Interplate Coupling derived from GPS surveys in Kii peninsula and its Implication to the Groundwater Changes Preceding the 1946 Nankai Earthquake

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In order to derive a detailed image of the source fault of the future Nankai earthquake, we established 10 GPS observation sites in Kii peninsula. These observation sites fill the gaps in the GEONET operated by GSI and are located along two lines nearly parallel to the relative motion between the Philippine Sea and Amurian plates. Resultant average spacing is 5~10km. These networks cross the hinge-line, which is the boundary between uplift and subsidence due to the 1946 Nankai earthquake, and are expected to detect the location of the lower margin of the coupling zone and its temporal changes.

We have repeated the campaign survey of this traverse across the hinge-line in the Kii peninsula using dual-frequency receivers since March 2001. The obtained velocities of observation sites are about 3cm/yr in the middle part of Kii peninsula and 4.5cm/yr at its southern tip, respectively, relative to the Amurian plate. Their directions are WNW. The gradient is almost linear, which suggests that the coupling zone is rather wide.

We apply a dislocation model with a uniform slip to this observed velocity field in order to estimate interplate coupling beneath the Kii peninsula. Changing the width of the Ando's(1975) fault model, we compare the fitness of theoretical displacement with the observed one. The calculation indicates that the original Ando's model is too narrow to represent the observed velocities. In order to explain the observed velocities in the middle Kii peninsula, we must double the width of the model fault. This implies that the coupling zone between the subducting Philippine Sea and Amurian plates might be extended much deeper than the depth previously suggested from the thermal model and others.

Groundwater level drops before the 1946 Nankai earthquake were reported in middle and south Kii peninsula and eastern and southern coastal region of Shikoku. We assume this change in Kii peninsula is caused by a preseismic slip on the fault

plane or its deep extension, and perform forward calculation of areal strain to find the possible preseismically slipping segments. The deepest segments of the model faults by Sagiya and Thatcher (1999) produce dilation south of the hinge-line, which does not coincides with the distribution of wells of reported anomalous changes. On the other hand, slip on the deeper extension beneath the Kii channel can reproduce dilatation in the middle Kii peninsula and eastern coast of Shikoku. The coupling zone derived from our GPS observation roughly corresponds to this deep extension of coseismic fault, which suggests that the deep coupling zone might be the source region of such preseismic slip.