

Role of orography, diurnal cycle, and intraseasonal oscillation in summer monsoon rainfall over Western Ghats and Myanmar coast

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Rainfall over the coastal regions of western India (Western Ghats; WG) and Myanmar (Arakan Yoma; AY), two regions experiencing the heaviest rainfall during the Asian summer monsoon, is examined using a Tropical Rainfall Measuring Mission (TRMM) Precipitation Radar (PR) dataset spanning 16 years. Rainfall maxima are identified on the windward slopes of the WG and the coastlines of AY, in contrast to the offshore locations observed in previous studies.

The rainfall in the WG and AY regions exhibits low diurnal variability, implying that the rainfall is not primarily driven by thermal convection, but by mechanical convection. Large rainfall amounts with small diurnal amplitudes are observed over the WG and AY under strong environmental flow perpendicular to the coastal mountains, and vice versa. Diurnal-driven mitigating systems are observed over the WG under weak environmental flow, but do not determine the seasonal distribution of summer monsoon rainfall, explaining why the rainfall maxima are not observed offshore.

Composite analysis of the boreal summer intraseasonal oscillation (BSISO) shows that the rain anomaly over the WG slopes lags behind the northward propagating major rain band. The cyclonic systems associated with the BSISO introduces south-west wind anomaly behind the major rain band, enhancing the orographic rainfall over the WG, and resulting in the phase lag. This lag is not observed in the AY region where more closed cyclonic circulations occur. Diurnal variations in rainfall over the WG regions are smallest (largest) during (preceding) the strongest BSISO rainfall anomaly phase.