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Revisiting long-range dependence in annual precipitation

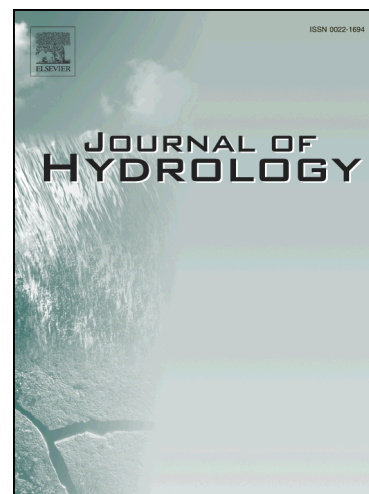
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Revisiting long-range dependence in annual precipitation

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Abstract

Long-range dependence (LRD), the so-called Hurst-Kolmogorov behaviour, is considered to be an intrinsic characteristic of most natural processes. This behaviour manifests itself by the prevalence of slowly decaying autocorrelation function and questions the Markov assumption, often habitually employed in time series analysis. Herein, we investigate the dependence structure of annual rainfall using a large set, comprising more than a thousand stations worldwide of length 100 years or more, as well as a smaller number of paleoclimatic reconstructions covering the last 12 000 years. Our findings suggest weak long-term persistence for instrumental data (average $H = 0.59$), which becomes stronger with scale, i.e. in the paleoclimatic reconstructions (average $H = 0.75$).

Keywords: Long-range dependence, Hurst behaviour, long-term persistence, rainfall variability, precipitation reconstructions, proxy records

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