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Exp 906: The Kumano Mud-Volcano Drilling II and Hybrid Pressure Coring System

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D/V Chikyu implemented pressure coring by using the newly developed Hybrid Pressure Coring System (Hybrid PCS) for the first time in Expedition 906 in June 25-28, 2012. The expedition was carried out at the Kumano Mud Volcano #5 (1900 m water depth), and penetrated to 203 mbsf by riserless drilling. Pressure coring of 3 m advance was attempted five times at selected horizons. Pressure core was analyzed onboard by using Pressure Core Analysis and Transfer System (PCATS) of Geotek Limited. In addition normal HPCS/ESCS coring was also carried out by turns.

Drilling Site: Mud volcano, typically formed at convergent margin, works as a natural pipeline that conveys material from deep source to the surface. In the Nankai Trough area, tectonic activity of subducting plate created mud volcanoes, among which Kumano Mud Volcano #5 is one of the most active site in terms of fluid and gas seepage. Surface cores to 20 mbsf were collected in previous Chikyu Exp 903 in 2009.

Scientific Purpose: Pressurized core samples will provide methane hydrates and in-situ volatile gas components such as H2 and CO. With accurate evaluation of geochemical, geophysical and microbiological characteristics of deep material in mud volcano, we can infer that the mud-volcano in the Nankai Trough forearc basin is the window to the deep seismogenic zone, in which geochemical and biological characteristics and behaviors may be highly sensitive to the seismogenic fault activity.

Hybrid PCS: Hybrid PCS was designed to capture a pressurized core sample with 51 mm in diameter, 3 m in length, and up to 5,000 psi in pressure. The system is compatible with Chikyu's ESCS wireline coring system, which runs through 5 and 5-1/2 inch drill pipes. The core liner closure mechanism includes three valves; lower ball valve, top seal for mud return port, and pressure control valve connected to the accumulator. These valves works by running / retrieving core wire line.

PCATS: PCATS provides non-destructive analysis of X-ray CT, P-wave velocity and gamma density of core samples in pressure chamber. Sampling and analysis of gas derived through controlled depressurization process can also be carried out. Core samples are transferred to storage chamber for transportation for further analysis in an onshore laboratory.

In Exp 906, core recovery was limited due to sticky formation in mud volcano, but 0.9 m of pressurized core material was recovered at the last attempt. This presentation, an introduction to the newly developed Hybrid PCS and a summary of Exp 906 will be presented.

Keywords: Pressure coring, Chikyu, Mud volcano, Hybrid PCS, PCATS