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地壳介质非均匀性对华北地区强震活动的影响

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Influence of crustal inhomogeneity on seismicity in North China

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摘要

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摘要 华北地区是我国地震灾害最频繁的地区之一, 该区域的强震空间分布可能与地壳介质的不均匀性有关. 本文建立了华北地区岩石圈三维Maxwell模型, 并尝试采用剪切波分裂参数为新的约束条件, 对区域地壳运动场和应力应变场进行了模拟, 探讨地壳介质不均匀性与区域地震活动的关系. 研究表明: 外部动力源控制了华北地区整体的地壳运动方式, 地壳介质的横向、纵向不均匀性则影响了区域的变形特征. 华北地区东西两部分的地震活动差异主要受到地壳介质横向差异的影响: 华北地区东部介质较软, 弹性应变能积累较大, 地震活动频繁; 鄂尔多斯地壳介质相对较硬, 弹性应变能积累相对较小, 地震活动水平低.

关键词: 华北 地震活动 Maxwell模型 数值模拟 地壳各向异性

Abstract: North China is one of the regions with most frequent earthquake disaster in the China mainland. The spatial distribution of major earthquakes may be caused by regional crustal inhomogeneity. In order to discuss the relationship between crustal inhomogeneity and seismicity, we construct a three-dimensional finite element model in North China, and simulate regional crustal movement field and stress field. Parameters of shear wave splitting were used as new constraints in the model. The primary results show that the dynamic boundary condition controls crustal motion pattern in North China. The lateral and vertical crustal inhomogeneities both affect local deformation. The difference between seismicity in western North China and in eastern North China is controlled by lateral crustal inhomogeneity. The crustal material in eastern North China is relatively weak, which results in high elastic strain energy accumulation, and more frequent seismicity. The crustal material in west North China is relatively hard, which causes relatively lower elastic strain energy accumulation, and less frequent seismicity.

Keywords: North China Seismicity Maxwell model Numerical simulation Crustal anisotropy

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