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南海トラフに沈み込むプレート境界の滑りを監視する海底孔内観測ネットワーク
Seafloor borehole observatories for monitoring slip events in the Nankai subducting plate boundary.

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Tonankai earthquakes are magnitude 8 class earthquakes known to occur every 100-150 years in the Nankai Trough, south of Japan. The last occurrence was in 1944 and we are concerned about the next occurrence. In order to monitor and watch detailed seismic process in the vicinity of its epicenter, a sea-floor observatory network called DONET was developed and it started observation from 2010. The DONET is consisted of 20 seafloor observatories linked with submarine cable, covering from aseismic seafloor near the trough axis, through the area where episodic slow slip events occur, as well on the Tonankai earthquake rupture zone. Each DONET seafloor observatory was designed to observe ground motion, seafloor pressure, and seafloor water temperature in wide frequency range and wide dynamic range to cover various types of events expected in the area of the DONET network, such as large earthquakes, micro-earthquakes, episodic slow slip events, and seafloor turbidity currents. Some of expected events are very small in amplitude therefore we established very low noise observation environment by completely burying each seismometer in the seabed. By January, 2011, we have successfully installed submarine cable network, and 8 seafloor observatories are operational.

Further low noise and stable observatory may be built using a seafloor borehole penetrating below the sediment on which seafloor observatories stand. During IODP Exp 332 in December 2010, we have successfully installed the first planned seafloor borehole observatories in IODP Hole C0002G. Strainmeter, tiltmeter and seismic sensors were cemented near the bottom of 980 m seafloor borehole to ensure stable environment required for these geodetic measurement, where distance to the Tonankai seismogenic fault is approximately 6 km. The borehole observatory in C0002G is currently measuring pore-fluid pressure in the accrecionary prism, sediment basin, and seafloor. In March, 2011, we plan to start long-term seismic and geodetic observation in the C0002G borehole observatory. We plan for installation of another permanent borehole observatory at IODP Hole C0010A which is located in the south of the C0002G penetrating one of the splay faults in shallower depth. We expect the strainmeter, tiltmeter, and broadband seismometer installed quiet and stable environment in Hole C0002G and C0010A will produce a key observation defining slip behavior of the subducting plate in zone between seismically coupled and decoupled plate interface.