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New mud gas monitoring system aboard D/V Chikyu

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Mud gas logging has been commonly used in oil industry and continental scientific drilling to detect mainly hydrocarbon gases from the reservoir formation. Quick analysis of the gas provides almost real-time information which is critical to evaluate the formation and, in particular, safety of drilling operation. Furthermore, mud gas monitoring complements the lack of core or fluid samples particularly in a deep hole, and strengthen interpretations of geophysical logs.

In scientific ocean drilling, on the other hand, mud gas monitoring was unavailable in riserless drilling through the history of DSDP and ODP, until riser drilling was first carried out in 2009 by D/V Chikyu. In IODP Exp 319, GFZ installed the same system with that used in continental drilling aboard Chikyu. High methane concentrations are clearly correlated with increased wood content in the cuttings. The system installation was, however, temporary and gas separator was moved during the expedition for a technical reason.

In 2011, new mud gas monitoring system was installed aboard Chikyu and was used for the first time in Exp 337. The gas separator was placed on a newly branched bypass mud flow line, and the gas sample was sent to analysis unit equipped with methane carbon isotope analyzer in addition to mass spectrometer and gas chromatograph. The data from the analytical instruments is converted to depth profiles by calculating the lag effects due to mud circulation.

Exp 337 was carried out from July 26 to Sep 30, 2011, at offshore Shimokita peninsula, northeast Japan, targeting deep sub-seafloor biosphere in and around coal bed. Data from the hole C0020A, which was drilled to 2466 mbsf with riser drilling, provided insights into bio-geochemical process through the depth of the hole. In this presentation, we show the design of Chikyu's new mud gas monitoring system, with preliminary data from Exp 337.