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Subseasonal Warming of Surface Soil Enhances Precipitation Over the Eastern Tibetan Plateau in Early Summer

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The precipitation over the eastern Tibetan Plateau (ETP, here defined as 29°–38°N, 91°–103°E) usually exhibits significant subseasonal variation during boreal summer. As the hot spot of land-air interaction, the influences of ETP surface soil temperature (T_{soil}) on the local precipitation through subseasonal land-air interaction are still unclear but urgently needed for improving subseasonal prediction. Based on station and reanalysis datasets of 1979–2018, this study identifies the evident quasi-biweekly (QBW) (9–30 days) periodic signal of ETP surface T_{soil}variation during the early summer (May–June), which results from the anomalies of southeastward propagating mid-latitude QBW waves in the mid-to-upper troposphere. The observational results further show that the maximum positive anomaly of precipitation over the ETP lags the warmest surface T_{soil} by one phase at the QBW timescale, indicating that the warming surface T_{soil} could enhance the subseasonal precipitation. The numerical experiments using the WRF model further demonstrate the effect of warming surface T_{soil} on enhancing the local cyclonic and precipitation anomaly through increasing upward sensible heat flux, the ascending motion, and water vapor convergence at the QBW timescale. In contrast, the effect of soil moisture over the ETP is much weaker than T_{soil} at the subseasonal timescale. This study confirms the importance of surface T_{soil} over the ETP in regulating the precipitation intensity, which suggests better simulating the land thermal feedback is crucial for improving the subseasonal prediction.