Press Releases



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Chikyu Completes International Ocean Discovery Program (IODP) Expedition 365

The IODP (International Ocean Discovery Program)^{*1} Scientific Expedition 365, "NanTroSEIZE^{*2} Shallow Megasplay LTBMS" with the deep sea drilling vessel, *Chikyu* at the Japan Agency for Marine-Earth Science and Technology (JAMSTEC: Asahiko Taira, President) has entered the port of Shimizu on April 27, 2016 after completion of all scheduled work in the expedition since March 26, 2016.

1. Overview

Expedition 365 recovered temporary monitoring instruments (a "GeniusPlug") from Integrated Ocean Drilling Program Site C0010 previously cased during Expedition 332 (as reported on October 22, 2010), and deployed a permanent long-term borehole monitoring system (LTBMS) in the same hole after deepening it to ~651 meters below seafloor. Also, core samples were collected.

It was led by Co-chief Scientists Demian Saffer at The Pennsylvania State University and Achim Kopf at University of Bremen, with participation of a total of 10 scientists including five from Japan and three from IODP member countries.

2. Results Overview and Future Prospectsw

This research at Site C0010 aims to realize continuous monitoring of borehole in the splay fault, which is one of the major faults likely to have caused the Tonankai Earthquake. In this expedition, a GeniusPlug deployed at Site C0010 during IODP Expedition 332 was recovered, which successfully collected data on pressure and temperatures in the borehole for the period of five years and four months since the deployment. The GeniusPlug has already provided high-quality data including from the 2011 off the Pacific coast of Tohoku Earthquake and earthquakes offshore southeast of Mie Prefecture on April 1, 2016. Detailed analysis of these data is, therefore, expected to help better understand processes of earthquake and tsunami generation.

In addition, a second long-term borehole monitoring system (LTBMS) was deployed, in addition to a previous installation at the C0002 site. This LTBMS is equipped with several sensors: 1) thermometer array; 2)strainmeter; 3)broadband seismometer; 4)tiltmeter; 5)geophones; 6) accelerometers; and 7) pressure ports. Fixed with cement in a stable layer in the borehole, it can observe and detect even a slight change in the splay fault and the surrounding crust over a long period with high precision. Measurement of pressure, temperatures and tilt in the crust will allow us to catch crustal changes near the megasplay fault which could be related to tsunami occurrences, as well as to detect accumulated strain energies and seismic activities. The deployed LTBMS will be connected to DONET1 $\frac{*3}{2}$ to collect real-time borehole observatory data in the future.

3. Chikyu schedule

Chikyu will be engaged in maintenance and repair work at Port of Shimuzu, Shizuoka Prefecture from the beginning of May, and then taking part in a commissioned project.

*1 The International Ocean Discovery Program (IODP)

IODP is a multinational cooperative project started from October 2013. The scientific drilling vessel D/V *Chikyu* operated by Japan and the *JOIDES* Resolution by the U.S, and the option to charter mission-specific platforms by Europe are utilized for expeditions. It aims to shed light on global environmental changes, the earth's mantle and crust dynamics and tectonics, and the biosphere beneath the seafloor. This project has been taken over from Integrated Ocean Drilling Program carried out from 2003 to 2013.

*2 Nankai Trough Seismogenic Zone Experiment (NanTroSEIZE) program It is designed to investigate fault mechanics and seismogenesis along subduction megathrusts through direct sampling, in situ measurements and long-term monitoring in conjunction with allied laboratory and numerical modeling studies. It aims to characterize the nature of fault slip and strain accumulation, fault and wall rock composition, fault architecture, and state variables throughout the active plate boundary system for elucidation of mechanism of earthquake and tsunami occurrence.

*3 Dense Ocean floor Network system for Earthquakes and Tsunamis (DONET) DONET is a unique development program of submarine cabled real-time seafloor observatory network. This program has aimed to establish the technologies of large scale real-time seafloor research and surveillance infrastructure for earthquake, geodetic and tsunami observation and analysis. The first phase of this program, DONET1, which was installed at water depths of 1,900-4,400 m in Kumamo-nada off Kii Peninsula, has started full-scale operation since 2006, followed by the second phase, DONET2 deployed at water depths of 1,000-3,600m from Kii-suido to off the eastern part of Shikoku in 2011. The DONET system has been operated by National Research Institute for Earth Science and Disaster Prevention since April 1, 2016.



Figure 1. Expedition area: Sea area 85km southeast of Shingu City, Wakayama Prefecture (33° 13′ N, 136° 41′ E)



Figure 2. Drilled sites in this expedition (The IODP Sites C0001 - C0012 have been drilled in the past.)



Figure 3. Schematic diagram of GeniusPlug



Figure 4. GeniusPlug collected at the IODP Site C0010



Figure 5. LTBMS: Long Term Borehole Monitoring System



Figure 6. LTBM data record and transfer

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