

CSIRO Marine Research

1999 Research Vessel Program

Cruise Plan

FRV Southern Surveyor
Cruise SS 2/99

6 February to 14 February, 1999

CSIRO Marine Research
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Itinerary

Depart Hobart: 0000 h Saturday, 6 February 1999

Arrive Hobart: 2400 h Sunday, 14 February 1999

Area of Operation

The cruise will operate in the area between Cape Grim, Tasmania, and the sub-Antarctic Front, from approximately 40° 45'S 144° 10'E to 50°S 142°E.

Research Background

The cruise is designed to improve understanding of the timing and factors regulating the oceanic uptake of carbon dioxide in the sub-Antarctic Zone. Previous work has shown the sub-Antarctic zone is one of the largest oceanic carbon sinks. The cruise will focus on improving understanding of the regional variability in upper ocean biogeochemical properties (CO₂, pigments, O₂, and nutrients) and linking surface ocean flux estimates to atmospheric measurements of CO₂ in the boundary layer near Cape Grim. The cruise will complement work done in the same region on *Southern Surveyor* in spring 1995 (SS11/95), and on *Aurora Australis* in late summer, 1998.

Cruise Objectives

1. To contribute to a better understanding of the carbon source/sink distributions in the region and the physical and biological controls on carbon uptake in the sub-Antarctic zone.
2. Coordinate the *Southern Surveyor* work off Cape Grim with the aircraft sampling as a preliminary study to better understand the link between air-sea exchange and the drawdown in CO₂ in the atmospheric boundary layer at Cape Grim.
3. Sample biogeochemical properties for summer conditions over a sediment trap mooring located at 46° 45.52' S 142° 05.38' E.

The cruise track is designed to provide a reasonable view of the upper ocean distributions of fCO₂ and other biogeochemical properties (oxygen, nutrients, and pigments, carbon isotopes) to the west of Cape Grim. CTD casts and the aquashuttle will be used to determine the upper water column structure and the relationship to surface biogeochemical properties measured underway. The work will be coordinated with aircraft sampling of the boundary layer in the vicinity of Cape Grim. There may also be a tracer release from the ship as a preliminary experiment to determine if an air mass passing over the ocean can be tagged with a tracer. The tracer will be monitored at Cape Grim and possibly in flask samples collected from aircraft flights. If successful, the tracer release could be useful in quantifying the air-sea exchange of a variety of trace gases, including CO₂, O₂, and DMS.

Cruise Plan

The *Southern Surveyor* will leave Hobart at 0000 local time Feb. 6, and steam towards $44^{\circ} 10'S$ $145^{\circ} 40'E$, where a test cast will be made to check the CTD and other equipment are functioning. The ship will then head towards Cape Grim and arrive at about $40^{\circ} 45'S$ $144^{\circ} 10'E$, at about 1700hrs on Feb 7, 1999.

From near Cape Grim, the *Southern Surveyor* will begin a transect towards $42^{\circ}S$ $141^{\circ} 30'E$, and CTD casts will be made about every 30nm. The aquashuttle will be deployed between the CTD stations. We will attempt to coordinate aircraft (by CAR) and ship sampling and, if possible, begin a tracer release into the atmosphere sometime during the transect. Air mass forward trajectories will be sent to the ship from Cape Grim Observatory to help determine the best location to start a tracer release. Some delays may occur in this region if bad weather will not allow aircraft sampling near the ship.

At $42^{\circ}S$ $141^{\circ} 30'E$, the ship will turn south and head towards $46^{\circ}S$ $142^{\circ}E$, with a CTD every 30 nm. The aquashuttle will be towed for part of the transect, depending on the weather and the location of fronts identified using satellite SST and ocean colour images. Sediment traps are moored at $46^{\circ}S$ $45.52'$ $142^{\circ} 05.38'E$. Two extra CTD casts will be made in the vicinity of the traps. If there is time to continue the line further south, the ship will head towards $50^{\circ}S$ $142^{\circ}E$, with CTD's about every 30nm.

The schedule allows only 4 hours for bad weather. If bad weather causes additional delays, the southernmost part of the cruise track between $47^{\circ}S$ and $50^{\circ}S$ will be reduced. Also, the section between $47^{\circ}S$ and $50^{\circ}S$ may be reduced if time is required for the tracer release off Cape Grim, or poor weather prevents aircraft sampling near the ship.

Cruise time allocation:
(Total cruise time: 9 d)

Location	Distance travelled	Hours
Hobart to about 44°10'S 145° 40'E	130nm @10 knots	13
Test CTD cast to 1000m		2
To 43°S 143°30'E	110nm @10 knots	11
To 40°45'S 144°10'E (shelf off Cape Grim)	150nm @10 knots	15
To 42°S 141°30'E towing aquashuttle	140nm @ 8 knots	17
with CTD about every 30nm (6 CTD's)		12
To 46° 50'S 142°00'E towing aquashuttle	300nm @ 8 knots	38
with CTD every 30nm (10 CTD's)		20
and 2 Extra CTD's near mooring site		5
To 50°S 142°00'E	190nm @10 knots	19
with CTD every 30nm (6 CTD's)		12
To Hobart	480nm @10 knots	48
Total Time: 212hrs (8.8 days)		

Note: - off Cape Grim at about 1700 on Feb 7, 1999, then head WSW.
- arrive west of Cape Grim at 42°S 141°30'E at about 2300hrs on Feb 8, 1999.

Personnel

(Note: unless indicated otherwise, all personnel are staff of CSIRO Marine Research)

B. Tilbrook (cruise leader)

N. White

P. Bonham

M. Pretty

Dave Terhell OMS

Gary Critchley OMS

1 OMS trainee (?)

D. McKenzie

Lindsay MacDonald (Electronics)

B. McNeil (Antarctic CRC/CSIRO)

S. Bray (Antarctic CRC)

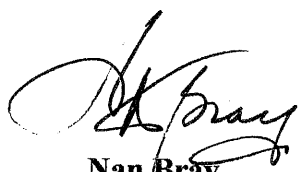
Student volunteer (Antarctic CRC)

CONTACTS

For further information about this cruise contact:

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Nan Bray
Chief, CSIRO Marine Research

Distribution:

Normal circulation

Cruise participants

Roger Francey, Paul Steele and Ray Langenfeld, CAR

Neil Tindale, Cape Grim Baseline Air Pollution Station, BOM

Tom Trull, Antarctic CRC

John Parslow, Gary Meyers

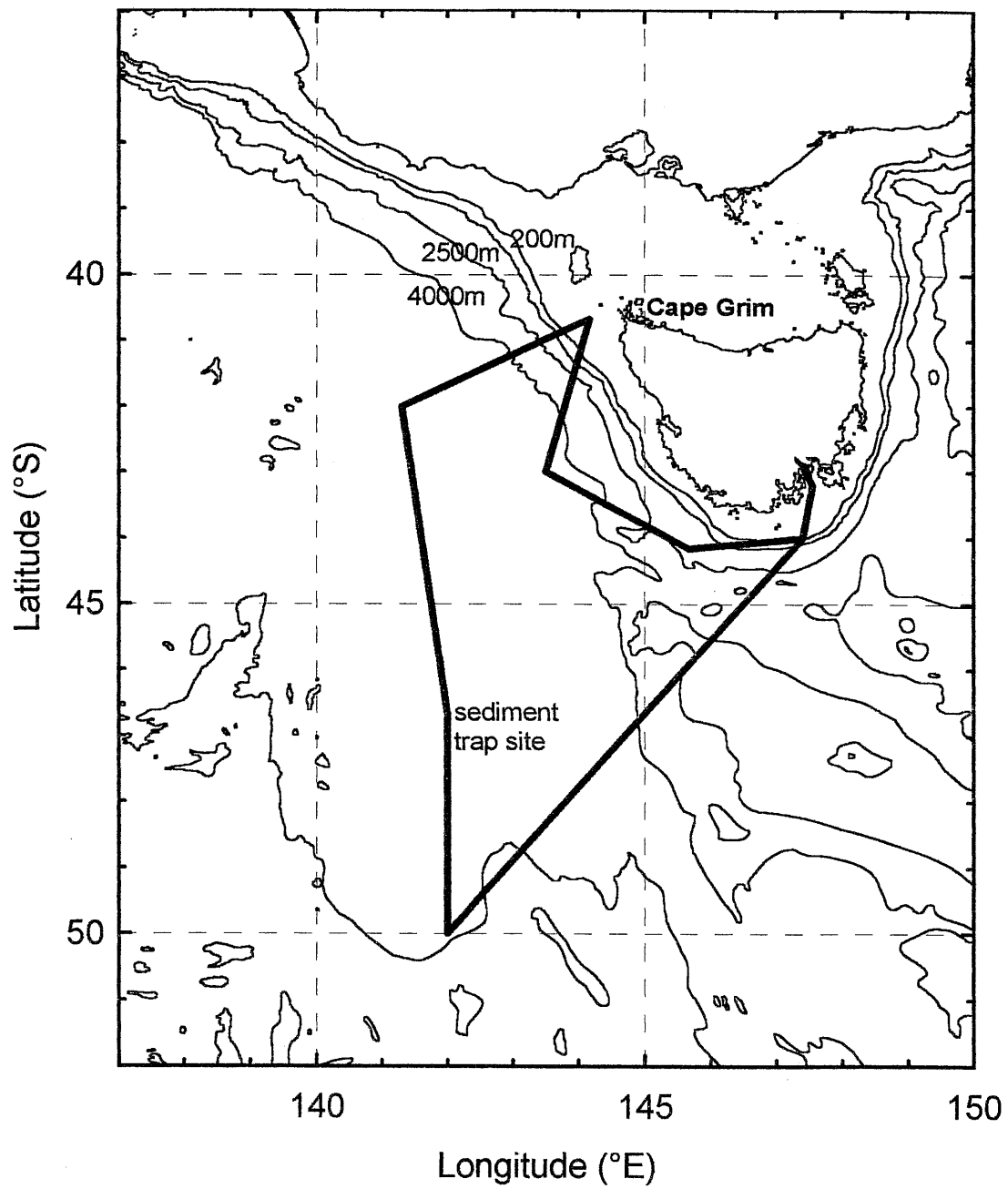


Figure 1. Cruise track for SS2/99, February 6-14, 1999.