MNF Voyage Highlights

Voyage #:	IN2022_V03
Voyage title:	**SOTS:** Southern Ocean Time Series automated moorings for climate and carbon cycle studies southwest of Tasmania
Mobilisation:	Hobart, 0800hrs Wednesday 27 – Saturday 30 April, 2022
Depart:	Hobart, 1000hrs Wednesday 4 May, 2022
Return:	Hobart, 0800hrs Sunday 15 May, 2022
Demobilisation:	Hobart, Monday 16 May, 2022
Voyage Manager:	Matt Kimber
Chief Scientist:	Elizabeth Shadwick
Affiliation:	CSIRO O&A / AAPP
Co-Chief Scientist	Eric Schulz
Affiliation:	Bureau of Meteorology
Principal Investigators:	Ben Scoulding
Project name:	Ecological and carbon sequestration role of mesopelagic organisms in the Southern Ocean
Affiliation:	CSIRO
Principal Investigators:	Jay Mace, Alain Protat
Project name:	CAPRIX
Affiliation:	Uni of Utah, Bureau of Meteorology
Principal Investigators:	Craig Hanstein
Project name:	ARGO Deployments
Affiliation:	CSIRO
Principal Investigators:	Zanna Chase and Andy Bowie
Project name:	Dust to the ocean: does it really increase productivity?
Affiliation:	University of Tasmania (UTAS)

Voyage Highlights

The Chief Scientist

Dr Elizabeth Shadwick is a marine biogeochemist and a Senior Research Scientist at CSIRO. Elizabeth completed a PhD in Chemical Oceanography in 2010 at Dalhousie University in Canada, and a post-doctoral fellowship at the Antarctic Climate and Ecosystems Cooperative Research Centre in Hobart. She then moved to the Virginia Institute of Marine Science as an Assistant Professor, and joined CSIRO in 2018. Elizabeth's research has focused on air-sea exchange, the marine carbon system, and ocean acidification across many environments from the North Atlantic, to the Arctic, to the Southern Ocean. Her research relies on autonomous sensors deployed on moorings, shipboard observations and laboratory analyses. Elizabeth Co-Leads the IMOS Southern Ocean Time Series Facility and the Biogeochemistry Project of the newly established Australian Antarctic Program Partnership (AAPP).

Title

SOTS: Southern Ocean Time Series automated moorings for climate and carbon cycle studies southwest of Tasmania.

Purpose

The Southern Ocean Time Series project deployed a new set of moorings and recovered the existing moorings. The SAZ sediment trap mooring collects samples to quantify the production and transfer of carbon and other nutrients to the ocean interior by sinking particles, and investigate their ecological controls. The Southern Ocean Flux Station (SOFS) mooring measures meteorological and ocean properties important to air-sea exchanges, ocean stratification, waves, currents, biological productivity and ecosystem structure. In addition, water samples were collected for more detailed investigations of nutrient and plankton characteristics, and their contributions to CO2 uptake by the ocean.

Contribution to the nation

The SOTS research improves understanding of the global climate system by focussing on a key region –the Southern Ocean. Careful sustained observations over the last decade and into the next increases our knowledge of how the ocean interacts with the atmosphere. Improved understanding is essential to enhance advice to the nation on climate variability affecting us now, develop future scenarios and impact assessments, and to make optimal decisions that will affect the nation's future. The work also directly addresses the issue of how ocean biogeochemistry and productivity respond to ocean dynamics, which is an important input to projecting future biogeochemical and ecosystem

states. In addition, enhanced understanding of process occurring in the region related to clouds, ocean mixing, waves and rain will also lead to improved forecasts and warnings issued to the public.

As a result of this voyage, we have re-deployed the Southern Ocean Time Series moored platforms to provide an integrated and ongoing assessment of the seasonality of the processes that control air-sea exchanges important to climate, and upper ocean processes important to Subantarctic productivity. This analysis extends from the physics of ocean mixing and insolation, to the chemistry of ocean nutrients and the biological responses of phytoplankton, zooplankton and fish. Many of the observations are available in real-time via the internet (www.imos.org.au).

As a result of this voyage

We have sustained the longest time series of Southern Ocean observations operated by any nation, contributing to the global effort to understand ocean dynamics and their role in climate and responses to anthropogenic emissions. This work is part of the OceanSITES global array of time series observations (www.OceanSITES.org) which is a network within the United Nations mandated Global Ocean Observing System (https://www.goosocean.org/) .

Next steps

Sensor records from the moored instruments will now go through careful quality control procedures and then be made freely available via the Australian Ocean Data Network (https://portal.aodn.org.au/). Readers interested in future outputs as a result of the voyage, can find all the data via this portal. Scientific outputs based on the data are produced by researchers from multiple agencies within Australia and around the world, and are compiled by the Integrated Marine Observing System and showcased via their Impact Database (http://imos.org.au/news/impact-database).