

Statistical investigation of spatio-temporal densities of foreshocks to understand earthquake predictability

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The relation between the size of earthquake preparation zone and the magnitude of forthcoming earthquake is different between nucleation and domino-like cascade models. The former model indicates that the magnitude is predictable before the mainshock of the earthquake, because the preparation zone is proportional to the rupture area. On the other hand, the latter indicates that the magnitude is unpredictable, because the rupture consisting of sequence of tiny earthquakes is unknown to terminate. Since this issue is still controversial, we would like to verify the two models using the methodology proposed by Lippiello et al. (Scientific reports, 2012). In the analysis, spatial occurrence rates of the foreshock and the aftershock are statistically compared. The results show that both the rates are similar and the distribution of the rates versus the epicentral distance depends on the magnitude of the mainshock. From the interpretation of these results, the nucleation model seems reliable.

Keywords: Earthquake, Foreshock, Mainshock