part of the integrated global observation strategy

17th ARGO DATA MANAGEMENT MEETING

TIANJIN

28th September – 30th September 2016

Version 2.0

22nd December 2016

TABLE OF CONTENTS

1 Objectives of the meeting

The 17th ADMT meeting was hosted by NMDIS in Tianjin, China. It started at 9am on the 28th September and finished at 12h30 on the 30th September. 41 persons from 11 countries and 29 institutes participated in the meeting.

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

- Review the actions decided at the 16th ADMT meeting and progress made since last year
- Agree on clear criteria to include float data in the Argo 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 5th Bio-Argo Workshop

2 Welcome

Zheng Rui welcomed the Argo Data Management Team to Tianjin. She stated that the International Argo project was very important to help understand the ocean and protect it. She noted that China became a member of Argo in 2001 and had its first pilot deployment in 2002. She recognized the hard work ahead and hoped the meeting would foster international cooperation and be successful.

Gao Zhigang spoke to the group next and welcomed everyone on behalf of NMDIS. He thanked the ADMT for coming to Tianjin for the meeting and he thanked SOA for their support. He said that NMDIS is a government funded public institute responsible for the management of data in the ocean and maritime affairs. He reminded everyone that NMDIS hosted the ADMT meeting 10 years ago and was happy to be the host again. He wished the ADMT the best of luck for the meeting and hoped it would be successful.

3 Feedback from 17th AST meeting

Breck Owens presented feedback of the AST17 and in particular the answers to the issues that were sent to the AST

Repeated notifications that a profile has failed quality tests, such as the comparison of dynamic heights from the float data with satellite sea surface height, are sometimes ignored by a DAC and the float provider or delayed mode operator. A procedure, including notification of the AST co-chairs, should be developed so that the data can be flagged as bad data without the approval of the scientist responsible for the float.

When a new sensor is deployed on a float, a peer-reviewed publication demonstrating that the sensor meets the prescribed Argo specifications is required before the data from this sensor can be included in the Argo data system. There should also be an indication that there will be large number of these sensors integrated into the Argo array. Once this data in included in the Argo data system, it should be labeled with a quality control flag of 3 until multi-year stability has been demonstrated. A

proposal for how to store the data from these new sensors will be presented in the next talk by Brian King.

There has been an increased burden on the Argo data system to support the increasing complexity of technical data telemetered by the floats which has (a) increased the cost of data management and (b) diverted efforts away from delayed mode quality control. Only a fraction of the data is scientifically relevant or provides the means to monitor and manage the Argo global array. The AST recommends that not all technical data should be curated and maintained in the technical files, but rather that there be a separate, auxiliary file structure that is rigidly controlled that can be used to store the increasingly complex engineering data that is telemetered by the floats. There should be a generally agreed upon structure for the files, including a readme file, but the details of the file are left to the float provider.

3.1 What is an Argo float and how to store data from Argo floats with sensors not yet approved (B. King)

Two connected questions have been posed and discussed at ADMT16 and AST17. Both these were further discussed at ADMT17.

1) If a PI proposes to deploy floats that are not part of an established national program, under what conditions should Argo accept those floats into the Argo system?
2) If a float is accepted as Argo, but reports data that the Argo data system cannot handle, how should those data be made publically available?

In response to (1) Argo will set out the requirements for a float to be included in the Argo system. The requirements include governance of floats and data according to Argo protocols, and passing of data through DMQC into long-term curation. A second aspect of this question is the requirements that must be met in order for Argo to modify its data system to accept data from novel sensors. A first draft of these protocols was presented at ADMT16, reviewed with comments at AST17 and iterated since then. The requirements will now be further revised and circulated to ADMT and AST for final comments. The plan will be to approve a document of requirements at AST18.

One of the situations that has already occurred and is likely to occur into the future is the deployment of floats that should be considered as part of Argo, but which report data that cannot be handled easily in the present Argo system. Argo wishes to encourage the development of new sensors to measure accepted parameters, and new sensors to measure new parameters. Changing the Argo data formats to accept new data types has a very large hidden burden on the Argo DACs (revising code to write files) and GDACs (format checking), so in future Argo will only add new sensors or float types to the data format when the new technology has become established and is expected to make a substantial contribution to the global array. While new technology is being tried, Argo needs a way to store and publish all relevant measurements made by floats and not included in the ‘dac’ files. Examples might include acoustic measures of precipitation, velocity shear from EM sensors, or novel BGC sensors. At present, such data are to be published on PI web sites but not held at Argo GDACs.

A proposal was made to establish a parallel directory at the GDACs for auxiliary data. This would be a ‘dacaux’ directory, and would be parallel to ‘dac’. This would contain a tree of dac names and WMO numbers. File names under a WMO number will have specified roots (WMO and cycle) that enable exact connection to files in the dac directory. Under the present proposal, PIs will decode auxiliary data and create files in PI-defined format which will be uploaded to GDACs via DACs. PI would be encouraged to use a file format that is easily readable – either csv, ASCII or netCDF that mimics the Argo data format version 3.1 if possible.

The meta file in the ‘dac’ directory will include text in the SPECIAL_FEATURES variable to indicate that there is additional data in the auxiliary directory and the nature of that data. A document will be drafted which will describe the proposed dacaux structure, with guidance on acceptable file names, formats and data descriptions. This will be circulated to ADMT and AST prior to AST18. GDACs will consider the feasibility of implementing dacaux, and work with two test groups to trial the process. It was suggested that EM-APEX velocity shear from CSIRO and Acoustic Precipitation

from UW would be good trial data sets. It is planned that the system should be demonstrated and established in time for approval and adoption at AST18.

Note that at present, the two examples given, ACOUSTIC_PRECIPITATION and EM are measured parameters that need to be provided to the users to comply with the IOC resolution. These sensors already exist as Argo sensors (Table 25) but do not have PARAMETER names (Table 3). These are examples of sensors which are never likely to become deployed globally and in large numbers, so in the future Argo would not want to add sensors and parameters for these measurements.

Novel platforms carrying established sensors (e.g. a new float design with a SBE41 CTD) should be handled in a similar manner, until the platform is established. Only AST can decide when or whether data from a new sensor or platform can enter the data stream. There is a big unseen overhead in defining new platforms in the Argo data system, especially in traj.nc and tech.nc files.

A method was proposed that would facilitate the correct notification of floats to EEZs that would include information about sensors not described in the float meta.nc file.

The overriding considerations in this issue are:

(i) Ensure Argo meets obligations to IOC of publishing all ocean measurements and notifying floats approaching EEZs.

(ii) Minimize the burden on DACs and GDACs when PIs produce novel platforms, sensors and data types. Minimize changes to the format descriptions and tables until there is clear benefit to the Argo global mission.

(iii) Facilitate technology developments that might benefit Argo in the future. Make it easy for PIs to distribute data that might otherwise remain hidden.

There were several conditions put on the acceptance of this data. It must be provided to the auxiliary directories in real-time, the PI must ensure that the core data, being delivered to the core directories, has a clear DMQC pathway, and the DAC will be free to reject these floats if all conditions are not met by the PIs. We recognize that there will be an impact on DACs who manage these floats.

Action: Produce a document and provide to AST by email prior to AST18 – restate for PIs and manufacturers what is and is not an Argo Float. Include development of an 'Aux' directory for non-Argo floats and novel sensors before they are approved for Argo. Action on Brian King, AST and ADMT co-chairs.

4 Status of Argo Program and link with Users

4.1 Review of the Actions from last ADMT

Sylvie Pouliquen reviewed the status of the action items from ADMT16. At ADMT16 it was decided to identify the high priority actions from routine and low priority ones. The status of the actions is:

- High: among the 3 actions decided all were done
- Routine: Among the 23 actions 16 were done, 5 partially, 1 canceled , 1 postponed after ADMT16
- Low: no low priority actions were identified

See complete status in Annex 3.

4.2 Argo Status and AIC development

M. Belbéoch reported on the status of the Argo network. He started with an overview on the historical contribution to Argo by China.

Through the use of performance indicators he demonstrated that Argo is doing very well, with an appropriate number of floats operating in each basin, and appropriate yearly deployment rate and a good spatial coverage, except in the Southern Ocean. Float reliability is still improving with the growing number of new float models. The turn over to iridium seems to have stabilized as only the USA and Australia have fully switched.

Data Flow

Delivery Argo Global	94.01% 8/2016	95% Monthly Target	Nb of registered units vs number of operational units (Global Argo)
Quality (DM Processing) Argo Global	68.53% 8/2016	75% Monthly Target	Nb of DM obs vs NB of DM eligible obs
Quality (PSAL) Argo Global	88.33% 8/2016	95% Monthly Target	Nb of monthly obs of best quality - PSAL
Quality (TEMP) Argo Global	92.91% 8/2016	95% Monthly Target	Nb of monthly obs of best quality - TEMP
Timeliness (GDAC FR) Argo Global	90.45% 8/2016	95% Monthly Target	% of monthly observations distributed within 24h (GDAC FR)
Timeliness (GDAC US) Argo Global	89.57% 8/2016	95% Monthly Target	% of monthly observations distributed within 24h (GDAC US)
Timeliness (GTS MF) Argo Global	94.36% 8/2016	95% Monthly Target	% of monthly observations distributed within 24h (GTS)
Whitelist Argo Global	96.54% 8/2016	95% Monthly Target	% of platforms whitelisted platforms vs operational platforms

The data flow indicators (see figure above) show that real time data distribution could be improved, and delays need to be shorter. He invited the French GDAC to check why an average of three hours was added in the distribution system (perhaps a time zone issue). Some ADMT members commented that it would be interesting to exclude early profiles from calculation to avoid large delays.

He invited the ADMT to provide further guidance on the design of new performance indicators monitoring Argo data quality.

4.3 New JCOMOPS/AIC WWW Site

Anthonin Lizé reported on the JCOMMOPS/Argo website.

Users can access the new website by directly connecting to http://argo.jcommops.org (http://www.jcommops.org redirects to the integrated view, and is still under validation)

The principle of the new website is to enable the user to build a query containing a selection of floats, save it, analyze it by showing statistics and map it on the interactive map. The user can then change the float sample or subset and every opened widget will be updated automatically.

New features have been added to the interactive map, including the ability to save a working layer within the current session, designed originally to emphasize a specific sample over another one. The printing option is still at early stages and needs to be optimized (especially the legend).

Users can also register and notify floats through the new interface, using meta NetCDF and meta ASCII files (updating an existing float's meta data is also possible). A bulk registration process has been designed and works currently with meta files (netCDF and ASCII). A CSV reader is currently under development. ADMT members commented it was saving them a lot of time.

Key Performance Indicators (KPIs) are computed on a monthly or yearly basis and available on the interface

M. Belbéoch recalled that regular webinar will be organized to interact directly with the users. The first one was held in August.

5 Feedback from 5th BIO-Argo Workshop

A meeting took place in January in Villefranche-sur-mer to discuss and review the science and implementation plan for the Biogeochemical-Argo program. This was then reviewed at the Bio-Argo workshop held just before ADMT. DACs with BGC floats presented their status. Interactions between different groups should be fostered to identify and correct for anomalies either in the meta data (with JCOMMOPS) or in the data processing (different DACs). In particular, a user-list interested in sharing codes will be created. The cookbook and the QC documentations for O2 (DOXY) were presented and approved pending some minor revisions. LOCODOX, a tool for DMQC of DOXY was also presented and its potential application to other BGC variables discussed. The processing for Nitrate (NITRATE) concentration was presented; some minor revisions will be applied as soon as they are published and an adjustment at depth in RT will be further investigated. Regarding chlorophyll-A (CHLA), the overestimation of a factor 2 of the factory calibration will be addressed in the meta data file, as soon as the community paper is published. A revision of the QC process described in the manual for the RT processing and QC of chlorophyll-A, with a new process for using the deep/dark signal, will be recommended and a DM procedure when CDOM is present will be tested. The updates of the documentation for the backscattering (BBP) processing were described. Anomalies in the deep signal have been seen when comparing the outputs of different DACs and these needs to be investigated. Both radiometry and pH still require drafting of cookbooks and QC manuals.

In the comments that followed, Brian King congratulated the BGC community on all the work it has done to establish the different real time and delayed mode procedures for all these variables. He also noted the large number of scientific papers to come from this community and encouraged their continued work.

5.1 Proposal on a set of Metrics to Monitor Argo

A set of Indicators on the implementation and data system have been set up by the AIC (see AIC report). However, no progress has been made on indicators that would track the scientific quality of the Argo data and monitor its evolution over time. It was agreed that Brian King's proposed statistics and Stephanie Guinehut's comparisons with altimetry would be a good starting point for metrics on the scientific quality of the Argo data stream and these should be extended to other core parameters reported by the floats. It would be useful to apply this to BGC data as well, once DMQC begins. It was agreed that these metrics should be presented at AST18 for feedback and suggestions.

Action: Study how to generate and update on a yearly basis indicators on scientific quality

- Monitoring adjustments made : the size and how they are evolving ; Method to be provided by Brian King
- Comparison with Altimetry from Stephanie Guinehut – yearly report

6 Real Time Data Management

6.1 GTS status

The Oceans Science branch of Fisheries and Oceans Canada monitors the performance of Argo timeliness on the GTS. From October 2015 to August 2016, on average there were 12,449 TESAC and 11,446 BUFR messages transmitted on the GTS each month. 92% and 89% of TESAC and BUFR messages are available to the users within 24 hours of the float surfacing. There is no significant different in timeliness whether a float uses ARGOS or Iridium for communication.

Currently there are no TESAC data transmitted from CLS and the China DAC, and there are no BUFR messages sent from the Korean DAC.

The comparison between the BUFR messages and NetCDF for all floats that reported between September 12 - 16, 2016 was performed. First, JULD in the NetCDF file was compared with the BUFR sequences 0 04 001 and 0 04 005. 74% of 2153 profile NetCDF files were matched with the BUFR messages. We found that there was no match for NetCDF files from Coriolis and INCOIS. When cycle number was used to find a match between the BUFR messages and NetCDF files, 94% of profile NetCDF files were matched with the BUFR messages.

Further examination showed that both Coriolis and INCOIS used JULD_LOCATION to encode BUFR sequences 0 04 001 and 0 04 005. The ADMT team agreed that all DACs should use JULD to encode BUFR sequences 0 04 001 and 0 04 005.

Actions:

- ***Determine whether it is feasible to restart TESAC transmission for CLS and CSIO***
- ***BUFR : Ifremer and India to change date to JULD instead of JULD_LOCATION as agreed at last meeting***
- ***Korea to restart BUFR transmission***

6.2 Status of profile anomalies at GDAC

Christine Coatanoan reported on the anomalies detected at the GDACs. On a daily basis, an objective analysis is performed on all in-situ temperature and salinity observations aggregated by Coriolis. A series of alerts are raised on atypical observations. Each profile with an 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. DAC contact points are invited 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 resubmit the files. If the DAC does not agree with the changes, he should send an email to codac@ifremer.fr.

In 2016, on average, about 80 profiles were reported to the DACs as bad each month. Some bad data are not correctly detected with the real-time QC tests. There is no obvious method to improve the real-time QC: an automatic test cannot detect some atypical errors. But a study has been proposed to try to catch more bad data; we will test the effect of changing the order of some tests and of adding a new level for the spike test with a stricter threshold value that will be associated with the deeper levels.

A few DACs perform real-time adjustments, without filling <param>_adjusted and <param>_adjusted_error. This situation should be corrected. Others do not correctly write the file name and data_mode when they do DMQC.

The status of the format version upgrade was presented for profile and multi-profile files and meta-traj-tech files. Some DACs have still V2.2 or V2.3 and need to update those versions.

All this information can be found in the report sent monthly to mailing lists: argo-dm & argo-dm-dm..

Action: Investigate if a change in the order (density before spike test) would help catching more anomalies Spike: add new deeper level (0-500/ 500-1500 / deeper than 1500 with threshold value more strict =>

T: 6,0 °C 2,0°C 1,0°C

S : 0,9 psu 0,3 psu 0,2 – 0,15 psu

6.3 Status of anomalies detected with Altimetry

The Altimetry check has been performed every four months again this year and automatic emails have been sent through the AIC database to the PI, DM-operator and DAC responsible for the extracted floats. 143 floats are currently on the list. We have received feedback on 22 of these. DACs, PIs and DM-operators are requested to feedback on the anomalies detected. They are also asked to correct flags or put sensor on the grey list to stop RT distribution of the bad data detected by this test.

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 are in the list for a long time. 38 floats are in the list for more than 2 years, 50 floats for more than 1 year (and less than 2 years) and 55 floats are there for less than 1 year.

Specific examples of bad data not caught by RT QC tests were shown and the concerned DACs are asked to further investigate.

The general quality of the Argo dataset was presented and showed slightly degraded statistics for RT observations as compared to last year. The statistics come back to stable values when the 143 floats present in the Altimetry 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 also show stable results compared to last year's 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).

An inventory has also been performed on quality flag values and shows that 0.7% of Argo profiles do not have a valid date or position (i.e. JULD_QC and POSITION_QC of '0', '1', '5' or '8'). The inventory also shows that 13.78% of Argo profiles do not have a valid PRES/TEMP/PSAL triplet (defined as PRES_QC='0' or '1' and TEMP_QC='1' and PSAL_QC='1'). Those statistics are again very similar to the ones obtained last year. It was requested that they compute them again excluding floats having FSI sensors or TNPD behaviors, and also to have examine them as a time series.

Action: Stéphanie will add a code to warn DACs, DM operator and PI that a float should go on the Grey list. Follow-up of the correction will be tracked by AIC

6.4 Status of density test implementation

An audit of the implementation of the density test was again undertaken to assess our progress in standardizing the application of this test. The density inversion test was run over a mirror of the US GDAC in early September. All DM files were run; only files for RT profiles within the last 90 days were run. If we have been notified that an apparent density inversion is real, that profile was added to a density test "Exclusion" list and was not checked. Only the primary profile was tested. This is just a rerun of the real time tests. Density is calculated and differences both upward and downward in the profiles are computed. Inversions larger than 0.03 for RT data and 0.05 for DM data are then written to a file to be checked by the DACs. These files are available via ftp at:

ftp.marine.csiro.au

login anonymous

cd pub/gronell/Argo

Files are listed by DAC.

Only BODC still has an issue with RT files, though a few DACs also have one or two files on the list. RT files should never fail this test because it is as strict limit that is automatically applied. Any profile with a density inversion greater than .0.3 should have that data flagged with 3 so this is a concern.

There have been improvements in the performance for D files but many profiles have been on the list for 2 years or more. AOML's results have improved but they still have more than 300 profiles with density inversions greater than 0.05. Coriolis responded very quickly and fixed 24 files before ADMT. CSIO, BODC and MEDS have what are apparently the same files on the list over multiple years and these need to be sent to the PI for further assessment.

If density inversions are judged real, then let us know and they will be added to the density test Exclusion list. The new point of contact, at least initially, will be Rebecca.Cowley@csiro.au

6.5 Near surface SST measurement RTQC implementation at DACs

Progress towards applying RTQC to near surface data and data availability on the GDACs is summarized in Table 1In addition to existing streams the new SOLO2 floats transmit raw pumped near surface CTD data that will be included as an auxiliary profile. The applicability of existing RTQC will need to be verified for this new data.

Table 1 Progress towards applying RTQC to near surface data and data availability on the GDACs.

Group	Implementation of RTQC	Delivery of data
AOML	Applied by AOML, all floats in RT	UW floats: In V3.0 at AOML when provided. SIO SOLO2 floats: As secondary profile in DMODE, AOML place into Argo 3.0 in RT.
BODC	Tests coded, implementation pending	Pending, V3.1 core profile mission data then BGC are the priority.
BSH	Real time via Ifremer	V.3.1 via Ifremer in secondary profile
IFREMER	PROVOR floats and a few APEX, unpumped data flagged '4'	Data included in secondary profile in RT, update of legacy data to V3.1 99.99% done
INCOIS	Near surface tests implemented	No active NST floats. NST data merged with core data in a single profile. To be split into secondary profile (coded, implementation pending). No active floats or new floats procured.
MEDS	Near surface data from NOVA floats flagged 4	Delivered in core profile netcdf No active floats or new floats procured.
JMA	JMA have implemented RTQC	Delivered with transition to V3.1, NPROF=2 pending.

6.6 Progress on Citation Index for Argo Data

The RDA awarded a small grant to progress towards having a single DOI for Argo. This resulted in a single DOI for the archive of monthly snapshots at Ifremer as is described on http://www.argodatamgt.org/Access-to-data/Argo-DOI-Digital-Object-Identifier . This meets the requirement by the AST for a single identifier for Argo data.

The solution is based on elements of the Research Data Alliance (RDA) recommendation on dynamic data citation (https://rd-alliance.org/system/files/RDA-DC-Recommendations_151020.pdf). The use of a '#' rather than a '?' and the http protocol used by DataCite DOIs means that the resolution of the snapshot is performed locally on the browser rather than at the DOI resolving service. This is necessary because the '?' is not currently supported by DataCite. These results were presented at the recent International Data Week and highlighted data citation principles that were not yet taken into account by DataCite. Consequently, the work may progress through iteration as efforts by the RDA data citation working group progress.

In discussion, the roles of Ifremer (as GDAC) and NCEI (as Argo GDAR) in the citation of historic Argo data were questioned. NCEI were invited to participate in the RDA proposal at the outset but declined and could not commit to contributing to the work. It was agreed that having two DOIs was not an issue as long as both DOIs are advertised and the method for citing Argo data is clear to users. NCEI also implement the single DOI approach on the NCEI archive ensuring the start date on the data in the DOI corresponds to the start of Argo. Details of this will be added to the Argo data management pages. The additional DOI for NCEI is still manageable in the scope of finding citations.

A prototype portal for tracking of citations was presented at the RDA meetings: https://dliservice.research-infrastructures.eu/#/

When this moved out of beta (at some point in 2017) this will enable cited reference searches for data DOIs. This will also include secondary and tertiary citations eventually too i.e. papers that use data products that include and cite Argo data.

Frederic Merceur (Ifremer) has rerun the bibliographic analysis of Argo citations for the last three years. It is in draft form and shows some illuminating insights into who the publishing scientific users of Argo data are. The inclusion of Bio-Argo citations is on-going and once the report is final it will be made publically available.

There has only been one citation of the new Argo DOI so far and it would be expected that there would be more. The question is how to increase usage.

Action

- Addition of citation information to the readme on the GDACs may be one option.
- NCEI to correct their DOI to start when the monthly snapshot is the exact copy of US-GDAC and review the content of the landing page with Megan

7 Reference database

7.1 Summary of the actions since ADMT-15

Christine Coatanoan reported on the CTD reference database for Argo DMQC. Since the last ADMT (ADMT16 – Bermuda), the work on the quality of the boxes (area 3) has been continued, scrutinizing deep water and density of the profiles. The visual inspection is necessary to remove bad profiles from the reference data base. In June 2015, Coriolis used the CCHDO API to download 749 cruises corresponding to 36773 stations; after checking the duplicates with the Coriolis database, only 30% (10934 stations) have been added to the reference database (Figure 1).

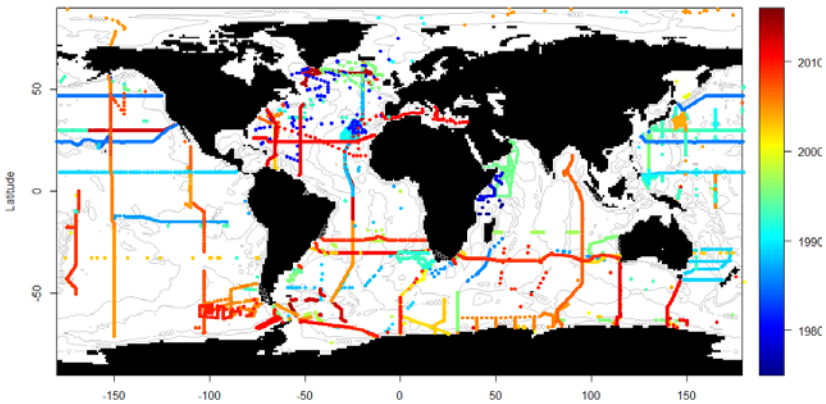

Figure 1:Stations that have been considered to add to the reference DB

The anomalies detected in the CCHDO dataset were presented. Those anomalies occur in both the file format (QC values, names of the parameter, errors on expocode), and data quality (fill_value, mix of 2 profiles in one, negative value for pressure, bad data with QC good, bad data without QC,…). Those anomalies have been reported in a document which has been sent to CCHDO in June 2016.

Information on the data providers has been defined in a new column QCLEVEL in the boxes (‘COR’ for Coriolis, ‘OCL’ for Ocean Climate Library, ‘ CCH’ for CCHDO and ‘SPI’ for Scientist PI). Work has to be done with CCHDO and GO-SHIP to identify GO-SHIP cruises in the dataset that

have to be added to the reference database, in order to provide high quality data (especially for the deep-Argo).

The new version, including all new CCHDO data, was delivered in the middle of September 2016 : CTD_for_DMQC_2016V01.tar.gz .

Action: Provide a cookbook for REFDB update

7.2 CCHDO/US-NODC-progress (Steve Diggs)

Steve Diggs (CCHDO) presented a progress report on CCHDO and NCEI contributions to the Argo. Tim Boyer filled-in details for the NCEI part of the presentation.

- CCHDO added 28 cruises /1827 profiles (November 2015 - September 2016)
- NCEI added 2916 profiles, 1119 coming from CCHDO (October 2015 - September 2016)

Last November at AST-16 in Bermuda, several lingering issues were discussed after the Coriolis presentation regarding the availability, format consistency and overall quality of CTD profiles provided by the CCHDO for the Argo CTD Reference Database.

These issues came up again this year, including:

- Format inconsistencies
- Parameter names
- QC codes
- ExpoCode / Ship Name or Code
- Data Anomalies

The CCHDO is primarily a data assembly and dissemination center, and data quality control is done largely through feedback from the hydrographic user community. Changes suggested by frequent and expert users are incorporated into the online data along with detailed notes regarding the QC code, meta data and/or data changes. Pre-WOCE data and non-GO-SHIP data may not have received such scrutiny. The discussion that followed dealt with flagging non-GO-SHIP and older cruise profiles that are in the Argo reference CTD database and assessing these ship-based data for use in the delayed mode QC procedures, especially for the DMQC of deep Argo floats.

These discussions are on-going, lead by Breck Owens, Brian King, Howard Freeland and Jim Swift. A draft set of criteria regarding the quality of these non-GO-SHIP data will be reviewed at AST-18 next March.

Action: Identify the best quality CTD before inclusion in REFDB by working group: Steve Diggs, Mathieu Belbéoch, Brian King, Breck Owens, Tim Boyer, Justin Buck and Thierry Carval

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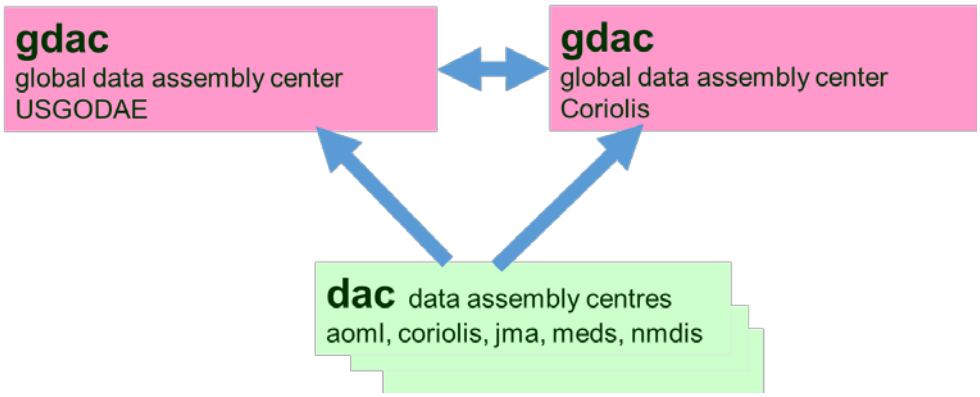
8 GDAC Status

8.1 Operation status at US-GDAC and Coriolis-GDAC

The presentation started with a reminder of the DAC-GDAC organization. Each DAC should send their data files to both GDACs (US and Coriolis). A few DACs do not distribute data to both GDACs; they will be contacted to fix that issue, to shorten the delay of availability of observations to users.

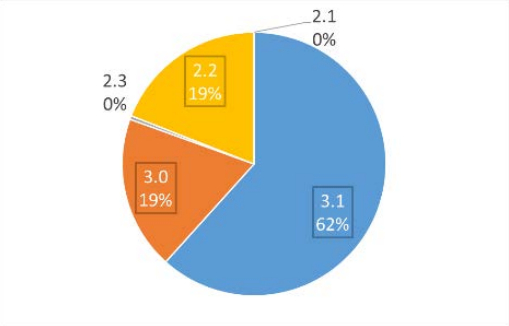


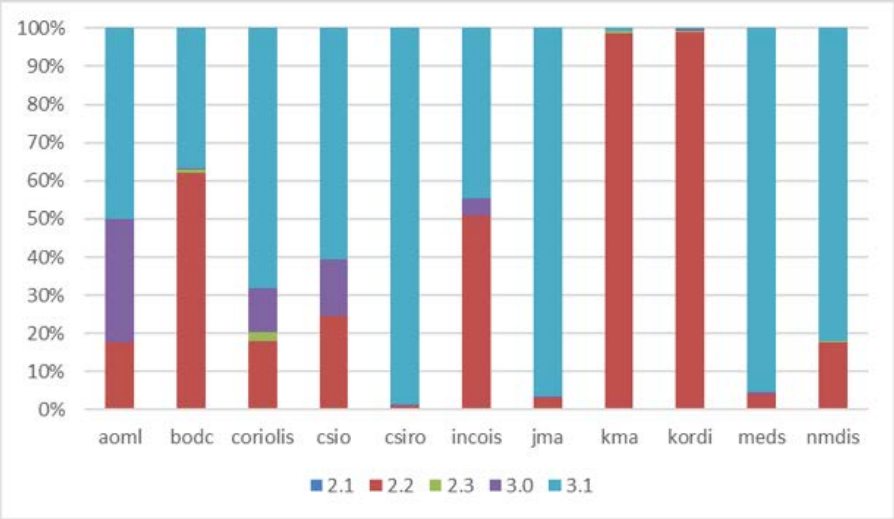
In September 2016, GDACs received data from 11 DACs. The total number of NetCDF files on the GDAC/dac directory was 1 844 628 (+13%). The size of GDAC/dac directory was 168Gb (+33%); the size of GDAC/geo directory was 68Gb. The size of GDAC/latest-data was 15Gb. The 33% increase of the size of the dac directory is not sustainable. It is mainly due to the multi-profile files that contain combinations of high vertical resolution profiles and standard or low resolution profile (ex: regular Argo sampling and near surface sampling; they are combined in a matrix containing many empty values). An action is opened to study the use of NetCDF4 (with built-in compression features) for multi-profile files built by the GDACs.

DAC	metadata files 2016	increase from 2015	profile files 2016	increase from 2015	delayed mode profile files 2016	increase from 2015	trajectory files 2016	increase from 2015
AOML	6 020	5%	877 797	11%	572 793	7%	7 226	7%
BODC	538	7%	57 307	8%	31 307	0%	420	0%
Coriolis	2 310	7%	226 052	14%	129 641	8%	2 223	7%
CSIO	344	6%	39 026	16%	10 221	1%	340	5%
CSIRO	748	9%	124 051	12%	97 631	48%	711	25%
INCOIS	394	6%	51 548	10%	27 819	3%	370	4%
JMA	1 454	3%	169 948	5%	95 532	0%	1 424	3%
KMA	217	9%	26 035	9%	20 786	14%	207	7%
KORDI	119	0%	16 300	2%	0		119	0%
MEDS	435	8%	44 327	5%	25 763	9%	421	7%
NMDIS	19	0%	2 460	2%	0		19	0%
Total	12 598	5,76%	1 634 851	10,42%	1 011 493	9,24%	13 480	6,80%

The number of files increased by 10% on the GDAC compared to 2015. The transition from Argo format 2.* and 3.0 toward format 3.1 is underway. On September 2016, the number of files in format version 3.1 passed a 60% threshold.

format version	nb files
3.1	1 146 481
3.0	350 446
2.3	8 277
2.2	353 767
2.1	20
Total	**1 858 991**





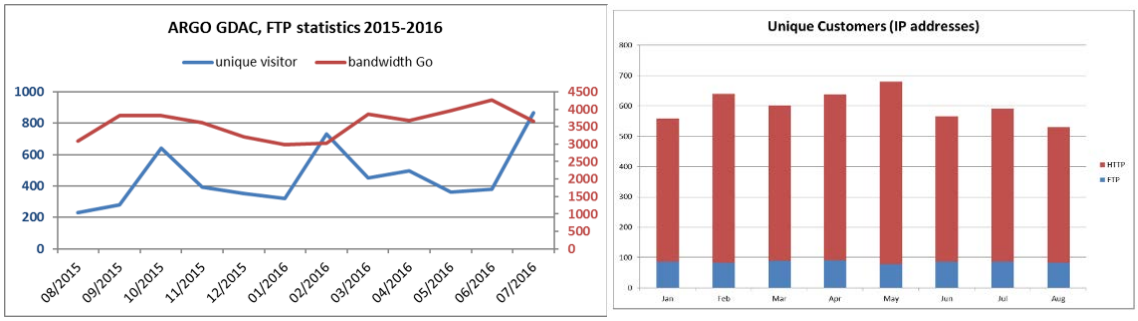
The files in format version V3.1 are much more homogeneous than their previous versions. The controls applied by the format checker on V3.1 are much more exhaustive and the controlled vocabulary listed in the 27 reference tables is used for V3.1 format checks.

- A non-valid content is automatically rejected
- Only valid V3.1 file content appears on GDAC.

For example, there are 8 valid DATA_FORMAT variables listed in reference table 1 (there are 26 more tables…). A survey of GDAC files shows that 40 188 files (2% of the total) do not have a valid DATA_FORMAT. The V3.1 files are not affected by this kind of problem.

Operations of the ftp server

Submitted files are automatically collected from the national DACs every 10 minutes. There is a monthly average of 321 unique visitors, performing 4229 sessions and downloading 3To of data files. There is no particular trend in the ftp statistics. Statistics performed on several years may give a better view of data distribution to users. Downloads were performed from 79 countries. Most users download the data via http from the US-GDAC but the amount of data delivered by the two GDACs is similar.

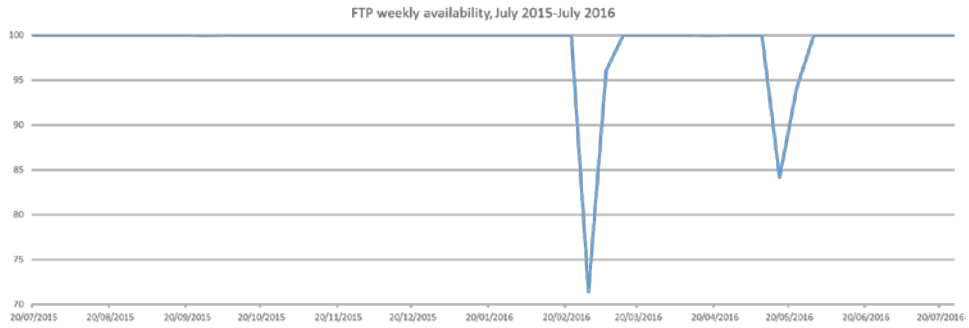


Coriolis and US-GDAC download statistics

FTP server monitoring

Coriolis GDAC ftp server is monitored by a Nagios agent. Every 5 minutes, an ftp download and a Google Internet test are performed. On the last 12 months, the weekly average performance was 99.51%. The 0.49% of poor performances represents 36 hours and 38 minutes. We faced 2 significant events these last 12 months

- First week of March: 20 hours of FTP poor performances
- Third week of May: 10 hours of FTP poor performances



Greylist operations

GDAC hosts a grey list of the floats which are automatically flagged by automatic QC. The greylist has 1054 entries (September 16th 2016), compared to 1000 entries one year ago.

Mirroring GDAC data rsync service

In July 2014 we opened a dedicated rsync server: http://www.argodatamgt.org/Access-to-data/Argo-GDAC-synchronization-service . It provides a synchronization service between the "dac" directory of the GDAC with a user mirror. Note that we cannot monitor data delivery via rsync. The total number of Argo users is much larger than we can see. 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/...

ERDDAP server

An ERDDAP server is now available on top of the GDAC ftp server http://www.ifremer.fr/erddap/index.html . ERDDAP is NOAA's data server to scientific data. ERDDAP is *a data server that gives you a simple, consistent way to download subsets of scientific data sets in common file formats and make graphs and maps. This particular ERDDAP installation has oceanographic data* (for example, data from Argo floats, satellites and buoys). Note that ERDDAP cannot use netCDF 4 files yet.

Actions

- Investigate if it is possible to add the index files and other top files in the rsync service at Coriolis
- Test encoding M-File in NetCDF4, evaluate the level of compression and provide these test-files to the community
- make sure that all ref table are on http://www.argodatamgt.org/Documentation
- Correct the 6 digit resolution in geo directory at US-GDAC
- Look for a way to make machine to machine access for the 27 tables of the user manual for Mark and the file checker.
- Investigate difference in delays between two GDACs from AIC report
- If a meta data file is rejected, implement a way to retrieve the rejected profile files once a valid meta data file is submitted
- Set up the auxiliary directory tree and distribution system at GDAC and run test cases

8.2 Status of File-Checker

The FileChecker has been operational at both GDACs since March 2015. It continues to have new features added to support evolving data format requirements and improved data consistency checks. As a reminder, the format checks are applied to all files but the data consistency checks are only applied to v3.1 files.

The FileChecker documentation is on the ADMT Documents page. The main page contains the current production version (v2.4). The Drafts page contains a draft version of the next version that will add the full trajectory data consistency checks (v2.5).

Since the last ADMT meeting, the following improvements were implemented:

- Bio-profile data consistency checks
- "Warning on deprecated" capabilities to support transitions as standards evolve. This allows existing files with deprecated features to be accepted, with warnings sent to the DAC, during a transition period.
- File name checking
- An "alternate dimension" capability that allows specified "alternate dimensions" for a variable
- Initial data consistency checks on trajectory files (does not include the N_MEASUREMENT and N_CYCLE variables)

- Numerous updates to the reference tables and "standard lists" to stay current with ADMT standards.

Next major release: Trajectory file data consistency checks for the N_MEASUREMENT and N_CYCLE variables have been developed and implemented. The tests were presented to the meeting participants and are documented in detail on the "Drafts" documentation page. The checks are undergoing testing currently; the groups involved in the tests will be expanded following the meeting. This new version will transition to production over the next several months. Full operations are expected in January 2017.

Full source code (including an Installation and User Guide), the executable FileChecker, and detailed update descriptions can be found on the US GDAC at:

http://usgodae.org/pub/outgoing/argo/etc/FileChecker

Actions Set up a group to provide files for the traj file checker

8.3 Status of the new GDAC Cookbook

The GDAC cookbook and the file format checker documentation are online as draft documents : http://www.argodatamgt.org/Documentation/Draft-documents :

- Description of the Argo GDAC File Checks: Data Format and Consistency Checks, DRAFT of version 2.5, September 2016, http://doi.org/10.13155/46120
- Argo GDAC cookbook http://doi.org/10.13155/46202

The cookbook ensures that both GDACs work with the same rules.

- Greylist synchronization
- File removal operations
- Scheduled services time table
- Argo profile file merger
  - core-Argo profiles merger
  - b-Argo profiles merger
  - m-profile merger

•Action: Document M-File generation for other types than profile in GDAC Cookbook

8.4 Maintenance of reference tables

Argo reference tables are managed online on Argo data management site. The reference tables describe standardized parameters: http://www.argodatamgt.org/Documentation

The tables are managed on excel or googledoc spreadsheets. A more robust management of the reference tables is proposed. These tables need to be machine readable.

Each entry in the reference tables should have the following attributes:

- Status
  - Active
  - Publication underway
    (approved but not yet active in the format checker)

  - Creation underway
  - Obsolete
  - Refused (?)
- Creation date
- Update date
- Publication date
- Who performed the last update
- Comment

On the web site, by default, all parameters with an active status are displayed. All parameters with any status can be displayed.

Editing of the parameters table is limited to authorized people, who may change over time.

- Technical parameter names and units tables: Birgit Klein and Ann Thresher (to be replaced)
- Configuration parameter names
  - John Gilson and Esmee Van Wijk (core parameters)
  - Catherine Schmechtig and Jean-Philippe Rannou (bio parameters)
- Argo reference table: Thierry Carval and Mathieu Belbéoch
- Standard format table: Megan Scanderbeg and Mathieu Belbéoch

9 Format Issues

9.1 Upgrade to V3.1 Real-Time and historical T&S floats at GDAC (all) Action 11 (30mn)

As can be seen in the report from the GDACs on the operational status, real progress has been made in the past year towards converting all files into version 3.1. Both DACs and PIs are moving in the correct direction and for the few DACs left who have not yet produced many V3.1 files, it appears they are on the verge of submitting the majority of their files by the end of the year. Most of the coding has been done and the DACs are in the testing phase. There is still some work to be done on the trajectory files as this depends on float type and some DACs with many float types have to allow for this. Hopefully by the next ADMT meeting, all DACs will have a majority of all files in V3.1.

9.2 Review status of meta and tech parameter tables)

There have been very few changes since the last ADMT. Trajectory and statistical variables are no longer allowed in the version 3.1 Tech files though this may be revisited as an outcome of ADMT 17. A total of 19 new Technical Variable names and approximately 10 new Meta data Configuration Parameter names have been added to the tables in the past year. Units have been unified and are now identical for both tables.

Note that Ann Thresher is retiring and so Birgit Klein needs assistance with maintaining the Tech name table – Volunteers should talk to us about what is involved (not much).

The issue of exploding data was raised at AST-17. Currently we allow all variables reported by a float to be put in the Tech files. We create names for these technical data and don't restrict what you can report. With Iridium, we are getting more and more fields in these files. Is this all necessary

information? Is some of it only required at the DAC level? Are all of these variables really useful? Do we need to discriminate between the essential and the non-essential technical information?

The risk of either restricting what we allow or making variables clearly optional is that we may miss something that later is identified as essential. The cost of not thinking about this is that the files are becoming more and more complex, making it harder to find the truly useful data. It also is a cost to retrieve, store and deliver this data and this is diverting resources from our other efforts.

We suggest that the list of technical parameters delivered by early Argos floats become a starting point for a list of "Essential" parameters. These have proved their worth in either adding scientific value to the data (surface pressure offset) or monitoring the health of a float (battery voltage, internal vacuum…). We also suggest asking the experts who know the new float models best for a list of what they consider most useful. The combined list then will be put at the top of the Technical Parameter names table and DACS should then work to provide this data whenever available. The rest of the variables then become optional or to be used at the discretion of the DACs.

We encourage DACs to think very hard about what is useful and what is not to avoid a situation we see developing where the essential data are swamped by information that is of interest to few and which could be held at the local or DAC level.

This essential list then becomes a recommendation to the manufacturers as to what they should provide at a minimum. And this data should not be placed in a position where it is only occasionally delivered.

9.3 How to store buoyancy actions

More numerous and complicated technical data are transmitted by newer Argo floats and higher bandwidth communication systems. It is inevitable that some of this data will not conform to the present Argo netCDF file structure.

Jean-Philippe Rannou requested input from the ADMT regarding one such non-conforming data: A 'time-series' of tech data recorded at instances of buoyancy adjustments including pressure, duration of pumping, voltage, and type of adjustment (valve or pump). Similar data exists currently in SOLOII/S2A.

Discussion touched on the recent statement by the AST that non-critical data needs not to be accommodated within the Argo netCDF, although no specific recommendation on this particular data was made.

Three possible placements of this data were presented

1) Trajectory netCDF
2) Tech netCDF with present format
3) Tech netCDF with modified format

The preference of the ADMT was either 2) or 3). For 2) the suggestion would be to not complicate the TECH_PARAMETER_NAME with a measurement code nor index, but to add these values into the TECH_PARAMETER_VALUE resulting in multiple values in this field rather than the standard single value.

In option 3) a detailed example of what this data would look like in a netCDF is requested. The impacts on the dataset should be highlighted (e.g. Need for PRES adjustment in tech netCDF).

The use of the newly discussed GDAC 'dacaux' directory for this data should be considered. This would make it the responsibility of those most interested in this data, taking pressure off of the DACs and technical files. It would also ensure that this data is permanently available without impacting the Argo data system directly.

Action: Study how to store time-series data in Tech Argo netCDF files if either option 2 or 3 is pursued. If necessary, test this solution in the 'dacaux' directory

9.4 Storing Timing information Feedback from AST and proposal on how to store timing information in b-profile files

M. Scanderbeg reported on AST feedback concerning the issue of timing information associated with profile files and how to store it. The AST felt that this timing information was important to the BGC community, but not to the core Argo community. Therefore, the AST suggested that this information be stored in the b-profile file and asked the BGC community to make a proposal on how to do this. The BGC community has thought about this and Henry Bittig went on to present their proposal. He began by illustrating uses of measurement times by Biogeochemical-Argo, e.g., for sensor time response corrections, thermal lag corrections, etc. This information needs to be unambiguously assigned to profile measurements, which a PRES value from the traj file cannot ensure (multiple PRES with the same value but with different sensor data is possible). Following the AST feedback, Henry presented a suggestion for an optional i-parameter in the b-profile files called 'MTIME' that gives the time of the individual measurement relative to JULD of the profile which is used as a 'base' date. Integer 'seconds' is suggested as the data type since floats report measurement times only as full seconds so far. Storing them as a relative time will avoid the need to adjust 'MTIME' for clock drift (assuming that the individual profile is short enough to neglect clock drift during a profile). During the discussion it was suggested that we change the time unit to fractional days to be consistent with the base date JULD. Moreover, the resolution of a double float (as JULD) allows for potential future sub-second time storage. The global range should allow for (deep) profiles longer than one day.

9.5 Discuss what parameters go into CONFIG_PARAM and how the mission number is assigned

The transition to V3.1 meta netCDF is 88% complete (Data at GDAC as of September, 14th, 2016). A cursory look at the contents of the new CONFIG variable group was performed. The primary goal was to identify differences in use of these variables between groups and float types. Identifying differences early will save work in the future.

Park Pressure and Profile Pressure: All DACs are including these critical CONFIG values within their netCDF meta files.

Action: John Gilson to inform DACs of files that do not include these two CONFIGs.

Non-Changing CONFIG: A clarification is necessary in the manual that makes clear that in addition to PI modified CONFIGS, the CONFIG_PARAMETER variable may include other CONFIGS not changed over the life of the float. DACs presently are including non-changing CONFIGS for practical reasons.

Strict versus flexible interpretation of float CONFIG: Some groups interpret this variable block to hold only those CONFIGs which control that specific float type (e.g. APEX 'downtime' but not 'cycle time' nor 'park time'). Other groups attempt to fill all the mandatory CONFIGS within this variable block even if the float type does not directly use a similar CONFIG in its operation. Due to the fact that these CONFIGs are important for data tracking by the AIC and for trajectory estimation (e.g. Cycle time, surface time) and that this is the only variable within the V3 netCDF for these meta values, it is important that groups add these meta values if at all possible.

Action: John Gilson to compile a list of critical mandatory and highly desirable CONFIGS to be included in all floats. Cycle time should be included and DACs are asked to estimate it if the float does not send this information.

Non_PI directed CONFIG changes: Some groups were including non-PI directed (not sent via 2-way communication) CONFIG changes in this variable group. An example is the CONFIG controlling the amount of pumping to target park depth. This CONFIG changes during normal float operation as the float learns how much to pump to best target park. It was decided that only PI directed changes to CONFIG should be included in CONFIG_PARAMETER.

Exact Missions: As the manual states, best practice is to minimize the number of CONFIG_MISSION_NUMBER values by grouping matching CONFIG constellations with one CONFIG_MISSION_NUMBER. Occurrence of non-unique missions is an error seen in V3.1 meta files from multiple groups. AOML, as policy, do not minimize the number of missions for some float types.

Action: Re-write of the Argo manuals definition of the CONFIG_PARAMETER variables based on this discussion. Indicate that CONFIG_MISSION_NUMBER should change only if the PI changes a variable. Automatic adjustments by the float during its regular operation should not create a new mission.

(CONFIG_PARAMETERS)….include all applicable mandatory and highly desirable parameters, and any other parameters that are changed by PI 2-way communication during the life of the float. Due to the importance of basic trajectory meta information, the mandatory and highly desirable parameters should be estimated if not directly part of a float's CONFIG.

9.6 RTQC on interpolated or changed values

A proposal was presented with respect to the position qc flag. **The consensus and decision was to flag bad interpolated values with 9 and replace the position with Fill Value.** Concerns are: (1) do we need to distinguish between interpolation and extrapolation? (2) do we need to indicate if the positions used for interpolation are from GPS or Iridium? Claudia Schmid thinks it would be beneficial to do both. Another concern came up during the presentation. If the traj file is the repository for all positions, then it may be advisable to keep the Iridium positions in the traj file. Claudia Schmid thinks this is the way to go, because the Iridium positions may be used for interpolation, and because if we do not do that, then it will be hard to access these positions in the future if desired. How to handle the Iridium positions will be part of the discussion on how to handle under ice floats.

Another discussion centered on the issue of handling changes to PARAM (e.g. CHLA quenching). The options were presented and the consensus was to only allow changes in the adjusted fields. The flag of 5 should be used in such cases. An open question is what to do if such a value fails a QC test. Should it be flagged as 4 or should it be flagged as 9 with the value set to Fill Value? However, this is not yet an issue as today the interpolated CHLA adjusted values have a flag of 8 or 5 after real-time QC (they will not be flagged as bad in real time).

In the discussion, it appeared that some positions are extrapolated values. The working group on positions should investigate whether extrapolating position is a valid method.

9.7 Estimated position handling

Several DM groups working with under-ice floats have created a list of issues that need to be resolved to ensure that all of the required position information can be given in the data files. The floats this concerns comprise RAFOS floats in Weddell Gyre that use RAFOS receiver to obtain time-of-arrival and correlation heights from moored sound sources and use this data to calculate a position in DM and SOCCOM under-ice floats and regional ice-pilots where different groups are working on new DM methods to better estimate under-ice positions. For a given cycle of these floats it could either have surface or stored the data on board. If the float has surfaced the position could have been derived from GPS positions, Iridium or Argos fixes or linear interpolation replacing bad positions in RT. For the under-ice profiles locations would be calculated by either linear interpolation in RT/DM, estimation from RAFOS data in DM or custom method (extrapolation, f/H contours, stream function,

etc.) in DM. The DM groups felt it was necessary or the user to know how a position was determined and the quality of the position.

Two proposals were presented to augment the POSITIONING_SYSTEM variable in the meta data file. It was proposed to either include three more options (INTERP, EXTRAP and CUSTOM) and use a POSITIONING_QC of '8' to broadly indicate extrapolated or only add one more option to the POSITIONING_SYSTEM (ESTIMATE) augmented by POSITION_QC flags 6 = extrapolated and flag 7 = custom method.

The discussion of these proposals at ADMT seemed to view the additional entries into the POSITIONING_SYSTEM as too detailed for the ordinary user needs and found the four existing entries for this variable sufficient to give the user information about the positioning system together with a QC of 8 which would indicate interpolation/estimation. Assigning the so far unused qc flags to represent details about the interpolation/extrapolation method was rejected because it would limit our future use of the remaining unused flags and it seemed sufficient for the user to know the position was not actually measured. However, in the discussion it turned out that the dimensions of POSITIONING_SYSTEM differ in the meta file with POSITIONING_SYSTEM (N_POSITIONING_SYSTEM, STRING8) to the dimensions in the trajectory file being only (STRING8) and therefore it might not be possible to transfer the information to the trajectory file. In the discussion it was also noted that there is no information on the POSITIONING_ACCURACY in the profile files. There was no clear consensus after this discussion if we need to add it to the profile files and it was suggested to continue the discussion intersessionally to resolve this issue.

The proposed additional entries for the POSITIONING_ACCURACY field in the trajectory file were in generally approved and will give error estimates for the other methods in four classes. The classes were proposed to cover the ranges < 5km, 5-20 km, 20-100 km and >100km. These should be assigned appropriate strings and it should be made sure they could not be confused with the ARGOS classes A, B, C. It was noted that some DACs are already filling error values using the ERROR_ELIPSE_MAJOR (MINOR)(ANGLE).

Since the open questions concerning the dimensions of the POSITIONING_SYSTEM in meta and trajectory files and implications of adding POSITIONING_QC in profile files could not be solved it was suggested to form a working group existing of John Gilson, Birgit Klein Jean-Philippe Rannou and Esmee van Wijk to address these issues in the interim-period and suggest changes to the files. Other remaining issues with split of under-ice data in the trajectory and tech-files should also be addressed in this group.

Actions:

- **Study how to provide information on position accuracy for floats without a surface position (i.e., under ice floats, floats with no GPS or Iridium position)**
- **Modify User Manual according to meeting results**
- **Modify QC manual according to meeting results:**
    - **Profile files need to be regenerated with data flagged bad when a float is put on the grey list**
    - **Change QC flag '8' meaning from 'interpolated' to 'estimated'**
    - **If RTQC test fails on an interpolated value, change the flag to '9' and replace the interpolated value with fill value**

10 Trajectory issues

10.1 Discussion on how DACs are assigning MC numbers, handling mission changes in the transition and Trajectory File Status to V3.1 Traj files

M. Scanderbeg reported on several issues related to trajectory files including how the files are being used in papers, what can be done in real time and delayed mode, updates to the Trajectory Cookbook and a possible delayed mode quality control workshop. Currently, about 70% of trajectory files at the GDACs are in v3.1. Most DACs have at least some v3.1 trajectory files which is great

news and huge progress since the previous ADMT meeting. Upon analyzing the Argo bibliography, M. Scanderbeg found over 100 papers published using Argo trajectories. The majority are regional studies using Argo trajectory data from the GDACs. This should motivate Argo to produce high quality trajectory files, especially in real time. To this end, the DAC Trajectory Cookbook needs to be kept up to date to help DACs create the trajectory files accurately and in a uniform manner. The DAC Trajectory Cookbook will be updated yearly and proposed changes made in the last year were presented. Most of the changes are clarifying things like not including launch data in the N_CYCLE array, that measurement codes can change order from cycle to cycle, and that the CONFIG_MISSION_NUMBER for cycle 0 should be Fill Value. In addition, information was added on how to create trajectory files for the new HM2000 float. Finally, M. Scanderbeg requested help from Iridium APEX experts to provide additional information on applying clock offsets and to provide clear links between data in the msg and log files and the measurement codes. Rebecca Cowley and Justin Buck will work with Dana Swift to provide this information for the DAC Trajectory Cookbook.

Another way to improve the quality of real time trajectory files is through the GDAC trajectory file checker. A small working group has been interacting with Mark Ignazewski to create trajectory file checks and will continue testing and the file checker on trajectory files through the end of the year. The final suggestion to improve real time trajectory files on the GDACs was that if a float is greylisted, this information should be carried to the trajectory files. In other words, the corresponding <PARAM>s should be marked with a QC flag of '3' for the appropriate cycles. The ADMT agreed that this was a good idea.

Finally, M. Scanderbeg raised several questions about delayed mode trajectory files. She said that there should be a better definition of what a 'D' trajectory file should contain, but recognized that current dmode operators may not have the time or expertise to perform dmode on trajectory files. She then asked if an outside person or group should do so or if ANDRO files can be used to produce 'D' mode trajectories. She also asked if Argo expects that all trajectory files will one day be 'D' files. Given that 70% of the trajectory files are in delayed mode, she suggested that a trajectory dmode workshop could be held alongside next year's ADMT meeting to explore some of these questions. Virginie Thierry said that EuroArgo intends to look at trajectory files this year and would be very interested in a dmode trajectory workshop in a year. This idea will be revisited in a few months to gauge interest and feasibility. It was decided that when a float was dead and the trajectory file had been completely converted to D-mode, the R-mode file should be removed from the GDAC. This will be managed by the DACs through the 'removal.txt' file.

10.2 Update on Coriolis to generate V3.1 D-traj files from ANDRO

Based on Argo trajectory data, Michel Ollitrault and Jean-Philippe Rannou have created 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: http://www.ifremer.fr/lpo/files/andro/ANDRO_JAOT_2013.pdf

See also : http://wwz.ifremer.fr/lpo/Produits/ANDRO

From Andro data set, 6900 Argo delayed mode trajectories in format version 3.1 are now available on: ftp://ftp.ifremer.fr/ifremer/argo/etc/coriolis-custom/argo-andro-data Note that these files only cover data until the end 2009 and so will be complete only for floats that were inactive before that time.

These files will not pass the recent version of the format checker. Some updates are needed. The update will be performed after the delayed mode file format checker release (well underway).

The delayed mode trajectories are described in ftp://ftp.ifremer.fr/ifremer/argo/etc/coriolis-custom/argo-andro-data/argo-andro-data_20141016.pdf

For each float, all ANDRO trajectory information has been transferred to an Argo V3.1 delayed mode trajectory. From GDAC profiles : pressure, temperature and salinity adjustments have been reported in the adjusted parameters of V3.1 trajectory file.

The Principal Investigators (PI) and DACs can decide to use or ignore the delayed mode trajectories proposed from ANDRO

11 Delayed Mode Data Management

11.1 Status of D-Files provision

The percentage for each DAC of Dmode eligible floats that have passed through DMQC was presented. A cycle is eligible for DMQC after 12 months. The overall percentage of 68.0% is a reduction of 1.7% from last year. This continues a trend seen in previous years. Three DACs (CSIRO, KMA, and MEDS) increased their percentage from last year (reduced their backlog), but the remaining DACs increased their backlog of eligible cycles awaiting DMQC

Discussion concerned the easing of the official Argo target to perform DMQC on all floats every 6 months, which directly leads to the 12 month metric above. Easing the DMQC revisit interval will not by itself reduce the backlog, but it may be more efficient leading to increased throughput. Reduced occurrence of conductivity drift in recent years, and availability of other near-real time tools (e. g. anomaly detection via altimetry) provides some cover for the DMQC relaxation. It was noted that for some groups the DMQC target may be linked to funding levels. A request was made to promptly notify the AST regarding this discussion. However it was pointed out that the DM data was of most use for scientific research and so we should work to ensure this was provided as soon as possible. However it was also pointed out that you need at least 2 years of data to reliably detect most salinity drift so the shorter time period might be missing some problems.

Analyzing DMQC results will help us judge whether relaxing our timing will risk degrading our data quality. Looking at how many floats have significant drift after 1, 2, 3 or more years will give us the data we need to make this decision.

Action Item: John Gilson has agreed to discuss this topic with Argo DMQC operators, who were not well represented at this meeting. The DMQC community will be asked to document efficiency improvements as a result of this change.

11.2 Changing flags at GDAC for D-profile that present anomalies not corrected

At previous meetings, it was recognized that there are floats and profiles which have repeatedly failed near real time quality tests and the DACs/PIs for these floats have taken no action to either mark the data as bad or to provide feedback to the test administrators that the data is actually of good quality. Therefore, the ADMT requested guidance from the AST on what to do in these situations. The AST suggested that for floats and profiles falling into this category, the DACs and PIs should be warned that if the data is not marked bad or feedback is not provided to the test operator, then the decision will be made to change the quality flags for the individual profiles to a QC flag of '3'. By doing so, the data is effectively 'removed' because it is of poor quality. This prevents degradation of the Argo data set.

Therefore, if no action is taken by the DACs and PIs, even after being warned, the AST co-chairs will be notified. At that point, the AST co-chairs will try and work with the DACs/PIs to fix the problem. If no fix is provided, the AST co-chairs can then direct the DACs to reprocess the affected files to apply a QC flag of 3.

In the discussion at the ADMT meeting, it was decided that there are two different situations here: one for individual profiles with identified anomalies and one for which an anomaly is identified in one profile and then continues on for many more profiles. In the case for which there are many profiles with identified anomalies, the ADMT suggested that the DAC greylist the float which removes it from the GTS and signals the data is not of good quality very quickly. In the case of individual profiles, the ADMT agreed with the suggestion that DACs and PIs be notified that these anomalous profiles will be

marked with a QC flag of '3' in a month if nothing is done. Following that, the AST co-chairs will be notified for permission to do so.

In either case, it was suggested that these anomalous floats and profiles should be made a top priority for the responsible delayed mode operators. If it is found in delayed mode that these profiles are of good quality, they can be flagged as such and feedback should be sent to the test operators to ensure that the profiles do not get flagged again by the near real time tests.

All near real time test will be re-run in December. At that point, anomalous floats and profiles older than 1-2 years will be identified. Mathieu Belbéoch will work with near real time test operators to notify DACs and PIs of floats with identified anomalies.

11.3 Orphan float management

M. Belbéoch presented his study on the delayed-mode data status of floats that are not undergoing DM at this point. (see Annex 5 –Orphan Float report).

The major conclusion of this study is that that most of the gaps in DM processing are already the responsibility of one of the regular Argo programs. Floats from some programs, however, remain without an identified DM operator. He then worked to identify volunteers for programs without DM capacity.

In particular a number of volunteers were identified to provide US Navy float DM processing: WHOI will process Indian Ocean and West Pacific ocean floats, Germany will process North Atlantic floats, Italy will process Med sea floats and Scripps will process the few SOLO floats in the East Pacific. Volunteers still need to be identified for Hawaii and US west coast floats.

China and Korea plan to address this issue in the coming months.

12 ARC status

12.1 North Atlantic ARC

DM consistency checks in the NA-ARC region

All the floats that have been processed in delayed mode in the North Atlantic ARC (1514) were checked again using a slightly modified OW method. Compared to the original OW method (Owens and Wong, 2009), our configuration better takes into account the inter-annual variability and provides more realistic error bars. The modifications applied are described in Cabanes et al, 2016.

We first selected a subset of unbiased floats and checked whether the modified OW method gave results generally in accordance with the PI decision (i.e. no correction is necessary). Among the 1058 unbiased floats, we only found 6 floats which may require a correction for an offset or a drift.

Finally, we checked the 299 floats that have a DM correction. We found 13 floats for which it may be necessary to revise the correction. A report will be send to the DM operators of these floats.

It was noted that this type of analysis is extremely useful to the Argo program and it was hoped that it will be continued in the future.

Cabanes C., V. Thierry and C. Lagadec (2016). Improvement of bias detection in the conductivity sensor of Argo floats. Application to the North Atlantic Ocean. Deep-Sea Res Part I, 114,128-136. doi.org/10.1016/j.dsr.2016.05.007

Owens, W.B. and A.P.S. Wong, 2009. An improved calibration method for the drift of the conductivity sensor on autonomous CTD profiling floats by Θ-S climatology. Deep-Sea Res. Part I, 56:450–457.

Action: Ask SBE to share their recommended cleaning and storage procedures for SBE sensors.

12.2 Statistics on the delayed mode corrections

Some indications exist that some floats with SBE sensors are more often corrected for a fresh bias at the beginning of the mission than a too salty one, although it is a very low percentage of the total of the floats (2% versus 1%). This seems to be more frequent for Provor/Arvor, Nemo and Solo SBE, than for APEX. According to Seabird, the bias is probably due to fouling. A recommended procedure for rinsing and cleaning the cell for storage has been provided by SeaBird and must be distributed to all float operators who use these floats. At NKE and Ifremer we modified our procedures to fit the recommendations of SeaBird. It would be useful if each group deploying floats can describe their current cleaning and storage procedure if used.

12.3 South Atlantic ARC:

Activities related to float deployments are continued in close collaboration with WHOI. AOML as well as WHOI work towards finding deployment opportunities. AOML provides ship riders for certain VOS (voluntary observing ships) lines used for float deployments. WHOI does the planning with respect to deployment locations.

12.4 MedArgo ARC

The historical float fleet has increased by about 7% (335 platforms) since last year, whilst the quantity of CTD profiles acquired has increased by 19% (38700 CTD profiles). Statistics about the lifetime of floats have been calculated; the mean half life varies according to the platform type and transmission mode and it is about 500 days. Note that this does not take into account the floats that have been recovered (and so artificially appear to have a shorter lifetime), nor those that were beached.

DMQC has been performed on about 85% of the eligible floats in the Mediterranean Sea, including the US NAVOCEANO files stored at the AOML DAC. More than 4600 CTD profiles were collected this year (up to September) and 18 new floats were deployed with the contribution of 3 countries. The first deep floats were deployed in the Mediterranean Sea in June in the Hellenic Trench. The deployment plans for the end of 2016 and 2017 are that about 35 floats will be deployed.

Action: Black Sea floats need a DMQC operator. Follow up with Bulgarian Argo Program to confirm their commitment to DMQC floats in the Black Sea. If this is not possible for them, ask Giulio Notarstefano to consider performing DMQC on these floats.

12.5 Pacific ARC:

JAMSTEC has operated PARC in cooperation with IPRC and CSIRO. PARC has provided float monitoring information in the Pacific on its web sites since 2006 including: float activity watch, deployment plans, results of comparison between individual Argo TS profiles and gridded data (WOA05 and MOAA-GPV), feedback of QC status and results to PIs. Argo products of countries currently involved with PARC have been provided on web sites of PARC and each institute. Most of the countries have provided objective analysis data using Argo data. JAMSTEC is going to improve PARC web site by next ADMT. JAMSTEC will make the float monitoring information more visible and useful.

The ADMT recognized the work done by PARC to implement the advanced real time QC tests and requested more feedback and information on these tests. If anomalies are found, the ADMT requested this information be relayed to DACs and PIs. Additionally, if any tests were found to be useful and could be applied in real time, the ADMT requested this be presented to the ADMT at a future meeting.

Action: Assess the advanced QC processes used by PARC and see if these can be applied to RTQC. During assessment, please feedback any anomalies to PIs and DACs responsible.

12.6 Southern Ocean ARC:

A short presentation was given on the activities of the Southern Ocean ARC. At the moment the three main partners consist of BODC, BSH and CSIRO, and further expressions of interest in joining SOARC partnership are welcome. A new webpage will be online soon and be hosted by BODC. One focus of work will be on investigations for under-ice positioning methods and work with CCHDO and SOOS to improve the Argo reference database in the Southern Ocean. The proposed plan to develop a list of co-located CTDs-on-deployment was met with great interest. Identification of orphaned floats in the southern Ocean has been started and as a result CSIRO has committed to take care of 20 Italian floats in this region.

12.7 Indian ARC:

As part of the ARC activities of Indian ocean, INCOIS has undertaken the following activities:

1. Conducted several user awareness and data utilization workshops to bring about awareness of Argo among the students of various universities. This is also our mandate as a part of our International Training Center for Operational Oceanography (ITCOO) centre.

2. Developed Graph theoretical based algorithms for performing QC of Argo data. This has been tested with some typical floats deployed by Indian and found to yield good results. A manuscript is prepared and will be submitted for peer review. Once published it can be expanded to other ocean basins.

3. Continued Data search and archeology of high quality CTD for updating the Argo reference data base and also for use in DMQC of Argo data from various sister concerns.

4. Continued archiving of temperature and salinity profile data from floats deployed by Indian and other countries in the Indian Ocean and making them available through Web-GIS.

5. Sustaining 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. Also monitoring the publications that are arising out of the Argo and derived products.

6. Continued to synchronize the "Argo data and product for Indian Ocean" products being made available on INCOIS and UCSD website. These products have GUI features catering to students and other researchers with low bandwidth capabilities.

13 GADR

The Global Argo Data Repository (GADR) is hosted by the National Centers for Environmental Information (NCEI, which includes all functions of the former US National Oceanographic Data Center) under the direction of Charles Sun. The GADR mirrors the Coriolis Argo GDAC twice daily, including all profile, trajectory, and meta data files as well as quality control manuals. The GADR also archives a monthly snapshot of the Argo dataset as represented at the Coriolis DAC. This monthly snapshot can provide the basis for the Argo digital object identifier (DOI) data. Data volume downloaded from the GADR increased 40% in 2015 (159 GB over 2014 (113 GB) while distinct hosts requesting data from GADR decreased by almost half in 2015 (1,158) over 2014 (2,117). So there are fewer users requesting larger data sets. The World Ocean Database (WOD), also hosted at NCEI, uploads data from the GADR every three months, compares this to Argo data already in WOD, and makes replacements accordingly. When problems are found, a report is sent to Charles Sun to check against the GADR. If problems are external to the GADR, Charles sends on the report to Mathieu Belbéoch at JCOMM. An informal request was made to Argo (and to CCHDO) to participate in the

World Meteorological Organization (WMO) Marine Climate Data System (MCDS) as a GDAC within that system. As Argo was amenable to the idea, a formal request is forthcoming.

14 All other business

14.1 Summary of the 16th ADMT actions

Sylvie, Ann and Megan have collated an action list from the ADMT17 discussions and the list was reviewed, actions assigned to DACs/operators, deadlines identified and priorities set.

14.2 Location of next meeting

The location of ADMT18 will be either in Ville_Franche in France hosted by CNRS/LOV or in Hamburg hosted by BSH Germany. This will depend of the availability of the new building that is under construction at LOV

15 Annex 1 – Agenda

Welcome address *Ms. Zheng Rui, department of international cooperation, SOA, and Mr. Xiang Wenxi, Vice General Director of NMDIS* (*15mn)*

- **Feedback from 17th AST meeting** : *B. Owens (30mn)*
- **What is an Argo float and how to store data from Argo floats with sensors not yet approved** *(B. King) Action 23 (30mn including discussions)*
- **Status of Argo Program and link with Users (1h00)**

Status on the actions 1,2

  - ***Review of the Action from last ADMT*** *(Sylvie Pouliquen) 15 min*
  - ***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 Belbéoch) Action 2 (30min)*
  - **New features on JCOMOPS/AIC WWW Site** *(Mathieu Belbéoch Antonin Lizé) (20min)*
  - **Proposal on a set of Metrics to Monitor Argo dataset** *(Mathieu Belbéoch – Brian King) Action 1 (30min)*

- **Feedback on 5th BIO-Argo Workshop (H Claustre) (0h30)**
- **Real Time Data Management (2h)**

Status on the actions : 3,4,5,6

  - **GTS status and** *(Anh Tran) (20min)*
  - **Status of delivery of BUFR to the GTS including BFFR converter tools feedback on the GTS test** *(Anh Tran, Kensaku Kobayashi, Thierry Carval and Mike Frost) Actions 3,4 (20 min)*
  - **Status of anomalies at GDAC** *(Christine Coatanoan) (20min)*
  - **Status on Anomalies detected with Altimetry** *(Stéphanie Guinehut) (20min)*
  - **Status on density test implementation** *(Ann Thresher-Gronell) (15min)*
  - **Status of real-time NST tests** *(Justin Buck) (15min)*

- **Status of Argo Program and link with Users follow up (0h30)**
  - **Progress on Citation Index for Argo Data** *(J Buck, T Carval, Ken Casey) 20mn*
- **Progress on Argo Reference data base (0h30)**

Status on the actions 7,8,9

  - **Summary of the actions since ADMT-16 (***C Coatanoan*) Actions 7,8,9
  - **CCHDO/US-NODC-progress** *(Steve Diggs, T Boyer)*
- **GDAC Services (M Frost , T Carval) (1h00)**

Status on the actions: 12,13,14,15,16,17,18

  - **Operation status at US-GDAC and Coriolis-GDAC***(Thierry Carval, Mike Frost) Actions 11, 12 (30min)*
  - **Status of Format Checking operations for profiles** *(M. Scanderbeg for Mark Ignazewski, Mike Frost) Action 13 to 18 (30min)*
    - **For profile files**
    - **For meta data, tech and trajectory files**
  - **Maintenance of tables centrally – who looks after additions and changes operationally? (***Thierry Carval, Mathieu Belbéoch, Catherine Schmechtig)*
  - **Status of the new GDAC Cookbook and profile Cookbook** *(Thierry Carval, Mike Frost)Action 21 (10 min)*
  - **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 : 11,

  - **Upgrade to V3.1 Real-Time and historical T&S floats at GDAC** *(all) Action 11 (30min)*
  - **Revisit Mandatory and desirable meta data list** *Claudia Schmid, Ann Thresher, Mathieu Belbéoch (15min)*
  - **Review status of meta and tech parameter tables** *(Ann Thresher)*
  - **How to store buoyancy actions** *(J. Gilson for J-P Rannou)*
  - **Storing Timing information Feedback from AST** *(Megan Scanderbeg) Action 26 (15min)*

- **Proposal on how to store timing information in b-profile files** (*H. Bittig*)
- **Discuss what parameters go into CONFIG_PARAM and how the mission number is assigned (***J. Gilson***)**
- **RTQC on interpolated or changed values** (C Schmid and T Carval)
- **Estimated position handling** *(Birgit Klein)*

- **Trajectory from Argo data (1h00)**
  - **Discussion on how DACs are assigning MC numbers, handling mission changes in the transition to V3.1 Traj files** (all DACS)
  - **Update on the DAC Trajectory Cookbook and Trajectory File Status***(Megan Scanderbeg) Action 20*
  - **Update on Coriolis to generate V3.1 D-traj files from ANDRO** *(T Carval) Action 10 (15min)*
- **Delayed Mode Data Management (1h00)**
  - **Status of D-Files provision** (J Gilson M Belbéoch) (10min)
  - **Changing flags at GDAC for D-profile that present anomalies not corrected** *(Ann Thresher, Megan Scanderbeg) Action 22 (15min)*
  - **Removing old T&S orphan floats from GDAC? Recommendation from AST** (Ann Thresher, Megan Scanderbeg) Action 25 (15min)
  - **Orphan float management** *(Ann Thresher, Mathieu Belbéoch Sylvie Pouliquen) (15mn)*
  - **New topics ???**
- **ARCs: provide an information on what done and what is planned (1h30)**
  - **Update on ARC progress** (ARCs leaders) 15mn each
    - **North Atlantic** Cecile Cabanes
    - **South Atlantic** Claudia Schmid
    - **Mediterranean Sea** Giulio Nortastefano
    - **Pacific Ocean** Kanako Sato
    - **Indian Ocean** Uday Bhaskar
    - **Southern Ocean** Birgit Klein/Matt Donnelly

- **GADR Status of the Archiving centre** (T Boyer) **(0h30)**
- **Other topics (1h00)**
  - **Summary of the 17th ADMT actions** *(S Pouliquen, A Gronell Thresher M Scanderbeg)* **30mn**
  - **Location of 18th ADMT**

16 Annex 2 - Attendant List

First Name	Last Name	Company	Country
Mathieu	Belbéoch	JCOMMOPS	France
Vincent	Bernard	Coriolis	France
TVS Udaya	Bhaskar	INCOIS	India
Henry	Bittig	LOV	France
Emmanuel	Boss	University of Maine	USA
Tim	Boyer	NCEI	USA
Robert	Brice	CLS	France
Justin	Buck	BODC-NOC	UK
Jae-Young	Byon	KMA	South Korea
Cecile	Cabanes	CNRS	France
Jiannan	Cai	Xiamen University	China
Thierry	Carval	IFREMER	France
Herve	Claustre	CNRS	France
Christine	Coatanoan	IFREMER	France
Rebecca	Cowley	CSIRO	Australia
Steve	Diggs	CCHDO	USA
John	Gilson	Scripps Institution of Oceanography	USA
Stephanie	Guinehut	CLS	France
Ken	Johnson	MBARI	USA
Brian	King	NOC	UK
Birgit	Klein	BSH	Germany
Kensaku	Kobayashi	JMA	Japan
Catherine	Lagadec	IFREMER	France
Joon-Soo	Lee	NIFS	South Korea
Zenghong	Liu	SIO, SOA	China
Anthonin	Lize	JCOMMOPS	France
Giulio	Notarstefano	OGS	Italy
Breck	Owens	WHOI	USA
Jong-Sook	Park	KMA	South Korea
Steve	Piotrowicz	NOAA	USA
Antoine	Poteau	UPMC/CNRS	France
Sylvie	Pouliquen	IFREMER	France
Guoqiang	Qiu	Xiamen University	China
Jan. H	Reibmann	BSH	Germany
Kanako	Sato	JAMSTEC	Japan
Megan	Scanderbeg	Scripps Institution of Oceanography	USA
Catherine	Schmechtig	CNRS	France
Claudia	Schmid	AOML	USA
Chaohui	Sun	SIO, SOA	China
Virginie	Thierry	IFREMER	France
Ann	Thresher	CSIRO	Australia
Anh	Tran	DFO	Canada
Haili	Wang	Xiamen University	China

17 Annex 3 - ADMT16 Action List

On 26 actions: 18 Done 9 Partially 1 Not Done and one canceled

	Action	Target Date	Responsibility	Priority	Status
1	Revise the set of metrics proposed by Mathieu and Brian	AST17	Brian, Sylvie, Mathieu, J Gilson, Katie Gowers, Pelle	R	**A first version of the KPIs proposed by Mathieu has been implemented and will be discussed at AMTT17 no feedback on Brian metrics**
2	AIC to make the link with the Centers that are integrating and redistributing Argo data and be sure they use our adjusted data and use the flags and report to ADMT	ADMT17	M Belbéoch	R	**cancelled**
	Real Time Data Stream				
3	Centres with access to the GTS to compare files sent to files received at various nodes. Data is going missing and we don't know where. Run comparison looking for all files sent in one or two days and DACs then need to provide list of what they sent onto the GTS in that time period.	AST17	Anh with JMA, BOM,UK MET OFFICE, AOML, US-GODAE with all DACs	H	**The test was done and a report was sent to the ADMT. Feedback will be provided at the meeting. There are still some issues with some DACs. From Coriolis: Once an hour, all new profile files are inserted in a BUFR message and sent on GTS. The BUFR encoder manages the primary profile of a cycle file. But it ignores the secondary profiles and the bio-profiles. Coriolis DAC is updating its version of BUFR encoder; the new version will manage primary, secondary and bio-profiles.**
4	Put the latest version of the BUFR encoders on the ADMT WWW pages All DACS to verify if they use the latest version of the Netcdf-BUFR converter	AST17	Thierry/Kensaku Kobayashi/Anh All DACs	H	**Done: http://www.argodatamgt.org/Documentation/Tools Argo NetCDF converter to WMO-BUFR, developed by Japan Meteorological Agency (JMA) http://dx.doi.org/10.17882/45983 Argo NetCDF converter to WMO-BUFR, developed by the Department of Fisheries and Oceans Canada (DFO) http://dx.doi.org/10.17882/45985**
5	Split the QC manuals in two : one for Core Argo managed by Thierry and Annie, one for Bio-Argo managed by Catherine and Virginie	AST17	Annie and Catherine	R	**done**
6	Change QC manual to only accept data with JULD >= 17167 and add range test to check that date is not later than NOW UTC.	AST17	Annie and Catherine	R	**done**

	Action	Target Date	Responsibility	Priority	Status
	Reference Database				
7	Provide feedback on rejected CTDs back to CDHDO and NCEI	ADMT17	Christine	R	**Report sent on 2016/06/06 to CCHDO**
8	Screen Argo reference dataset contents to assess data or originator quality issues based on Christine's QC of the dataset. Exclude "bad" quality providers.	ADMT17	Christine	R	**a study has been made and will be presented at the meeting**
9	Label the source in the REF DB to facilitate to identification of high quality data.	ADMT17	Christine	R	**In the new version, new column qc level in box files : COR for CORIOLIS, CCH for CCHDO, OCL for US-NODC, SPI for Scientific PI**
	Delayed Mode trajectory				
10	Thierry to update ANDRO converted D-Traj files to V3.1 as first version of D-files.	AST17	Thierry	R	**On hold The conversion from 3,0 to 3,1 will start when the trajectory format checker is officially released.**
	GDAC				
11	GDAC with AIC to keeping track on V3.1 progress by adding version information to the detailed index files	AST17	Mike, Thierry and Mathieu	R	**A status of the V3.1 progress is available in the Coriolis DAC/GDAC annual report, page 21, §"File format: transition to Argo NetCDF V3.1" http://archimer.ifremer.fr/doc/00350/46128/**
12	Provide a link from the ADMT pages to Megan's Matlab routine and to latest version of the BUFR converter	AST17	Thierry	R	**Done http://www.argodatamgt.org/Documentation/Tools**
13	Audit meta data config units against allowed tech units and see if there are any outliers, then negotiate to either add units or use an approved unit.	ADMT17	Mark, Ann	R	**units are now complete and include all required for both files The FileChecker is validating CONFIG parameter units**
14	For Tech file : generate warning when units of technical variables don't match the type of the field	ADMT17	Mark	R	**On hold pending completion of adding trajectory file data validation to the FileChecker**
15	Check data-type consistency with File name and presence or not of adjusted-parameters and reject files that don't match	ADMT17	Mark	R	**Completed. FileChecker now performs file name validation**
16	Implement Check for Trajectory file against reference tables (like for profile) when the discussion on the test to be done has reached consensus	ADMT17	Mark	R	**The FileChecker validates the "header date variables" (DATE_UPDATE, etc) and the float meta-data (PLATFORM_NUMBER, DATA_CENTRE, etc). Tests for the N_MEASUREMENT and N_CYCLE variables are still under**

	Action	Target Date	Responsibility	Priority	Status
					development and testing.
17	Move Ref Table from Google doc to something that can be more easily be machine readable and define a workflow for the information to flow to the person that will need to review and approve changes as well as to the GDAC for the required FileChecker update.	ADMT17	Mathieu, Mark	R	Not started
18	Modify the file checker to generate warnings for non-standard data types in the files. After 6 months, make this a rejection.	ADMT17	Mark, Thierry	R	done
	Format				
19	Provide clarification of data mode and parameter data mode usage : update user manual	AST17	Thierry, Annie		done
	GADR				
	Trajectory				
20	File format update and update the traj cookbook	AST17	Megan		http://dx.doi.org/10.13155/41152
21	Profile cookbook to be updated and posted on the official documents section of the web pages	AST17	Megan, Thierry		http://dx.doi.org/10.13155/41151
	Question to AST				
22	Propose to AST that GDACs change QC flags to Class 3 for D-profiles that aren't addressed when they have received feedback on issues and not corrected them (Altimetry, OA, Format check).	AST17	Sylvie, Ann	R	Done see AST17 report will be discussed at ADMT17
23	Form a working group to address the issue of people wanting to put their floats into Argo. Their recommendation to be approved by AST	AST17	Dean, Susan, Steve Piotrowicz, Brian, Sylvie, Breck, Annie, Megan	H	Discussion started at AST17 and will be continued at ADM17
24	ADMT requests guidance from AST as to what variables are considered of scientific value and need to be stored and which are	AST17	Sylvie, Ann, Brian, Susan	R	Discussion started at AST17 and will be continued at ADM17

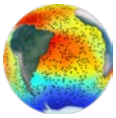
	Action	Target Date	Responsibility	Priority	Status
	useful for only specialist users (DM operators?) who can get that data (means, std, medians) from other sources.				
25	Some older T/S floats remain difficult to assign to DM operators. This is really an AST question - do we keep that data available or make the hard decision to remove it from the GDACs?	AST17	Sylvie, Ann	R	**Done see AST17 report will be discussed at ADMT17**
26	Request guidance from AST for where to store timing information - if it's a profile, put it in the C file? ? This will require a new parameter. Otherwise it can go in the B file. We recommend that sparse snapshots of time go into traj files, true profiles of time go into the core files. And if this is useful, we need to consult float manufacturers to ensure this information is provided. Pose cost/benefit question to AST and Deep Argo	AST17	Susan and Breck to pose the questions	H	**AST suggested that storing profile time be optional and put in the B files since at this time it does not seem necessary for DMQC of Core Argo. Sparse timing can go into the traj files. To be discussed at ADMT17**

18 Annex 4 - ADMT17 Action List

	Action	Target Date	Responsibility	Priority
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
2	Addition of citation information to the readme on the GDACs to better advertise the use of the existing DOIs	AST18	Thierry Justin Tim	
3	Study how to generate and update on a yearly basis indicators on scientific quality •monitoring adjustment made : how it is and how it is evolving ; Method to be provided by Brian • Comparison with Altimetry from Stephanie yearly report	AST18	M Belbéoch, Brian, Thierry, Cecile	R
4	BUFR transmission to be implemented	ADMT18	KMA	H
5	Study if possible to Restart TESAC transmission for CLS and CSIO	ADMT18	CSIO CLS	H
6	BUFR : Ifremer and India to change date to JULD instead of JULD_LOCATION as agreed at last meeting	AST18	Thierry Uday	H
7	Investigate if a change in the order (density before spike test) would help catching more anomalies Spike : add new deeper level (0-500/ 500-1500 / deeper than 1500 with threshold value more strict => T : 6,0 °C 2,0°C 1,0°C S : 0,9 psu 0,3 psu 0,2 – 0,15 psu	ADMT18	Christine	R
8	Stéphanie will add a code to warn DACs, DM operator and PI that a float should go on the Grey list . Follow-up of the correction will be tracked by AIC	AST18	Stéphanie Mathieu	R
9	Anomalies detected and uncorrected after multiple warnings will be submitted to the AST co-chairs for permission to add this float to the grey list or to instruct the DAC to re-flag the data to class 3 if it is a single profile that is affected. All grey listed R-Files will need to be regenerated by the DAC with correct QC	AST18	all DACs	H
10	Provide a cookbook for REFDB update	ADMT18	Christine	R
11	Identify the best quality CTD before inclusion in REFDB	ADMT18	Action Steve Mathieu Brian Breck Tim Justin and Thierry	R
12	Prepare a note for AST to revisit the timing for DMQC processing and identify if 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 statistics using history section of D-file to assess what is the situation now	AST18	Cecile, 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	

	Action	Target Date	Responsibility	Priority
14	Set up the auxiliary directory tree and distribution system at GDAC and test cases	ADMT18	Thierry , Mike,Mark, Rebecca, Claudia	R
15	Test encoding M-File in NetCDF4, evaluate the level of compression and provide these test-files to the community	ADMT18	Thierry	R
15	Set up a group to provide files for the traj file checker	Dec2016	Thierry, J-P, Rebecca, Claudia, JMA	**R**
16	Investigate if it is possible to add the index files and other top files in the rsync service at Coriolis	ADMT18	Thierry	**R**
17	make sure that all ref table are on http://www.argodatamgt.org/Documentation	Dec 2016	Thierry	**R**
18	Correct the 6 digit resolution in geo directory at US-GDAC	ADMT18	Mike	**R**
19	Document M-File generation in GDAC Cookbook	ADMT18	Thierry Mark	**R**
20	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**
21	Investigate difference in delays between two GDACs from AIC report	ADMT18	Thierry Mike	R
22	Improve the submission for rejected meta data file	AST18	Thierry Mike	
23	improve the situation with DACs that are only feeding one GDAC	ADMT18	Thierry Mike	R
24	Study how to store time series in tech-files and test it in the AUX directory.	ADMT18	Thierry, John, J-P	R
25	modify User Manual according to meeting results	oct-16	Thierry Catherine	R
25	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
26	Study how to provide information on the Position Accuracy for under ice float	AST18	Birgit Esmee Jean-Philippe, John, Taiyo, Claudia	R
27	John Gilson to compile a list of critical mandatory and highly desirable CONFIGS to be included in all floats. Cycle time should be included and DACs are asked to estimate it if the float does not send this information.	AST18	Thierry (Manual) +all DACs	
28	Change users manual to indicate that configuration mission number should change only if the PI changes a variable. Automatic adjustments to not create a new mission.	AST18	Thierry, John Gilson	
29	John Gilson to inform DACs of files that do not include the two CONFIGs: park pressure and profile pressure.	AST18	J. Gilson	
30	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**
31	Provide visibility on NCEI DOI near Coriolis-GDAC DOI and use both for biblio activities	ADMT18	Thierry and Megan	**R**
32	SBE should be asked to share the preparation procedures - cleaning and storage - for SBE sensors		Breck	
33	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	
34	Assess the advanced QC processes used by PARC and can these be applied to RTQC	ADMT	Kanako	

19 Annex 5 –Orphan Float report



Argo Data Management
Real-Time & Delayed-Mode Status

M. Belbeoch, Sept. 2016, for ADMT#17
mbelbeoch@jcommops.org,
http://argo.jcommops.org

This report provides information on the status of Argo data availability.
ADMT is invited to provide feedback as appropriate.

Content

IOC Resolution XX-6

(…) concerned coastal states must be informed in advance, through appropriate channels, of all deployments of profiling floats which might drift into waters under their jurisdiction, indicating the exact locations of such deployment. (…)

⇨ *All Argo floats should be registered at JCOMMOPS/AIC (and notified) in advance*

(…) the data and data products derived from those floats will be freely available in real-time and delayed mode through IOC and WMO exchange systems, as well as other appropriate international mechanisms (…)

⇨ *Real-time data distribution should start at 1st profile.*

Executive Summary

⇨ The real time data distribution could be optimized further as half of pending floats are older than a year. It is important to respect international regulations and meet modeler's requirements with real-time distribution of all Argo floats.

⇨ 90% of the array meets timeliness requirements but a few DACs could progress.
A few DACs are slow down at IFREMER GDAC (+3h). Could this be optimized as NRL-MRY adds only 0.5h to the process?
A few DACs cannot meet 24h target at NRL-MRY (while they do for IFREMER).
A few DACS had clear difficulties in August with 50% of profiles distributed within 24h.
There are still a few negative delays problems that need to be clarified and investigated further.

⇨ The ratio of data files processed in delayed mode, vs files eligible to this re-processing, keeps decreasing (68%). About half million profiles are waiting to be processed in delayed -mode. 2/3 of the challenge resides in regular Argo programmes.

⇨ DM processing status in the Southern Ocean is in better shape (78% and 83 % for the two areas studied)

⇨ BioGeoChemical Argo needs to improve all these stats as well

⇨ JCOMMOPS/AIC to improve monitoring stats on these issues on the new website

Performance Indicators

Data Flow

Delivery Argo BioGeoChemical	88.96% 8/2016	95% Monthly Target	Nb of registered units vs number of operational units (BioGeoChemical Argo)
Delivery Argo Global	94.01% 8/2016	95% Monthly Target	Nb of registered units vs number of operational units (Global Argo)
Quality (DM Processing) Argo Global	68.53% 8/2016	75% Monthly Target	Nb of DM obs vs NB of DM eligible obs
Quality (PSAL) Argo Global	88.33% 8/2016	95% Monthly Target	Nb of monthly obs of best quality - PSAL
Quality (TEMP) Argo Global	92.91% 8/2016	95% Monthly Target	Nb of monthly obs of best quality - TEMP
Timeliness (GDAC FR) Argo Global	90.45% 8/2016	95% Monthly Target	% of monthly observations distributed within 24h (GDAC FR)
Timeliness (GDAC US) Argo Global	89.57% 8/2016	95% Monthly Target	% of monthly observations distributed within 24h (GDAC US)
Timeliness (GTS MF) Argo Global	94.36% 8/2016	95% Monthly Target	% of monthly observations distributed within 24h (GTS)
Whitelist Argo Global	96.54% 8/2016	95% Monthly Target	% of platforms whitelisted platforms vs operational platforms

Fig. 1: Performance Indicators for Argo Data Flow on argo.jcommops.org

Real-Time

A number of floats were registered at the JCOMMOPS/AIC (and notified) and no data are available at GDACs or on GTS. A float failure, a deployment cancelled, a deployment date postponed, a deployment under seasonal ice, or more often a delay in the data processing chain can explain this status. JCOMMOPS contacts regularly float operators to check the status of these pending floats (153 as of September 2016).

⇨ Make a query on argo.jcommops.org with Status='REGISTERED' and Deployment Date < today. Save this query to monitor these pending floats more easily.

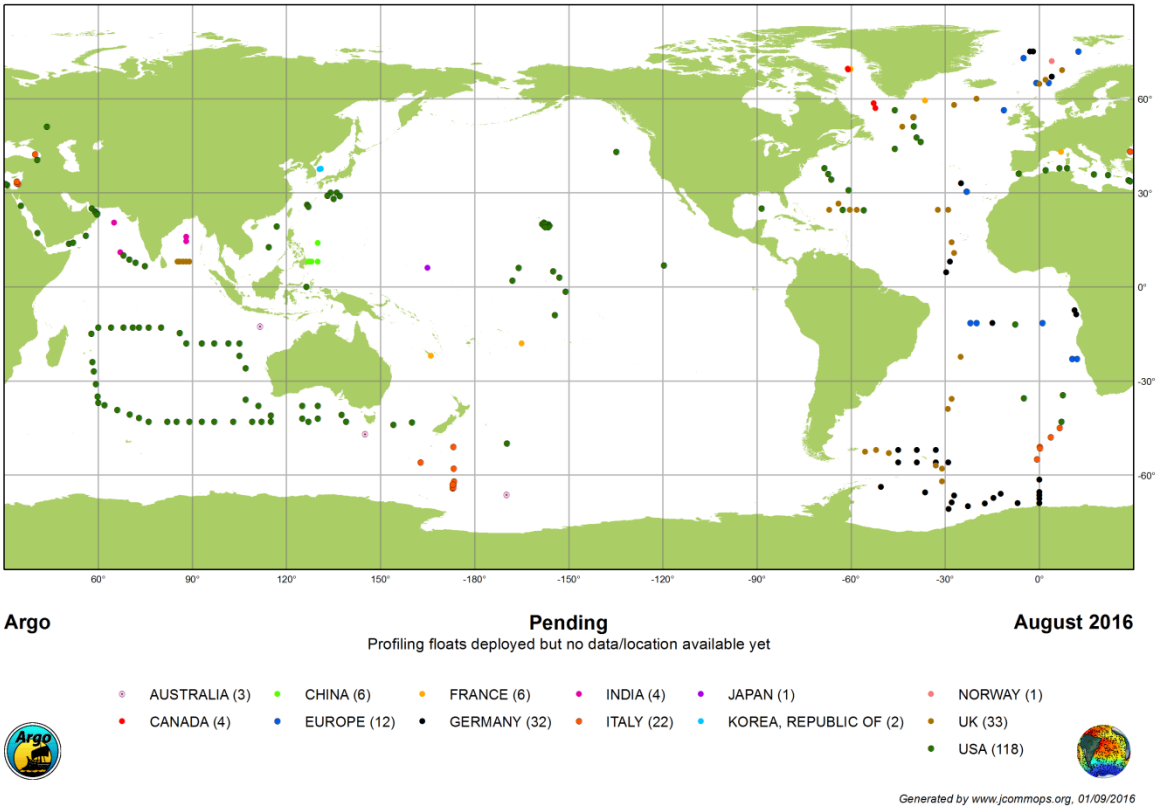


Fig. 2: Pending floats map, by country

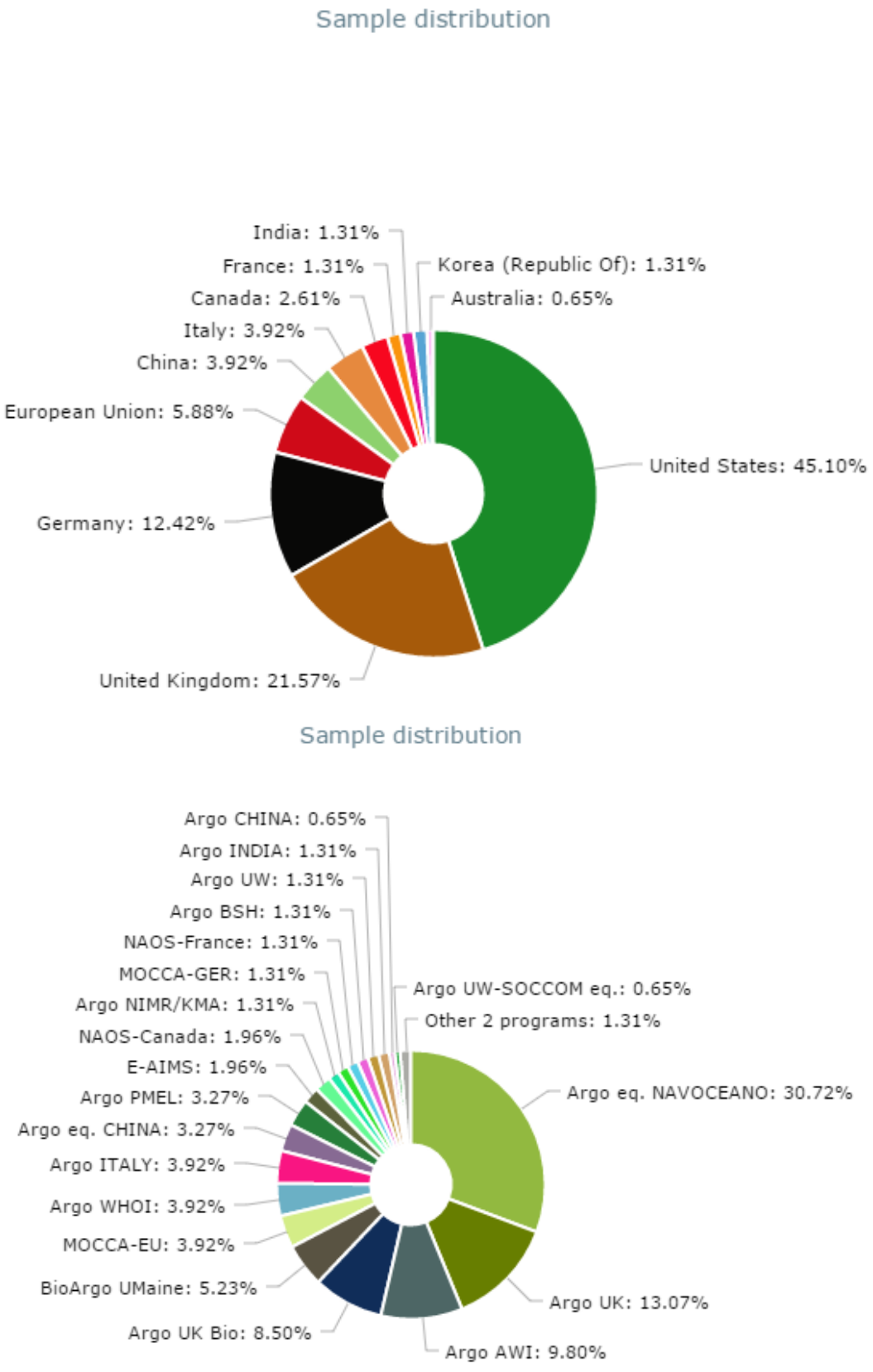


Fig. 3,4: Distribution of pending floats by Country and by Program

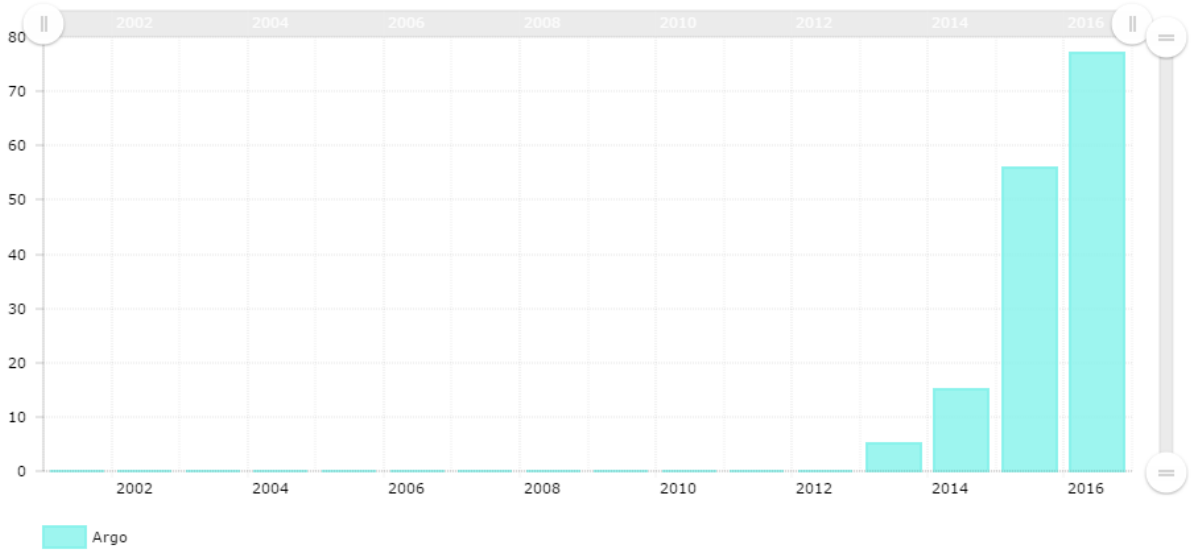


Fig. 5: Deployment date of pending floats

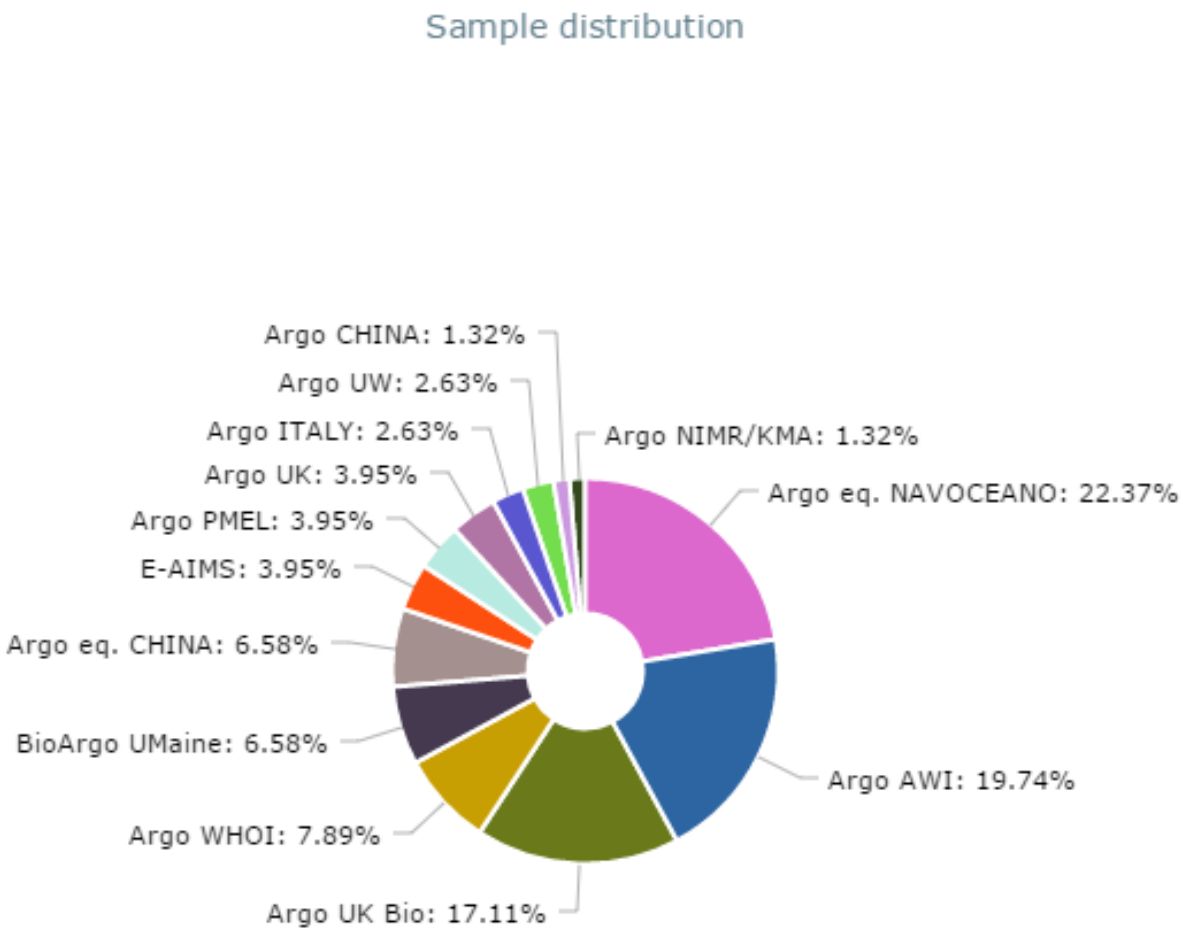


Fig. 6: Pending floats deployed before 2016, by Program

Delays

Source:
GDACs detailed index files

Definitions:
GDAC Distribution Date: 1st availability of file on GDAC ftp
Date Update: 1st date of assembly in netCDF file
Observation Date: Observation Date in netCDF file

Delay = (GDAC Distribution Date – Observation Date) = (Delay_DAC + Delay_GDAC)
Delay_DAC = (GDAC Distribution Date – Date Update)
Delay_GDAC = (Date Update – Observation Date)

Delays have been calculated below on all observations available at GDACs in August 2016, on September 20th 2016.
The later you calculate delays the higher will be the values as it is likely some files were submitted long after observation date.

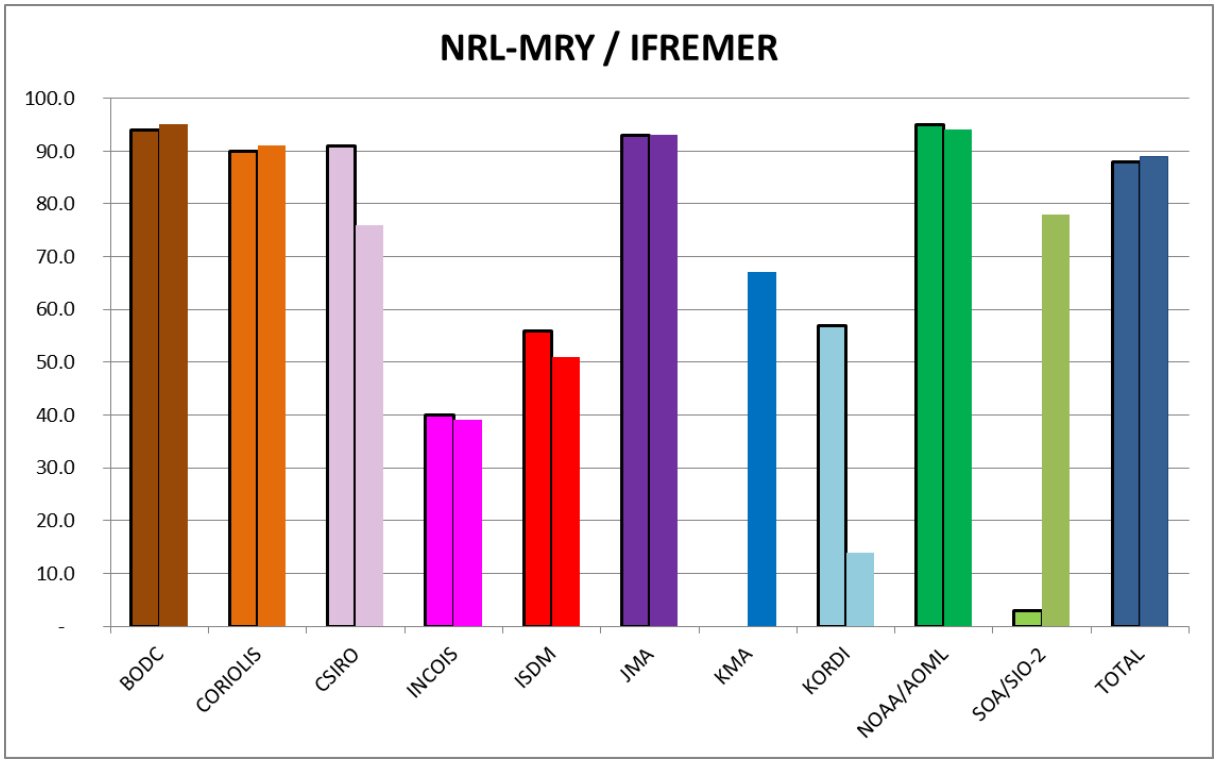
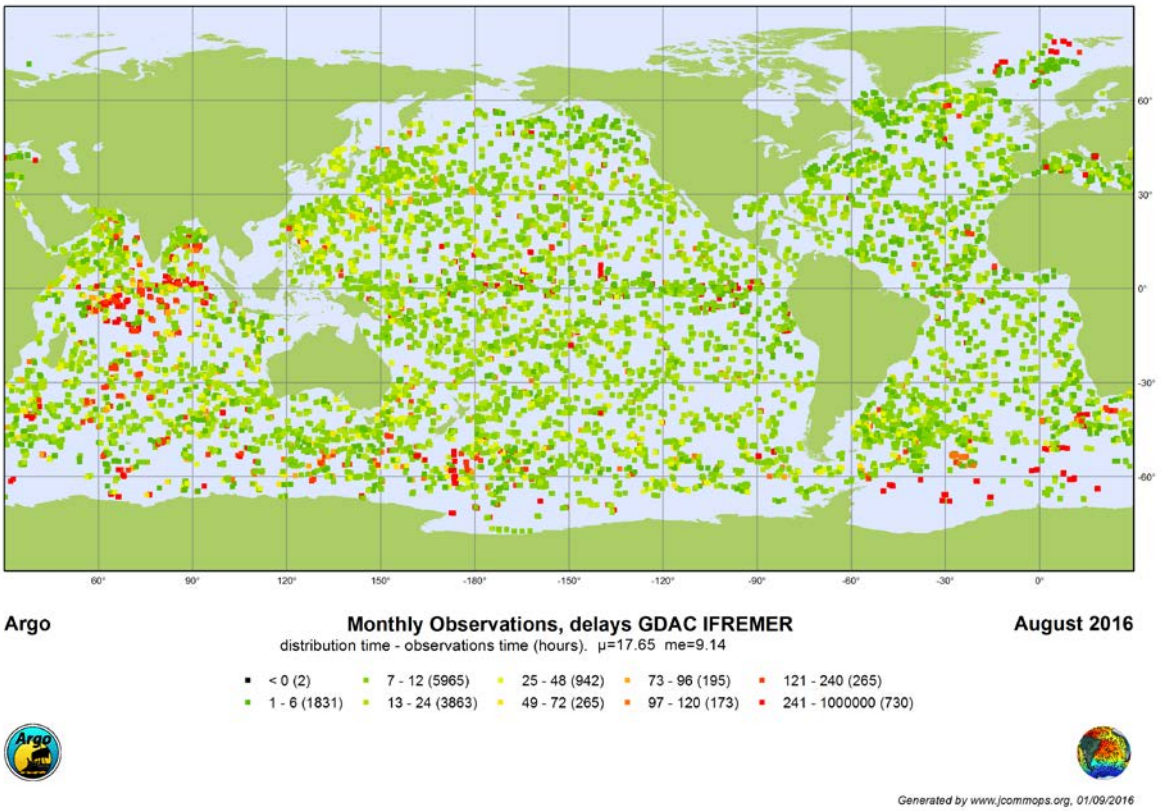


Fig. 7: % of observations distributed within 24h, by DAC, on the 2 GDACs



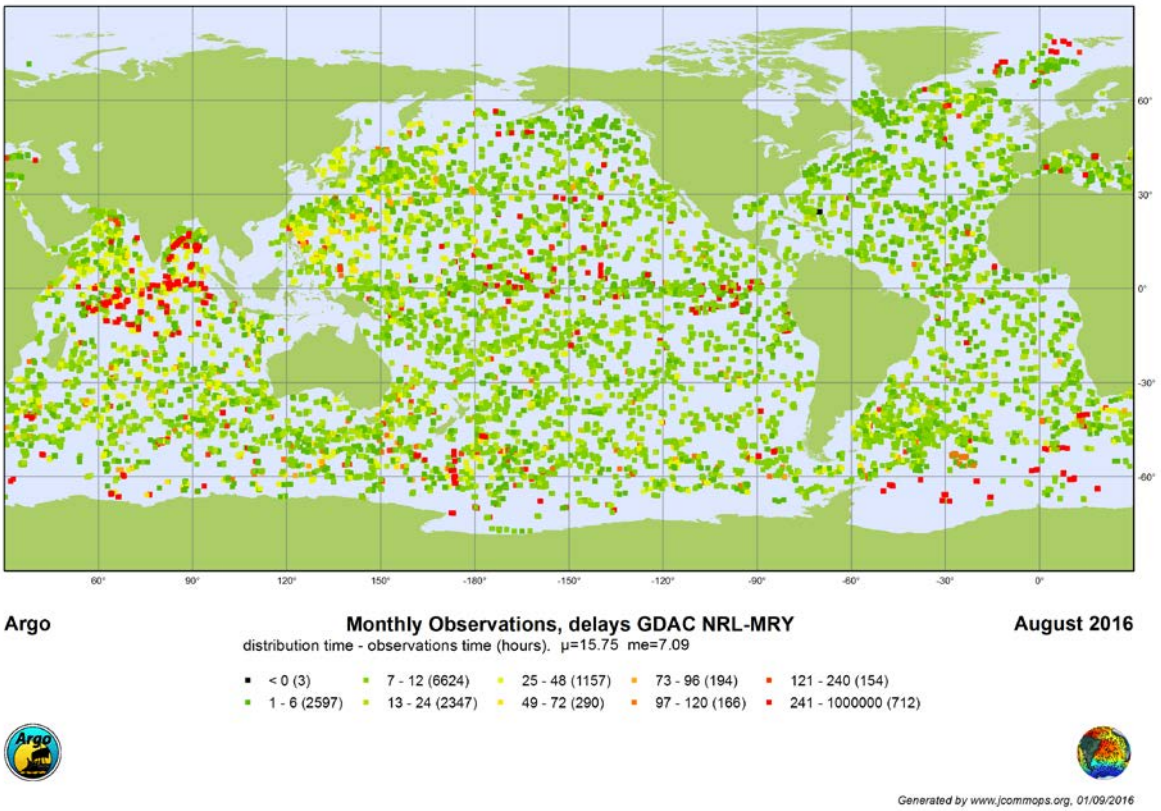


Fig. 8,9: Maps of total delays at GDACs for August 2016, as calculated on September 1st.

IFREMER							
DAC	**AVG**	**MEDIAN**	**PERCENT**	**AVG_DAC**	**AVG_GDAC**	**MEDIAN_DAC**	**MEDIAN_GDAC**
BODC	14.8	11.9	95.0	12.5	2.3	9.6	2.2
CORIOLIS	26.0	5.9	91.0	25.2	0.9	5.8	0.6
CSIRO	21.8	9.9	76.0	18.1	3.7	6.0	3.1
INCOIS	85.4	26.0	39.0	72.9	12.5	24.9	1.0
ISDM	102.5	12.7	51.0	70.2	32.2	2.4	9.3
JMA	16.6	11.1	93.0	13.5	3.2	8.0	3.2
KMA	27.6	23.6	67.0	24.4	3.2	20.4	3.2
KORDI	25.7	25.2	14.0	31.6	-5.9	31.1	-5.9
NOAA/AOML	18.5	9.5	94.0	16.4	2.1	6.8	3.0
SOA/SIO-2	27.6	18.2	78.0	21.6	6.0	12.7	5.4
TOTAL	**23.8**	**9.3**	**89.0**	**20.7**	**3.1**	**6.8**	**3.0**

Table1: Delays observed at IFREMER GDAC

NRL-MRY							
DAC	**AVG**	**MEDIAN**	**PERCENT**	**AVG_DAC**	**AVG_GDAC**	**MEDIAN_DAC**	**MEDIAN_GDAC**
BODC	12.4	9.2	94.0	13.3	-1.0	10.2	-0.6
CORIOLIS	26.0	6.4	90.0	25.1	0.9	5.8	0.9
CSIRO	19.1	7.1	91.0	18.8	0.2	6.5	0.7
INCOIS	84.9	25.2	40.0	72.6	12.4	24.8	0.6
ISDM	74.7	7.5	56.0	70.3	4.5	2.4	4.5
JMA	14.0	8.5	93.0	13.5	0.6	8.0	0.4
KMA	36.0	27.9	-	24.4	11.6	20.4	7.3
KORDI	23.6	23.0	57.0	31.6	-8.0	31.1	-8.2
NOAA/AOML	15.4	7.0	95.0	17.6	-2.1	9.1	0.3
SOA/SIO-2	44.3	35.2	3.0	21.6	22.7	12.7	22.4
TOTAL	**21.6**	**7.2**	**88.0**	**21.4**	**0.2**	**8.2**	**0.5**

Table2: Delays observed at NRL-MRY GDAC

- ⇨ Pb of dates for KORDI,BODC, AOML files (bad ftp file tagging at GDAC , update of observation date ?). to investigate further.
- ⇨ Delays have been very high for INCOIS and ISDM in August
- ⇨ GDAC adds 3h to the process
- ⇨ Large delays added by NRL-MRY for INCOIS, ISDM, KMA, SOA

Note that argo.jcommops.org provides views on delays, either on individual floats or on any group of float or observation. Section is however currently under review.

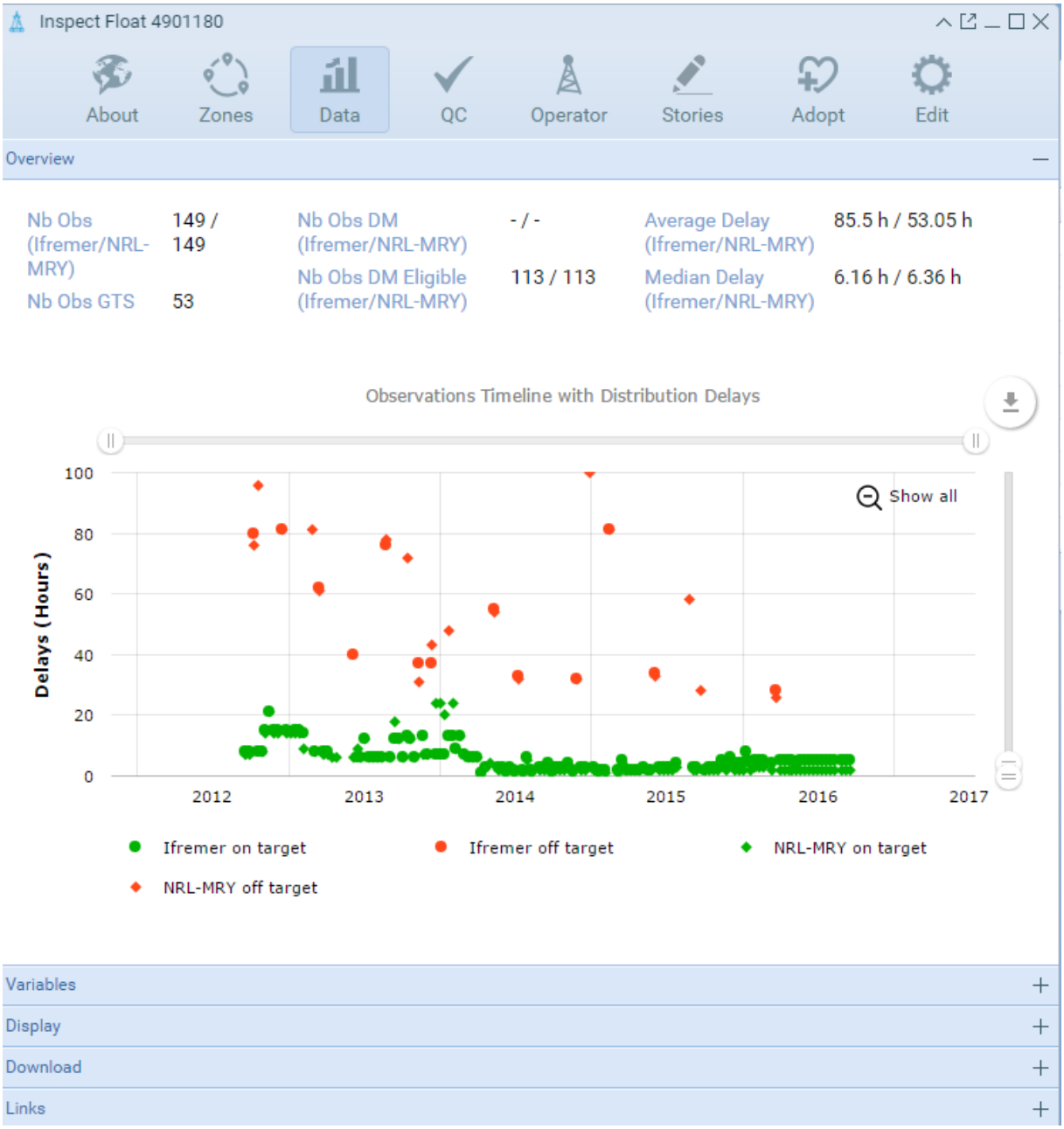


Fig. 10: Timeline of total delays for float 4901180 for both GDACs

Delayed-Mode

The ratio of data files processed in delayed mode, vs files eligible to this re-processing, keeps decreasing (68%). About half million profiles are waiting to be processed in delayed –mode.

PROGRAM	#OBS	#OBS DM_ELIGIBLE	#DM	%	TO DM
Argo eq. NAVOCEANO	71105	61991	514	1	61477
Argo PMEL	151911	132393	82671	62	49722
Argo WHOI	147642	133197	92818	70	40379
Argo UW	243796	223096	183062	82	40034
Argo JAMSTEC	115144	110502	77866	70	32636
Argo INDIA	51484	46224	27810	60	18414
Argo UK	50367	45908	27538	60	18370
Argo CANADA	43455	41308	25214	61	16094
Argo KIOST	16217	15814		-	15814
Argo eq. JMA	27442	23838	8560	36	15278
Argo CHINA	25924	23044	10100	44	12944
Coriolis	40051	32133	19680	61	12453
Argo AUSTRALIA	112544	99467	87415	88	12052
Argo eq. CHINA	13048	9757	132	1	9625
Argo eq. JAMSTEC	13727	12688	3994	31	8694
Coriolis-Good Hope	17243	15557	7080	46	8477
Argo eq. AOML	7433	7433		-	7433
Argo UW-MBARI eq.	9138	7707	955	12	6752
Argo SPAIN	7127	6631	691	10	5940
Coriolis-remOcean eq.	8386	5717		-	5717
Argo BSH	26866	22529	18424	82	4105
Argo NIMR/KMA	23033	22575	18857	84	3718
Coriolis-CONGAS	5228	5191	1706	33	3485
Argo UW-SPURS eq.	3914	3456		-	3456
Argo AWI	5247	4764	1628	34	3136
Argo UW-APL eq.	3592	3053		-	3053
Argo ITALY	10300	6670	3821	57	2849
NAOS-France	4247	2981	176	6	2805
Coriolis-BIOArgo	4476	3735	984	26	2751
Coriolis-PIRATA	5015	4241	1821	43	2420
Argo CHINA SOA	2462	2391		-	2391
Coriolis-FRONTALIS	2128	2128		-	2128
Argo eq. TU	1748	1748	167	10	1581
Argo IRELAND	2636	2302	920	40	1382
Argo eq. SAGE	5729	5729	4394	77	1335
DEKOSIM	1485	1286	105	8	1181
Argo eq. OIST	1263	1150		-	1150
Argo eq. FSU	1146	1146		-	1146

Argo IFM-GEOMAR	8647	8277	7195	87	1082
Argo eq. HNFRI	977	977		-	977
Argo eq. TNFRI	918	918		-	918
Argo FINLAND	1710	1315	456	35	859
Argo MAURITIUS	1726	1587	734	46	853
Coriolis-CANOA	824	824		-	824
Argo NORWAY	2820	2297	1503	65	794
BulArgo	922	785		-	785
Argo eq. ESP-OMZ	2439	2439	1727	71	712
Argo SIO	195464	174029	173401	100	628
Argo ARGENTINA	2576	2486	1903	77	583
Argo BRAZIL	2310	2238	1665	74	573
Coriolis-SPICE	561	561		-	561
Argo GOM-BOEM eq.	582	556		-	556
Coriolis-OVIDE	7063	6155	5611	91	544
Argo JMA	492	492		-	492
MEDARGO	3050	3050	2559	84	491
Argo GREECE	1116	587	101	17	486
Argo NETHERLANDS	8196	7768	7283	94	485
E-AIMS	941	467		-	467
Coriolis-PROSAT	1732	1732	1289	74	443
Argo eq. NDBC	433	433		-	433
Argo AUSTRALIA eq.	11423	9933	9504	96	429
Argo UK Bio	396	348		-	348
Argo UW-UA eq.	336	336		-	336
Coriolis-EGYPT	1477	1477	1141	77	336
Argo eq. NRIFS	308	308		-	308
EuroArgo	814	610	341	56	269
Argo MEXICO	674	582	319	55	263
Argo eq. UHH	3331	3328	3096	93	232
Argo GERMANY	4540	4528	4296	95	232
Argo RUSSIA	472	472	281	60	191
Gyroscope	7182	7182	6999	97	183
Argo BRAZIL Navy	637	182		-	182
Argo eq. AWI	2144	2144	1973	92	171
Coriolis-DRAKE	2741	2741	2576	94	165
Coriolis-TRACK	2004	2003	1842	92	161
Argo GABON	210	210	90	43	120
Argo ECUADOR	876	814	694	85	120
MERSEA	4194	4194	4083	97	111
Argo CHILE	372	372	268	72	104
Argo NEW ZEALAND	3776	3349	3253	97	96
Argo SOUTH AFRICA	297	261	170	65	91
Argo COSTA RICA	82	82		-	82
Argo SAUDI ARABIA	68	68		-	68

Argo eq. VOCALS	1313	1313	1252	95	61
Argo KENYA	708	672	623	93	49
Argo SIO eq (ASIRI)	849	633	591	93	42
Coriolis-FLOPS	2200	2163	2121	98	42
Argo SRI LANKA	77	77	41	53	36
Argo eq. IFM	3263	3263	3227	99	36
Argo eq. TSK	35	35	4	11	31
Argo eq. UM-OSU	26	26		-	26
Argo WHOI-MRV eq.	22	15		-	15
Argo WHOI eq. IR	2926	2926	2918	100	8
Argo eq. IFM2	1397	1397	1390	99	7
Coriolis-EGEE	3101	3101	3095	100	6
Coriolis-FLOSTRAL	2362	2362	2357	100	5
Argo UK eq.	2467	2467	2463	100	4
Argo LEBANON	53	53	52	98	1
Argo eq. PMEL	2086	2086	2085	100	1
Argo eq. UH	11854	11854	11854	100	0
Argo eq. POMME	3511	3511	3511	100	0
Argo eq. BSH	3295	3295	3295	100	0
Argo eq. ORI	728	728	728	100	0
Argo POLAND	419	206	206	100	0
Argo DENMARK	360	360	360	100	0
Argo eq. IRELAND	178	178	178	100	0
Meridian Goodhope	119	119	119	100	0
Argo eq. NIPR	28	28	28	100	0
Argo SIO eq. (OKMC)	5402	4914	5161	105	0
Argo UW-SOCCOM eq.	1633	543	759	140	0
Coriolis-FNOB-JCOMMOPS	489	201	2128	1 059	0
TOTAL	**1628453**	**1465503**	**1006002**	**68.6**	**461891**

Table 3: DM processing status by Program, ordered by files remaining to be processed.

⇨ We can note first that 2/3 of the challenge has to do with regular Argo programmes, and 1/3 with equivalent contributions that we often call 'orphan floats'.

PROGRAM	**#OBS**	**#OBS DM_ELIGIBLE**	**#DM**	**%**
Argo eq. NAVOCEANO	71105	61991	514	1
Argo KIOST	16217	15814		-
Argo eq. CHINA	13048	9757	132	1
Argo UW-MBARI eq.	9138	7707	955	12
Coriolis-remOcean eq.	8386	5717		-
Argo eq. AOML	7433	7433		-
Argo SPAIN	7127	6631	691	10
NAOS-France	4247	2981	176	6

Argo UW-SPURS eq.	3914	3456		-
Argo UW-APL eq.	3592	3053		-
Argo CHINA SOA	2462	2391		-
Coriolis-FRONTALIS	2128	2128		-
Argo eq. TU	1748	1748	167	10
DEKOSIM	1485	1286	105	8
Argo eq. OIST	1263	1150		-
Argo eq. FSU	1146	1146		-
Argo GREECE	1116	587	101	17
Argo eq. HNFRI	977	977		-
E-AIMS	941	467		-
BulArgo	922	785		-
Argo eq. TNFRI	918	918		-
Coriolis-CANOA	824	824		-
Argo BRAZIL Navy	637	182		-
Argo GOM-BOEM eq.	582	556		-
Coriolis-SPICE	561	561		-
Argo JMA	492	492		-
Argo eq. NDBC	433	433		-
Argo UK Bio	396	348		-
Argo UW-UA eq.	336	336		-
Argo eq. NRIFS	308	308		-
Argo COSTA RICA	82	82		-
Argo SAUDI ARABIA	68	68		-
Argo eq. TSK	35	35	4	11
Argo eq. UM-OSU	26	26		-
Argo WHOI-MRV eq.	22	15		-

Table 4: DM processing status by Program, ordered by files remaining to be processed (ratio < 25%)

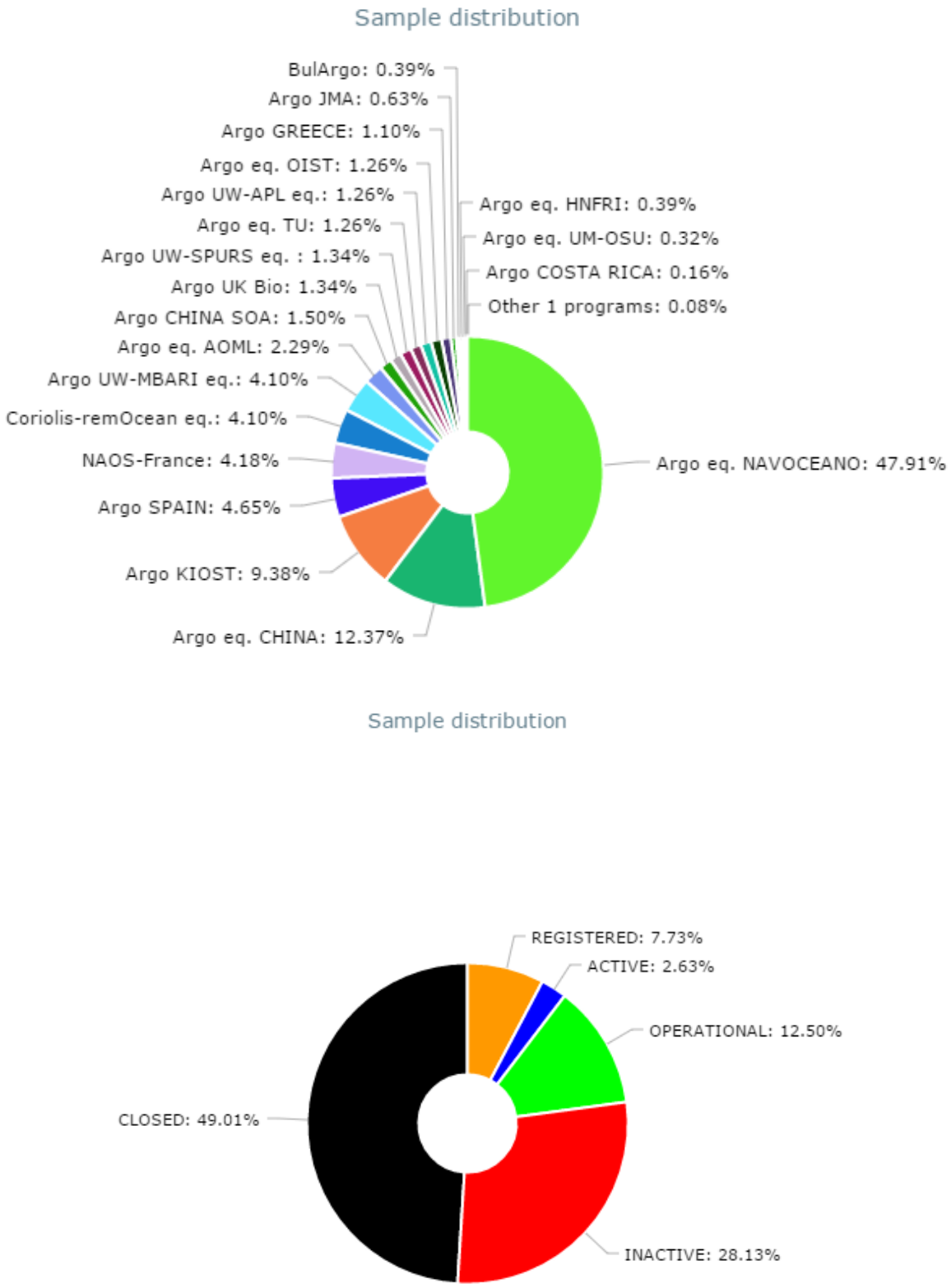


Fig 11, 12: Distribution of floats and Programmes with DM ratio < 25% and status of these floats

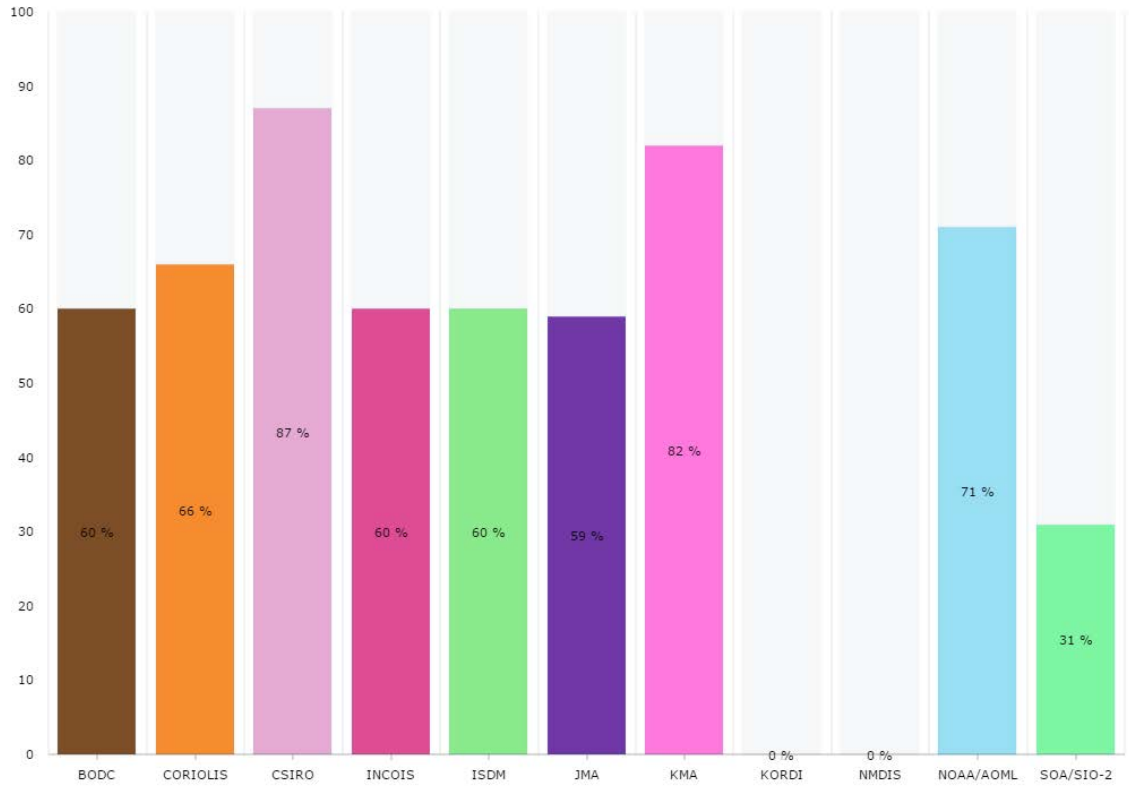


Fig 12: DM ratio by DAC

- ⇨ For the orphan floats, we may need to support US NAVY, KIOST, and CHINA (NMDIS).
- ⇨ Note that most of these floats are not active anymore so the work load will be for once.

Here are below additional information on these floats, to ease volunteers.

NMDIS :
20 Floats (Bay of Bengal, NW Pacific)
2535 obs,
2428 DM_Eligible
100% PROVORs

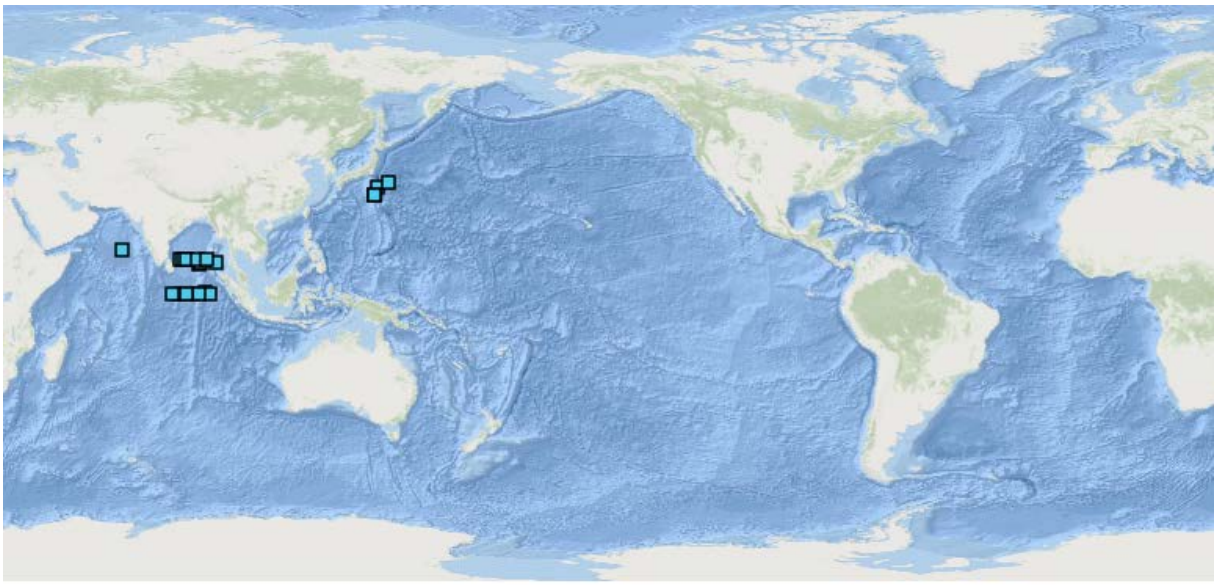


Fig 13: launch locations of NMDIS floats

KIOST (Sea of Japan, South Tasmania, Drake Passage)

117 floats
15736 obs
15370 dm eligible
22% PROVOR_MT, 78% APEX

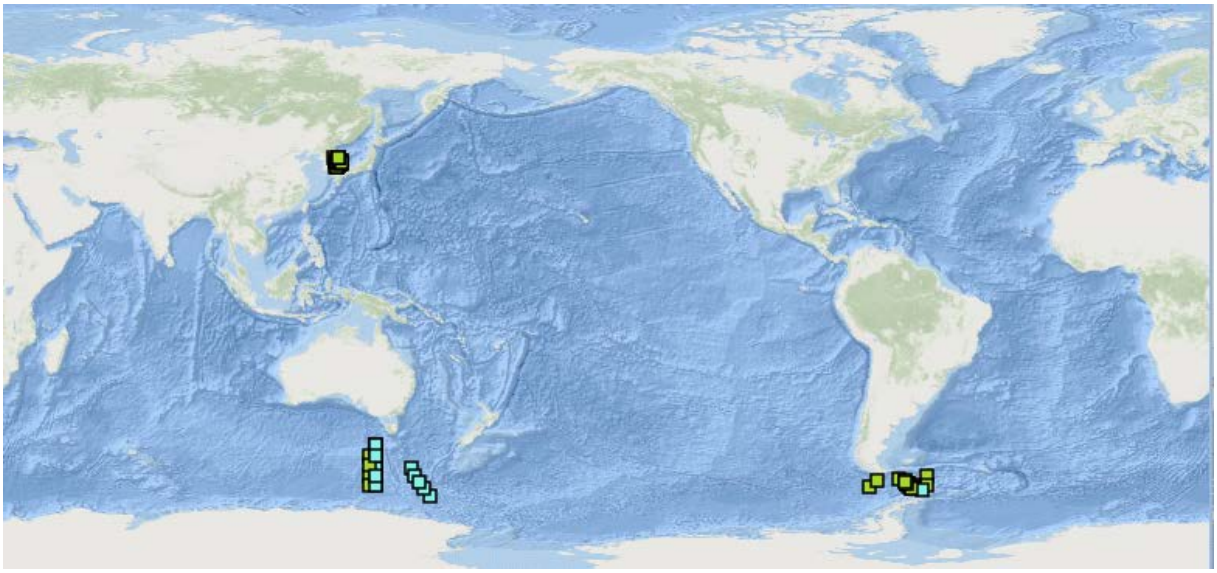


Fig 14: launch locations of KIOST floats

NAVO :

608 floats
71098 obs
514 dm
61990 dm_eligible
mainly APEX

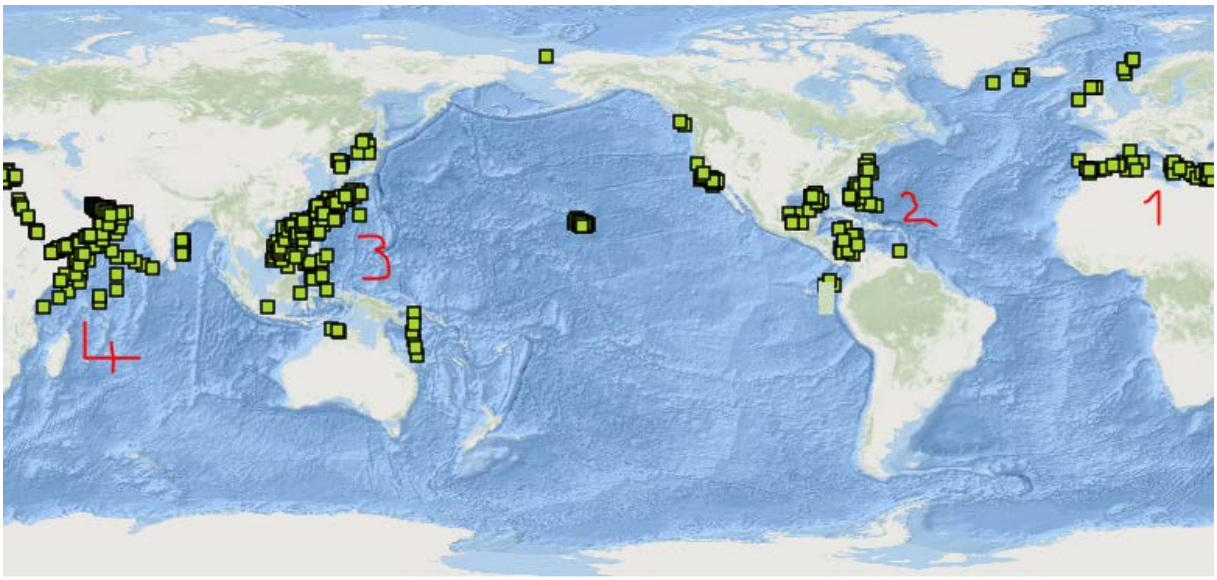


Fig 15: launch locations of NAVO floats

Region 1: Med Sea:
58 floats
6115 obs
316 dm
53914 dm_eligible

Region 2: Gulf of Mexico, Atlantic Ocean
59 floats
8530 obs
7115 dm_eligible

Region 3 :
203 floats
19714 obs
18945 dm_eligible

Region 4:
199 floats

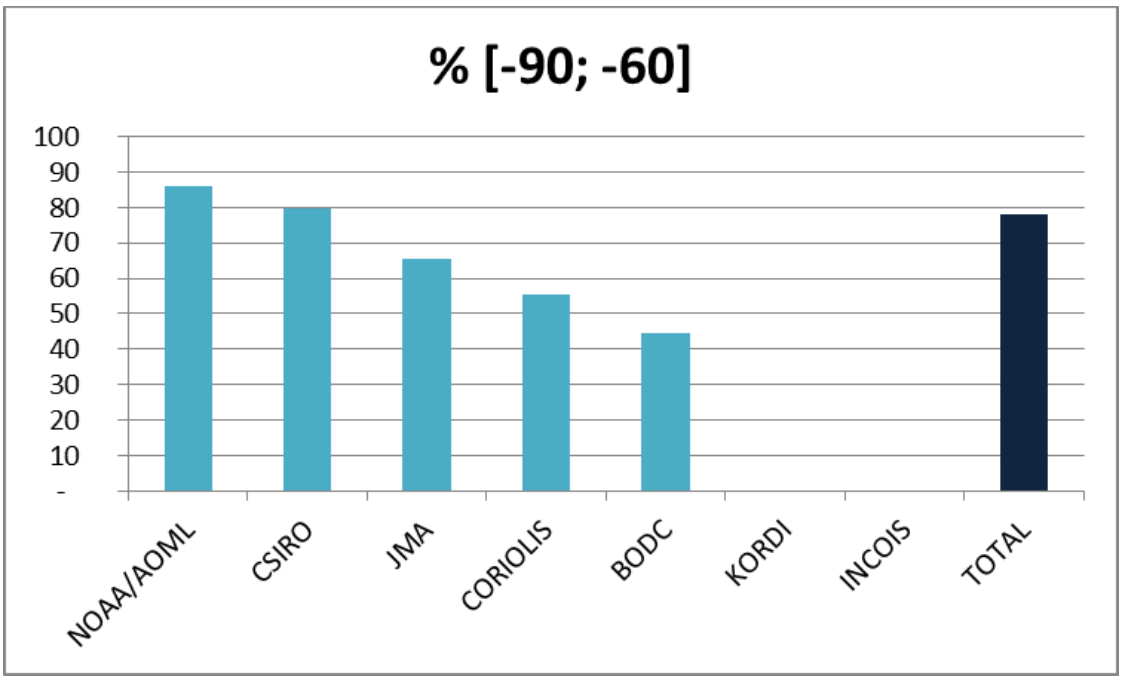
23103 obs
198 dm
20323 dm_eligible

- ⇨ Improve stats for monitoring on jcommops.org
- ⇨ Create workspace for DM operator
- ⇨ What functionalities would be useful? A permanent to do list by DM Operator? Other tools ?

DM Processing in the Southern Ocean

A special study was made under Argo Australia request, to monitor the status of DM processing in two zones of the southern ocean, [-90;-60] and [-60;-30].

We basically need some support for KIOST floats (that recalled regularly having no expertise on DMQC in SO).



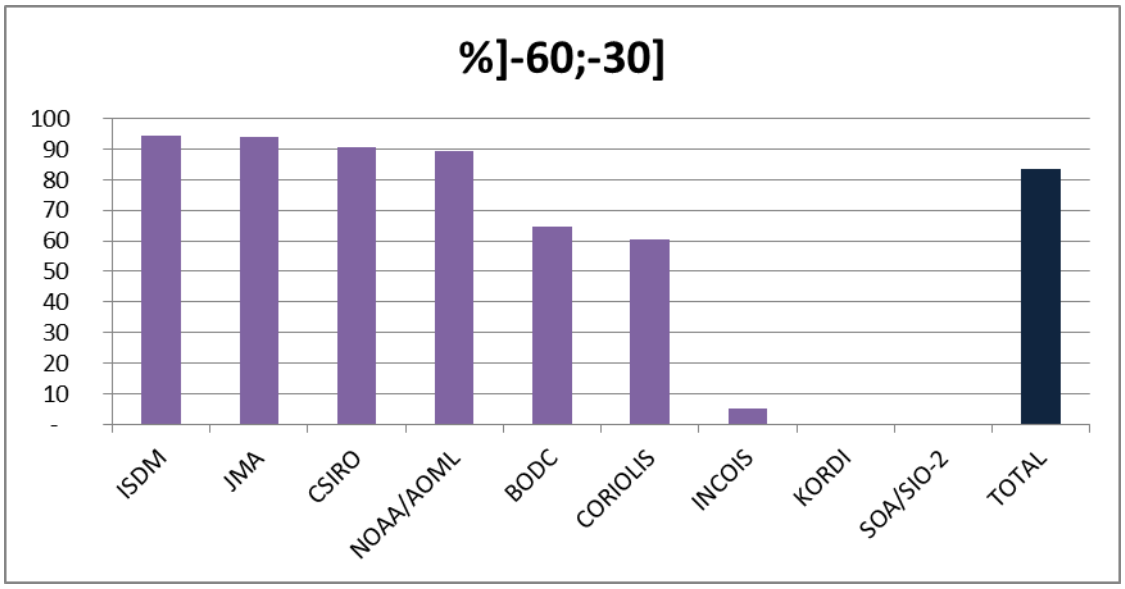


Fig 16, 17: DM processing Status in Southern Ocean, by DAC

DM Operators List

The following table provides the latest update on DM Operators.
This list is certainly not error free nor nominates anyone for additional task.
Please feedback.

PROGRAM	DM OPERATOR
Argo ARGENTINA	probbins@whoi.edu
Argo AUSTRALIA	esmee.vanwijk@csiro.au
Argo AUSTRALIA eq.	esmee.vanwijk@csiro.au
Argo AWI	gerd.rohardt@awi.de
Argo BRAZIL	probbins@whoi.edu
Argo BRAZIL Navy	
Argo BSH	birgit.klein@bsh.de
Argo CANADA	ouelletm@dfo-mpo.gc.ca
Argo CHILE	ouelletm@dfo-mpo.gc.ca
Argo CHINA	liuzenghong@139.com
Argo CHINA SOA	
Argo COSTA RICA	christine.coatanoan@ifremer.fr
Argo DENMARK	birgit.klein@bsh.de
Argo ECUADOR	awong@ocean.washington.edu
Argo eq. AOML	

Argo eq. AWI	birgit.klein@bsh.de
Argo eq. BSH	birgit.klein@bsh.de
Argo eq. CHINA	christine.coatanoan@ifremer.fr
Argo eq. ESP-OMZ	oulloa@profc.udec.cl
Argo eq. FERHRI	
Argo eq. FSU	
Argo eq. HNFRI	argo-dp@jamstec.go.jp
Argo eq. IFM	birgit.klein@bsh.de
Argo eq. IFM2	birgit.klein@bsh.de
Argo eq. IRELAND	juck@bodc.ac.uk
Argo eq. JAMSTEC	argo-dp@jamstec.go.jp
Argo eq. JMA	argo-dp@jamstec.go.jp
Argo eq. NAVOCEANO	ppoulain@inogs.it
Argo eq. NDBC	
Argo eq. NIPR	argo-dp@jamstec.go.jp
Argo eq. NRIFS	argo-dp@jamstec.go.jp
Argo eq. OIST	argo-dp@jamstec.go.jp
Argo eq. ORI	argo-dp@jamstec.go.jp
Argo eq. PMEL	gregory.c.johnson@noaa.gov
Argo eq. PMEL	kristene.e.mctaggart@noaa.gov
Argo eq. POMME	vthierry@ifremer.fr
Argo eq. SAGE	argo-dp@jamstec.go.jp
Argo eq. TNFRI	argo-dp@jamstec.go.jp
Argo eq. TSK	argo-dp@jamstec.go.jp
Argo eq. TU	argo-dp@jamstec.go.jp
Argo eq. UH	awong@ocean.washington.edu
Argo eq. UHH	katrin.latarius@awi.de
Argo eq. UM-OSU	
Argo eq. VOCALS	probbins@whoi.edu
Argo FINLAND	
Argo GABON	probbins@whoi.edu
Argo GERMANY	birgit.klein@bsh.de
Argo GREECE	ppoulain@inogs.it
Argo IFM-GEOMAR	birgit.klein@bsh.de
Argo INDIA	uday@incois.gov.in
Argo IRELAND	juck@bodc.ac.uk
Argo ITALY	esmee.vanwijk@csiro.au
Argo ITALY	ppoulain@inogs.it
Argo JAMSTEC	argo-dp@jamstec.go.jp
Argo JMA	argo-dp@jamstec.go.jp
Argo KENYA	awong@ocean.washington.edu
Argo KIOST	leejoonsoo@nfrdi.go.kr
Argo KIOST	hanis@nfrdi.go.kr
Argo LEBANON	birgit.klein@bsh.de
Argo MAURITIUS	juck@bodc.ac.uk

Argo MEXICO	christine.coatanoan@ifremer.fr
Argo MEXICO	jgilson@ucsd.edu
Argo NETHERLANDS	birgit.klein@bsh.de
Argo NEW ZEALAND	jgilson@ucsd.edu
Argo NIMR/KMA	leejoonsoo@nfrdi.go.kr
Argo NIMR/KMA	hanis@nfrdi.go.kr
Argo NORWAY	katrin.latarius@awi.de
Argo PERU	probbins@whoi.edu
Argo PMEL	gregory.c.johnson@noaa.gov
Argo PMEL	kristene.e.mctaggart@noaa.gov
Argo POLAND	birgit.klein@bsh.de
Argo ROMANIA	
Argo RUSSIA	ouelletm@dfo-mpo.gc.ca
Argo RUSSIA	denis.gilbert@dfo-mpo.gc.ca
Argo SAUDI ARABIA	juck@bodc.ac.uk
Argo SIO	jgilson@ucsd.edu
Argo SIO eq (ASIRI)	jgilson@ucsd.edu
Argo SIO eq. (OKMC)	jgilson@ucsd.edu
Argo SOUTH AFRICA	speich@univ-brest.fr
Argo SPAIN	argo@oceanografia.es
Argo SRI LANKA	uday@incois.gov.in
Argo UK	juck@bodc.ac.uk
Argo UK	grigor.obolensky@euro-argo.eu
Argo UK Bio	juck@bodc.ac.uk
Argo UK eq.	juck@bodc.ac.uk
Argo UW	awong@ocean.washington.edu
Argo UW eq.	awong@ocean.washington.edu
Argo UW-APL eq.	
Argo UW-MBARI eq.	
Argo UW-SOCCOM eq.	
Argo UW-SPURS eq.	awong@ocean.washington.edu
Argo UW-UA eq.	awong@ocean.washington.edu
Argo WHOI	probbins@whoi.edu
Argo WHOI eq. IR	probbins@whoi.edu
Argo WHOI	steve.piotrowicz@noaa.gov
Argo WHOI-MRV eq.	probbins@whoi.edu
BioArgo UMaine	
BulArgo	
Coriolis	vthierry@ifremer.fr
Coriolis-BIOArgo	christine.coatanoan@ifremer.fr
Coriolis-CANOA	christine.coatanoan@ifremer.fr
Coriolis-CONGAS	alain-serpette@shom.fr
Coriolis-DRAKE	nbalod@locean-ipsl.upmc.fr
Coriolis-EGEE	bernard.bourles@ird.fr
Coriolis-EGYPT	isabelle.taupier.letage@ifremer.fr

Coriolis-FLOPS	eldin@ird.fr
Coriolis-FLOSTRAL	rosemary.morrow@cnes.fr
Coriolis-FNOB-JCOMMOPS	christine.coatanoan@ifremer.fr
Coriolis-FRONTALIS	thierry.delcroix@cnes.fr
Coriolis-Good Hope	speich@univ-brest.fr
Coriolis-OVIDE	vthierry@ifremer.fr
Coriolis-PIRATA	bernard.bourles@ird.fr
Coriolis-PROSAT	christine.coatanoan@ifremer.fr
Coriolis-remOcean eq.	christine.coatanoan@ifremer.fr
Coriolis-SPICE	christophe.maes@noumea.ird.nc
Coriolis-TRACK	christine.coatanoan@ifremer.fr
DEKOSIM	
E-AIMS	birgit.klein@bsh.de, christine.coatanoan@ifremer.fr, ppoulain@inogs.it, juck@bodc.ac.uk
EuroArgo	birgit.klein@bsh.de, christine.coatanoan@ifremer.fr, ppoulain@inogs.it, juck@bodc.ac.uk
Gyroscope	vthierry@ifremer.fr
MEDARGO	ppoulain@inogs.it
Meridian Goodhope	speich@univ-brest.fr
MERSEA	gerd.rohardt@awi.de
MOCCA-EU	birgit.klein@bsh.de, christine.coatanoan@ifremer.fr, ppoulain@inogs.it, juck@bodc.ac.uk
MOCCA-GER	birgit.klein@bsh.de
MOCCA-IT	ppoulain@inogs.it
MOCCA-NETH	birgit.klein@bsh.de
MOCCA-POL	birgit.klein@bsh.de
NAOS-Canada	
NAOS-France	gnotarstefano@ogs.trieste.it

Remark:
Some DM operator download data files and may do the processing a while after.
If the real-time file have changed or were deleted … they will come back through the dm processing.
A checkpoint needs to be set up, comparing RT and DM file number e.g.

20 Annex 6_ National Reports

Australian Argo National Data Management Report

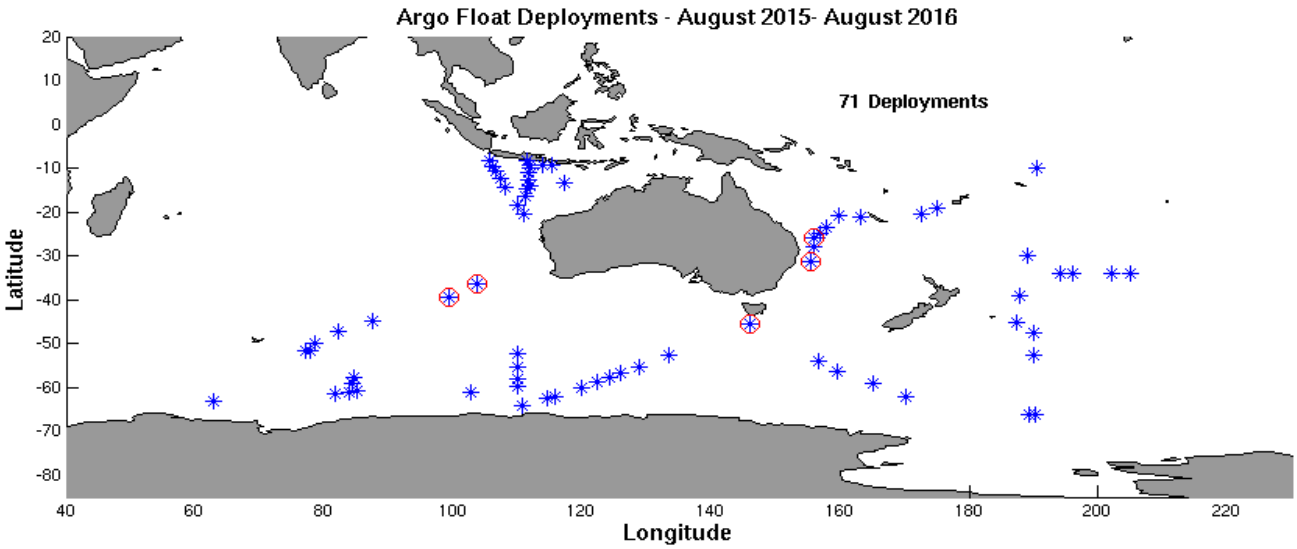
ADMT17

Tianjin China – 28-29 September 2016

Ann Gronell Thresher for the Argo Australia Team (CSIRO, Bureau of Meteorology)

Status of Array

Australian deployments in 2015-16:



Australian Argo deployments between August 2015 and August 2016.
Red circles indicate bio-Argo deployments

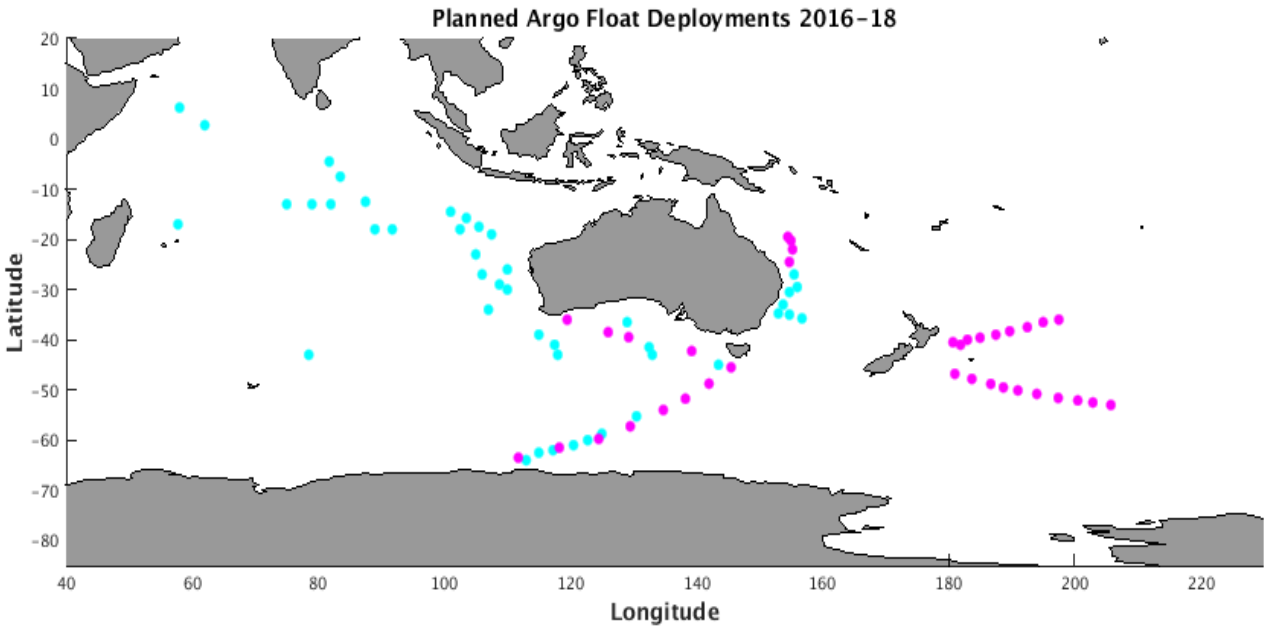
Australia has deployed 71 floats since the last meeting, including 5 complex Bio-Argo models which follows the deployment of 4 such floats the previous year. This has again been a very busy and productive year for us. A significant feature of our deployments this year were those within the Indonesian EEZ, made possible only through the assistance of our Japanese colleagues.

We currently have 431 floats listed as 'live' though this includes some that are under ice or have been missing for over a year, from a total of 750 deployments since 1999. We also have 49 floats in the lab, most with deployment opportunities already identified. We hope to order a further 30 – 40 floats depending on funding outcomes, from multiple funding sources including the Australian Bureau of Meteorology (ABOM), the Royal Australian Navy (RAN), the Integrated Marine Observing System (IMOS) and the Antarctic Climate and Ecosystems Cooperative Research Centre (ACE-CRC). These purchases will help us to maintain float density in the South Indian and South Pacific Oceans.

Known deployment locations for the floats over the next year are shown below. We will continue to re-seed the Indian Ocean and South Pacific Ocean but some deployment locations are still to be

decided. Focus this year will be on the central Indian (Kaharoa – Argo19); focus next year will be on the S. Pacific (Kaharoa – Argo20).

Australian Deployment plans 2016-17:



Locations identified for new float deployments. Cyan circles indicate floats to be deployed within the next 6 months, magenta indicates floats on order for deployment later in the year or next year.

Significant improvements:
With the help of Yulong Liu, a colleague from NMDIS who visited CSIRO in July, we have now coded our processing to use the latest versions of Matlab, utilizing the in-built netcdf routines instead of the older, CSIRO built netcdf routines. This makes processing faster and more reliable. We have also added trajectory file production to our real-time processing. All files are generated in format version 3.1.

Issues impacting data delivery in 2014-5:
Aside from further coding to create version 3.1 files, accommodating Bio-Argo data remains our biggest challenge. This has included the version 3.1 coding for the Bio data but also included deployment of floats that report profiles in new data formats.These have proved particularly challenging to process and deliver within the B-files.

The cumulative effect of the coding and getting things through the GDACs, as well as just gaining an understanding of this very complex data, has resulted in a long lag between data arrival and delivery to the GDACs for some of our floats. Other floats, with 'known' formats have had much shorter delays.

We also moved our servers and reorganized our data delivery ports. This caused some delays before the servers were correctly set up.

Software development:
We continue to evolve our code to deliver V3.1 for all of the 4 file types, which has been a huge undertaking and impacted the timeliness of both the RT and DM data streams. Trajectory files have only recently been completed and we continue to assess and adjust these files as needed. Profile, Metadata and Tech files are all being delivered in real-time in version 3.1, including B-Profiles. Almost all of our Bio data is now being delivered both in raw and derived form in the new BR data files.

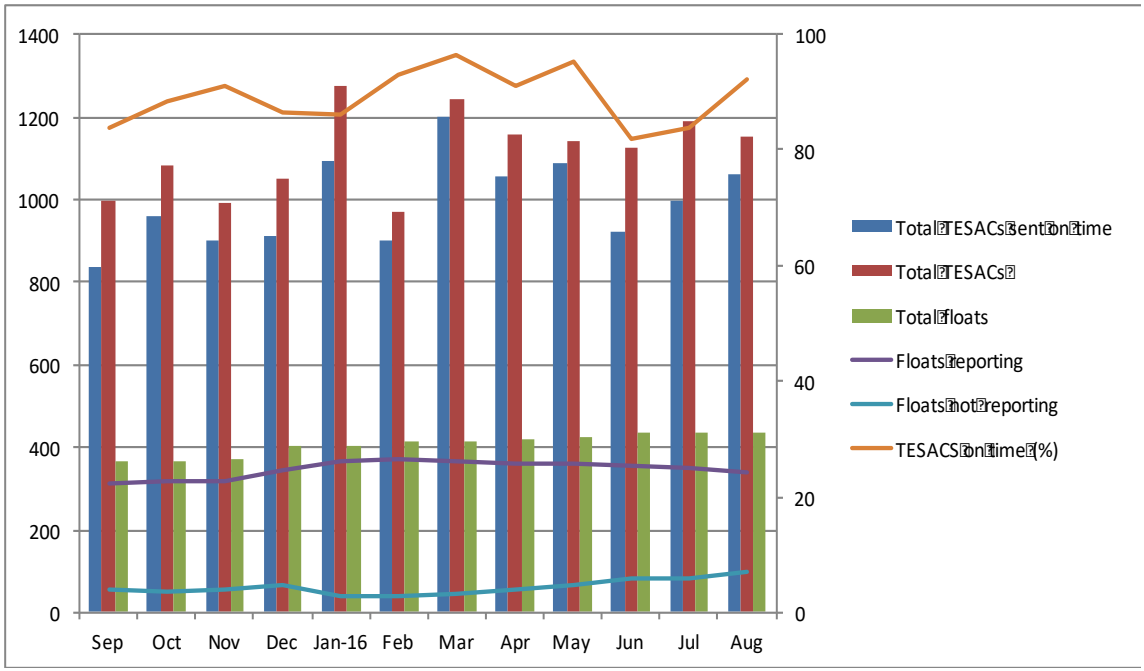
We have also finished redevelopment of our DM software and are now delivering DMQC'd oxygen data. We are working towards final software revisions and other data types will be added as manpower permits.

We continue to work with INCOIS and NMDIS on code for new float formats and new data formats.

Data Acquisition and delivery to the GDACs and GTS:
Our aim is that raw data is processed within a maximum of 18 hours of delivery from either Argos or via Iridium. We are achieving this for most of our floats. Some floats with new formats or which have been newly deployed take longer to enter our processing.

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 appear to have improved 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. Delivery problems this year appear to have been minor.



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

Data is available for delayed mode QC as soon as the real-time data is processed but only considered eligible for DMQC after 12 months. The Delayed Mode report is appended below.

Additional Data Distribution:
As noted in previous years, the National Collaborative Research Infrastructure Strategy (NCRIS) funds the Integrated Marine Observing System (IMOS) which is a major source of Argo funding for Australia. As part of this initiative, it is required that we have a local data delivery pathway. IMOS is now serving Argo data as a mirror to the US GDAC through its data portal which can be accessed at:

http://imos.aodn.org.au/webportal/

All IMOS data, from all platform Facilities, can be accessed through this web site.

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. We have added web pages that contain details of the technical data from our floats, aiding in the diagnosis of problems. This is done as a float is processed making them up-to-date and easy to find.

Home page for Argo Australia (IMOS)
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/

There are links to the technical pages for a float from each profile page.

Statistics of Argo data usage:
Argo data is downloaded to a local mirror daily using the *rsync* capability. We then generate a Matlab file of the data with an index table to make data access easier.

Argo usage is a difficult list to compile, as Argo data are now being used routinely by many researchers nationally and globally. Not much has changed in the past year. 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.

The data is being used with other data on the GTS to inform the Bureau of Meteorology's Seasonal Climate Outlook and is used in a dynamical climate forecast system (POAMA). As part of this the data are ingested into the Bureau's Ocean Analysis (http://www.bom.gov.au/oceanography/analysis.shtml)

- Argo data is also being used in the BLUElink ocean forecasting system.
  http://www.bom.gov.au/oceanography/forecasts/index.shtml

- We are also incorporating it as a high quality background data field for our upper ocean temperature QC programs (QuOTA archives, SOOP XBT QC).

We report usage to our funders IMOS – the Argo report can be found at:

http://imos.org.au/imospublications.html

A large number of Australian PhD students are using Argo data and it is an integral part of many collaborative research projects which rely on our outputs. Please see the IMOS web site for more details.

Please also see the AST-17 report for a list of research projects using Argo data in Australia.

Delayed Mode QC (DMQC) Report:

Australian DM Statistics (to 12 Sep 2016)

	Core Argo	**Core Argo and EM APEX, Argo Eq., BGC and Bio Argo**
D files submitted to GDAC	79528	97631
Total R files	23393	44758
R files eligible for DMQC	12325	29730
Total eligible files for DMQC	91853	127361
Total files at GDAC	102921	142389
DMQC % eligible files	**87**	77

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

We have made good progress towards our DMQC targets this year. Currently, the DMQC percentage stands at 87% 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. The statistics for the entire Argo array, expanding core Argo to include Bio, BGC, Argo equivalent and EM Apex Argo we are currently at 77% of eligible profiles completed.

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 spent significant time this year developing new DMQC processes and software to deal with the QC of oxygen and trajectory data. Floats that sample more than one profile per cycle also require manual inspection of both profiles for spikes, inversions etc. which significantly increases the time taken to DMQC these floats and has required a rewrite of all our DM software to deal with the multi-profile data formats.

A major achievement over the past year has been the DMQC of almost all of our Argo floats with DOXY sensors (91% submitted to the GDAC). We have assessed 67 floats with DOXY sensors through DMQC where the DOXY data is either on the primary, the secondary or on both profiles. In our fleet we have assessed 18 floats with Aanderaa Optodes (Stern Volmer calibration), 20 floats with Aanderaa Optodes (polynomial calibration), 9 floats with Aanderaa Optodes (factory calibration), 10 floats with SBE43 (factory calibration) and 10 floats with SBE63 (factory calibration). Of the 67 floats, we have submitted the P, T and S data for 61 floats, 56 of which also have DOXY data (5 floats had complete failure of the DOXY sensor). A further 2 floats were dead on deployment and therefore have no data. Another 4 floats have data issues that need to be resolved before the DOXY data can be submitted.

We have developed a DMQC approach that is modified from the approach used by Takeshita et al. 2013. We first assess the DOXY data on deep potential temperature or density surfaces to examine drift of the DOXY sensor with time. Consistent with other studies we find that once floats are deployed the oxygen sensors are very stable while the float is in the water and we did not find any evidence of sensor drift with time.

We do however find that there is 'storage' drift of the sensor, drift of the sensor that occurs in the lab, between the time of the calibration of the oxygen sensor and deployment (this can be many months for some floats). This means that when there is a co-located CTD on deployment, often the float data does not agree with the co-located CTD data and is generally lower than the climatology. Therefore, we correct the float DOXY data to climatology (CARS 2009) using a model II linear regression of percent oxygen saturation of the float data compared to climatology. We consider a gain only correction as most appropriate (as opposed to a gain and offset correction that Takeshita use) consistent with discussions with S Riser. In addition we exclude bad data and data sampled by the float in strong vertical gradients (exclude data where ascent rate > 0.2 uM/m). We also restricted data points used in the regression to those in the mixed layer and below 1500 db (where floats sample deep enough, otherwise deepest depth data available). Mixed layer data is defined using the density criterion of 0.03 kg/m^3 (Montegut et al., 2004) and a seasonal filter is applied, i.e. only data collected from May through September as the percent oxygen saturation remains very close to solubility equilibrium over these months. We estimate that once the data has been corrected to climatology the uncertainty of the corrected DOXY data is better than 3%.

We are also working on DMQC of other bio-sensors. In particular, we have started with CHL-A and are developing visualization products to help with this QC. This is complicated by non-zero black counts at depth which, when used to auto-correct the data, cause negative chlorophyll

calculations. The "*Bio-Argo quality control manual for Cholorphyll-A concentration*" does not properly address this. Along with suggested light quenching and spike testing we have implemented an alternative profile Dark Count adjustment which uses the profile minimum as the Dark Count.

DMQC for optical/backscatter sensors is under development with manuscripts in preparation. For radiometric profiles a statistical method for profile quality classification has been used. The results show that about 50% of radiometric profiles are of good quality. DMQC for backscattering data is more complicated as most of sensors display an initial drift during the first month of operation that needs to be addressed. As recommended, a good-quality pre-deployment measurements are crucial for obtaining correct magnitude of BBP. We also suggest that using dual-channel backscatter sensors can be useful for controlling the quality of BBP profiles.

Results and preliminary visualization tools can be found at

http://www.per.marine.csiro.au/staff/Dirk.Slawinski/bioargo/index.html

And

http://wa-shiny.imos.csiro.au:3838/bioargo/

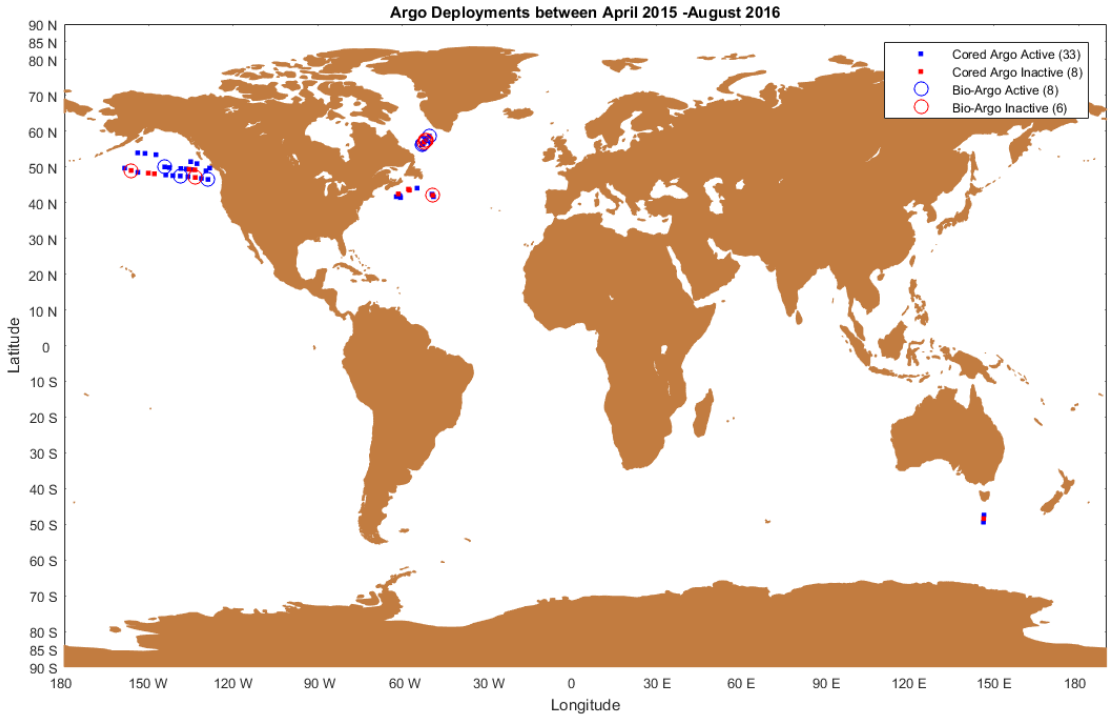
Argo Canada National Data Management Report

ADMT17

Tianjin China, Sep 26 - 30, 2016

1. Status

Canadian deployments in 2015-2016



Data acquired from floats: We are currently tracking 78 floats of which 3 might have failed to report within the last 6 months. Since April 2015, we deployed 55 floats acquired from MetOcean Data Systems Ltd. which report on the Iridium satellite system.

Data issued to GTS: All data are issued to the GTS in TESAC and BUFR formats. On average, 94% of data were issued on the GTS within 24 hours in TESAC and BUFR formats since October 2015 with the exception of March and August 2016 due to server problems.

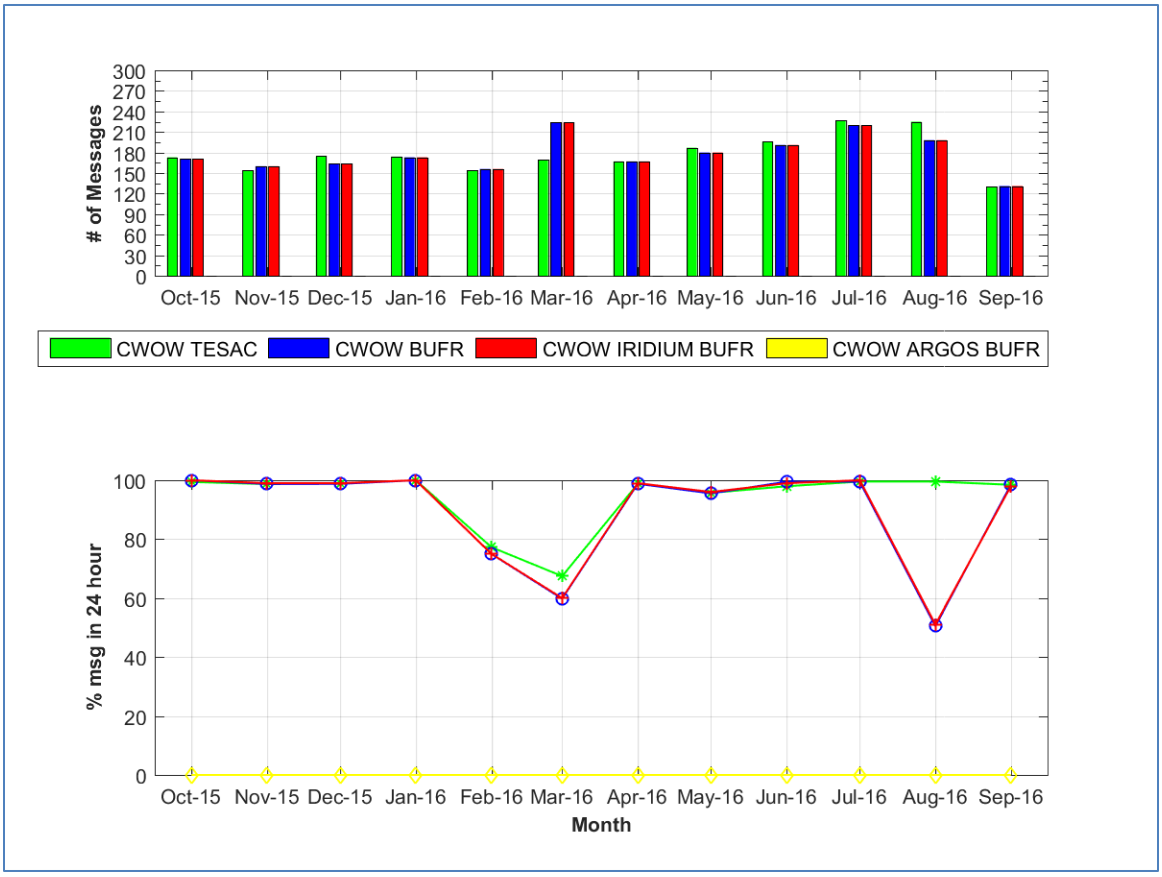


Figure 1: Performance of TESAC and BUFR transmission on the GTS under bulletin CWOW

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 back-log of profile and trajectory netCDF files (~5000 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 23 floats (3436 cycles) were quality-controlled or re-quality controlled for salinity or pressure since September 2015.

Web pages:

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

As of September 2016, 20 primary papers acknowledging Argo data usage and published between 2015 and 2016 were co-authored by at least one Canadian scientist.

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

2. Delayed Mode QC

As of September 2016, 33% 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 63% of eligible cycles.

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-17
Tianjin, China, 26-30 September 2016

1. Status

- Data acquired from floats

From October 2015 to September 2016, China acquired 5,833 profiles from 188 active floats including 113 active Argo equivalent floats (most are PROVOR floats). These floats were deployed by 7 PIs from 5 institutes in China. A statistic of different types of the floats is shown by Table1.

From the last ADMT meeting, CSIO started to submit profiles observed by HM2000 floats to GDAC. About 87 TS profiles (90-110 levels for each profile) from 5 HM2000 floats have been submitted.

This September, China will deploy 10 HM2000 floats (with cycle time about 5 days) in the South China Sea (SCS). It's the first time for China to deploy Argo profiling float in the SCS, and CSIO is ready to receive and process data for these floats. The design of the SCS regional Argo network will consist of 15-20 HM2000 floats.

NMDIS has operated 19 PROVOR floats since 2010. Till now, none of them is alive.

Table1 A statistic of different types of the active floats

Float type	Transmission system	Number of floats
ARVOR	Argos	7
PROVOR_DOI	Iridium	9
PROVOR	Argos	95
APEX	Iridium	16
APEX	Argos	56
HM2000	Beidou	5

- Data issued to GTS

From last October, CSIO started to send BUFR data on GTS through China Meteorological Administration (CMA), with bulletin header BABJ. However, we didn't send any corresponding TESACs under the same header. There was an

interruption during April-May 2016 owing to a breakdown of FTP server at Meteorological Bureau of Zhejiang Province, from which the BUFR data are transferred to CMA.

CLS still helps us send BUFR data and TESAC messages on GTS except for the new deployed floats.

- Data issued to GDACs after real-time QC

From the last ADMT meeting, China submitted 5,833 R-files to GDACs after real-time QC. Among these profiles, 3,189 are observed by Argo equivalent floats, and 134 O_2 profiles are obtained from 9 PROVOR_DOI floats.

This August, CSIO began to update all trajectory files. Now most of the trajectory files including files for HM2000 floats have been converted to V3.1. A new Matlab tool has been developed and used to create new netCDF trajectory file. It is very flexible because all the attributions for each variable are recorded in a table, the only thing an operator has to do is change the content in a table.

NMDIS has converted all the Argo data to V3.1 and submitted to GDAC after real-time QC.

- Data issued for delayed QC

Until now CSIO hasn't updated D-files from V2.0 to V3.1, and there is also a big backlog for DMQC including Argo equivalent floats. A new Matlab tool has been developed to convert old D-files into V3.1, but the new D-files have to be re-examined before submission.

NMDIS did not conduct DMQC since last ADMT meeting cause of the personnel adjustment and format changing.

- Delayed data sent to GDACs

It took a lot of manpower for CSIO to setup the BDS Profiling float Data Service Center (BDS-PDSC), as well as to update trajectory files, no D-files were submitted to GDACs this year.

None delayed data was submitted to GDACs by NMDIS.

- Web pages

Two web pages are maintained by NMDIS, and CSIO. The China Argo Data Centre (http://www.argo.gov.cn) and the China Argo Real-time Data Centre (http://www.argo.org.cn). Both sites provide the access to the float data, meta data,

trajectory and their related plots. A new Argo web inquiry system is operating at CSIO (http://101.71.255.4:8080/flexArgo/out/argo.html), which provides global Argo data inquiry and downloading services.

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

The Argo data have been used in scientific applications and operational oceanography at many institutions and universities. It has become the most important data source in studying about large-scale ocean variations. Several Argo products and reanalysis products have been developed, of which the BOA_Argo dataset is an annually updated monthly TS product from 2004. It has a horizontal resolution of $1^o \times 1^o$, and 58 vertical levels between 0 and 1975 m.

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 number of China Argo equivalent floats is more than half of the Argo floats of China. It is the biggest challenge to complete DMQC for these floats. But DMQC will be restored as soon as BDS-PDSC becomes operational. The backlog is expected to be eliminated before the next ADMT meeting.

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

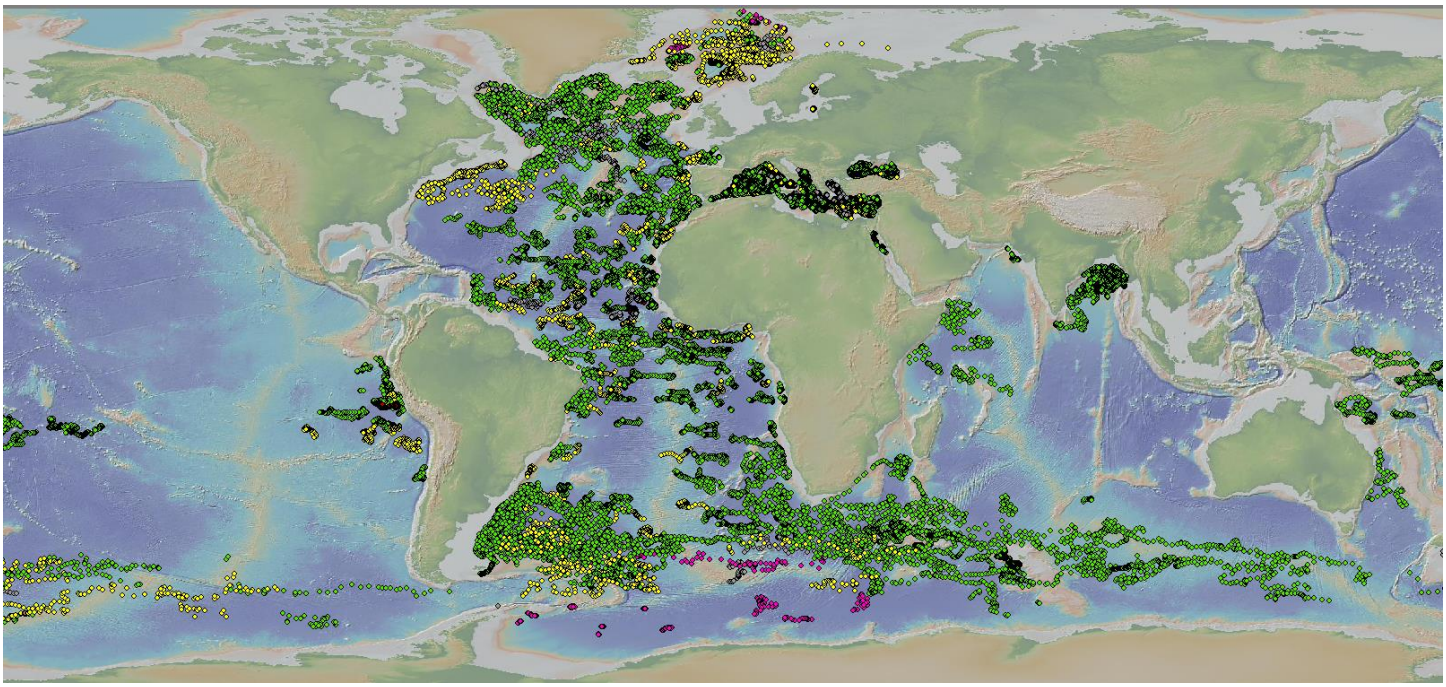
None.

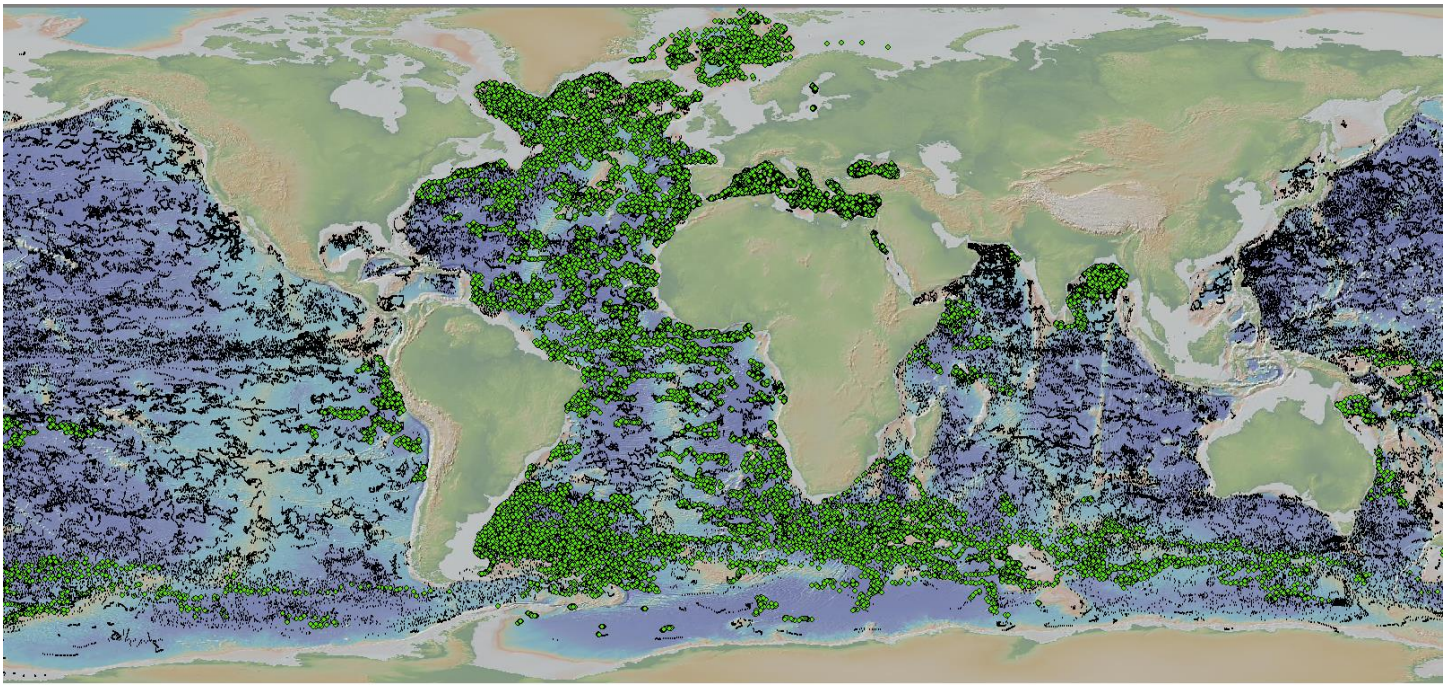
4. Regional Centre Functions

None.

Argo data management report 2016
Coriolis DAC & GDAC

Data Assembly Centre and Global Data Assembly Centre
Annual report September 2016
Version 1.0
September 14th, 2016
Reference : http://archimer.ifremer.fr/doc/00350/46128/





DAC status

This report covers the activity of Coriolis data centre for a one-year period from September 1st 2015 to August 31th 2016.

Data acquired from floats

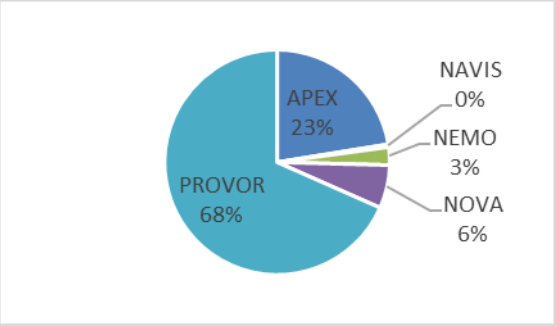
Active floats on the last 12 months

These last 12 months, **29 683 profile files from 740 active floats** were collected, controlled and distributed.

Compared to 2015, **the number of profiles files increased by 16%, the number of floats decreased by 1%.** The increase of profile files with a stable number of floats is explained by a better lifetime of active floats.

The 740 floats managed during that period had 57 versions, from 5 families.

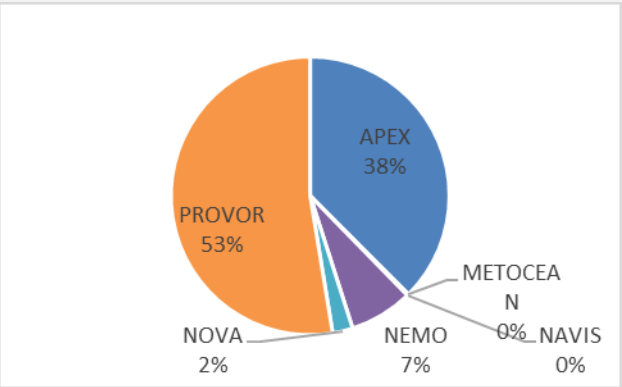
Coriolis DAC, active floats in 2016			
Float family	nb versions	nb floats	nb core profile
APEX	30	166	5 563
NAVIS	1	3	275
NEMO	1	19	526
NOVA	3	46	1 773
PROVOR	22	506	21 546
Total	**57**	**740**	**29 683**

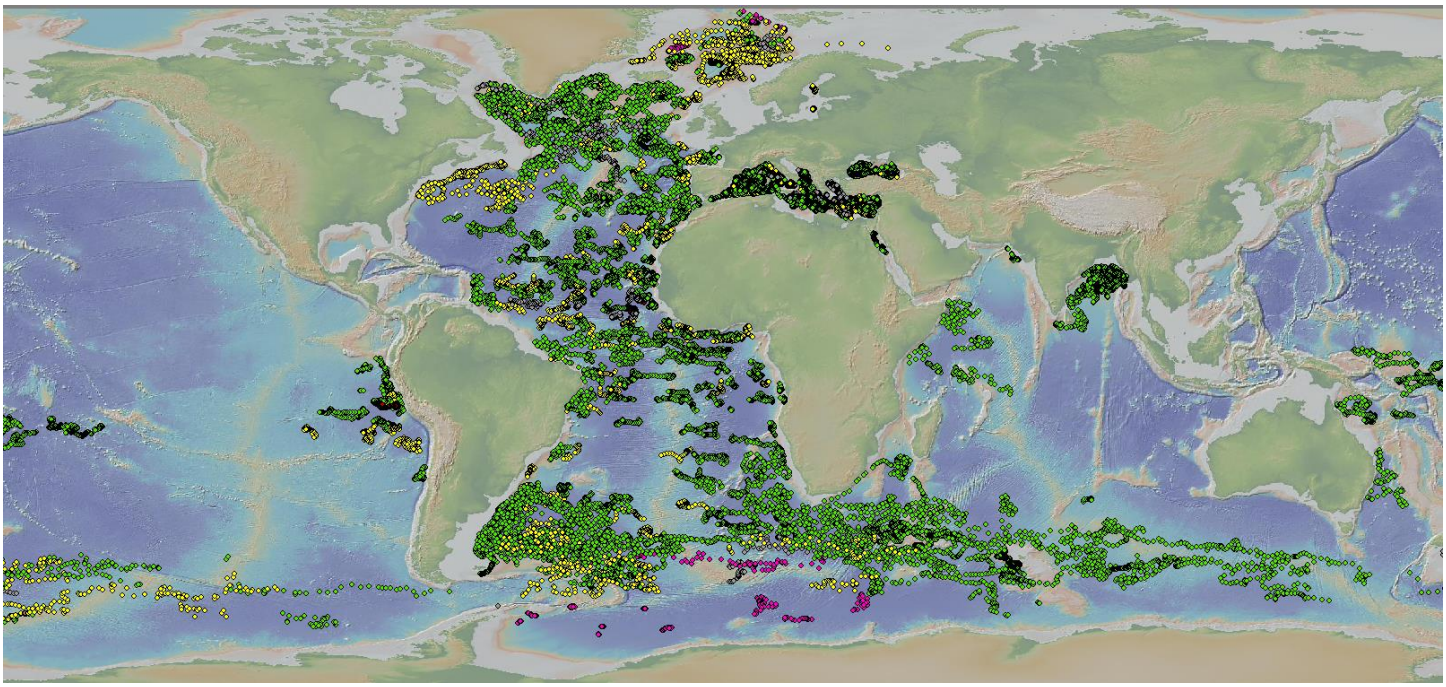


All floats managed by Coriolis DAC

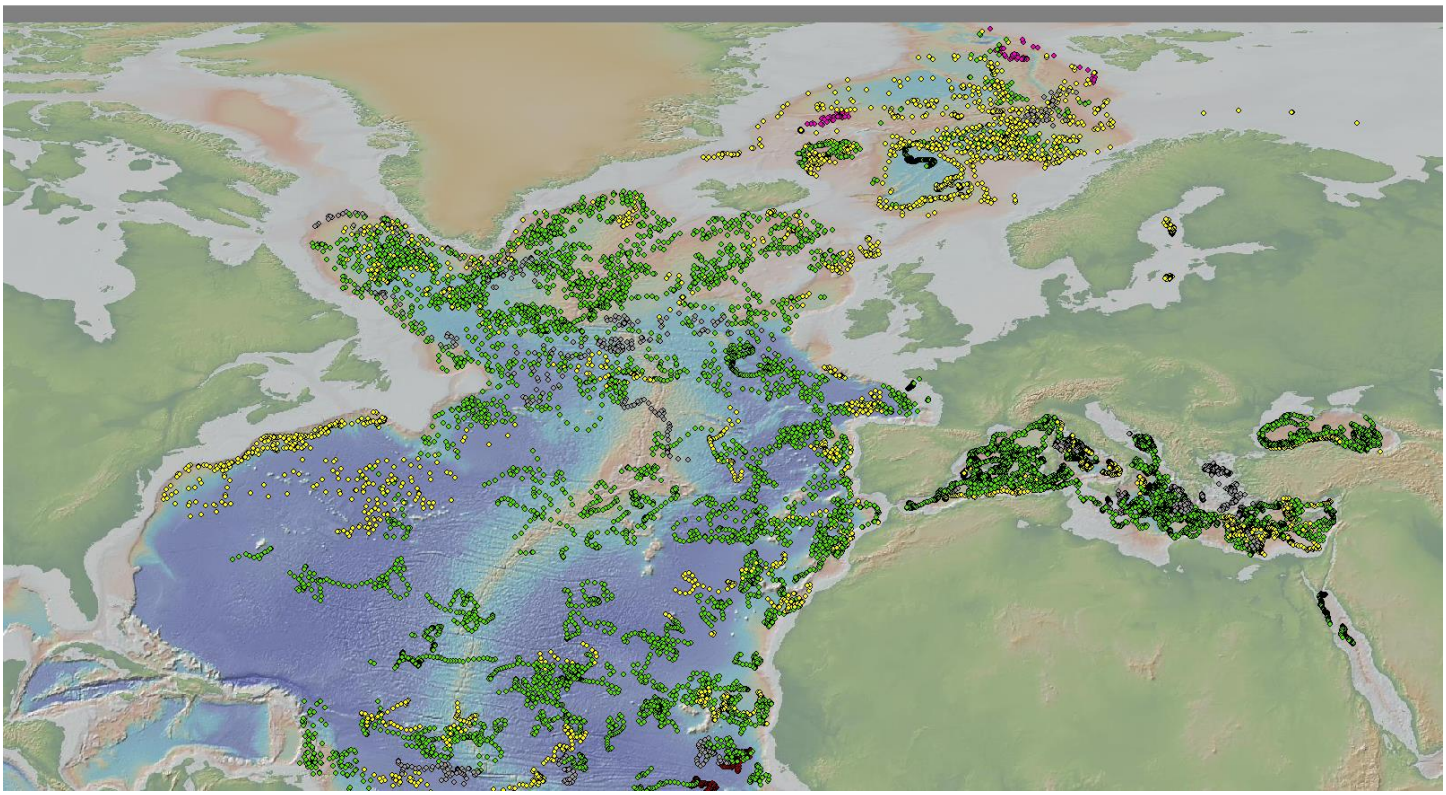
Coriolis DAC manages a total of 2 210 floats with 116 versions, from 6 families.

Coriolis DAC, all floats			
Float family	nb versions	nb floats	nb core profile
APEX	58	829	90 521
METOCEAN	1	1	52
NAVIS	1	3	488
NEMO	8	163	8 911
NOVA	3	52	2 721
PROVOR	45	1 162	122 942
Total	**116**	**2 210**	**225 635**

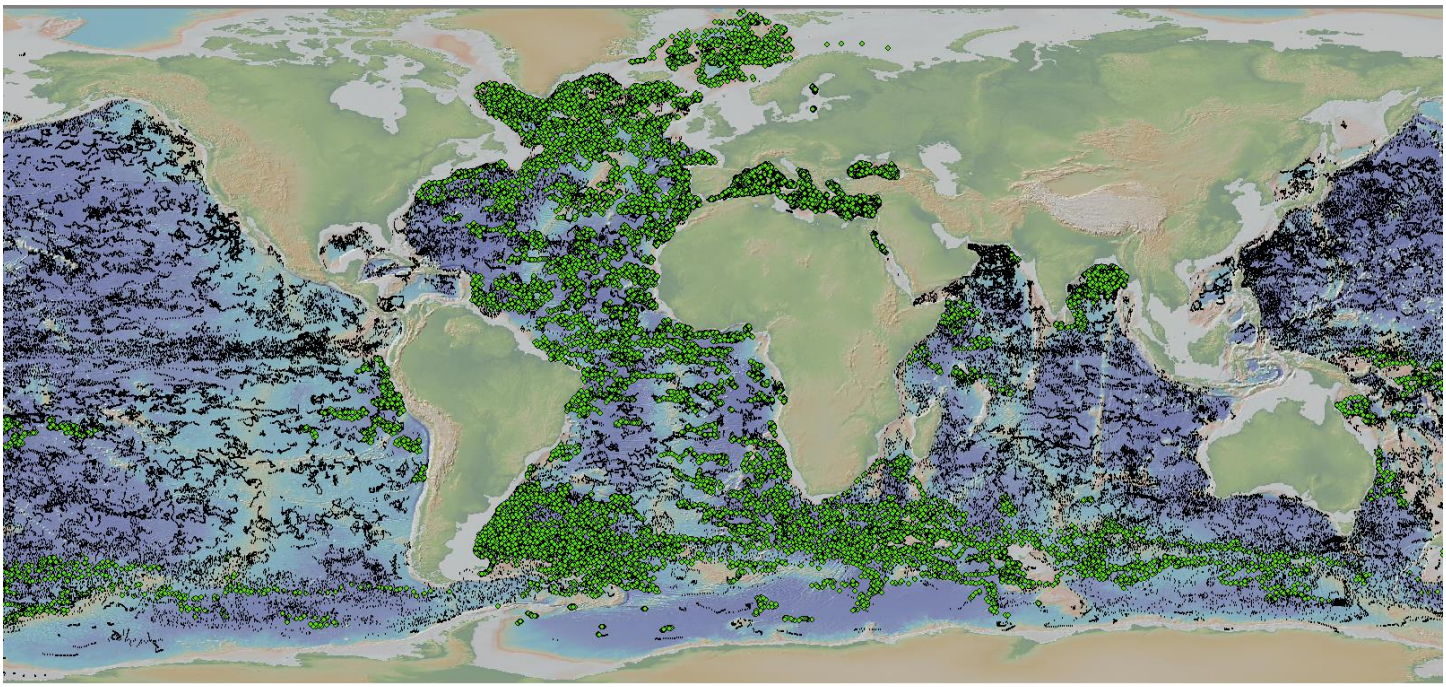




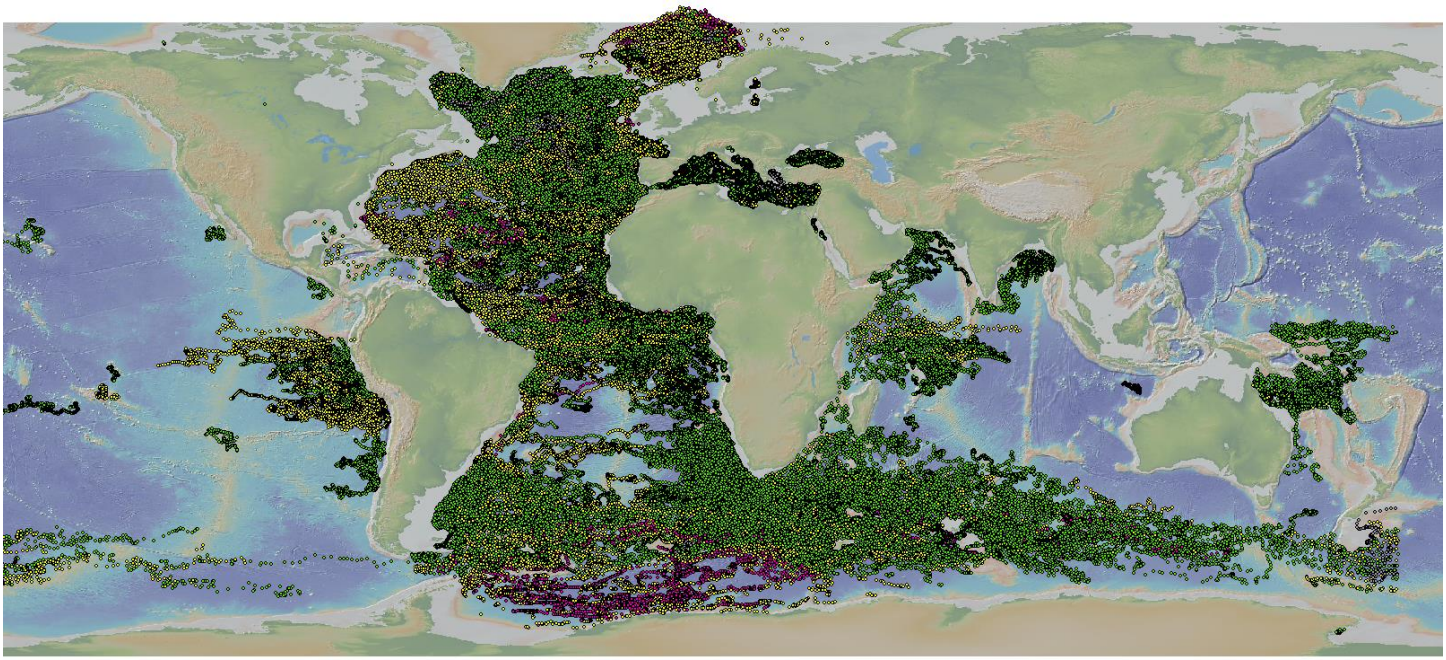
Map of the 29 683 profile files from 740 active floats decoded by Coriolis DAC this current year
Apex Navis Nemo Nova Provor



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)



Map of the 225 635 core-Argo profile files from 2210 floats managed by Coriolis DAC
Apex Navis Nemo Nova Provor

Transition to Argo NetCDF format 3.1

Provor floats

In 2015, most Provor Argo float files were reprocessed into Argo NetCDF version 3.1.

In 2016, the remaining delayed mode files were moved to V3.1.

Apex floats

In 2016, 10 versions of Apex floats were reprocessed into Argo NetCDF version 3.1.

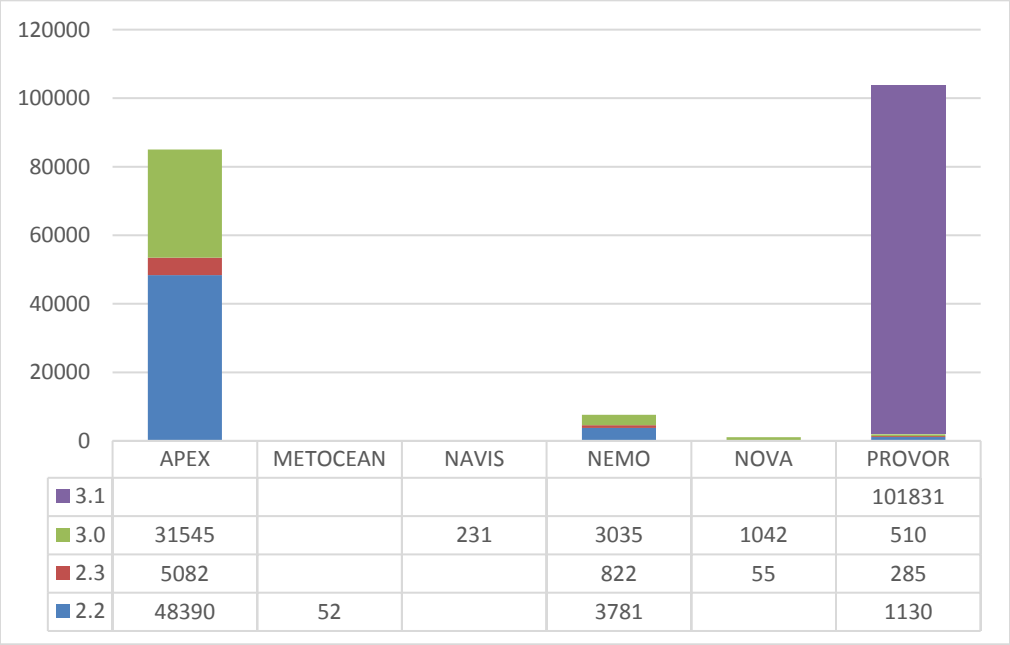
The delayed mode files from these 10 versions are still in version 3.0. They will probably be entirely reprocessed by the delayed mode operators, as the reprocessed real-time profiles have a higher quality than the former files.

The rest of 14 versions of still active Apex floats will be gradually converted (probably in 2016-2017).

The 35 versions no more active will be converted to V3.1.

Nemo, Nova, Navis floats

The schedule for V3.1 transition for these files is not yet defined.



	APEX	METOCEAN	NAVIS	NEMO	NOVA	PROVOR
3.1						101831
3.0	31545		231	3035	1042	510
2.3	5082			822	55	285
2.2	48390	52		3781		1130

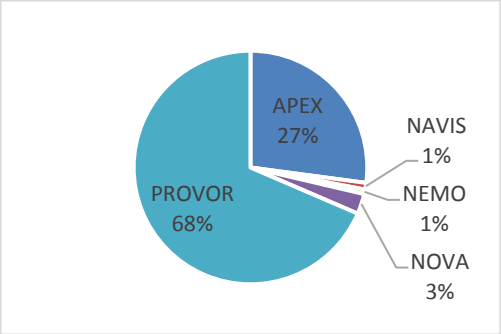
Number of files from Coriolis DAC, per file format

Bio-geo-chemical sensors on Coriolis floats

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

Coriolis DAC provides data for 321 bio-Argo floats from 5 families and 46 instrument versions. They performed 38 376 cycles.

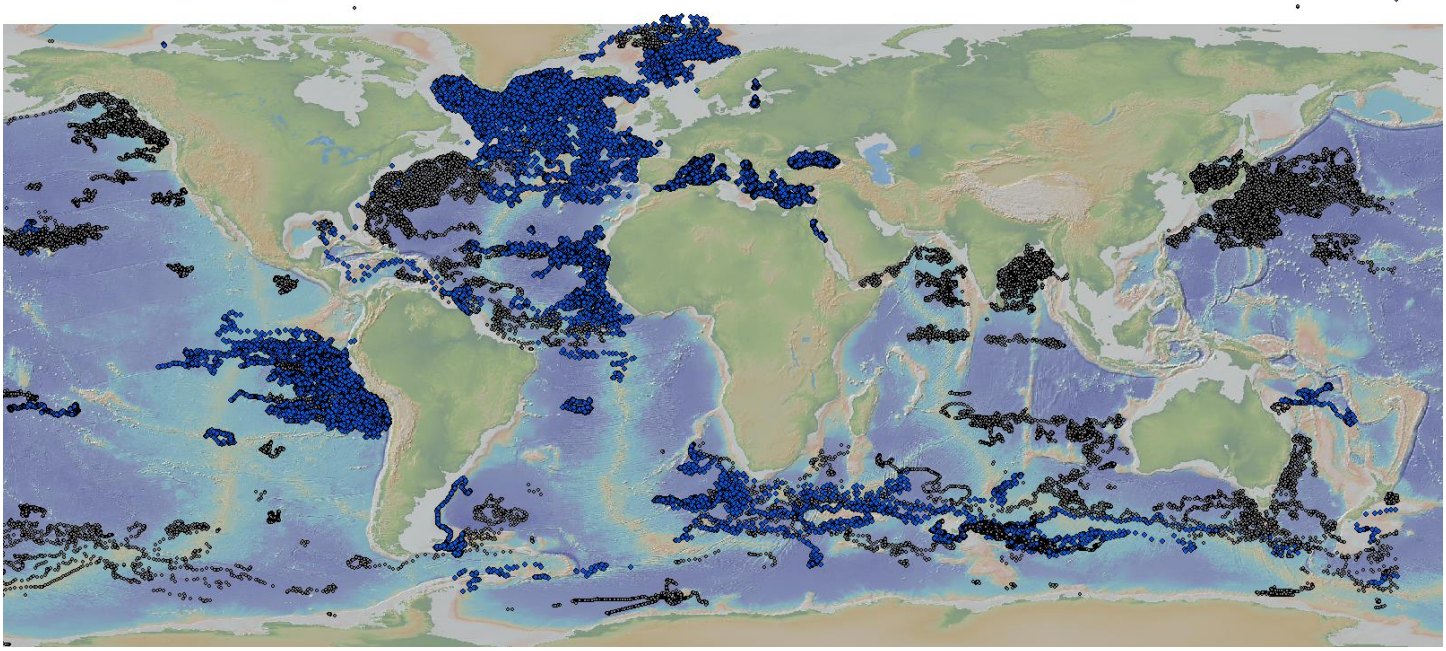
Bio-Argo floats processed by Coriolis DAC			
Familly	nb versions	nb floats	nb cycles
APEX	21	87	10 243
NAVIS	1	3	394
NEMO	1	2	297
NOVA	2	9	279
PROVOR	21	220	27 163
Total	**46**	**321**	**38 376**



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

83 parameters managed : core-argo, b-argo, i-argo parameters
These parameter include chlorophyll, turbidity, CDOM, back-scattering, UV, nitrate, bisulfide, pH, radiance, irradiance, PAR



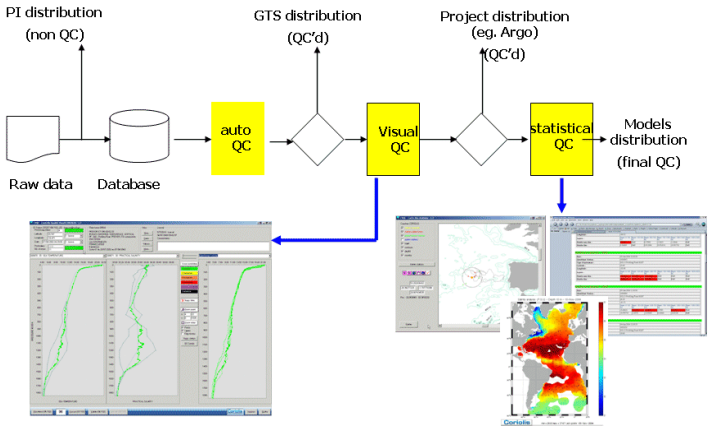
Map of the 321 bio-Argo floats managed by Coriolis DAC (grey dots: the others DACs bio-Argo floats). They measure parameters such as oxygen, chlorophyll, turbidity, CDOM, back-scattering, UV, nitrate, bisulfide, pH, radiance, irradiance, PAR.

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. We received information from Anh Tran that a fair amount of Coriolis BUFR messages did not reach American GTS nodes. Meteo-France accept Coriolis as valid BUFR messages and circulate them on neighbour nodes. Some neighbour nodes may reject some of Coriolis BUFR message. The situation still need a clarification.

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.

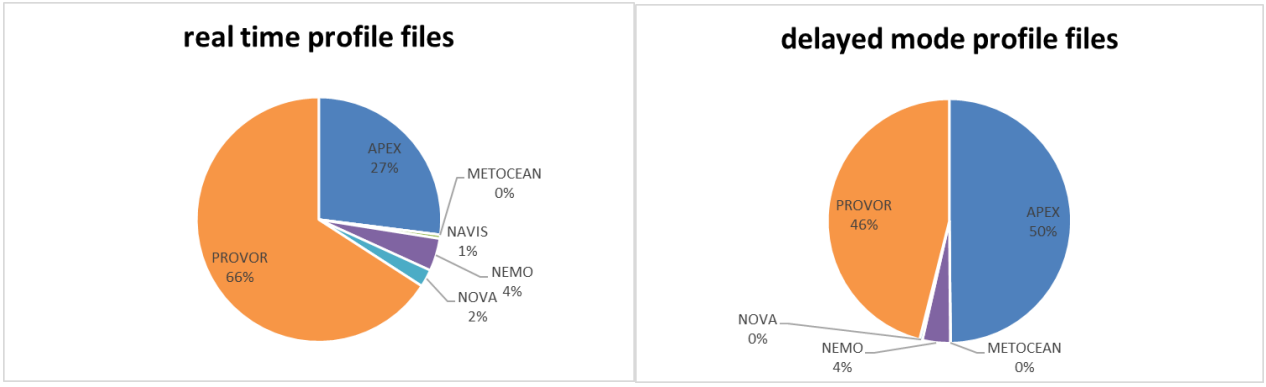


CORIOLIS DAC: Argo data flow

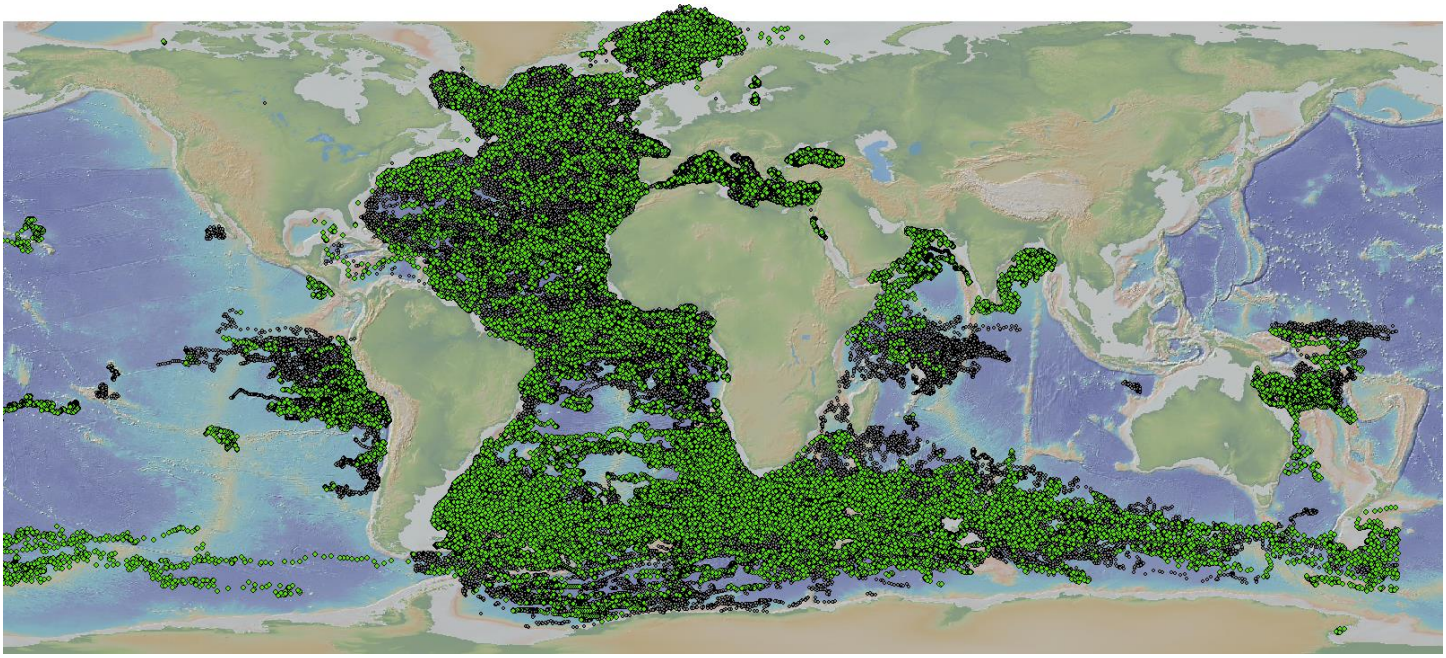
Data issued to GDACs after real-time QC

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 profile	RT profiles	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 – delayed mode profile files



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

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 within 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 when the work underway on the trajectory file checker is completed (http://dx.doi.org/10.13155/46120) .

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.

Delayed mode data sent to GDACs

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

- A total of **46 035 new or updated delayed mode profil**es from 501 floats were sent to GDACs this year.
- A total of **129 641 delayed mode profiles** where sent to GDACs since 2005.
  The number of delayed mode profiles increased by 8% this year.

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:

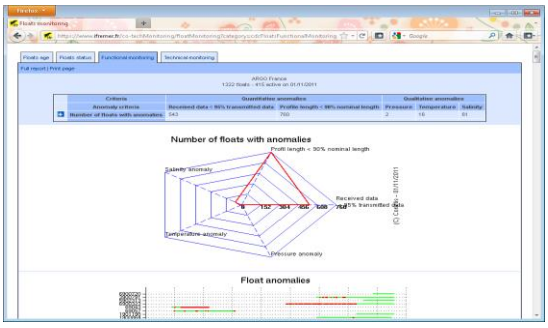
- http://www.ifremer.fr/co-argoFloats/
    - Individual float description and status (meta-data, geographic map, graphics : section, overlaid, waterfall, t/s charts)
    - Individual float data (profiles, trajectories)
    - FTP access
    - Data selection tool
    - Global geographic maps, GoogleEarth 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:

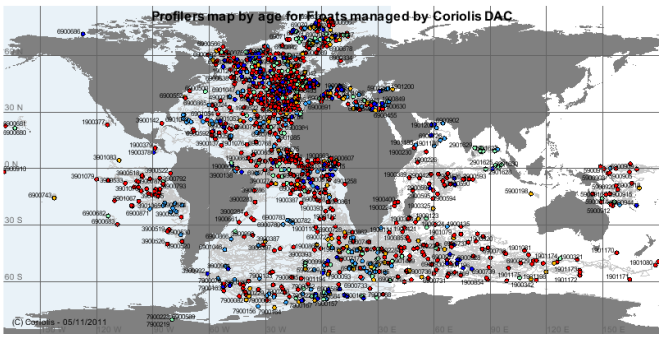
- http://www.coriolis.eu.org/Data-Products/Data-Delivery/Argo-floats-interoperability-services2
    - Display an individual float's data and metadata
    - Display an individual float's data and metadata in XML format
    - Display all Argo floats
    - Display a group of floats
    - Argo profiles and trajectories data selection
    - All individual float's metadata, profile data, trajectory data and technical data
    - Argo profiles data on OpenDAP, OGC-WCS and http
    - 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

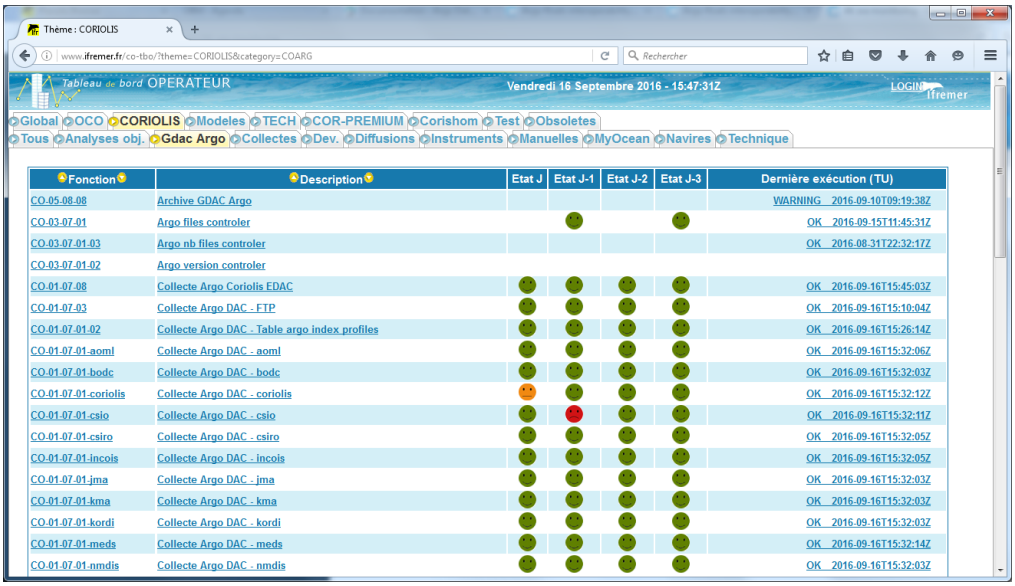


Example 1: technical monitoring of Argo-France floats



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

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



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

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 Previmer (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 **62 Argo scientific projects and 57 PIs (Principal Investigators).**

List of Coriolis scientific PIs and project names

Project name	nb floats
euro-argo	811
coriolis	468
bsh	148
goodhope	82
naos	75
argo italy	56
remocean	48
argomed	36
argo_spain	31
pirata	30

The top 10 scientific projects

The other scientific projects: gmmc, awi, argo-bsh, dap, ovide, eaims, sagar, argo greece, geovide, argo norway, amop, bwr, argo_fin, outpace, argo geomar, ticmoc, dekosim, ge moose, brazilian navy argo program, ifm, socib, gmmc_cnes, sri_lanka, aspex, argo bulgary, vsf, rrex, mafia, cnes, argo-italy, wen, lefe, shackelton, argo-poland, perseus, medargo_it, mooxy, bioargo-italy, track2010, cienperu, argo brazil, naos,pirata, plumrho leg 1, proteusmed, upsen, rrex asfar, shom, congas, physindien, euroargo, asa, flops

PI name	nb floats
birgit klein	111
christine coatanoan	86
pierre-marie poulain	66
sabrina speich	64
holger giese	57
virginie thierry	44
bernard bourles	33
pedro joaquin velez belchi	28
fabrizio d'ortenzio	27
herve claustre	26

The top 10 Principal Investigators (PI) in charge of floats

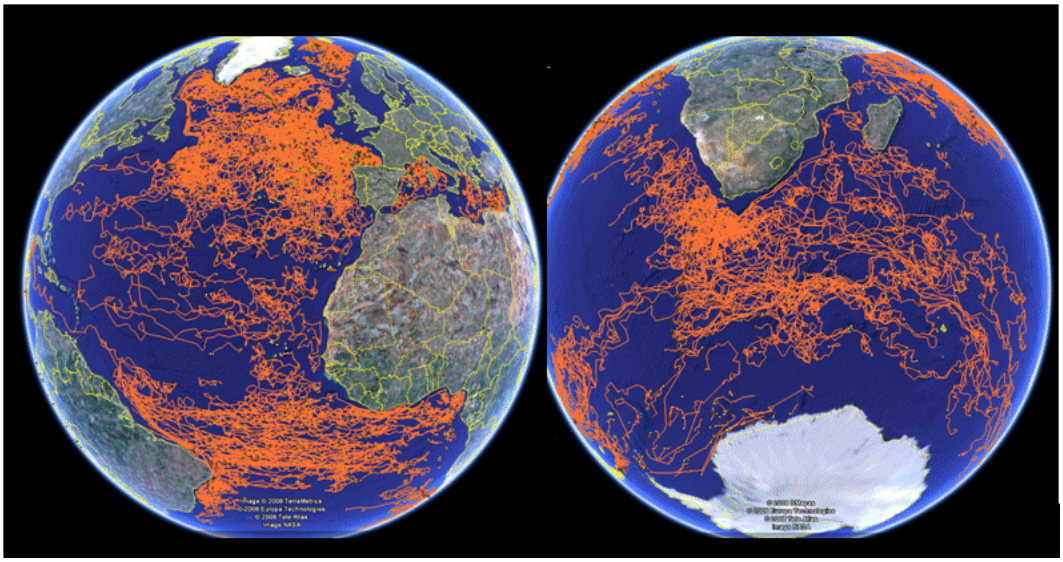
The other PIs : christophe maes, gerd rohardt, andreas sterl, sabrina speich et michel arhan, fabien durand, jose lluis pelegri, dimitris kassis, xavier andre, kjell arne mork, jean-baptiste sallee, rena czeschel, laurent coppola, cecile cabanes, sophie cravatte, luis felipe silva santos, violeta slabakova, serge le reste, bettina fach, tero purokoski, christine provost, alban lazar, stephanie louazel, arne kortzinger, stephane blain, thierry moutin, detlef quadfasel, w. walczowski, bert rudels, tobias ramalho dos santos ferreira, vincent echevin, vincent dutreuil et serge le reste, pascal conan, katrin latarius, velez belchi pedro, frederic vivier, alain serpette, sorin balan, elodie martinez, chistophe maes, pascual ananda, hubert loisel, waldemar walczowski, jordi font, anja schneehorst, gerard eldin, nathanaele lebreton, juliet hermes.

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:

- http://www.ifremer.fr/lpo/files/andro/ANDRO_JAOT_2013.pdf
- 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.

Delayed Mode QC

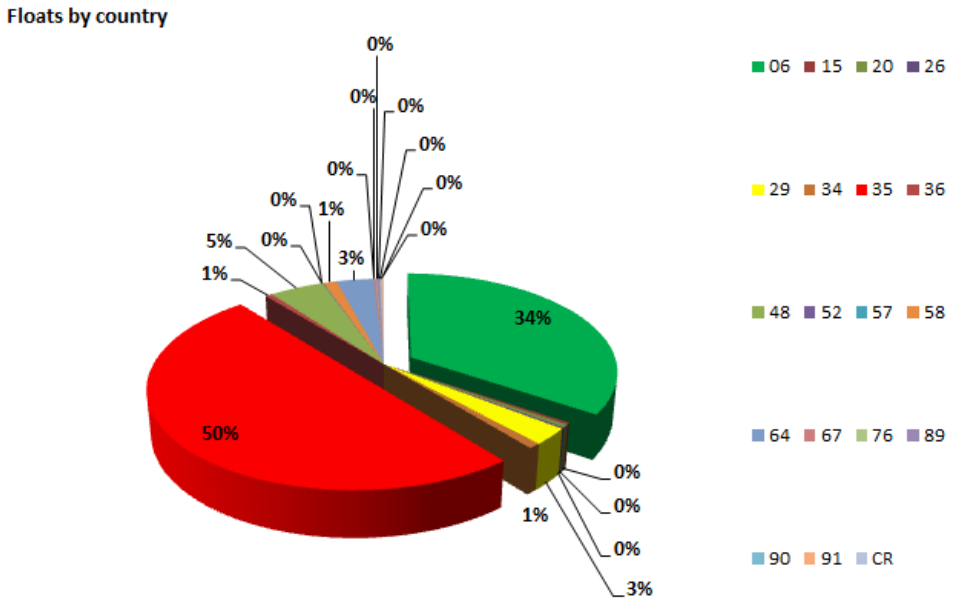
(Please report on the progress made towards providing delayed mode Argo data, how it's organized and the difficulties encountered and estimate when you expect to be pre-operational .)

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.

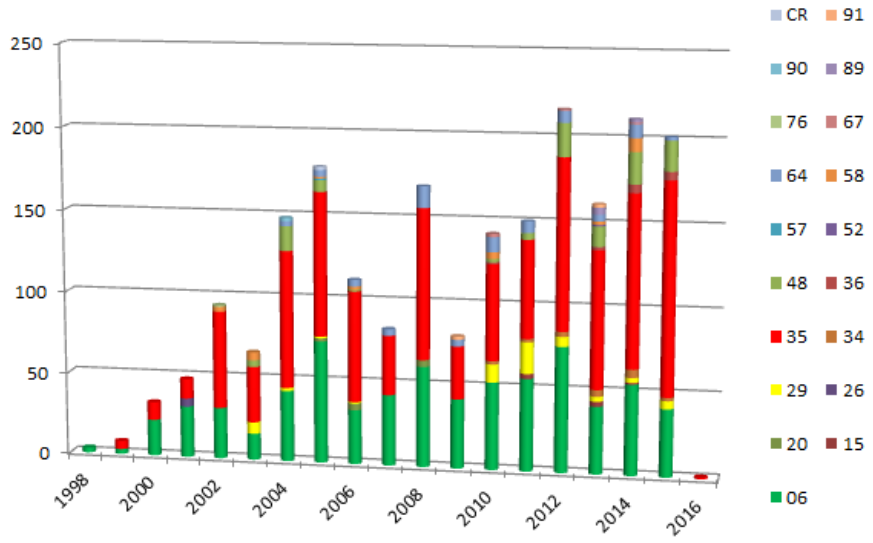
For a few projects, there are still no identified operators to do DMQC, for instance the first run has been done by students which have now left institutes or are not available to carry on with this work. We have made a lot of progress with BSH (Birgit Klein) taking into account also floats from other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



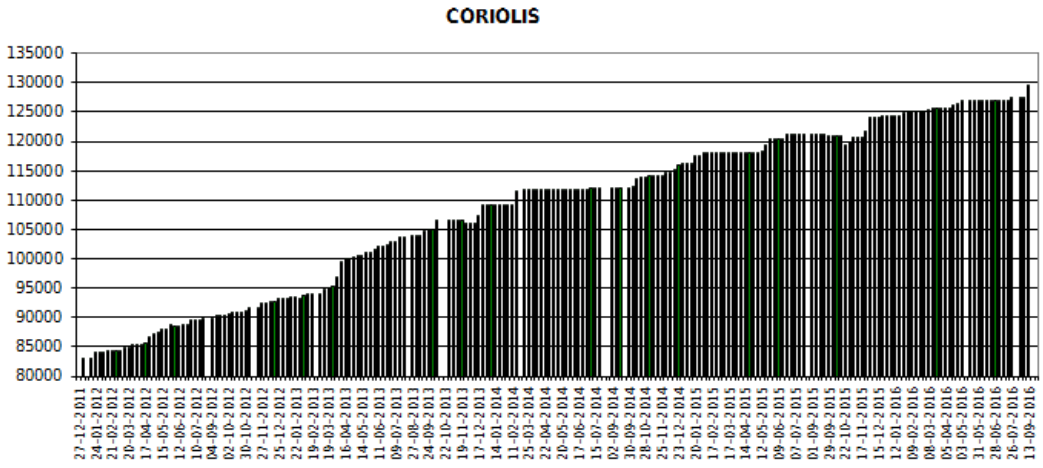
Percentage of floats by country in the Coriolis DAC.

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

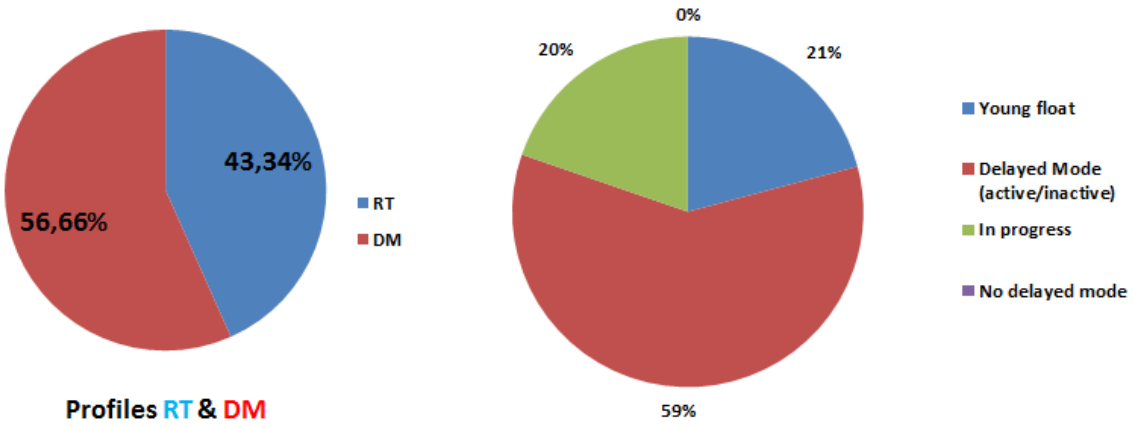


Number of floats by country and by launch's year in the Coriolis DAC

During the last year (from October 2015 to September 2016), 10371 new delayed mode profiles where produced and validated by PIs. A total of 129641 delayed mode profiles where produced and validated since 2005.

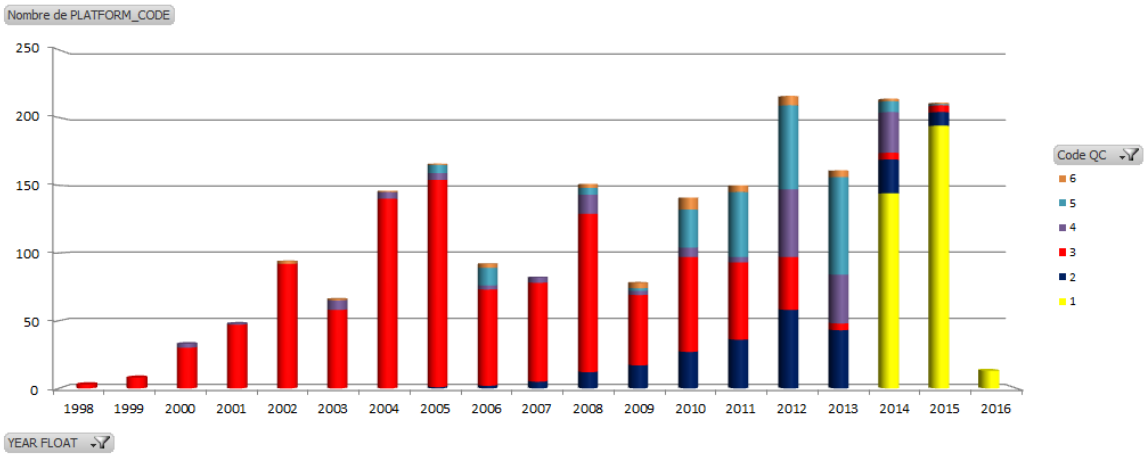


Evolution of the DM profiles' submission versus dates



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).

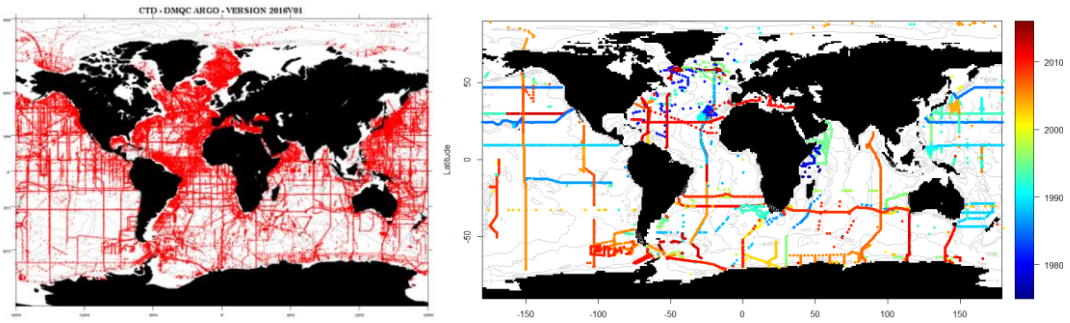
The status of the quality control done on the Coriolis floats is presented in the following plot. For the two last years (2015-2016), most of the floats are still too young (code 1) to be performed in delayed mode. For the years 2012-2013-2014, we are working on the DMQC of some floats, which should be available for the end of this year. 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.

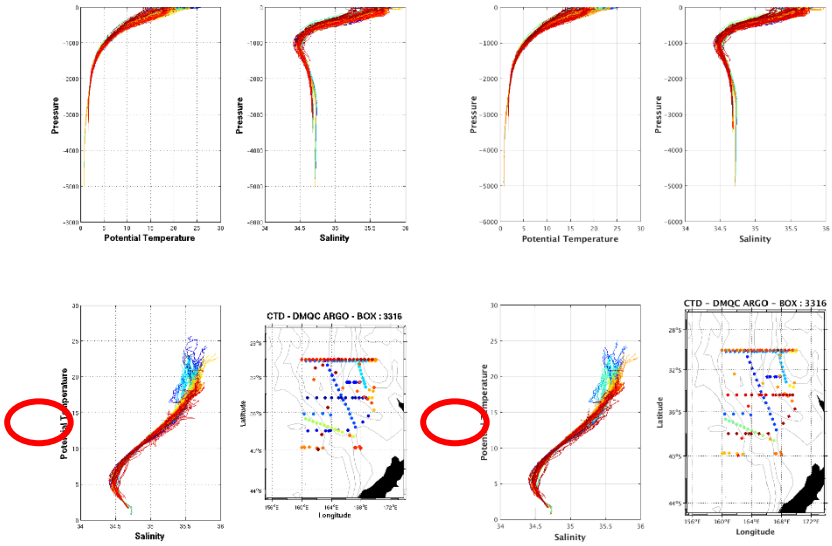
Reference database

The last version CTD_for_DMQC_2016V01 has been provided in September 2016. This version takes 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. Concerning the CCHDO API, all cruises have been imported but only 30% have been kept after duplicates check with data in Coriolis database.



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

The new version takes also into account best quality control on data (based on analysis of deep water). At this time, updates on boxes in the areas 1 & 3 have been corrected.



Example of updates - box 3316: left previous version, right; updated version.

This 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_2016V01_1.tar.gz for all boxes starting with wmo 1, then we will have 4 tar files. A new column has

been added QCLEVEL with information on the providers (CCH for CCHDO, OCL for US-NODC, COR for Coriolis and SPI for scientists PIs).

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) …

National centres reporting to you

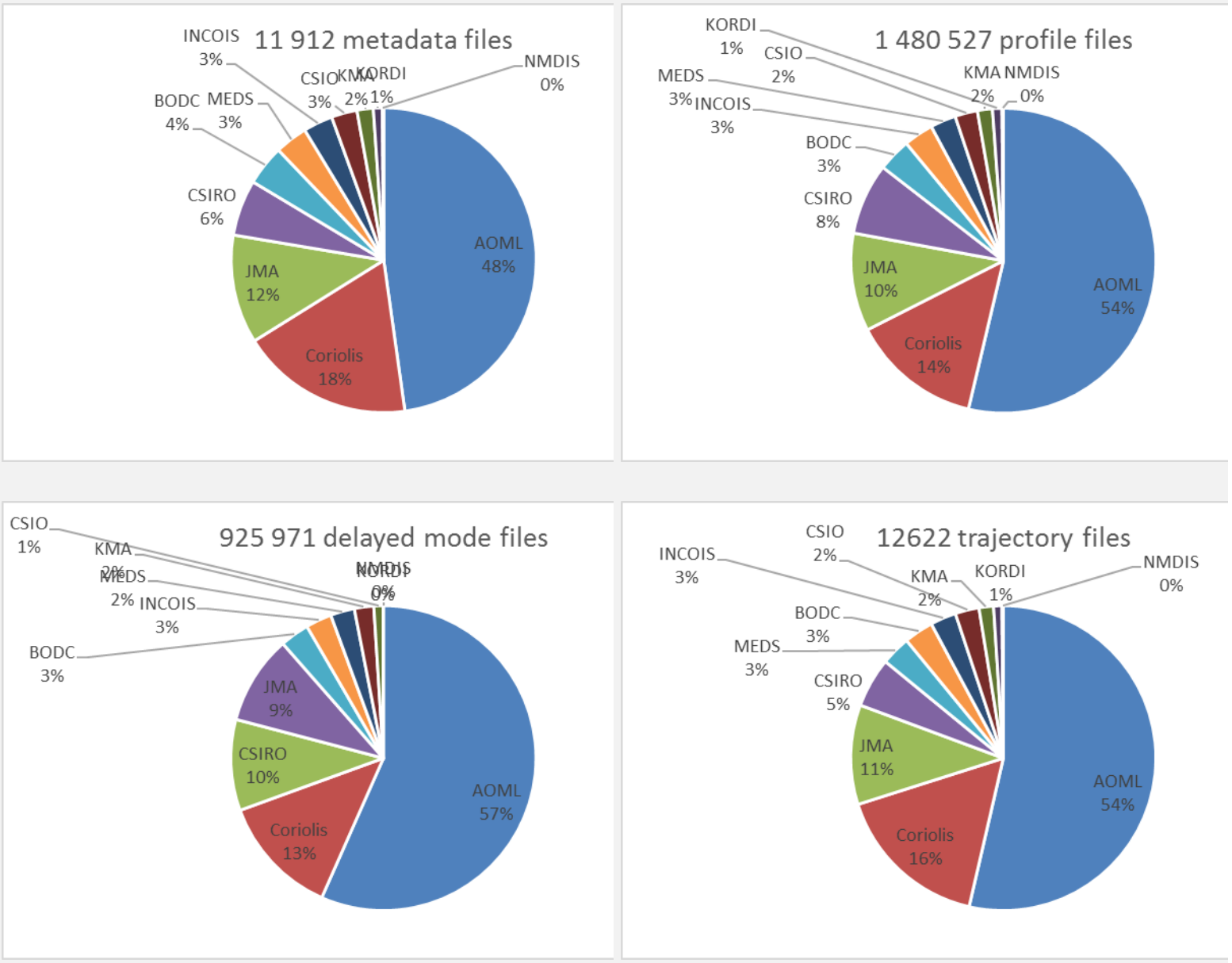
Currently, 11 national DACs submit regularly data to Coriolis GDAC.

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 September 16th, the following files were available from the GDAC FTP site.

DAC	metadata files 2016	increase from 2015	profile files 2016	increase from 2015	delayed mode profile files 2016	increase from 2015	trajectory files 2016	increase from 2015
AOML	6 020	5%	877 797	11%	572 793	7%	7 226	7%
BODC	538	7%	57 307	8%	31 307	0%	420	0%
Coriolis	2 310	7%	226 052	14%	129 641	8%	2 223	7%
CSIO	344	6%	39 026	16%	10 221	1%	340	5%
CSIRO	748	9%	124 051	12%	97 631	48%	711	25%
INCOIS	394	6%	51 548	10%	27 819	3%	370	4%
JMA	1 454	3%	169 948	5%	95 532	0%	1 424	3%
KMA	217	9%	26 035	9%	20 786	14%	207	7%
KORDI	119	0%	16 300	2%	0		119	0%
MEDS	435	8%	44 327	5%	25 763	9%	421	7%
NMDIS	19	0%	2 460	2%	0		19	0%
Total	**12 598**	**5,76%**	**1 634 851**	**10,42%**	**1 011 493**	**9,24%**	**13 480**	**6,80%**

- The total number of NetCDF files on the GDAC/dac directory was 1 844 628.
- The size of GDAC/dac directory was 168 Go
- The size of the GDAC directory was 647 Go



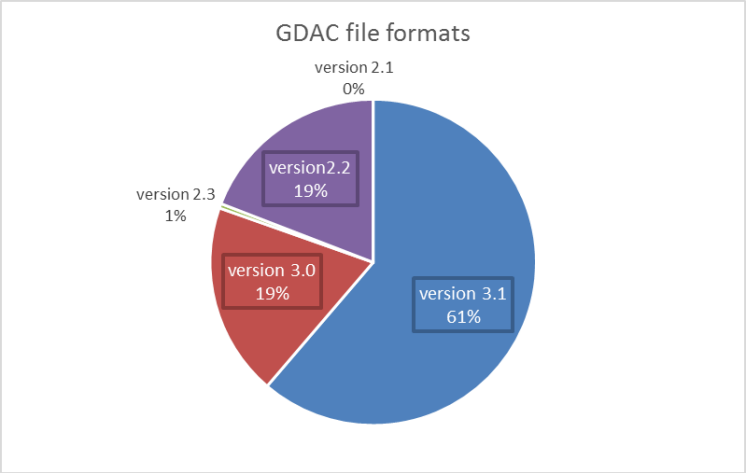
Number of files available on GDAC, September 2016

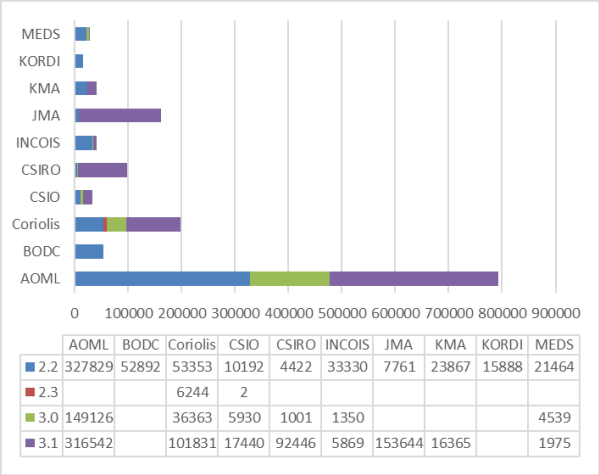
File format: transition to Argo NetCDF V3.1

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

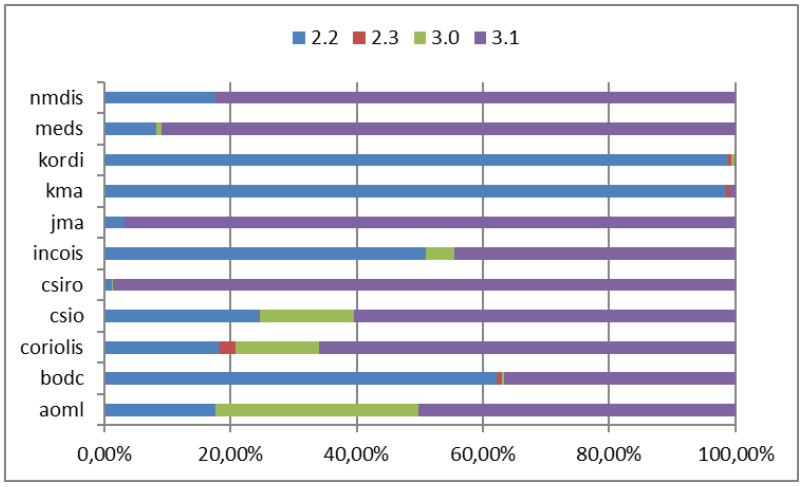
On September 2016, the number of files in format version 3.1 reached and passed a 60% threshold.

format version	nb files
3.1	1 130 689
3.0	353 116
2.3	8 369
2.2	353 155
2.1	20
Total	**1 845 349**





	AOML	BODC	Coriolis	CSIO	CSIRO	INCOIS	JMA	KMA	KORDI	MEDS
2.2	327829	52892	53353	10192	4422	33330	7761	23867	15888	21464
2.3			6244	2						
3.0	149126		36363	5930	1001	1350				4539
3.1	316542		101831	17440	92446	5869	153644	16365		1975



Number of files per DAC and format version

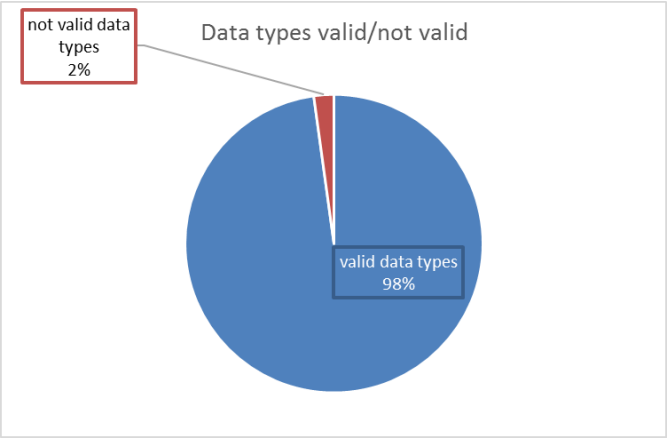
The files in format version V3.1 are much more homogeneous than their previous versions.

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 40 000 files (2% of the total) do not have a valid DATA_FORMAT.
The V3.1 files are not affected by this kind of problem.

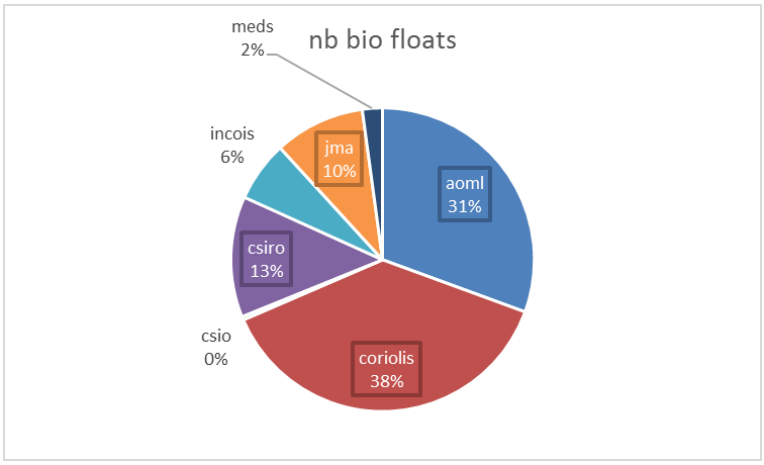
data_type	nb files	valid type
B-Argo trajectory	253	yes
B-Argo profile	79 271	yes
Argo trajectory	12 078	yes
Argo Trajectory	114	no
ARGO trajectory	1 287	no
Argo technical data	11 516	yes
ARGO technical data	239	no
Argo technical	510	no
Argo profile merged	79 736	yes
Argo profile	1 609 709	yes
ARGO profile	38 038	no
Argo meta-data	12 598	yes

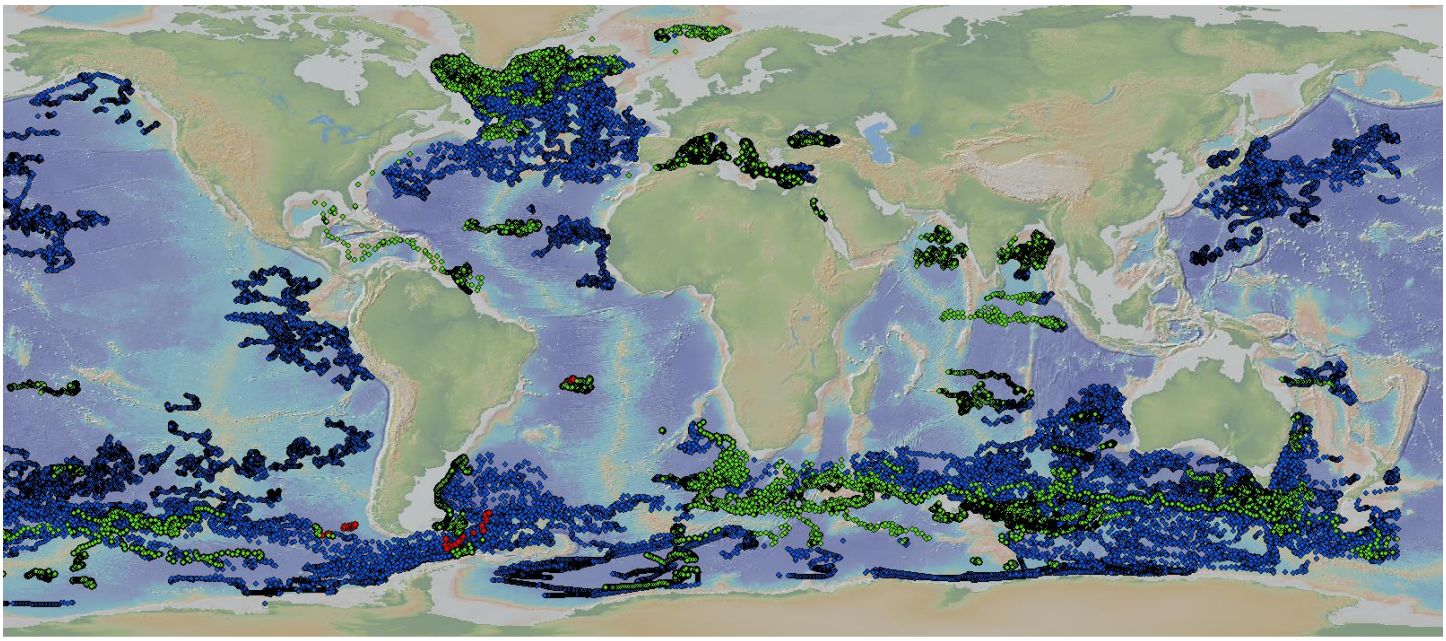


Bio-Argo floats

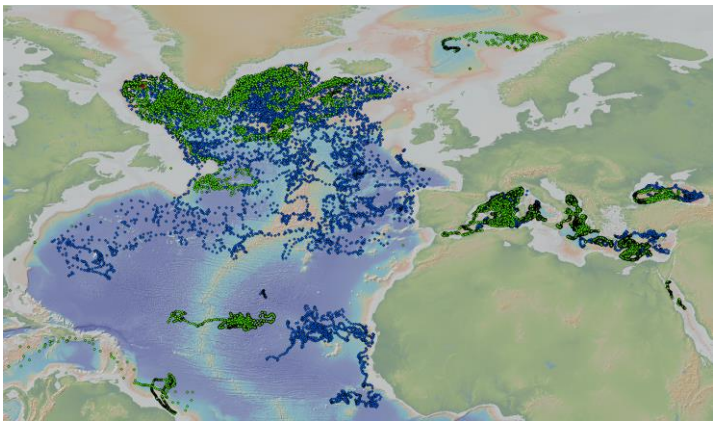
On September 20th, 559 floats reported bio parameters.

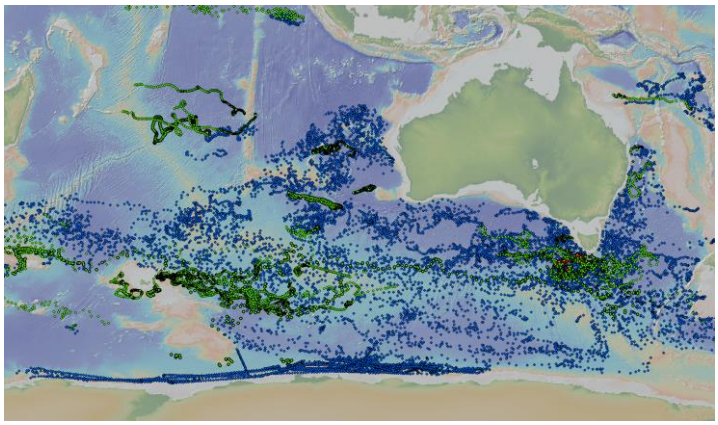
DAC	nb bio floats	nb bio files
aoml	171	22 324
coriolis	212	27 300
csio	2	371
csiro	72	18 635
incois	36	3 290
jma	54	7 151
meds	12	256
Total	**559**	**79 327**





Bio Argo observations, blue oxygen, green chlorophyll, red nitrate





Parameter	dac	nb floats	nb profiles
Oxygen	aoml	171	22324
Oxygen	coriolis	172	20130
Oxygen	csio	2	371
Oxygen	csiro	68	18631
Oxygen	incois	36	3290
Oxygen	jma	47	6345
Oxygen	meds	12	256
Nitrate	aoml	48	1495
Nitrate	coriolis	38	4374
Nitrate	csiro	3	774
Chlorophyll	aoml	43	1438
Chlorophyll	coriolis	101	15751
Chlorophyll	csiro	20	7900
Chlorophyll	incois	35	3104
Ph	aoml	43	1323
Ph	csiro	1	205
Irradiance	coriolis	100	15396
Irradiance	csiro	3	488
Backscattering	aoml	43	1438
Backscattering	coriolis	101	15751
Backscattering	csiro	20	7900
Backscattering	incois	35	3104
CDOM	aoml	12	198
CDOM	coriolis	97	15158
CDOM	csiro	4	1662

Main bio-Argo parameters received from DACs

Operations of the ftp server

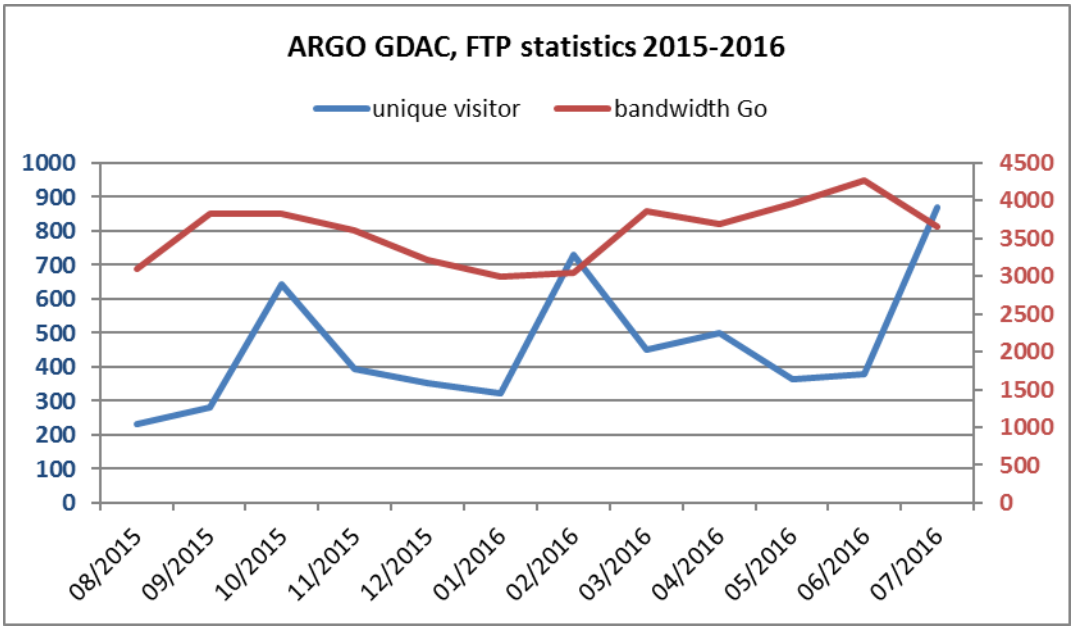
- Meta-data, profile, trajectory and technical data files are automatically collected from the national DACs ;
- Index files of meta-data, profile and trajectory are daily updated ;

- 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 321 unique visitors, performing 4229 sessions and downloading 3 To of data files.

ARGO GDAC FTP statistics				
month	unique visitor	number of visits	hits	bandwidth Go
08/2015	232	3 572	4 157 650	3095,86
09/2015	280	4 103	4 876 859	3826,07
10/2015	643	4 835	4 967 519	3829,28
11/2015	393	4 198	4 736 037	3613
12/2015	351	4 525	2 060 947	3216
01/2016	321	4 229	4 609 609	2988
02/2016	730	4 692	3 133 640	3038
03/2016	450	3 104	11 610 883	3853
04/2016	499	3 781	6 255 583	3684
05/2016	363	4 028	4 989 997	3971
06/2016	380	4 231	4 774 866	4273
07/2016	868	4 697	2 787 770	3656
Average	**459**	**4 166**	**4 913 447**	**3 587**

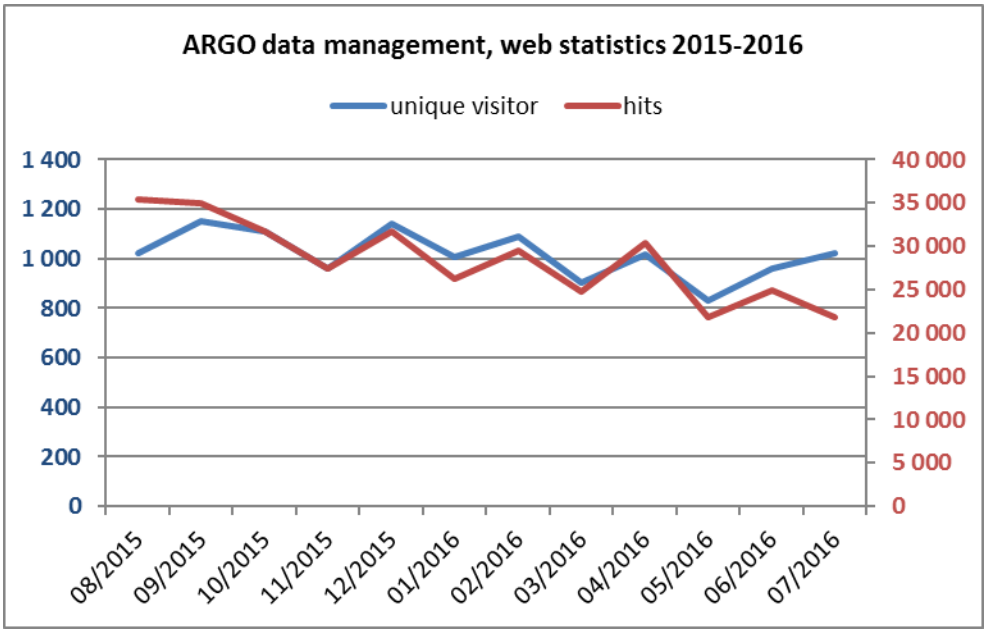


Statistics on the Argo data management web site: http://www.argodatamgt.org

There is a monthly average of 1142 unique visitors, performing 1941 visits and 31 653 hits.

The graphics shows a slightly increasing number of unique visitors.

ARGO GDAC web statistics					
month	unique visi	visits	pages	hits	bandwidth
09/2015	1 023	1 826	4 355	35 396	1,36
10/2015	1 152	1 874	4 970	34 967	1,40
11/2015	1 109	1 781	4 720	31 696	1,49
12/2015	960	1 639	3 916	27 460	2,31
01/2016	1 142	1 941	6 217	31 653	1,74
02/2016	1 006	1 760	4 090	26 253	2,60
03/2016	1 091	1 811	4 418	29 451	1,26
04/2016	903	1 445	3 703	24 696	0,83
05/2016	1 014	1 744	4 829	30 432	0,89
06/2016	831	1 326	3 246	21 740	0,77
07/2016	958	1 565	4 836	24 893	0,93
08/2016	1 023	1 738	3 993	21 817	0,98
Average	**1 018**	**1 704**	**4 441**	**28 371**	**1,38**



Data synchronization

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

The synchronization dashboard in August 2016: the daily synchronization time takes on average 100 minutes.

The above dashboard lists a series of synchronisation incidents that occurred in August 2016: the ftp connection between the Coriolis and US GDAC failed 7 times: August 4th , 6th, 11th , 20th , 21st , 23rd and 27th .

FTP server monitoring

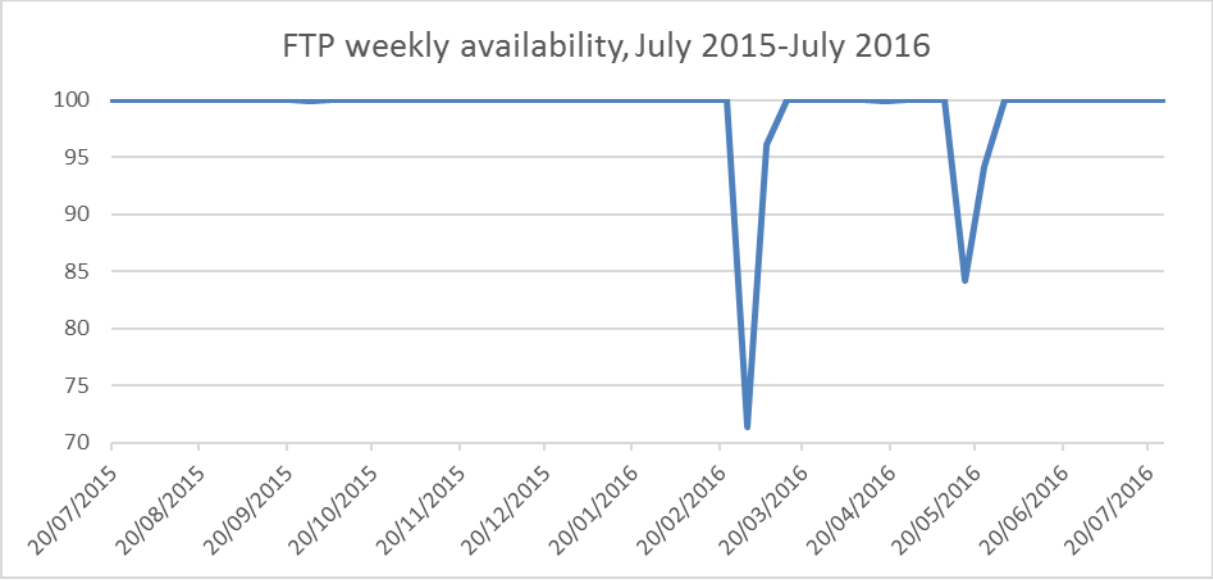
The Argo GDAC ftp server is actively monitored by a Nagios agent (http://en.wikipedia.org/wiki/Nagios).

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.

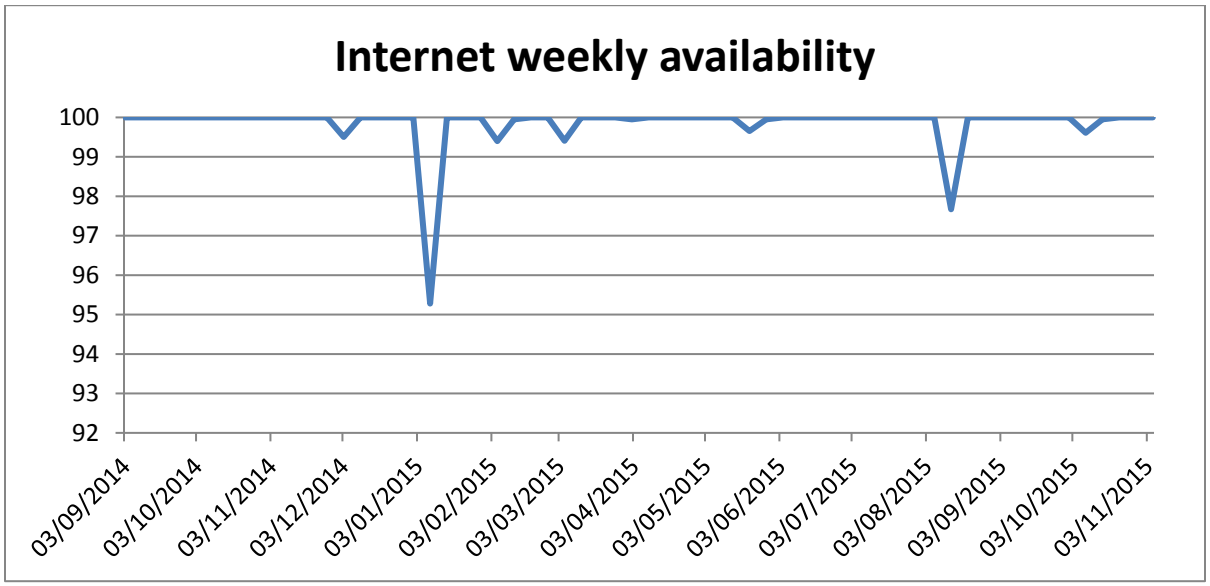
On the last 12 months, the weekly average performance was 99.51%. The 0.49% of poor performances represents 36 hours and 38 minutes.

We faced 2 significant events these last 12 months:

- First week of March: 20 hours of FTP poor performances
- Third week of May : 10 hours of FTP poor performances



Nagios ftp monitoring: between July 2015 and July 2016

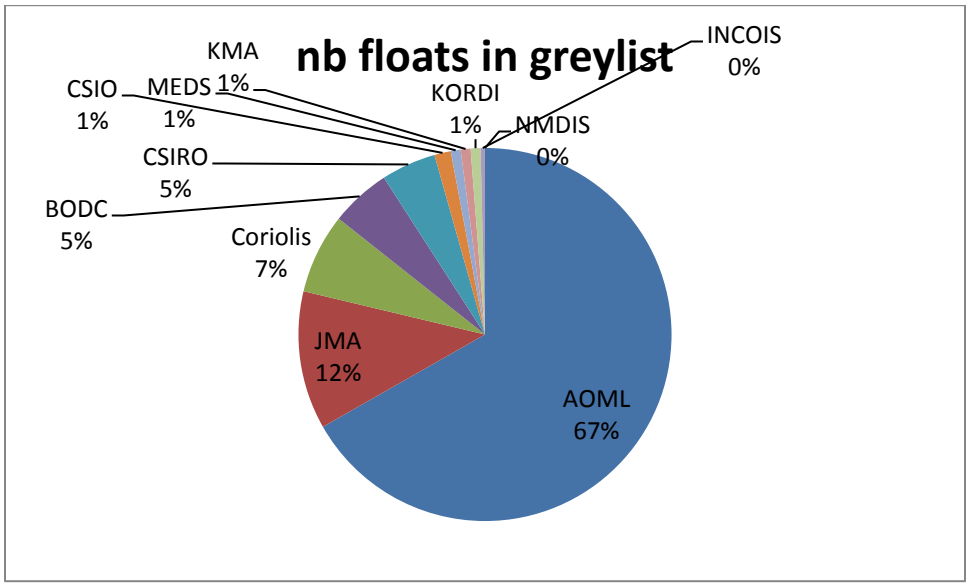


Nagios Internet monitoring: between September 2014 and October 2015

Grey list

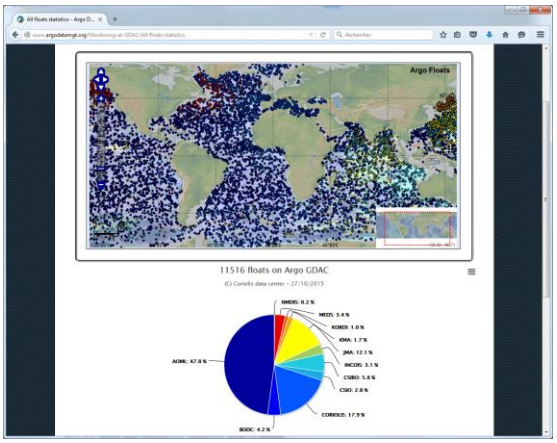
According to the project requirements Coriolis GDAC hosts a grey list of the floats which are automatically flagged before any automatic or visual quality control. **The greylist has 1054 entries** (September 16th 2016), compared to 1000 entries one year ago.

DAC	nb floats in greylist
AOML	703
JMA	126
Coriolis	73
BODC	55
CSIRO	50
CSIO	15
MEDS	9
KMA	9
KORDI	9
INCOIS	4
NMDIS	0
Total	**1053**



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



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/...

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://dx.doi.org/10.12770/1282383d-9b35-4eaa-a9d6-4b0c24c0cfc9

Argo GDAC monthly snapshots DOIs

- Snapshot of 2015 October 8th : http://dx.doi.org/10.12770/71b7b0ed-1e3a-4ebc-8e3b-b5b363112f2a
- Snapshot of 2015 September 08th : http://dx.doi.org/10.12770/ca035889-880d-463e-a523-10aabc3d6be3

Argo Germany National Report 2016

September 2016

Birgit Klein, BSH

1. The status of implementation (major achievements and problems in 2016)

Data acquired from floats:

Most of the floats deployed by Germany are operated by BSH but additional funding has been acquired by various research institutes. BSH will have deployed 45 floats by the end of 2016, 5 floats purchased in 2016 will used for a deployment cruise early 2017. No floats will be deployed by GEOMAR and AWI this year.

Currently (September 5th, 2016) 144 German floats are active (Fig.1) and the total number of German floats deployed within the Argo program increased to 843. The number of German floats in the network is stiller lower than anticipated due to the loss rate of APEX floats in the previous years. These floats were equipped with alkaline batteries and suffered from battery flue because of a missing diode. TWR has provided 9 more floats during 2016 from the warranty agreement for the lost floats. In total 34 floats were provided by TWR between 2014 and 2016 to replace floats suffering from battery flue. Some of the under-ice floats deployed by AWI in the previous years are assumed to be still active under the ice and could resurface again in the next austral summer and deliver their stored data.

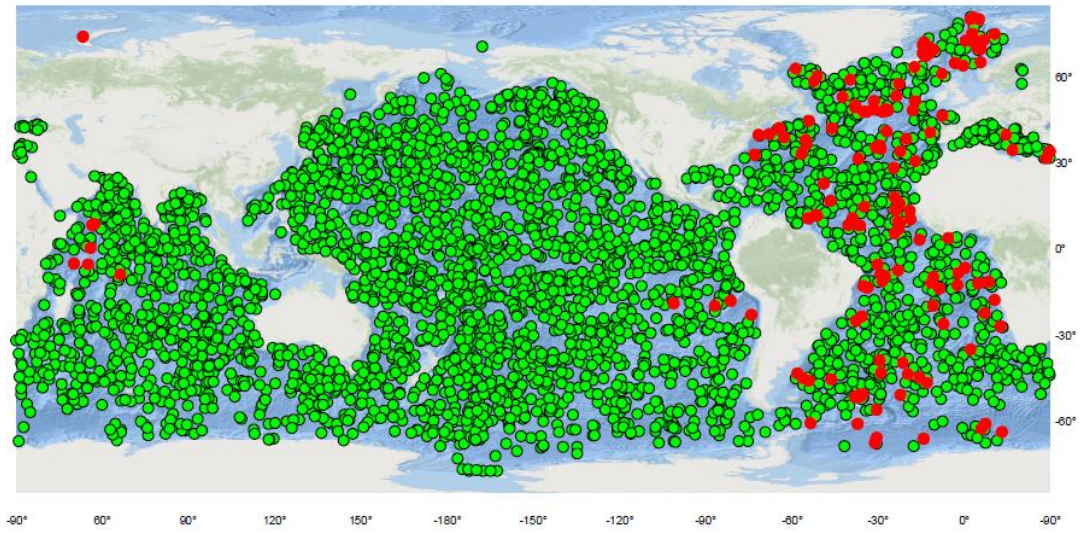


Fig. 1: Locations of active German floats (red) and active international floats (green) (Argo Information Centre, September 2016).

In the beginning most of the German floats were APEX floats purchased from Webb Research, and a smaller amount of floats were manufactured by the German company OPTIMARE. The company had been working in close collaboration with the AWI and had developed a float type suitable for seasonally ice covered seas. These floats were equipped with an ice sensing algorithm which prevents the float from ascending to the surface under ice conditions. Float profiles are stored internally until they can be transmitted during ice free

conditions. In the last year three manufacturers supplied floats to BSH: ARVOR floats from NKE, NOVA floats from METOCEAN and APEX floats from TELEDYNE/WEBB.

The major technical problems with the alkaline batteries in our APEX floats deployed since 2010 is slowly fading out. Until September 2016 more than 73 floats deployed between 2010 to 2014 expired early with life cycles of about 700-800 days. The technical data send back from the floats indicate a sudden loss of battery voltage to values of around 7 volt during the last profile and increased battery consumption during the previous cycles due to 'energy flue'. WEBB/TELEDYNE has already replaced floats 34 floats in three batches (14 floats in 2014, 11 floats in 2015 and 9 floats in 2016).

As has been reported at AST-16 the Canadian NOVA floats appear to have an extremely high early death rate. According to the analysis of the entire NOVA fleet in the Argo program the survival rate after 6 months was only 81%, i.e. 19% were lost in the first 6 months. In the smaller sample of 22 German NOVA floats 11 have died within the first year (<40 cycles). These floats should be covered by our warranty agreement and we will work with the company to settle the issue.

All of the German floats deployed in 2016 are standard TS floats. Deployment was carried on research vessels. The scientific research vessels comprised Canadian, German and UK ships. The deployment locations for 2016 are shown in Fig. 2.

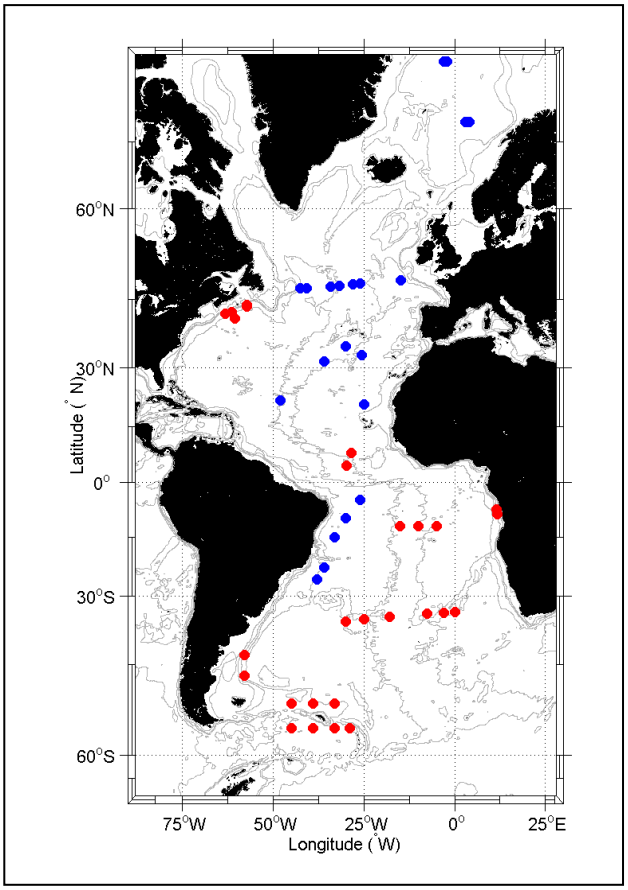


Fig. 2a-b: Deployment positions for floats operated by BSH in 2016 in the Atlantic Ocean. At positions marked in blue the deployment has already been carried out and those in red will be achieved until the end of the year.

Germany has continued to work in the new European Research Infrastructure Consortium EURO-ARGO-ERIC which was established in July 2014 in Brussel by 9 founding countries (France, Germany, United Kingdom, Italy, Netherlands, Norway, Greece, Poland and Finland). GEOMAR and AWI are members of the EU-funded ATLANTOS project and will deploy deep-floats and bio-Argo floats within this project.

2. Deployment plan for 2017

The deployment plans for 2017 at present comprise about 43 floats from BSH in the Atlantic, the Nordic Seas, the Weddell Gyre and the Arctic and consists of 5 floats purchased already in 2016 and funds from 2017 (Fig. 3a, Fig. 4a-c and Fig. 5, Fig. 6). Contacts with researchers on potential deployment cruises have been established and agreement has been reached on the possibility to deploy floats and formal clearance for floats deployed in EEZs. The priority of our deployments is grid completion and extension of the core Argo array into the seasonally ice covered oceans in the Nordic Seas and the Southern Ocean in accordance with the EuroArgo implementation plan. The deployments in the Weddell Gyre will be coordinated in close contact with the AWI. They will follow the same set of requirements defined by AWI (Olaf Boebel) for under-ice floats with additional RAFOS antenna. In order to test the new set-up only a subset of the floats depicted in Fig. 5 will be deployed by both BSH and AWI. The test should help to ensure that the floats function properly at sea under ice conditions. If tests with the new floats are successful, the AWI will purchase about 20 floats for deployment in the Weddell Gyre in 2018. The AWI is now planning to deploy its remaining 13 NEMO floats in 2017 during the Polarstern cruise PS103 (Dec. 2016-Feb. 2017). No deployments are planned yet for 2017 by GEOMAR. But GEOMAR is partner in the ATLANTOS consortium and will be involved in the deployment of deep floats as part of the pilot study in the Atlantic. The German Navy has been contacted again about potential deployments in the Indian Ocean during their regular survey operations. If additional funds become available from warranty agreements more deployments will be added.

The three deployments in the Arctic Ocean (Fig. 6) are in preparation for the contribution to intensive field phase of the YOPP program in 2018. These floats should operate in the marginal ice zone and provide subsurface ocean information for the coupled reanalysis. Testing of the floats will be performed in the context of the EuroArgo Eric and in cooperation with our colleagues from Finland and Poland.

Altogether it is planned to deploy at least 56 German floats during 2017. When floats from the warranty agreements can be used this could increase by ~15 floats.

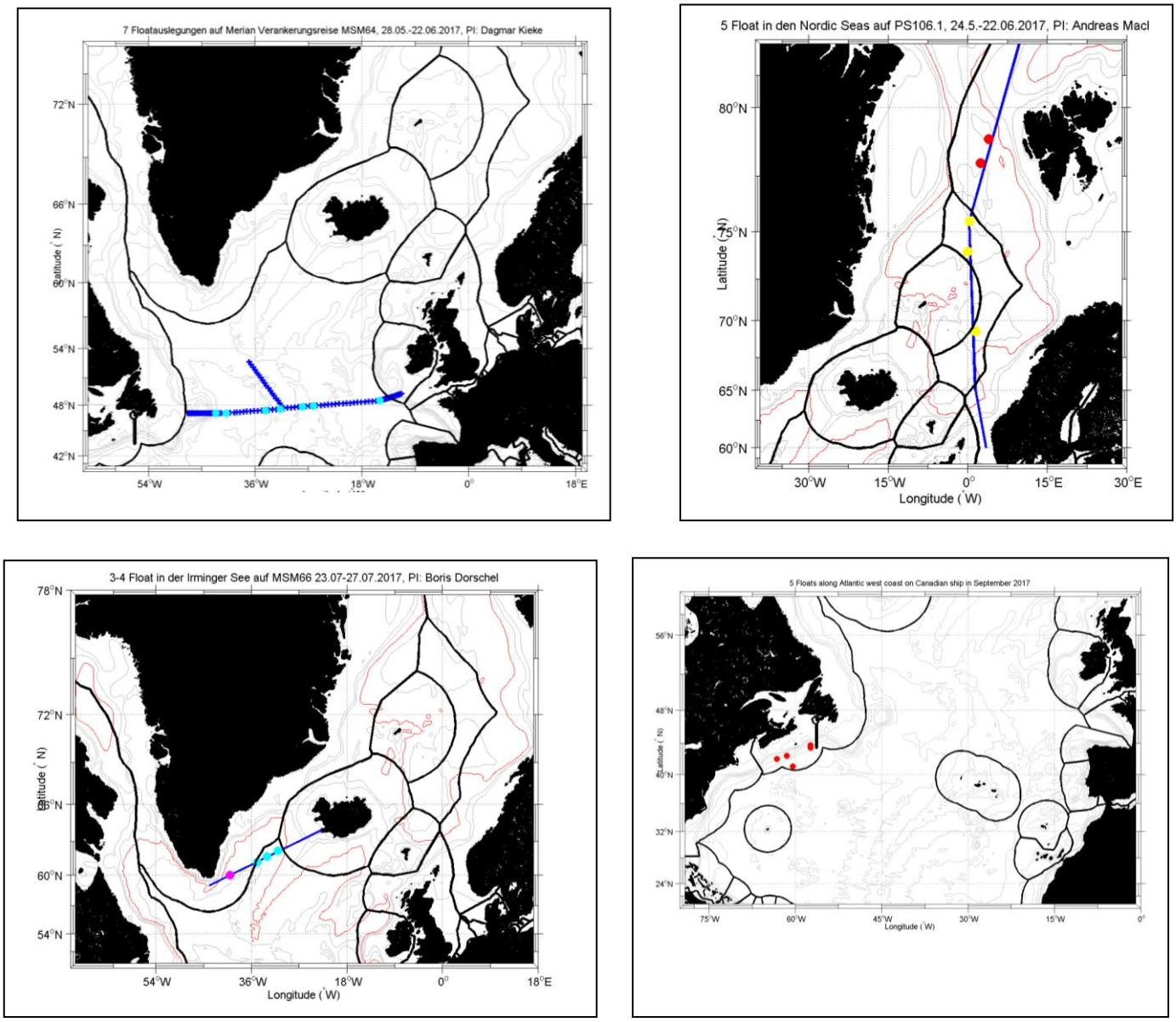
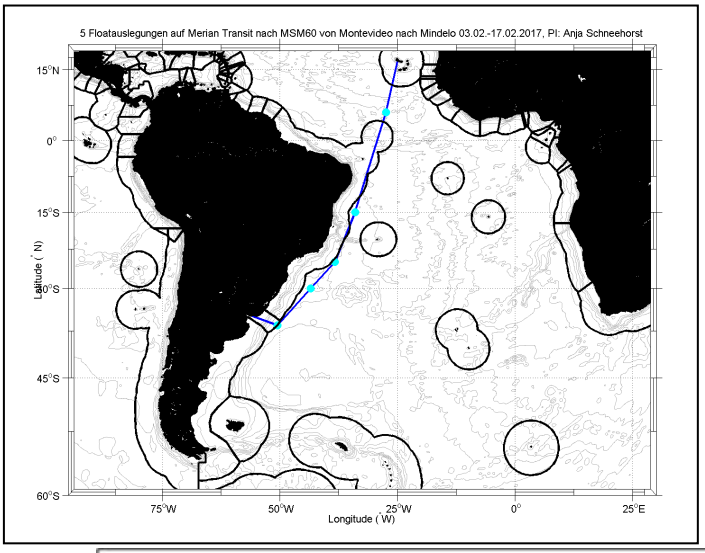
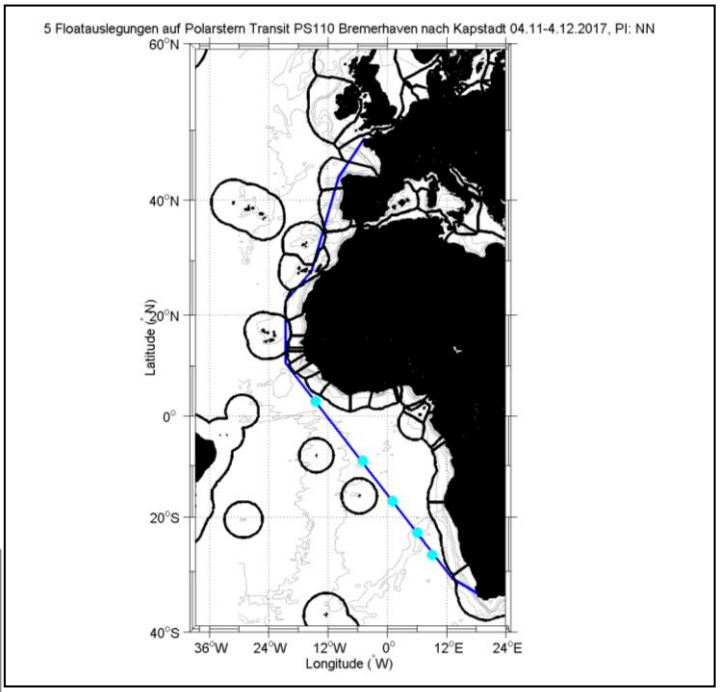


Fig. 3: a-d: Planned deployments of 21 floats in the North Atlantic





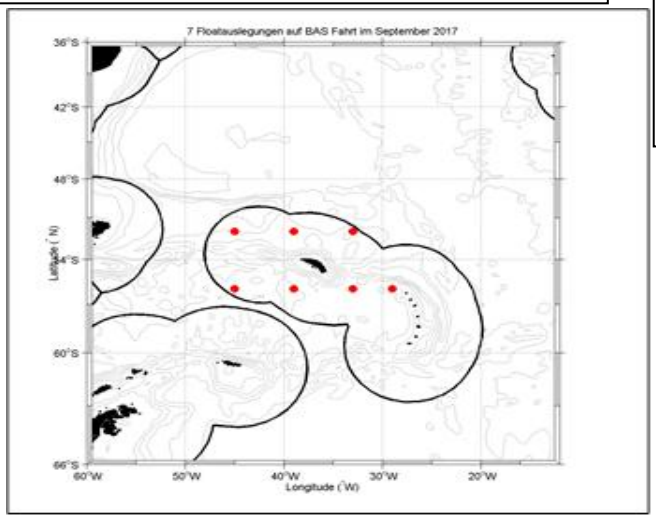


Fig. 4: a-c: Planned deployments of 17 floats in the South Atlantic

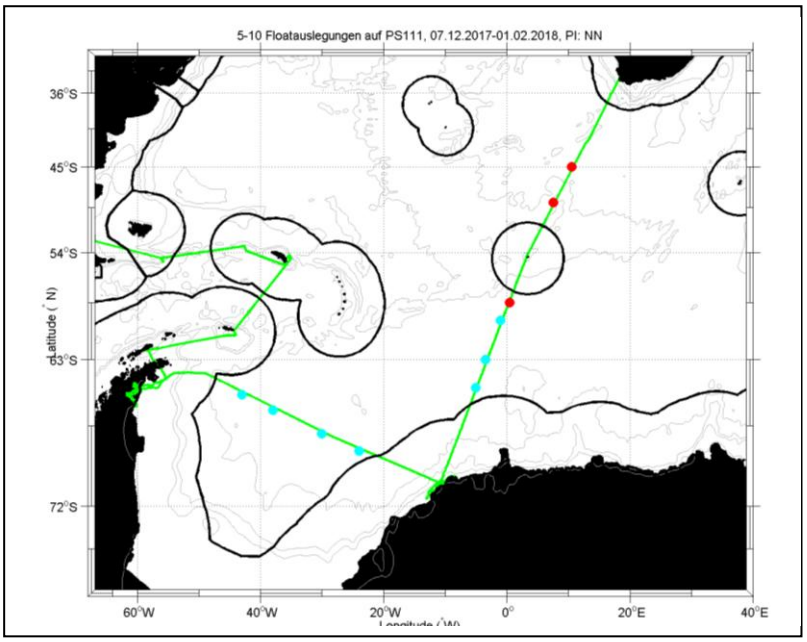


Fig. 5: Potential deployments in the Weddell gyre. Floats marked in cyan should have an additional RAFOS antenna and operate with an ice-sensing algorithm and interim-storage.

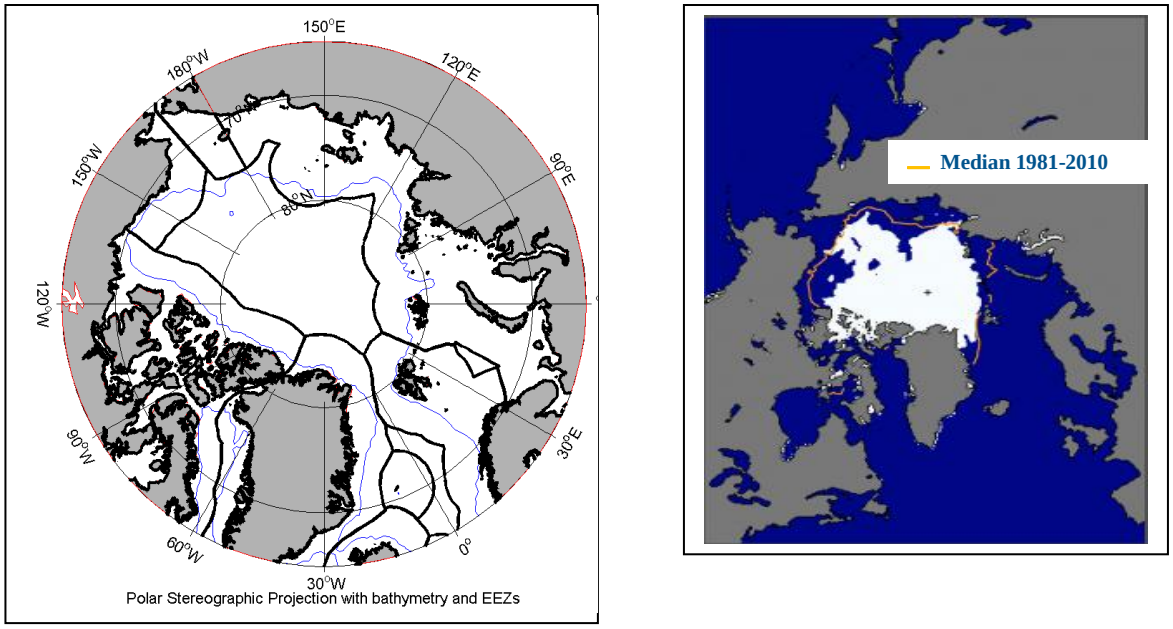


Fig. 6: Left: Arctic Ocean with indication of territorial waters, right: sea ice concentration in August 2016. Deployments in 2017 will be in preparation of the YOPP and will be carried out in cooperation with the EuroArgo ERIC.

3. Commitments to Argo data management

Data issued to GTS

The profiles for all German floats are processed by Coriolis and are distributed on the GTS by way of Meteo-France.

Data issued to GDACs after real-time QC

The real-time data processing for all German floats is performed at the Coriolis Center in France. Data processing follows the procedures set up by the Argo Data Management Team.

Data issued for delayed QC

The delayed mode processing is distributed between the various German institutions contributing to Argo, depending on their area of expertise. The Alfred-Wegener Institute is responsible for the Southern Ocean and GEOMAR is processing floats with oxygen data. BSH is also processing the German/Finnish/Norwegian floats in the Nordic Sea, and is covering the tropical, subtropical and subpolar Atlantic. German floats in the Mediterranean on the other hand are processed by MEDARGO. The sharing of delayed-mode data processing will be continued in the coming years, but BSH will cover all German floats which have not been assigned to a PI. BSH has also adopted some European floats which did not have a DMQC operator assigned to them, such as national Argo programs from the Netherlands, Denmark, Norway, Finland and Poland. All German institutions have been working in close collaboration with Coriolis and delayed mode data have been provided on a regular basis. Delays in delayed-mode data processing have occurred in the last year at AWI due to changes in personal and delays in replacement. The processing of the RAFOS information on the under ice floats needs reformatting of the files to file format 3.1. The intermediary RAFOS amplitudes and time-of-arrival will be stored in the trajectory data. AWI

is presently enhancing their decoders for the remaining NEMO floats to solve issues with the dating of under-ice profiles and will resubmit these data to Coriolis until beginning of October. These files will then be transformed to file format 3.1. Due to errors in some of the APEX manuals a larger subset of floats from the national programs of the Netherlands, Poland and Norway had to be grey-listed. These floats will now be reprocessed and will then be available for DMQC. Delayed-mode data processing follows the rules set up by the Data Management Team. The DMQC process is underway, but due to format issues with file format 3.1 and updates in hardware/software some delays have been encountered at BSH. The re-processing of APEX floats at Coriolis requires a replacement of already existing D-files with files based on the decoders. This will be finished until the end of year.

Delayed mode data send to GDACs

All delayed mode profiles from BSH have been sent to the Coriolis GDAC node. The total number of available profiles from German floats is 58644 (September 6th, 2016), the number of DM profiles is 44524. The percentage of DM profiles with respect to the total number of profiles is about 76%. The switch to file format 3.1 required some re-decoding of older versions of APEX floats. This is managed by Coriolis and since some of the floats affected already had been through delayed-mode quality control, their D-files have to be re-constructed.

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

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, 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.

The user workshop held on 22.06.2016 at BSH was attended by a mixed group; it included users from the modelling community and users performing observational studies. The three institutions contributing floats to the German program outside of BSH were also represented.

Publications based on Argo:

Myriel Horn (2015), Frontal analysis on the shelf region of the western North Atlantic, Master Thesis, M.Sc. Marine Environmental Sciences, University of Oldenburg.

Stendardo, I., M. Rhein, and R. Hollmann (2016), A high resolution salinity time series 1993-2012 in the North Atlantic from Argo and altimeter data, J. Geophys. Res., 121, 2523-2551, doi:10.1002/2015JC011439

Kieke, D., and I. Yashayaev (2015), Studies of Labrador Sea Water formation and variability in the subpolar North Atlantic in the light of international partnership and collaboration, Prog. Oceanogr., 132(3), 220-232, doi:10.1016/j.pocean.2014.12.010.

Roessler, A., M. Rhein, D. Kieke, and C. Mertens (2015), Long-term observations of North Atlantic Current transport at the gateway between western and eastern Atlantic, J. Geophys. Res., 120, 4003-4027, doi:10.1002/2014JC010662.

Schneider, L., D. Kieke, K. Jochumsen, E. Colbourne, I. Yashayaev, R. Steinfeldt, E. Varotsou, N. Serra, and M. Rhein (2015), Variability of Labrador Sea Water transported through Flemish Pass during 1993 - 2013, J. Geophys. Res., 120, 5074-5089, doi:10.1002/2015JC010939.

Burmeister, K., P. Brandt, and J. F. Lübbecke (2016), Revisiting the cause of the eastern equatorial Atlantic cold event in 2009, J. Geophys. Res. Oceans , 121 , 4777–4789, doi:10.1002/2016JC011719.

Schütte, F., Brandt, P. und Karstensen, J. (2016) Occurrence and characteristics of mesoscale eddies in the tropical northeast Atlantic Ocean Ocean Science, 12 (3). pp. 663-685. DOI 10.5194/os-12-663-2016.

Stramma, L., Czeschel, R., Tanhua, T., Brandt, P., Visbeck, M. und Giese, B. S. (2016) The flow field of the upper hypoxic Eastern Tropical North Atlantic oxygen minimum zone Ocean Science, 12 (1). pp. 153-167. DOI 10.5194/os-12-153-2016.

Hummels, R., P. Brandt, M. Dengler, J. Fischer, M. Araujo, D. Veleda, and J. V. Durgadoo (2015), Interannual to decadal changes in the western boundary circulation in the Atlantic at 11°S, Geophys. Res. Lett. , 42 , 7615 – 7622, doi:10.1002/015GL065254.

Czeschel, R., Stramma, L., Weller, R. A. und Fischer, T. (2015) Circulation, eddies, oxygen and nutrient changes in the eastern tropical South Pacific Ocean Ocean Science, 11 (3). pp. 455-470. DOI 10.5194/os-11-455-2015.

Karstensen, J., Fiedler, B., Schütte, F., Brandt, P., Körtzinger, A., Fischer, G., Zantopp, R. J., Hahn, J., Visbeck, M. und Wallace, D. W. R. (2015) Open ocean dead-zone in the tropical North Atlantic Ocean Biogeosciences (BG), 12 . pp. 2597-2605. DOI 10.5194/bg-12-2597-2015.

Stammer, D.; Balmaseda, M.; Heimbach, P.; Köhl, A.; Weaver, A.. “Ocean Data Assimilation in Support of Climate Applications: Status and Perspectives”. Annual Review of Marine Science 8. (2016): S. 491-518. doi: 10.1146/annurev-marine-122414-034113

Jochumsen, K.; Schnurr, S.M.; Quadfasel, D.. “Bottom temperature and salinity distribution and its variability around Iceland”. Deep Sea Research Part I: Oceanographic Research Papers 111. (2016): S. 79-90. doi: 10.1016/j.dsr.2016.02.009

Sena Martins, M., N. Serra, and D. Stammer (2015), Spatial and temporal scales of sea surface salinity variability in the Atlantic Ocean, J. Geophys. Res. Oceans , 120, 4306–4323,doi:10.1002/2014JC010649

Martins, M. S.; Stammer, D.. “Pacific Ocean surface freshwater variability underneath the double ITCZ as seen by satellite sea surface salinity retrievals”. Journal of Geophysical Research 120 (8). (2015): S. 5870-5885. doi: 10.1002/2015JC010895

K. Latarius, D. Quadfasel: Water mass transformation in the deep basins of the Nordic Seas: Analyses of heat and freshwater budgets, Deep_Sea Research I, 114 (2016): 23-42, http://dx.doi.org/10.1016/j.dsr.2016.04.012

Products generated from Argo data

A key aspect of the use of Argo data at BSH is to develop a data base for climate analysis, to provide operational products for interpretation of local changes and to provide data for research applications for BSH related projects (KLIWAS, RACE, MiKlip, ICDC and Expertennetzwerk BMVI).

Argo data are being used by many researchers in Germany to improve the understanding of ocean variability (e.g. circulation, heat storage and budget, and convection), climate monitoring and application in ocean models.

Germany contributes to the NAARC and also recently joined the SOARC. Researchers from German institutions have continued to contribute recent CTD data to the Argo climatology.

CTD data submitted to Reference data base:

MSM53 data in the subpolar North Atlantic have been submitted by Uni Bremen (Dagmar Kieke)

M130 and M131 data in subtropical South Atlantic will be submitted shortly after the cruises by GEOMAR (Markus Dengler/Peter Brandt).

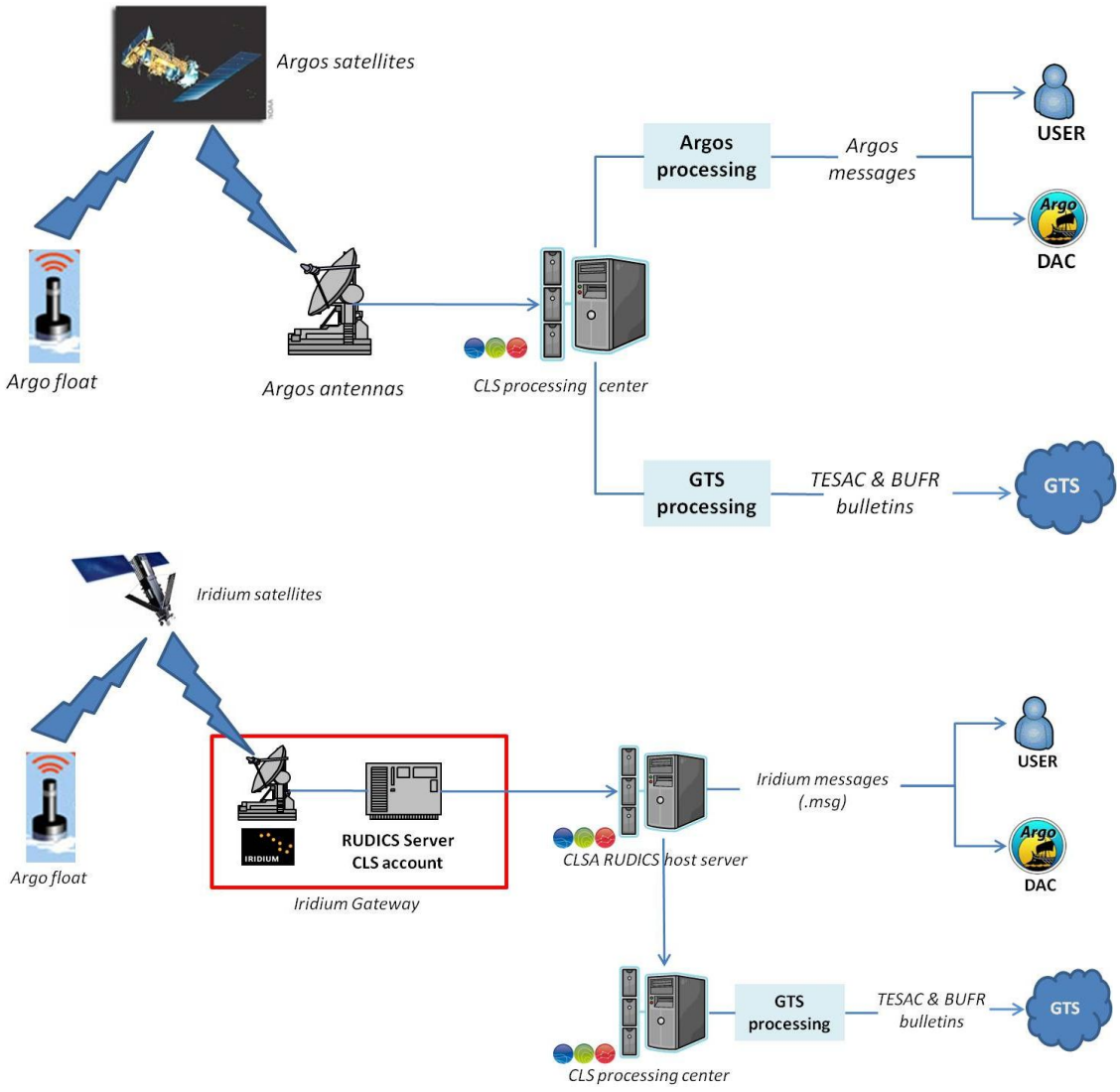
Argo Data Management Team 2015
CLS Report

Yann Bernard & Brice Robert (CLS)

1. CONTEXT

The CLS Company, operator of the Argos system and provider of both Argos and Iridium services, has a DAC (Data Assembly Center) role for the Argo programs that do not have real time processing capabilities. Argo data are processed operationally 24/7 by CLS processing centers (Toulouse, France and Largo, USA) and inserted into the GTS trough Meteo-France or the NWS insertion points.

In July 2016, CLS processed 54 Argo floats in real-time (47 with Argos and 7 with Iridium satellite system) for the GTS distribution. Data for these floats are sent via ftp to Meteo-France (Toulouse) as TESAC and BUFR bulletins, before being inserted by Meteo-France on the GTS (Global Telecommunication System). Figures below summarize the Argo data flow, from their transmission by the float to their dissemination on the GTS with Argos and Iridium systems.



2. STATUS OF THE CLS DAC IN JULY 2016

- **Floats activity for July 2016:** 156 floats were declared in the CLS GTS database
    - 53 floats have disseminated data profiles on GTS
    - 81 floats are inactive (no more transmission*) or grey listed (failing status)
    - 22 floats are not yet deployed
    - 177 profiles from CLS have been sent on GTS in July 2016

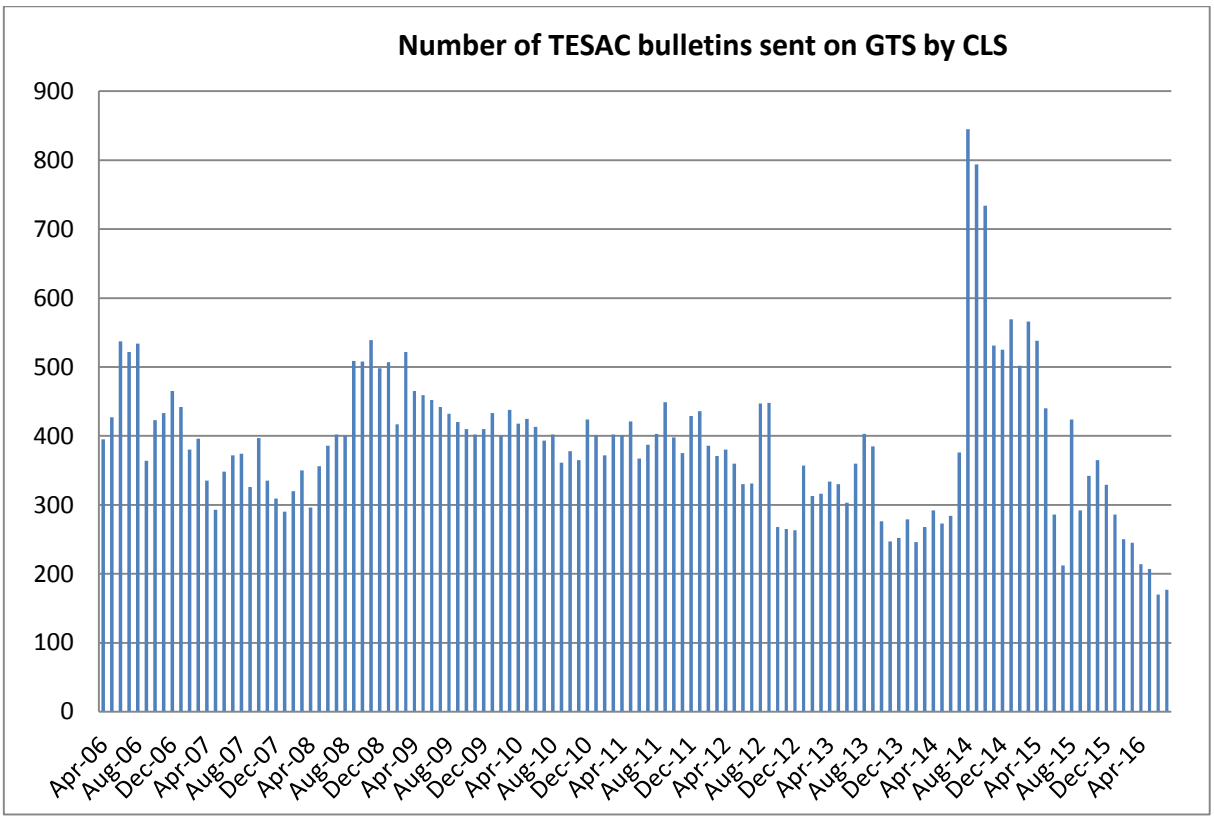
**A float stays 3 years in the CLS GTS database without transmission before being removed definitely.*

- **Description of the 156 floats :** CLS processed floats in real time for the Argo programs that are not hosted by a national DAC:
    - 125 SOA floats (China)
    - 17 FIO floats (China)
    - 14 KORDI floats (Korea)

These floats are Teledyne Webb Research Apex or NKE Provor, with 12 different data formats.

- **Data issued to GTS:** All data processed by CLS are distributed on the GTS by way of Meteo-France (GTS header LFVW) or by the National Weather Service (GTS header KARS) when the French center is in backup. This operation is automatically performed and GTS bulletins are sent to Meteo-France every 2 minutes. Before the encoding in TESAC and BUFR bulletins, Argo data are filtered by Argo QC procedure. Last year, 6 121 profiles were relayed onto GTS between September 1st, 2014 and August 31st, 2015 (source: Météo-France).

- **Argo Real Time processing monitoring:** All different data formats are referenced and each format has a dedicated template (processing model) in the CLS GTS database. Each month, a monitoring is made for Argo floats present in the CLS GTS database:
    - Argos transmissions in the last month are checked for all floats,
    - GTS disseminations in the last month are checked for all floats,
    - New floats to be set up for GTS are implemented in the CLS GTS database at each beginning of month with a list (table 10: “Floats to be set up for GTS”) provided by JCOMMOPS (M. Belbeoch) via the Argo Information Centre Monthly Report.
    - Active floats to be grey listed are removed from the CLS GTS database at each beginning of month with a list (table 15: “Active floats Grey list”) provided by JCOMMOPS (M. Belbeoch) in the Argo Information Centre Monthly Report.



Number of profiles sent (in TESAC and BUFR) on the GTS by CLS per month

- **Web pages**: All GTS observations (profiles for Argo) are available on https://argos-system.cls.fr/cwi/Logon.do. This is a user access to get the observation data.

- **BUFR format**: BUFR bulletins are produced in addition to TESAC bulletins for all floats processed for GTS by CLS (header: IOPX92 LFVW), since August 2009.

- **Time of delivery on GTS**: A monitoring delay tool, specified with JCOMMOPS, is operational since September 2008 at CLS. The average delivery time of TESAC & BUFR delivery on the GTS is less than 9 hours (average for the combination of Argos & iridium floats).

3. ARGOS SYSTEM STATUS

3.1. SPACE SEGMENT

There was no major change to the space segment in 2016. The current operational status of the Argos constellation is as follows:

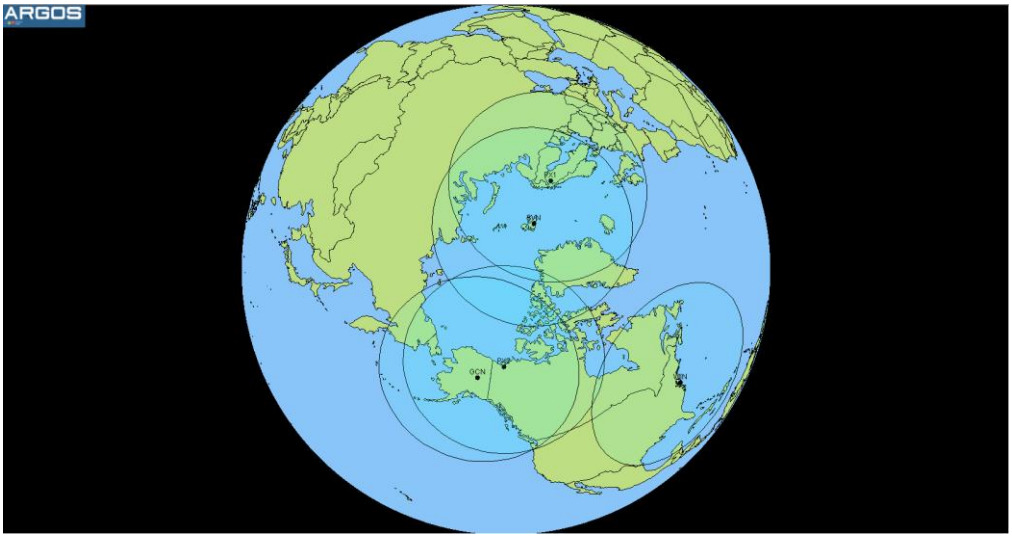
Satellites	Launch date	Instrument	High Data rate and Downlink capabilities
SARAL	25 February 2013	Argos-3	X
METOP-B (MB)	17 September 2012	Argos-3	
NOAA-N' (NP)	6 February 2009	Argos-3	
METOP-A (MA)	19 October 2006	Argos-3	X
NOAA-18 (NN)	20 May 2005	Argos-2	
NOAA-15 (NK)	13 May 1998	Argos-2	

3.2. GROUND SEGMENT

Global antennas network:

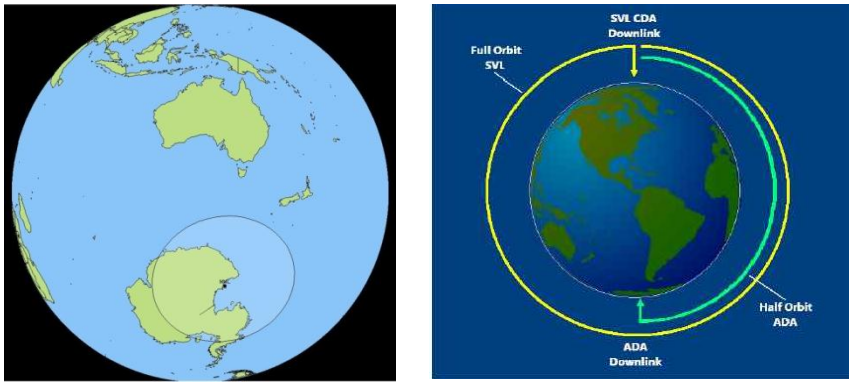
The Argos global antennas network is composed by seven stations:

- The two NOAA global stations of Fairbanks and Wallops acquire the global recorded telemetry transmitted by N15, N18 and N19.
- The EUMETSAT global receiving station of Svalbard acquires the global recorded telemetry transmitted by Metop-A and Metop-B as well as the 2 daily blind orbits of N19 for NOAA stations.
- The NOAA Svalbard antenna that delivers NOAA 15 and 18 blind orbits for Fairbanks and Wallops when not in conflict with NOAA-19.
- Inuvik (Canada) and Kiruna (Sweden) stations for SARAL operated by EUMETSAT.



The Argos Global antenna network (without McMurdo)

- Data recovery from MetOp-B will occur at Svalbard and McMurdo (ADA). Timeliness benefit of McMurdo data recovery is for MetOp-B only. MetOp-A data will continue to NOAA on a best effort basis and without the timeliness benefits of half orbit dumps at McMurdo.



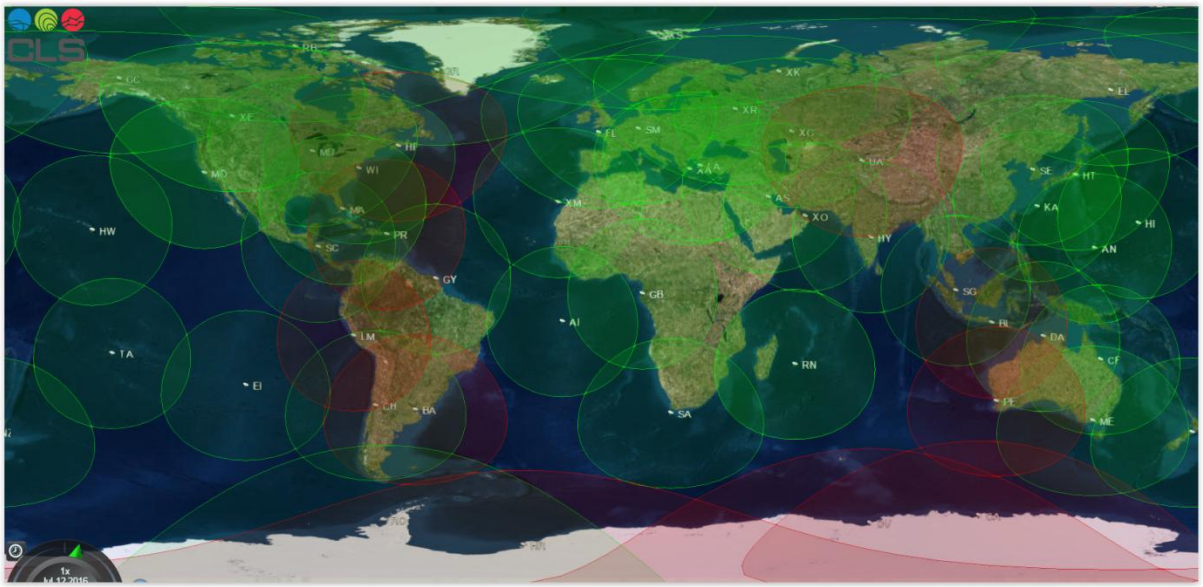
METOP-B Mc Murdo Global antennas coverage and principle

Real time antenna network:

Improvements are still focused on redundancy locations and coverage extension. Today, both Toulouse and Lanham processing centers receive Argos real-time data from 65 stations located all over the world.

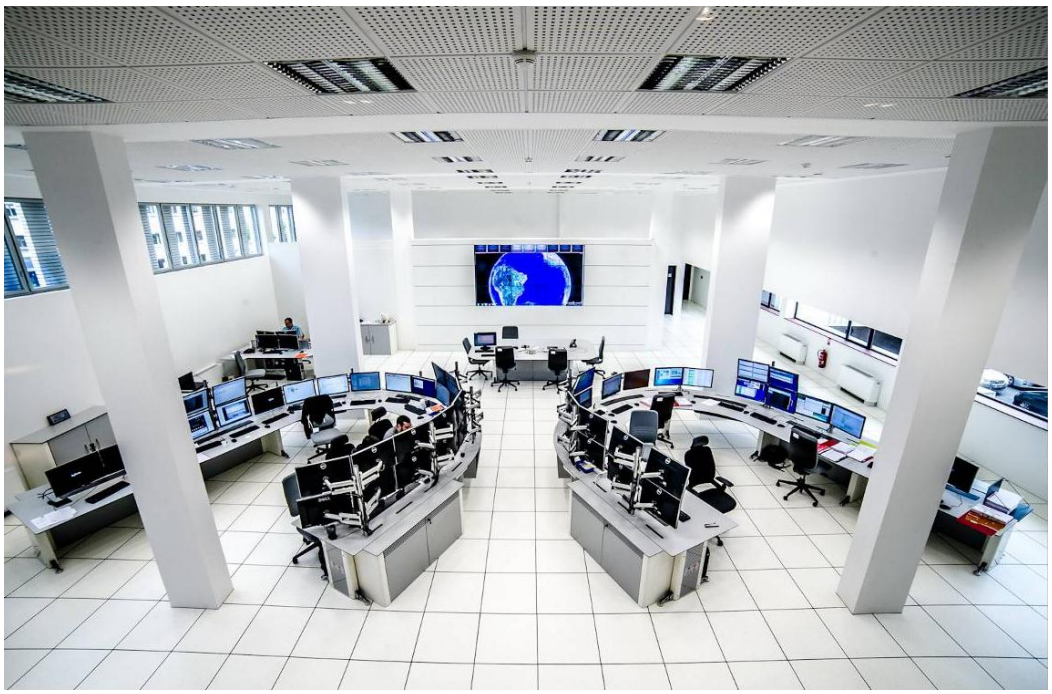
CLS continues the Real-Time Antenna Upgrade Project that consists of upgrading selected antennas in order to be compatible with NOAA, METOP and SARAL. This project also aims to optimize in terms of performance the real-time receiving stations network.

Here below is displayed the Argos Real-Time coverage world map.



July 2016 Argos Real-time coverage map

Processing centers: The two global processing centers in Toulouse and Lanham were nominal over 2015/2016. Redundancy is used at least once a month (Up to two times on one month). Redundancy means that all Argos users are rerouted to CLS or CLSA during an anomaly on the nominal global processing center.



CLS Toulouse Control Room

Both CLS global processing centers are autonomous, and receive, process, and distribute Argos data to:

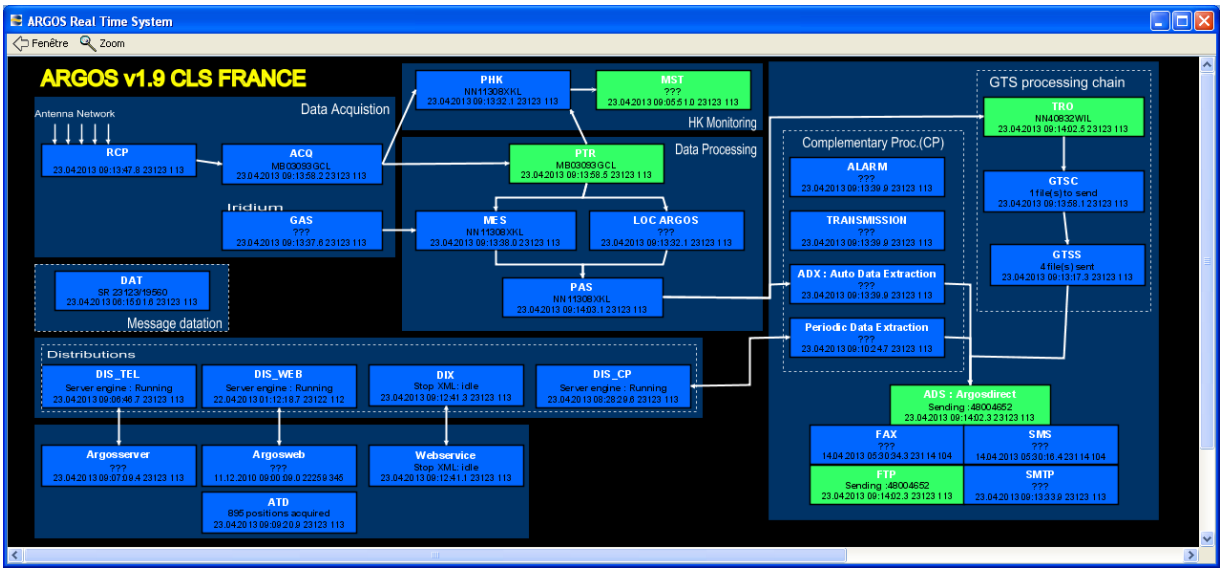
- North American users for CLS America
- Users of the rest of the world for CLS France

In case of a problem with one of the two centers, the other one stays alive and is capable of receiving, processing and distributing Argos data to ALL users. The switch to the remaining alive center is completely transparent for the users. It means that the users continue to receive or to access to their data, without any change on their side.

The CLS Argos processing chain: Composed of different software modules, the processing chain is in charge of receiving and processing the Argos data issued from the satellites and acquired by the global and real-time ground stations networks.

Argos data are processed in terms of collect and location, and stored into a database.

The processing chain is also in charge of distributing the data by ADS (Automatic Distribution System) or allowing users to access to their data using Telnet, ArgosWeb or the web services.



Synoptic of the CLS Argos processing chain

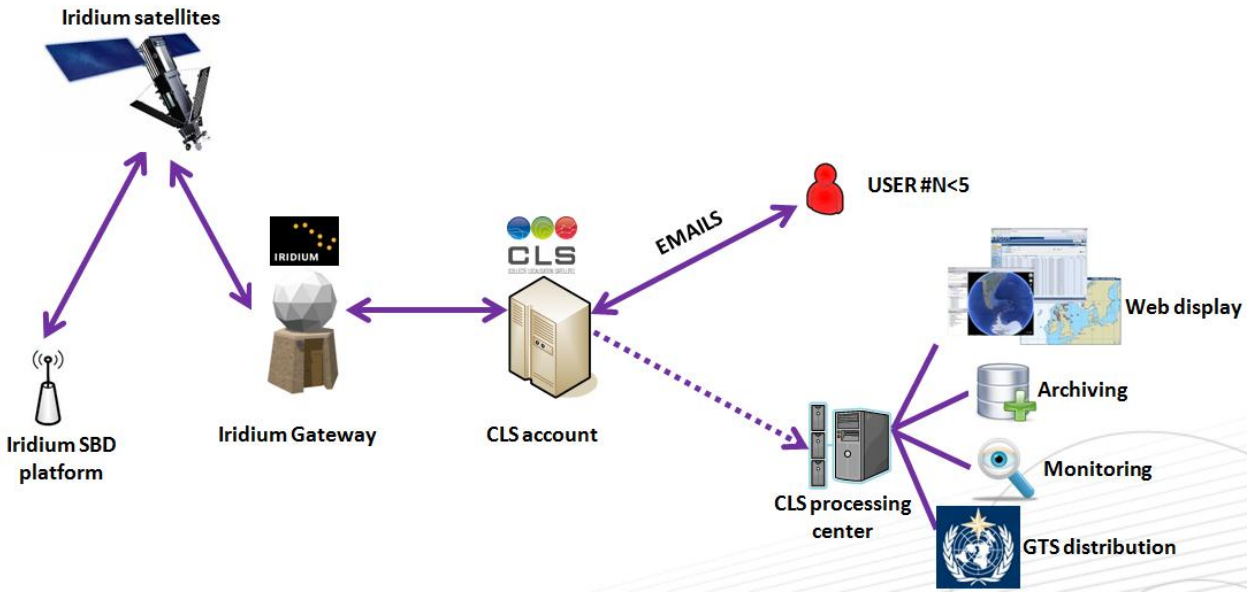
In order to monitor the Argos processing centers, statistics are produced in real-time:

- on the availability of Argos data distribution tools,
- on the data delivery time for sample platforms,
- on Argos location delivery time for sample platforms,
- and on the percentage of data available in less than one hour.

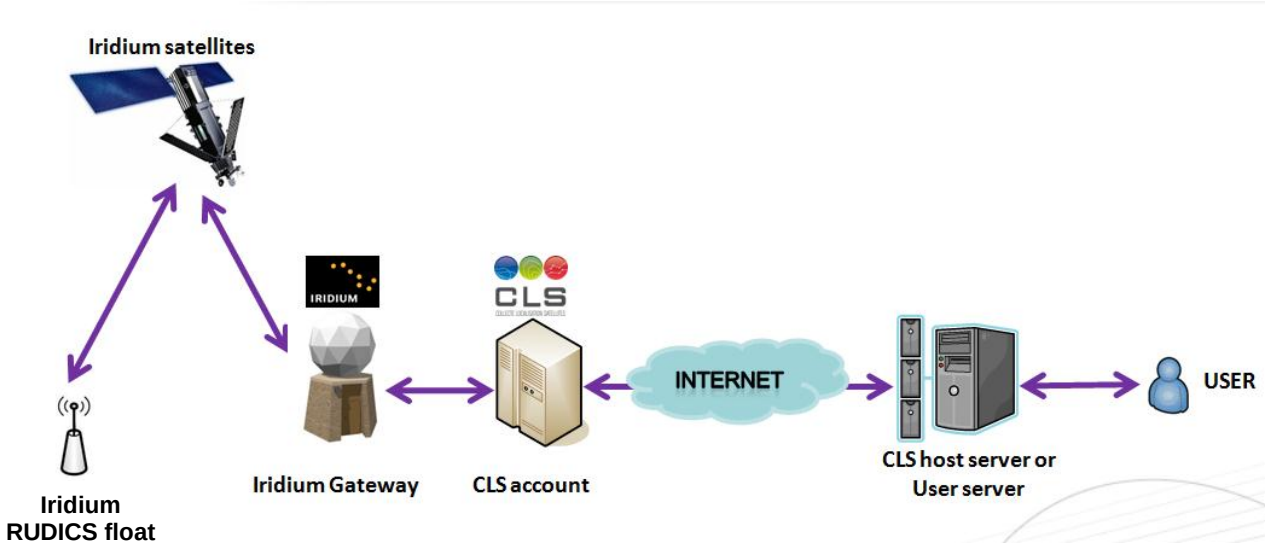
4. CLS IRIDIUM DATA SERVICES

CLS, exclusive operator of the Argos system since 1986 also provides dedicated Iridium data services to ocean platforms (profiling floats, gliders, drifting buoys…) since 2007. Thanks to a VAR (Value Added Reseller) agreement with Iridium, CLS is an Iridium data provider for Argo. It is already the case for several Argo programs as in France, UK, Germany, Italy, Norway, Spain, Bulgaria, Turkey, China, India, South Africa, Brazil and Japan.

CLS is providing all Iridium services (RUDICS, CSD and SBD) for all type of floats, from all manufacturers. Thanks to a long-standing partnership with the main floats manufacturers (Teledyne, NKE, Optimare, SeaBird, Metocean, etc.), Iridium services activation and transmission tests are easily performed.



The Iridium SBD communication service at CLS



The Iridium RUDICS communication service at CLS

CLS and CLS America processing centers are linked with an IP connection to the Iridium Gateway receiving Iridium raw data from floats in real-time, then process and distribute them to the Argo users by email or FTP. The service is fully operational 24/7.

If needed, GTS real-time processing (TESAC and BUFR bulletins) can be done by CLS. For further information, please contact Mr. Brice Robert at brobert@cls.fr.

In 2016, CLS has worked on a general upgrade of the iridium RUDICS hosting service for ARGO floats. Constant evolution of floats technology and the need for more operationality has led us to rethink the architecture of this service. The upgraded version is ready to be released, and will offer enhanced data safety, full compatibility with new floats, as well as a reinforced automatic backup system.

Currently hosted floats will be gradually transitioned to the new architecture, with a smooth migration plan (transition by batches, both solutions will remain accessible in parallel for several weeks) in order to leave enough time to the users to adapt to the new system. First migrations will be made in October 2016, and all floats will be moved by the end of November 2016, when the old service is expected to be completely replaced by the upgraded solution. CLS will offer full support during this period and detailed information on the schedule as well as a detailed manual will be sent to all concerned users.

Argo National Data Management Report (2016) – India

1. Status

- **Data acquired from floats**
  India has deployed 27 new floats (including 8 Apex-Bio Argo floats and 2 with EM software) between October 2015 and September 2016 in the Indian Ocean taking its tally to 397 floats so far. Out of these 131 floats are active. All the active floats data are processed and sent to GDAC.

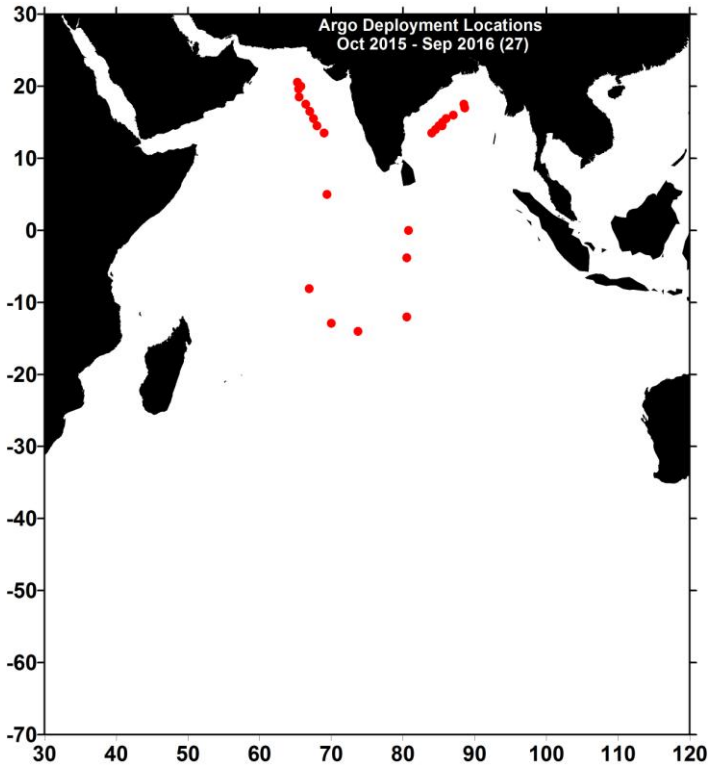


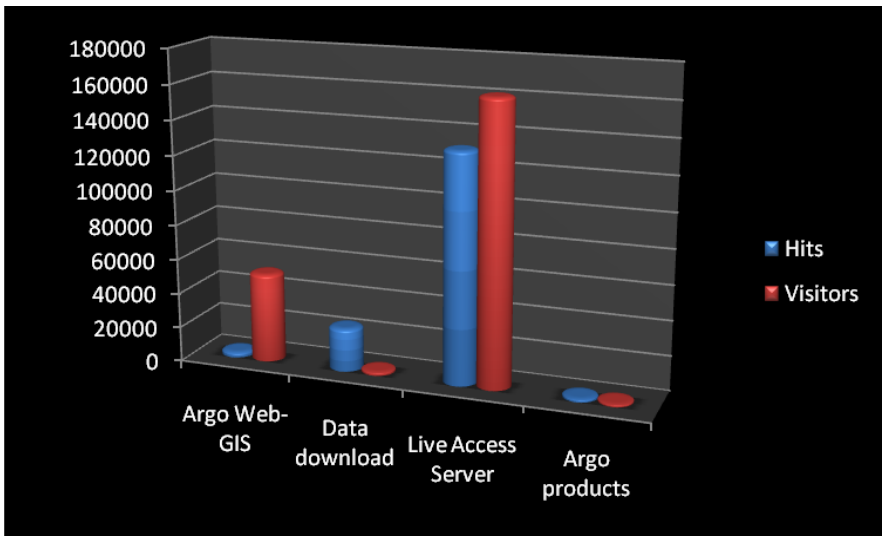
Fig. Location of Argo floats deployed by India

- **Data issued to GTS**
  All the active floats data is being distributed via RTH New Delhi. However there seems to be a problem in these messages being received by some centres. Started transmission of BUFR messages from June 2015. Even the BUFR count is found to be less then TESAC messages. Working on resolving the issue.

- **Data issued to GDACs after real-time QC**
  All the active floats (131) data are subject to real time quality control and are being successfully uploaded to GDAC. Also 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 54% 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.
  - This data is also 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

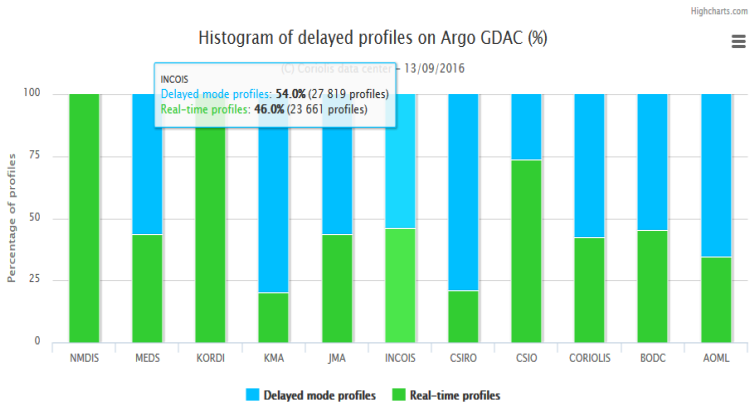
Page	Hits	Visitors
Argo Web-GIS	3024	51728

Data download	25106	2001
Live Access Server	131801	161502
Argo products	1881	1474

- **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 2.1 of DVD on "Argo data and products for the Indian Ocean" is released to public for use with data corresponding to 2016 being updated. This DVD consists of ~ 2,85,000 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 54% 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.



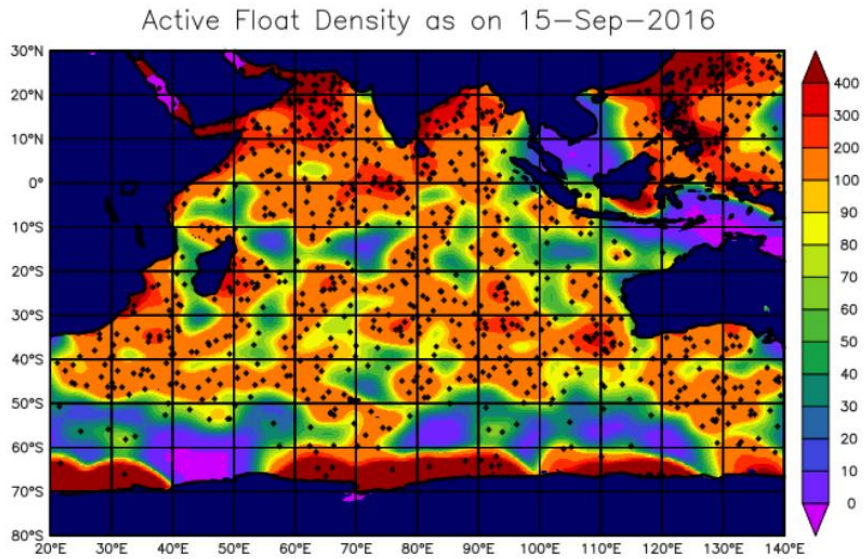
3. GDAC Functions

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 15 Sep, 2016 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. Akhil, V. P., M. Lengaigne, F. Durand, J. Vialard, A. V. S. Chaitanya, M. G. Keerthi, V. V. Gopalakrishna, J. Boutin, and C. de Boyer Montégut, 2016: Assessment of seasonal and year-to-year surface salinity signals retrieved from SMOS and Aquarius missions in the Bay of Bengal, *Int. J. Remote Sens.*, **37**(5), 1089-1114.
2. Keerthi, M. G., M. Lengaigne, K. Drushka, J. Vialard, C. Boyer Montegut, S. Pous, M. Levy, and P. M. Muraleedharan, 2016: Intraseasonal variability of mixed layer depth in the tropical Indian Ocean, *Climate Dynamics*, **46**(7), 2633-265.
3. Muni Krishna, K., 2016: Observational study of upper ocean cooling due to Phet super cyclone in the Arabian Sea, *Advances in Space Research*, **57**(10), 2115-2120.
4. Riser, S. C., et al., 2016: Fifteen years of ocean observations with the global Argo array, *Nature Clim. Change*, **6**(2), 145-153.
5. Roxy, M. K., A. Modi, R. Murtugudde, V. Valsala, S. Panickal, S. Prasanna Kumar, M. Ravichandran, M. Vichi, and M. Lévy, 2016: A reduction in marine primary productivity driven by rapid warming over the tropical Indian Ocean, *Geophys. Res. Lett.*, **43**(2), 826-833.
6. Udaya Bhaskar, T. V. S., C. Jayaram, P. R. R. E, and K. H. Rao (2016), Spatio-temporal evolution of chlorophyll-a in the Bay of Bengal: a remote sensing and bio-argo perspective, SPIE conference.

1. Status

- **<u>Data acquired from floats</u>:** 335 floats were deployed in the Mediterranean and in Black Seas between 2001 and 2016 (the floats temporal distribution is shown in Figure 2) and more than 38700 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. More than 80 floats per months have been operated simultaneously in the basin in 2016 and about 5000 CTD profiles have been acquired (up to September 2016) by different float models (Figure 3).

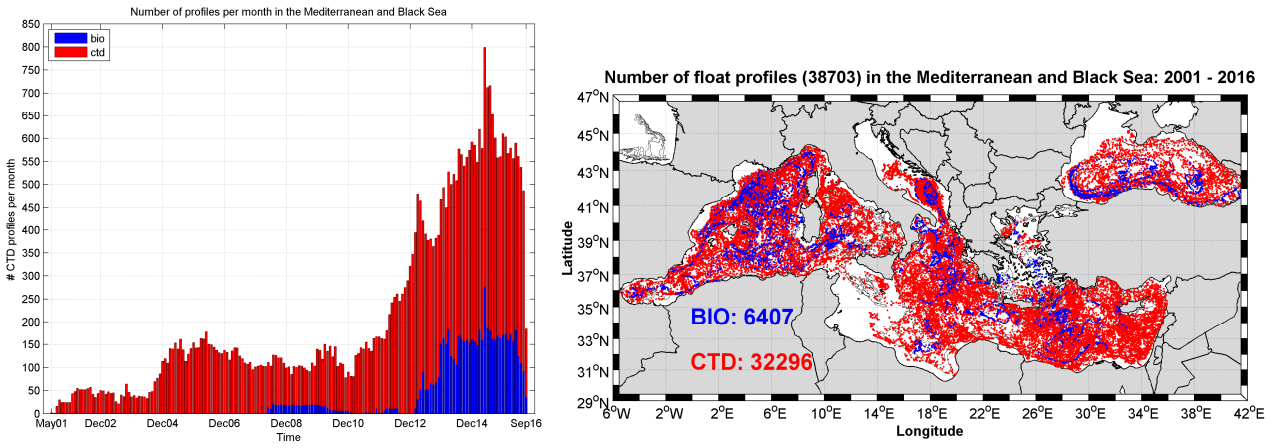


Figure 1. Temporal (left panel) and spatial (right panel) distribution of float profiles in the Mediterranean and Black Sea between 2001 and 2016.

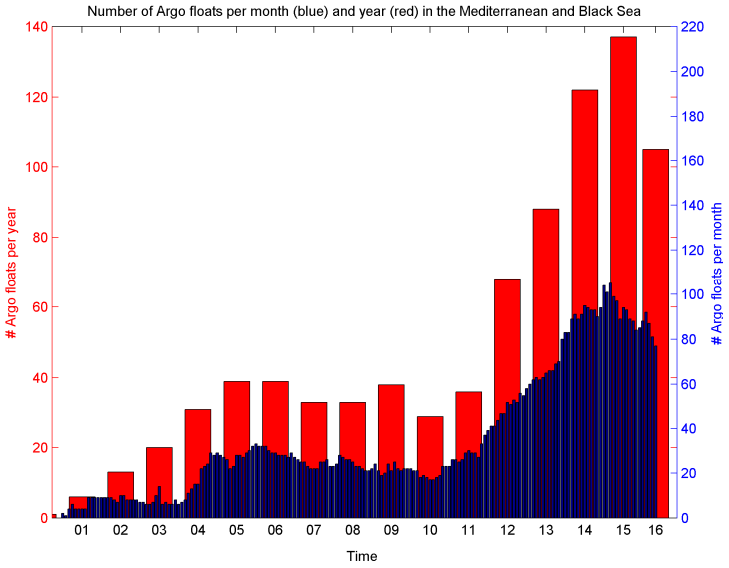


Figure 2. Monthly (blue bars) and yearly (red bars) distribution of Argo floats in the Mediterranean and Black Sea between 2001 and 2016.

The number of CTD profiles acquired by bio-Argo floats in 2016 (up to September) is about 1200 (contributors: France, Italy and Greece) and the data collected by the "standard" CTD Argo floats about 3450 profiles (up to September). The countries that contribute to maintain/increase the Argo population in 2016 are Greece, France and Italy: a total of 18 new floats (manufactured by Metocean and NKE) have been deployed both in the Mediterranean and in the Black Seas (Figure 3); 7 out of 18 platforms are equipped with biogeochemical sensors and the deployment strategy was chosen in order to replace dead floats or under-sampled areas.

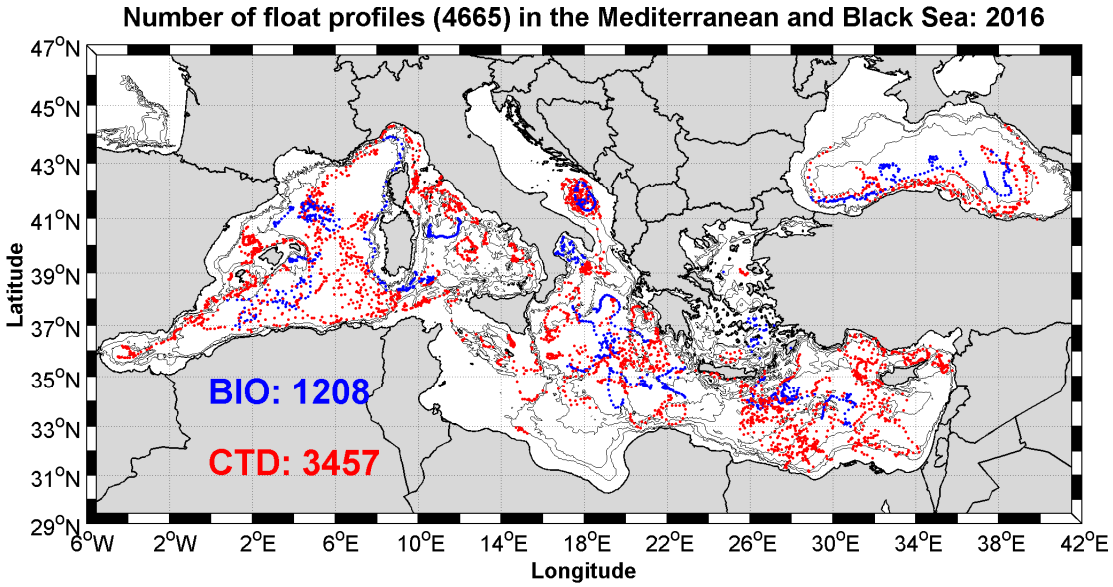


Figure 3. Spatial distribution of profiles collected by Argo floats in 2016 (January-September) in the Mediterranean and Black Sea: bio-Argo floats (blue dots) and standard Argo floats (red dots).

Statistics of the float survival rate in the Mediterranean and Black Sea were computed. The US Argo floats are excluded because many data are missing. All the floats which died before July 2016 were considered in the computation and the life time of each platform is defined as the time between the deployment (launch time) and the last available profile. The survival rate diagrams produced are separated by platform type and transmission mode (figure 4). The maximum operating life is more than 2500 days for a Provor, whilst the mean half life is about 400 days for Provor III, 500 days for Apex and Provor, and 700 days Arvor. Floats with Argos telemetry have a longer mean half life (near 500 days) compared to the floats equipped with Iridium (about 400 days), but the survival rate of platforms with Iridium is larger in the first year after the deployment.

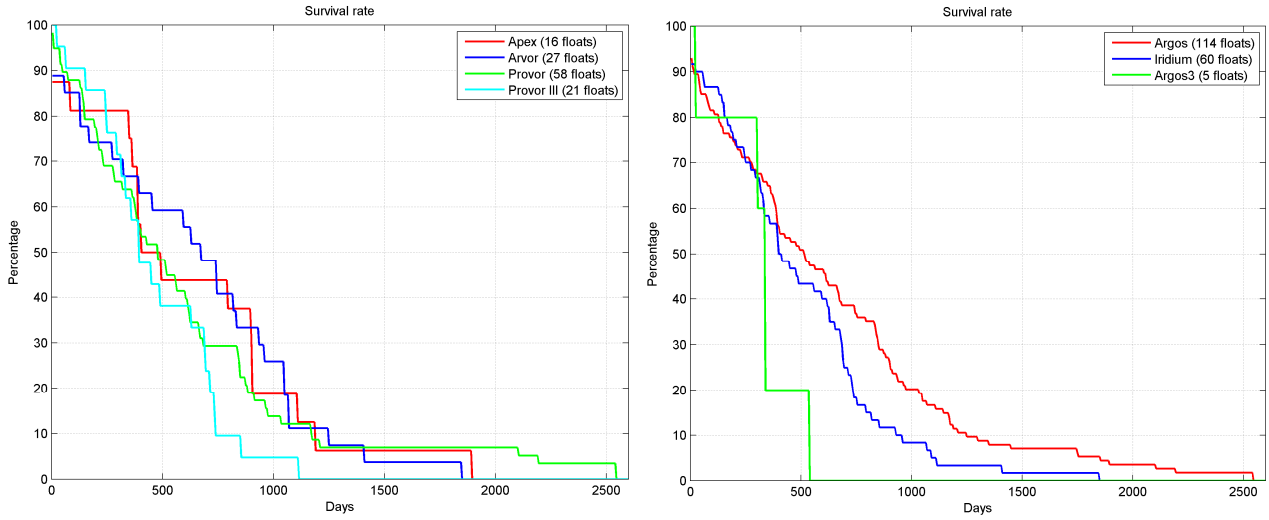


Figure 4. Survival rate diagrams separated by platform type and telemetry system.

- **<u>Web pages</u>:**

  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 2016 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.

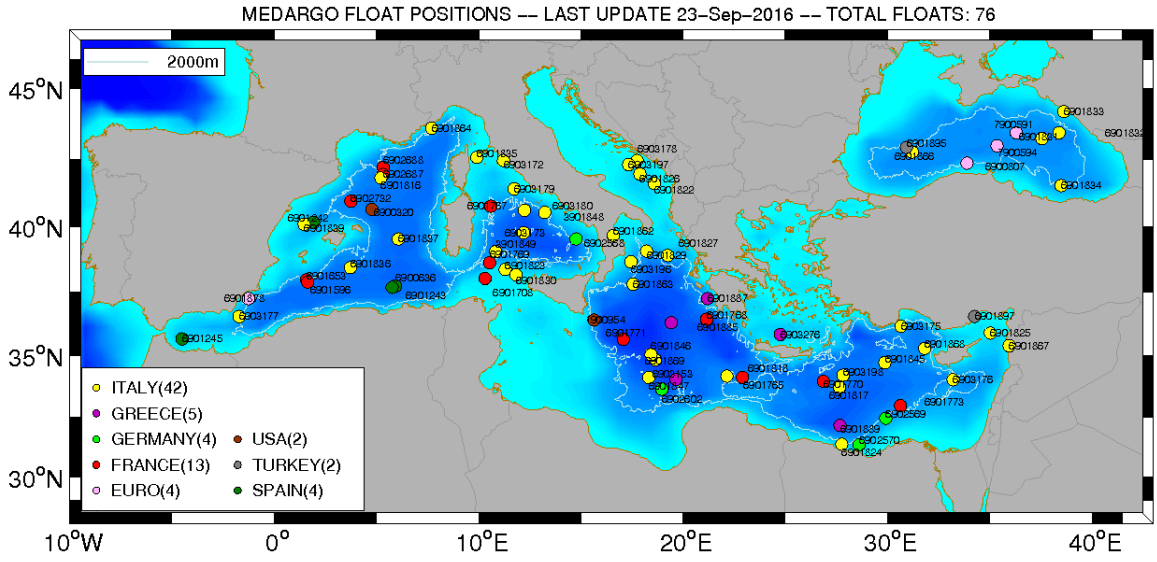


Figure 5. MedArgo float positions as of 20 September 2016 (updated daily).

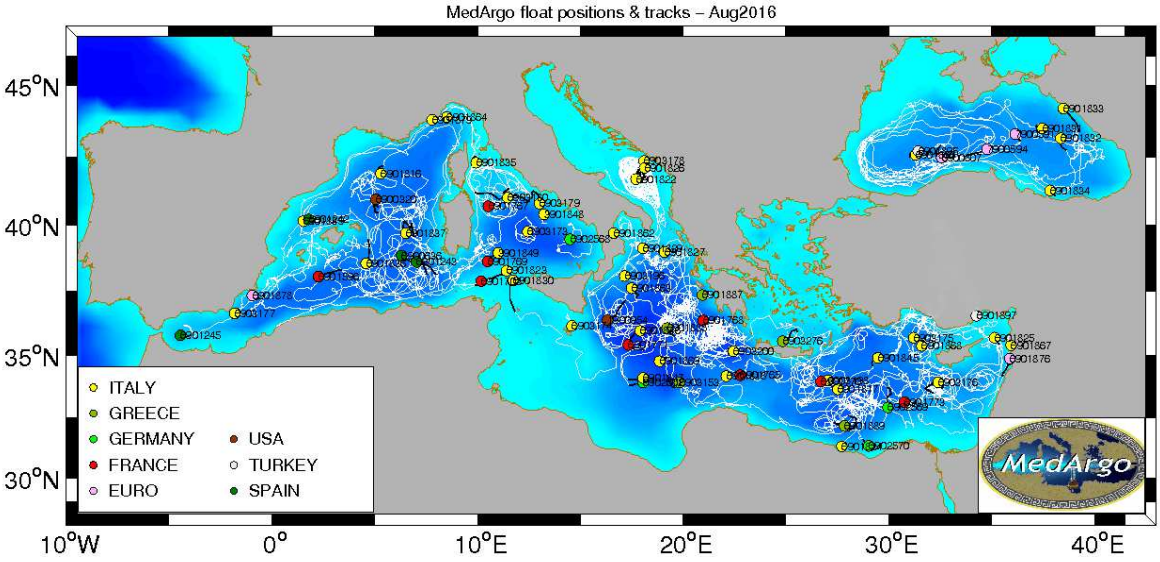


Figure 6. MedArgo float positions and tracks (August 2016). The monthly tracks are in black while the entire float trajectories are in white.

- **<u>Statistics of Argo data usage</u>:** (operational models, scientific applications, number of National Pis…):
- **<u>Products generated from Argo data</u>:**
  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).

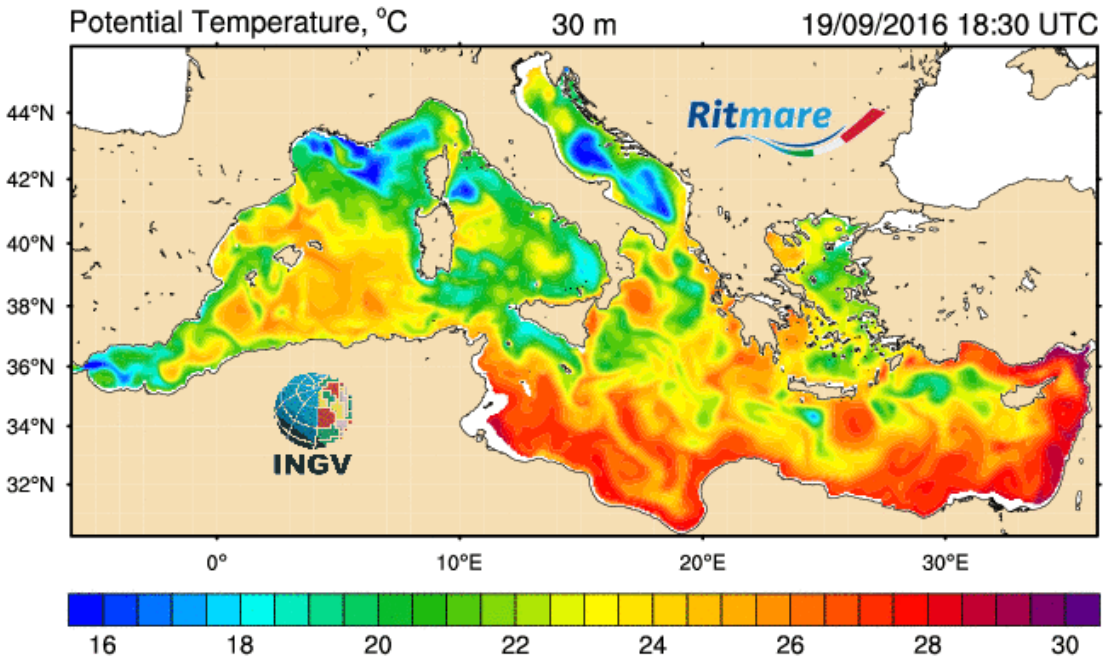


Figure 7. Forecasting model of potential temperature at surface.

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 2015 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. So far, the majority of the DM checked floats, can be considered as well calibrated. 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 (62 platforms) has been completed and the mat D-files were created. Some issues have been found: several floats have empty files at the DAC; some meta and tech files are missing; there were some problems with the surface pressure correction. An action of OGS and the DAC (AOML) is required to try to solve these issues.

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 (Algeria, Bulgaria, France, Spain, Greece, Germany, Turkey, Malta, Romania, Israel and Lebanon) in order to set the planning and the deployment coordination of floats. As part of these cooperations the float data are transferred in near real time to MedArgo and 18 new floats have been deployed in the Mediterranean and Black Sea during 2016. The first Arvor Deep was deployed in the Hellenic Trench area (Cretan Passage), a depression of about 4000 m located in the deepest area of the Mediterranean Sea.

There are 79 active Argo floats in the Mediterranean Sea and 9 in the Black Sea as of September 2016. About 30 floats (including also several floats equipped with biogeochemical sensors) will be deployed in late 2016 and in 2017 with the contributions of many countries.

Argo National Data Management Report of Japan, 2016

1. Status

The Japan DAC, the Japan Meteorological Agency (JMA), has processed data from 1449 Japanese Argo and Argo-equivalent floats including 185 active floats as of September 12th, 2016. 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 9,740 profiles observed by Japanese floats from October 14th 2015 to September 12th 2016 are in progress. JAMSTEC decoded 7,361 profiles of these, which were acquired as ARGOS messages and Iridium messages from October 14th 2015 to September 12th 2016. JAMSTEC sent 72 delayed profile files (D-files) to GDACs through the Japan DAC, JMA, during the period. Submission of delayed profile files has been still slowed down, but we will be able to submit more delayed profile files by the end of 2016.

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 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/

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.). JAMSTEC's website were renewed in the end of January 2016. The "Data FAQ" which translate to Japanese is going to be published on JAMSTEC's website soon.

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.
Please note that the URL has changed because of the renewal of JAMSTEC web site.
We have produced the new data set, which is produced through a 10-day global ocean analysis by optimal interpolation based on Argo, TRITON and available CTD data and will be available in the near future.

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.
Please note that the URL has changed because of the renewal of JAMSTEC web site.

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. We have fixed bugs of programs, and the updated data set will be released on the Argo JAMSTEC web site soon,
http://www.jamstec.go.jp/ARGO/argo_web/argo/?page_id=223.
Please note that the URL has changed because of the renewal of JAMSTEC web site.

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/top/).

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)

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

Based on the mutual agreement by PIs in Japan in 2006, JAMSTEC has done the DMQC for all Japanese floats.JAMSTEC has submitted the delayed mode files of 95,532 profiles to GDACs as of September 12th, 2016.
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(17th ADMT)

KMA (Korea Meteorological Administration)/
NIMS (National Institute of Meteorological Sciences)

1. Status

1.1. Data acquired from floats

In this year, KMA/NIMS DAC deployed additional 16(East Sea/Sea of Japan:10ea, Pacific Ocean:6ea) Argo floats and distributed real-time profiles data to the Global Data Assembly Centre(GDAC).
KMA has deployed 217 Argo floats in the East Sea/Sea of Japan and North Pacific Ocean including 57 active floats as of September 20, 2016. The DAC is acquiring ARGOS messages and IRIDIUM messages via web service from CLS in real-time. Most profiles transmitted to GDAC in the netCDF format and GTS using TESAC and BUFR format data after real-time QC on operational system.

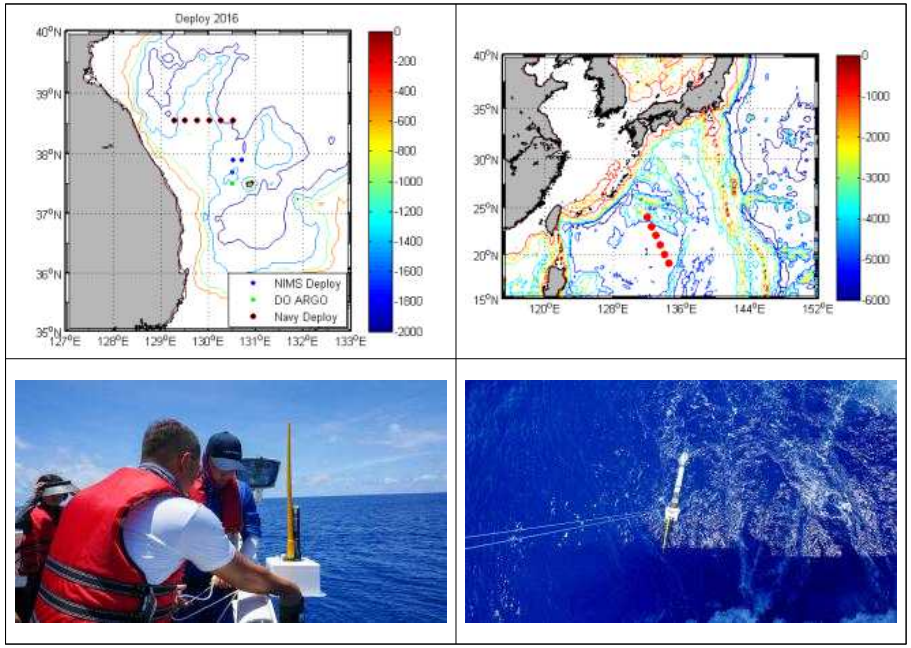


Fig.1. Deployment location of Argo floats in the East Sea/Sea of Japan, Pacific Ocean. The photos are deployment of floats.

1.2. Data issued to GDAC

During January~September 2016, 1,700 real-time data of KMA were sent to GDAC.

KMA will be convert the meta, trajectory, technical and profile data of KMA floats, including APEX, ARVOR, PROVOR, from Octorber. We have converted V.2.2 to V.3.1 and submitted them to GDAC. and we will convert to historical data in this year.
Since the May, 2016 KMA have changed Dissolved Oxygen data unit from micromole/L to micromole/Kg.

1.3. Statistics of Argo data usage

NIMS/KMA operates Global Ocean Data Assimilation and Prediction System, based on the NEMO-CICE coupled models and NEMOVAR assimilation. The system has a resolution of about 1/4 degree and 75 levels. The operation has daily cycle with 1-day hindcast and 1-day forecast, and global Argo profiles obtained from GTS network (Tesac and bufr formatted data) are assimilated with 24-hour time window.

1.4. Web pages

KMA is operating the Argo Korea web page. The URL is http://argo.nims.go.kr. It provides profile data and status of Argo floats to the public. There is a monthly average of performing 22,600 hits(visits).
From the last year, Korea web page is possible to view by the firefox, explorer and chrome browser.

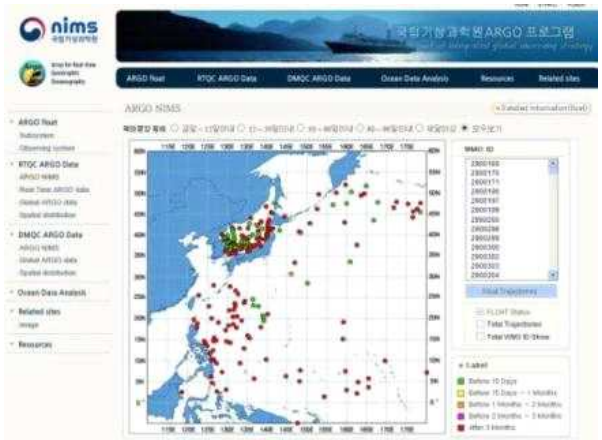


Fig.2. Argo web page of KMA/NIMS.

1.5. Deployment plan for 2017

Yellow Sea and South Sea of the Korea is a lack of Argo float data region. Mean water depth of Yellow Sea and South Sea of the Korea is 44m and 101m, respectively. We was not able to deploy Argo float due to shallow water depth over their region in the past time. We are going to deploy Argo float for shallow water depth over the Yellow Sea and South Sea of the Korea. Below figure indicates deployment position in the next year. Eight floats will be deployed over the Yellow Sea and South Sea of the Korea, respectively. And we will also deploy two floats over the East Sea/Sea of Japan.

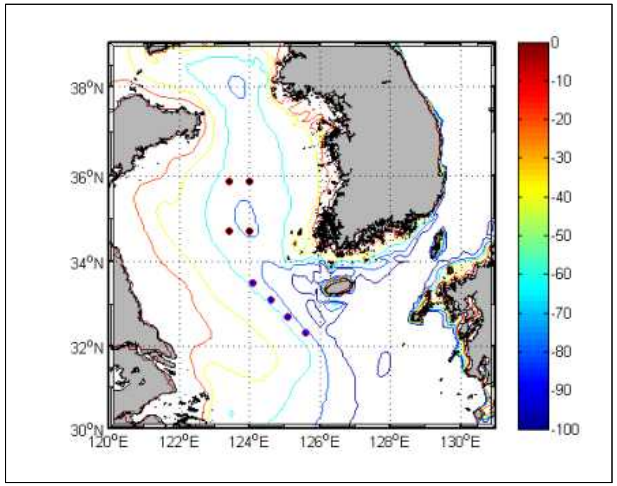


Fig. 3. Map of bathymetry and deployment location around Korea. Dot point indicates Argo float location for year 2017.

2. Delayed Mode QC

National Institute of Fisheries Science(NIFS, former NFRDI) / Korea Oceanographic Data Center(KODC) is responsible for Delayed Mode QC(DMQC) of KMA/NIMS Argo floats. During November 2015-September 2016, NIFS/KODC has sent 21,604 D-files to the GDACs after DMQC. KMA/NIMS D-files of profile format V.3.1 will be provided to the GDAC from October 2016.

Argo National Data Management Report 2014 – United Kingdom

Author list

The UK Argo data team (British Oceanographic Data Centre, National Oceanography Centre)
Justin Buck
Matt Donnelly
Katie Gowers

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

1. Status

The British Oceanographic Data Centre (BODC) is the data centre for UK Argo funded by the National Environment Research Council (NERC) and responsible for data management of UK and Irish floats. UK Argo is a member of Euro-Argo and will be managing European floats as part of the MOCCA project. BODC is also the lead for the Southern Ocean Argo Regional Centre (SOARC).

Staff changes

The organisation of the Argo team at BODC has changed over the last few months. Katie Gowers is now project manager for Argo (and related projects) within BODC. Justin Buck maintains a strong presence in the team as product owner (sharing his extensive knowledge and supporting the design of development projects). Matt Donnelly is still heavily involved in both data management and development tasks and Lise Quesnel has spent the last four months helping us with development tasks (but has recently returned to other projects).

Systems development

Robust retrieval of data from CLS

The method we were using to retrieve ARGOS data from the CLS system was unsupported and a risk to the project. We have therefore run a development project to replace this with the Web Service system as recommended by CLS. This is now in production and used for each retrieval we make from CLS for ARGOS data.

V3 NetCDF files

The team have successfully delivered V3 NetCDF metadata files for all of BODC's active and legacy core floats and continue to deliver them for active floats. We are now working on the profile files and are making significant progress. It will take us time to work through all ~59,500 profile files so this will continue to be a priority over the next 6 months. Prior to ADMT 2016 we have delivered > 30 % of our core profiles in V3.1 NetCDF format to the GDACS.

Preparation for the MOCCA project

We are currently preparing our system for the UK's MOCCA (Euro-Argo) floats that we expect to be deployed later this year/ early next year. This includes the ability to retrieve data from email attachments, automated

archival of that data and integration of the IFREMER decoder in to our system. Many thanks to IFREMER for making their decoder available for use.

Preparation for Delayed Mode Quality Control

BODC aims to deliver delayed model quality control for core floats in the coming months. We have invested time this year in testing and developing the system to ensure we can make use of community tools once we are fully trained and have the resource.

BODC Argo data system

The work started last year to make our system more robust and efficient continues and is showing considerable savings in time (giving us extra time to do development tasks).

Python-based Argo netCDF to BUFR converter (UK Met Office)

The UK Met Office has employed a software company to develop a Python-based Argo netCDF to BUFR converter that we should be able to implement at Exeter. They hope to make this software freely available when completed. This will initially be for CTD only and should soon be ready for testing. The code has been designed so that the addition of oxygen (and other BGC variables) can be done relatively easily (and oxygen at least to be included before the end of the year).

Data acquired from floats

Data from floats are received by BODC in a variety of ways including automatic download of data from the CLS database. BODC endeavours to set up floats for distribution of data to GTS and GDACs within a week of deployment. There are currently (early September 2016) 150 active core floats being processed by BODC.

Core data

Float type	**Core Argo**
APEX APF8, Argos communications, core mission	10
APEX APF8, Argos communications, core mission with ice detection	4
APEX APF9, Argos communications, core mission	5
APEX APF9 Argos communications, core mission with ice detection	8
APEX APF9 Iridium communications core mission	0
APEX APF9 Iridium communications core mission with ice detection	31
ARVOR, Argos communications, core mission	5
NAVIS, Iridium communications, core mission	10
Totals	**73**

Table 1: A summary of the number of floats managed by BODC in the year since 01 September 2015 grouped by float type. Also note core data are delivered from the UK near surface mission floats effectively increasing the total to 188 floats.

Float type	**Number of profiles**
APEX APF8, Argos communications, core mission	340

APEX APF8, Argos communications, core mission with ice detection	77
APEX APF9, Argos communications, core mission	150
APEX APF9 Argos communications, core mission with ice detection	275
APEX APF9 Iridium communications core mission	0
APEX APF9 Iridium communications core mission with ice detection	941
ARVOR, Argos communications, core mission	185
NAVIS, Iridium communications, core mission	469
Totals	**2437**

Table 2: A summary of the number of profiles processed by BODC in the year since 01 September 2015 grouped by float type.

Argo extensions

The diversity of floats being deployed by the UK Argo and Irish community is expanding and BODC is responsible for several types of extension floats.

Float type	**NST Argo**	**Bio Argo**	**Deep Argo**	**RBR**
APEX APF9, Argos communications, core mission with near surface sampling	115			
APEX APF9, Iridium communications, biogeochemical sampling		4		
PROVOR III BGC floats, Iridium communications		11		
NAVIS BGCi floats, Iridium communications,		7		
ARVOR Deep floats, Iridium communications			2	
Apex Deep floats, Iridium communications			2	
Apex floats with RBR sensors				1
Totals	**115**	**22**	**4**	**1**

Table 3: A summary of the number of extension floats managed by BODC in the year since 01 September 2015 grouped by float type.

BODC are not currently able to deliver data from all of these extension floats with the resource available. Core data are delivered from the NST floats. The UK Argo group currently consider the near real time and delayed mode management of core floats to be the highest priority. As management of the core data becomes increasingly efficient, BODC will be able to deliver significantly more data from these Argo extensions.

Float type	**Number of profiles**
APEX APF9, Argos communications, core mission with near surface sampling	3345[1]
APEX APF9, Iridium communications, biogeochemical sampling	133
PROVOR II BGC floats, Iridium communications	0
NAVIS BGC floats, Iridium communications,	0
ARVOR Deep floats, Iridium communications	0

[1] BODC are not able to process and submit NST data from our NST floats but are processing and delivering core (non-NST) data from these floats.

Apex Deep floats, Iridium communications	0
Totals	**3478**

Table 4: A summary of the number of profiles from extension floats processed by BODC in the year since 01 September 2015 grouped by float type.

Although the Bio-Argo data are not at the GDACs yet the data are available upon request from Giorgio Dall'Olmo, Plymouth Marine Laboratory on request. The Deep Argo data are available from Brian King, National Oceanography Centre.

Data issued to GTS

Data from all BODC hosted core floats are sent to the GTS twice a day. Almost 100% of TESACs messages for core floats are available within 24 hours. There is currently a difference between our internal metrics and those distributed amongst the Argo community regarding the delivery of BUFR which is being further investigated.

BUFR progress

See Python-based Argo netCDF to BUFR converter (UK Met Office) section above.

Data issued to GDACs after real-time QC

All core data received are processed within one hour of the data arriving at BODC with the agreed real-time quality control tests. Data are then submitted to both GDACs at least twice a day. Any file that fails to be transferred is queued for the next transfer attempt. BODC are making progress with the generation of V3 NetCDF files for core floats but there is still some way to go (see System development section above).

Data issued for delayed mode QC

All delayed mode QC on BODC hosted floats is done within BODC. See section 2 for the current status.

Delayed mode data sent to GDACs

All delayed QC on BODC hosted floats is done within BODC and forwarded to the GDACS the same day that delayed mode quality control is complete for a profile. See section 2 of this report for the current status of this activity.

Web pages

Work is underway to split the UK Argo website into separate UK Argo and SOARC websites, providing SOARC with a distinct web presence. The delivery of the new SOARC website is imminent. Additional small improvements have been made to the UK Argo website, and we have also identified and had corrected broken links from other Argo websites to UK Argo.

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

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 and Damien Desbruyeres are 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 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

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 models run to make monthly to decadal predictions, see: http://www.metoffice.gov.uk/research/modelling-systems/unified-model/climate-models

Products generated from Argo data …

National Oceanography Centre

Damien Desbruyeres has 4-D global fields of mapped Argo T and S, but they are not currently publicly available but Damien can be contacted by any interested parties.

UK Met Office

Argo profiles are a key source of data included within the Hadley Centre HadGOA (Global subsurface analysis of temperature) and EN4 (In situ ocean temperature and salinity profiles and objective analysis) data sets, see: http://www.metoffice.gov.uk/hadobs/hadgoa/ and http://www.metoffice.gov.uk/hadobs/en4/

In all applications Argo data are used together with other ocean data (XBTs, moorings, gliders etc.) and consequently Met Office products (or forecasts) are based on the combined datasets.

Plymouth Marine Laboratory

Giorgio Dall'Olmo is the lead PI for BGC data in the UK. As mentioned previously Bio-Argo data are available from Giorgio on request.

Argo DOIs

BODC-NOC and Ifremer won a small 15 kEuro 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 SEENOE 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 concerning 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. We await and seek to contribute to a formal recommendation on the topic of dynamic data from the RDA data citation working group.

Funding outlook

BODC continue to have National Capability funding from the Natural Environment Research Council (NERC) at the same rate as last year. Thanks to Graham Allen (Head of BODC) this was temporarily supplemented for the first 3 months of this financial year (April-June) to enable us to make greater progress on development work. We have funding from the Euro-Argo ERIC MOCCA project for the Euro-Argo floats to be managed by BODC. Starting next year we will have EU H2020 AtlantOS money to support delayed mode of Bio files.

We are aware of three NERC projects deploying Argo floats (and non-Argo floats which will be managed through the same system): ORCHESTRA, BOBBLE and ACSIS. BODC have submitted costings for all three to NERC and funding for BoBBLE has been confirmed (we await the outcome of the other bids). We are also looking for ways to improve the resourcing of SOARC; a recent bid for funding was unfortunately unsuccessful but we will continue to explore our options.

Delayed mode QC

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). 53% of BODC hosted floats profiles eligible for delayed mode QC have been processed and submitted to the GDACs in delayed mode. However due to resource issues BODC have not been able to deliver delayed mode quality control in the recent past.

We are now in a position to begin to deliver this again and have focused energy in the last couple of months to testing that our system can still interact with the community tools and training Matt and Katie to become delayed mode operators. The hope is that BODC will have re-established and sustained delayed mode processing by AST next year (2017).

2. GDAC functions

Section not applicable to the UK.

3. Regional Centre Functions

In the past year BODC has worked to deliver a separate distinct SOARC website to support the activities of the ARC and provide access to resources for DMQC operators and data users. The SOARC website is due to

launch imminently. In addition, we have worked with partners to identify areas of focus for SOARC and now have a clear plan for achievable activity given resource constraints. We are actively pursuing a number of additional funding sources to increase our capacity to support the work of the ARC alongside our partners which now formally includes BSH alongside CSIRO. Please refer to the SOARC report for further details.

US NATIONAL DATA MANAGEMENT REPORT

September 1st 2015 – September 1st 2016

17th ADMT Meeting

Tianjin, China

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 2,427 floats and processed more than 92,500 profiles in real time.

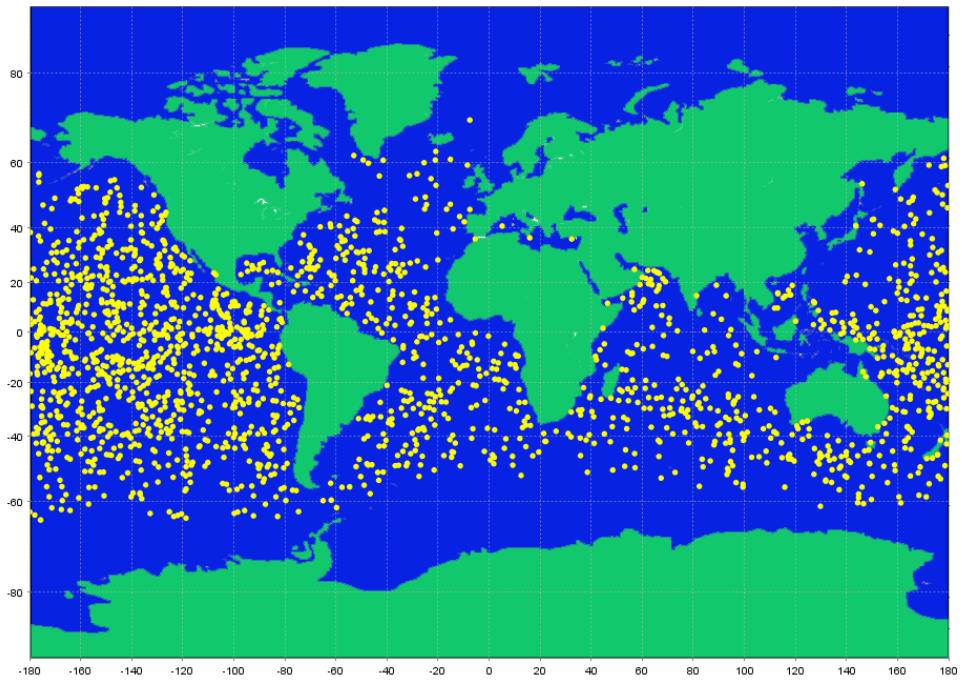


Fig. *1: Real-time profiles processed by the DAC in the period Oct 19-21, 2015. Hot spots link to data plots.*

With respect to timeliness, 95% of the profiles that were distributed to GTS in the TESAC were transferred within less than 24 hours of transmission. The US Argo DAC also has distributed the Argo profiles to GTS in the BUFR format (94 % of

them within the 24 hours) and to the GDACs (93% of them within 24 hours). The most recent performance statistics are available online at:

http://www.aoml.noaa.gov/phod/argo/opr/index.php

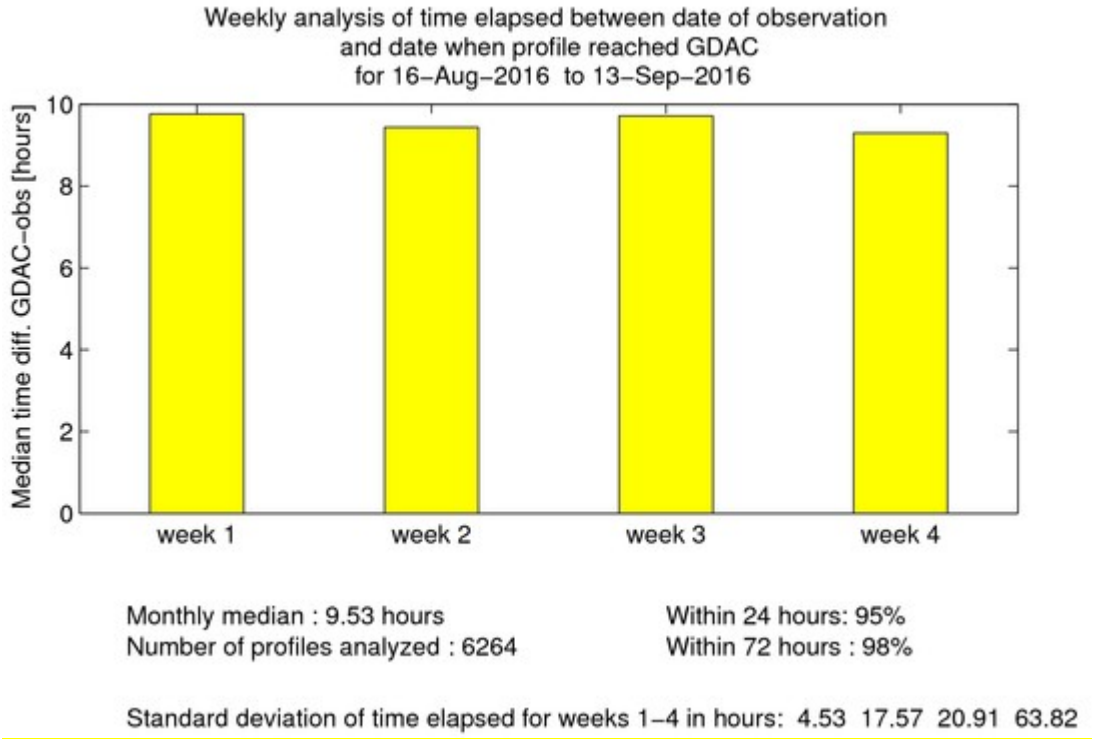


Fig 2: performance statistics; example: monitoring of profile distribution to GDACs.

In addition to this, the US Argo DAC distributed meta, technical and trajectory files in the Argo netcdf files to the GDACs as part of the real-time processing. 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 400 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: ww.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.

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

The US Argo DAC has been distributing real time netcdf profiles in version 3.03 since August 2014 while continuing to add capabilities to the new software. This included development necessary to enable the creation of the meta, technical and trajecotry netcdf files. In April, 2016 AOML went operational with creating meta and technical netcdf files in format 3.1. Trajectory netcdf files in format 3.1 were produced starting in May 2016. The capability to generate trajectory files for deep Argo SOLO floats was added in September 2016.

These developments involved creation and modification of tables as well as the software that uses them to control the file generation for each type of float and netcdf file. The tables allow the extraction of the data as needed and to associate them with the appropriate variable to be used to write the netcdf files.

With respect to the quality control, the DAC added test 22 (Unpumped Air and Water) to the profile file processing. In preparation for the transition to profile format 3.1, which has been put off partly due to the oxygen data and partly due to the need to get the other core Argo netcdf files done first, modules were added to prepare for splitting the oxygen off from the profile files that will be written as core Argo profile files in format 3.1. the oxygen data will be in the bio-Argo profile files in format 3.1. More complex bio-Argo floats that collect more thna just oxygen data will be created by the PI institution. This development will be continued in the coming year.

Software has been developed to transmit data to GTS using ftps rather than ftp. Currently, we send all data through both pathways so that the National Weather Service can monitor the robustness of the pathway on their end. The migration will be completed once we get the green light from the National Weather Service.

Other developments at the US Argo DAC

The processing system was migrated to a new server with a faster processor and more storage capacity which enabled the US Argo DAC to improve the daily data acquisition and processing. This migration required changes of many programs to adapt them to the newer operating system.

The mirror computer in Washington DC has been replaced with a more powerful computer that will allow faster processing than previously. This mirror computer will be used in the event that the computer at AOML has to be turned off due to emergencies.

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 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. Last year, on 13 October 2014, PMEL had 73,666 D-files at the GDAC that were more than one year old, comprising 63% of the total of 117,332 PMEL profiles that were older than one year at that time. So, our DMQC backlog has stayed constant in terms of percentage.

This 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. We have recently completed debugging, although we are still working on streamlining our GUIs and complying with changing formatting requirements.

John Lyman continues to work with Kristene McTaggart on DMQC efforts, which has resulted in considerable progress with the software upgrades. They are working on clearing the DMQC backlog. 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 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 nearly 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 183,792 Argo stations (profiles). This is an increase of 17,708 stations (485 nominal float years) since the previous United States Argo National Data Management Report (October, 2015). At present, 98.2% of the DMQC eligible, SIO stations have been completed by either John Gilson (jgilson@ucsd.edu) or Sharon Escher(sescher@ucsd.edu) . 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, and 3 floats donated to Argo Mexico. SIO has also accepted the future DMQC of 8 NAVOCEANO floats deployed from the Peruvian vessel Zimic.

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 90.6% of SIO DMQC trajectory files have been formatted to V3.1 netCDF (100% of Iridium data, 85.3% of Argos data). During the year 51 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 844. 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 transmited DMQC meta files to the GDAC at the same rate as the trajectory files (90.6% total, 100% Iridium, 85.3% 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 float type. Over the past year SOLOII/S2A firmware V2.1 was introduced with minor improvements. SIO continues to retain data decoding control for all SIO Iridium float data in order to simplify DMQC processing. DoD Iridium modems and Tadiran Hybrid “Pulse” batteries were included on some floats. The batteries are believed to not suffer to the same extent as the previous Electrochem batteries to passivation.

Scripps deployed 12 IDG[1] developed Deep SOLO floats as part of the Southwest Pacific Deep Argo array. An initial 7 Deep SOLO were deployed from the Kaharoa in Jan/Feb 2016. Due to a hardware defect within these V0.4 floats which might result in premature failure, a second Kaharoa cruise was completed in July 2016 to recover and reflash the firmware (to V0.5; which compensated for the hardware issue), and if possible redeploy the instruments. Five of the seven floats were recovered with 4 being redeployed (the fifth float had the Iridium antenna broken during the recovery). On the same cruise, 3 new Deep SOLO floats were deployed. Two additional floats were deployed from the Investigator in June 2016. At present, the Southwest Pacific Deep Argo array has 13 floats (11 Deep SOLO and 2 Deep APEX). All Deep SOLO data is reaching the GDAC/GTS within 24 hours of being received.

[1]IDG: Instrument Development Group

University of Washington

As of September 2016, University of Washington had submitted over 201,000 delayed-mode files (D-files) to the Argo GDACs via the US Argo DAC. 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. Visual comparison with nearby good Argo data was used to complement the statistical method of OW.

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.

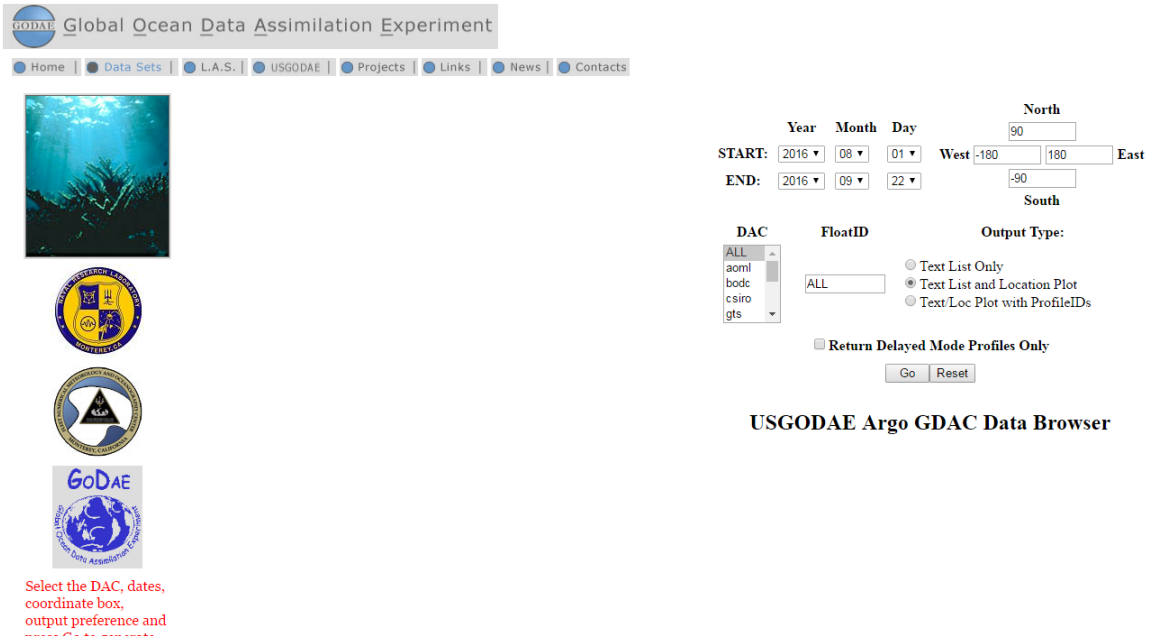
UW is now responsible for the production of BR- files for the SOCCOM project.

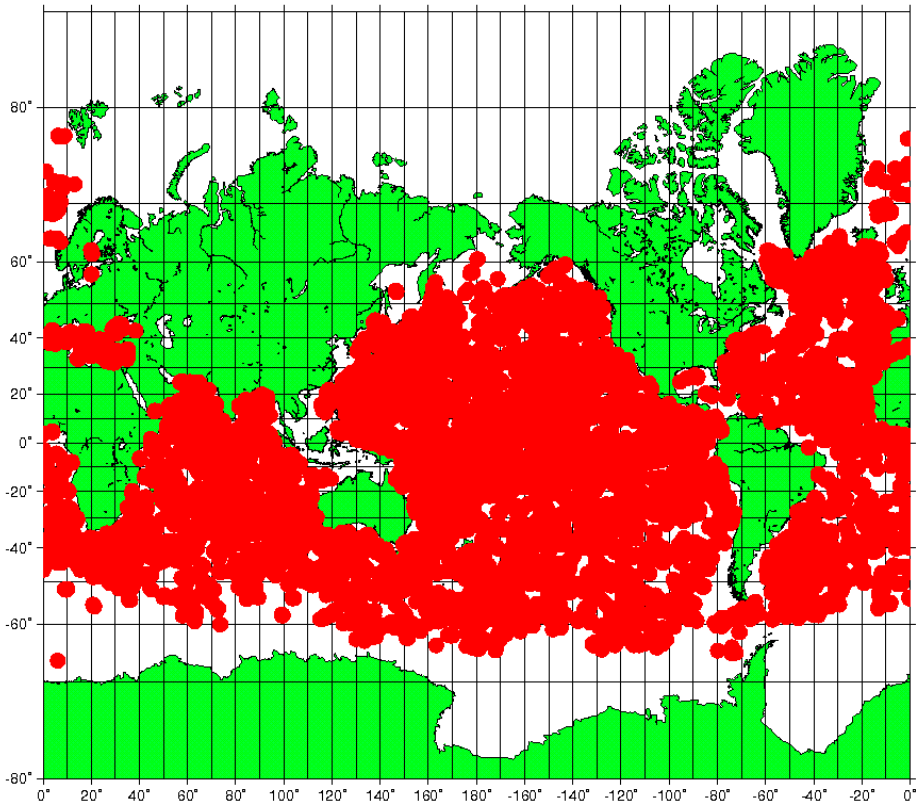
Wood Hole Oceanographic Institute

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 2016
US GDAC (Global Data Assembly Center)
September 22nd, 2016





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) …

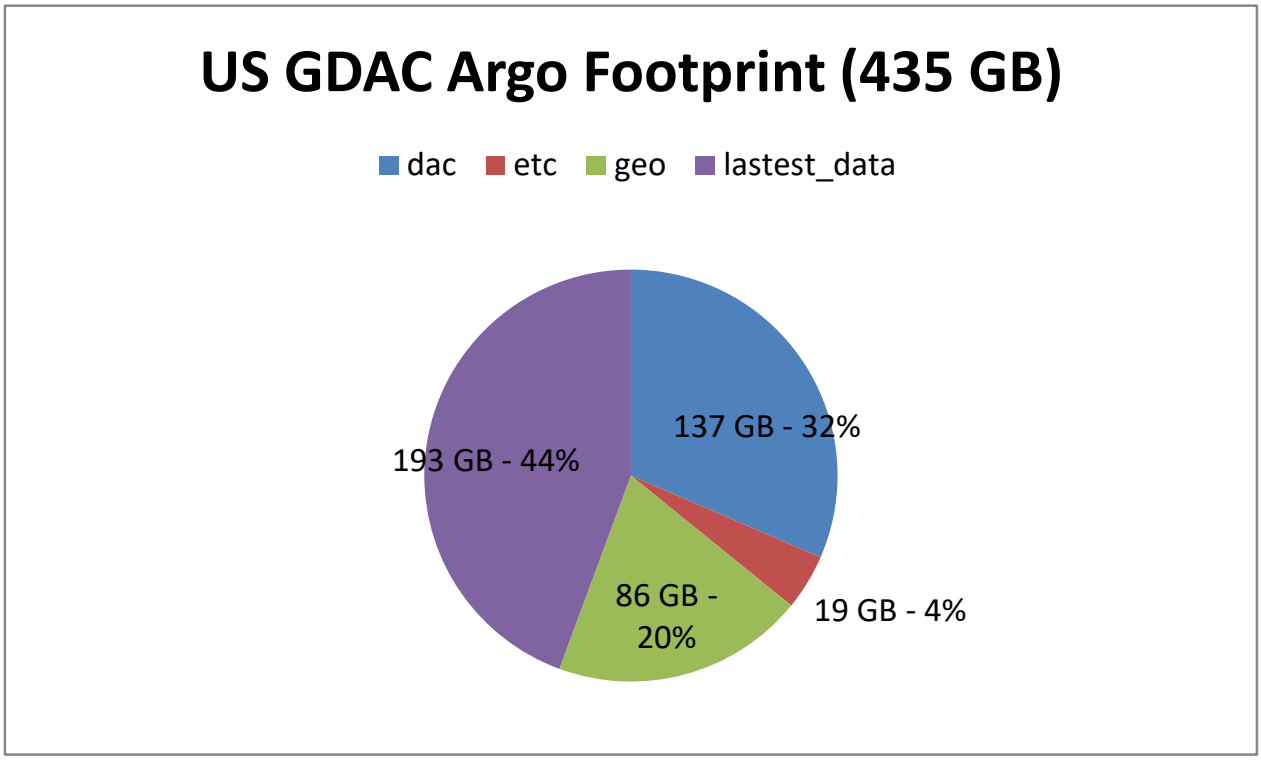
National centres reporting to you

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 September 22nd, 2016, the following shows the Argo footprint on the US GDAC.

DAC	MetaData	Technical	Trajectory	Trajectory D-Mode	Trajectory Bio
AOML	6,023	5,845	7,229	1,383	0
BODC	538	511	420	0	0
Coriolis	2,315	2,288	2,226	1	190
CSIO	345	331	340	0	0
CSIRO	748	730	711	0	0
INCOIS	394	382	370	0	18
JMA	1,455	1,422	1,418	0	0
KMA	217	206	207	0	0
KORDI	119	115	119	0	0
MEDS	435	423	421	0	6
NMDIS	19	19	19	0	0
Totals	12,608	12,272	13,480	1,384	214

DAC	Profiles	Profiles D-Mode	Profiles Bio
AOML	879,266	572,866	22,324
BODC	57,402	31,307	0
Coriolis	226,758	129,638	27,853
CSIO	39,115	10,221	0
CSIRO	124,279	97,846	18,612
INCOIS	51,631	27,819	3,076
JMA	170,094	95,532	7,118
KMA	26,074	20,786	0
KORDI	16,302	0	0
MEDS	44,379	27,386	2,707
NMDIS	2,460	0	0
Totals	1,637,760	1,013,401	81,690



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

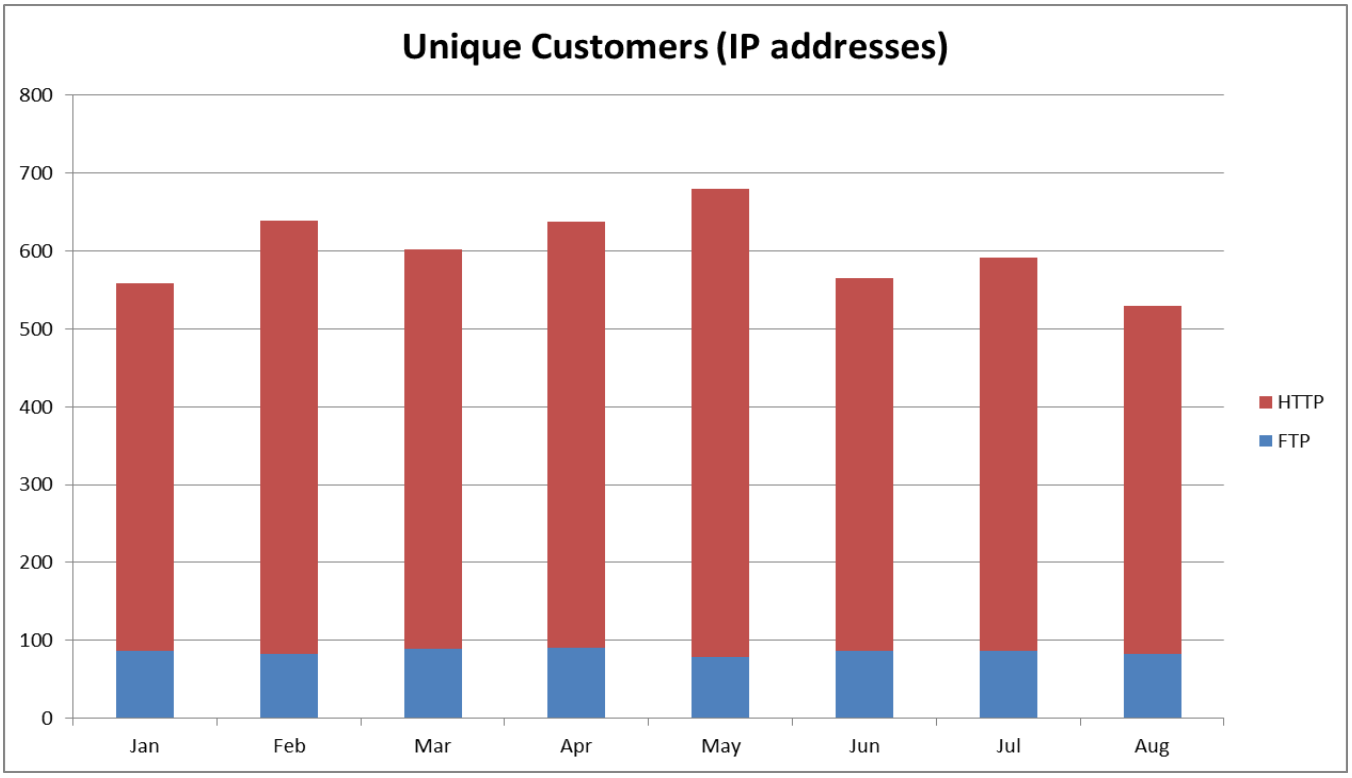
Date	Unique IPs	Hits (1000's)	Gigabytes
Jan 2016	86	1,437	1,732
Feb 2016	82	1,995	1,689
Mar 2016	89	1,807	2,325
Apr 2016	91	2,412	2,201
May 2016	79	1,998	2,903
Jun 2016	87	2,256	2,654
Jul 2016	86	2,134	1,987
Aug 2016	82	1,476	1,945

HTTP Statistics

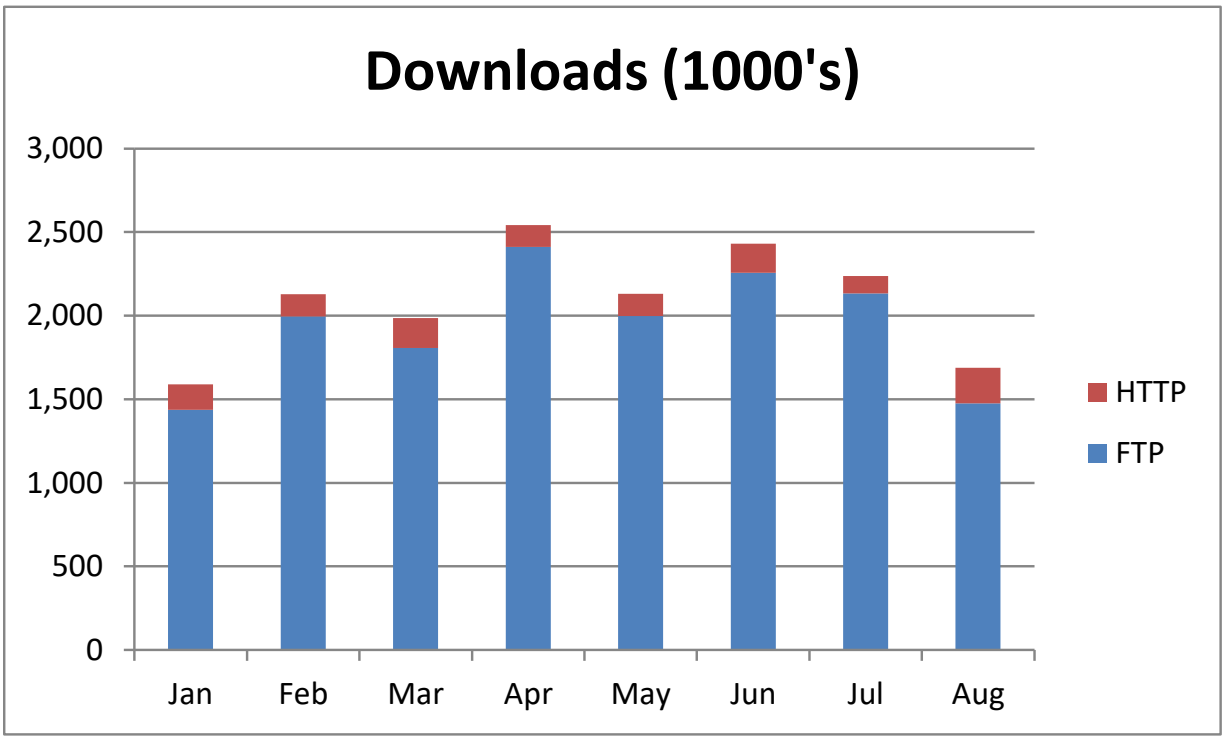
Date	Unique IPs	Hits (1000's)	Gigabytes
Jan 2016	473	153	1,775
Feb 2016	557	134	1,479

Mar 2016	513	178	1,850
Apr 2016	547	129	2,788
May 2016	601	133	2,567
Jun 2016	478	174	2,894
Jul 2016	505	104	2,004
Aug 2016	447	212	2,133

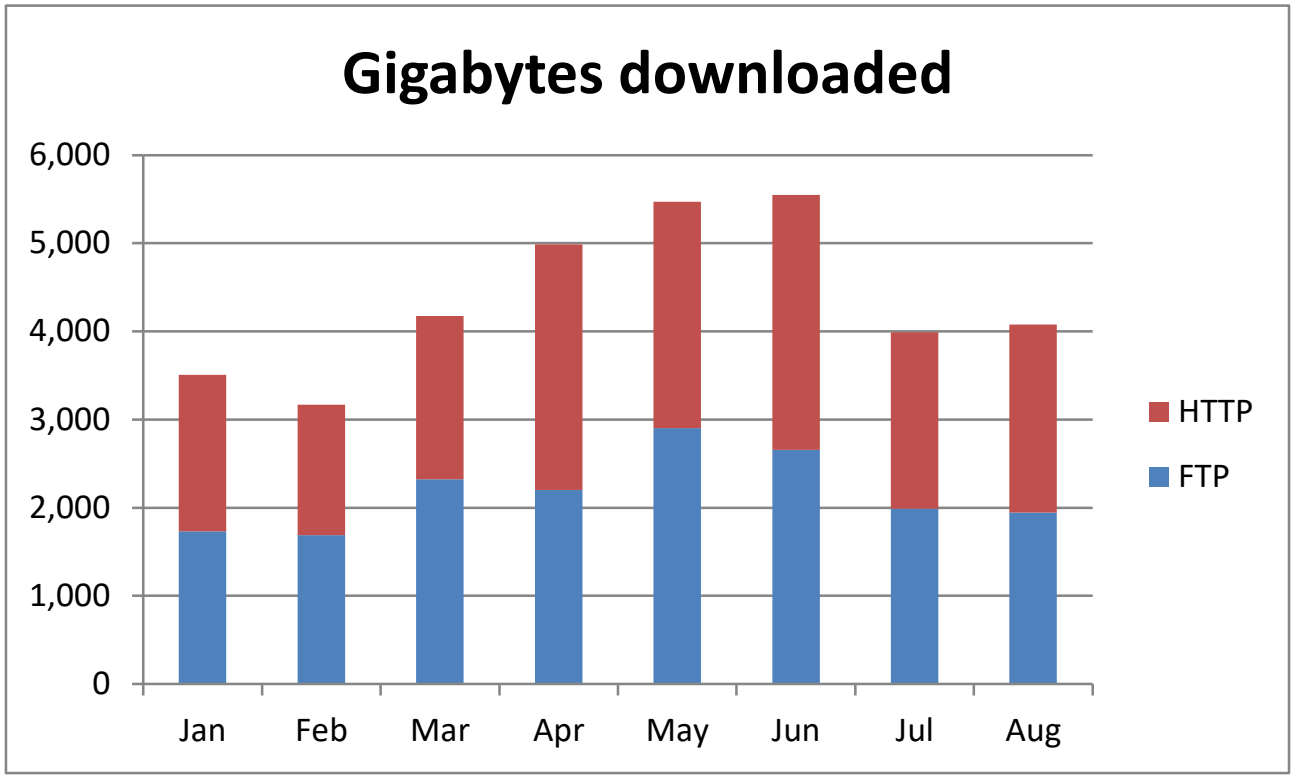
The following chart shows the unique customers downloading Argo data per month.



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 terabytes 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)

Report on the Southern Ocean Argo Regional Centre (SOARC)

SOARC Partners

Since AMDT16, Germany's BSH has formally joined SOARC as a partner, and SOARC continues to welcome expressions of interest from other institutions that would like to contribute to the SOARC partnership. The key contacts for SOARC partners are:

- Matt Donnelly, BODC, UK - matdon@bodc.ac.uk
- Esmee van Wijk, CSIRO, Australia - Esmee.Vanwijk@csiro.au
- Birgit Klein, BSH, Germany - Birgit.Klein@bsh.de

The recent focus of the SOARC partners and the agreed priorities for the coming year are outlined below.

Website & Resources

SOARC is being provided with a distinct web presence by BODC, separate from the existing pages on the UK Argo website. The website is nearing completion and will be launched imminently, and will include details on current activity and links to existing resources in coordination with the Southern Ocean Observing System (SOOS). The point of contact (POC) for this work is Matt Donnelly (BODC, UK).

Under ice

During the past year an investigation into a potential f/H contour method has revealed that this was never developed beyond a cursory examination some years ago. The focus is now on engaging with AWI and Ifremer regarding RAFOS positioning (POC: Birgit Klein), whilst development of positioning methods for floats under ice on the continental shelf continues (POC: Esmee van Wijk). Other groups outside SOARC are also working on this issue, e.g. Lynne Talley, Paul Chamberlain and Kevin Speer are working on under-ice RAFOS tracking for Steve Riser's floats in the Weddell Sea and on uncertainty and interpolation methods for use with SOCCOM under-ice floats.

Outside of SOARC, a POGO grant has been secured by UTAS/CSIRO/SOOS to support the OASIIS Working Group "Observing and understanding the ocean below the Antarctic sea ice and ice shelves" whose goal is to develop a detailed implementation plan for an under-ice observing system. The workshop will be held in 2017 and participation will be by invitation. Under-ice Argo will be a key part of an under-ice observing system. Esmee van Wijk is co-leading this effort and will keep the SOARC informed of relevant outcomes.

A proposal for an under-ice metadata field to help clarify the status of a float is intended for submission to ADMT17 from Esmee van Wijk.

Other activities

SOARC is working to identify and put in place support for orphaned floats in the Southern Ocean that may require DMQC support. JCOMMOPS has assisted with identifying current orphaned floats and CSIRO has already agreed to support the DMQC of 20 Italian floats. Additional resource is being

sought to support the remaining floats. Matthieu Belbeoch is presenting on this topic at ADMT17 where volunteer DMQC operators will be sought for remaining floats. Floats between 60 and 90 S are the highest priority followed by those between 30 and 60 S. Esmee van Wijk is the point of contact on behalf of the ARC.

SOARC has initiated conversation with CCHDO and SOOS regarding the health of the reference database in the Southern Ocean with the objective of identifying and reducing any gaps in data availability. SOARC has also identified that assessing the status of co-located CTDs-on-deployment in the Southern Ocean and making this available through the website is a future priority task to help support DMQC. Matt Donnelly is the point of contact on behalf of the ARC.

SOARC partners are currently applying for additional funding to support enhanced future activity relevant to Southern Ocean Argo, with one successful POGO application by UTAS for the Under Ice Workshop, one unsuccessful application to support coordination work by BODC, and other funding sources either in progress or being examined.

Argo Data Management
Real-Time & Delayed-Mode Status

M. Belbeoch, Sept. 2016, for ADMT#17
mbelbeoch@jcommops.org,
http://argo.jcommops.org

This report provides information on the status of Argo data availability.
ADMT is invited to provide feedback as appropriate.

Content

IOC Resolution XX-6

(…) concerned coastal states must be informed in advance, through appropriate channels, of all deployments of profiling floats which might drift into waters under their jurisdiction, indicating the exact locations of such deployment. (…)

- ⇨ *All Argo floats should be registered at JCOMMOPS/AIC (and notified) in advance*

(…) the data and data products derived from those floats will be freely available in real-time and delayed mode through IOC and WMO exchange systems, as well as other appropriate international mechanisms (…)

- ⇨ *Real-time data distribution should start at 1st profile.*

Executive Summary

- ⇨ The real time data distribution could be optimized further as half of pending floats are older than a year. It is important to respect international regulations and meet modeler's requirements with real-time distribution of all Argo floats.

- ⇨ 90% of the array meets timeliness requirements but a few DACs could progress.
  A few DACs are slow down at IFREMER GDAC (+3h). Could this be optimized as NRL-MRY adds only 0.5h to the process?
  A few DACs cannot meet 24h target at NRL-MRY (while they do for IFREMER).
  A few DACS had clear difficulties in August with 50% of profiles distributed within 24h.
  There are still a few negative delays problems that need to be clarified and investigated further.

- ⇨ The ratio of data files processed in delayed mode, vs files eligible to this re-processing, keeps decreasing (68%). About half million profiles are waiting to be processed in delayed -mode. 2/3 of the challenge resides in regular Argo programmes.

- ⇨ DM processing status in the Southern Ocean is in better shape (78% and 83 % for the two areas studied)

- ⇨ BioGeoChemical Argo needs to improve all these stats as well

- ⇨ JCOMMOPS/AIC to improve monitoring stats on these issues on the new website

Performance Indicators

Data Flow

Delivery Argo BioGeoChemical	88.96% 8/2016	95% Monthly Target	Nb of registered units vs number of operational units (BioGeoChemical Argo)
Delivery Argo Global	94.01% 8/2016	95% Monthly Target	Nb of registered units vs number of operational units (Global Argo)
Quality (DM Processing) Argo Global	68.53% 8/2016	75% Monthly Target	Nb of DM obs vs NB of DM eligible obs
Quality (PSAL) Argo Global	88.33% 8/2016	95% Monthly Target	Nb of monthly obs of best quality - PSAL
Quality (TEMP) Argo Global	92.91% 8/2016	95% Monthly Target	Nb of monthly obs of best quality - TEMP
Timeliness (GDAC FR) Argo Global	90.45% 8/2016	95% Monthly Target	% of monthly observations distributed within 24h (GDAC FR)
Timeliness (GDAC US) Argo Global	89.57% 8/2016	95% Monthly Target	% of monthly observations distributed within 24h (GDAC US)
Timeliness (GTS MF) Argo Global	94.36% 8/2016	95% Monthly Target	% of monthly observations distributed within 24h (GTS)
Whitelist Argo Global	96.54% 8/2016	95% Monthly Target	% of platforms whitelisted platforms vs operational platforms

Fig. 1: Performance Indicators for Argo Data Flow on argo.jcommops.org

Real-Time

A number of floats were registered at the JCOMMOPS/AIC (and notified) and no data are available at GDACs or on GTS. A float failure, a deployment cancelled, a deployment date postponed, a deployment under seasonal ice, or more often a delay in the data processing chain can explain this status. JCOMMOPS contacts regularly float operators to check the status of these pending floats (153 as of September 2016).

⇨ Make a query on argo.jcommops.org with Status='REGISTERED' and Deployment Date < today. Save this query to monitor these pending floats more easily.

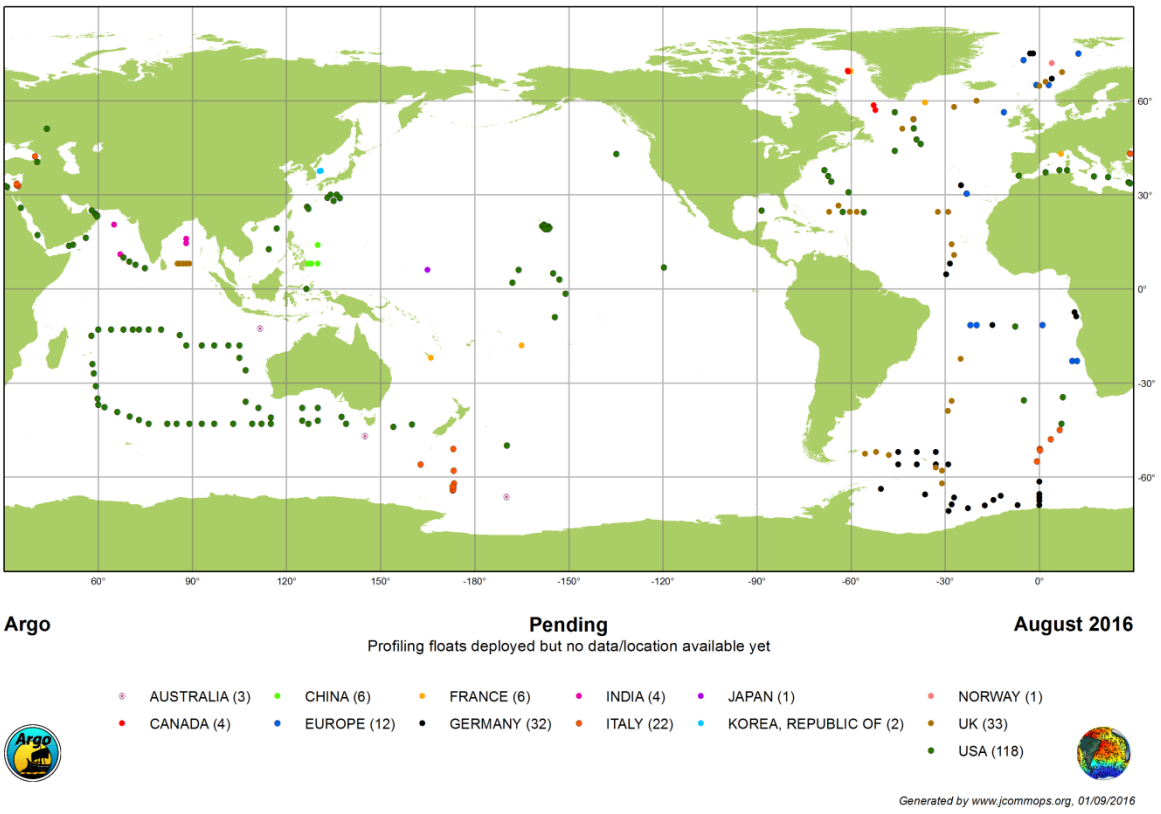
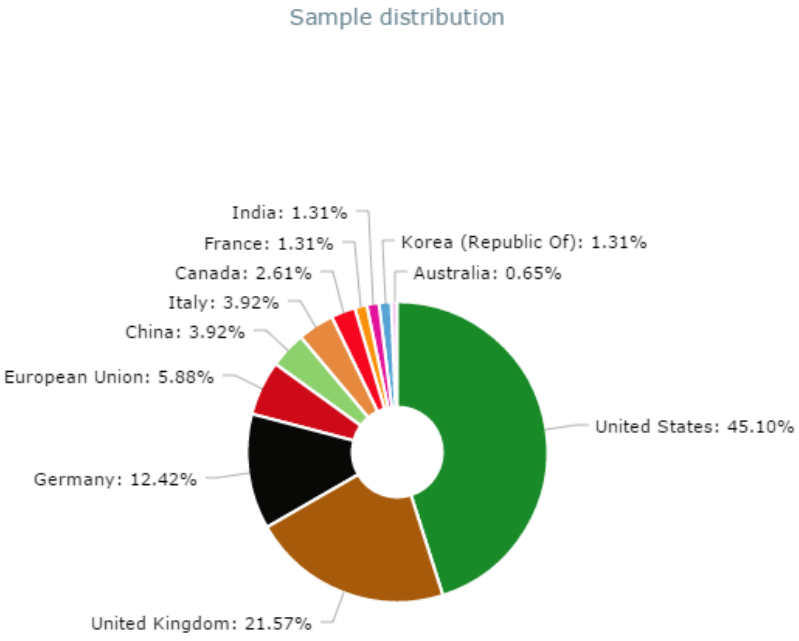


Fig. 2: Pending floats map, by country



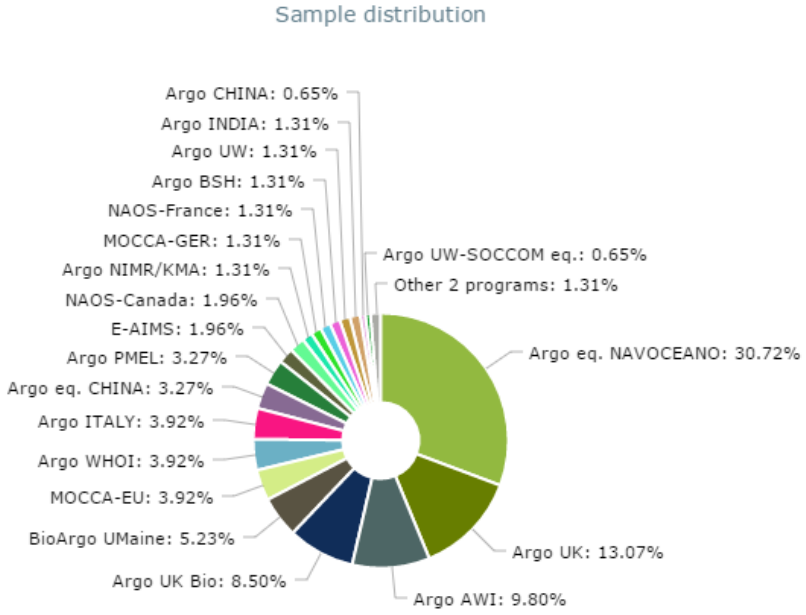


Fig. 3,4: Distribution of pending floats by Country and by Program

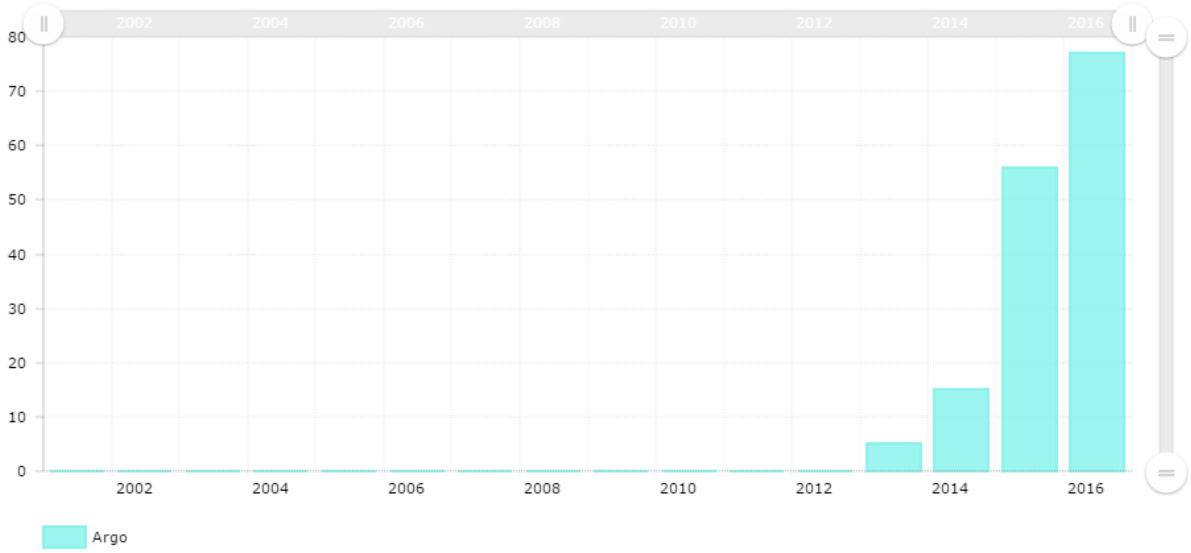


Fig. 5: Deployment date of pending floats

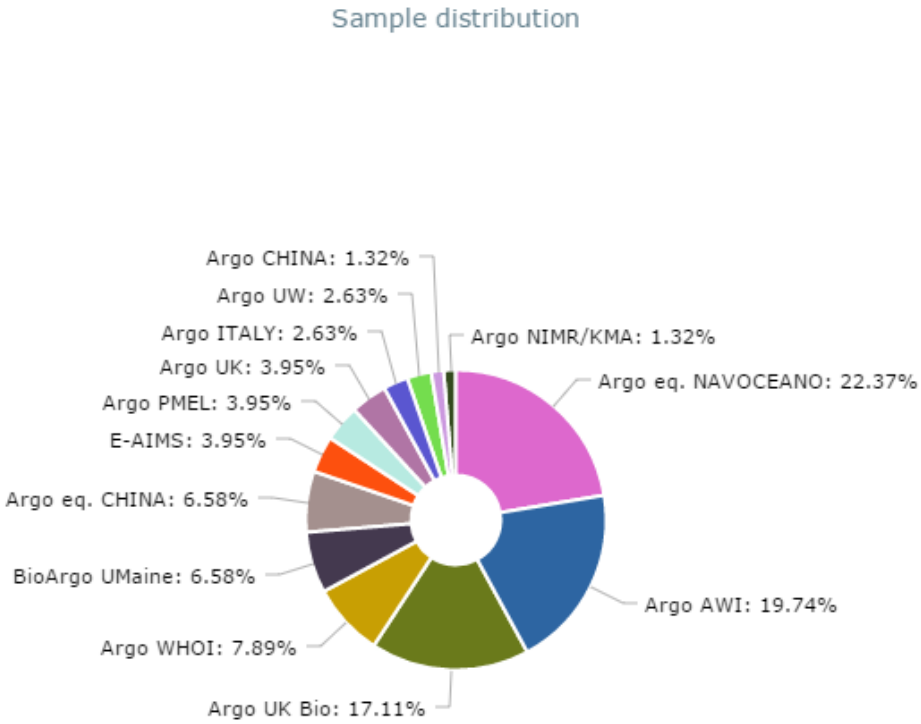


Fig. 6: Pending floats deployed before 2016, by Program

Delays

Source:
GDACs detailed index files

Definitions:
GDAC Distribution Date: 1st availability of file on GDAC ftp
Date Update: 1st date of assembly in netCDF file
Observation Date: Observation Date in netCDF file

Delay = (GDAC Distribution Date – Observation Date) = (Delay_DAC + Delay_GDAC)
Delay_DAC = (GDAC Distribution Date – Date Update)
Delay_GDAC = (Date Update – Observation Date)

Delays have been calculated below on all observations available at GDACs in August 2016, on September 20th 2016.
The later you calculate delays the higher will be the values as it is likely some files were submitted long after observation date.

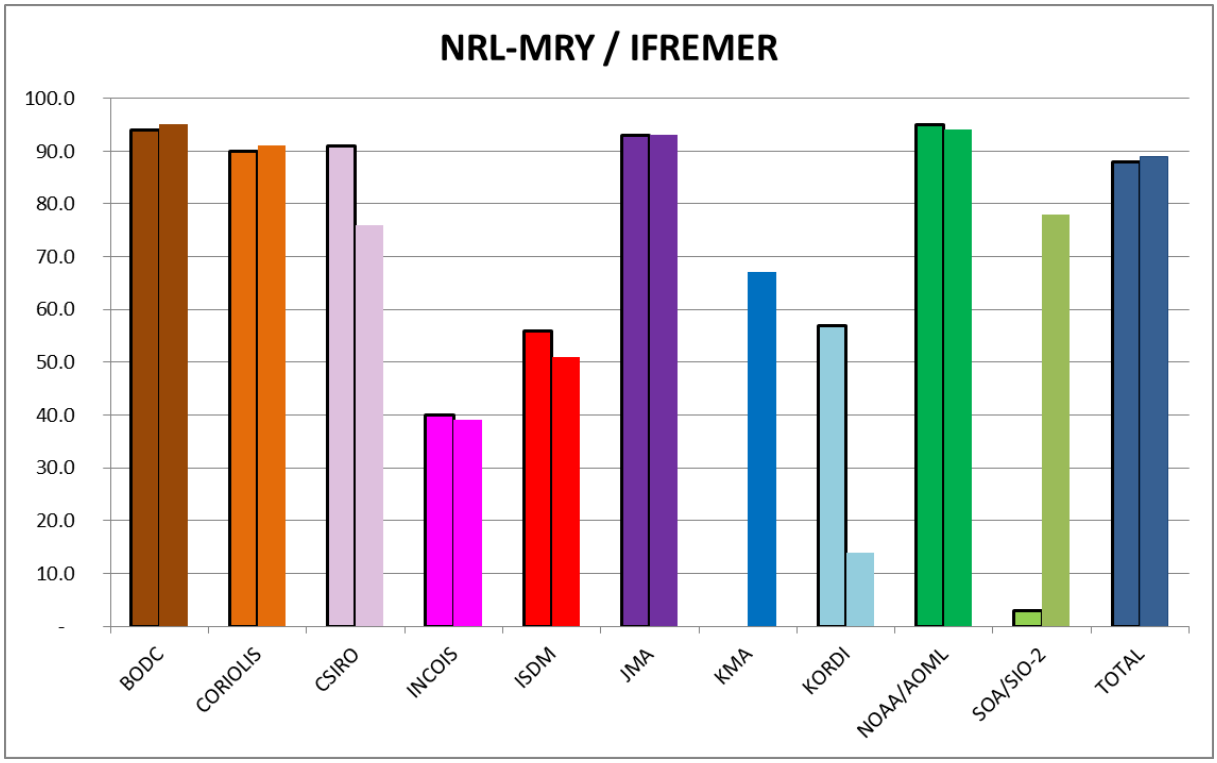
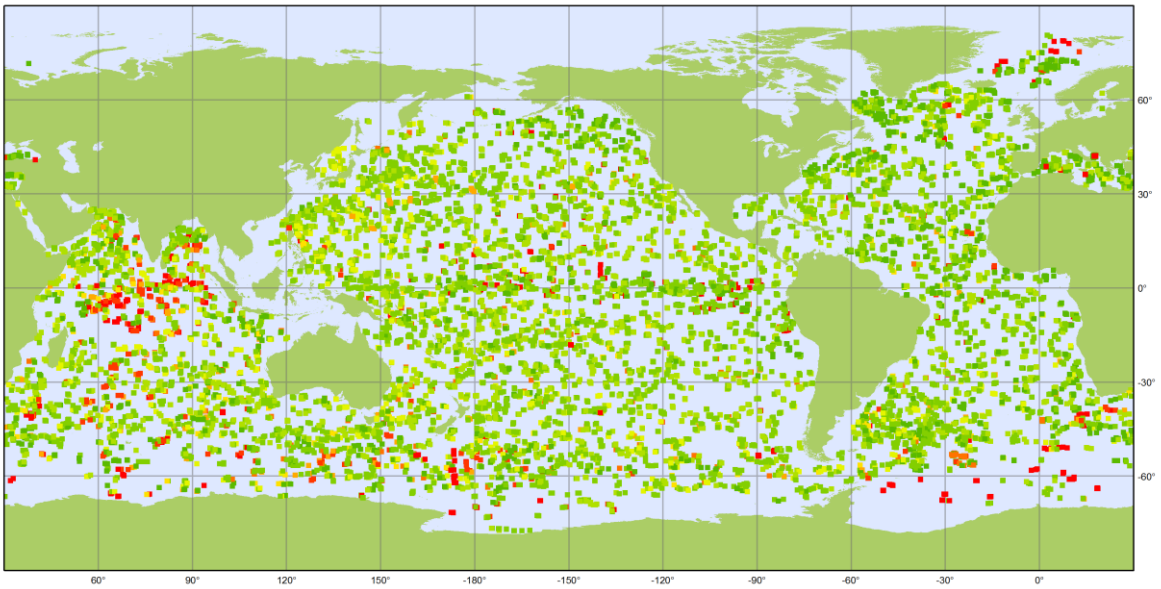


Fig. 7: % of observations distributed within 24h, by DAC, on the 2 GDACs

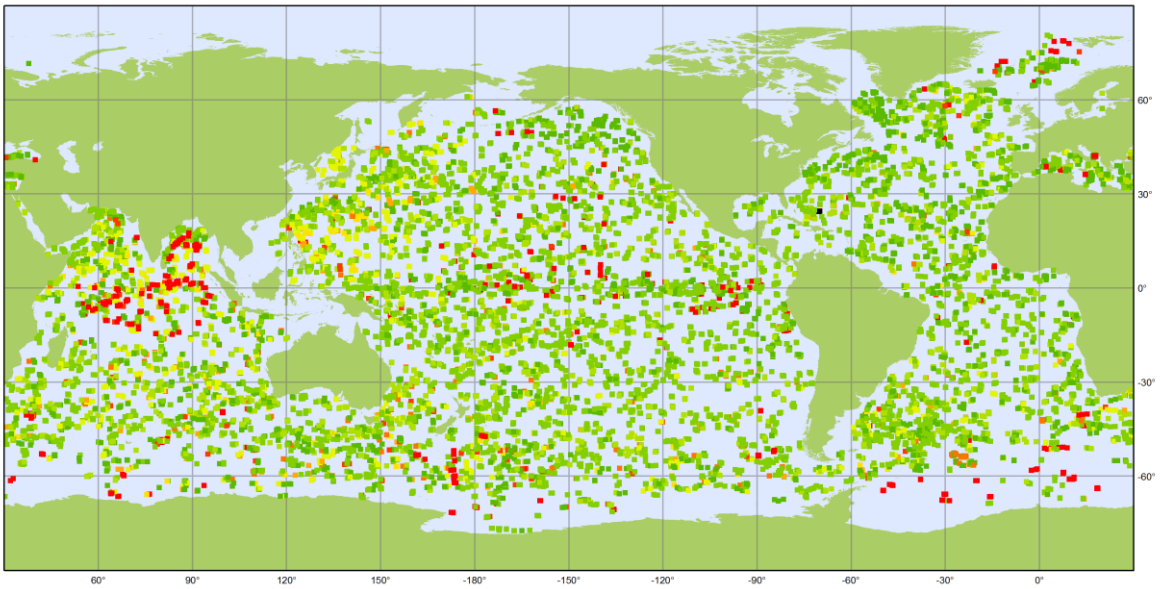


Argo **Monthly Observations, delays GDAC IFREMER** **August 2016**

distribution time - observations time (hours). μ=17.65 me=9.14

< 0 (2)	7 - 12 (5965)	25 - 48 (942)	73 - 96 (195)	121 - 240 (265)
1 - 6 (1831)	13 - 24 (3863)	49 - 72 (265)	97 - 120 (173)	241 - 1000000 (730)

Generated by www.jcommops.org, 01/09/2016



Argo **Monthly Observations, delays GDAC NRL-MRY** **August 2016**

distribution time - observations time (hours). μ=15.75 me=7.09

< 0 (3)	7 - 12 (6624)	25 - 48 (1157)	73 - 96 (194)	121 - 240 (154)
1 - 6 (2597)	13 - 24 (2347)	49 - 72 (290)	97 - 120 (166)	241 - 1000000 (712)

Generated by www.jcommops.org, 01/09/2016

Fig. 8,9: Maps of total delays at GDACs for August 2016, as calculated on September 1st.

IFREMER							
DAC	**AVG**	**MEDIAN**	**PERCENT**	**AVG_DAC**	**AVG_GDAC**	**MEDIAN_DAC**	**MEDIAN_GDAC**
BODC	14.8	11.9	95.0	12.5	2.3	9.6	2.2
CORIOLIS	26.0	5.9	91.0	25.2	0.9	5.8	0.6
CSIRO	21.8	9.9	76.0	18.1	3.7	6.0	3.1
INCOIS	85.4	26.0	39.0	72.9	12.5	24.9	1.0
ISDM	102.5	12.7	51.0	70.2	32.2	2.4	9.3
JMA	16.6	11.1	93.0	13.5	3.2	8.0	3.2
KMA	27.6	23.6	67.0	24.4	3.2	20.4	3.2
KORDI	25.7	25.2	14.0	31.6	- 5.9	31.1	- 5.9
NOAA/AOML	18.5	9.5	94.0	16.4	2.1	6.8	3.0
SOA/SIO-2	27.6	18.2	78.0	21.6	6.0	12.7	5.4
TOTAL	**23.8**	**9.3**	**89.0**	**20.7**	**3.1**	**6.8**	**3.0**

Table1: Delays observed at IFREMER GDAC

NRL-MRY							
DAC	**AVG**	**MEDIAN**	**PERCENT**	**AVG_DAC**	**AVG_GDAC**	**MEDIAN_DAC**	**MEDIAN_GDAC**
BODC	12.4	9.2	94.0	13.3	- 1.0	10.2	- 0.6
CORIOLIS	26.0	6.4	90.0	25.1	0.9	5.8	0.9
CSIRO	19.1	7.1	91.0	18.8	0.2	6.5	0.7
INCOIS	84.9	25.2	40.0	72.6	12.4	24.8	0.6
ISDM	74.7	7.5	56.0	70.3	4.5	2.4	4.5
JMA	14.0	8.5	93.0	13.5	0.6	8.0	0.4
KMA	36.0	27.9	-	24.4	11.6	20.4	7.3
KORDI	23.6	23.0	57.0	31.6	- 8.0	31.1	- 8.2
NOAA/AOML	15.4	7.0	95.0	17.6	- 2.1	9.1	0.3
SOA/SIO-2	44.3	35.2	3.0	21.6	22.7	12.7	22.4
TOTAL	**21.6**	**7.2**	**88.0**	**21.4**	**0.2**	**8.2**	**0.5**

Table2: Delays observed at NRL-MRY GDAC

- ⇨ Pb of dates for KORDI,BODC, AOML files (bad ftp file tagging at GDAC , update of observation date ?). to investigate further.
- ⇨ Delays have been very high for INCOIS and ISDM in August
- ⇨ GDAC adds 3h to the process
- ⇨ Large delays added by NRL-MRY for INCOIS, ISDM, KMA, SOA

Note that argo.jcommops.org provides views on delays, either on individual floats or on any group of float or observation. Section is however currently under review.

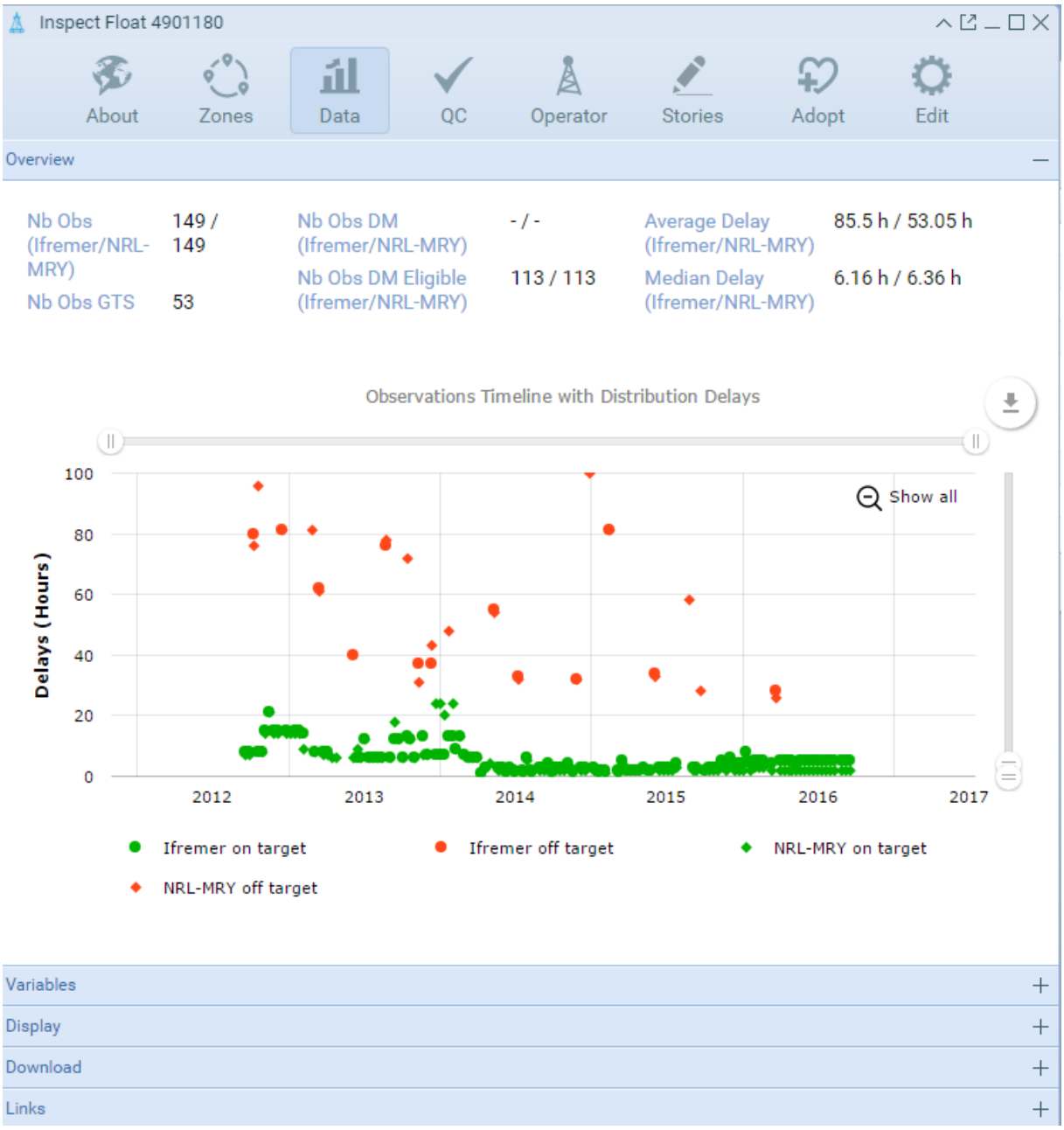


Fig. 10: Timeline of total delays for float 4901180 for both GDACs

Delayed-Mode

The ratio of data files processed in delayed mode, vs files eligible to this re-processing, keeps decreasing (68%). About half million profiles are waiting to be processed in delayed –mode.

PROGRAM	#OBS	#OBS DM_ELIGIBLE	#DM	%	TO DM
Argo eq. NAVOCEANO	71105	61991	514	1	61477
Argo PMEL	151911	132393	82671	62	49722
Argo WHOI	147642	133197	92818	70	40379
Argo UW	243796	223096	183062	82	40034
Argo JAMSTEC	115144	110502	77866	70	32636
Argo INDIA	51484	46224	27810	60	18414
Argo UK	50367	45908	27538	60	18370
Argo CANADA	43455	41308	25214	61	16094
Argo KIOST	16217	15814		-	15814
Argo eq. JMA	27442	23838	8560	36	15278
Argo CHINA	25924	23044	10100	44	12944
Coriolis	40051	32133	19680	61	12453
Argo AUSTRALIA	112544	99467	87415	88	12052
Argo eq. CHINA	13048	9757	132	1	9625
Argo eq. JAMSTEC	13727	12688	3994	31	8694
Coriolis-Good Hope	17243	15557	7080	46	8477
Argo eq. AOML	7433	7433		-	7433
Argo UW-MBARI eq.	9138	7707	955	12	6752
Argo SPAIN	7127	6631	691	10	5940
Coriolis-remOcean eq.	8386	5717		-	5717
Argo BSH	26866	22529	18424	82	4105
Argo NIMR/KMA	23033	22575	18857	84	3718
Coriolis-CONGAS	5228	5191	1706	33	3485
Argo UW-SPURS eq.	3914	3456		-	3456
Argo AWI	5247	4764	1628	34	3136
Argo UW-APL eq.	3592	3053		-	3053
Argo ITALY	10300	6670	3821	57	2849
NAOS-France	4247	2981	176	6	2805
Coriolis-BIOArgo	4476	3735	984	26	2751
Coriolis-PIRATA	5015	4241	1821	43	2420
Argo CHINA SOA	2462	2391		-	2391
Coriolis-FRONTALIS	2128	2128		-	2128
Argo eq. TU	1748	1748	167	10	1581
Argo IRELAND	2636	2302	920	40	1382
Argo eq. SAGE	5729	5729	4394	77	1335
DEKOSIM	1485	1286	105	8	1181
Argo eq. OIST	1263	1150		-	1150
Argo eq. FSU	1146	1146		-	1146

Argo IFM-GEOMAR	8647	8277	7195	87	1082
Argo eq. HNFRI	977	977		-	977
Argo eq. TNFRI	918	918		-	918
Argo FINLAND	1710	1315	456	35	859
Argo MAURITIUS	1726	1587	734	46	853
Coriolis-CANOA	824	824		-	824
Argo NORWAY	2820	2297	1503	65	794
BulArgo	922	785		-	785
Argo eq. ESP-OMZ	2439	2439	1727	71	712
Argo SIO	195464	174029	173401	100	628
Argo ARGENTINA	2576	2486	1903	77	583
Argo BRAZIL	2310	2238	1665	74	573
Coriolis-SPICE	561	561		-	561
Argo GOM-BOEM eq.	582	556		-	556
Coriolis-OVIDE	7063	6155	5611	91	544
Argo JMA	492	492		-	492
MEDARGO	3050	3050	2559	84	491
Argo GREECE	1116	587	101	17	486
Argo NETHERLANDS	8196	7768	7283	94	485
E-AIMS	941	467		-	467
Coriolis-PROSAT	1732	1732	1289	74	443
Argo eq. NDBC	433	433		-	433
Argo AUSTRALIA eq.	11423	9933	9504	96	429
Argo UK Bio	396	348		-	348
Argo UW-UA eq.	336	336		-	336
Coriolis-EGYPT	1477	1477	1141	77	336
Argo eq. NRIFS	308	308		-	308
EuroArgo	814	610	341	56	269
Argo MEXICO	674	582	319	55	263
Argo eq. UHH	3331	3328	3096	93	232
Argo GERMANY	4540	4528	4296	95	232
Argo RUSSIA	472	472	281	60	191
Gyroscope	7182	7182	6999	97	183
Argo BRAZIL Navy	637	182		-	182
Argo eq. AWI	2144	2144	1973	92	171
Coriolis-DRAKE	2741	2741	2576	94	165
Coriolis-TRACK	2004	2003	1842	92	161
Argo GABON	210	210	90	43	120
Argo ECUADOR	876	814	694	85	120
MERSEA	4194	4194	4083	97	111
Argo CHILE	372	372	268	72	104
Argo NEW ZEALAND	3776	3349	3253	97	96
Argo SOUTH AFRICA	297	261	170	65	91
Argo COSTA RICA	82	82		-	82
Argo SAUDI ARABIA	68	68		-	68

Argo eq. VOCALS	1313	1313	1252	95	61
Argo KENYA	708	672	623	93	49
Argo SIO eq (ASIRI)	849	633	591	93	42
Coriolis-FLOPS	2200	2163	2121	98	42
Argo SRI LANKA	77	77	41	53	36
Argo eq. IFM	3263	3263	3227	99	36
Argo eq. TSK	35	35	4	11	31
Argo eq. UM-OSU	26	26		-	26
Argo WHOI-MRV eq.	22	15		-	15
Argo WHOI eq. IR	2926	2926	2918	100	8
Argo eq. IFM2	1397	1397	1390	99	7
Coriolis-EGEE	3101	3101	3095	100	6
Coriolis-FLOSTRAL	2362	2362	2357	100	5
Argo UK eq.	2467	2467	2463	100	4
Argo LEBANON	53	53	52	98	1
Argo eq. PMEL	2086	2086	2085	100	1
Argo eq. UH	11854	11854	11854	100	0
Argo eq. POMME	3511	3511	3511	100	0
Argo eq. BSH	3295	3295	3295	100	0
Argo eq. ORI	728	728	728	100	0
Argo POLAND	419	206	206	100	0
Argo DENMARK	360	360	360	100	0
Argo eq. IRELAND	178	178	178	100	0
Meridian Goodhope	119	119	119	100	0
Argo eq. NIPR	28	28	28	100	0
Argo SIO eq. (OKMC)	5402	4914	5161	105	0
Argo UW-SOCCOM eq.	1633	543	759	140	0
Coriolis-FNOB-JCOMMOPS	489	201	2128	1 059	0
TOTAL	**1628453**	**1465503**	**1006002**	**68.6**	**461891**

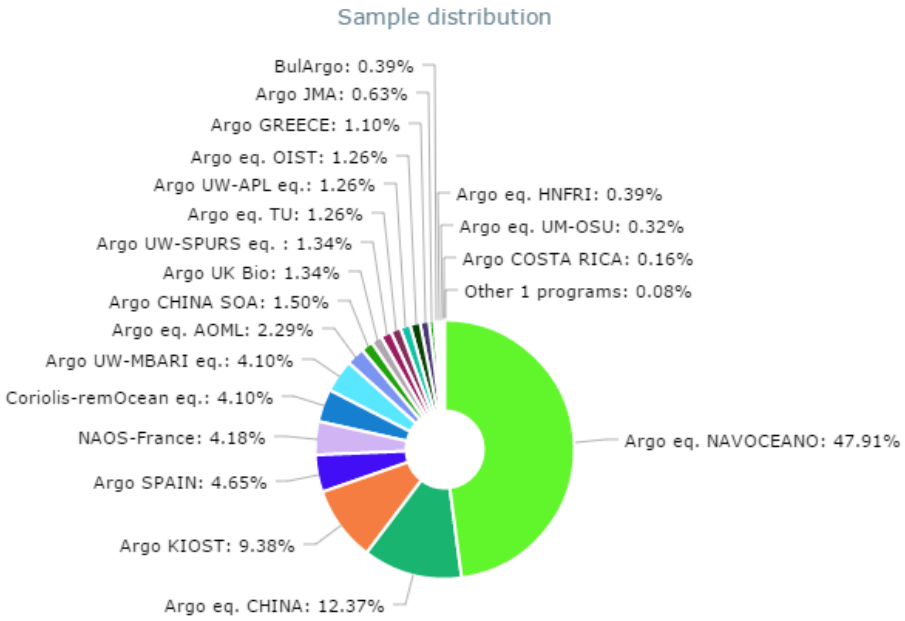
Table 3: DM processing status by Program, ordered by files remaining to be processed.

⇨ We can note first that 2/3 of the challenge has to do with regular Argo programmes, and 1/3 with equivalent contributions that we often call 'orphan floats'.

PROGRAM	**#OBS**	**#OBS DM_ELIGIBLE**	**#DM**	**%**
Argo eq. NAVOCEANO	71105	61991	514	1
Argo KIOST	16217	15814		-
Argo eq. CHINA	13048	9757	132	1
Argo UW-MBARI eq.	9138	7707	955	12
Coriolis-remOcean eq.	8386	5717		-
Argo eq. AOML	7433	7433		-
Argo SPAIN	7127	6631	691	10
NAOS-France	4247	2981	176	6

Argo UW-SPURS eq.	3914	3456		-
Argo UW-APL eq.	3592	3053		-
Argo CHINA SOA	2462	2391		-
Coriolis-FRONTALIS	2128	2128		-
Argo eq. TU	1748	1748	167	10
DEKOSIM	1485	1286	105	8
Argo eq. OIST	1263	1150		-
Argo eq. FSU	1146	1146		-
Argo GREECE	1116	587	101	17
Argo eq. HNFRI	977	977		-
E-AIMS	941	467		-
BulArgo	922	785		-
Argo eq. TNFRI	918	918		-
Coriolis-CANOA	824	824		-
Argo BRAZIL Navy	637	182		-
Argo GOM-BOEM eq.	582	556		-
Coriolis-SPICE	561	561		-
Argo JMA	492	492		-
Argo eq. NDBC	433	433		-
Argo UK Bio	396	348		-
Argo UW-UA eq.	336	336		-
Argo eq. NRIFS	308	308		-
Argo COSTA RICA	82	82		-
Argo SAUDI ARABIA	68	68		-
Argo eq. TSK	35	35	4	11
Argo eq. UM-OSU	26	26		-
Argo WHOI-MRV eq.	22	15		-

Table 4: DM processing status by Program, ordered by files remaining to be processed (ratio < 25%)



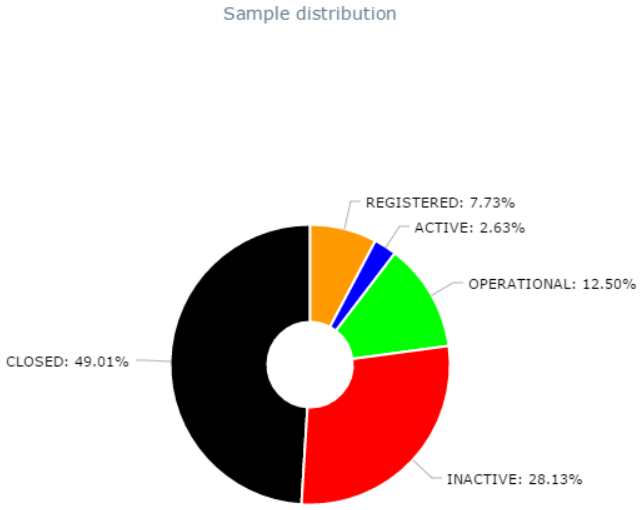


Fig 11, 12: Distribution of floats and Programmes with DM ratio < 25% and status of these floats

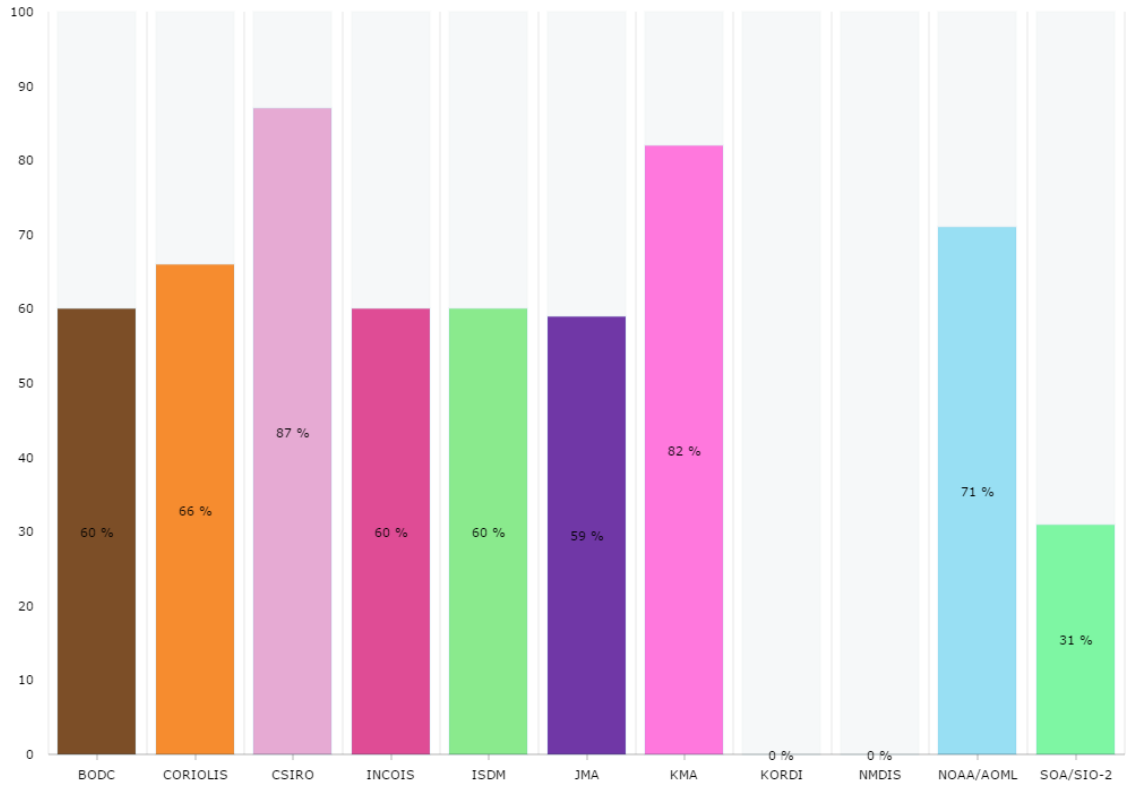


Fig 12: DM ratio by DAC

- ⇨ For the orphan floats, we may need to support US NAVY, KIOST, and CHINA (NMDIS).
- ⇨ Note that most of these floats are not active anymore so the work load will be for once.

Here are below additional information on these floats, to ease volunteers.

NMDIS :
20 Floats (Bay of Bengal, NW Pacific)
2535 obs,
2428 DM_Eligible
100% PROVORs

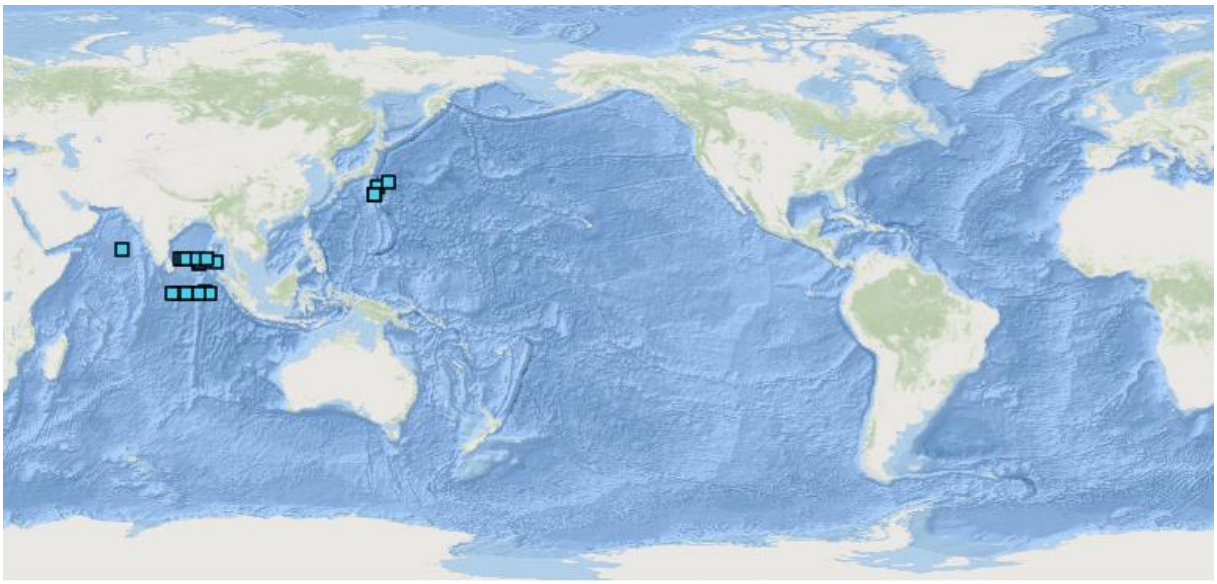


Fig 13: launch locations of NMDIS floats

KIOST (Sea of Japan, South Tasmania, Drake Passage)

117 floats
15736 obs
15370 dm eligible
22% PROVOR_MT, 78% APEX

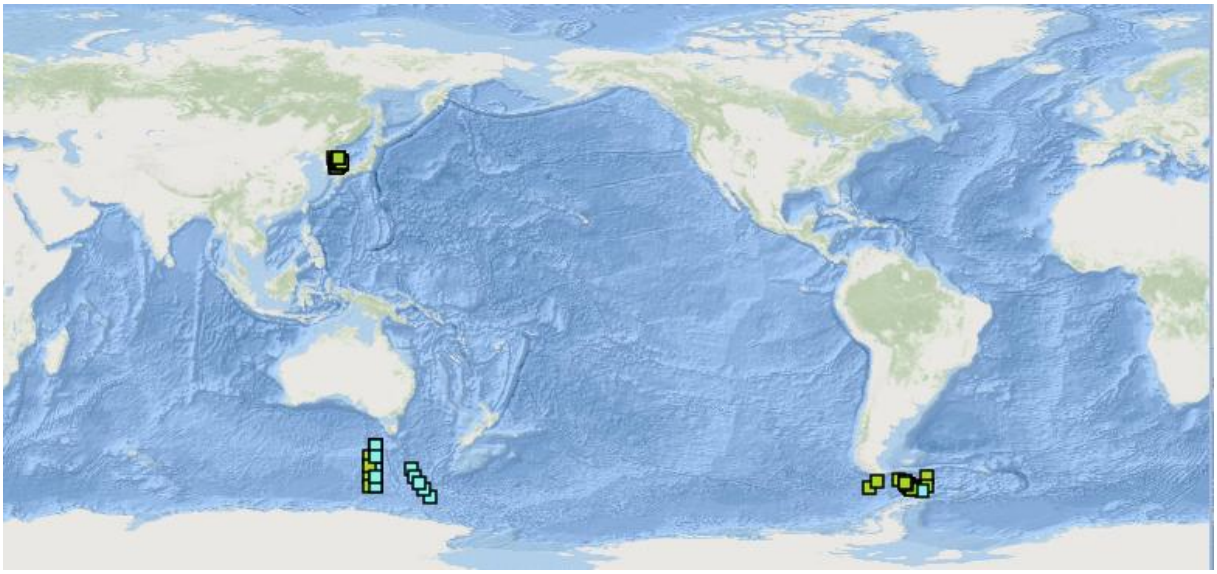


Fig 14: launch locations of KIOST floats

NAVO :

608 floats
71098 obs
514 dm
61990 dm_eligible
mainly APEX

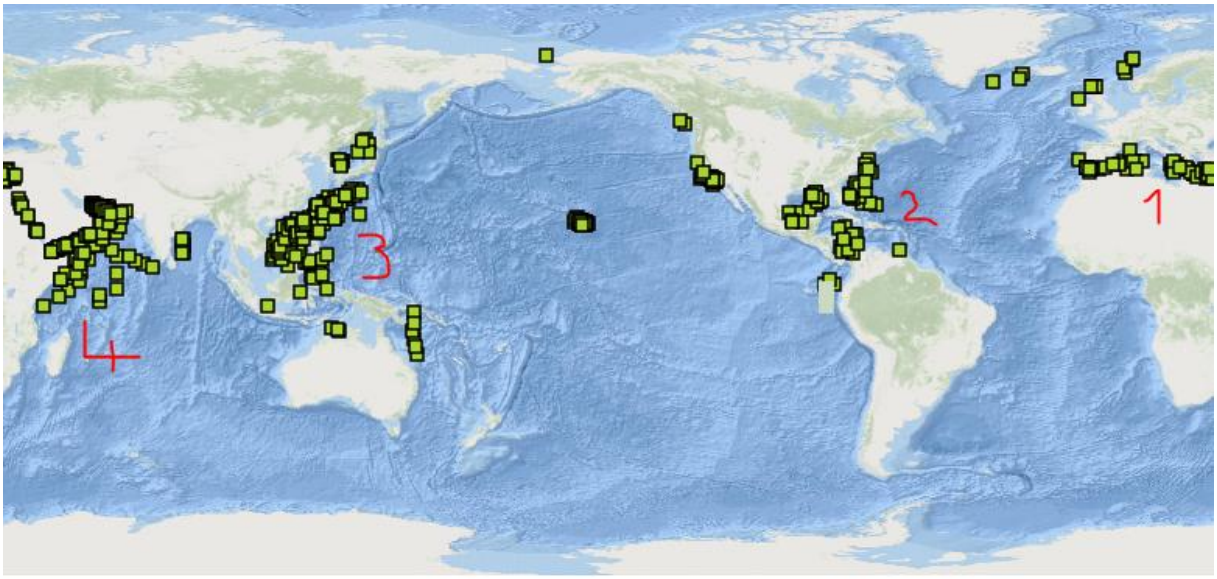


Fig 15: launch locations of NAVO floats

Region 1: Med Sea:
58 floats
6115 obs
316 dm
53914 dm_eligible

Region 2: Gulf of Mexico, Atlantic Ocean
59 floats
8530 obs
7115 dm_eligible

Region 3 :
203 floats
19714 obs
18945 dm_eligible

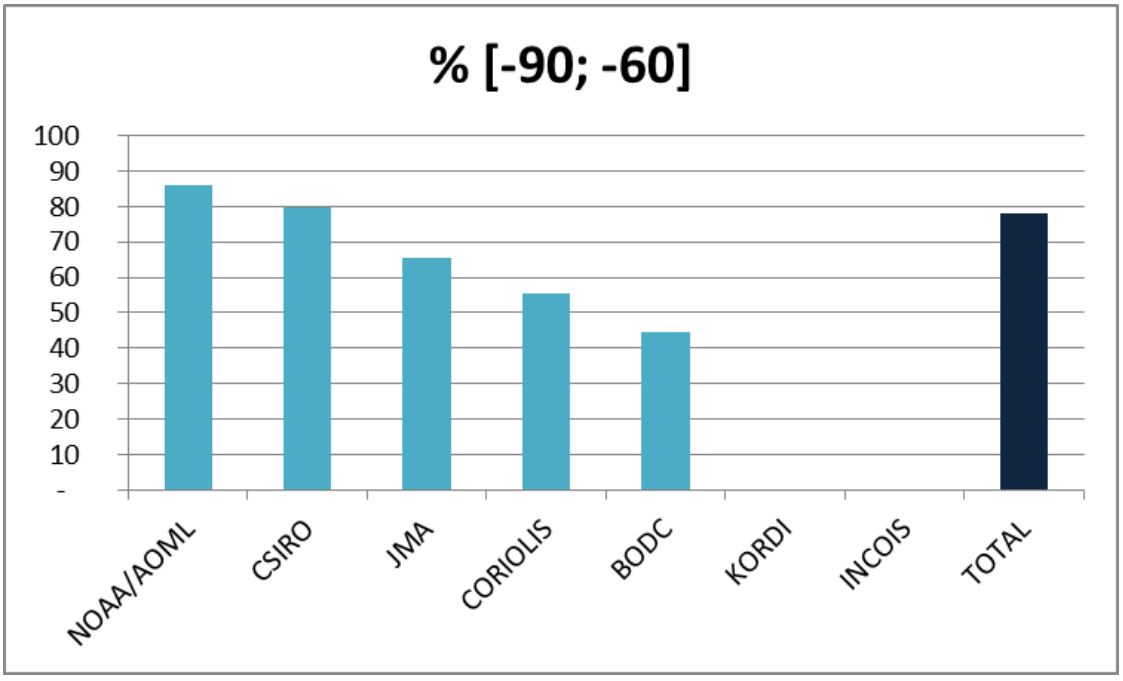
Region 4:
199 floats
23103 obs
198 dm

- ⇨ Improve stats for monitoring on jcommops.org
- ⇨ Create workspace for DM operator
- ⇨ What functionalities would be useful? A permanent to do list by DM Operator? Other tools ?

DM Processing in the Southern Ocean

A special study was made under Argo Australia request, to monitor the status of DM processing in two zones of the southern ocean, [-90;-60] and [-60;-30].

We basically need some support for KIOST floats (that recalled regularly having no expertise on DMQC in SO).



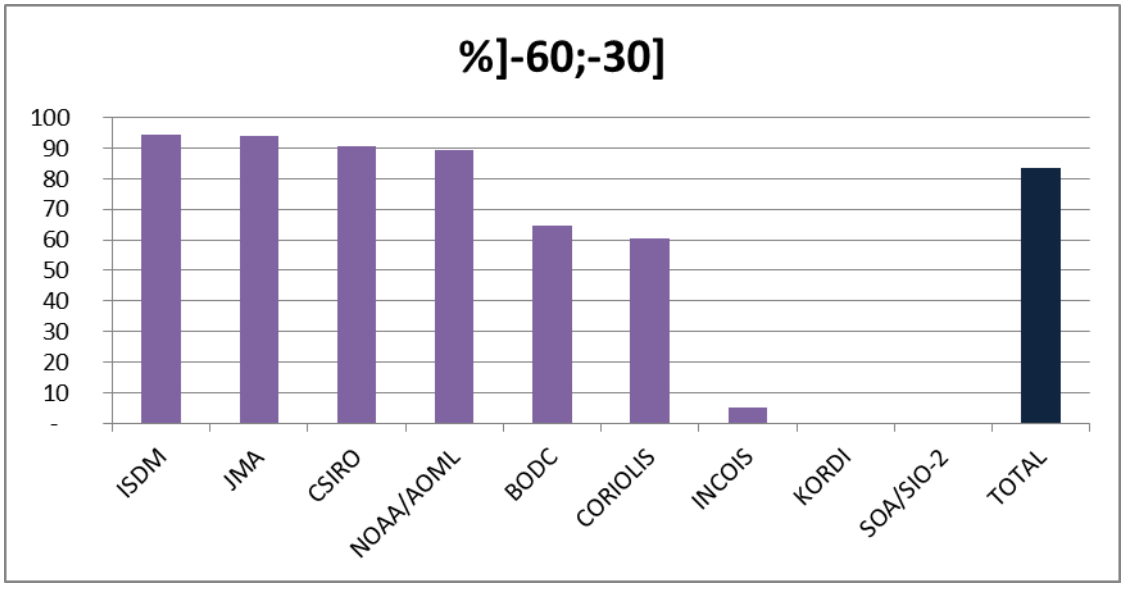


Fig 16, 17: DM processing Status in Southern Ocean, by DAC

DM Operators List

The following table provides the latest update on DM Operators.
This list is certainly not error free nor nominates anyone for additional task.
Please feedback.

PROGRAM	DM OPERATOR
Argo ARGENTINA	probbins@whoi.edu
Argo AUSTRALIA	esmee.vanwijk@csiro.au
Argo AUSTRALIA eq.	esmee.vanwijk@csiro.au
Argo AWI	gerd.rohardt@awi.de
Argo BRAZIL	probbins@whoi.edu
Argo BRAZIL Navy	
Argo BSH	birgit.klein@bsh.de
Argo CANADA	ouelletm@dfo-mpo.gc.ca
Argo CHILE	ouelletm@dfo-mpo.gc.ca
Argo CHINA	liuzenghong@139.com
Argo CHINA SOA	
Argo COSTA RICA	christine.coatanoan@ifremer.fr
Argo DENMARK	birgit.klein@bsh.de
Argo ECUADOR	awong@ocean.washington.edu
Argo eq. AOML	
Argo eq. AWI	birgit.klein@bsh.de
Argo eq. BSH	birgit.klein@bsh.de
Argo eq. CHINA	christine.coatanoan@ifremer.fr
Argo eq. ESP-OMZ	oulloa@profc.udec.cl
Argo eq. FERHRI	
Argo eq. FSU	
Argo eq. HNFRI	argo-dp@jamstec.go.jp
Argo eq. IFM	birgit.klein@bsh.de
Argo eq. IFM2	birgit.klein@bsh.de
Argo eq. IRELAND	juck@bodc.ac.uk
Argo eq. JAMSTEC	argo-dp@jamstec.go.jp
Argo eq. JMA	argo-dp@jamstec.go.jp
Argo eq. NAVOCEANO	ppoulain@inogs.it
Argo eq. NDBC	
Argo eq. NIPR	argo-dp@jamstec.go.jp

Argo eq. NRIFS	argo-dp@jamstec.go.jp
Argo eq. OIST	argo-dp@jamstec.go.jp
Argo eq. ORI	argo-dp@jamstec.go.jp
Argo eq. PMEL	gregory.c.johnson@noaa.gov
Argo eq. PMEL	kristene.e.mctaggart@noaa.gov
Argo eq. POMME	vthierry@ifremer.fr
Argo eq. SAGE	argo-dp@jamstec.go.jp
Argo eq. TNFRI	argo-dp@jamstec.go.jp
Argo eq. TSK	argo-dp@jamstec.go.jp
Argo eq. TU	argo-dp@jamstec.go.jp
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Argo eq. UHH	katrin.latarius@awi.de
Argo eq. UM-OSU	
Argo eq. VOCALS	probbins@whoi.edu
Argo FINLAND	
Argo GABON	probbins@whoi.edu
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Argo IFM-GEOMAR	birgit.klein@bsh.de
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Argo RUSSIA	ouelletm@dfo-mpo.gc.ca
Argo RUSSIA	denis.gilbert@dfo-mpo.gc.ca
Argo SAUDI ARABIA	juck@bodc.ac.uk

Argo SIO	jgilson@ucsd.edu
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Argo SIO eq. (OKMC)	jgilson@ucsd.edu
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Argo UW eq.	awong@ocean.washington.edu
Argo UW-APL eq.	
Argo UW-MBARI eq.	
Argo UW-SOCCOM eq.	
Argo UW-SPURS eq.	awong@ocean.washington.edu
Argo UW-UA eq.	awong@ocean.washington.edu
Argo WHOI	probbins@whoi.edu
Argo WHOI eq. IR	probbins@whoi.edu
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Argo WHOI-MRV eq.	probbins@whoi.edu
BioArgo UMaine	
BulArgo	
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Coriolis-EGYPT	isabelle.taupier.letage@ifremer.fr
Coriolis-FLOPS	eldin@ird.fr
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Coriolis-Good Hope	speich@univ-brest.fr
Coriolis-OVIDE	vthierry@ifremer.fr
Coriolis-PIRATA	bernard.bourles@ird.fr
Coriolis-PROSAT	christine.coatanoan@ifremer.fr
Coriolis-remOcean eq.	christine.coatanoan@ifremer.fr
Coriolis-SPICE	christophe.maes@noumea.ird.nc
Coriolis-TRACK	christine.coatanoan@ifremer.fr
DEKOSIM	
E-AIMS	birgit.klein@bsh.de, christine.coatanoan@ifremer.fr, ppoulain@inogs.it,

	juck@bodc.ac.uk
EuroArgo	birgit.klein@bsh.de, christine.coatanoan@ifremer.fr, ppoulain@inogs.it, juck@bodc.ac.uk
Gyroscope	vthierry@ifremer.fr
MEDARGO	ppoulain@inogs.it
Meridian Goodhope	speich@univ-brest.fr
MERSEA	gerd.rohardt@awi.de
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MOCCA-NETH	birgit.klein@bsh.de
MOCCA-POL	birgit.klein@bsh.de
NAOS-Canada	
NAOS-France	gnotarstefano@ogs.trieste.it

Remark:
Some DM operator download data files and may do the processing a while after.
If the real-time file have changed or were deleted … they will come back through the dm processing.
A checkpoint needs to be set up, comparing RT and DM file number e.g.