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Employing nonlinear similarities to identify distinct dynamical regimes in short palaeo records

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We present an intriguing new technique based on nonlinear similarities to detect regimes and states of distinct dynamical complexity in a short time series. We provide detailed tests and verification of the new approach on several numerical models by uncovering their bifurcation structures. We also provide comparison of the presented technique with existing traditional measures like Lyapunov exponent.
Further, we apply the method to identify abrupt dynamical changes and transitions in several different palaeo records. Most significant being the pelistocene record of Asian Monsoon, where we found that monsoonal system almost linearly responded to solar insolation. But this response can be disrupted by internal forcing on monsoonal dynamics, i.e. the glaciation cycles of the Northern Hemisphere and the onset of certain oceanic circulations. A statistical test is developed to estimate the significance of the identified transitions.