# R.V. FRANKLIN

## NATIONAL FACILITY

## OCEANOGRAPHIC RESEARCH VESSEL

Cruise Summary

R.V. FRANKLIN

FR 01/86

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AUSTRALIA

R.V. FRANKLIN IS OWNED AND OPERATED BY CSIRO

# Cruise Summary

R.V FRANKLIN

FR 01/86

## Scientific Program

Western Equatorial Pacific Ocean Circulation Study (WEPOCS)
Australian Component Part 2 - January and February 1986

## WEPOCS Principal Investigators

Eric Lindstrom, CSIRO Division of Oceanography
Gary Meyers, CSIRO Division of Oceanography
Stuart Godfrey, CSIRO Division of Oceanography
Mizuki Tsuchiya, Scripps Institution of Oceanography
Roger Lukas, University of Hawaii
Eric Firing, University of Hawaii

## Cruise Schedule

Depart Cairns........................................................1800 7 January 1986
Arrive Moen, Truk Islands....................................1600 26 January 1986
Depart Moen, Truk Islands....................................0700 28 January 1986
Arrive Cairns........................................................1100 13 February 1986

## Scientific Party (all from CSIRO Division of Oceanography unless noted)

Eric Lindstrom (Chief Scientist)
Fred Boland
Kevin Miller
Daniel McLaughlan
Jan Peterson
Eric Firing (Univ. of Hawaii)

Gary Meyers
Bruce Barker
Ron Plaschke
Bob Beattie
Ken Suber
Eric Madsen

## Cruise Objectives

1) To complete CTD sections along the cruise track for the purpose of geostrophic velocity computation and water mass analysis.

2) To recover three current meter moorings used for direct velocity measurement over a six month period in Vitiaz Strait, St, George's Channel, and in the Equatorial Undercurrent at 150$^{o}$E.

3) To obtain surface to bottom velocity profiles at seven sites within 2$^{o}$ of the equator along 150$^{o}$E using the Pegasus profiling system.

4) To obtain acoustic doppler current profiler sections along the cruise track for the purpose of determining relative and absolute flow patterns in the upper 400m.

**Cruise Narrative** (see Fig. 1 for cruise track)

FRANKLIN departed Cairns at 1800 on 7 January 1986, some eight hours behind schedule. Delay was caused by unsuitable tidal and wind conditions at the scheduled time. We proceeded northwestward across the Coral Sea enroute to Vitiaz Strait. A trial CTD station was occupied 24 hours out of Cairns in 4500m of water. Another 24 hours steaming was required to reach Jomard Entrance in the Louisiade Archipelago. Several XBTs were dropped as we approached the entrance. Proceeding northeastward into the Solomon Sea, a sounding run was completed across a seamount east of Normanby Island (work requested for next cruise).

Major work of the cruise began with a longitudinal CTD section into Vitiaz Strait that was started off the northern tip of Kiriwina Island. Upon reaching the narrowest portion of the Strait a transverse section was completed before proceeding northwestward to Long Island with the continuation of the longitudinal CTD section.

Franklin turned to the northeast upon completing this section and began CTD stations to the bottom every 30nm across the Bismarck Sea from Tolokiwa Island to New Hanover. From New Hanover FRANKLIN turned westward to complete another CTD section to Rambutyo Island. Weather to this point had been very calm but upon proceeding northward around Manus Island enroute to the equator at 143$^{o}$E strong westerlies were encountered.

CTD stations were completed along the equator from 143$^{o}$E to 150$^{o}$E at 30nm intervals. These stations were to 1100m depth except for a deep (4000m) station every 120nm. At 150$^{o}$E the equatorial surface mooring was sighted. It was used as a radar target for Doppler profiling and CTD work over the subsequent 24 hour period. During this period CTD stations to 400m were completed every hour in order to study the evolution of water structure over a tidal cycle.

Proceeding south from the equator to 1$^{o}$S of 150$^{o}$E we located the first Pegasus Velocity profiling site and began our northward trek along 150$^{o}$E doing Pegasus velocity profiling and CTD stations. Along this section CTD stations alternated between 1100m and 4000m casts. The Pegasus profiling was finished at 2$^{o}$N and CTD stations at 5$^{o}$N. From here FRANKLIN proceeded to Truk for a port call.

We arrived in Truk on Sunday afternoon, 26 January. The scheduled arrival on 27 January had been moved forward in order to allow time for repairs to the seawater cooling system which had sprung a few leaks. Time was needed to obtain fibre glass materials and let the repairs cure. This project, along with bunkering and provisioning was completed for a departure on Wednesday morning, 29 January.

From Truk we proceeded back to 150$^{o}$E at 5$^{o}$N to begin our run down this longitude for a repeat of the Pegasus profiling. We launched XBTs enroute. As the seven Pegasus sites from 2°N to 1°S were completed in succession we also launched XBTs and did 1100m CTD stations at each site. Also, at the equator, the Surface mooring was recovered. The details of this recovery are contained in the attached report by the mooring group.

From the southernmost Pegasus site we continued the 150°E CTD section south to New Hanover. FRANKLIN then proceeded back into the Bismarck Sea to begin a CTD section down the west coast of New Ireland to St. Georges Channel.

In St. Georges Channel several station in a tranverse section were completed before we proceeded at first light to the Eastern shores of Duke of York Island to recover a current meter mooring. This was successfully recovered and the CTD transverse section completed before nightfall. The next 24 hours were spent making 4 round trips across the Channel collecting repeated ADCP sections for analysis of tidal fluctuations. The CTD section along the west coast of New Ireland was then completed and we carried out stations down the center of St. Georges Channel into the Solomon Sea.

FRANKLIN turned westward on the south side of St. Georges Channel and proceeded toward the New Britain coast at Linden Harbour. At Linden Harbour we turned due south for a 30nm run dropping XBTs at 15 minute intervals. Upon completion of this detailed coastal section we again turned westward and north for our second visit to Vitiaz St.

At Vitiaz Strait our last current meter mooring was recovered successfully and we occupied a 24 hour ADCP section by steaming back and forth across the Strait (3 round trips) between Chissi Pt. and Higgins Pt. This completed the last of the major operational objectives of the cruise and we turned for Cairns, proceeding once again via Jomard Entrance. Enroute we completed another sounding run over a seamount in the Woodlark Basin, tested the new pinger on both the hydro wire and towing winch, and completed an XBT section from Vitiaz St. to Grafton Passage.

FRANKLIN berthed at the NQEA wharf, Cairns, at 1100 on the 13th of February.

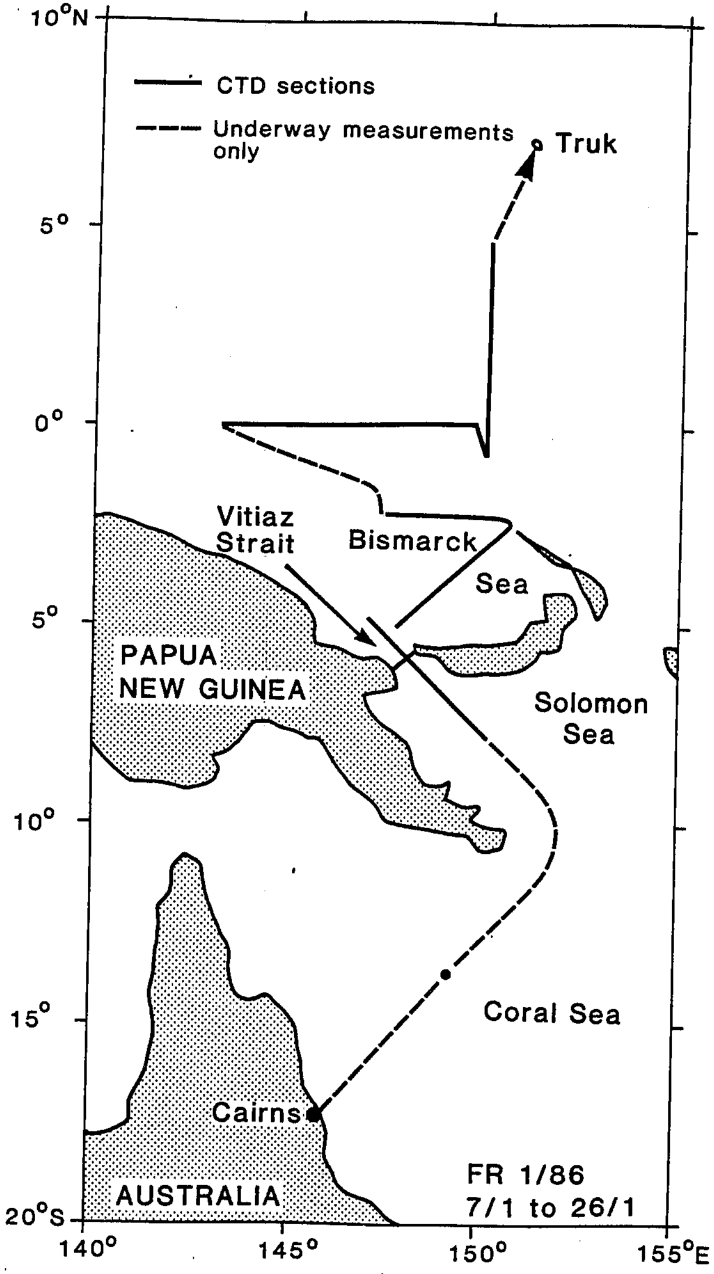



Figure 1a

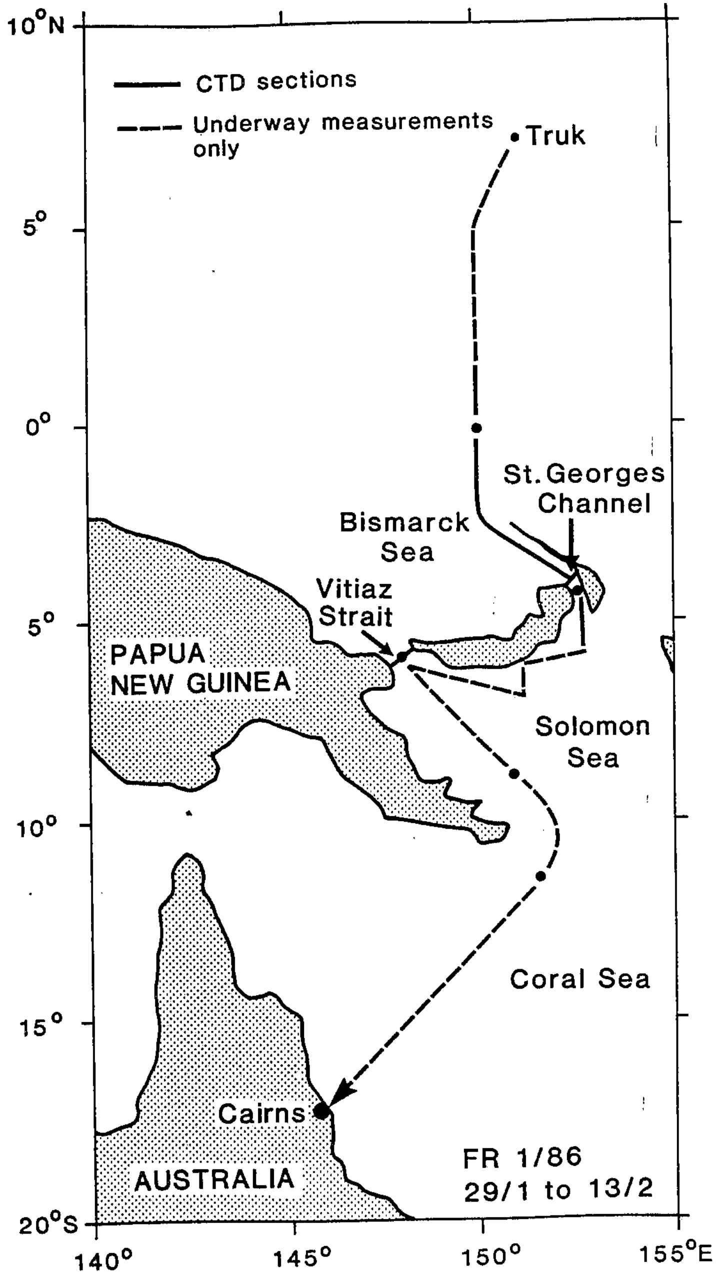



Figure 1b

## Summary of Data Aquired

1) 112 CTD Stations

2) 114 XBT Profiles

3) 1086 water samples for analysis of dissolved oxygen, phosphate, total nitrate, and silicate concentrations.

4) 789 hours of meteorological data logged.

5) ~600 hours of thermosalinigraph data logged.

6) ~500 hours of acoustic doppler current profiler data logged.

7) 12 current meters recovered.

8) 14 Pegasus profiles (2 each at 7 sites).

## Report on Scientific Equipment

1) Conductivity-Temperature-Depth Profiler (CTD)
CTD unit two was used during the entire cruise. A couple of major problems with this unit were overcome during the cruise. First, an intermittant fault with the 6 volt regulator occurred, leading to the units demise at station 23. As the same problem had occured previously on CTD unit one repair was initiated in similar fashion. Second, a problem with intermittant signal loss on upcasts was encountered. Cleaning of connectors did not clear up the problem and eventually the cabling and connectors from CTD unit one were used as replacements. As the problem only occured on upcasts it may be that the plugs and sockets of the that particular harness do not decompress at the same rate leading do occasional seawater intervention.

2) Acoustic Doppler Current Profiler (ADCP)
The instrument was not operational when FRANKLIN left Cairns. The problem was finally isolated in a broken cable on the SDC card as well as a cut ribbon cable connecting the DRV 11 and SDC. These problems overcome, the ADCP worked well for the entire voyage. An attempt was made to install new ROMs delivered to FRANKLIN in Truk but these were found to be faulty and the old equipment was reinstalled.

3) Thermosalinigraph
The salinity sensor was cleaned at the beginning of the cruise and this led to a marked improvement in the analog trace on the chart recorder. The extra pump and associated plumbing that were installed to ensure continued water supply to the sensors did not work. The instrument has to be turned off in head seas of moderate magnitude.

4) Satellite Navigation
The Intech system worked well during most of the voyage but played up during the last week. The problems were however mostly cosmetic. First, the waypoint alarm which has not worked since installation of the unit came on and refused to be silent. Remedial action taken during the voyage was to tape up the noisemaker... Second, the screen display exhibited waviness.

5) Meteorological Station
Considerable developmental work on the entire meteorological system occurred during the cruise. A full report on progress with these instruments is included as an appendix to this document.

6) Expendable Bathythermograph (XBT)
This system worked well during most of the voyage. Early on there were several instances of the HP-85 system rejecting blank tapes as unacceptable, however this problem ended with the opening of a fresh box of tapes. Both the stern and hand launchers were used during the cruise. The success rate was in excess of 90% and could have been further improved if all fishing lines are brought in before XBT launch.

7) Echo Sounder
The digital display of depth on the control panel of the sounder gave some problems. It displayed zero digits as blanks for most of the cruise. Also the quality of the trace seemed to vary from nearly no trace to black paper without human intervention. When faint the trace could sometimes be restored by temporarily deselecting transducer two.

8) Autoanalyzer
On the hardware side, the autoanalyser performed well during the cruise apart from the nitrate colourimeter which developed a case of baseline "hiccups". It was replaced with a spare (unused) colourimeter. On the analytical side, difficulty was experienced preparing reliable cadmium reduction columns. Despite increasing sample dilutions, the columns continued to exhibit decreasing reduction efficiency when running high nitrate samples from deep ocean waters. Better performance was obtained by replating columns *in situ* with 0.3% copper sulfate solution, storing columns under buffer at 4°C, and priming the columns with stronger buffer. Unfortunately no perfect solution to the decreased reduction efficiency problem was found and occasionally it was necessary to run frequent nitrate standards in order to correct sample peak heights for calibration changes by linear interpolation.

9) Inductive Salinometer
Salinometer number 002 was used for the entire cruise. This instrument performed well on temperature compensation 48 but dramatically changed standardization value, stability, and ease of zeroing on temperature compensation 49.

10) Computer network - See Appendix 1.

# APPENDIX 1

## COMPUTING REPORT (R D BEATTIE)

### 1.1 General

The major effort on this cruise was to make the software more crash proof and easy to use and to provide sufficient documentation for relatively inexperienced users to recognise and rectify most problems that they are likely to encounter.

I feel we have made considerable progress. No major problems were experienced and operations ran very smoothly. A new, more flexible and robust, version of the tape archiving program MTSPOL is required. Once this is written, logging of the 'Continuously' recorded data (Met, Nav, TSG etc), should be able to proceed with little operator intervention or risk of data loss.

### 1.2 The Tape Archiving Program MTSPOL

No changes were made to this program, but the interface subroutines used by programs interacting with MTSPOL were modified to enable them to re-establish the link if MTSPOL has been aborted and then restarted. The revised routines were incorporated into the NAV and thermosalinograph logging programs.

The 'prototype' program for interfacing to MTSPOL was modified to enable it to be used for manual transmission of file names to MTSPOL.

MTSPOL needs to be extensively revised to provide greater flexibility for transfers of files to the VAX, to stop files being lost in the event of a tape or VAX shutdown and to make it possible for unskilled operators to change data tapes.

### 1.3 Navigation Programs

The Mark 2 navigation programs were installed and have performed faultlessly apart from one occasion when the program 'locked up' and one minor program bug.

The back interpolated DRP postions were calculated successfully and most files were copied to tape and the VAX.

Several redundant debug printouts were eliminated and minor changes made to NAV to permit a more efficient overlay structure. The NAV restart code and the back interpolation program IRD were modified to place all DECNET functions into IRD and to fix a potential restart problem.

## 1.4 Timing

The new timing programs were installed successfully. All Micros on the network now use the calendar clock on the CTD micro to automatically set their time when they are powered up. They also use the calendar clock to reset their time at regular intervals. This, in combination with the previously installed 50Hz reference cards, gave us accurate and consistent times on all micros.

## 1.5 Thermosalinograph Programs

The programs worked well once some initial problems were sorted out. A number of enhancements incorporated into the software to eliminate potential problems.

## 1.6 CTD Programs

The CTD programs, and CLEAN in particular performed very well. Inexperienced users had no difficulty running the package. Improvements were made to CTD, RTD and OPT to provide better inter-task synchronization and to remove unnecessary operator interaction.

## 1.7 Meteorological Logging Programs

A number of changes had to be made to these programs to accommodate the new files produced by the Mark 2 NAV programs. It was decided not to interface the MET programs to the DECNET tape archiving program MTSPOL until this program had been re-written.

Jan Peterson made a number of developments to this software. These are reported elsewhere.

## 1.8 Doppler Profiler

The GPIB interface software now works and all routines performing doppler I/O have been modified to use the GPIB. It was not possible to fully test operation with the GPIB as this would have required a major re-write of the Menu section of the logging program (in order to reduce its memory requirements). It was decided that this would be better done in Hobart.

Ken Suber incorporated an optional real-time graphics display in the logging program.

## 1.9 XBT Program

No progress was made in getting Richard Harris' XBT programs operational. All XBTs were logged using the existing HP85 software.

## 1.10 Documentation

The general comment was made that more diagrams, showing data flow and the interrelationships between programs, are required. The status of the individual manuals is as follows:

1. ORV Cookbook
Extensive revisions and additions were made to the cookbook in response to problems experienced during the cruise and to suggestions from users.

2. Doppler Profiler Manual
No significant changes were made to Len's FR06/86 edition.

3. Meteorological Programs
Jan's documentation of these programs is now essentially complete.

4. Hydro Programs
No changes were made to the existing documentation prepared by Dave Crooks. Documentation of the program internals and the data file structure needs to be added.

5. CTD Program Manual
Some updating of this manual is required so that it reflects current operating procedures. More documentation of the program internals, particularly the master file and inter-program message structures, is required.

6. Navigation Program
A preliminary manual is now available

7. Thermosalinograph programs
No documentation apart from what is in the ORV Cookbook.

8. Tape Spooling program MTSPOL
No documentation will be prepared until the Mk2 MTSPOL has been designed and written.

## 1.11 Hardware

### 1.11.1 VAX -

The VAX was shut down on several occasions when airconditioning problems actuated the over-temperature cutout (installed after FR06/85). Where possible, TSG and NAV files that would have been automatically copied to the VAX if the VAX had been running, were later manually copied over, but this was not possible when I was not on watch.

### 1.11.2 Micro PDP 11's -

It is apparent that there is an inherent design problem in the micro's RS232 interface hardware and/or the RSX terminal driver software, that allows interrupts to be 'lost'. The interface effectively 'hangs up' as any subsequent characters sent to the interface cannot generate interrupts as the character from the 'lost' interrupt must be 'read' in order to clear the interface for further interrupts, but it never is.

The problem occurred on a number of occasions, and affected the CTD, NAV and MET logging programs.

## APPENDIX 2

## REPORT ON METEOROLOGICAL STATION (JAN PETERSON)

### A. INTRODUCTION

Work on the meteorological station involved a) development and documentation of software for data logging and display, and b) testing reliability of sensors (wind speed and direction, air temperature, relative humidity, pressure, and solar radiation (two sensors)).

In summary, software development is virtually completed, and documentation is available in two versions: a shorter version in the "ORV Computing Cookbook" and a complete version entitled: "ORV FRANKLIN METEOROLOGICAL DATA LOGGING".

The wind speed, wind direction and air temperature are giving reliable data. The relative humidity sensor gives data with accuracy of 3% or better, if it is cleaned and calibrated frequently. The radiation sensors require further calibration, although during daytime the analog recordings give qualitatively reasonable results considering cloud cover.

### B. SOFTWARE AND DATA LOGGING

Priorities for software development and documentation for FR 1-86 were to:

- incorporate output from the recently-installed integrating pyranometer into the data logging and display programs;

- improve the method of permanent file archiving to ensure that only one file per hour is created and that multiple aborts during any hour would not result in any loss of valid data;

- rework the display to: a) zero long-term averages when a significant amount of data is missing; b) include integrated radiation and long-term averages; c) cosmetically improve the display with instructions to facilitate error recovery and restarting;

- write a complete (to date) operating and programming manual for the met logging system;

- write printing and plotting programs for the hourly met data which can be run on the on-board VAX;

- test and verify that data are being sampled, corrected, averaged, and archived correctly.

With the exception of an automatic backup, all of the above were accomplished. This permanent archiving routine is presently under development.

Two further modifications to the met software have now been suggested:

- create a link between the met and thermosalinograph systems for the purpose of acquiring SST in real time to record within the met data files, and

- incorporate code to archive permanent data files to tape each hour rather than at cruise end.

In addition, the logging program (LOGMET.FTN) is nearing its memory limits. If either of the above two modifications are added it will probably be necessary to break LOGMET into overlays.

789 hours of meteorological data were collected during FR 1-86. The last 100 hours also include radiation data.

## C.SENSORS AND CALIBRATION

Wind speed and direction

The sensors were checked by comparison to ships speed and direction during periods of nearly dead-calm wind. This test suggests that wind speeds are being measured to an accuracy of $^{+/}_{-}$1-2 knots and direction to $^{+/}_{-}3^{o}$. When the FRANKLIN was tied up in Hobart, the wind speed sensor was calibrated against a standard used by the Bureau of Meteorology (Fig. 2a). Maximum deviations from the linear correction curve are no greater than .2 knots. The displayed and logged wind speed has been corrected according to the curve in in Fig. 2a. Under higher sea state conditions the cup anemometer may be expected to have a bias for high readings due to the ship's pitch and roll.

Air temperature and humidity

The instruments used as calibration standards were an Asman psychrometer (wet- and dry-bulb thermometers aspirated by a spring-driven fan) and an AMR digital psychrometer (wet and dry thermistors aspirated by an electronic fan).

Air temperature measured by the FRANKLIN's met station was found to be highly reliable (no detectable error) when compared to air temperature measured by the AMR digital psychrometer, during nighttimeto avoid contamination by direct radiation. Average values for 30-minute periods show nil differences (Fig. 2b). The larger differences on the order of $^{+/}_{-}0.1^{o}$ C using the Asman psychrometer as a standard are due to errors in reading the Asman thermometer by flashlight. Differences between air temperatures measured during daytime were larger, due to radiation effects, in spite of radiation shielding on both the FRANKLIN and the Asman thermometers. Values (30-minute averages) measured with the FRANKLIN's met station ranged from 0.4$^{o}$C cooler to 0.7$^{o}$C warmer than the Asman.

Humidity (30-minute averages) measured by the FRANKLIN's met station were compared to simultaneous measurements by the Asman and AMR psychrometers, collected during the period 12-18 January. Scatter diagrams showed that the FRANKLIN's measurement was biased high. After adjustment for the bias, no significant correlation was found between the FRANKLIN's measurements and the standards.

The FRANKLIN's hygrometer was then cleaned and calibrated, firstly by bathing the hairs in distilled water using a very soft water-coloring brush, and secondly, by following the procedure recommended in the "Installation and Operating Instructions Manual" on page 20. Briefly, the procedure was a) wrap a wet cloth around the wire cage enclosing the hygrometer to clean it of debris (mainly salt), b) use a screw at the bottom of the cage to set the humidity reading to 95%, c) adjust the gain to reproduce the ambient humdidity.

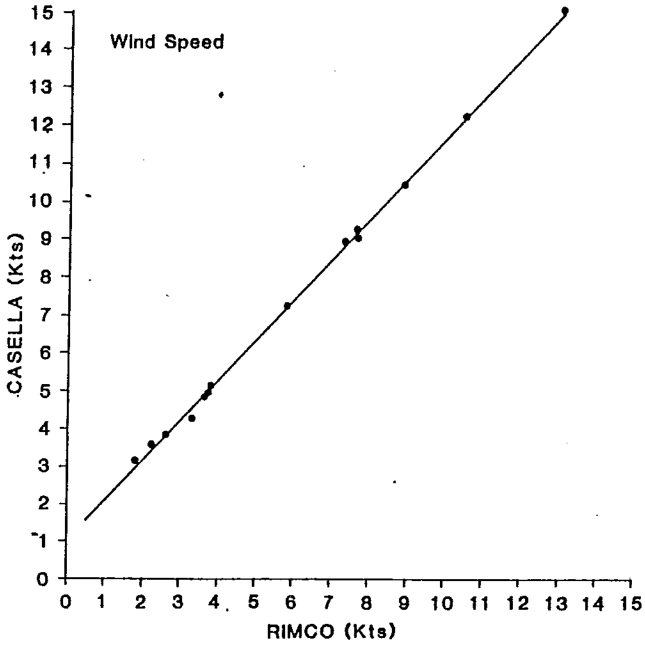



Figure 2a

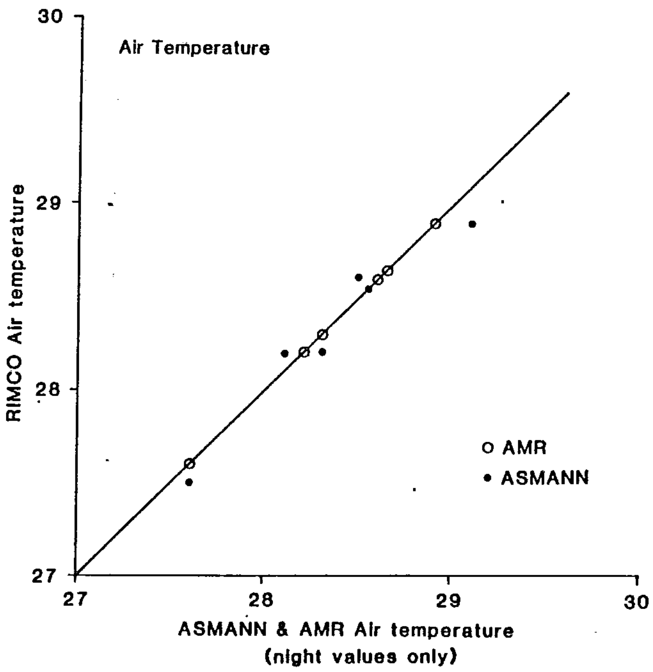



Figure 2b

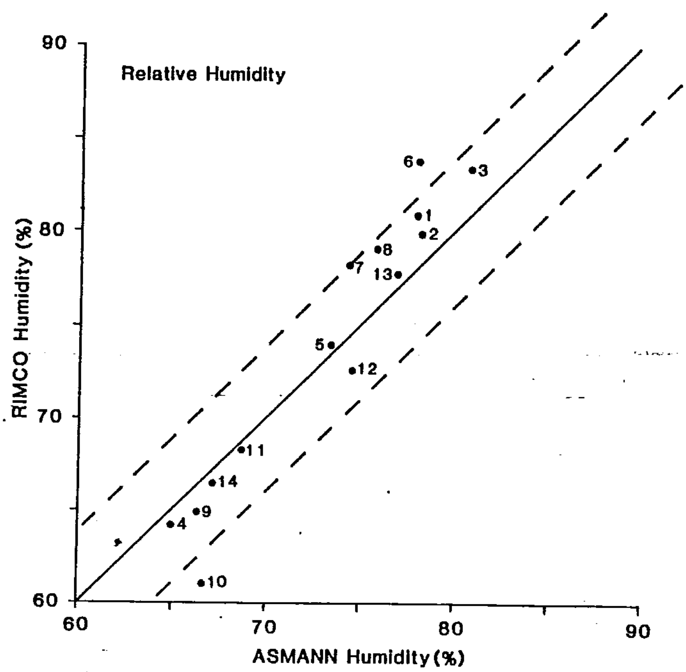



Figure 2c

During 23 January to 11 February, we again measured 30-minute averaged humidity with the FRANKLIN's sensor and the Asman psychrometer on 14 occasions.

These measurements suggest a linear calibration (Fig. 2c) which should be used to correct the recorded data. The apparent correction to the FRANKLIN's measurement should be made in the data logging software on future cruises. Maximum deviations from the line suggest a measurement accuracy of about 3%.

The AMR digital psychrometer was at first set up on top of the wheel house, but it produced unreliable results during daytime when the sensor mounting is exposed to radiation. A second attempt had it mounted inside the wheel house, and drawing air through a pipe fed by an opening close to the FRANKLIN's hygrometer. This also produced unrealiable results because the inflowing air is cooled by the air-conditioned environment inside the wheel house. Finally, the sensor mounting was placed inside a standard Bureau of Meteorology radiation shield mounted on top of the wheel house. The display unit was mounted inside the wheel house and connected to the sensors by a new lengthened cable. Qualitatively, this produces very reliable results when compared to the ship's wet and dry bulb temperatures.

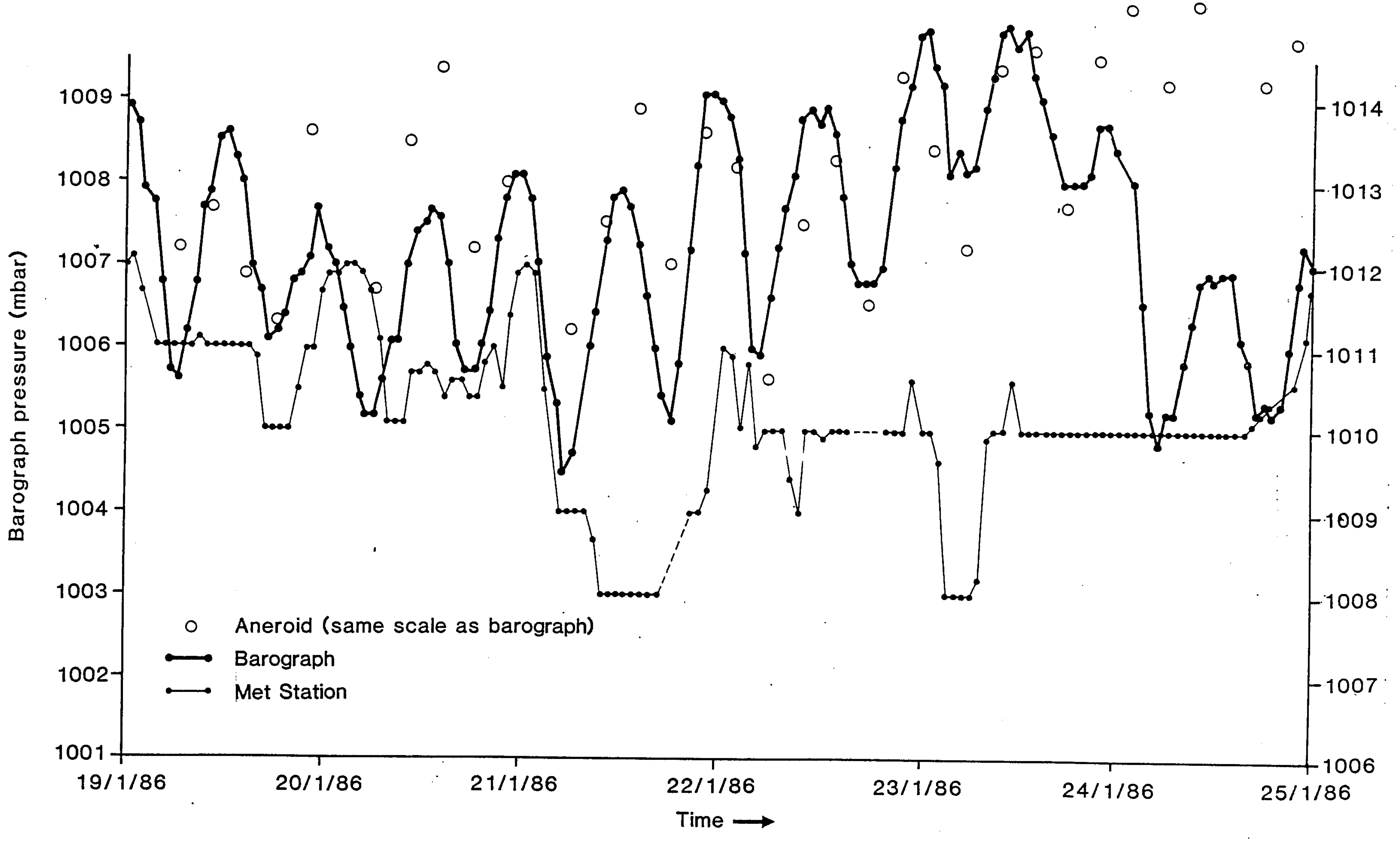
It is necessary to mention that as presently mounted, the FRANKLIN's air temperature and humidity sensors are drastically affected by the ship's superstructure; for example, the temperature rises about $2^{\circ}$ C and humidity drops about 15% when the ship is on station because the superstructure gets hot.

Barometric pressure

Barometric pressure from the met station's aneroid barometer was averaged over each hour for 22 days and compared with a) barograph records (located on the bridge) which were digitized at one-hour intervals, and b) readings taken every four hours by officers of the FRANKLIN from the aneroid barometer also located on the bridge.

The resulting correlation coefficients are:

| | corr. coeff. | num. samples |
|---|---|---|
| met vs barograph | .26 | 528 |
| met vs aneroid | .12 | 132 |
| aneroid vs barograph | .70 | 132 |



Barograph pressure (mbar)
1009
1008
1007
1006
1005
1004
1003
1002
1001
Met Station pressure (mbar)
1014
1013
1012
1011
1010
1009
1008
1007
1006
Aneroid (same scale as barograph)
Barograph
Met Station
19/1/86
20/1/86
21/1/86
22/1/86
23/1/86
24/1/86
25/1/86
Time


Figure 3

A five-day extract of the plotted time series for the three sources is attached (Fig. 3). Only the FRANKLIN's aneroid barometer readings are corrected to sea level pressure so the scales, although the same, have been shifted in an attempt to emphasize the correlation. It is easily seen that the met station's aneroid barometer appears to be suffering from frequent 'sticking'.

On two occasions the pressure sensor was cleaned and 'exercised' to loosen its moving parts. After each cleaning the pressure readings improved significantly and tracked the barograph record for about six hours before again sticking.

No calibration equation could be established.

## D.RECOMMENDATIONS

1. Move the temperature and humidity sensors to a higher level where contamination by ship's superstructure will be diminished. Note that the location has to be accessible for occasional cleaning and calibration of the sensors.

2. Connect the AMR psychrometer to the Soltec recorder.

3. Replace the present pressure sensor (aneroid barometer) with a solid state (parascientific) sensor.

4. Replace the present humidity sensor (hygrometer) with a solid state (capacitance-type) sensor.

5. At least once per cruise clean and calibrate the humidity sensor. Clean the glass covers on radiation sensors and change dessicant if necessary.

6. Incorporate code to archive permanent data files to tape every hour.

APPENDIX 3

Mooring Group Report (Fred Boland)

Mooring #81 - Equatorial Surface Mooring

On the 31st of January at 1910Z we were 4 miles from the site with the buoy on radar and the light became visible 2 miles closer. At 2035Z we first attempted to fire the releases. Sound receiving conditions on the ship are not good and it took some considerable time to establish contact with the underwater units. We tried for four hours to get the releases to fire withpout success and finally abandon the operation at 0013Z on the 1st of February. At this stage we were reasonably confident that the releases were hearing our signals bu we were unable to decipher their replies.

At 0630Z on the same day we put a boat over the side and attached a line and trailing float to the toroid and then resumed attempts to communicate with the releases. By 1120Z it had become obvious that they weren't going to let go and we stopped operations for the night. Next morning we picked up the line we had attached to the toroid the previous day and towed it upstream. This was a difficult manoeuvre since the surface current was running at 1.5knots. When the strain went off the mooring line we again attempted to fire the releases and again we were unsuccessful. We then let the ship drift down with the current and prepared to lift the mooring. The toroid was winched closer to the ship and the Zodiac to attach the main towing wire to it.

First on board was the toroid at 2315Z and it was disconnected and in its cradle at 2335Z. Next was ACM2 S/n1120 at 2348Z, ACM2 S/N3637-1260 at 0000Z (2/2/86),ACM2 S/N3647-1257 at 0015Z, ACM2 S/N3745-1251 at 0035Z, ACM2 S/N3122-1196 at 0044Z and VACM S/NV0660 at 0105Z. We continued winching until we reached the end of the wire. At this stage the anchors were apparantly still on the bottom (the ship's log was reading about -0.8knts during the whole operation) and we had two options available. First was to steam off and see if the mooring broke or second was to cut the rope and see if the releases would work with considerably less strain on them. We cut the rope just below the wire (670 m from the surface) at 0151Z and sent the releases signals again. No reply was received. The two releases and 34 glass floats were abandoned..

Mooring #80 - St George's Channel

We were on site at 2215Z on the 4 February. At 2225Z the release was enabled but we were unable to get a reply from the transponder. Conditions were calm with good visibility and we had a good position so the release command was sent at 2236Z. The mooring was sighted on the surface at 2246Z and recovery started at 2306Z. RCM5 S/N 7773 was on deck at 2312Z, RCM5 S/N 7154 at 2323Z, RCM5 S/N 7778 at 2336Z and ACR S/N 105602 at 2330Z. The bottom two sets of floats were tangled and so the release was on board before the last current meter. The operation was completed at 2358Z. After recovery we found that ACR 105602 was not transmitting and the pinger battery was flat. Final times for the current meters were #7773 at 0228Z on 05/02/86, #7154 on 05/02/86 and #7778 had a flat battery so no final time was available (the tape is about 50% used).

Mooring #79

Vitiaz Strait. The ship was on station at 0200Z on 8 February. The release was enabled at 0205Z, range 1.06 kms and fired at 0207Z, range 1.08kms. The mooring was sighted at 0216Z and recovery began at 0237Z. The first instrument on deck was RCM5 S/N 7770 at 0245Z (the vane was hanging loose with a screw missing from the top - there were no signs of wear so this probably happened on the way up). Next aboard was RCM5 S/N 7772 at 0254Z, RCM5 S/N 7777 at 0301Z and ACR S/N 401007 at 0322Z. Final record times for the current meters were: #7770 at 1531 on 09/02/86, #7777 at 1531Z on 09/02/86 and #7772 at 1545 on 09/02/86. #7772 battery voltage was too low to operate the A-D converter but enough to turn the tape.

Comments.

1. The radiated acoustic noise from the ship has become a problem. We have had problems interrogating the acoustic releases at a range of more than 2 km even with the shaft disengaged and the thrusters off. While we were trying to talk to the releases on the deep mooring we shut down the main engine and the air-conditioning to improve things but the difference was not marked. Eric Firing had similar problems with Pegasus. The source of the noise is not known. This is going to make the location and recovery of deep sub-surface moorings very difficult. To help with this we plan to build a towed body for the release transducer and to aquire some VHF radio transmitters to locate moorings on the surface.

2. We were lucky to get the equatorial mooring back. The toroid seems to have been hit by a ship. It had at least three leaks and a quantity of water inside. Most of the meteorological sensors were missing and the cap for Argos transmitter was missing.