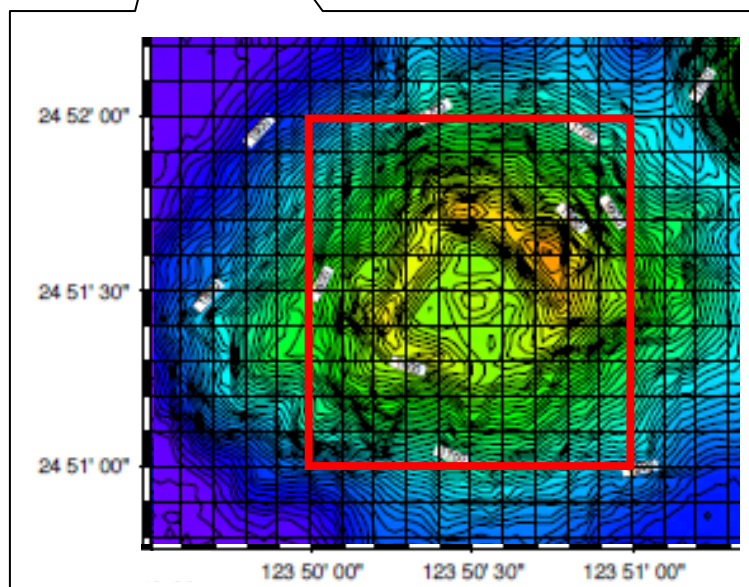
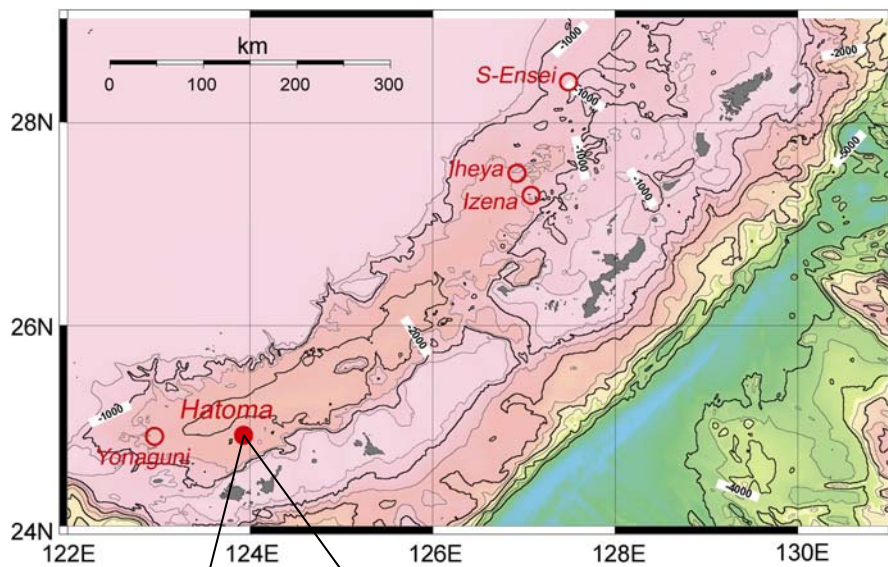


## 1. Cruise Information

- Cruise number : NT08-13
- Ship name : R/V Natsushima
- Title of the cruise : Blue Smoker
- Title of proposal : In-situ experiments for re-creation of “blue smoker” at Hatoma Knoll
- Cruise period : 2008/7/6 - 12
- Port call : Ishigaki - Ishigaki
- Research area : Okinawa Trough



## 2. Researchers

- Chief Scientist : Tomohiro Toki (University of the Ryukyus)
- Representative of Science Party : Tomohiro Toki (University of the Ryukyus)

### - List of Science party

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Name	Affiliation	Assignment
Toshitaka Gamo	ORI	Hydrogen isotope / Trace metal
Shinsuke Kawagucci	ORI	Hydrogen isotope
Genta Teranishi	ORI	Trace metal
Yuji Sano	ORI	Helium isotope
Jun-ichiro Ishibashi	Kyushu Univ.	Mineralogy / Gas chemistry
Hiroki Nakano	Kyushu Univ.	Mineralogy
Urumu Tsunogai	Hokkaido Univ.	Carbon isotope of methane and $\Sigma\text{CO}_2$
Toshiro Yamanaka	Okayama Univ.	Sulfur isotope / DOC
Hironori Akashi	Okayama Univ.	DOC
Tamotsu Oomori	Univ. Ryukyu	Sedimentology
Daigo Iwata	Univ. Ryukyu	Gas chemistry
Shogo Ooshima	Univ. Ryukyu	Fluid chemistry
Kei Okamura	Kochi Univ.	Trace metal in hydrothermal plume
Akira Ijiri	JAMSTEC	Carbon isotope of DOC
Ken Takai	JAMSTEC	Cultivation
Takuro Nunoura	JAMSTEC	Phage ecology
Satoshi Nakagawa	JAMSTEC	Symbiont ecology
Hisako Hirayama	JAMSTEC	Ecology of methanotroph
Tomoo Watsuji	JAMSTEC	Symbiont ecology
Masahiro Yamamoto	JAMSTEC	Enzymology
Hiroko Makita	JAMSTEC	Symbiont ecology
Michinari Sunamura	Univ. Tokyo	Microbial ecology in hydrothermal plume
Naoko Nomura	Univ. Tokyo	Biomass estimation
Takeshi Yorisue	ORI	Paralvinella ecolgy
Shigeaki Kojima	ORI	Paralvinella ecolgy
Satomi Minamizawa	NME	Research support

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### 3. Research

- Research

- Introduction

In August 2006, a clear smoker was newly observed with blue-colored at Gusuku site in Hatoma Knoll. We conducted emergently dive research by Shinkai6500 in March 2007 for clarification of formation of “blue smoker”. The blue smoker has not been observed since the first time.

Hydrothermal fluids contain a great amount of CO<sub>2</sub> at Hatoma Knoll. The CO<sub>2</sub> with in-situ venting temperature and pressure of Hatoma Knoll exists in super-critical condition. CO<sub>2</sub> in super-critical condition occur Rayleigh scattering in theory and laboratory experiments. Calculating intensity of the scattering of different wavelengths at various angles based on the theory, CO<sub>2</sub> with in-situ condition at Hatoma Knoll is blue-colored at the angle of 90 degree from light source to observer. Therefore, the blue smoker would be observed in the specific lighting, which *Shinkai* 6K shot Hyper-Dolphin 3K for TV program in August 2006.

Our objective is to verify the formation mechanism of the blue smoker at Hatoma Knoll. We observe the light through CO<sub>2</sub> venting at Hatoma Knoll, and compare the chemical composition of hydrothermal fluids with the previously reported values, as well as analyze chimneys to read the history of the activity in the hydrothermal system.

- Sampling

- In-situ experiments for re-creation of blue smoker

- Sampling hydrothermal fluids

- Sampling chimneys

- Sampling seawater

- Collection of chemosynthesis organisms

- Methods

- Search light

- LED light

- Vacuum sampler

- WHATS

- Bag sampler

- Niskin sampler

- In-situ large volume filtration system

- In-situ larva collection system

- Results

During this cruise, we visited several vents classifying two groups based on the temperature range. At *Gusuku* (C-1, C-2, C-3, 189-1) and *Oritori* site, hydrothermal fluids of high temperature around 300 deg. C were venting from active chimneys, which was venting CO<sub>2</sub> in super-critical condition. At *Chura* site, hydrothermal fluids were characterized by moderate temperature less than 200 deg. C, which was venting CO<sub>2</sub> after mixing with seawater.

We conducted in-situ re-creation experiment of blue smoker using two types of the light. Search light was held on the right arm. This light is normally attached to the front of Hyper-Dolphin 3K. We observed the light through venting fluids at various angles from Dive No.866 to No.870. Actually, this light was too strong to lighten fluids from 180 degree.

LED light was used in the experiment. This light is normally used as a CCD camera. It was specially fixed on the right arm from Dive No.871 to No.x873. The light was so feeble that we could observe the light through venting fluids from the opposite side. Additionally, the strength of the light was adjusted for alternative of changing the length of the light pass.

