Interplate coupling of the Tonankai region and inland tectonics of the Kinki-Chubu districts estimated from GPS data

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Interplate megathrust earthquakes have repeatedly occurred with a repeat time of 100-150 years along the Nankai subduction zone. The latest megathrust events there were the 1944 Tonankai (M7.9) and the 1946 Nankai (M8.0) earthquakes. According to the Earthquake Research Committee, the probability of the occurrence of the next Tonankai Earthquake in the next 30 years is estimated as 60˜70% as of 2007. So it is very important to investigate tectonic loading processes toward the next large earthquake in the Tonankai region. For this purpose, we estimated slip deficit distribution of the Tonankai region from GPS data inversion analysis and also examined east-west shortening in Central Japan where tectonic contraction between the northeastern and the southeastern Japan arcs.

We inverted GPS displacement rate data using the method by Yoshioka et al.(1993) for estimating interplate coupling in the Tonankai region. Because of the E-W shortening in this region, it is necessary to divide the GPS stations into two groups of east and west side of Ise Bay and install fixed point respectively for removing inland east-west shortening effects. We installed fixed points for each group (East; Hachiman(950282), West; Ohtsu1(950322)) and calculated displacement rates of observation points. Then we examined inland east-west shortening from relative velocity between Ohtsu1 and Hachiman, and compared with average displacement rates of active faults around the Ise Bay.

We found 4-5cm/yr slip deficit distribution at depth 10-25km around Kumanonada. This large slip deficit region correspond to the main source rupture of 1944 Tonankai earthquake estimated from Kikuchi et al. (2003) and Sagiya and Thatcher (1999). But, our slip deficit distribution is not corresponded the source rupture estimated from Yamanaka (2004). About inland deformation, 5mm/yr east-west shortening was examined between two fixed points. Average displacement rates of active faults around Ise Bay are corresponded to this inland shortening and we think that Yoro-Kuwana-Yokkaichi fault especially has a big influence for dissolution of east-west shortening. North of estimated slip deficit direct close direction of NA-PHS relative motion. On the other hand, south of slip deficit direct close directionof AM-PHS relative motion. From this result, we suggest that Kii Peninsula is transitional zone between northeast (North American Plate) and southwest (Amurian Plate) japan.