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Exponential earthquake productivity law

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Mechanisms of stress transfer and probabilistic models have been widely investigated to explain earthquake clustering features. However, these approaches are still far from being able to link individual events and to determine the number of earthquakes caused by a single event. An alternative approach based on proximity functions allows to generate hierarchical clustering trees and to identify pairs of nearest-neighbours between consecutive levels of hierarchy. Then, the productivity of an earthquake is the number of events of the next level to which it is linked. To account for scale invariance in the triggering process we use a relative magnitude threshold ΔM . Recently it was shown that the relative productivity attached to each event is a random variable that follows an exponential distribution. The exponential rate of this distribution does not depend on the magnitude of triggering events and systematically decreases with depth. Here we test a hypothesis that this stochastic property of the earthquake productivity is a consequence of high spatial heterogeneity of the background event rates. The study was supported by Russian Science Foundation, project no. 20-17-00180.