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川西及邻近地区地震活动性模拟和断层间相互作用研究

周仕勇

北京大学地球与空间科学学院，北京 100871

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摘要 本研究采用基于库仑破裂准则的地震活动性准静态模型，模拟计算了川西地区长达10000年的理论地震目录，通过对理论地震目录的分析发现川西地区M_S≥7.0强震在时间上表现出很强的随机性，与平均地震发生率为1/22.0年$^{-1}$（≈0.0454年$^{-1}$）的Poisson过程很相近， Poisson模型可能是川西地区开展长期（数10年）地震危险性计算中较为合适的模型.而单一断层M_S≥7.0强震的时间间隔分布与Poisson过程存在很大的差异，用Poisson模型估计单一构造上长期地震危险性可能是不合适的.通过分析模拟产生的长时间理论地震目录，逐一给出了川西地区主要断层的M_S≥7.0强震的时间间隔分布与平均M_S≥7.0强震的复现时间，并讨论了主要断层间强震活动的相互关联，计算出了强震在各断层间的转移概率.定量计算了研究区一断层的破裂产生的库仑应力在研究区其他断层面上的投影.从而为研究断层间的相互作用，研究一断层发生强震对其他断层发生强震危险性的影响提供了依据.本文为开展区域地震危险性分析研究提出了新的思想和途径.

关键词 地震活动性模拟,Poisson模型,库仑应力,地震危险性

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Seismicity simulation in Western Sichuan of China based on the fault interaction sand its implication on the estimation of the regional earthquake risk

ZHOU Shi-Yong

Department of Geophysics, Peking University, Beijing 100871, China

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Abstract Seismicity over 10000 years in Western Sichuan of China has been simula ted based on the mechanical synthetic seismicity model we developed. According to the analysis of the simulated synthetic seismic catalogue, the occurrence of strong earthquakes with M_S≥7.0 in the whole region of Western Sichuan is rather random, very close to the Poisson process with seismic rate 0 0454/year, which means it is reasonable to estimate the regional earthquake risk with Poisson model in Western Sichuan. However, the occurrence of strong earthquakes with M_S≥7.0 on the individual faults of Western Sichuan is far from Poisson process and could be predicted with a time dependent prediction model. The fault interaction matrices and earthquake transfer possibility matrices among the faults in Western Sichuan have been calculated based on the analysis of the simulated synthetic catalogues. We have also calculated the static change in Coulomb failure stress (CFS)on one fault induced by a strong earthquake on another fault in Western Sichuan to discuss the physical implications of the earthquake transfer possibility matrices inferred from the synthetic catalogue.

Key words Simulation of earthquake generation Poisson model Coulomb stress Seismic hazard

通讯作者:
周仕勇 zsy@pku.edu.cn
作者个人主页: 周仕勇