R.V. FRANKLIN

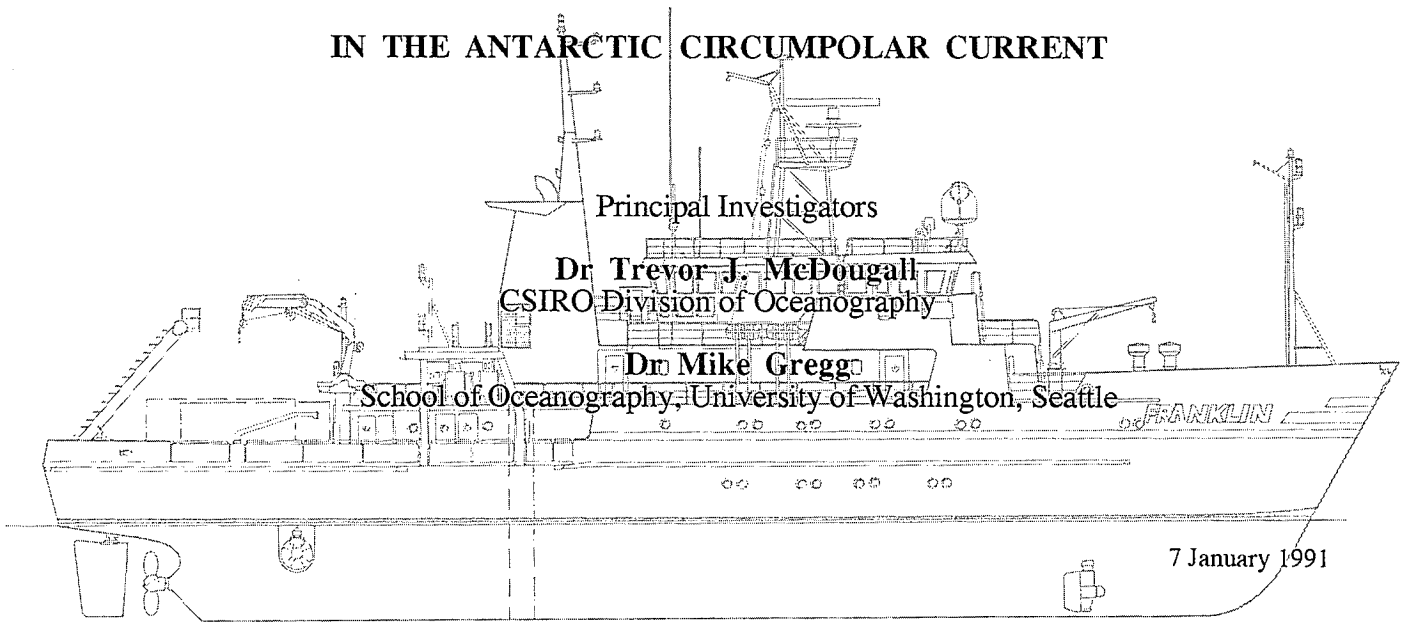
NATIONAL FACILITY
OCEANOGRAPHIC RESEARCH VESSEL

RESEARCH PLAN

Cruise FR 3/91

Sail Hobart	0700hr Wednesday 6 March 1991
Arrive Hobart	1400hr Wednesday 27 March 1991

TURBULENCE MEASUREMENTS AND TURBULENT SCALING IN THE ANTARCTIC CIRCUMPOLAR CURRENT



Principal Investigators

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7 January 1991

For further information contact

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AUSTRALIA

R.V. FRANKLIN IS OWNED AND OPERATED BY CSIRO

Research Plan

RV FRANKLIN

FR03/91

Itinerary

Sail Hobart	0700hr Wednesday 6 March 1991
Arrive Hobart	1400hr Wednesday 27 March 1991

Scientific Program

Turbulence Measurements and Turbulent Scaling in the Antarctic Circumpolar Current

This cruise aims to collect the first microstructure measurements from the Southern Ocean in the Antarctic Circumpolar Current and to compare these with the internal wave activity. Bunyip will be deployed as often as logistically possible and in between Bunyip tows, expendable current profilers (XCPs) will be dropped and CTD stations occupied:- all subject to the prevailing conditions.

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Cruise Objectives

(i) To measure the magnitude of vertical mixing activity in the Antarctic Circumpolar Current.

(i) To measure the internal wave shear levels in the region of the Antarctic Circumpolar Current, and to compare these to the Garrett and Munk spectrum.

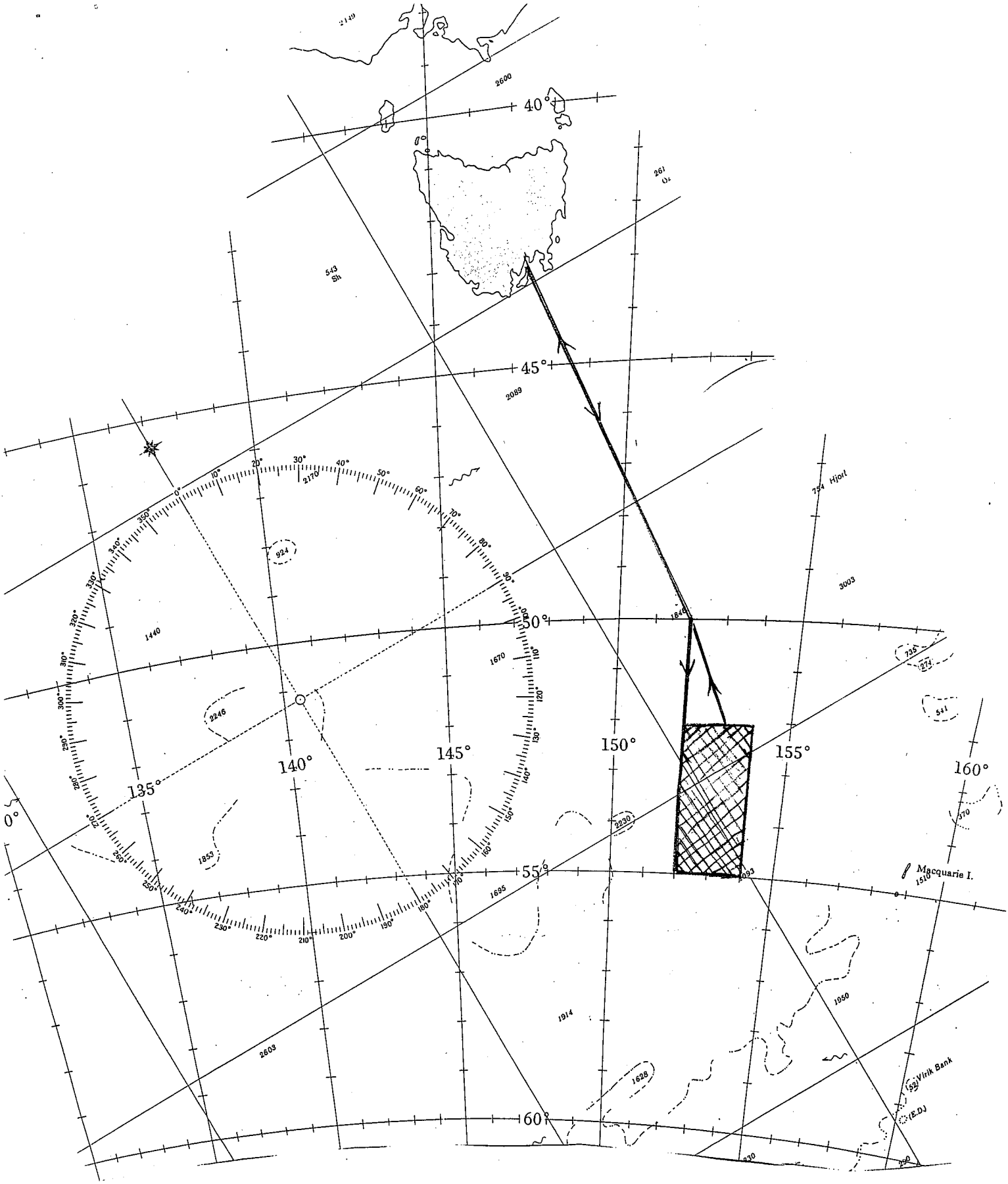
(iii) To determine whether the dissipation of mechanical energy, *e*, in the Antarctic Circumpolar Current conforms to the recently discovered relationship involving the mean square shear (measured over a vertical scale of 10 m) and the buoyancy frequency.

Our main objective is to measure the strength of vertical mixing activity in the Antarctic Circumpolar Current. There are some recent indications from an inverse study by Olbers and Wenzel (1989) that this region of the world ocean may exhibit anomalously large diapycnal mixing rates and there are presently no microstructure measurements from this region from which the diapycnal diffusivity could be deduced.

A recent analysis by Gregg (1989b) of microstructure dissipation data collected over many years from a range of oceanic environments has shown that the dissipation of mechanical energy seems to collapse quite well on a specific functional form of the observed shear (measured over an intermediate length scale, e. g. 10 m) and the buoyancy frequency. This collapse needs to be substantiated by data from many more and varied oceanic regions before we can believe that mixing, which happens at the centimetre scale, can be successfully parameterized with measurements on the 10 m scale.

Cruise Track and Time Estimates

On leaving Hobart, we will steam directly to 50°S, 152°E (a distance of 480 nm and a transit time of 48 hours at 10 knots) and will begin a southward XBT transect to 55°S, dropping XBTs every 20 nm and taking 48 hours to complete (at 6 knots). Allowing 4 days in which we cannot work due to bad seas, leaves 11 days of science time (11 = 21 - 2x2 - 2 - 4). We plan to spend these 11 days in the box marked on the attached cruise track map. Ideally we will work in a 24 hour cycle of a CTD, an XCP, a CTD, a 12-hr Bunyip tow, a CTD, an XCP, a CTD, and then steaming to recover some of the distance made to the east during the Bunyip tow. This cycle would ideally be repeated each day for 11 days. The steaming each day is required because of the expectation that the conditions will dictate that Bunyip will be towed mainly in one direction, namely to the east. The CTDs will be to a depth of 1600 m as this is the depth of the XCPs. The two dips of the CTD for each XCP is to obtain a more reliable estimate of the buoyancy frequency at each station.


40°
45°
50°
55°
60°
135°
140°
145°
150°
155°
160°
0°
Macquarie I.
Hjort
Virik Bank
(E.D.)

ORV Equipment Required
CTD
ADCP
XBTs
Bunyip mainfish and Bunyip winch
Satellite thermal image reception and display equipment

User Supplied Equipment
Bunyip micro-fish and small winch
Expendable Current Profilers, XCPs, (20 of)

Personnel

Dr T. J. McDougall	CSIRO Division of Oceanography (Cruise Leader)
Dr. L. F. Pender	CSIRO Division of Oceanography (Cruise Manager)
Mr I. Helmond	CSIRO Division of Oceanography
Mr S. Swan	CSIRO Division of Oceanography
Mr Paul Boult	CSIRO Division of Oceanography
Mr Leigh Carter	CSIRO Division of Oceanography
Mr Phillip Adams	CSIRO Division of Oceanography (& ORV Franklin)
~~Mr David Terhell~~ Bob Guppy	CSIRO Division of Oceanography (& ORV Franklin)
Mr Earl Krause	Applied Physics Laboratory, Uni. of Washington, USA.
Dr N. Bindoff	CSIRO Division of Oceanography
Dr John Hunter	

This Cruise Plan is in accordance with the directions of the National Steering Committee for the oceanographic research vessel, RV Franklin.

A. D. McEwan
CSIRO Division of Oceanography

G.W. Paltridge
National Facility Steering Committee

January 1991