JR66 CRUISE REPORT

British Antarctic Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Biosciences Early Seasonal Cruise to South Georgia

Oct/Nov 2001

(Main Contents) (Recommendations) (Event Log) (Transect Log) (Cruise Track)

Preface

Welcome to the cruise report for Biosciences Cruise JR66 carried out around South Georgia during November 2001.

This short opportunistic science cruise, assigned within the logistics cruise was a success, as approximately half the schedule was carried out. It was also a victim of the Southern Ocean weather conditions experienced throughout the passage from the Falklands, the South Georgia/ B.I. relief's and science survey section of the cruise. The high winds and very large swell especially hampered the Bird Island relief, causing us to run over schedule by nearly a week, and during in the days we couldn't get into Bird Island because it was too rough, it was also too bad to undertake any science. By the time we could head south for Signy we had used up all the possible over spill time allocated in the schedule, but we did have fantastic clear blue skies and clam seas as we made passage further south to Signy, and the personal drop to Signy was undertaken in glorious sunshine. I would also like to extend my thanks to Jeremy Robst, Vsevolod Afanasyev, the Captain, Officers and the Crew for ensuring the cruise was successful and enjoyable in some what adverse weather conditions.

Nathan Cunningham

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Recommendations

Recommedations regarding : Data Management (Top of Section) (Main Contents)

To integrate the SCS system into an underway data management system and subsequently store the ASCII files the PESTO data structure. With this implementation, it will allow easier access by the ships' scientific personal to the underway data.

Action: Discuss with Technical Services

Status: Pending

To develop metadata and data strategies to better manage the data and facllitate easier access to merging complex data sets. This would include the development of XML metadata sheets, Web based data merging tool and impementing grid based technology speciciations and structures

Action: Discuss with Technical Services

Status: Pending

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Cruise Objectives

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Introduction (Top of Section) (Main Contents)

Cruise JR66 is part of a series of Q3 cruises scheduled to be carried out annually for the Variability in the Southern Ocean Project (VSOE) which forms part of the OED (Ocean Ecosystem Dynamics) DYNAMOE Programme. It is designed to detect seasonal variation in the pelagic ecosystem by conducting a early season accoustic survey of the western core box and recording accompanying environmental measurements. The findings of which will be used inconjuction with the main Q3 core programme cruise JR70. This cruise is scheduled to be conducted mid-season 2002 (January-Febuary) and will concentrate on inter-seasonal variability and boundary condtions of the Western Core Box..

The Q3 core programme is concerned with monitoring interannual oceanographic and biological variation in the region of South Georgia and ultimately to understand its causes. The JR66 cruise objectives are:

- To carry out an acoustic survey within the Biosciences Core Programme western survey area in the austral spring, in order to detect seasonal variation in the pelagic ecosystem.
- To carry out accompanying environmental measurements.

JR66 Cruise (Top of Section) (Main Contents)

Translated into a scientific programme the project is concerned with acoustically surveying a number of transect pairs (each transect 80 km long and orientated at right angles to the shelf) grouped into 3 ‘core boxes’ along the north coast of South Georgia and a further one to the south. JR66 will only be survey the western core box (Cruise Track). The transect pairs are run during the hours of daylight at 10kts and data obtained by the Simrad EK500 scientific echo-sounder (3 transducers operating at 38, 120 and 200 KhZ respectively) are used to calculate mean volume backscattering strength (MVBS) and hence to estimate zooplankton (mainly krill) biomass. Running the transects during the hours of daylight means that the vast majority of planktonic scatterers are below the level of the ship’s hull mounted transducers compared with at night when an unknown proportion rise up into the near surface waters above the level of the downwards looking transducer. The swath bathymetry will be used through out the duration of the cruise (apart from on accoustic transect lines) and a detour made to survey Shag Rock passage so bathymetry maps can aid the oceanographers in the postioning of scientific bouys. It is not possible to run several pieces of kit such as the undulating oceanographic recorder (UOR),the tow fish, etc. on a short cruise like this, because of the requirement of several experienced operators for there use and deployment. The cruise will be depending on expendable bathymetry thermographs (XBTs) and CTD for oceanographic conditions An additional series of XBT drops will be made to coincide with the CTD station positions for JR70 long transect (ER635).

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Cruise JR66 Narrative

Time line

October

19th, 23rd, 24th, 25th, 26th, 27th, 28th, 29th, 30th, 31st

November

1st, 2nd, 3rd, 4th, 5th, 6th, 7th, 8th, 9th, 10th, 11th, 12th, 13th, 14th, 15th

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Narrative

19th (Top of Section) (Main Contents)

- Science party and base personal left BAS HQ Cambridge bound for Mount Pleasant via Paris and Santiago.

20th Oct (Top of Section) (Main Contents)

- Arrived in Stanley, waiting the arrival of the JCR.

23rd Oct (Top of Section) (Main Contents)

- Joined the JCR

24th Oct (Top of Section) (Main Contents)

- Initialised logging system to identify an problems. The oceanlogger not working properly.

25th Oct (Top of Section) (Main Contents)

- Ocean logger fixed, rest of the underway instrumentation seems to operate fine. prepared documentation for cruise and web page.

26th Oct (Top of Section) (Main Contents)

- Set systems to log, all underway systems seem to be operating ok.
- Due to embark at 20:00, but set off was postponed because of a strong wind hold the JCR against the side of the FIPAS.

27th Oct (Top of Section) (Main Contents)

- 0700 JCR embarked from Stanley.
- Turned on the swath bathy, ek500, ea5, a few problems synchronising the ping frequency. Sort out and seems to be operating in normally.
- The seas became heavy from a force 9 South Westerly. The original cruise track might have to be altered as it would cause us to be rolling excesively , to the point where the swath bathymetry would become ineffective. A decision would be made about 2am 28/10/01 when we reached waypoint 2.
- Dropped two XBTs to calibrate the em-120.

28th Oct (Top of Section) (Main Contents)

- The original cruise track has been abandoned from waypoint 2. The weather seem set at force 8/9 with heavy seas,

therefore we have had to turn the ship with the back to the waves. If the wind starts to drop a decision will be made about getting back on track to survey shag rock passage.

XBT at 20:26 dropped when on the Polar Front. Used data to calibrate files on em120

- Changed course at 20:00 for waypoint 5. The going quite heavy.
- Water box annex roller door broken in the night with heavy roll and water rushing down the deck.
- Abandoned cruise track – will get new points make way to waypoint 7.

29th Oct (Top of Section) (Main Contents)

- Went through Polar Convergence 3 times on route to way point 7.

30th Oct (Top of Section) (Main Contents)

- Fire Alarm at 03:15GMT – identified as earth problem from CTD/water bottle annex taking in sea water. Checked area every hour and report to the bridge.
- 6:15GMT - no more false alarms so bridge stopped hourly check.
- Set Scintillation counter going in rough seas – left standards to count repeatedly to sea if rolling effects counting efficiency
- The seas are rough but the XBT ER635 transect is progressing
- The ship heaved to - bow into the waves – the deck taking on water and the water bottle annex filling up again, trying to limit potential damage to CTD..
- T5 used from waypoint 15 – waypoint 16 diverted due to icebergs
- Long Transect completed.

31st Oct (Top of Section) (Main Contents)

- KEP Relief

1st Nov (Top of Section) (Main Contents)

- KEP Relief

2nd Nov (Top of Section) (Main Contents)

- Running 3.1 &3.2 because can't get on to Bird Island due to weather conditions
- Problems with SSU at 10:30gmt - gone out of sync. Fixed 11.00.
- CTD is storm damage. Working on it the temperature 2 sensor and clamp both of which are broken. Trying to fix or replace.
- Running XBTs at CTD position 18 and 17 on 3.2. Can't return after the transect due Bird Island relief.
- New temperature sensor fitted and calibrated - waiting for sea trial after acoustic run
- The weather conditions where calm and cold with a Nwesterley wind. The wind speed was about 20 knots, so Ran CTD test
- the loggers appeared to work but could be giving erroneous results.

3rd Nov (Top of Section) (Main Contents)

- At 05:00 did the relief for Bird Island. Rising swell by the afternoon caused the ship personal to be called back to the JCR.
- Stayed around bird island for the night.
- All the problems with the CTD have been resolved - mainly calibration software problems - with the fitting of the new secondary temperature sensor

4th Nov (Top of Section) (Main Contents)

- The seas too rough to re-start the Bird Island relief - moved off to do the 4.1 - 4.2 acoustic transect pair. Started at waypoint 4.1.S
- If the seas are still too rough for bird island will do CTD on 3.2 and the deep CTD at 4.2.N tonight

5th Nov(Top of Section) (Main Contents)

- CTD not completed because we are waiting for weather window - hanging around Bird Island for break in the weather around 05:00
- Weather window has not transpired - it is expect to occur with in the next 24 hours.
- The captain is reluctant to move away from Bird Island incase we miss the opportunity to complete the relief..

6th Nov (Top of Section) (Main Contents)

- A massive low pressure is moving on to South Georgia - high winds (60 knots +) are expected.
- The Captain thinks they is a good chance that we will get a small break as the centre of the low positions on South Georgia.
- 16:00 The conditions are deteriorating and the barometer is dropping like a stone. We will shelter in the lee of Bird Sound tonight.

7th Nov (Top of Section) (Main Contents)

- At 02:00 the JCR blow off anchor and we are caught in the weather - making for more a protected area in the Bay of Isles. The JCR has been rolling heavily, the UIC and Labs a bit of a mess, but nothing significant is broken.
- 06:00 dropped anchor in Rosita harbour and we will wait here until conditions improve.

8th Nov (Top of Section) (Main Contents)

- 08:00 The low pressure has slow moved south west and we are moving on to transect line 3.2 to do the shallow CTD. This is probably the only CTD we will complete today - as the Captain wants to have a look to the conditions at Bird Island and we will wait for that some what elusive weather window. Bird Island relief has been given absolutely top priority as time pressure is mounting for the completion of Signy and returning on time back to Stanley before the 17th Nov.
- Set swath and acoustics running.
- Ran the acoustics and swath all day - turned off at 16:50
- 14:30 - shallow CTD on 3.2 completed - heading in to assess Bird Island and the possibility of the relief ASAP.
- 16:35 Set anchor at Elsehul near bird sound.

9th Nov (Top of Section) (Main Contents)

- Bird Island relief completed. Waiting to hear back from logistics as to whether the the will be enough time to complete any more of the science transects.
- The captain has informed me that Cambridge wants the JCR to procede straight down to Signy.
- Therefore no more science for the JR66 cruise - approx. half of the programme was completed. To my understanding we are on quite a tight schedule to get the JCR back to Stanley by the 15th - 17th and if the Signy cargo drop gets delayed due to bad weather, this would be compromised.
- Making passage to Signy

10th Nov (Top of Section) (Main Contents)

- Anchored up ready for Signy relief.

11th Nov (Top of Section) (Main Contents)

Started and completed Signy relief. Standing by until 1:30 tomorrow to wait until all of Signy's system are up and running

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12th Nov (Top of Section) (Main Contents)

Set off back to Stanley - logging underway, swath and acoustic data.

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13th Nov (Top of Section) (Main Contents)

- Still on the way - logging underway data, swath and acoustic data.

14th Nov (Top of Section) (Main Contents)

- Still on the way - logging underway data, swath and acoustic data.

15th Nov (Top of Section) (Main Contents)

- Docked at Mare Habour at 08:00. Stopped logging. Wrapping up JR66
- Moving around to Stanley on the 16th.
- Flying from Mount Pleasant on 20th

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Acoustic Report

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Acoustic Report (Top of Section) (Main Contents)

Methods

First year's data has been collected at 38, 120 and 200 kHz with hull mounted sounders for each of the three seasons. No calibrations were carried out during the spring and autumn visits last year, and there will not be an opportunity for this cruise, so it will be important to use oceanographic information collected this time to extrapolate from calibrations that will be carried out on JR70. The addition of data logged from the EA500 at 12 kHz would provide a powerful supplement to the data from this cruise, and ideally would be begun as soon as possible (at the time of writing this is still under discussion). It is important to maintain the ship's speed at 10 knots and no faster during transecting (otherwise there are too many gaps between pings). The ship should be up to speed and on course before each waypoint is reached.

Noise

Passive noise measurements are very useful for post processing, and can be made over a ten-minute period at the end of each day's transecting. Active pinging is stopped and the noise recorded at all three frequencies together with notes about the weather and sea-state. Protocol for this may be found either on the synoptic survey website, or in the report of the La Jolla workshop to process the results of the synoptic survey.

Data logging methodology

1. The EK500 was switched and initialised using EchoConfig to load the configuration file.

2. The EK500 pings were set to be synchronous with the ping of the bridge echosounder the EA500, and the swath sounder the EM120, and the synchronisation unit, SSU, for achieving this. While using the swath system, its ping rate was used to drive the ping rate, but once the acoustic survey started the EK500 to drive everything with a regular ping rate. This may prove to be too fast for the Swath Bathy, so it might have to be turned off.

3. EchoLog is the logging module, self contained and more or less bullet-proof, it logs telegrams from the EK500 into files on the pc with the start date and time for the name and the extension .ek5. It automatically opens new files at regular

intervals, so once started, needs no attention, other than to check disk space.
4.EchoView displays groups of .ek5 files, but without modifying them.

5. Acoustic data were logged using Echolog_EK (version 2.00.21). Data were logged to EK500 Workstation 1 (EK500_WS_1, IP address 129.177.031.009, Internal IP port 2863, Ethernet address 00-01-02-a3-3d-27). While Workstation 1 was dedicated to logging/EK500 control, data were viewed live and post processed on Workstation 2 using Echoview (version 2.00.106). The D: directory on WS_1 was shared as G: on WS_2 to facilitate live viewing. Echolog_EK and Echoconfig_EK were installed on EK500_WS_2 so that in the event of a crash on EK500_WS_1 logging could be swapped to WS_2 quickly and data loss would be minimal. In this event the remote IP and ethernet addresses in the EK500 would have to be changed to those of WS_2 (IP address 129.177.031.010, Ethernet address 00-01-02-14-53-d6).

6. EK500 settings were downloaded daily using Echoconfig_EK (version 2.01.07, listening for EK500_WS_1 IP port 2863, writing to EK500 IP port 2000) to, for example, D:\sonardata\settings dumps\January7_2001.txt and compared to a master setting using the diff command under Cygwin (could also use fc under dos) in order to check for setting changes (as always this procedure would fail to detect a change in sound speed).

7. After one or two days worth of logging, .ek5 files were backed up onto CD. As well as the usual event log and transect log it is useful to keep a notebook (hard copy or electronic, to record anything and everything – e.g. diversions round icebergs, unusual natural phenomena, system crashes etc.)

8. The plan for the survey is in a QuattroPro spreadsheet with an approximate start date and time. The final date needs to be settled on after discussion with the Captain. The start time was chosen to be well into daylight, but can be shifted either way to suit people, so long as all the acoustic transects are completed in the light.

9. After dark, the plan calls for relocation to a first CTD station, and a second CTD station, before relocation to start the second day. Details for the CTDs are described below.

Data handling

Each morning .ek5 files from the previous day were copied to a day specific directory on D:/Log Data on EK500_WS_1 and also to D:\jr66\ek5 on EK500_WS_2. Once sufficient data had been accumulated (approx. 3 or 4 days) two duplicate CDs of these data were burnt.

Results/ discussion to be added by Cathy Goss

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Oceanographic Sampling

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Vessel-Mounted Acoustic Doppler Current Profiler (VM-ADCP) (Top of Section) (Main Contents)

Although the VM-ADCP performed well on JR57 it is a very time consuming instrument to use. Requiring substantial processing of the raw data to produce useful data, because of this and the small number of scientific personal on board for JR66, this instrument has not been used. .

Conductivity-Temperature-Depth (CTD) system (Top of Section) (Main Contents)

Introduction

For JR66, a Conductivity-Temperature-Depth (CTD) probe was used to vertically profile the temperature and salinity of the water column. Associated instrumentation profiled the light transmission and fluorescence of the water column, and captured twelve discrete samples. A full list of CTD deployments is given in Table 1. CTDs will be deployed at each end of the second of each transect pair, one on shelf (250m), one off shelf(1000m). A CTD deployment provides information on water temperature conductivity and fluorescence. A rosette sampler equipped with 10 l capacity water bottles provides water from standard depths for salinity analysis. In addition on deep CTD will be deployed (>3000m) at the offshore end of the most easterly transect (W4.2.North).

Equipment

The CTD system used on JR57 was the BAS Sea-Bird 911 plus (serial number 09P15759-0480). The CTD was fitted with seven scientific sensors:-

- Primary temperature (SBE 3 plus, serial number T32191, calibrated 22-6-2000)
- Primary conductivity (SBE 4C, serial number C41913, calibrated 22-6-2000)
- Pressure (series 410K-105 Digiquartz pressure transducer, serial no. 067241, calibrated 28-6-1999)
- Secondary temperature (SBE 3 plus, serial number T32307, calibrated 22-6-2000)
- Secondary conductivity (SBE 4C, serial number C41912, calibrated 22-6-2000)
- Transmissometer (serial number cdt-396dr, calibrated 17-10-2000)
- Fluorometer (Chelsea Instruments Aquatracka Mk.III, serial number 088216, calibrated 7-1-2000)

The temperature and conductivity sensors were connected to two SBE 5 T submersible pumps (serial numbers 051813 and 051807). The CTD was connected to an SBE 32, 12 position carousel water sampler carrying twelve 10 litre Niskins. In addition to these, an altimeter was fitted to permit accurate near-seabed approach, but the altimeter data were not processed alongside the data from the other sensors. Also fitted to the water sampler frame was an SBE 35 high precision thermometer (serial number 3515759-005).

Data Acquisition and Initial Processing

SBE 911 plus

During JR66, the CTD package was deployed from the midship's gantry and A-frame of the *James Clark Ross*. The general procedure was to start data logging (see below), deploy, and then stop with the CTD at 10 dbar pressure. After a 5 minute soak at this level, the package was raised nearly to the surface, then lowered to the target depth without stopping. For the long transect (northeast of South Georgia), the target depth was the bottom depth minus 10 m. For standard core program (core box) stations, the on-shelf station target depth was bottom depth minus 10m, and the off-shelf station target depth was 1000 m. The Niskin bottles were closed during the upcast; bottle closure depths are listed in Table 2. The downcast data were calibrated and averaged to 2 dbar intervals to form the final CTD product (see below).

Data from the CTD system were logged via an SBE 11 plus deck unit to a 486 Viglen PC running version 4.226 of Seasoft Data Acquisition Software (Sea-Bird Electronics Inc.). The initial module used for data acquisition was the *Seasave* program. For JR57, the data average rate was set to 1, producing 24 Hz raw data (the maximum permitted with the system). Four files are generated by *Seasave* per CTD cast. These are as follows, where NNN is the event number of the cast:-

66ctdNNN.dat (raw data file)

66ctdNNN.con (configuration data, generally a copy of the input configuration file jr57.con)

66ctdNNN.hdr (header file containing sensor information)

66ctdNNN.bl (file with data cycle numbers for bottle closures)

Futher analysis and preparation of the data was carried out by Mike Meredith

Oceanlogger (Top of Section) (Main Contents)

Instrumentation

The replacement oceanlogger system onboard the *James Clark Ross* was operated for virtually the entire duration of cruise JR66. It is a PC-based logging system, built in-house at BAS, by ETS using the Lab View Package. Its primary purpose is logging measurements from various of the ship's continuously-run data sources. Accordingly, it draws data from the ship's pumped non-toxic supply, plus assorted meteorological parameters. Some of the initial gliches were sorted out by Jeremy Robst.

Processing in Unix

Carried out by Mike Meredith

Depth Echosounding (Top of Section) (Main Contents)

Instumentation

The *James Clark Ross* has a hull-mounted Simrad EA500 Hydrographic Echosounder, with the transducers located approximately 5m below the water level. For JR66, data were logged into Pstar in 12 hourly segments using the standard unix script *jr66_sim.* This ran *datapup* on the SCS simulated level C data stream SIM500, taking the jday and am or pm as the requisite inputs. This data stream features uncorrected depth, i.e. it produces bottom depth calculated assuming a mean vertical sound velocity of 1500 ms^{-1}.

Processing in Unix

Carried out by Mike Meredith

Expendable Bathythermographs (XBTs) (Top of Section) (Main Contents)

Introduction

A sequence of XBT drops were performed from RRS *James Clark Ross* during JR66. These were performed on transit and on the the long transect ER635.

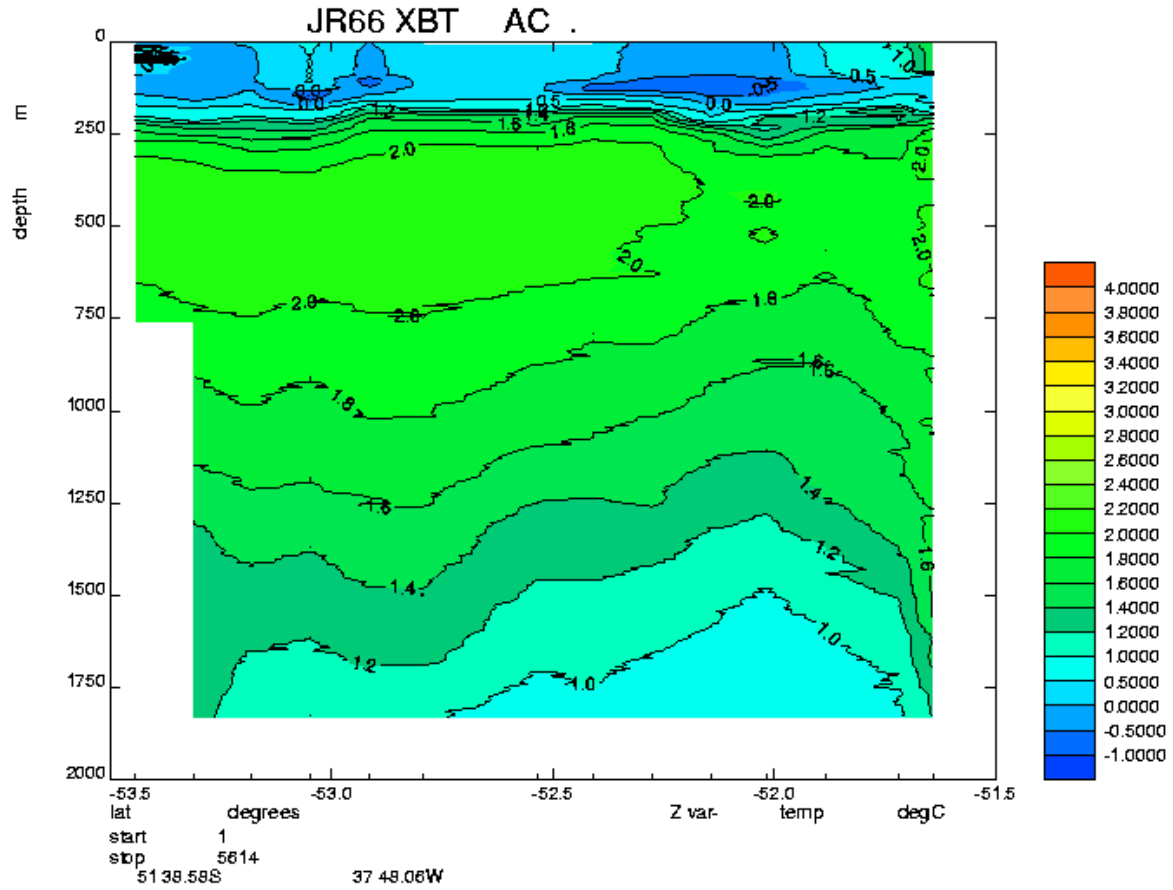
Instrumentation

Sippican T5 and T7 probes were used, having been provided by the U.K. Hydrographic Office, Taunton. A fixed launcher was used, sited on the rear port side of the aft deck. Data were logged by a Viglen IBM-type 486 PC running the Sippican WinMk12 software. Jeremy Robst developed an XML based XBT logging software to run over the intranet. Once a successful drop had been performed, data were transferred via ftp to the central unix system (jruf) for processing. Futher work is require on the new pece of software to ensure it writes the binary file header correctly.

Processing in Unix

Processing carried out by Mike Meredith

ERS 635 XBT Transect



Simrad 120 em - Swath Bathymetry (Top of Section) (Main Contents)

This data was routinely collected through out the cruise, and calibrated on a daily basis with an XBT drop. It will be work on by Peter Morris in Geosciences.

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ETS Engineer's Report

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Introduction (Top of Section) (Main Contents)

There were a few problems with the
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Data Logging System

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SCS (Top of Section) (Main Contents)

Java Logging System (Top of Section) (Main Contents)

Unix Systems (Top of Section) (Main Contents)

Netware Server & PC's (Top of Section) (Main Contents)

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Data Management (Nathan Cunningham)

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Overview (Top of Section) (Main Contents)

The underway data is still split into two components, the physical oceanography implementing PSTAR and analysed primarily for the oceanography and data that is used and analysed primarily back at Cambridge. All the data is saved in the PES pesto data storage system.

The JR66 cruise is the first core programme cruise to use the newly implemented SCS system. Traditionally a Virtual Data Management (VDM) system was used to split the data streams coming into the old level C, into 24 hour segments, and saved the files into the predefined PESTO data structure, corresponding to the logger used. The pesto data structure will still be implemented, but further work is required at Cambridge to full implement the new SCS system into the existing VDM system and scripts. The daily ASCII files for each of the binary RVS data streams will therefore be available shortly after returning to Cambridge.

All the collected onboard from the SCS, the RVS and the public network drive has been backed up to multiple tapes to return to Cambridge. Please refer to the Technical Services Instruction Manual: SCS System documentation (Ref BAS: TS0018) for a detailed list of all the data streams and configurations etc

Cruise Data (Top of Section) (Main Contents)

The cruise data is held in a general Excel spreadsheet called Event Log. The event log contains information on station events in the following fields, see table 1, and is updated daily from the ships scientific log. The scientific log is held on the bridge and only the bridge issue event numbers. This limits the chance of multiple numbers being issued to the same event.

The Quattro Pro event log also contains another table called Transect Log. This is used to record the information on when

the transects of the core program were started and completed, it is held in the following fields, see table 2.

Both the event log and transect log are checked and validated using RTMS GPS package developed by Andy Barker which plots the planned cruise track of the ship and the actual cruise track of the ship. The position information held in the event log and transect log is plotted in RTMS GPS and the actual cruise track is overlaid, and subsequently any discrepancies can be identified.

Recommendations (Top of Section) (Main Contents)

To integrate the SCS system into an underway data management system and subsequently store the ASCII files the PESTO data structure. With this implementation, the web based data mining tool that is being developed for PESTO could be implement on the ship wide network. This will allow easier access by the ships' scientific personal to the underway data.

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Appendices

Crew List

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Scientific Party (Top of Section) (Main Contents)

Name	Work	Position
Jeremy Robst	BAS	ITS

Vsevolod Afanasyev	BAS	ETS
Nathan Cunningham	BAS	PSO

Ship's Company (Top of Section) (Main Contents)

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Web page construction: Nathan Cunningham

Last edited: 28th October 2001