



## **Spatial structures and directionalities in precipitation over South Asia**

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Due to the underlying dynamics of atmospheric circulations and varied topography, precipitation during monsoon over the Indian subcontinent tends to occur in form of enormously complex spatiotemporal patterns. Employing methods from nonlinear time series analysis we studied the spatial structures of the rainfall field during the summer monsoon and identified the principle regions where the dynamics of monsoonal rainfall is more coherent or homogeneous and also, we estimated the time delay patterns of rain events. We have applied our method on two separate high resolution gridded data sets of daily rainfall covering the Indian subcontinent. Using the method of event synchronization, we have estimated the regions where heavy rain events during monsoon happen in some lag synchronized form. Active (Break) phase of monsoon is characterised by increase(decrease) of rainfall over certain regions of Indian subcontinent. We propose that our method is able to identify regions of such coherent rainfall activity. Further using the delay behaviour of rainfall events we estimate the directionalities involved in the progress of major rainfall events. We have been able to show that these directions are very similar to wind directions during these type of rainfall events. Employing the same method on a high resolution TRMM rainfall data we also show the path ways of precipitation over the Himalayas during different seasons.