Spatial variation of slip deficit at the Nankai Trough - Iterative inversion analysis shifting estimated area -

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We study interseismic slip deficit distribution at the Nankai Trough in southwest Japan based on horizontal crustal velocity field from continuous GPS array. Many previous studies have shown that current plate coupling at the Nankai Trough is generally so strong that the leading edge of the overriding plate is shortened in the direction of plate convergence. However, geometry of the plate interface is rather complicated from Kii peninsula through Shikoku to northeastern Kyushu. For example slab dip-angle varies along the trough, as low as 15-20 degrees below Shikoku while much larger below Kii peninsula. Nankai Trough changes to a more southward strike and increases its dip-angle steeply off the northeastern Kyushu.

We invert GPS horizontal velocities using ABIC geodetic inversion technique by Yabuki and Matsu'ura (1992) to estimate slip deficit distribution on the Nankai Trough plate interface. In most inversion analyses of geodetic data, a priori information and constraints to the model space are required to derive stable estimates. However, it is sometimes recognized that the slip deficit rates are apparently overestimated near the boundary of the model space because of a strong constraints. In this study we deploy a region of 640km x 330km on the plate interface and carry out the inversion analysis for the sub-region of 450km x 330km. We repeat the analyses shifting the sub-region along the strike of the trough with a step of 30km. For a specific point on the plate interface, results from iterative inversion analyses for three successive sub-regions are averaged as the slip deficit at that point. When an estimate deviates from the mean value by larger than 7mm/yr (10% in plate coupling ratio), it is omitted from the averaging as the outlier. The slip deficit distribution thus obtained is more stable and freer from the constraints compared with the inversion for a single model space.