SPACE-TIME POINT-PROCESS MODELS FOR EARTHQUAKE OCCURRENCES

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Abstract. Several space-time statistical models are constructed based on both classical empirical studies of clustering and some more speculative hypotheses. Then we discuss the discrimination between models incorporating contrasting assumptions concerning the form of the space-time clusters. We also examine further practical extensions of the model to situations where the background seismicity is spatially non-homogeneous, and the clusters are non-isotropic. The goodness-of-fit of the models, as measured by AIC values, is discussed for two high quality data sets, in different tectonic regions. AIC also allows the details of the clustering structure in space to be clarified. A simulation algorithm for the models is provided, and used to confirm the numerical accuracy of the likelihood calculations. The simulated data sets show the similar spatial distributions to the real ones, but differ from them in some features of space-time clustering. These differences may provide useful indicators of directions for further study.

Key words and phrases: Centroid of aftershock epicenters, ETAS model, inverse power laws, maximum likelihood estimates, magnitude based clustering (MBC) algorithm, modified Omori formula, thinning simulation.