

Statistical Physics Model of Seismic Activation Preceding a Major Earthquake

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Abstract : Starting from earthquake fault dynamic equations, a correspondence between earthquake occurrence statistics in a seismic region before a major earthquake and eigenvalue statistics of a differential operator whose bound state eigenfunctions characterize the distribution of stress in the seismic region is derived. Modeling these eigenvalue statistics with a 2D Coulomb gas statistical physics model, previously reported deviation of seismic activation earthquake occurrence statistics from Gutenberg-Richter statistics in time intervals preceding the major earthquake is derived. It also explains how statistical physics modeling predicts a finite-dimensional nonlinear dynamic system that describes real-time velocity model evolution in the region undergoing seismic activation and how this prediction can be tested experimentally.

Keywords : seismic activation, statistical physics, geodynamics, signal processing

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