Ground Deformations in the Kanto and Osaka Plains Observed by ALOS/PALSAR and ALOS-2/PALSAR-2

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Based on the hypothesis that the spatial distribution of ground deformation is correlated to substurface structure such as buried faults, we have investigated ground deformations in two typical alluvial plains in Japan, the Kanto and Osaka plains, with SAR and discussed their relationship with active faults. Here we report some results of time series analysis of ALOS/PALSAR images and 2-pass differential interferometry of ALOS-2/PALSAR-2 images in these two regions.
We utilized ALOS/PALSAR images acquired during August 2006 to April 2011 and ALOS-2/PALSAR-2 during August 2014 to December 2015. More than 15 acquisitions during longer period than 3 years were made for ALOS/PALSAR in each region. Therefore we applied persistent scatterer interferometry (PS-InSAR) using StaMPS software developed by the Stanford University (Hooper et al., 2004). On the other hand, interval of acquisitions of ALOS-2/PALSAR-2 is as long as 1 year and 4 months. Furthermore there are only a few acquisitions of an area with the same look angle. Therefore we applied conventional 2-pass differential interferometry to ALOS-2/PALSAR-2 images with Gamma® software. ASTER-GDEM ver.2 DEM (Tachikawa et al., 2011) is adopted for the derivation of topographic fringes and geocoding.
On the basis of PS-InSAR analysis of ALOS/PALSAR images (Path 406 Frame 710) in the Kanto plain, we revealed range increase up to 10 mm/yr in the Saitama city and northeastern Tokyo. This result infers that ground subsidence is still continuing there. We recognize subsidence along the Tone River. It is worth noting that range decrease > 5 mm/yr is found along the Tachikawa fault that crosses the Tachikawa city, western Tokyo. By stacking interferograms of ALOS-2/PALSAR-2 images (Path 119 Frame 750) centered in the Koga city, we found range increase near the Saitama city, which is consistent with the ALOS/PALSAR observation. However, there are inconsistent deformations with that in the rest of area. We need more data for longer time period. We also analyzed images of its western neighbor (Path 120 Frame 740) and found large change in line of sight in the Chichibu basin for the pairs including images acquired in summer. This might be attributed to the characteristics of local weather.
Hashimoto (2014) already reported subsidence along the Arima-Takatsuki Fault zone and uplift in southern Kyoto basin from the analyses of ALOS/PALSAR images (Path 65 Frame 2920). However, we did not find these deformations in any interferograms of ALOS-2/PALSAR-2 (Path 21 Frame 2910, Path 26 Frame 2920, Path 127 Frame 680 etc.). Deformation may be smaller than observation errors, but it may be necessary to examine the possibility that these deformations stopped during 2011 - 2014, using multi-satellite images.
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Keywords: Synthetic Aperture Radar, ground deformation, ALOS/PALSAR, ALOS-2/PALSAR-2, Kanto Palin, Osaka Plain

