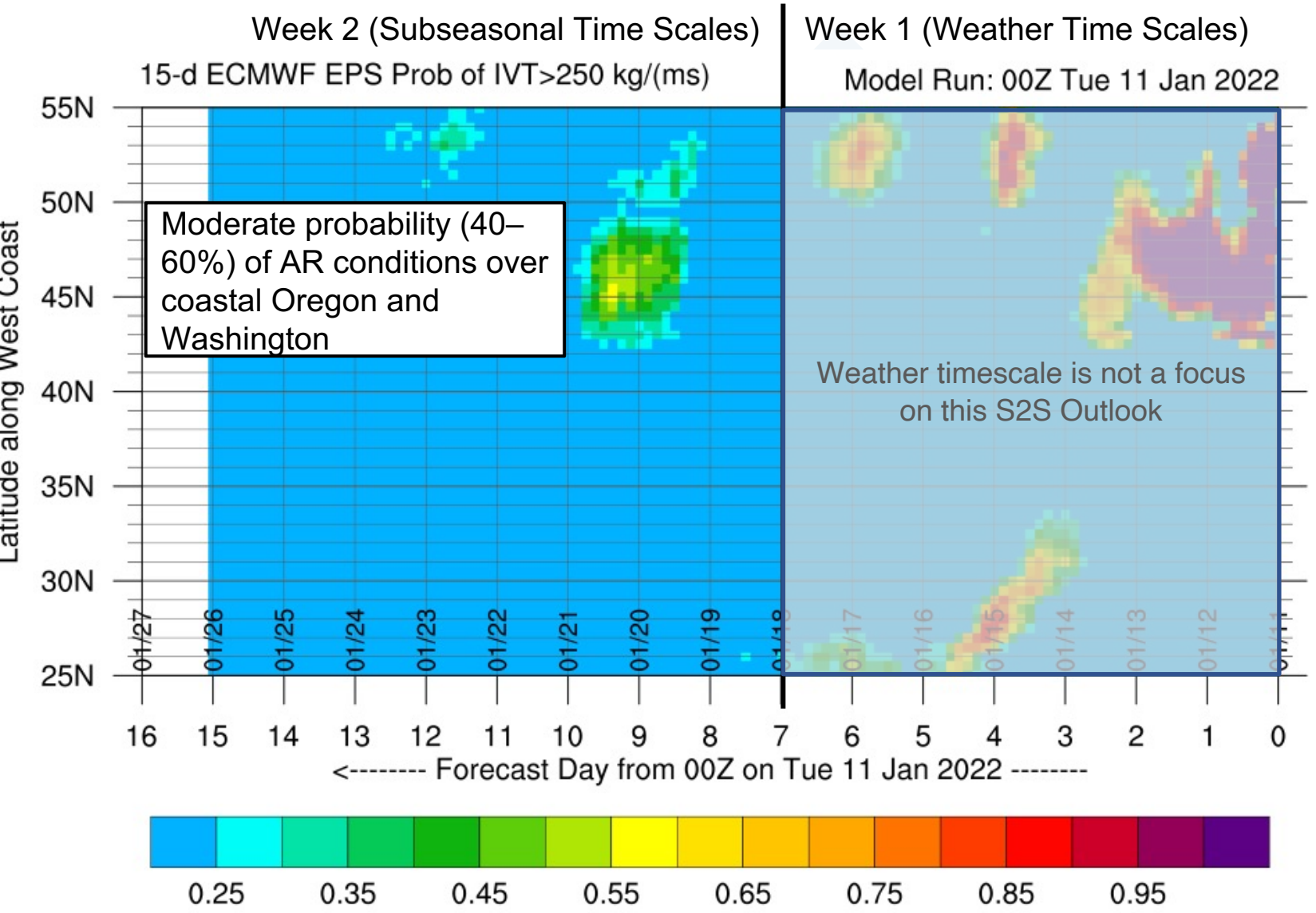


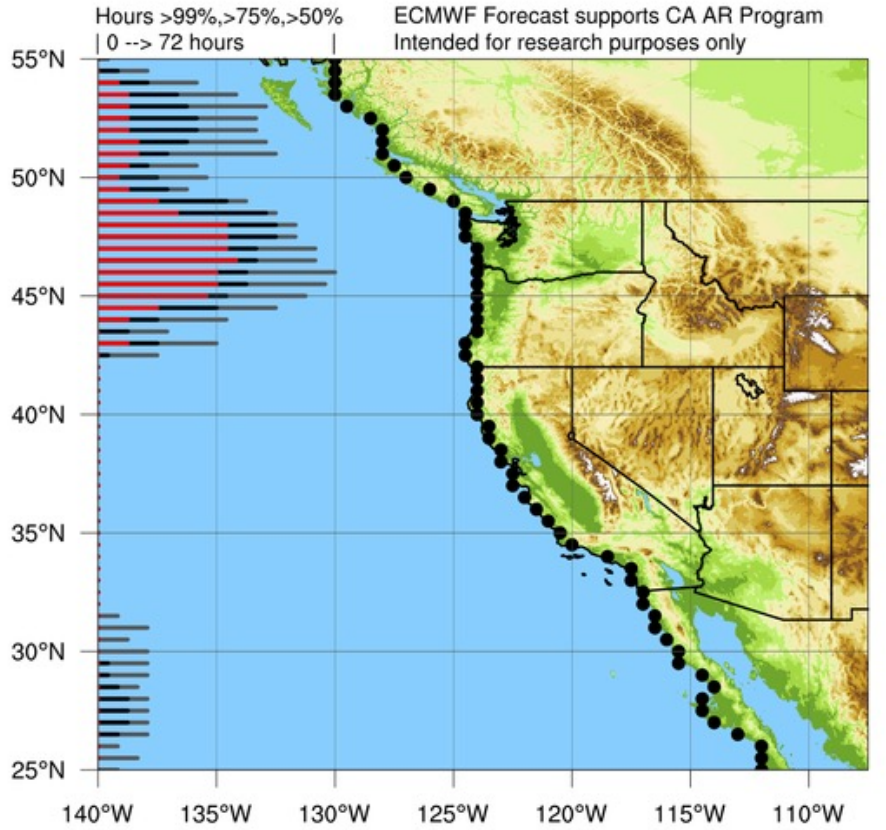


Center for Western Weather and Water Extremes
SCRIPPS INSTITUTION OF OCEANOGRAPHY AT UC SAN DIEGO

PLYMOUTH STATE METEOROLOGY

ECMWF EPS AR Landfall Tool: Valid 00Z 11–26 Jan

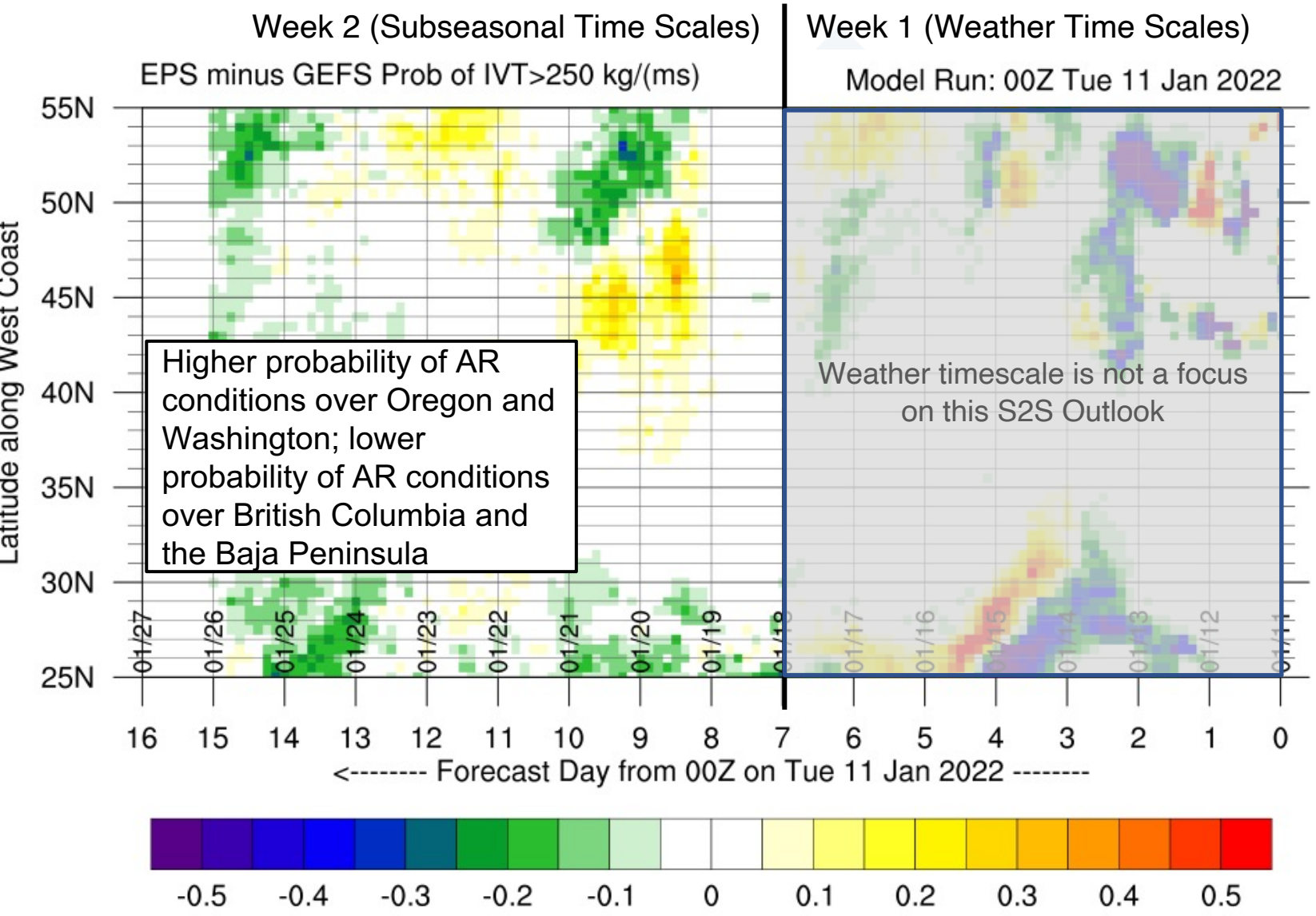


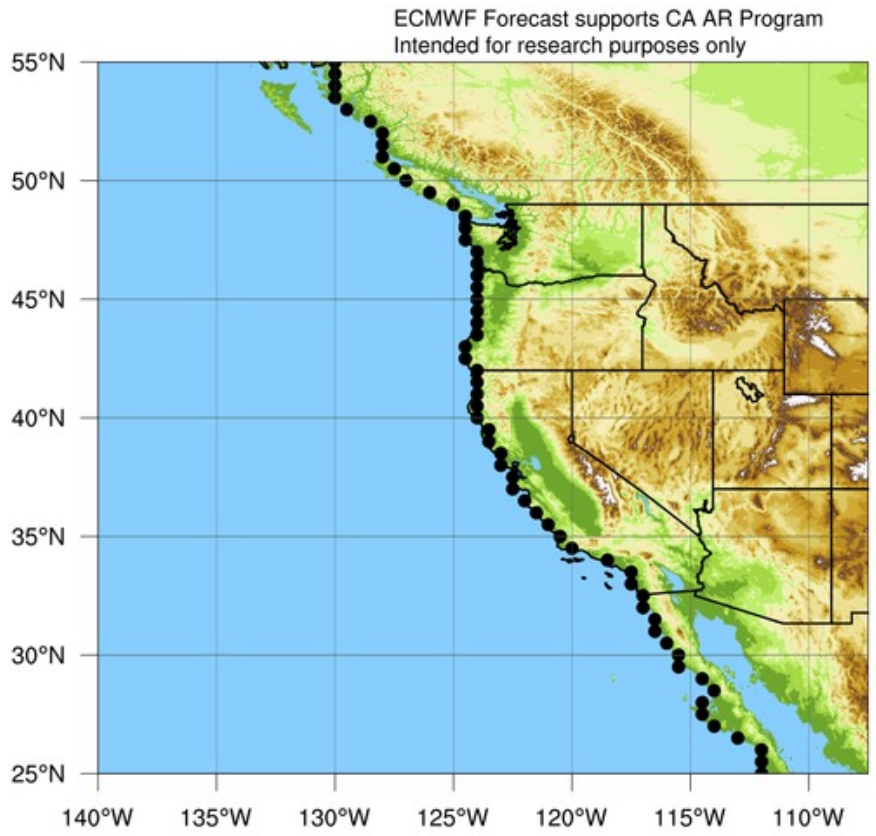


Center for Western Weather and Water Extremes
SCRIPPS INSTITUTION OF OCEANOGRAPHY AT UC SAN DIEGO

PLYMOUTH STATE METEOROLOGY

ECMWF Minus GEFS AR Landfall Tool: Valid 00Z 11–26 Jan

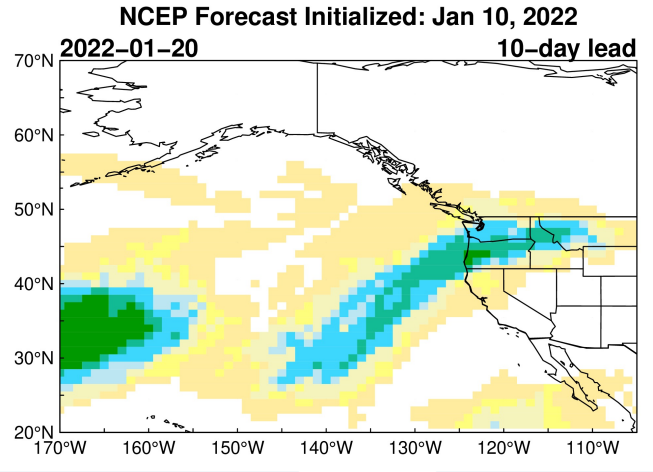


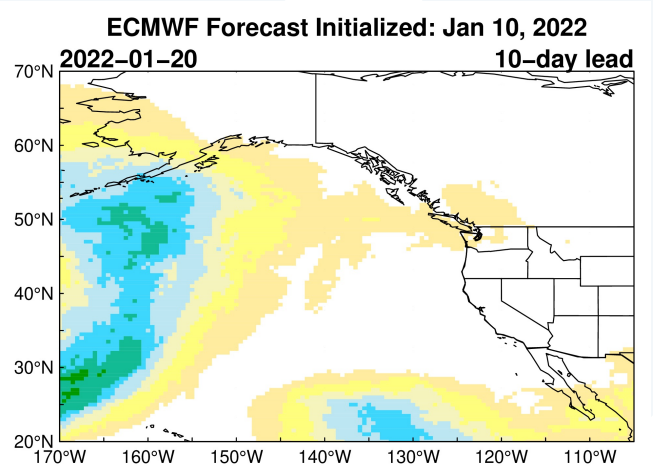


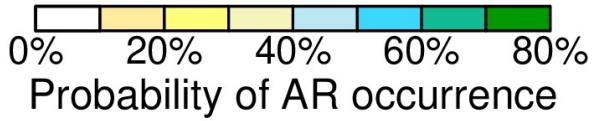
Center for Western Weather and Water Extremes
SCRIPPS INSTITUTION OF OCEANOGRAPHY AT UC SAN DIEGO

PLYMOUTH STATE METEOROLOGY

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







Center for Western Weather and Water Extremes

AMBASSADOR™ WRN WEATHER-READY NATION

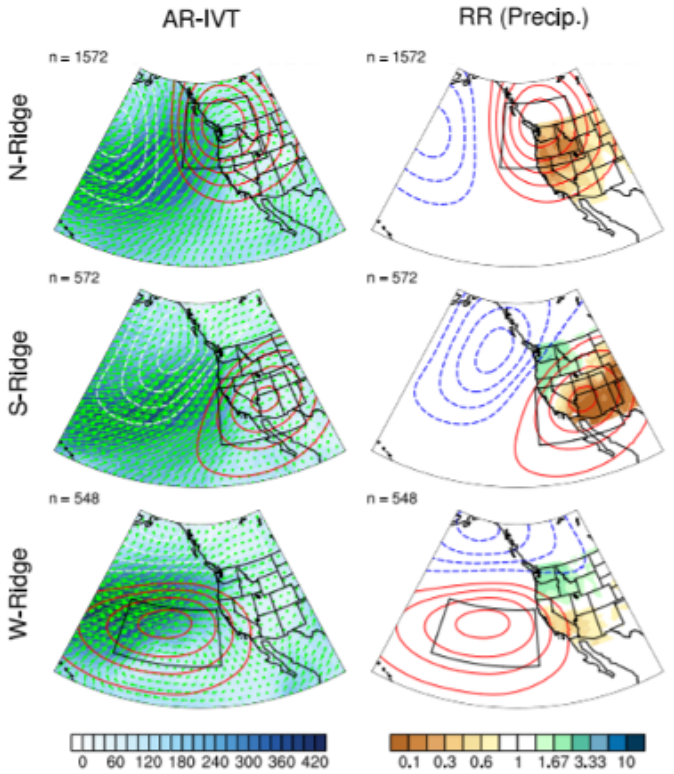
- NCEP model is showing moderate-to-high probabilities (50–80%) of AR activity over Washington, Oregon, and northern Idaho and low probabilities (< 20%) of AR activity over the southern Baja Peninsula on 20 Jan

- ECMWF model is showing low probabilities (< 30%) of AR activity over southern British Columbia and the southern Baja Peninsula

NCEP model shows much higher possibilities of a landfalling AR over the northwestern US on 20 Jan

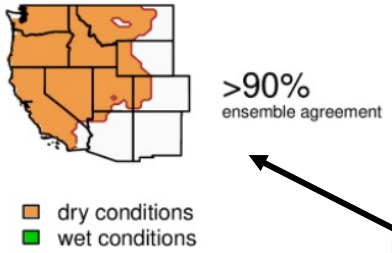
Center for Western Weather and Water Extremes
SCRIPPS INSTITUTION OF OCEANOGRAPHY AT UC SAN DIEGO

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

[weak south–ridge signal, <50% agreement]

West-Ridge

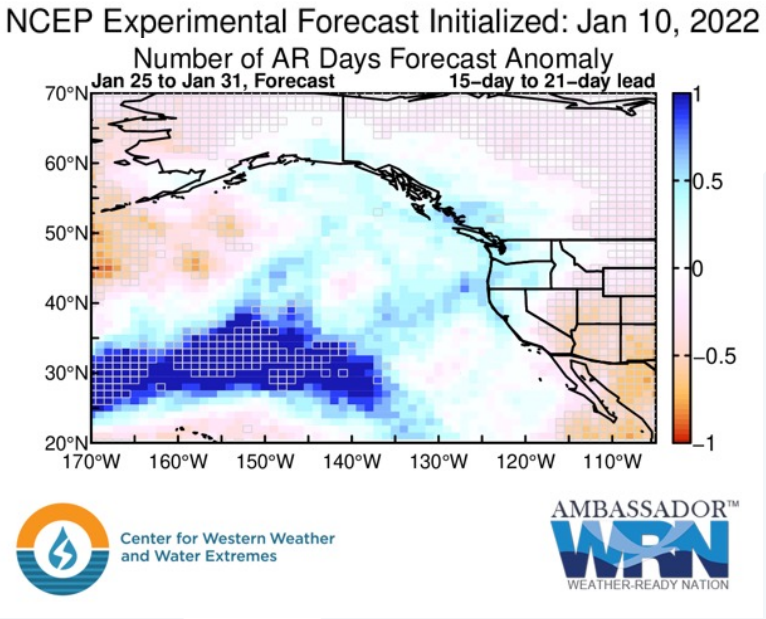
[weak west–ridge signal, <50% agreement]

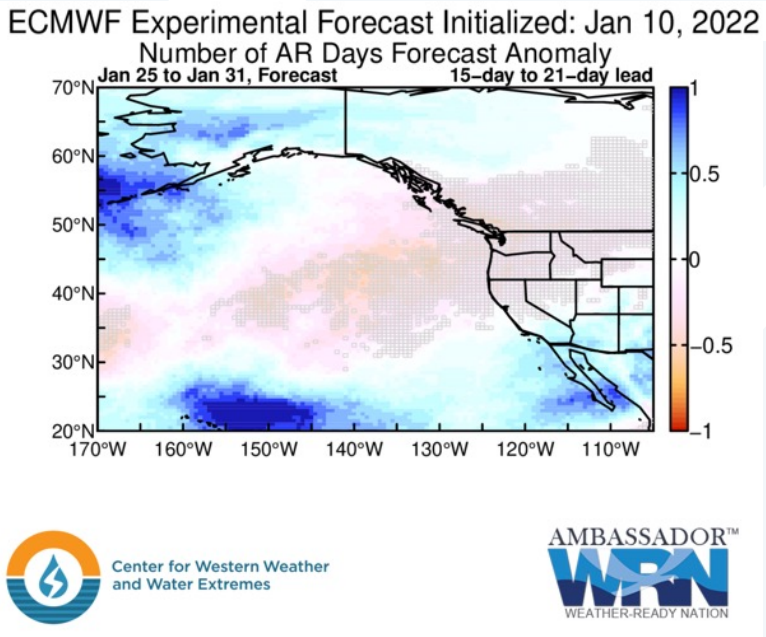
- NCEP model shows high confidence (> 90% ensemble agreement) in the occurrence of the North-Ridge type during Weeks 1–2 (10–24 Jan)
- The North-Ridge type is typically associated with widespread dry conditions across the entire US West
- NCEP model shows low confidence (< 50% ensemble agreement) in the occurrence of the South- and West-Ridge types
- ECMWF model also shows high confidence (> 90% ensemble agreement) in the occurrence of the North-Ridge type during Weeks 1–2 (not shown)

There is high confidence overall between models in the North-Ridge type forecasts

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

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



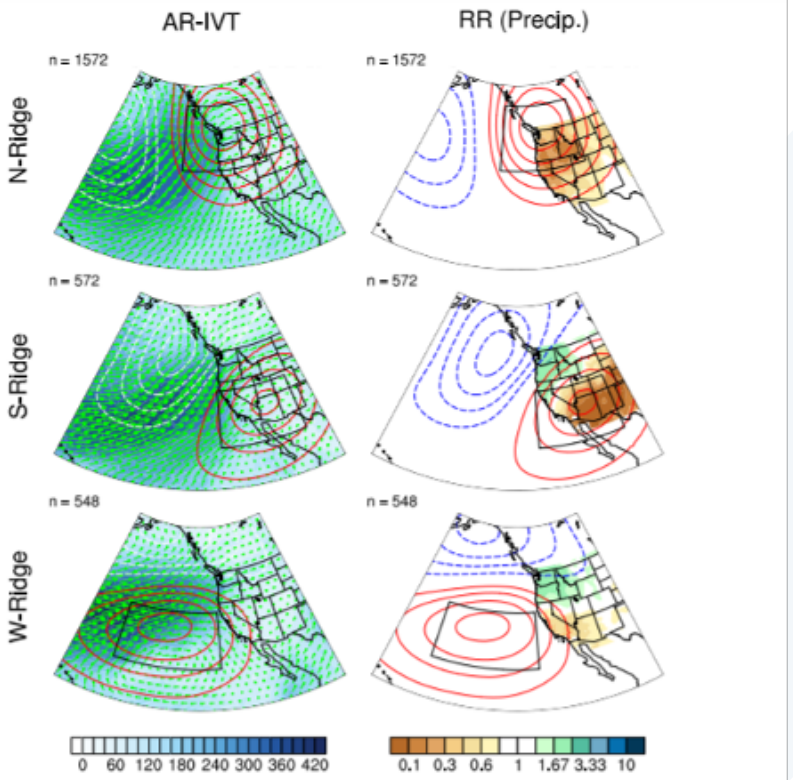


- NCEP model is predicting above-normal AR activity along the coast of British Columbia and the northwestern US during Week 3 (25–31 Jan)
- ECMWF model is predicting the opposite (below-normal) AR activity along the coast of British Columbia and the northwestern US during Week 3 and above-normal AR activity over the Baja Peninsula

There is large uncertainty of the landfalling AR location during 25–31 Jan

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

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

ak north–ridge signal, <50% agreement]

South-Ridge

ak south–ridge signal, <50% agreement]

West-Ridge

ak west–ridge signal, <50% agreement]

- NCEP model shows low confidence (< 50% ensemble agreement) in the occurrence of ridging near the US West Coast during Weeks 3–4 (24 Jan – 7 Feb)
- 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)

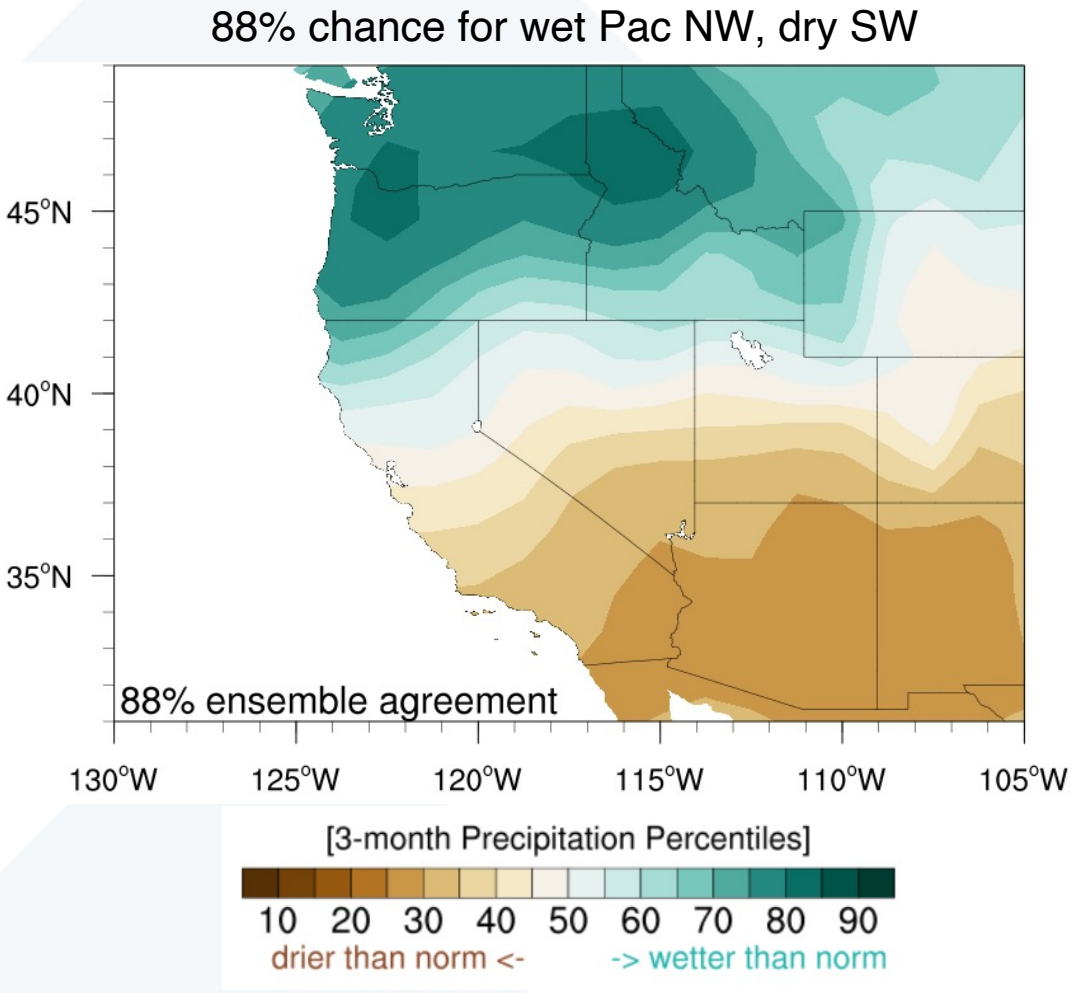
There is low confidence overall between models in the ridging forecasts

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

Seasonal Machine Learning Outlooks: Jan – Mar 2022 Precipitation

- CW3E machine learning models based on December SST/global weather patterns are predicting drier than normal conditions for the southwestern US and wetter than normal conditions for the northwestern US during Jan–Mar

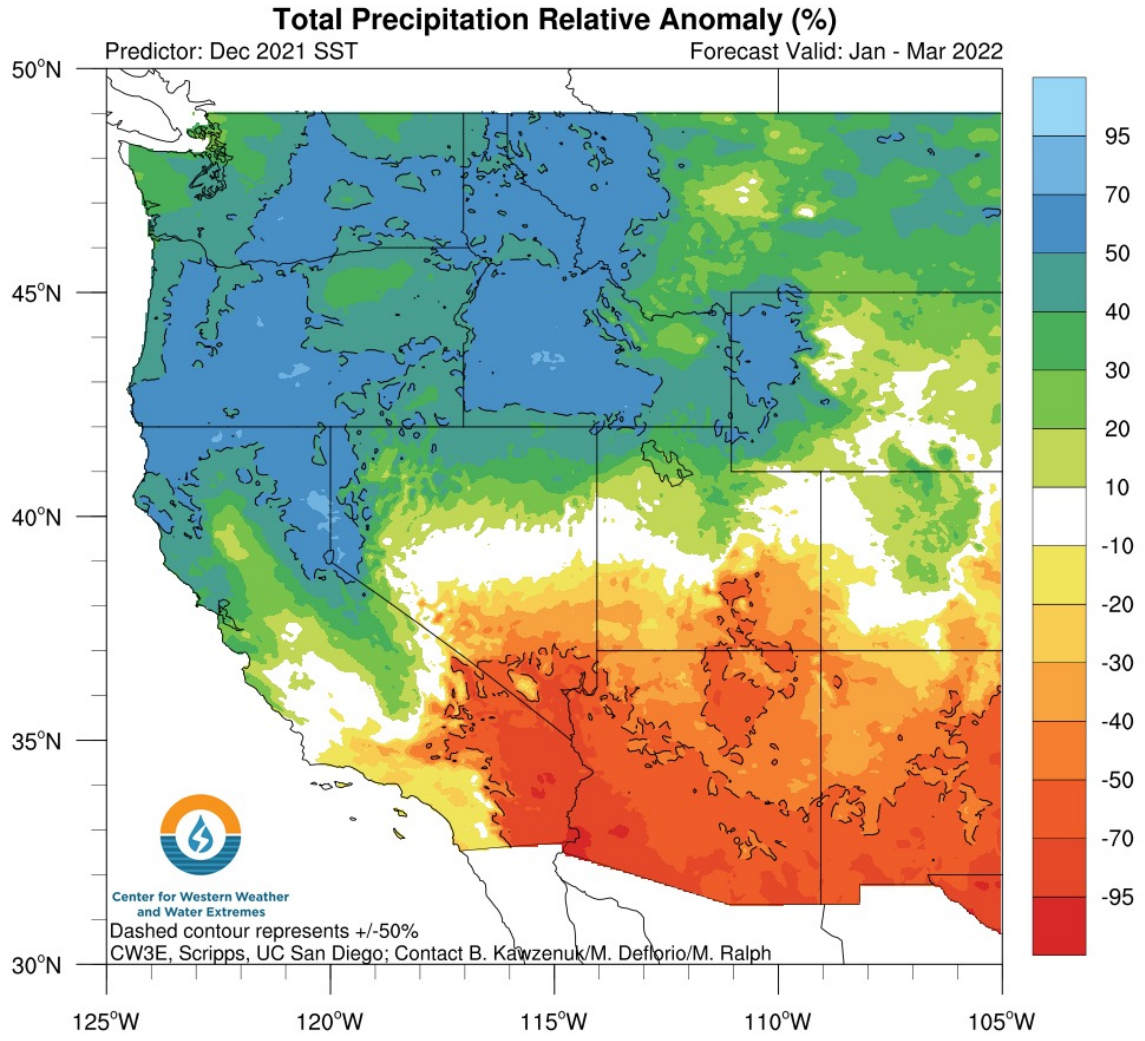
CW3E Machine Learning Models: Jan – Mar Forecast



Skill assessment: Gibson et al. 2021

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

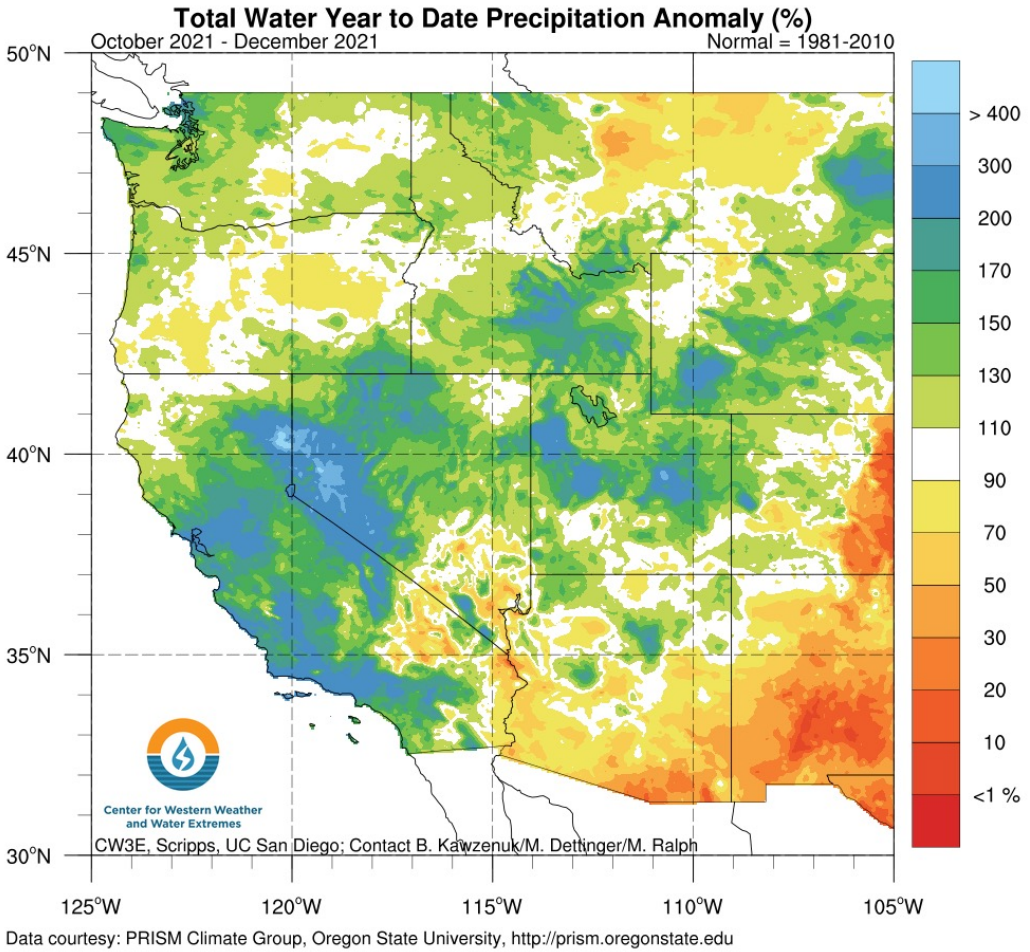
Seasonal CCA Outlooks: Jan–Mar 2022 Precipitation

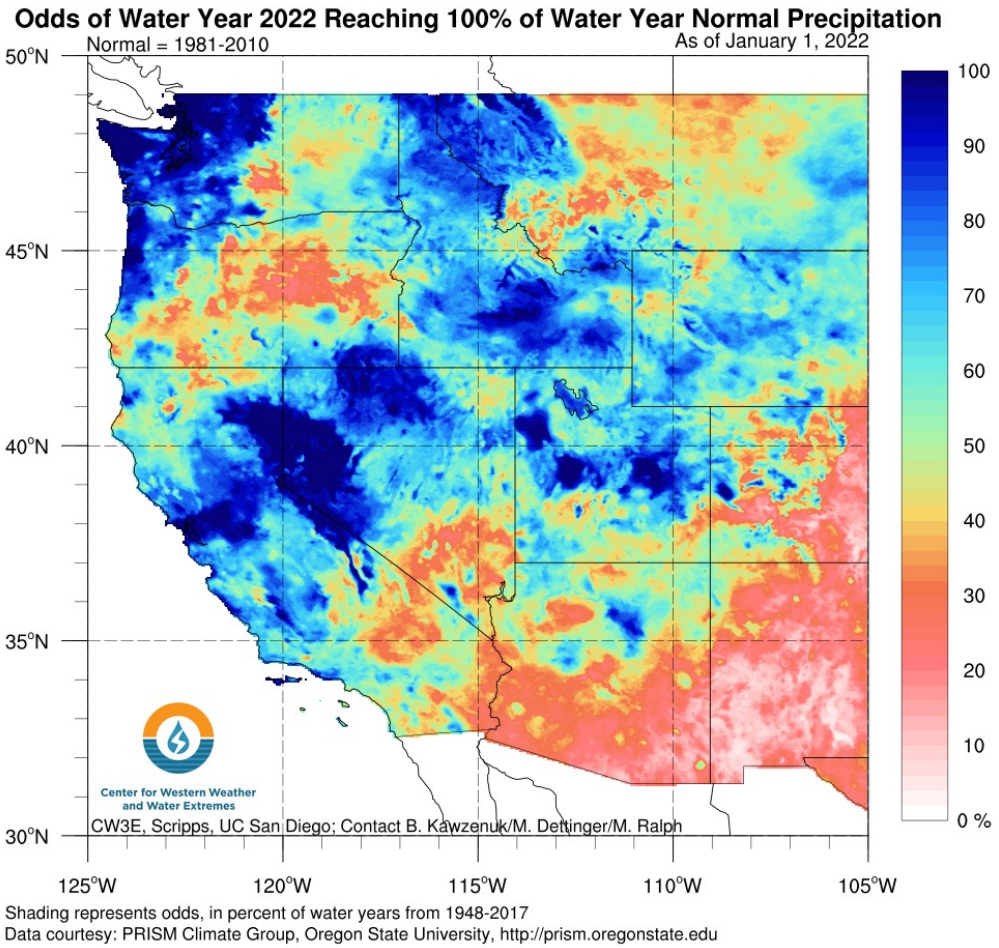


- CW3E statistical model based on December SST is predicting significantly below-normal (> 50% below normal) Jan–Mar precipitation over southern California and large portions of Arizona
- Significantly above-normal Jan–Mar precipitation is predicted across portions of the northwestern US

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

Seasonal Outlooks: Odds of Reaching Normal Water Year Precipitation





- As of 1 Jan 2022, total water-year-to-date precipitation was running well above the climatological normal in much of California, Nevada, Utah, and Idaho
- Based on historical precipitation data, the probability of reaching normal water year (WY) precipitation by the end of Sep 2021 is nearly 100% in parts of Northern California, Nevada, Utah, and Washington
- The probability of reaching normal water year precipitation in southern Arizona and much of New Mexico is still less than 30%

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

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