Japan Geoscience Union Meeting 2010
(May 23-28 2010 at Makuhari, Chiba, Japan)

SSS025-09 Room: 301A Time: May 25 14:15-14:30

Seismic intensities and crustal deformation of the 2008 Wenchuan Earthquake: from ALOS/PALSAR image matching analysis

Ken Xiansheng Hao[1*], Hiroyuki Fujiwara[1], Tomokazu Kobayashi[2], Hongjun Si[3], Xiwei Xu[4], Takeshi Inokuchi[1], Youichiro Takada[5], Masato Furuya[6], Makoto Murakami[6]

[1]NIED, Japan, [2]GSI, Japan, [3]KKE, Japan, [4]Institute of Geology, CEA, China, [5]JAMSTEC, Japan, [6]Hokkaido University

The Mw 7.9 Wenchuan earthquake has triggered 300km-length fault zones, and resulted in surface deformations in the much larger areas. The mega-quake left the devastation that over 87, 000 people killed and five million lost homes. The seismic intensity distribution, which was naturally related casualty, damage of building and construction, landslide, geological feature, was the basic information needed but lacked for the lesson. Immensity and variety of damages have not yet documented in detail since many difficulty from not only politically but technically as well.

To answer the question of what have we learned from the Wenchuan earthquake, we analyzed the entire area from the ALOS satellite synthetic aperture radar (SAR) data. Interferometric SAR (InSAR) analysis has an advantage of detecting ground deformation in a vast region with high precision. We captured whole coseismic surface-ruptures and their crustal deformations across the LMS faults last year. To detect large ground deformation even in an incoherent area where high seismic intensity occurred, we conducted an offset tracking procedure to explore it. Although similar approaches can be taken with optical images, SAR images are advantageous because of the radar's all-weather detection capability. The pixel matching distribution gave ground displacements in the line of sight component (range offset) and along the satellite track component (azimuth offset).

In this work, an attempt was made to evaluate the seismic intensity by an alternative way using the pixel matching analysis based on the assumption that large seismic intensities (for instance, MMI >8, or JMA >5), occurred always accompanying with the large crustal deformations that can be captured by satellite SAR image. Preliminary study of comparisons showed good coherences in general among the large displacement offset of pixel matching distribution with investigated intensity and acceleration distribution. However, the detailed information under 500m cannot be obtained by limitation of the pixel resolution. The field investigations in typical areas gave the calibrations of the pixel matching. We will report the ongoing results on the meeting.

Acknowledgments: ALOS/PALSAR level 1.0 data were provided from the Earthquake Working Group and PIXEL (PALSAR Interferometry Consortium to Study our Evolving Land surface) under a cooperative research contract with JAXA (Japan Aerospace Exploration Agency). The ownership of PALSAR data belongs to METI (Ministry of Economy, Trade and Industry) and JAXA.

Keywords: Wenchuan earthquake, InSAR, Seismic Intensity, Pixel matching, ALOS/PALSAR, Crustal deformation