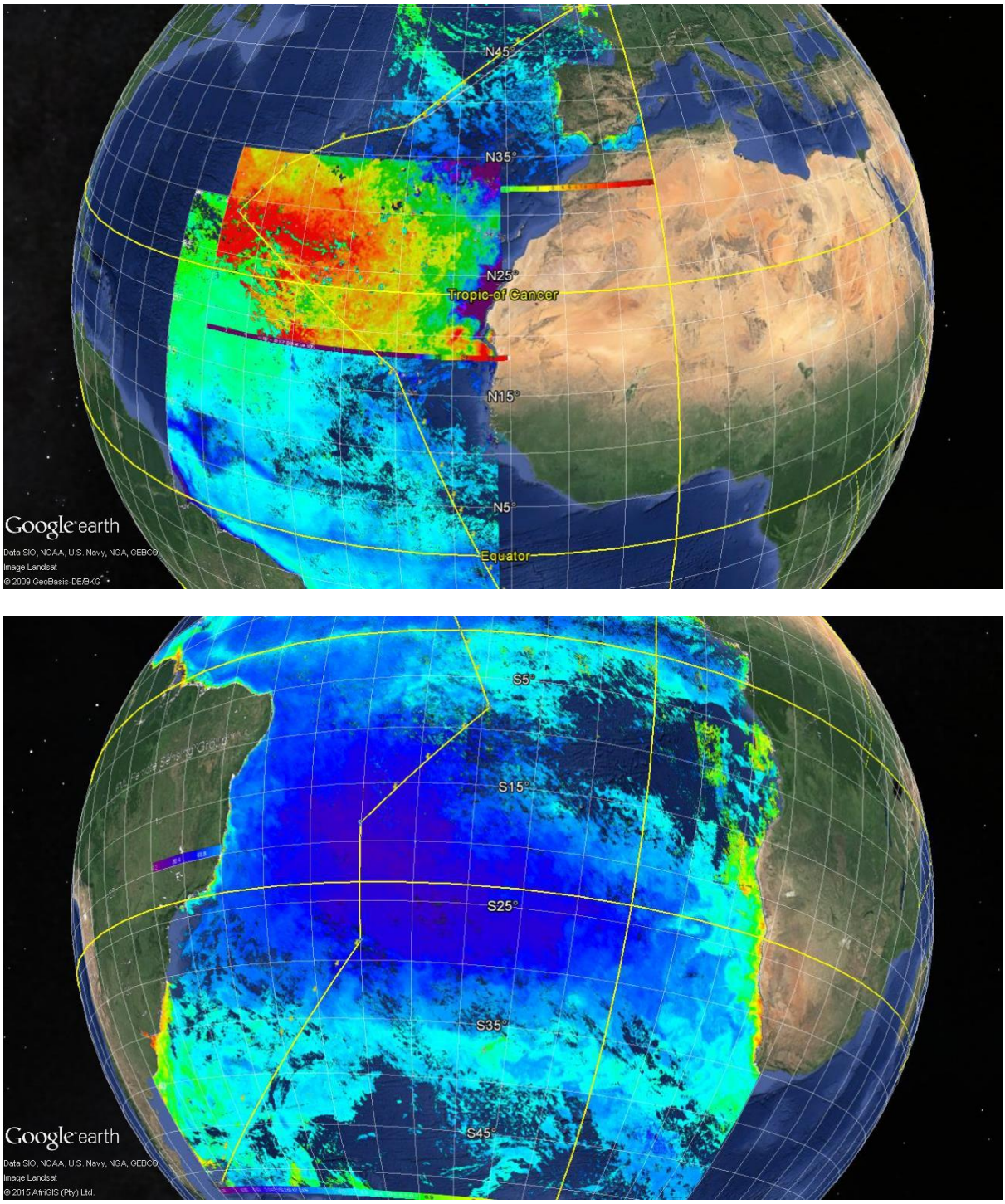
AMT25 (JR15001) Cruise Report



AMT25 cruise track overlaid by NEODAAS satellite products provided during the expedition. From top to bottom: VIIRS chlorophyll, AVHRR SST, VIIRS Euphotic depth and VIIRS chlorophyll.

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Overview

AMT25 set sail from Immingham on 15th September aboard the British Antarctic Survey vessel James Clark Ross, and arrived in Stanley, Falkland Islands on 3rd November 2015. The overall aim of the Atlantic Meridional Transect programme funded by the Natural Environmental Research Council as National Capability is: to quantify key biogeochemical and ecosystem processes and their inherent variability over extended time and spatial scales in the Atlantic Ocean. This is achieved by executing an annually repeated meridional transect through contrasting oceanic provinces, ranging from oligotrophic deserts, to highly productive shelf seas.

The specific objectives of AMT are:

- To quantify the nature and causes of ecological and biogeochemical variability in planktonic ecosystems;
- To quantify the effects of this variability on nutrient cycling, on biogenic export and on air-sea exchange of climate active gases;
- To construct multi-decadal, multidisciplinary ocean time-series which are integrated within a wider "Pole-to-pole" observatory concept;
- To provide essential sea-truth validation for current and next generation satellite missions;
- To provide essential data for global ecosystem model development and validation;
- To provide a valuable, highly sought after and unique training arena for the next generation of UK and International oceanographers.

The highlights of AMT25 were as follows:

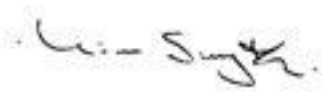
- Eighty-one CTD profiles at stations spaced approximately 200 nM apart measuring key physical and biogeochemical parameters including: temperature, salinity, chlorophyll, oxygen, nutrients, total alkalinity, dissolved inorganic carbon, phytoplankton abundance and microbial dynamics;
- Thousands of underway bio-optical and biogeochemical measurements covering a 100° range in latitude and vastly contrasting ocean biomes;
- Underway radiometry combined with hyperspectral in-water Inherent Optical Property measurements, particularly pertinent for satellite calibration validation. Both hyperspectral and multi-spectral data were taken independently;
- Launch of 7 Argo floats, on behalf of the UK and German Met Offices, in the tropical and south Atlantic;
- Recovery a deep (5000 m) sediment trap mooring in the South Atlantic Gyre for NOC, which had previously been deployed in October 2014 (AMT24) and the construction and deployment of a single sediment trap mooring at the same location. The entire operation was achieved in less than 18 hours;
- Automated processing chain, partly developed and designed on AMT24/25, to seamlessly send coarse resolution CTD data to the UK Met Office for assimilation into atmosphere / ocean forecasts. Of particular interest was the real-time ingestion to FOAM of a deep CTD cast (>5000 m) in the northern Atlantic;
- Continuous operation of acoustic sensors to probe positions of marine creatures;
- Continuous swath bathymetry and ADCP data;

In addition to this, AMT25 was able to deliver on high quality science for other NERC / BAS programmes including:

- Deployment of two complex moorings for the NERC RidgeMix project. The mid-Atlantic ridge (MAR) in this region was thoroughly bathymetrically surveyed and then characterised in terms of its biogeochemical properties. A survey of an additional transect down the MAR was also carried out, alternating deep CTD (2000 m) profiles with the AMT standard shallow (500 m) casts. A final 5500 m cast was done on the abyssal plain;
- A comprehensive swath bathymetry survey around Ascension Island, prior to BAS scientists joining for a three day field campaign. This enabled the BAS scientists to immediately plan the benthic surveying based on the data that AMT scientists had collected;
- Continuous operation of the Spectronus trace gas analyser for the University of Exeter.

All three points above demonstrate that AMT25 delivered value added science for the NERC Institute and HEI sectors this year.

All the scientists would like to acknowledge the work of the NMFSS (Candice Cameron, Paul Provost and Nick Rundle) and AME technical support (Seth Thomas, Andy England) teams, the Officers and crew of the JCR for making this a successful and highly enjoyable research cruise. I would like to thank Andy Rees and Glen Tarran for the exceptional pre-cruise planning and logistics and Christina Pardos-Bradley for her assistance.



Tim Smyth, PSO JR15001

Plymouth, 27 November 2015

AMT 25 Scientific cruise participants

Top row (l to r): Arwen Bargery, Bita Sabbaghzadeh, Carolina Beltran, Bob Brewin

Top middle (l to r): Cat Burd, Catherine Mitchell, Charlotte Smith

Bottom middle (l to r): Giorgio Dall'Olmo, Glen Tarran, Kim Bird, Pri Lange

Bottom row (l to r): Robyn Tuerena, Tim Smyth

CTD and underway sensor calibrations

Arwen Bargery
British Oceanographic Data Centre

CTD profiles

A total of 74 CTD casts were completed during the cruise. All casts were conventional profiling casts with water sampling by 24 x 20L OTE Niskin bottles. Casts were carried out at ~04:00-05:00 and ~13:00 - 14:00 ship-time each day weather permitting.

CTD casts were recorded using the Sea-Bird data collection software Seasave-Win32. The software outputs were then processed following the BODC recommended guidelines using SBE Data Processing-Win32 v7.23.2; the processing routines are named after each stage in brackets < >. The software applied the calibrations as appropriate through the instrument configuration file to the data in engineering units output by the CTD hardware.

An ascii file (CNV) containing the 24 Hz data for up and down casts was generated from the binary Sea-Bird files for each cast <DatCnv>. Files were created for each cast containing the mean values of all the variables at the bottle firing events <Bottle Summary>. Using the CNV files processing routines were applied to remove pressure spikes <WildEdit>, the oxygen sensor was then shifted relative to the pressure by 2 seconds, to compensate for the lag in the sensor response time <AlignCTD> and the effect of thermal 'inertia' on the conductivity cells was removed <CellTM>. The surface soak was identified for each cast, removed and LoopEdit run. Salinity and oxygen concentration were re-derived and density (sigma-theta) values were derived <Derive> after the corrections for sensor lag and thermal 'inertia' had been applied. The CTD files produced from Sea-Bird processing were converted from 24 Hz ascii files into 1 dbar downcast files for calibration and visualisation onboard <BinAverage>. The initial salinity and oxygen channels produced at the DatCnv stage, along with the conductivity, voltage and altimeter channels were removed from the 1 dbar downcast files <Strip>.

The sensor values at bottle firing produced by the Bottle Summary routine were collated and used to generate calibrations for the salinity, oxygen and fluorometer channels. Water samples were collected from each cast for measurement of salinity (bench salinometer) and chlorophyll-a (filtration, acetone extraction and fluorometer measurement) and from the pre-dawn cast each day for oxygen (Winkler titration).

The method used for calibration was to generate an offset between the discrete water sample measurement (salinity/oxygen/chl-a) and the nominal value from the sensor at bottle firing. The offsets were then plotted against the discrete sample values and a linear regression applied.

Where the regression was significant the calibration equation was derived by rearranging the regression equation:

Offset = a * Discrete sample + b

Where offset = Discrete sample – Sensor value

To give Calibrated value = 1/(1-a) * Sensor value + b/(1-a)

Where the regression was not significant the mean value of the offset was applied. All calibration datasets are available upon request from BODC post cruise.

- Temperature

There were no independent measurements of temperature made during the cruise and the sensors on the rig returned consistent data. No further calibration of these sensors has been carried out. The section generated from the primary sensor has been provided in fig. 1.

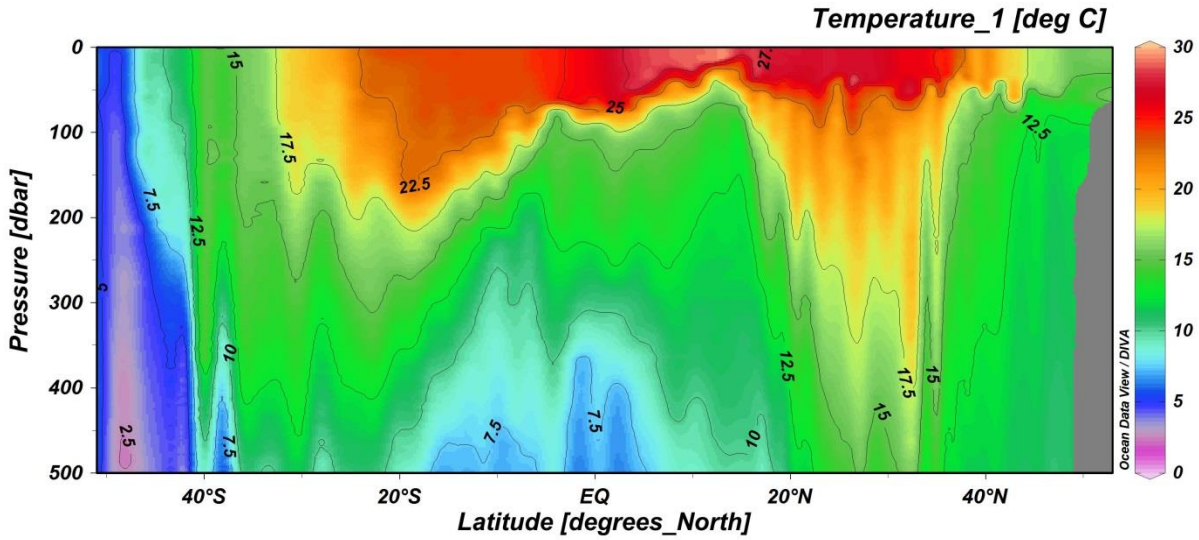


Fig. 1: Temperature section plot along the AMT25 transect by latitude (50 deg N – 50 deg S) from the primary temperature sensor.

- Salinity

The salinity channels were calibrated against bench salinometer measurements from 2 - 4 samples collected from each cast. Further details of these measurements can be found in the NMF-SS cruise report section.

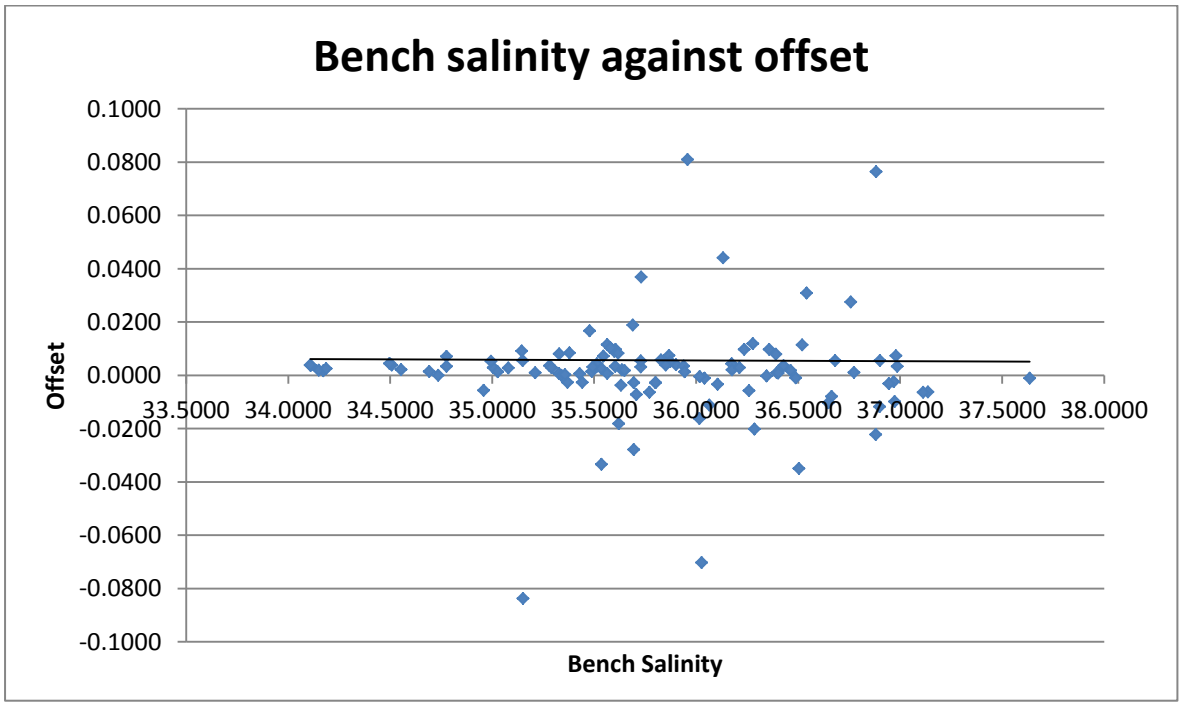


Fig. 2: Salinity offsets for each sensor against discrete sample salinity measured with a bench salinometer.

The calibration equation for the sensor was:

Salinity primary sensor calibrated = sensor + 0.005654 (n = 113; r^2 = 0.0037; p > 0.001);

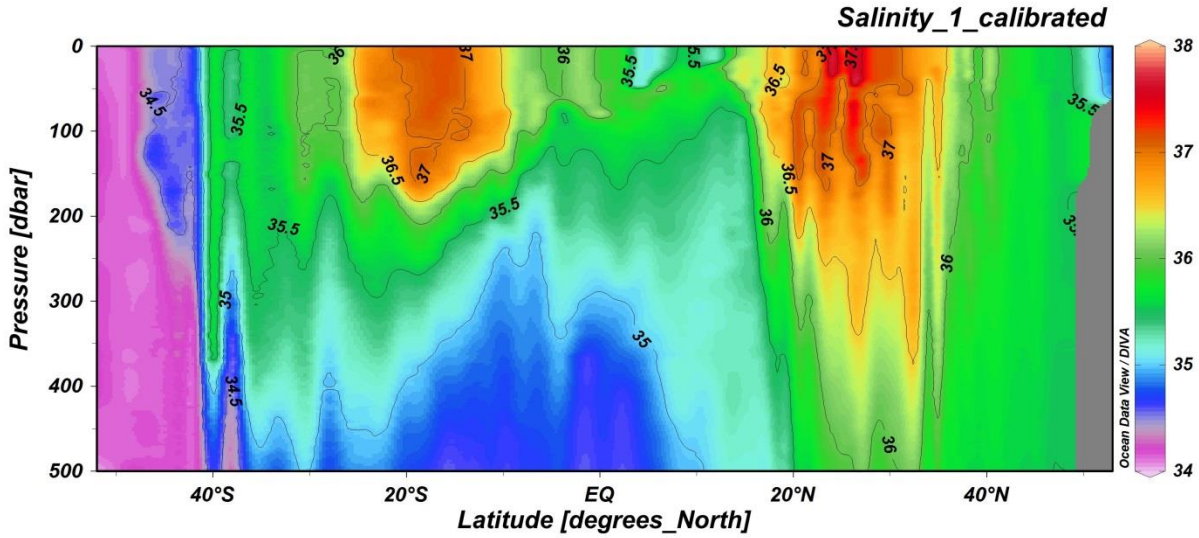


Fig. 3: Salinity section plot along the AMT25 transect by latitude (50 deg N – 50 deg S) from the primary sensor calibrated against bench salinometer samples.

- Oxygen

The oxygen sensor was calibrated against discrete oxygen sample Winkler titration measurements from up to 11 samples collected from the pre-dawn and noon CTDs. More details can be found in Carolina Beltran's report.

The oxygen sensor operated without problem throughout the cruise.

Several data points that did not fit the pattern observed with the data from the other casts were identified by Carolina and were excluded from the calibration data set.

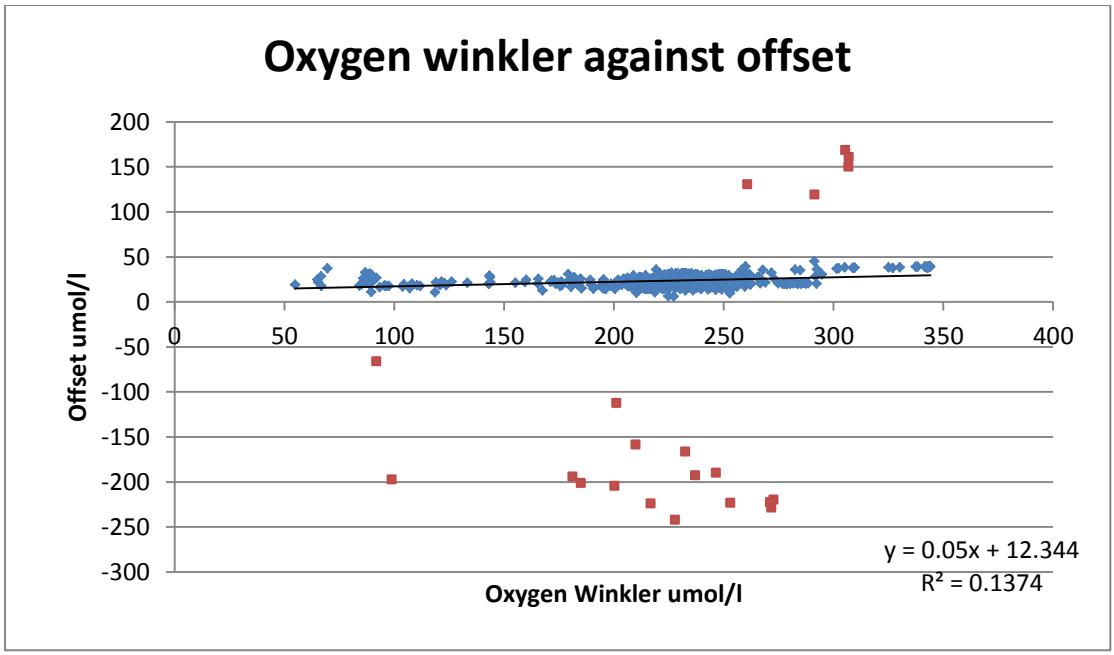


Fig. 4: Oxygen concentration offsets against Winkler titration measurements from discrete samples.

The calibration equation was:

Calibrated $O_{2\ (in\ umol/l)}$ = 1.0525 * sensor $O_{2\ (in\ umol/l)}$ + 12.9935 (n = 664; r^2 = 0.137; p < 0.001);

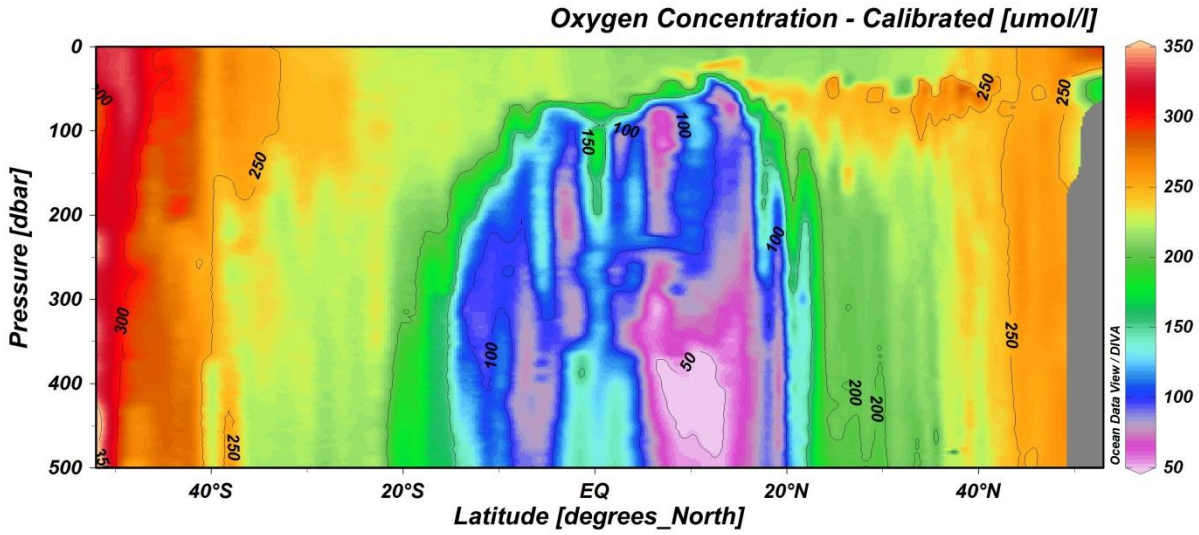


Fig. 5: Oxygen concentration section plot along the AMT25 transect by latitude (50 deg N – 50 deg S) from the SBE43 oxygen sensor calibrated against Winkler titration samples.

- Fluorometer

The CTD fluorometer operated without problem during the cruise. The calibration is to be carried out after the cruise once the fluorometer has been returned to PML for verification of the calibration against known standards.

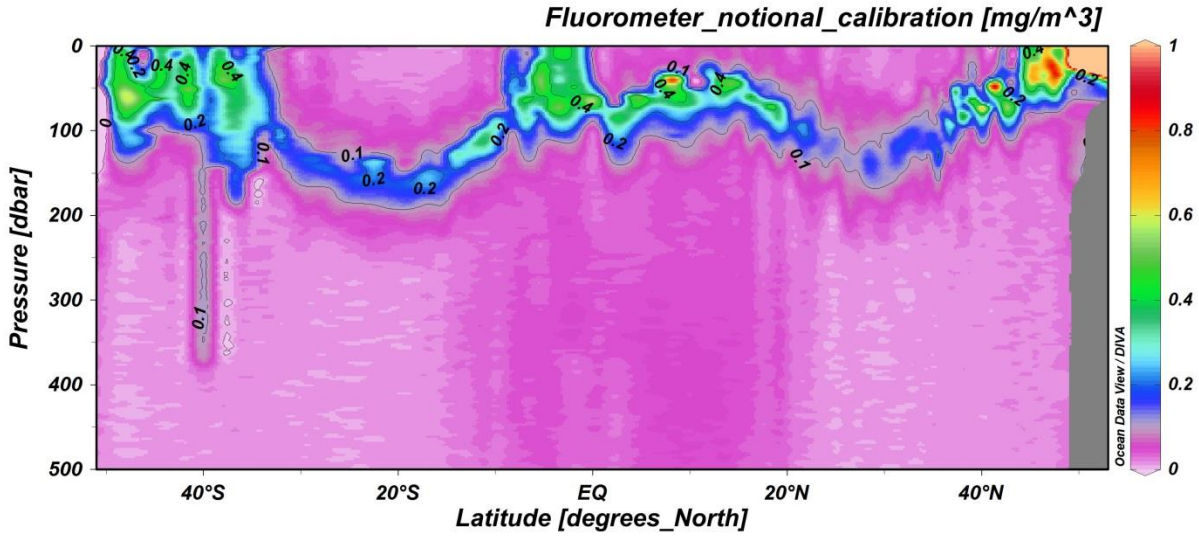


Fig. 6: Fluorometer (nominal calibration) section plot along the AMT25 transect by latitude (50 deg N – 50 deg S).

Underway sensors

The ship's underway meteorological and surface systems were run continuously through the cruise. The sea surface hydrography system started logging from 15/09/2015 14:24 (UT) and was switched off

at arrival to the Falklands on 03/11/2014. Samples were collected to calibrate the TSG and fluorometer connected to the ship's non-toxic flow-through system, which draws water from approximately 6 m below the water line.

- SST – hull mounted sensor

The hull temperature sensor was calibrated against the mean of the CTD temperature sensor values at each station at 6 dbar. There was not a significant regression of the offset with surface CTD sensor values (n = 68; r^2 = 0.0136; p > 0.001) and not offset with time (n=68; r^2 = 0.0097; p > 0.001) so the mean offset was applied.

Calibrated sstemp = sstemp – 0.012

The correction will be applied during BODC processing after the cruise before the data is made available online.

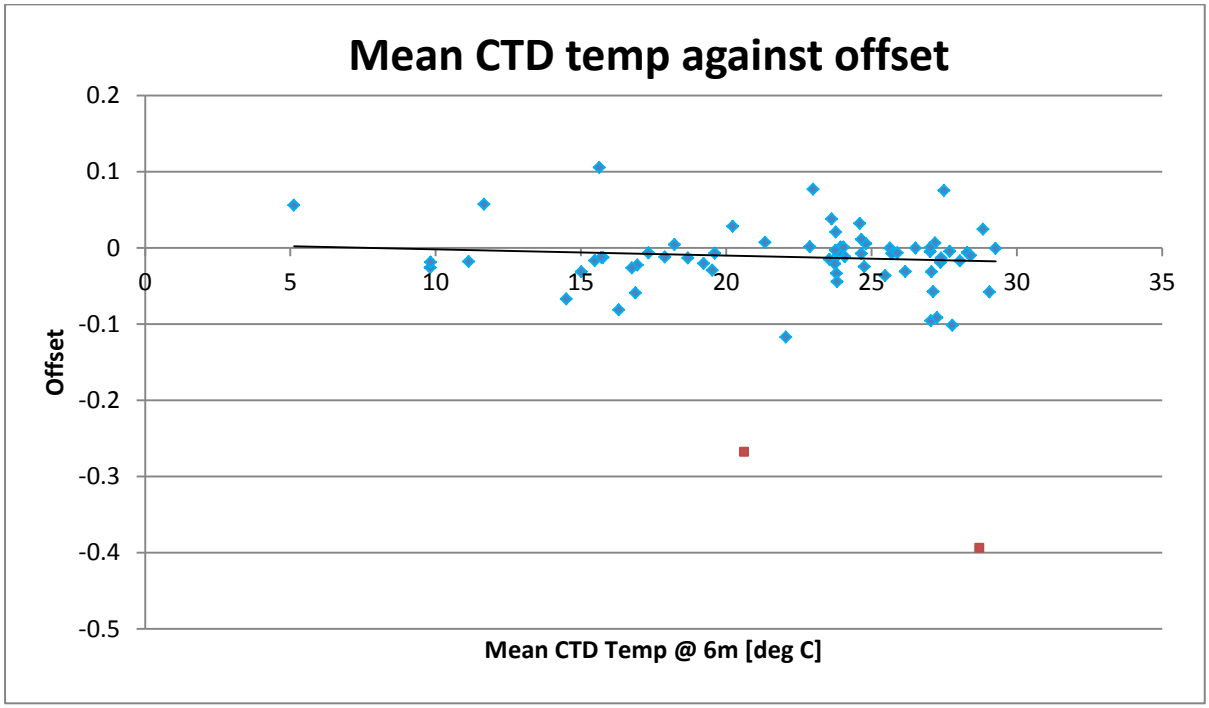


Fig. 7: Salinity offsets against bench salinometer measurements on discrete underway samples.

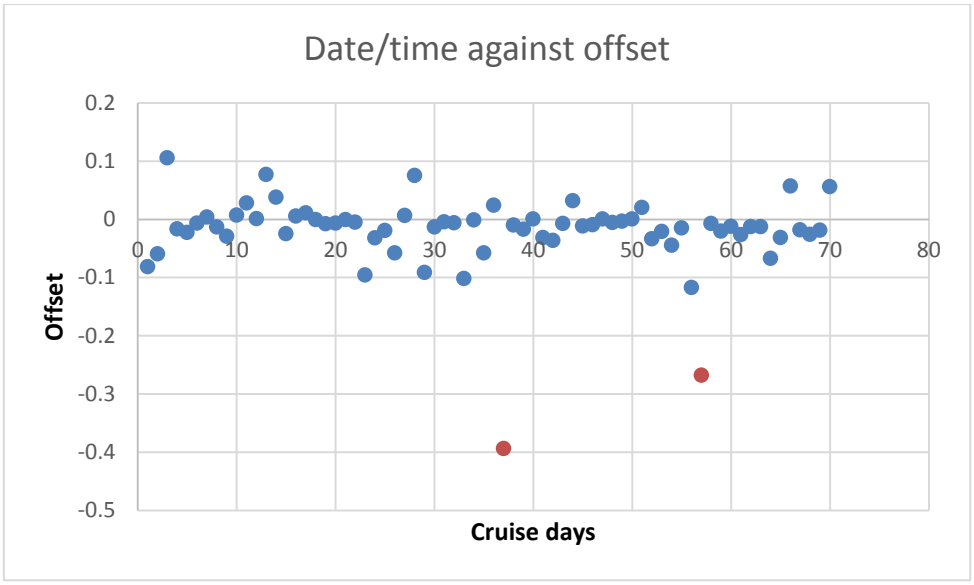


Fig. 8: Hull sensor temperature offsets against surface CTD temperature measurements and date/time.

- Salinity

The TSG sensor salinity data were calibrated against samples collected and analysed with a bench salinometer. Up to four samples were collected each day. There was not a significant regression of the offset with bench salinity measurement (n = 105; r^2 = 0.00004; p > 0.001) and not offset with time so the mean offset was applied.

Calibrated salinity = TSG salinity – 0.0065

The correction will be applied during BODC processing after the cruise before the data is made available online.

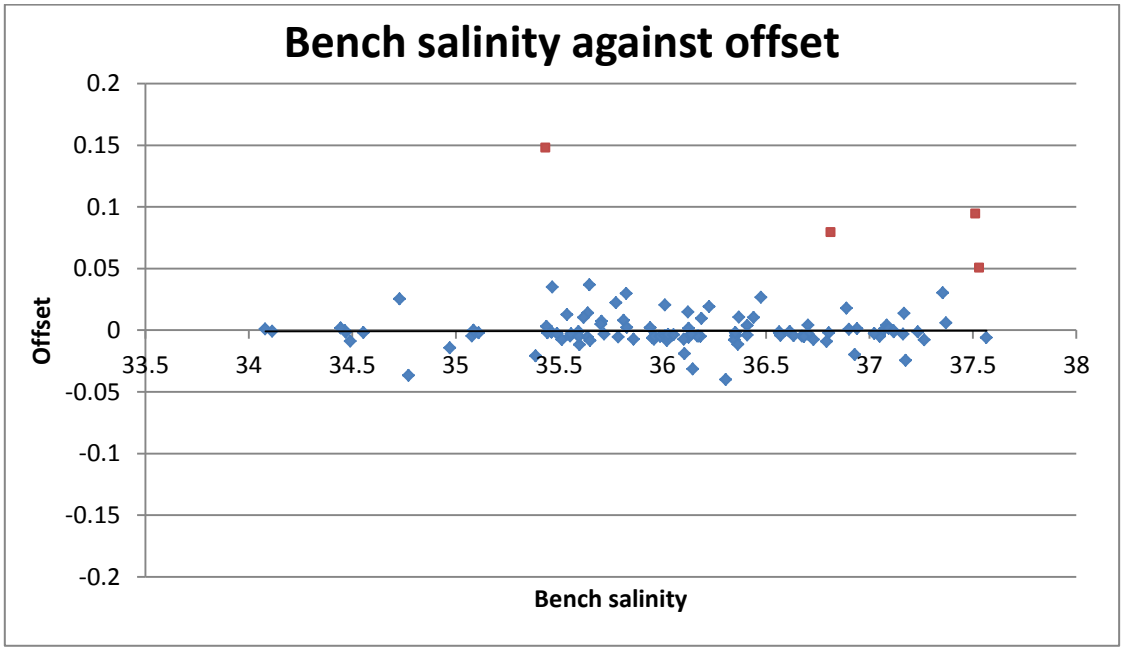


Fig. 9: Salinity offsets against bench salinometer measurements on discrete underway samples.

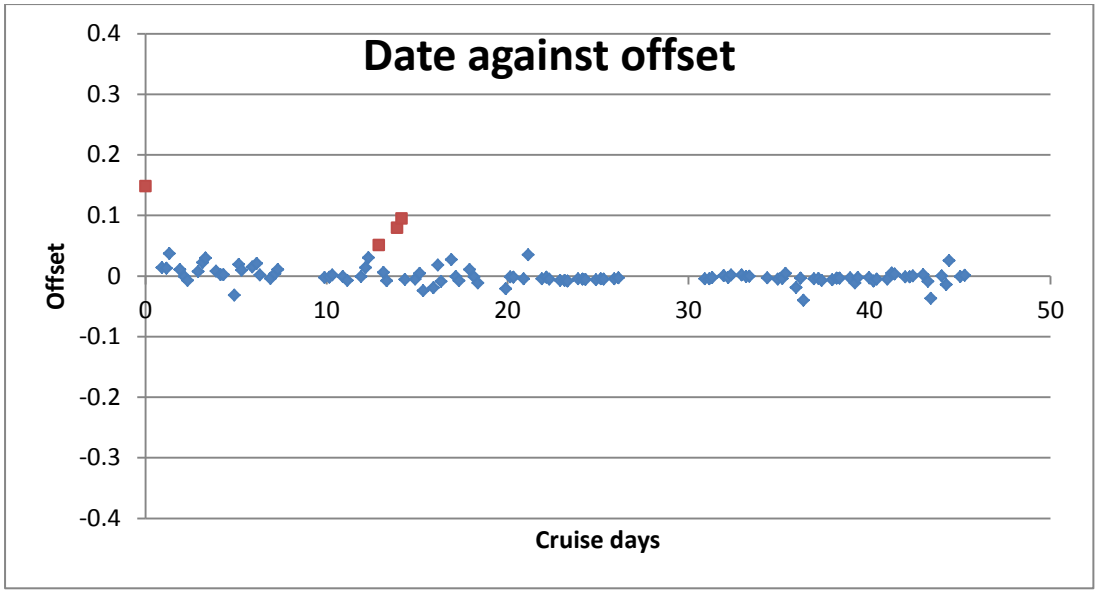


Fig. 10: Hull sensor temperature offsets against surface CTD temperature measurements and date/time.

- Fluorometer

The underway fluorometer data were calibrated against samples collected and analysed with a bench fluorometer. Three samples were collected each day. The calibration is to be carried out after the cruise once the fluorometer has been returned to PML for verification of the calibration against known standards. The correction will be applied during BODC processing after the cruise before the data is made available online.

Optical properties during AMT25

Giorgio Dall'Olmo and Bob Brewin

Plymouth Marine Laboratory

Goal

- To determine surface and depth-resolved optical properties along the AMT25 transect in support of satellite calibration/validation activities.

Methods

- Particulate optical backscattering coefficient (470, 532, 700 nm) and beam-attenuation and absorption coefficients (400 – 750 nm) were determined quasi-continuously from the ship's underway water following Dall'Olmo et al. (2009).
- In-situ optical backscattering measurements were also collected by means of a profiling package mounting a WETLabs ECO-BB3 sensor (3 channels) and a HobiLabs Hydroscat 6 sensor (6 channels plus chlorophyll fluorescence). The profiling package was deployed once a day simultaneously with the noon time CTD cast.
- A WETLAbs AC9 was also mounted on the optical profiling package to determine the particulate absorption and attenuation coefficients over the upper 250 m (see example in Figure 1).
- Particulate optical backscattering and attenuation were also determined by instruments (WETLabs BBRTD and C-star, respectively) mounted on the rosette over the upper 500 m of the water column (Figure 2).
- Above-water radiometric measurements were taken quasi-continuously using a Satlantic HyperSAS system. The HyperSAS optical remote sensing system provided high precision hyperspectral measurements of spectral water-leaving radiance and downwelling spectral irradiance, from which the above-water remote-sensing reflectance was computed. The 136-channel HyperOCR radiance and irradiance sensors were mounted onboard the ship for simultaneous viewing of the sea surface and sky. Above-water remote-sensing reflectance data are to be used for calibration and validation of satellite ocean colour products and alongside measurements of in-water optical properties obtained simultaneously with HyperSAS, for use in bio-optical modelling (Figure 3).
- Discrete optical measurements of Secchi disk and the Forel Ule Colour scale were also collected at stations along the AMT25, and used to cross-compare optical techniques that date back to the 19th century with modern optical instruments (such as data from the HyperSAS, see Figure 4).

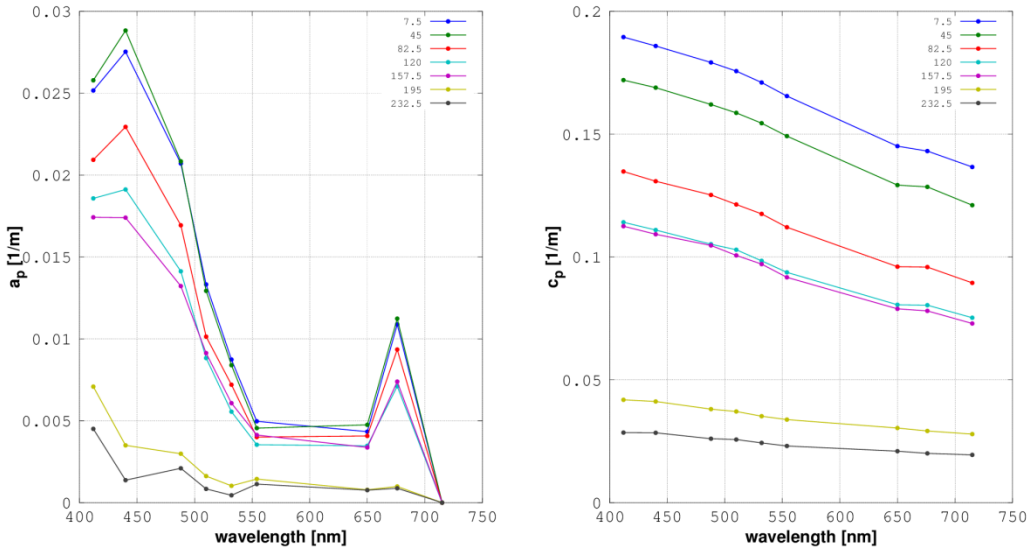


Figure 1. Example of particulate absorption (a_p, left) and beam attenuation (c_p, right) coefficients measured on Julian day 301 in the upper 250 m using the WETLabs AC9 sensor. Different colours correspond to different depths (in meters) as indicated in the legend.

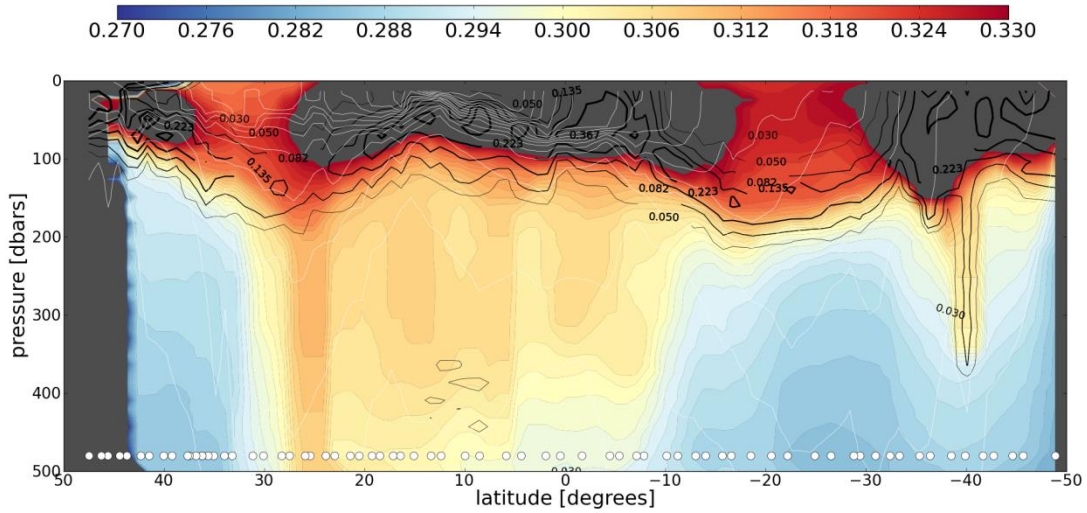


Figure 2. "Raw" beam-attenuation coefficient from the transmissometer mounted on the rosette. Black and white contours represent chlorophyll fluorescence and potential density data, respectively. The colour scale was selected to enhance mesopelagic particles. Gray colors are regions where either data were not collected or values were higher than the maximum allowed by the colour scale.

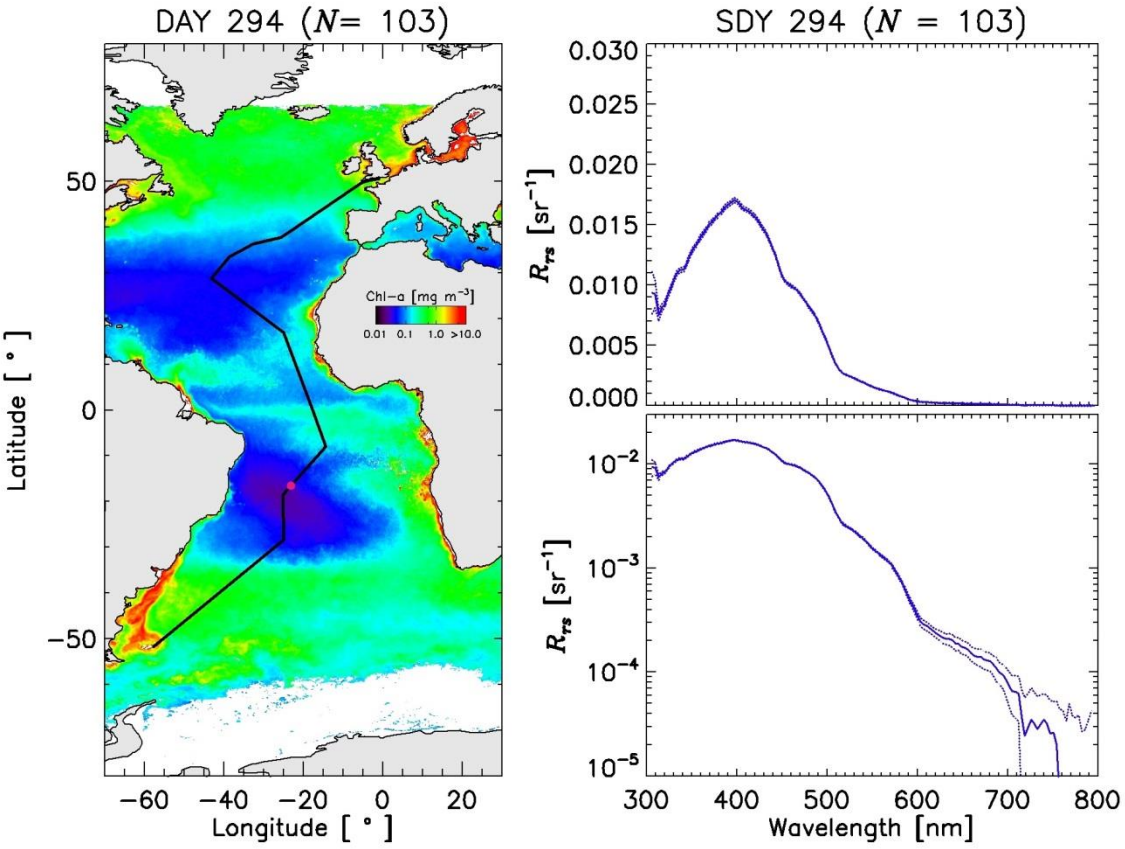


Figure 3. An example of hyperspectral remote sensing reflectance data (R_{rs}) collected using the HyperSAS at a station near the center of the South Atlantic gyre on AMT 25.

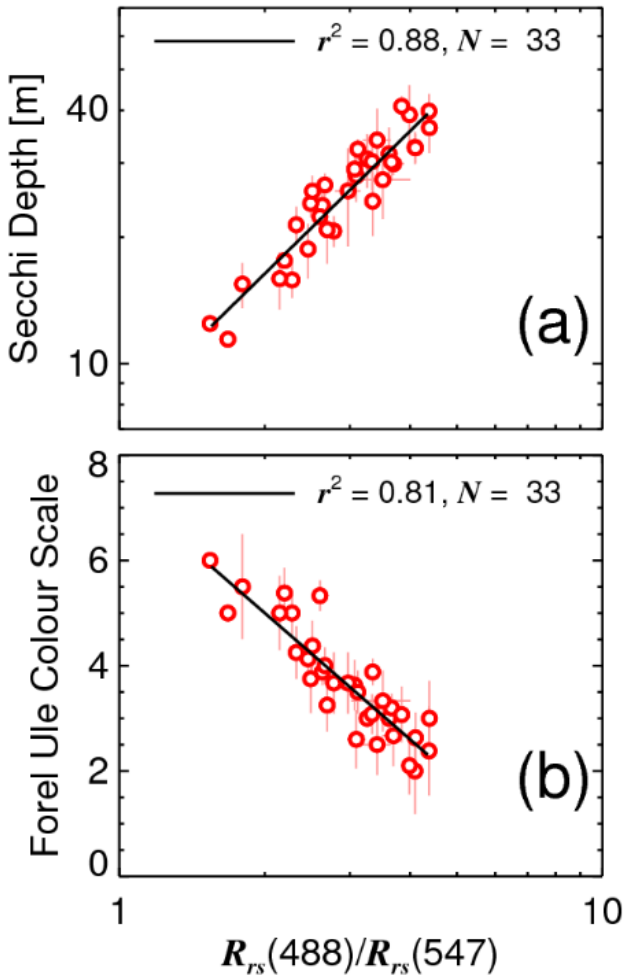


Figure 4. (a) Comparison of Secchi depth measurements with a blue to green ratio of remote sensing reflectance data (R_{rs}) data from the HyperSAS at 33 stations along AMT25. (b) Comparison of Forel Ule colour scale with a blue to green ratio of R_{rs} data from the HyperSAS at the same 33 stations.

References

Dall'Olmo et al. (2009) Significant contribution of large particles to optical backscattering in the open ocean. Biogeosciences, 6, 947–967.

Bio-Optics – PIC concentration

USE OF SUOMI NPP FOR DERIVING SCIENCE DATA RECORDS OF OCEAN PARTICULATE INORGANIC CARBON CONCENTRATION

Catherine Mitchell (for William Balch)

Bigelow Laboratory for Ocean Sciences

Cruise Objectives

1. Collection of CTD and underway samples for analysis of particulate organic carbon (POC), particulate inorganic carbon (PIC), coccolith enumeration (cell counts), biogenic silica concentration (BSi), and scanning electron microscopy for coccolithophore species identification. The purpose of these samples was to provide an assessment of the inorganic and organic particle concentrations in surface water, provide indices of community composition, and analytical means to calibrate satellite PIC algorithms.

2. Operation of an along-track flow-through system from the ship's non-toxic seawater system to characterize the fine-scale hydrographic and bio-optical variability of the various water masses for satellite development of the NASA PIC algorithm.

3. Water-leaving radiance measurements in the visible and near infrared taken for characterizing the particulate content of the seawater and to provide sea-truth data for NASA's satellite-based radiance measurements.

Underway Sampling

Discrete underway samples were collected from the ship's Surf-Met (underway surface and meteorological data collection) flow system in the prep lab 3 to 4 times per day. Samples for particulate organic carbon (POC), particulate inorganic carbon (PIC), biogenic silica (BSi), and coccolith enumeration were obtained along with chlorophyll and salinity samples taken for fluorometer calibration (chlorophylls measured by Rob Thomas, BODC and salinity measured by John Wynar).

PIC samples were collected on 0.4 µm polycarbonate filters, rinsed with potassium tetraborate buffer, dried and stored in metal free centrifuge tubes. These will be analyzed by ICPOES for particulate calcium.

Coccolith and cell counts were collected on 0.45 µm Millipore HA (nitrocellulose) filters, rinsed with potassium tetraborate buffer, frozen at 20ºC, dried, then mounted onto slides using Norland Optical Adhesive. They will later be enumerated by birefringence microscopy.

Biogenic silica (BSi) samples were filtered onto 0.4 µm polycarbonate filters, dried in clean centrifuge tubes, and will be analyzed following the protocol of *Brzezinski* and Nelson (1989).

POC samples were filtered onto pre-combusted glass fiber filters, rinsed with 0.2 µm filtered seawater, dried, and will later be fumed with concentrated HCl to remove inorganic carbon. They will be analyzed ashore at Bigelow Analytical Services.

Scanning electron microscopy (SEM) samples were collected at select underway stations on 0.4 um polycarbonate filters, rinsed with potassium tetraborate buffer, dried, and stored in petri dishes for analysis on shore.

Blanks for filtered samples were collected twice weekly.

CTD Sampling

During the pre-dawn CTD eight depths down to 500 m were analyzed for POC, PIC, BSi, coccolith enumeration, and SEM as described above. For the afternoon CTD, eight depths down to 500m were also analyzed for PIC and BSi with only surface samples collected for POC and cell counts. Scanning electron microscopy samples were collected at the DCM and surface for the pre-dawn CTD and at the surface only for the afternoon CTD.

Flow-through Bio-optical System

This system operates semi-continuously with water from the ships non-toxic sea water supply flowing at a rate of 3-4 liters per minute. Every 5-10 minutes temperature and salinity are measured (with a SeaBird sensor), chlorophyll fluorescence (WETLabs Wet star), total backscattering at 532nm (bb_{tot}; WETLabs ECO-VSF), acidified backscattering (bb_{acid}; backscattering of the seawater suspension after the pH has been lowered to dissolve calcite and aragonite), and acid labile backscattering (bb'; the difference between the bb_{tot} and bb_{acid}).

A WETLabs AC-9 is used to measure absorption and attenuation at 9 visible wavelengths (412, 440, 488, 510, 555, 630, 650, 676, and 715 nm) every 4 minutes and absorption and attenuation at the same wavelengths after the water was routed through a serially-mounted 1 µm poresize, then 0.2µm poresize filter (during the intervening 4 minute segments).

Each morning an AC-9 and bb calibration was performed using 0.2 µm (absolute) filtered seawater. Once per 7 – 10 days the entire system was disassembled, cleaned, and calibrated using Milli-Q water and also filtered seawater.

Above-water Radiance Measurements

In order to check the PIC algorithm performance, free of atmospheric error, total upwelling radiance, downwelling sky radiance and total downwelling irradiance were measured on the *RRS James Cook* using a Satlantic SeaWiFS Aircraft Simulator (MicroSAS). The same wavelengths are measured with the MicroSAS as are used in the 2-band and 3-band PIC algorithms (except the IR bands which are not needed for the implementation of the ship-derived, three-band algorithm because there is negligible atmospheric correction when measurements are made from ship).

The system consists of a down-looking ocean radiance sensor and an up-looking sky-viewing radiance sensor, both mounted on the meteorological platform. The water-viewing radiance detector was set to view the ocean surface at 40^{o} from nadir and the sky-viewing radiance sensor was set to view the sky 40^{o} from zenith (used in the correction for Fresnel reflectance) as recommended by Mueller et al. (2003b). The downwelling irradiance sensor was mounted at the top of the main mast. Data from these sensors will be used to calculate spectral normalized water-leaving radiance (after filtering out white-caps and high pitch/roll anomalies) for comparison to the satellite estimates of normalized water-leaving radiance.

Sensors were rinsed regularly with Milli-Q water in order to remove salt deposits and any dust. The water radiance sensor was able to view over an azimuth range of ~180^{o} across the ship's heading with no contamination from the ship's deck or wake. The direction of the sensor was adjusted constantly to view the water 120^{o} from the sun's azimuth, to minimize sun glint. This was done using a computer-based system that calculated the sun's azimuth angle relative to the ship's heading and elevation constantly. The system used the ship's gyro-compass to determine the heading of the ship. Depending on the ship's course, the computer controlled a stepper motor that turned the sensors to the proper viewing angle. Protocols for operation and calibration were performed according to Mueller (Mueller et al. 2003a; Mueller et al. 2003b; Mueller et al. 2003c). Data were collected between when the sun was above 20^{o} elevation. Post-cruise, the 16Hz data will be filtered to remove as much

residual white cap and glint as possible (we accept the lowest 5% of the data). Calibrations with 10% reflectance plaque were performed several times during the cruise in order to assess the status of the radiometric calibrations. A factory calibration of the radiometers was performed before the cruise.

Sampling metrics

- Flow-through optics: 46 days
- Above water radiance measurements: 42 days
- Underway samples: 110
- CTD casts sampled: 74

CTD discrete samples collected

DATE	TIME	CTD CAST	LATITUDE (+ve N)	LONGITUDE (+ve E)	DEPTHS SAMPLED (m)
18/09/2015	0755	001	50.03	-4.38	60, 50, 40, 30, 20, 15, 5
19/09/2015	0409	002	48.41	-9.20	140, 80, 75, 50, 37, 29, 11, 5
19/09/2015	1300	003	47.51	-11.06	500, 200, 80, 61, 46, 25, 20, 5
20/09/2015	0405	004	46.28	-12.94	500, 200, 75, 39, 29, 20, 13, 5
20/09/2015	1300	005	45.59	-13.99	500, 200, 129, 86, 50, 35, 21, 5
21/09/2015	0400	006	44.46	-15.69	500, 200, 75, 50, 35, 29, 13, 5
21/09/2015	1300	007	43.71	-16.78	500, 200, 113, 70, 58, 44, 19, 5
22/09/2015	0400	008	42.31	-18.81	500, 200, 120, 80, 70, 61, 20, 5
22/09/2015	1300	009	41.52	-19.87	500, 200, 90, 60, 50, 35, 15, 5
23/09/2015	0400	010	40.04	-21.92	500, 200, 113, 75, 58, 44, 19, 5
23/09/2015	1300	011	39.20	-23.05	500, 200, 113, 75, 65, 58, 45, 5
24/09/2015	0400	012	33.69	-25.06	500, 200, 135, 90, 80, 70, 22, 5
24/09/2015	1300	013	37.51	-26.66	500, 200, 115, 77, 55, 45, 19, 5
25/09/2015	0400	014	36.84	-29.96	500, 200, 150, 100, 90, 77, 25, 5
25/09/2015	1842	015	36.25	-32.76	200, 100, 50, 2
27/09/2015	0600	016	36.21	-32.77	180, 92, 80, 70, 29, 5
28/09/2015	0402	017	35.61	-34.17	500, 200, 130, 100, 77, 58, 25, 5
28/09/2015	1304	018	35.06	-35.44	500, 200, 150, 110, 80, 60, 25, 5
29/09/2015	0405	019	34.00	-37.57	500, 200, 120, 90, 70, 50, 20, 5

DATE	TIME	CTD CAST	LATITUDE (+ve N)	LONGITUDE (+ve E)	DEPTHS SAMPLED (m)
29/09/2015	1258	020	33.22	-38.92	200, 165, 110, 102, 84, 64, 27, 5
30/09/2015	0402	021	31.15	-40.92	500, 180, 120, 115, 90, 70, 30
30/09/2015	1259	022	30.10	-41.94	500, 180, 140, 120, 90, 70, 29, 2
01/10/2015	0403	023	28.26	-42.31	500, 200, 136, 120, 90, 70, 30, 2
01/10/2015	1256	024	27.47	-40.89	500, 190, 135, 125, 97, 74, 30, 2
02/10/2015	0402	025	25.93	-38.83	500, 180, 135, 120, 90, 70, 30, 5
02/10/2015	1024	026	25.45	-38.08	200, 150, 117, 100, 77, 58, 25, 5
03/10/2015	0410	027	23.90	-35.76	500, 200, 165, 120, 85, 65, 5, 2
03/10/2015	1302	028	22.99	-34.39	500, 200, 150, 105, 77, 58, 25, 5
04/10/2015	0401	029	21.47	-32.08	500, 200, 135, 98, 70, 50, 20, 2
04/10/2015	1300	030	20.58	-30.77	500, 200, 150, 97, 90, 75, 55, 2
05/10/2015	0402	031	19.27	-28.99	500, 200, 105, 77, 70, 41, 17, 2
05/10/2015	1303	032	18.48	-28.03	500, 200, 116, 72, 59, 45, 19, 2
06/10/2015	0359	033	17.18	-26.46	500, 200, 103, 70, 65, 40, 17, 2
06/10/2015	1258	034	16.43	-25.55	500, 200, 85, 60, 55, 33, 14, 2
07/10/2015	0357	035	15.10	-23.95	500, 200, 90, 60, 42, 35, 15, 2
08/10/2015	0410	036	13.38	-22.90	500, 200, 75, 59, 47, 29, 13, 2
08/10/2015	1258	037	12.37	-22.53	500, 200, 90, 60, 50, 35, 15, 2
09//10/2015	0356	038	10.00	-21.60	500, 200, 120, 80, 70, 47, 20, 2
09/10/2015	1301	039	8.57	-21.04	500, 200, 85, 57, 44, 38, 14, 2
10/10/2015	0358	040	5.88	-20.03	500, 200, 113, 75, 64, 44, 20, 2
10/10/2015	1300	041	4.40	-19.43	500, 200, 119, 80, 58, 46, 20, 2
11/10/2015	0357	042	1.93	-18.43	500, 200, 115, 85, 75, 44, 20, 2
11/10/2015	1257	043	0.49	-17.84	500, 200, 113, 75, 65, 44, 20, 2
12/10/2015	0429	044	-1.68	-16.98	500, 200, 98, 60, 50, 38, 16, 2
13/10/2015	0357	045	-4.42	-15.87	500, 200, 90, 62, 46, 35, 15, 2

DATE	TIME	CTD CAST	LATITUDE (+ve N)	LONGITUDE (+ve E)	DEPTHS SAMPLED (m)
13/10/2015	1258	046	-5.39	-15.45	500, 200, 110, 74, 56, 42, 20, 2
14/10/2015	0400	047	-7.11	-14.76	500, 200, 113, 75, 65, 58, 20, 2
14/10/2015	1202	048	-7.86	-14.44	500, 200, 133, 90, 67, 51, 20, 2
19/10/2015	0400	055	-10.11	-16.57	500, 200, 113, 95, 75, 55, 44, 2
19/10/2015	1310	056	-11.23	-17.69	500, 200, 150, 112, 100, 77, 58, 2
20/10/2015	0457	057	-13.00	-19.47	500, 200, 124, 110, 84, 64, 2
20/10/2015	1358	058	-14.02	-20.50	500, 200, 165, 125, 84, 64, 27, 2
21/10/2015	0457	059	-15.69	-22.19	500, 200, 180, 156, 120, 92, 29, 2
21/10/2015	1358	060	-16.57	-23.10	500, 240, 200, 160, 150, 93, 39, 5
22/10/2015	0455	061	-18.50	-25.00	500, 250, 170, 160, 130, 100, 41, 5
23/10/2015	0456	062	-20.54	-25.07	500, 255, 200, 170, 165, 130, 40, 2
23/10/2015	1358	063	-22.16	-25.09	500, 265, 175, 138, 105, 43, 23
24/10/2015	0457	064	-24.91	-25.07	500, 250, 200, 170, 158, 130, 41, 2
24/10/2015	1356	065	-26.50	-25.04	500, 240, 160, 148, 122, 93, 39, 2
25/10/2015	0512	066	-28.80	-25.46	500, 225, 150, 135, 87, 37, 5
25/10/2015	1415	067	-29.41	-26.21	500, 225, 150, 135, 115, 87, 37, 5
26/10/2015	1410	069	-30.94	-28.09	500, 225, 120, 67, 28, 5
27/10/2015	0507	070	-32.39	-29.85	500, 173, 115, 110, 88, 67, 28, 5
27/10/2015	1400	071	-33.33	-31.07	500, 200, 137, 92, 80, 53, 3
28/10/2015	0601	072	-35.33	-33.65	500, 200, 90, 65, 60, 35, 15, 2
28/10/2015	1457	073	-36.36	-34.98	500, 200, 115, 77, 50, 45, 2
29/10/2015	0558	074	-38.48	-37.75	500, 200, 105, 90, 70, 40, 20, 2
29/10/2015	1458	075	-39.87	-39.66	500, 200, 156, 104, 79, 50, 25, 2
30/10/2015	0602	076	-41.68	-42.23	500, 200, 98, 65, 12, 15, 18, 2
30/10/2015	1500	077	-42.72	-43.70	500, 200, 105, 70, 50, 15, 2
31/10/2015	0600	078	-44.59	-46.35	500, 200, 105, 70, 54, 35, 15, 2

DATE	TIME	CTD CAST	LATITUDE (+ve N)	LONGITUDE (+ve E)	DEPTHS SAMPLED (m)
31/10/2015	1459	079	-45.65	-48.01	500, 200, 119, 79, 55, 20, 2
02/11/2015	0709	080	-45.87	-53.11	500, 200, 105, 90, 70, 60, 40, 5
02/11/2015	1611	081	-49.78	-54.51	500, 200, 90, 60, 40, 35, 15, 5

Underway discrete samples collected

DATE	TIME	STATION
18/09/2015	1223	AA
19/09/2015	1006	AB
19/09/2015	1609	AC
19/09/2015	1958	AD
20/09/2015	1000	AE
20/09/2015	1600	AF
20/09/2015	2000	AG
21/09/2015	1006	AH
21/09/2015	1608	AI
21/09/2015	1956	AJ
22/09/2015	1001	AK
22/09/2015	1558	AL
22/09/2015	1946	AM
23/09/2015	1008	AN
23/09/2015	1600	AO
23/09/2015	2000	AP
24/09/2015	1000	AQ
24/09/2015	160	AR

DATE	TIME	STATION
10/10/2015	1952	CD
11/10/2015	1002	CE
11/10/2015	1559	CF
11/10/2015	1952	CG
12/10/2015	1000	CH
12/10/2015	1607	CI
12/10/2015	1944	CJ
13/10/2015	0958	CK
13/10/2015	1602	CL
13/10/2015	1950	CM
14/10/2015	0954	CN
14/10/2015	1535	CO
19/10/2015	1003	CP
19/10/2015	1559	CQ
19/10/2015	1958	CR
20/10/2015	1059	CS
20/10/2015	1658	CT
20/10/2015	2100	CU

DATE	TIME	STATION
24/09/2015	2008	AS
25/09/2015	1000	AT
25/09/2015	1600	AU
25/09/2015	2000	AV
28/09/2015	0958	AW
28/09/2015	1603	AX
28/09/2015	2000	AY
29/09/2015	1000	AZ
29/09/2015	1600	BA
30/09/2015	0959	BB
30/09/2015	1557	BC
30/09/2015	2006	BD
01/10/2015	0958	BE
01/10/2015	1601	BF
01/10/2015	2002	BG
02/10/2015	0958	BH
02/10/2015	1603	BI
02/10/2015	2014	BJ
03/10/2015	1002	BK
03/10/2015	1605	BL
03/10/2015	2021	BM
04/10/2015	1000	BN
04/10/2015	1603	BO
04/10/2015	2007	BP
05/10/2015	1003	BQ
05/10/2015	1603	BR
05/10/2015	2002	BS
06/10/2015	0958	BT

DATE	TIME	STATION
21/10/2015	1100	CV
21/10/2015	1659	CW
21/10/2015	2101	CX
22/10/2015	2045	CY
23/10/2015	1100	CZ
23/10/2015	1700	DA
23/10/2015	2101	DB
24/10/2015	1100	DC
24/10/2015	1659	DD
24/10/2015	2103	DE
25/10/2015	1100	DF
25/10/2015	1700	DG
25/10/2015	2056	DH
26/10/2015	1100	DI
26/10/2015	1659	DJ
26/10/2015	2058	DK
27/10/2015	1057	DL
27/10/2015	1701	DM
27/10/2015	2100	DN
28/10/2015	1157	DO
28/10/2015	1800	DP
28/10/2015	2210	DQ
29/10/2015	1200	DR
29/10/2015	1802	DS
29/10/2015	2157	DT
30/10/2015	1200	DU
30/10/2015	1758	DV
30/10/2015	2159	DW

DATE	TIME	STATION
06/10/2015	1600	BU
06/10/2015	2059	BV
08/10/2015	1003	BW
08/10/2015	1602	BX
08/10/2015	2015	BY
09/10/2015	1002	BZ
09/10/2015	1559	CA
10/10/2015	0955	CB
10/10/2015	1559	CC

DATE	TIME	STATION
31/10/2015	1140	DX
31/10/2015	1758	DY
31/10/2015	2200	DZ
01/11/2015	1208	EA
01/11/2015	1500	EB
01/11/2015	1758	EC
01/11/2015	2156	ED
02/11/2015	1257	EE
02/11/2015	1859	EF

References

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Mueller J.L., Morel A., Frouin R., Davis C., Arnone R., Carder K., Lee Z.P., Steward R.G., Hooker S.B., Mobley C.D., McLean S., Holben B., Miller M., Pietras C., Knobelspiesse K.D., Fargion G.S., Porter J., Voss K. 2003b. Ocean optics protocols for satellite ocean color sensor validation, Revision 4, Volume III: Radiometric measurements and data analysis protocols. Greenbelt, MD: Goddard Space Flight Center. 78 p.

Mueller J.L., Pietras C., Hooker S.B., Austin R.W., Miller M., Knobelspiesse K.D., Frouin R., Holben B., Voss K. 2003c. Ocean optics protocols for satellite ocean color sensor validation, Revision 4, Volume II: Instrument specifications, characterisation and calibration. Greenbelt, MD: Goddard Space Flight Center.

Atmospheric Optics, Carbonate Chemistry and Operational Oceanography

Tim Smyth (TS)

Plymouth Marine Laboratory

Atmospheric Optics

Sun photometry

Measurements of the aerosol optical thickness were taken at varying frequency, depending on weather and sky state, throughout the AMT transect. The aerosol optical thickness was determined at 380, 440, 500, 675 and 870 using a handheld Microtops II sunphotometer (Solar Light Co., Inc., S/N 19750: last calibration 14/10/2013) on loan from the NASA AERONET project. Measurements taken by TS were sent directly to the Maritime Aerosol Network (MAN) throughout the duration of the cruise via email and the data then posted on the internet. The overall aim of the MAN component of AERONET is to complement the widespread land-based measurements of aerosols with measurements in the remote ocean which are sparsely (temporally and spatially) sampled. The data collected on AMT25 can be accessed directly from the NASA AERONET website at:

http://aeronet.gsfc.nasa.gov/new_web/maritime_aerosol_network.html

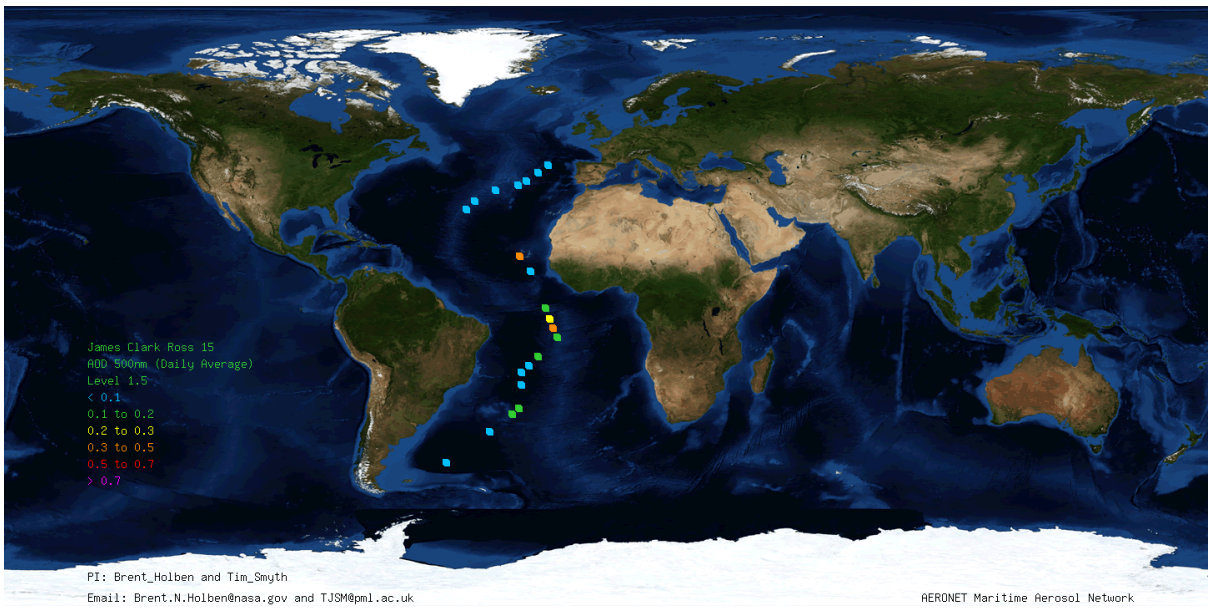

Figure 3: Daily averaged aerosol optical thickness at 500 nm along AMT25 track In total over 570 measurements were taken between the UK and the Falkland Islands.

Carbonate Chemistry

Samples were taken from two depths at both the pre-dawn and noon CTD casts for carbonate chemistry (Total Alkalinity and Dissolved Inorganic Carbon). For pre-dawn the sample was taken at the deepest depth (500 m) and the surface, for noon the sample was taken from the subsurface chlorophyll maximum and the surface. The sample was taken either second or third in order around the CTD, in compliance with sampling for atmospheric gases. Non-nitrile gloves were used to avoid contaminating the nutrient samples which were taken afterwards; 250 or 500 ml glass bottles (pre-washed and dried prior to cruise) were rinsed three times and then overfilled to three times the bottle

volume using a short tube, whilst gently moving the tube within the bottle, to prevent gas bubbles collecting. If any bubbles were visible, the sample bottle was tapped with the stopper to remove them. The samples were then taken into the laboratory (main lab, fumehood) where 250 µl or 500 µl of the sample was removed from the 250 or 500 ml bottles respectively. Then 100 µl of Mercuric Chloride was added to the samples as a biocide. The bottle stopper was then thoroughly coated in silicone grease, replaced in the top of the bottle, and then taped into position using a double loop of electrical insulation tape. The samples will be analysed at the Plymouth Marine Laboratory in the UK. Table 1 gives the details of the sampling.

Sample	Date	Time	Lat	Lon	Z (m)	T (°C)	S (PSU)	V (ml)	CTD #
1	19/09/2015	04:00	48.41	-9.20	140	11.90	35.57	250	CTD_S002
2	19/09/2015	04:00	48.41	-9.20	37	15.49	35.53	250	CTD_S002
3	19/09/2015	04:00	48.41	-9.20	2	15.51	35.53	250	CTD_S002
4	19/09/2015	13:00	47.51	-11.06	25	16.19	35.53	250	CTD_S003
5	19/09/2015	13:00	47.51	-11.06	2	16.29	35.54	250	CTD_S003
6	20/09/2015	04:00	46.28	-12.94	500	10.78	35.51	250	CTD_S004
7	20/09/2015	04:00	46.28	-12.94	2	16.92	35.60	250	CTD_S004
8	20/09/2015	13:00	45.59	-13.99	35	16.74	35.56	250	CTD_S005
9	20/09/2015	13:00	45.59	-13.99	2	17.00	35.59	250	CTD_S005
10	21/09/2015	04:00	44.46	-15.69	500	11.08	35.54	250	CTD_S006
11	21/09/2015	04:00	44.46	-15.69	2	17.31	35.72	250	CTD_S006
12	21/09/2015	13:00	43.71	-16.78	70	14.46	35.64	250	CTD_S007
13	21/09/2015	13:00	43.71	-16.78	2	18.22	35.73	250	CTD_S007
14	22/09/2015	04:00	42.31	-18.81	500	11.41	35.58	250	CTD_S008
15	22/09/2015	04:00	42.31	-18.81	2	18.68	35.82	250	CTD_S008
16	22/09/2015	13:00	41.52	-19.87	50	14.89	35.82	250	CTD_S009
17	22/09/2015	13:00	41.52	-19.87	2	19.49	35.90	250	CTD_S009
18	23/09/2015	04:00	40.04	-21.93	500	11.62	35.61	250	CTD_S010
19	23/09/2015	04:00	40.04	-21.93	2	21.35	36.20	250	CTD_S010
20	23/09/2015	13:00	39.20	-23.05	65	16.46	35.91	250	CTD_S011
21	23/09/2015	13:00	39.20	-23.05	2	20.83	35.98	250	CTD_S011

22	24/09/2015	04:00	37.69	-25.06	500	11.80	35.62	250	CTD_S012
23	24/09/2015	04:00	37.69	-25.06	2	22.87	36.35	250	CTD_S012
24	24/09/2015	13:00	37.51	-26.66	55	17.26	35.92	250	CTD_S013
25	24/09/2015	13:00	37.51	-26.66	2	22.72	36.05	250	CTD_S013
26	25/09/2015	04:00	36.84	-29.96	500	12.28	35.66	250	CTD_S014
27	25/09/2015	04:00	36.84	-29.96	2	23.58	36.23	250	CTD_S014
28	27/09/2015	06:00	36.23	-32.77	2000	3.82	35.00	250	CTD_S016
29	27/09/2015	06:00	36.23	-32.77	2	24.81	36.44	250	CTD_S016
30	28/09/2015	04:00	35.61	-34.17	2000	3.89	35.01	250	CTD_S017
31	28/09/2015	04:00	35.61	-34.17	2	24.63	36.51	250	CTD_S017
32	28/09/2015	13:00	35.06	-35.44	110	19.23	36.57	250	CTD_S018
33	28/09/2015	13:00	35.06	-35.44	5	25.19	36.79	250	CTD_S018
34	29/09/2015	04:00	34.00	-37.58	2000	3.66	35.00	250	CTD_S019
35	29/09/2015	04:00	34.00	-37.58	5	25.60	36.68	250	CTD_S019
36	29/09/2015	13:00	33.22	-38.92	5	25.69	36.74	250	CTD_S020
37	30/09/2015	04:00	31.15	-40.92	2000	3.91	35.02	250	CTD_S021
38	30/09/2015	04:00	31.15	-40.92	2	25.89	37.00	500	CTD_S021
39	01/10/2015	04:00	28.26	-42.31	2000	3.80	35.03	500	CTD_S023
40	01/10/2015	04:00	28.26	-42.31	2	27.02	37.20	500	CTD_S023
41	01/10/2015	13:00	27.47	-41.11	135	21.65	37.23	500	CTD_S024
42	01/10/2015	13:00	27.47	-41.11	2	27.00	37.40	500	CTD_S024
43	02/10/2015	04:00	25.93	-38.83	500	14.40	35.96	500	CTD_S025
44	02/10/2015	04:00	25.93	-38.83	2	27.07	37.47	500	CTD_S025
45	02/10/2015	14:00	25.45	-38.07	5000	2.41	34.89	500	CTD_S026
46	02/10/2015	14:00	25.45	-38.07	2	26.96	37.09	500	CTD_S026
47	03/10/2015	04:00	23.90	-35.76	500	13.77	35.88	500	CTD_S027
48	03/10/2015	04:00	23.90	-35.76	2	27.37	37.64	500	CTD_S027
49	03/10/2015	13:00	22.99	-34.39	105	22.18	37.18	500	CTD_S028
50	03/10/2015	13:00	22.99	-34.39	2	27.14	37.04	500	CTD_S028

51	04/10/2015	04:00	21.47	-32.08	500	11.72	35.57	500	CTD_S029
52	04/10/2015	04:00	21.47	-32.08	2	27.27	37.00	500	CTD_S029
53	04/10/2015	13:00	20.58	-30.77	97	21.08	37.14	500	CTD_S030
54	04/10/2015	13:00	20.58	-30.77	2	27.47	36.91	500	CTD_S030
55	05/10/2015	04:00	19.27	-29.00	500	10.28	35.29	500	CTD_S031
56	05/10/2015	04:00	19.27	-29.00	2	27.32	36.49	500	CTD_S031
57	05/10/2015	13:00	18.48	-28.03	72	20.98	36.68	500	CTD_S032
58	05/10/2015	13:00	18.48	-28.03	2	27.44	36.65	500	CTD_S032
59	06/10/2015	04:00	17.18	-26.46	500	9.12	35.10	500	CTD_S033
60	06/10/2015	04:00	17.18	-26.46	2	27.68	36.46	500	CTD_S033
61	06/10/2015	13:00	16.43	-25.55	60	21.46	36.42	500	CTD_S034
62	**Sample bottle jammed shut**							500	
63	06/10/2015	13:00	16.43	-25.55	2	28.31	36.33	500	CTD_S034
64	07/10/2015	04:00	15.10	-23.95	500	9.64	35.13	500	CTD_S035
65	07/10/2015	04:00	15.10	-23.95	2	27.72	36.22	500	CTD_S035
66	08/10/2015	04:00	13.38	-22.91	2	29.25	35.71	500	CTD_S036
67	08/10/2015	04:00	13.38	-22.91	500	9.80	35.15	500	CTD_S036
68	08/10/2015	13:00	12.37	-22.53	50	16.02	35.64	500	CTD_S037
69	08/10/2015	13:00	12.37	-22.53	2	29.11	35.31	500	CTD_S037
70	09/10/2015	04:00	10.00	-21.60	500	8.91	34.97	500	CTD_S038
71	09/10/2015	04:00	10.00	-21.60	2	28.83	35.45	500	CTD_S038
72	09/10/2015	13:00	8.57	-21.04	38	21.92	35.76	500	CTD_S039
73	09/10/2015	13:00	8.57	-21.04	2	28.71	35.54	500	CTD_S039
74	11/10/2015	13:00	0.49	-17.84	65	22.88	35.96	500	CTD_S043
75	11/10/2015	13:00	0.49	-17.84	2	26.25	35.84	500	CTD_S043
76	12/10/2015	04:00	-1.68	-16.98	500	6.34	34.56	500	CTD_S044
77	12/10/2015	04:00	-1.68	-16.98	2	25.47	36.17	500	CTD_S044

78	13/10/2015	04:00	-4.42	-15.87	500	8.27	34.74	500	CTD_S045
79	13/10/2015	04:00	-4.42	-15.87	2	24.66	35.94	500	CTD_S045
80	13/10/2015	13:00	-5.39	-15.46	42	24.37	35.97	500	CTD_S046
81	13/10/2015	13:00	-5.39	-15.46	2	24.62	35.95	500	CTD_S046
82	14/10/2015	04:00	-7.11	-14.76	500	7.29	34.66	500	CTD_S047
83	14/10/2015	04:00	-7.11	-14.76	2	24.07	36.08	500	CTD_S047
84	14/10/2015	13:00	-7.86	-14.44	67	21.94	36.09	500	CTD_S048
85	14/10/2015	13:00	-7.86	-14.44	2	23.87	36.15	500	CTD_S048
86	19/10/2015	04:00	-10.11	-16.57	500	7.00	34.61	500	CTD_S055
87	19/10/2015	04:00	-10.11	-16.57	2	23.95	36.43	250	CTD_S055
88	19/10/2015	13:00	-11.23	-17.69	112	22.74	36.76	250	CTD_S056
89	19/10/2015	13:00	-11.23	-17.69	2	23.91	36.65	250	CTD_S056
90	20/10/2015	05:00	-13.00	-19.47	500	6.93	34.59	250	CTD_S057
91	20/10/2015	05:00	-13.00	-19.47	2	23.75	36.83	250	CTD_S057
92	20/10/2015	14:00	-14.02	-20.50	125	22.57	36.85	250	CTD_S058
93	20/10/2015	14:00	-14.02	-20.50	2	24.10	37.00	250	CTD_S058
94	21/10/2015	05:00	-15.69	-22.19	500	6.92	34.56	250	CTD_S059
95	21/10/2015	05:00	-15.69	-22.19	2	23.76	37.15	250	CTD_S059
96	**Smashed bottle**								
97	21/10/2015	14:00	-16.57	-23.10	150	22.40	36.91	250	CTD_S060
98	21/10/2015	14:00	-16.57	-23.10	2	23.89	37.14	250	CTD_S060
99	22/10/2015	05:00	-18.50	-25.00	500	8.73	37.10	250	CTD_S061
100	22/10/2015	05:00	-18.50	-25.00	2	23.82	34.70	250	CTD_S061
101	23/10/2015	05:00	-20.54	-25.07	500	9.25	34.75	250	CTD_S062
102	23/10/2015	05:00	-20.54	-25.07	2	23.83	37.11	250	CTD_S062
103	23/10/2015	14:00	-22.16	-25.09	138	20.20	36.45	250	CTD_S063
104	23/10/2015	14:00	-22.16	-25.09	2	23.59	36.91	250	CTD_S063
105	24/10/2015	05:00	-24.91	-25.07	500	10.62	34.89	250	CTD_S064

106	24/10/2015	05:00	-24.91	-25.07	2	22.09	36.67	250	CTD_S064
107	24/10/2015	14:00	-26.50	-25.04	148	17.99	35.95	250	CTD_S065
108	24/10/2015	14:00	-26.50	-25.04	2	20.79	36.08	250	CTD_S065
109	25/10/2015	05:00	-28.80	-25.46	500	9.53	34.75	250	CTD_S066
110	25/10/2015	05:00	-28.80	-25.46	2	19.60	36.02	250	CTD_S066
111	25/10/2015	14:00	-29.41	-26.21	135	17.33	35.81	250	CTD_S067
112	25/10/2015	14:00	-29.41	-26.21	5	19.23	35.99	250	CTD_S067
113	26/10/2015	14:00	-30.94	-28.09	120	18.41	36.05	250	CTD_S069
114	26/10/2015	14:00	-30.94	-28.09	5	18.70	36.03	250	CTD_S069
115	27/10/2015	05:00	-32.39	-29.85	500	10.29	34.85	250	CTD_S070
116	27/10/2015	05:00	-32.39	-29.85	5	17.93	35.85	250	CTD_S070
117	27/10/2015	14:00	-33.33	-31.07	80	16.30	35.61	250	CTD_S071
118	27/10/2015	14:00	-33.33	-31.07	3	16.75	35.69	250	CTD_S071
119	28/10/2015	06:00	-35.33	-33.65	500	10.59	34.89	250	CTD_S072
120	28/10/2015	06:00	-35.33	-33.65	2	15.75	35.55	250	CTD_S072
121	28/10/2015	15:00	-36.36	-34.98	50	15.33	35.67	250	CTD_S073
122	28/10/2015	15:00	-36.36	-34.98	2	15.86	35.67	250	CTD_S073
123	29/10/2015	06:00	-38.48	-37.75	500	5.86	34.29	250	CTD_S074
124	29/10/2015	06:00	-38.48	-37.75	2	14.46	35.39	250	CTD_S074
125	29/10/2015	15:00	-39.87	-39.66	50	14.95	35.69	250	CTD_S075
126	29/10/2015	15:00	-39.87	-39.66	2	15.07	35.69	250	CTD_S075
127	30/10/2015	06:00	-41.68	-42.23	500	4.28	34.16	250	CTD_S076
128	30/10/2015	06:00	-41.68	-42.23	2	11.62	34.73	250	CTD_S076
129	30/10/2015	15:00	-42.72	-43.70	50	10.56	34.57	250	CTD_S077
130	30/10/2015	15:00	-42.72	-43.70	5	11.17	34.56	250	CTD_S077
131	31/10/2015	06:00	-44.59	-46.35	500	3.93	34.15	250	CTD_S078
132	31/10/2015	06:00	-44.59	-46.35	2	9.84	34.46	250	CTD_S078
133	31/10/2015	15:00	-45.65	-48.01	55	9.58	34.53	250	CTD_S079
134	31/10/2015	15:00	-45.65	-48.01	2	9.86	34.49	250	CTD_S079

135	02/11/2015	07:00	-48.87	-53.11	500	2.78	34.18	250	CTD_S080
136	02/11/2015	07:00	-48.87	-53.11	5	4.65	34.11	250	CTD_S080
137	02/11/2015	16:00	-49.78	-54.51	40	5.02	34.09	250	CTD_S081
138	02/11/2015	16:00	-49.78	-54.51	5	5.07	34.09	250	CTD_S081

Table 1: Samples taken for carbonate chemistry analysis

Operational Oceanography

Automated send of CTD data

During the cruise, software was refined and developed for the automated send of coarse resolution CTD data via email to the UK Met Office. Improvements to the code in 2015 (code originally developed on RRS Discovery in 2009, improved on RRS James Clark Ross in 2014) included processing of data down to 6000 m for deep CTD casts. During AMT25 a 5500 m cast was operationally assimilated into the UK Met Office FOAM model. The processing works as follows: the CTD controlling PC on JCR has a script which processes the CTD using SeaSave. A line has been inserted into this code to allow a separate .cnv file to be produced with the correct format and put in the correct directory. Every hour an automated script on the linux system looks for a new file in that directory, and if it finds one, runs an executable to coarsen the resolution of the CTD file and emails it to the UK Met Office (ocean.data@metoffice.gov.uk). Below is an example file:

```
  H.HHHH, DD, MM, YYYY, DDD.DDDD, DDD.DDDD, STN, PPPP.P, TT.TTT, SS.SSS

 14.2669, 25, 10, 2015, -29.4057, -26.2118, 067,    2.0, 19.231, 35.994
 14.2669, 25, 10, 2015, -29.4057, -26.2118, 067,    4.0, 19.233, 35.994

 14.2669, 25, 10, 2015, -29.4057, -26.2118, 067,    6.0, 19.243, 35.995

 14.2669, 25, 10, 2015, -29.4057, -26.2118, 067,    8.0, 19.218, 35.994

 14.2669, 25, 10, 2015, -29.4057, -26.2118, 067,   10.0, 19.216, 35.993

 14.2669, 25, 10, 2015, -29.4057, -26.2118, 067,   15.0, 19.208, 35.994

 14.2669, 25, 10, 2015, -29.4057, -26.2118, 067,   20.0, 19.178, 35.994

 14.2669, 25, 10, 2015, -29.4057, -26.2118, 067,   25.0, 19.152, 35.996

 14.2669, 25, 10, 2015, -29.4057, -26.2118, 067,   30.0, 19.151, 35.996

 14.2669, 25, 10, 2015, -29.4057, -26.2118, 067,   35.0, 19.143, 35.996

 14.2669, 25, 10, 2015, -29.4057, -26.2118, 067,   40.0, 19.024, 35.986

 14.2669, 25, 10, 2015, -29.4057, -26.2118, 067,   45.0, 18.936, 36.000

 14.2669, 25, 10, 2015, -29.4057, -26.2118, 067,   50.0, 18.916, 35.994
```

```
14.2669, 25, 10, 2015, -29.4057, -26.2118, 067,   60.0, 18.739, 35.987
14.2669, 25, 10, 2015, -29.4057, -26.2118, 067,   70.0, 18.725, 35.995
14.2669, 25, 10, 2015, -29.4057, -26.2118, 067,   80.0, 18.354, 35.965
14.2669, 25, 10, 2015, -29.4057, -26.2118, 067,   90.0, 18.239, 35.931
14.2669, 25, 10, 2015, -29.4057, -26.2118, 067,  100.0, 18.017, 35.916
14.2669, 25, 10, 2015, -29.4057, -26.2118, 067,  120.0, 17.574, 35.846
14.2669, 25, 10, 2015, -29.4057, -26.2118, 067,  140.0, 17.330, 35.814
14.2669, 25, 10, 2015, -29.4057, -26.2118, 067,  160.0, 16.670, 35.711
14.2669, 25, 10, 2015, -29.4057, -26.2118, 067,  180.0, 16.254, 35.638
14.2669, 25, 10, 2015, -29.4057, -26.2118, 067,  200.0, 15.726, 35.559
14.2669, 25, 10, 2015, -29.4057, -26.2118, 067,  250.0, 14.608, 35.405
14.2669, 25, 10, 2015, -29.4057, -26.2118, 067,  300.0, 13.824, 35.298
14.2669, 25, 10, 2015, -29.4057, -26.2118, 067,  350.0, 13.108, 35.218
14.2669, 25, 10, 2015, -29.4057, -26.2118, 067,  400.0, 12.663, 35.185
14.2669, 25, 10, 2015, -29.4057, -26.2118, 067,  450.0, 12.036, 35.102
14.2669, 25, 10, 2015, -29.4057, -26.2118, 067,  500.0, 10.777, 34.923
```

where H.HHHH is the decimal time (GMT), DD the day, MM the month, YYYY the year, DDD.DDDD the decimal latitude and longitude, STN the station number, PPPP.P the pressure in db, TT.TTT the temperature (°C) and SS.SSS the salinity (PSU).

This system successfully ran operationally on all JCR cruises during the 2014/15 season and should continue to do so during the 2015/16 season.

Launch of Apex Argo floats

Five Apex-Argo floats were launched at request of the UK Met Office. Table 2 gives the dates and positions of the deployments.

Date	Time	Log Identifier	Lat (degrees)	Lon (degrees)	Float ID
20/10/2015	15:07	MAF_JR15001_001	-14.0204	-20.4981	#4878
22/10/2015	18:35	MAF_JR15001_002	-18.5465	-25.0956	#6996
24/10/2015	15:08	MAF_JR15001_003	-26.5005	-25.0381	#6997
26/10/2015	15:04	MAF_JR15001_004	-30.9356	-28.0866	#7349
29/10/2015	15:54	MAF_JR15001_005	-39.8745	-39.6585	#7350

Table 2: Apex Argo Float deployments for the UK Met Office

Minor, housekeeping tasks

PML / Dartcom pCO_2 system

During JR15001, the JCR automated pCO_2 system was made operational after the stop at the Azores (24 September) when a replacement part was received and installed. There were numerous issues with the system during the cruise, in part due to the changes with the JCR internet. As the PC controlling the system is running Windows XP, it needed to be moved onto the data network because of non-compliance with the network policy. This raised issues with the way the pCO_2 system received the NMEA feed. It is recommended for next season the controlling PC OS is upgraded to Windows 7 or above. The data will be processed and quality controlled at PML after the cruise, and the data submitted to BODC and the SOCAT database.

Exeter BORIS / Spectronus

During JR15001 TS monitored the operation of the automated Spectronus (BORIS) trace gas and isotope system for the University of Exeter. This involved changing the compressed nitrogen standard gas bottles (twice during cruise), the onboard drier containing magnesium perchlorate (twice) and emailing the data to the Exeter group. It seems from the experience on JR15001 (and indeed on JR303) that in the tropics (particularly marked in the north and equatorial region) the drier is unable to cope with the high temperature and humidity combination as it was during this period there were several data outages (5 – 12 October) – only solved by replenishing the magnesium perchlorate.

The system analyses several trace gases in the atmosphere including CO_2, CO, CH_4 and N_2O.

The controlling PC on this system causes numerous problems after running for more than an indeterminate period of time, generally > 2 days. This means that the system is sluggish and difficult to operate. It is suggested that the controlling PC is given a thorough overhaul before next season. The system was shut down during the period around Ascension (15 – 18 October) because of the noise pollution in the UIC.

Data can be accessed from the University of Exeter Atmospheric and Ocean Science website: https://oao.exeter.ac.uk/?page_id=401

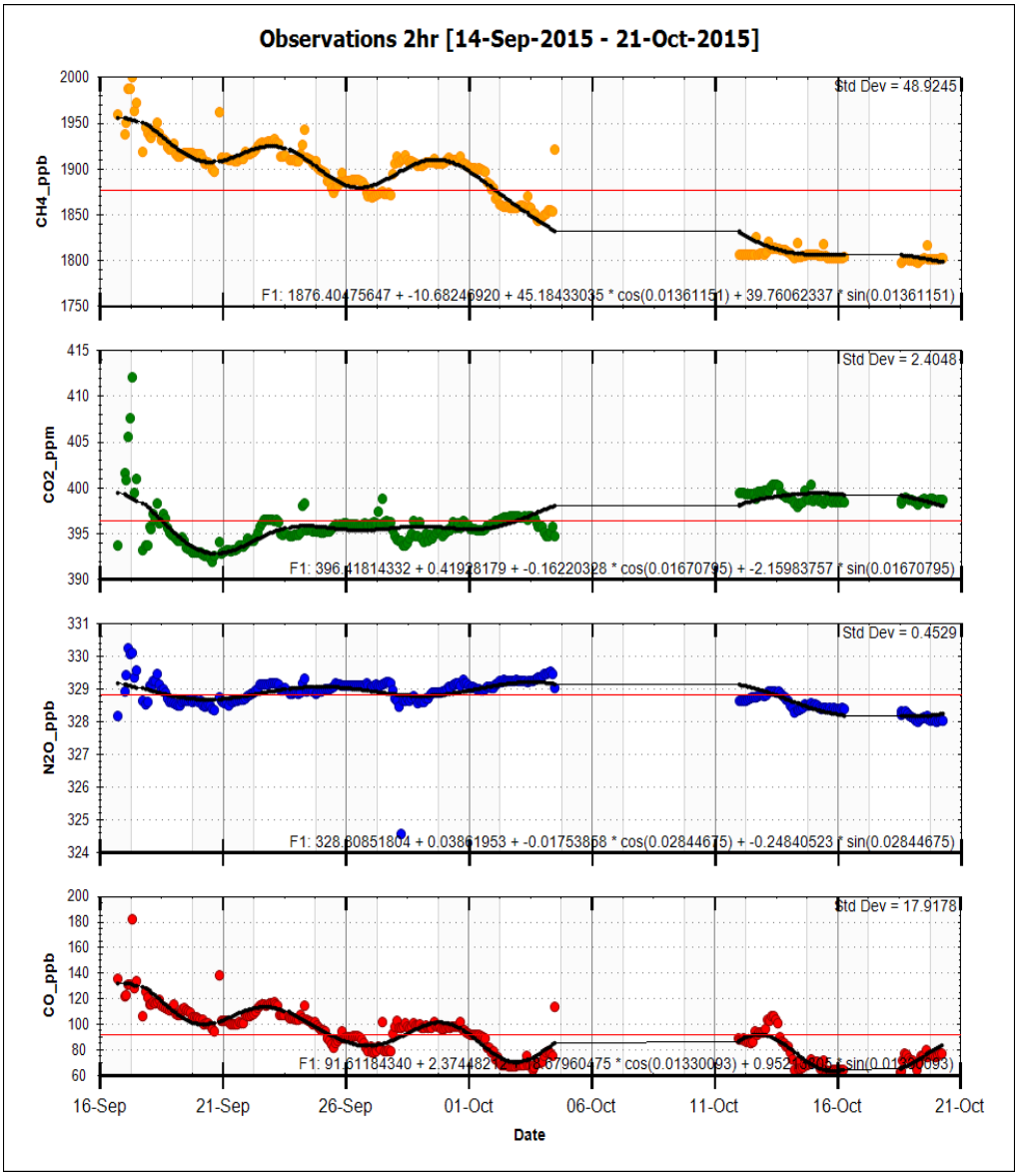

Figure 4: Variation of trace gases along the AMT25 cruise track. Downloaded from Exeter Atmospheric and Ocean Science website.

Phytoplankton and Oxygen samples

Carolina Beltrán (BC)

FCUL (Lisbon)

Phytoplankton samples

400 ml of surface water was collect at both pre-dawn and noon CTD casts, 200 ml was fixed with lugol's iodine neutral solution and 200 ml with formaldehyde neutral 20%. In 27 stations was collect 1 L of surface water and fixed with formaldehyde neutral 20%.

Samples will be analysed with an inverted microscope in the lab at FCUL in Lisbon. The aim of the study is to estimate cell abundance of phytoplankton species, for cells bigger than 10 µm, with the major objective of contributing to the validation of size classes and possibly Phytoplankton Functional Types obtained by Ocean Colour.

To accomplish this objective, microscope counts and flow cytometer results would have to be treated jointly, in order to get a complete survey of phytoplankton groups, from picoplankton cells to diatoms and dinoflagellates.

CTD	Station	Date	Time	Lat	Lon	Depth	Vol (ml)	Chemical
S001	001_Test	18/09/2015	07:55	50º 02.000' N	04º 22.000' W	5	200	Lugol & Formaldehyde
S002	001	19/09/2015	04:09	48º 24.500' N	09º 11.839' W	2	200	Lugol & Formaldehyde
S003	002	19/09/2015	13:00	47º 30.574' N	11º 03.737' W	2	200	Lugol & Formaldehyde
S004	003	20/09/2015	04:05	46º 16.584' N	12º 56.122' W	2	200	Lugol & Formaldehyde
S005	004	20/09/2015	13:00	45º 35.560' N	13º 59.470' W	2	200	Lugol & Formaldehyde
S006	005	21/09/2015	04:00	44º 27.345' N	15º 41.338' W	2	200	Lugol & Formaldehyde
S007	006	21/09/2015	13:00	43º 42.716' N	16º 46.747' W	2	200	Lugol & Formaldehyde
S008	007	22/09/2015	04:00	42º 18.470' N	18º 48.368' W	2	200	Lugol & Formaldehyde
S009	008	22/09/2015	13:00	41º 31.478' N	19º 52.276' W	2	200	Lugol & Formaldehyde
S010	009	23/09/2015	04:00	40º 02.466' N	21º 55.032' W	2	200	Lugol & Formaldehyde
S011	010	23/09/2015	13:00	39º 12.193' N	23º 02.733' W	2	200	Lugol & Formaldehyde
S012	011	24/09/2015	04:00	37º 41.325' N	25º 03.527' W	2	200	Lugol & Formaldehyde
S013	012	24/09/2015	13:00	37º 30.451' N	26º 39.631' W	2	200	Lugol & Formaldehyde
S014	013	25/09/2015	04:00	36º 50.257' N	29º 57.331' W	2	200	Lugol & Formaldehyde
S015	014	25/09/2015	18:42	36º 14.802' N	32º 45.655' W	50	200	Lugol & Formaldehyde
S016	016	27/09/2015	06:00	36º 13.709' N	32º 46.313' W	2	200	Lugol & Formaldehyde
							1000	Formaldehyde
S017	017	28/09/2015	04:02	35º 36.678' N	34º 09.999' W	5	200	Lugol & Formaldehyde
							1000	Formaldehyde
S018	018	28/09/2015	13:04	35º 03.813' N	35º 26.601' W	5	200	Lugol & Formaldehyde
S019	019	29/09/2015	04:05	33º 59.929' N	37º 34.490' W	5	200	Lugol & Formaldehyde
S020	020	29/09/2015	12:58	33º 13.289' N	38º 55.296' W	5	200	Lugol & Formaldehyde
S021	021	30/09/2015	04:02	31º 09.058' N	40º 55.078' W	2	200	Lugol & Formaldehyde
							1000	Formaldehyde
S022	022	30/09/2015	12:59	30º 06.032' N	41º 56.351' W	2	200	Lugol & Formaldehyde
S023	023	01/10/2015	04:03	28º 15.348' N	42º 18.575' W	2	200	Lugol & Formaldehyde
							1000	Formaldehyde
S024	024	01/10/2015	12:56	27º 28.478' N	41º 06.648' W	2	200	Lugol & Formaldehyde
S025	025	02/10/2015	04:02	25º 56.022' N	38º 49.624' W	2	200	Lugol & Formaldehyde
							1000	Formaldehyde
S026	026	02/10/2015	10:24	25º 27.193' N	38º 04.464' W	2	200	Lugol & Formaldehyde
							1000	Formaldehyde
S027	027	03/10/2015	04:10	23º 53.910' N	35º 45.339' W	2	200	Lugol & Formaldehyde
S028	028	03/10/2015	13:02	22º 59.199' N	34º 23.347' W	2	200	Lugol & Formaldehyde

							1000	Formaldehyde
S029	029	04/10/2015	04:01	21º 27.959' N	32º 04.532' W	2	200	Lugol & Formaldehyde
S030	030	04/10/2015	13:00	20º 34.807' N	30º 46.185' W	2	200	Lugol & Formaldehyde
							1000	Formaldehyde
S031	031	05/10/2015	04:02	19º 16.061' N	28º 59.699' W	2	200	Lugol & Formaldehyde
S032	032	05/10/2015	13:03	18º 28.840' N	28º 01.682' W	2	200	Lugol & Formaldehyde
							1000	Formaldehyde
S033	033	06/10/2015	03:59	17º 10.667' N	26º 27.348' W	2	200	Lugol & Formaldehyde
S034	034	06/10/2015	12:58	16º 25.975' N	25º 32.986' W	2	200	Lugol & Formaldehyde
S035	035	07/10/2015	03:57	15º 05.735' N	23º 56.810' W	2	200	Lugol & Formaldehyde
							1000	Formaldehyde
S036	036	08/10/2015	04:10	13º 22.756' N	22º 54.298' W	2	200	Lugol & Formaldehyde
S037	037	08/10/2015	12:58	12º 22.140' N	22º 31.941' W	2	200	Lugol & Formaldehyde
							1000	Formaldehyde
S038	038	09/10/2015	03:56	09º 59717' N	21º 36.097' W	2	200	Lugol & Formaldehyde
S039	039	09/10/2015	13:01	08º 34.053' N	21º 02.216' W	2	200	Lugol & Formaldehyde
							1000	Formaldehyde
S040	040	10/10/2015	03:58	05º 52.643' N	20º 01.625' W	2	200	Lugol & Formaldehyde
S041	041	10/10/2015	13:00	04º 24.185' N	19º 25.844' W	2	200	Lugol & Formaldehyde
							1000	Formaldehyde
S042	042	11/10/2015	03:57	01º 55.977' N	18º 25.939' W	2	200	Lugol & Formaldehyde
S043	043	11/10/2015	12:57	00º 29.407' N	17º 50.613' W	2	200	Lugol & Formaldehyde
S044	044	12/10/2015	04:00	01º 40.809' S	16º 58.619' W	2	200	Lugol & Formaldehyde
S045	045	13/10/2015	03:57	04º 25.425' S	15º 52.071' W	2	200	Lugol & Formaldehyde
S046	046	13/10/2015	12:58	05º 23.543' S	15º 27.299' W	2	200	Lugol & Formaldehyde
S047	047	14/10/2015	04:00	07º 06.599' S	14º 45.571' W	2	200	Lugol & Formaldehyde
S048	048	14/10/2015	12:02	07º 51.476' S	14º 26.477' W	2	200	Lugol & Formaldehyde
S055	050	19/10/2015	04:00	10º 06.813' S	16º 34.469' W	2	200	Lugol & Formaldehyde
S056	051	19/10/2015	13:10	11º 14.089' S	17º 41.679' W	2	200	Lugol & Formaldehyde
							1000	Formaldehyde
S057	052	20/10/2015	04:57	13º 00.015' S	19º 28.331' W	2	200	Lugol & Formaldehyde
S058	053	20/10/2015	13:58	14º 01.227' S	20º 30.001' W	2	200	Lugol & Formaldehyde
							1000	Formaldehyde
S059	054	21/10/2015	04:57	15º 41.461' S	22º 11.289' W	2	200	Lugol & Formaldehyde
S060	055	21/10/2015	13:58	16º 34.278' S	23º 06.057' W	2	200	Lugol & Formaldehyde
							1000	Formaldehyde
S061	056	22/20/2015	04:55	18º 30.119' S	25º 00.115' W	2	200	Lugol & Formaldehyde
S062	058	23/20/2015	04:56	20º 32.503' S	25º 04.119' W	2	200	Lugol & Formaldehyde
S063	059	23/20/2015	13:58	22º 09.482' S	25º 05.198' W	2	200	Lugol & Formaldehyde
S064	060	24/10/2015	04:57	24º 54.497' S	25º 04.416' W	2	200	Lugol & Formaldehyde
							1000	Formaldehyde
S065	061	24/10/2015	13:56	26º 30.148' S	25º 02.255' W	2	200	Lugol & Formaldehyde
							1000	Formaldehyde
S066	062	25/10/2015	05:12	28º 47.808' S	25º 27.556' W	5	200	Lugol & Formaldehyde
							1000	Formaldehyde
S067	063	25/10/2015	14:15	29º 24.341' S	26º 12.709' W	5	200	Lugol & Formaldehyde
							1000	Formaldehyde
S069	064	26/10/2015	14:10	30º 56.134' S	28º 05.192' W	5	200	Lugol & Formaldehyde
							1000	Formaldehyde
S071	066	27/10/2015	14:00	33º 19.952' S	31º 04.435' W	3	200	Lugol & Formaldehyde
							1000	Formaldehyde
S073	068	28/10/2015	14:57	36º 21.776'S	34º 58.827' W	2	200	Lugol & Formaldehyde
							1000	Formaldehyde
S075	070	29/10/2015	14:58	39º 52.449' S	39º 39.474' W	2	200	Lugol & Formaldehyde
							1000	Formaldehyde
S077	072	30/10/2015	13:00	42º 43.363' S	43º 41.959' W	5	200	Lugol & Formaldehyde
							1000	Formaldehyde
S079	074	31/10/2015	14:59	45º 39.017' S	48º 00.634' W	2	200	Lugol & Formaldehyde

S080	075	02/11/2015	07:09	48º 52.349' S	53º 06.422' W	5	200	Lugol & Formaldehyde
							1000	Formaldehyde
S081	076	02/11/2015	16:11	49º 46.592' S	54º 30.550' W	5	200	Lugol & Formaldehyde
							1000	Formaldehyde

Table 1: Samples taken for phytoplankton

Oxygen

The samples were collected used a clean length of Si-tubing for sampling from the CTD-rosette. Allow the sample bottle to overflow with 2 times its own volume and collect a water sample without bubbles.

The oxygen method is based on the Winkler titration with photometric end-point detection. Oxygen is fixed by addition of 1ml Manganese Sulphate and 1ml Sodium Hydroxide to form a yellow precipitate. At low oxygen concentration the precipitate is white turning yellow and orange with increasing oxygen concentration. The precipitate dissolves under acidic conditions after by addition of 1ml Sulphuric Acid, reacting with Iodite to form free Iodine. Finally, the Iodine is titrated against Thiosulphate until the solution becomes clear.

CTD	Station	Date	Time	Lat	Lon	Depth (m)
S003	002	19/09/2015	13:00	47º 30.574' N	11º 03.737' W	80, 61, 46, 34, 25, 20, 2
S004	003	20/09/2015	04:05	46º 16.584' N	12º 56.122' W	75, 50, 39, 29, 22, 20, 13, 7, 2
S005	004	20/09/2015	13:00	45º 35.560' N	13º 59.470' W	86, 66, 50, 37, 35, 21, 2
S006	005	21/09/2015	04:00	44º 27.345' N	15º 41.338' W	400, 250, 75, 50, 39, 35, 29, 14, 13, 5, 2
S007	006	21/09/2015	13:00	43º 42.716' N	16º 46.747' W	450, 350, 150, 113, 75, 70, 58, 44, 33, 19, 2
S008	007	22/09/2015	04:00	42º 18.470' N	18º 48.368' W	120, 80, 70, 61, 35, 20, 11, 2
S009	008	22/09/2015	13:00	41º 31.478' N	19º 52.276' W	450, 400, 200, 90, 60, 50, 46, 35, 26, 15, 2
S010	009	23/09/2015	04:00	40º 02.466' N	21º 55.032' W	450, 250, 113, 75, 70, 58, 44, 33, 19, 10, 2
S011	010	23/09/2015	13:00	39º 12.193' N	23º 02.733' W	450, 250, 113, 75, 65, 45, 25, 2
S012	011	24/09/2015	04:00	37º 41.325' N	25º 03.527' W	450, 250, 200, 135, 90, 80, 70, 39, 22, 12, 2
S013	012	24/09/2015	13:00	37º 30.451' N	26º 39.631' W	115, 77, 59, 55, 50, 45, 25, 19, 2
S014	013	25/09/2015	04:00	36º 50.257' N	29º 57.331' W	450, 150, 100, 90, 77, 30, 13, 2
S015	014	25/09/2015	18:42	36º 14.802' N	32º 45.655' W	2000, 1500, 1000, 800, 600, 500, 300, 200, 100, 50, 2
S016	016	27/09/2015	06:00	36º 13.709' N	32º 46.313' W	1500, 1000, 800, 650, 400, 300, 180, 120, 100, 92, 80, 75, 70, 52, 29, 16, 5, 2
S017	017	28/09/2015	04:02	35º 36.678' N	34º 09.999' W	2000, 1750, 750, 500, 150, 130, 100, 77, 58, 43, 25, 13, 5
S018	018	28/09/2015	13:04	35º 03.813' N	35º 26.601' W	400, 150, 110, 80, 45, 25, 5
S019	019	29/09/2015	04:05	33º 59.929' N	37º 34.490' W	2000, 1500, 1250, 1000, 700, 30, 20, 5
S020	020	29/09/2015	12:58	33º 13.289' N	38º 55.296' W	165, 110, 84, 64, 47, 27, 5
S021	021	30/09/2015	04:02	31º 09.058' N	40º 55.078' W	2000, 1500, 1250, 1000, 800, 180, 120, 115, 90, 70, 30, 15, 2
S023	023	01/10/2015	04:03	28º 15.348' N	42º 18.575' W	2000, 1250, 800, 400, 180, 160, 120, 90, 70, 30, 2
S024	024	01/10/2015	12:56	27º 28.478' N	41º 06.648' W	190, 135, 125, 97, 74, 30, 25, 2
S025	025	02/10/2015	04:02	25º 56.022' N	38º 49.624' W	450, 180, 150, 135, 120, 90, 70, 40, 30, 2
S026	026	02/10/2015	10:24	25º 27.193' N	38º 04.464' W	5000, 2400, 850, 150, 117, 100, 77, 58, 48, 25, 13, 2
S027	027	03/10/2015	04:10	23º 53.910' N	35º 45.339' W	165, 120, 110, 85, 65, 60, 20, 15, 2
S028	028	03/10/2015	13:02	22º 59.199' N	34º 23.347' W	105, 100, 80, 77, 58, 25, 20, 13, 2
S029	029	04/10/2015	04:01	21º 27.959' N	32º 04.532' W	135, 98, 90, 70, 63, 20, 10, 2
S030	030	04/10/2015	13:00	20º 34.807' N	30º 46.185' W	150, 97, 90, 75, 65, 55, 20, 13, 2
S031	031	05/10/2015	04:02	19º 16.061' N	28º 59.699' W	105, 78, 70, 60, 54, 41, 30, 10, 2
S032	032	05/10/2015	13:03	18º 28.840' N	28º 01.682' W	116, 78, 72, 62, 59, 45, 20, 19, 11, 2
S033	033	06/10/2015	03:59	17º 10.667' N	26º 27.348' W	500, 300, 70, 65, 50, 40, 20, 17, 2
S034	034	06/10/2015	12:58	16º 25.975' N	25º 32.986' W	400, 85, 60, 55, 45, 43, 33, 20, 14, 8, 2
S035	035	07/10/2015	03:57	15º 05.735' N	23º 56.810' W	350, 90, 60, 46, 42, 35, 25, 20, 15, 8, 2

S036	036	08/10/2015	04:10	13º 22.756' N	22º 54.298' W	500, 150, 75, 59, 47, 39, 29, 23, 20, 13, 7, 2
S037	037	08/10/2015	12:58	12º 22.140' N	22º 31.941' W	500, 90, 60, 50, 46, 35, 22, 20, 15, 8, 2
S038	038	09/10/2015	03:56	09º 59717' N	21º 36.097' W	500, 120, 80, 70, 61, 47, 45, 20, 11, 2
S039	039	09/10/2015	13:01	08º 34.053' N	21º 02.216' W	400, 100, 85, 57, 44, 38, 33, 20, 14, 8, 2
S040	040	10/10/2015	03:58	05º 52.643' N	20º 01.625' W	400, 75, 64, 58, 44, 20, 10, 2
S041	041	10/10/2015	13:00	04º 24.185' N	19º 25.844' W	300, 119, 80, 61, 50, 46, 20, 11, 2
S042	042	11/10/2015	03:57	01º 55.977' N	18º 25.939' W	115, 85, 60, 58, 44, 20, 10, 2
S043	043	11/10/2015	12:57	00º 29.407' N	17º 50.613' W	300, 113, 75, 65, 60, 44, 20, 10, 2
S044	044	12/10/2015	04:00	01º 40.809' S	16º 58.619' W	300, 98, 65, 60, 50, 30, 20, 16, 9, 2
S045	045	13/10/2015	03:57	04º 25.425' S	15º 52.071' W	400, 90, 65, 62, 46, 35, 20, 15, 8, 2
S046	046	13/10/2015	12:58	05º 23.543' S	15º 27.299' W	400, 110, 56, 50, 42, 35, 20, 10, 2
S047	047	14/10/2015	04:00	07º 06.599' S	14º 45.571' W	113, 75, 65, 58, 44, 40, 20, 10, 2
S048	048	14/10/2015	12:02	07º 51.476' S	14º 26.477' W	1000, 133, 90, 67, 60, 51, 20, 12, 2
S055	050	19/10/2015	04:00	10º 06.813' S	16º 34.469' W	113, 95, 75, 44, 20, 10 ,2
S056	051	19/10/2015	13:10	11º 14.089' S	17º 41.679' W	300, 150, 112, 100, 85, 77, 58, 13, 2
S057	052	20/10/2015	04:57	13º 00.015' S	19º 28.331' W	300, 124, 110, 88, 84, 64, 20, 15, 2
S058	053	20/10/2015	13:58	14º 01.227' S	20º 30.001' W	300, 165, 125, 110, 100, 84, 64, 27, 20, 15, 2
S059	054	21/10/2015	04:57	15º 41.461' S	22º 11.289' W	300, 180, 156, 120, 92, 70, 29, 16, 2
S060	055	21/10/2015	13:58	16º 34.278' S	23º 06.057' W	300, 240, 160, 150, 122, 100, 93, 39, 20, 2
S061	056	22/20/2015	04:55	18º 30.119' S	25º 00.115' W	500, 250, 170, 160, 130, 100, 41, 23, 20, 2
S062	058	23/20/2015	04:56	20º 32.503' S	25º 04.119' W	500, 255, 170, 165, 130, 50, 40, 20, 2
S063	059	23/20/2015	13:58	22º 09.482' S	25º 05.198' W	400, 265, 175, 138, 105, 100, 43, 25, 20, 2
S064	060	24/10/2015	04:57	24º 54.497' S	25º 04.416' W	250, 170, 158, 130, 100, 60, 23, 20, 2
S065	061	24/10/2015	13:56	26º 30.148' S	25º 02.255' W	240, 160, 148, 122, 93, 54, 39, 20, 2
S066	062	25/10/2015	05:12	28º 47.808' S	25º 27.556' W	225, 150, 135, 105, 87, 37, 5
S067	063	25/10/2015	14:15	29º 24.341' S	26º 12.709' W	500, 225, 150, 135, 120, 115, 87, 37, 20, 5
S069	064	26/10/2015	14:10	30º 56.134' S	28º 05.192' W	500, 200, 150, 120, 80, 67, 28, 15
S070	065	27/10/2015	05:07	32º 23.400' S	29º 51.195' W	115, 110, 100, 88, 67, 28, 20, 15, 5
S071	066	27/10/2015	14:00	33º 19.952' S	31º 04.435' W	500, 137, 92, 80, 53, 50, 20, 12, 3
S072	067	28/10/2015	06:01	35º 20.034' S	33º 38.760' W	500, 90, 65, 60, 46, 35, 30, 20, 15, 8
S073	068	28/10/2015	14:57	36º 21.776' S	34º 58.827' W	500, 170, 115, 90, 77, 59, 50, 45,2
S074	069	29/10/2015	05:58	38º 28.753' S	37º 45.128' W	200, 140, 105, 90, 70, 60, 40, 20, 10, 2
S075	070	29/10/2015	14:58	39º 52.449' S	39º 39.474' W	500, 156, 104, 79, 60, 50, 40, 25, 20, 14, 2
S076	071	30/10/2015	06:02	41º 40.674' S	42º 13.793' W	500, 98, 75, 65, 50, 45, 38, 20, 16, 9, 2
S077	072	30/10/2015	13:00	42º 43.363' S	43º 41.959' W	240, 200, 120, 70, 54, 50, 41, 20, 15, 5
S078	073	31/10/2015	06:00	44º 35.500' S	46º 21.284' W	230, 105, 70, 54, 40, 15, 10, 2
S079	074	31/10/2015	14:59	45º 39.017' S	48º 00.634' W	500, 175, 119, 100, 79, 61, 55, 46, 20, 11, 2
S080	075	02/11/2015	07:09	48º 52.349' S	53º 06.422' W	500, 105, 80, 70, 60, 55, 40, 20, 15, 10
S081	076	02/11/2015	16:11	49º 46.592' S	54º 30.550' W	500, 90, 75, 60, 50, 46, 40, 35, 20, 15, 5

Table 2: Samples taken for oxygen

Nutrients

Robyn Tuerena

University of Liverpool/ Plymouth Marine Laboratory

OBJECTIVES:

To investigate the spatial and temporal variations of the micro-molar nutrient species Nitrate, Nitrite, Phosphate, and Silicate during the research cruise along the Atlantic Meridional Transect (AMT) cruise track, departing from Immingham, UK and sailing through the North Atlantic Gyre (NAG), south to the equator, through the South Atlantic Gyre (SAG), before turning south-west to end the cruise at Port Stanley Falkland Islands.

SAMPLING and METHODOLOGY

Micro-molar nutrient analysis was carried out using a 4 channel (nitrate (Brewer & Riley, 1965), nitrite (Grasshoff,K., 1976), phosphate, silicate (Kirkwood, D.S., 1989) . Bran & Luebbe AAIII segmented flow, colourimetric, auto-analyser. Established, proven analytical protocols were used.

Water samples were taken from a 24 x 20 litre bottle stainless steel framed CTD / Rosette system (Seabird), typically every unique depth was sampled from each CTD cast. These were sub-sampled into clean (acid-washed) 60ml HDPE (Nalgene) sample bottles, which were rinsed x3 with sample seawater prior to filling.

CTD SAMPLES ANALYSED

A total of 74 vertical profiles were analysed along the axis of the AMT and the niskin bottles sampled and locations are listed detail in the table below.

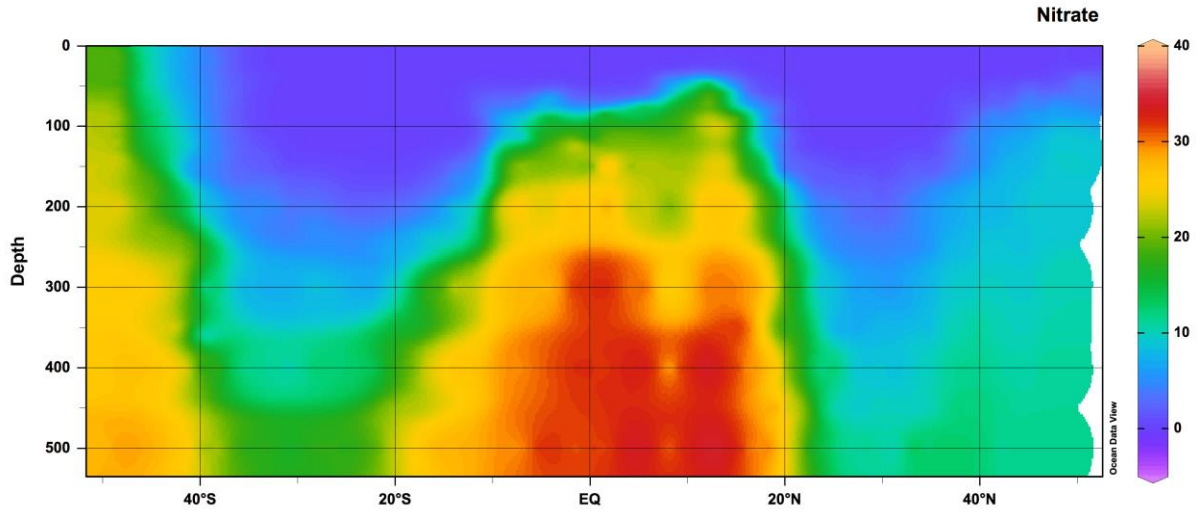

Figure 1. Nitrate concentrations (µmol L^{-1}) across the AMT25 transect (uncorrected).

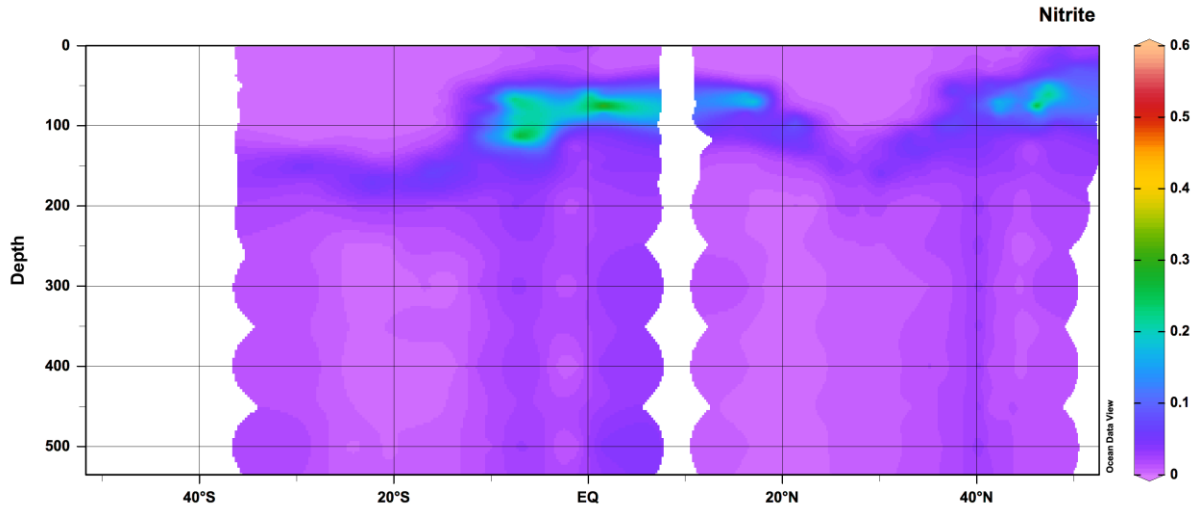

Figure 2. Nitrite concentrations (µmol L^{-1}) across the AMT25 transect (uncorrected).

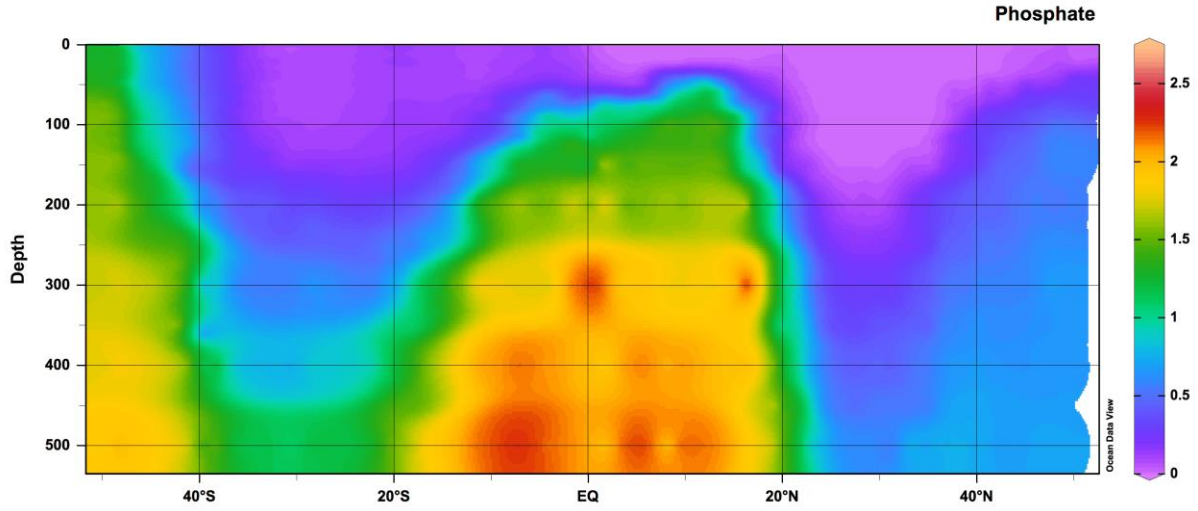

Figure 3. Silicate concentrations (µmol L^{-1}) across the AMT25 transect (uncorrected).

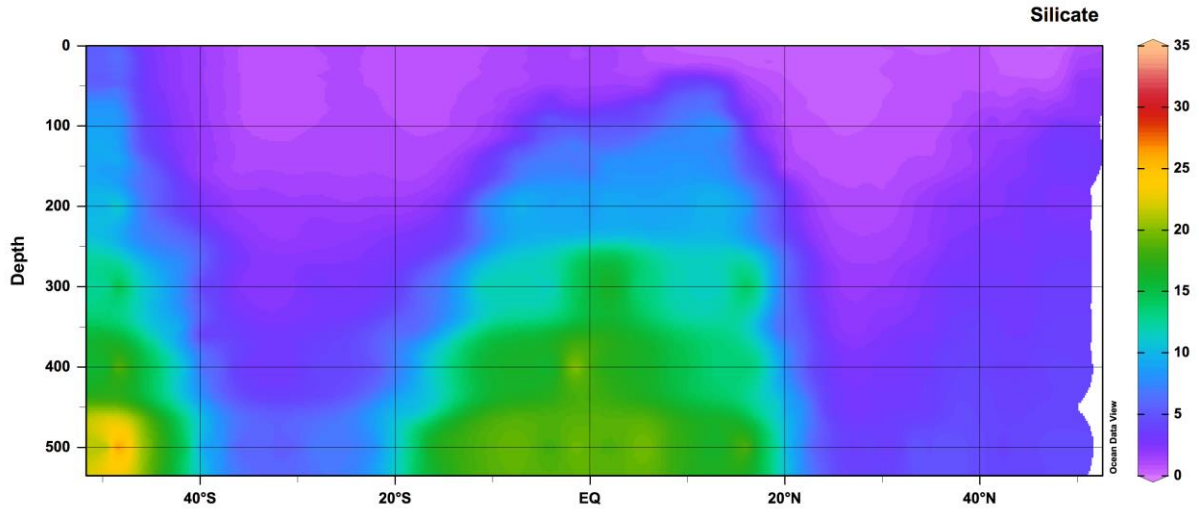

Figure 4. Phosphate concentrations (µmol L^{-1}) across the AMT25 transect (uncorrected).

Table 1: AMT 25 - Station & CTD Sampling Summary

Station	CTD no.	Latitude (°N)	Longitude (°E)	Time	Date	Niskin bottles sampled
0	1	50.2	-4.225	07:55	18/09/2015	1,3,5,8,9,11,13,15, 17,19,21,24
1	2	48.245	-9.11839	04:09	19/09/2015	1,2,3,4,5,7,9,11, 14,15,16,18,22
2	3	47.30574	-11.3747	13:00	19/09/2015	1,2,3,4,5,6,9,19,12,13, 14,15,18,19,21,22,24
3	4	46.16584	-12.5612	04:05	20/09/2015	1,2,3,4,5,6,7,8,10,12,13, 14,15,18,19,21,23
4	5	45.3556	-13.5947	13:00	20/09/2015	1,3,4,5,7,9,11,12,13, 14,15,19,21,22
5	6	44.27345	-15.4134	04:00	21/09/2015	1,3,4,5,6,7,8,9,10,12,13, 16,17,18,19,21,22
6	7	43.42716	-16.4675	13:00	21/09/2015	1,2,3,4,5,6,7,8,9,11,12, 15,16,17,18,19,21,22
7	8	42.1847	-18.4837	04:00	22/09/2015	1,2,3,4,5,6,7,8,9,10,12, 15,16,18,19,21,22
8	9	41.31498	-19.5228	13:00	22/09/2015	1,2,3,4,5,6,7,8,9,11,12, 15,16,17,18,19,21,22
9	10	40.2466	-21.5503	04:00	23/09/2015	1,2,3,4,5,6,7,8,9,10,12, 15,16,17,18,19,21,22
10	11	39.20313	-23.0457	13:00	23/09/2015	1,2,3,4,5,6,7,8,9,11,12, 15,16,18,21,24
11	12	37.79763	-24.9267	04:00	24/09/2015	1,2,3,4,5,6,7,8,9,10,12, 15,16,18,19,21,22
12	13	37.51996	-26.6251	13:00	24/09/2015	1,2,3,4,5,6,7,9,10,11,12, 15,16,17,18,19,21,22
13	14	36.83806	-29.9551	04:00	25/09/2015	1,2,3,4,5,6,7,8,9,10,14, 15,16,18,19,21,23
14	15	36.14802	-32.4555	18:42	25/09/2015	3,4,7,8,11,12,16, 19,20,23,24
16	16	36.13709	-32.463	06:00	27/09/2015	1,2,3,4,5,7,8,9,11,12, 13,15,16,17,18,19,21,22

17	17	35.36678	-34.9999	04:00	28/09/2015	1,2,3,4,5,6,7,8,9,10,11, 13,15,17,18,19,20,23
18	18	35.03813	-35.266	13:04	28/09/2015	1,2,3,4,5,6,7,8,9,10,12, 15,16,17,18,19
19	19	33.59929	-37.3449	04:05	29/09/2015	1,2,3,4,5,6,7,8,9,10,11, 12,13,15,17,18,19,20,23
20	20	33.13289	-38.553	12:58	29/09/2015	2,3,5,6,7,8,9,10,12,15, 16,17,18,19,20,24
21	21	31.09058	-40.5508	04:02	30/09/2015	1,2,3,4,5,6,7,8,9,10,11, 12,15,17,18,19,20,23
22	22	30.06032	-41.5635	12:59	30/09/2015	2,3,4,6,7,8,9,12,15,16, 17,18,19,20,22
23	23	28.15348	-42.1858	04:03	01/10/2015	1,2,3,4,5,6,7,8,9,10,11, 12,15,16,18,19,20,23
24	24	27.28478	-41.0665	12:56	01/10/2015	1,2,3,4,5,6,7,8,9,12,14, 15,16,17,18,19,21,24
25	25	25.56022	-38.4962	04:02	02/10/2015	1,2,3,4,5,6,7,8,9,10,13, 15,16,17,18,19,21,22
26	26	25.27193	-38.0446	10:24	02/10/2015	1,2,3,4,5,6,7,8,10,11,13, 14,15,16,17,20,21,22
27	27	23.5391	-35.4534	04:10	03/10/2015	1,2,3,4,5,6,7,10,12,13, 14,15,16,18,20,21,22
28	28	22.59199	-34.2335	13:00	03/10/2015	1,2,3,4,5,6,7,10,12,13, 14,15,16,17,18,20,21,22
29	29	21.27959	-32.0453	04:01	04/10/2015	1,2,3,4,5,6,7,10,12,13, 14,15,16,18,20,21,22
30	30	20.34807	-30.4619	13:00	04/10/2015	1,2,3,4,5,6,7,8,11,13, 14,15,16,18,20,21,22
31	31	19.16061	-28.597	04:02	05/10/2015	1,2,3,5,6,7,8,11,13,14, 15,16,18,20,22
32	32	18.2884	-28.0168	13:03	05/10/2015	1,2,3,4,6,8,11,12,13, 14,15,16,19,20,21
33	33	17.10667	-26.2735	03:59	06/10/2015	1,2,3,4,5,6,7,9,12,13,14, 15,16,17,20,21,22
34	34	16.25975	-25.3299	12:58	06/10/2015	1,2,3,4,5,6,7,10,12,14, 15,16,17,20,21,22
35	35	15.05735	-23.5681	03:57	07/10/2015	1,2,3,4,5,6,7,9,10,13, 14,16,17,20,21,22
36	36	13.22756	-22.543	04:10	08/10/2015	1,2,3,4,5,6,7,8,10,13, 14,15,17,18,20,21,22
37	37	12.2214	-22.3194	12:58	08/10/2015	1,2,3,4,5,6,7,9,12,13, 15,16,17,18,20,21,22
38	38	9.59717	-21.361	04:00	09/10/2015	1,2,3,4,5,6,7,9,12,13, 14,15,16,18,20,21,22
39	39	8.34053	-21.0222	13:01	09/10/2015	1,2,3,4,5,6,7,9,10,15, 16,18,20,21,22
40	40	5.52643	-20.0163	03:58	10/10/2015	1,2,3,4,5,6,7,9,12,13, 14,16,17,20,21,22
41	41	4.24185	-19.2584	13:00	10/10/2015	1,2,3,4,5,6,7,9,10,13, 14,15,17,20,21,22
42	42	1.55977	-18.2594	03:57	11/10/2015	1,2,3,4,5,6,7,10,12,13, 14,15,16,17,20,21,22
43	43	0.29407	-17.5061	12:57	11/10/2015	1,2,3,4,5,6,7,9,12,13, 14,15,16,18,21,22
44	44	-1.40809	-16.5862	04:00	12/10/2015	1,2,3,4,5,6,7,9,12,13, 14,15,16,18,20,21,22
45	45	-4.25425	-15.5207	03:57	13/10/2015	1,2,3,4,5,6,7,8,11,14, 15,16,18,20,21,22

46	46	-5.23543	-15.273	12:58	13/10/2015	1,2,3,4,5,6,9,10,11, 15,17,20,21,22
47	47	-7.06599	-14.4557	04:00	14/10/2015	1,2,4,5,6,7,9,12,13, 14,15,16,18,21,22
48	48	-7.51476	-14.2648	12:02	14/10/2015	1,2,4,5,6,8,10,13, 14,15,18,20,21,22
50	55	-10.0681	-16.3447	04:00	19/10/2015	1,2,4,5,6,7,10,11, 13,15,16,20,21,22
51	56	-11.1409	-17.4168	13:10	19/10/2015	1,2,3,4,6,7,10,13, 15,16,18,20,21,22
52	57	-13.0002	-19.2833	04:57	20/10/2015	1,2,3,4,6,7,10,13,14, 15,16,18,20,21,22
53	58	-14.0123	-20.3	13:58	20/10/2015	1,2,3,4,5,6,7,10,11,13, 14,15,16,17,18,20,21,22
54	59	-15.4146	-22.1129	04:57	21/10/2015	1,2,3,4,5,6,7,10,11,13, 14,15,16,17,18,20,21,22
55	60	-16.3428	-23.0606	13:58	21/10/2015	1,2,3,4,5,6,7,11,13, 14,15,16,17,20,21,23
56	61	-18.3012	-25.0012	04:55	22/10/2015	1,2,3,4,6,7,8,10,13, 14,15,16,19,20,21,23
58	62	-20.325	-25.0412	04:56	23/10/2015	1,2,3,4,5,6,7,9,12,13, 14,15,16,17,19,20,22
59	63	-22.0948	-25.052	13:58	23/10/2015	1,2,3,4,5,6,8,9,12,13, 14,15,16,17,19,20,21,22
60	64	-24.545	-25.0442	04:57	24/10/2015	1,2,3,4,5,6,7,9,12,13, 14,15,16,17,19,20,21,22
61	65	-26.3015	-25.0226	13:56	24/10/2015	1,2,3,4,5,6,7,9,12,13, 14,15,16,17,18,20,22
62	66	-28.4781	-25.2756	05:10	25/10/2015	1,2,3,4,5,6,7,9,12,13, 14,15,16,17,18,20,21,22
63	67	-29.2434	-26.1271	14:15	25/10/2015	1,2,3,4,5,6,7,9,12,13, 14,15,16,17,18,20,21,22
64	69	-30.5613	-28.0519	14:10	26/10/2015	1,2,3,4,5,6,7,9,10,12,14, 15,16,17,18,20,21,22
65	70	-32.234	-29.512	05:07	27/10/2015	1,2,3,4,5,6,7,9,12,13,14, 15,16,17,18,20,21,22
66	71	-33.1995	-31.0444	14:00	27/10/2015	1,2,3,4,5,6,7,9,12,13, 14,15,16,18,20,21,22
67	72	-35.20034	-33.38760	06:01	28/10/2015	1,2,3,4,5,6,7,9,13,14, 15,16,17,18,20,21,22
68	73	-36.21776	-34.58827	14:57	28/10/2015	1,2,3,4,5,6,7,8,9,11, 12,15,16,17,20,21,22
69	74	-38.28753	-37.45128	05:58	29/10/2015	1,2,3,4,5,6,7,8,9,10, 12,13,16,17,20,21,22
70	75	-39.52449	39.39474	14:58	29/10/2015	1,2,3,4,5,6,7,9,10,11,14, 15,16,17,18,20,21,22
71	76	-41.40674	-42.13793	06:02	30/10/2015	1,2,3,4,5,6,7,8,9,11,14, 15,16,17,18,20,21,22
72	77	-42.43363	-43.41959	13:00	30/10/2015	1,2,3,4,5,6,7,8,9,10,12, 13,16,17,18,19,21,22
73	78	-44.35500	-46.21284	06:00	31/10/2015	1,2,3,4,5,6,7,8,9,11,12, 13,16,17,18,20,21,22
74	79	-45.39017	-48.00634	13:00	31/10/2015	1,2,3,4,5,6,7,8,9,11,12, 13,16,18,20,21,22
75	80	-48.52349	-53.06422	07:09	02/11/2015	1,2,3,4,5,6,7,8,9,10,14, 15,16,17,18,19,21,22
76	81	-49.46592	-54.3055	16:11	02/11/2015	1,2,3,4,5,6,7,8,10,11, 12,15,17,18,19,21,22

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Dissolved Organic Carbon (DOC), Particulate Organic Carbon (POC), Size-Fractionated Chlorophyll and Microscopy.

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Objective:

The objective is to assess whether topography, specifically mid-ocean ridges, influences the biogeochemistry of the above surface waters.

This was approached by sampling for DOC and POC at regular intervals down to 500/2000 m (depending on CTD cast depth, and sampling around the chlorophyll maximum for size-fractionated chlorophyll and microscopy.

The work is part of the RidgeMix project, along with the Sharples Moorings. The project aims to measure physical mixing processes over the Mid-Atlantic Ridge and the associated impacts of this mixing on the biogeochemistry in the surface waters.

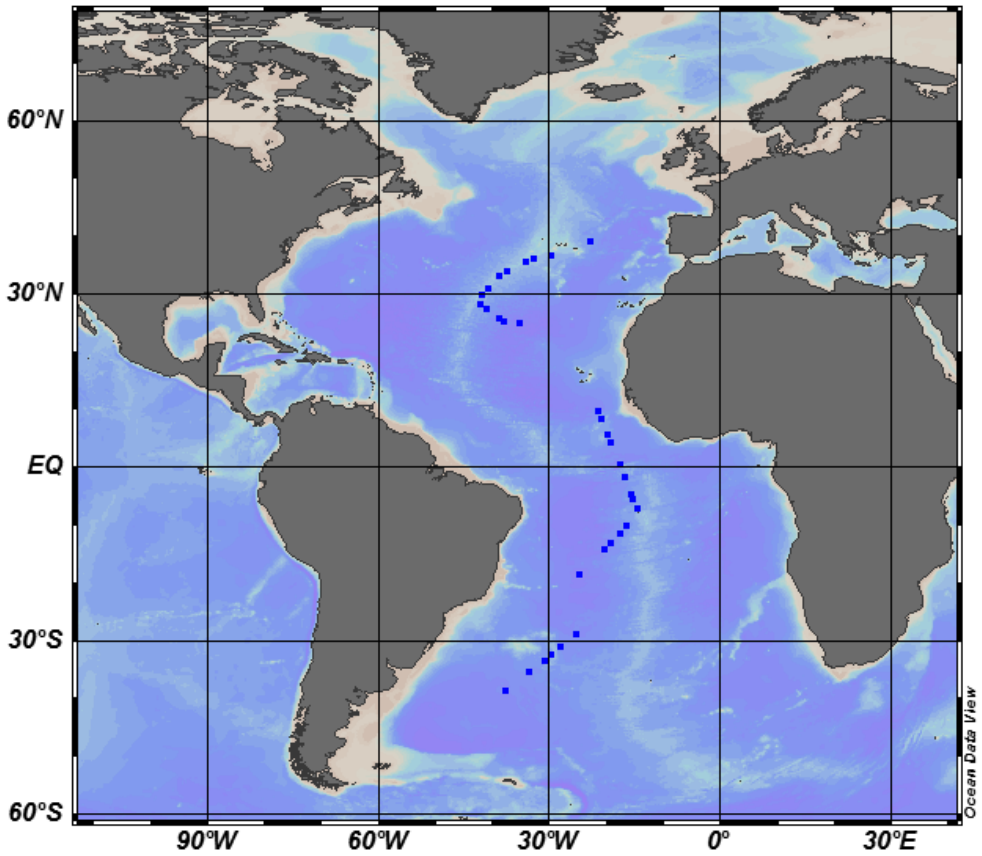

Figure 5 Location of Stations Sampled

Table 1 Niskin bottles sampled

Station	CTD	Date	Time	DOC Niskin Numbers	POC Niskin Numbers	Size-Fractionated Chlorophyll Niskin Numbers	Microscopy Niskin Numbers
4	4	20/9/15	04:05			15	
8	8	22/9/15	04:00		8, 10, 13, 16, 18, 22	8, 10, 13, 16, 18, 22	
9	9	22/9/15	13:00	1, 3, 5, 7, 8, 12, 22	5, 9, 14, 17, 22		9, 14
10	11	23-09-15	13:00	1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12 15, 16, 18, 21, 24	1, 2, 3, 4, 5, 6, 9, 11, 14, 16, 18, 22	9, 11, 14, 16, 18, 22	9, 14, 22
13	14	25-09-15	0.4:00	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 14, 15, 18, 23	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 13, 15, 18, 22	7, 9, 10, 13, 15, 18, 22	8, 13, 22
14	15	25-09-15	18:42	3, 4, 7, 8, 11, 12, 16, 19, 20, 23, 24	12, 16, 19, 20, 23, 24	19, 20, 23, 24	19, 20
16	16	27-09-15	6:00	1, 2, 3, 4, 5, 7, 8, 9, 11, 12, 13,	4, 5, 7, 8, 9, 11, 12, 13, 15, 16, 18,	9, 11, 12, 13, 15, 16, 17, 18, 19, 22	9, 12, 13, 15, 17, 22

				15, 16, 18, 19, 21	19, 22		
17	17	28-09-15	4:02	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 17, 18, 20, 23	5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 17, 18, 20, 23	10, 11, 12, 13, 14, 15, 17, 18, 20, 23	12, 13, 23
18	18	28-09-15	13:00	1, 2, 3, 4, 5, 7, 8, 9, 12, 15, 17, 19, 23	1, 3, 5, 7, 8, 9, 12, 15, 17, 19, 23	8, 9, 12, 15, 17, 23	
19	19	29-09-15	4:05	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 15, 17, 18, 23	5, 6, 7, 8, 9, 10, 11, 13, 15, 17, 19, 23	9, 10, 11, 13, 15, 17, 19, 23	9, 10, 13, 15, 23
20	20	29-09-15	12:58	2, 3, 5, 6, 7, 9, 12, 15, 19, 24	1, 3, 5, 7, 9, 12, 15, 17, 18, 19, 24	7, 8, 9, 10, 12, 15, 16, 17, 18, 24	7, 9, 15
21	21	30-09-15	4:02	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 15, 17, 19, 23	6, 7, 8, 9, 10, 11, 12, 15, 17, 19, 23	9, 10, 11, 12, 15, 17, 19, 23	9, 12, 15, 19
22	22	30-09-15	12:59	2, 3, 4, 6, 7, 12, 15, 19, 22	1, 3, 5, 6, 7, 8, 9, 12, 14, 15, 16, 17, 18, 20, 22	8, 9, 12, 15, 17, 22	8, 12, 14, 16, 22
23	23	01-10-15	4:03	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 15, 16, 18, 19, 20, 23	6, 7, 8, 9, 10, 11, 12, 15, 16, 18, 19, 20, 23	9, 10, 11, 12, 15, 16, 18, 19, 23	10, 12, 15, 18, 23
24	24	01-10-15	15:56	1, 2, 3, 4, 5, 6, 7, 9, 12, 14, 15, 17, 19, 24	1, 3, 5, 7, 9, 12, 14, 15, 17, 19, 24	7, 9, 12, 14, 15, 17, 19, 24	7, 12, 24
25	25	02-10-15	4:02	1, 2, 3, 4, 5, 6, 7, 8, 9, 12, 15, 17, 24	1, 3, 5, 7, 9, 12, 13, 15, 17, 18, 22	6, 7, 12, 13, 15, 17, 18, 22	7, 12, 22
26	26	02-10-15	10:24	1, 2, 3, 4, 5, 6, 7, 10, 11, 15, 17, 22	1, 2, 3, 4, 5, 6, 10, 11, 15, 17, 22	6, 7, 10, 11, 15, 22	
38	38	09-10-15	4:00	1, 2, 3, 4, 5, 11, 15, 18, 22	1, 2, 3, 4, 5, 11, 13, 15, 16, 18, 22	3, 5, 11, 13, 15, 16, 18, 22	5, 12, 22
39	39	09-10-15	13:01	1, 2, 3, 4, 5, 6, 12, 15, 22	1, 2, 3, 4, 5, 6, 10, 11, 15, 17, 22	4, 5, 7, 12, 13, 22	5, 12, 22
40	40	10-10-15	3:58	1, 2, 3, 4, 5, 7, 9, 13, 16, 22	1, 2, 3, 4, 5, 7, 9, 13, 16, 22	4, 5, 7, 9, 13, 16, 22	4, 9, 22
41	41	10-10-15	13:00	1, 2, 3, 4, 5, 6, 7, 12, 13, 15, 18, 22	1, 2, 3, 4, 5, 6, 7, 12, 13, 15, 22	4, 6, 7, 12, 13, 15, 22	4, 12, 22

43	43	11-10-15	12:57	1, 2, 3, 4, 5, 11, 14, 16, 22	1, 2, 3, 4, 5, 7, 11, 12, 14, 16, 22	5, 6, 7, 11, 12, 14, 22	4, 11, 22
44	44	12-10-15	4:00	1, 2, 3, 4, 6, 11, 22	1, 2, 3, 4, 5, 6, 7, 11, 13, 15, 22	5, 6, 7, 11, 13, 15, 22	
45	45	13-10-15	3:57	1, 2, 3, 4, 5, 6, 7, 10, 11, 15, 22	1, 2, 3, 4, 6, 15, 22	4, 5, 6, 10, 13, 15, 22	4, 10, 15, 22
46	46	13-10-15	12:58		1, 2, 3, 4, 5, 6, 7, 9, 13, 17, 22	4, 6, 7, 9, 13, 14, 17, 22	4, 13, 22
47	47	14-10-15	4:00	1, 2, 3, 4, 5, 6, 7, 11, 13, 16, 22	1, 2, 4, 5, 6, 7, 11, 13, 16, 22	4, 5, 6, 7, 11, 13, 16, 22	4, 11, 22
50	55	19-10-15	4:00	1, 2, 3, 4, 5, 6, 9, 10, 14, 16, 22	1, 2, 3, 4, 5, 6, 9, 10, 14, 16, 18, 22	4, 5, 6, 9, 10, 14, 16, 18, 22	4, 6, 9, 10, 22
51	56	19-10-15	12:59	1, 2, 3, 4, 6, 9, 12, 16, 18, 22	1, 2, 3, 4, 6, 9, 10, 12, 16, 18, 22	4, 6, 9, 10, 12, 16, 18, 22	4, 9, 22
52	57	20-10-15	4:57	1, 2, 3, 4, 5, 9, 12, 16, 18, 22	1, 2, 3, 4, 5, 9, 10, 12, 13,16, 22	4, 5, 9, 10, 12, 13,16, 22	4, 10, 22
53	58	20-10-15	13:58	1, 2, 3, 4, 5, 6, 8, 9, 10, 13, 16, 18, 22	1, 2, 3, 4, 5, 6, 8, 10, 13,16, 18, 22	4, 5, 6, 8, 10, 13,16, 22	4, 8, 22
56	61	22-10-15	4:55	1, 2, 3, 4, 6, 12, 13, 15, 16, 20, 23	1, 2, 3, 4, 6, 7, 8, 10, 13, 15, 16, 20, 23	4, 7, 8, 10, 13, 15, 16, 20, 23	4, 7, 10, 15, 23
59	63	23/10/15	13:58		1, 13, 22		
62	66	25-10-15	5:12	1, 2, 3, 4, 5, 6, 7, 11, 12, 15, 17, 22	1, 2, 3, 4, 5, 6, 7, 11, 12, 15, 17, 18, 22	3, 4, 6, 7, 11, 12, 13, 15, 17, 18, 23	3, 6, 11, 12, 22
64	69	26-10-15	14:10	1, 2, 3, 4, 5, 8, 10, 12, 18, 22	1, 2, 3, 4, 5, 8, 9, 10, 12, 13, 15, 18, 22	5, 8, 9 , 10, 12, 13, 15, 18, 23	5, 10, 22
65	70	27-10-15	5:07	1, 2, 3, 4, 5, 6, 11, 12, 13, 14, 15, 16, 18, 22	1, 2, 3, 4, 5, 6, 11, 12, 13, 15, 18, 22	4, 5, 6, 11 , 12, 13, 15, 18, 22	4, 11, 12, 13, 22
66	71	27-10-15	14:00	1, 2, 3, 4, 5, 6, 7, 11, 12, 13, 14, 15, 22	1, 2, 3, 4, 5, 6, 11, 12, 13, 15, 16, 18, 22	4, 5, 6, 11, 12, 13, 15, 16, 18, 22	4, 6, 12, 15, 22
67	72	28-10-15	6:01	1, 2, 3, 4, 5, 6, 7, 10, 13, 17, 22	1, 2, 3, 4, 5, 6, 7, 10, 13, 14, 17, 22	4, 5, 6, 7, 10, 13, 14, 17, 22	4, 6, 10, 13, 14, 22
69	74	29-10-15	5:58	1, 2, 3, 4, 5, 7, 9, 12, 15	1, 2, 3, 4, 5, 6, 7, 9, 12, 15, 22	1, 2, 3, 4, 5, 6, 7, 9, 12, 15, 22	4, 6, 12, 15, 22

Methods

Sample Collection

Samples were taken from both pre-dawn and noon CTD casts in selected areas throughout the cruise (Figure 1, Table 1). Non-nitrile gloves were used to avoid contamination of DOC samples. DOC samples were collected after oxygen (either first, second or third in order) around the CTD and chlorophyll, POC and microscopy samples were taken after flow cytometry (third to seventh). DOC samples were collected straight from the valve, after triple rinsing with sea water, into 1 L plastic bottles triple MilliQ rinsed. Size-fractionated chlorophyll samples were collected using tubing into 1 L brown bottles, triple rinsed with milliQ and seawater. POC samples were collected immediately after the chlorophyll samples into 5 or 10 L plastic bottles after triple rinsing with seawater. Once a week DOC and POC bottles were acid cleaned overnight and triple rinsed with MilliQ.

DOC analysis

In the main laboratory, for each water sample, a glass filtration rig holding 45 mm, 0.7 µm pore size GFFs was flushed through with sample water four times before 20 ml of water was collected into a pre-acidified (20 µl hydrochloric acid, 37%) 20 ml glass vial with a screw cap and septum. GFFs were changed every four to five samples. Every day, after the noon CTD filtration, the rig was dismantled and placed in a 10% acid bath overnight. Every day, before the dawn CTD, the rig was reassembled and covered in muffled foil (350°C for 24 hours). Samples were stored upright in the 4°C fridge and transported back to the UK in freezer bags with ice packs.

In the UK DOC will be analysed in a method similar to Pan et al., (2014).

POC analysis

In the wet-laboratory 2-8 L of seawater was filtered through 25 mm 0.7 µm pore size GFFs. The volume filtered varied with the quantity of material in the water.2 L was filtered for surface samples (down to ~150 m), 3 - 4 L was filtered between ~150 m and 500 m and 4 – 8 L was filtered between 500 and 5000 m. Filter papers were placed onto squares of muffled foil (350°C for 24 hours) in plastic petri-dishes and placed in the oven (58°C, 12 hours). After 12 hours the petri-dishes were removed from the oven, taped up, placed in double zip-lock plastic bags and placed in the -20°C freezer in polystyrene boxes until transport back to the UK with ice packs. Samples will be acid fumed in a desiccator and analysed for PN, PC and POC using a Carlo Erbo elemental analyser.

Size-Fractionated Chlorophyll analysis

In the wet lab 250 ml to 1000 ml of seawater was filtered through the size-fractionated chlorophyll rig containing 45 mm polycarbonate filter papers of pore size 20 µm, 2 µm and 0.2 µm. The filter papers were folded, transferred to glass tubes and 5 ml of 90% acetone was added in the fume cupboard. Samples were stored in the fridge at 4°C for 24 hours. Samples were run through a Turner Trilogy Fluorometer and chlorophyll concentrations calculated from raw fluorescence units (RFU). Three blanks were run before each batch of samples. The fluorometer couvet was triple rinsed with acetone between samples.

Microscopy

In the wet lab 2 L's of sea water was filtered through 45 mm polycarbonate filters of 10 µm pore size. The filter was transferred to an amber glass jar and 'fixed'/preserved in 2% Lugols solution. The jar was wrapped in foil and stored in the dark. In the UK species will be identified and enumerated.

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$\delta^{15}N$ and $\delta^{18}O$ of nitrate

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Objectives

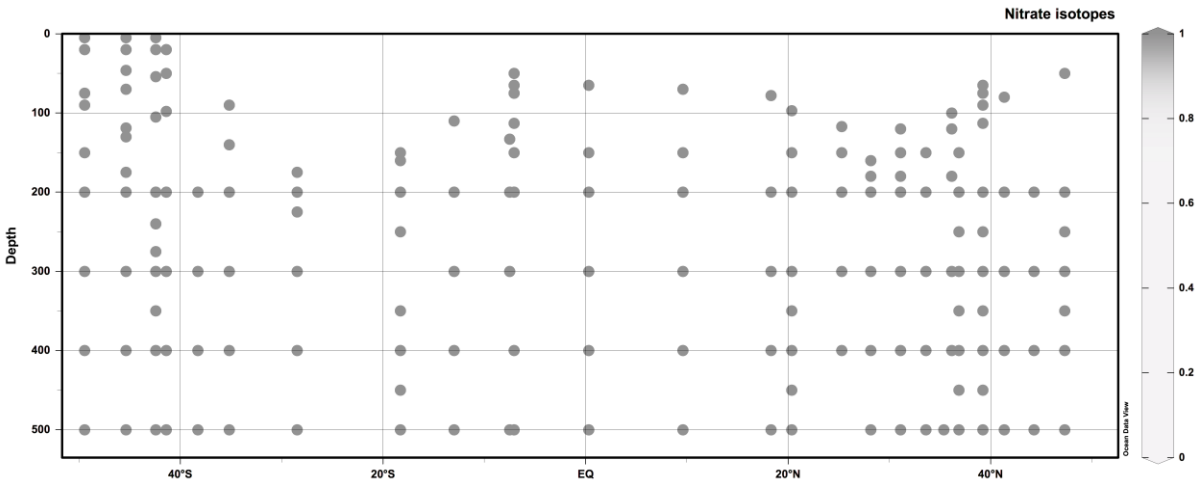
To determine the sources and recycling of nitrate within surface and intermediate water masses through the Atlantic basin.

This will be carried out by the characterisation of the nitrate isotope signatures ($\delta^{15}N_{NO3}$ and $\delta^{18}O_{NO3}$) of the Subantarctic Mode Waters in formation regions in the Subantarctic, and their subsequent subduction, transport and ventilation as a source of nutrients through the subtropical Atlantic thermocline. This information will be used to better understand the significance of nitrogen fixation and nutrient remineralisation stoichiometry through the north and south Atlantic gyres.

Sampling and Methodology

Samples were collected throughout the transect, typically once per every 3-4 CTDs, only at depths where adequate nitrate concentrations were identified for isotopic analysis. Samples were collected into 1 L Nalgene bottles (rinsed x3 with Milli Q). Seawater was subsequently filtered through a glass filtration rig using precombusted 47 mm GF/F (0.7 µm) filters, and collected into HCl clean 125 ml Nalgene bottles, which were double bagged, then frozen within one hour of collection. All samples will remain frozen at -20 °C prior to analysis at the University of Liverpool.

Figure 1. Sampling locations and depths throughout the AMT transect, from south (left) to north (right).



Isotopic analysis will be carried out using the Denitrifier Method (Sigman et al., 2001, Casciotti et al., 2002), by the conversion of nitrate to nitrous oxide using bacterial strain *P. aureofaciens* and analysis by isotope ratio mass spectrometry.

Table 1. CTD and niskin numbers of samples taken along the AMT transect.

Station	CTD	Latitude (°N)	Longitude (°E)	Date	Niskin bottle
2	3	47.31	-11.37	19/09/2015	1,2,3,4,5,6,12
5	6	44.27	-15.41	21/09/2015	1,3,5,7
8	9	41.31	-19.52	22/09/2015	1,3,5,7,9
10	11	39.20	-23.05	23/09/2015	1,2,3,4,5,6,7,8,9,11,12
13	14	36.84	-29.96	25/09/2015	1,2,3,4,5,6,7,8
16	16	36.14	-32.46	27/09/2015	1,2,3,4,5,7,8,9,11,12
17	17	35.37	-35.00	28/09/2015	1,2,3,4,5,6,7
19	19	33.60	-37.34	29/09/2015	1,2,3,4,5,6,7,8,9,10
21	21	31.09	-40.55	30/09/2015	1,2,3,4,5,6,7,8,9,10,11,12
23	23	28.15	-42.19	01/10/2015	1,2,3,4,5,6,7,8,9,10,11,12
26	26	25.27	-38.04	02/10/2015	1,2,3,4,5,6,7,10
30	30	20.35	-30.46	04/10/2015	1,2,3,4,5,6,7,8
32	32	18.29	-28.02	05/10/2015	1,2,3,4,6
38	38	9.60	-21.36	09/10/2015	1,2,3,4,5,11
43	43	0.29	-17.51	11/10/2015	1,2,3,4,5,11
47	47	-7.07	-14.46	14/10/2015	1,2,4,5,6,7,11,13
48	48	-7.51	-14.26	14/10/2015	1,2,4,5,6
52	57	-13.00	-19.28	20/10/2015	1,2,3,4,9
56	61	-18.30	-25.00	22/10/2015	1,2,3,4,6,7,12,13
62	66	-28.48	-25.28	25/10/2015	1,2,3,4,5,6
67	72	-35.20	-33.39	28/10/2015	1,2,3,4,5,6
69	74	-38.29	-37.45	29/10/2015	1,2,3,4
71	76	-41.41	-42.14	30/10/2015	1,2,3,4,6,11,17
72	77	-42.43	-43.42	30/10/2015	1,2,3,4,5,6,7,9,12,18,22
74	79	-45.39	-48.01	31/10/2015	1,2,3,4,5,6,7,11,16,18,21
75	80	-48.52	-53.06	02/11/2015	1,2,3,4,5,6,7,18,21

References

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Sigman, D. M., K. L. Casciotti, M. Andreani, C. Barford, M. Galanter, and J. K. Bohlke (2001), A bacterial method for the nitrogen isotopic analysis of nitrate in seawater and freshwater, Analytical Chemistry, 73(17), 4145-4153.

Natural Surfactant Enrichments in the Atlantic Ocean

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The sea surface microlayer (SML) covers more than 70% of the Earth's surface (Cunliffe et al., 2013) and is the boundary across which all gas exchange between the ocean and the atmosphere occurs (Liss and Duce, 2005). It is geochemically distinct from underlying water (Cunliffe et al., 2013) and importantly contains organic matter (OM) that is both soluble and insoluble; these components are surfactants that lower the water surface tension and they are ubiquitous in the marine environment (Frew et al., 1990; Goldman et al., 1988).

Surfactants that decrease air-sea gas exchange by suppressing the gas transfer velocity (k_w) show variable enrichments in the SML relative to the underlying water. This reflects variability in the rates of surfactant production and consumption.

Total surfactant activity (SA: equivalent to Triton-X-100, mgL^{-1}) was determined daily between the UK and the Falkland Islands, during cruise 25 of the Atlantic Meridional Transect programme (AMT 25). Samples were simultaneously obtained from the SML (Garrett screen), the ship's underway system (inlet at 7m) and in hydrocasts to 500m from a 24 x 20 L water-bottle rosette fitted with a CTD probe (Sea-Bird Electronics, SBE09). The samples were collected from different light penetration depths including 14, 55 and 97%, deep chlorophyll maximum depth (DCM) and O_2 Max depth. Also, the samples from 500m depth were collected as the blank. In order to minimise the disturbance to SML from the ship's discharge at the sample stations, the ship went to full attention (i.e. no discharge to the sea).

To investigate the long-term storage protocol for SA measurements, batches of the samples were also fixed with Formalin solution (Buffered-10%) and kept at 4˚C for later analysis. The samples will be analysed upon returning to Newcastle and assist in developing a standard operating procedure for storing samples for surfactant activity measurements.

Samples for coloured dissolved organic matter (CDOM) analyses were filtered through 0.22µm surfactant-free, single use syringe filters (MILLEX GP, Millipore). In order to avoid contamination during the filtration process, the syringes and containers were pre-rinsed with MilliQ water (18.2 Ohm) and a small aliquot of sample prior to usage.

Determination of surface active properties (SA) of organic matter (OM)

SA measurements were carried out by 797 VA Computerace Voltammetry (Metrohm) with a hanging mercury drop electrode as described by Schneider-Zapp et al., (2013). Briefly, SA measurements of samples are calibrated using a 10-point linear regression of electrode potential response against increasing Triton-X-100 concentration in a 0.55 mol l^{-1} NaCl solution. The SA of the samples was measured from the reduction of the capacity current over a range of potentials after 0, 15 and 60s accumulation of surfactants on the hanging mercury drop.

It has been noticed from the capacity current during the previous cruises (JCR302 & AMT24) that the ship movement is a potential problem for analyses. In order to minimize the vibration effect, the instrument was placed on a bespoke gimbal table. The data will be calibrated against the known concentration of T-X-100 and will be available later.

CDOM determination

CDOM measurements were conducted by high-performance spectrophotometer (UltraPath). Absorbance spectra (250-730 nm) of filtered samples were measured using a 200cm pathlength, providing greater sensitivity compared to conventional 10cm pathlength spectrophotometer.

The single scan mode was applied to record the CDOM spectrum. In order to minimize the refractive index effect due to the salinity difference between seawater samples and MilliQ water, NaCl solution standard with the salinity range of ±1of the samples were used. The solutions were prepared using analytical grade NaCl dissolved in MilliQ water. To remove any organic contaminants, the salt was baked at 400˚C in advance. The absorbance of the salt solution was measured at the same time as the samples. The integration time was set to maximize the signal measured for the applied pathlength while avoiding oversaturation of the detector (Max. Intensity of 80%). UltraPath was flushed with MilliQ. water between each sample. The data will be calibrated against the reference solutions and will be available later.

Table 1: Samples collected from CTD rosette bottles for surface active properties measurements of organic matter (surfactants) and dissolved organic matter (CDOM)

Date	Time(GMT)	Latitude	Longitude	Station No.	CTD No.
18.09.15	07:55	50° 2´N	4° 22.5´W	001	JR15001-S001
19.09.15	04:09	48° 24.5´N	9° 11.839´W	002	JR-15001-S002
19.09.15	13:00	47° 30.574´N	11° 3.747´W	003	JR-15001-S003
20.09.15	04:05	46° 16.584´N	12° 56.122´W	004	JR-15001-S004
21.09.15	04:00	44° 27.345´N	15° 41.338´W	005	JR-15001-S006
21.09.15	13:00	43° 42.716´N	16° 46.747´W	006	JR-15001-S007
22.09.15	04:00	42° 18.470´N	18° 48.368´W	007	JR-15001-S008
22.09.15	13:00	41° 31.498´N	19° 52.276´W	008	JR-15001-S009
23.09.15	04:00	40° 2.466´N	21° 55.032´W	009	JR-15001-S010
23.09.15	13:00	39° 12.193´N	23° 2.733´W	010	JR-15001-S011
24.09.15	04:00	33° 41.3256´N	25° 3.5274´W	011	JR-15001-S012
24.09.15	13:00	37° 30.451´N	26° 39.631´W	012	JR-15001-S013
25.09.15	04:00	36° 50.257´N	29° 57.331´W	013	JR-15001-S014
25.09.15	18:42	36° 14.802´N	32° 45.655´W	014	JR-15001-S015
27.09.15	06:00	36° 13.709´N	32° 46.313´W	016	JR-15001-S016
28.09.15	04:02	35° 36.678´N	34° 9.999´W	017	JR-15001-S017
28.09.15	13:04	35° 3.813´N	35° 26.601´W	018	JR-15001-S018
29.09.15	04:05	33° 59.929´N	37° 34.490´W	019	JR-15001-S019
29.09.15	12:58	33° 13.289´N	38° 55.296´W	020	JR-15001-S020
30.09.15	04:02	31° 9.058´N	40° 55.078´W	021	JR-15001-S021
01.10.15	Pre-down	28° 15.348´N	42° 18.575´W	023	JR-15001-S023
01.10.15	12:56	27° 28.478´N	41° 6.648´W	024	JR-15001-S024
02.10.15	04:02	25° 56.022´N	38° 49.624´W	025	JR-15001-S025
02.10.15	10:24	25° 27.193´N	38° 4.464´W	026	JR-15001-S026
03.10.15	Pre-down	23° 53.910´N	35° 45.339´W	027	JR-15001-S027
03.10.15	13:02	22° 59.199´N	34° 23.347´W	028	JR-15001-S028
05.10.15	04:02	19° 16.061´N	28° 59.699´W	031	JR-15001-S031
05.10.15	13:03	18° 28.840´N	28° 1.682´W	032	JR-15001-S032
06.10.15	03:59	17° 10.667´N	26° 27.348´W	033	JR-15001-S033
06.10.15	Noon	16° 25.975´N	25° 32.986´W	034	JR-15001-S034
07.10.15	03:57	15° 5.735´N	23° 56.810´W	035	JR-15001-S035
08.10.15	Pre-down	13° 22.756´N	22° 54.298´W	036	JR-15001-S036
08.10.15	12:58	12° 22.140´N	22° 31.941´W	037	JR-15001-S037
09.10.15	03:56	9° 59.717´N	21° 36.097´W	038	JR-15001-S038
10.10.15	03:58	5° 52.643´N	20° 1.625´W	040	JR-15001-S040
11.10.15	03:57	1° 55.977´N	18° 25.939´W	042	JR-15001-S042

12.10.15	Pre-down	1° 40.809´S	16° 58.619´W	044	JR-15001-S044
13.10.15	03:57	4° 25.425´S	15° 52.071´W	045	JR-15001-S045
14.10.15	04:00	7° 6.599´S	14° 45.571´W	047	JR-15001-S047
19.10.15	04:00	10° 6.813´S	16° 34.469´W	050	JR-15001-S055
20.10.15	04:57	13° 0.015´S	19° 28.331´W	052	JR-15001-S057
21.10.15	Pre-down	15° 41.461´S	22° 11.289´W	054	JR-15001-S059
Date	**Time(GMT)**	**Latitude**	**Longitude**	**Station No.**	**CTD No.**
22.10.15	04:55	18° 30.119´S	25° 0.115´W	056	JR-15001-S061
23.10.15	04:56	20° 32.503´S	25° 4.119´W	058	JR-15001-S062
24.10.15	04:57	24° 54.497´S	25° 4.416´W	060	JR-15001-S064
25.10.15	05:12	28° 47.808´S	25° 27.556´W	062	JR-15001-S066
27.10.15	05:07	32° 23.400´S	29° 51.195´W	065	JR-15001-S070
28.10.15	06:01	35° 20.034´S	33° 38.760´W	067	JR-15001-S072
29.10.15	Pre-down	38° 28.753´S	37° 45.128´W	069	JR-15001-S074
30.10.15	06:02	41° 40.674´S	42° 13.793´W	071	JR-15001-S076
31.10.15	06:00	44° 35.500´S	46° 21.284´W	073	JR-15001-S078
02.11.15	07:09	48° 52.349´S	53° 6.422´W	075	JR-15001-S080

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Filtration for High Performance Liquid Chromatography (HPLC) analysis

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Objectives

- To examine the horizontal and vertical phytoplankton pigment composition along the AMT25 transect (at the surface and at the subsurface chlorophyll maximum).
- The continuation of a 20-year spatially extensive and internally consistent time series of observations on the pigment structure of phytoplankton in the Atlantic Ocean.
- Collecting phytoplankton pigment data for using the development and validation of remote-sensing algorithms and marine ecosystem models designed to predict and model the phytoplankton biomass and community structure at basin scales.

Equipment

- 25 mm glass fibre filters (GF/F)
- 1 and 2 litre measuring cylinders
- Millipore forceps
- Cryovials
- Cryo-pen
- Filtration rig
- Gloves

Methods

Seawater samples were collected from the predawn and noon CTD casts and from the ship underway system. Seawater was sampled into 9.5 L polypropylene carboys covered in black plastic to keep out light. Using forceps, GF/F filters were placed on the filter rig with the smoother side facing down. Filter papers were fully covered over sintered glass circles such that there were no gaps and water could only pass through GF/F filters. Seawater samples were mixed to avoid issues with sedimentation. 1-4 L samples (depending on phytoplankton biomass, e.g. 1 litre in productive waters and 4 litres in the oligotrophic gyres) were measured using the rinsed measuring cylinders, and then decanted into rinsed polypropylene bottles with siphon tubes and inverted into a 4 port vacuum filtration rig. Samples were filtered using a low-medium vacuum setting on the vacuum pump. When the last of the water passed through the filter paper, taps on the vacuum pump were closed and the resulting sample filters were folded into 2 mL cryovials. Unfortunately, there was **no liquid nitrogen generator on the ship, and so the samples were not flash frozen in liquid nitrogen.** Instead the samples were stored immediately in the -80ºC freezer. For each station, 2 samples were taken at the surface (2-5m), and around the subsurface chlorophyll maximum (which varied between 25m-165m). Duplicate HPLC measurements were taken at both depths for every station (except on occasion when a CTD bottle misfired and there was not enough water to do a duplicate). Two daily samples were also taken using the ships underway system around the time of each station (to compare with surface CTD samples and for calibrating the ACS optics instrument), and a phytoplankton bloom at the start of the cruise (near station L4 in the Western Channel Observatory) was extensively sampled from the underway (9 underway samples). Frozen samples are to be analysed using HPLC methods (see Van Heukelem and Thomas, 2001) at Plymouth Marine Laboratory after the cruise. Table 1 below show the locations and stations of all the HPLC samples.

Table 1: Temporal and spatial locations of HPLC samples on AMT 25.

STATION	CTD	Standard Day of Year	TIME (GMT)	LAT (degrees)	LON (degrees)	SAMPLE DETPH (m)
0	1	261	07:55	50.03333	-4.375	2, 25
1	2	262	04:09	48.51015	-8.87814	2, 37
2	3	262	13:00	47.5129	-11.0625	2, 25
3	4	263	04:05	46.2764	-12.9354	2, 20
4	5	263	13:00	45.59267	-13.9913	2, 35
5	6	264	04:00	44.45575	-15.689	2, 35
6	7	264	13:00	43.71193	-16.7791	2, 70
7	8	265	04:00	42.30783	-18.8061	2, 70
8	9	265	13:00	41.52463	-19.8713	2, 50
9	10	266	04:00	40.0411	-21.9172	2, 70
10	11	266	13:00	39.20322	-23.0456	2, 65
11	12	267	04:00	37.68876	-25.0621	2, 80
12	13	267	13:00	37.50753	-26.6605	2, 55
13	14	268	04:00	36.83762	-29.9555	2, 90
14	15	268	18:42	36.24837	-32.7609	2, 100
15	16	270	06:00	36.22848	-32.7719	2, 80
17	17	271	04:02	35.6113	-34.1667	2, 100
18	18	271	13:04	35.06355	-35.4434	2, 110
19	19	272	04:05	33.99867	-37.5748	5, 120
20	20	272	12:58	33.22135	-38.9216	5, 102
21	21	273	04:02	31.15097	-40.918	2, 115
22	22	273	12:59	30.10053	-41.939	2, 140
23	23	274	04:03	28.2558	-40.3096	2, 136
24	24	274	12:56	27.47463	-41.1108	2, 135
25	25	275	04:02	25.9337	-38.8271	2, 135
26	26	275	10:54	25.45322	-38.0744	2, 117

27	27	276	04:10	23.8985	-35.7557	2, 120
28	28	276	13:02	22.98665	-34.3891	2, 105
29	29	277	04:01	21.46598	-32.0755	2, 98
30	30	277	13:00	20.58012	-30.7698	2, 97
31	31	278	04:02	19.26768	-28.995	2, 78
32	32	278	13:03	18.48067	-28.028	2, 72
33	33	279	03:59	17.17778	-26.4558	2, 65
34	34	279	12:58	16.43292	-25.5498	2, 60
35	35	280	03:57	15.09558	-23.9468	2, 42
36	36	281	04:10	13.37927	-22.905	2, 42
37	37	281	12:58	12.369	-22.5324	2, 47
38	38	282	03:56	9.995283	-21.6016	2, 70
39	39	282	13:01	8.56755	-21.0369	2, 38
40	40	283	03:58	5.877383	-20.0271	2, 64
41	41	283	13:00	4.403083	-19.4307	2, 58
42	42	284	03:57	1.93295	-18.4323	2, 85
43	43	284	12:57	0.490117	-17.8436	2, 65
44	44	285	04:30	-1.68007	-16.977	2, 60
45	45	286	03:57	-4.42375	-15.8679	2, 62
46	46	286	12:58	-5.3905	-15.455	2, 42
47	47	287	04:00	-7.10998	-14.7595	2, 65
48	48	287	12:02	-7.85793	-14.4413	2, 67
50	55	292	04:00	-10.1136	-16.5745	2, 95
51	56	292	13:10	-11.2348	-17.6947	2, 112
52	57	293	04:47	-13.0003	-19.4722	2, 124
53	58	293	13:58	-14.0205	-20.5	2, 125
54	59	294	04:57	-15.691	-22.1882	2, 156
55	60	294	13:58	-16.5713	-23.101	2, 150
56	61	295	04:55	-18.502	-25.0019	2, 160
58	62	296	04:56	-20.5417	-25.0687	2, 165

59	63	296	13:58	-22.158	-25.0866	2, 138
60	64	297	04:57	-24.9083	-25.0686	2, 158
61	65	297	13:56	-26.5025	-25.0376	2, 148
62	66	298	05:12	-28.7968	-25.4593	2, 135
63	67	298	14:15	-29.4057	-26.2118	2, 135
64	69	299	14:10	-30.9356	-28.0865	2, 120
65	70	300	05:07	-32.39	-29.8533	2, 110
66	71	300	14:00	-33.3325	-31.0739	2, 80
67	72	301	06:01	-35.3339	-33.646	2, 65
68	73	301	14:57	-36.3628	-34.9805	2, 50
69	74	302	05:58	-38.4792	-37.7521	2, 40
70	75	302	14:58	-39.8742	-39.6579	2, 50
71	76	303	06:02	-41.6779	-42.2299	2, 50
72	77	303	15:00	-42.7227	-43.6993	2, 50
73	78	304	06:00	-44.5917	-46.3547	2, 35
74	79	304	14:59	-45.6503	-48.0106	2, 55
75	80	306	07:09	-48.8725	-53.107	5, 60
76	81	306	16:11	-49.7765	-54.5092	5, 40
0	1	261	07:55	50.03333	-4.375	2, 25
1	2	262	04:09	48.51015	-8.87814	2, 37
2	3	262	13:00	47.5129	-11.0625	2, 25
3	4	263	04:05	46.2764	-12.9354	2, 20
4	5	263	13:00	45.59267	-13.9913	2, 35
5	6	264	04:00	44.45575	-15.689	2, 35
6	7	264	13:00	43.71193	-16.7791	2, 70
Underway	N/A	261	07:26	50.03333	-4.36667	5
Underway	N/A	261	10:08	49.943	-4.671	5
Underway	N/A	261	12:02	49.75	-5.143	5
Underway	N/A	261	12:32	49.715	-5.275	5
Underway	N/A	261	13:00	49.693	-5.415	5

Underway	N/A	261	13:30	49.644	-5.542	5
Underway	N/A	261	14:00	49.595	-5.677	5
Underway	N/A	261	14:32	49.55	-5.817	5
Underway	N/A	261	15:00	49.51	-5.94	5
Underway	N/A	262	03:45	48.51015	-8.87814	5
Underway	N/A	262	13:59	47.50953	-11.0623	5
Underway	N/A	263	03:50	46.27718	-12.9353	5
Underway	N/A	263	14:02	45.59333	-13.9912	5
Underway	N/A	264	03:51	44.458	-15.6801	5
Underway	N/A	264	14:32	43.67101	-16.8575	5
Underway	N/A	265	03:56	42.30781	-18.806	5
Underway	N/A	265	14:17	41.49153	-19.9341	5
Underway	N/A	266	04:02	40.04363	-21.9261	5
Underway	N/A	266	13:59	39.20717	-23.0456	5
Underway	N/A	267	03:52	37.68868	-25.0621	5
Underway	N/A	267	13:47	37.50585	-26.6565	5
Underway	N/A	268	03:54	36.83758	-29.9555	5
Underway	N/A	268	13:56	36.43116	-31.8421	5
Underway	N/A	268	20:46	36.247	-32.761	5
Underway	N/A	269	12:48	36.241	-32.741	5
Underway	N/A	270	07:48	36.229	-32.772	5
Underway	N/A	271	06:37	35.577	-34.288	5
Underway	N/A	271	13:47	35.064	-35.443	5
Underway	N/A	272	06:12	33.994	-37.625	5
Underway	N/A	272	13:50	33.221	-38.922	5
Underway	N/A	273	05:57	31.138	-40.929	5
Underway	N/A	273	13:44	30.101	-41.939	5
Underway	N/A	274	05:45	28.245	-42.289	5
Underway	N/A	274	13:52	27.475	-41.111	5
Underway	N/A	275	04:40	25.934	-38.827	5

Underway	N/A	275	14:08	25.453	-38.074	5
Underway	N/A	276	04:14	23.898	-35.756	5
Underway	N/A	276	14:03	22.987	-34.389	5
Underway	N/A	277	04:09	21.466	-32.076	5
Underway	N/A	277	13:53	22.58	-30.77	5
Underway	N/A	278	04:09	19.268	-28.995	5
Underway	N/A	278	13:50	18.481	-28.028	5
Underway	N/A	279	04:18	17.178	-26.456	5
Underway	N/A	279	13:43	16.433	-25.55	5
Underway	N/A	280	04:06	15.096	-23.947	5
Underway	N/A	281	04:14	13.379	-22.905	5
Underway	N/A	281	13:56	12.369	-22.532	5
Underway	N/A	282	04:13	9.995	-21.602	5
Underway	N/A	282	13:47	8.567	-21.037	5
Underway	N/A	283	04:11	5.877	-20.027	5
Underway	N/A	283	13:55	4.403	-19.431	5
Underway	N/A	284	04:16	1.933	-18.432	5
Underway	N/A	284	13:23	0.49	-17.844	5
Underway	N/A	285	04:14	-1.68	-16.977	5
Underway	N/A	285	12:53	-2.608	-16.603	5
Underway	N/A	286	04:16	-4.424	-15.868	5
Underway	N/A	286	13:48	-5.392	-15.455	5
Underway	N/A	287	04:15	-7.10998	-14.7595	5
Underway	N/A	287	12:58	-7.858	-14.442	5
Underway	N/A	292	04:19	-10.114	-16.574	5
Underway	N/A	292	13:50	-11.235	-17.695	5
Underway	N/A	293	05:20	-13	-19.472	5
Underway	N/A	293	14:51	-14.02	-20.5	5
Underway	N/A	294	05:19	-15.691	-22.188	5
Underway	N/A	294	14:46	-16.571	-23.101	5

Underway	N/A	295	05:16	-18.502	-25.002	5
Underway	N/A	296	05:18	-20.542	-25.069	5
Underway	N/A	296	14:46	-22.158	-25.087	5
Underway	N/A	297	05:18	-24.908	-25.074	5
Underway	N/A	297	14:45	-26.502	-25.037	5
Underway	N/A	298	06:06	-28.796	-25.461	5
Underway	N/A	298	15:05	-29.406	-26.212	5
Underway	N/A	299	14:58	-30.936	-28.087	5
Underway	N/A	300	05:15	-32.39	-29.853	5
Underway	N/A	300	14:50	-33.333	-31.074	5
Underway	N/A	301	06:19	-35.334	-33.981	5
Underway	N/A	301	15:45	-36.363	-34.981	5
Underway	N/A	302	06:33	-38.479	-37.752	5
Underway	N/A	302	15:52	-39.874	-39.659	5
Underway	N/A	303	06:18	-41.678	-42.23	5
Underway	N/A	303	15:57	-42.723	-43.699	5
Underway	N/A	304	06:21	-44.592	-46.355	5
Underway	N/A	304	15:50	-45.65	-48.011	5
Underway	N/A	305	14:44	-47.456	-50.869	5
Underway	N/A	306	06:19	-48.847	-53.033	5
Underway	N/A	306	17:03	-49.776	-54.509	5

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Extracted chlorophyll-a sampling for calibration of CTD and underway fluorometers

Arwen Bargery
British Oceanographic Data Centre

Samples of seawater from CTD niskin bottles and the ship's non-toxic supply were taken to calibrate the CTD and underway system fluorometers following Welschmeyer (1994). Samples of 250 ml were filtered through 47mm 0.2 um polycarbonate filters. The filters were then placed in a vial with 10 ml 90% acetone and left in a freezer for 24 hours. The samples were then analysed on a Turner Designs Trilogy fluorometer with a non-acidified chl module (CHL NA #046) fitted. Measurements were taken in units of RFU (Raw Fluorometry Units) as not all the equipment needed to carry out a calibration against known standards was available during the cruise. Fluorometer readings will be verified after the cruise when the fluorometer is returned to PML.

Underway samples
A total of 109 samples were collected from the underway supply. A list of date, time and position for the underway samples can be found in the appendices.

CTD samples
Samples were collected at 74 stations from up to 10 depths including light depths from 97%, 55%, 33%, mixed layer, 14%, 7%, 3%, above DCM, DCM, 1% & 0.1%.
A total of 709 samples were collected from the CTD casts. The depths and stations sampled are listed in Table 1.

See the CTD and SCS processing and calibrations section for details of the calibrations.

Data submission
The dataset will be submitted to BODC once the bench fluorometer has been calibrated using a known standard back at PML after the end of the cruise.

References:
Welschmeyer N.A., 1994. Fluorometric analysis of chlorophyll-a in the presence of chlorophyll-b and phaeopigments. *Limnology and Oceanography*, 39:1985-1992

Table 1: List of stations and depths sampled for extracted chlorophyll-a measurement

Date and Time (GMT)	Lat (+ve N)	Lon (+ve E)	CTD	Niskin Bottle	Depth (m)
2015-09-18T07:55:00	50.0333	-4.3653	JR15001_001	2, 3, 6, 8, 11, 15, 17, 19, 22	60, 50, 45, 40, 30, 20, 15, 10, 5
2015-09-19T04:09:00	48.4093	-9.1980	JR15001_002	3, 5, 7, 9, 11, 14, 15, 16, 22	100, 75, 50, 39, 37, 29, 22, 13, 2
2015-09-19T13:00:00	47.5095	-11.0623	JR15001_003	4, 7, 9, 10, 13, 14, 15, 18, 22	300, 199, 80, 61, 46, 34, 25, 20, 2
2015-09-20T04:05:00	46.2763	-12.9353	JR15001_004	4, 6, 8, 10, 12, 13, 14, 18, 23	300, 75, 50, 39, 29, 22, 20, 13, 2
2015-09-20T13:00:00	45.5933	-13.9912	JR15001_005	4, 7, 11, 13, 14, 15, 19, 22	300, 129, 66, 50, 37, 35, 21, 2
2015-09-21T04:00:00	44.4550	-15.6897	JR15001_006	5, 8, 10, 12, 13, 16, 18, 19, 22	300, 75, 50, 39, 35, 29, 14, 13, 2
2015-09-21T13:00:00	43.7120	-16.7792	JR15001_007	5, 8, 11, 12, 16, 17, 18, 19, 22	300, 113, 75, 70, 58, 44, 33, 19, 2
2015-09-22T04:00:00	42.3078	-18.8062	JR15001_008	5, 8, 10, 12, 15, 16, 18, 19, 22	300, 120, 80, 70, 61, 50, 35, 20, 2
2015-09-22T13:00:00	41.5247	-19.8713	JR15001_009	5, 8, 11, 12, 15, 16, 18, 19, 21	300, 90, 60, 50, 46, 35, 26, 15, 2
2015-09-23T04:00:00	40.0437	-21.9262	JR15001_010	5, 8, 10, 12, 15, 17, 18, 19, 22	300, 113, 75, 70, 58, 44, 33, 19, 2
2015-09-23T13:00:00	39.2032	-23.0455	JR15001_011	5, 8, 11, 12, 15, 16, 17, 18, 22	300, 113, 75, 65, 58, 45, 45, 25, 2
2015-09-24T04:00:00	37.6887	-25.0588	JR15001_012	5, 8, 10, 12, 15, 18, 19, 22, 9	300, 135, 90, 80, 70, 39, 22, 2, 100
2015-09-24T13:00:00	37.5058	-26.6565	JR15001_013	5, 7, 9, 11, 12, 16, 18, 19, 22	300, 115, 77, 59, 55, 45, 25, 19, 2
2015-09-25T04:00:00	36.8377	-29.9555	JR15001_014	5, 8, 10, 12, 15, 16, 18, 19, 22	300, 150, 100, 90, 80, 77, 30, 25, 2

2015-09-25T18:30:00	36.2467	-32.7610	JR15001_015	19, 19, 20, 20, 23, 23, 24, 24	200, 200, 100, 100, 50, 50, 2, 2
2015-09-27T06:00:00	36.2285	-32.7718	JR15001_016	8, 9, 11, 13, 14, 17, 18, 19, 20, 23	300, 180, 120, 92, 80, 70, 52, 29, 16, 2
2015-09-28T04:02:00	35.6113	-34.1667	JR15001_017	9, 11, 12, 15, 17, 18, 19, 20, 21, 22	300, 150, 130, 100, 77, 58, 43, 25, 13, 5
2015-09-28T13:04:00	35.0635	-35.4433	JR15001_018	5, 7, 8, 9, 10, 16, 17, 18, 19, 22	300, 200, 150, 130, 110, 80, 60, 45, 25, 5
2015-09-29T04:05:00	33.9988	-37.5750	JR15001_019	8, 10, 11, 12, 15, 17, 18, 19, 20, 22	300, 150, 135, 120, 90, 70, 50, 30, 20, 5
2015-09-29T12:58:00	33.2215	-38.9217	JR15001_020	7, 8, 12, 14, 16, 17, 18, 19, 20, 22	200, 165, 110, 102, 90, 84, 64, 47, 27, 5
2015-09-30T04:02:00	31.1510	-40.9180	JR15001_021	8, 10, 11, 12, 14, 17, 18, 19, 20, 23	300, 180, 150, 120, 115, 110, 90, 70, 30, 2
2015-09-30T12:59:00	30.1005	-41.9392	JR15001_022	8, 10, 15, 16, 17, 19, 20, 22	180, 140, 105, 90, 70, 36, 29, 2
2015-10-01T04:03:00	28.2558	-42.3097	JR15001_023	9, 11, 12, 13, 16, 18, 19, 20, 22	300, 180, 160, 136, 120, 90, 70, 30, 2
2015-10-01T12:56:00	27.4747	-41.1108	JR15001_024	5, 8, 10, 14, 15, 16, 18, 19, 22	300, 190, 135, 125, 97, 74, 30, 25, 2
2015-10-02T04:02:00	25.9343	-38.8270	JR15001_025	5, 8, 10, 13, 15, 16, 17, 18, 19, 22	300, 180, 135, 120, 100, 90, 70, 40, 30, 2
2015-10-02T10:24:00	25.4532	-38.0743	JR15001_026	5, 7, 8, 11, 13, 15, 16, 17, 20, 22	300, 150, 117, 100, 77, 48, 43, 25, 13, 2
2015-10-03T04:10:00	23.8985	-35.7555	JR15001_027	3, 6, 7, 10, 13, 15, 16, 20, 22	300, 165, 120, 110, 85, 60, 47, 15, 2
2015-10-03T13:02:00	22.9867	-34.3892	JR15001_028	3, 5, 7, 10, 12, 15, 16, 20, 22	300, 150, 105, 100, 80, 58, 43, 13, 2
2015-10-04T04:01:00	21.4660	-32.0755	JR15001_029	3, 6, 7, 10, 13, 15, 16, 18, 22	300, 135, 98, 90, , 50, 40, 20, 2
2015-10-04T13:00:00	20.5802	-30.7697	JR15001_030	5, 7, 8, 11, 14, 16, 18, 20, 22	300, 150, 97, 90, 65, 40, 20, 13, 2
2015-10-05T04:02:00	19.2677	-28.9950	JR15001_031	5, 7, 8, 11, 13, 15, 18, 20, 23	300, 105, 78, 70, 60, 41, 17, 10, 2
2015-10-05T13:03:00	18.4807	-28.0280	JR15001_032	3, 5, 6, 8, 11, 13, 14, 16, 19, 21	300, 116, 78, 72, 62, 45, 33, 19, 11, 2
2015-10-06T03:59:00	17.1778	-26.4558	JR15001_033	3, 6, 7, 9, 12, 14, 15, 17, 20, 22	300, 105, 70, 65, 55, 40, 30, 17, 10, 2
2015-10-06T12:58:00	16.4328	-25.5498	JR15001_034	3, 6, 7, 10, 12, 14, 15, 17, 20, 22	300, 85, 60, 55, 45, 33, 24, 14, 8, 2
2015-10-07T03:57:00	15.0955	-23.9468	JR15001_035	4, 6, 7, 9, 10, 13, 15, 20, 22	300, 90, 60, 46, 42, 35, 25, 8, 2
2015-10-08T04:10:00	13.3793	-22.9050	JR15001_036	3, 7, 8, 10, 13, 14, 15, 20, 22	300, 75, 59, 47, 39, 29, 23, 7, 2
2015-10-08T12:58:00	12.3690	-22.5323	JR15001_037	3, 5, 7, 9, 13, 15, 16, 18, 22	300, 90, 60, 50, 35, 26, 22, 15, 2
2015-10-09T03:56:00	9.9953	-21.6017	JR15001_038	3, 6, 7, 9, 15, 16, 18, 22	300, 120, 80, 70, 45, 35, 20, 2
2015-10-09T13:01:00	8.5675	-21.0370	JR15001_039	3, 6, 7, 9, 10, 13, 15, 18, 20, 22	300, 85, 57, 44, 38, 33, 25, 14, 8, 2
2015-10-10T03:58:00	5.8773	-20.0270	JR15001_040	3, 6, 7, 9, 12, 14, 16, 17, 20, 22	300, 113, 75, 64, 68, 44, 33, 20, 10, 2
2015-10-10T13:00:00	4.4032	-19.4308	JR15001_041	3, 6, 7, 9, 10, 13, 14, 17, 20, 22	300, 119, 80, 61, 58, 50, 46, 20, 11, 2
2015-10-11T03:57:00	1.9330	-18.4323	JR15001_042	3, 6, 7, 10, 13, 15, 16, 17, 22	300, 115, 85, 75, 60, 44, 33, 20, 2
2015-10-11T12:57:00	0.4902	-17.8435	JR15001_043	3, 6, 7, 9, 13, 15, 16, 18, 22	300, 113, 75, 65, 60, 44, 33, 20, 2
2015-10-12T04:29:00	-1.6802	-16.9770	JR15001_044	3, 6, 7, 9, 12, 14, 15, 20, 22	300, 98, 65, 60, 50, 38, 28, 9, 2
2015-10-13T03:57:00	-4.4237	-15.8678	JR15001_045	3, 6, 7, 8, 11, 13, 14, 15, 20, 22	300, 90, 65, 62, 60, 46, 35, 26, 8, 2
2015-10-13T12:58:00	-5.3923	-15.455	JR15001_046	3, 6, 7, 9, 11, 14, 18, 20, 22	300, 110, 74, 56, 42, 35, 20, 10, 2
2015-10-14T04:00:00	-7.1098	-14.7596	JR15001_047	4, 6, 7, 9, 12, 14, 15, 16, 22, 19	200, 113, 75, 65, 58, 44, 40, 33, 2, 10
2015-10-14T12:02:00	-7.858	-14.4415	JR15001_048	4, 6, 8, 10, 13, 15, 18, 20, 22	300, 133, 90, 67, 60, 38, 20, 12, 2
2015-10-19T04:00:00	-10.1135	-16.5745	JR15001_055	4, 6, 7, 10, 11, 13, 15, 18, 22	200, 113, 95, 78, 75, 58, 44, 20, 2
2015-10-19T13:10:00	-11.2348	-17.6946	JR15001_056	3, 6, 7, 10, 12, 13, 16, 18, 22	300, 150, 112, 100, 85, 77, 43, 20, 2
2015-10-20T04:57:00	-13.0001	-19.4721	JR15001_057	3, 5, 7, 10, 13, 15, 16, 20, 22	300, 175, 124, 110, 88, 64, 47, 15, 2
2015-10-20T13:58:00	-14.0205	-20.5	JR15001_058	3, 5, 7, 11, 13, 14, 15, 16, 17, 22	300, 165, 125, 110, 100, 84, 64, 47, 27, 2
2015-10-21T04:57:00	-15.691	-22.1881	JR15001_059	3, 5, 7, 11, 13, 15, 16, 17, 22	300, 180, 156, 120, 100, 70, 52, 29, 2
2015-10-21T13:58:00	-16.5713	-23.101	JR15001_060	3, 4, 7, 11, 13, 14, 16, 17, 20, 23	300, 240, 160, 150, 122, 100, 69, 39, 20, 2
2015-10-22T04:55:00	-18.502	-25.0018	JR15001_061	6, 8, 10, 14, 15, 16, 17, 19, 20, 23	250, 170, 160, 130, 100, 73, 41, 23, 20, 2
2015-10-23T04:56:00	-20.5416	-25.0686	JR15001_062	3, 4, 7, 9, 13, 14, 15, 16, 19, 21	300, 255, 170, 165, 130, 100, 75, 50, 20, 2
2015-10-23T13:58:00	-22.158	-25.0866	JR15001_063	3, 6, 9, 12, 14, 16, 17, 19, 20, 22	300, 175, 138, 135, 105, 75, 43, 25, 20, 2
2015-10-24T04:57:00	-24.9083	-25.0735	JR15001_064	3, 4, 7, 9, 13, 14, 16, 17, 19, 22	300, 250, 170, 158, 130, 100, 60, 41, 23, 2
2015-10-24T13:56:00	-26.5025	-25.0371	JR15001_065	4, 7, 9, 13, 14, 15, 16, 17, 18, 22	240, 160, 148, 122, 93, 69, 54, 39, 20, 2

2015-10-25T05:12:00	-28.7968	-25.4593	JR15001_066	3, 4, 7, 9, 15, 16, 17, 18, 20, 22	300, 225, 150, 135, 105, 87, 65, 37, 20, 5
2015-10-25T14:15:00	-29.4056	-26.2118	JR15001_067	3, 4, 7, 9, 13, 14, 16, 18, 20, 22	300, 225, 150, 135, 120, 115, 87, 37, 20, 2
2015-10-26T14:10:00	-30.9355	-28.0865	JR15001_069	3, 6, 10, 12, 14, 15, 16, 17, 20, 22	300, 175, 120, 110, 80, 67, 50, 28, 15, 5
2015-10-27T05:07:00	-32.39	-29.8531	JR15001_070	3, 5, 7, 9, 12, 14, 15, 16, 20, 22	300, 173, 115, 110, 100, 88, 67, 50, 15, 5
2015-10-27T14:00:00	-33.3325	-31.0738	JR15001_071	3, 5, 7, 9, 12, 14, 16, 18, 20, 22	300, 137, 92, 80, 70, 53, 39, 20, 12, 3
2015-10-28T06:01:00	-35.3338	-33.646	JR15001_072	3, 6, 8, 11, 13, 14, 16, 18, 20, 22	300, 90, 65, 60, 46, 35, 26, 15, 8, 2
2015-10-28T14:57:00	-36.363	-34.9805	JR15001_073	3, 7, 9, 11, 12, 15, 17, 18, 20, 22	300, 115, 77, 59, 50, 45, 33, 20, 10, 2
2015-10-29T05:58:00	-38.4791	-37.7521	JR15001_074	3, 5, 8, 10, 13, 16, 17, 20, 22	300, 140, 90, 70, 40, 30, 20, 10, 2
2015-10-29T14:58:00	-39.8741	-39.6578	JR15001_075	4, 6, 9, 10, 11, 15, 16, 17, 20, 22	300, 156, 79, 60, 50, 40, 30, 25, 14, 2
2015-10-30T06:02:00	-41.6778	-42.2298	JR15001_076	3, 6, 9, 11, 14, 15, 16, 18, 20, 22	300, 98, 65, 50, 45, 38, 28, 16, 9, 2
2015-10-30T13:00:00	-42.7226	-43.6993	JR15001_077	4, 9, 10, 12, 13, 16, 17, 19, 21, 22	300, 105, 70, 54, 50, 41, 30, 15, 10, 5
2015-10-31T06:01:00	-44.5916	-46.3546	JR15001_078	3, 6, 9, 11, 12, 13, 16, 18, 20, 22	300, 105, 70, 54, 40, 35, 30, 15, 10, 2
2015-10-31T14:59:00	-45.6503	-48.0105	JR15001_079	3, 7, 8, 9, 12, 13, 16, 18, 20, 22	300, 119, 100, 79, 61, 55, 46, 20, 11, 2
2015-11-02T 07:09:00	-48.8725	-53.107	JR15001_080	3, 7, 10, 12, 15, 16, 17, 19, 21, 22	300, 105, 70, 60, 55, 40, 30, 15, 10, 5
2015-11-02T 16:11:00	-49.7765	-54.5091	JR15001_081	3, 6, 8, 10, 11, 12, 15, 17, 19, 22	300, 90, 60, 50, 46, 40, 35, 26, 15, 5

Abundance and Composition of Microbial Plankton Communities by flow cytometry

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Objective

To determine the distribution, abundance and community structure of nano- and picophytoplankton, heterotrophic bacteria and heterotrophic nano- and picoplankton from CTD casts by flow cytometry.

Phytoplankton community structure and abundance by flow cytometry.

Fresh seawater samples from 200 m to the surface were collected in clean 250 mL polycarbonate bottles from a Seabird CTD system containing a 24 bottle rosette of 20 L Niskin bottles from predawn and solar noon CTD casts. Samples were stored in a refrigerator and analysed within 3 hours of collection. Fresh samples were measured using a Becton Dickinson FACSort flow cytometer which characterised and enumerated *Prochlorococcus* sp. and *Synechococcus* sp. (cyanobacteria) and pico- and eucaryote phytoplankton, based on their light scattering and autofluorescence properties. Data were saved in listmode format and analysed onboard. Table 1 summarises the CTD casts sampled and analysed during the cruise.

Bacteria and heterotrophic flagellate community structure and abundance by flow cytometry.
Samples for bacteria and heterotrophic flagellate enumeration were collected from 300 m to the surface of predawn and solar noon CTD casts in clean 50 mL centrifuge tubes and fixed with paraformaldehyde within half an hour of surfacing. Samples (see below) were stained with the DNA stain SYBR Green I (Sigma) in order to separate particles in suspension based on DNA content and light scattering properties. Samples were generally analysed flow cytometrically within 4 hours of surfacing. Each stained sample was run twice through a Becton Dickinson FACSCalibur flow cytometer: once to analyse sub-micron sized particles and once to analyse particles greater than 1 µm in diameter. Data were saved in listmode format and will be analysed ashore.

***Table 1*: CTD casts sampled for phytoplankton, heterotrophic bacteria and heterotrophic flagellate community structure & abundance. Note: heterotrophic organisms sampled to 300m**

DATE	STATION	CTD	TIME on deck (GMT)	LAT +N, -S	LONG E	DEPTHS SAMPLED/*NISKIN BOTTLES (italics)*
19-Sep	1	2	04:40	48.41	-9.20	2 5 13 22 29 37 39 50 75 80 100 140 *22 18 16 15 14 11 9 7 5 4 3 1*
19-Sep	2	3	13:55	47.51	-11.06	2 5 20 25 34 46 61 80 200 *22 21 18 15 14 13 10 9 6*
20-Sep	3	4	04:42	46.28	-12.94	2 5 13 20 22 29 39 50 75 200 *22 21 18 14 13 12 10 8 6 5*
20-Sep	4	5	13:53	45.59	-13.99	2 5 21 35 37 50 66 86 129 200 *22 21 19 15 14 13 11 9 7 5*

21-Sep	5	6	04:52	44.46	-15.69	2 5 13 14 29 35 39 50 75 200 *22 21 19 18 16 13 12 10 8 7*
21-Sep	6	7	13:43	43.71	-16.78	2 5 19 33 44 58 70 75 113 200 *22 21 19 18 17 16 12 11 8 6*
22-Sep	7	8	04:40	42.31	-18.81	2 5 20 35 50 61 70 80 120 200 *22 21 19 18 16 15 12 10 8 7*
22-Sep	8	9	13:40	41.52	-19.87	2 5 15 26 35 46 50 60 90 200 *22 21 19 18 16 15 12 11 8 7*
23-Sep	9	10	04:50	40.04	-21.92	2 5 19 33 44 58 70 75 113 200 *22 21 19 18 17 15 12 10 8 7*
23-Sep	10	11	13:39	39.20	-23.05	2 5 25 45 58 65 75 113 200 *22 21 18 17 15 12 11 8 7*
24-Sep	11	12	04:39	37.69	-25.06	2 5 22 39 52 70 80 90 135 200 *22 21 19 18 17 15 12 10 8 7*
24-Sep	12	13	13:45	37.51	-26.66	2 5 10 19 25 40 45 50 55 59 75 77 115 200 *22 21 20 19 18 17 16 15 12 11 10 9 7 6*
25-Sep	13	14	04:45	36.84	-29.96	2 5 13 25 30 77 80 90 100 120 150 200 *22 21 20 19 18 16 15 12 10 9 8 7*
25-Sep	14	15	20:38	36.25	-32.76	2 50 100 200 *24 23 20 19*
27-Sep	16	16	07:43	36.23	-32.77	2 5 16 29 52 70 75 80 92 100 120 180 *22 21 20 19 18 17 16 14 13 12 12 10 9*
28-Sep	17	17	05:39	35.61	-34.17	5 13 25 58 77 100 130 150 200 *22 21 20 18 17 15 12 11 10*
28-Sep	18	18	13:49	35.06	-35.44	5 15 25 45 60 80 90 100 110 130 150 200 *22 20 19 18 17 16 15 14 10 9 8 7*
29-Sep	19	19	05:35	34.00	-37.57	5 10 20 30 50 70 90 120 135 150 200 *22 21 20 19 18 17 15 12 11 10 9*
29-Sep	20	20	13:42	33.22	-38.92	5 15 27 47 64 84 90 102 110 120 140 165 200 *22 21 20 19 18 17 16 13 12 10 9 8 7*
30-Sep	21	21	05:37	31.15	-40.92	2 15 30 70 90 110 115 120 150 180 200 *23 21 20 19 18 17 14 12 11 10 9*
30-Sep	22	22	13:42	30.10	-41.94	2 16 29 35 52 70 90 105 120 140 160 180 200 *22 21 20 19 18 17 16 15 13 10 9 8 7*
01-Oct	23	23	05:28	28.26	-42.31	2 20 30 70 90 120 136 160 180 200 *22 21 20 19 18 16 13 12 11 10*
01-Oct	24	24	13:42	27.47	-41.11	2 10 17 25 30 55 74 97 125 135 170 190 200 *22 21 20 19 18 17 16 15 14 10 9 8 7*
02-Oct	25	25	04:39	25.93	-38.83	2 5 15 30 40 70 90 100 120 135 150 180 200 *22 21 20 19 18 17 16 15 13 10 9 8 7*
02-Oct	26	26	14:14	25.45	-38.07	2 5 13 20 25 43 48 58 77 100 117 150 200 *22 21 20 18 17 16 15 14 13 11 8 7 6*
03-Oct	27	27	04:48	23.90	-35.76	2 5 15 20 47 60 65 85 100 110 120 165 180 200 *22 21 19 18 17 16 15 14 13 12 10 7 6 5 4*

03-Oct	28	28	13:53	22.99	-34.39	2 5 13 20 25 43 58 75 77 80 100 105 125 150 200 *22 21 19 18 17 16 15 14 13 12 10 7 6 5 4*
04-Oct	29	29	04:42	21.47	-32.08	2 5 10 20 40 50 63 70 80 90 98 200 *22 21 20 18 16 15 14 13 12 11 7 4*
04-Oct	30	30	13:52	20.58	-30.77	2 5 13 20 40 55 65 75 90 97 150 200 *22 21 20 18 16 15 14 13 11 8 7 6*
05-Oct	31	31	04:43	19.27	-28.99	2 5 10 17 20 30 41 54 60 70 78 105 200 *22 21 20 18 17 16 15 14 13 11 8 7 6*
05-Oct	32	32	13:50	18.48	-28.03	2 5 11 19 20 33 45 59 62 72 78 116 200 *21 20 19 16 15 14 13 12 11 8 6 5 4*
06-Oct	33	33	04:37	17.18	-26.46	2 5 10 17 20 30 40 50 55 65 70 150 200 *22 21 20 17 16 15 14 13 12 9 7 5 4*
06-Oct	34	34	13:47	16.43	-25.55	2 5 8 14 20 24 33 45 55 60 85 150 200 *22 21 20 17 16 15 14 12 10 7 6 5 4*
07-Oct	35	35	04:36	15.10	-23.95	2 5 8 15 20 25 35 42 46 60 90 200 *22 21 20 17 16 14 13 10 9 7 6 5*
08-Oct	36	36	04:47	13.38	-22.90	2 5 7 13 20 23 29 39 47 59 75 100 150 200 *22 21 20 18 17 15 14 13 10 8 7 6 5 4*
08-Oct	37	37	13:49	12.37	-22.53	2 5 8 15 20 22 26 30 35 46 50 60 70 90 200 *22 21 20 18 17 16 15 14 13 12 9 7 6 5 4*
09-Oct	38	38	04:36	10.00	-21.60	2 5 11 20 35 45 47 50 61 70 80 120 150 200 *22 21 20 17 16 15 14 13 12 9 7 6 5 4*
09-Oct	39	39	13:52	8.57	-21.04	2 5 8 14 20 25 30 38 44 57 85 100 *22 21 20 18 17 15 14 10 9 7 6 5*
10-Oct	40	40	04:37	5.88	-20.03	2 5 10 20 33 44 50 58 64 75 150 200 *22 21 20 17 16 14 13 12 9 7 5 4*
10-Oct	41	41	13:51	4.40	-19.43	2 5 11 20 30 34 46 50 58 61 80 119 150 200 *22 21 20 17 16 15 14 13 10 9 7 6 5 4*
11-Oct	42	42	04:38	1.93	-18.43	2 5 10 20 33 44 58 60 65 75 85 115 150 200 *22 21 20 17 16 15 14 13 12 10 7 6 5 4*
11-Oct	43	43	13:47	0.49	-17.84	2 5 20 33 44 50 60 65 75 113 150 200 *22 21 18 17 16 15 14 13 9 7 6 5 4*
12-Oct	44	44	05:10	-1.68	-16.98	2 5 9 16 20 28 38 45 50 60 65 98 125 200 *22 21 20 17 16 15 14 13 12 9 7 6 5 4*
13-Oct	45	45	04:39	-4.42	-15.87	2 5 8 15 20 26 35 46 60 62 65 90 130 200 *22 21 20 18 16 15 14 13 11 8 7 6 5 4*
13-Oct	46	46	13:51	-5.39	-15.45	2 5 10 20 30 32 35 42 50 56 74 110 150 200 *22 21 20 17 16 15 14 11 10 9 7 6 5 4*
14-Oct	47	47	04:39	-7.11	-14.76	2 5 10 20 33 40 44 50 58 65 75 113 150 200 *22 21 19 18 16 15 14 13 12 9 7 6 5 4*
14-Oct	48	48	13:19	-7.86	-14.44	2 5 12 20 30 38 51 60 67 90 113 200 *22 21 20 18 16 15 14 13 10 8 6 5*
19-Oct	50	55	04:42	-10.11	-16.57	2 5 10 20 33 44 50 58 75 78 95 113 150 200 *22 21 20 17 16 15 15 14 13 11 10 7 6 5 4*

19-Oct	51	56	14:05	-11.23	-17.69	2 5 13 20 43 58 75 77 85 100 112 150 200 *22 21 20 18 16 15 14 13 12 10 7 6 4*
20-Oct	52	57	05:41	-13.00	-19.47	2 15 20 47 64 84 88 100 110 124 175 200 *22 20 18 16 15 14 13 12 10 7 5 4*
20-Oct	53	58	14:51	-14.02	-20.50	2 5 15 20 27 47 64 84 100 110 117 125 150 165 200 *22 21 20 18 17 16 15 14 13 11 10 7 6 5 4*
21-Oct	54	59	05:37	-15.69	-22.19	2 5 16 20 29 52 70 92 100 120 140 156 175 180 200 *22 21 20 18 17 16 15 14 13 11 10 7 6 5 4*
21-Oct	55	60	14:47	-16.57	-23.10	2 5 20 39 69 93 100 122 125 150 160 175 200 *23 21 20 17 16 15 14 13 12 11 7 6 5*
22-Oct	56	61	05:38	-18.50	-25.00	2 5 20 23 41 73 100 130 150 160 170 200 *23 21 20 19 17 16 15 14 13 10 8 7*
23-Oct	58	62	05:36	-20.54	-25.07	2 5 20 40 50 75 100 130 150 165 170 180 200 *21 20 19 17 16 15 14 13 12 9 7 6 5*
23-Oct	59	63	14:51	-22.16	-25.09	2 5 20 25 43 75 100 105 130 135 138 170 175 200 *22 21 20 19 17 16 15 14 13 12 9 8 6 5*
24-Oct	60	64	05:39	-24.91	-25.07	2 5 20 23 41 60 73 100 130 150 158 170 180 200 *22 21 20 19 17 16 15 14 13 12 9 7 6 5*
24-Oct	61	65	14:49	-26.50	-25.04	2 5 20 39 54 69 93 122 135 148 160 175 200 *22 20 18 17 16 15 14 13 12 9 7 6 5*
25-Oct	62	66	05:54	-28.80	-25.46	5 10 20 37 65 87 105 110 115 120 135 150 175 200 *22 21 19 18 17 16 15 14 13 12 9 7 6 5*
25-Oct	63	67	14:57	-29.41	-26.21	5 10 20 37 65 87 110 115 120 125 135 150 175 200 *22 21 20 18 17 16 15 14 13 12 9 7 6 5*
26-Oct	64	69	14:58	-30.94	-28.09	5 10 15 20 28 50 67 80 110 120 135 150 175 200 *22 21 20 18 17 16 15 14 12 10 9 7 6 5*
27-Oct	65	70	05:46	-32.39	-29.85	5 10 15 20 28 50 67 88 90 100 110 115 120 173 200 *22 21 20 18 17 16 15 14 13 12 9 7 6 5 4*
27-Oct	66	71	14:43	-33.33	-31.07	3 5 12 20 39 50 53 65 70 80 92 100 137 200 *22 21 20 18 16 15 14 13 12 9 7 6 5 4*
28-Oct	67	72	06:40	-35.33	-33.65	2 5 8 15 20 26 30 35 46 60 65 80 90 140 200 *22 21 20 18 17 16 15 14 13 11 8 7 6 5 4*
28-Oct	68	73	15:44	-36.36	-34.98	2 5 10 33 40 45 50 59 77 90 115 150 170 200 *22 21 20 17 16 15 12 11 9 8 7 6 5 4*
29-Oct	69	74	06:36	-38.48	-37.75	2 5 10 20 30 40 60 70 75 90 105 120 140 200 *22 21 20 17 16 13 12 10 9 8 7 6 5 4*
29-Oct	70	75	15:44	-39.87	-39.66	2 5 14 20 2530 40 45 50 60 79 104 156 200 *22 21 20 18 17 16 15 14 11 10 9 7 6 5*
30-Oct	71	76	06:41	-41.68	-42.23	2 5 9 16 20 28 38 45 50 65 75 85 98 120 200 *22 21 20 18 17 16 15 14 11 9 8 7 6 5 4*

30-Oct	72	77	15:49	-42.72	-43.70	5 10 15 20 30 41 50 54 70 105 120 200 *22 21 19 18 17 16 13 12 10 9 8 7*
31-Oct	73	78	06:39	-44.59	-46.35	2 5 10 15 30 35 40 54 70 75 85 105 200 *22 21 20 18 16 13 12 11 9 8 7 6 5*
31-Oct	74	79	15:47	-45.65	-48.01	2 5 11 20 46 55 61 70 79 100 119 130 175 200 *22 21 20 18 16 13 12 11 9 8 7 6 5 4*
02-Nov	75	80	07:46	-48.87	-53.11	5 10 15 20 30 40 55 60 70 80 90 105 120 140 200 *22 21 19 18 17 16 15 12 10 9 8 7 6 5 4*
02-Nov	76	81	16:57	-49.78	-54.51	5 10 15 20 26 35 40 46 50 60 75 90 150 200 *22 21 19 18 17 15 12 11 10 8 7 6 5 4*

Circadian cycle of picoplankton optical properties, community structure and abundance in the South Atlantic Gyre, under different light levels and nutrient concentrations

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Objective
To evaluate the effects of light and nutrient availability on the picoplankton community structure, abundance, and the metabolism (growth rate) of microbes (heterotrophic bacteria and cyanobacteria) in the South Atlantic subtropical gyre.

Relevance
This experiment will allow us to understand how changes in nutrient concentrations, and the seasonal variability of light in the mixed layer, influence to the dynamics of the picoplanktonic community structure, and may help explaining seasonal changes in the standing stocks of these important microbial populations, which are dominant in oligotrophic areas such as the South Atlantic Gyre.

Experiment design

Water samples were taken from the mixed layer (depth = 30 meters), using a Go Flo (OceanTest Equipment, Inc.), provided by National Marine Facilities (NMF). The Go Flo and associated parts were acid cleaned in 10% hydrochloric acid prior to use. Deployment of the Go Flo was conducted on the fore deck of the RRS James Clark, in conjunction with the solar noon CTD cast. Experiments were conducted at two stations in the South Atlantic Gyre. Details of the sampling sites where the experiment was set are shown in Table 1.

Table 1: Time and location of Go Flo deployments, all to a depth of 30m.

Go Flo ID	JCR Event Log*	Date and Time	Latitude	Longitude
20	GOF_JR15001_020	23/10/15 14:04	-22.15803	-25.08664
22	GOF_JR15001_022	27/10/15 14:15	-33.33253	-31.07391

**Please note that the JCR event log notes the deployment of two Go Flos on the 19th Sept and thus each Go Flo ID does not always match the event log. Go Flo ID will be used for data analysis.*

Seawater was incubated in 60mL polycarbonate bottles, pre-washed with HCl (10%) and rinsed with the same seawater. Photosynthetrons illuminated by 50 W, 12 V tungsten halogen lamps were used to incubate the seawater in different light levels. The temperature in the photosynthetrons was kept

stable by a constant flow of sea surface water provided by the ship's underway system. The temperature in the incubations was measured every three hours to assure it is similar to the *in situ* temperature at the moment the seawater was taken from the ocean.

Two sets of incubations were prepared in each experiment, with nutrients added to one of the sets, as detailed in Table 2.

Table 2: Final concentrations of added inorganic nutrients in seawater samples.

			Final concentration of added nutrient (µM)	
Experiment ID	**Location (latitude N)**	**Experiment set**	**Ammonium chloride (NH_4Cl)**	**Iron(III) chloride ($FeCl_3$)**
#1	-22.15803	control	0	0
		nutrients	1	0.002
#2	-33.33253	control	0	0
		nutrients	1	0

In each experiment, seawater was incubated under nine light levels, as described in Table 3. Picoplankton populations were quantified by flow cytometry at all incubations, and the methionine uptake rate by prokaryotic cells was determined the five light levels indicated in Table 3.

Table 3: Light levels (µE m^{-2} s^{-1}) where bottles were incubated. Bottles where the methionine uptake rate was measured are indicated by the symbol (*).

	Light levels (µE m^{-2} s^{-1})			
	Experiment #1		**Experiment #2**	
bottle	**control**	**nutrients**	**control**	**nutrients**
1*	1780	1620	1495	1450
2	830	800	750	750
3	510	500	493	490
4*	380	380	365	360
5	250	250	240	235
6	110	105	112	100
7	65	60	65	59
8*	45	45	46	40
9*	Dark	Dark	Dark	Dark

Subsamples were taken from each bottle every 3 hours, over a 24 hour period, and after 48 hours of incubation, in order to observe the circadian variability of abundance and optical properties of the different picoplanktonic groups. At each time point, two subsamples (0.8 mL and 1.6 mL) were taken from each bottle for 'unstained' and 'stained' flow cytometric analysis of picoplankton populations, as detailed below. Methionine uptake was measured at the start of the incubations, and after 24 and 48 hours, following the method described in the relevant topic.

Picoplankton abundance, optical properties, and community structure by flow cytometry

'Unstained' analysis: 0.8mL samples were taken at the determined time points and immediately analyzed using a FACSCalibur (Becton Dickinson) flow cytometer. These samples were analyzed fresh (not fixed). Cyanobacteria (*Prochlorococcus*, *Synechococcus*) populations were evaluated based on their autofluorescence and side scatter properties, using the conventional method (Olson et al. 1993).

'Stained' analysis: 1.6mL samples were fixed using paraformaldehyde and stained with 1% commercial stock solution of SYBR Green 1 (Molecular Probes, Inc.) in Milli-Q water mixed with 300mM potassium citrate (24.5mM final concentration) (Zubkov et al. 2000). The samples were analyzed using a FACSCalibur (Becton Dickinson), which allowed size (light forward- and side-scatter) and DNA (green fluorescence) determination of the auto and heterotrophic picoplanktonic populations, and photosynthetic pigment estimate (red fluorescence) of cyanobacteria and autotrophic

picoeukaryotes (Olson et al. 1993, Zubkov et al. 2007). Yellow-green 0.5 and 1.0 mm reference beads (Fluoresbrite Microparticles, Polysciences, Warrington, PA, USA) were used as an internal standard for both fluorescence and flow rates (Zubkov and Burkill 2006). The WinMDI, version 2.0, free software (Joseph Trotter) were used to process the data and plot graphs of the flow cytometer output. Data analysis will be conducted post-cruise to determine cell concentrations.

Microbial Uptake of Methionine

Known concentrations of 35S labeled methionine (supplemented with cold methionine) were added to aliquots of seawater. For the initial measurement, seawater samples were taken directly from the Go Flo and measured on the same day. For the 24 and 48-hour tests, aliquots were taken from the incubated seawater samples of the four light levels to be tested. Samples were then incubated for set time periods before fixation with paraformaldehyde, following the method described in Zubkov et al. (2004). They were then filtered onto a 0.2µm PC membrane and counted using a liquid scintillation counter. Data analysis will be conducted post-cruise, which will allow determination of methionine uptake rate.

Data analysis

As size- and forward-scatter can be used as a proxy for cell diameter, growth rates of the distinct picoplankton populations will be tentatively estimated using the anomalies in these parameters related to their values at the beginning of the incubation. Photoacclimation of the autotrophic picoplankton will be investigated through variations in red fluorescence, and population dynamics will be investigated using the variability in the abundance of different populations over time. Methionine uptake rates will be used as a proxy for the growth rate of prokaryotic organisms, and related to the temporal variability of the different prokaryotic populations.

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The effect of inorganic nutrient addition on bacterioplankton activity in the oligotrophic gyres of the Atlantic Ocean

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Aims of Cruise:

- Collection of trace metal clean seawater samples. Samples will undergo post-cruise analysis in order to determine seawater iron concentration.
- Enumeration and determination of microbial populations within the sample collected using flow cytometry.
- Assessing uptake rates of the amino acid methionine by the microbial community in each sample.
- Examining the affect of addition of inorganic nutrients to microbial populations in the oligotrophic gyres of the Atlantic in order to determine limiting nutrient(s).

Seawater Sample Collection:

In order to minimize iron contamination, seawater samples were collected using a Go Flo (OceanTest Equipment, Inc.), provided by National Marine Facilities (NMF). The Go Flo and associated parts were acid cleaned in 10% hydrochloric acid prior to use. Deployment of the Go Flo was conducted on the fore deck of the RRS James Clark Ross to a depth of 30m, in conjunction with the solar noon CTD cast. The times and locations of these deployments are shown in Table 1.

Go Flo ID	JCR Event Log*	Date and Time	Latitude	Longitude
1	GOF_JR15001_002	19/09/15 14:06	47.50953	-11.06231
2	GOF_JR15001_003	20/09/15 13:15	45.59332	-13.99119
3	GOF_JR15001_004	21/09/15 13:16	43.71193	-16.77912
4	GOF_JR15001_005	22/09/15 13:06	41.52464	-19.87126
5	GOF_JR15001_006	23/09/15 13:07	39.20321	-23.04559
6	GOF_JR15001_007	24/09/15 13:04	37.50581	-26.65652
7	GOF_JR15001_008	27/09/15 14:25	36.21833	-32.74565
8	GOF_JR15001_009	28/09/15 13:20	35.06356	-35.44332
9	GOF_JR15001_010	29/09/15 13:24	33.22153	-38.92158
10	GOF_JR15001_011	30/09/15 13:09	30.10052	-41.93919
11	GOF_JR15001_012	01/10/15 13:24	27.4746	-41.11079
12	GOF_JR15001_013	02/10/15 13:25	25.45323	-38.07437
13	GOF_JR15001_014	03/10/15 13:12	22.98664	-34.38911
14	GOF_JR15001_015	04/10/15 13:11	20.58012	-30.76972
15	GOF_JR15001_016	05/10/15 13:18	18.48065	-28.02801
17	GOF_JR15001_017	19/10/15 13:13	-11.23479	-17.69463
18	GOF_JR15001_018	20/10/15 14:05	-14.02047	-20.50001
19	GOF_JR15001_019	21/10/15 14:08	-16.57131	-23.10095
20	GOF_JR15001_020	23/10/15 14:04	-22.15803	-25.08664
21	GOF_JR15001_021	24/10/15 14:04	-26.50247	-25.03709
22	GOF_JR15001_022	27/10/15 14:15	-33.33253	-31.07391
23	GOF_JR15001_023	28/10/15 15:07	-36.36292	-34.98044
24	GOF_JR15001_024	29/10/15 15:06	-39.87416	-39.6579
25	GOF_JR15001_025	30/10/15 15:25	-42.72274	-43.69933

**Please note that the JCR event log notes the deployment of two Go Flos on the 19th Sept and thus each Go Flo ID does not always match the event log. Go Flo ID will be used for data analysis.*

Table 1: Time and location of Go Flo deployments, all to a depth of 30m.

The Go Flo was immediately taken to a laboratory container and, whilst working under a laminar flow hood, filtered (Sartobran 300 Sterile Capsule) and unfiltered seawater samples were collected in acid cleaned LDPE bottles, and stored at –20ºC for analysis after the cruise.

Analysis of Samples using Flow Cytometry:
Samples were fixed using paraformaldehyde and stained using SYBR Green I. The samples were analysed using a FACSCalibur (Becton Dickinson), which allowed size, DNA and photosynthetic pigment determination of the bacterioplankton and picoeukaryotic populations. Data analysis will be conducted post-cruise to determine cell concentrations which can be related back to cell uptake rates (see below).

Microbial Uptake of Methionine:
On the same day as collection of water samples, known concentrations of 35S labeled methionine (supplemented with cold methionine) were added to aliquots of the seawater. Samples were then incubated for set time periods before fixation with paraformaldehyde. Samples were filtered, onto a 0.2µm PC filter, which was counted using a liquid scintillation counter. Data analysis will be conducted post-cruise, which will allow determination of methionine uptake rate, as well as an estimation of ambient leucine concentration.

Nutrient Addition Experiments:
For each experiment, 200mL of seawater was added to four acid cleaned LDPE bottles; nutrients were then added as detailed in Table 2 below:

Sample Notation	Final concentration of added nutrient (µM)		
	Ammonium chloride (NH_4Cl)	Sodium phosphate (Na_2HPO_4)	Iron(III) chloride ($FeCl_3$)
C (control)	0	0	0
N	1	0	0
P *	0	0.1	0
NP *	1	0.1	0
F **	0	0	0.002
NF **	0	0	0.002

** Northern Atlantic gyre only*
*** Southern Atlantic gyre only*

Table 2: Final concentrations of added inorganic nutrients in seawater samples.

Samples were then incubated in a water bath, held at a temperature as close as possible to the temperature of the ship's underway seawater system. A light illuminated the samples from below at an intensity of approximately 300-500µE/m/s between the hours of sunrise and sunset.
After a 48-hour incubation period, the samples were analyzed via flow cytometry to assess the change in cell number or population, and via methionine uptake to measure any changes in cell activity. Methodology for these processes is described above. All data is to be analyzed post cruise.

DNA/RNA samples, preserved seawater samples and carbon monoxide incubations.

Kimberley Bird (KB)

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DNA/RNA samples
20L of seawater was collected from 1%, 55% and 97% light depths at both pre-dawn and noon CTD casts. Samples were collected in 20L 'blacked out' carboys which were rinsed with ~1L of sample water prior to filling. Bottles were immediately transferred to the laboratory (wet lab) where the seawater was filtered onto sterile 0.2µm cellulose nitrate membranes. Each depth was filtered simultaneously in replicates of two using a 6 funnel filter manifold (blacked out) and vacuum pump. Where possible the total volume ~9L x2 was filtered. For some samples it was not possible to filter the total volume due to the filter blocking. Filtration time ranged from 1hr20 to 03hr45 and averaged 2hr14. Membranes were transferred using sterile forceps into 1.5mL autoclaved tubes containing 800µL of RNA Later (stops RNase activity) and stored at -80°C.

On return to the UK, DNA and RNA will be extracted from the filters, molecular probes and qRT PCR used to determine bacterial diversity, CO oxidiser diversity and activity. Some samples will also be selected and sent for next generation sequencing.

Preserved seawater
45mL of seawater (collected as described above) was measured into 50mL sterile centrifuge tubes and preserved with gluteraldehyde at a final concentration of 2%. Each tube was mixed by inversion 25 times and stored at -20°C.

On return to the UK, bacterial cell counts using flowcytometry will be conducted and possibly fungal biomass determined using fluorescent microscopy techniques.

Table 1: Record of filtered seawater samples for RNA / DNA extraction and equivalent gluteraldehyde preserved samples.

Date	Light (%)	Depth (m)	Sample ID	Volume (L)	Tot (HH:MM)	Bottle no.	CTD ref
18/09/2015	n/a	2	E12MR1	2.50	00:52	23	CTD_JR15001_S_001
18/09/2015	n/a	2	E12MR2	2.50	00:50	23	CTD_JR15001_S_001
18/09/2015	n/a	25	E125MR1	2.50	00:48	14	CTD_JR15001_S_001
18/09/2015	n/a	25	E125MR2	2.50	00:48	14	CTD_JR15001_S_001
19/09/2015	97	2	97DR1002	4.00	02:34	24	CTD_JR15001_S_002
19/09/2015	97	2	97DR2002	4.00	02:24	24	CTD_JR15001_S_002
19/09/2015	55	7	55DR1002	4.00	02:39	17	CTD_JR15001_S_002
19/09/2015	55	7	55DR2002	4.00	02:33	17	CTD_JR15001_S_002

19/09/2015	1	50	1DR1002	5.50	02:28	8	CTD_JR15001_S_002
19/09/2015	1	50	1DR2002	5.50	02:31	8	CTD_JR15001_S_002
19/09/2015	97	2	97NR1003	5.50	02:19	23	CTD_JR15001_S_003
19/09/2015	97	2	97NR2003	5.50	01:58	23	CTD_JR15001_S_003
19/09/2015	55	11	55NR1003	5.00	02:14	20	CTD_JR15001_S_003
19/09/2015	55	11	55NR2003	5.00	02:12	20	CTD_JR15001_S_003
19/09/2015	1	80	1NR1003	8.25	01:39	8	CTD_JR15001_S_003
19/09/2015	1	80	1NR2003	8.25	01:39	8	CTD_JR15001_S_003
20/09/2015	97	2	97DR1004	5.50	02:08	24	CTD_JR15001_S_004
20/09/2015	97	2	97DR2004	5.50	02:08	24	CTD_JR15001_S_004
20/09/2015	55	7	55DR1004	6.00	02:14	20	CTD_JR15001_S_004
20/09/2015	55	7	55DR2004	6.00	02:14	20	CTD_JR15001_S_004
20/09/2015	1	50	1DR1004	6.50	02:17	9	CTD_JR15001_S_004
20/09/2015	1	50	1DR2004	6.50	02:18	9	CTD_JR15001_S_004
20/09/2015	97	2	97NR1005	5.00	01:45	23	CTD_JR15001_S_005
20/09/2015	97	2	97NR2005	5.00	01:44	23	CTD_JR15001_S_005
20/09/2015	55	12	55NR1005	5.00	01:56	20	CTD_JR15001_S_005
20/09/2015	55	12	55NR2005	5.00	01:54	20	CTD_JR15001_S_005
20/09/2015	1	86	1NR1005	11.50	02:16	8,9	CTD_JR15001_S_005
20/09/2015	1	86	1NR2005	11.50	02:16	8,9	CTD_JR15001_S_005
21/09/2015	97	2	97DR1006	6.00	01:54	24	CTD_JR15001_S_006
21/09/2015	97	2	97DR2006	3.00	01:54	24	CTD_JR15001_S_006
21/09/2015	55	7	55DR1006	5.50	01:56	20	CTD_JR15001_S_006
21/09/2015	55	7	55DR2006	5.50	01:56	20	CTD_JR15001_S_006
21/09/2015	1	50	1DR1006	8.75	02:07	11	CTD_JR15001_S_006
21/09/2015	1	50	1DR2006	8.75	02:08	11	CTD_JR15001_S_006
21/09/2015	97	2	97NR1007	8.50	02:19	23	CTD_JR15001_S_007

21/09/2015	97	2	97NR2007	8.00	02:12	23	CTD_JR15001_S_007
21/09/2015	55	10	55NR1007	8.00	02:19	20	CTD_JR15001_S_007
21/09/2015	55	10	55NR2007	8.00	02:20	20	CTD_JR15001_S_007
21/09/2015	1	75	1NR1007	11.50	02:22	10,11	CTD_JR15001_S_007
21/09/2015	1	75	1NR2007	11.50	02:21	10,11	CTD_JR15001_S_007
22/09/2015	97	2	97DR1008	5.00	01:46	24	CTD_JR15001_S_008
22/09/2015	97	2	97DR2008	5.50	01:46	24	CTD_JR15001_S_008
22/09/2015	55	11	55DR1008	6.00	01:53	20	CTD_JR15001_S_008
22/09/2015	55	11	55DR2008	5.00	01:47	20	CTD_JR15001_S_008
22/09/2015	1	80	1DR1008	8.50	01:51	11	CTD_JR15001_S_008
22/09/2015	1	80	1DR2008	8.50	01:51	11	CTD_JR15001_S_008
22/09/2015	97	2	97NR1009	5.50	01:31	23	CTD_JR15001_S_009
22/09/2015	97	2	97NR2009	5.50	01:31	23	CTD_JR15001_S_009
22/09/2015	55	8	55NR1009	6.50	01:53	20	CTD_JR15001_S_009
22/09/2015	55	8	55NR2009	6.00	01:50	20	CTD_JR15001_S_009
22/09/2015	1	60	1NR1009	12.50	02:45	10,11	CTD_JR15001_S_009
22/09/2015	1	60	1NR2009	12.50	02:45	10,11	CTD_JR15001_S_009
23/09/2015	97	2	97DR1010	5.00	01:11	24	CTD_JR15001_S_010
23/09/2015	97	2	97DR2010	5.00	01:11	24	CTD_JR15001_S_010
23/09/2015	55	10	55DR1010	5.00	01:10	20	CTD_JR15001_S_010
23/09/2015	55	10	55DR2010	5.00	01:11	20	CTD_JR15001_S_010
23/09/2015	1	75	1DR1010	5.50	01:10	11	CTD_JR15001_S_010
23/09/2015	1	75	1DR2010	5.50	01:11	11	CTD_JR15001_S_010
23/09/2015	97	2	97NR1011	7.50	02:13	23	CTD_JR15001_S_011
23/09/2015	97	2	97NR2011	7.50	02:12	23	CTD_JR15001_S_011
23/09/2015	55	10	55NR1011	7.00	02:10	20	CTD_JR15001_S_011
23/09/2015	55	10	55NR2011	7.00	02:16	20	CTD_JR15001_S_011

23/09/2015	1	75	1NR1011	9.50	02:01	10	CTD_JR15001_S_011
23/09/2015	1	75	1NR2011	9.50	02:01	10	CTD_JR15001_S_011
24/09/2015	97	2	97DR1012	9.00	03:10	24	CTD_JR15001_S_012
24/09/2015	97	2	97DR2012	9.00	03:10	24	CTD_JR15001_S_012
24/09/2015	55	12	55DR1012	8.50	03:00	20	CTD_JR15001_S_012
24/09/2015	55	12	55DR2012	8.50	03:00	20	CTD_JR15001_S_012
24/09/2015	1	90	1DR1012	9.35	02:51	11	CTD_JR15001_S_012
24/09/2015	1	90	1DR2012	9.35	02:51	11	CTD_JR15001_S_012
24/09/2015	97	2	97NR1013	9.00	02:54	23	CTD_JR15001_S_013
24/09/2015	97	2	97NR2013	9.00	02:54	23	CTD_JR15001_S_013
24/09/2015	55	10	55NR1013	8.00	02:34	20	CTD_JR15001_S_013
24/09/2015	55	10	55NR2013	8.00	02:34	20	CTD_JR15001_S_013
24/09/2015	1	77	1NR1013	14.00	03:11	8,9	CTD_JR15001_S_013
24/09/2015	1	77	1NR2013	14.00	03:13	8,9	CTD_JR15001_S_013
25/09/2015	97	2	97DR1014	8.50	02:26		CTD_JR15001_S_014
25/09/2015	97	2	97DR2014	8.50	02:22		CTD_JR15001_S_014
25/09/2015	55	13	55DR1014	8.50	02:22	20	CTD_JR15001_S_014
25/09/2015	55	13	55DR2014	8.50	02:21	20	CTD_JR15001_S_014
25/09/2015	1	100	1DR1014	10.00	02:22	11	CTD_JR15001_S_014
25/09/2015	1	100	1DR2014	9.50	02:20	11	CTD_JR15001_S_014
27/09/2015	97	2	97AMR1016	9.00	01:55	24	CTD_JR15001_S_016
27/09/2015	97	2	97AMR2016	8.70	01:55	24	CTD_JR15001_S_016
27/09/2015	55	16	55AMR1016	7.20	01:49	20	CTD_JR15001_S_016
27/09/2015	55	16	55AMR2016	7.20	01:49	20	CTD_JR15001_S_016
27/09/2015	1	120	1AMR1016	5.00	00:59	11	CTD_JR15001_S_016
27/09/2015	1	120	1AMR2016	4.25	00:47	11	CTD_JR15001_S_016
28/09/2015	97	5	97DR1017	8.25	02:12	24	CTD_JR15001_S_017

28/09/2015	97	5	97DR2017	8.25	02:12	24	CTD_JR15001_S_017
28/09/2015	55	13	55DR1017	8.60	02:07	21	CTD_JR15001_S_017
28/09/2015	55	13	55DR2017	8.60	02:12	21	CTD_JR15001_S_017
28/09/2015	1	100	1DR1017	8.60	02:05	16	CTD_JR15001_S_017
28/09/2015	1	100	1DR2017	8.60	02:09	16	CTD_JR15001_S_017
28/09/2015	97	5	97NR1017	8.70	02:04	24	CTD_JR15001_S_018
28/09/2015	97	5	97NR2017	8.70	02:04	24	CTD_JR15001_S_018
28/09/2015	55	15	55NR1017	8.80	02:07	20	CTD_JR15001_S_018
28/09/2015	55	15	55NR2017	8.80	02:07	20	CTD_JR15001_S_018
28/09/2015	1	100	1NR1017	8.50	01:54	13	CTD_JR15001_S_018
28/09/2015	1	100	1NR2017	8.50	01:52	13	CTD_JR15001_S_018
29/09/2015	97	5	97DR1019	8.70	02:09	24	CTD_JR15001_S_019
29/09/2015	97	5	97DR2019	8.70	02:09	24	CTD_JR15001_S_019
29/09/2015	1	90	1DR1019	9.40	02:11	16	CTD_JR15001_S_019
29/09/2015	1	90	1DR2019	9.40	02:10	16	CTD_JR15001_S_019
29/09/2015	97	5	97NR1020	8.75	02:20	23	CTD_JR15001_S_020
29/09/2015	97	5	97NR2020	8.50	02:05	23	CTD_JR15001_S_020
29/09/2015	55	15	55NR1020	8.00	01:56	21	CTD_JR15001_S_020
29/09/2015	55	15	55NR2020	8.00	01:56	21	CTD_JR15001_S_020
29/09/2015	1	110	1NR1020	8.00	01:46	11	CTD_JR15001_S_020
29/09/2015	1	110	1NR2020	8.00	01:39	11	CTD_JR15001_S_020
30/09/2015	97	2	97DR1021	7.35	01:50	24	CTD_JR15001_S_021
30/09/2015	97	2	97DR2021	7.35	01:50	24	CTD_JR15001_S_021
30/09/2015	55	15	55DR1021	6.50	01:44	21	CTD_JR15001_S_021
30/09/2015	55	15	55DR2021	6.70	01:41	21	CTD_JR15001_S_021
30/09/2015	1	120	1DR1021	9.30	02:08	13	CTD_JR15001_S_021
30/09/2015	1	120	1DR2021	9.30	02:07	13	CTD_JR15001_S_021

30/09/2015	n/a	1000	1KDR1021	6.00	01:11	4	CTD_JR15001_S_021
30/09/2015	n/a	1000	1KDR2021	6.00	01:12	4	CTD_JR15001_S_021
30/09/2015	n/a	2000	2KDR1021	6.00	01:10	1	CTD_JR15001_S_021
30/09/2015	n/a	2000	2KDR2021	6.00	01:11	1	CTD_JR15001_S_021
30/09/2015	97	2	97NR1022	9.95	02:35	23	CTD_JR15001_S_022
30/09/2015	97	2	97NR2022	9.90	02:35	23	CTD_JR15001_S_022
30/09/2015	55	16	55NR1022	8.15	02:03	21	CTD_JR15001_S_022
30/09/2015	55	16	55NR2022	8.15	02:03	21	CTD_JR15001_S_022
30/09/2015	1	120	1NR1022	8.90	01:50	13	CTD_JR15001_S_022
30/09/2015	1	120	1NR2022	9.00	01:46	13	CTD_JR15001_S_022
01/10/2015	97	2	97DR1023	9.15	02:12	24	CTD_JR15001_S_023
01/10/2015	97	2	97DR2023	9.20	02:13	24	CTD_JR15001_S_023
01/10/2015	55	20	55DR1023	7.80	01:52	21	CTD_JR15001_S_023
01/10/2015	55	20	55DR2023	7.80	01:53	21	CTD_JR15001_S_023
01/10/2015	1	120	1DR1023	9.30	01:46	17	CTD_JR15001_S_023
01/10/2015	1	120	1DR2023	9.30	01:46	17	CTD_JR15001_S_023
01/10/2015	97	2	97NR1024	9.30	02:59	23	CTD_JR15001_S_024
01/10/2015	97	2	97NR2024	9.30	02:59	23	CTD_JR15001_S_024
01/10/2015	55	17	55NR1024	9.05	02:53	20	CTD_JR15001_S_024
01/10/2015	55	17	55NR2024	9.05	02:47	20	CTD_JR15001_S_024
01/10/2015	1	125	1NR1024	12.00	02:56	13	CTD_JR15001_S_024
01/10/2015	1	125	1NR2024	12.00	02:56	13	CTD_JR15001_S_024
02/10/2015	97	2	97DR1025	9.30	02:24	24	CTD_JR15001_S_025
02/10/2015	97	2	97DR2025	9.30	02:24	24	CTD_JR15001_S_025
02/10/2015	55	18	55DR1025	9.15	02:14	20	CTD_JR15001_S_025
02/10/2015	55	18	55DR2025	9.15	02:20	20	CTD_JR15001_S_025
02/10/2015	1	120	1DR1025	9.65	02:02	14	CTD_JR15001_S_025

02/10/2015	1	120	1DR2025	9.65	02:02	14	CTD_JR15001_S_025
02/10/2015	97	2	97AMR1026	9.35	02:31	24	CTD_JR15001_S_026
02/10/2015	97	2	97AMR2026	8.85	02:30	24	CTD_JR15001_S_026
02/10/2015	55	13	55AMR1026	9.45	02:21	19	CTD_JR15001_S_026
02/10/2015	55	13	55AMR2026	9.45	02:22	19	CTD_JR15001_S_026
02/10/2015	1	100	1AMR1026	9.75	01:55	12	CTD_JR15001_S_026
02/10/2015	1	100	1AMR2026	9.80	01:55	12	CTD_JR15001_S_026
03/10/2015	97	2	97DR1027	8.60	02:12	24	CTD_JR15001_S_027
03/10/2015	97	2	97DR2027	8.60	02:12	24	CTD_JR15001_S_027
03/10/2015	55	18	55DR1027	9.15	02:18	19	CTD_JR15001_S_027
03/10/2015	55	18	55DR2027	9.15	02:19	19	CTD_JR15001_S_027
03/10/2015	1	110	1DR1027	9.65	02:01	11	CTD_JR15001_S_027
03/10/2015	1	110	1DR2027	9.65	02:01	11	CTD_JR15001_S_027
03/10/2015	97	2	97NR1028	8.00	03:10	24	CTD_JR15001_S_028
03/10/2015	97	2	97NR2028	8.00	03:10	24	CTD_JR15001_S_028
03/10/2015	55	13	55NR1028	9.00	02:58	19	CTD_JR15001_S_028
03/10/2015	55	13	55NR2028	9.00	03:00	19	CTD_JR15001_S_028
03/10/2015	1	100	1NR1028	9.45	02:19	11	CTD_JR15001_S_028
03/10/2015	1	100	1NR2028	9.45	02:19	11	CTD_JR15001_S_028
04/10/2015	97	2	97DR1029	9.30	03:00	24	CTD_JR15001_S_029
04/10/2015	97	2	97DR2029	9.30	02:59	24	CTD_JR15001_S_029
04/10/2015	55	10	55DR1029	9.05	02:51	19	CTD_JR15001_S_029
04/10/2015	55	10	55DR2029	9.05	02:51	19	CTD_JR15001_S_029
04/10/2015	1	90	1DR1029	9.20	02:04	11	CTD_JR15001_S_029
04/10/2015	1	90	1DR2029	9.20	02:04	11	CTD_JR15001_S_029
04/10/2015	97	2	97NR1030	9.50	02:31	24	CTD_JR15001_S_030
04/10/2015	97	2	97NR2030	9.50	02:31	24	CTD_JR15001_S_030

04/10/2015	55	13	55NR1030	8.90	02:30	19	CTD_JR15001_S_030
04/10/2015	55	13	55NR2030	8.90	02:30	19	CTD_JR15001_S_030
04/10/2015	1	90	1NR1030	8.95	01:43	12	CTD_JR15001_S_030
04/10/2015	1	90	1NR2030	9.45	01:43	12	CTD_JR15001_S_030
05/10/2015	97	2	97DR1031	9.00	03:01	24	CTD_JR15001_S_031
05/10/2015	97	2	97DR2031	9.00	03:01	24	CTD_JR15001_S_031
05/10/2015	55	10	55DR1031	9.00	03:02	19	CTD_JR15001_S_031
05/10/2015	55	10	55DR2031	9.00	03:02	19	CTD_JR15001_S_031
05/10/2015	1	70	1DR1031	9.20	02:41	12	CTD_JR15001_S_031
05/10/2015	1	70	1DR2031	9.25	02:42	12	CTD_JR15001_S_031
05/10/2015	97	2	97NR1032	7.50	03:01	23	CTD_JR15001_S_032
05/10/2015	97	2	97NR2032	7.50	03:01	23	CTD_JR15001_S_032
05/10/2015	55	11	55NR1032	7.50	02:53	18	CTD_JR15001_S_032
05/10/2015	55	11	55NR2032	7.50	02:56	18	CTD_JR15001_S_032
05/10/2015	1	78	1NR1032	8.50	02:57	7	CTD_JR15001_S_032
05/10/2015	1	78	1NR2032	8.50	02:57	7	CTD_JR15001_S_032
06/10/2015	97	2	97DR1033	6.50	02:59	24	CTD_JR15001_S_033
06/10/2015	97	2	97DR2033	6.50	02:59	24	CTD_JR15001_S_033
06/10/2015	55	10	55DR1033	6.50	02:59	19	CTD_JR15001_S_033
06/10/2015	55	10	55DR2033	6.50	02:59	19	CTD_JR15001_S_033
06/10/2015	1	70	1DR1033	8.75	02:43	8	CTD_JR15001_S_033
06/10/2015	1	70	1DR2033	9.00	02:46	8	CTD_JR15001_S_033
06/10/2015	97	2	97NR1034	7.50	02:04	24	CTD_JR15001_S_034
06/10/2015	97	2	97NR2034	7.50	02:06	24	CTD_JR15001_S_034
06/10/2015	55	8	55NR1034	7.50	02:12	19	CTD_JR15001_S_034
06/10/2015	55	8	55NR2034	7.50	02:09	19	CTD_JR15001_S_034
06/10/2015	1	55	1NR1034	8.00	02:05	11	CTD_JR15001_S_034

06/10/2015	1	55	1NR2034	8.00	02:03	11	CTD_JR15001_S_034
07/10/2015	97	2	97DR1035	5.50	01:49	24	CTD_JR15001_S_035
07/10/2015	97	2	97DR2035	5.50	01:50	24	CTD_JR15001_S_035
07/10/2015	55	8	55DR1035	5.00	01:51	19	CTD_JR15001_S_035
07/10/2015	55	8	55DR2035	5.00	01:50	19	CTD_JR15001_S_035
07/10/2015	1	60	1DR1035	8.85	01:54	8	CTD_JR15001_S_035
07/10/2015	1	60	1DR2035	9.00	01:50	8	CTD_JR15001_S_035
08/10/2015	97	2	97DR1036	9.00	02:58	24	CTD_JR15001_S_036
08/10/2015	97	2	97DR2036	9.00	02:59	24	CTD_JR15001_S_036
08/10/2015	55	7	55DR1036	8.50	02:58	19	CTD_JR15001_S_036
08/10/2015	55	7	55DR2036	8.50	02:58	19	CTD_JR15001_S_036
08/10/2015	1	59	1DR1036	8.75	02:37	9	CTD_JR15001_S_036
08/10/2015	1	59	1DR2036	8.75	02:37	9	CTD_JR15001_S_036
08/10/2015	97	2	97NR1037	8.00	02:19	24	CTD_JR15001_S_037
08/10/2015	97	2	97NR2037	8.00	02:21	24	CTD_JR15001_S_037
08/10/2015	55	8	55NR1037	7.50	02:25	19	CTD_JR15001_S_037
08/10/2015	55	8	55NR2037	7.50	02:23	19	CTD_JR15001_S_037
08/10/2015	1	60	1NR1037	8.85	02:02	8	CTD_JR15001_S_037
08/10/2015	1	60	1NR2037	8.85	02:02	8	CTD_JR15001_S_037
09/10/2015	97	2	97DR1038	8.00	02:20	24	CTD_JR15001_S_038
09/10/2015	97	2	97DR2038	8.00	02:20	24	CTD_JR15001_S_038
09/10/2015	55	11	55DR1038	8.00	02:22	19	CTD_JR15001_S_038
09/10/2015	55	11	55DR2038	8.00	02:23	19	CTD_JR15001_S_038
09/10/2015	1	80	1DR1038	9.15	01:52	8	CTD_JR15001_S_038
09/10/2015	1	80	1DR2038	9.20	01:52	8	CTD_JR15001_S_038
09/10/2015	97	2	97NR1039	8.00	02:45	24	CTD_JR15001_S_039
09/10/2015	97	2	97NR2039	8.00	02:46	24	CTD_JR15001_S_039

09/10/2015	55	8	55NR1039	8.00	02:51	19	CTD_JR15001_S_039
09/10/2015	55	8	55NR2039	8.00	02:51	19	CTD_JR15001_S_039
09/10/2015	1	57	1NR1039	8.80	02:44	8	CTD_JR15001_S_039
09/10/2015	1	57	1NR2039	8.80	02:43	8	CTD_JR15001_S_039
10/10/2015	97	2	97DR1040	9.20	02:51	24	CTD_JR15001_S_040
10/10/2015	97	2	97DR2040	9.20	02:57	24	CTD_JR15001_S_040
10/10/2015	55	10	55DR1040	9.45	02:51	19	CTD_JR15001_S_040
10/10/2015	55	10	55DR2040	9.45	02:51	19	CTD_JR15001_S_040
10/10/2015	1	75	1DR1040	8.90	02:05	8	CTD_JR15001_S_040
10/10/2015	1	75	1DR2040	9.00	02:05	8	CTD_JR15001_S_040
10/10/2015	97	2	97NR1041	9.30	02:30	24	CTD_JR15001_S_041
10/10/2015	97	2	97NR2041	9.35	02:37	24	CTD_JR15001_S_041
10/10/2015	55	11	55NR1041	9.30	02:39	19	CTD_JR15001_S_041
10/10/2015	55	11	55NR2041	9.30	02:38	19	CTD_JR15001_S_041
10/10/2015	1	80	1NR1041	9.30	02:12	8	CTD_JR15001_S_041
10/10/2015	1	80	1NR2041	9.30	02:12	8	CTD_JR15001_S_041
11/10/2015	97	2	97DR1042	8.85	02:50	24	CTD_JR15001_S_042
11/10/2015	97	2	97DR2042	8.80	02:51	24	CTD_JR15001_S_042
11/10/2015	55	10	55DR1042	8.70	02:49	19	CTD_JR15001_S_042
11/10/2015	55	10	55DR2042	8.65	02:48	19	CTD_JR15001_S_042
11/10/2015	1	75	1DR1042	8.90	02:42	11	CTD_JR15001_S_042
11/10/2015	1	75	1DR2042	8.90	02:42	11	CTD_JR15001_S_042
11/10/2015	97	2	97NR1043	8.50	02:26	24	CTD_JR15001_S_043
11/10/2015	97	2	97NR2043	8.50	02:27	24	CTD_JR15001_S_043
11/10/2015	55	10	55NR1043	8.70	02:30	19	CTD_JR15001_S_043
11/10/2015	55	10	55NR2043	8.80	02:29	19	CTD_JR15001_S_043
11/10/2015	1	75	1NR1043	8.50	02:03	8	CTD_JR15001_S_043

11/10/2015	1	75	1NR2043	8.50	02:03	8	CTD_JR15001_S_043
12/10/2015	97	2	97DR1044	8.50	03:16	24	CTD_JR15001_S_044
12/10/2015	97	2	97DR2044	8.50	03:45	24	CTD_JR15001_S_044
12/10/2015	55	9	55DR1044	8.00	03:32	19	CTD_JR15001_S_044
12/10/2015	55	9	55DR2044	8.00	03:46	19	CTD_JR15001_S_044
12/10/2015	1	65	1DR1044	9.30	03:21	8	CTD_JR15001_S_044
12/10/2015	1	65	1DR2044	9.35	03:22	8	CTD_JR15001_S_044
13/10/2015	97	2	97DR1045	7.50	03:06	24	CTD_JR15001_S_045
13/10/2015	97	2	97DR2045	7.50	03:03	24	CTD_JR15001_S_045
13/10/2015	55	8	55DR1045	7.50	03:10	19	CTD_JR15001_S_045
13/10/2015	55	8	55DR2045	7.50	03:10	19	CTD_JR15001_S_045
13/10/2015	1	60	1DR1045	7.50	03:03	12	CTD_JR15001_S_045
13/10/2015	1	60	1DR2045	7.50	03:02	12	CTD_JR15001_S_045
13/10/2015	97	2	97NR1046	6.00	02:37	24	CTD_JR15001_S_046
13/10/2015	97	2	97NR2046	6.00	02:37	24	CTD_JR15001_S_046
13/10/2015	55	10	55NR1046	6.00	02:36	19	CTD_JR15001_S_046
13/10/2015	55	10	55NR2046	6.00	02:33	19	CTD_JR15001_S_046
13/10/2015	1	74	1NR1046	8.50	02:32	8	CTD_JR15001_S_046
13/10/2015	1	74	1NR2046	8.50	02:33	8	CTD_JR15001_S_046
14/10/2015	97	2	97DR1047	7.00	02:22	24	CTD_JR15001_S_047
14/10/2015	97	2	97DR2047	7.00	02:23	24	CTD_JR15001_S_047
14/10/2015	55	10	55DR1047	7.45	02:30	19	CTD_JR15001_S_047
14/10/2015	55	10	55DR2047	7.40	02:28	19	CTD_JR15001_S_047
14/10/2015	1	75	1DR1047	8.50	02:14	8	CTD_JR15001_S_047
14/10/2015	1	75	1DR2047	8.50	02:15	8	CTD_JR15001_S_047
14/10/2015	97	2	97NR1048	8.00	02:50	24	CTD_JR15001_S_048
14/10/2015	97	2	97NR2048	8.00	02:58	24	CTD_JR15001_S_048

14/10/2015	55	12	55NR1048	8.50	02:59	19	CTD_JR15001_S_048
14/10/2015	55	12	55NR2048	8.50	03:04	19	CTD_JR15001_S_048
14/10/2015	1	90	1NR1048	8.40	02:00	9	CTD_JR15001_S_048
14/10/2015	1	90	1NR2048	8.45	01:59	9	CTD_JR15001_S_048
19/10/2015	97	2	97DR1055	8.85	03:02	24	CTD_JR15001_S_055
19/10/2015	97	2	97DR2055	8.90	03:02	24	CTD_JR15001_S_055
19/10/2015	55	10	55DR1055	8.50	02:34	19	CTD_JR15001_S_055
19/10/2015	55	10	55DR2055	8.50	02:34	19	CTD_JR15001_S_055
19/10/2015	1	75	1DR1055	8.70	02:33	12	CTD_JR15001_S_055
19/10/2015	1	75	1DR2055	8.70	02:33	12	CTD_JR15001_S_055
19/10/2015	97	2	97NR1056	9.00	02:13	24	CTD_JR15001_S_056
19/10/2015	97	2	97NR2056	9.00	02:13	24	CTD_JR15001_S_056
19/10/2015	55	13	55NR1056	7.85	01:50	19	CTD_JR15001_S_056
19/10/2015	55	13	55NR2056	7.95	01:51	19	CTD_JR15001_S_056
19/10/2015	1	100	1NR1056	9.00	02:11	11	CTD_JR15001_S_056
19/10/2015	1	100	1NR2056	9.00	02:10	11	CTD_JR15001_S_056
20/10/2015	97	2	97DR1057	9.15	02:40	24	CTD_JR15001_S_057
20/10/2015	97	2	97DR2057	9.10	02:38	24	CTD_JR15001_S_057
20/10/2015	55	15	55DR1057	8.85	02:34	19	CTD_JR15001_S_057
20/10/2015	55	15	55DR2057	8.80	02:33	19	CTD_JR15001_S_057
20/10/2015	1	110	1DR1057	9.35	02:23	11	CTD_JR15001_S_057
20/10/2015	1	110	1DR2057	9.30	02:23	11	CTD_JR15001_S_057
20/10/2015	97	2	97NR1058	8.75	02:12	24	CTD_JR15001_S_058
20/10/2015	97	2	97NR2058	8.75	02:12	24	CTD_JR15001_S_058
20/10/2015	55	15	55NR1058	8.75	02:12	19	CTD_JR15001_S_058
20/10/2015	55	15	55NR2058	8.75	02:12	19	CTD_JR15001_S_058
20/10/2015	1	110	1NR1058	8.20	01:59	12	CTD_JR15001_S_058

20/10/2015	1	110	1NR2058	8.20	01:59	12	CTD_JR15001_S_058
21/10/2015	97	2	97DR1059	8.60	02:10	24	CTD_JR15001_S_059
21/10/2015	97	2	97DR2059	8.70	02:10	24	CTD_JR15001_S_059
21/10/2015	55	16	55DR1059	8.00	02:00	19	CTD_JR15001_S_059
21/10/2015	55	16	55DR2059	8.00	02:01	19	CTD_JR15001_S_059
21/10/2015	1	120	1DR1059	8.20	01:55	12	CTD_JR15001_S_059
21/10/2015	1	120	1DR2059	8.20	01:55	12	CTD_JR15001_S_059
21/10/2015	97	160	97NR1060	6.40	01:20	24,22	CTD_JR15001_S_060
21/10/2015	97	160	97NR2060	6.40	01:20	24,22	CTD_JR15001_S_060
21/10/2015	55	20	55NR1060	8.65	01:57	19	CTD_JR15001_S_060
21/10/2015	55	20	55NR2060	8.65	01:57	19	CTD_JR15001_S_060
21/10/2015	1	2	1NR1060	12.00	02:15	8,7	CTD_JR15001_S_060
21/10/2015	1	2	1NR2060	12.00	02:16	8,7	CTD_JR15001_S_060
22/10/2015	97	2	97DR1061	8.50	02:10	24	CTD_JR15001_S_061
22/10/2015	97	2	97DR2061	8.50	02:10	24	CTD_JR15001_S_061
22/10/2015	55	23	55DR1061	8.70	02:04	18	CTD_JR15001_S_061
22/10/2015	55	23	55DR2061	8.70	02:04	18	CTD_JR15001_S_061
22/10/2015	1	170	1DR1061	8.50	01:44	9	CTD_JR15001_S_061
22/10/2015	1	170	1DR2061	8.50	01:44	9	CTD_JR15001_S_061
23/10/2015	97	2	97DR1062	9.00	02:04	24	CTD_JR15001_S_062
23/10/2015	97	2	97DR2062	8.50	02:02	24	CTD_JR15001_S_062
23/10/2015	55	20	55DR1062	8.80	02:03	18	CTD_JR15001_S_062
23/10/2015	55	20	55DR2062	8.80	02:04	18	CTD_JR15001_S_062
23/10/2015	1	170	1DR1062	9.05	01:36	8	CTD_JR15001_S_062
23/10/2015	1	170	1DR2062	9.05	01:36	8	CTD_JR15001_S_062
23/10/2015	97	2	97NR1063	8.85	02:28	24	CTD_JR15001_S_063
23/10/2015	97	2	97NR2063	8.90	02:38	24	CTD_JR15001_S_063

23/10/2015	55	25	55NR1063	8.50	02:20	18	CTD_JR15001_S_063
23/10/2015	55	25	55NR2063	8.50	02:20	18	CTD_JR15001_S_063
23/10/2015	1	175	1NR1063	8.80	01:38	7	CTD_JR15001_S_063
23/10/2015	1	175	1NR2063	8.85	01:38	7	CTD_JR15001_S_063
24/10/2015	97	2	97DR1064	8.60	02:03	24	CTD_JR15001_S_064
24/10/2015	97	2	97DR2064	8.55	02:07	24	CTD_JR15001_S_064
24/10/2015	55	23	55DR1064	8.75	02:05	18	CTD_JR15001_S_064
24/10/2015	55	23	55DR2064	8.75	02:05	18	CTD_JR15001_S_064
24/10/2015	1	170	1DR1064	7.70	01:39	8	CTD_JR15001_S_064
24/10/2015	1	170	1DR2064	7.70	01:39	8	CTD_JR15001_S_064
24/10/2015	97	2	97NR1065	8.45	02:11	24	CTD_JR15001_S_065
24/10/2015	97	2	97NR2065	8.45	02:11	24	CTD_JR15001_S_065
24/10/2015	55	20	55NR1065	8.45	02:02	19	CTD_JR15001_S_065
24/10/2015	55	20	55NR2065	8.50	02:03	19	CTD_JR15001_S_065
24/10/2015	1	160	1NR1065	8.85	01:40	8	CTD_JR15001_S_065
24/10/2015	1	160	1NR2065	8.85	01:40	8	CTD_JR15001_S_065
25/10/2015	97	5	97DR1066	7.25	01:58	24	CTD_JR15001_S_066
25/10/2015	97	5	97DR2066	7.25	01:58	24	CTD_JR15001_S_066
25/10/2015	55	20	55DR1066	6.57	01:30	20	CTD_JR15001_S_066
25/10/2015	55	20	55DR2066	6.95	01:31	20	CTD_JR15001_S_066
25/10/2015	1	150	1DR1066	8.25	01:33	8	CTD_JR15001_S_066
25/10/2015	1	150	1DR2066	8.30	01:33	8	CTD_JR15001_S_066
25/10/2015	97	5	97NR1067	8.20	02:17	24	CTD_JR15001_S_067
25/10/2015	97	5	97NR2067	8.15	02:17	24	CTD_JR15001_S_067
25/10/2015	55	20	55NR1067	7.55	02:16	19	CTD_JR15001_S_067
25/10/2015	55	20	55NR2067	7.60	02:17	19	CTD_JR15001_S_067
25/10/2015	1	150	1NR1067	7.85	01:45	8	CTD_JR15001_S_067

25/10/2015	1	150	1NR2067	7.85	01:45	8	CTD_JR15001_S_067
26/10/2015	97	5	97NR1069	9.00	02:08	24	CTD_JR15001_S_069
26/10/2015	97	5	97NR2069	9.00	02:08	24	CTD_JR15001_S_069
26/10/2015	55	15	55NR1069	9.00	01:51	19	CTD_JR15001_S_069
26/10/2015	55	15	55NR2069	9.00	01:51	19	CTD_JR15001_S_069
26/10/2015	1	120	1NR1069	8.80	02:06	11	CTD_JR15001_S_069
26/10/2015	1	120	1NR2069	8.85	02:08	11	CTD_JR15001_S_069
27/10/2015	97	5	97DR1070	9.05	02:03	24	CTD_JR15001_S_070
27/10/2015	97	5	97DR2070	9.05	02:03	24	CTD_JR15001_S_070
27/10/2015	55	15	55DR1070	9.05	02:06	19	CTD_JR15001_S_070
27/10/2015	55	15	55DR2070	9.05	02:06	19	CTD_JR15001_S_070
27/10/2015	1	115	1DR1070	8.90	01:49	8	CTD_JR15001_S_070
27/10/2015	1	115	1DR2070	8.90	01:49	8	CTD_JR15001_S_070
27/10/2015	97	3	97NR1071	8.50	02:54	24	CTD_JR15001_S_071
27/10/2015	97	3	97NR2071	8.50	02:56	24	CTD_JR15001_S_071
27/10/2015	55	12	55NR1071	8.50	02:57	19	CTD_JR15001_S_071
27/10/2015	55	12	55NR2071	8.50	02:58	19	CTD_JR15001_S_071
27/10/2015	1	92	1NR1071	8.95	02:31	8	CTD_JR15001_S_071
27/10/2015	1	92	1NR2071	8.95	02:31	8	CTD_JR15001_S_071
28/10/2015	97	2	97DR1072	8.00	02:40	24	CTD_JR15001_S_072
28/10/2015	97	2	97DR2072	8.00	02:41	24	CTD_JR15001_S_072
28/10/2015	55	8	55DR1072	8.00	02:42	19	CTD_JR15001_S_072
28/10/2015	55	8	55DR2072	8.00	02:43	19	CTD_JR15001_S_072
28/10/2015	1	60	1DR1072	6.00	02:33	12	CTD_JR15001_S_072
28/10/2015	1	60	1DR2072	6.00	02:32	12	CTD_JR15001_S_072
28/10/2015	97	2	97NR1073	9.50	02:46	24,22	CTD_JR15001_S_073
28/10/2015	97	2	97NR2073	9.50	02:46	24,22	CTD_JR15001_S_073

28/10/2015	55	10	55NR1073	8.90	02:45	19	CTD_JR15001_S_073
28/10/2015	55	10	55NR2073	8.90	02:45	19	CTD_JR15001_S_073
28/10/2015	1	77	1NR1073	9.00	02:43	10,9	CTD_JR15001_S_073
28/10/2015	1	77	1NR2073	9.00	02:43	10,9	CTD_JR15001_S_073
29/10/2015	97	2	97DR1074	6.50	02:58	24	CTD_JR15001_S_074
29/10/2015	97	2	97DR2074	6.00	02:44	24	CTD_JR15001_S_074
29/10/2015	55	10	55DR1074	6.00	02:59	19	CTD_JR15001_S_074
29/10/2015	55	10	55DR2074	6.00	02:57	19	CTD_JR15001_S_074
29/10/2015	1	70	1DR1074	7.50	02:49	11	CTD_JR15001_S_074
29/10/2015	1	70	1DR2074	7.50	02:49	11	CTD_JR15001_S_074
29/10/2015	97	2	97NR1075	8.45	02:13	24	CTD_JR15001_S_075
29/10/2015	97	2	97NR2075	8.45	02:13	24	CTD_JR15001_S_075
29/10/2015	55	14	55NR1075	8.45	02:14	19	CTD_JR15001_S_075
29/10/2015	55	14	55NR2075	8.45	02:14	19	CTD_JR15001_S_075
29/10/2015	1	104	1NR1075	8.35	02:13	8	CTD_JR15001_S_075
29/10/2015	1	104	1NR2075	8.45	02:14	8	CTD_JR15001_S_075
30/10/2015	97	2	97DR1076	6.00	02:34	24	CTD_JR15001_S_076
30/10/2015	97	2	97DR2076	6.00	02:33	24	CTD_JR15001_S_076
30/10/2015	55	9	55DR1076	5.00	02:23	19	CTD_JR15001_S_076
30/10/2015	55	9	55DR2076	5.00	02:23	19	CTD_JR15001_S_076
30/10/2015	1	65	1DR1076	7.00	02:27	10	CTD_JR15001_S_076
30/10/2015	1	65	1DR2076	7.00	02:26	10	CTD_JR15001_S_076
30/10/2015	97	5	97NR1077	5.00	01:58	24	CTD_JR15001_S_077
30/10/2015	97	5	97NR2077	5.00	01:57	24	CTD_JR15001_S_077
30/10/2015	55	10	55NR1077	5.00	01:57	20	CTD_JR15001_S_077
30/10/2015	55	10	55NR2077	5.50	02:00	20	CTD_JR15001_S_077
30/10/2015	1	70	1NR1077	5.50	02:02	11	CTD_JR15001_S_077

30/10/2015	1	70	1NR2077	5.50	01:55	11	CTD_JR15001_S_077
31/10/2015	97	2	97DR1078	6.00	02:38	24	CTD_JR15001_S_078
31/10/2015	97	2	97DR2078	6.00	02:37	24	CTD_JR15001_S_078
31/10/2015	55	10	55DR1078	6.00	02:38	19	CTD_JR15001_S_078
31/10/2015	55	10	55DR2078	6.00	02:38	19	CTD_JR15001_S_078
31/10/2015	1	70	1DR1078	7.50	02:39	10	CTD_JR15001_S_078
31/10/2015	1	70	1DR2078	7.50	02:39	10	CTD_JR15001_S_078
31/10/2015	97	2	97NR1079	5.00	02:04	24	CTD_JR15001_S_079
31/10/2015	97	2	97NR2079	5.00	02:04	24	CTD_JR15001_S_079
31/10/2015	55	11	55NR1079	5.00	02:07	19	CTD_JR15001_S_079
31/10/2015	55	11	55NR2079	5.00	02:06	19	CTD_JR15001_S_079
31/10/2015	1	79	1NR1079	5.50	01:54	10,9	CTD_JR15001_S_079
31/10/2015	1	79	1NR2079	5.50	01:54	10,9	CTD_JR15001_S_079
02/11/2015	97	5	97DR1080	7.50	02:43	24	CTD_JR15001_S_080
02/11/2015	97	5	97DR2080	7.50	02:44	24	CTD_JR15001_S_080
02/11/2015	55	10	55DR1080	7.50	02:55	20	CTD_JR15001_S_080
02/11/2015	55	10	55DR2080	7.50	02:50	20	CTD_JR15001_S_080
02/11/2015	1	70	1DR1080	8.50	03:00	11	CTD_JR15001_S_080
02/11/2015	1	70	1DR2080	8.50	02:59	11	CTD_JR15001_S_080
02/11/2015	97	5	97NR1081	6.00	02:48	24	CTD_JR15001_S_081
02/11/2015	97	5	97NR2081	6.00	02:48	24	CTD_JR15001_S_081
02/11/2015	55	10	55NR1081	6.00	02:49	20	CTD_JR15001_S_081
02/11/2015	55	10	55NR2081	6.00	02:56	20	CTD_JR15001_S_081
02/11/2015	1	60	1NR1081	6.50	02:56	9	CTD_JR15001_S_081
02/11/2015	1	60	1NR2081	6.50	02:54	9	CTD_JR15001_S_081

CO incubations

1L of Seawater (collected as described above) from 1% and 97% light depths was incubated for 24hrs at sea temperature in the dark. Incubations were in triplicate and consisted of two treatments; addition

of 0.1% CO or no CO control for each depth. Incubations were carried out in blacked out 2L polycarbonate culture flasks stoppered with silicone bungs. CO was added and sampled using a syringe and needle through septa in the bung to maintain an airtight seal. CO was added at a 0.1% headspace concentration, CO levels were recorded using a hand held CO meter at 1hr after addition and at 24hrs.

After 24HR dark incubation, the flasks were un-stoppered and allowed to de-gas for 15min before the seawater was filtered on to 0.2µm cellulose nitrate membranes. Membranes were transferred using sterile forceps into 1.5mL autoclaved tubes containing 800µL of RNA Later (stops RNase activity) and stored at -80°C.

On return to the UK, RNA will be extracted from the filters and molecular probes used to determine bacterial CO oxidiser activity. RNA from the Incubations will be used to investigate: If *coxL* transcription is higher when incubated with CO? If there is a difference in *coxL* transcription between the 97% light depth and the 1% light depth?

Table 2: Samples from CO incubation experiments

Date	XP no.	Incubation Temp (°C)	Light (%)	Treatment	Depth (m)	Sample ID	Bottle no.	CTD ref	CO 0HR
20/09/2015	1	17	97	Control	2	XP197CONTA	23	CTD_JR15001_S_005	0
20/09/2015	1	17	97	Control	2	XP197CONTB	23	CTD_JR15001_S_005	0
20/09/2015	1	17	97	Control	2	XP197CONTC	23	CTD_JR15001_S_005	0
20/09/2015	1	17	97	0.1% CO	2	XP197COA	23	CTD_JR15001_S_005	17
20/09/2015	1	17	97	0.1% CO	2	XP197COB	23	CTD_JR15001_S_005	17
20/09/2015	1	17	97	0.1% CO	2	XP197COC	23	CTD_JR15001_S_005	17
20/09/2015	1	17	1	Control	86	XP11CONTA	8	CTD_JR15001_S_005	0
20/09/2015	1	17	1	Control	86	XP11CONTB	8	CTD_JR15001_S_005	0
20/09/2015	1	17	1	Control	86	XP11CONTC	8	CTD_JR15001_S_005	0
20/09/2015	1	17	1	0.1% CO	86	XP11COA	8	CTD_JR15001_S_005	17
20/09/2015	1	17	1	0.1% CO	86	XP11COB	8	CTD_JR15001_S_005	18
20/09/2015	1	17	1	0.1% CO	86	XP11COC	8	CTD_JR15001_S_005	23
05/10/2015	2	27	97	Control	2	XP297CONTA	23	CTD_JR15001_S_032	0
05/10/2015	2	27	97	Control	2	XP297CONTB	23	CTD_JR15001_S_032	0
05/10/2015	2	27	97	Control	2	XP297CONTC	23	CTD_JR15001_S_032	0
05/10/2015	2	27	97	0.1% CO	2	XP297COA	23	CTD_JR15001_S_032	23
05/10/2015	2	27	97	0.1% CO	2	XP297COB	23	CTD_JR15001_S_032	23
05/10/2015	2	27	97	0.1% CO	2	XP297COC	23	CTD_JR15001_S_032	23

05/10/2015	2	27	1	Control	78	XP21CONTA	7	CTD_JR15001_S_032	0
05/10/2015	2	27	1	Control	78	XP21CONTB	7	CTD_JR15001_S_032	0
05/10/2015	2	27	1	Control	78	XP21CONTC	7	CTD_JR15001_S_032	0
05/10/2015	2	27	1	0.1% CO	78	XP21COA	7	CTD_JR15001_S_032	23
05/10/2015	2	27	1	0.1% CO	78	XP21COB	7	CTD_JR15001_S_032	17
05/10/2015	2	27	1	0.1% CO	78	XP21COC	7	CTD_JR15001_S_032	21
13/10/2015	3	24	97	Control	2	XP397CONTA	24	CTD_JR15001_S_046	0
13/10/2015	3	24	97	Control	2	XP397CONTB	24	CTD_JR15001_S_046	0
13/10/2015	3	24	97	Control	2	XP397CONTC	24	CTD_JR15001_S_046	0
13/10/2015	3	24	97	0.1% CO	2	XP397COA	24	CTD_JR15001_S_046	24
13/10/2015	3	24	97	0.1% CO	2	XP397COB	24	CTD_JR15001_S_046	23
13/10/2015	3	24	97	0.1% CO	2	XP397COC	24	CTD_JR15001_S_046	23
13/10/2015	3	24	1	Control	74	XP31CONTA	8	CTD_JR15001_S_046	0
13/10/2015	3	24	1	Control	74	XP31CONTB	8	CTD_JR15001_S_046	0
13/10/2015	3	24	1	Control	74	XP31CONTC	8	CTD_JR15001_S_046	0
13/10/2015	3	24	1	0.1% CO	74	XP31COA	8	CTD_JR15001_S_046	17
13/10/2015	3	24	1	0.1% CO	74	XP31COB	8	CTD_JR15001_S_046	17
13/10/2015	3	24	1	0.1% CO	74	XP31COC	8	CTD_JR15001_S_046	23
21/10/2015	4	23	97	Control	2	XP497CONTA	24	CTD_JR15001_S_060	0
21/10/2015	4	23	97	Control	2	XP497CONTB	24	CTD_JR15001_S_060	0
21/10/2015	4	23	97	Control	2	XP497CONTC	24	CTD_JR15001_S_060	0
21/10/2015	4	23	97	0.1% CO	2	XP497COA	24	CTD_JR15001_S_060	28
21/10/2015	4	23	97	0.1% CO	2	XP497COB	24	CTD_JR15001_S_060	17
21/10/2015	4	23	97	0.1% CO	2	XP497COC	24	CTD_JR15001_S_060	17
21/10/2015	4	23	1	Control	160	XP41CONTA	8	CTD_JR15001_S_060	0
21/10/2015	4	23	1	Control	160	XP41CONTB	8	CTD_JR15001_S_060	0
21/10/2015	4	23	1	Control	160	XP41CONTC	8	CTD_JR15001_S_060	0
21/10/2015	4	23	1	0.1% CO	160	XP41COA	8	CTD_JR15001_S_060	23
21/10/2015	4	23	1	0.1% CO	160	XP41COB	8	CTD_JR15001_S_060	23
21/10/2015	4	23	1	0.1% CO	160	XP41COC	8	CTD_JR15001_S_060	22

28/10/2015	5	15	97	Control	2	XP597CONTA	24	CTD_JR15001_S_073	0
28/10/2015	5	15	97	Control	2	XP597CONTB	24	CTD_JR15001_S_073	0
28/10/2015	5	15	97	Control	2	XP597CONTC	24	CTD_JR15001_S_073	0
28/10/2015	5	15	97	0.1% CO	2	XP597COA	24	CTD_JR15001_S_073	23
28/10/2015	5	15	97	0.1% CO	2	XP597COB	24	CTD_JR15001_S_073	27
28/10/2015	5	15	97	0.1% CO	2	XP597COC	24	CTD_JR15001_S_073	23
28/10/2015	5	15	1	Control	77	XP51CONTA	10	CTD_JR15001_S_073	0
28/10/2015	5	15	1	Control	77	XP51CONTB	10	CTD_JR15001_S_073	0
28/10/2015	5	15	1	Control	77	XP51CONTC	10	CTD_JR15001_S_073	0
28/10/2015	5	15	1	0.1% CO	77	XP51COA	10	CTD_JR15001_S_073	23
28/10/2015	5	15	1	0.1% CO	77	XP51COB	10	CTD_JR15001_S_073	23
28/10/2015	5	15	1	0.1% CO	77	XP51COC	10	CTD_JR15001_S_073	23
01/11/2015	6	9	97	Control	2	XP697CONTA	24	CTD_JR15001_S_079	0
01/11/2015	6	9	97	Control	2	XP697CONTB	24	CTD_JR15001_S_079	0
01/11/2015	6	9	97	Control	2	XP697CONTC	24	CTD_JR15001_S_079	0
01/11/2015	6	9	97	0.1% CO	2	XP697COA	24	CTD_JR15001_S_079	17
01/11/2015	6	9	97	0.1% CO	2	XP697COB	24	CTD_JR15001_S_079	23
01/11/2015	6	9	97	0.1% CO	2	XP697COC	24	CTD_JR15001_S_079	17
01/11/2015	6	9	1	Control	79	XP61CONTA	10	CTD_JR15001_S_079	0
01/11/2015	6	9	1	Control	79	XP61CONTB	10	CTD_JR15001_S_079	0
01/11/2015	6	9	1	Control	79	XP61CONTC	10	CTD_JR15001_S_079	0
01/11/2015	6	9	1	0.1% CO	79	XP61COA	10	CTD_JR15001_S_079	17
01/11/2015	6	9	1	0.1% CO	79	XP61COB	10	CTD_JR15001_S_079	17
01/11/2015	6	9	1	0.1% CO	79	XP61COC	10	CTD_JR15001_S_079	17

Appendix: Underway sample log

Sample ID	Julian Day	Date and time (UT)	Lat (+ve N)	Lon (+ve E)	Flow rate (l)	TSG salinity	SST - hull (deg. C)	Trans (volts)	Fluor (volts)	Bench Salinity Sample ID	Salinity Reading	Ext Chla RFU	Chl-a (ug/l)	Comments
	258	15/09/2015 14:24												Underway switched on
AA	261	18/09/2015 12:23	49.7244	-5.2375	0.6085	35.2861	14.9968	0.71	1.14	1-1	35.4341	255.19	2.42	
AB	262	19/09/2015 10:06	47.8848	-10.4836	0.5122	35.6258	16.6483	0.83	0.70	1-2	35.6397	50.06	0.48	
AC	262	19/09/2015 16:09	47.2720	-11.4030	0.5961	35.5263	16.2457	0.81	0.68	1-3	35.5389	34.95	0.34	
AD	262	19/09/2015 19:58	46.9511	-11.9183	0.5711	35.6103	16.8319	0.83	0.65	1-4	35.6472	23.42	0.23	
AE	263	20/09/2015 10:00	45.8325	-13.6152	0.5863	35.6085	16.7338	0.82	0.62	1-5	35.619	46.68	0.45	
AF	263	20/09/2015 15:56	45.4407	-14.2059	0.5792	35.5953	17.1710	0.82	0.59	1-6	35.5942	30.08	0.29	
AG	263	20/09/2015 20:00	45.1086	-14.7133	0.5585	35.5214	16.8966	0.81	0.64	1-7	35.5138	43.70	0.41	
AH	264	21/09/2015 10:06	44.0067	-16.3420	0.5803	35.6984	17.5627	0.83	0.57	1-8	35.7056	40.55	0.39	
AI	264	21/09/2015 16:09	43.4787	-17.1166	0.5680	35.7535	18.3010	0.84	0.55	1-9	35.7757	16.14	0.16	
AJ	264	21/09/2015 19:56	43.0575	-17.7144	0.5632	35.7947	18.4016	0.83	0.55	1-10	35.8245	15.13	0.15	
AK	265	22/09/2015 10:01	41.7872	-19.4980	0.5663	35.8045	19.0229	0.84	0.54	1-11	35.8126	15.54	0.15	
AL	265	22/09/2015 15:58	41.3233	-20.1633	0.5885	35.8251	19.6554	0.83	0.52	1-12	35.8274	14.42	0.14	
AM	265	22/09/2015 19:46	40.9072	-20.7359	0.5865	35.9385	20.0969	0.84	0.51	1-13	35.9405	12.68	0.13	
AN	266	23/09/2015 10:08	39.4843	-22.6697	0.5165	36.1782	21.0555	0.84	0.50	1-14	36.1468	14.48	0.14	
AO	266	23/09/2015 16:00	38.9763	-23.3358	0.4775	36.2068	21.9919	0.84	0.50	1-15	36.226	11.18	0.11	
AP	266	23/09/2015 20:00	38.5432	-23.9218	0.4220	36.1792	22.1455	0.84	0.50	1-16	36.1888	10.72	0.11	
AQ	267	24/09/2015 10:00	37.6460	-26.0075	0.5180	36.1092	22.4314	0.84	0.50	1-17	36.1239	8.88	0.09	
AR	267	24/09/2015 16:00	37.4309	-27.0796	0.5197	35.9915	22.7730	0.84	0.50	1-18	36.0119	10.48	0.11	
AS	267	24/09/2015 20:08	37.2089	-28.1075	0.4751	36.1241	22.9814	0.84	0.50	1-19	36.1256	6.49	0.06	
AT	268	25/09/2015 10:00	36.5941	-31.0878	0.5307	36.3582	23.9337	0.84	0.23	1-20	36.3538	8.62	0.09	
AU	268	25/09/2015 16:00	36.3432	-32.2346	0.6678	36.4050	24.6811	0.84	0.34	1-21	36.409	6.63	0.07	
AV	268	25/09/2015 20:01	36.2466	-32.7610	0.5420	36.4304	24.7483	0.84	0.34	1-22	36.4408	6.33	0.06	

AW	271	28/09/2015 09:53	35.3050	-34.8805	0.3051	36.7056	25.2684	0.84	0.31	1-23	36.7028	6.70	0.07
AX	271	28/09/2015 16:03	34.8356	-35.7232	0.4973	36.8064	25.0908	0.84	0.35	1-24	36.8042	6.22	0.06
AY	271	28/09/2015 20:01	34.2139	-36.1606	0.4735	36.9384	25.9516	0.84	0.35	10-1	36.9398	3.30	0.03
AZ	272	29/09/2015 10:00	33.5747	-38.4352	0.4790	36.5649	25.4459	0.84	0.36	10-2	36.5637	6.43	0.06
BA	272	29/09/2015 16:00	32.9159	-39.2179	0.4644	36.7372	25.8428	0.84	0.35	10-3	36.7296	6.37	0.06
BB	273	30/09/2015 09:59	30.5034	-41.5394	0.4735	37.2351	26.3995	0.84	0.35	10-4	37.2339	4.05	0.03
BC	273	30/09/2015 15:57	29.8204	-42.2293	0.4547	37.1535	26.4501	0.84	0.35	10-5	37.1672	4.02	0.03
BD	273	30/09/2015 20:06	29.1856	-42.8200	0.4440	37.3243	26.8014	0.84	0.35	10-6	37.3546	2.64	0.02
BE	274	01/10/2015 09:58	27.7722	-41.5744	0.3699	37.4813	27.1491	0.84	0.35	10-7	37.532	3.59	0.03
BF	274	01/10/2015 16:01	27.2622	-40.7938	0.5680	37.3650	26.9076	0.84	0.35	10-8	37.3709	3.76	0.03
BG	274	01/10/2015 20:02	26.8119	-40.1035	0.5756	37.2729	27.0735	0.84	0.35	10-9	37.2651	3.56	0.03
BH	275	02/10/2015 09:58	25.4219	-38.0261	0.5395	36.7341	26.6579	0.84	0.35	10-10	36.8134	6.45	0.06
BI	275	02/10/2015 16:03	25.2837	-37.8049	0.5705	37.4181	27.4768	0.84	0.35	10-11	37.5127	6.80	0.07
BJ	275	02/10/2015 20:14	24.7832	-37.0424	0.5203	37.5722	27.5368	0.84	0.35	10-12	37.5662	4.10	0.03
BK	276	03/10/2015 10:02	23.3000	-34.8558	0.4461	37.0556	27.1965	0.84	0.35	10-13	37.0506	8.75	0.09
BL	276	03/10/2015 16:05	22.7651	-34.0749	0.4149	37.0807	27.4189	0.83	0.35	10-14	37.0849	10.09	0.10
BM	276	03/10/2015 20:21	22.2798	-33.3200	0.4296	37.1993	27.5760	0.83	0.35	10-15	37.175	5.90	0.06
BN	277	04/10/2015 10:00	20.8922	-31.2313	0.5868	36.9490	27.1779	0.83	0.35	10-16	36.9293	10.84	0.11
BO	277	04/10/2015 16:03	20.3998	-30.5208	0.5313	36.8720	27.9728	0.83	0.35	10-17	36.8898	12.79	0.12
BP	277	04/10/2015 20:07	20.0392	-29.9792	0.5076	36.8020	27.6943	0.83	0.35	10-18	36.793	8.76	0.09
BQ	278	05/10/2015 10:03	18.7639	-28.3707	-0.0081	36.4494	27.2705	0.83	0.35	10-19	36.4761	15.45	0.15
BR	278	05/10/2015 16:03	18.3251	-27.8783	0.5851	36.6161	27.5976	0.83	0.35	10-20	36.615	11.11	0.11
BS	278	05/10/2015 20:02	17.9264	-27.3867	0.5880	36.3556	27.2545	0.83	0.35	10-21	36.3479	12.28	0.13
BT	279	06/10/2015 09:58	16.7016	-25.8750	0.5821	36.3591	28.2574	0.83	0.35	10-22	36.3697	18.55	0.18
BU	279	06/10/2015 16:00	16.2349	-25.3282	0.5439	36.3535	28.1996	0.83	0.35	10-23	36.3517	23.60	0.23
BV	279	06/10/2015 20:59	15.7603	-24.7532	0.5198	36.3762	28.0129	0.82	0.35	10-24	36.3647	36.94	0.37
BW	281	08/10/2015 10:03	12.8522	-22.7013	0.5208	35.4081	29.1358	0.83	19.57	U2-1	35.3872	14.51	0.14
BX	281	08/10/2015 16:02	12.0238	-22.3798	0.5693	35.4655	29.8176	0.82	0.04	U2-2	35.4638	13.86	0.14
BY	281	08/10/2015 20:15	11.4144	-22.1379	0.6035	35.4455	29.6614	0.82	0.04	U2-3	35.4433	12.56	0.12
BZ	282	09/10/2015 10:02	9.0632	-21.2324	0.5996	35.5585	28.1298	0.82	0.04	U2-4	35.5538	12.29	0.12

CA	282	09/10/2015 15:59	8.2117	-20.8940	0.5948	35.4318	28.9008	0.82	0.05	U2-5	35.4668	18.63	0.19
CB	283	10/10/2015 09:55	4.9215	-19.6448	0.6166	35.0837	28.2097	0.83	0.04	U2-6	35.079	14.95	0.15
CC	283	10/10/2015 15:59	4.0849	-19.3051	0.6070	35.1136	28.0436	0.82	0.04	U2-7	35.1114	14.54	0.14
CD	283	10/10/2015 19:52	3.3629	-19.0170	0.5450	35.6426	27.5291	0.83	0.04	U2-8	35.6372	6.45	0.06
CE	284	11/10/2015 10:02	0.9841	-18.0463	0.4709	35.8683	26.8152	0.82	0.04	U2-9	35.8609	13.17	0.13
CF	284	11/10/2015 15:59	0.1676	-17.7257	0.4746	35.9671	26.4657	0.82	0.04	U2-10	35.9598	13.27	0.13
CG	284	11/10/2015 19:52	-0.5422	-17.4246	0.4680	36.0287	25.9614	0.82	0.04	U2-11	36.0204	9.47	0.09
CH	285	12/10/2015 10:00	-2.2507	-16.7482	0.4178	36.1790	25.3984	0.81	0.04	U2-12	36.1744	31.31	0.31
CI	285	12/10/2015 16:07	-3.0201	-16.4313	0.3830	36.1885	25.3361	0.81	0.04	U2-13	36.1835	16.50	0.16
CJ	285	12/10/2015 19:44	-3.5027	-16.2342	0.6339	36.1325	25.0180	0.80	0.05	U2-14	36.1268	25.97	0.26
CK	286	13/10/2015 09:58	-5.0544	-15.6000	0.5030	35.9576	24.5430	0.79	0.05	U2-15	35.9513	30.61	0.31
CL	286	13/10/2015 16:02	-5.6267	-15.3656	0.4994	35.9655	24.5564	0.78	0.05	U2-16	35.9606	22.55	0.22
CM	286	13/10/2015 19:50	-6.1113	-15.1649	0.4809	36.0416	24.5055	0.79	0.05	U2-17	36.0364	23.30	0.23
CN	287	14/10/2015 09:54	-7.6610	-14.5221	0.5678	36.1737	23.8124	0.79	0.04	U2-18	36.1689	22.14	0.22
CO	287	14/10/2015 15:35	-8.0606	-14.4222	0.4937	36.1418	23.9153	0.78	0.04	U2-19	36.1387	20.90	0.21
CP	292	19/10/2015 10:03	-10.8722	-17.3547	0.7056	36.6795	23.8742	0.75	0.04	U2-20	36.6749	7.45	0.07
CQ	292	19/10/2015 15:58	-11.3087	-17.7766	0.6450	36.6377	23.9566	0.76	0.04	U2-21	36.6332	7.57	0.07
CR	292	19/10/2015 19:58	-11.8410	-18.3301	0.6473	36.5700	24.0243	0.76	0.04	U2-22	36.5673	8.66	0.09
CS	293	20/10/2015 10:59	-13.6670	-20.1546	0.5049	36.9012	23.9293	0.77	0.04	U2-23	36.9019	6.15	0.06
CT	293	20/10/2015 16:58	-14.2084	-20.6974	0.6384	37.0261	24.2180	0.78	0.04	U2-24	37.0234	4.80	0.05
CU	293	20/10/2015 21:00	-14.7221	-21.2213	0.6439	37.0728	23.9894	0.78	0.04	U3-1	37.074	3.79	0.04
CV	294	21/10/2015 11:00	-16.3331	-22.8642	0.6144	37.0921	23.6645	0.78	0.04	U3-2	37.094	3.03	0.03
CW	294	21/10/2015 16:59	-16.8246	-23.3568	0.6090	37.1193	24.3778	0.78	0.04	U3-3	37.118	3.05	0.03
CX	294	21/10/2015 21:01	-17.4108	-23.9279	0.6302	37.1181	24.1155	0.78	0.04	U3-4	37.118	4.24	0.04
CY	295	22/10/2015 20:45	-18.9596	-25.1023	0.5639	37.1656	24.3394	0.82	0.04	U3-5	37.163	3.77	0.04
CZ	296	23/10/2015 11:00	-21.6163	-25.0868	0.6153	36.6885	23.1269	0.82	0.04	U3-6	36.683	4.34	0.04
DA	296	23/10/2015 17:00	-22.5276	-25.0835	0.5987	36.5740	23.2221	0.82	0.04	U3-7	36.570	4.67	0.05
DB	296	23/10/2015 21:01	-23.3620	-25.0857	0.6346	36.6996	22.7718	0.82	0.04	U3-8	36.704	3.83	0.04
DC	297	24/10/2015 11:00	-25.9628	-25.0393	0.6263	36.1254	20.7137	0.82	0.04	U3-9	36.106	6.56	0.06
DD	297	24/10/2015 16:59	-26.8284	-25.0508	0.6232	36.4135	21.0015	0.83	0.04	U3-10	36.410	9.04	0.09

DE	297	24/10/2015 21:03	-27.6185	-25.0155	0.6393	36.3464	20.9500	0.83	0.04	U3-11	36.306	13.71	0.14	
DF	298	25/10/2015 11:00	-29.2392	-25.9982	0.6001	35.9930	19.3196	0.83	0.04	U3-12	35.988	7.39	0.07	
DG	298	25/10/2015 17:00	-29.5167	-26.3532	0.6119	36.0170	19.3992	0.83	0.04	U3-13	36.013	6.68	0.07	
DH	298	25/10/2015 20:56	-29.7837	-26.6795	0.6024	36.1109	19.2690	0.84	0.04	U3-14	36.104	6.62	0.06	
DI	299	26/10/2015 11:00	-30.7155	-27.8227	0.5757	36.0354	18.7182	0.84	0.04	U3-15	36.029	11.37	0.11	
DJ	299	26/10/2015 16:59	-31.1116	-28.2608	0.5623	36.0300	18.7257	0.84	0.04	U3-16	36.027	13.31	0.13	
DK	299	26/10/2015 20:58	-31.5095	-28.7805	0.5973	36.0567	18.9469	0.84	0.04	U3-17	36.053	14.11	0.14	
DL	300	27/10/2015 10:57	-33.0407	-30.7046	0.5786	35.7209	16.9808	0.83	0.04	U3-18	35.718	46.69	0.47	
DM	300	27/10/2015 17:01	-33.5643	-31.3820	0.5602	35.6100	16.2969	0.82	0.04	U3-19	35.598	29.11	0.29	
DN	300	27/10/2015 21:00	-34.0974	-32.0603	0.5509	35.4933	15.9589	0.82	0.04	U3-20	35.491	36.04	0.36	
DO	301	28/10/2015 11:57	-35.9614	-34.4569	0.5727	35.5612	15.6354	0.83	0.04	U3-21	35.558	36.26	0.36	
DP	301	28/10/2015 18:00	-36.5570	-35.2023	0.5749	35.6580	15.7106	0.84	0.04	U3-22	35.650	31.12	0.31	
DQ	301	28/10/2015 22:10	-37.2229	-36.0996	0.5859	35.7921	15.9356	0.83	0.05	U3-23	35.787	50.38	0.50	
DR	302	29/10/2015 12:00	-39.3923	-38.9939	0.5167	35.6008	15.0559	0.82	0.04	U3-24	35.596	56.02	0.56	
DS	302	29/10/2015 18:02	-40.1371	-40.0035	0.5273	35.6979	15.4249	0.82	0.04	U4-1	35.703	62.38	0.62	
DT	302	29/10/2015 21:57	-40.6572	-40.7406	0.5302	35.4369	14.4142	0.81	0.05	U4-2	35.440	72.15	0.72	
DU	303	30/10/2015 12:00	-42.3812	-43.1839	0.5136	34.4711	10.3647	0.83	0.05	U4-3	34.470	28.77	0.29	
DV	303	30/10/2015 17:58	-42.8483	-44.0013	0.5024	34.5563	11.3776	0.82	0.05	U4-4	34.555	39.49	0.39	
DW	303	30/10/2015 21:59	-43.4505	-44.8028	0.5161	34.4647	9.8613	0.82	0.05	U4-5	34.465	31.55	0.31	
DX	304	31/10/2015 11:40	-45.2667	-47.3873	0.5020	34.4421	9.7856	0.81	0.04	U4-6	34.444	41.64	0.42	
DY	304	31/10/2015 17:58	-45.8812	-48.3244	0.5038	34.5000	9.7135	0.81	0.05	U4-7	34.491	37.82	0.38	
DZ	304	31/10/2015 22:00	-46.3527	-49.0578	0.5131	34.8097	10.0973	0.79	0.06	U4-8	34.773	53.79	0.54	
EA	305	01/11/2015 12:08	-47.3069	-50.6696	0.5167	35.0869	11.8504	0.80	0.05	U4-9	35.087	90.98	0.91	
EC	305	01/11/2015 17:58	-47.6588	-51.1704	0.5127	34.9869	11.3531	0.80	0.05	U4-10	34.973	57.47	0.57	
ED	305	01/11/2015 21:56	-47.9882	-51.6401	0.5091	34.7031	9.8116	0.79	0.05	U4-11	34.729	70.36	0.70	
EE	306	02/11/2015 12:57	-49.4792	-54.0208	0.4792	34.1148	4.6770	0.78	0.05	U4-12	34.114	56.12	0.56	
EF	306	02/11/2015 18:59	-49.9106	-54.7564	0.4905	34.0790	5.2559	0.78	0.04	U4-13	34.080	40.92	0.41	
		03/11/2015 11:00												Arrival to Falklands

Appendix: RIDGEMIX Mooring Deployment Report

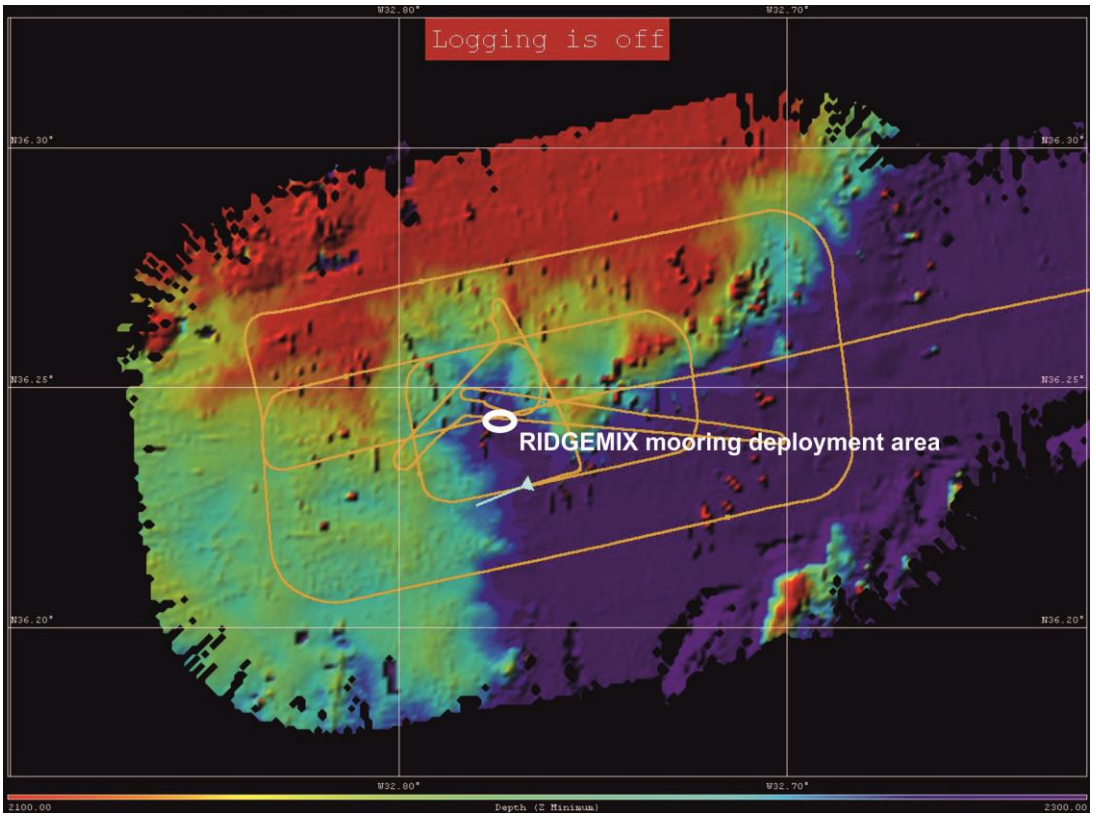
Paul Provost
Candice Cameron
Nick Rundle

Sensors & Moorings Group
National Marine Facilities Sea Systems

National Oceanography Centre

NATURAL ENVIRONMENT RESEARCH COUNCIL

Prior to the commencement of mooring operations the area of interest was surveyed using the hull mounted swath system to get an accurate topographical map of the seabed. From this map the mooring positions were assessed and determined.



The moorings were equipped with IXBlue Oceano 2500 acoustic releases (AR861), which were attached to the CTD frame on cast no.15, and a release test was performed at the expected deployment depth of 2200m. There are dual parallel releases on both moorings for redundancy. All moorings were deployed using the BAS direct-pull reeling winch system which was load-tested prior to commencement of operations. The moorings were deployed "top first, anchor-last", allowing the buoyancy to stream away from the vessel during deployment. Vessel speed varied between 0.5 and 1.5 knots during the mooring deployments.

Mooring deployment operations occurred on 26 September 2015 (Ridgemix 1 mooring) and 27 September 2015 (Ridgemix 2 mooring). All moorings were deployed from the aft deck of the RRS James Clark Ross by the National Marine Facilities team and the ship's crew.

The anchors for the instrumented moorings consisted of scrap eight-inch chain made up to the required dry weights.

The estimated final mooring anchor positions were determined from three independent ranging locations (triangulation) to the acoustic release. This required the ship to position itself approximately an ocean depth horizontally away from the likely location of the mooring. A transducer was deployed over the side of the ship and the slant range (distance) to the mooring was obtained. The calculated horizontal distance provided an estimate of the radius from the ship location within which the mooring was located. The cross-over of the range circles (the "cocked hat" method) provided an estimate of the location of the mooring. The estimated position given was the locus of the small area close to where the circles met.

There are inherent errors in the accuracy of the triangulation method which are a result of a number of factors such as variations in the speed of sound through the water column, the

relative positions of the GPS beacons and the transducer and the drift of the ship while the observations were being taken.

RIDGEMIX 1

The target for the Ridgemix 1 mooring was 36°14.625'N, 032°46.546'W in approximately 2280m of water. The mooring consisted of 35 RBR Solo T self logging thermistors, 6 RBR Duo TD self logging instruments, 4 SeaBird SBE37SMP MicroCAT CTD sensors, two TRDI 75 kHz Longer Ranger ADCPs rated to 1500m, one TRDI 75 kHz Longer Ranger ADCP rated to 3000m, two Flowquest 75 kHz ADCPs rated to 1500m. In addition, a Xenon light and Iridium locator beacon was attached at the top of the mooring, with a further Iridium locator beacon attached to the uppermost ADCP syntactic float at approximately 300m depth

Instrument/equipment	Serial number	Time (GMT) in water	Predicted depth (m from surface)	Sampling interval (seconds)
RBR Duo TD	50753	10:08	24	15
Xenon Flasher	W10-030	10:08	-	-
Iridium beacon	IMEI: 300234062982050	10:08	-	-
RBR Solo T	76492	10:08	28	15
RBR Solo T	76493		33	15
RBR Solo T	76494	10:09	38	15
RBR Solo T	76495		43	15
RBR Solo T	76496		48	15
RBR Duo TD	50752		53	15
RBR Solo T	76497		63	15
RBR Solo T	76498	10:18	73	15
RBR Solo T	76499		83	15
RBR Solo T	76500		93	15
RBR Duo TD	50751	10:27	103	15
RBR Solo T	76501		113	15
RBR Solo T	76502		123	15
RBR Solo T	76503		133	15
RBR Solo T	76504	10:37	142	15
RBR Solo T	76505	10:39	152	15
RBR Solo T	76506	10:40	162	15
RBR Solo T	76507	10:43	172	15
RBR Solo T	76508	10:44	183	15
RBR Solo T	76509		193	15
RBR Duo TD	50750	10:50	205	15
RBR Solo T	76510	10:54	255	15
TRDI 75kHz LRADCP (up)	10583	11:10	305	3600
Iridium beacon	IMEI: 300234062988050	11:10	-	-
SBE37SMP CTD	9395	11:10	305	300
RBR Solo T	76511	11:10	308	15
TRDI 75kHz LRADCP (down)	10584	11:10	309	3600
SBE37SMP CTD	9396	11:10	311	300
RBR Solo T	76512		352	15
RBR Solo T	76513	11:46	402	15
RBR Solo T	76514		452	15
RBR Duo TD	57049	11:55	503	15
RBR Solo T	76515	11:59	603	15
RBR Solo T	76516	12:03	703	15
RBR Solo T	76517	12:11	803	15

RBR Solo T	76518	11:18	902	15
RBR Solo T	76519		1002	15
RBR Solo T	76520		1102	15
RBR Solo T	76521		1202	15
SBE37SMP CTD	9397	12:50	1300	300
Flowquest 75kHz ADCP (up)	11626	12:50	1302	3600
Flowquest 75kHz ADCP (down)	15951	12:50	1303	3600
RBR Solo T	72067	12:50	1304	15
RBR Duo TD	50748	13:00	1394	15
RBR Solo T	72068	13:09	1598	15
RBR Solo T	72069	13:15	1799	15
SBE37SMP CTD	9398	13:30	1901	300
TRDI 75kHz LRADCP (up)	20676	13:30	1901	3600
RBR Solo T	72070	13:37	2005	15
RBR Solo T	72071	14:43	2197	15
IXBlue AR861 release	1501	14:45	2208	-
IXBlue AR861 release	1918	14:45	2208	-

The mooring operation began at 10:08 GMT on 26 September 2015 with the deployment of the pickup float. The attachment of instruments, buoyancy, releases and chain continued until 13:45 GMT, after which time the mooring had been streamed and ship had travelled 5.1km.

The plastic jacket on the wire just beneath the first set of ADCPs at approximately 350m was damaged by friction due to the wire digging into itself on the drum. The areas where the plastic coating was damaged was wiped clean and wrapped in self amalgamating tape, to prevent water ingress through the jacket, followed by a top layer of PVC electrical tape, for added protection. The wire was continually monitored for further damage which may have occurred in deeper layers on the drum.

The Aft gantry suffered a hydraulic leak during the deployment, whilst this was repaired the deployment of the mooring was stopped and the ship slowed to prevent over-running the mooring target position. The repair to the gantry did not significantly affect the deployment time.

Once the mooring had been streamed, the ship towed the mooring a further 1.8km until the deployment position of 36°14.654'N, 032°46.862'W was reached at 14:45 GMT when the anchor was released. This was approximately 470 m beyond the target position to allow for fall-back. The anchor took 15 minutes to reach the seabed after it released and this was tracked by acoustic ranging on the releases. The estimated final mooring anchor position was 36°14.680'N, 032°46.670'W. The estimated mooring location was 211m in a direction of 299°T from the target location. The mooring fall back was approximately 290m.

Moored instrumentation

The recovery cruise for the moorings is planned to finish on 4 July 2016, this gives approximately 300 days for data collection. All instruments were programmed prior to deployment to maximise data resolution during the planned deployment time using the manufacturers provided software to make best use of the calculated battery power and memory capacity available. In all cases the battery power capacity was the limiting factor.

RBR Solo T

There were 35 RBR Solo T sensors deployed along the mooring at 5m intervals in the top 50m of the water column, 10m intervals in the top 50 to 200m of the water column, 50m intervals in the upper 200 to 500m of the water column, 100m intervals between 500 and 1400m and 200m intervals from 1400m to the seabed. All 35 instruments were set-up with identical parameters and were programmed to start at 10:00 on 26 September 2015 and to take measurements continuously every 15s thereafter. The loggers were clamped to the wire using two Jubilee clips with added PVC tape for protection.

RBR Duo TD

There were six RBR Duo TD sensors measuring temperature and pressure deployed along the mooring at intervals of 0m, 50m, 100m, 200m, 500m and 1400m from the top of the mooring. All six instruments were set-up with identical parameters and were programmed to start at 10:00 on 26 September 2015 and to take measurements continuously every 15s thereafter. The loggers were clamped to the wire using two specifically made clamps for the instrument and wire diameter.

Sea Bird SBE37SMP CTD

There were four SeaBird SBE37SMP MicroCAT CTD sensors deployed on the moorings positioned as close as possible to each ADCP to measure temperature, pressure and conductivity. All four instruments were set-up with identical parameters and were programmed to start at 10:00 on 26 September 2015 and to take measurements continuously at five minute (300s) intervals thereafter. Three of the MicroCAT sensors were mounted within the syntactic floatation for the ADCPs, the fourth was clamped on the wire 1m below the ADCP transducer (s/n 9396).

SBE37SMP (s/n)	75kHz ADCP (s/n)	Relative distance of CTD from transducer face (m)
9395	10583	0
9396	10584	-1
9397	11626	-3
9397	15951	-4
9398	20676	0

TDRI 75kHz LRADCP

All three TRDI 75kHz ADCPs were set-up with identical parameters shown below and mounted in specially designed syntactic floatation:

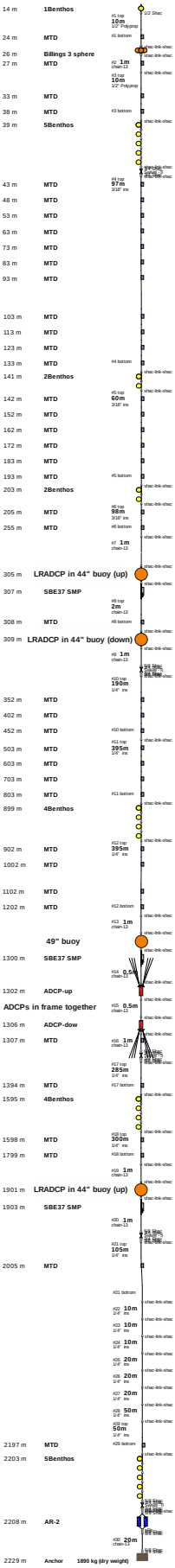
Blank Distance:	704cm
Bin cell size:	800cm
Max working distance:	74 bins
Ensemble Interval:	3600s
Pings per ensemble:	50
Ping Interval:	72s
Radial ambiguity velocity:	175 cm/s
Standard deviation:	2.07cm/s
Start time:	18:00 on the 25 September 2015

Flowquest 75kHz ADCP

Both Flowquest 75kHz ADCPs were setup with identical parameters shown below and mounted side by side in a dual clamping frame:

Blank Distance:	380cm
Bin cell size:	800cm

Max working distance:	600m
Ensemble Interval:	3600s
Pings per ensemble:	150
Ping Interval:	20s
Start time:	09:20 on the 26 September 2015


14 m 1Benthos
#1 top
10m
1/2" Polyprop
24 m MTD
#1 bottom
26 m Billings 3 sphere
27 m MTD
#2 1m
chain-13
#3 top
10m
1/2" Polyprop
33 m MTD
38 m MTD
#3 bottom
39 m 5Benthos
43 m MTD
#4 top
97m
3/16" ins
48 m MTD
53 m MTD
63 m MTD
73 m MTD
83 m MTD
93 m MTD
103 m MTD
113 m MTD
123 m MTD
133 m MTD
#4 bottom
141 m 2Benthos
142 m MTD
#5 top
60m
3/16" ins
152 m MTD
162 m MTD
172 m MTD
183 m MTD
193 m MTD
#5 bottom
203 m 2Benthos
205 m MTD
#6 top
98m
3/16" ins
255 m MTD
#6 bottom
#7 1m
chain-13
305 m LRADCP in 44" buoy (up)
307 m SBE37 SMP
#8 top
2m
chain-13
308 m MTD
#8 bottom
309 m LRADCP in 44" buoy (down)
#9 1m
chain-13
#10 top
190m
1/4" ins
352 m MTD
402 m MTD
452 m MTD
#10 bottom
#11 top
395m
1/4" ins
503 m MTD
603 m MTD
703 m MTD
803 m MTD
#11 bottom
899 m 4Benthos
#12 top
395m
1/4" ins
902 m MTD
1002 m MTD
1102 m MTD
1202 m MTD
#12 bottom
#13 1m
chain-13
49" buoy
1300 m SBE37 SMP
#14 0.5m
chain-13
1302 m ADCP-up
ADCPs in frame together
#15 0.5m
chain-13
1306 m ADCP-dow
1307 m MTD
#16 1m
chain-13
#17 top
285m
1/4" ins
1394 m MTD
#17 bottom
1595 m 4Benthos
#18 top
300m
1/4" ins
1598 m MTD
1799 m MTD
#18 bottom
#19 1m
chain-13
1901 m LRADCP in 44" buoy (up)
1903 m SBE37 SMP
#20 1m
chain-13
#21 top
105m
1/4" ins
2005 m MTD
#21 bottom
#22 10m
1/4" ins
#23 10m
1/4" ins
#24 10m
1/4" ins
#25 20m
1/4" ins
#26 20m
1/4" ins
#27 20m
1/4" ins
#28 50m
1/4" ins
#29 top
50m
1/4" ins
2197 m MTD
#29 bottom
2203 m 5Benthos
2208 m AR-2
#30 20m
chain-13
2229 m Anchor 1890 kg (dry weight)

RIDGEMIX 2

The target for the RIDGEMIX 2 mooring was 36°13.710'N, 32°46.307'W in approximately 2273m of water. The mooring consisted of a single Webb Research Apex float, which was programmed to profile in the upper 1000m of the water column whilst tethered to the mooring, with an integrated Satlantic Suna nitrate sensor and AADI Optode.

The Apex and Suna was programmed to perform one profile every three days. Prior to deployment the Apex float was switched on using the magnetic reed switch and the internal pump could be heard operating whilst the bladder was observed to inflate.

Instrument/equipment	Serial number	Time (GMT) in water	Predicted depth (m from surface)
Apex Float	7237	10:23	20 - 1135
Satlantic Suna	483		
IXBlue AR861 release	685	11:58	2218
IXBlue AR861 release	1468	11:58	2218

The mooring operation began at 09:53 GMT on 27 September 2015 with the deployment of the pickup float. The attachment of Apex float, buoyancy, releases and chain continued until 11:15 GMT.

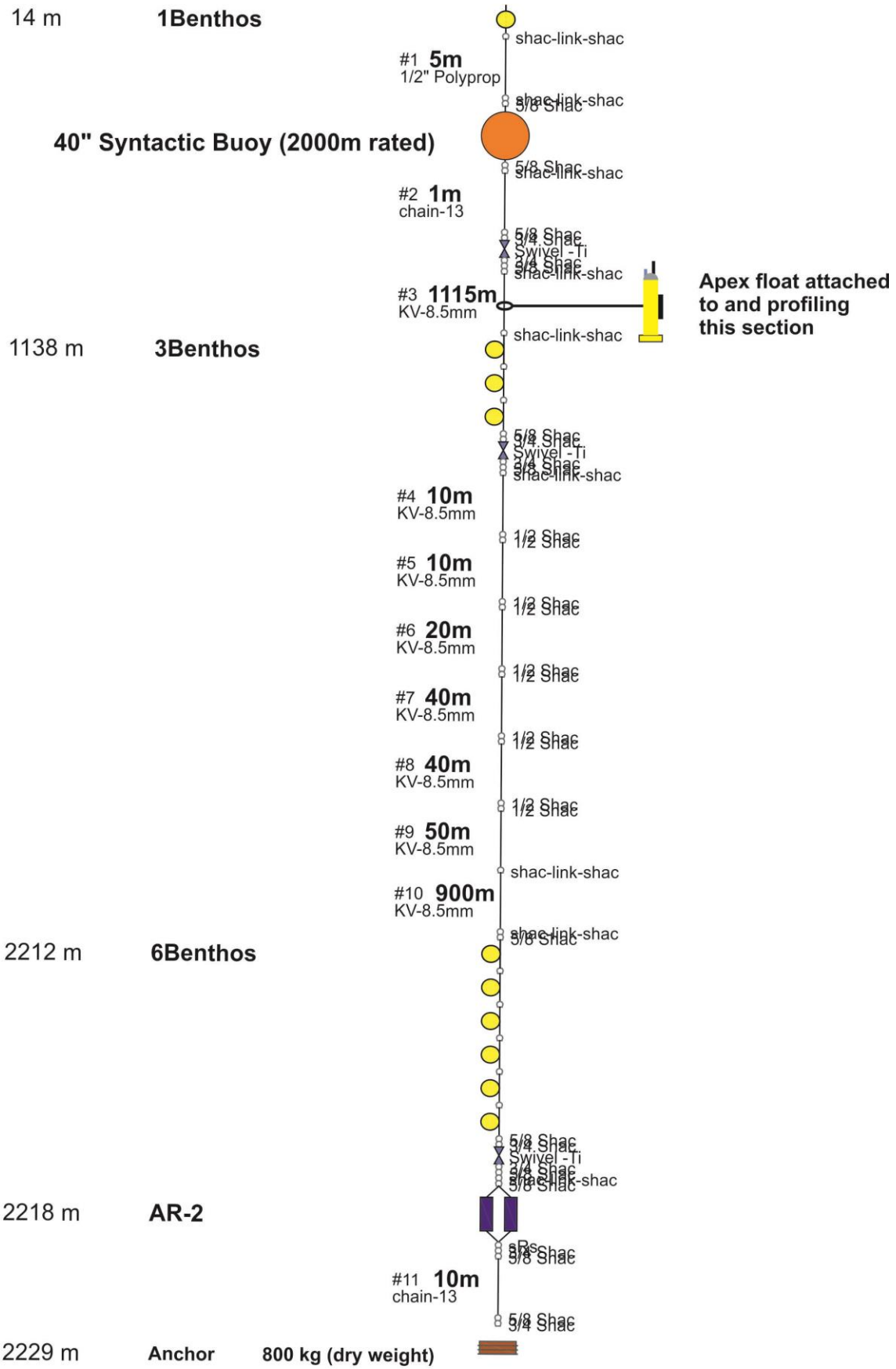
The float was attached to the mooring by a 1m length of 10mm neutrally buoyant Dynema rope. At one end this was attached to the Apex float using the deployment collar and at the other a 120mm eye was spiced in the rope tether that would allow it to freely move up and down the 1115m section of Dynema mooring rope. The float was attached to the mooring line once the 1115m rope had been paid out, whilst stopped off before the three glass spheres were installed. After which the remaining mooring deployment continued.

The Apex float was seen to float freely along the mooring line once it had been carefully lowered into the sea along the mooring line from the stern of the vessel. Once all of the mooring rope had been streamed after 90 minutes (travelling 3.9km), the ship towed the mooring a further 1.1km until the deployment position of 36°13.568'N 032°46.549'W was reached at 11:58 GMT at which point the anchor was released. This was approximately 450 m beyond the target position to allow for fall-back.

The anchor took 16 minutes to reach the seabed after it released and this was tracked by acoustic ranging on the releases.

The estimated final mooring anchor position was 36°13.632'N, 032°46.458'W. The estimated mooring location was 269m in a direction of 237°T from the target location. The mooring fall back was approximately 180m.


Apex float
Rope tether
Mooring line


14 m
1Benthos
shac-link-shac
#1 5m
1/2" Polyprop
shac-link-shac
3/8 Shac
40" Syntactic Buoy (2000m rated)
5/8 Shac
shac-link-shac
#2 1m
chain-13
5/8 Shac
3/4 Shac
Swivel -Ti
3/4 Shac
shac-link-shac
#3 1115m
KV-8.5mm
Apex float attached to and profiling this section
shac-link-shac
1138 m
3Benthos
5/8 Shac
3/4 Shac
Swivel -Ti
3/4 Shac
shac-link-shac
#4 10m
KV-8.5mm
1/2 Shac
1/2 Shac
#5 10m
KV-8.5mm
1/2 Shac
1/2 Shac
#6 20m
KV-8.5mm
1/2 Shac
1/2 Shac
#7 40m
KV-8.5mm
1/2 Shac
1/2 Shac
#8 40m
KV-8.5mm
1/2 Shac
1/2 Shac
#9 50m
KV-8.5mm
shac-link-shac
#10 900m
KV-8.5mm
shac-link-shac
3/8 Shac
2212 m
6Benthos
5/8 Shac
3/4 Shac
Swivel -Ti
3/4 Shac
shac-link-shac
3/8 Shac
2218 m
AR-2
3/8 Shac
#11 10m
chain-13
5/8 Shac
3/4 Shac
2229 m
Anchor
800 kg (dry weight)

Appendix: SOG Mooring Recovery & Deployment Report

Candice Cameron

Sensors & Moorings Group
National Marine Facilities Sea Systems

On Thursday 22nd October 2015 the objective was to first deploy a replacement SOG mooring before recovering that deployed 19th October 2014 at 18 32.70'S 25 05.75'W. The chosen target position for deployment of the SOG 2015 mooring was 18 30.000'S 25 00.0000'W. This was the position of the pre-dawn AMT CTD on the day and 6.1Nmi from the 2014 mooring.

The moorings were deployed/ recovered from the aft deck of the RRS James Clark Ross by the National Marine Facilities team and the ship's crew.

SOG 2015 DEPLOYMENT

The mooring consisted of two sediment traps and two downward looking current meters. A Xenon light was attached at to the billings float at the top of the mooring.

Instrument/equipment	Serial number	Time (GMT) in water
ST400A Xenon Light	W06-005	09:06
Sediment Trap	11262-03	09:22
AQD Current Meter	9960	09:22
Sediment Trap	12168-04	09:30
AQD Current Meter	9976	09:30
IXBlue AR861 release	830	10:50

The mooring operation began at 09:06 GMT on 22 October 2015 with the deployment of the pickup float.

Once the mooring had been streamed the anchor was released at 10:58 at 18 29.9472' S - 24 59.8968' W in approximately 5393m of water. The mooring was released prior to reaching the target position as time was a priority and location was not critical as long as we were in within the gyre as we were. The anchor took 60 minutes to reach the seabed after it released and this was tracked by acoustic ranging on the release. The estimated final mooring anchor position was 18°30.0785'N, 25°00.2050'W.

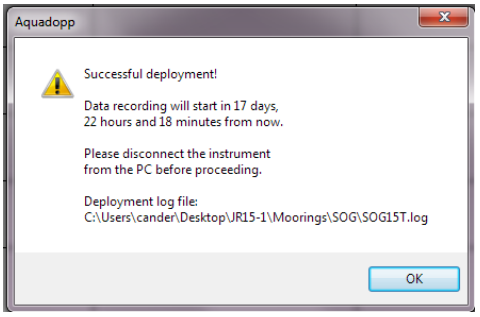
Moored instrumentation

The sediment traps were provided pre-configured. The AQD's were programmed as below and in such a way to maximise data resolution during deployment time using the manufacturers provided software to make best use of the calculated battery power and memory capacity available. In all cases the battery power capacity was the limiting factor.

AQD9960:

Beneath top sediment trap – SN11262-03. Down looking.

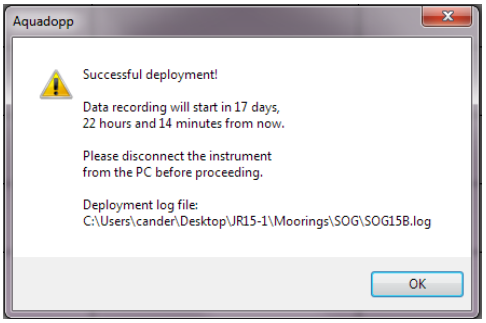
Deployment	SOG_15
Current time	01/10/2015 13:41
Start at	19/10/2015 12:00
Comment	-
Measurement interval (s)	1800
Average interval (s)	60
Blanking distance (m)	0.37
Measurement load (%)	4
Power level	HIGH
Diagnostics interval (min)	720
Diagnostics samples	20
Compass upd. Rate (s)	900
Coordinate System	ENU
Speed of sound (m/s)	MEASURED
Salinity (PPT)	35
Analog input 1	NONE
Analog input 2	NONE
Analog input power out	DISABLED
File wrapping	OFF
Serial output/TellTale	OFF
Assumed duration (days)	365
Battery utilization (%)	105
Battery level (V)	13.7
Recorder size (MB)	9
Recorder free space (MB)	8.973
Memory required (MB)	1
Vertical vel. prec (cm/s)	1.4
Horizon. vel. prec (cm/s)	0.9
Instrument ID	AQD 9960
Head ID	A6L 5227
Firmware version	3.37
quadopp Version 1.30	
Copyright (C) Nortek AS	



AQD9976:

Beneath bottom sediment trap – SN12168-04. Down looking.

Deployment	SOG_15B
Current time	01/10/2015 13:45
Start at	19/10/2015 12:00
Comment	-
Measurement interval (s)	1800
Average interval (s)	60
Blanking distance (m)	0.37
Measurement load (%)	4
Power level	HIGH
Diagnostics interval (min)	720
Diagnostics samples	20
Compass upd. Rate (s)	900
Coordinate System	ENU
Speed of sound (m/s)	MEASURED
Salinity (PPT)	35
Analog input 1	NONE
Analog input 2	NONE
Analog input power out	DISABLED
File wrapping	OFF
Serial output/TellTale	OFF
Assumed duration (days)	365
Battery utilization (%)	105
Battery level (V)	13.7
Recorder size (MB)	9
Recorder free space (MB)	8.973
Memory required (MB)	1.3
Vertical vel. prec (cm/s)	1.4
Horizon. vel. prec (cm/s)	0.9
Instrument ID	AQD 9976
Head ID	A6L 5242
Firmware version	3.37
Aquadopp Version 1.30	
Copyright (C) Nortek AS	



The estimated final mooring anchor positions were determined from three independent ranging locations (triangulation) to the acoustic release. This required the ship to position itself approximately an ocean depth horizontally away from the likely location of the mooring. A transducer was deployed over the side of the ship and the slant range (distance) to the mooring was obtained. The calculated horizontal distance provided an estimate of the radius from the ship location within which the mooring was located. The cross-over of the range circles (the "cocked hat" method) provided an estimate of the location of the mooring. The estimated position given was the locus of the small area close to where the circles met.

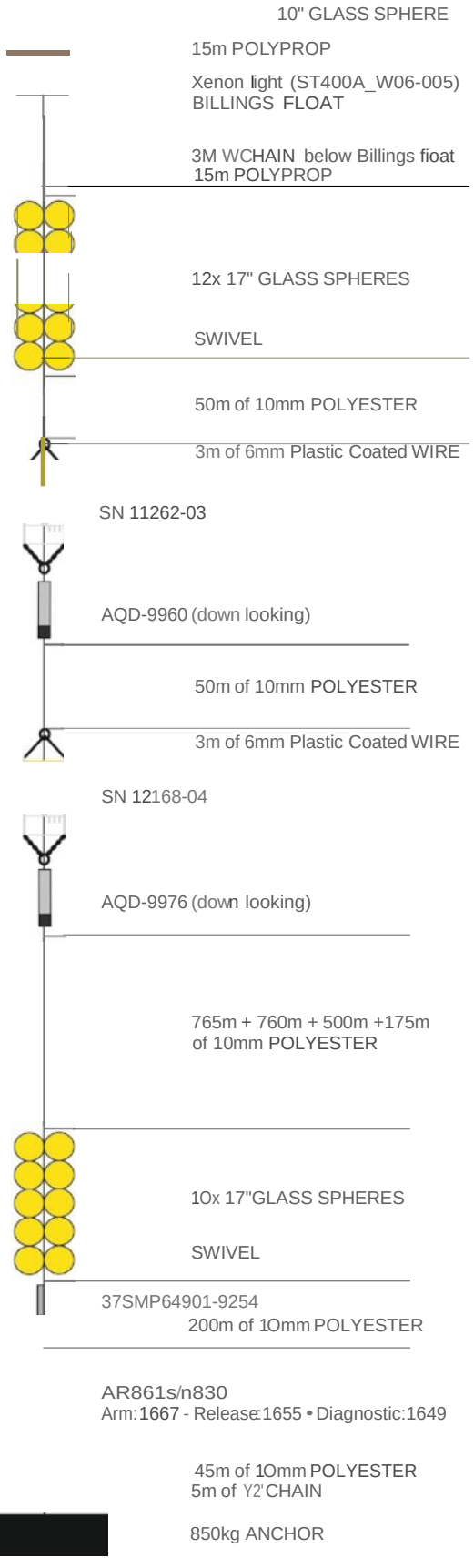
There are inherent errors in the accuracy of the triangulation method which are a result of a number of factors such as variations in the speed of sound through the water column, the relative positions of the GPS beacons and the transducer and the drift of the ship while the observations were being taken.

The mooring was equipped with a previously tested IXBlue Oceano 2500 acoustic release (AR861). The mooring was deployed using the BAS direct-pull reeling winch system which was load-tested prior to commencement of operations. The mooring was deployed "top first, anchor-last", allowing the buoyancy to stream away from the vessel during deployment. Vessel speed varied between 0.5 and 1.0 knots during the mooring deployment.

The anchor for the mooring consisted of scrap eight-inch chain made up to the required dry weight of 850kg.

SOG DEPLOYED
22/10/2015
JR15001

Triangulated position:
18° 30.0771'S
25° 00.2080 W



10" GLASS SPHERE
09:06GMT
15m POLYPROP
Xenon light (ST400A_W06-005)
BILLINGS FLOAT
shackle - link - shackle
3M WCHAIN below Billings float
15m POLYPROP
shackle - link - shackle
12x 17" GLASS SPHERES
2 packs of 6 to be joined
shackle - link - shackle,
swivelbeneath
SWIVEL
shackle - link - shackle
50m of 10mm POLYESTER
shackle - link - shackle
3m of 6mm Plastic Coated WIRE
SEDIMENT TRAP
SN 11262-03
09:22GMT
CURRENT METER
AQD-9960 (down looking)
shackle - link - shackle
50m of 10mm POLYESTER
shackle - link - shackle
3m of 6mm Plastic Coated WIRE
SEDIMENT TRAP
SN 12168-04
09:30GMT
CURRENT METER
AQD-9976 (down looking)
shackle - link - shackle
765m + 760m + 500m +175m
of 10mm POLYESTER
Mid rope sections to be
joined shackle - shackle
shackle - link - shackle
10x 17"GLASS SPHERES
2 packs of 4+6 to be joined
shackle - link - shackle,
swivelbeneath
SWIVEL
shackle - link - shackle
SBE37 2m below buoyancy
MOOREDCTD
37SMP64901-9254
200m of 10mm POLYESTER
09:41GMT
shackle - link - shackle
ACOUSTIC RELEASE
AR861s/n830
Arm:1667 - Release:1655 • Diagnostic:1649
10:50GMT
release link - shackle
45m of 10mm POLYESTER
5m of Y2' CHAIN
10:58GMT
850kg ANCHOR
All shackles to be lighted witr
shifter & seized with cable tie

WATER DEPTH 5393 m

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SOG 2014 RECOVERY

Once the deployment and triangulation of the 2015 mooring was complete the 2014 mooring was ranged at 5740m from 18°31.8102'N 25°06.4926'W. Communication with the release having been confirmed the release command was sent and tracking of the mooring to ensure its ascent was begun:

Date	Time (GMT)	Range 1 (m)	Range 2 (m)	Comment/ ascent rate
22/10/2015	15:07	5690.6	5687.6	Tracking ascent begun
22/10/2015	15:08	5671.9	5667.4	18.7m/min
22/10/2015	15:09	5647.2	5642.7	24.7 m/min
22/10/2015	15:14	5525	5523.5	24.4 m/min
22/10/2015	15:19	5406.2	5402.9	23.8 m/min
22/10/2015	15:24	No Answer	No Answer	
22/10/2015	15:25	5263	5259.9	23.9 m/min
22/10/2015	15:30	5143	5140.4	24.0 m/min
22/10/2015	15:35	5023	5025.6	24.0 m/min
22/10/2015	15:40	4915.1	4912	21.6 m/min
22/10/2015	15:45	4804.1	4800.7	22.2 m/min
22/10/2015	15:50	4691.4	4688.5	22.5 m/min
22/10/2015	15:55	4583	4580	21.7 m/min
22/10/2015	16:00	4481.3	4478.4	20.3 m/min
22/10/2015	16:05	4383.1	4380.6	19.6 m/min
22/10/2015	16:10	4288.2	4285.6	19.0 m/min
22/10/2015	16:15	4193.1	4190.9	19.0 m/min
22/10/2015	16:20	4104	No Answer	17.8 m/min
22/10/2015	16:25	4017.1	4014.8	17.4 m/min
22/10/2015	16:30	3932.4	3930	16.9 m/min
22/10/2015	16:35	3851	3850.2	16.3 m/min
22/10/2015	16:40	3784.8	No Answer	Signal from VHF detected. 2170m 130^{o} off starboard bow.

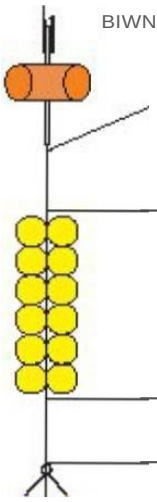
The ascent rate was a lot slower than that anticipated and hence it was suspected the some buoyancy form the mooring had been lost possibly as a result of some yellow sphere's imploding.

Once the mooring had been sighted at the surface the vessel moved to a suitable recovery position. At 17:15 position 18^{o}33.1236' S 25^{o}5.7726' W the recovery line was hooked and recovery commenced.

JR15001 SAG RECOVERY
22/10/2015

Re<:overy begun at:
18"33.1236' S 25°5.7726' W

SAG Deployod 1911012014
position.
18"" 32.70'5 25 05.75'W



BIWNGS Fl.OAT WfTH VHF (sin1MJ6.001- 151t62:5U-Iz)

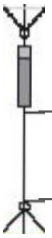
REOOVERY UNE — 17:15GMT

3M · OiA FR<»-1 BOTTOM OF BIWNGS
15m REDIBt.ACKPOlYPROP

12GIASS SPHERES
swrva

50mPOLYESTER

SB>IMelTTRAP — SIN:12283-01



CLRRENTMETER — SIN:9972 — 17:30GMT

50m POlVESTER

SB>IMENT TRN> — SIN:12168-03

CURRENT METER — SIN:9979 — 17:36GMT

2x2IDn + 3x500m + 1x 200m
POlYESIER

10 GIASS SPHERES
SWIVR

SBE37SMP
SIN:7300

200mPOLYESTER

AR861 SIN: 1610
ARM REL
OA67 OASS — 18:30GMT

45m POlVESTER
5m'CHAIN

850kgANOIOR

WATER 5259m

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Upon recovery it was discovered that the bottom 10 glass spheres had imploded and hence confirmed the cause of slow ascent rate. The reduction in buoyancy probably means that instruments were sat lower in the water column than expected and possibly the lower ones on the sea bed. This will need to be investigated upon data interrogation.

Imploded buoyancy spheres from SOG2014

Samples were collected from the sediment traps as soon as possible after mooring operations were complete:

SAG 2014 Sediment Sample Log.

Samples for both traps were collected starting at the funnel and following the direction of the arrow above bottles i.e anti-clockwise when standing closest to the funnel.

SN12168-03 (White Lids)

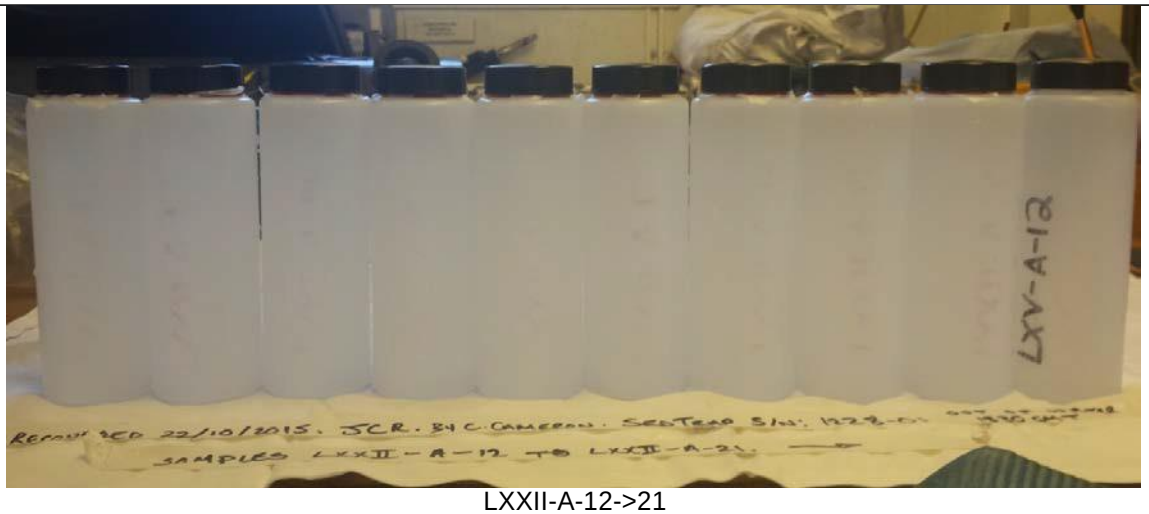
Bottle	Comments
LXXII-B-11	Beneath funnel
LXXII-B-10	
LXXII-B-9	
LXXII-B-8	
LXXII-B-7	
LXXII-B-6	
LXXII-B-5	
LXXII-B-4	
LXXII-B-3	
LXXII-B-2	
LXXII-B-1	
-	Gap opposite funnel
LXXII-B-21	No o-ring on bottle or left in trap
LXXII-B-20	
LXXII-B-19	
LXXII-B-18	
LXXII-B-17	
LXXII-B-16	
LXXII-B-15	
LXXII-B-14	
LXXII-B-13	
LXXII-B-12	

SN1228-01 (Black Lids)

Bottle	Comments
LXXII-A-11	Beneath funnel
LXXII-A-10	
LXXII-A-9	
LXXII-A-8	
LXXII-A-7	
LXXII-A-6	
LXXII-A-5	
LXXII-A-4	
LXXII-A-3	
LXXII-A-2	
LXXII-A-1	
-	Gap opposite funnel
LXXII-A-21	No o-ring on bottle or left in trap
LXXII-A-20	
LXXII-A-19	
LXXII-A-18	
LXXII-A-17	
LXXII-A-16	
LXXII-A-15	
LXXII-A-14	
LXXII-A-13	
LXXII-A-12	

Sediment Trap SN1228-01:

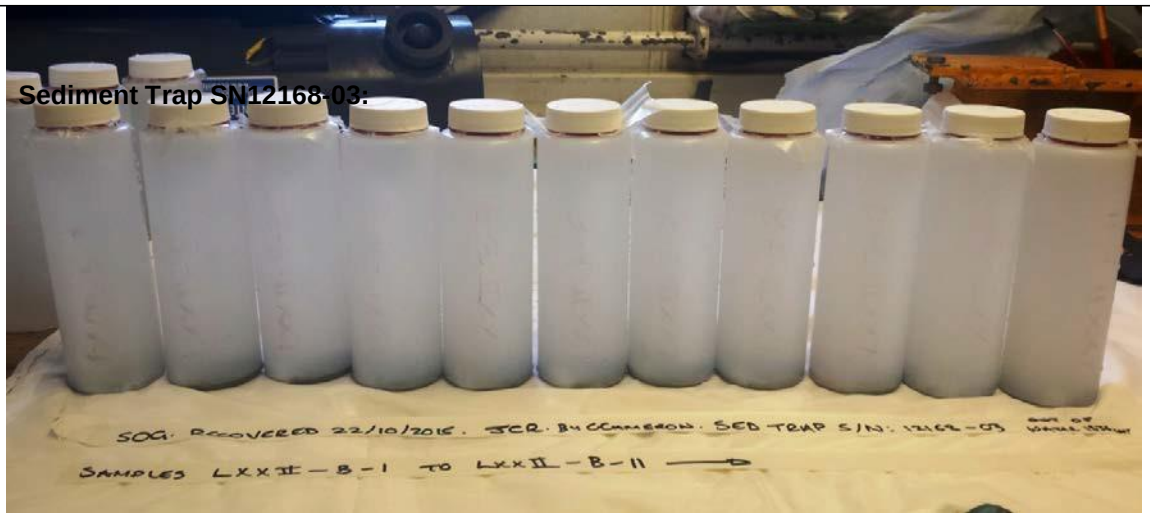
LXXII-A-1->11



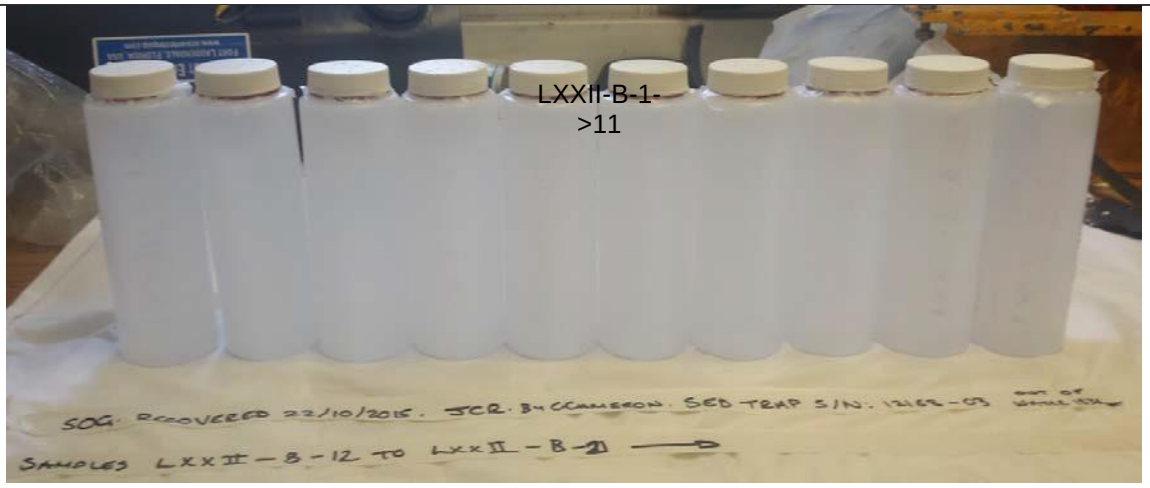
LXXII-A-12->21

Boxed Samples

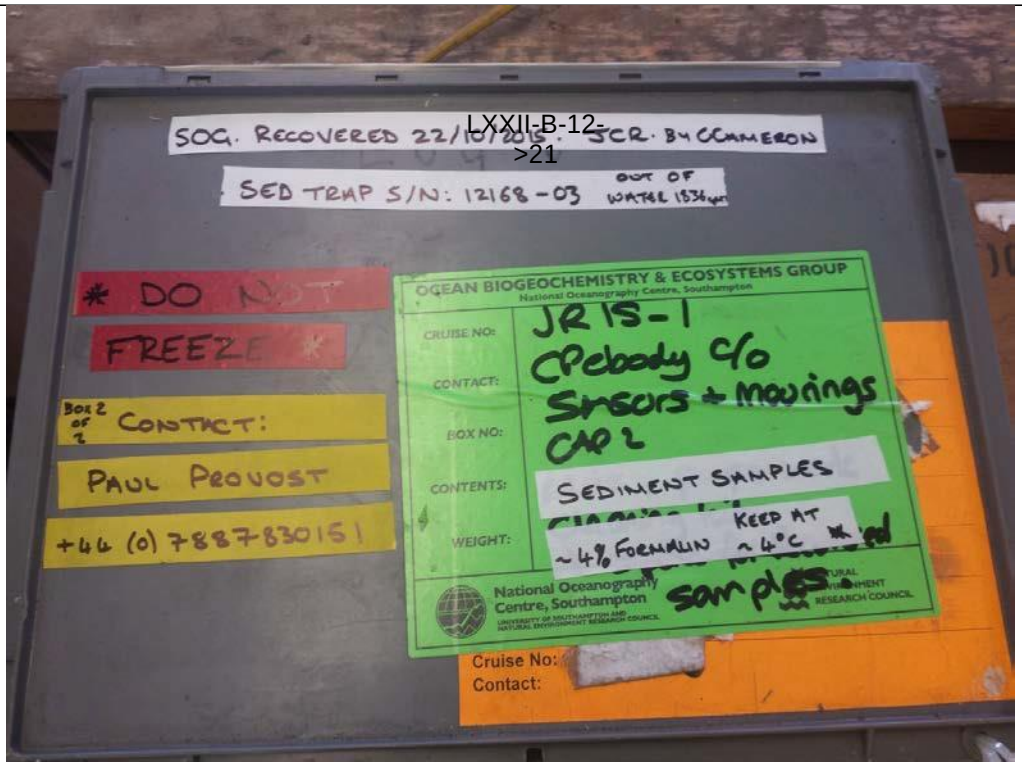
Sediment Trap SN12168-03:



LXXII-B-1->11



LXXII-B-12->21



Appendix: Autosal Report

Candice Cameron

Sensors & Moorings Group
National Marine Facilities Sea Systems

The Autosal used belonged to the British Antarctic Survey but was operated by NMFSS technicians. Details as below:

Guildline Autosal 8400B
SN: 63360
Serviced: April 2015
Aligned: April 2015

From the outset of the cruise there were temperature stability issues within the lab in which the Autosal was situated. In order to ensure greatest data accuracy operating guidelines recommend a room temperature of +/-1^{o}C to which the bath temperature is set. Due to the room not being a dedicated temperature controlled lab it was subject to fluctuations of the ships air-conditioning system and additionally the room was used as access between labs. By stopping through-access, and having the ship's engineers divert one compressor was to control temperature in the labs only as well as installing a fan in the room the temperature eventually stabilised at approximately 20^{o}C; bath temperature was set to 21^{o}C.

Date	**Temp (^{o}C)**
07/10/15	24
08/10/15	25
09/10/15	27
10/10/15*	22.8
11/10/15	22.1
12/10/15	21.3
13/10/15	21
14/10/15	20.8
15/10/15	20.2
16/10/15	20.0

**Engineers adjust ship's air conditioning and fan installed.*

With the room at a constant temperature a standardisation of the machine against Standard Seawater P157 was attempted on the afternoon of 16th October 2015. It was not possible to adjust suppression to accomplish standardisation and a high "zero" value (0.0003+) was presented. This re-occurred after a thorough cleaning of the conductivity cell had been undertaken.

On 17th October 2015 the unit was opened and inspected. It was first noted that with the movement of the tank there was a fair amount of dust/dirt in the bath and so the tank was drained, flushed and re-filled. On close inspection the cable for the back heater lamp had become unplugged and so was reconnected securely. Having left the Autosal to stabilise overnight it was noted the following day that there was no water movement – this was found to be due to a broken drive belt that was subsequently replaced.

Broken impellor drive belt.

Having been left to stabilise again the Autosal was successfully standardised and the first samples analysed on 18th October 2015.

Throughout the rest of the cruise the Autosal itself exhibited no significant drift or other problem – a Standard Seawater was run at the beginning/end of each crate to ensure accurate operation.

There was a re-occurring issue with the software such that, for example when “3” was displayed on the Autosal it was sometimes logging “3” and likewise for 2 and 4. As such the outputted conductivity ratio was recorded manually to a spreadsheet and salinity calculated retrospectively – the formula used was tested by running conductivity ratio’s from previous years and ensuring the salinity value given matched that produced by the software. The issue was not resolved by re-installing the software or swapping laptop and RS232 interfaces.

For the last set of salinities run on the 3rd of November 2015 the bath temperature was reduced the previous day to 18^{o}C as lab temperature had drop significantly. Due to time constraints

samples run on this day were run with a room temperature of 15^{o}C and bath temperature at its lowest setting of 18^{o}C - therefore outside of the +/-1^{o}C recommendation.

Appendix: AME report

Engineering Technical Section
British Antarctic Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

FAO:
The BAS AME (electronics) marine scientific instrumentation support engineers

Cruise Report Instructions

Neil French (nefren) is the first point of contact for marine scientific instrumentation – any questions email (nfren@nerc.ac.uk) or phone him (01223 221398); try Rob White (robite 01223 221294) or secondly Steve Bremner (sfbr, 01223 221416) when Neil not available.

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

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

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

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

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

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

Cruise:JR15001 Start date: 14 Sep 2015 Finish date: 6 Nov 2015
Name of AME engineer: Seth Thomas
Name of principle scientist (PSO): Tim Smyth

LAB Instruments

Instrument	S/N Used	Comments
AutoSal	63360	
Scintillation counter	Y	
Magnetometer STCM1	N	
XBT	N	

ACOUSTIC

Instrument	S/N Used	Comments
ADCP	N	
PES	N	
EM120	N	
TOPAS	N	
EK60	N	
SSU	Y	
USBL	Y	Comms error at NCU resolved
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)	5002	
Barometer1(UIC)	5003	
Foremast Sensors		
Air humidity & temp1	3898	
Air humidity & temp2	3896	
TIR1 sensor (pyranometer)	2993	Not working
TIR2 sensor (pyranometer)	2992	Not working
PAR1 sensor	0127	
PAR2 sensor	0126	
prep lab		
Thermosalinograph SBE45	0016	
Transmissometer	396	
Fluorometer	1100243	
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	2075	
Temp2 sensor SBE3plus	5766	
Cond1 sensor SBE 4C	2248	
Cond2 sensor SBE 4C	4471	
Pump1 SBE5T	1807	
Pump2 SBE5T	7606	
Standards Thermometer SBE35	0024	
Transmissometer C-Star	846	
Oxygen sensor SBE43	0676	
PAR sensor	7274	
Fluorometer Aquatracka	008-249	
Altimeter PA200	163162	
LADCP	15060	
CTD swivel linkage		
Pylon SBE32	0636	Some trigger failure (bottle #17) but suspect due to uneven loading of 20l bottles
Notes on any other part of CTD e.g. faulty cables, wire drum slip ring, bottles, swivel, frame, tubing etc		Fluorometer/ Transmissometer cable replacement made due to power failure at tyrans' end

AME UNSUPPORTED INSTRUMENTS BUT LOGGED

Instrument	Working?	Comments
EA600	Y	
Anemometer	Y	
Gyro	Y	
DopplerLog	Y	
EMLog	y	

End of Cruise Procedure

At the end of the cruise, please ensure that:

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

Please clean the intake fans on the following machines:

Instrument	Cleaned?
Oceanlogger	N
EM120, TOPAS, NEPTUNE UPSs	N
Seatex Seapath	N
EM120 Tween Deck	N
TOPAS Tween Deck	N

Additional notes and recommendations for change / future work

Oceanlogger

New interface software is up and running without any obvious glitches. Observation over time will tell if it needs any more modification.

The TIR sensors on the foremast have both failed.
I am intending to manufacture a complete replacement foremast sensor package so that the whole unit can be simply swapped over at the start of a season (refit maybe) and the incumbent package returned to BAS for overhaul. Having two 'sets' of sensors will allow rotation and annual repair/calibration work to be easily accomplished.

USBL

This system was non-responsive when requested. A suspected comms error from the NMEA message splitter PC was found not to be the issue.
The NCU box was not putting out any messages to the host PC.
The NCU has been stripped and cleaned and reassembled, and now seems to be working fine. The USBL
has GPS tracking (It didn't before)
The system as a whole has not been tested with beacon tracking as there was nowhere on the CTD frame to mount such beacons due to a host of extra sensors the scientists had mounted, 20litre bottles being fitted, and a lack of brackets (also due to said extra sensors).

CTD Bottles

Having put our 12 litre bottles back on the frame, much wear was noticed (since my trips last season when I replaced all of them) on the lanyards which hold the bottles open.
It is ESSENTIAL that worn lanyards are replaced, and periodic checks are made as the new larger rosette (to fit the 20litre bottles we have been using) means that the lower lanyard rubs on the edge of the rosette when triggered.
I've no ideas on how to alleviate this as yet so they must be checked and replaced often or bottles will implode and die.

Support Engineer: Seth Thomas Date: 6 November 2015

Appendix: Complete Event Log: JR15001

17/09/2015 17:06	Leaving Portsmouth	50.6881	-0.9715	Vessel full away on passage (1806LT) after loading AVCAT in HMNB Portsmouth.
18/09/2015 06:43	Test Station	50.0381	-4.3369	V/L reducing speed for station
18/09/2015 07:00	Test Station	50.0325	-4.3668	V/L on DP in full auto pos
18/09/2015 07:36	CTD_JR15001_S001	50.0333	-4.3653	CTD Wire reterminated and tested to 2.4 tonnes
18/09/2015 07:44	CTD_JR15001_S001	50.0334	-4.3653	Commence CTD deployment
18/09/2015 08:03	CTD_JR15001_S001	50.0334	-4.3653	CTD at depth. Wire out - 60m. EA600 - 70.1m
18/09/2015 08:26	CTD_JR15001_S001	50.0334	-4.3653	CTD on deck
18/09/2015 09:48	Test Station	49.9610	-4.5891	V/l off DP continuing passage
19/09/2015 03:40	Station 1	48.4152	-9.1616	Commence slowdown of vessel for pre-dawn CTD cast
19/09/2015 04:00	Station 1	48.4093	-9.1980	V/L on DP
19/09/2015 04:09	CTD_JR15001_S002	48.4093	-9.1979	CTD deployed
19/09/2015 04:10	GAR_JR15001_001	48.4093	-9.1980	Garret Screen deployed
19/09/2015 04:15	CTD_JR15001_S002	48.4093	-9.1980	CTD at depth 152m (EA600 154m) commence recovery
19/09/2015 04:16	GAR_JR15001_001	48.4093	-9.1979	Garret screen on deck
19/09/2015 04:42	CTD_JR15001_S002	48.4094	-9.1979	CTD on deck
19/09/2015 04:51	Station 1	48.4094	-9.1979	V/L off DP
19/09/2015 05:00	Station 1	48.4026	-9.2219	V/L on Passage speed
19/09/2015 12:53	Station 2	47.5144	-11.0624	Commenced slowing down
19/09/2015 12:59	Station 2	47.5095	-11.0623	Vessel set up on station in full auto pos DP.
19/09/2015 13:02	CTD_JR15001_S003	47.5095	-11.0623	CTD S003 off the deck
19/09/2015 13:03	CTD_JR15001_S003	47.5095	-11.0623	CTD S003 deployed
19/09/2015 13:06	GAR_JR15001_002	47.5095	-11.0623	Commenced Garrett Screen Sampling
19/09/2015 13:06	OPT_JR15001_001	47.5095	-11.0623	Optics Rig 001 off the deck
19/09/2015 13:07	OPT_JR15001_001	47.5095	-11.0623	Optics Rig 001 deployed
19/09/2015 13:12	GAR_JR15001_002	47.5095	-11.0623	Completed Garrett Screen sampling
19/09/2015 13:18	CTD_JR15001_S003	47.5095	-11.0623	CTD 003 at depth. Wire out 500m. EA600 water depth 4564m. Commenced recovery.
19/09/2015 13:27	GOF_JR15001_001	47.5095	-11.0623	Go Flo 001 off the deck
19/09/2015 13:28	GOF_JR15001_001	47.5095	-11.0623	Go Flo 001 deployed
19/09/2015 13:33	GOF_JR15001_001	47.5095	-11.0623	Go Flo 001 at the surface
19/09/2015 13:34	GOF_JR15001_001	47.5095	-11.0623	Go Flo 001 on deck

19/09/2015 13:37	OPT_JR15001_001	47.5095	-11.0623	Optics Rig 001 at the surface
19/09/2015 13:38	OPT_JR15001_001	47.5095	-11.0623	Optics Rig 001 on deck
19/09/2015 13:40	OPT_JR15001_002	47.5095	-11.0623	Optics Rig 002 off the deck
19/09/2015 13:41	OPT_JR15001_002	47.5095	-11.0623	Optics Rig 002 deployed
19/09/2015 13:52	OPT_JR15001_002	47.5095	-11.0623	Optics Rig 002 at the surface
19/09/2015 13:53	OPT_JR15001_002	47.5095	-11.0623	Optics Rig 002 on deck
19/09/2015 13:53	GOF_JR15001_002	47.5095	-11.0623	Go Flo 002 off the deck
19/09/2015 13:54	GOF_JR15001_002	47.5095	-11.0624	Go Flo 002 deployed
19/09/2015 13:54	CTD_JR15001_S003	47.5095	-11.0624	CTD 003 at the surface
19/09/2015 13:56	CTD_JR15001_S003	47.5095	-11.0623	CTD S003 on deck
19/09/2015 14:05	GOF_JR15001_002	47.5095	-11.0623	Go Flo 002 at the surface
19/09/2015 14:06	GOF_JR15001_002	47.5095	-11.0623	Go Flo 002 on deck
19/09/2015 14:09	Station 2	47.5095	-11.0623	Deck
19/09/2015 14:15	Station 2	47.5032	-11.0670	Vessel at passage speed
20/09/2015 03:40	Station 3	46.2891	-12.9224	Commence slowdown of vessel for pre-dawn CTD cast
20/09/2015 03:56	Station 3	46.2765	-12.9355	V/L on DP
20/09/2015 04:04	CTD_JR15001_S004	46.2764	-12.9354	CTD 004 deployed
20/09/2015 04:05	GAR_JR15001_003	46.2764	-12.9354	Garrett screen deployed
20/09/2015 04:15	CTD_JR15001_S004	46.2764	-12.9354	CTD 004 at depth 500m EA600 4115m. commence recovery.
20/09/2015 04:17	GAR_JR15001_003	46.2764	-12.9354	Garrett screen on deck
20/09/2015 04:44	CTD_JR15001_S004	46.2765	-12.9354	CTD on Deck
20/09/2015 04:49	Station 3	46.2765	-12.9354	V/L off DP
20/09/2015 04:53	Station 3	46.2719	-12.9372	V/L at passage speed
20/09/2015 12:53	Station 4	45.5921	-13.9886	Commence slowdown of vessel for 1300 CTD cast 20/9/2015
20/09/2015 13:04	Station 4	45.5933	-13.9912	V/l on DP
20/09/2015 13:05	CTD_JR15001_S005	45.5933	-13.9912	CTD 005 off the deck
20/09/2015 13:06	OPT_JR15001_003	45.5933	-13.9912	Optics Rig 003 off the deck
20/09/2015 13:06	GOF_JR15001_003	45.5933	-13.9912	Goflo 003 off deck
20/09/2015 13:07	GOF_JR15001_003	45.5933	-13.9912	goflo 003 deployed
20/09/2015 13:08	OPT_JR15001_003	45.5933	-13.9912	Optics Rig 003 deployed
20/09/2015 13:14	GOF_JR15001_003	45.5933	-13.9912	Go Flo 003 at the surface
20/09/2015 13:15	GOF_JR15001_003	45.5933	-13.9912	Go Flo 003 on deck
20/09/2015	CTD_JR15001_S005	45.5933	-13.9912	CDT 005 at depth wire out 500m EA600 Water Depth

13:18				4780m
20/09/2015 13:30	OPT_JR15001_003	45.5933	-13.9912	Optics Rig 003 at the surface
20/09/2015 13:31	OPT_JR15001_004	45.5933	-13.9912	Optics Rig 004 deployed
20/09/2015 13:52	CTD_JR15001_S004	45.5933	-13.9912	CTD 004 at the surface
20/09/2015 13:53	CTD_JR15001_S004	45.5933	-13.9912	CTD 004 on deck
20/09/2015 13:55	OPT_JR15001_004	45.5933	-13.9912	Optics Rig 004 at the surface
20/09/2015 13:56	OPT_JR15001_004	45.5933	-13.9912	Optics Rig 004 on deck
20/09/2015 14:10	Station 4	45.5933	-13.9912	Deck
20/09/2015 14:15	Station 4	45.5897	-13.9977	V/L on Passage speed
21/09/2015 03:40	Station 5	44.4779	-15.6553	Commence slowdown of vessel for pre-dawn CTD cast
21/09/2015 04:06	Station 5	44.4550	-15.6897	V/L on DP
21/09/2015 04:10	CTD_JR15001_S006	44.4550	-15.6898	CTD 006 deployed
21/09/2015 04:13	GAR_JR15001_004	44.4550	-15.6897	Garrett screen deployed
21/09/2015 04:23	GAR_JR15001_004	44.4548	-15.6896	Garrett screen on deck
21/09/2015 04:24	CTD_JR15001_S006	44.4549	-15.6896	CTD 006 at depth 500m EA600 4504m commence recovery
21/09/2015 04:55	CTD_JR15001_S006	44.4551	-15.6898	CTD on deck
21/09/2015 04:59	Station 5	44.4552	-15.6901	VSL off DP
21/09/2015 05:06	Station 5	44.4531	-15.7021	VSL at passage speed
21/09/2015 12:53	Station 6	43.7119	-16.7780	Commence slowdown of vessel for 1300 CTD cast 21/09/2015
21/09/2015 12:58	Station 6	43.7119	-16.7791	vsl on DP
21/09/2015 13:02	CTD_JR15001_S007	43.7119	-16.7791	CTD off the deck
21/09/2015 13:02	OPT_JR15001_005	43.7119	-16.7791	Optics Rig 005 off the deck
21/09/2015 13:05	OPT_JR15001_005	43.7119	-16.7791	Optics Rig 005 deployed
21/09/2015 13:06	CTD_JR15001_S007	43.7119	-16.7791	CTD 007 deployed
21/09/2015 13:06	GOF_JR15001_004	43.7119	-16.7791	goflo 004 deployed
21/09/2015 13:08	GAR_JR15001_005	43.7119	-16.7791	Garret Screen deployed
21/09/2015 13:15	CTD_JR15001_S007	43.7119	-16.7791	CTD 007 at depth. Wire out 500m. EA600 water depth 3671m
21/09/2015 13:16	GOF_JR15001_004	43.7119	-16.7791	Go Flo 004 at the surface
21/09/2015 13:17	GAR_JR15001_005	43.7119	-16.7791	Garrett screen on deck 005
21/09/2015 13:32	OPT_JR15001_006	43.7119	-16.7792	Optics Rig 006 deployed
21/09/2015 13:43	CTD_JR15001_S007	43.7119	-16.7792	CTD 007 at the surface
21/09/2015 13:44	CTD_JR15001_S007	43.7119	-16.7792	CTD 007 on deck
21/09/2015 13:44	Station 6	43.7119	-16.7792	Vessel at passage speed

21/09/2015 13:54	OPT_JR15001_006	43.7119	-16.7791	Optics Rig 006 at the surface
21/09/2015 13:55	OPT_JR15001_006	43.7119	-16.7791	Optics Rig 006 on deck
21/09/2015 14:00	Station 6	43.7119	-16.7791	Deck
21/09/2015 14:10	Station 6	43.7136	-16.7956	V/L on Passage speed
22/09/2015 03:40	Station 7	42.3057	-18.7989	Commence slowdown of vessel for pre-dawn CTD cast
22/09/2015 03:52	Station 7	42.3078	-18.8061	V/L on DP
22/09/2015 04:01	CTD_JR15001_S008	42.3078	-18.8061	CTD 008 deployed
22/09/2015 04:03	GAR_JR15001_006	42.3078	-18.8061	Garrett screen deployed
22/09/2015 04:09	GAR_JR15001_006	42.3078	-18.8061	Garrett screen on deck
22/09/2015 04:12	CTD_JR15001_S008	42.3078	-18.8061	CTD 008 at depth 500m EA600 4440m commence recovery
22/09/2015 04:43	CTD_JR15001_S008	42.3078	-18.8062	CTD 008 on deck
22/09/2015 04:46	Station 7	42.3078	-18.8062	V/L off DP
22/09/2015 04:52	Station 7	42.3085	-18.8137	V/L at passage speed
22/09/2015 12:48	Station 8	41.5247	-19.8708	Commence slowdown of vessel for 1300 CTD cast
22/09/2015 12:55	Station 8	41.5246	-19.8713	V/l on DP
22/09/2015 12:56	CTD_JR15001_S009	41.5246	-19.8713	CDT off deck
22/09/2015 13:00	CTD_JR15001_S009	41.5246	-19.8713	CDT Deployed
22/09/2015 13:00	GAR_JR15001_007	41.5246	-19.8713	Garrett screen deployed
22/09/2015 13:01	GOF_JR15001_005	41.5246	-19.8713	Goflo 005 deployed
22/09/2015 13:02	OPT_JR15001_007	41.5246	-19.8713	Optics Rig 007 deployed
22/09/2015 13:06	GOF_JR15001_005	41.5246	-19.8713	Go Flo 001 Recovered
22/09/2015 13:07	GAR_JR15001_007	41.5246	-19.8713	Garrett screen on deck
22/09/2015 13:11	CTD_JR15001_S009	41.5246	-19.8713	CTD 008 at depth 500m EA600 3982m commence recover9
22/09/2015 13:26	OPT_JR15001_007	41.5246	-19.8713	At surface
22/09/2015 13:28	OPT_JR15001_008	41.5246	-19.8713	Optics Rig 008 deployed
22/09/2015 13:39	CTD_JR15001_S009	41.5246	-19.8713	CTD at surface
22/09/2015 13:41	CTD_JR15001_S009	41.5246	-19.8713	CTD recovered
22/09/2015 13:44	OPT_JR15001_008	41.5246	-19.8713	Optics Rig 008 recovered
22/09/2015 13:50	Station 8	41.5246	-19.8713	VSL off DP
22/09/2015 14:00	Station 8	41.5250	-19.8849	V/L on Passage speed
23/09/2015 03:40	Station 9	40.0411	-21.9172	Commence slowdown of vessel for pre-dawn CTD cast 23/09/2015
23/09/2015 04:01	Station 9	40.0436	-21.9261	VSL on DP
23/09/2015	CTD_JR15001_S010	40.0436	-21.9261	CTD 010 deployed

04:05				
23/09/2015 04:07	GAR_JR15001_008	40.0436	-21.9261	Garrett screen deployed
23/09/2015 04:17	GAR_JR15001_008	40.0436	-21.9262	Garrett screen on deck
23/09/2015 04:18	CTD_JR15001_S010	40.0436	-21.9261	CTD 010 at depth 500m EA600 4136m commence recovery
23/09/2015 04:51	CTD_JR15001_S010	40.0436	-21.9262	CTD 010 on deck
23/09/2015 04:57	Station 9	40.0436	-21.9262	VSL off DP
23/09/2015 05:06	Station 9	40.0411	-21.9349	VSL on Passage speed
23/09/2015 12:40	Station 10	39.2031	-23.0457	Commence slowdown of vessel for 1300 CTD cast 23/09/2015
23/09/2015 12:55	Station 10	39.2032	-23.0456	V/l on DP
23/09/2015 12:55	OPT_JR15001_009	39.2032	-23.0456	Optics Rig 009 deployed
23/09/2015 12:57	CTD_JR15001_S011	39.2032	-23.0456	CTD off the deck
23/09/2015 12:59	CTD_JR15001_S011	39.2032	-23.0455	CTD 011 deployed
23/09/2015 13:00	GOF_JR15001_006	39.2032	-23.0456	Goflo 006 deployed
23/09/2015 13:00	GAR_JR15001_009	39.2032	-23.0456	Garrett screen deployed
23/09/2015 13:07	GOF_JR15001_006	39.2032	-23.0456	Go Flo 006 Recovered
23/09/2015 13:11	GAR_JR15001_009	39.2032	-23.0456	Garret screen on deck
23/09/2015 13:12	CTD_JR15001_S011	39.2032	-23.0456	CTD 010 at depth 500m EA600 4055m commence recovery
23/09/2015 13:20	OPT_JR15001_009	39.2032	-23.0456	Optics Rig 009 recovered
23/09/2015 13:23	OPT_JR15001_010	39.2032	-23.0456	Optics Rig 010 deployed
23/09/2015 13:38	OPT_JR15001_010	39.2032	-23.0456	Optics Rig 010 recovered
23/09/2015 13:39	CTD_JR15001_S011	39.2032	-23.0456	CTD 011 at the surface
23/09/2015 13:42	CTD_JR15001_S011	39.2032	-23.0456	CTD 011 on deck
23/09/2015 13:58	Station 10	39.2093	-23.0430	V/L on Passage speed
24/09/2015 03:40	Station 11	37.7976	-24.9267	Commence slowdown of vessel for pre-dawn CTD cast
24/09/2015 03:50	Station 11	37.6887	-25.0588	V/l on DP
24/09/2015 04:02	CTD_JR15001_S012	37.6887	-25.0588	CTD 012 deployed
24/09/2015 04:04	GAR_JR15001_011	37.6888	-25.0589	Garrett screen deployed
24/09/2015 04:12	GAR_JR15001_011	37.6887	-25.0589	Garrett screen recovered
24/09/2015 04:12	CTD_JR15001_S012	37.6887	-25.0589	CTD 012 at depth 500m EA600 2205m commence recovery
24/09/2015 04:40	CTD_JR15001_S012	37.6887	-25.0589	CTD 012 on deck
24/09/2015 04:43	Station 11	37.6886	-25.0588	V/L off DP
24/09/2015 04:48	Station 11	37.6837	-25.0584	VSL on Passage speed
24/09/2015 12:40	Station 12	37.5200	-26.6251	Commence slowdown of vessel for 1300 CTD cast

24/09/2015 13:01	Station 12	37.5058	-26.6565	VSL on DP
24/09/2015 13:04	GOF_JR15001_007	37.5058	-26.6565	Goflo 007 deployed
24/09/2015 13:04	GAR_JR15001_011	37.5058	-26.6566	Garrett screen deployed
24/09/2015 13:04	CTD_JR15001_S013	37.5058	-26.6565	CTD 013 deployed
24/09/2015 13:05	OPT_JR15001_011	37.5058	-26.6566	Optics Rig 011 deployed
24/09/2015 13:14	GAR_JR15001_011	37.5058	-26.6566	Garret screen on deck
24/09/2015 13:17	CTD_JR15001_S013	37.5058	-26.6566	CTD 013 at depth 500m EA600 2317.4m commence recovery
24/09/2015 13:29	OPT_JR15001_012	37.5058	-26.6566	Optics Rig 012 deployed
24/09/2015 13:45	OPT_JR15001_012	37.5058	-26.6566	Optics Rig 012 recovered
24/09/2015 13:45	CTD_JR15001_S012	37.5058	-26.6566	CTD 013 on deck
24/09/2015 13:55	Station 12	37.5058	-26.6565	Gantry lashed all personnel clear of deck
24/09/2015 14:10	Station 12	37.5059	-26.6565	VSL off DP
24/09/2015 14:15	Station 12	37.5037	-26.6514	V/L on Passage speed
25/09/2015 03:40	Station 13	36.8381	-29.9551	Commence slowdown of vessel for pre-dawn CTD cast
25/09/2015 03:50	Station 13	36.8376	-29.9555	VSL on DP
25/09/2015 04:00	GAR_JR15001_012	36.8376	-29.9555	Garrett screen deployed
25/09/2015 04:01	CTD_JR15001_S014	36.8376	-29.9555	CTD 014 deployed
25/09/2015 04:09	GAR_JR15001_012	36.8376	-29.9555	Garrett screen on deck
25/09/2015 04:12	CTD_JR15001_S014	36.8376	-29.9555	CTD 014 at depth 500m EA600 3297m commence recovery
25/09/2015 04:47	CTD_JR15001_S014	36.8376	-29.9555	CTD 014 on deck
25/09/2015 04:50	Station 13	36.8376	-29.9555	VSL off DP
25/09/2015 04:54	Station 13	36.8343	-29.9593	VSL on Passage speed
25/09/2015 18:30	Station 14	36.2495	-32.7441	VSL commence slow down
25/09/2015 18:40	Station 14	36.2467	-32.7608	VSL on DP
25/09/2015 18:41	GAR_JR15001_013	36.2467	-32.7609	Garrett screen 13 deployed
25/09/2015 18:42	CTD_JR15001_S015	36.2467	-32.7609	CTD 015 deployed
25/09/2015 18:55	GAR_JR15001_013	36.2467	-32.7609	Garrett screen 13 on deck
25/09/2015 19:27	CTD_JR15001_S015	36.2467	-32.7610	CTD 015 at depth 2224m EA6002190m commence recovery
25/09/2015 19:32	Station 14	36.2466	-32.7610	Acoustic release test commence
25/09/2015 19:46	Station 14	36.2466	-32.7610	Acoustic release test completed
25/09/2015 20:38	CTD_JR15001_S015	36.2466	-32.7610	CTD on deck
25/09/2015 20:48	Station 14	36.2466	-32.7610	V/L off DP
26/09/2015	Station 14	36.2461	-32.7761	Finished swath survey

01:12				
26/09/2015 01:20	Station 14	36.2471	-32.7779	VSL on DP holding station overnight @ Sharples waypoint.
26/09/2015 08:42	Station 15	36.2471	-32.7779	V/l off DP proceeding E'ly to mooring deployment posn
26/09/2015 09:16	Station 15	36.2385	-32.7034	V/l on DP
26/09/2015 10:06	Station 15	36.2386	-32.7039	Commence deployment of mooring 001
26/09/2015 14:30	Station 15	36.2438	-32.7758	400m to deployment of mooring.
26/09/2015 14:45	Station 15	36.2441	-32.7809	Mooring deployed
26/09/2015 15:02	Station 15	36.2441	-32.7812	Mooring on the seabed (confirmed by transducer)
26/09/2015 15:02	Station 15	36.2441	-32.7812	VSL off DP
26/09/2015 15:17	Station 15	36.2331	-32.8000	VSL on DP
26/09/2015 15:17	Station 15	36.2331	-32.8000	Hydrophone deployed commence ping ranging
26/09/2015 16:00	Station 15	36.2649	-32.7761	VSL off DP
26/09/2015 16:28	Station 15	36.2330	-32.7535	V/L on DP
26/09/2015 16:29	Station 15	36.2329	-32.7536	Transducer deployed
26/09/2015 16:35	Station 15	36.2329	-32.7534	Transducer recovered
26/09/2015 16:36	Station 15	36.2329	-32.7533	VSL off DP man. to Morning CTD station
26/09/2015 17:00	Station 16	36.2298	-32.7658	VSL on DP to await morning CTD
27/09/2015 06:00	CTD_JR15001_S016	36.2285	-32.7719	CTD 016 deployed
27/09/2015 06:01	GAR_JR15001_014	36.2285	-32.7719	Garrett screen 14 deployed
27/09/2015 06:09	GAR_JR15001_014	36.2285	-32.7719	Garrett screen 14 recovered
27/09/2015 06:40	CTD_JR15001_S016	36.2285	-32.7718	CTD 016 at depth 2274m EA600 2278m commence recovery
27/09/2015 07:44	CTD_JR15001_S016	36.2287	-32.7718	CTD 016 on deck
27/09/2015 09:06	Station 16	36.2286	-32.7719	V/l off DP proceeding to mooring deployment psn
27/09/2015 09:42	Station 16	36.2549	-32.7304	On DP. Commence deployment - ridgemix mooring 002
27/09/2015 12:25	Station 16	36.2246	-32.7783	VSL off DP
27/09/2015 12:36	Station 16	36.2184	-32.7940	VSL on DP
27/09/2015 12:53	Station 16	36.2181	-32.7941	Hydrophone deployed
27/09/2015 12:55	Station 16	36.2181	-32.7941	Hydrophone recovered
27/09/2015 13:45	Station 16	36.2423	-32.7739	VSL on DP
27/09/2015 13:45	Station 16	36.2423	-32.7739	Hydrophone deployed
27/09/2015 13:48	Station 16	36.2371	-32.7691	Hydrophone recovered
27/09/2015 13:48	Station 16	36.2371	-32.7691	VSL off DP
27/09/2015 14:00	Station 16	36.2186	-32.7460	VSL on DP

27/09/2015 14:08	Station 16	36.2184	-32.7456	Hydrophone deployed
27/09/2015 14:13	Station 16	36.2183	-32.7457	Hydrophone recovered
27/09/2015 14:15	GOF_JR15001_008	36.2184	-32.7457	goflo 008 deployed
27/09/2015 14:25	GOF_JR15001_008	36.2183	-32.7457	Go Flo 008 Recovered
27/09/2015 14:28	OPT_JR15001_013	36.2183	-32.7456	Optics Rig 013 deployed
27/09/2015 14:54	OPT_JR15001_013	36.2183	-32.7457	Optics Rig 013 recovered
27/09/2015 14:57	OPT_JR15001_014	36.2183	-32.7457	Optics Rig 014 deployed
27/09/2015 15:10	OPT_JR15001_014	36.2183	-32.7457	Optics Rig 014 recovered
27/09/2015 15:20	Station 16	36.2183	-32.7457	VSL off DP
27/09/2015 15:30	Station 16	36.2133	-32.7597	VSL on Passage speed
28/09/2015 03:40	Station 17	35.6102	-34.1643	Commence slowdown of vessel for pre-dawn CTD cast
28/09/2015 03:50	Station 17	35.6113	-34.1667	VSL on DP
28/09/2015 04:05	CTD_JR15001_S017	35.6113	-34.1667	CTD 017 deployed
28/09/2015 04:09	GAR_JR15001_015	35.6114	-34.1666	Garrett screen deployed
28/09/2015 04:11	GAR_JR15001_015	35.6114	-34.1667	Garrett screen cancelled due to rough sea conditions
28/09/2015 04:40	CTD_JR15001_S017	35.6114	-34.1667	CTD 017 at depth 2000m EA600 2113m commence recovery
28/09/2015 05:39	CTD_JR15001_S017	35.6113	-34.1666	CTD 017 on deck
28/09/2015 05:43	Station 17	35.6115	-34.1668	VSL off DP
28/09/2015 06:00	Station 17	35.6182	-34.1824	VSL on Passage speed
28/09/2015 12:40	Station 18	35.0635	-35.4433	Commence slowdown of vessel for 1300 CTD cast
28/09/2015 13:00	Station 18	35.0635	-35.4433	VSL on DP
28/09/2015 13:06	CTD_JR15001_S018	35.0635	-35.4433	CTD 018 deployed
28/09/2015 13:06	OPT_JR15001_015	35.0635	-35.4433	Optics Rig deployed
28/09/2015 13:13	GOF_JR15001_009	35.0636	-35.4433	goflo deployed
28/09/2015 13:20	GOF_JR15001_009	35.0636	-35.4433	Go Flo 009 Recovered
28/09/2015 13:20	CTD_JR15001_S018	35.0636	-35.4433	CDT 005 at depth wire out 500m EA600 Water Depth 2886.91m
28/09/2015 13:25	OPT_JR15001_016	35.0636	-35.4433	Optics Rig (2nd) deployed
28/09/2015 13:45	OPT_JR15001_016	35.0636	-35.4433	Optics Rig 016 recovered
28/09/2015 13:50	CTD_JR15001_S018	35.0636	-35.4433	CTD recovered
28/09/2015 14:00	Station 18	35.0641	-35.4432	VSL off DP
28/09/2015 14:10	Station 18	35.0766	-35.4538	V/L on Passage speed
29/09/2015 03:40	Station 19	33.9937	-37.5755	Commence slowdown of vessel for pre-dawn CTD cast
29/09/2015	Station 19	33.9987	-37.5750	VSL on DP

03:48				
29/09/2015 04:04	CTD_JR15001_S019	33.9988	-37.5750	CTD 019 deployed
29/09/2015 04:06	GAR_JR15001_015	33.9988	-37.5750	Garrett screen 015 deployed
29/09/2015 04:12	GAR_JR15001_015	33.9988	-37.5750	Garrett screen 015 recovered
29/09/2015 04:42	CTD_JR15001_S019	33.9987	-37.5750	CTD 019 at depth 2130m EA600 2205m commence recovery
29/09/2015 05:37	CTD_JR15001_S019	33.9987	-37.5749	CTD 019 on deck
29/09/2015 05:48	Station 019	34.0050	-37.5745	VSL off DP
29/09/2015 06:00	Station 19	34.0152	-37.5872	VSL on Passage speed
29/09/2015 12:40	Station 20	33.2179	-38.9206	Commence slowdown of vessel for 1300 CTD cast
29/09/2015 12:51	Station 20	33.2215	-38.9216	VSL on DP
29/09/2015 12:59	OPT_JR15001_017	33.2215	-38.9216	Optics Rig deployed (1st)
29/09/2015 12:59	CTD_JR15001_S020	33.2215	-38.9216	CTD 020 deployed
29/09/2015 13:00	GAR_JR15001_016	33.2215	-38.9216	Garrett screen deployed
29/09/2015 13:03	GOF_JR15001_010	33.2215	-38.9216	goflo deployed
29/09/2015 13:11	CTD_JR15001_S020	33.2215	-38.9216	CTD 019 at depth 500m EA600 2024.6m commence recovery
29/09/2015 13:12	GOF_JR15001_010	33.2215	-38.9216	goflo failed (re-deploy)
29/09/2015 13:21	OPT_JR15001_018	33.2215	-38.9216	Optics Rig deployed (2nd)
29/09/2015 13:24	GOF_JR15001_010	33.2215	-38.9216	Go Flo Recovered
29/09/2015 13:44	CTD_JR15001_S020	33.2215	-38.9216	ctd recovered
29/09/2015 13:46	CTD_JR15001_S020	33.2215	-38.9216	Optics Rig recovered
29/09/2015 14:00	Station 20	33.2290	-38.9205	VSL off DP
29/09/2015 14:07	Station 20	33.2180	-38.9341	VSL on Passage speed
30/09/2015 03:40	Station 21	31.1510	-40.9180	Commence slowdown of vessel for pre-dawn CTD cast
30/09/2015 03:51	Station 21	31.1510	-40.9180	VSL on DP
30/09/2015 04:02	CTD_JR15001_S021	31.1510	-40.9180	CTD 21 deployed
30/09/2015 04:03	GAR_JR15001_017	31.1510	-40.9180	Garrett screen 17 deployed
30/09/2015 04:08	GAR_JR15001_017	31.1510	-40.9180	Garrett screen 17 recovered
30/09/2015 04:38	CTD_JR15001_S021	31.1510	-40.9180	CTD 021 at depth 2000m EA600 2727m commence recovery
30/09/2015 05:37	CTD_JR15001_S021	31.1510	-40.9180	CTD 21 on deck
30/09/2015 05:42	Station 21	31.1510	-40.9180	VSL off DP
30/09/2015 05:54	Station 21	31.1459	-40.9202	VSL on Passage speed
30/09/2015 12:40	Station 22	30.0973	-41.9370	Commence slowdown of vessel for 1300 CTD cast.
30/09/2015 12:53	Station 22	30.1006	-41.9392	VSL on DP

30/09/2015 12:56	OPT_JR15001_019	30.1005	-41.9392	Optics Rig deployed (19)
30/09/2015 13:00	GAR_JR15001_018	30.1005	-41.9392	Garrett screen deployed
30/09/2015 13:00	CTD_JR15001_S022	30.1005	-41.9392	CTD 022 deployed
30/09/2015 13:09	GOF_JR15001_011	30.1005	-41.9392	goflo deployed
30/09/2015 13:10	GAR_JR15001_018	30.1005	-41.9392	Garrett screen on deck
30/09/2015 13:13	CTD_JR15001_S022	30.1005	-41.9392	CTD 022 at depth (500m) EA600 reading 3017m commence recovery
30/09/2015 13:19	OPT_JR15001_019	30.1005	-41.9392	Optics Rig recovered (1st)
30/09/2015 13:20	OPT_JR15001_020	30.1005	-41.9392	Optics Rig deployed (2nd)
30/09/2015 13:43	CTD_JR15001_S022	30.1005	-41.9392	CTD 022 on deck
30/09/2015 13:43	OPT_JR15001_020	30.1005	-41.9392	Optics Rig recovered
30/09/2015 13:50	Station 22	30.1006	-41.9392	VSL off DP
30/09/2015 14:00	Station 22	30.1014	-41.9357	VSL on Passage speed
01/10/2015 03:40	Station 23	28.2557	-42.3096	Commence slowdown of vessel for pre-dawn CTD cast
01/10/2015 03:50	Station 23	28.2558	-42.3096	VSL on DP
01/10/2015 04:03	CTD_JR15001_S023	28.2558	-42.3096	CTD 023 deployed
01/10/2015 04:04	GAR_JR15001_019	28.2558	-42.3096	Garrett screen 19 deployed
01/10/2015 04:12	GAR_JR15001_019	28.2558	-42.3096	Garrett screen 19 on deck
01/10/2015 04:38	CTD_JR15001_S023	28.2558	-42.3096	CTD 023 st depth 2000m EA600 3003m commence recovery
01/10/2015 05:29	CTD_JR15001_S023	28.2558	-42.3096	CTD 023 on deck
01/10/2015 05:34	Station 23	28.2558	-42.3096	VSL off DP
01/10/2015 05:42	Station 23	28.2523	-42.2999	VSL on Passage speed
01/10/2015 12:40	Station 24	27.4737	-41.1193	Commence slowdown of vessel for 1300 CTD cast
01/10/2015 12:50	Station 24	27.4746	-41.1108	VSL on DP
01/10/2015 12:56	CTD_JR15001_S024	27.4746	-41.1108	CTD 024 deployed
01/10/2015 12:56	OPT_JR15001_021	27.4746	-41.1108	Optics Rig 21 deployed
01/10/2015 13:00	GAR_JR15001_020	27.4746	-41.1108	Garrett screen deployed
01/10/2015 13:07	GAR_JR15001_020	27.4746	-41.1108	Garrett screen on deck
01/10/2015 13:11	CTD_JR15001_S024	27.4746	-41.1108	CTD 024 at depth 500m EA600 4526m commence recovery
01/10/2015 13:13	GOF_JR15001_012	27.4746	-41.1108	goflo deployed
01/10/2015 13:19	OPT_JR15001_021	27.4746	-41.1108	Optics Rig recovered
01/10/2015 13:20	OPT_JR15001_022	27.4746	-41.1108	Optics Rig deployed (2nd)
01/10/2015 13:24	GOF_JR15001_012	27.4746	-41.1108	Go Flo Recovered
01/10/2015	CTD_JR15001_S024	27.4746	-41.1108	ctd recovered

13:41				
01/10/2015 13:41	OPT_JR15001_022	27.4746	-41.1108	Optics Rig recovered
01/10/2015 13:53	Station 24	27.4746	-41.1108	V/l off DP
01/10/2015 14:08	Station 24	27.4682	-41.0925	VSL on Passage speed
02/10/2015 03:40	Station 25	25.9347	-38.8272	Commence slowdown of vessel for pre-dawn CTD cast
02/10/2015 03:47	Station 25	25.9342	-38.8270	VSL on DP
02/10/2015 04:02	CTD_JR15001_S025	25.9343	-38.8270	CTD 025 deployed
02/10/2015 04:03	GAR_JR15001_021	25.9343	-38.8270	Garrett screen 21 deployed
02/10/2015 04:09	GAR_JR15001_021	25.9342	-38.8270	Garrett screen 21 on deck
02/10/2015 04:12	CTD_JR15001_S025	25.9343	-38.8270	CTD 25 at depth 500m EA600 4846m commence recovery
02/10/2015 04:41	CTD_JR15001_S025	25.9342	-38.8270	CTD 25 on deck
02/10/2015 04:44	Station 25	25.9343	-38.8270	VSL off DP
02/10/2015 04:54	Station 25	25.9248	-38.8182	VSL on Passage speed
02/10/2015 10:18	Station 26	25.4537	-38.0741	V/L on DP
02/10/2015 10:24	CTD_JR15001_S026	25.4532	-38.0744	CTD 026 deployed
02/10/2015 11:59	CTD_JR15001_S026	25.4532	-38.0744	CTD 26 (Deep) at depth 5524m commence recovery
02/10/2015 12:57	OPT_JR15001_023	25.4532	-38.0744	Optics Rig deployed (1st)
02/10/2015 13:03	GAR_JR15001_022	25.4532	-38.0744	Garrett screen deployed
02/10/2015 13:06	GOF_JR15001_013	25.4533	-38.0744	goflo deployed
02/10/2015 13:13	GAR_JR15001_022	25.4532	-38.0744	Garret screen on deck
02/10/2015 13:21	OPT_JR15001_024	25.4532	-38.0744	Optics Rig deployed (2nd)
02/10/2015 13:25	GOF_JR15001_013	25.4532	-38.0744	Go Flo Recovered
02/10/2015 13:45	OPT_JR15001_024	25.4532	-38.0744	Optics Rig 024 recovered
02/10/2015 14:14	CTD_JR15001_S026	25.4532	-38.0744	ctd recovered
02/10/2015 14:29	Station 026	25.4532	-38.0744	VSL off DP
02/10/2015 14:40	Station 026	25.4416	-38.0601	VSL on Passage speed
03/10/2015 03:40	Station 27	23.8986	-35.7551	Commence slowdown of vessel for pre-dawn CTD cast
03/10/2015 03:48	Station 27	23.8984	-35.7556	VSL on DP
03/10/2015 04:10	CTD_JR15001_S027	23.8985	-35.7556	CTD 27 deployed
03/10/2015 04:10	GAR_JR15001_023	23.8985	-35.7556	Garrett screen 23 deployed
03/10/2015 04:17	GAR_JR15001_023	23.8985	-35.7556	Garrett screen 23 on deck
03/10/2015 04:20	CTD_JR15001_S027	23.8985	-35.7556	CTD 27 at depth 500m EA600 5520m commence recovery
03/10/2015 04:50	CTD_JR15001_S027	23.8985	-35.7556	CTD 27 on deck

03/10/2015 04:54	Station 27	23.8984	-35.7556	VSL off DP
03/10/2015 05:02	Station 27	23.8908	-35.7501	VSL on Passage speed
03/10/2015 12:40	Station 28	22.9871	-34.3854	Commence slowdown of vessel for 1300 CTD cast
03/10/2015 12:50	Station 28	22.9866	-34.3891	VSL on DP
03/10/2015 13:00	OPT_JR15001_025	22.9867	-34.3891	Optics Rig deployed (1st)
03/10/2015 13:04	GOF_JR15001_014	22.9866	-34.3891	goflo deployed
03/10/2015 13:04	GAR_JR15001_024	22.9866	-34.3891	Garrett screen deployed
03/10/2015 13:05	CTD_JR15001_S028	22.9866	-34.3891	CTD 028 deployed
03/10/2015 13:12	GOF_JR15001_014	22.9866	-34.3891	Go Flo Recovered
03/10/2015 13:12	GAR_JR15001_024	22.9866	-34.3891	Garrett screen on deck
03/10/2015 13:20	CTD_JR15001_S028	22.9866	-34.3891	CTD 28 at depth 500m EA600 4502m commence recovery
03/10/2015 13:22	OPT_JR15001_025	22.9866	-34.3891	Optics Rig recovered
03/10/2015 13:47	OPT_JR15001_026	22.9866	-34.3891	Optics Rig recovered
03/10/2015 14:00	CTD_JR15001_S028	22.9866	-34.3891	ctd recovered
03/10/2015 14:04	Station 028	22.9866	-34.3891	VSL off DP
03/10/2015 14:14	Station 28	22.9918	-34.3888	VSL on Passage speed
04/10/2015 03:40	Station 29	21.4657	-32.0769	Commence slowdown of vessel for pre-dawn CTD cast
04/10/2015 03:50	Station 29	21.4658	-32.0759	VSL on DP
04/10/2015 04:01	CTD_JR15001_S029	21.4660	-32.0755	CTD 029 deployed
04/10/2015 04:11	CTD_JR15001_S029	21.4660	-32.0755	CTD 029 at depth 500m EA600 4952m commence recovery
04/10/2015 04:42	CTD_JR15001_S029	21.4660	-32.0755	CTD 029 on deck
04/10/2015 04:50	Station 29	21.4660	-32.0755	VSL off DP
04/10/2015 05:00	Station 29	21.4583	-32.0582	VSL on Passage speed
04/10/2015 12:40	Station 30	20.5802	-30.7697	Commence slowdown of vessel for 1300 CTD cast
04/10/2015 12:55	Station 30	20.5802	-30.7697	VSL on DP
04/10/2015 13:00	OPT_JR15001_027	20.5801	-30.7697	Optics Rig deployed (1st)
04/10/2015 13:03	CTD_JR15001_S030	20.5801	-30.7697	CTD 030 deployed
04/10/2015 13:05	GOF_JR15001_015	20.5801	-30.7697	goflo deployed
04/10/2015 13:11	GOF_JR15001_015	20.5801	-30.7697	Go Flo Recovered
04/10/2015 13:17	CTD_JR15001_S030	20.5801	-30.7697	CTD 30 at depth 500m EA600 44562m commence recovery
04/10/2015 13:20	OPT_JR15001_027	20.5801	-30.7697	Optics Rig recovered
04/10/2015 13:22	OPT_JR15001_028	20.5801	-30.7697	Optics Rig deployed (2nd)
04/10/2015	OPT_JR15001_028	20.5801	-30.7697	Optics Rig recovered

13:44				
04/10/2015 13:54	CTD_JR15001_S030	20.5801	-30.7697	ctd recovered
04/10/2015 14:04	Station 30	20.5797	-30.7691	VSL off DP
05/10/2015 03:40	Station 31			Commence slowdown of vessel for pre-dawn CTD cast
05/10/2015 04:01	Station 31	19.2677	-28.9950	VSL on DP
05/10/2015 04:05	CTD_JR15001_S031	19.2677	-28.9950	CTD 031 deployed
05/10/2015 04:06	GAR_JR15001_025	19.2677	-28.9950	Garrett screen 25 deployed
05/10/2015 04:12	GAR_JR15001_025	19.2677	-28.9950	Garrett screen 25 on deck
05/10/2015 04:17	CTD_JR15001_S031	19.2677	-28.9950	CTD at depth 500m EA600 4487m commence recovery
05/10/2015 04:46	CTD_JR15001_S031	19.2677	-28.9950	CTD 31 on deck
05/10/2015 04:51	Station 31	19.2677	-28.9950	VSL off DP
05/10/2015 05:00	Station 31	19.2670	-28.9818	VSL on Passage speed
05/10/2015 12:40	Station 032	18.4940	-28.0476	Commence slowdown of vessel for 1300 CTD cast
05/10/2015 12:55	Station 032	18.4807	-28.0281	VSL on DP
05/10/2015 13:00	OPT_JR15001_029	18.4807	-28.0280	Optics Rig deployed
05/10/2015 13:00	CTD_JR15001_S032	18.4807	-28.0280	CTD 032 deployed
05/10/2015 13:07	GAR_JR15001_026	18.4807	-28.0280	Garrett screen deployed
05/10/2015 13:09	GOF_JR15001_016	18.4807	-28.0280	goflo deployed
05/10/2015 13:12	GAR_JR15001_026	18.4807	-28.0280	Garrett screen on deck
05/10/2015 13:18	GOF_JR15001_016	18.4807	-28.0280	Go Flo Recovered
05/10/2015 13:18	CTD_JR15001_S032	18.4807	-28.0280	CTD 32 at depth 500m EA600 4582m commence recovery
05/10/2015 13:24	OPT_JR15001_030	18.4807	-28.0280	Optics Rig deployed (2nd)
05/10/2015 13:46	OPT_JR15001_030	18.4806	-28.0280	Optics Rig recovered
05/10/2015 13:53	CTD_JR15001_S032	18.4806	-28.0280	ctd recovered
05/10/2015 14:35	Station 032	18.4815	-28.0269	VSL off DP
05/10/2015 14:50	Station 032	18.4655	-28.0083	VSL on Passage speed
06/10/2015 03:40	Station 33	17.1741	-26.4585	Commence slowdown of vessel for pre-dawn CTD cast
06/10/2015 03:50	Station 33	17.1778	-26.4558	VSL on DP
06/10/2015 03:58	CTD_JR15001_S033	17.1778	-26.4558	CTD 033 deployed
06/10/2015 04:01	GAR_JR15001_027	17.1778	-26.4558	Garrett screen 27 deployed
06/10/2015 04:07	GAR_JR15001_027	17.1778	-26.4558	Garrett screen 27 deployed
06/10/2015 04:08	CTD_JR15001_S033	17.1778	-26.4558	CTD 33 at depth 500m EA600 4299m commence recovery
06/10/2015 04:39	CTD_JR15001_S033	17.1779	-26.4558	CTD 33 on deck

06/10/2015 04:41	Station 33	17.1784	-26.4553	VSL off DP
06/10/2015 12:40	Station 34	16.4313	-25.5528	Commence slowdown of vessel for 1300 CTD cast
06/10/2015 12:45	Station 34	16.4329	-25.5498	VSL on DP
06/10/2015 12:55	OPT_JR15001_031	16.4329	-25.5498	Optics Rig deployed (1st)
06/10/2015 12:58	CTD_JR15001_S034	16.4329	-25.5498	CTD 34 deployed
06/10/2015 12:59	GAR_JR15001_028	16.4329	-25.5498	Garrett screen deployed
06/10/2015 13:09	GAR_JR15001_028	16.4329	-25.5498	Garrett screen on deck
06/10/2015 13:13	CTD_JR15001_S034	16.4329	-25.5498	CTD 34 at depth 500m EA600 4098m commence recovery
06/10/2015 13:17	OPT_JR15001_031	16.4329	-25.5498	Optics Rig recovered
06/10/2015 13:19	OPT_JR15001_032	16.4329	-25.5498	Optics Rig deployed (2nd)
06/10/2015 13:42	OPT_JR15001_032	16.4329	-25.5498	Optics Rig recovered (2nd)
06/10/2015 13:46	CTD_JR15001_S034	16.4329	-25.5498	ctd recovered
06/10/2015 13:55	Station 34	16.4329	-25.5498	VSL off DP
06/10/2015 14:15	Station 34	15.3134	-24.1946	VSL on Passage speed
07/10/2015 03:40	Station 35	15.1065	-23.9768	Commence slowdown of vessel for pre-dawn CTD cast
07/10/2015 03:49	Station 35	15.0956	-23.9468	VSL on DP
07/10/2015 03:57	CTD_JR15001_S035	15.0956	-23.9468	CTD 35 deployed
07/10/2015 04:00	GAR_JR15001_029	15.0956	-23.9468	Garret screen 29 deployed
07/10/2015 04:06	GAR_JR15001_029	15.0956	-23.9469	Garrett screen 29 on deck
07/10/2015 04:09	CTD_JR15001_S035	15.0956	-23.9468	CTD 35 at depth 500m EA600 2162m commence recovery
07/10/2015 04:36	CTD_JR15001_S035	15.0956	-23.9468	CTD 35 on deck
07/10/2015 04:42	Station 35	15.0956	-23.9468	VSL off DP
07/10/2015 04:48	Station 35	15.0975	-23.9415	VSL on Passage speed
08/10/2015 03:45	Station 36	13.3784	-22.9057	Commence slowdown of vessel for pre-dawn CTD cast
08/10/2015 04:05	Station 36	13.3793	-22.9050	VSL on DP
08/10/2015 04:10	CTD_JR15001_S036	13.3793	-22.9050	CTD 36 deployed
08/10/2015 04:11	GAR_JR15001_030	13.3793	-22.9050	Garrett screen 30 deployed
08/10/2015 04:17	GAR_JR15001_030	13.3793	-22.9050	Garrett screen 30 on deck
08/10/2015 04:21	CTD_JR15001_S036	13.3793	-22.9050	CTD 36 at depth 500m EA600 4580m commence recovery
08/10/2015 04:49	CTD_JR15001_S036	13.3793	-22.9050	CTD 36 on deck
08/10/2015 04:53	Station 36	13.3793	-22.9050	VSL off DP
08/10/2015 12:40	Station 37	12.3737	-22.5310	Commence slowdown of vessel for 1300 CTD cast
08/10/2015	Station 37	12.3690	-22.5323	VSL on DP

12:50				
08/10/2015 13:00	CTD_JR15001_S037	12.3690	-22.5323	CTD 037 deployed
08/10/2015 13:00	OPT_JR15001_033	12.3690	-22.5323	Optics Rig deployed (1st)
08/10/2015 13:00	GAR_JR15001_031	12.3690	-22.5323	Garrett screen deployed
08/10/2015 13:10	GAR_JR15001_031	12.3690	-22.5323	Garrett screen on deck
08/10/2015 13:15	CTD_JR15001_S037	12.3690	-22.5323	CTD 35 at depth 500m EA600 3937m commence recovery
08/10/2015 13:25	OPT_JR15001_033	12.3690	-22.5323	Optics Rig recovered
08/10/2015 13:27	OPT_JR15001_034	12.3690	-22.5323	Optics Rig deployed (2nd)
08/10/2015 13:49	CTD_JR15001_S037	12.3690	-22.5323	ctd recovered
08/10/2015 13:49	OPT_JR15001_034	12.3690	-22.5323	Optics Rig recovered
08/10/2015 14:00	Station 37	12.3690	-22.5323	VSL off DP
08/10/2015 14:08	Station 37	12.3605	-22.5335	VSL on Passage speed
09/10/2015 03:40	Station 38	9.9955	-21.6018	Commence slowdown of vessel for pre-dawn CTD cast
09/10/2015 03:44	Station 38	9.9953	-21.6016	VSL on DP
09/10/2015 03:58	CTD_JR15001_S038	9.9953	-21.6016	CTD 038 deployed
09/10/2015 03:59	GAR_JR15001_032	9.9953	-21.6016	Garrett screen deployed
09/10/2015 04:05	GAR_JR15001_032	9.9953	-21.6016	Garrett screen on deck
09/10/2015 04:10	CTD_JR15001_S038	9.9953	-21.6016	CTD 38 at depth 500m EA600 4200m commence recovery
09/10/2015 04:36	CTD_JR15001_S038	9.9953	-21.6016	ctd recovered
09/10/2015 04:55	Station 38	9.9953	-21.6016	VSL off DP
09/10/2015 05:05	Station 38	9.9870	-21.5992	V/L on Passage speed
09/10/2015 12:40	station 39	8.5696	-21.0380	Commence slowdown of vessel for 1300 CTD cast
09/10/2015 12:50	station 39	8.5676	-21.0369	VSL on DP
09/10/2015 12:57	OPT_JR15001_035	8.5676	-21.0369	Optics Rig deployed (1st)
09/10/2015 13:03	CTD_JR15001_S039	8.5675	-21.0369	CTD 39 deployed
09/10/2015 13:18	CTD_JR15001_S039	8.5676	-21.0369	CDT 039 at depth wire out 500m EA600 Water Depth 4780m
09/10/2015 13:20	OPT_JR15001_035	8.5676	-21.0369	Optics Rig deployed (1st)
09/10/2015 13:21	OPT_JR15001_036	8.5676	-21.0369	Optics Rig deployed (2nd)
09/10/2015 13:43	OPT_JR15001_036	8.5676	-21.0369	Optics Rig recovered (2nd)
09/10/2015 13:51	CTD_JR15001_S039	8.5676	-21.0370	ctd recovered
09/10/2015 14:05	station 39	8.5611	-21.0347	VSL off DP
09/10/2015 14:15	station 39	8.5411	-21.0273	Vessel at passage speed
10/10/2015 03:40	Station 40	5.8779	-20.0276	Commence slowdown of vessel for pre-dawn CTD cast

10/10/2015 03:53	Station 40	5.8774	-20.0271	VSL on DP
10/10/2015 04:00	CTD_JR15001_S040	5.8774	-20.0271	CTD 040 deployed
10/10/2015 04:00	GAR_JR15001_033	5.8774	-20.0271	Garrett screen deployed
10/10/2015 04:05	GAR_JR15001_033	5.8774	-20.0271	Garrett screen on deck
10/10/2015 04:09	CTD_JR15001_S040	5.8774	-20.0271	CDT 005 at depth wire out 500m EA600 Water Depth 3025m
10/10/2015 04:39	CTD_JR15001_S040	5.8774	-20.0271	CTD 40 on deck
10/10/2015 04:45	Station 40	5.8774	-20.0271	VSL off DP
10/10/2015 04:57	Station 40	5.8816	-20.0236	Vessel at passage speed
10/10/2015 12:40	Station 41	4.4085	-19.4336	Commence slowdown of vessel for 1300 CTD cast
10/10/2015 12:55	Station 41	4.4031	-19.4307	VSL on DP
10/10/2015 13:02	CTD_JR15001_S041	4.4031	-19.4308	CTD 041 deployed
10/10/2015 13:15	OPT_JR15001_037	4.4031	-19.4308	Optics Rig deployed (1st)
10/10/2015 13:17	CTD_JR15001_S041	4.4031	-19.4308	CTD 41 at depth 500m EA600 4652m commence recovery
10/10/2015 13:30	OPT_JR15001_038	4.4031	-19.4308	Optics Rig deployed (2nd)
10/10/2015 13:51	CTD_JR15001_S041	4.4031	-19.4308	ctd recovered
10/10/2015 13:53	OPT_JR15001_038	4.4031	-19.4308	Optics Rig recovered
10/10/2015 14:10	Station 41	4.4025	-19.4303	VSL off DP
10/10/2015 14:15	Station 41	4.3977	-19.4285	VSL on Passage speed
11/10/2015 03:40	Station 42	1.9354	-18.4317	Commence slowdown of vessel for pre-dawn CTD cast
11/10/2015 03:45	Station 42	1.9329	-18.4323	VSL on DP
11/10/2015 03:59	CTD_JR15001_S042	1.9329	-18.4323	CTD 042 deployed
11/10/2015 04:00	GAR_JR15001_034	1.9329	-18.4323	Garrett screen deployed
11/10/2015 04:06	GAR_JR15001_034	1.9330	-18.4323	Garrett screen on deck
11/10/2015 04:10	CTD_JR15001_S042	1.9330	-18.4323	CTD 42 at depth 500m EA600 5264m commence recovery
11/10/2015 04:38	CTD_JR15001_S042	1.9329	-18.4323	CTD 42 on deck
11/10/2015 04:44	Station 42	1.9330	-18.4323	VSL off DP
11/10/2015 12:40	Station 43	0.4981	-17.8463	Commence slowdown of vessel for 1300 CTD cast
11/10/2015 12:52	Station 43	0.4900	-17.8436	VSL on DP
11/10/2015 12:55	CTD_JR15001_S043	0.4901	-17.8436	CTD 043 off the deck
11/10/2015 12:56	CTD_JR15001_S043	0.4901	-17.8436	CTD 043 deployed
11/10/2015 12:57	OPT_JR15001_039	0.4901	-17.8436	Optics Rig 039 off the deck
11/10/2015 12:58	OPT_JR15001_039	0.4901	-17.8436	Optics Rig 039 deployed
11/10/2015	CTD_JR15001_S043	0.4901	-17.8435	ctd recovered

13:20				
11/10/2015 13:22	OPT_JR15001_039	0.4901	-17.8436	Optics Rig recovered
11/10/2015 14:00	Station 43	0.4901	-17.8436	VSL off DP
11/10/2015 14:20	Station 43	0.4717	-17.8389	VSL on Passage speed
12/10/2015 03:40	Station 44	-1.6788	-16.9782	Commence slowdown of vessel for pre-dawn CTD cast
12/10/2015 03:45	Station 44	-1.6802	-16.9770	VSL on DP
12/10/2015 04:03	GAR_JR15001_035	-1.6802	-16.9770	Garrett screen deployed
12/10/2015 04:14	GAR_JR15001_035	-1.6802	-16.9770	Garret screen on deck
12/10/2015 04:30	CTD_JR15001_S044	-1.6802	-16.9770	CTD 044 deployed
12/10/2015 04:40	CTD_JR15001_S044	-1.6801	-16.9770	CTD 44 at depth 500m EA600 4280m commence recovery
12/10/2015 05:09	CTD_JR15001_S044	-1.6801	-16.9770	CTD 044 at the surface
12/10/2015 05:11	CTD_JR15001_S044	-1.6801	-16.9770	CTD 044 on deck
12/10/2015 05:17	Station 44	-1.6801	-16.9770	Deck cranes and gantry secure. Vessel off DP and proceeding to next station.
12/10/2015 05:28	Station 44	-1.6864	-16.9734	Vessel at passage speed
13/10/2015 03:40	Station 45	-4.4233	-15.8669	Commence slowdown of vessel for pre-dawn CTD cast
13/10/2015 03:46	Station 45	-4.4238	-15.8679	VSL on DP
13/10/2015 03:58	CTD_JR15001_S045	-4.4237	-15.8679	CTD 45 deployed
13/10/2015 04:00	GAR_JR15001_036	-4.4237	-15.8679	Garrett screen 36 deployed
13/10/2015 04:07	GAR_JR15001_036	-4.4237	-15.8679	Garrett screen 36 on deck
13/10/2015 04:09	CTD_JR15001_S045	-4.4237	-15.8679	CTD 45 at depth 500m EA600 4210m commence recovery
13/10/2015 04:40	CTD_JR15001_S045	-4.4237	-15.8679	CTD 45 on deck
13/10/2015 04:46	Station 45	-4.4237	-15.8679	VSL off DP
13/10/2015 04:52	Station 45	-4.4268	-15.8654	VSL on Passage speed
13/10/2015 12:40	Station 46	-5.3914	-15.4558	Commence slowdown of vessel for 1300 CTD cast
13/10/2015 12:46	Station 46	-5.3924	-15.4550	VSL on DP
13/10/2015 13:00	CTD_JR15001_S046	-5.3924	-15.4550	CTD 046 deployed
13/10/2015 13:00	OPT_JR15001_040	-5.3924	-15.4550	Optics Rig deployed (1st)
13/10/2015 13:16	CTD_JR15001_S046	-5.3924	-15.4550	CDT 005 at depth wire out 500m EA600 Water Depth 3729m
13/10/2015 13:22	OPT_JR15001_040	-5.3924	-15.4550	Optics Rig recovered
13/10/2015 13:23	OPT_JR15001_041	-5.3924	-15.4550	Optics Rig deployed (2nd)
13/10/2015 13:46	OPT_JR15001_041	-5.3924	-15.4550	Optics Rig recovered
13/10/2015 13:50	CTD_JR15001_S046	-5.3924	-15.4550	ctd recovered
13/10/2015 14:02	Station 46	-5.3924	-15.4550	VSL off DP

13/10/2015 14:20	Station 46	-5.4485	-15.4143	VSL on Passage speed
14/10/2015 03:40	Station 47	-7.1097	-14.7594	Commence slowdown of vessel for pre-dawn CTD cast
14/10/2015 03:48	Station 47	-7.1099	-14.7596	VSL on DP
14/10/2015 04:00	CTD_JR15001_S047	-7.1099	-14.7596	CTD 47 deployed
14/10/2015 04:01	GAR_JR15001_037	-7.1099	-14.7596	Garret screen deployed
14/10/2015 04:07	GAR_JR15001_037	-7.1099	-14.7596	Garret screen on deck
14/10/2015 04:11	CTD_JR15001_S047	-7.1099	-14.7596	CTD 47 at depth 500m EA600 3729m commence recovery
14/10/2015 04:42	CTD_JR15001_S047	-7.1099	-14.7596	CTD 47 on deck
14/10/2015 04:45	Station 47	-7.1099	-14.7596	VSL off DP
14/10/2015 04:53	Station 47	-7.1168	-14.7561	VSL on Passage speed
14/10/2015 11:48	Station 48	-7.8580	-14.4416	V/l on DP
14/10/2015 12:00	CTD_JR15001_S048	-7.8580	-14.4416	CTD 48 deployed
14/10/2015 12:00	OPT_JR15001_042	-7.8580	-14.4416	Optics rig deployed
14/10/2015 12:25	OPT_JR15001_042	-7.8580	-14.4416	optics rig recovered 1st
14/10/2015 12:27	OPT_JR15001_043	-7.8580	-14.4416	Optics rig deployed 2nd
14/10/2015 12:30	CTD_JR15001_S048	-7.8580	-14.4416	CTD 48 at depth 1200m EA600 1218m commence recovery
14/10/2015 12:49	OPT_JR15001_043	-7.8580	-14.4416	optics rig recovered 2nd
14/10/2015 13:25	CTD_JR15001_S048	-7.8580	-14.4415	CTD 48 on deck
14/10/2015 13:29	Station 48	-7.8580	-14.4416	VSL off DP
14/10/2015 13:31	Station 49	-7.8584	-14.4413	Ascension Island swath bathymtry survey started.
18/10/2015 13:30	Station 49	-7.9976	-14.3587	Ascencion Island swath bathymetry complete
19/10/2015 03:55	Station 50	-10.1136	-16.5745	VSL on DP
19/10/2015 03:59	CTD_JR15001_S055	-10.1135	-16.5745	CTD 055 deployed
19/10/2015 04:01	GAR_JR15001_038	-10.1135	-16.5745	Garrett Screen deployed
19/10/2015 04:11	CTD_JR15001_S055	-10.1135	-16.5745	CTD 055 at depth 500m EA600 4564m commence recovery
19/10/2015 04:13	GAR_JR15001_038	-10.1135	-16.5745	Garrett Screen recovered
19/10/2015 04:44	CTD_JR15001_S055	-10.1135	-16.5745	CTD 55 on deck
19/10/2015 04:50	Station 50	-10.1135	-16.5744	VSL off DP
19/10/2015 05:00	Station 50	-10.1240	-16.5751	VSL on Passage speed
19/10/2015 12:40	Station 51	-11.2290	-17.7023	commence slowdown for 1300 CTD cast.
19/10/2015 12:56	Station 51	-11.2348	-17.6946	vsl on dp
19/10/2015 13:00	OPT_JR15001_044	-11.2348	-17.6946	Optics rig deployed
19/10/2015	GOF_JR15001_017	-11.2348	-17.6947	go-flo deployed

13:06				
19/10/2015 13:10	CTD_JR15001_S056	-11.2348	-17.6946	CTD deployed
19/10/2015 13:13	GOF_JR15001_017	-11.2348	-17.6946	go-flo recovered
19/10/2015 13:25	OPT_JR15001_045	-11.2348	-17.6946	Optics rig deployed 2nd
19/10/2015 13:26	CTD_JR15001_S056	-11.2348	-17.6946	CTD 056 at depth 500m EA600 1586m commence recovery
19/10/2015 13:46	OPT_JR15001_045	-11.2348	-17.6946	optics rig recovered 2nd
19/10/2015 14:10	CTD_JR15001_S056	-11.2348	-17.6946	CTD on deck
19/10/2015 15:15	Station 51	-11.2316	-17.7013	VSL off DP
20/10/2015 04:40	Station 52	-12.9956	-19.4783	commence slowdown for pre-dawn CTD cast.
20/10/2015 04:52	Station 52	-13.0003	-19.4722	vsl on dp
20/10/2015 04:57	CTD_JR15001_S057	-13.0002	-19.4722	CTD 057 deployed
20/10/2015 05:01	GAR_JR15001_039	-13.0003	-19.4722	Garrett Screen deployed
20/10/2015 05:03	GAR_JR15001_039	-13.0002	-19.4722	Garrett Screen recovered
20/10/2015 05:08	CTD_JR15001_S057	-13.0003	-19.4722	CTD 057 at depth 500m EA600 4564m commence recovery
20/10/2015 05:43	CTD_JR15001_S057	-13.0003	-19.4722	CTD 57 on deck
20/10/2015 05:47	Station 52	-13.0003	-19.4722	VSL off DP
20/10/2015 05:54	Station 52	-13.0038	-19.4679	VSL on Passage speed
20/10/2015 13:40	Station 53	-14.0189	-20.5037	commence slowdown for 1300 CTD cast.
20/10/2015 13:51	Station 53	-14.0205	-20.5000	vsl on dp
20/10/2015 14:00	CTD_JR15001_S058	-13.9343	-20.4253	CTD deployed
20/10/2015 14:00	OPT_JR15001_046	-14.0205	-20.5000	Optics rig deployed
20/10/2015 14:05	GOF_JR15001_018	-14.0205	-20.5000	go-flo deployed
20/10/2015 14:17	CTD_JR15001_S058	-14.0205	-20.5000	CTD 058 at depth 500m EA600 4564m commence recovery
20/10/2015 14:24	OPT_JR15001_047	-14.0205	-20.5000	Optics rig deployed 2nd
20/10/2015 14:52	CTD_JR15001_S058	-14.0204	-20.5000	CTD on deck
20/10/2015 15:07	MAF_JR15001_001	-14.0204	-20.4981	Met office ARGO float #4878 deployed
20/10/2015 15:15	Station 53	-14.0204	-20.4967	VSL off DP
20/10/2015 15:25	Station 53	-14.2061	-20.6950	VSL on Passage speed
21/10/2015 04:40	Station 54	-15.6926	-22.1923	commence slowdown for pre-dawn ctd cast
21/10/2015 04:49	Station 54	-15.6910	-22.1881	vessel on dp
21/10/2015 04:57	CTD_JR15001_S059	-15.6910	-22.1882	CTD 59 deployed
21/10/2015 04:58	GAR_JR15001_040	-15.6910	-22.1882	Garrett screen deployed
21/10/2015 05:03	GAR_JR15001_040	-15.6910	-22.1881	Garrett screen recovered

21/10/2015 05:08	CTD_JR15001_S059	-15.6910	-22.1881	CTD at depth 500m EA600 4865m commence recovery
21/10/2015 05:38	CTD_JR15001_S059	-15.6910	-22.1881	CTD on deck
21/10/2015 05:43	Station 54	-15.6910	-22.1881	VSL off DP
21/10/2015 05:54	Station 54	-15.6985	-22.1869	VSL on Passage speed
21/10/2015 13:40	Station 55	-16.5662	-23.0962	Commence slowdown for 1300 science operations.
21/10/2015 13:47	Station 55	-16.5713	-23.1009	vessel on dp
21/10/2015 14:00	OPT_JR15001_048	-16.5713	-23.1009	Optics rig deployed.
21/10/2015 14:00	CTD_JR15001_S060	-16.5713	-23.1010	CTD 60 deployed
21/10/2015 14:00	GOF_JR15001_019	-16.5713	-23.1010	GO-FLO DEPLOYED
21/10/2015 14:08	GOF_JR15001_019	-16.5713	-23.1010	GO-FLO Recovered
21/10/2015 14:21	OPT_JR15001_049	-16.5713	-23.1010	2nd Optics deployed
21/10/2015 14:30	CTD_JR15001_S060	-16.5713	-23.1009	CTD @ depth 500m (EA4600m) commence recovery
21/10/2015 14:46	OPT_JR15001_049	-16.5713	-23.1009	Optics rig recovered.
21/10/2015 14:53	CTD_JR15001_S060	-16.5713	-23.1009	CTD Recovered
21/10/2015 15:15	Station 55	-16.5798	-23.1106	VSL off DP
21/10/2015 15:30	Station 55	-16.6145	-23.1459	VSL on Passage speed
22/10/2015 04:40	Station 56	-18.4918	-24.9930	Commence slowdown for pre-dawn ctd cast
22/10/2015 04:50	Station 56	-18.5020	-25.0019	vessel on dp
22/10/2015 04:54	CTD_JR15001_S061	-18.5020	-25.0019	CTD 61 deployed
22/10/2015 04:56	GAR_JR15001_041	-18.5020	-25.0019	Garrett screen deployed
22/10/2015 05:01	GAR_JR15001_041	-18.5020	-25.0019	Garrett screen recovered
22/10/2015 05:07	CTD_JR15001_S061	-18.5020	-25.0019	CTD at depth 500m EA600 4502m commence recovery
22/10/2015 05:40	CTD_JR15001_S061	-18.5020	-25.0019	CTD on deck
22/10/2015 06:36	Station 56	-18.5020	-25.0019	VSL off DP man. to mooring start position
22/10/2015 06:55	Station 57	-18.5042	-25.0262	VSL on DP for SOG mooring
22/10/2015 09:06	SOG Mooring	-18.5120	-25.0232	Commence deploying SOG mooring. V/L hdg 062deg x 0.5kts
22/10/2015 10:57	SOG Mooring	-18.4991	-24.9983	Sinker released
22/10/2015 11:01	SOG Mooring	-18.4989	-24.9979	V/l stopped to deploy hydrophone
22/10/2015 11:06	SOG Mooring	-18.4989	-24.9979	Hydrophone in the water
22/10/2015 11:55	SOG Mooring	-18.4989	-24.9979	Hydrophone back onboard
22/10/2015 11:57	SOG Mooring	-18.4987	-24.9975	V/l off DP proceeding to 1st ranging posn
22/10/2015 12:20	SOG Mooring	-18.4757	-24.9517	On DP
22/10/2015	SOG Mooring	-18.4744	-24.9490	Mooring ranged at 8298m. Off DP > range posn #2

12:28				
22/10/2015 13:20	SOG Mooring	-18.4707	-25.0477	V/l stopped to deploy hydrophone
22/10/2015 13:25	SOG Mooring	-18.4707	-25.0476	Hydrophone back onboard. Ranged at 7795m
22/10/2015 13:26	SOG Mooring	-18.4705	-25.0470	VSL off DP
22/10/2015 14:04	SOG Mooring	-18.5545	-25.0049	V/l stopped to deploy hydrophone
22/10/2015 14:06	SOG Mooring	-18.5545	-25.0049	Hydrophone back onboard. Ranged at 7921m
22/10/2015 14:15	SOG Mooring	-18.5545	-25.0048	VSL off DP
22/10/2015 15:00	SOG Mooring	-18.5302	-25.1082	vessel on dp
22/10/2015 15:00	SOG Mooring	-18.5302	-25.1082	Hydrophone in the water
22/10/2015 15:05	SOG Mooring	-18.5302	-25.1082	Mooring trigger released
22/10/2015 16:40	SOG Mooring	-18.5302	-25.1082	VSL off DP
22/10/2015 17:04	SOG Mooring	-18.5534	-25.0981	VSL man. to pick up surfaced mooring
22/10/2015 17:15	SOG Mooring	-18.5521	-25.0962	Recovery Line hooked and recovery commenced
22/10/2015 18:28	SOG Mooring	-18.5469	-25.0957	Mooring fully recovered
22/10/2015 18:35	MAF_JR15001_002	-18.5465	-25.0956	ARGO Float deployed #6996
22/10/2015 18:36	Station 57	-18.5463	-25.0956	VSL off DP proceed on passage
23/10/2015 04:40	Station 58	-20.5419	-25.0695	commence slowdown for pre-dawn ctd cast
23/10/2015 04:44	Station 58	-20.5417	-25.0687	Vessel on dp
23/10/2015 04:57	CTD_JR15001_S062	-20.5417	-25.0687	CTD 62 deployed
23/10/2015 04:58	GAR_JR15001_042	-20.5417	-25.0687	Garrett screen deployed
23/10/2015 05:04	GAR_JR15001_042	-20.5417	-25.0686	Garrett screen recovered
23/10/2015 05:08	CTD_JR15001_S062	-20.5417	-25.0686	CTD 62 at depth 500m EA600 5497m commence recovery
23/10/2015 05:40	CTD_JR15001_S062	-20.5418	-25.0686	CTD 62 on deck
23/10/2015 05:41	Station 58	-20.5418	-25.0686	Vessel off DP
23/10/2015 05:54	Station 58	-20.5614	-25.0674	VSL on Passage speed
23/10/2015 13:40	Station 59	-22.1608	-25.0874	Commence slowdown for 1300 science operations.
23/10/2015 13:45	Station 59	-22.1580	-25.0867	vessel on dp
23/10/2015 13:58	CTD_JR15001_S063	-22.1580	-25.0866	CTD 63 deployed
23/10/2015 13:58	GOF_JR15001_020	-22.1580	-25.0867	GO-FLO DEPLOYED
23/10/2015 13:58	OPT_JR15001_050	-22.1580	-25.0866	Optics rig deployed.
23/10/2015 14:04	GOF_JR15001_020	-22.1580	-25.0866	GO-FLO Recovered
23/10/2015 14:16	CTD_JR15001_S063	-22.1580	-25.0866	CTD 63 at depth 500m EA600 5274m commence recovery
23/10/2015 14:20	OPT_JR15001_050	-22.1580	-25.0866	Optics rig recovered 1st.

23/10/2015 14:22	OPT_JR15001_051	-22.1580	-25.0866	Optics rig deployed 2nd.
23/10/2015 14:45	OPT_JR15001_051	-22.1580	-25.0866	Optics rig recovered 2nd.
23/10/2015 14:52	CTD_JR15001_S063	-22.1580	-25.0867	CTD on deck
23/10/2015 15:00	Station 59	-22.1580	-25.0867	VSL off DP
23/10/2015 15:10	Station 59	-22.1575	-25.0812	VSL on Passage speed
24/10/2015 04:40	Station 60	-24.9107	-25.0709	commence slowdown for pre-dawn ctd cast
24/10/2015 04:46	Station 60	-24.9083	-25.0736	vessel on dp
24/10/2015 04:56	CTD_JR15001_S064	-24.9083	-25.0736	CTD 64 deployed
24/10/2015 04:57	GAR_JR15001_043	-24.9083	-25.0736	Garrett screen deployed
24/10/2015 05:04	GAR_JR15001_043	-24.9083	-25.0736	Garrett screen recovered
24/10/2015 05:08	CTD_JR15001_S064	-24.9083	-25.0736	CTD at depth 500m EA600 5061m commence recovery
24/10/2015 05:40	CTD_JR15001_S064	-24.9083	-25.0736	CTD on deck
24/10/2015 05:45	Station 60	-24.9083	-25.0736	VSL off DP
24/10/2015 05:56	Station 60	-24.9194	-25.0707	VSL on Passage speed
24/10/2015 13:40	Station 61	-26.5063	-25.0321	Commence slowdown for 1300 science operations.
24/10/2015 13:48	Station 61	-26.5025	-25.0371	vessel on dp
24/10/2015 13:56	CTD_JR15001_S065	-26.5025	-25.0371	CTD 65 deployed
24/10/2015 13:56	OPT_JR15001_052	-26.5025	-25.0371	Optics rig deployed.
24/10/2015 13:56	GOF_JR15001_021	-26.5025	-25.0371	GO-FLO DEPLOYED
24/10/2015 14:04	GOF_JR15001_021	-26.5025	-25.0371	GO-FLO Recovered
24/10/2015 14:12	CTD_JR15001_S065	-26.5025	-25.0371	CTD 65 at depth 500m EA600 4899.8m commence recovery
24/10/2015 14:22	OPT_JR15001_053	-26.5025	-25.0371	Optics rig deployed 2nd.
24/10/2015 14:43	OPT_JR15001_053	-26.5025	-25.0371	Optics rig recovered.
24/10/2015 14:47	CTD_JR15001_S065	-26.5025	-25.0371	CTD on deck
24/10/2015 15:08	MAF_JR15001_003	-26.5005	-25.0381	Met Office ARGO float deployed #6997
25/10/2015 04:40	Station 62	-28.7971	-25.4453	commence slowdown for pre-dawn ctd cast
25/10/2015 05:00	Station 62	-28.7969	-25.4592	VSL on DP
25/10/2015 05:06	GAR_JR15001_044	-28.7968	-25.4592	Garrett Screen deployed
25/10/2015 05:12	CTD_JR15001_S066	-28.7968	-25.4593	CTD 66 deployed
25/10/2015 05:17	GAR_JR15001_044	-28.7968	-25.4593	Garrett screen recovered
25/10/2015 05:24	CTD_JR15001_S066	-28.7968	-25.4593	CTD at depth 500m EA600 4502m commence recovery
25/10/2015 05:55	CTD_JR15001_S066	-28.7968	-25.4593	CTD on deck
25/10/2015	Station 62	-28.7968	-25.4593	VSL off DP

06:03				
25/10/2015 06:07	Station 62	-28.7964	-25.4615	Deck Secure
25/10/2015 06:20	Station 62	-28.8091	-25.4828	Vessel on Passage speed
25/10/2015 13:54	Station 63	-29.4057	-26.2118	VSL on DP
25/10/2015 14:15	OPT_JR15001_054	-29.4057	-26.2118	Optics rig deployed.
25/10/2015 14:15	CTD_JR15001_S067	-29.4057	-26.2118	CTD deployed
25/10/2015 14:28	CTD_JR15001_S067	-29.4057	-26.2118	CTD 67 at depth 500m EA600 5227m commence recovery
25/10/2015 14:36	OPT_JR15001_055	-29.4057	-26.2118	Optics rig deployed 2nd.
25/10/2015 14:57	CTD_JR15001_S067	-29.4057	-26.2118	CTD on deck
25/10/2015 15:04	OPT_JR15001_055	-29.4057	-26.2118	Optics rig recovered.
25/10/2015 15:18	Station 63	-29.4056	-26.2140	VSL off DP
25/10/2015 15:31	Station 63	-29.4160	-26.2299	VSL on Passage speed
26/10/2015 14:00	Station 64	-30.9355	-28.0866	vessel on dp
26/10/2015 14:06	OPT_JR15001_056	-30.9355	-28.0866	Optics rig deployed.
26/10/2015 14:06	CTD_JR15001_S069	-30.9355	-28.0866	CTD deployed
26/10/2015 14:25	CTD_JR15001_S069	-30.9356	-28.0866	CTD 69 at depth 500m EA600 4256m commence recovery
26/10/2015 14:57	OPT_JR15001_057	-30.9356	-28.0866	Optics rig recovered 2nd.
26/10/2015 14:57	OPT_JR15001_056	-30.9356	-28.0866	Optics rig deployed 2nd.
26/10/2015 14:58	CTD_JR15001_S069	-30.9356	-28.0866	CTD on deck
26/10/2015 15:04	MAF_JR15001_004	-30.9356	-28.0866	MET OFFICE ARGO FLOAT #7349 DEPLOYED
26/10/2015 15:09	Station 64	-30.9361	-28.0872	VSL off DP
26/10/2015 15:20	Station 64	-30.9532	-28.1039	VSL on Passage speed
27/10/2015 04:35	Station 65	-32.3714	-29.8266	commence slowdown for pre-dawn ctd cast
27/10/2015 05:00	Station 65	-32.3900	-29.8533	vessel on dp
27/10/2015 05:07	GAR_JR15001_045	-32.3900	-29.8533	Garrett screen deployed
27/10/2015 05:08	CTD_JR15001_S070	-32.3900	-29.8533	CTD 70 deployed
27/10/2015 05:16	GAR_JR15001_045	-32.3900	-29.8533	Garrett screen recovered
27/10/2015 05:18	CTD_JR15001_S070	-32.3900	-29.8533	CTD at depth 500m EA600 3590m commence recovery
27/10/2015 05:50	CTD_JR15001_S070	-32.3900	-29.8533	CTD 70 on deck
27/10/2015 05:56	Station 65	-32.3900	-29.8533	VSL off DP
27/10/2015 06:06	Station 65	-32.3962	-29.8656	VSL on Passage speed
27/10/2015 13:40	Station 66	-33.3192	-31.0648	Commence slowdown for 1300 science operations.
27/10/2015 13:56	Station 66	-33.3325	-31.0739	vessel on dp

27/10/2015 13:58	OPT_JR15001_058	-33.3325	-31.0739	Optics rig deployed.
27/10/2015 13:59	CTD_JR15001_S071	-33.3325	-31.0739	CTD deployed
27/10/2015 14:07	GOF_JR15001_022	-33.3325	-31.0739	GO-FLO DEPLOYED
27/10/2015 14:15	CTD_JR15001_S071	-33.3325	-31.0739	CTD at depth 500m EA600 2594m commence recovery
27/10/2015 14:15	GOF_JR15001_022	-33.3325	-31.0739	GO-FLO Recovered
27/10/2015 14:21	OPT_JR15001_058	-33.3325	-31.0739	Optics rig recovered 1st.
27/10/2015 14:22	OPT_JR15001_059	-33.3325	-31.0739	Optics rig deployed 2nd.
27/10/2015 14:43	CTD_JR15001_S071	-33.3325	-31.0739	CTD on deck
27/10/2015 15:02	Station 66	-33.3424	-31.0868	VSL off DP
27/10/2015 15:15	Station 66	-33.3732	-31.1259	VSL on Passage speed
28/10/2015 05:40	Station 67	-35.3216	-33.6383	commence slowdown for pre-dawn ctd cast
28/10/2015 05:56	Station 67	-35.3339	-33.6460	vessel on dp
28/10/2015 06:02	CTD_JR15001_S072	-35.3339	-33.6460	CTD 72 deployed
28/10/2015 06:02	GAR_JR15001_046	-35.3339	-33.6460	Garrett screen deployed
28/10/2015 06:08	GAR_JR15001_046	-35.3339	-33.6460	Garrett screen recovered
28/10/2015 06:13	CTD_JR15001_S072	-35.3339	-33.6460	CTD 72 at depth 500m EA600 4353m commence recovery
28/10/2015 06:40	CTD_JR15001_S072	-35.3339	-33.6460	CTD on deck
28/10/2015 06:47	Station 67	-35.3339	-33.6460	VSL off DP
28/10/2015 07:00	Station 67	-35.3548	-33.6675	VSL on Passage speed
28/10/2015 14:40	Station 68	-36.3526	-34.9704	Commence slowdown for 1300 science operations.
28/10/2015 14:54	Station 68	-36.3629	-34.9804	vessel on dp
28/10/2015 14:55	OPT_JR15001_060	-36.3629	-34.9805	Optics rig deployed.
28/10/2015 14:55	CTD_JR15001_S073	-36.3629	-34.9805	CTD deployed
28/10/2015 15:00	GOF_JR15001_023	-36.3629	-34.9805	GO-FLO DEPLOYED
28/10/2015 15:07	GOF_JR15001_023	-36.3629	-34.9804	GO-FLO Recovered
28/10/2015 15:09	CTD_JR15001_S073	-36.3629	-34.9805	CTD at depth 500m EA600 4591.9m commence recovery
28/10/2015 15:21	OPT_JR15001_061	-36.3629	-34.9805	Optics rig deployed 2nd.
28/10/2015 15:44	OPT_JR15001_061	-36.3629	-34.9805	Optics rig recovered.
28/10/2015 15:45	CTD_JR15001_S073	-36.3629	-34.9805	CTD on deck
28/10/2015 15:52	Station 68	-36.3629	-34.9805	VSL off DP
28/10/2015 16:13	Station 68	-36.3629	-34.9805	VSL on Passage speed
29/10/2015 05:40	Station 69	-38.4629	-37.7224	commence slowdown for pre-dawn ctd cast
29/10/2015	Station 69	-38.4792	-37.7521	vessel on dp

05:50				
29/10/2015 05:57	CTD_JR15001_S074	-38.4792	-37.7521	CTD 74 deployed
29/10/2015 05:58	GAR_JR15001_047	-38.4792	-37.7521	Garrett screen deployed
29/10/2015 06:04	GAR_JR15001_047	-38.4792	-37.7521	Garrett screen recovered
29/10/2015 06:08	CTD_JR15001_S074	-38.4792	-37.7521	CTD at depth 500m EA600 5240m commence recovery
29/10/2015 06:36	CTD_JR15001_S074	-38.4793	-37.7521	CTD on deck
29/10/2015 06:41	Station 69	-38.4793	-37.7521	VSL off DP
29/10/2015 06:51	Station 69	-38.4880	-37.7705	VSL on Passage speed
29/10/2015 14:40	Station 70	-39.8678	-39.6432	Commence slowdown for 1300 science operations.
29/10/2015 14:50	Station 70	-39.8742	-39.6579	VSL on DP
29/10/2015 14:58	CTD_JR15001_S075	-39.8742	-39.6579	CTD deployed
29/10/2015 14:58	GOF_JR15001_024	-39.8742	-39.6579	GO-FLO DEPLOYED
29/10/2015 14:58	OPT_JR15001_062	-39.8742	-39.6579	Optics rig deployed.
29/10/2015 15:06	GOF_JR15001_024	-39.8742	-39.6579	GO-FLO Recovered
29/10/2015 15:20	OPT_JR15001_063	-39.8742	-39.6579	Optics rig deployed 2nd.
29/10/2015 15:26	CTD_JR15001_S075	-39.8741	-39.6579	CTD at depth 500m EA600 5128m commence recovery
29/10/2015 15:47	CTD_JR15001_S075	-39.8742	-39.6579	CTD on deck
29/10/2015 15:48	OPT_JR15001_063	-39.8742	-39.6579	Optics rig recovered.
29/10/2015 15:54	MAF_JR15001_005	-39.8745	-39.6585	Met Office ARGO float deployed #7350
29/10/2015 16:05	Station 70	-39.8748	-39.6592	VSL off DP
29/10/2015 16:20	Station 70	-39.9091	-39.7061	VSL on Passage speed
30/10/2015 05:40	Station 71	-41.6885	-42.2303	commence slowdown for pre-dawn ctd cast
30/10/2015 05:59	Station 71	-41.6779	-42.2299	vessel on dp
30/10/2015 06:03	CTD_JR15001_S077	-41.6779	-42.2299	CTD 77 deployed
30/10/2015 06:04	GAR_JR15001_048	-41.6779	-42.2299	Garrett screen deployed
30/10/2015 06:09	GAR_JR15001_048	-41.6779	-42.2299	Garrett screen recovered
30/10/2015 06:12	CTD_JR15001_S076	-41.6779	-42.2299	CTD at depth 500m EA600 5190m commence recovery
30/10/2015 06:43	CTD_JR15001_S076	-41.6779	-42.2299	CTD on deck
30/10/2015 06:44	Station 71	-41.6779	-42.2299	VSL off DP
30/10/2015 06:57	Station 71	-41.6756	-42.2420	VSL on Passage speed
30/10/2015 14:40	Station 72	-42.7339	-43.6920	Commence slowdown for 1300 science operations.
30/10/2015 15:00	Station 72	-42.7227	-43.6993	VSL on DP
30/10/2015 15:05	OPT_JR15001_064	-42.7227	-43.6993	Optics rig deployed.

30/10/2015 15:05	GOF_JR15001_025	-42.7227	-43.6993	GO-FLO DEPLOYED
30/10/2015 15:05	CTD_JR15001_S077	-42.7227	-43.6993	CTD deployed
30/10/2015 15:15	CTD_JR15001_S077	-42.7227	-43.6993	CTD at depth 500m EA600 5170m commence recovery
30/10/2015 15:25	GOF_JR15001_025	-42.7227	-43.6993	GO-FLO Recovered
30/10/2015 15:27	OPT_JR15001_065	-42.7227	-43.6993	Optics rig deployed 2nd.
30/10/2015 15:45	CTD_JR15001_S077	-42.7227	-43.6993	CTD on deck
30/10/2015 15:49	OPT_JR15001_065	-42.7227	-43.6993	Optics rig recovered.
30/10/2015 16:00	Station 72	-42.7227	-43.6993	VSL off DP
30/10/2015 16:10	Station 72	-42.7055	-43.7073	VSL on Passage speed
30/10/2015 23:57	BAF_JR15001_001	-43.7276	-45.1876	BSH APEX FLOAT DEPLOYED #7515
31/10/2015 05:40	Station 73	-44.5773	-46.3490	commence slowdown for pre-dawn ctd cast
31/10/2015 05:58	Station 73	-44.5917	-46.3548	VSL on DP
31/10/2015 06:00	CTD_JR15001_S078	-44.5917	-46.3547	CTD deployed
31/10/2015 06:01	GAR_JR15001_049	-44.5917	-46.3548	Garrett screen deployed
31/10/2015 06:11	CTD_JR15001_S078	-44.5917	-46.3548	CTD at depth 500m EA600 5094m commence recovery
31/10/2015 06:12	GAR_JR15001_049	-44.5917	-46.3548	Garrett screen recovered
31/10/2015 06:40	CTD_JR15001_S078	-44.5916	-46.3548	CTD on deck
31/10/2015 06:42	Station 73	-44.5917	-46.3548	VSL off DP
31/10/2015 06:54	Station 73	-44.6026	-46.3664	VSL on Passage speed
31/10/2015 14:40	Station 74	-45.6496	-47.9901	Commence slowdown for 1300 science operations.
31/10/2015 14:55	Station 74	-45.6502	-48.0106	VSL on DP
31/10/2015 15:00	CTD_JR15001_S079	-45.6503	-48.0106	CTD deployed
31/10/2015 15:00	OPT_JR15001_066	-45.6503	-48.0106	Optics rig deployed.
31/10/2015 15:13	CTD_JR15001_S079	-45.6503	-48.0106	CTD at depth 500m EA600 5457m commence recovery
31/10/2015 15:23	OPT_JR15001_067	-45.6503	-48.0106	Optics rig deployed 2nd.
31/10/2015 15:45	OPT_JR15001_067	-45.6503	-48.0106	Optics rig recovered.
31/10/2015 15:50	CTD_JR15001_S079	-45.6503	-48.0106	CTD Recovered
31/10/2015 16:20	Station 74	-45.6510	-48.0148	VSL off DP
31/10/2015 16:25	Station 74	-45.6571	-48.0262	VSL on Passage speed
01/11/2015 20:49	BAF_JR15001_002	-47.8917	-51.4935	BSH APEX FLOAT DEPLOYED #7516
02/11/2015 06:55	Station 75	-48.8727	-53.1076	VSL on DP - assessing weather conditions
02/11/2015 07:08	CTD_JR15001_S080	-48.8725	-53.1070	CTD deployed
02/11/2015	GAR_JR15001_050	-48.8725	-53.1070	Garrett screen deployed

07:10				
02/11/2015 07:16	GAR_JR15001_050	-48.8725	-53.1070	Garrett screen recovered
02/11/2015 07:20	CTD_JR15001_S080	-48.8725	-53.1070	CTD at depth 500m EA600 commence recovery
02/11/2015 07:47	CTD_JR15001_S080	-48.8725	-53.1070	CTD on deck
02/11/2015 07:54	Station 75	-48.8725	-53.1070	VSL off DP
02/11/2015 08:04	Station 75	-48.8765	-53.1216	VSL on Passage speed
02/11/2015 16:10	station 76	-49.7765	-54.5092	vsl on dp
02/11/2015 16:15	CTD_JR15001_S081	-49.7765	-54.5091	CTD deployed
02/11/2015 16:15	OPT_JR15001_68	-49.7765	-54.5091	Optics deployed 1st
02/11/2015 16:25	CTD_JR15001_S081	-49.7765	-54.5091	CTD @ depth 500m EA600 reading 1300m commence recovery.
02/11/2015 16:38	OPT_JR15001_069	-49.7766	-54.5091	Optics deployed 2nd
02/11/2015 16:56	CTD_JR15001_S081	-49.7765	-54.5091	CTD recovered to deck
02/11/2015 17:00	OPT_JR15001_069	-49.7765	-54.5091	Optics recovered to deck.
02/11/2015 17:20	station 76	-49.7788	-54.5249	vsl off dp
02/11/2015 17:27	station 76	-49.7799	-54.5268	vsl on passage speed