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Deformation in Niigataken-Chuestu region by using an InSAR time-series analysis

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Plate convergence zones exhibit deformation of various scales in both time and space. It is fundamentally important to know the spatio-temporal pattern of such deformation in detail to understand the physics of plate interactions. InSAR time-series analyses, which can track the temporal evolution of detailed deformation patterns, are suitable for such a purpose. In this presentation, we report the result of an InSAR time-series analysis applied on data acquired over Niigataken Chuetsu area, central Japan.

We used 13 ENVISAT SAR images acquired between the occurrences of 2004 Niigataken-Chuestu and 2007 Niigataken-Chuetsuoki earthquakes. We first performed a persistent scatterer SAR interferometry analysis using the StaMPS algorithm (Hooper et al., 2007, JGR). We then corrected for artifacts due to orbit inaccuracies and atmospheric phase delay using GPS displacements. This post-processing revealed that the dominant component of the displacements is a seasonal pattern caused by water extraction during winter. Precise estimation of the tectonic component of the displacements was further obtained by separating out the seasonal component using a principal component analysis.

We identified quasi-steady signals in two different locations. An area close to the coast (A in the figure) moved in the direction toward the satellite (upward and eastward) with an approximate rate of 1 cm/yr. This signal is consistent with the motion of the Amurian plate with respect to the North American plate, supporting the idea that the NKTZ can be considered as the plate boundary. The signal around the southern end of the source fault of the 2004 earthquake (B; west of Suwa-toge flexure (gray curve)) exhibits a higher rate of 2 cm/yr. This signal is consistent with leveling surveys conducted by the Geospatial Authority of Japan, and is best interpreted by an afterslip of the 2004 earthquake.

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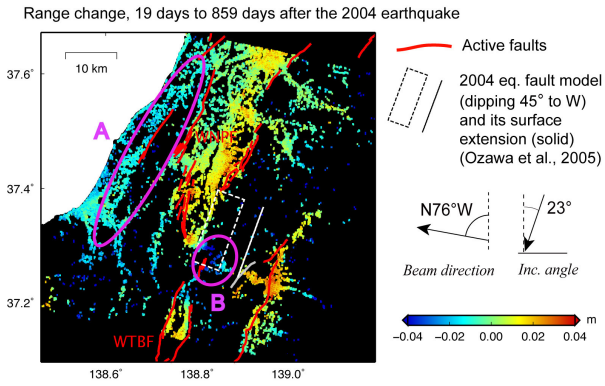

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