An Attempt to Detect Secular Deformation Associated with the Subduction of the Philippine Sea Plate with ALOS/PALSAR

Manabu Hashimoto and Yo Fukushima (DPRI, Kyoto University)

Introduction

There are several reports on the detection of secular deformation during interseismic periods, including several mm/yr slip of strike-slip faults, with time series analyses of space-borne SAR data. We try to detect interseismic deformation due to the subduction of plates with a similar approach.

Data and Method

The southwestern Japan arc has a strike perpendicular to the track of ALOS and gradient of deformation is parallel to the azimuth direction of ALOS/PALSAR data. Displacements observed by GPS have a large NNW-ward component (~5cm/yr) in the southern part of Shikoku w.r.t the northern coast of Honshu. Therefore the southwestern Japan is one of the most suitable sites to study the applicability of SAR to the detection of secular deformation. We collected all the ALOS/PALSAR images since May, 2006: 19 images from the path 417 (Cape Muroto,southern tip of Shikoku island, to Okayama, western part of Honshu) and 12 images from the path 414 (Cape Shionomisaki, southernmost tip of Honshu, to Tango peninsula). As a first step, we examined interferograms to identify error factors for these target areas and stacked the interferograms having high coherence. We used the Gamma software for the interferometry and stacking processings.

Results

Figure 1 shows a stacked interferogram, converted to average rates of line-of-sight displacements. We can recognize decrease of range around Cape Muroto relative to the northern Shikoku. This pattern is consistent with the LOS velocity field converted from that obtained from the GEONET, but the magnitude is about twice as large.

If we look at interferograms in more detail, several kinds of errors such as orbital fringe, tropospheric disturbance etc. are recognized. Especially orbital fringes are not easy to be eliminated, since target deformation may have as a long wavelength as orbital fringes. Furthermore unwrapping is difficult in some interferograms since steep topography of Shikoku ranges decrease coherence with long base lines. We will present several problems we found in this analysis and examine necessary conditions for the time series analysis.

PALSAR level 1.0 data are supplied through Earthquake Working Group (Geographical Survey Institute), Disaster Monitoring project with ALOS. The ownership of PALSAR data belong to JAXA and METI.

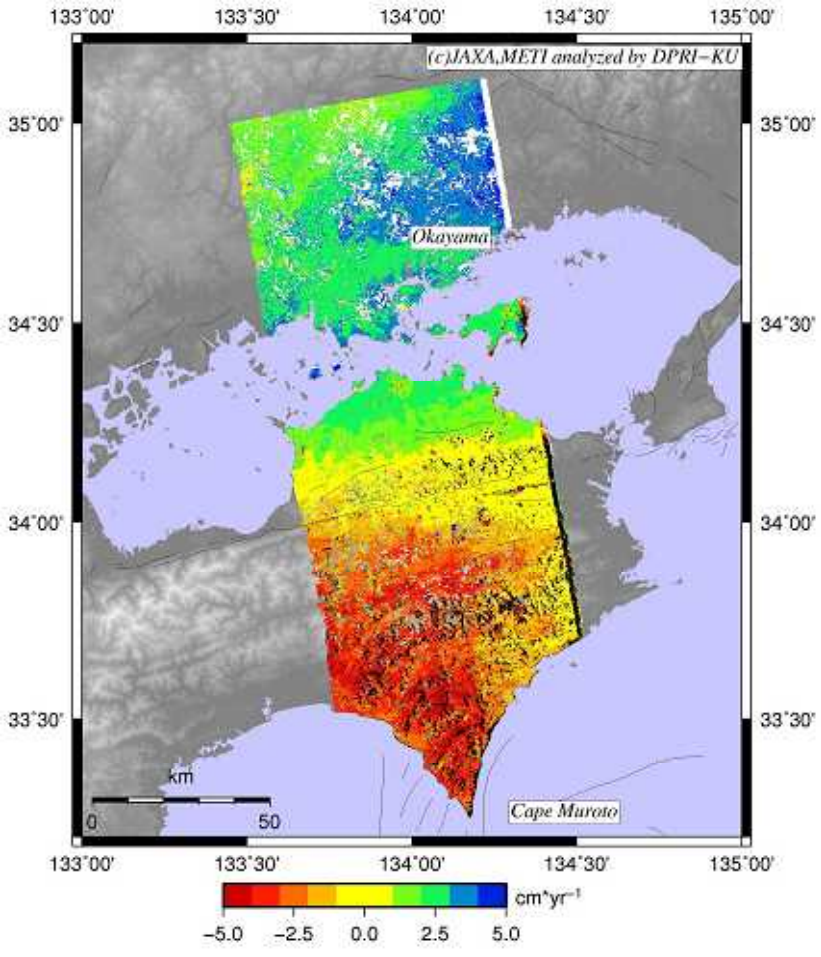

Figure 1. Stacked unwrapped interferogram of the Path 417 from the cape Muroto to Okayama. 11 Interferograms during the period from May, 2006 to June, 2008 with high coherence are used. Rate of line-of sight displacements are shown.