

# Foreshock seismicity on the frictionally heterogeneous fault

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## Abstract:

The activation of small earthquakes is sometimes observed before a large earthquake, but sometimes not. The precursory seismicity is often attributed to the nucleation process of the mainshock. In order to generate small precursory events in the rupture area of the mainshock, some heterogeneity or hierarchical nature of the fault plane is required. This study considers the heterogeneity of frictional parameters of rate-and-state dependent friction law on the fault. This idea is motivated by the recent geological observations and modelling in the field of slow earthquake. We set many velocity-weakening zones and velocity-strengthening zones alternatively on a finite linear fault in the 2D elastic medium. In this model, mainshocks rupturing the entire fault and smaller events between mainshocks are simulated. Smaller events are sometimes accelerated before the mainshock. However, the activeness of precursory seismicity is dependent on the frictional heterogeneity, which may explain variations of the precursory seismicity in the nature.