

Comments on a Bayesian approach to earthquake probabilities of the Poisson model

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In making national seismic hazard maps for Japan, earthquake probabilities are estimated based on past seismicity with the Brownian passage time model and the Poisson process model. With a small number of past earthquakes, unreliable model parameters produce large uncertainties of estimated values. In the present paper, we discuss a Bayesian approach to the problem for the Poisson model. When n earthquakes were observed in period T_0 , a Bayesian approach gives the probability that m earthquakes are observed in period T_1 in the form of a binomial distribution. We compared Bayesian probabilities with those obtained by the maximum likelihood estimate (MLE) for n less than 5 and found the following significant differences between them. 1) When T_1 is the average interval of the past earthquakes, Bayesian probabilities of at least one earthquake increase 3 to 12% over those of MLE. 2) For a somewhat smaller T_1 than that in 1), the differences become larger. The Bayesian approach presented here could be tested by a simulation study.

Keywords: Earthquake probability, Poisson model, Bayesian statistics, Seismic hazard maps for Japan, Kanto