Geophysical Research Abstracts
Vol. 14, EGU2012-11242, 2012
EGU General Assembly 2012

Deciphering scale-dependencies and trend changes in hydrological time series using Bayesian inversion

N. Schütz, N. Makarava, and M. Holschneider
Focus Area for the Dynamics of Complex Systems (DYCOS), Universität Potsdam

Climatic and hydrological signals are governed by internal or external forcing and, moreover, intrinsic variability on multiple temporal and spatial scales. To include the information incorporated by the noise of a signal, we introduce a confined Bayesian algorithm to investigate dependency patterns and transition regimes in hydrological time series.

Our algorithm combines two Bayesian inversion techniques based on linear mixed models. Thus we are able to infer on the one hand on transition events in time series and on the other hand on dependency patterns based on a fractional Gaussian noise process.

The change point algorithm may estimate multiple singularities in the mean and variability of a time series, meanwhile characterizing the local structure of the transition events. By formulating the singularity in terms of a linear mixed model for a kernel based approach, we are able to considerably speed up the parametric computational process.

To quantify dependency patterns in a time series, we assume a fractional Gaussian noise process with trend as an acceptable simulation of a hydrological data set. The Hurst exponent, as a hyperparameter of a fractional Gaussian process, depicts a measure for the intensity of self-similarity and enables us to investigate dependency patterns. Furthermore we simulate a time series with a temporally evolving Hurst parameter, such that we take previous sub-series of the signal into account.

We will present our confined algorithm separately and its joint performance on artificial time series. Moreover, we show preliminary results on hydrological data sets such as the Nile river flux. We also discuss the ability of our method to decipher dependency structures and correlation patterns parametrized by different Hurst exponents.