Argo National Report – South Africa

Report to Argo Steering Team Meeting: March 2014

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The South African Argo Program presently is one of deployment opportunities and educational outreach as opposed to procuring of floats and seeding the global Argo array. However, we are striving to develop projects and funding opportunities in that direction. Given South Africa's unique position geographically of bordering three oceans – The Atlantic, Indian and Southern Oceans – we are able to provide numerous deployment opportunities for Argo floats to the global array. We are also working on dynamic research programs and experiments using Argo floats to a) study physical forcing dynamics and b) contribute to the development of biogeochemical floats particularly in the Southern Ocean. The research groups currently involved in the South African Argo program are: The South African Weather Services (SAWS), Bayworld Centre for Research and Education (BCRE)[1], University of Cape Town (UCT)[2], the Department of Environmental Affairs (DEA)[3], The Council for Scientific and Industrial Research (CSIR)[4], The South African Environmental Observation Network (SAEON)[5], the Research Schooner *Lady Amber*[6] and the Nansen-Tutu Centre for Marine Environmental Research[7].

1. Status of implementation / Deployments undertaken in 2013:

Southern Ocean and South Atlantic Ocean:

Lady Amber Research Schooner – Decmber 2012-March 2013

26 SOLO floats: Woods Hole Oceanographic Institutde with Lady Amber (SOLO II WMO #'s: 1901620, 1901621, 1901623, 1901624, 1901601, 1901602, 1901603, 1901618, 1901619, 1901637, 1901638, 1901639, 1901640, 1901641, 1901642, 1901643, 1901644, 1901645, 1901646, 1901647, 1901666, 1901649, 1901650, 1901652, 1901653, 1901665)

Gough Island Cruise (RV SA *Agulhas II*) – September 2013

8 SOLO floats: Woods Hole Oceanographic Institute with UCT / DEA (SOLO I WMO #'s 1901651, 1901654, 1901655, 1901660, 1901656. SOLO II WMO #'s: 1901657, 1901658, 1901659)

5 ARVOR / PROVOR floats: University of Brest with UCT / DEA (serial #'s outstanding)

6 APEX floats: UK Met Office with UCT / DEA (serial #'s: 5557, 5558, 6616, 6617, 6618, 6619)

SANAE Cruise (RV SA *Agulhas II*) – November 2013-February 2014

5 SOLO floats: Woods Hole Oceanographic Institute with UCT / CSIR (SOLO II WMO #'s: 1901697, 1901698, 1901699, 1901700, 1901701)

11 ARVOR floats: University of Brest with UCT / CSIR (OIN: AR 1302, AR 1213, AR 1303, AR 1202, AR 1201, AR 1312, AR 1304, AR 1203, AR 1210, AR 1311, AR 1213)

2 PROVOR Bio-Argo floats: University of Brest with UCT / CSIR (OIN: 12S434, 12S35)

Indian Ocean:

ASCLME Alliance Cruise (RV *Algoa*) – April 2013

5 SOLO floats: WHOI with BCRE (WMO#'s: 1901676, 1901677, 1901678, 1901679, 1901680)

ACEP III Suitcase Cruise (RV *Algoa*) – July 2013

4 APEX floats: UK MetOffice with BCRE (WMO#'s: 1901309, 1901310, 1901311, 1901312)

Meteor Cruise – December 2013

5 APEX floats: CSIRO with ZMT-Bremen and BCRE (WMO#'s: 1901333, 1901334, 1901335, 1901336, 1901337)

East Coast Mooring Cruise (RV *Algoa*) – December 2013

3 SOLO floats: WHOI with BCRE (WMO#'s: 1901663, 1901664, 1901696)

Technical issues encountered and resolved:

None

Argo Data Management contributions:

None

Status of delayed mode quality control processes:

Not applicable

2. Present level of (and future prospects for) national funding for Argo including summary of human resources devoted to Argo:

Dedicated Argo funding to procure new floats to seed the global array is not currently available in South Africa, but it is a goal for the South African Argo group to work towards. Individuals from organisations (listed above) work on different projects involving Argo floats and have come together under the auspices of the South African Argo program to share knowledge, resources, cruise time where applicable and information regarding Argo.

3. Summary of deployment plans and cruise deployment opportunities for 2014:

Southern Ocean:

Marion Island Cruise (RV SA *Agulhas II*) – April/May 2014

3 floats: DEA (if ready for deployment)

14 Bio-Argo floats: LOV with UCT – to be deployed in 2 mesoscale eddies and along 2 transects

Gough Island Cruise (RV SA *Agulhas II*) – September 2014

3 floats: DEA (if ready for deployment)

available for deployments

SANAE Cruise (RV SA *Agulhas II*) – December 2014 / January 2015

available for deployments

Indian Ocean:

Walter Shoal (south of Madagascar – RV *Algoa*) – May-June 2014

available for deployments

East coast mooring cruise (RV *Algoa*) – June-July 2014

available for deployments

East coast mooring cruise (RV *Algoa*) – November-December 2014

available for deployments

Cape Town to India and Southern Indian Ocean(*Lady Amber* Research Schooner) – dates to be confirmed

available for deployments

Atlantic Ocean:

SAMBA Mooring Array (RV SA Agulhas II) – September 2013

available for deployments

Lady Amber Research Schooner – funding required to undertake voyage

10 floats: AOML with *Lady Amber* (plotted in green in Figure 1 below)

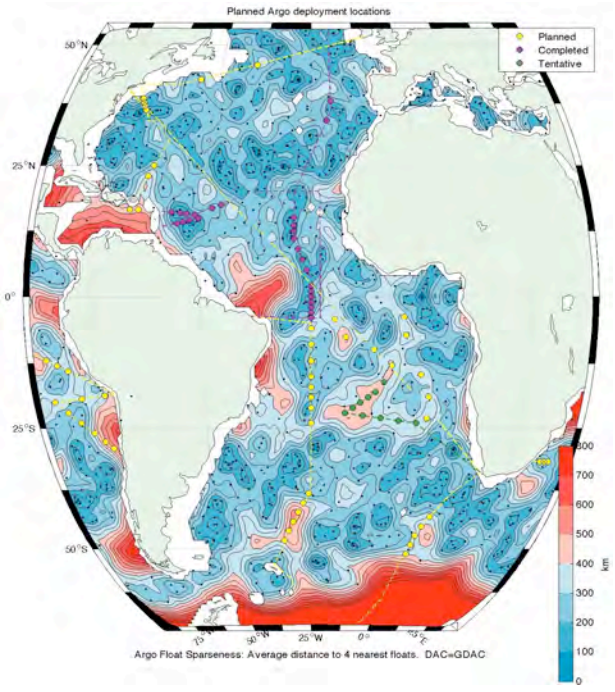

Figure 1: Proposed deployment positions for *Lady Amber* for South Atlantic Ocean (green dots).

4. Summary of national research and operational uses of Argo data:

Four research and two outreach project are noted below:

a) SOBOM:

The Centre for Southern Ocean Biogeochemical Observations and Modeling (SOBOM) are a focused group developing a new ocean observing system for carbon, nutrients and oxygen that will complement the already established observing system for heat and freshwater. To this end, 150-200 profiling floats equipped with biogeochemical sensors will be deployed throughout the Southern Ocean and the cruises run by UCT (Dr. Ansorge) in this region (i.e. SANAE and Gough Island) will be used as a platform for deployments in 2014. The first of these will see 14 Bio-Argo floats be deployed in two mesoscale eddies and along two transects to and from Marion Island on the Marion Island cruise in April 2014. For more information:

http://sobom.princeton.edu/content/deployment-opportunities

b) SOSCEx:

The Southern Ocean Carbon-Climate Observatory (SOCCO) group of the CSIR have developed a program to study carbon flux dynamics in the Southern Ocean through the SOSCEx experiment. Three carbon-flux biogeochemical floats were developed by Provor specifically for the CSIR and two were deployed on the Good Hope Line for this project in 2013. For more information:

www.csir.co.za/nre/coasts_and_oceans/osc.html

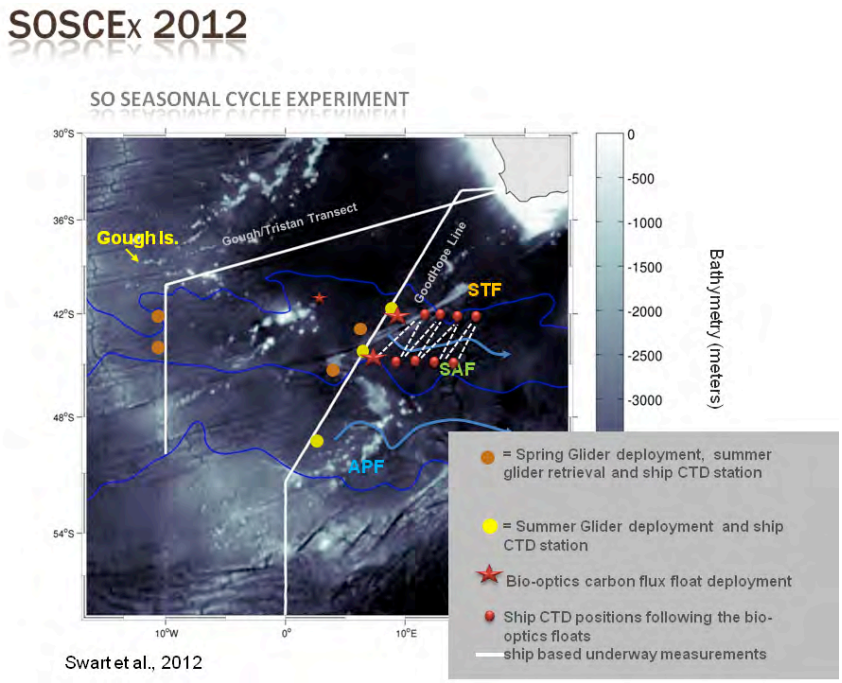

Figure 2: Complete SOSCEx experiment configuration.

c) Eddy Aging Dynamics:

Mesoscale eddy dynamics in the Mozambique Channel have been investigated over a number of years. However, the understanding of how these eddies age over time and space, and how this affects the upper-trophic levels, has yet to be determined. This project will use floats deployed off the Madagascan coast on a daily profile basis to sample the water column within an eddy to monitor its "collapse" as it progresses across the Mozambique Channel mouth. Four experiments were sucessfully undertaken in 2013 and looked at both cyclones and anti-cyclones. Data is currently being analyzed and written up.

d) The Nansen-Tutu Centre for Marine Environmental Research

The Nansen-Tutu Centre (NTC) is a non-profit research institute hosted at the Marine Research Institute and the Department of Oceanography at the University of Cape Town (UCT). Among its research priorities is the development of ocean modeling and prediction capabilities in South Africa. To this end, data assimilation of ocean observations, and in particular Argo profiles, can minimize model inaccuracies by constraining the ocean model to the observations providing better estimates of the ocean state and improving its prediction. Research is currently being undertaken to assess the benefit of assimilating Argo profiles in a regional model of the greater Agulhas Current system.

e) Educational Outreach – The Argo Floats Program by SAEON Egagasini:

Five secondary schools have been identified in the Western Cape region to track changes at sea from data collected on floats 1901469 and 1901470 purchased by SAEON/SANAP with support from SAWS and deployed in 2009.

In 2013 school monitoring teams were encouraged to do schools science projects on:

1. The Identification of deep water masses and their direction using temperature
2. Relationships between salinity and depth
3. Relations of temperature, pressure and salinity

The overall focus of the SAEON Egagasini education programme is to:

- primarily encourage awareness of science skills to learners
- to create a platform where Marine Science Research can be integrated into School Sciences curriculum by encouraging interactions between learners, educators and scientists
- to promote an understanding of, create awareness and generate an interest about our oceans

f) Research Schooner *Lady Amber* and her ship cat Argo:

The *Lady Amber* Research Schooner, while waiting for funding to undertake further voyages to the South Atlantic and Indian oceans to continue deployment of Argo floats for the community, has not been lying idle. Along with GLOBE (Global Learning and Observations to Benefit the Environment) have hosted lectures for 40 students in Cape Town and another 80 students and educators in Mossel Bay on the Argo program. They have also initiated collaborations between GLOBE, the SEREAD program, Mauritius and western Australian schools to bolster Argo program training initiatives at primary and secondary school levels. Figure 3 (at the end of this report) highlights this collaborative work courtesy of a newspaper article from a local Mossel Bay publication.

5. Issues that your country wishes to be considered (and resolved) by the Argo Steering Team regarding the international operation of Argo:

None at this stage.

6. CTD data to be added for data quality comparisons:

All CTD, where collected, can be sent for uploading to the data quality centres. We need to confirm the process to do this at the AST-15 meeting.

7. Bibliography:

Ansorge, I.J, Jackson, J.M., Reid, K., Durgadoo, J.V., Swart, S. and Eberenz, S. – 2014. Evidence of a southward eddy corridor in the South-West Indian Ocean. Submitted to Deep Sea Research. Special issue editor Igor Belkin.

8. Thesis citation list:

None at this stage

GLOBE brings The Lady Amber to Mossel Bay

TERSIA MARAIS

Mossel Bay is very fortunate to have the *'Lady Amber'* drop in. She has spent the past couple of years traversing the Indian Ocean, launching drifting monitoring devices into deep waters to help map the ocean we know so little about.

At 38 tonnes and 20 metres long, with her own desalination plant on-board, the South-African flagged Lady Amber is the only yacht from the southern hemisphere to have helped scientists from UNESCO's Intergovernmental Oceanographic Commission (IOC) complete research.

The journey began in June 2010, when Captain Peter Flanagan volunteered his expertise and his boat to the IOC's Global Ocean Observing System (GOOS). The programme asks merchant and research ships to deploy 'Argo' drifting robots into the ocean at specific points.

An Argo has amazing accuracy and releases pressure to sink 2 000m below the surface where it can stay for up to 10 days at one or varying depths. Data about ocean health, particularly pressure, salinity and temperature are transmitted by satellite to reception stations and used for numeric modelling and climate forecasting. The Argo robots are also used to research and better understand ocean conditions (currents, sea surface heights) and hazards (internal waves), associated coupled climate hazards like cyclones and rainfall, and patterns in climate variability and climate change.

While submerged, they can be programmed to stay at one depth or change depths. The Argo can repeat the data relay for between three and seven years, depending on its design. Currently there are more than 3 400 active floats in the ocean, however, most of them are deployed in the northern hemisphere.

Captain Flanagan has also used this as an opportunity to train young people and has shown that such a programme could be used as a basis for the development of a scholarship program. He also works very closely with GLOBE and a number of students will sail with Captain Flanagan in the Lady Amber whilst in Mossel Bay.

For more information about GLOBE and the works Capt Flanagan does on the Lady Amber, contact Mark Bretteny at 072 273 7997

Captain Peter Flanagan and Mark Bretteny at the Lady Amber in Mossel Bay Harbour.
Photo: Tersia Marais

Figure 3: The *Lady Amber* in Mossel Bay with the GLOBE program hosting lectures on the Argo program.