



## Charter Voyage SS07-2008

### Structure, Evolution, Petrology, and Hydrothermal Activity of Spreading Centres in the Northern Lau Backarc Basin

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

#### Contribution to Australia's national benefit:

During this voyage, we explored the region of fastest sea floor spreading in any backarc system in the world between Fiji, Tonga and Samoa, building on reconnaissance expeditions completed over the past 20 years. We first surveyed the bathymetry with high resolution (30 kHz) multibeam swath mapping and then developed survey strategies for magnetic characteristics, petrology, hydrothermal activity, and hence origins and evolution of spreading centres (Northwest Lau [NWLSC] and Central [CLSC]), and rift zones (Rochambeau).

The voyage comprised two legs: the first to the Rochambeau Rifts and NWLSC; the second, supported by Teck-Cominco-Nautilus, examined the CLSC and transform fault (Peggy Ridge) connecting the NWLSC and CLSC.

#### As a result of this voyage:

1. We have a detailed understanding of the characteristics of rifting and spreading processes accompanied by hydrothermal activity in the northern Lau Basin.
2. We discovered a large (45 km diameter) volcano (Dugong) located 25 km northwest of the subaerial backarc volcano of Niuafu'ou that is surmounted by a caldera with a small hydrothermal plume near its base.
3. We have found that Peggy Ridge is currently dominated by right-lateral transtensional tectonism, and its elevation (~900m) above the surrounding Lau Basin seafloor merits further study. Numerous magmatically-leaky faults and widespread lava flows accompanying right-lateral transtensional tectonic activity characterise the Lau Extensional Transform Zone (LETZ) to the south of the Peggy Ridge. The LETZ merges southwards with two inflated spreading ridges, in a north-south overlapping, en échelon arrangement of the CLSC. A distinctive hydrothermal plume was detected at the southern end of the southern ridge.
4. Following the voyage, the rock and water samples will be distributed to the scientific crew and collaborators for laboratory studies in concordance with the voyage objectives.
5. We achieved an excellent coverage for investigating the effects of distance from the Tonga Trench and possible ingress of the Samoan Plume in the genesis of the Lau Backarc Basin magmas.

#### Addressing National Research Priorities:

##### An Environmentally Sustainable Australia

- Goal 6: Developing deep earth resources

##### Safeguarding Australia

- Goal 1: Critical infrastructure

#### Itinerary

Departed Noumea 1100 hrs  
Wednesday 30 April 2008

Arrived Suva 1000 hrs  
Friday 6 June 2008

#### > Voyage track SS07-2008

