Cruise Report
RRS James Clark Ross
JR17003
26 January – 18 February 2018

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Introduction

Cruise JR17003 took place on RRS James Clark Ross from 26 January to 18 February 2018. The main objective of the cruise was the annual reoccupation of the A23 section from 64° S to South Georgia. This was the 12th repeat of the section, and the tenth on JCR. This work is now part of the ORCHESTRA (Ocean Regulation of Climate by Heat and Carbon Sequestration and Transports) project. In addition, we recovered four gliders that had been deployed on JR17001 for ORCHESTRA, and two gliders near the P3 mooring site that had been deployed in November on DY86 as part of the GOCART (Gauging ocean Organic Carbon fluxes using Autonomous Robotic Technologies) project (PI: Stephanie Henson). While waiting for weather to improve for the P3 glider recoveries, we did two CTD sections across the shelf break south of South Georgia near King Haakon Bay, four stations across the trough leading into the bay, and four stations into the bay, including one in the inner basin of the fjord. This additional work will hopefully be useful in planning the upcoming Discovery 100 project.

This was a very successful cruise, with all gliders recovered, all of the planned CTD casts performed, and additional CTDs near South Georgia. This would not be possible without the sterling efforts of the ship's officers and crew, and the science and science support team on board.

Povl Abrahamsen

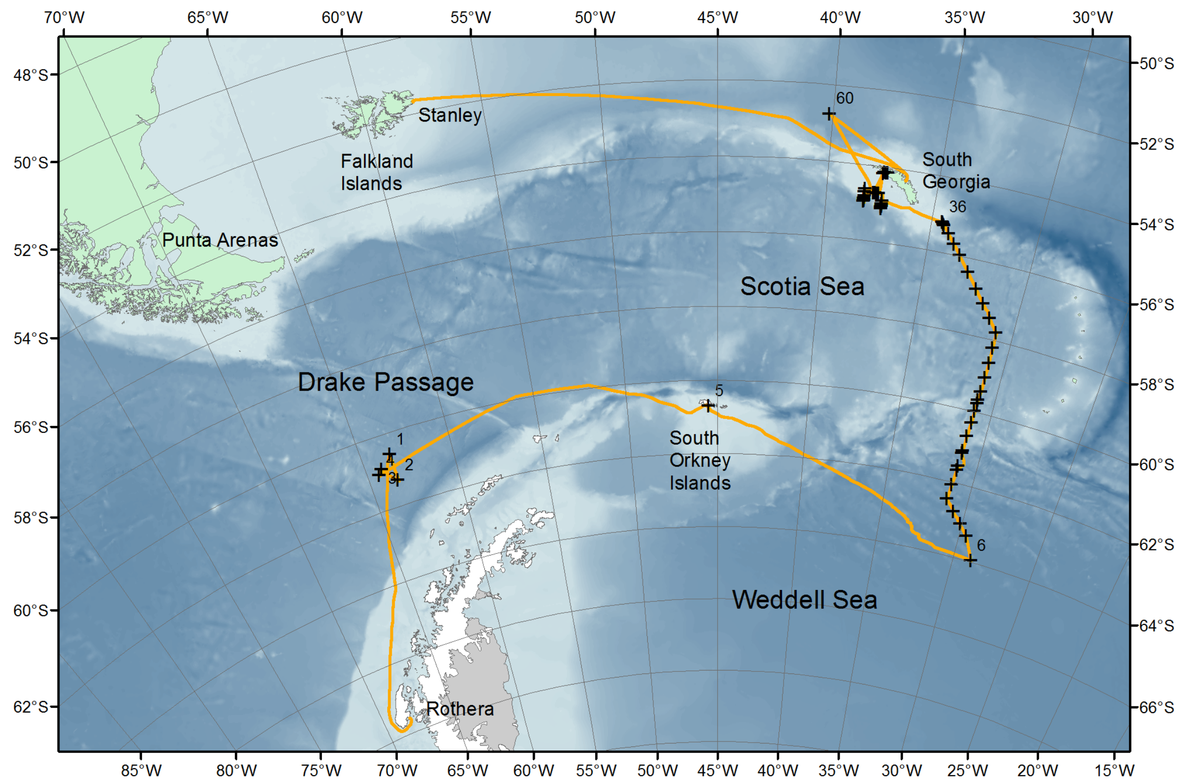

Figure 1: Overview of the cruise track and CTD stations occupied on JR17003

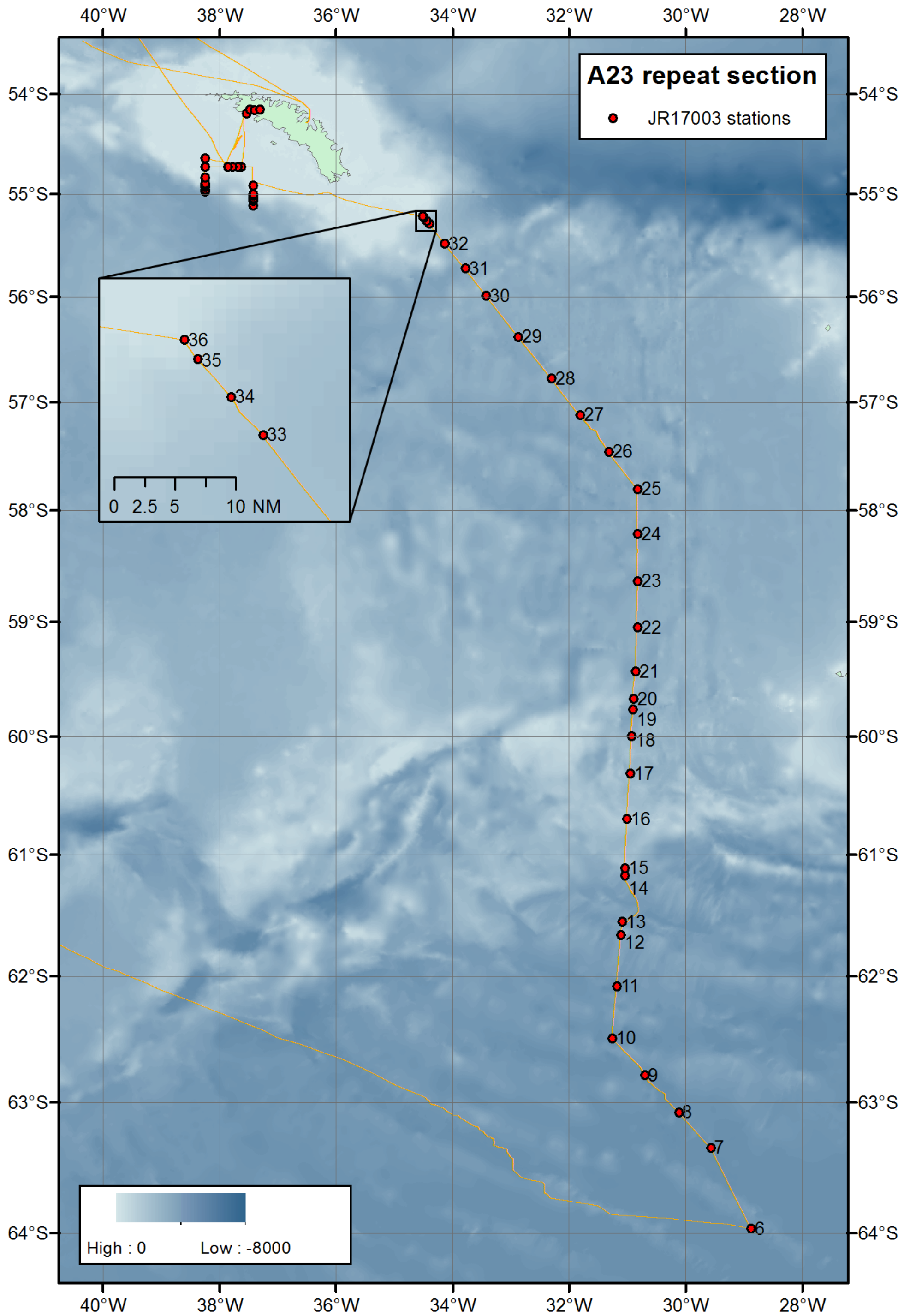

Figure 2: CTD stations on the A23 section; the inset shows the northernmost part of the section.

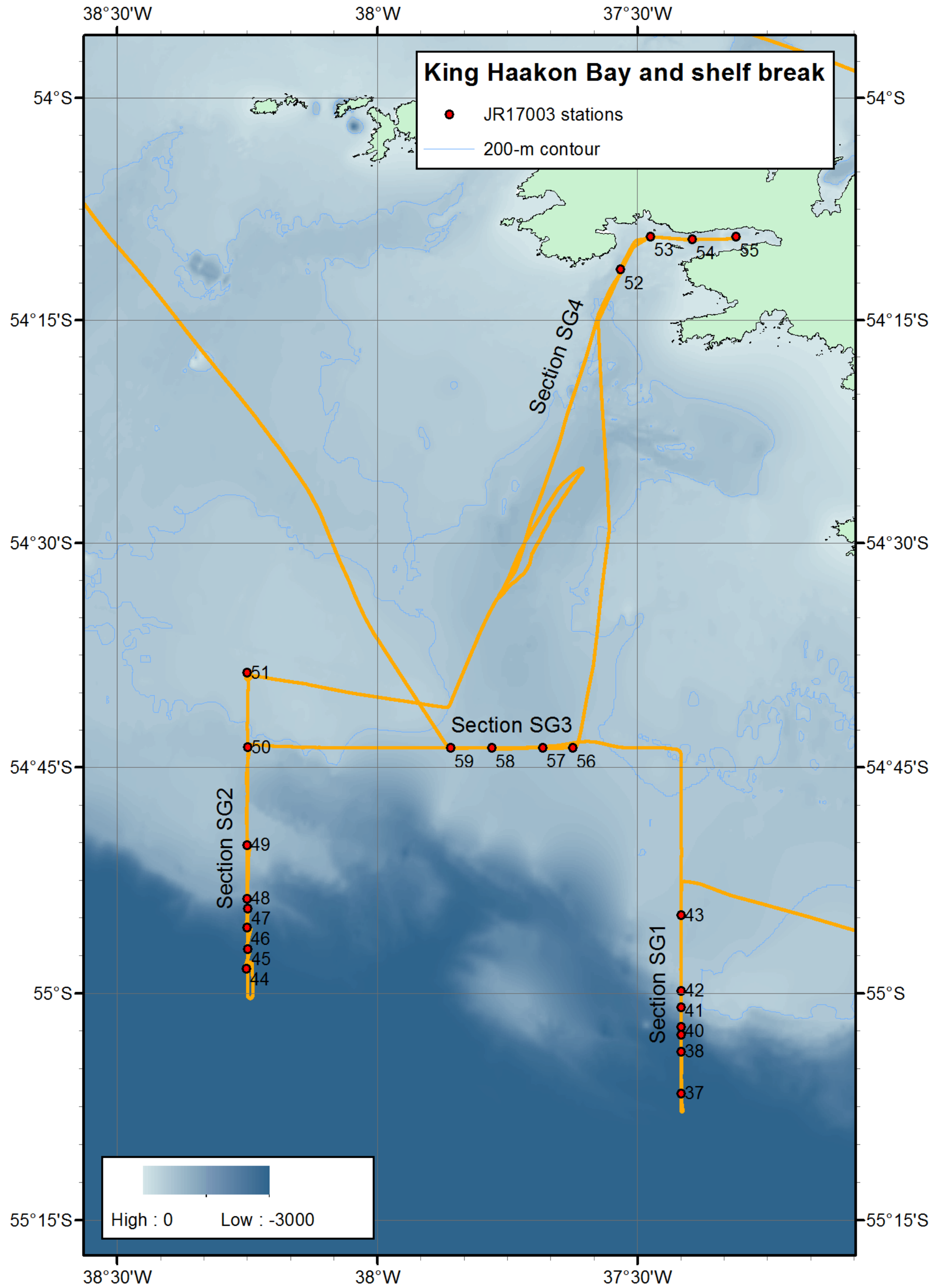

Figure 3: CTD stations in King Haakon Bay and on the surrounding shelf and shelf break.

Cruise personnel

Science party

Povl Abrahamsen, PSO (BAS)
David Bett (BAS & Southampton)
Peter Davis (BAS)
Elaina Ford (BAS)
Michael Hemming (UEA)
Hugh Venables (BAS)

Science support

Carson McAfee, AME
Manos Tsentides, IT

Officers and crew

Graham Chapman, Master
Simon Wallace, Chief Officer
Georgina Delph, 2nd Officer
Dominic Hills, 3rd Officer
George Hale, 3rd Officer
Charlie Waddicor, ETO (Comms)
Andris Kubulins, Chief Engineer
Christopher Donaldson, 2nd Engineer
Aleksandr Hardy, 3rd Engineer
Steven Eadie, 4th Engineer
Julian Klepacki, ETO (Eng)
Thomas Biggs, Deck Engineer
Jonathan Jackman, Deck Engineer
Lloyd Sutton, Purser
Clifford Mullaney, Bosun Science Ops
Grant Fraser, Bosun Science Ops
Christopher "Chicago" Littlehales, Bosun
John O'Duffy, Bosun's Mate
Craig Lennon, Launchman
Christopher Devitt, AB
Martins Neilands, AB
Robert Leech, AB
Paula Munoz Garcia, Deck hand
Carlos Vargas Leon, Motorman
Stephen Pictor, Motorman
Padraig Molloy, Chief Cook
Brian Robertson, Cook
Derek Lee, Senior Steward
James Newall, Steward
Brian Winton, Steward
Thomas Patterson, Steward
Alicia "Pips" Tomkinson, Doctor

Back row, L to R: David, Pete, Hugh, Grant, Martins, Carson, Paddy, Simon, George, Carlos
Front row, L to R: Michael, Manos, Paula, Povl, Elaina, Pips

Cruise narrative

Povl Abrahamsen

Mon 22 Jan: UK-based personnel (apart from Manos Tsentides, who had flown down previously, and Carson McAfee, who was already on board) flew from Heathrow to Punta Arenas, arriving the evening of 23 Jan.

Tues 23 Jan: Arrived in Punta Arenas, flight safety briefing at hotel.

Thurs 25 Jan: Departed hotel 09:00 for the airport. Flight departed 10:30, arriving Rothera at 15:30. Mostly overcast, but nice view of Marguerite Bay and Rothera once we dropped through the clouds before arrival. Glider boxes were craned out of the science hold, no further work done.

Fri 26 Jan: The ship departed Rothera at 08:00, followed by safety briefing at 09:00, boat drill at 10:30, viewing of Videotel video "Immersion suits – the difference between life and death", followed by all ship's personnel (even on the bridge) donning immersion suits. Science talk at 16:00.

Sat 27 Jan: Wind slowly picked up, from no wind 10 pm previous evening to ~35 knots early afternoon. Then started to fall, stabilising at 22 kt through evening. Removed glider cradles from crates, then ran UIC familiarisation session at 9:00. Toolbox talk at 10:30 to discuss the next day's glider recoveries.

Sun 28 Jan: Arrived at the first Slocum glider site at 6 am, promptly recovered the glider using the net, and did a 1000-m CTD cast. This was followed by a four-hour steam, then Seaglider recovery, another cast, and two more Slocums, with a full-depth CTD cast at the end. Overall a very smooth operation, and a relief to have all four gliders on board ahead of schedule. Forecast called for worsening weather, with a very deep low pressure system reaching the South Orkneys around Wednesday, about the same time as the ship. Weather forecast for passage north from Signy to P3 not looking good.

Mon 29 Jan: Data recovery from gliders started. No other events of note.

Tue 30 Jan: In transit all day. Poor visibility. Download of glider data continued.

Wed 31 Jan: Arrived at Signy Island early morning, took route around north of the island and then steamed east into ~275 m of water for a test CTD cast as the wind dropped, in moderate visibility. The brakes had been replaced on the CTD winch (failed at the end of JR17001), so the CTD was deployed on a "double yo-yo" cast, with bottles fired on the second upcast. By the end of the CTD, the wind had dropped considerably and visibility improved, so two Humbers were launched to take two station personnel (Paul Cousens and Rob Curtis) ashore, along with a few supplies for the station and cargo from Rothera – three boat loads in total. Shortly after lunch the boats were recovered. We steamed east along the coast of Coronation Island past cruise ship *Hanseatic*, and then gradually the fog closed in again. The wind and sea state gradually increased overnight.

Thurs 1 Feb: Steaming throughout the day, in poor visibility. Heavy rolling in the morning, gradually decreasing through the day.

Fri 2 Feb: Overnight the ship encountered spread patches of multi-year sea ice and bergy bits. This caused a lot of slalom and slowing down throughout the day. Visibility was still poor at times, with long swell. The CTD termination was load tested in the morning, engine room tours were held at 10:30, and the science teams were introduced to the salinometer at 13:00. ETA at the first CTD slipped from 5 pm to 11 pm because of ice and visibility.

Sat 3 Feb: Good start to the day, with plenty of CTDs and good progress in spite of poor visibility. Toward the evening we were slowed down considerably because of occasional bands of heavy multi-year sea ice and extensive banks fog banks. Otherwise nice and calm, with CTDs throughout the day.

Sun 4 Feb: CTDs through the day. Sun briefly broke through in the afternoon, otherwise overcast, but less fog. In the evening, we encountered another band of ice approaching station 13 (A23-31); luckily, there was open water to the east, so this station was done about 500 m away from the intended position. This band of ice didn't extend much farther to the east, so the ship was able to take a short detour to the following station, and we do not expect further sea ice on this cruise.

Mon 5 Feb: Sleet and snow in the morning; fog returned. More CTDs; birthday cake for Elaina served in the UIC shortly after 4 pm.

Tues 6 Feb: Rough weather in the morning, but sunny. Stern thruster cut out briefly in the morning, causing a short delay, but otherwise not delayed much by the weather. Lots of whales in the morning. CTDs throughout the day, otherwise little of note.

Wed 7 Feb: CTDs continued through the day, but winds and swell building up over the afternoon. After the evening CTD (recovered at dinner time), the swell was very large, and the captain decided to steam very slowly (~2 kts) toward the next CTD to reevaluate conditions at dawn.

Thurs 8 Feb: Very rough overnight. Still large swell in the morning; the ship arrived on station at 3 am, but conditions were unworkable. Winds gradually dropped through the day, with swell slowly dying down, too. First CTD went in the water at 10 am, followed by regular casts through the day. Fog returned in the afternoon.

Fri 9 Feb: Clear day, calm, becoming foggy in afternoon – but still calm. CTD termination failed immediately after breakfast, requiring replacement of the pigtail (but not mechanical retermination). Afterwards, CTDs continued through the day.

Sat 10 Feb: Last CTD finished around 1 am. The ship then steamed to the northern end of the eastern section south of King Haakon Bay (section SG1), where we arrived at 10:15 and ran swath to the south to determine CTD positions. First CTD at noon, section continued until around 11 pm. Then swath toward the west. Wind started out at zero, built up to 30 knots in afternoon, moderating slightly in the evening.

Sun 11 Feb: The wind increased dramatically overnight, peaking around 50 kt at 3 am. Swath lines were run, but with lots of gaps. Thankfully, the deep part over the trough was completed without too many problems, and after the ship turned south there were more returns. The first CTD of the day started around 6:30 am, and the western section (SG2) was completed at 19:30. Then the weather turned, with the wind increasing considerably overnight. The ship steamed slowly toward the start of section SG4 (into King Haakon Bay), to check conditions at dawn.

Mon 12 Feb: Conditions were still rough in the morning; after re-evaluating the weather at 5 am, the ship steamed toward the fifth station in King Haakon Bay (SG4_5). Four shallow CTD casts were done in the bay, across the shallow sill; science was then stopped for an hour for a barbecue on the aft deck – ably manned by the chief officer and deck engineer. The ship steamed out of King Haakon Bay to section SG3, where four additional CTD casts across the trough were performed, finishing at 8 pm to steam to P3 for glider recoveries and a CTD cast.

Tues 13 Feb: Reasonable weather overnight, though the wind started to pick up in the morning. After arriving near P3 at 9:15 am, we quickly recovered the first glider using the net. The second glider was recovered not long afterwards, and a full-depth CTD cast was taken a safe distance away from the P3 mooring. We then steamed toward Cumberland Bay, to pick up two personnel to be taken from KEP/Grytviken to Stanley. South Georgia briefing video shown to all ship's personnel in the afternoon.

Wed 14 Feb: Arrived in Cumberland Bay in the morning, in reasonable weather, and dropped anchor off King Edward Point. After a briefing by the government officer, two Humbers were launched, and most SPPs and many crew went ashore. Generally good weather in the morning, turning worse in the afternoon, with increasing wind and rain. All back on board by 14:30, anchors aweigh at 15:15. Ship left Cumberland Bay bound for Stanley. Strong gusts of wind leaving Cumberland Bay, and rough weather overnight.

Thurs 15 Feb: Weather improved throughout the day, but ship still pitching quite severely. Immersion suit drill for SPPs in the morning. Partial solar eclipse in the evening, with maximum (40%) around 18:30 local, 21:30 UTC.

Fri 16 Feb: Weather improved considerably. Three salinity crates run in the afternoon; cargo paperwork completed. Cruise report writing continues. Safety committee meeting at 16:00. Formal dinner in the evening for Charlie Waddicor's retirement.

Sat 17 Feb: Swath switched off in the morning; last salinity crate run after breakfast. Lab cleanup in the afternoon. Quiz in the evening, narrowly won by the SPP team.

Sun 18 Feb: ADCP switched off before breakfast; arrived at FIPASS east berth at 8 am. Lab signoff and kit bag return completed shortly after 10 am; most SPPs went for a walk ashore. SPPs disembarked at 14:15, to stay ashore at Shorty's, except Hugh Venables, who is staying on for JR17003A. All SPPs except Hugh met for post-cruise dinner at Malvina House.

Mon 21 Feb: Day ashore in the Falklands; several disembarked SPPs went to Volunteer Point. All met for dinner at Shorty's.

Tues 20 Feb: Science and science support personnel, plus two ship's crew (Leech and Jackman) departed Stanley at 07:30 for 11:40 MOD flight from RAF Mount Pleasant to RAF Brize Norton, with a two-hour refuelling stop in Cape Verde in the middle of the night.

Profiling Conductivity Temperature Depth (CTD) measurements

Hugh Venables

Introduction

A Conductivity-Temperature-Depth (CTD) unit was used to vertically profile the water column. 60 CTDs were carried out in total, with CTD 5 consisting of two casts during a wire test. CTD positions are included in the event log in Appendix A.

CTD instrumentation and deployment

The Sea-Bird Scientific SBE9plus CTD was mounted in a rosette with an SBE32 carousel water sampler and 24 12-litre Niskin bottles, and was connected through the sea cable to an SBE11plus deck unit in the UIC. The SBE9plus unit contains a Paroscientific pressure sensor and was connected to dual independent CT ducts with SBE3plus temperature and SBE4C conductivity sensors and an SBE5T submersible pump. An SBE35 Deep Ocean Standards Thermometer makes temperature measurements each time a bottle is fired, logging time, bottle position, and temperature, allowing comparison of the SBE35 readings with the CTD and bottle data. Additional sensors included a Tritech PA200 altimeter, a Chelsea Technologies Group AquaTracka Mk III fluorometer, an SBE43 dissolved oxygen sensor (plumbed into the primary CT duct), a Biospherical QCP2350 photosynthetically active radiation (PAR) sensor, and a WET Labs C-Star transmissometer. The altimeter returns real-time accurate measurements of height off the seabed within approximately 100 m of the bottom. This allows more accurate determination of the position of the CTD with respect to the seabed than is possible with the Simrad EA600 system, which sometimes loses the bottom or reverts to default values (approximately multiples of 500 m) and, in deep water, often returns depths that are several tens of metres different from the true bottom depth. A fin attached to the CTD frame reduced rotation of the package underwater. The CTD package was deployed from the mid-ships gantry on a cable connected to the CTD through a conducting swivel.

CTD data were collected at 24 Hz and logged via the deck unit to a PC running Seasave version 7.22.3 (Sea-Bird Scientific), which allows real-time viewing of the data. The procedure was to start data logging during deployment of the CTD, then stop the instrument at 10 m wire out, where the CTD package was left for at least two minutes to allow the conductivity-activated pumps to switch on and the sensors to equilibrate with ambient conditions. The pumps consistently switched on 60 seconds after the instrument entered the water, as they should.

After the 10-m soak, the CTD was raised to as close to the surface as sea conditions allowed and then lowered to within 10 m of the seabed. Bottles were fired on the upcast, where the procedure was to stop the CTD winch, hold the package *in situ* for a few seconds to allow sensors to equilibrate, and then fire a bottle. The CTD was left at this depth for ~10 seconds to allow the SBE35 temperature sensor to take readings over 8 data cycles. The sensor averages these readings to produce one value for each bottle fire. If duplicate bottles were fired at any depth the SBE35 does not take readings unless there is a 10-second gap between firings. The water sampler needs time to recharge between firings but can cope with two in succession.

Data acquisition and preliminary processing

The CTD data were recorded using Seasave version 7.22.3, which created four files:
JR17003_[NNN].hex hex data file
JR17003_[NNN].XMLCON ascii configuration file containing calibration information
JR17003_[NNN].hdr ascii header file containing sensor information
JR17003_[NNN].bl ascii file containing bottle fire information

where NNN is the CTD number (column 2 of the table in Appendix A).

The SBE Data Processing module *Datcnv* was used to convert the hex file to ascii. *Align* was then used to account for the time lag of the oxygen sensor, with data being advanced by 5 seconds. The cell thermal mass *(celltm)* module was then used to remove the conductivity cell thermal mass effects from the measured conductivity. This re-derives the pressure and conductivity, taking into account the temperature of the pressure sensor and the action of pressure on the conductivity cell. The output of this process is an ascii file, named as *JR17003_[NNN]_align_ctm.cnv*.

SBE35 high precision thermometer

Data from the SBE35 thermometer were usually uploaded after every cast using the *SeaTerm* program. Once the readings had been written to an ascii file, the file was opened and the contents checked to make sure the correct number of readings had been stored. The memory of the SBE35 was then cleared using the '*samplenum=0*' command. To check that the memory was clear, the command '*ds*' was entered, which displays the number of data points stored in the instrument's memory. This number should be 0. The date and time are also shown by the *ds* command and these should be checked and corrected if needed.

Salinity samples

Salinity samples were taken from deep areas with little salinity gradient and the mixed layer depth, as well as every depth where a $\partial^{18}O$ sample was taken. Once analysed, the conductivity ratios were entered by hand into *JR17003_master.xls*, converted to salinities and used for further CTD data processing.

CTD data processing

Further processing of CTD data was carried out in Matlab using existing programs, predominantly written by Mike Meredith and Karen Heywood, with modifications by numerous others, and further significant changes made on JR177 and JR307. Further significant changes, mostly generalising the code to reduce the number of adjustments needed between cruises were made on JR17003a and covered in that cruise report. The processing routines were split into two subsets: those that could be carried out in the absence of salinity calibration data and those that required the *JR17003_master.xls* file containing the salinometer readings. The first subset of programs was run following each CTD cast and allowed a visual check of the data to ensure that the instruments were working correctly. The second subset was run for those CTDs for which salt samples had been collected, following the salinity analysis. The first subset of Matlab routines applied to the CTD data is as follows:

- *ctdread17003* invokes the *cnv2mat* routine written by Rich Signell to read in the *JR17003_ctd_NNN_align_ctm.cnv* file. Data are stored in Matlab arrays and named accordingly. Latitude and longitude are now written into the file during data capture. The output file is of the form *JR17003_ctd_NNN.cal*.

- *editctd17003* reads in *JR17003_ctd_NNN.cal* and removes the 10-m soak prior to the CTD cast, through finding the minimum pressure after the soak and asking for user confirmation after displaying the full pressure plot for the cast. For unusual casts there is then the option to manually enter a scan count for the start of a cast or edit out pressure spikes. Data collected at the end of the upcast when the CTD was out of the water is removed graphically by selecting bad conductivities when the package is out of the water, these going wrong before pumps are switched off and at pressures either side of zero depending on pressure sensor offsets. The selected data points are set to NaN for all scientific sensors. Primary and secondary conductivity are also despiked using the interactive editor at the same time, with the option to edit the temperature profiles and T/S plots (where small conductivity spikes can be more obvious). Selected data points are set to NaN. These points are also set to NaN for PAR, fluorescence, oxygen and transmission. Output is *JR17003_ctd_NNN.edt*.

batch17003.m then runs:

- *salcalapp* checks whether bottle files have been generated from salinity samples (see the second subset of routines, below). If it does not find the required file, it loads *JR17003_ctd_NNN.edt* and calculates salinity, potential temperature and σ_θ, σ_2 and σ_4 as per the UNESCO 1983 algorithms by invoking the routines sw_*salt*, *sw_ptmp* and *sw_pden*. θ and salinity are calculated for both the primary and secondary sensors, whilst σ is calculated using primary temperature and conductivity, except for casts 23 and 38 where the secondary sensors are used. Output is *JR17003_ctd_NNN.var*.
- *splitcast* reads in *JR17003_ctd_NNN.var* and splits the downcast and upcast into *JR17003_ctd_NNN.var.dn* and *JR17003_ctd_NNN.var.up*. As the pressure profile has been checked, this can be safely done using the maximum pressure.
- *fallrate* was added on JR307 (after retrospectively being applied to JR161 and JR177 data and JR299 through mstar processing). It is a matlab version of the seapath loopedit script. It has to be run after the initial soak is removed as it removes any datapoint on the downcast where pressure is less than one previously recorded or if the fall rate is <0.25 ms^{-1}. Loopedit flags such points (excluding the initial soak if set to) but these flags were not subsequently used in the processing and often did erroneously include the initial soak. This process results in smoother density profiles with fewer apparent overturns. Input and output is *JR17003_ctd_NNN.var.dn* – it is not run on the upcast as it will remove bottle stops.
- *gridctd* reads in both *JR17003_ctd_NNN.var.dn* and *JR17003_ctd_NNN.var.up*, and averages the data into 2-dbar bins. Data are padded with NaNs to 5999dbar, thereby ensuring that arrays for all CTDs are the same size. Outputs are *JR17003_ctd_NNN.2db.mat* and *JR17003_ctd_NNN.2db.up.mat*.
- *fill_to_surf* was not run. It allows any missing data at the surface to be filled with values from the next non-NaN line. This should only be carried out where the upper water column is well mixed. Missing values for the time stamp and PAR are left as NaNs. The output file is the same as the input file.
- *ctdplot17003* reads in *JR17003_ctd_NNN.2db.mat* and plots profiles of θ and salinity (both primary and secdondary), density, fluorescence, transmission, oxygen and PAR. Plots are output for the entire CTD depth and for only the upper 200m of the cast. These plots are saved as png files and printed.

The second subset of Matlab programs is as follows:

- *makebot17003* reads in *JR17003_ctdNNN.ros*, *JR17003_ctdNNN.BL* and *JR17003_ctdNNN.int*, and extracts CTD pressure, temperature (1 & 2), conductivity (1 & 2), transmission, fluorescence, oxygen and PAR for each bottle fired. It also calculates the standard deviation for pressure, temperature and conductivity, and writes a warning to the screen if those for temperature and conductivity are greater than 0.001. Salinity and potential temperature are calculated from both primary and secondary temperature and conductivity using *ds_salt* and *ds_ptmp*. Results are saved in *JR17003botNNN.1st*.
- *readsal17003* extracts salinity calibration data from *JR17003_master.xls* and reads in *JR17003botNNN.1st*. Data from duplicate salinity samples are stored in *niskinsalts.mat*, and if the standard deviation of these samples is >0.002, a warning is written to the screen. Output is *JR17003salNNN.mat*.
- *addsal17003* reads in *JR17003botNNN.1st* and *JR17003salNNN.mat*, and stores all salinity information in *JR17003botNNN.sal*.
- *setsalflag17003* loads *JR17003botNNN.sal* and flags those bottles with high standard deviations for temperature and conductivity. Output is *JR17003botNNN.sal*.
- *salplot17003* loads *JR17003_ctdNNN.int* and *JR17003botNNN.sal*, and plots sample salinities on top of the CTD salinity profiles, allowing a visual check of the data. Plots of conductivity and temperature standard deviations against CTD salinity minus sample salinity are also generated.
- *sb35read17003* loads *JR17003sbeNNN.asc*, *JR17003botNNN.1st* and *JR17003_ctdNNN.cal*, and plots SBE35 temperature minus CTD temperature (1 & 2) for a visual check. The SBE35 data are saved in *JR17003botNNN.sb35* and SBE35 temperature minus CTD temperature is saved in *tempcals.all.mat*. This script must be run prior to *salcal17003*.
- *salcal17003* loads *JR17003botNNN.sal*, *JR17003_ctdNNN.int* and *tempcals.all.mat*, and uses sample salinities and SBE35 temperatures to calculate conductivity offsets for both CTD sensors. All offsets are stored in *salcals.all.mat*. Plots of temperature and conductivity offsets are output to the screen.
- *tempcal_decide and salcal_decide* read in *tempcals.all.mat* and *salcals.all.mat*, and plots primary and secondary temperature and conductivity minus SBE35 temperature and conductivity calculated from the salinity samples. This allows determination of any offsets that should be applied to calibrate the CTD sensors. Temperature offsets are needed first for the back-calculation of conductivity from bottle samples. The two offsets for each sensor should be checked to make sure they remove differences between the sensors as well as fit them to the calibration values available.

Once this second subset of programs has been run, the offsets found in calibrations are entered into *salcalapp*, which is then run again. Any required temperature or conductivity offset is applied here, and salinity, θ, and σ are recalculated; the uncalibrated values are saved with _uncal appended to variable names. Offset data are saved in *JR17003botNNN.cal*. All programs following *salcalapp* must then be re-run with versions including the _uncal variables.

Lowered Acoustic Doppler Current Profiler

David Bett

Instrument Configuration

On cruise JR17003 two Teledyne RDI 300-kHz Workhorse Monitor LADCPs were used in combination. These instruments were attached onto the CTD frame, with one being fitted so it has a downward facing orientation (master) and another with an upward one (slave). In preparation for each cast a pre-deployment script was run to test that the internal electronics were performing correctly. Then deployment scripts were sent first to the slave, then to the master, to start data acquisition. Both the pre-deployment and the master/slave deployment scripts are included below, with a brief description of the parameters used in our setup. The timings used result in staggered pulses with an interval of 1.3/1.5 s, with the master LADCP pinging approximately 550 ms after the slave.

Pre-deployment test script

PS0	print system configuration, so this is included in the transcript file
PA	run standard pre-deployment tests
PT200	run all built-in tests
PC2	display orientation and other sensor data
RS	display space used/free on memory card

Master deployment script

CR1	reset to factory settings
RN MA173	set file name prefix for JR17003 master
WM15	water mode 15 (LADCP)
TC2	ensembles per burst: 2
LP1	pings per ensemble: 1
TB 00:00:02.80	time per burst: 2.8 s
TE 00:00:01.30	time per ensemble: 1.3 s
TP 00:00.00	no time between pings
LN25	number of depth cells: 25
LS0800	bin size: 8 m
LF0	blank after transmit: 0 cm
LW1	narrow bandwidth LADCP mode
LV400	ambiguity velocity: 400 cm/s
SM1	set as master LADCP
SA011	send synchronization pulse before each ensemble
SB0	disable hardware-break detection on Channel B
SW5500	wait 550 ms after sending synchronization pulse
SI0	send a synchronization pulse after each ensemble
EZ0011101	sensor source: use manual speed of sound (1500 m/s); manual depth of transducer (0 m); measured heading, pitch, roll; manual salinity (35 psu); measured temperature
EX00100	use beam coordinates
CF11101	flow control: automatic ensemble cycling (next ensemble when

	ready); automatic ping cycling (ping when ready); binary data output format (if serial output is enabled, which it isn't); disable serial output; enable data recorder
CK	save as user defaults
CS	start pinging

Slave deployment script

CR1	reset to factory settings
RN SL173	set file name prefix for JR17003 slave
WM15	water mode 15 (LADCP)
LP1	pings per ensemble: 1
TP 00:00.00	no time between pings
TE 00:00:00.00	time per ensemble: none
LN25	number of depth cells: 25
LS0800	bin size: 8 m
LF0	blank after transmit: cm
WB1	set to narrow bandwidth (note: this command is redundant)
LW1	narrow bandwidth LADCP mode
LV400	ambiguity velocity: 400 cm/s
SM2	set as slave LADCP
SA011	wait for synchronization pulse before ensemble
SB0	disable hardware-break detection on Channel B
EZ0011101	sensor source: use manual speed of sound (1500 m/s); manual depth of transducer (0 m); measured heading, pitch, roll; manual salinity (35 psu); measured temperature
EX00100	use beam coordinates
CF11101	flow control: automatic ensemble cycling (next ensemble when ready); automatic ping cycling (ping when ready); binary data output format (if serial output is enabled, which it isn't); disable serial output; enable data recorder
CK	save as user defaults
CS	start pinging

Data Processing

The binary files recorded by the instrument were downloaded onto the local computer after each cast. These were then backed up onto the JRLB server under legdata/LADCP along with the log files. All data were processed using Matlab code developed at Lamont-Doherty Earth Observatory by Martin Visbeck and updated by Andreas Thurnherr (version LDEO_IX 13). The package calculates velocity based on both shear and inversion methods.

Modifications of the set_cast_params.m script were made by David Bett and Povl Abrahamsen to load in the processed CTD data in the form of Matlab files instead of Netcdf (mstar). If processed files are not available, the script reverts to using preliminary files generated from the raw 24-Hz CTD data. The processing should then be re-run once processed CTD files are available. However, as the Matlab 1-Hz data files do not contain pressure data from the soak (these values have been set to NaN), it is worth noting that this script now uses the CTD pressure from the raw 24-Hz data files (as in prelim_set_cast_params.m) when the processed pressure is NaN, as a fix to get initial results. Therefore, the data should ideally be processed again using the processed CTD pressure. The script was also edited, so that time-varying latitude and longitude values were taken from the logged Seapath GPS data streams, as the 1-Hz Matlab files do not contain the ship's position during the cast.

Results

The LADCP was used on all stations during the cruise. The data look good on most stations after processing, with no evident problems. Figure 4 shows the velocity components for casts along the A23 repeat section. It is worth noting though that station 31 zonal velocities do at first appearance seem to be an outlier, however the results are still within the expected range, but this will need to be investigated further.

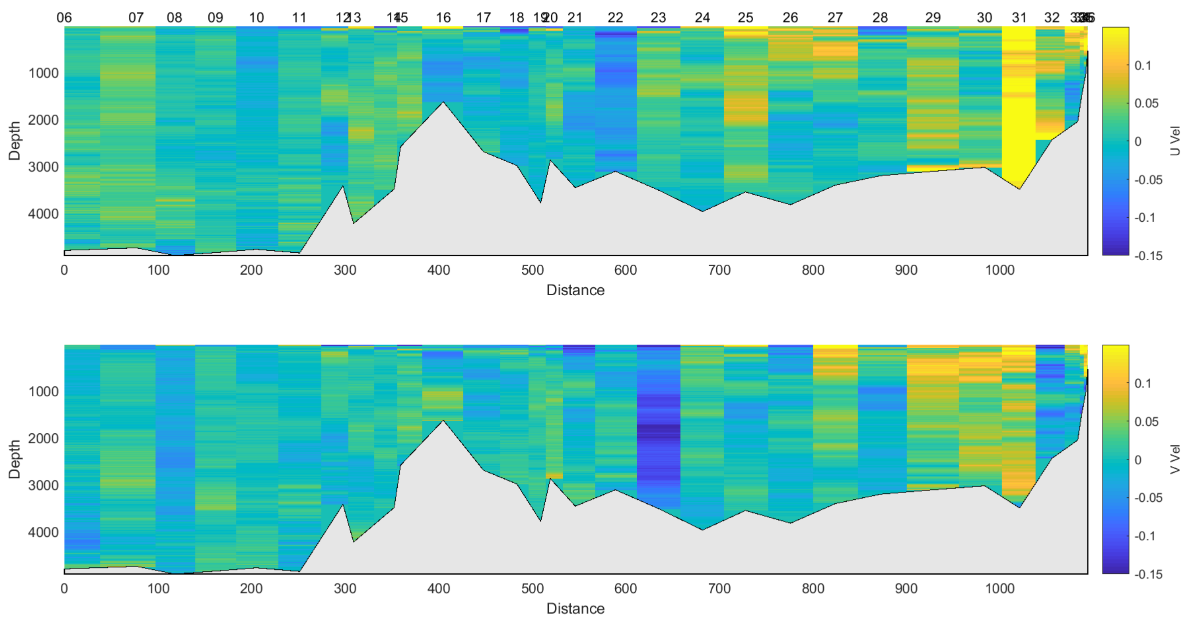

Figure 4: Zonal (upper graph) and meridional (bottom graph) velocities along the repeat section A23.

Samples for oxygen isotopes

Povl Abrahamsen

On the A23 section and on station 55 (the innermost station in King Haakon Bay), water samples were collected for $\partial^{18}O$ analysis. In total, 248 samples were collected on the cruise: 243 from A23 and five from station 55. These were consigned back to the UK with instructions to refrigerate through the tropics; they will be analysed at the NERC Isotope Geosciences Laboratory (NIGL), British Geological Survey, Keyworth.

Each sample was collected in a 30-ml Nalgene wide neck HDPE bottle with a screw cap. A thermally printed label with a unique sequential number was applied to the bottle while still dry, and the station and Niskin bottle number were written on the label in permanent marker. The bottle was rinsed three times with water from the Niskin bottle before it was filled to the top with water, and the cap screwed tightly onto the bottle. The sequential bottle number was noted on the sampling log (in the "O-18 bottle" column).

On A23, a subset of stations and depths was chosen to give reasonable coverage of the water mass properties with an emphasis on surface and bottom waters, based on data from previous cruises, where more samples had been collected. For each Niskin bottle that was sampled for $\partial^{18}O$, a salinity sample was also collected and analysed on board. The distribution of samples on the A23 section is shown in Figure 5.

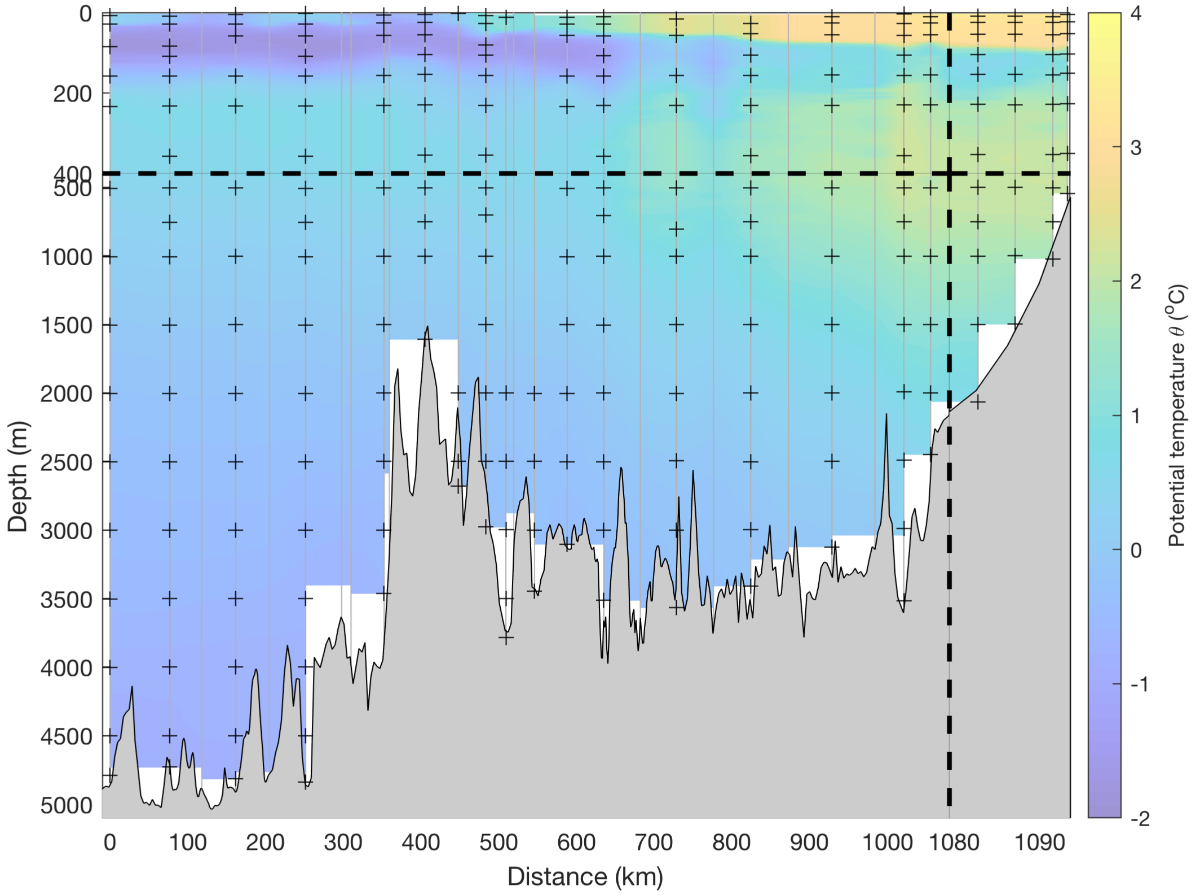

Figure 5: Distribution of $\partial^{18}O$ samples taken on the A23 section on JR17003 (starting from the south, going north). Note the changes of scale on the distance axis at 1079 km and on the depth axis at 400 m.

Underway navigational data

Hugh Venables

Instrumentation and data collection

Navigational data were collected continuously throughout the cruise. Instrumentation was as follows:

- Sperry Mk 37 Model D Gyrocompass
- Kongsberg Seatex Seapath 300 (integrated GPS and inertial position, heading, and attitude system)
- Hull-mounted Kongsberg Simrad EA600 Hydrographic 12kHz echo sounder (transducers located approximately 5 m below the water level).

Navigational data were collected every second, whilst the bathymetric data were logged every 10 seconds.

Processing

Navigational data were processed using Unix shell scripts (ssh pstar@jrlc, password "pstar") and Matlab using modified versions of programs developed by Mike Meredith. Data were initially read into the Unix system, then transferred to Matlab, where the bulk of the processing was carried out. Directory structures are written in to follow the pattern of the data being stored in parallel directories from the code (../../stream/daily_file relative to the code) for both unix and matlab scripts.

Unix

- *get_nav:* Calls the scripts *get_gyro*, *get_seatex* and *get_tsshrp*, which invoke the *listit* command to retrieve 24 hours (day of year must be given as three figure number, e.g. 059) of gyrocompass, Seatex and tsshrp (heave, pitch and roll) data. Data are saved in subdirectories 'gyro', 'seatex', and 'tsshrp' as *gyro.NNN*, *seatex.NNN* and *tsshrp.NNN*, where NNN is the jday. The updated version of listit is sourced from /users/dacon/projects/scs/bin
- *get_ea600:* Invokes the *listit* command to retrieve 24 hours of EA600 data. Data are saved as *ea600.NNN*.

Matlab

load_daily.m Reads in navigation files output by the Unix processing (above) by calling the following functions:

- *load_daily_gyro*: Reads in text file *gyro.NNN* and writes data to Matlab structure array. Data are flagged, such that any variable with flag ≠ 50 are poor, and thus discarded. Output is *gyro/gyroNNN.mat*.
- *load_daily_seatex*: Reads in text file *seatex.NNN* and writes data to Matlab structure array. Data are flagged, such that any variable with flag ≠ 50 are poor, and thus discarded. Output is *seatex/seatexNNN.mat*.
- *load_daily_tsshrp*: Reads in text file *tsshrp.NNN* and writes data to Matlab structure array. Data are flagged, such that any variable with flag ≠ 50 are poor, and thus discarded. Output is *tsshrp/tsshrpNNN.mat*.

For a quick visual check, the program then plots seatex data, gyrocompass heading, and pitch and roll.

- *plot_seatex_all:* Plots entire cruise track. Loads *seatexNNN.mat* for all jdays and GEBCO bathymetry data.
- *loadea600:* Reads in *ea600.NNN* and stores data in Matlab structure array. Saves *ea600_NNN.mat*
- *cleansim500:* Loads *ea600_NNN.mat.* It plots ea600 data (with em122 data underneath if present) and asks for minimum and maximum values for initial cleaning (defaults 0 and 15000). Data outside these limits and set to NaNs. Interpolation and spike removal have been removed as data are still not clean and spike removal was incomplete. Data are then cleaned using an interactive editor written on JR299 using the inpolygon function to speed the process relative to two-point rectangular boxes. Gaps are left as gaps. Output is *ea600_NNNclean.mat*.

Underway oceanographic and meteorological data

Hugh Venables

Instrumentation and data collection

Surface ocean and meteorological data were logged continuously throughout the cruise. Ocean data were collected from the ship's uncontaminated seawater supply, whilst instruments on the forward mast measured the meteorological data. Instruments were as follows:

- Sea-Bird Scientific SBE45 thermosalinograph
- WET Labs WSCHL fluorometer
- WET Labs C-Star transmissometer
- Two Sea-Bird Scientific SBE38 sea surface temperature probes at the inlet

Serial numbers of the instruments are listed in Appendix D. Both surface ocean and meteorological data were collected at 5 second intervals.

Processing

Initial processing was carried out in Unix, which generated files that could be further processed in Matlab.

Unix

- *get_underway:* Calls the scripts *get_oceanlog*, *get_anemom*, which invoke the *listit* command to retrieve 24 hours of underway data. Output files are *oceanlog.NNN*, *anemom.NNN*, where NNN is the jday. The updated version of listit is sourced from /users/dacon/projects/scs/bin

Matlab

- *loadunderway:* Calls functions *loadoceanlog* and *loadanemom* to read *oceanlog.NNN* and *anemom.NNN*. Data are stored in structure arrays and saved as *oceanlogNNN.mat* and *anemomNNN.mat*. The program then calls the function *cleanoceanlog*, which sets unrealistic values to NaNs, uses *dspike* to remove large spikes in conductivity, housing (CTD) temperature and remote (hull) temperature. Linear interpolation is used to fill data gaps. Data from periods of flow >1.5 l/min or <0.4 l/min are also set to NaNs, as are data from 5 minutes after a drop in flow to allow variables to return to normal. Surface ocean data are further cleaned using an interactive editor if necessary (conductivity first), which allows manual removal of remaining bad data from flow changes and spikes. Salinity is then calculated using *ds_salt* and the interactive editor is used to remove spikes and flier points. The output is *oceanlogNNNclean.mat*.
- *plot_oceanlog_daily:* Loads *oceanlogNNNclean.mat* and *seatexNNN.mat*, calculates 1-minute averages and plots maps of sea surface temperature, salinity and fluorescence. Bathymetry data from GEBCO are included in the plots. Output files are *oceanlog_navNNN.mat* and *oceanlog_navNNN_1minave.mat*.
- *plot_oceanlog_all:* Loads *oceanlog_navNNN_1minave.mat* for all jdays and plots sea surface temperature, salinity and fluorescence for the entire cruise track. Bathymetry data from GEBCO are included in the plots.
- *underwayAll:* Loads *oceanlogNNNclean.mat*, *anemomNNN.mat* and *oceanlog_navNNN.mat*, and appends all data to a master file.

Salinity samples

Throughout the cruise, water samples were collected for salinity analysis in order to calibrate the underway conductivity sensor. The collection and analysis procedure is described fully in the salinometer chapter of this report.

Salinometer

David Bett

Salinity samples were taken for both CTD cast and underway data calibration.

Standard seawater

To calibrate the readings from the salinometer, IAPSO P-series standard seawater was used. This is due to this water having a precisely know electrical conductivity ratio. The specific details of the batch used in this process are given below:

Provider	OSIL
Batch Number	P160
K_{15}	0.99983
Practical salinity	34.993
Expiry date	20th July 2019

Salinometer

The salinometer used on the JR17003 cruise was Guildline Autosal 8400B s/n 68959, with a peristaltic pump attached to the intake tube.

CTD calibration

Samples for CTD calibration, and to obtain known salinities for every O-18 sample, were taken using Niskin bottles at different depths during the cast. Apart from the fixed depths on the stations where $\partial^{18}O$ samples were taken, the depths and number of samples were decided by the operator, though depths with low salinity gradients tended to be chosen. Once the CTD had been recovered onto the deck and secured in the water bottle annex, water samples from each Niskin bottle were collected in 200-ml medicine bottles. The sample bottles were first rinsed out three times with the Niskin bottle water, before the actual sample was taken. Then the threads of the bottles were wiped with blue roll to prevent salt crystal build up, a plastic stopper was inserted, and the screw cap was reattached. The samples were then placed back into the crate of 24, from which it had come. Once this crate was filled with samples it was moved into a temperature-controlled room (the biology lab), which was kept at around 21-22° C, though it varied by a few degrees to the positive and the negative, especially when people were present in the room. Initially the cell temperature of the salinometer was set to 21° C; however, the cooler in the salinometer was unable to cope with the temperature of the samples, and measurements drifted considerably during the first crate sampled. After a second test run of five samples, the cell temperature was turned up to 24° C, as this enabled the device the give more stable readings. After the samples were kept in the lab for at least 24 hours to acclimatize to room temperature, they were ready to be processed.

The salinity samples were run with a standardised procedure. At the start of a run, the cell is flushed with old standards in order to bring the salinity of the water in the cell closer to that of the standard. Then a new bottle of standard seawater is analysed. Before testing any bottle, it is first agitated by gently tilting upside down repeatedly in order to mix out any stratification that could have occurred while the sample had been resting. The intake pipe is then cleaned with a Kim-wipe, and another Kim-wipe is used to clean the top of the bottle of any salt crystals that may have developed, before the plastic stopper is removed. The cell is then flushed three times with the sample, ensuring that each time it is filled past the conductivity sensors and that the device is on the standby setting. It is then flushed once more between each reading, with three readings in general being taken for each sample, with another reading taken if the variance of the first three is too high (more than two on the last digit). This procedure is repeated for the following samples until the crate is finished. Then to finish one last standard seawater is tested, before another case can be started. If multiple crates are run in succession, a single standard is used at the end of one crate and the start of the next, with the values duplicated on the log sheets.

Underway calibration

Similar to the CTD calibration, salinity samples were taken in order to calibrate the conductivity measurements of the underway thermosalinograph. These samples were instead collected via water that was pumped from under the ship directly into a sink in the preparation lab. These samples were taken roughly every four hours during the cruise. The same technique was used to sample this water as for CTD samples, with the sampling time and bottle number noted on the watchkeeping log sheets.

Ship-mounted Acoustic Doppler Current Profiler

Michael Hemming

Introduction

Ocean currents were measured on RRS *James Clark Ross* using a 75-KHz Teledyne RDI Ocean Surveyor Ship-mounted Acoustic Doppler Current Profiler (SADCP). VmDas software (version 1.42) was used for data acquisition, archiving and display. Data obtained by the SADCP were processed using a set of MATLAB routines during the cruise. Previous cruise reports were used as a guide for the processing of SADCP data during this cruise.

Settings

The SADCP was set to run in narrowband mode for the entire duration of JR17003. It acquired data in a beam coordinate system, profiling 50 bins at a length of 16 m each, with 1 profiling ping per ensemble. The surface blanking distance was 8 m, and the SADCP ensemble time was set to ping as fast as possible (in VmDas). The instrument was run independently from the SSU throughout the cruise, with bottom tracking on occasionally, using a maximum bottom search depth of between 500 m and 800 m. The misalignment angle and scaling factor were calculated during post-processing (explained later in this section). The command file that was used most of the time during the cruise can be seen below.

JR17003 SADCP Command file

CR1	Reset ADCP to factory defaults
CB611	Set the data collection baud rate to 38400, no parity, 1 stop bit, 8 data bits
NP1	Switch on Narrowband
NN50	Use 50 Narrowband bins
NS1600	Narrowband bin length: 16 m
NF0800	Narrowband blanking length: 8 m
WP000	Switch off Broadband (note: the following commands starting with "W" are ignored since Broadband is off)
WN100	Use 100 Broadband bins (not used)
WS800	Broadband bin length: 8 m (not used)
WF0800	Broadband blanking length: 8 m (not used)
WV390	Broadband ambiguity velocity: 390 cm/s (not used)
BP00	Disable single-ping bottom track
BX8000	Set maximum bottom search depth to 800 m (not used since bottom track is off)
WD111100000	output velocity, correlation, echo intensity, percent good
TP000050	Half a second between bottom and water pings
TE00000100	One second between ensembles (overridden by VmDas)
EZ1020001	Calculate speed of sound, no depth sensor, external synchro heading sensor, no pitch or roll being used, no salinity sensor, use internal transducer temperature sensor
EX00000	Output beam coordinate data (rotations are done in software)
EA6008	Set transducer alignment angle (60.08°)
ED00063	Set transducer depth (6.3 m on JCR)

ES0	Set Salinity (ppt) [salinity in transducer well = 0]
CX0,0	Disable external trigger (from K-Sync or SSU)
CK	Save this setup to non-volatile memory in the ADCP

Sequence files and output data format

The VmDas software saved SADCP files in the format 'JR17003_xxx_000nnn.aaa', where xxx is the file sequence number, nnn is the file number within that sequence, and aaa is the file type. The VmDas software set the file sequence number, incrementing every time recording was restarted. The file number started at 0 and automatically increased when the file size became too large (max size = 10 MB).

For each sequence, 9 different file types were created: .LOG, .ENR, .ENS, .ENX, .LTA, .NMS, .STA, .N1R, and .VMO. The file types .ENR and .N1R are the binary raw data, and navigational data obtained by the ship Seatex GPS system, respectively. A Table summarising the information stored in each file sequence, the file name, start and end time of the file sequence (first and last $PADCP lines from the .N1R files), the configuration used, and relevant comments, can be found in Appendix B.

Post-processing using Matlab

MATLAB scripts originally created by IFM Kiel were used to process the SADCP data. These scripts have been adapted over the years by several people. Therefore, please check whether the modifications are adequate for your cruise.

It is necessary to define certain information in the MATLAB script ('OS75_JCR_jr17003.m') when processing the data. This includes:

1. Paths to the raw SADCP output ('RAWPATH'), and to the folder in which created MATLAB and image files will be stored ('PATH');
2. Framework of the data files ('filename') and the cruise name ('cruise');
3. Range of file sequences to be processed ('files', e.g. [1-2]). It is important to be aware that the sequences included in this range will be considered in the final average file;
4. Averaging interval ('superaverage'), which is the rolling time period (seconds) that ping ensembles will be averaged;
5. Year of the cruise;
6. Upper and lower limits ('ref_uplim' and 'ref_lowlim') of the reference layer. For this cruise, the upper and lower limits were defined as 400 m and 600 m, respectively;
7. Misalignment angle for narrowband and broadband ('misalignment_nb' and 'misalignment_bb'), and the scaling factor for narrowband and broadband ('amplitude_nb' and 'amplitude_bb').

The SADCP operated continuously in narrowband during cruise JR17003. Therefore, the 'misalignment_nb' and 'amplitude_nb' parameters were modified only. These parameters were set as 0 and 1, respectively, in the first run of processing in order to obtain the median misalignment angle and scaling factor. This was done using sequences without bottom tracking (2-4,6-13,16,19). We obtained a median misalignment angle of 1.4154° and a scaling factor of 1.016553 taken from plot 'adcp_calib_calc.ps' found in 'PATH'. The processing script was then ran again changing 'misalignment_nb' and 'amplitude_nb' input parameters from 0 and 1, to 1.4154° and 1.016553, respectively, and using all SADCP sequences (including bottom tracking). This method was used because the MATLAB script 'OS75_JCR_jr17003.m' considers segments with bottom tracking only (if included), rather than both bottom tracking and water tracking sequences, when determining the angle and scaling factors.

More information regarding the processing steps and MATLAB scripts required for SADCP data can be found in 'jr165_adcp_report.pdf'. The MATLAB script 'OS75_JCR_jr17003.m' saves files in the format 'JR17003_xxx_000nnn.mat', similar to the raw data files, where xxx is the file sequence number, and nnn is the file number within that sequence. These created MATLAB files contain the absolute horizontal velocity (after correcting for the ship velocity), navigational information, bin depths, and reference layer information for all segments included in processing. These MATLAB files are used for creating plots, and are used for LADCP processing.

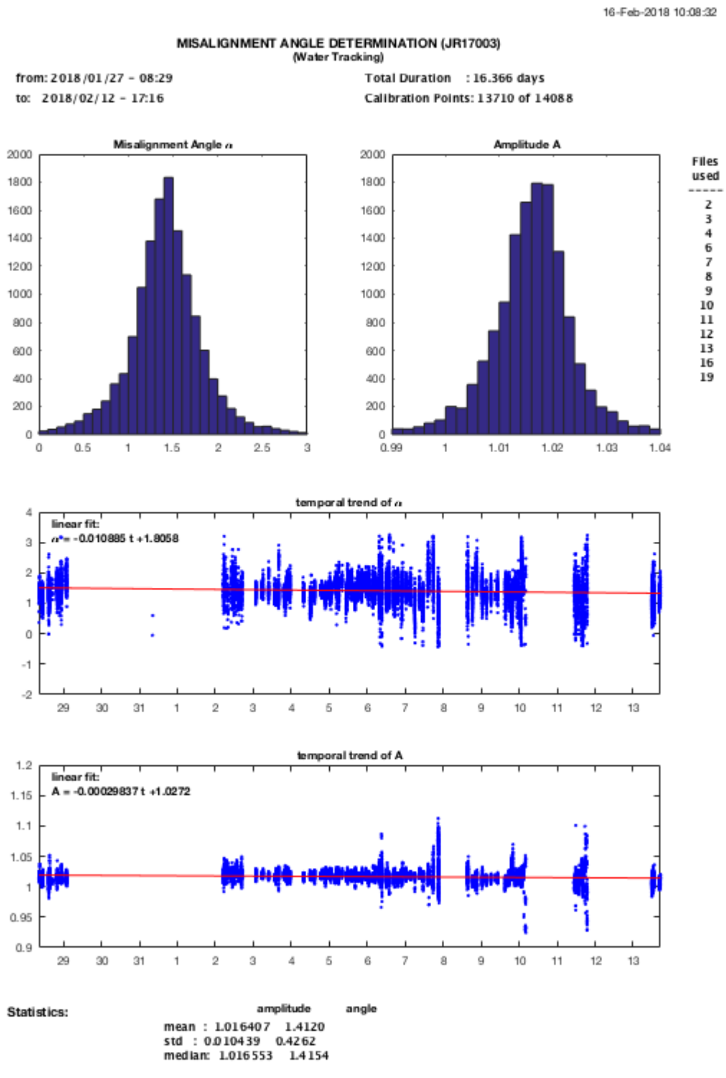

Figure 6: Distribution and time variability of misalignment angle and amplitude, before applying correction.

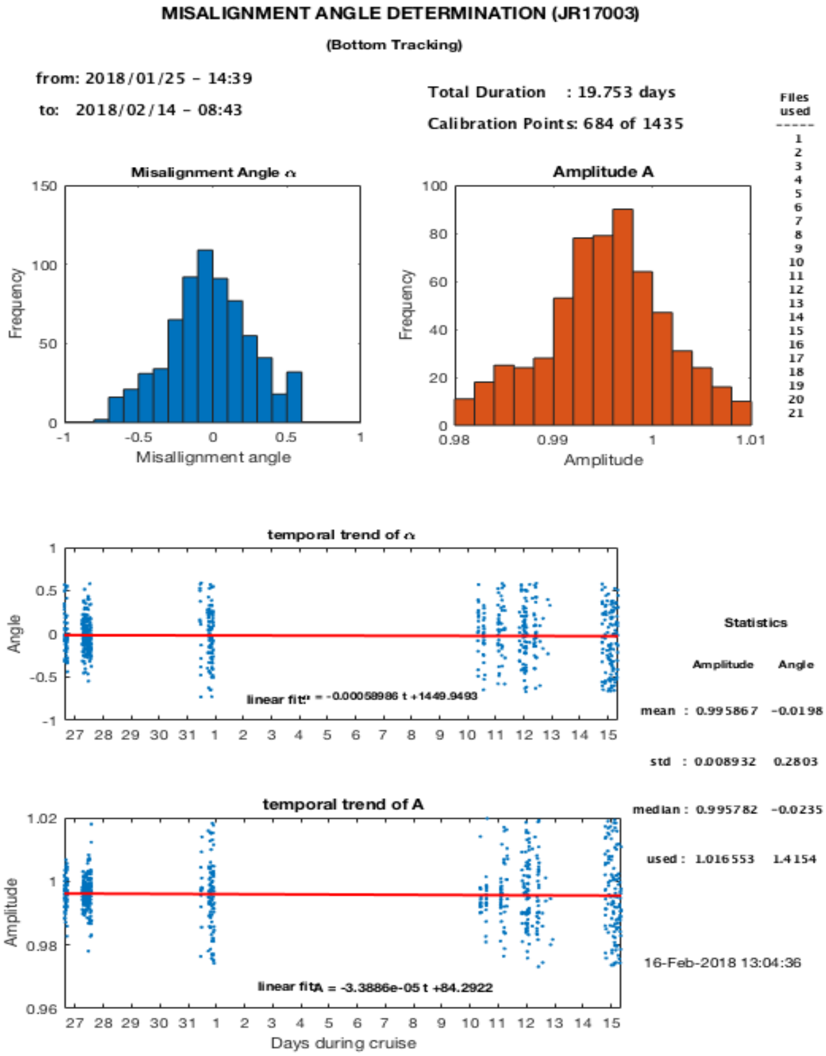

Figure 7: Misalignment angle and amplitude distributions after running the script with an initial misalignment angle of 1.4154° and an amplitude of 1.01655.

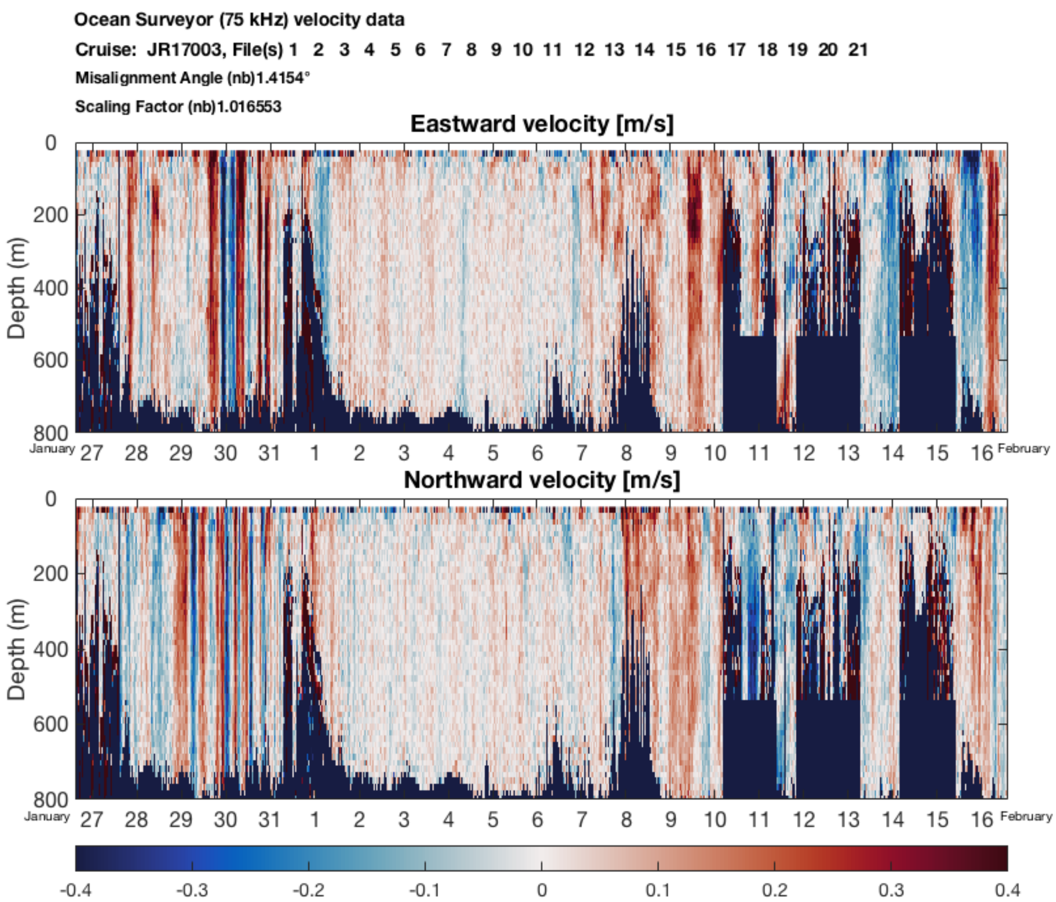

Figure 8: Eastward and northward SADCP current velocities (m/s) after correcting for the ship velocity.

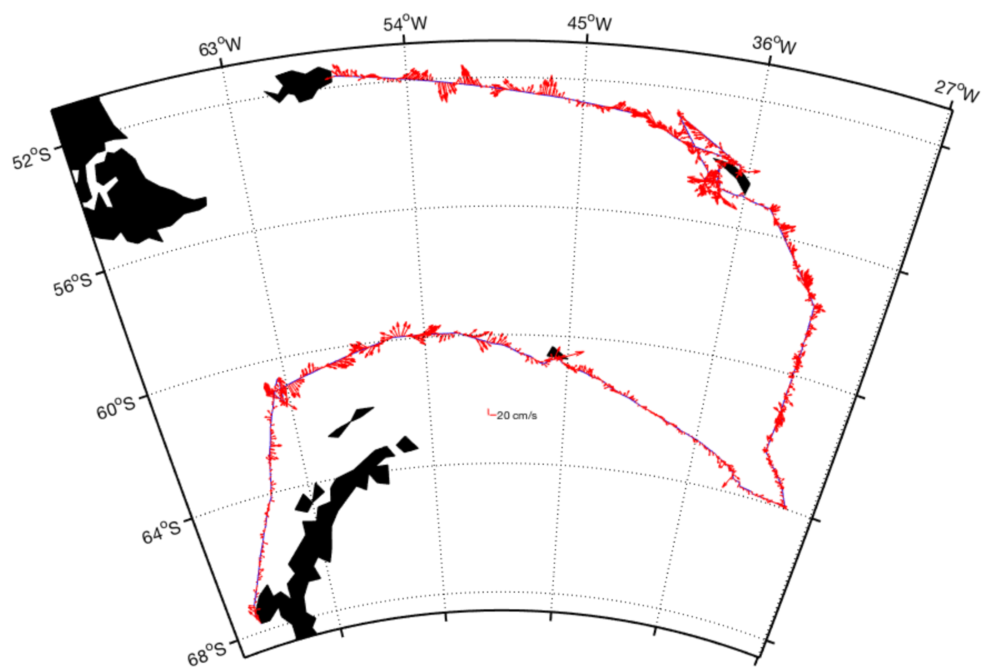

Figure 9: SADCP current direction and magnitude after correcting for the ship's velocity

Glider recoveries

Hugh Venables

Six gliders were successfully recovered during JR17003. These consisted of three Teledyne RDI Slocum G2 gliders from ORCHESTRA (two with Rockland Scientific MicroRider turbulence probes) and one Kongsberg Maritime Seaglider from the University of Gothenburg, all deployed on JR17001 in southern Drake Passage, and two Slocums from GOCART deployed in Georgia Basin on DY086, the COMICS (Controls over Ocean Mesopelagic Interior Carbon Storage) cruise to the South Georgia bloom. CTD casts were carried out after the recoveries (one each for first set, one after the second pair), with sampling for POC and Chl, with samples returned to NOCS at -80°C for analysis. Time allowed for full-depth casts on two occasions, the first three casts going to 1000 m depth to match the glider dive depth. Positions and times of the glider recoveries are given in the event log in Appendix A.

The improved internet links on the ship enabled real-time glider positions to be received much more easily than before, either through a direct connection to the Dockserver for the ORCHESTRA gliders or automated (and manual) emails for the other gliders. Gliders were opened so the data cards could be read. The turbulence data were downloaded from the MicroRiders (a process that took approximately 24 hours for each MicroRider),

All recoveries were with the net system that has been placed aboard the JCR (and Shackleton) and went very smoothly and efficiently in wind speeds up to 28 knots (though with a good sea state for that wind speed). The net was deployed using the 10-tonne crane from the aft deck, with heavy lead weights attached to each corner, and steadying lines attached to two adjacent corners, giving good control of its movement. The ship was maneuvered to bring the glider very slowly down the starboard side. The net was lowered into the water immediately before reaching the glider, and raised as soon as the glider was fully inside the net.

Figure 10: Recovery of a Slocum glider using the net.

Swath bathymetry

Povl Abrahamsen

The multi-beam sonar on the JCR, a Kongsberg Simrad EM122, was running during most of the cruise, from shortly after leaving Rothera, until the day before arriving at Stanley. During this time, data were recorded when we were not in areas already covered by BAS multibeam data holdings (e.g. the A23 section itself and much of the area between South Georgia and the Falkland Islands) The data have been split into four surveys. The first, JR17003_a covers the transit from Rothera to Signy via the glider recovery area. JR17003_b runs from Signy to the southern end of the A23 section, and a few areas along the section where the ship diverted and covered previously unswathed terrain. JR17003_c goes from the northern end of A23 to the shelf break south of King Haakon Bay. It includes two sections across the shelf break, various lines along and across the trough leading into King Haakon Bay, and goes into the bay itself, crossing the shallow sill. Some additional data were logged from King Haakon Bay to P3 and from P3 to Cumberland Bay, except where swath data had already been collected. The final survey, JR17003_d, covers the transit from KEP to Stanley, logging data only when we were outside the existing data areas. The division into surveys is shown in Figure 11.

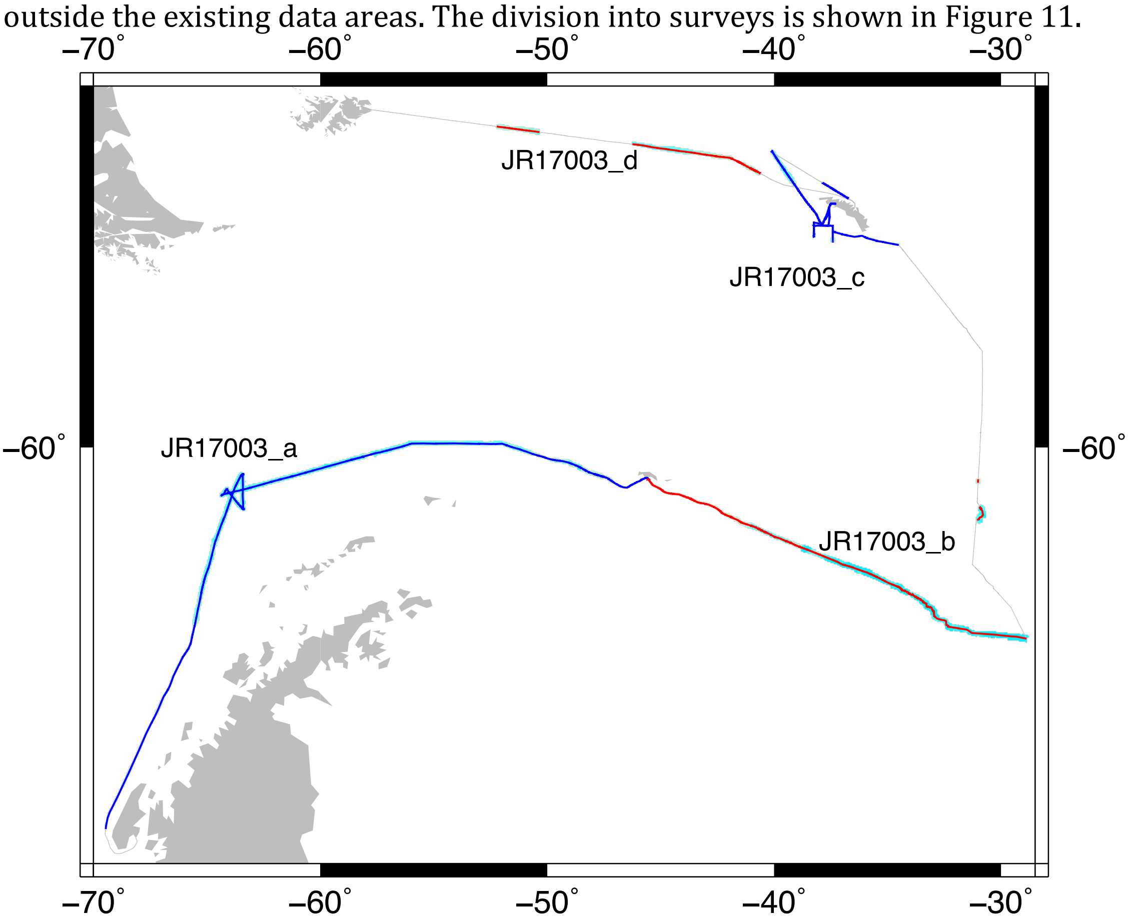

Figure 11: Overview of the swath bathymetry data from JR17003, with survey colours alternating between blue and red.

Instruments and methods

Data acquisition was performed on a Windows 7 workstation, em122, running Simrad's SIS software, version 4.1.5. The default settings, as described in the notes "Using the EM122 multibeam on an opportunistic basis", by Gwen Buys and Alex Tate, version 3.0

dated 28/4/2013, were used – with varying maximum beam angles, depending on the depth and sea state. For most of the cruise a beam angle of 65 degrees was used. CTD casts were imported regularly as sound velocity profiles, to represent local conditions. The details of the profiles used at different points in the cruise are in the table below. Before the first CTD cast, a representative XBT cast from JR84 was used.

Data from this cruise have not been cleaned and processed on board. Generally the data appear to be of good quality, though some manual cleaning will be required. During the rough weather encountered on the evening of 7-8 Feb many data were missing because of poor returns from the seabed, possibly caused by bubbles beneath the transducers.

When running the EM122, the EA600 was in passive mode, synchronised by the KSync synchronisation system.

Centre beam depths

The EM122 centre beam is used for the ship-track bathymetry. The output is found on the legdata folder under scs/Compress in .ACO format, and was also ingested into the underway navigation processing as described in an earlier chapter of this report.

Appendix A: Event log

The event numbers below are from the bridge event log. CTD times are from the processed 1-Hz data files. Glider recovery and other times are either from the bridge event log or from notes made on deck. Positions are from the Seapath GPS, with depths from the EM122 multibeam echo sounder. All depths are measured below the transducer (with a draft of roughly 6 m).

Event no.	Event (WPT)	Time (UTC)	Position	Water Depth	Description/notes
1	Glider 632 recovery	28/01/2018 09:13 28/01/2018 09:29 28/01/2018 09:32	60° 35.101'S 063° 24.990'W 60° 34.832'S 063° 25.342'W 60° 34.831'S 063° 22.327'W	3714 3724 3727	Glider 632 sighted Glider in net Glider on deck
2	CTD 1	28/01/2018 09:55:07 28/01/2018 10:00:47 28/01/2018 10:19:48 28/01/2018 10:52:53	60° 34.831'S 063° 25.326'W 60° 34.831'S 063° 25.325'W 60° 34.831'S 063° 25.326'W 60° 34.830'S 063° 25.327'W	3726 3730 3729 3726	Logging started Downcast started Bottom (1000 m) End of upcast
3	Glider 640 recovery	28/01/2018 15:29 28/01/2018 15:44 28/01/2018 15:47	61° 19.564'S 063° 25.929'W 61° 19.470'S 063° 25.915'W 61° 19.483'S 063° 25.880'W	3550 3553 3552	Glider 640 sighted Glider in net Glider on deck
4	CTD 2	28/01/2018 16:05:57 28/01/2018 16:13:32 28/01/2018 16:33:20 28/01/2018 16:58:30	61° 19.481'S 063° 25.877'W 61° 19.480'S 063° 25.877'W 61° 19.481'S 063° 25.878'W 61° 19.480'S 063° 25.880'W	3555 3554 3551 3560	Logging started Downcast started Bottom (1000 m) End of upcast
5	Glider 330 recovery	28/01/2018 20:06 28/01/2018 20:31 28/01/2018 20:33	60° 54.641'S 064° 06.797'W 60° 54.301'S 064° 07.225'W 60° 54.340'S 064° 07.189'W	3697 3667 3673	Glider 330 sighted Glider in net Glider on deck
6	CTD 3	28/01/2018 20:50:33 28/01/2018 20:55:31 28/01/2018 21:14:17 28/01/2018 21:38:52	60° 54.350'S 064° 07.171'W 60° 54.350'S 064° 07.172'W 60° 54.350'S 064° 07.174'W 60° 54.349'S 064° 07.176'W	3667 3670 3669 3669	Logging started Downcast started Bottom (1000 m) End of upcast

Event no.	Event (WPT)	Time (UTC)	Position	Water Depth	Description/notes
7	Glider 633 recovery	28/01/2018 22:48	61° 02.557'S 064° 19.897'W	3550	Glider 633 sighted
		28/01/2018 23:05	61° 02.284'S 064° 20.534'W	3481	Glider in net
		28/01/2018 23:08	61° 02.254'S 064° 20.531'W	3477	Glider on deck
8	CTD 4	28/01/2018 23:32:07	61° 02.255'S 064° 20.532'W	3476	Logging started
		28/01/2018 23:35:09	61° 02.257'S 064° 20.531'W	3444	Downcast started
		29/01/2018 00:35:39	61° 02.257'S 064° 20.531'W	3462	Bottom
		29/01/2018 01:54:10	61° 02.257'S 064° 20.533'W	3450	End of upcast
No event no.	CTD 5_01	31/01/2018 12:11:09	60° 42.772'S 045° 29.671'W	275	Logging started
		31/01/2018 12:16:29	60° 42.768'S 045° 29.671'W	276	Downcast Started
		31/01/2018 12:22:57	60° 42.769'S 045° 29.672'W	277	Bottom
		31/01/2018 12:29:35	60° 42.769'S 045° 29.670'W	276	End of upcast
No event no.	CTD 5_02	31/01/2018 12:30:30	60° 42.772'S 045° 29.671'W	275	Logging started
		31/01/2018 12:31:53	60° 42.770'S 045° 29.669'W	275	Downcast Started
		31/01/2018 12:39:31	60° 42.770'S 045° 29.669'W	275	Bottom
		31/01/2018 12:47:01	60° 42.772'S 045° 29.671'W	275	End of upcast
9	CTD 6 (A23-24)	03/02/2018 02:07:56	63° 57.928'S 028° 52.660'W	4810	Logging started
		03/02/2018 02:12:25	63° 57.930'S 028° 52.630'W	4816	Downcast started
		03/02/2018 03:32:46	63° 57.931'S 028° 52.636'W	4807	Bottom
		03/02/2018 05:58:32	63° 57.932'S 028° 52.634'W	4829	End of upcast
10	CTD 7 (A23-25)	03/02/2018 10:07:03	63° 20.795'S 029° 34.141'W	4739	Logging started
		03/02/2018 10:11:50	63° 20.795'S 029° 34.144'W	4745	Downcast started
		03/02/2018 11:39:29	63° 20.795'S 029° 34.140'W	4756	Bottom
		03/02/2018 14:04:45	63° 20.794'S 029° 34.141'W	4750	End of upcast
11	CTD 8 (A23-26)	03/02/2018 16:25:10	63° 04.362'S 030° 06.906'W	4894	Logging started
		03/02/2018 16:30:45	63° 04.363'S 030° 06.906'W	4891	Downcast started
		03/02/2018 17:55:08	63° 04.363'S 030° 06.906'W	4887	Bottom
		03/02/2018 19:55:50	63° 04.364'S 030° 06.907'W	4897	End of upcast

Event no.	Event (WPT)	Time (UTC)	Position	Water Depth	Description/notes
12	CTD 9	03/02/2018 23:53:05	62° 47.064'S 030° 42.014'W	4844	Logging started
	(A23-27)	03/02/2018 23:58:04	62° 47.065'S 030° 42.014'W	4846	Downcast started
		04/02/2018 01:19:12	62° 47.064'S 030° 42.044'W	4844	Bottom
		04/02/2018 03:15:33	62° 47.042'S 030° 42.041'W	4839	End of upcast
13	CTD 10	04/02/2018 08:17:23	62° 29.426'S 031° 15.730'W	4793	Logging started
	(A23-28)	04/02/2018 08:22:04	62° 29.426'S 031° 15.728'W	4788	Downcast started
		04/02/2018 09:41:11	62° 29.426'S 031° 15.730'W	4794	Bottom
		04/02/2018 12:27:45	62° 29.422'S 031° 15.727'W	4789	End of upcast
14	CTD 11	04/02/2018 15:41:03	62° 04.518'S 031° 11.002'W	4866	Logging started
	(A23-29)	04/02/2018 15:46:37	62° 04.518'S 031° 11.002'W	4877	Downcast started
		04/02/2018 17:12:14	62° 04.518'S 031° 11.003'W	4862	Bottom
		04/02/2018 19:23:32	62° 04.518'S 031° 11.004'W	4873	End of upcast
15	CTD 12	04/02/2018 22:00:47	61° 39.677'S 031° 06.638'W	3408	Logging started
	(A23-30)	04/02/2018 22:04:41	61° 39.677'S 031° 06.637'W	3402	Downcast started
		04/02/2018 23:03:28	61° 39.677'S 031° 06.636'W	3408	Bottom
		05/02/2018 00:14:10	61° 39.678'S 031° 06.638'W	3552	End of upcast
16	CTD 13	05/02/2018 01:22:18	61° 33.161'S 031° 05.608'W	4162	Logging started
	(A23-31)	05/02/2018 01:26:49	61° 33.160'S 031° 05.606'W	4161	Downcast started
		05/02/2018 02:42:12	61° 33.589'S 031° 04.954'W	4256	Bottom
		05/02/2018 04:18:22	61° 34.139'S 031° 03.980'W	4284	End of upcast
17	CTD 14	05/02/2018 08:40:06	61° 10.289'S 031° 02.824'W	3473	Logging started
	(A23-32)	05/02/2018 08:43:57	61° 10.289'S 031° 02.824'W	3469	Downcast started
		05/02/2018 09:42:47	61° 10.286'S 031° 02.824'W	3470	Bottom
		05/02/2018 11:17:57	61° 10.288'S 031° 02.826'W	3479	End of upcast
18	CTD 15	05/02/2018 12:10:39	61° 06.612'S 031° 02.580'W	2615	Logging started
	(A23-33)	05/02/2018 12:16:39	61° 06.604'S 031° 02.564'W	2560	Downcast started
		05/02/2018 13:02:39	61° 06.566'S 031° 02.478'W	2574	Bottom
		05/02/2018 14:06:48	61° 06.566'S 031° 02.480'W	2588	End of upcast

Event no.	Event (WPT)	Time (UTC)	Position	Water Depth	Description/notes
19	CTD 16 (A23-34)	05/02/2018 17:09:51	60° 41.988'S 031° 00.568'W	1617	Logging started
		05/02/2018 17:14:28	60° 41.988'S 031° 00.569'W	1622	Downcast started
		05/02/2018 17:44:43	60° 41.988'S 031° 00.566'W	1620	Bottom
		05/02/2018 18:35:03	60° 41.988'S 031° 00.569'W	1622	End of upcast
20	CTD 17 (A23-35)	05/02/2018 21:06:42	60° 18.900'S 030° 57.431'W	2697	Logging started
		05/02/2018 21:11:04	60° 18.900'S 030° 57.428'W	2703	Downcast started
		05/02/2018 21:56:59	60° 18.900'S 030° 57.431'W	2718	Bottom
		05/02/2018 22:56:21	60° 18.901'S 030° 57.431'W	2714	End of upcast
21	CTD 18 (A23-36)	06/02/2018 01:15:27	59° 59.638'S 030° 55.661'W	2997	Logging started
		06/02/2018 01:19:29	59° 59.645'S 030° 55.684'W	2996	Downcast started
		06/02/2018 02:09:52	59° 59.683'S 030° 55.802'W	2996	Bottom
		06/02/2018 03:30:56	59° 59.683'S 030° 55.802'W	2994	End of upcast
22	CTD 19 (A23-37)	06/02/2018 05:27:25	59° 45.955'S 030° 54.335'W	3798	Logging started
		06/02/2018 05:31:08	59° 45.959'S 030° 54.330'W	3795	Downcast started
		06/02/2018 06:37:52	59° 45.956'S 030° 54.326'W	3795	Bottom
		06/02/2018 08:05:44	59° 45.955'S 030° 54.330'W	3795	End of upcast
23	CTD 20 (A23-38)	06/02/2018 10:05:05	59° 40.450'S 030° 53.887'W	-	Logging started
		06/02/2018 10:10:06	59° 40.447'S 030° 53.890'W	-	Downcast started
		06/02/2018 11:01:49	59° 40.451'S 030° 53.892'W	2884	Bottom
		06/02/2018 12:11:25	59° 40.447'S 030° 53.892'W	2886	End of upcast
24	CTD 21 (A23-39)	06/02/2018 14:29:07	59° 26.124'S 030° 51.613'W	3444	Logging started
		06/02/2018 14:36:42	59° 26.122'S 030° 51.626'W	3451	Downcast started
		06/02/2018 15:44:55	59° 26.124'S 030° 51.619'W	3446	Bottom
		06/02/2018 17:14:52	59° 26.122'S 030° 51.628'W	3464	End of upcast
25	CTD 22 (A23-40)	06/02/2018 19:48:09	59° 02.998'S 030° 49.813'W	3119	Logging started
		06/02/2018 19:55:42	59° 02.996'S 030° 49.817'W	3118	Downcast started
		06/02/2018 20:57:47	59° 02.995'S 030° 49.825'W	3117	Bottom
		06/02/2018 22:10:20	59° 02.998'S 030° 49.822'W	3119	End of upcast

Event no.	Event (WPT)	Time (UTC)	Position	Water Depth	Description/notes
26	CTD 23 (A23-41)	07/02/2018 00:53:46	58° 38.123'S 030° 49.426'W	3539	Logging started
		07/02/2018 00:58:12	58° 38.124'S 030° 49.426'W	3531	Downcast started
		07/02/2018 01:56:54	58° 38.124'S 030° 49.422'W	3533	Bottom
		07/02/2018 03:28:06	58° 38.123'S 030° 49.426'W	3533	End of upcast
27	CTD 24 (A23-42)	07/02/2018 06:27:35	58° 12.773'S 030° 49.308'W	3992	Logging started
		07/02/2018 06:31:09	58° 12.775'S 030° 49.318'W	3990	Downcast started
		07/02/2018 07:38:38	58° 12.776'S 030° 49.319'W	3990	Bottom
		07/02/2018 08:55:52	58° 12.776'S 030° 49.316'W	3993	End of upcast
28	CTD 25 (A23-43)	07/02/2018 11:39:00	57° 48.110'S 030° 49.832'W	3570	Logging started
		07/02/2018 11:45:27	57° 48.106'S 030° 49.852'W	3587	Downcast started
		07/02/2018 12:49:07	57° 48.086'S 030° 49.955'W	3584	Bottom
		07/02/2018 14:43:21	57° 48.088'S 030° 49.955'W	3589	End of upcast
29	CTD 26 (A23-44)	07/02/2018 18:18:43	57° 27.449'S 031° 19.374'W	3909	Logging started
		07/02/2018 18:25:37	57° 27.448'S 031° 19.378'W	3828	Downcast started
		07/02/2018 19:39:44	57° 27.451'S 031° 19.376'W	3894	Bottom
		07/02/2018 21:08:44	57° 27.450'S 031° 19.374'W	3833	End of upcast
30	CTD 27 (A23-45)	08/02/2018 12:57:38	57° 07.090'S 031° 48.821'W	3429	Logging started
		08/02/2018 13:04:42	57° 07.090'S 031° 48.820'W	3444	Downcast started
		08/02/2018 14:06:16	57° 07.092'S 031° 48.827'W	3437	Bottom
		08/02/2018 15:37:00	57° 07.091'S 031° 48.822'W	3532	End of upcast
31	CTD 28 (A23-46)	08/02/2018 18:55:28	56° 46.540'S 032° 18.250'W	3227	Logging started
		08/02/2018 19:04:13	56° 46.542'S 032° 18.248'W	3227	Downcast started
		08/02/2018 20:03:17	56° 46.543'S 032° 18.250'W	3225	Bottom
		08/02/2018 21:12:03	56° 46.540'S 032° 18.247'W	3228	End of upcast
32	CTD 29 (A23-47)	09/02/2018 01:01:52	56° 22.865'S 032° 52.290'W	3131	Logging started
		09/02/2018 01:05:46	56° 22.864'S 032° 52.313'W	3131	Downcast started
		09/02/2018 01:59:45	56° 22.864'S 032° 52.368'W	3129	Bottom
		09/02/2018 03:11:44	56° 22.864'S 032° 52.368'W	3133	End of upcast

Event no.	Event (WPT)	Time (UTC)	Position	Water Depth	Description/notes
33	CTD 30 (A23-48)	09/02/2018 06:33:06	55° 59.358'S 033° 25.235'W	3012	Logging started
		09/02/2018 06:36:42	55° 59.365'S 033° 25.225'W	3028	Downcast started
		09/02/2018 07:28:16	55° 59.419'S 033° 25.169'W	3050	Bottom
		09/02/2018 08:30:16	55° 59.420'S 033° 25.168'W	3045	End of upcast
34	CTD 31 (A23-49)	09/02/2018 12:57:44	55° 43.510'S 033° 47.156'W	3515	Logging started
		09/02/2018 13:03:01	55° 43.510'S 033° 47.158'W	3471	Downcast started
		09/02/2018 14:05:48	55° 43.511'S 033° 47.160'W	3474	Bottom
		09/02/2018 15:40:50	55° 43.510'S 033° 47.159'W	3495	End of upcast
35	CTD 32 (A23-50)	09/02/2018 17:52:33	55° 29.053'S 034° 08.027'W	2450	Logging started
		09/02/2018 17:58:26	55° 29.052'S 034° 08.024'W	2447	Downcast started
		09/02/2018 18:45:10	55° 29.050'S 034° 08.030'W	2446	Bottom
		09/02/2018 19:49:36	55° 29.053'S 034° 08.030'W	2442	End of upcast
36	CTD 33 (A23-50A)	09/02/2018 21:49:51	55° 17.369'S 034° 23.982'W	2074	Logging started
		09/02/2018 21:54:06	55° 17.369'S 034° 23.983'W	2073	Downcast started
		09/02/2018 22:29:37	55° 17.369'S 034° 23.982'W	2075	Bottom
		09/02/2018 23:26:09	55° 17.369'S 034° 23.982'W	2073	End of upcast
37	CTD 34 (A23-51)	10/02/2018 00:16:43	55° 15.583'S 034° 26.597'W	1506	Logging started
		10/02/2018 00:20:19	55° 15.580'S 034° 26.617'W	1505	Downcast started
		10/02/2018 00:47:27	55° 15.577'S 034° 26.620'W	1504	Bottom
		10/02/2018 01:20:24	55° 15.577'S 034° 26.620'W	1504	End of upcast
38	CTD 35 (A23-51A)	10/02/2018 01:59:06	55° 13.807'S 034° 29.393'W	1022	Logging started
		10/02/2018 02:02:59	55° 13.806'S 034° 29.393'W	1021	Downcast started
		10/02/2018 02:21:10	55° 13.806'S 034° 29.392'W	1023	Bottom
		10/02/2018 02:48:31	55° 13.806'S 034° 29.394'W	1021	End of upcast
39	CTD 36 (A23-52)	10/02/2018 03:30:20	55° 12.912'S 034° 30.475'W	549	Logging started
		10/02/2018 03:34:10	55° 12.914'S 034° 30.480'W	549	Downcast started
		10/02/2018 03:45:13	55° 12.911'S 034° 30.475'W	549	Bottom
		10/02/2018 04:03:27	55° 12.913'S 034° 30.476'W	549	End of upcast

Event no.	Event (WPT)	Time (UTC)	Position	Water Depth	Description/notes
40	Swath (SG1)	10/02/2018 13:18 10/02/2018 14:48	54° 53.167'S 037° 24.935'W 55° 07.066'S 037° 24.994'W	221 2547	Start of swath survey End of swath survey
41	CTD 37 (SG1_1)	10/02/2018 15:22:36 10/02/2018 15:28:25 10/02/2018 16:13:31 10/02/2018 17:12:14	55° 06.596'S 037° 24.973'W 55° 06.598'S 037° 24.974'W 55° 06.594'S 037° 24.972'W 55° 06.596'S 037° 24.976'W	2496 2494 2495 2497	Logging started Downcast started Bottom End of upcast
42	CTD 38 (SG1_2)	10/02/2018 18:04:45 10/02/2018 18:12:47 10/02/2018 18:48:51 10/02/2018 19:39:43	55° 03.844'S 037° 24.991'W 55° 03.844'S 037° 24.992'W 55° 03.844'S 037° 24.991'W 55° 03.846'S 037° 24.991'W	2002 2001 2002 2005	Logging started Downcast started Bottom End of upcast
43	CTD 39 (SG1_3)	10/02/2018 20:15:06 10/02/2018 20:20:26 10/02/2018 20:54:37 10/02/2018 21:26:12	55° 02.707'S 037° 25.006'W 55° 02.724'S 037° 25.009'W 55° 02.723'S 037° 25.008'W 55° 02.722'S 037° 25.008'W	1498 1510 1508 1510	Logging started Downcast started Bottom End of upcast
44	CTD 40 (SG1_4)	10/02/2018 21:54:02 10/02/2018 21:58:27 10/02/2018 22:17:28 10/02/2018 22:39:12	55° 02.201'S 037° 25.001'W 55° 02.201'S 037° 25.001'W 55° 02.202'S 037° 25.000'W 55° 02.201'S 037° 25.000'W	995 955 983 1002	Logging started Downcast started Bottom End of upcast
45	CTD 41 (SG1_5)	10/02/2018 23:18:21 10/02/2018 23:22:13 10/02/2018 23:32:50 10/02/2018 23:47:08	55° 00.898'S 037° 24.992'W 55° 00.898'S 037° 24.994'W 55° 00.898'S 037° 24.992'W 55° 00.899'S 037° 24.990'W	511 512 511 512	Logging started Downcast started Bottom End of upcast
46	CTD 42 (SG1_6)	11/02/2018 00:13:43 11/02/2018 00:17:18 11/02/2018 00:23:22 11/02/2018 00:30:14	54° 59.809'S 037° 24.995'W 54° 59.809'S 037° 24.995'W 54° 59.810'S 037° 24.997'W 54° 59.809'S 037° 24.996'W	243 243 245 244	Logging started Downcast started Bottom End of upcast

Event no.	Event (WPT)	Time (UTC)	Position	Water Depth	Description/notes
47	CTD 43 (SG1_7)	11/02/2018 01:21:05	54° 54.809'S 037° 24.986'W	236	Logging started
		11/02/2018 01:24:39	54° 54.810'S 037° 24.988'W	235	Downcast started
		11/02/2018 01:29:57	54° 54.810'S 037° 24.986'W	237	Bottom
		11/02/2018 01:37:09	54° 54.810'S 037° 24.988'W	237	End of upcast
48	Swath (SG2)	11/02/2018 03:00	54° 43.714'S 037° 26.494'W	193	Start of swath survey (slowly, rough weather)
		11/02/2018 08:45	55° 00.159'S 038° 14.938'W	3417	End of swath survey
49	CTD 44 (SG2_1)	11/02/2018 09:24:00	54° 58.346'S 038° 15.072'W	2578	Logging started
		11/02/2018 09:30:03	54° 58.346'S 038° 15.073'W	2577	Downcast started
		11/02/2018 10:20:15	54° 58.349'S 038° 15.074'W	2576	Bottom
		11/02/2018 11:24:35	54° 58.348'S 038° 15.073'W	2572	End of upcast
50	CTD 45 (SG2_2)	11/02/2018 12:02:06	54° 57.060'S 038° 14.980'W	2017	Logging started
		11/02/2018 12:07:41	54° 57.060'S 038° 14.996'W	2018	Downcast started
		11/02/2018 12:46:49	54° 57.056'S 038° 14.995'W	2017	Bottom
		11/02/2018 13:34:01	54° 57.060'S 038° 14.999'W	2020	End of upcast
51	CTD 46 (SG2_3)	11/02/2018 14:45:35	54° 55.655'S 038° 14.998'W	1499	Logging started
		11/02/2018 14:51:12	54° 55.655'S 038° 14.998'W	1489	Downcast started
		11/02/2018 15:21:03	54° 55.654'S 038° 14.996'W	1500	Bottom
		11/02/2018 15:58:58	54° 55.650'S 038° 14.998'W	1495	End of upcast
52	CTD 47 (SG2_4)	11/02/2018 16:29:02	54° 54.376'S 038° 14.966'W	1025	Logging started
		11/02/2018 16:36:00	54° 54.373'S 038° 14.969'W	1009	Downcast started
		11/02/2018 16:57:17	54° 54.374'S 038° 14.969'W	995	Bottom
		11/02/2018 17:25:21	54° 54.374'S 038° 14.969'W	1025	End of upcast
53	CTD 48 (SG2_5)	11/02/2018 17:58:31	54° 53.699'S 038° 14.999'W	515	Logging started
		11/02/2018 18:04:08	54° 53.698'S 038° 15.000'W	521	Downcast started
		11/02/2018 18:17:00	54° 53.695'S 038° 14.998'W	517	Bottom
		11/02/2018 18:31:58	54° 53.693'S 038° 15.001'W	519	End of upcast

Event no.	Event (WPT)	Time (UTC)	Position	Water Depth	Description/notes
54	CTD 49	11/02/2018 19:28:02	54° 50.152'S 038° 14.999'W	278	Logging started
	(SG2_6)	11/02/2018 19:32:44	54° 50.149'S 038° 14.998'W	278	Downcast started
		11/02/2018 19:42:29	54° 50.150'S 038° 14.996'W	278	Bottom
		11/02/2018 19:52:52	54° 50.153'S 038° 14.995'W	279	End of upcast
55	CTD 50	11/02/2018 21:01:44	54° 43.652'S 038° 14.980'W	252	Logging started
	(SG2_7)	11/02/2018 21:05:22	54° 43.654'S 038° 14.977'W	253	Downcast started
		11/02/2018 21:12:42	54° 43.651'S 038° 14.974'W	251	Bottom
		11/02/2018 21:20:16	54° 43.655'S 038° 14.980'W	252	End of upcast
56	CTD 51	11/02/2018 22:43:03	54° 38.671'S 038° 14.999'W	163	Logging started
	(SG2_8)	11/02/2018 22:45:48	54° 38.672'S 038° 15.000'W	165	Downcast started
		11/02/2018 22:49:52	54° 38.674'S 038° 14.996'W	163	Bottom
		11/02/2018 22:56:55	54° 38.674'S 038° 15.004'W	165	End of upcast
57	(SG3_1)	12/02/2018 07:30	54° 33.645'S 037° 45.929'W	290	Ship on DP, assessing weather
		12/02/2018 08:18	54° 33.650'S 037° 45.950'W	290	Ship off DP, CTD not deployed
58	CTD 52	12/02/2018 11:15:54	54° 11.590'S 037° 31.968'W	187	Logging started
	(SG4_5)	12/02/2018 11:21:39	54° 11.590'S 037° 31.964'W	181	Downcast started
		12/02/2018 11:28:53	54° 11.591'S 037° 31.967'W	186	Bottom
		12/02/2018 11:38:34	54° 11.590'S 037° 31.964'W	182	End of upcast
59	CTD 53	12/02/2018 12:15:25	54° 09.359'S 037° 28.516'W	112	Logging started
	(SG4_6)	12/02/2018 12:20:56	54° 09.353'S 037° 28.519'W	112	Downcast started
		12/02/2018 12:26:30	54° 09.353'S 037° 28.520'W	111	Bottom
		12/02/2018 12:34:41	54° 09.350'S 037° 28.519'W	112	End of upcast
60	CTD 54	12/02/2018 13:08:59	54° 09.554'S 037° 23.669'W	150	Logging started
	(SG4_7)	12/02/2018 13:13:09	54° 09.554'S 037° 23.669'W	150	Downcast started
		12/02/2018 13:18:54	54° 09.558'S 037° 23.670'W	151	Bottom
		12/02/2018 13:28:50	54° 09.557'S 037° 23.669'W	152	End of upcast

Event no.	Event (WPT)	Time (UTC)	Position	Water Depth	Description/notes
61	CTD 55 (SG4_8)	12/02/2018 14:08:20	54° 09.391'S 037° 18.616'W	105	Logging started
		12/02/2018 14:12:53	54° 09.391'S 037° 18.613'W	103	Downcast started
		12/02/2018 14:18:17	54° 09.392'S 037° 18.612'W	102	Bottom
		12/02/2018 14:29:47	54° 09.391'S 037° 18.613'W	103	End of upcast
62	CTD 56 (SG3_6.5)	12/02/2018 20:00:00	54° 43.678'S 037° 37.475'W	236	Logging started
		12/02/2018 20:05:08	54° 43.676'S 037° 37.478'W	238	Downcast started
		12/02/2018 20:12:30	54° 43.676'S 037° 37.476'W	237	Bottom
		12/02/2018 20:19:23	54° 43.678'S 037° 37.482'W	236	End of upcast
63	CTD 57 (SG3_5)	12/02/2018 20:46:40	54° 43.670'S 037° 40.936'W	310	Logging started
		12/02/2018 20:50:41	54° 43.679'S 037° 40.954'W	310	Downcast started
		12/02/2018 20:59:00	54° 43.678'S 037° 40.952'W	312	Bottom
		12/02/2018 21:08:06	54° 43.678'S 037° 40.954'W	311	End of upcast
64	CTD 58 (SG3_3)	12/02/2018 21:41:53	54° 43.684'S 037° 46.788'W	249	Logging started
		12/02/2018 21:46:53	54° 43.686'S 037° 46.787'W	250	Downcast started
		12/02/2018 21:53:16	54° 43.685'S 037° 46.789'W	249	Bottom
		12/02/2018 22:02:47	54° 43.686'S 037° 46.789'W	250	End of upcast
65	CTD 59 (SG3_1)	12/02/2018 22:32:34	54° 43.678'S 037° 51.568'W	201	Logging started
		12/02/2018 22:37:33	54° 43.676'S 037° 51.596'W	197	Downcast started
		12/02/2018 22:43:31	54° 43.676'S 037° 51.600'W	197	Bottom
		12/02/2018 22:51:10	54° 43.675'S 037° 51.605'W	197	End of upcast
66	Glider 398 recovery	13/02/2018 12:05	52° 46.267'S 040° 06.737'W	3757	Glider 398 ("Churchill") sighted
		13/02/2018 12:22	52° 45.901'S 040° 07.189'W	3758	Glider in net
		13/02/2018 12:24	52° 45.896'S 040° 07.189'W	3764	Glider on deck
67	Glider 404 recovery	13/02/2018 13:00?	52° 47.800'S 040° 08.957'W	3756	Glider 404 ("Pancake") sighted
		13/02/2018 13:14	52° 47.754'S 040° 08.877'W	3764	Glider in net
		13/02/2018 13:15	52° 47.754'S 040° 08.877'W	3764	Glider on deck

Event no.	Event (WPT)	Time (UTC)	Position	Water Depth	Description/notes
68	CTD 60	13/02/2018 13:43:35	52° 46.907'S 040° 09.545'W	3759	Logging started
		13/02/2018 13:50:14	52° 46.906'S 040° 09.546'W	3755	Downcast started
		13/02/2018 14:57:41	52° 46.906'S 040° 09.547'W	3760	Bottom
		13/02/2018 16:29:35	52° 46.902'S 040° 09.545'W	3762	End of upcast

Appendix B: SADCP log

Seq.	$PADCP times	Files	Configuration	Comments
1	26/01/2018 14:29:50.89 27/01/2018 14:07:26.45	JR17003_001_00000-2.ENR JR17003_001_00000-1.N1R	BT on; 800m range	
2	27/01/2018 14:08:28.48 28/01/2018 17:09:59.52	JR17003_002_00000-5.ENR JR17003_002_00000-1.N1R	BT off; 800m range	
3	28/01/2018 17:10:19.24 29/01/2018 21:34:00.63	JR17003_003_00000-5.ENR JR17003_003_00000-2.N1R		
4	29/01/2018 21:34:19.03 30/01/2018 09:53:18.30	JR17003_004_00000-7.ENR JR17003_004_00000-2.N1R		
5	30/01/2018 09:54:08.66 01/02/2018 04:53:41.75	JR17003_005_00000-2.ENR JR17003_005_00000-1.N1R	BT on; 800m range	Near Signy Island
6	01/02/2018 04:54:49.97 02/02/2018 17:11:36.31	JR17003_006_00000-7.ENR JR17003_006_00000-2.N1R	BT off; 800m range	
7	02/02/2018 17:12:12.82 04/02/2018 03:29:33.99	JR17003_007_00000-6.ENR JR17003_007_00000-2.N1R		Start of A23 section
8	04/02/2018 03:29:36.42 05/02/2018 03:22:24.39	JR17003_008_00000-4.ENR JR17003_008_00000-1.N1R		
9	05/02/2018 03:22:37.11 06/02/2018 04:11:08.37	JR17003_009_00000-4.ENR JR17003_009_00000-1.N1R		
10	06/02/2018 04:11:16.19 07/02/2018 04:07:18.72	JR17003_010_00000-4.ENR JR17003_010_00000-1.N1R		
11	07/02/2018 04:07:27.39 08/02/2018 03:04:59.10	JR17003_011_00000-4.ENR JR17003_011_00000-1.N1R		
12	08/02/2018 03:05:07.89 09/02/2018 03:52:50.57	JR17003_012_00000-4.ENR JR17003_012_00000-1.N1R		
13	09/02/2018 03:52:59.96 10/02/2018 04:29:31.23	JR17003_013_00000-4.ENR JR17003_013_00000-1.N1R		End of A23 section
14	10/02/2018 04:30:07.18 11/02/2018 03:38:57.42	JR17003_014_00000-3.ENR JR17003_014_00000-1.N1R	BT on; 500m range	
15	11/02/2018 03:39:05.86 11/02/2018 09:21:12.56	JR17003_015_000000.ENR JR17003_015_000000.N1R		
16	11/02/2018 09:21:37.79 11/02/2018 19:53:06.74	JR17003_016_00000-2.ENR JR17003_016_000000.N1R	BT off; 800m range	

Seq.	$PADCP times	Files	Configuration	Comments
17	11/02/2018 19:53:54.73 12/02/2018 05:26:25.31	JR17003_017_00000-1.ENR JR17003_017_000000.N1R	BT on; 500m range	
18	12/02/2018 05:26:36.94 13/02/2018 06:35:53.02	JR17003_018_00000-3.ENR JR17003_018_00000-1.N1R		
19	13/02/2018 06:37:21.47 14/02/2018 03:33:13.14	JR17003_019_00000-4.ENR JR17003_019_00000-1.N1R	BT off; 800m range	
20	14/02/2018 03:34:11.11 15/02/2018 09:42:00.53	JR17003_020_00000-4.ENR JR17003_020_00000-2.N1R	BT on; 500m range	
21	15/02/2018 09:42:24.72 16/02/2018 14:29:23.34	JR17003_021_00000-5.ENR JR17003_021_00000-2.N1R	BT off; 800m range	
22	16/02/2018 14:29:33.44 17/02/2018 14:42:30.92	JR17003_022_00000-4.ENR JR17003_022_00000-1.N1R		
23	17/02/2018 14:42:38.36 18/02/2018 09:51:21.11	JR17003_023_00000-3.ENR JR17003_023_00000-1.N1R		On shelf and close to Falklands. ADCP switched off 09:52

Appendix C: Swath log

The table below summarises when swath data were collected and which speed of sound profiles were used. When data were not being collected, cells are shaded in grey. All dates and times are UTC.

Survey	Note	Lines	Date	Time	XBT/CTD for SVP	file name	Location/ station
			26/1	16:17	EM122 switched on		
JR17003_a		0 2	26/1 26/1	16:18 16:53	Unknown		
	1 2	3 34	26/1 28/1	17:30 00:41	JR84 XBT event 9	JR84_9	
		35 43	28/1 28/1	00:45 09:01	JR84 XBT event 9	JR84_9	 1
		44 47	28/1 28/1	11:01 14:53	JR17003 CTD 1	JR17003_001_thinned	1 2
		48 51	28/1 28/1	17:03 20:15	JR17003 CTD 1	JR17003_001_thinned	2 3
		52 53	28/1 28/1	21:45 23:02	JR17003 CTD 1	JR17003_001_thinned	3 4
	 3 	54 101 111	29/1 31/1 31/1	02:00 03:30 11:59	JR17003 CTD 4	JR17003_004_thinned	4 5
JR17003_b	 4	0 6	31/1 31/1	16:40 23:23	JR17003 CTD 4	JR17003_004_thinned	5
		7 57	31/1 3/2	23:24 01:54	ES031 CTD 115	ES031_CTD115_thinned	 6
	5 5 6		3/2 4/2 5/2	06:30 19:43 01:33	JR17003 CTD 6 JR17003 CTD 11	JR17003_006_thinned JR17003_011_thinned	6 11
		58 60	5/2 5/2	04:33 07:22	JR17003 CTD 11	JR17003_011_thinned	
		61 61	5/2 5/2	16:06 16:33	JR17003 CTD 11	JR17003_011_thinned	 16
	5 5 5,7 5		5/2 6/2 7/2 9/2	16:35 20:29 22:16 11:57	JR17003 CTD 15 JR17003 CTD 21 JR17003 CTD 26 JR17003 CTD 30	JR17003_015_thinned JR17003_021_thinned JR17003_026_thinned JR17003_030_thinned	16 21 26 30
JR17003_c		0 10	10/2 10/2	04:09 14:57	JR17003 CTD 30	JR17003_030_thinned	36 37
	5		10/2	17:23	JR17003 CTD 37	JR17003_037_thinned	37
	 7	11 18	11/2 11/2	01:41 09:37	JR17003 CTD 37	JR17003_037_thinned	43 44
		19 19	11/2 11/2	11:33 11:53	JR17003 CTD 37	JR17003_037_thinned	44 45
		20 20	11/2 11/2	13:40 13:58	JR17003 CTD 37	JR17003_037_thinned	45 46
		21 21	11/2 11/2	16:03 16:22	JR17003 CTD 37	JR17003_037_thinned	46 47
		22 22	11/2 11/2	17:30 17:52	JR17003 CTD 37	JR17003_037_thinned	47 48
		23 23	11/2 11/2	18:36 19:14	JR17003 CTD 37	JR17003_037_thinned	48 49
		24 24	11/2 11/2	19:57 20:52	JR17003 CTD 37	JR17003_037_thinned	49 50

Survey	Note	Lines	Date	Time	XBT/CTD for SVP	file name	Location/ station
JR17003_c		25 26	11/2 11/2	21:24 22:37	JR17003 CTD 37	JR17003_037_thinned	50 51
		27 35	11/2 12/2	23:00 07:34	JR17003 CTD 37	JR17003_037_thinned	51 SG4_1
		36 38	12/2 12/2	08:34 11:12	JR17003 CTD 37	JR17003_037_thinned	SG4_1 52
		39 39	12/2 12/2	11:42 12:15	JR17003 CTD 37	JR17003_037_thinned	52 53
		40 40	12/2 12/2	12:38 13:05	JR17003 CTD 37	JR17003_037_thinned	53 54
		41 41	12/2 12/2	13:32 14:05	JR17003 CTD 37	JR17003_037_thinned	54 55
		42 45	12/2 12/2	15:55 19:31	JR17003 CTD 37	JR17003_037_thinned	55 56
		46 46	12/2 12/2	20:25 20:59	JR17003 CTD 37	JR17003_037_thinned	56 57
		47 47	12/2 12/2	21:11 21:38	JR17003 CTD 37	JR17003_037_thinned	57 58
		48 48	12/2 12/2	22:06 22:27	JR17003 CTD 37	JR17003_037_thinned	58 59
	 8 	49 56 62	12/2 13/2 13/2	22:54 06:38 12:12	JR17003 CTD 37	JR17003_037_thinned	59 60
		63 68	14/2 14/2	03:35 08:49	JR17003 CTD 60	JR17003_060_thinned	
	9		14/2 15/2	10:59 15:45	EM122 pinging off EM122 pinging on		
JR17003_d		0 3	15/2 15/2	15:53 19:40	JR17003 CTD 60	JR17003_060_thinned	
		4 20	15/2 16/2	21:55 14:14	JR17003 CTD 60	JR17003_060_thinned	
		21 28	17/2 17/2	03:45 10:47	JR17003 CTD 60	JR17003_060_thinned	
			17/2	10:52	EM122 switched off.		

Notes:
1. Disregard previous lines.
2. SIS displayed errors "failed to received data from GridEngine". Otherwise everything appeared to be working (including the grid). Restarted SIS and everything working normally again.
3. Line 101 contains quite a lot of erroneous deep values (double reflections?)
4. Data toward the end of this period look a bit “smiley”, because of SVP.
5. Not logging; changed SVP.
6. Changed TX power to "max"; was previously on -10 dB. Beams now extend much further, and EA600 is much clearer.
7. Rough weather, few returns.
8. Increased max depth to 6000; a few lines missing when we went off the shelf break (previous max was 1000).
9. EM122 pinging disabled (and EA600 to active) on approach to KEP. This configuration was continued until we approached an unswathed area on the line between Cumberland Bay and Stanley.

Appendix D: AME report

Engineering Technical Section
British Antarctic Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

FAO:

BAS Science Engineering (electronics) marine scientific instrumentation support engineers

Cruise Report Instructions

Neil French (nefren) is the first point of contact for marine scientific instrumentation – any questions email (nefren@bas.ac.uk) or phone him (01223 221398); or secondly Mike Rose (mcr@bas.ac.uk, 01223 221584) when Neil not available.

Before you leave BAS for cruise support obtain an up to date image of the JCR directories from the M: drive. The database for locating incidentals and spares is now maintained on the JCR by AME and a copy for reference should be sent back to the UK each year. Please contact nefren if you are unfamiliar with this database. A list of spares/stock required should be included at the end of this report. However critical items must be ordered immediately.

A brief cruise report checklist is required for every cruise AME are responsible for supporting. Include pertinent notes on fault history and diagnosis at the end of the report even if you have already discussed via email. This information will be added to the instrumentation database maintained in the UK.

Log all problems or changes made to systems in use while the cruise is underway to your own log book.

At the end of the cruise, please fill in the simple checklist attached, briefly describing any problems or changes made to the instrumentation (including intermittent problems, repairs, expansion, changes to software, etc). Tick 'Used?' against all instruments which were used or logged. This is so we can follow up these issues and keep a good history of our instruments.

In order to help us with calibrations and repairs, please note the serial numbers of the instruments actually used (as listed on the checklist), and also serial numbers of any spares which you swapped or tested due to a fault or fault-finding. Enter any details on the checklist. We now have many spare sensors which are identical except for serial number.

Please leave a copy of the cruise report on the ship in the electronics workshop for the next support engineer and email a copy to nefren & mcr.

Cruise: JR17003
Start date: 23rd Jan 2017
Finish date: 18th Jan 2018

Name of AME engineer: Carson McAfee
Name of principal scientist (PSO): Povl Abrahamsen

LAB Instruments

Instrument	S/N Used	Comments
AutoSal	68959	
Scintillation counter	NO	
XBT	NO	

ACOUSTIC

Instrument	S/N Used	Comments
ADCP	YES	
PES	NO	
EM120	YES	
TOPAS	NO	
EK60	NO	
Ksync	YES	
USBL	NO	
10kHz IOS pinger	NO	
Benthos 12kHz pinger S/N 1316 + bracket	NO	
Benthos 12kHz pinger S/N 1317 + bracket	NO	
MORS 10kHz transponder	NO	

OCEANLOGGER

Instrument	S/N Used	Comments
Barometer1(UIC)	V145002	
Barometer1(UIC)	V145003	
Foremast Sensors		
Air humidity & temp1	60743897	
Air humidity & temp2	61698922	
TIR1 sensor (pyranometer)	172882	
TIR2 sensor (pyranometer)	172883	
PAR1 sensor	160959	
PAR2 sensor	160960	
Prep lab		
Thermosalinograph SBE45	453893-0130	
Transmissometer	846DR	
Fluorometer	1498	
Flow meter	05/811950	
Seawater temp 1 SBE38	3862856-0599	
Seawater temp 2 SBE38	3862856-0601	

CTD (all kept in cage/ sci hold when not in use)

Instrument	S/N Used	Comments
Deck unit 1 SBE11plus	11P15759-0458	
Underwater unit SBE9plus	09P30856-0707	
Temp1 sensor SBE3plus	032705	
Temp2 sensor SBE3plus	03P5042	
Cond1 sensor SBE 4C	042222	
Cond2 sensor SBE 4C	042255	
Pump1 SBE5T	054488	
Pump1 SBE5T	052371	
Standards Thermometer SBE35	3527735-0024	
Transmissometer C-Star	1399DR	
Oxygen sensor SBE43	432291	
PAR sensor	70688	
Fluorometer	097324001	Removed on 11/02/2018 (Cast 045)
Fluorometer	088-216	Installed on 11/02/2018 (Cast 046)
Altimeter PA200	10127.27001	
CTD swivel linkage	961018	
LADCP Master	14897	

LADCP Slave	15060	
SBE32 Pylon	052371	
Notes on any other part of CTD e.g. faulty cables, wire drum slip ring, bottles, swivel, frame, tubing etc		Two re-terminations. Replaced Flurometer. Changed a few o-rings. Biggest issue was state of CTD winch cable. Very rusty.
No of casts	59	
Max Depth	4890	
Min Depth		

AME UNSUPPORTED INSTRUMENTS BUT LOGGED

Instrument	**Working?**	**Comments**
EA600	YES	
Anemometer	YES	Use Main Mast all cruise.
Gyro	YES	
DopplerLog	YES	
EMLog	YES	

CHECK FANS ARE Running Daily

Instrument
Oceanlogger
EM122, TOPAS, NEPTUNE UPSs
Seatex Seapath
EM122 Tween Deck
TOPAS Tween Deck

End of Cruise Procedure

At the end of the cruise, please ensure that:

- The XBT is left in a suitable state (store in cage if not to be used for a while – do not leave on deck or in UIC as it will get kicked around). Remove all deck cables at end of cruise prior to refit.
- The salinity sample bottles have been washed out and left with deionised water in – please check this otherwise the bottles will build up crud and have to be replaced.
- the CTD is left in a suitable state (washed (including all peripherals), triton + deionised water washed through TC duct, empty syringes put on T duct inlets to keep dust out and stored appropriately). Be careful about freezing before next use – this will damage the C sensors (run through with used standard seawater to reduce the chance of freezing before the next use). Remove all the connector locking sleeves and wash with fresh water. Blank off all unconnected connectors. See the CTD wisdom file for more information. If the CTD is not going to be used for a few weeks, at the end of your cruise please clean all connectors and attach dummy plugs or fit the connectors back after cleaning if they are not corroded.
- The CTD winch slip rings are cleaned if the CTD has been used – this prevents failure through accumulated dirt.
- The SVP is left in a suitable state (washed and stowed). Do not leave this on deck without a cover for any length of time as it rusts. Stow inside at end of cruise.
- All manuals have been returned to the designated drawers and cupboards.
- Clean all the fans listed below every cruise or every month, whichever is the longer.

<u>Clean the intake fans on the following machines:</u>

<u>NOTE: 2 key access to the fans</u>

Instrument	Cleaned?
Oceanlogger	Yes
EM122, TOPAS, NEPTUNE UPSs	Yes
Seatex Seapath	Yes
EM122 Tween Deck	Yes
TOPAS Tween Deck	Yes

Cruise Summary

The cruise focused on a repeat of the A23 line (CTD a ridge running south from the east side of South Georgia). The aim was also to collect a number of gliders.

No unique equipment was required for this cruise. Other than a few minor incidents with the CTD, there were no significant issue to fix during the cruise.

Additional notes and recommendations for change / future work

CTD

Complete cruise notes for CTD:

- **2018-02-11 14:40** Discussions with Povl (PSO) have lead me to believe that I was using the wrong TW value in transmissometer calibration constant calculations. I was using TW=91.3%, and was not getting full range from Transmissometer. I should have been using TW=100% (for pure water). I misread the appnote. Given that I had to change the xmlconf for the fluorometer, I decided to change/update the transmissometer values too. I used the measured values from the last cruise. I did not re-run the Open/Close beam check. I will do this at the end of the cruise to see drift. So for processing all casts from 001-045 need to be changed to account for different Transmissometer values.
- **2018-02-11 14:40** Fluorometer SN: 09-7324-001 -> Changed to -> SN: 088-216 on Cast 046 JR17003. Updated calibration constants in Seabird JR17003.xmlconf.
- **2018-02-11 14:40** Fluorometer was changed. Original unit was tested on a new cable to eliminate the possibility that the cable was at fault. Value read by Plus9 from fluorometer stayed fixed at low value. Therefore it is not getting an analogue value from fluorometer. Therefore Unit has failed.
- **2018-02-11 13:24** Cast 045. Fluorometer has failed. No data. Unit still flashes.
- **2018-02-11** Cast 043. Spike in C1 data during upcast (144m).
- **2018-02-09** Cast 034. Fluorometer has spike to zero data on the upcast again.
- **2018-02-09** Cast 033. Fluorometer has spike to zero data on the upcast again.
- **2018-02-09** Cast 031 Repeat. New Termination is working. However Fluorometer had spike to zero data on upcast.
- **2018-02-09 13:05** NOTE: Problem was traced to a fault in the moulding of the Sea Termination -> Swivel Pigtail. Not the Sea termination... The moulding. Very interesting. I suspect that the problem was caused by having the pigtail cable tied too tight on to the CTD cable. If it is too tight then when the cable flexes (in every direction during the cast) it ends up tugging on the connector. But even then... this should have caused a break in connection, not a short... No clue.
- **2018-02-09 13:05** NOTE: NEED MORE CTD PIGTAILS!!!
- **2018-02-09 13:05** Problem traced to the Sea Termination-Swivel Connector length. Redid the sea termination with a new Swivel pigtail. Mega test showed 250V=>1000 MΩ, 500V=>2000 MΩ, 1000V=>4000 MΩ.
- **2018-02-09 11:22** CTD Failed during cast 31. Initially comms error light flashed, and then the fuse blew, and data stopped. CTD was at 175m, and was then recovered to deck. Ran mega test on cable, and found that it had a 1 kOhm resistance (should be >1000 MOhm). Problem somewhere. Will investigate.
- **2018-02-08** Cast 027. Altimeter acted up. Only started at 75m.
- **2018-02-07** Cast 025. On upcast winch was stopped multiple times to check spooling.
- **2018-02-06** Cast 021. Sea state bad. Lots of rolling (~5m swell). During downcast winch was run slow to maintain tension on cable (~5-12 m/min). This changed to 60 m/min from 250m depth. Winch also stopped on upcast to check winch spooling.
- **2018-02-05** Cast 016. Cast aborted at 48m due to a gantry leak.

- **2018-02-03** Cast 011. On upcast winch was stopped to check spooling and back tension issues
- **2018-02-04** Cast 011. Initial cast attempt cancelled. Potential Hydraulic leak on Gantry.
- **2018-02-04** Cast 010. On upcast winch was stopped for a long period to check spooling.
- **2018-02-03** Cast 009. On upcast winch was stopped multiple times to check spooling.
- **2018-02-03** Cast 007. On upcast winch was stopped multiple times to check spooling.

- **2018-02-03** Cast 006. On upcast winch was stopped multiple times to check spooling of rusty cable. After cast bottles 15+17 had a leak on bottom o-rings. Both fixed. Also reported an issue with LADCP, which was standard software glitch. No real problem.
- **2018-02-01 13:00** After : Mega Tested the CTD Cable (Deck unit and Instrument disconnected). 250V=>1000 MΩ, 500V=>2000 MΩ, 1000V=~3600 MΩ. Acceptable values for use.
- **2018-01-31 16:23** Before: Mega Tested the CTD Cable (Deck unit and Instrument disconnected). 250V=>1000 MΩ, 500V=>2000 MΩ, 1000V=~2400 MΩ. Acceptable values for use.
- **2018-01-31 16:23** Officers/Deck Engineer have tested the CTD cable and decided that it needs to be reterminated after chopping off approximately 100 m. Rust and wear to blame.
- '*2018-01-28* Cast 004. On upcast winch was stopped multiple times to deal with spooling issues.
- **2018-01-27 21:00** There was a fault with the slave LADCP. Traced to damaged connector on harness side of the deck cable slave link. Chopped and reconnected a new head. Fixed.

Reterminations:

The CTD had to be reterminated twice. The first time was done as preventative maintenance. The line was very rusty, and starting to birdcage. Approximately 100 m was removed. The second retermination (09/02/2018) was required due to a failure in the termination pigtail (at the moulded end, not the termination). I suspect that the pigtail was cable tied too tight to the teardrop and swivel. When the CTD twists in the water it was pulling on the moulding of the pigtail, and caused internal damage. This is the first time that I have seen this issue. A new pigtail was connected to the Sea Cable without requiring the mechanical teardrop being removed. This saved the effort of repeating a load test.

Cable State:

The CTD cable appears to be rusting and degrading quicker than previous years. During JR17001 400m were removed, and during JR17003 an additional 100 was removed. In addition to this we have encountered repeated issues spooling the CTD cable on to the winch drum. The suspected cause is that the rusted cable has a different diameter, and is interfering with the calculated spooling mechanism. The consequence of this is that cast times are slower due to all the stops/starts during upcasts, and the constant monitoring and tweaking. This has been the highest cost of science “downtime” during the cruise.

Fluorometer:

On CTD Cast 31 the fluorometer started showing problems during its upcast. During the downcast the values seemed normal, however at some point after this the data from the fluorometer became intermittent, with consistent drops to “0”, and then returning to expected values. This was especially clear while ascending through the

chlorophyll maximum. Initially we though this may have been a result of the high swell. This continued intermittently over the casts from 31-45, until the unit failed completely.
Initial tests showed that the fluorometer was still flashing, but the ADC was not receiving data. The cable was replaced with a spare, but no change. This confirmed the assumption that the fluorometer was damaged. The old unit was changed for a spare, and the problem went away.

The damaged unit has been labelled, and returned to the cage. No further testing has been done.

Time Issues:

The K9 program started to report large time steps and offsets on its time adjustments. The usual correction is in the range of +/-0.007 s, however on a number of occasions K9 was making adjustments of +/-2 s. This seems excessively high. After a few minutes the system generally recovers, and returns to normal, however this does seem to indicate a problem with the system. No clear cause was found, and no solution has been implemented.

PC:

The PC being used is beginning to show its age:
1. It is still running XP, and limits the options of testing new software.
2. The fans are constantly threatening to stop.
3. After a poweroff recently the screen failed to restart. Windows would boot correctly (bios and windows logo would show), however after this there would be no display. The cause was traced to a corrupt driver file, which is a common issue with these particular 1 Unit PC's. The solution involved booting in with safe mode, deleting and then reinstalling the graphics driver.

Ideally it would be good to get a new 1 unit sized rack PC running windows 7 or 10. However failing that there are a number of options in the case of a PC failure.

1. If the current PC disk fails there is a spare mounted inside the enclosure. Open up, and swap over the drives. This was a clone made in early 2016, and should work directly with the system. This was tested on the cruise when the display failed to initiate correctly.
2. Use one of the Backup CTD PC's in the tape store. There are now two. One of these was made during the cruise and runs Windows 7.
3. If the hardware fails completely, you could also "borrow" one of the 1 Unit PCs being used by the DWNM station. They have the same hardware.

Wiki

The JCR AME Wiki was revitalised during the previous cruise, and has proven to be very useful. It follows the same format as the Halley Wiki. Please make an effort to continue using it. Log all work immediately, and update the pages with gained knowledge.

UWIA

The UWIA has worked quite well through the cruise, with only minor problems here and there. A reoccurring problem was that the inline sea filter would get blocked, and the peristaltic pump would then pull air in to the outlet pipe of the filter. This is easily avoided by simply replacing the filters at regular intervals.

A bigger problem occurred at the end of the cruise. When inspecting the system on the 17/02/2018, it was clear that liquid had built up in the air exit pipe of the membrane. This was quite a high (2-3 drops) amount of liquid. The temperature in the room has remained constant over the past few days, so I do not believe that this is a condensation effect. I think that this may have leaked out of the membrane. I emptied the pipe, and dryed the system by bypassing the membrane and running the pure drierite source. The system will be powered off in this state ready for the next cruise.

Ocean Logger

It has been pointed out that the Thermosalinograph (SBE45) in the underway sea water measurement system requires between 0.6-1.8 l/min. We run the system at 0.6 l/min, but this is at the low end of the range, and often dips when the system pressure changes. It may be worth reviewing the system and see if we should increase the flow rate. The plan is to discuss this with Seth Thomas after returning to BAS Cambridge.

LADCP

On the 27/01/2018 when testing the Slave and Master LADCP it became clear that there was an issue with the comms line to the slave. This was traced back to the moulded connector on the harness side of the Deck-CTD interface. I believe that this is caused by operators pulling the connectors apart while holding the cable, rather than the connectors. When this happens the internal solder connections in the moulded connectors are partially severed. This leads to intermittent issues with communications lines, and more importantly issues with the battery charging lines. This was solved by removing the damaged connector, and replacing it with a new one cut from the diode pigtails in the spares box.

Please make sure that any scientists using the system know to separate the connectors only while holding the connectors. NOT THE CABLE.

Other than the connector termination there were no major issues with the system. The LADCPs have produced good data, and the scientists are happy with the results.

There is still an underlying issue with the BBTalk software when using the Slave and Master with the USB-Serial Converters on the CTD PC. There were a number of cases where the Slave would freeze. The solution is always the same. Stop operations with the master. Wait 2 minutes, and then send “Breaks” to both Master and Slave units. Eventually the Slave will reply with a wakeup “AB” state, meaning that it has recovered from a failure. I have found that by running every step in the deployment process on the slave then the master seems to reduce the chances of a slave failure.

In an effort to try and resolve this software issue, we tried the new “RDI Toolz” software package from Teledyne. They have produced a new serial terminal communications GUI. At first glance this software looks like an improvement, however it has not been implemented as well as BBTalk. On one hand through multiple tests it did not cause a slave failure. However it is not capable of recording the terminal to a log file.

The software was tested on both XP and Windows 7, however the result was the same. For the moment I would recommend that BBTalk is kept as the main LADCP communications software.

Transmissometer

The Transmissometer did drift through the cruise. The following tables show the calibration constants used throughout the cruise (Start Of Cruise column), and what they were at the end.

	Start Of Cruise	End Of Cruise
Vair Open Beam (A1)	4.71917 V	4.66831 V
Vair Closed Beam (Y1)	0.00366 V	0.00366 V
M	21.64889	21.88493
B	-0.07923493	-0.08009885

Support Engineer: Carson McAfee Date: 17/02/2018