Long-term probability earthquake forecasts based on the ETAS model

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Based on the ETAS (epidemic-type aftershock sequence) model,
which is used for describing the features of short-term clustering of earthquake occurrence, this paper presents some theories and techniques related to evaluating the probability distribution of the maximum magnitude in a given space-time window, where the Gutenberg-Richter law for earthquake magnitude distribution cannot be directly applied. It is seen that the distribution of the maximum magnitude in a given space-time volume is determined in the long-term by the background seismicity rate and the magnitude distribution of the largest events in each earthquake cluster. The techniques introduced were applied to the seismicity in the Italy and Southern California regions.

Figure: Spatial variations of the ETAS parameters in the Italy region.