Data-driven prediction of thresholded time series of rainfall and self-organized criticality models

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We study the occurrence of events, subject to threshold, in a representative self-organized criticality (SOC) sandpile model and in high-resolution rainfall data. The predictability in both systems is analyzed by means of a decision variable sensitive to event clustering, and the quality of the predictions is evaluated by the receiver operating characteristic (ROC) method. In the case of the SOC sandpile model, the scaling of quiet-time distributions with increasing threshold leads to increased predictability of extreme events. A scaling theory allows us to understand all the details of the prediction procedure and to extrapolate the shape of the ROC curves for the most extreme events. For rainfall data, the quiet-time distributions do not scale for high thresholds, which means that the corresponding ROC curves cannot be straightforwardly related to those for lower thresholds. In this way, ROC curves are useful for highlighting differences in predictability of extreme events between toy models and real-world phenomena.

References

Anna Deluca, Nicholas R. Moloney, and Alvaro Corral, Physical Review E 91, 052808 (2015)