part of the integrated global observation strategy

18th ARGO DATA MANAGEMENT MEETING

Hamburg

29th November – 1st December 2017

Version 0.1

10th December 2017

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1 Objectives of the meeting

The 18th ADMT meeting was hosted by BSH in Hamburg, Germany. It started at 9am on the 29th November and finished at 13h30 on the 1st December. 51 persons from 13 countries and 25 institutes participated in the meeting.

The objectives that had been fixed for the meeting were the following:

- *Review the actions decided at the 17th ADMT meeting and progress made since last year*
- *Agree on clear criteria to include float data in the Argo data system and moving forward with Auxiliary data system*
- *Feedback from monitoring the quality of Argo float data processing in Real time and Delayed mode*
- *Review Regional Argo Data Centre progress*
- *Report from 6th Bio-Argo Workshop*

2 Welcome

Dr. Bernd Brügge welcomed Argo to BSH and commended Argo for its success. He went on to explain some of BSH's mission. BSH serves oceans and seas and is the maritime authority of Germany. Research is also done at BSH, but it is applied research as BSH is not a research institute. BSH has five multipurpose ships and they are working on replacing the oldest ship. BSH has forecasting and warning services, grants approval of offshore wind warms, prosecutes environmental crimes, and operates the German Argo program. Dr. Brügge closed by wishing productive discussions and a successful meeting.

3 Feedback from 18th AST meeting

Susan Wijffels summarized the 18th Argo Steering Team meeting outcomes. The goals of the meeting were to:

- Monitor Argo's performance: original mission and progress of developing enhancements
- Address some key issues: data complexity, defining 'Argo'
- Hear about some local Argo science
- Discuss the challenges around Argo's long-term sustainability

The second Argo Manufacturer's Day was held after the IAST and was organised by Greg Johnson, RBR.

The status of enhancements was briefly covered.

A framework is being developed articulating what defines an Argo float and sensors. This document is to help contributing national programs, interested PIs and sensor developers

- Understand the responsibilities and requirements of a notified Argo float: transparency, quality, minimum sampling and data curation
- Detail a framework by which sensors may move along a readiness level from experiment through pilot through accepted for global use in Argo. The AST and ADMT will be responsible for assessing the progress of sensors along this pathway.

A summary of the AST discussions on the challenges for sustaining Argo was presented. These include attracting new scientific leadership, preserving Argo's global mission and focus while the leadership changes and new enhancements are implemented, funding adequacy as a program that is a mix of research and operational support, adapting our design as just one element of an integrated Global Ocean Observing System.

The issue of how Argo should interact with its suppliers was discussed. Two recent examples are:

A Manufacturers Day, held after AST:

- It was well attended, but the responses were mixed – some talks were excellent technical talks, some were sales pitches.
- On balance, it was deemed useful. Another is being organised for AST-19
- Low organisational overhead - Manufacturers self-organise – held annually?

A Technical Workshop week was held in Seattle in September.

- Organised by our community – agenda was in our hands
- Very strong positive feedback from 2005 and 2017 workshops, though suppliers were unhappy with being excluded for the mornings
- High organisational overhead – thus this might be a less frequent meeting.

Other items noted were

- An Argo Science Workshop is being planning for Tokyo, 2018 – it will have an applications theme to help us articulate the impact Argo has beyond research
- Howard Freeland stepped down as Argo Director, Breck Owens agreed to take on this role
- Dean Roemmich plans to step down as IAST-co chair, Toshio Suga will become co-chair at IAST-19. Dean will remain a member of IAST.
- As part of a GOOS report, an item was presented to the IOC General Assembly about Argo and some of its new missions e.g. BGC. Many member nations made interventions. A new paper with more information was requested to share with member nations and the IOC Executive on how new parameters might be approved for Argo and use of the IOC notification process that is currently in place

4 Feedback on 6th BGC-Argo Workshop

H Claustre reported about the 6th BGC-Argo data management meeting that was held on November 28 and 29 with 48 attendees, both from the Core- and BGC-Argo communities. Besides the various national reports with respect to BGC-Argo data management, the presentations and discussions were organized along several main topics dealing with:

Data format: We must find a balance between complex /large profile files that represent the reality of the sampling/measurement (mostly of the "Coriolis" type) vs other "aligned" formats, which are easier to use (key for end-users) but would be less close to the reality of the measurements. It was agreed that netCDF 4 was a temporary solution to compress large files into a size-manageable file. A sub-group was identified to work on a "standard " aligned format that would better fit with the requirements of end-users. Additionally, the production of higher-level processed data or products (e.g., comparable to L3/L4) was discussed. These would be designed to meet with the expectation / requirements of potential new end-users. Examples of such products might be merged float/satellite chlorophyll products that provide a 3D view of the ocean. A survey will be prepared and distributed to potentially interested groups or projects (e.g. IOCCP, SOLAS, COPERNICUS…) to get feedback from the community before developing fit-to-purpose data format and products.

Reprocessing issues. In 2017, two peer-reviewed papers have pointed out some inconsistencies in the calibrations for both b_{bp} and Chl*a* sensors, which lead to significant inaccuracies in the variable estimations (systematic overestimation by a 2 factor for all Chl*a* fluorometers, sensor-dependent issue in the gain for b_{bp}). The sources of these biases have been identified and discussed with the sensor provider (Sea-Bird). It was agreed to reprocess the whole BGC-Argo dataset with new calibration files that will be made available to the DACs on an Argo repository. Additionally and with the aim of the delivering high-quality measurement to scientific users in a timely way, it was decided to adopt the principle of the correction proposed by MBARI to deliver delayed mode and adjusted variables. The tool (SAGE) developed by MBARI in this respect will be made available to DACs once it is finalized.

Documentation. There is an urgent need to finalize all documents (1) "Processing the BGC-Argo *variables* at a DAC lever" and (2) "Real-Time Quality Control for BGC-Argo *variable* " for those *variables* that still need this finalization. This is the prerequisite to have new DACS coming into BGC-Argo data management and a step before continuing to develop DM procedures.

Additionally, as part of the special issue of Frontiers in Marine Science dedicated to "Ocean Observing Best practice" (see scope here), the principle of publishing a " BGC-Argo best practices" was accepted by the community. The paper would have three main topics (Sensors and Platforms, At-Sea Operations, Data Management). Henry Bittig will coordinate this paper with the contribution of interested colleagues.

The presentations of these two days will be made available through the BGC-Argo web site (here).

5 Feedback from the Profiling Float and Platform Workshop

A summary of the outcomes of the Seattle Float and CTD Technical Workshop was presented by Susan Wijffels. The goals of the workshop were to

- Increase the overall efficiency of profiling floats in the Argo program by elevating float reliability across all groups and suppliers
- Better mitigate the risk and exploit major changes (-controller boards, buoyancy engines, CTDs) being made to technology used in the global array
- Facilitate better communication between float deploying teams and suppliers

Many issues were discussed across platforms and CTDs, with recommendations arising around float testing by users, understanding battery health and performance, failure modes of platforms and sensors, and possible new activities to understand these. B. King noted that the conversion to v3.1 format, with all its additional meta data, has made these audits much easier for which he wanted to thank all the DACs for their hard. He also noted that further communication needs to occur between the manufacturers and Argo experts on a small number of meta variables to improve consistency and to make future audits more useful.

The meeting report and following analyses can be found at:
http://www.argo.ucsd.edu/UG_reports.html#Apex

The meeting summary and narrative can also be found at:
http://www.argo.ucsd.edu/Report_floattechnicalworkshop_2017.pdf

6 Status of Argo Program and link with Users

6.1 Review of the Action from last ADMT (M. Scanderbeg)

M Scandebeg reviewed the status of the action items from ADMT17. . The status of the actions is:

- High: 4 actions were done and one is ongoing
- Routine: Among the 30 actions 12 were done, 13 were partially done, 4 were not done, but will be carried over to next ADMT and 2 canceled
- Low: no low priority actions were identified

See the complete status in Annex 3.

6.2 Argo Status + Real-time Monitoring (Mathieu Belbeoch)

M. Belbeoch reported on the status of the Argo array. He emphasized that Argo was seen as a golden standard to reach for by other systems. He recalled in which context JCOMMOPS was operating, how it was managing metadata for the different observing systems under its terms of reference, and which responsibilities it gained at the last JCOMM-V session (allocation of unique Id for all systems, submission of marine metadata to WMO through WIGOS compliant format, production of a yearly report card).

He presented a set of performance indicators taking the pulse of the array. He showed that equivalent contributions to Argo were taking the activity indicator close to 100%, but the value added for the density (spatial distribution) was marginal. The drop of indicators for the Southern Ocean was due mainly to a review of the design (extension) at the last AST meeting. Anyway the SO is implemented at 25% and has too low intensity (50%) to meet the target. The Argo TC also remarked that the Indian Ocean intensity was dropping. The Pacific Ocean intensity drop was partially addressed by latest Kaharoa deployments but is still too low (75% overall). In particular most of the TPOS area (-30/30) is getting old. He gave a brief status on float performance and highlighted that only 50% of floats were reaching 150 cycles.

With regard to data flow, no major issue was identified. There are still about 100 floats pending data distribution due mainly to the need for a new decoder. Delayed mode profile status is stable around 70%. Delays are fine and some DACs progressed substantially to meet the 24h target.

He concluded by providing a set of planned actions for the next inter-sessional period, including:

- Review metadata reference tables in cooperation with manufacturers: organize webex to start discussions on Platform Types, Sensor Models, Batteries
- Ingest BGC index file, and produce EOV oriented KPIs
- Improve DMQC metrics/KPIs (working group)
- Improve orphan float tracking (at float/sensor level)

6.3 New Argo visualization website and API (M. Scanderbeg)

M. Scanderbeg presented on a new Argo visualization website called argovis being developed at Scripps with a statistics graduate student named Tyler Tucker and Donata Giglio. The new website, which allows easy navigation of profiles from the Argo GDACs, offers a simple user interface and allows both scientists and the general public to draw polygons on an interactive map and view the profiles within given date and depth ranges. After selection, the user may browse T/S/P profiles on interactive charts, either from a single float or those found within the drawn polygons. Some metadata about the floats are displayed as well, along with a list of links to locate the data of interest on the GDACs.

Overall, this website offers seamless navigation of the Argo dataset written with a representational state transfer (REST) architecture. RESTful design offers us the opportunity to feature API and cloud computing applications,e.g. map comparison from existing gridded Argo products, as well as derived variables. Currently, the API is written in Python, but hope to expand this to Matlab and R. Argo now has a maintainable, scalable, and portable tool to support this ever expanding big data set.

In addition, another part of the website will feature gridded Argo products and will allow for easy comparison of maps, sections, time series, etc. derived from the products. It will be similar to the Marine Argo Atlas, but will work through your browser instead of having to download a program to your computer. Users can choose from different variables including temperature, salinity, dynamic height, etc. At the beginning, the focus will be on global maps, but this will be expanded over time as possible.

The websites will be presented at Ocean Sciences by T. Tucker in Session OD44C: Visualization, Statistics, and Model Validation of Big Data for Oceanography, poster OD44C-2807 A New Website for Seamless Navigation of the Argo Data Set.

6.4 Earth.nullschool.net update (S. Diggs)

Steve report

6.5 Best Practices Argo Paper (S. Wijffels)

Susan Wijffels reported on a new initiative led out of the Observations Coordination Group for GOOS, to document best practices across the networks. The journal, Frontiers in Marine Science, is working on a special issue of 'best practices' papers. This is an opportunity to articulate what Argo does, why and lessons learned. The papers will be peer reviewed. The submission deadline is September 2019. BGC Argo is already planning one paper with three different topics for this volume.

Two topics were suggested for core Argo:

1. Sensor/platform handling and procedures in Argo. The recent technical workshop report has material that could be utilized
2. Data management in Argo: goals, rational, practical implementation

Both topics should be fairly high level – focusing on principles, goals, rational and organizational issues, not on the fine detail of what is done. The latter can live in the ongoing evolving Argo manuals and reports, which will be referenced in this paper.

The co-chairs solicited volunteers to be coordinating lead authors and contributing authors for the data paper. The Steering Team will likely lead the technical paper.

Action 1. People who want to contribute to the Best Practice Data Paper to contact ADMT co-chairs. Esmee van Wijk and Annie Wong want to help with the DMODE section. S. Pouliquen with the data system as a whole. M. Belbeoch for Monitoring, T. Carval for Real time GDAC operations, A. Tran for GTS, R. Cowley, M. Scanderbeg

6.6 Feedback on Citation advertisement (T. Carval)

The Argo ftp server readme file was obsolete (10 years old). A new version is now available on both GDACs

- ftp://usgodae.org/pub/outgoing/argo/readme_before_using_the_data.txt
- ftp://ftp.ifremer.fr/ifremer/argo/readme_before_using_the_data.txt

The new readme is hereafter in blue :

> Argo real-time data is subject to only coarse fully-automated quality control checks on a limited list of parameters such as pressure, temperature, salinity, oxygen or chlorophyll.
>
> Argo delayed-mode procedures for checking sensor drifts and offsets in salinity rely on a statistical comparison of the float data with reference data. An adjustment is made when the float PI judges that it will improve the quality of the dataset.
>
> Users should include the supplied error estimates in their usage of Argo delayed-mode salinity data.
>
> For both near real-time and delayed mode data, proper and appropriate use is the responsibility of the user.
>
> To properly acknowledge Argo data usage, please use the following sentence and place the appropriate Argo DOI afterwards as described below.
>
> "These data were collected and made freely available by the International Argo Program and the national programs that contribute to it (http://www.argo.ucsd.edu , http://argo.jcommops.org). The Argo Program is part of the Global Ocean Observing System.“
>
> There are two options when picking an Argo DOI:
>
> (1) Pick the one associated with when you obtained the data from the Argo GDAC. Please refer to the ADMT's DOI page (http://www.argodatamgt.org/Access-to-data/Argo-DOI-Digital-Object-Identifier) to find the correct DOI to include in your publication or product.
>
> (2) If you did not obtain the Argo data from the GDAC, but from an Argo data product or other source without a date for the Argo data attached to it, use the general one with no time associated with it:
>
> Argo (2000). Argo float data and metadata from Global Data Assembly Centre (Argo GDAC). SEANOE. http://doi.org/10.17882/42182
>
> Argo data management documentation is available on http://www.argodatamgt.org/Documentation
>
> Argo data long-term repository is hosted in US-NCEI https://www.nodc.noaa.gov/argo

Action 2. Thierry to move ahead with adding list of co-authors to DOI. Ask National Programs to provide Thierry, ADMT co-chairs, AST co-chairs a list of people who have contributed to Argo, along with possible ORCID to begin the list of authors.

7 Real Time Data Management (2h)

7.1 GTS status (Anh Tran)

The Oceans Science branch of Fisheries and Oceans Canada monitors the performance of Argo timeliness on the GTS. From September 2016 to October 2017, on average there were 12328 TESAC and 13145 BUFR messages transmitted monthly on the GTS. Respectively, 93% and 91% of TESAC and BUFR messages are available to users within 24 hours of the float surfacing. There is no significant difference in timeliness for floats with ARGOS versus Iridium for communication. Currently there are no TESAC data transmitted from the Chinese DAC. The number of GTS BUFR messages transmitted by INCOIS was significantly lower than their number of TESAC messages. On average, 94% of netCDF profile files were transmitted on the GTS in BUFR format. As of July 1, 2018, Argo will terminate the transmission of TESAC on the GTS.

Action 3. INCOIS to investigate why the number of BUFR message is very low compared to TESAC

7.2 BUFR converter tool (M. Scanderbeg for J. Turton)

At AST#18 it was reported that the UK Met Office had commissioned the development of a Python-based Argo netCDF to BUFR converter that was ready to undergo testing, prior to being implemented operationally at Exeter. However, due to lack of resources at BODC it was not possible to provide routine delivery of their real-time netCDF files to the Met Office until August 2017. Since then the code has been run at the Met Office on all BODC generated real-time netCDF files in order to generate BUFR files. At the time of writing (21st November 2017) some 1,644 netCDF to BUFR conversions have been made without failure, thus demonstrating the reliability of the new Python code.

The code is now being run at the Met Office on a routine 6-hourly schedule. In the recent period 16 to 21 November 2017, between 15 and 27 netCDF files were processed into BUFR each day. After a further period of testing in routine mode, the code will be implemented operationally at the Met Office in early 2018 and UK Argo will then discontinue use of the JMA perl converter that has been run by BODC.

The present Python software can handle netCDF files with either downward and upward profiles. The software has been designed and written in such a way that it can readily be expanded to include secondary temperature and/or temperature and salinity profiles (modifications anticipated for spring 2018), and dissolved oxygen (anticipated later in the year). Additional bio-geochemical capability will be added, as and when the additional BUFR sequences are approved by WMO for operational use. However, there has not yet been an opportunity to devote effort towards the validation of the proposed bio-geochemical sequences (for chlorophyll-A fluorescence, dissolved nitrate, pH and backscatter) and this should be progressed in 2018.

Once the conversion code has been run operationally by the Met Office for several months, it is planned to make the Python code available to the wider Argo community alongside those from JMA and MEDS. The version being run at the Met Office is in Python 2.7 (due to operational system constraints), although there is a working copy in Python version 3.5 (but which has not undergone such thorough testing).

Retiring the FM-64 TESAC format

As the BUFR distribution works fine at all DAC , it is proposed that Argo announces by the end of 2017 that it will cease to issue TESACs on 1st July 2018, thus giving data users six months' notice of TESAC cessation in order to give operational modelling centres time to implement the BUFR sequences. (Note this cessation is only for Argo and marine mammal and ship CTD profiles will continue to be distributed in TESAC.)

If agreed by ADMT-18, such an announcement will be made through both JCOMMOPS, JCOMM web-site and the WMO Operational Newsletter, and ADMT members would be requested to inform their respective national meteorological services of the Argo TESAC cessation timescale.

Action 4. Mathieu to Inform WMO users of the official end of Argo Tesac messages on 1st July 2018. Post this message on Argo websites.

Action 5. All DACs to stop sending Tesac messages on 1st July 2018.

Action 6. MetOffice to provide the python BUFR converter to Thierry to be made available in the Tools section of the ADMT website and possibly on AIC website

7.3 Status of anomalies at GDAC (Christine Coatanoan)

Christine Coatanoan reported on the anomalies detected on the GDAC. On a daily basis, an objective analysis is passed over all in-situ temperature and salinity observations aggregated by Coriolis. A series of alerts are raised on atypical observations. Each profile on alert is scrutinized by a Coriolis operator with Scoop (a visual quality control tool). If the operator changes the flags on a profile, an alert record is created. For each DAC, the list of alerts is sent by email to the DAC contact point. In October 2017, this message has been updated to take into account information on the vertical sampling scheme.

DAC's contact points are asked to check whether their email address is correct. If the DAC contact agrees with the flag changes, he should change these flags on the data files and then resubmit the files. If the DAC does not agree with the changes, he should send an email to codac@ifremer.fr.

In 2017, about 200 profiles on average each month are reported as bad to DACs. In June 2017, a large increase of anomalies was observed and it was due to feedback from CORA (the Coriolis ReAnalysis product).

Some bad data are not correctly detected with the real-time QC tests. As it is now, there is no obvious solution to improve the real-time QC: an automatic test cannot detect some atypical errors. A few DACs perform real-time adjustments, without filling <param>_adjusted and <param>_adjusted_error. This situation should be corrected. Others do not write correctly file name and data_mode when they do DMQC.

All this information can be found in the report sent monthly to mailing lists: argo-dm & argo-dm-dm. This report is also available on the Coriolis GDAC ftp site.

Christine Coatanoan also mentioned that a climatological test using MinMax climatology developed by Coriolis is implemented and feedback will be provided at next ADMT on the efficiency and complementarity with existing tests.

Action 7. Kordi to provide feedback contact name for anomaly corrections by Christine

Action 8. Mathieu to monitor the Monthly check anomalies in the JCOMMOPS system. Feed ADMT/AST co-chairs if profiles on list repeatedly

7.4 Status on Anomalies detected with Altimetry (Stéphanie Guinehut)

The Altimetry check has been performed every four months again this year and automatic emails have been sent through the AIC database to the DM-operator and DAC responsible for the extracted floats. As requested during last year's ADMT, two tags are now included in the subject of the emails (since Dec 2016), one for check (CHK), one for grey list (BLK) to help prioritize the actions. 115 floats are currently on the list. 12 feedbacks have been provided up to now. DACs, PIs and DM-operators are requested to provide feedback on the anomalies detected. They are also requested to correct flags or put sensor(s) on the grey list to stop the real time distribution of the bad data. The presentation has highlighted that there are more and more floats in the list. This is consistent with the fact that there are more and more floats into the water but also with the fact that some floats have been on the list for a long time. Specific examples of bad data not caught by RT QC tests were shown.

A discussion occurred on the method to be adopted to disseminate the Altimetry check results. Some DACs/DM-operators are happy with the current method, while others are not. Following discussions, AIC will make a proposition for the dissemination of the results.

General quality of Argo dataset has been presented and showed slightly degraded statistics for RT observations compared to last year. The statistics improve when the 115 floats present in the Alti QC list are rejected which confirms the need to correct some QC flags of those floats which report very bad values.

Order of magnitude of delayed time adjustments (PSAL & PRES) as a function of cycle number or float age has been studied and show also stable results compared to last year analysis. Most of the floats (> 90%) have had a salinity corrected by 0.02 psu or less and a pressure corrected by 5 dbar or less after 200 cycles (or 2000 days).

Action 9. Mathieu to modify the AIC warning system to separate out floats that need to be checked and floats that may need to be greylisted from S. Guinehut's comparison with altimetry and send them to appropriate person. Real time files to DAC. D files to DAC and dmode operator.

7.5 Feedback on Investigation in changing RT order test to catch more anomalies (C. Coatanoan)

At the previous ADMT, a study was proposed to try to catch more bad data and an action has been done to change the order of some tests and to add a new level for the spike test, for which a stricter threshold value is associated with the deeper levels. For the tests order, changing "spike - density inversion" to "density inversion – spike" catches more bad data but adds also QC 4 on good data that is not what is expected. To add new level and a stricter value on thresholds, a first step was to look at what is done elsewhere in others projects on temperature and salinity. Some reports show different ways to perform the spike test : no fixed threshold, use of the profile resolution to take into account the threshold and so on. Some cases have been defined with new levels and new threshold values but results do not show significant improvement on the way to flag the measurements.

Another step has been presented with calculation of the test values (defined in the spike test) for each profile by float and by DAC. A study is ongoing to try to identify a signal in looking at the distribution of the max value of those test values below different levels.

Action 10. Study how to improve the Spike and density test : use threshold per meter: Christine,

Action 11. Can we build a gradient climatology from Argo with good un-corrected data as done for the min max range by J Gourrion at Ifremer : Breck/Susan/Jerome to study

7.6 Density inversion test and alternate flagging algorithms (J. Reißmann)

The real time test 14 density inversion test was revisited and the deficiencies of the according flagging instruction were summarised. Appropriate specifications for alternative flagging algorithms of the density inversions were defined and some approaches presented. The open problems with the most promising approach using the local smoothness of the potential density profiles were discussed and possible ways to solve them suggested. Finally, some general remarks on the current density inversion test were made.

After a brief discussion about general issues not directly relevant to the addressed problem or the suggested alternative flagging algorithm of the density inversions (N^2 definition of density inversions, reference level of potential density), the ADMT decided to retain the current flagging scheme even though it is obviously not designed appropriately to tackle the observed density inversions correctly while the suggested alternative algorithm is working much more accurately even in the current state with some rather academic problems still left to solve. Consequently, the work on further development of this alternative approach was terminated.

7.7 Proposal on how to include RBR data in Argo data system (A. Wong) (15 mn)

Annie Wong initiated discussions on how to include RBR CTD data in the Argo data system. The float workshop in Seattle in September 2017 identified the newly re-engineered RBRargo CTD as having the potential to meet Argo accuracy and stability requirements. As a result, several Argo groups had plans to use RBRargo CTD in Argo floats as pilot studies. It was determined that data from the RBRargo CTD should be marked in real-time with PRES_QC = '3', TEMP_QC = '3', and PSAL_QC = '3'. In addition, they should not be distributed on the GTS. Discussions with real-time data managers suggested that the most efficient way for DACs to do so was to greylist all floats with the RBRargo CTD.

Action 12. Annie and Thierry will update the definition of the greylist to take into account BUFR. Annie will update the QC Manual.

Action 13. Mathieu and Breck will contact RBR to obtain information from the manufacturer to fill the Argo meta- and technical- tables. Immediate needs are a new WMO_INST_TYPE, and information to fill SENSOR_MODEL for CTD_PRES, CTD_TEMP, and CTD_CNDC.

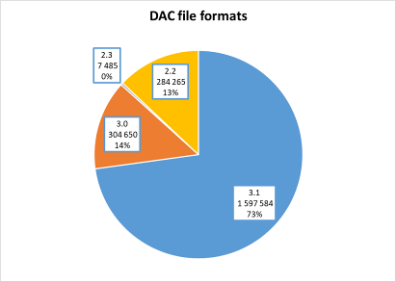
Several members of the ADMT were concerned about including data from experimental sensors in the Argo data system. As a result Brian King drafted up some Argo data policy guidelines that are to be finalized by the AST.

8 GDAC Services

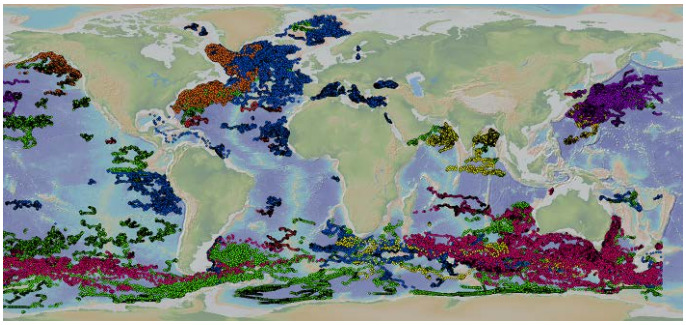
8.1 Operation status at US-GDAC and Coriolis-GDAC(T Carval, Mark Ignaszewski)

In November 2017, GDACs (Global Data Assembly Centres) receive data from 11 DACs (Data Assembly Centres). The total number of NetCDF files on the GDAC/dac directory was 2 178 811 (+18% compared to 2016). The size of GDAC/dac directory was 245Go (+46%). The size of GDAC/geo directory was 85Go (+25%).The size of GDAC/latest-data was 14Go (-7%). The strong increase in size will be addressed by gradually moving to NetCDF4 which has built-in and transparent compression features and has no impact on additional services such as THREDDS or ERDDAP..

The number of floats files increased by 10% in 2017. The number of delayed mode files increased by 20%, a good step to recover from an important backlog of files needing delayed mode processing. The transition from Argo format 2.* and 3.0 toward format 3.1 is underway. In 2017, the number of files in format version 3.1 passed a 70% threshold.

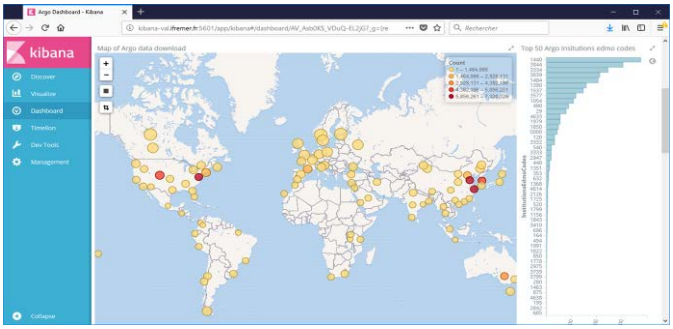


In November 2017, 131 308 BGC Argo cycle files from 863 floats were available on the Argo GDAC. This is a strong increase compared to 2016: +65% more profiles and +54% more floats.



BGC-Argo profiles, colored by DACs

Argo FTP server activity: There is a monthly average of 449 unique visitors, performing 4552 sessions and downloading 3.3 terabytes of data files.



Argo FTP user origins in 2017

Coriolis GDAC ftp server is monitored by a Nagios agent. Every 5 minutes, an ftp download and a Google Internet test are performed. Over the last 12 months, the weekly average performance was 99.870%. The 0.13% of poor performances represents 10 hours and 22 minutes.

MARK or MIKE do you want to add statistics from USGDAC

Argo greylist : GDAC hosts a greylist of the floats which are automatically flagged by automatic QC. The greylist has 887 entries (November 25th 2017), compared to 1000 entries one year ago.

Action 14. Breck to check on whether FSI floats have been removed from greylist

In TC presentation it was shown that the delay added by the GDAC processing was bigger at Coriolis GDAC than at US-GDAC while the GDAC was updated every 10mn at Coriolis and 30mn at US-GDAC.

Action 15. Thierry and Mathieu to further investigate difference in GDAC delays

8.2 Auxiliary directory tree status (Thierry Carval)

Auxiliary files are used for data and metadata that are not (yet) standardized among the Argo community. They typically contain data from new types of sensors or floats. Auxiliary data file format is NOT regulated, they are distributed on GDAC ftp server in the "aux" directory that is parallel to the "dac" directory. The float metadata file in the 'dac' directory includes a text in the SPECIAL_FEATURES variable to indicate that there is additional data in the auxiliary directory and the nature of that data.

PIs are encouraged to use a file format that is easily readable – either NetCDF or ASCII that mimics the Argo data format version 3.1 if possible. A good practice (not an obligation) within DACs is to document their auxiliary files. Coriolis DAC auxiliary file formats are documented here:

Rannou Jean-Philippe (2017). Argo auxiliary files format for Coriolis DAC. http://doi.org/10.13155/51995

Action 16. Set up the aux directory at US-GDAC

8.3 Status on the actions

#15 Test of NetCDF4 : The use of NetCDF4 on Argo data files is transparent for users, if they use reasonably recent NetCDF libraries (example : the Matlab NetCDF library reads NetCDF4).
Argo NetCDF4 files are well compressed (typically 6 times smaller). Sample file are available here:

- ftp://ftp.ifremer.fr/ifremer/argo/etc/netcdf4/Example

#16 - Add the index files and other top files in the rsync : The decision is to add a specific argo-index to rsync directory

- rsync -avzh --delete vdmzrs.ifremer.fr::argo/ /home/mydirectory/...
- rsync -avzh --delete vdmzrs.ifremer.fr::**argo-index**/ /home/mydirectory/...

Action 17. Thierry to go with proposal #2 for adding new directory for index file. Inform users on ADMT rsync page

#19 – Document M-File generation in GDAC Cookbook: *Ignaszewski Mark (2017). Description of the Argo GDAC File Merge Process. http://doi.org/10.13155/52154*

This document describes the process of creating "merge files" – a merged core-argo/bio-argo file. The core-file and bio-file are submitted to the GDACs by the DACs. The merge-file is created at the GDACs. Coriolis-GDAC additionally provides a file containing all Core and Merge profiles for each BGC float

#22 – Improve the submission for rejected metadata file : When a metadata file is accepted for the first time, move in the submit directory all the rejected profiles, trajectories and technical files that are not in the submit directory and that are less than one week old.

Action 18. Keep the action item about automatically resubmitting all files if metafile is fixed within 7 days.

#23 – improve the situation with DACs that are only feeding one GDAC : This action is mainly due to the fact that some countries are not allowed to connect to US-GDAC submission machines.

Action 19. Continue investigating ways to allow both GDACs to receive files from all DACs

#24 – Study how to store time series in tech-files and test it in the AUX directory. Floats such as Provor Iridium floats provides their buoyancy activities during the subsurface cycle, with a series of number of pump action and time stamps. An enhanced technical file format can manage these timeseries.
Example: float 6902804
ftp://ftp.ifremer.fr/ifremer/argo/aux/coriolis/6902804/6902804_tech_aux.nc

8.4 Status of Format Checking operations for profiles (Mark Ignaszewski)

The current status of the Argo FileChecker was presented. Participants were reminded of the basic functions of the FileChecker. All files and all versions are being format checked. Data consistency checks are being performed on all v3.1 except the trajectory files. For trajectory files, meta-data is being consistency checked. Full consistency checks on the N_MEASUREMENT and N_CYCLE variables are currently in "live testing" – that is, all v3.1 trajectories files submitted to the US GDAC are run through the tests and any warnings or errors are shared with the DACs. Overall 88% of the files are passing the tests. It is hoped that the trajectory workshop will result in further progress. There is currently no estimate of when these tests will be promoted to operations. All of the tests are thoroughly documented in the manual available on the ADMT website.

Action 20. Stop allowing Config Mission Number of 0 by AST

Action 21. Recheck all files on GDACs with a priority on Dmode files. To be performed early 2018 so that anomalies can be fixed by ADMT

8.5 Maintenance of tables centrally – who looks after additions and changes operationally? (R. McCandliss, Thierry Carval, Mathieu Belbeoch, Catherine Schmectig)

Presently tables used by Argo are either in the manual or in GoogleDocs or in excel files, all documents made available at http://www.argodatamgt.org/Documentation. The GoogleDoc means is not appropriate as some countries can't access them. Therefore it is important to move to a more efficient method that will also allow machine to machine access

Action 22. Thierry : put links to Google Ref tables on the documentation page

Robin McCandliss (BODC) gave a short presentation about the NERC Vocabulary Server (NVS), following a suggestion at ADMT17 that the NVS might be useful for hosting the increasing number of Argo vocabularies. The NVS is managed by a team of vocabulary experts at BODC and the infrastructure and expertise is provided as a service to a growing user base internationally. NVS vocabularies can be shared as a trusted resource because:

- Each vocabulary is referenced as a unique resource identifier (URI); e.g. http://vocab.nerc.ac.uk/collection/L22/current/TOOL0668/

- The identifier provides access to machine and human readable information;
- The information is structured and managed according to W3C standards;
- The NVS supports mapping to internally and externally hosted vocabularies;
- Once published the URIs are permanent;
- They can be deprecated but never removed or redefined;

Externally-governed vocabularies are increasingly managed via the NVS VocabEditor https://www.bodc.ac.uk/resources/vocabularies/vocabulary_editor/. This allows external editors to submit and edit new terms and mappings to vocabularies they are authorized to access. 231 vocabulary collections accessible through the NVS. Many of these are managed by BODC on behalf of SeaDataCloud, EMODnet, SeaVox, and SWE content governance authorities.

If Argo wished to use the NVS to manage its vocabularies, an ARGO vocabulary governance committee would be needed, made up of one or multiple authorized vocabulary managers from the Argo community, including a member of the BODC Vocab Management team. The Argo community would be responsible for developing the vocabularies (terms, definitions etc.) and for ensuring that the vocabularies are well defined. BODC will generally take in clean, well-defined vocabularies without charge, however, if significant BODC effort was required to get the Argo vocabularies into good shape, then this would need to be funded.

There is the option to trial taking an example of a good vocabulary into the NVS as a means of testing the effort involved, if the ADMT community is interested.

Action 23. Mathieu to work with GDACs to develop API for Argo ref tables . End of February

Action 24. Mathieu to look into NERC vocabulary and see how much work we need to do to use such vocabulary for ref table.

8.6 Production and serving of Mprof.nc files (A. Wong)

An interim solution for the production and distribution of the multi-cycle _Mprof files at the GDACS was agreed. The French GDAC will continue producing the _Mprof files, but compress them by using netcdf4. The US GDAC will mirror the _Mprof files from the French GDAC. M-File will therefore be distributed at both GDACs under the /dac directory. (Mark and Thierry to work out the details.)

This will be revisited when the action decided at BGC data meeting will provided a simplified data format for M-File

Action 25. M-File : French GDAC to move them to NetCDF4 and USGDAC to get them by mirroring the French GDAC . Interim solution until a new M-File format is specified by the group set up at BGC-Argo meeting

9 Format issues

9.1 Upgrade to V3.1 Real-Time and historical T&S floats at GDAC (J. Gilson, C. Coatonoan, all)

A census was performed on the netCDF profile files from the USGODAE GDAC (18 Nov 2017) to assess the progress in transitioning to V3.1 file format. When we consider all floats, progress continues modestly for all file types (profile, trajectory, and meta). The transition for meta and tech

netCDF is nearly complete (92% and 85% respectively). Trajectory netCDF has progressed, reaching 75% complete. Real time profile netCDF V3.1 has reached 50% of the total. A large amount of files at AOML remain in V3.0, and these older format files are now appearing at the GDAC after DMQC. The transition of the DM profile netCDF is 75% complete. Lists of all floats, ordered by netCDF format version and DAC are available at the SIO ftp site:

ftp kakapo.ucsd.edu (login as anonymous, and your email is the password

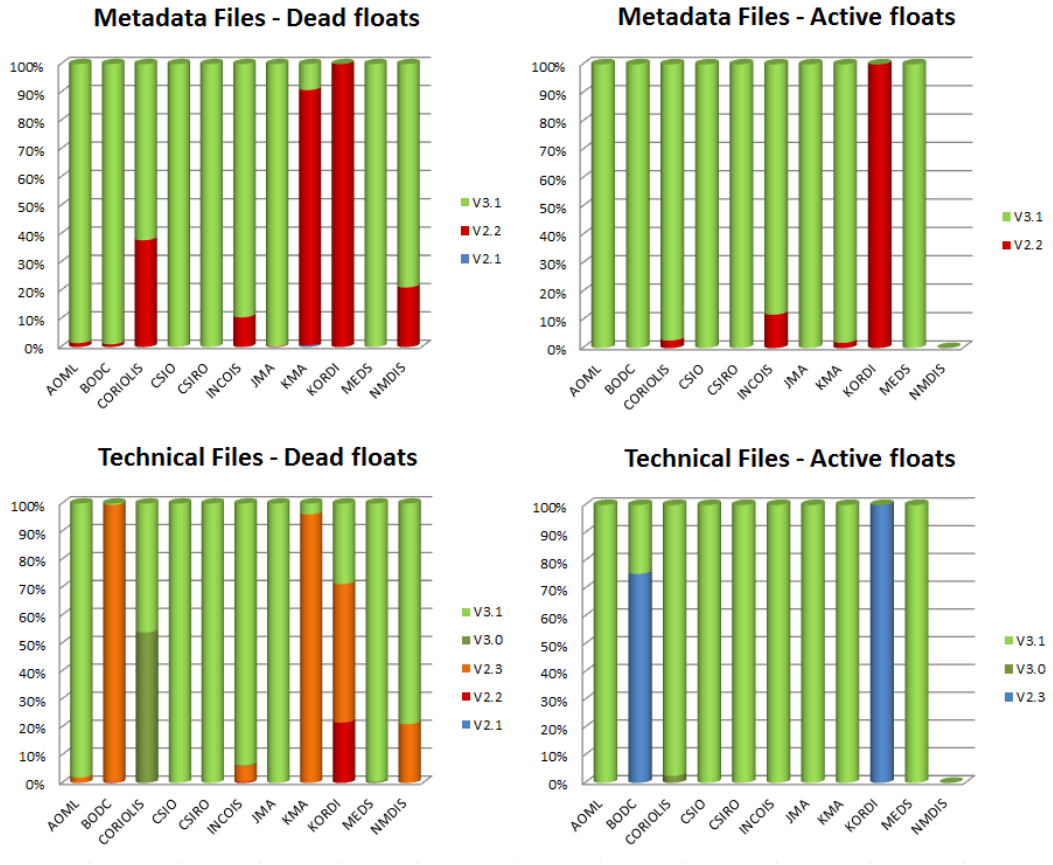
cd /pub/gilson/ADMT18

This analysis which looks at all floats, dead and alive, reveals modest progress towards a full transition. If the same transition rate continues, the full transition will take several more years.

At Coriolis similar status on format version upgrade is performed on a monthly basis for profile and multiprofile files and meta-traj-tech files. Some DACs have still V2.2 or V2.3 and need to update those versions. A large improvement on active floats has been observed since the last ADMT for the profiles files to convert to v3.1. On the plots distinguishing the inactive and active floats, the conversion to v3.1 has been improved for the active floats even if there are still a few DACs that need to update their files but some work still needs to be done for the inactive floats.

Action 26. Christine and John to send DACs the list of active floats that are still in version 3.0 or lower and DACs to reprocess them in V3.1

Action 27. Filechecker to stop accepting files D-Files in version 3.0 or lower 1st July 2018. If dmode operators are having trouble with this, alert ADMT co-chairs. Alert dmode operators of this change.



9.2 Meta- and tech-data updates from Float and Platform Workshop (R. Cowley)

During the recent Profiling float technical workshop, the importance of determining float energy profiles for float types, controller board types, and battery types became apparent. Rebecca presented the proposed changes in the metadata files to allow for derivation of more information on float energy expenditure. These proposals were introduced to the group for discussion. Some were accepted, some will be more clearly defined for the next ADMT. The working group consists of Rebecca Cowley, Annie Wong, John Gilson, and Brian King. We will work with the manufacturers to finalise these details for ADMT19.

1. Add new PLATFORM_TYPE ‘Navis_EBR’ – accepted
2. Standardise the entry for CONTROLLER_BOARD_TYPE_* in the standard managed tables – to be defined for next ADMT.
3. Update FIRMWARE_VERSION definition in the manual to: “Firmware version, as returned from the float log files (iridium) or in the test and launch logs (Argos). Example: ‘072804’ or ‘03/06/17 21:21:20 APF11-2MB-v2.5.2’” – accepted, but group needs to be made aware that they should extract the information from the float files, not the manual.
4. Standardise the entries for BATTERY_TYPE and BATTERY_PACKS to enhance the amount of information we can extract – group to work on the details of this update with manufacturers and present at ADMT19.
    a. Option 1: create a parsable string from a lookup table in the existing variables.
    b. Option 2 (preferred): create a series of new variables dimensioned by N-PACKS. Eg: BATTERY_PACKS, BATTERY_TYPE, BATTERY_MANUFACTURER, BATTERY_MODEL, BATTERY_ENERGY_MJ, BATTERY_ENERGY_USE.
5. Update BATTERY_* field definitions in the manual to reflect the decisions made in 4 – group to work on this and present at ADMT19.

Action 28. Work with Manufacturer to get firmware_version in data sent back at some point in its life

Action 29. Work with manufacturers to define the Battery technical information to be recorded

9.3 Feedback from AST on meta and tech parameters and current status of highly desirable CONFIG_PARAMs (J. Gilson, E. Van Wijk, B. Klein)

The curation of the CONFIG parameter table is an intensive task due to the increased complexity of modern Argo floats. The curators of the table: van Wijk, Klein, and Gilson, propose a concentration of effort upon a subset of critical CONFIG parameters, including the capability to run recurrent audits whose goal is to maintain consistency across the meta netCDF.

The critical subset of curated CONFIGs will be those that fall within three categories

1) Define the Core trajectory mission used to estimate a reference velocity
2) Measure sensor bias
3) Mission Modes: Significant alterations to the Core trajectory built into the firmware

The curated CONFIG spreadsheet will contain Mandatory, Highly Desirable, and Optional members, similar to the current list. Each will be maintained to be a unique control parameter applicable to all or a subset of float types. The non-curated list will not be guaranteed to be unique (may be redundant with another non-curated member). A procedure on how a non-curated CONFIG becomes curated will be developed.

Six critical CONFIGs have been accepted as mandatory universally across the Argo Program, due to their importance to trajectory estimation. AST18 and ADMT18 agree that estimation of these global CONFIGs is allowable and necessary.

6 universal mandatory CONFIGs

1)	CONFIG_Direction_Number	Vertical direction of recorded profile
2)	CONFIG_CycleTime_hours	Duration of a single cycle
3)	CONFIG_ParkTime_hours	Duration of the park phase (drift)
4)	CONFIG_SurfaceTime_hours	Duration of period on the ocean surface
5)	CONFIG_ParkPressure_dbar	Pressure of the park phase (drift)
6)	CONFIG_ProfilePressure_dbar	Pressure at the start of ascent to the surface

As these 6 CONFIGs are universally applicable, an audit confirming their presence in the meta netCDF will be regularly provided. If previous audits demonstrate sufficient inclusion within the netCDF, confirmation of their presence should be transferred to the GDAC file checker. An audit performed on the GODAE GDAC on Nov 20, 2017 identified near universal inclusion of Park and Profile Pressure CONFIGs with lesser use of the other four.

For the remaining mandatory curated-CONFIGs, a strong linkage between CONFIG and float type/firmware will need to be developed for an audit to be possible. This linkage will be developed by the CONFIG curator group and included in the CONFIG spreadsheet or other available resource. If a linkage is not able to be clearly defined, an audit will not be possible, making the CONFIGs designation as ‘Mandatory’ unenforceable. Linkages for optional CONFIGs may be attempted only for use as a guide to DACs to what CONFIGs may be included. It is suggested that only CONFIG names and units be audited. Fillvalue will be allowed, and the percentage of cycles which use

fillvalue will be tracked. The mistaken presence and the mistaken inclusion of a CONFIG will be an audit failure.

The CONFIG spreadsheet will be modified with additional columns to describe the level of curation, the status of the CONFIG, and the allowable float types. The spreadsheet with the curating groups recommendations will be distributed in March 2017, and an updated spreadsheet and audit made available to ADMT19 with changes based on feedback from the Argo community.

Action 30. Collect documentation of curated configs such as ice-detection algorithm documentation. Keep this with meta and tech tables (AIC or ADMT website?)

Action 31. John to release draft config table by March. Feedback needed from DACs and re-run audit before ADMT-19.

Action 32. John to propose at next ADMT a process to move config parameters from non-curated to curated table

9.4 Proposal on how to improve information on under-ice positions (C. Schmid, E. Van Wijk, B. Klein) Action 28 (30 min)

Several Delayed Mode groups work with data from under-ice floats and cannot currently convey all of the position information required in the data files. Some under-ice floats may not report data for many months whilst under sea ice and as the floats are unable to surface, no location is transmitted. These positions must then be estimated in Delayed Mode. Under-ice location data is most useful if the position error can be estimated, or if unknown, some indication given of the likely position accuracy.

A small working group (van Wijk, Klein, Gilson, Rannou, Schmid, Cowley, Kobayashi, Scanderbeg, Carval) was tasked with finding solutions to these issues as agreement could not be reached on these issues when they were presented at ADMT-17. A short presentation on the under-ice positioning issues was presented to the AST-18 in Hobart and a number of options given for AST to decide on.

After presenting a few different options to the ADMT, it became clear that the proposals for the profile files and the trajectory files needed to be split apart. The working group felt there was a need for four different pieces of information to be stored for these estimated positions: position error or accuracy, position QC, positioning system and the method used to derive the position. The path forward to address these needs for the profile files seemed fairly clear. Currently, position QC and positioning system are in the profile files, so two optional variables were suggested to store the additional information: POSITION_ERROR and POSITION_COMMENT. The error field would contain a numerical error estimate and this was supported by the AST at AST-18. The comment field would be a string where the PI could describe the method used to determine the estimated position. This could be standardized if desired. This proposal was generally accepted by the ADMT with the understanding that the members of the working group need to approve it as well since not all were able to attend the meeting. Once agreed upon by the working group, the proposal will be presented at AST-19 for approval.

In terms of the trajectory file, it was recognized that more discussion and research was needed to agree on how to store RAFOS positions and on whether estimated positions and Iridium positions should be stored in the trajectory file. For now, estimated positions are not allowed and RAFOS positions will go into the AUX directory. If more consensus is reached during the year within the working group, a new proposal for the trajectory files can be presented at ADMT-19.

9.5 How to accommodate alternate direction profiles in the netCDF (J Gilson)

Present Argo current ‘best practice’ is to strictly split ascending and descending profiles in separate netCDF files. The result may be that additional profile netCDF files will need to be maintained at the

GDAC and provided to GTS even if the profile data is not over a pressure span consistent with 'Primary Sampling'.

ADMT18 agreed that 'best practice' should continue to have a split into two profile netCDF (ascending and descending) if both are expected to contain data consistent with 'Primary Sampling'. However in cases where the PI believes the profile data sampled in the alternate direction is expected to not reach the level of 'Primary Sampling', the PI may, as 'best practice' include the profile in the primary direction netCDF. If the PI wishes to produce a profile netCDF without 'Primary Sampling', it should be placed in N_PROF>1, and N_PROF=1 should be fillvalue. Leaving N_PROF=1 fillvalue, keeps the secondary data off the GTS as well as the GDAC created multi-cycle prof.nc file.

The decision on how to handle the profile in the netCDF is decided when the mission is determined. It is not dependent on what data is eventually received. It only affects profiles where the mission is expected to return few data.

The definition of 'Primary Sampling' in the Argo manual should be refined to aid DACs in identifing the primary profile returned by ever-more complicated floats. The following proposal is submitted for further refinement by the Argo Program.

"Primary Sampling" is the vertical sampling that is *expected* to return temperature and salinity data as contribution to the core Argo Program. It can also return other ocean state variables on the same pressure levels. When there are multiple profiles from a single cycle, the determination of which profile constitutes "Primary Sampling" will be based on the pressure span with less consideration of the vertical resolution and proximity to the sea surface.

Action 33. For floats that perform Ascending and Descending profiles in the same cycle, if both are Primary Sampling profiles, then each primary sampling profile in N_PROF=1 in two separate netCDF files. Allow small fragment cycles that are not Primary Sampling profiles in N_PROF > 1 even if direction of profile is different than the Primary Sampling profile

Action 34. Clarify definition of primary sampling and put updated definition in user manuals. John to circulate this proposal

10 Trajectory files

M. Scanderbeg reported on the status of the v3.1 trajectory files at the GDAC. She noted that most DACs have moved to producing at least some v3.1 trajectory files in real time and that progress is better in real time than in delayed mode. In preparation for the AST-18 meeting, she performed an inventory at most DACs to look at the contents of the v3.1 files to check for consistency across DACs, whether DACs were following the DAC Trajectory Cookbook, whether timing information was being included in the primary (mandatory) and secondary (optional) measurement codes, if there was basic agreement between N_MEASUREMENT and N_CYCLE arrays, the order of events in the array and whether P/T/S information was included.

Most DACs responded to the query for example WMO numbers by float type and comparison across DACs was possible for all float types except the SOLO and SOLO-II. In general, mandatory measurement codes (MCs) related to timing information were being included, even if they contained FillValue which sometimes is the only value possible depending on float type. The exception here was for APEX APF9 floats for which some of this timing information must be calculated using simple equations. Optional timing measurement codes varied a lot across DAC and float type. Most inconsistencies discovered earlier in the year between the N_CYCLE and N_MEASUREMENT arrays have been resolved.

M. Scanderbeg noted that she found it not to be a trivial task to make these cross comparisons since the 'best' timing information was supposed to be in the N_CYCLE array and one must go cycle by cycle to determine this. The order of events in the trajectory files looked good except for Iridium floats at a few DACs. The category with the best news was the P/T/S study since all files included at least some of these measurements and the addition of the MC makes it immediately clear when in the cycle the measurement was taken and what type of measurement it is (ie, average, spot-sampled, etc.). This is a huge improvement over the previous version of trajectory file. The overall conclusion from this survey was that the contents are not much different than V2 trajectory files and that not all DACs are using the DAC Trajectory Cookbook. The most consistency was seen for Arvor floats where MCs are now included in the float user manual and for PROVOR floats where decoders are now being shared across DACs. SOLO-II decoders are also being shared across the two PIs at AOML which makes these files consistent as well.

There will be a DAC Trajectory Workshop after the ADMT-18 meeting where time can be spent going through each float type in detail so that all DACs learn how to properly code and fill the v3.1 trajectory files. In addition, time will be spent looking at real time QC procedures, the Trajectory Format Checker and code sharing.

Finally, M. Scanderbeg suggested that some time can be spent at the proposed upcoming delayed mode workshop on trajectory files.

11 Delayed Mode Data Management (1h00)

11.1 SBE41 Performance from delayed mode (A. Wong, J. Gilson)

Annie Wong and John Gilson reported that there had been an increase of SBE CTDs that showed conductivity sensor drifts towards salty. The increase seen in the UW floats started around the 2011 deployments, while the increase seen in the SIO floats started around 2014/15. Some of the salty drifts were detectable early in a float's life, between cycles 40-70, and rapidly drifted to > 0.07 PSU. Others were slow to manifest and were often not detectable with certainty until around cycle 200. There is an apparent geographic bias, seen as a concentration of salty drifting floats in the subtropical South Pacific. This apparent bias is due to the ease of drift detection in the South Pacific basin owing to its uniform and stable deep water masses, and is not related to the cause of the salty drift. The cause of the salty drift was as yet unknown (as of December 2017).

11.2 Improving Delayed Mode Processing Monitoring and Priority setting (B. King, S. Pouliquen and working group)

Brian Summary

Action 35. The first DMQC should be done after one year. Then the revisit could be after 2 years for the teams that struggle with DMQC backlog.

Action 36. Add deepest profile level sampled to index file to facilitate monitoring activities

11.3 Can Machine Learning help for Argo (DM)QC (G. Maze)

Quality Control (QC) of the Argo data is based on complex sequences of both automatic and manual tests with human inspection of the test results and the data. At a time where about 400 profiles are produced by the global array every single day, the QC of Argo data has become critically dependent on the performances of the tests and on human resources dedicated to QC. Most of the human expertise is "encoded" within the design of the tests and in the final quality of the Argo Delayed Mode dataset. So, we address the question of whether machine learning of this expertise can be conducted and used to improve the performance of the QC process, or not. Using standard supervised

classification methods, we show two use cases for wish a prediction model gives 89 and 97% of accuracy on QC flag changes and alarms status decided by a human operator. These encouraging results pave the way for more developments into incorporating machine learning methods into the Argo data flow. But building training datasets for machine learning is complicated. Proposals were made to the ADMT to improve how the history variables of the Argo dataset are filled and documented.

Action 37. Review the list of software reported in the HISTORY_SOFTWARE variable to identify human made actions and non-actions and actions driven by human expertise

Action 38. Propose an update to the user Manual section 5 to add more explanation about "group" of HISTORY_STEPS/ACTIONS, rather than isolated actions

Action 39. Propose profile file format checking tests to ensure the HISTORY variables are compliant to reference tables and coherent with each other

11.4 Progress on Argo Reference data base

11.4.1 Summary of the actions since ADMT-17 (*C Coatanoan*)

Christine Coatanoan reported on the CTD reference database for Argo DMQC. Since the last ADMT (ADMT17), a new version CTD_for_DMQC_2017V01.tar.gz was provided on February 2017. This version takes into account some corrections on a few boxes in the North Atlantic Ocean. In spring 2017, the OCL updates were downloaded and work was done on the quality control. The next version 2018_V01 will integrate this dataset. The work on the quality of the boxes (area 3) has been continued, scrutinizing deep water and density of the profiles, and will be continued for the next version (also on areas 5 & 7). The visual inspection is necessary to remove bad profiles from the reference data base. An overview of the database status has shown some information on the density of the CTD by box as well as the age of the CTD. In the southern hemisphere, there are some areas where there are few CTD but also in Atlantic ocean close to the tropical areas, there are boxes with less than 50 stations. An improvement to get more data is necessary but also an update of some boxes with more recent CTD.

Action 40. Christine provides the CTD ref db for Argo in index file. Steve provides all CCHDO CTD files that are not recorded in the index file.

11.4.2 CCHDO/US-NODC-progress (Steve Diggs, T Boyer)

Steve Summary

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11.5 Orphan float management (M. Belbeoch)

Mathieu did not prepare like last year a list of the floats that have been deployed by programs with no DM-QC operators identified that made it difficult to find volunteers for these floats and also highlighted the fact the DM-operator should be linked to a float and not a program in the AIC data base and also with the development of BGC-Argo to a parameter on a float

Action 41. Mathieu to provide the list of orphan floats which have no assigned DMQC operator and ask for volunteers to process them for this year

Action 42. Mathieu to specify a way to manage Dm-Operator at Float and parameter level to be able to manage programs that do not have a program DM-operator and BGC-Argo where different operators may be responsible for different parameters

Action 43. Study how to better capture the DM-Operator and Institution for each parameter in the profile file. Consider adding a global attribute. If this is accepted, consider using ORCid and EDMO-code to avoid spelling issues. This can help with audits done on the Argo dataset.

12 Update on ARC progress (ARCs leaders)

12.1 North Atlantic

Cécile Cabanes presented the activity carried on by the NA-ARC it is related to 3 activities

- DM consistency check in the NA-Arc region
- Check of the CTD Reference Database
- ISAS15 product : a delayed mode in situ temperature and salinity analysis

12.1.1 DM consistency checks in the NA-ARC region

In the Argo data snapshot of May 2017, 1682 floats have been processed in DM in the NAARC region (North of 20°S). Among them, we found 308 floats for which the PI applied a salinity correction and 1345 floats for which no salinity correction was necessary (i.e. the adjusted salinity profile is equal to the raw salinity profile). For each of the 1682 floats, we ran a modified OW method using four sets of configuration parameters. Compared to the OW original method (Owens and Wong, 2009), our modified method better takes into account the inter-annual variability and provides more realistic error bars (see Cabanes et al., 2016). We further checked the DM salinity correction of a float only if the results gotten for all of the four configurations differ significantly from the result obtained by the PI of the float. We were then able to isolate a small number of floats for which salinity profiles were further checked: sections along the float trajectory, comparison of some profiles with the closest reference data or with the closest real-time Argo data available, if needed. Finally, when we thought it was necessary, we suggested to the PI or DM operator of the float to modify the salinity corrections. This year, we sent a report to the PI or DM operator of the 10 following floats:

1900547, 1900608, 6901613, 6900230, 6901238, 6901506, 6900198, 1900803, 4900148, 4901063

Moreover, it appears that in the tropical North Atlantic (between 10°N and 20°N) the OW method often suggests that a salinity offset is present in the float data while the PI or the DM operator have chosen not to correct the salinity data. In this region, the OW method does not always reproduce the PI's decision, mainly because the reference databases (Argo and CTD) do not well sample the variability in this region, especially during the most recent years.

12.1.2 Check of the CTD reference database in the North Atlantic

The CTD reference database for Argo is supplied to delayed mode operators and updated on a yearly basis by the Coriolis team. The data quality of this database is crucial especially for correcting salinity measurements of deep Argo floats. We then scrutinized historical CTDs profiles in the North Atlantic, with a special attention given on the deepest layers. Suspicious profiles were identified by comparing salinity observed on deep and stable theta levels to the salinity of neighbor profiles, in space and in time. Theta/S diagrams of these suspicious profiles were also checked. More than 500 profiles have been reported to the Coriolis Team and will be excluded from the next version of the CTD reference database.

12.1.3 ISAS15 product : a delayed mode in situ temperature and salinity analyses

ISAS is a data based re-analysis of temperature and salinity fields over the global ocean. It is based on optimal interpolation method and synthesize the temperature and salinity profiles collected by the ARGO program as well as different types of profiles and time series (Marine mammals, TAO-TRITON-PIRATA-RAMA moorings and Ice tethered profilers). A configuration using only Argo data is available. The system aims at monitoring the time evolution of ocean properties for climatological studies. The data is freely available (http://www.umr-lops.fr/SNO-Argo/Products/ISAS-T-S-fields/Data-access).

12.2 Mediterranean Sea

S Pouliquen presented on the behalf of Gulio Nortastefano the activities carried on by the MED-ARC

12.2.1 STATUS OF ARGO

Since 2001, 426 floats were deployed in the Mediterranean and in Black Sea with the contribution of different countries and projects and about 50000 CTD profiles have been acquired. The BBG-Argo contribution is between 20% and 25% in terms of profiles, since 2013. This year (Jan to Oct 2017) 27 floats have been deployed and a total of 6100 profiles have been acquired.

12.2.2 STATISTICS

Statistics has been computed using the entire dataset: 1) the floats survival rate and 2) the vertical distance travelled; the floats that have been recovered and those still alive whose lifetime is shorter than the estimated mean-half life have been excluded by the computation. The mean half life is about 140 cycles and the floats equipped with the Iridium telemetry system live longer with respect to the floats with the Argos system onboard. Since the Med Sea is characterized by a complex bathymetry, where shallow and narrow areas exist, the vertical distance travelled by floats could be a good indicator of their performance: the mean vertical distance travelled is about 125 km and the floats with the Iridium system performed better than the floats with Argos.

12.2.3 DMQC

In the context of the DMQC activity, the reference dataset has been updated: the most recent version of the climatology provided by Coriolis, the Argo climatology and the products available from the European service of Copernicus have been collected. Other local data (CTD from ships in the South Adriatic Sea) will soon be added. About 75% of the dead floats have been checked in DM for the physical variables and the diagnostic plots are available on the MedArgo web page. The nc D-files have been created at OGS using a modified version of the script provided by Christine at Coriolis.

The DMQC of the dead US Argo NAVOCEANO (Argo equivalent project) floats in the Mediterranean Sea has been done and the D-files of 28 floats were created and sent to the AOML DAC. The Surface Pressure Offset has been corrected if needed and the variables recalculated before running the OW method. The TNPD status has also been checked. Some issues have been found related to tech and meta files, time and surface pressure. The data of another 25 floats are available only on the GTS, with the meta files missing and the T and S data are truncated to two decimal places.

The DMQC of floats in the Black Sea has been done on 13 floats from Italy, Bulgaria and Turkey. The reference dataset has been downloaded from the Copernicus European portal but it seems that the most recent CTD data available are too scarce to provide a reliable comparison. Nevertheless, the OW method has been applied in order to have at least an estimate of any potential conductivity sensor drift. The float data have been also cross-compared to the closest (in time) Argo profiles in the basin: the

float Θ-S diagrams were use as an indicator of the salinity behaviour at selected Θ levels. The floats that are QCed in DM are 13 and the D-files have been sent to the Coriolis DAC.

Action 44. AIC, OGS and AOML to define what to do in term of DMQC for GTS only floats

12.2.4 DEEP ARGO

Last year in December the second Deep Argo float was deployed in the Mediterranean Sea, in the Hellenic Trench. The maximal profiling depth and the drifting depth were changed accordingly to the depth of the sea bottom; these values were set between 3000 dbar and 4000 dbar. The float is still alive but it seems that the conductivity sensor has a positive drift since the beginning of the mission.

12.3 Pacific Ocean Shigeki Hosoda

Pacific ARC (PARC) is providing float monitoring information in the Pacific on its web sites since 2006, operating in collaboration with IPRC (USA) and CSIRO (Australia). The PARC is operating well, producing many kinds of information and dataset to Pacific PIs. In this year we consider to improve PARC web site to be more useful. One of plans is to improve the previous version of Advanced automatic QC (AQC) for Argo profile data. The aim of the upgrade is to produce useful QC information to PIs based on the process of making AQC v2.0 dataset. Over 10000 profiles in R, A and D mode have been checked with 9 QC test, R-mode files with insufficient QC are mostly corrected. Thus there is the possibility that information of QC flags on AQC dataset will be useful to monitor performance of Pacific Argo array. Statistical information based on error check process of AQC will be shown monthly from PARC website. The monthly AQC dataset ver2.0 has been released in JAMSTEC web site

(http://www.jamstec.go.jp/ARGO/argo_web/argo/?page_id=100&lang=en).

12.4 -Indian Ocean Uday Bhaskar

As part of the ARC activities of Indian Ocean, INCOIS has undertaken the following activities during the period Oct, 2016 - Nov 2017:

1. Co-ordination of float deployment by India and other countries. Helping in data processing of floats deployed as a part of Indo-Australian collaboration. Using the float density map to identify the region of low floats density and suggestion for deployment in those regions.
2. With a healthy number of BGC-Argo floats deployed by India, a working group was formed for dealing with the data from BGC-Argo floats deployed by India. Experts in the fields of BGC were roped into this group for guiding the best practices of deployment, QC and calibration.
3. Continued user awareness training and data utilization workshops were held to bring about awareness among the students of various universities. Students are encouraged to use the Argo data for their PG dissertations. Encouraging various users' groups to propose Argo data utilization by inviting project proposals for utilization of Argo data.
4. Data search and archeology of high quality CTD for updating the Argo reference data base and also for use in DMQC of Argo data. All the non-EEZ CTD data archived at INCOIS is shared with CCHDO.
5. Working on development of additional QC methods like convex hulls and Artificial Neural Networks (ANN) for detection of outliers and sensor degradations. GUI was developed for putting the convex hulls methods to use for performing quality control.
6. Archiving of temperature and salinity profile data from floats deployed by India and other countries in the Indian ocean and making them available through Web-GIS. Supply of "Argo data and product for Indian Ocean" to students and other researchers with low bandwidth capabilities.

A dedicated FTP is setup and the product is being made available. The same page is made available through UCSD website to maximize the benefit.

7. Continued generation of value added products based on gridded products obtained from Objective and Variational Analysis methods. These value-added products are made available on the web and also on the Live Access Server and ERDDAP web sites.

12.5 Southern Ocean Birgit Klein/Matt Donnelly

In the past year, SOARC has launched a new website (www.soarc.aq), improvements are planned and feedback is welcomed. Additional partners in SOARC are welcome, and SOCCOM has expressed an interest in doing so. A primary focus of SOARC activities has been investigating various under-ice positioning methods, including renewed interest in a potential Near Real Time f/H contours positioning method and RAFOS delayed-mode positioning. Progress has been made in providing DMQC for struggling programmes, BODC has regenerated its DMQC capability and attention is now moving to potential ways to undertake regional data quality assessments. Improvements to the CTD reference database are being pursued in partnership with SOOS and CCHDO, with provision of an inventory of the reference database by Coriolis being a key enabler to further progress. BODC has this year supplied training support to the South Africa Earth Observation Network (SAEON) in support of capacity building. Resources for SOARC activities remain highly constrained but BODC has plans to improve this situation. A full report is also available on the ADMT-18 meeting website.

13 All other business

13.1 Summary of the 18th ADMT actions

Sylvie and Megan have collated an action list from the ADMT18 discussions and the list was reviewed, actions assigned to DACs/operators, deadlines identified and priorities set.

13.2 Location of next meeting

The location of ADMT19 will be either in Scripps/USA hosted by UCSD.

14 Annex 1 – Agenda

Welcome address (*15mn)*

- **Feedback from 18th AST meeting** : *S. Wijffels (30mn) Action 1*
- **Feedback on 6th BGC-Argo Workshop (H Claustre) (0h30)**
- **Feedback from the Profiling Float and Platform Workshop (S. Wijffels) (0h30)**
- **Status of Argo Program and link with Users (1h00)**

Status on the actions 2,3,11,13,21,32

- ***Review of the Action from last ADMT*** *(M. Scanderbeg) 15 mn*

- ***Argo Status* + Real-time Monitoring** : including monitoring delays to deliver data to GDACS , monitoring of major anomalies detected each month, Requested actions from DACs. Trying to identify why some anomalies are not corrected *(Mathieu Belbeoch) Action 3,11,13,21 (30mn)*
- **New Argo visualization website and API** *(M. Scanderbeg) (15 mn)*
- **Earth.nullschool.net update** *(S. Diggs) (15mn)*
- **Best Practices Argo Paper** *(S. Wijffels) (15mn)*
- **Feedback on Citation advertisement** *(T. Carval) Actions 2,32 (5mn)*

- **Real Time Data Management (2h)**

Status on the actions 4,5,6,7,8,9

- **GTS status** *(Anh Tran) (20mn)*
- **BUFR converter tool***(M. Scanderbeg for J. Turton) Actions 4,5,6 (20 mn)*
- **Status of anomalies at GDAC** *(Christine Coatanoan) (20mn)*
- **Status on Anomalies detected with Altimetry** *(Stéphanie Guinehut) (20mn)*
- **Feedback on Investigation in changing RT order test to catch more anomalies** *(C. Coatanoan) Actions 7,8 (15mn)*
- **Density inversion test and alternate flagging algorithms** *(J. Reißmann) (15 mn)*
- **Status on density test implementation** *(discussion) (15mn)*
- **Proposal on how to include RBR data in Argo data system** *(A. Wong) (15 mn)*

Thursday 30th November

- **GDAC Services (M Frost , T Carval) (1h30)**

Status on the actions : 14 to 24

- **Operation status at US-GDAC and Coriolis-GDAC***(Thierry Carval, Mike Frost) Actions 15,16,17,18,19,22,23,24 (30mn)*
- **Auxiliary directory tree status** *(Thierry Carval, Mike Frost) Action 14 (20min)*
- **Status of Format Checking operations for profiles** *(Mark Ignaszewski, Mike Frost) Action 16, 21, 23(20mn)*
    - **For profile files**
    - **For metadata, tech and trajectory files**
- **Maintenance of tables centrally – who looks after additions and changes operationally? (***R. McCandliss, Thierry Carval, Mathieu Belbeoch, Catherine Schmectig) Action 21 (10 mn)*
- **Status of the new GDAC Cookbook and profile Cookbook** *(Thierry Carval, Mike Frost) Action 20 (10 mn)*
- **Production and serving of Mprof.nc files** *(A. Wong)*
- **New needs?**
-

- **Format issues (2h00)**

The new formats mean a challenge for the DACs – how well are we implementing V3.1? what issues remain?

Status on the actions : 25, 26,27,28,29,30

- **Upgrade to V3.1 Real-Time and historical T&S floats at GDAC** *(J. Gilson, C. Coatonoan, all) (15mn)*
- **Meta- and tech-data updates from Float and Platform Workshop** *(R. Cowley) (15 mn)*
- **Feedback from AST on meta and tech parameters and current status of highly desirable CONFIG_PARAMs** *(J. Gilson, E. Van Wijk, B. Klein) Actions 29,30 (20 mn)*
- **Proposal on how to improve information on under-ice positions** *(C. Schmid, E. Van Wijk, B. Klein) Action 28 (30 min)*
- **How to accommodate Deep Argo ascending/descending profiles** *(J. Gilson) (10mn)*

- **Trajectory files (15 min)**
  - **Update on Trajectory File Status and DAC Trajectory Workshop** *(Megan Scanderbeg) (15 mn)*
  -

- **Delayed Mode Data Management (1h00)**
  - **SBE41 Performance from delayed mode** *(A. Wong, J. Gilson) (20mn)*
  - **Improving Delayed Mode Processing Monitoring and Priority setting** *(B. King, S. Pouliquen and working group) Action 12 (45 min)*
  - **Progress on Argo Reference data base (0h30)**
    - **Summary of the actions since ADMT-17 (***C Coatanoan*) Action 10
    - **CCHDO/US-NODC-progress** *(Steve Diggs, T Boyer) Action 11*
  - **Can Machine Learning help for DMQC analyzing History fields?** *(G. Maze) (20mn)*
  - **Orphan float management** *(M. Belbeoch) (15mn)*

Friday 1st December

- **ARCs: provide an information on what done and what is planned (1h30)**

  - **Update on ARC progress** (ARCs leaders) 15mn each
    - **North Atlantic** Cecile Cabanes
    - **Mediterranean Sea** Gulio Nortastefano, Action item 34
    - **Pacific Ocean** Shigeki Hosoda, Fumihiko Akazawa, Action item 35
    - **Indian Ocean** Uday Bhaskar
    - **Southern Ocean** Birgit Klein/Matt Donnelly

- **GADR Status of the Archiving centre** *(T Boyer) Action item 31-32* **(0h30)**

Summary of the 18th ADMT actions *(S Pouliquen, M Scanderbeg)* **30mn**

- **Location of 19th ADMT**

15 Annex 2 - Attendant List

First Name	Last Name	Affiliation	Country
Fumihiko	Akazawa	JAMSTEC	Japan
Mathieu	Belbeoch	JCOMMOPS	France
Vincent	Bernard	Ifremer	France
Henry	Bittig	LOV	France
Emmanuel	Boss	University of Maine	USA
Cecile	Cabanes	LOPS - Ifremer - Centre de Brest	France
Romain	Cancouet	Ifremer	France
Thierry	Carval	Ifremer	France
Christine	COATANOAN	Ifremer	France
Rebecca	Cowley	CSIRO Oceans and Climate	Australia
Steve	Diggs	Scripps Institution of Oceanography / UCSD	USA
Mingmei	Dong	NMDIS	China
Matt	Donnelly	National Oceanography Centre	UK
John	Gilson	Scripps Institution of Oceanography	USA
Alberto	Gonzalez Santana	Instituto Español de Oceanografía	Spain
Stephanie	Guinehut	CLS	France
Shigeki	Hosoda	JAMSTEC	Japan
Mark	Ignaszewski	FNMOC	USA
HyeongJun	Jo	KMA	Korea
Ken	Johnson	MBARI	USA
KiRyong	Kang	KMA	Korea
Lydia	Keppler	BSH	Germany
Sung-Dae	Kim	KIOST	Korea
Brian	King	National Oceanography Centre	UK
Nicolas	Kolodziejczyk	Brest University	France
Catherine	Lagadec	Ifremer	France
Siv K	Lauvset	Uni Research Klima and University of Bergen	Norway
Joon-Soo	Lee	National Institute of Fisheries Science, Korea Oceanographic Data Center	Korea
Zenghong	Liu	Second Institute of Oceanography	China
Shaolei	Lu	Second Institute of Oceanography	China
Tanya	Maurer	MBARI	USA
Guillaume	MAZE	Ifremer	France
Robin	McCandliss	BODC	UK
Breck	Owens	Woods Hole Oceanographic Institution	USA
Violetta	Paba	BODC	UK
Hyukmin	Park	KIOST	Korea
Stephen	Piotrowicz	NOAA	USA
Josh	Plant	MBARI	USA
Antoine	Poteau	LOV	France
Sylvie	Pouliquen	Ifremer	France

Jan H.	Reißmann	BSH	Germany
Katsunari	Sato	JMA	Japan
Megan	Scanderbeg	Scripps Institution of Oceanography / UCSD	USA
Catherine	Schmechtig	OSU Ecce Terra	France
Claudia	Schmid	NOAA/AOML/PHOD	USA
ANH	TRAN	MEDS	Canada
TVS	UdayaBhaskar	INCOIS	India
Susan	Wijffels	Woods Hole Oceanographic Institution	USA
Annie	Wong	University of Washington	USA
Xiaogang	Xing	Second Institute of Oceanography	China
Jinkun	Yang	NMDIS	China
Nathalie	Zilberman	Scripps Institution of Oceanography, UCSD	USA

16 Annex 3 - ADMT17 Action List

On 30 actions: 16 Done 9 Partially 5 Not Done

	Action	Target Date	Responsibility	Priority	Status
1	Produce a document and provide to AST by email prior for AST18 – restate for PI and Manufacturer what is an Argo Float and not an Argo Float. Include development of an 'Aux' directory for non-Argo floats and novel sensors before they are approved for Argo.	AST18	Brian , AST and ADMT chairs	H	Done; will hear back from AST co-chairs at meeting on final state of document
2	Addition of citation information to the readme on the GDACs to better advertise the use of the existing DOIs	AST18	Thierry Justin Tim		Done
3	Study how to generate and update on a yearly basis indicators on scientific quality	AST18	M Belbéoch, Brian, Thierry, Cecile	R	Discussed by working group, but requires updates to either GDAC index files or history section of profile files. Statistics to be presented at ADMT and would be done by JCOMMOPS
	Real Time Data Stream				
4	BUFR transmission to be implemented	ADMT18	KMA	H	Done
5	Study if possible to Restart TESAC transmission for CLS and CSIO	ADMT18	CSIO CLS	H	Done
6	BUFR : Ifremer and India to change date to JULD instead of JULD_LOCATION as agreed at last meeting	AST18	Thierry Uday	H	On December 1st 2016, Ifremer installed a new version of BUFR data transmission. BUFR profiles properly use JULD. The BUFR messages managed by Ifremet on behalf of INCOIS are also properly using JULD.
7	Investigate if a change in the order (density before spike test) would help catching more anomalies	ADMT18	Christine	R	done; will hear report at mtg
8	Spike : add new deeper level (0-500/ 500-1500 / deeper than 1500 with threshold value more strict =>				studied presented at meeting
9	Anomalies detected and uncorrected after multiplewarnings will be submitted to the AST co-chairs for permission to add this float to the grey list or to instruct the DAC to reflag the dat to class 3 if it is a single profile that is affecte. All grey listed R-Files will need to be regenerated by the DAC with correct QC	AST18	all DACs	H	JMA:Done; MEDS: ongoing; INCOIS: ongoing; BODC: An issue with the application of the greylist test to a small subset fo floats has been resolved, QC feedback backlog in progress; WHOI hiring someone to focus more on real time
	Reference Database				
10	Provide a cookbook for REFDB update	ADMT18	Christine	R	done
11	Identify the best quality CTD before inclusion in REFDB	ADMT18	Action Steve Mathieu Brian Breck Tim Justin and Thierry	R	Mathieu: no access to individual CTD profile statistics at CCHDO yet
	Delayed Mode				
12	Prepare a note for AST to revisit the timing for DMQC processing and identify if	AST18	Cecile,		Reporting on at mtg

	Action	Target Date	Responsibility	Priority	Status
	there can be man power gain without reduction of the data quality, i.e., only revisit DMQC once a year, not every 6 months. In addition, should we increase the time before a float is eligible for DM to 2 years? Start with a survey of DMQC operators to estimate their real revisiting schedule + the mean cost of each revisit Make stat using history section of D-file to assess what is the situation now		Virginie, Sylvie John, Thierry		
13	Mathieu will provide list of WMO numbers for each NAVO float to the DMQC operator that accepted to do the QC.	Oct 2016	Mathieu		List provided to Birgit Klein and all floats have been through DMQC
	GDAC				
14	Set up the auxiliary directory tree and distribution system at GDAC and test cases	ADMT18	Thierry , Mike , Mark, Rebecca, Claudia	R	A proposal to describe "aux" data in Argo User's manual; not set up at US GDAC; CSIRO - test cases from CSIRO EM floats not done
15	Test encoding M-File in NetCDF4 ,evoluate the level of compression and provide these test-files to the community	ADMT18	Thierry	R	Done on ftp://ftp.ifremer.fr/ifremer/argo/etc/netcdf4/ Example 6901751_Mprof.nc NetCDF3 : 1900K NetCDF4 : 330K NetCDF4 M file is 6 time smaller
16	Set up a group to provide files for the traj file checker	Dec2016	Thiery, J-P, Rebecca, Claudia, JMA	R	It's in test mode now
17	Investigate if it is possible to add the index files and other top files in the rsync service at Coriolis	ADMT18	Thierry	R	for Coriolis: Proposal 1: copy index files in dac/index directory Proposal 2: add an upper level to rsync directory Today : ./dac New : ./argo/dac ./argo/index I prefer option 2
18	make sure that all ref table are on http://www.argodatamgt.org/Documentation	Dec 2016	Thierry	R	Done. The link to the 2 googledoc reference tables is in the user manual. No need to display it on the web site (?) http://tinyurl.com/nwpqvp2 http://tinyurl.com/qy7fdqc
19	Correct the 6 digit resolution in geo directory at Us-GDAC	ADMT18	Mike	R	not done
20	Document M-File generation in GDAC Cookbook	ADMT18	Thierry Mark	R	https://forge.ifremer.fr/mantis/view.php?id=33031
21	Study a way to make machine to machine access for the 27 tables of the user manual for Mark and the file checker.	ADMT18	Thierry Mark Mathieu Justin?	R	An Additional column was added to the file for status (active, approved, obsolete, etc). US GDAC implemented this additional column; JCOMMOPS to update files before ADMT; BODC is willing to give a brief presentation on NVS capabilities and discuss possible test case

	Action	Target Date	Responsibility	Priority	Status
22	Investigate difference in delays between two GDACs from AIC report	ADMT18	Thierry Mike	R	status unknown
23	Improve the submission for rejected metadata file	AST18	Thierry Mike		Started at US GDAC
24	improve the situation with DACs that are only feeding one GDAC	ADMT18	Thierry Mike	R	US GDAC: not done
	Format				
25	Study how to store time series in tech-files and test it in the AUX directory.	ADMT18	Thierry, John, J-P	R	Done at Coriolis GDAC
26	modify User Manual according to meeting results	oct-16	Thierry Catherine	R	partially done
27	Modify QC manual according to meeting results - profile files need to be regenerated with data flagged bad when a float is put on grey list -change QC flag 8 meaning from 'interpolated' to 'estimated' -if RTQC test fails on an interpolated value, put flag to 9 and replace the interpolated value by fill value	oct-16	Annie Catherine	R	done
28	Study how to provide information on the Position Accuracy for under ice float	AST18	Birgit Esmee Jean-Phillippe, John, Taiyo, Claudia	R	Reporting on at mtg
29	Make cycle time a required meta config value and ask DACs to estimate it if the float doesn't send it back. Park pressure and profile pressure must also be set.	AST18	Thierry (Manual) +all Dacs		JMA:Done; MEDS: done; BODC not yet, but on our radar; will see audit at mtg
30	Change user manual to indicate that configuration mission number should change only if the PI changes a variable. Automatic ajustments to not create a new mission.	ADMT18	Thierry		done
	GADR				
31	NCEI to correct his DOI to start when the monthly snapshot is the exact copy of US-GDAC and review the content of the landing page	ADMT18	Tim, Megan	R	in progress
32	Provide visibility on NCEI DOI near Coriolis-GDAC DOI and use both for biblio activities	ADMT18	Thierry and Megan	R	done
	ARC actions				
33	SBE should be asked to share the preparation procedures - cleaning and storage - for SBE sensors		Breck		done
34	Black sea floats need a DMQC operator. Follow up with Bulgarian Argo Program to see if they can DMQC floats. If not, ask Giulio if he can be DMQC operator		Giulio		This has begun on Italian floats and will continue onto floats from France, Germany, EuroArgo, Bulgaria, Turkey and USA
35	Assess the advanced QC processes used by PARC and can these be applied to RTQC	ADMT	Kanako		at meeting

17 Annex 4 - ADMT17 Action List

	Action	Target Date	Responsibility	Priority	Status
1	People who want to contribute to the Best Practice Data Paper to contact ADMT co-chairs. Esmee van Wijk and Annie Wong want to help with the DMODE section. S. Pouliquen with the data system as a whole. M. Belbeoch for Monitoring, T. Carval for Real time GDAC operations, A. Tran for GTS, U. Bhaskar, R. Cowley, M. Scanderbeg	ADMT 19	E. van Wijk A. Wong S. Pouliquen M. Belbeoch A. Tran U. Bhaskar R. Cowley M. Scanderbeg	R	
2	Thierry to move ahead with adding list of co-authors to DOI. Ask National Programs to provide Thierry, ADMT co-chairs, AST co-chairs a list of people who have contributed to Argo, along with possible ORCID to begin the list of authors.	ADMT 19	Thierry, National Programs	R	
3	INCOIS to investigate why the number of BUFR message is very low compared to TESAC	AST19	Uday	H	
4	Inform WMO users of the official end of Argo Tesac messages on 1st July 2018. Post message on Argo	January 2018	M. Belbeoch J. Turton M. Scanderbeg T. Carval	R	

	websites.				
5	All DACs to stop sending Tesac messages on 1st July 2018.	July 2018	DACs	R	
6	MetOffice to provide the python BUFR converter to Thierry to be made available in the Tools section of the ADMT website and possibly on AIC website	ADMT19	MetOffice	R	
7	Kordi to provide feedback contact name for anomaly corrections by Christine	AST19	Kordi	R	
8	Mathieu to monitor the Monthly check anomalies in the JCOMMOPS system. Feed ADMT/AST co-chairs if profiles on list repeatedly	ADMT19	Mathieu, Christine	R	
9	Mathieu to modify the AIC warning system to separate out floats that need to be checked and floats that may need to be greylisted from S. Guinehut's comparison with altimetry and send them to appropriate person. Real time files to DAC. D files to DAC and dmode operator.	ADMT19	Mathieu, Stephanie	R	
10	Study how to improve the Spike and density test : use threshold per meter: Christine,	ADMT19	Christine	R	
11	Can we build a gradient climatology from Argo with	ADMT19	J. Gourrion, B. Owens, S.	R	

	good un-corrected data as done for the min max range by J Gourrion at Ifremer : Breck/Susan/Jerome to study		Wijffels		
12	Annie and Thierry will update the definition of the greylist to take into account BUFR. Annie will update the QC Manual.	AST19	A. Wong, T. Carval	R	
13	Mathieu and Breck will contact RBR to obtain information from the manufacturer to fill the Argo meta- and technical- tables. Immediate needs are a new WMO_INST_TYPE, and information to fill SENSOR_MODEL for CTD_PRES, CTD_TEMP, and CTD_CNDC	ADMT19	M. Belbeoch, B. Owens	R	
14	Breck to check on whether FSI floats have been removed from greylist	ADMT19	B. Owens	R	
15	Thierry and Mathieu to further investigate difference in GDAC delays	ADMT19	T. Carval, M. Belbeoch	R	
16	Set up the aux directory at US-GDAC	AST19	Mike	R	
17	Thierry to go with proposal #2 for adding a new directory for index file. Inform users on ADMT rsync page	ADMT19	T. Carval	R	

18	Keep the action item to automatically resubmit all files if metafile is fixed within 7 days.	ADMT19	T. Carval, M. Frost, M. Ignaszewski	R	
19	Continue investigating ways to allow both GDACs to receive files from all DACs	ADMT19	GDACs	R	
20	Stop allowing Config Mission Number of 0 by AST	AST19	DACs	R	
21	Recheck all files on GDACs with a priority on Dmode files. To be performed early 2018 so that anomalies can be fixed by ADMT	ADMT19	M. Ignaszewski, DACs	R	
22	Put links to Google Ref tables on the ADMT documentation page	AST19	T. Carval	R	
23	Mathieu to work with GDACs to develop API for Argo ref tables . End of February	AST19	M. Belbeoch, GDACs	R	
24	Mathieu to look into NERC vocabulary and see how much work we need to do to use such vocabulary for ref table.	ADMT19	M. Belbeoch	R	
25	M-File : French GDAC to move them to NetCDF4 and USGDAC to get them by mirroring the French GDAC . Interim solution until a new M-File format is specified by the group set up at BGC-Argo	ADMT19	GDACs	R	

	meeting				
26	Christine and John to send DACs the list of active floats that are still in version 3.0 or lower and DACs to reprocess them in V3.1	ADMT19	Christine, J. Gilson, DACs	R	
27	Filechecker to stop accepting files D-Files in version 3.0 or lower 1st July 2018. If dmode operators are having trouble with this, alert ADMT co-chairs. Alert dmode operators of this change.	July 2018	M. Ignaszewski, Dmode operators	R	
28	Work with Manufacturer to get firmware_version in data sent back at some point in its life	ADMT19	PIs, B. King, R. Cowley	R	
29	Work with manufacturers to define the Battery technical information to be recorded and other trajectory cycle timing data	ADMT19	B. King, R. Cowley, M. Scanderbeg, H. Bittig	R	
30	Collect documentation of curated configs such as ice-detection algorithm documentation. Keep this with meta and tech tables (AIC or ADMT website?)	ADMT19	PIs, M. Belbeoch	R	
31	John to release draft CONFIG table by March. Feedback needed from DACs and re-run audit before ADMT-19.	AST19	J. Gilson	R	

32	John to propose at next ADMT a process to move CONFIG parameters from non-curated to curated tale	ADMT19	J. Gilson	R	
33	For floats that perform Ascending and Descending profiles in the same cycle, if both are Primary Sampling profiles, then each primary sampling profile in N_PROF=1 in two separate netCDF files. Allow small fragment cycles that are not Primary Sampling profiles in N_PROF > 1 even if direction of profile is different than the Primary Sampling profile	ADMT19	DACs with ascending and descending profiles where one profile is not mandatory	R	
34	Clarify definition of primary sampling and put updated definition in user manuals. John to circulate this proposal	AST19	J. Gilson	R	
35	The first DMQC should be done after one year. Then the revisit could be after 2 years for the teams that struggle with DMQC backlog	ADMT19	Dmode operators	R	
36	Add deepest profile level sampled to index file to facilitate monitoring activities	ADMT19	GDACs	R	
37	Review the list of software reported in the HISTORY_SOFTWARE	ADMT19	G. Maze, others??	R	

	variable to identify human made actions and non-actions and actions driven by human expertise				
38	Propose an update to the user Manual section 5 to add more explanation about "group" of HISTORY_STEPS/ACTIONS, rather than isolated actions	ADMT19	G. Maze, others??	R	
39	Propose profile file format checking tests to ensure the HISTORY variables are compliant to reference tables and coherent with each other	ADMT19	G. Maze, others??	R	
40	Christine to provide the CTD ref db for Argo in index file. Steve to provide all CCHDO CTD files that are not recorded in the index file.	ADMT19	Christine, Steve Diggs	R	
41	Mathieu to provide the list of orphan floats which have no assigned DMQC operator and ask for volunteers to process them for this year	ADMT19	M. Belbeoch	R	
42	Mathieu to specify a way to manage Dm-Operator at Float and parameter level to be able to manage programs that do not have a program DM-operator and BGC-Argo where different operators may be responsible for different	ADMT19	M. Belbeoch	R	

	parameters				
43	Study how to better capture the DM-Operator and Institution for each parameter in the profile file. Consider adding a global attribute. If this is accepted, consider using ORCid and EDMO-code to avoid spelling issues. This can help with audits done on the Argo dataset.	ADMT19	??	R	
44	AIC, OGS and AOML to define what to do in term of DMQC for GTS only floats	ADMT19	AIC, OGS and AOML	R	

18 Annex 5 –Orphan Float report

19 Annex 6 National Reports

Australian Argo National Data Management Report

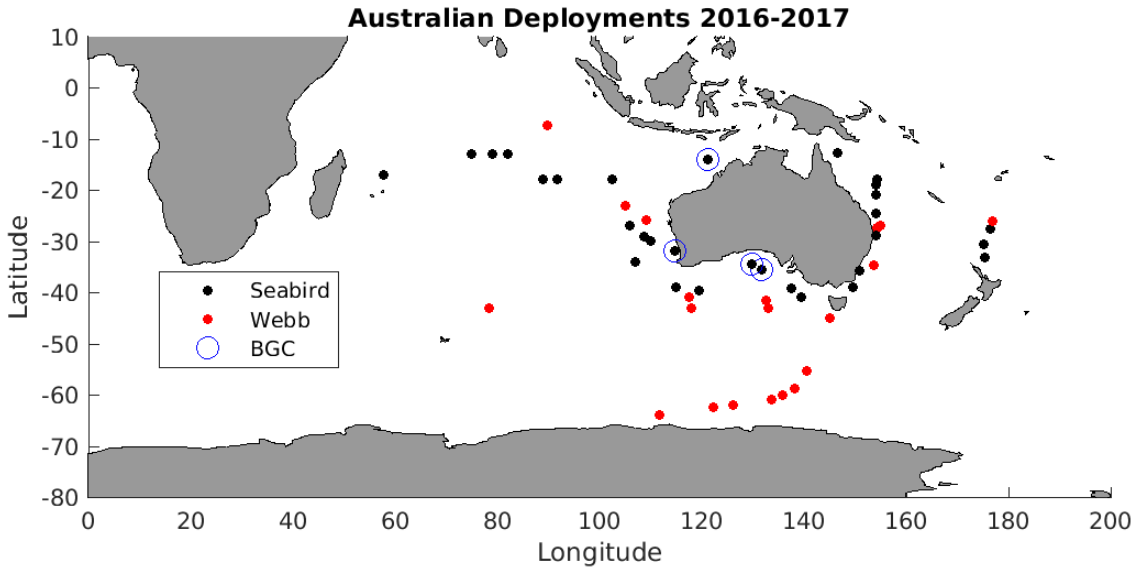
ADMT18

Hamburg, Germany, 29 November-1 December, 2017

Rebecca Cowley for the Argo Australia Team (CSIRO, Bureau of Meteorology)

Status of Array

Australian deployments in 2016-17



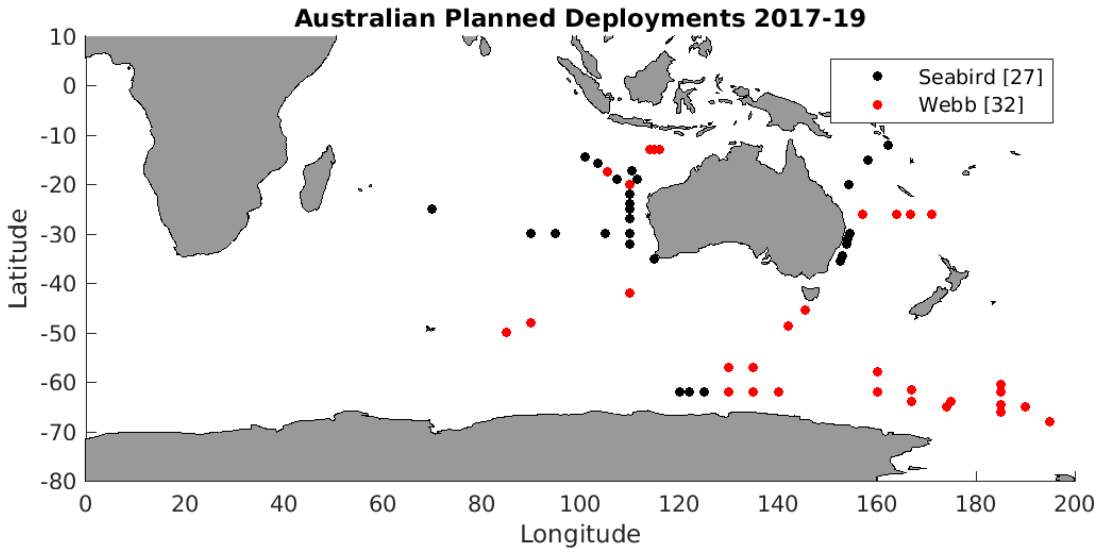
Australian Argo deployments between August 2016 and August 2017.

Australia has deployed 51 floats since the last meeting, including 4 Seabird Bio-Argo models.

We currently have 442 floats listed as 'live' though this includes some that are under ice or have been missing for over a year, from a total of 802 deployments since 1999. Contributors to the Australian Argo program include the Australian Bureau of Meteorology (ABOM), Australian Defence, the Integrated Marine Observing System (IMOS) and the Antarctic Climate and Ecosystems Cooperative Research Centre (ACE-CRC).

Australian Deployment plans 2017-19:

Approximate deployment locations for Australian floats currently in the lab and being purchased are shown below. We will continue to reseed the Southern Ocean, testing the Webb APF11 floats, and focus on gaps around Australia and into the Indian and Pacific Oceans.



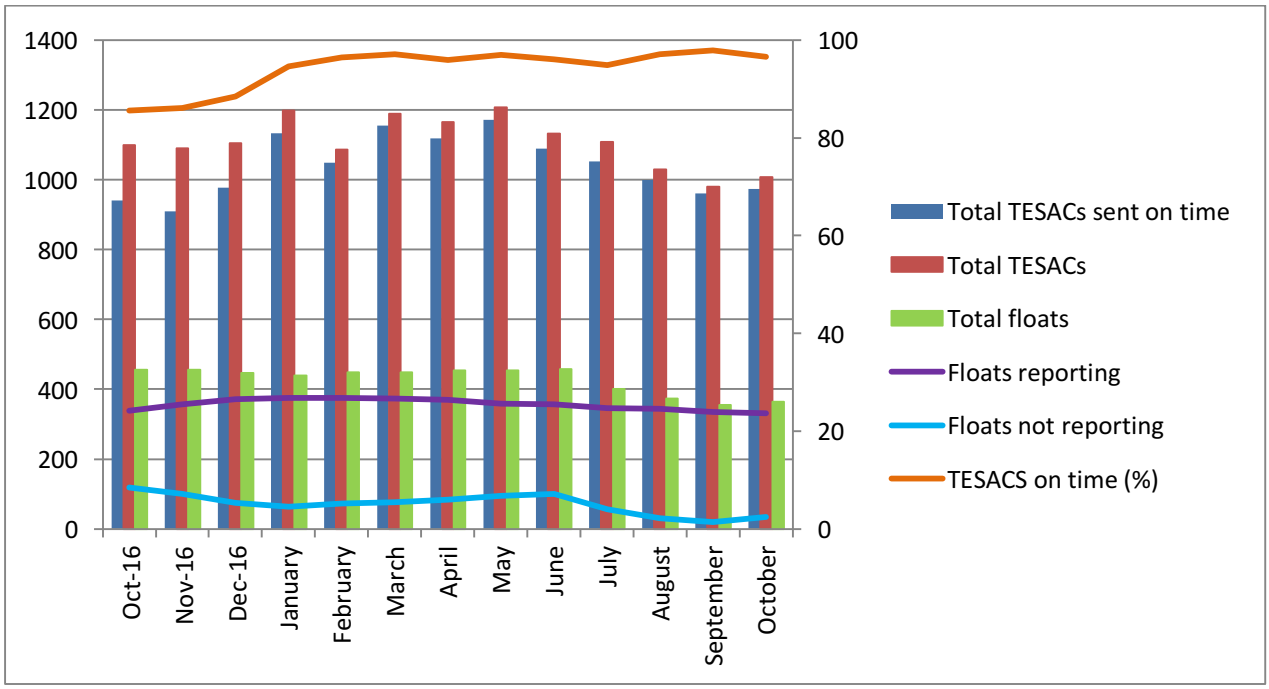
Locations identified for new float deployments. Floats will be deployed from December 2017 to January, 2019.

Issues impacting data delivery in 2016-7:
Rebecca Cowley has taken over the realtime data management from Ann Thresher at CSIRO, and Lisa Krummel continues to maintain the same RT code at the ABOM. Over the last year, there have been some changes to the RT code and the method of data handling between the ABOM and CSIRO. In addition, the ABOM has been upgrading their server and this is proving to be a long changeover
The net result is that there has been an improvement in efficiency of data delivery to the GTS.

Software development:
CSIRO has begun a re-write of the RT code. Over the last decade, the ArgoRT Matlab software has evolved and grown to incorporate the new float types and formats, and is now in need of a complete re-write. We have an in-house software developer working in Python and we are building postgres databases to hold the metadata and float profile data. We plan to test the new software in the coming year.

Data Acquisition and delivery to the GDACs and GTS:
Our aim is that raw data is processed within a maximum of 24 hours of delivery from either Argos or Iridium. We are achieving this for most of our floats. The data is issued to the GTS in both BUFR bulletins and TESAC messages by the Bureau of Meteorology (AMMC). These messages are generated 8 times daily.

Delays in data delivery have improved in 2017 but we will always have some floats that are under ice or have just been deployed and need additional processing before the data is sent out. Because many of the floats we are deploying tend to have the same formats as previous deployments, these delays are now minimal.



Summary of the timeliness of the Argo Australia GTS delivery for 2016-7.

Web Pages:
The Australian Argo Real Time web pages are updated with the most recent data during the processing of the reports from the floats. They are therefore up to date as soon as float data is received.

Home page for Argo Australia (IMOS)
http://imos.aodn.org.au/webportal/
http://imos.org.au/argo.html

The Australian data portal can be found at:
http://www.imos.org.au/facilities/argo-australia.html ;

Information on individual floats can be found at:
http://www.marine.csiro.au/~gronell/ArgoRT/ ;

Statistics of Argo data usage:
Argo data is downloaded to a local mirror daily using the rsync capability.

Argo usage is a difficult list to compile, as Argo data are now being used routinely by many researchers nationally and globally. In addition to the information below, there are numerous

publications from Australian researchers which have used Argo data and have appeared in the last year.

Argo data uploaded to the GTS is accessed and exploited by many operational forecast centeres, including:

- Australian Bureau of Meteorology (BoM);
- UK MetOffice;
- Mercator Ocean (French operational ocean organisation);
- Naval Research Laboratory and NAVOCEANO (US Defence);
- Japam Meteorological Agency (JMA);
- Nansen Environmental and Remote Sensing Center (NERSC; Norway's operational ocean forecasting organisation);
- and others.

Most operational ocean forecast centres – a sub-set of which is listed above – use Argo data, together with other publically available data (e.g., satellite sea surface temperature, satellite altimetry, XBT, TAO) to initialize ocean forecasts. Within Australia, Argo data is used to initialise multiple ocean and ocean-atmosphere forecast systems, including:

- OceanMAPS – BoM's operational Ocean Modelling, Analysis and prediction System (www.bom.gov.au/oceanography/forecasts/index.shtml) – producing daily, 7-day, publically-available, global ocean forecasts;
- POAMA – BoM's operational Predictive Ocean Atmosphere Model for Australia (www.bom.gov.au/oceanography/analysis.shtml) – producing weekly, 9-month, publically-available 14-member ensemble forecasts of the climate;
- eReefs – CSIRO's 4-km resolution forecast/hindcast model for the Great Barrier Reef – producing daily, 4-day forecasts for project partners;
- SAROMS – SARDI's 1-4 km resolution forecast/hindcast model for waters off Southern Australia – producing regular forecasts and scenarios for project partners;
- ROAM – Royal Australian Navy (RAN) Relocatable Ocean Atmosphere Model (ROAM) – producing multiple (typically 5-10, depending on need) regional, high-resolution (2-5 km) forecasts in regions of interest;
- BRAN – CSIRO's Bluelink ReANalysis system – producing annually-updated 5-25 year, global ocean reanalyses, using Argo R- and D-files;
- BRAN-NRT – CSIRO's Near-Real-Time version of BRAN – producing monthly updates of BRAN, using Argo R- and D-files;
- CARS – CSIRO Atlas of Regional Seas (www.marine.csiro.au/~dunn/cars2009/) – a publically-available, global ocean climatology (an updated version of CARS is in production).

Argo data also underpins other activities in real-time monitoring of the ocean, including:

- CARS, and other climatologies, are heavily used for quality-control systems, including Argo and SOOP XBT;
- OceanCurrent (oceancurrent.imos.org.au/profiles/) – primarily delivering ocean products based on satellite observations (SST and altimetry), but also displaying Argo profiles through an interactive web portal;

We report usage to our funders IMOS – the Argo report can be found at:
imos.org.au/imospublications.html

Delayed Mode QC (DMQC) Report:

We have made good progress towards our DMQC targets this year (Table 1). Currently, the DMQC percentage stands at 94% of eligible core Argo profiles. Core Argo is defined here as floats with the standard P, T and S sensors including floats in the seasonal ice zone. Our new software also allows us to DMQC the floats with dissolved oxygen sensors using an approach based on Takeshita *et al.* (2013). More than 40,000 cycles with oxygen are available at the GDAC (93% of the Australian oxygen float array). Expanding the Argo array to include core, Bio, BGC, Argo equivalent and EM Apex Argo floats means we are currently at 93% of eligible profiles completed.

Australian DM Statistics (to 22 Oct 2017)

	Core Argo	**BGC Argo (Oxygen)**	**Core, BGC, Argo eq.**
D files at GDAC	99758	35058	136130
R files at GDAC	17993	5152	23543
eligible R files	6867	2833	10639
Total eligible files	106625	37891	146769
Total files at GDAC	117751	40210	159673
DMQC % eligible	94	93	93

* eligible files have a 12 mth lag

Table 1. Delayed Mode processing statistics for the Australian array.

We aim to assess each float once per year and profiles are considered eligible when they are 12 months old to ensure there is an adequate time series to assess for sensor drift or offset. If a float is dead, then we process the entire record as long as profiles are more than 6 months old.

A challenge for our program is the significant increase in data volumes not only of the standard P, T and S floats but those with Bio or BGC sensors. We have continued to spend significant time this year finalising the development of our new DMQC software. Moreover, floats that sample more than one profile per cycle require significantly more time to DMQC, i.e. manual inspection of both profiles is required to check for spikes, inversions and drifts or offset.

A major achievement over the past two years has been the DMQC of almost all of our Argo profiles with oxygen data (93% submitted to the GDAC). We have assessed 74 floats with DOXY sensors through DMQC where the DOXY data is either on the primary profile, the secondary profile or on both profiles.

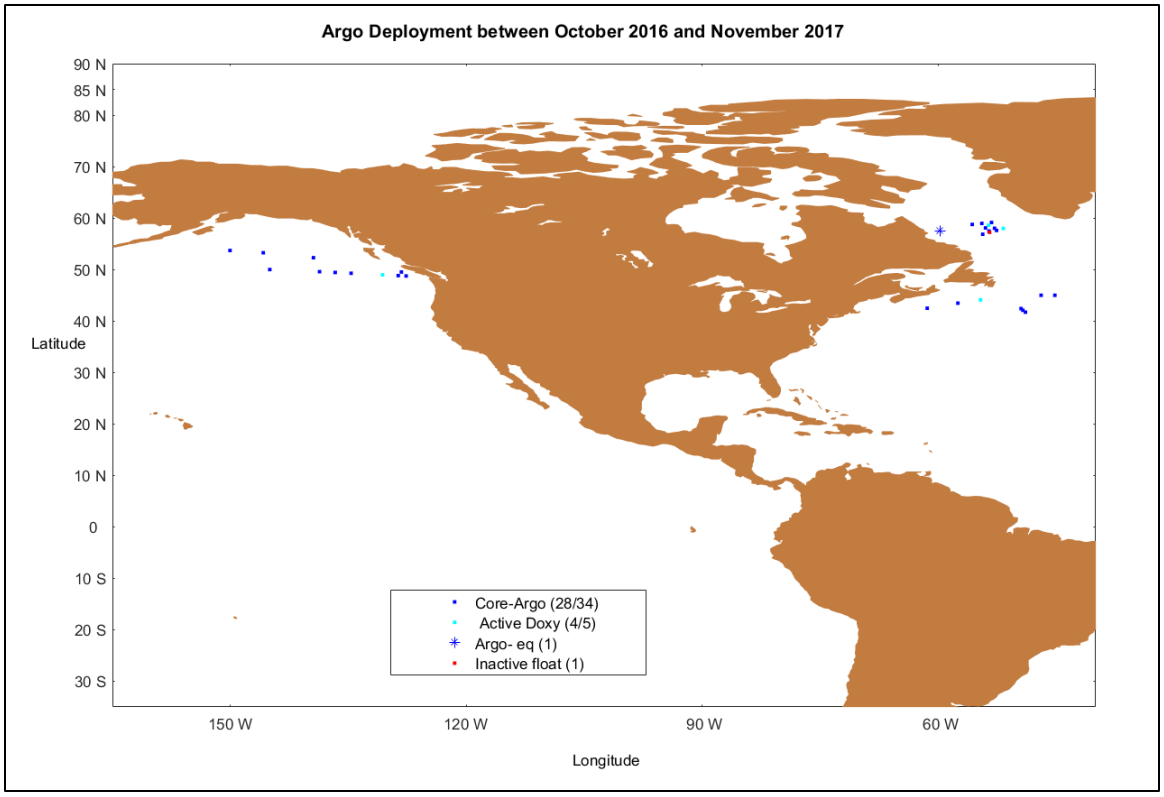
Argo Canada National Data Management Report

ADMT18

Hamburg, Germany, Nov 27 – Dec 1, 2017

1. Status

Canadian deployments in 2016-2017



Data acquired from floats: We are currently tracking 94 floats of which 5 might have failed to report within the last 6 months. Since October 2016, we deployed 33 Argo floats acquired from MetOcean Data Systems Ltd. which report on the Iridium satellite system. We also deployed one Argo equivalent float on the Labrador Shelf which reports daily and has a maximum profile pressure of 200 dbar.

Data issued to GTS: All data are issued to the GTS in TESAC and BUFR formats. Since September 2016, on average, 96.67% and 94.61% of data were issued on the GTS within 24 hours in TESAC and BUFR formats respectively with exception of August 2017 due to server breaking down.

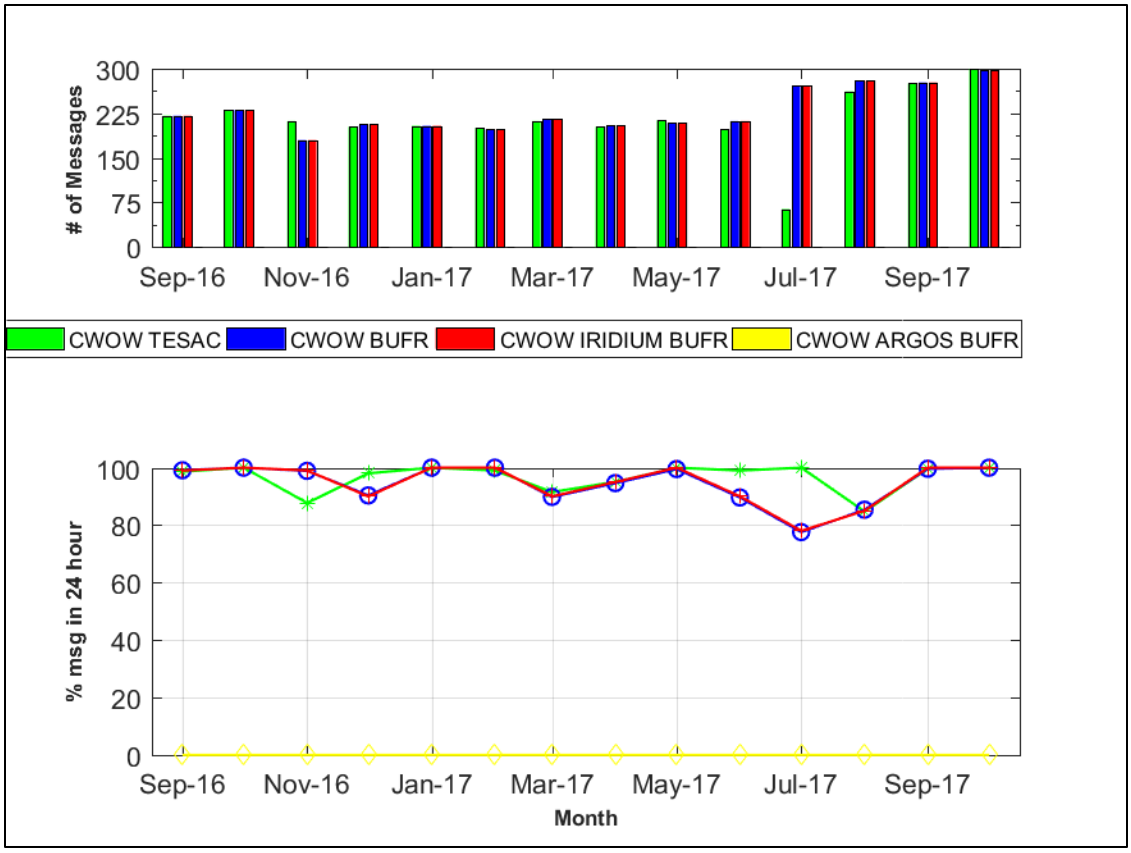


Figure 1: Performance of TESAC and BUFR transmission on the GTS under bulletin CWOW between September 2016 and October 2017

Data issued to GDACs after real-time QC: The profile, technical, trajectory and meta files are transmitted to the GDACs in netCDF format version 3.1 on an operational basis with some additional delay compared to the data sent on the GTS, because the two processes run on different servers. There is still a small back-log of profile, trajectory netCDF files that are not in format version 3.1 at the GDACs.

Data issued for delayed QC: Data are available for delayed mode QC as soon as they are sent to the GDACs, but only for floats deployed for at least 6 months.

Delayed mode data sent to GDACs: The DMQC eligible files from 42 floats (~4900 cycles) were quality-controlled or re-quality controlled for salinity or pressure since September 2016.

Web pages: http://www.meds-sdmm.dfo-mpo.gc.ca/isdm-gdsi/argo/index-eng.html

We maintain web pages that show float tracks and all data collected by Canadian floats. Links to both real-time and delayed mode data are also available for download directly from GDAC. The pages are updated daily.

We also show some information about the global programme including the position of floats over the previous months, the success rate of meeting the 24 hours target for getting data to the GTS at various GTS insertion points, the number of messages transmitted, reports of floats which distributed more than one TESAC within 18 hours and Canadian float performance statistics.

Another website section describes the Line-P products and other uses of Argo to monitor the N.E. Pacific:

http://www.meds-sdmm.dfo-mpo.gc.ca/isdm-gdsi/argo/canadian-products/index-eng.html

Statistics of Argo data usage: Argo data have been used to generate monthly maps and anomaly maps of temperature and salinity along line P in the Gulf of Alaska. Line P has been sampled for 50 years and has a reliable monthly climatology. For more information on the Line-P products and other uses of Argo to monitor the N.E. Pacific go to:

http://www.meds-sdmm.dfo-mpo.gc.ca/isdm-gdsi/argo/canadian-products/index-eng.html

The Canadian Meteorological Centre (Dorval, Québec) of Environment Canada is assimilating real-time Argo data in operational mode.

2. Delayed Mode QC

As of November 2017, 41% of all eligible floats, active and inactive, had their profiles QCed visually and adjusted for pressure according to the latest delayed-mode procedures at least once. The salinity component of DMQC had been performed at least once on 65% of eligible cycles. In addition to DMQC of new profiles, 16 previously-processed floats received either updates to the visual QC or new adjustments in response to feedbacks (e.g., reports of density inversions). Routines were developed to visually QC dissolved oxygen profiles and, in the case of Aanderaa dissolved oxygen sensors, apply calibration factors. As of November 2017, 12% of B-files had been visually QC'd, and 4% were fully DMQC'd.

3. GDAC functions

Canada forwards TESAC data to the GDACs in Ifremer (France) and USGODAE (USA) three times a week. Canada also monitors the timeliness of Argo data on the GTS in BUFR and TESAC formats.

4. Region Centre Functions

Canada has no regional centre function.

Chinese Argo National Data Management Report
ADMT-18
Hamburg, Germany, 27 November-2 December 2017

1. Status
(Please report the progress made towards completing the following tasks and if not yet complete, estimate when you expect them to be complete)

- Data acquired from floats

From October 2016 to November 2017, China acquired 5,177 profiles from 153 active floats. These floats were deployed by 9 PIs from 6 organizations. It should be noted that 6 APEX floats (with Aanderaa Optode 4330) deployed by Ocean University of China in 2015 were added into GDAC, because their PI agreed to share the data with Argo community.

Core Argo: 5,177 TS profiles (53 APEX, 77 PROVOR, 18 HM2000, 4 ARVOR and 1 NAVIS_A)

BGC Argo: 122 DO profiles (6 APEX)

- Data issued to GTS

CSIO sends daily BUFR bulletins on GTS through China Meteorological Administration (CMA). Unfortunately, there was a breakdown during May-October 2017, owing to a technical problem at CMA. The submission of BUFR bulletins was restored in the mid of this October. The TESAC data are still not inserted into GTS because CMA has not a fixed person deal with it.

- Data issued to GDACs after real-time QC

From the last ADMT meeting, China submitted 5,177 R-files to GDACs after real-time QC. All the meta and technical files for both of the dead and active floats have been converted to V3.1. While there are still old profile and trajectory files remaining to be converted.

- Data issued for delayed QC

There is a severe backlog for delayed QC. The situation is not changed from the last ADMT meeting owing to the lack of human resource. Next year, a new staff will be employed to eliminate the backlog.

NMDIS has newly conducted the DMQC for NMDIS' floats and submitted 488 testing profiles to GDAC. It seems the data was not adopted by GDAC and more work will be done to find the reason.

- Web pages

The China Argo Real-time Data Centre (Hangzhou) maintains a website (http://www.argo.org.cn) from which the latest progress on China Argo, the real-time observations from Chinese floats including data file and related plots are provided. Various Argo products and a Web-GIS based global Argo data inquiry system are also provided to users. NMDIS maintains the China Argo Data Centre (Tianjin) website (http://www.argo.gov.cn), as the CMOC/China was established in NMDIS in 2015, the Argo data and products are aslo delivered on CMOC/China website (http://www.cmoc-china.cn). Since NMDIS will unify the website style, a new Argo website will be developed and the old website is suspended updating right now.

- Statistics of Argo data usage (operational models, scientific applications, number of National Pis…)

The Argo data have become the most important dataset in scientific and operational applications. NMEFC and NMDIS from SOA, IAP/Chinese Academy of Sciences have applied Argo data into their operational models. Most of students or scientists downloaded data from GDACs or CSIO. There are 9 PIs from 6 organizations.

- Products generated from Argo data

NMDIS has developed 1º×1º monthly gridded TS products and 5º×5º multilayer velocity fields. The National Marine Environmental Forecasting Centre (NMEFC) developed a reanalysis product of monthly temperature and salinity fields in tropical Pacific Ocean.

CSIO has developed a yearly updated gridded Argo product — BOA_Argo (ftp://data.argo.org.cn/pub/ARGO/BOA_Argo/). It is based on the post-QCed Argo dataset provided by CSIO that keeps about 81% of the global Argo data. This April, an english user manual was prepared and sent to Megan Scanderbeg, from then on the Argo-UCSD provided a link to access this gridded dataset.

CSIO has prepared a global Argo dataset (1996-May 2017) that can be downloaded from ftp://ftp.argo.org.cn/pub/ARGO/global/. The data of each float have been visually

checked and a post-QC has been conducted. Statistically, the good temperature and salinity data are account for 81.7% and 80.7% of the totals (floats in the grey list are also eliminated).

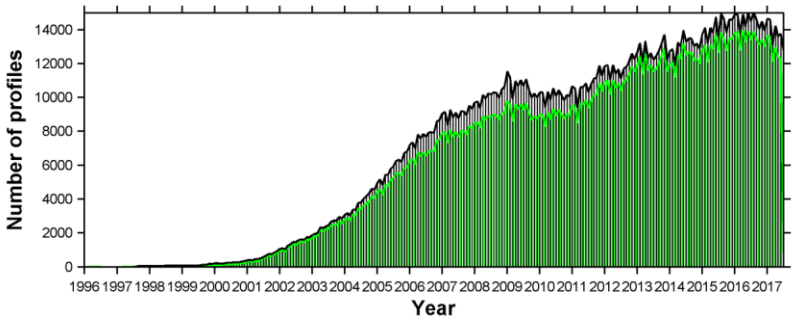


Fig.1 The monthly number of the Argo profiles (1996-May 2017)

Black: Downloaded from GDAC; Green: After post-QC

2. Delayed Mode QC

(Please report on the progress made towards providing delayed mode Argo data, how it's organized and the difficulties encountered and estimate when you expect to be pre-operational .)

OW tool is used to carry on delayed mode QC for Argo salinity observations, before this, a thermal mass correction will be conducted for all APEX floats. 2 out of 10 HM2000 floats have been found experience conductivity sensor drift in the South China Sea, however, we do not have a CTD reference dataset in this marginal sea. To prepare a good CTD reference dataset in the South China Sea is quite difficult because we cannot get many CTD casts from various institutes and universities. Even if we can get those data, the quality control will need a lot of human resource because some of them may have low quality.

3. GDAC Functions

None.

4. Regional Centre Functions

(If your centre operates a regional centre, report the functions performed, and in planning)

None.

Argo data management report 2017

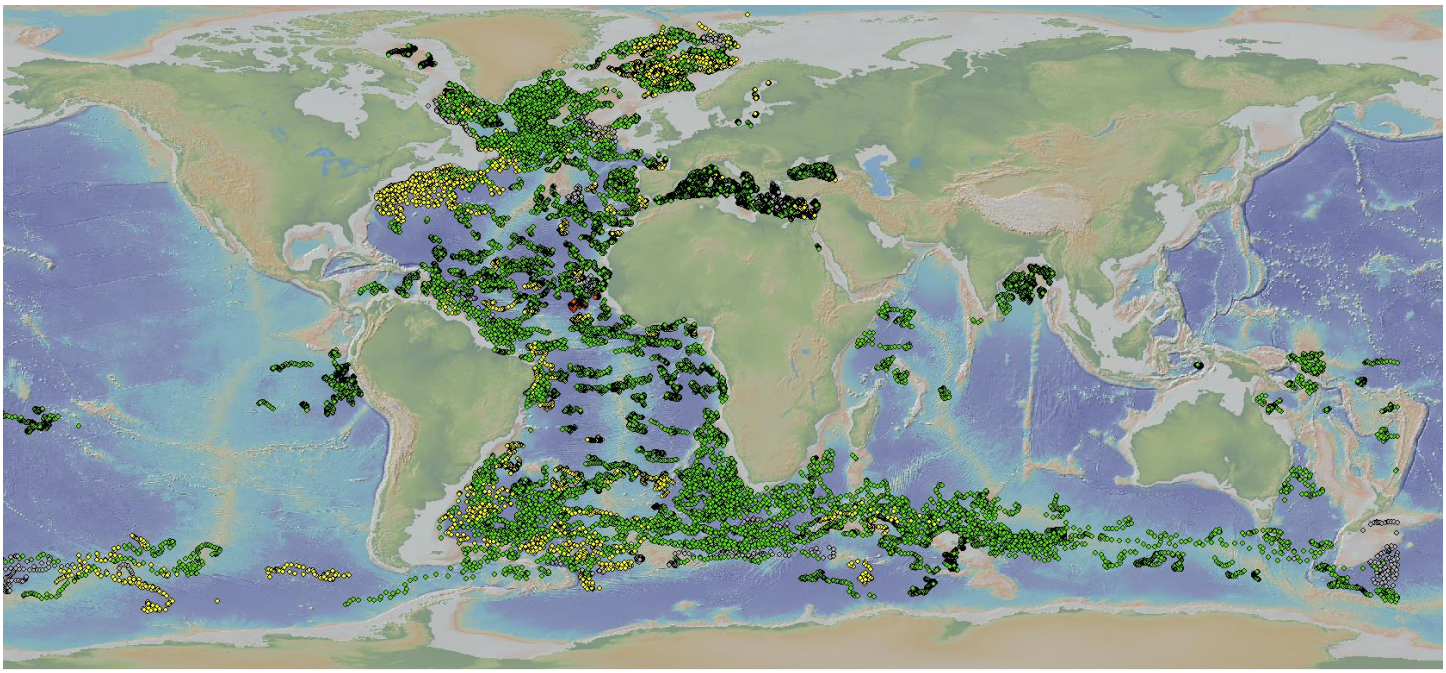
Coriolis DAC & GDAC

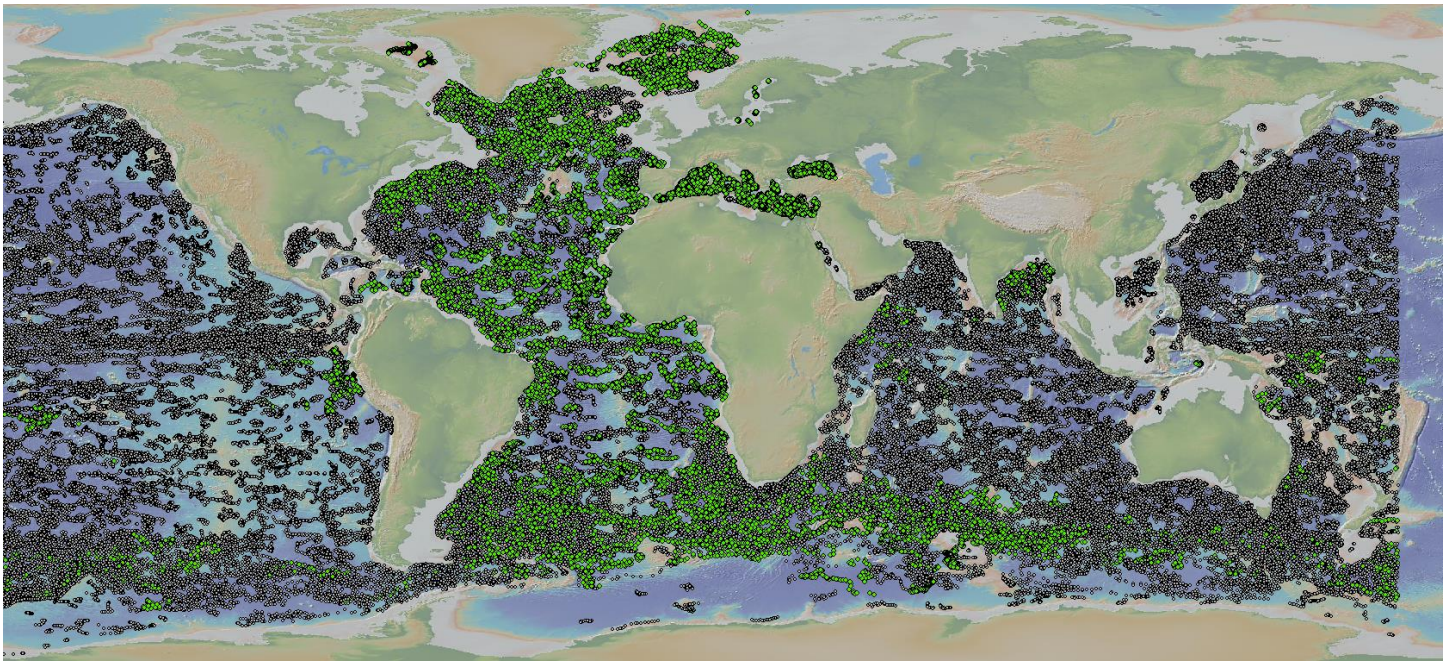
Data Assembly Centre and Global Data Assembly Centre

Annual report October 2017

Version 1.0

November 10th, 2017





1 DAC status

This report covers the activity of Coriolis data centre for a one-year period from November 1st 2016 to October 30th 2017.

1.1 Data acquired from floats

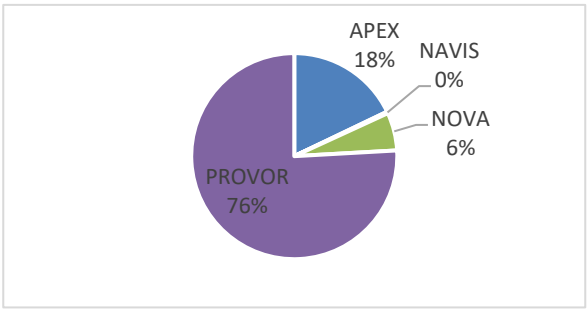
1.1.1 Active floats for the last 12 months

These last 12 months, **30 367 profiles from 788 active floats** were collected, controlled and distributed.

Compared to 2016, **the number of profiles decreased by 1%, the number of floats increased by 2%.**
These figures show a fair stability in Coriolis DAC activity.

The 788 floats managed during that period had 56 versions of data formats.

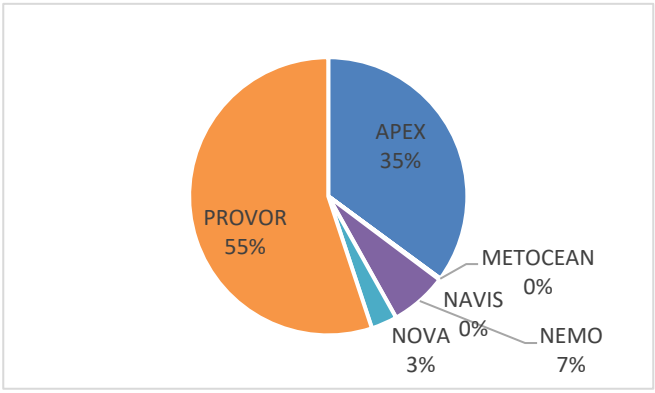
Coriolis DAC, active floats in 2017			
Float family	nb versions	nb floats	nb core profile files
APEX	23	141	4 915
NAVIS	1	2	101
NOVA	3	47	1 544
PROVOR	29	598	23 807
Total	**56**	**788**	**30 367**

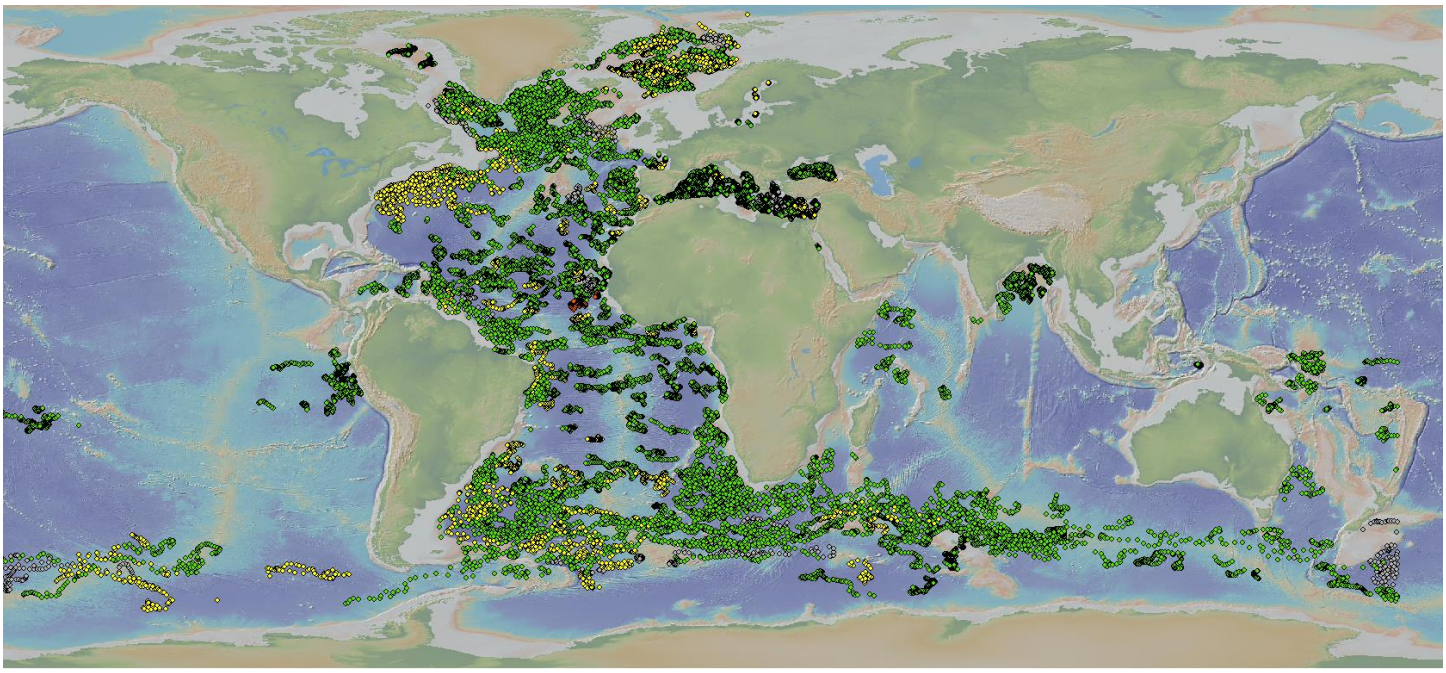


1.1.2 All floats managed by Coriolis DAC

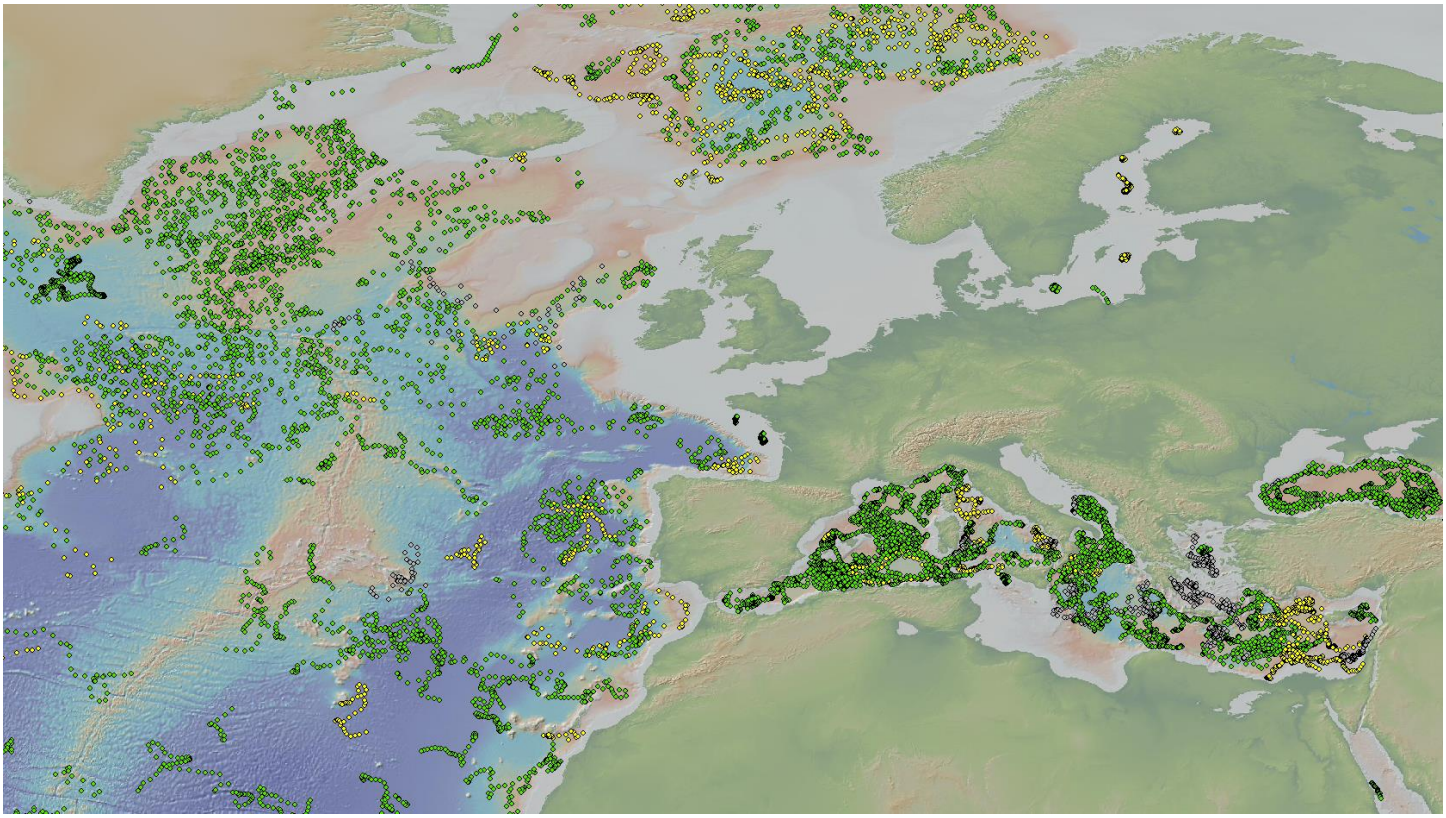
Coriolis DAC manages a total of 2 440 floats with 130 versions, from 6 families.
These floats reported 262 198 core Argo vertical profiles.

Coriolis DAC, all floats			
Float family	nb versions	nb floats	nb core profile files
APEX	62	856	96 663
METOCEAN	1	1	52
NAVIS	1	3	613
NEMO	8	162	8 908
NOVA	3	74	4 473
PROVOR	55	1 344	151 480
Total	**130**	**2 440**	**262 189**

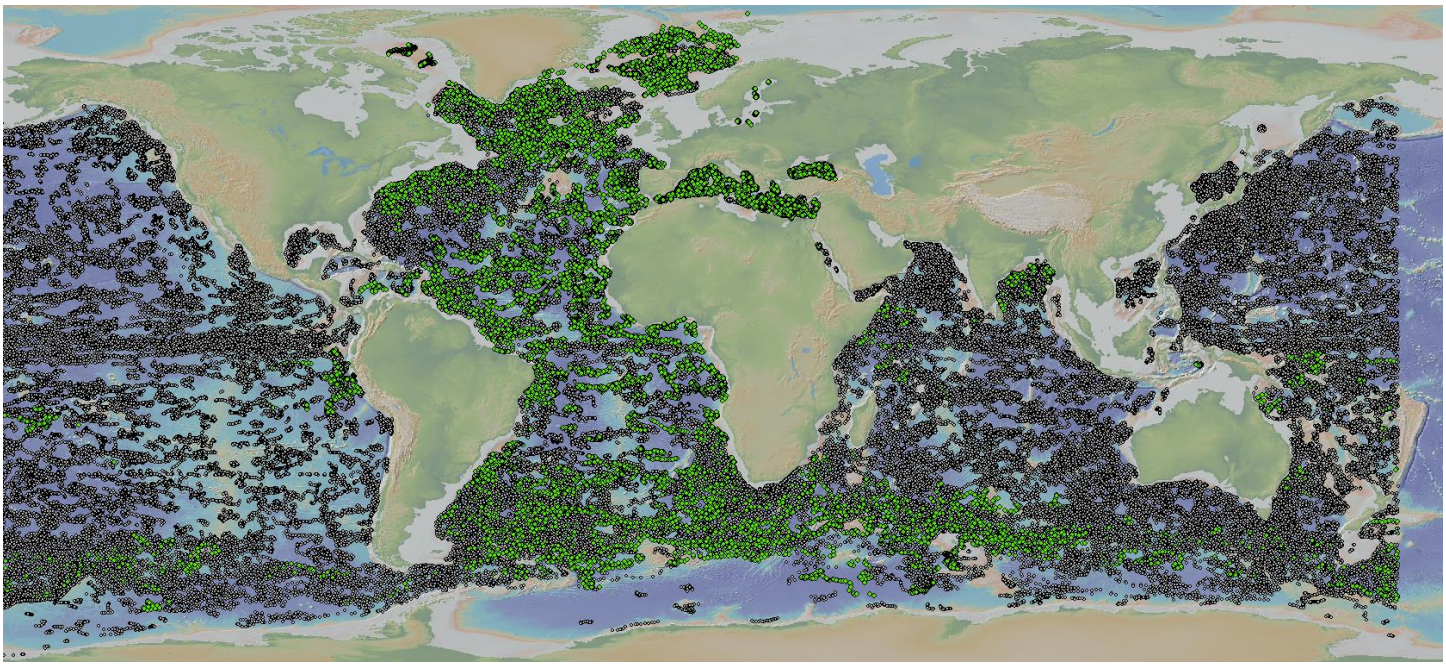




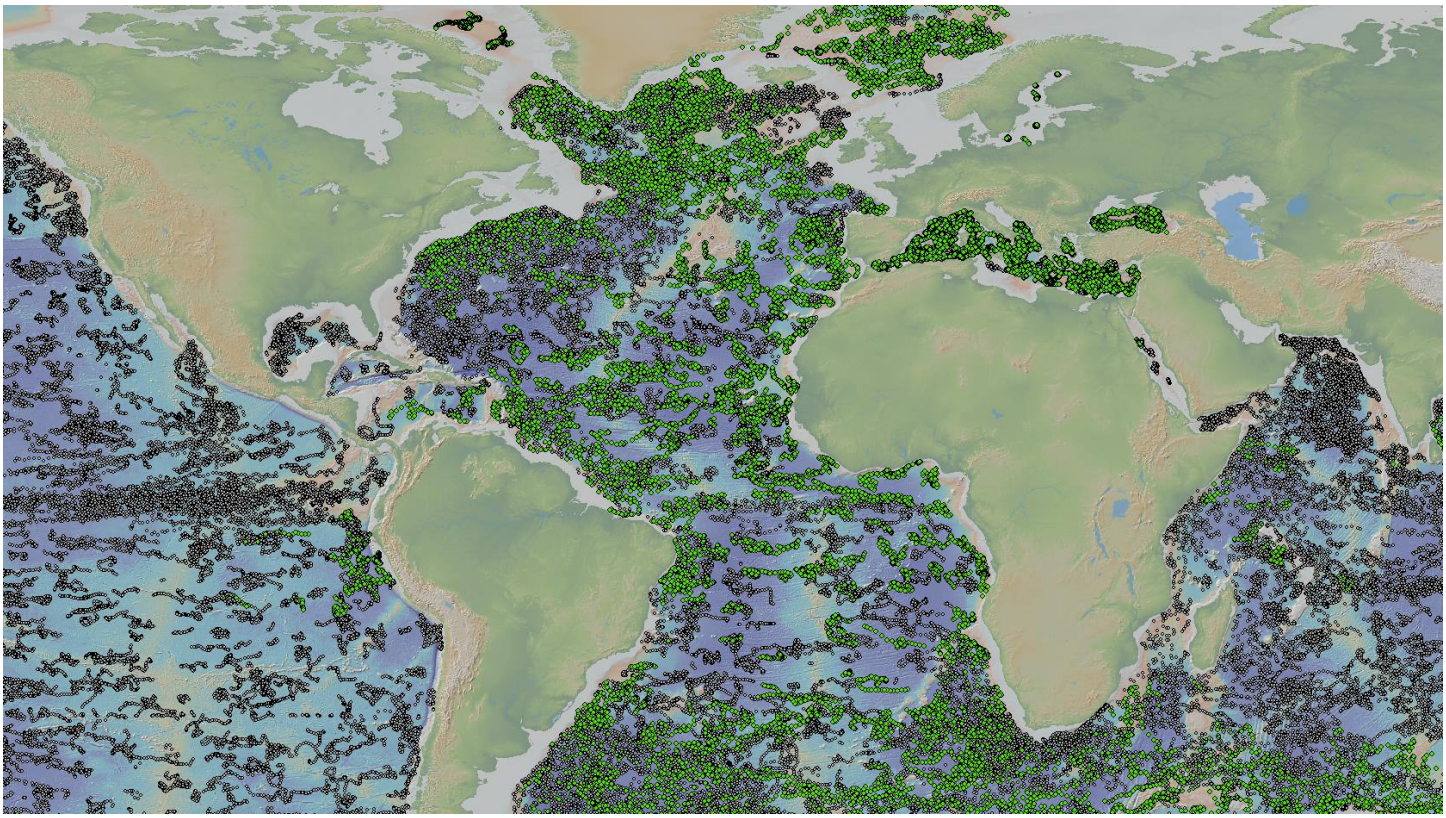
Map of the 30.367 profiles from 788 active floats decoded by Coriolis DAC this current year
Apex Navis Nemo Nova Provor



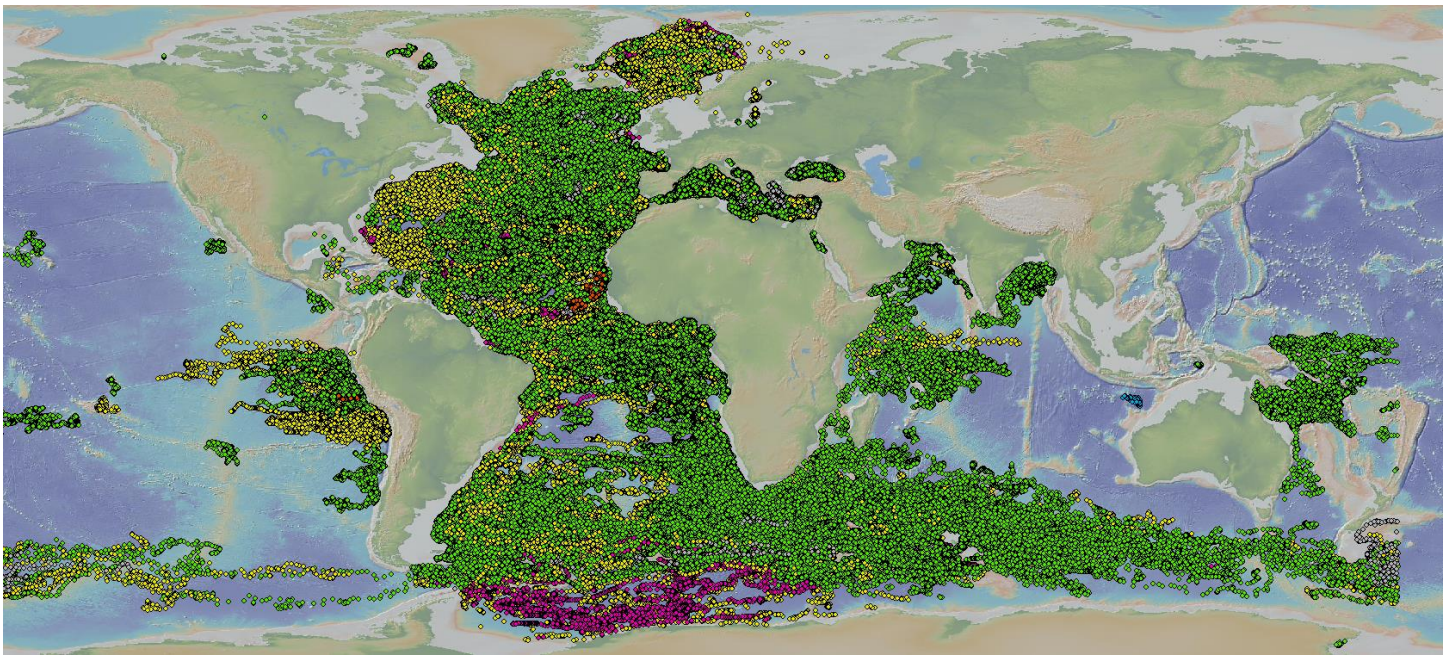
Map of active floats managed by Coriolis this current year, zoom on north Atlantic area



Map of the profiles from active floats decoded by Coriolis DAC this current year, among the other DAC's profiles (Coriolis: green, other DACs: grey)



Atlantic map active floats profiles from Coriolis DAC this current year, among the other DAC's profiles (Coriolis: green, other DACs: grey)



Map of the 262.189 profiles from 2.240 floats managed by Coriolis DAC
Apex Metocean Navis Nemo Nova Provor

1.1.3 BGC-Argo sensors on Coriolis floats

The data processing chain based on Matlab to manage data and metadata from Coriolis BGC-floats is continuously improved. These are advanced types of floats performing bio-geo-chemical measurements.

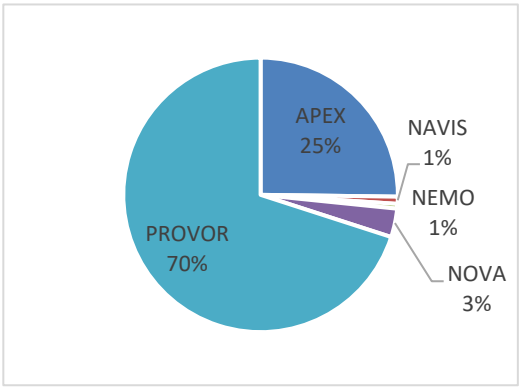
Coriolis DAC manages 357 BGC-Argo floats from 5 families and 51 instrument versions. They performed 46.460 cycles.

The data processing chain is freely available:

- *Coriolis Argo floats data processing chain, version 20170328_010a. SEANOE.* http://doi.org/10.17882/45589

Bio-Argo floats processed by Coriolis DAC

Familly	nb versions	nb floats	nb profiles	nb cycles
APEX	22	90	11 590	11 376
NAVIS	1	3	1 031	517
NEMO	1	2	297	297
NOVA	2	12	646	625
PROVOR	25	250	102 233	33 645
Total	**51**	**357**	**115 797**	**46 460**



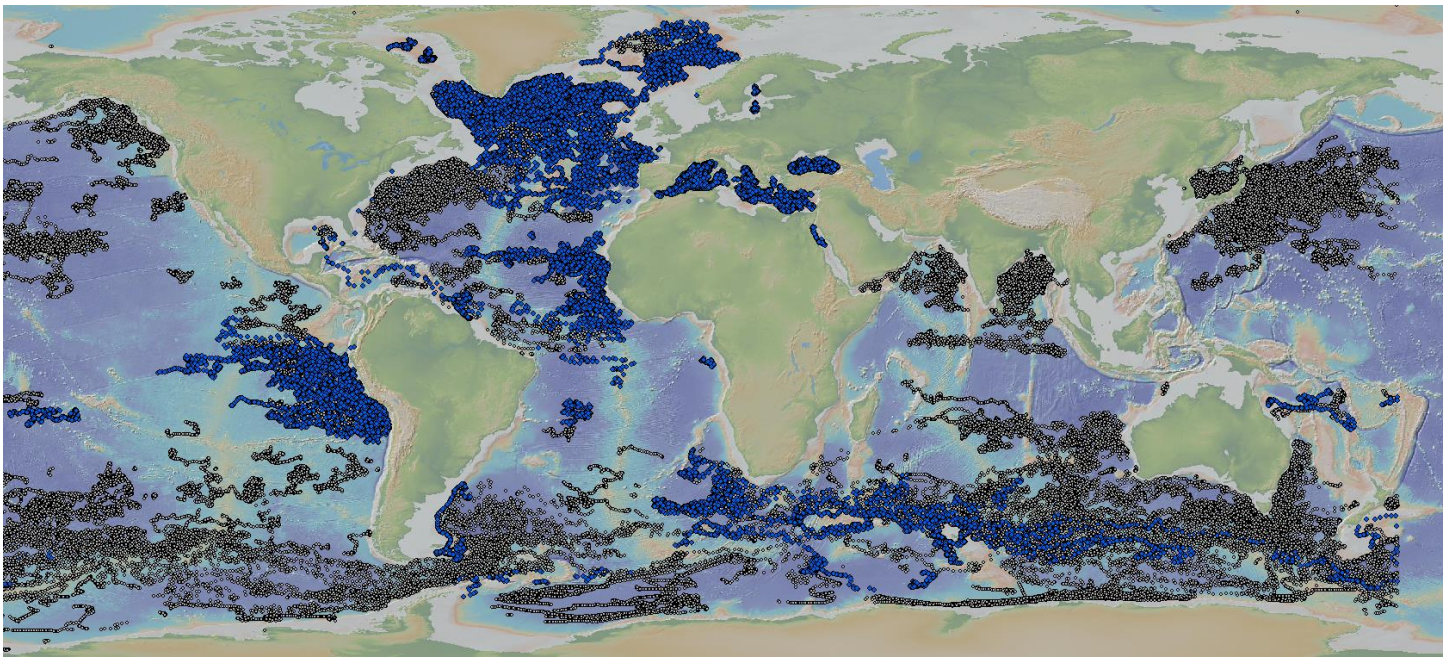
General characteristics

- Iridium rudics bi-directional communication or Argos
- Six sensors are fitted on the floats

- AANDERAA_OPTODE_4330 Aandera oxygen sensor
- C_ROVER Wetlabs transmissiometer
- ECO_PUCK Wetlabs fluorometer turbidity, scattering
- SATLANTIC_OCR504 Satlantic Irradiance sensor
- SBE41CP Seabird CTD sensor
- SUNA_V2 Satlantic nitrate sensor
- 41 parameters managed: core-argo, b-argo, i-argo parameters
  bbp532, bbp700, beta_backscattering532, beta_backscattering700, bisulfide, bphase_doxy, c1phase_doxy, c2phase_doxy, cdom, chla, cp660, down_irradiance380, down_irradiance412, down_irradiance490, downwelling_par, doxy, doxy2, fit_error_nitrate, fluorescence_cdom, fluorescence_chla, frequency_doxy, humidity_nitrate, molar_doxy, mtime, nitrate, phase_delay_doxy, phase_delay_doxy2, ppox_doxy, raw_downwelling_irradiance380, raw_downwelling_irradiance412, raw_downwelling_irradiance490, raw_downwelling_par, rphase_doxy, temp_cpu_chla, temp_doxy, temp_doxy2, temp_nitrate, temp_spectrophotometer_nitrate, tphase_doxy, uv_intensity_dark_nitrate, uv_intensity_nitrate

These parameter include chlorophyll, turbidity, CDOM, back-scattering, UV, nitrate, bisulfide, pH, radiance, irradiance, PAR.

Main parameters	nb profiles
DOXY (oxygen)	32716
BBP700	23397
BETA_BACKSCATTERING700	23397
CHLA (chrolophyll)	23397
DOWN_IRRADIANCE380	20941
DOWNWELLING_PAR	20941
CDOM	20627
NITRATE	6411
PPOX_DOXY (oxygen in air)	520
BISULFIDE	184



Map of the 357 bio-Argo floats managed by Coriolis DAC (grey dots: the others DACs bio-Argo floats). They measure parameters such as chlorophyll, turbidity, CDOM, back-scattering, UV, nitrate, bisulfide, pH, radiance, irradiance, PAR.

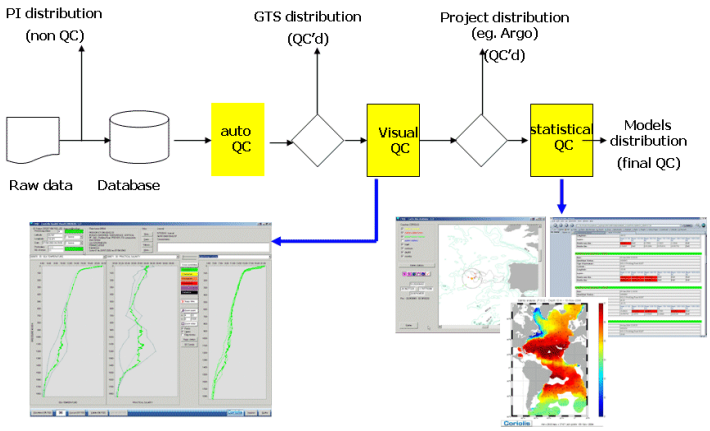
© Antoine Poteau, Observatoire Océanologique de Villefranche (CNRS/UPMC)
Deployments of a bio-argo Provor in Ligurian sea

1.2 Data issued to GTS

All profiles processed by Coriolis are distributed on the GTS by way of Meteo-France. This operation is automatically performed. After applying the automatic Argo QC procedure, the Argo profiles are inserted on the GTS every 2 hours. Argo profiles are inserted on the GTS 365 days per year, 24 hours a day.

The profile files are sent as TESAC and BUFR messages by way of Meteo-France. Meteo-France accept Coriolis as valid BUFR messages and circulate them on neighbouring nodes.

Once a day, floats data that are less than 21 days old are checked in an objective analysis (ISAS) that triggers alert and visual inspection for suspicious observations.

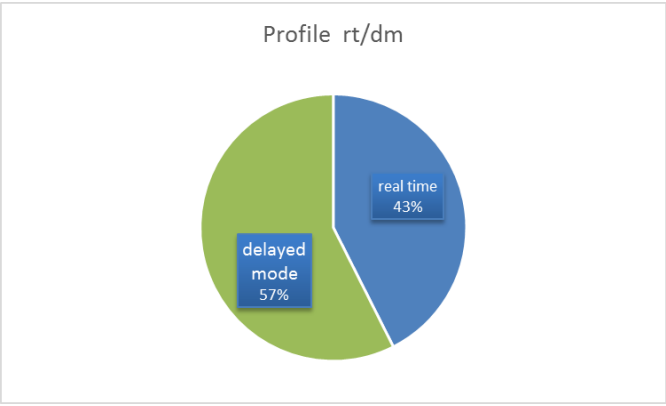


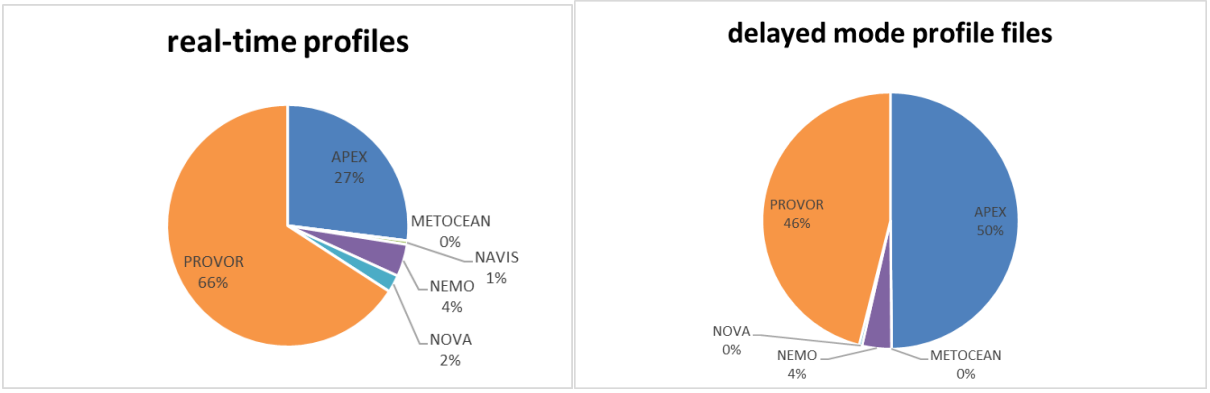
CORIOLIS DAC: Argo data flow

1.3 Data issued to GDACs after real-time QC

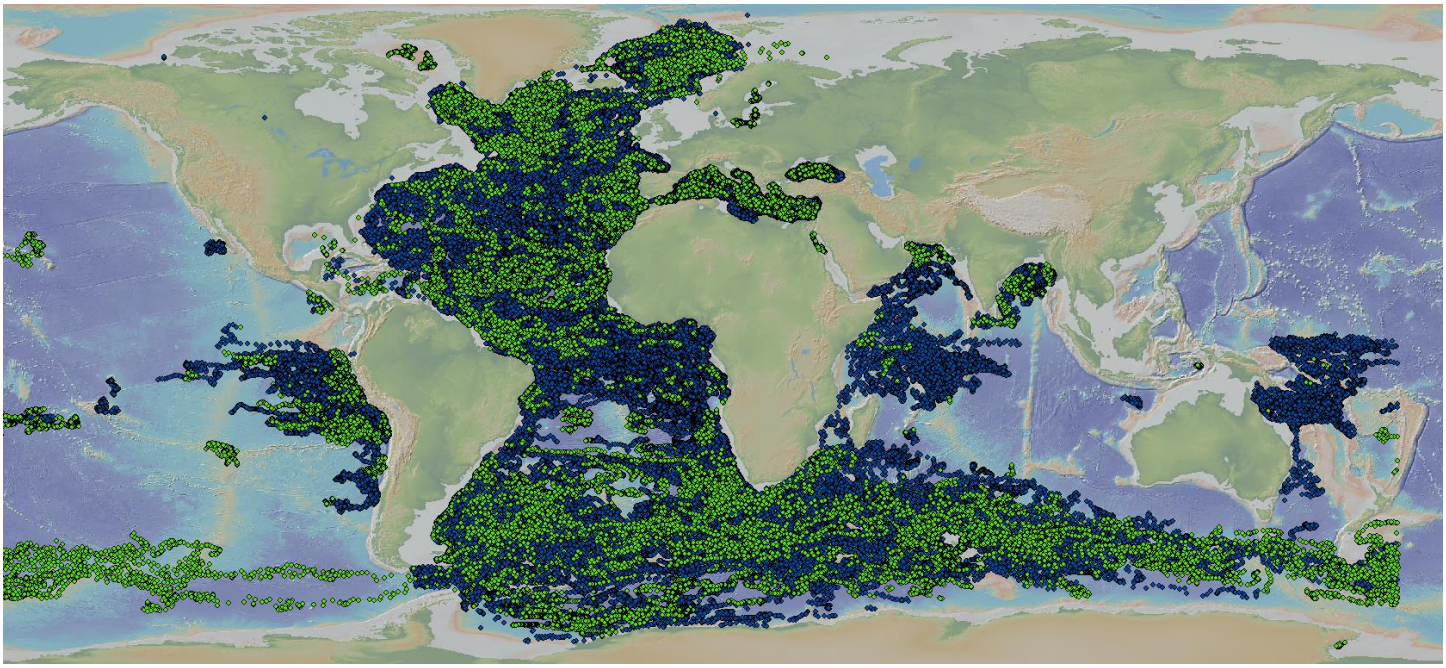
All meta-data, profiles, trajectory and technical data files are sent to Coriolis and US-GODAE GDACs. This distribution is automated.

All Coriolis floats, number of profile files on GDAC				
Family	nb floats	nb profil	RT profil	DM profiles
APEX	829	90 533	25 918	64 615
METOCEAN	1	52	-	52
NAVIS	3	488	488	
NEMO	163	8 911	4 141	4 770
NOVA	52	2 727	2 233	494
PROVOR	1 162	122 974	63 264	59 710
Total	**2 210**	**225 685**	**96 044**	**129 641**





Distribution of Coriolis DAC real-time and delayed mode profiles (96 044 profiles – 225 685 profiles)



Map of real-time profiles and delayed mode profiles
Real time: green dots, delayed mode: blue dots

1.4 Data issued for delayed mode QC

Delayed mode profiles

All profile files are sent to PIs for delayed QC. Most of the Atlantic data handled by Coriolis are checked by the European project Euro-Argo.

Preparation of Argo delayed mode trajectories

The delayed mode trajectories derived from Andro trajectory product were produced in version 3.0. Their conversion to V3.1 trajectory format will be performed in 2016.

The 1442 delayed mode trajectories files are available from:

- ftp://ftp.ifremer.fr/ifremer/argo/etc/coriolis-custom/argo-andro-data/data/dac/coriolis/

The Andro trajectory TRAJ3 files are available for most of the DACs. Each DAC may decide to use these files to provide delayed mode trajectory on GDAC.

Coriolis DAC will use these files as its delayed mode trajectories for old floats versions.

1.5 Delayed mode data sent to GDACs

An Argo delayed mode profile contains a calibrated salinity profile (psal_adjusted parameter).

- A total of **57 013 new or updated delayed mode profiles** was sent to GDACs this year.
- **A total of 179 361 delayed mode profiles** where sent to GDACs since 2005.
  The number of delayed mode profiles increased by 27% this year.

1.6 Web pages

The web site of the French DAC is available at:

- http://www.coriolis.eu.org/Observing-the-Ocean/ARGO

This web page describes all Argo floats:

- http://www.ifremer.fr/co-argoFloats/
    - Individual float description and status (meta-data, geographic map, graphics : section, overlaid, waterfall, t/s charts)
    - Individual float data (profiles, trajectories)
    - FTP access
    - Data selection tool
    - Global geographic maps, GoogleEarth maps
    - Weekly North Atlantic analyses (combines Argo data and other measurements from xbt, ctd, moorings, buoys)

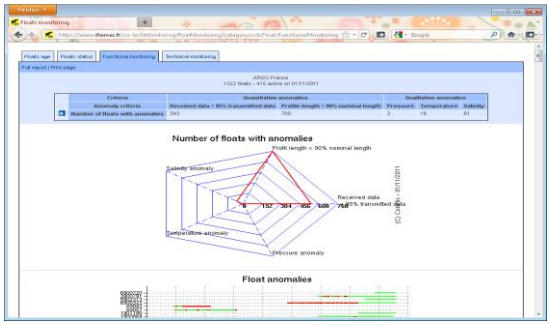
This web page describes all Argo floats interoperability services from Coriolis:

- http://www.coriolis.eu.org/Data-Products/Data-Delivery/Argo-floats-interoperability-services

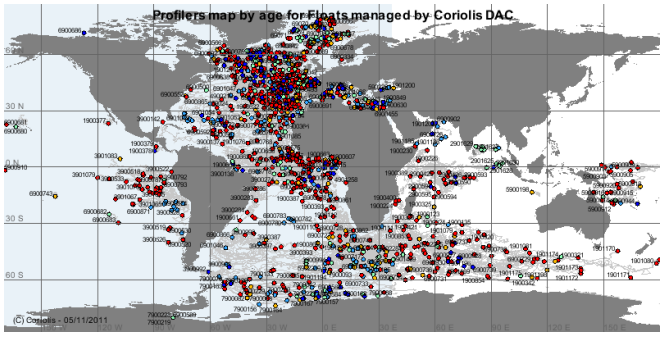
- Display an individual float's data and metadata in HTML or XML format
- Display all Argo floats, display a group of floats
- Argo profiles and trajectories data selection (HTML or XML)
- All individual float's metadata, profile data, trajectory data and technical data
- Argo profiles data on OpenDAP, OGC-WCS and http
- Argo data through RDDAP data server (www.ifremer.fr/erddap)
- Argo data through Oceanotron data server
- Argo profiles data through GCMD-DIF protocol
- Argo data through RDF and OpenSearch protocols
- Display Argo profiles and trajectories with GoogleEarth

Some pages of Coriolis web site are dedicated to technical monitoring:

- http://www.coriolis.eu.org/Data-Products/At-sea-monitoring

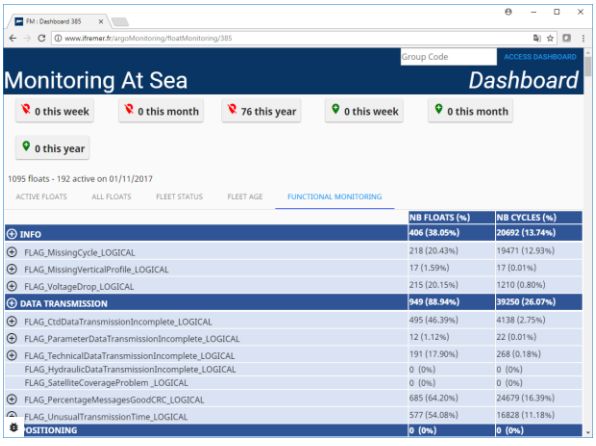


Example 1: technical monitoring of Argo-France floats



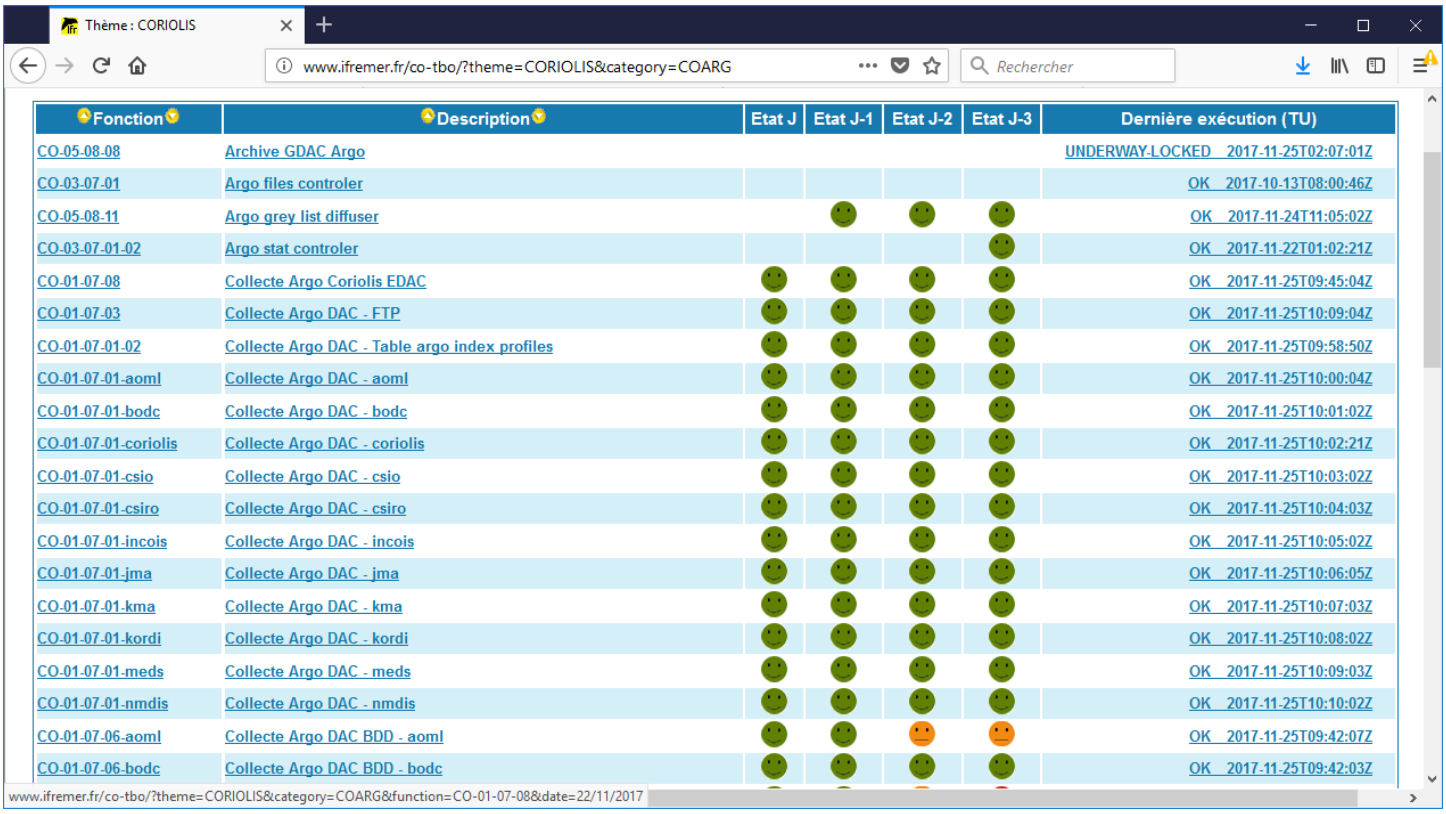
Example 2: age map of floats managed by Coriolis DAC.

Within Euro-Argo ERIC (European Research Infrastructure Consortium), a dashboard with alerts on anomalies was developed: http://www.ifremer.fr/argoMonitoring/floatMonitoring/385



Within ENVRIPLUS EU project, an Argo big data demonstration: http://co-discovery-demo.ifremer.fr/euro-argo/
All Argo data is indexed and available through an Elasticsearch API.
More on https://www.youtube.com/watch?v=PKU_JcmSskw

Data centre activity monitoring: Coriolis operators perform an activity monitoring with an online control board.



Fonction	Description	Etat J	Etat J-1	Etat J-2	Etat J-3	Dernière exécution (TU)
CO-05-08-08	Archive GDAC Argo					UNDERWAY-LOCKED 2017-11-25T02:07:01Z
CO-03-07-01	Argo files controler					OK 2017-10-13T08:00:46Z
CO-05-08-11	Argo grey list diffuser					OK 2017-11-24T11:05:02Z
CO-03-07-01-02	Argo stat controler					OK 2017-11-22T01:02:21Z
CO-01-07-08	Collecte Argo Coriolis EDAC					OK 2017-11-25T09:45:04Z
CO-01-07-03	Collecte Argo DAC - FTP					OK 2017-11-25T10:09:04Z
CO-01-07-01-02	Collecte Argo DAC - Table argo index profiles					OK 2017-11-25T09:58:50Z
CO-01-07-01-aoml	Collecte Argo DAC - aoml					OK 2017-11-25T10:00:04Z
CO-01-07-01-bodc	Collecte Argo DAC - bodc					OK 2017-11-25T10:01:02Z
CO-01-07-01-coriolis	Collecte Argo DAC - coriolis					OK 2017-11-25T10:02:21Z
CO-01-07-01-csio	Collecte Argo DAC - csio					OK 2017-11-25T10:03:02Z
CO-01-07-01-csiro	Collecte Argo DAC - csiro					OK 2017-11-25T10:04:03Z
CO-01-07-01-incois	Collecte Argo DAC - incois					OK 2017-11-25T10:05:02Z
CO-01-07-01-jma	Collecte Argo DAC - jma					OK 2017-11-25T10:06:05Z
CO-01-07-01-kma	Collecte Argo DAC - kma					OK 2017-11-25T10:07:03Z
CO-01-07-01-kordi	Collecte Argo DAC - kordi					OK 2017-11-25T10:08:02Z
CO-01-07-01-meds	Collecte Argo DAC - meds					OK 2017-11-25T10:09:03Z
CO-01-07-01-nmdis	Collecte Argo DAC - nmdis					OK 2017-11-25T10:10:02Z
CO-01-07-06-aoml	Collecte Argo DAC BDD - aoml					OK 2017-11-25T09:42:07Z
CO-01-07-06-bodc	Collecte Argo DAC BDD - bodc					OK 2017-11-25T09:42:03Z

Argo GDAC operations monitoring: every working day, an operator performs diagnostics and take actions on anomalies (red or orange smileys)

1.7 Statistics of Argo data usage (operational models, scientific applications, number of National Pis…)

Operational oceanography models; all floats data are distributed to:

- French model Mercator (global operational model)
- French model MARC (regional operational model)
- French model Soap (navy operational model)
- EU Copernicus models (Foam, Topaz, Moon, Noos)
- EuroGoos projects

Argo projects: this year, Coriolis data centre performed float data management for ***55 Argo scientific projects and 55 PIs (Principal Investigators).***

List of Coriolis scientific PIs and project names

Project name	nb floats
euro-argo	584
coriolis	397

bsh	83
argo-bsh	79
argo italy	76
naos	69
remocean	62
mocca	60
goodhope	47
mocca-eu	43
pirata	27
gmmc	21
argomed	16
rrex asfar	15
sagar	12
dap	11
rrex	10
argo norway	10
argo greece	10

List of projects with more than 10 active floats

List of project with less than 10 active floats: argo_fin, geovide, amop, soclim, bwr, argo_spain, ovide, outpace, ticmoc, mocca-germany, naos-canada, gmmc_cnes, brazilian navy argo program, naos-france, mocca-italy, cienperu, argo italy , morsea, argo-poland, moose, vsf, eaims, narval, mocca-poland, mafia, mocca-ger, argo bulgary, sri_lanka, aspex, argo spain, e-aims, argo brazil, cnes, proteusmed, asfar, argo-finland, mocca-eu, dekosim (metu), bioargo-italy, opportunity (sail), upsen, ge moose, naos,pirata, perseus, socib, mocca-ned, argo-italy, dekosim, lefe, bioargo italy, argo bsh, bide, mocca-netherlands, euroargo, peacetime, congas

PI name	nb floats
birgit klein	142
pierre-marie poulain	95
christine coatanoan	92
sabrina speich	64
virginie thierry	63
bernard bourles	28
christophe maes	24
herve claustre	23
holger giese	22
fabrizio d'ortenzio	17
romain cancouët	16
fabien durand	15
andreas sterl	13
jose lluis pelegri	12
marcel babin	12
dimitris kassis	11
waldemar walczowski	11
kjell arne mork	10

laurent coppola	10
pedro velez belchi	10
jean-baptiste sallee	9
peter brandt	8
tero purokoski	8

List of Principal Investigators (PI) in charge of more than 8 active floats

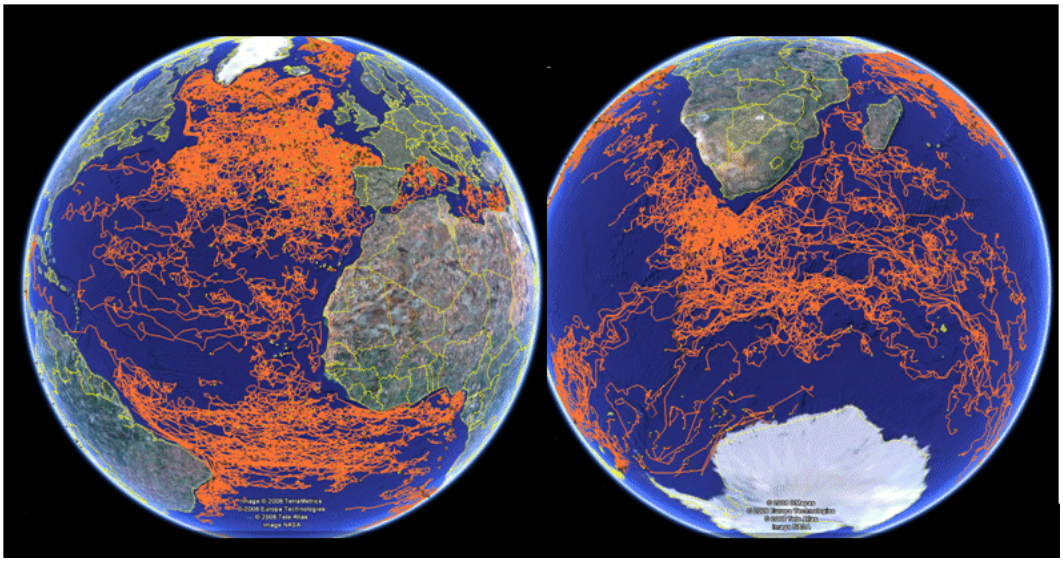
List of Principal Investigators (PI) in charge of less than 8 active floats: sophie cravatte, franck dumas, luis felipe silva santos, vincent echevin, guillaume maze, alban lazar, camille daubord, cecile cabanes, violeta slabakova, bert rudels, louis marié, stephane blain, thierry moutin, xavier andre, arne kortzinger, elodie martinez, katrin latarius, serge le reste, stephanie louazel, sven petersen, tobias ramalho dos santos ferreira, agus atmadipoera, alain serpette, anja schneehorst, bettina fach, jordi font, julia uitz, nathanaele lebreton, pascal conan, s. petersen, sorin balan

1.8 Products generated from Argo data …

Sub-surface currents ANDRO Atlas

Based on Argo trajectory data, Michel Ollitrault and the Ifremer team are regularly improving the "Andro" atlas of deep ocean currents. The ANDRO project provides a world sub-surface displacement data set based on Argo floats data. The description of each processing step applied on float data can be found in:

- *Ollitrault Michel, Rannou Philippe (2013).* ***ANDRO: An Argo-based deep displacement dataset****. SEANOE. http://doi.org/10.17882/47077*
- See also : http://wwz.ifremer.fr/lpo/Produits/ANDRO



Argo trajectories from Coriolis DAC are carefully scrutinized to produce the "Andro" atlas of deep ocean currents.

2 Delayed Mode QC

(Please report on the progress made towards providing delayed mode Argo data, how it's organized and the difficulties encountered and estimate when you expect to be pre-operational.)

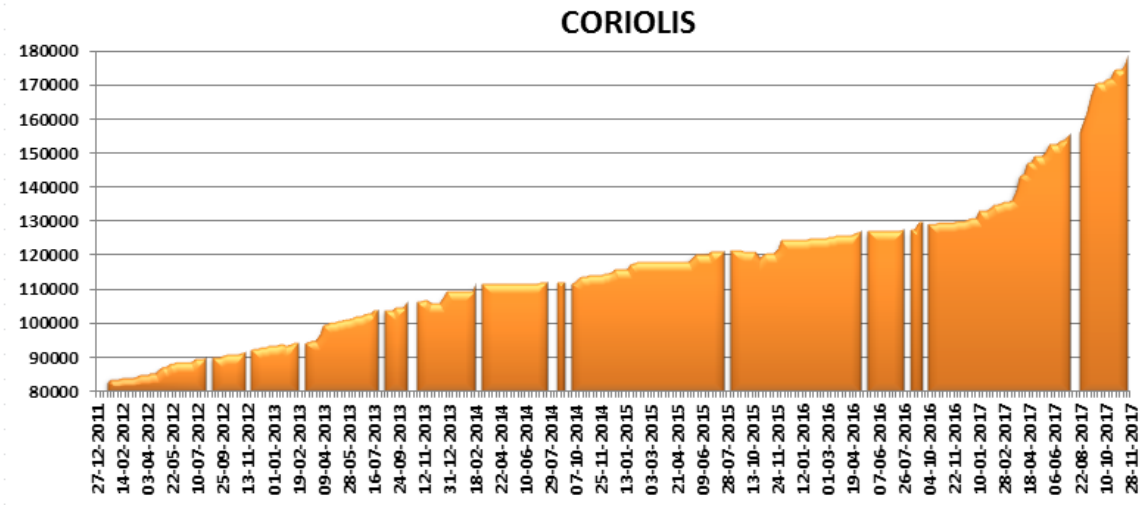
At the Coriolis data centre, we process the delayed mode quality control following four steps. Before running the OW method, we check carefully the metadata files, the pressure offset, the quality control done in real time and we compare with neighbor profiles to check if a drift or offset could be easily detected. As each year, we have worked on this way with PIs to strengthen the delayed mode quality control.

Some floats have been deployed from some projects, meaning a lot of PIs and a lot of time for explaining the DM procedure to all of them. A few PIs are totally able to work on DMQC following the four steps but this is not the case for most of them. Since the unavailability of the PIs leads to work by intermittence and then extend the period of work on the floats, we did the work with a private organism (Glazeo) to improve the realization of the DMQC, exchanging only with the PIs to validate results and discuss about physical oceanography in studied area. Working in this way, we largely improve the amount of delayed mode profiles.

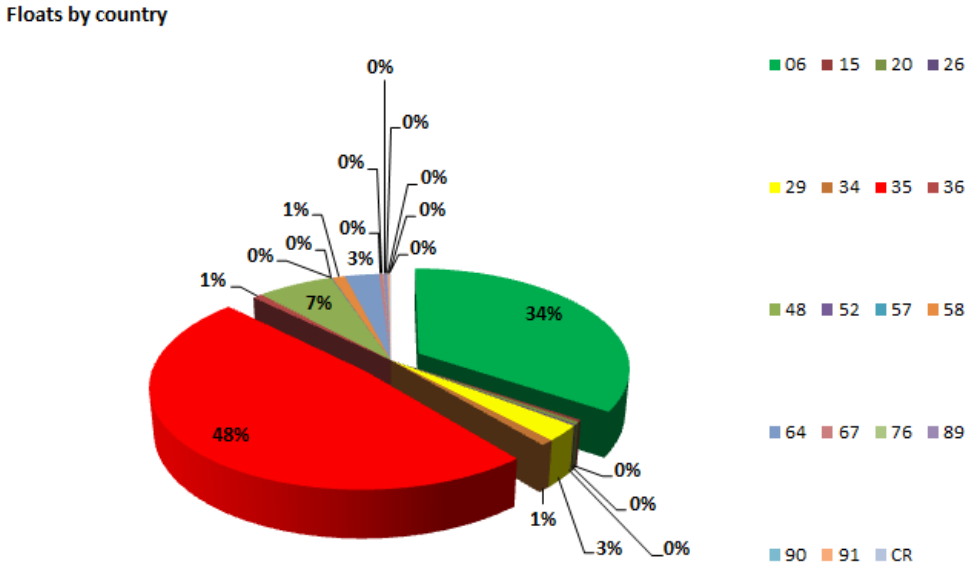
For a few projects, there are still no identified operators to do DMQC, for instance the first run has been done by students which have now left institutes or are not available to carry on with this work. We have made a lot of progress with BSH (Birgit Klein) taking into account also floats from other German institutes and OGS (Giulio Notarstefano) for the MedSea.

Some DM files have been updated to format version 3.1 taking into account a new decoder (matlab) developed at Coriolis. This work has been done for some Provor and Apex, few files need to be manually updated.

Regular DM files submission is performed each year but an effort has been done during the year 2017 to increase the DM files number.

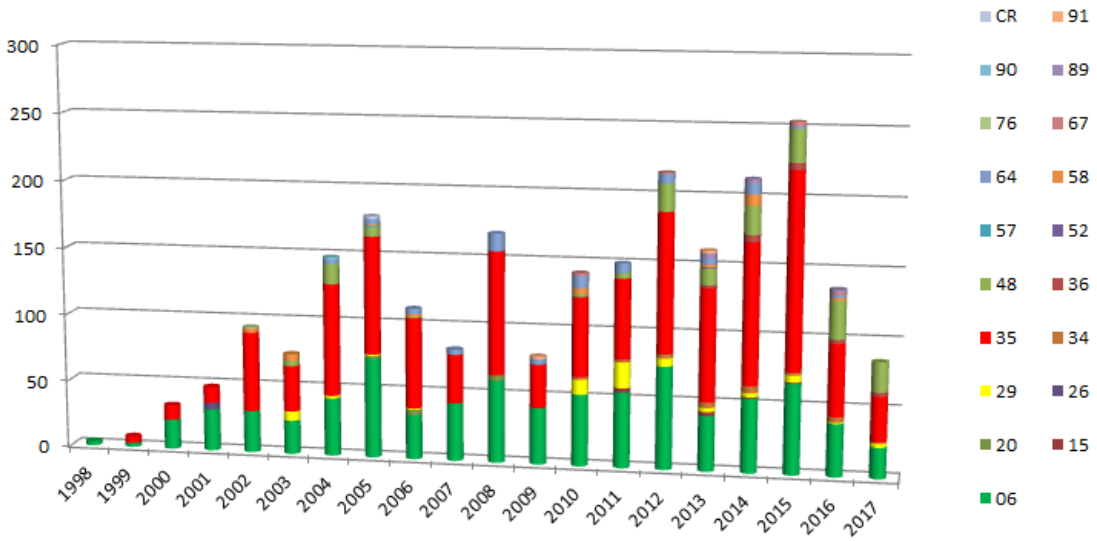


Evolution of the DM profiles' submission versus dates



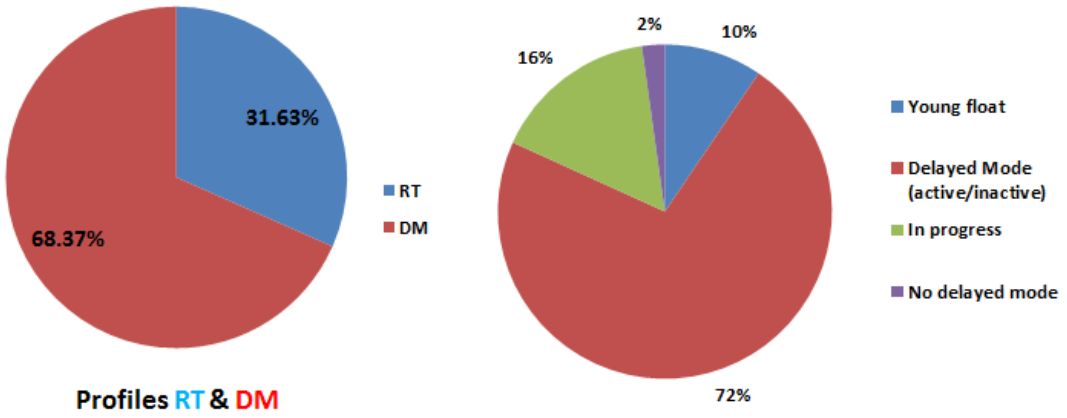
Percentage of floats by country in the Coriolis DAC.

Codes for the countries: 06 : Germany - 15 : Bulgaria - 20 : Chili – 26 : Denmark – 29 : Spain – 34 : Finland - 35 : France – 36 : Greece - 48 : Italy – 52 : Lebanon - 57 : Mexico - 58 : Norway – 64 : Netherlands – 67 : Poland – 76 : China – 89: Turkey - 90 : Russia – 91 : - South Africa - CR : Costa Rica



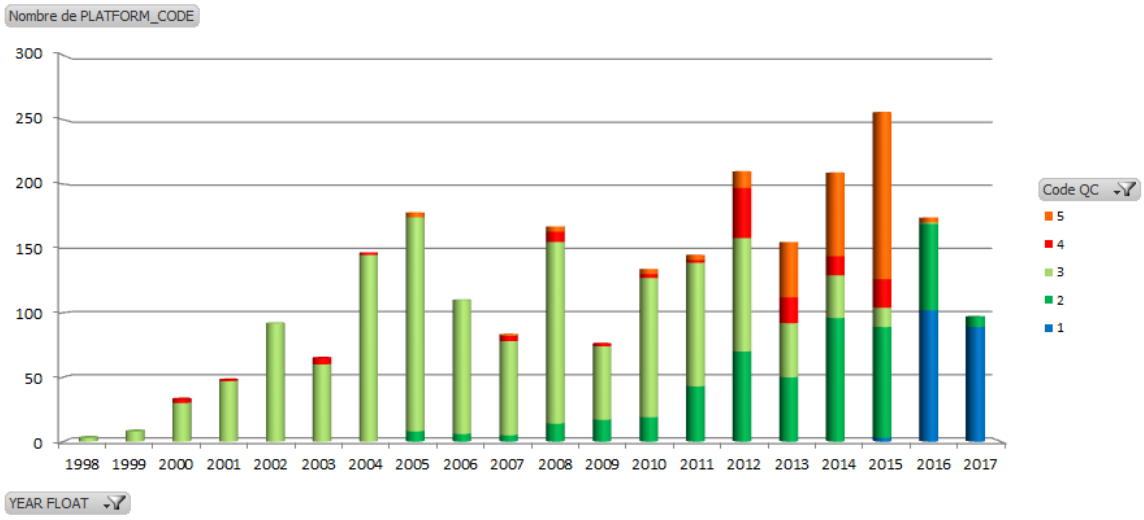
Number of floats by country and by launch's year in the Coriolis DAC

During the last year (from October 2016 to November 2017), 49125 new delayed mode profiles where produced and validated by PIs. A total of 178763 delayed mode profiles where produced and validated since 2005.



Status of the floats processed by Coriolis DAC.
Left: in terms of profile percent and right: in terms of float percent (DM : delayed mode – RT : real time).

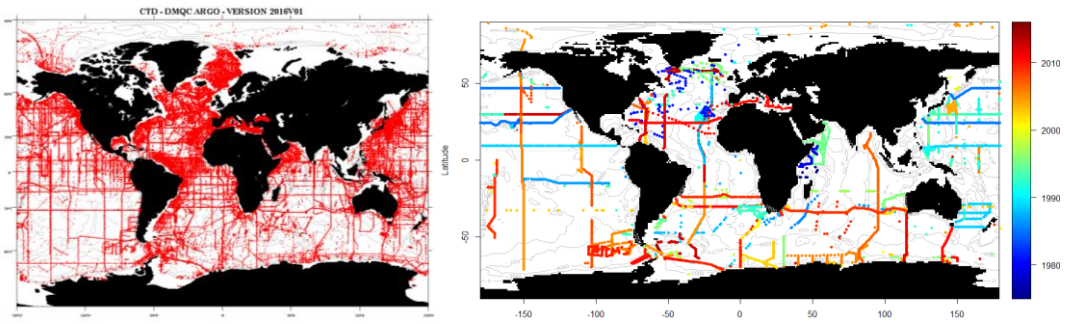
The status of the quality control done on the Coriolis floats is presented in the following plot. For the two last years (2016-2017), most of the floats are still too young (code 1) to be performed in delayed mode. For the years 2012-2013-2014, we are still working on the DMQC of some floats. The codes 2 and 3 show the delayed mode profiles for respectively active and dead floats.



Status of the quality control done on profiles sorted by launch's year, code 1: young float, code 2: active float, DM done, code 3 : dead float, DM done; code 4 : DM in progress, code 5 : waiting for DM, code 6 : problems with float.

2.1 Reference database

In September 2016, the version CTD_for_DMQC_2016V01 has been provided with a large improvement of the dataset since this version took into account new CTD provided by the CCHDO API (following figure), CTD from scientists as well as feedbacks from users on quality of some profiles.

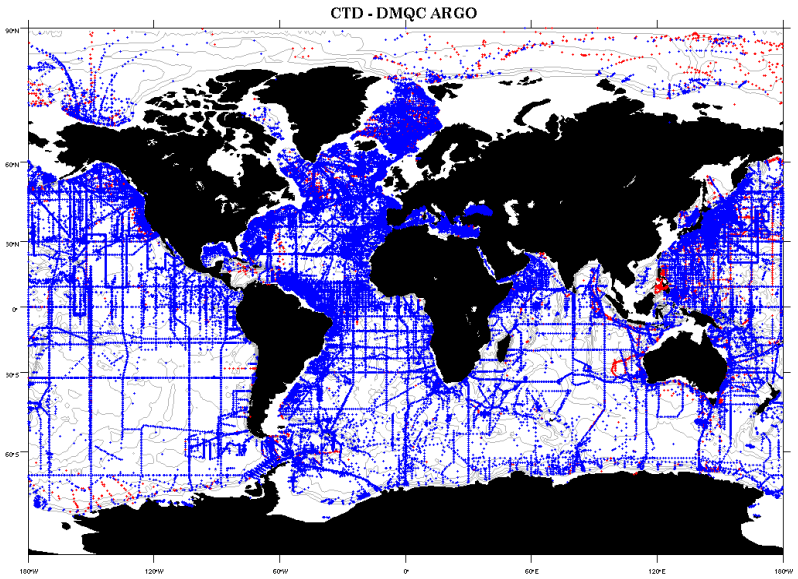


Version 2016 V01 & New CTD datasets downloaded from the CCHDO API

A new version 2017V01 has been provided at the beginning of this year with some updates on a few boxes, following the feedback sent by some scientists.

This last version is available on the ftp site in smaller tar balls, one by wmo box area (1-3-5-7): for instance, CTD_for_DMQC_2017V01_1.tar.gz for all boxes starting with wmo 1, then we will have 4 tar files.

During this year, the OCL updates have been downloaded and some works on quality control have been made before adding them in the reference database. A new version is in preparation and should be delivered at the beginning of 2018. Some new CTDs can be observed in the following plot (blue: last version and red: new CTDs).



3 GDAC Functions

(If your centre operates a GDAC, report the progress made on the following tasks and if not yet complete, estimate when you expect them to be complete)

- *National centres reporting to you*
- *Operations of the ftp server*
- *Operations of the www server*
- *Data synchronization*
- *Statistics of Argo data usage : Ftp and WWW access, characterization of users (countries, field of interest : operational models, scientific applications) …*

3.1 National centres reporting to you

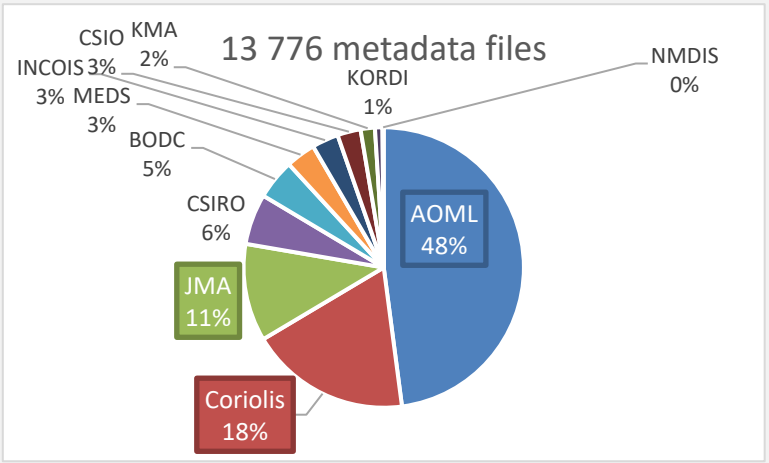
Currently, 11 national DACs submit regularly data to Coriolis GDAC.

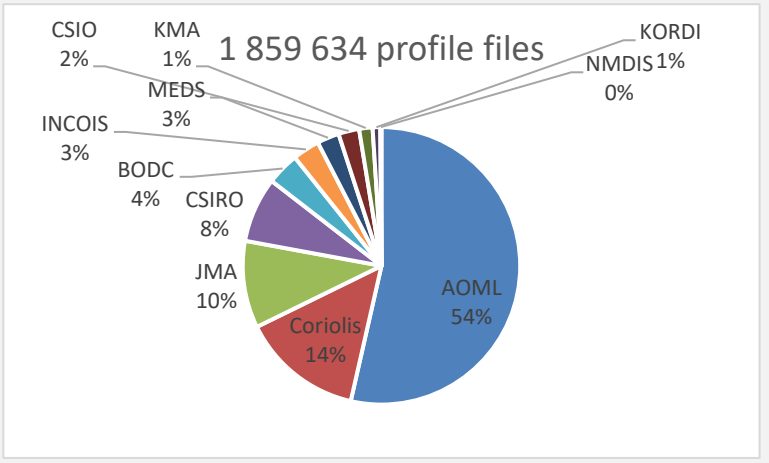
The additional GTS DAC contains all the vertical profiles from floats that are not managed by a national DAC. These data come from GTS and GTSPP projects. The GTS profiles are quality controlled by the French DAC (Coriolis).

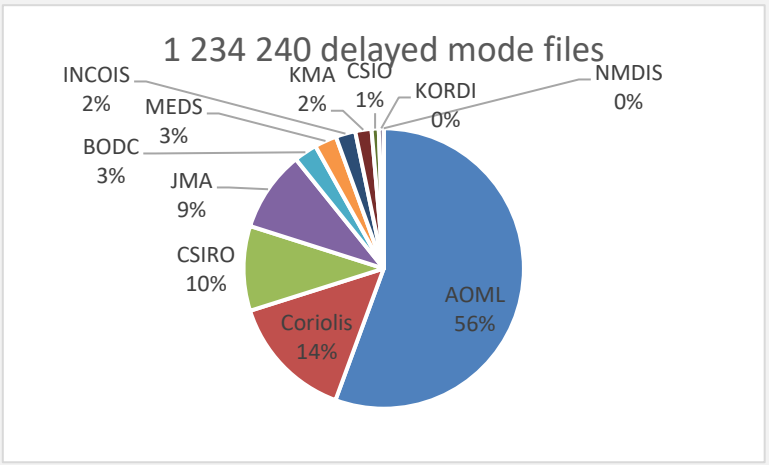
On November 25th 2017, the following files were available from the GDAC FTP site.

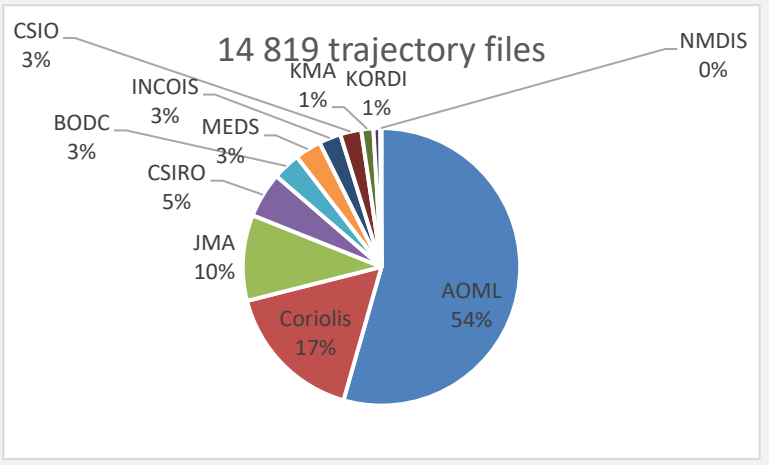
3.1.1 GDAC files distribution

DAC	metadata files 2017	increase from 2016	profile files 2017	increase from 2016	delayed mode profile files 2017	increase from 2016	trajectory files 2017	increase from 2016
AOML	6 601	10%	996 019	13%	686 144	20%	8 064	12%
BODC	636	18%	70 637	23%	33 015	5%	479	14%
Coriolis	2 554	11%	263 894	17%	179 361	38%	2 465	11%
CSIO	370	8%	44 934	15%	10 221	0%	365	7%
CSIRO	806	8%	140 870	14%	120 680	24%	781	10%
INCOIS	422	7%	58 538	14%	28 008	1%	379	2%
JMA	1 550	7%	188 716	11%	115 044	20%	1 484	4%
KMA	227	5%	29 005	11%	23 094	11%	208	0%
KORDI	119	0%	16 578	2%	6 986		119	0%
MEDS	472	9%	47 983	8%	31 687	23%	456	8%
NMDIS	19	0%	2 460	0%	0		19	0%
Total	13 776	9,35%	1 859 634	13,75%	1 234 240	22,02%	14 819	9,93%









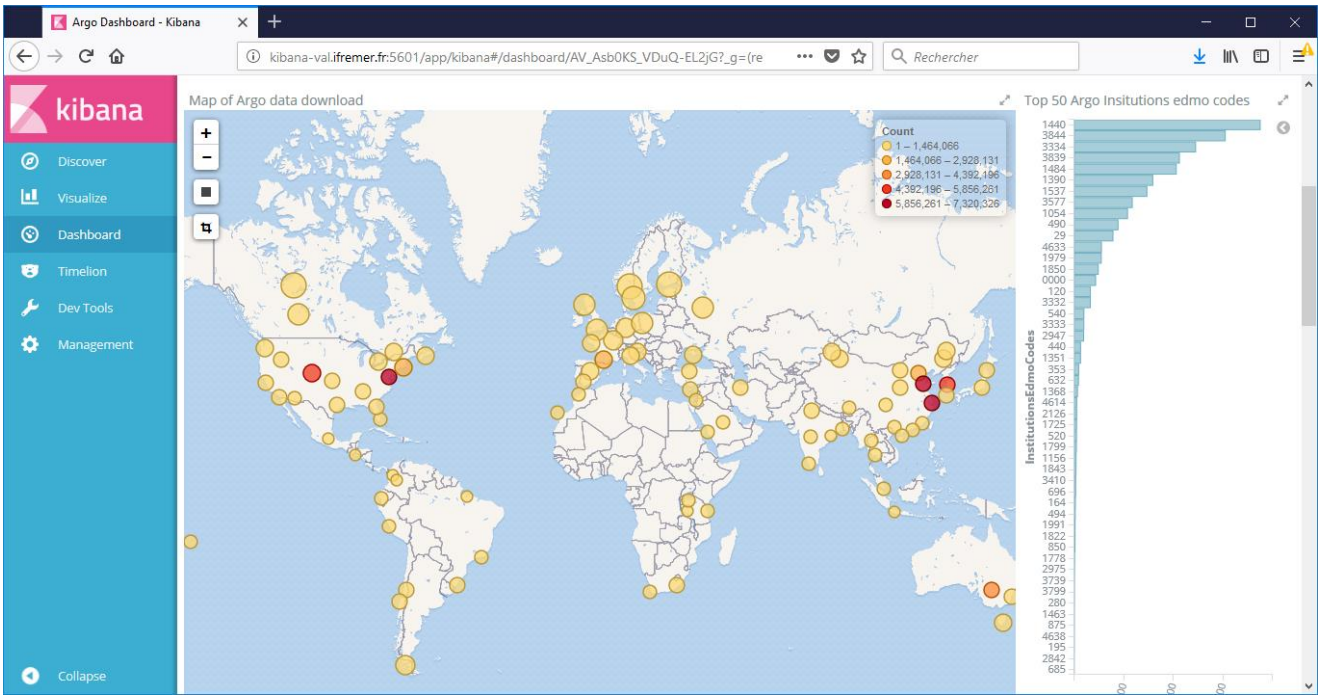
Number of files available on GDAC, November 2017

3.1.2 FTP dashboard: give credit to data providers

Within EU AtlantOS project, Ifremer is setting up a dashboard to monitor data distribution and give credit to data providers such as Argo floats.

FTP downloads log files are ingested in an Elsaticsearch index. A link between downloaded files, download originators, floats included in the downloaded files and institution owners of the floats is performed. These links are displayed in a Kibana dashboard.

This dashboard will offer the possibility to give credit to Floats owner institutions such as how many data from one particular institution was downloaded, by whose data users.



Geographical distribution of GDAC ftp downloads in 2017

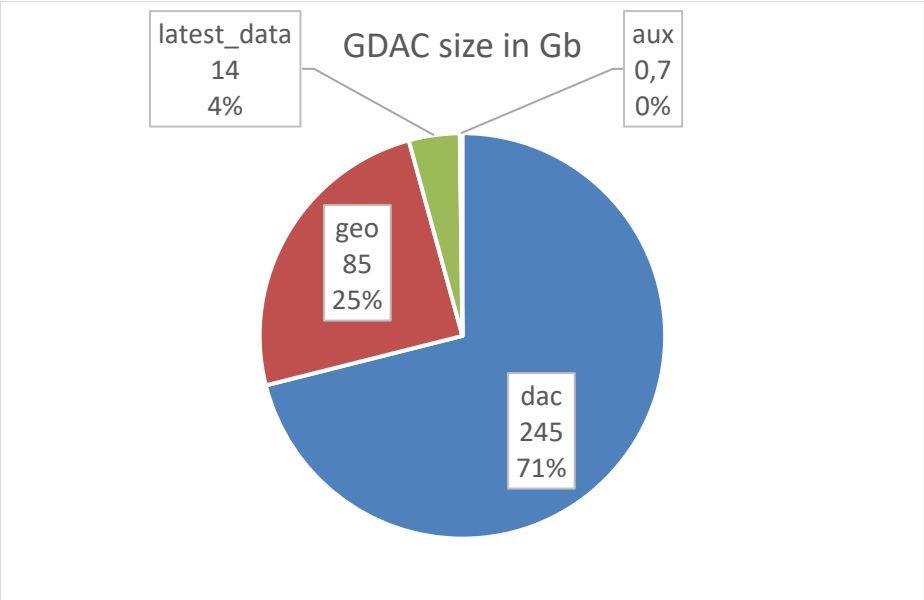
The majority of users (red dots) are located in USA, China, Australia and of course Europe. The right side histogram sorts the floats institution code (1440: PMEL, 3844: WHOI, 3334: INCOIS, 3839: UWA, 1484: CSIRO, …).

The top 50 of floats institutions downloads and the top 50 of data user's

3.1.3 GDAC files size

- The total number of NetCDF files on the GDAC/dac directory was 2 178 811
- The size of GDAC/dac directory was 245 G (+95%)
- *The size of the GDAC directory was 462Go*

GDAC branch	GDAC size in Gb	since 2016
dac	245	46%
geo	85	25%
latest_data	14	-7%
aux	0,7	-

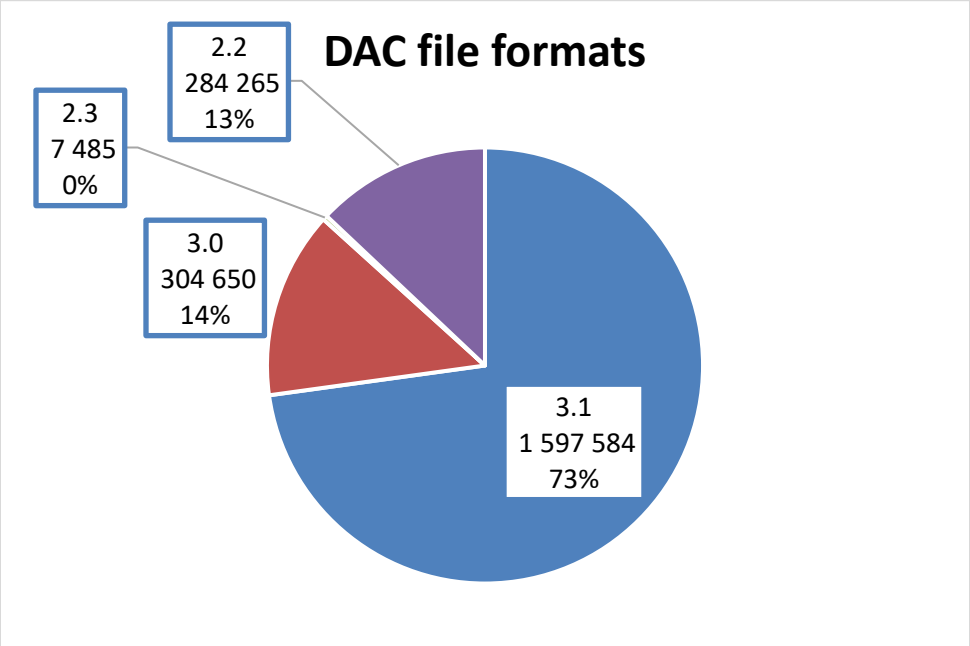


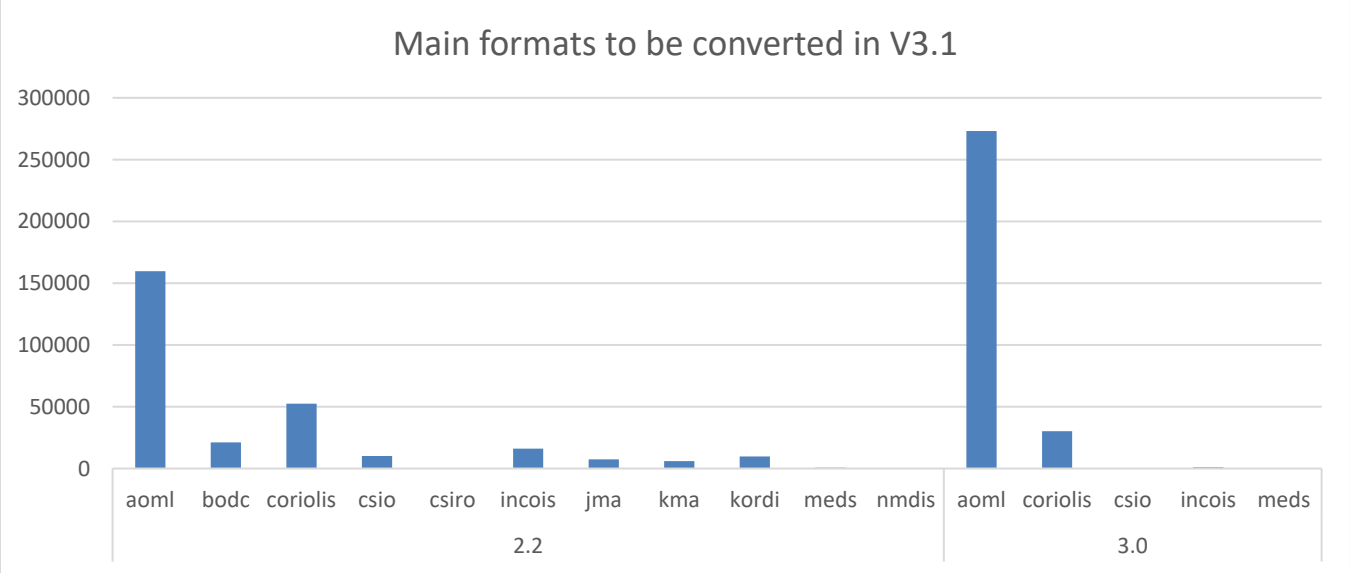
3.1.4 Argo NetCDF transition to format V3.1

The transition from Argo format 2.* and 3.0 toward format 3.1 is underway.

On 2017, the number of files in format version 3.1 reached and passed the 70% threshold.

format version	nb files	percentage
3.1	1 597 584	73%
3.0	304 650	14%
2.3	7 485	0%
2.2	284 265	13%
2.1	12	0%
Total	**2 193 996**	100%





Detailed list of format versions per DAC

File format	number of files
2.1	**12**
aoml	2
csio	8
kma	1
meds	1
2.2	**284265**
aoml	159647

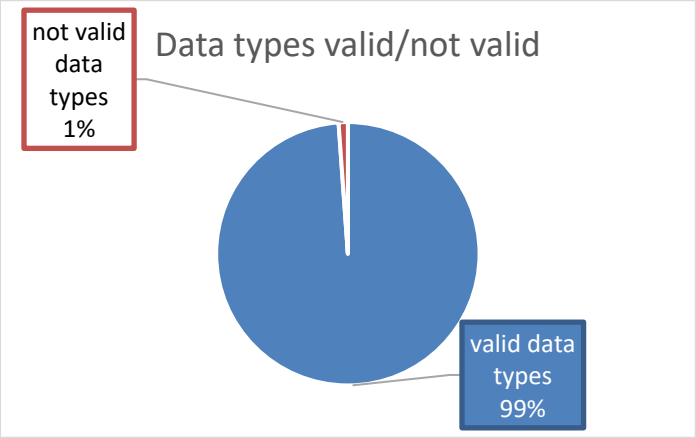
bodc	21137
coriolis	52487
csio	10097
csiro	314
incois	16122
jma	7447
kma	6064
kordi	9789
meds	713
nmdis	448
2.3	**7485**
aoml	80
bodc	556
coriolis	6623
csio	2
incois	16
jma	1
kma	148
kordi	55
nmdis	4
3.0	**304650**
aoml	273128
coriolis	30253
csio	352
incois	908
meds	9
3.1	**1577138**
aoml	663282
bodc	57140
coriolis	265158
csio	48531
csiro	183719
incois	53261
jma	216367
kma	23736
kordi	7200
meds	56660
nmdis	2084
Total général	**2173550**

The files in format version V3.1 are much more homogeneous than their previous versions. The controls applied by the format checker on V3.1 is much more exhaustive. The controlled vocabulary listed in the 27 reference tables is used for V3.1 format checks. A non-valid content is automatically rejected. Only valid V3.1 content appears on GDAC.

Example of valid content checked by the format checker on V3.1 files

There are 8 valid DATA_FORMAT variables listed in reference table 1 (there are 26 more tables…).
A survey on GDAC files shows that 24 779 files (1% of the total) do not have a valid DATA_FORMAT.
The V3.1 files are not affected by this kind of problem.

data_type	nb files	valid type
Argo meta-data	13748	yes
ARGO profile	22326	no
Argo profile	1867361	yes
Argo profile merged	131347	yes
Argo technical	556	no
ARGO technical data	174	no
Argo technical data	12686	yes
ARGO trajectory	1237	no
Argo Trajectory	110	no
Argo trajectory	13434	yes
B-Argo profile	130641	yes
B-Argo trajectory	376	no

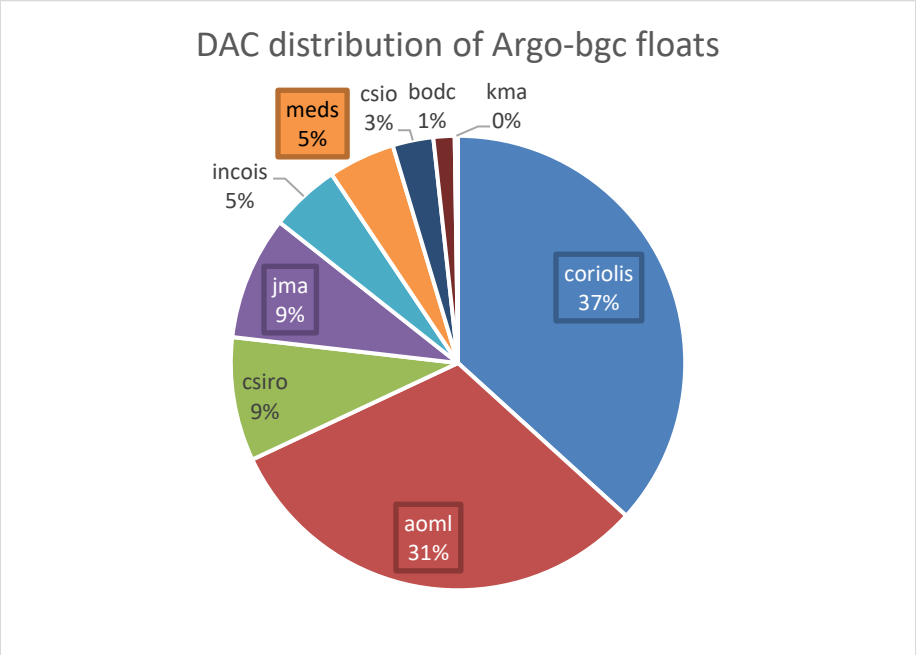


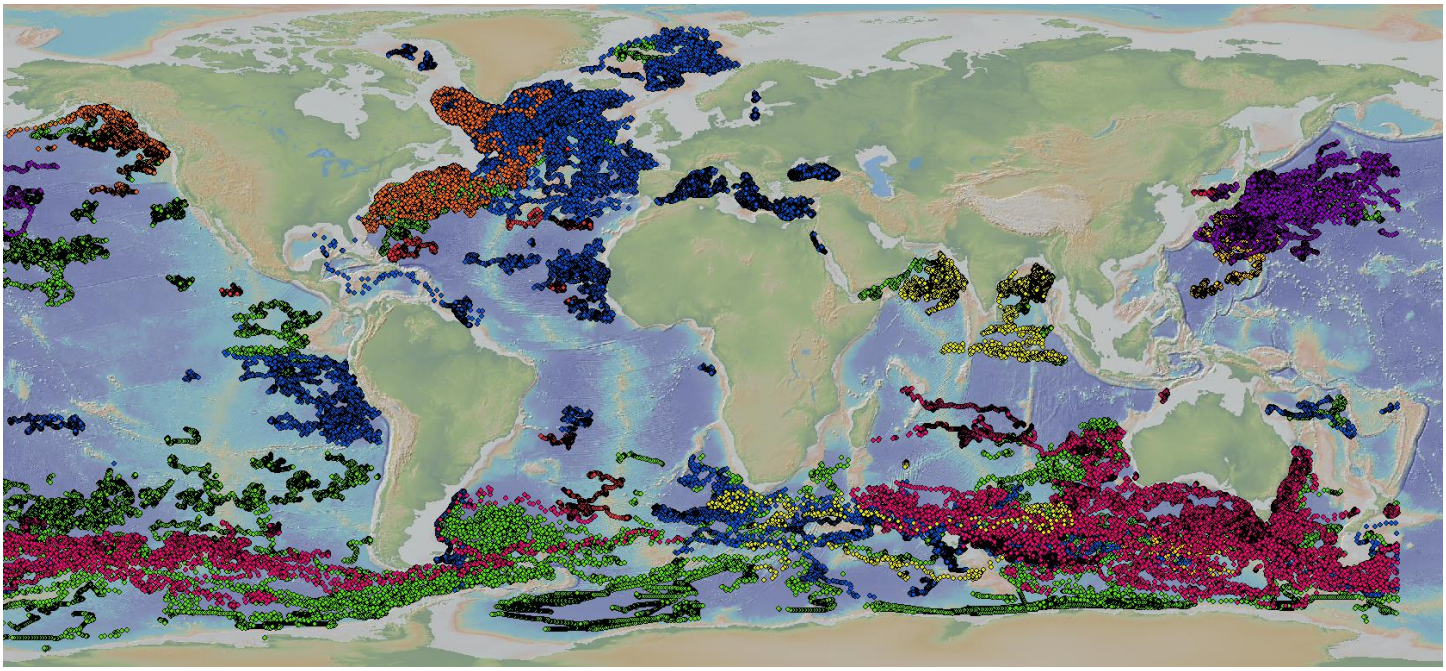
3.1.5 BGC-Argo floats

In November 2017, 131 308 BGC Argo profiles from 863 floats were available on Argo GDAC. This is a strong increase compared to 2016 : +65% more profiles and +54% more floats.

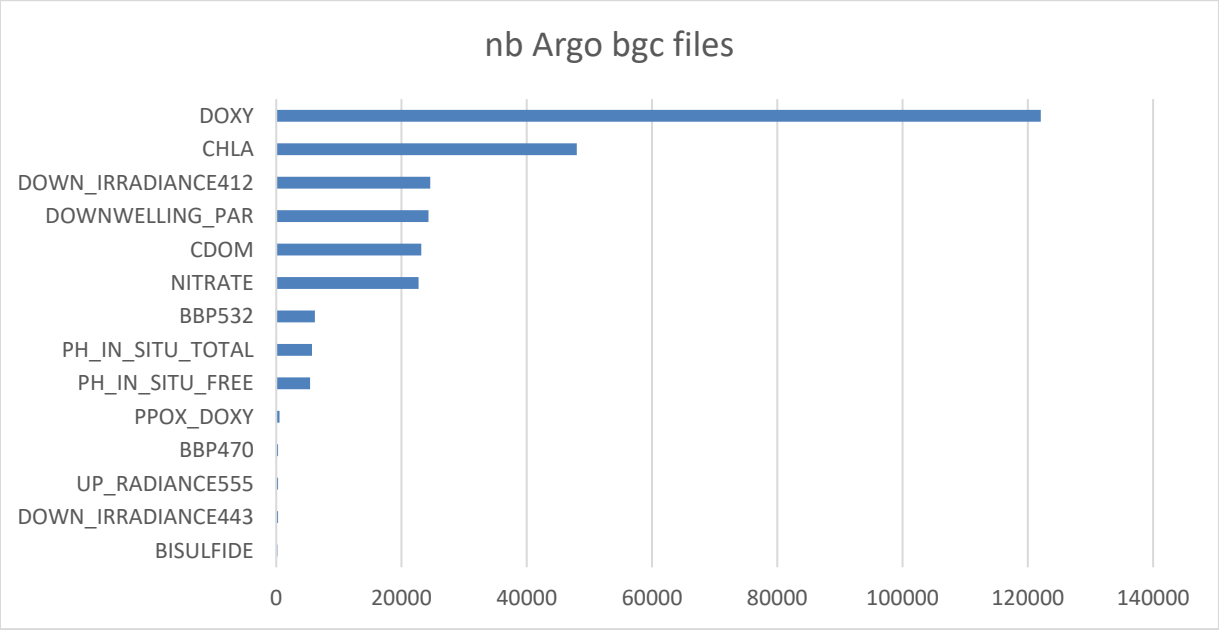
DAC	nb bio floats	nb bio files
coriolis	317	41 147
aoml	270	36 917
csiro	76	20 149
jma	76	14 602
incois	43	5 201
meds	41	3 821

csio	25	6 344
bodc	13	3 041
kma	2	86
Total	**863**	**131 308**





BGC-Argo profiles, colored by DACs



Main BGC-Argo physical parameters, number of profiles

3.2 Operations of the ftp server

Meta-data, profile, trajectory and technical data files are automatically collected from the national DACs ;

Index files of meta-data, profile and trajectory are daily updated ;

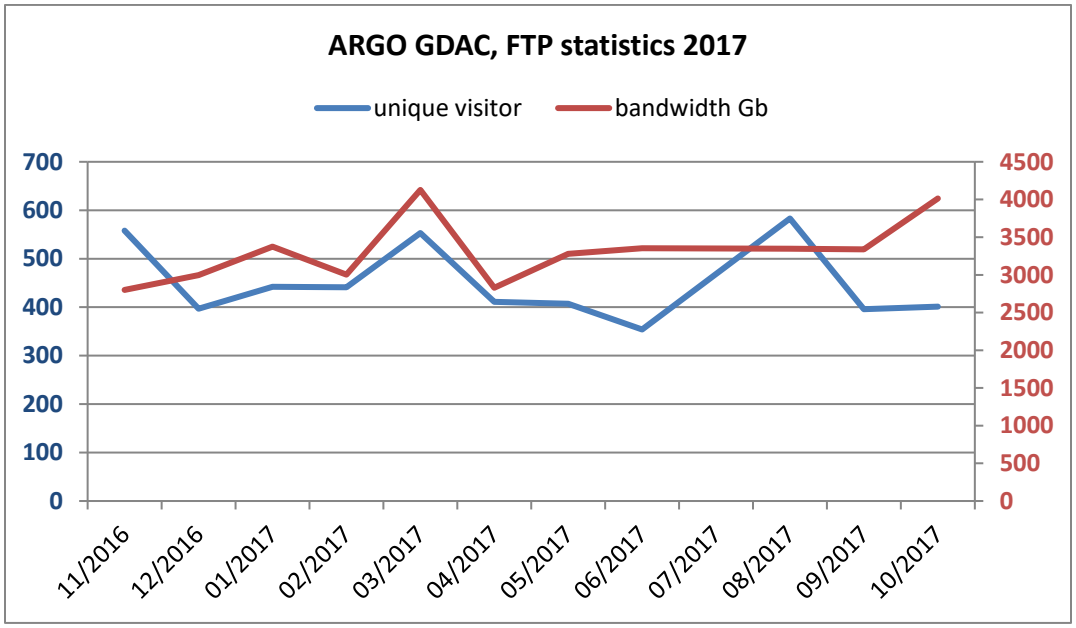
GDAC ftp address: *ftp://ftp.ifremer.fr/ifremer/argo*

Statistics on the Argo GDAC FTP server: *ftp://ftp.ifremer.fr/ifremer/argo*

There is a monthly average of 449 unique visitors, performing 4552 sessions and downloading 3.3 terabytes of data files.

The table below shows a a huge spike of visitors in July 2017 on GDAC FTP. This may be an attack of the server, the July unique visitors number is ignored in statistics.

ARGO GDAC FTP statistics				
month	unique visitor	number of visits	hits	bandwidth Gb
11/2016	558	5 045	3 969 591	2800,42
12/2016	397	3 839	4 072 286	2997,55
01/2017	442	4 778	7 213 071	3375,6
02/2017	441	4 215	4 913 490	3003
03/2017	553	4 619	10 495 933	4127
04/2017	411	4 113	3 583 758	2829
05/2017	407	4 563	4 006 245	3280
06/2017	354	4 011	3 718 402	3354
07/2017	29386	47153	3 810 288	3334
08/2017	583	6 183	7 235 786	3347
09/2017	396	4 345	4 923 991	3339
10/2017	401	4 360	8 097 647	4013
Average	**449**	**4 552**	**5 503 374**	**3 317**


ARGO GDAC, FTP statistics 2017
unique visitor
bandwidth Gb
700
600
500
400
300
200
100
0
4500
4000
3500
3000
2500
2000
1500
1000
500
0
11/2016
12/2016
01/2017
02/2017
03/2017
04/2017
05/2017
06/2017
07/2017
08/2017
09/2017
10/2017

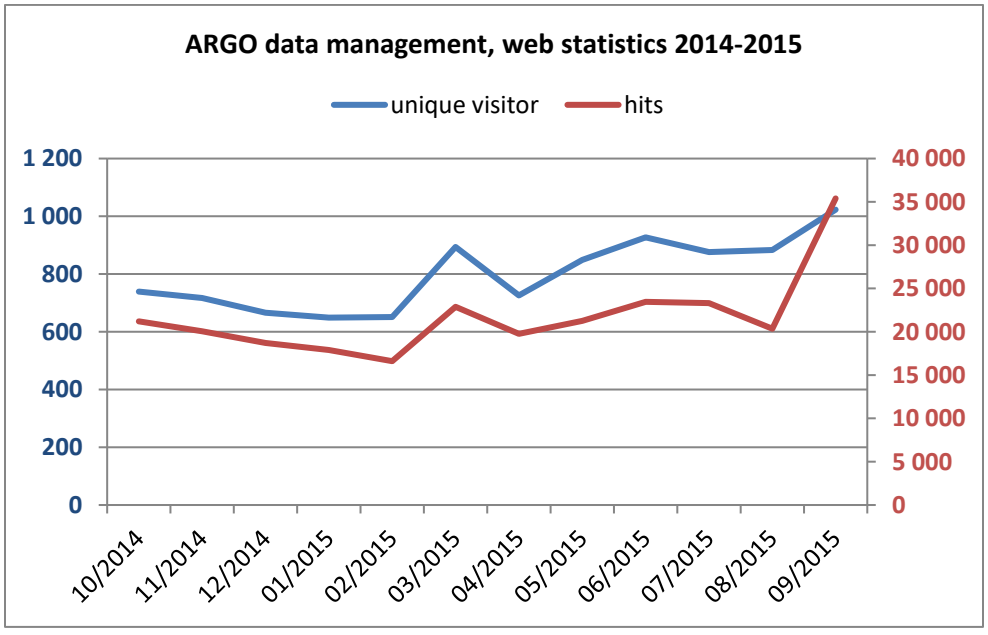
Statistics on the Argo data management web site: *http://www.argodatamgt.org*

Note : the 2017 figures are not available. This chapter will soon be updated.

There is a monthly average of 800 unique visitors, performing 1363 visits and 21 743 hits.

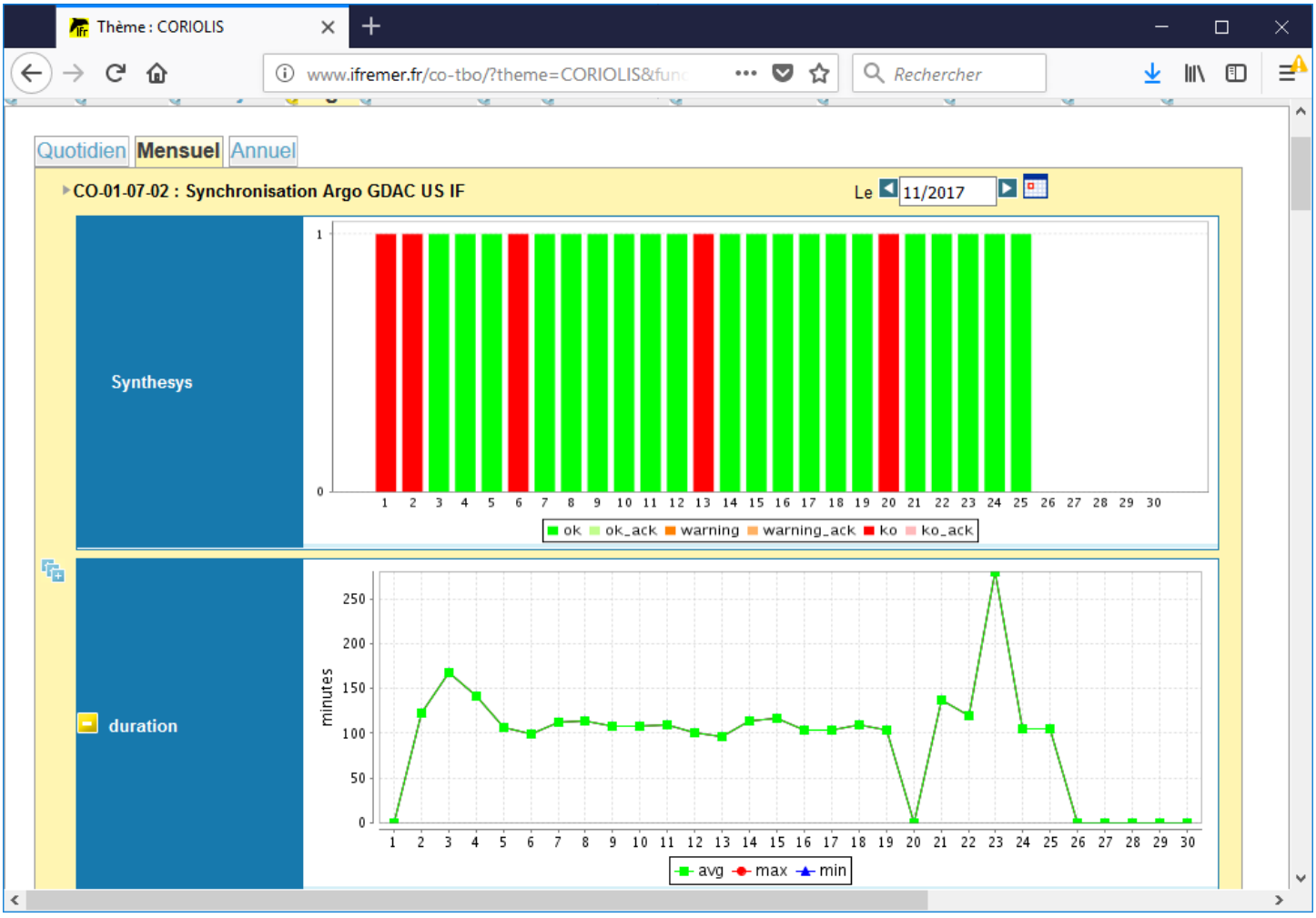
The graphics shows a slightly increasing number of unique visitors.

ARGO GDAC web statistics					
month	**unique visitor**	**visits**	**pages**	**hits**	**bandwidth Go**
10/2014	739	1 297	2 904	21 205	2
11/2014	717	1 224	2 486	20 050	1
12/2014	666	1 127	2 395	18 716	2
01/2015	649	1 138	2 290	17 901	1
02/2015	651	1 066	2 535	16 605	1
03/2015	894	1 531	3 643	22 890	2
04/2015	726	1 270	3 028	19 761	1
05/2015	849	1 403	2 940	21 263	1
06/2015	927	1 584	3 317	23 461	1
07/2015	876	1 478	3 185	23 313	1
08/2015	883	1 417	3 131	20 349	1
09/2015	1 023	1 826	4 355	35 396	1
Average	**800**	**1 363**	**3 017**	**21 743**	**1**



3.3 Data synchronization

The synchronization with US-Godae server is performed once a day at 01:55Z.



The synchronization dashboard in November 2017: the daily synchronization time takes on average 2 hours.

You may notice on the dashboard that the synchronization process reported 5 errors in November (red bars):

- "Can't create the ftp connection to usgodae.org"
  There was an ftp connection problem between Coriolis and US GDACs

3.4 FTP server monitoring

Note: this chapter is not yet available for 2017.

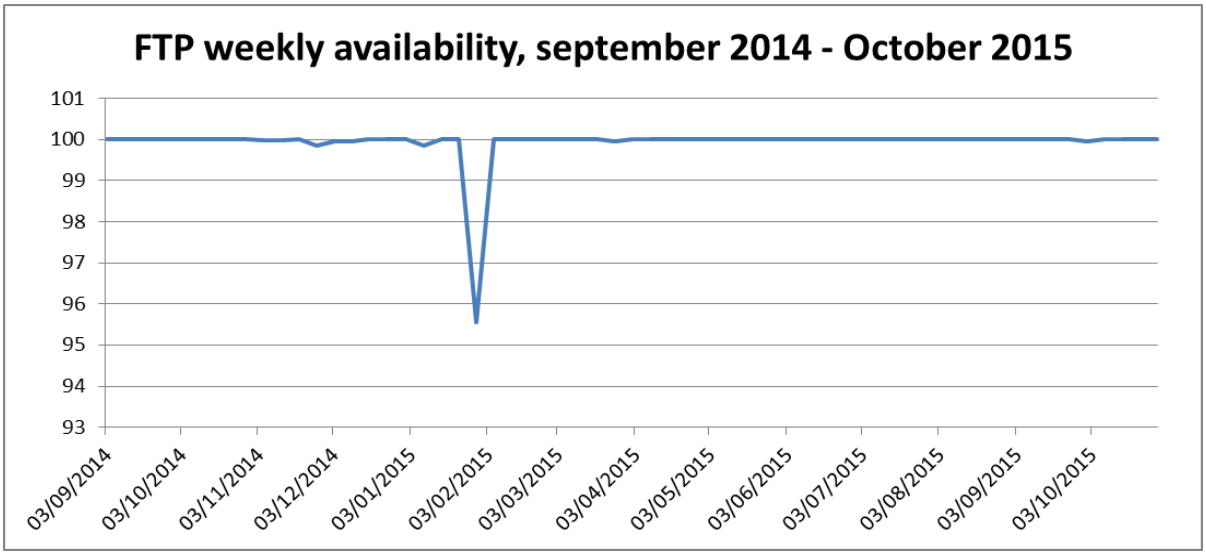
The Argo GDAC ftp server is actively monitored by a Nagios agent (http://en.wikipedia.org/wiki/Nagios).

Every 5 minutes, an ftp download test and an Internet Google query are performed. The success/failure of the test and the response time are recorded. The FTP server is a virtual server on a linux cluster.

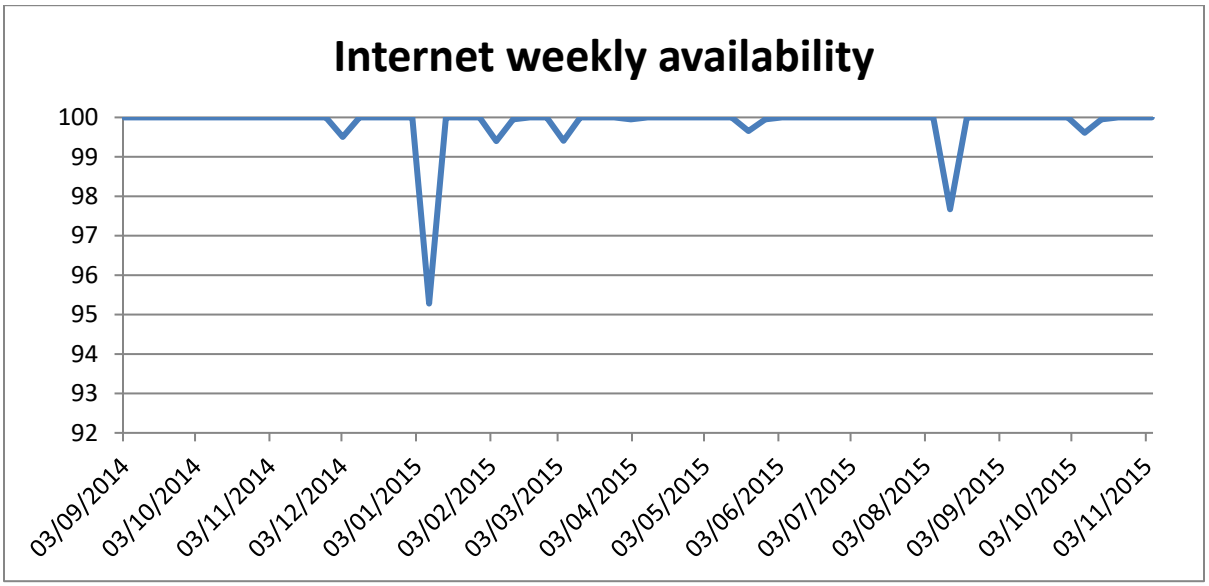
On the last 12 months, the weekly average performance was 99.84%. The 0.16% of poor performances represents 15 minutes for a week. For the last 12 months, the cumulative poor performances period is of 24 hours.

We faced 3 significant events these last 12 months.

- *First week of January: 8 hours of Internet poor performances*
- *Last week of January 2015: disk storage instability: 7 hours and 35 minutes of poor performances of ftp.*
- *Mid-August 2015 : 4 hours of poor Internet performances*



Nagios ftp monitoring: between September 2014 and October 2015

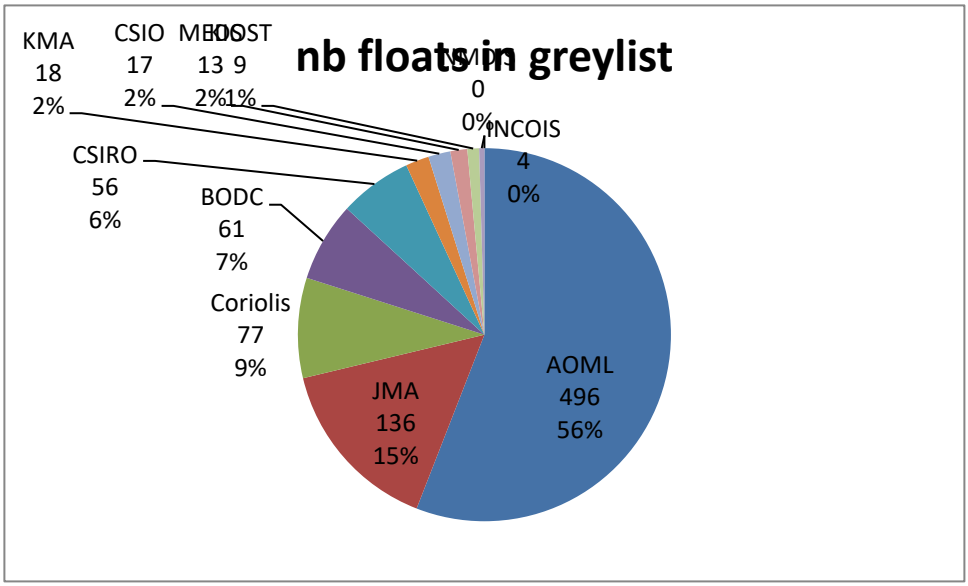


Nagios Internet monitoring: between September 2014 and October 2015

3.5 Grey list

According to the project requirements Coriolis GDAC hosts a grey list of the floats which are automatically flagged before any automatic or visual quality control. **The greylist has 887 entries** (November 25th 2017), compared to 1000 entries one year ago.

DAC	nb floats in greylist
AOML	496
JMA	136
Coriolis	77
BODC	61
CSIRO	56
KMA	18
CSIO	17
MEDS	13
KIOST	9
INCOIS	4
NMDIS	0
Total	887



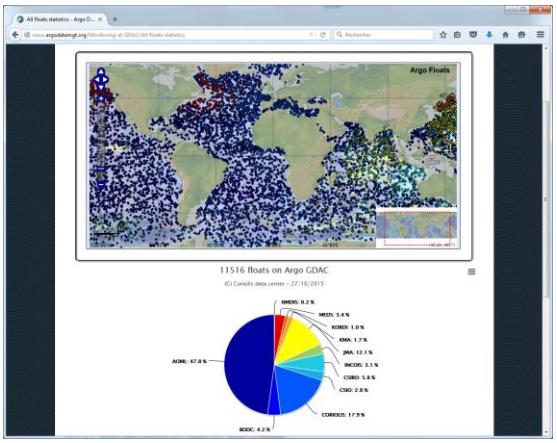
Distribution of greylist entries per DAC and per parameter

AOML reports a high percentage of pressure and temperature in the greylist, compared to other DACs.

Dac - parameter	Nb floats
AO	**496**
PRES	145
PSAL	226
TEMP	125
BO	**61**
PRES	15
PSAL	29
TEMP	17
CS	**56**
PRES	10
PSAL	32
PSAL	1
TEMP	13
HZ	**17**
PRES	2
PSAL	13
TEMP	2
IF	**77**
DOXY	2
PRES	5
PSAL	58
TEMP	12
IN	**4**
PRES	1
PSAL	2
TEMP	1
JA	**136**
DOXY	1
PRES	22
PSAL	83
TEMP	30
KM	**18**
PRES	6
PSAL	6
TEMP	6
KO	**9**
PRES	3
PSAL	3
TEMP	3
ME	**13**
PRES	2
PSAL	8
TEMP	3
Total général	**887**

3.6 Statistics on GDAC content

The following graphics display the distribution of data available from GDAC, per float or DACs. These statistics are daily updated on: http://www.argodatamgt.org/Monitoring-at-GDAC



3.7 Mirroring data from GDAC: rsync service

In July 2014, we installed a dedicated rsync server called vdmzrs.ifremer.fr described on:

- http://www.argodatamgt.org/Access-to-data/Argo-GDAC-synchronization-service

This server provides a synchronization service between the "dac" directory of the GDAC with a user mirror. From the user side, the rysnc service:

- Downloads the new files
- Downloads the updated files
- Removes the files that have been removed from the GDAC
- Compresses/uncompresses the files during the transfer
- Preserves the files creation/update dates
- Lists all the files that have been transferred (easy to use for a user side post-processing)

Examples

Synchronization of a particular float

- rsync -avzh --delete vdmzrs.ifremer.fr::argo/coriolis/69001 /home/mydirectory/...

Synchronization of the whole dac directory of Argo GDAC

- rsync -avzh --delete vdmzrs.ifremer.fr::argo/ /home/mydirectory/...

3.8 Argo DOI, Digital Object Identifier on monthly snapshots

A digital object identifier (DOI) is a unique identifier for an electronic document or a dataset. Argo data-management assigns DOIs to its documents and datasets for two main objectives:

- Citation: in a publication the DOI is efficiently tracked by bibliographic surveys
- Traceability: the DOI is a direct and permanent link to the document or data set used in a publication
- More on: http://www.argodatamgt.org/Access-to-data/Argo-DOI-Digital-Object-Identifier

Argo documents DOIs

- Argo User's manual: http://dx.doi.org/10.13155/29825

Argo GDAC DOI

- Argo floats data and metadata from Global Data Assembly Centre (Argo GDAC) http://doi.org/10.17882/42182

Argo GDAC monthly snapshots DOIs

- Snapshot of 2017 October 8th http://doi.org/10.17882/42182#52113
- Snapshot of 2014 October 8th http://doi.org/10.17882/42182#42280
- Snapshot of 2012 December 1st http://doi.org/10.17882/42182#42250

Argo data management report 2017

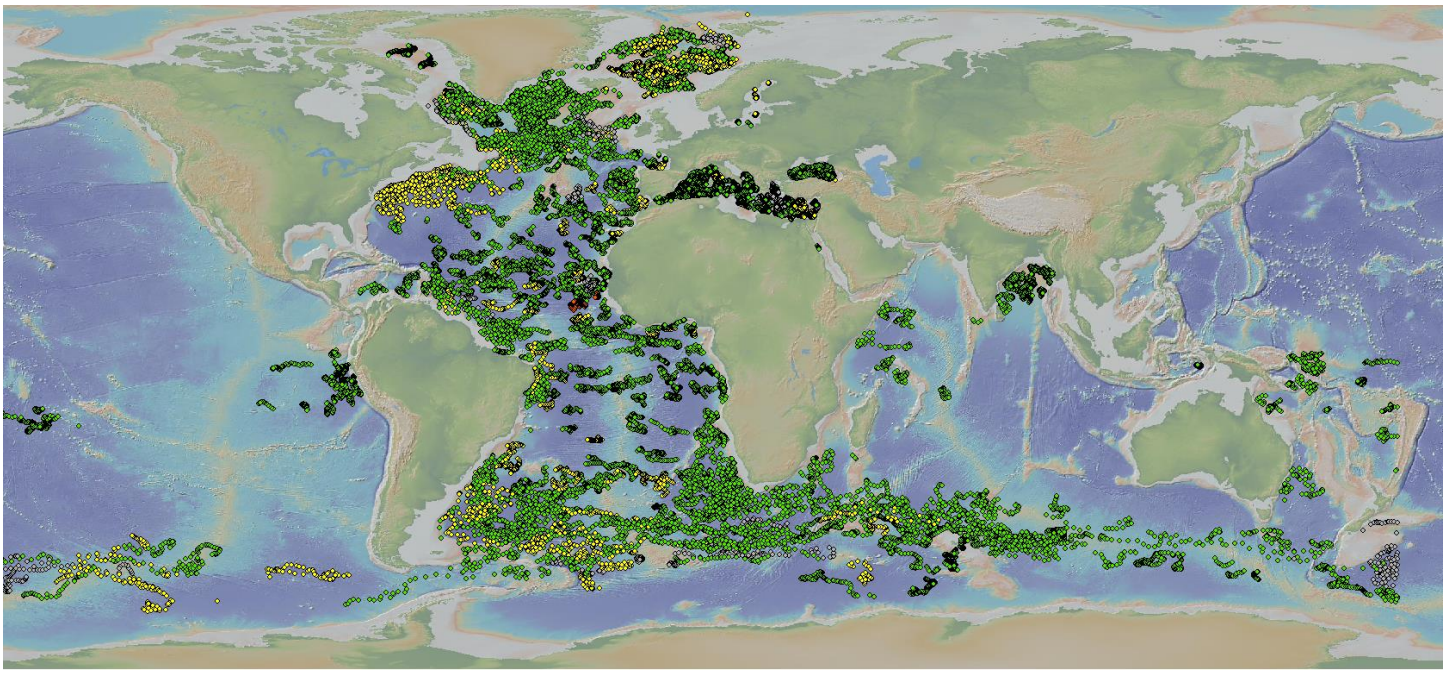
Coriolis DAC & GDAC

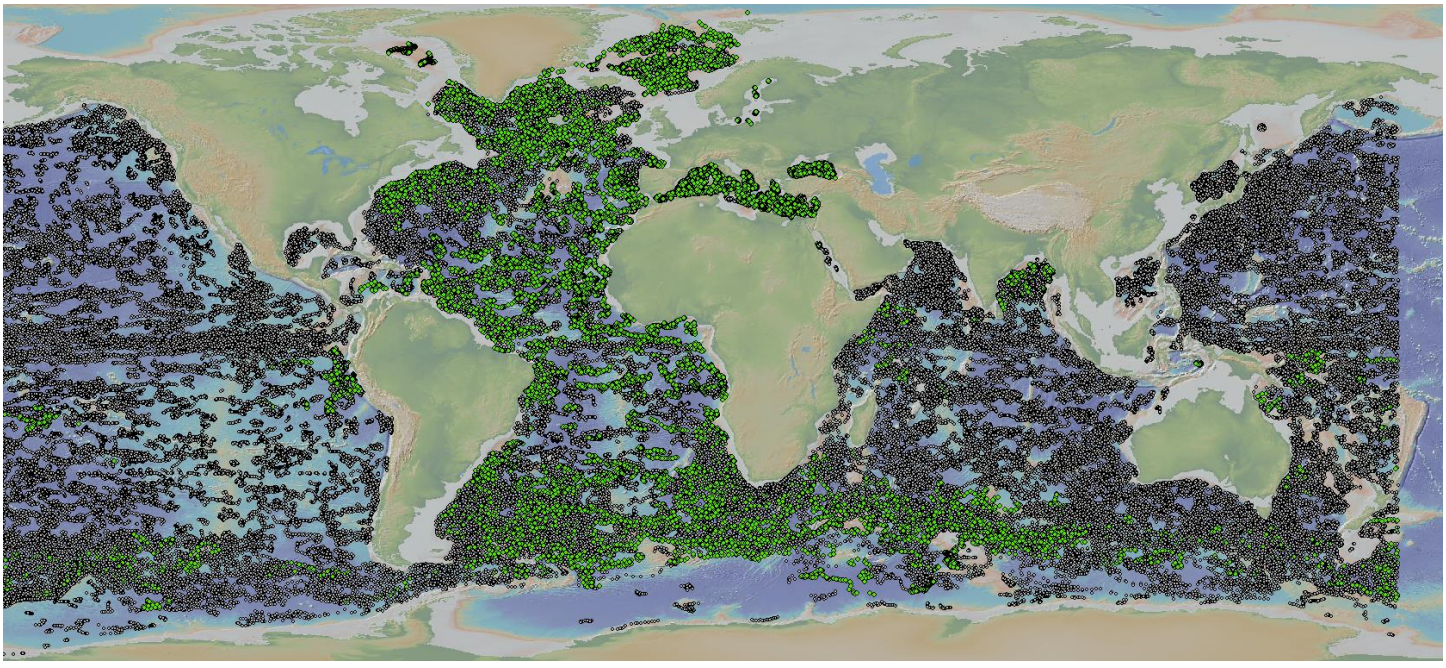
Data Assembly Centre and Global Data Assembly Centre

Annual report October 2017

Version 1.0

November 10th, 2017





1 DAC status

This report covers the activity of Coriolis data centre for a one-year period from November 1st 2016 to October 30th 2017.

1.1 Data acquired from floats

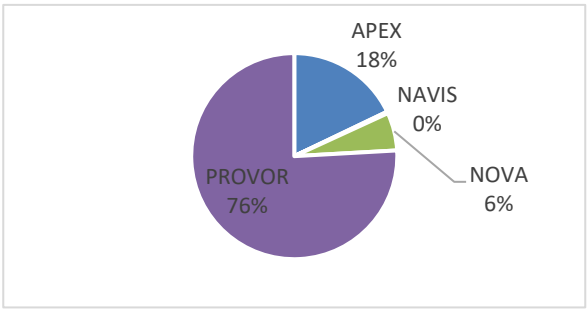
1.1.1 Active floats for the last 12 months

These last 12 months, **30 367 profiles from 788 active floats** were collected, controlled and distributed.

Compared to 2016, **the number of profiles decreased by 1%, the number of floats increased by 2%.**
These figures show a fair stability in Coriolis DAC activity.

The 788 floats managed during that period had 56 versions of data formats.

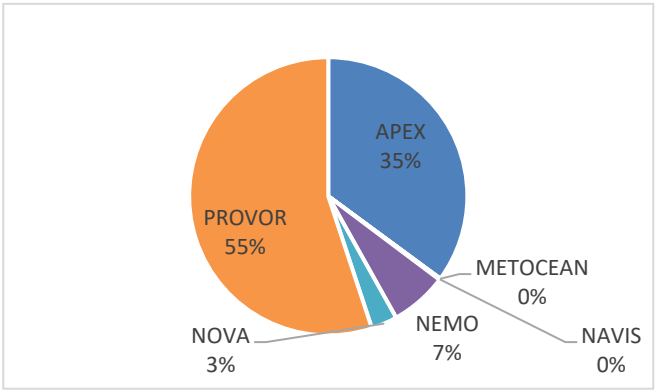
Coriolis DAC, active floats in 2017			
Float family	nb versions	nb floats	nb core profile files
APEX	23	141	4 915
NAVIS	1	2	101
NOVA	3	47	1 544
PROVOR	29	598	23 807
Total	**56**	**788**	**30 367**

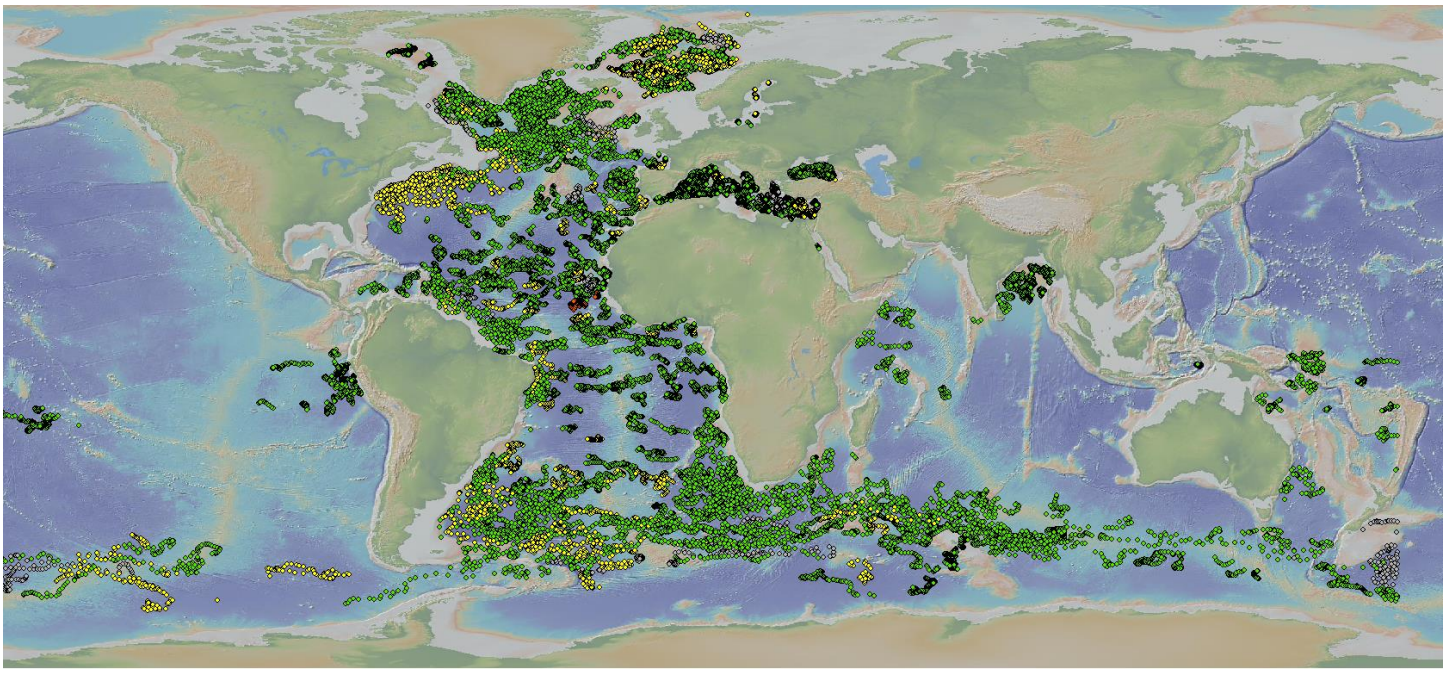


1.1.2 All floats managed by Coriolis DAC

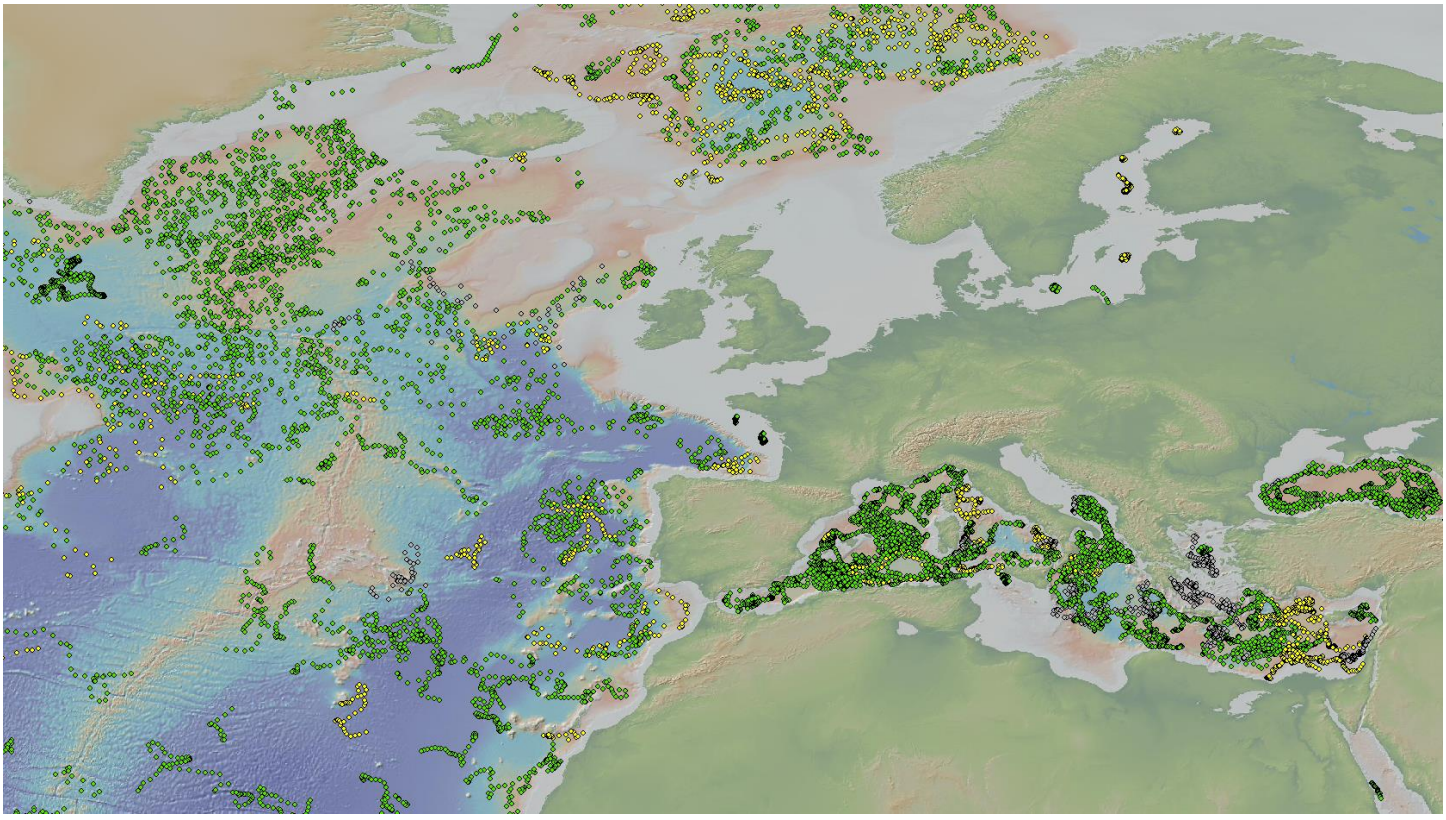
Coriolis DAC manages a total of 2 440 floats with 130 versions, from 6 families.
These floats reported 262 198 core Argo vertical profiles.

Coriolis DAC, all floats			
Float family	nb versions	nb floats	nb core profile files
APEX	62	856	96 663
METOCEAN	1	1	52
NAVIS	1	3	613
NEMO	8	162	8 908
NOVA	3	74	4 473
PROVOR	55	1 344	151 480
Total	**130**	**2 440**	**262 189**

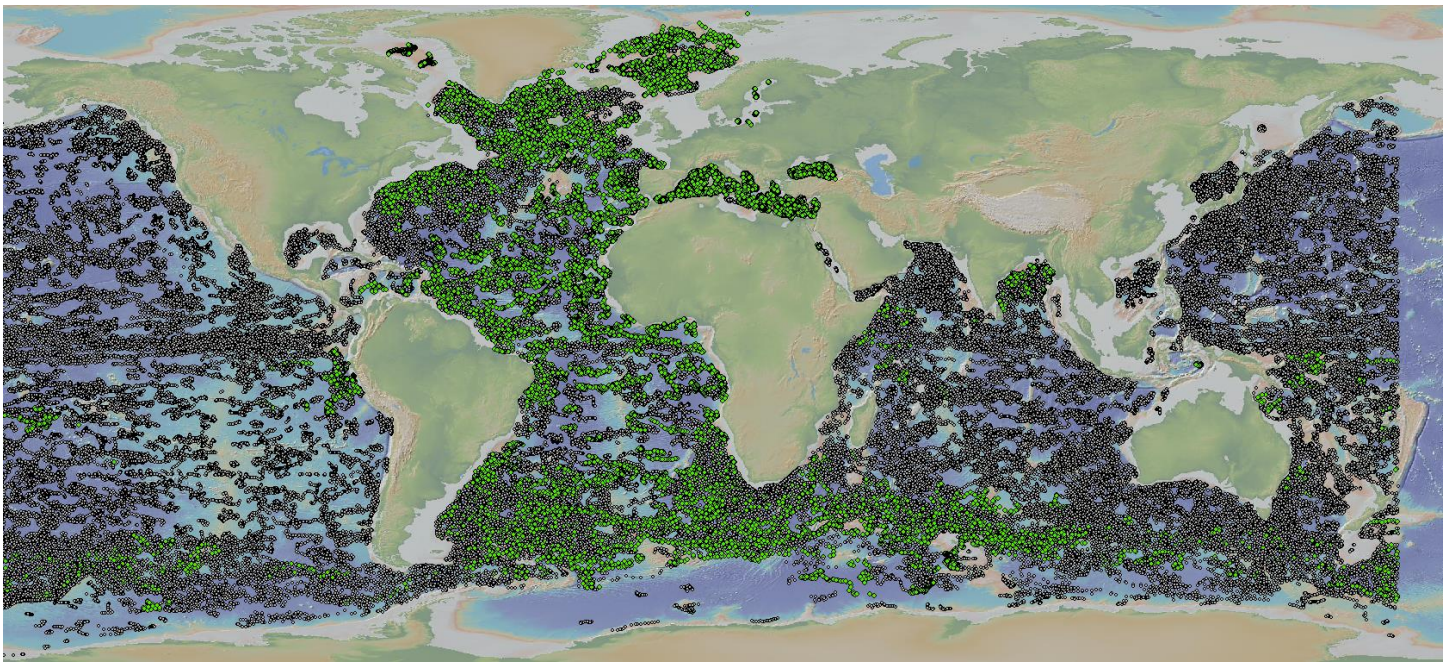




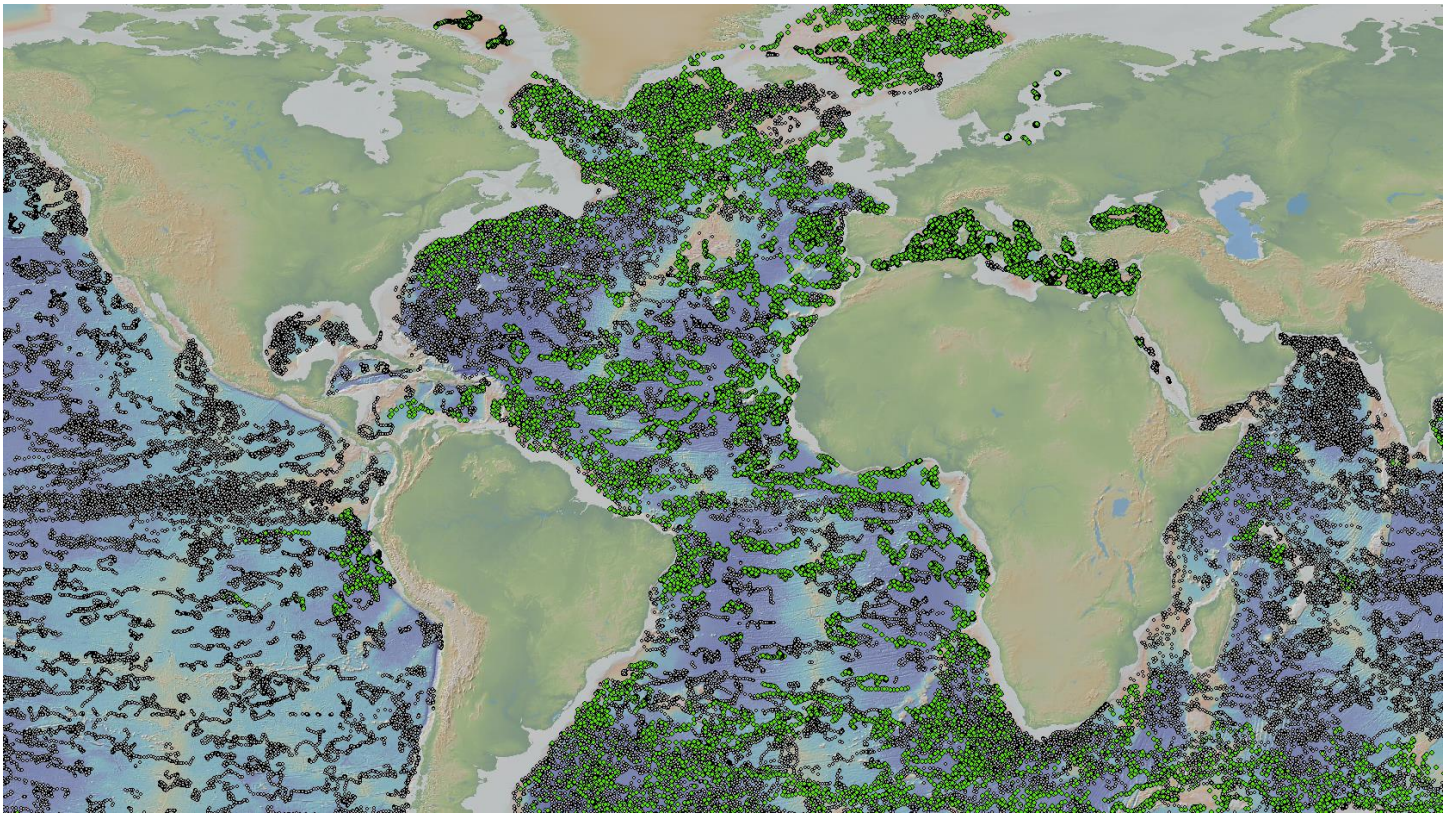
Map of the 30.367 profiles from 788 active floats decoded by Coriolis DAC this current year
Apex Navis Nemo Nova Provor



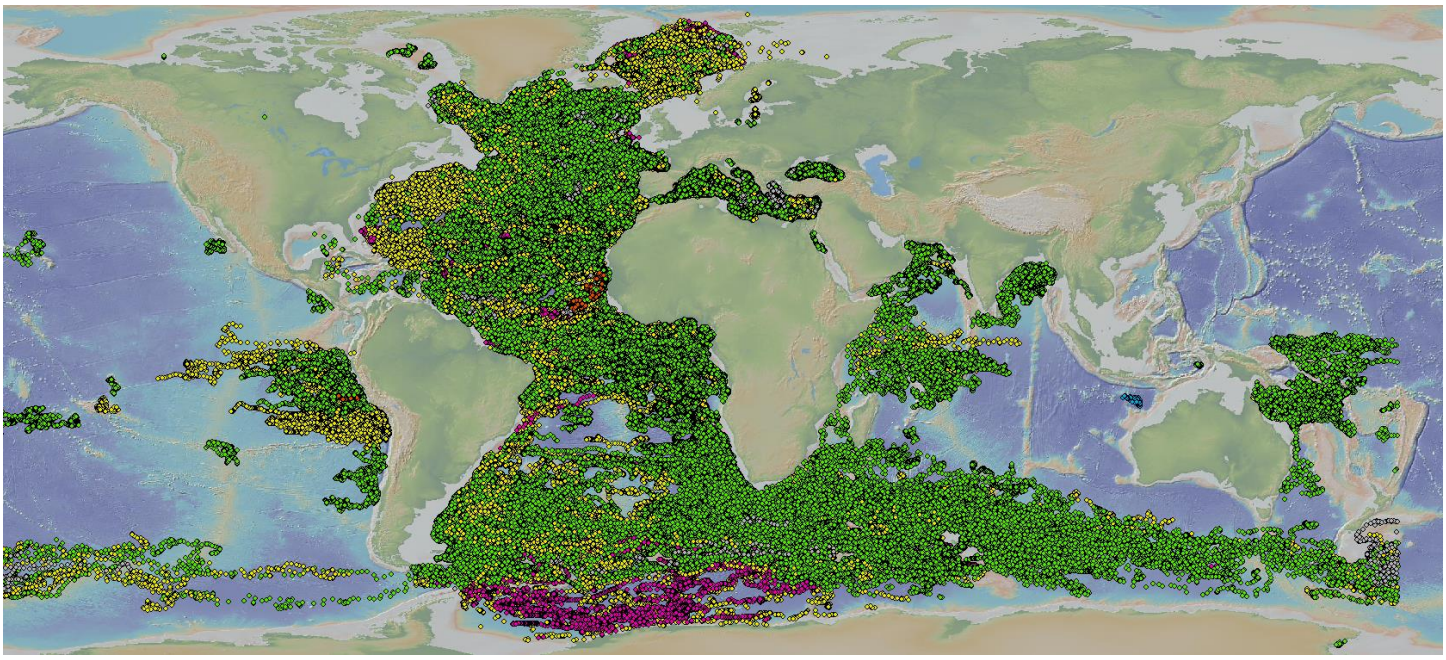
Map of active floats managed by Coriolis this current year, zoom on north Atlantic area



Map of the profiles from active floats decoded by Coriolis DAC this current year, among the other DAC's profiles (Coriolis: green, other DACs: grey)



Atlantic map active floats profiles from Coriolis DAC this current year, among the other DAC's profiles (Coriolis: green, other DACs: grey)



Map of the 262.189 profiles from 2.240 floats managed by Coriolis DAC
Apex Metocean Navis Nemo Nova Provor

1.1.3 BGC-Argo sensors on Coriolis floats

The data processing chain based on Matlab to manage data and metadata from Coriolis BGC-floats is continuously improved. These are advanced types of floats performing bio-geo-chemical measurements.

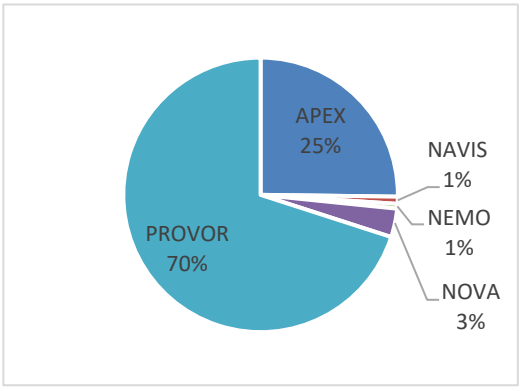
Coriolis DAC manages 357 BGC-Argo floats from 5 families and 51 instrument versions. They performed 46.460 cycles.

The data processing chain is freely available:

- *Coriolis Argo floats data processing chain, version 20170328_010a. SEANOE.* http://doi.org/10.17882/45589

Bio-Argo floats processed by Coriolis DAC

Familly	nb versions	nb floats	nb profiles	nb cycles
APEX	22	90	11 590	11 376
NAVIS	1	3	1 031	517
NEMO	1	2	297	297
NOVA	2	12	646	625
PROVOR	25	250	102 233	33 645
Total	**51**	**357**	**115 797**	**46 460**

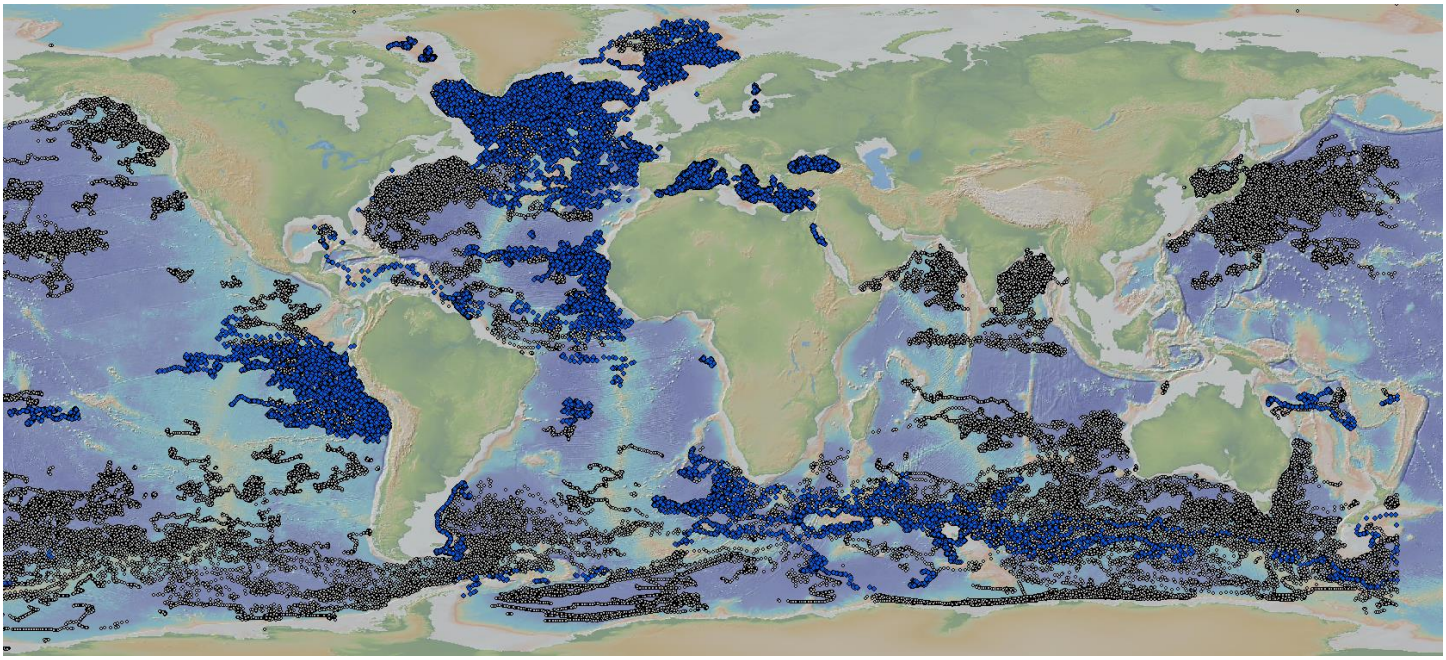


General characteristics

- Iridium rudics bi-directional communication or Argos
- Six sensors are fitted on the floats

- AANDERAA_OPTODE_4330 Aandera oxygen sensor
- C_ROVER Wetlabs transmissiometer
- ECO_PUCK Wetlabs fluorometer turbidity, scattering
- SATLANTIC_OCR504 Satlantic Irradiance sensor
- SBE41CP Seabird CTD sensor
- SUNA_V2 Satlantic nitrate sensor
- 67 parameters managed: core-argo, b-argo, i-argo parameters

These parameter include chlorophyll, turbidity, CDOM, back-scattering, UV, nitrate, bisulfide, pH, radiance, irradiance, PAR



Map of the 357 bio-Argo floats managed by Coriolis DAC (grey dots: the others DACs bio-Argo floats). They measure parameters such as chlorophyll, turbidity, CDOM, back-scattering, UV, nitrate, bisulfide, pH, radiance, irradiance, PAR.

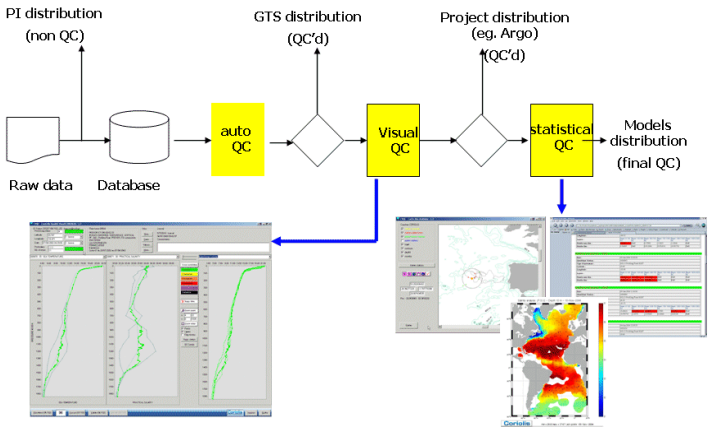
© Antoine Poteau, Observatoire Océanologique de Villefranche (CNRS/UPMC)
Deployments of a bio-argo Provor in Ligurian sea

1.2 Data issued to GTS

All profiles processed by Coriolis are distributed on the GTS by way of Meteo-France. This operation is automatically performed. After applying the automatic Argo QC procedure, the Argo profiles are inserted on the GTS every 2 hours. Argo profiles are inserted on the GTS 365 days per year, 24 hours a day.

The profile files are sent as TESAC and BUFR messages by way of Meteo-France. Meteo-France accept Coriolis as valid BUFR messages and circulate them on neighbouring nodes.

Once a day, floats data that are less than 21 days old are checked in an objective analysis (ISAS) that triggers alert and visual inspection for suspicious observations.

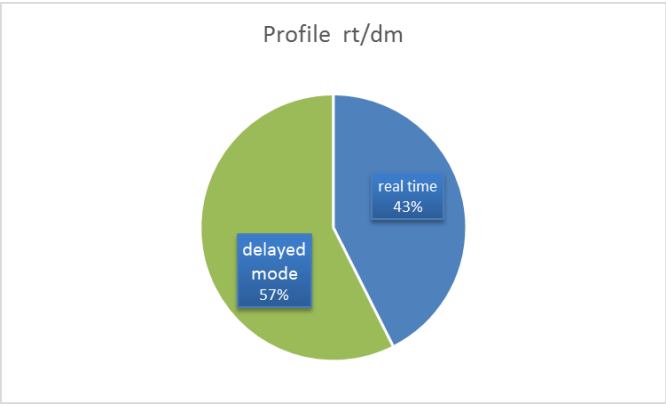


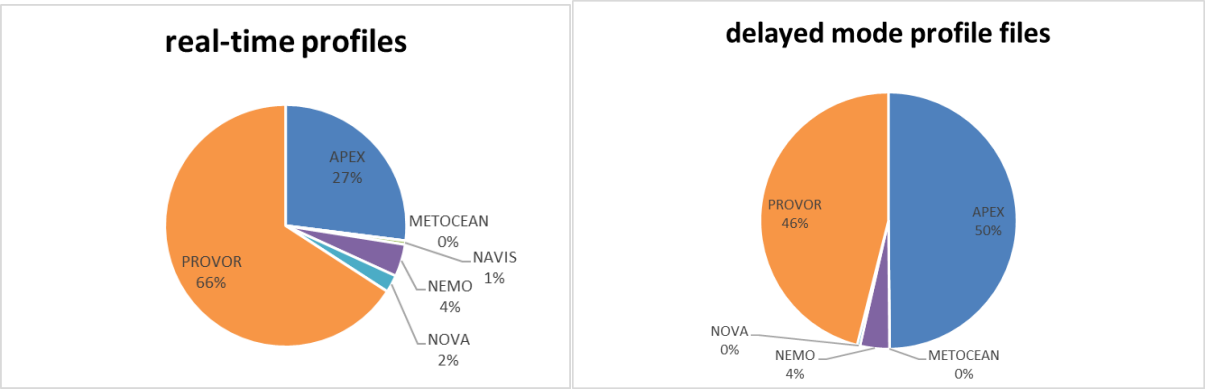
CORIOLIS DAC: Argo data flow

1.3 Data issued to GDACs after real-time QC

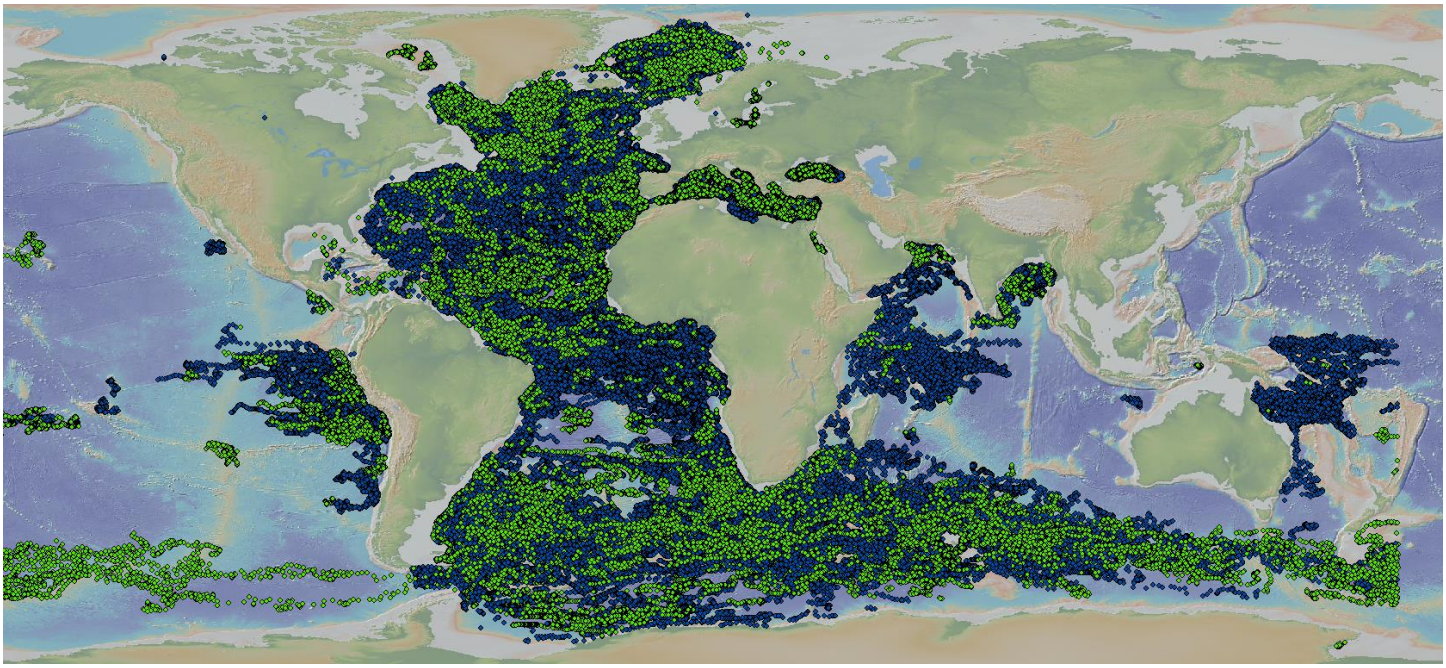
All meta-data, profiles, trajectory and technical data files are sent to Coriolis and US-GODAE GDACs. This distribution is automated.

All Coriolis floats, number of profile files on GDAC				
Family	nb floats	nb profil	RT profil	DM profiles
APEX	829	90 533	25 918	64 615
METOCEAN	1	52	-	52
NAVIS	3	488	488	
NEMO	163	8 911	4 141	4 770
NOVA	52	2 727	2 233	494
PROVOR	1 162	122 974	63 264	59 710
Total	**2 210**	**225 685**	**96 044**	**129 641**





Distribution of Coriolis DAC real-time and delayed mode profiles (96 044 profiles – 225 685 profiles)



Map of real-time profiles and delayed mode profiles
Real time: green dots, delayed mode: blue dots

1.4 Data issued for delayed mode QC

Delayed mode profiles

All profile files are sent to PIs for delayed QC. Most of the Atlantic data handled by Coriolis are checked by the European project Euro-Argo.

Preparation of Argo delayed mode trajectories

The delayed mode trajectories derived from Andro trajectory product were produced in version 3.0. Their conversion to V3.1 trajectory format will be performed in 2016.

The 1442 delayed mode trajectories files are available from:

- ftp://ftp.ifremer.fr/ifremer/argo/etc/coriolis-custom/argo-andro-data/data/dac/coriolis/

The Andro trajectory TRAJ3 files are available for most of the DACs. Each DAC may decide to use these files to provide delayed mode trajectory on GDAC.

Coriolis DAC will use these files as its delayed mode trajectories for old floats versions.

1.5 Delayed mode data sent to GDACs

An Argo delayed mode profile contains a calibrated salinity profile (psal_adjusted parameter).

- A total of **57 013 new or updated delayed mode profiles** was sent to GDACs this year.
- **A total of 179 361 delayed mode profiles** where sent to GDACs since 2005.
  The number of delayed mode profiles increased by 27% this year.

1.6 Web pages

The web site of the French DAC is available at:

- http://www.coriolis.eu.org/Observing-the-Ocean/ARGO

This web page describes all Argo floats:

- http://www.ifremer.fr/co-argoFloats/
    - Individual float description and status (meta-data, geographic map, graphics : section, overlaid, waterfall, t/s charts)
    - Individual float data (profiles, trajectories)
    - FTP access
    - Data selection tool
    - Global geographic maps, GoogleEarth maps
    - Weekly North Atlantic analyses (combines Argo data and other measurements from xbt, ctd, moorings, buoys)

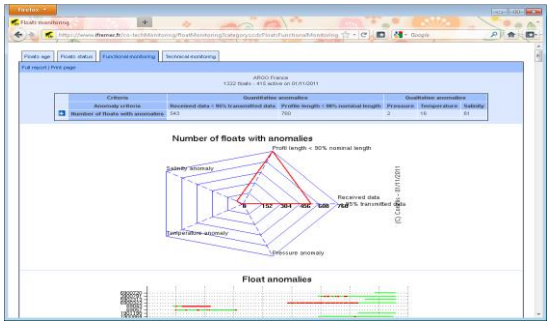
This web page describes all Argo floats interoperability services from Coriolis:

- http://www.coriolis.eu.org/Data-Products/Data-Delivery/Argo-floats-interoperability-services

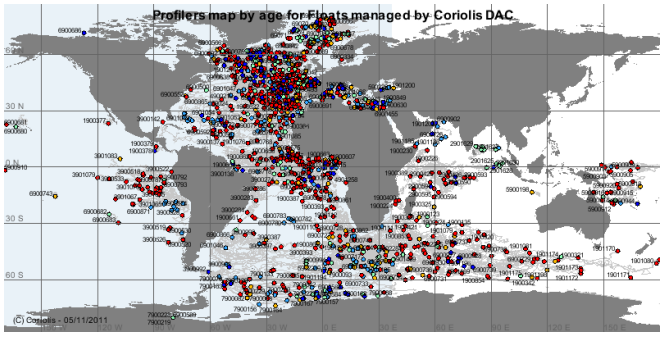
- Display an individual float's data and metadata in HTML or XML format
- Display all Argo floats, display a group of floats
- Argo profiles and trajectories data selection (HTML or XML)
- All individual float's metadata, profile data, trajectory data and technical data
- Argo profiles data on OpenDAP, OGC-WCS and http
- Argo data through RDDAP data server (www.ifremer.fr/erddap)
- Argo data through Oceanotron data server
- Argo profiles data through GCMD-DIF protocol
- Argo data through RDF and OpenSearch protocols
- Display Argo profiles and trajectories with GoogleEarth

Some pages of Coriolis web site are dedicated to technical monitoring:

- http://www.coriolis.eu.org/Data-Products/At-sea-monitoring

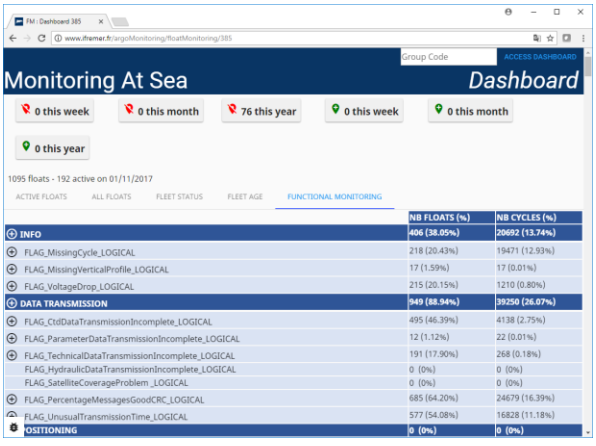


Example 1: technical monitoring of Argo-France floats



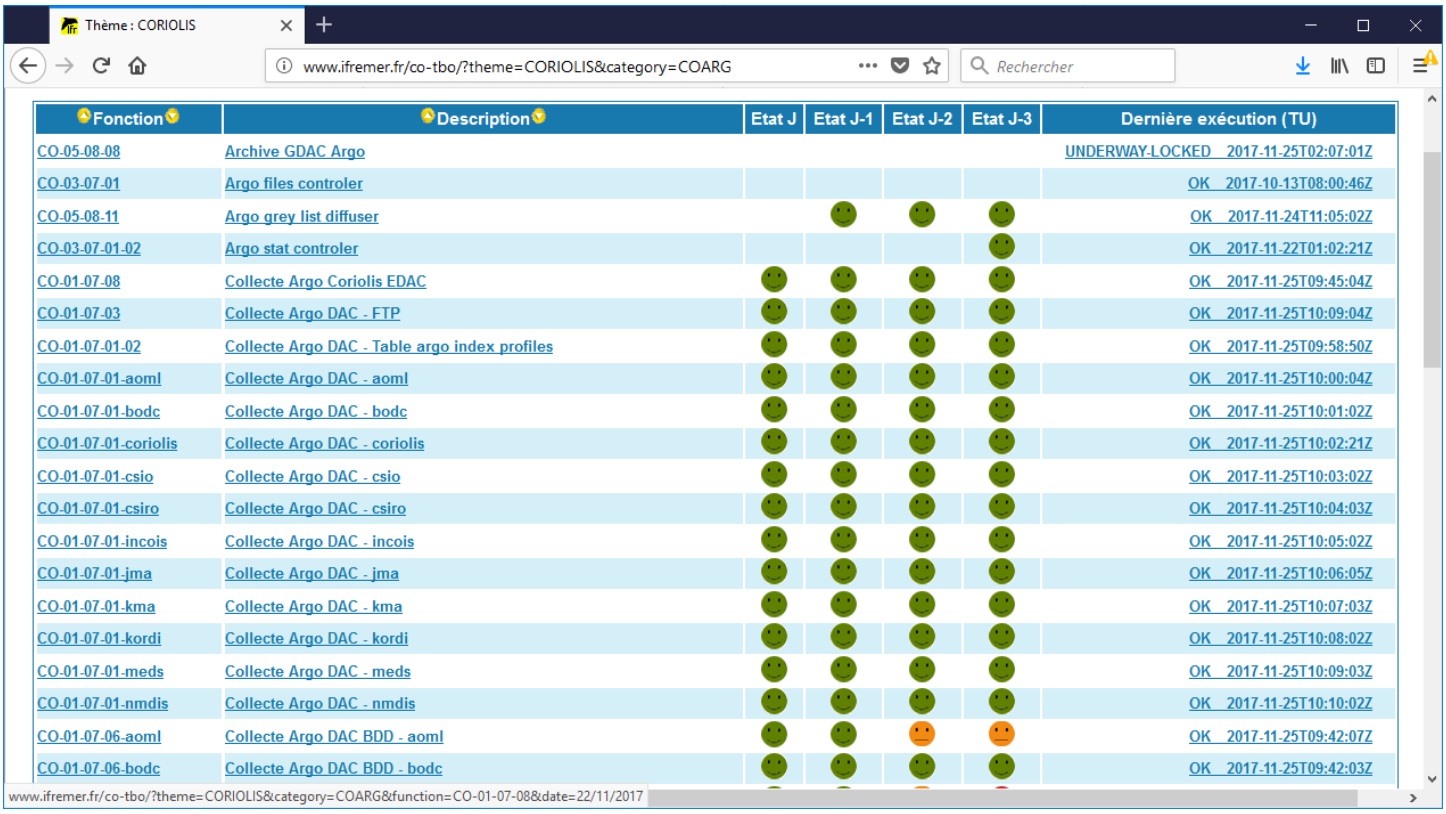
Example 2: age map of floats managed by Coriolis DAC.

Within Euro-Argo ERIC (European Research Infrastructure Consortium), a dashboard with alerts on anomalies was developed: http://www.ifremer.fr/argoMonitoring/floatMonitoring/385



Within ENVRIPLUS EU project, an Argo big data demonstration: http://co-discovery-demo.ifremer.fr/euro-argo/
All Argo data is indexed and available through an Elasticsearch API.
More on https://www.youtube.com/watch?v=PKU_JcmSskw

Data centre activity monitoring: Coriolis operators perform an activity monitoring with an online control board.



Fonction	Description	Etat J	Etat J-1	Etat J-2	Etat J-3	Dernière exécution (TU)
CO-05-08-08	Archive GDAC Argo					UNDERWAY-LOCKED 2017-11-25T02:07:01Z
CO-03-07-01	Argo files controler					OK 2017-10-13T08:00:46Z
CO-05-08-11	Argo grey list diffuser					OK 2017-11-24T11:05:02Z
CO-03-07-01-02	Argo stat controler					OK 2017-11-22T01:02:21Z
CO-01-07-08	Collecte Argo Coriolis EDAC					OK 2017-11-25T09:45:04Z
CO-01-07-03	Collecte Argo DAC - FTP					OK 2017-11-25T10:09:04Z
CO-01-07-01-02	Collecte Argo DAC - Table argo index profiles					OK 2017-11-25T09:58:50Z
CO-01-07-01-aoml	Collecte Argo DAC - aoml					OK 2017-11-25T10:00:04Z
CO-01-07-01-bodc	Collecte Argo DAC - bodc					OK 2017-11-25T10:01:02Z
CO-01-07-01-coriolis	Collecte Argo DAC - coriolis					OK 2017-11-25T10:02:21Z
CO-01-07-01-csio	Collecte Argo DAC - csio					OK 2017-11-25T10:03:02Z
CO-01-07-01-csiro	Collecte Argo DAC - csiro					OK 2017-11-25T10:04:03Z
CO-01-07-01-incois	Collecte Argo DAC - incois					OK 2017-11-25T10:05:02Z
CO-01-07-01-jma	Collecte Argo DAC - jma					OK 2017-11-25T10:06:05Z
CO-01-07-01-kma	Collecte Argo DAC - kma					OK 2017-11-25T10:07:03Z
CO-01-07-01-kordi	Collecte Argo DAC - kordi					OK 2017-11-25T10:08:02Z
CO-01-07-01-meds	Collecte Argo DAC - meds					OK 2017-11-25T10:09:03Z
CO-01-07-01-nmdis	Collecte Argo DAC - nmdis					OK 2017-11-25T10:10:02Z
CO-01-07-06-aoml	Collecte Argo DAC BDD - aoml					OK 2017-11-25T09:42:07Z
CO-01-07-06-bodc	Collecte Argo DAC BDD - bodc					OK 2017-11-25T09:42:03Z

Argo GDAC operations monitoring: every working day, an operator performs diagnostics and take actions on anomalies (red or orange smileys)

1.7 Statistics of Argo data usage (operational models, scientific applications, number of National Pis…)

Operational oceanography models; all floats data are distributed to:

- French model Mercator (global operational model)
- French model MARC (regional operational model)
- French model Soap (navy operational model)
- EU Copernicus models (Foam, Topaz, Moon, Noos)
- EuroGoos projects

*Argo projects: this year, Coriolis data centre performed float data management for **55 Argo scientific projects and 55 PIs (Principal Investigators).***

List of Coriolis scientific PIs and project names

Project name	nb floats
euro-argo	584
coriolis	397

bsh	83
argo-bsh	79
argo italy	76
naos	69
remocean	62
mocca	60
goodhope	47
mocca-eu	43
pirata	27
gmmc	21
argomed	16
rrex asfar	15
sagar	12
dap	11
rrex	10
argo norway	10
argo greece	10

List of projects with more than 10 active floats

List of project with less than 10 active floats: argo_fin, geovide, amop, soclim, bwr, argo_spain, ovide, outpace, ticmoc, mocca-germany, naos-canada, gmmc_cnes, brazilian navy argo program, naos-france, mocca-italy, cienperu, argo italy , morsea, argo-poland, moose, vsf, eaims, narval, mocca-poland, mafia, mocca-ger, argo bulgary, sri_lanka, aspex, argo spain, e-aims, argo brazil, cnes, proteusmed, asfar, argo-finland, mocca-eu, dekosim (metu), bioargo-italy, opportunity (sail), upsen, ge moose, naos,pirata, perseus, socib, mocca-ned, argo-italy, dekosim, lefe, bioargo italy, argo bsh, bide, mocca-netherlands, euroargo, peacetime, congas

PI name	nb floats
birgit klein	142
pierre-marie poulain	95
christine coatanoan	92
sabrina speich	64
virginie thierry	63
bernard bourles	28
christophe maes	24
herve claustre	23
holger giese	22
fabrizio d'ortenzio	17
romain cancouët	16
fabien durand	15
andreas sterl	13
jose lluis pelegri	12
marcel babin	12
dimitris kassis	11
waldemar walczowski	11
kjell arne mork	10

laurent coppola	10
pedro velez belchi	10
jean-baptiste sallee	9
peter brandt	8
tero purokoski	8

List of Principal Investigators (PI) in charge of more than 8 active floats

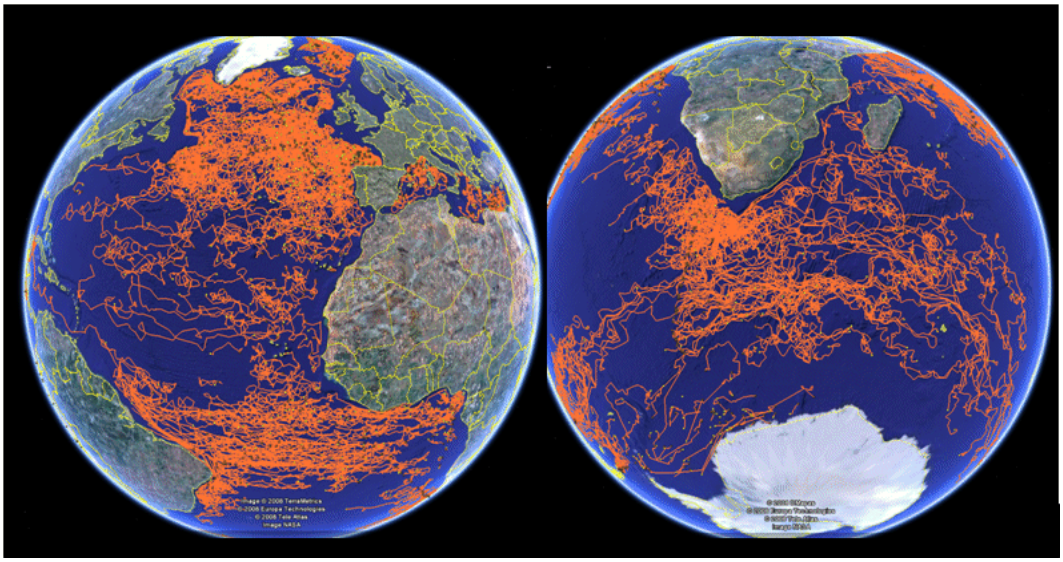
List of Principal Investigators (PI) in charge of less than 8 active floats: sophie cravatte, franck dumas, luis felipe silva santos, vincent echevin, guillaume maze, alban lazar, camille daubord, cecile cabanes, violeta slabakova, bert rudels, louis marié, stephane blain, thierry moutin, xavier andre, arne kortzinger, elodie martinez, katrin latarius, serge le reste, stephanie louazel, sven petersen, tobias ramalho dos santos ferreira, agus atmadipoera, alain serpette, anja schneehorst, bettina fach, jordi font, julia uitz, nathanaele lebreton, pascal conan, s. petersen, sorin balan

1.8 Products generated from Argo data …

Sub-surface currents ANDRO Atlas

Based on Argo trajectory data, Michel Ollitrault and the Ifremer team are regularly improving the "Andro" atlas of deep ocean currents. The ANDRO project provides a world sub-surface displacement data set based on Argo floats data. The description of each processing step applied on float data can be found in:

- *Ollitrault Michel, Rannou Philippe (2013).* ***ANDRO: An Argo-based deep displacement dataset****. SEANOE. http://doi.org/10.17882/47077*
- See also : http://wwz.ifremer.fr/lpo/Produits/ANDRO



Argo trajectories from Coriolis DAC are carefully scrutinized to produce the "Andro" atlas of deep ocean currents.

2 Delayed Mode QC

(Please report on the progress made towards providing delayed mode Argo data, how it's organized and the difficulties encountered and estimate when you expect to be pre-operational.)

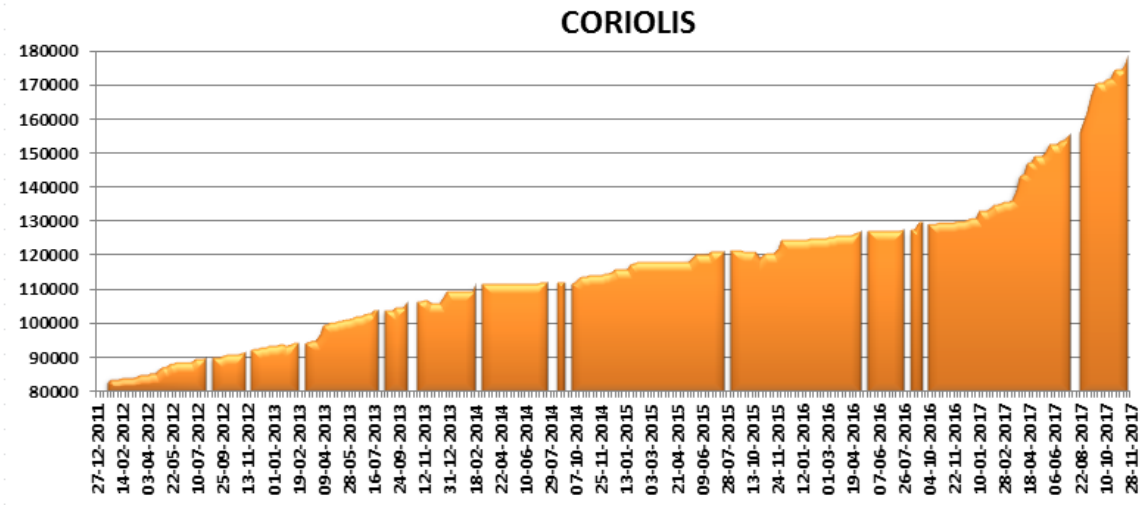
At the Coriolis data centre, we process the delayed mode quality control following four steps. Before running the OW method, we check carefully the metadata files, the pressure offset, the quality control done in real time and we compare with neighbor profiles to check if a drift or offset could be easily detected. As each year, we have worked on this way with PIs to strengthen the delayed mode quality control.

Some floats have been deployed from some projects, meaning a lot of PIs and a lot of time for explaining the DM procedure to all of them. A few PIs are totally able to work on DMQC following the four steps but this is not the case for most of them. Since the unavailability of the PIs leads to work by intermittence and then extend the period of work on the floats, we did the work with a private organism (Glazeo) to improve the realization of the DMQC, exchanging only with the PIs to validate results and discuss about physical oceanography in studied area. Working in this way, we largely improve the amount of delayed mode profiles.

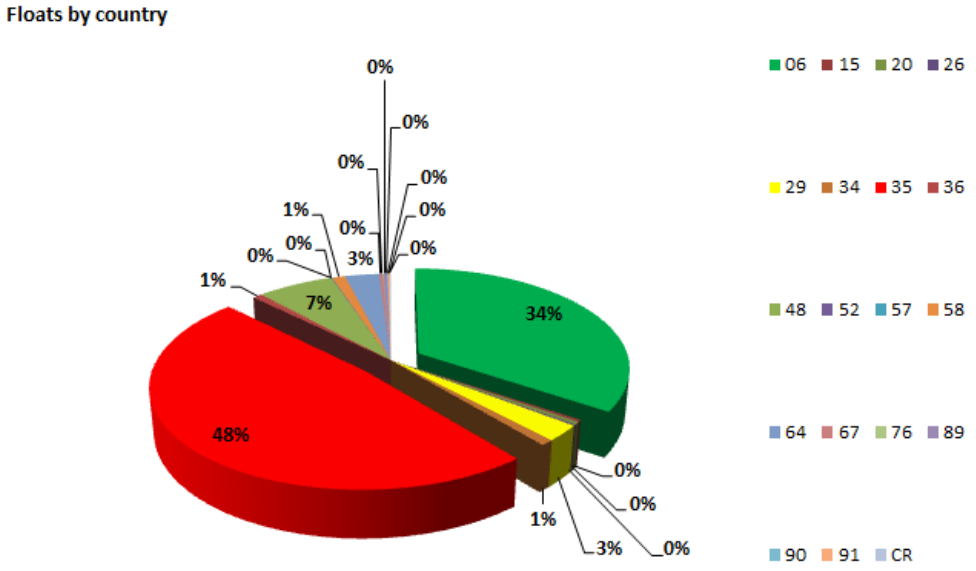
For a few projects, there are still no identified operators to do DMQC, for instance the first run has been done by students which have now left institutes or are not available to carry on with this work. We have made a lot of progress with BSH (Birgit Klein) taking into account also floats from other German institutes and OGS (Giulio Notarstefano) for the MedSea.

Some DM files have been updated to format version 3.1 taking into account a new decoder (matlab) developed at Coriolis. This work has been done for some Provor and Apex, few files need to be manually updated.

Regular DM files submission is performed each year but an effort has been done during the year 2017 to increase the DM files number.

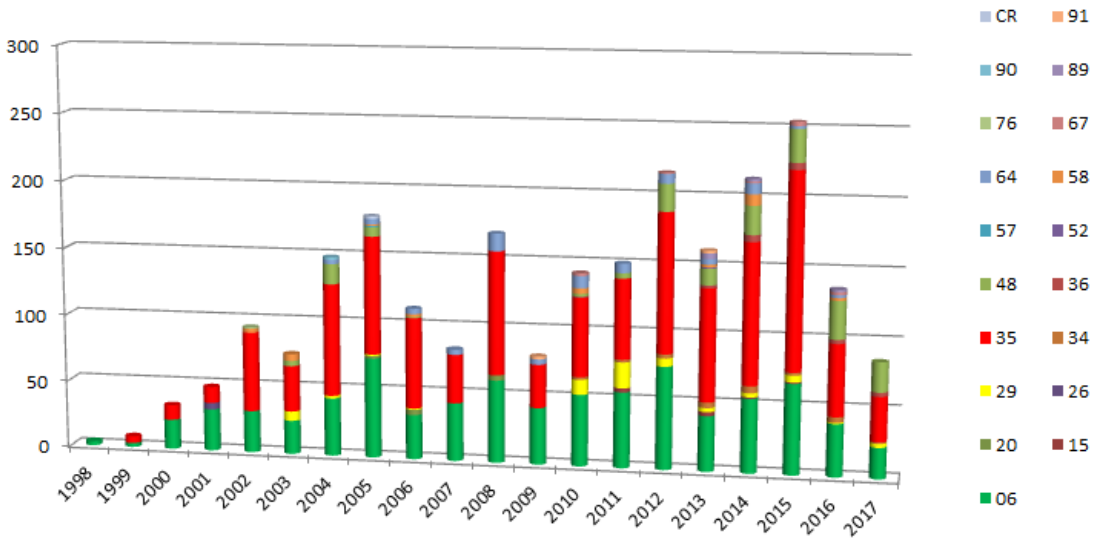


Evolution of the DM profiles' submission versus dates



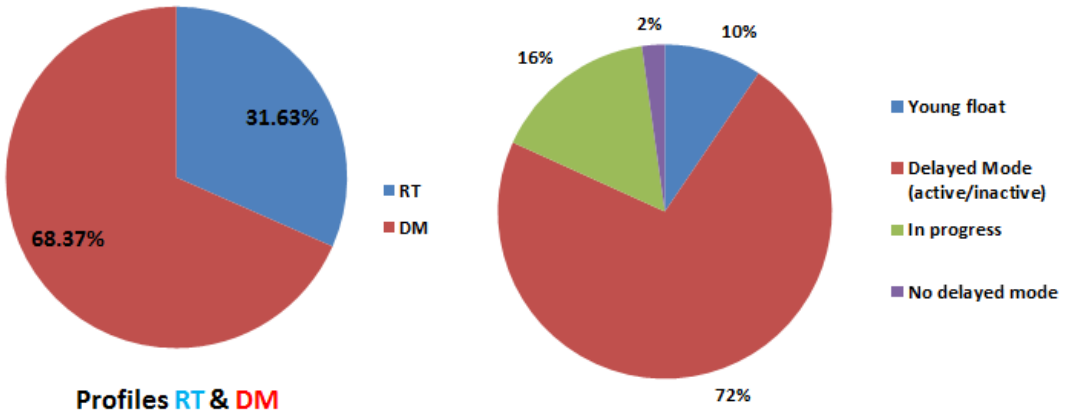
Percentage of floats by country in the Coriolis DAC.

Codes for the countries: 06 : Germany - 15 : Bulgaria - 20 : Chili – 26 : Denmark – 29 : Spain – 34 : Finland - 35 : France – 36 : Greece - 48 : Italy – 52 : Lebanon - 57 : Mexico - 58 : Norway – 64 : Netherlands – 67 : Poland – 76 : China – 89: Turkey - 90 : Russia – 91 : - South Africa - CR : Costa Rica



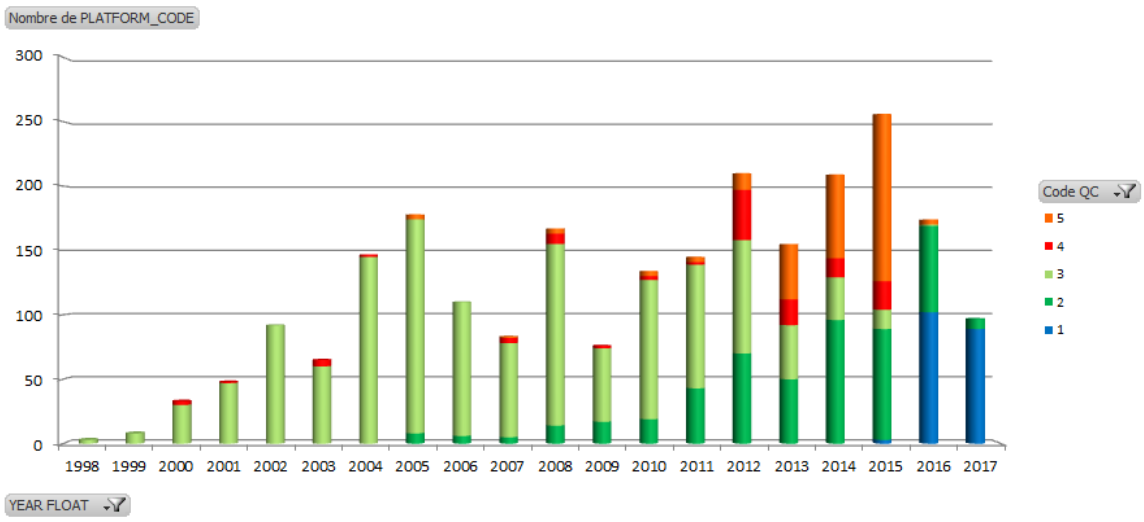
Number of floats by country and by launch's year in the Coriolis DAC

During the last year (from October 2016 to November 2017), 49125 new delayed mode profiles where produced and validated by PIs. A total of 178763 delayed mode profiles where produced and validated since 2005.



Status of the floats processed by Coriolis DAC.
Left: in terms of profile percent and right: in terms of float percent (DM : delayed mode – RT : real time).

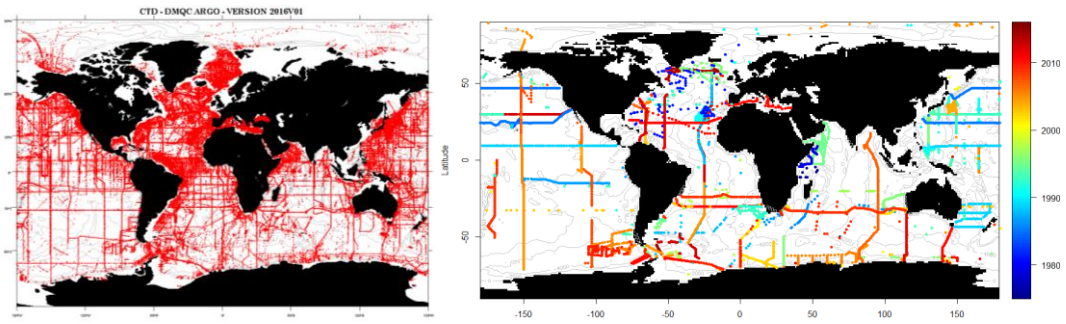
The status of the quality control done on the Coriolis floats is presented in the following plot. For the two last years (2016-2017), most of the floats are still too young (code 1) to be performed in delayed mode. For the years 2012-2013-2014, we are still working on the DMQC of some floats. The codes 2 and 3 show the delayed mode profiles for respectively active and dead floats.



Status of the quality control done on profiles sorted by launch's year, code 1: young float, code 2: active float, DM done, code 3 : dead float, DM done; code 4 : DM in progress, code 5 : waiting for DM, code 6 : problems with float.

2.1 Reference database

In September 2016, the version CTD_for_DMQC_2016V01 has been provided with a large improvement of the dataset since this version took into account new CTD provided by the CCHDO API (following figure), CTD from scientists as well as feedbacks from users on quality of some profiles.

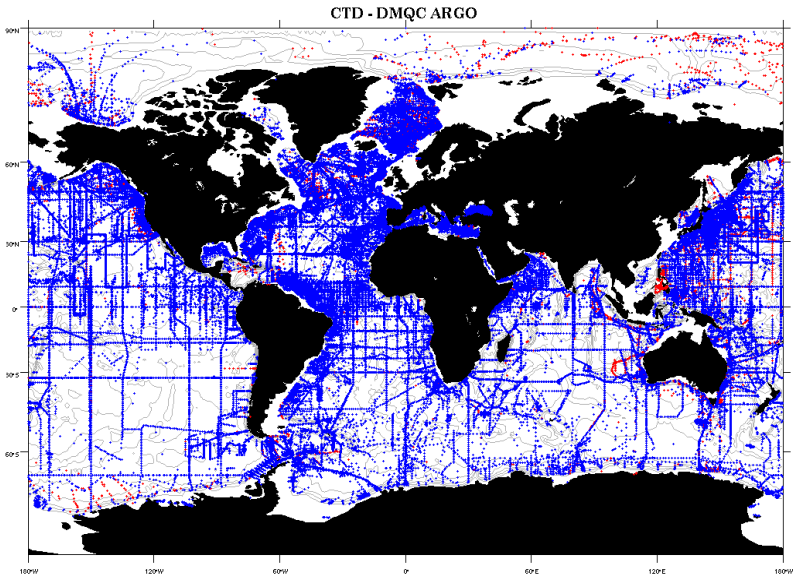


Version 2016 V01 & New CTD datasets downloaded from the CCHDO API

A new version 2017V01 has been provided at the beginning of this year with some updates on a few boxes, following the feedback sent by some scientists.

This last version is available on the ftp site in smaller tar balls, one by wmo box area (1-3-5-7): for instance, CTD_for_DMQC_2017V01_1.tar.gz for all boxes starting with wmo 1, then we will have 4 tar files.

During this year, the OCL updates have been downloaded and some works on quality control have been made before adding them in the reference database. A new version is in preparation and should be delivered at the beginning of 2018. Some new CTDs can be observed in the following plot (blue: last version and red: new CTDs).



3 GDAC Functions

(If your centre operates a GDAC, report the progress made on the following tasks and if not yet complete, estimate when you expect them to be complete)

- *National centres reporting to you*
- *Operations of the ftp server*
- *Operations of the www server*
- *Data synchronization*
- *Statistics of Argo data usage : Ftp and WWW access, characterization of users (countries, field of interest : operational models, scientific applications) …*

3.1 National centres reporting to you

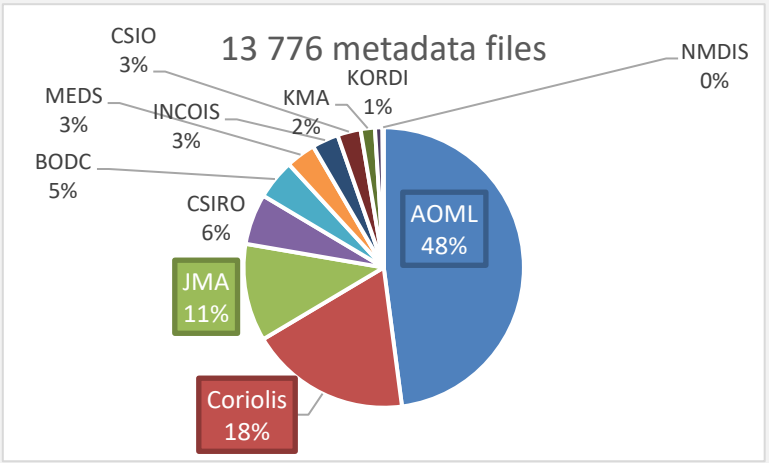
Currently, 11 national DACs submit regularly data to Coriolis GDAC.

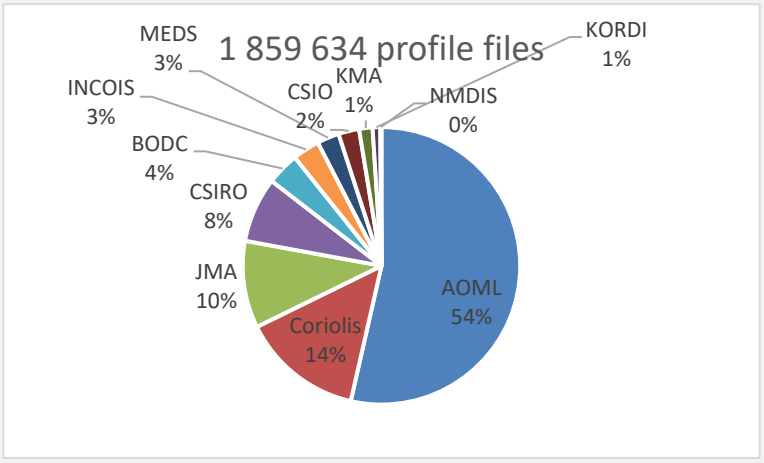
The additional GTS DAC contains all the vertical profiles from floats that are not managed by a national DAC. These data come from GTS and GTSPP projects. The GTS profiles are quality controlled by the French DAC (Coriolis).

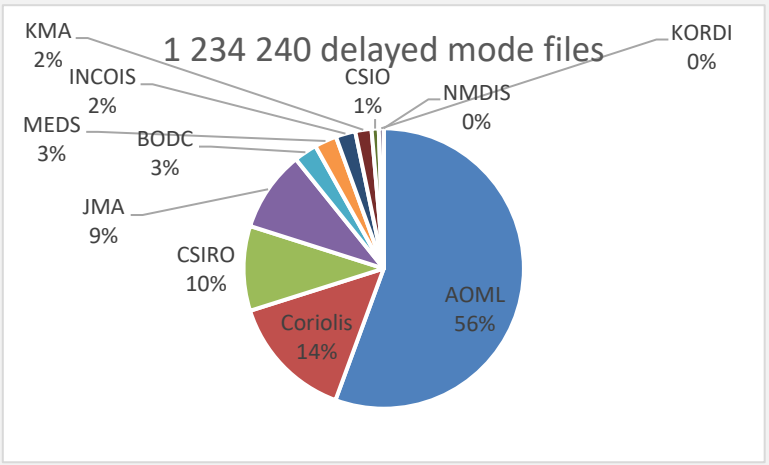
On November 25th 2017, the following files were available from the GDAC FTP site.

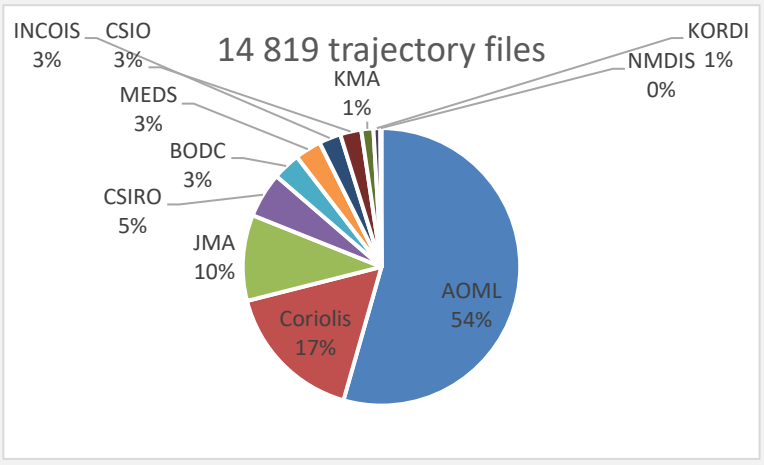
3.1.1 GDAC files distribution

DAC	metadata files 2017	increase from 2016	profile files 2017	increase from 2016	delayed mode profile files 2017	increase from 2016	trajectory files 2017	increase from 2016
AOML	6 601	10%	996 019	13%	686 144	20%	8 064	12%
BODC	636	18%	70 637	23%	33 015	5%	479	14%
Coriolis	2 554	11%	263 894	17%	179 361	38%	2 465	11%
CSIO	370	8%	44 934	15%	10 221	0%	365	7%
CSIRO	806	8%	140 870	14%	120 680	24%	781	10%
INCOIS	422	7%	58 538	14%	28 008	1%	379	2%
JMA	1 550	7%	188 716	11%	115 044	20%	1 484	4%
KMA	227	5%	29 005	11%	23 094	11%	208	0%
KORDI	119	0%	16 578	2%	6 986		119	0%
MEDS	472	9%	47 983	8%	31 687	23%	456	8%
NMDIS	19	0%	2 460	0%	0		19	0%
Total	13 776	9,35%	1 859 634	13,75%	1 234 240	22,02%	14 819	9,93%







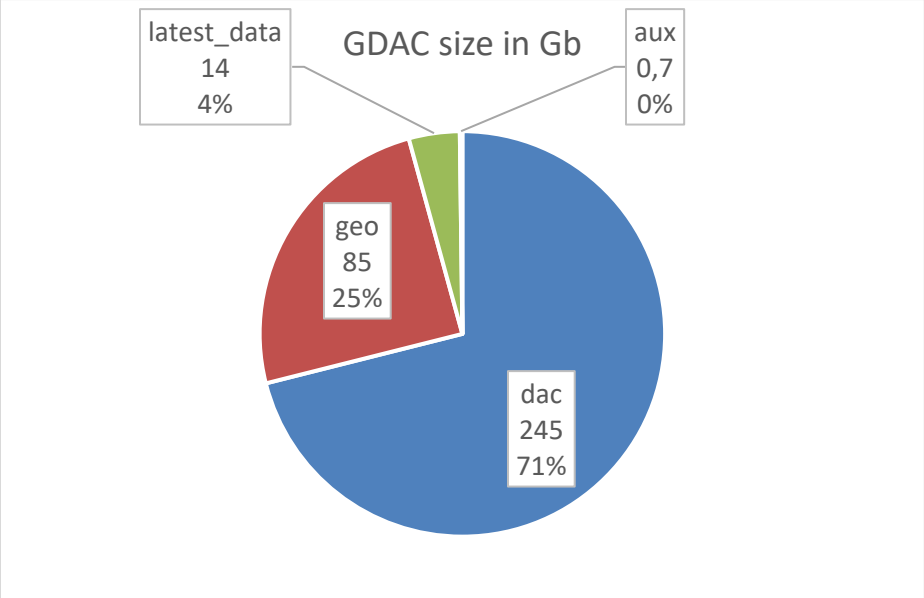


Number of files available on GDAC, November 2017

3.1.2 GDAC files size

- The total number of NetCDF files on the GDAC/dac directory was 2 178 811
- The size of GDAC/dac directory was 245 G (+95%)
- *The size of the GDAC directory was 462Go*

GDAC branch	GDAC size in Gb	since 2016
dac	245	46%
geo	85	25%
latest_data	14	-7%
aux	0,7	-

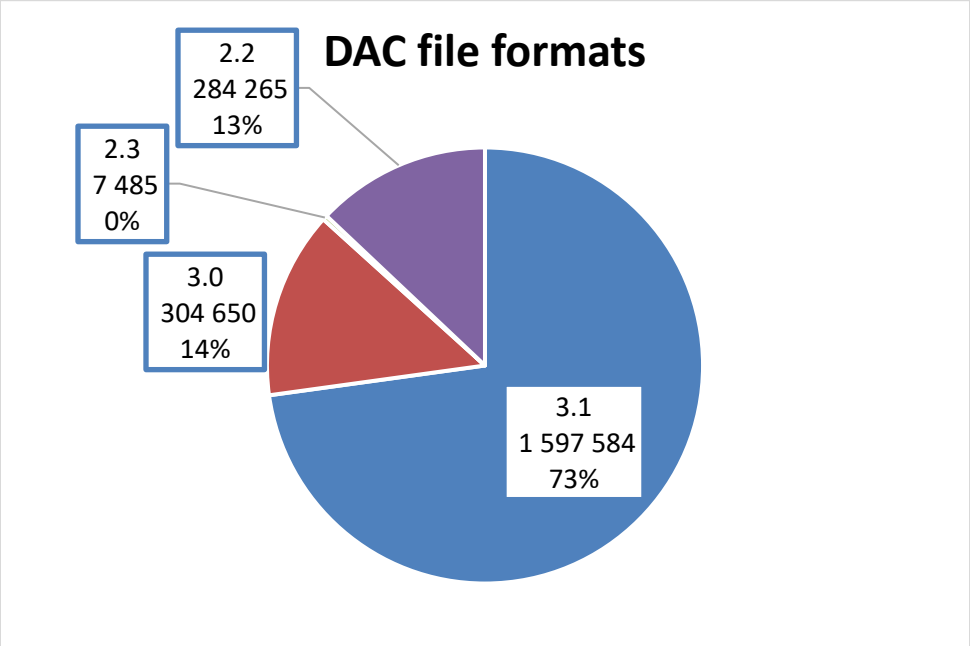


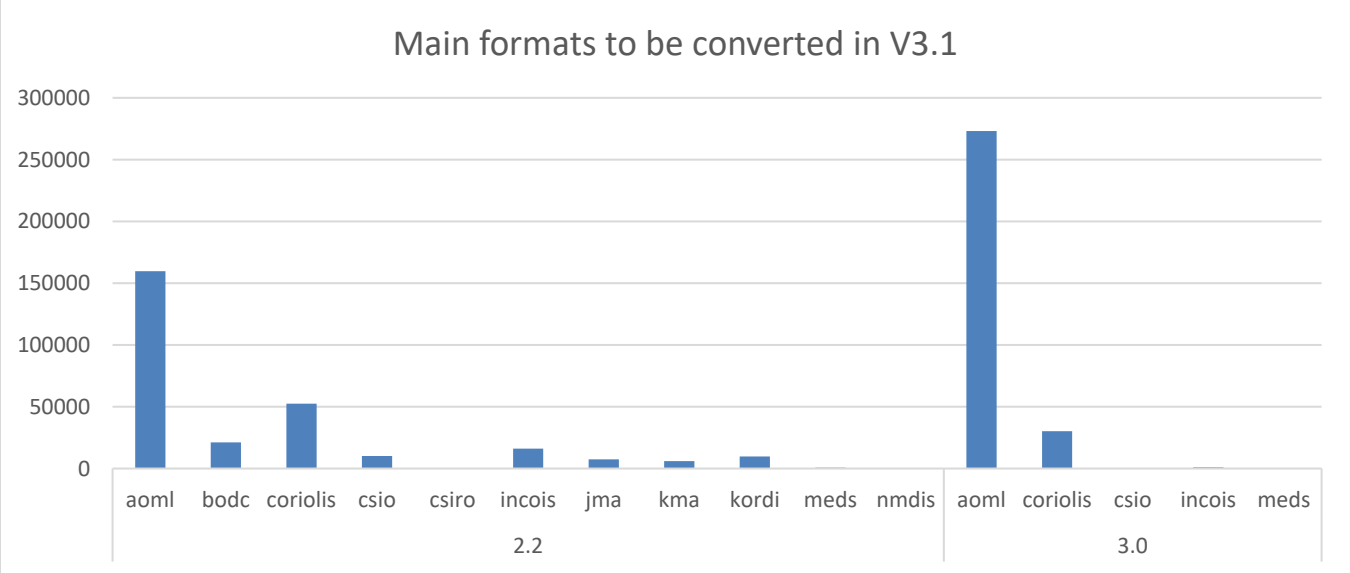
3.1.3 Argo NetCDF transition to format V3.1

The transition from Argo format 2.* and 3.0 toward format 3.1 is underway.

On 2017, the number of files in format version 3.1 reached and passed the 70% threshold.

format version	nb files	percentage
3.1	1 597 584	73%
3.0	304 650	14%
2.3	7 485	0%
2.2	284 265	13%
2.1	12	0%
Total	**2 193 996**	100%





Detailed list of format versions per DAC

File format	number of files
2.1	**12**
aoml	2
csio	8
kma	1
meds	1
2.2	**284265**
aoml	159647

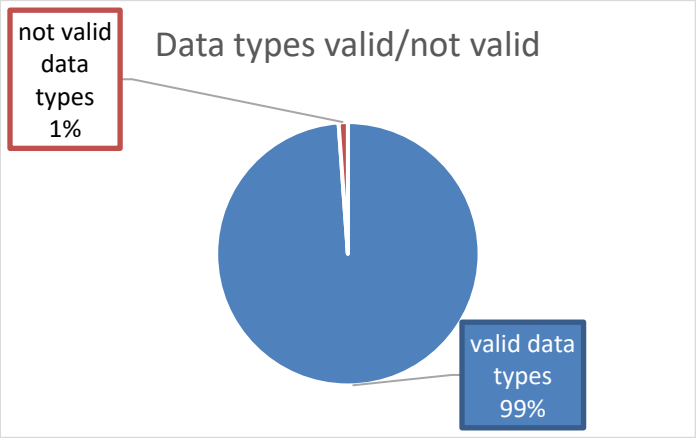
bodc	21137
coriolis	52487
csio	10097
csiro	314
incois	16122
jma	7447
kma	6064
kordi	9789
meds	713
nmdis	448
2.3	**7485**
aoml	80
bodc	556
coriolis	6623
csio	2
incois	16
jma	1
kma	148
kordi	55
nmdis	4
3.0	**304650**
aoml	273128
coriolis	30253
csio	352
incois	908
meds	9
3.1	**1577138**
aoml	663282
bodc	57140
coriolis	265158
csio	48531
csiro	183719
incois	53261
jma	216367
kma	23736
kordi	7200
meds	56660
nmdis	2084
Total général	**2173550**

The files in format version V3.1 are much more homogeneous than their previous versions. The controls applied by the format checker on V3.1 is much more exhaustive. The controlled vocabulary listed in the 27 reference tables is used for V3.1 format checks. A non-valid content is automatically rejected. Only valid V3.1 content appears on GDAC.

Example of valid content checked by the format checker on V3.1 files

There are 8 valid DATA_FORMAT variables listed in reference table 1 (there are 26 more tables…).
A survey on GDAC files shows that 24 779 files (1% of the total) do not have a valid DATA_FORMAT.
The V3.1 files are not affected by this kind of problem.

data_type	nb files	valid type
Argo meta-data	13748	yes
ARGO profile	22326	no
Argo profile	1867361	yes
Argo profile merged	131347	yes
Argo technical	556	no
ARGO technical data	174	no
Argo technical data	12686	yes
ARGO trajectory	1237	no
Argo Trajectory	110	no
Argo trajectory	13434	yes
B-Argo profile	130641	yes
B-Argo trajectory	376	no

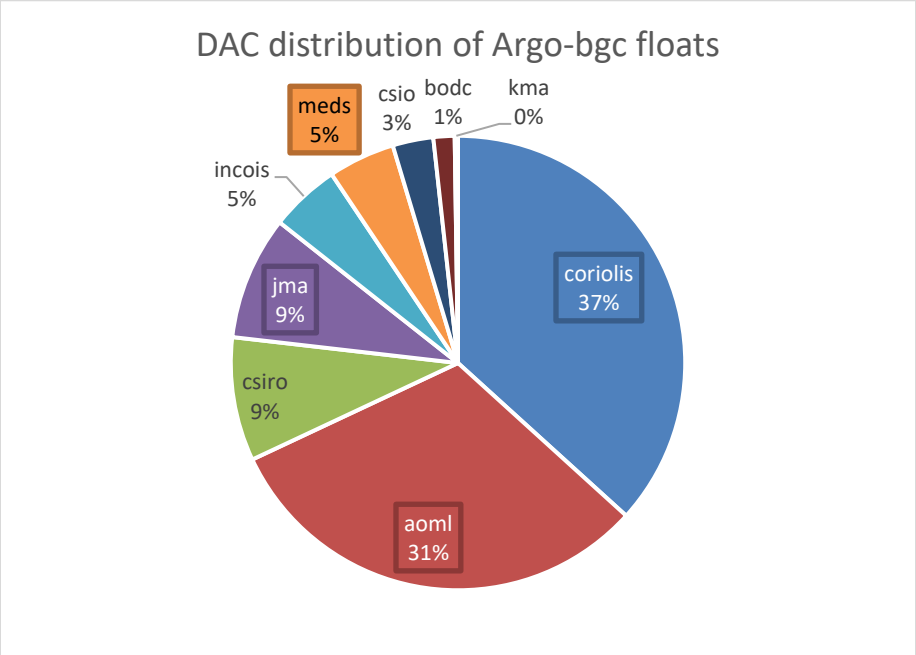


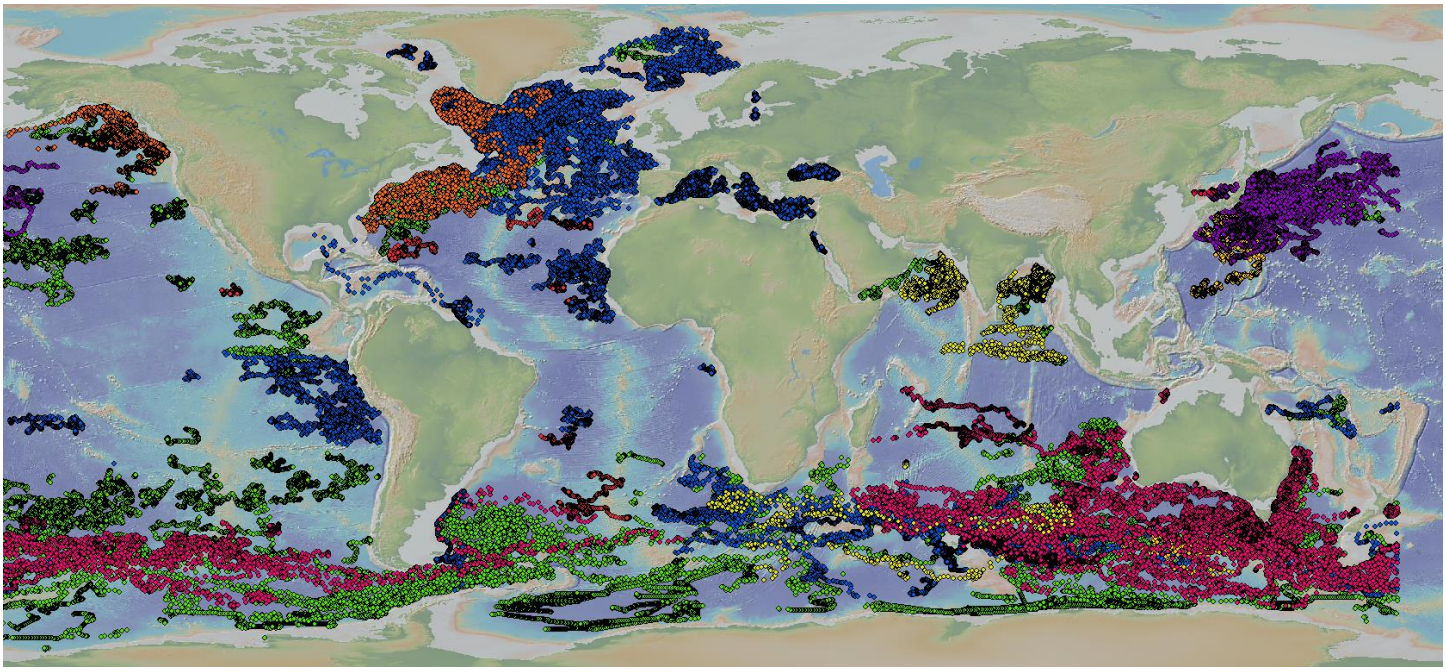
3.1.4 BGC-Argo floats

In November 2017, 131 308 BGC Argo profiles from 863 floats were available on Argo GDAC. This is a strong increase compared to 2016 : +65% more profiles and +54% more floats.

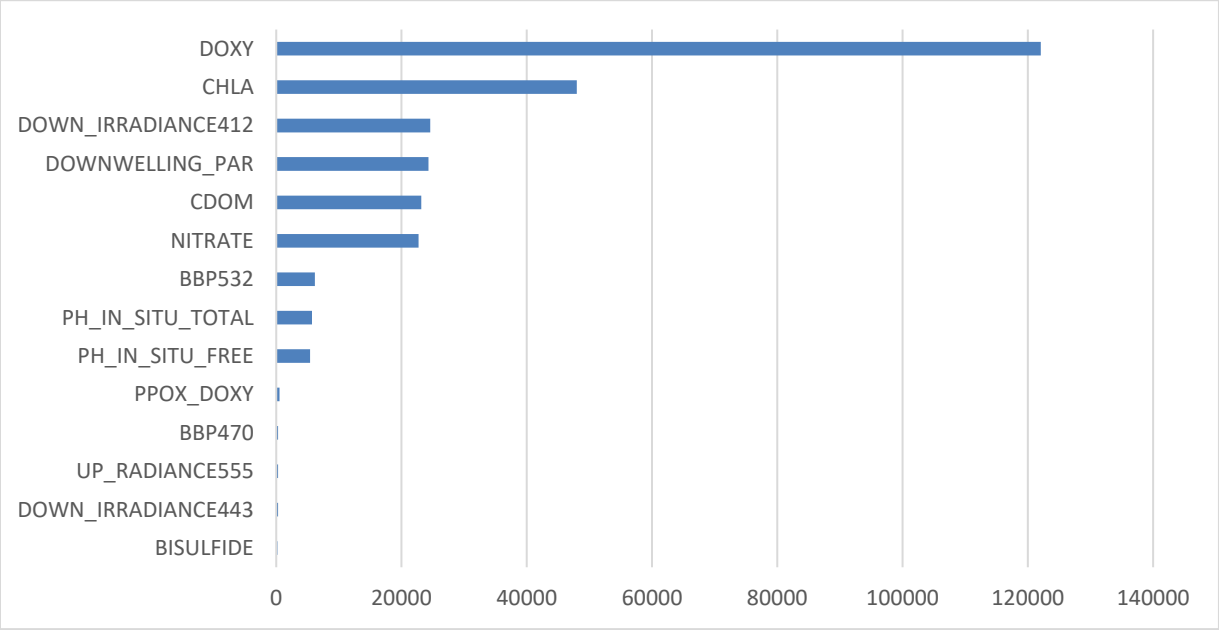
DAC	nb bio floats	nb bio files
coriolis	317	41 147
aoml	270	36 917
csiro	76	20 149
jma	76	14 602
incois	43	5 201
meds	41	3 821

csio	25	6 344
bodc	13	3 041
kma	2	86
Total	**863**	**131 308**





BGC-Argo profiles, colored by DACs



Main BGC-Argo physical parameters, number of profiles

3.2 Operations of the ftp server

Meta-data, profile, trajectory and technical data files are automatically collected from the national DACs ;

Index files of meta-data, profile and trajectory are daily updated ;

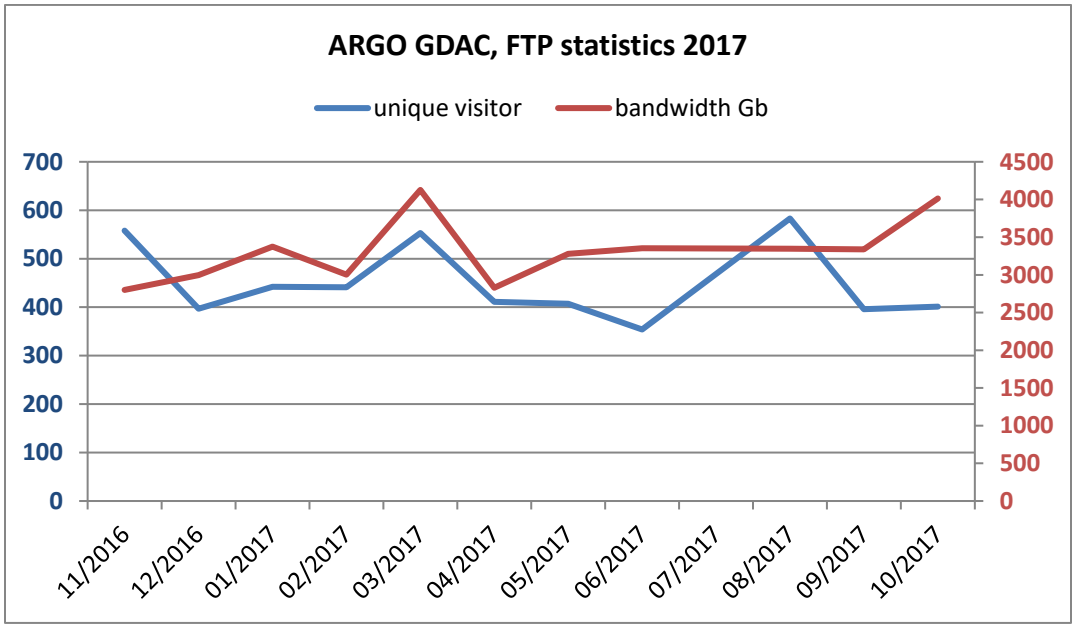
GDAC ftp address: *ftp://ftp.ifremer.fr/ifremer/argo*

Statistics on the Argo GDAC FTP server: *ftp://ftp.ifremer.fr/ifremer/argo*

There is a monthly average of 449 unique visitors, performing 4552 sessions and downloading 3.3 terabytes of data files.

The table below shows a a huge spike of visitors in July 2017 on GDAC FTP. This may be an attack of the server, the July unique visitors number is ignored in statistics.

ARGO GDAC FTP statistics				
month	unique visitor	number of visits	hits	bandwidth Gb
11/2016	558	5 045	3 969 591	2800,42
12/2016	397	3 839	4 072 286	2997,55
01/2017	442	4 778	7 213 071	3375,6
02/2017	441	4 215	4 913 490	3003
03/2017	553	4 619	10 495 933	4127
04/2017	411	4 113	3 583 758	2829
05/2017	407	4 563	4 006 245	3280
06/2017	354	4 011	3 718 402	3354
07/2017	29386	47153	3 810 288	3334
08/2017	583	6 183	7 235 786	3347
09/2017	396	4 345	4 923 991	3339
10/2017	401	4 360	8 097 647	4013
Average	**449**	**4 552**	**5 503 374**	**3 317**


ARGO GDAC, FTP statistics 2017
unique visitor
bandwidth Gb
700
600
500
400
300
200
100
0
4500
4000
3500
3000
2500
2000
1500
1000
500
0
11/2016
12/2016
01/2017
02/2017
03/2017
04/2017
05/2017
06/2017
07/2017
08/2017
09/2017
10/2017

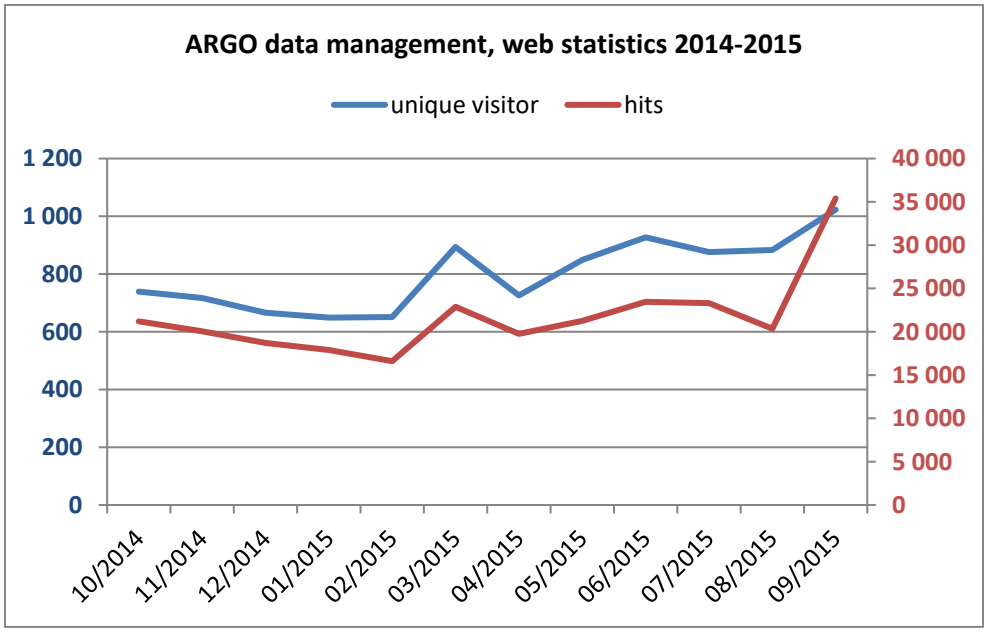
Statistics on the Argo data management web site: *http://www.argodatamgt.org*

Note : the 2017 figures are not available. This chapter will soon be updated.

There is a monthly average of 800 unique visitors, performing 1363 visits and 21 743 hits.

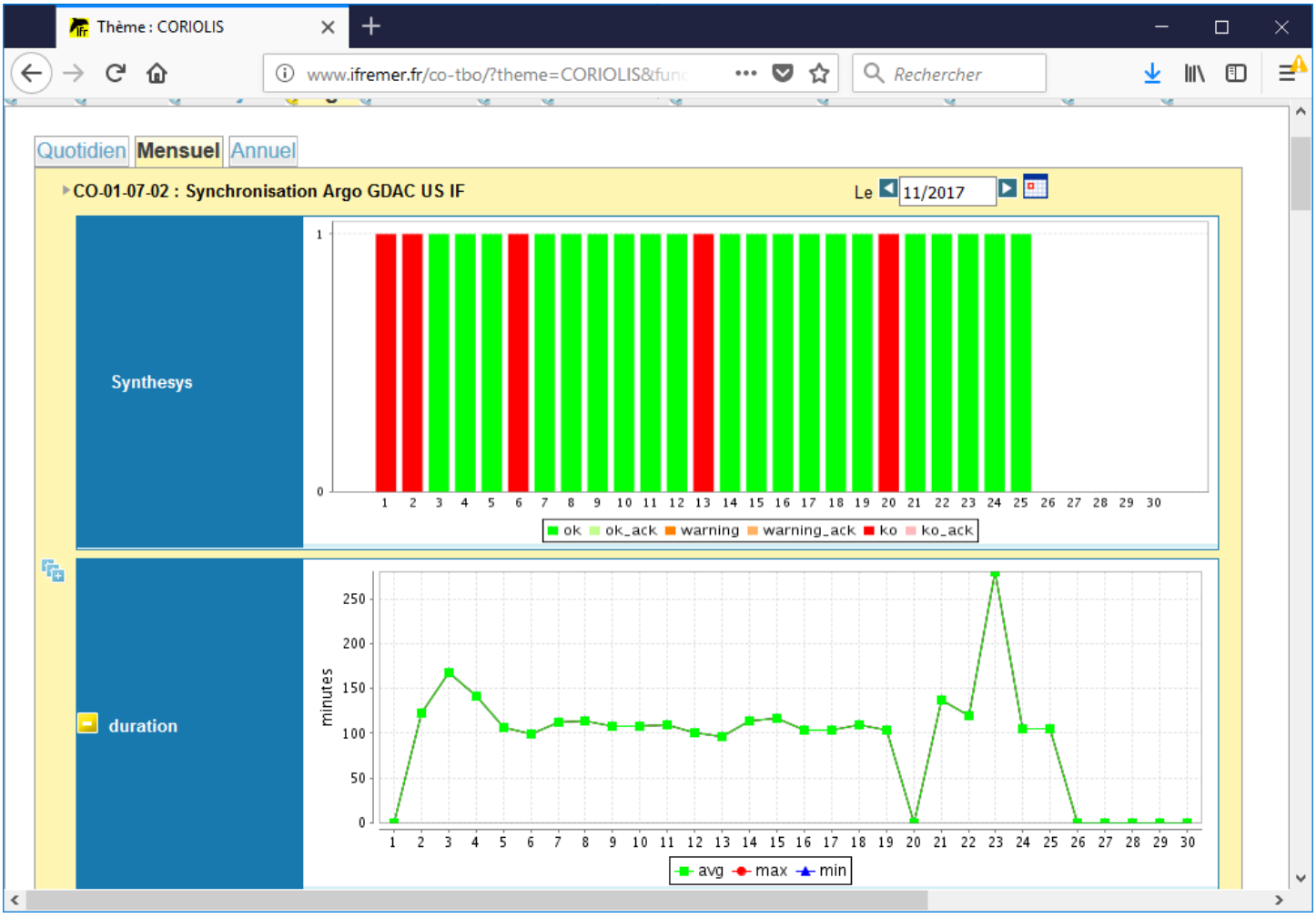
The graphics shows a slightly increasing number of unique visitors.

ARGO GDAC web statistics					
month	**unique visitor**	**visits**	**pages**	**hits**	**bandwidth Go**
10/2014	739	1 297	2 904	21 205	2
11/2014	717	1 224	2 486	20 050	1
12/2014	666	1 127	2 395	18 716	2
01/2015	649	1 138	2 290	17 901	1
02/2015	651	1 066	2 535	16 605	1
03/2015	894	1 531	3 643	22 890	2
04/2015	726	1 270	3 028	19 761	1
05/2015	849	1 403	2 940	21 263	1
06/2015	927	1 584	3 317	23 461	1
07/2015	876	1 478	3 185	23 313	1
08/2015	883	1 417	3 131	20 349	1
09/2015	1 023	1 826	4 355	35 396	1
Average	**800**	**1 363**	**3 017**	**21 743**	**1**



3.3 Data synchronization

The synchronization with US-Godae server is performed once a day at 01:55Z.



The synchronization dashboard in November 2017: the daily synchronization time takes on average 2 hours.

You may notice on the dashboard that the synchronization process reported 5 errors in November (red bars):

- "Can't create the ftp connection to usgodae.org"
  There was an ftp connection problem between Coriolis and US GDACs

3.4 FTP server monitoring

Note: this chapter is not yet available for 2017.

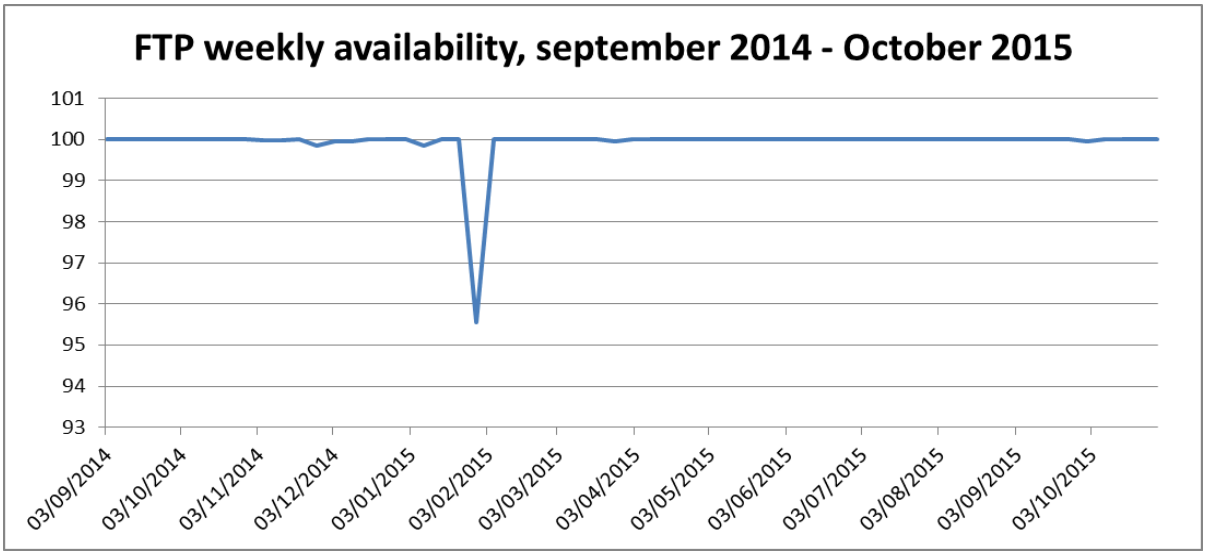
The Argo GDAC ftp server is actively monitored by a Nagios agent (http://en.wikipedia.org/wiki/Nagios).

Every 5 minutes, an ftp download test and an Internet Google query are performed. The success/failure of the test and the response time are recorded. The FTP server is a virtual server on a linux cluster.

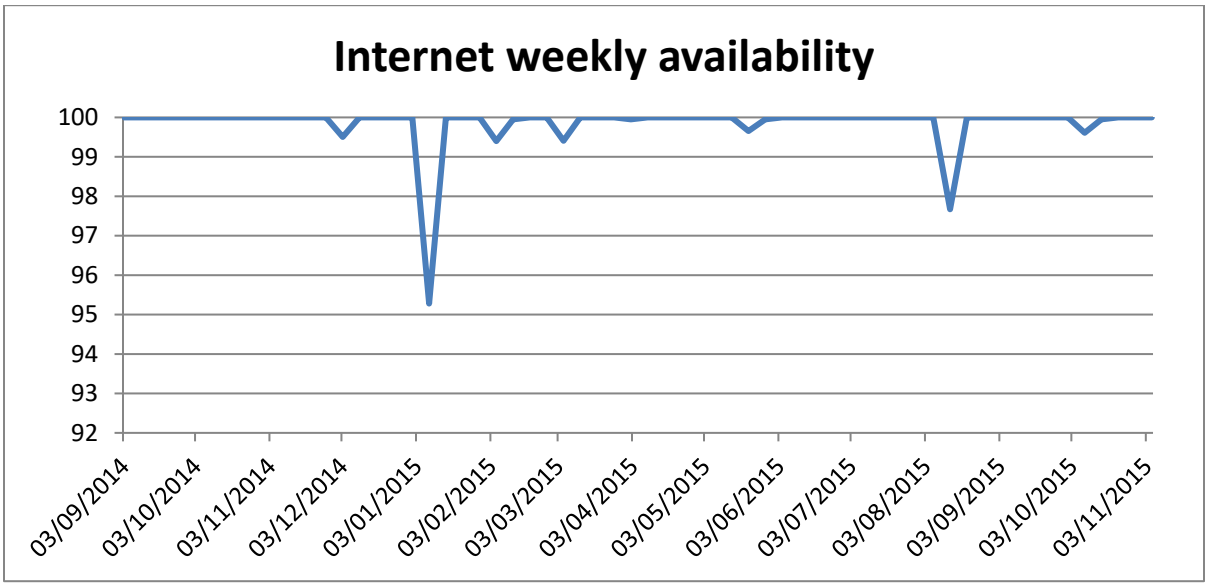
On the last 12 months, the weekly average performance was 99.84%. The 0.16% of poor performances represents 15 minutes for a week. For the last 12 months, the cumulative poor performances period is of 24 hours.

We faced 3 significant events these last 12 months.

- *First week of January: 8 hours of Internet poor performances*
- *Last week of January 2015: disk storage instability: 7 hours and 35 minutes of poor performances of ftp.*
- *Mid-August 2015 : 4 hours of poor Internet performances*



Nagios ftp monitoring: between September 2014 and October 2015

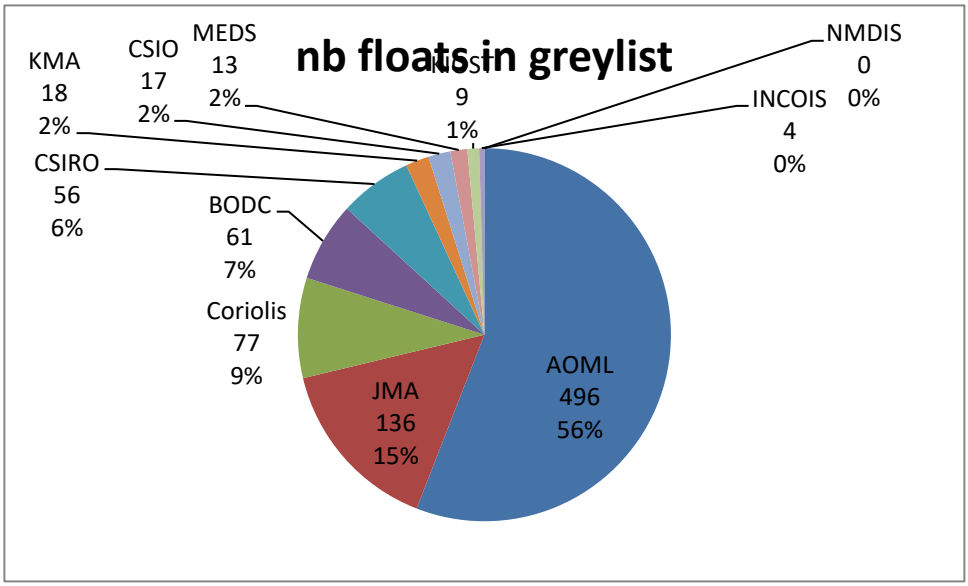


Nagios Internet monitoring: between September 2014 and October 2015

3.5 Grey list

According to the project requirements Coriolis GDAC hosts a grey list of the floats which are automatically flagged before any automatic or visual quality control. **The greylist has 887 entries** (November 25th 2017), compared to 1000 entries one year ago.

DAC	nb floats in greylist
AOML	496
JMA	136
Coriolis	77
BODC	61
CSIRO	56
KMA	18
CSIO	17
MEDS	13
KIOST	9
INCOIS	4
NMDIS	0
Total	**887**



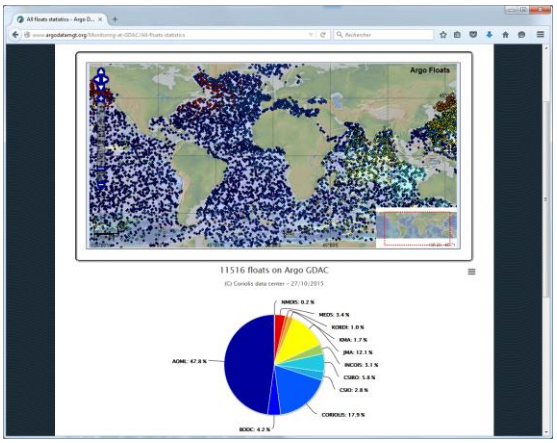
Distribution of greylist entries per DAC and per parameter

AOML reports a high percentage of pressure and temperature in the greylist, compared to other DACs.

Dac - parameter	Nb floats
AO	**496**
PRES	145
PSAL	226
TEMP	125
BO	**61**
PRES	15
PSAL	29
TEMP	17
CS	**56**
PRES	10
PSAL	32
PSAL	1
TEMP	13
HZ	**17**
PRES	2
PSAL	13
TEMP	2
IF	**77**
DOXY	2
PRES	5
PSAL	58
TEMP	12
IN	**4**
PRES	1
PSAL	2
TEMP	1
JA	**136**
DOXY	1
PRES	22
PSAL	83
TEMP	30
KM	**18**
PRES	6
PSAL	6
TEMP	6
KO	**9**
PRES	3
PSAL	3
TEMP	3
ME	**13**
PRES	2
PSAL	8
TEMP	3
Total général	**887**

3.6 Statistics on GDAC content

The following graphics display the distribution of data available from GDAC, per float or DACs. These statistics are daily updated on: http://www.argodatamgt.org/Monitoring-at-GDAC



3.7 Mirroring data from GDAC: rsync service

In July 2014, we installed a dedicated rsync server called vdmzrs.ifremer.fr described on:

- http://www.argodatamgt.org/Access-to-data/Argo-GDAC-synchronization-service

This server provides a synchronization service between the "dac" directory of the GDAC with a user mirror. From the user side, the rysnc service:

- Downloads the new files
- Downloads the updated files
- Removes the files that have been removed from the GDAC
- Compresses/uncompresses the files during the transfer
- Preserves the files creation/update dates
- Lists all the files that have been transferred (easy to use for a user side post-processing)

Examples

Synchronization of a particular float

- rsync -avzh --delete vdmzrs.ifremer.fr::argo/coriolis/69001 /home/mydirectory/...

Synchronization of the whole dac directory of Argo GDAC

- rsync -avzh --delete vdmzrs.ifremer.fr::argo/ /home/mydirectory/...

3.8 Argo DOI, Digital Object Identifier on monthly snapshots

A digital object identifier (DOI) is a unique identifier for an electronic document or a dataset. Argo data-management assigns DOIs to its documents and datasets for two main objectives:

- Citation: in a publication the DOI is efficiently tracked by bibliographic surveys
- Traceability: the DOI is a direct and permanent link to the document or data set used in a publication
- More on: http://www.argodatamgt.org/Access-to-data/Argo-DOI-Digital-Object-Identifier

Argo documents DOIs

- Argo User's manual: http://dx.doi.org/10.13155/29825

Argo GDAC DOI

- Argo floats data and metadata from Global Data Assembly Centre (Argo GDAC) http://doi.org/10.17882/42182

Argo GDAC monthly snapshots DOIs

- Snapshot of 2017 October 8th http://doi.org/10.17882/42182#52113
- Snapshot of 2014 October 8th http://doi.org/10.17882/42182#42280
- Snapshot of 2012 December 1st http://doi.org/10.17882/42182#42250

Argo National Data Management Report

- BSH (Federal Maritime and Hydrographic Agency), Germany

1. Status

(Please report the progress made towards completing the following tasks and if not yet complete, estimate when you expect them to be complete)

- Data acquired from floats
  Presently there are 150 active/operational German floats which mostly belong to BSH with the exception of 2 floats belonging to AWI and 1 float belonging to GEOMAR. 31 floats have been deployed in 2017.
- Data issued to GTS
  All German floats are processed in real-time by Coriolis and immediately inserted into the GTS.
- Data issued to GDACs after real-time QC
  All profiles from German floats are processed by Coriolis following the regular quality checks and are routinely exchanged with the GDACs.
- Data issued for delayed QC
  At present (13.11.2017) the German Argo fleet comprises 838 floats which have sampled 65112 profiles. 51661 profiles of all eligible files are already available as D-files and 8221 are still pending. The total rate of eligible D-files provided to the GDACs is 86% and has increased from last year's value of 81%.
- Delayed data sent to GDACs
  The D-files are submitted by email to Coriolis together with the diagnostic figures and a short summary of the DMQC decision taken and are inserted into the GDAC after format testing.
- Web pages
  BSH is maintaining the Argo Germany Web site. The URL for the Argo Germany is: http://www.german-argo.de/. It provides information about the international Argo Program, the German contribution to Argo, Argo array status, data access and deployment plans. It also provides links to the original sources of information.
- Statistics of Argo data usage
  Currently no statistics of Argo data usage are available. The German Navy uses Argo data on a regular basis for the operational support of the fleet and uses their liaison officer at BSH to communicate their needs. The SeaDataNet portal uses German Argo data operationally for the Northwest European Shelf. Argo data are routinely assimilated in the GECCO reanalysis, which is used for the initialisation the decadal prediction system MiKlip. At BSH the data are used within several projects such as KLIWAS, RACE, MiKlip, ICDC and Expertennetzwerk BMVI. Data are also used in various research groups at universities.
- Products generated from Argo data

2. Delayed Mode QC

(Please report on the progress made towards providing delayed mode Argo data, how it's organized and the difficulties encountered and estimate when you expect to be pre-operational).
The overall percentage of D-files from all German programs is increasing again and has reached a quota of 86%. BSH has adopted all floats from German universities (except for the AWI floats) and performs the DMQC for floats still alive and is reformatting older (dead) floats. There are 48927 profiles within this group and 43795 eligible D-files. With 3046 pending D-files the quota has reached 93%. We expect to have the few remaining profiles eligible for DMQC finished soon. The AWI had issues with their decoders and has spent the first half of 2017 re-decoding all their files in close communication with Coriolis to improve the technical information, meta data and solve some problems with the timing information of under-ice profiles. This process has been completed, files have been exchanged with Coriolis and new R-files have to be created. There is a larger backlog of files eligible for DMQC for AWI floats, only about half of these profiles have been finished. BSH will be offering support to AWI to help make progress within the next 6 month.
BSH has also adopted floats from Finland, the Netherlands, Norway and Poland for DMQC. The progress in these programs providing D-files is good for the Netherlands and Poland with nearly no pending D-files. Floats from Norway have recently been reformatted by Coriolis in the process of moving to file-format 3.1. Because of format issues the reformatted D-profiles from BGC floats had to be replaced by R-files and will need to have their DMQC decision repeated. This will be done soon and the program will be back on track. There is a remaining issue with floats from Finland, some of which are operating in the Baltic and will receive their dmqc decisions from regular laboratory calibrations performed when floats are recovered.

3. GDAC Functions
(If your centre operates a GDAC, report the progress made on the following tasks and if not yet complete, estimate when you expect them to be complete)

- National centres reporting to you
- Operations of the ftp server
- Operations of the www server
- Data synchronization
- Statistics of Argo data usage : Ftp and WWW access, characterization of users (countries, field of interest : operational models, scientific applications) …

4. Regional Centre Functions
(If your centre operates a regional centre, report the functions performed, and in planning)

5. References

Argo National Data Management Report (2017) – India

1. Status

- **Data acquired from floats**
  India has deployed 37 new floats (including 6 Apex-BioArgo, 8 Provor-Bio Argo floats and 1 with EM software) between October 2016 and November 2017 in the Indian Ocean taking its tally to 435 floats so far. Out of these 143 floats are active. All the active floats data are processed and sent to GDAC.

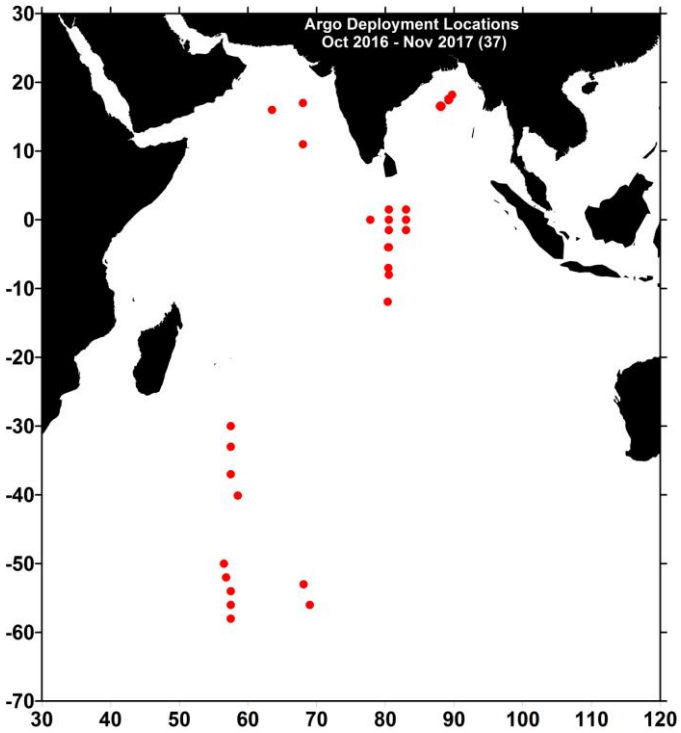


Fig. Location of Argo floats deployed by India

- **Data issued to GTS**
  All the active floats data is being distributed via RTH New Delhi. However there seems to be a problem in the BUFR messages being received. Also the BUFR count is found to be less then TESAC messages. Following up this issue with RTH New Delhi.

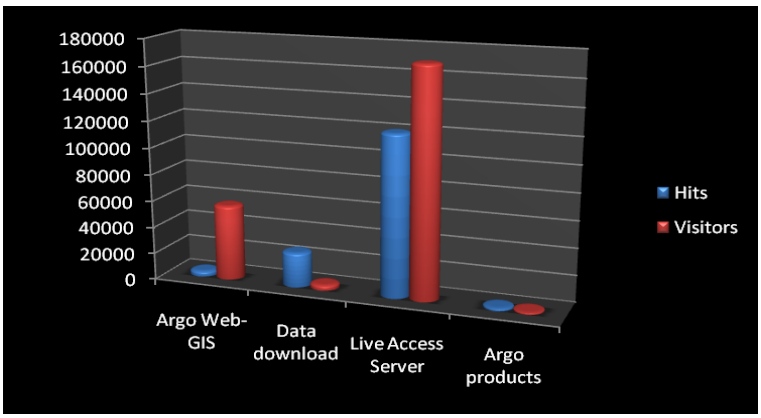
- **Data issued to GDACs after real-time QC**
  All the active floats (140) data are subject to real time quality control and are being successfully uploaded to GDAC. Also the some of the old floats whose life had ended are also converted to Ver 3.1 and uploaded to GDAC.

- **Data issued for delayed QC**
  In total 51% of the eligible profiles for DMQC are generated and uploaded to GDAC. Old DMQCed floats with old version 2.3 are converted to V 3.1 and uploaded to GDAC.

- **Web pages**

- INCOIS is maintaining Web-GIS based site for Indian Argo Program. It contains entire Indian Ocean floats data along with trajectories. Further details can be obtained by following the link http://www.incois.gov.in/Incois/argo/argo_home.jsp. Apart from the floats deployed by India, data from floats deployed by other nations in the Indian Ocean are received from the Argo Mirror and made available in the INCOIS website. User can download the data based on his requirement.
- Statistics of Indian and Indian Ocean floats are generated and maintained in INCOIS web site. The density maps for aiding people for new deployments are made available on a monthly basis. For full details visit http://www.incois.gov.in/Incois/argo/argostats_index.jsp.

- **Trajectory**
  INCOIS started generating Ver 3.1 trajectory files for all APEX float and uploading them to GDAC. Iridium and Provor, Arvor floats data will be uploaded shortly.
- **Statistics of Argo data usage**
  Argo data is widely put to use by various Organisations/ Universities/ Departments. Indian Meteorological Department (IMD) is using Argo data for their operational purpose. Scientists, Students and Researchers from INCOIS, NIO, SAC, C-MMACS, NRSA, IITM, NCMRWF, IISc etc are using Argo data in various analysis. Many paper based on Argo data were also published in reputed journals. See the references below.
  - The demand for Bio-Argo data is increasing and the same is being supplied for research interest by various research institutes and universities. More and more BioArgo floats are being deployed in the Indian Ocean. Simultaneous cruises are also being planned.
  - This data is continued to be used for validation of Biogeochemical model outputs like ROMS with Fennel module.



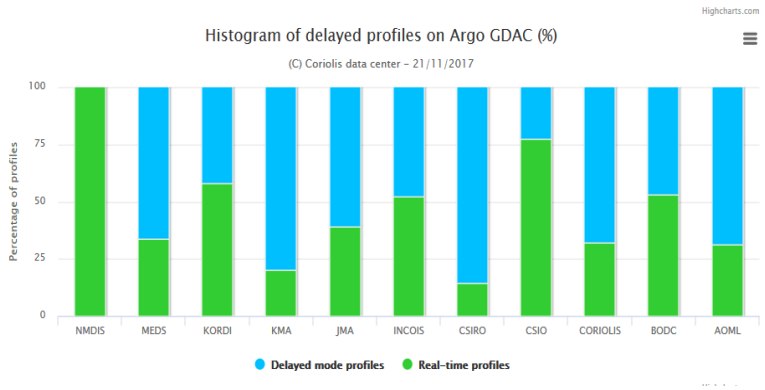
INCOIS Argo web page statistics (for the past one year) are as shown below

Page	Hits	Visitors
Argo Web-GIS	4011	56789
Data download	26196	3917
Live Access Server	120529	169906
Argo products	2018	1572

- **Products generated from Argo data**
    1. Value added products obtained from Argo data are continued. Continued to variational analysis method while generating value added products. Many products are generated using Argo temperature and salinity data. The Argo T/S data are first objectively analysed and this gridded output is used in deriving value added products. More on this can be see in the RDAC functions.
    2. Version 2.2 of DVD on "Argo data and products for the Indian Ocean" is released to public for use with data corresponding to August 2017 updated. This DVD consists of ~ 3,00,000 profiles and products based on the Argo T/S. A GUI is provided for user to have easy access to the data. DVD product is discontinued and it is being made available via INCOIS and UCSD web sites.
    3. To cater to many users of INCOIS LAS, it is enhanced in term of capacity. New Server is procured and new products viz., model outputs, new wind products (OSCAT), fluxes are made available. New products as per the request received from the users in future are being made available. For further details visit http://las.incois.gov.in.

2. Delayed Mode QC

- INCOIS started generating and uploading D files to GDAC form July 2006, and as of today, profiles belonging to all eligible floats have been subjected to DMQC.
- Advanced Delayed Mode Quality Control s/w developed by CSIRO is being put to use successfully. Using this s/w all the eligible floats are reprocessed to tackle pressure sensor offset problems, salinity hooks, thermal lag corrections, salinity drifts.
- Under the data search and archeology data from our own sister concerns is being obtained and put to use in the delayed mode processing.
- About 51% of the eligible profiles are subjected to DMQC and the delayed mode profiles are uploaded on to GDAC. Majority of the old dead float which are passed through DMQC are converted to Ver 3.1 and uploaded to GDAC.



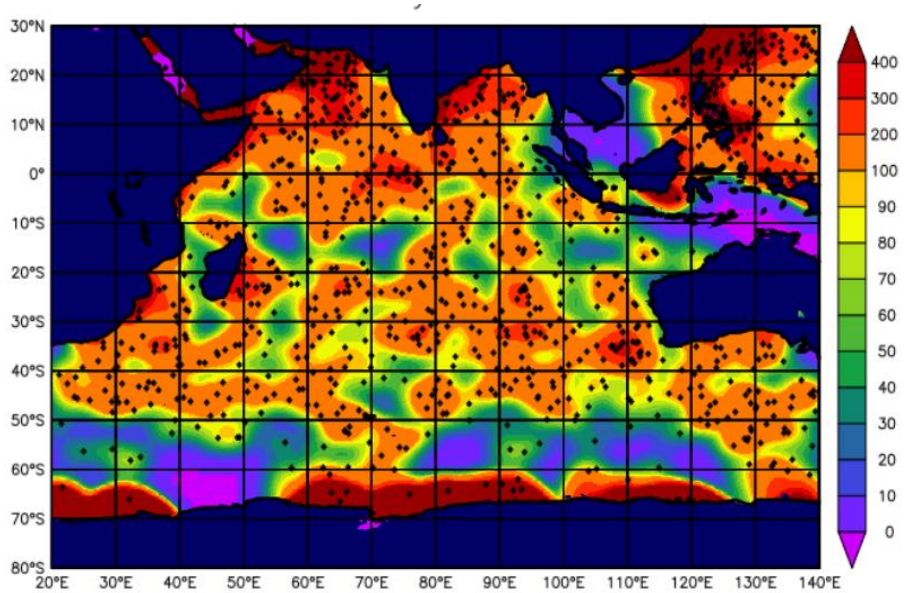
3. GDAC Functions

INCOIS is not operating as a GDAC.

4. Regional Centre Functions

- Acquisition of Argo data from GDAC corresponding to floats other than deployed by India and made them available on INCOIS web site.
- All these data sets are made available to the user through a s/w developed with all GUI facilities. This s/w is made available through FTP at INCOIS and UCSC web sites.
- Delayed Mode Quality Control (Refer 2.0 above)
- Data from the Indian Ocean regions are gridded into 1x1 box for monthly and 10 days and monthly intervals. These gridded data sets are made available through INCOIS Live Access Server (ILAS). Users can view and download data/images in their desired format.
- Efforts are underway to setup ERDDAP for the data and data products from Argo floats.
- Additionally SST from TMI, AMSRE and Wind from ASCAT, Chla from MODIS and OCM-2 are also made available on daily and monthly basis.
- Global wind products from OSCAT is also generated and made available on LAS along with TROP flux data sets.
- Data Sets (CTD, XBT, Subsurface Moorings) are being acquired from many principle investigators. These data are being utilized for quality control of Argo profiles.
- Value added products:
  Two types of products are currently being made available to various user from INCOIS web site. They are:
  (i) Time series plots corresponding to each float (only for Indian floats).
  (ii) Spatial plots using the objectively analysed from all the Argo floats data deployed in the Indian Ocean.
  These valued added products can be obtained from the following link http://www.incois.gov.in/Incois/argo/products/argo_frames.html

- Regional Co-ordination for Argo floats deployment plan for Indian Ocean. The float density in Indian Ocean as on 21 Nov, 2017 is shown below.



Publications:

INCOIS is actively involved in utilization of Argo data in various studies pertaining to Indian Ocean. Also INCOIS is encouraging utilization of Argo data by various universities by funding them. Some of the publications resulted from Argo data which includes scientists from INCOIS are given below:

1. Quality control of oceanographic in situ data from Argo floats using climatological convex hulls, TVS Udaya Bhaskar, R Venkat Shesu, Timothy P Boyer, E Pattabhi Rama Rao, MethodX, Vol 4, 469 - 479, doi: 10.1016/j.mex.2017.11.007
2. Chacko, N., 2017: Chlorophyll bloom in response to tropical cyclone Hudhud in the Bay of Bengal: Bio-Argo subsurface observations. Deep Sea Research Part I: Oceanographic Research Papers, 124, 66-72, http://dx.doi.org/10.1016/j.dsr.2017.04.010.
3. Chakraborty, K., N. Kumar, and G. V. M. Gupta, 2017: Getting the right wind-forcing for an ecosystem model: A case study from the eastern Arabian Sea. Journal of Operational Oceanography, 10, 176-190, http://dx.doi.org/10.1080/1755876X.2017.1354686
4. Chand, C. P., M. V. Rao, B. Prasad Kumar, and K. H. Rao, 2017: Influence of cyclone Phailin on the Upper Ocean over Bay of Bengal. International Journal of Applied Environmental Sciences, 12, 717-729, http://www.ripublication.com/ijaes17/ijaesv12n5_01.pdf
5. Ghosh, S., S. Hazra, S. Nandy, P. P. Mondal, T. Watham, and S. P. S. Kushwaha, 2017: Trends of sea level in the Bay of Bengal using altimetry and other complementary techniques. Journal of Spatial Science, 1-14, http://dx.doi.org/10.1080/14498596.2017.1348309.
6. Gordon, A. L., E. Shroyer, and V. S. N. Murty, 2017: An Intrathermocline Eddy and a tropical cyclone in the Bay of Bengal. Scientific Reports, 7, 46218, http://dx.doi.org/10.1038/srep46218
7. Jain, V., D. Shankar, P. N. Vinayachandran, A. Kankonkar, A. Chatterjee, P. Amol, A. M. Almeida, G. S. Michael, A. Mukherjee, M. Chatterjee, R. Fernandes, R. Luis, A. Kamble, A. K. Hegde, S. Chatterjee, U. Das, and C. P. Neema, 2017: Evidence for the existence of Persian Gulf Water and Red Sea Water in the Bay of Bengal. Climate Dynamics, 48, 3207-3226, https://doi.org/10.1007/s00382-016-3259-4.
8. Narvekar, J., J. R. D'Mello, S. Prasanna Kumar, P. Banerjee, V. Sharma, and P. Shenai-Tirodkar, 2017: Winter-time variability of the eastern Arabian Sea: A comparison between 2003 and 2013. Geophysical Research Letters, 44, 6269-6277, http://dx.doi.org/10.1002/2017GL072965

Argo National Data Management Report – Italy (2017) - MedArgo

1. Status

- **<u>Data acquired from floats</u>:** 426 floats were deployed in the Mediterranean and in Black Seas between 2001 and 2017 (the floats temporal distribution is shown in Figure 2) and more than 49900 CTD profiles were acquired. The temporal and spatial distribution of these profiles is depicted in Figure 1, sorted by the two main float models currently used (bio-Argo and core-Argo floats). Note that here bio-Argo also includes the floats with dissolved oxygen. About 115 floats per months have been operated simultaneously in the basin in 2017 and more than 6000 CTD profiles have been acquired (up to October 2017) by different float models (Figure 3).

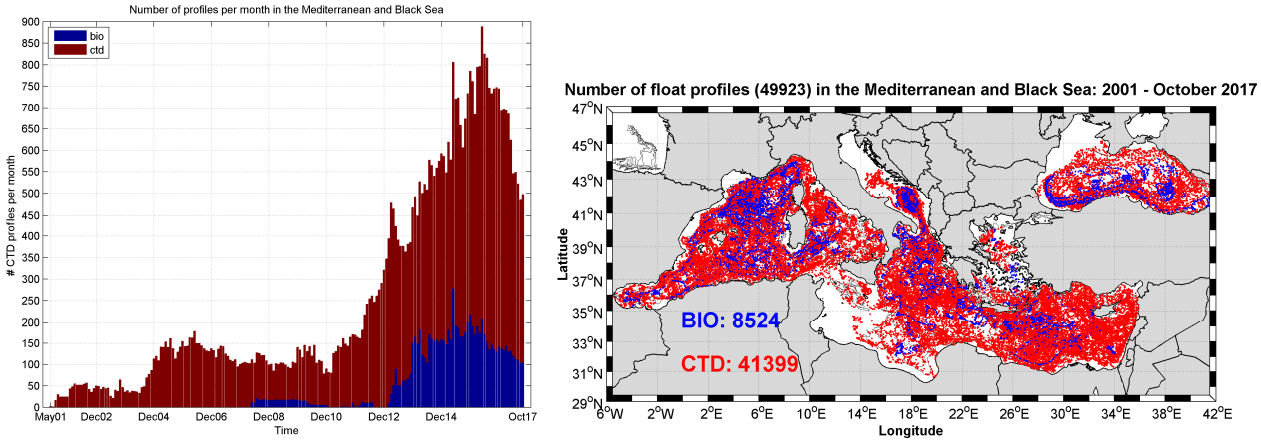


Figure 1. Temporal (left panel) and spatial (right panel) distribution of float profiles in the Mediterranean and Black Sea between 2001 and 2017.

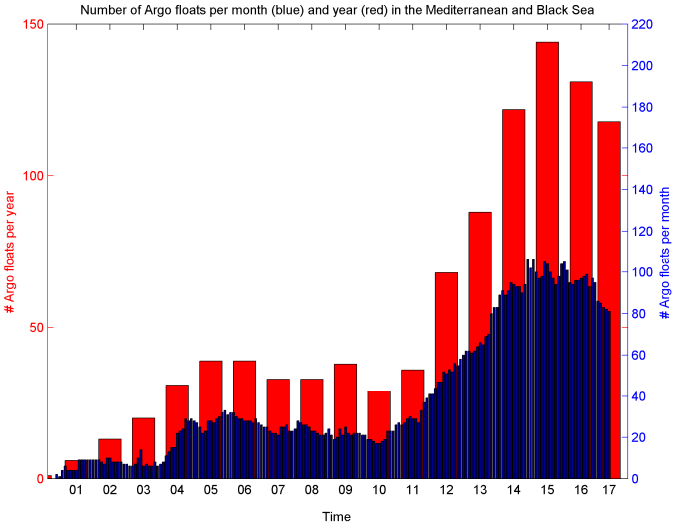


Figure 2. Monthly (blue bars) and yearly (red bars) distribution of Argo floats in the Mediterranean and Black Sea between 2001 and 2017.

The number of CTD profiles acquired by bio-Argo floats in 2017 (up to October) is about 1200 (contributors: France, Italy and Greece) and the data collected by the "standard" CTD Argo floats about 4870 profiles (up to October). The Euro-Argo ERIC and Spain, Greece, France and Italy contributed to maintain/increase the Argo population in 2017: a total of 27 new floats (manufactured by Teledyne Marine, Metocean and NKE) have been deployed both in the Mediterranean and in the Black Seas (Figure 3); 4 out of 27 platforms are equipped with biogeochemical sensors and the deployment strategy was chosen in order to replace dead floats or under-sampled areas.

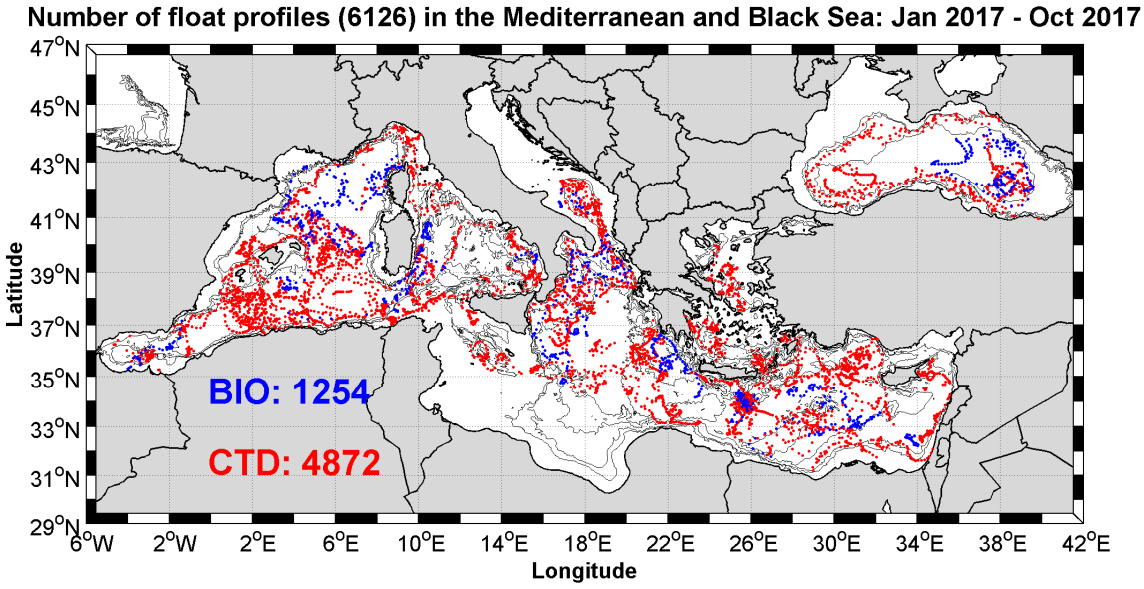


Figure 3. Spatial distribution of profiles collected by Argo floats in 2017 (January-October) in the Mediterranean and Black Sea: bio-Argo floats (blue dots) and standard Argo floats (red dots).

Statistics of the float survival rate in the Mediterranean Sea were computed, using the entire dataset. The survival rate diagram produced are separated by transmission mode (figure 4a). The maximum operating life is more than 400 cycles, whilst the mean half life is about 140 cycles. The vertical distance travelled by floats is computed and used as an indicator of the profiler performance (figure 4b). The maximal distance observed is about 400 km, whilst the mean distance travelled is about 125 km.

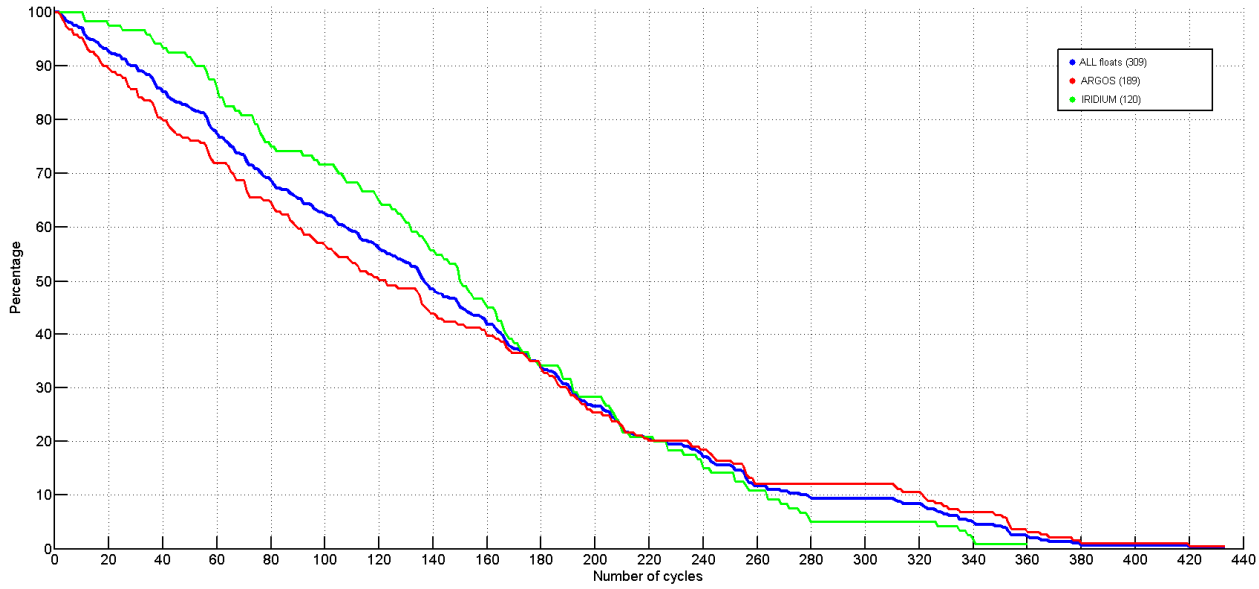


Figure 4a. Survival rate diagrams separated by telemetry system.

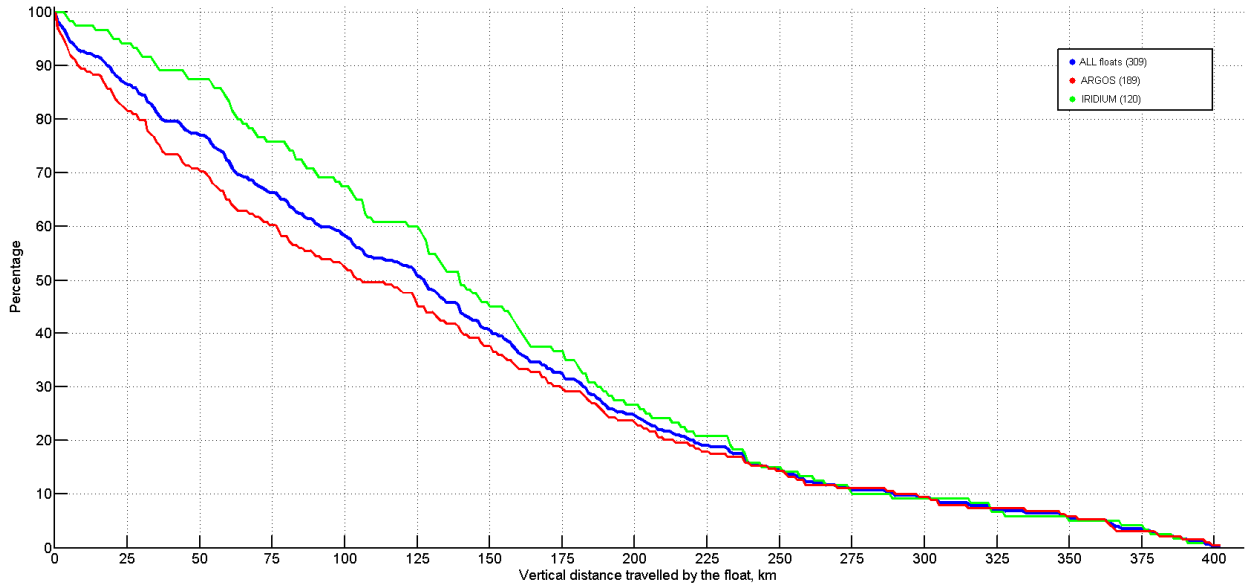


Figure 4b. Diagram of the vertical distance travelled floats, separated by telemetry system.

- **Web pages:**

The MedArgo web page (http://nettuno.ogs.trieste.it/sire/medargo/active/index.php) has been maintained and tables and graphics have been updated in near real time. The floats deployed during 2017 have been added to the web page as soon as the technical information are available. The float positions are plotted daily (Figure 5); the monthly and the whole trajectories are also provided (Figure 6). Links with the GDAC center (Coriolis) are also available for downloading both the real-time and delayed-mode float profiles. A link with the Laboratoire d'Oceanographie de Villefranche (OAO - Oceanographic Autonomous Observations) can provide detailed information about Argo floats equipped with biogeochemical sensors.

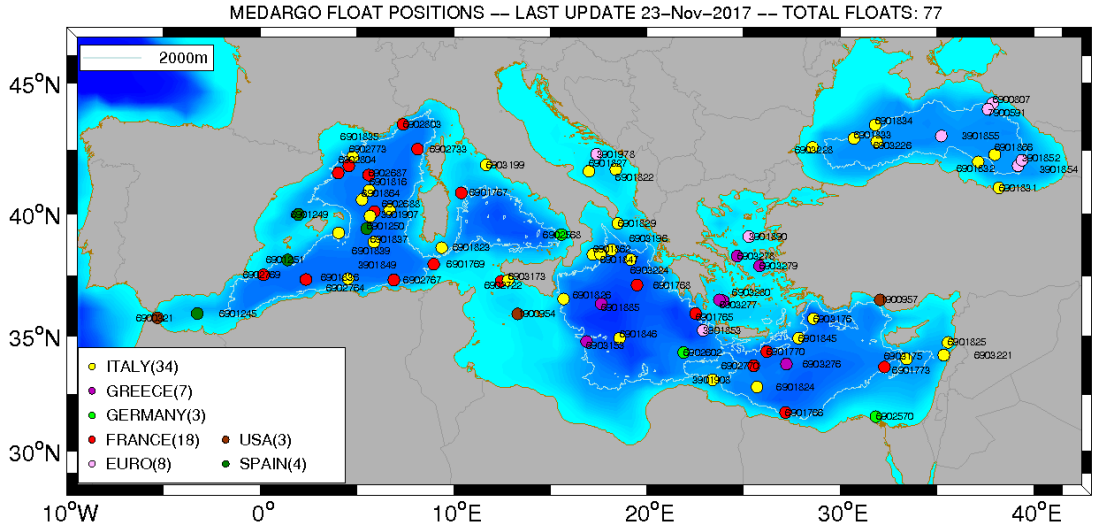


Figure 5. MedArgo float positions as of 23 November 2016 (updated daily).

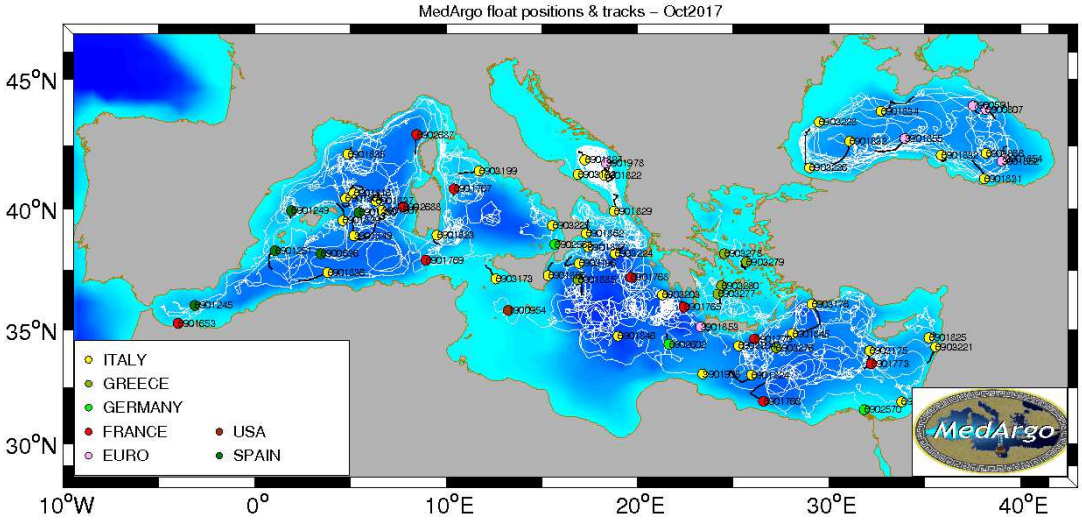


Figure 6. MedArgo float positions and tracks (October 2017. The monthly tracks are in black while the entire float trajectories are in white.

- **Statistics of Argo data usage:** (operational models, scientific applications, number of National Pis…):
- **Products generated from Argo data:**
    a. Daily maps of float positions (Figure 5)
    b. Monthly maps of float positions and track (Figure 6)
    c. Float data are assimilated in numerical forecasting models by INGV (MFS); daily and weekly maps of Mediterranean ocean forecasting system are produced (Figure 7).

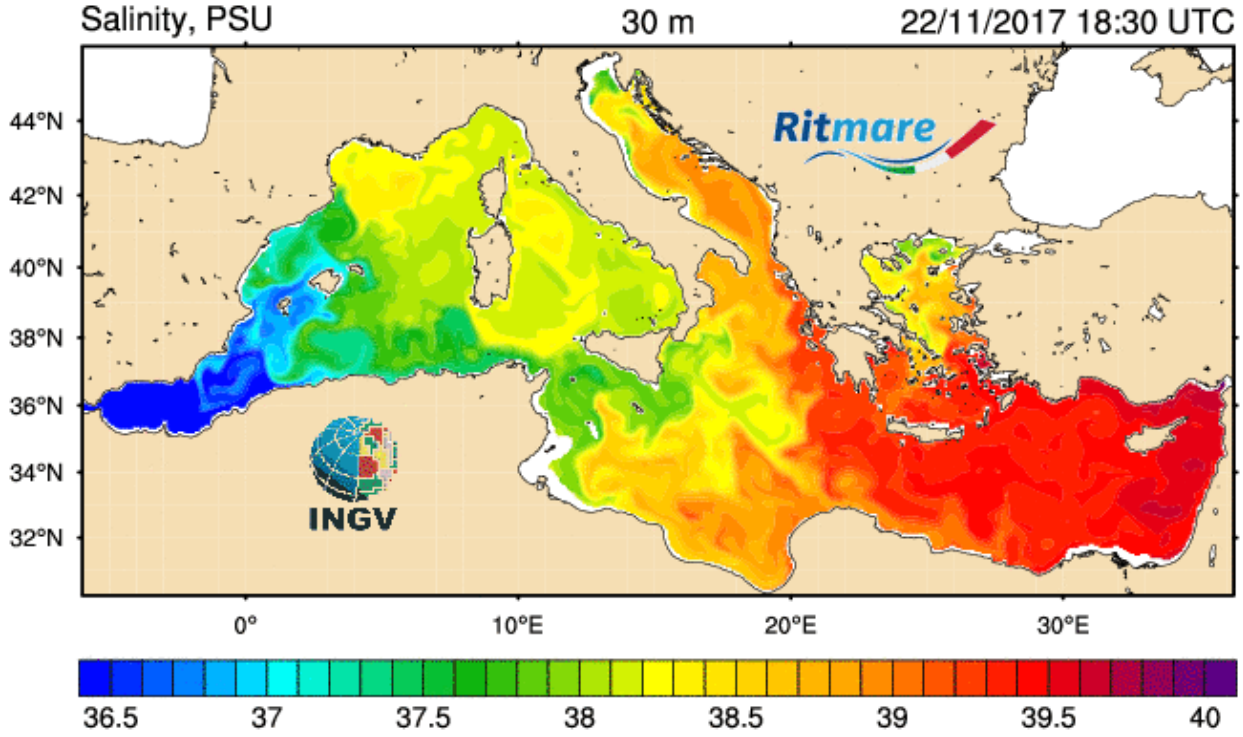


Figure 7. Forecasting model of salinity at 30 meters.

2. Delayed Mode QC

OGS has continued to carry out the DMQC for the Argo data in the Mediterranean Sea. Any possible surface pressure offsets were examined using the Metadata and Technical data files; different procedures were applied to correct this pressure offset depending on the float type, following the standard method proposed by the Argo community. The OW method in conjunction with other procedures is adopted to conduct the quality control analysis for the salinity data. The D files of floats in the "density inversion test" list were examined and feedback was provided.

Additional Argo reference data for the Mediterranean Sea have been added to the current reference dataset

The DMQC method has been applied to the majority of the floats deployed between 2001 and 2016 in the Mediterranean Sea: they were quality controlled in delayed-mode for salinity, temperature and surface pressure and the respective D-files are gradually sent to GDAC. The DMQC report/info of each float can be downloaded by the MedArgo web page (http://nettuno.ogs.trieste.it/sire/medargo/all/table_out_all.php).

The DMQC of the dead US Argo NAVOCEANO (Argo equivalent project) floats in the Mediterranean Sea (71 platforms) has been done and the D-files of 28 floats were created and sent to the AOML DAC. The Surface Pressure Offset have been corrected if needed and the variables recalculated before running the OW method. The TNPD status has also been checked. Some issues have been found related to tech and meta files, time and surface pressure. The data of other 25 floats are available only at GTS, where the meta files are missing and the T and S data are truncated to two decimal places.

The DMQC of floats in the Black Sea has been started. The reference dataset has been downloaded from the CMEMS INSTAC but it seems that the most recent CTD data available are too scarce to provide a reliable comparison. Nevertheless, the OW method has been applied in order to have an estimate of any potential conductivity sensor drift. The float data have been also cross-compared to the closest (in time) Argo profiles in the basin: the float Θ-S diagrams were use as an indicator of the salinity behaviour at different Θ levels.

3. Regional Centre Functions

MedArgo is the Argo Regional Centre for the Mediterranean and the Black Sea. OGS, who coordinates the MedArgo activities, established several collaborations with European and non-European countries (Bulgaria, France, Spain, Greece, Germany, Turkey, Malta and Lebanon) in order to set the planning and the deployment coordination of floats. Hence, a good coverage is maintained throughout the years. A network of deployment opportunities is well organized with R/V, commercial boats and the Seakeepers Discovery Yacht program. As part of these cooperations the float data

are transferred in near real time to MedArgo and 27 new floats have been deployed in the Mediterranean and Black Sea during 2017.

The second Arvor Deep was deployed in December 2016 in the Hellenic Trench area (Cretan Passage), a depression of about 4000 m located in the deepest area of the Mediterranean Sea. It was set to cycle every 5 days and the parking depth equal to the maximal profiling depth (3000 dbar at the beginning and currently at 4000 dbar). The vertical resolution is set at 2 dbar in the upper layer (0-100 dbar), 10 dbar in the intermediate layer (100-700 dbar) and 25 dbar in the deep one. The grounding mode is set to "0" that means the float goes up 50 dbar after grounding and wait there before starting its ascent.

MedArgo gives also a substantial contribution to the Euro-Argo ERIC whose 5 members are very active in the Mediterranean Sea.

There are 65 active Argo floats in the Mediterranean Sea and 12 in the Black Sea as of 22 November 2017.

Argo National Data Management Report of Japan, 2017

1. Status

The Japan DAC, the Japan Meteorological Agency (JMA), has processed data from 1544 Japanese Argo and Argo-equivalent floats including 162 active floats as of November 7th, 2017. There are ten Japanese PIs who agreed to provide data to the international Argo data management. The DAC is acquiring ARGOS messages from CLS and getting IRIDIUM messages via e-mail in real-time, thanks to the understanding and the cooperation of PIs. Almost all profiles from those floats are transmitted to GDACs in the netCDF format and issued to GTS using TESAC and BUFR codes after real-time QC on an operational basis.

The Japan Agency for Marine-Earth Science and Technology (JAMSTEC) has done the Delayed Mode QC for all Japanese floats. The delayed mode QC for the 18,439 profiles observed by Japanese floats from September 13th 2016 to November 7th 2017 are in progress. JAMSTEC decoded 7,417 profiles of these, which were acquired as ARGOS messages and Iridium messages from September 13th 2016 to November 7th 2017. JAMSTEC sent 20,328 delayed profile files (D-files) to GDACs through the Japan DAC, JMA, during the period.

JMA and JAMSTEC have been converting the meta-, prof-, tech-, and traj-files of Japanese floats, including APEX, PROVOR, ARVOR, NEMO, NOVA, Navis, NINJA, DeepNINJA and S2A. JMA and JAMSTEC have converted the almost all of Japanese meta-files, except a few Iridium floats, from v2 to v3.1 and submitted them to GDAC. JMA has converted almost all of Japanese tech-files and submitted them to GDAC. Accordingly, JMA has converted the Rprof-files of Japanese ARGOS floats, except floats with NST sampling scheme and Iridium floats. JAMSTEC has converted all v2 Dprof-files of Japanese floats to v3.1 and submitted them to GDAC. JMA has converted about 30% of Japanese traj-files from v2 to v3.1 and submitted them to GDAC.
JMA has made meta-, tech-, traj-, and Rprof-files v3.1 of the almost all of floats newly deployed since March 2016 and JAMSTEC has made meta-files in v3.1 of JAMSTEC's floats newly deployed since October 2015. JAMSTEC has made Dprof-files in v3.1 since January 2016.

Web pages:

Japan Argo

http://www.jamstec.go.jp/J-ARGO/index_e.html

This site is the portal of Japan Argo program. The outline of Japanese approach on the Argo program, the list of the publication, and the link to the database site and PIs, etc. are being offered.

Real-time Database (JMA)

http://ds.data.jma.go.jp/gmd/argo/data/index.html

This site shows global float coverage, global profiles based on GTS TESAC and BUFR messages, and status of the Japanese floats.

Delayed mode Database (Argo JAMSTEC)

http://www.jamstec.go.jp/ARGO/argo_web/argo/?lang=en

JAMSTEC's website shows mainly Japanese float list, trajectory map, profile chart, and QCed float data. Moreover, the position and trajectory maps of all floats of the world as well as Japanese floats by using Google Map. Brief profile figures of the selected floats are also shown. This site also shows global maps based on objective analysis (temperature, salinity, potential density, dynamic height, geostrophic current, mixed layer depth, etc.).

Statistics of Argo data usage:

Operational models of JMA

MOVE/MRI.COM-G2 (Multivariate Ocean Variation Estimation System/ Meteorological Research Institute Community Ocean Model – Global 2)

JMA operates the MOVE/MRI.COM-G2, which replaced the previous version (MOVE/MRI.COM) in June 2015, for the monitoring of El Niño and the Southern Oscillation (ENSO) and for initialization of the seasonal prediction model (JMA/MRI-CGCM2). The MOVE/MRI.COM-G2 consists of an ocean general circulation model (OGCM) and an objective analysis scheme.

For details please visit:
http://ds.data.jma.go.jp/tcc/tcc/products/elnino/move_mricom-g2_doc.html

JMA/MRI-CGCM2 (JMA/MRI - Coupled ocean-atmosphere General Circulation Model 2)

JMA operates JMA/MRI-CGCM2, which replaced the previous version (JMA/MRI-CGCM) in June 2015, as a seasonal prediction model and an ENSO prediction model. The oceanic part of this model is identical to the OGCM used for the MOVE/MRI.COM-G2.

For detail please visit:
http://ds.data.jma.go.jp/tcc/tcc/products/model/outline/cps2_description.html

MOVE/MRI.COM-WNP (Multivariate Ocean Variation Estimation System/ Meteorological Research Institute Community Ocean Model - Western North Pacific)

MOVE/MRI.COM-WNP provides daily, 10day-mean and monthly products of subsurface temperatures and currents for the seas around Japan and northwestern Pacific Ocean.

Other operational models

JCOPE2 (Japan Coastal Ocean Predictability Experiment)

JCOPE2 is the model for prediction of the oceanic variation around Japan which is operated by Research Institute for Global Change of JAMSTEC. JCOPE2 is the second version of JCOPE, developed with enhanced model and data assimilation schemes. The Argo data are used by way of GTSPP. The hindcast data 6 months back and the forecast data 3 months ahead are disclosed on the following web site: http://www.jamstec.go.jp/frcgc/jcope/. More information is shown in

http://www.jamstec.go.jp/frcgc/jcope/htdocs/e/home.html

FRA-JCOPE2

FRA-JCOPE2 is the reanalysis data created by assimilating most of available observation data into the JCOPE2 ocean forecast system. The high horizontal resolution of 1/12 deg. is used in order to describe the oceanic variability associated with the Kuroshio-Kuroshio Extension, the Oyashio, and the mesoscale eddies from January 1993 to December 2009. Collaboration with Japanese Fishery Research Agency (FRA) has allowed us to assimilated huge amount of in-situ data around Japan. FRA-JCOPE2 reanalysis data are openly available. The website, http://www.jamstec.go.jp/frcgc/jcope/vwp/, provides information about downloading and interactively visualizing the reanalysis data for users.

FRA-ROMS

FRA-ROMS is the nowcast and forecast system for the Western North Pacific Ocean developed by Japan Fisheries Research and Education Agency (FRA) based on the Regional Ocean Modeling System (ROMS). FRA started the operation in May 2012. The forecast oceanographic fields are provided every week on the website http://fm.dc.affrc.go.jp/fra-roms/index.html/.

Products generated from Argo data:

Products of JMA

El Niño Monitoring and Outlook

JMA issues the current diagnosis and the outlook for six months of ENSO on the following web site. The outputs of the MOVE/MRI.COM-G2 and the JMA/MRI-CGCM2 can be found here.
http://ds.data.jma.go.jp/tcc/tcc/products/elnino/index.html

Subsurface Temperatures and Surface Currents in the seas around Japan

The following parameter outputs of the MOVE/MRI.COM-WNP can be found on http://ds.data.jma.go.jp/gmd/goos/data/database.html.

- Daily, 10day-mean and Monthly mean subsurface temperatures at the depths of 50m, 100m, 200m and 400m analyzed for 0.1 x 0.1 degree grid points.
- Daily and 10day-mean Surface Currents for 0.1 x 0.1 degree grid points.

Products of JAMSTEC

MOAA (Monthly Objective Analysis using the Argo data)

MOAA is the global GPV data set which was made by monthly OI objective analysis using Argo and TRITON mooring data. Various maps have been made using MOAA, and opened to the public on the Argo JAMSTEC web site,

http://www.jamstec.go.jp/ARGO/argo_web/argo/?page_id=83&lang=en

Objectively mapped velocity data at 1000 dbar derived from trajectories of Argo floats

The gridded velocity data at 1000 dbar is made by optimal interpolation analysis using YoMaHa'07. This dataset has been disclosed since October 2009. This dataset are updated every 6 months. This data is opened to the public on the Argo JAMSTEC web site,
http://www.jamstec.go.jp/ARGO/argo_web/argo/?page_id=86&lang=en

MILA GPV (Mixed layer data set from Argo floats in the global ocean)

JAMSTEC has produced a data set of gridded mixed layer depth with its related parameters, named MILA GPV. This consists of 10-day and monthly average data and monthly climatology data in the global ocean using Argo temperature and salinity profiles. The updated data set is released on the Argo JAMSTEC web site,
http://www.jamstec.go.jp/ARGO/argo_web/argo/?page_id=223&lang=en.

Scientifically quality-controlled profile data of Deep NINJA observations

We have released a product of a quality-controlled data set of Deep NINJA observations for convenient use on scientific/educational purposes. The quality-control was led by JAMSTEC on the basis of mainly comparisons with highly accurate shipboard CTD observations conducted at float deployments. Its detailed information has been provided on the Argo JAMSTEC web site:
http://www.jamstec.go.jp/ARGO/deepninja/

ESTOC (Estimated state of global ocean for climate research)

This product is an integrated dataset of ocean observations including Argo data by using a four dimensional variational (4D-VAR) data assimilation approach. ESTOC is the open data that consists of not only physical but also biogeochemical parameters for 55 years during 1957-2011 (See the web site in JAMSTEC, http://www.godac.jamstec.go.jp/estoc/e/).

AQC Argo Data (Advanced automatic QC Argo Data) version 1.2

JAMSTEC has produced the Argo temperature and salinity profile data put through more advanced automatic checks than real-time quality controls every month. JAMSTEC improved this data set and has released it as AQC version 1.2. This data set has been provided in the ascii format as well as netcdf format, because it is useful for analyses using various software (see the web site in JAMSTEC,
http://www.jamstec.go.jp/ARGO/argo_web/argo/?page_id=100&lang=en)

Products of JAMSTEC/JMA·MRI

FORA-WNP30 (Four-dimensional Variational Ocean ReAnalysis for the Western North Pacific)

FORA-WNP30 is the first-ever dataset covering the western North Pacific over the last three decades (1982-2014) at eddy-resolving resolution. This is the cooperative work of Japan Agency for Marine-Earth Science and Technology (JAMSTEC) and Meteorological Research Institude, Japan Meteorological Agency (JMA/MRI) using the Earth Simulator. (see the web site http://synthesis.jamstec.go.jp/FORA/e/index.html)

2. Delayed Mode QC

JAMSTEC has done the DMQC for all Japanese floats.JAMSTEC has submitted the delayed mode files of 115,054 profiles to GDACs as of November 7th, 2017.

The procedure of DMQC in JAMSTEC is as follows.

(JAMSTEC floats and the most of Argo-equivalent floats)

1. (within 10days) data re-acquisition from CLS, bit-error repair (if possible), real-time processing, position QC, visual QC
2. (within 180days) surface pressure offset correction, cell TM correction (Apex only)
3. (after 180days) WJO and OW salinity correction, the definitive judgement by experts, D-netCDF file making

(Argo-equivalent floats that had ceased by 2007)

JMA executes real-time processing again by using the latest procedure. The procedure after real-time processing is executed by JAMSTEC according to the procedure describe above.

The OW software is mainly operated instead of WJO. The calculation result of OW has been used at the definitive judgment. The result OW has been used just for reference.

3. GDAC Functions

The JAMSTEC ftp server has been providing the mirror site of GDACs since 2003.

ftp://ftp2.jamstec.go.jp/pub/argo/ifremer/

ftp://ftp2.jmastec.go.jp/pub/argo/fnmoc/

4. Regional Centre Functions

JAMSTEC operates PARC in cooperation with IPRC and CSIRO and has extended the responsible region into the whole Pacific including the Southern Ocean by request of AST-9 (Action item 9) since April 2008.

JAMSTEC is providing the float monitoring information in the Pacific region (e.g., float activity watch, QC status, anomaly from objective analysis, diagnosis plot for

sensor correction, etc.), reference data set for DMQC (SeHyD and IOHB), the link to the CTD data disclosure site of Japanese PIs, some documents, and some QC tools on the following web pages (http://www.jamstec.go.jp/ARGORC/). JAMSTEC had changed PARC web site system in association with the release of v3.1 netcdf files from GDAC. We will plan to upgrade the contents of PARC web site.

Argo National Data Management Report
- KIOST(KORDI), Korea Rep of. -

1. Status
   - Data acquired from floats
     - 159 profiles acquired from 7 floats in 2017
   - Data issued to GTS
     - None
   - Data issued to GDACs after real-time QC
     - 159 profiles in 2017
   - Data issued for delayed QC
     - 9,116 profiles of 41 floats
   - Delayed data sent to GDACs
     - 9,116 profiles of 41 floats
   - Web pages
     - None
   - Statistics of Argo data usage (operational models, scientific applications, number of National Pis…)
     - No information
   - Products generated from Argo data …
     - No information
   - New ARGO Floats
     - 2 ARGO floats (2901779, 2901780) were deployed in Northwest Pacific on 3rd Nov. 2017.
     - Profile data will be issued to GDAC from December 2017.

2. Delayed Mode QC
   - Started DMQC from March 2017.
   - 2 Programs were developed : SP adjustment and visual check
   - OW1.1 was used for checking salinity drift and offset
   - DMQC for APEX floats in the East Sea (Japan Sea) were done.
   - DMQC for Provor floats will be done in 2018.
   - Have plan to DMQC again using upgraded program and updated Reference DB from 2018.
   - Profile files were converted to ver3.1 during DMQC.

KOREA Argo National Data Management Report
ADMT18
Hamburg, Germany, Nov 27 – Dec 1, 2017

1. Status

1.1. Data acquired from floats

In 2017, the National Institute of Meteorological Sciences (NIMS) of Korea Meteorological Administration (KMA) deployed 13 floats in total around Korea: 8 for the East Sea, 2 for the Yellow Sea and 3 for the South Sea of Korea (Fig. 1, 2). NIMS/KMA has deployed 230 Argo floats in the North Pacific Ocean and East Sea since 2011, and 53 floats are in active as of November 17, 2017. As one of regional DACs, the NIMS/KMA is acquiring ARGOS messages and Iridium messages via web service from CLS in real-time, and all profiles obtained from the floats are transmitted to GDAC in the NetCDF format using TESAC and BUFR data after the real-time quality-control process on operational system.

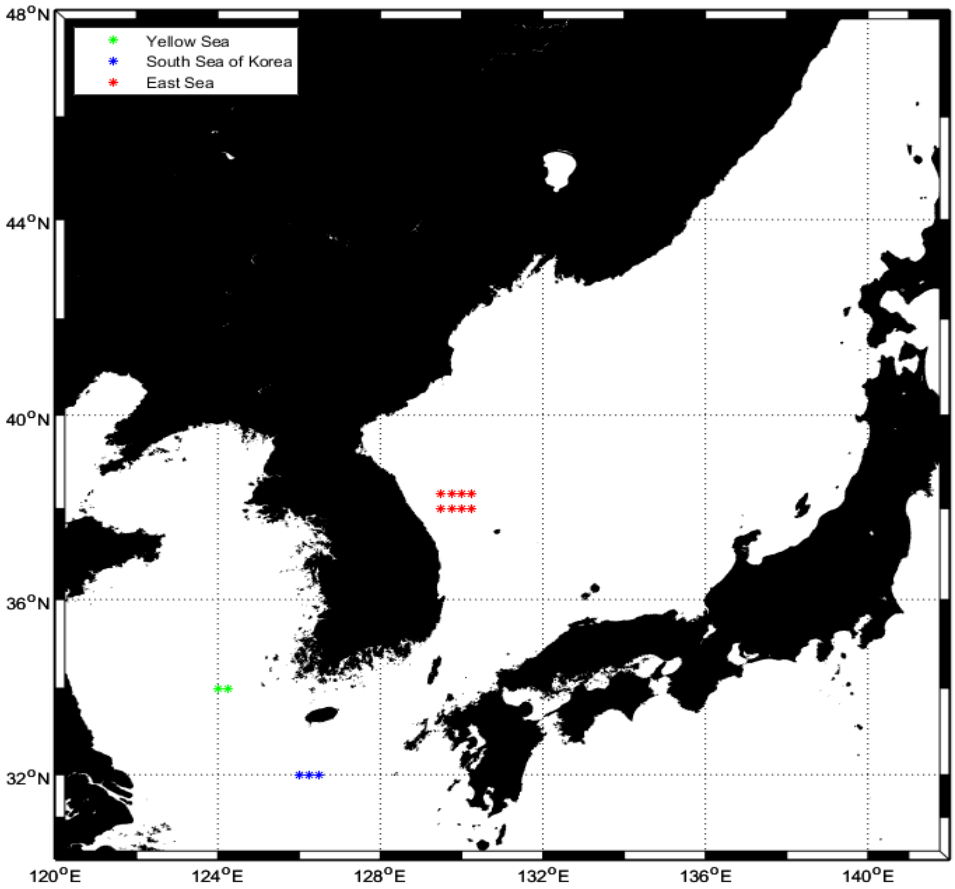


Fig. 1. Location map of deployment of Argo floats around Korea in 2017

Fig.2. Several snap shots of the NIMS/KMA's Argo float deployment in 2017

1.2. Data issued to GDAC

Total 2217 profiles were acquired during January thru November in 2017 and sent to the GDAC by real-time after the QC.

- NetCDF profile files conversion to v.3.1. (realtime data completed)
- NetCDF meta, technical and trajectory file conversion to v.3.1. (completed)
- transmission of converted NetCDF data to GDAC (France/USA)
- implementing the Argo data format check program.

1.3. Web pages

NIMS/KMA is operating the Korea Argo web page (http://argo.nims.go.kr). It provides profile data and status of Argo floats to the public and has shown 25,200 hits by visitors in monthly average. The web page has been updated so far and it is possible to view by the firefox, explorer and chrome browser.

Fig. 3. Argo homepage of NIMS/KMA (http://argo.nims.go.kr)

1.4. Deployment plan for 2018

NIMS/KMA will continue to deploy the Argo floats around Korea such as Yellow Sea and East Sea (see Fig. 4). The red circle shows a possible area for the floats to be deploy in 2018 aiming at covering the regional seas of Korea.

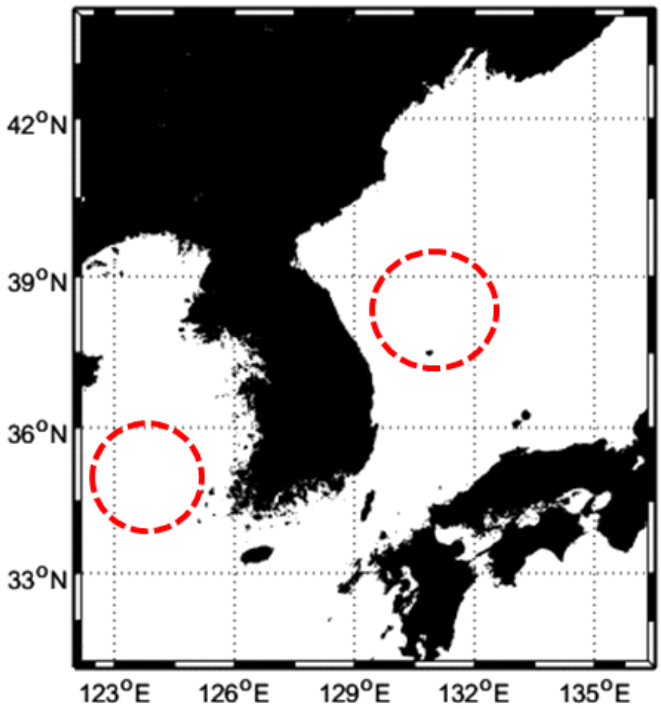


Fig. 4. NIMS/KMA's deployment area in 2018.

2. Delayed Mode QC

During October 2016 thru November 2017, we reprocessed most of previous D-files and has sent 7,208 of the revised D-files with NetCDf format (ver. 3.1) to the GDACs.

UK Argo National Data Management Report 2017

Report to the Argo Data Management Team – ADMT-18

Author list

The UK Argo data team (British Oceanographic Data Centre, National Oceanography Centre)
Contributing authors: Matt Donnelly, Katie Gowers, Robin McCandliss, Justin Buck
Other team members: Violetta Paba, Clare Bellingham, Paul McGarrigle, Elizabeth Bradshaw

With contributions from the wider UK Argo team by:
Jon Turton and Fiona Carse (UK Met Office)
Brian King (National Oceanography Centre)
Giorgio Dall'Olmo (Plymouth Marine Laboratory)

Status

The British Oceanographic Data Centre (BODC) is the data assembly centre for UK Argo funded primarily by the UK Natural Environment Research Council (NERC) and responsible for data management of UK, Irish and Mauritian floats. In addition, UK Argo is a member of Euro-Argo and has begun managing European Union floats as part of the MOCCA project. BODC has also made minor contributions to the developments of the GDACs and is also the lead for the Southern Ocean Argo Regional Centre (SOARC).

General Status

BODC Argo Team

The organisation of the Argo team at BODC has changed significantly in the past few months due to a range of staffing challenges, but has managed to make some progress throughout the changes. Violetta Paba joined the team in April 2017 from within BODC on a part-time basis, contributing to DAC operations. Robin McCandliss has joined the team from within BODC as the acting BODC Argo programme manager, pending a review of roles and responsibilities within the team. Katie Gowers remains involved with the team, primarily in a software development and advisory capacity, but is now working part-time. Matt Donnelly is still heavily involved in data science tasks and is taking the lead with NRT QC, delayed-mode QC and SOARC coordination. Justin Buck remains involved on a part-time basis, supporting the regeneration of delayed-mode QC and as a source of advice. Existing BODC team members Paul McGarrigle and Elizabeth Bradshaw have joined the Argo team on a part-time basis to provide support for DAC operations. We have recently recruited a new member of the team to BODC, Clare Bellingham, who brings a broad range of science and software skills to the Argo team. We have also benefitted from website development support provided by Craig Corbett at the National Oceanography Centre.

Funding outlook

National Capability funding from NERC is currently maintained for BODC at the same rate as previous years. In addition, it is expected that NERC-funded research projects deploying Argo floats will be providing additional sources of data management funding, such as from the ORCHESTRA, ACSIS, BoBBLE and RoSES projects. BODC also has funding from the Euro-Argo ERIC MOCCA project for the European Union floats now being managed by BODC, as well as some funding from the EU H2020 AtlantOS project to support delayed mode QC of Argo extensions. BODC continues to seek additional sources of funding to support SOARC functions: it has already identified a primary target and aims to make an application in 2018.

DAC Functions

Data acquired from floats

BODC retrieves data for all UK, Irish, Mauritius and EU MOCCA floats from a number of sources and archives these for further processing. Where possible, processing of arriving data is normally setup within one week of float deployment, and during the past year this has typically been achieved much more quickly. Please refer to table 1 for the types of communications used for different floats.

Progress in the past year:

During the past year, BODC has transitioned to retrieving all Iridium Rudics float data from the new CLS SFTP server, providing greater security and file integrity, and allowing us to terminate the FTP-push of data to our FTP by CLS. BODC has been working with CLS to address issues that arose during this migration and these have been resolved. BODC has also established a robust method for handling SBD Iridium messages received via email.

Data issued to GTS

BODC delivers core data in both TESAC and BUFR formats simultaneously to the UK Met Office four times a day, where it is subsequently issued to the GTS. Over 95% of these messages are delivered within 24 hours of the data being available to BODC. Coriolis is kindly providing the processing for a dozen PROVOR BGC floats and delivering the core data to the GTS on BODC's behalf until BODC can take on the management of these floats. The results of improvements to system performance, a proactive approach to loading floats to the BODC Argo System, and increased frequency of data processing and delivery can be seen in figure 1.

Progress in the past year – general processing:

Processing of floats for the EU MOCCA project began at BODC in December 2016, increasing the total of core floats being processed by 46 at the time of writing. This included the deployment of decoder software provided by Coriolis to augment the BODC Argo System. During 2017, BODC uprated automated data processing such that data are now submitted to the GTS four times a day, rather than twice a day as was previously the case. An issue identified with the application of the BODC greylist to a small subset of floats has now been resolved.

Progress in the past year – BUFR converter:

In support of a new BUFR converter, BODC has begun making all netCDFs available directly to the Met Office via SFTP and this is now occurring on a routine basis four times a day. The Met Office is currently testing a new Python netCDF to BUFR converter in a pre-operational mode. Once this testing is complete, the Met Office will assume responsibility for the BUFR generation prior to distribution on the GTS through this mechanism. Once operational, the Met Office will make the BUFR converter freely available for use. The code has been designed to be extensible, where capability for secondary temperature/temperature and salinity, and oxygen profiles will added plus other BGC variables when required.

Current activity and future plans:

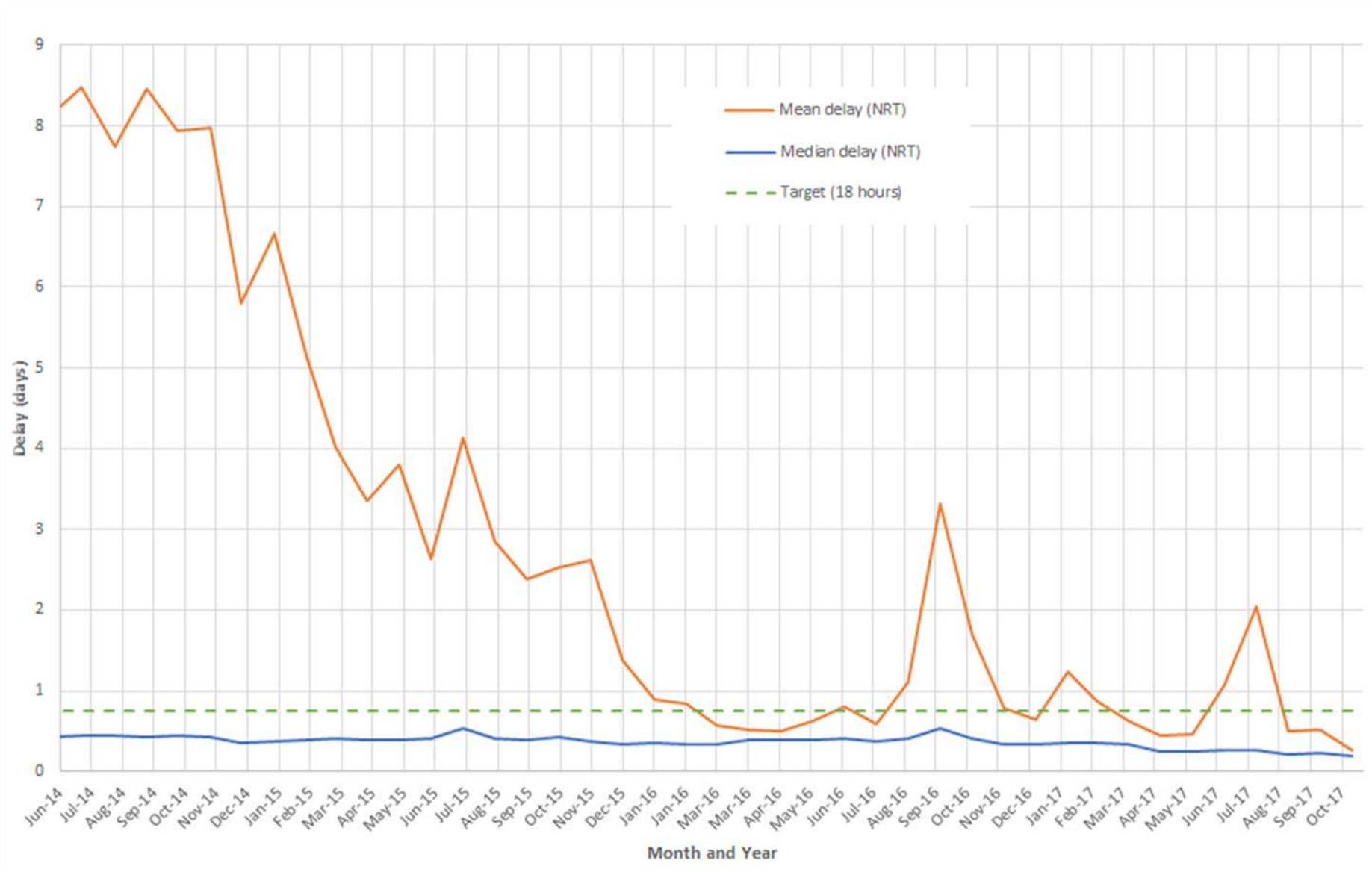
Distribution of all core data to the GTS from all BODC managed floats is a priority, including core data from floats with any type of Argo extension (deep, BGC or auxiliary data). BODC's current focus is to ensure all floats with an APF9I controller board are effectively managed within the BODC Argo System, and attention will then turn to floats with other controller boards such as the APF11. BODC is seeking to collaborate with other DACs in the development of APF11 decoders.

Table 1: Summary of all BODC managed Argo floats, with a focus on those that are currently active

					Mission of active floats					
Float type/controller	**Comms**	**Total no. of deployed floats**	**Total no. of active floats**	**No. of active floats with ice detection**	**Core only**	**Core + NST**	**Core with RBR CTD**	**Core + oxygen only**	**Core + other BGC**	**Total no. of active floats being fully processed**
Martec Provor	Argos	26	-	-	-	-	-	-	-	-
MetOcean NOVA	Iridium	1	-	-	-	-	-	-	-	-
NKE Arvor	Argos	5	1	-	1	-	-	-	-	1
NKE Provor *	Iridium SBD	13	11	-	-	-	-	-	11	11
NKE Arvor	Iridium SBD	47	46	-	-	46	-	-	-	46
NKE Deep Arvor	Iridium SBD	2	-	-	-	-	-	-	-	-
SBE Navis N1	Iridium Rudics	12	8	8	8	-	-	-	-	7
SBE Navis N1 with BGC	Iridium Rudics	4	1	-	-	-	-	-	1	0
SBE Navis N1 with oxygen	Iridium Rudics	6	6	-	-	-	-	6	-	0
SBE Navis N1 with radiometer	Iridium Rudics	3	3	-	-	-	-	-	3	0
TWR Apex APF7	Argos	7	-	-	-	-	-	-	-	-
TWR Apex APF8	Argos	252	2	1	2	-	-	-	-	2
TWR Apex APF9A	Argos	249	152	27	35	117	-	-	-	152
TWR Apex APF9I	Iridium Rudics	20	11	8	11	-	-	-	-	11
TWR Apex APF9I with BGC	Iridium Rudics	4	-	-	-	-	-	-	-	-
TWR Apex APF9I with STS	Iridium Rudics	4	4	-	-	4	-	-	-	0
TWR Apex APF11	Iridium Rudics	11	8	n/k	-	-	2	-	6	0
TWR Deep Apex APF11	Iridium Rudics	-	-	n/k	-	-	-	-	-	0
TOTAL		666	253	44	57	167	2	6	21	230

* = processing courtesy of Coriolis

Figure 1: Summary of all BODC processing times from time of profile to processing completion, indicative of GTS delays



Data issued to GDACs after real-time QC

All core data received for currently processed floats are distributed to the GDACs within one hour of the data arriving at BODC, with the real-time quality control tests applied. Any file that fails to be transferred is queued for the next transfer attempt. BODC has not yet completed the conversion to v3.1 for all file types. Please refer to table 1 for the types of float and whether they are being fully processed.

Progress in the past year:

BODC has effectively completed the transfer to v3.1 for metadata files, and has made further progress towards delivering core profile files in v3 netCDF files (now > 60 % compared to 30 % at the last ADMT). Progress on the conversion has been slowed by disruption to IT infrastructure and changes to the BODC Argo Team.

Current activity and future plans:

There remains further work to complete the conversion of the remaining core profile files, with the conversion to v3.1 for technical and trajectory files due after this work has been completed. We are not currently issuing any BGC-Argo files for UK floats due to the current focus on core profile data. The exception to this is the dozen PROVOR floats kindly hosted for BODC by Coriolis until such time as BODC can take over the real-time processing.

Data issued for delayed-mode QC

All delayed-mode QC on BODC hosted floats is performed within BODC, with the exception of some floats funded under the Euro-Argo MOCCA project. Currently BODC is only capable of providing data for delayed-mode QC for core data, with work required to finish the delivery of biogeochemical parameters in v3.1. Again, the exception to this are a dozen PROVOR floats that Coriolis is kindly hosting on BODC's behalf. See section 2 of this report for the status of delayed-mode QC.

For any given float, if the R-mode or A-mode file is available following real-time QC, then any profiles that have been through delayed-mode QC will be available as D-mode files. This applies to float profile files that are in either v2.2 and v3.1 format.

Progress in the past year:

Progress on v3.1 profile files has made more delayed-mode files available in v3.1. BODC has begun liaising with relevant Euro-Argo partners to manage the delayed-mode files for MOCCA floats as they become eligible for delayed-mode QC.

Delayed-mode data sent to GDACs

All delayed-mode QC on BODC hosted floats is submitted to the GDACS the same day that delayed mode QC is complete for a profile. See section 2 of this report for the status of delayed-mode QC.

Web pages

BODC continues to maintain the UK Argo website (www.ukargo.net) along with a Facebook page (www.facebook.com/UKArgofloats/) and a Twitter account (twitter.com/ukargo). Work has also progressed to split the UK Argo website into separate UK Argo and SOARC websites – providing SOARC with a distinct web presence – and the new SOARC website is now available (www.soarc.aq). For further details see the SOARC report.

Data use and data products

Statistics of Argo Data Usage

National Oceanography Centre

Argo data are used widely within NOC science with the following regional leads for float deployment and science:

- Alex Sanchez Franks (Indian Ocean)
- Yvonne Firing (Southern Ocean)
- Penny Holiday (Sub-polar N Atlantic)
- Brian King (everywhere else)

Elaine McDonagh is also engaged in using Argo data, bidding for float funds, planning strategies, leading analyses and mapped products

The applications of Argo data at NOC include:

- Measurement of evolution and drivers of mixed layer processes in the (Indian Ocean);
- Inventory and evolution of heat and freshwater establishing controls on budgets (both regional and global);
- Deep heat content (N Atlantic).

UK Met Office

Argo data (received over the WMO GTS) are routinely assimilated into the Met Office's FOAM (Forecasting Ocean Assimilation Model) which is run daily. The FOAM suite runs daily in an early morning slot and produces 2 analysis days (it has a 48 hour assimilation window) and a 7-day forecast. The 3-D temperature, salinity and current fields from the global model run are used as boundary conditions for the regional models run on the following day. There are 4 different configurations: ¼ degree global, 1/12 degree European North West Shelf, 1/12 degree North Atlantic, 1/12 degree Mediterranean and 1/12 degree Indian Ocean. More details are at: http://www.ocean-sci.net/12/217/2016/os-12-217-2016.pdf and http://www.geosci-model-dev.net/7/2613/2014/gmd-7-2613-2014.html. A coupled ocean/atmosphere prediction system is being developed in weather forecasting timescales, including assimilating Argo data in a coupled data assimilation framework (Lea et al., 2015). A demonstration coupled numerical weather prediction (NWP) system is being run operationally at the Met Office. The timeliness constraints on Argo for this application are more stringent (shorter, 24 hour, assimilation window). The impact of Argo on this system was assessed as part of an E-AIMS EU project (King et al., 2015).

Near-surface Argo data are used to validate the output from the Met Office's OSTIA (Operational Sea Surface Temperature and Sea Ice Analysis) – the OSTIA fields are in turn used as a lower boundary condition in numerical weather prediction models run by both the Met Office and ECMWF.

Argo data are also used in the initialization of ocean and sea-ice conditions in models run to make monthly to decadal predictions, see: http://www.metoffice.gov.uk/research/modelling-systems/unified-model/climate-models.

Plymouth Marine Laboratory

Giorgio Dall'Olmo is the lead PI for BGC data in the UK. Bio-Argo data from 13 Provor floats are now available from the GDACs, thanks to processing courtesy of Coriolis.

Core-Argo data are used at PML for:

- providing a description of the physical environment in the framework of biological (e.g. mapping eel migration routes) and biogeochemical studies;
- developing techniques to generate 3D fields of biogeochemical variables by merging ocean-colour and in-situ data;
- investigating mesoscale structures by combining altimetry and in-situ profiles with a special focus on Agulhas rings.

BGC-Argo data focuses on investigating new methods to:

- efficiently monitor the ocean biological carbon pump;
- quantify particle flux attenuation;
- vertically-resolve seasonal remineralisation rates;
- and to better understand the nitrogen cycle in oxygen minim zones.

Data Products

National Oceanography Centre

Elaine McDonagh is engaged with 4-D global fields of mapped Argo T and S, but they are not currently publicly available, however Elaine can be contacted by any interested parties.

UK Met Office

The Hadley Centre maintains two data products that incorporate Argo observations:

- EN4 contain in-situ ocean temperature and salinity profiles and objective analyses. It is updated monthly using real-time Argo profiles, and annually using delayed-mode Argo profiles. EN4 is freely available for scientific research use (see http://www.metoffice.gov.uk/hadobs/en4/);
- HadIOD is an integrated database of surface and sub-surface temperature and salinity observations for the period 1850 to present. It includes quality flags, bias corrections and uncertainty information (Atkinson et al., 2014). At present, HadIOD obtains sub-surface profile data from EN4. Public release of the data are expected during 2017. HadIOD is expected to supersede the HadGOA data product, which has not been updated for approximately 6 years (http://www.metoffice.gov.uk/hadobs/hadgoa/).

The datasets are used for climate and global change studies, including ocean heat content analysis.

Delayed Mode QC

In recent months BODC has regenerated delayed mode QC capability though a software and procedural review, accompanied by knowledge transfer primarily from Justin Buck to Matt Donnelly. BODC use OW software for delayed mode quality control with the latest reference data available from Coriolis (CTD climatology and Argo profile climatology for guidance).

Following advice from the wider UK Argo team, and particularly from Brian King, we are currently working to the following prioritisation:

- To facilitate increasing knowledge/experience of regional oceanography we are addressing DMQC on an ocean basin-by-ocean basin basis. DMQC has started with the Indian Ocean, and will move onto the South Atlantic next, followed by the Southern Ocean and North Atlantic.

- To facilitate increasing knowledge/experience of the use of the OW software and to avoid applying excessive corrections, we are tackling floats with simple pathologies first, then moving onto floats with increasingly complex pathologies as DMQC skills improve within BODC.

During October/November 2017 we have performed our first significant batch of DMQC since 2013, totalling c. 1700 profiles. At the time of writing, 49% of BODC hosted floats profiles eligible for delayed mode QC have been processed and submitted to the GDACs in delayed mode. BODC expects to continue improving this situation in the coming year.

Current activities and future plans:

Whilst BODC has restored DMQC capability using existing tools linked with the BODC Argo System, an assessment of current capabilities and workflows has highlighted a need to explore other available DMQC software, particularly with regard to biogeochemical variables. BODC would welcome an assessment of existing DMQC software tools within the Argo community to inform our decision-making.

GDAC Functions

The UK does not currently make a direct contribution to GDAC functions, although BODC has contributed to the development of the Argo DOI and has begun suppling some auxiliary data files to the new auxiliary directories at Ifremer for floats funded by the EU MOCCA project.

Argo DOIs

BODC-NOC and Ifremer won a small 15 k Euro grant to progress the Argo DOI from Research Data Alliance (RDA) Europe. Ifremer migrated the Argo snapshots to a single DOI (http://doi.org/10.17882/42182) in March 2016. A '#' key is used to identify the monthly snapshots within the archive on SEANOE, e.g. http://www.seanoe.org/data/00311/42182/#45420. The '#' means that the identification of the snapshot is evaluated on the browser rather than the DOI resolving server making it possible to use a single DOI without a change to the DOI system.

The approach was presented at International Data Week 2016. Although it meets the needs of the Argo community there is informatics community concern with the usage of the '#' key. It means there is a secondary resolving service creating an additional dependency. The RDA data citation working group is to become a formal interest group in the RDA and dynamic data has been identified as being in need of further research. This small project is now being brought to a close with the method being written up in a technical paper for publication. The first citation of the new DOI has been identified in the literature (Piron et al. 2017). Also, the approach has been used in other observing systems as part of the EC H2020 AtlantOS project, see:

https://www.atlantos-h2020.eu/download/deliverables/7.1%20Data%20Harmonization%20Report.pdf

Regional Centre Functions

BODC continues to provide the coordinating role between the SOARC partners.

The new SOARC website (www.soarc.aq) has recently been launched to provide a distinct SOARC web presence. This has been delivered after a series of delays caused by a combination of factors which include other pressures on the BODC Argo team, an election 'purdah' period, and ill-health. Thanks go to Jcommops for the new Southern Ocean status and planned deployments map. Feedback on the website is welcome and can be submitted either via the website contact form or direct to argo@bodc.ac.uk.

With the new website now in place, BODC is now reviewing with SOARC partners which priority areas to focus attention upon within its contribution to SOARC functions. Efforts continue to secure dedicated additional funding for BODC to carry out a greater range of regional centre functions. Please refer to the Southern Ocean Argo Regional Centre report for further details.

References

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Piron, A., V. Thierry, H. Mercier, and G. Caniaux (2017), Gyre scale deep convection in the subpolar North-Atlantic Ocean during winter 2014–2015, Geophys. Res. Lett., 44, doi:10.1002/2016GL071895.

US NATIONAL DATA MANAGEMENT REPORT

October 1st 2016 – October 30th 2017

18th ADMT Meeting

Hamburg, Germany

STATUS

US Argo Data Assembly Center at AOML

The US Argo Data Assembly Center (DAC) at AOML is responsible for the processing of Argo data obtained from all floats deployed by US institutions. During the last year the DAC has received data originated from 2,674 floats and processed 96,468 profiles in real time. Overall, the US DAC now has data from over 1,000,000 cycles.

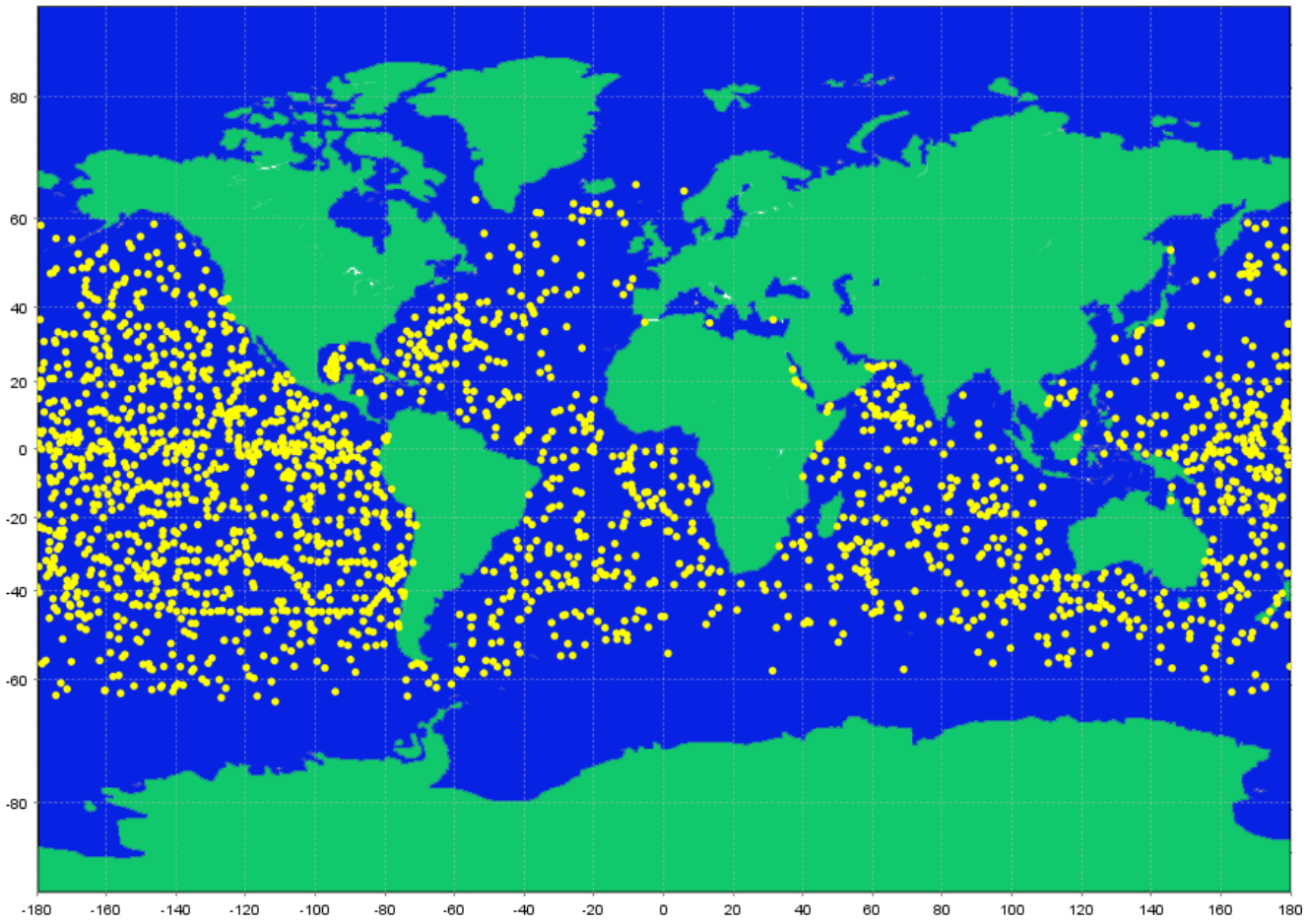


Figure 1: Real-time profiles processed by AOML DAC in the period Nov 4-16, 2017
Hot spots link to data plots.

With respect to timeliness, 94 % of profiles reached the GDACs as well as GTS in the BUFR and TESAC format within 24 hours of transmission. The most recent performance statistics are available online at: http://www.aoml.noaa.gov/phod/argo/opr/index.php
In addition to this, the US Argo DAC distributed meta, technical and trajectory files in the Argo NetCDF format to the GDACs as part of the real-time processing. With the exception of the meta NetCDF files for floats using Argos as transmission system, all these NetCDF files are sent to the GDACs every time new or updated data from a float are received. The US Argo DAC is also receiving the delayed-mode data from US floats and passes them on to the GDACs (see below).
The US Argo DAC maintains an ftp server for file exchanges between the DAC and DM operators (both for providing reprocessed R-mode files and for receiving D-mode files) as well as for real-time submission of data from Iridium floats and the submission of deployment information.
The US Argo DAC added 470 new floats to the processing system, recent maps showing their positions with link to graphics of the data collected by the floats can be found at:
http://www.aoml.noaa.gov/phod/argo/opr/php_forms/deployment_maps.php
The US Argo DAC has continued its involvement in deployment planning by finding ships of opportunity and providing ship riders for selected cruises, as pert of this collaboration AOML and WHOI has deployed 73 floats during this period.
The US Argo DAC is maintaining a website that provides documentation and information about the operations:
http://www.aoml.noaa.gov/phod/argo/index.php

Software Development at the US Argo DAC

- Software that generates trajectory NetCDF files in format version 3.1 was modified in order to improve the content of the files in the N_CYCLE and N_MEASUREMENT arrays, with a focus on the MEASUREMENT_CODE and proper sequence of the data. Modifications also included changes necessary due issues detected by GDACs file format checker.

- Software changes in progress to improve the content of Meta NetCDF files of format version 3.1 from more complex floats with Bio-sensors measuring multiple-parameters.

- Profile NetCDF files were transitioned to format version 3.1 NetCDF files for non-oxygen floats as well as floats for which University Washington and MBARI took charge of the bio-data processing. The ability to create v3.1 bio-Argo profile NetCDF files is targeted for implementation early next year.

- During the year, adjustments were made to the processing system for new & revised instrument types: (1) a deep APEX Iridium float type; (2) an ALAMO Iridium float type; (3) upgrades to deep SOLO Iridium floats that will be able to send ascending and descending profiles within a given cycle.

- One new Argos decoder and one new Iridium decoder have been developed and implemented.

- The software package for decoding of Iridium floats has been modified to adapt to changes in the float data as well as to improve the handling of data files with a few corrupted lines.

- The data processing was transitioned to the mirror site during hurricane Irma to ensure timely data processing and distribution

- Improved system in charge of applying delayed-mode salinity adjustments to real-time data of floats with sensor drift.

DELAYED MODE QC:

The US Argo DAC receives the Delay mode Argo profiles from US delayed-mode operators and verifies their contents to ensure soundness of the files if requested. Each US Argo institution has provided information on their delayed-mode processing which was added to this report.

NOAA/PMEL

As of 13 November 2017, PMEL had 113,795 D-files at the GDAC that were more than one year old, comprising 72% of the total of 158,072 PMEL profiles that were older than one year at that time. Last year, on 14 September 2016, PMEL had 84,713 D-files at the GDAC that were more than one year old, comprising 63% of the total of 134,794 PMEL profiles that were older than one year at that time. So, in the intervening 14 months, John Lyman and Kristy McTaggart performed DMQC on 29,082 profiles, substantially more than the 23,278 profiles that became older than one year during that time. Hence they made good progress towards clearing our DMQC backlog.

The DMQC backlog arose mostly from delays owing to difficulties encountered during major maintenance and upgrading efforts on PMEL DMQC software in response to Argo format changes and internal IT requirements, as explained in previous reports. It took considerable time and effort to make these changes, and debug them.

John Lyman and Kristy McTaggart continue their work to clear the DMQC backlog. John Lyman is also continuing work on streamlining our DMQC GUIs and processing. The PMEL float DMQC procedure currently consists of the following steps: We perform an automated correction, with visual check, of reported pressure drifts and correction for the effect of these pressure drifts on salinity, as well as an automated correction of conductivity cell thermal lag errors following Johnson et al. (2007). We do visual inspection and modification of quality control flags for adjusted pressure, temperature, and salinity using the SIO GUI. We overwrite the raw PARAM_QC flags during this step as required. We use a highly modified OW Version1.1, currently with CTD (2014V01) and Argo (2014V04) reference databases, and adjust run parameters to get appropriate recommended salinity adjustments. We accept or reject the OW recommendations on the basis of comparison with nearby historical profiles using a new PMEL GUI recently written for this step.

Scripps Institution of Oceanography

Scripps Institution of Oceanography (SIO) has evaluated, as part of delayed-mode quality control (DMQC), a total of 210,105 Argo stations (profiles). This is an increase of 26,313 stations (721 nominal float years) since the previous United States Argo National Data Management Report (September 14, 2016). At present, 98.7% of the DMQC eligible, SIO stations have been completed. Here we define a station as being DMQC eligible if it was sampled more than 12 months ago . The above numbers include all SIO performed delayed-mode stations, including SIO Argo floats, all Argo New Zealand floats, 30 Argo-Equivalent floats provided to Argo by Dan Rudnick as part of the 'Origins of the Kuroshio and Mindanao Current' and 'ASIRI' projects, 8 NAVOCEANO floats deployed from the Peruvian vessel Zimic, and 3 floats donated to Argo Mexico.

SIO expects to be able to continue to maintain a high DMQC completion percentage during the coming year and will continue to revisit the profile data of floats every 7-9 months. The standard consensus DMQC procedures for SOLO/SOLOII profile data were continued in 2016.
Profile V3.1 NetCDF: The transition to the V3.1 profile DM NetCDF has been completed at SIO.
Trajectory V3.1 NetCDF: To date 95.0% of SIO DMQC trajectory files have been formatted to V3.1 NetCDF (100% of Iridium data, 91.6% of Argos data). During the year 82 inactive SIO Argos SOLO floats underwent trajectory DMQC. This most notably includes the estimation of float cycle timing, including float arrival and departure from the surface, and the full quality control of all Argos position data. This brings the total number of V3.1 DMQC trajectory NetCDF data available from SIO Argos floats to 912. DMQC on additional Argos SOLO trajectory data will be ongoing as the floats cease transmitting data. The DMQC of trajectory files from SOLOII/S2A Iridium floats is completed as part of the standard 7-9 month revisit cycle. There is a match between profile/trajectory data which has passed SIO DMQC. The 'Dtraj' data files from SIO Iridium floats delivered to the GDAC include DMQC data as well as all subsequently transmitted cycles data, resulting in the need for only a single trajectory NetCDF at the GDAC.
Meta V3.1 NetCDF: Although not often considered a DM file, the V3.1 meta file contains cross information with both the profile and trajectory NetCDF, thus consistency across all three are required. Because of this fact, SIO has transmitted DMQC meta files to the GDAC at the same rate as the trajectory files (95.0% total, 100% Iridium, 91.6% Argos).
Scripps has actively participated in forwarding Argo Program priorities during the year. Most notably by Megan Scanderbeg's continued work with the Version 3.1 trajectory file. SIO continues to update semi-annually the Argo Climatological Dataset for OW salinity calibration and annually a census of format errors identified in delayed-mode NetCDF profile files.

Scripps continues to work with float developers (IDG[1], MRV) to add capabilities to the SOLOII/S2A/Deep SOLO float types. The battery passivation evident in our older Iridium floats has been overcome with the inclusion of a new battery type: Tadiran hybrid lithium batteries. At present 76 SOLOII and Deep SOLO floats have been deployed with the new battery type. Longer float lifetimes are expected.

Over the past year, Scripps deployed 7 IDG[1] developed Deep SOLO floats as part of the Southwest Pacific Deep Argo array, 8 in the Southeast Indian pilot array, and 6 in the

Northwest Atlantic pilot array. At present, the Southwest Pacific Deep Argo array has 20 floats (18 Deep SOLO and 2 Deep APEX). All Deep SOLO data is reaching the GDAC/GTS within 24 hours of being received. The first DMQC'd deep data has been submitted to the GDAC.

[1]IDG: Instrument Development Group.

University of Washington

As of November 2017, University of Washington (UW) had submitted over 220,000 delayed-mode core files (D-files) to the Argo GDACs via AOML. Delayed-mode evaluation of conductivity sensor drift was done by using the statistical comparison method of OW (2009), in conjunction with the CTD reference database compiled by Coriolis and the Argo reference database compiled by John Gilson.

As of date of writing, all UW D-files, including those from the KESS project from the University of Hawaii, had been upgraded to V3.1. Historical D-files that previously had DOXY embedded in them (V2.2 format) were upgraded to V3.1 D- and BR- files.

All bio-geochemical data from floats in the SOCCOM project and the pre-SOCCOM equivalent project are processed by MBARI. UW-MBARI is responsible for the production of BR- files for the SOCCOM project and the pre-SOCCOM equivalent project. For the SOCCOM project, BR- files are produced and transferred to the Argo GDACs from MBARI on a daily basis.

During the week of 11-15 September 2017, UW hosted a Profiling Float and Sensor Workshop, chaired by Susan Wijffels, Brian King and Steve Riser. A summary of the workshop will be presented at the next ADMT meeting.

Wood Hole Oceanographic Institute

US floats in the Mediterranean Sea D-mode qc performed by National Institute of Oceanography and Geophysics of Italy.

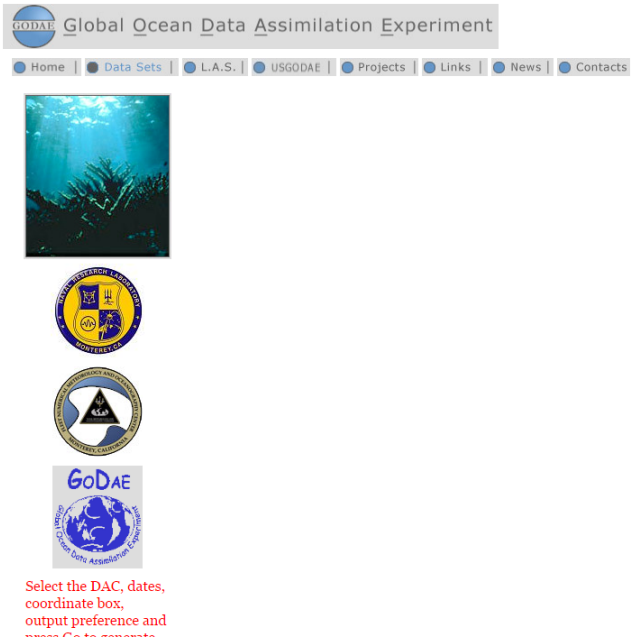
Summary of the delayed-mode QC activity for the US floats in the Mediterranean Sea:
The physical variables (Pressure, Temperature and Salinity) of 28 US float deployed in the Mediterranean Sea have been check in delayed-mode. The Surface Pressure Offset have been corrected if needed and the variables recalculated before running the OW method. The TNPD status has also been checked. The D-files of these floats have been created and sent to the AOML DAC.

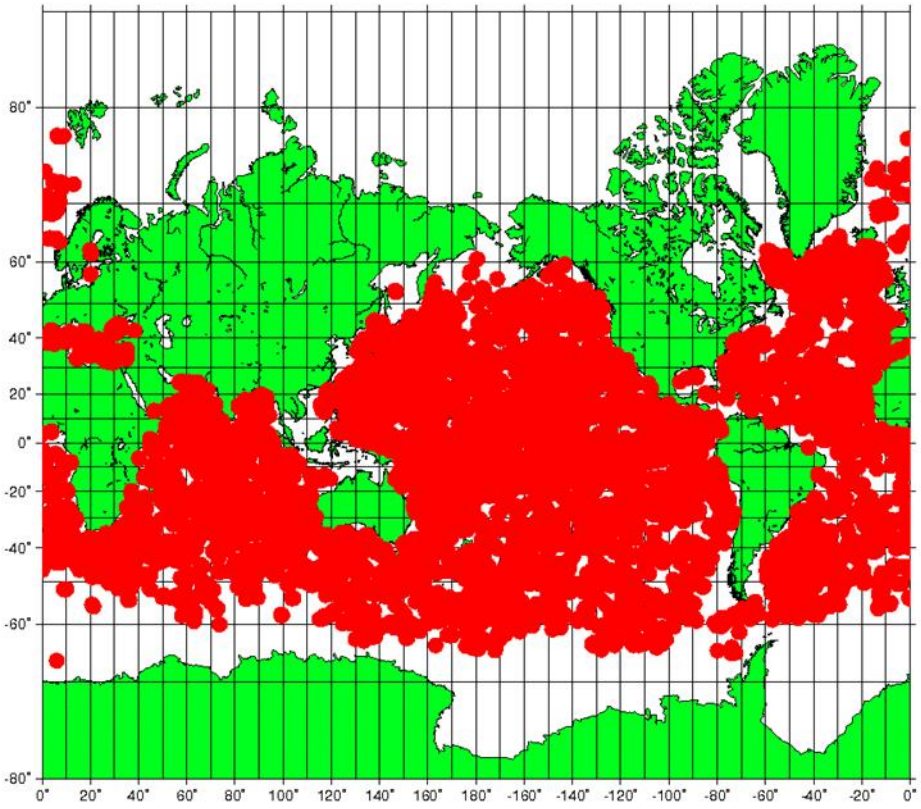
The diagnostic plots of the delayed-mode quality control activity are available on the MedArgo web page: http://nettuno.ogs.trieste.it/sire/medargo/active/table_out.php?med=2&active=0

South Atlantic Argo Regional Center at AOML

Currently no funding is available for the final stage of the delayed-mode quality control. Activities related to float deployments are continued in close collaboration with WHOI.

Argo Data Management report 2017
US GDAC (Global Data Assembly Center) November 22nd, 2017





GDAC Functions

(If your centre operates a GDAC, report the progress made on the following tasks and if not yet complete, estimate when you expect them to be complete)

- National centres reporting to you
- Operations of the ftp server
- Operations of the www server
- Data synchronization
- Statistics of Argo usage: Ftp and WWW access, characterization of users (countries, field of interest : operational models, scientific applications) …

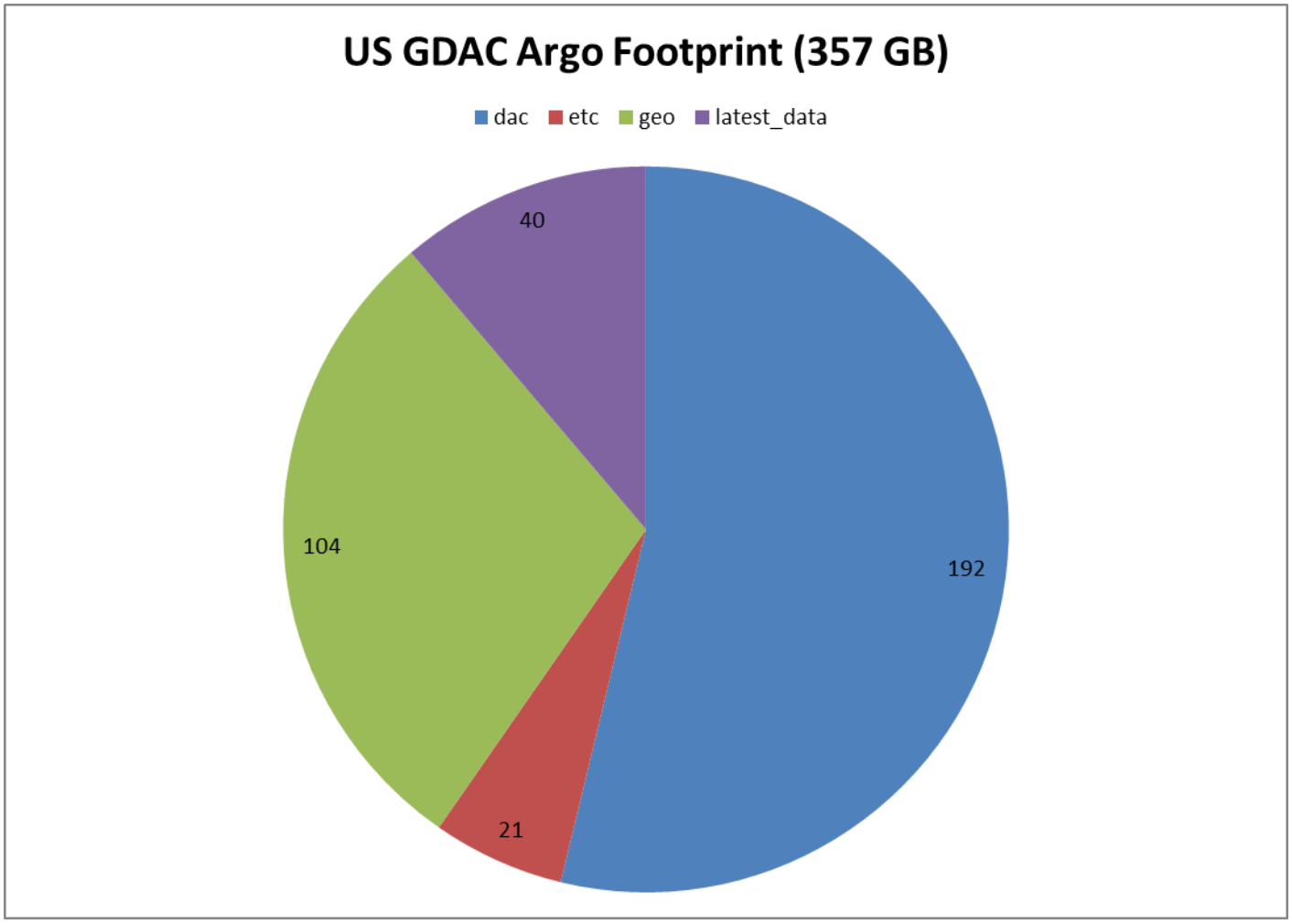
National centres reporting to you

Currently, 9 of the National DACs submit regularly to the US GDAC. The other DACs use the Coriolis as a proxy, and the US GDAC downloads the data from this proxy.

As of November 24th, 2017, the following shows the Argo footprint on the US GDAC.

DAC	MetaData	Technical	Trajectory	Trajectory D-Mode	Trajectory Bio
AOML	6,598	6,452	8,057	1,604	0
BODC	636	616	479	0	0
Coriolis	2,553	2,527	2,462	1	301
CSIO	368	357	363	0	0
CSIRO	805	791	780	0	0
INCOIS	422	410	383	0	18
JMA	1,550	1,489	1,484	0	0
KMA	227	207	208	0	1
KORDI	119	115	119	0	0
MEDS	472	458	456	0	15
NMDIS	19	19	19	0	0
Totals	13,769	13,441	14,810	1,605	335

DAC	Profiles	Profiles D-Mode	Profiles Bio
AOML	995,238	685,605	36,892
BODC	70,578	33,015	3,032
Coriolis	263,673	178,782	41,097
CSIO	44,893	10,221	6,344
CSIRO	140,946	120,517	20,144
INCOIS	58,493	28,008	5,191
JMA	188,659	115,044	14,599
KMA	28,975	23,094	84
KORDI	16,578	6,986	0
MEDS	47,950	31,687	3,817
NMDIS	2,460	0	0
Totals	1,858,443	1,232,959	131,200



Operations of the ftp server

The US GDAC hosts an anonymous FTP server that allows download to all available Argo data that it currently has. This includes the Argo aggregate files, as well as, the raw NetCDF files that are received by the DACs. Additionally, the Argo index files are available for download as well. These index files are updated on the US GDAC approximately twice per hour.

US GDAC FTP server: ftp://usgodae.org/pub/outgoing/argo

Operations of the www server

The US GDAC hosts an apache webserver that allows the users to download Argo data via standard tools such as wget. Similar to the FTP server, all Argo data is available for download.

In addition the US GDAC hosts the 'USGODAE Argo GDAC data browser' that allows for limited querying capabilities (time, area, dac, etc).

US GDAC HTTP server: http://usgodae.org/pub/outgoing/argo
Argo Data Browser: http://usgodae.org/cgi-bin/argo_select.pl

Data synchronization

The US GDAC synchronizes with the French GDAC once per day at 1015 UTC. The process involves downloading all of the index files from the French GDAC and comparing them to the local US GDAC. After comparison, all necessary files are then downloaded and submitted normally into the US GDAC.

The typical synchronization takes approximately 15 minutes to complete each day. However, there are times when it takes much longer and we need to investigate.

Statistics of Argo data usage

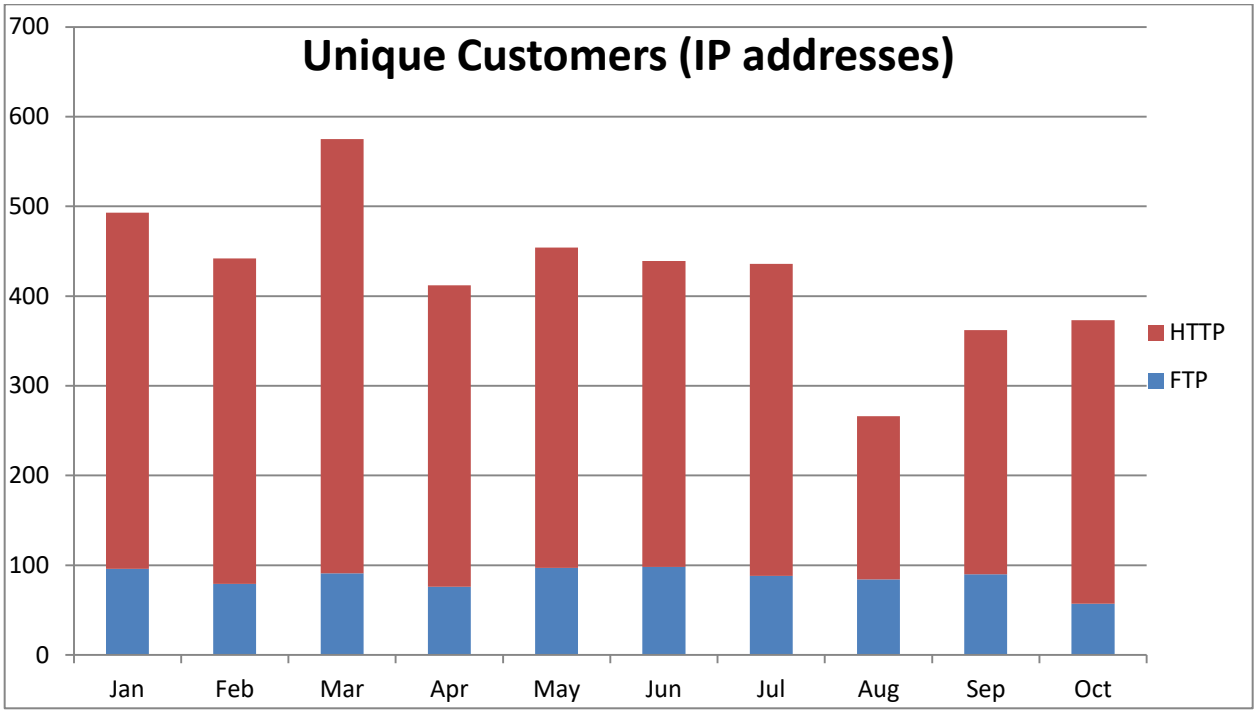
FTP Statistics

Date	Unique IPs	Hits (1000's)	Gigabytes
Jan 2017	98	1,547	1,848
Feb 2017	79	2,015	1,841
Mar 2017	91	1,891	2,431
Apr 2017	76	2,393	2,197
May 2017	97	2,035	2,857
Jun 2017	98	3,611	2,712
Jul 2017	88	1,449	1,949
Aug 2017	84	1,365	1,928
Sep 2017	90	1,412	2,385
Oct 2017	57	1,392	1,388

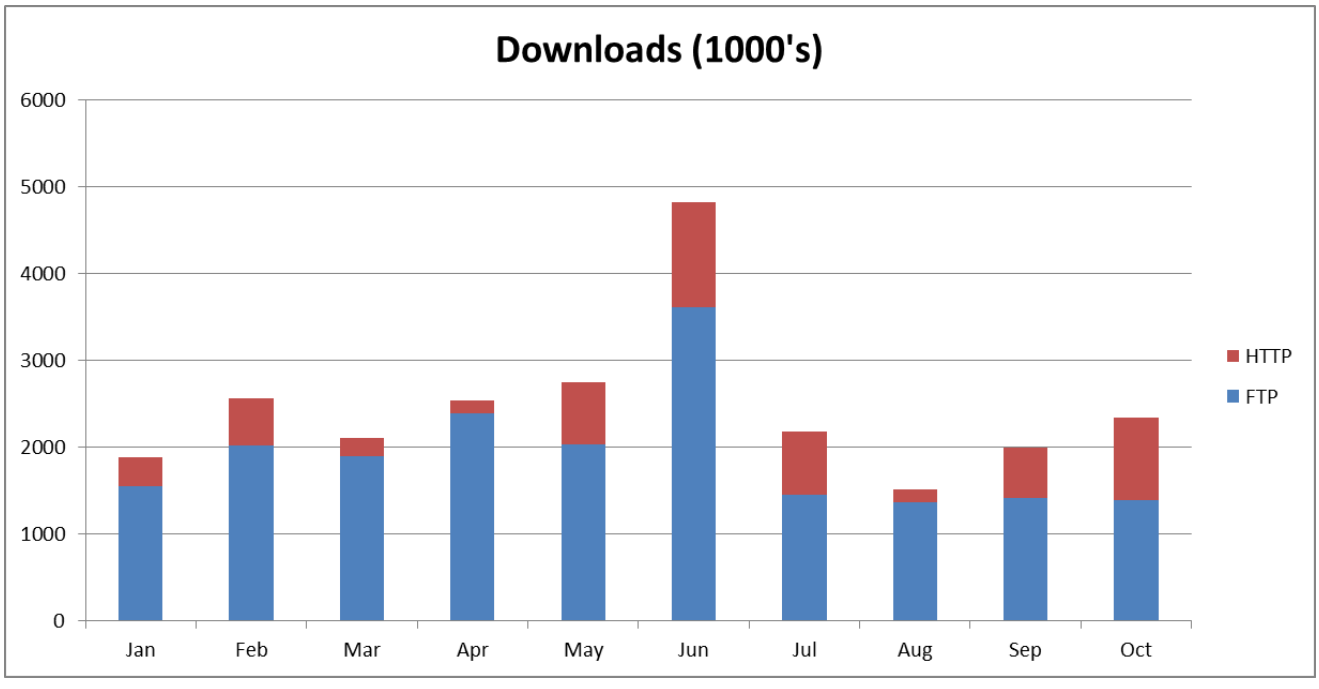
HTTP Statistics

Date	Unique IPs	Hits (1000's)	Gigabytes
Jan 2017	397	340	1,691
Feb 2017	363	549	578
Mar 2017	484	210	1,567
Apr 2017	336	141	1,007
May 2017	357	715	1,127
Jun 2017	341	1,209	2,172
Jul 2017	348	727	1,594
Aug 2017	182	154	216
Sep 2017	272	579	1,276
Oct 2017	316	955	1,702

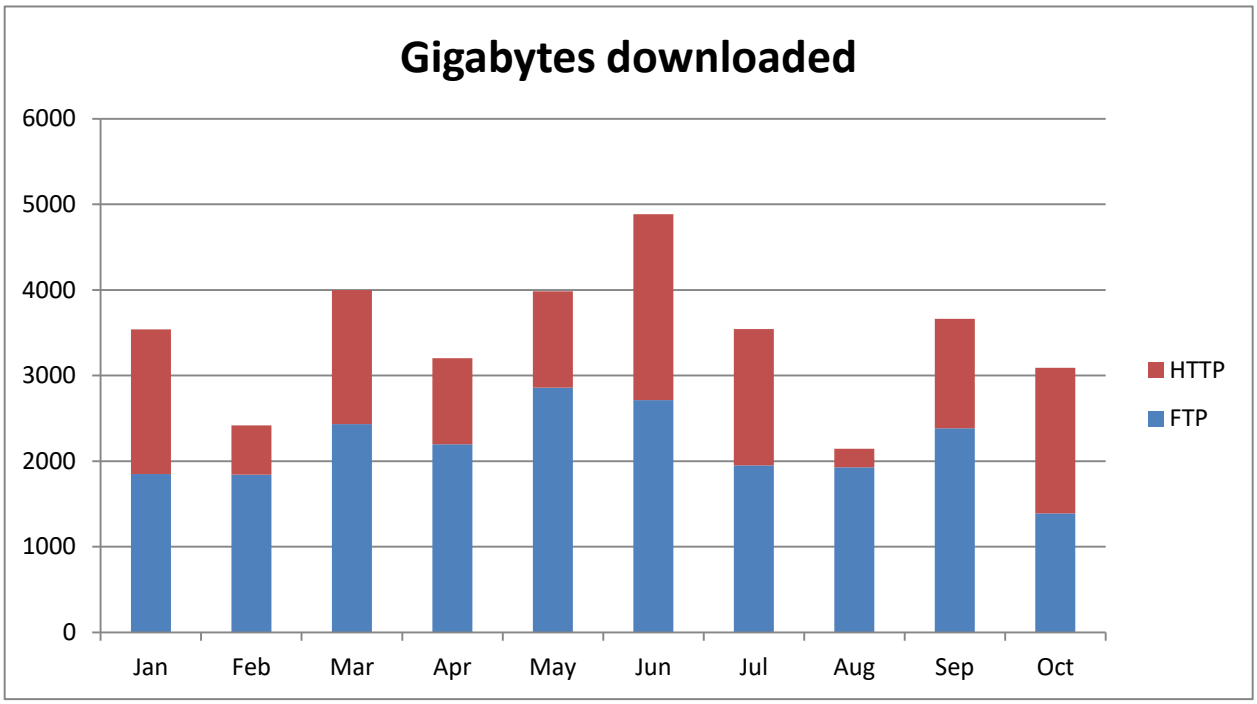
The following chart shows the unique customers downloading Argo data per month.



The following chart shows individual successful downloads in 1000's. One successful download would equate to one Argo file being downloaded, regardless of size.



The following charts shows how many bytes worth of Argo has been downloaded per month.



Visitors

The following list shows the countries that have downloaded Argo data from the US GDAC.

Australia (AUS)
Belgium (BEL)
Brazil (BRA)
Canada (CAN)
Chile (CHL)
China (CHN)
Denmark (DNK)
Fiji (FJI)
France (FRA)
Germany (DEU)
Hong Kong (HKG)
India (IND)
Indonesia (IDN)
Italy (ITA)
Japan (JPN)
Korea Republic of (KOR)
Macau (MAC)
Malaysia (MYS)
Mexico (MEX)
Netherlands (NLD)
New Zealand (NZL)

Norway (NOR)
Poland (POL)

Puerto Rico (PRI)
Samoa (WSM) South
Africa (ZAF) Spain
(ESP) Switzerland
(CHE)
Taiwan; Republic of China (ROC) (TWN)
United Kingdom (GBR)
United States (USA)