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Title: The possible impact of foreshocks and aftershocks on the earthquake dynamics in Northeast India: A Non-linear forecasting approach

Abstract:

RESUBMISSION For more than two decades, the concept of fractals increasingly been applied in geophysics. The study of fractals plays ar important role in studying the underlying dynamics of a system. Grassberger-Procaccia (G-P) method has been invariably used to mea the dimension of dynamical time series and thereby their dynamic ch However, the identification of fractal dimension and/or chaotic behavi G-P algorithm suffers from at least two main drawbacks: (1) detectin chaotic or fractal behavior using the G-P algorithm requires large num data points which is often not available in many cases; (2) even if en data is available a finite attractor dimension may not be actually indic deterministic chaos due to low signal to noise (N/R) ratio. In order to overcome the above problems, modern nonlinear dynamical system t has provided a novel perspective for quantifying the stability and predictability behavior of earthquake processes. The method of mode forecasting time series analysis is based on the concepts of nonlinear dynamical system theory and has gained wide acceptance for detecti distinguishing chaos/random fractals more accurately even with short series. Understanding the possible influence of fore and after shocks i essential for modeling complex earthquake dynamics. The Northeaste (NEI) region is seismo-tectonically one of the most active and comple regions of the world. Here in the present study, we employ a nonlinea forecasting approach to analyze time series of monthly earthquake fr from NEI region (20-28 °N and 88-98 °E) covering a time window o 1988. The non-linear predictive analyses reveal that the earthquake dynamics in this region is stochastic/high dimensional chaotic in natu order to assess the impact of foreshocks and aftershocks on the dyna behavior of earthquake process, we have also analyzed the data set removing appropriately foreshocks and aftershocks. However, the nor forecasting analyses of earthquake time series after removing fore ar shocks reveal better determinism. We suggest that such a complex hi dimensional earthquake behavior may be indicative of heterogeneous geological structures in which weak fault zones and/or individual fault interactions might have strength fluctuations due to pore pressure va The result may have insignificant implication for modeling the dynam earthquake process in this particular region and thereby place constra the criteria for testing the models of Northeast earthquake on a more