

A Joint Modeling Approach for Spatial Earthquake Risk Variations

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Abstract

Modeling spatial patterns and processes to assess the spatial variations of data over a study region is an important issue in many fields. In this paper, we focus on investigating the spatial variations of earthquake risks after a main shock. Although earthquake risks have been extensively studied in the literatures, to our knowledge, there does not exist a suitable spatial model for assessing the problem. Therefore, we propose a joint modeling approach based on spatial hierarchical Bayesian models and spatial conditional autoregressive models to describe the spatial variations in earthquake risks over the study region during two periods. A family of stochastic algorithms based on a Markov chain Monte Carlo technique is then performed for posterior computations. The probabilistic issue for the changes of earthquake risks after a main shock is also discussed. Finally, the proposed method is applied to the earthquake records for Taiwan before and after the Chi-Chi earthquake.

Key words : Conditional autoregressive model; Hierarchical Bayesian model; Markov chain Monte Carlo; Metropolis-Hastings algorithm