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Lagrangian tracing and analysis of the South Asian summer monsoon precipitation

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The water-mass sources and their variability responsible for the South Asian summer monsoon precipitation were investigated using Lagrangian atmospheric water-mass trajectories. The results indicated that water-masses from the Central and South Indian Ocean are the dominant contributors to the total South Asian summer monsoon rainfall, followed by the contribution from the local recycling, the Arabian Sea, remote sources and the Bay of Bengal. It was also found that although the direct contribution originating from the Bay of Bengal is small, it still provides a route for the water-masses that come from other regions. The outcomes further revealed that the water-masses originating from the Central and South Indian Ocean are responsible for the net precipitation over the coastal regions of the Ganges-Brahmaputra-Meghna Delta, Northeast India, Myanmar, the foothills of the Himalayas and Central-East India. Water-masses from the Arabian sea are mainly contributing to the rainfall over the Western coast and West-Central India. Summer monsoon precipitation due to the local recycling is primarily restricted to the Indo-Gangetic plain. No recycled precipitation was observed over the mountain chain along the West coast of India (Western Ghats). The inter-annual variability of the South Asian summer monsoon precipitation was found to be mainly controlled by the water-masses from the Central and South Indian Ocean.