A total station plan combined with “Chikyu” and DONET: simultaneous observation from seafloor to atmosphere

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DONET (Dense Oceanfloor Network system for Earthquakes and Tsunamis) has been developed and installed around Nankai Trough, which is motivated by the 2004 Sumatra-Andaman Earthquake. DONET contains pressure gauges as well as seismometers, which are expected to detect crustal deformations driven by peeling off subduction plate coupling process [5]. From our simulation results based on a rate- and state-dependent friction law [6], leveling changes due to slow earthquake [1-4] are different sense among the DONET points even in the same science node [7]. On the other hand, oceanic fluctuations such as melting ice masses through the global warming have so large scale as to cause ocean bottom pressure change coherently for all of DONET points especially in the same node. This difference suggests the possibility of extracting crustal deformations component from ocean bottom pressure data by differential of stacking data. However, this operation cannot be applied to local-scale fluctuations related to ocean mesoscale eddies and current fluctuations, which affect ocean bottom pressure through water density changes in the water column (from the sea surface to the bottom). Therefore, we need integral analysis by combining seismology, ocean physics and tsunami engineering so as to decompose into crustal deformation, oceanic fluctuations and instrumental drift, which will bring about high precision data enough to find geophysical phenomena. Since Integrated Ocean Drilling Program (IODP) has a plan of operation to connect borehole observations to DONET by using Scientific Deep Sea Drilling Vessel “Chikyu”, we have to discuss the best way to do simultaneous observation from seafloor to atmosphere by taking advantage of this chance. The combination of these evaluations brings about win-win results for all of various researchers and technicians. We also introduce our penetration observation at “Chikyu” launched from 14th of January.

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