2014 Argo Canada report of activities

(submitted by Denis Gilbert)

16th meeting of the Argo Steering Team (AST-16)
Brest, France
18-20 March 2015

1. Status of implementation (major achievements and problems in 2014)

- floats deployed and their performance

In 2014, Argo Canada deployed 9 NOVA floats (4 in the northeast Pacific, 5 in the northwest Atlantic). Of these 9 floats, one died prematurely. The 8 remaining floats are still active and functioning properly.

- problems in 2014

We spent nearly all of 2014 without a valid standing offer in place for the procurement of Argo floats, which partly explains our lower than normal number of float deployments. Our request for a more robust and more reliable replacement warranty for defective floats, especially early deaths within 180 days, has led to 3 iterations of the bidding process. A new standing offer was finally awarded by PWGSC (Public Works and Government Services Canada) in early November 2014. It contains options for renewal until March 2018, and gives us the opportunity to have floats shipped directly from the manufacturer to Australia so that Canada now has a mechanism in place for contributing to the southern Argo float array.

- Status of contributions to Argo data management (including status of pressure corrections, technical files, etc)

MEDS continues to acquire data from 67 Argo floats. Of which 19 floats seemed to be in trouble and have not reported data for at least 6 months, so that our number of active floats is actually 48. Data are issued to the GTS and GDACs hourly in TESAC, BUFR and NetCDF format. The data of all Canadian floats together with some graphics are posted on a website and updated daily:
http://www.isdm.gc.ca/isdm-gdsi/argo/index-eng.html

On average 87% of data from January 2014 to January 2015 data were issued to the GTS within 24 hours of the float reporting in TESAC and BUFR format. We sent no BUFR data on the GTS in January 2014 due to system failure.

Since AST-15, we completed the following tasks:

- All of the existing NetCDF profiles collected up to the end of January 2015 from various versions were converted to version 3.1. The NetCDF profiles from floats

equipped with dissolved oxygen are still in version 2.2 since the GDACs are not ready to accept them yet.

- All of the meta data NetCDF files were converted to version 3.1
- The remaining profiles in version 3.0, trajectory (version 2.2), and technical NetCDF version 3.0 will be converted to version 3.1 by April 2015.
- We worked with BODC to validate the new Argo BUFR template to send dissolved oxygen and surface observations on the GTS
- We rewrote the BUFR encoder to read NetCDF profile version 3.0 and 3.1 in order to send dissolved oxygen and surface observations on the GTS.
- ISDM provides ADMT with quarterly reports on the performance of Argo data on the GTS in TESAC and BUFR formats.

- Status of delayed mode quality control process

As of March 2015, 18% of all eligible floats, active and inactive, had their profiles visually QCed and adjusted for pressure and salinity according to the latest delayed-mode procedures. The salinity component of DMQC has been performed on 57% of all eligible cycles at least once. Five North Atlantic floats had their calibration modified following the results of Cabanes et. al. (2014).

2. Present level of and future prospects for national funding for Argo including a summary of the level of human resources devoted to Argo.

Financial resources

Canada does not have multi-year commitments of money devoted to Argo. New paperwork and lobbying is necessary on an annual basis to renew the funding required to purchase new floats and for satellite data transmission, in a context of ever tighter public spending by Canada's government. Nevertheless, we were able to secure 411k for the purchase of 29 Argo floats in late 2014. Some of that money was end-of-fiscal-year money left over from other programs.

Human resources

Year 2015 will see major changes in our human resources. Blair Greenan of the Bedford Institute of Oceanography (BIO) agreed to replace Denis Gilbert as national leader of the Argo Canada program. Blair's leadership will officially begin on April 1, 2015. He will benefit from the expert assistance of Ingrid Peterson who will take over many of Denis' responsibilities with respect to float deployment logistics and satellite data transmission.

Moreover, a staffing process is well underway for the replacement of Howard Freeland at the Institute of Ocean Sciences, nearly two years after he retired from DFO. We are hoping that Howard's successor at IOS will be able to maintain some of the data products developed by him, such as surface circulation maps of the Gulf of Alaska, Argo data interpolated to station Papa and projected onto Line P.

3. Summary of deployment plans (level of commitment, areas of float deployment, low or high resolution profiles, additional sensors) and other commitments to Argo (data management) for the upcoming year and beyond where possible.

In 2015, we plan to deploy 29 floats (firm commitment), all of which have already been purchased: 14 will be deployed in the Gulf of Alaska, 5 in the Labrador Sea, 4 in the Gulf Stream's northern recirculation gyre, 3 in the North Atlantic subtropical gyre by the Canadian Navy, and 3 south of Tasmania with help from CSIRO. Canada's last float deployments in the southern ocean occurred more than 10 years ago. We are glad to be back in this under sampled region.

4. Summary of national research and operational uses of Argo data as well as contributions to Argo Regional Centers. Please also include any links to national program Argo web pages to update links on the AST and AIC websites.

Scientists from the Canadian Meteorological Centre (Dorval, Québec) began assimilating real-time Argo temperature and salinity data in experimental mode in 2013. Early results indicate better prediction skill than in the operational model that is currently being run by Environment Canada for issuing weather forecasts. Increased skill is mainly seen at forecast times of 48 hours and longer. Migration from experimental mode to fully operational mode was expected to occur in October or November 2014. However, this had to be postponed due to various human resources staffing issues that are required for running a 24/7 fully operational service. National Defence Navy scientists routinely use real time Argo vertical profiles of temperature into their Ocean Work Station to aid in the computation of sound velocity profiles.

5. Issues that your country wishes to be considered and resolved by the Argo Steering Team regarding the international operation of Argo. These might include tasks performed by the AIC, the coordination of activities at an international level and the performance of the Argo data system. If you have specific comments, please include them in your national report.

Blair Greenan and Ingrid Peterson are proposing some changes to the AIC float density maps. In the Gulf Stream Extension where ASW-4 and AST-14 recommended double density sampling, the AIC density maps do not reflect this doubled density goal (a score of 100% means 4 floats per 6° x 6° square, rather than 8 floats per 6° x 6° square). Blair and Ingrid also propose that the fractional area of a 6 x 6 degree square that is shallower than 2000 m should be taken into consideration in estimating float density. For instance, if a single density square has three quarters of its area deeper than 2000m, then a score of 100% for that square could be achieved with 3 floats instead of 4.

6. To continue improving the number of CTD cruise data being added to the reference database by Argo PIs, it is requested that you include the number and location of CTD cruise data uploaded by PIs within your country to the CCHDO website in the past year. These cruises could be used for Argo calibration purposes only or could be cruises that are open to the public as well.

Most of the recently collected Canadian CTD data are transferred from ISDM to NODC and then to CCHDO. Steve Diggs sometimes obtains data directly from Canadian PI's at DFO labs.

7. Argo bibliography (http://www.argo.ucsd.edu/Bibliography.html).

1. Hauser, T., Demirov, E., Zhu, J. and Yashayaev, I., 2015 North Atlantic atmospheric and ocean inter-annual variability over the past fifty years – Dominant patterns and decadal shifts. Prog. Oceanogr. http://dx.doi.org/10.1016/j.pocean.2014.10.008
2. He, H., Thompson, K., Ritchie, H., Lu, Y. and Dupont, F. 2014 Reducing Drift and Bias of a Global Ocean Model by Frequency-Dependent Nudging, Atmosphere-Ocean, 52:3, 242-255, http://dx.doi.org/10.1080/07055900.2014.922240
3. Kieke, D. and Yashayaev, I. 2015 Studies of Labrador Sea Water formation and variability in the subpolar North Atlantic in the light of international partnership and collaboration. Prog. Oceanogr. http://dx.doi.org/10.1016/j.pocean.2014.12.010
4. D. Legler, H. J. Freeland, R. Lumpkin, G. Ball, M. McPhaden, S. North, R. Cowley, G. Goni, U. Send and M. Merrifield. 2015. The current status of the real-time in situ global ocean observing system for operational oceanography. Journal of Operational Oceanography (in press).
5. McKinnell, S.M., Curchitser, E., Groot, K., Kaeriyama, M., and Trudel, M. 2014. Oceanic and atmospheric extremes and marine survival of Fraser River sockeye salmon. Fisheries Oceanography 23(4): 322-341, http://dx.doi.org/10.1111/fog.12063
6. Oleg A. Saenko, Frédéric Dupont, Duo Yang, Paul G. Myers, Igor Yashayaev, and Gregory C. Smith, 2014: Role of Resolved and Parameterized Eddies in the Labrador Sea Balance of Heat and Buoyancy. J. Phys. Oceanogr., 44, 3008–3032. http://dx.doi.org/10.1175/JPO-D-14-0041.1
7. Yashayaev, I., Seidov, D., Demirov, E., 2015. A new collective view of oceanography of the Arctic and North Atlantic basins. Prog. Oceanogr., http://dx.doi.org/10.1016/j.pocean.2014.12.012