

## Spatial Variation on Recurrence-time Distribution of Paleearthquakes and Its Influence for Long-term Forecast

NOMURA, Shunichi<sup>1\*</sup> ; OGATA, Yosihiko<sup>2</sup>

<sup>1</sup>Graduate School of Information and Engineering, Tokyo Institute of Technology, <sup>2</sup>The Institute of Statistical Mathematics

The Earthquake Research Committee (ERC) of Japan performs and publishes the long-term forecast of major paleoearthquakes in Japan. The ERC adopts renewal processes assuming that the recurrence intervals of paleoearthquakes are independently and identically distributed as the BPT (Brownian Passage Time) distribution. When applying this model, we need to estimate the mean and coefficient of variation (CV) on recurrence times. The estimation error in CV occasionally affect so much on the long-term forecast. However, while the mean parameter can be estimated with a certain precision from only the number and approximate ages of historical activities, the estimates of CV parameter have quite large errors without plentiful and accurate data. So the ERC assumes a common estimate for all active faults in Japan to ensure a certain reliability for the estimate. But as the historical paleoseismic data are accumulated by investigations, some active faults show significantly large variation in recurrence times.

Renewal processes with the BPT distribution are based on a physical model that assumes a cyclic mechanism where stress on a fault surface is accumulated by tectonic forces until an earthquake occurs that releases the accumulated stress to a basal level. In this model, the mean recurrence time represents the rate of stress accumulation by tectonic motion and the CV implies the strength of stress perturbation caused by nearby seismicity. Therefore, these parameters are supposed to have regional trends as seen in the analysis of Nomura et al. (2011). In our study, we estimate the spatial variation of these parameters on the BPT distribution in Japan and apply it to the long-term forecast on the active faults with very few historical data. In addition, we compare our forecast with the forecast by the ERC to discuss the influence of parameter estimation on earthquake prediction.

Keywords: long-term forecast, BPT distribution, renewal process, coefficient of variation, spatial model