

Cruise Summary

1. Cruise Information

1) Cruise ID: NT11-20

2) Name of vessel: *Natsushima* with *Hyper Dolphin 3K*

3) Title of the cruise: Pilgrimage to hydrothermal fields in the Okinawa Trough

4) Science Party:

Jun-ichiro Ishibashi [Kyushu U., Chief Scientist], Hiromi Watanabe [JAMSTEC, Vice-chief Scientist], Yoshimi Takahashi, Tomomi Ogura, Masahiro Yamamoto, Tomo-o Watsuji, Tatsuo Nozaki [JAMSTEC], Takuya Yahagi, Yohey Suzuki, Yukari Miyazaki [Univ. Tokyo], Hiroshi Miyake [Kitasato Univ.], Fumihiro Sato [Okayama Sci. Univ.], Takuma Nishibayashi [Kumamoto Univ.], Yuji Onishi [Okayama Univ.], Masako Nakamura [OIST]

5) Title of the proposal:

History of hydrothermal activities and associated biological communities in the Okinawa Trough

(S11-60 proposed by J. Ishibashi and others)

6) Cruise period: from September 29th (Naha) to October 12th, 2011 (Naha)

7) Research area: Okinawa Trough

Ship tracks and dive points are shown in Fig. 1.

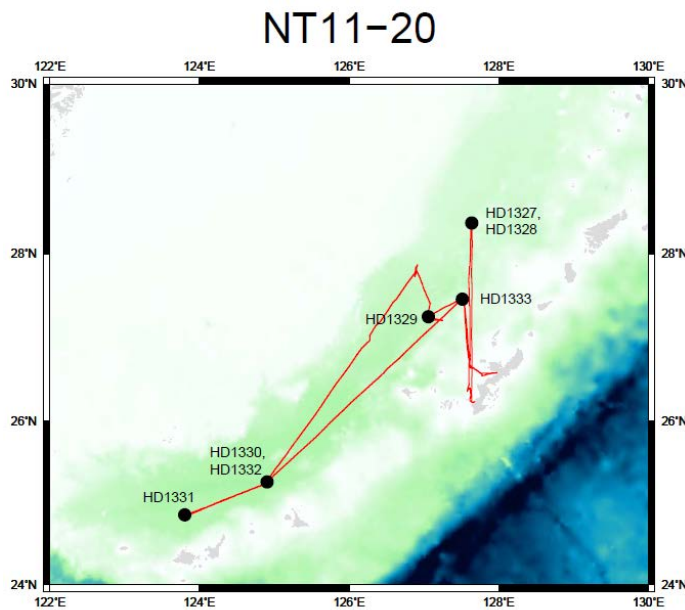


Fig. 1 Ship tracks and dive points during NT11-20 cruise conducted in the Okinawa Trough

2. Overview of the observation and future study plans

During NT11-20 cruise, we conducted dive surveys in five active hydrothermal fields in the Okinawa Trough; Minami-Ensei Knoll (28°23.5' N, 127°38.5' E), Izena Cauldron (27°15.0' N, 127°04.0' E), Irabu (Yaeyama) Knoll (25°14.0' N, 124°52.5' E), Hatoma Knoll (24°51.5' N, 123°50.5' E), Yoron Knoll (27°29.3' N, 127°32.0' E) . Our goal is to understand history of hydrothermal activities and associated biological communities based on a comparative study on diversity of geological, geochemical, microbiological, and biological characteristics observed in these hydrothermal fields. We devised systematic research procedures for the comparison, such as biological sampling using a quadrant frame, water sampling from the same animal colony, and measurement of chemical property using an *in situ* electrochemical sensor system. We also energetically collected geological samples such as volcanic rocks, hydrothermal ore deposits, and sediments. Moreover, we deployed an ADCP at the Irabu Knoll during HPD 1330 to monitor deep-sea water currents for about one year.

We are planning to conduct following researches using the collected samples and data. Many of them will be conducted under the framework of "TAIGA project" (funded by MEXT as Scientific Research on Innovative Areas).

- 1) Similarity analyses of species compositions among vent fields, population genetics and phylogeographic analyses for each vent-endemic species will be carried out using the collected specimens. Based on the ecological and molecular data, population expansion date and larval migration histories will be estimated.
- 2) Geochemical and mineralogical analyses of the collected volcanic rocks, hydrothermal ore deposits and sediments will be carried out. Based on the results, geochemical signature of hydrothermal interactions and correlation of trace element composition between hydrothermal deposits and host rocks will be discussed. Dating of some geological samples will be carried out using ESR, U/Th and other dating techniques, to provide basis for discussion on an initiation period of hydrothermal activities.
- 3) Analyses of bioavailable chemical species and microbial community will be carried out for the water samples collected from the animal colony. Based on these results, together with data of the *in situ* electrochemical measurements and isotopic analysis of biological samples, relationship among geochemical environmental factors, microbial phases and biological diversity will be discussed.
- 4) Above results will be synthesized to compare geological, geochemical, microbiological, and biological characteristics of each hydrothermal field, under the context of evolutionary phase of a hydrothermal activity.