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Intraseasonal variability of summer precipitation in Mexico: MJO influence on the midsummer drought

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The aim of this study is to understand how the MJO modulates the bimodal seasonal rainfall distribution across the regions in Mexico where the midsummer drought (MSD) occurs. The MSD is characterized by a precipitation decrease in the middle of the rainy season. Relative frequencies of each active phase of the Real-time Multivariate MJO (RMM) Index were calculated at each grid point in the high-resolution Climate Hazards Group Infrared Precipitation with Stations (CHIRPS) rainfall dataset for the first (MAX1) and second (MAX2) rainfall peaks and the MSD minimum (MIN). In addition, standardized anomalies of precipitation (from the CHIRPS dataset) and 300-hPa omega, 500-hPa geopotential height, and 850-hPa u- and v-wind components (from the Climate Forecast System Reanalysis) were calculated for each MJO phase and each month in the rainy season. Results show that the MIN (MAX2) occurs more frequently during the dry (wet) MJO phases, while the MJO seems not to influence MAX1 significantly. Anomalous anticyclonic (cyclonic) circulations at 850 hPa, positive (negative) 500-hPa geopotential height anomalies, northeast (southwest) 850-hPa wind anomalies over southern Mexico, and a low-level westward (eastward) flow in the northeastern tropical Pacific support the MIN (MAX2) pattern under the influence of the dry (wet) MJO phases. These features are more clearly observed in the MSDs of 1- and 2-month duration and over the southern half of Mexico. The results suggest that the bimodal distribution is less influenced by the MJO in regions of northeastern Mexico.