Quantifying characteristics of intraseasonal summer rainfall in Thailand and associated moisture transport during active MJO and ENSO warm phase

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Previous studies revealed that intraseasonal global climate variation is exerted by Madden-Julian Oscillation (MJO); meanwhile its year-to-year variability is strongly controlled by El Niño-Southern Oscillation (ENSO). In Thailand, previous studies indicated that rainfall deficit in summer season is interannually significantly linked to variation of ENSO warm phase (aka, El Niño). However, a compound effect between the MJO and the El Niño on the regional rainfall has not yet been understood. In this study, we, therefore, aimed at quantifying aspects of 20–60-day summer rainfall variation in Thailand in association with active MJO and El Niño. Daily rainfall data covering 1979–2019 were collected from the Thai Meteorological Department, whereas MJO (Oceanic Niño Index; ONI) was provided by the Bureau of Meteorology (National Centers for Environmental Prediction). Additionally, ERA–5 reanalysis is used for considering large-scale moisture transport. The result shows that the combined effect between MJO and the warm episode on Thailand's rainfall is spatially varying depending on different MJO phases by which the 20–60-day rainfall anomalies in upper Thailand are above (below) normal at MJO phases 3–4 (6–7). For southern Thailand, above normal rainfall is also profound at MJO phase 3–4, while below normal rainfall lasts slightly longer than in the upper sub-region (phases 5–7). The intraseasonal variation of rainfall in the upper Thailand is strongly associated with moisture transport from Bay of Bengal, Gulf of Thailand, and South China Sea, while moisture coming from easterly, and westerly is a major control of the rainfall anomalies in the South. Hence, this study provides a fundamental understanding and characteristics of the combined effect between the climate drivers on intraseasonal rainfall variation and is useful for further development of sub-seasonal to seasonal (S2S) prediction in Thailand.

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