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Test of Strain Behavior Model with Radon Anomaly in Seismogenic Area: A Bayesian Melding Approach

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ABSTRACT

Mathematical models in seismo-geochemical monitoring offer powerful tools for the study and exploration of complex dynamics associated with discharge of radon as the indicator of change of intense-deformed conditions of seismogenic layers or blocks within the lithosphere. Seismic precursory model of radon gas emanation in the process of earthquake prediction research aims to find out the distinct anomaly variation necessary to correlate radon gas with processes of preparation and realization of tectonic earthquakes in long-term and short-term forecasts tectonic earthquakes. The study involves a radon gas volume analytic model to find the correlation of radon fluctuations to stress drop under compression and dilatation strain condition. Here, we present a mathematical inference by observing radon gas emanation prior to the occurrence of earthquake that may reduce the uncertainties in models and updating their probability distributions in a Bayesian deterministic model. Using Bayesian melding theorem, we implement an inferential framework to understand the process of preparation of tectonic earthquake and concurrent occurrence of radon discharge during a tectonic earthquake phenomena. Bayesian melding for deterministic simulation models was augmented to make use of prior knowledge on correlations between model inputs. The background porosity is used as a priori information for analyzing the block subjected to inelastic strain. It can be inferred that use of probabilistic framework involving exhalation of radon may provide a scenario of earthquake occurrences on recession of the curve that represents a qualitative pattern of radon activity concentration drop, indicating associated stress change within the causative seismogenic fault. Using evidence analysis, we propose a joint conditional probability framework model simulation to understand how a single fracture may be affected in response to an external load and radon anomaly change that can be used to detect the slip, a predictable nature of the causative fault in the subsurface rock.

KEYWORDS

Radon; Deterministic Model; Probability Distribution; Strain, Bayesian Melding; Seismogenic Layer; Earthquake Prediction

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