

## **Structure and trend of Monsoon Low Pressure Systems and its connection with seasonal and extreme rainfall over central India**

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The tropical disturbances formed in the Bay of Bengal and the Arabian Sea and over land points in central India, known as low pressure systems (LPSs), bring copious rain to Indian continent. Analyses of a long record (113 years) of the paths and intensities of monsoon LPSs and daily rainfall over India show that the location, number, and duration of the LPSs are found to be closely related to the phases and propagation of the dominant intraseasonal modes of the Indian rainfall. The low-level and upper-level circulation patterns when LPSs are present (absent) represents strengthening (weakening) of monsoon trough synonymous with the characteristics of active (break) phases of the monsoon. The number of LPSs and their total duration and the corresponding rainfall during July and August exceed those in June and September. The LPS tracks reach up to northwest India during flood years, whereas they are confined to central India during drought years. The contribution of rainfall during the LPSs to the total seasonal rainfall and its significance in determining the interannual and interdecadal variability of the seasonal mean monsoon rainfall will be described. The nature of the increasing frequency of extreme rainfall events (ERE) in central India is investigated by relating their occurrence to the location, number, intensity and duration of the LPSs. A Synoptic Activity Index (SAI) is defined whose interannual variation correlates strongly with that in the number of ERE, demonstrating a strong connection between these phenomena. The synoptic activity index furthermore shows a rising trend statistically indistinguishable from that in ERE, indicating that the increasing frequency of ERE is likely attributable to a rising trend in synoptic activity. This synoptic activity increase results from a rising trend in relatively weak LPSs, which outweighs a declining trend in stronger LPSs.