

Crustal velocity field and estimation of deformation pattern in and around Izu Peninsula

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Nationwide continuous GPS array, GEONET, has shown that the motion of the Izu Peninsula is deviated significantly more westerly compared with the northwestward motion of the main part of the Philippine Sea plate (Ph). A kinematic model has been proposed that the westerly deviated motion is attributed to the collision between Ph and the Honshu arc at the neck of the Peninsula (Ishibashi and Itani, 2004). In this model north component of the motion is cancelled out with the rebound due to collision. Consequently the Peninsula moves to the west. It seems that the effect of the collision decays from the neck of the Peninsula toward the southern tip. However, elastic collision model using a vertical tensile crack (Okada, 1985) shows that effect of the collision decay rapidly with the distance and cannot reproduce the westward motion of the Peninsula. In this study we interpret that the motion of the Izu Peninsula is due not only to the collision but also to the stationary slip on the horizontal detachment beneath the Peninsula (Seno, 2005).

We assume a horizontal detachment with a length of 85 km and a width of 35 km in a strike of S20E at a depth of 15-20 km and give a stationary slip in a strike direction. Surface movement is a summation of two effects, that is, the tensile crack at the collision zone and the stationary slip on the detachment. Since relative magnitudes of these effects are unknown, we search an optimum model that reproduces the observed deformation field varying relative magnitudes of two effects. One possible model is that about 60% of the relative motion between Ph and the Honshu arc is absorbed by the collision and the rest by the slip on the detachment.

In this study we fix the southern boundary of the detachment at 20 km south of the southern tip of the Peninsula based on Seno (2005). However there are some evidences that are inconsistent to this assumption. Temporary GPS observations at the Zenisu Reef, about 70km south of the Peninsula, has shown that the motion of Zenisu is quite similar to that of the southern tip of the Peninsula. Moreover there is no clear seismic activity between them. Taking into consideration structure of oceanic crust, earthquake distribution, and similarity of the deformation between Zenisu and the southern tip of the Peninsula, it is more natural to extend the southern boundary of the detachment to the Zenisu Ridge.