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基于GPS观测分析日本9.0级地震同震位错与近场形变特征

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The analysis of coseismic slip and near-field deformation about Japanese 9.0 earthquake based on the GPS observation

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摘要

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摘要 2011年3月11日本州宫城县东海岸近海发生 M_w 9.0级地震, 本文在对GPS同震位移场分布及误差特征分析的基础上, 反演了同震位错分布. 误差分析结果表明震源北西向300 km、北北西向550 km、南西向700 km范围内的同震位移量值明显大于误差, 可以为位错反演提供有效的地表位移约束. 沿震源北西向GPS剖面结果和位错反演位移剖面结果均表明同震近场位移符合指数衰减特征. 位错反演结果表明, 日本9.0级地震最大同震位错为25.8 m, 位于震中附近; 位错量大于10 m的同震破裂集中在震中附近400 km范围内; 日本海沟南段同震位错量相对较小, 此次地震为日本海沟地区典型逆冲型地震. 根据此次9.0级地震和该地区以往强震破裂空间分布特征, 此次9.0级地震破裂既体现了强震原地复发的特点, 又体现了强震破裂的填充性.

关键词: 日本9.0级地震 GPS同震位移场 有效位移约束 同震位错反演

Abstract: An M_w 9.0 earthquake occurred on March 11, 2011 offshore the coast of Miyagi Prefecture of Honshu, Japan. In this paper, based on GPS coseismic displacement field and characteristics of error we invert for the distribution of coseismic dislocation. The result of error analysis shows that the coseismic displacement within 300 km in NW, 550 km in north, and 700 km in SW direction is significantly larger than the error, so can provide effective constraints to the inversion of surface displacement. The north-west section of GPS observation and inversion results show that near-field coseismic displacement is characterized by exponential decay with distance. Dislocation inversion results show that the largest coseismic dislocation is 25.8 m, located near the epicenter. Dislocation greater than 10 m occurs mainly within 400 km near the epicenter, the southern section of the Japan Trench has relatively smaller coseismic dislocation. According to the spatial distribution of seismic rupture, combined with previous earthquake rupture distribution of the region, the M_w 9.0 earthquake rupture embodies the characteristics of in situ recurrence, but also reflects the nature of earthquake rupture filling in the blank.

Keywords: Japan M_w 9.0 earthquake Coseismic displacement observed by GPS Effective displacement constraint Inversion of coseismic dislocation

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