

Electromagnetic survey and monitoring in the Tokai mega-earthquake area

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Existence of fluid on seismogenic zone has a key role on occurrence of great earthquakes because high pore pressure in a fault zone allows sliding at low shear stress. In this study, we introduce our scientific survey and monitoring of the off-shore seismogenic zone with a submarine cabled observatory.

Recently, marine electromagnetic surveys give us information about subsurface fluid distribution around seismogenic zones because enhanced electrical conductivity at subsolidus temperatures is principally controlled by the presence of water. Such crustal image indicates less fluid condition around seismically locked zones.

In this study, we add a new marine EM survey result obtained in the Tokai area, where is famous as an upcoming Tokai mega-thrust earthquake. The new result will help us detailed discussion about the mechanism why the resistivity values are different between slow slip area and mega-earthquake area. We deployed ocean bottom instruments (OBEM or OBE) at 10 sites and obtained ocean bottom EM data. After applying MT method and 2D inversion, we obtained sub-seafloor resistivity structure around the Tokai earthquake zone.

The result show that the subducting Philippine Sea plate indicates low resistivity before subduction and becomes resistive as the plate goes deep. This feature have been shown in the Kumano area (Kimura et al., 2005), far west of this survey area. The transient depth from low to high resistivity seems common between these two areas, whereas the subduction angles of the oceanic plate are different each other. It implies that the mechanism for the resistivity variation of the oceanic plate is controlled by pressure variation and resultant dehydration (or squeeze of water) in the oceanic crust.

Although the power of the EM imaging has been increased, there is no information how fluid can act on occurrence of great earthquakes. Therefore, we also conducted an active and passive monitoring project named Tokai-SCANNER: Tokai Submarine Cabled Network observatories for Nowcast of Earthquake Recurrences. We introduce the Tokai-SCANNER briefly, whose observation has been started since May, 2007.