

Reconsideration of optimum site distribution for detecting seafloor crustal deformation at the Nankai subduction zone

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The Philippine Sea plate subducts beneath the southwest Japan from the Nankai Trough with a rate of about 4-6 cm/yr, where great interplate earthquakes have repeatedly occurred every 100-150 years. To clarify the mechanism of megathrust earthquake occurrence at such subduction zones, we require the geodetic data obtained from not only onshore area but also offshore area. However it is difficult to estimate the coupling strength in offshore areas, due to the poverty of those data. For this issue, we have conducted seafloor geodetic observation using GPS/Acoustic techniques around the Nankai Trough since 2004. In this system, we estimate the position of a surveying vessel by Kinematic GPS analysis and measure the distance between the vessel and the benchmark on the seafloor by Acoustic measurements. Next, we determine the location of the benchmark and detected crustal movement on the seafloor. In the Kumano Basin, we have two seafloor benchmarks, which are located about 60 and 80 km away from the deformation front of the Nankai Trough. The observations from 2005 to 2008 have illustrated that those benchmarks are moving at rates of about 5-6 cm/yr toward west-northwest with velocity uncertainties of about 2 cm/yr relative to the Amurian plate. In this study, in order to estimate interplate coupling at the Nankai Trough, we calculated surface deformations accompanied with subduction of the Philippine Sea plate in an elastic half-space and compared them with on- and offshore GPS velocities. Then, we checked the effect of seafloor geodetic observation on slip resolution on the plate interface. Moreover, we investigated optimum seafloor site distribution at the Nankai Trough using numerical simulation, because we require more seafloor sites to understand spatial variation of the slip and strain accumulation on the plate interface.

Keywords: seafloor geodetic observation, Nankai Trough, interplate coupling