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# Steady interplate coupling at the Nankai Trou

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The Philippine Sea plate is subducting beneath southwest Japan at the Nankai Trough causing elastic shortening of the crust in the direction of plate convergence. To better understand interplate megathrust earthquake cycle, distribution of plate coupling on the plate interface at the interseismic stage should be monitored. The biggest problem may be a modeling of plate interface that changes abruptly its strike and dip-angle. Instead of conventional rectangular faults, we use a number of triangular elements to reproduce the plate interface in this study. We invert three-dimensional GPS velocities to estimate interseismic slip deficit rates at the Nankai Trough plate interface.

At first we calculate horizontal velocities relative to the Amurian plate and vertical velocities with respect to the ellipsoid at 430 GEONET stations in southwest Japan. We use final coordinate solutions of GSI (F3 solutions) during the period of January 2004 to December 2009. Next plate interface in depth of 4-60 km is reproduced by 533 triangular elements without any gap or overlap. In the inversion analysis, we employ Poly3D (Maerten et al., 2005) and apply a boundary condition of zero-coupling at the margin of the model space and a constraint of smoothness for spatial variation of slip deficit rates between the elements.

The result shows that the regions of the highest slip deficit rate (nearly 100% of plate coupling) are estimated off Sikoku and Kii peninsula. These regions are in accordance with the asperities of the 1946 Nankai earthquake and consistent with the results of the previous studies. Nearly 70% of coupling is estimated beneath the Bungo channel where long-term slow slip event (L-SSE) has been detected every 6-7 years. Cumulative slip deficit in one interval of the L-SSE (6-7 years) is roughly equivalent to the maximum slip of the 2003 and 2010 L-SSEs (about 30cm) if plate convergence rate (70 mm/yr from a global plate model) and plate coupling (70% in this study) are assumed. Moreover recent studies have revealed that crustal deformation field in southwest Japan involves lateral motion of the forearc block along the Median Tectonic Line (MTL). Assuming that the shallower portion of the MTL fault plane is locked but aseismic forearc block motion is going on along the deeper portion of the MTL, we calculate contributions of the MTL and remove them from the observed GPS velocity field. Reanalysed results show that slip deficit rates that have been overestimated especially in the western part of the model space are improved.