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Comparison of ETAS parameter estimates across different global tectonic zones

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Branching point process models such as the ETAS (Epidemic-Type Aftershock Sequence) models introduced by Ogata (1988, 1998) are often used in the description, characterization, simulation, and declustering of modern earthquake catalogs. The present work investigates how the parameters in these models vary across different tectonic zones. After considering divisions of the surface of the Earth into several zones based on the plate boundary model of Bird (2003), ETAS models are fit to the occurrence times and locations of shallow earthquakes within each zone. Computationally, the EM-type algorithm of Veen and Schoenberg (2008) is employed for the purpose of model fitting. The fits and variations in parameter estimates for distinct zones are compared. Seismological explanations for the differences between the parameter estimates for the various zones are considered, and implications for seismic hazard estimation and earthquake forecasting are discussed.

Keywords: branching process, earthquake, epidemic-type aftershock sequence model, space-time point process model, maximum likelihood, global earthquake prediction