

## **1. Cruise Information**

**Cruise ID:** YK-10-11

**Names of vessels:** YOKOSUKA

**Title of cruise:** SHINKAI 6500, the southern Mariana Trough

**Chief scientist:** Shigeaki Kojima (Atmosphere and Ocean Research Institute, the University of Tokyo)

### **Representatives of the science parties and titles of the proposal:**

1) Shigeaki Kojima (Atmosphere and Ocean Research Institute, the University of Tokyo) “Organization process of chemosynthesis-based communities in the southernmost part of the Mariana area”

2) Jun-ichiro Ishibashi (Department of Earth and Planetary Sciences, Kyushu University) “Evolution history of hydrothermal activities on southern Mariana Trough”

**Cruise period:** 3-15 September 2010

**Ports of call:** Guam

**Research area:** the southern Mariana Trough

## **2. Overview of the Observations**

**Overview of the observation:** The objectives of this cruise, which focused on three hydrothermal vent fields distributed almost on a straight line in the southern Mariana Trough, namely, the Snail (Fryer) site, the Archaean site, and the Pika site, were 1) to estimate the history (age) of hydrothermal activity of each site using both biological and geochemical methodologies; 2) to improve those methodologies for age-estimation by comparing results obtained using each method; and 3) to reveal processes of changes in hydrothermal activities and foundation of vent-endemic biological communities. In addition to three dives of the submersible SHINKAI6500 at each of three hydrothermal vent sites mentioned above, we also visited the Yamanaka site during a single dive. For biological researches, we sampled animals such as *Alviniconcha* snails, revealed fauna of each site, and recorded their distribution in video images. We deployed two plankton pump mooring systems around each of three vent sites to collect plankton samples for

24 hours. We also deployed a current meter mooring system near the Snail site and succeeded to obtain near-bottom water currents data for 10 days. After this cruise, we attempt to classify collected animals, to analyze population structure of dominant species, and to estimate age of foundation of population of each species based on larval dispersal and genetic deviation between vent sites. For geological researches, we observed and recorded sea bottom, collected basaltic rocks, sulfide chimney, and bottom sediment samples, surveyed bottom sediment layers using a sub-bottom profiler, measured *in situ* gamma ray doses using a gamma-ray spectrometer, measured magnetization of sea bottom using a three-component magnetometer. We recovered OSL (Optically Stimulated Luminescence) dosimeters, which were deployed during the previous cruise at the Pika site, and deployed them at the Archaean site. Deployed dosimeters will be recovered during the cruise YK-10-13. After this cruise, we will employ the following four dating methods to determine the ages of each sample; the ESR (electron spin resonance) method; the U-Th method; the  $^{226}\text{Ra}$ - $^{210}\text{Pb}$  and  $^{228}\text{Ra}$ - $^{228}\text{Th}$  disequilibrium method; and the K-Ar method. Combining with data of magnetization of rock samples and that of bottom sediment, we will try to reconstruct the history of hydrothermal activities, such as ages when activities started and fluctuated, at each vent site. By comparing the ages estimated based on geological data with foundation ages of animal populations, we attempt to synthetically understand relationships between geological events and changes of biological communities.

**Title of project:** Scientific Research Innovative Areas, MEXT “TAIGA project” (Representative: Tetsuro Urabe, Department of Earth & Planetary Science, the University of Tokyo)