

WFP Ref. No.: PR11/PR13N  
Updated: August 18, 1991

Location:

Ship name: R/V Franklin  
Cruise No.: Fr 2/90  
Dates: PR13N

Dep Hobart: Feb 26, 1990  
Arr Brisbane: Mar 19, 1990  
PR11  
Dep Brisbane: Mar 20, 1990  
Arr Newcastle: Apr 7, 1990

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Scientific Objectives

1. To estimate the volume transport (and its time variability) of the EAC along the east Australian coast and in the Tasman Front using CTD, ADCP and current meter moorings.
2. To determine the large-scale general circulation of the Tasman Sea using patterns of tracers (temperature, salinity, oxygen and nutrients) and of density to estimate geostrophic circulation.
3. To determine temporal changes in surface pressure gradient between two points on the Lord Howe Rise, one at 28 S and the other at 38 S using two independent methods (steric height estimate and GEOSAT altimetry).

Cruise narrative

The first CTD station was commenced at 1730 and then we proceeded east along 43 15'S (WOCE section PR13N).

Duplicate samples were taken at depth to test for bottle leaks and two nutrient samples were taken from each bottle (one filtered and one unfiltered) to try and determine the cause of the variability in the nutrient concentrations observed on Fr10/89. Some samples were also analyzed without freezing.

The CTD wire snagged on a protruding screw at 4,800m on one station and a single strand was broken. After this, 3 CTD stations were not taken right to the bottom. The 43 15'S section was completed on Monday, March 5.

The section north from Cape Reinga was commenced on March 8. This section was finished and the 28 15'S section commenced on Sunday, March 11. This section was finished at Evans Head on Sunday, March 18 and then we steamed to Brisbane. These two sections are WOCE section PR11.

Mostly good weather was experienced during this leg except about a day was lost because of bad weather associated with ex-cyclone Hilda.

Franklin left Brisbane at 0910 and after letting off the pilot steamed south to the first mooring. A southerly wind slowed our progress but overnight the wind eased and the swell moderated. The first mooring was on deck at 1100 March 21. The top current meter was full of water and there was a G-clamp missing. The second mooring was on deck by 1530 and the third 1930. We then steamed west to the coast doing an ADCP section overnight before starting mooring work again tomorrow morning.

On Thursday morning, March 22, mooring recoveries went well. The spindle on the top current meter on the 500 m mooring was broken so we lost that current meter and the near-surface flotation. The 40 m isobath mooring was north of its correct position but was recovered. The 60 m isobath mooring was not responding. A fisherman suggested he had caught it and dragged it 3 miles south. We then instigated a search pattern to be completed during the night. The overnight search for the missing mooring was not successful so we went back to where the fisherman thought it was and fired the release. We then searched unsuccessfully for 1.5 hours and we were on the way back to the mooring site to try firing it again when the mooring was spotted on the surface and was recovered by 0830. It must have been in the position where it was originally deployed.

We then steamed north to Fraser Island and started the CTD section towards the southeast. A strong southeasterly meant that in between stations we were steaming at between 4 and 8 knots for several days. During this time we rearranged some of the locations of the CTD stations to try and save time. Eventually on March 28 the wind decreased and for the remainder of the cruise we had good weather.

The first dynamic height mooring was recovered on the morning of March 29. We then continued south completing CTD stations. The second dynamic height mooring was recovered on April 1. We then completed the few remaining stations on the Lord Howe Rise section before starting the final CTD section westward towards Newcastle. On the first station of this section we had problems with the CTD wire spooling. Because of the time lost in the early part of the cruise, this section was done along 36 S to 157 E and thence to Newcastle, with coarser sampling than originally planned. We completed this section on Saturday 7 and then steamed to Newcastle.

The most serious problem experienced on cruise Fr10/89 was the variability of the deep nutrient data. During Fr2/90, duplicate and triplicate samples were taken and 2 bottles were fired at a number of depths but no anomalies were found. The possibility that the tubes for the nutrient samples were overfilled was then tested. All tubes that were purposely overfilled produced anomalous values. No difference was found between frozen and unfrozen (i.e. analyzed fresh) samples. The nutrient data all appear to be of high quality.

## Results

A total of 143 CTD stations were completed during Fr 2/90 and 163 during Fr 10/89. Not all of the CTDs were to the bottom because of the damage to the wire at 4750 m. A total of 154 XBTs were dropped. The ADCP operated continuously and appeared to give excellent results.

Some of the uncalibrated CTD data as well as the nutrient and ADCP data were plotted during the cruise. At 28 S, the CTD/ADCP section indicated a strong southward flow of the East Australian Current (EAC). As on Fr10/89, some of this flow appeared to return northward further offshore. An eastward flow was seen on the section north of New Zealand and on the section along the Lord Howe Rise.

On the 43 S section, there was some indication of southward flow,

or at least a southward meander, of the East Australian Current. The signature of the different deep basins (the Tasman Sea, the New Caledonia Basin and the Fiji Basin) is clearly evident in the deep O/S (and O/O2) data.

As on Fr 10/89, the Antarctic Intermediate Water had a considerable variability (and indicated interleaving of different salinity water).

#### CTD Measurements

The CTD used throughout this RV Franklin cruise Fr 2/90 was CSIRO CTD No.1 (A Neil Brown Instrument Systems MkIII B profiler).

#### Salinity Measurements

The water samples salinities were measured with a YeoKal Model 601MkIII Inductive Salinometer that was standardized daily with IAPSO Standard Sea Water.

#### Oxygen Measurements

The method used is a modified Winkler titration. All oxygen values (bottle and CTD) are converted from  $\mu\text{mol/l}$  to  $\mu\text{mol/kg}$  using the salinity and in-situ temperature at the time the Niskin bottle was closed.

#### Nutrient Analyses

Samples are collected in 15 polypropylene tubes and frozen for up to one week before analysis using a Technicon AA2 system.

#### Table: Cruise Participants

Name	Responsibility	Affiliation
Fr2/90 Leg 1	Hobart-Brisbane	26 Feb - 19 Mar 1990
Andrew Forbes	Chief Scientist	CSIRO DO
Dave Vaudrey	CTD/Hydrology	CSIRO DO
Tony Worby	XBT's	CSIRO DO
Ken Suber	Computing	CSIRO DO
Ron Plaschke	Nutrients/Salts/DO's	CSIRO DO
Gary Critchley	Nutrients/Salts/DO's	CSIRO DO
Erik Madsen	Electronics	CSIRO DO
Rosemary Morrow	Watch Stander	OSI, Uni Sydney
John Luick	Watch Stander	OSI, Uni Sydney
Fr 2/90 Leg 2	Brisbane - Newcastle	20 Mar - 7 Apr 1990
John Church	Chief Scientist	CSIRO DO
Neil White	Computing/CTD	CSIRO DO
Dave Edwards	Electronics	CSIRO DO
Ron Plaschke	Nutrients/Salts/DO's	CSIRO DO
Val Latham	Nutrients/Salts/DO's	CSIRO DO
Fred Boland	Moorings/CTD Watch	CSIRO DO
Kevin Miller	Moorings/CTD Watch	CSIRO DO
Bob Edwards	Watch Stander	CSIRO DO
Caroline Langley	Watch Stander	CSIRO DO
Xu Peng	Watch Stander	OSI, Uni Sydney
Kat Warmus	Watch Stander	OSI, Uni Sydney

#### References

Owens, W. Brechner and Robert C. Millard, Jr. "A New Algorithm for CTD Oxygen Calibration" *Journal of Physical Oceanography*, 15, 621-631. 1985