Monitoring of the inter-plate coupling using GNSS-A seafloor geodesy along the Nankai trough

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Recurring inter-plate megathrust earthquakes have occurred along the Nankai Trough subduction zone and the next earthquake in this region is predicted to occur in the near future. Because megathrust earthquakes are driven by accumulated inter-plate slip deficit, it is necessary to monitor the inter-plate coupling state. Crustal deformation data obtained from geodetic observations is an important tool for monitoring the coupling state. However, as the focal region of the Nankai trough earthquake is located beneath the seafloor, estimations based on terrestrial observations provide limited accuracy. Therefore, seafloor geodetic observations are particularly important for monitoring the coupling state. The Hydrographic and Oceanographic Department of the Japan Coast Guard has been developing a seafloor geodetic observation system based on the combined GNSS-Acoustic ranging (GNSS-A) technique and collecting data to monitor the coupling state.

Yokota et al. (2016) estimated inter-plate slip deficit rate of the Nankai trough subduction zone using the GNSS-A seafloor geodetic data. However, temporal variation of the coupling state could not be investigated due to the inadequacy of temporal resolution of the GNSS-A data. On the other hands, slow earthquake phenomena such as slow slip events (SSE) frequently occur along the Nankai trough. Therefore, it is essential to understand the temporal variations of the coupling state.

To clarify the difference between the SSE regions and the strong coupling regions, we evaluate the average coupling state estimated from the long-term GNSS-A data updated from Yokota et al. (2016). Because the long-term data include the SSE occurrence periods, the crustal velocity becomes relatively slow in the SSE regions. Therefore, the difference from the strong coupling regions where the crustal velocity is relatively fast becomes clear. Attritionary, we investigate temporal variations of the coupling state represented as deviation from the average state.

Keywords: GNSS-A, Seafloor geodesy, Nankai trough earthquake

