# Interseismic plate coupling at the Nankai Trough inferred from three-dimensional crustal velocity field

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We study interseismic plate coupling at the Nankai Trough off southwest Japan based on three-dimensional crustal velocity field from nationwide continuous GPS arrays. Oblique subduction of the Philippine Sea plate causes permanent lateral block motion of the Nankai forearc as well as short-term crustal shortening in the direction of plate convergence. While the vertical velocities have a higher sensitivity to the plate coupling at depth, they don't reflect lateral block motion of the forearc. We use both horizontal and vertical velocities to discriminate short-term crustal shortening and permanent lateral block motion and better estimate interseismic plate coupling.

The data used are GPS crustal velocities in a range from 132E to 135E. Horizontal velocity field is rotated to the Amurian plate reference frame and vertical velocity field is adjusted so that the mean velocity of the area far distant from the plate boundary becomes zero. The plate boundary is approximated by 21 rectangular sub-faults at 5-35km in depth. The Median Tectonic Line (MTL), the longest strike-slip fault system dividing the Nankai forearc from the rest of the overriding plate, is modeled by four segments with northward dipping fault planes. We assume that the MTL is a boundary of block motion but its shallower portion may be fully or partially locked to the depth of 15km. We make an inversion analysis with a priori information to estimate simultaneously back slip rates at the plate boundary, lateral block motion rate of the forearc, and slip deficit rates of the shallower portion of the MTL.

The results show nearly full coupling of the plate boundary in a rage of 5-25km in depth. As for the plate coupling at the sub-faults deeper than 25km, larger values are needed to reproduce vertical deformation field than for the horizontal. Plate coupling in a range of 25-30km is estimated as 50-70%, which is slightly larger than those in the previous studies. Lateral block motion rate of the forearc and slip deficit rates of the MTL are estimated as 6.7mm/yr to the west-southwest and 3-6mm/yr in a reverse sense to the block motion, respectively. It shows that shallower portion of the MTL is strongly locked to the depth of 15km and stationary aseismic slip is occurring at the deeper.