The outlooks are based on CW3E subseasonal to seasonal forecast products that can be found here: https://cw3e.ucsd.edu/s2s_forecasts/

CW3E subseasonal (2–6 weeks lead time) atmospheric river, ridging, and circulation regime products use three different global ensemble prediction systems to create these products:

- NCEP GFS (US Model): Weeks 2–3
- NCEP CFSv2 (US Model): Weeks 2–6
- ECCC (Canadian Model): Weeks 2–3
- ECMWF (European model): Weeks 2–6

CW3E seasonal precipitation products are produced using statistical and machine learning models. The suite of models includes:

- CCA (canonical correlation analysis) based statistical model
- Machine learning model, which also includes comparison to NMME (North American Multi-Model Ensemble)
Summary

- **Week 2 forecasts (9–15 Dec):** Models agree on low likelihood of AR activity over California
  - NCEP is forecasting slightly higher probabilities (> 30%) of AR activity over Northern CA than ECCC and ECMWF

- **Week 3 forecasts (16–22 Dec):** Models agree on low amount of AR activity over California
  - NCEP is predicting slightly more AR activity over Northern CA and near the Southern CA coast than ECCC and ECMWF

- NCEP shows low confidence in the occurrence of persistent ridging activity near the US West Coast during Weeks 1–2

- NCEP shows a moderate likelihood of a West Coast Ridge during Weeks 3–4, which favors dry and warm conditions across California
Looking Back: Recent Precipitation and Drought Conditions

- Much of the southwestern US, especially California and Arizona, has experienced very dry conditions over the past two weeks.
- Observed precipitation in California is consistent with a lack of landfalling AR activity, which was poorly predicted by the Week 3 forecasts initialized in early Nov.
- As of 29 Nov, much of California remains in severe or extreme drought, with exceptional drought conditions over the San Joaquin Valley.
• As of 1 Dec, water-year-to-date precipitation is above normal across Southern CA and below normal across Central and Northern CA
• Snowpack is near normal for this date in the Northern/Central Sierra Nevada and slightly above normal in the Southern Sierra Nevada, but most of the seasonal snowpack was provided by an early November storm
• Most major reservoirs in California are operating at below-normal storage due to the multi-year drought
None of the forecasts verified over CA
All models predicted AR activity over the West Coast of North America, but too far south
• A weak cold front produced 1–3 inches of precipitation over the Olympic Peninsula and Washington Cascades on 22–23 Nov
• No precipitation was observed over most of California
Looking Back: Week 3 AR Activity Forecasts

Forecasts Initialized 10 Nov; Valid: 25 Nov – 1 Dec 2022

None of the forecasts verified over CA
AR activity was mostly confined to the central North Pacific Ocean during this period
• A strong low-pressure system produced 2–4 inches of precipitation over portions of western WA, western OR, the Northern CA Coast Ranges, and the Sierra Nevada during 30 Nov – 2 Dec
NCEP GEFS AR Landfall Tool: Valid 00Z 1 Dec – 00Z 17 Dec

Week 1 (Weather Time Scales): 16-d GEFSv12 Prob of IVT>250 kg/(ms)
- Model Run: 00Z Thu 1 Dec 2022

Weather timescale is not a focus on this S2S Outlook

Generally low probabilities (< 40%) of AR conditions over the US West Coast, especially California

- NCEP is forecasting low probabilities of AR conditions over California in Week 2 with weak MJO activity predicted in Week 1 and low ridging activity predicted during Weeks 1–2
Low probabilities (< 40%) of AR conditions over the US West Coast, especially California

ECMWF is forecasting low probabilities of AR conditions over California in Week 2 with weak MJO activity predicted in Week 1
Slightly lower probabilities of AR conditions over the US West Coast
Subseasonal Outlooks: Week 2 AR Activity (NCEP vs. ECCC vs. ECMWF)

- All models are showing generally low probabilities (< 30%) of AR activity in California during Week 2 (9–15 Dec),
- NCEP is predicting slightly higher probabilities (> 30%) of AR activity in Northern CA on 13–15 Dec

Forecasts Initialized 1 Dec 2022

All models agree on low likelihood of AR activity over California in Week 2 (9–15 Dec)
• The North-Ridge type is typically associated with widespread dry conditions across the entire western US.

• The South-Ridge type is typically associated with dry conditions in Southern California and the Colorado River Basin and wet conditions in the Pacific Northwest.

• The West-Ridge type is typically associated with dry conditions over California and wet conditions over the Pacific Northwest.
Subseasonal Outlooks: Weeks 1–2 Ridging Forecasts (NCEP vs. ECMWF)

**NCEP**

- There is low likelihood of persistent ridging activity near the US West Coast during 1–15 Dec (Forecasts Initialized 1 Dec 2022)
  - NCEP shows low confidence (< 50% ensemble agreement) in persistent ridging activity near the US West Coast during Weeks 1–2 (1–15 Dec)
  - NCEP is predicting near-normal occurrence of the South Ridge, which favors dry conditions in Southern CA

**ECMWF**

Unavailable

There is low likelihood of persistent ridging activity near the US West Coast during 1–15 Dec
Subseasonal Outlooks: Week 3 AR Activity (NCEP vs. ECCC vs. ECMWF)

- All models are predicting near-to-below-normal AR activity over CA during Week 3 (16–22 Dec)

- NCEP is predicting slightly higher AR activity over Northern CA and near the Southern CA coast

Generally little AR activity is predicted over California during Week 3 (16–22 Dec)

Shading: Fractional # of AR days forecast over a 7-day period (top), model climatology (middle), and forecast minus model climatology (bottom)
Grey cells: >75% of ensemble members agree on sign of anomaly
Subseasonal Outlooks: Weeks 3–4 Ridging Forecasts (NCEP vs. ECMWF)

**NCEP**

There is low likelihood of persistent ridging activity near the US West Coast during 15–29 Dec.

**ECMWF**

Unavailable

**Forecasts Initialized 1 Dec 2022**

- NCEP shows low confidence (< 50% ensemble agreement) in any one particular ridge type during Weeks 3–4 (15–29 Dec).
- Despite lack of ensemble agreement on ridge location, most ensemble members are forecasting ridging activity near the US West Coast during this period.

There is low likelihood of persistent ridging activity near the US West Coast during 15–29 Dec.
Four dominant weather regimes identified using cluster analysis on daily 500-hPa geopotential height anomalies from MERRA data (1981–2015)

Subseasonal Outlooks: IRI North American Weather Regime Forecast

Latest Forecast Initialized 1 Dec 2022

- Daily forecast out to 45-day lead time shown on CW3E S2S website
- Uses NCEP CFSv2 ensemble
- High likelihood (> 75%) of Pacific Ridge during Week 1
- Moderate likelihood (> 50%) of Greenland High during Week 2
- Moderate likelihood of West Coast Ridge (which favors dry conditions in California) during Weeks 3–4

This graphic shows the which of the four North American weather regimes (different colors) is most likely to occur over the next 45 days. Darker (lighter) shading denotes higher (lower) probability of a particular regime.

For more information about the forecast product: https://wiki.iri.columbia.edu/index.php?n=Climate.S2S-WRs
Subseasonal Outlooks: IRI North American Weather Regime Forecasts

Historical precipitation (left) and temperature (right) composites associated with each regime

- Dry conditions over Northern CA are predicted in mid-December with moderate confidence
- Dry and warm conditions over all of California are predicted in late December with moderate confidence