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Australia

Voyage ss2013_v04

Observations of remarkable eastward flows and eddies in the subtropical southeast Indian Ocean

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Contribution to Australia's national benefit:

The Indian Ocean drives much of the variability of Australian weather and rainfall and is also evolving rapidly. It strongly influences global climate, contributing to the storage of carbon dioxide and heat through the sinking of surface waters beneath the eastward currents. Marine industries located off Western Australia (e.g. fisheries and gas exploration) are important sources of economic wealth. Productivity of west coast fisheries is closely linked to variability in the Leeuwin Current, which is in turn influenced by the eastward flows. The Leeuwin Current and its eddies are swift and variable and test the integrity of offshore structures. The work we are undertaking will improve our understanding of the principal physical, chemical and biological oceanographic processes controlling the eastward flows and Leeuwin Current system. Our results will contribute to improved predictions of Australian climate variability and change through enhanced understanding of the role of the Indian Ocean in the climate system.

An Environmentally Sustainable Australia:

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

As a result of this voyage:

- Australia is a player in the international effort to provide data in real-time for climate research and forecasting through deployment of an air-sea interaction mooring in the southeast Indian Ocean. The RAMA mooring at 25S, 100E provides sustained upper-ocean and surface measurements to determine the ocean-atmosphere fluxes in this region on hourly to annual timescales.
- We have used exciting new tools and methods to make measurements of nitrogen uptake in the Indian Ocean, measure turbulent mixing in the upper ocean, and to monitor the evolution of Leeuwin Current eddies with in-situ, autonomous sampling.
- We have mapped the physical and biogeochemical structure of eastward currents along 105E in a region where their character is not known.
- We now have the ocean data to determine the characteristics of the eastward flows and ocean eddies, and the penetration of subtropical surface waters into the deep ocean. The new temperature, salinity, velocity and mixing observations of a cold core ring complement the warm core eddy sampled in 2012 and earlier measurements. Characterisation of both eastward flows and the changing ocean state in this region will be achieved in our analysis of the data collected from this voyage.

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