FRANKLIN

National Facility
Oceanographic Research Vessel

ResearchSummary

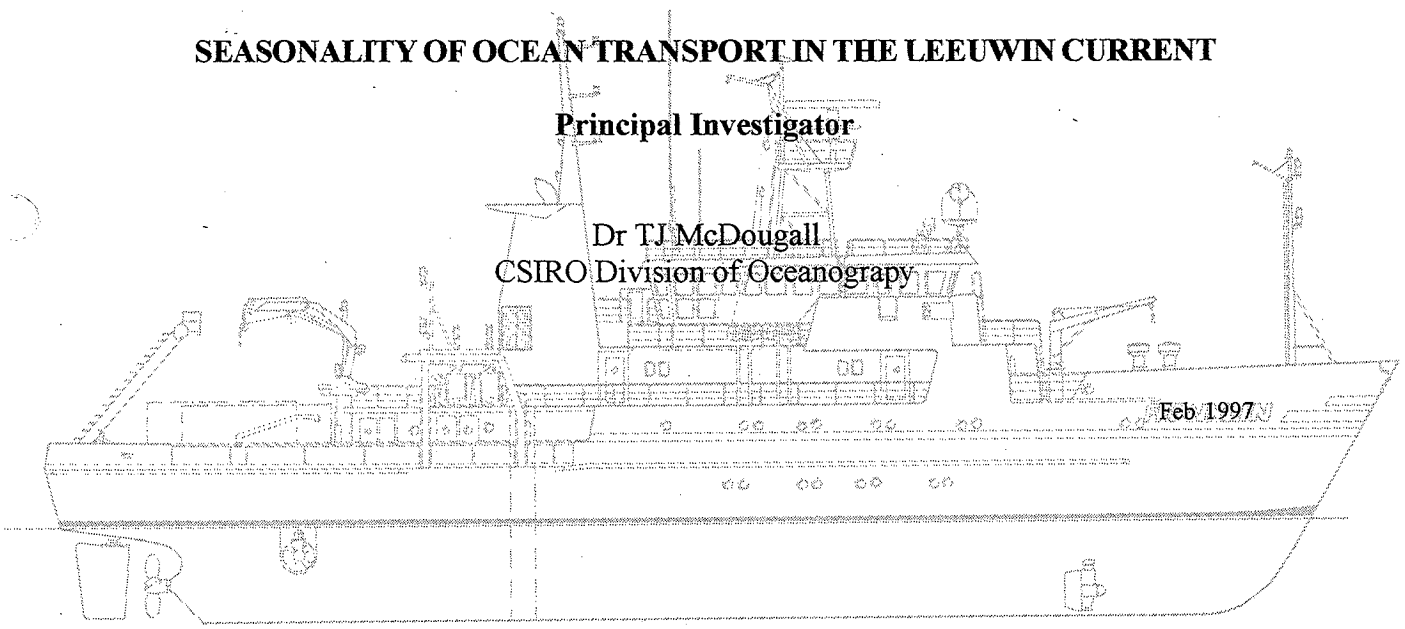
FR08/96

Sail	Fremantle	1000	Thursday 12 September 1996
Arrive	Fremantle	0800	Saturday 28 September 1996

SEASONALITY OF OCEAN TRANSPORT IN THE LEEUWIN CURRENT

Principal Investigator

Dr TJ McDougall
CSIRO Division of Oceanograpy



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AUSTRALIA

FRANKLIN is owned and operated by CSIRO

RV Franklin

National Facility
Oceanographic Research Vessel

Research Summary
Cruise Fr08/96

Itinerary

Sail	Fremantle	1000	Thursday 12 September 1996
Arrive	Fremantle	0800	Saturday 28 September 1996

Moored Measurements and CTD sections of the flow of Deep and Bottom Water into the West Australian Basin of the Indian Ocean

Principal Investigator

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Cruise Objectives

(i) To recover moored current meters in the passage between Cape Mentelle and Broken Plateau to measure the flow of Deep and Bottom water into the West Australian Basin.

(ii) To use the moored current-meter data together with several realisations of the hydrography across the section between Cape Mentelle and Broken Ridge to deduce the flow of Bottom, Deep and Intermediate Waters in this region.

(iii) To estimate the vertical diffusivity across the potential temperature surfaces less than 1.1°C in the West Australian Basin using the deduced volume flow rates of Deep and Bottom water across the section from Naturaliste Plateau to Broken ridge.

(iv) By obtaining more reliable estimates of the equatorward flux of deep and bottom water into the West Australian Basin, contribute to the estimate of the poleward heat flux borne by the Indian Ocean.

Personnel

Ship's Crew

Master	Ian Moss
1st Mate	Ian Menzies
2nd Mate	Franky Valeran
Chief Engineer	Michael Culpeper
1st Engineer	David Jonker
Elec. Engineer	Don Roberts
Bosun	Yannick Hansen
AB	Wayne Browning
AB	Peter Genge
AB	Patrick Willis
Greaser	Phil French
Chief Steward	John Tilley
Chief Cook	Gary Hall
2nd Cook	Peter Dux

Scientific Party

Trevor McDougall	CSIRO	Oceanography	Chief Scientist
David Jackett	CSIRO	Oceanography	
Kevin Miller	CSIRO	Oceanography	
Danny McLaughlan	CSIRO	Oceanography	
Beradette Heaney	CSIRO	ORV Computing	
Helen Beggs	CSIRO	ORV Computing	
Phil Adams	CSIRO	ORV Electronics	
Mark Rayner	CSIRO	ORV Hydrology	
Gary Critchley	CSIRO	ORV Hydrology	
Rebecca Deed	CSIRO	ORV Hydrology	

Cruise Narrative

After leaving Fremantle we headed for the easternmost of the ten moorings, M10. Shortly before reaching this position however, the wind increased and the conditions became unworkable. We spent the next three days hove to, making very slow progress to the northwest and enduring a seemingly endless series of lows that kept moving past us.

The first chance we had to recover any moorings was on Monday morning, 16th September and the first mooring we tackled was mooring M8 (see the attached cruise track, Figure 1). Unfortunately this mooring did not talk to us and despite sending the release command on several occasions, nothing appeared on the surface. Later that day we moved eastwards to mooring M9 and recovered it without a hitch.

We moved to the position of mooring M10 but arrived there with just half an hour of daylight remaining and so did not risk a recovery that night. The first CTD was done this evening to a depth of about 3320m and after this, the wind again increased so that we could do no CTDs or mooring recoveries for more than 24 hours.

Mooring M10 was recovered at first light on Wednesday 18th September. On our way westward we tried again to recover mooring M8 but without success. We had no indication that the release on this mooring was alive and its behaviour was consistent with the release

being flooded. The second CTD was taken in about 5150m just westward of the unretrievable M8.

Mooring M7 was recovered at first light on Thursday 19th September and after two more CTDs mooring M6 and M5 were recovered during Friday 20th September.

CTD #5 was taken on Friday night, 20th September but this was to be the last of our work for 36 hours. Another CTD was attempted Friday night but was abandoned at a depth of 400m as the bridge could not maintain control of the ship in the high winds.

After hoving to for more than a day, we awoke on Sunday morning 22 September to a sea without whitecaps: this being the first time without whitecaps on the cruise. We took advantage of the favourable weather to recover the remaining four moorings, M4, M3, M2 and M1, during this day, the last one being released at 1715hrs.

We then did some more CTDs along the line of the mooring positions and then moved closer to Fremantle and did some CTDs in the deep Perth basin, with the idea being to characterise the deep water properties in this basin to the north of the line of moorings. After doing five CTDs in this region, the weather again deteriorated and we were forced to abandon the last three stations and steam for Fremantle. On the shelf we cruised around a triangular track for the purpose of calibrating the ADCP alignment.

Summary of work completed

The main achievement of the cruise was the recovery of 9 out of the 10 moorings. The acoustic release on the other mooring did not communicate with the ship, and despite extensive efforts on two separate days to release and search for the mooring, nothing appeared on the surface. This lost mooring (M8) contained one release and three Aanderaa current meters.

The nine moorings that were recovered contained 26 current meters. None of these leaked and all but one of these contained good data:- the remaining one did not record any data. Hence we obtained moored current meter data from 25 current meters out of a total of 29 current meters deployed.

The extensive bad weather on the cruise precluded a complete CTD section across the complete line of the current meter deployments. We did however manage a few CTDs in the Perth Basin to the north of our line of moorings.

The data from the current meters is not yet analysed in detail but it is clear already that there is a general northward flow on the western part of the section and a general southward return flow on the eastern part of the section. It will be a challenge to determine the net inflow into the Perth basin at these depths. Data from two current meters are shown in Figures 2 and 3. Panels (a), (b), (c) and (d) are the speed, direction, velocity in the eastward direction and velocity in the northwards direction respectively, while panels (e) to (h) show the histograms of the corresponding panels on the left. When the rotor of the current meter stalls, the speed has been replaced with the stall speed of 1.1 cm/s in these figures. It is seen that the rotors are stalled for as much as one quarter of the time. The histogram of the directions shows that the flow is roughly to the north at mooring M3 and to the south at mooring M9.

Acknowledgments

The entire *Franklin* crew is thanked for their excellent support and cooperation throughout the cruise.

Franklin cruise 8/96

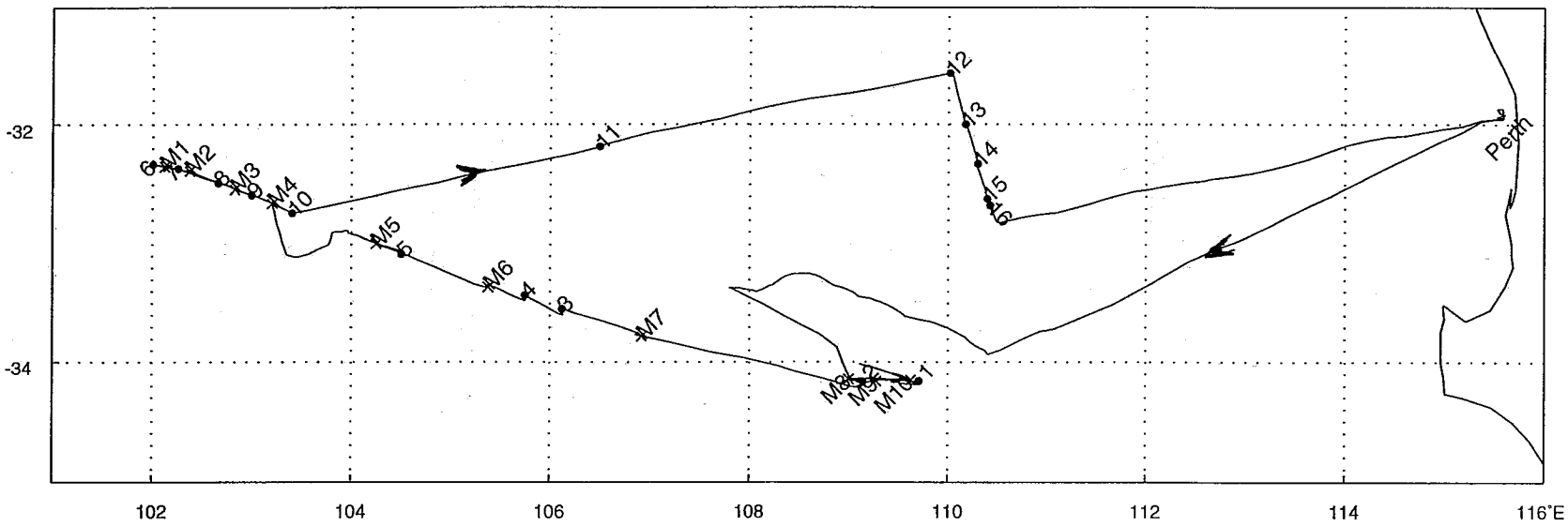

Figure 1.

M3, 4000m

M3 , 4000m

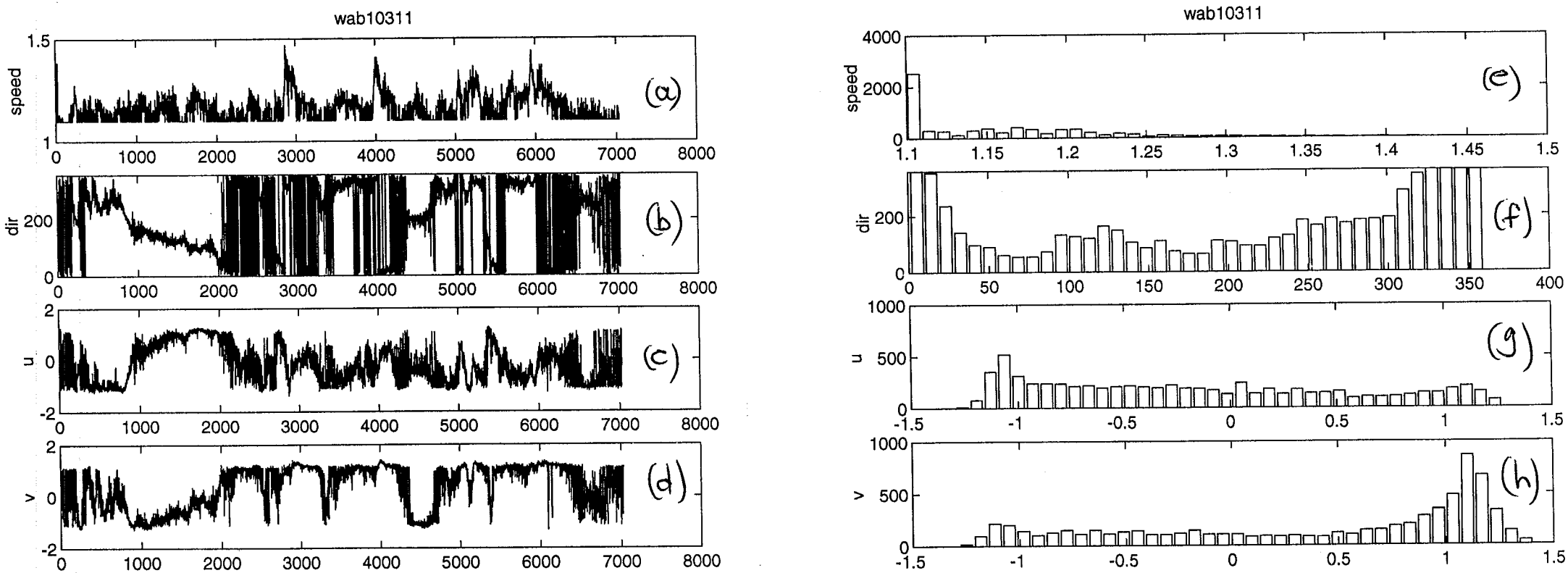

Figure 2

M9, 4000m

M9, 4000m

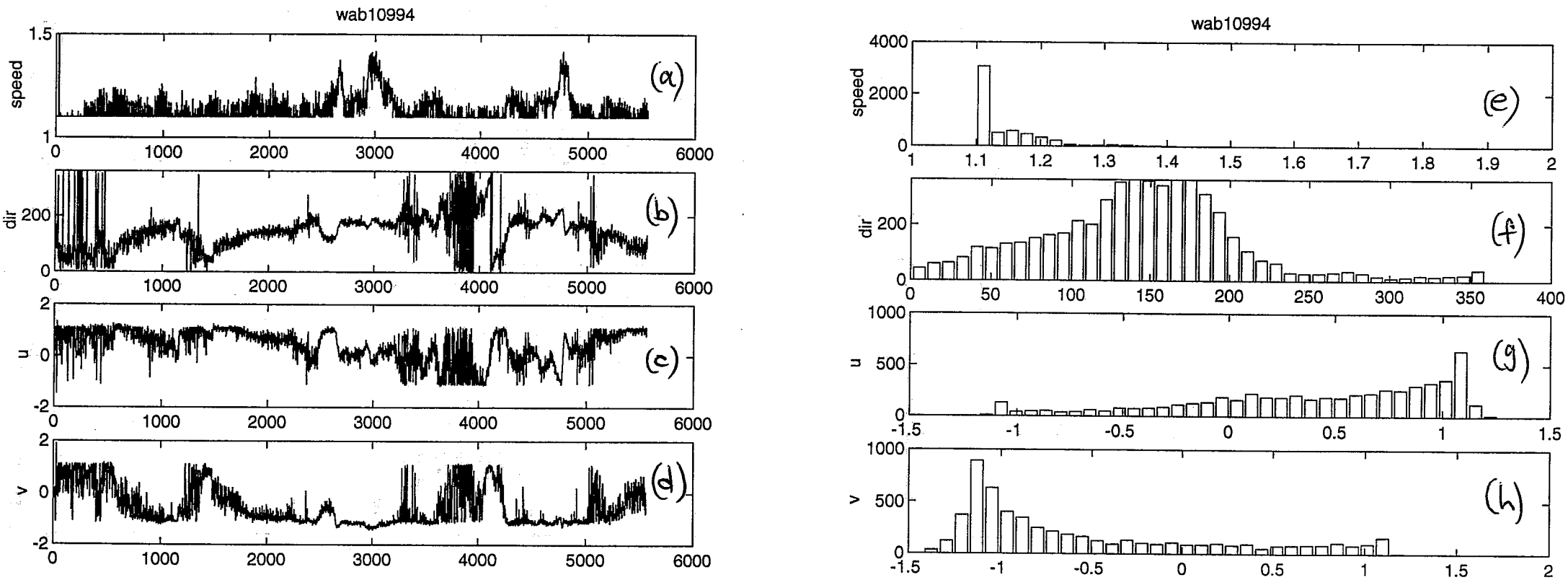

Figure 3