RV *Investigator* Voyage Scientific Highlights

Voyage #:	**IN2018_T01**		
Voyage title:	Physical and biogeochemical gradients in the East Australian Current		
Mobilisation:	Hobart, Tuesday 03 April, 2018		
Depart:	Hobart, 1700 Thursday 05 April, 2018		
Return:	Brisbane, 2100 Saturday 14 April, 2018		
Demobilisation:	Hobart, Tuesday 22 May, 2018		
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Scientific Highlights

The Chief Scientist

A/Prof Zanna Chase Zanna Chase is a chemical oceanographer and paleoceanographer. Her research focuses on the interaction of chemical cycles, particularly trace elements, with biological production in the ocean, on a range of spatial scales from estuaries to the open ocean, and a range of temporal scales, from glacial-interglacial variations to predictions of future changes. She is an Associate Professor and former ARC Future Fellow at the Institute for Marine and Antarctic Studies (IMAS) at the University of Tasmania. Prior to moving to Australia she was a faculty member at Oregon State University, and a postdoctoral fellow at the Monterey Bay Aquarium Research Institute. She received her PhD from Columbia University and Masters and undergraduate degrees from McGill University.

Physical and biogeochemical gradients in the East Australian Current

Purpose

This voyage had both scientific and educational objectives. This transit voyage formed part of the Master of Marine and Antarctic Science and Bachelor of Marine and Antarctic Science courses at the University of Tasmania. The primary educational objective of the voyage was to introduce students to research at sea and standard methods in physical, chemical and biological oceanography.

The scientific objectives of the voyage were focussed around the contrasting physical, biological and chemical gradients associated with warm-core and cold-core eddies of the East Australian Current. The objectives of the study were to determine:

1. The horizontal and vertical dynamics and heat and salt budgets of cyclonic and anticyclonic eddies
2. The distribution of zooplankton communities and microplastic loads in cyclonic and anticyclonic eddies
3. The contrasting distribution of nutrients and oxygen within cyclonic and anticyclonic eddies
4. The contrasting phytoplankton biomass and size structure in cyclonic and anticyclonic eddies

Contribution to the nation

This transit voyage provided invaluable hands-on training in oceanography to the next generation of marine scientists. Students at master's and undergraduate level learned how to conduct research at sea, how to operate standard oceanographic equipment, how to analyze and interrogate their data, and how to communicate with a wide range of audiences about their work. They also solidified their theoretical knowledge of physical, biological and chemical oceanography by gathering and analyzing data related to the dynamic eddy environment of the EAC. Finally, the datasets collected will be used in more in-depth research projects at Honours and Masters level allowing students to further their research skills in oceanography.

The EAC is a major influence on the climate of eastern Australia and an important factor in the warming waters experienced in the Tasman Sea as a result of climate change. Eddies are a pervasive feature of the southern EAC. Eddies are circular currents in the ocean, and they can be associated with vertical motion in the ocean, either upwelling or downwelling. Eddies play an important role in structuring the surface velocity in the southern EAC. They are also important in the southward transport of heat and salt. Finally, eddies impact the delivery of nutrients to the surface ocean, affecting the production and distribution of phytoplankton, which form the base of the ocean's food chain. Although the surface expression of eddies is visible from space, this voyage was an opportunity to get inside the eddies and probe the three dimensional distributions of velocity, nutrients, phytoplankton and zooplankton.

As a result of this voyage

1. We have a better understanding of the interactions between the physical, chemical and biological properties of eddies in the East Australian Current
2. We have found microplastic particles in all samples examined, with the highest concentration closest to Sydney
3. We have mapped the vertical distribution of heat, salt, nutrients and phytoplankton biomass in 3 warm core eddies, and one cold core eddy
4. We have commenced a program of training the next generation of marine scientists in how to conduct sea-going oceanographic research