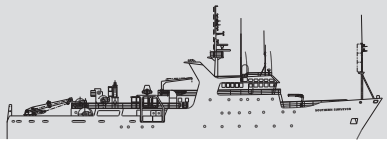

MARINE
NATIONAL FACILITY

2009 program

RV *Southern Surveyor*

voyageplan
SS06-2009

Perturbation Flow Processes Over Seamounts in the East Australia Current Outflow in the Tasman Sea

Itinerary

Mobilise Sydney, 0900 hrs Wednesday 28th October, 2009
Depart Sydney, 0900 hrs Thursday 29th October, 2009
Arrive Sydney, 0900hrs Monday 9th November, 2009

Principal Investigators

Professor Jason Middleton (Chief Scientist)
University of New South Wales
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Dr Moninya Roughan
University of New South Wales

Dr John Wilkin
Rutgers University

CSIRO

Scientific Objectives

The aim of this project is to investigate flow perturbations over and around seamounts in stratified waters. The flow perturbations due to moderate currents of the East Australia Current outflow impinging on seamounts in the Tasman Sea provides a unique laboratory for the study of oceanic stratified flows over and around obstacles. This study is significant as a study in fundamental physical oceanography, because of the implications of nutrient uplift to biological productivity, and because of the need to accurately encapsulate such effects in regional and larger scale models. This work will build substantially on that undertaken during SS09/06 where we studied flow perturbations around reefs and islands of the Lord Howe Rise. In this proposed project, we intend to utilise both modelling and field work approaches. The modelling work will be undertaken using the state of the art model ROMS (Wilkin and Zhang, 2006). Observational work will be undertaken aboard RV Southern Surveyor, using ADCP, CTD, Seasoar and moored current meters. We plan to deploy instrumentation on the top of Taupo Seamount, and to measure comprehensively the current and hydrographic structure of the ocean around that seamount, and that of a selection of Taupo and Barcoo Seamounts depending on flow conditions. These are steep-sided seamounts lying along the 156°E meridian. Model output will be used to plan our experimental array, the experimental results will be compared to model output, and the model further developed to more accurately predict topographic flow perturbations in regional scale ocean models.

In summary, the combination of currents and variety of islands/seamounts between 156-159°E and 30-35°S comprises an ideal natural laboratory to:

a.) observe flow perturbation processes in deep stratified ocean flows (Middleton and Robertson),

b.) utilise an improved ROMS model (presently the most innovative of regional ocean models) to facilitate interpretation and understanding (Wilkin, Roughan and Middleton), and

c.) determine likely effects of climate change on physical processes, and on nutrient supply from the deeper ocean (Roughan, Middleton and Wilkin) .

Voyage Objectives

The Barcoo and Taupo Seamounts lie along the 156°E meridian, usually impacting of the flow of the East Australia Current. We will undertake transects using ship-board equipments, including the CTD (and associated water samples), a lowered ADCP (suspended on the CTD) the ship's hull mounted ADCP, and the towed vehicle known as the Seasoar to investigate the interactions of the EAC with the topographic features. The precise location of the transects will depend on SST images obtained close to the voyage dates, however generally the transects will be 45-50 miles long across the width of the seamounts, (6-8 hrs, towing the Seasoar). The transects will lie in regions where steep topography (0-4000m) is associated with strong currents.

Ship-board Observational Program

CTD casts at stations along transects of the Tasman Front, normal to the current, as it approaches and crosses the seamount chains. The CTD on the Southern Surveyor is equipped with a full rosette, optode oxygen sensor, par transmissivity and fluorescence. We will take standard nutrient samples at each station, and transects will have casts 500-1000m (occasionally 200m) deep.

ADCP transects will provide current velocities in the upper 400m of the water column. Concurrently with the ADCP transects we will tow the CSIRO Seasoar which profiles the upper 200m of the water column, enabling a fine scale view of the stratification (temperature, salinity, fluorescence, oxygen) as the current interacts with the topography. It is also possible to mount an optical plankton counter on the Seasoar.

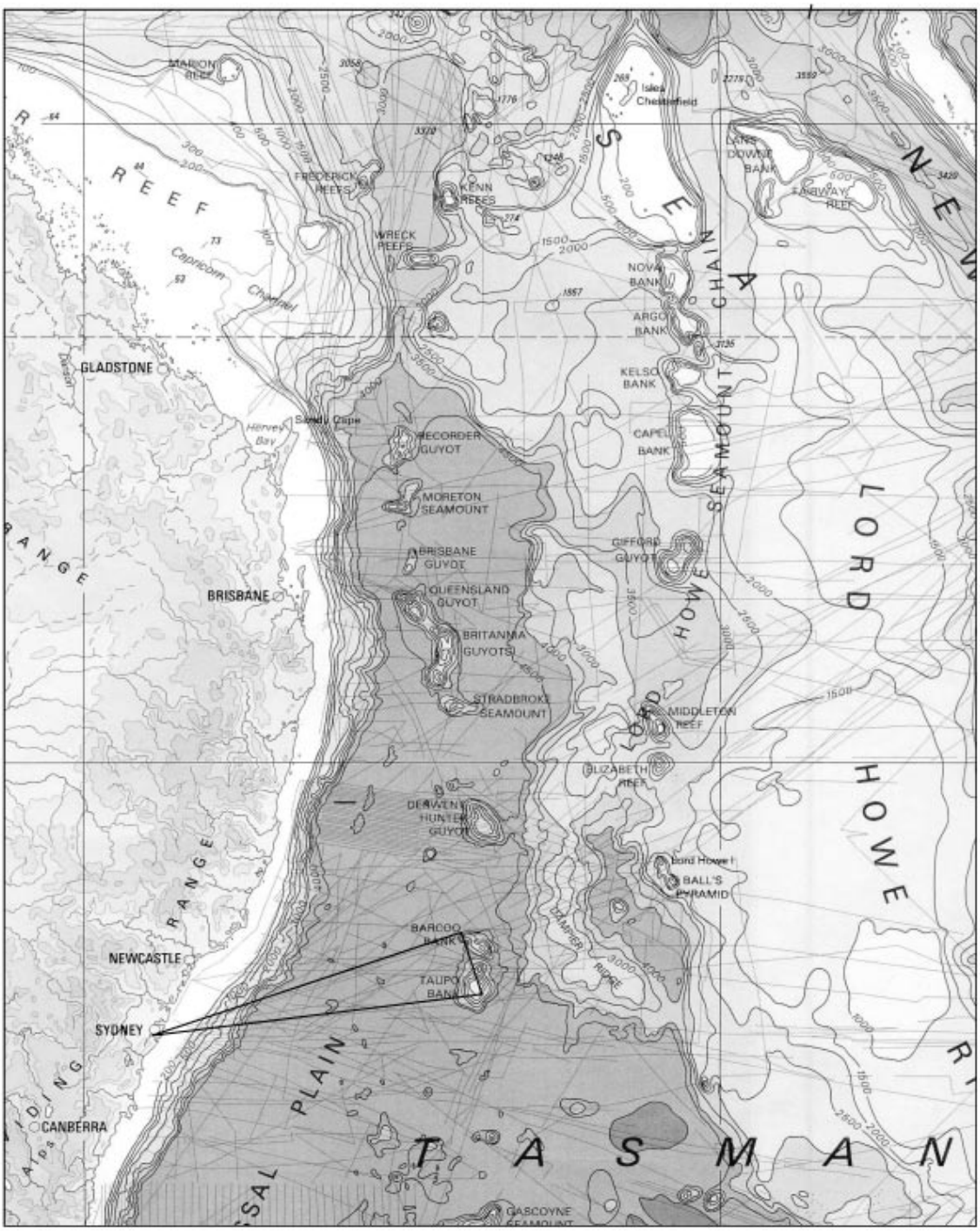
Satellite imagery of ocean colour and sea surface temperature will be utilised throughout the project. They are an essential part of the field component, and will be used to ensure transects are related to current and topography interactions.

Moored Observational Program

We propose to deploy one mooring on the Taupo Seamount for the duration of the voyage to identify tidal currents. Taupo is an ideal location as it extends from the seafloor (~4000m depth) to within 130m of the sea surface and is flat on the top. The mooring will be comprise of one single point current meter and one Seacat moored CTD system on a single mooring with acoustic release. A string of thermistors 5m apart will be placed on the mooring line.

Voyage track

Proposed Voyage Track for research planned about the seamounts which around which the East Australia Current flows.



Time Estimates

	No of days	Justification
Transit (from preferred departure port to first station + last station to preferred arrival port)	2	Transit Syd to 156E = 240 nm 240nm@11kt = 23 hours each way
Research program (total time taken between first and last station)	8	6 days Taupo 2 days Barcoo
Contingencies (allowance for unscheduled delays eg. bad weather and scientific equipment downtime)	1	Contingency of approx. 1 dpw follows from experience at sea
Mobilisation/demobilisation (time required to load and install equipment at the preferred departure port + remove your equipment at the preferred arrival port)	1	2* ½ day each for mob/demob

Southern Surveyor Equipment

- Simrad EA sounder for bottom detection (12KHz)
- Simrad EK500 sounder for biological detection (38 and 120 kHz)
- General Purpose lab
- Hydrochemistry lab
- Wet lab/CTD Room
- Shipboard ADCP
- Lowered ADCP
- CTD/Hydro winches with minimum 2000m conducting cable
- Towed body winch with 500m cable
- Hydrographic A Frame
- Stern A Frame
- CTD
- Rosette (12 bottle and 24 bottle rosette systems)
- Niskin bottles (12* 10 litre plus 12 * 2.5 litre)bottles
- Transmissometer
- Oxygen sensor
- Profiling Fluorometer
- PAR (light) to 500m depth
- Chemical analyses
- CTD casts planned: 120 to 1000m
- 10 samples per cast (minimum for 24 bottle rosette)
- Analyses for salinity, oxygen (to calibrate CTD), as well as nitrate + nitrite, nitrite, ortho phosphate, and reactive silicate (note: will be needing to identify low nutrient levels in upper100 m)
- Underway fluorometer
- Meteorological sensor
- Seasoar
- Swath bathymetry if possible to map seamount tops
- Data products from electronic sensors and water property analyses.

User Equipment

Current meter mooring equipment, including weights, cables, floats and instrumentation.

Personnel List

Jason Middleton	UNSW	Chief Scientist
Ryan McCabe	UNSW	Watch Leader
Philippe Estrade	UNSW	Watch Stander
Robin Robertson	UNSW-ADFA	Watch Leader
Darrell Terry	UNSW-ADFA	Watch Stander
Helen McDonald	UNSW	Watch Stander
Julie Wood	UNSW	Watch Stander
Matthew Perrett	UNSW	Watch Stander
Scott Baxter	UNSW-ADFA	Watch Stander
TBA		Watch Stander
Pamela Brodie	CMAR	MNF Voyage Manager/Computing Support
Drew Mills	CMAR	MNF Electronics Support
Bernadette Heaney	CMAR	MNF Swath Mapping Support
Mark Rayner	CMAR	MNF Hydrochemistry Support

As per AMSA requirements for additional berths on Southern Surveyor, the following personnel are designated as System Support Technicians and are required to carry their original AMSA medical and AMSA Certificate of Safety Training on the voyage:

Name	**AMSA Certificate of Safety Training No.**
Pamela Brodie	AS02447
Drew Mills	AS02348
Bernadette Heaney	AS02397
Mark Rayner	AS02432

This voyage plan is in accordance with the directions of the Marine National Facility Steering Committee for the Research Vessel Southern Surveyor.

Jason Middleton
Chief Scientist

Schematic Figure of Taupo showing station CTD, ADCP and transect lines.