THE SURFACE COSEISMIC DEFORMATION AND SOURCE PARAMETERS RESEARCH OF THE XIZANG GAIZE EARTHQUAKE BASED ON THE INSAR TECHNOLOGY

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Abstract

On 9 January, 2008, the M_w 6.4 earthquake occurred in Gaize, central Tibet of China. In the following one month, 40 aftershocks of above M_w 3.5 were recorded by the global seismic network. The largest (M_w 5.9) aftershock occurred on January 16,2008. The USGS-CMT focal mechanisms of the mainshock and its largest aftershock show mainly normal faulting with dip angles of ～ 45° on a NW-dipping fault plane. The epicenter locations is at 32.29° N, 85.17° E near the boundary of Nima county (in the west) and Gaize county (Xizang, China). Because few people live in there mote region, there were no casualties reported in the earthquake.

We use Synthetic Aperture Radar Interferometry (InSAR) to derive the coseismic deformation field of the Gaize earthquake. The result shows an asymmetric deformation pattern, with normal faulting. The complex line of-sight (LOS) fringe pattern suggests that a synthetic deformation in the hanging wall of the mainshock rupture slipped during the event, most likely during the largest aftershock. Fig. 1 shows the re-wrapped final interferograms into 12 cm cycles after phase unwrapping. The top-wall side has densely spaced fringes with two obvious deformation peaks at the center, and the foot-wall has smaller range change values with one deformation peak, but covers a larger area compared to the top-wall. The LOS fringes are clear with maximum LOS lengthening about 48.06 cm in the top-wall and shortening reach about -12.38 cm in the foot-wall respectively.

We use the sensitivity-based iterative fitting method developed by Wang (personal communication, 2009) to model the co-seismic deformation. Fig. 2 shows the

simulation Interferogram. The inverted hypocenter location of M_w 6.4 mainshock and M_w 5.9 aftershock are at 85.30±0.03°E/32.44±0.03°N and 85.27±0.01°E/32.46±0.02°N with strikes of 213.31° and 201°, and with dips of 56° and 54°, respectively. The mainshock upper side is about 2.9km from ground surface, the average slip is 0.74m and the maximum slip is about 2.32m occurring at depth of 7.92km under ground surface, and the average rake over the slipping area is -65.4°, the released scalar moment is 2.19×10^{18}Nm; The aftershock upper side is about 1.6km from ground surface, the average slip is 0.87m and the maximum slip is about 1.12m occurring at depth of 4.13km under ground surface, and the average rake over the slipping area is -75.0°, the released scalar moment is 1.41×10^{18}Nm. Fig.3 shows the residual of the simulation interferogram with the residual scope between -5.0cm to 8.5cm. concentrated near the faults.

Keywords: Gaize earthquakes; InSAR; co-seismic deformation field; the elastic half-space dislocation model; hypocentral parameters

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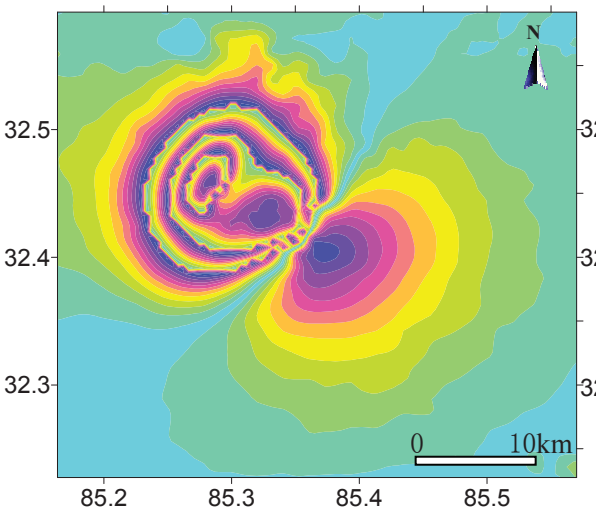

Fig. 1 InSAR deformation interferogram

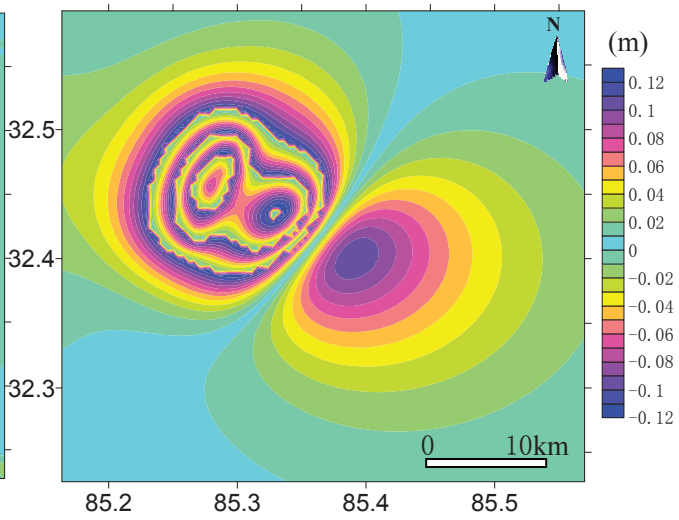

Fig. 2 simulation Interferogram

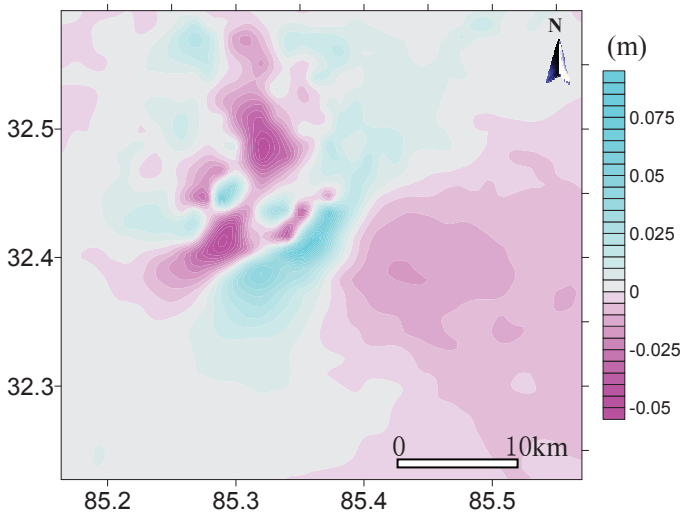

Fig. 1 residual of the simulation interferogram