Identification of permanent and changeable components in the network of extreme rainfalls over the Indian peninsula.

Liubov Tupikina (1,2), Veronika Stolbova (1,2), Jürgen Kurths (1,2,3)

(1) Potsdam Institute for Climate Impact Research , Potsdam, Germany, (2) Department of Physics, Humboldt University, Berlin, Germany, (3) University of Aberdeen, Aberdeen AB24 3FX, United Kingdom

The Indian monsoon is one of the active components of the global climate system in the tropics. We apply the complex network approach to understand the impact of monsoon on climate network of precipitation over India. The purpose of our work was to distinguish permanent patterns in the network of extreme rainfall of Indian peninsula and patterns that are changing due to monsoon influence.

We considered three time periods: pre-monsoon, summer monsoon and winter monsoon. The extreme rainfall network (90% quantile) over India was constructed for each of three periods. A comparison of adjacency matrices of networks exhibited common structures in networks of Indian summer monsoon, winter monsoon and period before summer monsoon. We showed that common features of these networks are high degree centrality, high betweenness centrality and low clustering coefficient in the Himalayas, the Tibetan plateau and North Pakistan. The network properties of the common component of the three networks are similar to properties of the pre-monsoon network. This allows us to suggest that these common structures are caused by permanent properties of the underlying system such as topography, geography and other factors. We removed the common components from each of the networks and obtained changing components for each network which showed the formation of new clusters with high clustering coefficient in the Tibet plateau, the central part of India, the Southern part of India and Sri Lanka during Summer Monsoon. The Winter monsoon period is characterized by high degree centrality in the Eastern part of the Himalayas, and high clustering coefficient in the North-Eastern part of the Indian peninsula. This result allows us to suggest that the changing patterns are caused by seasonal factors and, in particular, monsoonal activity.