

THE CHARACTERISTICS OF POST-SEISMIC SURFACE DEFORMATION OF THE WENCHUAN $M_s8.0$ EARTHQUAKE FROM InSAR

*Xiaogang Song, Xinjian Shan, Chunyan Qu, Yufei Han, Guifang Zhang, Guohong
Zhang, Limin Guo*

State Key Laboratory of Earthquake Dynamics, Institute of Geology, China
Earthquake Administration, Beijing 100029, China

Abstract Using the D-InSAR technology, we have analyzed the Japanese satellite ALOS/PALSAR data after the 2008 Wenchuan earthquake and obtained four strips of ground deformation spanning about one year, which cover the Yingxiu town, Wenchuan, Shifang, Maoxian county, Beichuan, Pingwu and Qingchuan county in Sichuan Province. Precise interferometric baseline is estimated using ground control points of known x and y image coordinates, the corresponding terrain height, and the corresponding unwrapped interferometric phase. A non-linear least-squares solution algorithm is used to determine the baseline parameter values. Depending on topographic dependence of the atmospheric path delay with respect to height caused by changes in the atmospheric water vapor and pressure profiles between the acquisitions of the interferometric image pair, a linear phase model of the height-dependent atmospheric phase delay is determined and removed from the unwrapped differential interferogram. Despite of all kinds of residual errors, some post-deformation characteristics can be showed in the final result. Around Yingxiu town, the epicenter of main shock, a area of uplift is present with small amplitude 0-5cm at the northern wall of the causative fault, where with subsidence 90cm in the coseismic deformation field, while relative subsidence took place with the amplitude 0-15cm on the other wall. Near Shifang county, there are slightly arranged concentric fringes, reflecting another subsidence area with amplitude 0-20cm. Around the Beichuan and Anxian county, there exists a relatively small uplift of an strip area with 0-5cm along the causative fault on its both side. A small area of dense concentric fringes(indicated by a rectangle box) appeared in 30km northeast of Qingchuan, which coincide with the locations of the aftershocks of 5 Aug. 2008, of which the new deformation is superposed on the post-seismic deformation field. It also can be saw that the focal mechanism solution of this aftershock is dominated by thrusting with northwest rupture direction. On the lower wall, we can see another large uplift area of sparse concentric fringes located in more than 100km southeast of Qingchuan, because it is far from the

causative fault, it's impossible so large deformation took place, and it should attribute to atmospheric component. We also have to admit that there exist obvious error in some areas because of limitation of processing methods, especially, when removing topographic-dependent atmospheric error, significant error may be induced into the far field from causative fault due to imprecise model estimation caused by co-existence of deformation, atmospheric effect, topographic error and other component in the interferometric phase. More fine step should be taken in the next step. Although the derived deformation from this work probably contains some errors related with DEM and the residual atmospheric delay, it demonstrates that remarkable post-seismic elastic recovery happened during one years after Wenchuan event.

Keywords: Wenchuan earthquake, D-InSAR, post-seismic deformation, Deformation characteristics

Reference

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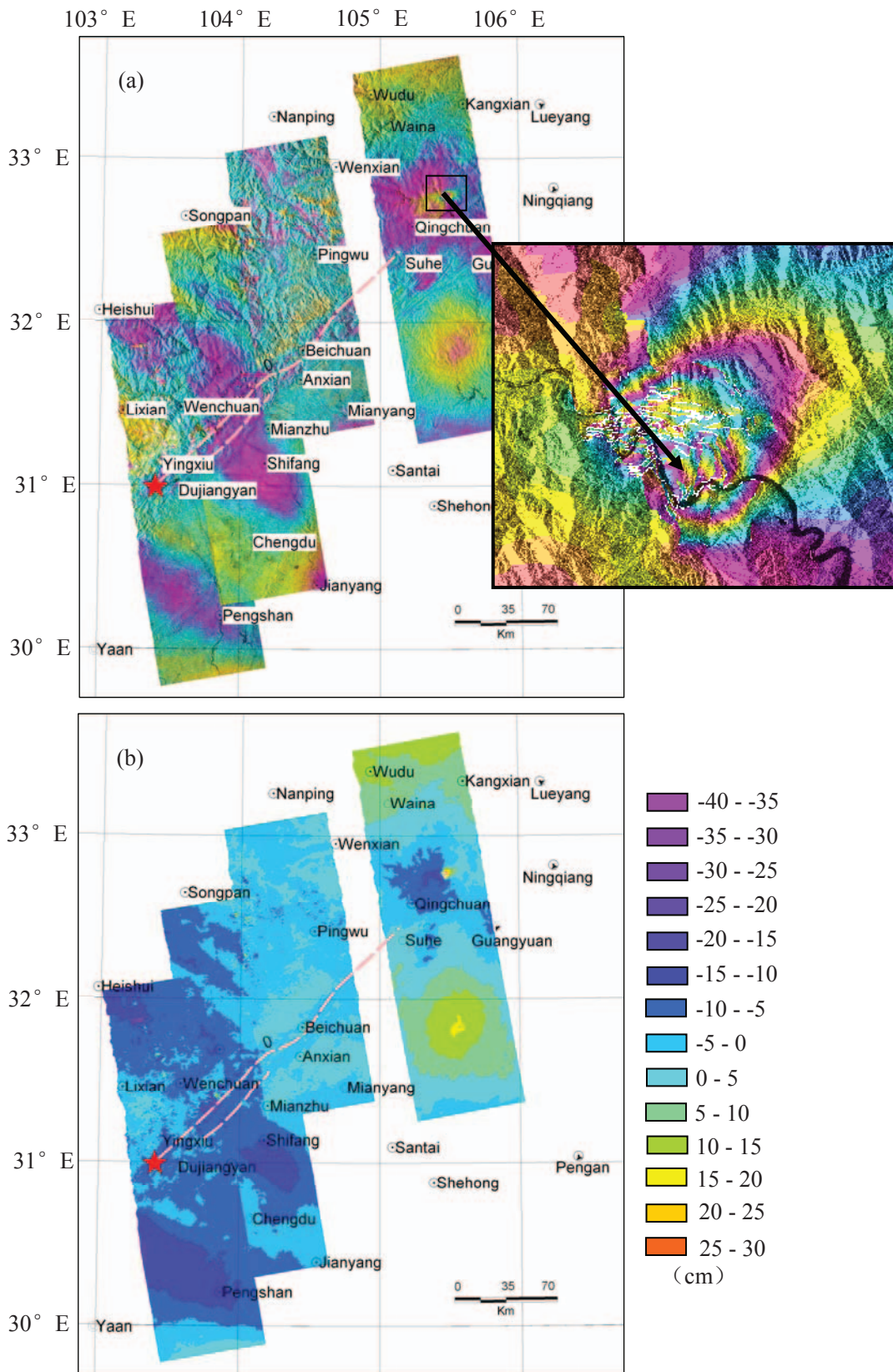


Fig.1 (a) The post-seismic interferometric fringes map of $M_s8.0$ Wenchuan earthquake and a aftershock inset. (b) The post-seismic displacement field in LOS of $M_s8.0$ Wenchuan earthquake. The red dash lines denote surface rupture.