



## **Normal, rare or extreme? A recurrence-based technique for the detection of genuine extremes**

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We analyze several outputs of model simulations and instrumental records of temperatures at different locations by using new techniques originally developed for the analysis of extreme values of dynamical systems. We show that they have the same recurrence time statistics as a chaotic dynamical system perturbed with dynamical noise and by instrument errors. The technique provides a criterion to discriminate whether the recurrence of a certain temperature belongs to the normal variability or can be considered as a genuine extreme event with respect to a specific timescale fixed as parameter. The method gives a self-consistent estimation of the convergence of the statistics of recurrences toward the theoretical extreme value laws. We focus on Millennium simulations using data from CMIP5 (Coupled Model Intercomparison Project phase 5) and a couple of IPSL simulations with different climate forcings in order to assess how models simulate the extreme events in the recent past.