Geophysical Research Abstracts
Vol. 13, EGU2011-4528, 2011
EGU General Assembly 2011

Linear and nonlinear similarity measures for networks from irregularly sampled data

Kira Rehfeld (1,2), Norbert Marwan (1), Jonathan F. Donges (1,2), Jürgen Kurths (1,2)

(1) Potsdam-Institute for Climate Impact Research, Transdisciplinary Concepts & Methods, Potsdam, Germany (rehfeld@pik-potsdam.de), (2) Department of Physics, Humboldt University Berlin, Newtonstr. 15, 12489 Berlin, Germany

Paleo records from proxy archives present the opportunity to study past climate and its changes. Owing to different archive properties, reconstructed observation times are not spaced at regular intervals and are prone to errors. Their automated and objective joint analysis and intercomparison is still of much interest due to the large number of proxy records available.

Standard linear and nonlinear similarity measures require regular sampling times and their application makes interpolation prior to analysis necessary. Interpolation introduces additional bias, especially for the high-frequency components.

Using a kernel-based correlation approach, we circumvent the need for interpolation and use the information that the time series offer at the different time scales directly.

In a benchmark test we compare the correlative patterns and network measures obtained from standard approach and kernel-based results. We illustrate robustness and reliability of the new method using synthetic time series of known inter-sampling time distributions similar to those found in reality and show that the results we obtain from paleo records show the same characteristics.

We find that the kernel-based approach offers a reliable and safe method to estimate linear and nonlinear correlation properties and that based on this we can construct complex networks representing similarity relationships between paleo records.