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Network of Networks and the Climate System

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Network of networks is a new direction in complex systems science. One can find such networks in various fields, such as infrastructure (power grids etc.), human brain or Earth system. Basic properties and new characteristics, such as cross-degree, or cross-betweenness will be discussed. This allows us to quantify the structural role of single vertices or whole sub-networks with respect to the interaction of a pair of subnetworks on local, mesoscopic, and global topological scales.
Next, we consider an inverse problem: Is there a backbone-like structure underlying the climate system? For this we propose a method to reconstruct and analyze a complex network from data generated by a spatio-temporal dynamical system. This technique is then applied to 3-dimensional data of the climate system. We interpret different heights in the atmosphere as different networks and the whole as a network of networks. This approach enables us to uncover relations to global circulation patterns in oceans and atmosphere. The global scale view on climate networks offers promising new perspectives for detecting dynamical structures based on nonlinear physical processes in the climate system.
This concept is applied to Indian Monsoon data in order to characterize the regional occurrence of strong rain events and its impact on predictability.

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