



Can nonlinear data analysis help to understand climate changes in Asia during the Holocene?

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Speleothems offer archives of climatic variability in the past. We analyse isotope records of stalagmites from several caves at rather different locations in Asia. These records are proxies for the rainfall variability at these locations and cover a time range between about 2 and 5 kyr. At these locations, the influences of the Intertropical Convergence Zone (ITCZ) and, hence, the summer and winter monsoon are rather different.

Recurrence is a fundamental property of dynamical systems. Recurrence plots are modern methods of nonlinear data analysis and allows us to study the recurrence behaviour in processes. A statistical analysis of recurrence plots can uncover hidden transitions in data series, which are not obvious using linear statistical methods.

The analyses of the recurrence structure of the isotope records of the stalagmites reveals transitions at the same times, although the data series themselves do not correlate. This result suggests that at these times the entire monsoon system underwent changes which are visible in the isotope records despite the different reaction of the local rainfall on the summer and winter monsoon.