

## Cruise Summary

1. **Cruise number / ship name:** YK11-08 / R/V Yokosuka
2. **Title of the cruise:** “Tectonics of a dying backarc basin as revealed by a dive study of the Godzilla Megamullion”
3. **Chief-Scientist / Affiliation:** Yasuhiko Ohara / Hydrographic and Oceanographic Department of Japan (also at IFREE-JAMSTEC)
4. **Proposal number and scientific title:** S11-49 “Tectonics of a dying backarc basin as revealed by a dive study of the Godzilla Megamullion”

### 5. List of participants:

Yasuhiko Ohara (Hydrographic and Oceanographic Department of Japan and IFREE-JAMSTEC)

Jonathan E. Snow (University of Houston)

Katsuyoshi Michibayashi (Shizuoka University)

Teruaki Ishii (Fukada Geological Institute)

Hiroyuki Yamashita (Kanagawa Prefectural Museum of Natural History)

Yosuke Kondo (Shizuoka University)

Toshiya Umegaki (Shizuoka University)

Henry J.B. Dick (Woods Hole Oceanographic Institution)

Alessio Sanfilippo (Woods Hole Oceanographic Institution and University of Pavia)

Wendy Nelson (University of Houston)

Matthew Loocke (University of Houston)

Satomi Minamizawa (Nippon Marine Enterprise, Ltd.)

6. **Investigation area:** Godzilla Megamullion (Parece Vela Basin) (Fig. 1)

See Fig. 2 for the dive sites.

7. **Cruise period and port calls:** Oct. 5 to Oct. 25, 2011 (JAMSTEC to Kobe, Japan)

### 8. Shinaki 6500 and deep-towed camera dive list (Fig. 2):

6K-1270: Yasuhiko Ohara (Northeastern slope of the bottom part of the West Shoulder Ridge)

6K-1271: Wendy Nelson (Southwestern slope of the northeastern half of the Hat Ridge)

6K-1272: Katsuyoshi Michibayashi (Northern slope of the potential neo-volcanic ridge of segment S1)

6K-1273: Jonathan E. Snow (Southwestern slope of the northeastern tip of the Hat Ridge)

6K-1275: Hiroyuki Yamashita (Northern slope of the northern tip of the Neck Peak along the same track line of YKDT-63 in YK09-05 cruise)

6K-1276: Teruaki Ishii (Eastern slope of the ridge delineating the eastern limit of the Neck Peak region)

YKDT-113 (Southwestern off-axis abyssal hill of segment S1)

YKDT-114 (Southwestern off-axis abyssal hill of segment S1)

YKDT-115 (Northern slope of the western tip of the West Shoulder Ridge)

YKDT-116 (Western slope of the western tip of the West Shoulder Ridge)

YKDT-117 (Northern slope of the small ridge connected to the northern tip of the Neck Peak)

YKDT-118 (Northern slope of the small ridge connected to the mid part of the Neck Peak)

## **9. Summary of the results**

### **9-1. Cruise objectives**

The motivation why we have conducted the cruise (YK11-08) was to understand the processes of the terminal phase of Parece Vela Basin (PVB) spreading that was responsible for the formation of the world's largest oceanic core complex.

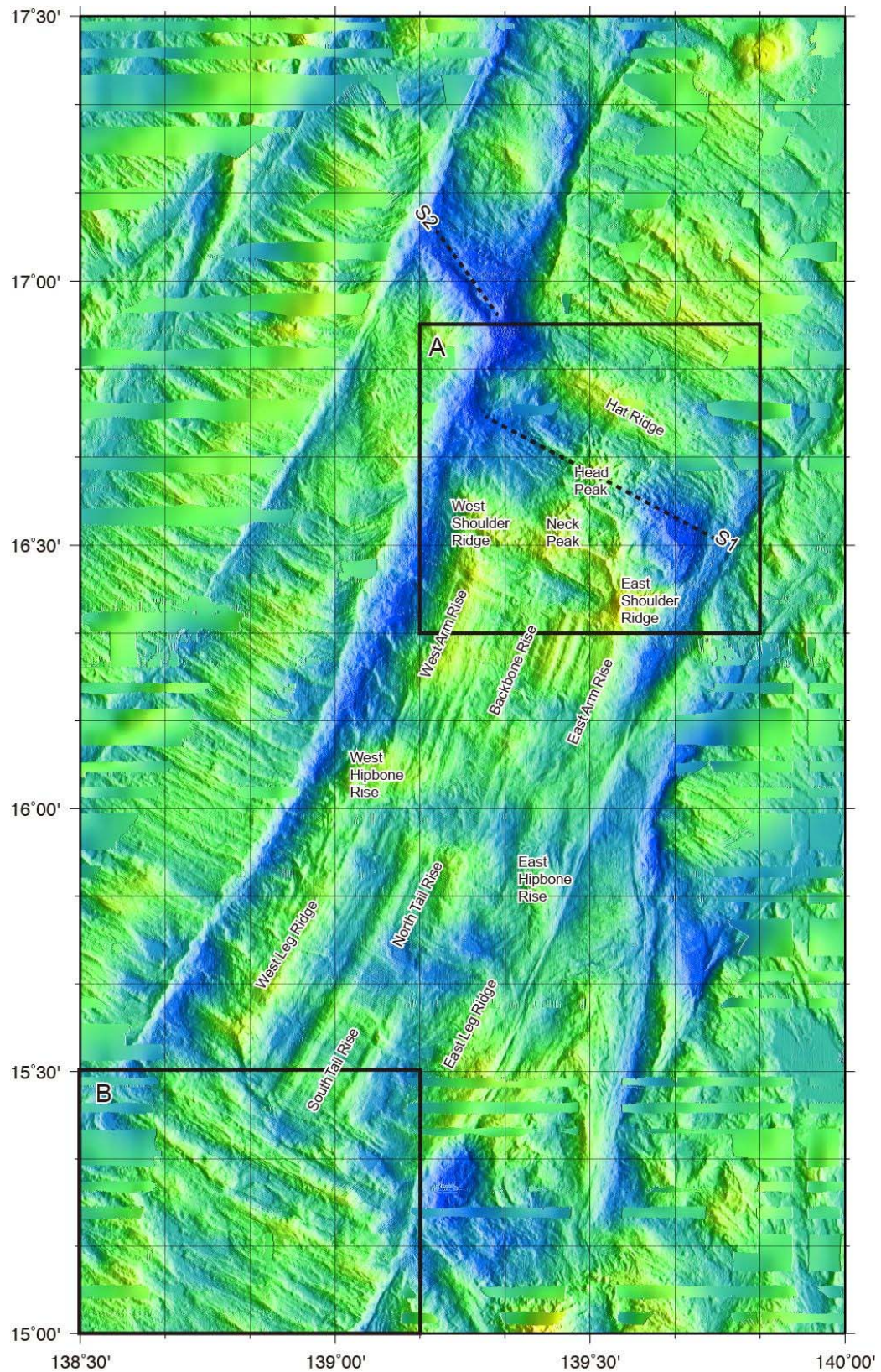
Our previous studies have produced a number of important new observations about the processes of the terminal phase of PVB spreading. Following these results, the principal objectives of YK11-08 cruise were to test two important hypotheses by in-situ dive operations using the Shinkai 6500 and deep-tow camera:

- (i) The intermediate-spreading PVB became a slow to ultraslow-spreading environment during the middle of the Godzilla Megamullion formation period; thereby thickening of the lithosphere was occurred towards the rift axis.
- (ii) The tectonics of the terminal phase of the Godzilla Megamullion formation was similar to that of the ultraslow-spreading ridges, such as the presence of mantle slab (Snow et al., 2011). The spreading of PVB was terminated at 4.8 Ma (the age of the alkaline basalts from the Head Peak dated by Ishizuka et al., 2004).

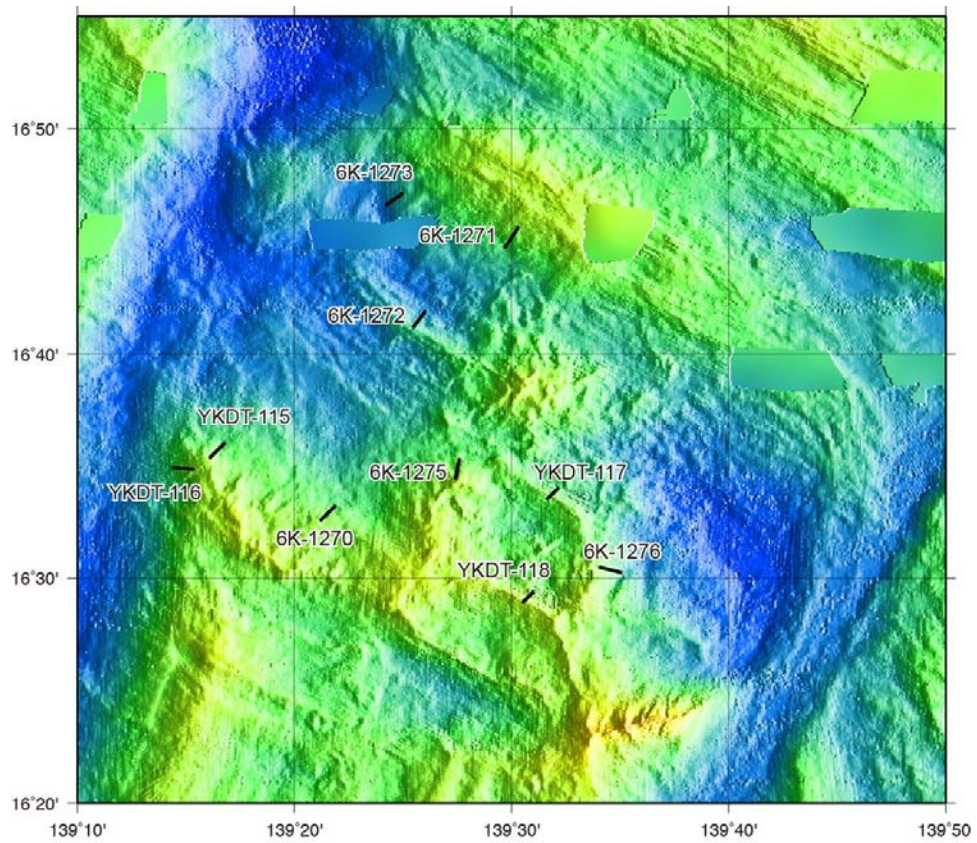
### **9-2. Results**

The Shinkai and YKDT dives (total 12 dives) obtained the data that can be testable the hypotheses noted above. The main results obtained by diving studies are (Fig. 4):

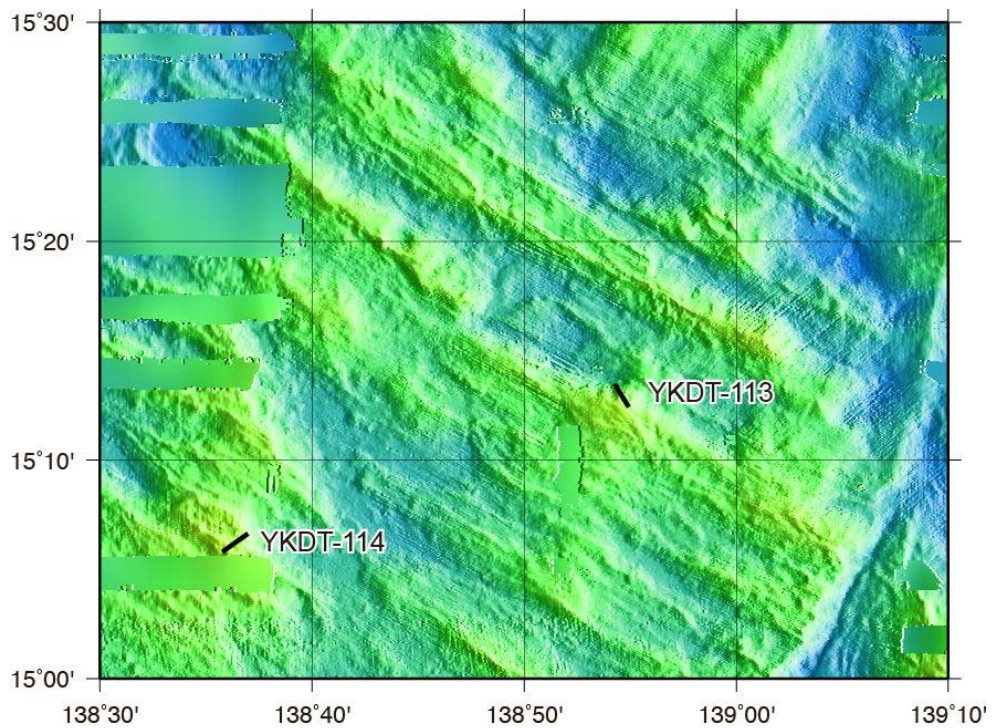
- It turns out that the West Shoulder Ridge consists of peridotite and fractionated gabbro (6K-1270, YKDT-115, YKDT-116).
- It turns out that the Hat Ridge, which is conjugate to the West and East Shoulder Ridges, consists of peridotite (6K-1271, 6K-1273).
- It turns out that the small ridge on the rift axis of the segment S1 is in fact the neo-volcanic ridge of the segment, yielding pillow lavas (6K-1272).
- It turns out that the Neck Peak and its surroundings consist of complex mixture of peridotite, gabbro and basalt (6K-1275, 6K-1276, YKDT-117, YKDT-118).
- Basalts for Ar-Ar dating were successfully recovered from the southwestern off-axis abyssal hills of segment S1 (YKDT-113, YKDT-114).



**Fig. 1.** Bathymetry of the Godzilla Megamullion and its surroundings. Names for individual bathymetric components on the Godzilla Megamullion are shown. Extinct rift axis of the Parece Vela Rift is marked by dotted lines (S1 and S2 after Ohara et al., 2001). Blow-up bathymetry for A and B is shown in Fig. 2a and b.



**Fig. 2a.** Bathymetry of the rift axis area of the Godzilla Megamullion. Locations of the Shinkai 6500 and deep-tow camera dives during the cruise are shown.



**Fig. 2b.** Bathymetry of the off-axis area of the segment S1. Locations of the deep-tow camera dives during the cruise are shown.