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Possibility of Forecasting Aftershock Distributions from Stress Change: A Case Study of Inland Taiwan Earthquakes

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ABSTRACT

Spatial heterogeneous slip dislocation models from seismic waveform inversions of several moderate to large earthquakes in the past decade in the Taiwan area are used to calculate stress transfer conditions associated with aftershock distributions. Regardless of the possibility of aftershocks along different fault planes to the mainshock, stress change calculations for optimum orientation planes after the mainshock show a great degree of consistency in positive stress change to aftershock distribution. Toward the possibility of forecasting aftershock distributions from stress changes due to the mainshock, we considered homogeneous fault models on the basis of earthquake scaling law to produce rapid stress change calculations. Stress changes from homogeneous and heterogeneous fault models show similar patterns. They both show good correlation with aftershock distributions, even for the complex fault rupture of the 1999 Chi-Chi, Taiwan, earthquake. Our results, thus, support the possibility of forecasting aftershock distributions using mainshock stress changes. Once the location, magnitude and focal mechanism of an earthquake become available, stress change calculations can be carried out to forecast aftershock distribution for earthquake hazard mitigation.

(Key words: Coulomb stress change, Scaling law, Da-Pu earthquake, Nan-Ao earthquake, Ruey-Li earthquake, Chi-Chi earthquake, Chia-Yi earthquake)

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