Geophysical Research Abstracts
Vol. 14, EGU2012-14115, 2012
EGU General Assembly 2012

The hunt for deterministic structures in noisy hydrological data

H Lange
Norwegian Forest and Landscape Institute, Postboks 115, N-1431 Ås, Norway

We calculate entropy and complexity of runoff time series and artificially generated series with long-range correlations. Entropy and complexity of data series may be represented against each other in a two-dimensional diagram which we will refer to as Complexity-Entropy Causality Plane, or CECP. We use a recently developed framework for these two indicators based on order statistics. It is well-known that runoff, as all other environmental time series actually measured, is a mixture of deterministic (signal) and stochastic (noise) parts, the latter due to noise inherent in the measurement process and externally induced by natural processes. The distinction between signal and noise is notoriously difficult and subject to much debate. In our approach, the observed series are compared to purely stochastic but long-range correlated processes, the k noise, where k is a parameter determining the strength of the correlations. Although these processes resemble runoff series in their correlation behavior and may be even tuned to any runoff series by changing the value of k, the CECP locations and in particular the order pattern statistics reveals qualitative differences between runoff and k noise. We use these differences to conclude on the deterministic nature of the (short-term) dynamics of the runoff time series. The proposed methodology also represents a stringent test bed for hydrological models.