



Voyage SS09/2008

The carbonate chemistry of the Great Barrier Reef

Dr Bronte Tilbrook, Centre for Weather and Climate Research, a CSIRO-BOM partnership (Chief Scientist)

Contribution to Australia's national benefit:

About thirty percent of fossil fuel CO₂ emissions each year are taken up and stored in the oceans, leading to a change in ocean carbonate chemistry and increasing acidity of surface waters. For current emission trajectories, the upper ocean is predicted to undergo a change in ocean acidity and associated carbonate chemistry over this century that is greater in extent than anything likely to have been experienced for millions of years. The changes are expected to cause a decline in calcification in corals and other organisms that produce calcium carbonate skeletons and help form reef structures. The resilience of coral reef ecosystems to these changes is a major area of concern and could lead to altered biodiversity and changes in the social and economic benefits derived from the reef. This research is the first regional scale study of the carbonate chemistry over much of the Great Barrier Reef. It provides foundation data to assess the vulnerability and sustainability of the reef to acidification.

For more information about this feature voyage, see page 18.

As a result of this voyage:

1. We have a better understanding of the carbonate chemistry of the shelf waters of the Great Barrier Reef and how they are modified as waters flow from the Coral Sea onto the reef.
2. We have found a distinct calcification signal in the carbonate chemistry of the shelf waters of the Great Barrier Reef with elevated pCO₂ and declines in alkalinity over the shelf compared to waters immediately offshore in the Coral Sea.
3. We have mapped carbon parameters (TCO₂, alkalinity and pCO₂), hydrochemistry and bathymetry over most of the length of the GBR and determined inshore-offshore and along reef gradients in carbonate chemistry.
4. We have commenced a program of data synthesis to quantify how net calcification and primary production on the reef influences the carbonate chemistry and investigate how future increases in atmospheric CO₂ might influence the carbonate chemistry with potential to impact the reef.

Addressing National Research Priorities

An Environmentally Sustainable Australia

- Goal 5: Sustainable use of Australia's biodiversity
- Goal 7: Responding to climate change and variability

Itinerary

Departed Cairns 24 July 2008

Arrived Gladstone 11 August 2008

> Voyage track SS09-2008

