



## **Structural Interrelationships between Evaporation and Precipitation: Application of Complex Networks to Satellite based Fields**

Irina Petrova (1), Alexander Löw (1), and Jürgen Kurths (2)

(1) Max-Planck Institute for Meteorology, Hamburg, Germany (irina.petrova@zmaw.de, 040 41173148), (2) Potsdam Institute for Climate Impact Research, Potsdam, Germany

Constantly growing amount of scientific questions and tasks demands exploitation of new analytical and interpretational strategies. The novel method of complex climate networks (CCN) opened new perspectives in climate research through its idea of decomposition a system of interactions to simpler structural dependencies.

Application of the CCN method to satellite and model based evaporation (E) and precipitation (P) fields in the study was aimed to answer three global questions: What are the structural properties of satellite based E and P fields at monthly and annual time scales and what do they represent? What is the system of interactions between E and P over the ocean and how stable they are with time? How biases in model simulated parameters of E and P are mirrored in their network structure, thus addressing the question of model evaluation using the method of CCN?

To construct single and coupled networks 13- year time-series (1992-2005) of E and P was retrieved from the Hamburg Ocean Atmosphere Parameters and Fluxes from Satellite Data (HOAPS-3) data set and the Earth System Model of the Max-Planck-Institute for Meteorology (MPI-ESM), conducted in the frame of the Coupled Model Intercomparison Project Phase 5 (CMIP5). Two experimental setups of the MPI-ESM using either a full coupled climate model (ocean, atmosphere, land) or prescribed sea surface temperature fields (atmosphere, land only) were utilized.

Analyzed topology of single and coupled E and P networks revealed most prominent ENSO and NAO driven (co-) variability areas over the global and North Atlantic domains correspondingly. Identified topological features, and especially in the (cros-)degree measure, showed high correlation to the first mode of the EOF (single) and SVD (coupled) analysis.

Comparison to the MPI-ESM based E and P networks demonstrated higher similarity to the fully coupled experiment based networks. Single and coupled networks of the latter quite well reproduced ENSO and NAO teleconnections correspondingly. This emphasizes again the importance of improvement of simulation responses of SST to related parameters as well as other coupled dynamical feedbacks.