Examination of detection of crustal deformation associated with the subduction of the Philippine Sea plate with ALOS/PALSAR

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Detection of crustal deformation is one of the most important issues in the study of forecast of subduction zone earthquakes. In Japan, daily positions can be tracked owing to the establishment of GEONET, and not only spatial but temporal variations in interplate coupling are now discussed. However, other techniques than GPS are required in subduction zones where dense GPS network is unavailable. SAR interferometry (InSAR) is the most powerful tool.

Although InSAR can detect crustal deformation with a spatial resolution of several to several ten meters, it is considered not suitable for the detection of interseismic deformation in subduction zones. It is difficult to detect crustal deformation with wavelength of about several ten km and rate of several cm/yr with conventional InSAR, because InSAR is less accurate than GPS, cannot simultaneously observe region larger than several ten km, and has low temporal resolution due to its recurrence interval.

Now we apply the Short Baseline approach (SB), one of time series analysis techniques of InSAR data, to the ALOS/PALSAR images in Southwest Japan, and try to detect secular deformations due to subduction. SB is the method to detect time series of deformation with less effects of several noises such as atmospheric disturbances by inverting as many interferograms of pairs with short spatial and temporal base lines as possible.

We have analyzed ALOS/PALSAR images along the paths 414 (Kii peninsula to Wakasa bay) and 417 (Cape Muroto, southern tip of Shikoku to Okayama) acquired during the period from 2006 to mid-2008, and evaluated characteristics in the interferograms. According to the analyses, we found several obstacle to achieve time series analysis. In 2006, it is hard to obtain enough coherence in whole scene due to longer perpendicular baselines than 1km. On the other hand, we obtained coherent images in 2007, since orbit of satellite is well controlled. However, it is still difficult to detect crustal deformations due to orbital errors, tropospheric disturbances, and fringes correlated to topography. We examine possibility to detect secular deformations by applying stacking and SB technique.