A probabilistic index based on a two-state process to quantify clustering of rainfall extremes

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Long term persistence, also known as Hurst-Kolmogorov (HK) behavior, is an intrinsic property of various geophysical processes, resulting among others in the temporal clustering of extremes. In the rainfall process, the latter signifies a pronounced clustering of wet and/or dry periods. While several indexes of clustering exist, attempts to quantitatively relate clustering behavior to HK dynamics have been in general limited. We devise a simple metric based on a two-state process (inspired by the probability-dry concept of the rainfall process) across different temporal scales which fully describes the multi-scale clustering behavior of extremes and links it to the persistence magnitude of the parent process. We test the index on real-world long rainfall series and provide analytical equations for various combinations of persistence magnitude and distribution type of the extremes generating process.