

*RRS James Cook*

## **Cruise JC086**

Glasgow to Glasgow  
**Extended Ellett Line**

6<sup>th</sup> May 2013 > 26<sup>th</sup> May 2013

C. R. Griffiths (SAMS) & N. P. Holliday (NOCS) et al.



SCOTTISH  
ASSOCIATION  
*for* MARINE  
SCIENCE

Scottish Marine Institute  
Oban, Argyll, PA37 1QA, Scotland

Tel: [+44] (0)1631 559000

Fax: [+44] (0)1631 559001

[www.sams.ac.uk](http://www.sams.ac.uk)

## Summary

This report describes the events that occurred during JC086, a joint SAMS/NOCS cruise on the *RRS James Cook* that sailed from Glasgow on the 6<sup>th</sup> May and returned to Glasgow on the 26<sup>th</sup> May during 2013. The principle objective of the cruise was to undertake the sampling of the Extended Ellett Line (EEL), an annual section of CTD and bio-chemical hydrographic stations that runs from the Sound of Mull via Rockall to Iceland.

The Extended Ellett Line is funded by NERC under the National Capability Program.

More information on the history and findings of the Extended Ellett Line can be found at:- <http://projects.noc.ac.uk/ExtendedEllettLine/>.

The principle activities undertaken were:-

- 1) Undertake the annual routine CTD & nutrients section along the Extended Ellett line between Scotland and Iceland via Rockall.
- 2) Recover the ADCP mooring on the Wyville Thomson Ridge and undertake supporting CTD observations in the vicinity of the mooring.
- 3) Deploy four ARGO floats along the transect.
- 4) Undertake a number of epibenthic sled tows in the vicinity of Station M.
- 5) Recovery a mooring from the Mingulay reef site in the Minch.
- 6) Deploy two Slocum Gliders in UK waters in support of FASTNet.

Additional measurements were:-

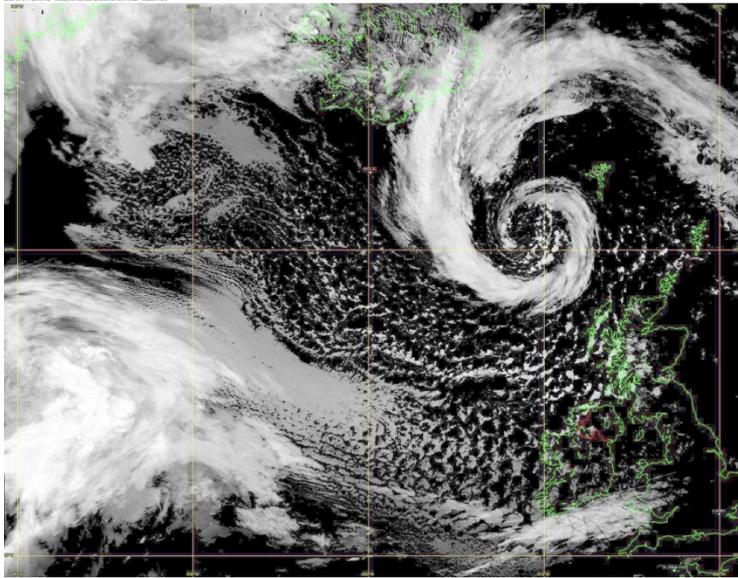
- 1) VM-ADCP & L-ADCP.
- 2) POC, O<sub>2</sub>, Chl, <sup>13</sup>C, DIC, pH &  $\delta^{18}\text{O}_w$ .
- 3) Stand alone pumps (SAPs) on selected CTD stations.
- 4) Underway Surfmet.

This was a successful cruise, with one exception (5) all objectives were fulfilled despite the unseasonal weather.

Data from this cruise will be banked with the British Oceanographic Data Centre (BODC – <http://www.bodc.ac.uk>), either directly after the cruise, or when they are processed/calibrated, as appropriate.

## Acknowledgements

JC086 was a successful trip with all but one objective met (5) despite some challenging weather. At times it was hard to believe this was a May trip. A number of storm systems passed through the NE Atlantic during the month.



Satellite image from the 13<sup>th</sup> May 2013.

We would like to thank the Master, John Leask, for all his support during the trip. We would also like to thank all the ship's crew for their professionalism, patience and good humour. The skill of the bridge officers, the engineers, the catering staff and the ABs was very much appreciated.

Special thanks to the NMF-SS technicians who sailed on JC086. The skill, support & patience of John Wynar, Martin Bridger and Sam Ward was also much appreciated.

Thanks also to the shore side team who helped with the planning of JC086, in particular we would like to thank both John Short & Jane Thompson.

We would also like to thank all the scientific party for their constant support during the trip. Special thanks to Abby Bull (BODC) & Estelle Dumont (SAMS) for ensuring that the log keeping of all events was maintained throughout the trip.

Special thanks to Brian King for setting up the Sun workstation prior to sailing.

# JC086 Cruise Report

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## 1 Introduction

### 1.1 JC086 Personnel List

#### JC086 – Officers & Crew

1	LEASK	JOHN ALAN	Master
2	WARNER	RICHARD ALAN	C/O
3	GRAVES	MALCOLM HAROLD	2/O
4	MUNRO	PAUL GRAHAM	3/O
5	PARKINSON	GEORGE GRANT	C/E
6	KEMP	CHRISTOPHER MARTIN	2/E
7	MURREN	MICHAEL GERARD	3/E
8	BENNETT	ALEXANDER	3/E
9	ULBRICHT	SEBASTIAN MARTIN	ETO
10	ROGERS	MARK ALAN	ETO
11	McDOUGALL	PAULA ANNE	PCO
12	HARRISON	MARTIN ANDREW	CPOS
13	ALLISON	PHILIP	CPOD
14	SMITH	PETER	CPO
15	GREGORY	NATHANIEL JAMES	SG1A
16	DEAL	RICHARD	SG1a
17	OSBORNE	ADAM VICTOR MURRAY	SG1A
18	HOPLEY	JOHN	SG1A
19	CONTEH	BRIAN	ERPO
20	HAUGHTON	JOHN	H/Chef
21	LINK	WALTER JOHN THOMAS	Chef
22	ROBINSON	PETER WAYNE	Stwd
23	PIPER	CARL	A/Stwd

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### JC086 – Scientific Personnel

24	GRIFFITHS	COLIN RICHARD	PSO
25	SMALLEY	CLAIRE EMILY	Scientist
26	ABELL	RICHARD EDWARD CHARLES	Scientist
27	ABERNETHY	COLIN	Scientist
28	BEATON	JOHN	Scientist
29	BRAND	TIM DAVID	Scientist
30	BULL	ABIGAIL JAYNE	Scientist
31	CLARKE	JENNIFER SARAH	Scientist
32	DUMONT	ESTELLE	Scientist
33	XIANGBO	FENG	Scientist
34	FOTI	GIUSEPPE	Scientist
35	GRAVELLE	ANDREW DAVID CHARLES	Scientist
36	HOLLIDAY	NAOMI PENNY	Scientist
37	JOHNSON	CLARE LOUISE	Scientist
38	KATARZYNA	KENITZ MALGORZATA	Scientist
39	LAMONT	PETER ALBERT	Scientist
40	MARZOCCHI	ALICE	Scientist
41	MENZEL BARRAQUETA	JAN LUKAS	Scientist
42	SERPETTI	NATALIA	Scientist
43	MOGG	ANDREW	Scientist
44	BRIDGER	MARTIN JOHN	SST
45	WYNAR	JOHN BASIL	ST
46	WARD	SAM JAMES	ST

## JC086 Cruise Report

### 1.2 Chronology/Narrative

<b>Date</b>	<b>Activity</b>	<b>Narrative</b>
06/05/2013	On passage to Glider deployment site	Sailed from Glasgow
07/05/2013	Deployed Slocum s/n 345 & shakedown CTD at launch site	Fine conditions, no issues with glider deployment or first CTD of the trip. Forecast not looking good, major storm brewing.
08/05/2013	Wyville Thomson mooring recovered. Started CTD section across the gully S355>S350.	Decision taken to head North ahead of the approaching storm. Plan now is to complete the Wyville Thomson work and then start the EEL from the Iceland end.
09/05/2013	No station work	Steaming for shelter off the Icelandic coast.
10/05/2013	CTDs IB22>IB18S	Commenced the EEL as soon as conditions allowed. Some issues with the CTD winch system during IB22S.
11/05/2013	CTDs IB17>IB16(SAPs)	Continuing down the line, SAPs deployed @ IB16. Conditions deteriorating, run for shelter.
12/05/2013	CTD IB19S(SAPS)	IB19S occupied again, this time with SAPs. Only one station worked today, awaiting calmer conditions before re-joining the line.
13/05/2013	No activity due to weather	See satellite image on Page 2
14/05/2013	CTDs & ARGO float IB15>IB14	Work commenced on the line just before breakfast. First ARGO float deployed @ IB15.
15/05/2013	CTDs IB13>IB12	Problems encountered again with the CTD winch system.
16/05/2013	CTDs & ARGO floats IB12>IB10(SAPs)	Continued with the CTD transect. ARGO floats deployed @ IB12 & IB10.
17/05/2013	CTDs IB8>IB4(SAPS)	Continued with the CTD transect. SAPS deployed @ IB4.
18/05/2013	CTDs IB3>E	Making good progress along the line. Reached Rockall @ ~1300Z.
19/05/2013	CTDs & SAPS	Now into Rockall Trough, work progressing well. SAPS deployed @

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	F>L	Station H.
20/05/2013	CTDs & ARGO M>R1	Work progressing well. We deployed the last APEX float @ M. Working intermediate stations between P & R.
21/05/2013	CTD & Epibenthic Sled R&M	Completed Station R in the early hours and then returned to Station M to commence the epibenthic sled work.
22/05/2013	CTD & Epibenthic Sled M	Completed last of 4 epibenthic sled tows and then deployed the SAPs @ Station M.
23/08/2013	CTDs 1G>7G	Wind freshening again. CTD completed @ 1G and then waited for conditions to improve before heading back out along the line. 4G skipped.
24/08/2013	CTDs & attempted Mooring recovery 8G>L6A	Worked out along the line. Broke off after 10G to recover Mingulay mooring. CTD first but no joy recovering the mooring. The Acoustic Release was vertical but despite numerous attempts the release failed to release the anchor. 11G was skipped and then continued along the line.
25/08/2013	CTDs & Glider deployment L6>L5	Completed the L line and then returned to original launch site. Slocum S/N 304 (Ammonite) was deployed. Final activity was a CTD alongside launch position.
26/08/2013	Disembarkation	Glasgow

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## 1.3 Cruise Track

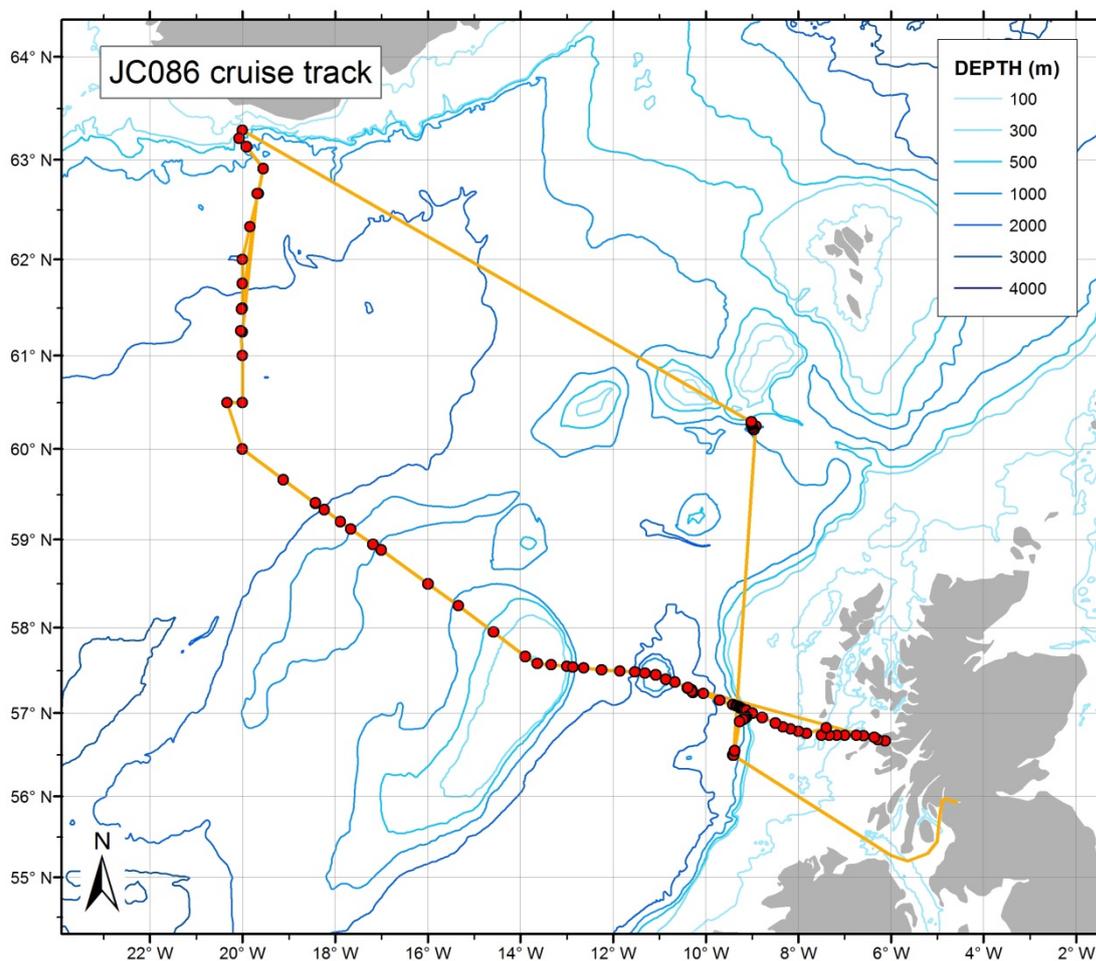


Figure 1.1 JC086 Cruise Track

The bathymetry is reproduced from GEBCO Sheet G.02 assembled by Peter M. Hunter, Southampton Oceanography Centre, U.K., from bathymetric charts compiled at the Institute of Oceanographic Sciences, Wormley, Surrey, U.K., and extracted from the GEBCO Digital Atlas published by the British Oceanographic Data Centre on behalf of the IOC and IHO, 2003.

# JC086 Cruise Report

## 1.4 Scientific Personnel & Malcolm



**2 NMFSS Operations Report**  
JOHN WYNAR (NOCS)

**2.1 CTD System Configuration**

The initial sensor configuration was as follows:

- Sea-Bird *9plus* underwater unit, s/n: 09P-0943
- Frequency 0 - Sea-Bird 3 Premium temperature sensor, s/n: 03P- 2674
- Frequency 1 - Sea-Bird 4 conductivity sensor, s/n: 04C-2231
- Frequency 2 - Digiquartz temperature compensated pressure sensor, s/n: 110557
- Frequency 3 - Sea-Bird 3 Premium temperature sensor, s/n: 03P - 4782
- Frequency 4 - Sea-Bird 4 conductivity sensor, s/n: 04C-2450
- V0 - Sea-Bird 43 dissolved oxygen sensor, s/n: 43-2055
- V1 - Free
- V2 - Free
- V3 - Free
- V4 - CTG transmissometer, s/n: 09-7107-001
- V5 - CTG Aquatracka MKIII fluorimeter, s/n: 088195
- V6 - WETLabs turbidity sensor, s/n: BBRTD-168
- V7 - Tritech PA200 altimeter, s/n: 6196.112522

Ancillary instruments & components:

- Sea-Bird *11plus* deck unit, s/n: 11P-24680-0587
- Sea-Bird 24-position Carousel, s/n: 32-31240-0423
- 24 x Ocean Test Equipment 10L water samplers, s/n's: 1 through 24
- TRDI WHM 300kHz LADCP, s/n: 15288

## CTD Operations

There were 81 individual CTD casts were made including a test cast. The “config” file for the first cast (i.e. JC086\_001.XMLCON) has an incorrect coefficient for the oxygen sensor (s/n: 43-2055) and so the default should be used (JC086\_ss.xmlcon). Log sheets were scanned and included with the data from this cruise.

The pressure sensor was located 33cm below the bottom and approximately 70cm below the centre of the 10L water sampling bottles.

The configuration file used for all casts was JC086\_ss.xmlcon.

CTD wire 1 was used throughout the cruise as it was the newest of the two CTD wires available (having been run on in October 2012). Despite this, it soon became apparent that all was not well with the wire and it began to “unwrap” after just a few CTD casts. Hence, after cast 7 over 330m of wire was run off the winch and cut before the wire was observed to return to a relatively tight lay. Whenever the wire was seen to be twisting, it was unshackled from the CTD frame and the wire manually untwisted. However, by cast 18 yet another section of wire had unravelled prompting a further 130m to be cut off and re-terminated. After load testing, the wire was streamed to a depth of 2000m using a steel weight. Unfortunately, on recovery slack along the run allowed the wire to jump off a traction winch sheave causing damage and necessitating a further 30m of wire to be removed and yet another re-termination. From that time on, the wire was streamed to depth using a weight whenever it was deemed prudent to do so.

### *Sensor Failures*

After casts 9 and 10 when the altimeter was found to be not functioning, the Trittech altimeter was finally replaced after cast 10 with a Benthos 916 unit, s/n: 413.

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## CTD configuration details

Initially, the following config file was used:-

Instrument configuration file: C:\Program Files\Sea-Bird\SeasaveV7\JC86\JC086\_ss.xmlcon

Configuration report for SBE 911plus/917plus CTD

-----  
Frequency channels suppressed : 0  
Voltage words suppressed : 0  
Computer interface : RS-232C  
Scans to average : 1  
NMEA position data added : Yes  
NMEA depth data added : No  
NMEA time added : No  
NMEA device connected to : deck unit  
Surface PAR voltage added : No  
Scan time added : No

### 1) Frequency 0, Temperature

Serial number : 03P-2674  
Calibrated on : 6 July 2012  
G : 4.35679460e-003  
H : 6.42315076e-004  
I : 2.35280318e-005  
J : 2.31639641e-006  
F0 : 1000.000  
Slope : 1.00000000  
Offset : 0.0000

### 2) Frequency 1, Conductivity

Serial number : 04C-2231  
Calibrated on : 6 July 2012  
G : -1.07744670e+001  
H : 1.69583460e+000  
I : -2.75293888e-003

## JC086 Cruise Report

J : 3.10502906e-004  
CTcor : 3.2500e-006  
CPcor : -9.57000000e-008  
Slope : 1.00000000  
Offset : 0.00000

### 3) Frequency 2, Pressure, Digiquartz with TC

Serial number : 110557  
Calibrated on : 29 May 2012  
C1 : -6.010548e+004  
C2 : -1.565601e+000  
C3 : 1.823090e-002  
D1 : 2.668300e-002  
D2 : 0.000000e+000  
T1 : 3.020528e+001  
T2 : -6.718318e-004  
T3 : 4.457980e-006  
T4 : 1.203850e-009  
T5 : 0.000000e+000  
Slope : 0.99998000  
Offset : -0.22270  
AD590M : 1.280700e-002  
AD590B : -9.299640e+000

### 4) Frequency 3, Temperature, 2

Serial number : 03P-4782  
Calibrated on : 6 July 2012  
G : 4.34994588e-003  
H : 6.36545555e-004  
I : 2.09399238e-005  
J : 1.77830113e-006  
F0 : 1000.000  
Slope : 1.00000000  
Offset : 0.0000

### 5) Frequency 4, Conductivity, 2

Serial number : 04C-2450

## JC086 Cruise Report

Calibrated on : 8 May 2012

G : -1.04295882e+001

H : 1.66046823e+000

I : -1.09902347e-003

J : 2.09983568e-004

CTcor : 3.2500e-006

CPcor : -9.57000000e-008

Slope : 1.00000000

Offset : 0.00000

### 6) A/D voltage 0, Oxygen, SBE 43

Serial number : 43-2055

Calibrated on : 27 June 2012

Equation : Sea-Bird

Soc : 3.60000e-001

Offset : -7.01700e-001

A : -2.36690e-003

B : 7.10770e-005

C : -1.52550e-006

E : 3.60000e-002

Tau20 : 2.01000e+000

D1 : 1.92634e-004

D2 : -4.64803e-002

H1 : -3.30000e-002

H2 : 5.00000e+003

H3 : 1.45000e+003

### 7) A/D voltage 1, Free

### 8) A/D voltage 2, Free

### 9) A/D voltage 3, Free

### 10) A/D voltage 4, Transmissometer, Chelsea/Seatech/WET Lab CStar

Serial number : 09-7107-001

Calibrated on : 11 June 2012

M : 23.7954

B : -0.1452

# JC086 Cruise Report

Path length : 0.250

11) A/D voltage 5, Fluorometer, Chelsea Aqua 3

Serial number : 088195

Calibrated on : 21 August 2012

VB : 0.612800

V1 : 1.973000

Vacetone : 0.635000

Scale factor : 1.000000

Slope : 1.000000

Offset : 0.000000

12) A/D voltage 6, Turbidity Meter, WET Labs, ECO-BB

Serial number : BBRTD-168

Calibrated on : 24 September 2012

ScaleFactor : 0.003764

DarkVoltage : 0.070000

13) A/D voltage 7, Altimeter

Serial number : 6196.112522

Calibrated on : 13 March 2006

Scale factor : 15.000

Offset : 0.000

Scan length : 37

## Data Processing

Post-processing the CTD cast data was basically to guidelines established with BODC (ref. Moncoiffe 7<sup>th</sup> July 2010), but for scientific reasons the Filter, Loop Edit, Derive, and Wild Edit routines were not used.

## 2.2 Salinity measurement

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A Guildline Autosol 8400B salinometer, s/n: 60839, was used for salinity measurements. The salinometer was sited in the Electronics Workshop, with the bath temperature set at 21°C, the ambient temperature being approximately 20°C. A bespoke program written in Labview called “Autosal” was used as the data recording program for salinity values.

Salinity samples were taken and analysed from cast 1 up to and including cast 61, the results being tabulated in a spreadsheet JC86\_SAL.XLS. When these results are compared with the Seabird 9plus sensors, it can be seen that cast 59 is anomalous. This may be due to contamination from either the water sampler bottles not sealing or poor sampling protocols, or errors made during the analysis. There were a few other samples with large errors but if these outliers are removed the resulting table (JC86\_SAL\_1.xlsx) gives a better summary of the performance of the conductivity sensors. From this it can be seen that the average primary error is -0.0011 but the average secondary error is just -0.0003. The secondary sensor is more precise due to its location outside the bulk of the frame on the vane.

### 2.3 TRDI LADCP Configuration

The TRDI WHM 300kHz LADCP (s/n: 15288) was deployed in a downward-looking orientation on the CTD frame. Battery voltage could be monitored as the cable was not diode protected. The instrument was configured to ping at intervals of one second, use 16 bins, a blanking distance of 5m and a depth cell size of 10m thus yielding a range of approximately 165m in ideal conditions. The ambiguity velocity was set to  $250 \text{ cms}^{-1}$  and pings per ensemble to 1.

Built-in pre-deployment tests (*PA and PT200*) were run before each cast, and then the following command file sent (*F2*):

*Master command file (WHM\_JC86.txt)*

```
PS0
CR1
CF11101
EA00000
EB00000
ED00000
ES35
EX11111
EZ0011101
WM15
LD111100000
LF0500
LN016
LP00001
LS1000
LV250
LW1
SM1
SIO
SA001
SW05000
TE00:00:01.00
TP00:01.00
CK
CS
```

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### *Deployment Comments*

Each deployment BBtalk terminal session was logged to a file (*F3*) of the form: *JC86\_XXX.txt*, where *XXX* is the CTD cast number. Downloaded data files were re-named to be of the form: *JC86\_XXXM.000*.

The real-time clock of the LADCP was checked prior to deployment (*TS?*) and re-synchronised with the ship's GPS clock if it was more than a few seconds in error. The time difference was written on the log sheet.

Paper log sheets were used for all casts, the LADCP file number being defined by the CTD cast number. These were also scanned and available in electronic format.

There were no LADCP files recorded for casts 59 to 74 inclusive.

### **2.4 Stand Alone Pumps (SAPs)**

Five SAPs were used during the cruise, s/n's: 02-03, 03-01, 03-02, 03-04 and 03-07 and a total of eight deployments. All except s/n: 03-02 were fitted with the new type timer boards which were programmed via a serial port. SAP s/n: 03-02 had an original timer board which was programmed using on-board switches. A full summary of the operation of the SAPs is tabulated in *JC086\_SAP\_log.docx*.

During the first few deployments using all five units, only the uppermost SAP's filter was not torn. In an attempt to prevent this a makeshift one-way valve was produced comprising of the "finger" of a latex glove cable-tied to the exhaust port of the SAP, the other open end held shut by the rigidity of electrical tape (the one-way valve). When the SAP was not pumping, the tape held the latex tube shut, but once pumping began the water pressure easily overcame the rigidity of the tape and opened the valve. This system prevented back-flushing from tearing the fragile filters.

After the first four deployments (the fourth being a test), only units s/n: 03-01, 03-02 and 03-04 were used. The reduced pumping times of the SAPs may be due to low voltage "troughs" causing the new type timers to prematurely shut-down the pumps and requires further investigation.

### 3 CTD Data Processing

Penny Holliday, NOCS, Southampton

#### 3.1 SBE Data processing

##### Preparation at the start of the cruise

The following steps were taken:

- SBE output variables selected: it is essential that the output variables include scan and pressure temperature. Variables selected for output on JC086 were:

```
# name 0 = timeS: Time, Elapsed [seconds]
# name 1 = depSM: Depth [salt water, m]
# name 2 = prDM: Pressure, Digiquartz [db]
# name 3 = t090C: Temperature [ITS-90, deg C]
# name 4 = t190C: Temperature, 2 [ITS-90, deg C]
# name 5 = c0mS/cm: Conductivity [mS/cm]
# name 6 = c1mS/cm: Conductivity, 2 [mS/cm]
# name 7 = sal00: Salinity, Practical [PSU]
# name 8 = sal11: Salinity, Practical, 2 [PSU]
# name 9 = sbeox0V: Oxygen raw, SBE 43 [V]
# name 10 = sbeox0Mm/Kg: Oxygen, SBE 43 [umol/Kg]
# name 11 = sbeox0ML/L: Oxygen, SBE 43 [ml/l]
# name 12 = xmiss: Beam Transmission, Chelsea/Seatech/WET Labs CStar [%]
# name 13 = flC: Fluorescence, Chelsea Aqua 3 Chl Con [ug/l]
# name 14 = turbWETbb0: Turbidity, WET Labs ECO BB [m^-1/sr]
# name 15 = altM: Altimeter [m]
# name 16 = scan: Scan Count
# name 17 = ptempC: Pressure Temperature [deg C]
# name 18 = pumps: Pump Status
# name 19 = latitude: Latitude [deg]
# name 20 = longitude: Longitude [deg]
# name 21 = flag: 0.000e+00
```

- Oxygen hysteresis correction: decide whether to use the SBE oxygen hysteresis correction using standard parameters, or whether to derive your own. Look at options in the SBE data conversion program: it is here that the hysteresis correction is applied and you can uncheck that option. Make sure that mstar script **moxy\_02b** is edited to match your requirement.

##### • SBE Data Processing

On the CTD logging computer, the SBE Data Processing software was used for initial processing when the cast was finished, by running the following:

**Data Conversion** to convert the raw frequency and voltage data to engineering units as appropriate by applying the manufacturer's calibrations stored in the CON file and save both downcast and upcast to an ASCII format file. Can include hysteresis correction using SBE parameters; on JC086 this option was on.

**Align CTD** to align the oxygen sensor in time relative to pressure. A value of 6 was used.

**Cell Thermal Mass** to correct the pressure and conductivity . The SeaBird recommended settings of  $\alpha = 0.03$  and  $1/\beta = 7.0$  were used on both primary and secondary conductivities.

Output File: **JC86\_NNN\_actm.cnv**

All raw, bottle and processed data files were placed on the cookfs server (/mnt/cookfs/Specific\_Equipment/CTD/ ) ready for mstar processing.

### 3.2 MSTAR Data Processing

The CTD stations were processed using NOC Matlab-based MSTAR processing routines.

#### • Preparation at the start of the cruise

The following steps were taken:

- Create symbolic links to the cookfs data directories from /data/ctd/ASCII\_FILES, for use in **ctd\_linkscript**

**ln -s /mnt/cookfs/Specific\_Equipment/CTD/'Processed data'/ cookfspro**

**ln -s /mnt/cookfs/ Specific\_Equipment/CTD/'Raw data'/ cookfsraw**

- Edit **ctd\_linkscript** to pick up the files using the symbolic links, check format of lines that extract information from SBE filenames to create the standard mstar names. The script only picks up data files not already copied to the ASCII\_FILE directory.

- Edit the list of variable names that you require for your sample file. This will vary from cruise to cruise depending on which samples are being collected. The list of variables is contained in the file **/data/templates/sam\_jc086\_varlist.csv**.

- Create a template csv file in which you will input information about bottle firing, ready for pasting into the master sample file later. It is useful to create a blank master file with all bottles set to flag 2 (No problems noted), to be edited after each cast when bottles are either not fired (flag 9), or dont trip correctly (flag 4) etc.

File: **/data/ctd/ASCII\_FILES/bot\_jc086\_001.csv**.

• **ctd\_linkscript** was used to copy the data from the ship's network drive to the NOCS Sun workstation NOSEA1. The files are copied with their original names, then a symbolic link created for each one with the name in the format expected by standard mstar scripts.

• MatLab was opened and '**m\_setup**' run to setup the environment for mexec processing.

The MSTAR processing was split into several phases. '**ctd\_all\_part1**' included the following:

• **msam\_01** creates an empty sam file sam\_jc086\_NNN.nc (make sure that the list of variable contains the expected channels);

• **mctd\_01** reads in 24Hz CTD data into ctd\_jc086\_NNN\_raw.nc;

• **mctd\_02a** renames SeaBird variable names in ctd\_jc086\_NNN\_raw.nc ;

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- **mctd\_02b** carries out oxygen hysteresis correction using SBE default parameters or users preferred parameters (edit as appropriate, check it matches your decision for SEBE data processing). Creates ctd\_jc086\_NNN\_24hz;

On JC086 the hysteresis correction was mistakenly applied twice on ctd casts 1 to 57; in datconv and in mctd\_02b. This was later corrected by the use of:

**mctd\_02\_oxy\_hyst\_reverse.m.** Input ctd\_jc086\_NNN\_raw.nc, output ctd\_jc086\_NNN\_raw\_o2reverse.nc

**mctd\_02b** with no correction applied. Input ctd\_jc086\_NNN\_raw.nc or ctd\_jc086\_NNN\_raw\_o2reverse.nc, output ctd\_jc086\_NNN\_24hz

For ctd casts 58 onwards, the correction was only applied in datcnv.

- **mctd\_03** averages data to 1Hz (output to ctd\_jc086\_NNN\_1hz.nc) and calculates derived variables (output to ctd\_jc086\_NNN\_psal.nc);
- **mdcs\_01** creates empty dcs file which will store information about start, bottom and end of good data in CTD file;
- **mdcs\_02** populates dcs file with data to identify bottom of cast.

- **mdcs\_03g** allows the user to decide which scan numbers mark the start of the downcast and the end of the upcast. This is a graphical interface. The start of the downcast was selected to be the lowest pressure after the CTD had soaked and been brought to the surface before descending. The end of the downcast was selected as the last scan for which there was good in-water oxygen, temperature, conductivity and salinity data (note that oxygen data becomes out-of-water before the other variables because the different sensor response times). Output to dcs\_jc086\_nnn.nc.

Phase 3 routines grouped under '**ctd\_all\_part2**' ran the following:

- **mctd\_04** extract downcast data from psal file using index information from dcs file; sort, interpolate gaps and average to 2db (output to ctd\_jc086\_NNN\_2db.nc);
- **mdcs\_04** merge positions of start, bottom and end cast from navigation file into dcs file;
- **mfir\_01** read in information from SeaBird .bl file and create netCDF fir file;
- **mfir\_02** merge time from ctd file onto fir file using scan number (output to fir\_jc086\_NNN\_time.nc);
- **mfir\_03** merge CTD upcast data onto fir file;
- **mfir\_04** paste CTD fir data into sam file and output to sam\_jc086\_NNN.nc;
- **mwin\_01** creates win file which will hold winch data and extracts times from start and end of 1Hz ctd file;
- **mwin\_03** merge winch wire out data onto fir file;
- **mwin\_04** paste winch fir data into sam file;

At this point the data were examined using some scripts to generate standard plots:

- **mctd\_checkplots** and **mctd\_rawshow** generate a series of plots of raw, 1hz and 2db data. mctd\_checkplots allows a series of previous casts to be plotted also. The plots were examined for data quality.
- **mctd\_rawedit** is a graphical interface that allows the user to manually select bad data cycles in temp, cond and oxygen. Preserves original raw file as ctd\_jc086\_nnn\_raw\_original.nc and outputs new file ctd\_jc086\_nnn\_raw\_cleaned.nc. The

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cleaned file is linked by a new symbolic link called `ctd_jc086_nnn_raw.nc` so that following scripts work on the cleaned version if it exists.

The editing is done on the raw data file so that edits are preserved throughout all derived files. So after the edits are finished, the derived files need to be re-generated. This is done in steps `mctd_02b`, `mctd_03`, `mctd_04`, `mfir_03`, `mfir_04`. These scripts can be run manually or using **`smallscript.m`** (check and edit this first).

- **`list_ctd_1hz(nnn)`** generates an ascii listing of the 1hz file ready for use in the LADCP processing. Each file was saved in `/data/ctd` and a symbolic link created to it from the LADCP directory (`/data/ladcp/ix/data/CTD/`)
- **`mbot_01.m`** takes bottle firing quality flags manually set in `bot_jc086_001.csv`. Output: `bot_jc086_nnn.nc`.
- **`mbot_02.m`** pastes the bottle firing codes into `sam__jc086_nnn.nc`

Towards the end of the cruise the header information for the various CTD data files was updated through the following steps:

- **`mdep_01.m`** requires a matlab file (**`station_depth_jc086.mat`**) containing water depth in variable 'bestdeps'. On JC086 this information came from the LADCP data files where it existed, or from the bathymetry file (saved as ascii file **`ctd_depths.csv`**). Where there was neither LADCP or bathymetry data (one station) the depth was left as NaN. `mdep_01.m` pastes this information into headers of all CTD files.
- **`mdcs_04.m`** takes the lat and lon from the navigation (**`pos_jc086_01`**) at the time of start, bottom and end of each cast and pastes into **`dcs_jc086_nnn_pos.nc`**.
- **`mdcs_05.m`** pastes the lat and lon for the bottom of the cast into the headers of all CTD files.

### 3.3 Water Bottle Sample Data Processing

The aim of the sample data processing is to create a master sample data file (**`sam_jc086_nnn.nc`**, initially created by `msam_01` in `ctd_all_part1.m`) which is populated with CTD firing data, sensor data, and subsequently the water sample data as they become available. The CTD winch, firing and sensor data are pasted into the sam file during `ctd_all_part2.m` described above. This section describes how the water sample data were processed. All sample data need to be first saved in ascii csv files; mstar scripts read the ascii files and create an equivalent netcdf file (the '\_01' scripts), and pastes data from the nc file into `sam_jc086_nnn.nc` (the '\_02' scripts).

#### • Preparation at the start of the cruise

The key decisions at the start of the process involve settling on a consistent and suitable format for the ascii files; the mstar scripts need to be checked and edited so that they work on the same format. Changes to the number of variables or the number of rows in the ascii file mid-cruise will cause problems. Some columns in the ascii files need to have a particular format (as below). Absent data should be -999, flag values for bottles not sampled should be 9, not -999. Sample data were flagged according to WOCE standard flags given in the GO-SHIP Repeat Hydrography manual (<http://www.go-ship.org/HydroMan.html>).

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- **Salinity:** ascii files **sal\_jc086\_nnn.csv**. Edit the salinometer spreadsheets so that there are 10 lines of header information, one file per cast. The first column of data takes the form **ctdnnn\_xxx**, where **nnn** is station number and **xxx** is salinity bottle number. Last column of data (**sampnum**) needs to be added in the form **nnnbb** where **nnn** is cast number and **bb** is niskin bottle number. Standard Seawater samples are best given sample number 999001 onwards so that they can be recognised as SSW in later scripts. This file preparation was done manually on JC086.

**msal\_01.m** reads the ascii file into matlab and saves as **sal\_jc086\_nnn.nc**. The script asks the user for the salinometer bath temperature (21°C on JC086) and for the conductivity ratio offset to be applied to create a new adjusted salinity variable. The offset is derived from the SSW samples run through the salinometer. On JC086 an offset of zero was used for all casts, until the end of the cruise when the salinometer performance was assessed using **evaluate\_standards.me** (see below). **msal\_01.m** and **msal\_02.m** were then re-run for all casts (and TSG bottle samples) using the derived offset (-0.00003).

**msal\_02.m** pastes the bottle salinity into **sam\_jc086\_nnn.nc**.

- **Oxygen:** ascii files **oxy\_jc086\_nnn\_noc.csv** and **oxy\_jc086\_nnn\_sams.csv**. Usually there would be one oxygen ascii file per cast, but on JC086 we had data from two groups that we wanted to be able to compare. Both sets of files were prepared in the same way, with header lines and a range of columns of data. The first columns in both sets were: bottle number (**bb**), station number (**nnn**), sample number (**86nnnbb**).

**moxy\_01\_sams** reads the SAMS ascii file into matlab and saves as **oxy\_jc086\_nnn\_sams.nc**

**moxy\_02\_sams** pastes the bottle oxygens into **sam\_jc086\_nnn.nc**.

**moxy\_01\_noc** reads the NOC ascii file into matlab and saves as **oxy\_jc086\_nnn\_noc.nc**

**moxy\_02\_noc** pastes the bottle oxygens into **sam\_jc086\_nnn.nc**.

On JC086, oxygen data from both groups were re-read into **oxy** and **sam** files a number of times as a result of errors in the data files that became apparent after comparison of the to datasets.

**msam\_oxykg\_jc086** calculates bottle oxygen in units of  $\mu\text{mol/kg}$  (using CTD salinity and bottle oxygen fixing temperature. Output variables: **botoxysams** and **botoxynoc**  
**sam\_jc086\_nnn.nc**.

- **Nutrients:** ascii files **nut\_jc086\_nnn\_noc.csv** and **nut\_jc086\_nnn\_sams.csv**. Usually there would be one nutrient ascii file per cast, but on JC086 we had data from two groups that we wanted to be able to compare. Both sets of files were prepared in the same way, with header lines and a range of columns of data. The first columns in both sets were: bottle number (**bb**), station number (**nnn**), sample number (**86nnnbb**). The data columns differed between the two groups. The SAMS nut files included chlorophyll and phaeophytin data. The nutrient data themselves were not ready during the cruise but will be processed after the cruise at NOC.

**mnut\_01\_sams** reads the SAMS ascii file into matlab and saves as **nut\_jc086\_nnn\_sams.nc**

**mnut\_02\_sams** pastes the bottle data into **sam\_jc086\_nnn.nc**

**mnut\_01\_noc** reads the NOC ascii file into matlab and saves as **nut\_jc086\_nnn\_noc.nc**

**mnut\_02\_noc** pastes the bottle data into **sam\_jc086\_nnn.nc**

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- **mapend.m** as bottle data were pasted into the sample files they could be examined collectively by appending all `sam_jc086_nnn.nc` to create **sam\_jc086\_all.nc**. This program is rather slow, so if a small number of cast files had been modified, the script **msam\_updateall.m** could be used.
- **msam\_02**: generates residuals between bottle and CTD sensor data at firing time, but was not typically used on JC086.
- **data evaluation**: there are mstar scripts that provide useful figures for evaluating data.
  - **ctd\_evaluate\_sensors.m** conductivity and salinity data can be examined in groups of primary or secondary sensors, or a second group of those if a sensor was changed during the cruise, or there was an apparent calibration shift at any point. The script generates plots of residuals against time, pressure etc to allow the user to get a sense of how the sensors are behaving. Needs editing for each cruise to define the groups.
  - **evaluate\_standards.m** uses a small text file of the standards sample number and conductivity ratio (`sal_jc086_standards`). On JC086 `sal_jc086_standards` was edited by hand, but it can also be generated by the use of **msal\_get\_standards.m** which is more convenient if there are a lot of standard samples. `evaluate_standards` generates a plot of the adjustment indicated by the samples to the Guideline Ratio of the SSW batch. The script can be edited to account for more than one batch of SSW used during the cruise. The figure allows the user to look for drift in the salinometer over time and to decide on an appropriate offset to use in **msal\_01.m**. The performance of the salinometer is shown in Figure 3.1.

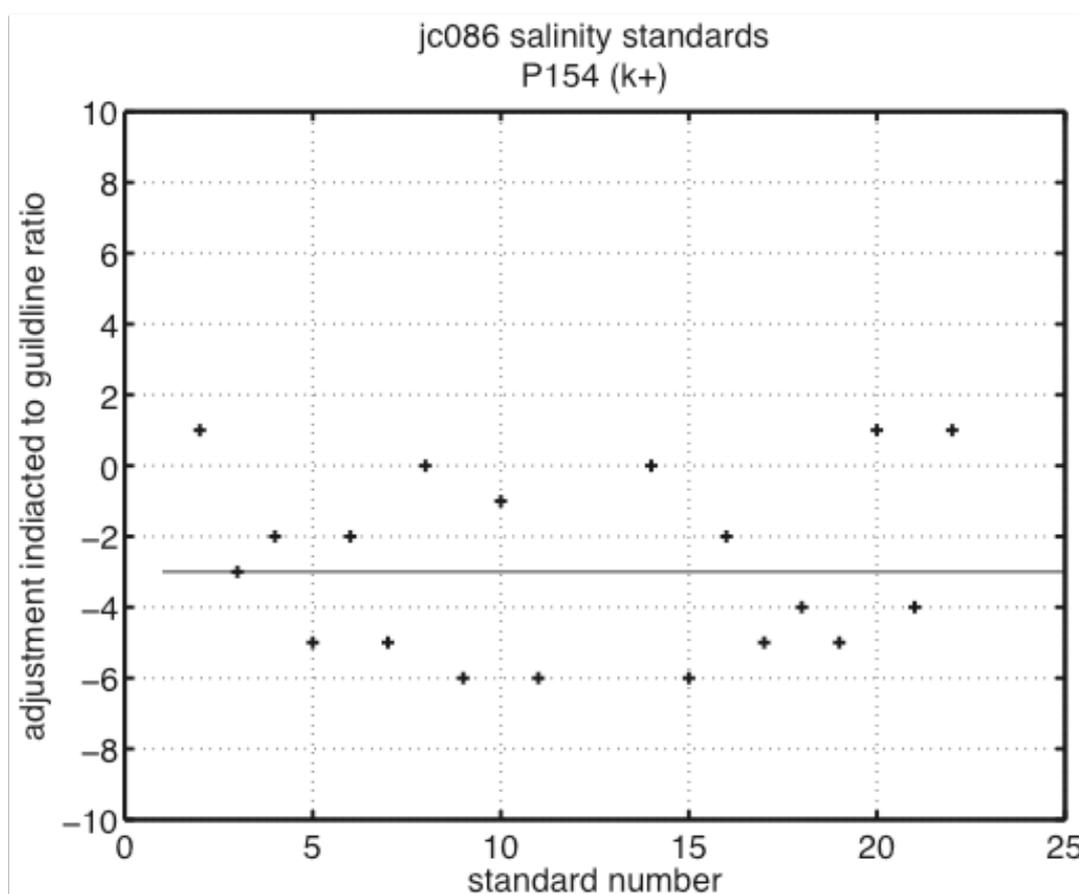


Figure 3.1, Salinometer performance as indicated by the standard seawater (SSW) bottles run at the start and end of crates of salinity samples. The variable plotted is the difference between the salinometer reading and the SSW ratio of the batch (listed on the bottle) ( $\times 10^{-5}$ ). Horizontal line indicates the  $-0.00003$  adjustment applied to the bottle salinity samples.

### 3.4 Conductivity Sensor Calibrations

Once all the salinity bottle data have been pasted into the sample files, and the individual station sample files had been appended as described above (creating sam\_jc086\_all), the data were used to examine the performance of the CTD conductivity sensors. The primary and secondary sensor pairs were treated separately. The bottle salinity data were used to calculate bottle conductivity and this was compared to the CTD conductivity (Figure X2). Both sensors show a change in calibration over time, with an apparent drift around CTD numbers 16-19. There was a 3 day break between CTD 16 and 17 which is the likely cause of the change, so the stations were put into 2 groups for conductivity calibration purposes(1:16 and 17:81, noting that salinity samples were not collected for the shallow on-shelf stations at the end of the cruise).

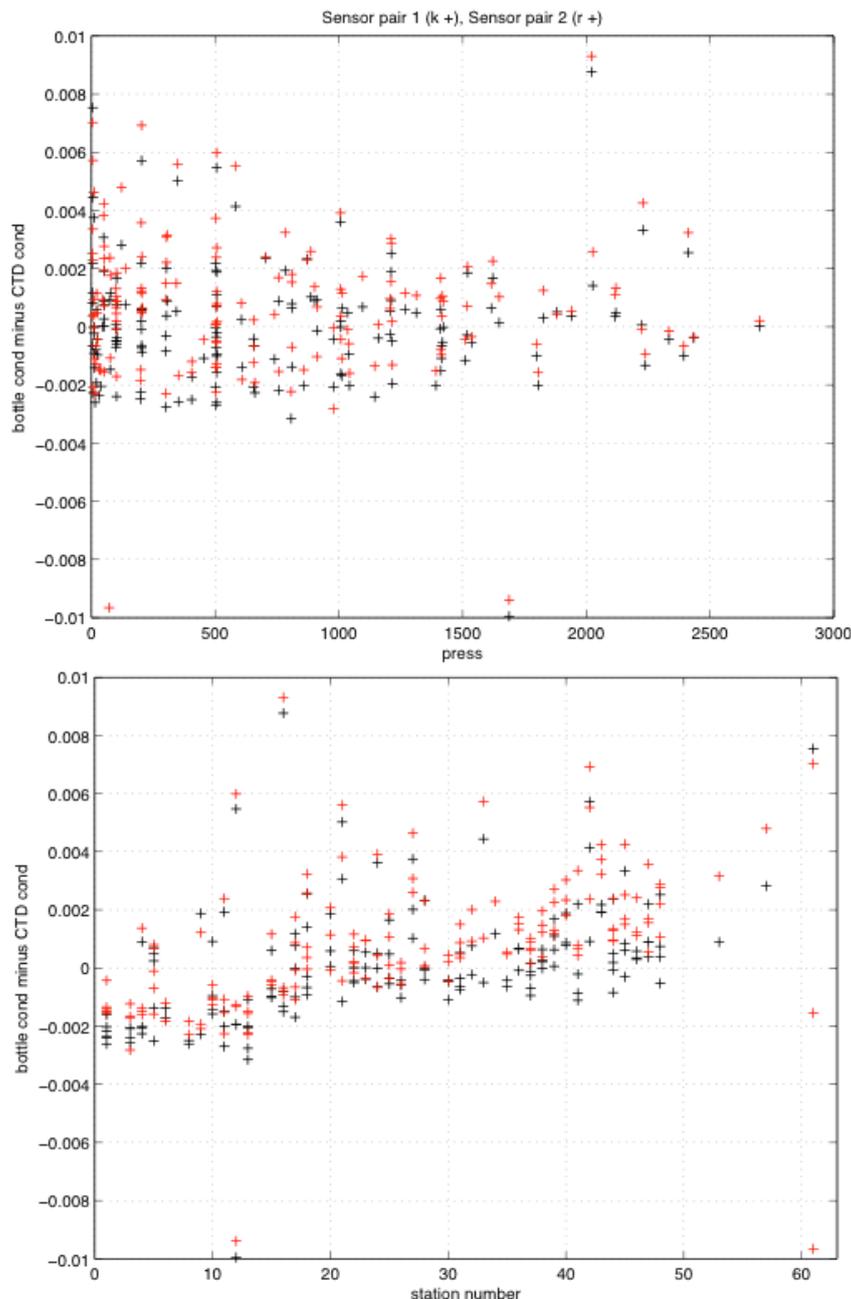


Figure 3.2. Conductivity residuals (bottle minus CTD) before calibrations. Black crosses are for primary sensor pair (in-frame), red crosses are for secondary sensor pair (on fin, preferred data stream), all samples shown.

The statistics for the conductivity residuals for groups A and B, and sensor pairs 1 and 2 are given in Table 3.1. There are few deep stations on the Extended Ellett Line, so in order to get calibration information over a wide range of salinity, data from all depths were considered at first, though the results from data deeper than 1000 dbar were given greater weight if they were notably different. There was no detectable additional drift with pressure or time so simple offset calibration parameters were derived. Outliers (unreliable samples) were defined

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as those falling outside of  $\pm 1$ sd of the mean of all samples in each group, or  $\pm 2$  sd of the deep samples in each group.

Table 3.1. Before calibrations: conductivity residuals (bottle minus CTD). Values in bold are those used as calibration offsets.

		All depths excl. outliers		Deep samples excl. outliers	
<b>Group</b>	<b>Sensor</b>	<b>mean</b>	<b>sd</b>	<b>mean</b>	<b>sd</b>
A (1:16)	1	<b>-0.0013</b>	0.0016	<b>-0.0013</b>	0.0009
A (1:16)	2	<b>-0.0008</b>	0.0014	<b>-0.0008</b>	0.0008
B (17:81)	1	0.0011	0.0054	<b>0.0007</b>	0.0019
B (17:81)	2	0.0020	0.0050	<b>0.0013</b>	0.0020

- **mctd\_condcal:** used to apply these calibrations to the CTD files (**ctd\_jc086\_nnn\_24hz**). After calibrations have been applied, subsequent steps need to be repeated (**mctd\_03**, **mctd\_04**, **mfir\_03**, **mfir\_04**) this was done by editing and running **smallscript.m**.

After this process is complete, the sample files contained the calibrated CTD conductivity and salinity data, the sample files were re-appended, and new salinity residuals calculated. The mean of all salinity residuals for secondary sensor pair (the preferred data stream) was 0.0109, standard deviation 0.0671. Excluding outliers, defined as  $\pm 1$  sd from the mean, the mean of salinity residuals was 0.0004, standard deviation 0.0049 (Figure 3.3).

The relatively high scatter of the samples, even at depths where salinity gradients tend to be low (Figure 3.3) indicates that the quality of salinity sampling was not high on JC086. The consequence of the quality of sampling, as well as a shortage of deep samples, is that the quality of the sensor calibration is not as good as it might be. This issue needs to be addressed on future Extended Ellett Line cruises.

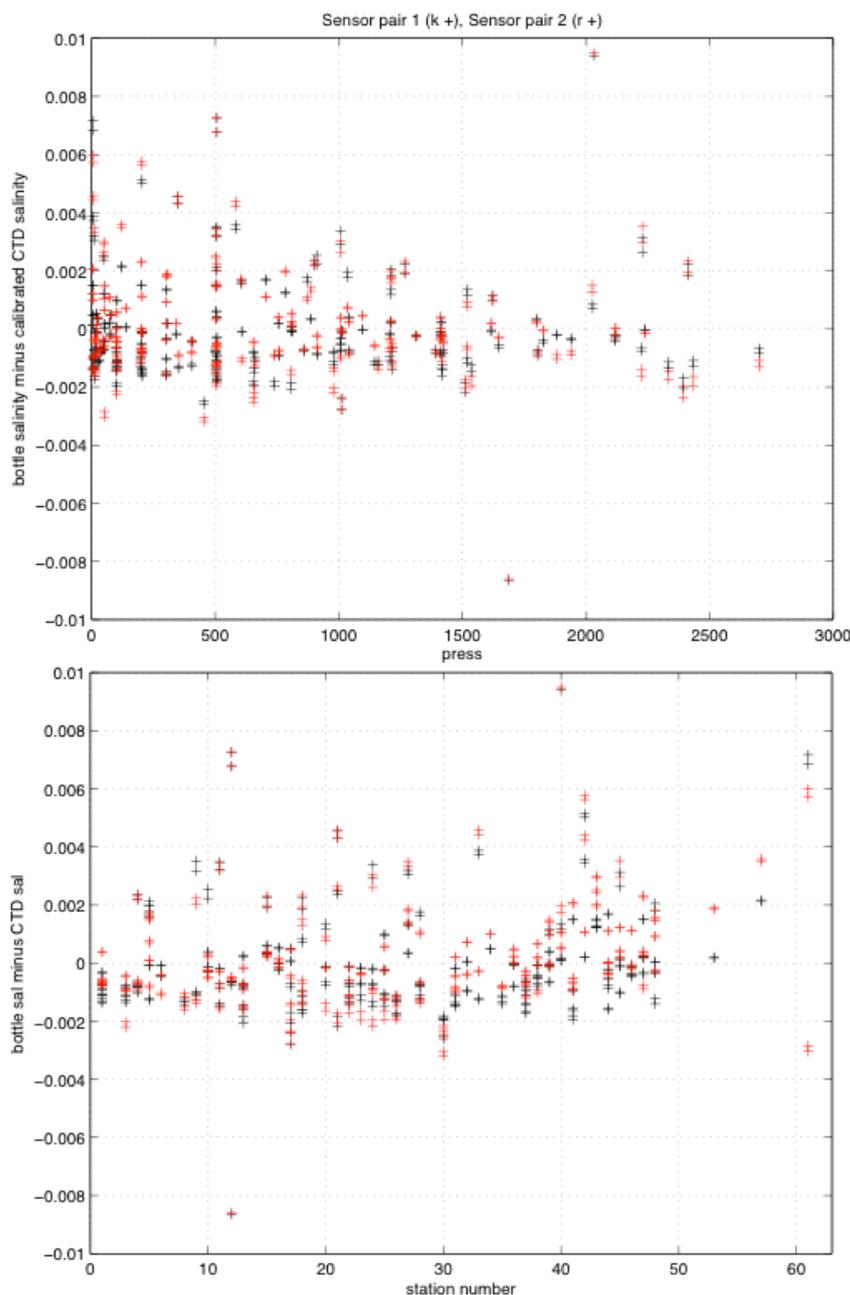


Figure 3.3. Salinity residuals (bottle minus CTD) after conductivity calibrations. Black crosses are for primary sensor pair (in-frame), red crosses are for secondary sensor pair (on fin, preferred data stream), all samples shown.

### 3.5 Oxygen Sensor Calibration

Once all the oxygen bottle data have been pasted into the sample files, and the individual station sample files had been appended as described above (creating sam\_jc086\_all), the data were used to examine the performance of the CTD oxygen sensor. First the relationship between the bottle oxygen and CTD oxygen was examined (bottle sample units were

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converted to  $\mu\text{mol/kg}$  using the calibrated CTD salinity). Data from the NOC and SAMS chemists were initially examined as separate groups, as part of the inter-group comparison during the cruise (Figure 3.4). The two groups sampled different niskins from the same casts, often, but not always, fired at the same depths. The NOC group sampled more bottles than the SAMS group (Figure 3.4).

Although there is a small offset between the NOC and SAMS samples, there is no way of knowing which has higher accuracy, so for calibration of the CTD sensor we use all available samples (Figure 3.5). The process is to calculate an initial fit to the data, which might be linear or quadratic, then apply further temperature- and/or pressure-dependent corrections to the residuals. For the JC086 data, a linear initial fit was not improved by attempting a quadratic fit, so the linear fit shown in Figure 3.5 was applied to the CTD data. The figure also shows the pressure dependency of the initial residuals, and the linear fit used to attempt to correct it. The shortage of samples from deeper than 1000 dbar made this correction rather uncertain.

- **mctd\_oxycal:** used to apply these calibrations to the CTD files (**ctd\_jc086\_nnn\_24hz**). After calibrations have been applied, subsequent steps need to be repeated (**mctd\_03**, **mctd\_04**, **mfir\_03**, **mfir\_04**) this was done by editing and running **smallscript.m**. All **sam\_jc086\_nnn** files were re-appended to create a new version of **sam\_jc086\_all.nc** that contained the calibrated CTD conductivity, salinity and oxygen.

Figure 3.6 shows the residuals after the calibrations had been applied. The mean of all oxygen residuals was  $0.2 \pm 7.8 \mu\text{mol/kg}$ , and excluding outliers the mean was  $1.0 \pm 5.1 \mu\text{mol/kg}$ . The quality of the sampling was high on JC086, but the small number of deep samples mean that the quality of the sensor calibration is rather uncertain. This issue needs to be addressed on future Extended Ellett Line cruises.

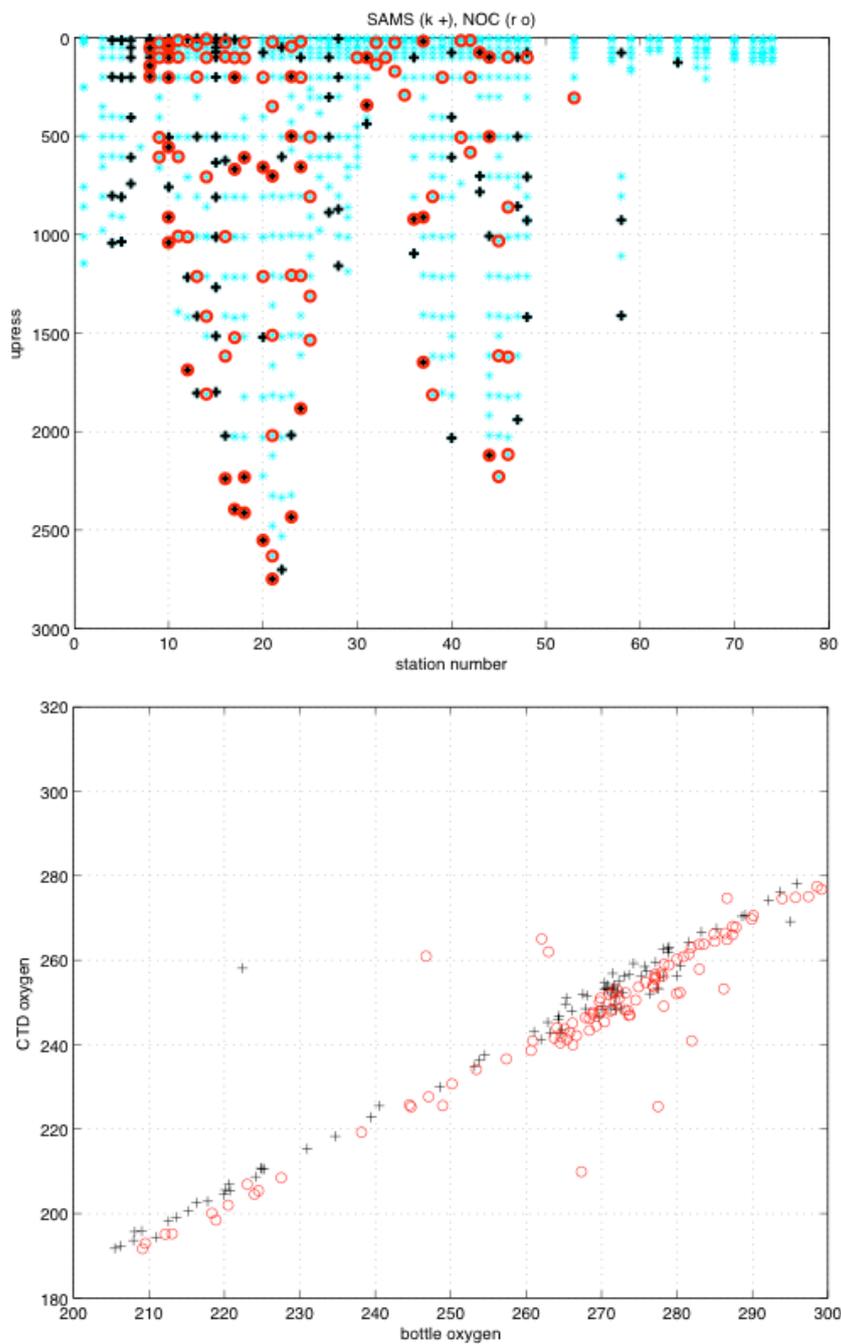


Figure 3.4 Oxygen bottle sampling distribution (top panel) and uncalibrated CTD oxygen vs bottle oxygens (units are  $\mu\text{mol/kg}$ ). Red circles are NOC samples, black crosses are SAMS samples, cyan asterisks in top panel show depths of all bottle firings.

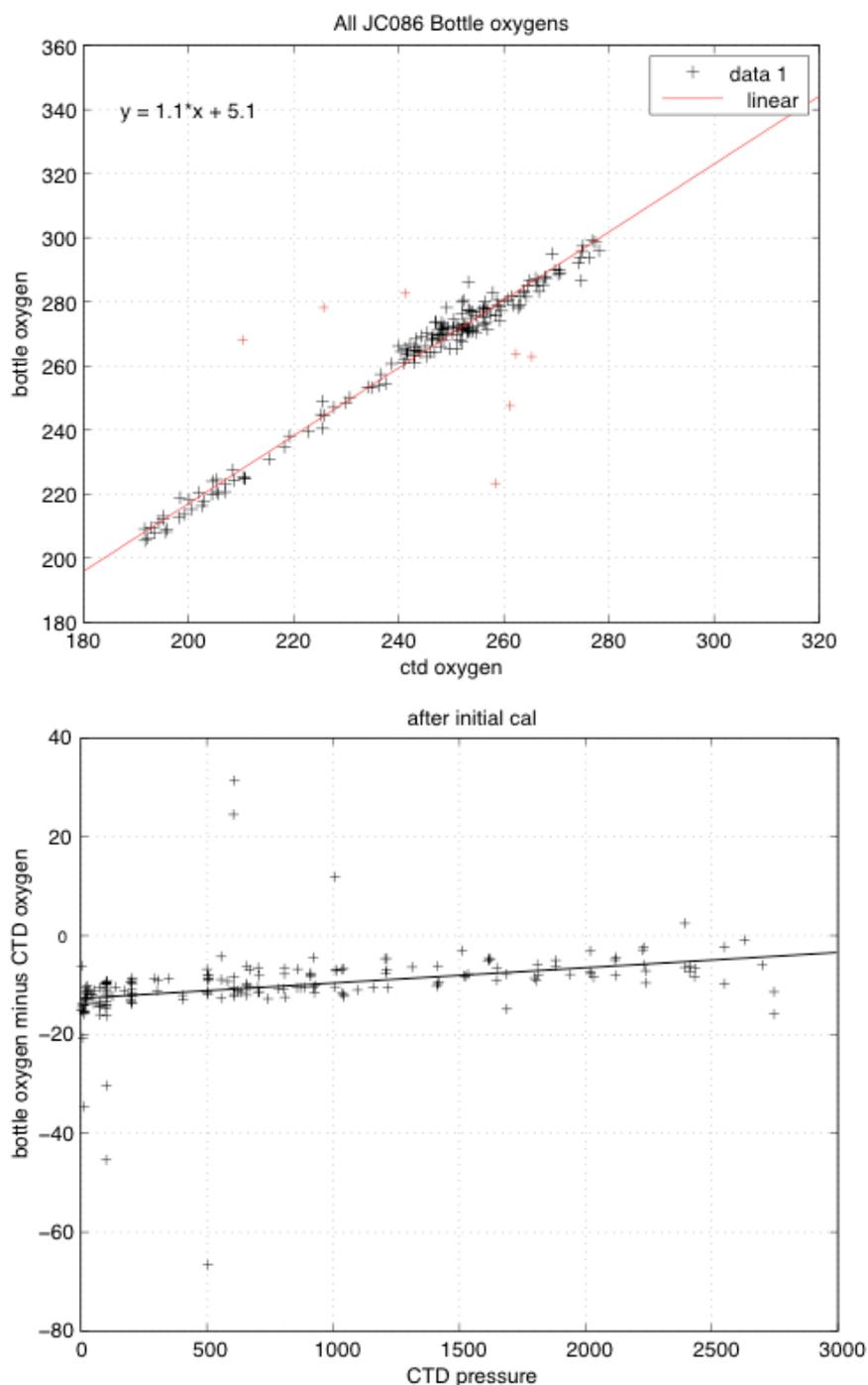


Figure 3.5. Top panel: bottle and CTD oxygen data before sensor calibrations, all samples, linear relationship derived after outliers excluded (defined as  $\pm 2$  sd of mean of residuals, shown in red). Bottom panel: bottle minus CTD oxygen after the initial linear fit has been applied, showing pressure dependency. Straight line is the pressure correction subsequently applied to sensor data.

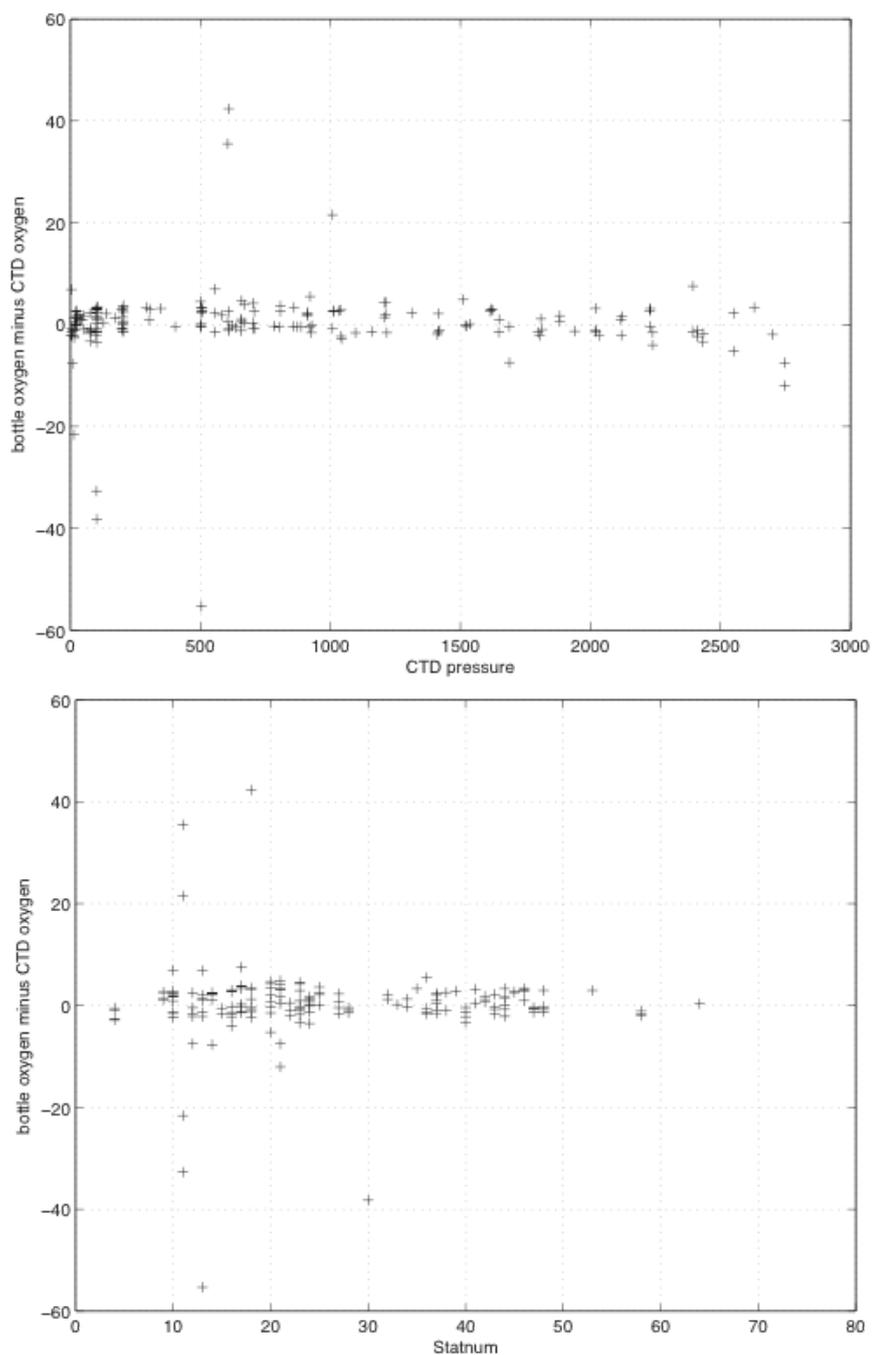


Figure 3.6. Oxygen residuals (bottle minus CTD) after sensor calibrations.

#### 4. VMADCP processing

Penny Holliday (NOCS) and Alice Marzocchi(University of Bristol)

The Cook has two vessel mounted ADCPs; the 150kHz and the 75kHz, both installed on the drop keels. On JC086 only the 75 kHz instrument was operational; the 150kHz ADCP had failed during JC085 and had been removed for repair.

Data were gathered and processed following established protocols described in many previous cruise reports.

##### 4.1 Configuration

Os75: 50 \* 16m bins; 8m blank; ED00069 (6.9m transducer depth for keels up); initially EA00000 (0 degree offset), later set to EA00900, 9 degree offset, see table 4.1).

Command files were prepared for BT on and off, before leaving Govan.

##### 4.2 Outputs

Data were logged to the ADCP PC. These were automatically transferred to cookfs on a regular schedule. Data were therefore available on cookfs for processing shortly after file dataset number was closed and the next in sequence started. File names are shown in table 4.1.

Output files are of the form:

- .N1R (NMEA telegram + ADCP timestamp; ASCII)
- .ENR (Beam co-ordinate single-ping data; binary). These two are the raw data, saved to both disks
- .VMO (VmDas configuration; ASCII)
- .NMS (Navigation and attitude; binary)
- .ENS (Beam co-ordinate single-ping data + NMEA data; binary)
- .LOG (Log of ADCP communication and VmDas error; ASCII)
- .ENX (Earth co-ordinate single-ping data; binary). This is read by matlab processing
- .STA (Earth co-ordinate short-term averaged data; binary)
- .LTA (Earth co-ordinate long-term averaged data; binary).
- .N1R and .ENR files are saved to the secondary file path and can be reprocessed by the software to create the above files.

## 4.3 CODAS/Hawaii processing

The data were processed using the CODAS software. The processing route can be summarised as copying the raw files, converting them into a working format, merging navigation data, deriving velocities, quality control, and conversion of data to matlab and netcdf files. Calibration information can be obtained after several water and bottom-track data files have been processed; calibration can be performed at any time during the cruise or left until the end.

While the ship is steaming, the main signal that the ADCP instrument records is the ship speed. 12 knots (6 m/s) is 1-2 orders of magnitude greater than the water velocity. This velocity is removed using GPS derived ship velocities but there is clearly the potential for a significant error associated with this process as the output data is the small difference between two large numbers. To address this, the velocity of the bottom can be measured and compared directly to the GPS velocity of the ship. This should give the amplitude error for the ADCP and the misalignment with the ship heading. This only works in water where the bottom track ping can reach the sea bed – 800 m or shallower. In deeper water the processing uses changes in the ship velocity to assess what proportion of the ship velocity is contaminating the calculated water velocity. This calculation necessarily invokes assumptions that the true water velocity is relatively constant in space (if slowing down) or time (if turning round) and is therefore considered less precise than bottom tracking. A large number of water track data were collected during JC086, from slowing down and speeding up from stations.

Each daily file was approximately 24 hours long (JDAY range and start and end times are recorded in Table 4.1). Note that JDAY on the system corresponds to our DOY minus 1, and that this software sometimes outputs a decimal day, calculated from time in seconds since the start of the year.

Below is a summary of the initial processing steps that need to be setup:

a) Created once at start of cruise

```
~/data/vmadcp/jc086_os75
```

```
~/data/vmadcp/jc086_os75/rawdata
```

b) For dataset NNN (where NNN is the file number, as they appear in Table 4.1) copy raw data files (ENX, N1R, etc) from /mnt/data/cruise/jc086/current/adcp into:

```
/local/users/pstar/jr265/data/vmadcp/jrCCC_os75/rawdata
```

File names have the format: OS75\_JR265NNN\_000000.ENX

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NNN increments each time the ADCP logging is re-started. Data logging was generally stopped and started once every day. The 000000 increments each time a new file is started, when the previous one reaches 100 Mb. All raw files are automatically transferred to:

/mnt/data/cruise/jcr/current/adcp

### 4.4 Filenames on the PC

Due to operator error in loading the command files, the filenames on the ADCP PC got in a right old muddle in the first few days, with two sets of incrementing filenames (BTonNNN and BToffNNN) and some being recorded in another cruise directory with the same filenames as those in the JC086 directory. This problem was resolved by renaming the filenames for processing through the use of symbolic links (see Table 4.1). Additionally, there was a mixture of files with Alignment Angle (EA) set to zero, or set to 9° (the transducer is offset by 9° and setting EA=9 means that the real-time on-screen data displayed is accurate).

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Processing Number	PC file number	Start DOY and time	End DOY and time	Notes
no data	BTon008	126 not noted	126 19:08	BT, EA=0, No data
no data	BTon009	126 not noted	126 19:17	BT, EA=0, No data
011	BTon010	126 20:00	127 08:20	<b>BT, EA=0</b>
012	BToff014	127 08:21	127 14:56	WT, EA=0
013	BToff015	127 not noted	127 17:00	WT, EA=0
no data	BToff016	127 17:00	127 17:11	WT, EA=9 no data
015	BTon011	127 17:11	127 22:49	<b>BT, EA=9</b>
no data	jc83/BToff014	127 22:49	127 23:05	WT, EA=0 no data
no data	jc83/BToff015	127 23:05	127 23:14	WT, EA=0 no data
018	jc83/BToff016	127 23:14	128 07:27	WT, EA=0
019	jc83/BToff017	128 07:27	128 08:47	WT, EA=0
020	JC086020	128 08:53	129 08:23	WT, EA=9
021	JC086021	129 08:24	130 06:32	WT, EA=9
008	JC086008	130 06:33	130 10:44	<b>BT, EA=9</b>
022	JC086022	130 10:45	131 09:28	WT,EA=9
023	JC086023	131 09:29	132 10:57	WT,EA=9
024	JC086024	132 10:57	133 08:30	WT,EA=9
025	JC086025	133 08:14	134 10:25	WT,EA=9
026	JC086026	134 10:25	136 10:03	WT,EA=9
027	JC086027	136 10:03	137 07:28	WT,EA=9
009	JC086009	137 07:29	137 14:21	WT,EA=9
028	JC086028	137 14:21	138 08:50	WT,EA=9
029	JC086029	138 08:50	139 17:33	WT,EA=9
030	JC086030	139 17:33	140 17:30	WT,EA=9
031	JC086031	140 17:30	141 17:02	WT,EA=9
032	JC086032	141 17:02	142 16:47	WT,EA=9
033	JC086033	142 16:47	144 01:27	WT,EA=9
034	JC086034	144 05:12	145 08:52	WT,EA=9

**Table 4.1.** ADCP filenames (original and for processing purposes). All times are GMT.

### 4.5 Processing steps

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1) Symbolic links were made in each rawNNN directory to ensure the correct data were used (all original files were copied to /rawdata).

2) Copy data from the ship server:

```
cd data
```

```
cd v75
```

```
vmadcp_linkscript
```

*This redistributes raw data from rawdata to rawdataNNN; rawdataNNN is automatically created if necessary (may need to edit movescript so that it parses the file names correctly).*

*The script also copies data that is still being collected, creating a new incomplete rawdataNNN directory, but if a directory is already present it does not get updated with new data. To copy the most up to date data (once the logging has been restarted) it is necessary to remove the previously created directory before running 'vmadcp\_linkscript'.*

3) Create a new directory containing all the output files:

```
adctree.py jc086NNNnbenx --datatype enx
```

*Note "nb" for narrowband ping, and that the -- datatype has two dash characters.*

*On several occasions, the processing failed at the first attempt at running 'quick\_adcp', with the error message suggesting the script was looking for a program in a JC069 directory (see /v75/file18\_error.txt for an example). The solution was to delete the entire jc086NNNnbenx directory and re-create with "adctree". The cause of this episodic error is unknown.*

4) Copy calibration files:

```
cd jc086NNNnbenx
```

```
cp ../q_py.cnt .
```

Generally, only the dbname and datadir for each NNN need to be updated.

An example q\_py.cnt file is

```
# q_py.cnt is
```

```
## comments follow hash marks; this is a comment line
```

```
--yearbase 2013
```

```
--dbname jc086001nnx
```

```
--datadir /local/users/pstar/cruise/data/vmadcp/jc086_os75/rawdata001
```

```
#--datafile_glob "*.LTA"
```

```
--datafile_glob *.ENX
```

```
--instname os75
```

## JC086 Cruise Report

```
--instclass os
--datatype enx
--auto
--rotate_angle 0.0
--pingtype nb
--ducer_depth 5
#--verbose
# end of q_py.cnt
# end of q_py.cnt
```

At the start of the cruise check yearbase, dbname, os75 or os150 and datatype enx (glob ENX). dbname should be of form jc086NNNPTT where P is n for narrowband, b for broadband. The instrument should be operated in narrow unless there is a good reason to choose broad. TT is “nx” for ENX; “ns” for ENS; “nr” for ENR; “lt” for LTA; “st” for STA. Standard processing is to process ENX. As far as I can tell, dbname must not exceed 11 chars. So if we use 9 for jc086NNNn, there are only two left to identify ENX, ENS, LTA, STA.

Table 4.2 lists some of the calibrations obtained from bottom-tracking or water-tracking. Each daily file was approximately 24 hours long (when restarting was possible). A couple of files are longer (about 2 days).

File NNN	BT/WT	Amp Median	Mean	sd	Phase Median	Mean	sd	ncols
011	BT	1.0008	1.0006	0.0036	-9.0940	-9.0918	0.1500	121
013	WT	1.0039	1.0041	0.0017	-9.0579	-9.0701	0.1624	21
015	BT	1.0052	1.0052	0.0013	-0.0788	-0.0844	0.0858	59
008	BT	1.0080	1.0081	0.0041	0.0454	0.0722	0.2953	12

**Table 4.2** *Calibrations*

We decided to go with a calibration of:

Amplitude = 1.0030, Phase = -9.086 for EA=0, and -0.086 for EA=9

(averages of files 011 and 015)

Two calibration files were produced. Copy the appropriate one into the directory:

```
cp ../q_pyrot_1.cnt . (EA=0)
```

or

## JC086 Cruise Report

**cp ../q\_pyrot\_2.cnt . (EA=9)**

5) Still in directory /jc086NNNnbenx, apply the bottom track or water track calibration:

**quick\_adcp.py --cntfile q\_py.cnt**

*("killed matlab engine" is the normal message received).*

*This takes a minute or two per 24 hours of ENX data. Note --cntfile has two dash characters*

6) To see the BT (bottom track) or WT (water track) calibration, look at the ascii output of jc086001nbenx/cal/\*/\*out (note that a calibration is not always achieved, for example if the ship has made no manoeuvres while the ADCP is in water tracking mode, so there may be no \*out file). Note also that additional calibration information maybe saved after flags applied after gautoedit process.

7) To access data in Matlab type in the command line:

**>> m\_setup**

**>> codaspaths**

8a) Can manually clean up data by applying flags to suspected bad data cycles (this can be done post-cruise, i.e. omitted, go straight to step 8b). This step can also be a useful first look at the data. Note that the uncalibrated files may show a slight bias in u and/or v, which will appear as stripes that coincide with periods of on-station and steaming. This effect will disappear when you correct for the amplitude and phase error (step 8b).

**>> cd edit**

**>> gautoedit**

Clean up data. Select day and step to view, then "show now". "show now" may have to be done twice to get the surface velocity plot. "show next" to step through the file. "Del bad times" sets "bad" flags for a section of time, or for a whole profile. "rzap" allows single bins to be flagged. Note that "list to disk" must be clicked each time for the flags to be saved.

Applying edits identified in gautoedit, The gautoedit process in Matlab sets flags, but does not change the data.

To apply the flags and recalculate a calibration:

**quick\_adcp.py --cntfile q\_pyedit.cnt**

*Note two dashes before cntfile.*

Where q\_pyedit.cnt contains

# q\_pyedit.cnt is

## comments follow hash marks; this is a comment line

## JC086 Cruise Report

```
--yearbase 2013
--steps2rerun apply_edit:navsteps:calib:matfiles
--instname os75
--auto
```

```
# end of q_pyrot.cnt
```

It took us a while to understand that the JDAY on the plots was our DOY minus 1 - at first we suspect an error in time. Also it took a while to realise we needed to alter the time step and to tick the list of figures, then "show now" in order to get plots up on the screen.

8b) Still in directory /jc086NNNNbenx, apply the final calibration ONLY ONCE (adjustments are cumulative, so if this step is done twice, the cal is applied twice) when you have done the edits and applied the time-varying heading adjustment. After inspecting the cal out files, and deciding what the amplitude and phase of the calibration should be:

**quick\_adcp.py --cntfile q\_pyrot\_1.cnt (or --cntfile q\_pyrot\_1.cnt)**

*Note two dashes before cntfile..*

q\_pyrot.cnt contains:

```
# q_pyrot.cnt is
```

```
## comments follow hash marks; this is a comment line
```

```
--yearbase 2013
```

```
--rotate_angle -9.086 (q_pyrot_1.cnt) or --rotate_angle -0.086 (q_pyrot_2.cnt)
```

```
--rotate_amp 1.0030
```

```
--steps2rerun rotate:navsteps:calib
```

```
--auto
```

```
# end of q_pyrot.cnt
```

Final calibration values used were those given by the JR265 Bottom Track data.

9) To get data into MSTAR:

Still in directory /jc086NNNNbenx open Matlab window and type into command line:

```
>> mcod_01
```

## JC086 Cruise Report

*Produces output file os75\_jr265NNNnnx.nc, which has a collection of variables of dimensions Nx1 1xM NxM*

>> **mcod\_02**

*Will calculate water speed and ship speed and get all the variables onto an NxM grid.*

10) Append individual files using:

>> **mcod\_mapend**

*This script will append individual files to create a single cruise file. It does seem to depend on the files having the same bin number and bin depths.*

*The new .nc file needs to be manually added to the 'nc\_files' text file, which contains a list of all the processed ones.*

11) Create .mat files to re-process CTD stations:

>> **mcod\_03**

>> **mcod\_stn\_out('ctd',nnn,75)**

*Where nnn is the CTD cast number. This will generate the .mat files in:*

*~/data/vmadcp/jc086\_os75*

12) Create symbolic links to the .mat files in /ladcp/ix/data/SADCP with the format 'os75\_jc086\_ctd\_nnn.mat'.

These final steps make data available for comparison with LADCP data (the .mat files are automatically picked up by the 'process\_cast' script). An example of a reprocessed cast is given in Figure 1.

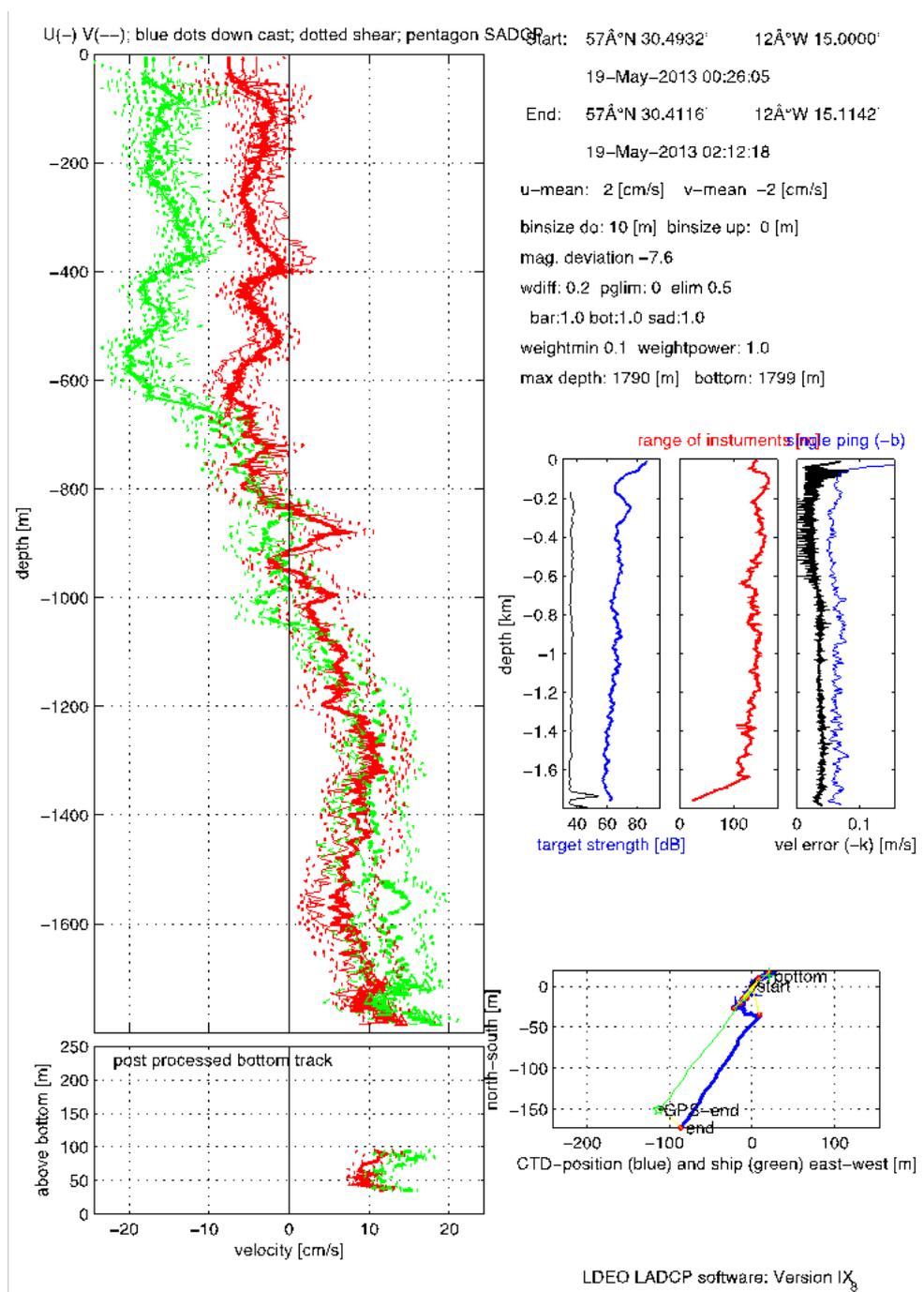
### 4.6 Final remarks

After some hiccups with the initial setup and processing of the VMADCP system, good quality data have been obtained for the whole duration of JC086. VMADCP data were not recorded until 7 pm on 6<sup>th</sup> May due to operator error, and most of it was also lost throughout that day. Data acquisition proceeded smoothly from 11 pm on 27<sup>th</sup> May 2013 onwards. However, no data were collected between 1.30 and 5 am on 24<sup>th</sup> May 2013 due to system failure (system froze and watch-keepers did not restart it for a few hours).

VMADCP and LADCP data have been integrated for the CTD casts where both were available. Only VMADCP and no LADCP has been collected for stations 1G, 2G, 3G, 5G, 6G, 7G, 8G, 9G, 10G, Mingulay, 12G, 13G, 14G, 15G, S, and T.

Two different alignment angles have been used during the first few days (EA= 0, EA=9). A final value of EA=9 has been used consistently since 8.30 am on 29<sup>th</sup> May 2013.

# JC086 Cruise Report



**Figure 4.1.** Example of good quality LADCP data from cast 038 during JC086, where data has been reprocessed after CTD and VMADCP processing.



## 5 LADCP data processing

Penny Holliday(NOCS) and Alice Marzocchi (University of Bristol)

### 5.1 Introduction and Data Processing

Data from the LADCP instrument was processed as soon as possible between stations to allow early detection of any problems with the ADCP workhorse. Instructions are given below for initial LADCP processing during JC086.

Bold text denotes commands to enter at the X-window/terminal prompt. '>>' preceding bold text indicates commands to be entered in the Matlab window. Notes are in italics.

a) Move to the appropriate location on the Unix system and create a new directory for each CTD cast (cast numbers are given as nnn). Now copy raw LADCP data and log files from cookfs\_ladcp on to NOSEA1:

**cd data**

**cd ladcp/ix/data/raw**

**mkdir nnn**

**cp cookfs\_ladcp/\*nnn\* nnn**

b) Create a symbolic link to the data file, using the required filename convention:

**cd nnn**

**ln -s JC086\_nnnM.000 nnnDL000.000**

*Different users downloaded the data, so the raw data file naming convention has varied slightly. However, the symbolic links have all been created following the nnnDL000.000 naming format.*

*The correct creation of the link can be checked by typing **ls -ltr**, which will show its existence and which file it is linked to. This will also denote if the link is corrupted.*

*A link can be deleted using **rm filename**. This will not delete the original file.*

c) Open Matlab window, move to the processing directory, setup paths, and process the cast:

>> **m\_setup**

>> **mcd ladcp**

>> **cd ix/data**

>> **ixpath**

>> **process\_cast(nnn)**

*The Matlab processing script produces and automatically saves .ps image files. These can be viewed by typing:*

**cd data**

**cd ladcp/ix/data/DL/processed**

**display filename**

The processing steps described above can be performed before the CTD casts have been processed as far as 1hz files, to check the LADCP performance.

d) Once the CTD casts have been processed as 1hz files, the 'process\_cast' script can be run again and the CTD files will automatically be read in. Check that the corresponding CTD links are in place by typing:

**cd data**

**cd ladcp/ix/data/CTD**

**ls -ltr**

Each cast should have a corresponding link in the format 'ctd\_jc086\_056\_1hz\_txt'.

e) The 'process\_cast' script can also be re-run after the vessel-mounted ADCP data has been processed, and these are added to the cast. Check that the corresponding .mat files have been generated in **/ladcp/ix/data/SADCP** in the format 'os75\_jc086\_ctd\_041.mat'.

Figures have been saved before and after re-processing. They can be found (respectively) in:

**/ladcp/ix/data/DL/processed/no\_VMADCP** and **/ladcp/ix/data/DL/processed**.

## 5.2 LADCP preliminary quality checks

Some of the figures generated by the processing script are particularly useful to provide early indication of poor quality data, possible faults, and incorrect transfer of the raw data.

### Figure 1

Make sure that the bottom track velocities (bottom part of the plot on the left hand side) match those of the water track (plot on the left hand side). See Figure 5.1 for an example. Also check if time and depth of the cast indicated in Figure 5.1 match with the corresponding logged data.

### Figure 2

Check the performance of the four beams from the bottom-left plot. See Figure 5.2 and 5.3 for examples of good and bad quality data.

This figure also indicates the CTD heading direction. This can represent valuable information for the CTD operator, in case it is spinning excessively.

### Figure 4

Compare profiles from down and up casts and check if they are both complete. If not, this could indicate a fault. This figure also indicates the depths of the cast, which can be checked against logged information.

### Figure 11

This figure provides a list of processing errors and warnings. Examples of those found in the LADCP processing during JC086 are given in Table 5.1.

## **5.3 Final remarks**

All casts consistently showed a 'low battery voltage' warning during the processing (Table 1). However, the battery has been checked and recharged repeatedly before and after deployment and no issues were found.

Shallow casts are characterised by poor quality data, due to the reduced depth of the water column, producing a disturbed signal that cannot be picked up by the beams.

LADCP acquisition was switched off for the shallow stations of the Ellett Line (casts 059-074) and restarted during the final L line (casts 075-080) and at the site of the glider deployment. During cast 058 the CTD did not reach the bottom (used as a test after SAPS deployment) and these data were not processed.

Generally, the LADCP workhorse did not experience any problems during JC086. Good quality data exists for all stations apart from the five shallow ones (as indicated in Table 1) and for cast number 003. Good quality vessel-mounted ADCP data exist for the five shallow stations, and those should be used in preference to the LADCP data.

JC086 Cruise Report

CTD	ST. NAME	DEPTH	Orig. filename	New filename	Notes
001	Marmitel	1134 m	JC86_001M.000	001DL000.000	Low battery voltage warning.
002	S355	553 m	JC86_002M.000	002DL000.000	Low battery voltage warning.
003	S354	966 m	No data saved	-	Error in preparation for cast.
004	S353	1078 m	JC086_004M.000	004DL000.000	Low battery voltage warning.
005	S352	1080 m	jc086_005M.000	005DL000.000	Low battery voltage warning.
006	S351	729 m	JC86_006M.000	006DL000.000	Low battery voltage warning.
007	S350	559 m	JC86_007M.000	007DL000.000	Low battery voltage warning.
008	IB22	208 m	JC86_008M.000	008DL000.000	Low battery voltage warning. Removed 148 pressure spikes during 4 scans.
009	IB22S	666 m (no alt.)	JC86_009M.000	009DL000.000	Low battery voltage warning. Removed 32 pressure spikes during 2 scans.
010	IB21S	1040 m	JC086_010M.000	010DL000.000	Low battery voltage warning.
011	IB20S	1406 m	JC086_011M.000	011DL000.000	Low battery voltage warning.
012	IB19S	1688 m	JC086_012M.000	012DL000.000	Low battery voltage warning.
013	IB18S	1790 m	JC86_013M.000	013DL000.000	Low battery voltage warning.
014	IB17	1809 m	JC86_014M.000	014DL000.000	Low battery voltage warning.
015	IB16A	1797 m	JC86_015M.000	015DL000.000	Low battery voltage warning.
016	IB16	2217 m	JC086_016M.000	016DL000.000	Low battery voltage warning.
017	IB15	2384 m	JC86_017M.000	017DL000.000	Low battery voltage warning.
018	IB14	2409 m	JC86_018M.000	018DL000.000	Low battery voltage warning. Removed 14 pressure spikes during 2 scans. Shifted ADCP series by 12 sec.
019	-	-	-	-	Aborted cast. Not processed.
020	IB13	2536 m	JC86_020M.000	020DL000.000	Low battery voltage warning.
021	IB12	2727 m	JC086_021M.000	021DL000.000	Low battery voltage warning.
022	IB11	2680 m	JC86_022M.000	022DL000.000	Low battery voltage warning.
023	IB10	2424 m	JC86_023M.000	023DL000.000	Low battery voltage warning.
024	IB9	1868 m	JC086_024M.000	024DL000.000	Low battery voltage warning. Missing .txt file among original

# JC086 Cruise Report

					files on cookfs_ladcp
025	IB8	1572 m	JC086_025M.000	025DL000.000	Low battery voltage warning.
026	IB7	974 m	JC86_026M.000	026DL000.000	Low battery voltage warning. Removed 16 pressure spikes during 2 scans.
027	IB6	890 m	JC86_027M.000	027DL000.000	Low battery voltage warning.
028	IB5	1155 m	JC086_028M.000	028DL000.000	Low battery voltage warning.
029	IB4	1188 m	JC86_029M.000	029DL000.000	Low battery voltage warning.
030	IB3	657 m	JC086_030M.000	030DL000.000	Low battery voltage warning.
031	IB2	442 m	JC86_031M.000	031DL000.000	Low battery voltage warning. Removed 88 pressure spikes during 5 scans.
032	IB1	147 m	JC86_032M.000	032DL000.000	Low battery voltage warning. <b>Shallow cast. Poor data quality.</b>
033	A	107 m	JC086_033M.000	033DL000.000	Low battery voltage warning. Removed 14 pressure spikes during 2 scans. Shifted ADCP series by 37 sec. <b>Shallow cast. Poor data quality.</b>
034	B	175 m	JC86_034M.000	034DL000.000	Low battery voltage warning. Removed 68 pressure spikes during 4 scans. <b>Shallow cast. Poor data quality.</b>
035	C	292 m	JC86_035M.000	035DL000.000	Low battery voltage warning. Removed 14 pressure spikes during 2 scans.
036	D	1078 m	JC86_036M.000	036DL000.000	Low battery voltage warning.
037	E	1638 m	JC86_037M.000	037DL000.000	Low battery voltage warning.
038	F	1805 m	JC086_038M.000	038DL000.000	Low battery voltage warning.
039	G	1798 m	JC86_039M.000	039DL000.000	Low battery voltage warning.
040	H	2012 m	JC86_040M.000	040DL000.000	Low battery voltage warning.
041	I	738 m	JC86_041M.000	041DL000.000	Low battery voltage warning.
042	J	585 m	JC86_042M.000	042DL000.000	Low battery voltage warning.
043	K	784 m	JC86_043M.000	043DL000.000	Low battery voltage warning.
044	L	2100 m	JC086_44M.000	044DL000.000	Low battery voltage warning.
045	M	2213 m	JC086_045M.000	045DL000.000	Low battery voltage warning.

# JC086 Cruise Report

046	N	2104 m	JC86_046M.000	046DL000.000	Low battery voltage warning.
047	O	1923 m	JC86_047M.000	047DL000.000	Low battery voltage warning.
048	P	1406 m	JC086_048M.000	048DL000.000	Low battery voltage warning.
049	Q4	940 m	JC086_049M.000	049DL000.000	Low battery voltage warning.
050	Q3	672 m	JC86_050M.000	050DL000.000	Low battery voltage warning.
051	Q2	540 m	JC86_051M.000	051DL000.000	Low battery voltage warning.
052	Q1	403 m	JC86_052M.000	052DL000.000	Low battery voltage warning.
053	Q	312 m	JC86_053M.000	053DL000.000	Low battery voltage warning.
054	R3	244 m	JC86_054M.000	054DL000.000	Low battery voltage warning. Removed 14 pressure spikes during 2 scans. <b>Shallow cast. Poor data quality.</b>
055	R2	206 m	JC86_055M.000	055DL000.000	Low battery voltage warning. Shifted ADCP series by 13 sec. <b>Shallow cast. Poor data quality.</b>
056	R1	154 m	JC86_056M.000	056DL000.000	Low battery voltage warning. Sallow cast. Poor data quality.
057	R	130 m	JC086_057M.000	057DL000.000	Low battery voltage warning. Removed 60 pressure spikes during 3 scans.
058	M	2210 m	JC_058M.000	058DL000.000	Not processed. CTD did not reach bottom.
075	L7A	241 m	JC86_075M.000	075DL000.000	Low battery voltage warning. Large up/down bias (u=0.12 m/s; v=0.08 m/s) GPS problems? – warning disappears when reprocessed with VMADCP. Bottom track still does not match water track.
076	L7	385 m	JC86_076M.000	076DL000.000	Low battery voltage warning.
077	L6A'	538 m	JC086_077M.000	077DL000.000	Low battery voltage warning.
078	L6A	758 m	JC086_078M.000	078DL000.000	Low battery voltage warning.
079	L6	1023 m	JC086_079M.000	079DL000.000	Low battery voltage warning.
080	L5	1267 m	JC086_080M.000	080DL000.000	Low battery voltage warning.
081	Ammo-nite1	1157 m	JC86_081M.000	081DL000.000	Low battery voltage warning.

## JC086 Cruise Report

**Table 5.1** LADCP processing notes, warnings, and errors (as obtained after CTD processing). Shallow casts showing poor data quality are indicated in red.

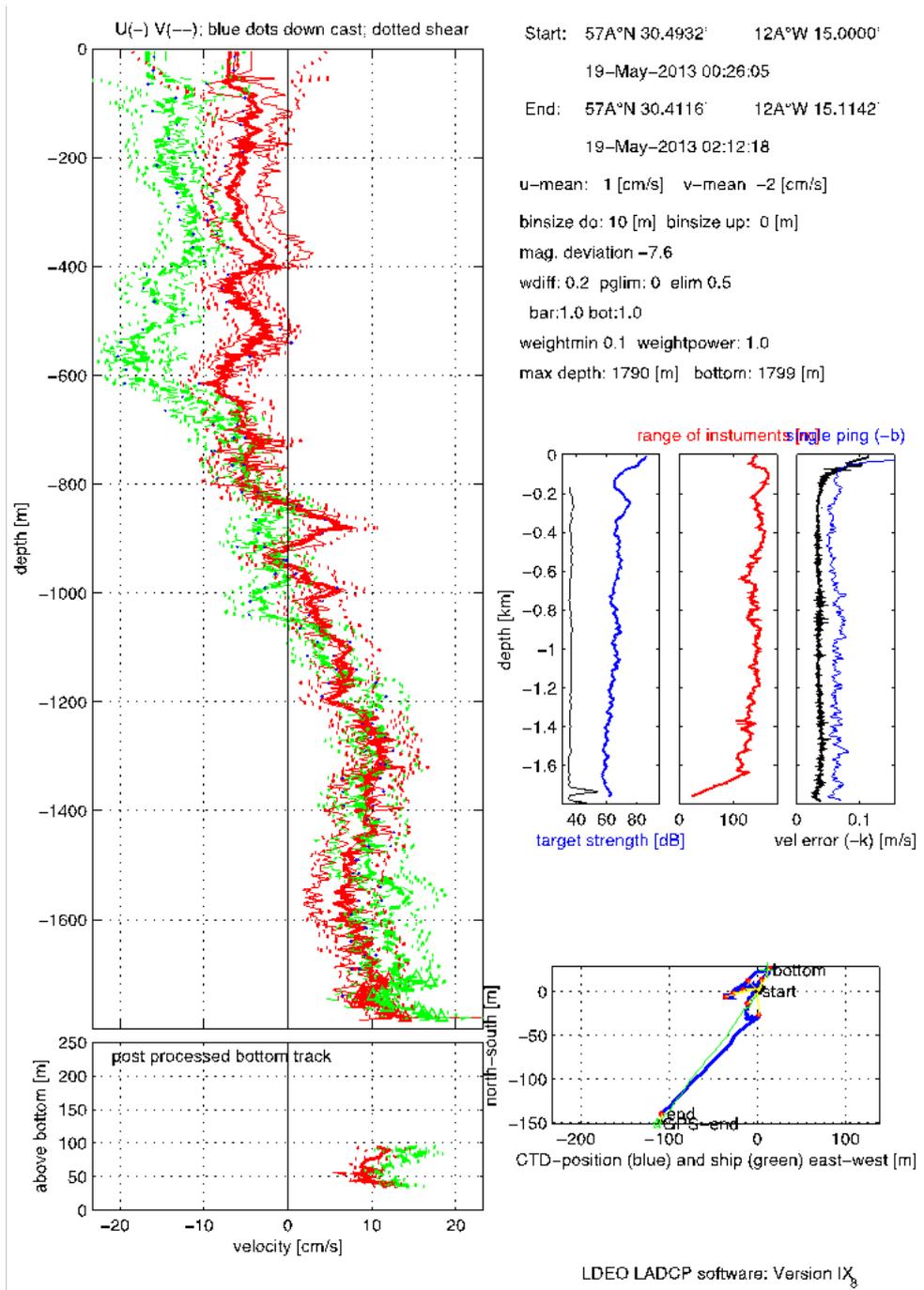
Cast 001 represents the CTD taken at the site of the first glider deployment.

Casts 002-007 were taken across the Wyville Thompson Ridge.

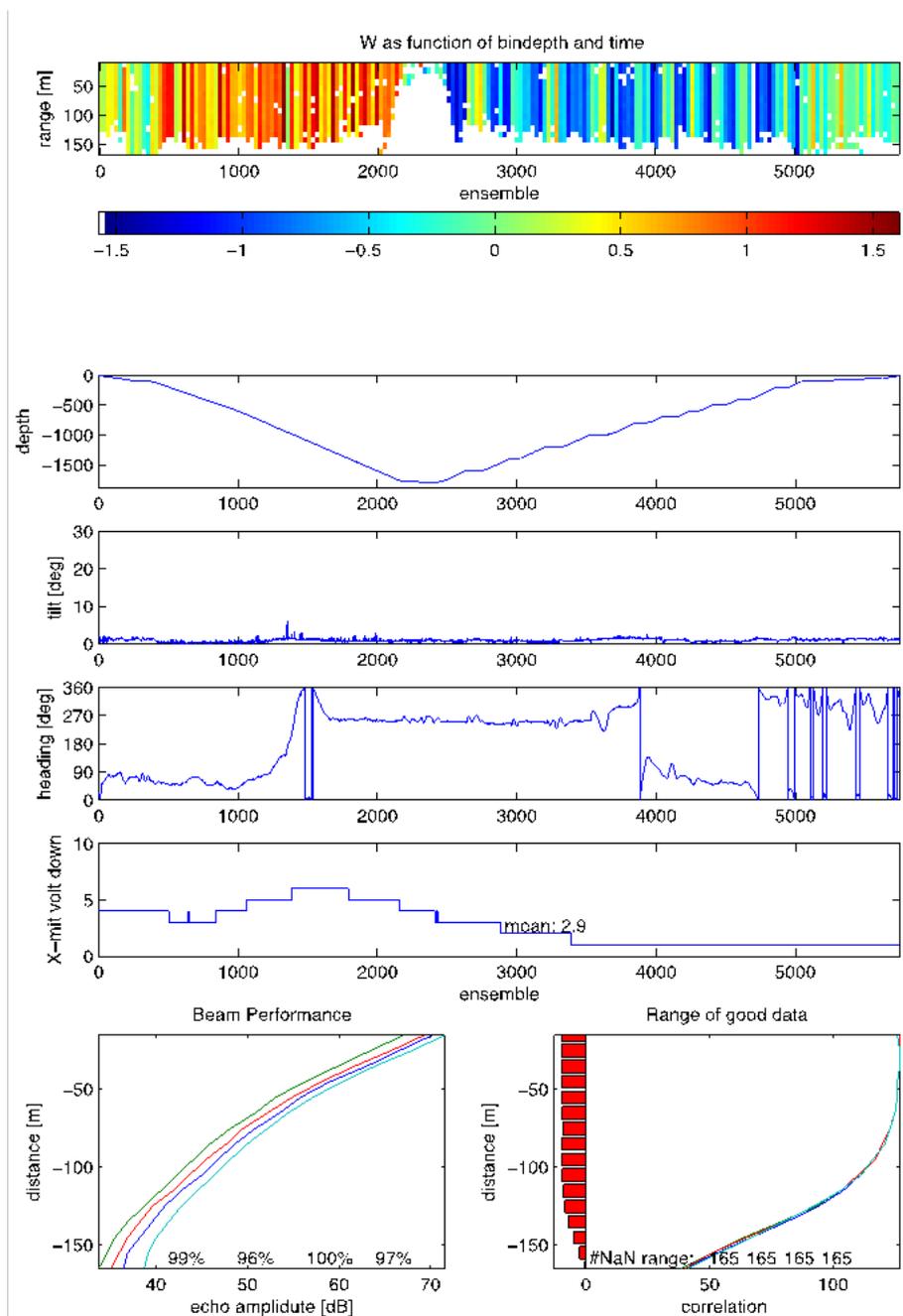
Casts 008-057 represent Extended Ellett Line stations.

Casts 075 -080 correspond to line L.

Cast 081 was taken at the site of the final glider deployment.

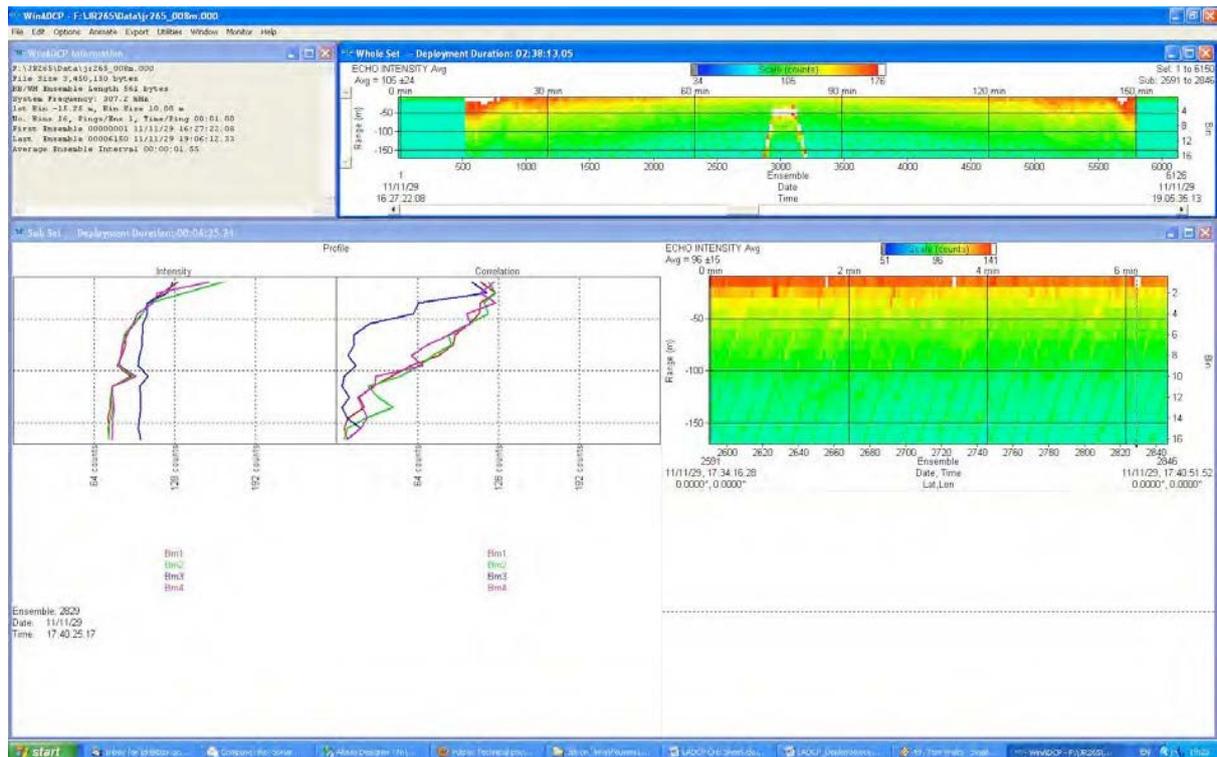


**Figure 5.1** Example of good quality LADCP data (cast 038 during JC086) after CTD processing, with bottom track matching water track. No VMADCP included in the processing.

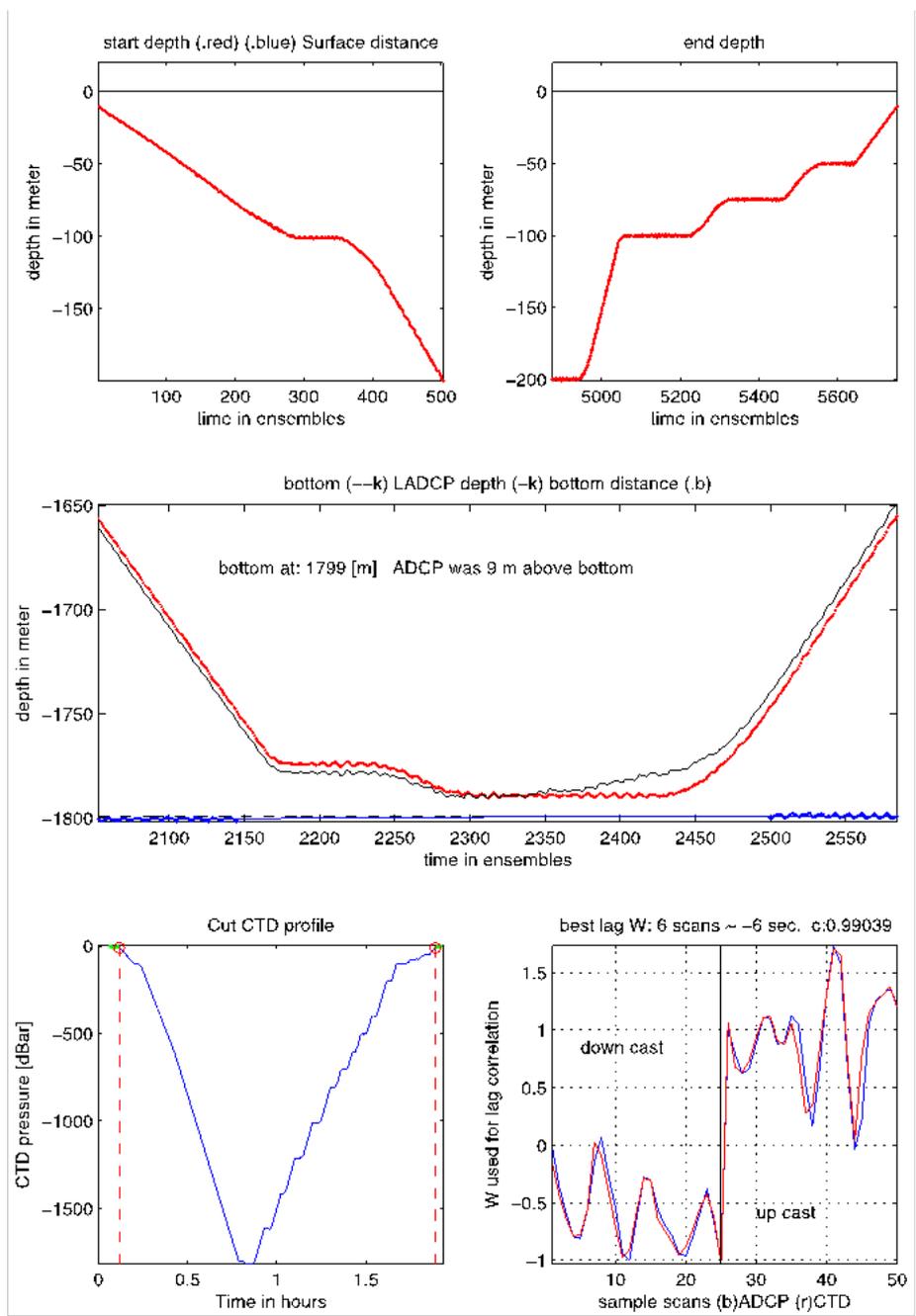


**Figure 5.2** Example of good quality data (again from cast 038 during JC086) showing good beam performance and correlation (two bottom plots). CTD heading is also shown in the 4<sup>th</sup> plot from the top).

# JC086 Cruise Report



**Figure 5.3** Example of bad quality data (from JR265) where data close to bottom shows intensity off set and poor correlation, due to a failing beam requiring manufacturer attention. This is a simple quick manner to monitor unit performance and performance degradation, which can often be experienced.



**Figure 5.4** Example of complete down and upcast (two plots at the top) from cast 038 during JC086. CTD distance from bottom is also shown the middle plot.

## 6 Mexec Data Processing

### N. P Holliday (NOCS)

Brian King (NOC) set up the mexec processing during 2 days of mobilisation before JC086. Brian's work and patient explanation to NPH of the processing and pitfalls was key to the success of the data processing during JC086. He also provided vital support from base during the cruise. Many thanks to Brian.

In this section the mexec setup and operation is described. Linux workstation noseal was set up in the main lab, and the m\_setup advanced from jr281 and jc069. The workstation was used for mexec processing of CTD and underway data; as well as being the platform for codas processing of OS75 VMADCP data.

### 6.1 Key steps in establishing the m\_setup

- i) All processing done under username pstar, password pstar.
- ii) A number of filesystems were remotely mounted: TECHSAS, mounted on /mnt/techsas (read-only, netcdf files of underway data), and the two public cookfs partitions, /mnt/cookfspub (Public, read-write for file sharing) and /mnt/cookfs (JC86, read-only, data streams for all data from cruise-specific instruments including CTD, LADCP and VMADCP). The file "/etc/fstab" allows the user to automount all filesystems including usb disks, with the command "mount -a", logged in as root. The fstab file needed updating from jc069, with new syntax for mounting techsas and cookfs.

The command "df -h" shows which file servers and disks have mounted; this was useful for identifying which of 4 possible USB automount locations the two JC086 USB hard disks had mounted at.

It became apparent at this stage that there was an issue with the IP address for noseal. The workstation seemed to switch from its presently assigned IP address of 192.168.62.203, to an old IP address (192.168.62.5) which had been given to a different workstation on the ship. Martin Bridger was able to resolve the conflict and convince noseal to keep the IP address 192.168.62.203. This solved problems experienced on JC069 including printing and remote VPN access.

- iii) Create skeleton directory structure for JC086 as follows.

Make new cruise directory: `mkdir noc/users/pstar/jc086`

Make new symbolic link to cruise directory (in noc/users/pstar): `ln -s jc086 cruise`  
This allows users to change to the right directory easily, and is used in many processing scripts.

Copy latest software (jr281) into software\_jc086 in cruise directory and create symbolic links for use by scripts:

```
/noc/users/pstar/jc086/software_jc086
ln -s software_jc086 software
ln -s software sw
```

Create skeleton data directories:

`mkdir /noc/users/pstar/cruise/data` and then under /data/ create the following:

`mkdir -p mexec/housekeeping/version/` (this creates the version directory for the history file. Make this rather than copying old cruise history file.)

```
mkdir other_backups
mkdir chf
```

## JC086 Cruise Report

```
mkdir ctd
mkdir ctd/BOTTLE_CO2
mkdir ctd/BOTTLE_NUT
mkdir ctd/BOTTLE_OXY
mkdir ctd/BOTTLE_SBE35
mkdir ctd/BOTTLE_WINCH
mkdir ctd/BOTTLE_SALTS
mkdir ctd/ASCII_FILES
ln -s ASCII_FILES BOTTLE_FILES
mkdir em120
mkdir -p ladcp/ix/data
mkdir -p vmadcp/jc086_075/rawdata
ln -s vmadcp/jc086_075 v75
mkdir -p vmadcp/jc086_150/rawdata
mkdir -p met/surftsg
mkdir -p met/surfmet
mkdir -p met/surflight
mkdir tsg
mkdir ocl
mkdir sim
mkdir -p nav/ash
mkdir nav/attsea
mkdir nav/cnav
mkdir nav/dps116
mkdir nav/gyropmv
mkdir nav/gyros
mkdir nav/posmvpos
mkdir nav/seapath200
mkdir -p techsas/NetCDF
in techsas: ln -s NetCDF netcdf_files_postcruise
in techsas: ln -s netcdf_files_ship netcdf_files
in techsas: ln -s /mnt/techsas/JC086/NetCDF netcdf_files_ship
```

Note that if the ship does not record any of these data streams (eg SBE35 not used on JC) the directories are ignored by the mexec scripts. But if a directory is not there, the scripts will also ignore it, and the data will not be processed. We discovered this a few days into the cruise when we realised that the tsg stream was not being processed in the daily processing. Creating /data/tsg allowed the scripts to run successfully.

Copy programs, scripts, and templates from jr281 directory into /cruise/data/:

```
rsync -a /noc/users/pstar/cruise/data/jr281/data/mexec* .
rsync -a /noc/users/pstar/cruise/data/jr281/data/exec/ .
rsync -a /noc/users/pstar/cruise/data/jr281/data/templates/ .
```

iv) Edit the mexec setup script

In /noc/users/pstar/cruise/data/mexec\_processing/ get a copy of the most recent version of m\_setup, call it m\_setup\_jc086 then create symbolic link m\_setup.m:  
cp -p m\_setup\_jr281\_v2.m m\_setup\_jc086\_v2.m  
ln -s m\_setup\_jc086\_v2.m m\_setup.m

## JC086 Cruise Report

Edit the cruise m\_setup file for JC086, including reference to cruise number, cruise string, year for data time origin, directory names.

### v) Edit template files

Template files are used to control lists of variables within scripts. They include list of variables including those for CTD data and for sample files.

```
cd data/templates
```

```
edit files dcs_jc086_varlist.csv, sam_jc086_varlist.csv
```

## 6.2 Backing up

Two external usb drives were used for daily backups. One drive failed after a week and was substituted for a new external drive. The drives were called jc086\_01 (failed), jc086\_02, and jc086\_03, each of capacity 500 Gb. Initially A crontab entry, adapted from one left in place from jc069 ran at 0030 and 1230 each day and backed up cruise/data and cruise/software using 'rsync -a' in scripts '/exec/freecom\_backup\_exec\_jc086\_1' (replaced by '/exec/freecom\_backup\_exec\_jc086\_3' after 1 failed) and '/exec/freecom\_backup\_exec\_jc086\_2' to alternating disks.

The required entry in crontab was saved in 'exec/crontab\_contents\_jc086'. crontab jobs are simply scheduled using 'crontab -e' to edit the crontab file. Or 'crontab -l' to list the present jobs.

Two archives were made onto 500Gb usb external hard drive and taken to NOC after the cruise.

## 6.3 TECHSAS data

During the cruise TECHSAS data were accessed over the network. At the end of the cruise after TECHSAS logging stopped, all TECHSAS files were copied onto noseal to form part of the cruise mexec archive. The techsas streams in that archive is as follows:

yy/mm/dd	Start		End	yy/mm/dd	
13/05/04	124 12:47:45	to	146 07:25:30	13/05/26	AirSeaII-S84_JC1.AirSeaII
13/05/07	127 09:44:59	to	145 08:47:56	13/05/25	CLAM-CLAM_JC1.CLAM
13/05/06	126 12:54:44	to	146 07:25:36	13/05/26	EA600-EA600_JC1.EA600
13/05/04	124 12:47:34	to	146 07:25:40	13/05/26	EMLog-log_chf_JC1.EMLog
13/05/04	124 12:47:42	to	146 07:25:45	13/05/26	GPPAT-GPPAT_JC1.GPPAT
13/05/04	124 12:47:35	to	146 07:25:49	13/05/26	Light-JC-SM_JC1.SURFMETv2
13/05/04	124 12:47:35	to	146 07:25:49	13/05/26	MET-JC-SM_JC1.SURFMETv2
13/05/04	124 12:47:38	to	146 07:25:55	13/05/26	PASHRPOS- ADUPOS_JC1.PASHR
13/05/04	124 12:47:41	to	146 07:25:55	13/05/26	SBE45-SBE45_JC1.TSG
13/05/04	124 12:47:35	to	146 07:25:57	13/05/26	Surf-JC-SM_JC1.SURFMETv2
13/05/06	126 06:29:03	to	146 07:26:00	13/05/26	VDVHW-log_skip_JC1.Log

## JC086 Cruise Report

13/05/04	124 12:47:39	to	146 07:26:06	13/05/26	cnav-CNAV.GPS
13/05/04	124 12:47:29	to	146 07:26:09	13/05/26	gyro-GYRO1_JC1.gyr
13/05/04	124 12:47:35	to	146 07:26:10	13/05/26	gyro-SGYRO_JC1.gyr
13/05/04	124 12:47:19	to	146 07:26:15	13/05/26	position-Applanix_GPS_JC1.gps
13/05/04	124 12:47:32	to	146 07:26:16	13/05/26	position-DPS-116_JC1.gps
13/05/04	124 12:47:42	to	146 07:26:20	13/05/26	position-Seapath200_JC1.gps
13/05/04	124 12:47:19	to	146 07:26:25	13/05/26	satelliteinfo-Applanix_GPS_JC1.gps
13/05/04	124 12:47:39	to	146 07:26:26	13/05/26	satelliteinfo-CNAV.gps
13/05/04	124 12:47:32	to	146 07:26:31	13/05/26	satelliteinfo-DPS-116_JC1.gps
13/05/04	124 12:47:42	to	146 07:26:31	13/05/26	satelliteinfo-Seapath200_JC1.gps
13/05/04	124 12:47:31	to	146 07:26:35	13/05/26	shipattitude-Aplanix_TSS_JC1.att
13/05/04	124 12:47:40	to	146 07:26:41	13/05/26	shipattitude-Seapath200AT_JC1.att
13/05/04	124 12:47:31	to	146 07:26:45	13/05/26	shipattitude_aux-Aplanix_TSS_JC1.att
13/05/04	124 12:47:40	to	146 07:26:51	13/05/26	shipattitude_aux-Seapath200AT_JC1.att

The mexec short names can be used in mexec to access the TECHSAS streams. The pairings are resolved by script *mtnames*:

mexec short name	rvs stream name	techsas stream name
'adupos'	''	'PASHRPOS-ADUPOS_JC1.PASHR'
'smartsv'	'smartsv'	'AML-AMLSV.SVP'
'gravity'	'gravity'	'AirSeaII-S84_JC1.AirSeaII'
'ea600m'	'ea600m'	'EA600-EA600_JC1.EA600'
'gyropmv'	'gyropmv'	'gyro-GYRO1_JC1.gyr'
'gyro_s'	'gyro_s'	'gyro-SGYRO_JC1.gyr'
'winch'	'winch'	'CLAM-CLAM_JC1.CLAM'
'surflight'	'surfmet'	'Light-JC-SM_JC1.SURFMETv2'
'surfmet'	'surfmet'	'MET-JC-SM_JC1.SURFMETv2'
'SBE45'	'SBE45'	'SBE45-SBE45_JC1.TSG'
'surftsg'	'surfmet'	'Surf-JC-SM_JC1.SURFMETv2'
'adu5pat'	'adu5pat'	'GPPAT-GPPAT_JC1.GPPAT'
'posmvpos'	'posmvpos'	'position-Applanix_GPS_JC1.gps'
'dps116'	'dps116'	'position-DPS-116_JC1.gps'
'seapos'	'seapos'	'position-Seapath200_JC1.gps'
'usbpos'	''	'position-usbl_JC1.gps'
'satinfoposmv'	''	'satelliteinfo-Applanix_GPS_JC1.gps'
'satinfodps'	''	'satelliteinfo-DPS-116_JC1.gps'

## JC086 Cruise Report

'satinfosea'	''	'satelliteinfo-SeaPath200_JC1.gps'
'satinfousb'	''	'satelliteinfo-usb1_JC1.gps'
'mag'	''	'scalar_mag-SeaSpy_JC1.mag'
'posmvtss'	'posmvtss'	'shipattitude-Aplanix_TSS_JC1.att'
'attsea'	'attsea'	'shipattitude-SeaPath200AT_JC1.att'
'attposmv'	''	'shipattitude_aux-Aplanix_TSS_JC1.att'
'attseaaux'	''	'shipattitude_aux-SeaPath200AT_JC1.att'
'log_skip'	'log_skip'	'VDVHW-log_skip_JC1.Log'
'log_chf'	'log_chf'	'EMLog-log_chf_JC1.EMLog'
'em120'	'EM120'	'sb_depth-EM120_JC1.depth'
'cnav'	'cnav'	'cnav-CNAV.GPS'
'satinfocnav'	'satinfocnav'	'satelliteinfo-CNAV.gps'
'surflight_regen'	'surfmet_regen'	'Light-JC-SM_JC1.SURFMETv2.regen'
'surfmet_regen'	'surfmet_regen'	'MET-JC-SM_JC1.SURFMETv2.regen'
'surftsg_regen'	'surfmet_regen'	'Surf-JC-SM_JC1.SURFMETv2.regen'
'posmvpos_regen'	'posmvpos_regen'	'position-Aplanix_GPS_JC1.gps.regen'
'dps116_regen'	'dps116_regen'	'position-DPS-116_JC1.gps.regen'
'seapos_regen'	'seapos_regen'	'position-SeaPath200_JC1.gps.regen'

In mstar there are the following commands for quick look at Techsas datastreams:

```

help mtechsas           lists the 'mt' commands
mtlookd                tells you filename, start, end
mtlookdf               faster version that doesnt count datacycles
mtnames                lists mexec 'shortnames', full filenames in cell array.
mtdfinfo winch         provides info about that datastream (eg winch)
mtgaps gyro_s 10s     lists gaps in datastream of more than 10s
mtposinfo([2012 2 5 0000]) gives you position for that time
help mtlistit          for how to use mtlistit to list segments of data

```

## 7 Underway Data

Penny Holliday (NOCS) and Xiangbo Feng (NOCS)

All underway data (which includes navigation, surface air and water, and bathymetry) were processed on a daily basis as follows:

Run **m\_jc086\_daily\_processing(nnn)** where nnn is day number (124 to 145 for JC086). The script calls **mday\_get\_all** which in turn calls a script (**mday\_00**) that extract the appropriate 24 hours worth of raw data from every Techsas data stream given as an input variable. **mday\_get\_all** will skip any data stream called that does not actually exist for the present cruise or ship. The output is a series of daily files from each data stream, located in their individual data directories (eg **sim\_jc086\_d130\_raw.nc**). After the initial step to acquire the raw data, the script further processes key data streams to edit (remove bad data) and average to appropriate time steps (the "**\_01**" scripts, eg **msim\_01**). Finally, the script runs **mday\_02\_all** which appends the daily file to create a master cruise file for each data stream (eg **sim\_jc086\_01.nc**). The list of daily files appended into the master files is given in the header information of that file.

Note: if daily processing is run more than once for an individual day, the master file will have the day's data appended again and may need to be recreated. It may be useful for future cruises to run the appending steps in a separate script.

Further details of the individual data streams are given in the following sections.

### 7.1 Navigation

As part of the routine daily processing eight navigation streams were extracted from TECHSAS into mexec directories, as summarised in the following table:

mexec directory	mexec short name	mexec directory abbreviation	mexec file root
nav/ash	adu5pat	M_ASH	ash
nav/attsea	attsea	M_ATTSEA	attsea
nav/cnav	cnav	M_CNAV	cnav
nav/dps116	dps116	M_DPS116	dps116
nav/gyropmv	gyropmv	M_GYP	gyp
nav/gyros	gyro_s	M_GYS	gys
nav/posmvpos	posmvpos	M_POS	pos
nav/seapath200	seapos	M_SEA200	seapos

Synchro gyro & Ashtech ADU heading: Due to the availability of high-quality real-time heading from the Applanix posmv, the Ashtech ADU was a low-priority navigation stream on this cruise. However, it was maintained in case needed at short notice. Standard processing on previous cruises includes scripts **mgyr\_01**, **mash\_01** and **mash\_02** to clean up any duplicated times in the 5Hz gyro stream, and then an ashtech minus gyro comparison, which cleans up the ashtech data before producing a smoothed ashtech minus gyro time series.

## JC086 Cruise Report

posmvpos: posmvpos was used as the master position source; no problems were noted during the cruise. The data stream contains no gaps longer than 5 seconds. Master file **pos\_jc086\_01.nc** contain the full and final cruise archive.

Bestnav: **mbest\_all** runs a series of scripts to produce the master bestnav file, **bst\_jc086\_01**. This uses posmvpos for position, and merges on heading so that there is a complete file containing position, heading, course and speed made good, and distance run. The data are reduced to a 30-second time base and heading is properly vector averaged. This is the 'definitive' cruise navigation file. The file is found in the nav/posmvpos directory. In order to avoid the problem of housekeeping variables like distrun across daily files, the bestnav processing is rerun from the start of the cruise each time it is required. There is therefore only ever one bst\_jc086\_01 file.

### 7.2 Surfmet

This surfmet report covers surface meteorology and underway pumped seawater measurements.

The surfmet streams are divided into three TECHSAS streams. In addition, the SeaBird SBE45 thermosalinograph data are also logged in separate data stream

mexec directory	mexec short name	mexec directory abbreviation	mexec file root	variables
met/surfmet	surfmet	M_MET	met	speed direct airtemp humid
met/surflight	surflight	M_MET_LIGHT	met_light	pres ppar spar ptir stir
met/surftsg	surftsg	M_MET_TSG	met_tsg	temp_h temp_m cond fluo trans
tsg	SBE45	M_TSG	tsg	temp_h temp_r cond salin sndspeed

Note the alternative names for sea surface temperature (temp\_r and temp\_m) as opposed to TSG housing temperature (temp\_h).

Note also that wind speed is stored in techsas in m/s, whereas TECHSAS gives the variable units as knots. Therefore script **mmet\_01** is inserted in the daily processing to correct the units in the met/surfmet/met\_jc086\_dnnn\_raw.nc file.

## JC086 Cruise Report

At the start of the cruise a check was performed to ensure that the salinity calculated from 'surftsg' cond and temp\_h matched the salinity found in 'tsg'.

Since the 'surftsg' file also contains the other pumped seawater variables, calibration work was carried out in the 'surftsg' directory. The 'tsg' files are uncalibrated and should not be used.

Note that apart from salinity in the thermosalinograph, all other data have no further calibration applied. For example, no record was made of meteorology sensor numbers, calibrations applied en route to TECHSAS, date of last sensor cal, etc.

### 7.2.1 Thermosalinograph salinity calibration

First note the pumps were off and data discarded between the following times:

Start	End	Comment
Start of cruise	May 06 19:07	Start of pumped data
May 07 08:47	May 08 08:45	Pumps switched off 1
May 18 11:12	May 18 11:28	Pumps switched off 2
May 25 10:00	End of cruise	End of surfmet logging

The daily processing creates two sets of daily raw files and two appended cruise master files (ddd is day number):

/data/tsg/**tsg\_jc086\_ddd\_raw.nc** and **tsg\_jc086\_01.nc**

Extracted from Techsas data stream 'SBE45-SBE-45\_JC1.TSG' (mstar shortname SBE45), variables are temp\_h, cond, salin, snspeed, temp\_r, time.

and

/data/met/surftsg/**met\_tsg\_jc086\_ddd\_raw.nc** and **met\_tsg\_jc086\_01.nc**

Extracted from Techsas data stream 'Surf-JC-SM-JC1.SURFMETv2', (mstar shortname SurfTsg) variables are temp\_h, temp\_m, cond, fluor, trans, time.

The appended data from SurfTsg were further processed as follows. These steps can be performed at any time of the cruise, but need to be carried out again at the end of the cruise since step (i) acts on the appended file which is incremented daily. Note that no calibration or data cleaning has been applied to the fluorometer or transmissometer data, except that it has been set to absent where the salinity is absent.

i) Run **mtsg\_make\_sal\_jc086.m**

Input: met\_tsg\_jc086\_01.nc

Output: **met\_tsg\_jc086\_01\_sal.nc**

To calculate salinity from cond and temp\_h

ii) Edit **mtsg\_cleanup.m** (in mexec\_processing\_scripts) to hardwire in any periods when the pumps were switched off, including the start of the cruise, short periods in the early part of the cruise, and the end of the cruise.

iii) Run **mtsg\_findbad.m**

Input: met\_tsg\_jc086\_01\_sal.nc

Output: **bad\_time\_lims.mat**

## JC086 Cruise Report

Allows graphical identification of bad data. Note the use of 'n' to store the start and end of bad data and move onto the next segment of bad data. This is a CRITICAL step.

iv) Run **mtsg\_medav\_clean\_cal.m**

Input: met\_tsg\_jc086\_01\_sal.nc

Uses bad\_time\_lims.mat and mtsg\_cleanup.m

Output: **met\_tsg\_jc086\_01\_medav\_clean.nc**

To generate 1-minute median bin average of data, remove known bad data identified in mtsg\_cleanup.m.

v) You can re-run mtsg\_findbad and **m\_tsg\_medav\_clean\_cal.m** as many times as required to get a clean record. Limits of bad times are accumulated by successive uses of mtsg\_findbad so it is worth making a back-up copy of bad\_time\_lims.mat.

vi) TSG salinity bottle samples were converted from ascii to netcdf using **mtsg\_01.m** (see section XX). Text files were saved in /data/ctd/BOTTLE\_SALTS/ and netcdf files saved at /data/met/surftsg/. Each time mtsg\_01.m was run the data were saved as:

**tsg\_jc086\_001.nc**                      Data from crate 001

**tsg\_jc086\_all.nc**                     Master appended bottle salts file

vi) Run **mtsg\_bottle\_compare\_jc086.m**

Input: tsg\_jc086\_all.nc

Input: met\_tsg\_jc086\_01\_medav\_clean.nc

Output: **met\_tsg\_jc086\_01\_medav\_clean\_botcompare.nc**

Or:

Input: met\_tsg\_jc086\_01\_medav\_clean\_cal.nc

Output: **met\_tsg\_jc086\_01\_medav\_clean\_cal\_botcompare.nc**

Merges the clean 1-minute data onto bottle samples. The script is set up to make it easy to switch between uncalibrated (variable salin) or calibrated (variable salin\_cal) data. (Set the case switch at the start of the .m file). Individual bottle residuals are plotted, as well as a smoothed time series of the residuals, which can then be used as a slowly-varying adjustment to the TSG salinity. Figure 7.1 shows the resulting comparison for the entire set of surface bottles (93 samples, taken nominally every 4 hours).

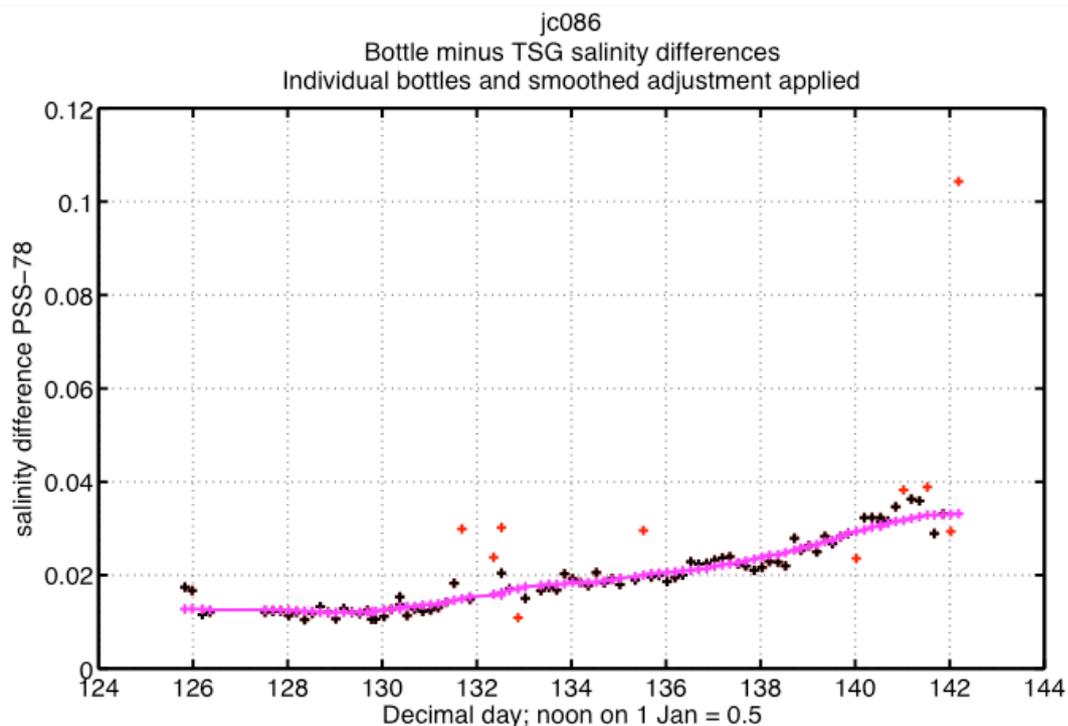


Figure 7.1 Bottle minus TSG salinity differences, and the smoothed adjustment.

vii) Run **mtsg\_apply\_salcal.m**

calls **mtsg\_salcal.m**

Input: met\_tsg\_jc086\_01\_medav\_clean.nc

Input: met\_tsg\_jc086\_01\_medav\_clean\_botcompare.nc

Output: **met\_tsg\_jc086\_medav\_clean\_cal.nc**

Smooths the differences in botcompare, interpolates and adds them to the uncalibrated salinity data. Can run `mtsg_bottle_compare_jc086.m` after this to check the residuals are acceptable. Figure 7.2 shows residuals with calibrated data. The residuals have mean 0.0003 and stdev 0.0019

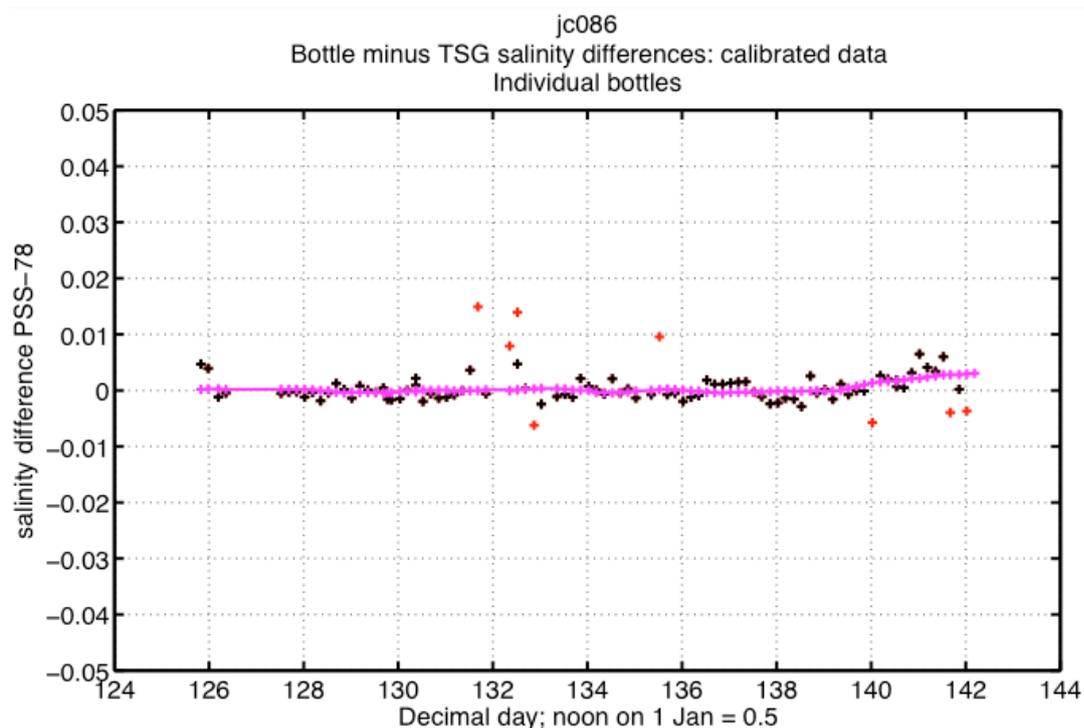


Figure 7.2 Bottle minus calibrated TSG salinity.

vii) Run **mtsg\_merge\_nav\_jc086.m**

Merge with navigation data (lat and long) on variable time

Input: **met\_tsg\_jc086\_medav\_clean\_cal.nc**

Input: **bst\_jc086\_01.nc**

Output: **met\_tsg\_jc086\_medav\_clean\_cal\_nav.nc** (final file)

### 7.2.2. Meteorology

Wind variables: Ship speed, position and heading from the bst navigation file are merged onto the wind data in the surfmet. The absolute wind speed is calculated and vector averaged in one multi-step script **mtruew\_01**. As with bst processing, this is rerun for the entire cruise each time the data are updated. The output files from this processing are

**met\_jc086\_true.nc**

**met\_jc086\_trueav.nc**

The latter file is reduced to 1-minute averages, with correct vector averaging when required. In order to avoid ambiguity, variable units are explicit in whether wind directions are 'towards' or 'from' the direction in question. The result is a bit cumbersome, but should be unambiguous if the units are read carefully.

Wind over the stern: The standard test of whether the relative wind processing has been done correctly would be to observe no change in the calculated absolute wind when the ship changes direction or speed. This can be misleading, since the anemometer sited on the foremast under-reads speed by a significant margin when the wind is over the stern. Therefore if either the 'before' or 'after' wind direction is over the stern, there can be a significant change in the apparent true wind speed during such manoeuvres.

## JC086 Cruise Report

Wind relative direction near 0/360: The age old problem of wind direction near the 0/360 boundary still remains. Since the anemometer is set up with 0/360 at the bow, the relative wind is very often around this heading. Even though the anemometer data are recorded at the data rate generated by the sensor (nominal 1 Hz), there is a problem with the raw data. In particular, when the wind is near 0/360, the TECHSAS files will sometimes contain headings in between, eg in the range 150 to 210, reminiscent of when simple numerical averaging of heading was occurring. When these bad headings are used in correct calculation of true wind, bad data are the result. Additionally, on day 130 at 0945, MB noted that the anemometer was accidentally rotated to around 20° clockwise. There is no way of knowing when this rotation occurred, but at that point the instrument was aligned to zero. In summary, the wind data are fully processed, but may contain significant heading error prior to day 130, and even then, cannot be regarded as perfectly 'clean'.

### Irradiance and surface pressure

Downwelling PAR and TIR data are found in the surflight stream, which also contains barometer pressure. These streams were ingested and stored, but no further processing was undertaken.

### 7.3 Bathymetry

The EA600 was operated throughout the cruise. Data were read into mexec directory 'sim'. The data were routinely processed in the script **m\_jc086\_daily\_processing.m**. Daily files of raw data and smoothed data were preserved. The key stages are:

**mday\_00('sim',nnn)**: output daily file of raw data (**sim\_jc086\_dnnn\_raw.nc**)

**msim\_01(nnn)**:

reads raw data; picks data in depth range 20 to 10000, to discard zeros; takes median depth in 300 second bins, to discard noise.

Input: **sim\_jc086\_dnnn\_raw.nc**

Output: **sim\_jc086\_dnnn\_smooth.nc**

(In **msim\_01** the \*\_smooth.nc files were also copied to daily **edited** files (eg **sim\_jc086\_dnnn\_edited.nc**), ready for manual editing using **mplxied** (see JC069 cruise report). But no manual editing was attempted during JC086 and the data remain noisy at times - these "edited" files can be ignored or used for future editing).

**mday\_02**

Raw daily files were appended into a single file

Input: **sim\_jc086\_dnnn\_raw.nc**

Output: **sim\_jc086\_01.nc**

For JC086 there followed some manual stages to generate a master cruise file:

**mapend**

The daily smoothed files were appended to create a single cruise file

Input: all daily files **sim\_jc086\_dnnn\_smooth.nc**

Output: **sim\_jc086\_01\_smooth.nc**,

**mmerge**

Merged with navigation on time

Input: **sim\_jc086\_01\_smooth.nc**

Input: **bst\_jc086\_01.nc**

## JC086 Cruise Report

Output: **sim\_jc086\_smooth\_nav.nc**. This still has noisy data in it, but should be considered the master cruise file.

## 8 Dissolved Inorganic Nutrients

*Tim Brand (SAMS)*

### **8.1 Introduction**

The basic water column dissolved nutrients ammonia, phosphate, silicate (reactive silica) and total oxidized nitrogen (nitrate + nitrite) were analyzed from CTD casts along the extended Ellett line and from the ships non-toxic sea water supply. CTD depths for the samples were chosen to correspond with those of the chlorophyll and particulate carbon down to 100m and 500m respectively and at depths below this coinciding with changes in water mass identified by the TS and dissolved oxygen characteristics from the CTD casts. A full list of CTD and non-toxic supply samples taken is available in the appendix.

In total 558 nutrient samples were measured in triplicate from 51 CTD stations along the Extended Ellett line, adjoining shelf G station transects and 4 stations around the Wyville Thompson Ridge, together with 25 underway supply samples.

### **8.2 Method**

Samples were collected in 125mls acid cleaned polythene bottles directly from the CTD spigots without the use of a tube. Samples were always analyzed within 24 hours of collection and stored in a fridge prior to analysis. Measurement was conducted using a Lachat *QuikChem 8500* flow injection autoanalyser using the manufacturers recommended methods: Ammonia, 31-107-06-1-B; Orthophosphate, 31-115-01-1-G; Silicate, 31-114-27-1-A and Nitrate/Nitrite, 31-107-04-1-A.

Samples were measured in triplicate to identify instrument precision. A stock mixed standard was prepared in deionized water with subsequent dilutions made in OSIL Low Nutrient Sea Water using the instruments auto-dilutor facility. Using standards prepared in LNSW removes the need to do a separate salt correction. Five standard concentrations and a blank were run in all cases and new standards were prepared every 48hrs. Three standard concentration ranges were prepared for the non-toxic supply samples and CTD transect samples depending upon expected sample nutrient concentration, *vis*

	Ammonia (microM)	Phosphate (microM)	Silicate (microM)	Total Oxid. N (microM)
Non-toxic	0.0 – 2.5	0.0 – 2.5	0.0 – 2.5	0.0 – 2.5
CTD	0.0 – 2.5	0.0 – 2.5	0.0 – 15.0	0.0 – 20.0

A standard reference solution prepared from nutrient standard solutions supplied by OSIL containing 1microM NH<sub>4</sub>, 1microM PO<sub>4</sub>, 10microM SiO<sub>2</sub> and 10microM NO<sub>3</sub> was run at the start and end of each sample batch to determine analytical accuracy and to adjust for calibration drift during the course of a sample batch analysis.

### 8.3 *Data quality*

Lachat instrument *precision*, determined from analysing each sample in triplicate, routinely yielded a coefficient of variation (SD/mean x 100%) of less than 2% for nutrient concentrations greater than 10microM and generally less than 5% for concentrations for concentrations less than 10microM.

### 8.4 *Results*

Preliminary results for phosphate, silicate and nitrate from the extended Ellett line transect from Iceland to the Outer Hebrides are shown in Figures 8.1 to 8.3 below.

Nutrient concentrations across the Iceland Basin transect  
JC086 May 2013

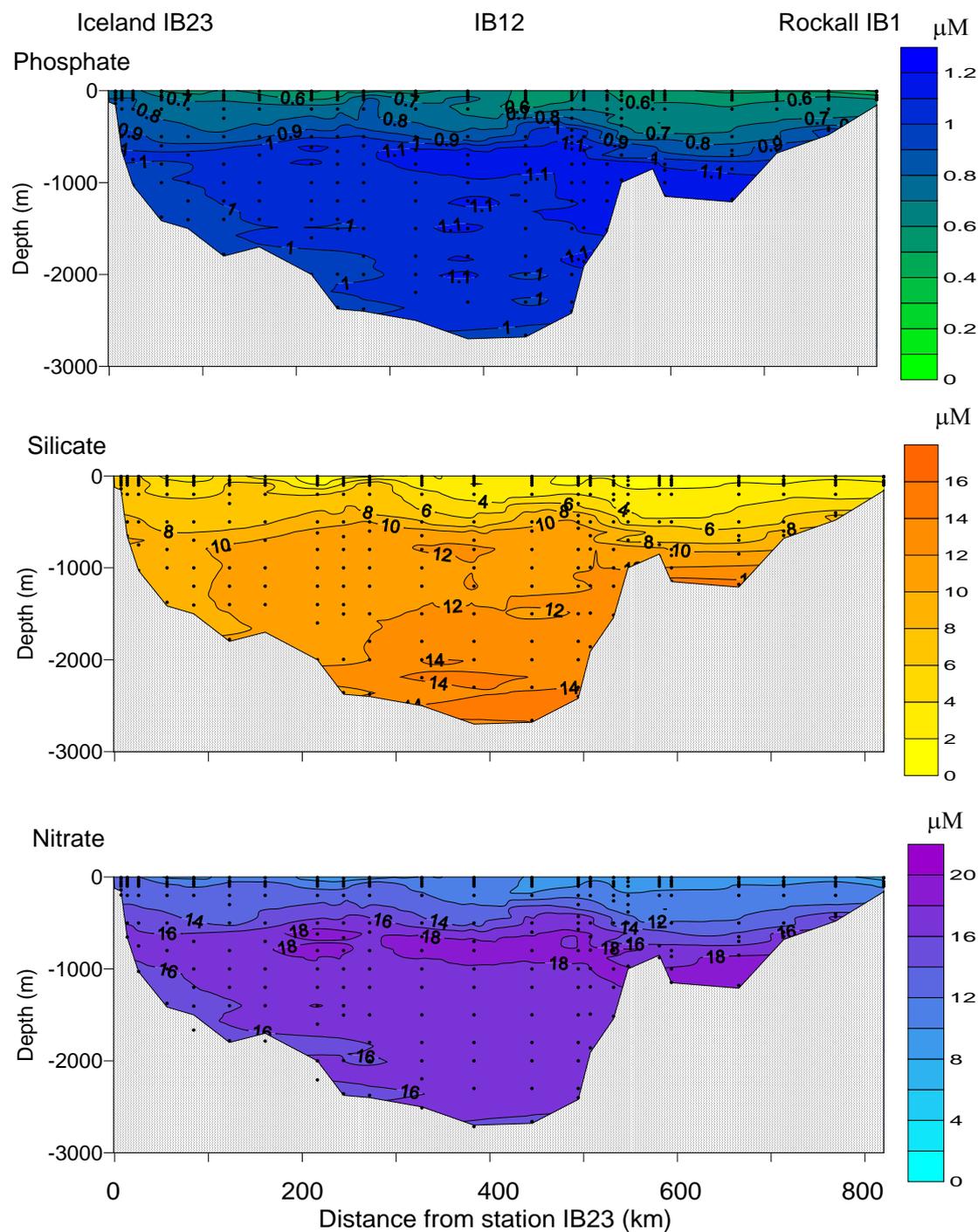


Figure 8.1 Nutrient concentrations across the Iceland Basin transect

Nutrient concentrations across the Ellett Line transect during May 2013

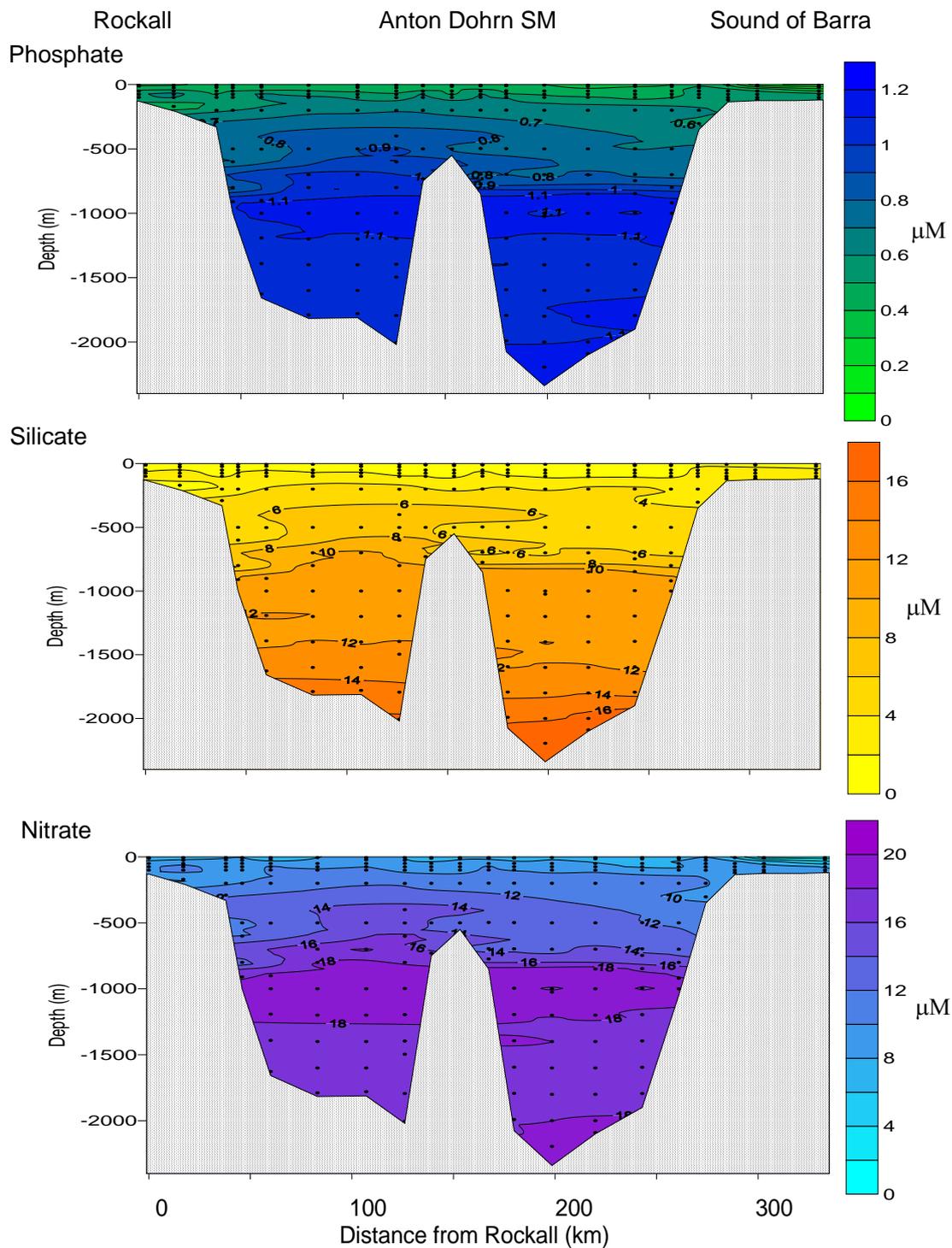


Figure 8.2 Nutrient concentrations across the Ellett Line transect

Nutrient concentrations across the G Line transect during May 2013

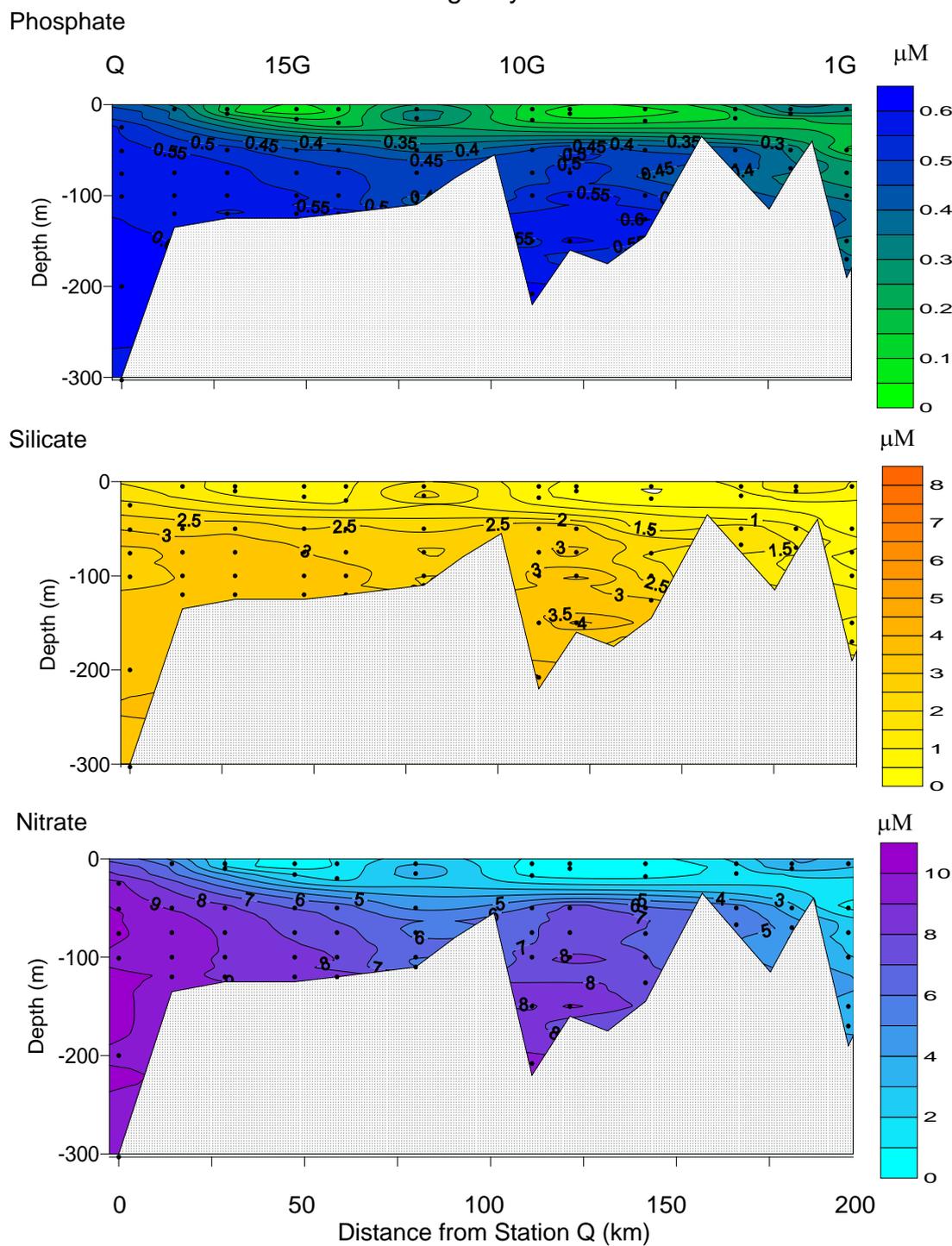


Figure 8.3 Nutrient concentrations across the G line transect

## **9 Particulate Organic and Inorganic Carbon**

*Tim Brand(SAMS) and Colin Abernethy(SAMS)*

### **9.1 Introduction**

To determine the transfer of organic and inorganic carbon from the chlorophyll maximum to mid water depths along the extended Ellett line transect (500m water depth) water samples were collected from the CTD and filtered. Samples were taken from the chlorophyll maxima depth, 75m, 100m 200m and 500m. All stations and respective depths chosen are shown in the CTD logs in the appendices.

### **9.2 Method**

Samples were collected from the CTD in 2l polythene bottles and between 1 and 2l of each sample were filtered through pre-combusted (500C, 3hrs) 13mm diameter Gelman A/D glass fiber filters. The filtration rig used is an in-house design that uses 13mm filter holders and vacuum filtration. Normally 1l of sample was filtered if from the chlorophyll maxima and 2l was filtered for samples taken below this depth. A maximum of five depths were sampled from 54 casts along the transect. Samples, once collected and filtered, were stored in plastic 30mm diameter petri dishes in the -20C freezer. Analysis will take place at SAMS using a Costech Elemental Analyser. Prior to analysis the organic carbon filter samples will undergo 24hrs of hydrochloric acid fuming to removing inorganic carbon (calcium carbonate).

## **10 Chlorophyll**

*Tim Brand(SAMS) and Colin Abernethy(SAMS)*

### **10.1 Introduction**

To determine the photosynthetic biomass of the upper waters of the extended Ellett Line transect. Samples were collected from the CTD and filtered. Samples were taken from from 5m depth, chlorophyll maxima, 50m, 75m and 100mm depth. All stations and respective depths chosen are shown in the CTD logs in the appendices. 25 underway samples were also taken from the non-toxic supply

### **10.2 Method**

Samples were collected from the CTD in 2l polythene bottles and between 1 and 2l of each sample were filtered through Whatman 25mm GF/F diameter glass fiber filters. The filtration rig used is an in-house design that uses 25mm filter holders and vacuum filtration. Normally 1 l of sample was filtered if from the chlorophyll maxima and 2l was filtered for samples taken below this depth. A maximum of five depths were sampled from 54 casts along the transect. Samples, once collected and filtered, were stored in plastic 15mm diameter centrifuge tubes in a -20C freezer. Whilst on board extraction using 5mls of 90% buffered (magnesium carbonate) acetone was injected into the tube and the sample was sonicated for 1 minute. An aliquot of the extract was then taken and measured on a Turner bench top fluorometer using a chlorophyll calibrated program.

## 11 Determination of dissolved oxygen in sea water by Winkler titration.

*Richard Abell SAMS & Penny Holliday NOC.*

### 11.1 Introduction

Dissolved oxygen (DO) concentrations were measured via Winkler photometric auto-titration (Carpenter 1965) as a tool to calibrate the oxygen sensor deployed with the CTD. In addition, a cross calibration exercise was possible comparing these data with tandem measurements made using an amperometric technique. During the course of the cruise 322 water samples were collected in total. 294 samples were taken from 99 Niskin bottles with which to calibrate the DO sensor.

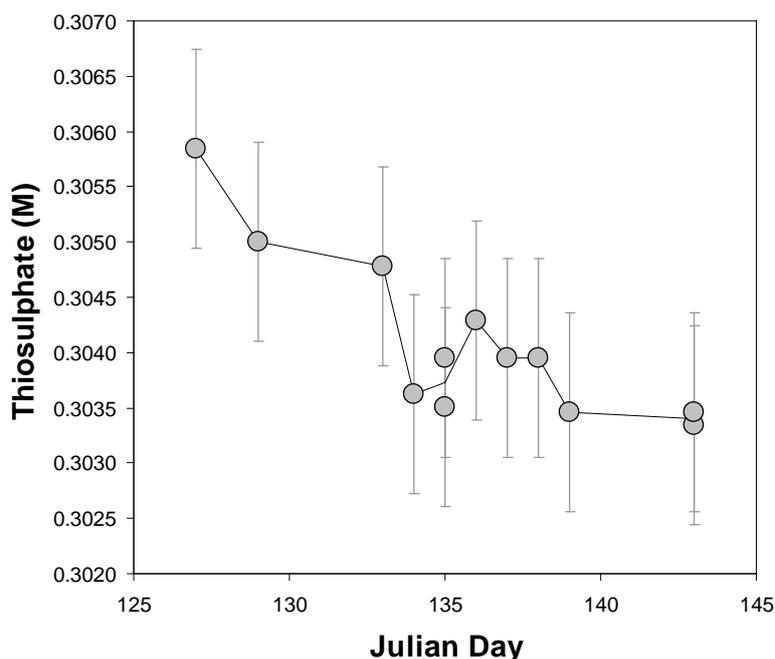
### 11.2 Methodology

Niskin bottles were fired for DO sampling after reviewing the CTD profile. 3 – 4 depths were chosen including both DO minima and maxima whilst not coinciding with sharp changes in gradient. Typically, surface waters with high fluorescence were avoided whilst the deepest bottle was routinely sampled to monitor any pressure effects. Each bottle was sampled in triplicate following WOCE protocols (Culberson, 1991 and Dickson, 1995). Seawater samples were drawn from Niskin bottles via a short length of silicon tubing without allowing air bubbles to enter the individually calibrated borosilicate sampling bottles. Excess seawater (at least three times the bottle volume) was flushed through the sample bottle to both clean it and remove air bubbles. Samples were fixed immediately using 1ml of 3M  $\text{MnSO}_4$  and 1ml of 8M NaOH + 4M NaI and the temperature of fixing recorded using a digital thermometer in a separate sample bottle. Reagents were dispensed below the surface of the sample so as not to introduce air bubbles and ensure all reacting species were contained within the sample. Ground glass lid stoppers were added tightly, again ensuring no air bubbles were trapped within the sample. Samples were shaken vigorously and transferred to a dark cool storage space in the lab. After 1 hour samples were re-shaken and allowed to settle for at least 6 hours prior to analysis.

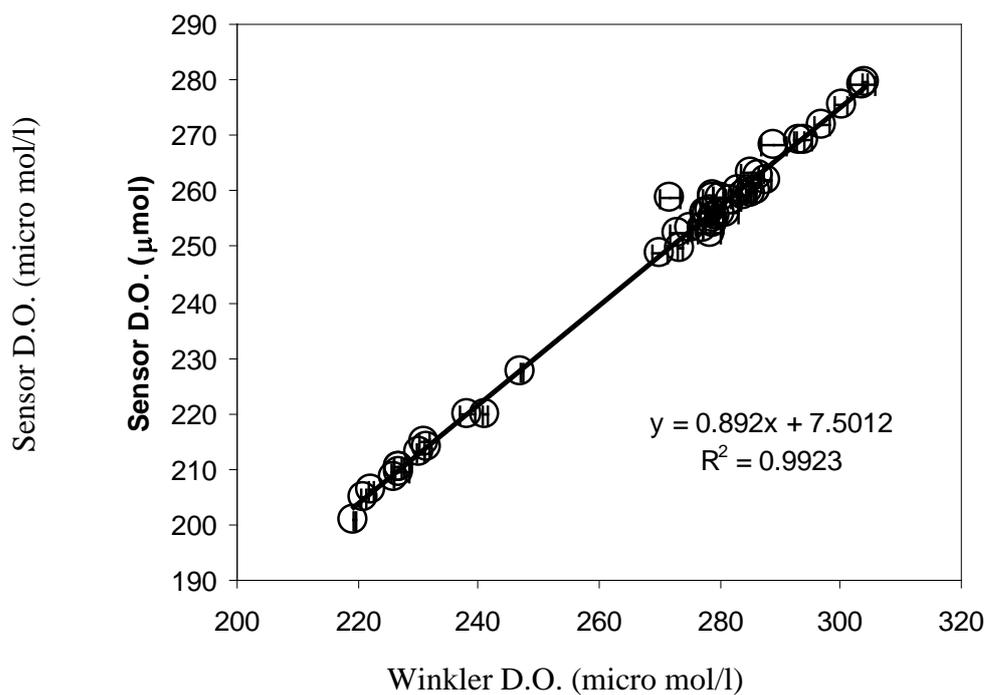
Samples were placed on a bench for 1 hour before titration allow equilibration with lab temperature. Before every analytical session the titrant (0.3 M  $\text{Na}_2\text{S}_2\text{O}_3$ ) was standardised using an in-house gravimetrically prepared 0.009M  $\text{KIO}_3$  standard. During the course of the cruise the drift in titre concentration was small ( $\sim 0.0025\text{M}$ , Figure 11.1). 1 ml of 5M  $\text{H}_2\text{SO}_4$  was added to samples followed by a Teflon coated magnetic stirrer. End points reached by the auto burette were recorded. Reagent blanks were also measured prior to sample analysis and subtracted during the titration calculation. The reagent blank although small,  $\sim 0.003$  ml of titre, is significant and reduces the mean DO concentration of the samples by  $\sim 1$  micro mol/l. The temperature of fixing has the smallest effects of the correcting parameters, resulting in a mean correction value of  $\sim -0.02$  micro mol/l (although this parameter is also used in the conversion of micro mol/l to micro mol/kg during post analysis data conversion).

### 11.3 Results

In total, 278 samples were taken from 99 bottles. 19 samples (~6%) were lost due to air being trapped within the bottle or, being spoilt (dropped/spilled) during analysis. Data are reported as a mean and standard deviation of three repeat measurements. Preliminary results of the DO concentrations measured at the time of bottle firing via CTD sensor versus the Winkler titration of water samples taken from the first 48 bottles are shown in Figure 11.2. Although the Winkler titration results are not strictly an independent variable, a regression equation shows that the data can be explained well by a linear model. The internal reproducibility of the 99 triplicates analysis was 0.28%. A key factors in maintaining low reproducibility was regular servicing (including replacement of the reagent reservoir) of the multi dispensing pipettes, the mechanisms of which became 'sticky' with constant use. Anecdotally, this seemed to be linked with air bubbles introduced during addition of Winkler A. This was identified halfway through the cruise and the mean reproducibility of triplicate measurements dropped from 0.30 in the first half of the cruise, to 0.19 thereafter.



**Figure 11.1.** Drift in molarity of sodium thiosulphate titre solution during the JCO86 cruise.



**Figure 11.2.** Preliminary data from the first 46 CTD casts showing dissolved oxygen concentration measured by Winkler titration versus CTD sensor measurements. Error bars are 1 standard deviation of three repeat measurements.

References.

Carpenter, J.H. 1965. The Chesapeake Bay Institute technique for the Winkler dissolved oxygen method. *Limnol. and Oceanogr.* 10:141-143.

Culbertson, C.H. 1991. Dissolved Oxygen. WHPO Publication 91-1.

Dickson, A.D. 1995. Determination of dissolved oxygen in sea water by Winkler titration. WOCE Operations Manual, Part 3.1.3 Operations & Methods, WHP Office Report WHPO 91-1.

## 12 Stand-Alone Pump (SAP) deployment

*Tim Brand, Clare Johnson, Andy Mogg (SAMS)*

*John Wynar (NMF-SS)*

### 12.1 Rationale

To investigate the biogeochemistry of the particulate material within the lower oxygen layer of the eastern subpolar North Atlantic.

### 12.2 Deployment

Eight stations were occupied in the Iceland Basin, Rockall-Hatton Plateau and Rockall Trough (Table 12.1). At each station between three to five SAPS were deployed in order to sample both the core of the lower oxygen layer and water above and below this. The SAPs were deployed on the ships coring wire with a weight 50 m below the deepest SAP. This was lowered and raised to the desired depths at a rate not exceeding 40 m min<sup>-1</sup>.

Station Name	SAP deployment	Lat. (°N)	Long.(°W)	Depth (m)	SAP depths (m) and (SAP number)
IB16	SAP001	61.492	20.017	2236	200 (5), 500 (4), 620 (3), 800 (2), 1200 (1)
IB19	SAP002	62.667	19.677	1689	200 (5), 500 (4), 700 (3), 1000 (2), 1200 (1)
IB14	SAP003	61.001	20.000	2409	200 (5), 500 (4), 600 (3), 800 (2), 1200 (1)
Test	SAP004	59.409	18.425	2436	300 (4), 300 (2)
IB10	SAP005	59.409	18.425	2435	300 (5), 500 (4), 800 (2)
IB4	SAP006	58.500	16.000	1190	700 (5), 850 (4), 1000 (2)
H	SAP007	57.483	11.533	2021	400 (5), 600 (4), 800 (2)
M	SAP008	57.300	10.383	2211	800 (5), 920 (4), 1100 (2)

*Table 12.1 Metadata for SAP sampling. Numbers in brackets refer to individual SAP numbers (see Table 12.2 for SAP serial numbers).*

The SAPs are designed such that a large volume (1000 litres plus) of seawater can be filtered *in-situ* within the ocean with any particulate material trapped on a filter within the housing. The filters used for this work were Whatman 293mm diameter GFF filters (0.7 m pore) which prior to the cruise had been prebaked at 500 °C for 4 hours to remove organic carbon. These were wrapped in tin foil until use. Each SAP was primed to pump for between 90 and 120 minutes, with a suitable programmed delay to ensure that all the units were at the required depth before pumping commenced. The flow reading for each SAP was noted prior to and after deployment allowing the volume pumped, in litres, to be calculated. For four out of the five SAPs (those primed using a computer) the actual time the SAP pumped for was recorded. However, for one SAP (no. 5, SN 03-02) this was not possible due to the magnetic priming mechanism. Disappointingly the actual pump times were less than programmed

## JC086 Cruise Report

pump times for nearly every deployment (Table 2). One SAP performed particularly badly: SAP 1 (SN 02-003); whilst SAP 3 (SN 03-07), although pumping for a long period, only pumped a very small volume during its second and third deployment. These two SAPs were therefore not used from cast SAP004 onwards. This is discussed further in the problems section.

After recovery the filter housings were disconnected from the SAPs and stored in a dark fridge until subsampling which was completed within two hours. Prior to deployment SAP005, filter papers were torn badly despite the recommended deployment procedure being followed. A number of unsuccessful solutions were tried; however, a simple home-made one way valve used for SAP005 onwards solved the problem. This is discussed more fully in the problems section.

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Station name	SAP deployment	SAP No.	SAP serial No.	Programmed pump time (mins)	Actual pump time (mins)	Vol. filtered (litres)
IB16	001	1	02-003	90	19	244
		2	03-01	90	38	624
		3	03-07	90	36	601
		4	03-04	90	44	805
		5	03-02	90	NA	813
IB19	002	1	02-003	120	38	589
		2	03-01	120	65	1096
		3	03-07	120	120	23
		4	03-04	120	72	1303
		5	03-02	120	NA	1170
IB14	003	1	02-003	90	40	456
		2	03-01	90	71	841
		3	03-07	90	90	13
		4	03-04	90	80	1021
		5	03-02	90	NA	690
IB10	005	2	03-01	90	64	1081
		4	03-04	90	56	1047
		5	03-02	90	NA	996
IB4	006	2	03-01	90	78	1373
		4	03-04	90	69	1325
		5	03-02	90	NA	1069
H	007	2	03-01	90	72	1232
		4	03-04	90	59	1088
		5	03-02	90	NA	949
M	008	2	03-01	90	64	1079
		4	03-04	90	90	1809
		5	03-02	90	NA	978

*Table 12.2 Programmed pump times, actual pump times and volume filtered for each SAP during each deployment. Actual pump time is not available for SAP 5 (SN 03-02) due to it being primed by dials and a magnet rather than via a computer.*

### 12.3 Subsampling SAP filters

The large GFF filters from individual SAPs were subsampled in a laminar flow hood immediately after recovery. Subsamples of various sizes were taken using punches, generally in the following order:

- (1) 2 x 100 mm subsamples for trace metal analysis (work-up by Rich Abell).
- (2) 2+ x 44 mm subsamples for DNA/RNA analysis (work-up by Dave Green and Angela Hatton).
- (3) 3 x 22 mm subsamples for Thorium-234 analysis (work-up by Robert Turnewitsch).
- (4) 3 x 44 mm subsamples for lipid analysis (work-up by Dave Pond).
- (5) 3 x 13 mm subsamples for particulate inorganic carbon analysis (work-up by Rich Abell).
- (6) 3 x 13 mm subsamples for particulate organic carbon analysis (work-up by Rich Abell).
- (7) 1 x 44 mm subsample for chlorophyll analysis (analysed onboard by Colin Abernethy).
- (8) 1 x 100 mm spare subsample.

These were stored in petri-dishes, plastic screw-cap tubes, or in the case of those for lipid analysis in small glass screw-cap vials with the addition of sufficient 1:1 ethanol:chloroform to cover the filters. All samples were then kept at -20 °C. Whilst those for chlorophyll A and phaeophytin. A were analysed on-board, the remaining samples were transported back to SAMS and will be analysed within the next few months.

### 12.4 Problems

Problems encountered during JC086 were: tearing of filter papers within the SAP filter housing, poor performance of the SAP batteries, and poor performance of the SAP pumps. These are discussed individually below. The tearing of the filter papers prior to cast SAP005 means that data collected during the first three stations in the Iceland Basin (IB16, IB19, IB14) must be regarded as suspect: particulate matter may have escaped through the tears in the filters and the exact volume of water filtered is not accurately known. The poor performance of two out of the five SAPs led to them not being used, decreasing the number of depths that could be sampled at each station. Although the three remaining SAPs performed reasonably well, the fact that the pumps stopped prior to the pre-determined time reduced the volume of water filtered and therefore amount of particulate matter on the filter. This may mean that the concentrations of some analysed parameters are too low to measure accurately.

#### 1. Tearing of filter papers

Prior to deployment SAP005, all but one filter paper (at 200 m, IB16, SAP001) from each depth on every cast tore badly despite following recommended deployment and recovery procedures. It was hypothesised that this was due to back-flow of water through the pump

outflow pipe causing the filter paper to dome and therefore tear. A number of unsuccessful solutions, including those recommended by scientists who had used SAPs before, were tried:

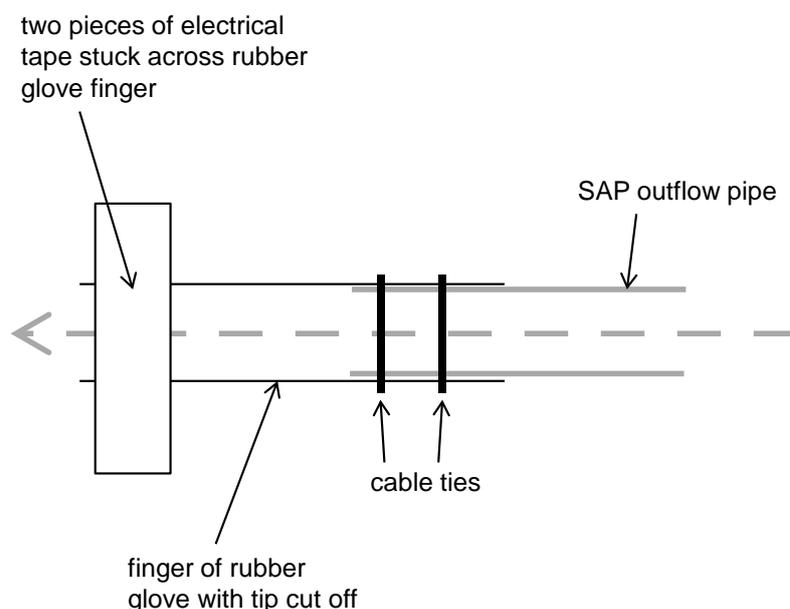
(1) filling the filter housing and pump system with reverse osmosis water prior to deployment and preventing this water from escaping by removing a bung from the outflow pipe as late as possible in the deployment procedure. (A large amount of the water drained from the SAPs whilst lowering from deck level, when the bung was removed, to the sea surface. Filter papers still tore badly).

(2) filling the filter housing and pump system with reverse osmosis water prior to deployment and preventing this water from escaping the system by placing either blue roll or a salinity cap in the outflow pipe. These ‘bungs’ were left in during deployment with the assumption that they would be forced out either during descent or when the pump began. (The salinity cap ‘bung’ was missing on recovery, however, the filter paper still tore badly. The blue roll ‘bung’ remained in the outflow pipe during the whole deployment meaning that the SAP was not able to filter any water. Despite this the filter paper was still torn although the tear was not as large as seen on previous deployments).

(3) allowing the SAP to sit at around 2-5 m below the sea surface so the system de-bubbled before deployment to depth. (All filter papers were still badly torn).

(4) putting two GFF filters within the filter housing (i.e. double filtering) to try and prevent the filters from doming and tearing. (All upper filters were badly torn, and four out of five of the lower filter papers were also badly torn).

The problem was eventually solved by adding a simple home-made one-way valve to the SAP outflow pipe (Fig. 12.1). After adding this modification only one filter paper (out of 12) tore slightly although this tear was less than 4 mm in length (at 850 m, SAP006, IB4).



*Figure 12.1 The simple one-way valve used during JC086 to prevent water from entering the SAP outflow pipe and causing the filter papers to dome and tear, whilst still allowing water (and any trapped air) to flow out of the SAP system (dashed grey arrow). Designed by John Beaton and Tim Brand.*

## **2. Poor performance of SAP batteries**

Even though the SAPs were trickle charged until around 30 minutes before deployment, nearly every SAP deployed (17 out of 20) stopped pumping, due to low battery voltage, prior to its designated stop time (Table 2). This meant that a smaller volume of water was filtered possibly rendering some of the chemical components on the filter at too low a concentration to measure accurately. The performance of SAP 1 (SN 02-003) was particularly poor with it only pumping for 19, 38 and 40 minutes respectively, out of a programmed 90 minutes, on the three occasions it was deployed.

## **3. Poor performance of pumps**

In the case of SAP 3 (SN 03-07), although the pump was switched on for the whole of the programmed pump time during deployments SAP002 and SAP003, only 23 and 13 litres were filtered respectively (Table 2). However, on cast SAP001, 601 litres were filtered. This indicates that the system malfunctioned at some point on the latter period of deployment SAP001, or early during SAP002. Possible causes may be a blockage within the system, or failure of the pump.

## 12.5 Recommendations

Modifications are required to the current SAP design when using a GFF filter paper to prevent these from doming and tearing. (We believe that this problem is not encountered when using zooplankton mesh due to this materials higher strength). As a simple one-way valve on the SAP outflow pipe solved the problem, this indicates that water backflow through the system is the likely cause. We therefore recommend that one-way valves are added to the marine pools stock.

It was suspected that the SAP pumps may be shutting down as the result of the battery voltage temporarily dipping (i.e. spiking) below a pre-designated cut-off level. We therefore recommend that the SAP programming is checked to ensure that an increased period of time of low battery voltage is required before the pumps automatically shut down. Alternatively some SAPs (such as SAP 1, SN 02-003) may require new batteries which is not an easy task at sea. It may also be worth investigating whether a better power source, such as lithium batteries could be used.

## 13 Oxygen isotopes samples

Alice Marzocchi (University of Bristol)

### 13.1 Introduction

The oxygen isotopic composition of seawater ( $\delta^{18}\text{O}_w$ ) is mainly controlled by surface processes. It is increased by evaporation and decreased by precipitation, and it therefore has a relationship to salinity. This relationship is linear, but the slope varies regionally as it depends upon local evaporation and precipitation patterns. The isotopic composition of precipitation decreases with latitude; hence,  $\delta^{18}\text{O}_w$  acts as a conservative tracer away from the surface.

At high latitudes,  $\delta^{18}\text{O}_w$  is a very sensitive tracer for sea ice melt-waters. This process will decrease salinity but have little impact on  $\delta^{18}\text{O}_w$ , because the isotopic composition of sea ice is very similar to the seawater from which it formed. Similarly, brine rejection will increase salinity but leave  $\delta^{18}\text{O}_w$  unchanged. Thus, although these characteristics are controlled by evaporation and precipitation processes, the two tracers uncouple at high latitudes.

The Global Seawater Oxygen-18 Database (<http://data.giss.nasa.gov/o18data>) contains some 26,000 measurements of  $\delta^{18}\text{O}_w$ , but few sites include data spanning all months of the year (most of them being one measurement for a single month of the year). Hence, there is considerable uncertainty in the impact of both seasonal variations and interannual variability on derived relationships. The purpose of  $\delta^{18}\text{O}_w$  sampling along the Extended Ellett Line is to add measurements that could fill in the existing gaps in the available datasets. This offers the possibility to sample in a systematic way the isotopic composition of both the warm salty northward flowing North East Atlantic waters, and of the cooler, fresher deep return flow from the Arctic Ocean.

### 13.2 Method

Samples were collected from CTD casts at 12 selected stations at different depths (see Table 13.1 and 13.2). Sea water was collected from the CTD using a flexible silicon tube, which was placed onto the Niskin bottle spigot. 30 ml HDPE bottles were used. These were new, and 1-2 bottle volumes of sample water were used to rinse them out and to flush out any air bubbles in the tube. The bottles were then slowly filled with sea water using a pinch technique on the tube to avoid introduction of air bubbles into the sample due to turbulence. The tube was initially placed at the bottom of the bottle and gradually withdrawn. No air space was left at the top of the bottles by filling them up to the brim (forming a meniscus). Straight after sampling, sample bottles were sealed with self-amalgamating tape and stored in the dark at 7.5°C, in order to prevent evaporation and consequent change in  $\delta^{18}\text{O}_w$  values. Samples will be analysed at the University of Bristol using a Picarro L1102-i isotopic Liquid Water and Water Vapor Analyzer.

STATION	CTD CAST No.	LATITUDE	LONGITUDE	DEPTH (m)
IB21S	010	63° 08.047' N	19° 55.038' W	1040
IB17	014	61° 59.943' N	20° 00.148' W	2217
IB14	018	61° 00.042' N	19° 59.968' W	2409
IB11	022	59° 39.989' N	19° 07.007' W	2680
IB8	025	59° 12.043' N	17° 53.048' W	1572
IB4	029	58° 30.022 ' N	15° 59.915' W	1188
IB3	030	58° 15.015' N	15° 20.030' W	657
B	034	57° 34.001' N	13° 19.996' W	170
H	040	57° 29.214' N	11° 31.843' W	2012
J	042	57° 26.983' N	11° 04.917' W	585
M	045	57° 17.909' N	10° 23.425' W	2213
15G	073	56° 52.962 ' N	08° 29.916 ' W	124

**Table 13.1** Ellett Line *stations sampled for oxygen isotopes analysis.*

STATION	DEPTHS SAMPLED (pressure - dbar)
IB21S	7, 52, 203, 506, 1041
IB17	7, 51, 202, 505, 1011, 1514, 1810
IB14	11, 54, 205, 508, 1013, 1519, 2026, 2412
IB11	4, 50, 203, 505, 1009, 1519, 2000, 2330, 2700
IB8	5, 50, 202, 505, 1010, 1535
IB4	5, 51, 201, 505, 1013, 1188
IB3	6, 51, 202, 504, 655
B	6, 26, 50, 101, 171
H	5, 51, 203, 506, 1009, 1515, 2033
J	5, 50, 203, 507, 582
M	5, 50, 201, 504, 1009, 1514, 2022, 2228
15G	6, 21, 51, 82, 121

**Table 13.2** *Depths sampled at each of the stations indicated in Table 1.*

## 14 Carbonate chemistry (DIC/TA), Carbon isotopes ( $^{13}\text{C}$ ), Nutrients and Dissolved Oxygen

*Jan-Lukas Menzel Barraqueta, Jennifer Clarke and Giuseppe Foti  
(NOCS).*

### 14.1 Introduction

Atmospheric  $\text{CO}_2$  concentrations have increased rapidly over the past century, from 280 ppm at the beginning of the industrial revolution to 400 ppm, present day. Major contributors to this include anthropogenic fossil fuel burning and increased deforestation. The oceans are a major sink in the global carbon cycle and help mitigate the effects of this increasing atmospheric  $\text{CO}_2$ .

As carbon dioxide dissolves, it equilibrates into seawater in three forms ( $\text{CO}_2$  (aq),  $\text{HCO}_3^-$  and  $\text{CO}_3^{2-}$ -that are collectively Dissolved inorganic Carbon (DIC) -and causes the formation of protons ( $\text{H}^+$ ). The three carbon forms then remain in equilibrium on timescale longer than a few minutes. The oceanic uptake and storage of anthropogenic  $\text{CO}_2$  is impacting the chemistry of the oceans by increasing the amount of DIC present and therefore ultimately decreasing the pH of water.

Currently a third of the anthropogenic emissions to the atmosphere are sequestered by the oceans, with the North Atlantic accounting for 23% of them (*Sabine et al, 2004*), despite only covering 15% of the global ocean area. This magnifies the importance of research into the biogeochemistry of this area, and more specifically the carbonate system. The carbonate system can be determined by four parameters: DIC,  $\text{pCO}_2$ , alkalinity and pH (*Millero 1995; Zeebe and Wolf-Gladrow 2005; Millero 2007*).

The Extended Ellett line 2013 offers us the opportunity to investigate, in a higher vertical and horizontal spatial resolution, and compare to previous years, the changes in chemistry and the rates of accumulation of anthropogenic  $\text{CO}_2$  in the different water masses that appear along the transect.

To achieve these objectives five different parameters: dissolved inorganic carbon (DIC), total alkalinity (TA), carbon ( $^{13}\text{C}$ ) isotopes, nutrients and dissolved oxygen have been sampled on board the R.R.S. James Cook across the Extended Ellett line. Furthermore, a high spatial surface resolution of carbonate chemistry (pH and DIC) has been covered by using two different underway sampling systems which sample approximately every five minutes from the non-toxic underway water supply.

### 14.2 Sampling and Analysis

Across 51 stations all the samples, except the ones from the underway non-toxic supply, were sampled using a silicon tube, from 24x10l Niskin bottles attached to a stainless steel CTD rosette.

- DIC/TA:

Samples were collected in 250ml borosilicate glass bottles.

A total number of 555 samples have been sampled (**Table 14.1**), from which 47 samples have been taken from the non-toxic underway supply at the same moment than the 5 metre depth Niskin bottle was fired, allowing us to compare the non-toxic underway

supply with the Niskin bottle samples. 36 samples are duplicates which will allow us to estimate the accuracy of the results.

Special care has been taken to avoid bubble formation either in the sampling or spiking time.

Samples with spiked with saturated mercuric chloride solution, stoppers were greased (apeizon) and the bottles taped to prevent gas exchange or alteration within the sample. In addition they have been stored in crates in the dark until analysis back at NOCS.

Sampling procedure follows the methodology describe by *Dickson et al, 2007* in “Guide to Best Practices for Ocean CO<sub>2</sub> Measurements”.

Analysis will be undertaken in NOCS by using the Versatile Instrument for Analysis of Dissolved Inorganic Carbon and Titration Alkalinity (VINDTA 3C) which uses a coulometer and a closed titration cell for the analysis of DIC and TA respectively.

- **Carbon Isotopes <sup>13</sup>C:**

Samples were taken in 40ml air extractive vials.

A total amount of 291 samples were taken (**Table 14.1**). The sampling procedure follows the same principles as above with no headspace created. Samples were spiked with saturated mercuric chloride, taped and stored in dark until analysis.

DIC  $\delta^{13}\text{C}$  will be differentiated from the natural DIC inventory via a Helium stripping technique and the  $\delta^{13}\text{C}$  signal of the resultant CO<sub>2</sub> gas during the procedure will be analysed using a mass spectrometer.

- **Nutrients:**

Samples were taken in 30ml plastic vials which were filled up to 2/3 of the total volume to allow expansion of water.

In total, 451 samples were taken (**Table 14.1**), matching the same depths as for DIC and TA. Samples were labelled and stored in the freezer until analysis.

Analysis will be run back at NOCS using a Quattro nutrient analyzer system.

- **Oxygen:**

Samples were taken in  $\pm$  110 ml wide neck borosilicate glass bottles. All the bottles were volume calibrated before the cruise to allow exact calculations post-analysis.

364 samples were taking during the section (**Table 14.1**), with no samples taken across the Scottish shelf. From each depth sampled, a duplicate was taken to allow a comparison of the values. Special care was taken at the time of sampling to not produce bubbles. Immediately after sampling, samples were spiked, first with 1 ml of manganous chloride 3M and secondly with 1 ml of alkaline iodide (sodium hydroxide (8M) and sodium iodide (4M)). Samples were shaken straight after spiking and one hour after sampled to allow complete reaction of the chemicals with the dissolved oxygen.

Analysis was performed on board as soon as possible, following the Winkler titration method (*Carpenter, 1965*) and using a high precision 5ml automatic burette and a Titrimo

unit supplied by Metrohm. Before titration, samples were spiked with 1 ml of sulphuric acid (5M) and titrated with sodium thiosulphate (0.01M).

To allow accurate calculations of the concentration of dissolved oxygen, standardization of the thiosulphate with an iodate standard (Ocean Sciences International) and a set of blank measurements was undertaken before every analysis session.

Results have been used to allow the calibration of the O<sub>2</sub> CTD sensor attached to the stainless steel rosette.

All the sampling and analysis followed the methodology outlined in *Langdon, 2010* "Determination of dissolved oxygen in seawater using the amperometric technique".

### 14.3 Issues

No major issues occurred with the sampling and processing of DIC, TA and Nutrient samples. Some samples were left a couple of hours after spiking without greasing and taping.

Carbon isotopes sampling complicate the situation, since at the moment of spiking it was very difficult to keep a meniscus on top of the vials which will allow the no formation of bubbles when sealed with the air-tight lids. Many of the samples had a small bubble inside due to this problem.

Oxygen sampling differs from the above mentioned as many people were involved in the sampling and spiking (Due to excess of samples needed to be taken from each cast). This allows inexperienced people to spike, handle and shake the samples which finally induce an offset in the results of the duplicates. Values with a higher offset of 1 micro mol haven't been taken into account for calibration with the CTD O<sub>2</sub> sensor.

As a recommendation, we will suggest the use of only experienced people while sampling etc, to avoid the waste of time at sampling and post-analysis.

In general sampling and storing was very successful.

#### • References:

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**Table 14.1 Station, Cast and depth distribution of the five different parameters sampled across the Extended Ellett Line 2013. Stations marked in blue have no nutrient data.**

Cast	Station	Depth's Sampled (Underway (U) for DIC/Alk only)		
		DIC/Alk & Nutrients	<sup>13</sup> C	Oxygen
8	IB22	195, 160, 140, 100, 50, 20, 15, 5, U	195, 160, 140, 100, 50, 20, 15, 5	195, 140, 50
9	IB22s	653, 600, 500, 400, 300, 200, 100, 50, 25, 5, U	653, 600, 500, 400, 300, 200, 100, 50, 25, 5	653, 600, 500, 100, 25
10	IB21s	1028, 900, 750, 550, 500, 200, 100, 75, 50, 32, 5, U	1028, 900, 750, 550, 500, 200, 100, 75, 50, 32, 5	1030, 900, 750, 550, 200, 100, 50, 32
11	IB20s	1380, 1000, 600, 500, 200, 100, 75, 50, 15, 5, U	1380, 600, 500, 75, 50, 15, 5	1380, 1000, 600, 100, 15
12	IB19s	1665, 1000, 700, 500, 200, 100, 50, 20, 5, U	1665, 1000, 700, 500, 200, 100, 50, 20, 5	1665, 1000, 700, 200, 20
13	IB18s	1780, 1200, 800, 500, 100, 75, 40, 25, 5, U	1780, 1200, 800, 500, 100, 75, 40, 25, 5	1780, 800, 500, 200, 40
14	IB17	1785, 1400, 1000, 850, 700, 500, 100, 50, 7, U	1785, 1400, 1000, 850, 700, 100, 50, 7	1785, 1400, 700, 100, 7
16	IB16	2206, 1600, 1200, 1000, 800, 620, 500, 200, 100, 50, 28, 5, U	2206, 1600, 1200, 1000, 620, 500, 100, 28, 5	2206, 1600, 1000, 620, 100, 28
17	IB15	2358, 2000, 1500, 1000, 660, 200, 100, 75, 50, 16, 5, U	2358, 2000, 1500, 1000, 660, 200, 75, 50, 5	2360, 1500, 1000, 660, 200, 100
18	IB14	2375, 2200, 2000, 1800, 1400, 1200, 800, 600, 200, 100, 75, 50, 20, 8, U	2375, 2000, 1400, 800, 600, 100, 75, 50	2375, 2200, 1200, 600, 100, 20
20	IB13	2510, 2200, 1800, 1500, 1200, 1000, 800, 650, 400, 200, 100, 75*, 50, 22, 5	2510, 1800, 1200, 400, 200, 22	2510, 1200, 650, 200, 22
21	IB12	2715, 2600, 2450, 2300, 2100, 2000, 1800, 1650, 1500, 1350, 1200, 1000, 800, 700, 500, 350, 200, 100, 75, 50, 25, 10, U	2715, 2600, 2450, 2300, 2100, 1800, 1650, 1500, 1200, 1000, 800, 700, 500, 350, 200, 75, 25	2715, 2600, 2000, 1500, 700, 350, 25
22	IB11	2660, 2500, 2300, 2000, 1800, 1500, 1200, 1000, 800, 600,	2660, 2500, 2300, 2000, 1500, 1200,	2660, 2000, 1500, 1000,

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		500, 200, 100, 75, 50, 25, 5, U	800, 600, 100, 50, 25	600, 200, 75
23	IB10	2400, 2300, 2000, 1800, 1500, 1200, 1000, 800, 500, 200, 100, 75, 50, 25, 10	2400, 2000, 1500, 1000, 500, 100, 50, 10	2400, 1200, 500, 200, 50
24	IB9	1859, 1600, 1400, 1200, 1000, 800, 650, 500, 350, 200, 100, 50, 20, 5, U	1859, 1600, 1400, 1000, 650, 500, 200, 50	1859, 1200, 650, 200, 20
25	IB8	1515, 1300, 1100, 900, 800, 600, 500, 300, 100, 50, 260, 5, U	1515, 1300, 1100, 800, 500, 100, 260	1515, 1300, 800, 500, 260
26	IB7	970, 700, 600, 500, 380, 300, 200, 100, 75, 50, 10, 5, U	970, 700, 500, 380, 100, 50	970, 700, 380, 300, 100
27	IB6	880, 748, 600, 300, 200, 100, 50, 30, 5, U	880, 748, 600, 300, 100, 30	880, 748, 300, 100, 30
28	IB5	1146, 1000, 865, 600, 300, 200, 100, 75, 50, 35, 10, 5, U	1146, 1000, 865, 600, 300, 100, 35, 5	1146, 865, 600, 300, 100
29	IB4	1180, 850, 700, 500, 100, 75*, 50, 20, 5, U	1180, 850, 700, 500, 100, 50, 20	1180, 850, 500, 100, 20
30	IB3	648, 550, 450, 250, 100, 75, 40, 5, U	648, 550, 250, 40	648, 500, 100
31	IB2	433, 400, 340, 200, 100, 75, 50, 15, 5, U	433, 340, 200, 75	435, 340, 100, 15
32	IB1	140, 100, 75, 50, 25, 10, 5, U	140, 100, 50	140, 25
33	A	100, 75, 50, 12, 5, U	100, 75, 12	100, 12
34	B	170, 100, 50, 25, 5, U	170, 100	170, 25
35	C	290, 100, 50, 22, 5, U	290, 100	290, 22
36	D	1083, 910, 500, 100, 25, 5, U	1083, 910, 500	1083, 910, 25
37	E	1627, 1400, 1200, 1000, 900, 500, 300, 100, 20, 5, U	1627, 1400, 1200, 900, 300, 20	1627, 910, 20
38	F	1789, 1600, 1400, 1200, 1000, 800, 600, 400, 200, 100, 5, U	1789, 1200, 800, 200, 5	1789, 800, 200
39	G	1785, 1600, 1200, 1000, 800, 700, 400, 200, 75, 44, 5, U	1785, 1600, 1000, 400, 44	1785, 800, 200
40	H	2005, 1600, 1200, 1000, 600, 500, 200, 100, 50, 25, 5, U	2005, 1200, 600, 200	2005, 600, 100
41	I	730, 500, 100, 15, 5	730, 500	730, 500, 15
42	J	575, 200, 100, 50, 15, 5	575, 200	575, 200, 15
43	K	775, 700, 500, 300, 100, 50, 10, 5, U	775, 500, 300, 10	775, 700, 75

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44	L	2090, 1900, 1700, 1400, 1200, 1000, 700, 500, 300, 100, 50, 10, 5, U	2090, 1900, 1200, 500, 10	2090, 1000, 500, 100
45	M	2195, 2000, 1800, 1600, 1400, 1200, 1000, 1025, 600, 500, 300, 100, 50, 5, U	2195, 1800, 1200, 1025, 500, 5	2195, 1600, 1025
46	N	2090, 1800, 1600, 1200, 1000, 850, 500, 100, 75, 50, 15, 5, U	2090, 1800, 1600, 1000, 850, 500, 100	2090, 1600, 850, 100
47	O	1913, 1600, 1200, 1000, 850, 500, 200, 75, 50, 15, 5, U	1913, 1600, 1000, 850, 200	1913, 850, 200
48	P	1405, 1200, 920, 700, 300, 100, 50, 15, 5, U	1405, 1200, 920, 700	920, 100, 15, (extra sampled but not enough reagent?)
53	Q	303, 200, 100, 75, 50, 40, 5, U	303, 100, 50, 40	303
57	R	120, 100, 50, 5, U	120, 50, 5	120
59	1G	170, 100, 75, 50, 10, 5, U	170, 75, 5	
61	3G	70, 50, 10, 5, U	70, 10	
62	5G	68, 50, 15, 5, U	68, 15	
64	7G	126, 100, 75, 17, 5, U	126, 100, 75, 17	126 x 20
66	9G	150, 100, 75, 30, 10, 5, U	150, 75, 30, 10	
67	10G	208, 150, 100, 60, 17, 5, U	207, 150, 100, 17	
70	13G	110, 100, 80, 50, 15, 5, U	110, 100, 80, 15	
72	T	120, 100, 75, 20, 5, U	120, 100, 75, 20	
73	15G	120, 100, 80, 50, 16, 5, U	120, 100, 80, 16	
74	S	120, 60, 10, 5, U	120, 60, 10	



## 15 High spatial horizontal carbonate chemistry spatial resolution (Dissolved Inorganic Carbon and pH)

*Jennifer Clarke, Jan-Lukas Menzel Barraqueta, Giuseppe Foti (NOCS).*

### 15.1 Introduction

Two different systems were used to allow the first high spatial resolution, horizontal surface carbonate chemistry across the Extended Ellett line. Both systems sampled every five minutes of cruise using the non-toxic underwater supply available in the lab.

Furthermore the two systems were running from the beginning of the cruise adding extra information about the carbonate system in the Iceland Basin and North Atlantic to the results from EEL.

- Dissolve Inorganic Carbon:

For the analysis of dissolve inorganic carbon an Apollo SciTech System (**Image 15.1**) has been used. Special care has been taken to decrease the length of the sampling tube, increasing the accuracy of matching the sample with the actual position of the ship at the moment of the sampling. The amount of time that the seawater needs to actually reach the sink in the lab is about 50 seconds which will be taking into account when calculating results.

The equipment is divided into two sections. The first part allows the conversion of all the inorganic species of carbon into CO<sub>2</sub> gas by mixing it with phosphoric acid in a closed cell. The total CO<sub>2</sub> gas is then carried out with the help of N<sub>2</sub> gas (99.9%) to the Li-COR, keeping a constant pressure of 1 to 1.5 bars, where by infrared analysis, the amount of CO<sub>2</sub> gas produced is analysed.



**Image 15.1: Apollo SciTech analyzer (Upper part) and Li-COR analyzer (Bottom part) used to determine Dissolve Inorganic Carbon.**

The sample volume used was 1 ml (Maximum sampling volume is 1.5 ml) and a full calibration was undertaken every day, running seven to ten times each volume (0.25, 0.5, 0.75, 1 and 1.25 ml) with a Certified Reference Material provided by Professor A.

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Dickson from Scripps Oceanographic Institute (Batch 123). Furthermore, every 80 samples, a CRM sample was analysed 10 times with 1 ml sample volume to allow corrections due to the natural drift of the system.

- pH

The pH sensor is based on an immobilised indicator entrapped in a membrane alongside a fluorescent reference compound. The indicator fluorescence altered according to the pH of the seawater. The fluorescence intensity was recorded throughout the cruise and analysed based on time-domain dual-luminophore referencing (Liebsch et al. 2001; Schroeder et al. 2005; Stahl et al. 2006).

*pH sensor*- The pH sensors have been developed at NOCS (Sensor group). The immobilized indicator was purchased from PreSens GmbH and attached to a fibre optic cable using silicone rubber glue.

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*Underway measurements*- The immobilized pH indicator system was running continuously from 8/05/2013 to 24/05/2013. Measurements were only interrupted for system performance checking and when the non-toxic water supplied was stopped. The performance of the system is evaluated by running certified reference material (Tris buffer and DIC/Alkalinity CRM) provided by Andre Dickson at Scripps Institute of Oceanography. The consistency of the data will be checked against the DIC underway and the CTD samples (see Carbonate chemistry cruise report), and trends in other parameters such as chlorophyll, temperature, salinity and nutrients. Data analysis and temperature/salinity corrections will be performed at NOCS.

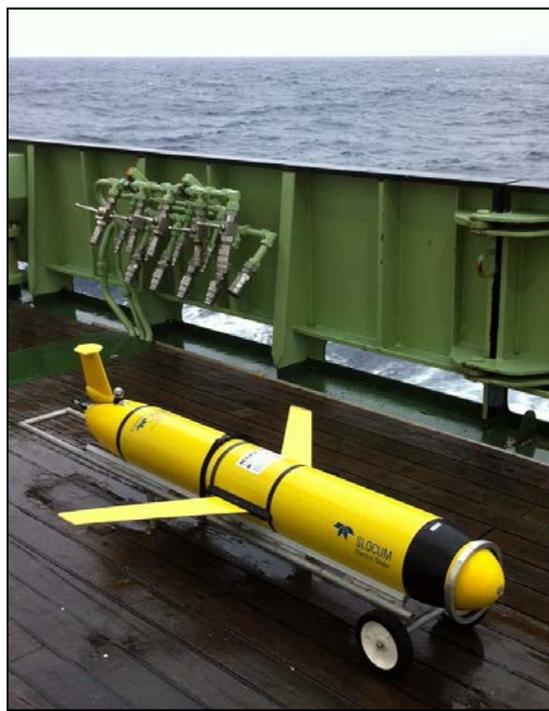


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## 16 Slocum Glider deployments

Sam Ward (NOCS)



### 16.1 Introduction

The FASTNET project aims to keep gliders in the water at the Malin site throughout the season. Two Teledyne Webb Slocum gliders 'Unit 345' and 'Ammonite' were launched on board the RRS James Cook during JC086.

'Unit 345' is rated to 200 meters and 'Ammonite' is rated to 1000 meters both are standard G2 Slocums equipped with CTD, Andraaa oxygen optode and a Wetlabs Triplet puck with Chlor- $\alpha$ , CDOM and 650nm or 700nm turbulence.

They are going to be recovered in July and replaced by 'Bellamite' and 'Zephyr' so to achieve a continuous glider presence at the Malin site.

### 16.2 Pre-deployment tests

The day before the first deployment (06.05.13) the standard 'Deck Test' procedures were followed on both gliders. 'Unit 345' passed all of its deck tests fine and was good to go, however 'Ammonite' failed the run status.mi test mission and was not safe to deploy.

After contacting Webbs Slocum support team, it was discovered that due to a 'pressure drift' fault the gliders pressure sensor thought it was at 8 meters of ocean pressure instead of at 0 meters of ocean pressure. After zeroing the gliders pressure sensor the pressure drift

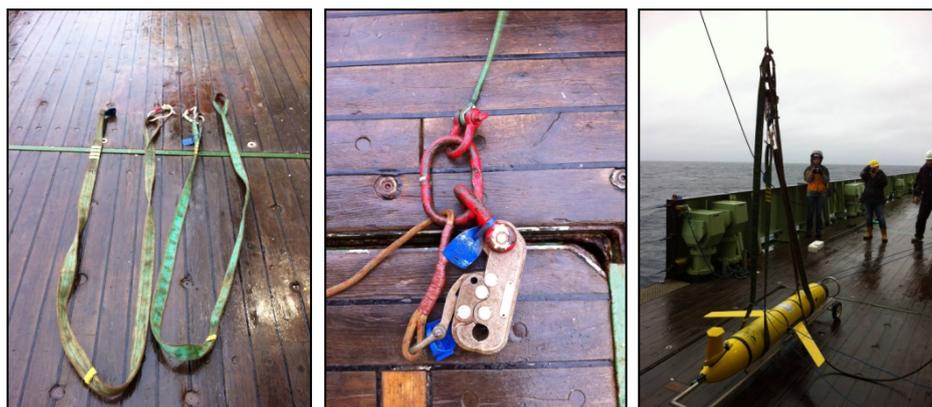
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stabilized. 'Ammonite' passed the run status.mi mission and was in a fit state for deployment which due to bad weather was set back until the 25.05.13.

### 16.3 Deployment Technique

Equipment used: Seacatch, 2 x strops, two guide lines, starboard gantry

- Attached strops to the Seacatch
- Position strops forward and aft on glider
- Lower glider into the water using the starboard gantry
- Trigger the Seactach when the glider is semi submerged
- Gently poke the glider clear of the ships side
- Continue with free-wave communications until the pilot back at base takes over operations



#### Deployment 1 Unit 345

Date:	07.05.13	
Time:	08:56	
Deployment Position:	056° 29.967'N	009° 24.786'W

#### CTD Cast 'Marmite 1' CTD 001

Date:	07.05.13	
Water Depth:	1168 m	
Time in:	09:58	
Bottom Time:	10:29	

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Time out:	11:15	
Deployment Position:	056° 30.016'N	009° 23.827'W

Unit 345's deployment went smoothly, free wave communications worked very well and the free-wave was pulled after ini0.mi mission was completed, this is when the Pilot (David White) took control from NOCS.

### Deployment 2 Ammonite

Date:	25.05.13	
Time:	07:29	
Deployment Position:	056° 32.859'N	009° 023.09'W

### Cast CTD 081

Date:	25.05.13	
Water Depth:	1155 m	
Time in:	07:18	
Bottom Time:	07:54	
Time out:	08:26	
Deployment Position:	056° 33.116'N	009° 22.397'W

Ammonite had free-wave communication issues pre-deployment. After the glider logged in to the base station at NOCS it was reset and the deck communications seemed to work adequately before deployment. Once it was in the water free-wave communications were very flaky so the pilot (Dave White) took control before the run status.mi mission was completed. The issue which prevented Ammonite being deployed originally (the 'ocean pressure drift') caused a continuous loop in the terminal programme which was rectified by resetting the zero ocean pressure command, Ammonite then completed all of its test missions successfully and the go ahead was given to move off.

#### 16.4 Suggestions for Slocum Deployments and Recoveries

- Smaller Seacatch needed for deployment (one on order)
- Deployment techniques worked sufficiently but it may be worth thinking about other possible options, 'poking' polls needed to fend off glider from the vessel
- Recovery technique needs re-evaluating as it is time consuming to construct the recovery frame/net.

## 17 Benthic macrofauna

Peter Lamont, Natalia Serpetti and Bhavani Narayanaswamy

### 17.1 Introduction

SAMS sampling in the Rockall Trough dates from 1973. As Dave Ellett established his survey line the late John Gage decided to use one of the Ellett stations – ‘M’ – as a regular benthic sampling station, located at the foot of Anton Dohrn seamount at 2,200 m depth.

Over the years until 1998 samples were obtained from M with the Agassiz trawl (x35), Bed-Hop Camera (x7), Barnett-Watson Multicorer (x10), USNEL spade boxcorer (x24), Megacorer (x3), rectangular midwater trawl (x6) and WHOI-pattern epibenthic sled (x23). The historical samples span a time frame of ~25 years and there have been noticeable changes in the surface productivity during this period possibly as a consequence of a changing climate. With increasing interest in global warming effects on marine fauna it was decided to investigate possible changes in the macrobenthic community at Station M and the opportunity arose in 2013 to re-sample with a refurbished epibenthic sled to provide a new sample point over a 40 year time span record for this gear and position.

### 17.2 Methods

Two of the original WHOI-pattern sleds used by John Gage were refurbished and rigged with identical net meshes of 0.5 mm for both main and extension nets. The sleds are fished with the door open and fishing stops when the door is closed by a timer mechanism. The new sled door closing timing device was tested in deep water for the first time during this cruise. This prevents both over-washing of the trapped sample and incorporation of planktonic fauna during the recovery. As far as possible, deployment procedures followed the method used for historical samples. Winches on the James Cook were restricted, especially in veering rates compared to historical sampling and in the time window available four sled hauls were recovered, the last of which was a relatively small sample. The epibenthic sled usually collects a large volume of sediment that is impractical to process as a unit. Normally subsampling is carried out and this is achieved onshore in the laboratory in an agitated water column which allows the fauna to settle out at random between eight segments in a collecting chamber (Gage 1982).

The sleds were deployed according to a three step deployment procedure (Fig. 1).

#### Shooting

Ship's speed is requested to be 2 – 2.5 knots (Fig. 1, light blue line). Check frequently that the ship's speed does not drop below 2 knots.

Winch speed dead slow initially. After 250 m veered wire gradually increase veering rate to a traditional maximum of 60 m/min (Fig. 1, green line) after 1000 m of wire (Fig. 1, red line).

#### Fishing

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Once the chosen wire length has been paid out (5,000 m in our case, Fig. 17.1, red line) stop winch and reduce ship's speed to 1 knot ideal with 1.5 knots MAXIMUM (sled and Agassiz) (Fig. 1, light blue line). Allow 15 minutes for gear to settle on bottom. Tow for one hour (normally).

If there is a tension plotter, watch for any sudden increase in tension as for any towed gear (Fig. 1, blue line). Should the gear become fast (sudden tension increase) inform bridge immediately. Wire may be paid out to reduce tension while the ship speed relative to the bottom is reducing. Both sled and Agassiz are rigged with (usually) a 3 ton weak link between the towing strops and the safety strop. Inboard of the safety strop is rigged a swivel.

### Hauling

Maintain ship's speed at 1 to 1.5 knots. Start hauling at dead slow until the gear is assumed to be off the bottom (probably 10 minutes). Gradually increase hauling speed to a maximum of 50 m/min sled and 70 m/min Agassiz. At 200 m wire remaining, reduce speed to 50 m/min falling to 30 m/min at 100 m wire remaining.

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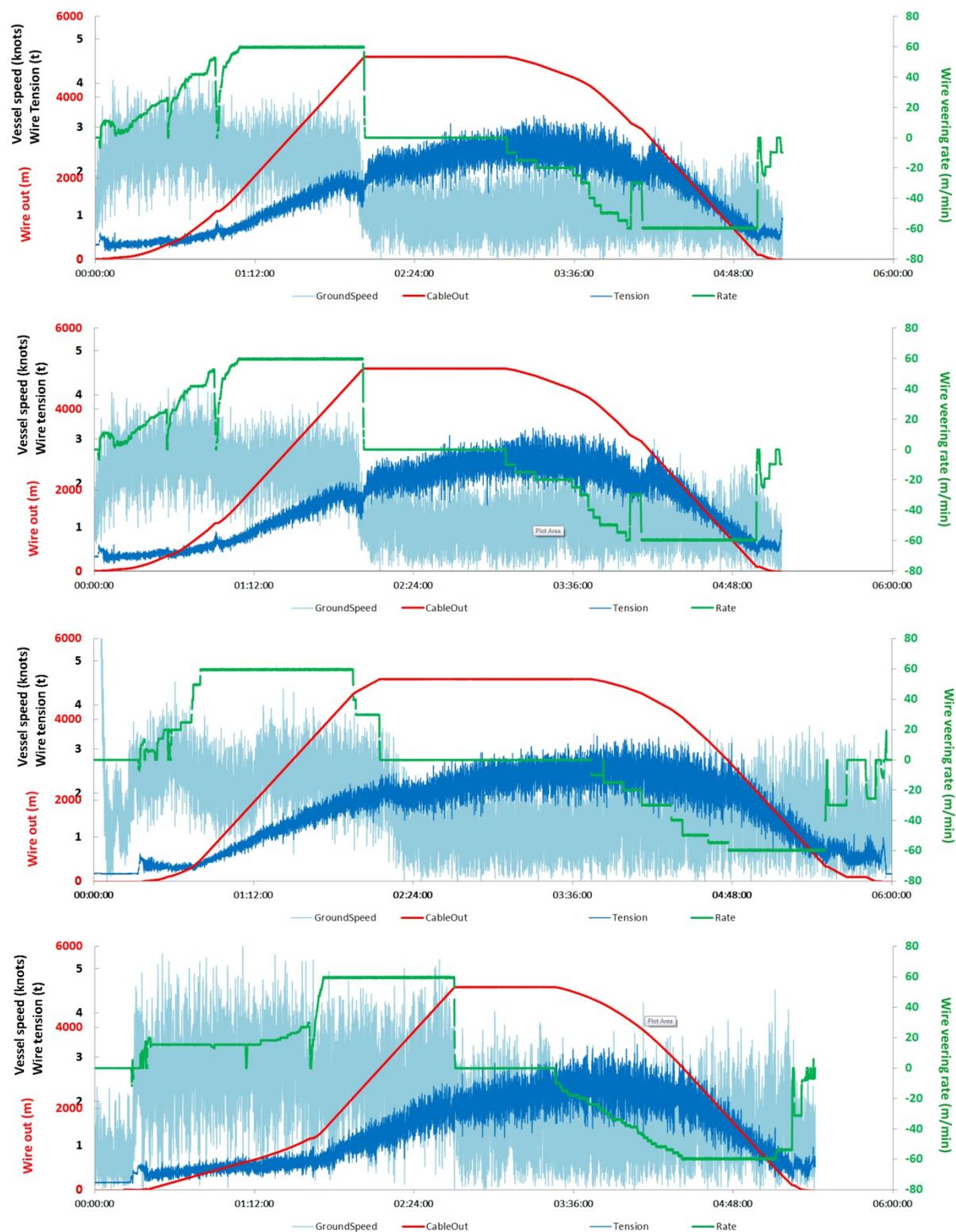


Fig. 17.1 Composite synchronous plots of vessel speed (knots, light blue line), wire out (m, red line), wire veering rate (60 m/min, green line) and the wire tension (t, blue line)

### 17.3 Results

Four sled deployments (ES\_1673, ES\_1674, ES\_1675, and ES\_1676) (Table 17.1, Fig. 17.2) were obtained the last of which was small due to reduced time on the bottom. The first haul was large (11 buckets of 20 L) (Fig. 17.3) and required 6 people working for 8 hours in order for the entire sample to be processed. The samples were sieved on board through 4 sieves (Fig. 17.4) of 4 mm, 1 mm, 500  $\mu\text{m}$  and 420  $\mu\text{m}$  apertures.

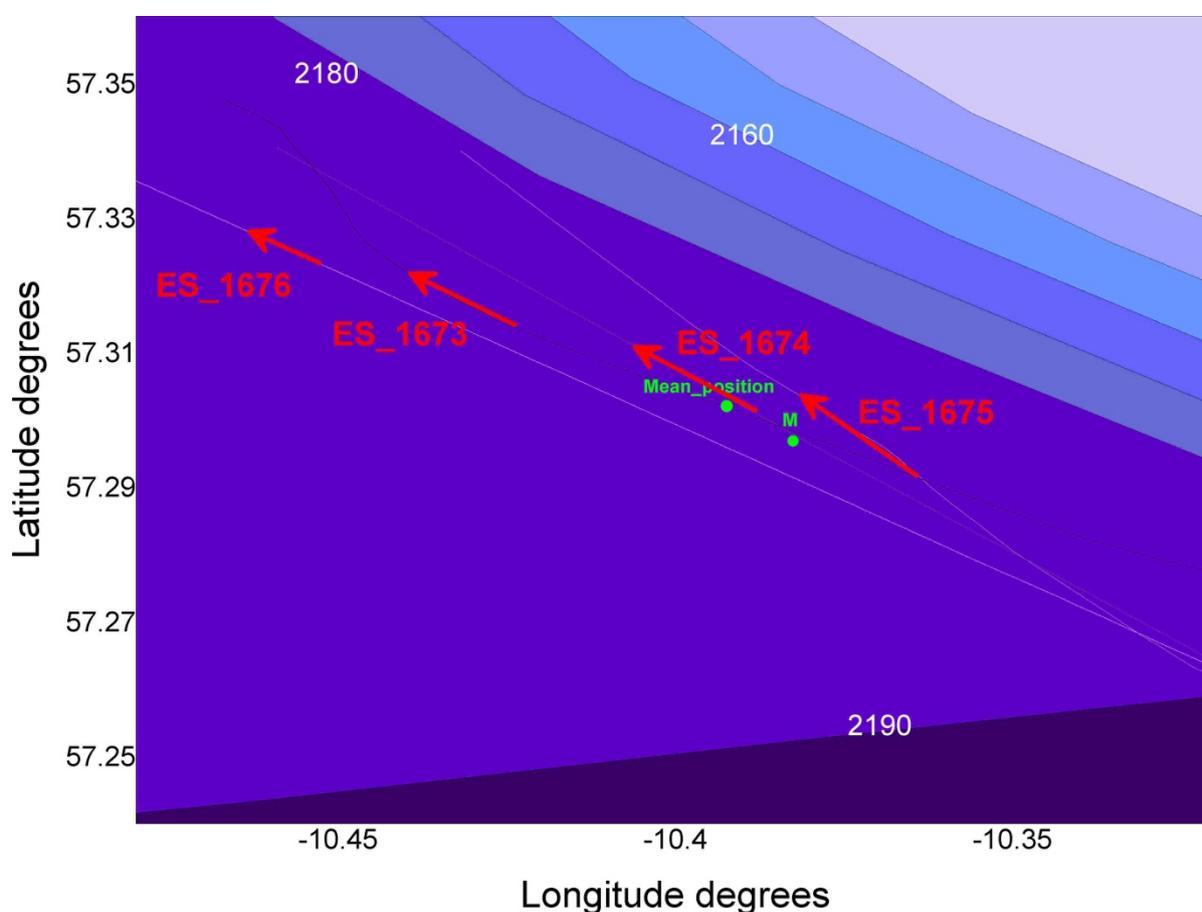


Fig. 17.2 Estimated tracks of the four sled deployments on JC086. Arrows indicate the direction of tow and length represents the estimated distance along the seabed.



Fig. 17.3 Sled ES1673 on deck with extension net full of sediment.



Fig. 17.4 Ophiuroids collected on the 4 mm sieve.

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Sled ID.	Date	Depth (m)	Latitude Start	Longitude start	Latitude end	Longitude end
ES_1673	13.05.21	2200	57° 18.833	10 ° 25.464	57° 19.288	10 ° 26.34
ES_1674	13.05.21	2228	57 ° 18.063	10 ° 23.292	57° 18.66	10 ° 24.366
ES_1675	13.05.21	2229	57 ° 17.512	10 ° 21.852	57° 18.208	10 ° 22.878
ES_1676	13.05.22	2227	57 ° 19.381	10 ° 27.144	57° 19.668	10 ° 27.774

Table 17.1 Sled deployment showing depth (m), sledge ID, date and geographical coordinates.

To date (October 2013) only last sample, ES1676, has been processed and for which results are available. ES1676 was full to about 1 m from the end pot which is small for a sled sample. Accordingly the entire sample was sorted without subsampling. A total of 4233 metazoan macrofauna were recovered from the < 4 mm fraction. The dominant taxa are recounted in Table 17.2 Fig. 17.5 and Fig. 17.6 showed the relative abundances of bivalve species and polychaete families respectively.

Taxa	individuals	g wet wt.
Annelida	1297	1.64
Crustacea	1111	1.08
Mollusca	1718	2.94
Echinodermata	90	0.24

Table 17.2 ES1676 whole sample

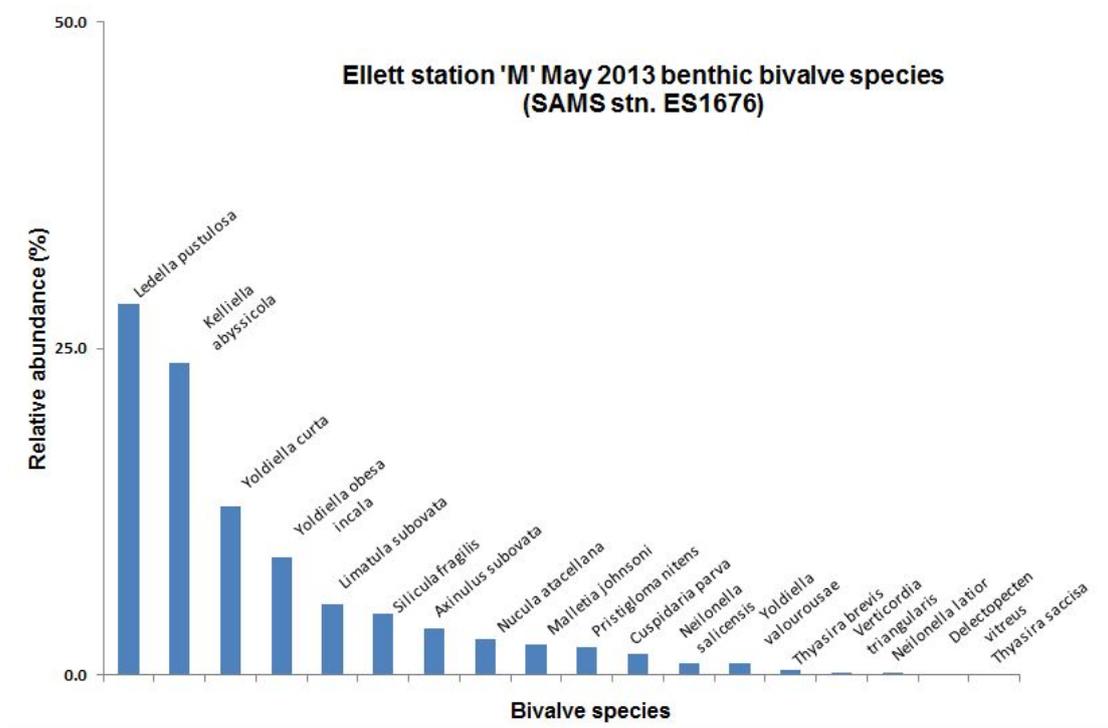


Fig. 17.5 Sled ES\_1676. Relative abundances of macrofauna bivalve species on sieving fractions >0.5 mm < 4 mm

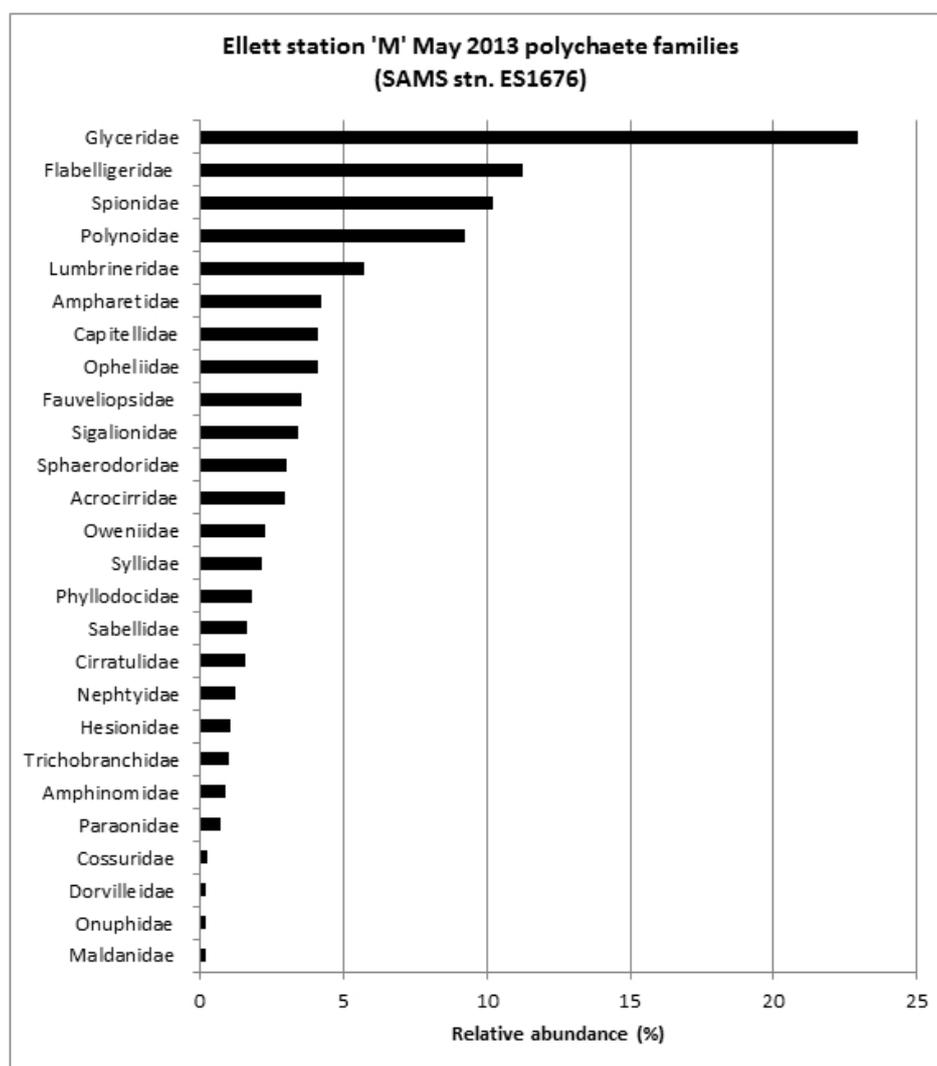


Fig. 17.6 Sled ES\_1676. Relative abundances of macrofauna polychaete families on sieving fractions >0.5 mm < 4 mm

#### 17.4 Comments

Historically trawling was more commonly practiced on NERC ships than it is today and there was some unfamiliarity with procedures. A selection of weak links would have been carried as routine on board in the past and were requested for JC086 but were omitted on this occasion. However, a weak link was ingeniously rigged by ships' bosun taking the form of a short wire strop. For future work it would be useful to ensure that a selection of weak links is carried along with the epibenthic sled.

#### References

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## 18 Mooring Report

*John Beaton & Colin Griffiths (SAMS)*

### 18.1 Wyville Thomson Mooring

The WTR mooring was deployed on the 7<sup>th</sup> August 2012 from RRS Discovery (D379) in the centre of the gully in 1211m of water, N60° 14.998 W008° 54.579'. The mooring comprised of a 75kHz LR-ADCP (S/N 9201) moored 20m above the seabed in a 40" syntactic sphere. A SBE37SMP (S/N 9111) was moored 12m above the sea floor.

The ADCP setup:-

First bin – 16.67m

Bin size – 8m

Pings/Ens – 10

Time/Ping - 01:30:00

Ensemble Interval – 15 minutes

The mooring was retrieved on the 8<sup>th</sup> May 2013. All instruments were recovered in good condition. The mooring had been exposed to very high currents in excess of 2 knots. The mooring configuration is shown in Figure 18.1. A series of data plots from the two instruments are shown in Figures 18.2>18.7. No Mooring was redeployed at the site.

D379 - Wyville Thomson Mooring  
Deployed 16:49Z 7th August 2012  
N60° 14.998' W008° 54.579' 1211m

Recovered 0937Z 8th May 2013

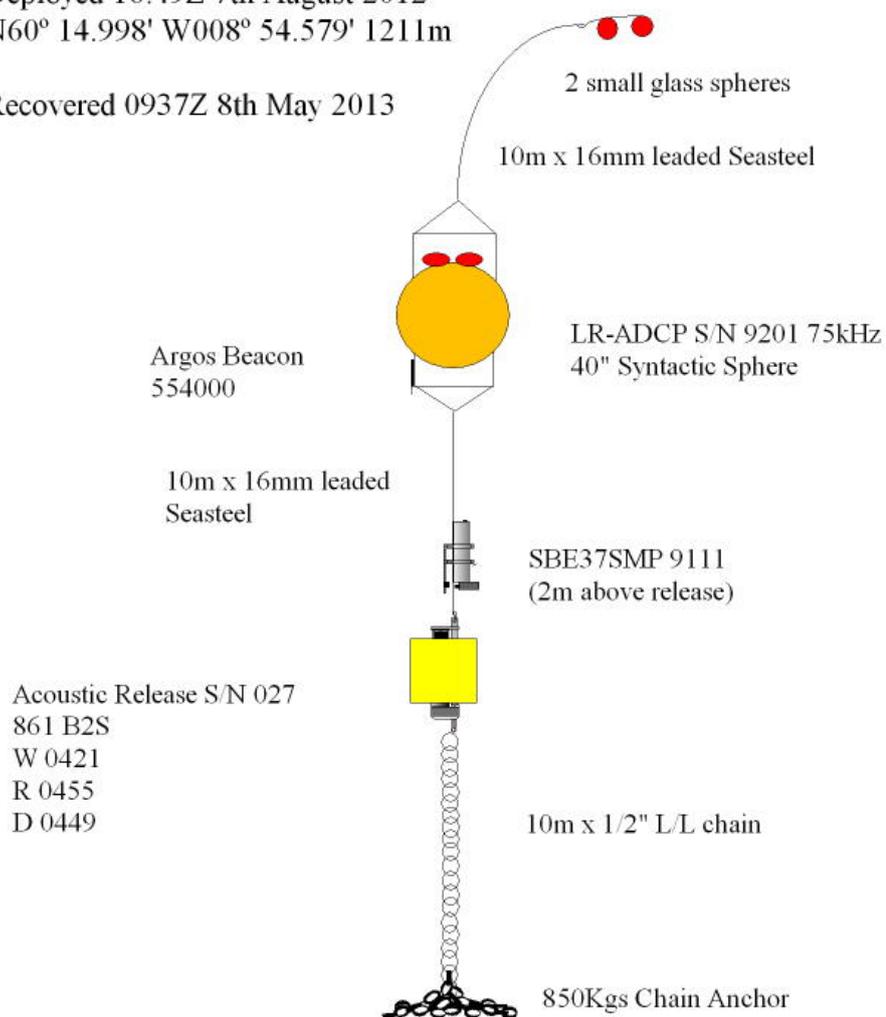


Figure 18.1 - WTR Mooring – deployed during D379 August 2012

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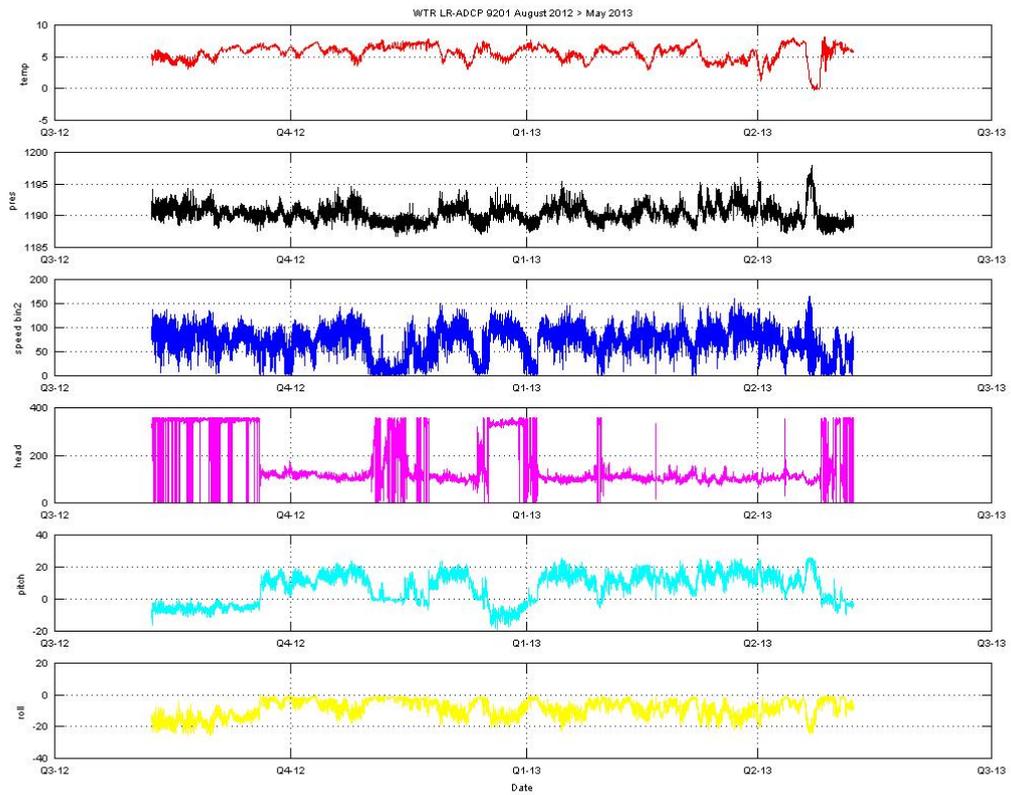


Figure 18.2 – Plot of ADCP ancillary data including speed (cm/s) from Bin No 2

# JC086 Cruise Report

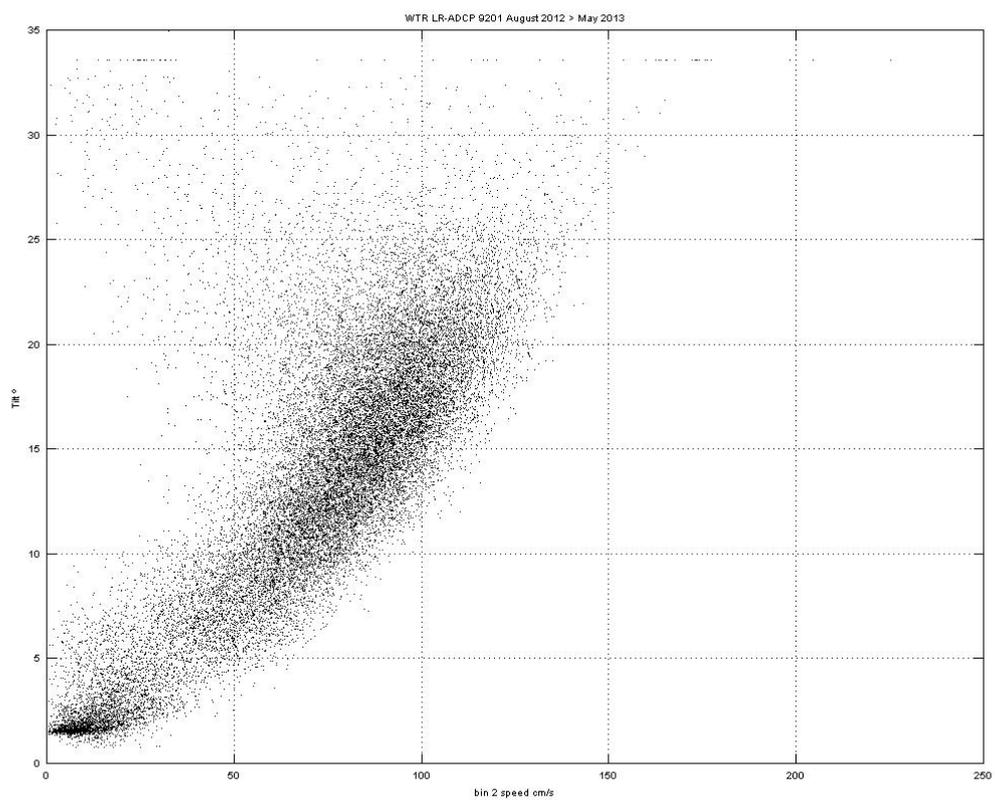


Figure 18.3 – Plot of ADCP tilt<sup>o</sup> vs speed (cm/s) from Bin No 2

# JC086 Cruise Report

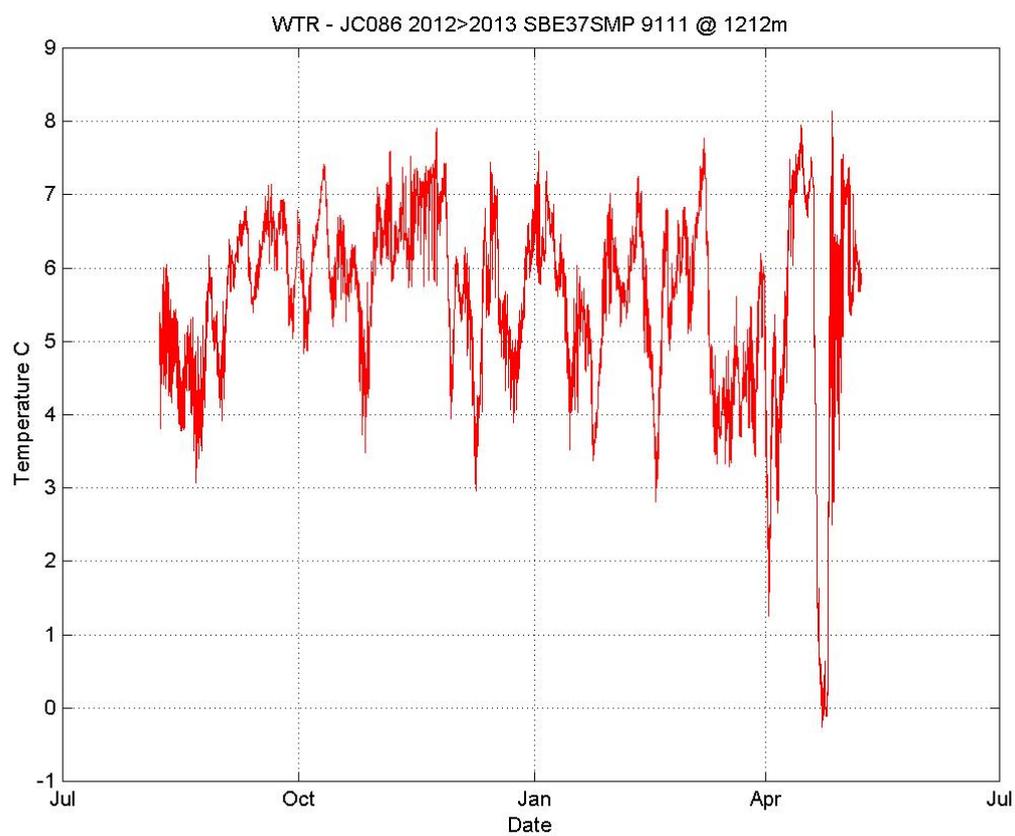


Figure 18.4 – Plot of SBE37 Temperature (°C) data

# JC086 Cruise Report

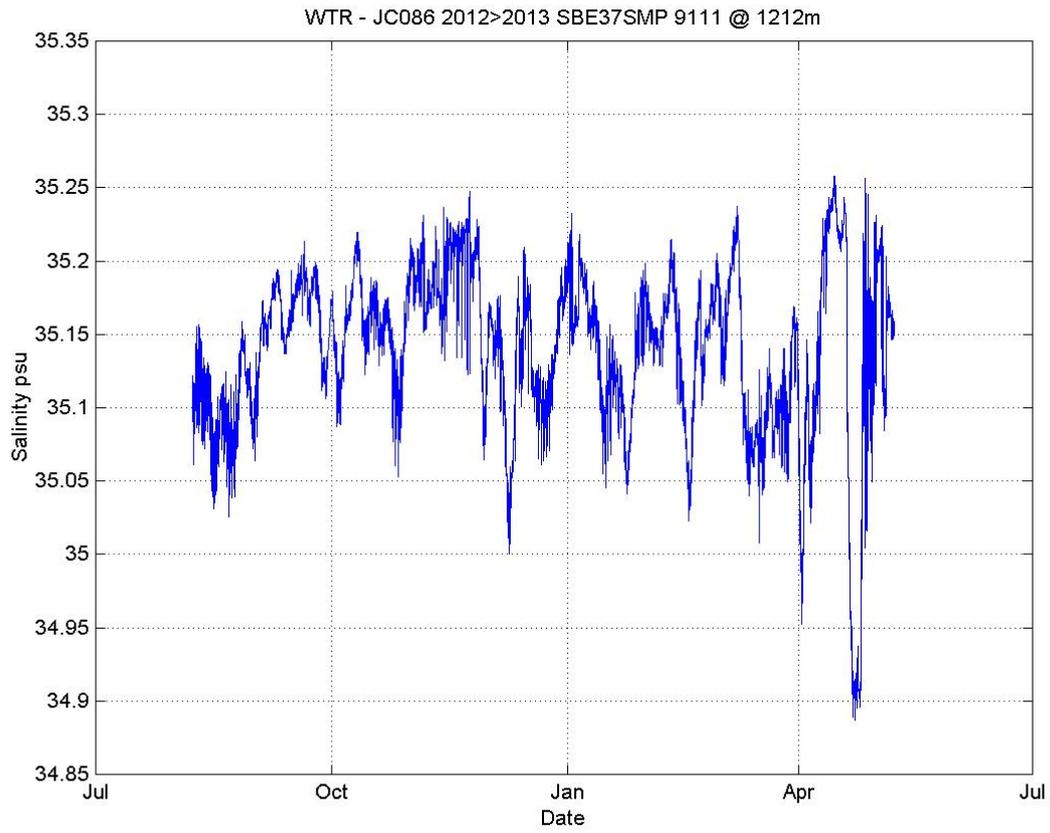


Figure 18.5 – Plot of SBE37 Salinity (psu) data

# JC086 Cruise Report

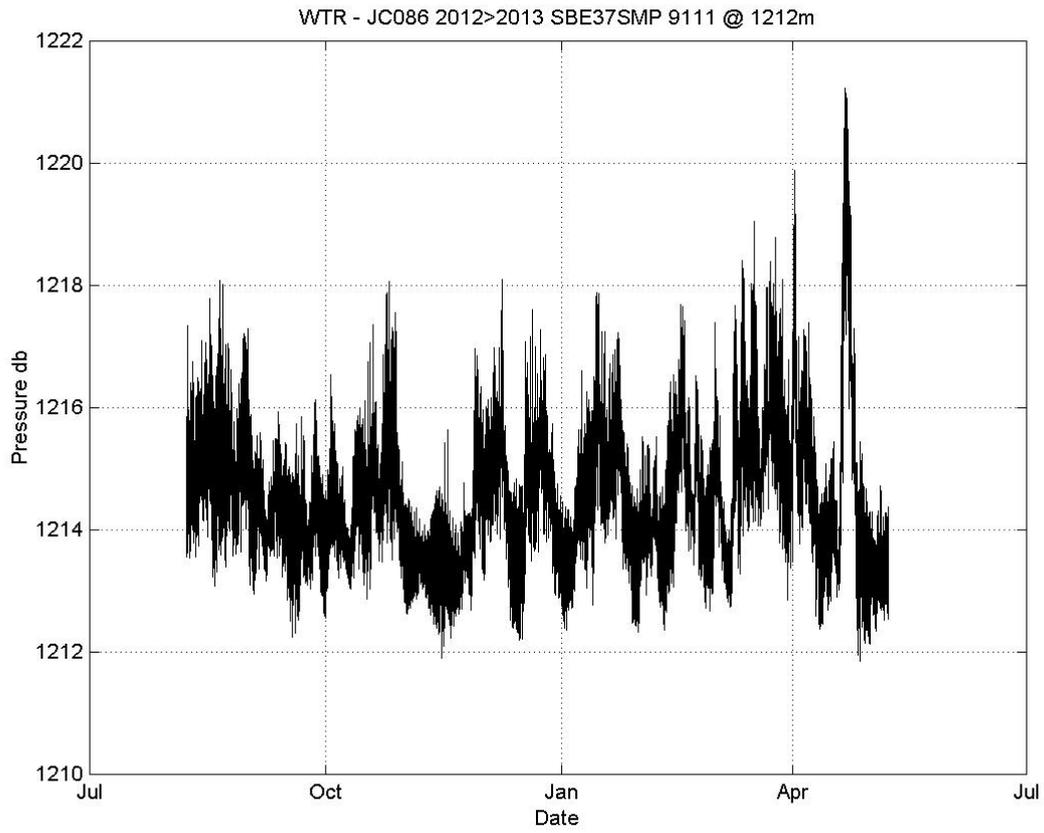


Figure 18.6 – Plot of SBE37 Pressure (db) data

# JC086 Cruise Report

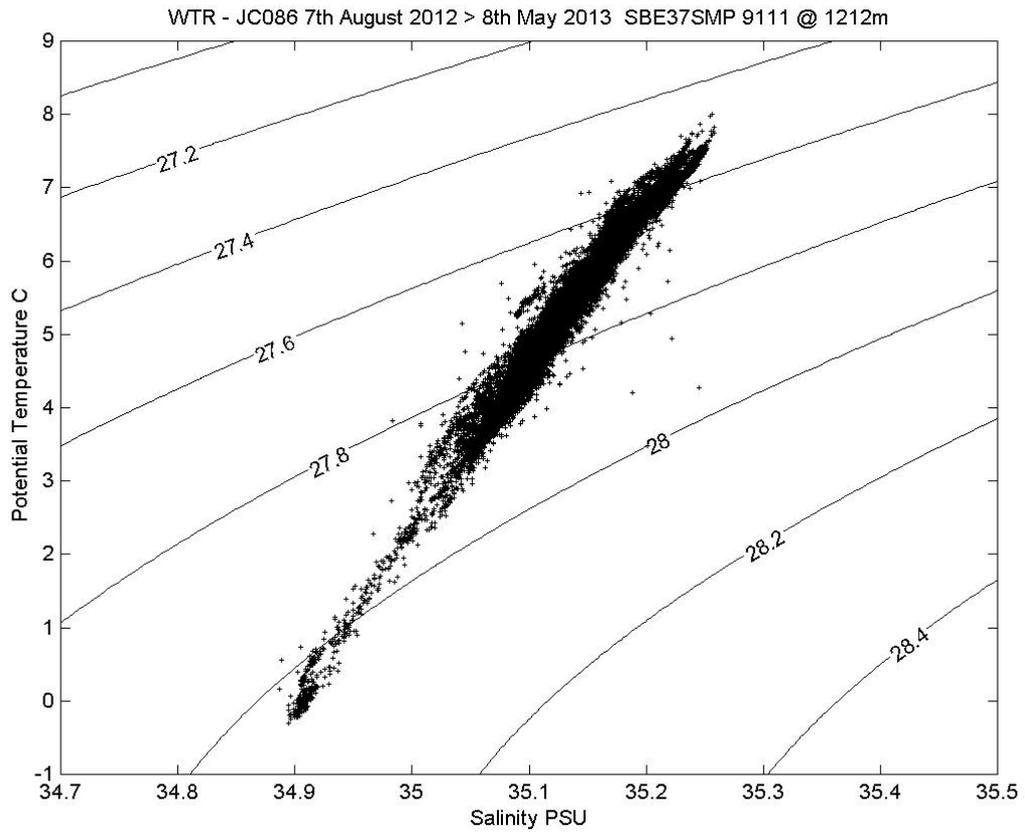


Figure 18.7 – Plot of SBE37 T-S plot

18.2 Mingulay Reef Mooring

This mooring had been deployed earlier in the year from the RRS James Cook. The mooring consisted of an Acoustic Release (5m asf) & an Anderaa RCM11 (10m asf) deployed in 213m of water, position N56° 49.50' W007° 23.61'. Attempted recovery commenced @ 0718Z on the 24<sup>th</sup> May 2013. Immediate contact was made with the Acoustic Release which was in a vertical position. Despite numerous attempts over an hour and a half the release would not release from the anchor.

## JC086 – Appendix 1 – Event Log

## JC086 Event Log

Event No.	Date	Station	START Latitude	START Longitude	Depth (m)	Time IN (GMT)	Time BOTTOM (GMT)	Time OUT (GMT)	Activity	Comments
001	07/05/13	Marmite 1	56° 29.967' N	09° 24.786' W	1168	08:56	-	-	Glider deployment	Slocum S/N 345 (no name)
002	07/05/13	Marmite 1	56° 30.016' N	09° 23.827' W	1146	09:58	10:29	11:15	CTD001	Shake down CTD (test) All stainless steel as no trace metal sampling to take place during cruise
003	08/05/13	WTRM	60°14.973' N	08° 55.119' W	1217	08:44	-	09:37	Mooring recovery	Released – 08:44 Surfaced – 09:00 Grabbed – 09:26 Onboard – 09:37
004	08/05/13	S355	60° 12. 467' N	08° 57.666'W	557	10:44	11:12	11:32	CTD002	
005	08/05/13	S354	60° 13.795' N	08° 59.392' W	?	12:24	13:02	13:49	CTD003	Echo-sounder interference – depth unreliable No data recorded from the LADCP
006	08/05/13	S353	60° 15.346' N	09° 00.436' W	1078	14:42	15:13	15:53	CTD004	
007	08/05/13	S352	60° 15.666' N	09° 00.482' W	1080	16:36	17:07	17:54	CTD005	
008	08/05/13	S351	60° 16.618' N	09° 00.783' W	792	18:36	18:59	19:38	CTD006	
009	08/05/13	S350	60° 17.697' N	09° 00.969' W	562	20:19	20:42	21:05	CTD007	
010	10/05/13	IB22	63° 17.610' N	19° 59.981' W	208	07:20	07:41	08:11	CTD008	
011	10/05/13	IB22S	63° 13.001' N	20° 03.999' W	666	09:09	09:49	10:29	CTD009	Winch issue on the downcast – cast stopped for ~20 minutes
012	10/05/13	IB21S	63° 08.048' N	19° 55.037' W	1028	11:26	11:57	12:45	CTD010	
013	10/05/13	IB20S	62° 55.070' N	19° 33.092' W	1408	14:47	15:23	16:15	CTD011	
014	10/05/13	IB19S	62° 40.07' N	19° 40.03' W	1688	18:00	18:45	19:53	CTD012	
015	10/05/13 – 11/05/13	IB18S	62° 20.000' N	19° 49.979' W	1790	22:18	23:00	00:05	CTD013	
016	11/05/13	IB17	61° 59.94' N	20° 00.14' W	1809	02:47	03:28	04:27	CTD014	

Event No.	Date	Station	START Latitude	START Longitude	Depth (m)	Time IN (GMT)	Time BOTTOM (GMT)	Time OUT (GMT)	Activity	Comments
017	11/05/13	IB16A	61° 45.23' N	19° 59.97' W	1797	06:32	07:20	08:36	CTD015	
018	11/05/13	IB16	61° 29.998' N	19° 59.976' W	2234	10:28	11:22	12:40	CTD016	
019	11/05/13	IB16	61° 29.507' N (at depth)	20° 01.015' W (at depth)	2236	14:06	15:04	18:18	SAP deployment SAP001	Time IN = at start of deployment Time bottom = all SAPs at depth Time OUT = SAPs and weight recovered
020	12/05/13	IB19S	62° 40.005' N (at depth)	19° 40.598' W (at depth)	1689	10:38	11:29	15:21	SAP deployment SAP002	Time IN = at start of deployment Time bottom = all SAPs at depth Time OUT = SAPs and weight recovered
021	14/05/13	IB15	61° 15.027' N	20° 00.025' W	2383	06:13	07:32	09:00	CTD017	
022	14/05/13	IB15	61° 15.622' N	20° 02.264' W	2380	09:20	-	-	ARGO float deployment	S/N: 6249
023	14/05/13	IB14	61° 00.042' N	19° 59.973' W	2409	11:17	12:30	14:09	CTD018	
024	14/05/13	IB14	61° 00.043' N (at depth)	19° 59.970' W (at depth)	2409	15:04	16:12	19:35	SAP deployment SAP003	Time IN = at start of deployment Time bottom = all SAPs at depth Time OUT = SAPs and weight recovered
025	15/05/13	IB13	60° 30.000' N	20° 00.000' W	2534	12:20	-	14:00	CTD019	CTD failure on the downcast at 1530m. Brought back on deck. No bottles fired
026	15/05/13	IB13	60° 30.000' N	20° 20.000' W	2536	17:01	18:02	19:40	CTD020	Replica of aborted CTD019 cast
027	15/05/13	IB12	60° 00.017' N	19° 59.953' W	2727	22:58	00:07	01:53	CTD021	
028	16/05/13	IB12	60° 00.019' N	20° 00.279' W	2727	02:05	-	-	ARGO float deployment	S/N: 6246
029	16/05/13	IB11	59° 39.975' N	19° 07.075' W	2690	05:58	07:01	08:30	CTD022	
030	16/05/13	IB10	59° 24.011' N	18° 25.249' W	2424	11:33	12:42	14:13	CTD023	
031	16/05/13	IB10	59° 24.557' N (at depth)	18° 25.489' W (at depth)	2437	15:00	15:21	16:15	SAP deployment SAP004	Test deployment Time IN = at start of deployment Time bottom = all SAPs at depth Time OUT = SAPs and weight recovered
032	16/05/13	IB10	59° 24.546' N (at depth)	18° 25.477' W (at depth)	2435	17:05	17:44	20:48	SAP deployment SAP005	Time IN = at start of deployment Time bottom = all SAPs at depth Time OUT = SAPs and weight recovered

Event No.	Date	Station	START Latitude	START Longitude	Depth (m)	Time IN (GMT)	Time BOTTOM (GMT)	Time OUT (GMT)	Activity	Comments
033	16/05/13	IB10	59° 24.562' N	18° 25.485' W	2438	20:58	-	-	ARGO float deployment	S/N: 6245
034	16/05/13	IB9	59° 20.022' N	18° 13.941' W	1868	21:58	22:49	23:55	CTD024	
035	17/05/13	IB8	59° 12.043' N	17° 53.048' W	1572	01:59	02:39	03:38	CTD025	
036	17/05/13	IB7	59° 06.991' N	17° 39.857' W	973	04:58	05:30	06:16	CTD026	
037	17/05/13	IB6	58° 57.009' N	17° 10.981' W	890	08:21	08:54	09:43	CTD027	
038	17/05/13	IB5	58° 53.002' N	16° 59.970' W	1155	11:28	12:06	12:56	CTD028	
039	17/05/13	IB4	58° 30.022' N	15° 59.915' W	1188	17:03	17:36	18:30	CTD029	
040	17/05/13	IB4	58° 30.000' N (at depth)	16° 00.001' W (at depth)	1189	19:08	19:56	23:30	SAP deployment SAP006	Time IN = at start of deployment Time bottom = all SAPs at depth Time OUT = SAPs and weight recovered
041	18/05/13	IB3	58° 15.015' N	15° 20.030' W	657	02:22	02:46	03:34	CTD030	
042	18/05/13	IB2	57° 57.002' N	14° 34.958' W	442	06:50	07:22	07:52	CTD031	
043	18/05/13	IB1	57° 39.975' N	13° 54.000' W	147	10:48	11:00	11:19	CTD032	
044	18/05/13	A (Rockall)	57° 35.018' N	13° 38.065' W	107	12:57	13:06	13:17	CTD033	
045	18/05/13	B	57° 34.001' N	13° 19.996' W	175	14:46	15:00	15:19	CTD034	
046	18/05/13	C	57° 32.928' N	13° 00.045' W	292	16:43	16:57	17:25	CTD035	
047	18/05/13	D	57° 32.47' N	12° 52.116' W	1059	18:12	18:43	19:35	CTD036	
048	18/05/13	E	57° 31.978' N	12° 38.039' W	1640	20:39	21:21	22:26	CTD037	
049	19/05/13	F	57° 30.443' N	12° 14.999' W	1805	00:27	01:09	02:16	CTD038	
050	19/05/13	G	57° 29.491' N	11° 51.159' W	1798	04:21	05:05	06:17	CTD039	
051	19/05/13	H	57° 29.054' N	11° 32.100' W	2020	07:41	08:33	09:50	CTD040	

Event No.	Date	Station	START Latitude	START Longitude	Depth (m)	Time IN (GMT)	Time BOTTOM (GMT)	Time OUT (GMT)	Activity	Comments
052	19/05/13	H	57° 29.008' N (at depth)	11° 31.983' W (at depth)	2021	10:45	11:00	14:21	SAP deployment SAP007	Time IN = at start of deployment Time bottom = all SAPs at depth Time OUT = SAPs and weight recovered
053	19/05/13	I	57° 28.26' N	11° 18.926' W	738	15:39	16:06	16:47	CTD041	
054	19/05/13	J	57° 26.982' N	11° 04.918' W	585	17:50	18:11	18:45	CTD042	
055	19/05/13	K	57° 23.983' N	10° 51.990' W	784	19:52	20:16	20:55	CTD043	
056	19/05/13	L	57° 21.999' N	10° 40.000' W	2102	21:52	22:40	23:53	CTD044	
057	20/05/13	M	57° 18.000' N	10° 22.980' W	2213	01:15	02:04	03:18	CTD045	
058	20/05/13	M	57° 17.768' N	10° 24.000' W	2217	03:26	-	-	Argo float deployment	S/N: 5542
059	20/05/13	N	57° 13.941' N	10° 02.934' W	2104	04:57	05:52	07:19	CTD046	
060	20/05/13	O	57° 09.001' N	09° 41.930' W	1923	08:46	09:34	10:47	CTD047	
061	20/05/13	P	57° 06.002' N	09° 25.019' W	1411	13:38	14:08	15:00	CTD048	
062	20/05/13	Q4	57° 65.100' N	09° 20.698' W	940	15:55	16:26	16:55	CTD049	
063	20/05/13	Q3	57° 04.691' N	09° 18.594' W	676	17:16	17:39	17:58	CTD050	
064	20/05/13	Q2	57° 04.201' N	09° 16.299' W	540	18:24	18:42	18:55	CTD051	
065	20/05/13	Q1	57° 03.408' N	09° 14.844' W	407	19:22	19:44	19:58	CTD052	

Event No.	Date	Station	START Latitude	START Longitude	Depth (m)	Time IN (GMT)	Time BOTTOM (GMT)	Time OUT (GMT)	Activity	Comments
066	20/05/13	Q	57° 03.000' N	09° 12.997' W	312	20:23	20:40	21:03	CTD053	
067	20/05/13	R3	57° 02.700' N	09° 11.400' W	244	21:35	21:49	22:00	CTD054	
068	20/05/13	R2	57° 02.214' N	09° 09.797' W	206	22:22	22:35	22:45	CTD055	
069	20/05/13	R1	57° 01.999' N	09° 07.100' W	244	23:12	23:25	23:38	CTD056	
070	21/05/13	R	57° 00.000' N	09° 00.000' W	130	00:29	00:42	01:00	CTD057	
071	21/05/13	M	57° 16.401' N	10° 17.930' W	2200	06:10	08:22 (5000m wire out)	11:32	SLED_001	Hauling commenced at 09:25 ES 1673
072	21/05/13	M	57° 14.518' N	10° 16.658' W	2228	13:19	15:16 (5000m wire out)	18:25	SLED_002	Hauling commenced at 16:28 ES 1674
073	21/05/13	M	57° 14.376' N	10° 16.470' W	2229	19:52	21:40 (5000m wire out)	01:26	SLED_003	ES 1675
074	22/05/13	M	57° 15.214' N	10° 17.952' W	2227	03:04	05:29 (5000m wire out)	08:10	SLED_004	ES 1676
075	22/05/13	M	57° 18.001' N	10° 22.994' W	2210	09:31	10:09	10:52	CTD058	CTD058 – not deployed to full depth in order to resolve the lower oxygen layer
076	22/05/13	M	57° 17.998' N (when deployed)	10° 22.998' W (when deployed)	2211	11:24	12:10	14:53	SAP deployment SAP008	
077	23/05/13	1G	56° 40.007' N	06° 07.955' W	171	06:19	06:30	06:53	CTD059	
078	23/05/13	2G	56° 41.046' N	06° 17.060' W	23	13:57	14:05	14:07	CTD060 (no bottles)	
079	23/05/13	3G	56° 42.499' N	06° 21.995' W	73	15:12	15:21	15:31	CTD-61	
080	23/05/13	5G (station 4G skipped)	56° 43.886' N	06° 35.752' W	78	20:16	20:25	20:34	CTD062	
081	23/05/13	6G	56° 44.000' N	06° 44.999' W	40	21:38	21:44	21:46	CTD063 (no bottles)	

Event No.	Date	Station	START Latitude	START Longitude	Depth (m)	Time IN (GMT)	Time BOTTOM (GMT)	Time OUT (GMT)	Activity	Comments
082	23/05/13	7G	56° 43.999' N	07° 00.001' W	136	23:08	23:16	23:34	CTD064	
083	24/05/13	8G	56° 44.062' N	07° 10.307' W	174	00:45	01:00	01:06	CTD065 (no bottles)	
084	24/05/13	9G	56° 44.008' N	07° 20.015' W	155	02:20	02:32	02:52	CTD066	
085	24/05/13	10G	56° 44.004' N	07° 29.969' W	215	03:59	04:12	04:43	CTD067	
086	24/05/13	Mingulay	56° 49.137' N	07° 23.741' W	168	06:23	06:38	06:47	CTD068 (no bottles)	Mooring recovery site (no bottles)
087	24/05/13	Mingulay	56° 49.346' N	07° 23.651' W	110	07:18	-	08:53	Mooring recovery	Release code sent and several fires executed, but mooring did not return to the surface. Stopped trying at 08:53
088	24/05/13	12G	56° 45.528' N	07° 50.015' W	49	10:55	11:03	11:05	CTD069	
089	24/05/13	13G	56° 47.035' N	08° 00.014' W	117	12:04	12:17	12:36	CTD070	
090	24/05/13	14G	56° 48.523' N	08° 09.911' W	124	13:35	13:46	13:51	CTD071	
091	24/05/13	T	56° 50.189' N	08° 19.950' W	129	14:56	15:05	15:24	CTD072	
092	24/05/13	15G	56° 52.955' N	08° 29.902' W	124	16:23	16:31	16:57	CTD073	
093	24/05/13	S	56° 56.971' N	08° 46.983' W	123	18:16	18:23	18:42	CTD074	
094	24/05/13	L7A	56° 57.401' N	09° 06.997' W	241	20:22	20:35	20:48	CTD075	
095	24/05/13	L7	56° 57.001' N	09° 07.998' W	385	21:14	21:30	21:41	CTD076	
096	24/05/13	L6A'	56° 56.602' N	09° 08.998' W	538	22:04	22:28	22:44	CTD077	
097	24/05/13	L6A	56° 56.201' N	09° 09.998' W	758	23:03	23:35	00:04	CTD078	
098	25/05/13	L6	56° 55.526' N	09° 11.974' W	1023	00:43	01:09	01:32	CTD079	
099	25/05/13	L5	56° 54.010' N	09° 15.997' W	1258	02:19	02:50	03:16	CTD080	
100	25/05/13	AMMONITE1	56° 32.850' N	09° 23.089' W	1171	05:45	-	-	Glider deployment	Slocum S/N 304 (Ammonite)

Event No.	Date	Station	START Latitude	START Longitude	Depth (m)	Time IN (GMT)	Time BOTTOM (GMT)	Time OUT (GMT)	Activity	Comments
101	25/05/13	AMMONITE1	56° 33.116' N	09° 22.397' W	1157	07:18	07:54	08:26	CTD081	

## JC086 – Appendix 2 – CTD Bottle Log

Lat & lon  
at bottom

Station	Marmite 1	CTD No	001	Date	07/05/2013
Lat	56° 30.015' N	Event No	002	Time I/W (GMT)	09:58
Lon	09° 23.826' W	Depth (m)	1143	Time bottom (GMT)	10:29
Filename	JC86_001	Cast Depth (m)	1134	Time O/W (GMT)	11:15
Weather	Overcast with some swell				
Comments	Shake down CTD (test)				

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	1133	10:31	X															1
2	2	2	1133	10:31													X			2
3	3	3	1000	10:37																3
4	4	4	1000	10:38													X			4
5	5	5	850	10:42																5
6	6	6	850	10:42													X			6
7	7	7	750	10:46	X															7
8	8	8	750	10:46													X			8
9	9	9	500	10:52																9
10	10	10	500	10:52													X			10
11	11	11	250	10:58	X															11
12	12	12	250	10:58																12
13	13	13	30	11:07											X	X				13
14	14	14	30	11:07											X					14
15	15	15	30	11:07											X					15
16	16	16	30	11:07													X			16
17	17	17	10	11:09											X	X				17
18	18	18	10	11:10											X					18
19	19	19	10	11:10											X					19
20	20	20	10	11:10																20
21	21	21	5	11:12	X															21
22	22	22	5	11:12											X	X				22
23	23	23	5	11:12											X					23
24	24	24	5	11:12											X					24
			<b>Analyst</b>	Richard	-	-	-	-	-	-	-	-	-	-	Andy	Andy	Estelle	-		



Lat & lon  
at bottom

Station	S354	CTD No	003	Date	08/05/2013
Lat	60° 13.800' N	Event No	005	Time I/W (GMT)	12:24
Lon	08° 59.400' W	Depth (m)	?	Time bottom (GMT)	13:02
Filename	JC86_003	Cast Depth (m)	966	Time O/W (GMT)	13:49
Weather	Bright with force 5 winds				
Comments	Echo-sounder interference present - depth shown unreliable No data recorded from the LADCP Bottle #5 fired, but no sanity sample taken or analysed No water recovered from bottle #2 – lost on recovery				

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	966	13:03							X						X			1
2	2	2	800	13:12																2
3	3	3	650	13:17													X			3
4	4	4	600	13:20							X									4
5	5	5	500	13:23																5
6	6	6	400	13:26							X									6
7	7	7	350	13:29													X			7
8	8	8	200	13:34							X									8
9	9	9	100	13:39							X						X			9
10	10	10	50	13:43							X									10
11	11	11	10	13:47							X									11
12																				
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24																				
					Analyst	-	-	-	-	-	-	Tim/ Abby	-	-	-	-	Estelle/ Abby	-		

Lat & lon  
at bottom

Station	S353	CTD No	004	Date	08/05/2013
Lat	60° 15.346' N	Event No	006	Time I/W (GMT)	14:42
Lon	09° 00.436' W	Depth (m)	1078	Time bottom (GMT)	15:13
Filename	JC86_004	Cast Depth (m)	1031	Time O/W (GMT)	15:53
Weather	Bright with force 5 winds				
Comments					

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	1031	15:13	X						X						X			1
2	2	2	900	15:18							X						X			2
3	3	3	800	15:21	X						X									3
4	4	4	600	15:26							X									4
5	5	5	500	15:29													X			5
6	6	6	400	15:33							X									6
7	7	7	200	15:39	X						X						X			7
8	8	8	100	15:43							X									8
9	9	9	50	15:49							X									9
10	10	10	15	15:51	X						X									10
11																				
12																				
13																				
14																				
15																				
16																				
17																				
18																				
19																				
20																				
21																				
22																				
23																				
24																				
			<b>Analyst</b>	Richard	-	-	-	-	-	-	-	Tim	-	-	-	-	Andrew/ Abby	-		

Lat & lon  
at bottom

Station	S352	CTD No	005	Date	08/05/2013
Lat	60° 15.666' N	Event No	007	Time I/W (GMT)	16:36
Lon	09° 00.482' W	Depth (m)	1080	Time bottom (GMT)	17:07
Filename	JC86_005	Cast Depth (m)	1030	Time O/W (GMT)	17:54
Weather	Dry with force 5 winds				
Comments					

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	Chl	DMSP	Salinity	Bact Abun		Bot. No.
1	1	1	1024	17:09							X						X			1
2	2	2	900	17:14							X									2
3	3	3	800	17:19							X						X			3
4	4	4	600	17:25							X						X			4
5	5	5	500	17:29													X			5
6	6	6	400	17:34							X						X			6
7	7	7	200	17:40							X									7
8	8	8	100	17:46							X						X			8
9	9	9	50	17:49							X									9
10	10	10	15	17:52							X									10
11																				
12																				
13																				
14																				
15																				
16																				
17																				
18																				
19																				
20																				
21																				
22																				
23																				
24																				
			<b>Analyst</b>		-	-	-	-	-	-	Tim	-	-	-	-	-	Kasia	-		

Lat & lon  
at bottom

Station	S351	CTD No	006	Date	08/05/2013
Lat	60° 16.618' N	Event No	008	Time I/W (GMT)	18:36
Lon	09° 00.783' W	Depth (m)	792	Time bottom (GMT)	18:59
Filename	JC86_006	Cast Depth (m)	740	Time O/W (GMT)	19:38
Weather	Dry with force 6 winds				
Comments					

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	734	19:01							X									1
2	2	2	734	19:01	X															2
3	3	3	600	19:06							X						X			3
4	4	4	400	19:12	X															4
5	5	5	400	19:12							X						X			5
6	6	6	200	19:20							X									6
7	7	7	100	19:26							X						X			7
8	8	8	50	19:31							X									8
9	9	9	15	19:35							X									9
10	10	10	15	19:35	X															10
11																				
12																				
13																				
14																				
15																				
16																				
17																				
18																				
19																				
20																				
21																				
22																				
23																				
24																				
			<b>Analyst</b>	Richard	-	-	-	-	-	-	Tim	-	-	-	-	-	Kasia	-		



Lat & lon  
at bottom

Station	IB22	CTD No	008	Date	10/05/2013
Lat	63° 17.61' N	Event No	010	Time I/W (GMT)	07:20
Lon	19° 59.98' W	Depth (m)	208	Time bottom (GMT)	07:41
Filename	JC86_008	Cast Depth (m)	195	Time O/W (GMT)	08:11
Weather	Dry with force 5 winds				
Comments					

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	195	07:41	X						X		X	X			X			1
2	2	2	195	07:42		X	X													2
3	3	3	160	07:47																3
4	4	4	160	07:48			X													4
5	5	5	140	07:50	X						X									5
6	6	6	140	07:51		X	X													6
7	7	7	100	07:55							X	X	X	X						7
8	8	8	100	07:56			X													8
9	9	9	75	07:59							X	X	X	X						9
10	10	10	75	07:59			X													10
11	11	11	50	08:02	X						X	X	X	X						11
12	12	12	50	08:02		X	X													12
13	13	13	20	08:05							X	X	X	X						13
14	14	14	20	08:05			X													14
15	15	15	15	08:07											X	X	X			15
16	16	16	15	08:07			X													16
17	17	17	5	08:09							X	X			X	X				17
18	18	18	5	08:09			X													18
19																				
20																				
21																				
22																				
23																				
24																				
			<b>Analyst</b>	Richard	Jen	Jen	-	-	-	Estelle	Colin	Colin	Colin	Andy	Andy	Estelle	-			

Lat & lon  
at bottom

Station	IB22S	CTD No	009	Date	10/05/2013
Lat	63° 13.000' N	Event No	011	Time I/W (GMT)	09:09
Lon	20° 04.000' W	Depth (m)	666 (no altimeter)	Time bottom (GMT)	09:49
Filename	JC86_009	Cast Depth (m)	653	Time O/W (GMT)	10:29
Weather	Dry with force 5 winds				
Comments	Problem with winch on downcast – stopped at 295m for a while (~09:25). Problem resolved at 09:38 when it started again. Bottle #21 did not close properly				

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	653	09:50							X						X			1
2	2	2	653	09:51		X	X	X	X											2
3	3	3	600	09:54																3
4	4	4	600	09:55		X	X	X	X											4
5	5	5	500	09:58							X		X	X			X			5
6	6	6	500	09:58		X	X	X	X											6
7	7	7	400	10:02																7
8	8	8	400	10:02			X	X	X											8
9	9	9	300	10:07																9
10	10	10	300	10:07			X	X	X											10
11	11	11	200	10:11							X		X	X						11
12	12	12	200	10:11			X	X	X											12
13	13	13	100	10:16							X	X	X	X						13
14	14	14	100	10:16		X	X	X	X											14
15	15	15	75	10:19							X	X	X	X						15
16	16	16	75	10:19																16
17	17	17	50	10:22							X	X								17
18	18	18	50	10:23			X	X	X											18
19	19	19	25	10:25							X	X	X	X						19
20	20	20	25	10:25		X	X	X	X											20
21	21	21	5	10:28																21
22	22	22	5	10:28			X	X	X		X	X					X			22
23																				
24																				
			<b>Analyst</b>			JanLukas / Jen/ Giuseppe	-	Tim	Colin	Colin	Colin	-	-	Estelle	-					

Lat & lon  
at bottom

Station	IB21S	CTD No	010	Date	10/05/2013
Lat	63° 08.047' N	Event No	012	Time I/W (GMT)	11:26
Lon	19° 55.038' W	Depth (m)	1040	Time bottom (GMT)	11:57
Filename	JC86_010	Cast Depth (m)	1028	Time O/W (GMT)	12:45
Weather	Overcast with force 4 winds				
Comments					

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	1028	11:59	X					X	X						X			1
2	2	2	1028	11:59		X	X	X	X											2
3	3	3	900	12:06													X			3
4	4	4	900	12:06		X	X	X	X											4
5	5	5	750	12:10							X									5
6	6	6	750	12:10		X	X	X	X											6
7	7	7	550	12:14	X								X	X						7
8	8	8	550	12:14		X	X	X	X											8
9	9	9	500	12:17						X	X						X			9
10	10	10	500	12:17			X	X	X											10
11	11	11	200	12:24	X					X	X		X	X						11
12	12	12	200	12:24		X	X	X	X											12
13	13	13	100	12:28							X	X	X	X						13
14	14	14	100	12:28		X	X	X	X											14
15	15	15	75	12:31							X	X	X	X						15
16	16	16	75	12:31			X	X	X											16
17	17	17	50	12:33						X	X	X								17
18	18	18	50	12:33		X	X	X	X											18
19	19	19	32	12:36							X	X	X	X	X	X				19
20	20	20	32	12:36		X	X	X	X											20
21	21	21	12	12:39											X	X	X			21
22	22	22	12	12:39	X															22
23	23	23	5	12:41						X	X	X								23
24	24	24	5	12:41			X	X	X											24
			<b>Analyst</b>	Richard	Giuseppe	Giuseppe	Giuseppe	Giuseppe	Alice	Abby	Colin	Colin	Colin	Andy	Andy	Abby	-			

Lat & lon  
at bottom

Station	IB20S	CTD No	011	Date	10/05/2013
Lat	62° 55.040' N	Event No	013	Time I/W (GMT)	14:47
Lon	19° 33.092' W	Depth (m)	1406	Time bottom (GMT)	15:23
Filename	JC86_010	Cast Depth (m)	1375	Time O/W (GMT)	16:15
Weather	Bright and calm with force 4 winds				
Comments					

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact abun		Bot. No.
1	1	1	1375	15:24							X						X			1
2	2	2	1375	15:24																2
3	3	3	1000	15:33							X									3
4	4	4	1000	15:33																4
5	5	5	800	15:38							X									5
6	6	6	600	15:43																6
7	7	7	600	15:43							X									7
8	8	8	500	15:48													X			8
9	9	9	500	15:48							X		X	X			X			9
10	10	10	200	15:54																10
11	11	11	200	15:54							X		X	X						11
12	12	12	100	15:58																12
13	13	13	100	15:58							X	X	X	X						13
14	14	14	75	16:03													X			14
15	15	15	75	16:04							X	X	X	X						15
16	16	16	50	16:06																16
17	17	17	50	16:07							X	X								17
18	18	18	15	16:11																18
19	19	19	15	16:11							X	X	X	X						19
20	20	20	5	16:12																20
21	21	21	5	16:12							X	X								21
22																				
23																				
24																				
			<b>Analyst</b>	-	-	-	-	-	-	-	Natalia	Colin/ Peter/ Andy	Colin/ Peter/ Andy	Colin/ Peter/ Andy	-	-	Kasia	-		

Lat & lon  
at bottom

Station	IB19S	CTD No	012	Date	10/05/2013
Lat	62° 40.07' N	Event No	014	Time I/W (GMT)	18:00
Lon	19° 40.04' W	Depth (m)	1688	Time bottom (GMT)	18:45
Filename	JC86_012	Cast Depth (m)	1670	Time O/W (GMT)	19:53
Weather	Force 4 winds with light rain				
Comments					

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	1665	18:47	X						X						X			1
2	2	2	1665	18:47		X	X	X	X											2
3	3	3	1405	18:55							X									3
4	4	4	1405	18:55																4
5	5	5	1200	19:03	X						X						X			5
6	6	6	1200	19:03																6
7	7	7	1000	19:10							X									7
8	8	8	1000	19:10		X	X	X	X											8
9	9	9	700	19:18	X						X									9
10	10	10	700	19:18		X	X	X	X											10
11	11	11	500	19:24							X		X	X			X			11
12	12	12	500	19:24			X	X	X											12
13	13	13	200	19:33							X		X	X						13
14	14	14	200	19:33		X	X	X	X											14
15	15	15	100	19:38							X	X	X	X						15
16	16	16	100	19:38			X	X	X											16
17	17	17	75	19:41							X	X	X	X						17
18	18	18	75	19:41																18
19	19	19	50	19:44							X	X								19
20	20	20	50	19:44			X	X	X											20
21	21	21	20	19:47							X	X	X	X			X			21
22	22	22	20	19:47		X	X	X	X						X	X				22
23	23	23	5	19:49	X						X	X								23
24	24	24	5	19:49			X	X	X						X	X				24
			<b>Analyst</b>		Richard	Giuseppe	Giuseppe	Giuseppe	Giuseppe	-	Natalia	Kasia	Natalia	Natalia	Andy	Andy	Kasia	-		

Lat & lon  
at bottom

Station	IB18S	CTD No	013	Date	10/05/2013
Lat	62° 20.00' N	Event No	015	Time I/W (GMT)	22:18
Lon	10° 49.999' W	Depth (m)	1790	Time bottom (GMT)	23:00
Filename	JC86_013	Cast Depth (m)	1780	Time O/W (GMT)	00:05
Weather	Force 4 winds with light swell				
Comments					

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	1780	23:01							X						X			1
2	2	2	1780	23:01		X	X	X	X											2
3	3	3	1400	23:10							X									3
4	4	4	1400	23:10													X	X		4
5	5	5	1200	23:16			X	X	X		X									5
6	6	6	1000	23:22														X		6
7	7	7	1000	23:22							X									7
8	8	8	800	23:27		X	X	X	X											8
9	9	9	800	23:27							X						X	X		9
10	10	10	500	23:35		X	X	X	X											10
11	11	11	500	23:35							X		X	X				X		11
12	12	12	300	23:41													X	X		12
13	13	13	300	23:41							X									13
14	14	14	200	23:46		X					X		X	X						14
15	15	15	100	23:50							X	X	X	X						15
16	16	16	100	23:50			X	X	X											16
17	17	17	75	23:52							X	X	X	X						17
18	18	18	75	23:52			X	X	X											18
19	19	19	50	23:56							X	X								19
20	20	20	40	23:58		X	X	X	X											20
21	21	21	40	23:58							X	X	X	X			X			21
22	22	22	25	00:00			X	X	X											22
23	23	23	5	00:03							X	X								23
24	24	24	5	00:03			X	X	X											24
			<b>Analyst</b>		-	Jan Lukas	Jan Lukas	Jan Lukas	Jan Lukas	-	Abby	Peter	Peter	Peter	-	-	John B	Andy		

Lat & lon  
at bottom

Station	IB17	CTD No	0014	Date	11/05/2013
Lat	61° 59.943' N	Event No	0016	Time I/W (GMT)	02:47
Lon	20° 00.148' W	Depth (m)	1809	Time bottom (GMT)	03:28
Filename	JC86_014	Cast Depth (m)	1785	Time O/W (GMT)	04:27
Weather	Dry with force 6 winds				
Comments					

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	1785	03:29						X	X						X			1
2	2	2	1785	03:29		X	X	X	X											2
3	3	3	1500	03:36						X										3
4	4	4	1400	03:39		X	X	X	X								X			4
5	5	5	1400	03:39							X						X			5
6	6	6	1200	03:45							X									6
7	7	7	1000	03:50						X	X									7
8	8	8	1000	03:50			X	X	X											8
9	9	9	850	03:54			X	X	X											9
10	10	10	700	03:57		X	X	X	X											10
11	11	11	700	03:57							X									11
12	12	12	500	04:03			X	X	X											12
13	13	13	500	04:03						X	X		X	X						13
14	14	14	200	04:11						X	X		X	X			X			14
15	15	15	100	04:14							X	X	X	X						15
16	16	16	100	04:14		X	X	X	X											16
17	17	17	75	04:17							X	X	X	X						17
18	18	18	50	04:20			X	X	X											18
19	19	19	50	04:20						X	X	X								19
20	20	20	20	04:22											X	X				20
21	21	21	7	04:25						X	X	X	X	X						21
22	22	22	7	04:25		X	X	X	X											22
23	23	23	7	04:25											X	X				23
24																				
			<b>Analyst</b>	-	Jan Lukas	Jan Lukas	Jan Lukas	Jan Lukas	Jan Lukas	Alice	Natalia	Peter	Peter	Peter	Kasia	Kasia	Alice	-		

Lat & lon  
at bottom

Station	IB16A	CTD No	0015	Date	11/05/2013
Lat	61° 45.231' N	Event No	0017	Time I/W (GMT)	06:32
Lon	19° 59.981' W	Depth (m)	1797	Time bottom (GMT)	07:20
Filename	JC86_015	Cast Depth (m)	1774	Time O/W (GMT)	08:36
Weather	Dry with force 5 winds				
Comments	Flc shift in the upcast – this could be a sensor problem? Top end not in place – use bottle #22 instead				

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	1774	07:21	X						X									1
2	2	2	1774	07:21													X			2
3	3	3	1495	07:30							X									3
4	4	4	1495	07:30																4
5	5	5	1251	07:37							X									5
6	6	6	1251	07:37													X			6
7	7	7	1001	07:44							X									7
8	8	8	1001	07:44																8
9	9	9	800	07:51																9
10	10	10	801	07:51																10
11	11	11	628	07:58	X						X									11
12	12	12	628	07:58																12
13	13	13	498	08:08							X		X	X						13
14	14	14	499	08:08													X			14
15	15	15	200	08:16							X		X	X						15
16	16	16	100	08:21																16
17	17	17	100	08:21							X	X	X	X						17
18	18	18	74	08:24							X	X	X	X						18
19	19	19	50	08:28							X	X								19
20	20	20	50	08:28																20
21	21	21	24	08:30																21
22	22	22	25	08:30							X	X	X	X			X			22
23	23	23	5	08:33							X	X								23
24	24	24	5	08:33																24
			<b>Analyst</b>	Richard	-	-	-	-	-	-	Tim	Colin	Colin	Colin	-	-	Estelle	-		

Lat & lon  
at bottom

Station	IB16	CTD No	016	Date	11/05/2013
Lat	61° 29.852' N	Event No	018	Time I/W (GMT)	10:28
Lon	20° 00.372' W	Depth (m)	2217	Time bottom (GMT)	11:22
Filename	JC86_016	Cast Depth (m)	2207	Time O/W (GMT)	12:39
Weather	Dry with force 5 winds				
Comments					

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	2207	11:23	X						X						X			1
2	2	2	2206	11:23		X	X	X	X											2
3	3	3	2000	11:29	X						X						X			3
4	4	4	1600	11:38		X	X	X	X		X									4
5	5	5	1400	11:45							X						X			5
6	6	6	1200	11:52			X	X	X											6
7	7	7	1200	11:52							X							X		7
8	8	8	1000	12:00		X	X	X	X		X									8
9	9	9	800	12:06			X	X	X		X							X		9
10	10	10	620	12:11		X	X	X	X											10
11	11	11	620	12:11	X						X						X	X		11
12	12	12	500	12:15			X	X	X											12
13	13	13	500	12:15							X		X	X				X		13
14	14	14	200	12:22			X		X											14
15	15	15	200	12:22							X		X	X				X		15
16	16	16	100	12:26		X	X	X	X											16
17	17	17	100	12:26							X	X	X	X						17
18	18	18	75	12:29							X	X	X	X						18
19	19	19	50	12:31			X	X	X		X	X								19
20	20	20	28	12:33		X	X		X											20
21	21	21	28	12:33							X	X	X	X	X	X				21
22	22	22	20	12:35											X	X	X			22
23	23	23	5	12:37	X						X	X								23
24	24	24	5	12:37			X		X											24
			<b>Analyst</b>	Richard	Giuseppe /Jen	Giuseppe /Jen	Giuseppe /Jen	Giuseppe /Jen	-	Tim	Colin	Colin	Colin	Andy	Andy	Estelle	Andy			

Lat & lon  
at bottom

Station	IB15	CTD No	017	Date	14/05/2013
Lat	61° 15.414' N	Event No	021	Time I/W (GMT)	06:13
Lon	20° 00.824' W	Depth (m)	2384	Time bottom (GMT)	07:32
Filename	JC86_017	Cast Depth (m)	2360	Time O/W (GMT)	09:00
Weather	Dry and sunny with force 4 winds				
Comments	Delayed start - camera 6 was not functioning as it should (winch). First CTD deployed following the high winds and swell – surface layer is well mixed Bottle #21 leaked				

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	2358	07:33	X						X						X			1
2	2	2	2358	07:34		X	X	X	X											2
3	3	3	1996	07:47							X									3
4	4	4	1996	07:47			X	X	X											4
5	5	5	1502	07:58		X	X	X	X		X									5
6	6	6	1400	08:03							X						X			6
7	7	7	1200	08:10							X									7
8	8	8	1000	08:16			X	X	X											8
9	9	9	1000	08:16							X						X			9
10	10	10	800	08:22							X									10
11	11	11	660	08:27	X						X									11
12	12	12	660	08:28			X	X	X											12
13	13	13	500	08:32							X		X	X						13
14	14	14	200	08:39			X	X	X											14
15	15	15	200	08:39	X						X		X	X						15
16	16	16	100	08:46			X	X	X											16
17	17	17	100	08:46							X	X	X	X			X			17
18	18	18	75	08:50			X		X											18
19	19	19	75	08:50							X	X	X	X			X			19
20	20	20	50	08:53			X	X	X		X	X								20
21	21	21	16	08:57																21
22	22	22	16	08:57			X		X		X	X	X	X	X	X				22
23	23	23	5	08:58	X						X	X			X	X				23
24	24	24	5	08:58			X	X	X											24
			<b>Analyst</b>		Richard	Jen	Jen	Jen	Jen	-	Tim	Colin	Colin	Colin	Andy	Andy	Estelle	-		

Lat & lon  
at bottom

Station	IB14	CTD No	018	Date	14/05/2013
Lat	61° 00.042' N	Event No	023	Time I/W (GMT)	11:17
Lon	19° 59.968' W	Depth (m)	2409	Time bottom (GMT)	12:30
Filename	JC86_018	Cast Depth (m)	2375	Time O/W (GMT)	14:09
Weather	Dry and sunny with force 3 winds				
Comments					

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.	
1	1	1	2375	12:31	X					X	X						X			1	
2	2	2	2375	12:31		X	X	X	X												2
3	3	3	2200	12:36	X	X	X		X												3
4	4	4	2000	12:41			X	X	X	X	X						X				4
5	5	5	1800	12:48			X		X		X										5
6	6	6	1500	12:56						X	X						X				6
7	7	7	1400	12:59			X	X	X								X				7
8	8	8	1200	13:05		X	X		X		X							X			8
9	9	9	1000	13:12						X	X										9
10	10	10	800	13:17			X	X	X		X							X			10
11	11	11	600	13:22	X						X							X			11
12	12	12	600	13:23		X	X	X	X												12
13	13	13	500	13:29						X	X		X	X				X			13
14	14	14	400	13:32																	14
15	15	15	200	13:37						X	X		X	X							15
16	16	16	200	13:37			X		X									X			16
17	17	17	100	13:44		X	X	X	X		X	X	X	X							17
18	18	18	75	13:49			X	X	X		X	X	X	X							18
19	19	19	50	13:51						X	X	X									19
20	20	20	50	13:51			X	X	X												20
21	21	21	20	13:55							X	X	X	X	X	X					21
22	22	22	20	13:55		X	X		X												22
23	23	23	8	13:59	X					X	X	X			X	X					23
24	24	24	8	13:59			X		X								X				24
			<b>Analyst</b>		Richard	Giuseppe	Giuseppe	Giuseppe	Giuseppe	Alice	Abby	Colin	Colin	Colin	Andy	Andy	Abby	Andy			



Lat & lon  
at bottom

Station	IB13	CTD No	020	Date	15/05/2013
Lat	60° 29.999 N	Event No	026	Time I/W (GMT)	17:01
Lon	19° 59.997 W	Depth (m)	2536	Time bottom (GMT)	18:02
Filename	JC86_020	Cast Depth (m)	2520	Time O/W (GMT)	19:40
Weather	Overcast with force 5 winds				
Comments					

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.	
1	1	1	2511	18:03	X						X									1	
2	2	2	2510	18:03		X	X	X	X												2
3	3	3	2192	18:14			X		X		X						X				3
4	4	4	2000	18:21							X										4
5	5	5	1800	18:27							X										5
6	6	6	1800	18:27			X	X	X												6
7	7	7	1500	18:34	X						X										7
8	8	8	1500	18:34			X		X								X				8
9	9	9	1200	18:43							X										9
10	10	10	1200	18:43		X	X	X	X												10
11	11	11	1000	18:49							X										11
12	12	12	1000	18:50			X		X												12
13	13	13	800	18:58			X	X	X		X										13
14	14	14	650	19:03		X	X		X												14
15	15	15	650	19:03	X						X										15
16	16	16	500	19:09							X		X	X							16
17	17	17	400	19:13			X	X	X												17
18	18	18	200	19:19		X	X	X	X		X		X	X			X				18
19	19	19	100	19:24			X		X		X	X	X	X							19
20	20	20	75	19:28	X		X		X		X	X	X	X							20
21	21	21	50	19:32			X		X		X	X									21
22	22	22	22	19:35		X	X	X	X						X	X	X				22
23	23	23	22	19:35	X						X	X	X	X							23
24	24	24	5	19:39			X		X		X	X			X	X					24
			<b>Analyst</b>	Richard	Giuseppe	Giuseppe	Giuseppe	Giuseppe	-	Natalia	Colin	Colin	Colin	Andy	Andy	Kasia	-				

Lat & lon  
at bottom

Station	IB12	CTD No	021	Date	15/05/2013
Lat	60° 00.000'N	Event No	027	Time I/W (GMT)	22:58
Lon	19° 59.999'W	Depth (m)	2727	Time bottom (GMT)	00:07
Filename	JC86_021	Cast Depth (m)	2715	Time O/W (GMT)	01:53
Weather	Wind force 5				
Comments	Bottle #18 – 350m forgot to be fired before moving to next depth (200m) went back to 350m depth in order to fire bottle #18 – will cause loop in profile. Bottle #1 did not fire. Not enough water in bottle #23 for salinity sample – taken from bottle #22 instead. Not enough water in bottle #23 for phyto samples – only half filled for sample.				

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	-	2715	00:07																1
2	2	1	2715	00:07	X	X	X	X	X		X						X			2
3	3	2	2600	00:14		X	X	X	X											3
4	4	3	2450	00:18	X		X	X	X											4
5	5	4	2300	00:22			X	X	X		X									5
6	6	5	2100	00:27			X	X	X											6
7	7	6	2000	00:30		X	X		X		X									7
8	8	7	1800	00:34			X	X	X		X									8
9	9	8	1650	00:38			X	X	X											9
10	10	9	1500	00:42		X	X	X	X		X						X			10
11	11	10	1350	00:46			X		X											11
12	12	11	1200	00:50			X	X	X		X									12
13	13	12	1000	00:55			X	X	X		X									13
14	14	13	800	01:00			X	X	X		X									14
15	15	14	700	01:03	X						X									15
16	16	15	700	01:03		X	X	X	X											16
17	17	16	500	01:08			X	X	X		X		X	X						17
18	18	17	350	01:24		X	X	X	X								X			18
19	19	18	200	01:28			X	X	X		X		X	X						19
20	20	19	100	01:33	X		X		X		X	X	X	X						20
21	21	20	75	01:38			X	X	X		X	X	X	X						21
22	22	21	50	01:41			X		X		X	X					X			22
23	23	22	25	01:44		X	X	X	X		X		X	X	X	X				23
24	24	23	5	01:47			X		X		X	X			X	X				24
			<b>Analyst</b>		Richard	Jan Lukas	Jan Lukas	Jan Lukas	Jan Lukas	-	Abby	Peter	Peter	Peter	Abby	Abby	Abby	-		

Lat & lon  
at bottom

Station	IB11	CTD No	022	Date	15/05/2013
Lat	59° 39.989'N	Event No	029	Time I/W (GMT)	05:57
Lon	19° 07.007'W	Depth (m)	2680	Time bottom (GMT)	07:01
Filename	JC86_022	Cast Depth (m)	2690	Time O/W (GMT)	08:33
Weather	Dry with force 5 winds				
Comments	Bottle # 23 – top not closed before cast – no samples taken				

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.	
1	1	1	2660	07:02	X					X	X						X			1	
2	2	2	2660	07:02		X	X	X	X												2
3	3	3	2500	07:10			X	X	X												3
4	4	4	2300	07:16			X	X	X	X	X						X				4
5	5	5	2000	07:29		X	X	X	X	X	X										5
6	6	6	1800	07:30			X		X		X										6
7	7	7	1500	07:37		X	X	X	X	X	X										7
8	8	8	1200	07:45			X	X	X		X						X				8
9	9	9	1000	07:51		X	X		X	X	X										9
10	10	10	800	07:56			X	X	X		X										10
11	11	11	600	08:03	X						X										11
12	12	12	600	08:03		X	X	X	X												12
13	13	13	500	08:08			X		X	X	X		X	X							13
14	14	14	200	08:15		X	X		X						X	X					14
15	15	15	200	08:15						X	X		X	X			X				15
16	16	16	100	08:20			X	X	X												16
17	17	17	100	08:20							X	X	X	X							17
18	18	18	75	08:23		X	X		X		X	X	X	X							18
19	19	19	50	08:25	X					X	X	X					X				19
20	20	20	50	08:25			X	X	X												20
21	21	21	25	08:27			X	X	X		X	X	X	X							21
22	22	22	10	08:30											X	X					22
23	23	23	5	08:32																	23
24	24	24	5	08:32			X		X	X	X	X									24
			<b>Analyst</b>		Richard	Jen	Jen	Jen	Jen	Alice	-	Andy	Colin	Colin	Andy	Andy	-	-			

Lat & lon  
at bottom

Station	IB10	CTD No	023	Date	16-5-13
Lat	59° 24.307'N	Event No	030	Time I/W (GMT)	11:13
Lon	18° 25.414'W	Depth (m)	2424	Time bottom (GMT)	12:42
Filename	JC86_023	Cast Depth (m)	2400	Time O/W (GMT)	14:13
Weather	Dry with force 6 winds				
Comments					

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	2400	12:44	X						X						X			1
2	2	2	2400	12:44		X	X	X	X											2
3	3	3	2300	12:49			X		X		X									3
4	4	4	2000	12:56			X	X	X											4
5	5	5	2000	12:56	X						X									5
6	6	6	1800	13:02			X		X		X									6
7	7	7	1500	13:10			X	X	X		X									7
8	8	8	1200	13:17		X	X		X											8
9	9	9	1200	13:17							X						X			9
10	10	10	1000	13:26			X	X	X		X									10
11	11	11	800	13:32			X		X		X							X		11
12	12	12	570	13:38							X									12
13	13	13	500	13:41	X						X		X	X				X		13
14	14	14	500	13:41		X	X	X	X											14
15	15	15	430	13:43							X									15
16	16	16	300	13:47							X							X		16
17	17	17	200	13:51	X						X		X	X						17
18	18	18	200	13:51		X	X		X											18
19	19	19	100	13:54			X	X	X		X	X	X	X						19
20	20	20	75	13:58			X		X		X	X	X	X						20
21	21	21	50	14:02							X	X	X	X	X	X				21
22	22	22	50	14:02		X	X	X	X								X			22
23	23	23	25	14:04			X		X		X	X								23
24	24	24	10	14:06			X	X	X		X	X			X	X				24
			<b>Analyst</b>	Richard	Giuseppe	Giuseppe	Giuseppe	Giuseppe	-	Abby	Colin	Colin	Colin	Andy	Andy	Abby	Andy			

Lat & lon  
at bottom

Station	IB9	CTD No	024	Date	16/05/2013
Lat	59° 20.552'N	Event No	034	Time I/W (GMT)	21:58
Lon	18° 14.045'W	Depth (m)	1868	Time bottom (GMT)	22:49
Filename	JC86_024	Cast Depth (m)	1859	Time O/W (GMT)	23:55
Weather	Dry with force 4 winds				
Comments	Bottle #1 did not fire and bottle #21 leaked				

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	1859	22:50																1
2	2	2	1858	22:50	X	X	X	X	X		X						X			2
3	3	3	1591	22:57			X	X	X											3
4	4	4	1492	23:00							X									4
5	5	5	1393	23:04			X	X	X											5
6	6	6	1195	23:10		X	X		X		X									6
7	7	7	995	23:15			X	X	X		X						X			7
8	8	8	796	23:21			X		X		X									8
9	9	9	650	23:23	X						X						X			9
10	10	10	650	23:26		X	X	X	X											10
11	11	11	500	23:30							X		X	X						11
12	12	12	500	23:31			X	X	X											12
13	13	13	350	23:35			X		X											13
14	14	14	201	23:39		X	X	X	X		X		X	X						14
15	15	15	101	23:42	X						X	X	X	X						15
16	16	16	102	23:42			X		X											16
17	17	17	75	23:45							X	X	X	X						17
18	18	18	50	23:47			X	X	X											18
19	19	19	50	23:47							X	X								19
20	20	20	20	23:49		X	X		X		X	X	X	X	X	X				20
21	21	21	20	23:50																21
22	22	22	10	23:52											X	X	X			22
23	23	23	5	23:53							X	X								23
24	24	24	5	23:53			X		X											24
			<b>Analyst</b>	Rich	Jan Lukas	Jan Lukas	Jan Lukas	Jan Lukas	-	Estelle	Estelle	Estelle	Estelle	Andy	Andy	Estelle	-			

Lat & lon  
at bottom

Station	IB8	CTD No	025	Date	17/05/2013
Lat	59° 12.043'N	Event No	035	Time I/W (GMT)	01:59
Lon	17° 53.048'W	Depth (m)	1572	Time bottom (GMT)	02:39
Filename	JC86_025	Cast Depth (m)	1515	Time O/W (GMT)	03:38
Weather	Dry and calm with force 3 winds				
Comments					

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	1515	02:39						X	X						X			1
2	2	2	1515	02:39		X	X	X	X											2
3	3	3	1300	02:45		X	X	X	X								X			3
4	4	4	1200	02:49							X									4
5	5	5	1100	02:52			X	X	X											5
6	6	6	1000	02:56						X	X									6
7	7	7	900	02:59			X		X											7
8	8	8	800	03:03		X	X	X	X											8
9	9	9	800	03:03							X									9
10	10	10	600	03:08			X	X	X											10
11	11	11	500	03:12						X	X		X	X						11
12	12	12	500	03:12		X	X		X								X			12
13	13	13	300	03:17			X		X											13
14	14	14	260	03:20		X	X	X	X											14
15	15	15	260	03:20							X	X	X	X						15
16	16	16	200	03:22						X										16
17	17	17	200	03:22							X		X	X						17
18	18	18	100	03:25			X	X	X								X			18
19	19	19	100	03:25							X	X	X	X						19
20	20	20	75	03:29							X	X	X	X						20
21	21	21	50	03:31						X	X	X								21
22	22	22	50	03:31			X		X											22
23	23	23	5	03:35						X	X	X								23
24	24	24	5	03:35			X		X											24
			<b>Analyst</b>		-	Jan Lukas	Jan Lukas	Jan Lukas	Jan Lukas	Alice	John B	Peter	Peter	Peter	-	-	John B	-		

Lat & lon  
at bottom

Station	IB7	CTD No	026	Date	17/05/2013
Lat	59° 06.991'N	Event No	036	Time I/W (GMT)	04:58
Lon	17° 39.857'W	Depth (m)	974	Time bottom (GMT)	05:30
Filename	JC86_026	Cast Depth (m)	970	Time O/W (GMT)	06:16
Weather	Dry with force 3 winds				
Comments					

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	970	05:31							X						X			1
2	2	2	970	05:31		X	X	X	X											2
3	3	3	700	05:38							X									3
4	4	4	700	04:38		X	X	X	X											4
5	5	5	600	05:42																5
6	6	6	600	05:42			X		X											6
7	7	7	500	05:47							X		X	X						7
8	8	8	500	05:47			X	X	X								X			8
9	9	9	380	05:51							X	X	X	X						9
10	10	10	380	05:51		X	X	X	X						X	X				10
11	11	11	300	05:55							X									11
12	12	12	300	05:55		X	X		X											12
13	13	13	200	06:00							X		X	X						13
14	14	14	200	06:00			X		X											14
15	15	15	100	06:04							X	X	X	X						15
16	16	16	100	06:04		X	X	X	X								X			16
17	17	17	75	06:07							X	X	X	X						17
18	18	18	75	06:07			X		X											18
19	19	19	50	06:10							X	X								19
20	20	20	50	06:10			X	X	X											20
21	21	21	10	06:13							X				X	X				21
22	22	22	10	06:13			X		X											22
23	23	23	5	06:15								X								23
24	24	24	5	06:15			X		X											24
			<b>Analyst</b>		-	Jen	Jen	Jen	Jen	-	Natalia	Kasia	Natalia	Natalia	Kasia	Kasia	Kasia	-		

Lat & lon  
at bottom

Station	IB6	CTD No	027	Date	17/05/2013
Lat	58° 57.011'N	Event No	037	Time I/W (GMT)	08:21
Lon	17° 10.981'W	Depth (m)	890	Time bottom (GMT)	08:54
Filename	JC86_027	Cast Depth (m)	878	Time O/W (GMT)	09:43
Weather	Sunny with force 2 winds				
Comments					

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	878	08:55	X						X						X			1
2	2	2	878	08:56			X	X	X											2
3	3	3	748	09:01		X					X									3
4	4	4	748	09:01			X	X	X											4
5	5	5	599	09:06		X														5
6	6	6	600	09:07			X	X	X											6
7	7	7	500	09:11	X						X		X	X						7
8	8	8	500	09:11																8
9	9	9	300	09:17	X												X			9
10	10	10	300	09:18		X	X	X	X											10
11	11	11	200	09:22							X		X	X						11
12	12	12	200	09:22			X		X											12
13	13	13	100	09:28	X						X	X	X	X						13
14	14	14	100	09:28		X	X	X	X											14
15	15	15	75	09:31							X	X	X	X						15
16	16	16	75	09:31																16
17	17	17	50	09:34							X	X								17
18	18	18	50	09:34			X		X											18
19	19	19	30	09:36							X	X	X	X	X	X				19
20	20	20	30	09:37		X	X	X	X											20
21	21	21	10	09:39											X	X				21
22	22	22	10	09:40													X			22
23	23	23	5	09:41							X	X	X							23
24	24	24	5	09:42			X		X											24
			<b>Analyst</b>	-	Jen	Jen	Jen	Jen	-	Natalia	Kasia	Natalia	Natalia	Kasia	Kasia	Kasia	-			

Lat & lon  
at bottom

Station	IB5	CTD No	028	Date	17/05/2013
Lat	58° 53.029'N	Event No	038	Time I/W (GMT)	11:28
Lon	17° 00.112'W	Depth (m)	1155	Time bottom (GMT)	12:06
Filename	JC86_028	Cast Depth (m)	1146	Time O/W (GMT)	12:56
Weather	Sunny with force 2 winds				
Comments	Bottle #21 did not close				

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	1146	12:06	X						X						X			1
2	2	2	1146	12:06		X	X	X	X											2
3	3	3	1000	12:12							X									3
4	4	4	1000	12:12			X	X	X											4
5	5	5	865	12:16	X						X						X			5
6	6	6	865	12:16		X	X	X	X											6
7	7	7	800	12:18							X									7
8	8	8	600	12:23		X	X	X	X											8
9	9	9	500	12:26							X		X	X			X			9
10	10	10	300	12:34		X	X	X	X											10
11	11	11	200	12:37	X						X		X	X						11
12	12	12	200	12:37			X		X											12
13	13	13	100	12:41							X	X	X	X			X			13
14	14	14	100	12:41		X	X	X	X											14
15	15	15	75	12:45							X	X	X	X						15
16	16	16	75	12:45			X		X											16
17	17	17	50	12:47							X	X								17
18	18	18	50	12:47			X		X											18
19	19	19	35	12:49							X	X	X	X	X	X				19
20	20	20	35	12:49			X	X	X											20
21	21	21	10	12:52																21
22	22	22	10	12:52			X		X						X	X				22
23	23	23	5	12:53	X						X	X	X							23
24	24	24	5	12:53			X	X	X											24
			<b>Analyst</b>	Richard	Giuseppe	Giuseppe	Giuseppe	Giuseppe	-	Abby	Colin	Colin	Colin	Andy	Andy	Abby	-			

Lat & lon  
at bottom

Station	IB4	CTD No	029	Date	17/05/2013
Lat	58° 30.022' N	Event No	039	Time I/W (GMT)	17:03
Lon	15° 59.915' N	Depth (m)	1188	Time bottom (GMT)	17:36
Filename	JC86_029	Cast Depth (m)	1180	Time O/W (GMT)	18:30
Weather	Sunny with force 3 winds				
Comments	Bottle #1 did not fire				

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	1180	17:36																1
2	2	2	1180	17:36		X	X	X	X	X	X						X			2
3	3	3	1000	17:42						X	X							X		3
4	4	4	900	17:47			X	X	X											4
5	5	5	850	17:51	X						X									5
6	6	6	850	17:51		X												X		6
7	7	7	700	17:55			X	X	X		X							X		7
8	8	8	650	17:58																8
9	9	9	650	17:58							X									9
10	10	10	500	18:03		X	X	X	X											10
11	11	11	500	18:03	X					X	X		X	X			X			11
12	12	12	200	18:10									X	X						12
13	13	13	200	18:10						X	X									13
14	14	14	100	18:15		X	X	X	X											14
15	15	15	100	18:15	X						X	X	X	X			X			15
16	16	16	74	18:18			X		X											16
17	17	17	74	18:18							X	X	X	X						17
18	18	18	50	18:21			X		X											18
19	19	19	50	18:21						X	X	X								19
20	20	20	20	18:24		X	X	X	X						X	X				20
21	21	21	20	18:24							X	X	X	X						21
22	22	22	10	18:26											X	X				22
23	23	23	5	18:28						X	X	X								23
24	24	24	5	18:28			X		X											24
			<b>Analyst</b>		Richard	Giuseppe	Giuseppe	Giuseppe	Giuseppe	Alice	Natalia	Colin	Colin	Colin	Andy M	Andy M	Natalia	Andy M		

Lat & lon  
at bottom

Station	IB3	CTD No	030	Date	18/05/2013
Lat	58° 15.015' N	Event No	041	Time I/W (GMT)	02:22
Lon	15° 20.030' N	Depth (m)	657	Time bottom (GMT)	02:46
Filename	JC86_030	Cast Depth (m)	648	Time O/W (GMT)	03:34
Weather	Calm with force 3 winds				
Comments	Bottle #21 leaked				

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	648	02:47	/	/	/	/	/	X	X	/	/	/	/	/	X	/	/	1
2	2	2	648	02:47		X	X	X	X											2
3	3	3	600	02:50							X									3
4	4	4	600	02:50																4
5	5	5	550	02:53			X	X	X											5
6	6	6	500	02:55		X														6
7	7	7	500	02:55						X	X		X	X						7
8	8	8	450	02:59			X		X											8
9	9	9	450	02:59													X			9
10	10	10	250	03:05			X	X	X											10
11	11	11	250	03:05																11
12	12	12	200	03:08																12
13	13	13	200	03:08						X	X		X	X						13
14	14	14	100	03:12		X	X		X											14
15	15	15	100	03:12							X	X	X	X			X			15
16	16	16	75	03:21			X		X											16
17	17	17	75	03:21							X	X	X	X						17
18	18	18	50	03:25																18
19	19	19	50	03:25						X	X	X								19
20	20	20	40	03:27			X	X	X		X	X	X	X	X	X				20
21	21	21	40	03:27																21
22	22	22	10	03:30											X	X				22
23	23	23	5	03:31						X	X	X								23
24	24	24	5	03:31			X		X											24
			<b>Analyst</b>		-	Jan Lukas	Jan Lukas	Jan Lukas	Jan Lukas	Abby	John B	Peter	Peter	Peter	Abby	Abby	John B	-		

Lat & lon  
at bottom

Station	IB2	CTD No	031	Date	18/05/2013
Lat	57° 57.000' N	Event No	042	Time I/W (GMT)	06:50
Lon	14° 34.999' N	Depth (m)	442	Time bottom (GMT)	07:22
Filename	JC86_031	Cast Depth (m)	435	Time O/W (GMT)	07:52
Weather	Sunny with force 4 winds				
Comments	Delayed start as monitor not working				

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>18</sup> O	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	433	07:23	X						X		X	X						1
2	2	2	433	07:23		X	X	X	X											2
3	3	3	401	07:26							X									3
4	4	4	401	07:26			X		X											4
5	5	5	340	07:29	X												X			5
6	6	6	340	07:29		X	X	X	X											6
7	7	7	200	07:36							X		X	X			X			7
8	8	8	200	07:36			X	X	X											8
9	9	9	100	07:40	X						X	X	X	X			X			9
10	10	10	100	07:40		X	X		X											10
11	11	11	75	07:42							X	X	X	X						11
12	12	12	75	07:42			X	X	X											12
13	13	13	50	07:45							X	X								13
14	14	14	50	07:45			X		X											14
15	15	15	15	07:48							X	X	X	X	X	X				15
16	16	16	15	07:48		X	X		X											16
17	17	17	10	07:50											X	X				17
18	18	18	10	07:50																18
19	19	19	5	07:51							X	X					X			19
20	20	20	5	07:51			X		X											20
21																				
22																				
23																				
24																				
			<b>Analyst</b>		Richard	Jen	Jen	Jen	Jen	-	Colin	Kasia	Colin	Colin	Andy	Andy	Claire	-		

Lat & lon  
at bottom

Station	IB1	CTD No	032	Date	18/05/2013
Lat	57° 39.976' N	Event No	043	Time I/W (GMT)	10:48
Lon	13° 54.001' W	Depth (m)	147	Time bottom (GMT)	11:00
Filename	JC86_032	Cast Depth (m)	137	Time O/W (GMT)	11:19
Weather	Dry and sunny with force 5 winds				
Comments	Springs on bottle #21 replaced before this cast Bottle #21 fired for testing purposes only due to previous problems experienced with this bottle				

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	137	11:01	/	/	/	/	/	/	X	/	X	X	/	/	X	/	/	1
2	2	2	137	11:02		X	X	X	X											2
3	3	3	100	11:05							X	X	X	X						3
4	4	4	100	11:05			X	X	X											4
5	5	5	75	11:07							X	X	X	X						5
6	6	6	75	11:08			X		X											6
7	7	7	50	11:10							X	X								7
8	8	8	50	11:10			X	X	X											8
9	9	9	25	11:12							X	X	X	X						9
10	10	10	25	11:13		X	X		X											10
11	11	11	25	11:13											X	X				11
12	12	12	10	11:16											X	X	X			12
13	13	13	10	11:16																13
14	14	14	5	11:18			X		X											14
15	15	15	5	11:18					X		X	X								15
16																				
17																				
18																				
19																				
20																				
21			5	11:18																
22																				
23																				
24																				
			<b>Analyst</b>		Richard	Jen	Jen	Jen	Jen	-	Colin	Kasia	Colin	Colin	Andy	Andy	Claire	-		

Lat & lon  
at bottom

Station	A	CTD No	033	Date	18/05/2013
Lat	57° 35.018' N	Event No	044	Time I/W (GMT)	12:57
Lon	13° 38.065' W	Depth (m)	107	Time bottom (GMT)	13:06
Filename	JC86_033	Cast Depth (m)	100	Time O/W (GMT)	13:17
Weather	Cloudy with force 5 winds				
Comments					

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	100	13:06							X	X	X	X			X			1
2	2	2	100	13:06		X	X	X	X											2
3	3	3	75	13:08							X	X	X	X						3
4	4	4	75	13:08			X	X	X											4
5	5	5	50	13:10							X	X	X	X						5
6	6	6	50	13:10			X		X											6
7	7	7	12	13:14							X	X	X	X	X	X				7
8	8	8	12	13:14		X	X	X	X											8
9	9	9	10	13:14											X	X				9
10	10	10	6	13:16			X		X											10
11	11	11	6	13:16							X	X					X			11
12																				
13																				
14																				
15																				
16																				
17																				
18																				
19																				
20																				
21																				
22																				
23																				
24																				
			<b>Analyst</b>		-	Giuseppe	Giuseppe	Giuseppe	Giuseppe	-	Abby	Colin	Colin	Colin	Andy	Andy	Abby	-		

Lat & lon  
at bottom

Station	B	CTD No	034	Date	18/05/2013
Lat	57° 34.001' N	Event No	045	Time I/W (GMT)	14:46
Lon	13° 19.996' W	Depth (m)	175	Time bottom (GMT)	15:00
Filename	JC86_034	Cast Depth (m)	170	Time O/W (GMT)	15:19
Weather	Overcast and calm with force 5 winds				
Comments					

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	170	15:00						X	X		X	X			X			1
2	2	2	170	15:00		X	X	X	X											2
3	3	3	100	15:03						X	X	X	X	X						3
4	4	4	100	15:03			X	X	X											4
5	5	5	75	15:07							X	X	X	X						5
6	6	6	75	15:07																6
7	7	7	50	15:10						X	X	X								7
8	8	8	50	15:10			X		X											8
9	9	9	25	15:13						X	X	X	X	X						9
10	10	10	25	15:13		X	X		X											10
11	11	11	10	15:15																11
12	12	12	10	15:15																12
13	13	13	5	15:16						X	X	X					X			13
14	14	14	5	15:16			X	X	X											14
15																				
16																				
17																				
18																				
19																				
20																				
21																				
22																				
23																				
24																				
			<b>Analyst</b>		-	Giuseppe	Giuseppe	Giuseppe	Giuseppe	Alice	Abby	Colin	Colin	Colin	-	-	Abby	-		

Lat & lon  
at bottom

Station	C	CTD No	035	Date	18/05/2013
Lat	57° 33.000' N	Event No	046	Time I/W (GMT)	16:43
Lon	12° 59.987' W	Depth (m)	292	Time bottom (GMT)	16:57
Filename	JC86_035	Cast Depth (m)	290	Time O/W (GMT)	17:25
Weather	Cloudy with force 6 winds				
Comments					

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	290	16:58							X		X	X						1
2	2	2	290	16:58		X	X	X	X											2
3	3	3	200	17:03							X		X	X			X			3
4	4	4	200	17:03																4
5	5	5	100	17:09							X	X	X	X						5
6	6	6	100	17:09			X	X	X											6
7	7	7	75	17:12							X	X	X	X						7
8	8	8	75	17:12																8
9	9	9	50	17:15							X	X								9
10	10	10	50	17:15			X		X											10
11	11	11	22	17:18							X	X	X	X	X	X				11
12	12	12	22	17:18		X	X		X								X			12
13	13	13	10	17:21											X	X				13
14	14	14	10	17:21																14
15	15	15	5	17:23							X	X								15
16	16	16	5	17:23			X		X											16
17																				
18																				
19																				
20																				
21																				
22																				
23																				
24																				
			<b>Analyst</b>		-	Giuseppe	Giuseppe	Giuseppe	Giuseppe	-	Natalia	Andy	Natalia	Natalia	Andy	Andy	Kasia	-		

Lat & lon  
at bottom

Station	D	CTD No	036	Date	18/05/2013
Lat	52° 32.470' N	Event No	047	Time I/W (GMT)	18:12
Lon	12° 52.117' W	Depth (m)	1078	Time bottom (GMT)	18:43
Filename	JC86_036	Cast Depth (m)	1083	Time O/W (GMT)	19:35
Weather	Cloudy with force 6 winds				
Comments	Bottle #1 misfired – sampled from bottle #2 instead				

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	1083	18:44																1
2	2	2	1083	18:44	X	X	X	X	X		X						X			2
3	3	3	910	18:50	X						X									3
4	4	4	910	18:50		X	X	X	X											4
5	5	5	800	18:56							X						X			5
6	6	6	800	18:56																6
7	7	7	600	19:02							X									7
8	8	8	600	19:02																8
9	9	9	500	19:07							X		X	X						9
10	10	10	500	19:07			X	X	X											10
11	11	11	200	19:14							X		X	X			X			11
12	12	12	200	19:14																12
13	13	13	100	19:19	X						X	X	X	X						13
14	14	14	100	19:19			X		X											14
15	15	15	75	19:21							X	X	X	X						15
16	16	16	75	19:21																16
17	17	17	50	19:25							X	X								17
18	18	18	50	19:25																18
19	19	19	25	19:27							X	X	X	X	X	X				19
20	20	20	25	19:27		X	X		X											20
21	21	21	10	19:29											X	X				21
22	22	22	10	19:29																22
23	23	23	5	19:31							X	X								23
24	24	24	5	19:31			X		X											24
			<b>Analyst</b>		Richard	Giuseppe	Giuseppe	Giuseppe	Giuseppe	-	Natalia	Colin	Colin	Colin	Andy	Andy	-	-		

Lat & lon  
at bottom

Station	E	CTD No	037	Date	18/05/2013
Lat	57° 31.979' N	Event No	048	Time I/W (GMT)	20:39
Lon	12° 38.041' W	Depth (m)	1638	Time bottom (GMT)	21:21
Filename	JC86_037	Cast Depth (m)	1627	Time O/W (GMT)	22:26
Weather	A little wet with force 6 winds				
Comments					

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	1627	21:23	X						X						X			1
2	2	2	1627	21:23		X	X	X	X											2
3	3	3	1391	21:30							X									3
4	4	4	1390	21:30			X	X	X											4
5	5	5	1192	21:36							X						X			5
6	6	6	1192	21:36			X	X	X											6
7	7	7	1000	21:42							X									7
8	8	8	1000	21:42			X		X											8
9	9	9	901	21:46	X						X						X			9
10	10	10	900	21:46		X	X	X	X											10
11	11	11	502	21:55							X		X	X			X			11
12	12	12	501	21:55			X		X											12
13	13	13	301	22:01			X	X	X											13
14	14	14	200	22:06							X		X	X						14
15	15	15	99	22:10							X	X	X	X			X			15
16	16	16	99	22:11			X		X											16
17	17	17	74	22:14							X	X	X	X						17
18	18	18	75	22:16																18
19	19	19	50	22:18							X	X								19
20	20	20	20	22:21		X	X	X	X											20
21	21	21	20	22:21	X						X	X	X	X	X	X				21
22	22	22	10	22:22											X	X				22
23	23	23	5	22:24							X	X								23
24	24	24	5	22:24			X		X											24
			<b>Analyst</b>		Richard	Jan Lukas	Jan Lukas	Jan Lukas	Jan Lukas	-	Estelle	Andy	Estelle	Estelle	Andy	Andy	Estelle	-		

Lat & lon  
at bottom

Station	F	CTD No	038	Date	19/05/2013
Lat	57° 30.443' N	Event No	049	Time I/W (GMT)	00:27
Lon	12° 14.999' W	Depth (m)	1805	Time bottom (GMT)	01:09
Filename	JC86_038	Cast Depth (m)	1789	Time O/W (GMT)	02:16
Weather	Calm with force 6 winds				
Comments					

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	1789	01:09	/	/	/	/	/	/	X	/	/	/	/	/	/	/	/	1
2	2	2	1789	01:09		X	X	X	X											2
3	3	3	1600	01:15			X		X		X						X			3
4	4	4	1400	01:20			X		X		X									4
5	5	5	1200	01:26							X									5
6	6	6	1200	01:26			X	X	X											6
7	7	7	1000	01:32							X						X			7
8	8	8	1000	01:32			X		X											8
9	9	9	800	01:38							X									9
10	10	10	800	01:38		X	X	X	X											10
11	11	11	700	01:41							X									11
12	12	12	600	01:45			X		X											12
13	13	13	500	01:48							X		X	X						13
14	14	14	400	01:52			X		X											14
15	15	15	200	01:56							X		X	X			X			15
16	16	16	200	01:56		X	X	X	X											16
17	17	17	100	02:00							X	X	X	X						17
18	18	18	100	02:00			X	X	X											18
19	19	19	75	02:06							X	X	X	X						19
20	20	20	75	02:06																20
21	21	21	50	02:09							X	X					X			21
22	22	22	50	02:09																22
23	23	23	5	02:13							X	X	X	X						23
24	24	24	5	02:13			X	X	X											24
			<b>Analyst</b>		-	Jan Lukas	Jan Lukas	Jan Lukas	Jan Lukas	-	Abby	Peter	Peter	Peter	-	-	John B	-		

Lat & lon  
at bottom

Station	G	CTD No	039	Date	19/05/2013
Lat	57° 29.500' N	Event No	050	Time I/W (GMT)	04:21
Lon	12° 50.996' W	Depth (m)	1798	Time bottom (GMT)	05:05
Filename	JC86_039	Cast Depth (m)	1780	Time O/W (GMT)	06:17
Weather	Dry with force 5 winds				
Comments	Bottle #21 mis-fired				

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.	
1	1	1	1780	05:06							X									1	
2	2	2	1780	05:06		X	X	X	X												2
3	3	3	1600	05:12			X	X	X		X						X				3
4	4	4	1400	05:18							X										4
5	5	5	1200	05:22			X		X		X										5
6	6	6	1000	05:28			X	X	X		X						X				6
7	7	7	800	05:33			X		X												7
8	8	8	700	05:37		X	X	X	X												8
9	9	9	700	05:37							X										9
10	10	10	600	05:40																	10
11	11	11	500	05:45							X						X				11
12	12	12	500	05:45									X	X							12
13	13	13	400	05:49			X		X												13
14	14	14	200	05:54		X	X		X												14
15	15	15	200	05:54							X		X	X							15
16	16	16	200	05:59							X						X				16
17	17	17	100	05:59								X	X	X							17
18	18	18	75	06:04			X		X												18
19	19	19	75	06:04							X	X	X	X							19
20	20	20	50	06:06							X	X									20
21	21	21	44	06:08																	21
22	22	22	44	06:08			X	X	X		X	X	X	X	X	X					22
23	23	23	10	06:12											X	X					23
24	24	24	5	06:14			X		X		X	X									24
			<b>Analyst</b>		-	Jen	Jen	Jen	Jen	-	Natalia	Kasia	Natalia	Natalia	Kasia	Kasia	Kasia/ Claire	-			

Lat & lon  
at bottom

Station	H	CTD No	040	Date	19/05/2013
Lat	57° 29.214' N	Event No	051	Time I/W (GMT)	07:41
Lon	11° 31.843' W	Depth (m)	2012	Time bottom (GMT)	08:33
Filename	JC86_040	Cast Depth (m)	2004	Time O/W (GMT)	09:50
Weather	Cloudy with force 5 winds				
Comments	Bottle #1 did not fire				

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	2005	08:34																1
2	2	2	2005	08:34	X	X	X	X	X	X	X						X			2
3	3	3	1794	08:41							X									3
4	4	4	1595	08:46			X	X	X		X									4
5	5	5	1496	08:50						X										5
6	6	6	1396	08:54							X									6
7	7	7	1196	09:00			X		X		X						X			7
8	8	8	998	09:06			X		X											8
9	9	9	998	09:06						X	X									9
10	10	10	800	09:13							X						X	X		10
11	11	11	601	09:18	X						X							X		11
12	12	12	601	09:19		X	X	X	X											12
13	13	13	501	09:23						X	X		X	X						13
14	14	14	500	09:23			X		X											14
15	15	15	400	09:28	X						X							X		15
16	16	16	202	09:34			X	X	X											16
17	17	17	201	09:34						X	X		X	X						17
18	18	18	101	09:39		X	X		X		X	X	X	X						18
19	19	19	76	09:42	X						X	X	X	X						19
20	20	20	50	09:44			X		X											20
21	21	21	50	09:44						X	X	X					X			21
22	22	22	25	09:47			X		X		X	X	X	X						22
23	23	23	5	09:49						X	X	X								23
24	24	24	5	09:49			X		X											24
			<b>Analyst</b>		Richard	Jen	Jen	Jen	Jen	Estelle	Tim	Andy	Colin	Colin	-		Estelle	Andy		

Lat & lon  
at bottom

Station	I	CTD No	041	Date	19/05/2013
Lat	57° 28.260' N	Event No	053	Time I/W (GMT)	15:39
Lon	11° 18.926' W	Depth (m)	738	Time bottom (GMT)	16:06
Filename	JC86_041	Cast Depth (m)	730	Time O/W (GMT)	16:47
Weather	Force 4 winds				
Comments	Bottle #3 leaked				

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	730	16:08							X						X			1
2	2	2	730	16:08		X	X	X	X											2
3	3	3	500	16:16																3
4	4	4	500	16:16		X	X	X	X		X		X	X			X			4
5	5	5	200	16:25							X		X	X						5
6	6	6	200	16:25													X			6
7	7	7	100	16:30							X	X	X	X						7
8	8	8	100	16:30			X		X											8
9	9	9	75	16:33							X	X	X	X						9
10	10	10	75	16:33																10
11	11	11	50	16:36							X	X								11
12	12	12	50	16:36																12
13	13	13	15	16:40											X	X				13
14	14	14	15	16:40		X	X		X											14
15	15	15	10	16:42							X	X	X	X	X	X				15
16	16	16	10	16:42																16
17	17	17	5	16:45							X	X					X			17
18	18	18	5	16:45			X		X											18
19																				
20																				
21																				
22																				
23																				
24																				
			<b>Analyst</b>	-	Giuseppe	Giuseppe	Giuseppe	Giuseppe	-	Natalia	Colin	Colin	Colin	Andy	Andy	Alice	-			

Lat & lon  
at bottom

Station	J	CTD No	042	Date	19/05/2013
Lat	57° 26.983' N	Event No	054	Time I/W (GMT)	17:50
Lon	11° 04.917' W	Depth (m)	585	Time bottom (GMT)	18:11
Filename	JC086_042	Cast Depth (m)	575	Time O/W (GMT)	18:45
Weather	Overcast with force 4 winds				
Comments	Bottle #14 did not close properly				

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	575	18:12						X	X						X			1
2	2	2	575	18:12		X	X	X	X											2
3	3	3	500	18:17							X		X	X						3
4	4	4	500	18:17						X										4
5	5	5	200	18:24						X	X		X	X			X			5
6	6	6	200	18:24		X	X	X	X											6
7	7	7	100	18:30							X	X	X	X						7
8	8	8	100	18:30			X		X											8
9	9	9	75	18:33							X	X	X	X			X			9
10	10	10	75	18:33																10
11	11	11	50	18:35						X	X	X								11
12	12	12	50	18:35			X		X											12
13	13	13	15	18:39		X	X		X		X	X	X	X						13
14	14	14	15	18:39																14
15	15	15	10	18:41																15
16	16	16	10	18:41																16
17	17	17	5	18:43						X	X	X								17
18	18	18	5	18:43			X		X											18
19																				
20																				
21																				
22																				
23																				
24																				
			<b>Analyst</b>		-	Giuseppe	Giuseppe	Giuseppe	Giuseppe	Alice	Natalia	Colin	Colin	Colin	-	-	Kasia	-		

Lat & lon  
at bottom

Station	K	CTD No	043	Date	19/05/2013
Lat	57° 23.983' N	Event No	055	Time I/W (GMT)	19:52
Lon	10° 52.055' W	Depth (m)	784	Time bottom (GMT)	20:16
Filename	JC086_043	Cast Depth (m)	775	Time O/W (GMT)	20:55
Weather	?				
Comments	Bottle #17 did not close properly				

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	774	20:17	X						X						X			1
2	2	2	774	20:18		X	X	X	X											2
3	3	3	696	20:21	X						X									3
4	4	4	695	20:22		X	X		X											4
5	5	5	497	20:27							X		X	X			X			5
6	6	6	497	20:27			X	X	X											6
7	7	7	298	20:34																7
8	8	8	298	20:34			X	X	X											8
9	9	9	199	20:38							X		X	X						9
10	10	10	199	20:38																10
11	11	11	99	20:42							X	X	X	X						11
12	12	12	99	20:42			X		X											12
13	13	13	75	20:45	X						X	X	X	X						13
14	14	14	75	20:45		X														14
15	15	15	50	20:48							X	X					X			15
16	16	16	50	20:48			X		X											16
17	17	17	15	20:51																17
18	18	18	15	20:51											X	X				18
19	19	19	10	20:53							X	X	X	X	X	X				19
20	20	20	10	20:53			X	X	X											20
21	21	21	5	20:54							X	X								21
22	22	22	5	20:54			X		X											22
23																				
24																				
			<b>Analyst</b>	Richard	Jan Lukas	Jan Lukas	Jan Lukas	Jan Lukas	Jan Lukas	-	Estelle	Andy	Estelle	Estelle	Andy	Andy	Estelle	-		

Lat & lon  
at bottom

Station	L	CTD No	044	Date	19/05/2013
Lat	57° 21.954' N	Event No	056	Time I/W (GMT)	21:52
Lon	10° 40.224' W	Depth (m)	2100	Time bottom (GMT)	22:40
Filename	JC86_044	Cast Depth (m)	2090	Time O/W (GMT)	23:53
Weather	Overcast with force 4 winds				
Comments					

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	2090	22:41	X						X						X			1
2	2	2	2090	22:41		X	X	X	X											2
3	3	3	1991	22:46							X									3
4	4	4	1892	22:50			X	X	X											4
5	5	5	1793	22:54							X									5
6	6	6	1694	22:58			X		X											6
7	7	7	1594	23:02							X									7
8	8	8	1394	23:07			X		X		X						X			8
9	9	9	1195	23:13			X	X	X		X									9
10	10	10	995	23:18		X	X	X	X											10
11	11	11	996	23:18	X						X						X			11
12	12	12	697	23:25			X		X		X						X			12
13	13	13	498	23:30	X						X		X	X						13
14	14	14	498	23:31		X	X	X	X											14
15	15	15	299	23:36			X		X								X			15
16	16	16	199	23:39							X		X	X						16
17	17	17	99	23:42	X						X	X	X	X						17
18	18	18	99	23:42		X	X	X	X											18
19	19	19	74	23:45							X	X	X	X						19
20	20	20	49	23:47			X		X											20
21	21	21	49	23:47							X	X								21
22	22	22	9	23:50			X		X											22
23	23	23	9	23:50							X	X	X	X						23
24	24	24	5	23:52			X		X		X	X								24
			<b>Analyst</b>	Richard	Jan Lukas	Jan Lukas	Jan Lukas	Jan Lukas	Jan Lukas	-	Abby/ Estelle	Peter	Peter	Peter	-	-	John B	-		

Lat & lon  
at bottom

Station	M	CTD No	045	Date	20/05/2013
Lat	57° 17.909' N	Event No	057	Time I/W (GMT)	01:15
Lon	10° 23.425' W	Depth (m)	2213	Time bottom (GMT)	02:04
Filename	JC86_045	Cast Depth (m)	2195	Time O/W (GMT)	03:18
Weather	Calm with force 5 winds				
Comments					

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	2195	02:04						X	X						X			1
2	2	2	2195	02:04		X	X	X	X											2
3	3	3	2000	02:09			X		X	X	X									3
4	4	4	1800	02:15			X	X	X		X									4
5	5	5	1600	02:20		X	X		X		X									5
6	6	6	1500	02:23						X										6
7	7	7	1400	02:26			X		X		X						X			7
8	8	8	1200	02:31			X	X	X		X							X		8
9	9	9	1025	02:37							X							X		9
10	10	10	1025	02:37		X	X	X	X											10
11	11	11	1000	02:39			X		X	X	X							X		11
12	12	12	700	02:45							X									12
13	13	13	600	02:49			X		X											13
14	14	14	500	02:52			X	X	X											14
15	15	15	500	02:52						X	X		X	X						15
16	16	16	300	02:56			X		X								X			16
17	17	17	200	03:00						X	X		X	X						17
18	18	18	100	03:04			X		X											18
19	19	19	100	03:04							X	X	X	X						19
20	20	20	75	03:09							X	X	X	X						20
21	21	21	50	03:12			X		X	X	X									21
22	22	22	10	03:15											X	X				22
23	23	23	5	03:16						X	X	X	X	X	X	X				23
24	24	24	5	03:16			X	X	X								X			24
			<b>Analyst</b>	-	Jan Lukas	Jan Lukas	Jan Lukas	Jan Lukas	Abby	John B	Peter	Peter	Peter	Abby	Abby	John B	Abby			

Lat & lon  
at bottom

Station	N	CTD No	046	Date	20/05/2013
Lat	57°13.941' N	Event No	059	Time I/W (GMT)	04:57
Lon	10° 02.934' W	Depth (m)	2104	Time bottom (GMT)	05:52
Filename	JC86_046	Cast Depth (m)	2090	Time O/W (GMT)	07:19
Weather	Overcast with force 5 winds				
Comments					

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	2090	05:53							X						X			1
2	2	2	2090	05:53		X	X	X	X											2
3	3	3	2000	05:59							X									3
4	4	4	1800	06:05			X	X	X		X						X			4
5	5	5	1600	06:12			X	X	X		X									5
6	6	6	1400	06:19							X									6
7	7	7	1200	06:25			X		X		X									7
8	8	8	1000	06:32			X	X	X											8
9	9	9	1000	06:32							X							X		9
10	10	10	850	06:38		X	X	X	X											10
11	11	11	850	06:38							X							X		11
12	12	12	700	06:42							X							X		12
13	13	13	500	06:48							X		X	X						13
14	14	14	500	06:48			X	X	X											14
15	15	15	200	06:57							X		X	X			X			15
16	16	16	100	07:01		X	X	X	X											16
17	17	17	100	07:01							X	X	X	X						17
18	18	18	75	07:05			X		X											18
19	19	19	75	07:05							X	X	X	X						19
20	20	20	50	07:08			X		X		X	X								20
21	21	21	15	07:12							X	X	X	X						21
22	22	22	15	07:12			X		X											22
23	23	23	5	07:14							X	X								23
24	24	24	5	07:14			X		X											24
			<b>Analyst</b>		-	Jen	Jen	Jen	Jen	-	Natalia	Kasia	Natalia	Natalia	-	-	Kasia	Kasia		

Lat & lon  
at bottom

Station	O	CTD No	047	Date	20/05/2013
Lat	57° 09.145' N	Event No	060	Time I/W (GMT)	08:46
Lon	09° 42.208' W	Depth (m)	1923	Time bottom (GMT)	09:34
Filename	JC86_047	Cast Depth (m)	1913	Time O/W (GMT)	10:47
Weather	Cloudy with wind force 5				
Comments					

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	1913	09:35	X						X						X			1
2	2	2	1913	09:35		X	X	X	X											2
3	3	3	1794	09:40							X									3
4	4	4	1595	09:45			X	X	X		X									4
5	5	5	1395	09:51							X									5
6	6	6	1196	09:57			X		X											6
7	7	7	1196	09:57							X						X			7
8	8	8	997	10:03			X	X	X		X									8
9	9	9	847	10:09	X						X									9
10	10	10	847	10:09		X	X	X	X											10
11	11	11	747	10:14							X						X			11
12	12	12	697	10:17							X									12
13	13	13	498	10:22	X						X		X	X						13
14	14	14	498	10:23			X		X											14
15	15	15	199	10:30							X		X	X			X			15
16	16	16	199	10:31		X	X	X	X											16
17	17	17	100	10:35	X						X	X	X	X						17
18	18	18	75	10:37			X		X		X	X	X	X						18
19	19	19	50	10:39							X	X								19
20	20	20	50	10:40			X		X											20
21	21	21	15	10:43							X	X	X	X	X	X				21
22	22	22	15	10:43			X		X											22
23	23	23	10	10:44											X	X				23
24	24	24	5	10:46			X		X		X	X								24
			<b>Analyst</b>	Richard	Jen	Jen	Jen	Jen	-	Tim	Andy	Colin	Colin	Andy	Andy	Estelle	-			

Lat & lon  
at bottom

Station	P	CTD No	048	Date	20/05/2013
Lat	57° 06.125' N	Event No	061	Time I/W (GMT)	13:38
Lon	09° 25.058' W	Depth (m)	1406	Time bottom (GMT)	14:08
Filename	JC86_048	Cast Depth (m)	1405	Time O/W (GMT)	15:00
Weather	Calm and cloudy with force 5 winds				
Comments	Bottle #8 – un-used as fired by mistake				

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	1405	14:08	X						X						X			1
2	2	2	1405	14:08		X	X	X	X											2
3	3	3	1200	14:13							X						X			3
4	4	4	1200	14:13		X	X	X	X											4
5	5	5	1000	14:18							X									5
6	6	6	920	14:21		X	X	X	X											6
7	7	7	920	14:21	X						X									7
8	8	8	920	14:21																8
9	9	9	800	14:25							X									9
10	10	10	700	14:28		X	X	X	X											10
11	11	11	700	14:28	X						X									11
12	12	12	500	14:32							X		X	X						12
13	13	13	300	14:37			X		X								X			13
14	14	14	200	14:40							X		X	X						14
15	15	15	100	14:43							X	X	X	X						15
16	16	16	100	14:43		X	X		X											16
17	17	17	75	14:49	X						X	X	X	X						17
18	18	18	75	14:49																18
19	19	19	50	14:51							X	X					X			19
20	20	20	50	14:51			X		X											20
21	21	21	15	14:54							X	X	X	X						21
22	22	22	15	14:54		X	X		X											22
23	23	23	5	14:56							X	X								23
24	24	24	5	14:56			X		X											24
			<b>Analyst</b>	Richard	Giuseppe	Giuseppe	Giuseppe	Giuseppe	-	Abby	Peter	Peter	Peter	-	-	Abby	-			

Station	Q4	CTD No	049	Date	20/05/2013
Lat	57°05.009' N	Event No	062	Time I/W (GMT)	15:55
Lon	09°20.697' W	Depth (m)	940	Time bottom (GMT)	16:26
Filename	JC86_049	Cast Depth (m)	941	Time O/W (GMT)	16:55
Weather	Overcast with force 4 winds				
Comments					

Station	Q3	CTD No	050	Date	20/05/2013
Lat	57°04.701' N	Event No	063	Time I/W (GMT)	17:16
Lon	09°18.498' W	Depth (m)	672	Time bottom (GMT)	17:39
Filename	JC86_050	Cast Depth (m)	660	Time O/W (GMT)	17:58
Weather	Overcast with force 4 winds				
Comments					

Station	Q2	CTD No	051	Date	20/05/2013
Lat	57°04.201' N	Event No	064	Time I/W (GMT)	18:24
Lon	09°16.299' W	Depth (m)	540	Time bottom (GMT)	18:42
Filename	JC86_051	Cast Depth (m)	475	Time O/W (GMT)	18:55
Weather	Overcast with force 4 winds				
Comments					

Station	Q1	CTD No	052	Date	20/05/2013
Lat	57°03.401' N	Event No	065	Time I/W (GMT)	19:22
Lon	09°14.795' W	Depth (m)	403	Time bottom (GMT)	19:44
Filename	JC86_052	Cast Depth (m)	397	Time O/W (GMT)	19:58
Weather	Overcast with force 4 winds				
Comments					

Lat & lon  
at bottom

Station	Q	CTD No	053	Date	20/05/2013
Lat	57° 03.000' N	Event No	066	Time I/W (GMT)	20:23
Lon	09° 12.995' W	Depth (m)	312	Time bottom (GMT)	20:40
Filename	JC86_053	Cast Depth (m)	303	Time O/W (GMT)	21:03
Weather	Grey with force 5 winds				
Comments	Bottle #3 leaked				

Fire Seq	Bot. No.	Rose te pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	303	20:41							X						X			1
2	2	2	303	20:41		X	X	X	X											2
3	3	3	201	20:46																3
4	4	4	200	20:46			X		X		X		X	X						4
5	5	5	101	20:51							X	X	X	X						5
6	6	6	101	20:51			X	X	X											6
7	7	7	76	20:53							X	X	X	X						7
8	8	8	76	20:53			X		X											8
9	9	9	51	20:55							X	X								9
10	10	10	51	20:55			X	X	X											10
11	11	11	25	20:57							X	X	X	X						11
12	12	12	25	20:57			X	X	X											12
13	13	13	10	21:00											X	X				13
14	14	14	10	21:00																14
15	15	15	5	21:02							X	X			X	X				15
16	16	16	5	21:02			X		X											16
17																				
18																				
19																				
20																				
21																				
22																				
23																				
24																				
			<b>Analyst</b>		-	Jan Lukas	Jan Lukas	Jan Lukas	Jan Lukas	-	Xiangbo	Andy	Estelle	Estelle	Andy	Andy	Estelle	-		

Station	R3	CTD No	054	Date	20/05/2013
Lat	57°02.700' N	Event No	067	Time I/W (GMT)	21:35
Lon	09°11.399' W	Depth (m)	244	Time bottom (GMT)	21:49
Filename	JC86_054	Cast Depth (m)	234	Time O/W (GMT)	22:00
Weather	Calm, but a little wet with force 4 winds				
Comments					

Station	R2	CTD No	055	Date	20/05/2013
Lat	57°02.201' N	Event No	068	Time I/W (GMT)	22:22
Lon	09°09.797' W	Depth (m)	206	Time bottom (GMT)	22:35
Filename	JC86_055	Cast Depth (m)	196	Time O/W (GMT)	22:45
Weather	Calm, but a little wet with force 4 winds				
Comments					

Station	R1	CTD No	056	Date	20/05/2013
Lat	57°02.000' N	Event No	069	Time I/W (GMT)	23:12
Lon	09°07.100' W	Depth (m)	154	Time bottom (GMT)	23:25
Filename	JC86_056	Cast Depth (m)	144	Time O/W (GMT)	23:38
Weather	Calm, but a little wet with force 4 winds				
Comments					

Lat & lon  
at bottom

Station	R	CTD No	057	Date	21/05/2013
Lat	57° 00.000' N	Event No	070	Time I/W (GMT)	00:29
Lon	09° 00.000' W	Depth (m)	130	Time bottom (GMT)	00:42
Filename	JC86_057	Cast Depth (m)	120	Time O/W (GMT)	01:00
Weather	Calm with force 4 winds				
Comments					

Fire Seq	Bot. No.	Rose te pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	120	00:43							X						X			1
2	2	2	120	00:43		X	X	X	X											2
3	3	3	100	00:46							X	X	X	X						3
4	4	4	100	00:46			X	X	X											4
5	5	5	75	00:48							X	X	X	X						5
6	6	6	75	00:48																6
7	7	7	50	00:52							X	X								7
8	8	8	50	00:52			X		X											8
9	9	9	10	00:56																9
10	10	10	10	00:56																10
11	11	11	5	00:57							X	X	X	X						11
12	12	12	5	00:57			X	X	X											12
13																				
14																				
15																				
16																				
17																				
18																				
19																				
20																				
21																				
22																				
23																				
24																				
			<b>Analyst</b>	-	Jan Lukas	Jan Lukas	Jan Lukas	Jan Lukas	-	Abby	Peter	Peter	Peter	-	-	Abby	-			

Lat & lon  
at bottom

Station	M	CTD No	058	Date	22/05/2013
Lat	57° 17.862' N	Event No	075	Time I/W (GMT)	09:31
Lon	10° 23.113' W	Depth (m)	2211	Time bottom (GMT)	10:09
Filename	JC86_058	Cast Depth (m)	1400	Time O/W (GMT)	10:52
Weather	Dry with force 6 winds				
Comments	CTD not deployed to full depth in order to resolve lower oxygen layer				

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.	
1	1	1	1394	10:11	X															1	
2	2	2	1394	10:11							X								X		2
3	3	3	1100	10:19																	3
4	4	4	1100	10:19							X								X		4
5	5	5	916	10:24	X																5
6	6	6	916	10:24							X								X		6
7	7	7	800	10:28																	7
8	8	8	800	10:29							X								X		8
9	9	9	700	10:33																	9
10	10	10	700	10:34							X								X		10
11	11	11	75	10:48	X																11
12	12	12	75	10:48																	12
13																					
14																					
15																					
16																					
17																					
18																					
19																					
20																					
21																					
22																					
23																					
24																					
			<b>Analyst</b>	Richard	-	-	-	-	-	-	Tim	-	-	-	-	-	-	-	Andy		

Lat & lon  
at bottom

Station	1G	CTD No	059	Date	23/05/2013
Lat	56° 39.998' N	Event No	077	Time I/W (GMT)	06:19
Lon	06° 07.996' W	Depth (m)	179	Time bottom (GMT)	06:30
Filename	JC86_059	Cast Depth (m)	170	Time O/W (GMT)	06:53
Weather	Overcast with force 5 winds				
Comments	No LADCP				

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	170	06:31							X						X			1
2	2	2	170	06:31			X	X	X											2
3	3	3	150	06:34							X									3
4	4	4	150	06:34																4
5	5	5	100	06:38							X	X	X	X						5
6	6	6	100	06:38			X		X											6
7	7	7	75	06:42							X	X	X	X			X			7
8	8	8	75	06:42			X	X	X											8
9	9	9	50	06:44							X	X								9
10	10	10	50	06:44			X		X											10
11	11	11	10	06:49											X	X				11
12	12	12	10	06:49			X		X											12
13	13	13	5	06:51							X	X	X	X	X	X				13
14	14	14	5	06:51			X	X	X								X			14
15																				
16																				
17																				
18																				
19																				
20																				
21																				
22																				
23																				
24																				
			<b>Analyst</b>		-	-	Jen	Jen	Jen	-	Natalia	Kasia/ Alice	Kasia/ Alice	Kasia/ Alice	Andy	Andy	Alice	-		

Lat & lon  
at bottom

Station	3G	CTD No	061	Date	23/05/2013
Lat	56° 42.499' N	Event No	079	Time I/W (GMT)	15:12
Lon	06° 21.995' W	Depth (m)	73	Time bottom (GMT)	15:21
Filename	JC86_061	Cast Depth (m)	70	Time O/W (GMT)	15:31
Weather	Dry with force 6 winds				
Comments	No LADCP				

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	70	15:21							X						X			1
2	2	2	70	15:21			X	X	X											2
3	3	3	50	15:24							X	X	X	X			X			3
4	4	4	50	15:24			X		X											4
5	5	5	10	15:27							X	X	X	X						5
6	6	6	10	15:27			X	X	X											6
7	7	7	5	15:29							X	X					X			7
8	8	8	5	15:29			X		X											8
9																				
10																				
11																				
12																				
13																				
14																				
15																				
16																				
17																				
18																				
19																				
20																				
21																				
22																				
23																				
24																				
			<b>Analyst</b>		-	-	Jan Lukas	Jan Lukas	Jan Lukas	-	Abby	Colin	Colin	Colin	-	-	Abby	-		

Lat & lon  
at bottom

Station	5G	CTD No	062	Date	23/05/2013
Lat	56° 43.888' N	Event No	080	Time I/W (GMT)	20:16
Lon	06° 35.752' W	Depth (m)	68	Time bottom (GMT)	20:25
Filename	JC86_062	Cast Depth (m)	78	Time O/W (GMT)	20:34
Weather	Grey with force 5 winds				
Comments	Bottle #3 leaked No LADCP				

Fire Seq	Bot. No.	Rose tte pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	67	20:26							X	X	X	X						1
2	2	2	68	20:26			X	X	X											2
3	3	3	51	20:29																3
4	4	4	50	20:29			X		X		X	X	X	X						4
5	5	5	15	20:32							X	X	X	X						5
6	6	6	15	20:32			X	X	X											6
7	7	7	6	20:33							X	X								7
8	8	8	6	20:33			X		X											8
9																				
10																				
11																				
12																				
13																				
14																				
15																				
16																				
17																				
18																				
19																				
20																				
21																				
22																				
23																				
24																				
							Jan Lukas	Jan Lukas	Jan Lukas	-	Xiangbo	Andy	Estelle	Estelle	-	-	-	-		

Lat & lon  
at bottom

Station	7G	CTD No	064	Date	23/05/2013
Lat	56° 44.000' N	Event No	082	Time I/W (GMT)	23:08
Lon	07° 00.000' W	Depth (m)	136	Time bottom (GMT)	23:16
Filename	JC86_064	Cast Depth (m)	170	Time O/W (GMT)	23:34
Weather	Wind force 6				
Comments	Bottle #1 did not fire No LADCP				

Fire Seq	Bot. No.	Rosette pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	126	23:17																1
2	2	2	126	23:17		X														2
3	3	3	126	23:17		X														3
4	4	4	126	23:18	X															4
5	5	5	126	23:18		X	X	X	X											5
6	6	6	126	23:18	X						X		X	X						6
7	7	7	100	23:21							X	X	X	X						7
8	8	8	101	23:21			X	X	X											8
9	9	9	76	23:23							X	X	X	X						9
10	10	10	76	23:23			X	X	X											10
11	11	11	50	23:26							X	X								11
12	12	12	51	23:26			X		X											12
13	13	13	18	23:29							X	X	X	X	X	X				13
14	14	14	18	23:30			X	X	X											14
15	15	15	10	23:31											X	X				15
16	16	16	10	23:31																16
17	17	17	5	23:32							X	X								17
18	18	18	5	23:32			X		X											18
19																				
20																				
21																				
22																				
23																				
24																				
			<b>Analyst</b>		Richard	Jan Lukas	Jan Lukas	Giuseppe	Giuseppe	-	Xiangbo	Andy	Estelle	Estelle	Andy	Andy	-	-		

Lat & lon  
at bottom

Station	9G	CTD No	066	Date	24/05/2013
Lat	56° 44.008' N	Event No	084	Time I/W (GMT)	02:20
Lon	07° 20.015' W	Depth (m)	155	Time bottom (GMT)	02:32
Filename	JC86_066	Cast Depth (m)	150	Time O/W (GMT)	02:52
Weather	Overcast with force 6 winds				
Comments	Bottle #3 did not close. Bottle 13 - fired by mistake at ~6m - no samples taken from it.				

Fire Seq	Bot. No.	Rosette pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	150	02:32							X		X	X						1
2	2	2	150	02:32			X	X	X											2
3	3	3	100	02:36																3
4	4	4	100	02:36			X		X		X	X	X	X						4
5	5	5	75	02:39							X	X	X	X						5
6	6	6	75	02:39			X	X	X											6
7	7	7	50	02:43							X	X								7
8	8	8	50	02:43			X	X	X											8
9	9	9	10	02:46							X	X	X	X						9
10	10	10	10	02:46			X	X	X											10
11	11	11	5	02:48							X	X								11
12	12	12	5	02:48			X		X											12
13	13	13	5	02:48																13
14																				
15																				
16																				
17																				
18																				
19																				
20																				
21																				
22																				
23																				
24																				
				<b>Analyst</b>	-	-	Jan Lukas	Jan Lukas	Jan Lukas	-	Abby	Peter	Peter	Peter	-	-	-	-		

Lat & lon  
at bottom

Station	10G	CTD No	067	Date	24/05/2013
Lat	56° 44.004' N	Event No	085	Time I/W (GMT)	03:59
Lon	07° 29.969' W	Depth (m)	215	Time bottom (GMT)	04:12
Filename	JC86_067	Cast Depth (m)	208	Time O/W (GMT)	04:43
Weather	Overcast with force 5 winds				
Comments	Bottle #3 did not fire No LADCP				

Fire Seq	Bot. No.	Rosette pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	208	04:14							X		X	X						1
2	2	2	208	04:14			X	X	X											2
3	3	3	150	04:20																3
4	4	4	150	04:20			X	X	X		X									4
5	5	5	100	04:24							X	X	X	X						5
6	6	6	100	04:24			X	X	X											6
7	7	7	75	04:27							X	X	X	X						7
8	8	8	75	04:27																8
9	9	9	60	04:30																9
10	10	10	60	04:30			X		X											10
11	11	11	50	04:32							X	X								11
12	12	12	50	04:32																12
13	13	13	17	04:35							X	X	X	X	X	X				13
14	14	14	17	04:35			X	X	X											14
15	15	15	10	04:37											X	X				15
16	16	16	10	04:37																16
17	17	17	5	04:39							X	X								17
18	18	18	5	04:39			X		X											18
19																				
20																				
21																				
22																				
23																				
24																				
				<b>Analyst</b>	-	-	Jen	Jen	Jen	-	Natalia	Kasia/ Alice/ Natalia	Kasia/ Alice/ Natalia	Kasia/ Alice/ Natalia	Kasia	Kasia	-	-		

Lat & lon  
at bottom

Station	13G	CTD No	070	Date	24/05/2013
Lat	56° 47.035' N	Event No	089	Time I/W (GMT)	12:04
Lon	08° 00.014' W	Depth (m)	117	Time bottom (GMT)	12:17
Filename	JC86_070	Cast Depth (m)	110	Time O/W (GMT)	12:36
Weather	Sunny with force 4 winds				
Comments	No LADCP				

Fire Seq	Bot. No.	Rosette pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	110	12:18							X		X	X						1
2	2	2	110	12:18			X	X												2
3	3	3	100	12:19							X	X	X	X						3
4	4	4	100	12:19			X	X												4
5	5	5	80	12:22																5
6	6	6	80	12:22			X	X												6
7	7	7	75	12:23							X	X	X	X						7
8	8	8	75	12:23																8
9	9	9	50	12:27							X	X								9
10	10	10	50	12:27			X													10
11	11	11	15	12:29							X	X	X	X	X	X				11
12	12	12	15	12:29			X	X												12
13	13	13	10	12:31											X	X				13
14	14	14	10	12:31																14
15	15	15	5	12:33							X	X								15
16	16	16	5	12:33			X													16
17																				
18																				
19																				
20																				
21																				
22																				
23																				
24																				
			<b>Analyst</b>		-	-	Giuseppe	Giuseppe	-	-	Abby	Colin	Colin	Colin	Andy	Andy	-	-		

Lat & lon  
at bottom

Station	T	CTD No	072	Date	24/05/2013
Lat	56° 50.189' N	Event No	091	Time I/W (GMT)	14:56
Lon	08° 19.950' W	Depth (m)	129	Time bottom (GMT)	15:05
Filename	JC86_072	Cast Depth (m)	120	Time O/W (GMT)	15:24
Weather	Sunny with force 2 winds				
Comments	Bottle 3 did not close. Missed firing at 100m - fired at 75m first and then 100m. No LADCP				

Fire Seq	Bot. No.	Rosette pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	120	15:05							X		X	X						1
2	2	2	120	15:05			X	X												2
3	3	3	75	15:11																3
4	4	4	75	15:11			X	X			X	X	X	X						4
5	5	5	100	15:14							X	X	X	X						5
6	6	6	100	15:14			X	X												6
7	7	7	50	15:17							X	X								7
8	8	8	50	15:17																8
9	9	9	20	15:19							X	X	X	X						9
10	10	10	20	16:19			X													10
11	11	11	5	15:21							X	X								11
12	12	12	5	15:21			X	X												12
13																				
14																				
15																				
16																				
17																				
18																				
19																				
20																				
21																				
22																				
23																				
24																				
			<b>Analyst</b>	-	-	Giuseppe	Giuseppe	-	-	Abby	Colin	Colin	Colin	-	-	-	-			

Lat & lon  
at bottom

Station	15G	CTD No	073	Date	24/05/2013
Lat	56° 52.962' N	Event No	092	Time I/W (GMT)	16:23
Lon	08° 29.916' W	Depth (m)	124	Time bottom (GMT)	16:31
Filename	JC86_073	Cast Depth (m)	120	Time O/W (GMT)	16:57
Weather	Dry, with force 1 winds				
Comments					

Fire Seq	Bot. No.	Rosette pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	120	16:32						X	X									1
2	2	2	120	16:32			X	X	X											2
3	3	3	100	16:35							X	X	X	X						3
4	4	4	100	16:35			X	X	X											4
5	5	5	80	16:39						X										5
6	6	6	80	16:39			X	X	X											6
7	7	7	75	15:41							X	X	X	X						7
8	8	8	75	16:41																8
9	9	9	50	15:45						X	X	X								9
10	10	10	50	16:45			X		X											10
11	11	11	20	16:48						X										11
12	12	12	20	16:48																12
13	13	13	16	16:51							X	X	X	X						13
14	14	14	16	16:51			X	X	X											14
15	15	15	5	16:54						X	X	X								15
16	16	16	5	16:54			X		X											16
17																				
18																				
19																				
20																				
21																				
22																				
23																				
24																				
			<b>Analyst</b>		-	-	Giuseppe	Giuseppe	Giuseppe	Alice	Natalia	Colin	Colin	Colin	-	-	-	-		

Lat & lon  
at bottom

Station	S	CTD No	074	Date	24/05/2013
Lat	56° 56.978' N	Event No	093	Time I/W (GMT)	18:16
Lon	08° 46.963' W	Depth (m)	123	Time bottom (GMT)	18:23
Filename	JC86_074	Cast Depth (m)	120	Time O/W (GMT)	18:42
Weather	Force 4 winds				
Comments	NO LADCP				

Fire Seq	Bot. No.	Rosette pos.	Depth (m)	Time (GMT)	DO SAMS	DO NOCS	DIC	<sup>13</sup> C	Nuts NOCS	<sup>18</sup> O	Nuts SAMS	Chl	POC	PIC	DMSP	Phyto	Salinity	Bact Abun		Bot. No.
1	1	1	120	18:24							X		X	X						1
2	2	2	120	18:24			X	X	X											2
3	3	3	100	18:27							X	X	X	X						3
4	4	4	100	18:27																4
5	5	5	75	18:30							X	X	X	X						5
6	6	6	75	18:30																6
7	7	7	60	18:33																7
8	8	8	60	18:33			X	X	X											8
9	9	9	50	18:35							X	X								9
10	10	10	50	18:35																10
11	11	11	10	18:38							X	X	X	X	X	X				11
12	12	12	10	18:38			X	X	X						X	X				12
13	13	13	5	18:40							X	X								13
14	14	14	5	18:40			X		X											14
15																				
16																				
17																				
18																				
19																				
20																				
21																				
22																				
23																				
24																				
			<b>Analyst</b>		-	-	Giuseppe	Giuseppe	Giuseppe	-	Natalia	Colin	Colin	Colin	Andy	Andy	-	-		

Station	2G	CTD No	060	Date	23/05/2013
Lat	56° 41.046' N	Event No	078	Time I/W (GMT)	13:57
Lon	06° 17.060' W	Depth (m)	33	Time bottom (GMT)	14:05
Filename	JC86_060	Cast Depth (m)	12	Time O/W (GMT)	14:07
Weather	Dry with force 6 winds				
Comments	First station sampled after experiencing strong winds				

Station	6G	CTD No	063	Date	23/05/2013
Lat	56° 43.999' N	Event No	081	Time I/W (GMT)	21:38
Lon	06° 44.998' W	Depth (m)	40	Time bottom (GMT)	21:44
Filename	JC86_063	Cast Depth (m)	30	Time O/W (GMT)	21:46
Weather	Wind force 6				
Comments					

Station	8G	CTD No	065	Date	24/05/2013
Lat	56° 44.062' N	Event No	083	Time I/W (GMT)	00:45
Lon	07° 10.307' W	Depth (m)	174	Time bottom (GMT)	01:00
Filename	JC86_065	Cast Depth (m)	165	Time O/W (GMT)	01:06
Weather	Wind force 6				
Comments					

Station	MINGULAY	CTD No	068	Date	24/05/2013
Lat	56° 49.116' N	Event No	086	Time I/W (GMT)	06:23
Lon	07° 23.750' W	Depth (m)	168	Time bottom (GMT)	06:38
Filename	JC86_068	Cast Depth (m)	165	Time O/W (GMT)	06:47
Weather	Sunny with force 4 winds				
Comments					

Station	12G	CTD No	069	Date	24/05/2013
Lat	56° 45.569' N	Event No	088	Time I/W (GMT)	10:55
Lon	07° 50.064' W	Depth (m)	49	Time bottom (GMT)	11:03
Filename	JC86_069	Cast Depth (m)	38	Time O/W (GMT)	11:05
Weather	Sunny with force 4 winds				
Comments					

Station	14G	CTD No	071	Date	24/05/2013
Lat	56° 48.523' N	Event No	090	Time I/W (GMT)	13:35
Lon	08° 09.911' W	Depth (m)	124	Time bottom (GMT)	13:46
Filename	JC86_071	Cast Depth (m)	115	Time O/W (GMT)	13:51
Weather	Calm and sunny with force 3 winds				
Comments					

Station	L7A	CTD No	075	Date	24/05/2013
Lat	56° 57.401' N	Event No	094	Time I/W (GMT)	20:22
Lon	09° 06.997' W	Depth (m)	241	Time bottom (GMT)	20:35
Filename	JC86_075	Cast Depth (m)	231	Time O/W (GMT)	20:48
Weather	?				
Comments					

Station	L7	CTD No	076	Date	24/05/2013
Lat	56° 57.000' N	Event No	095	Time I/W (GMT)	21:14
Lon	09° 07.998' W	Depth (m)	385	Time bottom (GMT)	21:30
Filename	JC86_076	Cast Depth (m)	380	Time O/W (GMT)	21:41
Weather	?				
Comments					

Station	L6A'	CTD No	077	Date	24/05/2013
Lat	56° 56.600' N	Event No	096	Time I/W (GMT)	22:04
Lon	09° 09.000' W	Depth (m)	538	Time bottom (GMT)	22:28
Filename	JC86_077	Cast Depth (m)	532	Time O/W (GMT)	22:41
Weather	Wind force 5				
Comments					

Station	L6A	CTD No	078	Date	24/05/2013
Lat	56° 56.201' N	Event No	097	Time I/W (GMT)	23:03
Lon	09° 10.000' W	Depth (m)	758	Time bottom (GMT)	23:35
Filename	JC86_078	Cast Depth (m)	752	Time O/W (GMT)	00:04
Weather	Wind force 4				
Comments					

Station	L6	CTD No	079	Date	25/05/2013
Lat	56° 55.526' N	Event No	098	Time I/W (GMT)	00:43
Lon	09° 11.974' W	Depth (m)	1023	Time bottom (GMT)	01:09
Filename	JC86_079	Cast Depth (m)	1010	Time O/W (GMT)	01:32
Weather	Calm with force 5 winds				
Comments					

Station	L5	CTD No	080	Date	25/05/2013
Lat	56° 54.010' N	Event No	099	Time I/W (GMT)	02:19
Lon	09° 15.997' W	Depth (m)	1267	Time bottom (GMT)	02:50
Filename	JC86_080	Cast Depth (m)	1256	Time O/W (GMT)	03:16
Weather	Raining with force 5 winds				
Comments					

Station	AMMONITE1	CTD No	081	Date	25/05/2013
Lat	56° 33.115' N	Event No	101	Time I/W (GMT)	07:18
Lon	09° 22.398' W	Depth (m)	1157	Time bottom (GMT)	07:54
Filename	JC86_081	Cast Depth (m)	1152	Time O/W (GMT)	08:26
Weather	Overcast, wind force 5				
Comments	Glider deployment site				

JC086 – Appendix 3  
CTD Salinity Log

## JC086 CTD salinity sampling log

CTD #	Date & time (GMT)	Station	Btl depth (m)	Rosette btl #	Crate #	Sample btl #	Comments	Sampler
001	07/05/2013	Marmite 1	1133	2	7	188		Estelle
001	07/05/2013	Marmite 1	1000	4	7	189		Estelle
001	07/05/2013	Marmite 1	850	6	7	190		Estelle
001	07/05/2013	Marmite 1	750	8	7	191		Estelle
001	07/05/2013	Marmite 1	500	10	7	192		Estelle
001	07/05/2013	Marmite 1	30	16	7	193		Estelle
003	08/05/2013 13:51	S354	966	1	7	194	No water in bottle 2 on recovery. Therefore, a duplicate salinity sample was taken from bottle 1.	Abby
003	08/05/2013 13:51	S354	966	1	7	195		Andrew
003	08/05/2013 13:51	S354	650	3	7	196		Estelle
003	08/05/2013 13:51	S354	350	7	7	197		Abby
003	08/05/2013 13:51	S354	100	9	7	198		Andrew
004	08/05/2013 16:15	S353	1031	1	7	199		Andrew
004	08/05/2013 16:15	S353	900	2	7	200		Abby
004	08/05/2013 16:15	S353	500	5	7	201		Andrew
004	08/05/2013 16:15	S353	200	7	7	202		Abby
005	08/05/2013 18:00	S352	1024	1	7	203		Kasia
005	08/05/2013 18:00	S352	800	3	7	204		Kasia
005	08/05/2013 18:00	S352	600	4	7	205		Kasia
005	08/05/2013 18:00	S352	500	5	7	206		Kasia
005	08/05/2013 18:00	S352	400	6	7	207		Kasia
005	08/05/2013 18:00	S352	100	8	7	208		Kasia
006	08/05/2013 19:40	S351	600	3	7	209		Kasia
006	08/05/2013 19:40	S351	400	5	7	210		Kasia
006	08/05/2013 19:40	S351	100	7	7	211		Kasia
008	10/05/2013 08:30	IB22	195	1	6	164	New crate Old crate placed in CT lab at 20:35 on 08/05/2013	Estelle
008	10/05/2013 08:30	IB22	15	15	6	165		Estelle
009	10/05/2013	IB22S	653	1	6	166		Estelle
009	10/05/2013	IB22S	500	5	6	167		Estelle
009	10/05/2013	IB22S	5	22	6	168		Estelle
010	10/05/2013	IB21S	1028	1	6	169		Abby
010	10/05/2013	IB21S	900	3	6	170		Abby
010	10/05/2013	IB21S	500	9	6	171		Abby
010	10/05/2013	IB21S	12	21	6	172		Abby
011	10/05/2013	IB20S	1375	1	6	173		Kasia
011	10/05/2013	IB20S	500	8	6	174	Duplicates taken at 500m. 1 sample from bottle 8 and one from bottle 9.	Kasia
011	10/05/2013	IB20S	500	9	6	175	Duplicates taken at 500m. 1 sample from bottle 8 and one from bottle 9.	Kasia
011	10/05/2013	IB20S	75	14	6	176		Kasia
012	10/05/2013 20:15	IB19S	1665	1	6	177		Estelle
012	10/05/2013 20:15	IB19S	1200	5	6	178		Estelle
012	10/05/2013 20:15	IB19S	500	11	6	179		Estelle
012	10/05/2013 20:15	IB19S	20	21	6	180		Estelle
012	10/05/2013 20:15	IB19S	1665	1	6	181		Estelle
013	11/05/2013 00:45	IB18S	1780	1	6	182		John B

## JC086 CTD salinity sampling log

CTD #	Date & time (GMT)	Station	Btl depth (m)	Rosette btl #	Crate #	Sample btl #	Comments	Sampler
013	11/05/2013 00:45	IB18S	1400	4	6	183	Duplicates taken at 1400m. Both samples taken from bottle 4.	John B
013	11/05/2013 00:45	IB18S	1400	4	6	184	Duplicates taken at 1400m. Both samples taken from bottle 4.	John B
013	11/05/2013 00:45	IB18S	800	9	6	185		John B
013	11/05/2013 00:45	IB18S	300	12	6	186		John B
013	11/05/2013 00:45	IB18S	40	21	6	187		John B
014	11/05/2013 02:47	IB17	1785	1	15	380	New crate Old crate placed in CT lab at 00:50 on 11/05/2013 NO INSERTS, THEREFORE NOT ANALYSED	Alice
014	11/05/2013 02:47	IB17	1400	4	15	381	Duplicates taken at 1400m. One sample taken from bottle 4 and one from bottle 5. NO INSERTS, THEREFORE NOT ANALYSED	Alice
014	11/05/2013 02:47	IB17	1400	5	15	382	NO INSERTS, THEREFORE NOT ANALYSED	Alice
014	11/05/2013 02:47	IB17	200	14	15	383	NO INSERTS, THEREFORE NOT ANALYSED	Alice
015	11/05/2013 08:30	IB16A	1774	2	15	384		Estelle
015	11/05/2013 08:30	IB16A	1251	6	15	385		Estelle
015	11/05/2013 08:30	IB16A	500	14	15	386		Estelle
015	11/05/2013 08:30	IB16A	25	22	15	387		Estelle
016	11/05/2013 13:00	IB16	2207	1	15	388		Abby
016	11/05/2013 13:00	IB16	2000	3	15	389		Estelle
016	11/05/2013 13:00	IB16	1400	5	15	390		Abby
016	11/05/2013 13:00	IB16	620	11	15	391		Estelle
016	11/05/2013 13:00	IB16	20	22	15	392		Estelle
017	14/05/2013 09:00	IB15	2358	1	15	393	Duplicates taken at 2358m. Both samples taken from bottle 1.	Estelle
017	14/05/2013 09:00	IB15	2358	1	15	394		Estelle
017	14/05/2013 09:00	IB15	1400	6	15	395		Estelle
017	14/05/2013 09:00	IB15	1000	9	15	396		Estelle
017	14/05/2013 09:00	IB15	100	17	15	397		Estelle
017	14/05/2013 09:00	IB15	75	19	15	398		Estelle
018	14/05/2013 15:08	IB14	2375	1	15	399		Abby
018	14/05/2013 15:08	IB14	2000	4	15	400		Abby
018	14/05/2013 15:08	IB14	1500	6	15	401		Abby
018	14/05/2013 15:08	IB14	1400	7	15	402		Abby
018	14/05/2013 15:08	IB14	8	24	15	403		Abby
020	15/05/2013 19:45	IB13	2192	3	13	332	New crate Old crate placed in CT lab at 15:24 on 14/05/2013	Kasia
020	15/05/2013 19:45	IB13	1500	8	13	333		Kasia
020	15/05/2013 19:45	IB13	200	18	13	334		Kasia
020	15/05/2013 19:45	IB13	22	22	13	335		Kasia
021	16/05/2013 02:56	IB12	2715	2	13	336		John B
021	16/05/2013 02:56	IB12	1500	10	13	337		John B
021	16/05/2013 02:56	IB12	350	18	13	338	Duplicates taken at 350m. Both	John B

## JC086 CTD salinity sampling log

CTD #	Date & time (GMT)	Station	Btl depth (m)	Rosette btl #	Crate #	Sample btl #	Comments	Sampler
							samples taken from bottle 18.	
021	16/05/2013 02:56	IB12	350	18	13	338	Duplicates taken at 350m. Both samples taken from bottle 18.	John B
021	16/05/2013 02:56	IB12	50	22	13	340	Originally selected bottle 23 to take salinity sample from. Not enough water was present in bottle 23, and therefore salinity sample was taken from bottle 22 instead.	John B
022	16/05/2013 08:40	IB11	2660	1	13	341		Estelle
022	16/05/2013 08:40	IB11	2300	4	13	342		Estelle
022	16/05/2013 08:40	IB11	1200	8	13	343		Estelle
022	16/05/2013 08:40	IB11	200	15	13	344		Estelle
022	16/05/2013 08:40	IB11	50	19	13	345		Estelle
023	16/05/2013 14:53	IB10	2400	1	13	346		Abby
023	16/05/2013 14:53	IB10	1200	9	13	347		Abby
023	16/05/2013 14:53	IB10	50	22	13	348		Abby
024	16/05/2013 14:53	IB9	1859	2	13	349		John B
024	16/05/2013 14:53	IB9	1000	7	13	350		John B
024	16/05/2013 14:53	IB9	650	9	13	351		John B
024	16/05/2013 14:53	IB9	10	22	13	352		John B
025	17/05/2013 04:00	IB8	1515	1	13	353		Abby
025	17/05/2013 04:00	IB8	1300	3	13	354		Abby
025	17/05/2013 04:00	IB8	500	12	13	355		Abby
025	17/05/2013 04:00	IB8	100	18	7	188	New crate Old crate placed in CT lab at 04:15 on 17/05/2013.	John B
026	17/05/2013 05:35	IB7	970	1	7	189		Claire
026	17/05/2013 05:35	IB7	500	8	7	190		Claire
026	17/05/2013 05:35	IB7	100	16	7	191		Claire
027	17/05/2013 09:30	IB6	878	1	7	192		Estelle
027	17/05/2013 09:30	IB6	300	9	7	193		Estelle
027	17/05/2013 09:30	IB6	10	22	7	194		Estelle
028	17/05/2013 13:22	IB5	1146	1	7	195		Abby
028	17/05/2013 13:22	IB5	865	5	7	196		Abby
028	17/05/2013 13:22	IB5	500	9	7	197		Abby
028	17/05/2013 13:22	IB5	100	13	7	198		Abby
029	17/05/2013 18:25	IB4	1180	2	7	199	No inserts in samples – emptied and can be used for the next CTD salinity samples.	Natalia
029	17/05/2013 18:25	IB4	500	11	7	200	No inserts in samples – emptied and can be used for the next CTD salinity samples.	Natalia
029	17/05/2013 18:25	IB4	100	15	7	201	No inserts in samples – emptied and can be used for the next CTD salinity samples.	Natalia
030	18/05/2013 04:05	IB3	648	1	7	199		Abby
030	18/05/2013 04:05	IB3	450	9	7	200	Duplicates taken at 350m. Both samples taken from bottle 9.	Abby
030	18/05/2013 04:05	IB3	450	9	7	201	Duplicates taken at 350m. Both samples taken from bottle 9.	Abby

## JC086 CTD salinity sampling log

CTD #	Date & time (GMT)	Station	Btl depth (m)	Rosette btl #	Crate #	Sample btl #	Comments	Sampler
030	18/05/2013 04:05	IB3	100	15	7	202		Abby
031	18/05/2013 08:00	IB2	340	5	7	203		Estelle
031	18/05/2013 08:00	IB2	200	7	7	204		Estelle
031	18/05/2013 08:00	IB2	100	9	7	205		Estelle
031	18/05/2013 08:00	IB2	5	19	7	206		Estelle
032	18/05/2013 11:20	IB1	137	1	7	207		Estelle
032	18/05/2013 11:20	IB1	10	12	7	208		Estelle
033	18/05/2013 13:35	A	100	1	7	209		Abby
033	18/05/2013 13:35	A	5	11	7	210		Abby
034	18/05/2013 15:38	B	170	1	7	211		Abby
034	18/05/2013 15:38	B	5	13	33	812	New crate Old crate placed in CT lab at 15:40 on 18/05/2013	Abby
035	18/05/2013 17:40	C	200	3	33	813		Claire
035	18/05/2013 17:40	C	22	12	33	814		Claire
036	18/05/2013	D	1083	1	33	815		
036	18/05/2013	D	800	5	33	816		
036	18/05/2013	D	200	11	33	817		
037	18/05/2013	E	1627	1	33	818		Estelle
037	18/05/2013	E	1200	5	33	819		Estelle
037	18/05/2013	E	900	9	33	820		Estelle
037	18/05/2013	E	500	11	33	821		Estelle
037	18/05/2013	E	100	15	33	822		Estelle
038	19/05/2013 02:38	F	1600	3	33	823		John B
038	19/05/2013 02:38	F	1000	7	33	824		John B
038	19/05/2013 02:38	F	200	15	33	825		John B
038	19/05/2013 02:38	F	50	21	33	826		John B
039	19/05/2013	G	1600	3	33	827		Kasia
039	19/05/2013	G	1000	6	33	828		Kasia
039	19/05/2013	G	500	11	33	829		Kasia
039	19/05/2013	G	100	16	33	830		Kasia
040	19/05/2013 10:00	H	2005	2	33	831		Estelle
040	19/05/2013 10:00	H	2005	2	33	832		Estelle
040	19/05/2013 10:00	H	1200	7	33	833		Estelle
040	19/05/2013 10:00	H	800	10	33	834		Estelle
040	19/05/2013 10:00	H	50	21	33	835		Estelle
041	19/05/2013 16:55	I	730	1	14	356	New crate Old crate placed in CT lab at 11:00 on 19/05/2013	Alice
041	19/05/2013 16:55	I	500	4	14	357		Alice
041	19/05/2013 16:55	I	200	6	14	358		Alice
041	19/05/2013 16:55	I	5	17	14	359		Alice
042	19/05/2013 18:50	J	575	1	14	360		Kasia
042	19/05/2013 18:50	J	200	5	14	361		Kasia
042	19/05/2013 18:50	J	75	9	14	362		Kasia
043	19/05/2013 20:45	K	774	1	14	363		Estelle
043	19/05/2013 20:45	K	500	5	14	364		Estelle
043	19/05/2013 20:45	K	50	15	14	365		Estelle
044	20/05/2013 00:14	L	2090	1	14	366		John B

## JC086 CTD salinity sampling log

CTD #	Date & time (GMT)	Station	Btl depth (m)	Rosette btl #	Crate #	Sample btl #	Comments	Sampler
044	20/05/2013 00:14	L	1400	8	14	367		John B
044	20/05/2013 00:14	L	1000	11	14	368		John B
044	20/05/2013 00:14	L	700	12	14	369		John B
044	20/05/2013 00:14	L	300	15	14	370	Duplicates taken at 300m. Both samples taken from bottle 15.	John B
044	20/05/2013 00:14	L	300	15	14	371	Duplicates taken at 300m. Both samples taken from bottle 15.	John B
045	20/05/2013 03:54	M	2195	1	14	372		John B
045	20/05/2013 03:54	M	1400	7	14	373		John B
045	20/05/2013 03:54	M	300	16	14	374		John B
045	20/05/2013 03:54	M	5	24	14	375		John B
046	20/05/2013 07:25	N	2090	1	14	376		Kasia
046	20/05/2013 07:25	N	1800	4	14	377		Kasia
046	20/05/2013 07:25	N	200	15	14	378		Kasia
047	20/05/2013 11:00	O	1913	1	14	379	New crate Old crate placed in CT lab at 11:20 on 20/05/2013	Estelle
047	20/05/2013 11:00	O	1200	7	15	380		Estelle
047	20/05/2013 11:00	O	750	11	15	381		Estelle
047	20/05/2013 11:00	O	200	15	15	382		Estelle
048	20/05/2013 15:27	P	1405	1	15	383		Abby
048	20/05/2013 15:27	P	1200	3	15	384		Abby
048	20/05/2013 15:27	P	300	13	15	385		Abby
048	20/05/2013 15:27	P	50	19	15	386		Abby
053	20/05/2013 21:30	Q	30	1	15	387	Duplicates taken at 30m. Both samples taken from bottle 1.	Estelle
053	20/05/2013 21:30	Q	30	1	15	388	Duplicates taken at 30m. Both samples taken from bottle 1.	Estelle
057	21/05/2013 01:11	R	120	1	15	389		Abby
059	23/05/2013 06:55	1G	170	1	15	390		Alice
059	23/05/2013 06:55	1G	75	7	15	391		Kasia
059	23/05/2013 06:55	1G	5	14	15	392		Alice
061	23/05/2013 15:51	3G	70	1	15	393		Abby
061	23/05/2013 15:51	3G	50	3	15	394		Abby
061	23/05/2013 15:51	3G	5	7	15	395		Abby

JC086 – Appendix 4

U/W Salinity Log

# JC086 UNDERWAY SALINITY LOG

DATE	TIME (GMT)	LAT	LON	Water Depth (m)	Crate #	Sample bottle #	Comments	Sampled by
06/05/13	19:49	55° 30.34' N	006° 30.17' W	94	1	1		Estelle
06/05/13	23:33	55° 51.71' N	007° 31.06' W	2346??	1	2		Abby
07/05/13	04:43	56° 20.02' N	008° 55.48' W	135	1	3		Alice
07/05/13	08:34	56° 29.967' N	009° 24.786' W	1168	1	4		Estelle
08/05/13	12:34	60° 13.796' N	008° 59.395' W	1028	1	5		Abby
08/05/13	16:35	60° 15.666' N	009° 00.483' W	1080	1	6		Alice
08/05/13	20:30	60° 17.698' N	009° 00.966' W	562	1	7		Estelle
09/05/13	00:33	60° 34.756' N	010° 03.567' W	143	1	8		Peter
09/05/13	04:35	60° 55.287' N	011° 15.445' W	667	1	9		Alice
09/05/13	08:37	61° 18.083' N	012° 37.191' W	1603	1	10		Estelle
09/05/13	12:33	61° 38.313' N	013° 49.137' W	1509	1	11		Abby
09/05/13	16:35	61° 59.186' N	015° 06.050' W	2109	1	12		Natalia
09/05/13	20:39	62° 20.851' N	016° 27.674' W	2158	1	13		Estelle
10/05/13	00:26	62° 41.074' N	017° 41.887' W	1605	1	14		John B
10/05/13	04:29	63° 03.756' N	019° 06.611' W	1250	1	15		Kasia
10/05/13	08:37	63° 16.066' N	020° 01.408' W	225	1	16		Estelle
10/05/13	12:34	63° 08.068' N	019° 55.993' W	1040	1	17		Abby
10/05/13	16:27	62° 54.237' N	019° 33.226' W	1458	1	18		Alice
10/05/13	18:43	62° 40.072' N	019° 40.043' W	1688	1	19		Clare S
10/05/13	20:35	62° 35.407' N	019° 42.512' W	1733	1	20		Estelle
11/05/13	00:56	62° 13.830' N	019° 53.151' W	1762	1	21		Abby
11/05/13	04:35	61° 59.943' N	020° 00.150' W	1811	1	22		Clare S
11/05/13	08:56	61° 42.539' N	019° 59.979' W	1931	1	23	Duplicate	Estelle
11/05/13	08:58	61° 42.246' N	019° 59.969' W	2001	1	24	Duplicate	Estelle
11/05/13	12:34	61° 29.559' N	020° 00.944' W	2234	6	121	New create, old crate placed in CT Lab at 09:00 on 11/05/13	Abby
11/05/13	16:28	61° 29.508' N	020° 01.012' W	2237	6	122		Kasia
11/05/13	20:36	61° 49.688' N	019° 57.614' W	1700	6	123		Estelle
12/05/13	00:34	62° 32.729' N	019° 42.527' W	1761	6	124		Abby
12/05/13	04:28	62° 46.168' N	019° 47.353' W	1591	6	125		Kasia
12/05/13	08:35	62° 47.798' N	019° 57.199' W	1424	6	126		Estelle
12/05/13	12:32	62° 40.005' N	019° 40.598' W	1689	6	127		Abby
12/05/13	16:29	62° 31.50' N	019° 35.05' W	1651	6	128		Kasia
12/05/13	20:35	62° 33.341' N	019° 48.405' W	1807	6	129		Estelle

## JC086 UNDERWAY SALINITY LOG

13/05/13	00:27	62° 31.158' N	019° 35.004' W	1635	6	130		Abby
13/05/13	04:30	62° 33.666' N	019° 51.542' W	1739	6	131		Natalia
13/05/13	08:35	62° 15.466' N	019° 51.111' W	1695	6	132		Estelle
DATE	TIME (GMT)	LAT	LON	Water Depth (m)	Crate #	Sample bottle #	Comments	Sampled by
13/05/13	12:35	61° 33.900' N	019° 54.427' W	2159	6	133		Abby
13/05/13	16:30	61° 23.055' N	020° 03.086' W	2297	6	134		Kasia
13/05/13	20:56	61° 18.003' N	020° 03.058' W	2368	6	135		Estelle
14/05/13	00:37	61° 09.099' N	019° 49.722' W	2342	6	136		Abby
14/05/13	04:38	61° 15.027' N	020° 00.023' W	2384	6	137		Natalia
14/05/13	08:30	61° 15.550' N	020° 01.756' W	2380	6	138		Estelle
14/05/13	12:32	61° 00.043' N	019° 59.965' W	2409	6	139		Abby
14/05/13	16:30	61° 00.043' N	019° 59.969' W	2410	6	140		Kasia
14/05/13	20:32	61° 52.619' N	019° 58.711' W	2428	6	141		Estelle
15/05/13	00:36	60° 40.284' N	019° 58.364' W	2381	6	142		Abby
15/05/13	04:32	60° 45.209' N	019° 37.966' W	2429	6	143		Kasia
15/05/13	08:33	60° 33.168' N	019° 50.369' W	2487	6	144		Xiangbo
15/05/13	12:40	60° 29.989' N	19° 59.838' W	2534	4	73	New crate. Old crate placed in CT lab at 12:28 on 15/05/13	Abby
15/05/13	16:40	60° 29.999' N	19° 59.995' W	2536	4	74		Kasia
15/05/13	20:35	60° 22.104' N	19° 59.643' W	2606	4	75		Xiangbo
16/05/13	00:37	60° 00.000' N	20° 00.000' W	2727	4	76		Andrew
16/05/13	04:45	69° 45.099' N	19° 19.944' W	2704	4	77	No insert – emptied	Natalia
16/05/13	08:25	59° 39.999' N	19° 06.999' W	2681	4	78		Xiangbo
16/05/13	12:34	59° 24.277' N	18° 25.395' W	2424	4	79		Abby
16/05/13	16:34	59° 24.546' N	18° 25.479' W	2436	4	80		Kasia
16/05/13	20:30	59° 24.547' N	18° 25.479' W	2435	4	81		Estelle
17/05/13	00:36	59° 18.187' N	18° 06.706' W	1760	4	82		Abby
17/05/13	04:40	59° 07.151' N	17° 40.825' W	1010	4	83		Claire
17/05/13	08:32	58° 57.012' N	17° 10.981' W	891	4	84		Xiangbo
17/05/13	12:38	58° 53.050' N	17° 00.419' W	1153	4	85		Abby
17/05/13	16:35	58° 31.56' N	16° 04.40' W	1203	4	86		Alice
17/05/13	20:38	58° 30.000' N	16° 00.000' W	1189	4	87		Xiangbo
18/05/13	00:41	58° 23.824' N	15° 41.735' W	1156	4	88		Abby
18/05/13	04:35	58° 10.008' N	15° 07.510' W	565	4	89		Kasia
18/05/13	08:22	57° 54.651' N	14° 29.159' W	382	4	90		Xiangbo

## JC086 UNDERWAY SALINITY LOG

18/05/13	12:34	57° 34.539' N	13° 39.355' W	115	4	91		Abby
18/05/13	16:27	57° 32.953' N	13° 01.430' W	277	4	92		Kasia
18/05/13	20:42	57° 31.979' N	12° 38.040' W	1640	4	93		Xiangbo
19/05/13	00:40	57° 30.494' N	12° 14.997' W	1805	4	94		Peter
19/05/13	04:31	57° 29.495' N	11° 51.092' W	1797	4	95		Natalia
19/05/13	08:49	57° 29.266' N	11° 31.783' W	2022	4	96		Xiangbo
DATE	TIME (GMT)	LAT	LON	Water Depth (m)	Crate #	Sample bottle #	Comments	Sampled by
19/05/13	12:40	57° 28.997' N	11° 31.999' W	2021	6	121	New crate. Old crate put into C.T. lab at 09:00 on 19/05/13	Peter
19/05/13	17:12	57° 28.103' N	11° 12.130' W	639	6	122		Kasia
19/05/13	20:31	57° 23.986' N	10° 52.260' W	777	6	123		Xiangbo
20/05/13	00:33	57° 19.543' N	10° 30.897' W	2209	6	124		Abby
20/05/13	04:36	57° 14.048' N	10° 04.299' W	2138	6	125		Claire
20/05/13	08:40	57° 08.998' N	09° 41.902' W	1927	6	126		Xiangbo
20/05/13	12:31	57° 07.513' N	09° 34.106' W	1791	6	127		Andrew
20/05/13	16:37	57° 05.100' N	09° 20.697' W	939	6	128		Kasia
20/05/13	20:28	57° 02.999' N	09° 12.997' W	310	6	129		Xiangbo
21/05/13	00:40	56° 59.999' N	08° 59.999' W	130	6	130		Abby
21/05/13	04:39	57° 12.715' N	10° 01.154' W	2098	6	131		Kasia
21/05/13	08:29	57° 18.772' N	10° 25.320' W	2205	6	132		Xiangbo
21/05/13	12:51	57° 14.553' N	10° 16.523' W	2229	6	133		Estelle
21/05/13	13:02	57° 14.475' N	10° 16.543' W	2229	6	134		Andrew
21/05/13	16:40	57° 18.880' N	10° 24.768' W	2203	6	135		Alice
21/05/13	20:35	57° 15.459' N	10° 18.428' W	2226	6	136		Estelle
22/05/13	00:32	57° 19.597' N	10° 24.849' W	2197	6	137		Abby
22/05/13	04:28	57° 17.557' N	10° 23.117' W	2217	6	138		Kasia
22/05/13	08:35	57° 20.460' N	10° 29.394' W	2206	6	139		Claire
22/05/13	12:36	57° 18.000' N	10° 22.997' W	2211	6	140		Abby
22/05/13	16:10	57° 13.591' N	10° 03.198' W	2111	6	141		Alice
22/05/13	20:39	56° 56.993' N	08° 46.999' W	123	6	142		Xiangbo
23/05/13	00:34	56° 44.774' N	07° 45.689' W	52	6	143		Abby
23/05/13	04:32	56° 44.120' N	06° 26.504' W	87	6	144		Natalia
23/05/13	08:43	56° 40.456' N	06° 12.096' W	52	1	1		Estelle
23/05/13	09:58	56° 40.009' N	06° 08.081' W	182	1	2		Estelle
23/05/13	10:32	56° 40.008' N	06° 08.079' W	181	1	3		Estelle

## JC086 UNDERWAY SALINITY LOG

23/05/13	11:33	56° 40.608' N	06° 12.644' W	94	1	4		Estelle
23/05/13	12:30	56° 41.044' N	06° 17.059' W	21	1	5		Abby
23/05/13	13:35	56° 41.046' N	06° 17.059' W	22	1	6		Abby
23/05/13	14:50	56° 42.505' N	06° 22.023' W	78	1	7		Andrew
23/05/13	15:36	56° 42.500' N	06° 21.998' W	72	1	8	Last underway salinity sample of JC086	Andrew

JC086 – Appendix 5

NMF-SS Computing Report

## JC086 NMFSS Ship Fitted Systems Cruise Report

### CRUISE OVERVIEW

JC086 Extended Ellett Line



All times given in this report are in UTC.

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### TECHNICIANS;

Martin Bridger ([mart@noc.ac.uk](mailto:mart@noc.ac.uk))  
or [nocs\\_nmfss\\_shipsys@noc.ac.uk](mailto:nocs_nmfss_shipsys@noc.ac.uk)

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### METEOROLOGY MONITORING PACKAGE.

The Surfmet system was run throughout the cruise. The only problems seen were at the start of the cruise when the humidity sensor was reading high between J127 07:23 and J130 08:49. The sensor was changed at the earliest opportunity once the high readings were noticed. This swap was performed on J130. The old sensor was removed at 09:33, and the new one was fitted. At the same time it was noticed that the Windsonic anemometer was not straight, it was out of line by an obvious amount anticlockwise. The mountings were loosened and the pole was straightened by rotating it approximately 20 degrees clockwise. After studying the data, especially the absolute wind direction before and after the adjustment, it looks like the change is between 10 and 15 degrees anticlockwise. The correction has not been applied to the data prior to the adjustment. The anemometer adjustment took place between 09:40 and 09:45.

Please see the separate Surfmet information sheet JC86\_Surfmet\_sensor\_information\_sheet.docx for details of the sensors used and the calibrations that need to be applied. The calibration sheets are included in the directory Ship\_Systems\Met\SURFMET\calibrations on the final ships data disk.

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PUMPED SEA WATER SAMPLING SYSTEM [HULL BOTTOM INTAKE].  
SEA SURFACE MONITORING SYSTEM [SALINITY, TEMPERATURE, TRANSMISSOMETER,  
FLUORIMETER].

The Surfmet system was run throughout the cruise. Please see the separate BODC information sheet for details of the sensors used and the calibrations that need to be applied. No problems were encountered. The calibration sheets are included in the directory Ship\_Systems\Met\SURFMET\calibrations on the final ships data disk.

The Non-toxic water supply was turned off and the sensors cleaned at intervals throughout the cruise details below. Transmissometer readings were taken after cleaning with the sensor in open air and closed off to light, readings are also below.

<b>JDay</b>	<b>Time</b>	<b>Event</b>
<b>126</b>	19:07	Underway non-toxic turned on
<b>127</b>	08:47	Underway non-toxic turned off to repair leak in non-toxic pipework
<b>128</b>	08:45	Underway non-toxic restarted after leaks fixed
<b>134</b>	13:21	Underway non-toxic turned off for cleaning Trans open 4.7682 closed 0.0586
<b>134</b>	13:34	Underway non-toxic restarted after cleaning
<b>138</b>	11:12	Underway non-toxic off for cleaning Trans open 4.760 closed 0.0587
<b>138</b>	11:28	Underway non-toxic on after cleaning
<b>142</b>	13:48	Underway non-toxic turned off for cleaning Trans open 4.7083 closed 0.0587
<b>142</b>	14:01	Underway non-toxic turned on after cleaning
<b>145</b>	10:40	Underway non-toxic turned off for end of cruise.

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#### SHIP SCIENTIFIC COMPUTING SYSTEMS.

Data was logged by the Techsas data acquisition system into NetCDF files. The format of the NetCDF files is given in the file NMFSS\_NetCDF\_Description\_Cook.docx. The instruments logged are given in JC86\_Ship\_fitted\_information\_sheet\_JC.docx. Data was additionally logged into the RVS Level-C format, which is described in the same document.

The Level-C software was run on the Sun Enterprise Sparc server. The Cook file server was used to provide a network storage area which was used to provide shared storage for everyone to use. This was copied to the end of cruise data disk.

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#### GPS.

All scientific GPS systems worked throughout the cruise without any problems. GPS feeds from the splitter PC that provides NMEA strings to WAMOS and third party equipment had periods of dropout during the first two days of the cruise. This was tracked down to a loose power lead to the Edgeport comm port hub. This was providing intermittent power due to the ships motion. ASCII text files were supplied with 1s resolution including ships position that can be used in post processing to cover the loss of the live feeds.

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#### DROP KEELS.

These remained flush with the ship hull throughout the cruise.

---

#### KONGSBERG EA600 12 KHZ SINGLE BEAM ECHO SOUNDER.

The EA600 single beam echo sounder was run throughout the cruise. The results are typical for this vessel with lots of aeration under the hull and some poor performance from the acoustic systems in rough weather. The underway depth data logged is therefore of variable quality with lots of spikes and gaps as a result. Before using depth data from the EA600's NetCDF file the .bmp files should be consulted to see if the depth data for that time period was reliable. The EA600 was used with a constant sound velocity of  $1500 \text{ ms}^{-1}$  throughout the water column to allow it to be corrected for sound velocity in post processing.

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#### 75 KHZ AND 150 KHZ HULL MOUNTED ADCP SYSTEM.

Both ADCP systems were run throughout the cruise. As there was no one in the scientific party able to configure these systems, the set-up configurations which are included on the data disk were copied from AMT 20.

<b>System Setup</b>	<b>75KHz</b>	<b>150KHz</b>
<b>Number of Bins</b>	48	N/A

<b>Bin Size</b>	16m	N/A
<b>Blank Distance</b>	8m	N/A
<b>Transducer Depth</b>	6m	N/A
<b>Temporal Averaging</b>	1 <sup>st</sup> time interval STA 120s 2 <sup>nd</sup> time interval LTA 600s	N/A
<b>Alignment Offset EA</b>	9	N/A

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#### WAVE HEIGHT RECORDERS.

Wamos wave radar was run throughout the cruise with a few problems. The PC was only rebuilt from scratch during the mobilisation for this cruise, so there were a few teething problems. Once these were addressed, the system logged data for the rest of the cruise happily rebooting itself whenever it hung.

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#### CTD.

The CTD data is included on the data disk in Specific Equipment\CTD\.



JC086 – Appendix 6

Ship fitted equipment

Cruise	JC86
Technician	Martin Bridger <a href="mailto:mart@noc.ac.uk">mart@noc.ac.uk</a>
Date	6 <sup>th</sup> – 26 <sup>th</sup> May 2013

### BODC Ship-fitted Systems Information Sheet (James Cook)

#### Ship-fitted instruments:

The following table lists the logging status of ship-fitted instrumentation and suites.

Manufacturer	Model	Function/data types	Logged? (Y/N)	Comments
Steatite	MM3S	GPS network time server (NTP)	N	Not logged but feeds times to other systems
Applanix	POS MV	DGPS and attitude	Y	Primary GPS
Ashtech	ADU-5	DGPS and attitude	Y	
C-Nav	3050	DGPS and DGNSS	Y	
Kongsberg Seatex	DPS116	Ship's DGPS	Y	Bridge GPS
Kongsberg Seatex	Seapath 200	DGPS and attitude	Y	Secondary GPS
Sonardyne	Fusion USBL	USBL	N	Not used this cruise.
Sperry Marine		Ship gyrocompasses x 2	Y	
Chernikeeff Instruments	Aquaprobe Mk5	Electromagnetic speed log	Y	
Kongsberg Maritime	Simrad EA600	Single beam echo sounder (hull)	Y	
Kongsberg Maritime	Simrad EA500	Single beam echo sounder (hull)	N	Not used this cruise
Kongsberg Maritime	Simrad EM120	Multibeam echo sounder (deep)	N	
Kongsberg Maritime	Simrad EM710	Multibeam echo sounder (shallow)	N	Not used this cruise
Kongsberg Maritime	Simrad SBP120	Sub bottom profiler	N	Not used this cruise
Kongsberg Maritime	Simrad EK60	Scientific echo sounder (fisheries)	N	Not used this cruise
NMFSS	CLAM	CLAM system winch log	Y	
NMFSS	Surfmet	Meteorology suite	Y	
NMFSS	Surfmet	Surface hydrography suite	Y	
		Skipper log (ship's velocity)	Y	
OceanWaveS GmbH	WaMoS II	Wave Radar	Y	
Teledyne RD Instruments	Ocean Observer 75 kHz	VM-ADCP	Y	
Teledyne RD	Ocean Observer	VM-ADCP	N	Not installed

Instruments	150 kHz			
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**Bestnav hierarchal ordering:**

The following table lists the order of navigational systems in the *bestnav* process for positional fix.

Rank	Order of positional fixes	Comment
1	POS MV	
2	CNAV	
3	DPS116	

Units of dist\_run: nautical miles

**Relmov source:**

The following table lists the navigational systems that are used in the *relmov* process for ship's motion.

Navigational source of ship's motion	Comment
POS MV Gyro	
Chernikeeff EM log	

**RVS data processing:**

The following table lists the RVS Level-C processing programs that were run.

Program	Was it run?	Comments
<i>bestnav</i>	Y	
<i>prodep</i> **	N	Using Carter Table Corrections
<i>protsg</i>	N	
<i>relmov</i>	Y	
<i>satnav</i>	N	
<i>windcalc</i>	Y	

\*\*Please state if sound velocity probes used for depth correction instead of *prodep*.

JC086 – Appendix 7

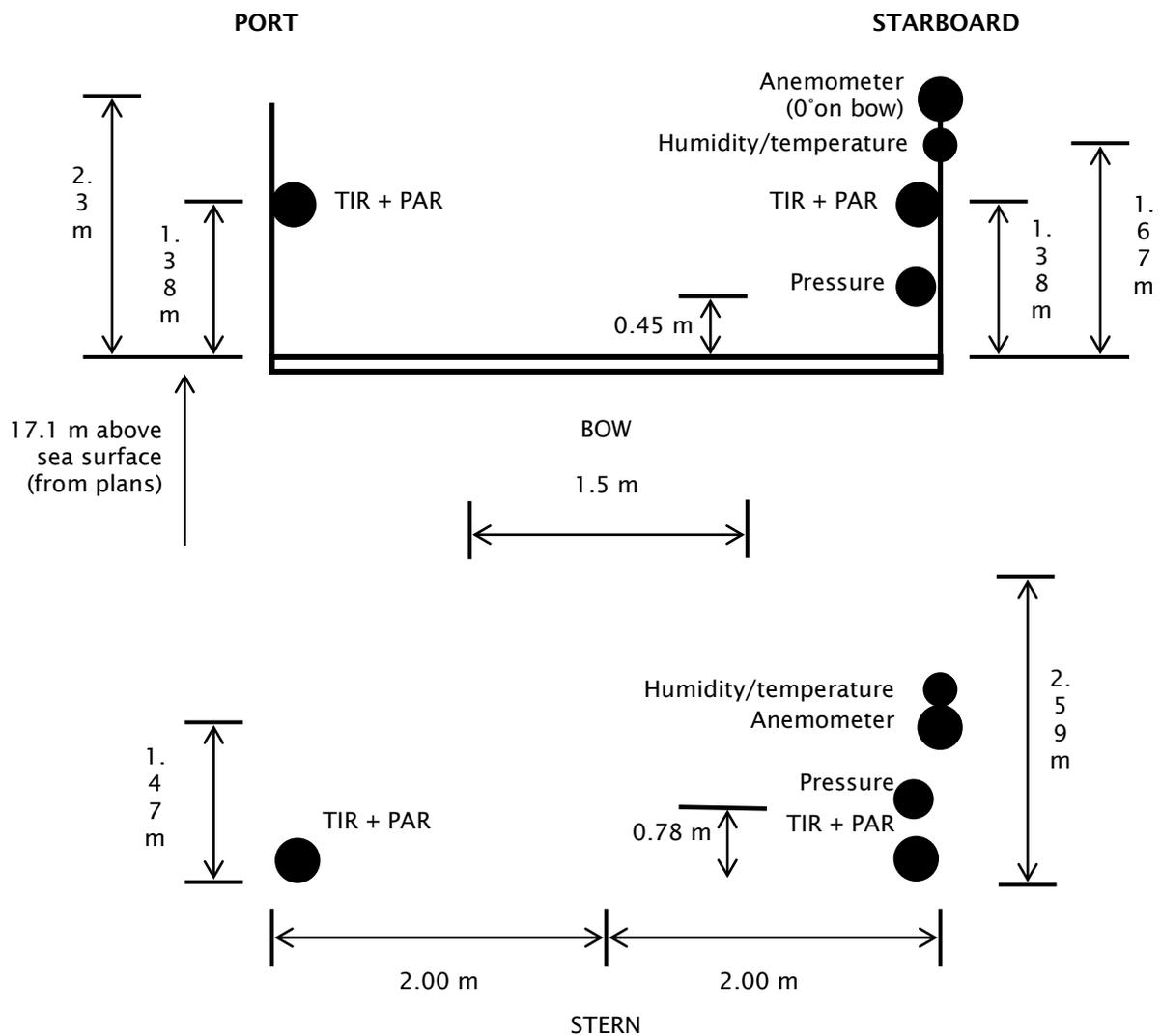
Surfmet information

## Surfmet Sensor Information Sheet (James Cook)

Cruise	JC086 - Griffiths
Technician	Martin Bridger
Date	6th - 26th May 2013

### Meteorology platform (Foremast)

#### JAMES COOK MET PLATFORM



<b>Pumped seawater flow rates (ml/min):</b>	1500
<b>Anemometer orientation on bow (deg):</b>	0
<b>Seawater intake depth (m):</b>	5.5

Fitted Sensors:

<b>Manufacturer</b>	<b>Sensor</b>	<b>Serial No.</b>	<b>Comments (eg. port)</b>	<b>Calibration applied?</b>	<b>Last calibration date</b>
Skye	PAR	28560	Starboard	No	5/7/2011
Skye	PAR	28561	Port	No	5/7/2011
Kipp & Zonen	TIR	973134	Starboard	No	15/7/2011
Kipp & Zonen	TIR	973135	Port	No	15/7/2011
Gill	Windsonic	064537	-20 degrees until 130 0934	No	No cal
Vaisala	HMP45 Temp./Hum.	E1055002 until 130 0933 Then C1320001	Changed to C1320001 on 130 0934	No	2/7/2012
Vaisala	PTB100 Air Pres.	U1420016		No	21/3/2013
Wet Labs	WS3S Fluorimeter	WS3S-351P		No	24/7/2012
Wet Labs	CST Transmissometer	CST-1132PR		No	19/7/2012
Sea-Bird	SBE38 Temperature	3854115-0488		No	13/06/2012
Sea-Bird	SBE45 TSG	4548881-0233		No	19/7/2012

Spare Sensors on-board not fitted:

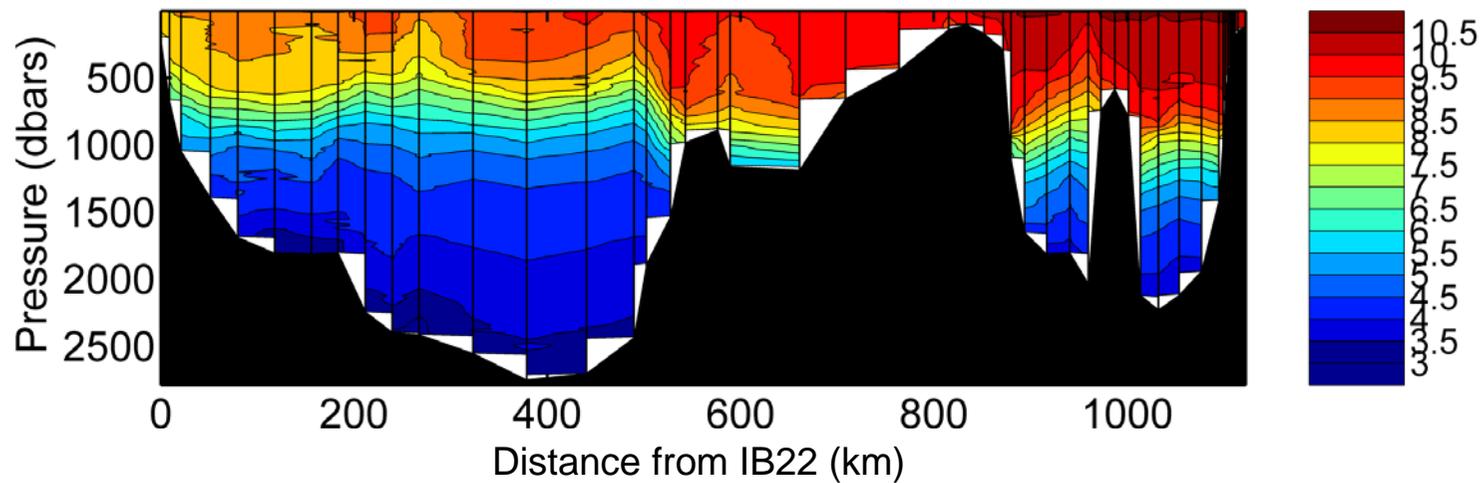
<b>Manufacturer</b>	<b>Sensor</b>	<b>Serial No.</b>	<b>Comments (eg. port)</b>	<b>Calibration applied?</b>	<b>Last calibration date</b>
Skye	PAR	28562	-	-	22/09/2011
Skye	PAR	28563	-	-	22/09/2011
Kipp & Zonen	TIR	994133	-	-	10/07/2012
Kipp & Zonen	TIR	-	-	-	-
Gill	Windsonic	064538	-	-	No cal
Vaisala	HMP45 Temp./Hum.	C1320001	-	-	02/07/2012
Vaisala	PTB100 Air Pres.	S3440012	-	-	17/05/2012
Wet Labs	WS3S Fluorimeter	WS3S-246	-	-	23/07/2012
Wet Labs	CST Transmissometer	CST-114PR	-	-	19/07/2012
Sea-Bird	SBE38 Temperature	3854115-0487	-	-	13/06/2012
Sea-Bird	SBE45 TSG	4548881-0229	-	-	8/6/2012



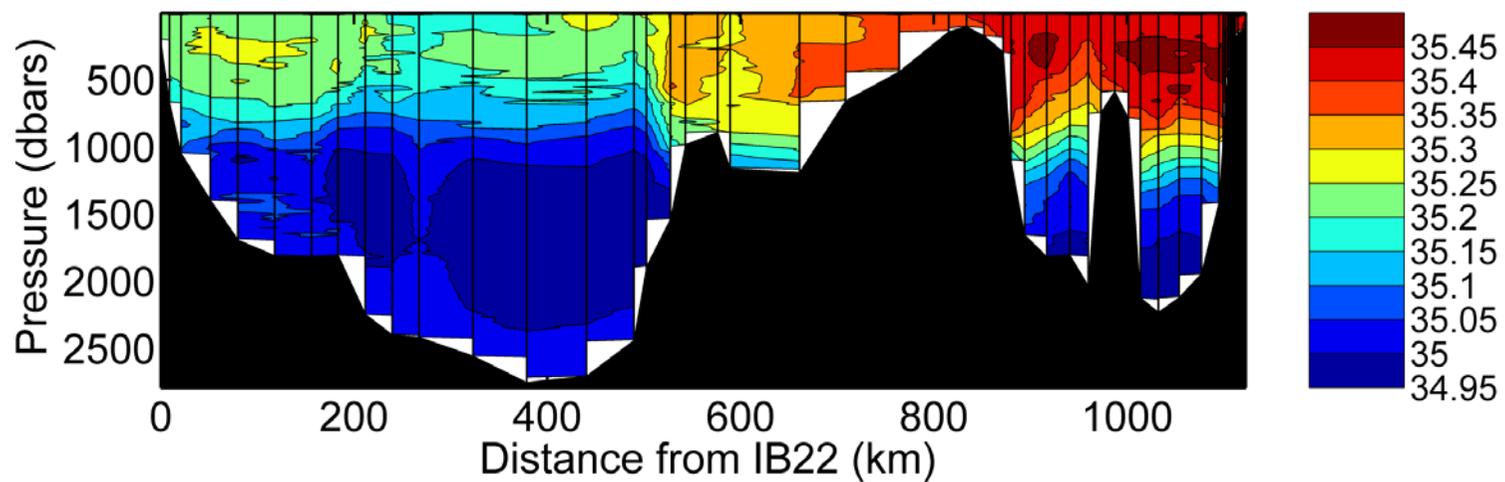
JC086 – Appendix 8

Preliminary Results

a. JC086 EEL Potential Temperature ( $^{\circ}\text{C}$ )



b. JC086 Salinity





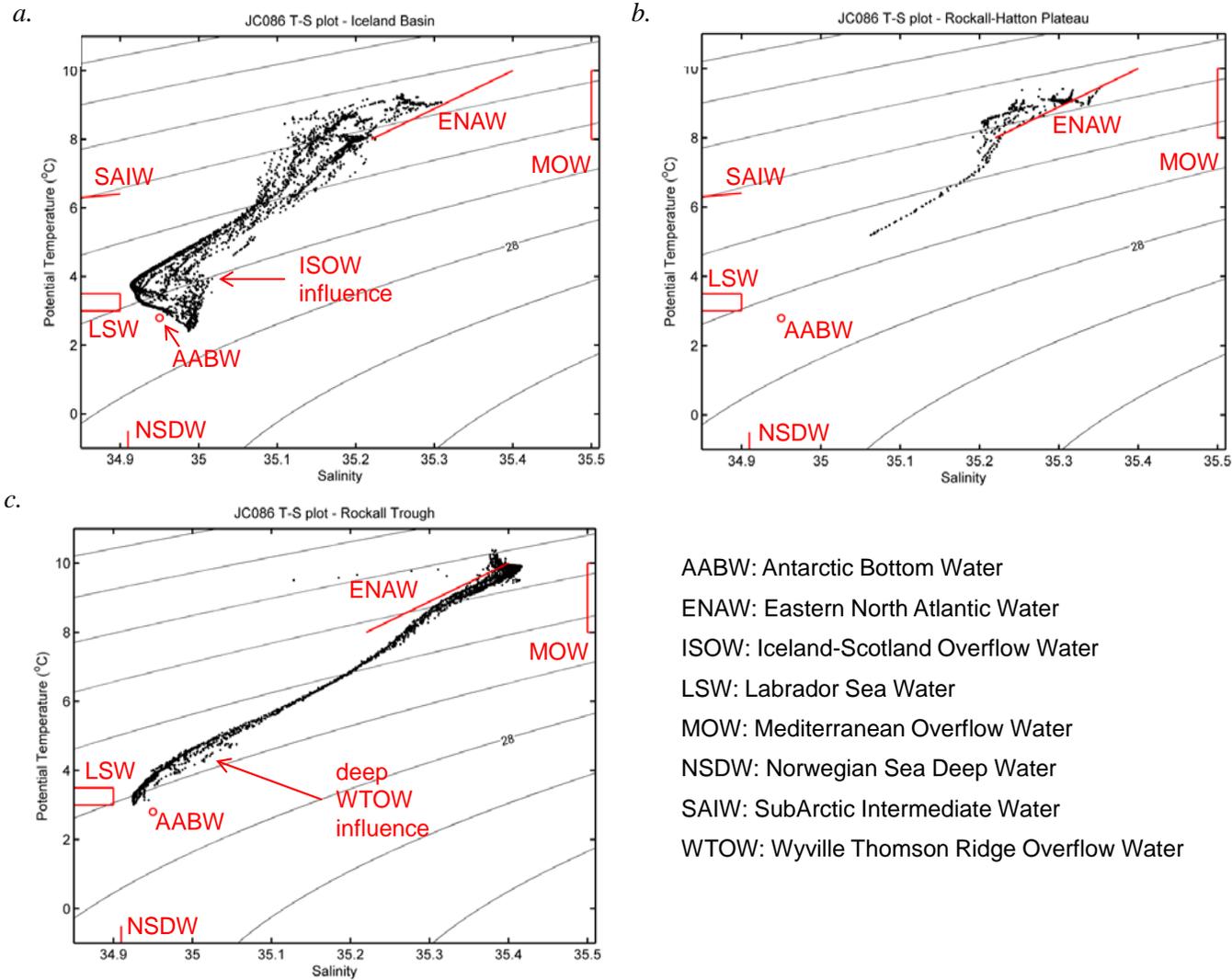
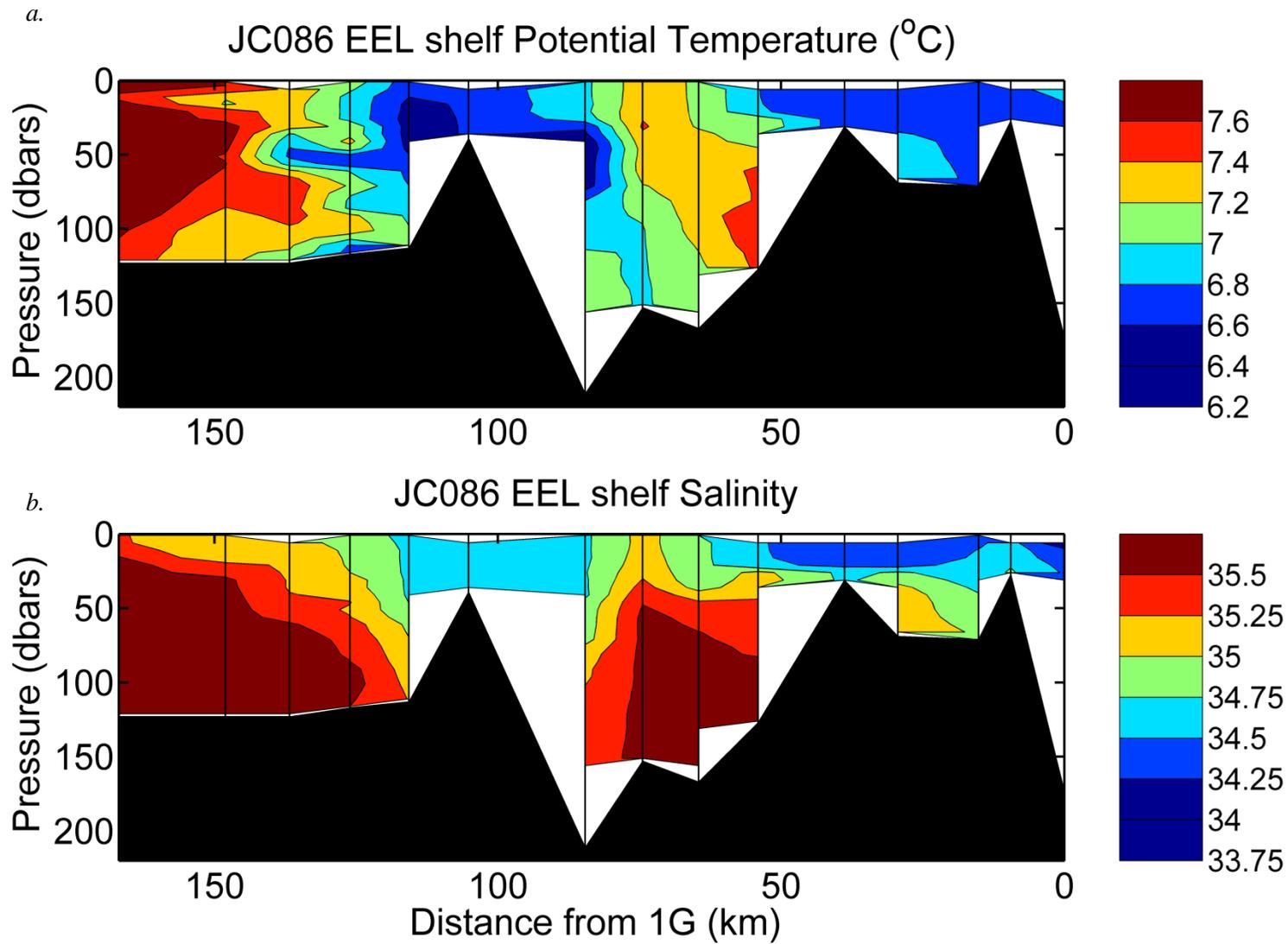


Figure 2. Potential Temperature – Salinity Plots across the offshore EEL during JC086. (a.) Iceland Basin, (b.) Rockall-Hatton Plateau, (c.) Rockall Trough. Salinity data are not calibrated.



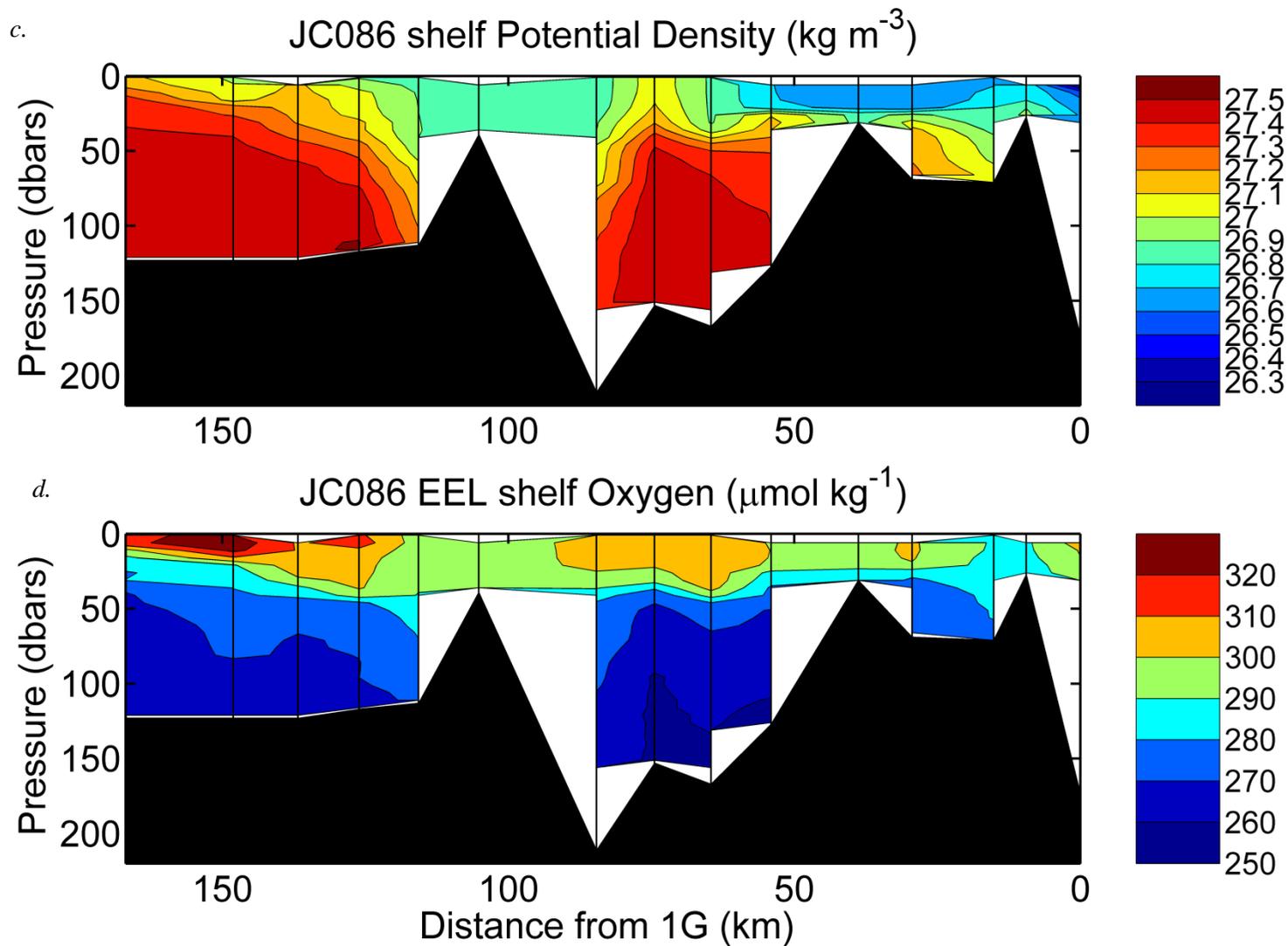
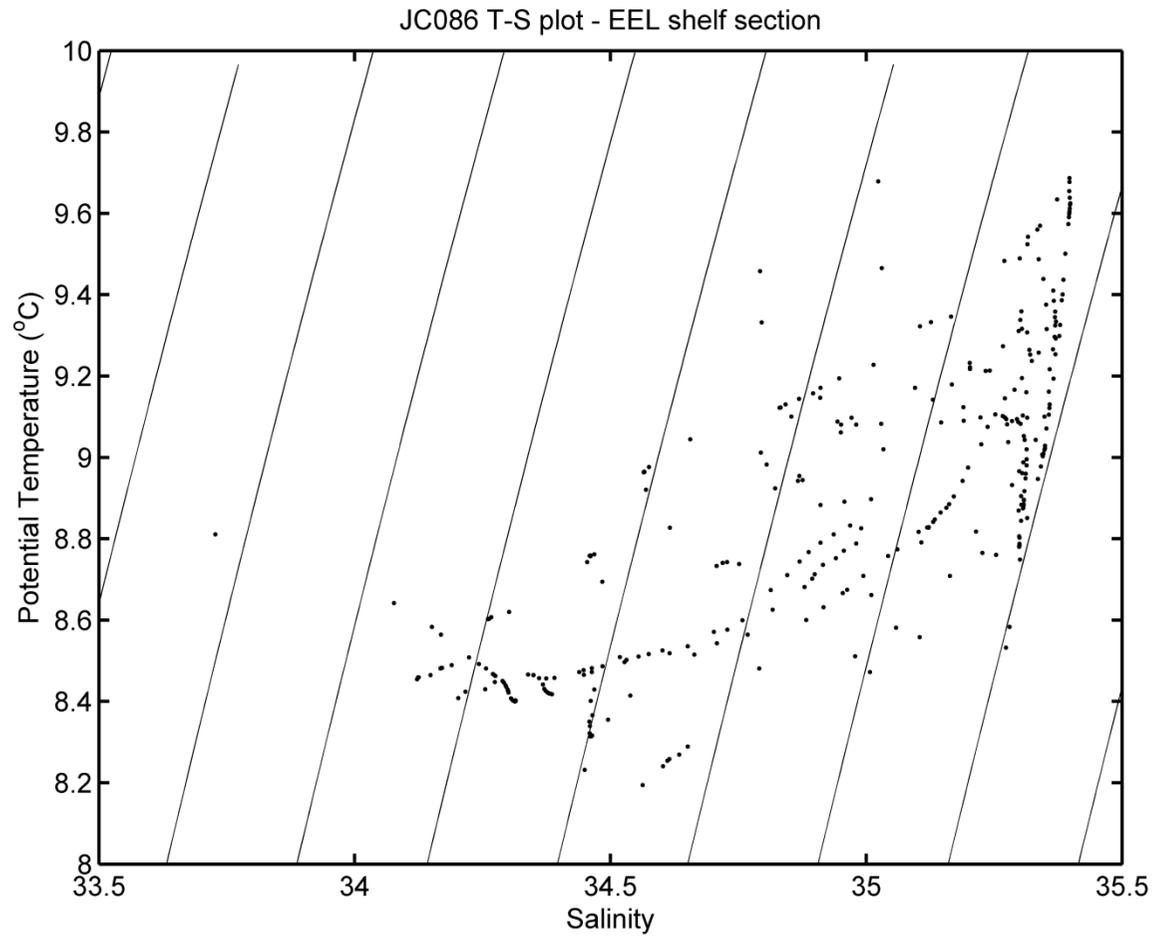


Figure 3. Contour plots of (a.) potential temperature, (b.) salinity, (c.) potential density and (d.) oxygen across the shelf section of the EEL during JC086. Salinity and oxygen data are uncalibrated. Data were interpolated onto a regular 5 m vertical grid before contouring.



*Figure 4. Potential temperature – Salinity Plot of the Scottish Shelf portion of the EEL during JC086. Salinity data are uncalibrated. Water masses include: Atlantic Water, Irish Sea – Clyde Sea Water, and a minimal influence of freshwater coastal runoff.*

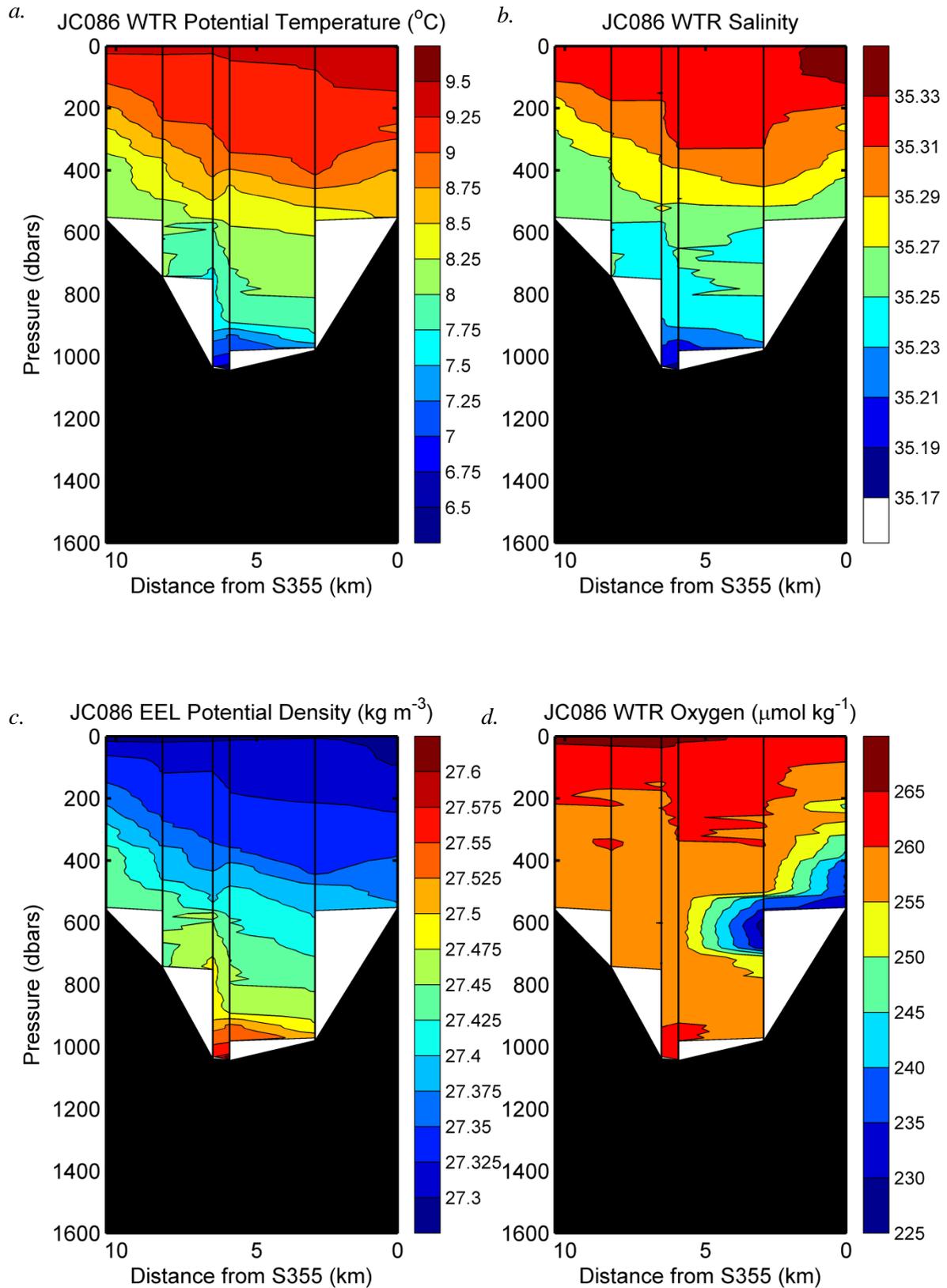


Figure 5. Contour plots of (a.) potential temperature, (b.) salinity, (c.) potential density and (d.) oxygen from the WTR (S) section (CTD002-CTD007) during JC086. Salinity and oxygen data are uncalibrated. Interpolated onto a regular 10 m vertical grid.

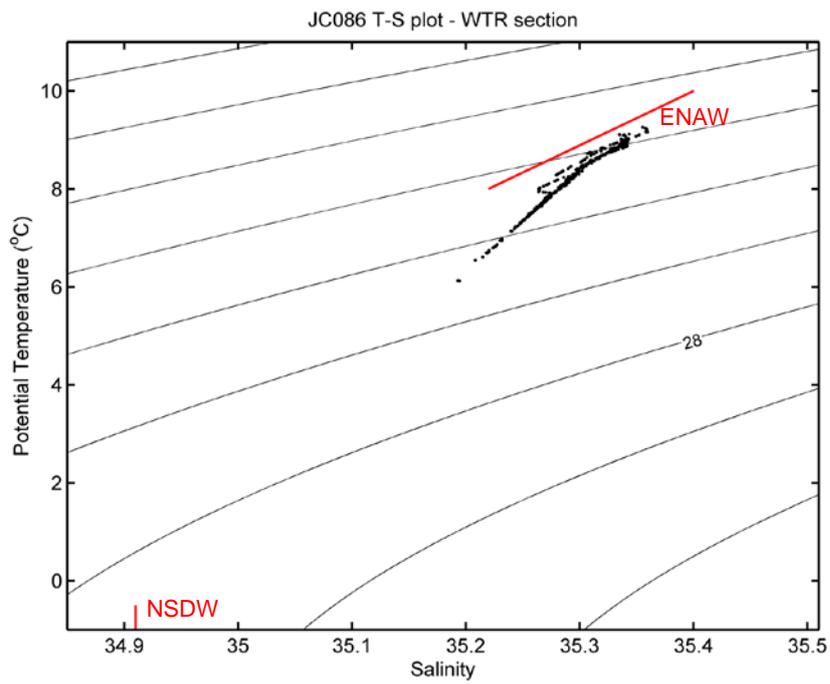


Figure 6. Potential Temperature – Salinity Plots for the WTR (S) section (CTD002-CTD-007) during JC086. Salinity data is uncalibrated. ENAW: Eastern North Atlantic Water, NSDW: Norwegian Sea Deep Water.

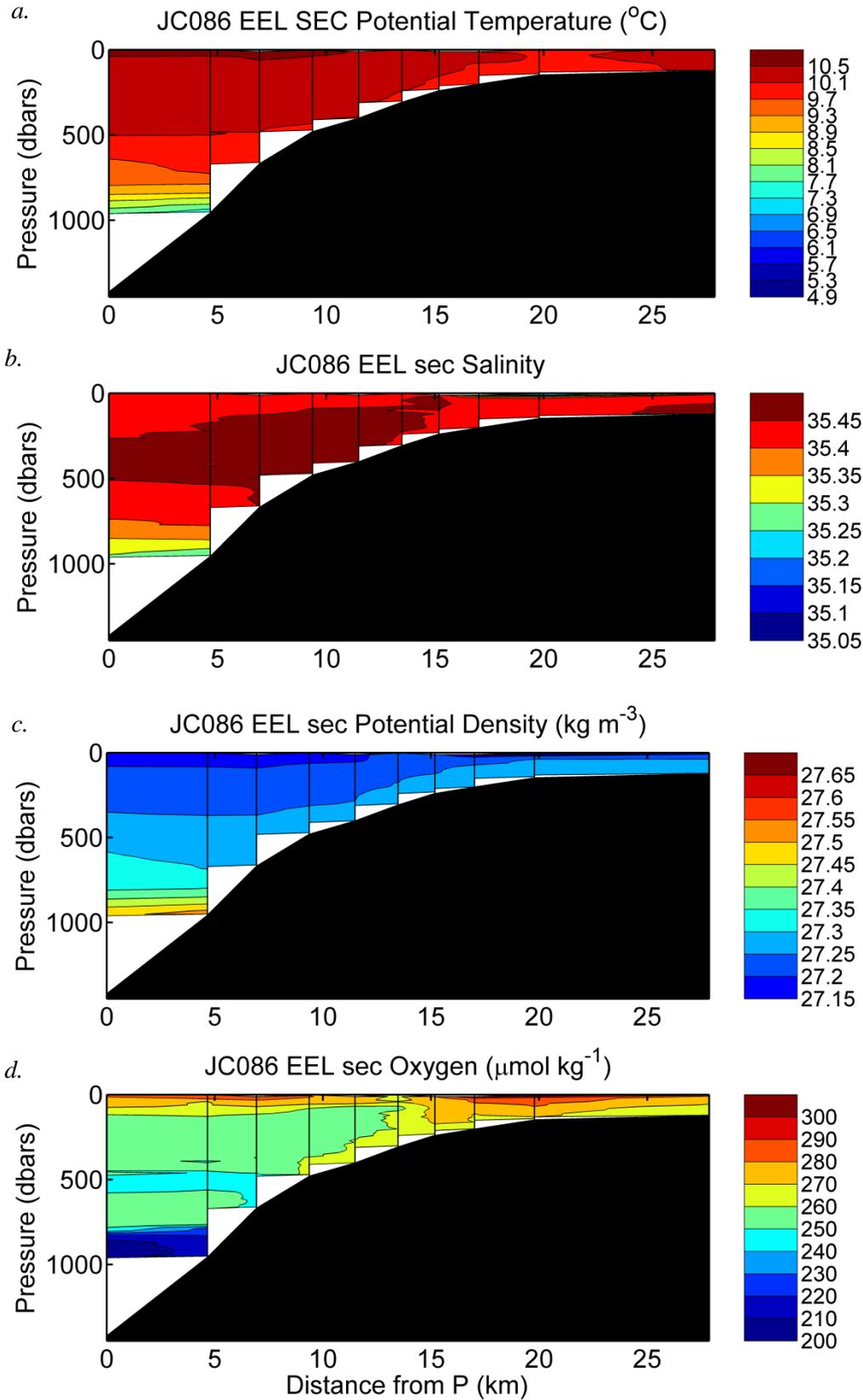


Figure 7. Contour plots of (a.) potential temperature, (b.) salinity, (c.) potential density and (d.) oxygen across the Shelf Edge Current from the EEL during JC086 (CTD0048 – CTD057). Salinity and oxygen data are not calibrated.

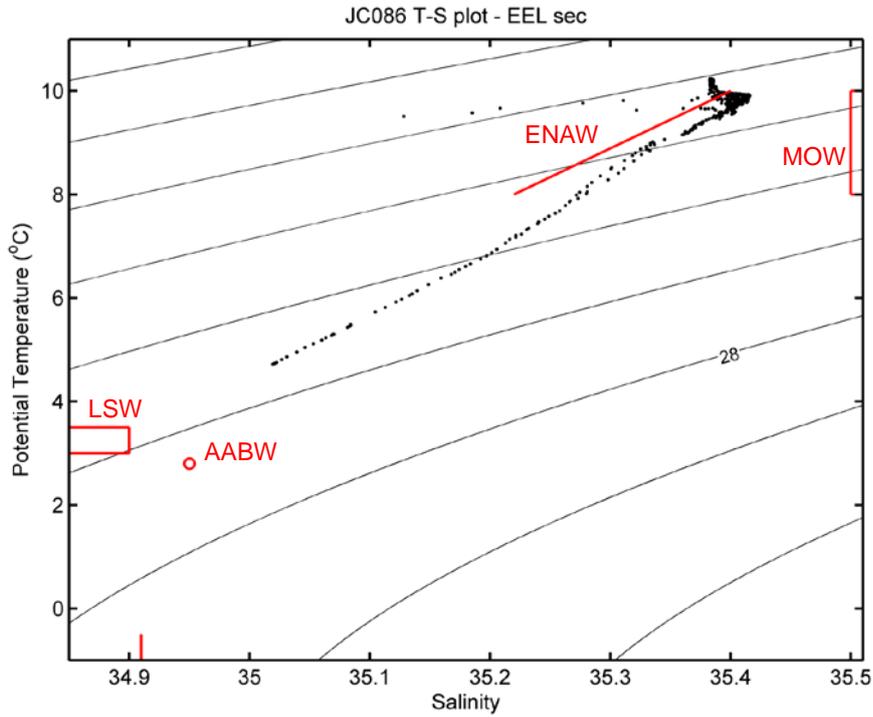


Figure 8. Temperature – Salinity Plot across the Shelf Edge Current during the Extended Ellett Line during JC086 (CTD048 - CTD057). Salinity data are not calibrated. AABW: Antarctic Bottom Water, ENAW: Eastern North Atlantic Water, LSW: Labrador Sea Water, MOW: Mediterranean Overflow Water.

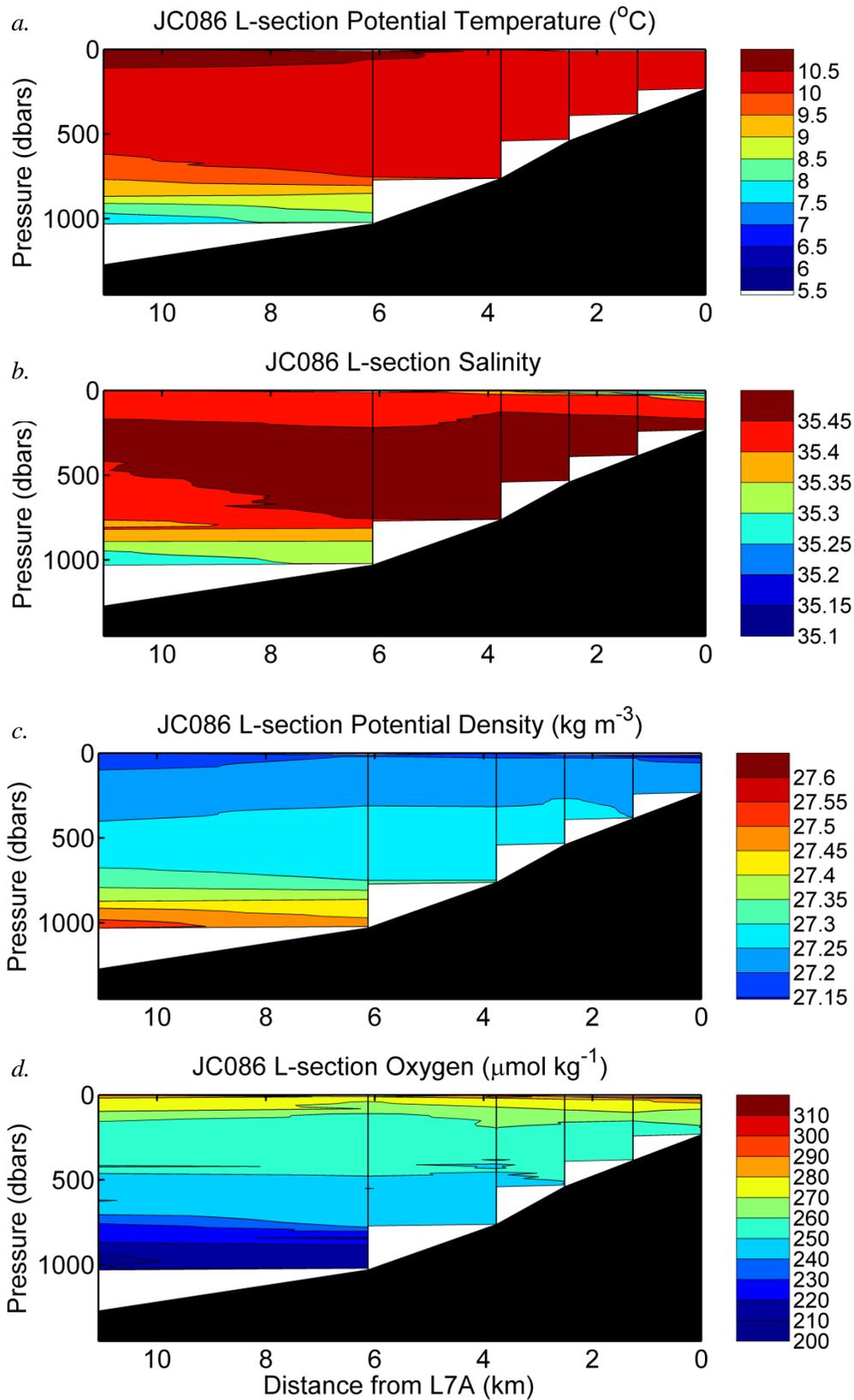


Figure 9. Contour plots across section L (CTD075 – CTD080) during JC086. This section is across the Shelf Edge Current and is perpendicular to the Scottish Shelf. Salinity and oxygen data are not calibrated.

