

Cruise Summary

1. Cruise Information

- Cruise ID: NT10-06 Leg 3
- Name of vessel: *RV Natsushima*
- Title of the cruise: **“Biogeochemical investigation of CO₂ seep environment at the Yonaguni Knoll IV hydrothermal vent field, the southern Okinawa Trough”**
- Chief scientist [Affiliation]: Fumio Inagaki [JAMSTEC-Kochi]
- Representative of the Science Party [Affiliation]: Fumio Inagaki [JAMSTEC-Kochi]
- Cruise period: April 13 – April 18, 2010
- Ports of call: Ishigaki to Naha
- Research area: Yonaguni Knoll IV, Okinawa Trough

2. Overview of the Observation

During the expedition of NT10-06 Leg 3 using *RV Natsushima* and *ROV HyperDolphin*, we studied microbiological and biogeochemical characteristics of CO₂ seep environment at the Yonaguni Knoll IV hydrothermal field, the southern Okinawa Trough, Japan. At the CO₂ seep area, the emission of liquid CO₂ has been often observed during the previous JAMSTEC research cruises and RV SONNE. Using ROV, it has been demonstrated that the CO₂ seepage significantly lowers the pH of ambient seawater, and subsequently impacts on the biological ecosystem that sensitively responds to the environmental change. This is extremely unique natural laboratory, which enables us to study potential biological impact of industrial CO₂ capture and sequestration (CCS) into the deep-sea sediment and subsequent ecosystem services such as the possibility of biological CO₂ turnover to organic matter. In collaboration with colleagues in Germany, Max-Planck-Institute for Marine Microbiology and IFM-GEOMAR, we planned to re-visit the CO₂ seep area at the Yonaguni Knoll IV and expand our biogeochemical and microbiological knowledge by deploying some *in-situ* sensor-measurement kits and *in-situ* high-pressure sampling devices.

During NT10-06 Leg 3, we allowed three working days plus a reserve day for the ROV operation. However, unfortunately we encountered very strong low-pressure zone of weather, preventing the green light to dive only for one day. Nevertheless, we performed two ROV dives (#1100 and #1111) within a day as follows: First, we brought MPI-profiler sensor kit to the bottom and start multiple measurements at close locations to the CO₂ seepage. Then, ROV was once recovered and went back to dive again with *in-situ* sampling systems. Although the location was very close to the CO₂ seep site, because of the time severely limited, we could not observe any

scientifically important biogeochemical data using *in-situ* sensors. After the ROV operations on MPI-profiler sensor kit and sampling, we recovered the kit and other payloads by hooking the rope.

This site is well-known high sea-current area and not-easy to access with ROV and the weather is often unstable. Thus, if the proposal is allowed in the future, we strongly recommend to be given at least one week (i.e, 7 working days) or more to produce a complete scientific data set. Otherwise, our vast efforts on preparation and scientific discussion at the high level will often be in vain –all this depends on the proposal evaluation committees, not on the scientists. This is one of what we learned from the short expedition.