



Using multi-layer complex networks to understand interrelationships and changes in extreme flood generation

Matthias Kemter (1,2,3), Bruno Merz (2), and Norbert Marwan (3)

(1) Institute of Environmental Science and Geography, University of Potsdam, Potsdam, Germany (kemter@uni-potsdam.de), (2) German Research Centre for Geosciences, Potsdam, Germany (bmerz@gfz-potsdam.de), (3) Potsdam Institute for Climate Impact Research, Potsdam, Germany (marwan@pik-potsdam.de)

The generation of extreme flood events is influenced by a multitude of parameters that interact in complex ways. To understand their temporal and spatial relationships as well as changes in this system we need adequate tools. We therefore use multilayer complex networks and extreme event statistics to discover and interpret relationships between flood influencing parameters (e.g. precipitation, catchment wetness, discharge). Complex networks have formerly been successfully used for climatic and hydrological representations. A multilayer approach enables us to find inter-relationships between the different influences. We use non-linear similarity measures to generate the network connections. By analysis of variations of the network appearance and metrics with time, we can reconstruct temporal changes in the underlying processes. We are investigating several hundred river gauges across Europe over a timeframe of 70 years.