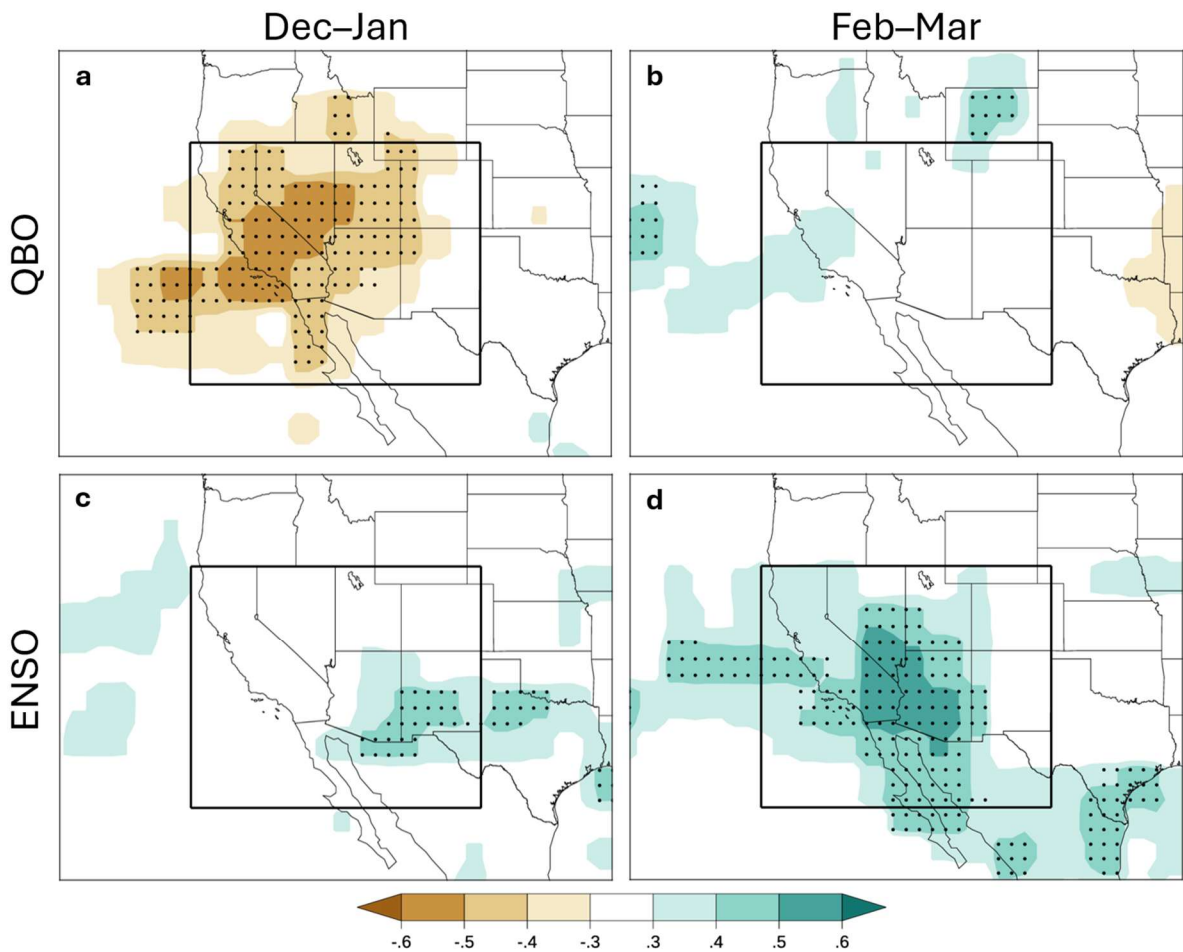
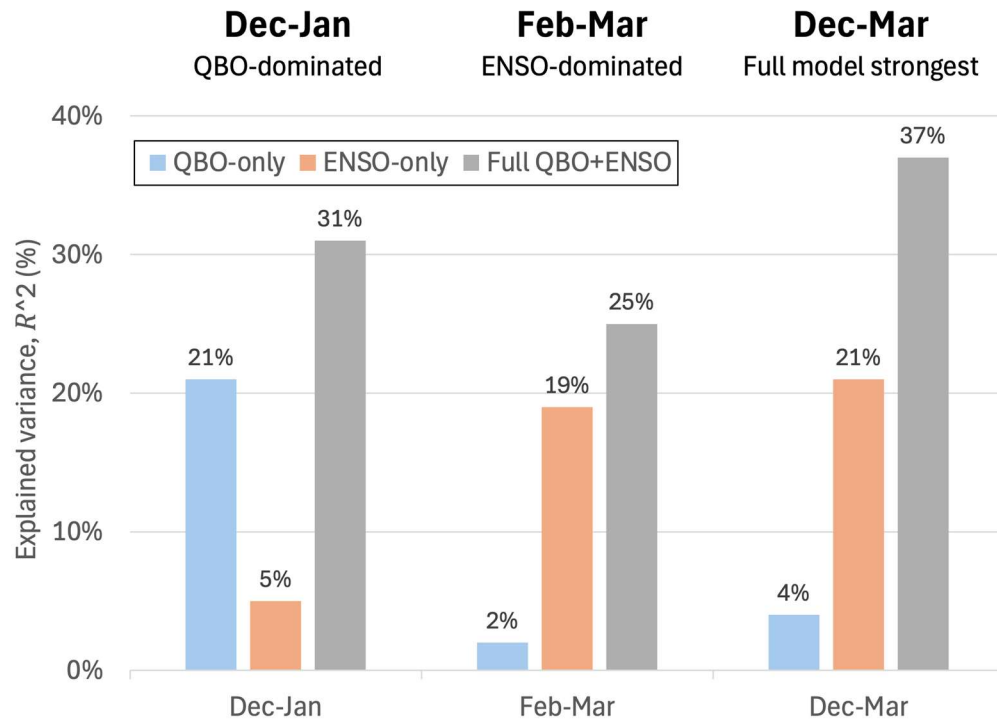


Supplemental figures



Supplemental Fig. 1 | Precipitation correlations associated with QBO and ENSO. Panels show correlations between precipitation and the corresponding predictor, using the correlation-maximizing lead-lag offsets from Fig. 1. The box marks the SWUS averaging region. Stippling indicates statistical significance at the 95% confidence level.



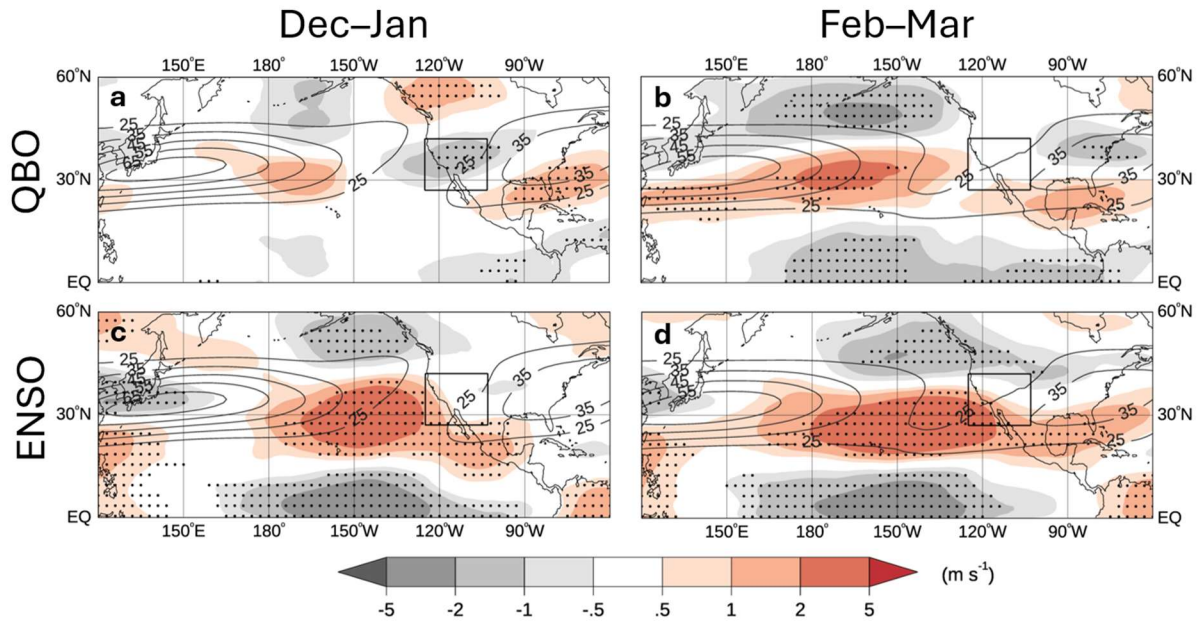
8

9 **Supplemental Fig. 2 | Explained variance of SWUS precipitation predictions.** Cross-

10 validated explained variance, $R^2 = r^2$, is shown for the combined QBO–ENSO model and

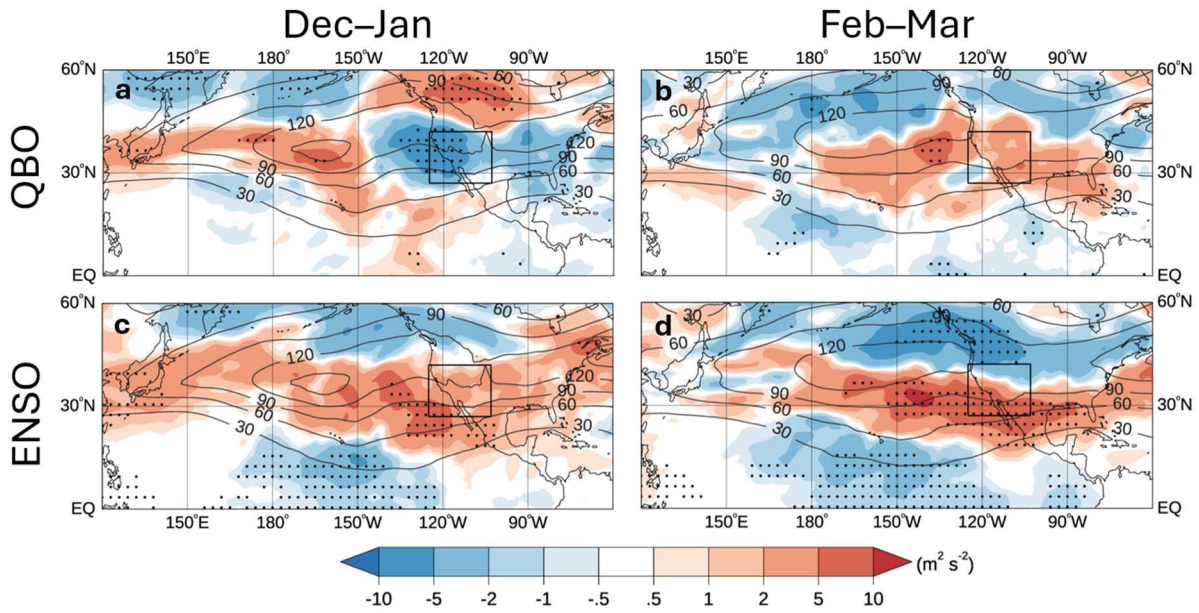
11 single-predictor benchmark models during the given months. For Dec–Mar, the full model

12 denotes the composite forecast obtained by averaging the Dec–Jan and Feb–Mar predictions.



Supplemental Fig. 3 | 250 hPa zonal-wind anomalies associated with QBO and ENSO.

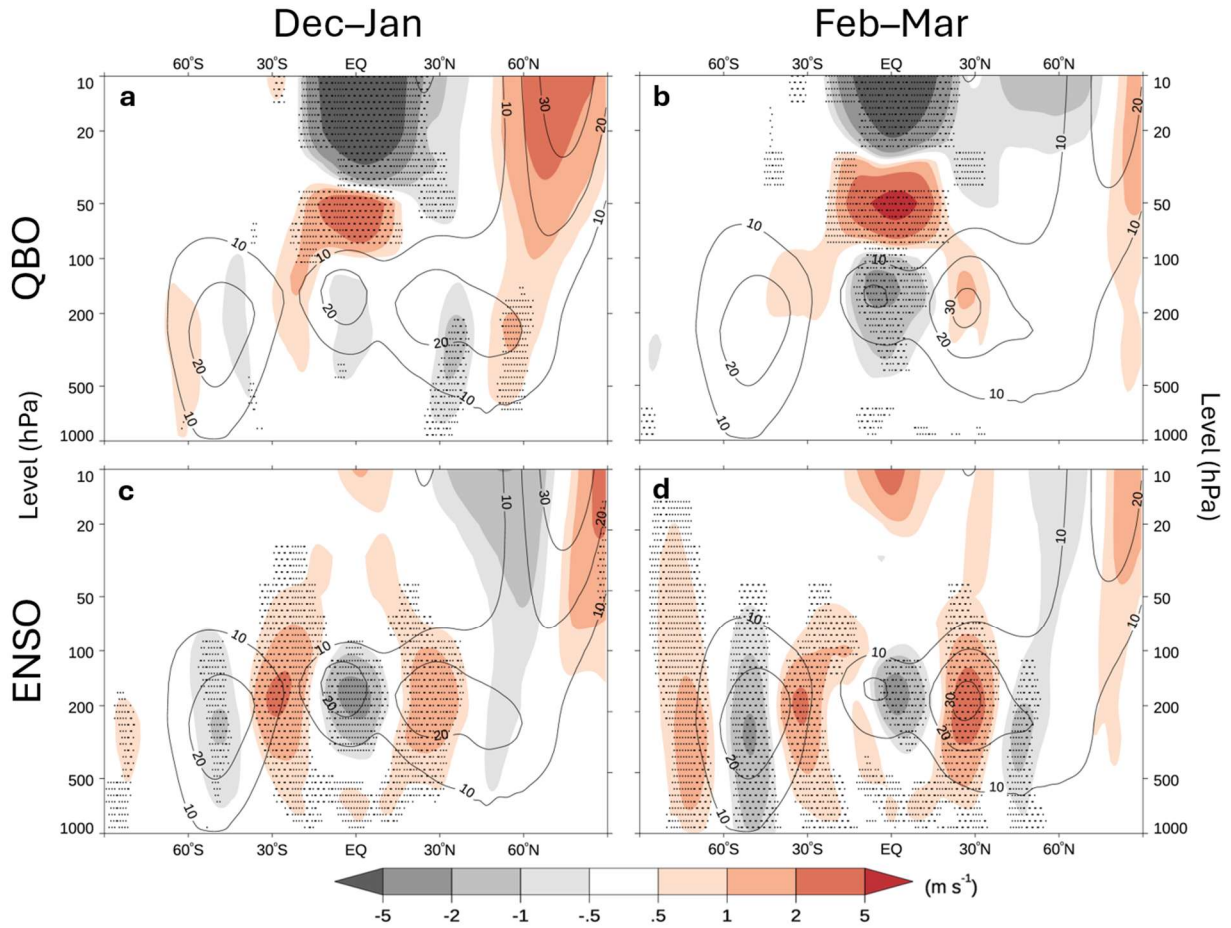
Shading shows anomalies associated with one standard deviation of the corresponding predictor, using the correlation-maximizing lead-lag offsets from Fig. 1. Black contours show the climatology. The box marks the SWUS region. Stippling indicates statistical significance at the 95% confidence level.



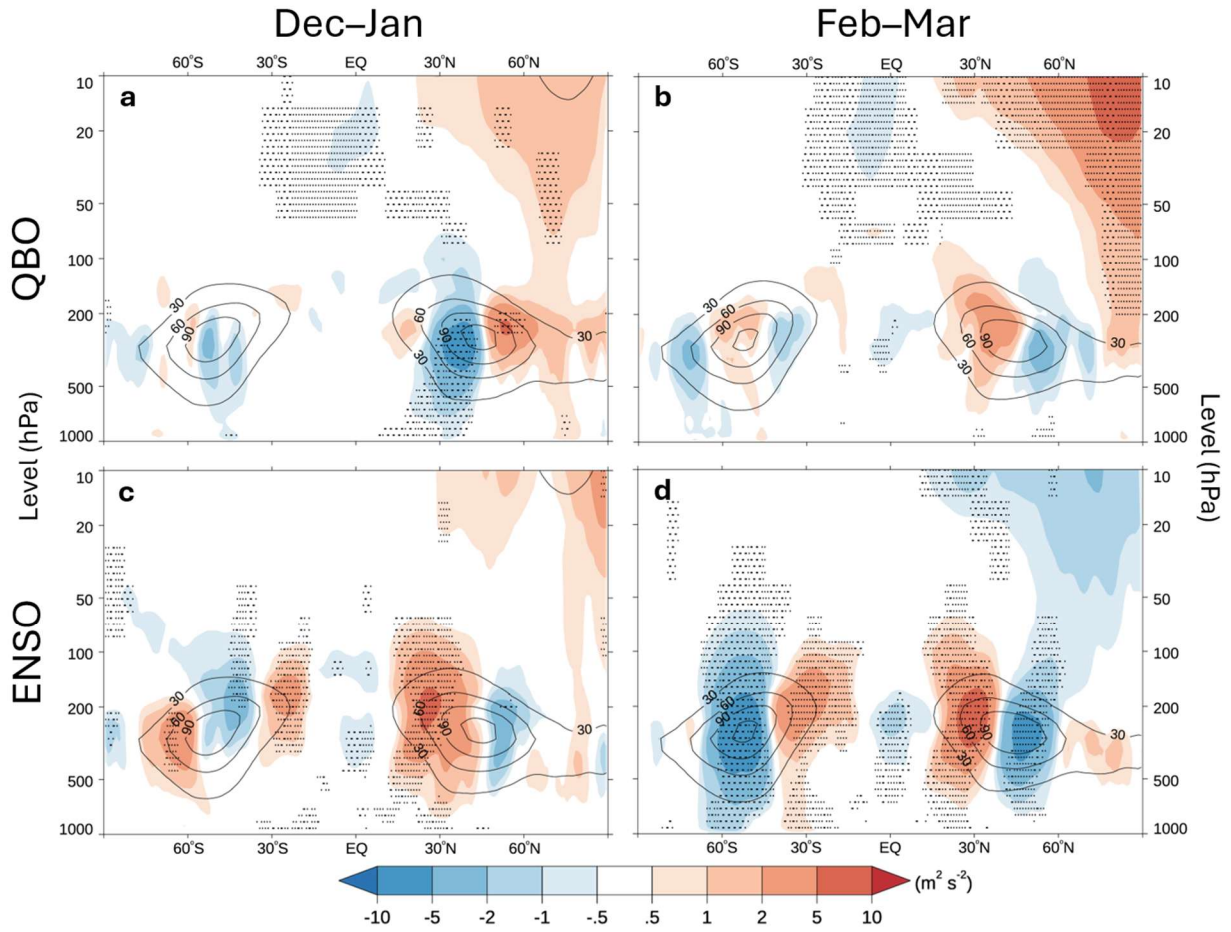
19

20 **Supplemental Fig. 4 | 250 hPa EKE anomalies associated with QBO and ENSO. As in**

21 **Supplemental Fig. 3, but for 250 hPa EKE.**



Supplemental Fig. 5 | Zonal-wind cross sections associated with QBO and ENSO. Latitude–pressure sections averaged over 135–105°W show anomalies associated with a one-standard-deviation increase of the corresponding predictor, using the correlation-maximizing lead–lag offsets from Fig. 1. Black contours show the climatology. Stippling indicates statistical significance at the 95% confidence level.



Supplemental Fig. 6 | EKE cross sections associated with QBO and ENSO. As in Supplemental Fig. 5, but for EKE.