

CRUISE PLAN

RV FRANKLIN

FR5/99

Title

Tidal mixing and the seasonal cycle of the Leeuwin Current.

Itinerary

Depart Dampier 1000 hrs, Wednesday 14 July, 1999

Arrive Darwin 1100 hrs, Monday 26 July, 1999

Principal Investigator(s)

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* denotes a Principal Investigator who will not be on the cruise. (They have each provided substantial quantities of equipment and will participate in the data analysis.)

Scientific Objectives

The objectives of the study will be:

- 1) To estimate temperatures and currents (both directly and via geostrophy) over a year, within a closed region from Darwin to the southern North West Shelf, with a view to (a) testing the closure of mass and heat budgets; (b) documenting the "Rochford Current", observed in 1962 by Mr. David Rochford as a tongue of high-nutrient water intruding from the Arafura Sea towards the Gulf of Carpentaria, in winter.
- 2) To examine the probable role of tidal mixing in forming the 50-100m deep internal mixed layers observed in XBT traces near the continental shelf edge, off Darwin; in converting cool inflow to warmer outflow; in removing SST minima contrasts during the summer upwelling regime; and in surveying the predicted regions of intense internal tides. (Figure 2, from P. Holloway (pers. comm) shows their predicted energy flux.)

The scientific background is described in more detail in Godfrey and Mansbridge (JGR, accepted).

Cruise Objectives

8 moorings will be placed, at eight of the waypoints shown in Figure 1 (heavy dots on Figure 1). Any discrepancies in depth between assigned mooring depth (below) and depth estimate from the AGSO chart (table) will be resolved on arrival on site. These moorings form 3 lines, from south to north:

1) Adele Island-Scott Reef (a continuation of a 4-year time series maintained by AIMS). We will deploy 2 moorings; one in 178m on the shelf, one at 550m depth southwest of Scott Reef. Tide gauges have already been placed at Adele Island and at Scott Reef by AIMS scientists.

2) Inshore from Ashmore Reef. We will deploy 3 moorings, one west of Ashmore Reef in 400m of water; and two moorings ESE of Ashmore, in 250m and 150m of water respectively.

3) North of Bathurst Island. These will be in depths of 60m; 150-200m; and about 300m, the last lying just inside the the Australian EEZ. The depths of these moorings will be chosen after a preliminary survey.

Cruise Track

The thick full line in Figure 1 shows the location of the outer edge of Australia's EEZ. Dots on the main cruise track (thinner line, Figure 1) indicate waypoints; mooring locations are shown by asterisks on the table beneath. The cruise track shown does not allow for the 2.5 days of CTD and ADCP survey work inshore from Ashmore Reef. This will largely be devoted to looking for signs of internal mixing around the predicted region of intense internal tides, Figure 2.

Time Estimates

The full line in Fig. 1 is 1512 sea miles long, taking 5 days 18 hrs at 11 kts. Mooring deployments at 2 hrs each will take 16 hrs. This leaves 5.6 days for other uses. We propose using most of this at CTD stations along the track of Figure 1, as follows:

Adele Is - Scott Reef: 4*1-hr stations and 2*12-hr stations (12-hr stations at mooring locations)

Scott Reef - Ashmore Reef: 5*1-hr stations and 1*12-hr station

Inshore from Ashmore: 4*1-hr stations and 1 * 12-hr station (at Holloway mooring)

Bathurst Island north: 6*1-hr stations and 2*12-hr stations

This adds to just over 3.75 days. We may spend about 0.5 days on Scott Reef, undertaking work for WNI; details being negotiated by Mr. Buchan. We propose using much of the remaining 1.3 days inshore from Ashmore Reef, surveying for the intense internal tides and associated mixing predicted by Dr. Holloway (Figure 2).

Franklin Equipment

CTD with 12-bottle rosette; thermosalinograph; ADCP; standard reagents for nutrient chemistry; transmissometer; fluorometer (for qualitative use).

User Equipment

8 moorings as in Table 1. In addition, a boom will be placed on the foredeck, for use in the following cruise (Fr6/99).

Table 1

Adele Island - Scott Reef line:

1. Recover AIMS 178 m mooring (14.645S, 122.341E), replace with ours: 2 releases, ADCP, 4 Anderaas, 1 NBACM, pressure gauge.
2. Scott Reef 550m: (1430S, 12142E): 2 acoustic releases, 8 S8 current meters, pressure gauge. (Steve Buchan to supply.)

3. Ashmore Reef 400m: (1218S, 12248E) 2 releases, ADCP, 3 Anderaas, thermistor chain (deep), NBACM, pressure gauge

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Line ESE of Ashmore:

- Holloway mooring, 250m: (13 00S, 123 42E). Acoustic releases, 6 * S4 current meters, pressure gauge. (Peter Holloway to supply instruments, CSIRO provides wire, flotation).
- 75m mooring: (1324S, 12430E). 2 releases, pressure gauge, 3 Anderaas, 1 NBACM.

Bathurst Is. north line:

- 60m Mooring (10.5S, 12950E), 2 releases, pressure gauge, 2 Anderaas, 1 NBACM. (Positioning of this mooring will need special care: the recommended position is on a fairly steeply sloping feature, to avoid trawling activity. All other moorings are considered safe from trawling).
- 150-200m mooring, (10S, 13012E): 2 releases, ADCP, up to 5 Anderaas, NBACM, pressure gauge.
- About 300m: EEZ edge mooring, (near 9 48S, 130 12E): 2 releases, pressure gauge, ADCP, thermistor chain, 3 Anderaas, 1 NBACM.

Personnel List

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Andreas Walsch Hamburg

Gavin Wark WNI

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Dan McLaughlan CMR Moorings

Phil Adams CMR Electronics

Mark Rayner CMR Hydrochemistry

Gary Critchley CMR Hydrochemistry

Neil White CMR Computing

John Wallace Cruise Manager CMR Ships Sub-program

This cruise plan is in accordance with the directions of the National Facility

Steering Committee for the Research Vessel Franklin.

Signed

Chairman, Steering Committee