Cruise Report

Agulhas System Climate Array (ASCA) 0416

RV Algoa 226/227

6 April – 1 May 2016

Report compiled by Jethan d'Hotman with input from cruise participants as noted

Chief scientists:

Lisa Beal (RSMAS; Leg 1), Gavin Louw (DEA; Leg 1, 2 & 3), Rosemery Dorrington (Rhodes University & SAEON; Leg 2) & Jethan d'Hotman (SAEON, Trainee chief scientist Leg 1, 2 & 3)

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Introduction

The Agulhas System Climate Array is an international oceanography project with partners from South Africa, The United Stated of America (USA) and the Netherlands. The ASCA project receives 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). The ASCA project has been designed to provide long term observations of the Agulhas Current volume, heat and salt transport, its variability from mesoscale features and seasonal and inter-annual time scales. This is achieved through a series of moorings (two shelf and seven full depth tall moorings) that measure pressure, temperature, salinity and current velocities. These moorings are interspersed with five Current- and Pressure recording Echo Sounders (CPIES). The ASCA shelf and tall moorings extend ~ 200 km offshore while the CPIES further extend the array to ~ 300 km offshore through the core of the Agulhas Current along the descending TOPEX/Jason satellite ground track # 96.

During the first deployment cruise in April 2015, the two shelf moorings and four tall moorings were deployed. One year later the second deployment cruise was planned to include the additional moorings and CPIES. Both cruises were planned to include high resolution Conductivity, Temperature and Depth (CTD) and Vertical Bongo surveys along the full ASCA transect, along with underway chemistry and Ship-Borne Acoustic Doppler Current Profiler (ADCP) surveys as well as the deployments of other autonomous instrumentation (SVP drifters, Argo floats).

Cruise Objectives (As per approved and signed Sailing orders)

Leg 1:

1. Continuous Plankton Recorder (CPR) tow from Cape Town to the start of the ASCA line
2. Retrieval of shelf moorings C2 and C3, and four tall moorings A – D along the ASCA Transect
3. Maintenance of instruments, calibration CTD casts and setup of new moorings C2, C3, tall moorings A – G and CPIES P1 – P5
4. Deployment of moorings C2, C3, tall moorings A – G and CPIES P1 – P5
5. S-ADCP transect along the ASCA transect

Leg 2:

1. Undertake 20 discrete sample stations with the following over-side instrumentation
    a. Oblique bongo tow (300 um and 500 um mesh net) to max depth of 200 m at 2 knots coming into the station
    b. CTD cast to max depth 1000 m for discrete samples:
        i. Dissolved Oxygen
        ii. Salinity
        iii. Discrete chl a at six depths around the F-max
        iv. Nutrients targeted at depths relating to water masses. Duplicate samples for N isotope analysis
        v. Size Fractionated chl a
        vi. Phytoplankton ID
    c. Vertical bongo tow (2x 200 um mesh nets) to max depth of 200 m
    d. CTD cast to max depth 1000 m for discrete samples:
        i. Microplankton at surface and below F-max (decided *ad hoc*) x 5 litre samples
        ii. Microbe sampling from first and second CTD casts (2 x 2 litre at surface and F-max, 2 x 5 litre at oxygen and salinity minima / bottom water)
    e. Oblique multi-net (200 um mesh nets) to max depth of 200 m, closed at disctete depths (*ad hoc*) for foram samples
2. Deployment of SVP drifters and four Argo floats along the ASCA transect
3. S-ADCP transect along ASCA transect
4. Eight benthic camera stations between ASCA transect and Algoa Bay

Leg 3:

1. Benthic camera stations on shelf outside PE harbour

5. Underway chemistry sampling, repeated along the same stations as the April 2015 cruise, for chlorophyll a, nutrients, dissolved oxygen and salinity.
6. Continuous underway sampling of pCO_2 system
7. Environmental educational training of learners and educators

Cruise Participants, with responsibilities and affiliations

Acronyms:

DEA	Department of Environmental Affairs (Oceans and Coasts)
SAEON	South African Environmental Observation Network
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
RSMAS	Rosenstiel School of Marine & Atmospheric Science

Table 1: Leg 1: Mooring Recovery, Service and Deployments

Name	Affiliation	Responsibility
Lisa Beal	RSMAS	Co-CS
Gavin Louw	DEA	Co-CS
Jethan d'Hotman	SAEON	Logistics, Moorings (Deck and Instruments), SVP Drifters deployments and CPR
Shane Elipot	RSMAS	MicroCat instruments
Adam Houk	RSMAS	Moorings (Instruments)
Mark Graham	RSMAS	Moorings (Deck)
Leon Wuis	NIOZ	Moorings (Deck)
Bradley Blows	BCRE	Moorings
Cobi Christianson	RSMAS	Moorings
Mfundo Lombi	DEA	Electronics technician
Kayleen McMonigal	RSMAS	Student
Mbulelo Makheta	DEA	CTD Operator
Ntombifikile Nxiba	SAEON	Student

Figure 1: Leg 1 mooring team. Names from left to right; Kayleen McMonigal, Shane Elipot , Adam Houk, Lisa Beal, Cobi Christiansen, Mark Graham, Gavin Louw (front), Leon Wuis (back), Bradley Blows, Mfundo Lombi, Jethan d'Hotman, Mbulelo Makheta

Table 2: Leg 2: CTD and plankton net survey

Name	Affiliation	Responsibility
Gavin Louw	DEA	Co-CS
Rosie Dorrington	Rhodes/SAEON	Co-CS
Jethan d'Hotman	SAEON	Logistics, CTD Team, Argo floats deployment
Kaya Siswana	DEA	Chemistry Lead
Shane Elipot	RSMAS	CTD PI
Samantha Waterworth	Rhodes	Microbe sampling
Charlie von der Maden	SAEON	Benthic camera sampling, CTD team
Mbulelo Makheta	DEA	CTD operator
Sifiso Mbambo	DEA	Discrete sampler, net operations
Heather Forrer	UCT	Chemistry
Kayleen McMonigal	RSMAS	Student
Sandra Sesati	DEA	Zooplankton net operator and sampler
Samantha Ockhuis	DEA	Discrete sampler, Nets assist
Mfundo Lombi	DEA	Electronics technician
Phaphama Sibiya	DEA	Zooplankton net operator and sampler
Ntombifikile Nxiba	SAEON	Student

Table 3: Leg 3 Cape Town bound

Name	Affiliation	Responsibility
Gavin Louw	DEA	Co-CS
Jethan d'Hotman	SAEON	Co-CS
Ntombifikile Nxiba	SAEON	Student
Kaya Siswane	DEA	Underway chemistry sampling
Mbulelo Makhetha	DEA	Underway chemistry sampling
Mfundo Lombi	DEA	Electronics technician
Phaphama Sibiya	DEA	Zooplankton net operator and sampler
Samantha Ockhuis	DEA	Discrete sampler
Sifiso Mabambo	DEA	Discrete sampler
Sandra Sesati	DEA	Zooplankton net operator and sampler

Cruise narrative

Leg 1 (Lisa Beal Co-CS):

6/4/2016 Left Cape Town at 10:00Z. Turned on ADCP 10:20Z (8 m bins, BB/BT, 1 s pings). 30-40 knots winds and heavy seas from Cape Point to Cape Agulhas. Ship speed down to 6-7 knts. Continuous plankton recorder (CPR) launched ~11:00Z.

7/04/2016 Transit around cape. Winds 25-35 knots on north side of high pressure, rough seas. 08:00 All science hands meeting to introduce goals of cruise and set watch schedule —Gavin and Ntombi, Shane and Kayleen to keep 24 hour underway log for TSG, navigation, and ADCP data streams. Too rough to work on MicroCAT calibration baths.

8/04/2016 Last day of transit. Winds and seas down. MicroCAT calibration baths achieved for all 52 UM MicroCATs at ambient and cold temperatures (~ 3C). LT 10:30 LT Beal met with officers to discuss ship handling for mooring recovery/deployment. 12:30 LT Beal met with bosun to discuss deck operations (+Bradley, Mark, Leon). CPR recovered 21:50Z

9/4/2016 On site B for recovery at 05:00Z. Stood 1/4 nm downstream for release. Bow thruster down for about 30 minutes during recovery. ADCP buoy on board 0620Z. Top buoy (no beacon) and two MicroCATs lost. Dyneema sheared off about 100 m below top buoy. Dyneema break is clean, perhaps at MicroCAT clamp, and occurred 7 days after deployment. Could deployment against current have compromised dyneema? 10:30Z deploy CPIES P1 at target. Afternoon, download data from mooring, test CTD (ctd001) and first MicroCAT calibration dip (stn001) with 10-minute stops. Maximum number of MicroCATs fitting on package is 16. Decide to build B for redeployment as planned, despite loss of MicroCAT tail, but change top float to hydrofloat to reduce strain. That means sacrifice MicroCAT tail on A. Wrong size links brought for Dutch releases - Bradley and Leon configured something using shackles from Aanderaa and benthic ski.

10/4/2016 5-15 knt winds, 2 m swell. Set up ship into wind at target,1.5 knts thru water. Resulting SOG 3 knts, COG 343°T. Allow 1.75 hours for deployment, results in setup 5 nm at 63°T from target. Finish preparations for redeployment of mooring B -

MicroCAT refurb and configuration and attachment of beacons. Proceeded with operations 0730Z, top float over 0740Z, anchor drop 0920Z. Mooring B triangulated position 33°39.37' S, 27°39.456' E, 480 m off target. Mooring A recovered 1223Z. One NIOZ release flooded. Reconfigured shipboard ADCP to long range mode 12:50Z (16 m bins, NB, 2s pings). Redeployed A, but with no MicroCAT tail. NIOZ Release pair replaced by DEA pair from coastal mooring. Anchor drop 33°33.626' S, 27°36.026' E, 325 m depth (no triangulation). Drove inshore to C3 before turning around and heading all the way down the ASCA line to P5 for a continuous ADCP transect (from ~1500Z to 0600Z on 11th, average speed 10 knts—should have asked officers to slow down to 8 knots). Drifters deployed at C3, A, B, D-E, and P4 during the underway transect.

11/4/2016 Deployed CPIES P5 0717Z. Lost contact during transponding on the way down, at about 2700 m. Failed? Tried deepening transducer by taking deck box out to deck, tried back-up deck box and transducer, tried listening for sampling. Nothing. MicroCAT calibration dip stn002 1150-1400Z. In order to calculate jet transport need P5 25% of time, so decided to deploy a back-up CPIES at P5, named P5b. P5b deployed at 35°39.47' S, 28°51.28' E in 4560 m water at 1646Z. Traced to 4466 m at 1752Z (72 m/min descent rate) on transpond, but needed lowest threshold setting of 10. Lost contact from there. Assume landed and functional, but acoustics on ship too noisy. NOTE: Will not be able to pick up CPIES on Algoa due to unreliable acoustics. Need a quieter ship and/or ship's-hull transducer.

12/4/2016 Cold front, 15-25 knots SW wind, swell 3-5 m. Deployed CPIES P4 0617Z. Traced to bottom 4410 m at 0720Z. Clear command received! Cal dip 0850Z-1030Z at P4 (stn003). Deployed CPIES P3 1340Z. Preparations of ADCP, Nortek's, and MicroCATs for mooring G deployment.

13/4/2016 Wind 15 knts from NE. Set up for deployment of mooring G 6 nm from target at bearing 220°. Allowed 700m for fall back. Mooring deployment begun 0700Z, releases deployed 0918Z, anchor drop 1022Z, 34°48.96'S, 28°21.08'E. Radio last gasp 1045Z. No trace to bottom or triangulation possible due to poor acoustics. Preparation of instrumentation for mooring F.

14/4/2016 Sunny calm day, wind <10 knts from 20°. Set up for mooring F 4 nm from target at bearing 165°. About 0.3 knts current to SW. Allowed 600 m for fall back. Top float deployed 0609Z, anchor readied 0753Z. Anchor drop at time 0858Z and position 34°31.935'S, 28°10.0938'E. Did not hear radio beacon. Last sighting of top float at surface 0915Z. Usually one release is enabled upon deployment in order to range after anchor drop as the mooring sinks to the bottom. On this occasion we decided to disable both due to the poor acoustics experienced on RV Algoa. Enabled mode drains the battery and could jeopardise recovery if we are unable to communicate with the release to disable it. No triangulation due to poor acoustics. Preparation of instrumentation for mooring E. One new XEOS radio beacon (SAEON) found faulty.

15/4/2016 Calm day, wind <10knts from 40°. Set up for deployment of mooring E 2 nm from target at bearing 210° in about 1 knt of WSW current. Deployment begun at 0606Z, anchor ready at 0800Z, anchor drop at time 0901Z and position 34°17.1'S, 28°02.102' E. Last sighting of buoy at surface 0914Z. Radio beacon not heard, no acoustic communications. Could not triangulate mooring. Mooring D released at 1142Z, sighting on surface 1154Z, all instruments recovered successfully and

releases aboard 1336Z. Aanderaa at 1500 m fell on deck during recovery due to broken frame. MicroCAT calibration dip.

16/4/2016 MicroCAT calibration bath cancelled. Turnaround of instrumentation from D for redeployment. Download time for Aanderaas very variable - up to 2 hours per year long record. Download of Dutch MicroCATs about one hour for year-long record. Need to bring more cables and laptops to download in parallel and save turnaround time.

17/4/2016 Mooring C recovery was difficult, with over 3 knots of current and poor acoustics. Both IXSEA and EDGETECH deck boxes could communicate with the IXSEA releases, although replies were received only about one tenth of the time. Release command given 0505Z while ship standing downstream about 300 m and drifting back with current. Release command repeated and two further ranges obtained over about thirty minutes of drifting, to 1.5 nm SW of triangulated position. No confirmation of release and no sighting. First Argos email gave initial surfacing at 0533Z, consistent with 50 m/min ascent rate. Turned ship to head slowly back upstream, looking for mooring, assuming a slower drift rate than the ship. No sighting. Drifted back downstream with transducer over the side again and obtained two more slant ranges, with the closest horizontal distance of 2 km - but which direction? Finally received Argos email with a position fix at 0710Z and estimated that the mooring was drifting at about 2.5 knots along a drift track offset to the shore of us (why?). Mooring was sighted at 0745Z and picked up at 0819Z. Releases aboard 0907Z.
In preparations for redeployment of C had to fabricate some brackets to mount beacons on a glass float, because small elliptical float on Dutch mooring has no frame, despite what is shown on the mooring diagram. Data from the Aanderaas was finally extracted and plotted to find that 4/9 stopped short of the deployment period, but not understood why?

18/4/2016 Deployment of mooring C commenced at 0636Z in about 3.5 knots of south-westward current. With the ship heading into the wind at 40° we backed onto the target while deploying the mooring at 1.5 knts through the water. The anchor was dropped at 0812Z. Triangulated position for mooring C is 33° 44.167’ S 27° 43.02’ E, almost 1000 m downstream of the anchor drop position and about 500 m off target. All Aanderaas on mooring C were deployed with a 30 minute sampling interval, instead of 20 minutes, to see if this improves the length of their records. The one spare Aanderaa was swapped in for the instrument that had a short record. In the afternoon test CTD casts were conducted to try to fix a problem with communications between the deck unit and the rosette.

19/4/2016 We recovered mooring C3 without a hitch. Current was 4 knots southwestward. The release command was given at 0617Z while drifting past the target about 200 m to the west. The mooring was sighted at 0624Z after steaming across to the drift trajectory, directly downstream of target. Recovery completed at 0644Z. A replacement 300 kHz ADCP, MicroCAT, and releases were brought from East Pier ready for redeployment of C3. We set up 1.5 nm from target at bearing 52°, backing onto target at about 3 knts due to the strong current. Anchor drop at 0834Z, 33°30.696’S, 27°34.070’E. Transit to Port Elizabeth

20-22/04/2016 Docked in Port Elizabeth Harbour for equipment and scientific personnel changeover

Leg 2 & 3 (Gavin Louw Co-CS):

23/04/2016	The arrival of Leg 2 scientific crew. After settling in the new arrivals started setting up the biological nets for deployment tomorrow. Sailing was then delayed as a result of bad weather.
24/04/2016	The Algoa sailed out of Port Elizabeth harbour, making its way to the ASCA line on a 10 -12 hour journey. Once we were at the ASCA line we looked for 500 m water depth to test the CTD operation and error messages (report of the testing was compiled by the electronic engineer). Three CTD test dips were done.
25/04/2016	At 06:00 we returned to CTD1 to commence with the S-ADCP transect to CTD 20.At 07:30 the S-ADCP transect was aborted by the captain's order as weather became too rough to continue. Later a decision was made to not conduct any CTD stations today and return to Algoa Bay and throw anchor to wait out the weather. While the weather was better inshore two inshore benthic camera stations were carried out.
26/04/2016	Arrived in Algoa bay and threw anchor. The S-ADCP was switched off at 14:28. The captain's weather forecast predicted bad weather until Sunday (today being Tuesday)
27/04/2016	Still at anchor in Algoa Bay. The captain's weather report states that weather bad till Saturday and slowly getting better over Sunday. The chief scientists (Professor Rosemary Dorrington and Gavin Louw), together with the captain made a decision to cancel Leg 2. This decision was conveyed and supported by managers and PI's
28/04/2016	Docked in Port Elizabeth harbour to offload passengers and gear. 6 Passengers disembarked. TSG concerns from Professor Dorrington were conveyed to the chemistry lead onboard (Khaya). Khaya and Mfundo met to assess the technical problems with the TSG and ultimately made a call to not proceed with underway sampling on the way back to Cape Town. Similarly, the same decision was made by Sandra Setati not to redeploy the CPR system.
29/04/2016	Extreme weather conditions, due to the high swell and strong wind, maximum speed achieved was 4 knots.
30/04/2016	Sailing ~10 knots back to Cape Town. Weather improved drastically.
01/05/2016	The Algoa docked in Cape Town harbour around 08:30. Data downloaded and stored on flash drives. Systems switched off.

Moorings

The designs for Agulhas System Climate Array (ASCA) moorings were based on the Agulhas Climate Time-series (ACT) array of moorings deployed along the same line as ASCA from 2010 to 2013. Figure 1 below shows a cross section of the ASCA mooring array (note: Mooring A was deployed without a MicroCAT tail and the CPIES at P2 was deployed at position P5 and is referred to as P5_B). The ASCA array improves on the original ACT mooring array due to the inclusion of MicroCAT CTD sensors attached throughout the mooring array. The logs and notes and designs of the mooring recovery and deployments are available in Annexure 1.

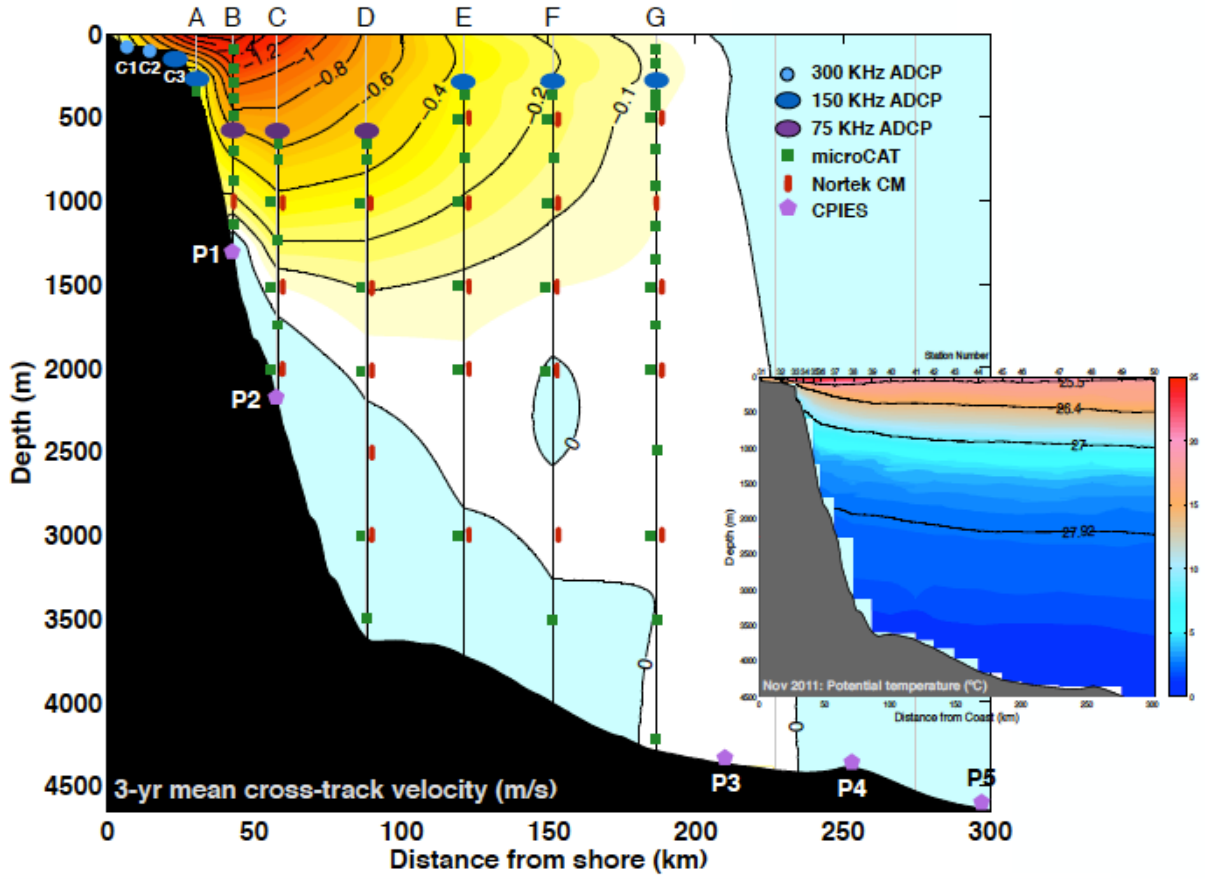


Figure 2: Cross section of ASCA mooring array

Instrumentation and Data (Lisa Beal, Adam Houk, Kayleen McMonigal)

Loss and Condition upon Recovery: Mooring A was recovered successfully with a full ADCP record. Mooring B lost its top float and two MicroCATs at 100 and 200 m via a break in the dyneema after only one week in the water. The rest of the dyneema (microcat tail) was tangled below the ADCP float at 567 m and the MicroCAT at nominally 500 m was flooded. Mooring C was recovered intact, with a bracket loose on the Aanderaa at 1500 m. On mooring D, the ADCP had corrosion around one transducer head. The MicroCAT at 650 m lost its guard around the sensors, and the Aanderaa at 2000 m had the frame bracket missing and fell out of the frame on deck.

MicroCAT Records: All 9 MicroCATs recovered recorded data for the full sampling time period (10 April 2015 – 9 April 2016 for mooring B, 10 April 2015 – 15 April 2016 for mooring D), as shown in Figure 1. All records from mooring B show a jump on 19 April 2015, when the dyneema broke and wrapped around the cable below the ADC float. The MicroCAT deployed at 300 m (sn 13185) fell 300 db, the MicroCAT deployed at 400 m (sn 13182) fell 200 db, and the MicroCAT deployed at 700m (sn 2655) rose about 50 db. These three instruments have overlapping records for the remaining sampling period. The MicroCAT deployed at 900m (sn 4353) rose 25 db and the MicroCAT deployed at 1200m (sn 4350) rose about 5 db at the same time. The 1500m MicroCAT from mooring D (sn 3623) shows unphysical values in salinity on 15 January 2016. There are no other data dropouts in the time series. Pressure data has noise on the order of 10 db, salinity data has noise on the order of .01 PSU, temperature data has noise on the order of 0.1°C.

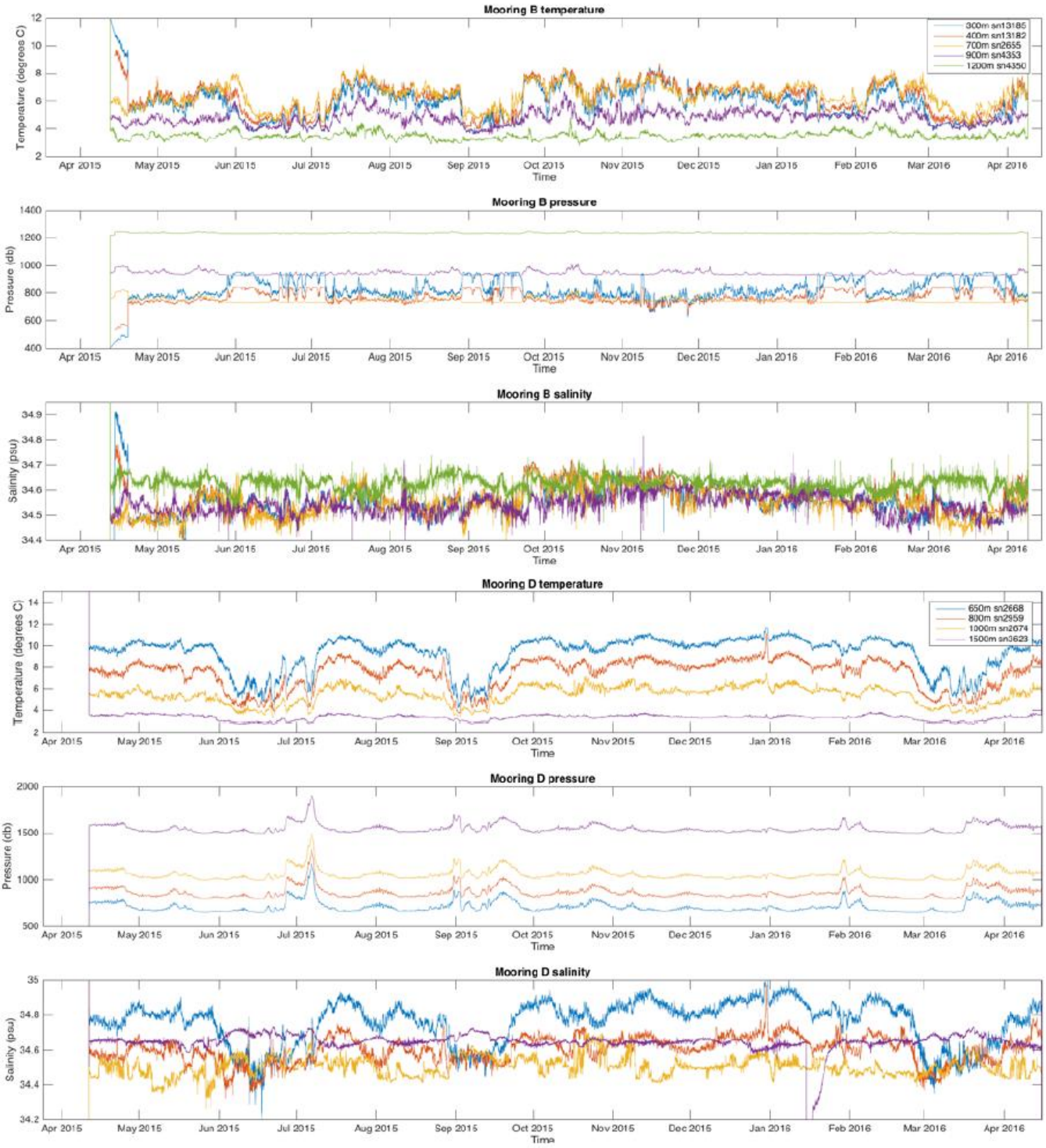


Figure 3: Microcat records of temperature, pressure and salinity from moorings B and D

Aanderaas and ADCP Records: Four of the nine Aanderaas did not record data over the full deployment period (Figures 2 and 3). Some instruments appeared to have temperature sensors, but temperature records were not found (there are no pressure sensors). All four ADCPs have good records with minimal blow-down.

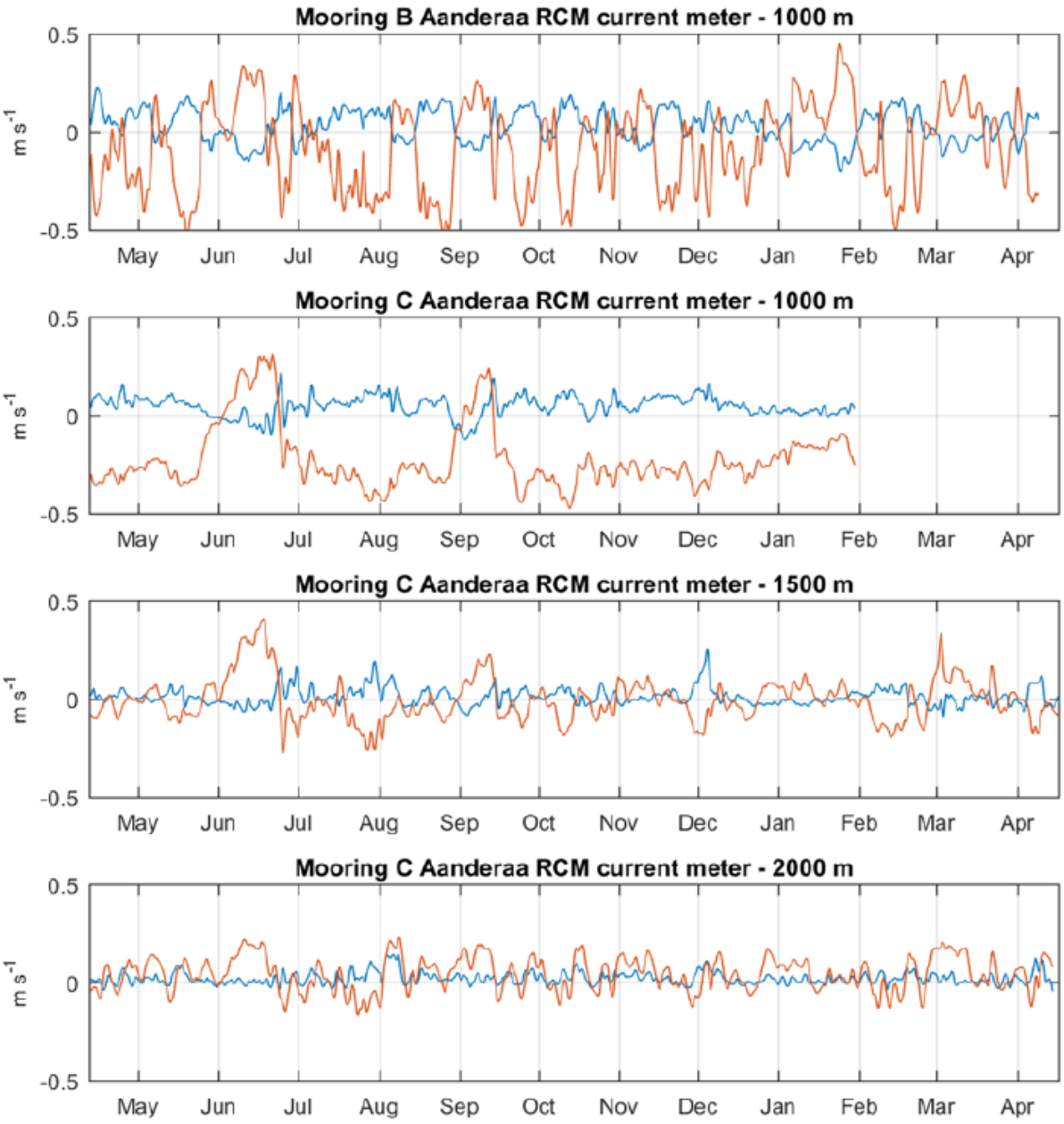


Figure 4: Aanderaa current meter records from moorings B and C. Velocities are rotated by 64 to cross-track and along track and smoothed with 40-hour low pass filter.

Figure 5: Aanderaa current meter records from mooring D. These records stopped short of deployment. Velocities are rotated by 64 to cross-track and along track and smoothed with 40-hour low pass filter.

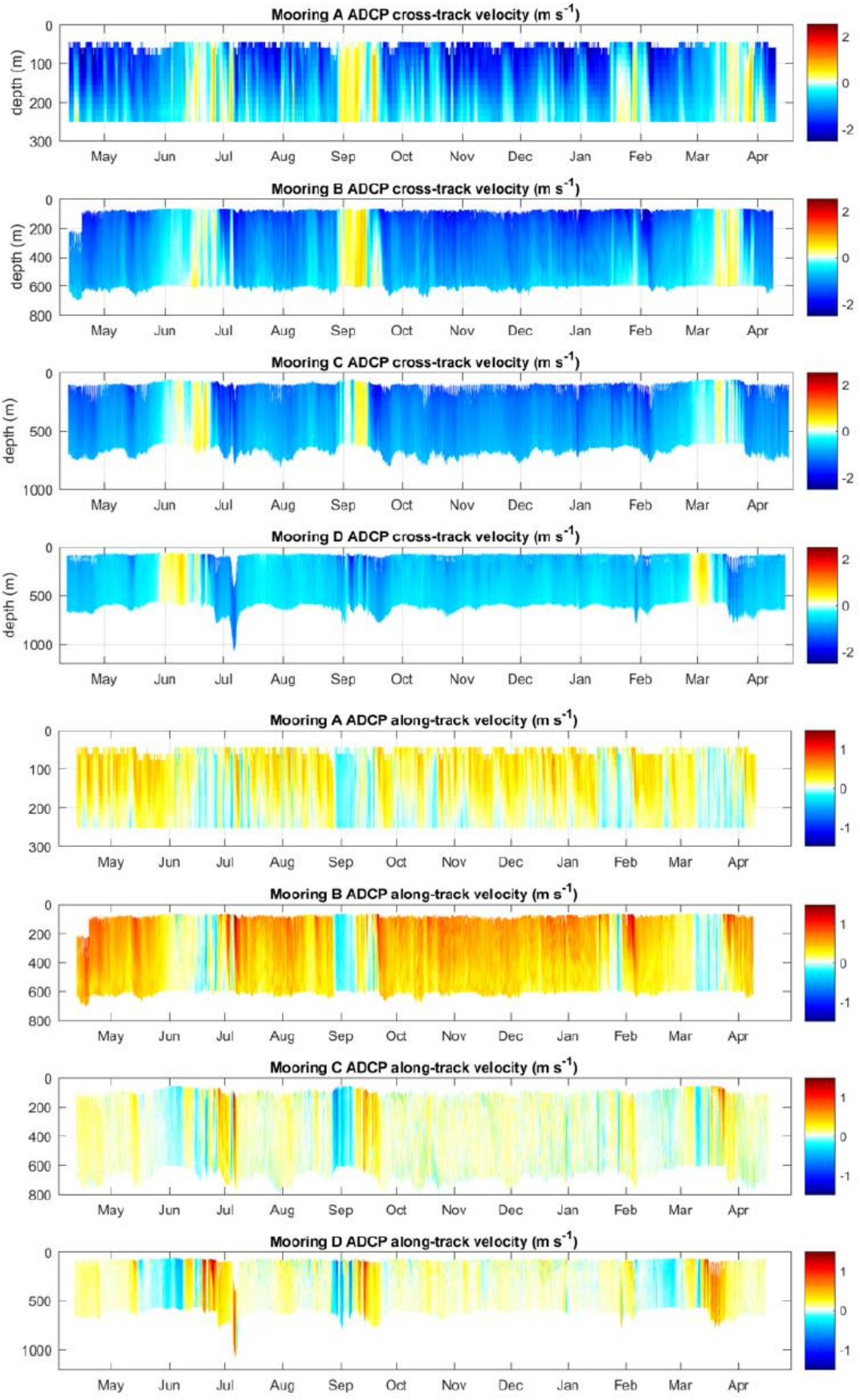


Figure 6: ADCP records from moorings A, B, C and D. Velocities are rotated by 64 to cross-track components. Evidence of ~ 100 m blow-down on B until MicroCat tail was lost.

Deployment Configurations: All moorings were deployed as planned, except the MicroCAT tail on mooring A was omitted, owing to the losses from mooring B, and the CPIES P2 at C was deployed 10 km inshore of P5 as P5b. Mooring recovery and deployment diagrams / log sheets can be found in the Appendix to this report. Norteks were configured to ping for 2 minutes every 20 minutes, with a blanking distance of 0.35 m. ADCPs were configured with 16 m bins and ensembles of 40 pings over an hour. Aanderaas were configured to sample every 20 minutes on "channel 4", except all those deployed on mooring C which were set to sample every 30 minutes. The clock for an Aanderaa deployed on mooring B was not checked and reset. MicroCATs were configured to record every 20 minutes.

Recommended Recovery Procedure

1. **Site**: Go to triangulated site (e.g. A recover) and assess wind and current speed. If mooring is not "surveyed in" (e.g. due to poor acoustics during deployment cruise) must enable release and triangulate first. Estimate where/when mooring will surface based on depth of top float and current. Tune direction-finding radio (ADDF) in lab and VHF radio on bridge to radio beacon frequency. Log-in to ARGOS webpage, or turn on ARGOS receiver—should get first message within 15-20 minutes of buoy surfacing.

2. **Release**: Once communication with mooring releases is established, have ship reposition 1/4 nm downstream or downwind (or split the difference) of triangulated site. Go up to the bridge with observers and ask officer which direction to look. Note time of confirmation of release and have ship drop back with current/wind as mooring rises. Note time of first radio blast, and time of first sighting.

3. **Recovery**: Wait for whole mooring to surface before approaching. Have ship steam to top float and tip bow to port for pick-up on starboard side. As buoys and instruments come aboard note the time and any losses or poor condition on the mooring diagram / log sheet (see appendix). Clean instruments and download the data.

Recommended Deployment Procedure

1. **Target**: Target latitude and longitude are the original, surveyed sites for the ACT moorings. These are different from the triangulated positions of moorings in the water (which will have landed some distance from the target, due to the inexact science of operations at sea.) Hence, the bridge should be given two sets of positions, for instance, A_recover and A_deploy.

2. **Ship set-up**: At target site, ask bridge to steam **into the wind** at 1.5 knots **through the water** for 10-15 minutes. Look at SOG and COG over this time, e.g. 1.7 knots at 140°. Use this estimate plus the time needed for deployment, to estimate the distance and bearing of the starting point from the target. Add (or subtract if ship is backing onto target) a fall-back distance of about 1/6th the length of the mooring. Current drift may also be a consideration. 1.5 knots relative to the water provides enough forward motion to stream out the mooring without tangling and without excess tension on the wire for ease and safety of operations. The ship needs to steam into the wind during deployment in order to stream the mooring directly behind, otherwise windage on the ship will cause the wire to pull at an angle. If swell

is large and at an angle to the wind, it may be better to split the difference for heading – ask the officer on watch. The current is taken into account in the ship's speed and course over ground.

3. **Deployment**: Tune the ADF radio for the frequency of the radio beacon on the top float. During mooring deployment use mooring diagram to log instruments, noting serial numbers, and to check in with technicians on upcoming floats and instrumentation. Note the time each instrument was deployed and any changes or incidents. Check in with the bridge periodically to get the COG and remaining distance to target. It is possible to make small adjustments to speed through the water and/or speed of winch to adjust course or time to target. When the anchor is dropped, note the time, position, and depth.

4. **Descent**: Send someone to the bridge to watch for top float going down. Stop the engines (careful of ship drift towards moorings), put transducer over the side and transpond with releases as they drop. Note the time of the radio "last gasp", as top float leaves the surface. Once on bottom, disable both releases.

5. **Triangulation**: Steam to three points, each about half water depth distance from the anchor drop site and range on the moorings to find their exact position at bottom. (Use Matthew's Tables for bulk sound speed adjustment to depth of releases.) Note latitude and longitude of actual mooring position.

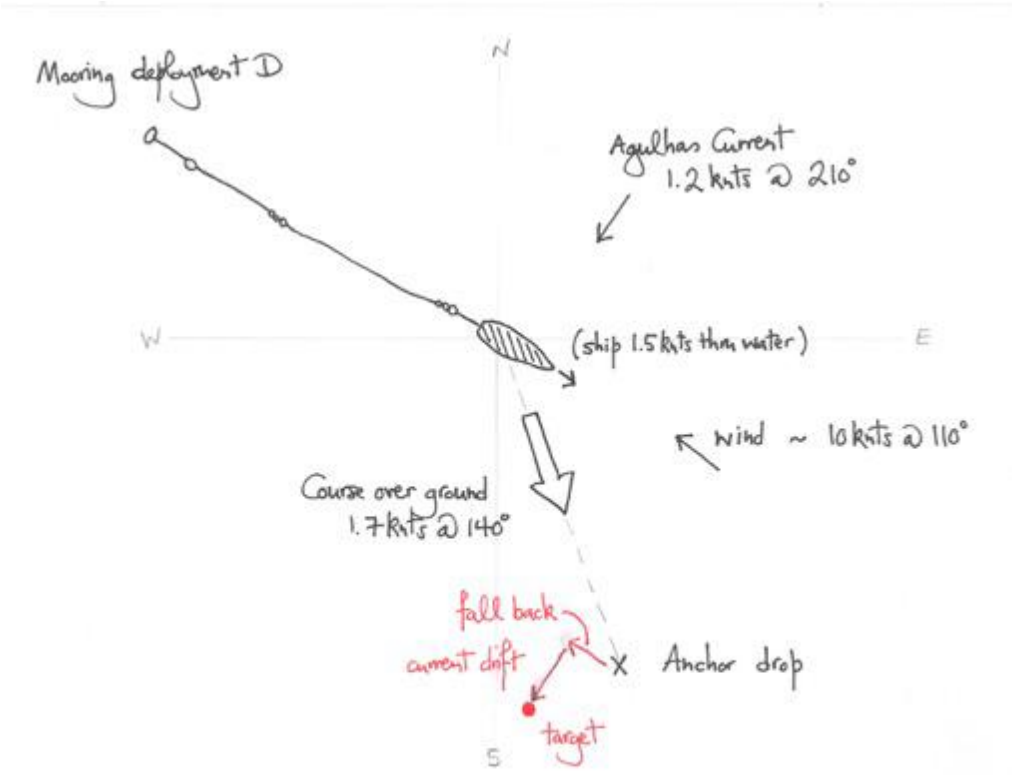


Figure 7: Example of forcing vectors, including current, and resulting ship course over ground during a mooring deployment. Optimal conditions for mooting deployment are always 1.5 knots through the water while heading into the wind.

CPIES (Lisa Beal & Adam Houk)

Five CPIES were deployed along the ASCA line (Table 4). All CPIES were configured with a travel time measure rate of 4 pings every ten minutes, plus pressure, temperature, and velocity measured every 20 minutes. Site P2 (at mooring C) was sacrificed to deploy a back up CPIES at P5, because we lost contact with the first CPIES deployed there at about 2700 m depth and thought it may have been lost. P1 was deployed 2 nm upstream of target in order to account for drift in 4 knts of current during descent. P5b was deployed 5 nm inshore of P5 along the ASCA line to avoid acoustic cross-talk in event P5 is active. All other CPIES were deployed at target in currents less than 0.5 knts. After deployment, we ranged on the CPIES as they sank. Descent rate was about 72 m/min (as expected), or about an hour in waters of 4000 m depth. We were not able to trace any of the CPIES all the way to the bottom, except P4. For a high-quality GEM, one should collect a full depth CTD cast at each CPIES deployment site while collecting telemetered data from the CPIES. This was not achieved during ASCA because of the limited CTD wire length (1000 m) and the poor acoustics. Full-depth CTDs must be collected at the CPIES sites another time.

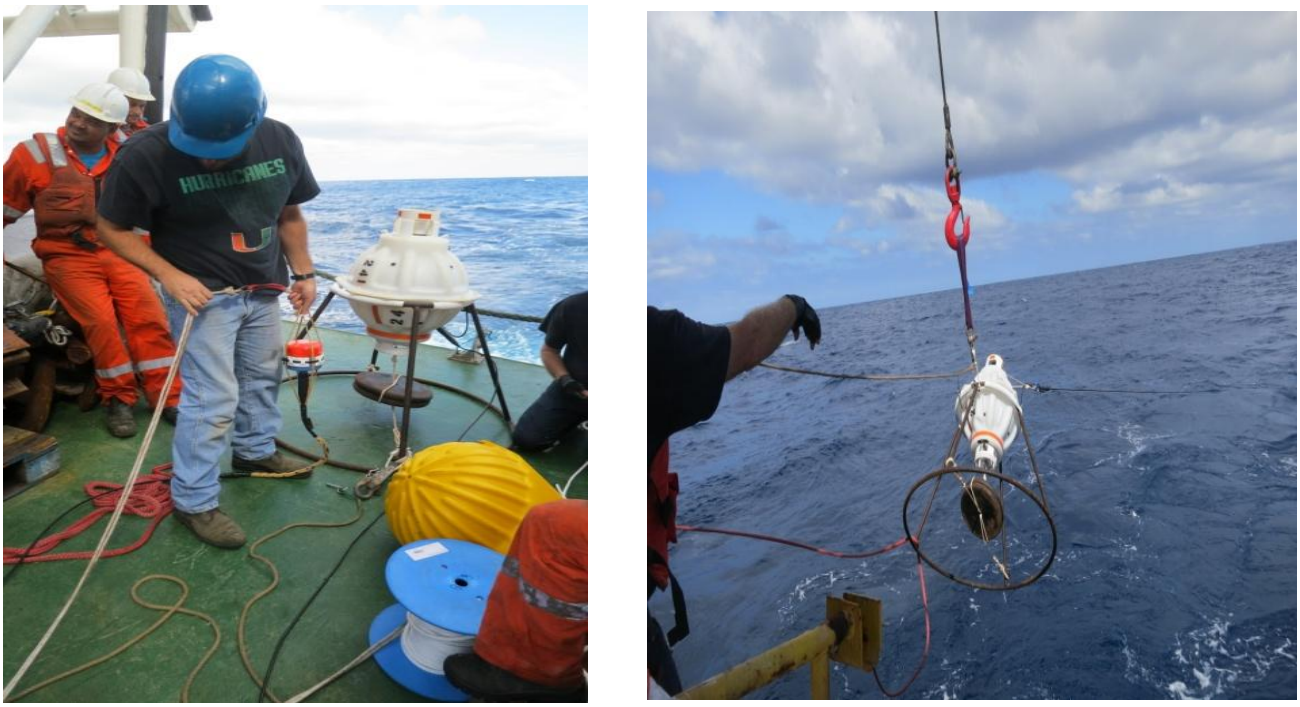


Figure 8: Deployment of CPIES (Photo taken by Shane Elipot)

Station data:

Table 4: Mooring and CPIES deployment positions

Mooring (deployment position)	Latitude	Longitude
C3	33°30.696’ S	27°34.070’ E
A	33°33.626’ S	27°36.026’ E
P1	33°39.06’ S	27°39.80’ E
B	33°39.37’ S	27°39.456’ E
C	33°46.802’ S	27°43.5022’ E
D	34°01.7138’ S	27°51.3185’ E

E	34°17.0996’ S	28°02.1021’ E
F	34°31.9356’ S	28°10.0938’ E
G	34°48.96’S	28°21.08’E
P3	34°49.28’ S	28°20.72’ E
P4	35°14.338’ S	28°37.4384’ E
P5_A	35°44.100’ S	28°54.033’ E
P5_B	35°39.47’ S	28°51.28’ E

Ship-board ADCP (Lisa Beal & Adam Houk)

The ship-board ADCP set-up aboard RV Algoa is an RD Instruments 75 kHz ADCP with gyrocompass feed and no heading correction. An underway log was created and data collection checked every hour by watch-standers (also TSG and navigation streams). There were several incidences when data streams were interrupted by power surges or outages. Two configurations were used: (1) Interleaved broadband / bottom-track pings over the shelf, with 50*8 m bins and 1 s ensembles; (2) Narrowband pings in deep water, with 70*16 m bins and 2 s ensembles. ADCP was switched from shelf to deep water mode at 1250Z 10/4/2016. A continuous underway transect was occupied across the Agulhas Current between about ~1500Z 10/4/2016 and 0600Z 11/4/2016 at an average speed over ground of 10 knots, recorded in file ASCA0416004*.lta(sta). Based on preliminary processing, gyrocompass errors are ±0.7°, which translates to a velocity error of ±7 cm/s at a ship speed of 10 knots. These large errors preclude a transport estimate, but, for the underway transect at least, gyrocompass error and bias should be steady and therefore the velocity shears tolerably good. A first-pass of the processing for the continuous offshore section is shown below.

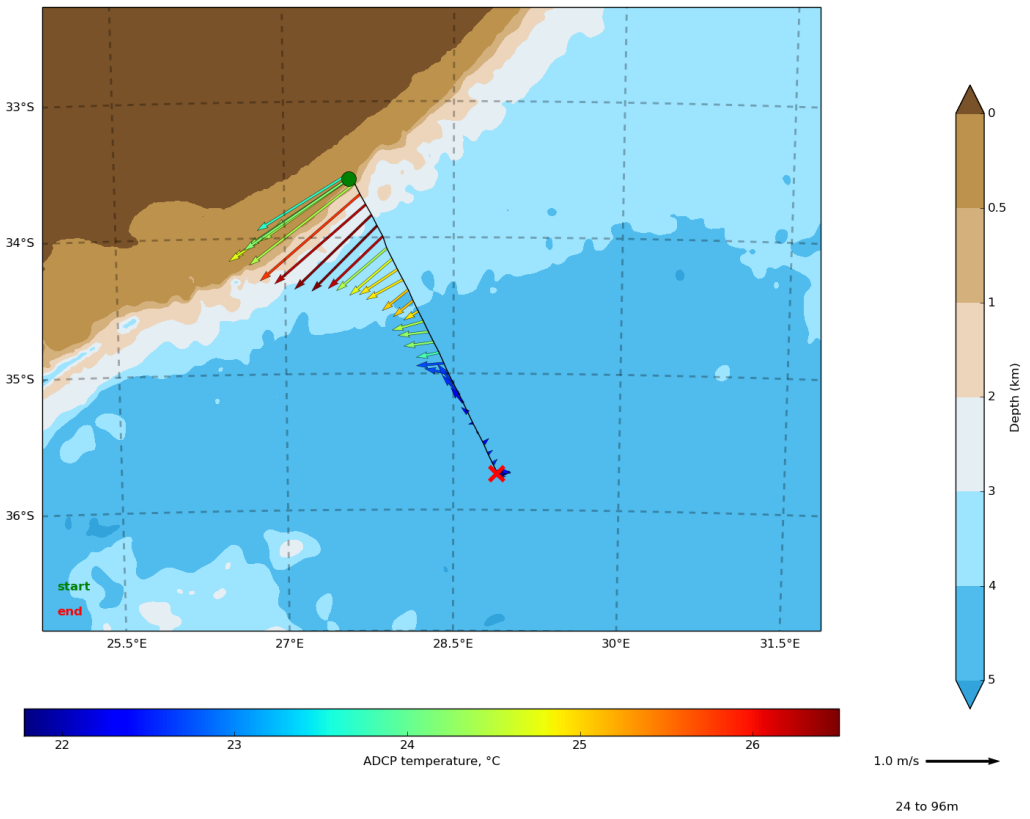


Figure 9: Ship-Board ADCP velocity vectors averaged from 24 to 96 m depth from a continuous underway transect along the ASCA line, between C3 and P5. This data was collected from VMDAS long-term-averages (LTA), processed using university of Hawaii CODAS software

CTD and MicroCAT Calibration (Shane Elipot)

The main purpose of the CTD operations for the first leg of the ASCA 2016 cruise was the calibration of the Seabird SBE37 MicroCAT instruments. A total of five standard calibration casts (stn001 - stn005) and two calibration baths were conducted during the first leg. For a detailed list of the CTD stations and MicroCAT calibrations see the full CTD Report, separate from this Cruise Report.

Calibration Baths

The CTD was removed from the rosette and placed in a large plastic tub filled with sea water and frozen water in bottles and bags (Figure 7), for the purpose of obtaining calibration data for a colder range of temperatures than can be reached by CTD casts to only 1000 m depth. The sampling rate of the MicroCATs was set to 10 seconds. The recovered MicroCATs from moorings B and D were not cold-bath calibrated. In the cold water bath the water was stirred continuously in an attempt to homogenise temperature. Despite this, we found that the differences in temperature and conductivity between the CTD and MicroCATs, and between the MicroCATs themselves, were at

least an order of magnitude larger than the expected accuracy of the instruments (0.2–0.4°C compared to 0.002°C for temperature, 0.02 S/m compared to 0.0003 S/ m for conductivity). These large differences were not apparent during the calibration casts on the rosette, when in general all MicroCAT records agreed closely. We conclude that the baths were never homogeneous enough and therefore of little use for calibrations.

Calibration Casts

We followed the procedure of Kanzow et al. (2006). Sixteen to eighteen MicroCATs were strapped to the CTD frame and a CTD cast completed with 7 or 8-minute pressure-plateaus during the up-cast. Comparisons were made between the CTD and the MicroCATs during theses pressure plateaus, typically chosen to match the pressure levels at which the MicroCATs are to be deployed. In our case, the CTD sensors had not been calibrated since 2010 and we found a significant bias in the CTD. While the MicroCAT conductivity records agreed among themselves (bar one) to within manufacturer specification (0.0003 S/m) they all departed from the CTD by 0.001 S/m, an order of magnitude larger than instrument accuracy (Figure 8). Hence, the CTD must be immediately re-calibrated following the cruise in order to be able to derive correction coefficients for the MicroCATs from these calibration casts. Despite the CTD issue, the calibration casts can be used for a qualitative comparison between MicroCATs themselves. Visual inspection indicated that MicroCATs s/n 13728 (UM), 13755 (UM), and 13791 (UM) suffer from significant pressure offsets (on the order of 3-5 db), and s/n 13182 (SAEON), 13752 (UM), and 12196 (UM) suffer from conductivity offset (on the order of 0.001-0.025 S/m). Without available spares on board, these MicroCATs were still deployed, but placed on the moorings in a way to mitigate their potential impact on the scientific measurements.

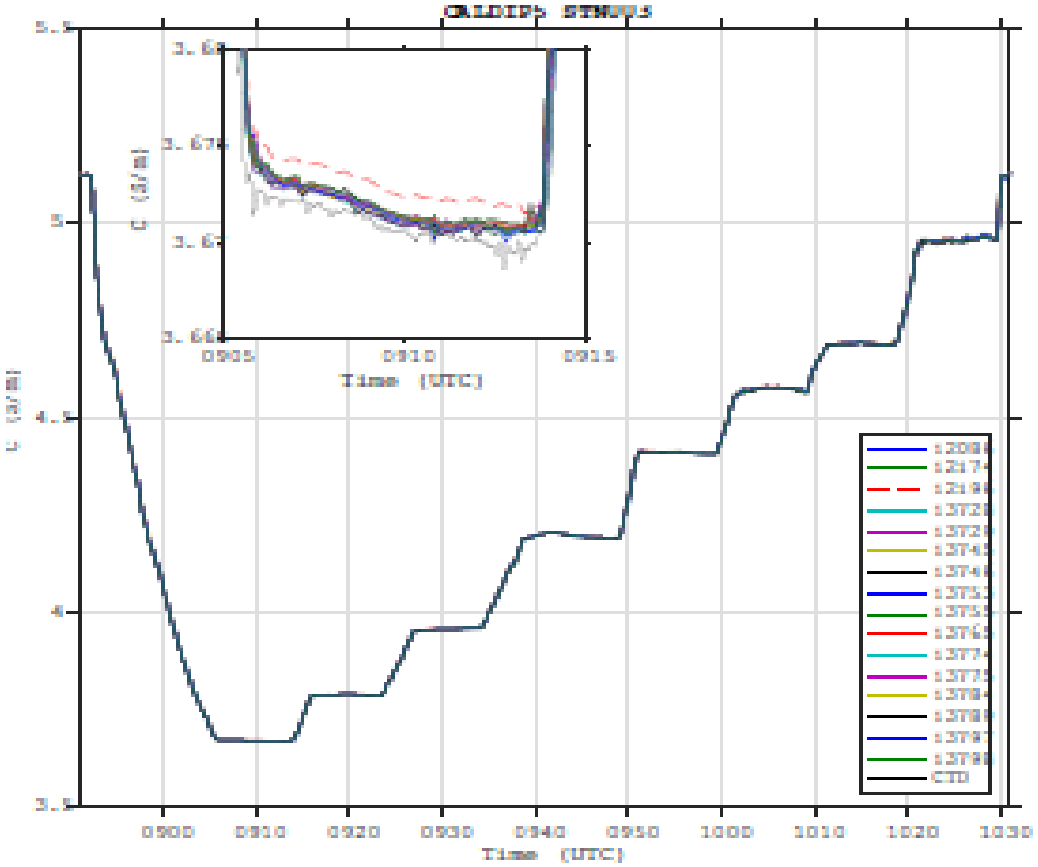


Figure 10: Conductivity as a function of time for calibration cast #5 on station 003. The insert shows how the MicroCats agree with each other (except for stn 12196) but not with the shipboard CTD.

SVP Drifters

Five SVP drifters were donated by the South African Weather Service (SAWS) and were deployed as part of the global drifter program. These SVP drifters were originally obtained from the National Oceanic and Atmospheric Administration (NOAA) in the United States and were upgraded with barometer sensors in addition to sea surface temperature sensors already installed. The SVP drifters deployed around the world contribute data that helps our understanding of surface currents strength and direction as well as contribute data for global climate prediction models. The deployment details can be seen in table 5 and the trajectories in figure 9.

Table 5: SVP deployment details

Buoy ID	Date	Time GMT	Latitude	Longitude
132725	10/04/2016	15:34	33.51 S	27.581 E
132719	10/04/2016	15:51	33.5599 S	27.5977 E
139596	10/04/2016	16:31	33.6655 S	27.6592 E
132724	10/04/2016	19:45	34.1760 S	27.9638 E
139594	11/04/2016	02:41	35.2060 S	28.5830 E

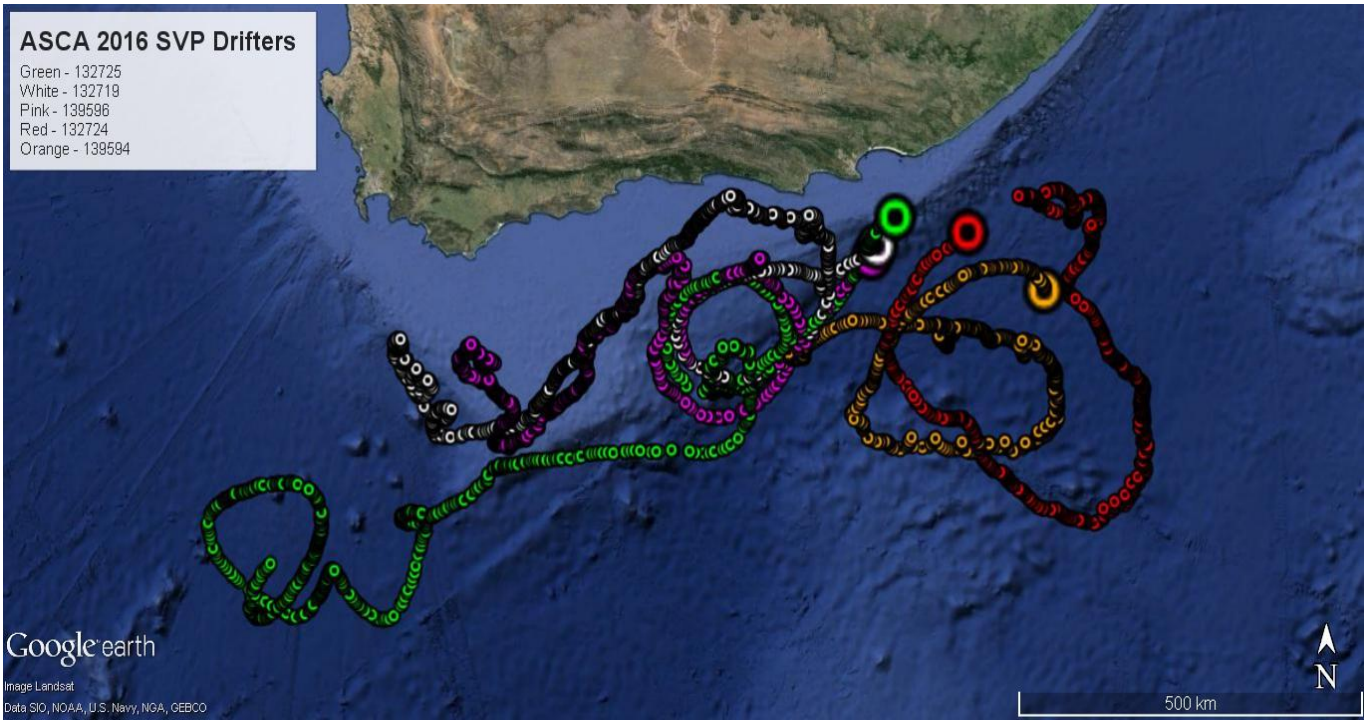


Figure 11: SVP Drifter trajectories (the larger points are the first received locations)

Figure 12: Deploying surface drifters

Critical Issues Encountered during Leg 1 (Lisa Beal):

1. CTD sensors used on ASCA0416 were calibrated in 2010 and there were no back-up sensors. For scientific data quality standards sensor calibrations should be conducted annually and dual-sensors installed. This represents a serious data quality issue for temperature, pressure, and salinity, and for all MicroCAT records (>60) collected as part of ASCA.

2. CTD operations lack organisation and scientific standard. The number of salinity bottles available limited our sampling to 3 per cast. Typical calibrations require 6 samples per 1000 m cast, 12 samples per full-depth cast. Rinsing and bathing of sensors was not done every cast. There were no plastic caps for salinity bottles, these help prevent formation of salt crystals, and salinity bottles were not filled correctly. Station numbering was confusing (test casts called ctd00*, cal dips called stn00* ?). Stops at the surface can be hazardous for the package—better to go straight to 10 m and bottle stops were cut too short (should be 30 s). Records of deck pressure before and after each cast will help monitor pressure drift. Data should be backed up immediately following each cast.

3. No spares: SAEON needs to start purchasing spare instrumentation. NIOZ MicroCAT and release flooded, two further MicroCATs plus one elliptical float lost from top of B, frame corroded on top float of A. Corrosion around transducer head of ADCP and Aanderaa frame broken from mooring D. Four of nine Aanderaas did not collect data to full deployment period. NIOZ equipment is old (year 2000) and needs replacing rapidly.

4. Full depth CTDs essential for ASCA: MicroCAT calibrations and dynamic height from CPIES rely on full-depth CTD casts during the mooring cruise. Moreover, the lack of night-time operations costs dearly in ship time.

5. Need two instrument technicians capable of leading data download, refurbishment, and configuration of instrumentation, plus multiple download cables and laptops. Particularly important for SAEON to have a reliable, senior instrument technician going forward. Turnarounds are time consuming, especially with added MicroCATs and MicroCAT dips. Each calibration dip takes half a day including prep and attachment, detachment and download of (up to 16-18) instruments, with 5-7 minute bottle stops. Aanderaas can take up to 2 hours to download data. NIOZ MicroCATs about 1 hour for a year-long record.

6. There was no instrument technician familiar with Aanderaa current meters for refurbishment, reconfiguration, data download and plotting. Dutch group did not provide a tech because they held a workshop in Cape Town in Feb 2015 on Aanderaa - but no one aboard had this training. No spare zincs or ‘o’ rings were brought. Clock was not reset for Aanderaa on B -unknown drift. We were not able to plot data and establish quality and length of the records before redeploying instruments. Data quality compromised.

7. RV Algoa too noisy for communication with CPIES and moorings. Only managed to triangulate moorings B and C (down to 2200 m). Will need to pick up ASCA moorings on a quieter vessel, preferably with ship’s hull transducer. Risk is too high to recover moorings without knowing where they are and whether they have released, especially in strong current.

8. TSG has no filter! Salinity data are bad with many gradual biases and sudden offsets caused by clogging of the system. Suggest the electrical technician cleans the system daily at a set time. Better to deal with data gaps than try to process bad data.

9. Ship Issues: Too noisy for acoustic operations. Air on starboard deck around CTD gets up to 35°C (recorded by MicroCATs while package on deck). Air conditioning units need to be moved away from CTD sampling area to reduce noise and temperature of working environment and the chance of contamination of samples with particulates from the air conditioning exhaust. Too few berths for simultaneous mooring and CTD programs, and limits the number of trainees, students, and outreach personnel.

Leg 2 Overview (Gavin Louw):

The goal of Leg 2 was to undertake 20 CTD stations along the ASCA line. Each station would require two deployments of the CTD. Between CTD dips, bongo nets would be deployed for biological sampling. An S-ADCP transect was to be completed, starting at CTD 1 all the way to CTD 20 before CTD sampling commenced. This transect would stretch roughly 160 nm, intersecting the core of the Agulhas Current.

The deployment of four Argo floats (UK MetOffice) along the ASCA transect was too be carried out by Jethan d'Hotman (SAEON). After completion of the CTD sampling, benthic camera work was to be carried out between the ASCA line and Algoa Bay.

Benthic Biodiversity (Charles von der Meden)

Overview

Collaborative offshore benthic sampling and science education outreach exercises were planned for the second and third legs of the 2016 ASCA cruise respectively. Both aspects of the work falls under an NRF post-doctoral Innovation Fellowship aimed at characterizing benthic biodiversity and ecological functioning on the continental shelf of the Agulhas ecoregion.

Sampling undertaken

Due to poor weather and sea conditions, sampling was limited to two of the eight planned stations (A3_5 and A3_6). Sampling at these stations was, however, successful, with SAEON's towed underwater camera (SkiMonkey III) being deployed to depths of between 100 - 120 m. At station A3_5, a total of 204 benthic survey images were obtained, while 126 were taken at station A3_6. At each camera station, CTD data were collected via the onboard MicroCAT instrument. In addition, sediment samples were successfully obtained via a small cone dredge to allow characterisation of benthic habitat characteristics, such as sediment particle size and organic content. Two small sub-samples from these sediment collections were preserved for exploratory microbial analysis by Prof Dorrington (Rhodes University), and it is hoped that these will inform future sampling efforts and potentially add to collaborative scientific output.

Output and conclusions

While sampling was limited, survey images and sediment samples from the two completed stations will be processed and will feed into the wider Innovation project (as sample timing is not an essential issue). Usefully, the sampling provided a gear-trial of the Skimonkey camera onboard the RV Algoa, highlighting several important considerations for the operator and technical staff which will be useful for future work. Considerations include: increased sea-cable length and operation of the Large Towing Winch (LTW); possibility of using the stern crane as a secondary block in conjunction with the LTW; need for extra rope for deployment of the cone dredge.

Leg 3 (Gavin Louw & Charles von der Meden):

Benthic camera stations just outside Algoa Bay were to be completed on the return leg as part of a training initiative. A CPR tow was to be completed, together with underway sampling on the return journey back to Cape Town. The CPR would collect biological samples for roughly 470 nm. The underway chemistry sampling (discrete samples) was to be taken every 15 min for nutrients and chlorophyll samples and every 4 hours an oxygen titration was to be done. This underway sampling line was to be repeated along the same stations as the April 2015 cruise (as closely as possible), for chlorophyll a, nutrients and dissolved oxygen. The third leg was to be used as an opportunity for environmental education training of learners and educators by Thomas Mtontsi (SAEON).

Unfortunately no education/outreach work was conducted as the third leg of the cruise was cancelled. Support for the education program in terms of benthic work remains in place for future cruises.

Due to inclement weather Leg 2 and Leg 3 was cancelled by the advice of the co-chief scientists and the captain. Thus, participants according to the signed sailing orders and participants within this cruise report differ. Those due to travel to Cape Town via air, instead came back by sea and those to meet up with the Algoa in Port Elizabeth for Leg 3 did not do so. No discrete sampling was carried out and the SADCP transect was cut short.

ASCA Data Policy and Data Access

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

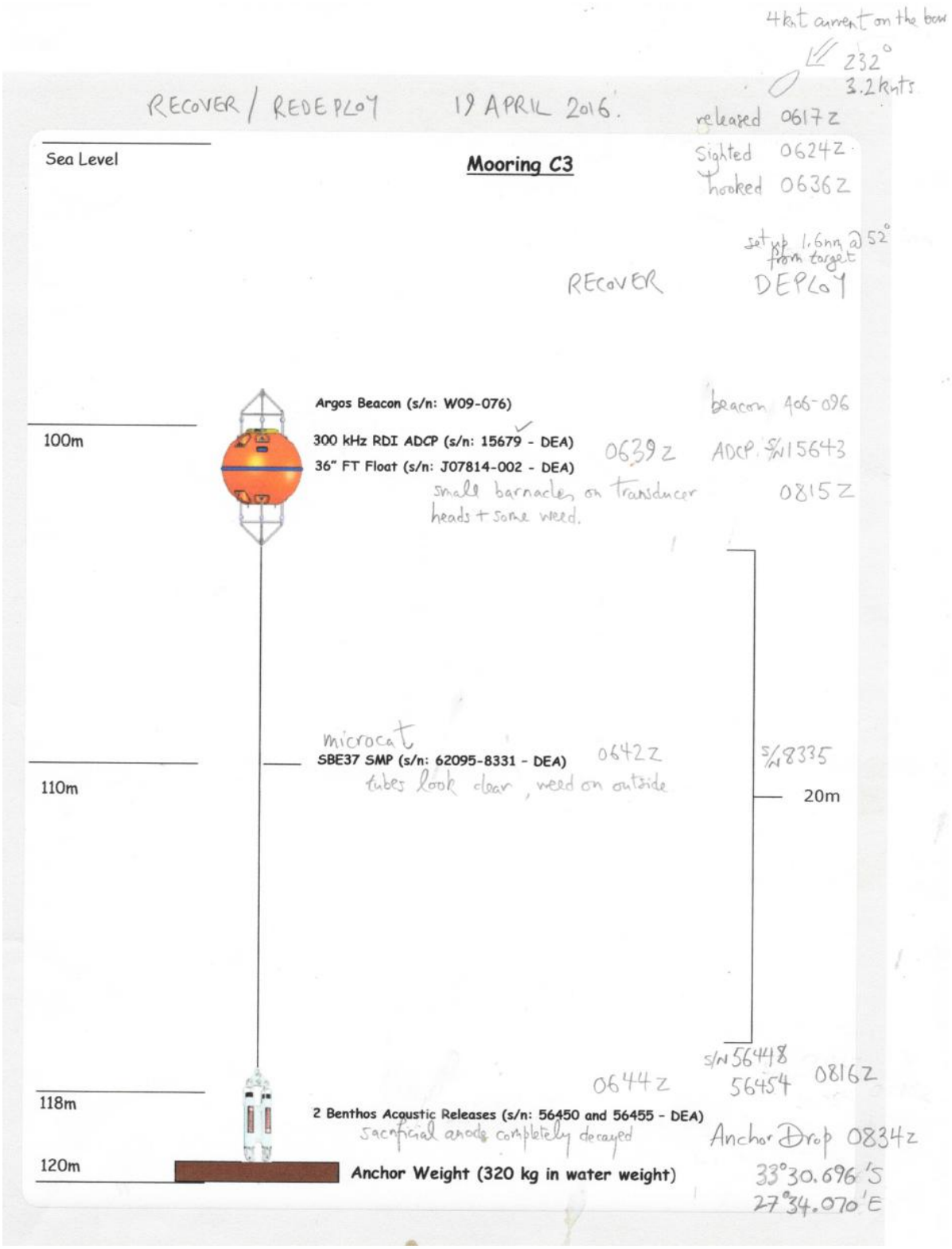
- In compliance with the data policy for the Indian Ocean Observing System (IndOOS), as stipulated by the CLIVAR Indian Ocean Panel, ASCA data will be open to the public and made easily accessible, with reasonable time lag for data quality checks. All data will be listed on the IndOOS data portal and 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 SADCO and the US NODC within 12 months of retrieval, with open access for the international scientific community.

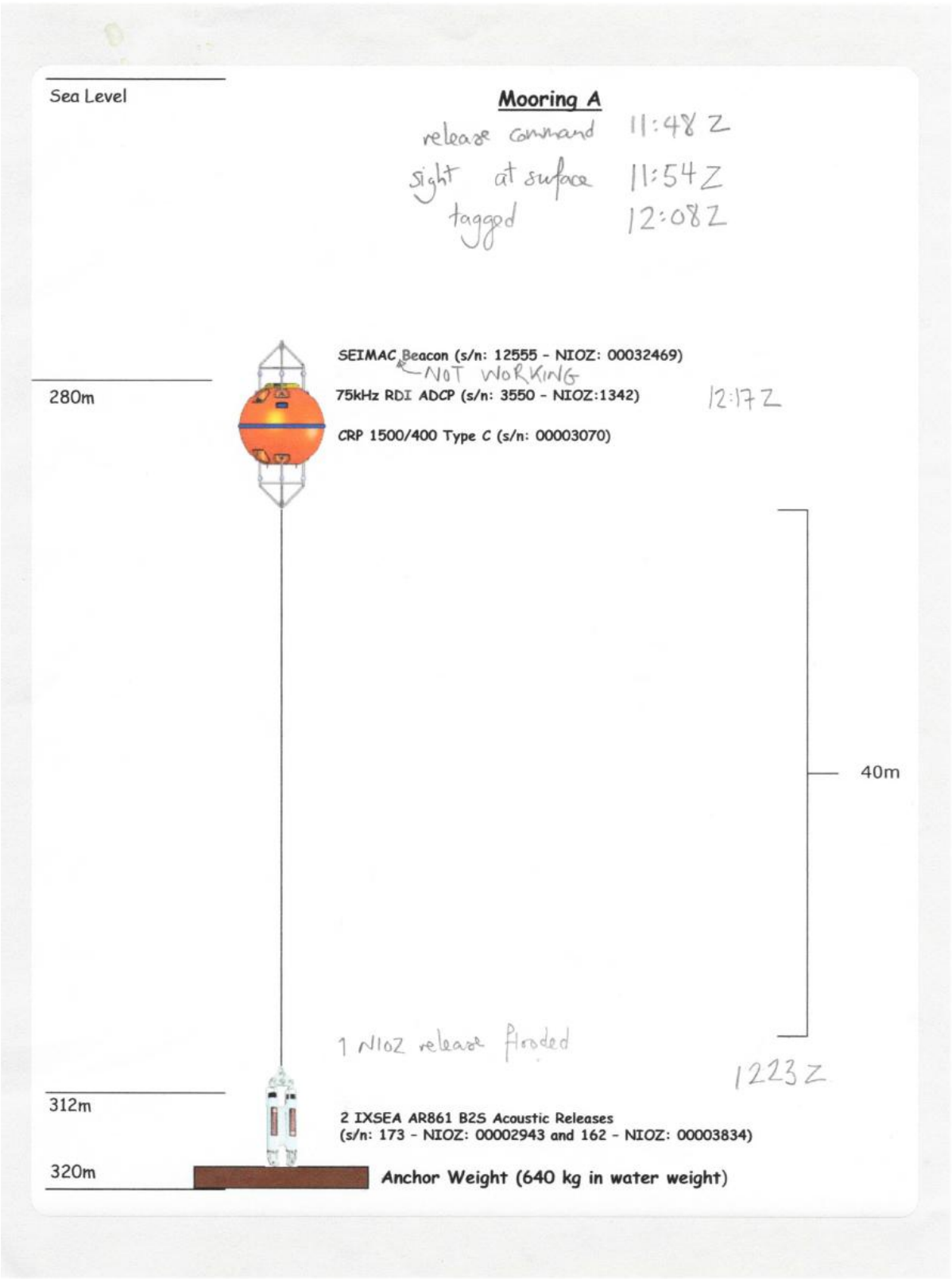
A Dropbox account has been setup with all the metadata information and raw and processed data available from this cruise. It is been added to periodically as samples are analyzed and further interpretations are done. For access, please contact Ms. T. Morris - tammy@saeon.ac.za.

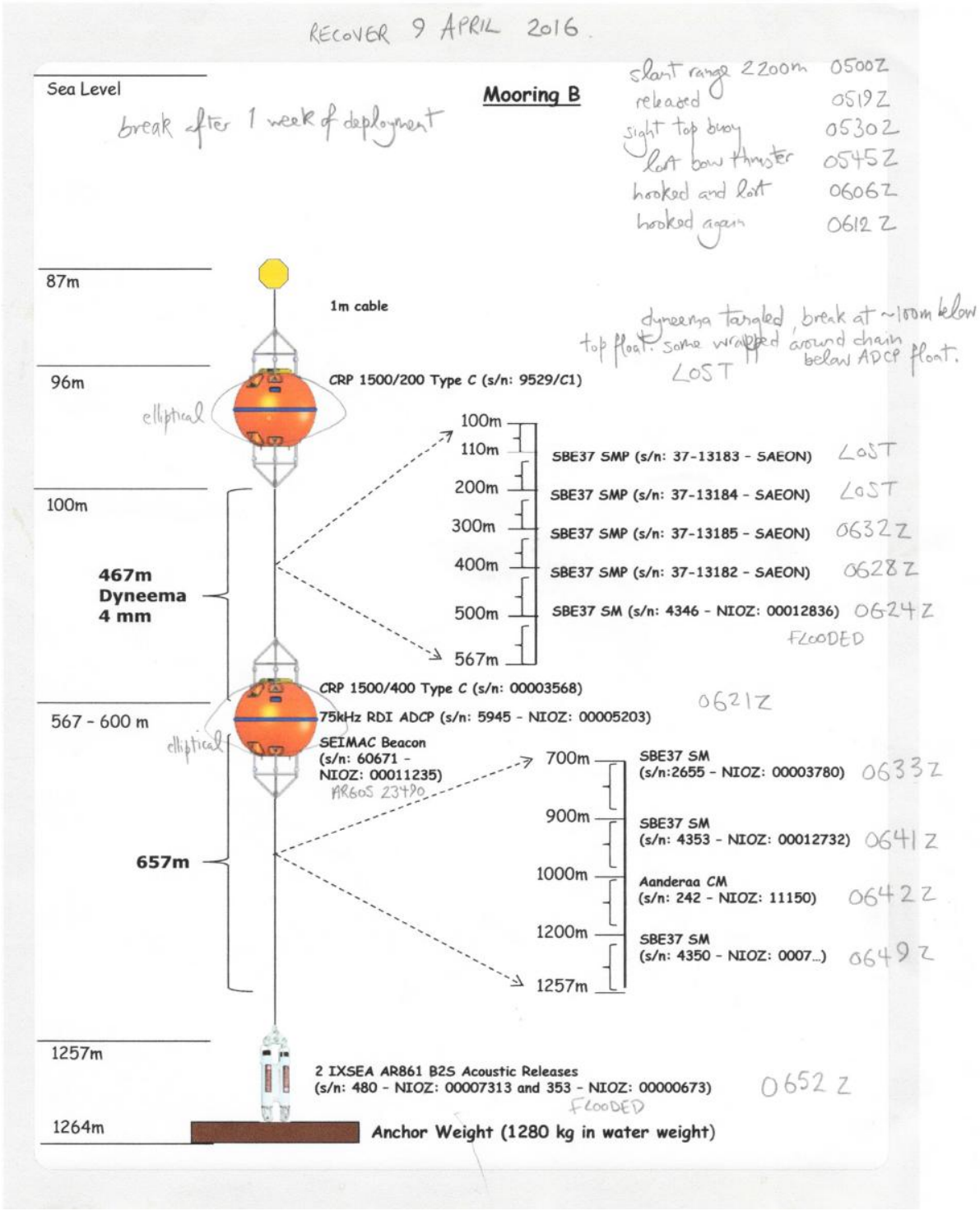
Alternatively, all data is available to the co-PI's as per the data agreement above. As noted in a few sections above, some further post processing is required on some data sets before it can be used for further work. Please refer back to the co-PI's or Coordinator for this project prior to using the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

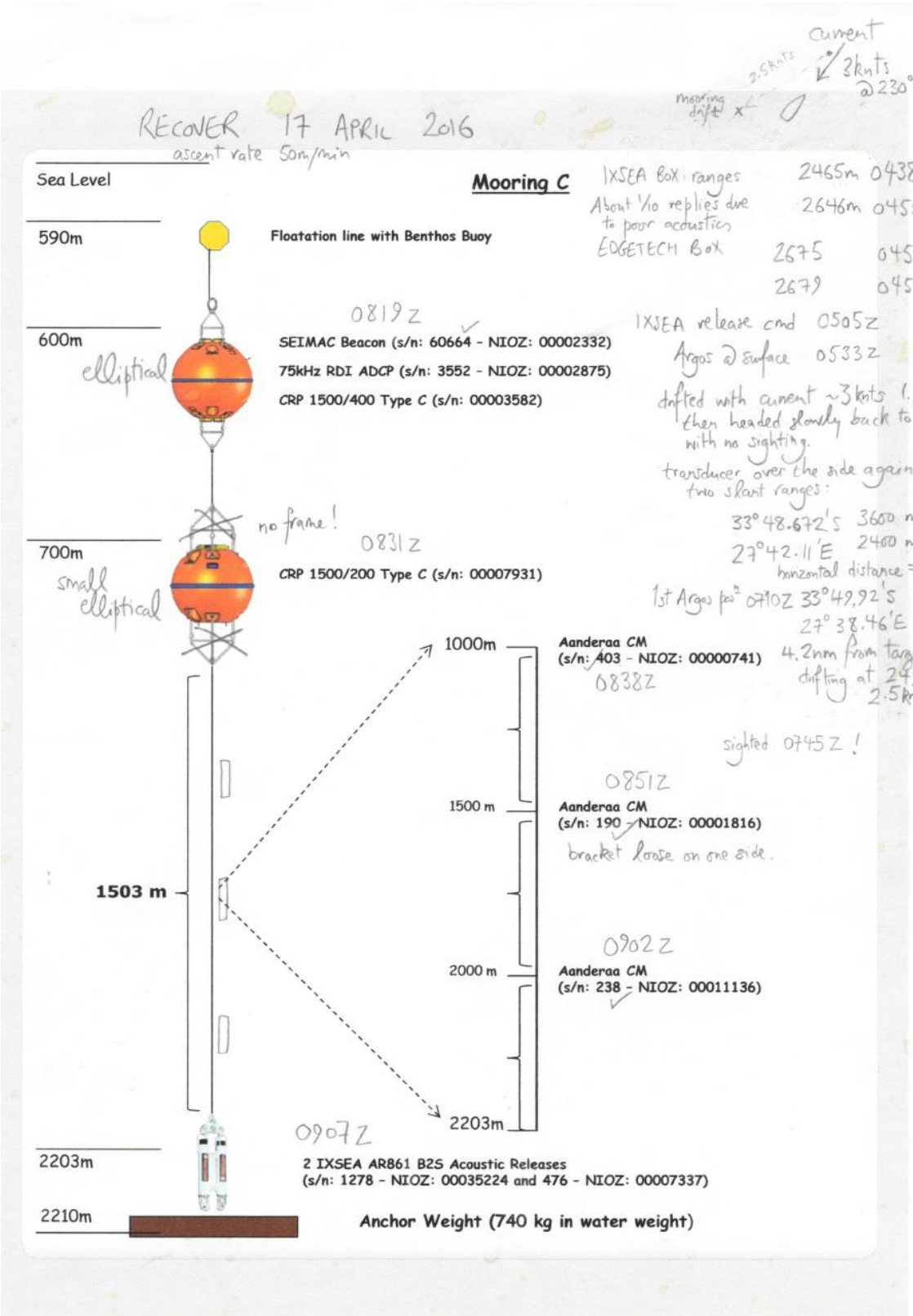
Annexure 1:

Mooring recovery diagrams:



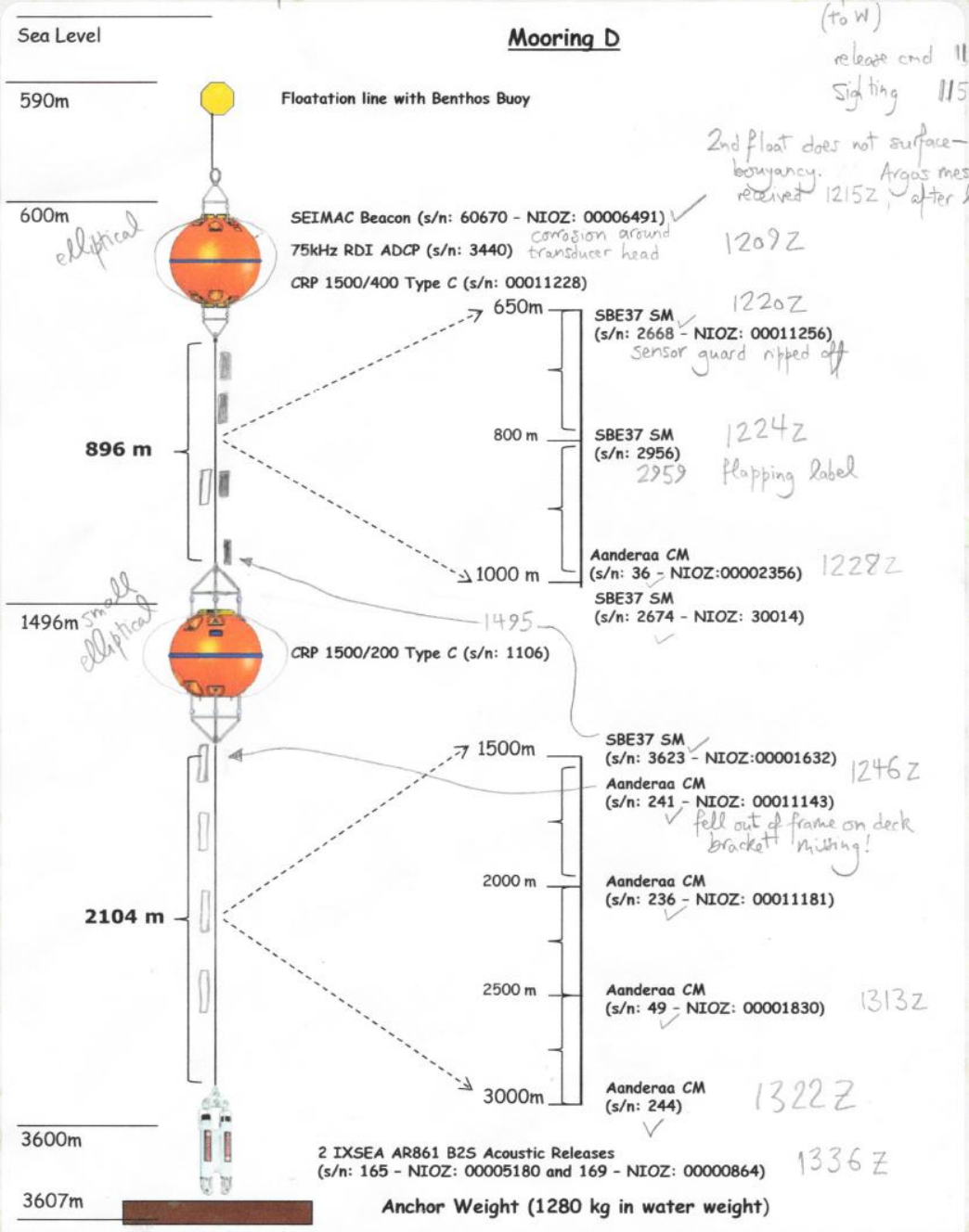

Sea Level
Mooring A
release command 11:48 Z
sight at surface 11:54 Z
tagged 12:08 Z
SEIMAC Beacon (s/n: 12555 - NIOZ: 00032469)
NOT WORKING
280m
75kHz RDI ADCP (s/n: 3550 - NIOZ:1342)
12:17 Z
CRP 1500/400 Type C (s/n: 00003070)
40m
1 NIOZ release flooded
1223 Z
312m
2 IXSEA AR861 B2S Acoustic Releases
(s/n: 173 - NIOZ: 00002943 and 162 - NIOZ: 00003834)
320m
Anchor Weight (640 kg in water weight)


RECOVER 9 APRIL 2016.
Sea Level
Mooring B
break after 1 week of deployment
slant range 2200m 0500Z
released 0519Z
sight top buoy 0530Z
lost bow thruster 0545Z
hooked and lost 0606Z
hooked again 0612Z
87m
1m cable
dyneema tangled, break at ~100m below top float. some wrapped around chain below ADCP float.
LOST
96m
CRP 1500/200 Type C (s/n: 9529/C1)
elliptical
100m
100m
110m
SBE37 SMP (s/n: 37-13183 - SAEON) LOST
200m
SBE37 SMP (s/n: 37-13184 - SAEON) LOST
300m
SBE37 SMP (s/n: 37-13185 - SAEON) 0632Z
400m
SBE37 SMP (s/n: 37-13182 - SAEON) 0628Z
467m
Dyneema
4 mm
500m
SBE37 SM (s/n: 4346 - NIOZ: 00012836) 0624Z
FLOODED
567m
CRP 1500/400 Type C (s/n: 00003568)
0621Z
567 - 600 m
75kHz RDI ADCP (s/n: 5945 - NIOZ: 00005203)
elliptical
SEIMAC Beacon
(s/n: 60671 -
NIOZ: 00011235)
ARGOS 23490
700m
SBE37 SM
(s/n:2655 - NIOZ: 00003780) 0633Z
900m
SBE37 SM
(s/n: 4353 - NIOZ: 00012732) 0641Z
657m
1000m
Aanderaa CM
(s/n: 242 - NIOZ: 11150) 0642Z
1200m
SBE37 SM
(s/n: 4350 - NIOZ: 0007...) 0649Z
1257m
1257m
2 IXSEA AR861 B2S Acoustic Releases
(s/n: 480 - NIOZ: 00007313 and 353 - NIOZ: 00000673) 0652Z
FLOODED
1264m
Anchor Weight (1280 kg in water weight)


RECOVER 17 APRIL 2016
ascent rate 50m/min
current
3knts
@230°
mooring drift
Sea Level
Mooring C
590m
Floatation line with Benthos Buoy
600m
elliptical
0819Z
SEIMAC Beacon (s/n: 60664 - NIOZ: 00002332)
75kHz RDI ADCP (s/n: 3552 - NIOZ: 00002875)
CRP 1500/400 Type C (s/n: 00003582)
no frame!
0831Z
700m
small elliptical
CRP 1500/200 Type C (s/n: 00007931)
1000m
Aanderaa CM
(s/n: 403 - NIOZ: 00000741)
0838Z
0851Z
1500 m
Aanderaa CM
(s/n: 190 - NIOZ: 00001816)
bracket loose on one side.
1503 m
0902Z
2000 m
Aanderaa CM
(s/n: 238 - NIOZ: 00011136)
2203m
0907Z
2203m
2 IXSEA AR861 B2S Acoustic Releases
(s/n: 1278 - NIOZ: 00035224 and 476 - NIOZ: 00007337)
2210m
Anchor Weight (740 kg in water weight)
IXSEA Box ranges
About 1/10 replies due to poor acoustics
EDGETECH Box
2465m 0438Z
2646m 0455Z
2675 0457Z
2679 0457Z
IXSEA release cmd 0505Z
Argos @ surface 0533Z
drifted with current ~3knts 1.5nm then headed slowly back to target with no sighting.
transducer over the side again, got two slant ranges:
33° 48.672'S 3600 m
27° 42.11'E 2400 m
horizontal distance = 2 km
1st Argos fix 0710Z 33° 49.92'S
27° 38.46'E
4.2nm from target drifting at 242° 2.5knts
sighted 0745Z!

15th April 2016 RECOVERY

transducer over 1121 z
no response either release.
reposition 300 m downstrm (to W)
release cmd 1142 no reply
Sighting 1154



2nd float does not surface — not enough boyancy. Argos message received 1215z, after landing.

1209z

1220z

1224z

1228z

1495

1246z

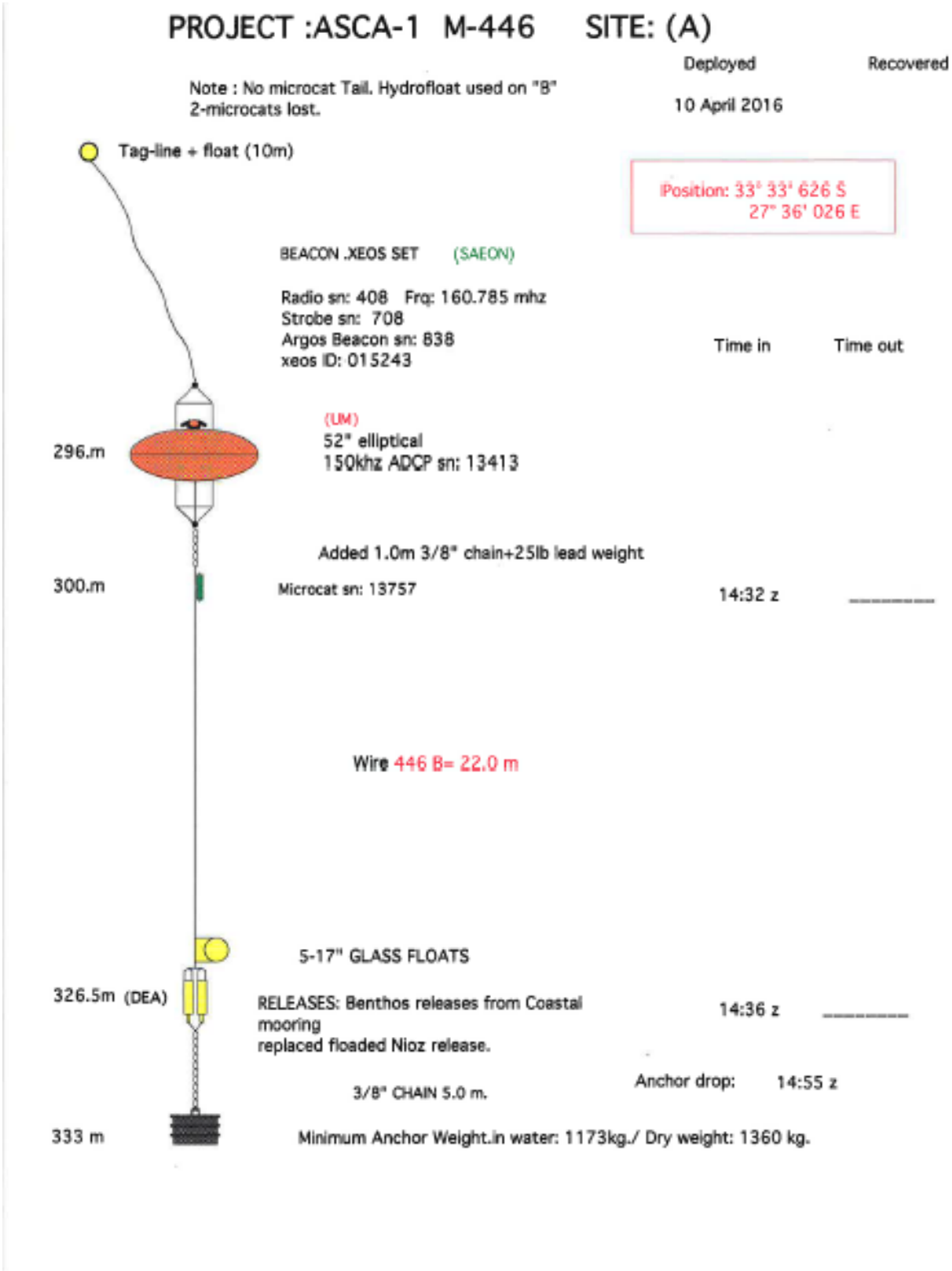
1313z

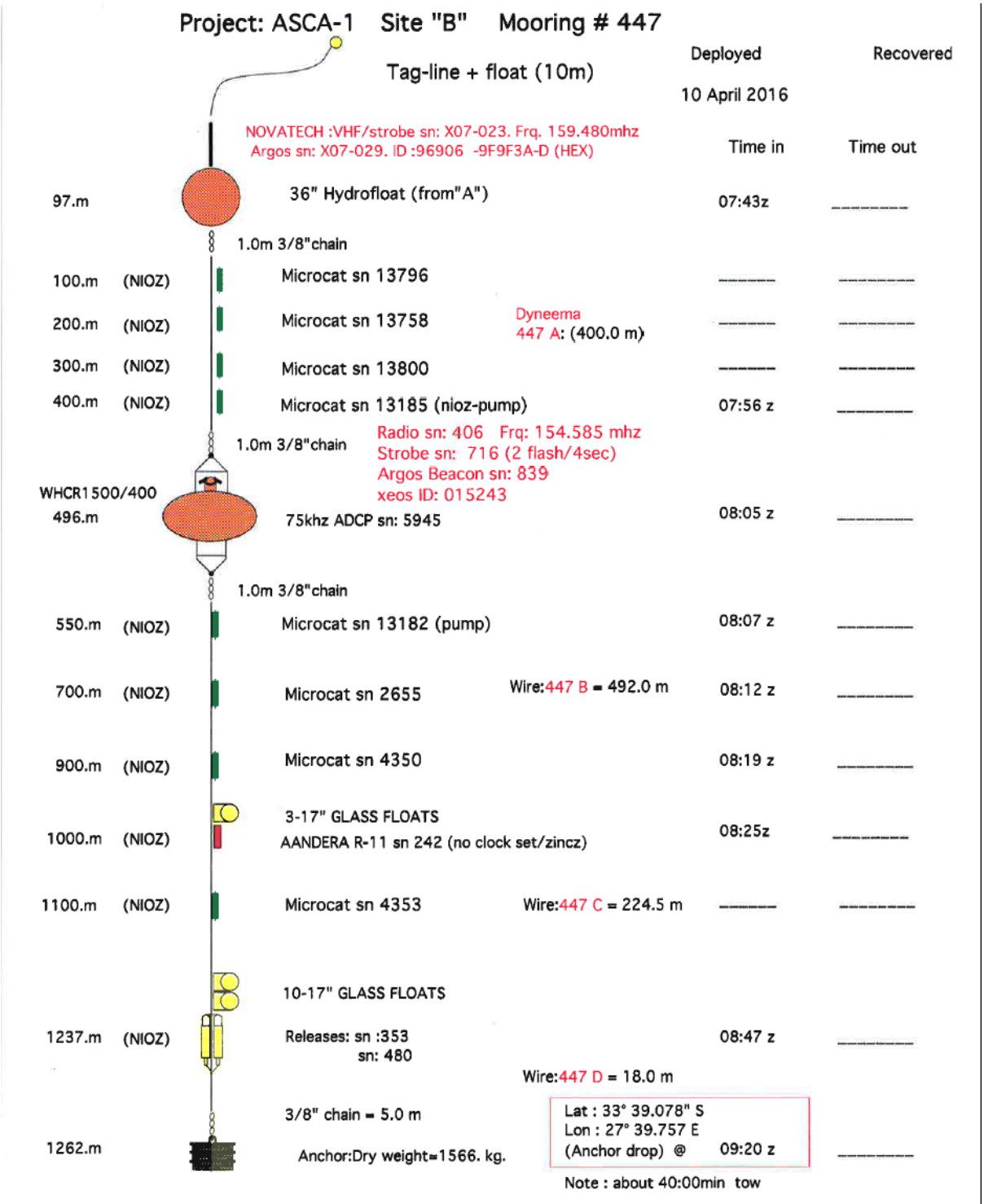
1322z

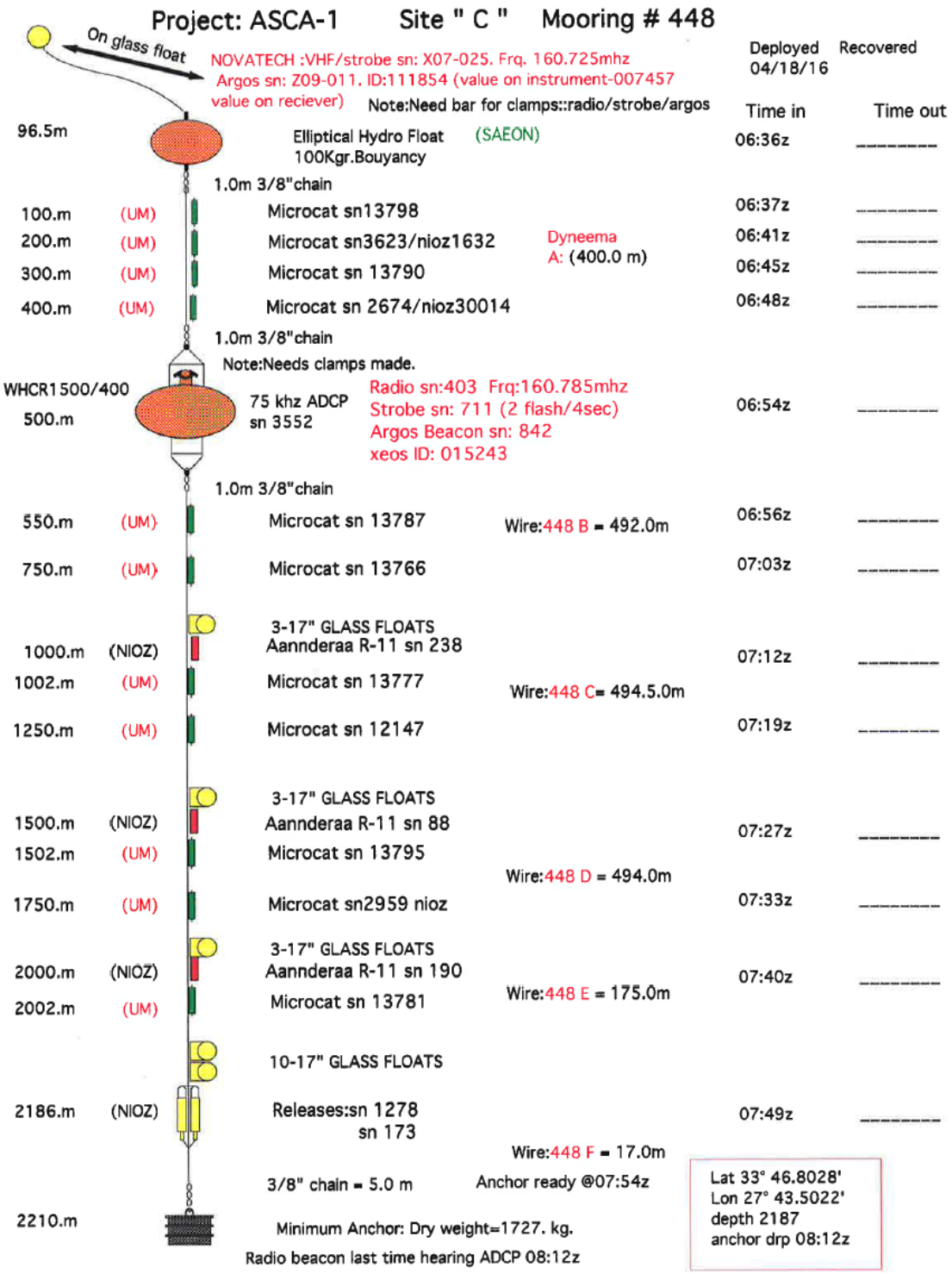
1336z

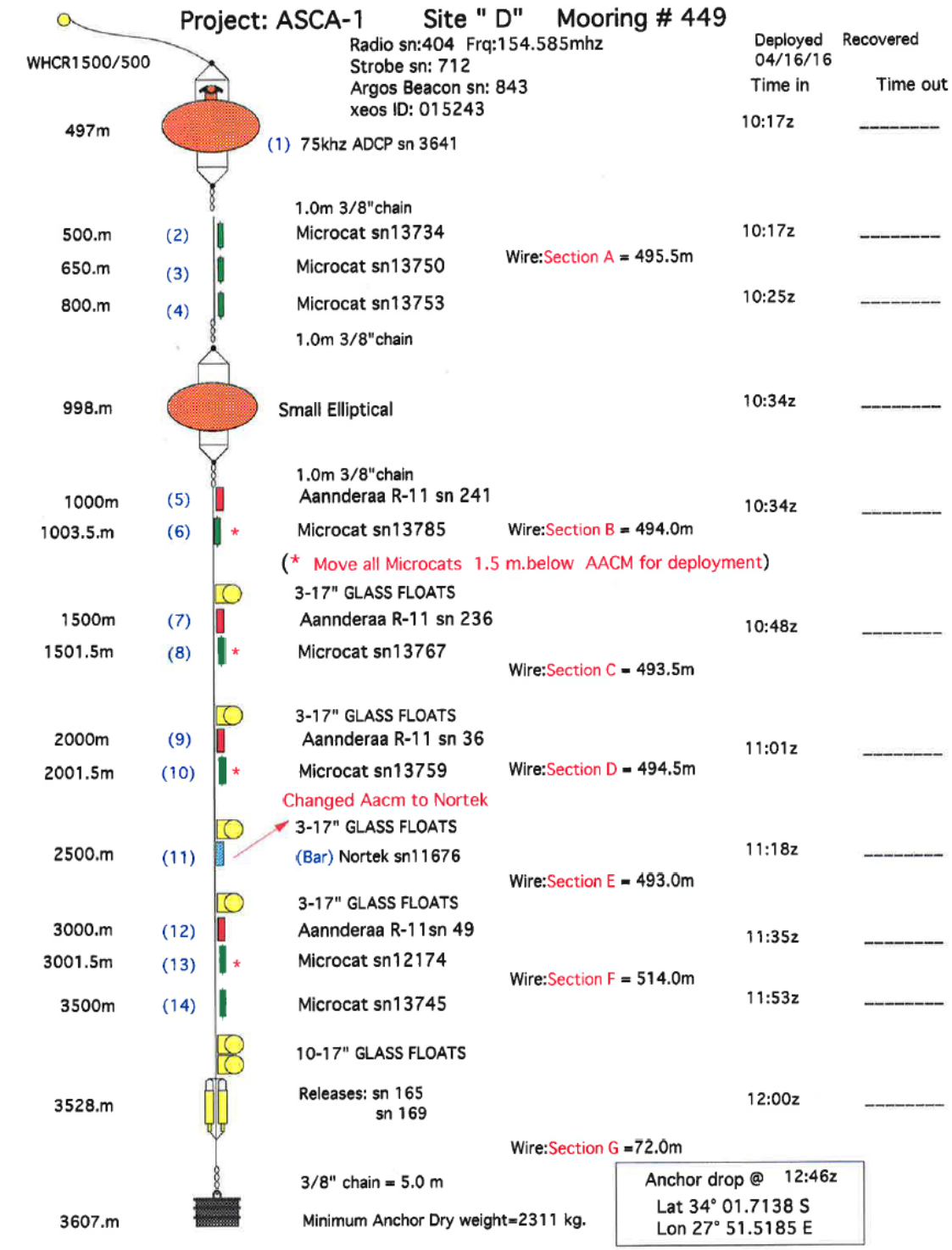
Aanderaa's have no pressure sensors but will be paired with microcats on new mooring D.

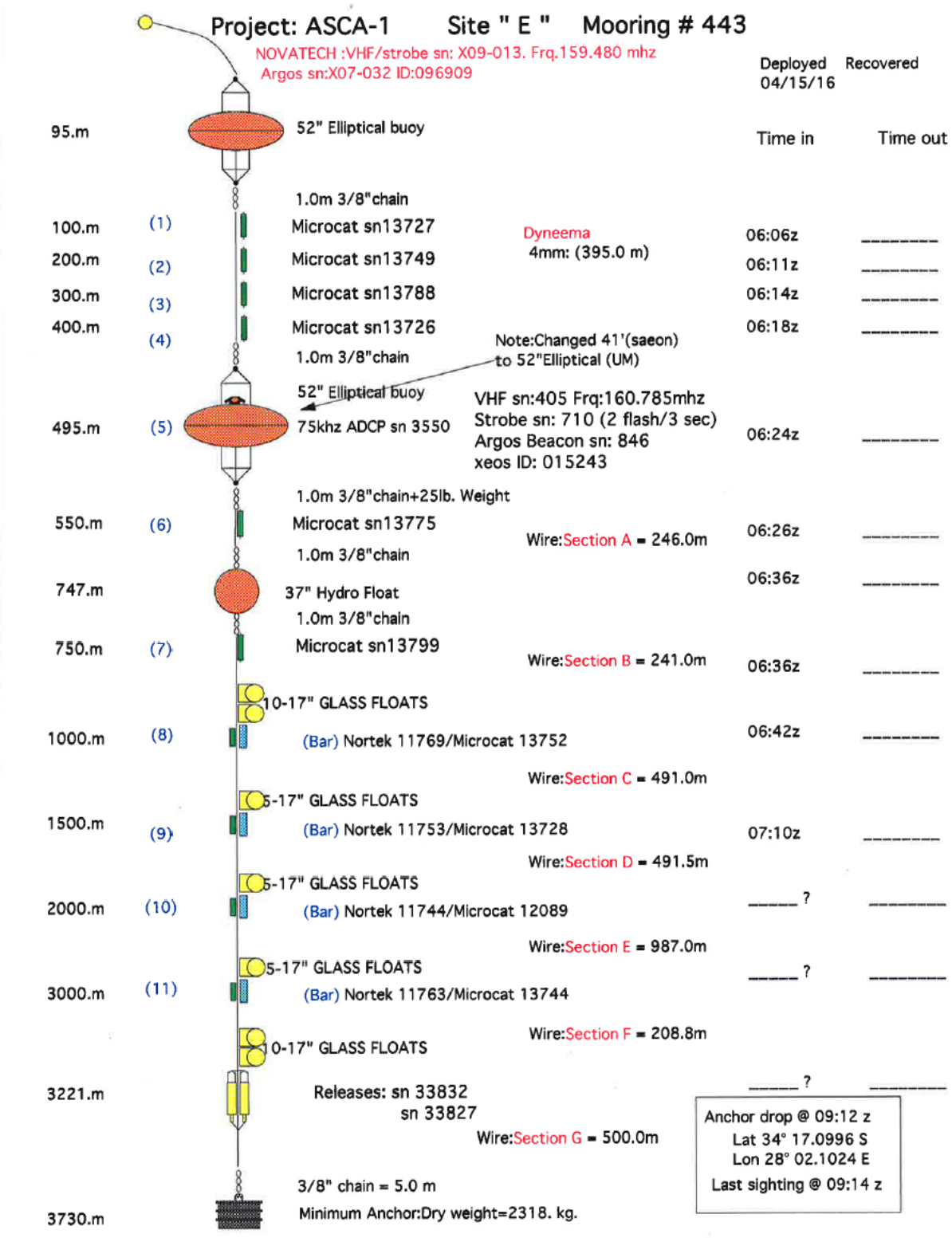
Mooring deployment diagram log sheets:

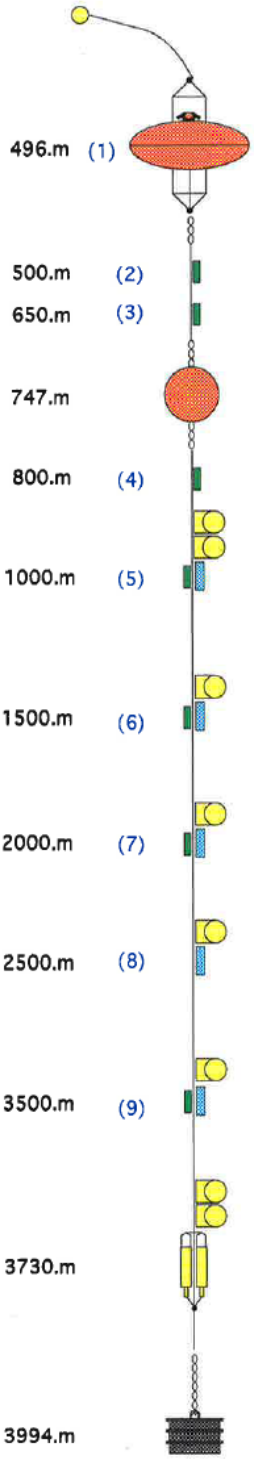



Project: ASCA-1 Site "B" Mooring # 447
Tag-line + float (10m)
Deployed
10 April 2016
Recovered
NOVATECH :VHF/strobe sn: X07-023. Frq. 159.480mhz
Argos sn: X07-029. ID :96906 -9F9F3A-D (HEX)
Time in
Time out
97.m
36" Hydrofloat (from"A")
07:43z
1.0m 3/8"chain
100.m (NIOZ)
Microcat sn 13796
200.m (NIOZ)
Microcat sn 13758
Dyneema
447 A: (400.0 m)
300.m (NIOZ)
Microcat sn 13800
400.m (NIOZ)
Microcat sn 13185 (nioz-pump)
07:56 z
1.0m 3/8"chain
Radio sn: 406 Frq: 154.585 mhz
Strobe sn: 716 (2 flash/4sec)
Argos Beacon sn: 839
xeos ID: 015243
WHCR1500/400
496.m
75khz ADCP sn: 5945
08:05 z
1.0m 3/8"chain
550.m (NIOZ)
Microcat sn 13182 (pump)
08:07 z
700.m (NIOZ)
Microcat sn 2655
Wire:447 B = 492.0 m
08:12 z
900.m (NIOZ)
Microcat sn 4350
08:19 z
3-17" GLASS FLOATS
1000.m (NIOZ)
AANDERA R-11 sn 242 (no clock set/zincz)
08:25z
1100.m (NIOZ)
Microcat sn 4353
Wire:447 C = 224.5 m
10-17" GLASS FLOATS
1237.m (NIOZ)
Releases: sn :353
sn: 480
08:47 z
Wire:447 D = 18.0 m
3/8" chain = 5.0 m
Lat : 33° 39.078" S
Lon : 27° 39.757 E
(Anchor drop) @ 09:20 z
1262.m
Anchor:Dry weight=1566. kg.
Note : about 40:00min tow


Project: ASCA-1 Site " C " Mooring # 448
On glass float
NOVATECH :VHF/strobe sn: X07-025. Frq. 160.725mhz
Argos sn: Z09-011. ID:111854 (value on instrument-007457
value on reciever)
Note:Need bar for clamps::radio/strobe/argos
Deployed 04/18/16
Recovered
Time in
Time out
96.5m
Elliptical Hydro Float (SAEON)
100Kgr.Bouyancy
06:36z
1.0m 3/8"chain
100.m (UM) Microcat sn13798 06:37z
200.m (UM) Microcat sn3623/nioz1632 Dyneema A: (400.0 m) 06:41z
300.m (UM) Microcat sn 13790 06:45z
400.m (UM) Microcat sn 2674/nioz30014 06:48z
1.0m 3/8"chain
Note:Needs clamps made.
WHCR1500/400
500.m
75 khz ADCP sn 3552
Radio sn:403 Frq:160.785mhz
Strobe sn: 711 (2 flash/4sec)
Argos Beacon sn: 842
xeos ID: 015243
06:54z
1.0m 3/8"chain
550.m (UM) Microcat sn 13787 Wire:448 B = 492.0m 06:56z
750.m (UM) Microcat sn 13766 07:03z
3-17" GLASS FLOATS
1000.m (NIOZ) Aannderaa R-11 sn 238 07:12z
1002.m (UM) Microcat sn 13777 Wire:448 C= 494.5.0m
1250.m (UM) Microcat sn 12147 07:19z
3-17" GLASS FLOATS
1500.m (NIOZ) Aannderaa R-11 sn 88 07:27z
1502.m (UM) Microcat sn 13795
Wire:448 D = 494.0m
1750.m (UM) Microcat sn2959 nioz 07:33z
3-17" GLASS FLOATS
2000.m (NIOZ) Aannderaa R-11 sn 190 07:40z
2002.m (UM) Microcat sn 13781 Wire:448 E = 175.0m
10-17" GLASS FLOATS
2186.m (NIOZ) Releases:sn 1278 sn 173 07:49z
Wire:448 F = 17.0m
3/8" chain = 5.0 m
Anchor ready @07:54z
Lat 33° 46.8028'
Lon 27° 43.5022'
depth 2187
anchor drp 08:12z
2210.m
Minimum Anchor: Dry weight=1727. kg.
Radio beacon last time hearing ADCP 08:12z


Project: ASCA-1 Site " D" Mooring # 449
Radio sn:404 Frq:154.585mhz
Strobe sn: 712
Argos Beacon sn: 843
xeos ID: 015243
Deployed 04/16/16
Recovered
Time in
Time out
WHCR1500/500
497m
(1) 75khz ADCP sn 3641
10:17z
1.0m 3/8"chain
500.m (2) Microcat sn13734
10:17z
650.m (3) Microcat sn13750
Wire:Section A = 495.5m
800.m (4) Microcat sn13753
10:25z
1.0m 3/8"chain
998.m
Small Elliptical
10:34z
1.0m 3/8"chain
1000m (5) Aannderaa R-11 sn 241
10:34z
1003.5.m (6) * Microcat sn13785
Wire:Section B = 494.0m
(* Move all Microcats 1.5 m.below AACM for deployment)
3-17" GLASS FLOATS
1500m (7) Aannderaa R-11 sn 236
10:48z
1501.5m (8) * Microcat sn13767
Wire:Section C = 493.5m
3-17" GLASS FLOATS
2000m (9) Aannderaa R-11 sn 36
11:01z
2001.5m (10) * Microcat sn13759
Wire:Section D = 494.5m
Changed Aacm to Nortek
3-17" GLASS FLOATS
2500.m (11) (Bar) Nortek sn11676
11:18z
Wire:Section E = 493.0m
3-17" GLASS FLOATS
3000.m (12) Aannderaa R-11sn 49
11:35z
3001.5m (13) * Microcat sn12174
Wire:Section F = 514.0m
3500m (14) Microcat sn13745
11:53z
10-17" GLASS FLOATS
3528.m
Releases: sn 165
sn 169
12:00z
Wire:Section G =72.0m
3/8" chain = 5.0 m
Anchor drop @ 12:46z
Lat 34° 01.7138 S
Lon 27° 51.5185 E
3607.m
Minimum Anchor Dry weight=2311 kg.


Project: ASCA-1 Site " E " Mooring # 443
NOVATECH :VHF/strobe sn: X09-013. Frq.159.480 mhz
Argos sn:X07-032 ID:096909
Deployed 04/15/16
Recovered
95.m
52" Elliptical buoy
Time in
Time out
1.0m 3/8"chain
100.m (1) Microcat sn13727
Dyneema 4mm: (395.0 m)
06:06z
200.m (2) Microcat sn13749
06:11z
300.m (3) Microcat sn13788
06:14z
400.m (4) Microcat sn13726
06:18z
1.0m 3/8"chain
Note:Changed 41'(saeon) to 52"Elliptical (UM)
52" Elliptical buoy
495.m (5) 75khz ADCP sn 3550
VHF sn:405 Frq:160.785mhz
Strobe sn: 710 (2 flash/3 sec)
Argos Beacon sn: 846
xeos ID: 015243
06:24z
1.0m 3/8"chain+25lb. Weight
550.m (6) Microcat sn13775
Wire:Section A = 246.0m
06:26z
1.0m 3/8"chain
747.m
37" Hydro Float
06:36z
1.0m 3/8"chain
750.m (7) Microcat sn13799
Wire:Section B = 241.0m
06:36z
10-17" GLASS FLOATS
1000.m (8) (Bar) Nortek 11769/Microcat 13752
06:42z
Wire:Section C = 491.0m
5-17" GLASS FLOATS
1500.m (9) (Bar) Nortek 11753/Microcat 13728
07:10z
Wire:Section D = 491.5m
5-17" GLASS FLOATS
2000.m (10) (Bar) Nortek 11744/Microcat 12089
_____ ?
Wire:Section E = 987.0m
5-17" GLASS FLOATS
3000.m (11) (Bar) Nortek 11763/Microcat 13744
_____ ?
Wire:Section F = 208.8m
0-17" GLASS FLOATS
3221.m
Releases: sn 33832
sn 33827
_____ ?
Wire:Section G = 500.0m
Anchor drop @ 09:12 z
Lat 34° 17.0996 S
Lon 28° 02.1024 E
Last sighting @ 09:14 z
3/8" chain = 5.0 m
3730.m
Minimum Anchor:Dry weight=2318. kg.

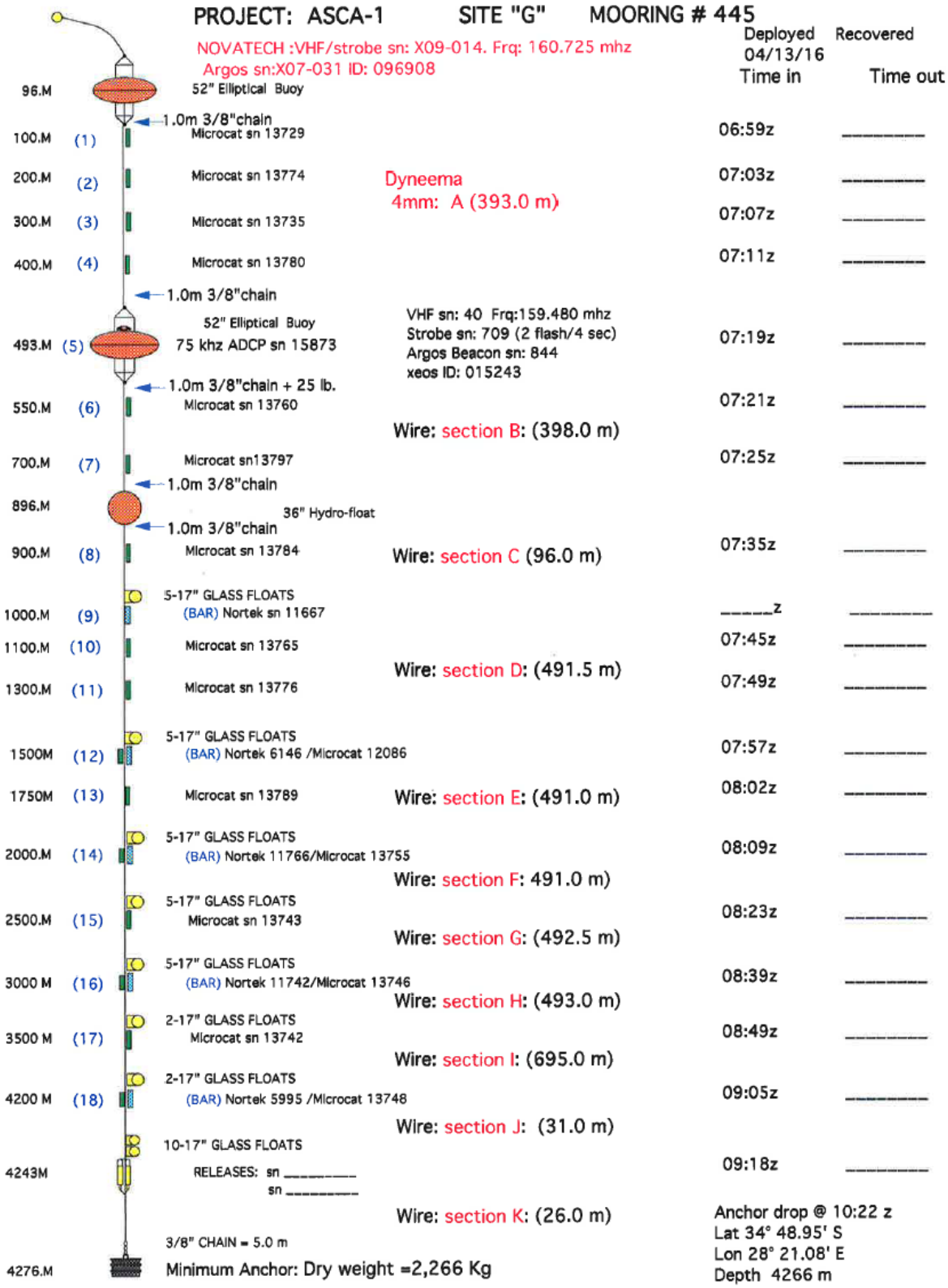


PROJECT: ASCA-1 #444 SITE: "F"

Radio sn:399 Frq:160.725 mhz
Strobe sn: 713 (2flash/3 sec)
Argos Beacon sn: 802
xeos ID: 015243

			Deployed 04/14/16	Recovered
			Time in	Time out
496.m	(1)	52" Elliptical 75khz ADCP sn 15427	06:09z	_____
		1.0m 3/8"chain+25lb. Weight		
500.m	(2)	Microcat sn 13786	06:09z	_____
		Wire: section A: (247.0 m)		
650.m	(3)	Microcat sn 13756	06:12z	_____
		1.0m 3/8"chain		
747.m		36" Hydro Float	06:18z	_____
		1.0m 3/8"chain		
800.m	(4)	Microcat sn 13754	06:21z	_____
		Wire: section B: (240.0 m)		
		10-17" GLASS FLOATS		
1000.m	(5)	(Bar) Nortek 11656/Microcat 13791	06:30z	_____
		Wire: section C: (492.0 m)		
		5-17" GLASS FLOATS		
1500.m	(6)	(Bar) Nortek 6137/Microcat 13773	06:42z	_____
		Wire: section D: (492.0 m)		
		5-17" GLASS FLOATS		
2000.m	(7)	(Bar) Nortek 11759/Microcat 12196	06:56z	_____
		Wire: section E: (492.0 m)		
		5-17" GLASS FLOATS		
2500.m	(8)	(BAR) Nortek sn 11635	07:07z	_____
		Wire: section F:(989.0 m)		
		5-17" GLASS FLOATS		
3500.m	(9)	(Bar) Nortek 11747/Microcat 13747	07:32z	_____
		Wire: section G: (218.0 m)		
		10-17" GLASS FLOATS		
3730.m		Releases sn: 33823 sn: 33829	07:42z	_____
		Wire: section H: (255.0 m)		
		3/8" CHAIN = 5.0 m Anchor ready @ 07:53 z ~1hr tow		
3994.m		Minimum Anchor: Dry weight= 2070.0 Kg		

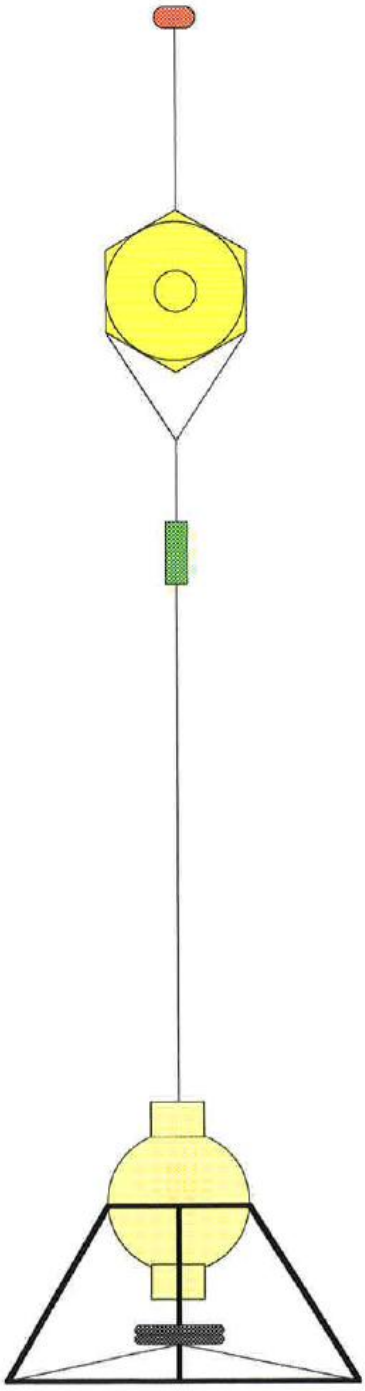
Anchor drop @ 08:58 z
Lat 34° 31.9356' S
Lon 28° 10.0938' E
Depth 3983m


PROJECT: ASCA-1 SITE "G" MOORING # 445
NOVATECH :VHF/strobe sn: X09-014. Frq: 160.725 mhz
Argos sn:X07-031 ID: 096908
Deployed Recovered
04/13/16
Time in Time out
96.M
52" Elliptical Buoy
1.0m 3/8"chain
100.M (1)
Microcat sn 13729
06:59z
200.M (2)
Microcat sn 13774
Dyneema
4mm: A (393.0 m)
07:03z
300.M (3)
Microcat sn 13735
07:07z
400.M (4)
Microcat sn 13780
07:11z
1.0m 3/8"chain
52" Elliptical Buoy
493.M (5)
75 khz ADCP sn 15873
VHF sn: 40 Frq:159.480 mhz
Strobe sn: 709 (2 flash/4 sec)
Argos Beacon sn: 844
xeos ID: 015243
07:19z
1.0m 3/8"chain + 25 lb.
550.M (6)
Microcat sn 13760
07:21z
Wire: section B: (398.0 m)
700.M (7)
Microcat sn13797
07:25z
1.0m 3/8"chain
896.M
36" Hydro-float
1.0m 3/8"chain
900.M (8)
Microcat sn 13784
Wire: section C (96.0 m)
07:35z
5-17" GLASS FLOATS
1000.M (9)
(BAR) Nortek sn 11667
z
1100.M (10)
Microcat sn 13765
07:45z
Wire: section D: (491.5 m)
1300.M (11)
Microcat sn 13776
07:49z
5-17" GLASS FLOATS
1500M (12)
(BAR) Nortek 6146 /Microcat 12086
07:57z
1750M (13)
Microcat sn 13789
Wire: section E: (491.0 m)
08:02z
5-17" GLASS FLOATS
2000.M (14)
(BAR) Nortek 11766/Microcat 13755
08:09z
Wire: section F: 491.0 m)
5-17" GLASS FLOATS
2500.M (15)
Microcat sn 13743
08:23z
Wire: section G: (492.5 m)
5-17" GLASS FLOATS
3000 M (16)
(BAR) Nortek 11742/Microcat 13746
08:39z
Wire: section H: (493.0 m)
2-17" GLASS FLOATS
3500 M (17)
Microcat sn 13742
08:49z
Wire: section I: (695.0 m)
2-17" GLASS FLOATS
4200 M (18)
(BAR) Nortek 5995 /Microcat 13748
09:05z
Wire: section J: (31.0 m)
10-17" GLASS FLOATS
4243M
RELEASES: sn
sn
09:18z
Wire: section K: (26.0 m)
Anchor drop @ 10:22 z
Lat 34° 48.95' S
Lon 28° 21.08' E
Depth 4266 m
3/8" CHAIN = 5.0 m
4276.M
Minimum Anchor: Dry weight =2,266 Kg

PROJECT: AGULHAS CURRENT C PIES

Site "B" (P -1)

Deployed	Recovered
9 April/16	_____



Anchor drop @ 33° 39.06' S
27° 39.80' E
At 10:41 Z

1-17" glass float

Z- Pulse sensor. sn 21

50.0 m

IES. sn 241

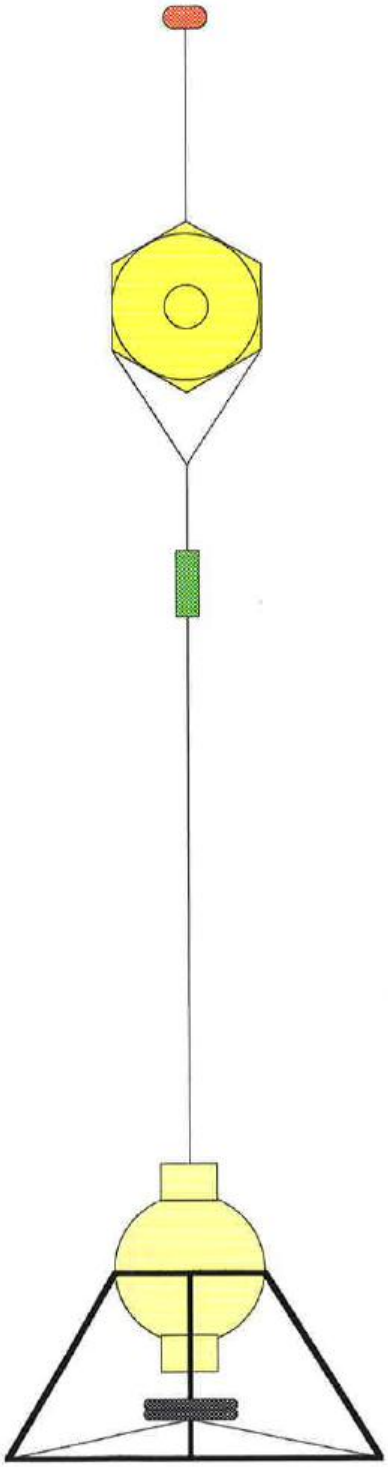
Water depth. 1278 m

PROJECT: AGULHAS CURRENT C PIES (P -3)

Deployed Recovered

12 April/16 _____

Target : 34° 49.28' S
28° 20.72 E
depth 4270



1-17" glass float

Anchor drop : 34° 49.30 S
28° 20.68' E

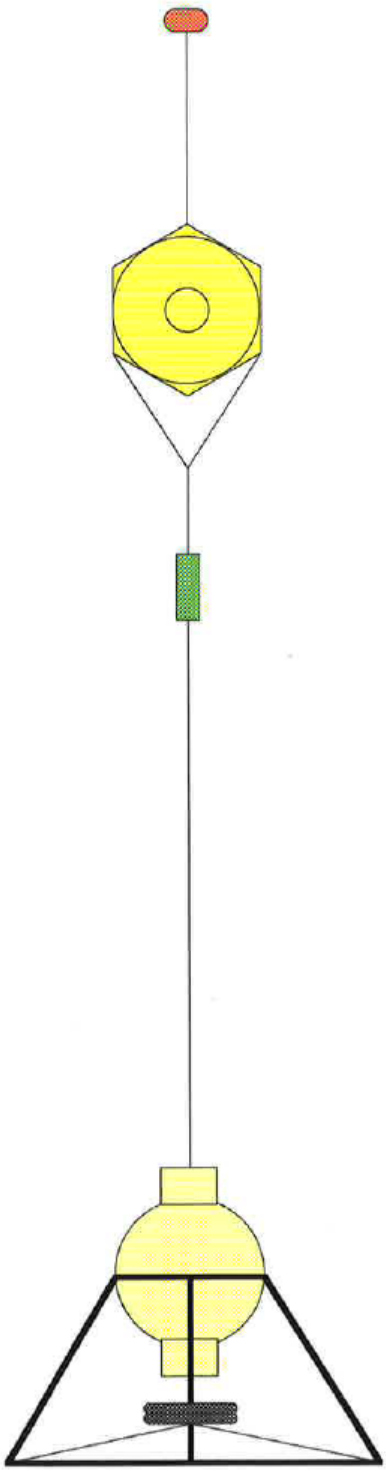
Z- Pulse sensor. sn 090

50.0 m

IES. sn 243

Water depth. 4267 (uncorrected)

PROJECT: AGULHAS CURRENT C PIES (P -4)



Deployed 12 April/16

Recovered _____

Target position :35° 14.72' S
28° 37.488' E
depth 4400 m

1-17" glass float

Anchor drop 35° 14.338' S
28° 37.4348' E
Depth 4395 m

Z- Pulse sensor. sn 22

Xponder CMD 0623 Z
traced to bottom 4410 m @07:19 z
clear cmd received

50.0 m

IES. sn 245

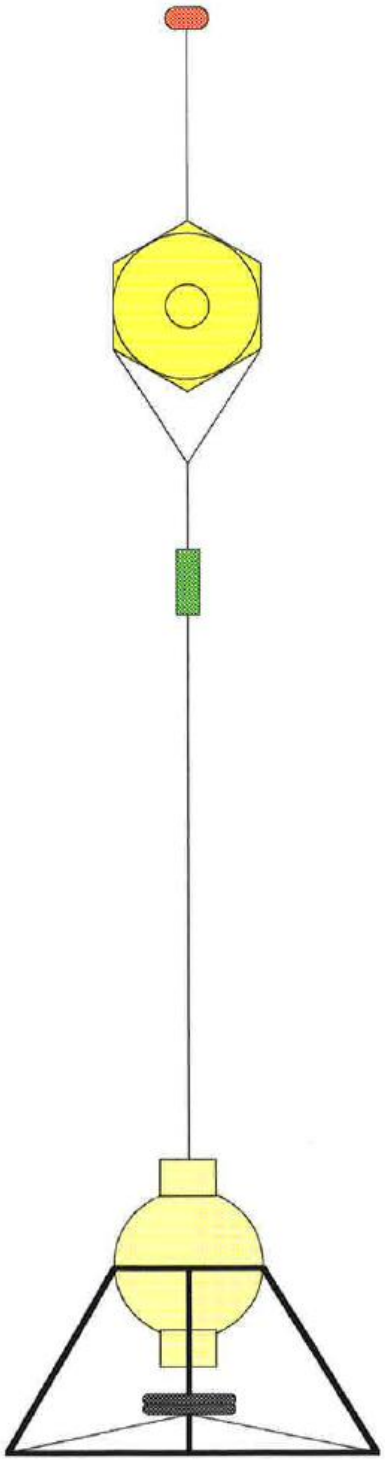
Water depth. 4395

PROJECT: AGULHAS CURRENT C PIES

Site "B" (P -5)

Deployed	Recovered
11 April/16	_____

Anchor drop 35° 44.100' S
28° 54.033' E
Depth 4563 m
deployed @ 07:17 z



1-17" glass float

software not aaccepting water depth correctly. reset to 4600 m.
tried old deck box and xdcer-nothing ?
Lost??

Z- Pulse sensor. sn 20

Xpond command 0923
lost signal ~2700 m

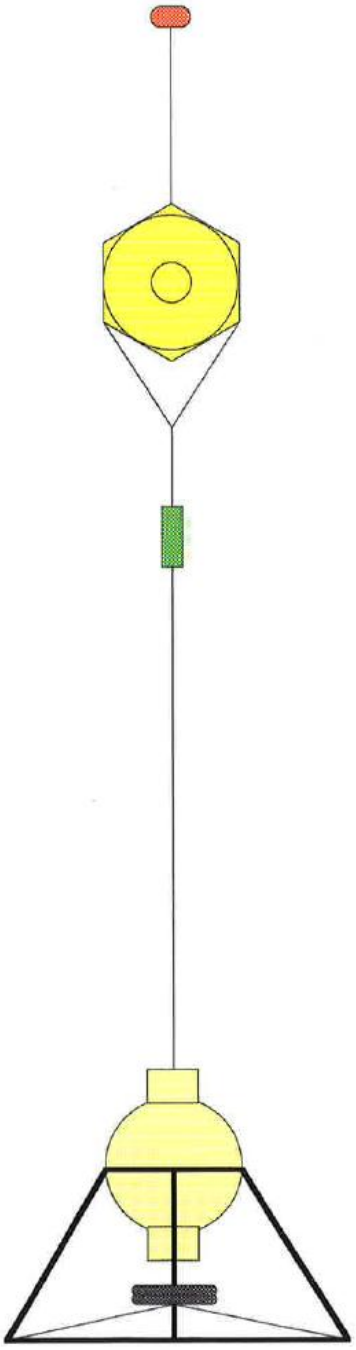
50.0 m

IES. sn 247

Water depth. 4608 (uncorrected)

PROJECT: AGULHAS CURRENT C PIES (P -5-B)

Deployed	Recovered
11 April/16	_____



1-17" glass float

Z- Pulse sensor. sn 19

50.0 m

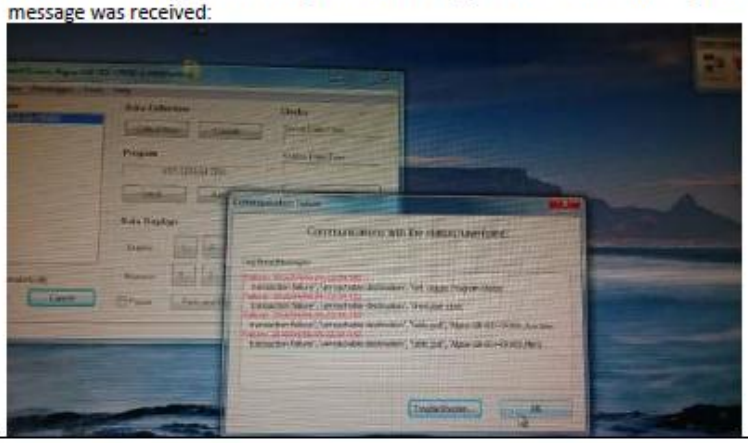
IES. sn 246

Water depth. 4580 m (uncorrected)

Anchor drop 35° 39.470' S
28° 51.280' E
Depth 4580 m
deployed @ 16:46 z

Moved 5 nm back up the line
to avoid acoustic contamination
with P-5. in case it is still pinging.
Xpoder 1635 Z
(threshold@ 10, traced to 4466 m)
moved deck box, one sensible depth=4587m
lot of noice.
WILL NOT BE ABLE TO PICK UP C_PIES
ON THE "ALGOA"
Last clear depth :4466 m A2 17:52 z

Annexure 2: Electronics Log (Mfundo Lombi)

Date	Time	Activity	Resp Person/s	Recommendation/Observations
Leg 1				
07/04/2016	11:35	Left Q500 & had a safety drill after lunch		
	12:30	Started underway sampling to ASCA line- TSG & SDS. Problems running the MetPak Pro weather station, serial cabling between datalogger & PC ok. The following error message was received: 	ML	System functionality to be verified together with SAWS personnel (Peter Roux?) before cruises.
08/04/2016	09:00	CTDs Calibrations were conducted- the ship's SBE 9 was placed in a seawater bath with 8 MicroCATs (SBE 37SM) at 20 min intervals until all 54 MicroCATs were compared, files were logged as BTH00X in ops room's seasave software.	ML, MM & UM	A suitable "closed" container or system to be sourced, if these experiments will be done on-board in future.
	14:30	Calibration continued- ice packets were now placed in the bath, cooling the seawater to 2.6°C and repeating the calibration process as above.		

				
09/04/2016	08:18	Mooring B recovered (elliptical float with ADCP, 6 (of 8) MicroCATs, a current meter & acoustic release)	UM, DEA, SAEON & crew	
	10:30	Calibrations again- SBE 9 + recovered MicroCATs, after data was downloaded from recovered units- the calibration had to be CANCELLED @ 11:00, due to time constraints. 18 kHz transducer depth output was incorrect- showing a depth of around 4.6m in a 1000+m area; rebooted the ES 70 PC and cycled power through GPTs. All ok again.	ML, MM & UM ML	
	11:30	SBE 9 package mounted back on the rosette frame & prepared for a test cast.	ML & MM	
	12:42	CPIES P1 deployed & triangulated, ship's echosounders switched off to aid triangulation.	UM	
	14:30	CTD test cast CTD001 to a max depth of ~ 720m, wire out of 1144m @ P1 position (until 15:26).	MM, ML	CTD unit dragged by the strong currents. CS suggested adding more weights.
	18:00	Over the side SBE 9/11 cast with 15 MicroCATs mounted on the rosette frame using ratcheted straps (STN001). Spikes occurred on all sensors during downcast @ 551m.	ML, MM & UM	

		 **Unsupported modem error message were observed on seasave, with the CTDs package @ 900m of up cast.** (until 19:52). SDS Exported data doesn't show the depth sounder readout.	ML	In date & enough CTD system spares needed to assist fault-finding by elimination, for these types of faults. STS to be notified for fixing.
	20:40	Chief Engineer (CE) picked up that the TSG pump was off & he restarted it.	CE	
10/04/2016	11:21	Mooring B deployment	UM, DEA, SAEON & crew	

	12:08	Triangulation commenced & finished @ 12:55.		
	14:25	Mooring A recovered.	UM, DEA, SAEON & crew	
	16:33	Mooring A deployed.	UM, DEA, SAEON & crew	
		Drifters deployed @ 17:33; 17:51; 18:31	GL	
11/04/2016	04:40	Drifter deployed	GL	
	09:17	CPIE P5 deployed @ 4608m.	UM, DEA, SAEON & crew	
	09:20	Triangulation. No comms with P5	UM, DEA & SAEON	
	13:54	Calibrations CTDs (SBE 9/11 & MicroCATs) deployed, STN002. (until 15:45)	UM, MM & ML	
	18:33	V/L arrived @ position 5 meters north of P5	Nav Off	
	18:46	CPIE (P2) deployed on "new P5" positioned, since P5 was "lost"?	UM, DEA, SAEON & crew	
12/04/2016	08:00	ADCP & MetPak Pro WS PCs went off, due to a power dip? Switched back on.	NN & ML	Is power supplied to the acoustic lab ADCP rack sourced from the UPS or not? If not, it needs to be corrected.
	08:05	TSG pump went off, due to **Uv1** (Refer to pg. 114, 139 of AC drive manual- Protection Functions; Fault Conditions) error on its Varispeed drive. CE restarted. [**Momentary Power Loss; DC Bus Under voltage condition**]	LB, ML & CE	Second Engineer noticed a power dip when winch hydraulics were switched on- suspects this affected power supplied through the pump.

	08:20	P4 deployed.	UM, DEA, SAEON & crew	
	09:30	Pump tripped again on the same drive error Uv1	ML & CE	
	10:45	Calibrations CTDs STN003 deployed; max depth 1000m (until 12:33)	MM, UM	Aircon units dissipating heat to the hydrodeck & the CTD, it is suggested that these be moved to the upper deck/s.
	15:44	P3 deployed	UM, DEA, SAEON & crew	
	18:10	Calibrations CTDs STN004 deployed; max depth 1000m (until 19:54)	MM & UM	
13/04/2016	12:22	Tall mooring G deployed		
	08:15	Mess room light above officers table, in the right corner became faulty- LED tubes removed.	ML	
14/04/2016	10:58	Tall mooring F deployed		
15/04/2016		TSG salinity trace uncharacteristic & noisy- suspicion of conductivity cell drift. Also unwanted debris collects in the instrument, due to absence of filtering within the seawater intake & supply system.	ML	CS suggested regular cleaning of the TSG's SBE 45 jacket.
	15:35	Mooring D recovered (13:20 – 15:35)		
	19:25	CTD STN005 deployed (19:20 – 21:13), unsupported modem messages error popped up & some bottle trigger confirmations didn't show up on seasave.		
16/042016	06:30 09:40	TSG pump tripped again. The CTD winch electrical termination was redone- the two conductors used were changed with the other pair & a new pigtail connected. But problems persisted when a test cast CTD002 was performed- the modem error message came up @ ~ 200m, all	ML	

<table>
<tr><td></td><td></td><td>sensors spiked @ 270m & bottle confirmations intermittently received at variable depths & at times not received (bottle 7).</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>17/04/2016</td><td></td><td>Mooring C recovered (07:00 – 11:08).</td><td></td><td></td></tr>
<tr><td></td><td>08:00</td><td>Cut off 25m off the hydro-winch cable & re-terminated. Cable tests results:
<table>
<tr><th>End Cable – Hydro-winch</th><th>Patch-Ops room</th><th>Continuity (Ω)</th><th>Insulation Resistance (MΩ)</th></tr>
<tr><td>Black</td><td>Yellow</td><td>62.4</td><td>220</td></tr>
<tr><td>Red</td><td>Green</td><td>63.2</td><td>220</td></tr>
<tr><td>W1</td><td>Black</td><td>63.2</td><td>220</td></tr>
<tr><td>W2</td><td>White</td><td>64.1</td><td>220</td></tr>
<tr><td>W3</td><td>Red</td><td>64.0</td><td>220</td></tr>
<tr><td>W4</td><td>N/C</td><td>N/C</td><td>220</td></tr>
<tr><td>W5</td><td>Blue</td><td>64.0</td><td>220</td></tr>
</table></td><td></td><td></td></tr>
<tr><td></td><td></td><td>CTD003 test deployed (16:22 – 17:11) & everything worked fine except the modem error message that came up @ 330m, all bottle confirmations received.

A second CTD004 test was cast, after the slip ring was replaced & the error message shoed @ 280m (18:40 – 19:29).</td><td></td><td></td></tr>
<tr><td colspan="5">Leg 2</td></tr>
<tr><td>18/04/2016</td><td></td><td>Mooring C deployed (08:37 - 10:13).</td><td></td><td></td></tr>
<tr><td></td><td></td><td>Swapped the CTD DU & did another test cast CTD005 (12:10 – 13:12) - CTD works & bottle closure confirmations are received, but the errors from the carousel were still showing @ 282m- a maximum depth of 1586m was reached with 1778m of wire out, safety marker placed on the wire for max permissible depth sampling.

Another dip CTD006 (13:28 – 13:46) was done after the acquisition computer was restarted, error messages continued to show @ 263m.

The VPW was prepared for CTD use by cutting off 63m of its kinked section, mechanically & electrically terminating the cable after insulation resistance and continuity tests were performed. The CTD package was then connected to this winch</td><td></td><td>A full-on CTD backup package is needed & must be carried on-board the vessel, with accompanying accessories.</td></tr>
</table>

<table>
<tr><td></td><td></td><td>and a test cast CTD007 done to 1000m (18:15 – 18:56), error messages appeared again during up cast at 200m. Cable tests results:
<table>
<tr><th>End Cable - VPW</th><th>Patch-Ops room</th><th>Continuity (Ω)</th><th>Insulation Resistance (MΩ)</th></tr>
<tr><td>Black</td><td>Yellow</td><td>67.5</td><td>220</td></tr>
<tr><td>Red</td><td>Green</td><td>68.5</td><td>220</td></tr>
<tr><td>W1</td><td>Black</td><td>68.5</td><td>N/C</td></tr>
<tr><td>W2</td><td>White</td><td>69.5</td><td>220</td></tr>
<tr><td>W3</td><td>Red</td><td>69.4</td><td>220</td></tr>
<tr><td>W4</td><td>N/C</td><td>N/C</td><td>220</td></tr>
<tr><td>W5</td><td>Blue</td><td>69.5</td><td>220</td></tr>
</table></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>19/04/2016</td><td></td><td>Mooring C3 recovered (08:12 – 08:40).</td><td></td><td></td></tr>
<tr><td></td><td></td><td>Mooring C3 deployed (10:15 – 10:30).</td><td></td><td></td></tr>
<tr><td></td><td></td><td>V/L heading to PE.</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>20/04/2016</td><td></td><td>Liaised with STS in an attempt to fix CTD malfunction- gather DUs & carousel serial number and sent sample data.

Performed further fault-finding on the system- modem error message came up during a deck test & there were issues with bottles triggering, when the carousel cable was replaced the message didn't appear, suggesting that the cable was at fault. System to be tested when the vessel goes out for the second leg on Saturday.</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>23/04/2016</td><td>10:00

14:00</td><td>Resolved the MetPak Pro w/s parameters' display issue with assistance from Peter Roux, once the V/L docked in PE for the changeover. Numeric display table definitions were recreated, the Humidity readings are still not showing though (0.00).

Assisted the DEA biological team in setting up the oblique bongo system- drilled holes on the side of the bongo frame to accommodate the flow meter brackets that are configured differently.</td><td></td><td></td></tr>
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<tr><td>23/04/2016</td><td></td><td>Discussions regarding railway line weights organised for the CTD- concerns about the rust which could contaminate the instrument's sensors & bottle samples. It was eventually decided that the rusted railway line weights be removed from the CTD package frame, after they were mounted by the SAEON coordinator.</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>24/04/2016</td><td>10:00 – 14:00</td><td>The STW was mechanically & electrically terminated, following the removal of a previous mechanical restraint by the engineers during refurbishment work on the spooling sheave block, mounted on the crane boom. The termination was load tested to 600kg & electrical tests were done as follows:
<table>
<tr><th>End Cable - STW</th><th>Patch</th><th>Continuity (Ω)</th><th>Insulation Resistance (MΩ)</th></tr>
<tr><td>Black</td><td>Black</td><td>17.07</td><td>220</td></tr>
<tr><td>Red</td><td>Red</td><td>18.00</td><td>220</td></tr>
<tr><td>W1</td><td>N/C</td><td>N/C</td><td>N/C</td></tr>
<tr><td>W2</td><td>White</td><td>18.00</td><td>220</td></tr>
<tr><td>W3</td><td>Yellow</td><td>18.00</td><td>220</td></tr>
<tr><td>W4</td><td>Green</td><td>18.00</td><td>220</td></tr>
<tr><td>W5</td><td>Blue</td><td>18.12</td><td>220</td></tr>
</table></td><td></td><td></td></tr>
<tr><td></td><td>20:22</td><td>The regulator valve on one of the pCO_2 gas cylinders (STD4) broke off during an attempt to open it, the mechanism had seized due to exposure to the elements and  there was no gas coming through the line.</td><td></td><td>Suitable protective enclosure is required for the gas standards' cylinders, to ward off corrosion & oxidation.</td></tr>
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<tr><td></td><td></td><td>Due to the continual sea debris and corrosion collecting in the underway seawater sampling instrument (TSG) during leg 1, CS on leg 2 decided to cancel biological sampling. This jeopardized the underway biological sampling planned for the second leg.</td><td></td><td>Investigate whether the underway seachest & piping are degrading.
Adequate filtering system is also urgently needed.</td></tr>
<tr><td></td><td></td><td>V/L steamed to a position adjacent to the ASCA line, of 500m depth; the first test cast CTD008 was performed with a replacement carousel cable, error message showed @ 323m (23:30 - 00:07).</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>25/04/2016</td><td></td><td>A second CTD test cast CTD009 was done after the carousel was swapped out (02:10 – 02:36), and a third cast done CTD010 after the carousel cable was replaced once again (03:20 – 03:37). In all the three dips the "Unsupported Modem Messages" error came up, just after 300m.</td><td></td><td></td></tr>
<tr><td></td><td></td><td>SMII camera system connected to the STW winch, geared & deck tested with success. A cast was successfully completed (15:50 – 16:20).

SMII station T3 – 6 (17:11 – 17:38) went well.</td><td></td><td></td></tr>
<tr><td></td><td></td><td>Informed by the Bosun that they had removed the LTW termination, attached a rope at the end of the cable & spooled it on the drum for pulling a mini-dredge. The mini-dredge was then deployed (18:12 – 18:23) also at T3 – 6.

Another mini-dredge deployment was done at station T3 – 5 (19:06 – 19:16)</td><td></td><td>All involved should notify the ET before making changes to on-board equipment.</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>27/04/2016</td><td></td><td>Assisted the engine room staff in transferring the funnel & life boat light's wiring and switch from an old control enclosure to another one, next to the VPW.</td><td></td><td></td></tr>
<tr><td></td><td></td><td>Leg 2 cancelled due to foul weather & sea state!</td><td></td><td></td></tr>
<tr><td colspan="5">Leg 3</td></tr>
<tr><td>28/04/2016</td><td>22:00</td><td>V/L set sail for CT- underway sampling resumed.</td><td></td><td></td></tr>
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Annexure 3: Wash Up Meeting Notes

- The Air-con fan situated by the CTD generates a lot of heat especially when working in humid conditions. The temperatures recoreded by the MicroCats before a calibration cast recorded temperatures in excess of 30° C. This is on the limit of the CTD sensors recommended temperature range and as a result the scientists requested that this air-con unit be moved away from this area.
    - This air-con unit has already been scheduled to be moved one floor up. This move will take place within the year.
- General housekeeping: during the cruise scientists noticed mould and mildew growing in the showers. This could be caused by insufficient ventilation in the scientists toilets and showers. SMIT are to look into this.
- The galley staff complained that the scientists weren't cleaning up after themselves and not returning coffee mugs.
- Mfundo warned that the Teflon on the small towing winch is wearing out and will need to be fixed/ replaced in the near future.
- The MiliQ system needs to be used with caution due to the poor water quality entering the system. It was also recommended that scientists take extra replacement filters for future cruises
- SMIT stated that a new sewage system is to be fitted in July. This will help prevent (but not completely stop) nasty smells on the ship.
- Mfundo asked the chief electrician to look for faults on ADCP PC rack, he mentioned that during the cruise the system kept tripping.
- The TSG was continuously clogged with dirt during the cruise. SMIT is looking into adding an inline filter to the system to prevent this in future.
- During the cruise a scientific staff member and a incident on deck. SMIT asked that IOD forms are to be completed when there is an incident on the ship and as soon as possible.
- During the cruise the weather station on the ships mast wasn't working properly and is to be fixed before the next cruise.