



Structural Interrelationships in the Evaporation-Precipitation Satellite-based Fields: Application of Complex Networks

I. Petrova (1,2), A. Loew (1), C. Klepp (1,2)

(1) Max Planck Institute for Meteorology, Land Department, Hamburg, Germany (irina.petrova@zmaw.de), (2)
Meteorological Institute, KlimaCampus, University of Hamburg, Hamburg, Germany

Complex Networks have been recently successfully applied to problems in climate science. They have been used as an alternative tool to reveal persistent structural features in the climate system based on observed and model simulated fields of temperature, humidity and others. Networks provide information on the topology, dynamics and stability characteristic properties in the climate system and help to identify regions with important teleconnection features.

The present paper uses climate networks to analyze precipitation-evaporation observational fields from the combined Hamburg Ocean Atmosphere Parameters and fluxes from Satellite data (HOAPS-3) and Global Precipitation Climatology Center (GPCC) products. To investigate dynamical and structural features, and identify physical properties within the studied climate networks the 13-year monthly mean time-series (1992-2005) of evaporation over the ocean and global precipitation were used to construct single and coupled network fields. Spearman rank correlation coefficient at zero lag was used as a network similarity criterion.

By using local and global measures such as centralities and link distance the non-local spatial linkages to the main teleconnection patterns, like NAO and ENSO within the single evaporation/ precipitation networks were resembled and analyzed. The North Atlantic source-receptor relationship was revealed by studying coupled evaporation-precipitation networks. Finally, comparison of network topology obtained with the model data based networks from the Earth System Model of the Max-Planck-Institute for Meteorology (ESM-MPI), conducted in the framework of the Coupled Model Intercomparison Project Phase 5 (CMIP5) was performed.