

CRUISE SUMMARY

KAIYO Cruise KY-11-02 Leg 1 : Jan.31 - Feb. 8, 2011

Processes and Environment for Deposition of Ferromanganese Crusts at the Ryusei Seamounts, Kyushu-Palau Ridge.

By Akira Usui and Shipboard Scientists

- Cruise ID : KY-11-02 Leg 1
- Name of vessel : KAIYO
- Title of the cruise : Study of Ferromanganese crusts in the Ryusei Seamount
- Chief scientist : Akira Usui [Geology Professor, Kochi University]
- Representatives of party : Aya Sakaguchi [Dept. Earth Sci., Hiroshima Univ.], Blair Thornton [Inst. Ind. Sci., University of Tokyo], Shingo Kato [Tokyo Univ. Pharmacy & Life Sci.], Ayaka Tokumaru [Dept. Earth Sci., Univ. Tokyo]
- Title of proposal : Processes and Environment for Deposition of Ferromanganese Crusts.
- Cruise period : Jan. 31 to Feb. 6, 2011
- Ports of call : Left Yamashita port, Yokosuka and arrived at Aja, Naha, Okinawa
- Research area : Ryusei seamount, Kyushu-Palau Ridge

-Overview of the Cruise

The Northwestern Pacific seamounts are believed as potential areas for ferromanganese crusts as future rare metal resources. The reality in geological occurrence, compositional variations are not well yet understood as well as controlling factors for growth and concentration processes. Our team, composed of geologists, mineralogists, geochemists, physical engineers, and microbiologists have planned to collect and study in the two two typical environments in the Pacific seamounts and marginal seamounts. We attempt to collect ferromanganese crusts samples from an isolated flat-topped guyot in the NW Pacific basin, and the Ryusei seamount (This study). A Tansei-Maru cruise is planned by AORI, Tokyo, by our team.

We carried out two Kaiyo-Hyper Dolphin explorations and successfully mapped the micro-topography by laser sensors (Univ. Tokyo), and substrate geology together with in-situ occurrences of ferromanganese crusts again using the powerful and skillful ROV Hyper Dolphin 3K. The ROV mapping and sampling proved to be useful and efficient for exploration of ferromanganese crusts in the last cruise at Takuyo-Daigo seamount. We expect to understand the depositional environments and processes, behavior of metal elements. This inter-disciplinary joint study have been expected for this study.

In advance of the two dive over the slope between water depths from 1000 to 3000m, we conducted a multi-narrow beam bathymetric study. The flat and steep (20-25 degree gradient) slopes were covered partly with sand-clay sediments from 800 to 2200 m water depths or covered with black hydrogenetic ferromanganese crusts. The deepest point at a depth of 2200m was fully covered with sediments but the shallowest part at depths between 800 and 1600m is show similar morphology. The apparent sediment cover is usually thin enough to cover the depression and flat volcanic edifice or limestone. The shoulders of the seamounts at depths between 900-1100 meters are unexpectedly fully covered with thick ferromanganese crusts with 90 mm thickness or greater. This unique occurrences of thick-flat shape ferromanganese plates were similar to those in the Takuyo seamount where consolidated lagoon sediments with milky carbonate matrix.

The undisturbed and uncontaminated ferromanganese deposits or sediments were most suitable for the following analysis in collaboration of participants and co-workers, i.e., geological and geological and oceanography study. We started analysis in mineralogy,

geochemistry, isotopes, trace and rare metal elements in the crusts to understand the modes of cycling and concentration of metal elements in space and time. Microbiological diversity will be described in terms of modern processes in oxidation of iron and manganese within and at the bottom waters. We shipboard scientists agreed to collaborate and share information in order to understand growth mechanism and environment of hydrogenetic ferromanganese crusts.

The ship track of Kaiyo and the dive track of HyperDolphin are shown in Figs. 1 and 2.

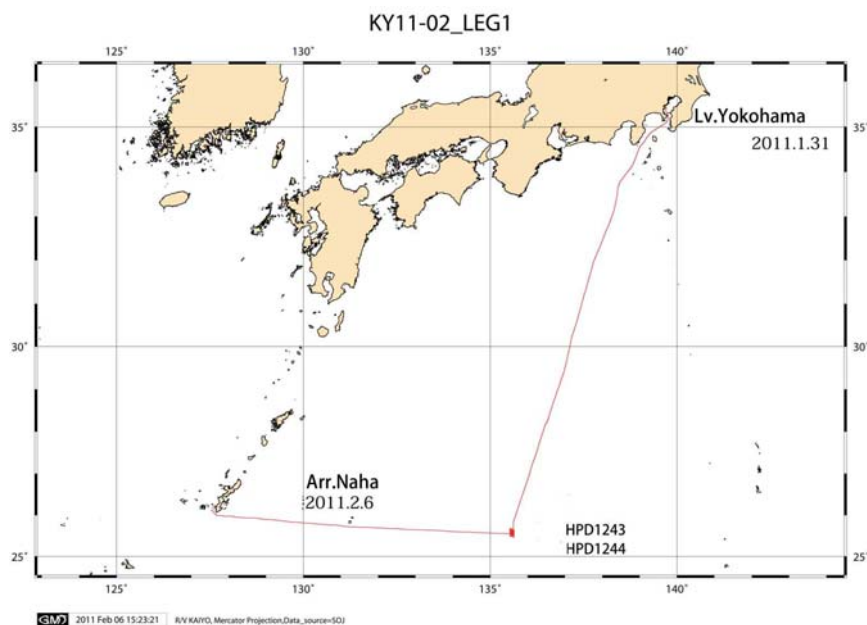


Fig. 1.

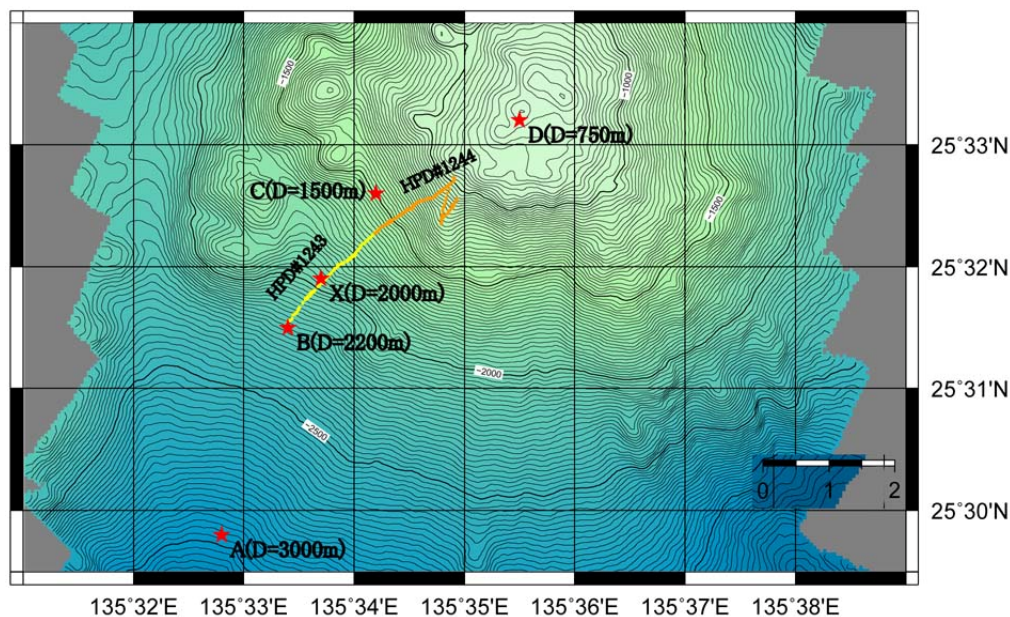


Fig. 2