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Australia

Voyage ss2010_v04

Assessing Oceanographic Delivery of Nutrients to Ningaloo Reef (Part I : Autumn Dynamics)

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Contribution to Australia's national benefit:

Ningaloo Reef is Australia's largest fringing coral reef and the basis of a major tourist industry. Our work has shown that currents flowing through offshore industrial developments in Australia's northwest can impinge directly on the reef, via mechanisms yet to be elucidated. Our work will help provide a scientific basis for determining the oceanographic distance beyond which industrial developments will not damage a reef's ecological processes. This analysis is essential for maintaining guiding sustainable development in the region.

We have documented complex mixing processes occurring at the consolidation point of the Leeuwin Current off the NW Cape and analysed the biogeochemical signatures and processes therein. We observed potentially novel sources of nitrate, layers of low and high salinity and oxygen and strong northerly water flow apparently against the regional geostrophic forcing. Our work will clarify the core biogeochemical processes driving regional ecology, especially including reef dynamics.

As a result of this voyage:

1. We have a better understanding of the major uncertainties in circulation in Australia's NW region. We now understand the complexities in water mass distribution and movement, biogeochemical signatures and production rates. We have the first set of comprehensive data on regional ocean acidity.
2. We have found a series of interleaving water masses entering the Leeuwin Current, originating from the NW (Gyral Current) and the NE (NW Australian Shelf). These create repeating layers of low/high oxygen and high/low nitrate, whose microbial dynamics we have assessed (N-uptake; genetic analysis).
3. We have mapped the forming Leeuwin Current from 21°S using SVP drifters, showing high degree of unexplained complexity. Our understanding of the regional circulation is, surprisingly, still rudimentary. Coastal currents flowing through oil and gas installations move directly onto the shores of Ningaloo Reef.

4. We have commenced a program of detailed assessment of water mass biogeochemistry to elucidate precisely how the low-salinity waters of the NW contribute to the as yet unexplained nitrate maxima associated with these layers in the forming Leeuwin Current.

Itinerary

Departed Port Hedland, 12:00, Saturday 8 May 2010

Arrived Fremantle, 08:00, Thursday 27 May 2010

> Transit voyage track ss2010_v04

