



Complex network approach for recurrence analysis of time series

Norbert Marwan (1), Jonathan Donges (1,2), Yong Zou (1), Reik Donner (1,3,4), Jürgen Kurths (1,2)

(1) Potsdam Institute for Climate Impact Research, Transdisciplinary Concepts and Methods, Potsdam, Germany (marwan@pik-potsdam.de, 0331/ 288 2640), (2) Department of Physics, Humboldt University Berlin, Germany, (3) Max Planck Institute for Physics of Complex Systems, Dresden, Germany, (4) Institute for Transport and Economics, Dresden University of Technology, Germany

We propose a novel approach for analysing time series using complex network theory. We identify the recurrence matrix (calculated from time series) with the adjacency matrix of a complex network and apply measures for the characterisation of complex networks to this recurrence matrix. We illustrate similarities and differences between the recurrence quantification analysis and the complex network analysis. By using the logistic map, we demonstrate the potential of the complex network measures for the detection of dynamical transitions. Finally, we apply the proposed approach to a marine palaeo-climate record and identify the subtle changes to the climate regime.