



Natsushima “Cruise Report”

NT11-10 Leg1

**Cruise NT11-10 (Leg 1) on Myojinsho Caldera, Izu-Ogasawara Arc,
Japan**

Jun.28, 2011-July.2, 2011

Japan Agency for Marine-Earth Science and Technology
(JAMSTEC)

* There is no prescribed format. Images such as photographs may be included.

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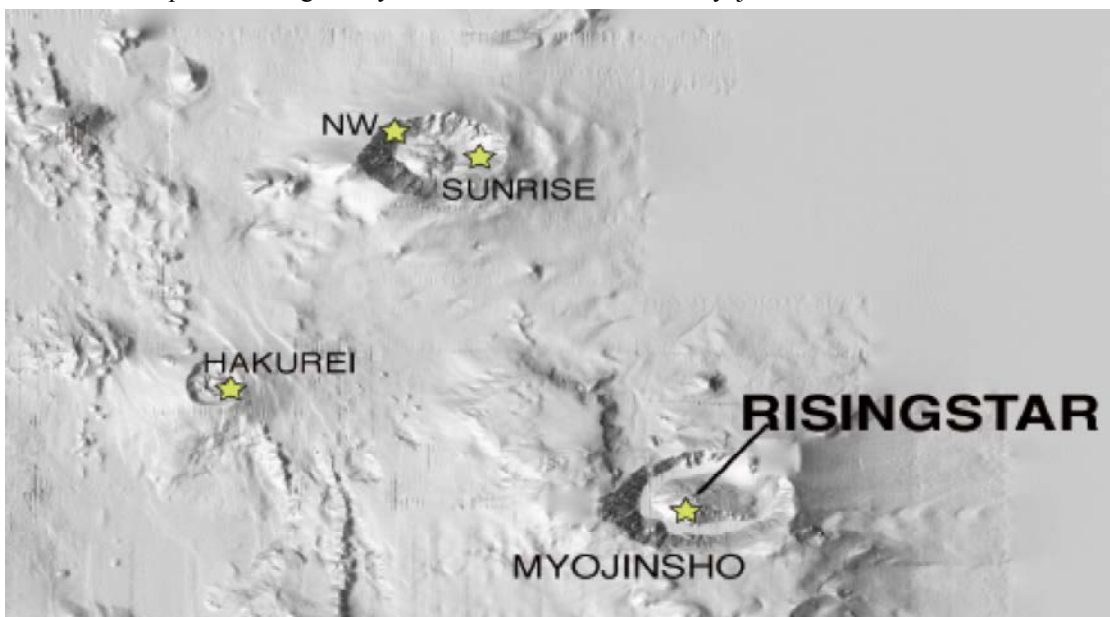
Geosciences

Water chemistry

Biodiversity of vent species

1. Cruise Information

- Cruise ID: NT11-10 Leg1
- Name of vessel: Natsushima
- Title of the cruise: Cruise NT11-10 (Leg 1) on Myojinsho Caldera, Izu-Ogasawara Arc, Japan
- Title of proposal: Seafloor massive sulfide deposit: Potential mineral resources and biodiversity of hydrothermal biota
- Cruise period: Jun.28, 2011-July.2, 2011
- Ports of call: Yokosuka - Futami
- Research area: Myojinsho, Izu-Ogasawara arc
- Research Map: The RisingStar hydrothermal vent field in the Myojinsho caldera



2. Researchers

- Chief scientist [Affiliation] : Kokichi Iizasa [University of Tokyo]
- Representative of the science party [Affiliation]: Kokichi Iizasa [University of Tokyo]
- Science party (List) [Affiliation, assignment etc.]

Geoscience group: Kokichi Iizasa, Sangkyun Lee, and Hajime Shimoda,

Water chemistry group: Kei Okamura (onboard), and Toshiro Yamanaka and Kiminori Shitashima (land-based water chemistry group).

Biodiversity Group: MiHye Seo, and Takuya Yahagi.

3. Observation

Introduction

Cruise by ROV Hyper-Dolphin of R/V Natsushima has been carried out at the RisingStar

hydrothermal vent field of Myojinsho submarine caldera where active black smokers and hydrothermal biota occur (Fig. 1). This multidisciplinary research expedition (Leg 1) during the period of June 28 to July 2 in 2011 is to delineate the hydrothermal active area, to collect black smoker particles, to study chemical characteristics of hydrothermal fluids and ambient seawater around black smoker chimneys, and to grasp the distribution and species of hydrothermal biota in the hydrothermal field.

Geosciences

The objective of this group is to grasp the distribution and mode of occurrence of chimneys, and collect particles of black smokers jetting from chimneys.

During dive #1295 there occur many chimneys on the steep slope of central cone in the caldera at the water depth ranging from 995 m to 786 m. The area of hydrothermal field investigated is roughly distributed from 150 m to 100 m in plan view. Active chimneys in the field are spouting black smokes at the maximum temperature of 304° C on the chimney top and their flanks (Fig. 2). The heights of chimneys measure up to 29 m. The chimneys recovered are mineralogically composed of major sphalerite, and medium chalcopyrite and barite.

Black smokers are preliminary sampled by a cylinder-like device at a small chimney less than 50 cm high and the flank of a tall chimney more than 10 m high. The latter sample contains much black particulates of sphalerite and some chalcopyrite with hydrogen sulfide smell.

Although the investigation during this cruise is limited in a small area in the hydrothermal field, chimneys in almost half portion of the field are actively venting hydrothermal fluids, and then black in color at the exit of the chimney top.



Fig. 2. Black smoker chimneys in the RisingStar hydrothermal vent field, Myojinsho caldera at the water depth of 844 m.

Water chemistry

1. Introduction

The purpose of this study is to evaluate circulation of chemical components in hydrothermal fluid at the Myojinsho caldera. Temperature and H₂S measurements were conducted using on-line H₂S sensor (H2S-10, Kochi Univ.) and temperature recorder (Okayama Univ.). Water sampling for high-temperature fluid and surrounding water were conducted by water KOTETSU sampler (Kyushu Univ) and Niskin type water Sampler.

2. Apparatus

2.1 H₂S sensor : H2S-10 Kochi university

H2S-10 is an on-line type electrochemical hydrogen sulfide (H₂S) sensor. H₂S was measured by linear sweep voltametry. H₂S in surrounding water was concentrated on Ag-electrode on H2S-10 at -0.3 V v.s. Ag/AgCl electrode for 10 seconds. Then concentrated H₂S was released by sweeping -1.3 V v.s. Ag/AgCl electrode for 1 second. H₂S concentration was measured from electric currents during the release of the H₂S. The data of H₂S concentration was transferred from ROV Hyper dolphin to the control room on R/V Natsushima.

2.2 Temperature recorder: Okayama University

Water temperature for hydrothermal fluid was measured by on-line type temperature recorder. The temperature data was transferred from ROV Hyper dolphin to the control room on R/V Natsushima

2.3. Water sampler KOTESHU: Kyushu University

Water sampling for hydrothermal fluid was conducted by stand-alone type water sampler KOTETSU. KOTETSU is made by titanium. Sampling volume is 150 ml.

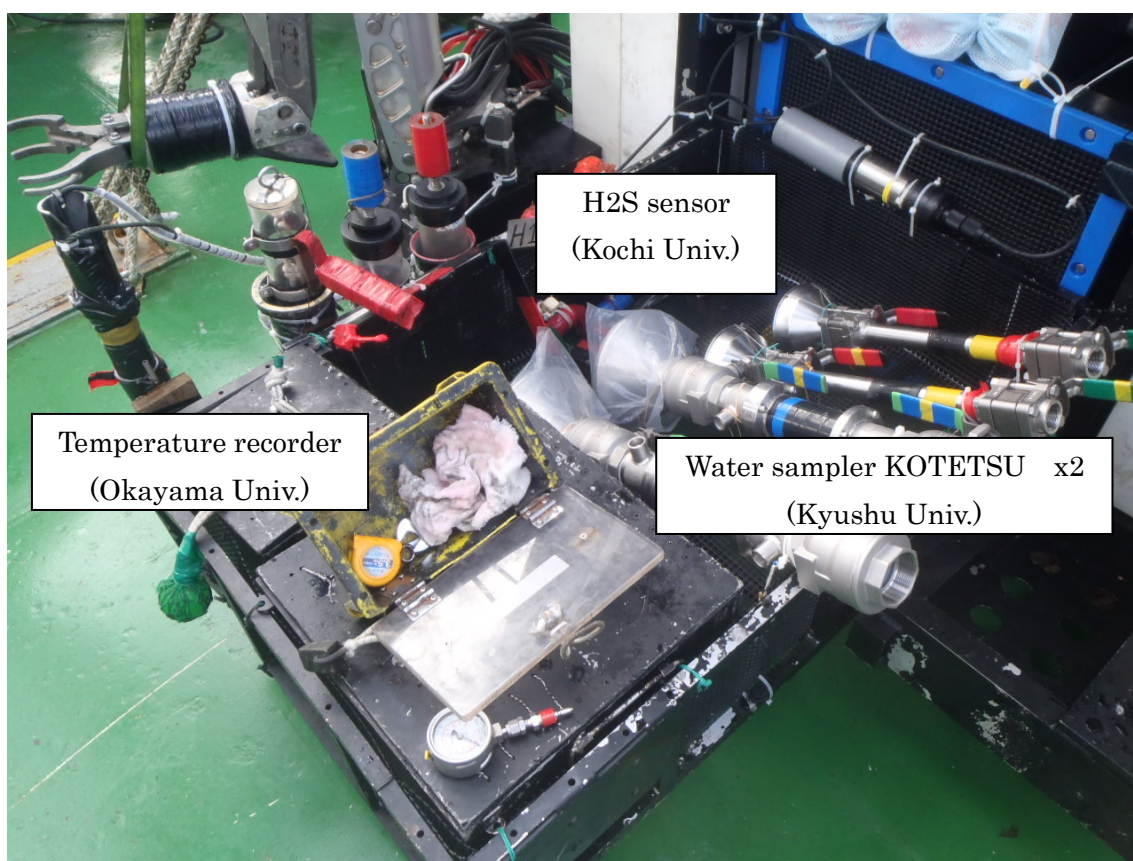


Fig: Payloads for water chemistry

3. Water Sampling

#1 sampling: Depth = 852 m, from clear smoker

12:27 Niskin type water sampler (surrounding water)

12:35 KOTETSU sampler (temperature = 304 deg C)

#2 sampling : Depth = 846 m from black smoker

14:46 KOTETSU sampler (temperature = 285 deg C)

14:49 Niskin type sampler (surrounding water)

4. Future analysis

Water samples were filtered by 0.2 um filter and added 1% of nitric acid on board. Chemical analysis for measure, minor, trace elements will be conducted in Kochi University.

Biodiversity of vent-species in the RisingStar hydrothermal vent field,

the Myojinsho Caldera, the Izu-Bonin Arc

Our main objective of this NT11-10 Leg.1 cruise was to evaluate biodiversity of vent-species in the Myojinsho Caldera. During *ROV Hyper-Dolphin* dive (HPD#1295), fauna in the Myojinsho Caldera was observed and recorded with the CCD and high-vision cameras. After the observation of biological communities and surrounding environment, several vent species were collected around the RisingStar hydrothermal vent field using the Slurp-gun loaded on *ROV Hyper-Dolphin*. The sampled animals included 6 specimens of *Gundalfus yunohana*, one specimen of *Munidopsis* crab, one specimen of *Alvinocaris* shrimp, some *Desbruyeresia* snails, some *Neoverruca* barnacles, a few number of unidentified polychaete worms, peanut worms, and shrimp larvae.

The present survey showed relatively small biomass of vent-endemic animals around the RisingStar hydrothermal vent field. Although dense aggregations of vent barnacles were observed along the active chimneys (Fig.1), distributions of other animals, including vent crabs and shrimps, were very patchy, and typical vent-obligate *Bathymodiolus* bivalves had not been seen in this cruise.

Another objective of this cruise was sampling of *Alvinocaris* shrimps for morphological and genetic analyses. Unfortunately, only one specimen of adult *Alvinocaris* shrimp (Fig.2) was sampled in spite of more shrimps captured in high-vision camera. The sampled shrimp larvae have not been identified yet, but they possibly are the larvae of *Alvinocaris* shrimps. Therefore, for future study, the shrimp larvae will be morphologically and genetically identified, and resulting data will be added to compiled knowledge of vent-obligated animals of the Myojinsho Caldera.

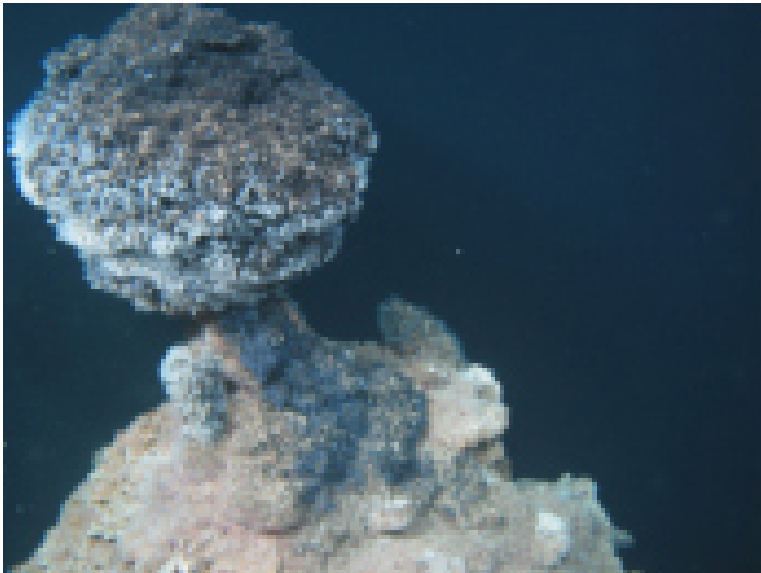


Fig. 1. Dense aggregations of vent barnacles were observed on the active chimneys including patchy distributions of vent crabs and shrimps.



Fig. 2. Only one specimen of adult *Alvinocaris* shrimp was sampled though numerous shrimp larvae exist in the ambient water above a sulfide mound.

4. Notice on Using

This cruise report is a preliminary documentation as of the end of the cruise.

This report may not be corrected even if changes on contents (i.e. taxonomic classifications) may be found after its publication. This report may also be changed without notice. Data on this cruise report may be raw or unprocessed. If you are going to use or refer to the data written on this report, please ask the Chief Scientist for latest information.

Users of data or results on this cruise report are requested to submit their results to the Data Management Group of JAMSTEC.