

Cruise Summary

1. Cruise Information

Cruise ID: NT15-13

Name of vessel: Natsushima

Title of the cruise: 2015 Summer Tour of deep-sea hydrothermal vent fields in mid Okinawa Trough and investigation of their geochemical and (micro)biological diversity

Chief scientist [Affiliation]: Ken Takai [JAMSTEC]

Representative of the Science Party [Affiliation] : Ken Takai [JAMSTEC]

Title of proposal: Geochemical exploration of subseafloor hydrothermal fluid reservoirs for three closely located hydrothermal systems in the Iheya North Knoll through natural and artificial hydrothermal vents

Representative of the Science Party [Affiliation] : Satoshi Nakagawa [Kyoto University]

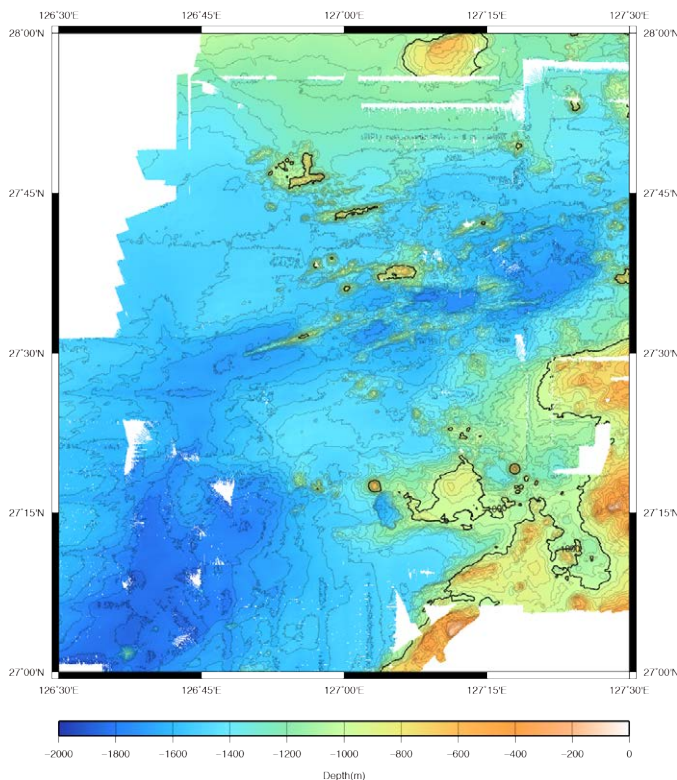
Title of proposal: Taming of chemolithoautotrophic endosymbionts: micro-structural analysis staring at the “autophagy”

Cruise period: July 27th, 2015 ~ August 6th, 2015

Ports of call: Kumamoto ~ Kagoshima

Research area: Mid Okinawa Trough

Research map



2. Overview of the Observation

In NT15-13 cruise, we have totally conducted 6 dives of HyperDolphin in four different hydrothermal vent sites in the Iheya North Knoll and the Iheya Small Ridge of the Mid Okinawa Trough. We plan to conduct the wide range mapping of seafloor hydrothermal events in the Iheya North Original site and Sakai Noho site. With only one dive of hyperDolphin, the SeaXeroxs covered major hydrothermal event area, for example, huge hydrothermal mound area (NBC, SBC, ESBC, CBC, C0016B artificial hydrothermal vent and E18 vent). The detail seafloor mapping will provide not only post-drilling impact on the whole landscape of the Iheya North Original field but also the world's first quantitative estimation of biomass and migration-colonization pattern shifts in the macrofaunal components in the vent-endemic chemosynthetic ecosystem that have responded to episodic environmental change events.

During the dive surveys in the Iheya North original field in this cruise, I (Ken Takai) found that NBC mound structure and landscape had been considerably changed since the drilling operation. In two years after the drilling operation, high temperature hydrothermal fluid discharge was quite focused at the newly created vent (C0016A) and rapid growing big chimney was outstanding. However, during this cruise, almost five years later, the hydrothermal discharge from C0016A vent became weak. Instead, many diffusing flows and their total fluxes were highly increased from middle parts of NBC close to top of the mound. According to the increased side discharge flows, lots vent-endemic faunal communities disappeared in the top roof but increased their populations in the middle parts. This was an important observation of NBC mound structure and landscape that should be recorded at this stage.

In this cruise, we have established state-of-art in situ methane sensor, particularly to characterize physical and chemical conditions of zonation of macrofaunal populations. Although operation and manipulation of sensors were still to be developed, the obtained data seemed to be excellent. We certainly detected tiny but clear difference of chemical environments (methane concentrations) of different representative fauna such as *Shinkaia* and *Bathymodiolus*. The in situ chemical conditions were quite important to estimate their metabolic activities and rates of energy and carbon species derived from the hydrothermal fluid inputs. In addition, we conducted lots of onboard metabolic experiments of representative faunal species and chimney structures.

The most outstanding achievement during this cruise is successful sampling of lots of hydrothermal fluids, sulfide deposits, mixing waters and animal specimens from different hydrothermal vent sites. These samples will accelerate the future onboard multidisciplinary investigations.