



Recurrence quantification analysis in maximum monthly precipitation based on atmospheric circulation

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The goal of this research is to reveal the complex non-stationary precipitation patterns via the analysis of the recurrent behaviour in the maximum monthly precipitation time series conditioned on atmospheric circulation over the mountainous Mesochora catchment in Central-Western Greece. The precipitation was modelled as a stochastic process coupled with atmospheric circulation. An automated objective classification of daily patterns (CPs) based on optimized fuzzy rules was also used to classify the observed CPs. From the so resulted daily precipitation we calculated the daily maximum precipitation in each month. The analysis of the recurrent behaviour of sequential precipitation patterns based on the Recurrence Quantification (Zbilut and Webber, 1992) has pointed out time periods of non-linear deterministic behaviour, as well as time periods of stochasticity in their temporal evolution. Interestingly, along with the piece-wise nonlinear deterministic behaviour a variable laminar behaviour was also identified. The joint observation of nonlinear determinism and variable laminar behaviour is indicative of possible chaos-to-chaos transitions.