地球物理学报 » 2012, Vol. 55 » Issue (1) :105-116 doi:10.6038/j.issn.0001-5733.2012.01.010
地球动力学★地震学★地磁学

引用本文(Citation):
杨树新, 陆远忠, 陈连旺, 叶际阳, 米琦.用单元降刚法探索中国大陆强震远距离跳迁及主体活动区域转移. 地球物理学报, 2012,55(1): 105-116,doi: 10.6038/j.issn.0001-5733.2012.01.010

YANG Shu-Xin, LU Yuan-Zhong, CHEN Lian-Wang, YE Ji-Yang, MI Qi.The mechanism of long-distance jumping and the migration of main active for strong earthquakes occurred in the Chinese continent.Chinese J.Geophys. (in Chinese),2012,55(1): 105-116,doi: 10.6038/j.issn.0001-5733.2012.01.010

用单元降刚法探索中国大陆强震远距离跳迁及主体活动区域转移

杨树新[1,2], 陆远忠[1], 陈连旺[1], 叶际阳[1], 米琦[3]*

1. 中国地震局地壳应力研究所, 北京 100085;
2. 北京交通大学土木建筑工程学院, 北京 100044;
3. 中国科学院研究生院, 北京 100049

The mechanism of long-distance jumping and the migration of main active areas for strong earthquakes occurred in the Chinese continent

YANG Shu-Xin[1,2], LU Yuan-Zhong[1], CHEN Lian-Wang[1], YE Ji-Yang[1], MI Qi[3]*

1. Institute of Crustal Dynamics, China Earthquake Administration, Beijing 100085, China;
2. School of Civil Engineering, Beijing Jiaotong University, Beijing 100044, China;
3. Graduate University of Chinese Academy of Sciences, Beijing 100049, China

摘要 | 参考文献 | 相关文章

Download: PDF (865KB) HTML 1KB Export: BibTeX or EndNote (RIS) Supporting Info

摘要 中国大陆强震有成组活动、远距离跳迁和不同时段形成主体活动地区的特征.本文利用强震发生位置处单元降刚法,对中国大陆地区强震的远距离跳迁和主体活动地区转移机理进行了数值模拟研究.得出的新认识是:(1)在地壳中存在初始应力场的环境中,已发生强震区部分丧失承载能力(模拟中作为显著降低单元组的弹性模量来处理),可以引起大范围兆帕量级的应力场调整,它是后续强震可远距离跳迁的主要因素;(2)一个活动期中,中国大陆强震主体活动地区及其迁移,受主要活动断层分布、初始应力场和边界载荷的配置方式的综合影响,但在十年左右的活动幕中,边界载荷的配置方式可能是控制主体活动地区及主体活动地区转移的重要因素.

关键词 单元刚度, 应力场调整, 数值模拟, 强震迁移, 初始应力场, 中国大陆

Abstract: Strong earthquakes occurred in the Chinese continent are usually characterized by grouped activity, long-distance jumping migration, and different main activity areas formed in different times. In the present study a three-dimensional (3-D) finite element model was set up for the Chinese continent involving surface topography, major active fault zones as well as initial stress field to study the mechanism of the long-distance jumping migration and the migration of main active areas for the strong earthquakes occurred in the Chinese continent by using numerical simulations, after considering the birth and death of element groups under different boundary loading actions. Our results show that (1) in an environment where always exists an initial stress field in the Earth's crust, the area where a strong earthquake has occurred has no longer the ability to support high stress (we suppose that the moduli of elasticity of elements within the area be reduced), which can lead to stress adjustment to the order of MPa in a large area, and may be one of the main factors affecting the long-distance jumping migration of the follow-up strong earthquakes, and (2) it is hard to accurately predict where the follow-up strong-earthquakes will occur because it could be affected by many factors such as the loading manner, geological structure, active fault zones, initial stress field, stress field adjustment induced by strong earthquakes, but in an active period of earthquakes, the major factor to affect the activity area and migration of strong earthquakes is the boundary loading configurations. These results suggested that it is helpful to predict the trend of strong-earthquake migration by investigating various kinds of boundary loading manners and the relationship between stress field adjustment induced by strong earthquakes and the regions where strong-earthquakes occurred.

Keywords Element stiffness, Stress field adjustment, Numerical simulation, Strong earthquake migration, Initial stress field, Chinese continent

Received 2010-11-02;