Monitoring of crustal deformation under the Kanto Asperity drilling Project

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The M˜8 great earthquakes including the 1923 Taisho Kanto and the 1707 Genroku Kanto earthquakes repeated to occur along the Sagami Trough. Slow slip events occurred southeast off Boso Peninsula in 1996 and 2002. Although slip distribution of great earthquakes and slow slip events was estimated from geodetic and seismological data, it is difficult to estimate a detailed spatial pattern of slip distribution in the offshore region because of observation points limited in land.

The present geodetic networks including GPS(GEONET) and tiltmeters(Hi-net) can detect slip with M_w 5.0 in the region within 15-20km of the coastline if slip occurs on the subducting Philippine Sea plate. The plate boundary is estimated to lock in the source region of great earthquakes from GPS data. However, it is difficult to estimate whether the locked region reaches the Sagami trough using the present geodetic data.

The Kanto Asperity drilling Project(KAP) proposes the ocean bottom drilling by Chikyuu in Sagami Bay and off Boso Peninsula to clarify geology of the seafloor. The drilling sites locate above asperities of the Taisho Kanto and Genroku Kanto earthquakes and regions where slow slip and stable sliding occur. Geophysical instruments, that is, seismometers, tiltmeters, and strainmeters are set up in the drilling hole to monitor crustal deformation. The pressure gauge near the drilling hole is used to detect vertical displacement. The proposed geodetic network can detect slip M_w 5.0 in all region of the plate boundary.

We expect two kinds of geodetic signals captured by the proposed network. One is a short-term signal whose duration is less than several weeks. The other is a long-term signal which continues for a month to several years. The expected short-term signal is related with the slow slip events which occurred periodically off Boso Peninsula. One of the proposed sites locates just above the area where slow slip occurred. The tilt change is expected to clarify a source mechanism and propagation process of the slow slip. Another short-term signal may be caused by creep events near the trough axis where the fault zone is unconsolidated. A long-term signal, in particular, vertical displacement detected by pressure gauge can constrain an updip limit of interplate coupling near the trough axis. It gives useful information for source regions of the great earthquakes.