Cruise Summary

CRUISE INFORMATION

Cruise ID: YK10-08

Name of vessel: R/V Yokosuka

Title of the cruise:

Analysis and acquisition of high resolution map data of the accumulation and auto-collapse processes of the sea-floor gas hydrates

Chief scientist: Ryo Matsumoto [University of Tokyo]

Representative of the Science Party: Ryo Matsumoto [University of Tokyo]

Cruise period: July 10 2010 to July 26 2010

Ports of call: Jamstec Pier – Naoetsu – Nagasaki

Survey map: (attached)

Cruise track

Survey area

AUV Urashima survey lines

OVERVIEW OF THE OBSERVATION

1. Purpose

The purposes of the cruise are to obtain high-resolution images of depression and collapse structures formed by dissolution and rifting of surface-type gas hydrates.

2. Background

We identified unique gas hydrate field characterized by gas hydrate exposures and active methane venting in Joetsu basin, eastern margin of Japan Sea in 2004. A series of sea-going surveys of the field has revealed that the methane activity and gas hydrate formation in the field are closely related with tectonic inversion and crustal shortening along the eastern margin of Japan Sea. We also found a number of gigantic methane plumes and large depressions (pockmarks) and mounds, and crater-like collapse structures. Highly accumulated, surface-type gas hydrates are presumably underlain by free-gas zone. The occurrence of gas hydrates and free-gas reservoirs seem to become future energy resources.

3. Methods and instruments

1) Subsurface survey by single channel seismics.
2) Acquisition of high-resolution topographic images by side scans sonar (SSS), malti-narrow beam echo sounder (MNBES) and sub-bottom profiler (SBP) of AUV "Urashima".
3) Intensive photographing of sea floor and extremely high-resolution bathymetric survey by means of AUV "Tuna Sand" of IIS of U. Tokyo.

We conducted five cruises of "R/V Natsushima" in the study area and obtained detailed SEABAT topographic maps. A number of methane seep sites and gas hydrate outcrops were also defined in the area. We planned AUV survey lines based on these base maps and succeeded to draw high-resolution maps. Cruising levels of the Urashima were between 30 to 100 meters above seafloor. MNBES has identified characteristic depression in the center of "hydrate mounds". This finding will provide basis to support the model of the growth and decay of mounds of the study area. SBP has revealed and established standard sedimentary sequence down to about 70 meters below sea floor. Gas chimney structures defined by SBP are classified into three stages. Transparent gassy zone is limited below stratified unit 10-20 meters below seafloor (Stage 1). For Stage 2, gas chimney reaches up to the sea floor to form mound with hard ground. Stage 3 mounds are characterized by collapsed depression in the middle.

Survey box of "Tuna Sand" was defined on the basis of "Urashima" dives and ROV records. Mosaic photos taken from the level of 2 to 3 meters above sea floor showed detailed structures and relations between the cliffs, bacterial mats and depressions.

Name of the Project:

Gas hydrate exploration in the eastern margin of Japan Sea.

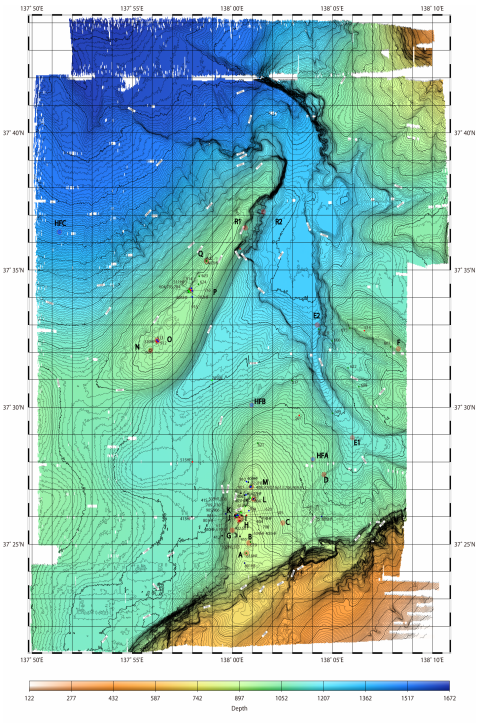

Fig. 1 Survey area of Joetsu basin, Umitaka Spur (lower center) and Joetsu knoll (upper center).

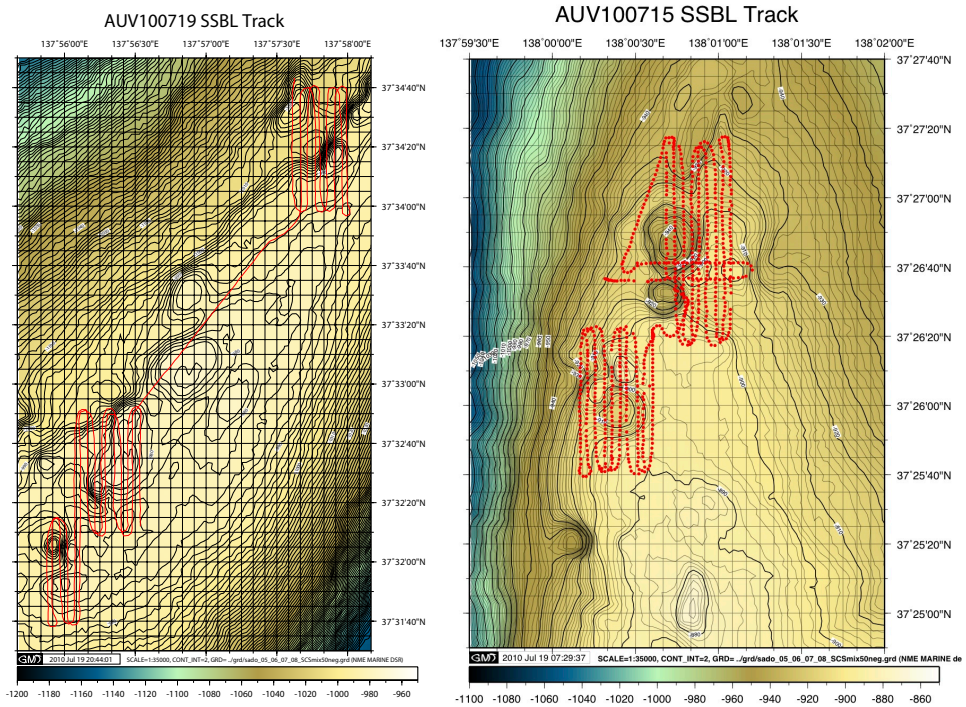

Fig. 2 Survey lines of AUV Urashima on Joetsu knoll (left) and Umitaka spur (right

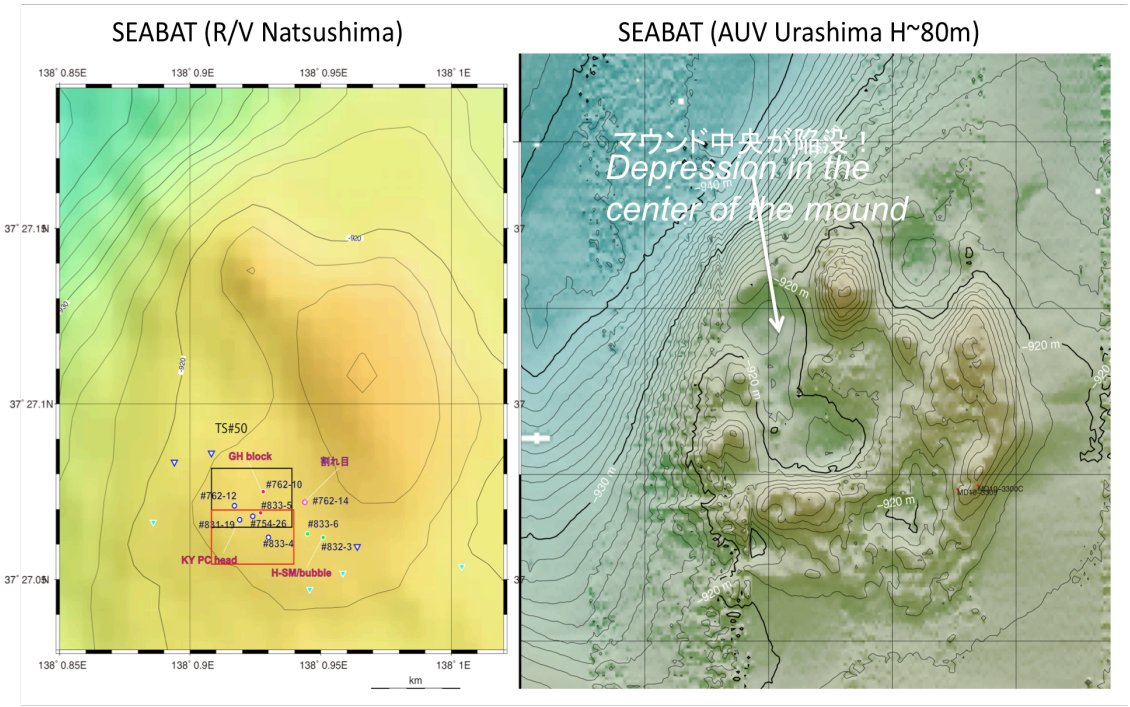

Fig. 3 Comparison between conventional MNBES map (left) and AUV Urashima MNBES map (right).

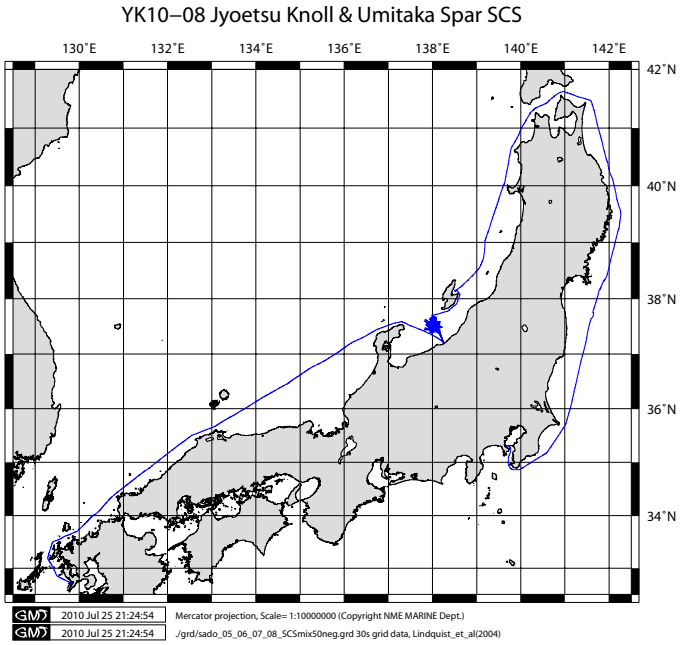

Fig. 4 Cruise track