



Voyage SS06-2007

Volcanism and Tectonism of the South Bismarck Microplate, Papua New Guinea

Professor Richard J. Arculus, The Australian National University (Chief Scientist)

Contribution to Australia's national benefit:

During this voyage, we built on background reconnaissance carried out by previous expeditions (most notably RV *Franklin* 02/2002, and RV *Kilo Moana* 0419 in 2004) in the submerged portions of the New Britain and Bismarck arcs, in order to characterise the magmatic origins, hydrothermal activity, tectonic settings, and potential for tsunamigenic eruptions and collapses of numerous volcanic centres.

We used the multibeam swath mapper to explore the bathymetry and sea floor properties of the arc and backarc region, dredging to recover fresh, glassy volcanic rock samples, and hydrocasts using the conductivity-temperature-depth (CTD) apparatus to explore for submarine hydrothermal activity.

To obtain insights into upper mantle flows associated with arc-continent collision on the northern margin of the Australian Plate the rock samples are being analysed for:

- major, trace and volatile elements
- isotopic (radiogenic and stable) abundances

In addition, these results will determine the volatile contents and melting processes, identify mantle sources including "Indian"-type and possible plume components.

As a result of this voyage:

1. We have a better understanding of the distribution of submarine hydrothermal vents, crustal stresses, and tsunamigenic collapses in the Bismarck-New Britain arcs.
2. We have located nine possible hydrothermal plume sites.
3. For the first time in any global study of active submarine arc systems we found fragments of the Earth's upper mantle brought to the surface by an explosive eruption in the vicinity of the Ritter volcano. Numerous relatively small, submerged satellite cones and rifts are present around the major subaerial volcanoes of the volcanic arc front but there are no major submerged volcanoes, unlike the case in the Izu-Bonin-Mariana or Tonga-Kermadec intraoceanic arcs.
4. It is clear the major volcanic edifices in the Bismarck-New Britain system are emergent. Alignments

of satellite cones and rifts shows the orientation of the major compressive stress in the crust is at 010° at the volcanic front and swings to 045° in the Witu Islands.

5. We are undertaking an extensive, internationally-collaborative research program on the rock and water samples recovered during the voyage, together with interpretations of the bathymetry of the arc system.

Addressing National Research Priorities:

An Environmentally Sustainable Australia

- Goal 6: Developing deep earth resources

Safeguarding Australia

- Goal 1: Critical infrastructure

Itinerary

Departed Madang 1800 hrs
Wednesday 25 July 2007

Arrived Madang 1530 hrs
Monday 13 August 2007

> Voyage track SS06-2007

