The steady crustal deformation around the Omaezaki, Sionomisaki, Muroto and Ashizuri, using InSAR time-series analysis

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At the Meteorological Research Institute, we are working on detection of crustal deformation using satellite SAR data as a method to detect changes in locked part such as slow slips and pre-slips at the plate boundary.
Especially focusing on the large-scale earthquake of the Nankai-Trough which is concerned about the occurrence in the near future, near the cape from Tokai to Shikoku which is close to the subduction zone of the plate and is thought to be susceptible to the change of the fixation state Analysis was conducted as an object.
We carried out time series analysis by PS-InSAR and SBAS methods using StaMPS (Hooper et al., 2004) developed by Stanford Institute of Technology, and from these integrated analysis steady variation during the analysis period in the target area The speed was calculated. The data used for the analysis in each area is as follows, and in each case, we used ALOS/PALSAR data (operation period: 2006 to 2011).

Omaezaki: path 60 (19 scenes, 114 pairs) and path 409 (24 scenes, 156 pairs)
Shionomisaki: path 65 (10 scenes, 41 pairs) and path 414 (17 scenes, 114 pairs)
Muroto: path 67 (12 scenes, 44 pairs) and path 417 (21 scenes, 127 pairs)
Ashizuri: path 70 (14 scenes, 57 pairs) and path 420 (20 scenes, 62 pairs)

In principle, we used all data in which the archive exists for analysis in any path, but recalculated after excluding data which is clearly an error by checking the analysis result. These results obtained are as follows (Fig.1).

Omaezaki: elongation of about 2 cm/year in descending orbit (pass 60) and of about 1 cm/year in ascending orbit (pass 409).
Shionomisaki: elongation of about 2 cm/year in descending orbit (Pass 65), shortening of about 1.5 cm/year in ascending orbit (Pass 414).
Muroto: elongation of about 2.5 cm/year in descending orbit (path 67), shortening about 1.5 cm/year in ascending orbit (pass 417).
Ashizuri: elongation of about 4 cm/year in descending orbit (Pass 70), shortening of about 1 cm/year in ascending orbit (Pass 420).

As a result, these deformations of elongation in the descending orbit and shortening in the ascending orbit were observed, and these deformations were relatively large in the descending orbit except for the results of Omaezaki. This is thought to be because the descending orbit shows better sensitivity to the direction of subduction of the Philippine Sea plate than the ascending orbit. In this presentation, we also report on the comparison with the GNSS observation results in the analysis area.

Some of PALSAR data were prepared by the Japan Aerospace Exploration Agency (JAXA) via Geospatial Information Authority of Japan (GSI) as part of the project “ALOS Domestic Demonstration on Disaster Management Application” of the SAR analysis of earthquake Working Group. Also, we used some of PALSAR data that are shared within PALSAR Interferometry Consortium to Study our Evolving Land surface

(PIXEL). PALSAR data belongs to Ministry of Economy Trade and Industry (METI) and JAXA. In the process of the InSAR, we used Digital Ellipsoidal Height Model (DEHM) based on the Shuttle Radar Topography Mission (SRTM 4.1) provided by Consortium for Spatial Information (CSI) of the Consultative Group for International Agricultural Research (CGIAR), and Generic Mapping Tools (P.Wessel and W.H.F.Smith, 1999) to prepare illustrations.

Keywords: TS-InSAR analysis, ALOS/PALSAR, crustal deformation, Nankai-Trough

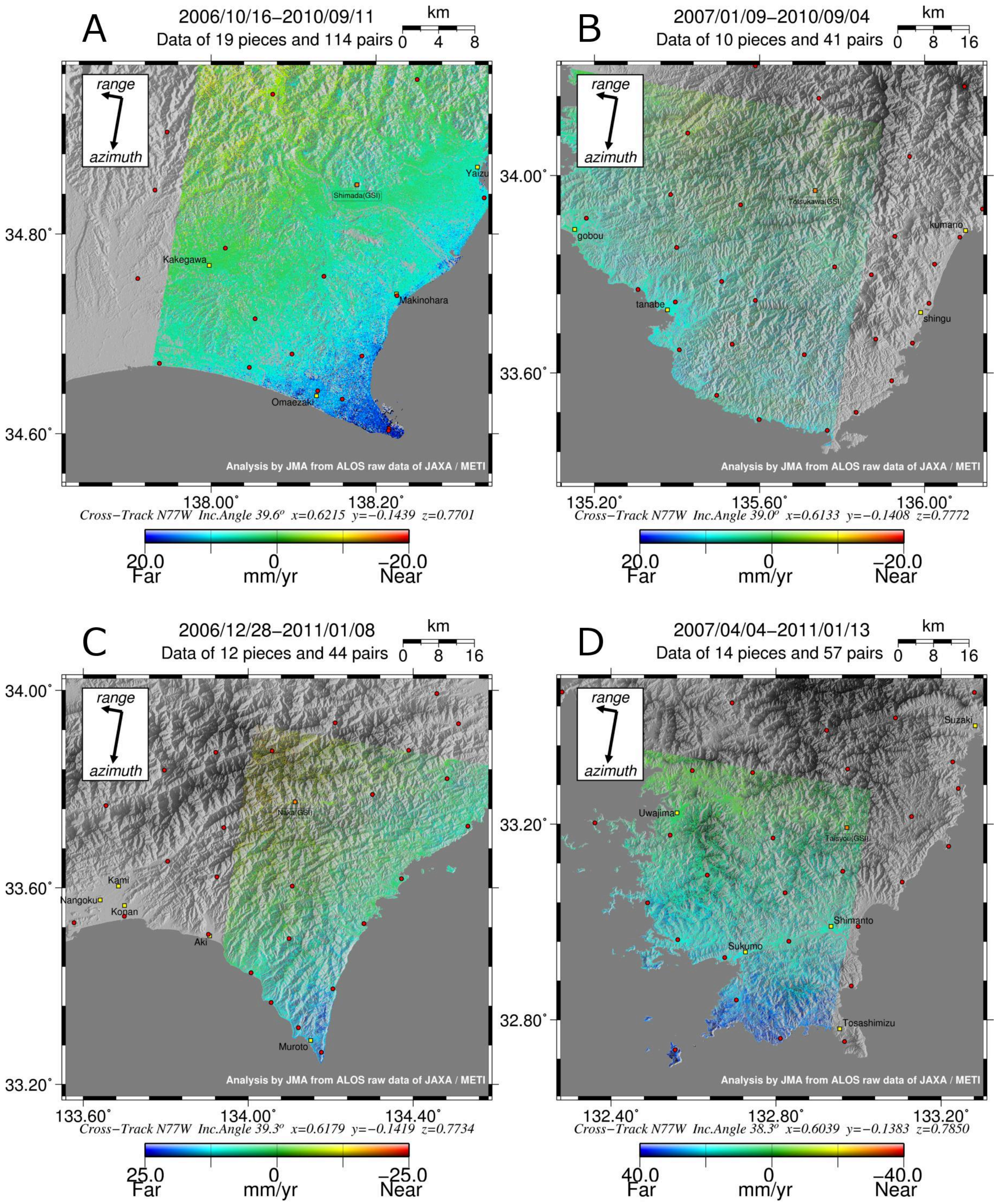

Fig1. The crustal deformation speed in LOS direction of the Descending orbit. (A) Omaezaki, (B) Shionomisaki, (C) Muroto, and (D) Ashizuri. The red circles indicate the GNSS point. The orange square indicate reference point for the displacement.