



Voyage SS01-2009

Monitoring Ocean Climate Change Around Australia: Deep Ocean Time Series Section (DOTSS) along 170oW between 50oS and the Equator.

Bernadette Sloyan, CSIRO Marine and Atmospheric Research, (Chief Scientist)

Contribution to Australia's national benefit:

Ocean warming accounts for around 90% of the excess energy trapped in the Earth system through anthropogenic changes to atmospheric composition. The oceans also sequester around 30% of anthropogenic emissions of carbon dioxide, and thus are a major player in regulating atmospheric CO₂ concentrations. The ability of the ocean to continue to ameliorate anthropogenic forcing remains uncertain, as ocean reservoirs will saturate in heat and carbon. Hydrographic sections are the only way to monitor the ocean to full depth.

The observations obtained on this voyage have enabled us to monitor ocean circulation and property changes by the reoccupation of a full depth ocean section in the Pacific along 170oW from 50oS to the equator. We have directly measured the full suite of ocean water properties (temperature, salinity, nutrients and tracers and carbon) at high vertical and spatial resolution throughout the entire water column and in the deep boundary currents. This section is one of Australia's contributions to the International Repeat Hydrography and Carbon Program.

As a result of this voyage:

1. We have been able to continue to add to the DOTSS in the western Pacific. This hydrographic section will contribute to the understanding of decadal and longer timescale changes in the inventory and transport of important climate quantities such as heat, freshwater, carbon and nutrients. The continuation of a series of full-depth ocean time series sections will also enable separation on the effects of natural versus anthropogenic induced climate change from the multi-decadal data. The DOTSS sections will also be used to assess ocean-only numerical models and climate models simulation of ocean circulation and climate prediction, respectively.
2. Initial analysis of the deep ocean (below 2500m) has shown that the abyssal ocean of the Pacific Ocean is continuing to warm. The warming observed by this section is significantly different from previous occupation in the 1996 and 2001. The signal of deep warming is now clearly evident in the mid- and low-latitudes, while significant rates of warming are seen south of 35oS. Investigation of the rapid propagation of the deep warming signal from the high-latitude water mass formation site to the equator will be the subject of future research. This research will rely heavily on the observations obtained from this voyage.

Addressing National Research Priorities

An Environmentally Sustainable Australia

- Goal 1: Water – a critical resource
- Goal 7: Responding to climate change and variability

Itinerary

Leg 1: Departed Wellington, New Zealand, 2 February 2009. Arrived Nuku'alofa, Tonga, 26 February 2009.

Leg 2: Departed Nuku'alofa, Tonga 27 February 2009. Arrived Lautoka, Fiji, 24 March 2009.

> Voyage track SS01-2009

