

# Cloud and Rain Microphysical Characteristics of North Indian Ocean Tropical Cyclones during Pre-Monsoon, Monsoon, and Post-Monsoon Seasons

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This study examines the environmental conditions that influences the tropical cyclone (TC) occurrence frequency (TCOF) as well as the rain microphysics of TCs over the North Indian Ocean (NIO) during major monsoon stages (pre-monsoon, monsoon, and post-monsoon) in 2014-2021. Two regions in NIO domain are a particular focus, namely, the Arabian Sea (AS) and the Bay of Bengal (BOB). TCs that formed within the NIO domain and reached at least the tropical storm stage were selected. High TCOF is attributed to the combined presence of warm sea surface temperature and cyclonic wind or positive 850-hPa relative vorticity. Moreover, high reflectivity and heavy rainfall are found within the 50 km radius from the storm's center. Monsoon season TC Vayu (2019) have the heaviest rainfall and highest reflectivity within the inner band region, as compared to pre-monsoon TC Fani (2019) and post-monsoon TC Kyaar (2019). The probability density functions of the rain microphysics parameters vary with the season (pre-monsoon, monsoon, and post-monsoon) and the mode of rain (total, stratiform, and convective). In all season, the breakup process is found to be dominant in total and stratiform precipitating clouds, whereas the break-up and coalescence processes are comparable in convective precipitating clouds.

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