Short-Term Prediction of Medium- and Large-Size Earthquakes Based on Markov and Extended Self-Similarity Analysis of Seismic Data

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We propose a novel method for analyzing precursory seismic data before an earthquake that treats them as a Markov process and distinguishes the background noise from real fluctuations due to an earthquake. A short time (on the order of several hours) before an earthquake the Markov time scale t_M increases sharply, hence providing an alarm for an impending earthquake. To distinguish a false alarm from a reliable one, we compute a second quantity, T1, based on the concept of extended self-similarity of the data. T1 also changes strongly before an earthquake occurs. An alarm is accepted if both tM and T1 indicate it simultaneously. Calibrating the method with the data for one region provides a tool for predicting an impending earthquake within that region.