Statistics of Monsoon Low Pressure Systems in the Indian Subcontinent and Estimation of Related Extreme Rainfall Risk

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Indian monsoon, which spans through the months of June-September, brings in copious rain for the agriculture dependent country India. Monsoon low pressure systems (LPS) are the major rain bearers during the season. Apart from being a lifeline, they are also cited as a cause of disastrous floods in the country. Various approaches have been attempted to locate and track these LPS. Inconsistency exists among them in statistics of LPS not only for the historical period, but also in future projections of these systems. We have developed an improved tracking scheme in this study. The new approach takes into consideration geopotential height anomaly condition and is named Automated Tracking algorithm using geopotential criteria (ATAGC). The approach is validated by comparing characteristics of LPS identified by it with those identified in previous studies. On average, around 14 LPS each year are identified by the new approach, which comprise 9 lows, 4 depressions and about one deep depression. Further, the annual average number for LPS days is estimated as 68. The LPS mostly form over north part of Bay of Bengal and move north-westwards. Synoptic Activity Index, which quantifies LPS risk at a location in terms of both frequency and intensity of the system, shows that locations in the coastal regions of central India are highly affected by LPS. But the effect in terms of extreme rainfall is not localized near the coast. Even though contribution of LPS towards total monsoon rainfall and total extreme precipitation has been analyzed in previous studies, the risk in terms of extreme rainfall due to LPS has not been assessed. In this study, extreme rainfall risk map in terms of average extreme precipitation and 90 percentile precipitation observed at a location in the vicinity of an LPS is determined. An average extreme rainfall of 60-100mm/day and 90 percentile extreme rainfall of 150-250mm/day is estimated at many locations in Central Indian region due to LPS. While analyzing continuous spells of rainfall, it is found that along with LPS, topography of a region has considerable effect on the duration of the spells.