

Installation plan of long-term seafloor borehole observatories using riserless boreholes in the Nankai Trough

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The first stage of Scientific drilling in the Nankai Trough by D/V Chikyu was successfully finished recently. We plan to install long-term observatories in boreholes drilled by the IODP (Integrated Ocean Drilling Program). We are currently design a long-term seafloor borehole observation system that can be installed by D/V Chikyu. The observation system under development is capable of monitoring seismic activity and ground deformation in the plate boundary in the Nankai Trough, in which area occurrence of large earthquake is expected. We plan to install such long-term observation system in not only borehole drilled by riserless technology, but deep borehole drilled by riser drilling technology in the future. Here, we present our installation plan of the borehole observatory in riserless boreholes in 2009.

Observation parameters of the riserless longterm borehole observation system are strain, pore-fluid pressure, broadband seismic, strong-motion, tilt, and temperature. These parameters are chosen to precisely observe seismic activity, slow slip, and fluid motion associated with slip activity of fault system near the observatories. These sensors are designed to be installed by D/V Chikyu. Many of sensors are cemented at the bottom of the borehole to securely coupled to the formation and to maintain stability for long period. Pore-fluid pressure is to monitor hydrologic activity of the fault system and to monitor strain change around the observatory. Pore-pressure change in the borehole is transmitted to the seafloor with watertube, while other sensors are connected to seafloor with electrical cables.

Development of observation system, installation, and long-term observation will be realized by joint effort with reserch groups in Japan, the U.S and other countries. We are currently planning installation sites, in the southern part of the Kumano Basin, and in the area of splay fault system south of outer rise. We also consider connection of these future long-term borehole observatories to the scientific submarine cable network for earthquake and tsunami observation off Kii Peninsula. Technical feasibility study is now undergoing for the cable connection of the borehole observation system.