FRANKLIN

National Facility
Oceanographic Research Vessel

RESEARCH SUMMARY

CRUISE FR 6/91

Sailed Townsville 0900 Friday 12 July 1991
Called Lae 0900 Friday 19 July 1991
Arrived Lae 0800 Saturday 27 July 1991
Sailed Lae 0800 Sunday 28 July 1991
Arrived Townsville 0800 Thusday 1 August 1991

Principal Investigators

Dr Eric Lindstrom - UCAR & CSIRO - Division of Oceanography
Professor Hideo Inaba, Tokai University, Japan
JOINT AUSTRALIA - JAPAN MOORED ARRAY

Dr Eric Lindstrom - UCAR & CSIRO - Division of Oceanography
Dr Stephen Murray, Louisiana State University, USA
NEW GUINEA COASTAL UNDERCURRENT

Drs Ian Barton & Fred Prata - CSIRO Division of Atmospheric Research
VALIDATION OF ERS1 SCANNING RADIOMETER

30 August 1991

FRANKLIN is owned and operated by CSIRO

Cruise Summary FR 6/91

Itinerary

Departed	Townsville	0900	Friday 12 July 1991
Called	Lae, PNG	0900-1100	Friday 19 July 1991
Arrived	Lae, PNG	0800	Saturday 27 July 1991
Departed	Lae, PNG	0800	Sunday 28 July 1991
Arrived	Townsville	0800	Thursday 1 August 1991

Scientific Program

JOINT AUSTRALIA-JAPAN MOORED INSTRUMENT ARRAY (CYCLE 4)
This project commenced in November 1989 and involves maintaining a current meter mooring on the equator at 147°E. The mooring is part of the Tropical Ocean Global Atmosphere (TOGA) moored observing array for observing currents in the equatorial Pacific Ocean. This cruise was the fourth cycle, marking the start of the third CSIRO mooring deployment and the end of the second Tokai University deployment. The project is scheduled to continue until February 1993.

MOORED CURRENT METER ARRAY IN THE NEW GUINEA COASTAL UNDERCURRENT
The principal aim of this experiment is to directly measure the currents in and transport through Vitiaz Strait, Papua New Guinea, over an annual cycle. A line of five moorings are to be deployed across the strait from a US research vessel in August 1991. The primary task of R V Franklin during FR 6/91 was to collect CTD and ADCP data for use in later interpretation of the moored data and to aid in the description of the dynamic of the New Guinea Coastal Undercurrent.

Principal Investigators

JOINT AUSTRALIA-JAPAN MOORED INSTRUMENT ARRAY
Dr. Eric Lindstrom, CSIRO Division of Oceanography; University Corporation for Atmospheric Research, USA
Professor Hideo Inaba, Tokai University, Japan

MOORED CURRENT METER ARRAY IN THE NEW GUINEA COASTAL UNDERCURRENT
Dr. Eric Lindstrom, CSIRO Division of Oceanography; University Corporation for Atmospheric Research, USA
Dr. Stephen Murray, Louisiana State University, USA

Results

JOINT AUSTRALIA-JAPAN MOORED INSTRUMENT ARRAY (CYCLE 4)
The third Australian equatorial mooring in this project was successfully deployed. However, the Japanese mooring that has occupied the same site for the last six months was not recoverable and all that equipment is lost. Twenty seven hours of high quality ADCP data were collected at the mooring site. A Tokai University mooring at 2°N, 147°E was recovered successfully. A CTD section was completed along 147°E, as planned.

MOORED CURRENT METER ARRAY IN THE NEW GUINEA COASTAL UNDERCURRENT

All work planned for Vitiaz Strait was completed. This included three CTD sections across the Strait and one along the axis of the Strait (34 Stations in all). ADCP data was collected along all these lines plus additional transects in Vitiaz Strait, in the Huon Gulf and across the northern reaches of Dampier Strait.

Cruise Narrative

FRANKLIN left Townsville on the morning of 12 July 1991 enroute to Vitiaz Strait, Papua New Guinea via Jomard Entrance. The entire cruise track is shown in Figure 1 and is narrated below.

The first significant operation was a test CTD station conducted in the Solomon Sea. This revealed potential problems with the conductivity sensor, so the spare CTD unit was pressed into service for the remainder of the voyage.

The primary work in Vitiaz Strait was the completion of three cross-strait CTD sections and one along-strait section plus current profiling across all critical passages. The area covered by three days of survey work is shown in Figure 2. This picture shows the near surface current (16 m) observed in Vitiaz Strait determined by use of the Acoustic Doppler Current Profiler (ADCP). Currents greater than 1 m/sec (2 kts) were common and often extended to depths greater than 250 m (the present depth limit of the ADCP). All thirty four CTD stations planned for the Strait were completed and all ADCP transects occupied.

FRANKLIN called in Lae, PNG on the morning of 19 July and was joined by four scientists from Tokai University, Japan. Enroute to the equator for work on current meter moorings we again crossed Vitiaz Strait, to obtain additional ADCP data. At the equator on 147°E on 21 July we were to recover one current meter mooring of Tokai University and deploy a CSIRO mooring in the same spot. Upon reaching the equator the surface buoy of the Tokai mooring was not found. Signals for the acoustic release were heard from the ocean bottom however, and it was assumed that all equipment from the mooring was on the ocean bottom. In order to clear the decks for recovery of the lost equipment at a later time, the CSIRO mooring was successfully deployed 3 miles west of the Tokai mooring. FRANKLIN then proceeded to 2°N 147°E overnight and successfully recovered a Tokai University subsurface ADCP mooring at that site. A CTD section was begun along 147°E from 2°N back to the equator.

The Tokai University mooring on the equator was relocated on the morning of 23 July and numerous attempts were made to fire the acoustic release. Although it appeared to be operating correctly, it remained on the bottom. It appears as if the release has had a mechanical malfunction or the mooring is tangled and the buoyancy is unable raise it off the bottom. While monitoring the situation over a 24 hour period, a time series of ADCP data were collected in the vicinity of the CSIRO mooring for future comparison with the current meter records.

Upon completion of the mooring operations and ADCP time series, the CTD section along 147°E was completed with four CTD stations south of the equator to the northern shore of Manus Island.

Enroute to Lae, FRANKLIN diverted from a direct course so as to complete further ADCP transects related to the study of the New Guinea Coastal Undercurrent through Vitiaz Strait. These sections were across the northern reach of Dampier Strait and across Vitiaz Strait from Tolokiwa Island to Teliata Point, PNG. Also, upstream conditions leading to Vitiaz Strait were further examined with ADCP transects in the Huon Gulf.

FRANKLIN made a second call at Lae on the morning of Saturday July 27. Lindstrom, Inaba, Moriya, Kodama and Usui disembarked. The Japanese mooring gear was off-loaded. FRANKLIN then proceeded to Townsville via China Strait and the inside of the Barrier Reef south of Cooktown.

Summary

The cruise work in and around Vitiaz Strait was very successful. The 24 hour coverage of GPS makes the quality and coverage of ADCP measurements very good. The ship and crew performed admirably in the often windy conditions and strong currents found in Vitiaz Strait.

The mooring work went very smoothly, but the inability to recover the Tokai University mooring at the equator was a scientific blow to that program.

FRANKLIN scientific software systems worked adequately, although many problems were experienced in getting them going at the beginning of the cruise. Startup procedures were complicated, sensitive, and inadequately documented.

Personnel

University Corporation for Atmospheric Research
    Eric Lindstrom

CSIRO Division of Oceanography
Jeff Butt	Jan Peterson
Kevin Miller	Daniel McLaughlan
David Terhell	Phillip Adams

Tokai University
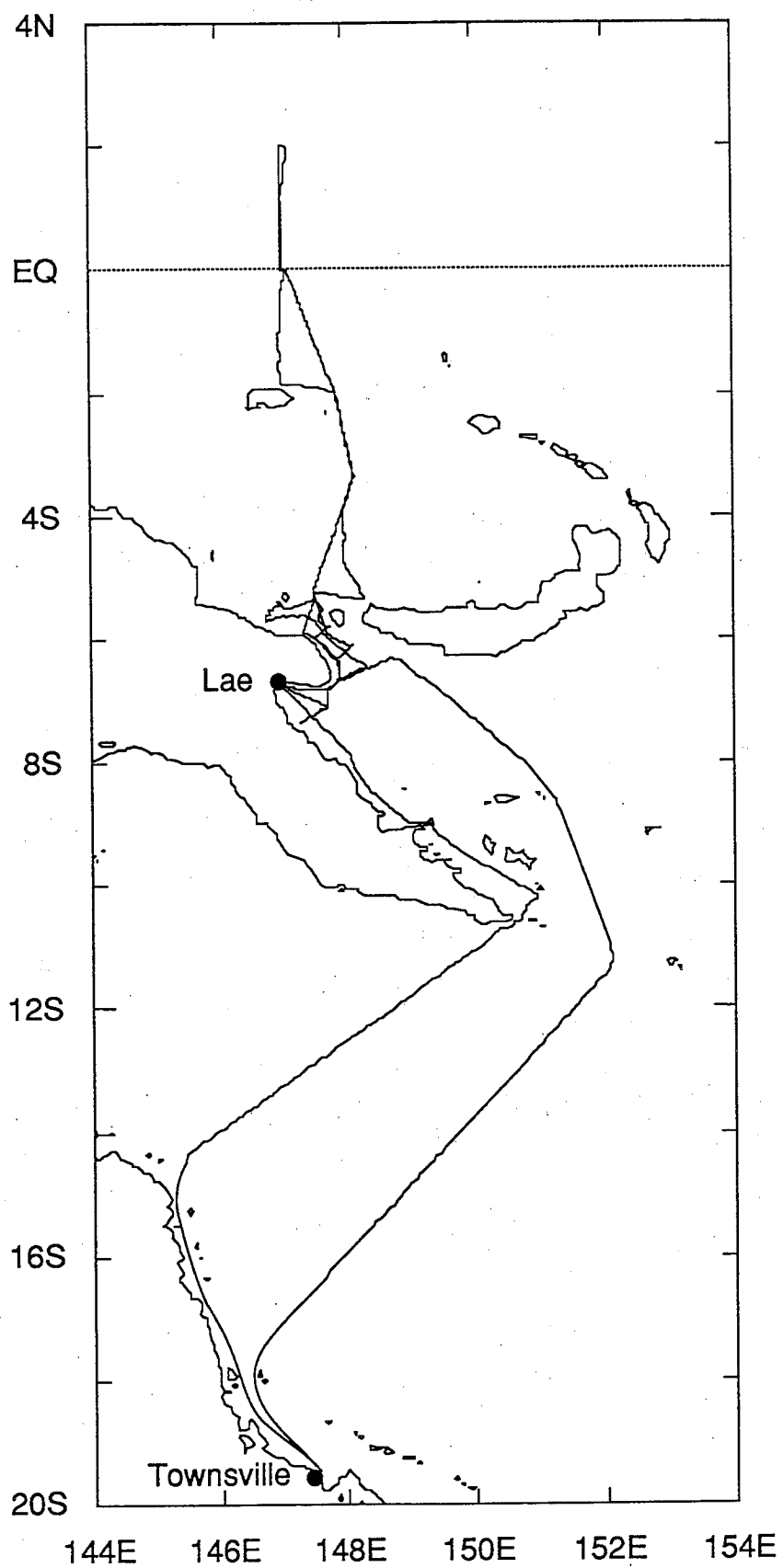|	
Hideo Inaba	Hiroshi Moriya
Ryo Kodama	Masakazu Usui

Figures

1) Cruise track.
2) ADCP vectors at 16m in Vitiaz Strait.

Appendices

1) Computing Report
2) Electronics Report

FR6/91 Cruisetrack

FR0691

G CURRENT VECTORS NEAR 16 METERS
10 MINUTE AVERAGES

.5 M/S ⟶

PRELIMINARY CALIBRATION
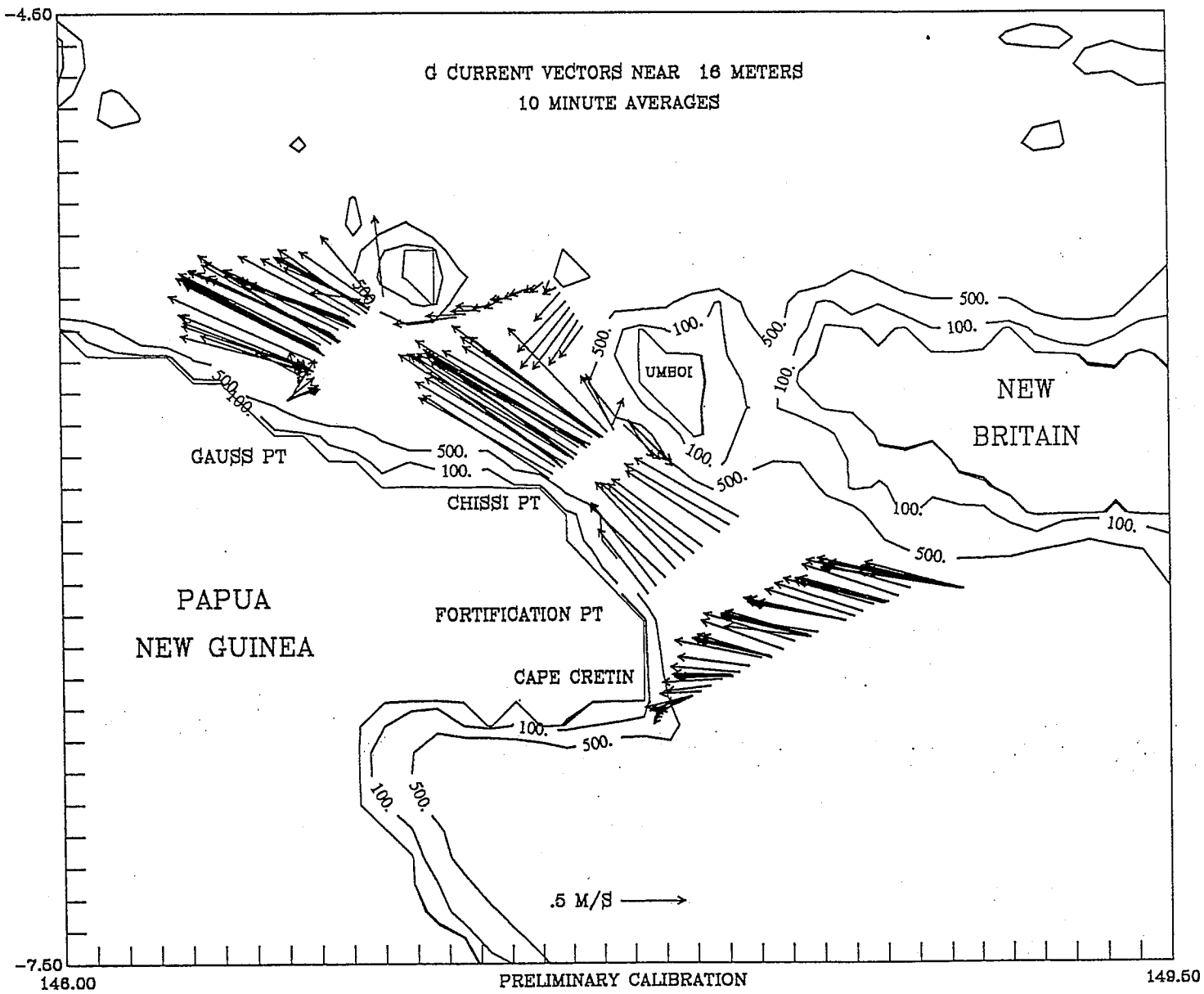
FR6/91 Computing Report

Jeff Butt, Jan Peterson

During the first four days of the cruise many headaches due to both software and hardware problems were encountered. It was not until 0450 (local time) on 16/7 that all was behaving normally.

VAX

At the very start of the cruise and after the Lae stop-over the Vax power supply needed attention. On the first occasion 2 fuses were replaced, on the second occasion a faulty diode was replaced.

The Vax booted with the incorrect time at the start of the cruise, this was reset correctly via the procedure in the Cookbook (p5). Due to air-conditioning failures the Vax had to be taken down now and then and each time (presumably until the clock battery charged) it reverted to its base time (1978). On successive attempts to reset the time (as per the Cookbook p5 procedure) the Vax hung, necessitating a re-boot. In the end we gave up and allowed the Vax to happily think it was in 1978.

The RA80 ceased to operate on 13/7 with a 'spin-up error'. Eventually it was discovered that the belt had fallen off! After replacing it, the unit worked faultlessly for the remainder of the cruise. Whilst the RA80 was inoperational, our attempts at booting the Vax from the userdisk by swapping the drive keys over were unsuccessful. Some guidance from Hobart gave us a few commands to allow the Vax to start from the userdisk, however this didn't have to be put to the test as the RA80 was repaired.

The air conditioner in the Vax room had periods of being unable to cope with the load. Most of the time it was running at above the maximum pressure, which is not good for the unit. With sea temperatures of 30C the Vax room was maintained in the marginal 27-28C temperature range.

Improved software for the Exabyte backup procedure was installed in account EXABACK; this worked fine. Problems were encountered with getting MUA1: mounted; it took 3 or 4 attempts each time tapes were to be backed up. Once mounted successfully all was okay.

The QMS laser printer hangs up whenever more than a single frame job is sent to it. By sending multiple single frame jobs this problem could be avoided.

MICROS

Micro2 was plagued with hardware problems at the start of the cruise. After much juggling of cables and cleaning the backplane it managed to boot successfully.

After some juggling of the power cable and replacement of the Calender Clock circuit board Micro3 was brought to life.

On one occasion Micro1 exhausted its 'free pool'. A reboot fixed this problem.

MTSPOL

A software upgrade (for improved end of cruise cleanup performance) was installed at the start of the cruise. In the following three days there were a lot of problems with MTSPOL. Initially it wasn't writing files to tape, but was sending the data to the Vax and deleting files from the Micros (as a precaution we manually backed up the data files to tape each 12 hours). We removed the new software and reinstated the earlier version. After many restart/stop cycles, re-boots we managed to get it writing files to tape, but then it wasn't sending anything to the Vax. After stopping it, ending the cruise, cleanly shutting down the Vax and then rebooting both the Vax and Micro1 we managed to get it working correctly. Files that didn't get taped during this period were backed up to tape, and were copied over to the Vax into [Crooks.Crudat].

The automatic end of cruise cleanup did not eventuate (despite waiting 12 hours). As a result this process was done manually.

DELP

Delp was basically dead for the first 4 days of the cruise, it refused to operate and only every now and then came to life (usually coinciding with some 'catastrophe'). Eventually we found that by turning the display terminal in the GP lab on everything became normal. The cookbook makes no mention of this terminal being on as being a necessary requirement for Delp to function.

GPS

Coverage was virtually 24 hours per day. This allowed 'real-time' analysis of ADCP data.

ADCP

The ADCP worked well. On one occasion the terminal locked up (without any operator assistance) with a "printer ready" message being displayed at the base of the display. By terminating logging, rebooting Micro7 and turning the ADCP unit off and on all came back to life.

CTD

At the start of the cruise a software update was installed. On one occasion the Micro 6 tape drive chewed a tape, somehow it managed to load the tape with a twist. No data was lost.

XBT

For diagnostic purposes 2 XBT's were dropped, ".XBT" files appeared on the Vax okay.

CRUISE REPORT
R.V.FRANKLIN FR0691
TECHNICIAN P.ADAMS
DATE:1-AUGUST-91

CTD

The CTD cable was re-terminated at the begining of the cruise.
CTD1
On the first cast the oxygen sensor failed and a large salinity
offset occurred at 600m.The salinity offset remained for the rest
of the cast indicating a faulty cell.
During the removal of the cell extensive crevice corrosion was
noticed on the mounting block at the cell o'ring seal.Removal of
the other sensors revealed similar corrosion.The sensor block
was removed,re-surfaced and the conductivity cell mounting hole
enlarged.
The enlarging of the cell mounting hole enabled the new style cell
to be fitted Now both CTD1 and CTD4 have the same type of
conductivity cell(one with a 5.5mm dia socket at the base).
The oxygen sensor was "not" replaced.This will be done prior
to the start of the next cruise.
CTD4
CTD4 was used for the rest of the cruise.

ADCP
The chain on the block and tackle used for lifting the transducer
was badly rusted.It was replaced with new chain from the Bowsun's
store.

VAX

The Vax would not boot from magnetic tape.Two fuses were found
blown.
The system after booting from the magnetic tape was shutting down
as soon as it accessed the hard disk,this was accompanied by a
vibration in the hard disk assembly.The disk drive belt was re
installed.(it had slipped off)
After Lae the vax aux power supply was repeatedly blowing fuses.A
blown diode was replaced and the system performed normally.The
system although working still appears to be drawing too much
current on startup and should be looked at under the maintainence
contract.The diode was not a standard DEC part and should be
replaced.

MICRO3

The Crystal clock was found to be faulty.The intermittent variable
capacitor was replaced,and the board re-installed.

MICRO2

CPU with math's co-processor was installed.
Micro would not communicate with network,re-seating DEQNA board
solved problem.

NAVTRAC GPS

The Navtrac GPS,sent to Quinn's at the end of the previous cruise,
was installed.Quinn's replaced the Eprom's containing the original
software.They suggested keeping the route library to less than 20.

APC IV (Drawing Office)

The existing 720k disk drive(B) was replaced with a 1.4Mb drive.
The ROM was updated to version 3.10.

SIMRAD EK400

A new transducer cable was run from the EK400 (12KHZ TRANSDUCER
No 4) and the moon pool.It has a 3 pin seacon connector on the
the moon pool end,and is to be used with the new low power,wide
beam transducer.
Circuitry was built and installed to inhibit the transmitter
when transducer No 4 is selected.(a copy of the circuit diagram
is attached,plus one copy in the manual)

MISCELLANEOUS

The Op's room air conditioner was continually tripping out.The
fresh water condenser was cleaned and two valves were removed,
the unit functioned well for the rest of the trip.
In tropical climates the air conditioner should be started and the
room cooled,before any electronic equipment is turned on.

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CTD Processing Notes
Fr06/91
D.J. Vaudrey
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General.

        RV Franklin cruise Fr06/91 was a cruise into equitorial waters north of Papua
New Guinea in conjunction with two moored arrays. The first aim was to servive the Joint
Australian-Japan Moored Instrument Array on the Equator at 147¡E. The second aim was to
complete a CTD survey and ADCP measurements in the New Guinea Coastal current in
conjunctin with a USA moored array. Three CTD sections were completed across Vitiaz
Strait and one along the axis of the Strait.
        A total of 44 CTD stations were carried out. CTD#1 was used for the first
station and the conductivity cell failed during the cast. The subsequent Stations were
all carried out with CTD #4. The majority of casts were carried out to 2000 decibars
except where limited by bathymetry. A total of 246 samples where available for
calibrating the Conductivity cell of which 192 were used. Only 6 bottles were collected
on any one cast, thus limiting the samples available. More samples where rejected
automatically due to large ranges in the sample burst data. Many of these where
primarily due to steep gradients in the upper 250 metres of the water column. Station 1,
a bottle test station, was carried out with CTD #1 and not calibrated due to the failure
of the conductivity cell on the down cast. Some density inversions are apparent due to
salinity spiking associated with the steep gradients in both salinity and temperature and
interleaving of water massses through Vitiaz Strait. The Dissolved Oxygen for Stations
14 to 44 exhibited an alarmingly consistent discontinuity at about 450 - 500 decibars
which may preclude reasonable calibration of the data. This discontinuity is indicative
of a pressure related contact failure.

Station List

1.   Not calibrated. Bottle testing cast with CTD #1. Conductivity cell failure.
15.   Density inversion at 328.0 decibars.
16.   Density inversion at 340.0 decibars.
17.   Density inversion at 382.0 decibars.
18.   Density inversion at 304.0 decibars.
20.   Density inversion at 426.0 decibars.
23.   Density inversions at 136.0 decibars and 532.0 decibars.
26.   Density inversion at 576.0 decibars.
27.   Density inversion at 396.0 decibars.
28.   Density inversions at 116 decibars, 204 decibars, 206 decibars, 230 decibars, 308
decibars and 360.0 decibars.
30.   Density inversions at 104.0 decibars, 316 decibars and 470 decibars.
31.   Density inversion at 320.0 decibars.
32.   Density inversion at 290.0 decibars.
33.   Density inversion at 510.0 decibars.
34.   Density inversion at 586.0 decibars and 796.0 decibars.
35.   Density inversion at 490.0 decibars.
38.   Density inversion at 186.0 decibars and 196.0 decibars.

Calibration Information.

        Temperature Coefficients (determined 13/9/91)
                Temperature Bias =1.0000
                Temperature Offset = -0.001oC

        Conductivity (Cell Factors)
                S.D Salinity following calibration = 0.0024 psu
        Offset Term   Cond Term   Stn. Dep. Term
        Stations   2, 10   pres. bounds   0.0 6500.0 ,edit= 2.8
         0.68105563E-01   0.10003216E-02 -.33115708E-07 ,   n = 40
                        std. dev. =   0.23442E-02
```

```
        Stations   11, 20  pres. bounds        0.0  6500.0,  edit=  2.8
        0.68136497E-01  0.10001195E-02  -.92315136E-08 ,   n =    48
std. dev. =       0.13444E-02
        Stations   21, 28  pres. bounds        0.0  6500.0,  edit=  2.8
        0.71217061E-01   0.99964313E-03 0.67887947E-08 , n =    25
std. dev. =       0.24020E-02
        Stations   29, 35  pres. bounds        0.0  6500.0,  edit=  2.8
        0.52708892E-01  0.10004701E-02  -.90283300E-08 ,n =    32
std. dev. =       0.30370E-02
        Stations   36, 44  pres. bounds        0.0  6500.0 edit=  2.8
        0.22338957E-01  0.10017597E-02  -.31670180E-07 , n =    47
std. dev. =       0.28902E-02


        Pressure Offset (Individual Stations)
station 002    offset = -8.20    station 003    offset = -8.30    station 004    offset =
-8.10    station 005    offset = -8.10    station 006    offset = -7.90    station 007
offset = -8.40    station 008    offset = -8.30    station 009    offset = -8.40    station
010    offset = -8.80    station 011    offset = -8.40    station 012    offset = -8.20
station 013    offset = -8.50    station 014    offset = -8.40    station 015    offset =
-8.10    station 016    offset = -8.10    station 017    offset = -8.20    station 018
offset = -8.60    station 019    offset = -8.40    station 020    offset = -8.00    station
021    offset = -8.40    station 022    offset = -7.90    station 023    offset = -7.90
station 024    offset = -8.30    station 025    offset = -8.10    station 026    offset =
-8.20    station 027    offset = -8.20    station 028    offset = -8.20    station 029
offset = -8.70    station 030    offset = -8.50    station 031    offset = -8.10    station
032    offset = -8.10    station 033    offset = -8.00    station 034    offset = -8.00
station 035    offset = -8.10    station 036    offset = -8.20    station 037    offset =
-8.30    station 038    offset = -8.20    station 039    offset = -8.30    station 040
offset = -8.30    station 041    offset = -8.30    station 042    offset = -8.20    station
043    offset = -8.40    station 044    offset = -8.50
```