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2008年 M_S 7.1于田地震InSAR同震形变场及其震源滑动反演

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The coseismic InSAR measurements of 2008 Yutian earthquake and its inversion for source parameters

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摘要

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摘要 本研究利用InSAR技术与ALOS PALSAR雷达数据, 获取了2008年3月20日于田 M_S 7.1地震视线同震形变场, 并基于该数据集和限制性最小二乘法反演了此次地震的断层滑动分布; 通过构造四大类反演方案, 详细分析了InSAR观测系统中的入射角与方位角对反演结果的影响。结果表明: 入射角随点位变化对反演结果有较大影响, 使用其平均值将对破裂细节产生一定影响; 而方位角对反演结果的影响不大, 使用其平均值是一种较为理想的选择; 引入入射角与方位角变化后, 反演获得了较佳的于田地震同震滑动, 主要集中分布于0~14 km深度附近, 最大滑动量达3.2 m, 矩张量为 $3.3 \times 10^{19} \text{ N} \cdot \text{m}$, 相当于矩震级 M_W 7.0。

关键词: 于田地震 InSAR同震形变场 滑动分布反演 InSAR入射角 InSAR方位角

Abstract: We have obtained the coseismic deformation along line of sight of the 2008 Yutian earthquake, using ALOS PALSAR images and SAR interferometry technique. Based on the InSAR measurements and the constrained least square method, we studied the source parameters of this big normal event. Four schemes of inversion were constructed, with the emphasis on the effect to slip distribution inversion of the incidence angle and azimuth angle. Our inversion results show that the incidence angle has certain effect on the slip distribution, which means that a substitution of location-dependant incidence angle with constant mean incidence angle will lose some useful slip distribution on fault plane. Our inversion also shows the azimuth angle, however, has almost no obvious effect and it is an optimal choice to use the mean azimuth angle. Our most robust slip distribution can be obtained with the two parameters being location-dependant. In our favored inversion scheme using location dependant angles for both, the maximum slip reaches 3.2m. Slip is mainly confined to 0~14 km depth and no evidence of shallow slip deficit. The inverted seismic moment M_0 is $3.3 \times 10^{19} \text{ N} \cdot \text{m}$, equivalent to an event of magnitude M_W 7.0.

Keywords: Yutian earthquake Co-seismic deformation derived from InSAR Slip distribution inversion Incidence angle of InSAR Azimuth angle of InSAR

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