

SOC COM Technical Report Series



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SOC COM Biogeochemical Profiling Float Deployments from SA Agulhas II AGU027

Ship and Expedition ID: SA Agulhas II (Gough Island); #AGU027

Dates: 7 September 2017 – 11 October 2017

Cruise identifier (CCHDO and SOCCOM): 91AH20170907

SOC COM Cruise Number: 17

Technical Report 2017-1

**National Science Foundation Polar Programs PLR-1425989 (Princeton University);
NASA NNX14AP49G; U.S. Argo Program (NOAA)**

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https://socom.princeton.edu/sites/default/files/imagesfiles/SOCCOM_2017-1_91AH20170907_Gough_.pdf

SOCCOM float deployments from SA Agulhas II ('Gough')
12 October 2017

Cruise information:

7 September 2017 – 11 October 2017
Cape Town to Cape Town (Gough Island and Tristan da Cunha)
Chief Scientist: Tahlia Henry (University of Cape Town)
Ship: SA Agulhas II
Captain: Gavin Syndercombe
Cruise identifier: (none)
SOCCOM and CCHDO cruise identifier (expocode): 91AH20170907

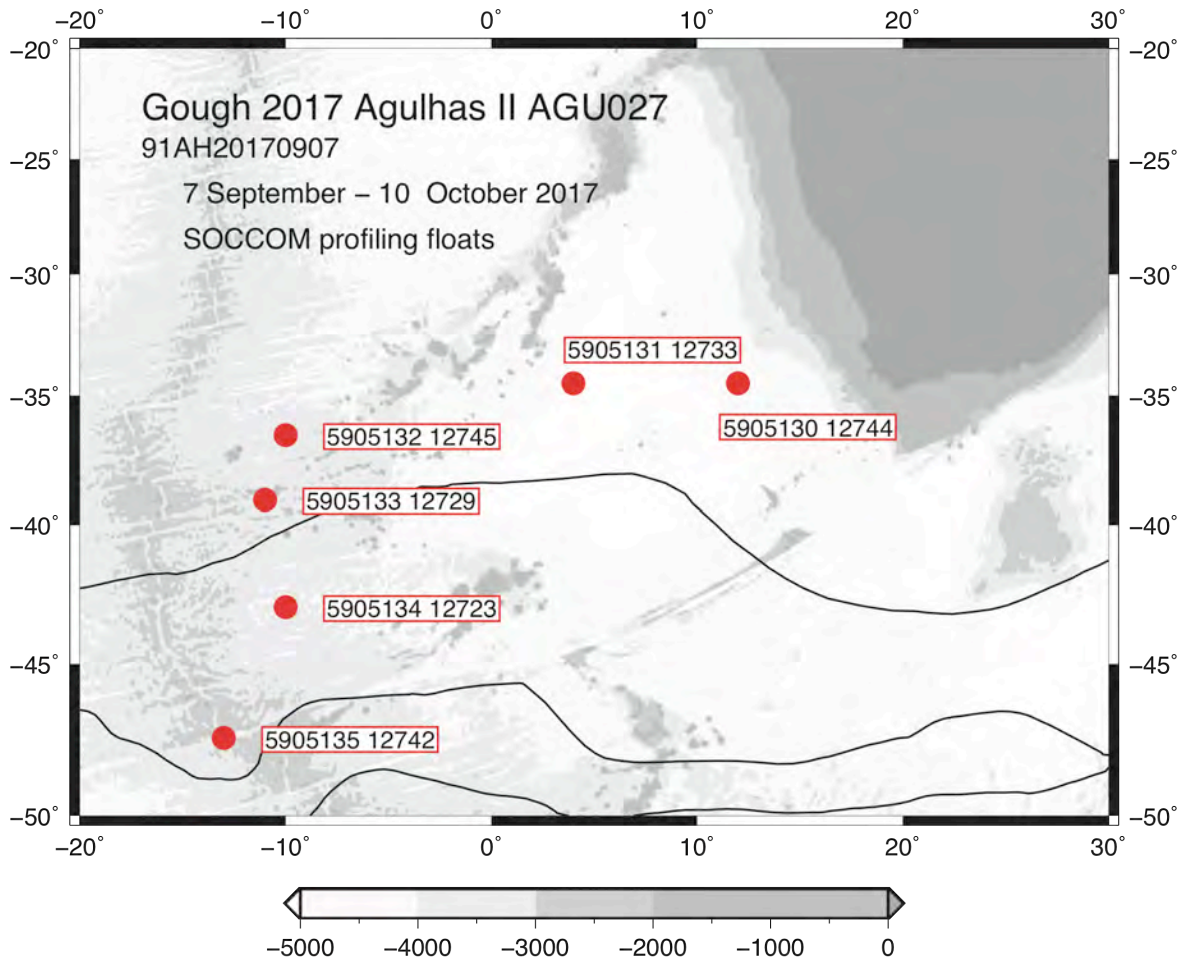


Figure 1. SOCCOM float deployments and CTD stations from SA Agulhas II Gough Island relief cruise (7 September 2017 – 11 October 2017). Light curves are the standard Orsi et al. (1995) fronts (subtropical, subantarctic, polar and southern boundary, from north to south).

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Table 1: SOCCOM-17 SA Agulhas II Gough Island float deployment details.

SOCCOM Float Deployment Log Sheet Oct. 11, 2017

Number of SOCCOM floats:	6
Cruise Name or Nickname:	Gough Island
Ship:	SA Agulhas II (South Africa)
Cruise number:	AGU027
Expocode:	91AH20170907
Chief Scientist or Cruise POC:	Tahlia Henry tahliahenry@gmail.com (C.S.) Isabelle Ansonge isabelle.ansonge@uct.ac.za (POC)
Departure Port	Cape Town
Departure Date	Sept. 7, 2017
Final Port	Cape Town
Final Date:	Oct. 11, 2017
SOCCOM responsible person onboard:	Melissa Miller melissa-miller@ucsd.edu
SOCCOM UW Engineering port set-up:	Rick Rupan rupan@uw.edu

	Float WMO ID	Float UW ID	Sensors*	Sta. #	Deployment Date	Deployment Time	Lat.	Lon.	Deployer
1	5905130	12744	CApex OpFN	1	9/9/17	08:47 GMT	34S 30.102	11E 59.930	Melissa Miller
		Comments: ‘Marine Mustang’. Our first deployment went off smoothly. Bosun and crew were champs, it was lovingly lowered slowly into the ocean as we steamed off station.							

2	5905133	12729	CApex OpFN	2	9/16/17	0600 GMT	39 03.179S	11 00.061 W	Melissa Miller
		Comments: aka Pixel is away.							
3	5905134	12723	CApex OpFN	3	9/18/17	23.27 GMT	43 00.037S	10 00.115 W	Melissa Miller
		Comments: "Titans" It had a slightly more rough entry than desired. A wave dropped away and it went the last foot or so to the water with a bit of a slap, though at an angle, not straight on. Then the top came down away from the ship, whereas usually the top comes down towards it. I would say it was hardly worth noting anything irregular about the deployment, but I'm noting it anyway. Fingers crossed for comms and a nice profile.							
4	5905135	12742	CApex OpFN	4	9/20/17	08:10 GMT	47 29.986S	13 00.197 W	Melissa Miller
		Comments: 'Zora'. Rough seas this morning but the deployment went smoothly. Here's a snap of the moment of entry.							
5	5905132	12745	CApex OpFN	5	10/5/17	22:35 GMT	36 34.310S	10 00.168 W	Melissa Miller
		Comments: 'Freddy Cougar' You'll notice we're farther south than originally planned. The captain cut off the corner, so the cruise track doesn't take us to 34S until we're farther east. Calm weather, smooth deployment. Following seas, so we deployed the float and then turned to head on our way. The bridge assures me it was a wide turn with no risk of hitting the float.							
6	5905131	12733	CApex OpFN	6	10/8/17	15:32 GMT	34 30.065 S	4 00.081 E	Melissa Miller
		Comments: 'Olympians' was deployed. The base of the box hit the water a bit harder than I'd like, but only just.							

I = ice enabled

Ice > 1 yr: stay out of ice for first yr

O = oxygen sensor

N = nitrate sensor

F = FLbb

p = pH

A = Apex

CApex = carbon fiber hull Apex

Nav = Navis (Seabird)

Table 2. SOCCOM float sensor information (D. Swift, UW)

```

#----- # $Id:
IsusInventory.mbari,v      1.55      2017/08/17      18:27:25      swift      Exp      $
#----- # For

Soccom project:
# Wrcld  Apfld SbelD  Isusld  OptodelD  Flbbld  DeploymentOpportunity
#-----
8047  12744  9268   780   2732  4429 (GoughIslandAghulas) PtvChk  48"CfApf9iSbe41cp
8048  12733  9280   784   2727  4430 (GoughIslandAghulas) PtvChk  48"CfApf9iSbe41cp
8050  12745  9279   783   2729  4432 (GoughIslandAghulas) PtvChk  48"CfApf9iSbe41cp
8051  12729  9269   781   2725  4433 (GoughIslandAghulas) PtvChk  48"CfApf9iSbe41cp
8052  12723  9281   785   2653  4434 (GoughIslandAghulas) PtvChk  48"CfApf9iSbe41cp
8053  12742  9282   786   2677  4435 (GoughIslandAghulas) PtvChk  48"CfApf9iSbe41cp
    
```

Table 3. SOCCOM shipboard measurements (L. Talley, SIO)

Measure ment	Institu- tion	Contact name & Email	Onboard or ship samples	Analysis Lab	Date Rec'd	Date Archived	Archive location
SOCCOM REQUIRED CALIBRATION OBSERVATIONS							
CTD profile	UCT	Tahlia Henry tahliahenry@gmail.com	onboard	UCT	Oct. 12, 2017		
Optical profile	SOCCOM and UCT	Boss (BB2F #2) emmanuel.boss@umaine.edu	onboard	SOCCO M and UCT	Oct. 12, 2017		
Rosette salts	UCT	Tahlia Henry tahliahenry@gmail.com	onboard	UCT	Oct. 10, 2017		
Rosette O ₂	SOCCOM SIO ODF	Melissa Miller (SIO ODF) Melissa-miller@ucsd.edu	onboard	SOCCO M SIO ODF	Oct. 10, 2017		
Nutrients	SOCCOM SIO ODF	Melissa Miller (SIO ODF) Melissa-miller@ucsd.edu	onboard	SOCCO M SIO ODF	Oct. 10, 2017		
pH	SOCCOM	Andrew Dickson	Ship to	SIO			

		adickson@ucsd.edu	SIO	Dickson			
Talk	SOCCOM	Andrew Dickson adickson@ucsd.edu	Ship to SIO	SIO Dickson			
HPLC	SOCCOM SIO	Susan Becker sbecker@ucsd.edu	Ship to ODF	NASA Goddard			
POC	SOCCOM SIO	Susan Becker sbecker@ucsd.edu	Ship to ODF	UCSB			
OTHER USEFUL OBSERVATIONS FOR SOCCOM PROGRAM							
TSG underway	UCT	Tahlia Henry tahliahenry@gmail.com	onboard	UCT	Oct. 12, 2017		
pCO2 underway	UCT	Tahlia Henry tahliahenry@gmail.com	onboard	UCT			

Table 4. Shipboard personnel associated with SOCCOM floats and stations

Gavin Syndercombe	Captain	SA Agulhas II
Craig DeBeer	Chief Mate	SA Agulhas II
Lionel Alexander	Bosun	SA Agulhas II
Tafique Lotters	Chippie (2 nd to Bosun)	SA Agulhas II
Tahlia Henry	Chief Scientist, CTD, salts	Student, U. Cape Town
Melissa Miller	Marine technician, nutrients, oxygen, floats	Shipboard Technical Support, Oceanographic Data Facility, SIO/UCSD
Caitlin Kelly	Student	U. Cape Town
Mark Weston	Student	U. Cape Town
Lelethu Nohay	Technician	Council for Scientific and Industrial Research (CSIR)

SOCCOM Shipboard measurements ‘metadata’ (R. Key, Princeton U.)

The metadata ‘readme’ is the information that appears in the header of each shipboard measurement data file.

<http://socompu.princeton.edu/DeploymentCruises/Atlantic/Agulhas II/2017/91AH20170907/General Documentation/README.91AH20170907.txt>

Table 5. Float and shipboard data servers

Server	url	Purpose
Floatviz (MBARI)	http://www.mbari.org/chemsensor/floatviz.htm	Float profile data including all sensors, quality controlled data
U. Washington Argo float server	http://runt.ocean.washington.edu	U.W. float summaries, diagnostics, engineering data, profiles
U.S. GODAE Argo GDAC	http://www.usgodae.org/argo/argo.html	Real-time and delayed-mode Argo data server (U.S.), high resolution T/S
Coriolis (Ifremer) Argo portal	http://socom.ucsd.edu/floats/SOCCOM_data_ref.html	Float metadata and graphics
JCOMMOPS Argo data server	http://argo.jcommops.org/ (links to US GODAE for data access)	Real-time and delayed-mode Argo data server (international), high resolution T/S
CCHDO (CLIVAR and Carbon Hydrographic Data Office)	http://cchdo.ucsd.edu/	CTD and discrete rosette sample data (calibration), to be listed with A10 cruises
NASA Seabass	http://seabass.gsfc.nasa.gov	HPLC and POC discrete samples; bio-optical profiles

Narrative.

Organization.

This cruise was organized jointly with the University of Cape Town's Dr. Isabelle Ansorge, who arranged for SOCCOM to deploy from the ship and importantly provided the CTD/rosette and autosal support, including the group of experienced sea-going students who managed the shipboard data collection and CTD, headed by Tahlia Henry, Chief Scientist for the expedition. One SOCCOM scientist, Melissa Miller from the Oceanographic Data Facility at SIO

Float deployment locations.

6 nominal float locations were selected prior to the cruise.

The track from Cape Town to Tristan da Cunha lies roughly along the repeated SAMOC and WHP/GO-SHIP section A10. The track southward from Tristan lies roughly along the mid-Atlantic Ridge, and WHP/GO-SHIP section A14. These sections were used for guidance for float deployment locations.

Three floats were designated for deployment along this segment, and three floats along the meridional section southward to Gough Island and from there south to the Subantarctic Front.

Regimes: Benguela Current, Cape Basin, S. Atlantic subtropical gyre, S. Atlantic Subantarctic Zone, S. Atlantic Polar Frontal Zone

The subtropical front lies between Tristan and Gough Islands. We requested the thermosalinograph measurements to detect the location of the front.

Pre-cruise preparations.

Rick Rupan tested and prepped the 6 SOCCOM floats in Cape Town before the cruise and loaded them on the ship. All floats tested fine.

Floats.

All floats were ballasted for subtropical waters. All have carbon-fiber hulls, which allows them to reach 2000 m, unlike standard BGC-Apex floats with subtropical ballasting.

All of this cruise's floats (all Apex) were encased in cardboard boxes. With the ship moving at 1-2 knots, the bosun and his team looped a rope through the box's handle and lowered it gently over the stern. This was the first SOCCOM cruise with all floats in boxes.

Float deployment initial issues:

All floats were deployed without incident close to the chosen locations and within the range of lats/longs that were provided.

Float UW ID 12729 (WMO ID xxxx) had a faulty pH sensor on its first profile, and the failure mode was such that it will not recover. Therefore the pH/Alk samples that were collected at this station will not be run, after float panel discussion determined that there would be little value in a single profile in this region.

Float UW 12745 (WMO ID xxxx) has some type of communications problem between the float controller and the pH sensor. The pH values that were returned are correct.

Shipboard measurements:

Methods:

CTD and FLBB: The CTD, winch, and software were operated by Tahlia Henry and Mark Weston, both students at the University of Cape Town (UCT).

The Wetlabs FLBB sensor, S/N 4399, was provided by the U. Maine (Emmanuel Boss) through SIO Oceanographic Data Facility (S. Becker and M. Miller).

The FLBB was added to the rosette and configured by Marcel Van den Berg (Department of Environmental Affairs (DEA)) during the load period. The sensor was relocated on the rosette after station 1 with direction from Dr. Emmanuel Boss, in order to get a longer unimpeded light path. A dark test of all optical sensors was performed by covering the light path and lowering the CTD to 7 meters for 5 minutes. Since there were no additional CTD casts during this cruise, this was done while the ship was near Tristan da Cunha Island.

Nutrients (nitrate, nitrite, phosphate, and silicate) were measured using a SEAL Analytical continuous-flow Auto-Analyzer (AA3) operated in the chemistry lab by Melissa Miller. Two sets of standards and one cadmium column were used over the course of the cruise. Primary and secondary standards, as well as reagents, were made up in deionized (DI) water. The ship's system worked perfectly during the cruise. Working standards were made up in low nutrient seawater (LNSW), brought from the US. Surface waters along the cruise route were too high in nutrient concentration to use for this purpose. Reference materials (RMNS) from Kanson were analyzed with samples from stations 2-6.

30ml of water was collected for each sample. Nutrients were sampled by Melissa Miller or Mark Weston. The AA3 and AACE software required troubleshooting throughout the cruise.

Dissolved oxygen was measured using an automated titrator designed at Scripps Institution of Oceanography and operated in the chemistry lab by Melissa Miller. Pre-made standards were run at regular intervals throughout the cruise, including right before analysis of samples at all stations. One batch of reagents was used over the course of the cruise.

Dissolved oxygens were sampled into 125ml glass flasks by Melissa Miller, Dr. Alan Boyd (DEA), or Caitlin Kelly (student, UCT). As this was the first sample taken from each bottle, leak tests were performed prior to collection of the sample.

Salinity samples were measured using a Guidline Portasal in the underway lab. On station 1, only 4 samples were taken. After discussion with Dr. Lynne Talley, it was decided to sample all bottles (24) on future casts. 250ml of water was collected and all samples were run by Tahlia Henry or Mark Weston after they had adjusted to lab temperature over 24 hours. OSIL IAPSO standard seawater batch P158 was used with each run. Salinities were sampled by Mark Weston or Caitlin Kelly.

Optical (HPLC/POC) samples were taken from Niskin bottles at the surface and chlorophyll maximum. 1-2L of water was sampled, and filtered immediately in the chemistry lab by Melissa Miller. Filters were then stored in the -80C freezer and shipped to SIO after the cruise in a liquid-nitrogen charged dry shipper. All HPLC and POC samples were taken by Melissa Miller.

pH/alkalinity samples will be shipped to the US for analysis by Dr. Andrew Dickson's lab at SIO. 500ml of water was collected, and poisoned with mercuric chloride before being sealed. Melissa Miller took all pH/alkalinity samples. The pH sensor on float 12729 (station 2) is not working, and the one on float 12745 (station 5) is malfunctioning. Samples from station 2 were dumped (will not be analyzed), by decision of the SOCCOM float panel.

Underway thermosalinograph.

Underway pCO₂.

Brief discussion and conclusion:

Tahlia Henry provided processed data from the CTD and other sensors mounted to the rosette. This will be further disseminated by the SOCCOM team, and combined with the various analyses taken from bottle samples. This will then be used to calibrate the sensors on the floats during their initial cast, and all subsequent casts over the lifetime of the float.

Issues/recommendations: All six floats were deployed successfully. Many thanks to Captain Gavin Syndercombe and Bosun Lionel Alexander and his team for the smooth operations. The ship itself is a great platform for science. There is sufficient lab space and facilities such as refrigerators, freezers, water, and power. Comforts such as speedy internet and cafe kiosks were much appreciated.

Operations were done in sea states ranging from calm to stormy, and all were performed safely. The order of stations changed due to weather and time concerns, but everything got done.

Chief Scientist Tahlia Henry was a perfect leader for the science on this cruise. She is known and respected by the crew. She answered endless questions before, during, and after sailing, and facilitated the sharing of data. The other members of the science party were also extremely helpful.

From start to finish, SIO's participation in this cruise was well accommodated by Dr. Isabelle Ansorge (UCT) and Tahlia Henry. Dr. Sarah Fawcett facilitated procurement of mercuric chloride, and loaned a vacuum pump and power transformer at the last minute. Acids and liquid nitrogen were procured at the UCT chemistry storeroom.

The three day load period was sufficient for setting up the lab and preparing the floats. However, there was no power in the chemistry lab for the first 1.5 days, which hindered the preparation of reagents and testing of equipment. Due to the ship's departure delay of one day, everything was ready to go before station 1.

We look forward to working on *Agulhas II* again during the Marion 2018 cruise. Three pallet boxes of gear have been put in storage in the East Pier warehouse for use on that cruise.

Outreach:

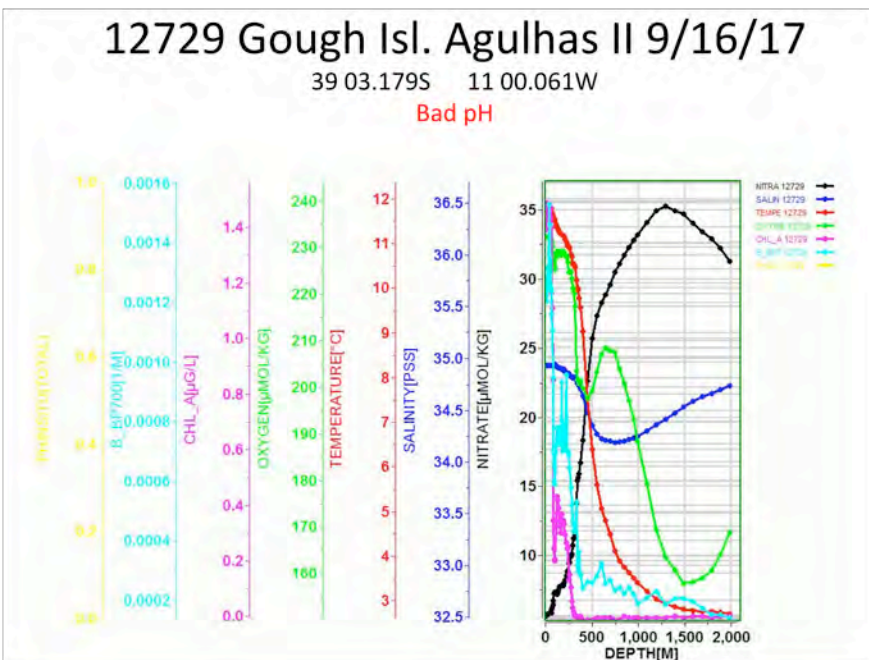
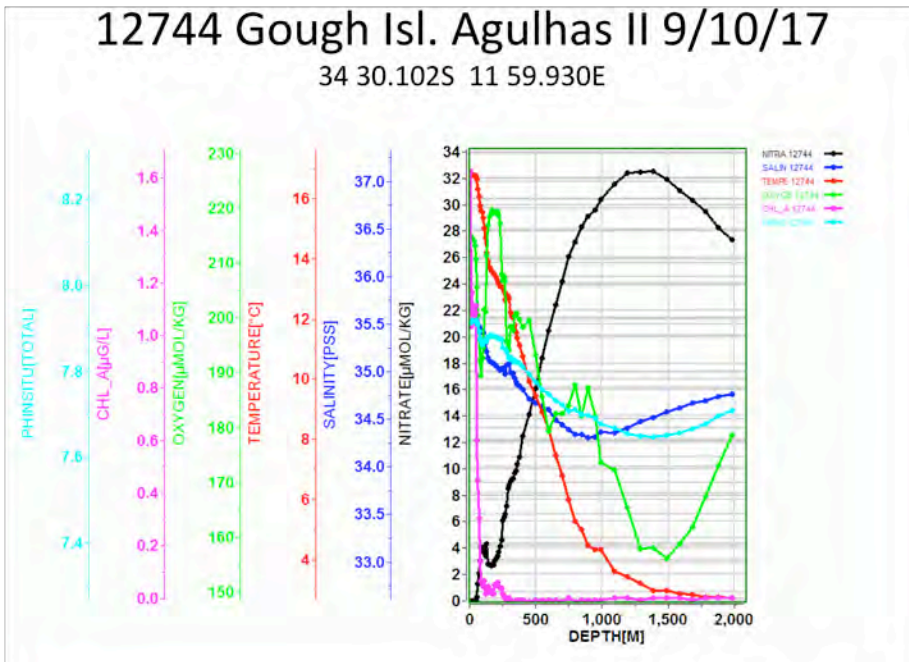
SOCOM representative Melissa Miller, from SIO Shipboard Technical Support, maintained a blog throughout the cruise, including the attached photos of some of the float deployments.

Blog address: <http://socomatsea.blogspot.com/> (see entries for 2017-September and October)

All floats were ,adopted' by schools:

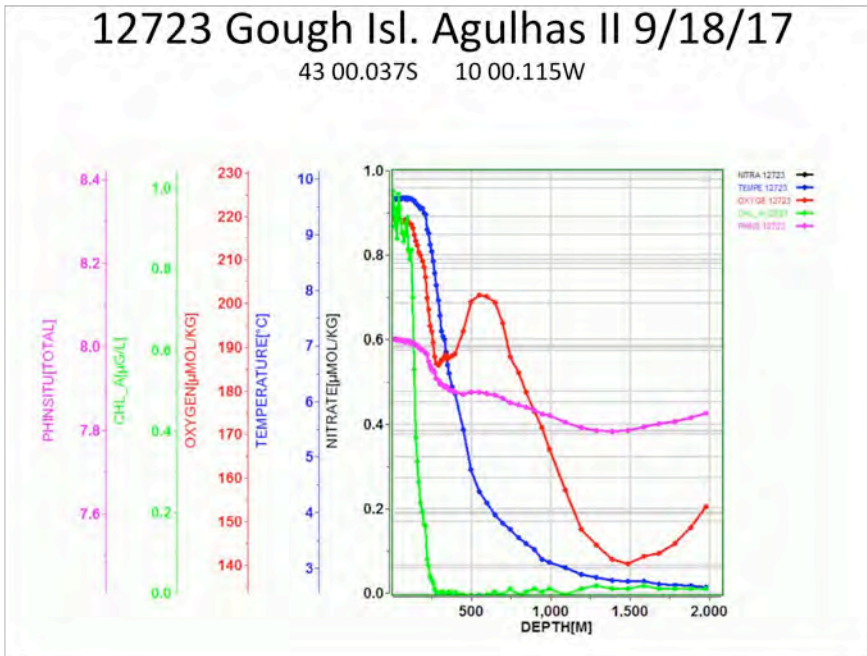
Float #	<i>Float Name</i>	Classes assigned
1	<i>Freddy Cougar</i>	Melvin Kreps Middle School, East Windwor - NJ
2	<i>Pixel</i>	Stanford Online High School
3	<i>Marine Mustang</i>	J.C. Parks Elementary
4	<i>Olympians</i>	Desert Ridge Middle School Albuquerque NM
5	<i>Titans</i>	"
6	<i>Zora</i>	Homeschool

SOCOM Float First Profiles



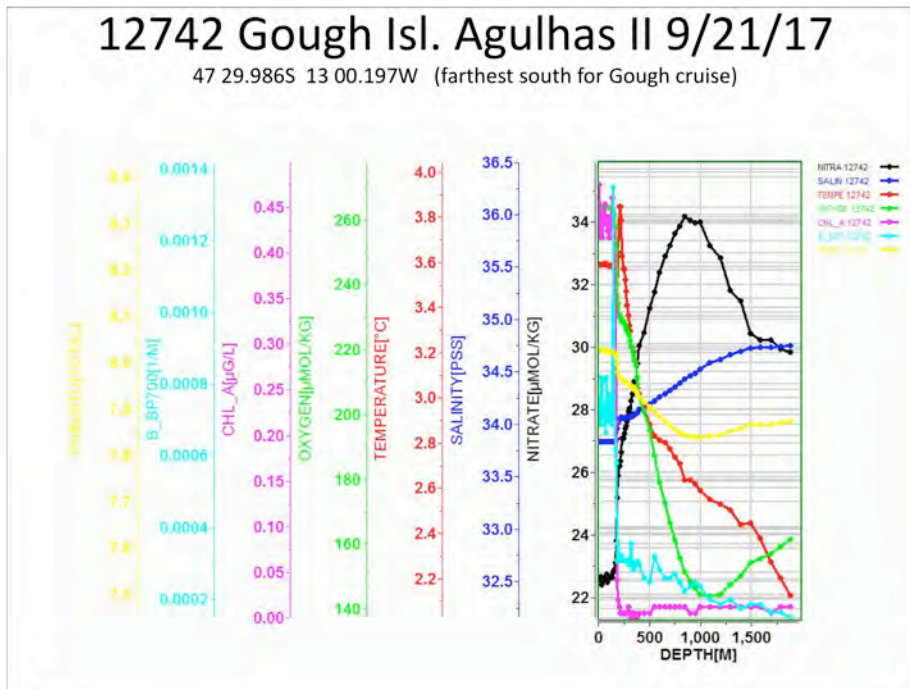
12723 Gough Isl. Agulhas II 9/18/17

43 00.037S 10 00.115W



12742 Gough Isl. Agulhas II 9/21/17

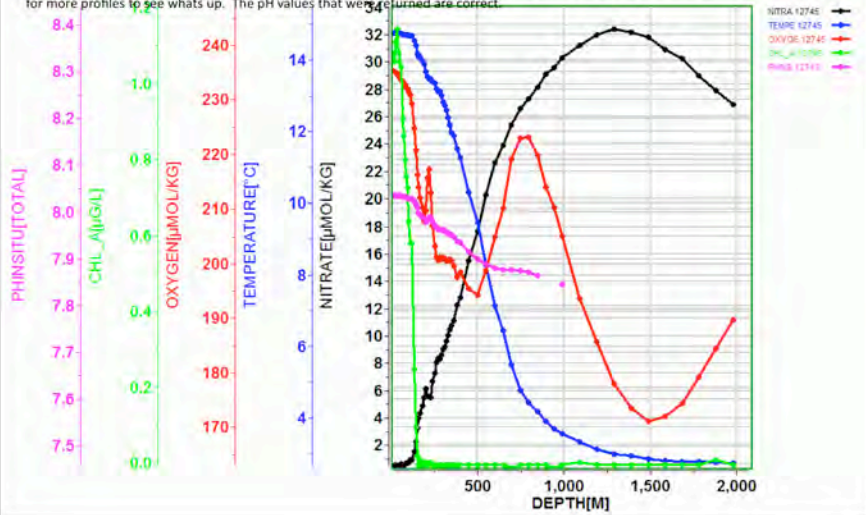
47 29.986S 13 00.197W (farthest south for Gough cruise)



12745 Gough Isl. Agulhas II 10/5/17

36 34.310S 10 00.168W

The first profile from 12745 (aka Freddy Cougar) is up. The sensors are all working correctly. There does seem to be a communications issue between the float controller and the pH sensor. The controller asked for data from 2000 m and up, but the pH sensor didn't start responding until 1000 m. That would seem to be a communications problem. I don't think we've seen that before. We'll just have to wait for more profiles to see what's up. The pH values that were returned are correct.



12733 Gough Isl. Agulhas II 10/9/17

34 30.065 S 4 00.081 E

