

Analysis of local surface deformation induced by the Noto Hanto and the Chuetsu-oki Earthquakes in 2007 using SAR interferograms

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1) Noto Hanto Earthquake in 2007 (March 25, 2007)

GSI processed the PALSAR data acquired by Daichi on February 23, 2007 and April 10, 2007 to generate an interferogram using differential interferometric method. The arc-shaped pattern of fringes indicating wide-area crustal deformation appeared in the image, as well as small oval and horseshoe patterns of phase variation reflecting local deformation of land surface. To isolate local deformation from wide-area crustal movement, we produced a residual image by subtracting the calculated elastic displacement based on the simulation of source fault model after Ozawa et al. (2007) from the observed ones. We overlaid this image on our 1:25,000 topographic maps and landslide distribution maps and found that the distribution and the direction of movement of such deformation patterns are consistent with existing landslides. We carried out field surveys and clarified that these patterns reflect the landslides triggered by the ground shaking. The amount of the movement is between a few cm to a few tens cm. In order to detect the characteristics of such deformation, we resolved the displacement into quasi-vertical and east-west components by analyzing two different tracks' interferograms using the method after Fujiwara et al. (2000). The result showed that such patterns provide the sign of the initial process of the development of large landslides, which is not easily recognizable through the field survey or normal aerial photo interpretation.

2) Niigataken Chuetsu-oki Earthquake in 2007(July 16, 2007)

We generated interferogram by processing the PALSAR data acquired on January 16 and July 19. We identified not only the arc-shaped fringes indicating wide-area crustal deformation but also phase shift patterns reflecting local ground deformation. By the close investigation of the images for the city center of Kashiwazaki where heavy damage hit, we found some patterns indicating ground uplift caused by the compression associated with the lateral soil flow at the edge of sand dune, and horizontal movement showing the lateral flow of the sandy or fluvial soil toward the lower direction. It is assumed that such ground deformation might amplify the earthquake damage.