

Estimating earthquake swarms in volcanic regions

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In the eastern Izu region, earthquake swarms have occurred repeatedly since 1978. These events are known to be triggered by magma intrusions, and the amount of magma intrusion is correlated with volumetric strain of the crust. We show the background seismicity rate is highly correlated with the volumetric strain in this region, with a short time delay. We then discuss the possibility to forecast the seismicity in volcanic regions.

To calculate the background seismicity rate, we used the epidemic-type aftershock sequence (ETAS) model extended for application to nonstationary seismic activity, introduced by Kumazawa & Ogata (2013). The time-dependent rates of both background seismicity and aftershock productivity in the ETAS model are optimally estimated from hypocenter data by Bayesian smoothing method. These rates can provide quantitative evidence for abrupt or gradual changes in shear stress and/or fault strength due to aseismic transient causes such as triggering by remote earthquakes, slow slips, or fluid intrusions within the region.

Keywords: ETAS model, Bayesian smoothing, earthquake swarm, volcanic region, Izu