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南海連動型巨大地震の西縁ー日向灘セグメントーを規定する構造

Structural factor controlling the Hyuga-nada segment, western edge of the Nankai mega-earthquake

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The western end of the Nankai Trough, the Hyuga-nada region, is distinguished from the other three domains (Nankai, Tonankai and presumed Tokai earthquake regions) from a view of megathrust earthquake rupture behavior. While the other three domains have M8 earthquakes with a recurrence interval of 100-200 years [e.g., Ando, 1975], the Hyuga-nada region is marked by just M6 or M7 earthquakes with a recurrence interval of 10-20 years [e.g. Utsu, 1974].

The Nankai and Tonankai earthquakes had often occurred simultaneously, and caused a great event. Possibility of a megathrust earthquake along the Nankai Trough from Tokai to the Hyuga-nada, east off the Kyushu Island, Japan, is recently pointed out [e.g. Hori et al., AOGS 2009].

In the Hyuga-nada region, the Kyushu-Palau Ridge, which is a remnant arc associated with backarc spreading of the Shikoku Basin of about 30-15Ma [Okino et al., 1994], appears to be one of the major structural features.

To understand rupture synchronization and segmentation of the Nankai megathrust earthquake, it is important to know the deep seismic image and activity in the Hyuga-nada, the western end of the Nankai seismogenic zone.

To obtain the deep structure related to the rupture synchronization and segmentation in this region, the large-scale high-resolution wide-angle seismic study was conducted in Dec. 2008. In this study, 160 ocean bottom seismographs are deployed with a spacing of 5km along four seismic profiles, 830km in a total length. A tuned airgun system (7800 cu. in.) was shot every 200m along these profiles (Fig. 1). This research is part of 'Research concerning Interaction Between the Tokai, Tonankai and Nankai Earthquakes' funded by Ministry of Education, Culture, Sports, Science and Technology, Japan.

Seismic velocity and reflectivity images along four profiles are derived by first arrival tomography [Zhang et al., 1998] and traveltime mapping method [Fujie et al., 2006]. These images clearly indicate the structural variation of the subducting Philippine Sea Plate from the subducting oceanic crust of Nankai Trough to the thick crust of the Kyushu Palau Ridge. The structural boundary between the oceanic crust and the Kyushu Palau Ridge is considered to lead to the southwestern rim of the coseismic slip zone of the 1968 Hyuga-nada earthquake (Mw7.5) (Yagi et al., 1999). This structural boundary may control the southwestern end of the megathrust earthquake of the Nankai Trough from the Tokai to Hyuga-nada. Observed tsunami height of the 1707 Hoei earthquake can be practically explained by simulation of strong motion and tsunami considering the Hyuga-nada segment with its southwestern end at the structural boundary (Furumura et al., 2009).