

Dominant synoptic disturbance in the extreme rainfall at Cherrapunji, northeast India, based on 104 years of rainfall data (1902-2005)

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The characteristics of active rainfall spells (ARSs) at Cherrapunji, northeast India, where extreme rainfall is experienced, and their relationships with large-scale dynamics were studied using daily rainfall data from 1902 to 2005 and Japanese 55-year reanalysis from 1958 to 2005. Extreme daily rainfalls occur in association with ARSs. The extremely large rainfall amounts in the monsoon season are decided by a cumulative rainfall during ARSs. ARSs start when anomalous anticyclonic circulation (AAC) at 850-hPa propagates westward from the South China Sea and western North Pacific, and covers the northern Bay of Bengal. The AAC propagates further westward and suppresses convection over central India during ARSs at Cherrapunji, and continues for 3 to 14 days. Consequently, a northward shift of the monsoon trough during the 'break' in the Indian core region occurs. The westerly wind, which prevails in the northern portion of the AAC, transports moisture toward northeast India and enhances moisture convergence over northeast India with southerly moisture transport from the Bay of Bengal, and greatly intensifies the orographic rainfall. In the upper troposphere, the Tibetan high tends to extend southward with the onset of ARSs. A linear relationship can be seen between the length and total rainfall of an ARS. Longer ARSs tends to result in greater total rainfall. AACs with a greater zonal scale tend to produce longer and more intense ARSs. This study provide a certain evidence for the effect of AACs in the western North Pacific on the Indian summer monsoon.

Keywords: extreme rainfall , Indian summer monsoon, intraseasonal variability, orographic rainfall