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Radon measurement during IODP Exp.337

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D/V Chikyu is capable of riser-drilling using circulation mud. The circulation mud repeatedly comes back on the deck of D/V Chikyu from the deep bottom of the borehole. Thus, it is regarded to be a carrier of formation gases and other information, which could be utilized for real-time monitoring on formation gases and fluids. On D/V Chikyu, a degasser is placed on its mud circulation line, we could retrieve the dissolved gases and supply into various monitoring and sampling apparatus. As such monitoring apparatus, Radon (Rn) monitor is also available as a third party tool connecting to one of the auxiliary ports of scientific gas line on D/V Chikyu through fine-mesh dust filter.

Radon (Rn) is an inert radioactive gas of the daughter nuclei of Uranium and Thorium with rather short half-lives. Among Rn isotopes we focus 222Rn having longest half-life of 3.82dy. Although 220Rn shows second longest half-life of 55.3s, most of 220Rn decayed during transportation to the surface. Due to such short half lives and volatility, Rn has widely been monitored to detect micro-cracking prior to the seismic activities (e.g. Igarashi et al., 1995). The concentration of Rn dissolved into the circulation mud is anticipated to reflect the lithological units of the formation; its parental elements, Uranium and Thorium, are generally rich in the terrigenous sediments and felsic rocks. In addition, some coal bed contain abundant Uranium up to 200 ppm (Takeda, 1981), which may enables sensitive detection of coal bed or lithological change during the drilling with continuous profile.

The measurement was performed by an AlphaGUARD PQ2000 Pro apparatus (Saphymo GmbH, Germany) based on an ionization chamber method. The extracted gases dissolving in circulation mud certainly contained formation gases from deep borehole although careful calibrations are required. The newly obtained time sequential Rn data will be presented. The parameter of the measurement are as follows; effective chamber volume is 650mL with 10 min integration, the flow-rate was controlled as 65ml/min.

References:
Igarashi G. et al. (1995) Science, 269, 60-70.
Takeda E. (1981) Bull. Geol. Surv. Japan, 31(11), 583-682 (in Japanese).

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