



Center for Western Weather
and Water Extremes

SCRIPPS INSTITUTION OF OCEANOGRAPHY
AT UC SAN DIEGO

CW3E Seasonal Outlook: 17 November 2023

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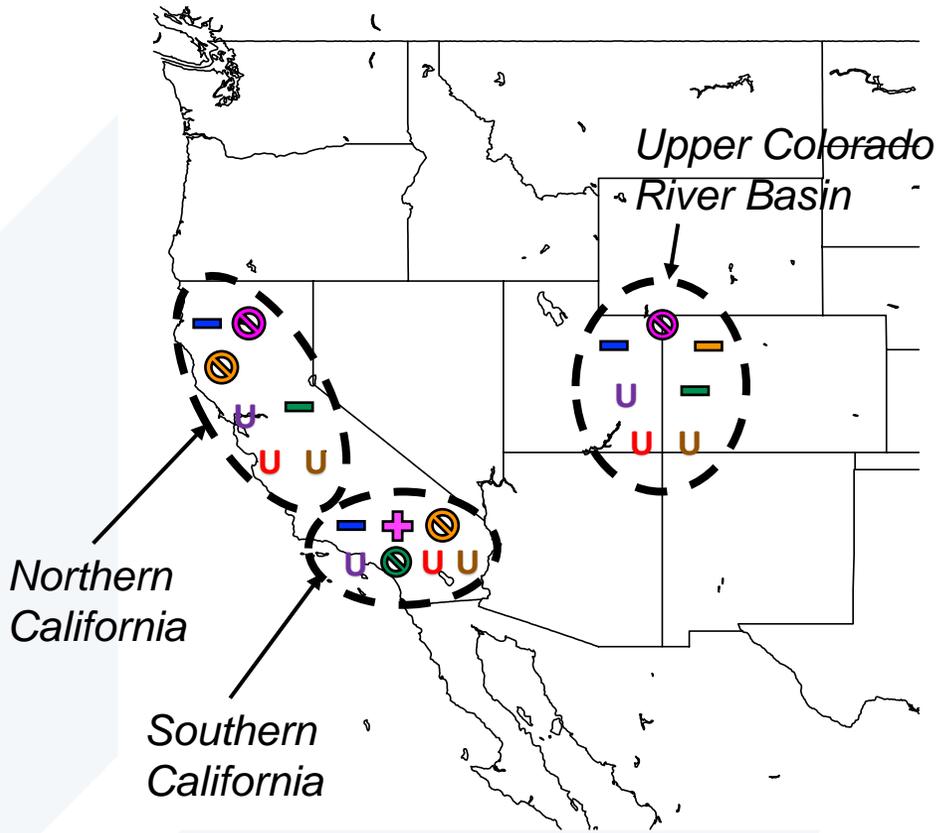
CW3E Seasonal Outlooks: Glossary & Context

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

Nov 2023 – Jan 2024 seasonal forecasts:

- CW3E experimental seasonal precipitation forecasts contain a wide range of possible outcomes
 - CCA model based on Oct SST is predicting above-normal precipitation over Southern CA with higher confidence in the southeastern portion, and near-normal precipitation over Northern and Central CA
 - Machine Learning (ML) model based on Oct SST and other atmospheric variables is suggesting below-normal precipitation conditions over CA
- Synthesis seasonal precipitation product suggests large uncertainty of precipitation conditions over Northern CA, Southern CA, and the Upper Colorado River Basin

Summary: Seasonal Synthesis Precipitation Outlook: Winter 2023-24



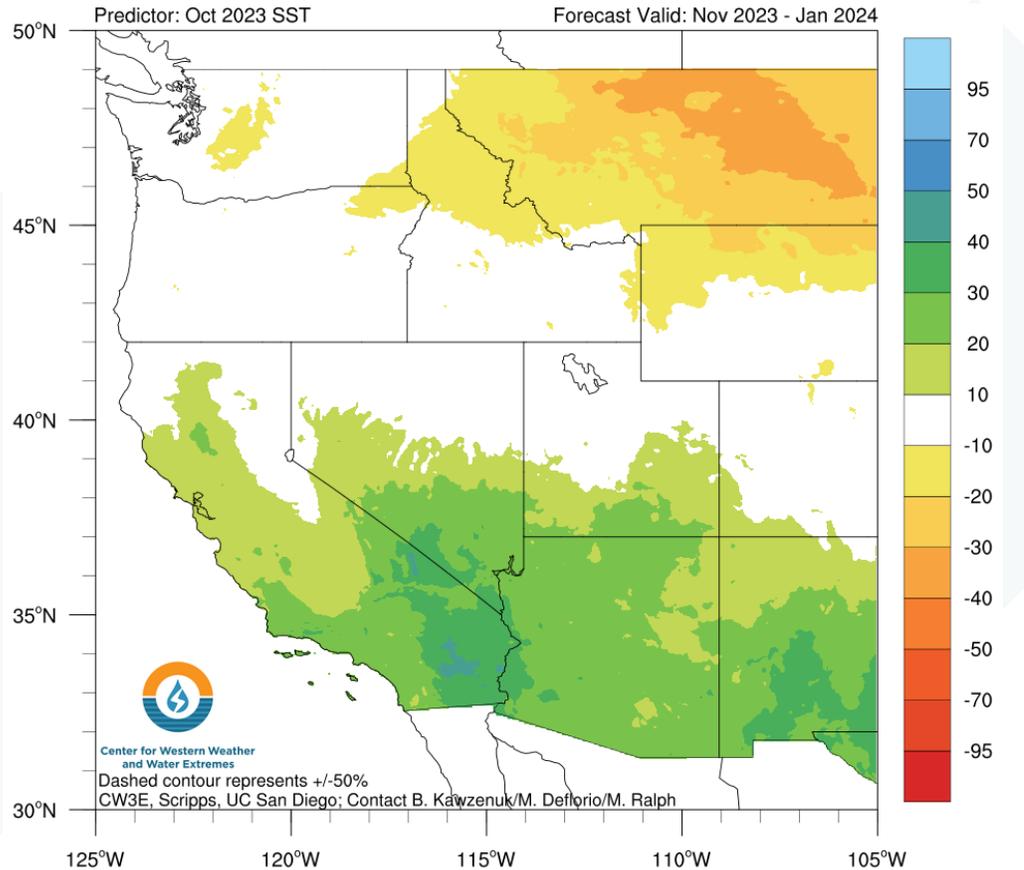
Methods	Forecast Period	Organization(s)	Nor Cal	So Cal	Upper Colo
Machine Learning based Forecast (Gibson et al.)	Nov-Jan	 Jet Propulsion Laboratory California Institute of Technology  Center for Western Weather and Water Extremes SCRIPPS INSTITUTION OF OCEANOGRAPHY AT UC SAN DIEGO	—	—	—
CCA Seasonal Precipitation Forecast (Gershunov et al.)	Nov – Jan	 Center for Western Weather and Water Extremes SCRIPPS INSTITUTION OF OCEANOGRAPHY AT UC SAN DIEGO	⊘	+	⊘
Univ. of Arizona Hybrid Seasonal Forecast (Scheftic et al.)	Nov-Jan		⊘	⊘	—
IRI/CPC Forecast (Robertson et al.)	Nov-Jan		U	U	U
NOAA ESRL Seasonal Forecast (Switanek et al.)	Nov-Mar		—	⊘	—
NMME Seasonal Forecast	Nov-Jan	The North American Multi-Model Ensemble	U	U	U
NOAA CPC Operational Outlook	Nov-Jan		U	U	U

- +** Above Normal
- Below Normal
- ⊘** Normal
- U** Uncertain/Equal Chances

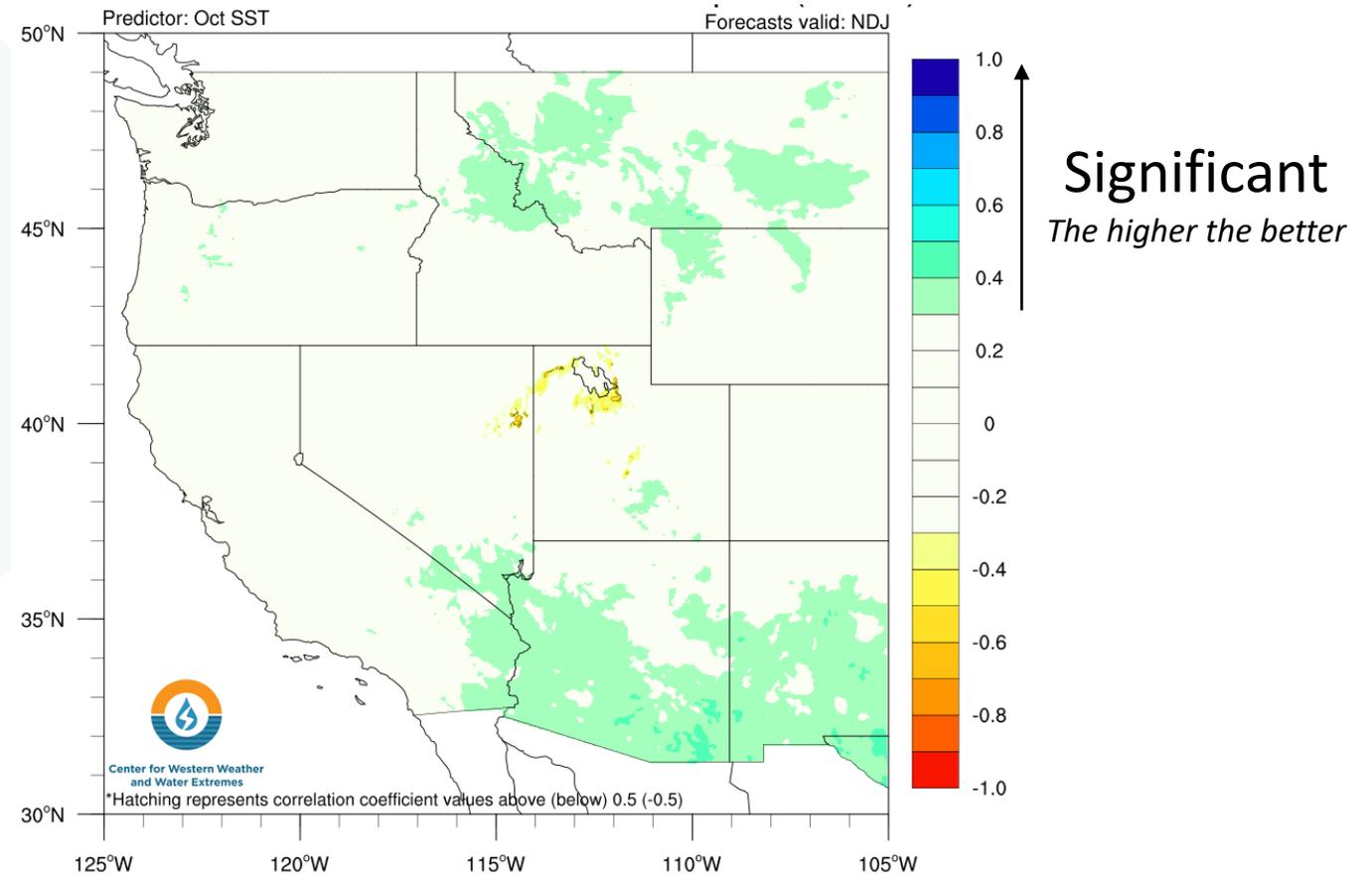


Seasonal Outlooks: Nov 2023 – Jan 2024 Precipitation (CCA Model)

NDJ precipitation forecast



Historical forecast skill



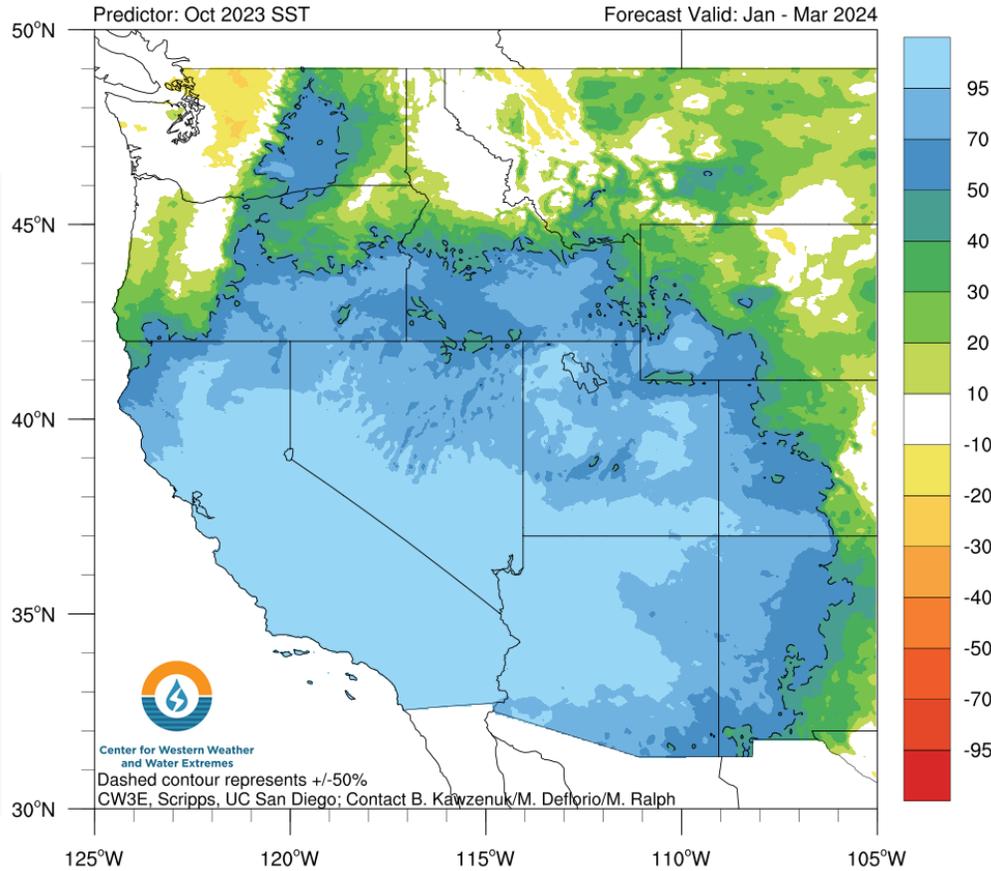
- CW3E statistical model based on Oct SST is predicting above-normal Nov 2023 – Jan 2024 precipitation over Southern CA with higher confidence in the southeastern portion, and near-normal precipitation over Northern and Central CA with low confidence

CCA: Canonical correlation analysis relating seasonal precipitation anomalies to observed monthly Pacific SST anomalies (click [here](#) for more information)

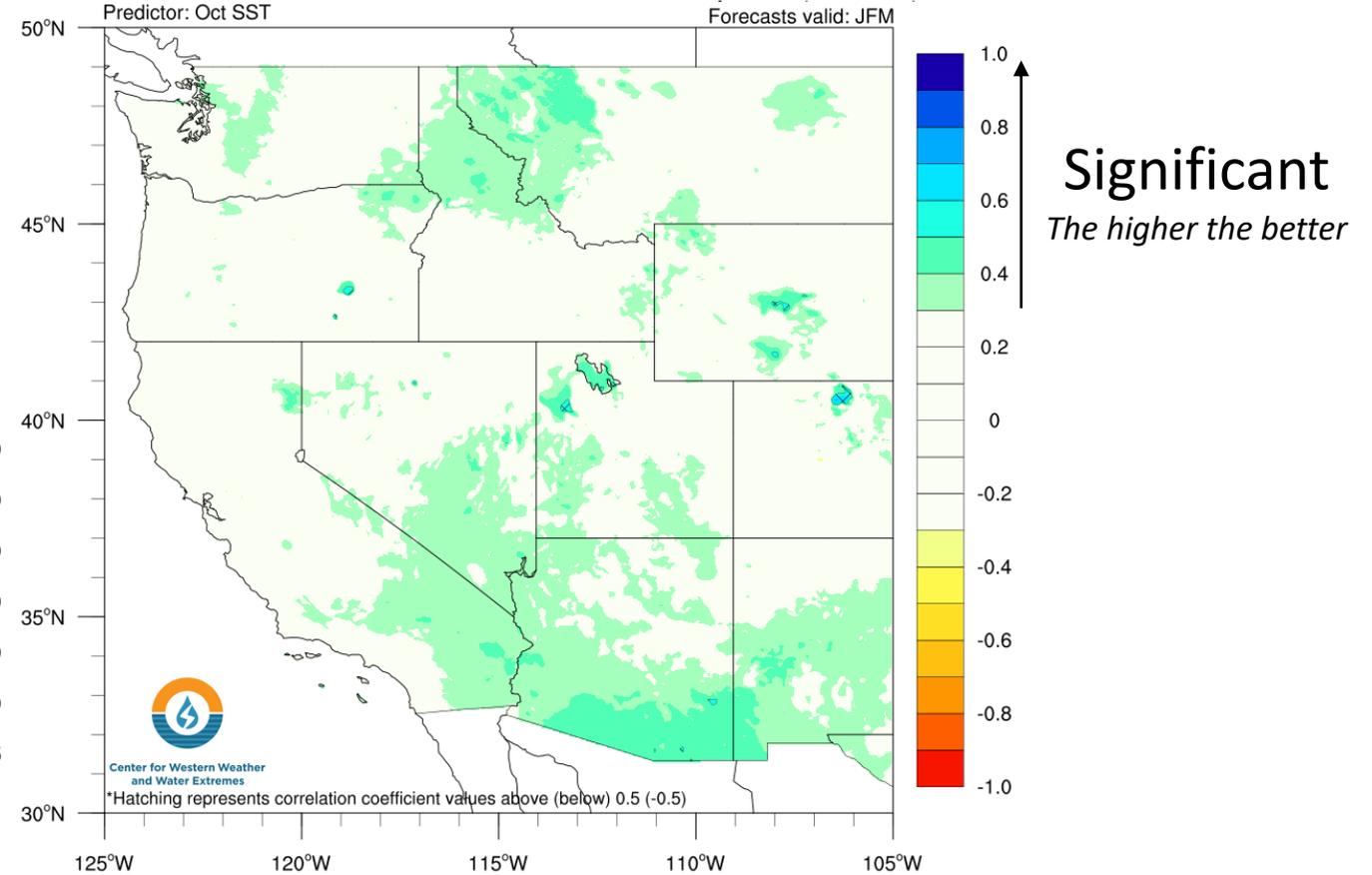
Above-normal: >+30%; **Below-normal:** <-30%

Seasonal Outlooks: Jan–Mar 2024 Precipitation (CCA Model)

JFM precipitation forecast



Historical forecast skill



- CW3E statistical model based on Oct SST is predicting significantly above-normal (>150% of normal) Jan–Mar 2024 precipitation in CA, portions of OR/WA, and much of the interior Southwest with higher confidence in Southwestern US

CCA: Canonical correlation analysis relating seasonal precipitation anomalies to observed monthly Pacific SST anomalies (click [here](#) for more information)

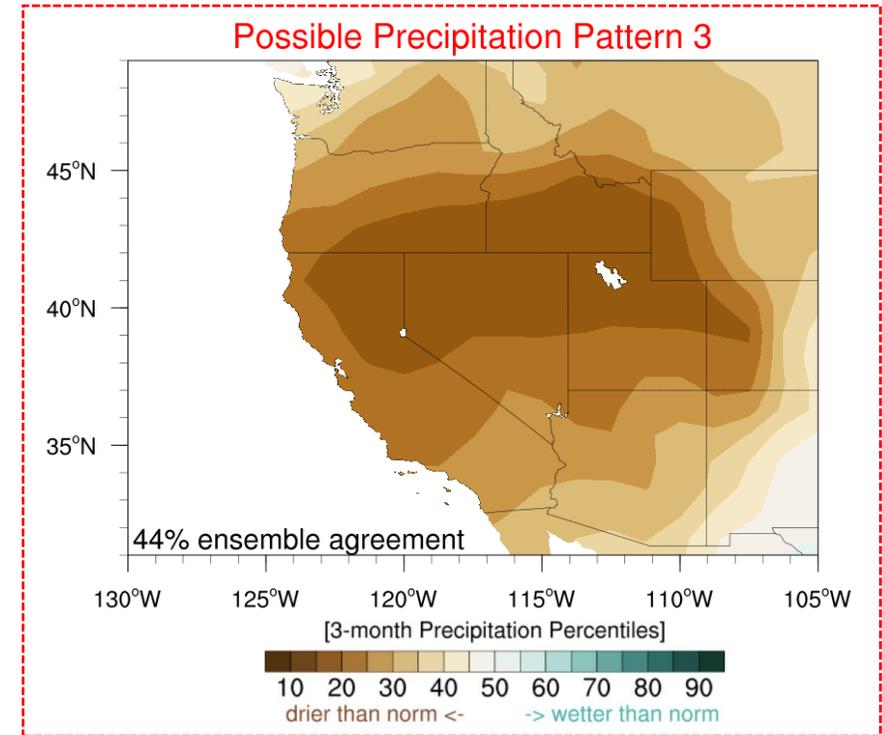
Above-normal: >+30%; **Below-normal:** <-30%

Seasonal Outlooks: Nov 2023 – Jan 2024 Precipitation (ML Model)

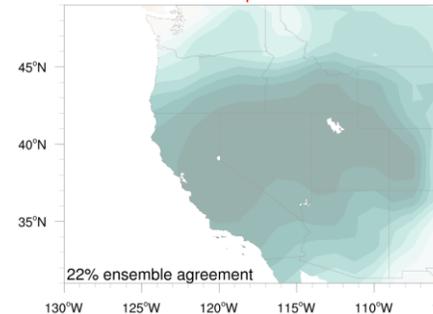
- CW3E Machine Learning (ML) and NOAA NMME models show a large degree of uncertainty for precipitation anomalies across the NDJ period (44% ensemble agreement)
- A majority of the ML + NMME forecasts are predicting patterns consistent with drier than normal conditions in Southern CA (6/9 members)
- There is lower confidence in drier than normal conditions over Northern CA (4/9 members)

A plurality of combined ML + NMME ensemble members tilt the odds towards drier than normal conditions across the western U.S. region (44% ensemble agreement; 4/9 members)

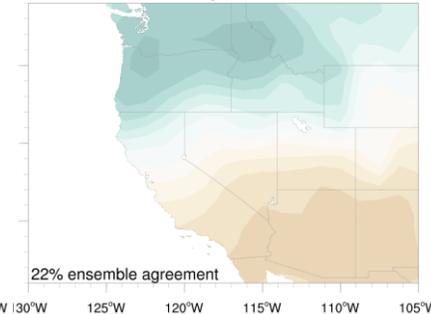
44% chance for dry Western U.S.



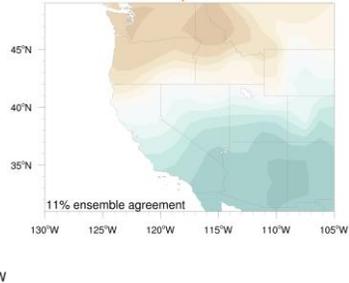
Possible Precipitation Pattern 2



Possible Precipitation Pattern 4



Possible Precipitation Pattern 1



The ensemble is comprised of both CW3E ML models (4 ensembles) and NOAA NMME models (5 ensembles). See [Gibson et al. \(2021\)](#) for methodology and skill assessment.

