3-D Crustal Deformation Detected by SAR Interferograms of ALOS-2 Satellite

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SUMMARY

SAR interferometry (InSAR) is a powerful and unique technique for detecting and monitoring ground surface deformation without any ground based observation infrastructures. We, Geospatial Information Authority of Japan, has analyzed images acquired by L-band SAR satellite of Japan, ALOS-2, and utilized the SAR interferograms for monitoring ground surface deformation over the whole national land. InSAR has a capability to detect deformation with spatially high resolution. On the other hand, it can detect the displacement only in one dimensional (1-D) line of sight (LOS) direction to the satellite. However, full three dimensional (3-D) displacement can be retrieved by decomposing three or more 1-D LOS displacements in different directions. ALOS-2 has a not only right but also left looking observation capability. Using the right and left looking observations from both ascending and descending orbits, surface deformation can be measured in the full 3-D. We constructed full 3-D surface deformation fields from SAR interferograms of ALOS-2. 3-D displacements caused by individual two characteristic events, an earthquake and volcanic activity, were clearly detected by the deformation analyses. The constructed deformation fields achieved the standard deviation of approximately 1 cm, 4 cm and 1 cm in the east-west, north-south and vertical component, respectively. We report the 3-D ground surface deformation detected by SAR interferograms of ALOS-2 in the paper.