

Cruise Information

- ◎ Cruise number: NT10-06 Leg2
- ◎ Ship name: Natsushima, Hyper-Dorpin
- Title of the cruise: ROV Hyper Dolphin research dive, deep sea research, FY2010
- Chief Scientist Toshio Yamanaka
[Graduate school of Natural science and Technology, Okayama University]
- Representative of Science Party
Toshio Yamanaka [Okayama University]
Geoscientific and biological investigation using submersible for unexplored hydrothermal fields in the Central ~ Southern Okinawa Trough
- Cruise period: April 4, 2010, April 12, 2010
- Port call: Kagoshima, Ishigaki
- Research Area: Daiichi Kohama knoll and Tarama knoll, the Nansei Islands (Fig.1)

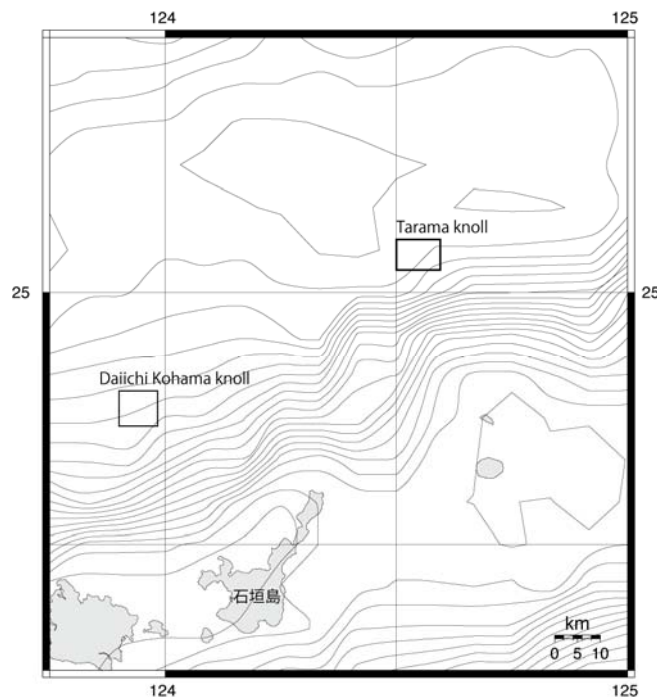


Fig.1 Research area

Leg2 Daiichi Kohama knoll (Depth: 1,500 ~ 1,900m)
and Tarama knoll (Depth: 1,600 ~ 1,900m)

The areas surrounded with the following lines of longitudes and latitudes,
Daiichi Kohama knoll: 24°44.0'N, 123°54.0'E – 24°48.0'N, 123°59.0'E
Tarama knoll: 25°04.0'N, 124°30.0'E – 25°07.0'N, 124°36.0'E

● Overview of Observation

Purpose and Background:

For understanding of whole Okinawa Trough as a single system, it is necessary to research of a blank area of possible hydrothermal activity. It is expected to strongly improve the knowledge how geology and tectonics control chemistry of the hydrothermal fluids and distribution of the related (micro-) organisms in the Okinawa Trough. To reach the goal our targets of this cruise were focused on the Daiichi Kohama and Tarama knolls, which are located southeastern part of western edge of the Okinawa Trough. Significant methane-concentration anomaly possibly originated in hydrothermal activity has been found on the summit of Daiichi Kohama and Tarama knolls during the KT05-26 cruise in 2005 by

surface ship study. Although last year we surveyed the Tarama knoll using HyperDolphin during NT09-10 leg.2 cruise, we found dense turbid water around the summit and weak shimmering from the seafloor covered with characteristic red-brown sediment. However we could not find hydrothermal vent emitting high temperature fluid. Therefore, we try again to find venting site at the Tarama knoll and also visit the Daiichi Kohama knoll for finding venting sites. After the identifying the venting sites we plan to conduct the geological, geochemical and (micro-) biological sampling and clarify the nature. Then we compare the nature with the known hydrothermal sites in the Okinawa Trough for further understanding of the linkage between the chemical and biological nature and the geological and tectonic background.

Methods and Instruments:

For accomplish the purpose, we sampled seawater (Niskin bottle, bag pump sampler, multi syringe water sampler and WHATS with temperature probe), sediments (push corer), rocks and organisms (sponge, fish, etc. with suction sampler). In addition, during each dive the transmissivity of water had been measured and pH and ORP sensors were tested.

Research results:

We first visited the summit of Daiichi Kohama knoll, where was reported anomaly of methane concentration around the summit. The knoll also was surveyed by DSV/Shinkai 2000 in 1996 (Watanabe, 2000), however, any sign of hydrothermal activity was not reported. We planed the dive study of HyperDolphin #1105 to observe mainly southwest slope of the knoll, where Shinkai 2000 did not visit, as a result we also had not found any evidence of hydrothermal activity around the summit. We concluded that hydrothermal activity at the Daiichi Kohama knoll was currently inactive.

The other three days we did the survey at the Tarama knoll. At the knoll we recognized dense turbid water at the almost same depth frequently during the dives performed last year, and we detected anomaly of methane concentration in the turbid water sampled last year, strongly suggesting existence of active hydrothermal venting from the knoll. We first visited the area covered with red-brown sediment found last year, where was detected temperature anomaly about 7°C higher than the ambient seawater, then we sampled the red-brown sediment and deployed two *in situ* colonization system. After that, we surveyed the west slope of the knoll widely and we observed dense turbid water frequently during the dives. However, we could not find active hydrothermal vent site. So at the last dive we visited the area covered with red-brown sediment again, then we found a significant shimmering in the area. The temperature of the shimmering fluid was about 20°C higher than that of the ambient seawater. We sampled the shimmering fluid and replaced the *in site* colonization system with new one. During the dives we samples some benthic animals, such as a squid shrimp and a sea cucumber.

After back to the onland laboratory we will analyses the shimmering fluid sample and its dissolved gas for clarify the origin of the shimmering fluid and the red-brown sediment. In addition, from the isotopic signatures of the benthos samples we try to estimate whether they rely on the chemosynthesis-based primary production.