

## Long-term earthquake forecasts based on the ETAS model for short-term clustering

ZHUANG, Jiancang<sup>1\*</sup>

<sup>1</sup>Institute of Statistical Mathematics

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 applied directly. It is shown that the distribution of the maximum magnitude in a given space-time volume in long term is determined by the background seismicity rate, the magnitude distribution for all earthquakes, and the structure of earthquake clusters. The introduced techniques were applied to the seismicity in the Japan region in the period from 1926 to 2009. It is found that the regions most likely to have great earthquakes are along the Tohoku (Northeastern Japan) Arc and the Kuril Arc, both much higher probabilities than the offshore Nankai and Tokai regions.

Keywords: ETAS model, background seismicity, long term earthquake forecast, earthquake probability

