

# **CSIRO MARINE RESEARCH**

**1998 RESEARCH VESSEL PROGRAM**

**CRUISE PLAN**

**FRV *SOUTHERN SURVEYOR***

**CRUISE SS 02/98**

**10 MARCH - 31 MARCH 1998**

CSIRO MARINE RESEARCH

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## ITINERARY

### LEG 1

Depart: Hobart 1000 Tuesday, March 10

Arrive: Hobart 1200 Tuesday, March 31

## AREA OF OPERATION

Southern Ocean ( $48^{\circ}$ – $52^{\circ}$ S,  $138^{\circ}$ – $145^{\circ}$  E) see Figure 1.

## RESEARCH BACKGROUND

The Subantarctic Front (SAF) is found near  $50^{\circ}$  S south of Tasmania. The SAF is the main core of the Antarctic Circumpolar Current in this sector of the Southern Ocean. The front extends throughout the water column and marks the boundary between relatively warm, salty water to the north and cool, fresh water to the south. The SAF south of Tasmania is characterized by numerous meanders, which sometimes pinch off to form both warm- and cold-core rings. The meanders are sites of enhanced vertical velocities and cross-front exchange. The goal of SS 02/98 is to estimate the vertical and cross-front exchange by carrying out an intensive survey of a meander of the SAF.

*Southern Surveyor* cruise SS 02/98 is part of a two-ship expedition to study the SAF and the waters to either side of the front. *Aurora Australis* will carry out a north-south transect along  $141^{\circ} 30' \text{ E}$ , including four time series stations where the ship will remain on site for five days. *Aurora Australis* will also recover four sediment trap moorings. The focus of the work on *Aurora Australis* is on uptake and export of carbon and on processes controlling biological productivity.

## CRUISE OBJECTIVES

1. To map the distribution of temperature, salinity, oxygen, nutrients and velocity in the vicinity of the Subantarctic Front, with a cross-front resolution of 12 nm or better, and an along-front resolution of 18 nm or better.
2. To use the detailed spatial maps to determine how cross-front exchange and vertical velocities are related to meanders of the Subantarctic Front.
3. To recover two magnetometer moorings for Dr Ted Lilley.

## METHODS

The survey will involve steaming a number of legs across the front in a grid pattern. Along each cross-front leg a CTD profile to 1500 m will be made every 12 nm; about 10 stations will be completed in each cross-front leg. The cross-front legs will be separated by about 18 nm in the along-front direction. A 12 bottle rosette package will be used and samples taken for

oxygen, salinity and nutrient analyses. The CTD package will include an oxygen sensor and a fluorometer.

While underway, we will measure upper ocean currents continuously using the new ADCP/3DF GPS system. Continuous measurements of sea surface salinity and temperature will be obtained from the thermosalinograph.

Dr Lilley will be supplying the acoustic release gear and radio direction finder needed for recovery of his moorings. The moorings consist of tripods that sit on the sea floor. Each recovery should take between 3 to 6 hours on site.

## CRUISE PLAN

Prior to the ship's departure, we will locate the SAF using satellite surface temperature and surface height measurements. We expect to find the front near 50° S, between 140° E and 143° E.

After departing Hobart on March 10, we will sail to the site of the first mooring "Rossel" at 50° 37.3' S, 143° 49.2' E. One or more test casts will be carried out during the transit from Hobart to the mooring site. The ADCP and thermosalinograph will run continuously during the cruise. We expect to cross the SAF during this transit leg.

We will recover mooring "Rossel" (anticipated time on site is 3 hours) and proceed to the second mooring "Girardin" at 51° 45.1' S, 143° 16.8' E. The recovery of the second mooring may take up to six hours, since its precise position has not been determined previously.

From mooring "Girardin" we will sail north to obtain another crossing of the front to confirm its location and orientation. If necessary, additional crossings of the front may be made using the ADCP, thermosalinograph and XBT's before starting the detailed survey. The *Aurora Australis* will also cross the front near 141° 30' E and will fax/email us their results to assist in locating the front.

The details of the survey grid will need to evolve as it proceeds, depending on the location and shape of the front. We are interested in surveying both sides of a meander of the front; this may be done in one continuous survey or in two separate surveys, depending on the size and shape of the meander.

After completing the meander survey we will transit to Hobart, continuing to collect ADCP and thermosalinograph measurements. If time permits, additional 0-1500 m CTD casts may be completed on the return leg to Hobart.

## PERSONNEL

|                  |                    |
|------------------|--------------------|
| Steve Rintoul    | Cruise leader, CTD |
| Serguei Sokolov  | CTD                |
| Ted Lilley (ANU) | CTD, moorings      |
| Matt Fitzpatrick | CTD                |
| Helen Beggs      | ADCP               |
| Lindsay McDonald | Electronics        |
| Val Latham       | Hydrochemistry     |
| Gary Critchley   | Hydrochemistry     |
| Mark Rayner      | Hydrochemistry     |

(Matt Fitzpatrick is a student CSIRO Volunteer Fellow)

All personnel are CSIRO staff unless otherwise indicated.

## CONTACTS

For further information about this cruise contact:

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Dr Nan Bray  
Chief, CSIRO Marine Research

Date 5/3/98

Figure 1. Nominal cruise track of SS 02/98. The survey consists of a number of sections across the Subantarctic Front. The exact location of the sections will depend on the location and orientation of the front, and may be modified during the cruise. Aurora Australis will carry out a transect along  $141^{\circ}30'$  E and conduct 5-day process stations at each of the sediment trap mooring sites (indicated by squares). Two magnetometer moorings (indicated by circles) will be recovered by *Southern Surveyor* prior to the meander survey.

