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Crustal deformation due to the 2010 southeastern Iran earthquake, obtained from InSAR analysis using ALOS/PALSAR data

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Preface:

Active deformation in Iran is a result of the convergence between the Arabian and Eurasian plates. In eastern Iran, where nearly north-south shortening is dominant with rates about 2-3 cm/yr, two major north-south strike-slip fault systems develop with mainly right-lateral shear component. In these fault zone, several M6-7 class earthquakes have occurred historically. On 26 December 2003, a M=6.6 earthquake occurred at the Bam fault that is a southern portion of the western fault zone, which struck the town of Bam with devastating damages. A large inland earthquake with M=6.5 (USGS) occurred in southeastern Iran on 20 December 2010. The epicenter is about 100 km distant from that of the Bam earthquake. To map the surface displacement associated with this earthquake, we conduct interferometric SAR (InSAR) analysis using ALOS/PALSAR data. We will report the crustal deformation obtained from the InSAR analysis.

InSAR analysis:

We analyze SAR data acquired from the Path559 (ascending orbit) which are strip-map imagery with off-nadir angle of 34.3 degrees. We process the SAR data from a level-1.0 product using a software package GSISAR. The Path559 data acquired on 30 September 2010 and 31 December 2010 are used for master and slave images, respectively. We use hole-filled SRTM3 DEM (Jarvis et al., 2008) to remove the topographic phase.

SAR interferograms obtained show clear coseismic deformation due to this earthquake with high coherence. We can identify two major fringes in the interferogram; in the western part about 25 cm lengthening of slant range at maximum is observed, while in the eastern part about 11 cm shortening of slant range at maximum is observed. A displacement boundary across which the ground movement is in the opposite direction runs on an orientation of N40-50E, suggesting the fault involved with this seismic event has a strike of NE-SW direction.

In this presentation, we will report further detailed features of the crustal deformation with adding new observation data and a preliminary fault model constructed on the basis of the InSAR data.

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Keywords: 2010 Iran Earthquake, InSAR, ALOS/PALSAR, Crustal deformation