

DESSC Meeting

December 2007

ABE Science User Reports

Bob Embley

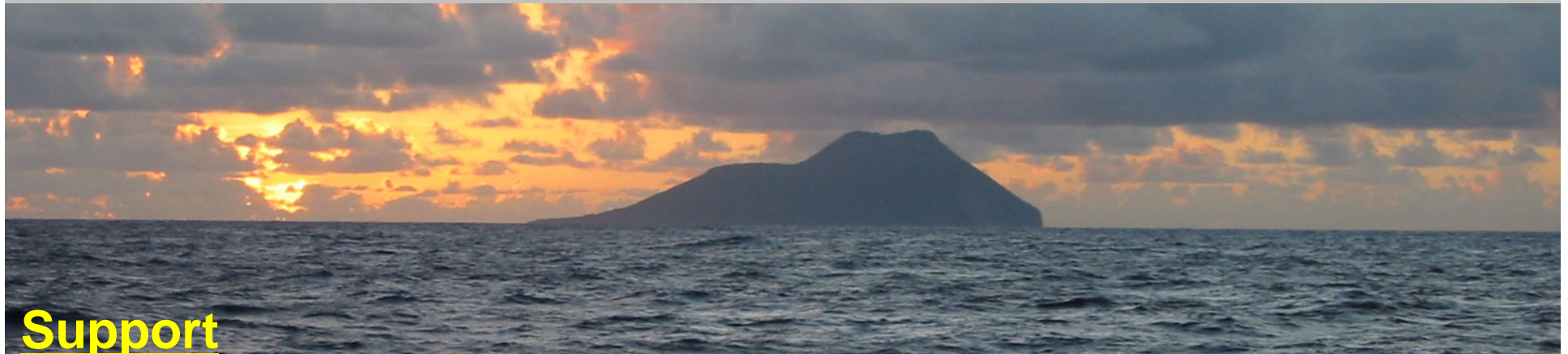
29 July – 16 August, 2007

***Preliminary Results of a Near-Bottom Integrated
Seafloor and Water Column survey of Brothers volcano,
Kermadec arc, Using the Autonomous Vehicle ABE***

R.V. Sonne ROVARK - NZ-American Submarine Ring of Fire Expedition

R/V Sonne 29 July – 16 August (Auckland – Auckland, NZ)

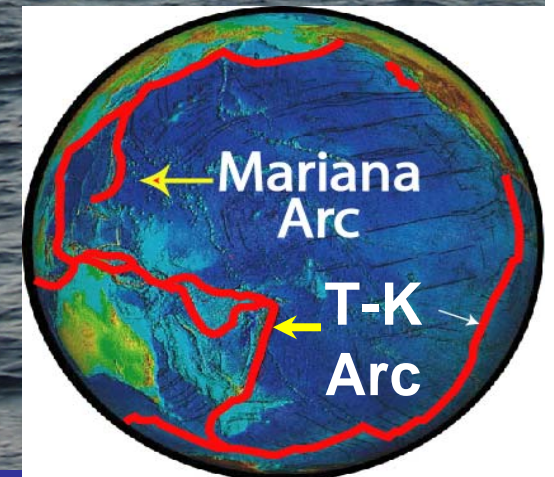
***R. W. Embley, C. E. J. de Ronde, B. Davy, E. T. Baker,
S. Walker, J. Resing, D. Yoerger and S. G. Merle***



Support

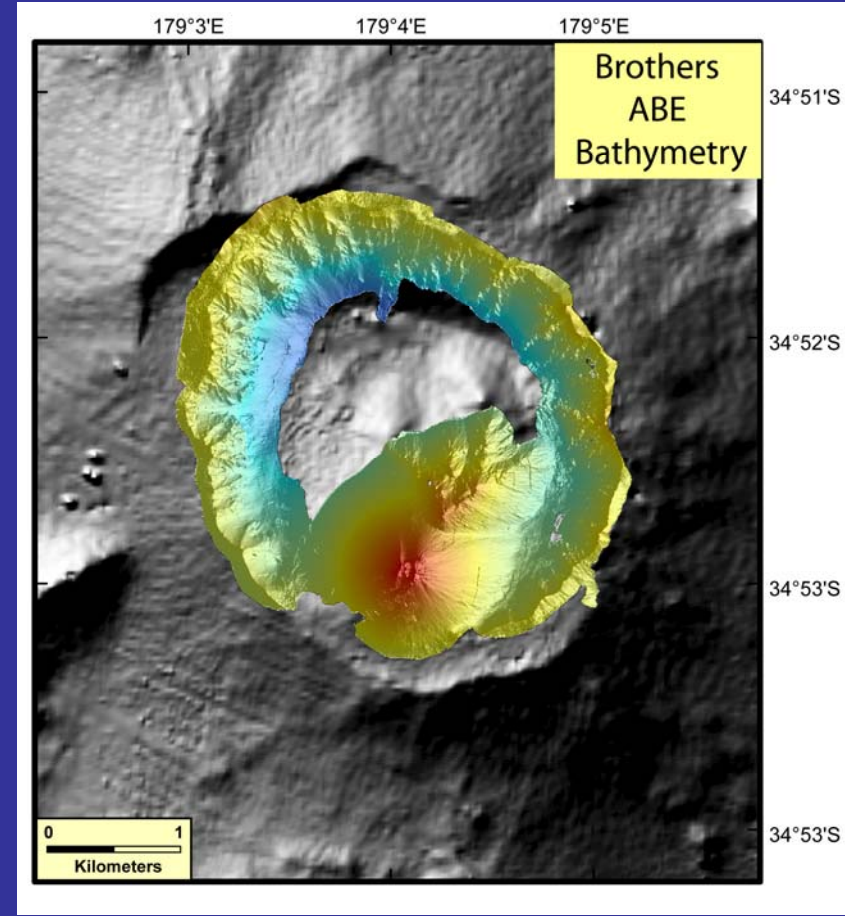
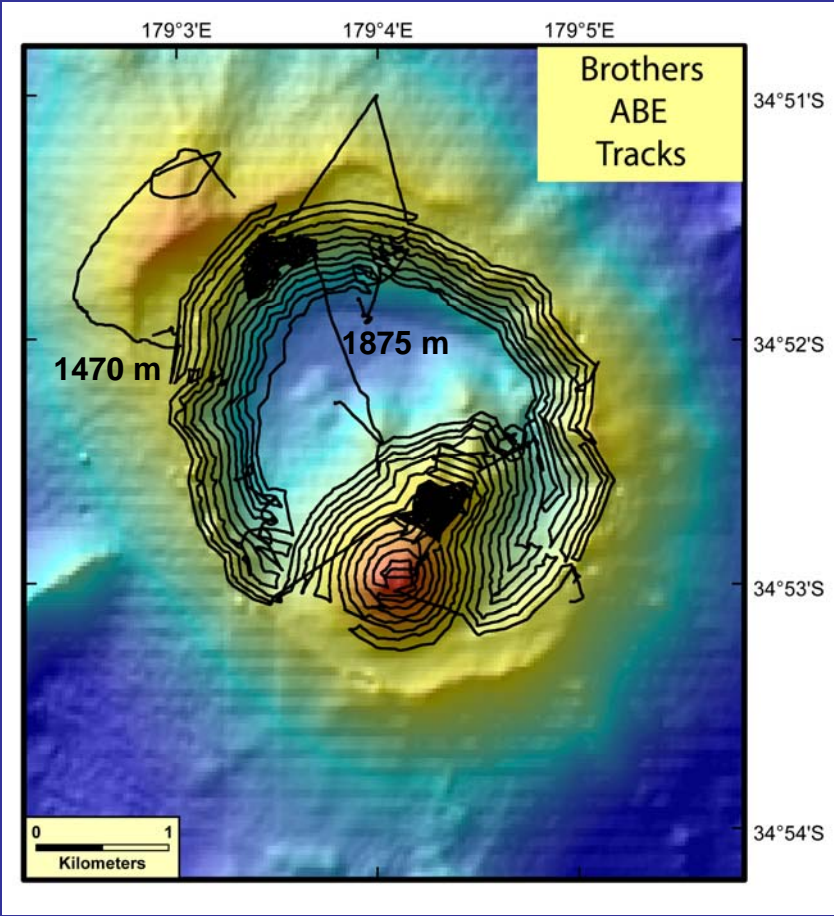
- NOAA Office of Ocean Exploration
- NOAA/Pacific Marine Environ. Lab./VENTS
- GNS Science, New Zealand
- Woods Hole Oceanographic Inst.
- GEOMAR (C. Devey – Expedition Ch. Sci.)

<http://oceanexplorer.noaa.gov/explorations/07fire/welcome.html>

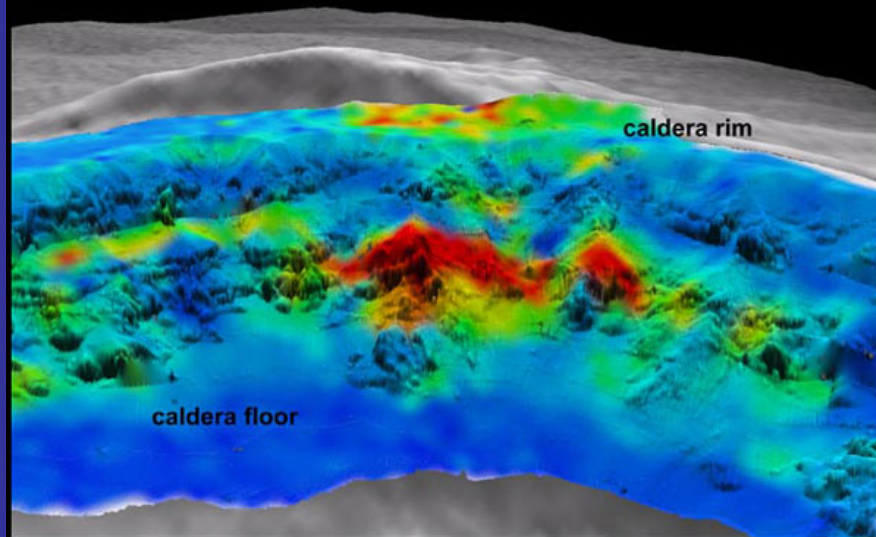


Objectives

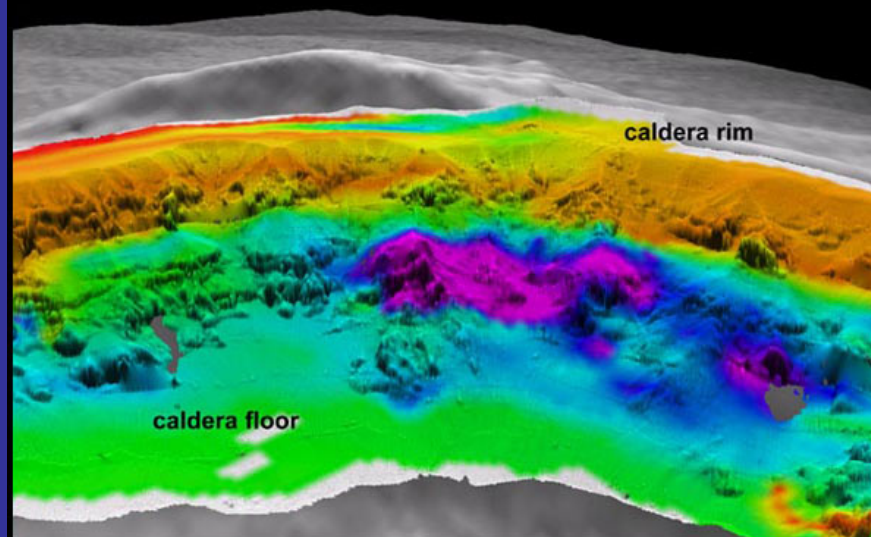
- 1) Program carried out with joint NOAA OE and New Zealand GNS Science funding, and joint with GEOMAR ROV test cruise
- 2) Primary objective was to map caldera of Brothers volcano, one of the most hydrothermally active arc volcanoes found to date
- 3) Science questions included:
 - Effect of hydrothermal systems on geomorphology of caldera
 - Magnetic signature of hydrothermal zones
 - Structural control on venting?
 - Detailed near-bottom surveys of hydrothermal sites for thermal and chemical flux calculations
- 4) ABE made 7 long dives and mapped most of Brother's caldera



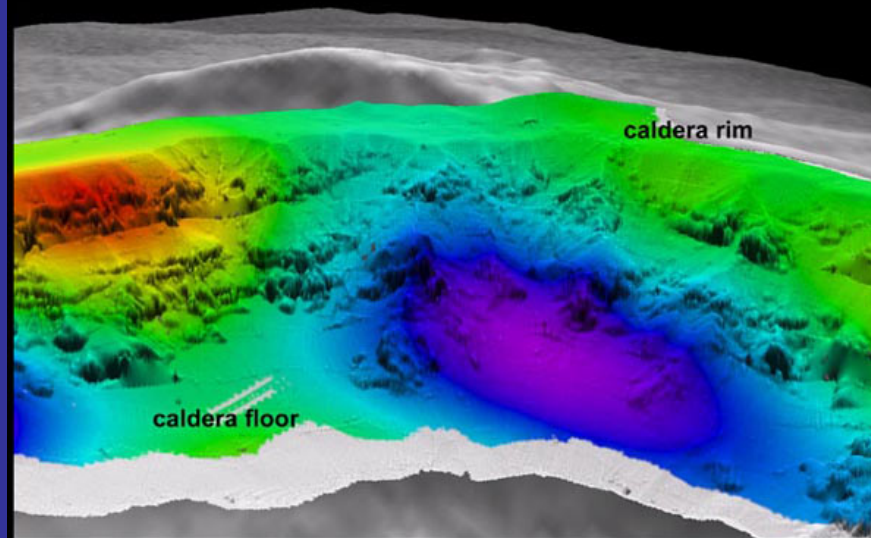
Temperature anomaly values



Eh values



Magnetization values



NW Wall Hydrothermal Zone Data Sets

Some Results

- 1) Hydrothermal alteration has a profound effect on degradation of caldera walls, similar to that found on subaerial volcanoes
- 2) Relative ages can be assigned to younger cones based on detailed morphology
- 3) Erosion of cone A (older) has proceeded faster on NW side, possibly because SE caldera wall is backstopping SE flank of cone
- 4) There is distinct ESE fracture system that appears to be a conduit for hydrothermal fluids rising up NW wall fault
- 5) There are good correlations between morphology, hydrothermal activity and magnetic lows

Comments

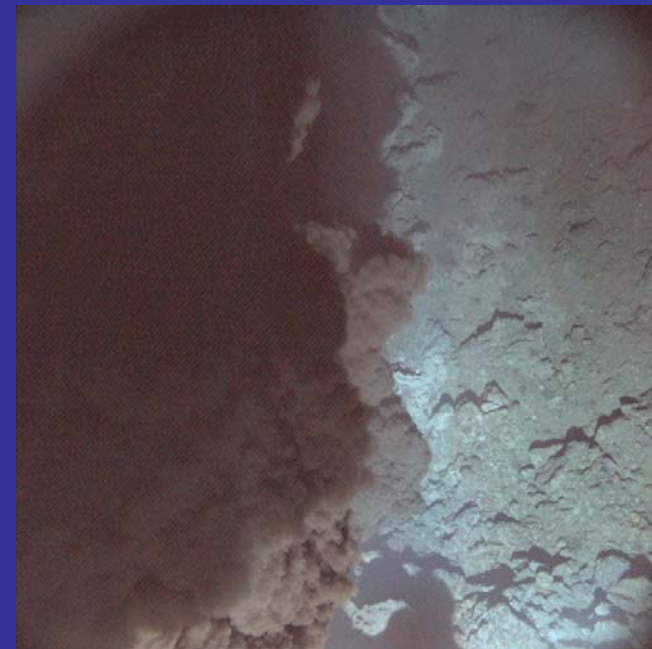
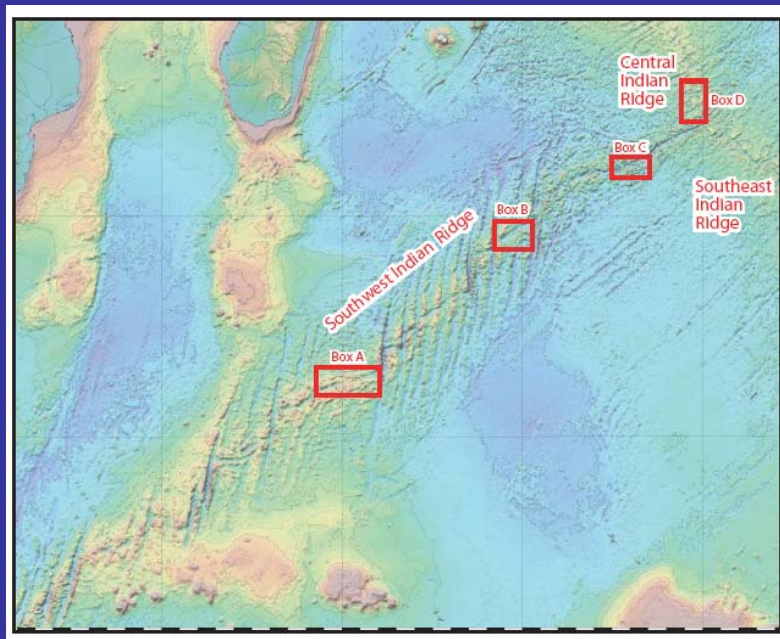
- **ABE's bottom tracking capability is unique in being able to survey complex terrain such as steep caldera walls**
- **Multi-sensor platform (bathy, magnetics, water column parameters) fosters cross-disciplinary 3D exploration**
- **5) PIs were very pleased with results!**

Chris German

Feb 19-Mar 11, 2007



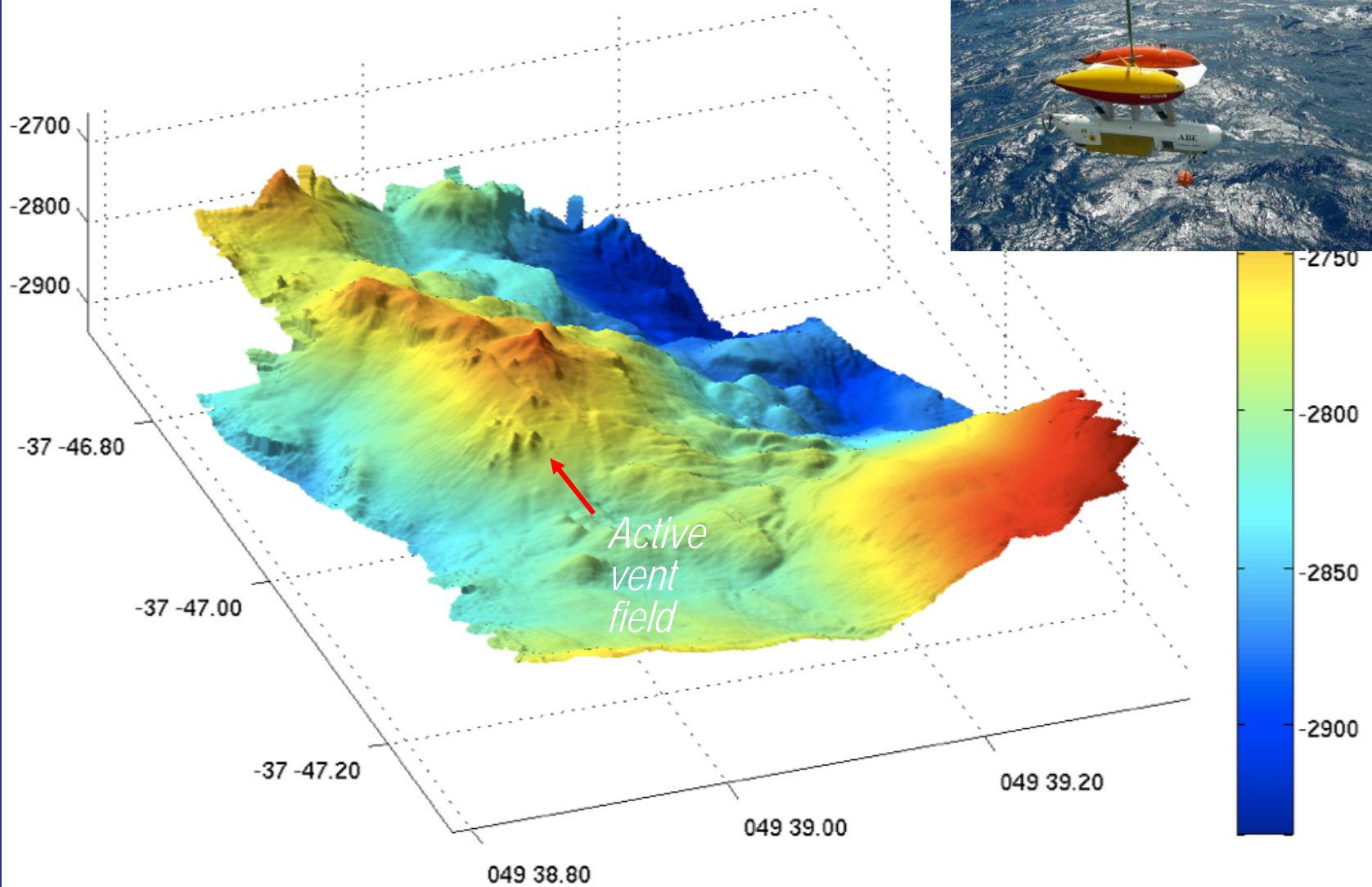
First discovery of high-temperature venting on an ultra-slow ridge (SWIR) using ABE



C. Tao, J. Lin et al RV Da Yang Yi Hao DY115-19 (Feb 19-Mar 11, 2007)

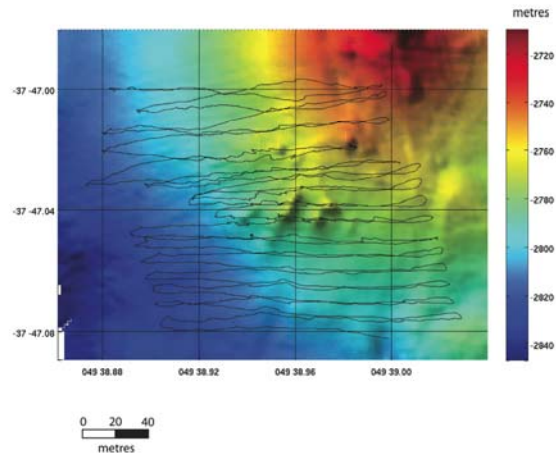
Full Report at AGU: T52B-07 (MW 3020; Friday @ 11:50am)

ABE201-202 bathymetry, 2m grid



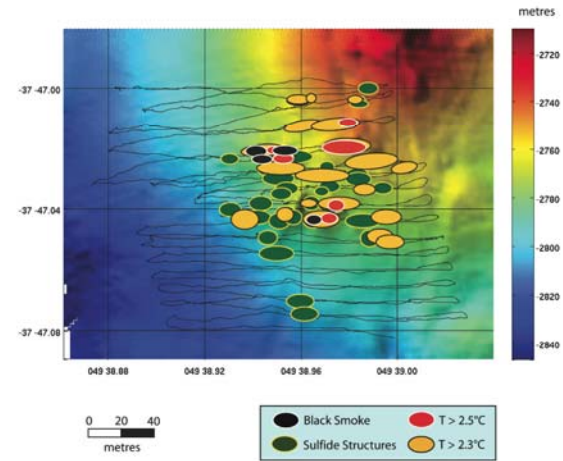
a)

Geologic Aspects of Area A Hydrothermal Field, SWIR (37°47'S, 49°39'E)



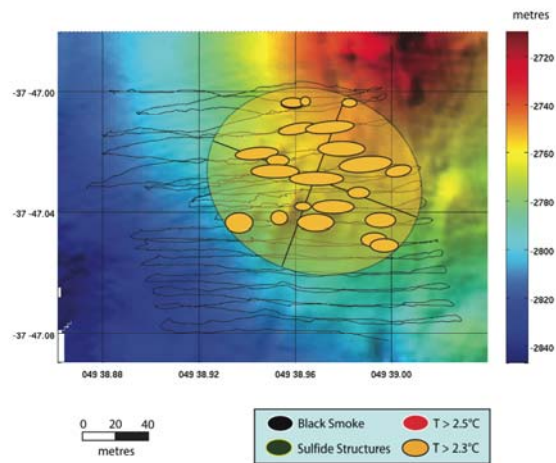
b)

Geologic Aspects of Area A Hydrothermal Field, SWIR (37°47'S, 49°39'E)



c)

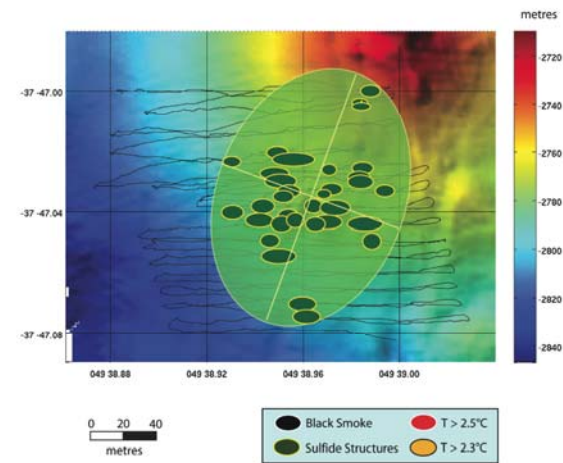
Geologic Aspects of Area A Hydrothermal Field, SWIR (37°47'S, 49°39'E)



Active fluid flow extends 130m along 110° and 105m along 020°
 Area of ellipse shown is ~10,700m²

d)

Geologic Aspects of Area A Hydrothermal Field, SWIR (37°47'S, 49°39'E)



Sulfide outcropping extends 160m along 020° and 115m along 110°
 Area of ellipse shown is ~14,500m²