R.V. FRANKLIN

NATIONAL FACILITY

OCEANOGRAPHIC RESEARCH VESSEL

Research Summary FR07/89

Itinerary

Sailed Sydney Tue 16 May 1989 0700 hrs
Arrived Bluff Sat 20 May 1989 2000 hrs
Sailed Bluff Mon 22 May 1989 1430 hrs
Port-call Bluff Tue 30 May 1989 0830-1030 hrs
Arrived Launceston Sun 4 June 1989 1130 hrs

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Principle Investigators and Scientific Programs

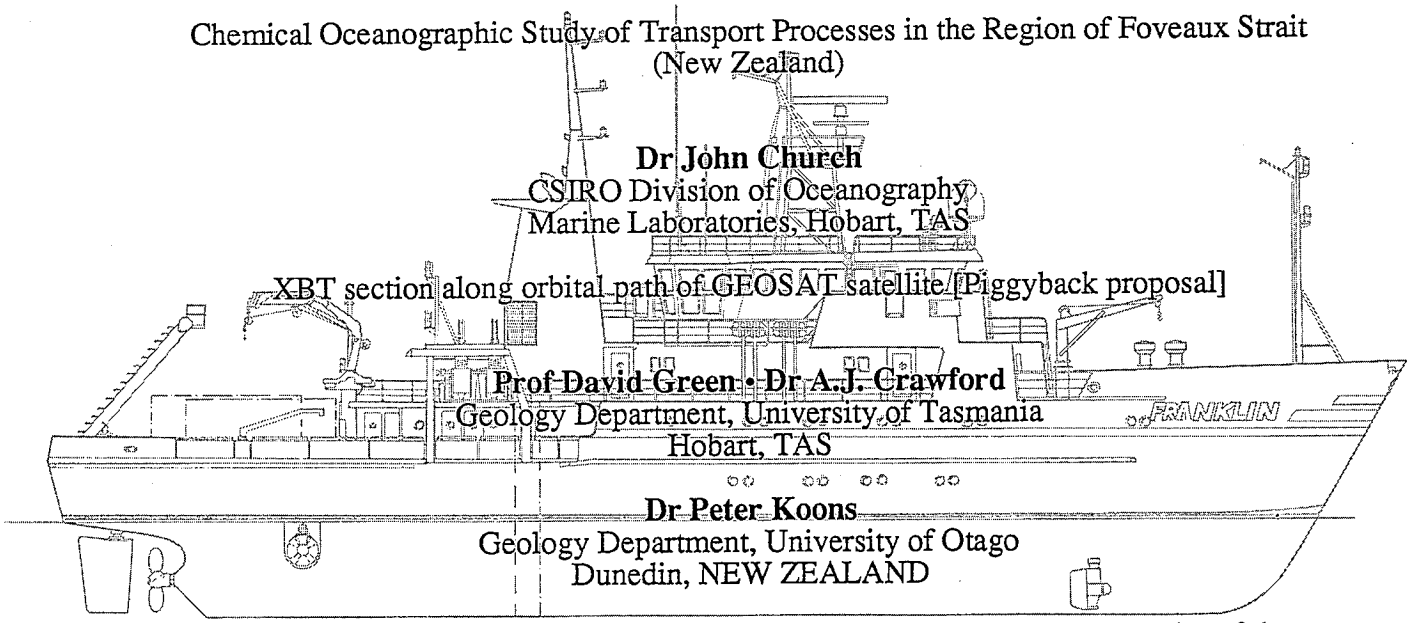
Dr Edward Butler • Dr Denis Mackey • Dr John Volkman
CSIRO Division of Oceanography
Marine Laboratories, Hobart, TAS.

Dr Keith Hunter
Chemistry Department, University of Otago
Dunedin, NEW ZEALAND

Chemical Oceanographic Study of Transport Processes in the Region of Foveaux Strait (New Zealand)

Dr John Church
CSIRO Division of Oceanography
Marine Laboratories, Hobart, TAS

XBT section along orbital path of GEOSAT satellite [Piggyback proposal]



Prof David Green • Dr A.J. Crawford
Geology Department, University of Tasmania
Hobart, TAS

Dr Peter Koons
Geology Department, University of Otago
Dunedin, NEW ZEALAND

Dredging of rock samples from seamount and continental slope in the vicinity of the Snares Islands (New Zealand) [Piggyback proposal]

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For further information contact

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AUSTRALIA

R.V. FRANKLIN IS OWNED AND OPERATED BY CSIRO

Cruise Objectives

- Determine the physical oceanographic features of Foveaux Strait and neighbouring waters with particular reference to the Subtropical Convergence
- Collect water samples for trace element analysis using clean techniques
- Investigate surface pH (and thereby p_{CO_2}) and fluorescence using continuous data logging of underway pH analyser and Turner fluorometer
- Measure vertical profiles of pH using an electrode fitted to CTD unit 1
- Measure vertical profiles of fluorescence and turbidity using Variosens III interfaced to CTD unit 1
- Collect samples of particulate matter at selected stations using Niskin bottles for analysis of lipids, pigments and total CHN.
- Collect water samples for dissolved organic carbon (DOC) and copper complexing measurements
- Take water samples for on-board intercalibration of Turner fluorometer and Variosens III
- Collect sediment samples by grab in selected regions of Foveaux Strait, Doubtful Sound, and other suitable locations
- Undertake an XBT section along orbital path of GEOSAT
- Perform rock dredging in vicinity of Snares Islands, and on nearby seamount

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Results

(I) *Chemical oceanographic studies - Foveaux Strait region (Major project)*

Station time on this cruise amounted to about 76 hours. Although this was less than initially planned, most of the objectives were accomplished.
57 'CTD' stations were done, of which 15 were Kevlar hydro-line casts using Go-Flo bottles triggered by messengers.
The following water samples were collected for subsequent analysis in the laboratory:

105 trace metal samples
(59 from Go-Flo bottles)
(1 surface sample from rubber inflatable boat)
296 samples for dissolved iodine measurement
115 DOC samples
126 copper complexing samples
28 samples were preserved with Lugols solution for electron microscopy

Other sampling or work carried out included:

6 extractions using Sep-Pak cartidges were carried out for later HPLC-AF fractionation of metal-organic compounds

Particulate matter filtered from 84 water samples was preserved for analysis of lipids, pigments and total CHN

A Smith-Macintyre grab was used to obtain sediments in shallow waters. Locations were Doubtful Sound, Foveaux Strait and at other stations on the continental shelf. A total of 12 grab samples were obtained for later organic compound analysis

A spectrophotometric procedure was used on board to analyse and calibrate for chlorophyll in 15 water samples taken from either Niskin bottles or the thermosalinograph line

Continuous measurement of the pH of surface seawaters was successfully performed throughout the duration of the cruise. This data was logged and incorporated with temperature and salinity data from the thermosalinograph. Monitoring of surface-water chlorophyll concentration by Turner Fluorometer was also undertaken, but this data was of uncertain quality (The operation of the Fluorometer will be discussed later in the appendices).

Variosens III provided good quality fluorescence data for all CTD stations of cast depth <800 m. Tubidity was below the limit of measurement for all stations

Surface-water p_{CO_2} measurements were made on an intermittent basis throughout the cruise. Detector stability was good; data quality is to be assessed.

XBT's were interspersed between CTD stations on the meridional section from the latitude of the Snares Islands to Doubtful Sound. They were also deployed at 2- to 3-hourly intervals on the return trip, Bluff-Launceston.

(II) ***XBT section along orbital path of GEOSAT satellite (Piggyback project - Church)***

A total of 22 XBT's was dropped along the orbital path of the GEOSAT satellite from the vicinity of Gascoyne seamount to 43° 18' S, 160° 39' E.

(III) ***Dredging of rock samples from the vicinity of Snares Islands (Piggyback project - Green, Crawford & Koons)***

Dredging of rock samples from the vicinity of Snares Islands, and the seamount to the west, could not be undertaken when at the proposed sites, because of very unfavourable weather conditions (wind gusts up to 60 kts, and a large swell). A return to the dredging sites was not contemplated later because of lost time, and advice from the Master that the persistent swell made dredging procedures hazardous.

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Cruise Narrative

RV *Franklin* sailed from its Woolloomooloo berth at 0700 hrs (EST) on Tuesday 16 May after clearing Customs. Off Sydney Heads at 0745 hrs, a course was set for the Gascoyne Seamount. In slight seas, a speed in excess of 12 knots was possible. Intersecting the selected orbital path of GEOSAT at 0620 hrs the next day, just to the north of the seamount, 2-hourly XBT drops were begun. *Franklin's* course was adjusted to 154° to track under the GEOSAT orbit. This XBT section was continued until 1921 hrs (EST+1hr) on May 18 with the overflight of GEOSAT, at 43° 18' S, 160° 39'E.

Whereupon, a course was set for the first station of Leg A, 120 NM off the coast of Fiordland and due west of Doubtful Sound. Arriving at this station at 1200 hrs (EST+2hrs) on May 19, a total of 4 CTD casts were made. A trial of the Kevlar hydroline was abandoned in the deteriorating weather conditions. The station at 60 NM off the coast was cancelled because of rough seas and time limitations for making a rendezvous with the New Zealand oceanographic research vessel *Rapuhia* at the entrance to Doubtful Sound (at 0800 hrs on May 20).

At 0135 hrs (May 20), one of *Franklin's* two emergency transformers burnt out, causing an overload on the other, which resulted in immediate major failure in the supply of power to vital ship's systems (steering, SATNAV, gyro compass, etc.) and to all computers. A decision was made by the Master, in consultation with the Chief Engineer, that continuing the scientific program was unsafe, and that we should proceed to Bluff to make repairs.

Weather conditions improved in the afternoon, and we picked up the Bluff pilot as scheduled at 1930 hrs (May 20), and berthed at 2000 hrs. Fortunately, the transformer could be rewired locally, and would be available by about midday on Monday 22 May. *Rapuhia* was contacted by radio to arrange a new rendezvous for the intercalibration station at 0200 hrs on May 23, just to the west of the Snares Islands. While in port, it was discovered that the VAX computer had sustained some damage in the power failure resulting from the burn-out of the emergency transformer. The head of the VAX system tape unit had failed, which necessitated the lengthy installation of VAX systems information onto the user disk.

Following successful re-installation and testing of the repaired emergency transformer, *Franklin* departed Bluff at 1430 hrs on Monday 22 May, and proceeded down the east coast of Stewart Island to make a rendezvous with *Rapuhia* in the early hours of May 23. After exchange of information by towed buoy, an intercalibration of CTD's and basic hydrology parameters was carried out at 1000 hrs at their designated station, R405. This station (CTD #7) was in 200 m of water at about 5 NM southwest of the Snares Islands.

With weather worsening before an approaching cold front, it was decided to head west toward the 'deep' station at the southwest corner of Leg B. Very rough seas and winds gusting up to 70 kts during the night of May 23, resulted in the abandonment of stations in between, and also cancellation of deployment of the rock dredge at either of the two sites specified in the piggyback proposal.

As the storm abated, slow progress was made toward the deep station. XBT's were dropped at two-hourly intervals to assess the influence of the strong winds on the depth of the mixed layer. At 1000 hrs (May 24), shallow CTD casts were begun in marginal conditions at the deep station. Eventually the conditions improved sufficiently for deeper CTD casts to be made, and for the use of the Kevlar hydro-line and Go-Flo bottles.

By 0200 hrs (May 25) the intensive chemical sampling at the deep station was complete. CTD stations were then spaced at 20 NM intervals in a N-S transect up to Doubtful Sound. XBT's were launched mid-way between stations. At CTD station #17 (~1000 hrs), a kink was noted in the cable as the CTD was about to be deployed. A resplicing was required with the loss of about two hours and 20 m of cable. By 2345 hrs (May 25), when due west of Puysegur Pt., rough weather had returned. CTD stations from there north to Doubtful Sound had to be passed over.

At 0900 hrs (May 26) *Franklin* entered Thompson Sound - a safer passage into Doubtful Sound in the prevailing weather conditions. It had not been possible to do a CTD station one nautical mile off the entrance to Thompson Sound. At a station in Malaspina Reach that *Rapuhia* had occupied (R395/399), there was intensive chemical sampling of the water column, and a sediment grab sample was taken(1100-1600 hrs). In addition, the rubber inflatable boat was deployed to take uncontaminated surface water samples at a distance upwind of the ship. Doubtful Sound was exited by the passage to the south of Bauza Is. At 1700 hrs (May 26) *Franklin* was in a large ground-swell off the entrance to the Sound. CTD casts and a Kevlar hydro-cast had to be made further out to sea than the initial option of one nautical mile.

In improving conditions through May 27, stations that were missed early the previous day were done; *Rapuhia* CTD stations R401-R403 were re-occupied; and turning eastward there was a CTD station to the south of Windsor Pt, and another near Solander Is. that also included a Kevlar hydro-cast. Overnight, shallow stations around Centre Is. and through Foveaux Strait were done in good conditions. Typically, there was both standard CTD and Kevlar hydro-casts along with sediment grab sampling at each of these stations.

At 0220 hrs (May 28), *Franklin* was on station (CTD #48) at the eastern end of Foveaux Strait. There followed three hours of ADCP calibration procedures to the east of Stewart Is. (gyro calibration and transducer alignment test), and a further CTD station on the continental shelf. Poor weather intervened again; 24 hours were spent hove to.

Lost time now meant that Leg C as depicted in the cruise plan had to be severely shortened. Three more stations were done on the eastward section starting at 1000 hrs (May 29), with the last being a re-occupation of a Rapuhia station (R414 at 47° 37' S, 170° 00' E). CTD stations #52 and #54 straddled the Southland Front - the boundary between the warm, more saline Shelf waters and the cold, fresher Sub-antarctic waters. This Front is seen to closely follow the 200 m isobath in satellite SST imagery.

At 1900 hrs (May 29), *Franklin* began the return trip to Bluff. The port-call in Bluff (0830-1030 hrs, May 30) was made to offload the New Zealand scientists and their equipment, as well as for minor re-provisioning.

The return trip to Launceston was slowed considerably by adverse weather conditions. No CTD stations were performed on this part of the cruise, but all underway systems were kept in operation. XBT's were dropped at 2- to 3-hourly intervals to provide a long section from just west of Puysegur Pt. to just east of Banks Strait. This section traverses the region of the Sub-tropical Convergence between Tasmania and the South Island of New Zealand.

Minor delays were experienced on June 2 with problems in the fuel pump to the main engine stopping the ship at 1120-1300 hrs and 1420-1525 hrs (EST+0.5hr). At 0900 hrs(EST, June 3), in deep water to the east of Banks Strait, a stainless steel, submersible data logger and a prototype 'antenna' were sent to 2000 m on the hydrowire as a pressure test.

In the early hours of Sunday 4 June (0230-0500 hrs), a second ADCP transducer alignment test was carried out in Bass Strait to the north of Low Head. At 0800 hrs the Georgetown pilot came aboard. *Franklin* entered the Tamar Estuary at about 0830 hrs, and berthed at Launceston at 1130 hrs.

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Summary

Cruise Statistics:

Steaming time	265.7 hrs
Downtime (Weather)	40.4
Downtime (Ship)	64.4
Station time	75.6

Although, much time on the cruise was lost in downtime caused by weather, or electrical and mechanical failures of ship's equipment, the research cruise was a success in scientific terms. Some stations in each of the Legs (A,B,C) designated in the cruise plan had to be omitted. However, by the use of satellite SST imagery transmitted to the ship, and from information passed by radio from RV *Rapuhia*, it was possible to optimise station positions on the two major sections. A positive outcome from the extra distance steamed in the study region (e.g. unscheduled transit to the east of Stewart Is.) was the additional underway data that these excursions provided.

On-station and underway instrumentation performed well,with the only exceptions being the Simrad depth sounder and the Turner fluorometer. There were a few transient problems with computer systems, but these did not severely impede shipboard operations. Sampling equipment operated well; this certainly applies also to water sampling by Kevlar hydroline and Go-Flo bottles that were used aboard *Franklin* for the first time.

It had initially been intended for *Franklin* and *Rapuhia* to carry out a concurrent survey of Leg B, starting in Doubtful Sound. This did not eventuate because of the failure of the emergency transformer on *Franklin*. Nevertheless, the subsequent re-occupation of many of the *Rapuhia* stations in the Leg B zone by *Franklin* some 3 to 5 days later will provide information on short-term dynamics for the Sub-tropical Convergence region about the south of New Zealand. It is intended that information from both vessels, after suitable calibration, will be used to describe the oceanography of the region. This will be a collaborative exercise between CSIRO, DSIR and the University of Otago.

Our gratitude to the officers and crew of *Franklin* must be recorded. The overall success of the cruise can be attributed to their efforts, maintained in the face of adversities. Our thanks also to Warwick Vincent (Taupo Research Labs, DSIR), the other scientific personnel, and the master and crew of RV *Rapuhia* on cruise 2027 for provision of Doubtful Sound charts, preliminary data, and other useful information.

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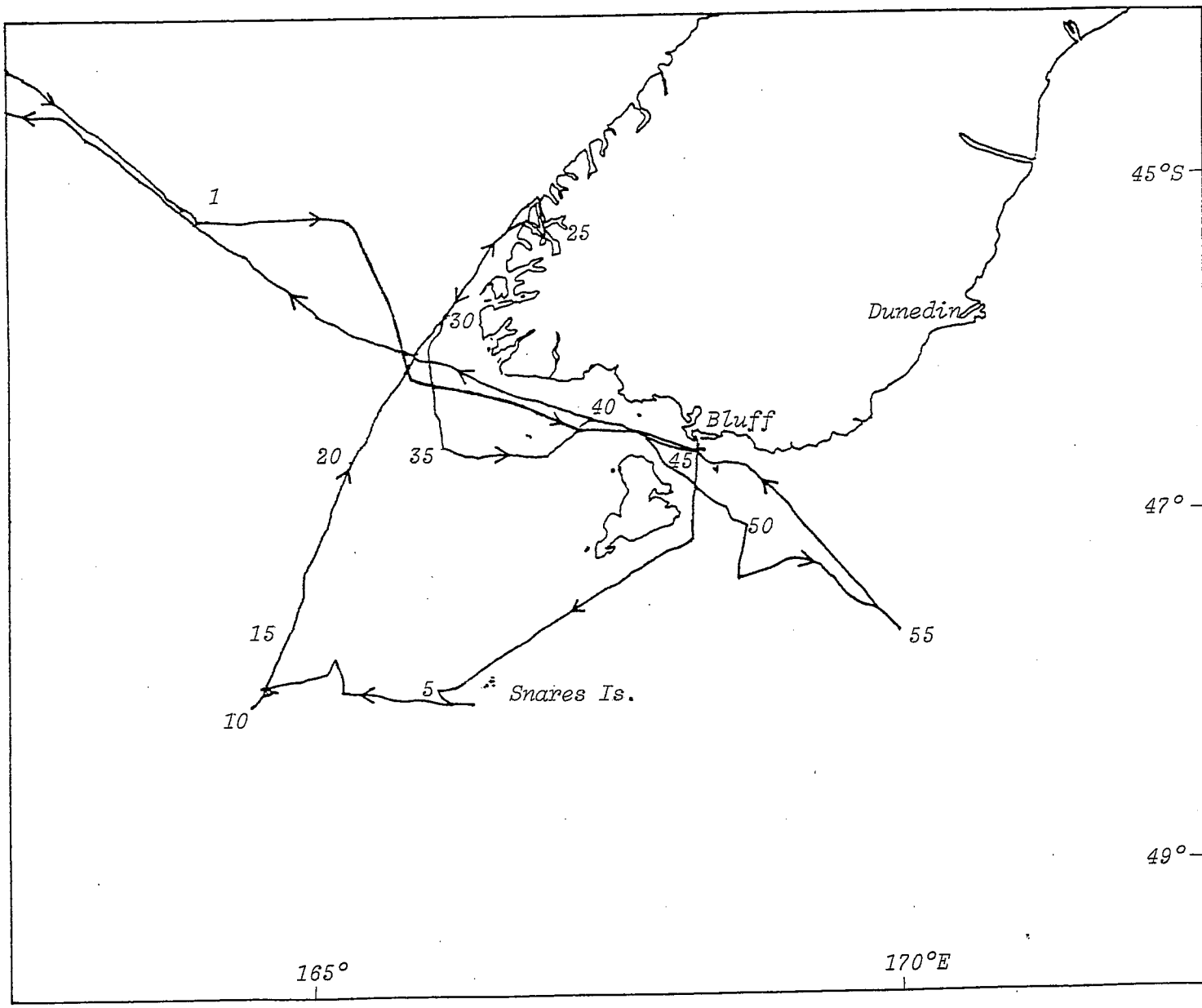
Personnel

Edward Butler	Chief Scientist	CSIRO Oceanography
Denis Mackey		"
Jeanette O'Sullivan		"
Patrick Deprez		"
Jeff Butt		"
Bob Beattie		CSIRO-ORV
Erik Madsen		"
Ron Plaschke		"
Bob Griffiths		"
Scott Coram		CSIRO Atmospheric Research
Keith Hunter		University of Otago (NZ)
Russell Frew		"

Keith Hunter and Russell Frew departed the ship at Bluff on Tuesday 30 May.

E.C.V. Butler.

Edward Butler, Chief Scientist
FR07/89



FR07/89 Cruise Track. Numbers depict CTD Stations.

APPENDICES

The following attachments include the Computing and Electronics report, as well as some reports on individual instruments, equipment or procedures.

Satellite SST image reception

The reception of satellite SST, from Hobart, aboard *Franklin* is a very useful adjunct in cruise planning, and particularly, in updating and optimising station disposition where surface or near-surface features are being investigated. On this cruise where lost time meant that adjustments and curtailments had to be made, satellite SST images were essential for maximising data from a reduced number of stations.

Although there were initially some teething problems with the data transfer via a modem, by the end of the cruise it was becoming a routine procedure (see attached computing report). We thank Paul Tildesley for helping to set up the image reception facility on the ship, and for processing images and making possible their transfer to *Franklin.*

Operation of Kevlar hydro-line on hydro winch

The winch-drum, idler, and block had been well prepared before the cruise to minimise the possibility of trace metal contamination from these components of the the hydro winch.

About 1800 m of Kevlar hydro-line was spooled over the plastic and canvas sheeting that covered the hydro-wire. The first layer on the drum was used as 'backing', which meant that approximately 1500 m was available for casts. A weight, sealed in plastic bags, was attached to the end of the hydro-line.

In operation, a listing of the proposed bottle depths and their spacing on the hydro-line was provided at the winch control position. Communication between the winch driver and the scientists on the 'hero platform' was by two-way radio. This procedure worked well for Kevlar hydro-line casts throughout the cruise.

Computing Report for FR07/89

General

The cruise generally went smoothly apart from diabolical problems with FILHAN and an initial misunderstanding of the operation and display of the CTD A to D channels.

Work done

NAV

The initialization dialogue was made more user friendly (at last).

GPS

GPS occasionally told FRNMON (& hence DELP) that it was not receiving fixes, when in fact it was. Rectified.

A new GPS file was opened every hour, even when the preceding file contained no data. The empty files were not being archived and deleted, with the result that the available file headers on the data disk came close to being exhausted. It was modified so that a new file is not opened if the preceding file is empty.

CTD

The CTD programs did not run in the correct UIC if the CTD terminal is set to a default UIC of other than [40,200]. The raw data files were being written into [40,200], but were owned by the default UIC. The post-dip processing programs could not access them because of privilege violations.

To fix the problem, ...CTD and ...OPT were renamed to CTDLOG and CTDOPT resp. A new program, CTDPRGRUN was written. This is installed as both ...CTD and ...OPT. Typing 'CTD' or 'OPT' causes it to run either CTDLOG or CTDOPT resp in UIC [40,200].

Similar treatment needs to be given to the master program ...CRU and to the file archiving program ...CLE. A conversion to CTDCRU and CTDCLE resp was done. As far as I can tell, it works, but there was insufficient time to test it fully. (Addtional work needs to be done on these programs, eg CTDCRU should specify a UIC when it spawns tasks such as PIP.) The converted programs are in UIC [40,251]. To use them, copy them to [40,250]:

```
PIP [40,250]*.*/CD/NV = [40,251]*.*
```

and reboot MICRO6.

Other CTD Problems

1. The documentation re the setting up and use of the CTD AtoD channels needs to be expanded. We had some confusion over difference between CTD parameters, Neil Brown AtoD channel numbers and 'OPT' AtoD channel numbers. The default scaling applied to the AtoD data by RTD etc is not documented. (I had modified CTDOPT.DAT to take the minium A to D value of +/-4096 before I realized the RTD etc automatically apply a scaling factor to convert the readings to +/- 10.0 volts!!)
2. If a cruise spans a newyear, the first dip is named correctly but the up-dip takes the cruise start year if this is different to the cruise year.
3. Why is CO0: left set to UIC [4,11]? This leads to problems with privilege violations when non-console tasks access TEMPXYZ.LIS.

XBT

Entering a lower case vessel identifier prevented XBT data files from being archived. (FIND does not like lowercase letters in filenames). Rectified.

pH logging

The logging program was modifed so that it would accept either pH or mV format data. The output format had to be changed so that the mV data would fit into the 26 byte data record. The new format for PH, PHFLG ('P' or 'M'), TEMP, SIGERR & NREAD is:

pH: F6.3, A1, F4.1, E11.4, I4
mV: F6.1, A1, F4.1, E11.4, I4

DELP

Now displays pH in pH units or mV (without the sign). The DELP label needs to be modified to include 'mV', if this is being displayed.

DLPEVN cannot handle 'locked' EVENT.DAT's.

DLPEVN crashed a number of times due to *Reserved Instruction* and *Odd Address* traps when 'rubbing out' comment data. The cause was not determined, but I suspect the Fortran Cluster Library. (DLPEVN is too big if built with FCSRES.)

TURNER FLUOROMETER

Data files are now written to DU1:, rather than to DU0:

HYDRO/FILHAN

This cruise used a lot of non-standard rosette arrangements, which could not be handled by FILHAN/HYDRO. As a result, the HYDRO file required so much editing by the OMS personnel that it would have been quicker for them to have entered all the data by hand.

HYD.COM now queries the user if the requested cruise file does not exist. This prevents them from inadvertently creating spurious directories (and 'losing' the data.

SATELLITE IMAGES

3 satellite images of the cruise area were received from Hobart during the cruise. We had to receive the images with the Commodore Amiga instead of the VAX , as the VAX transfers insisted on only working at half duplex, making for a prohibitively slow transfer rate. Our thanks are extended to Paul Tildesley for holding the hand of the Hobart computer until the late hours so that we could get the images across.

UNDERWAY OXYGEN

Denis installed an experimental system to monitor 'underway' dissolved oxygen. Ken Suber's logging program worked well, but problems with the logging harware meant that no good data was obtained.

ADCP

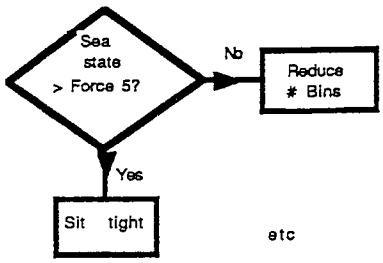
Geoff's new ADCP software worked well throughout the cruise, apart from some known bugs. In good weather, we had 100% data acceptance to 200m, with the acceptance level dropping off to 0% at 300m. All data was rejected by 'VL', which suggests that this criterion may be too severe.

MOP now informs DELP when it requires a new tape. The 'get attention' task, MPP, should now work. It was installed as ...MPP and invoked directly. It is now installed as MPP and invoked by the command line 'RUN MPP /RSI=15M'. Incidentally, MOPAUS and SSPAWN can call each other recursively - strictly speaking, RSX Fortran does not support recursive subprogram calls.

Suggestions for the ADCP package

1. GPS is not automatically used by DOP when coverage bcomes available. It would be useful if the User's Guide indicated that GPS should be enabled manually by first aborting GPS and then typing GPS<CR>.
2. The Guide should have a flowchart, or something similar, to help the lay-person improve data quality if it is poor.

Eg



3. Should BT velocities be entered in the ADCP log, even when reference VREF is 'Ship'? If so, it could be indicated in the manual.
4. MNU has no provision for <RUBOUT> s to correct a menu entry.
2. When 'DIRECTORY' is selected in a sub-menu, the selection should go back to the previously selected main menu item and not to the first entry in the menu.

MISCELLANEOUS

A VAX program for producing concatenated files of TSG, pH and Turner Fluorometer data was expanded to include dissolved oxygen.

Updates for Ken's autoanalyser programs were installed and run, but no useful data was obtained as far as we can tell.

The use of the ...TSK form of RSX task installation should be avoided when the task is spawned or run by another task. It is bad programming practice under RSX11M and is illegal with RSX11M-Plus. RSX11M-Plus is already running on the future CTD micro, MICROA, and I hope to be installing it on MICRO7 in the near future.

Much obsolete data was deleted from the VAX user disk, but a large amount of data and duplicated programs still remain. Could all users please attend to their areas when the Franklin is next in Hobart!!!!

Hardware

The VAX system disk failed while the Franklin was in Bluff having one of the emegency transformers rewound. The cause is unknown, but it could have been damaged when the transformer burnt out. It was going to cost some $6-7000 for DEC NZ to repair the disk and our departure would have been delayed, so it was decided to copy VMS on to the User dis. The available backup was unfortunately not an up to date version, so changes to the system will be required when the disk is repaired in Launceston.

Incidentally, our maintenance contract with DEC Australia does not cover us when Franklin is overseas. We should look into extending its cover.

The VAX was out of action for 24 hours, following a power failure on 2nd June. We finally realized that the circuit breaker had tripped on one of the two UPS circuits to which it is connected.

The VAX tape drive is having intermittent load failures and hardware errors.

The 10Mb system disk on Micro6 was replaced with a 30Mb RD52 disk, giving much more space for programs. The external hard disk on Micro6 failed during the installation of the RD52, and was replaced.

The tape hub on the MICRO6 tape drive was badly worn and had to be replaced. There would probably be less wear if the tapes were not rewound after each group of files had been archived.

No other problems were experienced with the computing hardware.

A VT220 is needed to display DELP data in the GP Lab.

A hard disk is needed for the Franklin Macintosh computer as users need to be able to get access to all the application software without having to change system diskettes. eg to merge MacDraw and WriteNow documents.

The use of an Appletalk port on the back of the NEC would simplify setting up the laser printer - at present one has to select 1 of 3 possible setups.

ELECTRONICS REPORT FOR FR07/89

TRIMBLE GPS RECEIVER

Steve Quee from AWA was onboard replacing ROM's in the GPS when I arrived at Woolloomooloo, unfortunately he had the wrong ROMS with him, replacements were forwarded by courier later in the day and were fitted during the cruise.
As there was no information from the gps during the first GPS window, it became obvious that the RS232 communication ports from the Trimble had been reset to 9600 Baud at some stage, I suspect this may have been during the initial ROM replacement in Sydney.

EK400 SOUNDER

Although the 12 Khz transducer is faulty, it was still possible, with some nursing, to get a readable trace on the PDR down to 5500 metres, but as the digitising was mostly untrustworthy, there was no point in running the PDR logging program with the 12Khz transceiver during this cruise.

DIGITAL CLOCK

The clock, cruise data print initiate strobe was erratic from start of the cruise, causing time and cruise detail to be printed at random, a small clock pulse delay was required to ensure that trailing edge of data pulse did not coincide with rising edge of clock pulse, this fault condition was most likely to stem from a replacement clock chip which was installed prior to FR05/89.

VARIOSENS III

This and battery container, was fitted to CTD 1 in Sydney prior to departure and worked well throughout the cruise, there was no occurance of the previous connector and wiring problems, however some problems arose in making the data available on the vt241 display and the LA100 printer, but they were eventually overcome by R. Beattie Esq.
As the variosens is only rated to 800 metres, it was necessary to remove it, and battery supply from the CTD during deeper casts.

TITRON PH

This new sensor/amplifier assembly was also fitted in Sydney, but to avoid damage to the sensor, it was only deployed on casts where minimum temperature were not expected to fall below 3 C. Early tests with this unit were encouraging, noise level was initially very low, even close to the ship, but it appears that the noise spike level increases with use, and there is some hysteresis on upcasts, but downcast ave. values were still encouraging.
As we only had the one assembly, we didn't test to deeper than 1500 dB. to avoid pressure or temperature damage.

ACOUSTIC DOPPLER PROFILER

A couple of small hic-ups were attributed to over heating in the rack, and probably due to the rack exhaust fans not being switched on, after remedial action, no further hardware problems were encountered, but the software which accepts GPS positions needs looking as it continually crashes.
An ADCP Gyro heading analysis was produced for the Chief Scientist for calibration purpose, after the dual circle +/- 450 degree compass check had been performed east of Stewart Island.

CTD AND DECK UNIT

Ctd 1 was fitted in its support frame in Sydney, all zinc anodes were removed and two lead filled stainless steel weights fitted instead to minimise metal contamination around the Niskin bottles, but with resulting immediate corrosion of the aluminium frame.
Initially the oxygen sensor was very noisy, this was temporarely remedied by tightening the sensor in the sub housing assy., but a new sensor was eventually fitted in Malaspina Reach, this unfortunately only lasted one cast, and after a couple of resurrection attempts, had to be replaced as well.
The ctd went into salinity spasms during the bottom of a deep station, however the symptons cleared on coming up through 2500m, on replaying the audio tape I concluded that it touched bottom at about 4500 m., examination of the Ctd didn't reveal any damage, apart from a broken unused fast response thermistor.
The 1150 Deck unit had problems with the function display and audio switching control from the start of the cruise and had to be dismantled for cleaning of the multibus edge connectors.

ROSETTE SAMPLERS

Rossette unit 1 functioned well throughout the cruise, but as Hydrology personnel informed me there were numerous misfirings on the previous cruise which used Rosette unit 2, I removed and cleaned the upper rotor assembly of that as well, the aluminium indicator knob is fairly close fitting and required slight persuasion to come off, but no corrosion was apparent.

BENTHOS ALTIMETER

The altimeter was dismantled for examination after the grounding, apart from one of the backplane screws falling off and the remaining ones being loose, no damage was evident, but to enable us to work close to the bottom, I removed a previously fitted extra filter/delay Capacitor.

WINCHES AND SPOOLING

The hydrographic winch drum was covered with a layer of canvas and over layered with 1800 metres of kevlar rope for trace metal Nansen casts at some of the ctd sites.
The necessary slack and re-spooling of the ctd wire after each hydro cast resulted in a bad kink, to which a re-splice was required, we lost about 20 metres ctd wire

COMPUTERS AND PRINTERS

Numerous aircondition failures caused similar amounts of over heating alarms from the VAX.
On re-starting the VAX during the first Bluff stopover the system disk (RA80) crashed fatally, the system was transferred from tape to the RA81 disk drive by R. Beattie.
Micro2 had a little hic-up which was thought to be due to power supply interconnecting cable failure, but inspection of the cable showed it to be ok. and no further problems were encountered.
Delp display crashed regularly during comment editing and had to be re-started.
The hydrology software (FILHAN) is not flexible enough to cope with varying bottle No's, it crashes frequently and is not very user friendly. review or replacement should be considered as soon as possible.

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TURNER FLUOROMETER

The Turner Fluorometer was found to have a high blank reading and a high calibration reading.

Several steps were taken to reduce these readings:

Initially the cuvette was cleaned with detergent then oxalic acid.

22/5 The metal filter in the engine room was cleaned of algal growth.

27/5 The pump tubing was inspected outside the debubbler and down in the GP lab. A brown gunge was found coating the inside walls of the tubing. The brown gunge seemed to contain rust as it stained skin as rust does. The tubing outside the debubbler was cleaned and in the GP lab the lines were cleaned as well as possible using the bottle brush.

30/5 Removed the front panel of the Turner, inspected the cuvette, and cleaned.

The pump lines and the debubbler were cleaned, also a piece of tubing was placed in the debubbler so as water was not taken from the bottom of the debubbler where the sediment settles.

In the GP lab the inlet lines were replaced and the on/off valve system cleaned. The bypass system was cleaned and washers replaced. The bottom washer in the cuvette cell was also replaced. The washers were supplied by the ship's engineers as there were no spare parts for the fluorometer

The calibration blank showed a reduction only after the cleaning, etc. on the 30/5. The calibration rod remained constant.

Notes:

1. Need a photocopy of the Turner Fluorometer manual used by the electronics section.

2. Need spare parts, eg. washers, cuvette, lamp.

3. Look into running the flow-through system during cruises where the instrument is not used, to prevent sediment build up.

4. Look into leakages in the bypass system, also the problem with internal washers and check flow restriction during bypass mode.

5. Calibration of instrument including electronic calibration and normal rod calibration. Check rod for condensation problems.

6. New bottle brush, plastic coated to prevent rusting.

7. Take a stopwatch for flow-through volumes.

CHLOROPHYLLS AND SPECTROPHOTOMETER

The chlorophyll filters looked suspect with very dirty filters. Although the chlorophyll values were not always indicative of the colour of the filters.

After the cleaning etc. on the 30/5 of the Turner fluorometer line, the chlorophyll filters improved greatly and seemed realistic.

Using Pat's filtering apparatus worked well.

The original chlorophyll method had to be changed due to equipment failure and difficulties in running the method at sea. The final method involved leaving the filters to stand in 100% acetone for a minimum of 4 hrs. Volumes and solutions were replicated from the original method.

The spectrophotometer seemed to work well.
4cm cells and a sample volume of 6mls were used.

CLEAN CONTAINER

The clean container set up worked well although a few recommendations were noted.

1. The rack holders have paint coming off and metal exposed, also the stainless steel clamps are becoming very rusty and are difficult to keep clean on the ship.

--- Is it possible to have a new racking system to allow easier racking, reduce the metal content and incorporate a clamping system in the rack holders?
I feel this would improve the racking area for Trace Metal sampling greatly.

2. Rosette bottom lanyards should be lengthened by 3 cm.

3. The refrigeration unit in the airconditioner should have an overhaul just prior to shipment.

4. All niskin air bleed stoppers should have cheminert fittings. So that cheminert screw can be interchanged with cheminert screw in pressure set up.

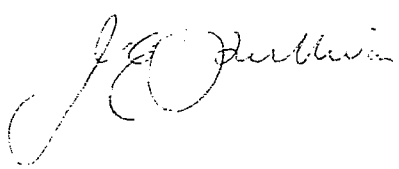
5. Check damage to bottom flap in rack area as damaged during attachment to the ship. This has happened on other occasions, therefore problem should be investigated to prevent further damage.

6. Look into leakage into racking area through roof flap, seawater and rain leak in.

OTHER MATTERS

1. Need a lock on the fridge door in the hold.

2. Possibility of looking into cleaning up the wet lab.--- Degreaser ran through the roof onto niskins (luckily at the end of the cruise).



RECOMMENDATIONS

- To ensure optimal performance of the Turner Fluorometer, and other underway instrumentation in the GP Lab, the seawater line to that laboratory from the Thermosalinograph intake should have flow through it on each cruise, irrespective of whether underway instruments are operational. Such action will prevent build-up of corrosion products and biological growth

- Modifications should be made to the flaps of the Chemistry Clean Laboratory container that serve to provide a seal around the bulkhead into the Chemistry Laboratory. At present, they are not sufficiently weather-proof, and they make it difficult to install the container onto its mountings

- Improvements to the hydrology program FILHAN are needed, as discussed in both the Computing and Electronics Reports. It is understood that a new version of the program, available on PC and soon to be translated for VAX, may improve this situation

- The provision of a console in the GP Lab that displays DELP would greatly assist personnel operating underway instrumentation in that area