Geophysical Research Abstracts
Vol. 16, EGU2014-2217, 2014
EGU General Assembly 2014

Flow networks for time dependent velocity fields

Nora Molkenthin (1,2), Liubov Tupikina (1,2), Jürgen Kurths (1,2)

(1) Potsdam Institute for Climate Impact Research, Potsdam, Germany, (2) Humboldt Universität Berlin, Germany

By providing an insight into large scale topological features of a highly complex system, climate networks have been shown to be a useful tool in the nonlinear analysis of climate data. However, their interpretation and connection to the underlying physical system is still lacking. This study is an attempt to close that gap by comparing climate networks to networks created from a simple model. By discretizing the advection-diffusion-equation we obtain a linear equation for the temporal evolution.

Using this, the covariance matrix is defined as the sum over n time steps over tensor products of coeval temperature realizations with zero mean.

This allows us to analytically construct flow networks not only from deterministic, static flows, but also from time-dependent flows, situations incorporating noise, artificial common drivers and even interacting layers of flows. We apply the method to a meandering flow as it can be found in many ocean currents and analyze the resulting networks using common network measures in their weighted and unweighted form. The aim is to develop methods by which all of those different regimes can be classified correctly from the topology of the resulting network. Such network measures would help to interpret climate networks from data and categorize regions in terms of different physical regimes.