Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

MIS022-07 Room:201B Time:May 23 10:00-10:15

Unique hydrogeological mode of a submarine hydrothermal system within volcaniclastic sediment

Jun-ichiro Ishibashi[1*], Ken Takai[2], Michael Mottl[3], Expedition 331 Scientists[4]

[1]Faculty of Science, Kyushu University, [2]JAMSTEC, [3]University of Hawaii, [4]Integrated Ocean Drilling Program

Submarine hydrothermal systems have been located not only in mid-oceanic ridges of the plate spreading region, but also in the plate convergent region. In such setting where the seafloor is dominantly covered with volcaniclastic material erupted with felsic magmatism, a hydrothermal fluid circulation system is expected to be spread within sediment layer of significantly high porosity. IODP Exp.331 drilled through an active hydrothermal field at the Iheya North Knoll in the Okinawa Trough, which provided the first opportunity to access directly the subseafloor to reveal the unique hydrogeological mode that may support biosphere and stimulate mineralization. While bulky sedimentation of volcanic clasts dominantly composed of tubular pumice was notable along the slope of the knoll, prevalent hydrothermal alteration was recognized in the vicinity of the hydrothermal center even at very shallow depth. Together with observation of extremely high temperature gradient, the intense and prevalent hydrothermal alteration is attributed to a result of fluid intrusion and occupation extended laterally within the sediment layer. Startificated occurrence of sulfide mineralization, sulfides with clastic texture in the upper interval and siliceous volcanic breccias with sulfide vein in the lower interval, was notable, which is naturally comparable to structure of the Kuroko type deposit where stratiform ore bodies are recognized as concordant with the surrounding sediment layers. The large fluid reservoir laterally extended within porous volcaniclastic sediment would contain large space and surface inside for hydrothermal interactions and stimulate the gradual progress, which should be favorable for formation of a large size ore deposit. The unique hydrogeological mode could be attributed to one of key factors to explain that majority of VMSD was associated with felsic magamtic activity.

Keywords: Volcanic massive sulfide deposit, submarine mineral resources, felsic magma, hydrothermal alteration, volcaniclastic sediment, submarine hydrothermal fluid circulation