



A significance test for a recurrence based transition analysis

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The recurrence of states is a fundamental behaviour of dynamical systems. A modern technique of nonlinear data analysis, the recurrence plot, visualises and analyses the recurrence structure and allows us to detect transitions in the system's dynamics by using recurrence quantification analysis (RQA). In the last decade, the RQA has become popular in many scientific fields. However, a sufficient significance test was not yet developed.

We propose a statistical test for the RQA which is based on bootstrapping of characteristic small scale structures in the recurrence plot. Using this test we can present significance levels for the detected transitions and, hence, get a more reliable result. We demonstrate the new technique on marine dust records from the Atlantic which were used to infer climate changes in Africa for the last 4 Ma.