Tectonic stress of the upper-plate crust above the Tonankai seismogenic zone

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The crustal physical property is necessary information to understand the seismogenic mechanism. Soft sediment changes to hard rock to be the seismogenic material during plate subduction. In this process, strength is the most developing property than the other of the porosity, bulk density, elastic wave velocity and etc. The sediment lithification depends on the stress due to strain hardening, and the strength of the sediment products us the stress condition in the plate subduction zone.
IODP Exp.338 took samples from 1000 mbsf to 2000 mbsf above the seismogenic zone of the Tonankai earthquake of 1944 (Mw=8.0) during Nankai Trough Seismogenic Zone Drilling Project (Moore et al., 2013). Because the riser-drilling, the cutting-sample were taken in all section differ from the core samples. These cutting-samples have the potential to make the strength profile of upper plate in the subduction zone. We develop new method to estimate the rock strength using the needle penetrator that applicable for small cuttings-sample. Since the needle penetration makes the Mode I crack, the obtained strength concerns with cohesion of the rock. This needle-penetration strength was compared with uniaxial compression strength using various strength samples of mortar and natural sandstones.
In the result, higher cohesive samples were obtained at deeper section at site C0002. The cohesion gradient increases suddenly at the boundary between the Kumano basin and the accretionary prism. The accretionary sediment may suffer tectonic stress, and high cohesion gradient can be explained by increasing tectonic stress with depth. In case of frictional sliding, shear stress within upper plate increases with depth above the asperity. The cohesion curve may show upper plate stress field in the seismogenic zone.

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