Interseismic Strain Partitioning in Nankai Subduction Zone, Southwest Japan: Block Movement and Internal Deformation of the Forearc Sliver

*Masahiko Shiomi[1], Takao Tabei[2], Takeo Ito[3], Makoto Okubo[2]

1. Graduate School of Science, Kochi University, 2. Faculty of Science, Kochi University, 3. EVRC, Nagoya University, Nagoya, Japan

We study interseismic strain partitioning in the Nankai subduction zone, southwest Japan (SWJ). Oblique subduction of the Philippine Sea plate (PHS) and strong coupling on the plate interface have deformed the overriding SWJ arc in two ways: interseismic crustal shortening in the direction of PHS convergence and long-term lateral block movement of the forearc sliver along the Median Tectonic Line (MTL) that is the arc-parallel strike-slip fault dividing the forearc from the rest of SWJ. Slip deficit on the MTL fault plane may disturb local deformation filed.

Basic data used in this study are GPS displacement rates obtained from the nationwide continuous network. We incorporate the rates from dense campaign measurements along two traverse lines across the MTL to improve spatial resolution around it. Furthermore we add seafloor displacement rates near the Nankai Trough to better estimate plate coupling far offshore. PHS interface and MTL fault plane are reproduced by many triangular elements to a depth of 50 km and 15 km, respectively. We introduce Markov Chain Monte Carlo method to simultaneously estimate slip deficit distribution on the PHS interface and MTL fault plane, together with the Euler vector of the forearc block motion relative to SWJ.

The slip deficit rate on the PHS interface is the strongest (> 50 mm/yr) at the depth of 15-25 km, which nearly overlaps with the main rupture zone at the last megathrust event in 1946. While the slip deficit rates decrease steeply toward the deeper portion, they are still large enough in a shallower zone near the trough. Rate of the forearc block motion is 5-7 mm/yr relative to SWJ but locking of the MTL fault plane is not uniform from east to west. The block motion across the MTL and partial locking of its boundary fault plane have caused a small-scale shear deformation zone in the SWJ arc.

Keywords: Crustal deformation, Southwest Japan, Philippine Sea plate, Median Tectonic Line, GPS

