

Analysis of Induced seismicity after the 2011 Tohoku-Oki earthquake by non-stationary ETAS models

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The epidemic-type aftershock sequence (ETAS) model is a stationary point process, and provides a good fit to an ordinary seismic activity. Its poor fitting suggests that the earthquake mechanisms are affected by changes in geophysical factors. Fault strength is one of the fundamental factors in a seismogenic zone, and its temporal change can induce nonstationary seismicity. Although changes in fault strength have been suggested to explain various phenomena, such as the remote triggering of seismicity, there has been almost no means of quantitatively monitoring this property in situ. For this purpose, we extend the ETAS model for non-stationary cases. This allows the parameters to be time-variant, which then describes anomalous features of the seismic activity. We prepare Bayesian models, and apply them to the data from inland seismic swarm activities that have been induced by the 2011 Tohoku-Oki earthquake of M9.0.

Keywords: ETAS model, non-stationary model, Bayesian smoothing, Tohoku-oki earthquake, pore fluid pressure