



Center for Western Weather  
and Water Extremes

SCRIPPS INSTITUTION OF OCEANOGRAPHY  
AT UC SAN DIEGO

# CW3E Subseasonal Outlook: 24 March 2026

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UC San Diego



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OCEANOGRAPHY

# CW3E Subseasonal Outlooks: Glossary & Context

- The outlooks are based on CW3E subseasonal forecast products that can be found here: [https://cw3e.ucsd.edu/s\\_and\\_s\\_forecasts/](https://cw3e.ucsd.edu/s_and_s_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 CFSv2 (US Model): Weeks 2–4
  - ECCO (Canadian Model): Weeks 2–4
  - ECMWF (European model): Weeks 2–4
- *On the following slides, the term confidence refers to the forecasters' interpretation of the magnitude of the anomalies, the level of ensemble agreement, and the skill of the products used to generate the forecasts. All the tools used are shown in the outlook presentation.*
- *The thresholds for below-normal, near-normal, and above-normal conditions are determined by forecast product and noted on each forecast product slide*

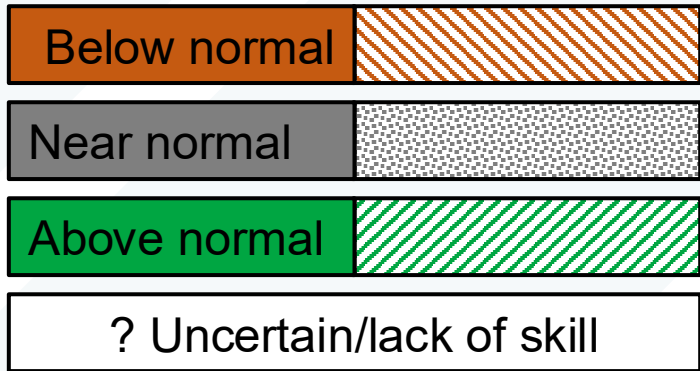
# Summary: Subseasonal Precipitation Outlook by Model

This slide shows the CW3E synthesis of subseasonal products by model

## Forecasts Initialized 23 Mar 2026

Region	Week 2 (30 Mar – 5 Apr)				Week 3 (6–12 Apr)				Week 4 (13–19 Apr)			
	NCEP <sup>1,2</sup>	ECMWF <sup>1,2</sup>	ECMWF <sup>1,2</sup>	Multi-Model Forecast	NCEP <sup>1,2</sup>	ECMWF <sup>1,2</sup>	ECMWF <sup>1,2</sup>	Multi-Model Forecast	NCEP <sup>1,2</sup>	ECMWF <sup>1,2</sup>	ECMWF <sup>1,2</sup>	Multi-Model Forecast
WA/OR		Higher Confidence				Higher Confidence	Lower Confidence			Higher Confidence	Lower Confidence	
Northern CA		Lower Confidence			Lower Confidence	Lower Confidence	Lower Confidence	Lower Confidence	Lower Confidence	Lower Confidence		Lower Confidence
Central CA	Higher Confidence	Higher Confidence		Higher Confidence		Lower Confidence				Lower Confidence		
Southern CA	Lower Confidence	Higher Confidence				Lower Confidence				Lower Confidence		

Higher Confidence | Lower Confidence



- Forecasts tilt the odds toward near-normal precipitation in Central CA during Week 2; more uncertainty in Northern and Southern CA
- Forecasts generally agree on below-normal precipitation in Northern CA during Week 3; more uncertainty over Central and Southern CA
- Forecasts tilt the odds toward below-normal precipitation in Northern CA during Week 4; more uncertainty over Central and Southern CA

### Subseasonal products included in this Outlook:

<sup>1</sup>CW3E/JPL Atmospheric River Activity Forecasts ([DeFlorio et al. 2019](#), [Zhang et al. 2023](#))

<sup>2</sup>CW3E/JPL Ridging Forecasts ([Gibson et al. 2020](#))

<sup>3</sup>IRI North American Weather Regime Forecasts ([Robertson et al. 2020](#)) – Unavailable This Week

<sup>4</sup>CW3E West Coast Weather Regime Forecasts (Guirguis et al. [2023a](#) and [2023b](#))

# Summary

## MJO/QBO Conditions

- MJO convection is currently located over the Central Pacific/Western Hemisphere (Phase 8); QBO is in the easterly phase
  - Without considering QBO/ENSO conditions, MJO in the Western Hemisphere is associated with an increase in extreme precipitation over Central and Southern CA at lag times of 1–2 weeks
- NCEP is forecasting MJO convection to weaken slightly during Week 1, then re-strengthen and propagate eastward over the Western Hemisphere and Africa during Week 2

## Week 2 Forecasts (30 Mar – 5 Apr):

- Models generally agree on near-normal to slightly below-normal AR activity over Northern and Central CA
  - NCEP is showing higher confidence in below-normal AR activity over Northern and Central CA compared to ECCO and ECMWF
  - In Southern CA, NCEP is forecasting near-normal to slightly below-normal AR activity with areas of high confidence, ECCO is forecasting near-normal AR activity, and ECMWF is forecasting near-normal to slightly above-normal AR activity
- Ridging outlooks show high likelihood of above-normal South-ridge activity (wet conditions in Northern CA; dry conditions in Southern CA)
  - ECMWF is also showing high confidence in above-normal North-ridge activity (dry conditions over all of CA)
- IRI North American weather regime forecasts and CW3E West Coast weather regime forecasts do not extend to Weeks 2–4 (last valid forecast date is 31 Mar)

# Summary

## **Week 3 Forecasts (6–12 Apr):**

- Models generally agree on slightly below-normal AR activity over Northern CA and near-normal to slightly-below normal AR activity over Central CA
  - ECCC and ECMWF are showing higher confidence in below-normal AR activity over Central CA compared to NCEP
  - In Southern CA, NCEP is forecasting near-normal AR activity, whereas ECCC and ECMWF are forecasting slightly below-normal AR activity with high confidence
- Ridging outlooks show uncertainty in frequency and location of ridging activity during Weeks 3–4

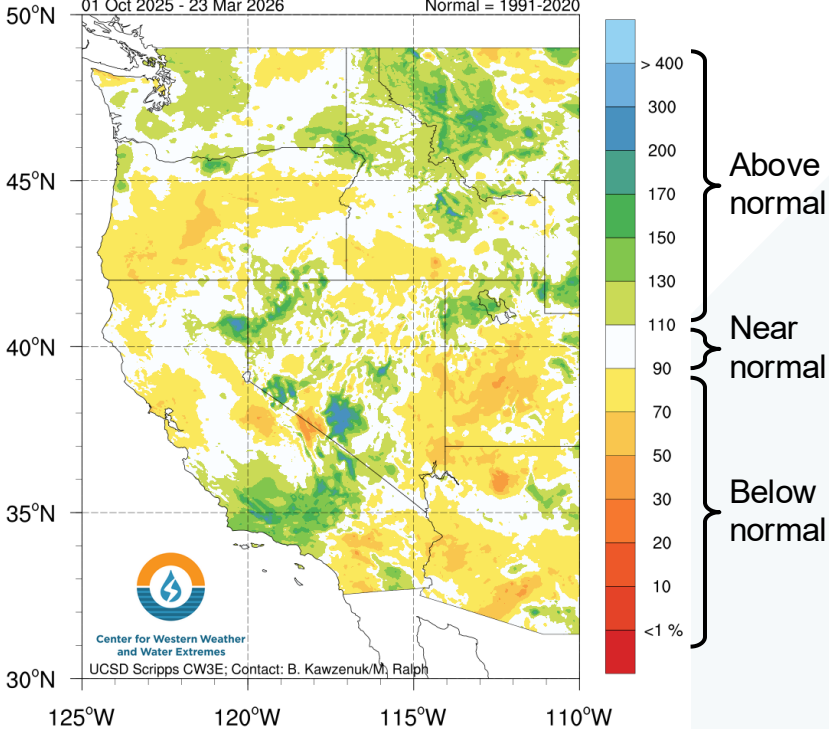
## **Week 4 Forecasts (13–19 Apr):**

- Models generally agree on near-normal to slightly below-normal AR activity over Northern/Central CA and near-normal AR activity over Southern CA
  - ECCC is forecasting some areas of slightly below-normal AR activity with high confidence in Southern CA

# Hydrologic Summary

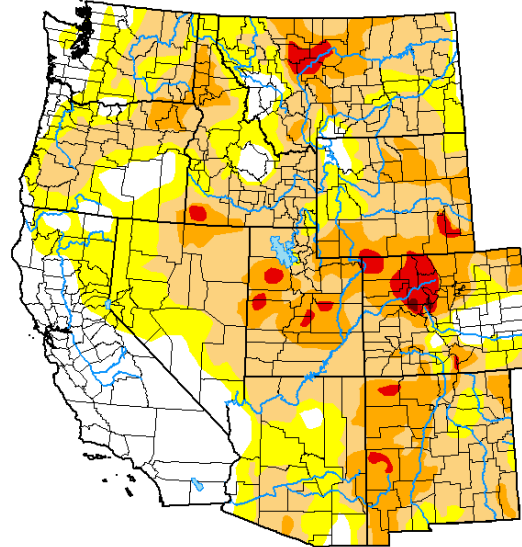
## Precipitation

PRISM Water Year to Date Precipitation Anomaly (%)  
01 Oct 2025 - 23 Mar 2026 Normal = 1991-2020



## Drought Conditions

### U.S. Drought Monitor Western U.S.



March 17, 2026  
(Released Thursday, Mar. 19, 2026)  
Valid 8 a.m. EDT

	Drought Conditions (Percent Area)					
	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	20.05	79.95	55.84	19.42	2.51	0.07
Last Week 03-10-2026	23.49	76.51	50.97	17.95	2.50	0.07
3 Months Ago 12-16-2025	32.42	67.58	45.00	19.90	1.86	0.00
Start of Calendar Year 01-06-2026	40.61	59.39	36.26	14.36	1.16	0.06
Start of Water Year 09-30-2025	18.15	81.85	64.82	44.12	12.00	0.69
One Year Ago 03-18-2025	34.21	65.79	49.14	29.31	12.54	1.03

#### Intensity

None	D2 Severe Drought
D0 Abnormally Dry	D3 Extreme Drought
D1 Moderate Drought	D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <https://droughtmonitor.unl.edu/About.aspx>

Author:  
Curtis Riganti  
National Drought Mitigation Center



[droughtmonitor.unl.edu](https://droughtmonitor.unl.edu)

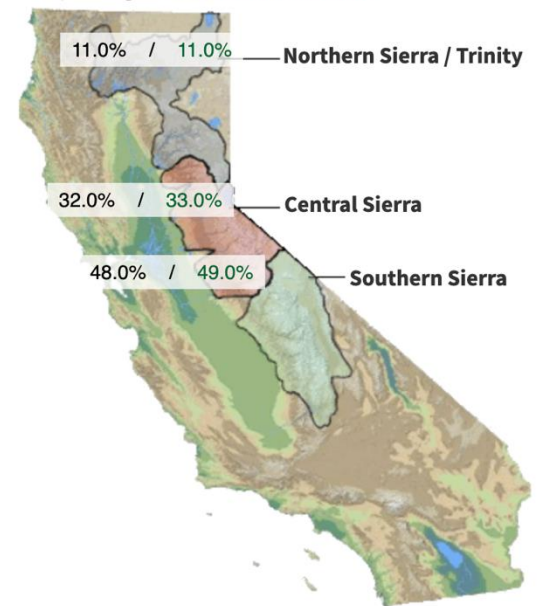
Disclaimer: In addition to climate indicators, the U.S. Drought Monitor also uses impact reports from local observers about crop failures or water restrictions to quantify drought.

## Snowpack Conditions

Provided by the California Cooperative Snow Surveys

Data For: 23-Mar-2026

% Apr 1 Avg. / % Normal for this Date



Source: California DWR

- As of 23 Mar, water-year-to-date precipitation is still running **above normal (>130% of normal)** in portions of Central and Southern CA and **slightly below normal to near normal (70–110% of normal)** across most of the rest of the state
- The most recent drought monitor update is showing abnormally dry conditions in portions of interior Northern CA
- As of 23 Mar, estimated snowpack is **well-below normal (<50% of normal)** statewide, with the largest deficit in the Northern Sierra Nevada/Trinity region (**11% of normal**), followed by the Central Sierra Nevada (**33% of normal**) and Southern Sierra Nevada (**49% of normal**)

# Looking Back: Week 3 AR Activity Forecasts

Forecasts Initialized 2 Mar 2026; Valid: 16–22 Mar 2026

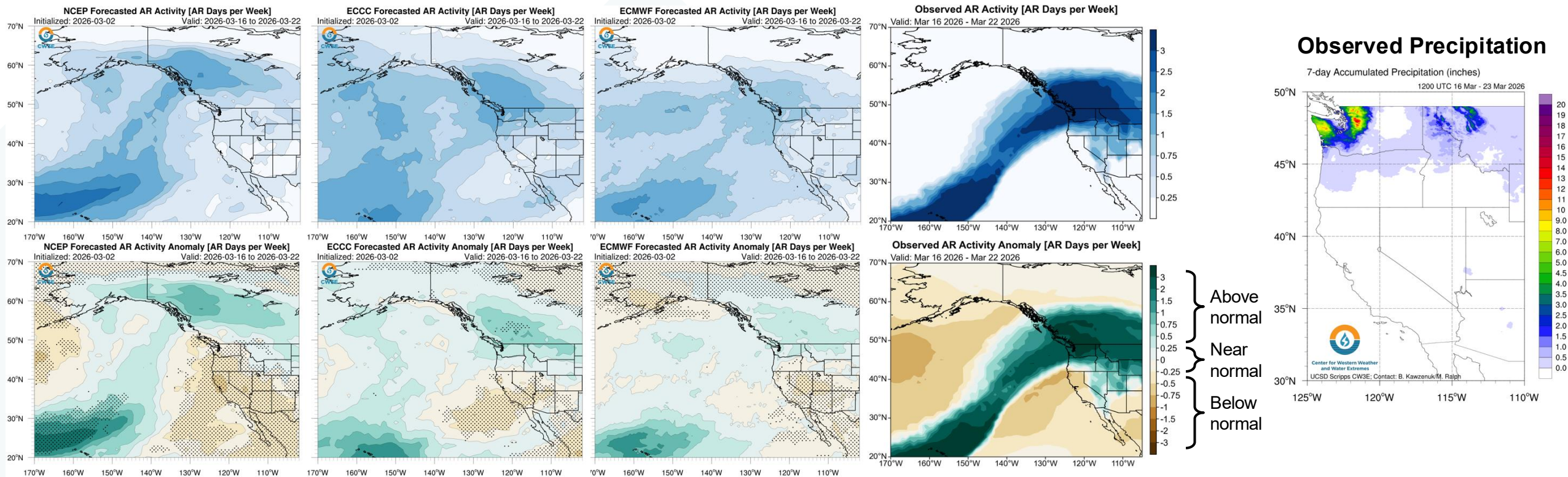
NCEP

ECCC

ECMWF

Observed (CFSv2 Analysis)

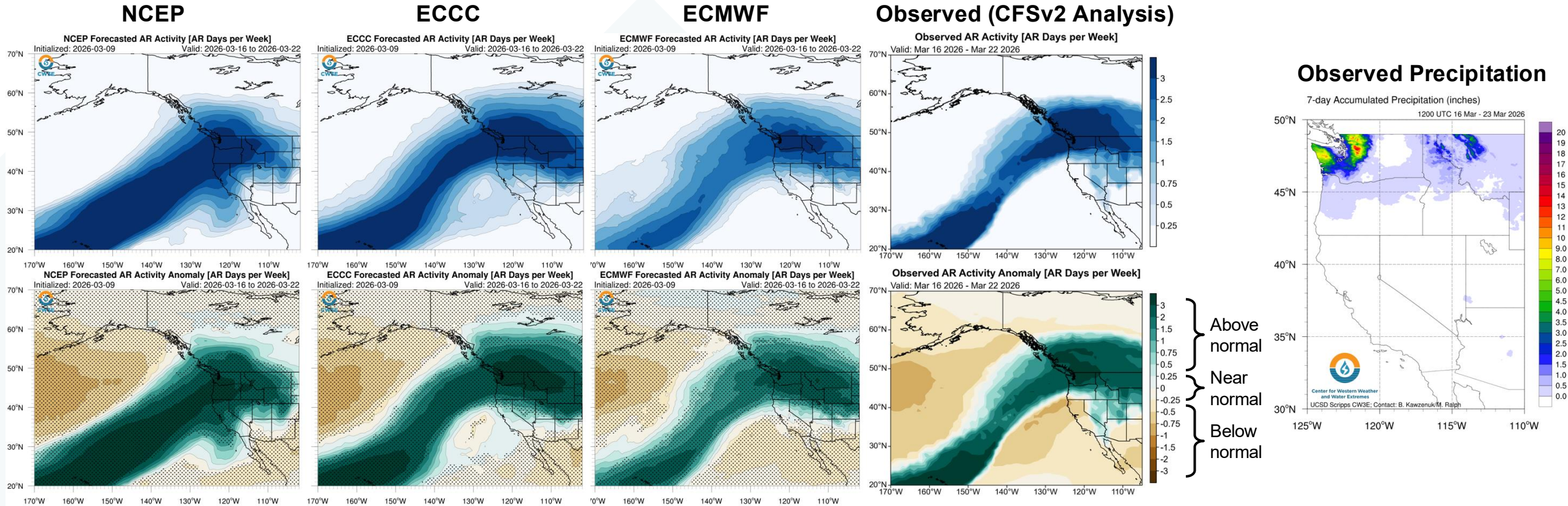
Observed Precipitation



- At 3-week lead times, all models somewhat captured the large-scale pattern of ridging and reduced AR activity over California, as well as a northward displacement of AR activity into southwestern Canada
- While ECCC and ECMWF captured some AR activity over the Pacific Northwest, all models substantially underestimated the amount of AR activity, especially NCEP
- A long-duration AR produced 6–12 inches of precipitation in portions of the Olympic Peninsula and Washington Cascades during 15–20 Mar

# Looking Back: Week 2 AR Activity Forecasts

Forecasts Initialized 9 Mar 2026; Valid: 16–22 Mar 2026



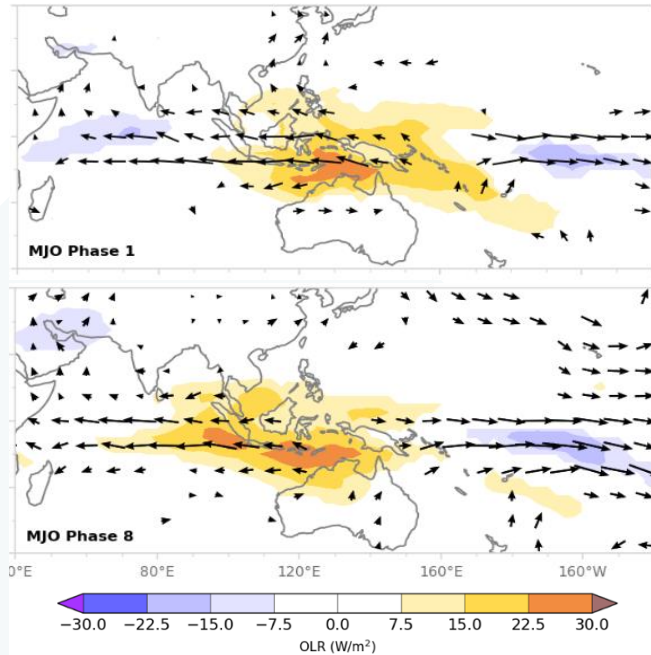
Shading: Fractional # of AR days forecast over a 7-day period (top) and forecast minus model climatology (bottom; green/blue = higher than climatology; brown = lower than climatology)

- At 2-week lead times, all models well captured the axis of enhanced AR activity extending from the subtropical Central Pacific to the Pacific Northwest
- All models underestimated the amplitude of the ridge near California, leading to an overestimation of AR activity in Northern and Central CA, particularly in NCEP
- A long-duration AR produced 6–12 inches of precipitation in portions of the Olympic Peninsula and Washington Cascades during 15–20 Mar

# Dynamical Model MJO Forecasts (NCEP)

## Observed MJO

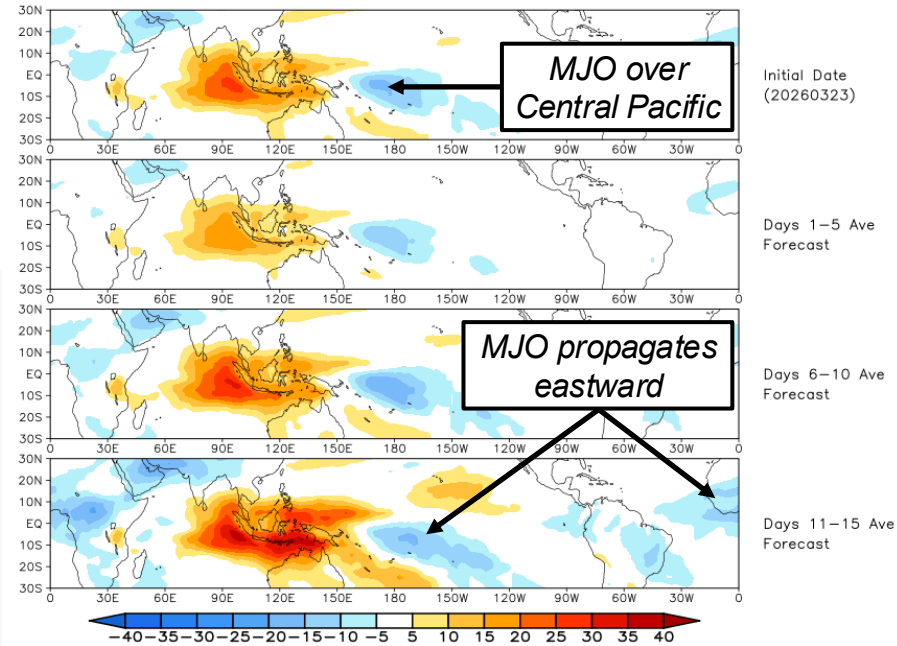
### Phases 8&1 (Western Hemisphere)



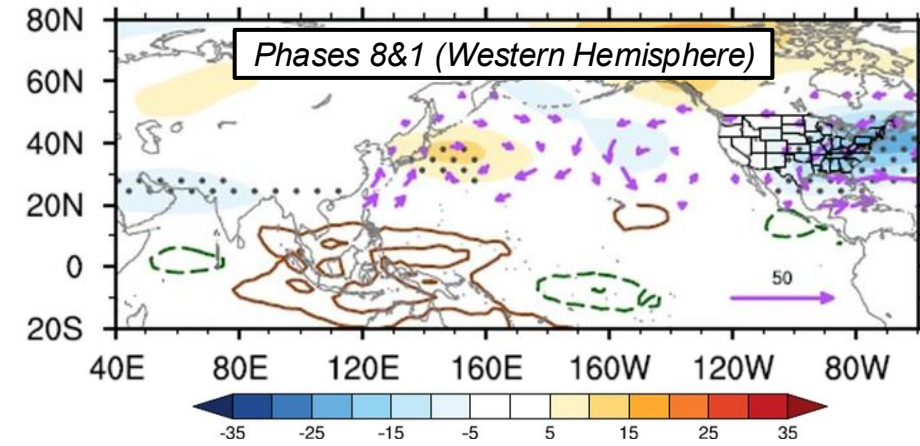
OLR = Outgoing longwave radiation

## Weeks 1–2 MJO Prediction

OLR prediction of MJO-related anomalies using GFS model reconstruction by RMM1 & RMM2 (20260323)

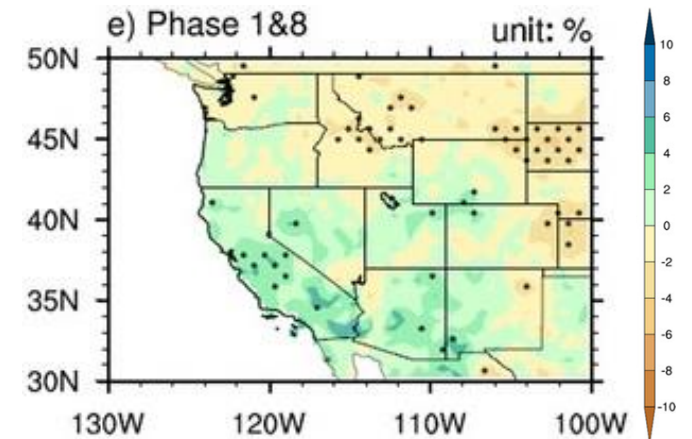


## Circulation and Moisture Transport Anomalies



Composite Z500 anomalies (shading; orange = positive; blue = negative), IVT anomalies (vectors); and OLR anomalies (brown = suppressed convection; green = enhanced convection)

## Extreme Precipitation Frequency

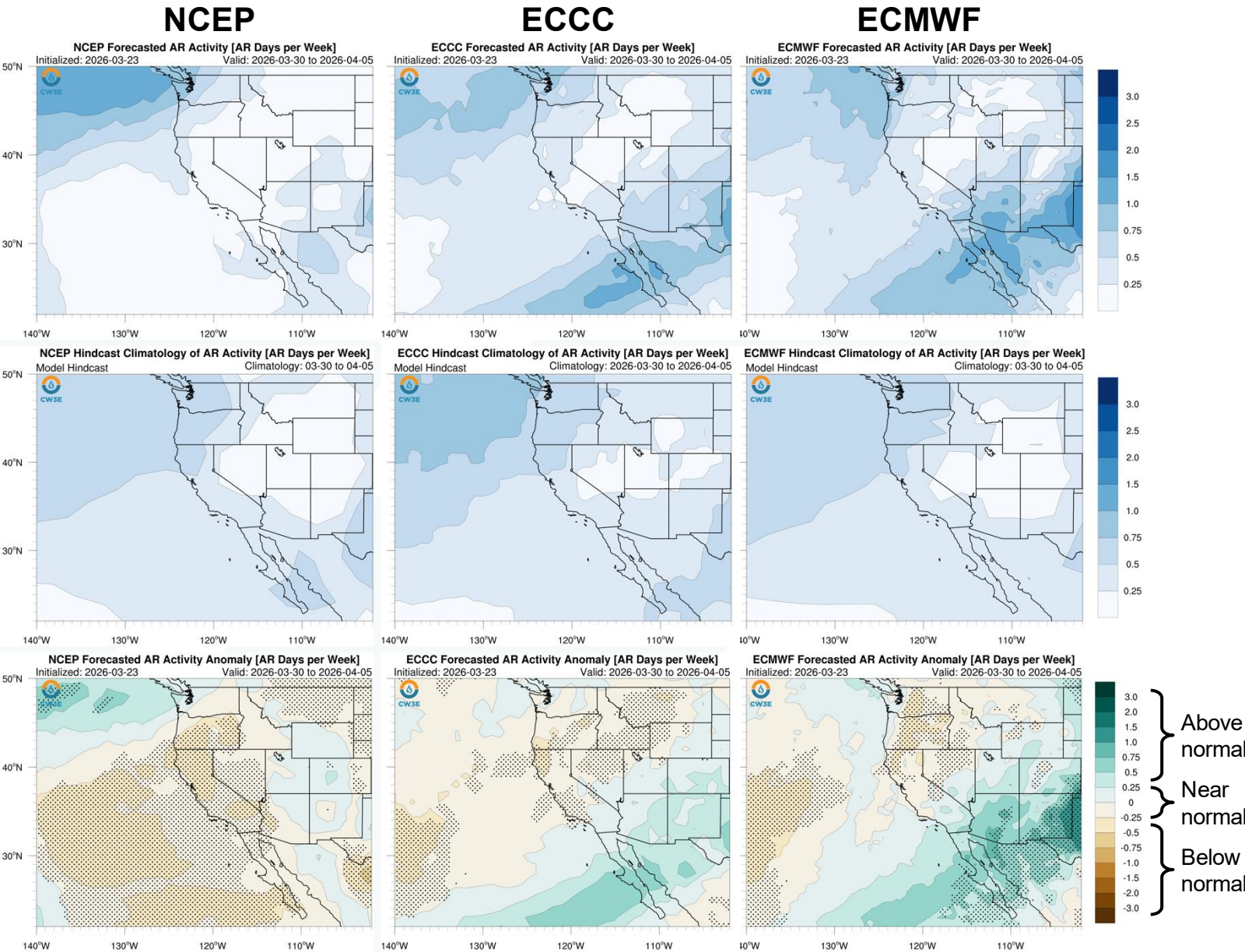


Percent Change in frequency of extreme precipitation (brown = decreased frequency; green/blue = increased frequency)

- As of 23 Mar, strong MJO convection is currently located over the Central Pacific/Western Hemisphere (Phase 8)
- NCEP is forecasting MJO convection to weaken toward the end of Week 1, then re-strengthen and propagate eastward over the Western Hemisphere and Africa during Week 2
- MJO convection over the Western Hemisphere is associated with a weak trough over the Northeast Pacific at lag times of 1–2 weeks, leading to slightly increased moisture transport and an increase in extreme precipitation frequency over Central and Southern CA

# AR Activity Forecasts: Week 2 (NCEP vs. ECCC vs. ECMWF)

Forecasts Initialized 23 Mar 2026



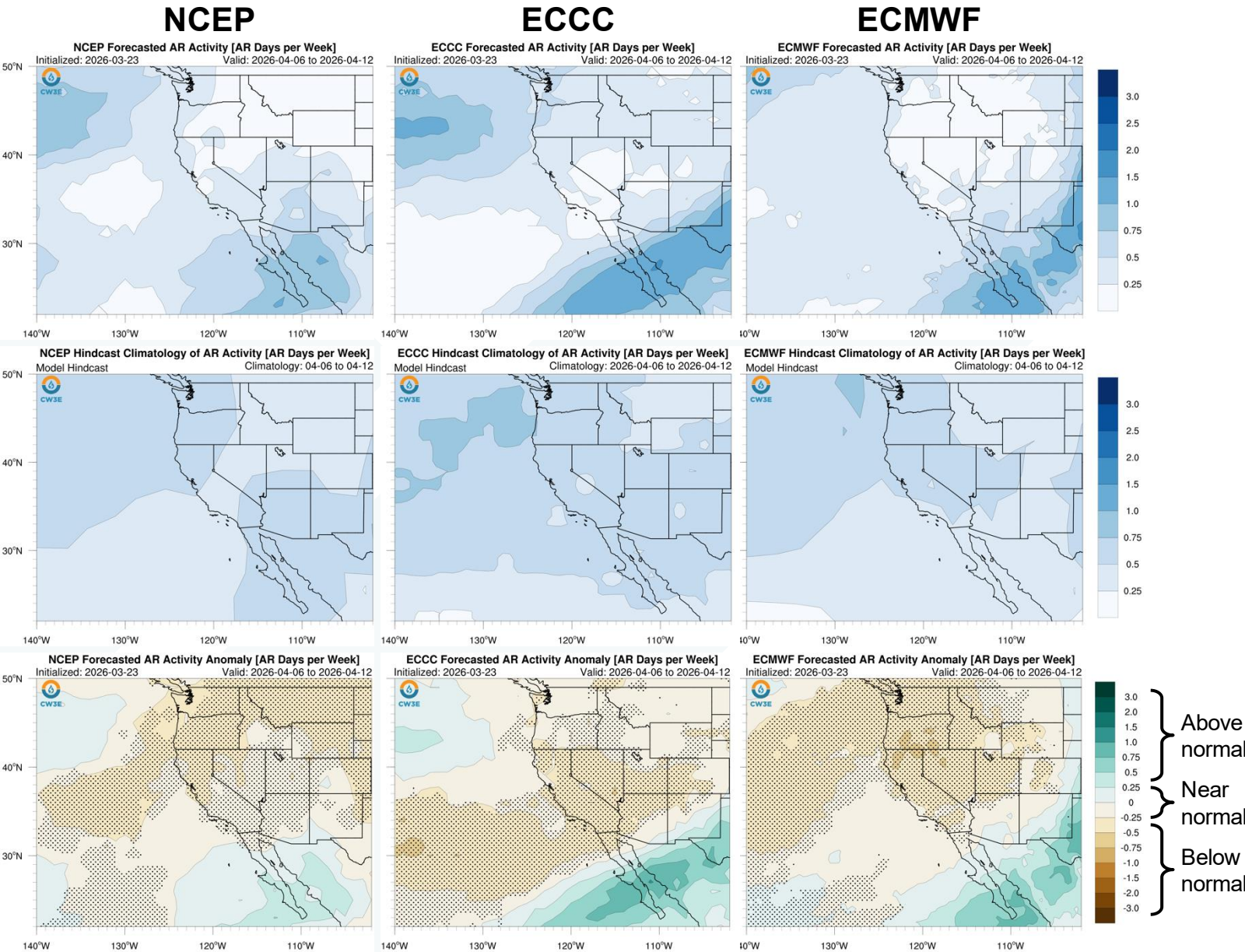
- Models generally agree on near-normal to slightly below-normal AR activity over Northern and Central CA during Week 2 (30 Mar – 5 Apr); confidence in below-normal AR activity is higher in NCEP
- In Southern CA, NCEP is forecasting near-normal to slightly below-normal AR activity with areas of high confidence, ECCC is forecasting near-normal AR activity, and ECMWF is forecasting near-normal to slightly above-normal AR activity

Models generally agree on near-normal to slightly below-normal AR activity over Northern and Central CA during Week 2 (30 Mar – 5 Apr)

Shading: Fractional # of AR days forecast over a 7-day period (top), model climatology (middle), and forecast minus model climatology (bottom; green/blue = higher than climatology; brown = lower than climatology)

# AR Activity Forecasts: Week 3 (NCEP vs. ECCC vs. ECMWF)

**Forecasts Initialized 23 Mar 2026**



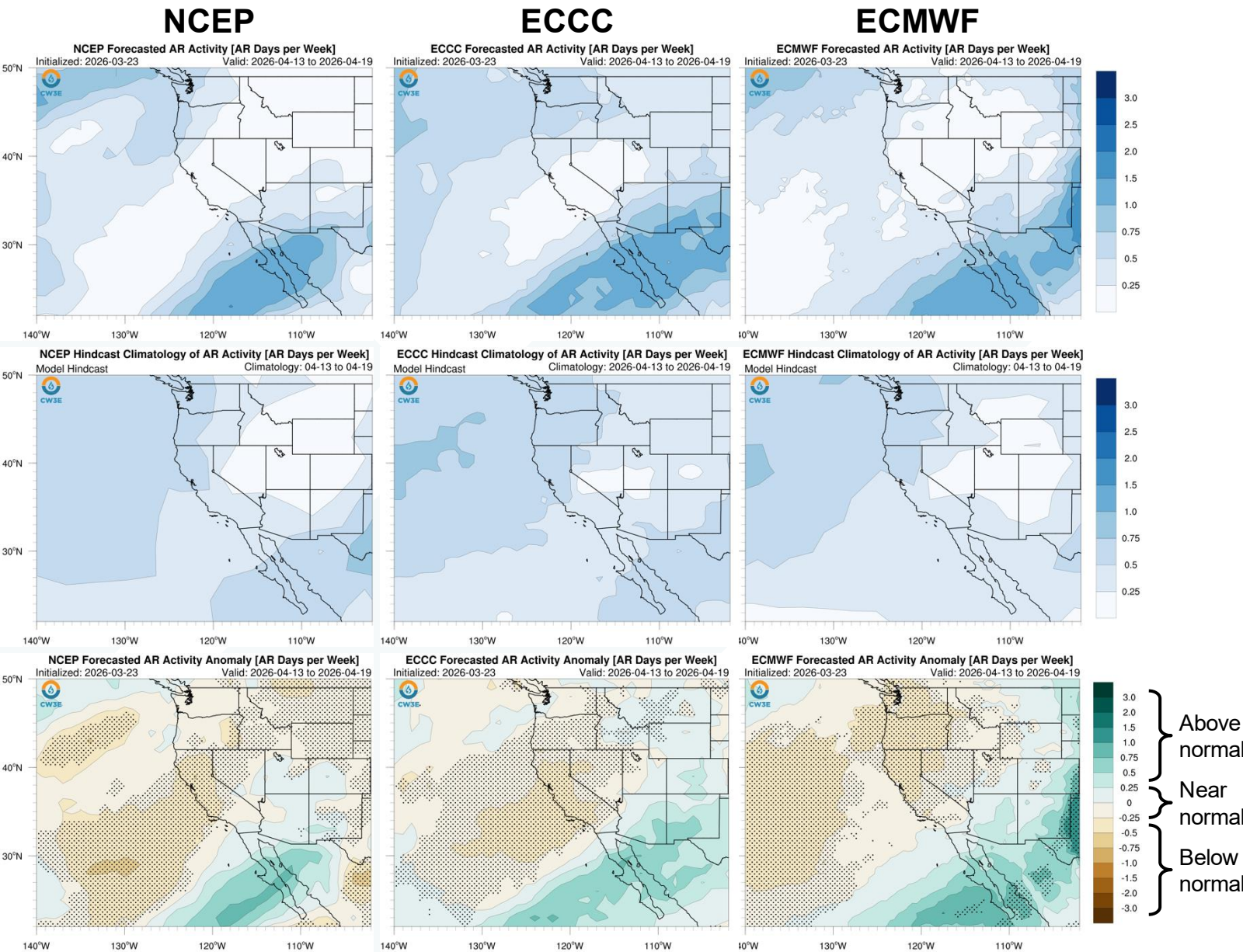
- Models agree on slightly below-normal AR activity over Northern CA with high confidence during Week 3 (6–12 Apr)
- Models generally agree on near-normal to slightly below-normal AR activity over Central CA, with higher confidence in below-normal AR activity in ECCC and ECMWF
- In Southern CA, NCEP is forecasting near-normal AR activity, whereas ECCC and ECMWF are forecasting slightly below-normal AR activity with high confidence

Models generally agree on slightly below-normal AR activity over Northern CA and near-normal to slightly-below normal AR activity over Central CA during Week 3 (6–12 Apr)

Shading: Fractional # of AR days forecast over a 7-day period (top), model climatology (middle), and forecast minus model climatology (bottom; green/blue = higher than climatology; brown = lower than climatology)

# AR Activity Forecasts: Week 4 (NCEP vs. ECCC vs. ECMWF)

Forecasts Initialized 23 Mar 2026

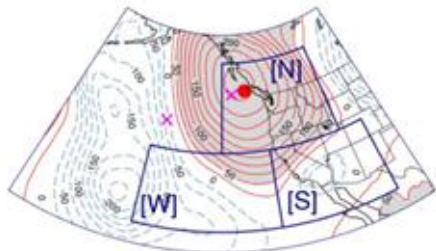


- Models generally agree on near-normal to slightly below-normal AR activity over Northern and Central CA with areas of high confidence during Week 4 (13–19 Apr)
- Models generally agree on near-normal AR activity over most of Southern CA, except ECCC is forecasting some areas of slightly below-normal AR activity with high confidence

Models generally agree on near-normal to slightly below-normal AR activity over Northern/Central CA and near-normal AR activity over Southern CA during Week 4 (13–19 Apr)

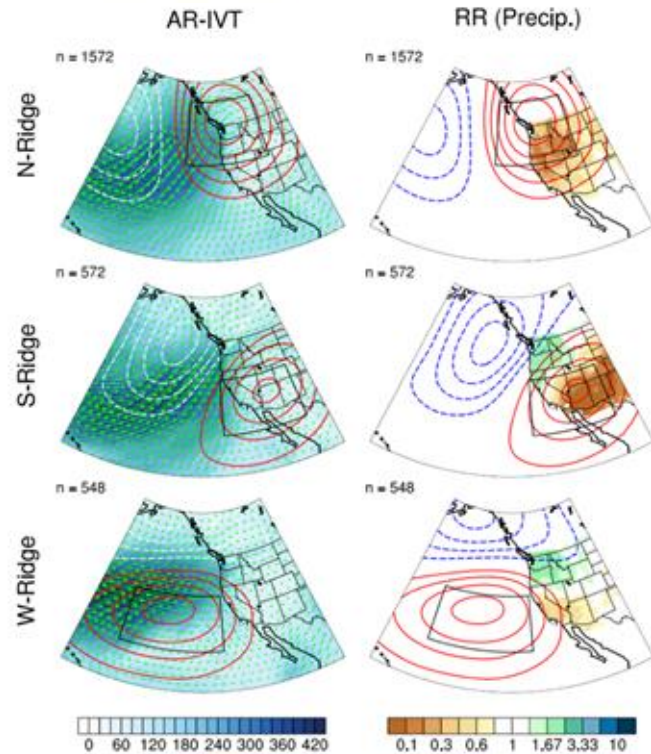
Shading: Fractional # of AR days forecast over a 7-day period (top), model climatology (middle), and forecast minus model climatology (bottom; green/blue = higher than climatology; brown = lower than climatology)

# Background Info: Subseasonal Ridging Outlooks



N = North Ridge  
S = South Ridge  
W = West Ridge

This slide contains background information about the three different ridge types in CW3E's subseasonal ridging outlook tool



- 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 CA and the Colorado River Basin and wet conditions in the Pacific Northwest
- The West-Ridge type is typically associated with dry conditions over Central and Southern CA and wet conditions over the Pacific Northwest

## 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



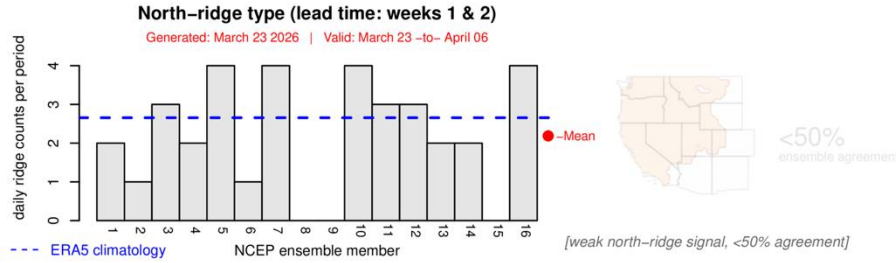
Contact: [pgibson@ucsd.edu](mailto:pgibson@ucsd.edu)  
Reference: Gibson et al. (2020)  
Journal of Climate

# Ridging Forecasts: Weeks 1–2 (NCEP vs. ECMWF)

Forecasts Initialized 23 Mar 2026

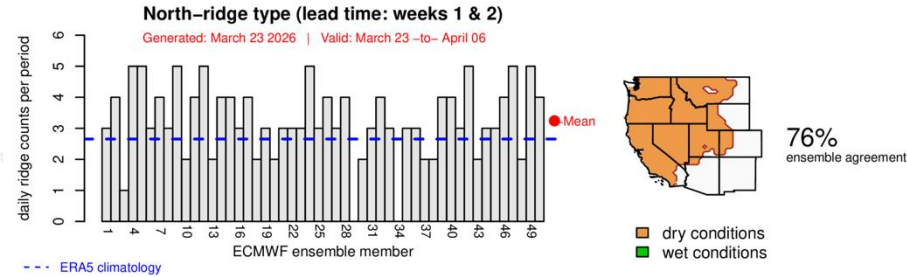
## NCEP

### CW3E Subseasonal Ridging Forecast (Uses NCEP CFSv2 model)

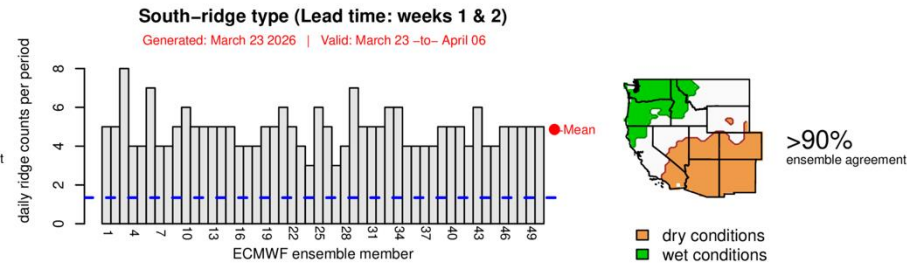
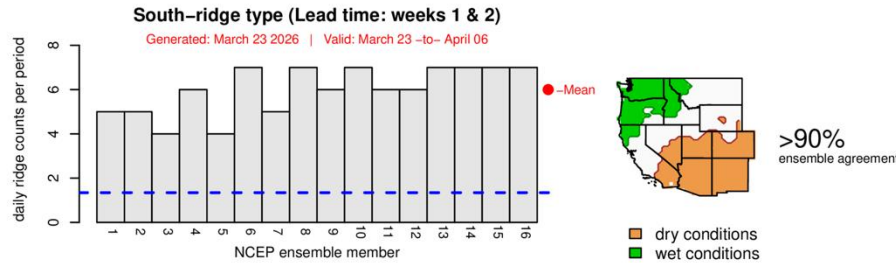


## ECMWF

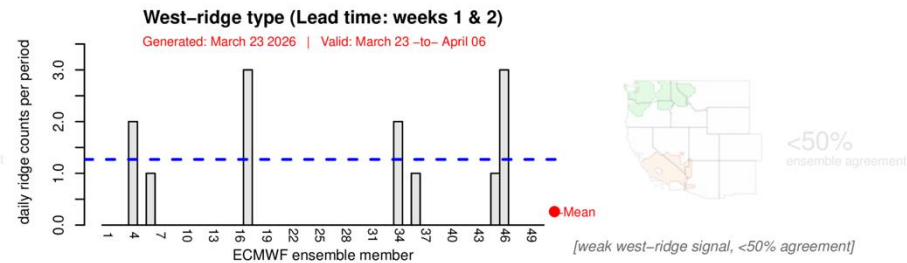
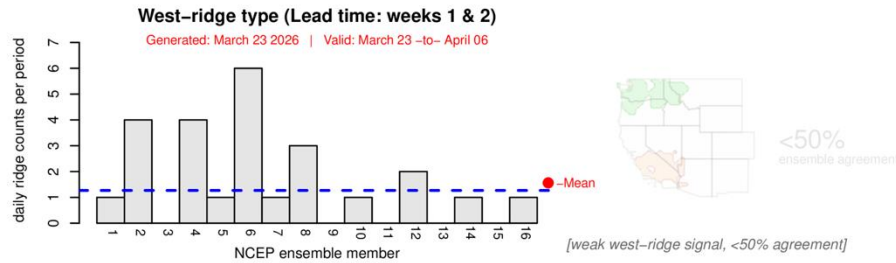
### CW3E Subseasonal Ridging Forecast (Uses ECMWF model)



- Both models are forecasting above-normal South-ridge activity with high confidence (>90% ensemble agreement) during Weeks 1–2 (23 Mar – 6 Apr)



- ECMWF is also forecasting above-normal North-ridge activity with high confidence (76% ensemble agreement), whereas NCEP is forecasting slightly below-normal North-ridge activity



- NCEP is forecasting near-normal West-ridge activity, whereas ECMWF is forecasting below-normal West-ridge activity



Models show high likelihood of persistent ridging activity over the southwestern US during Weeks 1–2 (23 Mar – 6 Apr)

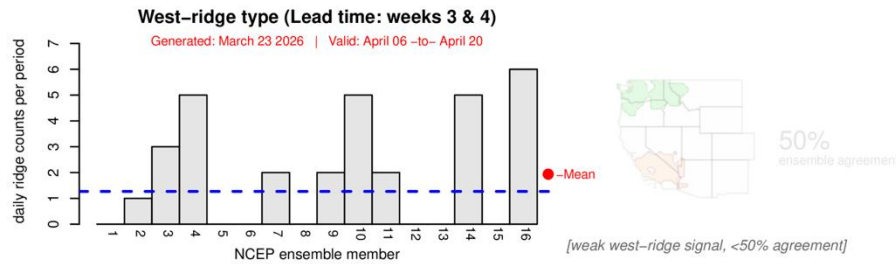
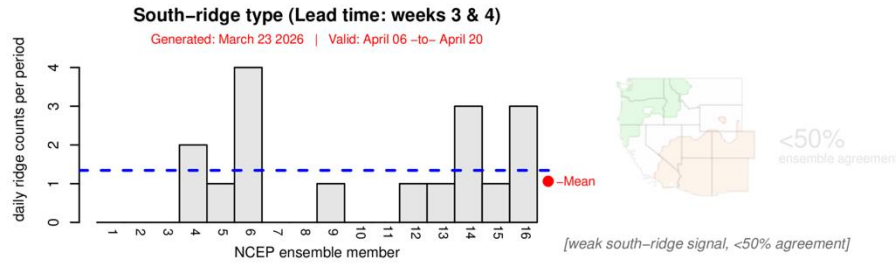
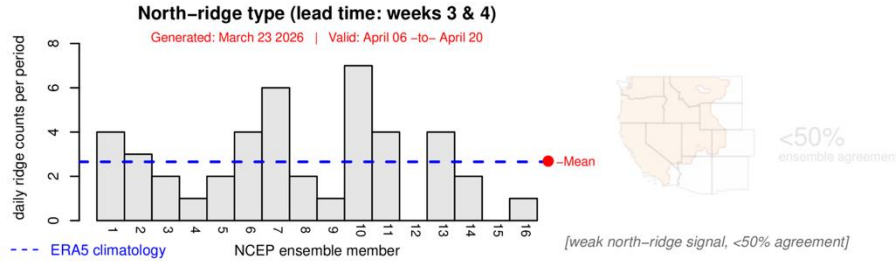


# Ridging Forecasts: Weeks 3–4 (NCEP vs. ECMWF)

Forecasts Initialized 23 Mar 2026

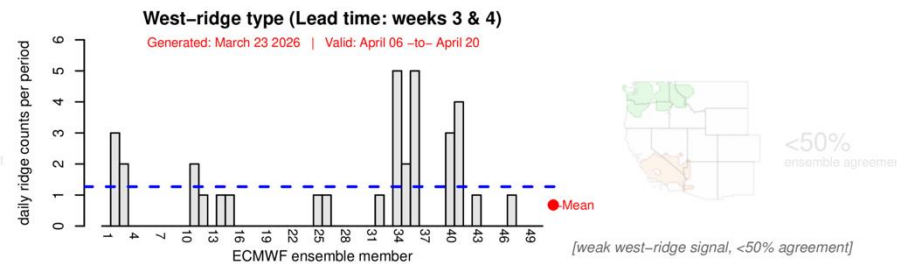
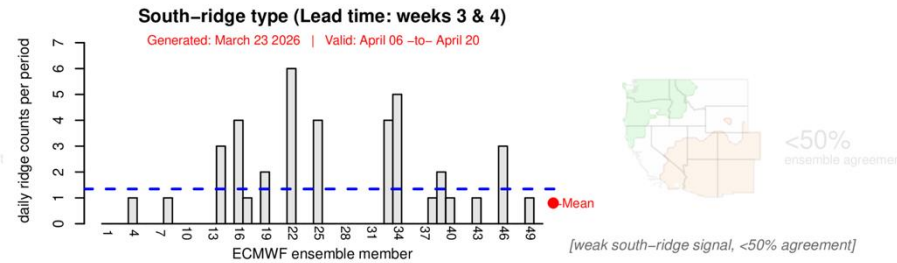
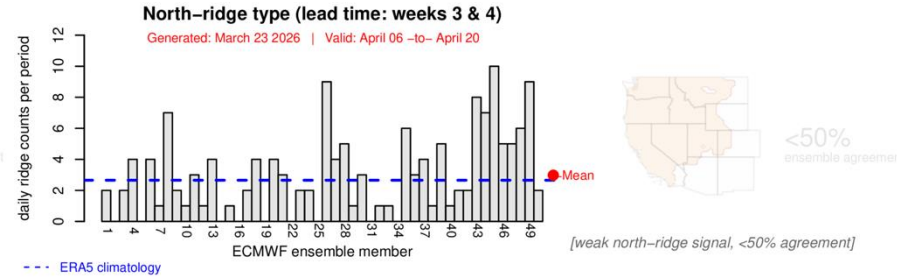
## NCEP

### CW3E Subseasonal Ridging Forecast (Uses NCEP CFSv2 model)



## ECMWF

### CW3E Subseasonal Ridging Forecast (Uses ECMWF model)



- Both models are forecasting near-normal North-ridge activity and slightly below-normal South-ridge activity during Weeks 3–4 (6–20 Apr)

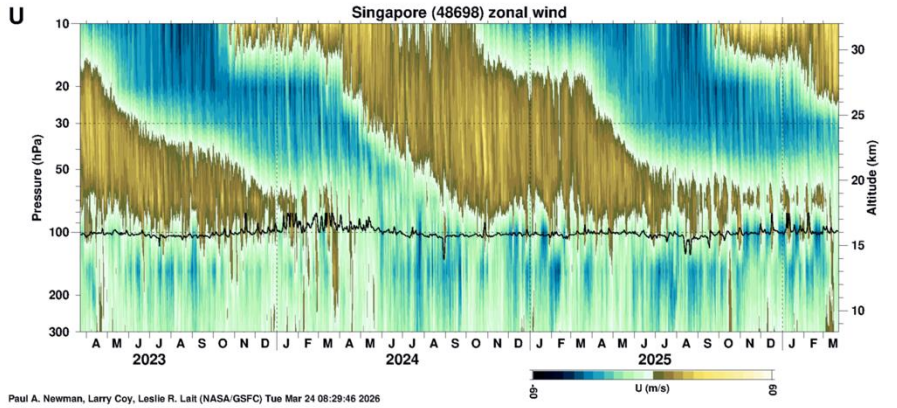
- NCEP is forecasting slightly above-normal West-ridge activity with low confidence (<50% ensemble agreement), whereas ECMWF is forecasting slightly below-normal West-ridge activity

Models show uncertainty in frequency and location of ridging activity during Weeks 3–4 (6–20 Apr)



# Background Info: AR Activity and Precipitation Based on MJO and QBO

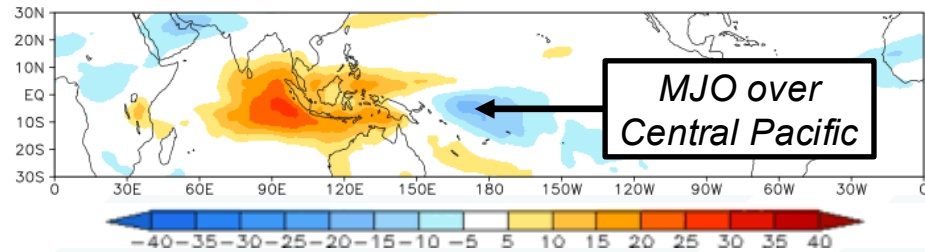
## QBO Conditions



**QBO is in the easterly phase at 50-hPa**

## MJO Conditions

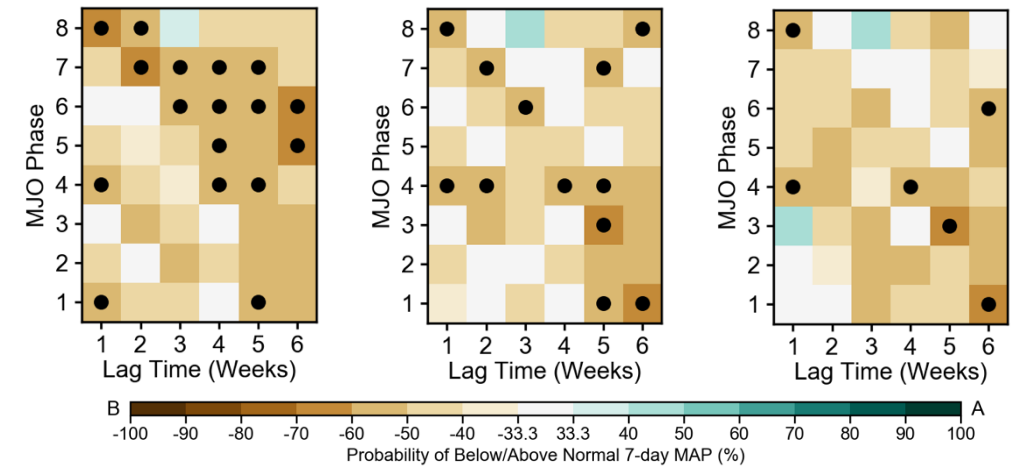
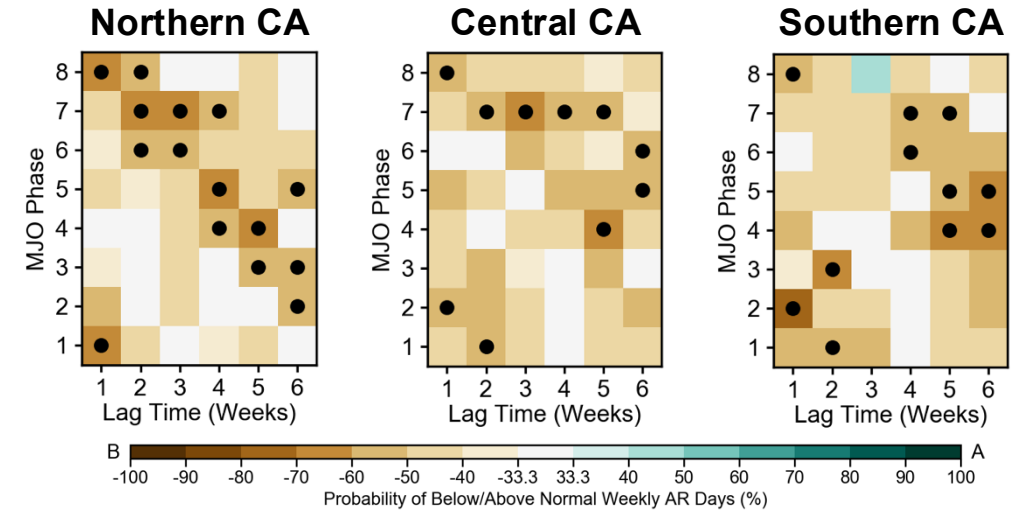
OLR prediction of MJO-related anomalies using GFS model reconstruction by RMM1 & RMM2 (20260323)



**MJO convection is currently located over the Central Pacific/Western Hemisphere (Phase 8)**

**Probability of Above/  
Below-Normal  
AR Occurrence  
(EQBO in JFM)**

**Probability of Above/  
Below-Normal  
Precipitation  
(EQBO in JFM)**



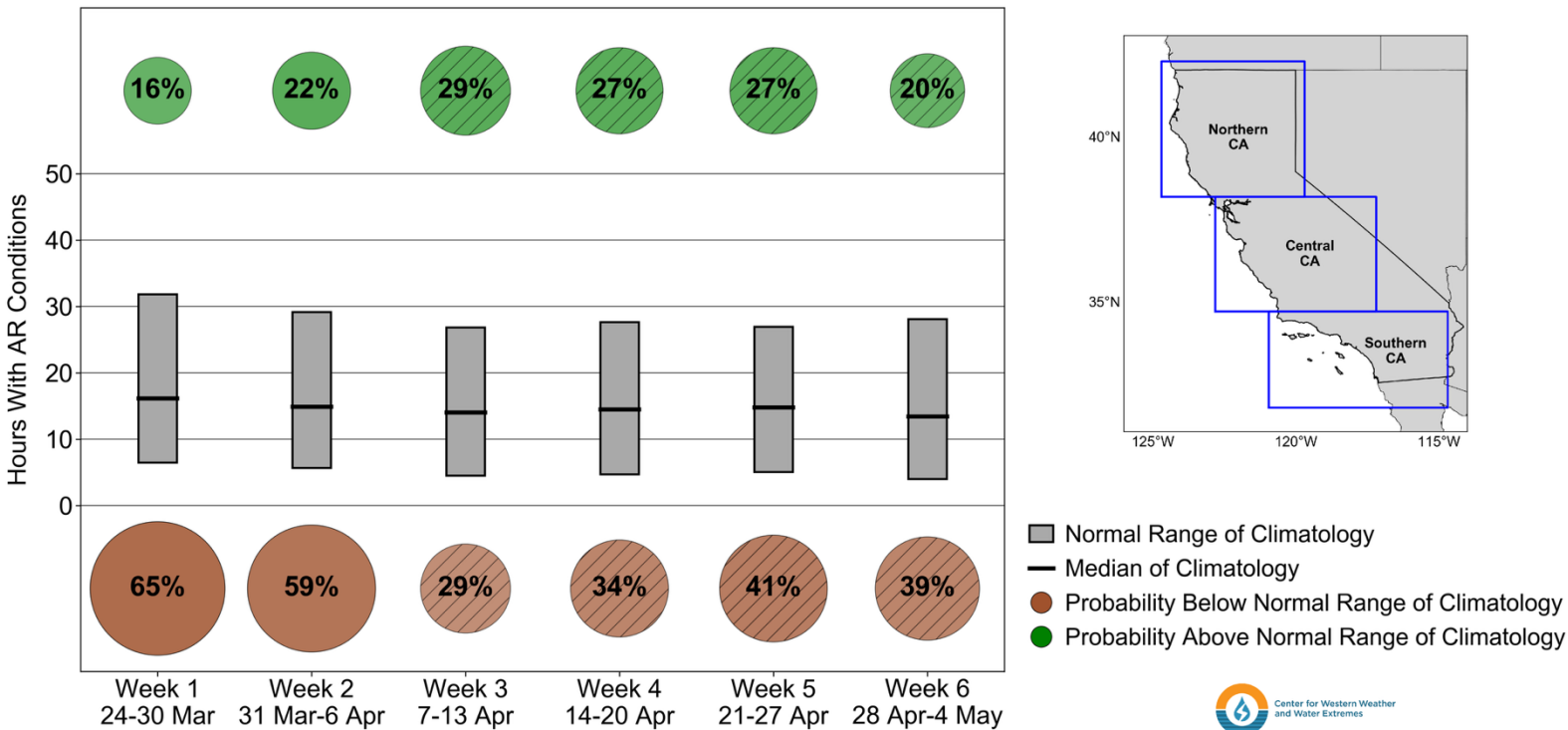
Probability matrices illustrating the weeks 1–6 lagged probability of below-normal (brown shading) or above-normal (green shading) AR occurrence and precipitation for all MJO phases when the QBO is in the westerly phase during JFM in Northern CA (left), Central CA (middle), and Southern CA (right). White squares indicate that the near-normal category has the highest probability. The black dots denote statistically significant probabilities of below- or above-normal conditions based on a bootstrapping analysis. Historical observations less (more) than the lower (upper) tercile of climatology (1981–2019 period) are considered below (above) normal.

# AR Activity and Precipitation Based on MJO and QBO

Forecasts Initialized 23 Mar 2026

## AR Occurrence: Northern CA

Northern CA Subseasonal AR Occurrence Outlook  
Issued: 23 Mar 2026 MJO Phase 8 EQBO



- CW3E’s probabilistic AR occurrence forecast based on current MJO and QBO conditions (see forecast for all regions [here](#))
- **Moderate likelihood ( $\geq 40\%$  probability) of below-normal AR occurrence in Northern CA during Week 2 (31 Mar – 6 Apr), with higher confidence supported by elevated forecast skill**
- Moderate likelihood of below-normal AR occurrence in Central CA during Weeks 2–4 (31 Mar – 20 Apr) and Southern CA during Weeks 2 and 4 (14–20 Apr)
- Moderate likelihood of above-normal AR occurrence in Southern CA during Week 3 (7–13 Apr)

\*Sum of probabilities of below-normal, near-normal, and above-normal conditions is 100%

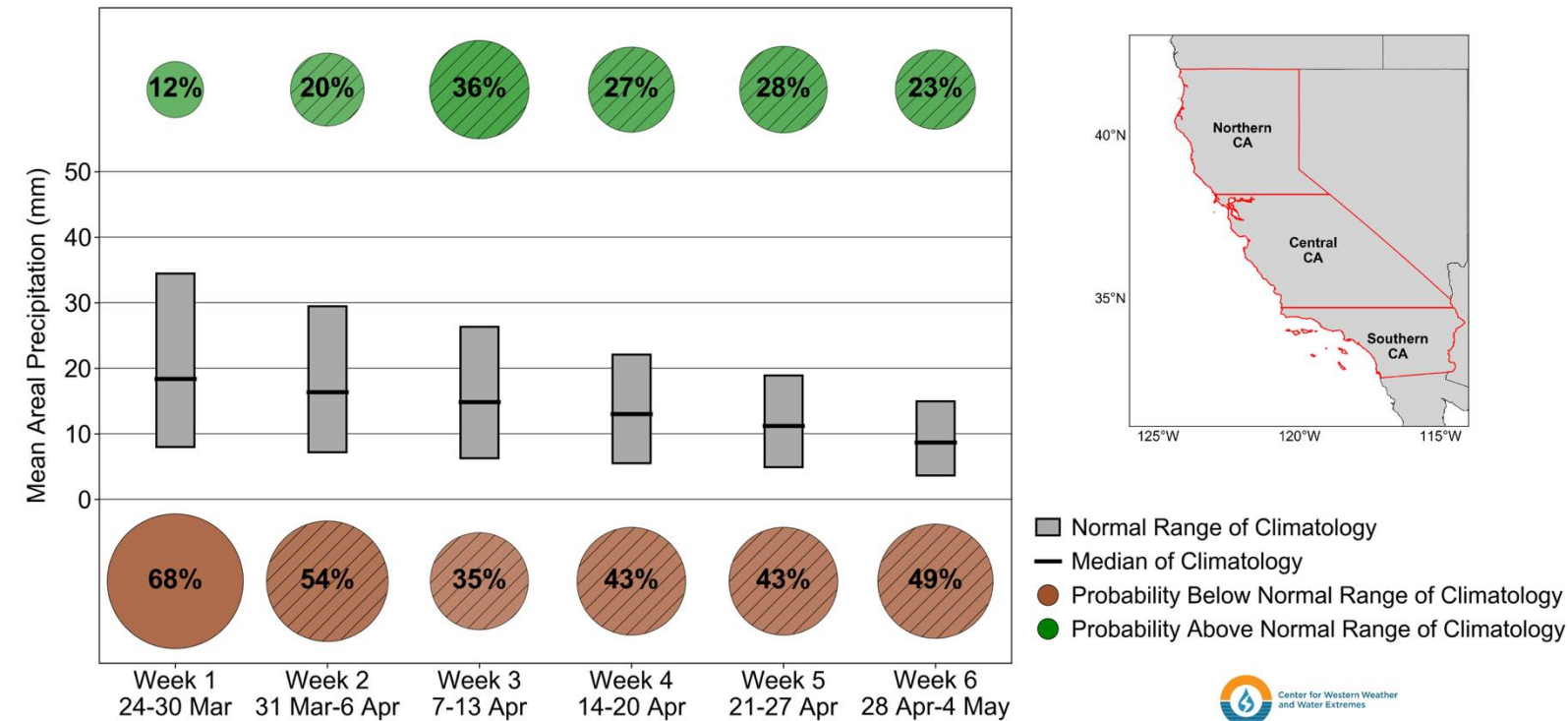
This product shows weekly probabilities of above-normal and below-normal AR occurrence in California. These probabilities are calculated for lead times of 1–6 weeks based on the current season (i.e., OND or JFM) and phases of the Madden-Julian Oscillation (MJO) and Quasi-biennial Oscillation (QBO). If MJO convection is weak or the QBO is in a neutral phase, no probabilities will be displayed. Circles without hatching denote periods with high confidence based on the hindcast skill assessment in [Castellano et al. \(2023\)](#).

# AR Activity and Precipitation Based on MJO and QBO

Forecasts Initialized 23 Mar 2026

## Precipitation: Northern CA

Northern CA Subseasonal Precipitation Outlook  
Issued: 23 Mar 2026 MJO Phase 8 EQBO



- CW3E's probabilistic precipitation forecast based on current MJO and QBO conditions (see forecast for all regions [here](#))
- **Moderate likelihood of below-normal precipitation in Northern CA during Weeks 2 and 4**
- Moderate likelihood of above-normal precipitation in Central and Southern CA during Week 3
- Moderate likelihood of below-normal precipitation in Central and Southern CA during Week 4



\*Sum of probabilities of below-normal, near-normal, and above-normal conditions is 100%

This product shows weekly probabilities of above-normal and below-normal precipitation in California. These probabilities are calculated for lead times of 1–6 weeks based on the current season (i.e., OND or JFM) and phases of the Madden-Julian Oscillation (MJO) and Quasi-biennial Oscillation (QBO). If MJO convection is weak or the QBO is in a neutral phase, no probabilities will be displayed. Circles without hatching denote periods with high confidence based on the hindcast skill assessment in [Castellano et al. \(2023\)](#)