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The 2010 Chile Earthquake: Crustal deformation detected by ALOS/PALSAR data

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A great earthquake with a moment magnitude of 8.8 (USGS) that occurred on 27 February, 2010 (UTC: 06:34) struck the coastal zone in the middle of Chile. This earthquake occurred at the boundary between the Nazca and the South American plates with a thrust-faulting type. At this plate boundary, historical large seismic events have been recorded. Among them the 1960 event with a moment magnitude of 9.5 is the largest instrumentally recorded earthquake in the world. The 2010 event is located about 300 km north from the 1960's epicenter.
The area subjected to crustal deformation associated with this earthquake is expected to be vast. Thus an observation with satellite synthetic aperture radar (SAR) that can provide us spatially comprehensive ground information will play an important role to measure the ground displacements. The purpose of this report is to present the ground surface displacement detected by ALOS/PALSAR data.
As of this writing, observations on the several paths such as 119, 111, 417, and 114 were made. We conducted the InSAR analyses using these data and succeeded in obtaining the interferograms showing the surface displacement due to this seismic event. However, these obtained interferograms cover only a part of the displacement field, and thus at present the whole picture of the crustal deformation field has not been grasped yet. We will further conduct the InSAR analyses with adding newly acquired SAR data, and show the results at the presentation time.
A swath width of a fine beam (high resolution) mode which is a normal operation type for ALOS/PALSAR is approximately 70 km. The spatial range is not wide enough to quickly map the expected vast displacement field. Resultantly the fine beam modes data make us spend much time and effort to grasp the whole picture of the crustal deformation.
The ALOS/PALSAR can operate a ScanSAR mode with about 350 km swath width, which is approximately 5 times as wide as the fine beam mode. Thus an analysis using the ScanSAR data is efficient to map such a vast crustal deformation field more quickly. However a ScanSAR interferometry has not been feasible so far.
After the mainshock, observations with a ScanSAR mode were made for the paths 422 and 425 (as of this writing). We developed a ScanSAR interferomtric technique, and succeeded in obtaining the interferograms. In this presentation, we will report the results of interferometric analyses using the ScanSAR data in addition to the interferograms created by fine beam ? fine beam pairs.

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Keywords: 2010 Chile Earthquake, ALOS/PALSAR, InSAR, ScanSAR, Crustal deformation