

Real-time monitoring of seismic and geodetic activities by long term borehole monitoring system in the Nankai Trough subduction zone

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The Nankai Trough, Japan, is a major subduction zone formed by the subducting Philippine Sea plate beneath the Eurasian plate with a rate of approximately 4-6.5 cm/year, and over M 8.0 huge mega-thrust earthquake occurred along plate interface repeatedly with intervals of 100 to 150 years. These earthquakes generate not only strong ground motion but also huge tsunamis, which cause serious and widespread damage in coastal urban area in the southcentral part of Japan. It is very important to understand earthquake preparation and generation process by in-situ seismic and geodetic monitoring to assess the risk of mega-thrust earthquakes including huge tsunamis.

In the Nankai Trough, submarine cable network observation system named DONET (Dense Oceanfloor Network system for Earthquake and Tsunamis) is now monitoring real-time seismic and tsunami activities, which cannot be captured by conventional land-based observations. Moreover, to measure very weak geodetic and seismic events, which cannot be measured by DONET seafloor observatories, borehole observatories have been constructed as a part of the IODP NanTroSEIZE project. From January 12 to February 7, 2018, the IODP expedition 380 was conducted to install long term borehole monitoring system (LTBMS) to the C0006G hole. The C0006G observatory has a suite of borehole sensors comprising a volumetric strainmeter, tiltmeter, broadband seismometer, thermometer array, and pressure gauges. The IODP C0002G and C0010A LTBMS observatories, which were respectively installed during IODP expeditions 332 and 365, have the same observation system as the C0006G, and are now real-time observatories connected to the DONET submarine cable. The C0006G will be also connected to DONET submarine cable in March, 2018 by ROV Hyper-dolphin and Shinsei-maru, and become the third real-time LTBMS observatory located in the toe region of the accretionary prism.

In this presentation, we will report the initial data observed by the C0006G LTBMS sensors after the DONET connection. Also, we will show the recent results obtained from long-term LTBMS data observed by the C0002G and C0010A LTBMS including slow slip events, which occurred repeatedly every 8 to 15 months and would accommodate 30 to 55 % of the plate motion as reported by Araki et al (2017). We will also discuss the possibility of future C0006G observed data providing new information to discuss spatial distribution of SSEs and other seismic and geodetic events along the Nankai Trough subduction zone.

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