



Royal Netherlands Institute for Sea Research

Cruise Report

Agulhas System Climate Array (ASCA) Cruise

RV Algoa 215

07 – 26 April 2015

Report compiled by the co-Chief Scientists for the cruise, with input from cruise participants as noted through the cruise report document.

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1. Introduction:

The Agulhas System Climate Array is an international oceanographic project with partners from South Africa, the United States of America (USA), and the Netherlands, and funding support from the South African Departments of Science and Technology (DST) and Environmental Affairs (DEA), the US National Science Foundation (NSF) and the Royal Dutch Institute for Sea Research (NIOZ). It is designed to provide long term observations of Agulhas Current volume, heat and salt transport and its variability from mesoscale (eddies), through seasonal to interannual timescales. This will be achieved by means of two shelf and seven full-depth tall moorings, interspersed with five Current- and Pressure-recording Inverted Echo Sounders (CPIES), measuring pressure, current velocities, temperatures and salinities. The ASCA shelf and tall moorings will extend 200 km offshore along the descending TOPEX/Jason satellite ground track # 96, through the core of the Agulhas Current, with CPIES measurements extending the array to 300 km (~ 160 nm) offshore.

For this first deployment cruise, two shelf moorings and the first four tall moorings were deployed, with the rest of the moorings and CPIES planned for deployment in 2016 when these first moorings are serviced. The cruise was complimented by a Conductivity, Temperature and Depth (CTD) and Vertical Bongo survey along the full ASCA transect (~ 160 nm), with underway chemistry and ship-borne Acoustic Doppler Current Profiler (ADCP) surveys, SVP Drifter and iRobot Glider deployments.

2. Cruise Objectives (as per approved and signed Sailing Orders)

1. Deploy two shelf moorings (C1 and C2) and four tall moorings (A-D) as part of the ASCA Mooring array, off Hamburg just south of East London.
2. Undertake 2 x S-ADCP transects along the ASCA mooring array line. The first from Mooring C1 to D at the beginning of the mooring leg to assess the bathymetry and the actual currents along the transect (~ 46 nm); the second from CTD 20 to CTD 1 after the CTD survey on Leg 2 (~ 160 nm)
3. Deploy two gliders inshore of the Agulhas Current to do shelf interaction surveys for ~ 2 months. The gliders will be retrieved by the SAEON Elwandle team, once the survey along shelf edge is complete.
4. Deploy 10 x SVP drifters (split between legs 1 and 2), along the Sentinel-1 swath overpass on leg 1, and along the ASCA CTD survey on leg 2.
5. Undertake 20 x CTD stations along the ASCA line for physical and chemical oceanographic parameters, biogeochemistry, microzooplankton and phyto- and zooplankton net sampling.
6. Undertake underway microplankton sampling along ASCA CTD survey transect, if station spacing further than 15 minute degrees apart
7. Undertake underway chemistry sampling from Cape Town to Cape Town (i.e. entire duration of the cruise)
8. The vessel will be involved with the ASCA science launch at the end of the cruise showcasing the project and highlighting the achievements made on this inaugural deployment cruise

3. Cruise Participants, with responsibilities and affiliations

Acronyms:

DEA	Department of Environmental Affairs (Ocean and Coasts)
SAEON	South African Environmental Observation Network (Egagasini and Elwandle Nodes)
NIOZ	Royal Netherlands Institute for Sea Research
BCRE	Bayworld Centre for Research and Education
UCT	University of Cape Town
CPUT	Cape Peninsula University of Technology
DAFF	Department of Agriculture, Forestry and Fisheries
CSIR	Council for Scientific and Industrial Research
STS	Sea Technology Services

Leg 1: Mooring Deployments

Name	Affiliation	Responsibility
Geert-Jan Brummer	NIOZ	Co-Chief Scientist, Moorings, Data Management
Tamaryn Morris	SAEON	Co-Chief Scientist, Moorings, Data Management
Gavin Louw	DEA	Co-Chief Scientist, Moorings, Data Management
Bradley Blows	BCRE	Moorings
Leon Wuis	NIOZ	Moorings
Fehmi Dilmahamod	UCT	Moorings (training)
Xolisa Dlomo	SAEON	Moorings (training)
Jarred Voorneveld	CPUT	Moorings (training), GoPro Filming
Katherine Moffett	CPUT	Moorings (training), GoPro Filming
Jethan d'Hotman	CPUT	Moorings (training)
Khaya Siswana	DEA	Chemistry
Mbulelo Makhetha	DEA	Chemistry, Moorings (training)
Elijah Ramphago	DEA	Electronics (intern), Moorings (training)
Beate Holscher	SAEON	Media relations

Leg 2: CTD and Vertical Bongo Survey

Name	Affiliation	Responsibility
Geert-Jan Brummer	NIOZ	Co-Chief Scientist, CTD chemistry, Data Management
Tamaryn Morris	SAEON	Co-Chief Scientist, CTD sampling, Data Management
Gavin Louw	DEA	Co-Chief Scientist, CTD operator, Data Management
Fehmi Dilmahamod	UCT	CTD and Vertical Bongo (training)
Estee Vermeulen	UCT	CTD and Vertical Bongo (training)
Leandro Ponsoni	NIOZ	CTD and Vertical Bongo (training)
Khaya Siswana	DEA	Chemistry
Mbulelo Makhetha	DEA	CTD operator, Chemistry
Elijah Ramphago	DEA	Electronics (intern)
Xolani Methu	DAFF	Electronics
Elana Wright	DEA	Vertical Bongo
Mfundo Bizani	SAEON	CTD sampling

Marjolaine Krug	CSIR	Glider deployments, CTD sampling
Fred Fourie	STS	Glider deployments, CTD sampling

Leg 3: Cape Town bound – Underway Sampling and Educator / Learner Training

Name	Affiliation	Responsibility
Gavin Louw	DEA	Chief Scientist, Data Management
Khaya Siswana	DEA	Underway Chemistry
Mbulelo Makhetha	DEA	Underway Chemistry
Fehmi Dilmahamod	UCT	Underway Chemistry
Estee Vermeulen	UCT	Underway Chemistry
Elana Wright	DEA	Underway Chemistry
Elijah Ramphago	DEA	Electronics (intern)
Xolani Methu	DAFF	Electronics
Thomas Mtontsi	SAEON	Education Officer
Hannah Raven	SAEON	Intern – Outreach and Awareness
Denver Bowers	SAEON	Educator – Ocean View Secondary
Gilbert Musona	SAEON	Learner – Ocean View Secondary

4. Cruise Narrative

Professor Geert-Jan Brummer

Tuesday, April 7. In the early morning the scientific staff boarded the RV *Algoa*, as well as several visitors including DEA Chief Director Ashley Naidoo and the DEA Science Manager for Oceans Research, Mthuthuzeli Gulekana to wish us a successful trip, while Dr. Juliet Hermes (SAEON, Egagasini Node Manager) stayed on board during the recalibration of the compass for about two hours around Cape Town harbor. Later in the morning, all scientific staff met for familiarization with each other, the ship, and execution of the scientific planning. By 12:00 hours, the RV *Algoa* departed, heading for the first mooring station off Port Elizabeth. Continuous biogeochemical sampling started at 14:00, after the compass calibration, and was conducted in shifts of 4 hours, sampling for nutrients and chlorophyll-a (every 15 minutes) as well as measuring dissolved oxygen (every 4 hours). In the afternoon, the sea state rapidly deteriorated with very heavy swell that continued during the night.

Wednesday, April 8. While the sea swell slowly diminished, a muster and lifeboat drill was completed successfully in the early morning. Biogeochemical sampling continued throughout the day and night. Also the Continuous Plankton Recorder (CPR) was deployed from the aft shift, starting at 16:49 (34°29.93'S and 21°43.88'E).

Thursday, April 9. While the biogeochemical sampling continued, preparations for the mooring deployments started. Spooling of the mooring cables onto the net drum went fine except that on one occasion the cable for mooring C became stuck behind a shackle joint, damaging the plastic liner in two places. In one place a short ca. 2 meter section below the spelter socket was cut and replaced by a new one, while in the other place the cable was cut in two, the damaged 30 cm section removed and replaced by two new spelter sockets. All instruments for mooring D, the longest one (3017 m) and the first to be deployed, were prepared, checked and found to be OK. However, none of the beacons did return a satellite signal, although testing showed they were all working.

Meanwhile the CPR was recovered (11:45, at 34°12.5'S and 25°05.8'E) and redeployed (11:54, at 34°12.1'S and 25°07.5'E). Shortly after the early afternoon the sampling program and mooring preparations were rudely interrupted by a fire alarm, which appeared the real thing and not a drill. While the fire itself was rapidly extinguished, a vital cooling element of the main engine appeared damaged beyond repair.

Consequently it was decided to abort the scientific program and slowly sail for Port Elizabeth on the bow thrusters in order to get the required repairs. By 18:00 the ship anchored off Port Elizabeth.

Friday, April 10. While anchored off Port Elizabeth, a small boat arrived to collect the broken cooling unit for repairs and returned with the repaired unit by 17:00. However, in turn its own engine broke down, which necessitated yet another small vessel to come collect the repaired unit, bring it to the RV *Algoa* and tow the other vessel back to Port Elizabeth. The unit arrived by 20:00 and already by 21:00 the RV *Algoa* managed to set sail to the first and deepest mooring station furthest offshore (Mooring D, at 3.6 km bottom depth). Also from that time onward, the 24-hour biogeochemical sampling program recommenced, continuing until we would reach position the next day.

Saturday, April 11. Given the calm sea and moderate current close to shore, we reached Mooring site D already by noon. In the meantime the wind had turned a 180 degrees and doubled in strength, while the current had changed direction from the NE to nearly southward, probably due to the influence of a large anticyclonic eddy approaching from the east. Our timely arrival gave us the opportunity to actually deploy our first and longest mooring of nearly 3 km, after letting the ship drift for half an hour to assess its behavior in order to properly set up mooring deployment against the 2 m/sec (!) current, starting at 13:00. In all, we laid out Mooring D equipped with 5 current meters, 4 Microcat CTDs, and an ADCP in the uppermost float, within 1.5 hours, much more rapidly than envisaged and steamed for over half an hour upstream in order to drop the anchor at the desired depth. Indeed, by 15:12 the anchor, a concrete cube weighing 1280 kilos (in water), was released, which subsequent triangulation showed to be at 34°02.615'S and 27°51.619'E at a depth of 3625 m (velocity uncorrected). Mooring activities were followed by a CTD to 1000m depth and the deployment of two surface drifters.

Sunday, April 12.

A very busy and successful day indeed. Starting before sunrise, we first conducted a short survey of the bathymetry around the targeted position of Mooring C and let the ship drift to assess its behavior in the prevailing current (three knots to the southwest!). Setting it up 1½ nm against the current, everything went smoothly so that we were ready to drop the anchor weight within 45 minutes. Slowly steaming to the target position, the anchor was dropped half an hour later at 34°46.926'S and 27°42.948'E. The anchor fell to the bottom at 2211 m. A CTD cast was undertaken, but the triangulation yielded no pings from the echo sounder. Decision taken to try this mooring again on the CTD survey leg. We sailed to the next mooring site B for the most challenging operation of the entire cruise given the steep slope, critical bottom depth and the soaring current of close to five knots. In addition the upper nearly 500 m of Mooring B consisted of a very thin albeit strong rope to which five instruments had to be mounted as it was paid out pulled by its 200 kg end float from the back. It was a tense operation altogether which owing to the excellent teamwork went flawlessly and so rapidly that it took an hour of steaming with the mooring towed behind us until at 14:59 the anchor was dropped 33°39.472'S and 27°39.016'E, at a bottom depth of 1257m.

Given the time remaining, we steamed to the third mooring station of the day, to deploy a short one (40 m) with an ADCP only at a bottom depth of 320 m at 33°33.4986'S and 27°35.7040'E. After some bathymetric surveying Mooring A was successfully deployed within 5 minutes. We then returned to the site of mooring B for triangulation, took a CTD, then returned to mooring A for a CTD there, and deployed a surface drifter.

Monday, April 13. The last two moorings of Leg 1, C3 and C2 were deployed early in the morning on the shelf at a bottom depth of 120m and 80 m, respectively, each containing an ADCP. After a CTD at both mooring sites, the CPR was deployed from the aft (09:07) while sailing for Port Elizabeth. In the evening we celebrated the graduation of 4 students who happened to be on board rather than at the ceremony in Cape Town.

Tuesday, April 14. Anchored off Port Elizabeth waiting for permission to dock and a pilot to bring us into port. In the middle of the night the pilot finally arrived and we heaved the anchor for docking in Port Elizabeth.

Wednesday, April 15. Docked in Port Elizabeth, cleaning labs and packing personal belongings for those of us who would be leaving the ship.

Thursday, April 16. Throughout the day we have been saying thank you and goodbye to seven scientific staff members who participated in the successful execution of the first leg of the ASCA 2015 cruise. At the same time we welcomed seven new scientific staff participating in the second leg, of which some immediately went to prepare and test their instruments. Bunkers were received late in the afternoon and after the pilot arrived in the evening, we sailed for the transect despite deteriorating conditions, particularly the high swell, which made the ship roll heavily; at least when the sea state would improve, we would be there.

Friday, April 17. Unfortunately, the sea state further deteriorated rather than improved and we spent a full day cruising up and down the coast.

Saturday, April 18. One CTD was attempted but aborted within a few minutes as the swell proved too high, running the risk of losing the CTD if not personal injury. As the swell continued to take its toll on scientific staff with at least half of them sea sick, we decided to leave the transect and head for Port Elizabeth again to seek shelter.

Sunday, April 19. For the first time in days virtually everybody turned up for breakfast as the swell at the anchor station diminished and we set sail to the alternative site for a renewed attempt to deploy one of the gliders. When we arrived the sea had calmed down sufficiently to actually make a serious attempt. When the dense fog had also disappeared, preparation began in earnest. By midafternoon all systems were communicating properly and after the seaborne test proved successful too, the glider was launched by 17:00. And what a launch it was: in a beautiful sunset, we found ourselves surrounded by a large group of dolphins, accompanied by flocks of albatross, petrels and gannets, several seals and even a jumping large shark. Immediately after we set again sail to the transect in the hope that weather and sea state would finally allow for some proper sampling in the little time remaining.

Monday, April 20. Arriving at the transect we started systematic sampling of the preset sampling stations using the CTD and vertical Bongo nets on 20 sites from near shore to 150 nm offshore. In a 24/7 operation we first profiled the water column down to ca. 1000m, taking 12 seawater samples along the depth profile for calibrating salinity, oxygen and chlorophyll-a. In addition, we sampled for nutrients, size fractionated chlorophyll and phytoplankton. While sampling the CTD bottles, station activities continued with a vertical haul of the Bongo net system from a depth of 200m for macro-zooplankton (>200µm), which was followed by a second, shallow cast of the CTD to sample for pigments and absorption, phytoplankton and micro-zooplankton (20-220µm), targeting the fluorescence maximum. The latter proved somewhat problematic, because there was hardly a clear maximum to be distinguished in the more offshore sites, in the Agulhas Current proper.

Tuesday, April 21. Sampling continued in the same way until the Bongo net broke down on the 15th and penultimate station of the transect. Anti-cyclonic eddy.

Wednesday, April 22. Very early in the morning at 05:00 we arrived at the same site where we deployed Mooring C on the previous leg of the cruise, just to chat with the mooring's release gears and determine its exact location on the seafloor. A few hours later preparations for deploying a second glider started, communication with both the shore and the satellite were established, the glider was dipped into the

water and out again until everything was cleared for launching at 11:00. Immediately thereafter, a drifter was launched, followed by a CTD for calibrating the measurements of temperature, salinity and chlorophyll the glider would be taking. A similar CTD dip was carried out at the location where the previous glider last surfaced and had send back its acquired data via the satellite to the ground station. This concluded the CTD-sampling program, which we celebrated together with the crew during a braai on the aftdeck, while the ship headed for Port Elizabeth.

Thursday, April 23. The day was spent at anchor in the morning cleaning the labs and scientific equipment in preparation for the launch. The vessel docked in the afternoon at Quay 8 in Port Elizabeth.

Friday, April 24. The launch of the ASCA project was undertaken in Port Elizabeth with two events – tours of the RV *Algoa* and a presentation event at the Nelson Mandela Metropolitan University in the afternoon. Further details of this will be available in the ASCA Capacity Building Report.

The vessel steamed for Cape Town at 19:00 with a small change-over of scientific staff. An educator, a learner and two SAEON Education staff from the Egagasini Node joined the vessel for hands-on training back to Cape Town. Underway sampling recommenced as the vessel left the Port Elizabeth harbor.

Saturday, April 25. Underway sampling en route to Cape Town

Sunday, April 26. Underway sampling en route to Cape Town. Vessel docked in the afternoon. Cruise finished.

5. Station details and Study Area Maps

Leandro Ponsoni from NIOZ plotted all station detail maps. The underway station detail metadata is available in spreadsheet form from the ASCA Data Repository (Drop Box and ASCA co-PIs for the project).

Leg 1 – Underway Sampling Transects:

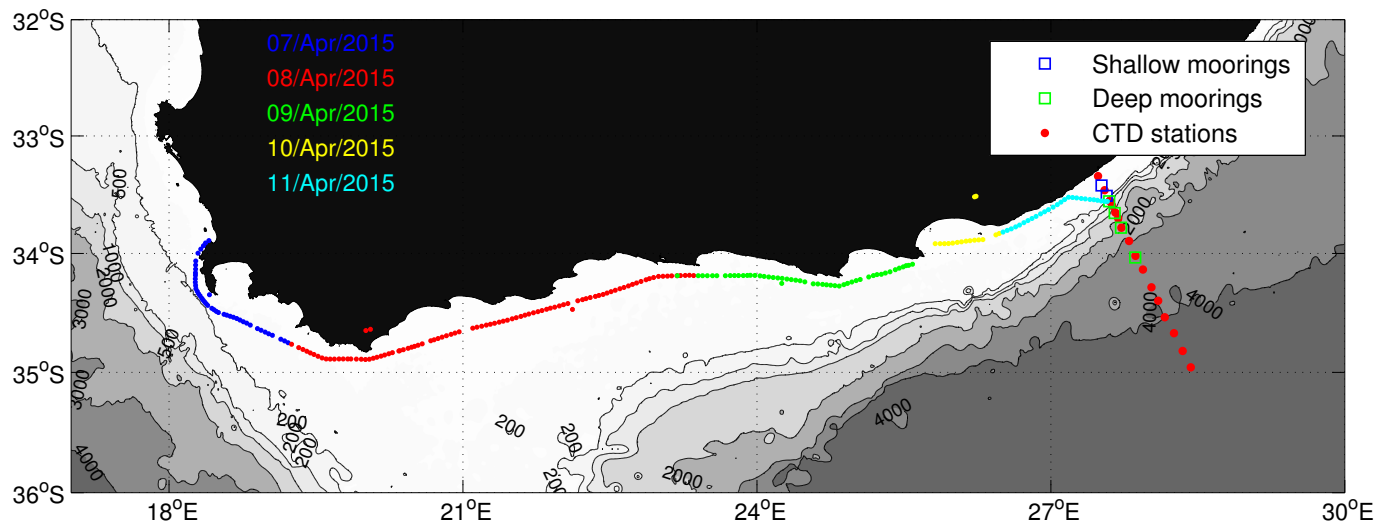


Figure 1: Underway sampling from Cape Town to the start of the ASCA line (shown as a transect of mooring deployments and CTD stations). The underway sampling is broken down per day of sampling activity.

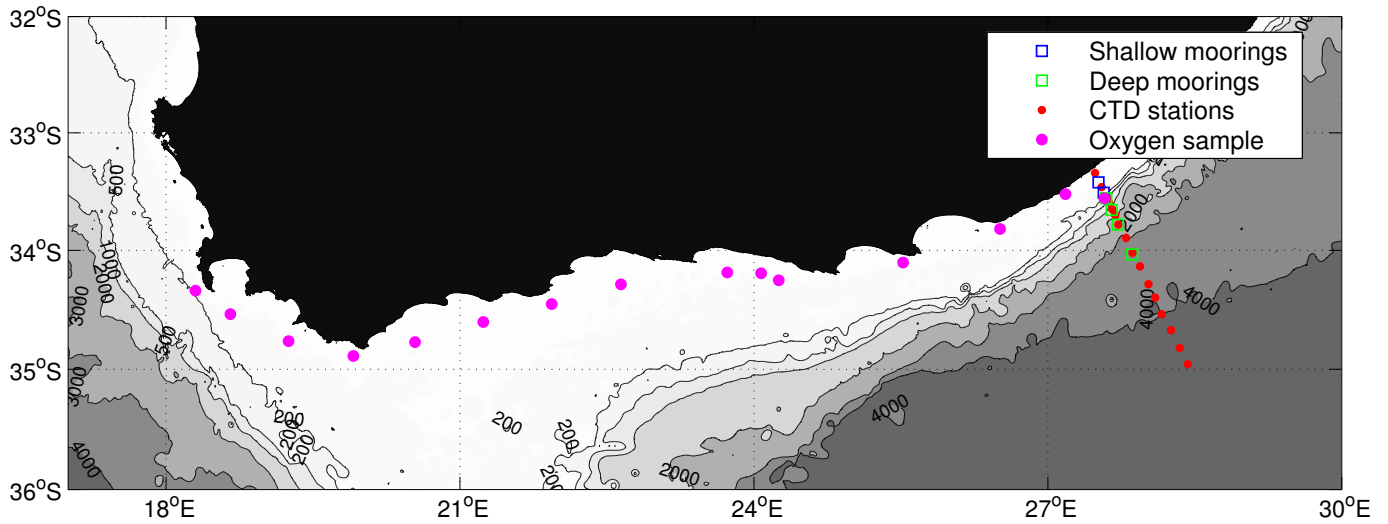


Figure 2: Underway dissolved oxygen samples (purple dots) for the underway transect from Cape Town to the start of the ASCA line.

Leg 1 and 2 – Mooring, SVP drifter and Glider Deployments and CTD station details:

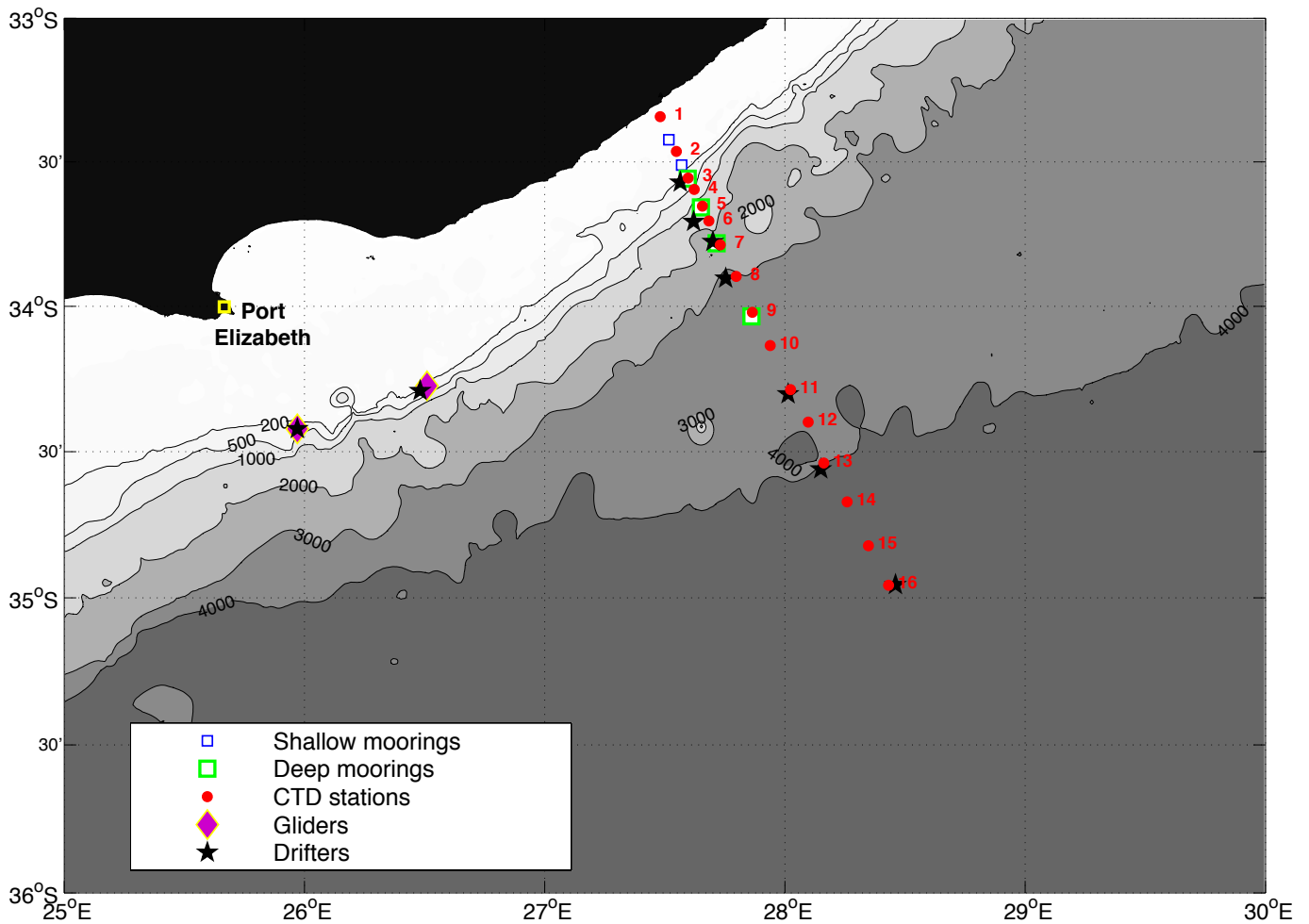


Figure 3: Leg 1 and 2 mooring deployments (shallow – blue square and deep – green square), SVP drifter deployments (black stars), Sea Glider deployments (purple diamonds) and the CTD stations along the ASCA transect (red circles). CTD stations were done after each mooring and glider deployment (CTD-001 - CTD-006 for moorings, CTD-024 and CTD-025 for gliders), and along the ASCA transect on Leg 2, two casts per CTD station were undertaken for additional water samples. Please refer to Table 3 below and the CTD deckchits in Annexure 4 for further details.

Table 1: Mooring deployments:

Mooring	Date	Time (GMT)	Latitude	Longitude	Triangulated	Depth (m)
D - tall	11/04/2015	13:12	-34,0435	27,8603	Yes	3625,00
C – tall	12/04/2015	06:18	-33,7996	27,7152	Yes	~ 2211,00
B – tall	12/04/2015	13:00	-33,6674	27,6428	Yes	~ 1257,00
A – tall	12/04/2015	14:15	-33,5583	27,5950	No	319,00
C3 – shelf	13/04/2015	04:59	-33,5112	27,5698	No	121,00
C2 – shelf	13/04/2015	05:49	-33,4232	27,5167	No	79,00

Table 2: SVP Drifter deployments:

Serial #	WMO #	Date	Time (GMT)	Latitude	Longitude
127198	14547	11/04/2015	16:45	-33,9034	27,7536
127199	14901	11/04/2015	16:45	-33,9034	27,7536
132511	14903	12/04/2015	18:48	-33,5710	27,5643
132528	14545	19/04/2015	15:37	-34,4218	25,9706
127313	16516	20/04/2015	14:51	-33,7071	27,6200
127315	16517	20/04/2015	15:32	-33,7768	27,7003
127272	16519	21/04/2015	04:48	-34,3022	28,0129
132634	16520	21/04/2015	09:16	-34,5597	28,1493
127314	16521	21/04/2015	16:50	-34,9557	28,4603
127281	16522	22/04/2015	09:18	-34,2909	26,4818

Table 3: Glider deployments:

Serial #	Date	Time (GMT)	Latitude	Longitude
543	19/04/2015	15:04	-34,4218	25,9706
573	22/04/2015	08:42	-34,2740	26,5100

Table 4: CTD station positions. Please refer to Annexure 4 for the CTD Deckchits. Note, CTD-007 is not represented on this table, as the stations was aborted due to bad weather. The deckchit of this station is however available in Annexure 4 to show station numbering of the aborted station.

Station #	Grid #	Date	Time (GMT)	Latitude	Longitude	Depth (m)
Alg11194	CTD-001	11/04/2015	13:49	-34,0262	27,8617	3603,60
Alg11195	CTD-002	12/04/2015	07:00	-33,7887	27,6941	2415,00
Alg11196	CTD-003	12/04/2015	15:58	-33,6704	27,6313	1167,00
Alg11197	CTD-004	12/04/2015	18:20	-33,5543	27,5936	299,25
Alg11198	CTD-005	13/04/2015	05:57	-33,4227	27,5149	72,00
Alg11199	CTD-006	13/04/2015	06:51	-33,5119	27,5681	117,00
Alg11201	CTD-008a+b	20/04/2015	04:00	-33,3430	27,4804	52,26
Alg11202	CTD-009a+b	20/04/2015	06:54	-33,4633	27,5479	88,43
Alg11203	CTD-010a+b	20/04/2015	08:23	-33,5560	27,5975	314,75
Alg11204	CTD-011a+b	20/04/2015	10:16	-33,5955	27,6225	599,44
Alg11205	CTD-012a+b	20/04/2015	12:26	-33,6539	27,6569	1264,00
Alg11206	CTD-013a+b	20/04/2015	15:25	-33,7051	27,6829	1754,00
Alg11207	CTD-014a+b	20/04/2015	17:47	-33,7876	27,7309	2222,00
Alg11208	CTD-015a+b	20/04/2015	20:15	-33,8967	27,7974	3210,00
Alg11209	CTD-016a+b	20/04/2015	22:37	-34,0203	27,8645	3595,17
Alg11210	CTD-017a+b	21/04/2015	00:53	-34,1349	27,9385	3614,78
Alg11211	CTD-018a+b	21/04/2015	03:26	-34,2871	28,0238	3699,16
Alg11212	CTD-019a+b	21/04/2015	05:33	-34,3982	28,0974	3821,22
Alg11213	CTD-020a+b	21/04/2015	07:52	-34,5391	28,1616	3990,29
Alg11214	CTD-021a+b	21/04/2015	10:20	-34,6726	28,2585	4146,00

Alg11215	CTD-022a+b	21/04/2015	12:59	-34,8221	28,3474	4265,00
Alg11216	CTD-023a+b	21/04/2015	15:27	-34,9575	28,4308	4322,00
Alg11217	CTD-024	22/04/2015	08:49	-34,2751	26,5079	223,00
Alg11218	CTD-025	22/04/2015	14:12	-34,4268	25,9124	349,00

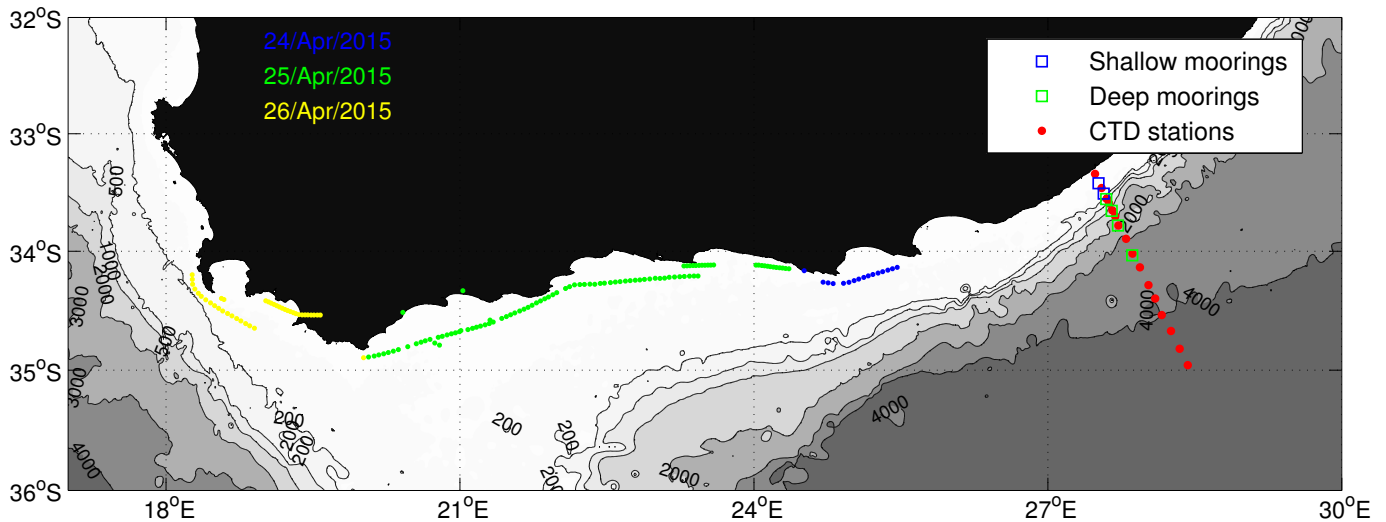


Figure 4: Underway sampling from Port Elizabeth to Cape Town. The underway sampling is broken down per day of sampling activity. Note: Position data needs to be checked and verified.

6. Real-time Satellite Imagery

Dr. Marjolaine Krug

Maps of sea surface temperature (SST) and geostrophic currents were provided in near-real time to the RV *Algoa* vessel to support operations during the ASCA cruise. All images provided had a 1-day delay. Three different SST products were used. The 1st SST product was the Odyssea SST produced by the CERSAT and which consists in a merged SST product with a 2km spatial resolution. Daily MODIS SST maps at a 1km spatial resolution were produced using the data processed by the Marine Remote Sensing Unit (MRSU, www.afro-sea.org.za). Finally, daily composite of SST were generated and mapped from the OSI-SAF hourly SEVIRI product provided by CERSAT (<http://cersat.ifremer.fr/data/collections/o-si-saf>). The SST maps were overlaid with absolute geostrophic current vectors in order to provide some information on the ocean circulation in near-real time. The absolute geostrophic currents were sourced from the AVISO website (<http://www.aviso.altimetry.fr/duacs/>).

7. Mooring Deployments

co-Chief Scientists

a. Tall Moorings

The Agulhas System Climate Array (ASCA) moorings were based on a similar design to the Agulhas Climate Time-series (ACT) array of moorings deployed in the same region as ASCA from 2010-2013. Figure 5 below shows the proposed full deployment of the ASCA moorings. The ASCA array improves on the original ACT array design with the inclusion of Microcat CTD sensors attached to the mooring lines with an additional experimental section above the ADCP and floatation buoy on Mooring B to capture the core of the Agulhas Current.

Updated diagrams of the individual moorings, including serial numbers, are available in Annexure 1. Mooring setup sheets are available for each individual mooring, listing instrument serial numbers and deployment details, in Annexure 2 and the Instrument setup sheets in Annexure 3.

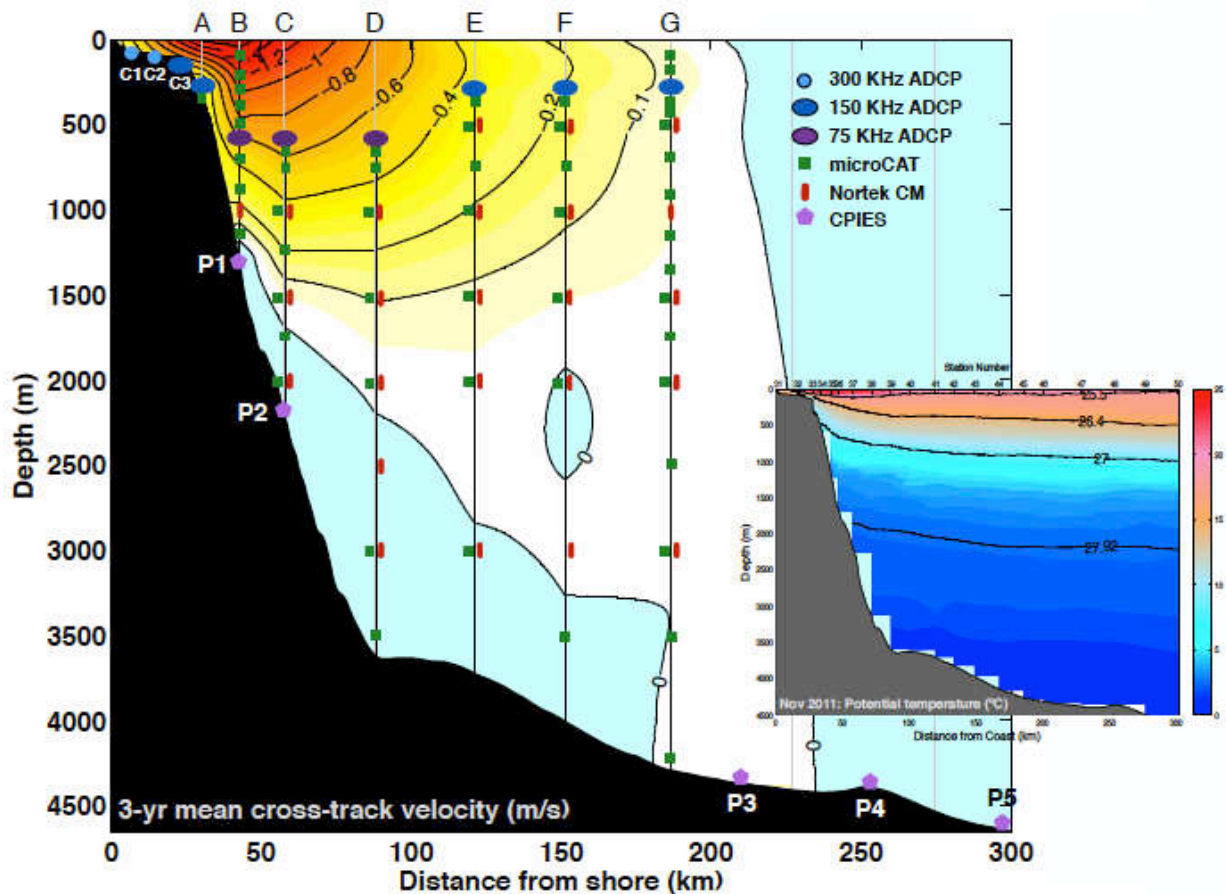


Figure 5: Proposed ASCA Mooring Array based on a three year cross-track of velocities collected during the Agulhas Climate Time-series project from 2010-2013. Image courtesy of Professor Lisa Beal (Rosenstiel School of Marine and Atmospheric Science, University of Miami).

Four of the seven tall moorings were deployed on this cruise.

Mooring D:

Mooring D was deployed first on 11 April 2015. At the time of ship positioning, the wind, swell and Agulhas Current were all coming from the northeast; the wind between 12-15 knots, the current at 1 m s^{-1} (~ 2 knots) and the swell minimal. The ship was positioned 3.5 nautical miles (nm) due south of the drop position (after analyzing the ship drift for fifteen minutes prior to the deployment) and the ship was requested to steam northwards at 1.5 knots while mooring was being paid out. The vessel setup was decided upon (for this mooring and all subsequent) by the mooring technicians in discussion with the co-Chief Scientists, as they preferred to set the mooring out in to the Agulhas Current as opposed with it. Start time for mooring setup was 11:10 (GMT) with all cable, buoys and instruments in the water, and mooring line attached to acoustic releases and anchor block by 12:20 (GMT). The ship was at this stage still 1.5 nm short of the drop position and the entire mooring had to be towed against the current for a further 52 minutes. The anchor block was deployed at 13:12 (GMT) at $34^{\circ} 02.071 \text{ S}$, $027^{\circ} 51.790 \text{ E}$ in 3622 m water depth (includes the 5 m draft of the ship). The triangulated position was calculated as $34^{\circ} 02.615 \text{ S}$, $027^{\circ} 51.619 \text{ E}$ in 3625 m water depth (includes the 5 m draft of the ship). Triangulation took place south of the anchor drop position (as detailed below) to account for the fall-back of the mooring within the current.

A CTD cast (stn001) was completed thereafter. Please refer to CTD notes below for further details on processing. Two drifters were deployed after the mooring deployment – serial # 127198 and 127199 as a dual-deployment study to see how (if) the drifters separate in the Agulhas Current.

Mooring C:

Mooring C was deployed on the morning of 12 April 2015. The current and swell were both from the northeast, the current at 1.5 m s^{-1} (~3 knots) and the swell marginal. The wind was from the southwest, between 5 and 7 knots. The ship was positioned 1.5 nm due south, after analysis of the ships drift from the drop position, to begin the mooring deployment (similar to Mooring D above). Start time for mooring setup was 05:09 (GMT) with all cable, buoys and instruments in the water, and mooring line attached to acoustic releases and anchor block by 05:52 (GMT). The ship towed the mooring for a further 26 minutes before deploying the anchor block at $33^{\circ} 46.926 \text{ S}$, $027^{\circ} 42.948 \text{ E}$ in 2211 m water depth (includes the 5 m draft of the ship). No clear pings were received on the transducer for the triangulation after the mooring deployment (pinged for the mooring ~ 0.5 nm south of the anchor deployment position). The mooring was triangulated again on 22 April 2015 after the CTD survey, ~ 1 nm south of the anchor deployment position, and three clear readings were received on the transducer box. The triangulated mooring position is $33^{\circ} 47.978 \text{ S}$, $027^{\circ} 42.915 \text{ E}$. These positions again take in to account the fall-back of the moorings with the current. CTD cast stn002 was done after the mooring was deployed.

Mooring B:

The drop position for mooring B was reached at 10:30 (GMT) on 12 April 2015. The currents had increased to 2 m s^{-1} (~4 knots) as the ship steamed inshore of mooring C, though still from the northeast. The wind and swell both from the southwest, with the wind picking up to 10 knots, but the swell still marginal. The ship setup 0.75 nm southwest of the drop position, and deployment commenced at 11:02 (GMT). All instruments and floatation buoys were in the water by 11:46, with the entire section of 4 mm Dyneema cable and Microcat deployments going very smoothly. The mooring was deployed at 13:00 (GMT) after a substantial steam northeastward at $33^{\circ} 39.472 \text{ S}$, $027^{\circ} 39.016 \text{ E}$ in 1257 m water depth (includes the 5 m draft of the ship). The mooring was successfully triangulated after mooring A was deployed (thus headed back to site), ~ 0.5 nm from the anchor drop position at $33^{\circ} 40.047 \text{ S}$, $027^{\circ} 38.570 \text{ E}$, accounting for the fall-back again within the Agulhas Current.

CTD cast stn003 was done after mooring A was deployed.

Mooring A:

Mooring was deployed fairly quickly without having to position the ship within the parameters of current, wind and swell. The ~ 4 knot current from the northeast persisted at the mooring deployment site, but winds and swell were marginal. The mooring deployment began at 14:10 (GMT) with the anchor weight being deployed at 14:15 (GMT) at $33^{\circ} 33.4986 \text{ S}$, $027^{\circ} 35.7040 \text{ E}$ in 319 m water depth (includes the 5 m draft of the ship).

CTD cast stn004 was done after mooring B triangulation and mooring B CTD cast completed. Additional, a satellite drifter (serial # 132511) was deployed after the mooring A CTD cast.

No triangulation of mooring C2 necessary.

b. Shelf Moorings

Two shelf moorings were deployed along this transect.

Mooring C3:

Mooring C3 was deployed on the morning of 13 April 2015 (04:59 GMT) at 33° 30.676 S, 027° 34.190 E in 121 m water depth (includes the 5 m draft of the ship). This mooring had a 20 m long cable between the ADCP floatation buoy and acoustic releases where a Microcat was attached for additional temperature and salinity data on the shelf.

CTD cast stn006 was completed after mooring C2 was deployed and CTD cast stn005 was completed.

No triangulation of mooring C3 necessary.

Mooring C2:

Mooring C2 was deployed on the morning of 13 April 2015 (05:59 GMT) at 33° 25.395 S, 027° 31.006 E in 121 m water depth (includes the 5 m draft of the ship).

CTD cast stn005 was completed after the mooring deployment.

No triangulation of mooring C2 necessary.

c. Mooring Triangulation Details

Triangulation of the deep moorings was undertaken from the starboard side of the vessel using a standard IXSEA deck unit and overside transducer. Given the strong currents the moorings were deployed in, the vessel was asked to position itself due south of the anchor drop position (distances per mooring noted below), and the vessel was instructed to drift over the calculated drop site further south and with the current. Pings from the acoustic releases were successfully received on Moorings D and B on the first attempts. Mooring C had to be triangulated again on the CTD leg, but further away from the anchor drop position attempted initially (noted below). The southward drift takes in to account the distance the mooring “fell back” after deployment of the anchor block within the flow of the Agulhas Current.

Approximate distances from anchor drop position and direction of drift:

Mooring D	0.5 nm - south
Mooring C – first attempt	0.5 nm - south
Mooring C – second attempt	1.0 nm – south-east
Mooring B	0.5 nm - south

8. SVP Drifter Deployments

Dr. Marjolaine Krug and Jethan d’Hotman

In 2014, Sentinel-1, the first of a series of satellites was launched as part of the European Space Agency (ESA) Global Monitoring for Environment and Security (GMES) Space Component program. One the product output planned as part of the Sentinel-1 missions consists in synoptic maps of surface currents derived using the Doppler signals measured from the satellite's Synthetic Aperture Radar (SAR). The Agulhas Current has been selected as one of the testing ground for observations of surface currents derived at part of the ESA-driven Sentinel mission series. *In-situ* observations from surface drifters are essential for the validation of satellite products. During the ASCA deployment cruises, surface drifters were deployed at times of Sentinel-1 satellite acquisition with the aim to validate and improve the Sentinel SAR derived ocean products in the Agulhas Current region. The region of coverage and times of Sentinel-1

acquisitions were obtained using the online acquisition plan available at: <https://sentinel.esa.int/web/sentinel/missions/sentinel-1/observation-scenario/acquisition-segments> SVP drifters were then released in conjunctions with the Sentinel-1 acquisitions of the 16th, and 21st of April 2015. To validate the satellite products, as a strong signal is needed due to the potential of relatively large errors in the satellite dataset. For this reason, the surface drifters were released in regions of the Agulhas Current associated with very strong flow velocity.

SVP drifters were supplied by the South African Weather Services (SAWS), originally obtained from NOAA in the United States of America, and upgraded with barometer sensors in addition to the sea surface temperature sensors already installed. Additionally to the Sentinel-1 application above, the SVP drifters will contribute data into global climate prediction models and provide current strength and directional data for surface currents in the Agulhas Current region.

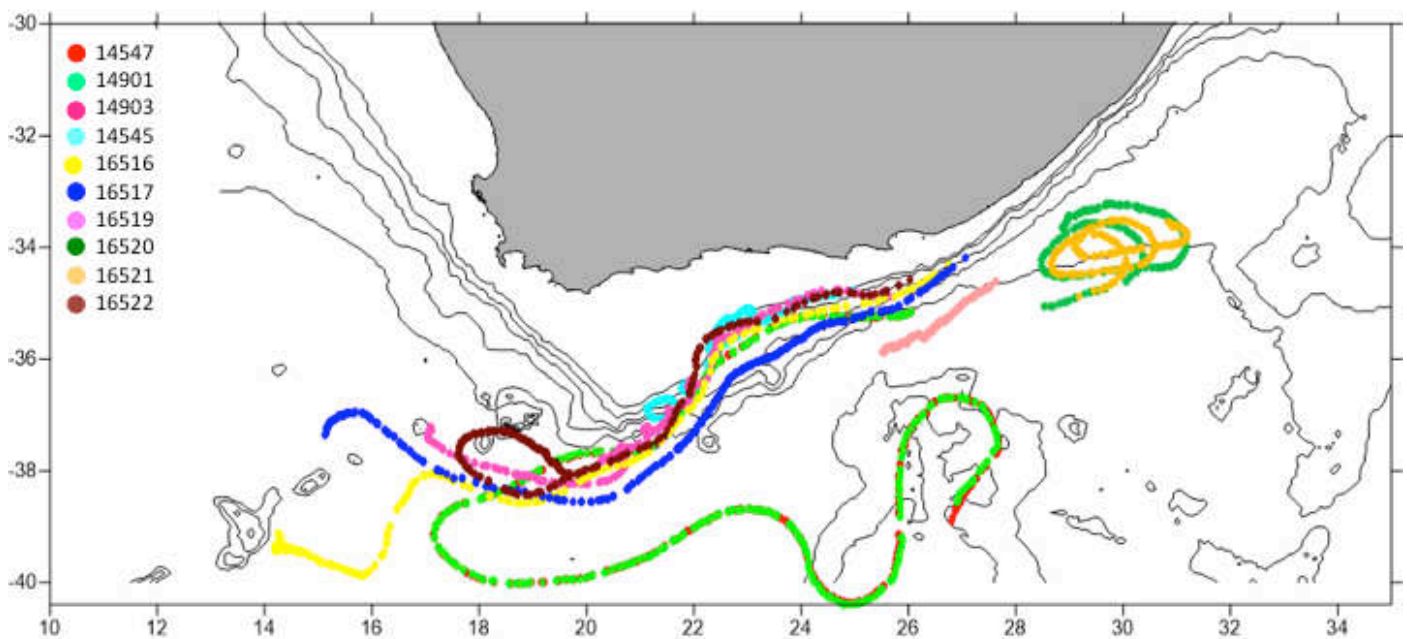


Figure 6: SVP drifter trajectories as of 05 May 2015

9. Shelf Agulhas Glider Experiment (SAGE) Dr. Marjolaine Krug and Mr. Fred Fourie

The Shelf Agulhas Glider Experiment (SAGE) is a CSIR-SAEON joint experiment which aims to better understand the response of the coastal and shelf regions to changes in the Agulhas Current. In this pilot project, interactions between the Agulhas Current and coastal and shelf regions are investigated using two Seagliders. Seagliders are autonomous robotic platforms, which profile the ocean between the surface and 1000m depth by controlling their buoyancy. A set of wings, coupled with a low-drag hydrodynamic shape, drives forward propulsion as the Seagliders move up and down the water column. Profiling gliders offer a revolutionary technology to sample the energetic inshore regions of the Agulhas Current. Gliders provide a means by which continuous (multi-month) measurements of the water column can be made at high spatial (100s of meters to 3km) and temporal (0.5-4 hourly) resolution. They carry a suite of sensors that can measure the physics, chemistry and biological properties of the water. Data collected from the Seagliders is communicated back via satellite in real-time to land for analysis. Meanwhile the entire glider functioning, from navigation to sensor sampling rates, are controlled by pilots that can send the glider new commands at any point in the deployment.

The two Seagliders were deployed on the 19th and 23rd of April 2015 from the RV *Algoa* as part of the one of the activity of the [ASCA](#) deployment cruise. Data collected from the Seagliders during SAGE will be used in synergy with satellite imagery of the Agulhas Current to:

- Improve our fundamental understanding of the role of western boundary current on the across-shelf exchange between the coastal and deep ocean.
- Improve our understanding of sub-mesoscale dynamics in western boundary current regimes
- Better understand and exploit synergies between satellite and glider-based observations
- Test the feasibility of operating autonomous platforms in the highly turbulent and energetic Agulhas Current region

To follow the SAGE Seagliders in near-real time and for further information on the SAGE project, please visit the SAGE website (<http://socco.org.za/sage/>). Figure 7 below shows the glider tracks as of 05 May 2015.

SAGE Technical Deployment Report:

Two 1KA Sea Gliders were successfully deployed from the RV *Algoa* during the ASCA voyage.

The two gliders, in their crates, were loaded onto the *Algoa* on the 30th of March in Cape Town.

Marjolaine Krug and Fred Fourie joined the ASCA voyage's second leg on the 16th of April, from Port Elizabeth.

Initial setup and testing was done on the 16th of April onboard the *Algoa*:

- Each glider was taken from its crate and assembled.
- Both gliders' Argo trackers were enabled.
- Full automated self-tests were completed on both gliders.
- The gliders were then stored upright on the port side aft deck.

Upon reaching the intended deployment zone, on the 17th of April, the deployment efforts were aborted because of a 4m swell. On the 18th of April conditions were assessed at first light. Deployment was again aborted because of unfavourable weather conditions.

Mid day on the 19th of April the swell dropped down enough to launch, but thick fog still hindered deployment until 15:00. At 15:00 conditions were deemed acceptable and seaglider 543 was setup for deployment. The glider had trouble with its satellite communications, but moving the glider to the upper aft deck resolved the issue. During setup, the land piloting team requested that the deployment was done further inshore to avoid stronger currents closer to the shelf edge. At 17:37 and at $-34^{\circ} 25.309' S$; $25^{\circ} 58.284' E$ the glider was successfully ballast tested and deployed. A drifter was deployed shortly after glider deployment.

On the 22nd of April conditions were found favourable to launch the second glider. Start-up was commenced at 08:57. The glider was directly taken to the upper deck to ease communications. At 10:43, at $-34^{\circ} 16.44' S$; $26^{\circ} 30.60' E$ seaglider 573 was deployed. The first dive was observed from deck and 573 was spotted passing port side, close to the ship, upon completion of the first dive. The all clear was given and a CTD cast was done for glider calibration. The *Algoa* then steamed to a location close to 543 to do a CTD cast. At 16:30 a recovery order for 573 was received from the land team and the *Algoa* was immediately

set on a course to intercept as the glider was found to have trouble diving. At 17:47 a stand-down order was received, as the pilots managed to resolve the situation remotely.

All operations went smoothly. Cpt. Smith was understanding of what was needed and the crew proved very helpful.

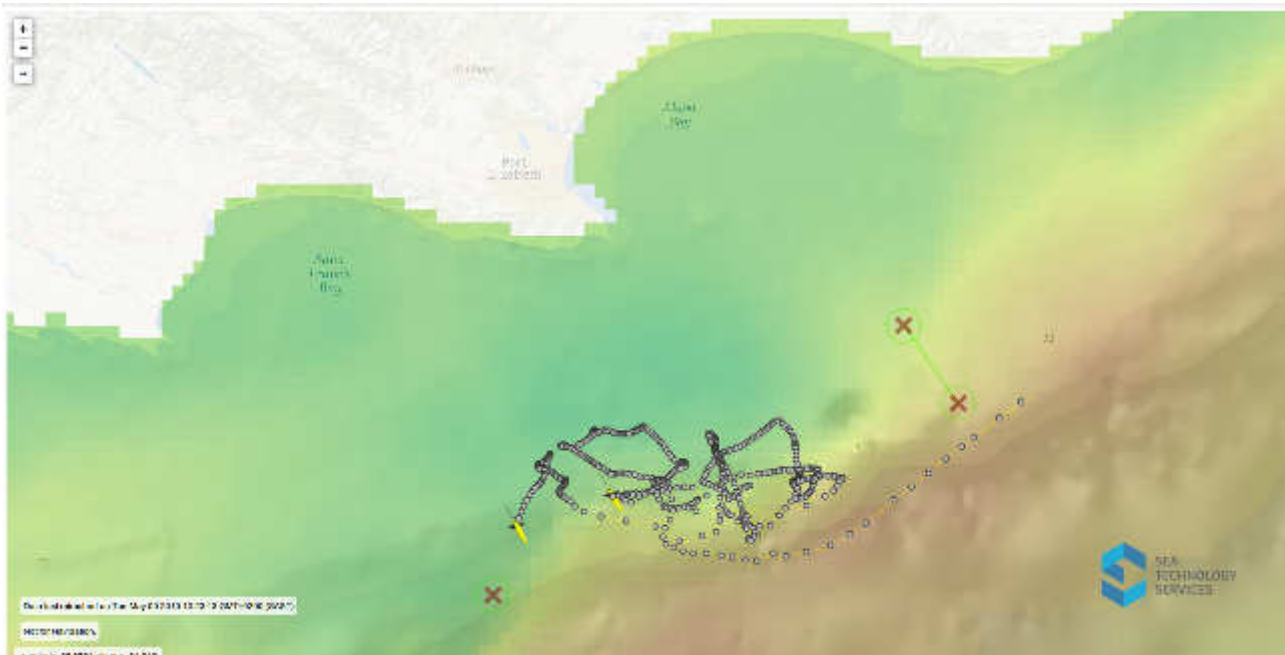


Figure 7: Position of the SAGE Seagliders on the 5th of May 2015 downloaded from <http://seatechnology.co.za/maps/map.html>

10. CTD and Vertical Bongo transect

a. CTD data collection and data processing

Detailed above in the mooring section are the six CTDs completed after each mooring was deployed for instrument verification purposes, thus stn001-stn006 (CTD filenames).

Alg11200 (grid # CTD-007) was attempted as the first station of the CTD survey, but was cancelled prior to deployment due to bad swells. This CTD filename (stn007) was reused for the actual start of stations, but with the next consecutive numbers for SDS entered ship station number and grid number (Alg11201 and CTD-008 respectively). Please refer to Annexure 4 for the CTD station details and the RV *Algoa* numbering system.

Twenty CTD stations were planned for the ASCA CTD survey on the second leg, along with a vertical bongo cast on each. However, due to weather complications, only 16 stations could be completed before the vertical bongo net got torn away from the cod-end bucket and the CTD became too dangerous to deploy. In terms of the CTD water budget, a second CTD cast was done at each station to collect additional water from the fluorescence maximum and the surface (~ 5 m) depths. The order of instrument deployments was thus 1) CTD for general sampling, 2) vertical bongo to maximum 200 m and 3) CTD to fluorescence maximum for additional sample collection. Each ship and grid station number thus has two CTD filenames associated to it for this transect, and named a and b respectively (i.e. stn008a and stn008b). The casts labeled “a” were the deep casts to a

maximum of 1000 m, while “b” casts the shallower casts to the fluorescence maximum, usually between 100 and 150 m.

Finally, two CTD casts were done close to the glider deployment sites for verification of onboard sensor purposes. Stn023 was done after the second glider deployment, and stn024 was done at the last known position of the first glider (approximately three hours further west of stn023) due to a CTD cast not being done at the time of the first glider deployment.

A quick look CTD data post-processing was done once all the stations were completed to plot vertical sections of the ASCA line for this report and the presentation of co-Chief Scientists at the ASCA launch in Port Elizabeth. The steps followed were:

1. Data Conversion – with the following output variables chosen:
 - a. Pressure (db)
 - b. Depth (m)
 - c. Temperature (ITS-90 °C)
 - d. Conductivity (S/m)
 - e. Dissolved Oxygen (ml/l)
 - f. Fluorescence (mg/m³)
 - g. Beam Transmission (%)
 - h. Turbidity (NTU)
 - i. Par
 - j. SPAR
2. Loop edit
3. Derive – with the following parameters derived:
 - a. Salinity (PSU)
 - b. Sound Velocity (m/s)
 - c. Density (kg/m³)
4. Bin average (to pressure and not depth bins)
5. Split
6. Bottle summary

The following should be noted:

1. Stn001 had the incorrect conductivity cell serial number and co-efficients loaded in the .con file. This was rectified for stn002 onwards, but processing stn001 was not done correctly in the quick look processing.
2. No corrections have been undertaken on the data yet – i.e. dissolved oxygen and salinity regressions. These will be undertaken in due course.

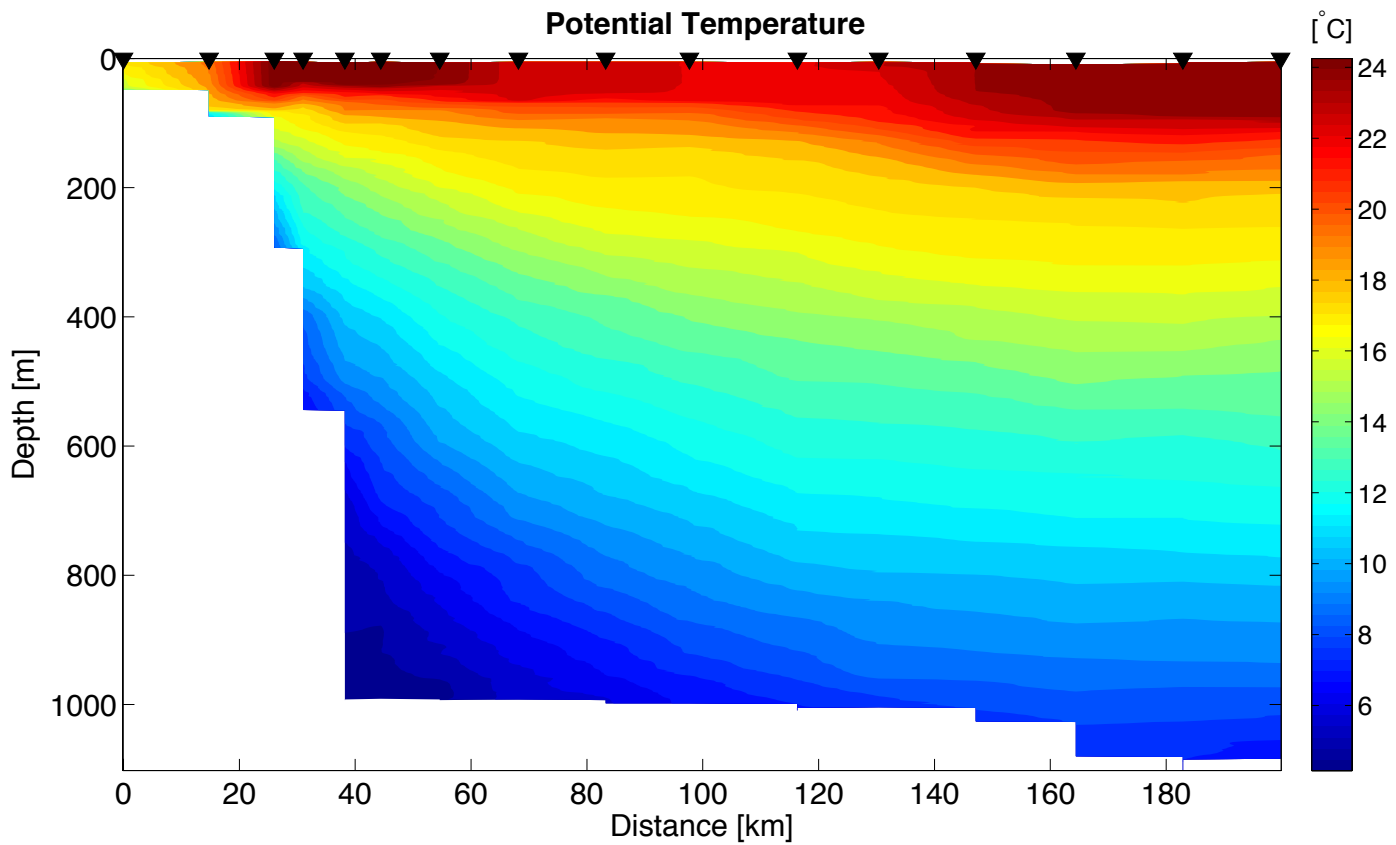


Figure 8: Vertical section of Potential Temperature from the CTD survey of Leg 2. The black triangles mark the station positions along the transect.

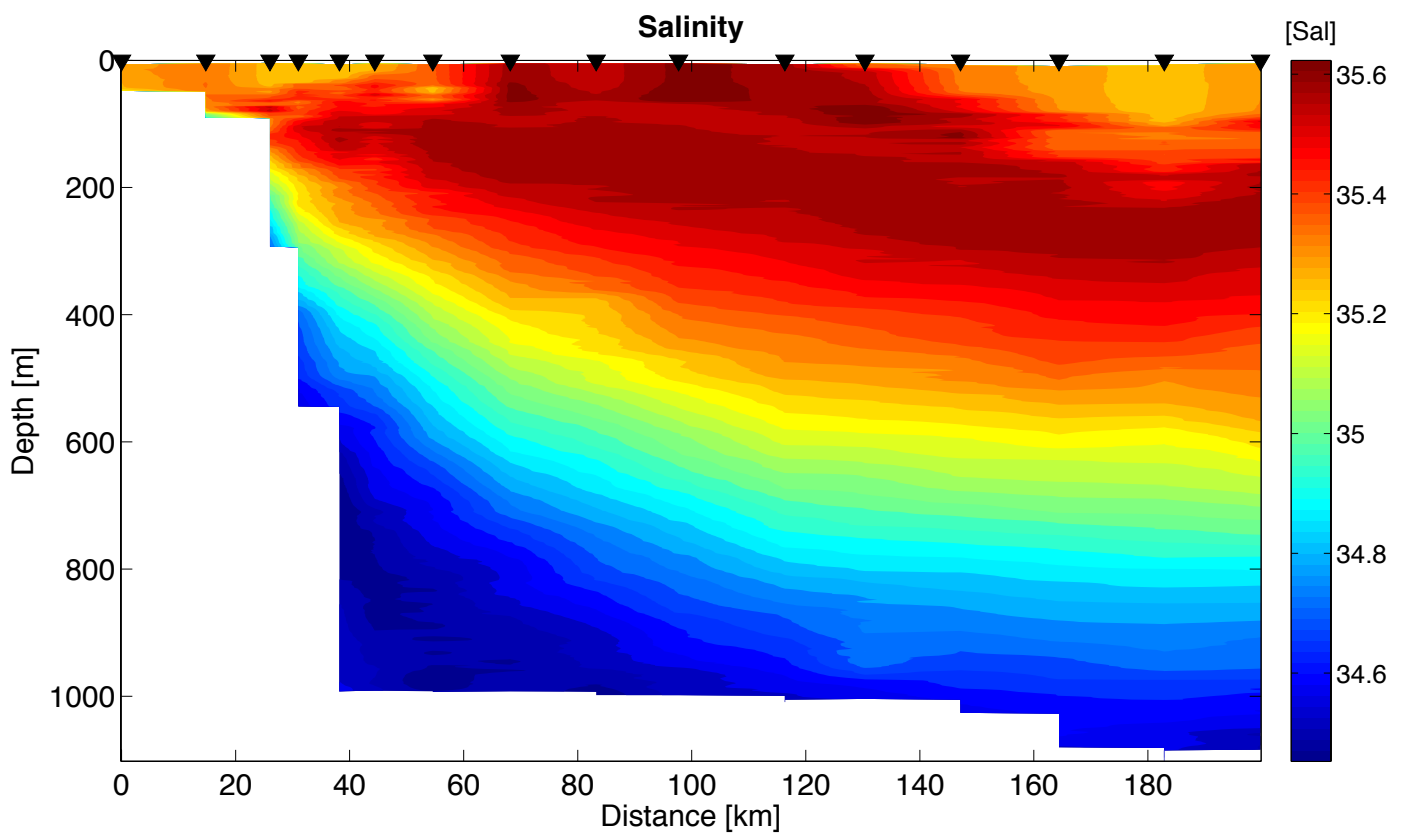


Figure 9: Vertical section of Salinity from the CTD survey of Leg 2. The black triangles mark the station positions along the transect.

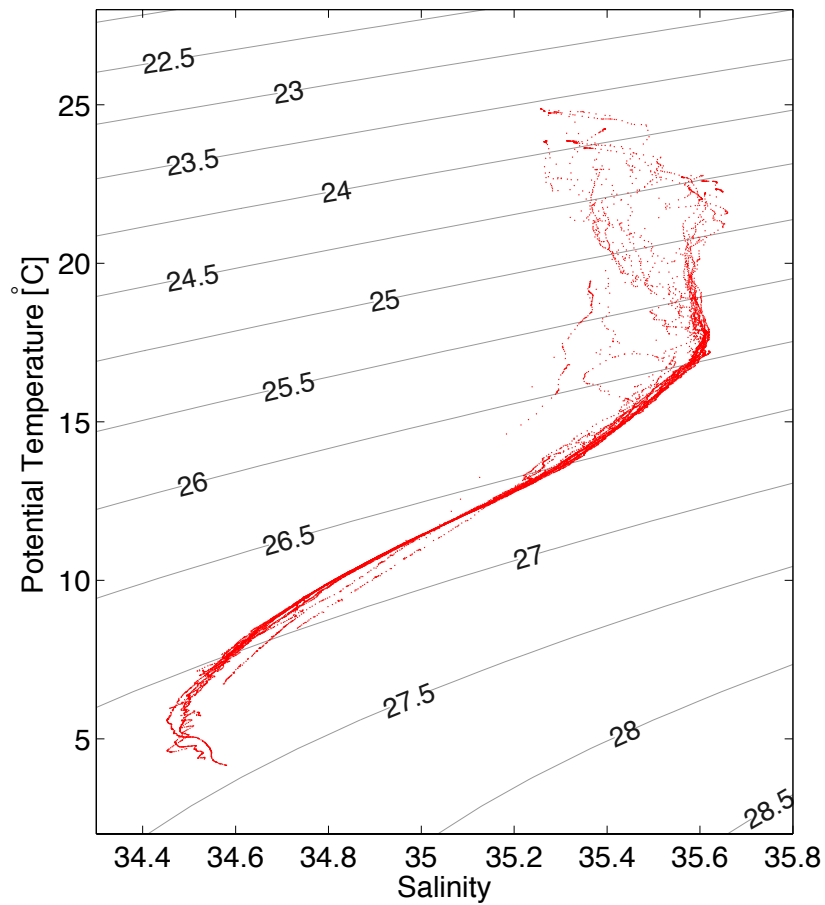


Figure 10: Potential Temperature / Salinity diagram overlaid with isopycnals for the CTD transect

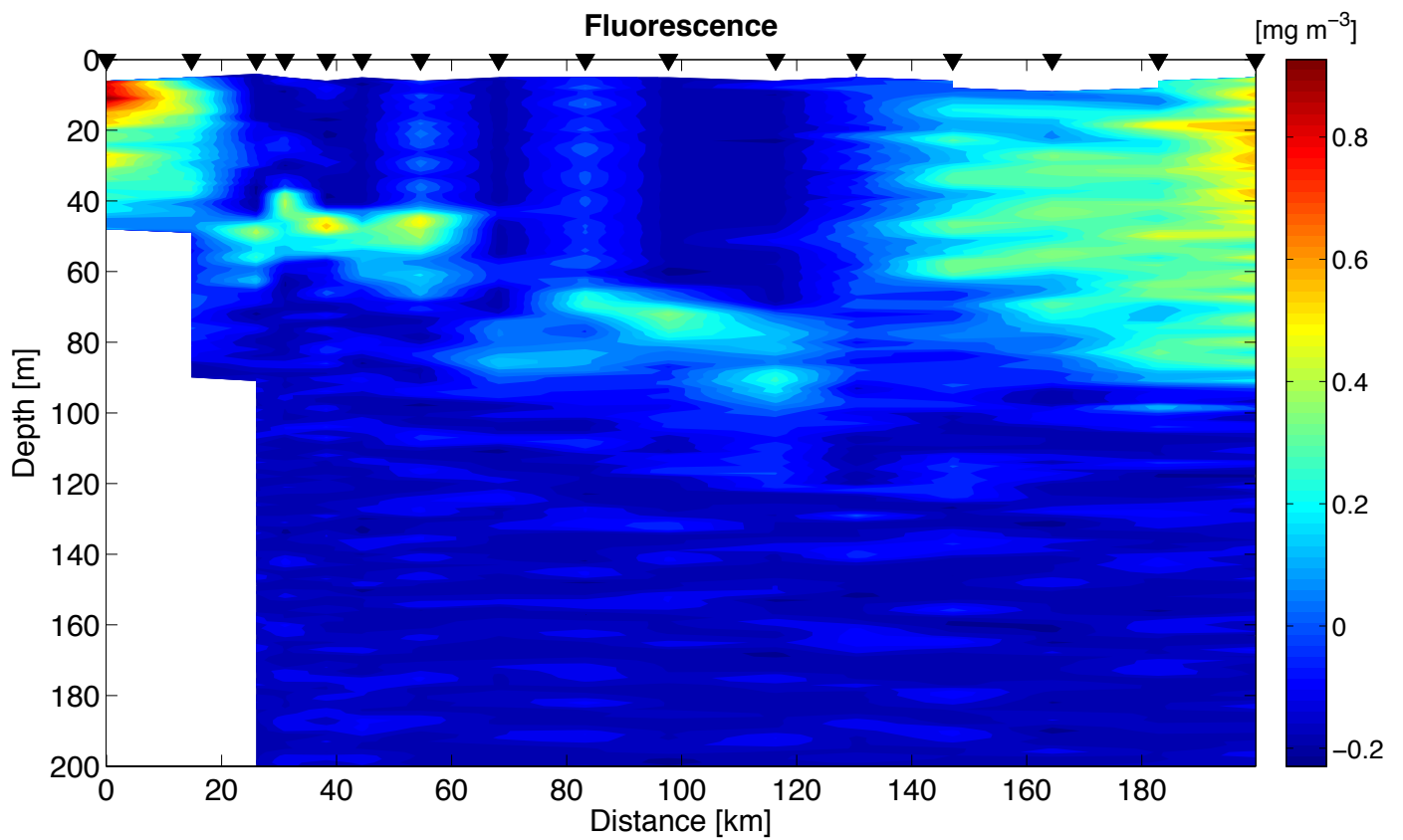


Figure 11: Vertical section of Fluorescence (CTD fluorometer data) from the CTD survey of Leg 2. The black triangles mark the station positions along the transect. Note the section is plotted to 200 m only.

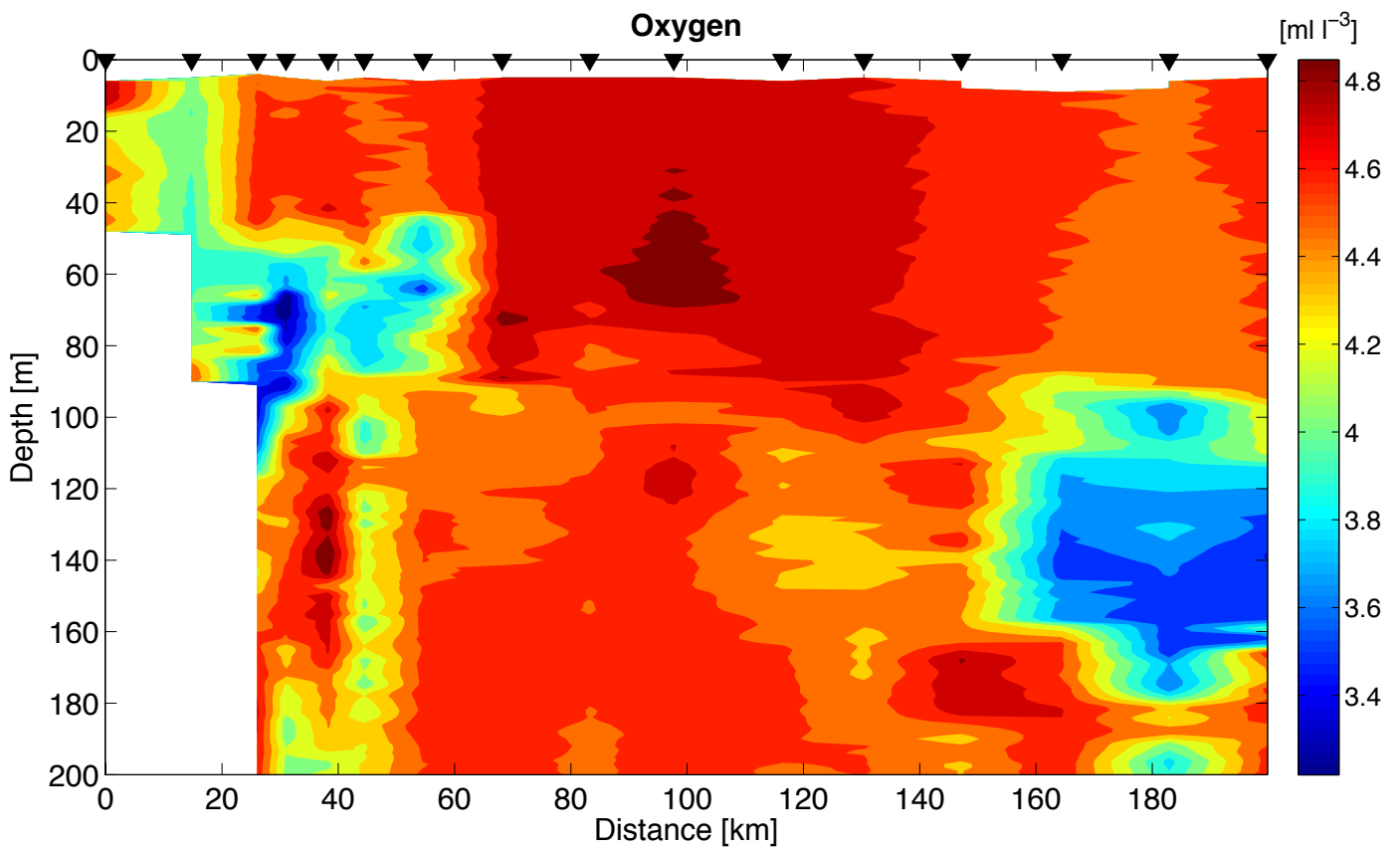


Figure 12: Vertical section of Dissolved Oxygen from the CTD survey of Leg 2. The black triangles mark the station positions along the transect. Note the section is plotted to 200 m only.

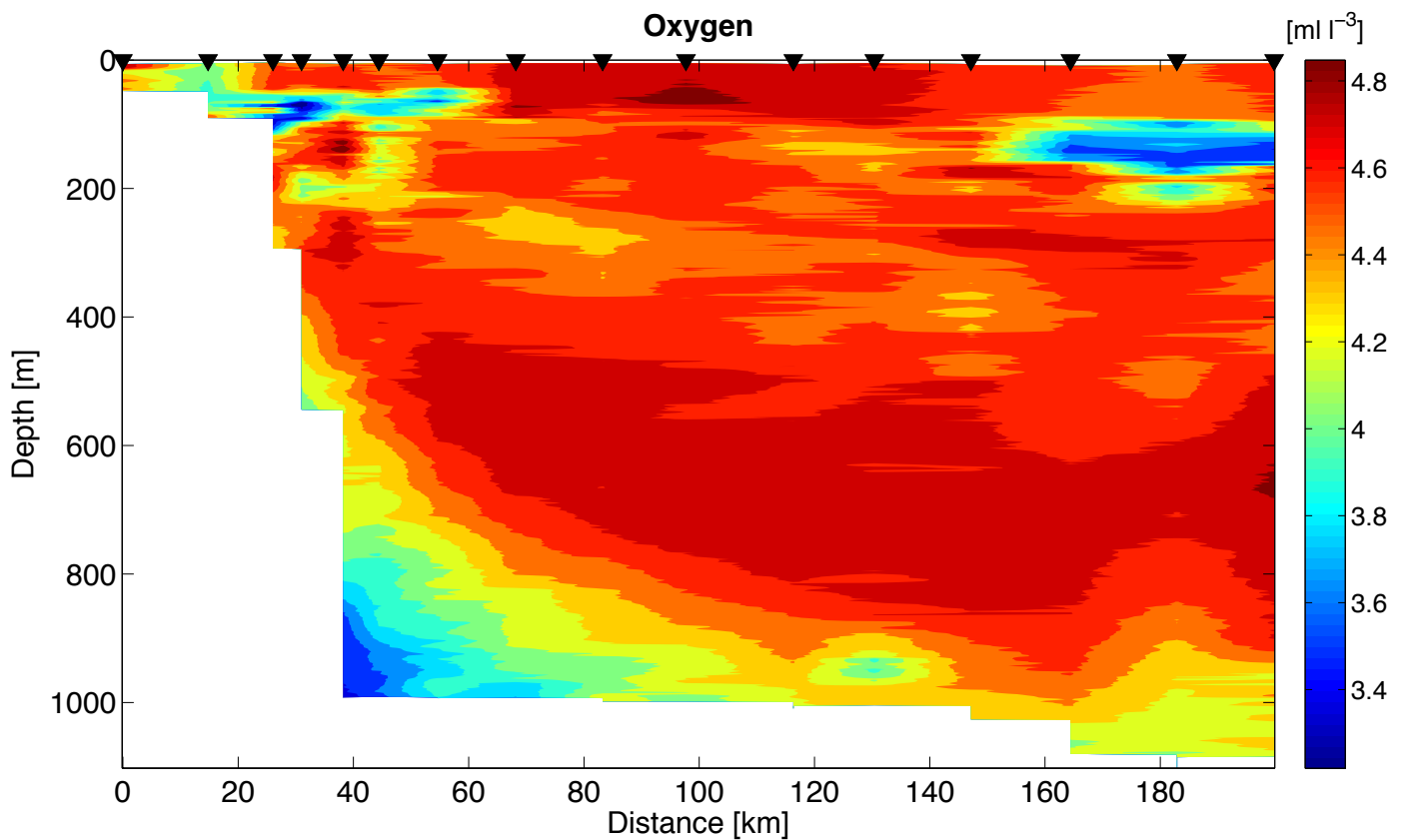


Figure 13: Vertical section of Dissolved Oxygen from the CTD survey of Leg 2. The black triangles mark the station positions along the transect. Note the section is extended to the full 1000 m.

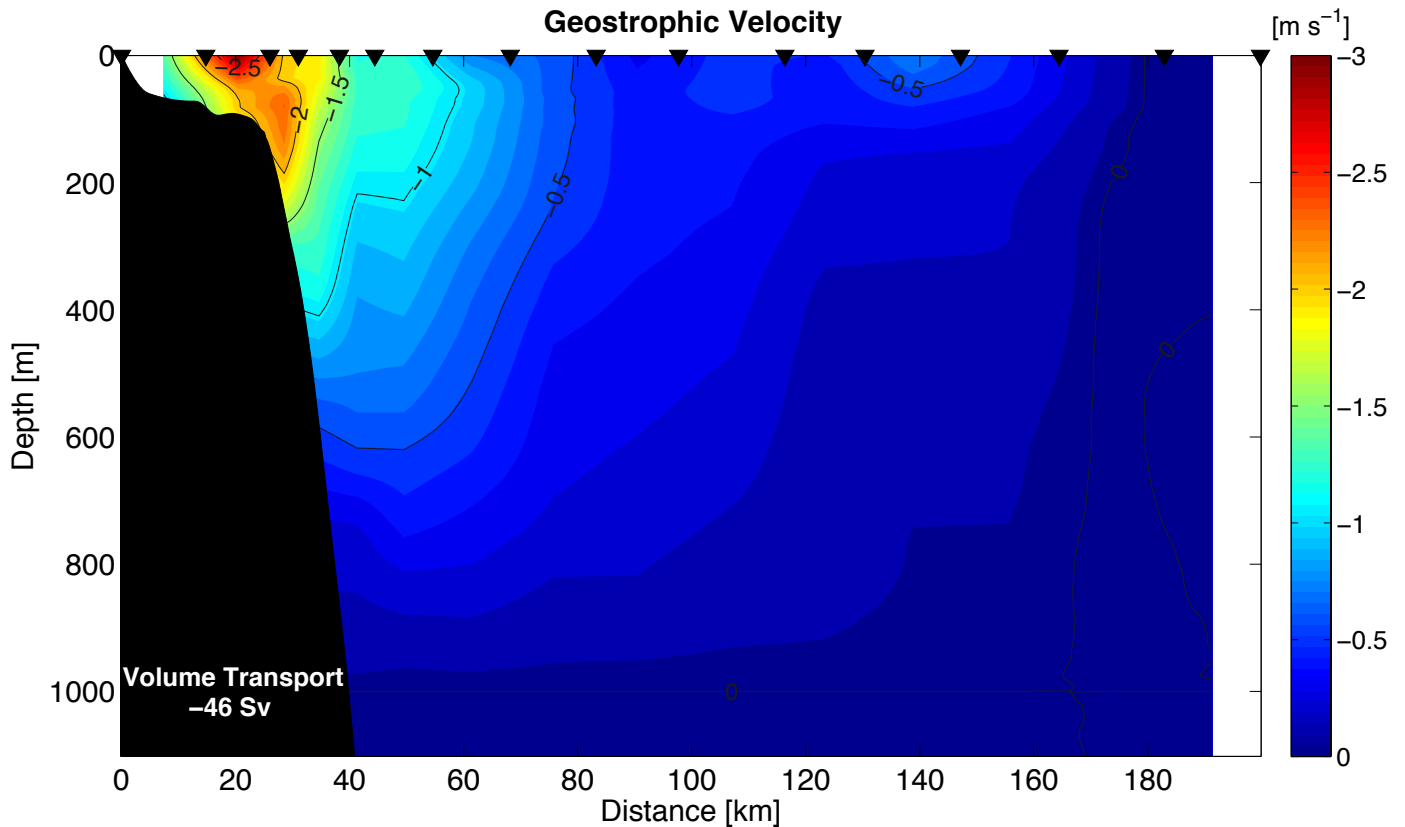


Figure 14: Vertical section of Geostrophic Velocity calculated from the CTD transect data. The black triangles mark the station positions along the transect. A Volume Transport of -46 Sv is calculated to a level of no motion of 1000 m – the limitation of the CTD data.

b. CTD sampling

i. Dissolved Oxygen Regression

Dissolved oxygen bottle samples were taken from Niskin bottles targeting regions of interest noted on the downcast. An attempt was made to sample regions of lower and higher oxygen regions, avoiding the surface samples due to micro bubbles and wind-induced turbulence within samples. Two DEA technicians (Mbulelo Makhetha and Khaya Siswana), exclusively to avoid “finger trouble” of multiple samplers and analyzers, did the dissolved oxygen bottle sampling, Winkler titrations and thiosulphate standardization. Figure 8 shows the dissolved oxygen regression for the full set of samples taken, and Figure 9 the removal of the three outlier stations circled in Figure 8.

On examination of the outliers (refer to Addendum 4 – highlighted in red), the first (station stn011a) could be human error, but the last two on the same station suggest the oxygen sample bottles were swapped around when water from Niskin Bottle was tapped.

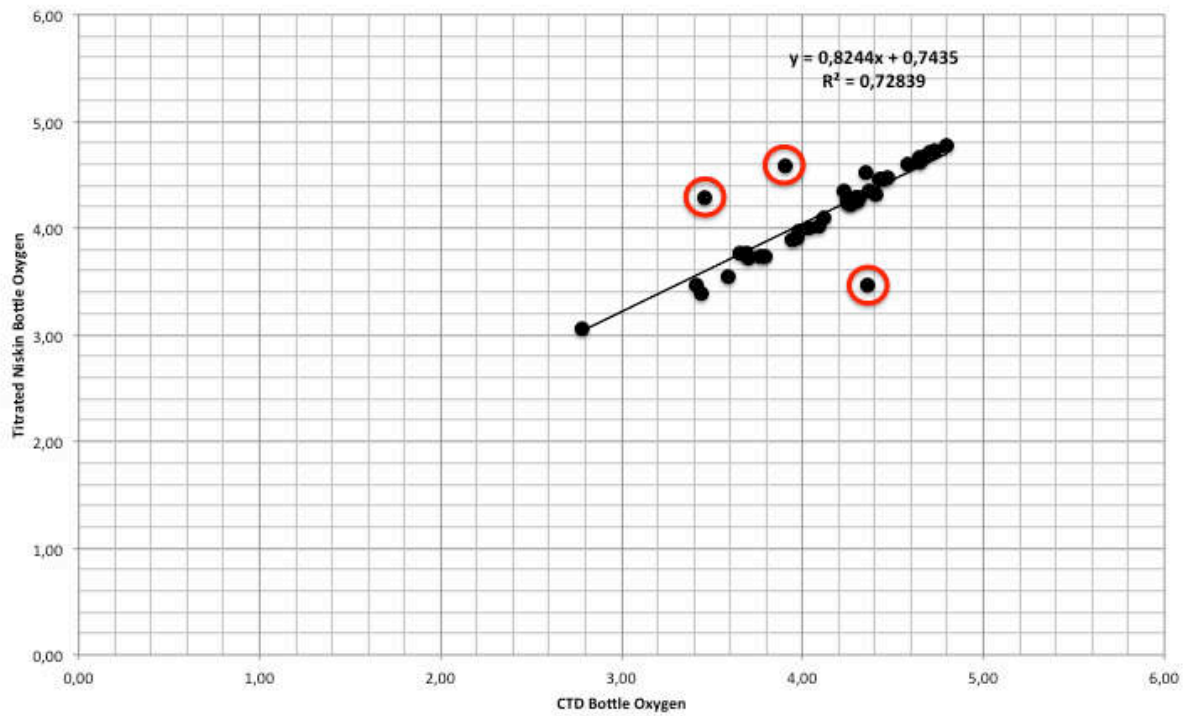


Figure 15: Oxygen regression plot of titrated Niskin bottle titrated dissolved oxygen against CTD bottle dissolved oxygen, with the three outlier stations circled in red.

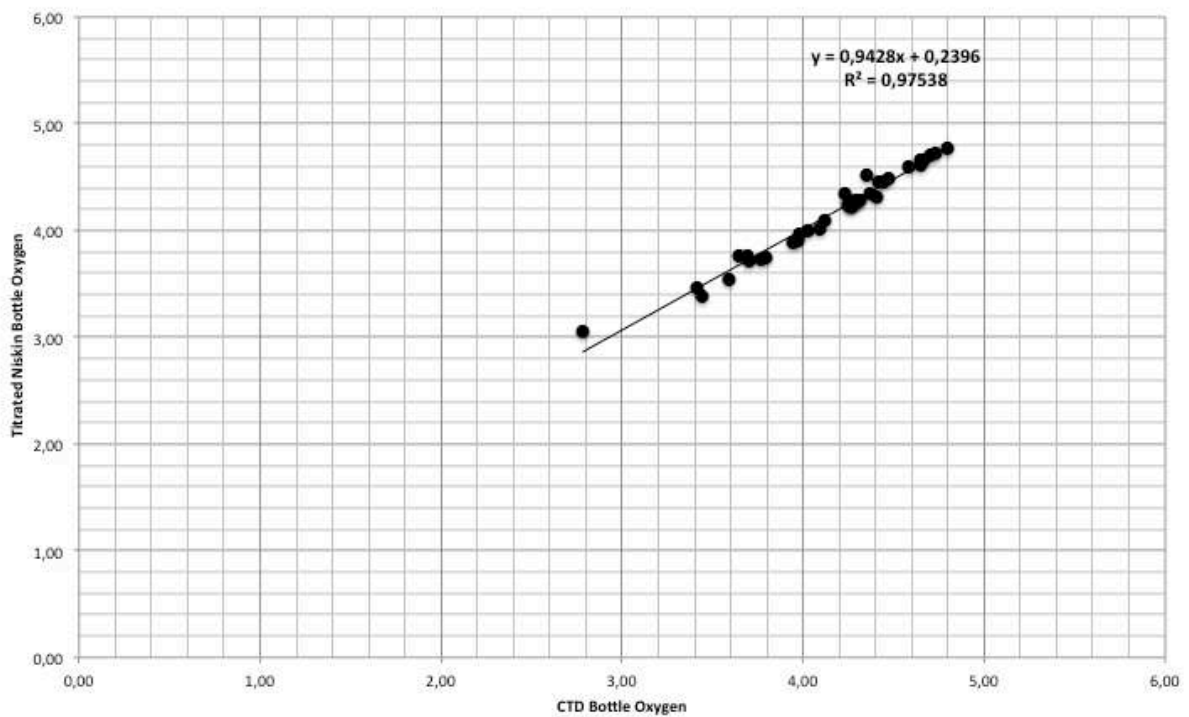


Figure 16: Oxygen regression plot of titrated Niskin bottle titrated dissolved oxygen against CTD bottle dissolved oxygen, with the three outlier stations removed.

ii. Salinity, Total Chlorophyll a and Nutrients

Salinity samples were taken from regions of interest, again targeting lower and higher sections of the down trace. These samples were collected in dark brown glass bottles and are currently awaiting analysis on the Autosol salinometer. These should be processed in the next few weeks.

Total chlorophyll a samples were taken from below the fluorescence maximum to the surface at six discrete depths. Samples were collected in 500 ml containers and filtered through 25 mm GFF glass fiber circles and frozen in a -20° C freezer. These samples are awaiting analysis using the spectro-fluorometric method.

Nutrient samples were collected at 12 discrete depths (on average) through the entire water column. Samples were collected in plastic test tubes and stored in the -20° C freezer. These samples are awaiting analysis on the auto-analyzer.

All containers for the above sampling (salinity bottles, nutrient tubes and chl a bottles) were rinsed three times with water from the Niskin bottle before filled to required volume on chl a bottles (500 ml), and allowing space in the salinity bottles (up to neck) and nutrient tubes (for freezing purposes).

iii. Pigments and Absorption

Pigments and absorption samples were taken from fluorescence maximum and the surface (on cast “b”) for analysis by HPLC method. For each depth, 2 liters of seawater was filtered per sample. Samples were stored in embedding cassettes and frozen in the -20° C freezer. Analysis of these samples still needs to be done, and may need to be done in Southampton as DEA’s HPLC is still undergoing repair from fire damage.

iv. Size fractionated chlorophyll and Phytoplankton ID

Seawater was collected in one liter containers to filter through a size fractionated filter stand with 47 mm diameter 20 um filter papers at the top, 2 um in the middle and GFF at the bottom. Samples were taken at each station (cast “a”) according to the fluorescence trace and is noted in the metadata spreadsheet as to exact depths sampled (generally from below fluorescence maximum to the surface – three to four depths per cast). Samples were stored within the -20° C freezer and are currently awaiting analysis. Additionally, one liter of seawater was taken at the same depths sampled for the size fractionated samples and fixed with glutaldehyde. These were stored in a dark container and are currently awaiting analysis.

v. Microzooplankton

Microzooplankton samples were collected from the CTD cast “b” at fluorescence maximum and the surface. A total of five liters (one complete Niskin bottle) was filtered through a 200 um mesh onto a 20 um mesh. This was then “washed” down with filtered seawater taken from the “waste” water of the total chlorophyll a sampling and stored in 100 ml container. Samples were fixed with 4 ml of formalin and stored for analysis at the zooplankton laboratory at DEA.

All sample metadata has been captured, along with CTD station metadata for post-processing and analysis of samples.

c. Vertical bongo

Vertical bongos were done to a maximum depth of 200 m on each CTD station. Both nets were 200 um mesh size nets. Samples were stored in honey jars and fixed with formalin. Currently, samples are being analyzed for dry weights and settled weights, with the second sample analyzed for species composition and ID.

The Hydrobios data, including pressure and temperature, did not work optimally for the cruise. The unit was tested prior to the vessel sailing, but was left on which drained the batteries. Unfortunately, no real replacements were available on board and the Hydrobios only managed three casts before failing completely. The depth of the vertical bongo cast has to be estimated from wire-out alone, which is biased due to strong currents experienced on the CTD survey (up to 4 knots in places) and the vertical bongo system being extremely light.

The only three casts of data have not yet been loaded on to Dropbox for distribution. Extracted files will be requested soon.

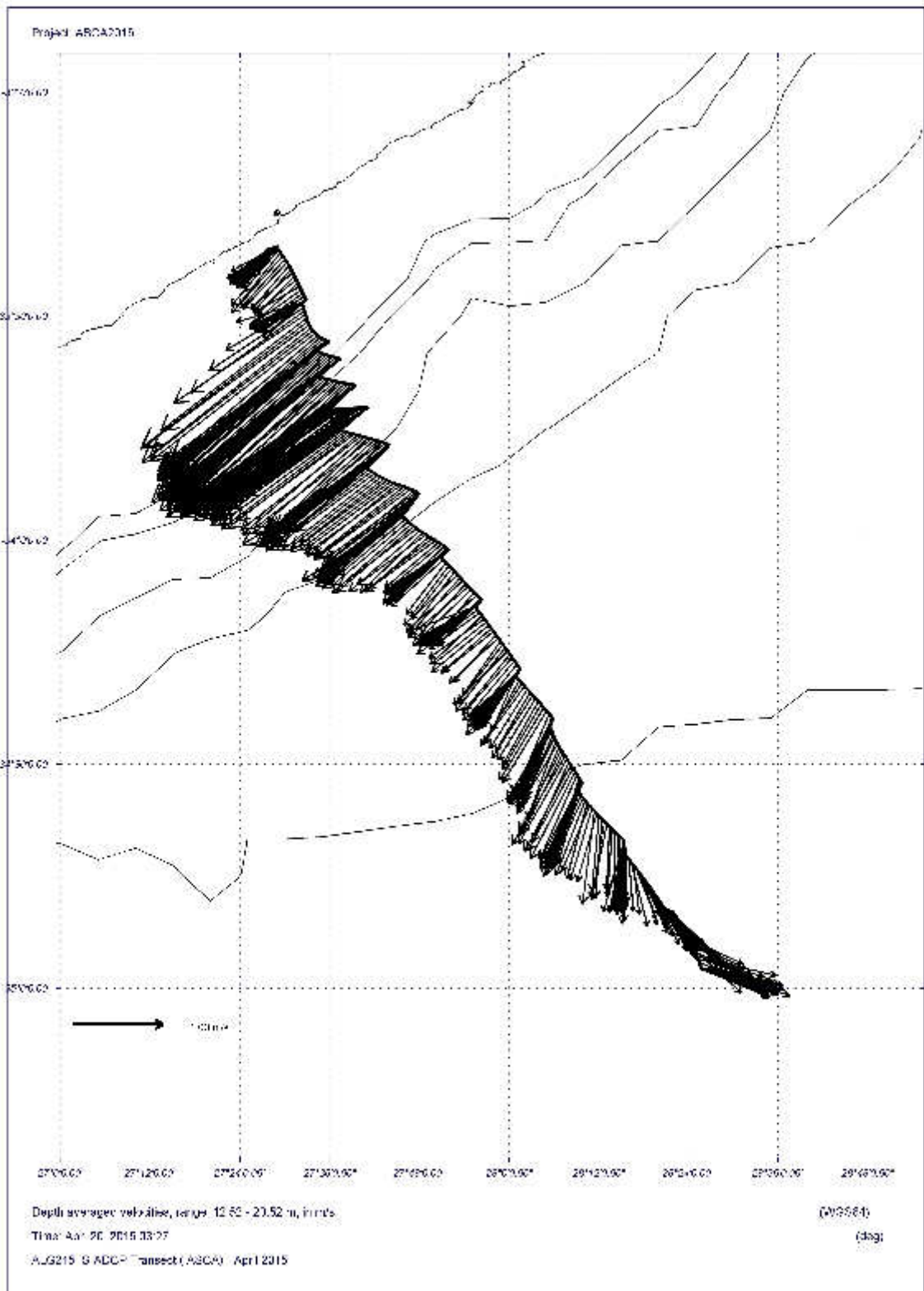
11. Scientific Underway Equipment

a. S-ADCP

The RV *Algoa* has a hull-mounted RD Instruments 75 kHz S-ADCP. The VMDAS Acquisition software (version 1.46) received direct GPS and gyro compass (heading) feeds. The raw ADCP data was averaged into Short Time Averaged (STA) files every 180 seconds (3 minutes) and Long Time Averaged (LTA) files every 600 seconds (10 minutes). Only the STA and LTA files are loaded on to Dropbox. Should you require the raw data, please contact the co-PI's or the ASCA Coordinator for this data as it is very large.

The S-ADCP setup for underway collection was as follows:

- Hull draft: 4 m
- Blanking distance: 8 m
- Number of bins: 70
- Bin size: 8 m
- First bin good data: ~ 20 m
- EA (Alignment correction): -46° (determined after installation trials in July 2012)
- Pings per ensemble 41
- Time per ping 1 second
- Average ensemble interval 3 seconds



Misha DPS & Aquavision RV

Figure 17: The surface (~ 20 m) S-ADCP transect (3 minute averaged data) from the start to the end of the ASCA line while undertaken the CTD and Vertical Bongo survey. Note the CTD stations have not been removed from the data set. The STA data (3 minute averages) were plotted by Marcel van den Berg using the Aquavision Data Presentation Software (DPS) Package.

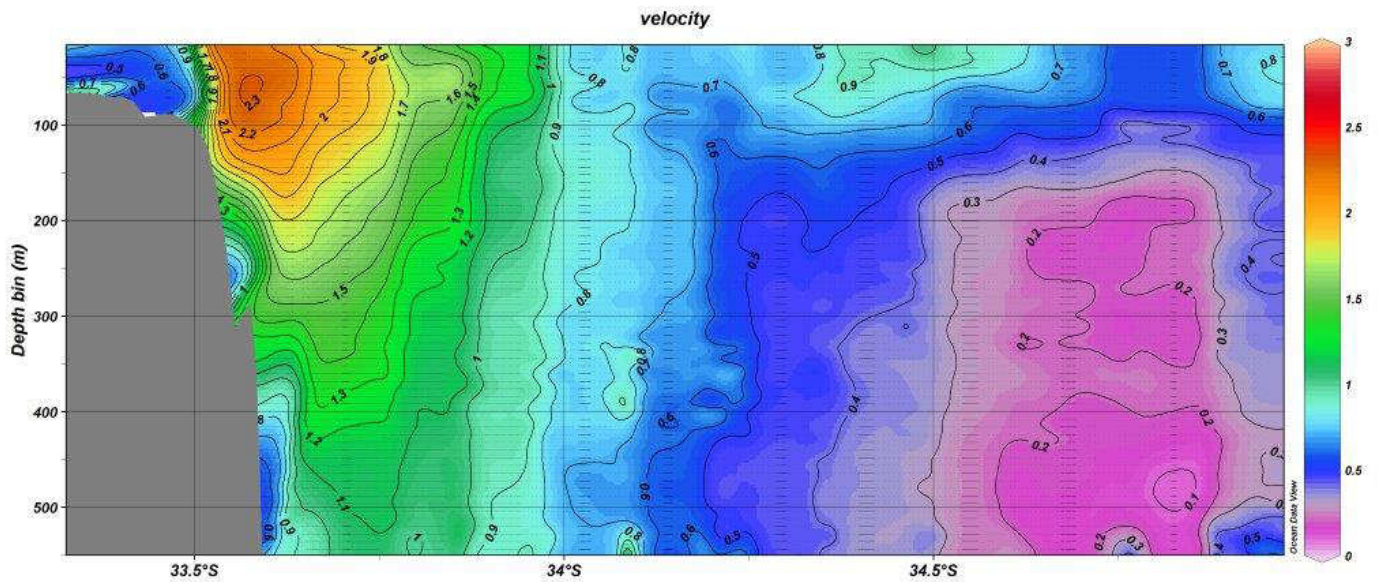


Figure 18: The vertical section showing velocity from the S-ADCP transect from the start to the end of the ASCA line while undertaking the CTD and Vertical Bongo survey. The data was plotted in Ocean Data View (ODV) by Marcel van den Berg using output from the Aquavision DPS Package.

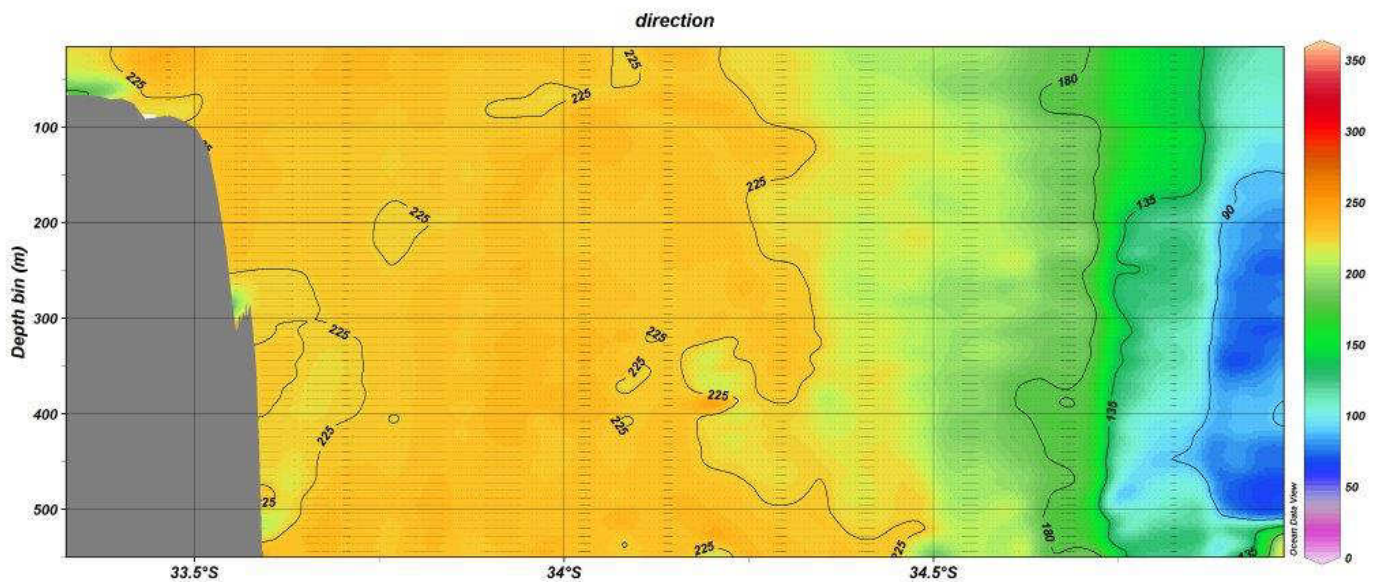


Figure 19: The vertical section showing direction from the S-ADCP transect from the start to the end of the ASCA line while undertaking the CTD and Vertical Bongo survey. The data was plotted in Ocean Data View (ODV) by Marcel van den Berg using output from the Aquavision DPS Package.

b. PCO₂ and TSG Sampling

Seawater is pumped through a dedicated scientific pump in the engine room to the TSG unit on the port side deck of the RV *Algoa*. A tributary water pipe, branched off prior to the scientific pump pipe flowing in to the TSG, is directed through the PCO₂ system within the port side laboratory. The PCO₂ system was run continuously on the underway sections from Cape Town to the ASCA line and on its return, with dissolve oxygen samples taken from the TSG outflow water every four hours for calibration thereof. This regression is not included in this report at this stage, and the PCO₂ data will be analyzed by the DEA's chemistry department.

Underway samples were taken from the outflow water every 15 minutes for nutrients and chlorophyll *a* analysis. Please refer back to Figures 1, 2 and 4 above for the underway sampling transects plotted for both the 15 minute samples (Cape Town to ASCA and return) and for the dissolved oxygen PCO₂ calibration (for the Cape Town to ASCA line) described above. The underway nutrient and chlorophyll *a* samples will also be analyzed by the DEA's chemistry department.

A note regarding the TSG data: The conductivity cell continuously showed a considerably fresher value than what the surrounding waters should be, and further comparison with the CTD data needs to be undertaken before the TSG data is used in any way. The TSG has been recently calibrated by SeaBird Electronics, but still this freshness of water problem persists. Please refer back to the co-PI's for this project for clarity on data post-processing before using this data.

c. Scientific Data System

The Scientific Data System (SDS) is run continuously while the vessel is at sea and all data pertaining to the cruise is logged under a particular cruise file name. Data collected and logged for display through this system includes vessel speed and heading information, meteorological data and winch wire out descriptions, and the TSG data (described above). It also logs the opening and closing of overside operations (i.e. CTD's and Vertical Bongos) with continuous vessel station numbers and pre-allocated grid numbers (as per chief scientist instructions), along with all activities taking place at that station.

Unfortunately for this cruise, the Weatherpak system was not working correctly and the wind speed and direction data should be treated with caution. The air temperature and humidity were definitely incorrect. The 1 minute and 10 minute averaged data has been loaded on to the Dropbox data folder for use in post processing if needed.

d. Continuous Plankton Recorder

Only two, partially loaded, cassettes were available for the Continuous Plankton Recorder (CPR) tows for this cruise. It was decided to maximize the data collection by concentrating the sample collection along the eastern Agulhas Bank up to the ASCA line. The first CPR tow was deployed off Ystervarkpunt (34° 29.93 S, 021° 43.88 E) on 08 April 2015, 14:49 (GMT). The CPR was retrieved off St. Francis Bay (34° 12.50 S, 025° 05.80 E) on 09 April 2015, 09:45 (GMT). The cassette was then exchanged and the CPR was redeployed at 34° 12.10 S, 025° 07.50 E on 09 April 2015, 09:54 (GMT). Shortly thereafter however, a small fire broke out in the engine room and the CPR had to be retrieved at 34° 09.40 S, 025° 21.10 E on 09 April 2015, 11:15 (GMT). The vessel had to steam on the bow thruster to Port Elizabeth and undertake repairs the whole of the following day before the cruise could resume. Unfortunately, upon leaving Port Elizabeth for the ASCA line, the CPR was not redeployed to continue data collection, due to forgetfulness on the part of the co-Chief Scientists.

It was however deployed on the way back from the ASCA to Port Elizabeth after the moorings were deployed and the silk was marked with a black permanent marker before it was redeployed for the transect back to PE. Deployment details: 13 April 2015, 07:07 (GMT), 33° 30.71 S, 027° 34.01 E. The CPR was retrieved prior to the vessel anchoring in Algoa Bay (12 April 2015, 17:06 (GMT), 33° 57.4 S, 025°40.5 E.

12. Wash-up Meeting Notes

Meeting Date: 29 April 2015
Time: 11 am
Venue: RV *Algoa*
In attendance: Capt. Smith
Shaun Adams (CEO)
Tamaryn Morris (co-CS)
Gavin Louw (co-CS)
Elana Wright
Henry Kakora

Notes (no particular order of departments):

*Responses from the Smit Amandla vessel manager, Mr. Rob Hales, in **italics** below (items 1-6):*

1. Toilets have been blocked up in the scientific accommodation – notably the forward and port side ones. These will probably be flushed out using fresh water while the vessel is in port over the next few days to try minimizing any blockages. While at sea, the toilets were cleared as best as possible when there were issues.
“The vessel has attempted to clear the pipes and we tried to arrange a company to attend to clear any possible blockages, but they can only attend on the vessels return to port after current voyage (IEP)”
2. A small fire occurred in the engine room on leg 1 over the seawater cooler system, resulting in the spare part having to be landed in PE and welded back together. A suggestion was made for the vessel to purchase its own aluminum welder to fix these issues in the future, but this was not accepted by the CEO given so few issues occur where a specific aluminum welder would be needed and would be a waste for the vessel to own.
“We have purchased a new lub oil cooler that will be fitted and the old cooler will be kept as a backup spare”
3. The air con unit in the officer’s mess was being serviced at the time of the wash up meeting.
“AC unit has been repaired”
4. The remote control for the air con in the Ops Room has gone missing and needs to be located. It was still in the Ops Room at the beginning of the second leg.
“Vessel to locate remote control for Ops Room”
5. For the CS cabin (large one port side – Cabin 5?) – door handle is broken and needs to be replaced, and the curtain railing over the single bunk needs to be fixed
“Door handle has been replaced”
6. The bulkhead lights above the bunks (all scientific cabins) need to be replaced, as the light bulb fixtures currently in use are outdated and light bulbs for these can no longer be sourced. This is perhaps a job for dry-dock, but a number of lights are currently not working.
“Supplier has attended to quote on replacement bunk lights”
7. The vertical bongo cable needs to be cut and a new dead-end installed. This was suggested as a job to do while the vessel proceeds to Cape Town after the CTD line was completed on Leg 2, but it had not been done by the time of the wash up meeting.
8. The Hydrobios on the vertical bongo was left on after testing prior to the vessel sailing and there were insufficient batteries for replacement in the spares box. This needs to be rectified prior to the IEP cruise.
9. The TSG is not given the correct salinity readings. This may be a problem with the software or the sensor, but the data cannot be trusted at this stage. The temperature data would need to be

compared fairly closely with the CTD before being used. This problem persisted even after the con file was updated.

10. As noted at the last wash up, the Weather Pak is not working correctly. The wind speed and direction data seem to be correct (from the bridge through to the SDS system). At the dry dock, we do need to work with the South African Weather Services (SAWS) to ensure all the underway meteorological sensors are registered with WMO numbers and corrected serviced.
11. Only one small glitch with the CTD in that the incorrect conductivity cell sensor serial number was loaded on the con file. This was changed after the first station.
12. The S-ADCP and Echo Sounder system worked fine for the current data acquisition and mooring deployment data respectively.

13. Electronics Intern – Elijah Ramphago Cruise Report:

Date: 28 April 2015
From: Elijah Ramphago
To: Mfundo Lombi

Algoa's ASCA V214 Duty Technician (Engineering Support) Report, 7 April to 26 April 2015 **Technical Support Approach**

First leg (7 April to 16 April 2015)

The $p\text{CO}_2$, TSG, ADCP and Logger light DPAR systems were setup for underway sampling using preconfigured settings from previous voyages, with the SDS capturing the outputs except from the ADCP and $p\text{CO}_2$ systems.

The ship's engineers assisted in getting the scientific underway seawater pump running.

Support was also given to the chemistry scientist, when the $p\text{CO}_2$ system was serviced during an underway seawater sampling downtime. Due to the over pumping ratio of the peristaltic pump. The pump speed was reduced to 5 or ratio was reduced to 5:1.

18 kHz Echo sounder system was not responding to the software or communicating with the instrument, after looking at the software and playing around with it, I then decided to restart the computer, then restart the software, after that it started communicating with the echo sounder.

The TSG system was running, sea term was giving feedback but when you change to sea save, there was no feedback in terms of displaying sea surface readings, therefore physical senior technician looked at it before vessel sailed but still there was no display and I did look at it throughout leg one, new configuration files were sent via email and still there was no communications, I was not happy with TSG.

There were no CTD or Vertical Bongo in leg one

Second leg 17 April to 24 April 2015

The $p\text{CO}_2$, TSG, ADCP and Logger light DPAR systems were setup for underway sampling with the SDS capturing the outputs except from the ADCP and $p\text{CO}_2$ systems.

The ship's engineers were assisted in getting the scientific underway seawater pump running at the correct rate after it almost busted pipes, this was due to the half opened valve in $p\text{CO}_2$ lab instead of fully opened and the speed of which it was running. Biological team were assisted to setup the vertical bongo system

During the second day of the second leg salinity readings dropped drastically this was due to measurements under suspected shallow waters. I then flushed it with a little bit of bleach and salt water because we were not allowed to use any fresh water as we had lost lots of fresh water because of an open pipe. We lost 2 days of work due to bad weather, the weather came down on Monday. When we started working on Monday morning, 20 April 2015, we experienced a short-circuit fault on the bongo system, the deck unit "no data" problem with the underwater unit. This was because of the flat batteries inside the

battery pack inside the underwater unit, I checked inside the spares box and could not find any 3V batteries, I then scratched around and then got one of the used ones with a voltage reading of 2.3V, which worked but couldn't work for long. On station 5, the battery pack was showing a short-circuit fault "no data" problem on the deck unit and when measuring the batteries, I got 4.5V instead of a reading between 7 V and 9V. I then decided to continue using the vertical bongo system but with a blind-depth. After station 6, the underwater unit came with the both the power and flow meter cables cut off completely, this was due to the picking up wind and high sea swells.

There were not enough spares for this instrument! e.g. batteries, underwater unit

NB: the bongo needs attention as soon as possible "the winch cable and the underwater unit" as they couldn't be any bongo in the next cruise

Third leg 24 April to 26 April 2015

The pCO_2 , TSG, ADCP and Logger light SPAR systems were setup for underway sampling, with the SDS capturing the outputs except from the ADCP and pCO_2 systems.

There were no CTD or Vertical Bongo on this leg

Problems Encountered:

- I experienced a short-circuit fault on bongo system "no data" problem with the underwater unit This was because of the flat batteries inside the battery pack inside the underwater unit
- The SBE 45 MicroTSG salinity trace is a suspect, as the TSG was noisy and giving wrong readings of salinity.

Efforts were made to respond to the abovementioned problems with an aim to resolve them satisfactorily, where this is not possible workarounds that will allow operations to continue while maintaining the integrity of the systems were implemented and are mentioned below:

- ✓ After inspecting spares box and could not find any 3V batteries, I then scratched around and then got one of the used ones with a voltage reading of 2.3V, which worked but couldn't work for long. On station 5, the battery pack was showing short-circuit fault again on the Deck Unit and when measuring the batteries, I got 4.5V instead of a reading between 7 V and 9V I then decided to continue using the vertical bongo system but with a blind-depth. After station 6, the underwater unit came with both the power and Flow meter cables cut off completely, this was due to the picking up wind and high sea swells.
- ✓ I then flushed it with little bit of bleach and salt water because I was not allowed to use any fresh water as we lost lot of fresh water because of an open pipe.

Apart from my Technical Support

Mooring training was done on mooring B and C

Vertical Bongo training was done on second leg (2x200 μ M)

- I operated vertical bongo on leg two
- Collected micro zooplankton
- Collected phytoplankton

Sampling training was done

- Water samples done
- Chlorophyll simple done
- Filtering was done

14. ASCA Data Policy and Data Access

The points listed below are taken directly from the signed MoA for the ASCA Project:

- In compliance with the data policy for the Indian Ocean Observing System (IndOOS), as stipulated by the CLIVAR Indian Ocean Panel, ASCA data will be open to the public and made easily accessible, with reasonable time lag for data quality checks. All data will be listed on the IndOOS data portal and be accessible through it.
- ASCA PI's and associated scientists and students will have immediate access to raw data and they "walk off the ship" following ASCA maintenance cruises.
- Data will be quality controlled, processed and archived in South Africa (skills transfer).
- Data will be stored at SAEON, and passed to SADC and the US NODC within 12 months of retrieval, with open access for the international scientific community.

A Dropbox account has been setup with all the metadata information and raw and processed data available from this cruise. It is been added to periodically as samples are analyzed and further interpretations are done. For access, please contact Ms. T. Morris – tammy@saeon.ac.za. Alternatively, all data is available to the co-PI's as per the data agreement above.

As noted in a few sections above (notably the TSG data), some further post processing is required on some data sets before it can be used for further work. Please refer back to the co-PI's or Coordinator for this project prior to using the data on the data quality control management and readiness of the data.

ANNEXURE 1:
Final Mooring Designs

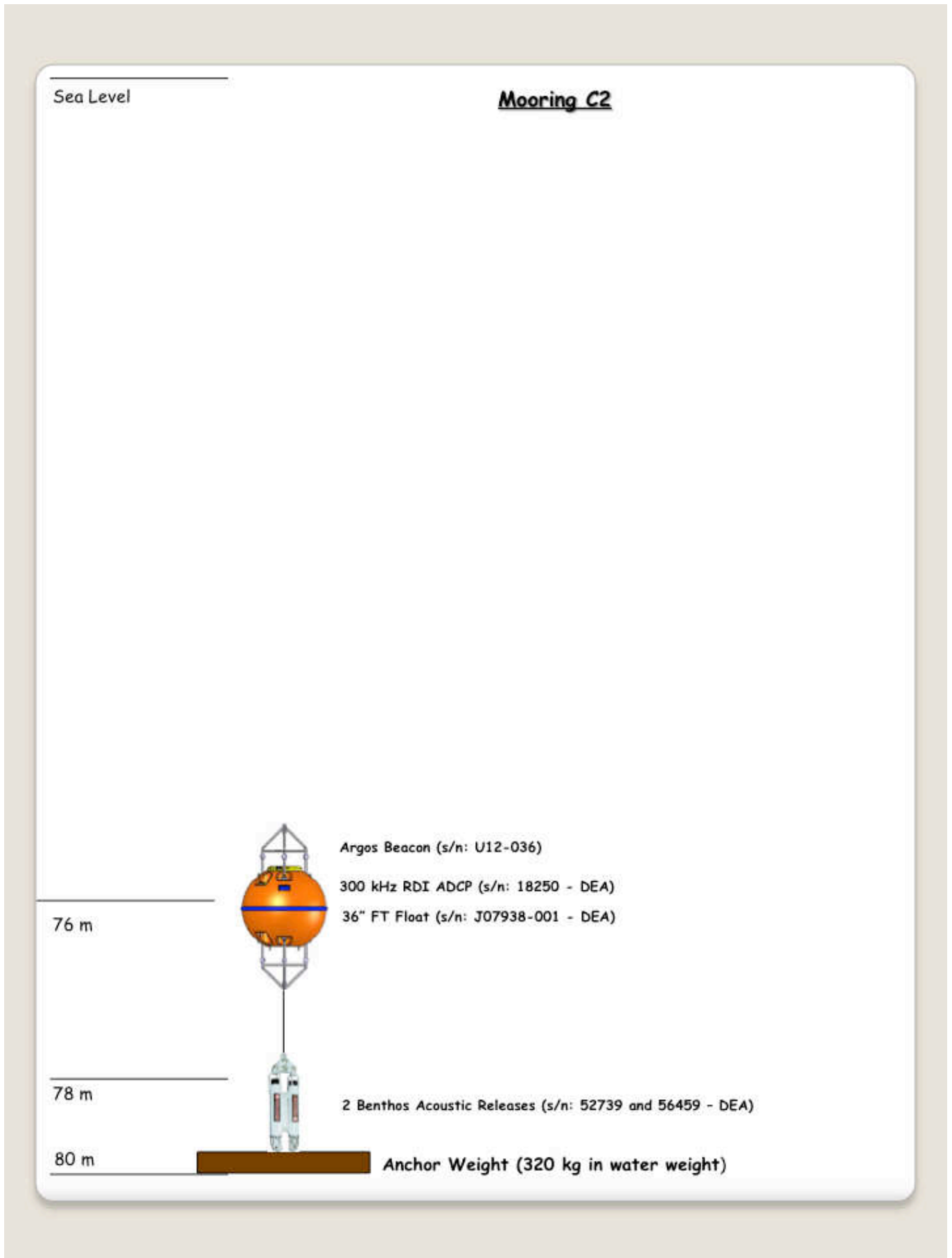


Figure 20: Mooring C2

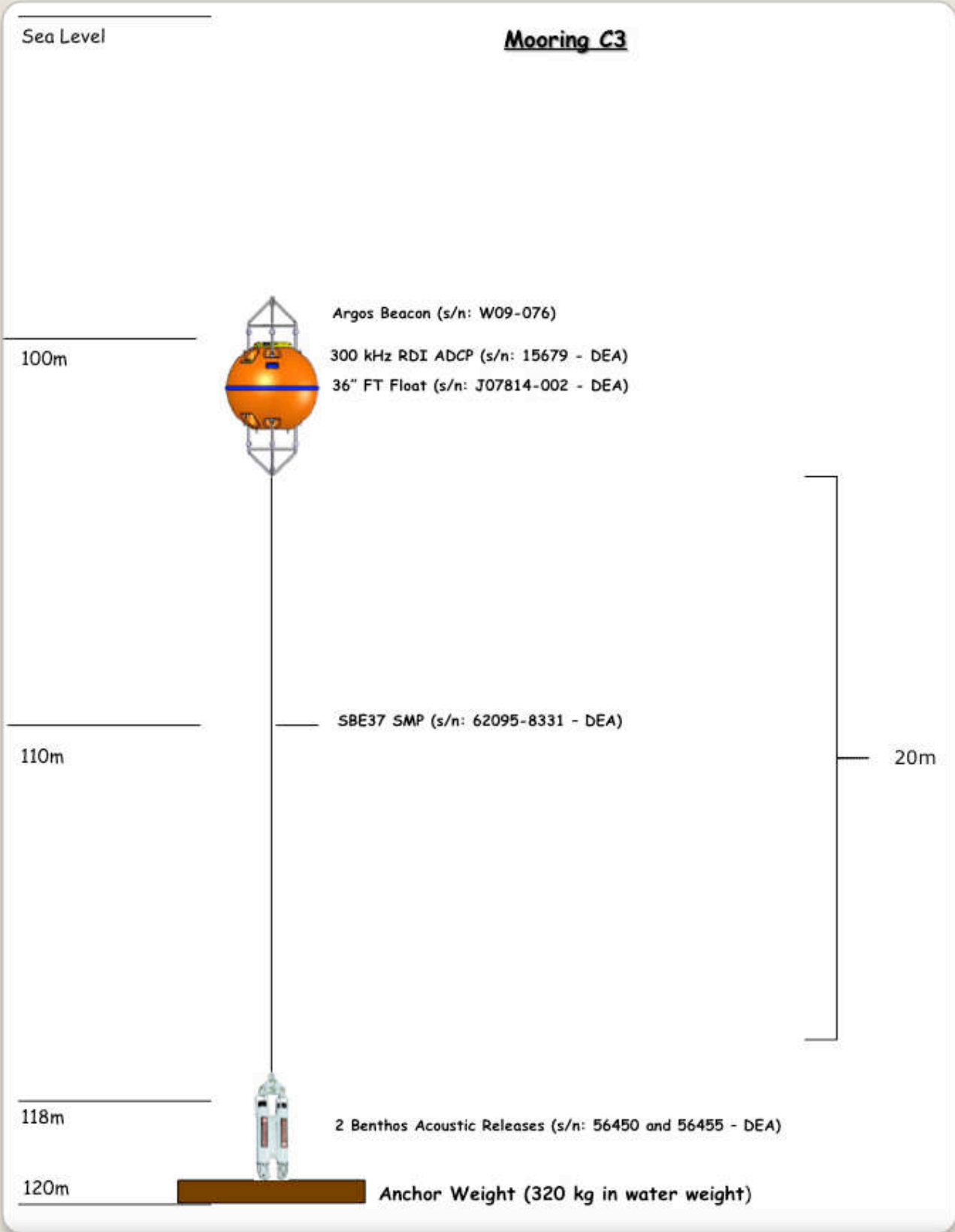


Figure 21: Mooring C3

Sea Level

Mooring A

280m



SEIMAC Beacon (s/n: 12555 - NIOZ: 00032469)

75kHz RDI ADCP (s/n: 3550 - NIOZ:1342)

CRP 1500/400 Type C (s/n: 00003070)

40m

312m

2 IXSEA AR861 B25 Acoustic Releases
(s/n: 173 - NIOZ: 00002943 and 162 - NIOZ: 00003834)

320m

Anchor Weight (640 kg in water weight)

Figure 22: Mooring A

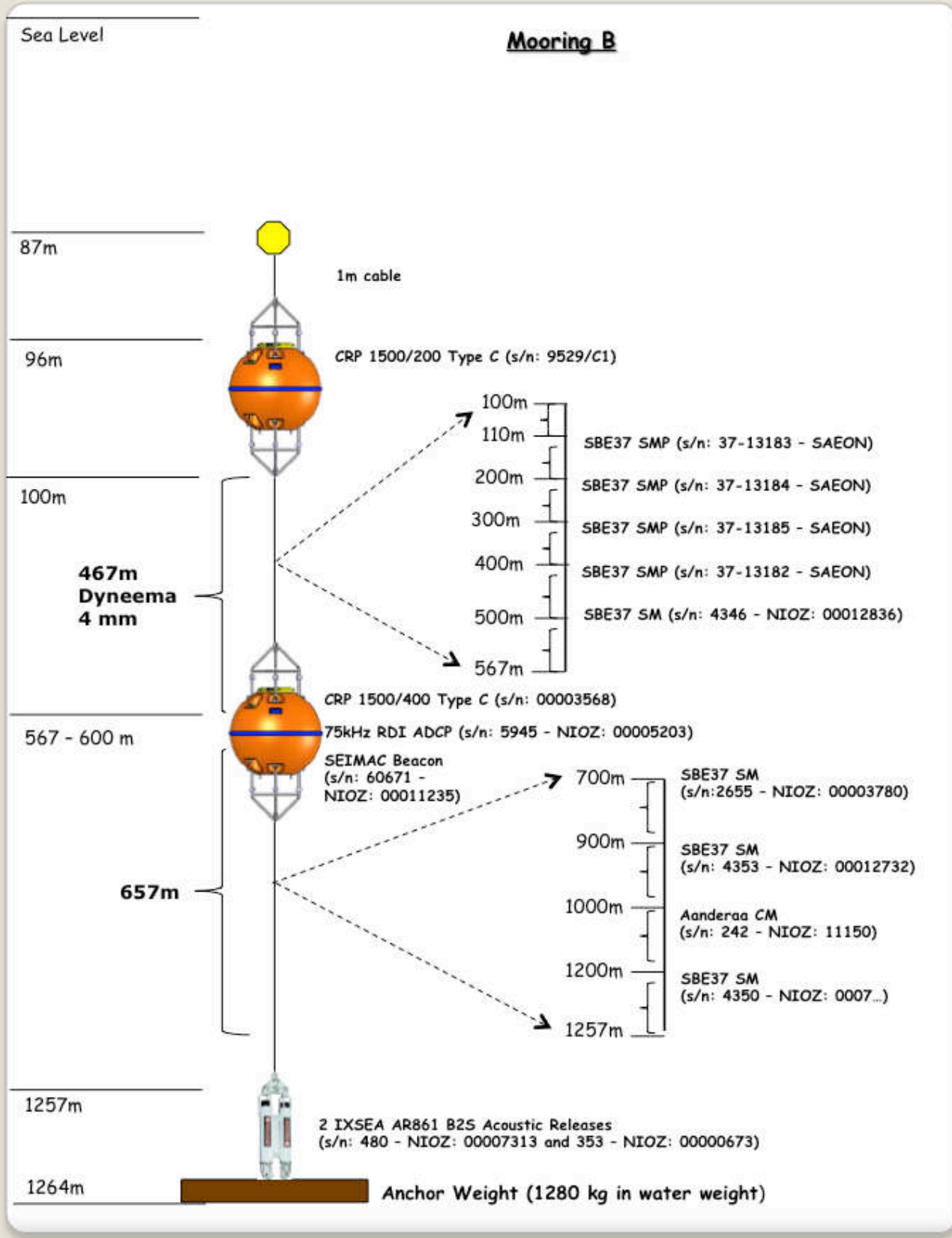


Figure 23: Mooring B

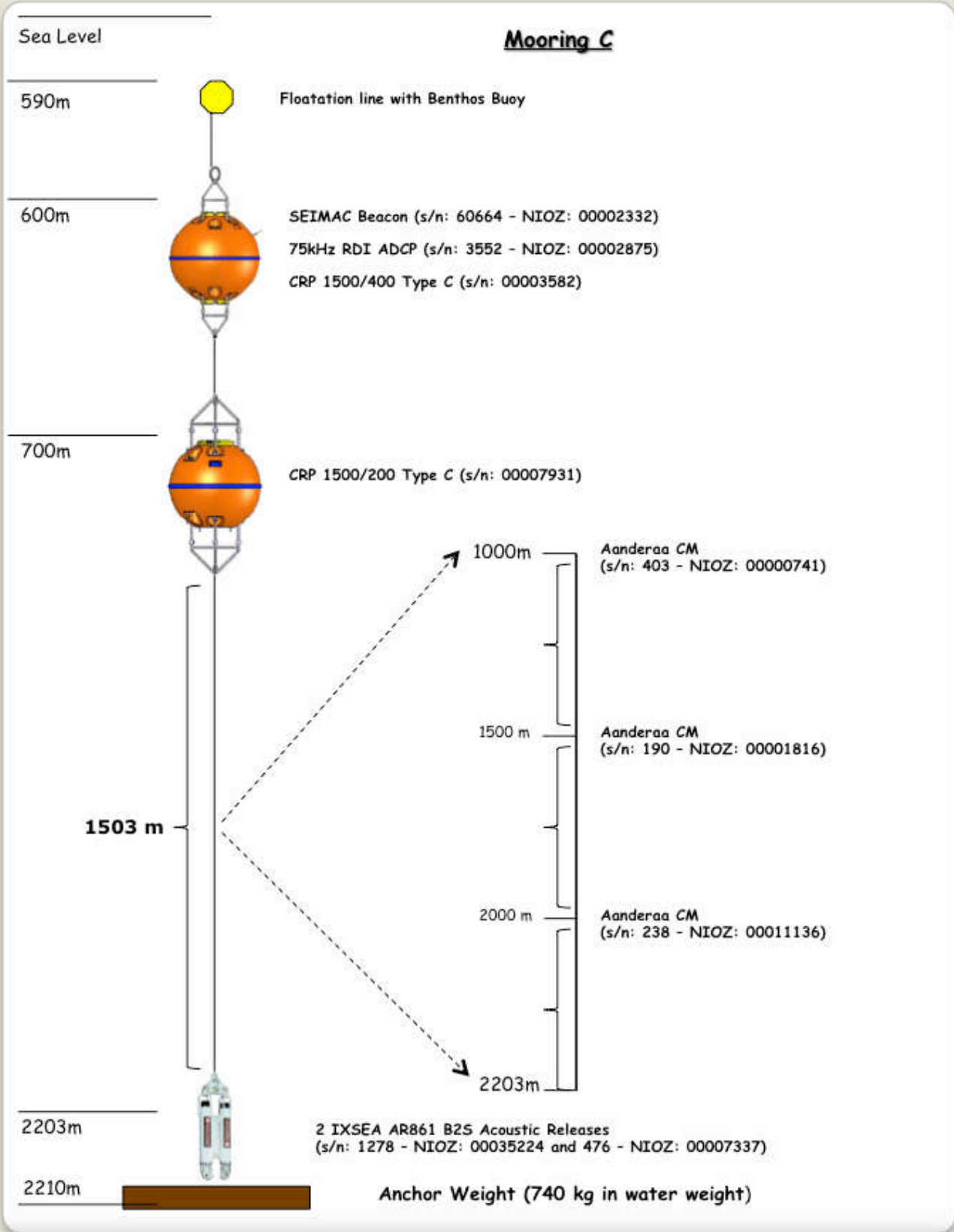


Figure 24: Mooring C

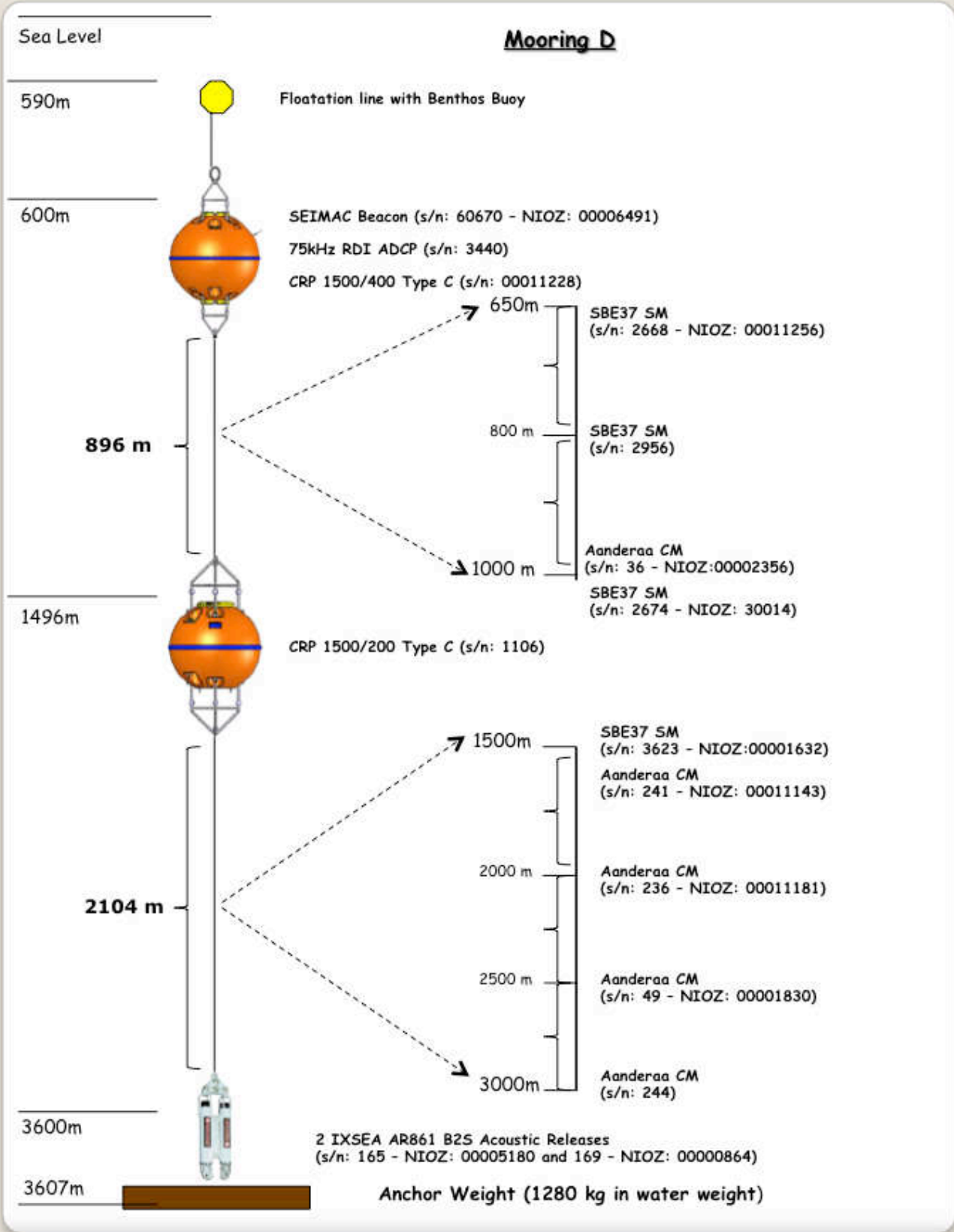


Figure 25: Mooring D

ANNEXURE 2: Mooring Deployment Sheets

MOORING DEPLOYMENT SHEET - ASCA

Cruise: ASCA Date: 13/04/2015 Site Arrival Time: 07:49 (SAST) Start Time: 07:49 (SAST) 05:49 (GMT) Start Latitude: 33° 30.726 S Start Depth: 116 m	Mooring: C2 Set-up Distance: 0 nautical miles End Time: 07:49 (SAST) 05:49 (GMT) Start Longitude: 027° 34.1890 E
--	--

MOORING INSTRUMENT DEPLOYMENT:

Item	Serial #:	Time (on mooring)	Comment:
Float	J07938-001	At start	36" FT floats
ADCP	18250	At start	300 kHz
Benthos 866-A AR	52739	At start	
Benthos 866-A AR	56459	At start	
Concrete Block		At start	320 kg in water (500 kg in air)

Acoustic Releases: Serial #: 52739 **Serial #:** 56459
Enable Code: F **Enable Code:** K
Release Code: G **Release Code:** I
Frequency: Rx:10.25 Tx:12 **Frequency:** Rx: 11.75 Tx: 12

ARGOS Beacon ID #: serial #: U12-036 / Argo ID: 73190 (Dec.), 8DE836A (Hex)

Anchor Release: **Latitude:** 33° 25.395 S
Longitude: 027° 31.006 E

Water Depth (including draft): 74 m + 5 m (draft) = 79 m

Technicians: **Instruments:** Tammy, Geert-Jan, Jethan (all on deck)
Moorings: Leon, Gavin, Bradley (all on deck)

MOORING DEPLOYMENT SHEET - ASCA

Cruise: ASCA	Mooring: C3
Date: 13/04/2015	
Site Arrival Time: 06:56 (SAST)	Set-up Distance: 0 nautical miles
Start Time: 06:56 (SAST) 04:56 (GMT)	End Time: 06:59 (SAST) 04:59 (GMT)
Start Latitude: 33° 30.726 S	Start Longitude: 027° 34.1890 E
Start Depth: 116 m	

MOORING INSTRUMENT DEPLOYMENT:

Item	Serial #:	Time (on mooring)	Comment:		
Float	J07814-002	At start	36" FT floats		
ADCP	15679	At start	300 kHz		
SB37 SMP	62095-8331	At start			
Benthos 866-A AR	56450	At start			
Benthos 866-A AR	56455	At start			
Concrete Block		At start	320 kg in water (500 kg in air)		

Acoustic Releases: Serial #: 56450 Serial #: 56455
 Enable Code: L Enable Code: M
 Release Code: M Release Code: J
 Frequency: Rx: 9.5 Tx: 12 Frequency: Rx: 10.75 Tx: 12

ARGOS Beacon ID #: serial #: W09-076 / Argo ID: 88941 (Dec.), 81F82D4 (Hex)

Anchor Release: Latitude: 33° 30.676 S
 Longitude: 027° 34.190 E

Water Depth (including draft): 116 m + 5 m (draft) = 121 m

Technicians: Instruments: Tammy, Geert-Jan, Jethan (all on deck)
 Moorings: Leon, Gavin, Bradley (all on deck)

MOORING DEPLOYMENT SHEET - ASCA

Cruise: ASCA	Mooring: A
Date: 12/04/2015	
Site Arrival Time: 16:00 (SAST)	Set-up Distance: 0 nautical miles
Start Time: 16:10 (SAST) 14:10 (GMT)	End Time: 16:15 (SAST) 14:15 (GMT)
Start Latitude: 33° 33.496 S	Start Longitude: 027° 35.730 E
Start Depth: 316 m	

MOORING INSTRUMENT DEPLOYMENT:

Item	Serial #:	Time (on mooring)	Comment:
Float	00003070	At start	NIOZ Serial Number
ADCP	3550	At start	NIOZ: 1342 (75 kHz)
IX Sea AR	173	At start	NIOZ: 00002943
IX Sea AR	162	At start	NIOZ: 00003834
Concrete Block		At start	640 kg in water (1 T in air)

Acoustic Releases: Serial #: 173 Serial #: 162
Arm Code: 04DD Arm Code: 04D2
Frequency: 12.0 kHz Frequency: 12.0 kHz

ARGOS Beacon ID #: serial #: 12555 / Argo ID: 21534 / NIOZ serial #: 00032469 (tied on to top buoy)

Anchor Release: Latitude: 33° 33.4986 S
Longitude: 027° 35.7040 E

Water Depth (including draft): 314 m + 5 m (draft) = 319 m

Technicians: Instruments: Tammy, Geert-Jan, Jethan (all on deck)
Moorings: Leon, Gavin, Bradley (all on deck)

MOORING DEPLOYMENT SHEET - ASCA

Cruise: ASCA		Mooring: C	
Date: 12/04/2015			
Site Arrival Time: 06:00 (SAST)		Set-up Distance: 1.5 nautical miles (due south)	
Start Time: 07:09 (SAST) 05:09 (GMT)		End Time: 08:18 (SAST) 06:18 (GMT)	
Start Latitude: 33° 48.4509 S		Start Longitude: 027° 42.9457 E	
Start Depth: 2453 m			

MOORING INSTRUMENT DEPLOYMENT:

Item	Serial #:	Time (on mooring)	Comment:		
Float	00003582	At start	600 m	NIOZ Serial Number	
ADCP	3552	At start	600 m	NIOZ: 00002875 (75 kHz)	
Float	00007931	7:12	700 m	NIOZ Serial Number	
Aanderaa CM	403	7:21	1000 m	NIOZ: 00000741	
Aanderaa CM	190	7:33	1500 m	NIOZ: 00001816	
Aanderaa CM	238	7:45	2000 m	NIOZ: 00011136	
IX Sea AR	1278	7:52		NIOZ: 00035224	
IX Sea AR	476	7:52		NIOZ: 00007337	
Concrete Block		7:52		740 kg in water (1.1 T in air)	

Acoustic Releases: Serial #:	<u>1278</u>	Serial #:	<u>476</u>
Arm Code:	<u>08D3</u>	Arm Code:	<u>1527</u>
Frequency:	<u>12.0 kHz</u>	Frequency:	<u>12.0 kHz</u>

ARGOS Beacon ID #: serial #: 60664 / Argo ID: 22179 / NIOZ serial #: 00002332 (tied on to frame)

Anchor Release: **Latitude:** 33° 46.926 S
Longitude: 027° 42.948 E

Water Depth (including draft): 2206 m + 5 m (draft) = 2211 m

Technicians: **Instruments:** Tammy, Geert-Jan, Jethan (all on deck)
Moorings: Leon, Gavin, Bradley (all on deck)

Triangulated position: **Latitude:** 33° 47.978 S
Longitude: 027° 42.915 E

MOORING DEPLOYMENT SHEET - ASCA

Cruise: ASCA	Mooring: D
Date: 11/04/2015	
Site Arrival Time: 11:30 (SAST)	Set-up Distance: 3.1 nautical miles (due south)
Start Time: 13:10 (SAST) 11:10 (GMT)	End Time: 15:12 (SAST) 13:12 (GMT)
Start Latitude: 34° 04.5352 S	Start Longitude: 027° 51.4268 E
Start Depth: 3611 m	

MOORING INSTRUMENT DEPLOYMENT:

Item	Serial #:	Time (on mooring)	Comment:
Float	00011228	At start	600 m NIOZ Serial Number
ADCP	3440	At start	600 m No NIOZ Serial Number (75 kHz)
SB37 SM	30203-2668	At start	650 m NIOZ: 00011256
SB37 SM	33078-2956	13:14	800 m No NIOZ Serial Number
SB37 SM	30203-2674	13:20	1000 m NIOZ: 30014
Aanderaa CM	36	13:20	1000 m NIOZ: 00002356
SB37 SM	35418-3623	13:33	1500 m NIOZ: 00001632 (just above float)
Float	1106	13:33	1496 m NIOZ Serial Number
Aanderaa CM	241	13:33	1500 m NIOZ: 00011143 (just below float)
Aanderaa CM	236	13:45	2000 m NIOZ: 00011181
Aanderaa CM	49	13:57	2500 m NIOZ: 00001830
Aanderaa CM	244	14:08	3000 m No NIOZ Serial Number
IX Sea AR	165	14:20	NIOZ: 00005180
IX Sea AR	169	14:20	NIOZ: 00000864
Concrete Block		14:20	1280 kg in water (2T in air)

Acoustic Releases: Serial #: 165 Serial #: 169
 Arm Code: 04D5 Arm Code: 04D9
 Frequency: 12.0 kHz Frequency: 12.0 kHz

ARGOS Beacon ID #: serial #: 60670 / Argo ID: 22621 / NIOZ serial #: 00006491 (tied on to frame)

Anchor Release: **Latitude:** 34° 02.071 S
 Longitude: 027° 51.790 E

Water Depth (including draft): 3617 m + 5 m (draft) = 3622 m

Technicians: **Instruments:** Tammy, Geert-Jan, Jethan (all on deck)
 Moorings: Leon, Gavin, Bradley (all on deck)

Triangulation **Latitude:** 34° 02.615 S
 Position: **Longitude:** 027° 51.619 E

ANNEXURE 3: Instrumentation Setup Sheets

INSTRUMENT SETUP SHEET - ASCA

ADCP - Mooring:

	C2	C3	A	B	C	D
Serial #	18250	15679	3550	5945	3552	3440
ADCP Type	RDI 300 kHz	RDI 300 kHz	RDI 75 kHz	RDI 75 kHz	RDI 75 kHz	RDI 75 kHz
Institution / Research Group	DEA	DEA	NIOZ	NIOZ	NIOZ	NIOZ
First Ping Date	14/04/2015	14/04/2015	10/04/2015	10/04/2015	10/04/2015	10/04/2015
First Ping Time	04:00:00 AM (GMT)	04:00:00 AM (GMT)	04:00:00 AM (GMT)	04:00:00 AM (GMT)	04:00:00 AM (GMT)	04:00:00 AM (GMT)
Battery Voltage	37,4	37,36	45	45	45	45
Battery Types and number of packs	Alkaline (1)	Alkaline (1)	Alkaline (4)	Alkaline (4)	Alkaline (4)	Alkaline (4)
Sampling Interval	60 minutes	60 minutes	60 minutes	60 minutes	60 minutes	60 minutes
Blank Distance (m)	1,76	1,76				
No. of bins	50	50	45	45	45	45
Bin size (m)	2	2	16	16	16	16
Pings per ensemble	120	120	22	22	22	22
Magnetic Variation	0	0	0	0	0	0
Deployment Duration (days)	200	200	400	400	400	400
Filename	C2_01	C3_01				
PlanADCP Consequences:						
First Bin Range	4,2	4,2				
Last Bin Range	102,2	102,2				
Battery Usage	229,59	229,59	3,9 battery packs	3,9 battery packs	3,9 battery packs	3,9 battery packs
Std Deviation	0,63	0,63				
Storage Needed	5,28	5,28				
ADCP Tests Completed						
Was TESTADCP run	✓	✓	✓	✓	✓	✓
Compass calibrated	X	X	✓	✓	✓	✓
Degree of calibration	n/a	n/a	1.6°	1.6°	3.3°	4°
O-Rings checked	✓	✓	✓	✓	✓	✓
Transducer heads anti-fouled	✓	X	n/a	n/a	n/a	n/a
Sufficient disk space	✓	✓	✓	✓	✓	✓

INSTRUMENT SETUP SHEET - ASCA

Aanderaa - Mooring and depth: B - 1000 m C - 1000 m C - 1500 m C - 2000 m D - 1000 m D - 1500 m

Serial #	242	403	190	238	36	241
Aanderaa Type	RCM 11	RCM 11	RCM 11	RCM 11	RCM 11	RCM 11
Institution / Research Group	NIOZ	NIOZ	NIOZ	NIOZ	NIOZ	NIOZ
Institution serial number (if applicable)	11150	00000741	00001816	00011136	00002356	00011143
Data Storage Unit serial number	14142	13512	13743	13745	13742	8168
Instrument start date	12/04/2015	09/04/2015	09/04/2015	09/04/2015	09/04/2015	09/04/2015
Instrument start time	4:00:00 AM (GMT)	11:00:00 AM (GMT)	11:00:00 AM (GMT)	11:00:00 AM (GMT)	08:35:00 AM (GMT)	08:45:00 AM (GMT)
Battery Type	Lithium	Lithium	Lithium	Lithium	Lithium	Lithium
Sampling Interval	20 minutes	20 minutes	20 minutes	20 minutes	20 minutes	20 minutes
Temperature Range	Wide	Wide	Wide	Wide	Wide	Wide
Magnetic Variation	0	0	0	0	0	0
Log filename						
Tests Completed						
UTC Clock Adjusted	✓	✓	✓	✓	✓	✓
New Battery Pack	✓	✓	✓	✓	✓	✓
New O-Ring	✓	✓	✓	✓	✓	✓
Battery terminals taped (for vibrations)	✓	✓	✓	✓	✓	✓
Instrument Service Date	24/03/2015	24/03/2015	24/03/2015	24/03/2015	24/03/2015	24/03/2015

INSTRUMENT SETUP SHEET - ASCA

Aanderaa Mooring and depth: D - 2000 m D - 2500 m D - 3000 m

Serial #	236	49	244
Aanderaa Type	RCM 11	RCM 11	RCM 11
Institution / Research Group	NIOZ	NIOZ	NIOZ
Institution serial number (if applicable)	00011181	00001830	5173
Data Storage Unit serial number	12227	13846	13746
Instrument start date	09/04/2015	09/04/2015	09/04/2015
Instrument start time	09:20:00 AM (GMT)	09:20:00 AM (GMT)	09:20:00 AM (GMT)
Battery Type	Lithium	Lithium	Lithium
Sampling Interval	20 minutes	20 minutes	20 minutes
Temperature Range	Wide	Wide	Wide
Magnetic Variation	0	0	0
Log filename			
Tests Completed			
UTC Clock Adjusted	✓	✓	✓
New Battery Pack	✓	✓	✓
New O-Ring	✓	✓	✓
Battery terminals taped (for vibrations)	✓	✓	✓
Instrument Service Date	24/03/2015	24/03/2015	24/03/2015

INSTRUMENT SETUP SHEET - ASCA

Microcats - Mooring and depth:

C3 - 110 m

B - 100 m

B - 200 m

B - 300 m

B - 400 m

B - 500 m

Serial #	8331	13183	13184	13185	13182	4346
Microcat Type	SBE37 SMP	SBE37 SMP	SBE37 SMP	SBE37 SMP	SBE37 SMP	SBE37 SM
Institution / Research Group	DEA	SAEON	SAEON	SAEON	SAEON	NIOZ
Institute Serial Number	n/a	XXX	XXX	XXX	XXX	00012836
Pumped?	✓	✓	✓	✓	✓	X
Firmware Version	3.0	4.1	4.1	4.1	4.1	2.66
Start Recording Date	14/04/2015	14/04/2015	14/04/2015	14/04/2015	14/04/2015	10/04/2015
Start Recording Time	04:00:00 AM (GMT)	04:00:00 AM (GMT)	04:00:00 AM (GMT)	04:00:00 AM (GMT)	04:00:00 AM (GMT)	04:00:00 AM (GMT)
Battery Voltage (main)	6,94	New Saft	New Saft	New Saft	New Saft	New Saft
Battery Voltage (lith)	3,17	New Saft	New Saft	New Saft	New Saft	New Saft
Battery Type	Lithium	Lithium	Lithium	Lithium	Lithium	Lithium
Sampling Interval	600 seconds	600 seconds	600 seconds	600 seconds	600 seconds	600 seconds
Sampling Type	Autonomous	Autonomous	Autonomous	Autonomous	Autonomous	New Saft
Pressure Sensor	✓	✓	✓	✓	✓	✓
Pressure Rating	7000 m	1000 m	1000 m	1000 m	1000 m	3500 m
Oxygen Sensor	X	X	X	X	X	X
Pre-deployment Calibration	X	New instrument	New instrument	New instrument	New instrument	SBE calibration
CTD Cast Number	n/a	n/a	n/a	n/a	n/a	n/a
*Further details on CTD calibration sheet	n/a	n/a	n/a	n/a	n/a	n/a
Filename	dep_..._SN8331	dep_..._SN13183	dep_..._SN13184	dep_..._SN13185	dep_..._SN13182	dep_..._SN4346
Tests Completed						
Pre-test	✓	✓	✓	✓	✓	✓
UTC Clock Adjusted	✓	✓	✓	✓	✓	✓
Memory erased	✓	✓	✓	✓	✓	✓
Available memory	838860	559240	559240	559240	559240	190650
Battery usage	~ 460 days	> 460 days	> 460 days	> 460 days	> 460 days	186182

INSTRUMENT SETUP SHEET - ASCA

Microcats - Mooring and depth: B - 700 m B - 900 m B - 1200 m

Serial #	2655	4353	4350
Microcat Type	SBE37 SM	SBE37 SM	SBE37 SM
Institution / Research Group	NIOZ	NIOZ	NIOZ
Institute Serial Number	00003780	00012732	0007...
Pumped?	X	X	X
Firmware Version	2.2	2.66	2.66
Start Recording Date	10/04/2015	10/04/2015	10/04/2015
Start Recording Time	04:00:00 AM (GMT)	04:00:00 AM (GMT)	04:00:00 AM (GMT)
Battery Voltage (main)	New Saft	New Saft	New Saft
Battery Voltage (lith)	New Saft	New Saft	New Saft
Battery Type	Lithium	Lithium	Lithium
Sampling Interval	600 seconds	600 seconds	600 seconds
Sampling Type	Autonomous	Autonomous	Autonomous
Pressure Sensor	✓	✓	✓
Pressure Rating	3500 m	3500 m	3500 m
Oxygen Sensor	X	X	X
Pre-deployment Calibration	SBE calibration	SBE calibration	SBE calibration
CTD Cast Number	n/a	n/a	n/a
*Further details on CTD calibration sheet	n/a	n/a	n/a
Filename	dep_..._SN2655	dep_..._SN4353	dep_..._SN4350
Tests Completed			
Pre-test	✓	✓	✓
UTC Clock Adjusted	✓	✓	✓
Memory erased	✓	✓	✓
Available memory	190650	190650	190650
Battery usage	186182	186182	186182

INSTRUMENT SETUP SHEET - ASCA

Microcats - Mooring and depth:

D - 650 m

D - 800 m

D - 1000 m

D - 1500 m

Serial #	2668	2959	2674	3623
Microcat Type	SBE37 SM	SBE37 SM	SBE37 SM	SBE37 SM
Institution / Research Group	NIOZ	NIOZ	NIOZ	NIOZ
Institute Serial Number	11256	?	30014	1632
Pumped?	X	X	X	X
Firmware Version	2.2	2.3	2.6	2.5
Start Recording Date	10/04/2015	10/04/2015	10/04/2015	10/04/2015
Start Recording Time	04:00:00 AM (GMT)	04:00:00 AM (GMT)	04:00:00 AM (GMT)	04:00:00 AM (GMT)
Battery Voltage (main)	New Saft	New Saft	New Saft	New Saft
Battery Voltage (lith)	New Saft	New Saft	New Saft	New Saft
Battery Type	Lithium	Lithium	Lithium	Lithium
Sampling Interval	600 seconds	600 seconds	600 seconds	600 seconds
Sampling Type	Autonomous	Autonomous	Autonomous	Autonomous
Pressure Sensor	✓	✓	✓	✓
Pressure Rating	3500 m	3500 m	3500 m	3500 m
Oxygen Sensor	X	X	X	X
Pre-deployment Calibration	SBE Calibration	SBE Calibration	SBE Calibration	SBE Calibration
CTD Cast Number	n/a	n/a	n/a	n/a
*Further details on CTD calibration sheet	n/a	n/a	n/a	n/a
Filename	dep_..._SN2668	dep_..._SN2959	dep_..._SN2674	dep_..._SN3623
Tests Completed				
Pre-test	✓	✓	✓	✓
UTC Clock Adjusted	✓	✓	✓	✓
Memory erased	✓	✓	✓	✓
Available memory	190650	190650	190650	190650
Battery usage	186182	186182	186182	186182

ANNEXURE 4: CTD Deckchits

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	11 April 2015	Time on Surface:	13:49
Time on station:	13:47	Latitude:	34 01.5749 S
Ship Station #:	Alg11194	Longitude:	27 51.7041 E
Grid #:	CTD-001	Sounding:	3603.60
CTD filename:	stn001		
Operator:	G. Louw		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												

NOTES: No samples taken. Cast for Mooring D deployment
 Salinity trace wrong - turned out incorrect sensor coefficients entered into con file. Corrected for next station

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	12 April 2015	Time on Surface:	7:00
Time on station:	6:59	Latitude:	33 47.3202 S
Ship Station #:	Alg11195	Longitude:	27 41.6481 E
Grid #:	CTD-002	Sounding:	2415 m
CTD filename:	stn002		
Operator:	G. Louw		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												

NOTES: No samples taken. Cast for Mooring C deployment

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	12 April 2015	Time on Surface	15:58
Time on station:	15:56	Latitude:	33 40.2220 S
Ship Station #:	Alg11196	Longitude:	27 37.8803 E
Grid #:	CTD-003	Sounding:	1167 m
CTD filename:	stn003		
Operator:	M. Makhetha		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												

NOTES: No samples taken. Cast for Mooring B deployment
 250 m wire out difference to pressure (750 m @ 1000 m wire out): Agulhas Current!

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	12 April 2015	Time on Surface	18:20
Time on station:	18:19	Latitude:	33 33.2583 S
Ship Station #:	Alg11197	Longitude:	27 35.6147 E
Grid #:	CTD-004	Sounding:	299.25 m
CTD filename:	stn004		
Operator:	K. Moffett		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												

NOTES: No samples taken. Cast for Mooring A deployment

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	13 April 2015	Time on Surface:	5:57
Time on station:	5:54	Latitude:	33 25.3617 S
Ship Station #:	Alg11198	Longitude:	27 30.8954 E
Grid #:	CTD-005	Sounding:	72 m
CTD filename:	stn005		
Operator:	M. Makhetha		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												

NOTES: No samples taken. Cast for Mooring C2 deployment

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	13 April 2015	Time on Surface:	6:51
Time on station:	6:49	Latitude:	33 30.7118 S
Ship Station #:	Alg11199	Longitude:	27 34.0884 E
Grid #:	CTD-006	Sounding:	117 m
CTD filename:	stn006		
Operator:	M. Makhetha		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												

NOTES: No samples taken. Cast for Mooring C3 deployment

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	18 April 2015	Time on Surface:	3:06
Time on station:	3:06	Latitude:	33 20.5849 S
Ship Station #:	Alg11200	Longitude:	27 28.7032 E
Grid #:	CTD-007	Sounding:	46.51 m
CTD filename:	stn007		
Operator:	G. Louw		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												

NOTES: CTD aborted due to heavy swells over the side of the vessel prior to the CTD being lowered.

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	20 April 2015	Time on Surface:	4:06
Time on station:	4:03	Latitude:	33 20.5799 S
Ship Station #:	Alg11201	Longitude:	27 28.8215 E
Grid #:	CTD-008	Sounding:	52.26 m
CTD filename:	stn007a		
Operator:	G. Louw		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1	48.1	169	18	1	1 (500 ml)							
2	40.4			2	2 (500 ml)							
3	29.3			3	3 (500 ml)							
4	16.8	171	19	4	4 (500 ml)					C01	C01	C01
5	10.7			5	5 (500 ml)					C01	C01	C01
6	3.9			6	6 (500 ml)					C01	C01	C01
7												
8												
9												
10												
11												
12												

NOTES:

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	20 April 2015	Time on Surface:	4:52
Time on station:	4:03	Latitude:	33 20.5799 S
Ship Station #:	Alg11201	Longitude:	27 28.8215 E
Grid #:	CTD-008	Sounding:	52.26 m
CTD filename:	stn007b		
Operator:	G. Louw		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1	10.2					1 (2 iterl)						
2	10.3						2 (2 liter)					
3	10.8							5 liter				
4	9.9								1 liter			
5	3.3					3 (2 iterl)						
6	3.2						4 (2 liter)					
7	3.5							5 liter				
8	3.3								1 liter			
9												
10												
11												
12												

NOTES:

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	20 April 2015	Time on Surface:	6:54
Time on station:	6:53	Latitude:	33 27.7988 S
Ship Station #:	Alg11202	Longitude:	27 32.8745 E
Grid #:	CTD-009	Sounding:	88.48
CTD filename:	stn008a		
Operator:	G. Louw		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chia (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1	89.9	189,194, 195	18	7	1 (500 ml)							
2	71.4			8	2 (500 ml)							
3	50.5		19	9	3 (500 ml)							
4	30.5			10	4 (500 ml)					C02	C02	C02
5	9.1			11	5 (500 ml)					C02	C02	C02
6	4.0			12	6 (500 ml)					C02	C02	C02
7												
8												
9												
10												
11												
12												

NOTES:

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	20 April 2015	Time on Surface:	7:23
Time on station:	6:53	Latitude:	33 20.5799 S
Ship Station #:	Alg11202	Longitude:	27 28.8215 E
Grid #:	CTD-009	Sounding:	88.48 m
CTD filename:	stn008b		
Operator:	G. Louw		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chia (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1	12.4					1 (2 liter)						
2	12						2 (2 liter)					
3	12							5 liter				
4	12.1								1 liter			
5	3.9					3 (2 liter)						
6	3.4						4 (2 liter)					
7	3.2							5 liter				
8	3.4								1 liter			
9												
10												
11												
12												

NOTES:

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	20 April 2015	Time on Surface:	8:23
Time on station:	8:21	Latitude:	33 33.3583 S
Ship Station #:	Alg11203	Longitude:	27 35.8512 E
Grid #:	CTD-010	Sounding:	314.75 m
CTD filename:	stn009a		
Operator:	G. Louw		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1	287.6	175	18	13								
2	208.1			14								
3	147.2	176	19	15								
4	99.6			16	1 (500 ml)							
5	76	177	84	17	2 (500 ml)							
6	59.2			18	3 (500 ml)					C03	C03	C03
7	49.8			19	4 (500 ml)					C03	C03	C03
8	24.7			20	5 (500 ml)							
9	3.8			21	6 (500 ml)					C03	C03	C03
10												
11												
12												

NOTES:

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	20 April 2015	Time on Surface:	9:29
Time on station:	8:21	Latitude:	33 33.3583 S
Ship Station #:	Alg11203	Longitude:	27 35.8512 E
Grid #:	CTD-010	Sounding:	299.68
CTD filename:	stn009b		
Operator:	G. Louw		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1	50.4					1 (2 liter)						
2	50.6						2 (2 liter)					
3	50.2							5 liter				
4	50.1								1 liter			
5	4.5					3 (2 liter)						
6	4.3						4 (2 liter)					
7	3.7							5 liter				
8	3.5								1 liter			
9												
10												
11												
12												

NOTES:

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	20 April 2015	Time on Surface:	10:16
Time on station:	10:15	Latitude:	33 35.7306 S
Ship Station #:	Alg11204	Longitude:	27 37.3523 E
Grid #:	CTD-011	Sounding:	599.44 m
CTD filename:	stn010a		
Operator:	G. Louw		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1	543.7			22								
2	404.4			23								
3	307.3			24								
4	180.7	179	18	25								
5	119.3	180	19	26								
6	69.5	181	84	27	1 (500 ml)							
7	50.2			28	2 (500 ml)					C04	C04	C04
8	39			29	3 (500 ml)					C04	C04	C04
9	29.5			30	4 (500 ml)					C04	C04	C04
10	9.9			31	5 (500 ml)					C04	C04	C04
11	4.2			32	6 (500 ml)					C04	C04	C04
12												

NOTES:

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	20 April 2015	Time on Surface:	11:28
Time on station:	11:25	Latitude:	33 35.7306 S
Ship Station #:	Alg11204	Longitude:	27 37.3523 E
Grid #:	CTD-011	Sounding:	599.44 m
CTD filename:	stn010b		
Operator:	M. Makhetha		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1	45.9					1 (2 liter)						
2	45.9						2 (2 liter)					
3	45.9							5 liter				
4	45.9								1 liter			
5	5.9					3 (2 liter)						
6	5.9						4 (2 liter)					
7	5.9							5 liter				
8	5.9								1 liter			
9												
10												
11												
12												

NOTES:

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	20 April 2015	Time on Surface:	12:26
Time on station:	12:24	Latitude:	33 39.2334 S
Ship Station #:	Alg11205	Longitude:	27 39.4126 E
Grid #:	CTD-012	Sounding:	1284 m
CTD filename:	stn011a		
Operator:	M. Makhetha		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1	992.7	182	18	33								
2	897.1			34								
3	713.9			35								
4	610.7			36								
5	409			37								
6	142.6	183	19	38								
7	76	184	84	39	1 (500 ml)							
8	61			40	2 (500 ml)					C05	C05	C05
9	45.5			41	3 (500 ml)					C05	C05	C05
10	32			42	4 (500 ml)					C05	C05	C05
11	9.8			43	5 (500 ml)					C05	C05	C05
12	6			44	6 (500 ml)					C05	C05	C05

NOTES:

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	20 April 2015	Time on Surface:	11:28
Time on station:	14:06	Latitude:	33 39.2334 S
Ship Station #:	Alg11205	Longitude:	27 39.4126 E
Grid #:	CTD-012	Sounding:	1284 m
CTD filename:	stn011b		
Operator:	M. Makhetha		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1	44.9					1 (2 liter)						
2	44.9						2 (2 liter)					
3	44.9							5 liter				
4	44.9								1 liter			
5	10.8					3 (2 liter)						
6	10.8						4 (2 liter)					
7	10.8							5 liter				
8	10.8								1 liter			
9												
10												
11												
12												

NOTES:

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	20 April 2015	Time on Surface:	15:25
Time on station:	15:21	Latitude:	33 42.3056 S
Ship Station #:	Alg11206	Longitude:	27 40.9721 E
Grid #:	CTD-013	Sounding:	1754 m
CTD filename:	stn012a		
Operator:	M. Makhetha		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1	998.4	185	18	45								
2	893			46								
3	801.5			47								
4	629.5			48								
5	351.8			49								
6	115.8	186	19	50								
7	91.4			51	1 (500 ml)							
8	77	187	84	52	2 (500 ml)							
9	60.2			53	3 (500 ml)					C06	C06	C06
10	48			54	4 (500 ml)					C06	C06	C06
11	31.8			55	5 (500 ml)					C06	C06	C06
12	5.4			56	6 (500 ml)					C06	C06	C06

NOTES:

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	20 April 2015	Time on Surface:	16:44
Time on station:	16:44	Latitude:	33 42.3056 S
Ship Station #:	Alg11206	Longitude:	27 40.9721 E
Grid #:	CTD-013	Sounding:	1859 m
CTD filename:	stn012b		
Operator:	M. Makhetha		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1	50.2					1 (2 liter)						
2	50.2						2 (2 liter)					
3	50.2							5 liter				
4	50.2								1 liter			
5	5					3 (2 liter)						
6	5						4 (2 liter)					
7	5							5 liter				
8	5								1 liter			
9												
10												
11												
12												

NOTES:

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	20 April 2015	Time on Surface:	17:47
Time on station:	17:44	Latitude:	33 47.2558 S
Ship Station #:	Alg11207	Longitude:	27 43.8546 E
Grid #:	CTD-014	Sounding:	2222 m
CTD filename:	stn013a		
Operator:	M. Makhetha		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1	1001.6	188	18	57								
2	900.6			58								
3	784.5			59								
4	658.8			60								
5	575.9			61								
6	438.3			62								
7	235.6			63	1 (500 ml)							
8	102.6			64	2 (500 ml)							
9	64.2	190	19	65	3 (500 ml)					C07	C07	C07
10	44.5			66	4 (500 ml)					C07	C07	C07
11	30.6			67	5 (500 ml)					C07	C07	C07
12	6.9			68	6 (500 ml)					C07	C07	C07

NOTES:

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	20 April 2015	Time on Surface:	19:08
Time on station:	17:44	Latitude:	33 47.2558 S
Ship Station #:	Alg11207	Longitude:	27 43.8546 E
Grid #:	CTD-014	Sounding:	2222 m
CTD filename:	stn013b		
Operator:	M. Makhetha		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1	46.2					1 (2 liter)						
2	46.2						2 (2 liter)					
3	46.2							5 liter				
4	46.2								1 liter			
5	5.4					3 (2 liter)						
6	3.6						4 (2 liter)					
7	4.5							5 liter				
8	4.7								1 liter			
9												
10												
11												
12												

NOTES:

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	20 April 2015	Time on Surface:	20:15
Time on station:	20:13	Latitude:	33 53.8033 S
Ship Station #:	Alg11208	Longitude:	27 47.8458 E
Grid #:	CTD-015	Sounding:	3210 m
CTD filename:	stn014a		
Operator:	M. Makhetha		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chia (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1	999.9	191	18	69								
2	894.6			70								
3	839.1			71								
4	709.7			72								
5	424.3			73								
6	262.8			74								
7	174			75	1 (500 ml)							
8	101.2	192	19	76	2 (500 ml)							
9	79.5			77	3 (500 ml)					C08	C08	C08
10	44.9			78	4 (500 ml)					C08	C08	C08
11	29			79	5 (500 ml)					C08	C08	C08
12	4.8			80	6 (500 ml)					C08	C08	C08

NOTES:

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	20 April 2015	Time on Surface:	21:29
Time on station:	20:13	Latitude:	33 53.8033 S
Ship Station #:	Alg11208	Longitude:	27 47.8458 E
Grid #:	CTD-015	Sounding:	3210 m
CTD filename:	stn014b		
Operator:	M. Makhetha		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chia (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1	84.1					1 (2 liter)						
2	84.1						2 (2 liter)					
3	84.1							5 liter				
4	84.1								1 liter			
5	4.4					3 (2 liter)						
6	4.9						4 (2 liter)					
7	4.4							5 liter				
8	4.5								1 liter			
9												
10												
11												
12												

NOTES:

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	20 April 2015	Time on Surface:	22:37
Time on station:	22:34	Latitude:	34 01.2190 S
Ship Station #:	Alg11209	Longitude:	27 51.8683 E
Grid #:	CTD-016	Sounding:	3595.17 m
CTD filename:	stn015a		
Operator:	G. Louw		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1	1005.5	197,198,199	18	81								
2	850.6			82								
3	700.2		19	83								
4	500.2			84								
5	301.	BOTTLE DID NOT CLOSE										
6	201.3			85								
7	99.4			86	1 (500 ml)							
8	79.8			87	2 (500 ml)					C09	C09	C09
9	68			88	3 (500 ml)					C09	C09	C09
10	60			89	4 (500 ml)					C09	C09	C09
11	10.2			90	5 (500 ml)							
12	4.7			91	6 (500 ml)					C09	C09	C09

NOTES:

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	20 April 2015	Time on Surface:	23:52
Time on station:	22:34	Latitude:	34 01.2190 S
Ship Station #:	Alg11209	Longitude:	27 51.8683 E
Grid #:	CTD-016	Sounding:	3595.17 m
CTD filename:	stn015b		
Operator:	G. Louw		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1	82.2					1 (2 liter)						
2	81.2						2 (2 liter)					
3	81.8							5 liter				
4	82.1								1 liter			
5	5.8					3 (2 liter)						
6	4.7						4 (2 liter)					
7	4.5							5 liter				
8	5.2								1 liter			
9												
10												
11												
12												

NOTES:

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	21 April 2015	Time on Surface:	0:53
Time on station:	0:51	Latitude:	34 08.0968 S
Ship Station #:	Alg11210	Longitude:	27 56.3079 E
Grid #:	CTD-017	Sounding:	3614.78 m
CTD filename:	stn016a		
Operator:	G. Louw		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1	1005.5			92								
2	974.8	196,200,202	18,19,84	93								
3	701.3			94								
4	519.8			95								
5	301			96								
6	200.6			97								
7	101			98	1 (500 ml)							
8	82.2			99	2 (500 ml)					C10	C10	C10
9	73.3			100	3 (500 ml)					C10	C10	C10
10	61.3			101	4 (500 ml)					C10	C10	C10
11	10.6			102	5 (500 ml)							
12	5			103	6 (500 ml)					C10	C10	C10

NOTES:

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	21 April 2015	Time on Surface:	2:08
Time on station:	0:51	Latitude:	34 08.0968 S
Ship Station #:	Alg11210	Longitude:	27 56.3079 E
Grid #:	CTD-017	Sounding:	3614.78 m
CTD filename:	stn016b		
Operator:	G. Louw		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1	80.9					1 (2 liter)						
2	81.3						2 (2 liter)					
3	82.1							5 liter				
4	81.4								1 liter			
5	4					3 (2 liter)						
6	5.2						4 (2 liter)					
7	4.2							5 liter				
8	3.8								1 liter			
9												
10												
11												
12												

NOTES:

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	21 April 2015	Time on Surface:	3:26
Time on station:	3:23	Latitude:	34 17.2271 S
Ship Station #:	Alg11211	Longitude:	28 01.4294 E
Grid #:	CTD-018	Sounding:	3699.16
CTD filename:	stn017a		
Operator:	G. Louw		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1	1016.6	168	18	104								
2	851.1	193	19	105								
3	700.4			106								
4	449			107								
5	300.1	201	84	108								
6	200.8			109								
7	122.6			110	1 (500 ml)							
8	101.1			111	2 (500 ml)					C11	C11	C11
9	93.9			112	3 (500 ml)					C11	C11	C11
10	59.7			113	4 (500 ml)					C11	C11	C11
11	10.1			114	5 (500 ml)					C11	C11	C11
12	3.2			115	6 (500 ml)					C11	C11	C11

NOTES:

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	21 April 2015	Time on Surface:	4:35
Time on station:	3:23	Latitude:	34 17.2271 S
Ship Station #:	Alg11211	Longitude:	28 01.4294 E
Grid #:	CTD-018	Sounding:	3699.16
CTD filename:	stn017b		
Operator:	G. Louw		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1	93.3					1 (2 liter)						
2	93.4						2 (2 liter)					
3	92.1							5 liter				
4	93.1								1 liter			
5	5.7					3 (2 liter)						
6	5.5						4 (2 liter)					
7	5.5							5 liter				
8	5.3								1 liter			
9												
10												
11												
12												

NOTES:

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	21 April 2015	Time on Surface	5:33
Time on station:	5:31	Latitude:	34 23.8928 S
Ship Station #:	Alg11212	Longitude:	28 05.8452 E
Grid #:	CTD-019	Sounding:	3821.22
CTD filename:	stn018a		
Operator:	G. Louw		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1	1012.2			116								
2	955	157	18	117								
3	815.5	158	19	118								
4	643.6			119								
5	408.7			120								
6	312.1	159	84	121								
7	180			122	1 (500 ml)							
8	97.1			123	2 (500 ml)							
9	51.1			124	3 (500 ml)					?	?	?
10	29			125	4 (500 ml)							
11	10.7			126	5 (500 ml)					C12	C12	C12
12	4.6			127	6 (500 ml)					C12	C12	C12

NOTES:

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	21 April 2015	Time on Surface	6:41
Time on station:	5:31	Latitude:	34 23.8928 S
Ship Station #:	Alg11212	Longitude:	28 05.8452 E
Grid #:	CTD-019	Sounding:	3821.22
CTD filename:	stn018b		
Operator:	G. Louw		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1	83.4					1 (2 liter)						
2	82.4						2 (2 liter)					
3	82.1							5 liter				
4	83.1								1 liter			
5	3.3					3 (2 liter)						
6	3.1						4 (2 liter)					
7	3.3							5 liter				
8	3.0								1 liter			
9												
10												
11												
12												

NOTES:

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	21 April 2015	Time on Surface:	7:55
Time on station:	7:52	Latitude:	34 32.3468 S
Ship Station #:	Alg11213	Longitude:	28 09.6957 E
Grid #:	CTD-020	Sounding:	3990.29
CTD filename:	stn019a		
Operator:	G. Louw		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1	1035.1	156	18	128								
2	800.4	160	19	129								
3	602.6			130								
4	539.3			131								
5	439.1			132								
6	283.7	161	84	133								
7	201.2			134	1 (500 ml)							
8	121.8			135	2 (500 ml)					C13	C13	C13
9	60.9			136	3 (500 ml)					C13	C13	C13
10	29.8			137	4 (500 ml)					C13	C13	C13
11	10			138	5 (500 ml)							
12	4			139	6 (500 ml)					C13	C13	C13

NOTES:

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	21 April 2015	Time on Surface:	9:04
Time on station:	7:52	Latitude:	34 32.3468 S
Ship Station #:	Alg11213	Longitude:	28 09.6957 E
Grid #:	CTD-020	Sounding:	4004.65
CTD filename:	stn019b		
Operator:	G. Louw		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1	58.7					1 (2 liter)						
2	59.1						2 (2 liter)					
3	58.6							5 liter				
4	58.7								1 liter			
5	4.5					3 (2 liter)						
6	4.3						4 (2 liter)					
7	4.3							5 liter				
8	4.1								1 liter			
9												
10												
11												
12												

NOTES:

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	21 April 2015	Time on Surface	10:20
Time on station:	10:18	Latitude:	34 40.3580 S
Ship Station #:	Alg11214	Longitude:	28 15.5076 E
Grid #:	CTD-021	Sounding:	4146
CTD filename:	stn020a		
Operator:	M. Makhetha		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1	1089	151	18	140								
2	802.6			141								
3	515.2			142								
4	291.3			143								
5	190.6			144								
6	141.4	152	19	145								
7	95.4			146	1 (500 ml)					C14	C14	C14
8	68.6			147	2 (500 ml)					C14	C14	C14
9	55.5			148	3 (500 ml)					C14	C14	C14
10	43.3			149	4 (500 ml)							
11	30.5			150	5 (500 ml)					C14	C14	C14
12	4.8			151	6 (500 ml)					C14	C14	C14

NOTES:

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	21 April 2015	Time on Surface	11:45
Time on station:	10:18	Latitude:	34 40.3580 S
Ship Station #:	Alg11214	Longitude:	28 15.5076 E
Grid #:	CTD-021	Sounding:	4146
CTD filename:	stn020b		
Operator:	M. Makhetha		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1	72.5					1 (2 liter)						
2	72.3						2 (2 liter)					
3	72.5							5 liter				
4	72								1 liter			
5	5.5					3 (2 liter)						
6	5.5						4 (2 liter)					
7	5.5							5 liter				
8	5.5								1 liter			
9												
10												
11												
12												

NOTES:

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	21 April 2015	Time on Surface:	12:59
Time on station:	12:57	Latitude:	34 49.3236 S
Ship Station #:	Alg11215	Longitude:	28 20.8416 E
Grid #:	CTD-022	Sounding:	4265
CTD filename:	stn021a		
Operator:	M. Makhetha		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1	1110.7			152								
2	1037.2	141	18	153								
3	727			154								
4	244.1	142	19	155								
5	202.5			156								
6	186.4			157								
7	166.2	144	84	158	1 (500 ml)							
8	115.5			159	2 (500 ml)							
9	88.4			160	3 (500 ml)							
10	62.8			161	4 (500 ml)					C15	C15	C15
11	30.8			162	5 (500 ml)					C15	C15	C15
12	5.8			163	6 (500 ml)					C15	C15	C15

NOTES:

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	21 April 2015	Time on Surface:	14:22
Time on station:	12:57	Latitude:	34 49.3236 S
Ship Station #:	Alg11215	Longitude:	28 20.8416 E
Grid #:	CTD-022	Sounding:	4265
CTD filename:	stn021b		
Operator:	M. Makhetha		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1	82					1 (2 liter)						
2	82						2 (2 liter)					
3	82							5 liter				
4	82								1 liter			
5	5					3 (2 liter)						
6	5						4 (2 liter)					
7	5							5 liter				
8	5								1 liter			
9												
10												
11												
12												

NOTES:

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	21 April 2015	Time on Surface	15:27
Time on station:	15:25	Latitude:	34 57.4496 S
Ship Station #:	Alg11216	Longitude:	28 25.8503 E
Grid #:	CTD-023	Sounding:	4322
CTD filename:	stn022a		
Operator:	M. Makhetha		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1	1092.5			164								
2	1065.6			165								
3	964	130	18	166								
4	911.4			167								
5	424			168								
6	283.4			169								
7	178.1			170	1 (500 ml)							
8	138.6	131	19	171	2 (500 ml)							
9	97.5			172	3 (500 ml)							
10	69.4			173	4 (500 ml)					C16	C16	C16
11	28.9			174	5 (500 ml)					C16	C16	C16
12	5.3			175	6 (500 ml)					C16	C16	C16

NOTES:

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	21 April 2015	Time on Surface	16:40
Time on station:	15:25	Latitude:	34 57.4496 S
Ship Station #:	Alg11216	Longitude:	28 25.8503 E
Grid #:	CTD-023	Sounding:	4322
CTD filename:	stn022b		
Operator:	M. Makhetha		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1	62					1 (2 liter)						
2	62						2 (2 liter)					
3	62							5 liter				
4	62								1 liter			
5	5					3 (2 liter)						
6	5						4 (2 liter)					
7	5							5 liter				
8	5								1 liter			
9												
10												
11												
12												

NOTES:

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	22 April 2015	Time on Surface:	8:49
Time on station:	8:49	Latitude:	34 16.5040 S
Ship Station #:	Alg11217	Longitude:	26 30.4753 E
Grid #:	CTD-024	Sounding:	223 m
CTD filename:	stn023		
Operator:	M. Makhetha		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1	222	117			1 (500 ml)							
2	140	118			2 (500 ml)							
3	95	121			3 (500 ml)							
4	60	122			4 (500 ml)							
5	35	123										
6	5	124										
7												
8												
9												
10												
11												
12												

NOTES: Glider 2 Deployment - calibration sample CTD

CTD SAMPLE SHEET: ALGOA - ALG 215: Agulhas System Climate Array (CTD)

ALL TIMES IN GMT

Date:	22 April 2015	Time on Surface:	14:14
Time on station:	14:12	Latitude:	34 25.6066 S
Ship Station #:	Alg11218	Longitude:	25 54.7435 E
Grid #:	CTD-025	Sounding:	349 m
CTD filename:	stn024		
Operator:	M. Makhetha		

Niskin Bottle #:	Depth	Salinity	DO	Nutrients	Total Chla (vol.)	Pigs (Vol)	Abs (Vol)	Micro (Vol)	Phyto (DEA)	Size Frac Chl	Phyto (SAEON)	Nutrients (SAEON)
1	354.2	126										
2	202.4	138										
3	121	139										
4	70.3	147			1 (500 ml)							
5	46.4	153			2 (500 ml)							
6	25.3	155			3 (500 ml)							
7	14.8	137			4 (500 ml)							
8	5.6				5 (500 ml)							
9												
10												
11												
12												

NOTES: Glider 1 calibration sample CTD