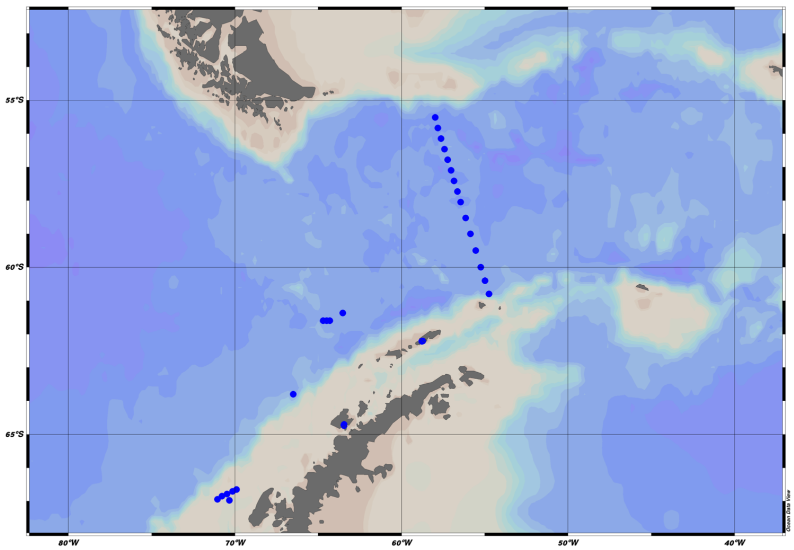
# CRUISE REPORT: SR1b

*Submitted: January 2020 Created: May 2024*




## Highlights

### Cruise Summary Information

| | |
|---|---|
| Section Designation | **SR1b** |
| Alias | **JR17001** |
| Expedition Designation (ExpoCode) | **74JC20171121** |
| Chief Scientist | **David KA Barnes / BAS** |
| Dates | 21 November – 21 December 2017 |
| Ship | RRS *James Clark Ross* |
| Ports of Call | FIPASS, Stanley, Falkland Islands<br>Punta Arenas, Chile |
| Geographic Boundaries | 55° 52”S<br>71° 05”W 54° 74”W<br>66° 98”S |
| Stations | 43 |
| Floats and Drifters Deployed | 4 Deep Apex (ORCHESTRA)<br>3 Arvor (Euro-ARGO MOCCA) |
| Moorings Deployed and Recovered | 0 |

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Report assembled by Savannah Lewis

**Links to Selected Topics**

Shaded sections are not relevant to this cruise or were not available when this report was compiled.

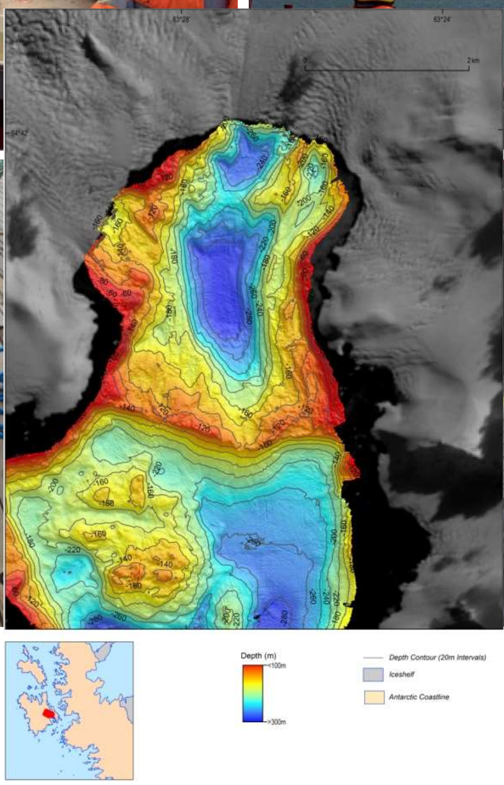
| **Cruise Summary Information** | **Hydrographic Measurements** |
|---|---|
| Description of Scientific Program | **CTD Data:** |
| Geographic Boundaries | Acquisition |
| Cruise Track (Figure): PI CCHDO | Processing |
| Description of Stations | Calibration |
| Description of Parameters Sampled | Temperature Pressure |
| Bottle Depth Distribution (figure) | Conductivity Oxygen |
| | |
| Deployments | **Bottle Data** |
| Moorings Deployed or Recovered | Salinity |
| | Oxygen |
| Programs and Principal Investigators | Nutrients |
| Scientific Personnel | Total CO2 |
| | CFCs and SF6 |
| Problems and Goals Not Achieved | Total Alkalinity |
| | pH |
| | Microplastics |
| | eDNA |
| | |
| **Underway Data Information** | **Lowered Acoustic Doppler Current Profiler** |
| Navigation Bathymetry | |
| Acoustic Doppler Current Profiler | |
| Thermosalinograph | |
| XBT and/or XCTD | |
| pCO2 | **Acknowledgements** |
| Atmospheric Chemistry Data | |
| Meteorological Observations | |

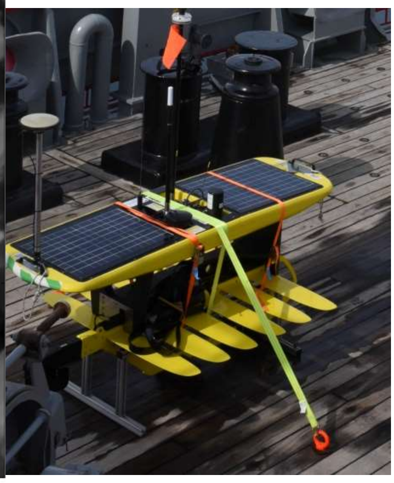
# Scientific cruise report JR17001 RRS James Clark Ross

## NERC ICEBERGS & ORCHESTRA projects 2017







**Report authors**

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**3** Exeter University, UK
**4** University of Gothenburg, Sweden
**5** Princeton University, USA
**6** Bangor University, UK
**7** University of West Florida, USA
**8** Newcastle University, UK
**9** Concepcion University, Chile
**10** MacEwan University, Canada

21 Nov – 21 Dec 2017 Stanley (FI) – West Antarctic Peninsula – Punta Arenas (Chile)

## Table of content

# 1. Overview

**The research cruise JR17001 focussed on Southern Ocean science in the Drake Passage and West Antarctic Peninsula. This is both a hotspot of climate-forced physical change and an area of global importance in relation to carbon and heat fluxes between the atmosphere and ocean. JR17001 included three workpackages, a NERC-Conicyt project ICEBERGS (seabed biology) and two ORCHESTRA projects (oceanography). These projects had differing operation areas from the open ocean of Drake Passage (Firing team), offshore from the NW Antarctic Peninsula (Brearley team) and fjordic inshore of NW Antarctic Peninsula (Scourse team).**

**The most inshore project, ICEBERGS, planned to sample transects from fjord mouth to inner most safe navigation along three retreating glaciers. The sample fjords were selected as those for which there was detailed spatial retreat history (courtesy of Alison Cook) and seabed bathymetry (collated by Floyd Howard). Thus seabed and water column physics, biogeochemistry and biology could be sampled along a gradient of age and glacier influence, from where glaciers had not covered for >60 years to where they were less than a decade ago. This three-year joint UK-Chile project required a wide skills pool of scientists from seven different academic institutions and a similarly diverse array of apparatus. Ultimately ICEBERGS goal was to quantify how glacial retreat was influencing nearshore systems and biology and what the medium-term consequences of this would be.**

**The glider programme, and associated Collaborative Antarctic Science Scheme (CASS) WaveGlider project led by Morales-Maqueda, forms part of Work Package 2 of ORCHESTRA, tasked with understanding subduction processes of heat and carbon in the Southern Ocean. To that end, a glider programme was designed to understand how mixed layers change over the summer period in response to seasonal warming, storm events and submesoscale ocean dynamics. The initially planned deployment of 4 Slocum gliders (2 with microstructure) was supplemented by a SeaGlider (through a collaboration with Louise Biddle and Sebastiaan Swart at the University of Gothenburg) and an autonomous surface vehicle, an SV2 WaveGlider. In addition to the glider measurements, ship-borne high-resolution flux observations were made using the Plymouth Marine Laboratory installed meteorological sensors, and overflights with the BAS MASIN Twin Otter Aircraft over the glider region from Marsh were also scheduled.**

**The Drake Passage hydrographic observations are part of ORCHESTRA Workpackage 3, on the effect of Southern Ocean interior circulation and exchanges with other ocean basins on heat and carbon transports and storage. We aim to monitor Southern Ocean water masses and circulation pathways and Antarctic Circumpolar Current volume and property transports by continuing a near-annual annual time series of high-quality repeat hydrographic measurements on GO-SHIP line SR1b begun in 1993. The hydrographic measurements are complemented by ocean current and underway surface ocean and meteorological observations and by the deployment of profiling floats which will monitor stratification and deep currents in the Scotia Sea over time.**

# 2. List of personnel

## *2.1. Scientific and technical cruise compliment*

| | | |
|---|---|---|
| DKA Barnes | BAS | PSO |
| J Scourse | Exeter | PI |
| A Brearley | BAS | PI |
| Y Firing | NOC | PI |
| L Biddle | Gothenburg | Physical oceanographer |
| M Boniface | Exeter | VMP tech |
| M Clark | BAS | Rothera Marine Assistant |
| OC Dragomir | NOC | Physical oceanographer |
| J Edmonston | BAS | IT engineer |
| A Fitzmaurice | Princeton | Physical oceanographer |
| W Goodall-Copestake | BAS | Plankton ecologist |
| P Hollyman | Bangor | Marine ecologist |
| F Howard | BAS | Multibeam geophysicist |
| A Janosik | W Florida | Microplastics |
| M Magueda | Newcastle | Physical oceanographer |
| A Mountford | Newcastle | Physical oceanographer |
| C Munoz-Ramirez | Concepcion | Marine ecologist |
| A Pieńkowski | MacEwan | Micropalaeontologist |
| S Polfrey | BAS | Mech engineer |
| A Roman Gonzalez | Exeter | Marine ecologist |
| L Rogerson | Newcastle | Electrical engineer |
| Rachael Sanders | BAS | Physical oceanographer |
| Ross Sanders | BAS | Electrical engineer |
| CJ Sands | BAS | Molecular ecologist |
| K Sheen | Exeter | Oceanographer |
| R Scott | BAS | Physical oceanographer |
| D Stephenson | NOC | Physical oceanographer |
| S Thomas | AME | Electronics engineer |
| K Van Landeghem | Bangor | Geophysicist |

### 2.2. Rothera Station staff

| | |
|---|---|
| P Beard | BAS |
| S Bowman | BAS |
| J Foster Davidson | BAS |
| M Jackson | BAS |
| E Lewis | BAS |
| N Logan-Park | BAS |
| L Zikking | BAS |

BAS = British Antarctic Survey, AME = Antarctic Marine Engineering (BAS), Exeter = Bangor = Bangor University, Exeter University, Gothenburg = University of Gothenburg, Macewan = Macewan University, Newcastle = Newcastle University, NOC = National Oceanography Centre, Princeton = Princeton University, W Florida = University of West Florida.

### 2.3.Ship's complement

| | |
|---|---|
| TS Page | Master |
| C Hipsey | Ch Off |
| RJ Bellis | 2nd Off |
| C O'Donnel | 3rd Off |
| MC Chapman | 3rd Off |
| MEP Gloistein | ETO Comms |
| GJ Lloyd | Ch Eng |
| G Behrmann | 2nd Eng |
| A Little | 3rd Eng |
| E Murray | 4th Eng |
| G Wale | Deck Eng |
| P Kusmierek | ETO |
| RJ Turner | Purser |
| A Tomkinson | Doctor |
| DJ Peck | Bosun Sci Ops |
| AM Bowen | Bosun |
| FJ Hernandez | Bosun's mate |
| ST Smith | SG1A |
| S English | SG1A |
| GL Waylett | SG1A |
| AS Howard | SG1A |
| J Scott | MG1 |
| O'Reilly | MG1 |
| CI Walton | Chief cook |
| JSC Liddy | 2nd cook |
| LJ Jones | Snr steward |
| NR Greenwood | Steward |
| G Raworth | Steward |
| ZA Fileva | Steward |

# 3. Timetable of events

| | |
|---|---|
| 19th Nov | Mobilization commences alongside FIPASS, Stanley |
| 20th Nov | Final complement join, Mobilization complete, JCR relocates to Mare Harbour |
| 21st Nov | JCR bunkers fuel and departs south |
| 22nd Nov | Test deployments at Burdwood Bank affected by deteriorating weather conditions, vessel heads straight to first ICEBERGS station at Marian Cove, King George Island |
| 24th Nov | Science deployments at Marian Cove commence at 0500: XBT followed by multibeam and TOPAS survey (which continues between subsequent gear deployments), 5 CTD stations, 5 SUCS stations. Stern thruster problems halt operations between 14.00 and 18.30. |
| 25th Nov | Science deployments at Marian Cove continue with 15 N70 plankton net deployments, a VMP attempt (despite successful deployment, equipment failed due to flooding), and 14 Hamon Grab deployments |
| 26th Nov | Science deployments continue at Marian Cove with 5 AGTs and 5 multicore deployments. Science complete at 11.30, JCR departs for Börgen Bay, Anvers I. |
| 27th Nov | Arrival at 0730 and first science deployments at Börgen Bay: XBT and multibeam, 6 CTDs (one test for oceanography program), and 6 SUCS deployments. |
| 28th Nov | Science continues at Börgen Bay: 6 AGTs, 15 N70s, 14 grabs and 3 mulitcores. |
| 29th Nov | Science complete at 0018, JCR departs for Glider work |
| 30th Nov | First physical oceanography deployments: CTD at GL1 02.00, five gliders successfully deployed (2 at GL1, 1 at GL2, wave glider at GL2, 1 at GL3), met data transect and CTD at GL2. |
| 1st Dec | CTD at GL3, Glider deployed at GL4. Met data and ADCP transect, CTD at GL1 |
| 2nd Dec | CTD at GL4, transit to GL5 |
| 3rd Dec | CTD at GL5, Glider deployment at GL5, work concluded, JCR optimistically departs for Rothera. |
| 4th Dec | Vessel enters pack ice 02.10 but inhibited by thick porridge ice around 1230 and returns to open water. |
| 5th Dec | Vessel re-enters pack ice 06.30 and again inhibited by porridge ice around 13.30 and heads back to open water. |
| 6th Dec | Alternation of attempts to reach Rothera and opportunistic Marguerite Bay science commences with XBT and multibeam survey |
| 7th Dec | 5 AGT deployments across the Marguerite Trough. Vessel re-re-enters pack ice at 1930. EA600 packs it in around 2100 |
| 8th Dec | After a really good go, vessel is continually thwarted by thick pack ice and heads back to open water. Multibeam resumes overnight. |
| 9th Dec | Continuing opportunistic multibeam while waiting more definitive instructions from BAS Cambridge |
| 10th Dec | During day shift, 5 CTD deployments and 2 SUCS deployments with multibeam survey continuing overnight. |
| 11th Dec | 3 SUCS deployments in the morning, a CTD in the afternoon followed by overflights by MASSIN twin Otter until 1930. Instructions come to once again attempt to reach Rothera, entering pack ice at 2130. |
| 12th Dec | Pushing through heavy pack at 0640 until 0950. JCR has had enough and departs northward for recovery of misbehaving gliders and Drake Passage oceanographic work. |

| | |
|---|---|
| 13th Dec | Recovery of two malfunctioning gliders |
| 14th Dec | Continuing transit to first CTD site |
| 15th Dec | Drake Passage CTD work commences |
| 16th Dec | CTD work continues in the Southern Drake |
| 17th Dec | CTD work continues mid Drake Passage |
| 18th Dec | CTD work continues in the Northern Drake until terminated by winch malfunction |
| 19th Dec | XBT transect conducted in Northern Drake Passage; data collection concludes |
| 21st Dec | Arrival in Punta Arenas |

**Börgen Bay by Dr Katy Sheen**

# 4. Working area

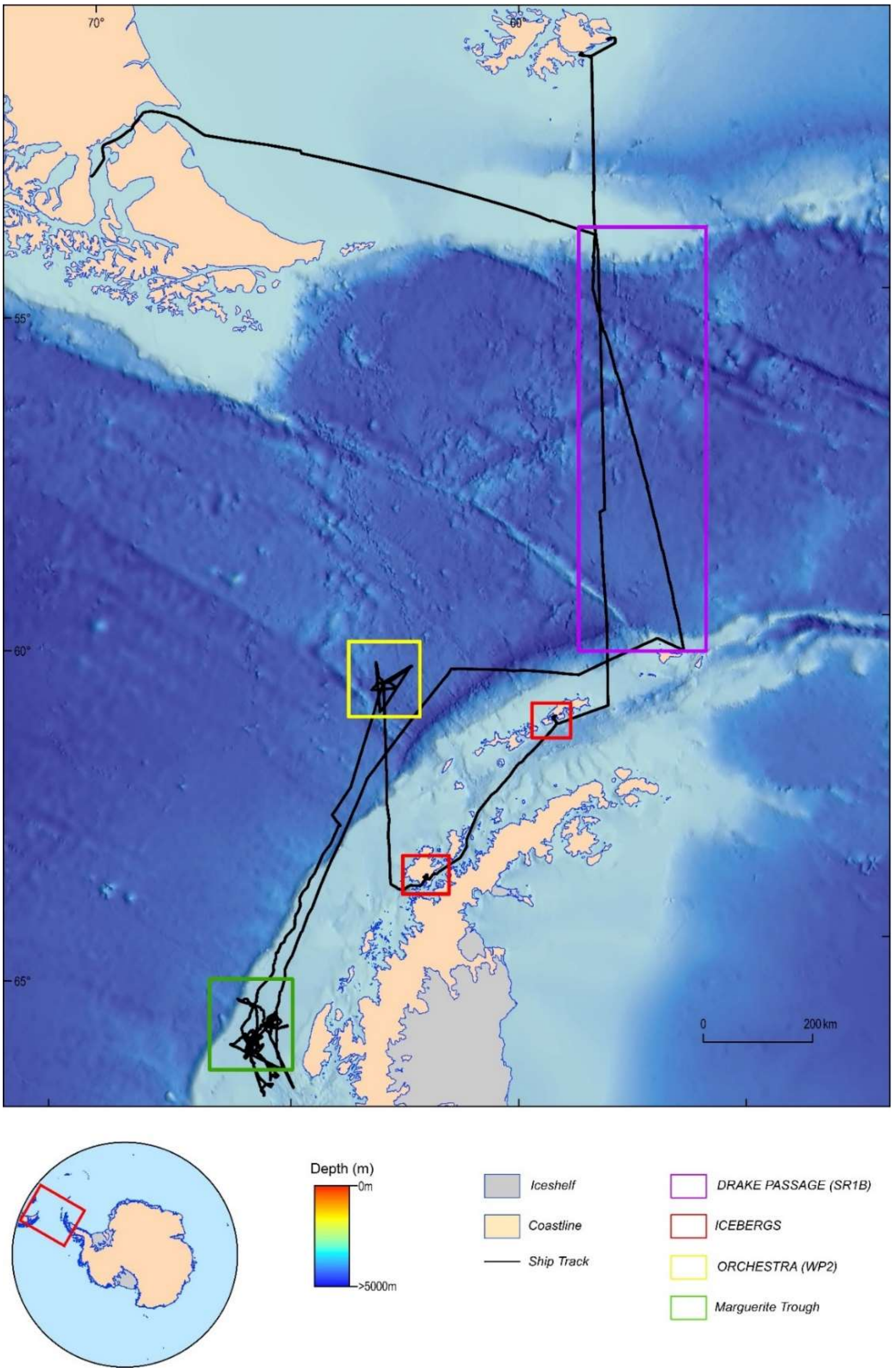


**Fig. 4.1: Working area of JR17001**

# 5. Introduction

**IMPACTS OF DEGLACIATION ON BENTHIC MARINE ECOSYSTEMS IN ANTARCTICA ("ICEBERGS") project**

Waters around the West Antarctic Peninsula (WAP) is experiencing rapid marine warming (e.g. Meredith and King 2005) resulting in retreating glaciers, collapse of ice shelves and lengthening of the sea-ice melting season (e.g. Cook et al. 2005, Stammerjohn et al. 2012). Increased iceberg scouring (Barnes and Souster 2011) and sediment discharge (Sahade et al 2015) are the most frequent resulting physical disturbances on West Antarctica's shallow benthos. However, sea ice losses over West Antarctica's continental shelves have also lead to longer phytoplankton blooms, resulting growth increases by benthos and thus increased (blue) carbon capture and storage on the seabed – the largest negative feedback on climate change (Barnes et al 2016). Given the lack of scientific knowledge of the Antarctic coastal ecosystems it is difficult to predict present and future responses of these ecosystems to regional warming. There is an urgency to, first, evaluate the real changes in environmental variables due to this disturbance, and second, estimate the magnitude and direction of ecosystem responses at different biological levels and spatial scales to regional warming. In addition, it is important to develop new tools to detect disturbance. These new data will allow quantification of the impact of regional warming in Antarctica and inform conservation and management strategies. **In this context, ICEBERGS aims to investigate the impacts of physical disturbance arising from climate-warming induced deglaciation on benthic communities around the West Antarctic Peninsula. We adopt a multidisciplinary approach across nested scales from individual to ecosystem level, and from an ecological to evolutionary scale, evaluating genetic, physiological, population, community and ecosystem impacts of this deglacial perturbation. In addition, we use sclerochronology to develop biological proxies for reconstructing multidecadal environmental changes in Antarctica.**

The overall aim of the ICEBERGS project is guided by the **general hypothesis** that *ice loss and deglaciation in the Antarctic Peninsula due to regional warming will have significant impacts on glacier dynamics, local coastal oceanographic conditions and the benthic coastal marine biota. These effects are observed from the individual to ecosystem level.* At the **assemblage level** we test the hypothesis that *the combined disturbance effects of glacier retreat, loss of winter sea ice and disintegration of ice shelves generate assemblage-wide effects on the diversity and dominance patterns of benthic* *assemblages modulated by the differential resistance of species, leading to major shifts in community structure according to perturbation strength (magnitude of glacier retreat).* At the **individual level** we test the hypothesis that ***i****ce loss and deglaciation affect the coastal environmental conditions in terms of temperature, salinity, turbidity and primary productivity affecting individual performance and reproductive investment. These effects are recorded temporally in the shell increments of marine invertebrate species*. At the **evolutionary level** we test the hypothesis that *ice loss and deglaciation perturbations affect genetic diversity and population connectivity of marine benthic species, especially in species with low dispersal potential (brooding species).*

The **general objective** of ICEBERGS is *to assess the effects of ice loss and deglaciation on coastal marine habitats from the individual to the ecosystem level.* **Specific objectives are:**

1. Monitoring glacier retreat over time and scour intensity on the adjacent seabed.
2. Determine the benthic assemblage structure from localities with different perturbation levels.
3. Evaluate nutritional and reproductive conditions of adults.
4. Analyse growth rates from bivalve/ gastropod shells and bryozoan populations with different perturbation levels.
5. Develop reconstructions of physical disturbance due to iceberg discharge from growth patterns present in the carbonate structure of the shells of marine molluscs.
6. Estimate the effect of marine glacier discharge and iceberg scouring on the genetic diversity and connectivity of marine invertebrate populations and the role of dispersal potential.

In order to achieve these objectives ICEBERGS has, and will, deploy, from RRV *James Clark Ross,* physical oceanographic (CTD), marine geological (multi-beam swath bathymetry, TOPAS sub-bottom profiling) and habitat mapping (shallow underwater camera system) instrumentation, alongside water column (plankton net) and bottom sampling (Agassiz trawl, Hamon grab, multi-corer) gear for determining and sampling seabed sediments, community structure and benthic biodiversity at three actively deglaciating fjord sites along the west Antarctic Peninsula during three field seasons starting in 2017 (Figure 5.1). These sites, Marian Cove (Maxwell Bay, King George Island, South Shetland Islands), William Glacier (Börgen Bay, Anvers Island) and Sheldon Glacier (Ryder Bay, Adelaide Island) have been selected on the basis of the availability of pre-existing bathymetric (multi-beam swath bathymetry) and glacier retreat data from satellite observations (e.g. Cook et al., 2016).

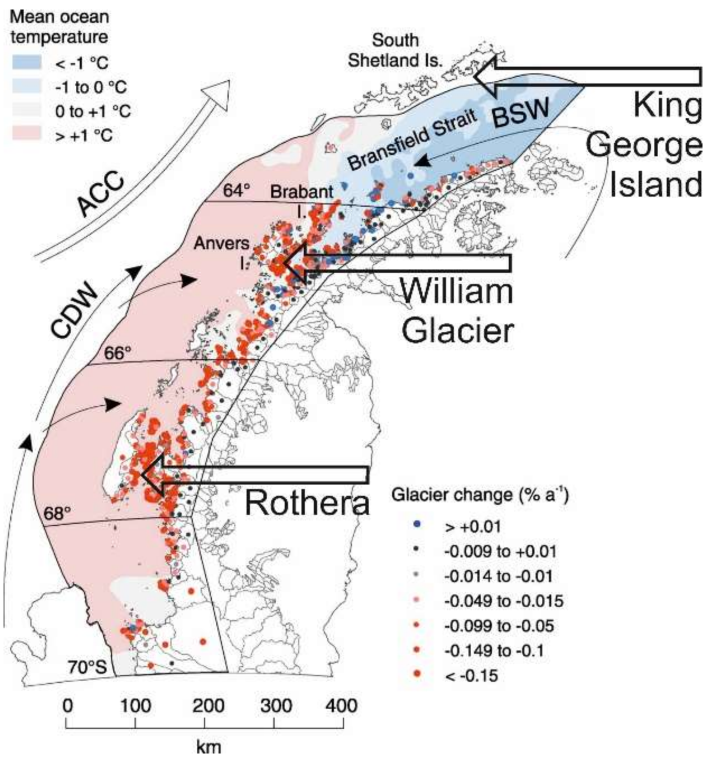


**Figure 5.1. Field sites for sample collection (base map from Cook et al., 2016)**

During the 2017 research cruise three satellite projects have taken advantage of the ICEBERGS opportunity and, independently funded, these have allowed additional specialist personnel (and additional equipment) to participate in the cruise in turn conferring significant additional capability and data for the core ICEBERGS project. These are

1: Characterization of the impacts of microplastic ingestion by Southern Ocean filter-feeders (Alexis Janosik, West Florida University, USA),

2: OCean Turbulence effects on Antarctic Glacier Outflows (OCTAGONAL) (Katy Sheen, University of Exeter, UK), and

3. Biological and biogeochemical proxy calibration of deglaciating environments in Antarctica (Anna Pieńkowski, MacEwan University, Alberta, Canada).

***References***


Barnes and Souster 2011 *Nature Climate Change* 1, 365-368

Barnes et al. 2016 *Global Change Biology* 22, 1110-1120

Cook et al. 2005 *Science* 22 541-544

Cook et al. 2016 *Science 353* 283-286

Meredith and King 2005 *Geophysical Research Letters* 32 L19604

Sahade et al. 2015 *Science Advances* 1, DOI: 10.1126/sciadv.1500050

Stammerjohn et al. 2012 *Geophysical Research Letters* 39 L06501


**Figure 5.2: logo of the ICEBERGS project**

# 6. Equipment used and science areas

## 6.1 Multibeam and Topas seabed mapping

Floyd Howard[1] & Katrien Van Landeghem[2] 1.BAS, 2.Bangor University,UK flohow@bas.ac.uk, k.v.landeghem@bangor.ac.uk

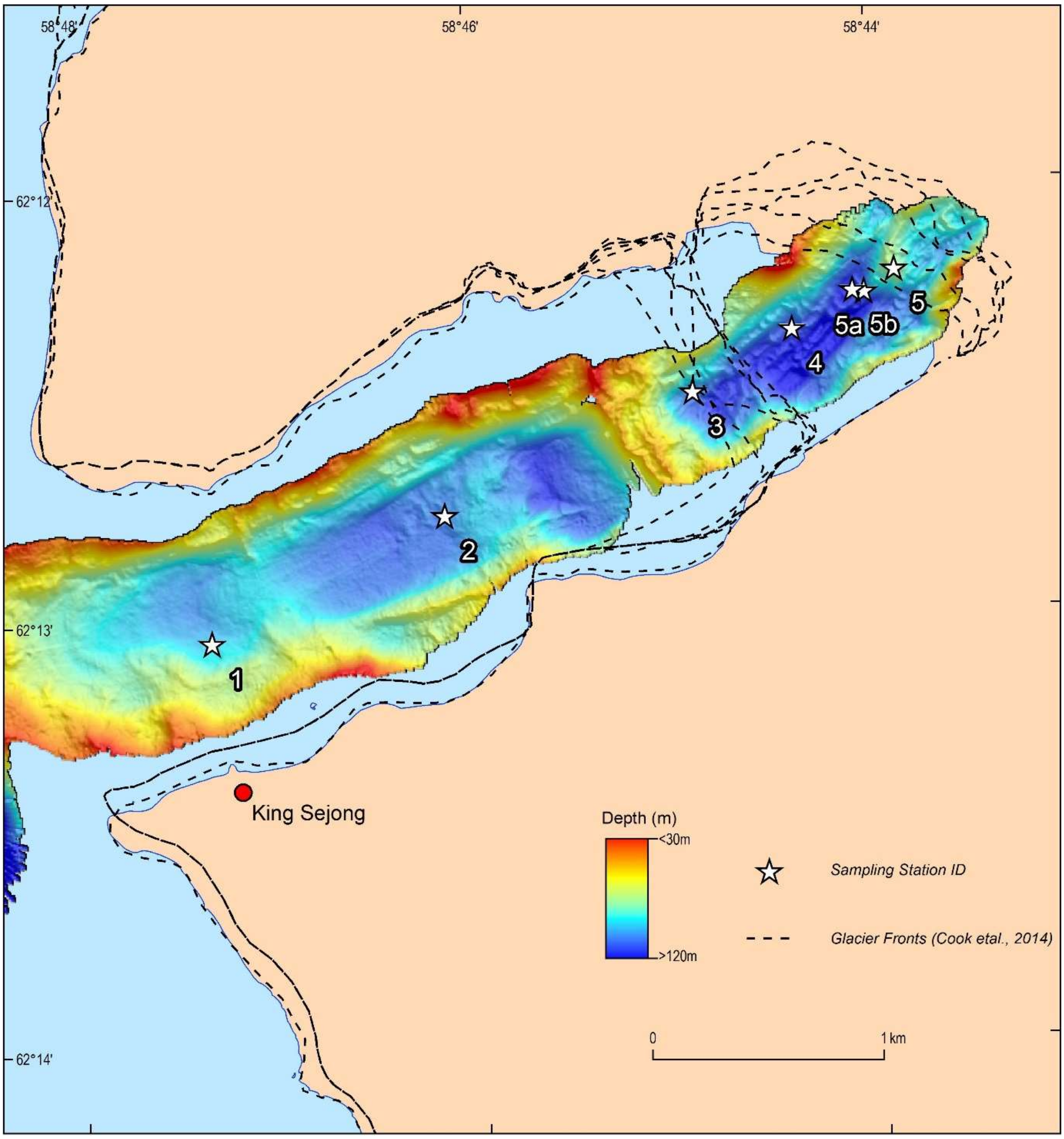


**Figure 6.1.1: Multibeam bathymetry collected within Marian Cove, King George Island on JR17001. Dashed lines indicate the position of the past glacier front and were provide by Dr Alison Cook (Cook et al., 2014). Stars indicate the location of sampling stations targeted within the fjord.**

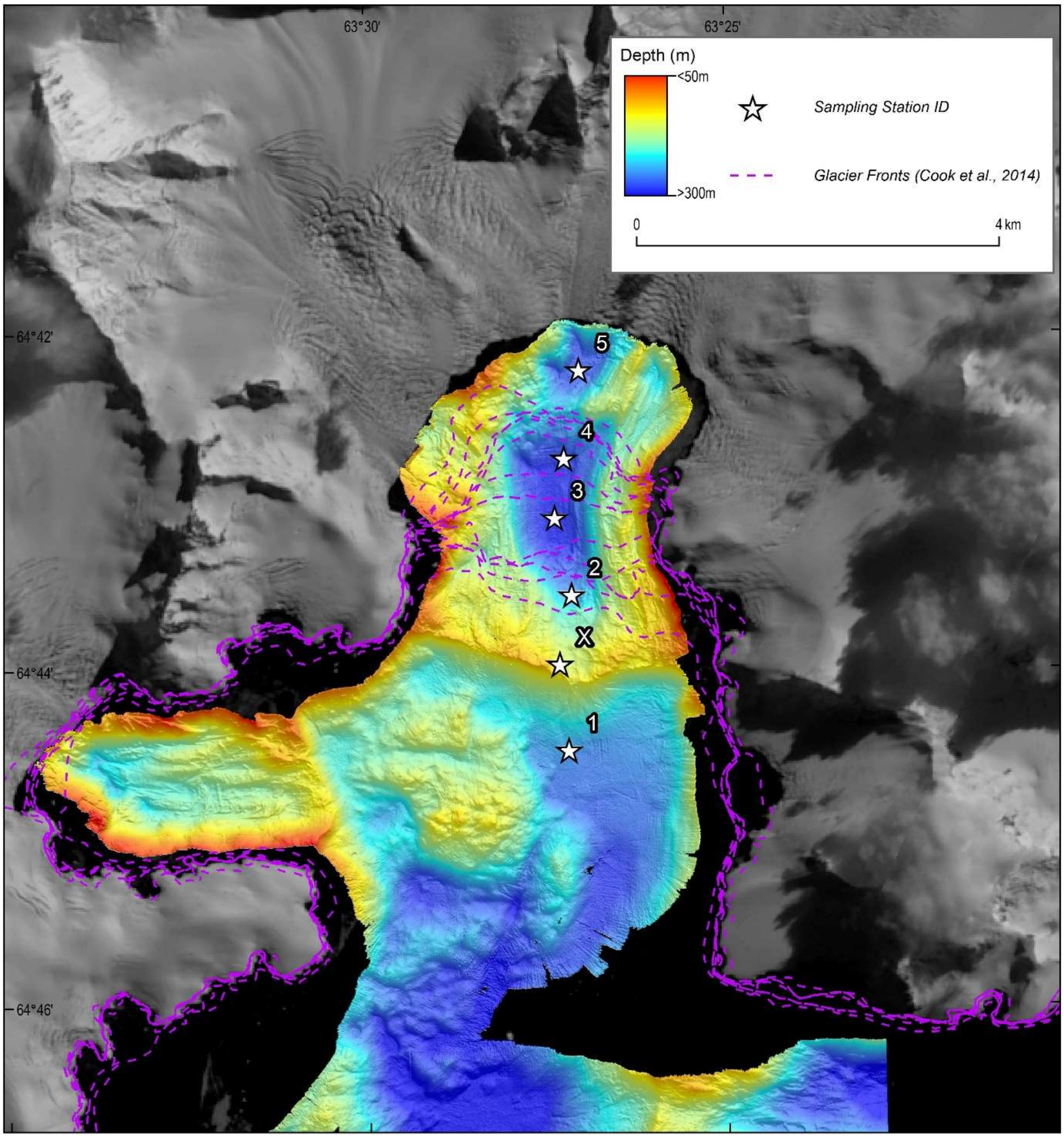


**Figure 6.1.2 Multibeam bathymetry collected within Börgen Bay, Anvers Island on JR17001. Dashed lines indicate the position of the past glacier front and were provide by Dr Alison Cook (Cook et al., 2014). Stars indicate the location of sampling stations targeted within the fjord.**

## *6.1 a) EM122 Multibeam Echosounder*

### *Data acquisition*

Bathymetric data were collected using a hull-mounted 1° x 1° EM122 multibeam echosounder (see appendix 15.1 for further details). The EM122 equipment was operated using Kongsberg Seafloor Information System (SIS) and Helmsman software. A detailed report on the collection and processing of the data with an evaluation of data quality and surveying methods is presented in Appendix. Data was organised into four separate surveys, summarised in Table 6.1.1. Changes to acquisition parameters are summarised in the EM122 event log in Appendix 15.1.

**Table 6.1.1: Summary of EM122 data collected on JR17001.**

| Survey Name | Start (UTC) | End (UTC) | Description | Number of files (.all) | Processed (mb-system) | Processed (Fledermaus) |
|---|---|---|---|---|---|---|
| **jr17001_a** | 24/11/2017 00:37 | 27/11/2017 07:55 | A portion of transit to Marian Cove site, Marian Cove and a portion of the transit to Börgen Bay site | 24 | 24 | Lines 8-16 |
| **jr17001_b** | 27/11/2017 10:16 | 29/11/2017 03:35 | Börgen Bay site | 13 | 13 | Lines 0-13 |
| **jr17001_c** | 30/11/2017 21:46 | 13/12/2017 00:00 (approx.) | Around southern Drake's Passage and Marguerite Trough | 143 | Lines 21-110 | No lines |
| **jr17001_d** | 12/12/2017 19:01 | 15/12/2017 06:01 | Transit Marguerite Trough to Sr1b. | 59 | None | No lines |

Figure 6.1.1 and 6.1.2 illustrate the final bathymetry grids at 5m cell size resolution for the two fjord systems (Marian Cove and Börgen Bay resp.), with values of slope and rugosity plotted directly derived from the bathymetry grids, and with backscatter data from the central lines (see section below). Values of slope (in degrees) represent the inclination of the seabed, compare each depth point with its neighbours. Areas of low slope (arbitrarily chosen as 7° or less) on the seabed were of particular interest to select the best sites for Agassiz trawl sampling, an activity which ideally requires the surveyed seabed to gently slope downwards Figure 6.1.3a and Figure 6.1.3b. Values of rugosity of the seafloor are a measure of surface roughness of the bed, and are considered influential for benthic habitat suitability Figure 6.1.3c and Figure 6.3d. The rugosity value of a cell is high when its depth is significantly different than the mean depth from the surrounding cells in a gridding window of 3x3 cells. Slope and rugosity gridding were calculated using Fledermaus v7.7.6 processing algorithms.

Another data output of the EM122 multibeam echosounder besides bathymetry, is the backscatter data, i.e. the intensity with which the sound returned to the transducer, measured in decibels (dB). This backscatter intensity depends (amongst many other factors) on the geometry of the bed, and is a function of seabed properties like grain size. The many turns taken by the vessel whilst surveying the narrow fjords rendered a large proportion of the backscatter data very noisy, and it would need to be post-processed in detail to plot the values across the entire MBES coverage. This was beyond the scope and time constraints of this report. Figure 6.1.4 illustrates initial gridding of unprocessed backscatter within the two fjords.

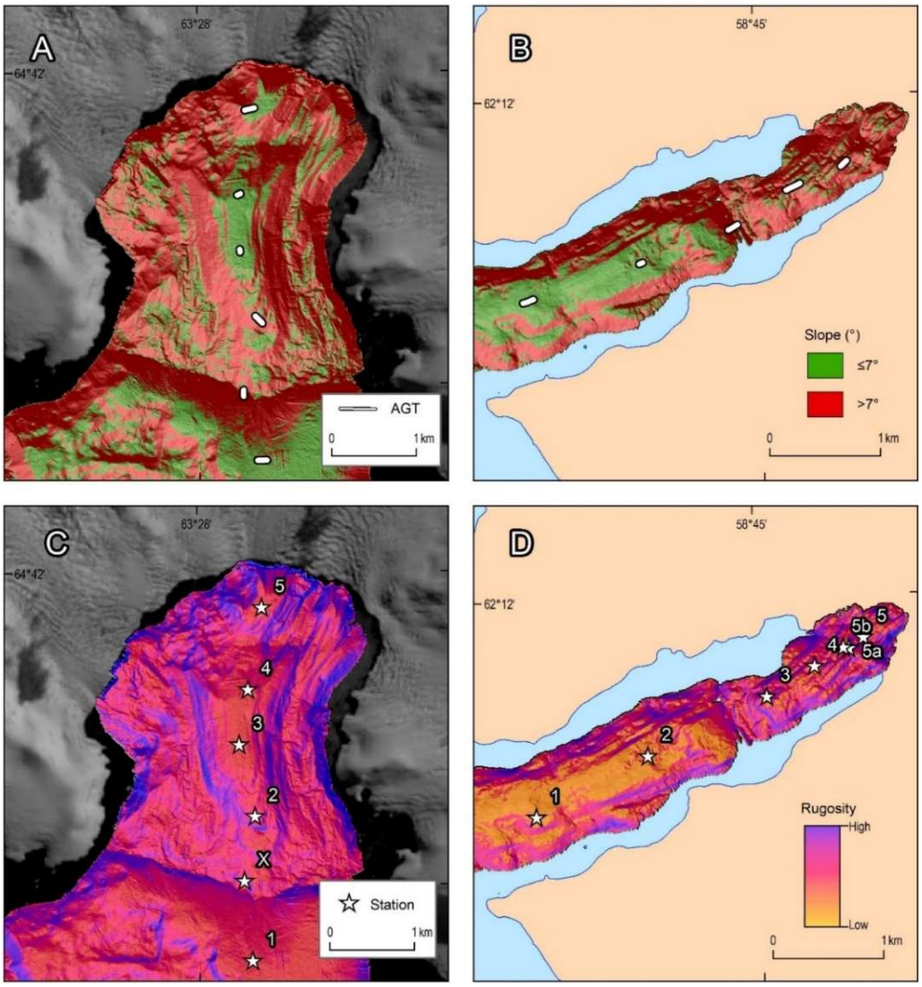


**Figure 6.1.3: A) Hillshaded seabed slope map of Börgen Bay. B) Hillshaded seabed slope map of Marian Cove. Areas of low slope ≤7°) were mapped to identify appropriate locations for Aggasiz trawling. C) Hillshaded rugosity map of Börgen Bay. D) HIllshaded rugosity map of Marian Cove.**

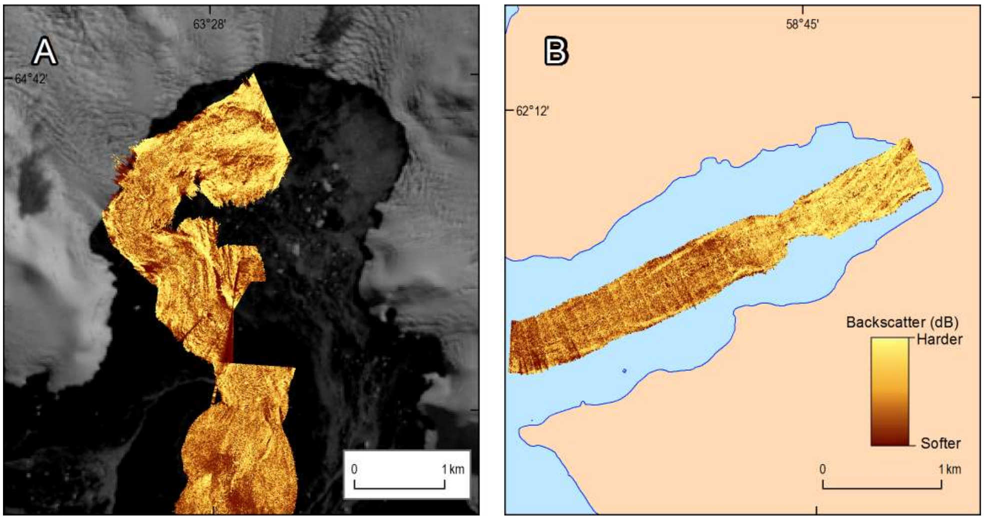


**Figure 6.1.4: A) Unprocessed backscatter grid of lines jr17001_b 0000 & 0004 at Börgen Bay. B) Unprocessed backscatter grid of line jr17001_a 0009 at Marian Cove. Note the numerous artefacts in the data. Light colours = relatively harder seabed, Darker colours = relatively softer seabed.**

## *6.1 b) TOPAS (PS018) Sub-bottom Profiler*

The TOPAS sub-bottom profiler was used intermittently in support of the ICEBERGS component of JR17001. Generally TOPAS was run for a single line within each fjord in order to survey the seabed to ensure that there was sufficient sediment cover prior to deploying the agassiz trawl and the multicorer. The TOPAS was also run within the opportunistic Marguerite Trough science program to assist identifying appropriate agassiz trawl sites. During surveying both raw and segy data were logged.

### *Data Acquisition*

All lines were run in shallow water (<500 m). Typical parameter settings on the control work station are summarised in Table 6.2. The TOPAS trigger was generally operated in a synchronised mode with an external trigger from the KSYNC (see EM122 section for further details). A time variable gain (TVG) and small gain adjustments were used to improve imaging of the seafloor on the screen display. During most lines both .raw and .segy format were recorded. Acquisition parameters were changed from time to time and are summarised in the TOPAS event log in Appendix 15.1, Table 15.1.5.

**Table 6.1.2: Summary of typical TOPAS acquisition parameters generally used on JR17001. Please refer to Appendix 15.1 for a detailed log of when parameter settings varied from those below.**

| Acquisition Parameters | | |
|---|---|---|
| Transmitter | Mode | Normal |
| | Trigger | External |
| | Pulse Form | Chirp (LFM) |
| | Start Frequency | 1.3 kHz |
| | Stop Frequency | 5 kHz |
| | Chirp Length | 15 ms |
| | Power Level | 0 to -2 dB |
| | HRP | Enabled |
| | Beam Forming | Manual (with 0° Slopes) |
| Receiver | Delay Control | Manual |
| | Master Trigger Delay | Depth dependant |
| | Delay offset | 40 ms |
| | Sample Rate | 30 kHz |
| | Trace Length | Generally 400ms but did increase occasionally (see Appendix 15.1) |
| | Gain | 10 dB |
| | HP-filter | 1kHz |
| Depth Selector | Enabled | Generally used Bottom Tracker 1 over EM122 since the EM122 was operating at the shallow end of its range. |
| Average Sound Speed Selector | Enabled | 1500 m/s |
| **Processing Chain** | | |
| Filters | Filter Type | Matched |
| | Corner Frequencies | Auto |
| Bottom Tracker | Enabled | Used this feature when bottom detection was lost/lagging. |
| | Show Master Depth | Enabled |
| | Window Start | Depth dependant |
| | Window Length | 8 ms |
| | Threshold | 50% |
| | Auto Search | Disabled |
| Time Variable Gain (TVG) | Enabled | TVG values were set by clicking and dragging the squares in the Single Trace Area. |
| | TVG control | Tracking |
| | Offset | -10 ms |
| Attribute Processing | Enabled | Instant Amplitude. |

*Problems Encountered*

There was initial difficulty in triggering the TOPAS through the KSYNC with the EM122 while transiting to the first survey area. It was discovered that this was a consequence of trying to operate too many echosounders concurrently, and the high transit speed of the JCR (12 kn) over deep water (>3000m) which resulted in the TOPAS never getting a turn to trigger before the next trigger cycle arrived. This problem was rectified once we reached Marian Cove where the shallower water depths, slower surveying speeds and turning off the unused echosounders (OS75 in particular) resulted in the KSYNC successfully triggering the TOPAS with the EM122.

Our intention was for the TOPAS to generate output files (both .raw and .segy) with meaningful names using the acquisition software. Instead, files received names using a time stamp from when recording started (YYYYMMDDHHMMSS.raw). Table 15.1.6 in Appendix 15.1 provides a summary of logged raw file names and their corresponding line numbers that they are referred to in the event log.

Finally, clear interference was observed with the TOPAS and the centre beams EM122 during the opportunistic science program at Marguerite Trough (JR1700c lines 0034-0053). This resulted in false bottom detection both just above and below the actual seabed. It was determined that the seabed was very flat in this area and that these artefacts could be processed out of the final bathymetry product. However, in more rugose terrain it might be better to reduce the power from the TOPAS.

### *6.1 c) Expendable bathythermographs (XBT)*

#### *Data acquisition*

XBTs (T-7 models) were deployed during the multibeam mapping components of the cruise to provide sound velocity profile corrections for the EM122 data. XBTs (T-5 and T-7 models) were also deployed for the Drake Passage to obtain remaining temperature profiles for the northern stations after winch failure prevented further CTD casts. In total 12 XBTs were deployed with CTDs providing the remaining SVPs. A summary of XBTs deployed is provided in Table 6.1.3.

**Table 6.1.3: Summary of XBTs deployed collected on JR17001.**

| XBT ID | Model | Serial Number | Latitude (DD) | Longitude (DD) | Depth (m) | Bridge Event | Location |
|---|---|---|---|---|---|---|---|
| **JR17001_Br2_XBT_1** | T-7 | 1220023 | -62.21637 | -58.80814 | 61 | 2 | Marian Cove |
| **JR17001_Br3_XBT_2** | T-7 | 1220021 | -62.22857 | -58.83611 | 422 | 3 | Marian Cove |
| **JR17001_Br58_XBT_3** | T-7 | 1220015 | -64.77740 | -63.46647 | 312 | 58 | Börgen Bay |
| **JR17001_Br121_XBT_4** | T-7 | 1220022 | -67.21850 | -71.06049 | 449 | 121 | Marguerite Trough |
| **JR17001_Br127_XBT_5** | T-7 | 1220036 | -67.23905 | -71.51179 | 435 | 127 | Marguerite Trough |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **JR17001_Br169_XBT_6** | T-5 | 383635 | -55.02649 | -57.98299 | 1948 | 169 | North SR1b |
| **JR17001_Br170_XBT_7** | T-5 | 383639 | -55.01940 | -57.98302 | 1826 | 170 | North SR1b |
| **JR17001_Br171_XBT_8** | T-5 | 383643 | -55.03358 | -57.99196 | 1651 | 171 | North SR1b |
| **JR17001_Br172_XBT_9** | T-5 | 383643 | -55.01067 | -58.00678 | 1974 | 172 | North SR1b |
| **JR17001_Br173_XBT_10** | T-5 | 383638 | -55.01067 | -58.00678 | 1762 | 173 | North SR1b |
| **JR17001_Br174_XBT_11** | T-7 | 1220040 | -54.96226 | -57.99632 | 894 | 174 | Burwood Bank |
| **JR17001_Br175_XBT_12** | T-7 | 1220037 | -54.88430 | -57.98324 | 410 | 175 | Burwood Bank |

*Problems Encountered*

XBT deployments 6 through to 9 failed, logging erroneous data just prior to launching. At first it was suspected to be a result of operator error, with the XBT being loaded 20 minutes prior to arriving on station. However launching a new XBT just after loading still resulted in erroneous logging. The AME electrical engineer cleaned the contacts and rebooted the system but the fault still persisted. In the end the fault was discovered to be flooding of the connector on both the deck and the launcher. Once both these had been replaced the XBT resumed launching successfully.

*References*

Cook, A.J., Vaughan, D.G., Luckman, A. & Murray, T. A new Antarctic Peninsula glacier basin inventory and observed area changes since the 1940s. *Antarctic Science*. 2014. 26:614-624.
Fledermaus, 2014. Fledermaus Reference Manual: Version 7. *QPS Canada*. pp. 357

## 6.2 UK VMP-2000 Operations and Measurements

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### 6.2 a) Overview

The Vertical Microstructure tethered Profiler (VMP-2000, VMP for short thereafter) is a much loved scientific instrument manufactured by Rockland Scientific International that measures profiles of temperature, conductivity and velocity microstructure (i.e. on the length scales of the dissipation of turbulent flows, typically a few millimetres to tens of centimetres) throughout the water column. On JR17001 a VMP loaned from K.Polzin at WHOI was used, and run by K.Sheen and M.Boniface. The central goal was to obtain measurements of turbulent kinetic energy dissipation and mixing across the three ICEBERGS measurement sites: Marion Cove, Borgen Bay and Sheldon Bay.

The plan was to deploy the VMP at each of the ICEBERGS stations. However, after a successful set-up and deck tests, unfortunately the instrument flooded on the first test dive. A leak had occurred due to a slightly pinched o-ring between the front nose cone and main body. As such some of the electronics and circuit boards had burnt out, and we were unable to fix aboard. As such no relevant microstructure data was collected. Some notes are documented below regards set-up and operation during the test dive.

## *6.2 b) Operations*

### *i Deployment and Recovery*

The VMP-2000 was deployed off the aft port on a tethered 2000 m cable that runs off a hydraulically powered winch-spool and through a shiv held by crane and line-feeder (see Figure 6.2.1). The instrument was initially deployed using the crane with a quick-release method, off the side of the vessel. Effort was made to ensure a small current was acting to displace the VMP away from the hull. Care must be taken during the VMP dive to ensure that it falls freely without any jerks from the wire becoming too tight or, on the other hand, without allowing too much free-wire to coil up in the water. The correct wire tension was achieved by situating one person to watch the VMP dive and wire tension (keep a couple of coils on the sea surface), with a second person operating the winch-spool. The instrument was recovered using the hydraulic winch, which also acts to communicate data back in real-time. The ODAS software is used to continually analyse the communication and watch for bad buffers, by a third person located on deck in the science container. We also rigged up a network cable to the deck-computer so that water depth, and ship position was continually visible. Deploying with the above method was found to be successful for the one test dive performed. A wooden horse was made aboard by super-star Gareth to store the instrument in the rough lab, but see recommendations below. NB The hydraulic power pack was provided by NMF, and we had to change the hydraulic fluid to bio from 32-weight mineral. If ships hydraulics are used the settings are 38 litres per minute at 1000 psi.

### *ii Set-up*

Prior to being deployed on JR17001, the instrument was used on the GoMix cruise in summer of 2017. After assembling the instrument, and series of initial bench tests were carried out with the instrument connected both through just the tether and through the entire 2000 m cable spool. Initially we found that we were getting several bad buffers, suggesting that the comms rate needed to be adjusted. The information guide provided by Rockland Scientific 'Transmission-Reception Time with ODAS Serial Communication' booklet suggested that for a 2000m wire, the maximum comm rate setting needed to be adjusted to 6 with channels (2 slow, 6 fast). To achieve this we removed the Az and T2_dT2 channels. Therefore we modified the set-up file and opened up the instrument to change the jumpers from the GoMIX settings (of comm rate and channels). The final set-up file is shown in Appendix 15.2. Having made these changes, all tests looked good, with no bad buffers and quick communication. If we had continued to find problems, Rockland suggested a further reduction of man_com_rate to 4. Calibration coefficients in the set-up files were checked and probe diagnostics analysed using ODAS matlab codes such as plot_VMP. Also, we found it best not to have the laptop connected to power for noise isolation during dives, as this has been noted to cause bad buffers.

*iii Recommendations:*

- Make deck and lab cradle (with sliders to align different sections during assembly to prevent difficulties in aligning o-rings and for ease of working). Replace and grease all o-rings after splitting the VMP.
- Shiv was too heavy for the job, but was good to have one with snatch-block
- Test dive should be factored into timing before start true data-collection
- After test dive check fall speed is ok
- If still bad buffers on man_com_rate 6, drop to 4 (and adjust channel number accordingly)

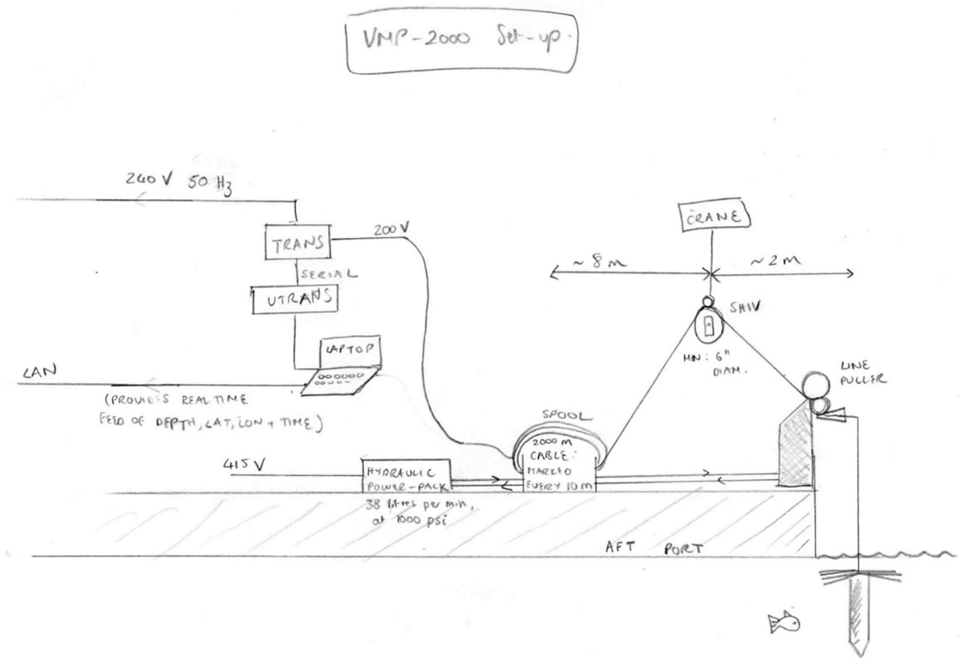


**Figure 6.2.1: Sketch of VMP set-up**

**Final figuration file is shown in Appendix 15.2**

## *6.3 ICEBERGS physics: CTD, VMADCP, and oxygen isotopes*

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CTD/LADCP deployments, with water sampling for salinity, dissolved oxygen, oxygen isotopes, and microplastics, were performed at the ten ICEBERGS sites, and processed and calibrated as described in Section 12.2; the instrumentation and setup are described in Appendices E and F. The ICEBERGS sites are represented by CTD casts 2-7 and 9-12. Salinity and dissolved oxygen samples were analysed aboard by the ORCHESTRA hydrography team; samples from the entire cruise were used together to calibrate the CTD conductivity and dissolved oxygen sensors, as described in Section 12.2.

| | MC5 | MC4 | MC3 | MC2 | MC1 | BB5 | BB4 | BB3 | BB2 | BB1 |
|---|---|---|---|---|---|---|---|---|---|---|
| LADCP speed (cm/s) | 2.1 | 1.7 | 4.9 | 2.9 | 4.6 | 4.5 | 6.5 | 4.2 | 2.2 | 0.8 |
| :ADCP direction (N of E) | 357 | 80 | 67 | 308 | 156 | 115 | 129 | 5 | 95 | 220 |
| VMADCP speed (cm/s) | | 2.0 | 3.9 | 1.3 | 2.3 | | | 1.5 | 2.2 | 3.9 |
| VMADCP direction (N of E) | | 196 | 215 | 168 | 130 | | | 243 | 85 | 81 |

**Table 6.3.1 Bottom currents at each site from the LADCP and VMADCP**

VMADCP data were also collected and processed as described in Section 12.2. While VMADCP data were collected both on-station and underway, time averages for the ICEBERGS sites were made using only station data, to avoid possible contamination by erroneous values when the ship was undergoing rapid heading changes moving on an off station, as described in Section 12.2. Post-processing ashore will attempt to recover more of the data around the ICEBERGS sites.

Seawater samples for oxygen isotope ratio analysis were taken in glass bottles from both the CTD Niskins (see Table 15.3.1) and the underway pumped seawater supply while over the WAP continental shelf (30 samples), to investigate the variability in freshwater sources with distance from the glacial sites and/or from the sea ice edge. The samples will be analysed ashore by the British Geological Survey.

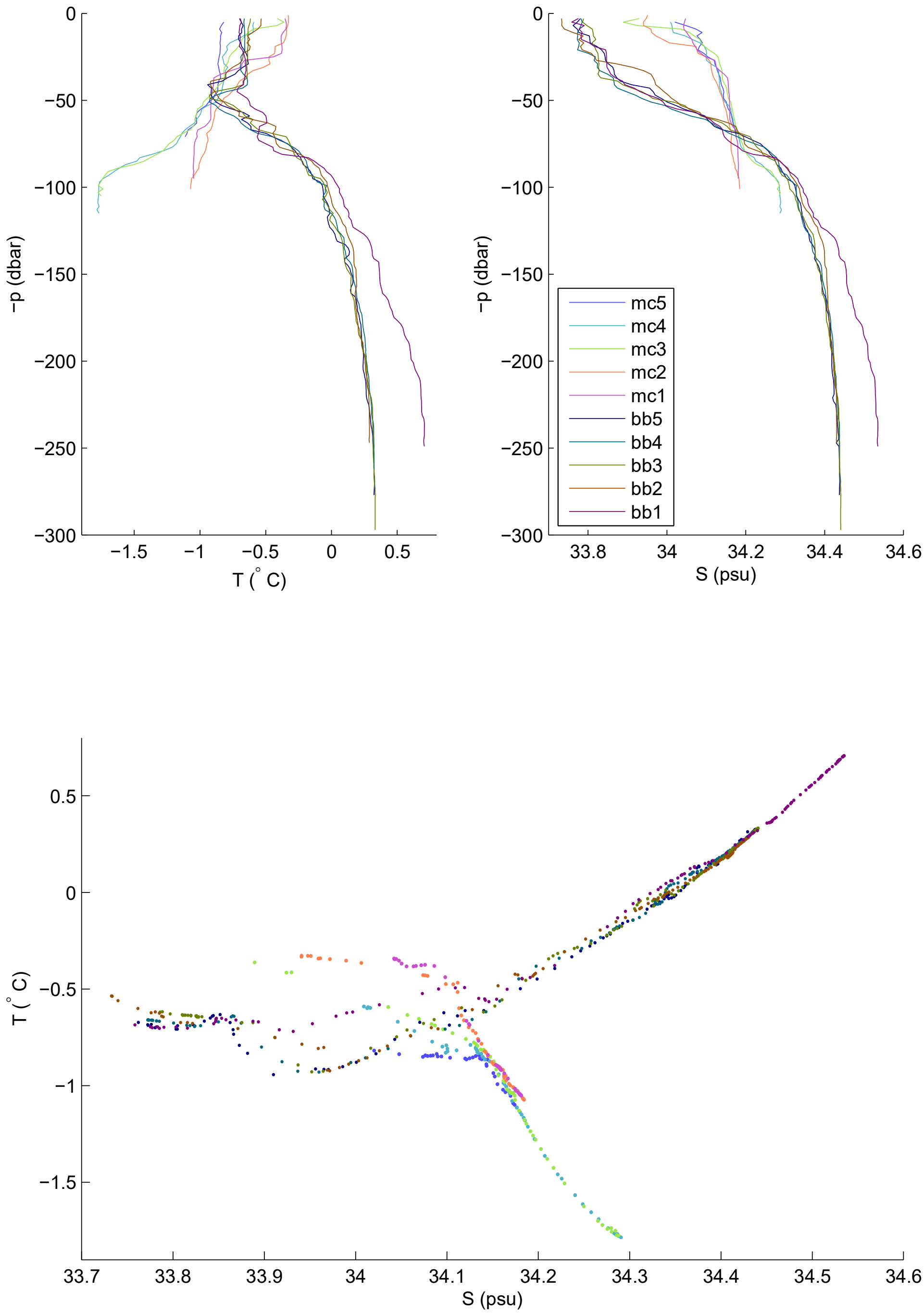


**Figure 6.3.1 Temperature and salinity profiles and T-S relationship at the ICEBERGS sites. A particularly strong gradient in bottom water properties was observed at Marion Cover.**

## *6.4 Microplastics*

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Investigating microplastics in fjords, such as Marian Cove, King George Island and Börgen Bay, Anvers Island, on the Antarctic Peninsula is of importance as these ecosystems are relatively new due to glacial retreat. Thus, Antarctic fjords represent newly colonized communities that are likely subjected to microplastic pollution. Microplastics are an unrelated stressor to glacial retreat, but nonetheless, such an anthropogenic impact could have lasting and devastating effects on macrofauna in newly colonized habitats. For this study, we investigate the presence of microplastics in Marion Cove and Börgen Bay fjords from seawater and sediments, along the Antarctic Peninsula in efforts to help provide a better understanding of the impacts of pollution on newly colonized habits in Antarctica.

Seawater was collected from ten sites in two fjords (Marian Cove, King George Island; Börgen Bay, Anvers Island) along the Antarctica Peninsula (Table 6.4.1). Specifically, one liter of water was collected from both the surface and bottom using niskin bottles of a CTD rosette (depths and coordinates can be found in Table 6.4.1). Water was immediately filtered using 0.45 micron gridded cellulose nitrate filters (Cole-Parmer, Vernon Hills, Illinois) and a hand-operated vacuum pump (Figure 6.4.1). To eliminate contamination, filtering apparatus was rinsed with milliq water between each sample. Additionally, the filtering apparatus was covered during filtration to avoid contamination. Filters were stored in sealed petri dishes until identification and quantification.

Sediment cores were also collected for microplastic characterization. Two cores were collected from each of the following sites: MC2, MC3, MC4, BB2, BB3, BB4, totaling 12 cores. Each core was sliced at 1cm intervals for the top ten centimeters. Sediments were preserved in ethanol. Microplastics from sediment cores and water samples will be quantified, measured, and characterized at the University of West Florida.

Although macroplastics were not the focus of this study, three macroplastics were observed during the course of this study. Specifically, two macroplastics, likely plastic bags, were observed using the Shallow Underwater Camera System in Marian Cove at sites MC1 and MC2. Moreover, a macroplastic was recovered in the Agassiz trawl at site MC5. Some degradation of the macroplastics was observed (A.M. Janosik and D.K.A Barnes personal communication).

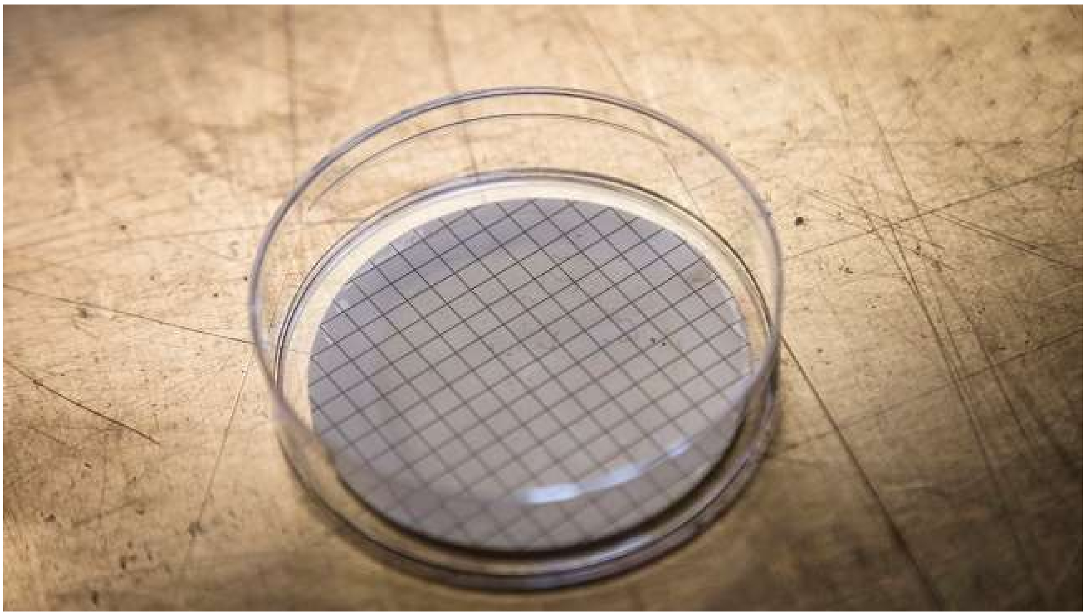

Figure 6.4.1 Filter with microplastics from Marian Cove, King George Island, Antarctica.

Table 6.4.1 Microplastics water collection data.

| Geographic Region | Station number | Depth (meters) | Latitude | Longitude |
|---|---|---|---|---|
| Marian Cove, King George Island | MC1 surface | 4.0m | -62.21763 | -58.78921 |
| | MC1 benthic | 93.0m | | |
| | MC2 surface | 2.1m | -62.21273 | -58.76889 |
| | MC2 benthic | 93.8m | | |
| | MC3 surface | 2.07m | -62.20815 | -58.74787 |
| | MC3 benthic | 102.0m | | |
| | MC4 surface | 4.7m | -62.20588 | -58.73986 |
| | MC4 benthic | 113.1m | | |
| | MC5 surface | 2.7m | -62.20373 | -58.73144 |
| | MC5 benthic | 70.8m | | |
| Börgen Bay, Anvers Island | BB1 surface | 3.0m | -64.74165 | -63.45343 |
| | BB1 benthic | 246.0m | | |
| | BB2 surface | 4.0m | -64.72616 | -63.45239 |
| | BB2 benthic | 244.0m | | |
| | BB3 surface | 2.3m | -64.71836 | -63.45799 |
| | BB3 benthic | 295.0m | | |
| | BB4 surface | 2.8m | -64.7106 | -63.45467 |
| | BB4 benthic | 273.0m | | |
| | BB5 surface | 2.0m | -64.70347 | -63.45032 |
| | BB5 benthic | 274.0m | | |

## *6.5 Micropalaeontology & biogeochemistry*

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Two of the retrieved cores from the multicorer were assigned for micropalaeontological and biogeochemical analyses. In general, surface and near surface sediments from the multicores were taken to calibrate microfossil distributions and assemblage patterns with measured environmental parameters (from CTD) to assess the proxies that most faithfully reconstruct 1. ocean temperature, 2. sea ice cover, and 3. distance from the ice front. Proxies in subsurface sediments from the multicores, in tandem with chronological control ($^{210}$Pb dating), will be used to trace deglaciation in the recent past.

One core was dedicated to analysis for foraminifera, the prime microfossil group used in palaeoceanography and marine climate reconstructions. For this, the core was extruded at 1 cm intervals for the first 10 cm of the core (10 samples), and then at approximately every 5 cm to the end of the core. The sediment was placed in 120 cc plastic vials, and 40 cc of ethanol mixed with Rose Bengal (1% concentration; dye which stains living tissue) was added to each sample. This procedure was adopted in order to determine live (in situ; authochthonous) vs. dead (allochthonous; potentially transported) foraminifera for each site along the transects. Samples were refrigerated (4°C) until processing, which primarily involves wet sieving (at 63 μm), followed by oven drying at low temperature (45°C).

Another core was dedicated to the analysis of two proxy types: 1) biomarkers (organic compounds produced by sea ice algae and open water algae) and 2) other microfossils (dinocysts and other non-pollen palynomorphs; diatoms). For biomarker (chemical fossils) analysis, approximately 20 cc of sediment from the top 5 cm of the core was taken at 1 cm intervals (5 samples). The sediments were placed in glass vials and frozen at -20°C. For analysis of organic-walled and siliceous microfossils, ca. 50 cc were taken from the top 5 cm of the core at 1 cm intervals (5 samples), and at approximately 10 cm intervals thereafter, until the end of the core. Sediments for microfossil analysis were placed in a plastic bag and frozen at -20°C. These samples will be processed according to standard protocols. For chemical fossils, this involves freeze drying, followed by extraction for gas chromatography–mass spectrometry (GC-MS). For organic-walled microfossils (dinocysts and other non-pollen palynomorphs), processing encompasses digestion in hydrofluoric and hydrochloric acids. For siliceous microfossils, sediments will be digested in hydrogen peroxide.

## *6.6 Plankton (N70) net*

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The aim was to identify the major planktonic components above each of the ICEBERGS 2017 benthic research sites. Depending on the catch composition, sub-samples were planned for use in genetic, stable isotope, and ingested microplastic analyses, as well as analyses for planktonic organisms that preserve as microfossils in seabed sediments.

**Gear**

An N70 net was used for plankton sampling; this has a 70cm diameter mouth opening, 445µm upper mesh and 195µm lower mesh. It is a BAS reconstruction of pelagic sampling nets used during the Discovery Investigations - described in detail by Ward *et al.* 2012 (Polar Biology DOI 10.1007/s00300-012-1163-x). The N70 was set up for simple vertical hauls, and consequently, the throttling rope and messenger system for sampling discrete depth horizons was not used. A jubilee clip, rather than the brass fitting ring, was used to fit the net to the cod end because the latter was challenging to pull over the net seam (Fig. 6.6.1). The brass wires were attached to a short section of rope to facilitate handling of the lead weight (Fig. 6.6.2). By alternating between two cod ends, re-deployments could be carried out in a timely fashion: either 3 deployments to 80m or 2 deployments to 180m within 1 hour.

Fig. 6.6.1

Fig. 6.6.2

**Sampling sites**

Two fjords were sampled: Marian Cove (MC) at King George Island and Börgen Bay (BB) at Anvers Island. Vertical N70 hauls were made at five sites within each fjord, corresponding to the five ICEBERGS

2017 research sites that occur in a transect from fjord mouth to glacier edge (sites 1-5). Three hauls were made at each site in the shallower waters of Marian Cove, whilst in the deeper Börgen Bay only two hauls were made per site due to time constraints. Hauls deeper than 200m were not possible due to the constraint of cable length. All 25 of the N70 deployments were successful (see Table 6.6.1).

**Table 6.6.1: N70 plankton net hauls in West Antarctic Peninsula fjords.**

| Sampling Code | Time | Latitude | Longitude | ea600 Depth | Sea Surface Temp | Salinity | Bridge Event | Haul Depth |
|---|---|---|---|---|---|---|---|---|
| MC-1 haul 1 | 25/11/2017 08:51 | -62.20425 | -58.734 | 106.57 | -0.5731 | 34.0006 | 17 | 80 |
| MC-1 haul 2 | 25/11/2017 09:05 | -62.20425 | -58.734 | 106.69 | -0.5804 | 34.0406 | 18 | 80 |
| MC-1 haul 3 | 25/11/2017 09:19 | -62.20424 | -58.734 | 108.72 | -0.5341 | 34.0115 | 19 | 80 |
| MC-2 haul 1 | 25/11/2017 10:41 | -62.20568 | -58.73986 | 112.88 | -0.4492 | 33.9901 | 21 | 80 |
| MC-2 haul 2 | 25/11/2017 10:52 | -62.20563 | -58.73981 | 112.64 | -0.4526 | 33.9881 | 22 | 80 |
| MC-2 haul 3 | 25/11/2017 11:03 | -62.20564 | -58.73982 | 112.71 | -0.5139 | 34.0083 | 23 | 80 |
| MC-3 haul 1 | 25/11/2017 11:29 | -62.20813 | -58.74826 | 103.53 | -0.4951 | 34.036 | 24 | 80 |
| MC-3 haul 2 | 25/11/2017 11:45 | -62.20802 | -58.74814 | 101.77 | -0.4419 | 33.9489 | 25 | 80 |
| MC-3 haul 3 | 25/11/2017 12:01 | -62.20801 | -58.74814 | 100.49 | -0.4465 | 33.9489 | 26 | 80 |
| MC-4 haul 1 | 25/11/2017 12:30 | -62.21275 | -58.76924 | 105.15 | -0.3769 | 34.0356 | 27 | 80 |
| MC-4 haul 2 | 25/11/2017 12:45 | -62.21277 | -58.76927 | 104.98 | -0.3556 | 33.9486 | 28 | 80 |
| MC-4 haul 3 | 25/11/2017 13:00 | -62.21278 | -58.76925 | 104.84 | -0.3667 | 33.9453 | 29 | 80 |
| MC-5 haul 1 | 25/11/2017 13:26 | -62.21747 | -58.78868 | 96.29 | -0.3774 | 34.017 | 30 | 80 |
| MC-5 haul 2 | 25/11/2017 13:39 | -62.21746 | -58.78868 | 96.31 | -0.3645 | 34.016 | 31 | 80 |
| MC-5 haul 3 | 25/11/2017 13:51 | -62.21746 | -58.7887 | 96.38 | -0.3693 | 33.9432 | 32 | 80 |
| BB-1 haul 1 | 28/11/2017 10:10 | -64.74137 | -63.45338 | 252.72 | -0.4717 | 33.6474 | 78 | 180 |
| BB-1 haul 2 | 28/11/2017 10:33 | -64.74138 | -63.45337 | 252.6 | -0.5627 | 33.5973 | 79 | 180 |
| BB-2 haul 1 | 28/11/2017 11:15 | -64.72615 | -63.45248 | 249.69 | -0.5953 | 33.7791 | 80 | 180 |
| BB-2 haul 2 | 28/11/2017 11:38 | -64.72613 | -63.45232 | 249.65 | -0.4801 | 33.7405 | 81 | 180 |
| BB-3 haul 1 | 28/11/2017 12:18 | -64.71846 | -63.45676 | 302.68 | -0.5504 | 33.8204 | 82 | 180 |
| BB-3 haul 2 | 28/11/2017 12:39 | -64.71849 | -63.45701 | 302.82 | -0.5757 | 33.8132 | 83 | 180 |
| BB-4 haul 1 | 28/11/2017 13:16 | -64.71278 | -63.45455 | 291.05 | -0.5892 | 33.8249 | 84 | 180 |
| BB-4 haul 2 | 28/11/2017 13:37 | -64.71278 | -63.45456 | 292.19 | -0.4778 | 33.7547 | 85 | 180 |
| BB-5 haul 1 | 28/11/2017 14:18 | -64.70351 | -63.45044 | 281.48 | -0.5286 | 33.72 | 86 | 180 |
| BB-5 haul 2 | 28/11/2017 14:40 | -64.7035 | -63.4504 | 281.03 | -0.576 | 33.7497 | 87 | 180 |

## N70 catch processing and initial assessment

N70 catches were re-suspended in c. 500mL of seawater. The contents of haul 2 from every station was used for microfossil analysis (see below); for this c.120mL aliquots were preserved in ethanol (50%; for foraminifera) and Lugol's solution (iodine; for dinoflagellates and diatoms). Catches from the remaining hauls were assessed for zooplankton by eye and by examining c. 100mL subsamples under a dissecting microscope. Each catch was subsequently concentrated into either 40mL or 80L volumes prior to freezing and storage at -20°C for transit to the UK and further morphological (and potentially molecular) characterisation.

All of the N70 catches were dominated by phytoplankton (principally diatoms). Diatom densities were clearly lower at Marian Cove than at Börgen Bay. Among the Marian Cove stations, MC1 stood out from the other stations by virtue of its lower phytoplankton density (Fig. 6.6.3); phytoplankton densities appeared to be similar across all of the Börgen Bay stations. After phytoplankton, the next most abundant macro particles were zooplankton faecal pellets. The zooplankton component of each catch was limited. Low numbers of Acantharia and Ctenophora were found in multiple stations within both Marion Cove and Börgen Bay. Chaetognatha and Copepoda were also found at both of these localities, with Chaetognatha the most abundant zooplankton group at Börgen Bay and Copepoda the most abundant group at Marian Cove. Börgen Bay appeared to have the highest pelagic taxonomic diversity as species from Amphipoda, Calycophorae, Euphausiacea, Ostracoda and Polychaeta were spotted in the subsamples assessed from this location but not in those from Börgen Bay. With the exception of some species of Chaetognatha, the number of individuals sampled per morphospecies were low (<10) and thus of limited use for population genetic or stable isotope analysis. However, some of these small samples were suitable for the analysis of ingested microplastics (see below).

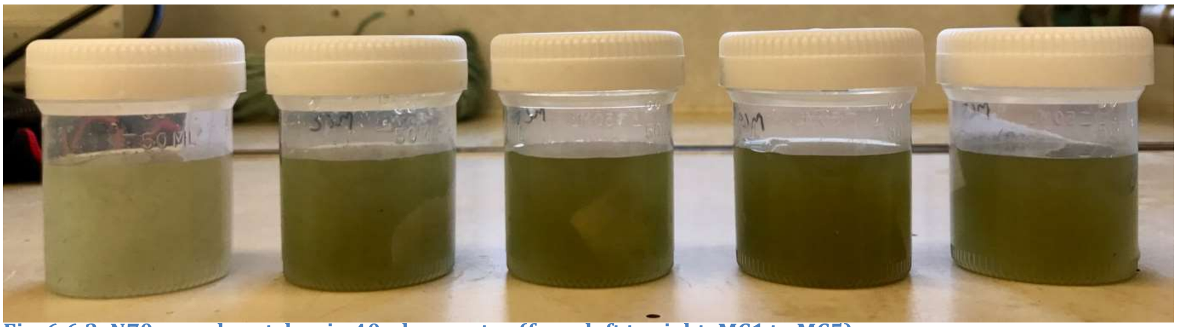

**Fig. 6.6.3: N70 sample catches in 40ml seawater (from left to right: MC1 to MC5)**

## *6.7 Hamon Grab*

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A Hamon grab with a 20 x 40 x 40 cm bucket was used to sample the infauna present in the muddy substrate of both glacial fjords. The Hamon grab consists of swivel spade bucket housed in a metallic frame. The grab mechanism is not spring loaded but relies on a weighted deployment catch which is released upon contact with the seabed. This changes the bucket arm position from horizontal to vertical as the grab is retrieved. The Hamon grab was connected to the ships coring wire using two shackles and a heavy duty swivel, this was necessary as the grab itself weighs over 350 kg. Before deployment, the cable attached to the grab was replaced with a new unused cable and the small grab bucket (20 x 20 x 40 cm) was replaced with the larger bucket to ensure enough sample was collected.

Prior to deployment, the multibeam maps and SUCS images were used to ensure that the grab was deployed on to soft sediment and not bedrock, the Simrad echo sounder was also used to monitor bottom depth. Prior to lifting the grab cable was tensioned and the counter weight was hand lifted in order to minimise the chances of a failed triggering of the grab. The grab was then gently lifted from its stand, ensuring that the deployment catch was locked in place with the safety pin. It was then hoisted overboard whilst being steadied by two people (Figure 6.7.1). Whilst the grab was suspended over the side of the ship, the safety pin was removed, ensuring that the grab would deploy when it touched the seabed. The grab was lowered at a maximum rate of 50 m/min which was reduced to 20 m/min roughly 50 m from the seabed. Once on the seabed, tension was let off the cable to ensure enough weight was placed on the bucket to allow the deployment catch to disengage. The grab was then left for approximately 30 sec before being gently raised from the seabed to allow the grab to collect an adequate sample and then hauled at a rate of 50 m/min. Once on deck, if the grab had fully deployed, two people steadied it back onto its stand. A large plastic box was placed underneath the stand to collect the sample and the grab arm was slowly lowered by releasing the tension on the cable and pulling down on the handles at the top of the arm. This generally resulted in the full grab contents falling into the plastic box beneath the stand. If the sample did not fall out easily, small shovels and pressured seawater were used to remove it from the grab bucket. Once fully released, the deployment catch was put back in place and the safety pin was re-inserted. At this point the grab could be immediately re-deployed if necessary. If the grab did not deploy, it was hoisted out of the water and whilst still over the side of the ship, the safety pin was re-inserted to avoid the grab deploying whilst being lowered on to the deck.

The sample collected was equally split between two 1 mm sieves. The rationale for splitting the sample was that both frozen and ethanol preserved samples were required for different team members. Splitting the sample at this point ensured that there was no bias in the sample split. Deck hoses were then used to wash the sample with seawater through the sieve; the power of the hoses was carefully monitored to make sure the infaunal animals were not damaged by high water pressure. Once the sample was fully sieved and all of the sediment/mud removed, the two cleaned samples were taken into the wet lab where a sub sample was photographed (Figure 6.7.2) as a record of the overall community structure. Each sample was then sorted using forceps to remove all living specimens and dead mollusc shells. The sorted samples were then either placed into a labelled plastic sample tub and preserved in 100% ethanol or into a labelled ziplock bag and frozen at -80ºC.

**Figure 6.7.1: The Hamon grab is lifted from its stand and hoisted over board. The bucket for collecting the sample can be observed within the grab stand frame. Notice that the swivel mechanism of the grab is in horizontal position (prior to triggering) with the spade bucket on the right side of the grab.**

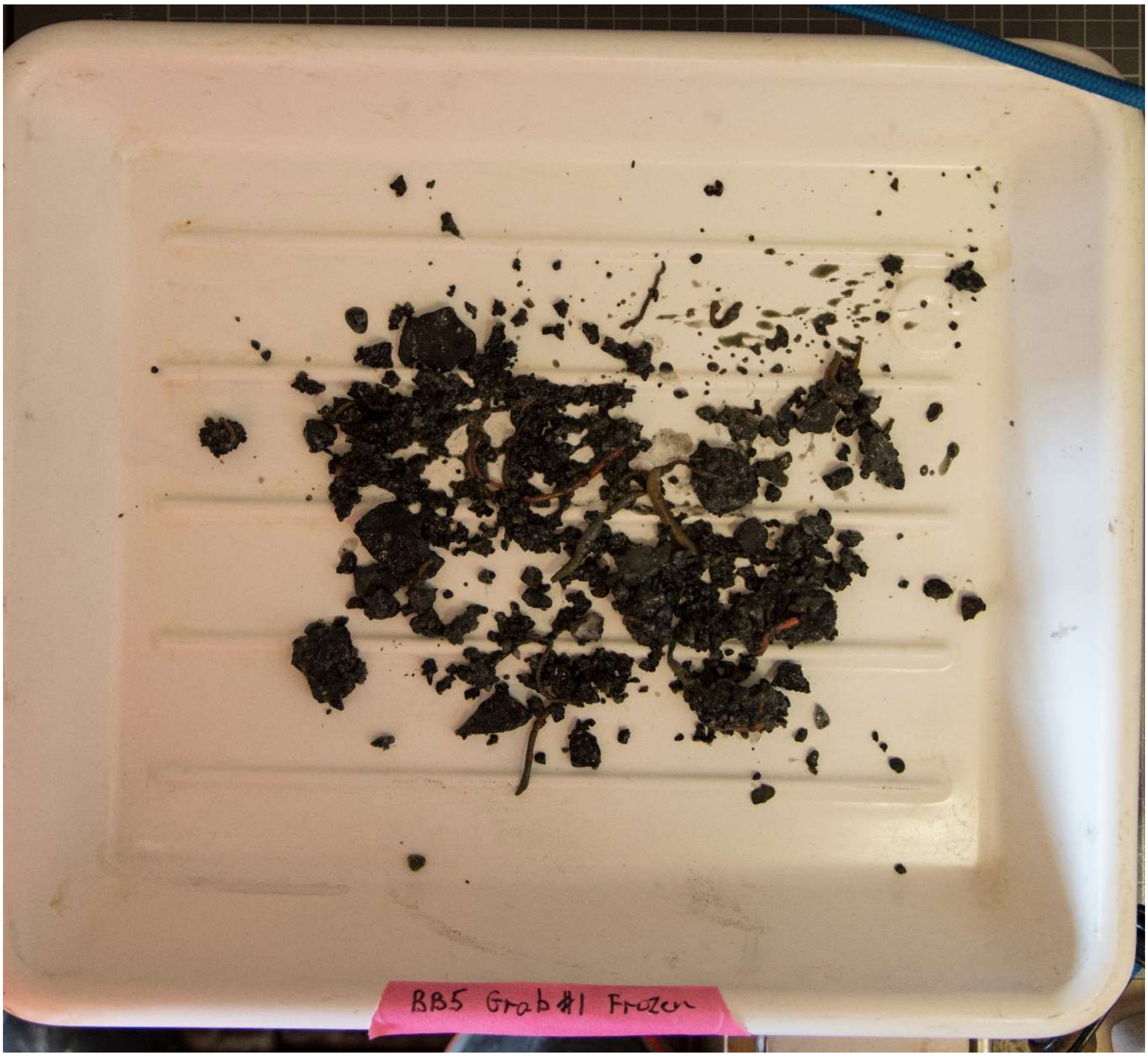


**Figure 6.7.2. A subsample of a sieved grab sample from station 5 at Börgen Bay.**

Four out of five potential stations were sampled in each glacial fjord with three replicate grabs per station. In Marian Cove, King George Island, time constraints led to the removal of site one (MC1) at the mouth of the cove (station number increasing towards the glacier front). Two failed grab deployments occurred at stations three and four (MC3 and MC4), the reasons for these were unclear. Station five (MC5) also caused several problems as there were many large glacial drop stones present in the soft sediment which caught between the grab bucket and the backplate. Luckily, as the mud was very cohesive the caught drop stones did not result in any sample loss. In Börgen Bay, Anvers Island, problems only arose in station five (BB5) where the liquefied soft muddy sediment did not present sufficient consistence to trigger the grab mechanism. Two attempts were made to deploy the grab at station five (BB5) with no success, after the second deployment it was decided to move to the next station.

**Table 6.7.1. An overview of all collected samples at each site. MC – Marian Cove, BB – Börgen Bay.**

| Station Event Number | Bridge Event Number | Depth | Latitude | Longitude |
|---|---|---|---|---|
| MC2.1 | 33 | 102.89 | -62.2127 | -58.7691 |
| MC2.2 | 34 | 102.89 | -62.2127 | -58.7691 |
| MC2.3 | 35 | 103.38 | -62.2127 | -58.769 |
| MC3.1 | 37 | 103.39 | -62.2081 | -58.7483 |
| MC3.2 | 38 | 102.44 | -62.2081 | -58.7482 |
| MC3.3 | 39 | 102.39 | -62.2081 | -58.7482 |
| MC4.1 | 40/41 | 112.71 | -62.2057 | -58.7397 |
| MC4.2 | 42 | 112.71 | -62.2057 | -58.7397 |
| MC4.3 | 43 | 112.08 | -62.2057 | -58.7396 |
| MC5B.1 | 44 | 113.81 | -62.2043 | -58.7345 |
| MC5B.2 | 45 | 112.32 | -62.2043 | -58.7344 |
| MC5B.3 | 46 | 112.32 | -62.2043 | -58.7344 |
| BB4.1 | 90 | 288.36 | -64.7124 | -63.4542 |
| BB4.2 | 91 | 288.57 | -64.7124 | -63.4542 |
| BB4.3 | 92 | 282.18 | -64.7122 | -63.4535 |
| BB3.1 | 93 | 302.84 | -64.7177 | -63.4578 |
| BB3.2 | 94 | 302.84 | -64.7177 | -63.4578 |
| BB3.3 | 95 | 302.91 | -64.7182 | -63.4574 |
| BB2.1 | 96 | 245.21 | -64.7263 | -63.4518 |
| BB2.2 | 97 | 244.04 | -64.7263 | -63.4518 |
| BB2.3 | 98 | 244.12 | -64.7263 | -63.4518 |
| BB1.1 | 99 | 254.24 | -64.7416 | -63.4534 |
| BB1.2 | 100 | 253.34 | -64.7415 | -63.4533 |
| BB1.3 | 101 | 253.34 | -64.7415 | -63.4533 |

## *6.8 Shelf Underwater Camera System (SUCS)*

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The SUCS is a camera mounted in a tethered tripod with adjustable lights designed to capture photographs of the seabed and its macro epifauna at up to 900 m depth. It can take video and still photos, and comprises three units:

1. Within vessel-laboratory unit; a) a PC and monitor, b) a deck box.

2. On vessel deck unit with a) the winch consisting of the UW-fibre optic cable, b) a deck monitor and c) a metering sheave on the mid-ships gantry.

3. An UW-unit of the tripod consisting of a) the UW-housing including the camera, booster and power, b) the UW-lights and c) the USBL pinger.

The inside unit had one hardware and software failure only (the system is much more reliable that it was before recent upgrades). The fibre optic winch (with newly fitted split ring) worked well and reliably. The new weather cover made in Denmark was good but not ideal at keeping weather off the outside operator. The maximum deployment depths of the system on JR17001 were all well within its maximum limit. The deck monitor was attached on to the winch using the brackets and jubilee clips used on previous cruises (e.g. JR16006 and JR16-NG). The monitor did not require shading (as on previous cruises) so the shades were not fitted. Three RMT8 weights attached to the UW-tripod, using short strops and cable ties, as used on previous cruises. The camera housing worked very well as well as did the LED lights with no recurrence of flickering that occurred on JR16006. The USBL in its purpose-built bracket, unlike in the Arctic, only worked intermittently.
The SUCS was used at each of two fjords, at a total of 11 sites. Twently pictures were taken at each of 10 of these sites but only three were taken at the last Börgen Bay site (BB5). At this latter site there was so much suspended sediment that the seabed could not be seen.

The SUCS was used on JR17001 to do two tasks, 1) to investigate the seabed type to ensure suitable substrate for use of Hammon grab and multicorer, and 2) to estimate faunal density, and (in conjunction with trawl samples biomass) biomass, functional group prevalence. SUCS images can also be analysed to provide micro-topography (rugosity) and approx particle size (e.g. by Wentworth scale). The SUCS and Agassiz gears, when both deployed at the same site, increase the value of the data obtained, as the specimens trawled in the latter and identified by detailed morphological inspection or using molecular methods then improve the likelihood and confidence of correct identifications of individuals seen in the SUCS images.

During JR17001 203 photographic stills were taken at two fjords; Marian Cove (Maxwell Bay, King George Island) and Börgen Bay (Anvers Island), both in the northern part of the West Antarctic Peninsula. These spanned a depth range of *c*. 68 - 303 m. In total 11 different sites in fjords were examined (Table 6.8.1). Several lower resolution videos were also taken. We had planned to capture images at a third fjord, that in which Sheldon Glacier retreats, near Rothera Research Station. Time constraints, reducing our planned ship time from six days to four days forced us to delay this until the next ICEBERGS cruise in 2018.

**Table 6.8.1: Summary of SUCS deployments.**

| Site | No. SUCS sites planned | No. SUCS sites undertaken |
|---|---|---|
| Marian Cove | 5 | 5 |
| Börgen Bay | 5 | 6 |
| Sheldon Glacier | 5 | 0 |

**Figure 6.8.1 SUCS being readied for deployment, Borgen Bay (left) & a typical image collected (right).**

## 6.9 MiniAgassiz Trawl

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The Agassiz trawl (AGT) has become the primary apparatus to sample benthic assemblages of macro- and megafauna on the relatively flat Antarctic continental shelf. Although the catches are qualitative they can be used to ground truth seafloor images from SUCS that provide quantitative estimates of abundance and biomass. For this expedition we used a “mini” AGT originally designed for the small winch and A-frame on the Russian ship *Akademic Tryoshnikov* during the Antarctic Circumpolar Expedition (December 2016- March 2017). The trawl was modified for use on the RRS *James Clark Ross* by adding 160 kg (bolting 4 x 40 kg cylinders between the skid plates) to enable it to be deployed using the much larger A-frame and heavier winch wire.

The mini AGT has a mesh size of 1 cm and a mouth width of 1.25 m. Trawl stations were slightly offset from the deployment of the grab, SUCs and multicore and chosen by examining features shown on multibeam sonar (swath) imagery to ensure safe deployment.

The deployment protocol of the mini AGT deviated slightly from the standard AGT procedure. While the AGT was lowered, the ship had to compensate for the wire lowering speed of max of 50 m/min by steaming at 0.3 knots until the AGT reached the seabed and until the full trawling wire length was put out (standard BAS AGT increases speed to 0.5 knots once the trawl hits the sea floor). The full trawling cable length used was 2 times the water depth (standard BAS AGT uses a cable length of 1.5 times water depth). The net was then trawled at 0.3 knots for 5 minutes (standard BAS AGT protocol is a trawling speed of 1 knot). Afterwards, with the ship speed kept to 0.3 knots, the AGT was hauled at 30 m/min in order to avoid damaging the gear. When the AGT had left the seafloor, the hauling speed was increased to 45 m/min. The reduced size of the trawl and reduced trawling speed results in a slightly smaller catch, damages substantially less seafloor, but the quality of the catch is much higher.

As the trawl was raised from the water, fire hoses were used to wash most of the mud out of the net – much more efficient that sieving on the deck (Fig. 6.9.1). Once the net was clean it was held over the 1mm mesh sieve and the cod end released so the catch was caught in its entirety into the sieves where the remaining mud was carefully washed off.

Samples were sorted to class and where possible to morphotype. Most specimens were preserved in pre-chilled 99.8% ethanol (total vial volume at least 80% ethanol) and stored in the -20°C freezer. The gastropods kept aside and statoliths were removed for aging and the two fish were frozen at -80°C for stable isotope analyses.

A total of eleven deployments were made during the expedition, five in Marian Cove (MC) and six in Börgen Bay (BB). Our expectations were that richness would increase from the head of a fjord (most recent loss of glacier, new potentially hostile environment) to the mouth (long established benthic habitat). The extra site in BB (BBX) was chosen due to the prominent moraine identified at the mouth of the BB fjord with the expectation that it would be the most biologically rich and abundant of the sampling sites.

**Figure 6.9.1 miniAGT being recovered. Fire hoses were used to wash out mud before landing the trawl on the deck.**

A total number of 1275 specimens were collected representing 13 phyla and 23 classes. Bivalves (472), tunicates (325) and polychaetes (149) dominated the catches, however, the catch composition, richness and abundance differed markedly between the two fjord systems. Marian Cove was considerably richer (all 23 classes present) and greater abundance (>1000 specimens in five trawls) compared to Börgen Bay (18 classes, ~250 specimens from six trawls). Within the limitations of our non-replicated sampling, the MC sites generally met expectations with lower abundance and richness at the head of the fjord compared with the mouth. However, this was not obviously the case at BB, apart from BBX on the moraine, which we predicted would be a local hotspot. BB sites were characterized by abundances of polychaetes and pycnogonids. The data summary is presented in Table 6.9.1.

| CLASS | MC1 | MC2 | MC3 | MC4 | MC5 | BB1 | BBX | BB2 | BB3 | BB4 | BB5 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Anthozoa | **1** | | **2** | **1** | **2** | | **9** | | | | |
| Articulata | **1** | **1** | | | | | | | | | |
| Ascidiacea | **80** | **137** | **34** | **31** | **22** | | **14** | **6** | | | **1** |
| Asteroidea | **2** | **1** | **12** | | | | **3** | | | | **1** |
| Bivalvia | **11** | **150** | **82** | **192** | **35** | | **1** | | **1** | | |
| Bryozoa | **3** | **4** | **4** | | **3** | | **292+2rock2colonies** | **8** | **1** | **1** | **1** |
| Cirripedia | **1** | | | | | | | | | | |
| Crinoidea | | **1** | | | | | **6** | | | | |
| Demospongia | | | **3** | | | | | **1** | | | |
| Echinoidea | | | **2** | | | | | | | | |
| Gastropoda | **52+2many2eggs** | **3** | **10** | **62+2many2eggs** | | | **1** | | | | |
| Hexactinellida | **1** | **3** | | | | | | | | | **2** |
| Holothuroidea | **4** | | | | | | **1** | | | | |
| Hydrozoa | | | **2** | **2** | | **1** | | | **1** | | |
| Malacostraca | **8** | **14** | **8** | **4** | | **9** | **21** | | | **2** | **1** |
| Nemertea | | | **4** | | | | | | | | |
| Ophiuroidea | **38** | **13** | **1** | | | **4** | **23** | | **2** | **2** | **3** |
| Pisces | | **1** | | | | | **1** | | | | |
| Polychaeta | **25** | **8** | **9** | **16** | **5** | **2** | **47** | **13** | | **14** | **10** |
| Priapulida | **6** | **1** | | | | | | | | | **3** |
| Pycnogonida | | | **1** | | **1** | | **7** | **7** | **2** | **12** | **1** |
| Rhodophyta | **2** | | | | | | | | | **1** | |
| Thaliacia | | | **1** | | | | | | | | |

**Table 6.9.1**

## *6.10 MULTI-CORER*

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The BAS Oktopus 12-core multi-corer (Fig. 6.10.1) was deployed at both Marian Cove and in Börgen Bay. This instrument enables high quality, undisturbed, samples of bottom water and seabed sediments. The core tubes are 0.5 m in length and on successful recovery typically to top 10-20 cm of each tube consists of bottom water and the remaining 30-40 cm of the uppermost sediment column and seabed.

The multi-corer was set with maximum weight and on the maximum penetration setting. This was done to ensure we could recover as much sediment as possible. The multi-corer had a full inspection prior to use to be sure it was mechanically sound since the trials earlier in 2017.

Prior to deployment careful assessment of seabed conditions at the target sites was undertaken using the multi-beam swath bathymetric data, TOPAS sub-bottom profiling data, and images from the shallow underwater camera system. The multi-corer can only be successfully deployed in soft sediments with significant mud content, so terrain with large numbers of boulders (moraines) and dropstones, and bedrock, was avoided. Although this necessarily results in habitat bias, deployment of the multi-corer in inappropriate terrain can result in shattered core tubes and damage to the array structure. The location of the deployment sites was moved in about 40% of cases as a result of this phase of terrain reconnaissance.

In advance of recovery a subsampling protocol was established and all bags, tin foils, plastic pots and glass vials were pre-labelled to save time during subsampling (Fig. 6.10.2). This preparatory phase proved to be essential to enable the team to process core samples quickly and efficiently, and to keep up with the flow of cores requiring extrusion. High resolution subsampling was undertaken using two plastic extrusion columns and slicing of the emergent subsample by metal or plastic slicer as appropriate (Figs. 6.10.3 & 6.10.4). At least one core per deployment was sieved in bulk (at 1 mm) for macrofauna and at Börgen Bay bulk samples were also taken for particle size analysis. Bottom water not collected was siphoned off. The initial protocol devised for each deployment recovery was as follows:

Tube 1: Micropalaeontology. Subsample top 10 cm at 1 cm resolution, one 1 cm sample every 5 cm below that. Place subsamples in pre-labelled plastic pots, add mixed ethanol and Rose Bengal. Store in fridge 4 degrees C. These samples ultimately to be placed in UN barrel for transport of hazardous samples.

Tube 2: Micropalaeontology. Subsample top 5 cm at 1 cm resolution and place in pre-labelled glass vials and frozen at -20 degrees C. Then sample 1 cm sample every 10 cm from 5 cm core depth, place in a pre-labelled plastic bag and store at -20 degrees C.

Tube 3: Organic carbon. Subsample USING METAL SLICER every 0.5 cm to 2 cm core depth, then every 1 cm to 10 cm core depth, then every 2 cm to core base. Subsamples to be placed in pre-labelled foil trays, place inside a pre-labelled plastic petri dish with lid. Store in freezer at -80 degrees C.

Tube 4: Inorganic carbon. Subsample USING PLASTIC SLICER every 0.5 cm to 2 cm core depth, then every 1 cm to 10 cm core depth, then every 2 cm to core base. Subsamples to be placed in pre-labelled foil trays, place inside a pre-labelled plastic petri dish with lid. Store in freezer at -80 degrees C.

Tube 5: Microplastics. Subsample USING METAL SLICER top 10 cm at 1 cm resolution. Subsamples to be placed in pre-labelled glass vials. Store in ethanol at 4 degrees C.

Tube 6: Microplastics. Subsample USING METAL SLICER top 10 cm at 1 cm resolution. Subsamples to be placed in pre-labelled glass vials. Store in ethanol at 4 degrees C.

Tube 7: Sedimentation rate: Subsample full length of core at 1 cm resolution. Subsamples to be placed in pre-labelled silver foil and stored at -80 degrees C.

Tubes 8, 9 and 10: whole tubes to be washed out for macrofauna. In addition selected tubes to be sampled for plankton within the epibenthic water.

Only three of the five sampling stations at both Marian Cove and Börgen Bay were sampled by multi-corer resulting from a combination of poor terrain suitability, time constraints and, at Börgen Bay, deteriorating weather conditions. At each site the multi-corer was deployed at stations #2, #3 and #4; these stations nevertheless captured the main sequence of mapped glacial retreat positions. The following table 6.10.1 details the subsamples collected from the multi-corer:

| | MC#2 | MC#3 | MC#4 | BB#2 | BB#3 | BB#4 | TOTAL |
|---|---|---|---|---|---|---|---|
| Micropalaeontology #1 (Foraminifera) | 0-10, 15-16, 20-21 cm | 0-10, 15-16, 18-19 cm | 0-10 cm | 0-10, 15-16, 18-19 cm | 0-10, 15-16, 20-21, 25-25.5 cm | 0-10, 15-16, 20-21 cm | 71 |
| Micropalaeontology #2 (Biomarkers) | 0-5 cm | 0-5 cm | 0-5 cm | 0-5 m | 0-5 cm | 0.5 cm | 30 |
| Micropalaeontology #3 (Other microfossils) | 0-5, 15-16, 21-22 cm | 0-5, 15-16 cm | 0-5 cm | 0-5, 15-16 cm | 0-5, 15-16, 20-21 cm | 0-5, 15-16, 22-23 cm | 39 |
| Organic carbon | 0-24 cm | 0-22 cm | 0-18 cm | 0-16 cm | 0-20 cm | 0.30 cm | 130 |
| Inorganic carbon | 0-26 cm | 0-18 cm | NO | 0-22 cm | 0-24 cm | 0-24cm | 114 |
| Microplastics #1 | 0-10 cm | 0-10 cm | 0-10 cm | 0-10 cm | 0-10 cm | 0-10 cm | 60 |
| Microplastics #2 | 0-10 cm | 0-10 cm | 0-10 cm | 0-10 cm | 0-10 cm | 0-10 cm | 60 |
| Sedimentation rate | 0-11 cm | 0-24 cm | 0-9 cm | 0-22 cm | NO | 0.22 cm | 88 |
| Macrofauna | 2 bulk | 1 bulk | 1 bulk | 4 bulk | 1 bulk | 1 bulk | 10 bulk |
| Particle size | NO | NO | NO | 1 bulk | 1 bulk | 1 bulk | 3 bulk |
| Filled cores | 9 | 8 | 7 | 12 | 8 | 9 | 53 (73.6%) |
| Failed cores | 3 | 4 | 5 | 0 | 4 | 3 | 19 (26.4%) |

**Table 6.10.1**

In addition, two 500 ml epibenthic bottom water samples were collected for plankton, one from Marian Cove and one from Börgen Bay.

The operation of the multi-corer during ICEBERGS was generally successful, but there were three unsuccessful deployments in which the corer failed to trigger and all the tubes were recovered empty, and in most successful deployments there were some individual tubes that failed to trigger (see Table for numbers). In addition, human error was responsible for the loss of three core tubes during the release of the tubes from the assembly, or in transit from the assembly into the wet lab for extrusion; all the latter cases resulted from the basal bungs slipping or becoming dislodged from the base of the tubes. Better-fitting and longer bungs would prevent this from occurring.

At King George Island, the second deployment failed twice due to blocked piston. This was not clear at first why, but after the second failure the piston was cleared of a large build-up of water and sediment. This was done by operating the release mechanism on deck. All of the following deployments were successful as the piston was cleared after each recovery.

A Health and Safety hazard was identified during the operation of the multi-corer. The core tube lids are cocked prior to deployment by placing a coarse wire through a groove in the lid assembly. These wires protrude outwards from the assembly at the same height as operators' heads when preparing for deployment, or recovering tubes following deployment. The wires have rough cut ends and cannot be easily seen when wearing hard hats. There is a real danger that these could seriously damage eyes.

**Recommendations for future use:**

1. Label all vials and containers well in advance of deployment
2. Ensure sufficient staff are on hand to help with the multi-core deployment and recovery (2 minimum), to carry filled tubes into the wet lab (1 minumum), and to subsample in the wet lab (6 minimum) (Fig. 6.10.5)
3. Acquire improved (longer) bungs
4. Protect the wire ends on the assembly with rubber balls

**Fig. 6.10.1: The Oktopus 12-core multi-core array.**

**Fig. 6.10.2: Pre-labelling vials, foils and containers prior to deployment.**

**Fig. 6.10.3: Extruding multi-core tube using 1 cm thick Perspex ring to guide sub-sampling.**

**Fig. 6.10.4: Sub-sampling multi-core tube using plastic slicers. cm thick Perspex ring to guide sub-sampling.**

**Fig.6.10.5: Multi-core subsampling in the wet lab**

## 7. Chilean collaboration

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ICEBERGS is a UK-Chilean collaboration, supported by a NERC-CONICYT grant, with Dr. Antonio Brante from Universidad Catolica de la Santisíma Concepción (UCSC) as the PI in the Chilean group. The Chilean team includes Dr. Patricio Camus (UCSC), Dr. Florence Tellier (UCSC), and Dr. Angel Urzua as co-investigators and Dr. Carlos Munoz (UCSC) as a postdoctoral researcher. The work uses a multidisciplinary approach to attempt to quantify and understand climate change impacts on Antarctic benthic ecosystems. The Chilean collaborators will aid this project with their experience in ecological, genetics and bioenergetics analyses that will contribute to the understanding of relevant processes at the individual and population levels.

### *7.1 Bioenergetics*

As a consequence of global warming, meltwater discharge from glaciers is causing changes in salinity, temperature, and primary productivity which are presumed as environmental stressors. At the individual level, stressor environments affect physiological processes and bioenergetic components that may be translated in a deficiency in the individual performance directly impacting population dynamics and community structure. In this way, these changes in environmental conditions in Antarctic waters may influence fitness traits of individuals such as growth, survival and reproductive output. In this situation it is expected that organisms inhabiting localities impacted by ice loss and deglaciation may show a decrease in bioenergetic constituents, nutritional condition and reproductive output. In this project we will evaluate the effects of these perturbations on the bioenergetic, nutritional quality and reproductive output of Antarctic marine invertebrate organisms. We will examine such physiological parameters in the context of temporal disturbance revealed through sclerochronological analyses of mollusc shells and other such proxies.

### *7.2 Genetics*

Extreme perturbation events, such as ice loss and deglaciation, not only may produce important effects at individual and ecological levels but also at genetic level, with implications for the long-term sustainability of local benthic ecosystems. Decrease in species abundances as a result of perturbations may produce a genetic bottleneck increasing genetic drift and negatively impacting genetic diversity. In addition, both theory and experiments indicate that allelic richness is more sensitive to the effects of short, severe bottlenecks than is haplotype diversity. These genetic changes would affect viability of populations at two temporal scales: (1) over the short term it is expected that a reduction in genetic diversity will lead to an increase in the susceptibility of populations to pathogens and parasites, and fastening the fixation of deleterious alleles. (2) Over the long term, the diminished population would reduce capacity to respond to changing selection pressures if genetic reduction is associated with adaptive genes and so the absence of genetic variation may increase the risk of extinction. Increasing local fecundity may not be an effective strategy to compensate for abundance reduction because glacier perturbations strongly affect mortality of benthic species locally. By contrast, abundance and genetic population diversity may be maintained by immigration (dispersal), the 'rescue effect'. In this situation genetic diversity would be maintained or would be less impacted through genotype immigration from neighbouring populations. The significance of the rescue effect depends on the extent of the perturbation effect and the dispersal potential of the species. In this context we predict a reduction of genetic diversity in localities impacted by ice loss and deglaciation with higher effects in species with low dispersal potential than those with high dispersal potential. In addition, disturbed localities will show less population connectivity (higher population genetic distance) and higher inbreeding levels than less impacted localities.

An additional goal of the sampling, which is pending for funding from a postdoctoral research grant (FONDECYT postdoctoral grant to CM-R) aim to understand the co-evolutionary history between parasites and their invertebrate hosts (bivalves and gastropods). Although not directly related, this project may also shed light on the relationship of host-parasite interactions under a climatic change scenario and will greatly benefit from the samples that can be collected as part of the ICEBERGS project.

### *7.3 Sampling on the JCR*

Sampling for both goals, the bioenergetics and the genetics studies, were obtained from the Hammon Grab samples (see section 6.7) and Trawl (section 6.9) sampling strategies. We aimed to collect bivalve and gastropod molluscs that were known for differing in their life history traits, such as *Yoldia* sp and *Margarella* sp., a key aspect to address the genetic goal related with estimating genetic connectivity.

Of the 3 sampling fjords initially planned (Marian Cove, Börgen Bay and Sheldon glacier), time constraints only allowed for two to be sampled; Marian Cove and Börgen Bay. We collected several bivalves in Marion Cove, across the sites 2, 3, 4, and 5 of the transect, via the Grab sampling. In Börgen

Bay, where only sites 1, 2, 3, and 4 were possible for the Grab sampling, some bivalves and gastropods were collected (but in much less number than in Marian Cove), as well as several polychaetes. The Trawl method also yielded bivalves and gastropods in the Marian Cove and Börgen Bay fjords, although gastropods were not as abundant as the bivalves. Different taxa of benthic worms were also collected across the four sites on Börgen Bay in relatively high numbers.

In order to fulfil all the goals of the genetic study, additional sampling will be needed in the next campaigns (2018, 2019). In particular, the addition of at least one more fjord will be of great utility to optimally quantify patterns of population connectivity across different benthic species in a comparative framework. As bivalves and gastropods were less abundant in some sites, other species, perhaps polychaetes that were abundant in Börgen Bay, may also be considered for genetic analyses, as they were present in most sampling sites. This is an aspect that needs to be discussed and evaluated more deeply in the next few months. Nevertheless, there are sufficient samples to start working on bioenergetics and genetics analyses as well as for examining the presence of parasites in bivalves and gastropods.

## 8. ICEBERGS photography and film

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Photographs and videos from the JR17001 cruise were primarily taken with a Canon 5Ds with lenses: Canon 24-105 mm f/4 and a Sigma 150-600 mm C f/5.6-6.3. RAW picture format was selected for photographs and 1080p for video quality. These formats maximised the capabilities of post-processing the images. The secondary camera used in the project was a Canon 60D with lenses: 25-55 mm, 55-250 mm, this was used for photographs and videography at 1080p & 50fps for the best quality. Action shots and underwater footage was collected using a GoPro Hero 3+ and a GoPro hero 5, these were perfect for landscape shots as well as underwater footage of the deployed and retrieval of scientific equipment. Action cameras enabled the ability to create time lapses, footage of which provided a great addition to outreach presenting how the samples collected were analysed and provide overviews of the sites visited. Images and videos were stored in an external 500 GB hard drive, a backup copy was made in a separate hard drive, and any images/videos were stored on the media drive so other scientists, passengers and crew have access to the content.

Images were edited in Adobe Camera RAW and Adobe Photoshop CC and saved with the image collection. The image collection was collated for each location (i.e. Marian Cove, Börgen Bay, Falkland Islands and Rothera research station). Videos were edited using Sony Vegas Pro 12.0, this software enabled good quality editing, text and sound adjustments. Using editing software shortens and removes the less interesting parts of the footage which preserves space to increase the ease of uploading. It displayed how the samples were collected, processed and stored which was perfect for outreach.
Due to the consecutive working shifts, more than one photographer was needed to acquire necessary footage. The camera was kept in the wet laboratory during working hours readily available for any member of the team to make use of it. The Rothera Marine assistant took images and videos using his personal camera equipment during his working shifts, adding to the footage collection already acquired. Due to the limited bandwidth on board of the RRS *James Clark Ross*, the images needed to be reduced in size from approximately 7-10 Mb to 100-200 kb. The resized images were passed to the outreach team for use on different social media platforms of the ICEBERGS project. Due to the large size of the videos recorded, these could not be uploaded from the RRS JCR and were stored for subsequent upload after the conclusion of the cruise.

We recommend that for future cruises, the images will be taken both in JPEG and RAW format to reduce processing times of the images. The same can be done with videos by reducing the 1080p quality to 720p with reduced frame rate. The reduction in frame rate will create a marginal reduction in quality but a big reduction in bandwidth demand, and thus would permit uploading of such videos throughout the cruise.

Investing in better GoPro accessories would increase the effectiveness of the action cameras. We used a SLOCUM glider retrieval pole to secure the action cameras for underwater footage. As these were not fit for purpose it meant the camera moved more than planned. Possessing a plethora of accessories increases the type of objects you can connect/attach the camera to. Especially prescient for polar regions, the use of camera filters would have been very helpful, a neutraliser would allow a lower amount of light into the camera which would enhance the photographs taken by giving a higher range of aperture options.

**Fig. 8.1 Wilson's Storm-petrel feeding on zooplankton. One of the many images captured during JR17001, this one in particular was captured around 6 pm local time about 10 m in front of the bow whilst the crew was deploying a CTD. A small flock of Wilson's Storm-petrels were flying over the water trying to spot the small zooplankton on the surface.**

**Fig. 8.2 Photograph taken during the transit in the Gerlache Strait to Börgen Bay. The dimensions of the mountainous terrain and the glaciers only become evident when compared with a passengers cruise.**

**Fig. 8.3 King Sejong South Korea station situated in Marian Cove in King George Island. The strong contrast between the red colour of the base with the monochrome hillsides which look as they were painted in Chinese ink.**

**Fig. 8.4 Icebergs and sea ice. Photograph taken during the crossing of the sea ice surrounding Adelaide Island on route to Rothera. As the *James Clark Ross* made its way through the sea ice, many of these small icy islands passed by, each on sculptured in a different way, painted with different colours and bouncing light with its own personality.**

# 9. ICEBERGS Outreach

Alexis Janosik, James Scourse, Katy Sheen & Marlon Clark

There were several outreach projects running as part of ICEBERGS:

## *9.1 Twitter*

During the cruise we used twitter as one of the main platforms to communicate with the public. Since commencement of the twitter page we have amassed 235 followers and created as much as 1409 impressions per tweet with a mean of 636 impressions per tweet. We achieved a mean number of engagements at 33 per tweet and lots of activity from followers favouriting and retweeting our tweets. Twitter provided a real-time progress report for people to visit and interact with, as well as enabling outside contributions from the crew members on their own private social media pages.

To enhance our outreach capabilities in subsequent years, new social media platforms would increase the scope of potential followers from different demographics. Applications such as Instagram would be perfect for uploading photos and videos of our science in this area, and open a new audience of different age ranges to present the significance and potential that a career in research can grant.

## *9.2 Blog*

A blog was compiled throughout the cruise with updates of activities aboard the JCR and a description of the science being conducted. Typically a new post was uploaded every other day, with photographs. Before leaving, the blog was advertised amongst scientific institutions, family and friends, as well as through social media. The blog can be found at http:icebergsjcr.blogspot.com. Throughout the course of the cruise, 16 blog posts were written and published. Overall, the blog was viewed 7,397 times with the most popular posts being the video compiled by Marlon Clark (679 views), “Microplastics” (287 views), and “Antarctic Plankton Pigments” (140 views).  Blog hits were recorded in over ten different countries and from a variety of operating systems (Fig 9.2.1).

**Fig. 9.2.1 Blog pageviews by countries: United Kingdom= 776, United States= 564, Chile= 189, Spain= 122, Canada= 107, Germany= 57, Belgium= 49, Australia= 33, Ireland= 33, Denmark= 23.**

## *9.3 School link-up*

James Scourse has initiated an ICEBERGS outreach project with the pupils and staff of San Sior Primary School, Llandudno, Gwynedd. After a preparatory visit to the School during the summer of 2017 to discuss the project with staff, JS met Kim Quince and the outreach team at BAS on 8th September 2017 to collect information packs and bookmarks; unfortunately it was not possible for BAS to supply a specimen kit bag because of pressure of other commitments. JS then visited the School on 16th October 2017 and delivered an introductory talk, a physical demonstration of ice flow, and interactive question and answer session with the Key Stage 2 children, distributed the BAS outreach materials, and discussed communications during the ICEBERGS cruise between JCR and School.

The staff and children followed the blog and twitter-feeds during the cruise. All Key Stage 2 children were then asked to formulate questions to ask, and during 15-minute phone calls between JCR and the School approximately once every 4 days, selected and rotating groups of 5 children asked JS the questions. The discussions were relayed by loudspeaker at the School and recorded. The children asking the questions then prepared a school assembly for the whole School based on the issues discussed during the phone sessions. Feedback from the staff has been very positive; after the first session the Headmaster emailed JS: "Children loved it as did we. THANK YOU SO MUCH". These sessions continued throughout the cruise.

JS has agreed to visit the School during the spring of 2018 in order to have a wash-up session and to help lead an excursion into Snowdonia to observe the impact of glaciation on the landscape interpreted in the context of the landscapes and seascapes witnessed during the ICEBERGS cruise. It is likely this outreach relationship will continue during the 2018 and 2019 ICEBERGS cruises.

# 10. ORCHESTRA I: air-sea fluxes and mixed layer processes

## *10.1 Glider and WaveGlider Operations*

Alexander Brearley, Louise Biddle, Miguel Morales-Maqueda, Ryan Scott, Liam Rogerson jambre@bas.ac.uk

### *10.1 a) Overview*

Four Teledyne Slocum gliders, one Seaglider and one WaveGlider were deployed to the east of the Hero Fracture Zone as part of glider operations for work package 2 (WP2) the ORCHESTRA project (Ocean Regulation of Climate by Heat and Carbon Sequestration and Transport). The key scientific aims of this array of autonomous vehicles were:

1. To document the evolution of the mixed layer around the SACCF during summer and early autumn of 2017.
2. To quantify the dissipation of turbulent kinetic energy during periods when the mixed layer is deepening, shoaling and stable.
3. To understand the controlling processes (Ekman buoyancy fluxes, baroclinic instabilities, direct heat fluxes) that determine mixed layer depths and dissipation of TKE at and away from the frontal boundary.
4. To provide information about the relative importance of these processes to the ORCHESTRA modellers.

In addition to glider deployments, CTD samples were taken at each of the glider deployment locations, three of which involved bottle analysis for dissolved oxygen and chlorophyll (see Section 12.2 for processing and calibration details). Concurrent meteorological turbulent flux data were also collected using Plymouth Marine Laboratory (PML) instruments installed by Dr. Tom Bell prior to the JCR's cruise south from the UK. Procedures for checking that data were logging to the base station (located in the JCR post room) are given in Section 10.2.

It was originally intended that overflights by the BAS MASIN aircraft of the glider region would take place during the deployment of the vehicles. Unfortunately, logistical and weather constraints prevented flights of the aircraft whilst the ship was in the vicinity. However, an overflight of the region was achieved from Marsh airfield on 7 December – details provided in a separate report (contact Tom Lachlan-Cope).

In addition to the main ORCHESTRA array, one further ocean microstructure glider (OMG) was deployed close to the shelf break, to replace a glider failure in the 2016/17 season, and supporting Ryan Scott's PhD work. Details of deployment location and sensors for each glider are summarised in Table 10.1.

**Gliders**

| Serial number/operator | Vehicle type | Installed sensors | Deployment location (degrees and decimal mins) | Deployment date and time (UTC) |
|---|---|---|---|---|
| 632 (BAS) | Slocum (1000m) | CTD, EcoPuck, microstructure | 61° 35.978' S 64° 29.882' W | 30/11/2017 1116 |
| 633 (BAS) | Slocum (1000m) | CTD, EcoPuck, microstructure | 61° 35.843' S 64° 30.613' W | 30/11/2017 1327 |
| 640 (Gothenburg) | SeaGlider | CTD, EcoPuck, dissolved oxygen optode, PAR, acousonde | 61° 35.990' S 64° 41.921' W | 30/11/2017 1525 |
| Newcastle University | SV2 WaveGlider | Met station, water speed sensor, inclinometer, time-lapse camera, ADCP. | 61° 35.961' S 64° 42.608' W | 30/11/2017 1630 |
| 408 | Slocum (1000m) | CTD, Ecopuck, dissolved oxygen optode | 61° 35.984' S 64° 17.998' W | 30/11/2017 1840 |
| 330 (NMF) | Slocum (1000m) | CTD, Ecopuck, dissolved oxygen optode | 61° 21.980' S 63° 32.062' W | 01/12/2017 1146 |
| 424 (NMF) | Slocum (1000m) | CTD, dissolved oxygen optode, microstructure | 63° 47.993' S 66° 29.993' W | 03/12/2017 0451 |

**Table 10.4: Deployment details, instruments and locations of gliders**

## *10.1 b) WaveGlider Description*

The Wave Glider is a semi-autonomous surface vehicle in that it can read and follow a predetermined course unattended and regular relay information (statuses) about on board and environmental parameters back to base. However, for safe navigation, the vehicle requires frequent monitoring, which is achieved through the web-based Wave Glider Management System, or WGMS. The Wave Glider deployed is a relatively old SV2 model acquired by the National Oceanography Centre-Liverpool (NOC) in 2011 and is currently managed by the University of Newcastle upon Tyne.

The vehicle reports its position and other relevant parameters via Iridium and these parameters can be retrieved and visualised using WGMS. The frequency of this telemetry reports can be changed by the pilot and, during the deployment, is oscillated between 2 minutes and 15 minutes. **Redundant tracking mechanisms** powered separately from the rest of the Wave Glider are: (1) a NAL Research SHOUT nano Iridium tracker (set to report location every 6 hours) and (2) two radio locators with frequencies 151.782 & 151.883 kHz. Unfortunately, the RDF locators need to be activated before deployment by removing a magnet. Unfortunately, this was not done. However, the magnets were secured to the locators only with ordinary electric tape. Since the locators are directly exposed to weather and water, it is fairly possible that the tape will peel off eventually, thus activating the finders.

The scientific instrumentation on board consists of the following:
- Airmar Weather Station Model PB200 including:
    1. Ultrasonic anemometer measuring apparent horizontal wind. Range/Resolution of speed: 0-80/0.1 knot. Range/Resolution of direction: 0-360o/0.1o. For accuracy information see WeatherStation, Weather Reporting Option, User Guide, Version 1.0, LIQUID ROBOTICS, INC., LRI Part Number: 030-01526).
    2. Thermistor measuring air temperature. Range/Resolution/Accuracy: -25°-55° C/0.1o C/±1o C.
    3. Piezoresistive pressure sensor measuring air pressure. Range/Resolution/Accuracy: 850-1150 mbar/0.1 mbar/±2 mbar.
    4. Magnetoinductive XYZ sensors providing a tilt-compensated magnetic compass heading.
    5. Three-axis MEMS accelerometer providing pitch and roll angles.
    6. Micro Electro-Mechanical Systems (MEMS) gyroscope providing rate of turn.
    7. GPS receiver providing position (latitude and longitude), speed, course over ground, time, and date. The GPS receiver is augmented by WAAS and EGNOS for greater accuracy. Accuracy: 3 m.

True wind speed and direction from the apparent wind speed and direction that the anemometer provides are calculated with the weather sensor. Apparent wind speed and direction are measured relative to the weather sensor. True wind speed and direction are measured relative to a fixed point on the earth. The weather sensor applies motion data such as heading, pitch and roll angles, speed over ground, and rate of turn to the relative wind speed and direction to calculate the true wind speed and direction. The weather sensor reports weather conditions once a second to the iPIB, and reports GPS position, time, and date once every ten seconds.

During the deployment, we have noticed that the air temperatures reported by the Weather Station can be outrageously wrong (values on the order of 1000s $^{o}$C!). We do not entirely understand in detail why this happens but it seems to occur when water, spray or fog freeze around the instrument –for example, when temperatures drop in the evening or night.

Weather records are transmitted back to base every 10 minutes and downloadable via the WGMS system. These records are ten minute averages of data collected at 1 Hz. The wind data consist of 10-minute winds (speed and direction) plus wind gust speed, i.e. the maximum wind speed during every 10-minute interval.

-**Airmar CS4500 ultrasonic water speed sensor**. Range/Accuracy: 01-40 knot/0.1 knot. These data are provided at the same frequency as the vehicle's telemetry (typically 10-15 minutes).
-**Septentrio AsteRx-m receiver and PolaNt-x MF antenna**, with L1 and L2 GPS and GLONASS pseudorange and carrier phase measurements collected continuously at 1 Hz with a zero degree elevation angle mask. These data will allow us to calculate the geoid, dynamic topography and wave field in the area of deployment similarly to work reported in Morales Maqueda et al. (2016) and Penna et al. (2018). Data from this system is recorded internal in a linux computer/logger installed in payload 2 (forward payload box) of the vehicle. The GPS antenna is located astern mounted on a 70-cm, aluminium mast screwed to a metal plate, itself bolted to the deck.
-**SignalQuest SQ-SI-360DA solid-state MEMS inclinometer**. This system is located inside payload 2, as close as possible to the center of the Wave Glider. Pitch and roll are measured and recorded continuously at 5 Hz. Range/Resolution/Accuracy: -70-70 °/0.1 °/1 °.
-**Brinno Time Lapse Camera TLC200**. Self-powered. Mounted on an unused Iridium spare mast located on to vehicle's turtle deck. The settings for the camera are:

1. AVI Frame Rate: 1 FPS
2. Image Quality: Good
3. Time Stamp: On
4. Low Light Recording: On
5. Scene: Daylight
6. Output Resolution: 720P
7. LED Display: Off
8. Band Filter: None
9. Time Interval: 10 minutes

-**Nortek AquaPro side looking ADCP**. Self-powered (battery pack with a capacity of 100 Wh). The ADCP was configured using AquaPro software provided by the manufacturer as follows:

```
============================================================
Deployment   : ORCHES
Current time : 30/11/2017 15:36:22
Start at     : 30/11/2017 15:36:00
Comment:

------------------------------------------------------------
Profile interval      (s) : 1200
Number of cells           : 20
Cell size             (m) : 1.00
```

Blanking distance (m) : 0.41
Measurement load (%) : 25
Average interval (s) : 90
Power level : HIGH
Number of wave samples : 1024
Wave interval (s) : 6000
Wave sampling rate (Hz) : 1
Wave cell size (m) : 2.00
Compass upd. rate (s) : 1
Coordinate System : ENU
Speed of sound (m/s) : MEASURED
Salinity (ppt) : 33
Analog input 1 : NONE
Analog input 2 : NONE
Analog input power out : DISABLED
File wrapping : OFF
TellTale : OFF
Acoustic modem : OFF
Serial output : OFF
Baud rate : 9600
------------------------------------------------------------
Assumed duration (days) : 60.0
Battery utilization (%) : 85.0
Battery level (V) : 14.8
Recorder size (MB) : 15185
Recorder free space (MB) : 15184.972
Memory required (MB) : 21.2
Vertical vel. prec (cm/s) : 0.7
Horizon. vel. prec (cm/s) : 2.2
------------------------------------------------------------
Instrument ID : AQD13722
Head ID : ASP 8543
Firmware version : 3.40
ProLog ID : 1544
ProLog firmware version : 4.22
------------------------------------------------------------
SD Card Inserted : YES
SD Card Ready : YES
SD Card Write protected : NO
SD Card Type : SDHC
SD Card Supported : YES
------------------------------------------------------------
AquaPro Version 1.37.08
Copyright (C) Nortek AS
============================================================

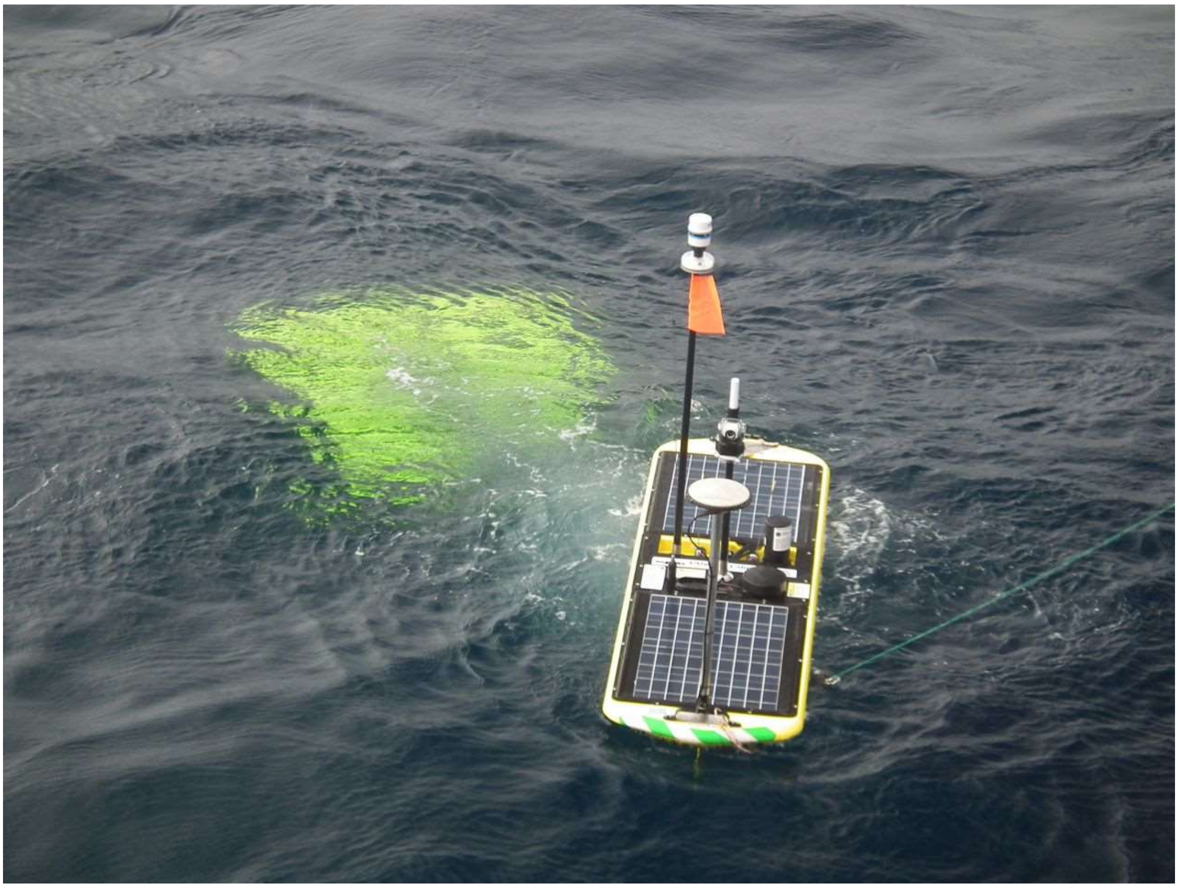

Figure 10.1.2: The Wave Glider immediately after having been released. The green line is fastened to the Wave Glider cradle, which is recovered last after deployment. Visible are the GNSS antenna (aft), the Brinno camera mounted on the spare Iridium mast (centre) and the Weather Station (centre port). The Wave Glider sub (port side ahead of the Wave Glider) is linked to the float by a 7-m umbilical communications cable and has only started to descend to its cruising depth.

## *10.1 c) Setup*

*Slocum gliders*

Prior to deployment, we ran through a number of checks for each glider, and some specialized checks for the MicroRiders on 632, 633 and 424. This included:

1. Downloading the proglets.dat file from each glider to check the installed proglets.
2. Making new sample files for each glider (sample11.ma, sample12.ma, sample13.ma). Initially, we set state_to_sample to 7 for CTD, Ecopuck and oxygen optodes (diving, climbing, hovering), except for the MicroRider, which we set to be on all the time (state_to_sample 15).
3. Making a new mission file – orch.mi (based on oban.mi, successfully tested in Oban in June 2017). This included two surfacing behaviours – surfac10 and surfac12 – with a no comms time initially set to 1hr (later 12 hrs then 24 hrs).

4. Making new yo files (yo11.ma). These were initially set to 70m single yos, before being later modified after the first successful dive to 1000 m (or altimeter if sooner).
5. Sbdlist and tbdlist were compiled for each glider. m_speed was included within the sbdlist for each glider – this is an important check for the OMGs. m_de_oil_vol was also added after a few days in the water to 632 and 633.
5. Completing functional checkout for each glider (sheets attached and backed up).

*Microrider checks*

For the Microrider gliders, two further tests were carried out. The instruments were bench tested using mains power using the test probes using the following command:

odas5ir –f setup.cfg –N

Data were collected for 90 secs, and quick_bench used to check the spectra for each instrument. After consultation with Rockland, spectra for 221, 224 and 105 were considered normal, whilst a concerning 1s signal was observed in 072. It was decided following this test not to use glider 390/SN072 for this deployment.

To check the microrider was receiving power from the glider, we connected the instrument to the glider and ran loadmission sci_on.mi. We then checked that non-zero size .P files had been recorded to the MicroRider, and once again examined the spectra. The spectra were saved in the legwork directory as part of the glider cruise record.

For each glider, a setup.cfg file was created. This included changing the coefficients for the shear probes in each file and choosing and updating the serial numbers. The microrider was then bench tested using the new files.

Probes were then installed to each microrider following the manufacturer's instructions. S1 was oriented with the plate horizontal (measuring in the vertical plane), whilst S2 was oriented with the plate vertical (measuring in the horizontal plane) (Figure 10.1.3). Probes selected for each microrider were bench tested and any broken ones replaced through spectral examination. A table of probes used in each instrument is given in Table 10.1.2.

| Glider | Microrider SN | S1 | S2 | T1 | T2 |
|---|---|---|---|---|---|
| 424 | 105 | M1071 | M1074 | T1324 | T1326 |
| 632 | 221 | M1505 | M1552 | T1309 | T718 |
| 633 | 224 | M1557 | M1570 | T966 | T967 |

**Table 10.1.5: Probes used in different microstructure gliders**

**Figure 10.1.3: Photograph to show orientation of microstructure probes in the OMGs.**

*Seaglider*

Pre-deployment tasks for the Seaglider were completed between 21st and 30th November. These included checking under the aft fairing for correct wiring and placement of wires around the bladder, and self test and sim dives. Initially, a self test and two sim dives were completed on 21st November while docked at Mare Harbour, but, due to an incorrect parameter preventing transmission of files from the glider that had been left in the software from a previous mission, they were repeated on 22nd November. These tests produced log files and capture files, which can be reviewed on the ship, with additional files reviewed by pilots based in Gothenburg, Sweden. The files were checked for reasonable movement of the battery for pitch and roll, and inflation and deflation of the external bladder, in addition to any errors reported by the glider. All checks were clear from these tests, except for retries on the GPS entry, which is to be expected whilst on a ship that can block the iridium signal.

Further self tests and sim dives were completed whilst stable in Börgen Bay on 28th November. Files required by the glider were also checked (including targets, science, SciCon.sch and cmdfile) prior to sim dives. Communications were poor in this location, resulting in several time-outs by the glider. VBD pumping slightly exceeded the expected time length, but this was seen on previous deployments and not considered an issue.

The glider was put in to Sealaunch procedure approximately 2 hours before deployment, and pilots in Gothenburg checked the prm file produced from this. All hardware and software tests completed satisfactorily.

Acousonde

The glider is also carrying an Acousonde to collect acoustic measurements to estimate wind speeds at the surface. This was set up in advance of deployment, and activated during the Sealaunch procedure, ensuring that it was recording by checking for the yellow LED light. It was set to record on 50kHz, recording for 5 minutes out of every 60 minutes.

### *10.1 d) Deployment*

Deployment took place with the aft starboard crane. For the Slocums, the specially-constructed JCR cradle, strops and toggle were used to deploy the vehicle.

The Seaglider was deployed using the aft starboard crane, with a rope threaded around the rudder. One end of the rope ended in an eye which had a toggle inserted, and the other was connected to the crane. When the Seaglider was safely in the water, the toggle was removed, and rope released. After an initial snag, the rope was removed and Seaglider assessed for position in the water before the piloting team were contacted in Sweden to send the glider on a dive. From deployment onwards the piloting team in Sweden have taken over, with shipboard operations providing back up.

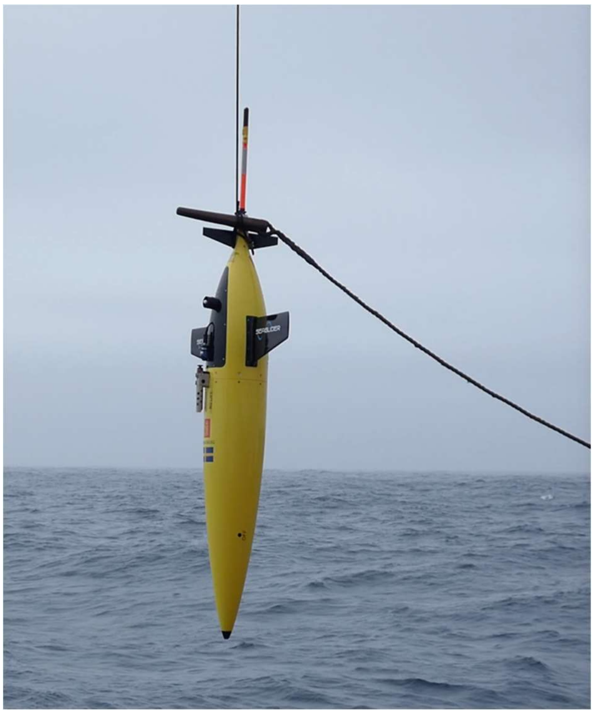

**Figure 10.1.4: The Seaglider on deployment. One line feeds up to the aft crane, with an eye looping around the base of the rudder. The eye is held in place by the wooden toggle, which is removed for deployment.**

Log sheets were completed for each Slocum deployment. Pre-deployment checks included running status.mi on deck and in water, checking probes and wings were fitted and that the plug was taped. Sim dives were run on 330 to check the dive behaviour – this revealed a problem with the surfac12.ma file which was rectified prior to deployment.

### *10.1 e) Sampling strategy*

The initial sampling strategy was to have three gliders conducting 20 km north-south sumesoscale transects roughly 10 km apart (see Figures 10.1.5 and 10.1.6), across a strong sea surface height/sea surface temperature gradient in southern Drake Passage. A mesoscale transect 100 km in length was also included as part of the central array. A second mesoscale transect was included 60 km downstream. The WaveGlider was installed as part of the central submesoscale array.

The initial sampling strategy for 424 was to occupy a series of cross shelf break sections moving southwest to northeast up the WAP shelf and ultimately joining the ORCHESTRA gliders prior to recovery.

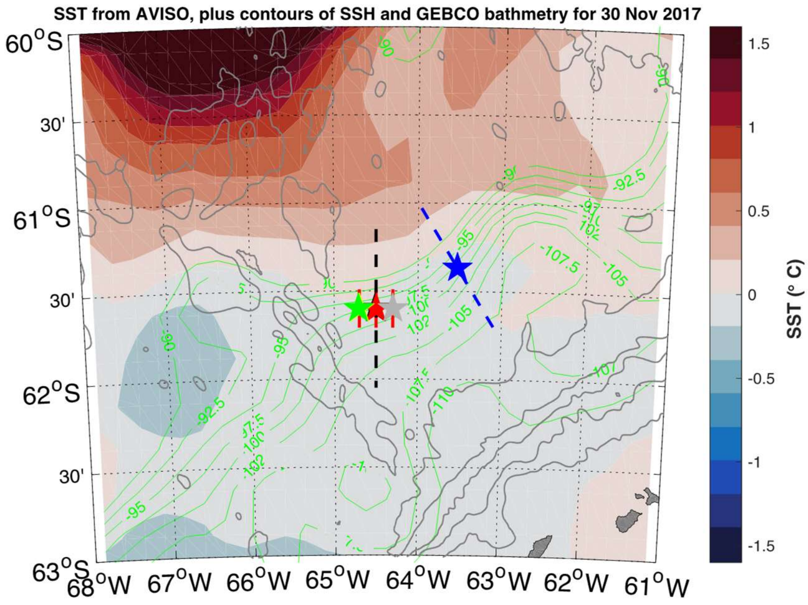


**Figure 10.1.5: Overview of the deployment location, showing the location of the submesoscale array and the two mesoscale transects. SST and SSH for the deployment time is marked. A magnification of the submesoscale array is shown in Figure 11.1.6. 330's deployment location is shown with the blue star.**

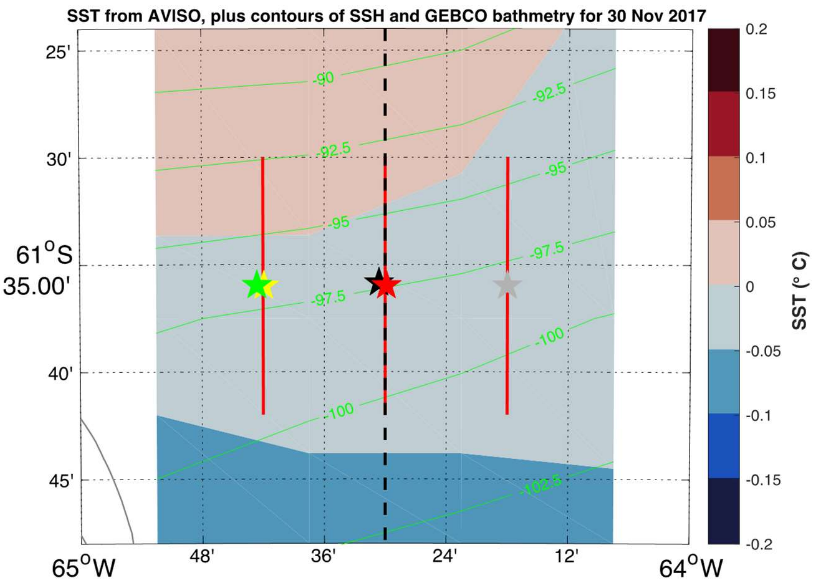


**Figure 10.1.6: Magnification of the submesoscale array. The Seaglider deployment location is shown in yellow, the WaveGlider in green, 632 and 633 in red and black respectively, and 408 in grey.**

### *10.1 f) Post-deployment*

At deployment, each Slocum was programmed to complete a single 70 m dive. The subsequent sbd and tbd profiles were downloaded via Freewave in order to save time sending the large header files over iridium. Having inspected the contents of these files, the gliders were then sent new yo files to dive to 1000 m. Later in the deployment, double yos were generally used to minimize surface time and aid piloting. Time outs for no communications were increased progressively from 1 h to 12 h and then 24 h.

For 632, 633 and 424, the properties of the dive profiles (including battery position, oil volume pumped and speed through the water) were examined during the period of autoballast. Whilst 424 quickly converged on a solution, 632 and 633 appear to have been ballasted heavy and the speed on the upcast remained significantly smaller than on the downcast ($0.15\ m\ s^{-1}$ compared with $0.35\ m\ s^{-1}$). Communications with Rockland suggest that speeds of less than $0.15\ m\ s^{-1}$ may not yield good microstructure data – we will thus need to ensure these data are carefully quality-controlled prior to analysis.

Dive angles on 330 and 408 were set to 26°, whilst those on the three OMGs were set to 30°, to minimize the angle of attack. 424 was ultimately left on autoballast as it appeared that the software did a better job of managing the battery position than a manual intervention.

Data communications between the glider and the microrider were checked using the u4stalk command, as 424, 632 and 633 have each had the communications cable installed within the glider allowing printout of the odas5ir output to the screen.

Some piloting issues were observed with each of the ORCHESTRA gliders, mainly because of the strong currents. The solution for the Slocums was to set the b_arg: max_wpt_distance(m) argument to -1 (thus disabling maximum distance to waypoint), and then including a line in the goto_l10.ma file b_arg: list_when_wpt_dist(m). This was typically set to between 5000 m and 20000 m, and defines how far from the waypoint a glider needs to be to have achieved it (the default is 10 m). This gets around the issue of a glider never quite reaching a waypoint by being in a strong current.

### *10.1 g) Waveglider mission narrative*

The ship remained in the vicinity of the deployment for about two days completing a CTD survey and deploying underwater gliders. During this time the Wave Glider was kept at a prudent distance of at least several miles from the ship in order to avoid a collision and the one-way AIS (Automatic Identification

System) on board was on at all times. Upon deployment, the Brinno camera and AquaPro ADCPs were on and recording. Also on were the Weather Station, the Water Speed Sensor and the AIS. Soon after deployment, the GNSS 1 Hz recorder was turned on. The tilt meter recorder was not turned on until the mission proper was started. The mission, which consisted in following the loop-through course: 249, 250, 251, 252, 253, 254, 251, 252, where the numbers correspond to the waypoints listed below, commenced soon after the ship left the deployment area on 02-12-2017 at approximately 1200 UTC.

Waypoints of initial Wave Glider mission:
248 ORCHESTRA Centre -61.60000,-64.50000
249 ORCHESTRA SW -61.70000,-64.70000
250 ORCHESTRA NW -61.50000,-64.70000
251 ORCHESTRA N -61.50000,-64.50000
252 ORCHESTRA S -61.70000,-64.50000
253 ORCHESTRA SE -61.70000,-64.30000
254 ORCHESTRA NE -61.50000,-64.30000

Unfortunately, most non-critical systems and sensors had to be turned off to be save batteries as it transpired after a few days of deployment that the batteries were not properly charging. The AIS was turned off on 02-12-2017 and Line Following on 04-12-2017. The inclinometer and GNSS 1Hz systems were stopped on 05-12-2017. The Weather Station, and Water Speed Sensor and XBee radio (latter should have not been on in the first place) followed on 06-12-2017. After consultation with Liquid Robotics, it transpired that the problem was caused by the fact that the batteries on the vehicle cannot charge properly at temperatures below about 3° C. SSTs in the area of deployment were around -0.5° C, which explains the problem. We are currently moving the glider to a location ~50 nm to the northwest, where we expect temperatures to be well above 0° C in the expectation that this will cure the problem. Although the Wave Glider will no longer be in the same area as the underwater gliders, it is expect that, in its new position, it still will provide very valuable meteorological and upper ocean information.

Note added on 19-12-2017. The Wave Glider was successfully "parked" in an area centred at (-60.5 N,-65.5 E) on 11-12-2017 at 0541 UTC, where it is following a figure of 8 course similar to the original one within a square whose sides are 12 nautical miles long. The vehicle will stay on this course until recovery unless changes are required. At present, all data streams are on.

### *10.1 h) Data processing*

The script used on each glider allowed .mi and .ma files to be received by the glider, and up to 6 sbds and tbds to be sent at each surfacing. Data were then downloaded to the ToughBook from the Cambridge dockserver, with files placed in the /home/localuser/Desktop/ orchestra_data directory and backed up on the glider subdiretory of legwork. The dbd2asc script was then placed in the data subdirectory from each glider and the sbds and tbds converted to ascii as follows:

```
dir *.sbd | ./dbd2asc –s > sbdtemp.dba
dir *.tbd | ./dbd2asc –s > tbdtemp.dba
```

These files were then transferred to Ryan or Alex’s laptop for processing in Matlab. The SOCIB library was then used to convert the ascii files into Matlab format. Note that the file segments section of the sbdtemp.dba and tbdtemp.dba files needs to be stripped from the data file processing can take place, with the number of ascii tags modified accordingly.

Plots of temperature, salinity, T/S, oxygen, chlorophyll and turbidity were assessed day and the sensors analysed. A number of issues were identified, but none of these were critical to the mission:

1. The unpumped CTDs (632, 633, 330, 424) each showed evidence of thermal lag that will need to be rectified in forthcoming analysis.
2. The temperature sensor on 633 had numerous issues in the early dives, including giving unrealistic values at high pressure. This issue appeared to ameliorate after the first day of dives, but careful inspection will be needed in later analysis to isolate and rectify this issue.
3. The turbidity sensor on 633 failed after several days of good data.
4. The pressure sensor on 424 flatlined at values greater than 542 dbar. However, it was decided that this was manageable given good T and S data and that alternative pressure sources (the MicroRider and glider pressure sensor).

### *10.1 j) Leak of 408*

Roughly 3 days after deployment, at 2017 UTC on 03/12/2017, unit 408 aborted for a leak in the aft compartment. Hugh Venables at BAS, who provided piloting support throughout the experiment, was the first to notice this and took action. The vehicle was kept at the surface, initially on a callback 15, but later on a callback_2h script. It was noticed that the GPS position feed goes out of service periodically. Hugh therefore made sure that the GPS was put back in service each day (use + gps) to give accurate daily positions for tracking. For the final period before recovery, the u_max_time_in_gliderdos was set to 6 hours, and a callback 30, later callback 15 script was run.

### *10.1 k) Abort of Slocum unit 424*

Roughly 6 days after deployment, at 1300 on 10 December, 424 aborted for MS_ABORT_SAMEDEPTH_FOR. It was initially unclear what had happened, and by the time the abort had been noticed, the glider had sequenced into the next orchwp.mi. However by the next surfacing, the glider had aborted and dropped its weight (the abort for MS_ABORT_WEIGHT_DROPPED occurred at 0340 on 11 December).

### *10.1 l) Recovery of 408 and 424*

Unit 424 was recovered on 13 December at 1920 at 63° 6'S, 65° 21.25'W. Unit 408 was recovered on 14 December at 0752 at position 61° 26.39'S, 62° 10.25'W. Both recoveries used the installed recovery line, released with the command put c_recovery_on 1.

### *10.1 m) Inspection of 408 and 424 after recovery*

After recovery, both gliders were opened and both glider and science cards removed. The data were backed up on the legwork/gliders/unit_xxx directory.

Inspection of 408 revealed a small trail of salt crystals from the location where the wire to the aft shorting plug goes through the rear bulkhead. Pictures were taken (Figure 10.1.6), the crystals removed and NOC advised accordingly.

**Figure 10.1.6: Trail of salt crystals in the interior of the rear bulkhead of unit 408.**

Rust staining of the T2 micro-temperature probe was observed on recovery of the glider, suggesting a leak through the Microrider. After inspection, a significant quantity of water was found in the nose cone of the Microrider, with corrosion of the internal screw and probable damage to the connectors and probes (Figure 12.1.7). A defective O-ring in the T2 probe is the most likely culprit.

Figure 10.1.7 Water ingress into the nose cone of Microrider SN 105 (glider 424).

Preliminary inspection of the Microrider data by Ryan Scott suggested that water ingress in T2 occurred mid-deployment, but that catastrophic leakage only occurred near the end, with the other temperature and shear data becoming bad. This pattern also fits with the abort pattern, whereby the initial abort for MS_ABORT_SAMEDEPTH_FOR was solved by pumping to maximum buoyancy, but the second time the glider became too heavy to surface and had to drop the weight.

**References**

Liquid-Robotics (2011). WeatherStation, Weather Reporting Option, User Guide, Version 1.0, LIQUID ROBOTICS, INC., LRI Part Number: 030-01526.

Morales Maqueda, M. A., Penna, N. T., Williams, S. D. P., Foden, P.R., Martin, I., & Pugh, J. (2016). Water surface height determination with a GPS Wave Glider: A demonstration in Loch Ness, Scotland. Journal of Atmospheric and Oceanic Technology, 33(6), 1159-1168.

Penna, N. T., Morales Maqueda, Martin, I., Guo, J., & Foden, P. (2018). Sea surface height measurement using a GPS Wave Glider. Submitted to Geophysical Research Letters.

## *10.2 Plymouth Marine Laboratory Met Sensors Operations*

Miguel Morales-Maqueda[1], Alexander Brearley[2] 1.Newcastle University ,2.BAS,UK Miguel.Morales-Maqueda@newcastle.ac.uk

Prior to the cruise, four meteorological sensing systems were installed by PML (by Thomas Bell and Ming-Xi Yang) on the vessel's foremast. Data from these systems is recorded via a Windows computer/logger located in the ship's mail room. At present, this computer is not connected to the ship's network and so the only means of accessing it is to use the keyboard, mouse and screen directly connected to the computer in the mail room. On entering the room, the computer is located inside a cabinet containing an instrument rack, of which the computer is part, and located on the left behind the door. Peripherals are reached by removing the top metal lid of the cabinet. The lid is covered by a protective plastic sheet gaffer-taped to the rack. The systems in question are:

1. Licor 7500 water vapour (latent heat) flux sensor,
2. Metek sonic anemometer (xyz-wind plus momentum and sensible heat fluxes),
3. LPMS motion sensor,
4. Systron Donner motion sensor.

The status of the four data streams was examined shortly after our arrival on board. Normal, hourly data file sizes for the systems are as follows. Licor (COM3): 7314 kB; Metek (COM6): 2602 kB; LPMS (COM7): 2252 kB; Systron Donner: 3300 kB. The Licor and Metek systems were recording correctly but the Systron Donner system's recording had halted 10 October and the LPMS data being incorrectly written into a file several orders of magnitude larger than expected.

Following instructions from PML, we stopped the logging macros and programs, copied the existing data from the computer into a 2TB Maxtor external drive (with paths F:\DATA\Licor, F:\DATA\Metek, F:\DATA\LPMS and F:\DATA\SysDon, respectively) and then restarted all systems. All macros were modified so that they now point to the new file directories on the external drive and all new data is logged on the external drive. The Licor and Metek systems are working and logging correctly. The Systron Donner tends to run correctly but, from time to time, stops abruptly generating the message "timeout while reading data". Logging needs to be restarted manually in these cases. The LPMS system does not log at all.

Instructions for restarting data logging are as follows.

Licor, LPMS, Metek:

1. Open Teraterm
    a. Click serial

b. Enter correct COM port
c. Go to setup, Serial port and choose the correct baud rate:
   i. Licor: 38400
   ii. Metek: 19200
   iii. LPMS: 19200
d. Go to Control, Macro, choose the macro corresponding to each instrument in sequence.

Systron Donner:

2. Open Igor program
   a. Open MotionPak_Send_Receive2,ipf
   b. Compile function
   c. Go to Macros, click MotionPak Data Acquisition and choose path for output file.

Data logging from the various systems has been monitored regularly, although not daily, since the beginning of the cruise.

# 11. Void

***** For continuity purposes *****

# 12. ORCHESTRA II – ocean inventories and transports

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## *12.1 Introduction*

The CTD section in Drake Passage is a continuation of a 24-year time series repeat hydrographic section is a continuation of A section stretching across Drake Passage from Burdwood Bank to Elephant Island, designated SR1b, has been occupied in The Drake Passage hydrographic observations are part of ORCHESTRA Workpackage 3, on the effect of Southern Ocean interior circulation and exchanges with other ocean basins on heat and carbon transports and storage. We aim to monitor Southern Ocean water masses and circulation pathways and Antarctic Circumpolar Current volume and property transports by continuing a near-annual annual time series of high-quality repeat hydrographic measurements on GO-SHIP line SR1b begun in 1993. The hydrographic measurements are complemented by ocean current and underway surface ocean and meteorological observations and by the deployment of profiling floats which will monitor stratification and deep currents in the Scotia Sea over time.

In addition to the ORCHESTRA-funded work, two opportunistic experiments took advantage of the CTD section by sampling from the Niskin bottles for microplastics and environmental DNA (eDNA).

## 12.2 Drake Passage repeat hydrography

The JR17001 CTD casts and Niskin bottle samples are summarized in Table 15.3.1 (Appendix 15.3). Casts 25-44 were on SR1b.

### 12.2.1 Section plan and modifications

The SR1b section has 30 nominal stations (see JR16002 cruise report for positions). Due to time constraints on this cruise, the planned station number was reduced to 27 by increasing the spacing between stations in the southern half of the transect; these 27 stations are shown in Figure 12.1. To save more time, no Niskin bottles were fired at the closely-spaced stations on the southern continental slope, where water sampling is the limiting factor in between-station time. The hope was that the more energetic northern part of the passage could be fully sampled, and in particular that the transport-defining end points of the two continental slopes would be resolved.

The catastrophic overheating of the winch gearbox when the CTD was at the bottom of station 44 (the 20$^{th}$ of the SR1b stations), at the base of the northern continental slope, ended CTD operations for the cruise and meant that the northern slope was not sampled at all. In 9/10 years missing the northern slope would mean missing much or all of the Subantarctic Front (SAF) and its transport, meaning that the occupation could not be used as part of the time series. In a stroke of fortune, however, this year the SAF was unusually far south, and the ACC had been crossed by station 43; therefore the time series might not be interrupted.

Three XBTs deployed along the northern continental slope will also provide some subsurface information, albeit only on temperature structure and only above 1800 m.

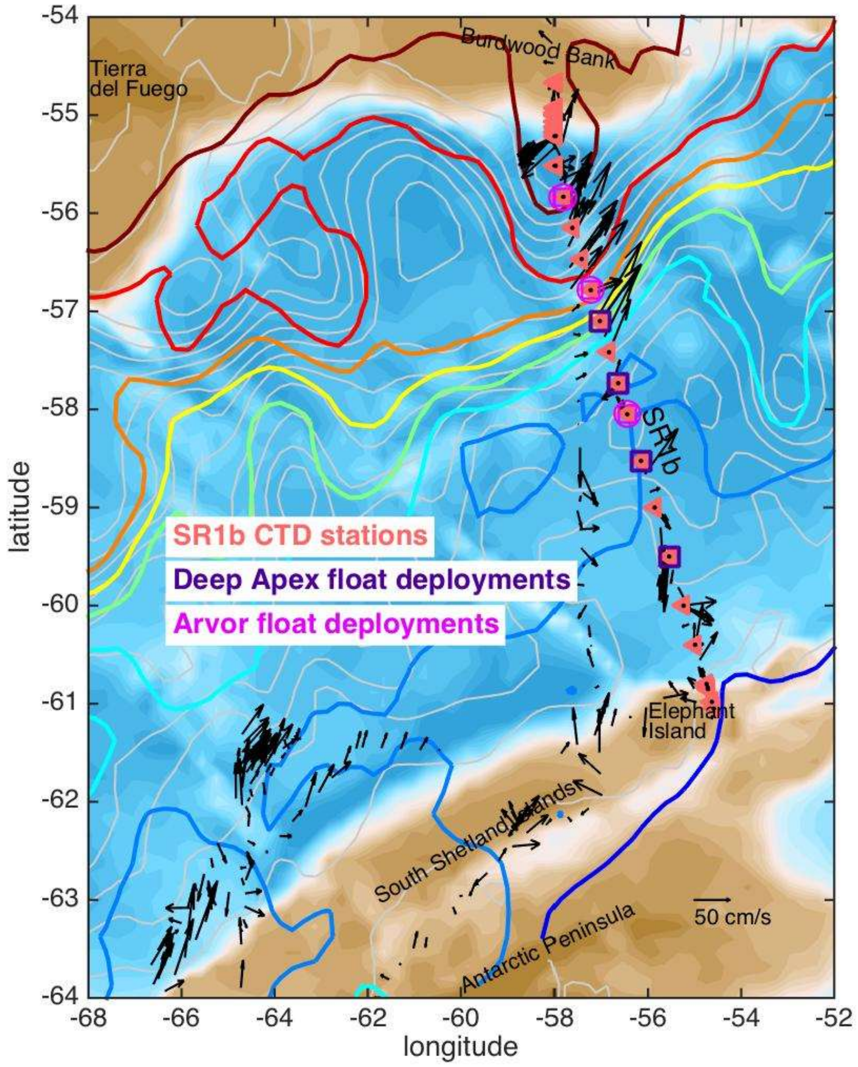


**Figure 12.1: Planned (orange triangles) and completed (with black dots) SR1b CTD stations and float deployment locations (squares and circles). Vectors are hourly subsampled 15-minute averaged VMADCP velocity from 50-100 m. Gray contours show 18 December sea surface height at 10 cm intervals. Colour contours show sea surface temperature (0 to 7 C) from 17 December.**

### *12.2.2 CTD operations and data processing*

Details of the CTD instrumentation and stations are given in Appendices 15.3 and 15.5. Casts 25 through 44 pertain to SR1b.

CTD data were acquired with SeaSave V 7.22.3. After each cast, a batch script, BASsvp, was run to prepare a sound velocity profile and a CTD data file for transmission to the UK Met Office. Subsequently, three steps were run in SBE Data Processing: Data Conversion, to export the data as a text (.cnv) file; Align CTD, to apply a time alignment offset to the oxygen data (note that the hysteresis correction is applied subsequently); and Cell Thermal Mass, to correct the conductivity readings. The settings for these

steps are provided by the manufacturer. The procedure for Niskin bottle firing for casts 1-24 was as follows: wait at least 30 s at the bottle stop for equilibration; fire a bottle; if a second bottle is to be fired at the same depth, wait another SBE35 temperature data, collected upon Niskin bottle firing, were uploaded using SeaTerm every few casts (so files may contain data from multiple casts).
Data were processed using Mexec 3.1, a suite of MATLAB programs developed by the Ocean Circulation and Processes group at the NOC.

### *12.2.3 Water sampling and analysis*

Yvonne Firing and Dafydd Stephenson, NOC, UK

The goals for ORCHESTRA water sampling from the CTD Niskin bottles were two-fold: first, to calibrate the CTD conductivity and oxygen sensors; and second, to obtain profiles of oxygen isotopes. For the first goal, it is desirable to take samples in locations of relatively stable water properties, covering a range of conductivity and oxygen values, as well as temperature and pressure. For the second, it is desirable to take samples over a range of depths and water masses, including in or at the edge of pycnoclines. Niskin bottles for calibration samples were fired only after allowing the CTD sensors to equilibrate for at least 30 s at the bottle stop depth; waiting 15 s before moving off ensured a corresponding good SBE35 temperature calibration sample.

The opportunistic microplastics and eDNA sampling operated using the depths chosen by the above criteria. Duplicate bottles were fired for microplastics to provide sufficient volume. On SR1b the duplicate Niskins for microplastics were fired while recommencing the ascent, since an exact depth is not critical in this case.

**Salinity**
Salinity samples were taken in 200 mL glass sample bottles, rinsed three times before filling and sealed with clean dry stoppers. Crates of samples were stored in the Bio Lab for a minimum of 12 hours before analysis to allow equilibration to laboratory temperature (approximately 22 C).
The samples were analysed for conductivity using a BAS-supply Guildline 8400B Salinometer, with a cell temperature of 24 C, following standard procedures as described in the GO-SHIP manual and cruise reports for JR306, JR15003, and JR16002. Bottle conductivity ratio readings were logged both by hand and using the OSIL Salinometer Data Logger software. IAPSO standard seawater bottles run before and after each crate of samples were used to compute a linearly drifting offset by reference to the nominal conductivity ratio of the standard. Batch P160 was used except for one (logged) instance in which P158 was used instead. Batch-batch adjustments have not been applied on the ship but may be applied before computing the final calibrated data.

**Dissolved oxygen**
Dissolved oxygen sampling and analysis followed the GO-SHIP manual procedures for amperometric determination of dissolved oxygen in seawater by Winkler titration. The procedure is outlined here, with some discussion of issues encountered.

**Procedures**:
**Standards and blanks**
The titrator's measurements were calibrated by a series of five standards (program STD JR) and three blanks (program BLK JR) every 24 hours, close to processing seawater samples. These each use (in

order) 1 mL of sulfuric acid, 1mL of manganese chloride, 1 mL alkaline iodide and, respectively, 10 mL and 1 mL of iodate standard, plus a variable quantity of thiosulfate, typically less than 2 mL. If there are sufficient quantities of thiosulfate and iodate standard, the titrator may first be "flushed" using the *prepare* function, or via the *dosing fixed vol.* option, accessed through the "manual" menu (pressing the "hand" icon). This helps to push through any trapped bubbles in the tubing. The blank measurements are also more consistent if they follow the standards, due to the higher volume of iodate used for the latter flushing the Dosino unit and its tubing. It was found that there is no detectable difference between filling the bottle used for the method to the shoulder or half way with de-ionised water.

The blank program is set to save two titrations, although the second must be started manually using the play button and keeping the "cruise name" and "blank no." options the same.

**Sample analysis**

Seawater samples captured by the Niskin bottles or from the underway supply were measured with a thermometer probe, then fixed by adding 1 mL of manganese chloride and 1 mL of alkaline iodide, before sealing and agitating. The flasks used for sampling were individually volume-calibrated in advance, with volumes up to around 140 mL. After an hour, including a further agitation at 30 minutes, the samples were processed using the "O2 JR" program on the titrator. The analysis requires a further 1 mL of sulfuric acid and typically no more than 2 mL of thiosulfate. The number of sample points per CTD cast varied with depth, but at least one duplicate sample was taken at each station, with repeats also taken if visual inspection revealed bubbles after fixing.

**Disposal**

The end product of completed analyses was disposed of in jerry cans brought aboard for lab waste. A typical oxygen sample produced no more than 150 mL of waste, and a full set of blanks and standards no more than 800 mL.

**Issues**

At the point of sampling, agitation is necessarily quite vigorous, and a flask was at one point dropped and smashed. The risk of this can be partially negated by shaking the flask over a container in case it is dropped, and away from other people working around the rosette.

Waste disposal requirements were underestimated, and additional sealed containers were required. These were supplied by engine room staff.

The titrator (Metrohm Ti-Touch) was somewhat temperamental in behaviour following initial setup, and then less frequently throughout the cruise. The machine did not recognise the Dosino units unless they were plugged into the opposite ports (i.e. Iodate std into port D1 and Thiosulfate into port D2). This further required the reprogramming of the analysis methods to account for the difference – all aforementioned programs are based on this rearrangement.

The Ti-Touch would occasionally fail its start-up test, displaying the initial splash screen and then shutting back off. There appeared to be no particular cause or solution to this, but it invariably would return to proper functionality of its own accord following repeated attempts. The Dosino "status" lights flash when there is an issue. It may be the case that the machine is sensitive to cable movement, as error and warning messages were prone to displaying following movement of attached units.

Bubbles in the tubing of the Ti-Touch were a common occurrence, and could either be resolved through flushing and manual dosing, as described above, or by pointing the tubing upward and flicking it to encourage stubborn bubbles through.

**Oxygen Isotopes (d18O)**
Samples were collected in plastic bottles from the CTD Niskins, following dissolved oxygen sample collection and before collection of salinity an other samples. A total 233 oxygen isotope samples were collected on SR1b. They will be analysed ashore by the British Geological Survey.

### *12.2.4 CTD calibration*

The CTD temperature sensor was calibrated by comparison with SBE35 values obtained at bottle firing times. The conductivity (salinity) and dissolved oxygen records were calibrated by comparison between laboratory analysed values from Niskin water samples, and CTD values at bottle firing times,

| | |
|---|---|
| temp1 | temp1_cal = temp1_uncal + 0.00013n + 0.00441 |
| temp2 | temp2_cal = temp2_uncal + 0.00019n + 0.00686 |
| cond1 | cond1_cal = cond1_uncal x ( ((0.007 – 0.0003n + interp([0 700 5000], [0.001 -0.0005 -0.001], p))/35 + 1) |
| cond2 | cond2_cal = cond2_uncal x ( ((0.0025 – 0.0001n + interp([0 400 5000], [0.0005 0.001 -0.001], p))/35 + 1) |

**Table 12.2.1 CTD sensor calibrations as functions of station number n and pressure p. Oxygen calibrations will be computed in post-cruise processing. The conductivity calibrations include a piecewise-linear function of pressure; calibration factor is computed by linearly interpolating between the listed values.**

### *12.2.5 LADCP*

The 300-kHz Workhorse lowered acoustic Doppler current profiler (LADCP) was installed in a downward-looking configuration on the CTD rosette. The instrument was configured to sample 25 x 8-m bins, with data collected in beam coordinates and rotated to earth coordinates during processing. The LADCP was connected to a charger and by a serial cable to the CTD computer in the UIC for programming prior to each station and data download after each station using BBTalk. Pre-deployment tests were run before each cast. Data downloaded after each station were copied to the network data drive.

There were some complications due to a faulty charging cable, which from the data point of view resulted in multiple output data files on several of the casts (see Appendix 15.3 for more details). A weak beam 4 was also observed from time to time. Other than on the first (test) cast, however, the LADCP does appear to have produced reasonable and useable measurements.

LADCP data were processed with the LDEO IX software, incorporating ship navigation and CTD pressure streams to constrain the solution for earth-relative velocity from the measured instrument-relative velocity.

### *12.2.6 XBT deployments*

Initial XBT deployment attempts on the Drake Passage leg were unsuccessful because of water ingress to the cable on the primary launcher. This manifested as supurious deployments with nonsense temperatures, and failure to correctly record actual deployments. After swapping out for the secondary launcher, one T5 and two T7 XBTs were successfully deployed at approximately 1800 msw, 800 msw, and 400 msw along the SR1b line. It may be necessary to adjust the fall rates: the first launch appeared to continue well past the bottom depth measured by the swath at the time, without any noticeable spike indicating reaching the bottom.

### *12.2.7 VMADCP*

Yvonne Firing and Floyd Howard

VMADCP data collected in RDI's VMDAS software (see Appendix 15.3) were processed using the University of Hawaii currents group's python CODAS software. On-ship processing of ping (ENR) data used the PRDID heading messages. The nominal transducer alignment of the VMADCP is 60.08; based on 656 bottom tracking points and 91 watertracking points, an additional rotation of 1.4 degrees and an amplitude correction of 1.02 were applied.

In addition to the automatic edits (including a percent good threshold and bottom detection) ping data were edited manually using gautoedit.py, taking a relatively light touch approach. Some data collected while icebreaking were discarded entirely (the VMADCP should have been turned off sooner), and scattered extreme values throughout were removed. In one case, presumably associated with a decrease in signal amplitude throughout the column, the automatic bottom detection failed for a short time; as the bottom appeared to be at the same depth on either side of this segment, it was straightforward to edit out manually.
Contaminated (erroneously large) top bin values were trickier to detect, as particularly over the continental shelf there did appear to be periods of strong surface-intensified flow. Editing of top-bin values was conservative, removing only those which were clearly unphysical.

Two additional types of errors were observed: 1) segments of strong negative followed by strong positive values at approximately 80 m while on (some) stations in Drake Passage; and 2) strong (negative or positive) values when moving on and off station at the shallow sites of Marion Cove and Borgen Bay. In both cases the anomalies did not have a consistent direction relative to the ship's heading, although it is not known whether they might have had a consistent direction relative to the ship's direction of motion while on DP. Additional investigation is required. Post-processing ashore should also include heading correction using the gyro feed.

The 15-minute averaged currents at 50 m are shown in Figure 12.2.1.

### *12.2.8 Other underway data*

The SCS underway data streams for navigation, meteorological parameters, and thermosalinograph (TSG) were read in and processed on a daily basis using Mexec v3.1. Processing included some automatic removal of out-of-range values (or values when the seawater pumps were off, in the case of the TSG), despiking, and averaging (vector averaging in the case of the wind data). The TSG salinity was calibrated, following the same procedure described in 12.2.4, using samples taken from the underway pumped seawater supply throughout the cruise, at 4-hourly intervals during the active segments and 6-12 hour intervals during longer steaming periods.

## 12.3 Float deployments

Two types of Argo autonomous profiling floats were deployed in Drake Passage during JR17001. Four 6000-m capable Deep Apex floats were deployed for ORCHESTRA, while three 2000-m Provor floats were deployed opportunistically for Euro-Argo MOCCA.

| Float, S/N | date | time (UTC) | lat | lon | Calibration CTD |
|---|---|---|---|---|---|
| Deep Apex, 20 | 20171216 | 0524 | -59.50035 | -55.5489 | 32 (SR1b_8) |
| Deep Apex, 19 | 20171216 | 1747 | -58.52646 | -56.14773 | 34 (SR1b_10) |
| Arvor, AI2600-16FR092 | 20171216 | 2325 | -58.04956 | -56.44746 | 35 (SR1b_11) |
| Deep Apex, 18 | 20171217 | 0413 | -57.73314 | -56.64433 | 36 (SR1b_12) |
| Deep Apex, 21 | 20171217 | 1336 | -57.09167 | -57.00814 | 38 (SR1b_14) |
| Arvor, AI2600-16FR091 | 20171217 | 1819 | -56.78318 | -57.23179 | 39 (SR1b_15) |
| Arvor, AI2600-16FR093 | 20171218 | 0920 | -55.83342 | -57.82059 | 42 (SR1b_18) |

**Table 12.3.1: Autonomous profiling float deployments.**

### 12.3.1 Deep APEX floats

The Deep Apex floats were prepared at the National Oceanography Centre in Southampton before transport to the JCR, and were deployed in pressure-activation mode without shipboard checks. (This procedure was followed because on a previous cruise, JR16002, attempts to repeat checks aboard the ship were hindered by the difficulty of finding good sky exposure while keeping the floats out of the cold, compounded by the graceless failure mode of the floats when they miss communications during self-tests.) The only pre-deployment preparation was to flush the conductivity cells using a weak solution of Tritron-100 in deionized water, following as closely as possible the procedure outlined by the float manufacturer. Each float was deployed following a CTD cast, by lifting by the crane using a strop through the lifting bail and lowering into the water while the ship was underway at 0.5 kt.

Because Drake Passage is relatively shallow, the floats were programmed to profile to 3500 m, with a 3-day cycle. The cycle length was chosen to maximse the number of profiles available, and is appropriate to the decorrelation time scales of Scotia Sea deep temperature and currents.

Deep 19 and Deep 21 are operating normally, having reported two cycles each at the time of writing. Deep 20 was observed to sink but then failed to report in; this is being investigated. Deep 18 pressure activated, returned to the surface, and reported in, but then failed to report subsequently.

### 12.3.2 Arvor floats

The Arvor floats were provided by Euro-Argo. Before each deployment, the float was activated by removing a magnet from the casing, and self-tests run. These floats were lowered by hand on a line over the port quarter.

## 12.4 Opportunistic sampling

### 12.4.1 Microplastics

Alethea Mountford, Newcastle, UK

To benefit a PhD project on modelling the distribution of microplastics throughout the ocean, microplastic sampling was conducted along the SR1b transect in Drake Passage as well as at Marion Cove, Borgen Bay, and Marguerite Trough sites. Samples were taken at depths throughout the water column, ranging from approximately 5 m to 4000 m; the number of samples is summarized in Table 15.3.1.

Water samples were collected from CTD rosette Niskin bottles, with Tygon tubing placed over the spigots and fed into 5 litre translucent white plastic bottles. This was done for ease of water collection, as well as to minimise atmospheric contamination. A total of 10 litres was taken at each depth, unless for some reason the full 10 litres was not available such as through bottle misfires or leaks. Samples were processed as soon as possible after collection to avoid algal and other biological growth. The seawater was filtered using a small desktop vacuum pump, attached to a Büchner flask with a Büchner funnel. For the sample taken from Marion Cove, one Whatman GF/A 47mm circular filter (pore size 1.6μm) was used per Niskin bottle, however within the surface water samples in particular, the filter was getting too clogged with biological matter. From Börgen Bay onwards, two filter papers were used per Niskin bottle as standard, with three or four being used for particularly biologically active samples. After filtering, the filter papers were placed in labelled glass petri dishes, which were then sealed with tape around the edge.

Initial analysis of some of the filtrate samples was done onboard using a dissection microscope, however once back in the UK more detailed and thorough analysis will be done using a compound microscope.

### 12.4.2 eDNA

Will Goodall-Copestake, BAS, UK

DNA extracted from water samples is increasingly being used to assess the biodiversity of the marine environment. Often referred to as environmental DNA (eDNA), this DNA is derived from the cellular debris of macroscopic animals as well as microscopic life forms such as single celled algae, protozoa and bacteria. Thus, it has the potential to provide a snapshot of entire biological assemblages.

This project aims to assess the eDNA complement of two contrasting water bodies within the Drake Passage transect: cold, young, downwelling Antarctic Bottom Water (AABW), and warm, old, upwelling Circumpolar Deep Water (CDW). To sample these water masses in a consistent manner, eDNA samples were taken at 2750m ±50m at 14 stations along the Drake's Passage transect, from SR1b_6 (CTD30) to SR1b_19 (CTD43). For comparative purposes, eDNA samples were also taken from epibenthic and surface water at site SR1b_14 which was assumed to be closest to the Polar Front.

Each eDNA sample comprised approximately one litre of water, released directly from the Niskin bottle into a sterile plastic bag. 200-300mL of this water was used to rinse a pre-cleaned 50ml syringe, which was subsequently used to filter 500ml of seawater through a 0.22 micron sterivex filter. Filters were immediately frozen at -80 degrees for storage and transit back to the UK. The total time between CTD carousel recovery and eDNA samples being frozen was less than one hour.

Upon receipt of the frozen sterivex filters in BAS Cambridge, DNA will be extracted and quantified using PCR primers that co-amplify bacterial 16S ribosomal DNA and the corresponding region of eukaryotic 18S ribosomal DNA. Pending the acquisition of funding, these same primers will be used to generate amplicons for Illumina sequencing. Post-sequencing bioinformatics analysis will reveal if the eDNA samples from AABW and CDW were derived from distinct biological assemblages, and if these correlate with taxa known to associate with key environmental parameters such as temperature and salinity.

# 13. Opportunistic Science

## *13.1 A record of Upper Circumpolar Deepwater history in Marguerite Trough*

James Scourse[1], Alejandro Roman Gonzalez[1], David Barnes[2], Chester Sands[2]   1.Exeter University, 2.BAS UK
j.scourse@exeter.ac.uk

### *13.1 a) Justification*

The West Antarctic Peninsula (WAP) is a hotpsot of rapid physical change, including glacier retreat rate, ice shelve and sea ice losses [1-3]. Until recently this was considered linked to a warming atmospheric trend in the Southern Hemisphere[4-6] but the current hypothesis is that this is the result of warming ocean temperatures, specifically linked to upper Circumpolar Deep Water[7,8] (uCDW). Pulses of uCDW ingress onto the continental shelf along trough axes appear to be transmitting heat directly to sites of sea ice formation and glacier melt, driving the rapid changes observed. Given the short duration, and intermittency, of seawater temperature instrumental series from the WAP, it is critical to generate longer continuous records to assess the natural variability in uCDW temperature. In particular, it is important to establish the periodicity and longevity of uCDW pulses across the shelf and to establish the modes of climate variability that appear to control such events.

Pilot studies have demonstrated that oxygen isotope series from the annual increments of the long-lived the Antarctic bivalve *Aequiyoldia eightsii* can be used to generate histories of seawater temperature from the sites of collection[9]. Furthermore, the annual increment series from this species enables sclerochronological cross-dating so that the series extend beyond the longevity of the individual specimens[10]. *A. eightsii* inhabits shallow waters in the WAP, from shallow sub-tidal down to 100 m, but specimens have been trawled from depths of 300-600 m. A large individual collected during the Discovery cruise of 1927 from the South Orkney Islands has generated a 25-year record[9]. Existing series from Ryder Bay and Signy provide records of shallow water temperatures for several decades over the last 100 years. If material was available from deeper waters e.g. Marguerite Trough, sclerochronological and geochemical analysis of this material would provide a key link between the depper troughs, the sites of uCDW ingress, and the coastal settings where ice melt is focused. Currently there are no such records from the deeper trough settings.

The overall aim of this proposal is to deploy an Agassiz trawl in the Marguerite Trough to recover sufficient specimens of live and dead-collected shells of *A. eightsii*, and any other long-lived species of bivalve suitable for sclerochronology (e.g. *Laternula elliptica*), in order 1. To construct a crossdated chronology of growth increment series and 2. To generate from such a series oxygen isotopic data that can be used to generate proxy records of seawater temperature. At depths of 300-600 m the confounding influence of freshwater from glacier melt, sea ice formation and precipitation on the interpretation of the oxygen isotopic data as a temperature proxy will be minimized. The hypotheses we test are 1. that incursions of uCDW into Marguerite Trough can be detected in the oxygen isotopic data from the shell series and 2. that, based on model simulations, that there has been an increase in the incursions of uCDW into Marguerite Trough over the last few decades.

Following site survey by multi-beam swath bathymetry and TOPAS sub-bottom profiling to identify suitable locations to deploy an Agassiz trawl, we propose to deploy the Agassiz trawl across a depth transect on the western flank of Marguerite Trough. Samples will be sorted on recovery into functional groups. Molluscs will be separated and stored in ethanol prior to dissection of the live specimens, retention of soft tissue for additional analyses, and curation of the dry shell material prior to analysis on return to the UK. All other specimens collected will be retained to investigate biodiversity and ecosystem functioning.

This proposal represents an extension of the joint UK-Chile NERC-CONICYT ICEBERGS project investigating the impact of rapid deglaciation on the marine benthic ecosystem of the WAP.

### *13.1 b) Methods*

Six Agassiz trawls were undertaken in outer Marguerite Bay, with approximate bottom (trawling) times of 10 minutes. In each case the catch was hosed in the net before placement into a stack 1cm and 1mm set of sieves. Catches were preserved for later analyses.

1 Cook et al. 2005 *Science* 22 541-544, 2 Cook and Vaughan 2010 *The Cryosphere* 4 77-98, 3 Stammerjohn et al. 2012 *Geophysical Research Letters* 39 L06501, 4 Vaughan et al. 2003 *Climatic Change* 60, 243-274, 5 Meredith and King 2005 *Geophysical Research Letters* 32 L19604, 6 Vaughan et al. 2013 *Climate Change 2013: The Physical Science Basis. IPCC* 317-382, 7 Klinck et al. 2004 *Deep-Sea Research Part II*, 51 1925-1946, 8 Meredith et al. 2008 *Deep-Sea Research Part II* 55 309-322, 9 Roman-Gonzalez et al. 2016 *Holocene* 27 271-281, 10 Roman-Gonzalez 2018 PhD thesis, Cardiff University.

## 13.2 Impacts of Trough Circulation on Benthic Communities in the marginal sea ice zone of the West Antarctic

Alex Brearley[1], David Barnes[1], Yvonne Firing[2], Miguel Morales-Maqueda[3], Louise Biddle[4] 1.BAS, 2. NOC, 3. Newcastle University, UK, 4. University of Gothenburg, Sweden jambre@bas.ac.uk

### 13.2 a) Justification

The West Antarctic Peninsula (WAP) shelf is punctuated by a number of deep glacially carved troughs that act as conduits for warm (>1.5°C) offshore ocean waters to permeate into the inner shelf. The largest such example is Marguerite Trough off the western coast of Adelaide Island. Recent limited observations from gliders and high-resolution modelling have suggested that the circulation of this trough is dominated by an onshore flow of deep warm waters on its northern side, and a compensating offshore flow of cooler waters close to the southern boundary (Moffat et al., 2009, Dinniman et al., 2010, Brearley et al., in prep). In addition, Marguerite Trough is a well-known region of marginal sea ice, where surface forcing is believed to vary strongly on very small spatial scales, strongly impacting the mixed layer dynamics and productivity of the near surface ocean (Venables et al., 2013). As the primary route by which warm waters enter Ryder Bay, where the Rothera time series has been collected in 1997, Marguerite Trough forms an important boundary condition for one of BAS's longest time series.

### 13.2 b) Proposed work

We propose to conduct two one-day work packages to understand:
(a) The circulation structure and water mass properties across Marguerite Trough, including the location of inflows/outflows and their associated heat transports.
(b) The impact of differing near-bottom temperatures on benthic community structures within the trough.
(c) The effect of this circulation on the water column concentration of microplastics of the WAP shelf.
(d) The effect of marginal sea ice on mixed-layer dynamics, water mass properties and near-surface productivity.

*Day 1* will incorporate a cross-Marguerite Trough section of ~5 CTDs (to include temperature, salinity, dissolved oxygen, chlorophyll), vessel-mounted ADCP, and imagery of benthic communities using the Shallow Underwater Camera System (SUCS). This will take place at approximately 6 nm spacing to a position currently 27nm (2.5 hours steam) from the ship's current waiting location. Water samples for salinity and microplastics will be collected and analysed.

*Day 2* will involve an along-trough section from the edge of the marginal ice to the shelf break of Marguerite Trough. This will allow an analysis of proximity to the shelf edge and sea ice on near-surface physical and biological processes to be conducted. Sampling will include CTD, VMADCP, SUCS and microplastics. 5 locations will again be sampled, the furthest being 36nm (3.5 hours steam) from the current location.

As samples are generally shallow (<700 m), departure within 30 minutes from the science site would be achievable if sea ice conditions suddenly change to permit safe passage to Rothera for relief.

*Map*

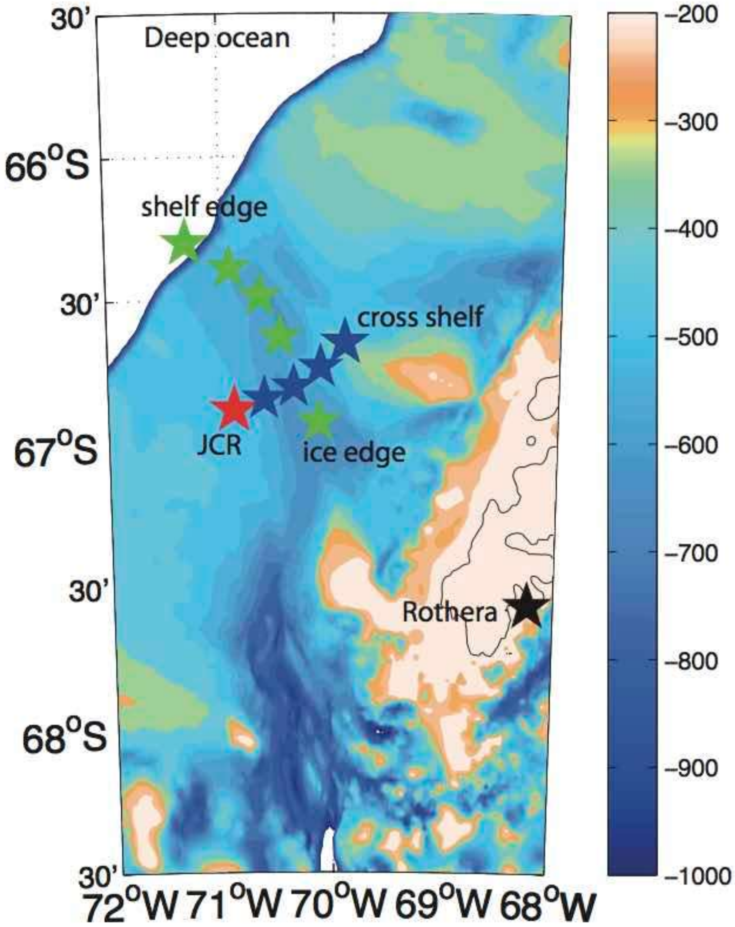


**Figure 13.2.1: Map to show proposed sections across trough from current JCR location (Day 1, blue stars), and from ice edge to shelf break (Day 2, green stars). Rothera is also marked. Colours denote bathymetry.**

## *13.2 c) Completed work*

The cross-trough section, and the inshore CTD of the along-trough section, were completed before we were instructed to return to the sea ice for another attempt to reach Rothera. CTD stations 19-24 (see table 15.3.1) correspond to this component. Data from the CTD (stations 19-24)

SUCS deployments were completed at the cross-trough stations.

# 14. Technical

Johnnie Edmonston – British Antarctic Survey, NERC, Cambridge, UK, dkab@bas.ac.uk

## *14.1 IT*

Underway instrumentation and data logging performed flawlessly throughout the cruise with the exception of one power down, which lasted between 0337 and 0511gmt on the 12th December 2017 during a period of unexpected power and propulsion issues the ship suffered due to and engine management issue.

At the point of resolution of said power issues, all acquisition, logging and processing systems were brought back on line with no issues and in addition scientific systems which were in use such as ADCP, XBT, EM120, CTD and SCS remote display were remapped to ensure the logging locations were re-mapped.

The SUCS machine experienced some problems with graphical output and at one point video the bridge had to be bypassed to feed to the deck. This problem was later resolved when the machine was disassembled and re- assembled due to a motherboard problem.

Some confusion over the speed of a locally attached usb 3.1 was resolved, when the aforesaid drive was suspected of under performing, when in actual fact the bottleneck in data speeds was a network limitation and not a disk, or driver problem.

On the next build of the SUCS, motherboard and graphics problems will be resolved, and full support for usb 3.1 available. A more powerful graphics card will be included in the build which will resolve reported problems when viewing in conditions of high occlusion.

The Wave glider, had, and indeed most likely still has a problem with comms to the on board instrumentation, as evidenced by a non functional comms channel when the instrument is connected to its dedicated network intended to talk to the pre deployment control machine.

The platform itself talks to the control laptop via both serial and Ethernet, on a private network via a dual headed cable. It was found that the ethernet component of the dual headed cable was non functional.  However, a secondary ethernet port was found on the platform, and successful comms established via that, and the instrument deployed successfully.

SCS data acquisition, jrlb stream processing and access to scientific data via SAMBA was uninterrupted and without problem for the duration of the cruise, with the exception of the even mentioned in paragraph 1.

Data acquisition and data drives were stopped and cruise data was backup up succesfuly at 1228gmt on 21/12/2017 for transportation back to Cambridge for restoration to the data volumes, which has since been done.

## *14.2 AME*

**a) Elec eng**

**LAB Instruments**

| Instrument | S/N Used | Comments |
|---|---|---|
| AutoSal | 68959 | |
| Scintillation counter | N | |
| Magnetometer STCM1 | N | |
| XBT | Y | Bulgin connectors replaced due to water ingress |
| | | |

**ACOUSTIC**

| Instrument | S/N Used | Comments |
|---|---|---|
| ADCP | Y | |
| PES | N | |
| EM122 | Y | |
| TOPAS | Y | |
| EK60/80 | N | |
| SSU | Y | |
| USBL | Y | |
| 10kHz IOS pinger | N | |
| Benthos 12kHz pinger S/N 1316 + bracket | N | |
| Benthos 12kHz pinger S/N 1317 + bracket | N | |
| MORS 10kHz transponder | N | |
| | | |

**OCEANLOGGER**

| Instrument | S/N Used | Comments |
|---|---|---|
| Barometer1(UIC) | V145002 | |
| Barometer1(UIC) | V145003 | |
| **Foremast Sensors** | | See appendix 15.4 |
| Air humidity & temp1 | 0061698924 | |
| Air humidity & temp2 | 61698922 | |
| TIR1 sensor (pyranometer) | 172882 | |
| TIR2 sensor (pyranometer) | 172883 | |
| PAR1 sensor | 160959 | |
| PAR2 sensor | 160960 | |
| **prep lab** | | |
| Thermosalinograph SBE45 | 0130 | |
| Transmissometer C-Star | 846 | |
| Fluorometer Wetstar | 1498 | |
| Flow meter | 811950 | |
| Seawater temp 1 SBE38 | 0601 | |
| Seawater temp 2 SBE38 | 0599 | |
| | | |

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

| Instrument | S/N Used | Comments |
|---|---|---|
| Deck unit 1 SBE11plus | 0458 | |
| Underwater unit SBE9plus | 0707 | |
| Temp1 sensor SBE3plus | 2705 | |
| Temp2 sensor SBE3plus | 5042 | |
| Cond1 sensor SBE 4C | 3488 | |
| Cond2 sensor SBE 4C | 2248 | Very spikey output replaced with 2255 |
| Cond2 sensor SBE 4C | 2255 | |
| Pump1 SBE5T | 4488 | |
| Pump2 SBE5T | 2371 | |
| Standards Thermometer SBE35 | 0024 | |
| Transmissometer C-Star | 396 | |
| Oxygen sensor SBE43 | 0242 | |

| | | |
|---|---|---|
| PAR sensor | 70636 | |
| Fluorometer Aquatracka | 09-7324-001 | |
| Altimeter PA200 | 10127.27001 | |
| LADCP | 15060 | Replaced due to excessive file fragmentation |
| LADCP | 14897 | |
| CTD swivel linkage | 1961018 | |
| Pylon SBE32 | 0636 | |
| Notes on any other part of CTD e.g. faulty cables, wire drum slip ring, bottles, swivel, frame, tubing etc | | |

**AME UNSUPPORTED INSTRUMENTS BUT LOGGED**

| **Instrument** | **Working ?** | **Comments** |
|---|---|---|
| EA600 | Y | Computer failed. New one made. |
| Anemometer | Y | |
| Gyro | Y | |
| DopplerLog | Y | |
| EMLog | y | |
| | | |

**Oceanlogger**

**Met sensors.**
The underway system was rock solid reliable up to the 15th Dec, when the TH sensors started to drop out. (This was after a prolonged period of rough weather in which spray was freezing all over the sensor set, and also after 4 days or so of breaking ice in our attempts to reach Rothera…..so water/ice ingress or vibration could be the cause) Monitoring of the serial messages showed that the bytes received by the computer were 'shrinking' from their proper size (143 bytes) over time. First TH1s reply message would slowly shrink (over an hour or so) until there were no bytes read, and then TH2 would so the same. (At this point, all the other sensors on the foremast were reading well with no comms errors) Power cycling the system restored comms to the TH sensors, but then they again behaved as described above. During a calm CTD deployment, the junction box on the A-frame of the foremast was opened up for inspection. All connections seemed fine and soundly attached, and there was no sign of water ingress to the box. The bulkhead connectors were clean and dry with no signs of breakage or corrosion.

A day later, all sensors seemed to come back online and were reading as intended. This remained so for nearly a day, after which, first the T&H sensors, and then the solar sensors started to fail comms again. At present, only PAR2 is still responding (TIR1 was online this morning (20-12-17) but has stopped responding. It is my intention to get up the mast for further investigation upon our arrival in Punta. ………work is ongoing.

**USBL-NMEA splitter.**

It was noticed (when the USBL was not getting correct NMEA messages) that a second heading string was being output to the splitter PC from the Seapath. This extra sentence 'shunted' the correct message one place further down the data array. As the output messages were selected by their array index, this meant that incorrect messages were being sent. The Labview code has been amend to search for the correct strings by name and not array index, so this should no longer be an issue.

**Clam/winch monitor.**

The outboard load cell on the coring wire was not reporting strain values to the CLAM computer. Extensive testing indicated that the load cell itself, and the cable connecting it to the CALM junction box in the winch room were faulty. These have been replaced.

**CTD sea cable.**

On cast 42, the cable was noted by the deck engineer to be thinner than when new, sufficiently so to interfere with the smooth spooling on the drum. 400m of cable was cut off, and the remainder re-terminated. One of the motors in the winch room got excessively hot during cast 44, which triggered the fire alarms when the winch room filled with smoke. After people were released from the emergency muster, the CTD was slowly hauled back aboard.

**LADCP.**

The battery pack subsea connector has substantial mechanical damage and signs of salt water corrosion. When the case was opened up, it was noticed that one of the o-rings was shredded and the internal fuse was blown, but the batteries were clean, dry, and operational.
(Pictures were taken during mobilization)


Due to there being no spare connector in the box, this one was cleaned up and packed with silicon grease in an attempt to prevent water ingress into the air gap while under pressure.

The o-rings were replaced and a new fuse fitted.

The LADCP system has been used extensively on this cruise with the only observable electrical fault being occasional fluctuations (rapidly changing values) and low readings at the multimeter by the battery charger. Voltage measured at the battery bulkhead connector were constant and of appropriate value. It is assumed that the connection between the LADCP loom and this ropey connector is the reason. Presumably related to this issue, on 14 of the casts the LADCP appeared to stop and restart data logging, producing two to five data files rather than one.

One of the ship-side comms cables coming through the gland into the bottle annex from the chem lab had been sheared during refit. This tail has been replaced.

**b) Mech eng**

SUCS and Multicorer-

Overall the SUCS worked very well and was deployed a total of 16 times. The Images taken were well lit and great quality.

Twice during the cruise I had problems getting an image on the main screen and the PC would not boot properly. The main screen cable was changed and worked for a while, we then lost all of the screens. I decided to look further into the PC. We took the PC apart and removed, cleaned and re seated the memory and the graphics card. We also found the heat sink on the motherboard was loose on one corner. After having done this the PC and the graphics card seems to work. I tested all the graphics card ports and there does not seem to be a problem. The SUCS then worked as expected and know further problems occurred. Some more display port to DVI cables have been ordered.

The so called waterproof monitor had some water ingress, it was cleaned, dried and re assembled. This is something which needs to be looked at when the unit is back in Cambridge. The main fiber optic seems to have a tendency to twist and would benefit from having a fiber optic swivel fitted. A new cover needs to be made for the deck winch as the existing one is heavily torn. Spare fiber optic blanking caps, o rings and cleaning kit for the connectors is also needed.

The Oktopus 12-core Multicorer was deployed a total of 8 times. The Multicorer was set with maximum weight and on the maximum penetration setting. This was done to ensure we could recover as sediment as possible. The samples recovered were typically 50% sediment, 50% water with 1 or 2 samples of the 12 lost upon recovery. The Multicorer had a full inspection prior to use to be sure it was mechanically sound since the trails earlier on in the year.

The Multicorer does seem to suffer from the piston getting blocked. If the cylinder is not cleared after each deployment it will not fire. To do this all of the core holders need to be removed from the corer and the corer then needs to be operated on the deck. This issue will need to be addressed for the future. One suggestion is to perhaps have a bleed nipple put into the cylinder. Care needs to be taken when fitting and removing the core tubes from there holders as the holders have a retaining wire which could cause injury. I suggest we have new ones made with the end of the wire folded over to help prevent injury.

# 15. APPENDIX

## 15.1 Multibeam and Topas

### 15.1.1 EM122 Acquisition and Processing

The initial set-up of the system is the same as outlined in the document 'Using the EM122 Multibeam on an Opportunistic Basis v3.3' provided on the JCR. The performance of the Kongsberg Seafloor Information System (SIS) and Helmsman software is summarised in Table 15.1.1.

**Table 15.1.1: Problems encountered with EM122 acquisition software.**

| Date (UTC) | Issue | Resolution | Observer |
|---|---|---|---|
| 23/11/2017 16:44 | BIST Test Failure | Was a receiver failure. The sea state was high. Turned the machine on and off and waited until seas were calmer rectified this. | Floyd/ Katrien |
| 23/11/2017 23:55 | EM122 not being triggered by KSYNC | EM122 was unable to detect bottom due to rough sea state. Waited until the seas calmed down and used the EA600 depth reading to force bottom detection resulted in EM122 being triggered by KSYNC. | Floyd/ Katrien |
| 27/11/2017 10:56 | TOPAS interference in multibeam data | Forgot that TOPAS was set to internal trigger (Figure A-1a). Turned off TOPAS pinging. Ensured that TOPAS was set to external trigger through KSYNC whenever it was acquiring data in conjunction with EM122 | Floyd/ Katrien |
| Occurred two or three times. Didn't effect logging. | Helmsman crash when adding too many background TIF images to helmsman. | Restarting Helmsman and ensuring that each background image was added and removed one-by-one. | Floyd |
| Ongoing within areas with sea ice/icebergs. | Losing bottom/getting large noise to sound ratio in the seabed image (backscatter window – at irregular intervals) (Figure A-1b) | No resolution. Noise appeared random and restricted to locations where there was visible pack or fast ice. It was suspected that the suspect might be ice scraping the outside of the vessel. | Floyd |
| 7/12/2017 00:38 | Cron job syncing the EM122 and the ship backup stopped working. | Line JR17001_c 0054 only logged partially. Restarted the EM122 computer and transducers and contacted the IT Engineer. | Floyd |
| 7/12/2017 12:21 | EA600 failure – offline for the rest of the cruise. KSYNC no longer triggering the EM122. | Set EM122 to internal trigger. No solution for getting KSYNC to trigger EM122 due to inexperience setting up KSYNC. All logging of EM122 data was done in internal trigger mode from this point. | Floyd |

During JR17001 the EM122 was run in in parallel with the EA600 12 kHz singlebeam echosounder (which was run in passive mode) and at times the VMADCP and TOPAS with all devices' ping rates being externally triggered and calculated by the Kongsberg Synchronisation Unit (K-Sync). When running VMADCP+EA600+EM122 concurrently the *Opportunisitic Swath + bio* KSYNC configuration setup was used. When TOPAS+EM122+EA600 were run concurrently the *Swath + Topas (<1000m)* KSYNC configuration was used. No EA600 and VMADCP interference was observed in the EM122 data. TOPAS interference was noticed in data when TOPAS was set on internal trigger mode. This was rectified by setting the TOPAS trigger to be the external trigger mode. Several sound velocity profiles (SVPs) were applied within SIS over the course of JR17001 to calibrate the EM122 data during acquisition (see Table 15.1.2). Multibeam acquisition coverage in the two fjords surveyed during this campaign is shown in Figure 15.1.1 and Figure 15.1.2.

Surveying conditions in in the West Antarctic Peninsula coastal fjord system are challenging. Limited hydrographic or scientific mapping had been conducted inside the fjords, where water depths decrease suddenly and where icebergs block the vessel's track. The JCR therefore had to manoeuvre in tight turns at times to remain within previous swath coverage and to ensure the safety of the vessel. Whilst this method ensured overlap of the outer beams it also meant that there was frequent turning, which in areas had occasional adverse impact on data quality and bottom detection, resulting in small holes in the final coverage. Additionally, fjords with actively calving glaciers are characterised by highly variable water properties, and thus sound velocity profiles through the water column. This, and the reduced quality of outer beams during turns, contributed to the vertical offset of overlapping data, generating artefacts in final gridded products, see Figure 15.1.1.c.

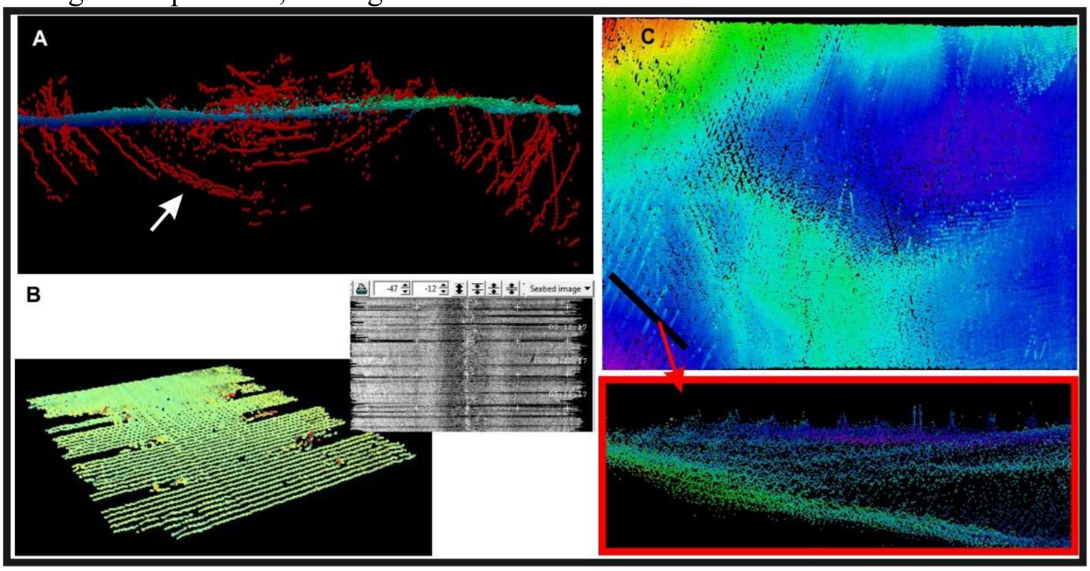


**Figure 15.1.1.: Examples of EM122 swath bathymetry data showing sources of error or poor quality. (A) Profile of soundings with interference from TOPAS pinging with an internal triggering mode. (B) Plan views of backscatter and bathymetry illustrating loss of bottom detection and high signal to noise ratio whilst surveying through ice. (C) Plan view (top) and profile (bottom) of the soundings with artefacts caused by the overlap of swath bathymetry data of different quality, due to the vessel turning, inappropriate svp correction and poor data quality in the outer beams.**

Raw multibeam data was processed in a two-step process depending on its final purpose. Raw multibeam data was initially processed and cleaned using MB System v5.4.2202 so that it could be integrated into the UK Polar Data Centre's existing processed multibeam data holdings of the British

Antarctic Survey. Data within the target fjords of the ICEBERGS program were further cleaned and processed using Fledermaus v7.7.6 3D editor to produce final accepted xyz sounding clouds.

**Table 15.1.2: Summary of the sound velocity profiles used on JR17001 to calibrate the EM122 bathymetry data.**

| Date-Time Applied (UTC) | SVP Source | Comment |
|---|---|---|
| 24/11/2017 00:37 | XBT – T5 | T5_002_thinned.asvp from JR284 was applied as the initial transit svp to correct the data as the seas were too rough to deploy an XBT on transit to King George Island. This XBT was taken off Anvers Island on 24 December 2013 and was chosen as a more appropriate svp than the last svp used by SIS on the JCR (which was taken off Ascension Island near the equator). |
| 24/11/2017 08:48 | XBT – T7 | T7_00002_thinned.asvp applied from XBT2. |
| 27/11/2017 10:16 | XBT – T7 | T7_00003_thinned.asvp applied from XBT3. |
| 30/11/2017 21:46 | CTD | JR17001_013_thinned.asvp applied from CTD13. |
| 03/12/2017 11:38 | CTD | JR17001_018_thinned.asvp applied from CTD18. |
| 06/12/2017 12:42 | XBT – T7 | T7_00004_thinned.asvp applied from XBT4. |
| 9/12/2017 17:47 | XBT – T7 | T7_00005_thinned.asvp applied from XBT5. |
| 10/12/2017 20:59 | CTD | JR17001_021_thinned.asvp applied from CTD21. |
| 12/12/2017 19:21 | CTD | JR17001_021_thinned.asvp applied from CTD21. |
| 13/12/2017 16:21 | CTD | JR17001_018_thinned.asvp applied from CTD18. |

## Mb-system data processing

Raw data were automatically written to the data drive (D:/sisdata/raw/'survey name') on the em122 acquisition machine and then a cron job running every 10 minutes copied the data to the path:
/data/cruise/jcr/current/em122/raw/'survey name'
where current is a symbolic link to the leg id 20171119 (the date the cruise leg started – 20171119 (YYYMMDD))
Data were processed with MB System v5.4.2202 installed on the Linux virtual server JRLC (full server name is jrlc.jcr.nerc-bas.ac.uk) following the same general procedures detailed in the JR93, JR134, JR168, JR206 and JR259 cruise reports. Mb-system can be setup by typing the following commands into a Linux command line terminal:
*setup mb*
*setup gmt*
GMT (version 5.1.1) is needed for several of the MB System subroutines and is worth setting up at the same time. Type, 'man mbsystem' for an overview of MB.

Copying the data and producing auxiliary files
The perl script mbcopy_em122 was used to copy raw EM122 data into MB system format and produce auxiliary files. To run the script type,
*setup gsd*

*mbcopy_em122*
from a Linux command line terminal. The program asks several questions regarding the raw data location, the desired location of the copied data and whether the operator wants all the lines copied (type 'n' if you are actively acquiring data and the script will not copy the last hour file as it will not be complete). Note that the script will check for lines already copied and will ignore these. You can force the script to start at a predetermined line number if you do not want the earlier line numbers copied. The script automatically creates a text file of all the raw data copied (named raw_datalist) and creates auxiliary files which help MB speed up functions such as gridding.

<u>Cleaning the data</u>
Mb-system data cleaning was done manually using both the mbedit and mbeditviz graphical interface. These allow the operator to manually flag data in either a ping-by-ping view, waterfall view where n number of pings can be viewed together (mbedit) or as a 3D point cloud (mbeditviz). Generally editing was completed line by line using the 3D mbeditviz to investigate the sounding cloud in 3D dimensional space to flag erroneous depth values.
Cleaning the data creates two additional files, a .esf file which holds the flagging information and a .par file which contains a whole variety of edits including cleaning and navigation fixes. Navigation data was not a problem during JR17001 so did not need fixing.

<u>Processing the data</u>
The command mbprocess takes information from the .par file and processes the .mb59 data to produce a final output file. If the input file is called "data.all.mb59", the processed file becomes "data.allp.mb59". mbprocess also creates additional auxillary files (.inf, .fnv, .fbt). The command takes and options used were:
mbprocess –Iraw_datalist –F-1 -V
A text file (proc_datalist) containing the names of all the processed data was created by typing the following command into a Linux command line terminal opened in the processing data directory.
ls *p.mb59 | awk '{print $1" 59"}' > proc_datalist

**Table 15.1.3: A summary of the mb-system functions used to process the bathymetry and the file types they output.**

| Input | Function | Output |
|---|---|---|
| Data.all.raw | mbcopy | Data.all.raw.mb59 |
| Data.all.raw.mb59 | mbdatalist | Data.all.raw.mb59.inf |
| | | Data.all.raw.mb59.fbt |
| | | Data.all.raw.mb59.fnv |
| **Note : The above two functions are combined in the script em122_mbcopy** | | |
| Data.all.raw.mb57 | mbedit/mbeditviz | Data.all.raw.mb59.esf |
| | | Data.all.raw.mb59.par |
| Data.all.raw.mb59 | mbnavedit | Data.all.raw.mb59.nve |
| | | Data.all.raw.mb59.par (modified) |
| Data.all.raw.mb59 | mbprocess | Data.allp.raw.mb59 |
| | | Data.allp.raw.mb59.inf |
| | | Data.allp.raw.mb59.fbt |
| | | Data.allp.raw.mb59.fnv |

Gridding the data

Data was gridded using the mbgird command. Data were output directly to ArcGIS ascii grids as ArcGIS was the primary software tool used to view the grids. The command and options used on JR17001 were:

*mbgrid -Iproc_datalist*
*-O'grid filename' (naming scheme – 'surveyname_resolution' e.g. jr17001_a_5m. A suffix is automatically added)*
*-E5/5/meters! (specifies grid resolution and units, 5x5 meters in this case)*
*-G4 (specifies an ArcGIS ascii grid output)*
*-A2 (Produces a grid with bathymetry as negative values)*
*-F1 (type of filter used; 1=gaussian weighting, 5=sonar footprint)*
*-C5 (spline interpolation into data free areas, grid resolution x 5 in this case*
*-M (produces two further grids; one giving the number of beams within each grid cell and the other giving the standard deviation of those beams in each grid cell)*
*-JU (specifies that the output grid will be projected in the appropriate UTM projection – as determined by the midpoint of the dataset's longitude and latitude bounds).*

Fledermaus data processing

The seabed bathymetry data served to inform sampling strategy during the survey, and will be analysed to achieve some of the key research objectives of the ICEBERGS program. One key outcome from swath bathymetry surveying is to quantify the seabed physical properties that support a benthic ecosystem. Values of water depth and the roughness of the bed (expressed in values of rugosity), will characterise each sampling site. Additionally, we will investigate the changes in seabed morphology over time at each fjord. Both types of analyses requires accurate, high-resolution (ideally ≤ 5m) bathymetry outputs. Data artefacts were caused by the style of surveying in unchartered glacial fjords as explained above, and noise levels in the data were high due to the fact that the EM122 multibeam system is a deep ocean optimised system operating at the shallow range of its capability. In order to produce the accurate outputs required, a thorough and manual QA/QC of the sounding cloud was conducted by an experienced geomorphologist/geologist to remove any remaining artefacts and noise from the data whilst ensuring subtle seabed features of interest weren't accidently erased. The program Fledermaus v7.7.6 was used for this time intensive data inspection as it allows for the rapid visualisation and manipulation of large amounts of 3D data from multiple perspectives more rapidly than mb-system. The mb-system processing is otherwise of sufficient quality for integrating into the UK Polar Data Centre's multibeam archives.

Processed mb-system fast bathymetry (p.fbt) files within the fjords, produced from the previous processing steps, were imported into Fledermaus using the *Add Ungridded Data* wizard (p. 107, Fledermaus, 2014) accepting all default options. These ungridded files were then used to build a PFM (pure file magic) sounding clouds using the *Build PFM* wizard (p. 120, Fledermaus, 2014). The output coordinate system of the PFM was the projected UTM zone that the data was collected in (21S for Marian Bay, 20 S for Börgen Bay) and the bin size set to 5m, for all other options the default setting was used.

Fledermaus 3DEditor's slice based editing functionality (p. 56-57, Fledermaus, 2014) was then used to manually inspect, flag and reject noisy soundings. This was completed with reference to the EM122 event log and on a slice by slice basis from multiple perspectives to determine whether features were real, noise or artefacts from overlapping data. Figure 15.1.2 shows a representative example of clean and flagged sounding clouds within the 3D editor. This subset of the data shows the seabed of Börgen Bay with the grounding zone of William Glacier clearly visible as a vertical wall of ice.

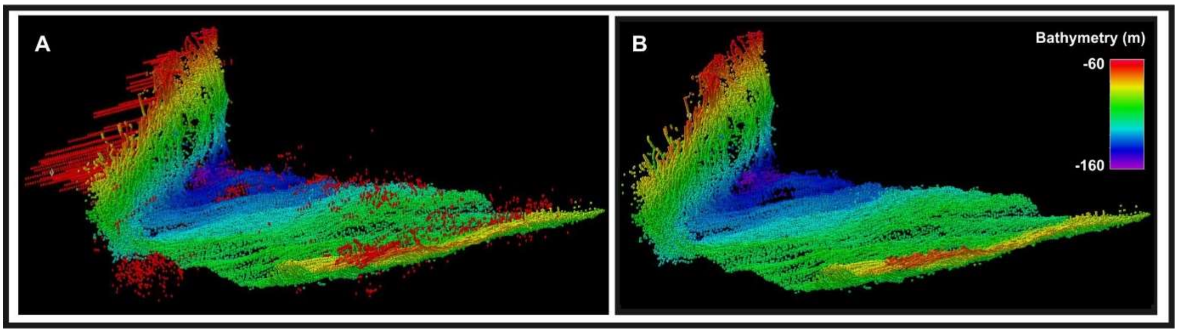


**Figure 15.1.2: The display in Fledermaus 3DEditor of a subset of the bathymetry data (A) showing the uninspected sounding cloud with rejected noisy soundings (shown as red diamond) and (B) showing a cleaned sounding cloud used for the final xyz grid.**

Final accepted soundings were exported as xyz .csv files using the *Export Sounding* tool ensuring to select the *unproject soundings* option. XYZ files were gridded into a surface in Fledermaus by importing the clean soundings with the *Add Ungridded Data* wizard and then gridded using the *Data Gridding* wizard (p. 114-120, Fledermaus, 2014). Gridding parameters were as follows:

- Output Horizontal Coordinate System = FP_WGS_84_UTM_zone_21S (Marian Cove), FP_WGS_84_UTM_zone_20S (Börgen Bay
- Gridding Type = Weighted Moving Average;
- Weight Diameter = 3;
- Cell Size = 5m;
- All other options set to default.

Gridded surfaces were exported as Arcview ascii grids using the *Export Surface* wizard (p 133-134, Fledermaus, 2014) with all default options accepted.

### *15.1.2 EM122 event log*

**Table 15.1.4: Event log for the EM122. Event log indicates any processing issues and processing parameters selected at the time of data acquisition.**

| Time | Latitude | Longitude | Windspeed (m/s) | Comment |
|---|---|---|---|---|
| **15/12/2017 06:01** | -61.0492 | -54.592 | 14.43 | Stopped logging on line 0059. At start of sr1b |
| **15/12/2017 00:40** | -61.1515 | -56.4721 | 16.42 | Changed Salinity to 34.17 from ocean logger. |
| **14/12/2017 16:37** | -61.504 | -59.1971 | 25.77 | Sea state really rough. Beaufort 7. |
| **14/12/2017 10:36** | -61.4659 | -61.1193 | 12.53 | Sea state and ship speed has resulted in pretty noisy data/lost beams. 35/35 is the max angle. |
| **13/12/2017 22:43** | -62.7013 | -64.5647 | 15.39 | Sea state quite rough brought in beam angle to 45. |
| **13/12/2017 19:49** | -63.1064 | -65.3536 | 4.39 | Started logging again. On transit to second glider recovery. Logging to jr17001_d 0025. |
| **13/12/2017 19:38** | -63.1064 | -65.3536 | 4.39 | On station recovering glider. Stopped logging. Had been on station logging for approximately 30 minutes. |
| **13/12/2017 16:21** | -63.5571 | -65.8883 | 14.68 | Applied CTD_018_thinned asvp as we were nearing Glider recovery site. |
| **12/12/2017 20:45** | -66.8794 | -69.9984 | 4.13 | Data definitely logging - gridded and checked. Just not gridding on the fly in SIS. Updated Ping mode to auto. |
| **12/12/2017 19:21** | -67.1642 | -70.1448 | 3.94 | Applied thinned extended svp profile from CTD 24 (jr17001_024_thinned.asvp). Changed salinity to 33.75 as the ocean logger recorded it. On the fly gridding doesn't appear to be working. Perhaps an inappropriate cell size was chosen. |
| **12/12/2017 19:01** | -67.2312 | -70.1824 | 5.18 | jr17001_d survey - SOL 0000 |
| **11/12/2017 03:39** | -66.3105 | -71.3261 | 8.26 | Spike filter to strong |
| **11/12/2017 02:10** | -66.3913 | -70.9222 | 4.02 | Started logging overnight. Heading to the shelf break to swath the Thalweg of Marguerite Trench from shelf break to the ice edge. |
| **10/12/2017 20:58** | -66.9323 | -71.0365 | 7.08 | Applied CTD021 SVP to the em122. Not currently logging. This was JR17001_021_thinned.asvp file. This was the CTD taken at the deepest part of the trench at site MT3. |
| **10/12/2017 10:27** | -66.6512 | -69.9031 | 8.92 | Stopped logging on line 0123. At north CTD station. |

| Time | Latitude | Longitude | Windspeed (m/s) | Comment |
|---|---|---|---|---|
| **10/12/2017 00:17** | -66.6499 | -69.9121 | 13.95 | End CTD transect bathymetry line for Marguerite Trough (Finished on line 012). |
| **09/12/2017 23:54** | -66.6912 | -70.0166 | 14.93 | Spike filter to MEDIUM |
| **09/12/2017 22:20** | -66.8083 | -70.5643 | 15.51 | Sea is calmer. Penetration and spike filter to weak. |
| **09/12/2017 21:07** | -66.9101 | -70.9768 | 15.91 | Line 0109 for jr17001_c is start of opportunistic CTD swath. |
| **09/12/2017 17:47** | -67.2083 | -71.4614 | 11.95 | SVP T7_00005_thinned applied |
| **09/12/2017 03:50** | -67.1117 | -71.1563 | 14.2 | Changed back to medium ping mode. Sea state high. Data really noisy. |
| **09/12/2017 03:33** | -67.1117 | -71.1563 | 14.2 | Changed ping mode to deep. Results in coarser, rougher data but given the sea state - helps SIS track the bottom. Bottom had been patchy before this point, travelling with the wind. |
| **09/12/2017 03:33** | -67.1117 | -71.1563 | 14.2 | Changed ping mode to deep. Results in coarser, rougher data but given the sea state - helps SIS track the bottom. Bottom had been patchy before this point, travelling with the wind. |
| **09/12/2017 01:31** | -67.2607 | -71.2797 | 21.88 | Changed ping mode from auto to medium for bcksct. Note that the auto mode had selected medium previous to this change. Beam angle set to 50 m as the wind is picking up and the sea state is quite rough. It appears that port beams are more noisy than starboard. |
| **09/12/2017 00:16** | -67.3987 | -71.245 | 24.76 | Started logging on line 0080 of jr17001_c. Sea state around 5. Ping and coverage mode set to auto. Spike filter = strong Range and Phase = Normal Penetration = Medium |
| **07/12/2017 22:29** | -67.3143 | -71.2676 | 2.85 | Stopped logging. Entered sea ice. Tried narrowing beams to 5 deg port starboard to use em122 similar to ea600. However the noise on the hull meant bottom couldn't be found still. |
| **07/12/2017 20:20** | -66.9262 | -70.9297 | 0.67 | Started logging line 0077. Heading to ice edge and Rothera. |
| **07/12/2017 12:38** | -66.8994 | -70.8933 | 2.91 | Restarted KSYNC and set trigger to external. Still no response/triggering of em122. Might be caused by the EA600 playing up. Set EM122 to internal trigger to give depths for trawling. |
| **07/12/2017 12:29** | -66.8999 | -70.8942 | 4.07 | Restarting KSync Computer to try get it triggering EM122 |

| Time | Latitude | Longitude | Windspeed (m/s) | Comment |
|---|---|---|---|---|
| **07/12/2017 12:21** | -66.8999 | -70.8942 | 3.86 | Successfully ran BIST tests. EA600 not working. EM122 not being recognised by KSYNC so pinging in internal trigger mode. |
| **07/12/2017 11:56** | -66.8999 | -70.8943 | 4.5 | Restarting EM122 computer/SIS as CRON job has stopped syncing data from this computer to the SCS |
| **07/12/2017 11:49** | -66.9005 | -70.8918 | 5.82 | Stopped logging on line 0076 of jr1700c. Starting trawling. |
| **07/12/2017 09:47** | -66.9485 | -71.3438 | 4.37 | SOL 0074: to fill in previously left data gap (due to iceberg) as normal progress on lines is currently restricted due to presence of icebergs. |
| **07/12/2017 09:22** | -67.0025 | -71.3335 | 9.84 | Filling in gap where iceberg was previously. SOL 072 |
| **07/12/2017 08:31** | -67.0685 | -71.0696 | 4.03 | PU status (the left dot of the three dots in top bar) temporarily turned from green to red during turn. |
| **07/12/2017 06:05** | -66.923 | -71.4498 | 2.39 | PU status (the left dot of the three dots in top bar) temporarily turned from green to red. |
| **07/12/2017 00:38** | -66.8494 | -70.989 | 6.93 | Turned off topas and increased ship's speed to 10 kn to opportunistically swath overnight. Topas noise stopped on line 0054. |
| **06/12/2017 15:57** | -67.1603 | -70.8455 | 5.45 | Changed penetration filter to medium. |
| **06/12/2017 14:53** | -67.106 | -70.7206 | 5.1 | SOL 0039 - going at about 4 knots to allow for an optimised Topas line (line 008). |
| **06/12/2017 13:44** | -67.1939 | -70.8998 | 5.22 | Power of Topas increased |
| **06/12/2017 13:31** | -67.2054 | -70.9594 | 0.81 | Spike filter strength set from medium to strong |
| **06/12/2017 13:25** | -67.1993 | -70.9816 | 1.4 | Started pinging topas. Noticed more noise in centre beams. Set spike filter to medium to try compensate. |
| **06/12/2017 12:51** | -67.2032 | -71.096 | 4.43 | Em122 logged no data as we changed KSYNC to topas + em122 mode and em122 was turned off. |
| **06/12/2017 12:42** | -67.2105 | -71.1054 | 6.32 | Started logging logging on line 0033 of jr17001_c. Applied svp xbt_04_thinned asvp. Salinity 33.8 based on last time ocean logger was running. It has been off for a while due to sea ice. Spike filter = weak Range = Normal Phase ramp = normal Penetration = weak |

| Time | Latitude | Longitude | Windspeed (m/s) | Comment |
|---|---|---|---|---|
| **04/12/2017 07:57** | -67.24235 | -71.20382 | 0.41 | EOL 032 - data of insufficient quality as we are going through loose ice. |
| **03/12/2017 18:38** | -61.53912 | -64.09881 | 2.39 | Since the multibeam has been switched back on, ice has been scratching the sides of the ship causing frequent but easily cleanable noise. SVP is slightly frowning and needs an updated SVP. However time constraints means that there was no time for an XBT given other priorities. Post-process SVP if accurate data from this part of the transit is required. |
| **03/12/2017 11:38** | -64.48927 | -67.58518 | 10.67 | Applied CTD_018_thinned svp and logging on line 12 of jr17001_c. Changed salinity to 33.7 as this was what the oceanlogger had as the value. Ping & Cov. mode = auto Spike = normal Range = normal Phase = normal Penetration = Medium |
| **01/12/2017 11:11** | -61.36679 | -63.5331 | 13.85 | EOL 011. Vessel stationary |
| **01/12/2017 06:49** | -61.53912 | -64.09881 | 2.39 | Start logging again |
| **01/12/2017 06:49** | -61.53912 | -64.09881 | 2.39 | Logging turned off. Transiting to next site. No note of when logging stopped. |
| **01/12/2017 04:56** | -61.59998 | -64.2998 | 15.8 | EOL - stopped logging: CTD 015 / GL3 |
| **01/12/2017 04:56** | -61.59998 | -64.2998 | 15.8 | Logging off. At CTD015, GL3 site. |
| **01/12/2017 03:24** | -61.60004 | -64.69985 | 14.43 | Start logging again |
| **01/12/2017 03:24** | -61.60004 | -64.69985 | 14.43 | Logging on. |
| **01/12/2017 02:24** | -61.60006 | -64.69983 | 12.2 | EOL, stopped logging: CTD014 / GL2 |
| **01/12/2017 02:24** | -61.60006 | -64.69983 | 12.2 | Logging off. At CTD014, GL2 site. |
| **30/11/2017 22:20** | -61.69997 | -64.29924 | 12.97 | Changed to very deep ping mode to try get a stronger bottom detection in rough sea state. |
| **30/11/2017 21:50** | -61.69983 | -64.19214 | 11.1 | Penetration filter set to strong. As centre beams quite spikey |

| Time | Latitude | Longitude | Windspeed (m/s) | Comment |
|---|---|---|---|---|
| **30/11/2017 21:46** | -61.6999 | -64.18099 | 11.78 | Started logging on jr1700c. Line 0000 during transit around glider array in the drake's passage. Sea state is quite high so max angle is 50. Applied CTD_013_thinned svp for sound speed correction. Spike filter = strong Range gate = large Phase ramp = normal Penetration = medium. Coverage and ping mode set to auto. |
| **29/11/2017 03:35** | -64.78604 | -63.53019 | 15.53 | Stopped logging on line 014 of jr17001_v. Too windy. End of BB. |
| **29/11/2017 03:23** | -64.74905 | -63.49199 | 21 | Spike filter to normal |
| **29/11/2017 03:20** | -64.74164 | -63.49978 | 14.81 | Lost bottom as we turned across wind. |
| **29/11/2017 02:53** | -64.74212 | -63.4879 | 16.67 | Wind picked up. Data quite noisy |
| **29/11/2017 02:32** | -64.71135 | -63.46197 | 2.8 | Started logging line 0012 of jr17001_b. Wind has died down but still a little choppy. |
| **28/11/2017 23:34** | -64.74516 | -63.45425 | 17.98 | Stopped logging line 11. Wind too strong for surveying. |
| **28/11/2017 23:27** | -64.74165 | -63.42774 | 30.46 | Lost bottom again. Now surveying with rather than across the wind. |
| **28/11/2017 23:23** | -64.73561 | -63.42701 | 15.92 | Lost depth. wind gusting at 50 kn. |
| **28/11/2017 23:10** | -64.72578 | -63.45417 | 2.73 | Logging on line 0011 |
| **28/11/2017 22:37** | -64.73009 | -63.45814 | 7.49 | Stopped logging line 10. At bb2. |
| **28/11/2017 21:49** | -64.75405 | -63.47163 | 12.93 | Data noisy. Turned off adcp. Still losing bottom occasionally. |
| **28/11/2017 21:31** | -64.75066 | -63.48998 | 15.52 | Going through pack ice occasionally. Loosing bottom/noise. |
| **28/11/2017 20:42** | -64.74309 | -63.45268 | 2.01 | Started logging line 009. Settings same as earlier. |
| **27/11/2017 18:20** | -64.73871 | -63.44608 | 2.02 | Stop logging line 008. CTD @ BB5 |
| **27/11/2017 17:51** | -64.72588 | -63.45146 | 0.22 | Start logging line008. |
| **27/11/2017 17:13** | -64.72612 | -63.45261 | 0.74 | Stopped logging line 008 @ ctd BB2 |
| **27/11/2017 16:59** | -64.73479 | -63.43394 | 2.34 | Bottom occasionally drops. I believe that it is caused by the ship moving through pack ice patches. |
| **27/11/2017 16:43** | -64.71884 | -63.45632 | 2.67 | Started logging line 0007. |

| Time | Latitude | Longitude | Windspeed (m/s) | Comment |
|---|---|---|---|---|
| **27/11/2017 16:03** | -64.71813 | -63.45827 | 0.64 | stopped logging at bb03 |
| **27/11/2017 15:28** | -64.71662 | -63.44684 | 4.6 | Spike filter to weak. |
| **27/11/2017 15:23** | -64.71109 | -63.45447 | 0.71 | started logging line 0006 transit to BB site 3 |
| **27/11/2017 15:03** | -64.71102 | -63.45466 | 0.42 | EOL L005 - Katrien mistakenly thought we were moving onto the next station. |
| **27/11/2017 15:02** | -64.71103 | -63.4547 | 0.15 | SOL 005 |
| **27/11/2017 14:04** | -64.72549 | -63.46165 | 4.8 | Stopped logging line 004. At CTD 04 |
| **27/11/2017 13:49** | -64.71084 | -63.48202 | 1.84 | Spike filter = off as we're imaging grounding line. |
| **27/11/2017 13:39** | -64.70386 | -63.45256 | 0.38 | SOL 004 |
| **27/11/2017 13:02** | -64.70376 | -63.45288 | 4.04 | EOL L003, data too noisy now. Arriving at revised station 5. |
| **27/11/2017 12:45** | -64.70576 | -63.47095 | 2.07 | Started a new line less than an hour so we can grid data to assist sampling. |
| **27/11/2017 10:56** | -64.75421 | -63.47622 | 6.63 | Turned topas on with internal trigger. Lots of noise for 2 minutes. changed topas to external trigger |
| **27/11/2017 10:43** | -64.77845 | -63.49377 | 3.26 | Applied xbt3 and changed salinity to 33.8 to match ocean logger. |
| **27/11/2017 10:23** | -64.77632 | -63.42607 | 5.29 | Penetration filter to normal |
| **27/11/2017 10:16** | -64.77504 | -63.38426 | 5.77 | Started line 0000 of jr17001_b. Ping mode = shallow. Filter = weak Range = normal Phase = normal Penetration = Off |
| **27/11/2017 07:55** | -64.54194 | -62.49629 | 10.61 | EOL 0024 as ADCP data is collected for Yvonne and both systems are interfering. |
| **27/11/2017 07:22** | -64.48699 | -62.27539 | 11.75 | SOL 0024 |
| **26/11/2017 22:03** | -63.14199 | -60.27609 | 25.95 | Stopped logging on line 0023 as the sea state was too high to find bottom. |
| **26/11/2017 21:45** | -63.10446 | -60.22026 | 26.09 | Changed ping mode to deep as very noisy/heavy sea state. |
| **26/11/2017 19:39** | -62.86723 | -59.74788 | 26.98 | Data really noisy and losing bottom due to high speed and sea state. |

| Time | Latitude | Longitude | Windspeed (m/s) | Comment |
| --- | --- | --- | --- | --- |
| **26/11/2017 17:55** | -62.6492 | -59.28088 | 27.8 | Spike filter to strong. Heavier seas and travelling at 11-12 knots data quite noisy. |
| **26/11/2017 15:40** | -62.33053 | -58.7151 | 17.16 | Switched back to auto mode since we found the bottom. |
| **26/11/2017 15:33** | -62.32031 | -58.71345 | 14.73 | Turned into the swell. Lost bottom. Switchged ping mode to deep to assist bottom detection. |
| **26/11/2017 15:20** | -62.29016 | -58.73393 | 16.25 | spike filter to medium as leaving the swath unattended. |
| **26/11/2017 15:07** | -62.25262 | -58.78592 | 12.27 | Started logging line jr17001_a 017. Transit to Maxwell bay. Coverage and pin = auto Spike filter = weak Range Gate = normal phase ramp = normal penetration filter = weak |
| **24/11/2017 16:20** | -62.20358 | -58.73103 | 6.38 | Stopped pinging (weren't logging) for sucs deployment. ea600 in active mode. |
| **24/11/2017 15:35** | -62.2156 | -58.79032 | 2.5 | EOL 0016 |
| **24/11/2017 15:29** | -62.21758 | -58.78916 | 11.65 | SOL 0016, towards open end of fjord and ready for a Topaz line |
| **24/11/2017 14:48** | -62.21999 | -58.7879 | 11.71 | EOL 0015, towards MC1 |
| **24/11/2017 14:13** | -62.21272 | -58.76895 | 14.29 | SOL 0015, towards MC1 |
| **24/11/2017 13:29** | -62.21802 | -58.7853 | 5.49 | EOL 0014, on way to MC2 |
| **24/11/2017 12:58** | -62.20812 | -58.74828 | 14.94 | SOL 0014 towards MC2 |
| **24/11/2017 12:15** | -62.20904 | -58.76049 | 10.67 | Stop logging line 013. Steaming to mc003 |
| **24/11/2017 11:44** | -62.20579 | -58.74039 | 11.76 | line 013 from mc004 to mc003 |
| **24/11/2017 11:01** | -62.2059 | -58.73979 | 12.21 | End of line 012 @ mc004. |
| **24/11/2017 10:28** | -62.20583 | -58.73988 | 9.84 | Line 012. Mapping loop from mc002 to mc002 while ctd chows down on breakfast. |
| **24/11/2017 10:05** | -62.20598 | -58.73726 | 0.42 | Endo of line 11. on mc004 |
| **24/11/2017 09:55** | -62.20376 | -58.73162 | 8.58 | Start of line 11 from mc005 to mc004. |
| **24/11/2017 09:26** | 73.68 | 75.22 | 0.561935 | EOL 10, on station, pinging still, not logging. Casing changed (Sync Unit): from swath+topaz mode to physics mode |

| Time | Latitude | Longitude | Windspeed (m/s) | Comment |
|---|---|---|---|---|
| **24/11/2017 09:18** | -62.2051 | -58.73046 | 3.4 | start of new line 10 before turn, spike filter set to MEDIUM 30 sec later |
| **24/11/2017 08:55** | -62.21808 | -58.79579 | 8.22 | Spike filter set to WEAK and penetration filter OFF |
| **24/11/2017 08:54** | -62.21792 | -58.7942 | 7.2 | SOL L09 |
| **24/11/2017 08:48** | -62.21968 | -58.82342 | 5.67 | applied T7_00002_thinned.asvp |
| **24/11/2017 07:39** | -62.26658 | -58.77884 | 9.47 | spike filter to medium |
| **24/11/2017 06:22** | -62.26874 | -58.33583 | 6.82 | Spike filter set to weak as we're in shallow water. Hopefully this won't be too noisy and allow more features to be detected/not smoothed out. |
| **24/11/2017 04:08** | -62.07739 | -57.33163 | 10.79 | Updated filters to be normal spike gate and weak penetration filter as previous filter change didn't help. Seems to be running smoother. Coverage and ping mode set to auto still and spacing hd-equidistant. |
| **24/11/2017 03:54** | -62.0574 | -57.22804 | 9.77 | Set spike filter to strong as the centre beams kept penetrating |
| **24/11/2017 03:27** | -62.01783 | -57.02064 | 13.62 | Started logging on em122 again but with external trigger. Forced the bottom and k-ync eventually began behaving. Asked master to turn ea600 onto passive. |
| **24/11/2017 02:25** | -61.58542 | -57.03466 | 7.99 | Restarted em122. Ksync logging not working with topas. em122 and ea600 had a lot of noise interference and we didn't realise that this was the case until late. |
| **24/11/2017 01:49** | -61.6736 | -57.02175 | 9.14 | Stop pingging and swathing on line two. Noticed that the Topas was interfeering with the ea600 and em122 in internal trigger mode. Testing topas settings. EA600 in active. |
| **24/11/2017 01:37** | -61.62847 | -57.0275 | 8 | Changed ping mode to shallow as depth was struggling. |
| **24/11/2017 00:37** | -61.41292 | -57.05808 | 10.21 | SOL start logging line 0000 on JR17001_a. SVP used: JR284_002_thinned.asvp. Runtime parameters: HD EQDST ; Max angles: changed after few minutes from 40 to 60 degrees. Ping mode: auto External trigger UNCHECKED |

| Time | Latitude | Longitude | Windspeed (m/s) | Comment |
|---|---|---|---|---|
| **23/11/2017 23:59** | -61.2761 | -57.0779 | 9.72 | Floyd is re-staring the K-Sync PC to try solve the external trigger issue. |
| **23/11/2017 23:55** | -61.25946 | -57.08 | 9.5 | Floyd ran the BIST tests again as the EM122 as the external trigger isn't working. BIST tests are fine. |
| **23/11/2017 22:25** | -60.93257 | -57.12458 | 13.42 | Floyd Re-ran BIST test - all successful. Saved as "BIST test JR17001_23112017_2" |
| **23/11/2017 16:44** | -59.74008 | -57.37984 | 17.98 | Floyd reran BIST tests. High sea state; tests 6, 7 8 and 9 failed. Consulted Johnny. Likely to the high sea state. |
| **17/11/2017 17:17** | | | | Johnny (IT Engineer) ran BIST tests whilst at port in Stanley. All fine. |

### *15.1.3: TOPAS event log*

**Table 15.1.5: Event log for the TOPAS. Event log indicates any processing issues and processing parameters selected at the time of data acquisition.**

| Time | Depth (em122) | Latitude | Longitude | Comment |
|---|---|---|---|---|
| 07/12/2017 00:34 | 494.12 | -66.8519 | -70.9805 | Stopped logging Topas (line15). Ship increasing speed to 10 kn to opportunistically fill in swath coverage overnight. |
| 06/12/2017 22:17 | 492.83 | -66.9725 | -70.6742 | SOL line 15 |
| 06/12/2017 21:50 | 497.04 | -66.9953 | -70.7371 | SOL 14: short line NE to approach upcoming longer line SW. |
| 06/12/2017 19:55 | 498.6 | -66.8831 | -71.0315 | Topas Line 013 parallel to line 12 and not including turn. |
| 06/12/2017 19:36 | 489.08 | -66.8712 | -70.9917 | EOL 12. Turning. |
| 06/12/2017 19:17 | 515.76 | -66.8933 | -70.9525 | delay offset = 600 ms tracelength = 200 ms |
| 06/12/2017 18:34 | 509.6 | -66.941 | -70.8506 | delay offset = 650 ms |
| 06/12/2017 17:42 | 490.14 | -66.9888 | -70.7034 | Started line 012 over deep feature on shelf. |
| 06/12/2017 17:31 | 483.69 | -66.9964 | -70.7448 | SOL 011: start of turn |
| 06/12/2017 17:11 | 482 | -67.0147 | -70.8502 | SOL 10 |

| Time | Depth (em122) | Latitude | Longitude | Comment |
|---|---|---|---|---|
| 06/12/2017 16:28 | 477.09 | -67.105 | -70.8647 | Bottom tracker threshold lowered from 50% to 30% |
| 06/12/2017 16:08 | 470.22 | -67.1476 | -70.8542 | TVG changed: offset: -10ms<br>21.1 - 0.72<br>30.2 - 0.11<br>63.6 - 0.00 |
| 06/12/2017 16:05 | 473.14 | -67.1549 | -70.8547 | Started logging line 9. Ship speed increased to 8 kn. |
| 06/12/2017 15:59 | 493.79 | -67.1617 | -70.8499 | EOL 8. Started turning. |
| 06/12/2017 14:53 | 471.35 | -67.1062 | -70.7209 | SOL 8. Increased chirp length to 20 ms. Decreased ship speed from 8.5 to 4kn. |
| 06/12/2017 14:22 | 478.24 | -67.1382 | -70.7358 | Trace length changed to 150 ms |
| 06/12/2017 14:13 | 491.51 | -67.1536 | -70.7726 | Changed chirp length to 10 ms |
| 06/12/2017 14:04 | 484.7 | -67.1671 | -70.8111 | Changed receiever setting. Delay offset = 600; Sample rate = 30 kHz; Trace length = 100 ms |
| 06/12/2017 13:52 | 488.78 | -67.1829 | -70.8636 | TVG changed to:<br>5-3.28<br>30.6-0.07<br>63.6-0 |
| 06/12/2017 13:47 | 488.78 | -67.1829 | -70.8636 | SOL 7. Had topas on for 30 minutes optimising settings. Started with xml jr17001_b.xml Pulse= Chirp (LFM) Trigger = External Chirp length = 15[ms] start frequency = 1.3 stop frequency = 5 Beam control = manual Power = 0 Bottom tracking enable. Gain = 12 Sampling rate = 30 kHz. Used autosearch to find bottom. |
| 27/11/2017 11:33 | 271.26 | -64.711 | -63.4559 | EOL5 |
| 27/11/2017 11:33 | 271.6 | -64.7111 | -63.457 | start of turn |

| Time | Depth (em122) | Latitude | Longitude | Comment |
|---|---|---|---|---|
| 27/11/2017 11:29 | 292.12 | -64.7136 | -63.4596 | In last 10 minutes: echogram not visualising beyond 200ms, single trace is locked at certain depth, not corresponding to EM122 depth. We will have to run another Topas line later on. With bottom tracker disabled, seabed less distinct. |
| 27/11/2017 11:22 | 294.8 | -64.7206 | -63.4582 | Changed power to -3dB |
| 27/11/2017 11:07 | 228.2 | -64.7387 | -63.4613 | TVG changed |
| 27/11/2017 11:04 | 223.3 | -64.7422 | -63.4634 | SOL L5 Settings as in L17001_b config file |
| 24/11/2017 16:13 | 71.75 | -62.2035 | -58.731 | Stopped pinging as well as logging as vessel largely stationary. |
| 24/11/2017 16:10 | 73.88 | -62.2034 | -58.7308 | HP filter to 1 khz |
| 24/11/2017 16:03 | 79.66 | -62.2028 | -58.7308 | Updated TVG (not logging data however)<br>6.5 - 1.8<br>10.9 - 0.15<br>15.7 - -0.43 |
| 24/11/2017 16:01 | 78.58 | -62.2033 | -58.7308 | Stopped recording the line. |
| 24/11/2017 15:58 | 106.45 | -62.2044 | -58.7341 | Updated the sampling rate to 15 kHZ |
| 24/11/2017 15:40 | 101.52 | -62.2151 | -58.7794 | Water column messy -> EOL L03 and SOL L04 with changed variable gain: 5.2 - 3.14 13 - 0.13 15.3 - 0.04 |
| 24/11/2017 15:36 | 104.18 | -62.2148 | -58.7889 | SOL L03 |
| 24/11/2017 09:26 | 73.68 | -62.2034 | -58.7308 | EOL 02 - stopped logging as well |
| 24/11/2017 09:17 | 94.52 | -62.2055 | -58.7325 | Stopped and started logging ahead of turn to port side |
| 24/11/2017 09:03 | 120.76 | -62.2136 | -58.7732 | TVG changed to: 7.9 - 1.92 6.1 -0.36 14.6 - 0 |
| 24/11/2017 09:00 | 91.46 | -62.2157 | -58.7827 | TVG changed manually: 3.5 - 2.43 12.5 - 0.63 14.6 - 0.04 |
| 24/11/2017 08:58 | 99.3 | -62.2168 | -58.7875 | Sample rate set from 30 to 20kHz |
| 24/11/2017 08:54 | 85.45 | -62.2182 | -58.7983 | SOL 02 in Marian Cove - MTD set to 50 ms, TL to 150ms |
| 24/11/2017 08:52 | 68.92 | -62.2186 | -58.8084 | MTD to 50ms |
| 24/11/2017 08:51 | 173.6 | -62.2189 | -58.8141 | MTD to 100ms |

| Time | Depth (em122) | Latitude | Longitude | Comment |
|---|---|---|---|---|
| 24/11/2017 08:49 | 235.63 | -62.2192 | -58.8185 | MTD to 200ms |
| 24/11/2017 08:41 | 375.95 | -62.2239 | -58.8364 | ship turning and MTD set from 500 ms to 300ms |
| 24/11/2017 08:35 | 403.66 | -62.2273 | -58.8284 | MTD to 500 ms |
| 24/11/2017 08:34 | 340.56 | -62.2244 | -58.8247 | MTD to 350 ms and window (trace length TL) opended up to 250 ms |
| 24/11/2017 08:32 | 284.65 | -62.221 | -58.8201 | MTD to 550 ms |
| 24/11/2017 08:32 | 247.44 | -62.22 | -58.8184 | MTD to 250 ms |
| 24/11/2017 08:30 | 128.75 | -62.2181 | -58.8113 | Master trig delay (MTD) from 60 ms to 150 ms |
| 24/11/2017 08:26 | 101.03 | -62.2165 | -58.7914 | Master trig delay set from 40ms to 60ms |
| 24/11/2017 08:22 | 89.56 | -62.2173 | -58.7851 | Ship turning around to deploy another SVP further out the fjord, as the sv with the first XBT deployed is about 1470m/s (and is likely more to be 1440 m/s) |
| 24/11/2017 08:19 | 87.79 | -62.2173 | -58.7848 | Vessel stationary whilst updating svp for em122. |
| 24/11/2017 08:17 | 94.39 | -62.2175 | -58.786 | Trying to optimise window: changed trace length to 100 ms, then back to 150 ms |
| 24/11/2017 08:15 | 100.68 | -62.2164 | -58.7919 | Changed master trig delay from 20 to 40 ms, trace length from 200 to 250 ms |
| 24/11/2017 08:12 | 68.86 | -62.2152 | -58.8019 | Changed trace length from 300 ms to 200 ms |
| 24/11/2017 08:09 | 78.33 | -62.2166 | -58.8092 | Changed master trig delay to 50ms, than 20 ms. |
| 24/11/2017 08:05 | 226.56 | -62.2186 | -58.8186 | Changed master trig delay to 100ms. Steep slope going into the fjord |
| 24/11/2017 08:04 | 262.78 | -62.2193 | -58.8214 | Changed master trig delay to 300ms. |
| 24/11/2017 07:51 | 448.03 | -62.2438 | -58.8285 | changed power to 0 dB |
| 24/11/2017 07:49 | 462.71 | -62.2477 | -58.8201 | set MTD to 400 from 600ms and sample rate to 30 hz from 50 hz |
| 24/11/2017 07:17 | 493.29 | -62.3118 | -58.6922 | Changed k-sync to swath +topas <1000m to test. adcp switched off by ksync. |

| Time | Depth (em122) | Latitude | Longitude | Comment |
|---|---|---|---|---|
| 24/11/2017 03:48 | 669.52 | -62.048 | -57.1787 | Turned on swath topas k-sync mode and set topas as first, em122 as second and ea600 as lowest priority. Started getting topas to ping through ksync successfully. os 75 was turned off using the ksync however. It was briefly turned off at 0338 for a minute or so too while testing this out. |
| 24/11/2017 03:38 | 668.64 | -62.0339 | -57.1034 | Topas seemed to get some pings. still not many but we were in deeper water and travelling fast. ksync switched back to opportunistic swath + bio mode. Hopefully this means we can shallow sync the swath and topas. |
| 24/11/2017 02:52 | 630.07 | -61.9039 | -56.9891 | Katrien set topas to internal trigger and managed to get some half decent data - not logged. However this would have meant that os75/em122 data could be very noisy/rubbish at this time. |
| 23/11/2017 23:19 | | -61.1307 | -57.0979 | This time is approximate. Tried for a long time with IT engineer and Katrien to get topas to operate with ksync. Wasn't working no matter what we tried. There could be lots of duds - also interference with the em122/ea60 and os75 data. |

Table 15.1.6: Overview of the raw files logged and the name that they are referred to in the TOPAS event log (Table 15.1.5). MC = Marian Cove, BB = Börgen Bay, MT = Marguerite Trough.

| Raw Filename | File Size (Mb) | Start Time (UTC) | Location | Line Number in Topas Log |
|---|---|---|---|---|
| 20171124074203.raw | 76.62 | 24/11/2017 07:42:03 | Test | JR17001_TOPAS_001 |
| 20171124085442.raw | 15.33 | 24/11/2017 08:54:42 | MC | JR17001_TOPAS_002 |
| 20171124091703.raw | 6.12 | 24/11/2017 09:17:03 | MC | JR17001_TOPAS_002 |
| 20171124153745.raw | 0.73 | 24/11/2017 15:37:45 | MC | JR17001_TOPAS_003 |
| 20171124153948.raw | 13.69 | 24/11/2017 15:39:48 | MC | JR17001_TOPAS_004 |
| 20171127110447.raw | 19.89 | 27/11/2017 11:04:47 | BB | JR17001_TOPAS_005 |
| 20171206134627.raw | 0.036 | 06/12/2017 13:46:27 | MT | JR17001_TOPAS_006 |
| 20171206134636.raw | 17.76 | 06/12/2017 13:46:36 | MT | JR17001_TOPAS_007 |
| 20171206140400.raw | 3.26 | 06/12/2017 14:04:04 | MT | JR17001_TOPAS_007 |
| 20171206141317.raw | 3.37 | 06/12/2017 11:04:47 | MT | JR17001_TOPAS_007 |
| 20171206142252.raw | 11.53 | 06/12/2017 14:22:52 | MT | JR17001_TOPAS_007 |
| 20171206145346.raw | 31.05 | 06/12/2017 14:53:46 | MT | JR17001_TOPAS_008 |
| 20171206155302.raw | 3.00 | 06/12/2017 15:53:02 | MT | JR17001_TOPAS_008 |
| 20171206160538.raw | 31.55 | 06/12/2017 16:05:38 | MT | JR17001_TOPAS_009 |
| 20171206170501.raw | 2.46 | 06/12/2017 17:05:01 | MT | JR17001_TOPAS_009 |
| 20171206171114.raw | 10.15 | 06/12/2017 17:11:14 | MT | JR17001_TOPAS_010 |
| 20171206173055.raw | 6.03 | 06/12/2017 17:30:55 | MT | JR17001_TOPAS_011 |
| 20171206174241.raw | 29.49 | 06/12/2017 17:42:41 | MT | JR17001_TOPAS_012 |
| 20171206184201.raw | 16.55 | 06/12/2017 18:42:01 | MT | JR17001_TOPAS_012 |
| 20171206191728.raw | 11.88 | 06/12/2017 19:17:28 | MT | JR17001_TOPAS_012 |
| 20171206195509.raw | 38.87 | 06/12/2017 19:55:09 | MT | JR17001_TOPAS_013 |
| 20171206205501.raw | 37.72 | 06/12/2017 20:05:51 | MT | JR17001_TOPAS_013 |
| 20171206215010.raw | 18.43 | 06/12/2017 21:50:10 | MT | JR17001_TOPAS_014 |
| 20171206221723.raw | 0.02 | 06/12/2017 22:17:23 | MT | JR17001_TOPAS_015 |
| 20171206221732.raw | 38.21 | 06/12/2017 22:17:32 | MT | JR17001_TOPAS_015 |
| 20171206231700.raw | 37.36 | 06/12/2017 23:17:00 | MT | JR17001_TOPAS_015 |
| 20171207001700.raw | 11.58 | 07/12/2017 00:17:00 | MT | JR17001_TOPAS_015 |

## *15.2 VMP*

**1.Spares, tools and ancillaries list**

1. **Tools**
2. 1 11/16 socket on 6 inch extension and ratchet (3/8 inch standard drive) (for pressure tube sealing nuts)
3. 1 3/16 inch Hex Drive (1/4-inch Socket Head Cap Screw)
4. 1 9/16 inch wrench (3/8 inch bolts and nuts)
5. 1 9/16 inch socket (3/8 inch bolts andnuts)
6. 1 7/16 inch wrench or socket/ratchet (all 1/4 inch bolts and nuts)
7. 1 3/8 inch wrench (#10 nuts)
8. 1 5/32" Hex Key (#10 Socket Head Cap Screws and ¼-inch Flat Head Socket Screws)
9. 1 5/16 Nut Driver (hose clamps)
10. 
11. **Spares**
12. 
13. 8" 1/2" x 3/4" Latex tube for termination
14. 3 Ferrule for probe holder
15. 3 5-254 O-Ring (for MHDG bulkhead connector face seal)
16. 2 2-010 O-Ring (for cable termination seal)
17. 3 2-253 O-Ring (for main bulkhead face seals)
18. 6 2-012 O-Ring (for probe holder sensor seal)
19. 6 2-015 O-Ring (for probe holder face seal)
20. 4 2-016 O-Ring (for sealing nut piston seal and connector plug face seals)
21. 8 2-017 O-Ring (for MHDG connectors)
22. 1 Seal gasket for Keller pressure transducer
23. 1 Assembly, Morrison Seal, 0.27inch Tether
24. 2 #52 Hose Clamp
25. 2 #64 Hose Clamp
26. 2 #28 Hose Clamp
27. 5 1A Slo-Blo Fuses
28. 4 1/4-28x1/2", Hex Head Cap Screw (HHCS) SS304
29. 8 1/4-20 x 1/2", HHCS, SS304
30. 4 1/4-20 x 5/8" HHCS, SS304
31. 2 1/4-20 x 3/4" SHCS, SS304
32. 2 .-20 x 1" Flat Head Socket Cap Screw
33. 16 1/4 Flat Washer (F.W.), Nylon
34. 8 1/4 F.W., 304SS
35. 16 1/4 Lock Washer (L.W.), Split, SS304
36. 8 10-32x5/8", Socket Head Cap Screw (SHCS) SS304

37. A/R 6 inch cable ties (to secure tether and SBE3/4 cable to tail fin)
38. A/R 28 inch releasable cable ties (for main body tie down)
39. A/R 4 inch cable ties (to secure eddy brush to nose guard ring)
40. 242 (Blue) Loctite
41. 5 minute epoxy
42. Electrical tape (with multiple colours for tether marking)
43. O-ring grease

**44. Ancillaries**
45.
46. Deck horse for securing VMP to deck
47. Bench mount (with parallel nose cone guides to ensure correct alignment)
48. Ratchet straps

## 2. Final set-up configuration file

; Standard configuration setup.cfg file for a downward profiling VMP.

; Change the vehicle type in the [instrument_info] section to rvmp for an

; uprising profiler.

; Created by RSI, 2015-12-17

; 2015-12-21 , Created for VMP2000 SN014

; 2017-07-20, edited with all coefficients at RSI after ASTP re-calibrations

;Probe specific info added by Evan 2017-08-18 and by Katy on 23rd Nov 2017 for ICEBERGS. Katy also changed P channel coeffs to match calibraiton file and 2017-07-19

; The first section is the [root] section. It determines the data

; acquisition parameters. It does not need to be declared explicitly.

rate = 512 ; the sampling rate of "fast" channels

prefix = VMP_ ; the base name of your data files. A 3-digit file number is

;

appended to this base name. The limit is 8 characters

; total for internally recording instruments.

disk = ; the directory for the data files. It must exist. The directory

; should be /data for internally recording instruments. For

; real-time instruments it is best to leave this blank, so

; that it defaults to the local directory.

recsize = 1 ; the size of a record in seconds

man_com_rate= 6 ; the communication rate for real-time VMPs. This value must

; match the jumper settings of the RSTRANS in your VMP.

; It is not needed for internally recording instruments.

no-fast = 6 ; number of fast "columns" in the address matrix (see below).

no-slow = 2 ; number of slow "columns" in the address matrix.

; -----------------

;This section presents the address [matrix] of your instrument and

; automatically ends the [root] section above. The first columns are "slow"

; channels as defined by the "no-slow" parameter in the [root] section.

; The remainder are "fast" columns ("no-fast").

[matrix]

num_rows=8

row01 = 255 0 1 2 5 8 9 12

row02 = 4 6 1 2 5 8 9 12

row03 = 10 11 1 2 5 8 9 12

row04 = 16 17 1

2 5
8 9
12

row05 = 18 19
1
2 5
8 9
12

row06 = 32 33
1
2 5
8 9
12

row07 = 34 0
1
2 5
8 9
12

row08 = 0 0
1
2 5
8 9
12

; --------------------

;This section identifies your instrument. Only the vehicle is important.

[instrument_info]

vehicle = vmp ; downward profiling. Use either vmp or rvmp but not both.

model = vmp-2000 ; The actual model. Used for trouble shooting.

sn = 014 ; The serial number of the instrument. For trouble shooting

; --------------------

; The ground reference channel.

[channel]

; instrument dependent parameters

id = 0 ; the channel address, 0 to 254. Listed in the [matrix] section.

```
name    = Gnd ; the name it will have in the mat-file.
type    = gnd ; the algorithm used to convert raw data into physical units.
;coef0   = 0   ; the coefficients required for conversion. None in this case.

; --------------
; The accelerometers
[channel]
; instrument dependent parameters
id      = 1
name    = Ax
type    = accel
coef0   = -411.5
coef1   = 13094.5
display = true ; Pertinent only to real-time telemetering VMPs.

[channel]
; instrument dependent parameters
id      = 2
name    = Ay
type    = accel
coef0   = -388.5
coef1   = 12910.5
display = true

[channel]
; instrument dependent parameters
;id      = 3
;name    = Az
;type    = accel
;coef0   = -187.5
```

```
;coef1   = 12758.5
;display = true

; -----------------
; The thermistor channels
; without pre-emphasis
[channel]
; instrument dependent parameters
id         = 4
name       = T1
type       = therm
adc_fs     = 5.0
adc_bits   = 16
a          = -49
b          = 0.99814
G          = 11
E_B        = 0.642400
; sensor dependent parameters
SN         = T1422
beta       = 3143.55
beta_2     = 2.5e5
T_0        = 289.301
cal_date   =
units      = [C]

; with pre-emphasis
[channel]
; instrument dependent parameter
id         = 5
name       = T1_dT1
```

```
type        = therm
diff_gain   = 0.99

; without pre-emphasis
[channel]
; instrument dependent parameters
id          = 6
name        = T2
type        = therm
adc_fs      = 5.0
adc_bits    = 16
a           =-30
b           = 0.99823
G           = 11
E_B         = 0.642400
; sensor dependent parameters
SN          = T1356
beta        = 3143.55
beta_2      = 2.5e5
T_0         = 289.301
cal_date    =
units       = [C]

; with pre-emphasis
[channel]
; instrument dependent parameters
;id          = 7
;name        = T2_dT2
;type        = therm
;diff_gain   = 0.99
```

```
; -----------------
; The shear probe channels
[channel]
; instrument dependent parameters
id         = 8
name       = sh1
type       = shear
adc_fs     = 5.0
adc_bits   = 16
diff_gain  = 1.00
; sensor dependent parameters
sens       = 0.0664
SN         = M1606
cal_date   =

[channel]
; instrument dependent parameters
id         = 9
name       = sh2
type       = shear
adc_fs     = 5.00
adc_bits   = 16
diff_gain  = 1.01
; sensor dependent parameters
sens       = 0.0733
SN         = M1605
cal_date   =

; -----------------
```

; The pressure transducer

; without pre-emphasis

[channel]

; instrument dependent parameters

id = 10

name = P

type = poly

; sensor dependent parameters

coef0 = 2.89

coef1 = 0.16871

coef2 =-7.018e-8

cal_date = 2017 07 19

units = [dBar]

; with pre-emphasis

[channel]

; instrument dependent parameters

id = 11

name = P_dP

type = poly

diff_gain = 20.2

; -------------------------

; the micro-conductivity sensor.

[channel]

; instrument dependent parameters

id = 12

name = C1_dC1

type = ucond

a =-0.7629

```
b          = 113
adc_fs     = 5.0
adc_bits   = 16
diff_gain  = 1.0
; sensor dependent parameters
SN         = C237
K          = 1.03e-3 ; the cell constant
units      = [mS/cm]

; -----------------
; Sea-Bird SBE3 thermometer. Remove, if you are using a JAC CT, and
;  remember to update the [matrix] section.
[channel]
; instrument dependent parameters
id         = 16, 17 ; A two-channel signal. Separate channels with a "," and/or a space.
name       = SBT
type       = sbt
coef5      = 24e6 ; reference clock
coef6      = 128 ; periods
; sensor dependent parameters
coef0      = 4.37039387e-3
coef1      = 6.38913891e-4
coef2      = 2.25756105e-5
coef3      = 2.10452339e-6
coef4      = 1000
SN         = 6225
cal_date   = 2017-04-08 ; date of calibration
units      = [C]

; Sea-Bird SBE4 conductivity cell. Remove, if you are using a JAC CT, and
```

```
;  remember to update the [matrix] section.
[channel]
; instrument dependent parameters
id         = 18, 19
name       = SBC
type       = sbc
coef5      = 24e6
coef6      = 128
; sensor dependent parameters
coef0      =-9.92630735e0
coef1      = 0
coef2      = 1.28660669e0
coef3      =-4.18564720e-4
coef4      = 8.50180750e-5
SN         = 4691
cal_date   = 2017-03-30 ; date of calibration
units      = [mS/cm]

; micro-Mag, 3-axis Magnetometer
; Remove if not installed
[channel]
; instrument dependent parameters
id         = 32
name       = Mz
type       = magn
; sensor dependent parameters
coef0      = -121.5
coef1      = 60.34
cal_date   = 2017-07-19
units      = [uT]  ; micro-Tesla
```

```
display = false

[channel]
; instrument dependent parameters
id       = 33
name     = My
type     = magn
; sensor dependent parameters
coef0    = -195.5
coef1    = 54.01
cal_date = 2017-07-19
units    = [uT]
display = false

[channel]
; instrument dependent parameters
id       = 34
name     = Mx
type     = magn
; sensor dependent parameters
coef0    =-74.5
coef1    = 50.24
cal_date = 2017-07-19
units    = [uT]
display = false

; ------------------
; This is a list of typical channels (addresses) and their signals
; Only some of these channels will be in any particular instrument
;  id   Name    - rate - Description
```

```
; ------------------------------------------------------------------
;  0     Gnd     - slow - Reference ground
;  1     Ax      - fast - horizontal acceleration in the direction of the pressure port or ON/OFF magnet
;  2     Ay      - fast - horizontal acceleration orthogonal to the direction of the pressure port
;  3     Az      - fast - vertical acceleration, positive up
;  4     T1      - slow - Temperature from Thermistor 1 without pre-emphasis
;  5     T1_dT1  - fast - Temperature from Thermistor 1 with pre-emphasis
;  6     T2      - slow - Temperature from Thermistor 2 without pre-emphasis
;  7     T2_dT2  - fast - Temperature from Thermistor 2 with pre-emphasis
;  8     sh1     - fast - velocity derivative from shear probe 1
;  9     sh2     - fast - velocity derivative from shear probe 2
; 10     P       - slow - pressure signal without pre-emphasis
; 11     P_dP    - slow - pressure signal with pre-emphasis
; 12     C1_dC1 - fast conductivity with pre-emphasis (previously: PV      - slow - voltage on pressure transducer)
; 16, 17 SBT     - slow - The even and odd addresses of the Sea-Bird SBE3 thermometer
; 18, 19 SBC     - slow - The even and odd addresses of the Sea-Bird SBE4 conductivity sensor
; 32     Mz      - slow - vertical component of magnetic field from magnetometer
; 33     My      - slow - horizontal component of magnetic field from magnetometer
; 34     Mx      - slow - horizontal component of magnetic field from magnetometer
; 255    sp_char - slow - special Character that always returns 32752D or 7FF0H and
;                 is used to test the integrity of communication.

; End of setup configuration file.
```

## 15.3 Ocean physics measurements configuration and summary

a) CTD

| station | Bottom date, time (UTC) (yy/mm/dd) | Latitude (S) | Longitude (W) | Max CTD press (dbar) | N | O2 | d18O | S | C | MP | eDNA |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 001 | 17/11/22, 12:11 | 54°00.30′ | 58°03.78′ | 103 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |
| 002 | 17/11/24, 09:37 | 62°12.23′ | 58°43.89′ | 71 | 14 | 4 | 12 | 7 | 0 | 2 | 0 |
| 003 | 17/11/24, 11:21 | 62°12.35′ | 58°44.39′ | 115 | 13 | 6 | 12 | 5 | 0 | 2 | 0 |
| 004 | 17/11/24, 12:35 | 62°12.49′ | 58°44.87′ | 105 | 13 | 7 | 12 | 6 | 0 | 2 | 0 |
| 005 | 17/11/24, 13:55 | 62°12.76′ | 58°46.13′ | 101 | 12 | 5 | 12 | 4 | 0 | 2 | 0 |
| 006 | 17/11/24, 15:10 | 62°13.05′ | 58°47.37′ | 95 | 16 | 5 | 12 | 4 | 0 | 5 | 0 |
| 007 | 17/11/24, 13:17 | 64°42.21′ | 63°27.02′ | 277 | 17 | 6 | 12 | 4 | 0 | 6 | 0 |
| 009 | 17/11/24, 15:01 | 64°42.66′ | 63°27.28′ | 275 | 17 | 6 | 12 | 4 | 0 | 6 | 0 |
| 010 | 17/11/27, 16:19 | 64°43.10′ | 63°27.48′ | 297 | 16 | 5 | 12 | 4 | 0 | 6 | 0 |
| 011 | 17/11/27, 17:26 | 64°43.57′ | 63°27.14′ | 247 | 17 | 5 | 12 | 4 | 0 | 5 | 0 |
| 012 | 17/11/27, 18:38 | 64°44.50′ | 63°27.21′ | 249 | 16 | 5 | 12 | 4 | 0 | 6 | 0 |
| 013 | 17/11/30, 05:44 | 61°35.99′ | 64°29.85′ | 1013 | 18 | 7 | 0 | 6 | 12 | 0 | 0 |
| 014 | 17/12/01, 02:54 | 61°36.00′ | 64°41.30′ | 1013 | 6 | 6 | 0 | 6 | 5 | 0 | 0 |
| 015 | 17/12/01, 05:18 | 61°35.99′ | 64°17.99′ | 1013 | 6 | 6 | 0 | 4 | 5 | 0 | 0 |
| 016 | 17/12/02, 00:56 | 61°36.00′ | 64°29.99′ | 1039 | 6 | 7 | 0 | 6 | 0 | 0 | 0 |
| 017 | 17/12/02, 05:19 | 61°22.00′ | 63°31.99′ | 1071 | 6 | 7 | 0 | 5 | 3 | 0 | 0 |
| 018 | 17/12/03, 04:16 | 63°47.99′ | 66°29.97′ | 1013 | 6 | 6 | 0 | 5 | 3 | 0 | 0 |
| 019 | 17/12/10, 11:16 | 66°39.00′ | 69°54.00′ | 353 | 9 | 7 | 0 | 6 | 3 | 3 | 0 |
| 020 | 17/12/10, 13:09 | 66°42.59′ | 70°08.31′ | 473 | 11 | 7 | 0 | 6 | 5 | 5 | 0 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 021 | 17/12/10, 15:01 | 66°46.95′ | 70°28.97′ | 613 | 8 | 5 | 3 | 4 | 0 | 4 | 0 |
| 022 | 17/12/10, 16:56 | | | 505 | 10 | 7 | 3 | 6 | 0 | 4 | 0 |
| 023 | 17/12/10, 19:10 | 66°56.65′ | 71°03.13′ | 473 | 9 | 5 | 4 | 5 | 0 | 4 | 0 |
| 024 | 17/12/11, 18:47 | 66°58.47′ | 70°20.20′ | 629 | 9 | 6 | 3 | 5 | 0 | 4 | 0 |
| 025 | 17/12/15, 06:13 | 54°00.30′ | 54°00.30′ | 373 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 026 | 17/12/15, 07:30 | 61°02.95′ | 54°35.52′ | 581 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 027 | 17/12/15, 08:55 | 60°58.81′ | 54°37.98′ | 1049 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 028 | 17/12/15, 10:14 | 54°00.30′ | 54°00.30′ | 1797 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 029 | 17/12/15, 12:14 | 60°50.98′ | 54°42.67′ | 2577 | 19 | 12 | 10 | 10 | 0 | 10 | 0 |
| 030 | 17/12/15, 17:05 | 60°24.18′ | 54°59.14′ | 3511 | 10 | 10 | 10 | 10 | 0 | 0 | 1 |
| 031 | 17/12/15, 22:15 | 59°59.99′ | 55°14.28′ | 3555 | 16 | 11 | 10 | 10 | 0 | 6 | 1 |
| 032 | 17/12/16, 03:58 | 59°30.03′ | 55°32.90′ | 3769 | 24 | 26 | 24 | 24 | 3 | 0 | 1 |
| 033 | 17/12/16, 10:21 | 58°59.98′ | 55°51.46′ | 3837 | 19 | 14 | 12 | 12 | 0 | 5 | 1 |
| 034 | 17/12/16, 15:59 | 58°31.59′ | 56°08.89′ | 3835 | 24 | 22 | 24 | 24 | 0 | 0 | 1 |
| 035 | 17/12/16, 21:43 | 58°02.98′ | 56°26.79′ | 4033 | 19 | 11 | 12 | 12 | 0 | 6 | 1 |
| 036 | 17/12/17, 02:28 | 57°43.99′ | 56°38.64′ | 3529 | 24 | 21 | 24 | 24 | 0 | 0 | 1 |
| 037 | 17/12/17, 07:12 | 57°24.96′ | 56°50.39′ | 3517 | 19 | 13 | 12 | 12 | 0 | 7 | 1 |
| 038 | 17/12/17, 11:41 | 57°05.76′ | 57°01.37′ | 4041 | 24 | 25 | 24 | 24 | 0 | 0 | 6 |
| 039 | 17/12/17, 16:57 | 56°46.99′ | 57°13.86′ | 3077 | 17 | 11 | 10 | 10 | 0 | 0 | 1 |
| 040 | 17/12/17, 21:30 | 56°27.74′ | 57°25.02′ | 3753 | 12 | 13 | 12 | 12 | 0 | 0 | 1 |
| 041 | 17/12/18, 02:21 | 54°00.30′ | 54°00.30′ | 3447 | 17 | 12 | 10 | 10 | 0 | 7 | 1 |
| 042 | 17/12/18, 07:24 | 56°08.99′ | 57°37.46′ | 4831 | 16 | 20 | 15 | 15 | 0 | 0 | 1 |
| 043 | 17/12/18, | 55°50.00′ | 57°49.22′ | 4287 | 18 | 13 | 12 | 12 | 0 | 6 | 1 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 17:32 | | | | | | | | | | |
| 044 | 17/12/18, 22:39 | 55°31.00’ | 57°59.00’ | 4067 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**Table 15.3.1: Summary of CTD casts, number of Niskins fired (N), and number of Niskin water samples taken for dissolved oxygen (O2), oxygen isotopes (d18O), salinity (S), chlorophyll/POC (C), microplastics (MP), and eDNA. Cast 1 was a test cast; 2-7 and 9-12 ICEBERGS, 13-18 glider calibration casts, 19-24 Marguerite Trough, 25-44 SR1b. Cast 8 was a short cast performed to calibrate the WaveGlider ADCP.**

b) LADCP

The LADCP was configured with 25 8-m bins. Data were collected in beam coordinates and rotated to earth coordinates during processing.

**LADCP command file:**

CR1

RN JR17001

WM15

TC2

LP1

TB 00:00:02.80

TP 00:00:00

TE 00:00:01.30

LN25

LS0800

LF0

LW1

LV400

SM1

SA011

SB0

SW5500

SI0

EZ0011101

EX00100

CF11101

CK

CS

c) VMADCP

The VMADCP was set up through VMDAS and configured with 65 16-m bins for most of the cruise. In the very shallow waters near the ICEBERGS sites it was instead configured with 30 8-m bins. Bottom tracking was switched on when in shallow water, except around the ICEBERGS sites. LTA (long-term average) data are rotated and corrected for the ship's motion by VMDAS. ENR (ping) data are collected in instrument-relative coordinates and corrected for the instrument orientation and ship's motion in post-processing. A new sequence was started when the configuration changed or else approximately daily.

**VMADCP sequences**

notes: sequences 011, 012, 020, and 021 did not contain enough good data to process due to the SSU triggering in the case of 011 and 012); sequence 003 was terminated for TOPAS sampling; LTA data from sequences 000-003 are averaged over 600 s and from sequences 004-027 over 300 s

| sequence | start | end | ensembles | mode |
|---|---|---|---|---|
| 000 | 326, 01:54 | 326, 07:47 | 1875 | bt 16 m |
| 001 | 326, 07:48 | 326, 11:06 | 3900 | wt 16 m |
| 002 | 326, 11:07 | 326, 19:57 | 6544 | bt 16 m |
| 003 | 326, 19:58 | 328, 07:54 | 42477 | wt 16 m |
| 004 | 328, 09:33 | 328, 15:57 | 5411 | wt 16 m SSU |
| 005 | 328, 18:46 | 329, 08:03 | 12715 | bt 8 m |
| 006 | 329, 08:03 | 329 09:00 | | bt 8 m |
| 007 | 329, 09:01 | 330, 07:55 | | wt 8 m |
| 008 | 330, 07:56 | 331, 16:22 | | wt 8 m |
| 009 | 330, 16:24 | 331, 02:51 | 18252 | wt 8 m |
| 010 | 331, 07:52 | 331, 10:33 | 1805 | bt |
| 013 | 331, 15:59 | 332, 21:45 | 70283 | wt 8 m |
| 014 | 333, 08:05 | 334, 07:51 | 28038 | wt 16 m |

| | | | | |
|---|---|---|---|---|
| 015 | 334, 07:52 | 335, 06:51 | 27141 | wt 16 m |
| 016 | 335, 06:52 | 336, 17:22 | 40750 | wt 16 m |
| 017 | 336, 17:23 | 337, 20:13 | 31700 | wt 16 m |
| 018 | 337, 20:20 | 338, 19:12 | 15385 | bt 16 m |
| 019 | 344, 10:57 | 346, 09:45 | | bt 8 m |
| 022 | 347, 14:02 | 348, 06:40 | 19669 | wt 16 m |
| 023 | 348, 06:41 | 349, 12:27 | 33145 | wt 16 m |
| 024 | 349, 12:28 | 350, 06:08 | 20867 | wt 16 m |
| 025 | 350, 06:09 | 351, 04:55 | 30418 | wt 16 m |
| 026 | 351, 04:56 | 352, 02:48 | 50623 | wt 16 m |
| 027 | 352, 02:49 | 353, 14:33 | 13859 | wt 16 m |

**VMADCP configuration commands for watertracking mode with 16-m bins**

CR1

CB611

NP1

NN65

NS1600

NF8

WP000

WV390

BP00

BX12000

WD1111100000

TP000150

TE00000300

EZ1020001

EX00000

EA6008

ED00065

ES0

CX0,0

CK

## *15.4 AME*

**a) Elec eng**

**LAB Instruments**

| Instrument | S/N Used | Comments |
|---|---|---|
| AutoSal | 68959 | |
| Scintillation counter | N | |
| Magnetometer STCM1 | N | |
| XBT | Y | Bulgin connectors replaced due to water ingress |
| | | |

**ACOUSTIC**

| Instrument | S/N Used | Comments |
|---|---|---|
| ADCP | Y | |
| PES | N | |
| EM122 | Y | |
| TOPAS | Y | |
| EK60/80 | N | |
| SSU | Y | |
| USBL | Y | |
| 10kHz IOS pinger | N | |
| Benthos 12kHz pinger<br>S/N 1316 + bracket | N | |
| Benthos 12kHz pinger<br>S/N 1317 + bracket | N | |
| MORS 10kHz transponder | N | |
| | | |

**OCEANLOGGER**

| Instrument | S/N Used | Comments |
|---|---|---|
| Barometer1(UIC) | V145002 | |
| Barometer1(UIC) | V145003 | |
| **Foremast Sensors** | | See appendix |
| Air humidity & temp1 | 0061698924 | |
| Air humidity & temp2 | 61698922 | |
| TIR1 sensor (pyranometer) | 172882 | |
| TIR2 sensor (pyranometer) | 172883 | |
| PAR1 sensor | 160959 | |
| PAR2 sensor | 160960 | |
| **prep lab** | | |
| Thermosalinograph SBE45 | 0130 | |
| Transmissometer C-Star | 846 | |
| Fluorometer Wetstar | 1498 | |
| Flow meter | 811950 | |
| Seawater temp 1 SBE38 | 0601 | |
| Seawater temp 2 SBE38 | 0599 | |
| | | |

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

| Instrument | S/N Used | Comments |
|---|---|---|
| Deck unit 1 SBE11plus | 0458 | |
| Underwater unit SBE9plus | 0707 | |
| Temp1 sensor SBE3plus | 2705 | |
| Temp2 sensor SBE3plus | 5042 | |
| Cond1 sensor SBE 4C | 3488 | |
| Cond2 sensor SBE 4C | 2248 | Very spikey output replaced with 2255 |
| Cond2 sensor SBE 4C | 2255 | |
| Pump1 SBE5T | 4488 | |
| Pump2 SBE5T | 2371 | |
| Standards Thermometer SBE35 | 0024 | |
| Transmissometer C-Star | 396 | |
| Oxygen sensor SBE43 | 0242 | |

| | | |
|---|---|---|
| PAR sensor | 70636 | |
| Fluorometer Aquatracka | 09-7324-001 | |
| Altimeter PA200 | 10127.27001 | |
| LADCP | 15060 | Replaced due to excessive file fragmentation |
| LADCP | 14897 | |
| CTD swivel linkage | 1961018 | |
| Pylon SBE32 | 0636 | |
| Notes on any other part of CTD e.g. faulty cables, wire drum slip ring, bottles, swivel, frame, tubing etc | | |

**AME UNSUPPORTED INSTRUMENTS BUT LOGGED**

| **Instrument** | **Working ?** | **Comments** |
|---|---|---|
| EA600 | Y | Computer failed. New one made. |
| Anemometer | Y | |
| Gyro | Y | |
| DopplerLog | Y | |
| EMLog | y | |
| | | |

**Oceanlogger**

**Met sensors.**

The underway system was rock solid reliable up to the 15th Dec, when the TH sensors started to drop out. (This was after a prolonged period of rough weather in which spray was freezing all over the sensor set, and also after 4 days or so of breaking ice in our attempts to reach Rothera…..so water/ice ingress or vibration could be the cause) Monitoring of the serial messages showed that the bytes received by the computer were 'shrinking' from their proper size (143 bytes) over time. First TH1s reply message would slowly shrink (over an hour or so) until there were no bytes read, and then TH2 would so the same. (At this point, all the other sensors on the foremast were reading well with no comms errors) Power cycling the system restored comms to the TH sensors, but then they again behaved as described above. During a calm CTD deployment, the junction box on the A-frame of the foremast was opened up for inspection. All connections seemed fine and soundly attached, and there was no sign of water ingress to the box. The bulkhead connectors were clean and dry with no signs of breakage or corrosion.

A day later, all sensors seemed to come back online and were reading as intended. This remained so for nearly a day, after which, first the T&H sensors, and then the solar sensors started to fail comms again. At present, only PAR2 is still responding (TIR1 was online this morning (20-12-17) but has stopped responding. It is my intention to get up the mast for further investigation upon our arrival in Punta. ………work is ongoing.

**USBL-NMEA splitter.**

It was noticed (when the USBL was not getting correct NMEA messages) that a second heading string was being output to the splitter PC from the Seapath. This extra sentence 'shunted' the correct message one place further down the data array. As the output messages were selected by their array index, this meant that incorrect messages were being sent. The Labview code has been amend to search for the correct strings by name and not array index, so this should no longer be an issue.

**Clam/winch monitor.**

The outboard load cell on the coring wire was not reporting strain values to the CLAM computer. Extensive testing indicated that the load cell itself, and the cable connecting it to the CALM junction box in the winch room were faulty. These have been replaced.

**CTD sea cable.**

On cast 42, the cable was noted by the deck engineer to be thinner than when new, sufficiently so to interfere with the smooth spooling on the drum. 400m of cable was cut off, and the remainder re-terminated. One of the motors in the winch room got excessively hot during cast 44, which triggered the fire alarms when the winch room filled with smoke. After people were released from the emergency muster, the CTD was slowly hauled back aboard.

**LADCP.**

The battery pack subsea connector has substantial mechanical damage and signs of salt water corrosion. When the case was opened up, it was noticed that one of the o-rings was shredded and the internal fuse was blown, but the batteries were clean, dry, and operational.

(Pictures were taken during mobilization)

Due to there being no spare connector in the box, this one was cleaned up and packed with silicon grease in an attempt to prevent water ingress into the air gap while under pressure.

The o-rings were replaced and a new fuse fitted.

The LADCP system has been used extensively on this cruise with the only observable electrical fault being occasional fluctuations (rapidly changing values) and low readings at the multimeter by the battery charger. Voltage measured at the battery bulkhead connector were constant and of appropriate value. It is assumed that the connection between the LADCP loom and this ropey connector is the reason. Presumably related to this issue, on 14 of the casts the LADCP appeared to stop and restart data logging, producing two to five data files rather than one.

One of the ship-side comms cables coming through the gland into the bottle annex from the chem lab had been sheared during refit. This tail has been replaced.

**b) Mech eng**

SUCS and Multicorer-

Overall the SUCS worked very well and was deployed a total of 16 times. The Images taken were well lit and great quality.

Twice during the cruise I had problems getting an image on the main screen and the PC would not boot properly. The main screen cable was changed and worked for a while, we then lost all of the screens. I decided to look further into the PC. We took the PC apart and removed, cleaned and re seated the memory and the graphics card. We also found the heat sink on the motherboard was loose on one corner. After having done this the PC and the graphics card seems to work. I tested all the graphics card ports and there does not seem to be a problem. The SUCS then worked as expected and know further problems occurred. Some more display port to DVI cables have been ordered.

The so called waterproof monitor had some water ingress, it was cleaned, dried and re assembled. This is something which needs to be looked at when the unit is back in Cambridge. The main fiber optic seems to have a tendency to twist and would benefit from having a fiber optic swivel fitted. A new cover needs to be made for the deck winch as the existing one is heavily torn. Spare fiber optic blanking caps, o rings and cleaning kit for the connectors is also needed.

The Oktopus 12-core Multicorer was deployed a total of 8 times. The Multicorer was set with maximum weight and on the maximum penetration setting. This was done to ensure we could recover as sediment as possible. The samples recovered were typically 50% sediment, 50% water with 1 or 2 samples of the 12 lost upon recovery. The Multicorer had a full inspection prior to use to be sure it was mechanically sound since the trails earlier on in the year.

The Multicorer does seem to suffer from the piston getting blocked. If the cylinder is not cleared after each deployment it will not fire. To do this all of the core holders need to be removed from the corer and the corer then needs to be operated on the deck. This issue will need to be addressed for the future. One suggestion is to perhaps have a bleed nipple put into the cylinder. Care needs to be taken when fitting and removing the core tubes from there holders as the holders have a retaining wire which could cause injury. I suggest we have new ones made with the end of the wire folded over to help prevent injury.

## *15.5 Event log*

Key: CTD XBT SUCS Grab N70 AGT MUC Glider WaveGlider

| Time | Event | Lat | Lon | Comment |
|---|---|---|---|---|
| 22/11/2017 11:17 | Test CTD | -54.0054 | -58.0622 | Vessel on DP |
| 22/11/2017 11:38 | Test CTD | -54.005 | -58.063 | Wire load tested 2.2 for 2 minutes |
| 22/11/2017 12:05 | Test CTD | -54.005 | -58.063 | CTD Deployed |
| 22/11/2017 12:13 | Test CTD | -54.005 | -58.0631 | CTD wire out 100m |
| 22/11/2017 12:18 | Test CTD | -54.005 | -58.063 | CTD at surface |
| 22/11/2017 12:19 | Test CTD | -54.005 | -58.0631 | CTD on deck |
| 24/11/2017 08:10 | 2 | -62.2164 | -58.8081 | XBT deployed. Speed 5.0 kts |
| 24/11/2017 08:13 | 2 | -62.2151 | -58.7996 | XBT released |
| 24/11/2017 08:38 | 3 | -62.2286 | -58.8361 | XBT deployed. Speed 5.0 kts |
| 24/11/2017 08:41 | 3 | -62.2251 | -58.8364 | XBT released |
| 24/11/2017 08:54 | 4 | -62.2181 | -58.8016 | Commence multibeam survey of Marian Cove. Speed 5.0 kts |
| 24/11/2017 09:28 | | -62.2036 | -58.7314 | Vessel on DP at MC5 location |
| 24/11/2017 09:31 | 5 | -62.2037 | -58.7314 | CTD deployed |
| 24/11/2017 09:36 | 5 | -62.2037 | -58.7314 | CTD stopped at depth 69m. Commence recovery |
| 24/11/2017 09:54 | 5 | -62.2038 | -58.7316 | CTD recovered to deck |
| 24/11/2017 09:55 | | -62.2038 | -58.7316 | Vessel off DP. Proceeding to MC4 location |
| 24/11/2017 10:11 | | -62.206 | -58.74 | Vessel on DP at MC4 location |
| 24/11/2017 10:27 | | -62.2058 | -58.7399 | Vessel off DP. Continuing with multibeam survey |
| 24/11/2017 11:01 | | -62.2059 | -58.7395 | Vessel on DP at MC4 location |
| 24/11/2017 11:13 | 6 | -62.2059 | -58.7399 | CTD Deployed |
| 24/11/2017 11:20 | 6 | -62.2059 | -58.7399 | CTD at depth. Wire out 112m |
| 24/11/2017 11:39 | 6 | -62.2059 | -58.7399 | CTD at surface |
| 24/11/2017 11:40 | 6 | -62.2059 | -58.7399 | CTD on deck. Continuing swath servey |
| 24/11/2017 12:24 | 7 | -62.2081 | -58.7479 | VSL on DP at Station M3 |
| 24/11/2017 12:29 | 7 | -62.2081 | -58.7479 | CTD Deployed |
| 24/11/2017 12:35 | 7 | -62.2082 | -58.7479 | CTD at depth. Wire stopped at 104m |
| 24/11/2017 12:54 | 7 | -62.2082 | -58.7479 | CTD at surface |
| 24/11/2017 12:56 | 7 | -62.2082 | -58.7479 | CTD on deck |
| 24/11/2017 12:58 | 7 | -62.2082 | -58.7479 | Continuing swath survey |
| 24/11/2017 13:40 | 8 | -62.2128 | -58.7687 | VSL on DP at MC2 location |
| 24/11/2017 13:48 | 8 | -62.2128 | -58.7689 | CTD deployed |
| 24/11/2017 13:55 | 8 | -62.2127 | -58.7689 | CTD at depth. Wire stopped at 100m |
| 24/11/2017 14:08 | 8 | -62.2127 | -58.7689 | CTD at surface |
| 24/11/2017 14:10 | 8 | -62.2127 | -58.7689 | CTD on deck |

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| 24/11/2017 14:13 | **8** | -62.2127 | -58.7689 | VSL off DP |
| 24/11/2017 14:15 | **8** | -62.2128 | -58.7699 | Continuing swath survey |
| 24/11/2017 14:56 | | -62.2176 | -58.7892 | VSL on DP AT MC1 |
| 24/11/2017 15:04 | **9** | -62.2176 | -58.7892 | CTD deployed |
| 24/11/2017 15:09 | **9** | -62.2176 | -58.7892 | CTD @ 92m; commenced recovery |
| 24/11/2017 15:28 | **9** | -62.2176 | -58.7892 | CTD recovered |
| 24/11/2017 15:29 | **9** | -62.2176 | -58.7892 | CTD on deck |
| 24/11/2017 15:32 | | -62.2176 | -58.7892 | Vessel off DP |
| 24/11/2017 15:35 | **10** | -62.2164 | -58.7907 | Commenced TOPAZ transect MC1-->MC5 |
| 24/11/2017 16:03 | | -62.2028 | -58.7308 | Vessel on DP @ MC5 |
| 24/11/2017 16:26 | **11** | -62.2036 | -58.731 | SUCS deployed |
| 24/11/2017 16:28 | **11** | -62.2036 | -58.731 | SUCS @ bottom (76m) |
| 24/11/2017 16:35 | **11** | -62.2036 | -58.7311 | Commenced move @ 0.2 kts for SUCS survey |
| 24/11/2017 17:03 | **11** | -62.2043 | -58.734 | SUCS completed. Commenced move to MC4 |
| 24/11/2017 17:12 | | -62.2057 | -58.7402 | Stern thruster failed. Science suspended. |
| 24/11/2017 21:16 | | -62.2349 | -58.8108 | Vessel proceeding back to Marian cove |
| 24/11/2017 21:36 | | -62.2174 | -58.7893 | Vessel on DP at MC1 location |
| 24/11/2017 21:40 | **12** | -62.2175 | -58.7892 | SUCS deployed |
| 24/11/2017 21:42 | **12** | -62.2175 | -58.7892 | SUCS on bottom (93m) |
| 24/11/2017 21:43 | **12** | -62.2175 | -58.7892 | Commence move ahead at 0.2 kts for SUCS |
| 24/11/2017 22:12 | **12** | -62.2181 | -58.7866 | SUCS complete. Commence recovery |
| 24/11/2017 22:13 | **12** | -62.2181 | -58.7866 | SUCS recovered to deck |
| 24/11/2017 22:14 | | -62.2181 | -58.7866 | Vessel off DP. Proceeding to MC2 location |
| 24/11/2017 22:28 | | -62.2123 | -58.7704 | Vessel on DP at MC2 location |
| 24/11/2017 22:31 | **13** | -62.2124 | -58.7705 | SUCS deployed |
| 24/11/2017 22:33 | **13** | -62.2124 | -58.7705 | SUCS on bottom (depth 103m) |
| 24/11/2017 22:34 | **13** | -62.2124 | -58.7705 | Commence move ahead at 0.2 kts for SUCS |
| 24/11/2017 23:00 | **13** | -62.2131 | -58.7681 | SUCS complete. Commence recovery |
| 24/11/2017 23:02 | **13** | -62.2132 | -58.768 | SUCS at surface |
| 24/11/2017 23:03 | **13** | -62.2132 | -58.768 | SUCS recovered and vsl off DP |
| 24/11/2017 23:17 | **14** | -62.208 | -58.7496 | On DP Location MC3 |
| 24/11/2017 23:21 | **14** | -62.208 | -58.7496 | SUCS Deployed |
| 24/11/2017 23:24 | **14** | -62.208 | -58.7496 | SUCS at the bottom (91m) |
| 25/11/2017 00:02 | **14** | -62.2084 | -58.7454 | SUCS complete. Commence recovery |
| 25/11/2017 00:03 | **14** | -62.2084 | -58.7454 | SUCS at surface |
| 25/11/2017 00:05 | **14** | -62.2084 | -58.7454 | SUCS on deck. Vsl off DP |
| 25/11/2017 00:14 | **15** | -62.2054 | -58.7413 | VSL on DP. Location MC4 |
| 25/11/2017 00:17 | **15** | -62.2054 | -58.7413 | SUCS deployed |
| 25/11/2017 00:20 | **15** | -62.2054 | -58.7414 | SUCS at depth 96m |
| 25/11/2017 00:54 | **15** | -62.2062 | -58.7377 | SUCS complete. Commence recovery |
| 25/11/2017 00:56 | **15** | -62.2062 | -58.7378 | SUCS at surface |
| 25/11/2017 00:57 | **15** | -62.2062 | -58.7378 | SUCS recovered on deck |

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| 25/11/2017 01:02 | | -62.2062 | -58.7378 | VSL off DP |
| 25/11/2017 01:15 | | -62.2041 | -58.7335 | VSL on DP at MC5A |
| 25/11/2017 01:17 | | -62.2041 | -58.7336 | Moving vsl to position MC5A |
| 25/11/2017 02:03 | **16** | -62.2044 | -58.7337 | Grab off the deck |
| 25/11/2017 02:06 | **16** | -62.2043 | -58.7337 | Grab deployed |
| 25/11/2017 02:10 | **16** | -62.2043 | -58.7337 | Grab deployment held. |
| 25/11/2017 02:15 | **16** | -62.2044 | -58.7337 | Commencing recovering of grab |
| 25/11/2017 02:20 | **16** | -62.2044 | -58.7338 | Grab at surface |
| 25/11/2017 02:21 | **16** | -62.2044 | -58.7337 | Grab on deck |
| 25/11/2017 07:40 | | -62.2042 | -58.7339 | Plan changed to abandon grab work and start Plankton net work. Commence changing over equipment |
| 25/11/2017 08:40 | **17** | -62.2042 | -58.734 | Science resumed. Plankton net deployed |
| 25/11/2017 08:43 | **17** | -62.2043 | -58.734 | Plankton net stopped at depth 90m |
| 25/11/2017 08:44 | **17** | -62.2042 | -58.734 | Commence hauling plankton net |
| 25/11/2017 08:52 | **17** | -62.2043 | -58.734 | Plankton net recovered to deck |
| 25/11/2017 08:54 | **18** | -62.2043 | -58.734 | Plankton net deployed |
| 25/11/2017 08:59 | **18** | -62.2043 | -58.734 | Plankton net stopped at depth 90m. Commence hauling |
| 25/11/2017 09:06 | **18** | -62.2043 | -58.734 | Plankton net recovered to deck |
| 25/11/2017 09:09 | **19** | -62.2043 | -58.734 | Plankton net deployed |
| 25/11/2017 09:15 | **19** | -62.2042 | -58.734 | Net at 90m hauling |
| 25/11/2017 09:20 | **19** | -62.2042 | -58.734 | Plankton net recovered to deck |
| 25/11/2017 09:38 | **20** | -62.2042 | -58.7342 | Test VMP deployed. |
| 25/11/2017 10:11 | **20** | -62.2037 | -58.7342 | VMP recovered to deck |
| 25/11/2017 10:21 | | -62.2038 | -58.7345 | Commence move on DP to MC4 location |
| 25/11/2017 10:32 | | -62.2055 | -58.7403 | Vessel in position at MC4 |
| 25/11/2017 10:33 | **21** | -62.2055 | -58.7403 | Plankton net deployed |
| 25/11/2017 10:37 | **21** | -62.2056 | -58.74 | Plankton net stopped at depth 75m. Commence recovery |
| 25/11/2017 10:42 | **21** | -62.2057 | -58.7399 | Plankton net recovered to deck |
| 25/11/2017 10:44 | **22** | -62.2056 | -58.7398 | Plankton net deployed |
| 25/11/2017 10:48 | **22** | -62.2056 | -58.7398 | Plankton net stopped at depth 75m. Commence recovery |
| 25/11/2017 10:53 | **22** | -62.2056 | -58.7398 | Plankton net recovered to deck |
| 25/11/2017 10:56 | **23** | -62.2056 | -58.7398 | Plankton net deployed |
| 25/11/2017 10:59 | **23** | -62.2056 | -58.7398 | Plankton net stopped at depth 75m. Commence recovery |
| 25/11/2017 11:04 | **23** | -62.2056 | -58.7398 | Net surfaced |
| 25/11/2017 11:05 | **23** | -62.2056 | -58.7398 | Net on deck |
| 25/11/2017 11:07 | **23** | -62.2056 | -58.7398 | Vsl off DP. Proceeding to MC3 |
| 25/11/2017 11:17 | **24** | -62.2081 | -58.7483 | Vsl on DP in position MC3 |
| 25/11/2017 11:18 | **24** | -62.2081 | -58.7483 | Deploying plankton net in position MC3 |
| 25/11/2017 11:23 | **24** | -62.2081 | -58.7483 | Net at the bottom. 80m. Starting to recover |
| 25/11/2017 11:29 | **24** | -62.2081 | -58.7483 | Net at the surface |
| 25/11/2017 11:30 | **24** | -62.2081 | -58.7483 | Net on deck |
| 25/11/2017 11:34 | **25** | -62.208 | -58.7482 | Deploying plankton net. MC3 |
| 25/11/2017 11:40 | **25** | -62.208 | -58.7481 | Plankton Net at Depth. Commenced Recovery. |

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| 25/11/2017 11:46 | **25** | -62.208 | -58.7481 | Net at the surface |
| 25/11/2017 11:47 | **25** | -62.208 | -58.7481 | Net on deck |
| 25/11/2017 11:48 | **26** | -62.208 | -58.7481 | plankton net off the deck at MC3 |
| 25/11/2017 11:50 | **26** | -62.208 | -58.7481 | Plankton net deployed at MC3 |
| 25/11/2017 11:54 | **26** | -62.208 | -58.7481 | Net at depth. Commence recovery |
| 25/11/2017 12:02 | **26** | -62.208 | -58.7481 | Net at surface |
| 25/11/2017 12:02 | **26** | -62.208 | -58.7481 | Net on deck |
| 25/11/2017 12:04 | **26** | -62.208 | -58.7481 | VSL off DP. Proceeding to MC2 |
| 25/11/2017 12:17 | **27** | -62.2128 | -58.7692 | VSL on DP. Location MC2 |
| 25/11/2017 12:18 | **27** | -62.2127 | -58.7693 | Net off the deck |
| 25/11/2017 12:19 | **27** | -62.2127 | -58.7692 | Plankton net deployed at MC2 |
| 25/11/2017 12:24 | **27** | -62.2128 | -58.7692 | Plankton net at depth. Commence recovery |
| 25/11/2017 12:31 | **27** | -62.2128 | -58.7692 | Net at surface |
| 25/11/2017 12:32 | **27** | -62.2128 | -58.7692 | Net on deck |
| 25/11/2017 12:33 | **28** | -62.2128 | -58.7692 | Deploying plankton net at MC2 |
| 25/11/2017 12:33 | **28** | -62.2128 | -58.7692 | Plankton net deployed at MC2 |
| 25/11/2017 12:38 | **28** | -62.2128 | -58.7692 | Plankton net at depth. Commence recovery |
| 25/11/2017 12:45 | **28** | -62.2128 | -58.7693 | Net at surface |
| 25/11/2017 12:46 | **28** | -62.2128 | -58.7693 | Net on deck |
| 25/11/2017 12:47 | **29** | -62.2128 | -58.7693 | Deploying net at MC2 |
| 25/11/2017 12:48 | **29** | -62.2128 | -58.7693 | Plankton net deployed at MC2 |
| 25/11/2017 12:53 | **29** | -62.2128 | -58.7693 | Plankton net at depth. Commence recovery |
| 25/11/2017 13:00 | **29** | -62.2128 | -58.7693 | Net at surface |
| 25/11/2017 13:01 | **29** | -62.2128 | -58.7693 | Net on deck |
| 25/11/2017 13:01 | **29** | -62.2128 | -58.7693 | Net on deck. Vsl off DP. Proceeding to MC1 |
| 25/11/2017 13:14 | **30** | -62.2175 | -58.7887 | Vsl on DP at MC1 |
| 25/11/2017 13:16 | **30** | -62.2175 | -58.7887 | Deploying plankton net at MC1 |
| 25/11/2017 13:17 | **30** | -62.2175 | -58.7887 | Plankton net deployed at MC1 |
| 25/11/2017 13:21 | **30** | -62.2175 | -58.7887 | Plankton net at depth. Commence Recovery |
| 25/11/2017 13:26 | **30** | -62.2175 | -58.7887 | Net at surface |
| 25/11/2017 13:27 | **30** | -62.2175 | -58.7887 | Net on deck |
| 25/11/2017 13:28 | **31** | -62.2175 | -58.7887 | Deploying plankton net at MC1 |
| 25/11/2017 13:29 | **31** | -62.2175 | -58.7887 | Plankton net deployed at MC1 |
| 25/11/2017 13:34 | **31** | -62.2175 | -58.7887 | Plankton net at depth. Commence recovery |
| 25/11/2017 13:39 | **31** | -62.2175 | -58.7887 | Net at surface |
| 25/11/2017 13:40 | **31** | -62.2175 | -58.7887 | Plankton net on deck |
| 25/11/2017 13:41 | **32** | -62.2175 | -58.7887 | Deploying plankton net at MC1 |
| 25/11/2017 13:42 | **32** | -62.2175 | -58.7887 | Plankton net deployed at MC1 |
| 25/11/2017 13:47 | **32** | -62.2175 | -58.7887 | Plankton net at depth. Commence recovery |
| 25/11/2017 13:52 | **32** | -62.2175 | -58.7887 | Net at surface |
| 25/11/2017 13:53 | **32** | -62.2175 | -58.7887 | Net on deck |
| 25/11/2017 18:28 | | -62.2126 | -58.769 | 30T traction winch fully operational and science is resumed. Vessel @ MC2 for grab deployment. |

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| 25/11/2017 18:36 | **33** | -62.2127 | -58.7691 | Grab deployed |
| 25/11/2017 18:41 | **33** | -62.2126 | -58.7691 | Grab @ bottom; commenced recovery. (~100m) |
| 25/11/2017 18:46 | **33** | -62.2127 | -58.7691 | Grab recovered |
| 25/11/2017 18:53 | **34** | -62.2127 | -58.7691 | Grab deployed |
| 25/11/2017 18:58 | **34** | -62.2127 | -58.7691 | Grab @ bottom; commenced recovery. (~100m) |
| 25/11/2017 19:03 | **34** | -62.2127 | -58.7691 | Grab recovered to deck |
| 25/11/2017 19:10 | **35** | -62.2127 | -58.769 | Grab deployed |
| 25/11/2017 19:15 | **35** | -62.2126 | -58.769 | Grab on bottom (102m). Commence recovery |
| 25/11/2017 19:21 | **35** | -62.2126 | -58.769 | Grab recovered to deck |
| 25/11/2017 19:26 | | -62.2126 | -58.769 | Commence move on DP to MC3 |
| 25/11/2017 19:42 | | -62.2082 | -58.7486 | Vessel in position at MC3 |
| 25/11/2017 19:45 | **36** | -62.2081 | -58.7484 | Grab deployed |
| 25/11/2017 19:49 | **36** | -62.2081 | -58.7484 | Grab on bottom (102m). Commence recovery |
| 25/11/2017 19:54 | **36** | -62.2081 | -58.7484 | Grab recovered to deck |
| 25/11/2017 19:56 | **37** | -62.2081 | -58.7483 | Grab deployed |
| 25/11/2017 20:00 | **37** | -62.2081 | -58.7483 | Grab on bottom (102m) Commence recovery |
| 25/11/2017 20:04 | **37** | -62.2081 | -58.7483 | Grab recovered to deck |
| 25/11/2017 20:08 | **38** | -62.2081 | -58.7482 | Grab deployed |
| 25/11/2017 20:11 | **38** | -62.2081 | -58.7482 | Grab on bottom (103m) Commence recovery |
| 25/11/2017 20:16 | **38** | -62.2082 | -58.7482 | Grab recovered to deck |
| 25/11/2017 20:27 | **39** | -62.2081 | -58.7482 | Grab deployed |
| 25/11/2017 20:31 | **39** | -62.2081 | -58.7481 | Grab on bottom (103m) Commence recovery |
| 25/11/2017 20:35 | **39** | -62.2081 | -58.7482 | Grab recovered to deck |
| 25/11/2017 20:37 | | -62.2081 | -58.7481 | Commence move on DP to MC4 |
| 25/11/2017 20:53 | | -62.2057 | -58.7399 | Vessel in position at MC4 |
| 25/11/2017 22:00 | **40** | -62.2057 | -58.7398 | Grab deployed |
| 25/11/2017 22:04 | **40** | -62.2057 | -58.7398 | Grab on bottom (113m) Commence recovery |
| 25/11/2017 22:09 | **40** | -62.2057 | -58.7398 | Grab recovered to deck |
| 25/11/2017 22:11 | **41** | -62.2057 | -58.7398 | Grab deployed |
| 25/11/2017 22:15 | **41** | -62.2057 | -58.7398 | Grab on bottom (113m) |
| 25/11/2017 22:16 | **41** | -62.2057 | -58.7398 | Commence recovery of grab |
| 25/11/2017 22:22 | **41** | -62.2057 | -58.7398 | Grab recovered to deck |
| 25/11/2017 22:25 | **42** | -62.2057 | -58.7397 | Grab deployed |
| 25/11/2017 22:30 | **42** | -62.2057 | -58.7397 | Grab on bottom (113m) Commence recovery |
| 25/11/2017 22:36 | **42** | -62.2057 | -58.7397 | Grab recovered to deck |
| 25/11/2017 22:39 | **43** | -62.2057 | -58.7397 | Grab deployed |
| 25/11/2017 22:44 | **43** | -62.2057 | -58.7396 | Grab on bottom (114m) Commence recovery |
| 25/11/2017 22:50 | **43** | -62.2057 | -58.7396 | Grab recovered to deck |
| 25/11/2017 22:53 | | -62.2057 | -58.7396 | Commence move on DP to MC5b |
| 25/11/2017 23:03 | | -62.2044 | -58.7348 | Vessel in position at MC5b |
| 25/11/2017 23:06 | **44** | -62.2043 | -58.7346 | Grab deployed at MC5B |
| 25/11/2017 23:12 | **44** | -62.2043 | -58.7347 | Grab at bottom (119m) Commence recovery |

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| 25/11/2017 23:17 | **44** | -62.2043 | -58.7346 | Grab lifted clear of seabed. Moving ship 5m astern |
| 25/11/2017 23:19 | **44** | -62.2043 | -58.7345 | Lowering grab |
| 25/11/2017 23:23 | **44** | -62.2043 | -58.7345 | Grab aborted due to sea bottom |
| 25/11/2017 23:28 | **44** | -62.2043 | -58.7345 | Grab recovered on deck |
| 25/11/2017 23:30 | | -62.2043 | -58.7345 | Ship moved 5m astern |
| 25/11/2017 23:32 | **45** | -62.2043 | -58.7345 | Grab deployed |
| 25/11/2017 23:38 | **45** | -62.2043 | -58.7344 | Grab at depth. 115m. Commence recovery |
| 25/11/2017 23:43 | **45** | -62.2043 | -58.7345 | Grab recovered on deck |
| 25/11/2017 23:45 | | -62.2043 | -58.7344 | Ship moving 5m astern |
| 25/11/2017 23:46 | **46** | -62.2043 | -58.7344 | Grab deployed |
| 25/11/2017 23:52 | **46** | -62.2043 | -58.7344 | Grab at depth 119m. Commence recovery |
| 25/11/2017 23:59 | **46** | -62.2043 | -58.7343 | Grab recovered on deck. Did not fire |
| 26/11/2017 00:01 | | -62.2043 | -58.7343 | Vsl moved 5m astern |
| 26/11/2017 00:02 | **47** | -62.2043 | -58.7342 | Grab deployed |
| 26/11/2017 00:07 | **47** | -62.2043 | -58.7342 | Grab at depth 114m. Commence recovery |
| 26/11/2017 00:12 | **47** | -62.2043 | -58.7342 | Grab recovered on deck |
| 26/11/2017 00:14 | | -62.2043 | -58.7342 | Grab work complete bridge |
| 26/11/2017 00:24 | | -62.2046 | -58.7322 | Vsl in position at SOL5 |
| 26/11/2017 00:50 | | -62.2045 | -58.7321 | Wire ready on stern gantry awaiting finish of mud siving prior to starting trawl |
| 26/11/2017 01:55 | **48** | -62.2045 | -58.7321 | Speeding up to deployment speed for the trawl in position at SOL5 |
| 26/11/2017 01:59 | **48** | -62.2047 | -58.7326 | Trawl deployed in the water for SOL5 |
| 26/11/2017 02:05 | **48** | -62.2053 | -58.734 | Trawl at the bottom |
| 26/11/2017 02:09 | **48** | -62.2057 | -58.7349 | Begin hauling cable |
| 26/11/2017 02:13 | **48** | -62.206 | -58.7355 | Trawl off the bottom |
| 26/11/2017 02:17 | **48** | -62.2063 | -58.7364 | Trawl clear of the water |
| 26/11/2017 02:24 | | -62.2064 | -58.7368 | Vessel moving to line 4 |
| 26/11/2017 02:33 | | -62.2066 | -58.7394 | Vessel in position for line 4 |
| 26/11/2017 02:38 | **49** | -62.2066 | -58.7399 | Commenced deployment of trawl for line 4 |
| 26/11/2017 02:41 | **49** | -62.2067 | -58.7403 | Trawl deployed for line 4 |
| 26/11/2017 02:47 | **49** | -62.2071 | -58.7419 | Trawl at the bottom |
| 26/11/2017 02:49 | **49** | -62.2071 | -58.7423 | All stopped trawling |
| 26/11/2017 02:54 | **49** | -62.2074 | -58.7436 | Commence haul |
| 26/11/2017 03:03 | **49** | -62.2077 | -58.7451 | Agassiz Trawl recovered |
| 26/11/2017 03:07 | | -62.2079 | -58.7456 | Vessel re-positioning to line 3 for next Agassiz Trawl |
| 26/11/2017 03:11 | | -62.2084 | -58.7465 | Vessel standing by for next Agassiz Trawl deployment |
| 26/11/2017 04:51 | **50** | -62.2099 | -58.7517 | Commenced deployment of Agassiz Trawl |
| 26/11/2017 04:56 | **50** | -62.21 | -58.752 | Agassiz Trawl deployed |
| 26/11/2017 05:02 | **50** | -62.2104 | -58.7534 | Commenced trawl @ 0.5kts for 5 mins (wire out 100m) |
| 26/11/2017 05:07 | **50** | -62.2107 | -58.7546 | Commenced recovery of Agassiz Trawl |
| 26/11/2017 05:13 | **50** | -62.211 | -58.7557 | Agassiz Trawl recovered. Vessel re-positioning to line 2 for next Agassiz Trawl deployment. |

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| 26/11/2017 05:31 | | -62.2125 | -58.7663 | Vessel standing by for next Agassiz Trawl deployment |
| 26/11/2017 06:05 | **51** | -62.2125 | -58.7667 | Commenced Agassiz Trawl deployment |
| 26/11/2017 06:07 | **51** | -62.2126 | -58.767 | Agassiz Trawl deployed |
| 26/11/2017 06:14 | **51** | -62.2129 | -58.7685 | Commenced trawl @ 0.5 kts for 5 mins (wire out 160m) |
| 26/11/2017 06:20 | **51** | -62.2133 | -58.7701 | Commenced recovery of Agassiz Trawl |
| 26/11/2017 06:28 | **51** | -62.2136 | -58.7715 | Agassiz Trawl recovered. Vessel re-positioning for next deployment at line 1 |
| 26/11/2017 06:46 | | -62.2154 | -58.7853 | Vessel standing by for next Agassiz Trawl deployment |
| 26/11/2017 07:19 | **52** | -62.2157 | -58.7872 | Commence AGT deployment |
| 26/11/2017 07:21 | **52** | -62.2157 | -58.7875 | AGT deployed |
| 26/11/2017 07:25 | **52** | -62.2159 | -58.7884 | AGT on bottom |
| 26/11/2017 07:28 | **52** | -62.216 | -58.7892 | Commence trawl at 0.5 kts for 5 mins (wire out 160m) |
| 26/11/2017 07:33 | **52** | -62.2163 | -58.7906 | Commence recovery of AGT |
| 26/11/2017 07:40 | **52** | -62.2164 | -58.7918 | AGT recovered to deck |
| 26/11/2017 07:50 | | -62.2165 | -58.7919 | Commence move on DP to MC2 |
| 26/11/2017 08:15 | | -62.2127 | -58.7692 | Vessel in position at MC2 |
| 26/11/2017 09:11 | **53** | -62.2126 | -58.7691 | Multicorer off the deck |
| 26/11/2017 09:12 | **53** | -62.2126 | -58.7691 | Multicorer deployed. |
| 26/11/2017 09:17 | **53** | -62.2126 | -58.7691 | Multicorer on bottom (104m) |
| 26/11/2017 09:18 | **53** | -62.2126 | -58.7691 | Commence recovery of Mulitcorer |
| 26/11/2017 09:24 | **53** | -62.2126 | -58.7691 | Multicorer recovered to deck |
| 26/11/2017 09:33 | | -62.2127 | -58.7691 | Commence move on DP to MC3 |
| 26/11/2017 09:49 | | -62.208 | -58.7482 | Vessel in position at MC3 |
| 26/11/2017 11:40 | **54** | -62.2081 | -58.7481 | Commence multi corer deployment |
| 26/11/2017 11:41 | **54** | -62.2081 | -58.7481 | Multi corer deployed at MC3 |
| 26/11/2017 11:45 | **54** | -62.2081 | -58.7481 | Multi corer at the bottom 105m |
| 26/11/2017 11:46 | **54** | -62.2081 | -58.7481 | Commence recovery |
| 26/11/2017 11:49 | **54** | -62.2081 | -58.7481 | Multi corer recovered to deck |
| 26/11/2017 11:57 | | -62.2081 | -58.7481 | Vsl proceeding to MC2 |
| 26/11/2017 12:23 | | -62.2127 | -58.7692 | Vsl in position at MC2 |
| 26/11/2017 12:24 | | -62.2127 | -58.7692 | Vsl off DP proceeding to MC4 |
| 26/11/2017 12:52 | | -62.2056 | -58.7395 | Vsl on DP |
| 26/11/2017 12:56 | | -62.2057 | -58.7397 | Vsl in position at MC4 |
| 26/11/2017 13:06 | **55** | -62.2057 | -58.7397 | commence multi corer deployment at MC4 |
| 26/11/2017 13:08 | **55** | -62.2057 | -58.7397 | Multicorer deployed at MC4 |
| 26/11/2017 13:12 | **55** | -62.2057 | -58.7397 | Corer at the bottom 119m |
| 26/11/2017 13:13 | **55** | -62.2057 | -58.7397 | Commence recovery |
| 26/11/2017 13:17 | **55** | -62.2057 | -58.7397 | Multicorer recovered to deck bridge |
| 26/11/2017 13:21 | | -62.2057 | -58.7396 | Vsl moved 5m astern |
| 26/11/2017 13:25 | **56** | -62.2057 | -58.7396 | Commence multicorer deployment at MC4 |
| 26/11/2017 13:27 | **56** | -62.2057 | -58.7396 | Multicorer deployed at MC4 |
| 26/11/2017 13:31 | **56** | -62.2057 | -58.7396 | Multicorer on the seabed |
| 26/11/2017 13:32 | **56** | -62.2057 | -58.7396 | Hauling |

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| 26/11/2017 13:36 | **56** | -62.2057 | -58.7396 | Multicorer recovered on deck. Did not fire |
| 26/11/2017 13:39 | | -62.2057 | -58.7396 | Vsl moved 5m astern |
| 26/11/2017 13:59 | **57** | -62.2057 | -58.7395 | Commencing deployment of multicorer at MC4 |
| 26/11/2017 14:00 | **57** | -62.2057 | -58.7395 | Multicorer deployed at MC4 |
| 26/11/2017 14:05 | **57** | -62.2057 | -58.7395 | Multicorer at the bottom 117m |
| 26/11/2017 14:06 | **57** | -62.2057 | -58.7395 | Commence recovery |
| 26/11/2017 14:10 | **57** | -62.2057 | -58.7395 | Multicorer recovered to deck |
| 26/11/2017 14:39 | | -62.2057 | -58.7395 | Vsl off DP finished this station |
| 27/11/2017 10:34 | **58** | -64.7774 | -63.4665 | XBT deployed at Borgen Bay (Speed 5.0 kts) |
| 27/11/2017 10:38 | **58** | -64.7779 | -63.4787 | XBT released |
| 27/11/2017 10:45 | **59** | -64.7774 | -63.4969 | Commence SWATH survey of Borgen Bay |
| 27/11/2017 13:06 | | -64.7035 | -63.4503 | Vsl on DP at BB5 |
| 27/11/2017 13:07 | **60** | -64.7035 | -63.4503 | Commence CTD deployment |
| 27/11/2017 13:14 | **60** | -64.7035 | -63.4503 | CTD deployed at BB5 |
| 27/11/2017 13:17 | **60** | -64.7035 | -63.4503 | CTD at depth. Wire out 275m. Commenced recovery. |
| 27/11/2017 13:35 | **60** | -64.7036 | -63.4512 | CTD at surface |
| 27/11/2017 13:37 | **60** | -64.7037 | -63.4519 | CTD on deck |
| 27/11/2017 13:38 | | -64.7037 | -63.4519 | Vsl off DP. Continuing swath survey |
| 27/11/2017 14:18 | | -64.7111 | -63.454 | Vsl on DP at BB4 |
| 27/11/2017 14:23 | **61** | -64.7111 | -63.4537 | Commencing CTD deployment at BB4 |
| 27/11/2017 14:24 | **61** | -64.7111 | -63.4537 | CTD deployed at BB4 |
| 27/11/2017 14:36 | **61** | -64.7111 | -63.4543 | CTD recovered on deck after test |
| 27/11/2017 14:51 | **62** | -64.7111 | -63.4547 | Commence deployment of CTD at BB4 |
| 27/11/2017 14:52 | **62** | -64.7111 | -63.4547 | CTD deployed at BB4 |
| 27/11/2017 15:00 | **62** | -64.7111 | -63.4547 | CTD @ depth (wire out 273m); commenced recovery |
| 27/11/2017 15:20 | **62** | -64.7111 | -63.4548 | CTD recovered |
| 27/11/2017 15:21 | **62** | -64.7111 | -63.4548 | CTD on deck |
| 27/11/2017 15:22 | | -64.7111 | -63.4548 | Vessel off DP and resuming Swath survey |
| 27/11/2017 16:04 | | -64.7182 | -63.4582 | Vessel on DP @ BB3 |
| 27/11/2017 16:07 | **63** | -64.7183 | -63.458 | CTD off deck |
| 27/11/2017 16:09 | **63** | -64.7184 | -63.458 | CTD deployed |
| 27/11/2017 16:17 | **63** | -64.7184 | -63.458 | CTD @ depth (wire out 295m); commenced recovery |
| 27/11/2017 16:40 | **63** | -64.7184 | -63.458 | CTD recovered |
| 27/11/2017 16:42 | **63** | -64.7184 | -63.458 | CTD on deck. Vessel off DP and resuming Swath survey. |
| 27/11/2017 17:14 | | -64.7262 | -63.4525 | Vessel on DP @ BB2 |
| 27/11/2017 17:16 | **64** | -64.7262 | -63.4524 | CTD off deck |
| 27/11/2017 17:17 | **64** | -64.7262 | -63.4524 | CTD deployed |
| 27/11/2017 17:24 | **64** | -64.7262 | -63.4524 | CTD @ depth (wire out 244m); commenced recovery |
| 27/11/2017 17:49 | **64** | -64.7258 | -63.4515 | CTD recovered |
| 27/11/2017 17:50 | **64** | -64.7258 | -63.4515 | CTD on deck. Vessel off DP and resuming Swath survey |
| 27/11/2017 18:26 | | -64.7416 | -63.4534 | Vessel on DP @ BB1 |
| 27/11/2017 18:27 | **65** | -64.7417 | -63.4534 | CTD off deck |

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| 27/11/2017 18:28 | **65** | -64.7417 | -63.4535 | CTD deployed |
| 27/11/2017 18:37 | **65** | -64.7417 | -63.4534 | CTD @ depth (wire out 246m); commenced recovery |
| 27/11/2017 19:10 | **65** | -64.7419 | -63.4533 | CTD recovered to deck |
| 27/11/2017 19:53 | **66** | -64.7415 | -63.4534 | SUCS deployed |
| 27/11/2017 19:57 | **66** | -64.7415 | -63.4534 | SUCS on bottom (252m) |
| 27/11/2017 19:58 | **66** | -64.7415 | -63.4534 | Commence move at 0.2 kts for SUCS |
| 27/11/2017 20:22 | **66** | -64.7405 | -63.4554 | SUCS complete. Commence recovery |
| 27/11/2017 20:27 | **66** | -64.7403 | -63.4559 | SUCS recovered to deck |
| 27/11/2017 20:29 | | -64.7403 | -63.4559 | Commence move on DP to BBX |
| 27/11/2017 20:42 | | -64.7353 | -63.4557 | Vessel stopped in positon at BBX |
| 27/11/2017 21:14 | **67** | -64.7329 | -63.4555 | SUCS deployed |
| 27/11/2017 21:17 | **67** | -64.7329 | -63.4553 | SUCS on bottom (135m) |
| 27/11/2017 21:18 | **67** | -64.7329 | -63.4554 | Commence move at 0.2 kts for SUCS |
| 27/11/2017 21:40 | **67** | -64.7341 | -63.4554 | SUCS complete. Commence recovery |
| 27/11/2017 21:43 | **67** | -64.7342 | -63.4554 | SUCS out of water. Not recovered to deck |
| 27/11/2017 21:45 | | -64.7342 | -63.4554 | Commence move on joystick DP to BB2 |
| 27/11/2017 22:05 | | -64.726 | -63.4527 | Vessel stopped in position BB2 |
| 27/11/2017 22:06 | **68** | -64.726 | -63.4527 | SUCS deployed |
| 27/11/2017 22:10 | **68** | -64.726 | -63.4527 | SUCS on bottom (251m) |
| 27/11/2017 22:11 | **68** | -64.726 | -63.4527 | Commence move at 0.2 kts for SUCS |
| 27/11/2017 22:35 | **68** | -64.7269 | -63.4505 | SUCS complete. Commence recovery |
| 27/11/2017 22:40 | **68** | -64.727 | -63.4503 | SUCS out of water. Not recovered to deck |
| 27/11/2017 22:41 | | -64.727 | -63.4503 | Commence move on joystick DP to BB3 |
| 27/11/2017 23:06 | | -64.7184 | -63.458 | Vsl stopped on DP in position BB3 |
| 27/11/2017 23:08 | **69** | -64.7184 | -63.458 | SUCS deployed at BB3 |
| 27/11/2017 23:14 | **69** | -64.7185 | -63.4579 | SUCS at the bottom at BB3 |
| 27/11/2017 23:46 | **69** | -64.72 | -63.4568 | Commence recovery |
| 27/11/2017 23:52 | **69** | -64.7202 | -63.4564 | SUCS clear of the water |
| 27/11/2017 23:53 | | -64.7202 | -63.4565 | Vsl making way on DP to BB4 |
| 28/11/2017 00:15 | | -64.713 | -63.4547 | Vsl in position at BB4 |
| 28/11/2017 00:18 | | -64.713 | -63.4548 | Technical issue with SUCS. Recovering onboard |
| 28/11/2017 00:22 | | -64.7129 | -63.4547 | SUCS recovered on deck for technical issue |
| 28/11/2017 01:31 | **70** | -64.7125 | -63.4539 | Commence deployment of SUCS |
| 28/11/2017 01:32 | **70** | -64.7125 | -63.4539 | SUCS deployed at BB4 |
| 28/11/2017 01:37 | **70** | -64.7126 | -63.4538 | SUCS at bottom |
| 28/11/2017 02:09 | **70** | -64.7135 | -63.457 | Commence recovery |
| 28/11/2017 02:15 | **70** | -64.7137 | -63.4575 | SUCS recovered to deck |
| 28/11/2017 02:17 | | -64.7137 | -63.4575 | Vsl proceeding to BB5 off DP |
| 28/11/2017 02:40 | | -64.7034 | -63.45 | Vsl on DP at BB5 |
| 28/11/2017 02:42 | **71** | -64.7034 | -63.45 | Commence deploying SUCS at BB5 |
| 28/11/2017 02:43 | **71** | -64.7034 | -63.45 | SUCS deployed at BB5 |
| 28/11/2017 02:52 | **71** | -64.7035 | -63.4501 | SUCS at the bottom |

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| 28/11/2017 02:56 | **71** | -64.7036 | -63.4508 | Commence recovery of SUCS |
| 28/11/2017 03:02 | **71** | -64.7036 | -63.4511 | SUCS recovered. Vessel repositioning to start of BB5 transect for Agassiz Trawl deployment. |
| 28/11/2017 03:35 | **72** | -64.7034 | -63.4478 | Commenced deployment of Agassiz Trawl |
| 28/11/2017 03:37 | **72** | -64.7035 | -63.4481 | Agassiz Trawl deployed |
| 28/11/2017 03:53 | **72** | -64.7038 | -63.4521 | Commenced trawl @ 0.3 kts for 5 mins (wire out 450m) |
| 28/11/2017 03:58 | **72** | -64.704 | -63.4532 | Commenced recovery of Agassiz Trawl |
| 28/11/2017 04:16 | **72** | -64.7043 | -63.4566 | Agassiz Trawl recovered |
| 28/11/2017 04:17 | | -64.7043 | -63.4568 | Vessel off DP and relocating to BB4 transect |
| 28/11/2017 04:33 | | -64.7122 | -63.4519 | Vessel on DP for Agassiz Trawl deployment @ BB4 |
| 28/11/2017 04:39 | **73** | -64.7121 | -63.4523 | Commenced Agassiz Trawl deployment |
| 28/11/2017 04:41 | **73** | -64.7121 | -63.4526 | Agassiz Trawl deployed |
| 28/11/2017 04:57 | **73** | -64.713 | -63.456 | Commenced trawl @ 0.3 kts for 5 mins (wire out 450m) |
| 28/11/2017 05:02 | **73** | -64.7132 | -63.457 | Commenced recovery of Agassiz Trawl |
| 28/11/2017 05:18 | **73** | -64.7138 | -63.4597 | Agassiz Trawl recovered. Vessel off DP and relocating to BB3 transect. |
| 28/11/2017 05:27 | | -64.7164 | -63.4565 | Vessel on DP for Agassiz Trawl deployment @ BB3 |
| 28/11/2017 05:35 | **74** | -64.7171 | -63.4564 | Commenced deployment of Agassiz Trawl |
| 28/11/2017 05:37 | **74** | -64.7172 | -63.4564 | Agassiz Trawl deployed |
| 28/11/2017 05:53 | **74** | -64.719 | -63.4563 | Commenced trawl @ 0.3 kts for 5 min (wire out 450m) |
| 28/11/2017 05:57 | **74** | -64.7193 | -63.4563 | Commenced recovery of Agassiz Trawl |
| 28/11/2017 06:12 | **74** | -64.7205 | -63.4562 | Agassiz Trawl recovered. Vessel off DP and relocating to BB2 transect. |
| 28/11/2017 06:21 | | -64.7248 | -63.4557 | Vessel on DP for Agassiz Trawl deployment @ BB2 |
| 28/11/2017 06:28 | **75** | -64.7247 | -63.4555 | Commenced deployment of Agassiz Trawl |
| 28/11/2017 06:30 | **75** | -64.7248 | -63.4552 | Agassiz Trawl deployed |
| 28/11/2017 06:46 | **75** | -64.7261 | -63.4525 | Commenced trawl @ 0.3 kts for 5 min (wire out 420m) |
| 28/11/2017 06:50 | **75** | -64.7263 | -63.452 | Commenced recovery of Agassiz Trawl |
| 28/11/2017 07:05 | **75** | -64.7273 | -63.45 | ATG recovered to deck |
| 28/11/2017 07:06 | | -64.7273 | -63.4499 | Vessel off DP. Commence move to BBX |
| 28/11/2017 07:17 | | -64.7328 | -63.4555 | Vessel on DP for AGT at BBX |
| 28/11/2017 07:22 | **76** | -64.733 | -63.4556 | AGT deployed |
| 28/11/2017 07:28 | **76** | -64.7335 | -63.4556 | AGT on bottom (132m) |
| 28/11/2017 07:30 | **76** | -64.7338 | -63.4556 | Commence trawl at 0.3 kts for 5 mins (wire out 200m) |
| 28/11/2017 07:35 | **76** | -64.7343 | -63.4556 | Commence AGT recovery |
| 28/11/2017 07:43 | **76** | -64.7349 | -63.4556 | AGT recovered to deck. Vessel off DP. Commence move to BB1 |
| 28/11/2017 07:54 | | -64.7415 | -63.4566 | Vessel on DP for AGT at BB1 |
| 28/11/2017 08:01 | **77** | -64.7415 | -63.4559 | AGT deployed |
| 28/11/2017 08:09 | **77** | -64.7414 | -63.4544 | AGT on bottom (251m) |
| 28/11/2017 08:16 | **77** | -64.7414 | -63.4523 | Commence trawl at 0.3 kts for 5 mins (wire out 400m) |
| 28/11/2017 08:21 | **77** | -64.7414 | -63.4513 | Commence AGT recovery |
| 28/11/2017 08:36 | **77** | -64.7412 | -63.4487 | AGT recovered to deck |
| 28/11/2017 08:38 | | -64.7412 | -63.4488 | Commence move on DP back to BB1 centre location |

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| 28/11/2017 08:45 | | -64.7414 | -63.4533 | Vessel stopped in position at BB1 |
| 28/11/2017 09:48 | **78** | -64.7414 | -63.4534 | Plankton net deployed |
| 28/11/2017 09:57 | **78** | -64.7414 | -63.4534 | Plankton net stopped at depth 180m. Commence recovery |
| 28/11/2017 10:10 | **78** | -64.7414 | -63.4534 | Plankton net recovered to deck |
| 28/11/2017 10:14 | **79** | -64.7414 | -63.4534 | Plankton net deployed |
| 28/11/2017 10:22 | **79** | -64.7414 | -63.4534 | Plankton net stopped at depth 180m. Commence recovery |
| 28/11/2017 10:34 | **79** | -64.7414 | -63.4534 | Plankton net recovered to deck |
| 28/11/2017 10:35 | | -64.7414 | -63.4534 | Vessel off DP. Commence move to BB2 |
| 28/11/2017 10:51 | | -64.7262 | -63.4522 | Vessel on DP at BB2 |
| 28/11/2017 10:55 | **80** | -64.7262 | -63.4522 | Plankton net deployed |
| 28/11/2017 11:03 | **80** | -64.7262 | -63.4522 | Plankton net at the bottom. Commence recovery |
| 28/11/2017 11:15 | **80** | -64.7262 | -63.4525 | Net recovered on deck |
| 28/11/2017 11:18 | **81** | -64.7262 | -63.4525 | Plankton net deployed at BB2 |
| 28/11/2017 11:26 | **81** | -64.7261 | -63.4525 | Plankton net at depth. Commence recovery |
| 28/11/2017 11:37 | **81** | -64.7262 | -63.4525 | Plankton net recovered on deck |
| 28/11/2017 11:39 | | | | Vessel off DP proceeding to BB3 |
| 28/11/2017 11:57 | | -64.7184 | -63.456 | Vsl on DP at BB3 |
| 28/11/2017 11:59 | **82** | -64.7183 | -63.4561 | Deploying plankton net at BB3 |
| 28/11/2017 12:00 | **82** | -64.7184 | -63.4561 | Plankton net deployed at BB3 |
| 28/11/2017 12:08 | **82** | -64.7184 | -63.4564 | Plankton net at depth 180m. Commence recovery |
| 28/11/2017 12:19 | **82** | -64.7185 | -63.4568 | Net recovered on deck |
| 28/11/2017 12:21 | **83** | -64.7184 | -63.4568 | Plankton net deployed at BB3 |
| 28/11/2017 12:29 | **83** | -64.7184 | -63.4569 | Plankton net at depth 180m. Commence recovery |
| 28/11/2017 12:39 | **83** | -64.7185 | -63.457 | Plankton net recovered on deck |
| 28/11/2017 12:42 | | -64.7185 | -63.457 | Off DP. Proceeding to BB4 |
| 28/11/2017 12:54 | | -64.713 | -63.4545 | Vsl on DP in position BB4 |
| 28/11/2017 12:58 | **84** | -64.7127 | -63.4546 | Plankton net deployed at BB4 |
| 28/11/2017 13:06 | **84** | -64.7128 | -63.4546 | Net at depth 180m. Commence recovery |
| 28/11/2017 13:16 | **84** | -64.7128 | -63.4546 | Plankton net recovered on deck |
| 28/11/2017 13:18 | **85** | -64.7128 | -63.4546 | Plankton net deployed |
| 28/11/2017 13:27 | **85** | -64.7128 | -63.4546 | Net at depth 180m. Commence recovery |
| 28/11/2017 13:38 | **85** | -64.7128 | -63.4546 | Net recovered on deck |
| 28/11/2017 13:39 | | -64.7128 | -63.4545 | Vsl proceeding to BB5 off DP |
| 28/11/2017 13:58 | | -64.7036 | -63.4506 | Vsl on DP at BB5 |
| 28/11/2017 13:59 | **86** | -64.7036 | -63.4506 | Plankton net deployed at BB5 |
| 28/11/2017 14:07 | **86** | -64.7037 | -63.4506 | Net at depth 180m. Commence recovery |
| 28/11/2017 14:18 | **86** | -64.7036 | -63.4505 | Net recovered on deck |
| 28/11/2017 14:21 | **87** | -64.7036 | -63.4505 | Plankton net deployed at BB5 |
| 28/11/2017 14:30 | **87** | -64.7035 | -63.4504 | Net at depth 180. Commence recovery |
| 28/11/2017 14:40 | **87** | -64.7035 | -63.4504 | Net recovered on deck |
| 28/11/2017 15:22 | **88** | -64.7034 | -63.4504 | Grab deployed |
| 28/11/2017 15:31 | **88** | -64.7035 | -63.4506 | Grab @ bottom (~284m); commenced recovery |

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| 28/11/2017 15:40 | **88** | -64.7035 | -63.4508 | Grab recovered - did not fire |
| 28/11/2017 15:43 | **89** | -64.7036 | -63.4508 | Grab deployed |
| 28/11/2017 15:50 | **89** | -64.7037 | -63.4509 | Grab @ bottom (~280m); commenced recovery |
| 28/11/2017 15:59 | **89** | -64.7037 | -63.4512 | Grab recovered - did not fire |
| 28/11/2017 16:01 | | -64.7038 | -63.4512 | Vessel off DP and relocating to BB4 |
| 28/11/2017 16:14 | | -64.7123 | -63.454 | Vessel on DP @ BB4 |
| 28/11/2017 16:17 | **90** | -64.7124 | -63.4542 | Grab deployed |
| 28/11/2017 16:26 | **90** | -64.7124 | -63.4542 | Grab @ bottom (~290m); commenced recovery |
| 28/11/2017 16:35 | **90** | -64.7124 | -63.4542 | Grab recovered |
| 28/11/2017 16:38 | **91** | -64.7123 | -63.4542 | Grab deployed |
| 28/11/2017 16:46 | **91** | -64.7123 | -63.454 | Grab @ bottom (~289m); commenced recovery |
| 28/11/2017 16:55 | **91** | -64.7122 | -63.4536 | Grab recovered |
| 28/11/2017 16:57 | **92** | -64.7122 | -63.4535 | Grab deployed |
| 28/11/2017 17:04 | **92** | -64.7121 | -63.4535 | Grab @ bottom (~286m); commenced recovery |
| 28/11/2017 17:12 | **92** | -64.7122 | -63.4535 | Grab recovered |
| 28/11/2017 17:14 | | -64.7122 | -63.4535 | Vessel off DP and relocating to BB3 |
| 28/11/2017 17:30 | | -64.7178 | -63.4576 | Vessel on DP @ BB3 |
| 28/11/2017 17:33 | **93** | -64.7177 | -63.4578 | Grab deployed |
| 28/11/2017 17:40 | **93** | -64.7179 | -63.4576 | Grab @ bottom (~303m); commenced recovery |
| 28/11/2017 17:48 | **93** | -64.718 | -63.4576 | Grab recovered |
| 28/11/2017 17:50 | **94** | -64.718 | -63.4576 | Grab deployed |
| 28/11/2017 17:57 | **94** | -64.7181 | -63.4575 | Grab @ bottom (~304m); commenced recovery |
| 28/11/2017 18:04 | **94** | -64.7182 | -63.4575 | Grab recovered |
| 28/11/2017 18:07 | **95** | -64.7182 | -63.4574 | Grab deployed |
| 28/11/2017 18:13 | **95** | -64.7182 | -63.4574 | Grab @ bottom (~304m); commenced recovery |
| 28/11/2017 18:21 | **95** | -64.7182 | -63.4574 | Grab recovered |
| 28/11/2017 18:23 | | -64.7182 | -63.4574 | Vessel off DP and relocating to BB2 |
| 28/11/2017 18:39 | | -64.7263 | -63.4519 | Vessel on DP @ BB2 |
| 28/11/2017 18:41 | **96** | -64.7263 | -63.4518 | Grab deployed |
| 28/11/2017 18:48 | **96** | -64.7263 | -63.4518 | Grab @ bottom (~252m); commenced recovery |
| 28/11/2017 18:54 | **96** | -64.7263 | -63.4518 | Grab recovered |
| 28/11/2017 18:57 | **97** | -64.7263 | -63.4518 | Grab deployed |
| 28/11/2017 19:04 | **97** | -64.7263 | -63.4518 | Grab on bottom (250m) Commence recovery |
| 28/11/2017 19:11 | **97** | -64.7263 | -63.4518 | Grab recovered to deck |
| 28/11/2017 19:13 | **98** | -64.7263 | -63.4518 | Grab deployed |
| 28/11/2017 19:19 | **98** | -64.7263 | -63.4519 | Grab on bottom (250m) Commence recovery |
| 28/11/2017 19:25 | **98** | -64.7263 | -63.4518 | Grab recovered to deck |
| 28/11/2017 19:28 | | -64.7263 | -63.4518 | Vessel off DP. Commence move to BB1 |
| 28/11/2017 19:48 | | -64.7416 | -63.4531 | Vessel on DP at BB1 |
| 28/11/2017 19:49 | **99** | -64.7416 | -63.4534 | Grab deployed |
| 28/11/2017 19:56 | **99** | -64.7416 | -63.4536 | Grab on bottom (254m) Commence recovery |
| 28/11/2017 20:02 | **99** | -64.7416 | -63.4536 | Grab recovered to deck |

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| 28/11/2017 20:05 | **100** | -64.7416 | -63.4534 | Grab deployed |
| 28/11/2017 20:10 | **100** | -64.7415 | -63.4533 | Grab on bottom (254m) Commence recovery |
| 28/11/2017 20:17 | **100** | -64.7415 | -63.4532 | Grab recovered to deck |
| 28/11/2017 20:23 | **101** | -64.7415 | -63.4532 | Grab deployed |
| 28/11/2017 20:29 | **101** | -64.7415 | -63.4533 | Grab on bottom (254m) Commence recovery |
| 28/11/2017 20:36 | **101** | -64.7415 | -63.4533 | Grab recovered to deck |
| 28/11/2017 20:39 | | -64.7415 | -63.4533 | Vessel off DP. Resuming SWATH survey |
| 28/11/2017 22:42 | | -64.7258 | -63.4518 | Vessel on DP at BB2 |
| 28/11/2017 22:46 | **102** | -64.7257 | -63.4526 | Multicorer deployed |
| 28/11/2017 22:57 | **102** | -64.7257 | -63.4529 | Multicorer on bottom (252m) |
| 28/11/2017 22:58 | **102** | -64.7257 | -63.453 | Commence recovery of Multicorer |
| 28/11/2017 23:06 | **102** | -64.7258 | -63.4537 | Multi core at surface |
| 28/11/2017 23:07 | **102** | -64.7258 | -63.4538 | Multi core on deck |
| 28/11/2017 23:10 | | -64.7258 | -63.4542 | Vsl off DP |
| 28/11/2017 23:40 | | -64.7429 | -63.4546 | Vsl on DP with operations suspended due to strong winds |
| 29/11/2017 00:37 | | -64.7173 | -63.4521 | Vsl on DP at BB3 |
| 29/11/2017 00:57 | **103** | -64.7184 | -63.4563 | Multi core off the deck at BB3 |
| 29/11/2017 00:59 | **103** | -64.7184 | -63.4563 | Multi core deployed at BB3 |
| 29/11/2017 01:10 | **103** | -64.7184 | -63.4563 | Multi core at the seabed |
| 29/11/2017 01:12 | **103** | -64.7184 | -63.4563 | Commence recovery |
| 29/11/2017 01:20 | **103** | -64.7184 | -63.4562 | Multi core at surface |
| 29/11/2017 01:22 | **103** | -64.7184 | -63.4562 | Multicore recovered on deck |
| 29/11/2017 01:26 | | -64.7184 | -63.4562 | Vsl off DP proceeding to BB4 |
| 29/11/2017 01:39 | | -64.7128 | -63.454 | VSL on DP at BB4 |
| 29/11/2017 01:49 | **104** | -64.7125 | -63.4541 | Multi corer off the deck at BB4 |
| 29/11/2017 01:51 | **104** | -64.7125 | -63.4541 | Multi corer deployed at BB4 |
| 29/11/2017 02:01 | **104** | -64.7125 | -63.4541 | Multicore at seabed |
| 29/11/2017 02:02 | **104** | -64.7125 | -63.4541 | Commence recovery |
| 29/11/2017 02:11 | **104** | -64.7125 | -63.454 | Multicore at surface |
| 29/11/2017 02:13 | **104** | -64.7125 | -63.454 | Multicore recovered on deck |
| 29/11/2017 02:26 | | -64.7124 | -63.454 | Vsl off DP continuing to swath |
| 29/11/2017 03:18 | | -64.7366 | -63.4982 | Swath survey completed. End of science at this station. Vessel proceeding to Glider work site. |
| 30/11/2017 04:36 | | -61.6001 | -64.4985 | Vessel on DP @ Glider site 1 |
| 30/11/2017 05:18 | **105** | -61.5998 | -64.4976 | CTD off deck |
| 30/11/2017 05:22 | **105** | -61.5999 | -64.4975 | CTD deployed |
| 30/11/2017 05:44 | **105** | -61.5998 | -64.4975 | CTD @ 1000m; commenced recovery |
| 30/11/2017 06:18 | **105** | -61.5998 | -64.4975 | CTD recovered |
| 30/11/2017 06:19 | **105** | -61.5998 | -64.4975 | CTD on deck. Vessel remains on station for Glider deployment |
| 30/11/2017 11:14 | **106** | -61.5998 | -64.4976 | Glider off the deck |
| 30/11/2017 11:16 | **106** | -61.5996 | -64.498 | Glider 632 deployed |
| 30/11/2017 11:26 | | -61.5993 | -64.5082 | Vsl off DP |
| 30/11/2017 12:00 | | -61.5993 | -64.508 | Vsl on DP |

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| 30/11/2017 13:05 | | -61.5994 | -64.508 | Vsl off DP |
| 30/11/2017 13:26 | | -61.5991 | -64.498 | Vsl in DP |
| 30/11/2017 13:27 | **107** | -61.5974 | -64.5102 | Glider 633 off the deck |
| 30/11/2017 13:28 | **107** | -61.5974 | -64.5102 | Glider 633 deployed |
| 30/11/2017 13:41 | | -61.5985 | -64.4993 | Vsl off DP |
| 30/11/2017 14:00 | | -61.5974 | -64.5106 | Vsl on DP |
| 30/11/2017 15:11 | | -61.6002 | -64.6982 | Vessel on DP @ Glider site 2 |
| 30/11/2017 15:22 | **108** | -61.6 | -64.698 | Commenced deployment of Glider |
| 30/11/2017 15:25 | **108** | -61.5998 | -64.6987 | Glider deployed (640) |
| 30/11/2017 16:28 | **109** | -61.5994 | -64.7096 | Commenced Wave Glider deployment |
| 30/11/2017 16:30 | **109** | -61.5994 | -64.7101 | Wave Glider deployed |
| 30/11/2017 16:50 | | -61.599 | -64.712 | Vessel off DP and relocating to Glider site 3 |
| 30/11/2017 18:23 | | -61.5998 | -64.2996 | Vessel on DP @ Glider site 3 |
| 30/11/2017 18:39 | **110** | -61.5998 | -64.2997 | Commenced deployment of Glider |
| 30/11/2017 18:40 | **110** | -61.5997 | -64.3 | Glider deployed (408) |
| 30/11/2017 20:21 | | -61.5995 | -64.3013 | Vessel off DP. Proceeding to start of Met data transect |
| 30/11/2017 21:20 | **111** | -61.7001 | -64.0875 | Commence met data transect at 6.0 kts |
| 01/12/2017 01:10 | **111** | -61.7008 | -64.9101 | Met data transect complete. Vessel proceeding to site 2 |
| 01/12/2017 02:12 | | -61.5998 | -64.6982 | Vsl on DP |
| 01/12/2017 02:29 | **112** | -61.6 | -64.6998 | CTD off the deck |
| 01/12/2017 02:31 | **112** | -61.6001 | -64.6998 | CTD deployed at S2 |
| 01/12/2017 02:54 | **112** | -61.6 | -64.6998 | CTD at depth 1000m. Commence recovery |
| 01/12/2017 03:17 | **112** | -61.6 | -64.6998 | CTD recovered |
| 01/12/2017 03:19 | **112** | -61.6 | -64.6998 | CTD on deck |
| 01/12/2017 03:26 | | -61.6001 | -64.6999 | Vessel off DP and proceeding to Glider site 3 for CTD deployment |
| 01/12/2017 04:36 | | -61.5997 | -64.2961 | Vessel on DP @ Glider site 3 |
| 01/12/2017 04:54 | **113** | -61.6 | -64.2998 | CTD off deck |
| 01/12/2017 04:57 | **113** | -61.6 | -64.2998 | CTD deployed |
| 01/12/2017 05:18 | **113** | -61.6 | -64.2998 | CTD @ 1000m; commenced recovery |
| 01/12/2017 05:43 | **113** | -61.6 | -64.2999 | CTD recovered |
| 01/12/2017 05:44 | **113** | -61.6 | -64.2999 | CTD on deck |
| 01/12/2017 06:00 | | -61.6 | -64.2998 | Vessel off DP and proceeding to Glider site 4 |
| 01/12/2017 08:49 | | -61.3671 | -63.5322 | Vessel on DP at Glider site 4 |
| 01/12/2017 11:41 | **114** | -61.3662 | -63.5348 | Glider off the deck |
| 01/12/2017 11:46 | **114** | -61.3663 | -63.5344 | Glider 330 deployed at S4 |
| 01/12/2017 12:46 | | -61.3653 | -63.5452 | Vessel off DP. Proceeding to start of met/ADCP transect |
| 01/12/2017 17:40 | **115** | -62.0506 | -64.6979 | Commenced ADCP and mast MET transect |
| 01/12/2017 22:00 | **115** | -61.2714 | -64.7006 | Met data/ADCP transect suspended. Proceeding to site 1 for CTD |
| 02/12/2017 00:14 | | -61.6005 | -64.4995 | Vsl on DP at S1 |
| 02/12/2017 00:32 | **116** | -61.6 | -64.4999 | CTD off the deck |
| 02/12/2017 00:34 | **116** | -61.6 | -64.4999 | CTD deployed at S1 |
| 02/12/2017 00:56 | **116** | -61.6 | -64.4999 | CTD stopped at depth 1000m. Commence recovery |

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| 02/12/2017 01:20 | **116** | -61.6 | -64.4999 | CTD at surface | |
| 02/12/2017 01:22 | **116** | -61.6 | -64.4999 | CTD on deck | |
| 02/12/2017 01:41 | | | | Vsl off DP | |
| 02/12/2017 04:32 | | -61.3668 | -63.5322 | Vessel on DP @ Glider site 4 | |
| 02/12/2017 04:55 | **117** | -61.3667 | -63.5332 | CTD off deck | |
| 02/12/2017 04:57 | **117** | -61.3667 | -63.5332 | CTD deployed | |
| 02/12/2017 05:19 | **117** | -61.3667 | -63.5333 | CTD @ 1055m; commenced recovery | |
| 02/12/2017 05:44 | **117** | -61.3667 | -63.5333 | CTD recovered | |
| 02/12/2017 05:46 | **117** | -61.3667 | -63.5332 | CTD on deck | |
| 02/12/2017 06:00 | | -61.3667 | -63.5333 | Vessel off DP and proceeding to Glider site 1 | |
| 02/12/2017 09:30 | **118** | -61.5998 | -64.5005 | Vessel on DP at site 1. Head to wind for met data collection | |
| 02/12/2017 13:13 | | -61.5999 | -64.4999 | VSL off DP | |
| 03/12/2017 03:50 | | -63.7999 | -66.4982 | Vessel on DP @ Glider site 5 | |
| 03/12/2017 03:53 | **119** | -63.7998 | -66.4995 | CTD off deck | |
| 03/12/2017 03:54 | **119** | -63.7999 | -66.4994 | CTD deployed | |
| 03/12/2017 04:15 | **119** | -63.7999 | -66.4995 | CTD @ 1000m; commenced recovery | |
| 03/12/2017 04:41 | **119** | -63.7999 | -66.4995 | CTD recovered | |
| 03/12/2017 04:42 | **119** | -63.7999 | -66.4995 | CTD on deck | |
| 03/12/2017 04:50 | **120** | -63.7999 | -66.4995 | Commenced Glider deployment | |
| 03/12/2017 04:51 | **120** | -63.7999 | -66.4999 | Glider deployed: Vessel moved 500m SW and remains on station | |
| 03/12/2017 07:11 | | -63.8032 | -66.5089 | Vessel off DP. Resume passage to Rothera | |
| 06/12/2017 12:25 | | -67.2159 | -71.0749 | Vsl off DP | |
| 06/12/2017 12:28 | **121** | -67.2185 | -71.0605 | XBT deployed | |
| 06/12/2017 17:58 | | -66.9747 | -70.7468 | Vessel commenced TOPAZ survey in addition to opportunistic Swath survey | |
| 07/12/2017 00:35 | | -66.8518 | -70.9808 | Finished Topaz. Continuing swath at 10kn | |
| 07/12/2017 10:31 | | -67.0271 | -71.3124 | SWATH survey suspended. Vessel proceeding to AGT site | |
| 07/12/2017 11:54 | | -66.8999 | -70.8942 | Vsl on DP | bridge |
| 07/12/2017 12:00 | | -66.8999 | -70.8943 | EA600 non operational. Switching to swath depths | |
| 07/12/2017 12:29 | | -66.8999 | -70.8942 | Depth on swath operational | |
| 07/12/2017 12:30 | | -66.8999 | -70.8942 | Vsl moving at 0.3kn on DP ready to deploy | |
| 07/12/2017 12:32 | **122** | -66.8998 | -70.894 | Trawl off the deck | |
| 07/12/2017 12:33 | **122** | -66.8997 | -70.8939 | Trawl deployed | |
| 07/12/2017 12:49 | **122** | -66.8985 | -70.8919 | trawl on bottom | |
| 07/12/2017 12:56 | **122** | -66.8977 | -70.8906 | Cable out 800m | bridge |
| 07/12/2017 13:02 | **122** | -66.8964 | -70.8884 | reduce to 0.3kn | bridge |
| 07/12/2017 13:11 | **122** | -66.8944 | -70.8866 | trawl off the bottom | |
| 07/12/2017 13:24 | **122** | -66.8948 | -70.8859 | trawl at surface | |
| 07/12/2017 13:26 | **122** | -66.8948 | -70.8858 | trawl on deck | bridge |
| 07/12/2017 13:27 | | -66.8942 | -70.8871 | Vsl proceeding to trawl site 2 | |
| 07/12/2017 13:39 | | -66.8935 | -70.8887 | Vsl in position | bridge |
| 07/12/2017 13:51 | **123** | -66.8933 | -70.8887 | Trawl off the deck. Vsl at 0.3kn | |
| 07/12/2017 13:52 | **123** | -66.8931 | -70.8886 | Trawl deployed at site 2 | |

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| 07/12/2017 14:07 | **123** | -66.892 | -70.8879 | Increase speed to 0.5kn |
| 07/12/2017 14:08 | **123** | -66.8919 | -70.8878 | trawl on the bottom |
| 07/12/2017 14:15 | **123** | -66.8909 | -70.8873 | Increase speed to 1kn. 800m cable |
| 07/12/2017 14:20 | **123** | -66.8895 | -70.8865 | Reduce speed to 0.3kn and hauling |
| 07/12/2017 14:28 | **123** | -66.8889 | -70.886 | trawl off the bottom |
| 07/12/2017 14:41 | **123** | -66.8882 | -70.885 | Trawl at surface |
| 07/12/2017 14:45 | **123** | -66.888 | -70.8838 | Trawl on deck |
| 07/12/2017 14:52 | | -66.8878 | -70.8824 | Vsl off DP proceeding to site 3 |
| 07/12/2017 15:29 | | -66.8965 | -70.9534 | Vessel on DP @ Agassiz Trawl site 3 |
| 07/12/2017 15:58 | **124** | -66.8962 | -70.9536 | Commenced Agassiz Trawl deployment |
| 07/12/2017 16:00 | **124** | -66.8961 | -70.9536 | Agassiz Trawl deployed |
| 07/12/2017 16:23 | **124** | -66.8937 | -70.9536 | Commenced trawl @ 1kt for 5 mins (wire out 800m) |
| 07/12/2017 16:28 | **124** | -66.8924 | -70.9536 | Commenced Agassiz Trawl recovery |
| 07/12/2017 16:50 | **124** | -66.8904 | -70.9536 | Agassiz Trawl recovered |
| 07/12/2017 16:57 | | -66.8902 | -70.9536 | Vessel off DP and relocating to Agassiz Trawl site 4 |
| 07/12/2017 17:26 | | -66.9177 | -70.9191 | Vessel on DP @ Agassiz Trawl site 4 |
| 07/12/2017 17:29 | **125** | -66.9174 | -70.9189 | Commenced Agassiz Trawl deployment |
| 07/12/2017 17:30 | **125** | -66.9174 | -70.9189 | Agassiz Trawl deployed |
| 07/12/2017 17:53 | **125** | -66.915 | -70.9193 | Commenced trawl @ 1 kt for 5 mins (wire out 800m) |
| 07/12/2017 17:58 | **125** | -66.9138 | -70.9194 | Commenced Agassiz Trawl recovery |
| 07/12/2017 18:24 | **125** | -66.9114 | -70.9197 | Agassiz Trawl recovered |
| 07/12/2017 18:30 | | -66.9113 | -70.9198 | Vessel off DP and relocating to Agassiz Trawl site 5 |
| 07/12/2017 18:54 | | -66.9326 | -70.9246 | Vessel on DP @ Agassiz Trawl site 5 |
| 07/12/2017 19:00 | **126** | -66.9322 | -70.9243 | AGT deployed |
| 07/12/2017 19:18 | **126** | -66.9307 | -70.9243 | AGT on bottom |
| 07/12/2017 19:26 | **126** | -66.9296 | -70.9242 | Commence trawl at 1.0kts for 5 mins (wire out 800m) |
| 07/12/2017 19:31 | **126** | -66.9283 | -70.9241 | Commence recovery of AGT |
| 07/12/2017 19:56 | **126** | -66.926 | -70.924 | AGT recovered to deck |
| 07/12/2017 20:15 | | -66.9259 | -70.924 | Vessel off DP. Proceeding to ice edge to attempt passage to Rothera |
| 09/12/2017 01:02 | | -67.325 | -71.3079 | Commence opportunistic swathing near ice edge |
| 09/12/2017 16:40 | | -67.2494 | -71.5264 | Swath survey suspended |
| 09/12/2017 16:53 | | -67.2434 | -71.5229 | Vessel on DP for MASIN aircraft overflight |
| 09/12/2017 17:23 | | -67.2433 | -71.5226 | Vessel off DP and resuming Swath survey |
| 09/12/2017 17:30 | **127** | -67.2391 | -71.5118 | XBT deployed |
| 09/12/2017 17:31 | **127** | -67.2372 | -71.5089 | XBT released |
| 09/12/2017 21:26 | | -66.8798 | -70.8921 | Commence SWATH survey of CTD/SUCS transect |
| 10/12/2017 00:17 | | -66.6499 | -69.9122 | Vsl finishes SWATH of CTD / SUCS transect and continues opportunistic SWATHING |
| 10/12/2017 10:28 | | -66.6512 | -69.9029 | SWATH suspended. Vessel on DP at CTD/SUCS transect site 5 |
| 10/12/2017 11:03 | **128** | -66.65 | -69.9001 | CTD off the deck at site MT5 |
| 10/12/2017 11:05 | **128** | -66.65 | -69.9001 | CTD deployed at site MT5 |
| 10/12/2017 11:16 | **128** | -66.65 | -69.9 | CTD stopped at depth 348. Commence recovery |

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| 10/12/2017 11:29 | **128** | -66.65 | -69.9001 | CTD at surface |
| 10/12/2017 11:31 | **128** | -66.65 | -69.9001 | CTD on deck |
| 10/12/2017 11:36 | | -66.65 | -69.9 | Vsl off DP. proceeding to MT4 |
| 10/12/2017 12:49 | | -66.7099 | -70.1384 | Vsl on DP near MT4. Position moved due to iceberg proximity to MT4 |
| 10/12/2017 12:54 | **129** | -66.7099 | -70.1384 | CTD off deck near MT4 |
| 10/12/2017 12:56 | **129** | -66.71 | -70.1384 | CTD deployed near MT4 |
| 10/12/2017 13:09 | **129** | -66.7099 | -70.1384 | CTD stopped at depth 467 |
| 10/12/2017 13:12 | **129** | -66.7099 | -70.1384 | Commence CTD recovery |
| 10/12/2017 13:29 | **129** | -66.7099 | -70.1385 | CTD at surface |
| 10/12/2017 13:31 | **129** | -66.7099 | -70.1385 | CTD recovered on deck |
| 10/12/2017 13:33 | | -66.7099 | -70.1385 | Vsl off DP bridge |
| 10/12/2017 14:39 | | -66.7824 | -70.4829 | Vsl on DP near MT3. Not on exact position due to proximity of icebergs |
| 10/12/2017 14:44 | **130** | -66.7824 | -70.4829 | CTD off the deck near MT3 |
| 10/12/2017 14:46 | **130** | -66.7825 | -70.4829 | CTD deployed near MT3 |
| 10/12/2017 15:01 | **130** | -66.7825 | -70.4829 | CTD @ 600m; commenced recovery |
| 10/12/2017 15:22 | **130** | -66.7824 | -70.4829 | CTD recovered |
| 10/12/2017 15:24 | **130** | -66.7824 | -70.4829 | CTD on deck |
| 10/12/2017 15:28 | | -66.7824 | -70.4829 | Vessel off DP and proceeding to next station |
| 10/12/2017 16:35 | | -66.8509 | -70.7734 | Vessel on DP in proximity of station MT2 |
| 10/12/2017 16:41 | **131** | -66.8509 | -70.7737 | CTD off deck |
| 10/12/2017 16:43 | **131** | -66.8509 | -70.7737 | CTD deployed |
| 10/12/2017 16:56 | **131** | -66.8509 | -70.7737 | CTD @ 500m; commenced recovery |
| 10/12/2017 17:16 | **131** | -66.8509 | -70.7737 | CTD recovered |
| 10/12/2017 17:18 | **131** | -66.8509 | -70.7737 | CTD on deck |
| 10/12/2017 17:20 | | -66.8509 | -70.7738 | Vessel off DP and proceeding to next station |
| 10/12/2017 18:30 | | -66.9443 | -71.0517 | Vessel on DP in proximity of station MT1 |
| 10/12/2017 18:47 | **132** | -66.9441 | -71.0521 | CTD off deck |
| 10/12/2017 18:50 | **132** | -66.9441 | -71.0521 | CTD deployed |
| 10/12/2017 19:10 | **132** | -66.9441 | -71.0521 | CTD on bottom (467m) Commence recovery |
| 10/12/2017 19:31 | **132** | -66.9454 | -71.055 | CTD recovered to deck |
| 10/12/2017 19:57 | **133** | -66.935 | -71.0431 | SUCS deployed |
| 10/12/2017 20:07 | **133** | -66.935 | -71.0431 | SUCS on bottom. Commence move ahead at 0.2 kts |
| 10/12/2017 20:39 | **133** | -66.9334 | -71.0412 | SUCS complete. Commence recovery |
| 10/12/2017 20:52 | **133** | -66.9334 | -71.0412 | SUCS recovered to deck |
| 10/12/2017 20:54 | | -66.9334 | -71.0412 | Vessel off DP. Commence move to MT2 |
| 10/12/2017 21:45 | | -66.8675 | -70.8268 | Vessel on DP in proximity of MT2 |
| 10/12/2017 21:51 | **134** | -66.8665 | -70.8266 | SUCS deployed |
| 10/12/2017 22:01 | **134** | -66.8666 | -70.8266 | SUCS on bottom. Commence move ahead at 0.2 kts |
| 10/12/2017 22:35 | **134** | -66.8651 | -70.8238 | SUCS complete. Commence recovery |
| 10/12/2017 22:46 | **134** | -66.8651 | -70.8238 | SUCS recovered to deck |
| 10/12/2017 22:59 | | -66.8651 | -70.8238 | Vessel off DP. Recommence opportunistic SWATH survey |

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| 11/12/2017 10:38 | | -66.788 | -70.4809 | SWATH suspended. Vessel on DP at MT3 | |
| 11/12/2017 11:06 | **135** | -66.7877 | -70.4815 | SUCS off the deck at MT3 | |
| 11/12/2017 11:07 | **135** | -66.7877 | -70.4815 | SUCS deployed at MT3 | |
| 11/12/2017 11:18 | **135** | -66.7877 | -70.4816 | SUCS on the bottom moving ahead at 0.2kn | |
| 11/12/2017 12:01 | **135** | -66.7889 | -70.4866 | Commence recovery of SUCS | |
| 11/12/2017 12:13 | **135** | -66.7891 | -70.4878 | SUCS recovered to deck | |
| 11/12/2017 12:15 | | -66.7891 | -70.4877 | VSL off DP proceeding to MT4 | |
| 11/12/2017 13:09 | | -66.7292 | -70.166 | Vsl stopped on DP near MT4. Position moved due to proximity of Icebergs | |
| 11/12/2017 13:15 | **136** | -66.7291 | -70.1661 | SUCS off the deck near MT4 | |
| 11/12/2017 13:16 | **136** | -66.7291 | -70.1661 | SUCS deployed near MT4 | |
| 11/12/2017 13:27 | **136** | -66.7291 | -70.1661 | SUCS at depth | bridge |
| 11/12/2017 14:03 | **136** | -66.7295 | -70.1705 | Commence recovery of SUCS | |
| 11/12/2017 14:12 | **136** | -66.7296 | -70.171 | SUCS at the surface | |
| 11/12/2017 14:13 | **136** | -66.7296 | -70.171 | SUCS recovered on deck | |
| 11/12/2017 14:18 | | -66.7296 | -70.171 | Vsl off DP | bridge |
| 11/12/2017 15:05 | | -66.6651 | -69.9201 | Vessel on DP in proximity of MT5 | |
| 11/12/2017 15:13 | **137** | -66.665 | -69.9204 | Commenced SUCS deployment | |
| 11/12/2017 15:14 | **137** | -66.665 | -69.9205 | SUCS deployed | |
| 11/12/2017 15:25 | **137** | -66.6651 | -69.9218 | SUCS @ bottom (~350m) | |
| 11/12/2017 15:45 | **137** | -66.6654 | -69.9245 | Commenced recovery of SUCS | |
| 11/12/2017 15:54 | **137** | -66.6655 | -69.9253 | SUCS recovered | |
| 11/12/2017 16:06 | | -66.6655 | -69.9253 | Vessel off DP and proceeding to MT6 | |
| 11/12/2017 18:22 | | -66.9744 | -70.3366 | Vessel on DP @ MT6 | |
| 11/12/2017 18:27 | **138** | -66.9745 | -70.3367 | Commenced CTD deployment | |
| 11/12/2017 18:30 | **138** | -66.9745 | -70.3367 | CTD deployed | |
| 11/12/2017 18:46 | **138** | -66.9745 | -70.3367 | CTD @ 621m; commenced recovery | |
| 11/12/2017 19:14 | **138** | -66.9745 | -70.3367 | CTD recovered to deck | |
| 11/12/2017 19:15 | | -66.9745 | -70.3367 | Vessel standing by for MASIN twin otter overflight | |
| 11/12/2017 20:00 | **139** | -66.9745 | -70.3367 | MASIN twin otter overflight commenced. Vessel stopped on DP head to wind | |
| 11/12/2017 22:33 | **139** | -66.9745 | -70.3367 | MASIN overflight complete | |
| 11/12/2017 22:34 | | -66.9745 | -70.3367 | Vessel off DP. Proceeding to ice edge to attempt passage to Rothera | |
| 13/12/2017 18:50 | | -63.1093 | -65.3569 | Visual on Glider | |
| 13/12/2017 18:54 | | -63.1038 | -65.3526 | Vessel on DP for Glider recovery | |
| 13/12/2017 18:56 | **140** | -63.1035 | -65.353 | Command sent for recovery line to be released from nose. ~ 20 min burn time. | |
| 13/12/2017 19:14 | **140** | -63.1006 | -65.3528 | Recovery line released | |
| 13/12/2017 19:18 | **140** | -63.1002 | -65.3536 | Glider grapple hooked | |
| 13/12/2017 19:19 | **140** | -63.1001 | -65.3539 | Glider on crane hook | |
| 13/12/2017 19:20 | **140** | -63.1 | -65.3542 | Glider clear of water | bridge |
| 13/12/2017 19:46 | | -63.1031 | -65.3582 | Vessel off DP. Proceeding to next glider recovery position | |
| 14/12/2017 07:27 | **141** | -61.4399 | -62.1778 | Visual on glider | |

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|---|---|---|---|---|
| 14/12/2017 07:29 | **141** | -61.4401 | -62.1739 | Command sent to release recovery line |
| 14/12/2017 07:31 | **141** | -61.4401 | -62.1749 | Vessel on DP for glider recovery |
| 14/12/2017 07:47 | **141** | -61.4397 | -62.1708 | Recovery line released |
| 14/12/2017 07:50 | **141** | -61.44 | -62.1708 | Glider grapple hooked |
| 14/12/2017 07:51 | **141** | -61.44 | -62.171 | Glider on crane hook |
| 14/12/2017 07:52 | **141** | -61.44 | -62.1709 | Glider recovered to deck |
| 14/12/2017 08:00 | | -61.4412 | -62.1672 | Vessel off DP. Proceeding to CTD transect |
| 15/12/2017 05:53 | | -61.0492 | -54.5916 | Vessel on DP @ SR1B_1 for CTD deployment |
| 15/12/2017 06:01 | **142** | -61.0492 | -54.592 | CTD off deck |
| 15/12/2017 06:02 | **142** | -61.0492 | -54.592 | CTD deployed |
| 15/12/2017 06:13 | **142** | -61.0492 | -54.5921 | CTD @ 367m; commenced recovery |
| 15/12/2017 06:21 | **142** | -61.0492 | -54.592 | CTD recovered |
| 15/12/2017 06:22 | **142** | -61.0492 | -54.592 | CTD on deck |
| 15/12/2017 06:30 | | -61.0492 | -54.592 | Vessel off DP and proceeding to next CTD station |
| 15/12/2017 06:54 | | -60.9822 | -54.6352 | Vessel on DP @ SR1B_2 for CTD deployment |
| 15/12/2017 07:06 | **143** | -60.9801 | -54.6332 | CTD deployed |
| 15/12/2017 07:20 | **143** | -60.9801 | -54.6332 | CTD stopped at depth 574m. Commence recovery |
| 15/12/2017 07:32 | **143** | -60.9801 | -54.6332 | CTD recovered to deck |
| 15/12/2017 07:38 | | -60.9801 | -54.6331 | Vessel off DP. Proceeding to next CTD station |
| 15/12/2017 08:22 | | -60.8496 | -54.711 | Vessel on DP at SR1B_3 |
| 15/12/2017 08:30 | **144** | -60.8497 | -54.7111 | CTD deployed |
| 15/12/2017 08:54 | **144** | -60.8498 | -54.7111 | CTD stopped at depth 1034m. Commence recovery |
| 15/12/2017 09:14 | **144** | -60.8498 | -54.7111 | CTD recovered to deck |
| 15/12/2017 09:19 | | -60.8498 | -54.7111 | Vessel off DP. Proceeding to next CTD station |
| 15/12/2017 09:34 | | -60.8325 | -54.7209 | Vessel on DP at SR1B_4 |
| 15/12/2017 09:40 | **145** | -60.8328 | -54.7212 | CTD deployed |
| 15/12/2017 10:14 | **145** | -60.8328 | -54.7212 | CTD stopped at depth 1770m. Commence recovery |
| 15/12/2017 10:47 | **145** | -60.8327 | -54.7212 | CTD recovered to deck |
| 15/12/2017 10:51 | | -60.8328 | -54.7212 | Vessel off DP. Proceeding to next CTD station |
| 15/12/2017 11:15 | | -60.7996 | -54.7426 | Vsl on DP at SR1B_5 |
| 15/12/2017 11:21 | **146** | -60.7996 | -54.7425 | CTD of the deck at SR1B_5 |
| 15/12/2017 11:23 | **146** | -60.7996 | -54.7425 | CTD deployed at SR1B_5 |
| 15/12/2017 12:14 | **146** | -60.7996 | -54.7425 | CTD at depth 2538m. Commence recovery |
| 15/12/2017 13:16 | **146** | -60.7997 | -54.7425 | CTD at surface |
| 15/12/2017 13:17 | **146** | -60.7997 | -54.7425 | CTD on deck |
| 15/12/2017 13:26 | | -60.7997 | -54.7425 | VSL off DP. Proceeding to SR1B_6 |
| 15/12/2017 15:42 | | -60.4031 | -54.9862 | Vessel on DP @ SR1B_6 |
| 15/12/2017 15:55 | **147** | -60.403 | -54.9857 | CTD off deck |
| 15/12/2017 15:58 | **147** | -60.403 | -54.9857 | CTD deployed |
| 15/12/2017 17:05 | **147** | -60.403 | -54.9857 | CTD @ 3453m; commenced recovery |
| 15/12/2017 18:23 | **147** | -60.403 | -54.9857 | CTD recovered |
| 15/12/2017 18:24 | **147** | -60.403 | -54.9857 | CTD on deck |

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|---|---|---|---|---|
| 15/12/2017 18:31 | | -60.403 | -54.9857 | Vessel off DP and proceeding to next CTD station |
| 15/12/2017 20:54 | | -59.9988 | -55.2365 | Vessel on DP at SR1B_7 |
| 15/12/2017 21:07 | **148** | -59.9997 | -55.2379 | CTD deployed |
| 15/12/2017 22:14 | **148** | -59.9998 | -55.2379 | CTD stopped at depth 3502m. Commence recovery |
| 15/12/2017 23:29 | **148** | -59.9998 | -55.2379 | CTD at surface |
| 15/12/2017 23:31 | **148** | -59.9998 | -55.2379 | CTD on deck |
| 15/12/2017 23:41 | | -59.9998 | -55.2379 | Vsl off DP proceeding to SR1B_8 |
| 16/12/2017 02:42 | | -59.5005 | -55.5484 | Vsl on DP at SR1B_8 |
| 16/12/2017 02:50 | **149** | -59.5005 | -55.5483 | CTD off deck at SR1B_8 |
| 16/12/2017 02:52 | **149** | -59.5005 | -55.5483 | CTD deployed at SR1B_8 |
| 16/12/2017 03:58 | **149** | -59.5005 | -55.5483 | CTD @ 3724m; commenced recovery |
| 16/12/2017 05:33 | **149** | -59.5005 | -55.5482 | CTD recovered |
| 16/12/2017 05:35 | **149** | -59.5005 | -55.5482 | CTD on deck |
| 16/12/2017 05:53 | **150** | -59.5004 | -55.5484 | Commenced Float deployment |
| 16/12/2017 05:55 | **150** | -59.5004 | -55.5489 | Float deployed (Deep Apex 20) |
| 16/12/2017 06:00 | | -59.5002 | -55.5499 | Vessel off DP and proceeding to next CTD station |
| 16/12/2017 09:02 | | -58.9999 | -55.8575 | Vessel on DP at SR1B_9 |
| 16/12/2017 09:13 | **151** | -58.9997 | -55.8577 | CTD deployed |
| 16/12/2017 10:20 | **151** | -58.9997 | -55.8577 | CTD stopped at depth 3775m. Commence recovery |
| 16/12/2017 11:45 | **151** | -58.9997 | -55.8577 | CTD at surface |
| 16/12/2017 11:47 | **151** | -58.9997 | -55.8577 | CTD recovered on deck |
| 16/12/2017 11:54 | | -58.9997 | -55.8577 | VSL off DP bridge |
| 16/12/2017 14:36 | | -58.527 | -56.1487 | Vsl on DP at SR1B_10 |
| 16/12/2017 14:45 | **152** | -58.5268 | -56.1479 | CTD off the deck |
| 16/12/2017 14:46 | **152** | -58.5267 | -56.1479 | CTD deployed at SR1B_10 |
| 16/12/2017 15:59 | **152** | -58.5266 | -56.1482 | CTD @ 3771m; commenced recovery |
| 16/12/2017 17:32 | **152** | -58.5266 | -56.1483 | CTD recovered |
| 16/12/2017 17:33 | **152** | -58.5266 | -56.1483 | CTD on deck |
| 16/12/2017 17:45 | **153** | -58.5265 | -56.1483 | Commenced Float deployment |
| 16/12/2017 17:47 | **153** | -58.5265 | -56.1477 | Float deployed (Deep Apex 19) |
| 16/12/2017 17:49 | | -58.5263 | -56.1468 | Vessel off DP and proceeding to next CTD station |
| 16/12/2017 20:24 | | -58.0496 | -56.4468 | Vessel on DP at SR1B_11 |
| 16/12/2017 20:30 | **154** | -58.0497 | -56.4464 | CTD deployed |
| 16/12/2017 21:42 | **154** | -58.0497 | -56.4465 | CTD stopped at depth 3962m. Commence recovery |
| 16/12/2017 23:12 | **154** | -58.0497 | -56.4465 | CTD at surface |
| 16/12/2017 23:14 | **154** | -58.0497 | -56.4465 | CTD on deck |
| 16/12/2017 23:22 | | -58.0497 | -56.4465 | Begin move for deployment of hand met float |
| 16/12/2017 23:25 | **155** | -58.0496 | -56.4475 | ARVOR float deployed at speed 1.1kn. Serial number AI2600-16FR092 |
| 16/12/2017 23:33 | | -58.0489 | -56.4519 | VSl off DP proceeding to SR1B_12 |
| 17/12/2017 01:20 | | -57.7331 | -56.644 | VSL on DP at SR1B_12 |
| 17/12/2017 01:23 | **156** | -57.7332 | -56.644 | CTD off the deck |
| 17/12/2017 01:25 | **156** | -57.7332 | -56.644 | CTD deployed at SR1B_12 |

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|---|---|---|---|---|
| 17/12/2017 02:28 | **156** | -57.7332 | -56.644 | CTD at depth 3469m. Commence recovery |
| 17/12/2017 03:58 | **156** | -57.7332 | -56.644 | CTD recovered |
| 17/12/2017 03:59 | **156** | -57.7332 | -56.644 | CTD on deck |
| 17/12/2017 04:12 | **157** | -57.7332 | -56.644 | Commenced Float deployment |
| 17/12/2017 04:13 | **157** | -57.7331 | -56.6443 | Float deployed (Deep Apex 18) |
| 17/12/2017 04:14 | | -57.7331 | -56.6446 | Vessel off DP and proceeding to next CTD station |
| 17/12/2017 06:02 | | -57.4164 | -56.8394 | Vessel on DP @ SR1B_13 |
| 17/12/2017 06:06 | **158** | -57.416 | -56.8397 | CTD off deck |
| 17/12/2017 06:09 | **158** | -57.416 | -56.8398 | CTD deployed |
| 17/12/2017 07:11 | **158** | -57.416 | -56.8398 | CTD stopped at depth 3464m. Commence recovery |
| 17/12/2017 08:28 | **158** | -57.416 | -56.8398 | CTD recovered to deck |
| 17/12/2017 08:36 | | -57.416 | -56.8398 | Vessel off DP. Proceeding to next CTD station |
| 17/12/2017 10:18 | | -57.1 | -57.0343 | Vessel on DP at SR1B_14 |
| 17/12/2017 10:26 | **159** | -57.0999 | -57.035 | CTD deployed |
| 17/12/2017 10:30 | **159** | -57.0999 | -57.035 | Vessel moving up to 0.8 kts astern to counter wire lead |
| 17/12/2017 11:41 | **159** | -57.0961 | -57.0228 | CTD at depth bridge |
| 17/12/2017 13:22 | **159** | -57.0917 | -57.0081 | CTD at the surface |
| 17/12/2017 13:23 | **159** | -57.0916 | -57.0079 | CTD on deck bridge |
| 17/12/2017 13:34 | | -57.0916 | -57.0079 | Vsl moving ahead 0.5kn |
| 17/12/2017 13:36 | **160** | -57.0917 | -57.0081 | Deep Apex float deployed at SR1B_14. Serial no. 21 |
| 17/12/2017 13:37 | | -57.0917 | -57.0083 | Vsl stopped on DP |
| 17/12/2017 14:02 | | -57.0917 | -57.0084 | Vsl off DP proceeding to SR1B_15 |
| 17/12/2017 15:47 | | -56.7832 | -57.2309 | Vessel on DP @ SR1B_15 |
| 17/12/2017 15:53 | **161** | -56.7832 | -57.231 | Commenced CTD deployment |
| 17/12/2017 15:54 | **161** | -56.7832 | -57.2311 | CTD deployed |
| 17/12/2017 17:00 | **161** | -56.7832 | -57.2311 | CTD @ 3030m; commenced recovery |
| 17/12/2017 18:08 | **161** | -56.7832 | -57.231 | CTD recovered |
| 17/12/2017 18:10 | **161** | -56.7832 | -57.231 | CTD on deck |
| 17/12/2017 18:19 | **162** | -56.7834 | -57.2318 | ARVOR Float Deployed (A12600-16FR091) |
| 17/12/2017 18:21 | | -56.7836 | -57.2333 | Vessel off DP and proceeding to next CTD station |
| 17/12/2017 20:16 | | -56.4664 | -57.4271 | Vessel on DP at SR1B_16 |
| 17/12/2017 20:22 | **163** | -56.4664 | -57.4273 | CTD deployed |
| 17/12/2017 20:25 | **163** | -56.4664 | -57.4273 | Vessel moving up to 0.7 kts astern and to stbd to counter wire lead |
| 17/12/2017 21:29 | **163** | -56.4623 | -57.4171 | CTD stopped at depth 3690m. Commence recovery |
| 17/12/2017 22:50 | **163** | -56.4582 | -57.41 | CTD recovered to deck |
| 17/12/2017 23:01 | | -56.4582 | -57.41 | Vessel off DP. Proceeding to SR1B_17 |
| 18/12/2017 01:00 | | -56.15 | -57.6244 | Vsl on DP at SR1B_17 |
| 18/12/2017 01:18 | | -56.15 | -57.6244 | CTD off the deck |
| 18/12/2017 01:20 | **164** | -56.15 | -57.6243 | CTD deployed at SR1B_17 |
| 18/12/2017 02:20 | **164** | -56.15 | -57.6244 | CTD at depth 3388m. Commence recovery |
| 18/12/2017 03:35 | **164** | -56.15 | -57.6243 | CTD recovered |
| 18/12/2017 03:37 | **164** | -56.15 | -57.6243 | CTD on deck |

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| 18/12/2017 03:44 | | -56.15 | -57.6243 | Vessel off DP and proceeding to next CTD station |
| 18/12/2017 05:48 | | -55.8328 | -57.8179 | Vessel on DP @ SR1B_18 |
| 18/12/2017 05:57 | **165** | -55.8335 | -57.8202 | CTD off deck |
| 18/12/2017 05:59 | **165** | -55.8334 | -57.8202 | CTD deployed |
| 18/12/2017 07:23 | **165** | -55.8334 | -57.8203 | CTD stopped at depth 4738m. Commence recovery |
| 18/12/2017 09:07 | **165** | -55.8334 | -57.8203 | CTD recovered to deck |
| 18/12/2017 09:20 | **166** | -55.8334 | -57.8206 | ARVOR float (AI2600-16FR093) deployed |
| 18/12/2017 09:22 | | -55.8335 | -57.8211 | Vessel off DP. Proceeding to next CTD station |
| 18/12/2017 11:24 | | -55.5162 | -57.9836 | Vsl on DP at SR1B_19. Standing by for retermination of the CTD wire |
| 18/12/2017 15:55 | | -55.5167 | -57.9833 | CTD wire load tested @ 2.2T for 2 mins |
| 18/12/2017 16:10 | **167** | -55.5166 | -57.9833 | CTD off deck |
| 18/12/2017 16:11 | **167** | -55.5166 | -57.9832 | CTD deployed |
| 18/12/2017 17:31 | **167** | -55.5166 | -57.9833 | CTD @ 4211m; commenced recovery |
| 18/12/2017 19:14 | **167** | -55.5166 | -57.9834 | CTD recovered to deck |
| 18/12/2017 19:21 | | -55.5166 | -57.9834 | Vessel off DP. Proceeding to next CTD station |
| 18/12/2017 21:04 | | -55.2145 | -57.9813 | Vessel on DP at SR1B_20 |
| 18/12/2017 21:18 | **168** | -55.214 | -57.983 | CTD deployed |
| 18/12/2017 22:33 | **168** | -55.214 | -57.9829 | Ship fire alarm sounded. CTD stopped at 3900m. Science suspended until further notice |
| 18/12/2017 23:56 | **168** | -55.214 | -57.983 | Commence recovery of CTD |
| 19/12/2017 01:15 | **168** | -55.214 | -57.9831 | Commence move ahead up to 0.5kn due to lead of cable |
| 19/12/2017 02:10 | **168** | -55.214 | -57.9911 | CTD at surface |
| 19/12/2017 02:11 | **168** | -55.214 | -57.9912 | CTD on deck and VSL stopped |
| 19/12/2017 08:56 | | -55.2141 | -57.9914 | Vessel off DP. Proceeding North for XBT deployments |
| 19/12/2017 10:24 | **169** | -55.0265 | -57.983 | XBT deployed. Ship speed 6.0 kts (failed) |
| 19/12/2017 10:28 | **170** | -55.0194 | -57.983 | XBT deployed. Ship speed 6.0 kts (failed) |
| 19/12/2017 10:36 | | -55.0101 | -57.9856 | Vessel on DP standing by awaiting instruction |
| 19/12/2017 10:49 | | -55.0099 | -57.9862 | Vessel off DP. Recommence heading North for XBT's |
| 19/12/2017 10:56 | **171** | -55.0054 | -57.9922 | XBT deployed. Ship speed 6.0 kts (failed) |
| 19/12/2017 11:01 | | -54.9989 | -57.9944 | Vessel on DP standing by awaiting instruction |
| 19/12/2017 11:30 | | -54.9989 | -57.9945 | Vsl off DP heading back South for XBT deployment |
| 19/12/2017 11:46 | | -55.0324 | -57.9968 | Vsl altered to the North for deployment |
| 19/12/2017 11:52 | **172** | -55.0336 | -57.992 | XBT deployed. Ship speed 6.0kn |
| 19/12/2017 11:59 | | -55.0252 | -57.9944 | Vsl on DP awaiting instruction |
| 19/12/2017 12:13 | | -55.0251 | -57.9945 | VSL off DP for deployment |
| 19/12/2017 12:25 | | -55.0148 | -58.0018 | VSL on DP awaiting further instruction |
| 19/12/2017 12:30 | | -55.0148 | -58.0015 | Vsl off DP bridge |
| 19/12/2017 12:36 | **173** | -55.0107 | -58.0068 | XBT deployed at 6.0kn |
| 19/12/2017 12:57 | **174** | -54.9623 | -57.9963 | XBT deployed at 5.9kn |
| 19/12/2017 13:25 | **175** | -54.8843 | -57.9833 | XBT launched at 5.9kn |
| 19/12/2017 14:34 | | -54.6632 | -57.9833 | End of science cruise |

## *15.6. Data Management*

Floyd Howard, Polar Data Centre, BAS

**Data storage**

All data recorded by instrumentation linked to the ship's network were recorded directly to respective folders within /data/cruise/jcr/2017/ and additional folders were created within /data/cruise/jcr/20171119/work/scientific_work_area to allow the scientists to back-up their work. When the data are transferred to the Storage Area Network (SAN) at BAS, the pathname to the files will be identical.

**Event logs**

In addition to the bridge event log, a number of digital logs were maintained to record deployments and sampling:
CTD (ICEBERGS ONLY)
Shallow Underwater Camera System (SUCS)
Mini Agassiz Trawl
Multicore
Hammon Grab
N70 net
VMP 2000 tethered
Topas
EM122 multibeam bathymetry
XBT

**Event numbers**

Event numbers were assigned to equipment deployments by the officers on watch and were assigned sequentially when completing the bridge event log. 175 separate events were recorded and comprise the following:

| Equipment / activity | Number of deployments / times | Comments |
|---|---|---|
| Agassiz Trawl (AGT) | 16 | Of which xx deployments failed.<br>Aggsiz Trawls were deployed on two science programs.<br>AGTs 1-11 deployed for ICEBERGS program<br>AGTs 12-16 for Opportunistic Marguerite Trough Program |
| Multicorer (MC) | 8 | Of which 3 deployments failed |
| Shallow Underwater Camera System (SUCS) | 16 | Of which one was aborted (sediment too cloudy)<br>SUCS were deployed on two science programs.<br>SUCS 1-11 deployed for ICEBERGS program |

| | | |
|---|---|---|
| | | SUCS 12-16 for Opportunistic Marguerite Trough Program |
| Conductivity-Temperature-Depth (CTD) | 44 | CTDs were deployed for all three science programs:<br>CTD 1 deployed as a test<br>CTDs 2-12 deployed for ICEBERGS program<br>CTDs 13-17 deployed for ORCHESTRA (WP2) program<br>CTDs 18-24 for opportunistic Marguerite Trough program<br>CTDs 25-44 deployed for Drake Passage (SR1b) program. |
| Expendable Bathythermograph (XBT) | 12 | Of which one was deployed in too shallow water to be considered successful and 4 deployments failed.<br>XBTs 1-3 deployed for ICEBERGS<br>XBTs 4-5 deployed for opportunistic Marguerite Trough program<br>XBTs 6-12 deployed for SR1b program. |
| Hamon Grab | 26 | Of which 3 deployments failed |
| N70 Net | 25 | All deployments successful |
| Glider deployments (SLOCUM, Sea Glider, Wave Glider) | 1 x Wave Glider<br>1 x Sea Glider<br>5 x SLOCUM | Of which two SLOCUM Gliders had to be recovered due to technical issues. |
| Velocity Micro Profiler (VMP) | 1 | VMP test deployment resulted in instrument failure. |
| Floats (FL) | 5 | All deployments successful. |

Site identifiers

The ICEBERGS program used site identifiers in their sampling ID. Sites at Marian Cove, King George Island were labelled using MC as the site identifier while William Glacier at Borgen Bay, Anvers Island were labelled using BB as the identifier and Sheldon Glacier, Adelaide Island were labelled using SG as the identifier. Additionally at each site there were generally five sampling stations labelled numerically with station one being closest. The opportunistic Marguerite Trough science program consisted of 10 stations (of which only 6 were visited) labelled using MT. The Drake Passage science program sites were referred to in the Bridge Log by the identifier SR1b. The ORCHESTRA (WP2) Glider science program sites were referred to by the identifier GL.

*Data sets and their use*

| Dataset | **Trawl event metadata** |
|---|---|

| | | |
|---|---|---|
| Instruments | **Mini Agassiz Trawl** | |
| Description | Trawl deployment information was vital to correctly work out the length of seabed trawled | |
| Analogue data | None | |
| Digital data | Logs | JR17001 Bridge Event Log, JR17001 miniAGT log |
| Long term data management | Event metadata will be stored within the Marine Metadata Portal developed by the Polar Data Centre | |
| Other users of the data | All cruise participants | |

| | |
|---|---|
| Dataset | **Trawl physical samples** |
| Instruments | **Mini Agassiz Trawl** |
| Description | Biological samples were sorted after trawls and a record was made of (rough) taxonomy, number of individuals, weight and sample preservation technique all linked to a storage vial ID. |
| Analogue data | None |
| Digital data | /data/cruise/jcr/20171119/work/miniAGT/JR17001_AGT.csv |
| Physical samples | Samples will be returned to the biological store at BAS and accompanying cruise participants to their respective institutions.<br>Post-cruise the samples will be examined, described and analysed by a variety of cruise and non-cruise participants.<br>Tissue samples of key taxa were preserved in 96% ethanol, RNA-later or frozen at -80 degrees for future molecular and isotopic analysis.<br>A limited amount of taxa specific analysis was undertaken but was too preliminary to include as distinct datasets. |
| Long term data management | There are ongoing efforts to hold trawl sample metadata and sample analysis data within the Polar Data Centre but in the meantime PSO Dave Barnes will manage these data.<br>The primary repository for physical samples will be the BAS biological store. |
| Other users of the data | All cruise participants. The list below shows those most likely to work further on samples and sample metadata and their general research area for reference:<br><br>SANDS, Chester (Ophiuroida; BAS)<br>HOLLYMAN, Phillip (Gastropoda; U. Bangor)<br>ROMAN, Alejandro (Bivalava; U. Exeter)<br>MUÑOZ-RAMÍREZ, Carlos (Molusca; U. Concepcion)<br>BARNS, David (Bryozoa; BAS) |

| | |
|---|---|
| | JANOSIK , Alexis (Asteroida; Organisms for microplastic contamination; UWF)<br>STOWASSER, Gabrielle (fissssh ;BAS)<br>GOODALL-COPESTAKE, William (Tunicata; BAS) |

| Dataset | **Hamon grab metadata** | |
|---|---|---|
| Instruments | **Hamon Grab** | |
| Description | Grab deployment information summarising the location of the successful and unsuccessful grab locations | |
| Analogue data | None | |
| Digital data | Logs | JR17001 Bridge Event Log, JR17001 Hamon Grab log |
| Long term data management | Event metadata will be stored within the Marine Metadata Portal developed by the Polar Data Centre | |
| Other users of the data | All cruise participants | |

| Dataset | **Hamon grab photos** |
|---|---|
| Instruments | **Hamon Grab** |
| Description | Still photography was used to document the state of a grab just after recovery. |
| Analogue data | None |
| Digital data | Raw format. Canon raw format codek (.cr2)<br>/data/cruise/jcr/20171119/work/hamon_grab/'site identifier' |
| Long term data management | Metadata will be stored on the SAN at BAS and managed by the Polar Data Centre. |
| Other users of the data | All cruise participants |

| Dataset | **Hamon grab physical samples** |
|---|---|
| Instruments | **Hamon Grab** |
| Description | Biological samples were sorted after grab to be sorted and analysed after the research cruise. |
| Analogue data | None |
| Digital data | None |

| | |
|---|---|
| Physical samples | The majority of the samples will be returned to Bangor University and Concepcion University. Post-cruise the samples will be examined, described and analysed by a variety of cruise and non-cruise participants.<br>Each grab was split into two sub-samples and sieved:<br>One subsample sample was fresh frozen at -80 degrees and will be further analysed at Concepcion University for future molecular and isotopic analysis.<br>The other subsample was preserved in 96% ethanol, and frozen at -80 degrees for future molecular and isotopic analysis at Bangor University. |
| Long term data management | The primary repository for physical samples will be the institutions mentioned above. |
| Other users of the data | All cruise participants.<br><br>The list below shows those most likely to work further on samples and sample metadata and their general research area for reference:<br><br>HOLLYMAN, Phillip (Gastropoda and benthic community assemblages; U. Bangor)<br>ROMAN, Alejandro (Bivalva and benthic community assemblages; U. Exeter)<br>MUÑOZ-RAMÍREZ, Carlos (Molusca and benthic community assemblages; U. Concepcion) |

| | | |
|---|---|---|
| Dataset | **N70 net metadata** | |
| Instruments | **N70 net** | |
| Description | Net deployment information to summarising the location of the seabed net sampling locations. | |
| Analogue data | None | |
| Digital data | Logs | JR17001 Bridge Event Log, JR17001 N70 net log |
| Long term data management | Event metadata will be stored within the Marine Metadata Portal developed by the Polar Data Centre | |
| Other users of the data | All cruise participants | |

| | |
|---|---|
| Dataset | **N70 net physical samples** |
| Instruments | **N70 net** |

| | |
|---|---|
| Description | Plankton sample, frozen in water, collected with a N70 net. |
| Analogue data | None |
| Digital data | None |
| Physical samples | The majority of the samples will be returned to the biological store at BAS and remain fresh frozen at -20 degrees for any future analyses. A small subset of organisms we preserved in 96% ethanol, and frozen at -80 degrees for microplastic analysis at the University of West Florida. |
| Long term data management | There are ongoing efforts to hold trawl sample metadata and sample analysis data within the Polar Data Centre but in the meantime William Goodall-Copestake will manage these data.<br>The primary repository for physical samples will be the BAS biological store. |
| Other users of the data | All cruise participants.<br><br>The list below shows those most likely to work further on samples and sample metadata and their general taxonomic areas for reference:<br><br>GOODALL-COPESTAKE, William (Plankton samples; BAS)<br>JANOSIK , Alexis (Organisms for microplastic contamination; UWF) |

| Dataset | **SUCS metadata** | |
|---|---|---|
| Instruments | **Shallow Underwater Camera System** | |
| Description | SUCS deployment information summarising the location of the SUCS photographs on the seabed. | |
| Analogue data | None | |
| Digital data | Logs | JR17001 Bridge Event Log, JR17001 SUCS |
| Long term data management | Event metadata will be stored within the Marine Metadata Portal developed by the Polar Data Centre | |
| Other users of the data | All cruise participants | |

| Dataset | **SUCS photos and video** |
|---|---|
| Instrument | **SUCS** |
| Description | The SUCS frame holds an underwater Prosilica video camera that can be operated in a number of modes. On JR17001 the camera was |

| | | |
|---|---|---|
| | mainly used to capture still photos when the SUCS frame was at rest on the seabed. | |
| Analogue data | None | |
| Digital data | Raw | /data/cruise/jcr/20171119/work/scientific_working_area/sucs/'sample site'/'event_id'<br>Prosilica video files (.avi) are in with the still photos (.png) |
| Long term data management | Metadata will be stored on the SAN at BAS and managed by the Polar Data Centre. | |
| Other users of the data | All cruise participants | |

| | | |
|---|---|---|
| Dataset | **Multicore metadata** | |
| Instruments | **Okatpus Multicorer** | |
| Description | Multicorer deployment information summarising the location of the successful and unsuccessful grab locations. | |
| Analogue data | None | |
| Digital data | Logs | JR17001 Bridge Event Log, JR17001 Multicorer |
| Long term data management | Event metadata will be stored within the Marine Metadata Portal developed by the Polar Data Centre | |
| Other users of the data | All cruise participants | |

| | |
|---|---|
| Dataset | **Multicore physical samples** |
| Instrument | **Oktopus 12-core multi-corer** |
| Description | The Oktopus multicorer has the capacity to recover up to 12 co-located cores of up to xx cm in length. Depending on the recovery the cores were sub-sampled for the following analyses:<br>Sedimentation Rate (SED) (x1)<br>Inorganic Carbon (IC) (x1)<br>Organic Carbon (OC) (x1)<br>Micropalaeontology (x2)<br>Microplastic (x2)<br>Macrofauna Carbon Analysis (Remaining Cores) |
| Analogue data | None |
| Digital data | None |
| Physical Data | SED : Cores were subsampled and sent to British Antarctic Survey before being sent elsewhere (TBC) for further analysis. |

| | |
|---|---|
| | IC: Cores were subsampled and sent to Leeds University for further analysis.<br>OC: Cores were subsampled and sent to Leeds University for further Analysis<br>Micropalaeontology: Cores were subsampled and sent to MacEwan University for further analysis.<br>Microplastics: Cores were subsampled and sent to University of West Florida for further analysis.<br>Macrofauna Carbon Analysis: Cores were subsampled and sent to Rothera for further analysis |
| Long term data management | Metadata will be stored on the SAN at BAS and managed by the Polar Data Centre.<br>If analysed eDNA sequences will be made publically available on Genbank. |
| Other users of the data | All cruise participants.<br><br>The list below shows those most likely to work further on samples and sample metadata and their general research areas for reference:<br><br>CLARK, Marlon (Macro Carbon Analysis; BAS)<br>GOODALL-COPESTAKE, William (Epibenthic water for eDNA Analysis (to be confirmed); BAS)<br>JANOSIK , Alexis (Organisms for microplastic contamination; UWF)<br>PIENKOWWSKI, Anna (Micropalaeontology; MacEwan University)<br>BARNES, David (IC, OC and SED cores; BAS) |

| Dataset | **CTD sensor data and metadata** | |
|---|---|---|
| Instruments | **Various sensors on the CTD frame including Niskin bottles** | |
| Description | CTDs were deployed for all science programs on JR17001.<br>CTDs consisted of the following sensors and 24 niskin bottles that were fired and sampled water for further analysis (see next table for further information on niskin sampling and analyses):<br>• Sea-Bird SBE 3plus (SBE 3P) temperature sensor<br>• Sea-Bird SBE 4C conductivity sensor<br>• Teledyne RDI Workhorse Mariner 300kHz ADCP<br>• Biospherical QCD-905L underwater PAR sensor<br>• Sea-Bird SBE 43 Dissolved Oxygen Sensor<br>• Sea-Bird SBE 35 thermometer<br>• Chelsea Technologies Group Aquatracka III fluorometer<br>• WETLabs C-Star transmissometer | |
| Analogue data | Logs | BAS PDC holds paper copies of the CTD logs. These have been scanned (.pdf) and can be found in |

| | | | |
|---|---|---|---|
| | | /data/cruise/jcr/20160223/work/scientific_work_area/ctd | |
| Digital data | Logs | Bridge event log, CTD .bl files (note that this contains unprocessed values from the sensors), JR17001 CTD for ICEBERGS CTD metadata | |
| | Raw | .asc, .cnv, .ros | /data/cruise/jcr/20171119/ctd |
| | Calibration | /data/cruise/jcr/20171119/work/ctd | |
| | Processed | .bl, .cnv, .hdr, .ros, .hex, .XMLCON NETCDF (.nc) | Initial CTD processing on the cruise was stored within /data/cruise/jcr/20171119/ctd/jr17001<br><br>Raw and processed data will be submitted to the British Oceanographic Data Centre (BODC). |
| Long term data management | Metadata will be stored on the SAN at BAS and managed by the Polar Data Centre.<br>Raw and processed CTD data will be submitted and accessible from the BODC.<br>Final calibrated 2dbar and niskin bottle sample files will also be submitted and accessible from the Cilvar & Carbon Hydrographic Data Office (CCHDO) website once fully processed.<br>[www.cchdo.ucsd.edu](http://www.cchdo.ucsd.edu) | | |
| Other users of the data | All cruise participants.<br><br>FIRING, Yvonne (NOC) | | |

| Dataset | **CTD bottle samples** | |
|---|---|---|
| Instrument | **CTD – Niskin bottles** | |
| Description | Seawater collected from Niskin bottles was analysed during the cruise for dissolved oxygen concentration and salinity, after the cruise water samples will be further analysed for oxygen isotope, in some cases chlorophyll, POC, microplastics and eDNA. | |
| Analogue data | Paper copies of the CTD NISKIN sampling logs were managed and maintained by Yvonne Firing (NOC). Logs were scanned and can be found in /data/cruise/jcr/20160223/work/scientific_work_area/ctd/ | |
| Digital data | Raw | /data/cruise/jcr/20160223/work/scientific_work_area/ctd/ |
| Long term data management | Metadata will be stored on the SAN at BAS and managed by the Polar Data Centre.<br>Raw and processed niskin bottle data will be submitted and accessible from the BODC.<br>Final calibrated 2dbar and niskin bottle sample files will also be submitted and accessible from the Cilvar & Carbon Hydrographic Data Office (CCHDO) website once fully processed.<br>[www.cchdo.ucsd.edu](http://www.cchdo.ucsd.edu) | |

| | |
|---|---|
| | eDNA sequences will be made publically available on Genbank after publication. |
| Other users of the data | All cruise participants.<br><br>FIRING, Yvonne (NOC)<br>MOUNTFORD , Alethia (Microplastics, U. Newcastle)<br>GOODALL-COPESTAKE, William (eDNA from SR1b CTDs; BAS)<br>JANOSIK , Alexis (Microplastics and eDNA from ICEBERGS CTDs; UWF) |

<table>
<tr><td>Dataset</td><td colspan="2">Expendable Bathythermographs</td></tr>
<tr><td>Instrument</td><td colspan="2">XBT, CTDs</td></tr>
<tr><td>Description</td><td colspan="2">A limited number of XBTs were deployed to gain sound velocity profiles for input into the multibeam echosounder. A series of XBTs were also launched for the Drake Passage (SR1b) program to gain temperature profiles of the water column.</td></tr>
<tr><td>Analogue data</td><td colspan="2">None</td></tr>
<tr><td rowspan="2">Digital data</td><td>Log</td><td>Bridge Event Log; JR17001 XBT</td></tr>
<tr><td>Raw</td><td>/data/cruise/jcr/20171119/xbt</td></tr>
<tr><td>Long term data management</td><td colspan="2">Data will be stored on the SAN at BAS and managed by the Polar Data Centre.</td></tr>
<tr><td>Other users of the data</td><td colspan="2">HOWARD, Floyd (UKPDC)<br>VAN LANDEGHEM, Katrien (U. Bangor)<br>FIRING, Yvonne (NOC)</td></tr>
</table>

<table>
<tr><td>Dataset</td><td colspan="3">Topas</td></tr>
<tr><td>Instrument</td><td colspan="3">Kongsberg Parametric Sub-bottom Profiler 18.</td></tr>
<tr><td>Description</td><td colspan="3">Depth data as collected by the Kongsberg EM122 multibeam echosounder.</td></tr>
<tr><td>Analogue data</td><td colspan="3">None</td></tr>
<tr><td rowspan="3">Digital data</td><td>Logs</td><td colspan="2">JR17001 Bridge Event Log, JR17001 Topas</td></tr>
<tr><td>Raw</td><td>.raw</td><td>/data/cruise/jcr/20171119/topas/raw/jr17001/RAW</td></tr>
<tr><td>Processed</td><td>.seg</td><td>/data/cruise/jcr/20171119/topas/segy/jr17001/SEG</td></tr>
<tr><td>Long term data management</td><td colspan="3">Data will be stored on the SAN at BAS and managed by the Polar Data Centre.</td></tr>
<tr><td>Other users of the data</td><td colspan="3">All cruise participants.<br>VAN LANDEGHEM, Katrien (U. Bangor)</td></tr>
</table>

| | |
|---|---|
| | HOWARD, Floyd (UKPDC) |

| | | | |
|---|---|---|---|
| Dataset | **Multibeam bathymetry** | | |
| Instrument | **EM122** | | |
| Description | Depth data as collected by the Kongsberg EM122 multibeam echosounder. | | |
| Analogue data | None | | |
| Digital data | Logs | JR17001 Bridge Event Log, JR17001 EM122 multibeam | |
| | Raw | .raw | /data/cruise/jcr/20170223/em122/raw |
| | Processed | /data/cruise/jcr/20160223/work/scientific_work_area/em122/mb/ | |
| Calibration | None – there was insufficient time during this cruise for a calibration. | | |
| Long term data management | Data will be stored on the SAN at BAS and managed by the Polar Data Centre. | | |
| Other users of the data | All cruise participants.<br>VAN LANDEGHEM, Katrien (U. Bangor)<br>HOWARD, Floyd (UKPDC) | | |

| | | |
|---|---|---|
| Dataset | **Wave Glider Deployment** | |
| Instrument | **Liquid Robotics SV2 Model Wave Glider** | |
| Description | A Wave Glider was deployed for the ORCHESTRA (WP2) science program with the following sensors:<br>Met station, water speed sensor, inclinometer, time-lapse camera, ADCP. | |
| Analogue data | None | |
| Digital data | Logs | Bridge event log |
| | Raw | Met, surface current and navigation data synced every 10 minutes via IRIDIUM to Liquid Robotics Wave Glider Management System. Available via request to Miguel Maqueda on request.<br>Other sensors are recording data locally to be downloaded afte the glider is recovered. |
| | Processed | None |
| Long term data management | Metadata will be stored at on the SAN at BAS and managed by the Polar Data Centre.<br>Raw and processed data will be submitted and managed by BODC in line with the ORCHESTRA data management plan. | |
| Other users of the data | MAQUEDA, Miguel (U. Newcastle) | |

| | | |
|---|---|---|
| Dataset | **SeaGlider Deployment** | |
| Instrument | **Kongsberg SeaGlider** | |
| Description | A Kongsberg SeaGlider (Serial Number: 640) was deployed for the ORCHESTRA (WP2) science program with the following sensors: CTD, EcoPuck, dissolved oxygen optode, PAR, acousonde | |
| Analogue data | None | |
| Digital data | Logs | Bridge event log |
| | Raw | Raw data synced after each dive via IRIDIUM with Kongsberg's servers. Available via request to Louise Biddle. |
| | Processed | None |
| Calibration | None | |
| Long term data management | Metadata will be stored at on the SAN at BAS and managed by the Polar Data Centre.<br>Raw and processed data will be submitted and managed by BODC in line with the ORCHESTRA data management plan.<br>Final calibrated and processed .nc files will be submitted and accessible from the Southern Ocean Observing System website, www.soos.aq. | |
| Other users of the data | BIDDLE, Louise (U. Gottenberg) | |

| | | |
|---|---|---|
| Dataset | **SLOCUM Deployments** | |
| Instrument | **Teledyne Slocum gliders** | |
| Description | Five Teledyne Slocum Gliders were deployed for the ORCHESTRA (WP2) science program with the following sensors:<br>1. Serial Number (SN): 632, Sensors: CTD, EcoPuck, microstructure<br>2. SN: 633, Sensors: CTD, EcoPuck, microstructure<br>3. SN: 408, Sensors: CTD, Ecopuck, dissolved oxygen optode<br>4. SN: 330, Sensors: CTD, Ecopuck, dissolved oxygen optode<br>5. SN: 424, Sensors: CTD, dissolved oxygen optode, microstructure | |
| Analogue data | None. | |
| Digital data | Logs | Bridge event log, Functional_Checkout_Log (/data/cruise/jcr/20160223/work/gliders) |
| | Raw | Raw data for recovered gliders 408 and 424 have been archived in binary format on /data/cruise/jcr/20160223/work//gliders/unit_xxx /glider_cf_dump /data/cruise/jcr/20160223/work/gliders/unit_xxx/ glider_cf_dump |

| | | |
|---|---|---|
| | | A decimated version of actively acquiring SLOCUM data is synced after each dive via IRIDIUM to docserver.nerc-bas.ac.uk:/var/opt/gmc/gliders/unit_XXX/from-glider. Available via request to Alexander Brearley. |
| | Processed | None |
| Calibration | setup.cfg files for microstructure instruments can be found in /data/cruise/jcr/20160223/work/gliders/unit_XXX/microstructure. | |
| Long term data management | Metadata will be stored at on the SAN at BAS and managed by the Polar Data Centre.<br>Raw and processed data will be submitted and managed by BODC in line with the ORCHESTRA data management plan. | |
| Other users of the data | BREARLEY, Alexander (BAS)<br>VENABLES, Hugh (BAS)<br>SCOTT, Ryan (U. Southhampton, BAS) | |

| Dataset | **VMADCP** | | |
|---|---|---|---|
| Instrument | **Vessel Mounted Acoustic Doppler Current Profiler** | | |
| Description | A vessel mounted acoustic Doppler Ocean Surveyor 75 kHz was used during JR17001 to map the distribution and speed of ocean currents beneath the ships path.<br>Data was calibrated and processed using the UHDAS+CODAS 2015.05.01 python library. | | |
| Analogue data | Paper logsheets. These have been scanned and can be found in /data/cruise/jcr/20160223/work/scientific_work_area/VMADCP | | |
| Digital data | Raw | .enr .ens .enx .log .lta .nr1 .nms .sta .vmo | /data/cruise/jcr/20160223/adcp |
| | Processed | /data/cruise/jcr/20160223/work/scientific_work_area/VMADCP | |
| | Calibration | /data/cruise/jcr/20160223/work/scientific_work_area/VMADCP | |
| Long term data management | Data will be stored on the SAN at BAS and managed by the Polar Data Centre. | | |
| Other users of the data | All cruise participants:<br><br>FIRING, Yvonne (U. Southhampton)<br>BARNES, Dave (BAS) | | |

| Dataset | **Float data and metdata** |
|---|---|
| Instruments | **ARGO Float (Teledyne Deep APEX)** |
| Description | 4 Deep APEX were deployed for ORCHESTRA science program.<br>The floats measured the following variables:<br>• Temperature, |

| | | |
|---|---|---|
| | • Conductivity,<br>• Pressure,<br>• Dissolved oxygen. | |
| Analogue data | Logs | None. |
| Digital data | Logs | Bridge event log, |
| | Raw | Raw data from each dive is synced in near real time via IRIDIUM to servers managed by argo.uscd.edu. |
| | Calibration | None. |
| | Processed | None on cruise. |
| Long term data management | Metadata will be stored on the SAN at BAS and managed by the Polar Data Centre.<br>Raw and processed Deep APEX float data will be archived, managed and accessed by the argo programme from www.argo.uscd.edu. | |
| Other users of the data | FIRING, Yvonne (NOC) | |

| Dataset | **Float data and metdata** | |
|---|---|---|
| Instruments | **Argo Float (NKE Arvor float)** | |
| Description | 3 NKE Arvor floats were deployed for Euro-argo program. The floats measured the following variables:<br>• Temperature,<br>• Conductivity,<br>• Pressure,<br>• Dissolved oxygen. | |
| Analogue data | Logs | None. |
| Digital data | Logs | Bridge event log, Arvor deployment log found in /data/cruise/jcr/20171119/work/scientific_work_area/floats/ |
| | Raw | Raw data from each dive is synced in near real time via IRIDIUM to servers managed by argo.uscd.edu. |
| | Calibration | None. |
| | Processed | None on cruise. |
| Long term data management | Metadata will be stored on the SAN at BAS and managed by the Polar Data Centre.<br>Raw and processed float data will be archived, managed and accessed by the argo programme from www.argo.uscd.edu. | |
| Other users of the data | FIRING, Yvonne (NOC) | |

| | | |
|---|---|---|
| Dataset | **Underway data streams** | |
| Instruments | Various – all logged by NOAA SCS software | |
| Description | Underway data from a variety of oceanographic, meteorological, navigational and acoustic sources are logged by SCS software on a timescale dependent on the instrument. Some additional sources are available when they are deployed such as the USBL positional device that can be optionally fixed to the SUCS frame. | |
| Analogue data | None | |
| Digital data | Raw | /data/cruise/jcr/20171119/scs |
| Long term data management | Data will be stored on the SAN at BAS and managed by the Polar Data Centre. | |
| Other users of the data | All cruise participants | |