



The Diurnal Variability of Precipitating Cloud Populations during DYNAMO

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This study uses high-resolution rainfall estimates from the S-Polka radar during the DYNAMO field campaign to examine variability of the diurnal cycle of rainfall associated with MJO convection over the Indian Ocean. Two types of diurnal rainfall peaks were found: 1) a late afternoon rainfall peak associated with the diurnal peak in sea surface temperatures (SSTs) and surface fluxes and 2) an early to late morning rainfall peak associated with increased low-tropospheric moisture. Both peaks appear during the MJO suppressed phase, which tends to have stronger SST warming in the afternoon, while the morning peak is dominant during the MJO enhanced phase. The morning peak occurs on average at 0000–0300 LST during the MJO suppressed phase, while it is delayed until 0400–0800 LST during the MJO enhanced phase. This delay partly results from an increased upscale growth of deep convection to broader stratiform rain regions during the MJO enhanced phase. During the MJO suppressed phase, rainfall is dominated by deep and isolated convective cells that are short-lived and peak in association with either the afternoon SST warming or nocturnal moisture increase. This study demonstrates that knowledge of the evolution of cloud and rain types is critical to explaining the diurnal cycle of rainfall and its variability. Some insights into the role of the complex interactions between radiation, moisture, and clouds in driving the diurnal cycle of rainfall are also discussed.