10th ARGO DATA MANAGEMENT MEETING

Toulouse
September 30th - October 2nd 2009

Version 1.1
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1. Objectives of the meeting

The 10th ADMT meeting was hosted by CLS, Toulouse, France. The meeting was opened by Dr P. Escudier, the Head of Oceanography division in CLS company. He presented the CLS company and its involvement in environment monitoring. CLS employs 245 people located mainly in Toulouse but also in Brest. CLS is collaborating with Argo especially with Argos data transmission, real-time float processing, cross-calibration with Altimetry and support to Jcommops.

The ADMT was organized the same week as a Delayed Mode QC workshop and an ARC meeting to foster communication between these three communities. 51 persons from 10 countries and 29 institutes attended.

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

- Review the actions decided at the 9 th ADMT meeting to improve Real-Time data flow (considering all aspects of the system from transmission from the float to arrival at GDAC and accessibility of data by users)
- Review the status of surface Pressure correction
- Review status of Delayed-Mode quality control and Progress to reduce backlog
- Review the metrics regarding Argo program to document future (and if possible past) growth and performance of the array and the data system
- Feedback from the Regional Argo Data Centre meeting

2. Feedback from 10th AST meeting (Dean Roemmich)

D. Roemmich reminded the ADMT that Argo is presently undertaking a decadal review of its status and plans in conjunction with other elements of the Global Ocean Observing System. A report of progress on this review was provided by the AST at the OceanObs'09 Conference (Freeland et al., 2009, OceanObs09 Community White Paper). In looking toward the future, Argo will evolve along two major pathways.

First, a consolidation of the core Argo program is aimed improving float technology, float coverage within the original 60°S to 60°N ocean interior domain, and data quality and completeness. Floats are evolving toward smaller, more efficient, and more capable models with longer lifetime. Spatial coverage is still incomplete in the some regions, particularly in the southern hemisphere, where deployment opportunities are limiting. With respect to data completeness and quality, Roemmich said that the recent "pressure sensor microleak" problem underlines the strong need to have technical expertise and proactive detection of problems among all Argo teams. Complete and accurate technical and metadata files are essential for addressing this and other problems Argo will encounter in the future.

The second pathway for Argo's evolution is an expansion of the spatial domain toward truly global ocean sampling and increased multidisciplinary breadth of user applications. These expansions will include sampling in the high latitude oceans through the seasonal ice zones, into more marginal seas, into the deep ocean below 2000 m, and upward through the surface layer. Increased communications bandwidth will enable transmission of high vertical resolution profiles needed for estimates of ocean mixing. New sensors for biogeochemical investigations will greatly increase Argo's value, and are already beginning to appear on Argo floats. Each of these enhancements is discussed in one or more OceanObs09 plenary presentations, community white papers, and additional contributions. Roemmich emphasized that, while these expansions of Argo can increase and broaden its value, it is essential that they be implemented with new resources.

Even if there will not be clear requirement after OceanObs'09 to include Glider data in Argo, there is a feeling that there should be collaboration set up as these data are used similarly both in operational and research activities .

3. Status of Argo Program and link with Users

3.1. Review of the Action from last ADMT

Sylvie Pouliquen reviewed the action list from last ADMT (30 actions done; 22 started; 3 not started.) and pointed out that most of the actions were once again finalized during summer while the deadlines were much earlier. Nonetheless a lot of the actions have been either completed or started. See the annex 3 for detailed status.

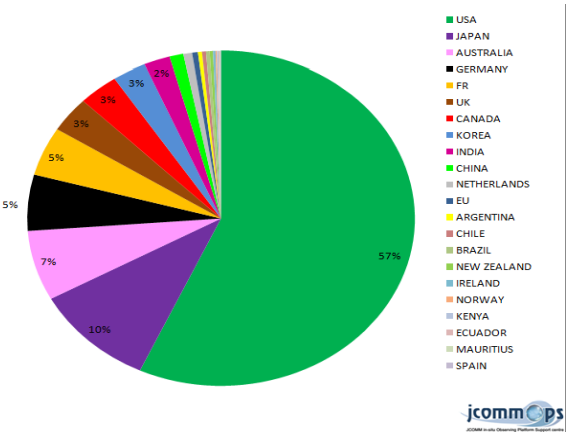
While the real-time process is working well and routine operations are steady, DAC and GDACs have difficulties with new developments as well as reprocessing activities. It's a matter of resources when the changes require human validation. It's much easier when changes can be automated (Name changes, etc easy. More fundamental changes are much more difficult.)

S. Pouliquen presented the new Argo Data Management Web Site (http://www.argodatamgt.org) . The site that was initially embedded into the Coriolis one, exists presently on its own and can incorporate any information that way be useful to inform and guide the users to use properly the Argo dataset. The site presently contains the information that was previously on Coriolis, soon a subsetting/viewing and downloading facility on Argo dataset will be made available derived from Coriolis tools. There is already plan to add a Delayed mode branch for DM operators. If there are things that ADMT or AST would like to see added, they should contact Sylvie. There were recommendations to add a tool sections as well as the Argo Disclaimer on how to use data on this site.

For the ADMT to be an effective organization and for the good the entire Argo program, **the entire ADMT must be more responsive to the action list in the future!** In that spirit, Megan Scanderbeg will continue to assist the co-chairs with action item tracking and "motivating" the responsible parties as target dates are approached.

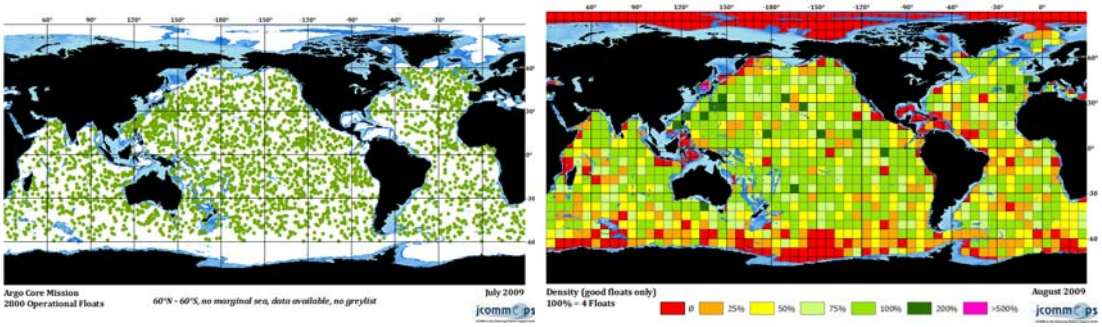
3.2. Argo Status and AIC development (M Belbéoch)

M. Belbeoch, the Argo Technical Coordinator, presented a brief status on the Argo programme.



Regarding national contributions, he reminded the ADMT that funding for main Argo program was critical to sustain the array and that cooperation with new partners will be important to fill regional gaps and increase international support to Argo.

He then proposed to change the communication strategy on the array status to highlight the fact that Argo was not yet completed (500 floats missing to achieve the 3200 floats Argo core mission target, 60N/60S, no marginal seas, see picture below). Increasing the target to 4000 floats for an extended Argo array could be also a solution.



He reminded the panel that any float deployment must be registered at the AIC before data distribution and encouraged float operators to continue their efforts in that regard. In particular this planning information is used to score the deployment plans, to encourage operators to meet Argo requirements concerning coverage and help manufacturers to prioritize the delivery of floats to customers. There was some questions about the fairness of this rating method and AST co-chair, D. Roemmich, reminded the ADMT that the method was discussed and agreed within the AST and will be only one element amongst others to help decision. There is the need to also take into account the priority on southern ocean, the fact that float spread rapidly in some areas, cruises deadlines, the possibility to revisit the area next year … . He mentioned by the way that the TC did a good job in inventing and developing quickly such a tool.

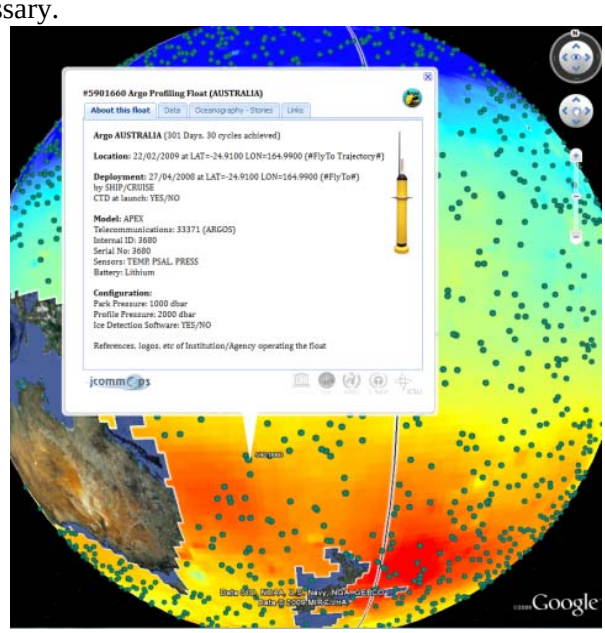
Regarding the growing activity on Argo ancillary arrays (such a ArgO2, Bio Argo, etc), TC recalled that transparency was the number one requirement and that some restrictions will be made soon on the use of the Argo label by manufacturers. Argo needs to preserve its core mission (T/S) and avoid issues that could arise on the use of sensitive sensors. This would not impact data centres that are invited to keep on sharing as much data as possible.

He then presented a set of metrics about Argo status and data management status. He thanked Coriolis for the development of a new detailed index file that will be crucial to monitor delays in data distribution next year. In particular 72% of the eligible floats have been processed in delayed mode. S Pouliquen pointed out that it would be good to monitor not only the amount of delayed mode profiles, but also the amount of delayed mode profiles reprocessed as this may represent an important activity this year.

He provided an update on JCOMMOPS activities, that allow now coordination for Argo, DBCP, SOT and OceanSITES. JCOMMOPS has gained a new I.T. staff and is working with CCHDO, POGO, IOCCP and other partners to fund a "ship coordinator" position within JCOMMOPS that would permit to monitor closely the 150 research vessels operating each year and hence (to be discussed):

- Identify CTD cruises and data essential to Argo data quality control.
- Facilitate maintenance and operations of global arrays through logistics coordination when required.
- Further develop cooperation between programs (e.g. shared cruises, ship time).
- Further develop Float/buoy/XBTs donor programs and identify new regional deployment opportunities.
- Arrange retrieval of beached instruments when necessary.

He reminded Argo data users to provide feedback through the AIC support centre and to data producers to use the on-line information and AIC monthly reports.
He mentioned the future development to be done on the JCOMMOPS information system insisting in particular on the new Google Earth monitoring tool developed to promote all Argo regional/national initiatives, tell stories on floats and oceans, give access to all on-line diagnostic/data tools for floats, provide ocean state data layer (T/S/Anomalies) viewed by Argo, and promote Argo as the pillar of the ocean climate warning system.



Scripps, Euro-Argo, JAMSTEC are actively participating in this initiative. Beta version will be on-line by the end of October for comments.

4. Real Time Data Management

4.1. GTS status (Ann Tran and Mark Ignaszewski)

MEDS receives Argo data via GTS from the following bulletin headers: AMMC (Australia), CWOW (Canada), EGRR Exeter), KWBC & KARS (Washington & Landover), LFPW (Toulouse), RJTD (Japan), RKSL (Seoul). On average, 91% of Argo data reach the GTS within 24 hours of the float's arrival at the surface. Each month we receive about 9000 Argo messages. There are a small amount of duplicate and partial Argo messages on the GTS.

MEDS receives Argo BUFR messages on the GTS from Japan and BUFR messages sent by MEDS themselves. However, the volume of BUFR data is much lower than that of TESAC messages. We are investigating the missing BUFR messages with Japan. Other data centers are either working on their encoding BUFR software or making arrangements with their meteorological office to transmit BUFR messages on the GTS.

Then the different DAC indicated the status of their developments to generate Argo data in BUFR format:

- Australia: CSIRO is generating them but the Bureau can't send them
- UK: Can generate BUFR but not possible yet to send them
- France: Both CLS and Coriolis can produce but stopped at Meteo-France
- USA: AOML can generate but not CLS yet
- Korea: under validation BUFR
- China: India is done through CLS
- NAVO: BUFR ready to go will distribute through Silver Spring

The contents of the GTS data were compared to the data on the GDAC, as is done every year prior to the ADMT. This year's results were excellent. Three DACs still showed some offsets in the observation times. Mark Ignaszewski will provide detailed feedback to INCOIS and KMA regarding the exact nature of the detected errors. JMA is awaiting the results of action item #24 and will then correct the discrepancies. (See the discussion on a "Common Method for Determining the Positions and Times" below.)

4.2. Status of anomalies at GDAC

Anomalies on Argo profiles are detected by objective analysis at Coriolis. Spike, drift, high pressure value not detected by the deepest pressure test, bad measurements due to doubtful sensors, negative pressure are still observed in the submitted files from the DACs. Some of the profiles are corrected without getting feedback from GDAC, certainly due to a new submission to replace uncompleted previous profile. Some of all the detected anomalies are due to automatic tests that are not sufficient to detect bad data. The need to add test on negative pressure with a threshold seems to be adopted.
Actions have been done to automate feedbacks (in text files, by email) to DAC:

- for incorrect grey-list (problems in metadata files, erroneous date, etc)
- in order to update the flags. A daily email which contains the list of Argo profiles highlighted by objective analysis, and corrected by a Coriolis operator, is sent to DAC for which theirs profiles are in the list. The information is also available in a csv format file on a ftp site: ftp://ftp.ifremer.fr/ifremer/argo/etc/ObjectiveAnalysisWarning

Some anomalies are due to negative pressure. There is no pressure range test and therefore floats with negative pressure can be submitted. Agreement on adding a pressure range test greater than -5.

4.3. Status of anomalies detected with Altimetry

Global results as of August 2008 are presented. 111 floats have been extracted, among those 101 are RT data and 10 are DT data. Feedbacks have been provided by a large number of groups (UW, PMEL, SOI, WHOI, Coriolis, Germany, JMA, INCOIS, KMA and MEDS) for a total of 48 floats. Altimeter results have been confirmed for 36 floats, 7 floats need further analysis and 5 floats have good data

and should be removed from the list. 63 floats still need to be checked. They will be classified in different categories in order to prioritized the checks (active ones first, then dead ones, …).
Global results are updated every 3 to 4 months and distributed at the following address: ftp://ftp.ifremer.fr/ifremer/argo/etc/argo-ast9-item13-AltimeterComparison and on the AIC reports.

It was pointed out that a significant number of anomalies are on WHOI floats and that's it's important to get more feedback from WHOI in particular in real-time.

4.4. Grey List

Initially we set up the grey list to prevent sending bad or suspicious data on GTS from floats having an offset or drifting floats. With time GDAC users have started to use it more and more without knowing exactly what it was meant for and how it was completed. There is therefore a need to provide recommendation in QC manual on why a PI or a DM operator decides to put a float on the grey list. We agreed on the following description: when the drift in DM is too big to be corrected on the fly or when he thinks that the sensor is no more working properly, then the DM operator decides to put the float on the grey list.
There is also a need to explain to users how to use the grey list and this will be done in the User manual stating that it only concerns R-Files. It was agreed that when a float is dead and has been processed in delayed mode it should not appear in the grey list. When a float is active and have been partially corrected in DM, it should remain in the grey list only if the correction can't be applied on the fly because to important.
Presently the grey list is the only way to know the failure of one sensor and this information is lost when the file has been processed in delayed mode as the adjusted data have been set up at flag 4. The reason for the flag 4 should be indicated in D-Files. There is an action to be worked on to provide the information about sensor anomalies on a float in a way that is easily accessible without opening all the D-Files. A suggestion was to use the anomaly filed in the META-files when a float is dead.

4.5. Jump real time Test

At last ADMT meeting it was proposed a new definition for the Jump RT test. There was not much information to report on this item. Ann reported that CSIRO had coded up the newly defined test and tested it on the CSIRO data. It did not detect any errors but she suggested that perhaps their floats are not subject to this problem. BODC (Justin Buck) agreed to test the new procedure on his data and report back in time for AST11.

4.6. Common method for determining position and time and attribute the appropriate QC

A new method of calculation for JULD_TRANSMISSION_START for APEX floats has been suggested by Michel Ollitrault and Jean-Philippe Rannou. This new preferred method requires only the raw data to calculate the variables. The full calculation can be found in the document circulated earlier and attached in Annex 5.

If there are insufficient copies of the “technical message” (message #1), then the Webb recommended calculation can be used but it can be less reliable because it requires knowledge of the length of the block (number of M messages to be transmitted) AND the repetition rate of the Argos emitter of the float (from either the metadata file or from the raw data directly).

PROVOR floats transmit these values directly and calculations are not needed.
Solo floats do not send enough data to do these calculations and so values must be filled in delayed mode.

JULD_ASCENT_END for Webb floats must include the 10 minutes the float spends on the surface before transmissions begin. So, JULD_ASCENT_END = JULD_TRANSMISSION_START – 10 minutes.
Other manufacturers have different delays or no delay and should use the appropriate number.

If no copy of message #1 is received, then the JULD_ASCENT_END and JULD_TRANSMISSION_START values must be filled as missing and will be fixed in delayed mode

Birgit showed that there could be large errors associated with using later locations for the float. Waiting until you have the best quality Argos position has a cost in accuracy. Therefore, the location in the profile file should be the first location reported with an Argos location class greater than 0; and the JULD_LOCATION = JULD of the location chosen.

JULD_Ascent_End should be used for JULD unless it can't be calculated. In that case, it should be the time of the first received message, regardless of whether it had a location attached. Time on GTS should be the JULD.

RAFOS floats are still a problem and will require interpolation of their profile positions in real-time while the RAFOS positions are calculated. This is a complex process and can take time so to allow immediate use of the data, an interpolated position is acceptable. We also need to add RAFOS to the positioning system fields of the data files. Because floats may use RAFOS positioning for one cycle and Argos positioning for another, we need to be able to note which system was used with which cycle. It is possible that this could be done using the technical file variables.

4.7. Using or not CRC for decoding

Virginie Thierry raised the issue of how the CRC (Cyclic Redundancy Check) is used during decoding by the different DACs. During the discussion it was noted that the CRC is not good enough on its own to detect transmission errors; that is, more than one copy of a message may pass the CRC check when there are differences between the messages.

It was further stated that rejecting all messages that fail the CRC check could significantly reduce the amount of data that gets distributed in near real-time (1.5% of the APEX profiles have at least one message (that is 5 CTD measurements) that failed the CRC check).

After lively discussion, the following recommendation was adopted:

- If only one copy of a message with a good CRC is received, use it.
- If there are multiple messages with a good CRC, select the “most redundant” message.
- If there is only one copy of a message received and it has a bad CRC, use it anyway.
- If multiple messages are received, all with bad CRCs, select the “most redundant” message.

When the “technical message” (message #1) is corrupt, the DACs handle the situation differently. The following list is not complete but serves to display the differences:

- CSIRO, Coriolis: The message (and the cycle) are lost.
- MEDS: Manual correction is performed.
- AOML: Does its best to determine the correct values and continues decoding.

This situation is acceptable with the ADMT.

5. Pressure correction

5.1. Status on Tech Files updates (Actions 45-46) (A Gronell)

Ann presented the status of Technical File conventions that should be applied by all DACs and allows a better use of the information available in technical files. It was agreed that a discussion via email about naming for the newly required PRES_SurfaceOffset variables was needed because non-Apex floats handle surface pressure in different ways that are not captured by the currently approved names.

The only issue noted preventing TECH file generation was manpower, though some DACs are still working on their technical names for new variables. We hope to work through this in the next few weeks. It was highlighted that:

- CTD measured data doesn't belong in the technical files – it is parameter data that belongs either in the profile or trajectory files.
- If you propose new names, please make sure the variable doesn't already exist, use the naming convention and PROVIDE A DEFINITION that makes sense.
- APEX test message data (transmitted before the first dive) belongs in cycle #0 of TECH files.

The question was raised of implementing a file checker for TECH file. It was agreed that a check according to last version of the file on the ADMT www site was necessary to prevent new bad TECH files to enter GDAC as otherwise all this harmonization would have been done for nothing.

5.2. Status on Pressure correction on Apex Floats in RT and DM

Correcting in realtime and in delayed mode the pressure on Apex floats was done with Real-time DACs and Delayed Mode Operators. The status of this operation and of TECH files updates are summarized in the following tables. These tables will be made available in ADMT www site to inform the users.

APEX group (in alphabetical order)	Updated tech files	Implemented RT PRES CORRECTION
AOML - USA	End November 09	End 2009
BODC - UK	Yes	Yes
CLS (including China, Kordi) On GTS	No	End October
CHINA	???	????
CORIOLIS	Yes but additional validation needed end November	End 2009
CSIRO - AUSTRALIA	Yes	Yes
INCOIS - INDIA	Yes	yes
JMA – JAPAN	Yes	yes
KOREA	End November 09	End December 09
MEDS - CANADA	Yes	Yes

Table 1 Real-time progress from each APEX group on pressure correction as of 30th September 2009

APEX group (in alphabetical order)	Implemented DM PRES CORR for new D-files	Re-processed old D-files with DM PRES CORR	Expected date of completion
AOML/PMEL - US	YES	YES	N/A
AOML/UW - US	YES	YES	N/A
BODC - UK	YES	NO	December 2009
CHINA	NO	NO	2010?
CORIOLIS	In progress	NO	March 2010
GERMANY	NO	NO	March 2010
CSIRO - AUSTRALIA	YES	60%	December 2009
INCOIS - INDIA	NO	NO	February 2010
JAMSTEC - JAPAN	YES	YES	N/A
KOREA	NO	NO	2010?
MEDS - CANADA	NO	NO	January 2010

Table 2 Delayed-mode progress from each APEX group on pressure correction as of 28th September 2009

6. Trajectory from Argo data

King reviewed the background and recent activities in analyzing trajectory files. At the time of ADMT-9 there remained significant inconsistencies and errors in the way DACs decoded raw Argos messages to make trajectory files. After an initial study and fresh decoding of PROVOR and APEX raw messages at Coriolis, J-P Rannou and M Ollitrault have embarked on a process of decoding all raw messages for the global fleet to create clean trajectory information. Their order of working will include the DACs with the greatest number of floats, thus after Coriolis (completed) they started to work through AOML and will continue with JMA.

Problems corrected include erroneous or incomplete timing data, and erroneous park pressure in META files, corrected by examining the drift pressures reported by the floats. Information about errors fed back to DACs (Coriolis and AOML so far) has led to significant improvements in the quality of META and TRAJ files at GDAC.

Products The YoMaHa product continues to be updated. This product will continue to benefit from improvements in GDAC files resulting from Rannou and Ollitrault's work. YoMaHa remains a useful global product that assembles the entire global fleet of displacement data. But it is still liable to include erroneous data, for example incorrect park pressures in META files. As their clean-up progresses, Rannou and Ollitrault are producing a similar product called ANDRO, which includes only data that they have reworked. Thus ANDRO should be cleaner than YoMaHa, but it does not yet contain all Argo data.

Surface extrapolation Following the availability of clean trajectory information, Rannou and Ollitrault are developing procedures for the surface extrapolation to ASCENT_END and DESCENT_START positions and times. Ollitrault presented examples of cases where the procedures apparently work well and cases where they clearly do not. Further refinement of extrapolation algorithms is need in order to have a procedure that can be applied with confidence to the global fleet,

as well as having the global fleet of TRA files cleaned. Rannou and Ollitrault will continue to work on this.

Format checking There is a long-standing action to prepare a format checker for TRAJ files. No progress has been made because those involved (King and others) have not felt able to define a series of format checks that could be applied uniformly to all floats. For example some timing information for SOLOs may only be available in delayed mode, so it is not appropriate for SOLOs to define tests on these times that must be satisfied by the TRAJ files built in RT. Rannou and Ollitrault have made considerable progress in understanding the requirements and defects of files built by DACs, but their present priority is to continue cleaning files rather than assist with developing a format checker. Carval made the sensible suggestion that in order to start the process, some simple checks should be defined, which could be added to later.

7. GDAC status:

7.1. GDACs upgrades

The developments at the two GDACs were described:

- The French GDAC is generating a "detailed index" file in the "etc/" directory. This index has grown in scope over time and currently includes:
  - File, date, position, profiler type, institution, update date, profile temperature QC, profile salinity QC, profile doxy QC, psal adjusted mean, psal adjusted std deviation, GDAC date creation, GDAC data update

  The last two items were added in the past year to allow monitoring of the file delivery delays to the GDACs. There was a suggestion that the GDACs should move to a single index. This will be studied. (Currently, the US GDAC only produces the original format index file.)

- The Coriolis GDAC has automated the file removal process as decided upon at the last ADMT. The US GDAC will implement the automated file removal by the end of October 2009. The full process will be documented in the Users Manual.

- The Coriolis has implemented the MD5 file signatures. The US GDAC will add the feature by the end of October 2009 and complete documentation by the end of 2009.

- The US GDAC has implemented the "new" latest_data file processing as decided upon at the last ADMT. The Coriolis GDAC is in the process of implementing the new scheme. This action will be completed and documented by AST 10.

- The near-real-time process at Coriolis that detects anomalies through an objective analysis is now performed daily. The results are stored in the etc/ObjectiveAnalysisWarning directory for review by the DACs. The process will be fully documented in the QC manual.

7.2. DFILE format checker

The details of the enhanced format and consistency checks were presented along with results from processing a random selection of the existing files. Several improvements were suggested during the presentation that will be implemented immediately. The complete format checking process will be documented in the QC manual.

The enhanced format checker will be implemented in advisory-mode (messages will be generated but files will not be rejected) at the US GDAC on 21 October and continue through the end of 2009. During November the process will be transitioned to the French GDAC. The enhanced format checker will become fully operational for incoming files at the beginning of 2010. After that time a full scan of the existing files will be performed and the DACs will be requested to correct the detected anomalies.

Additional checks will be added during the coming year, including:

- Checks of QC flags against the grey list
- Cycle-to-cycle comparisons: consistent positions and times, duplicates

8. Format Issues

8.1. Meta-Files updates

Version 2.3 of the Argo meta-data file has been documented in the latest version of the Argo User Manual (version 2.2). The changes are based on the approach used for the new version of the technical files and will allow an unlimited number of standardized configuration parameters which will allow for floats that can change missions.

There was discussion about the exact meaning and use of the "phase" parameters (CONFIGURATION_PHASE_NUMBER and CONFIGURATION_PHASE_REPITITION). A small working group will finalize the meaning and use of these variables.

It was also noted that complete documentation of the allowed standardized names is required.

8.2. WMO-INST-TYPE

There was a discussion regarding how to request a new WMO_INST_TYPE and what level of specificity we should be trying to capture. This code table is managed by WMO for a broad range of observation platforms; a range of values are used by Argo for our instruments. This code captures the broad "classification" of the instrument – manufacturer and (possibly) type of CTD. It cannot be used to capture information about all of the details of a float.

PLATFORM_MODEL currently captures very similar information. There was a great deal of discussion of trying to capture more detailed information in this one parameter. There was a consensus that PLATFORM_MODEL should be standardized but no decision was reached on what level of detail was appropriate.

8.3. User Manual V2.2

There were several comments on the proposed new version of the User Manual (v2.2):

- It is important to know whether the information recorded in the Technical files is directly decoded or if it is created/estimated. This information will be added to the table of technical parameters (not in the Argo files themselves) for each specific float model.
- Trajectory files:
  - DACs are requested to put the launch position of the float in cycle #0
  - DACs are requested to put the first and last Argos message date in the file, even if there is no position associated with the date.
  - Park depth pressure, temperature, and salinity data should be in the trajectory files and NOT the in technical files.
  - N_CYCLE should always be the maximum cycle number recorded in the file. Missing cycles should be included within the data as missing values.
- Bottom pressure, temperature, salinity measurements: Some floats sample just before the instrument begins its ascent. In some cases, this measurement is taken before the pump has been run. In others, this is a spot sample while the profile is taken using bin-averaged sampling. Including this measurement in the profile can introduce "hooks" in the bottom of the profile. It will be left to the DACs discretion whether to include these measurements in the profile.

These recommendations can be easily implemented for active floats. Reprocessing of dead floats will need to be planned at a later time.

8.4. Bounce profile format

AOML is creating the "bounce profile" files and submitting them to the GDACs. There is no information within the profile files that identifies the files as "bounce profiles" and since the GDACs create the GDAC file names from information within the files, these data are not being handled correctly at the GDACs. Essentially, the last file processed for a given cycle is the only file distributed on the GDAC; this file overwrites any previously created file for that cycle. The GDACs will work cooperatively to more correctly handle these files.

8.5. Towards CF compliant

Argo has received suggestions over the years that the files should be made to be CF compliant. This recommendation was heard most recently at the OceanObs '09 conference just the week before the ADMT. It was noted that the Argo standard was adopted in 2002 and v1.0 of the CF standard was not adopted until 2003.

Thierry Carval presented some of the issues related to adapting the Argo profile format to be CF compliant. The CF standard does not standardize the variable names in a netCDF file. Rather, it defines a set of attributes to implement the CF standards. These could be added to the Argo formats relatively easily and without a major disruption to the Argo data stream.

The primary attributes are:

- Global attributes:
  - :data_type = "Argo vertical profile" ;
  - :format_version = "2.2"; "2.3" ?
  - :user_manual_version = "2.3" ;
  - :conventions = "CF-1.4" ;
- Variable attributes:
  - Define a "long_name", "standard_name", and (optionally) "axis" attribute for each variable. The "standard_name" and "axis" attributes will define how CF compliant tools interpret the variables.
  - Other CF defined attributes could be added to enrich the description of the data within the data files. For example, "ancillary_variables", "cell_method", etc.

Charles Sun described the requirements for "coordinate" variables in the CF standard. Converting the Argo formats to coordinate variables would be a *major* format change and cannot be considered at this time. During the discussions, there was a great deal of confusion over what the exact requirements for coordinate variables are. Further investigation is needed.

Thierry will produce a test set of Argo files with the added attributes that IPRC, CCHDO, and NODC can evaluate with some of the "standard CF aware" tools.

8.6. Oxygen Argo Data Management

The presentation did NOT address the issue of oxygen data quality control (either real-time or delayed mode). As a preliminary step towards that goal, the aim of the presentation is to ensure that all countries deploying floats equipped with oxygen sensors document the data and metadata related to these floats properly. This presentation has been made in response to action item 14 from the AST-10 meeting in Hangzhou (March 22-23, 2009): *"Denis Gilbert to work with Taiyo Kobayashi and Virginie Thierry to ensure DACs are processing oxygen data according to recommendations"*.

DO concentration data from 426 profiling floats are already distributed through the Argo data stream.
There are two main methods to measure dissolved oxygen (DO) with sensors in the ocean. The first one is an electrochemical method that uses a Clark-type polarographic cell. The second one is an optical method. It is based on the principle of dynamic fluorescence quenching. As of today, SeaBird

Electronics provides a DO sensor based on the electrochemical method (SBE43) and Aanderaa provides a DO sensor based on the optical method (Aanderaa optode). The Aanderaa Optode also measures temperature, and in some cases, this temperature is transmitted by Argo floats.
The official Argo unit for dissolved oxygen concentration is µmol/kg, as in JGOFS and CLIVAR, but none of the existing sensors provides DO data in native units of µmol/kg. Depending on the sensor, additional conversions must also be done to correct for pressure or salinity effects for example. **As a consequence, whatever the sensor considered, DO sensor output must be transformed to convert the output in dissolved oxygen concentration, to take into account temperature, salinity and pressure effects or to convert the data in µmol/kg (see the schematic of the processing of oxygen data).**

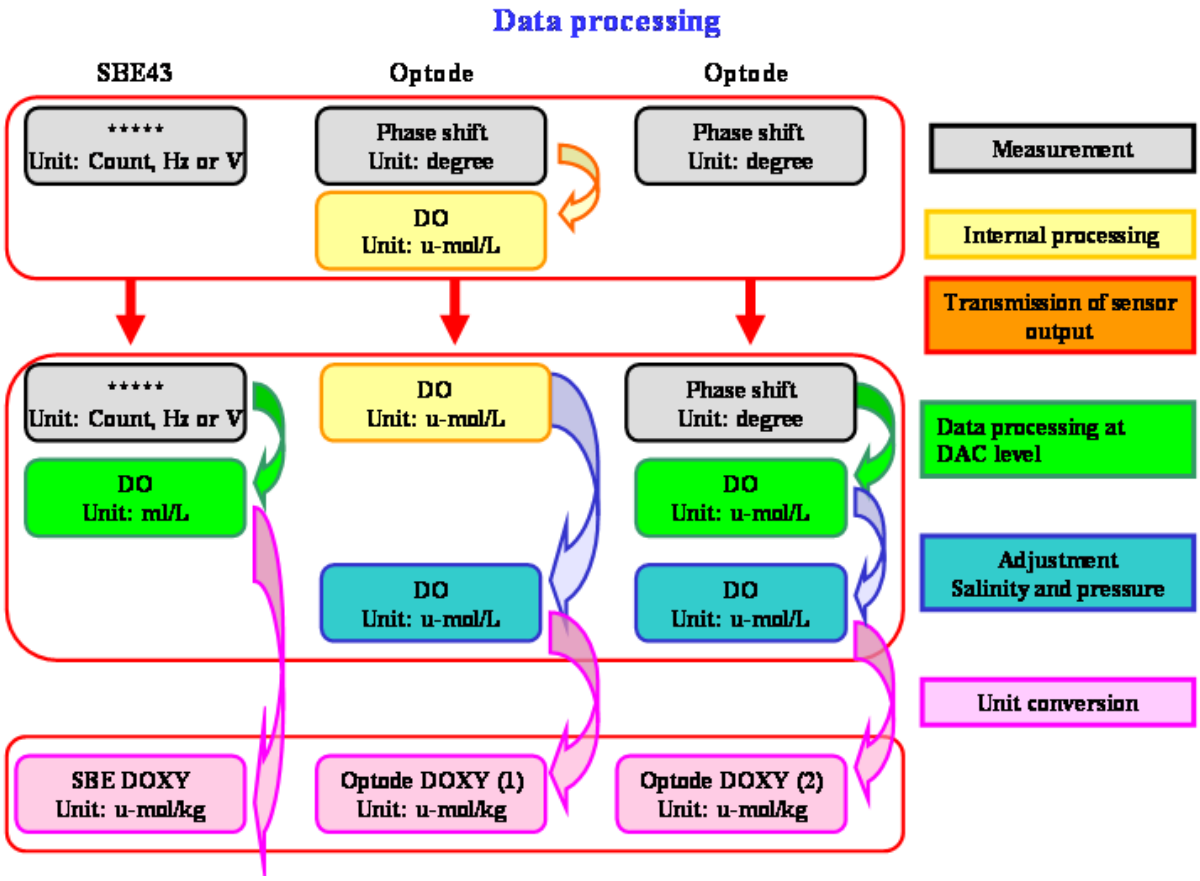


Figure 1: Schematic of the oxygen data processing.

According to the present recommendations, when the Aanderaa optode transmits a dissolved concentration, the transmitted value is stored in DOXY. As the data are estimated at zero pressure and usually in fresh water (or at a given reference salinity), the DO concentration value is then corrected for the pressure and salinity effects in the DOXY-ADJUSTED field. In such case, the correction can be as large as 20%.
In any other cases, DOXY is estimated from the sensor output and all conversions are done to fill this field. In particular, the pressure and salinity compensations for the Aanderaa optode are taken into account and no ADJUSTED field is filled.
As a consequence, the available DOXY data from the different floats are not comparable and a user cannot use O2 data from other groups with confidence. There is a clear need to standardize procedures.
In addition, the available oxygen-related fields are DOXY, TEMP_DOXY and BPHASE_DOXY. Those parameters do not allow us to report all possible transmitted data.

We thus made the following recommendations:

- **Store any transmitted data by the oxygen sensor with meaningful names:**
  - VOLTAGE_DOXY when SBE43 sensor output is a voltage (Unit = V)
  - FREQUENCY_DOXY when SBE43 sensor output is a frequency (Unit = Hz)
  - COUNTS_DOXY when SBE43 sensor output are counts (no Unit ?)
  - BPHASE_DOXY when Aanderaa optode output is BPHASE (Unit = degree)
  - DPHASE_DOXY when Aanderaa optode output is DPHASE (Unit = degree)
  - CONCENT_DOXY when Aanderaa optode output is DO concentration at zero pressure and in fresh water or at a reference salinity (Unit = degree)
  - TEMP_DOXY when the Aaandera optode transmits its temperature measurement (Unit = degree Celsius)
  - XXX_DOXY for any new variables
- Store in DOXY, the dissolved oxygen concentration in µmol/kg estimated from the telemetered variables and corrected for any pressure, salinity or temperature effects
- Fill properly the metadata to document the calibration and conversions equations

It is important to store the telemetered variables to keep the raw data in case we have to change the calibration/conversion equations used to convert the sensor output in DOXY.

8.7. Multiple sensors –Multiple axis

A vertical axis refers to the set of pressure levels that parameters are measured on.

Currently, for each cycle of a float, the primary profile file (what has commonly been referred to as the single-profile file) contains one profile (N_PROF = 1). The vertical axis of the primary CTD is always referred as PRES (and PRES_ADJUSTED). If there are parameters (DOXY, as an example) that are measured on a different set of pressure levels, then a different variable name is used to store these levels (PRES2, PRES_DOXY, etc). Several people have expressed concern about the feasibility of this method; there is a significant possibility of confusion and improper use.
A small working group developed an alternative that was presented to the ADMT.

The basic proposal is to allow multiple profiles within the "single cycle" float profile files. Each profile would correspond to a single vertical axis. The primary CTD profile would always be N_PROF = 1. All parameters (TEMP, PSAL, DOXY, etc) that are measured on this vertical axis are stored in this profile.

If there are parameters measured on different vertical axes, an additional profile is used for each unique vertical axes. For instance, if the DOXY sensor measures its own pressure, N_PROF =2 would contain PRES and DOXY as measured by this sensor.

The file format already supports this capability (as used in the "geo" and "latest_data" files) so this proposal would not require a major format change.

The current recommendation is that only the primary CTD data would be included in the "aggregated profile" files – the "geo", "latest_data", and float "*_prof" files; the files we used to refer to as the multi-profile files.

Sample files will be generated and distributed to a set of users for "usability" testing.

9. Delayed mode data management activities : Feedback from DMQC4

The fourth Delayed-Mode Quality Control workshop (DMQC-4) was held immediately prior to ADMT-10, on Monday 28 September. It was convened by Wong and King. For full details see the

DMQC-4 report. A summary of some of the most important outcomes was prepared by Wong and King, and presented at ADMT-10. The action items from DMQC-4 are identified in the DMQC-4 report.

The first half of DMQC-4 was devoted to the handling of surface pressure offsets. There were two main aspects to this issue.

First, the Druck microleak problem, which results in negative offsets in the pressures measured by the CTD. At the time of DMQC-3 this was thought to occur in 3% of cases. Since then, the severity of the problem and failure rates have increased significantly. Also, the problem occurs much earlier in float lifetime than was the case 12 months ago. According to data from UW, 28% of a batch of floats deployed in Oct 2008 showed the problem within the first 5 months of their lifetime. Pressure sensors with this problem are diagnosed by examining the surface pressure offset reported by floats. APEXs report the progressive surface pressure offset. SOLOs and PROVORs adjust pressure on board the float, and report the magnitude of successive adjustments which can then be accumulated to give the offset time series.

DMQC-4 was shown examples of the pressure time series for a range of pressure sensor failures. DM operators will be vigilant in monitoring floats from the batches likely to be affected so that data can be flagged appropriately and floats added to the greylist when the pressure errors make the data uncorrectable.

Bad floats can sometimes be identified through bias in the T/S properties, but usually not until the error is at least 10 dbar. A second diagnostic is the difference between DHA and altimeter SLA calculated and notified by S Guinehut, which can identify dynamic height discrepancies of order 5 cm. This test is most sensitive when there is a strong vertical TEMP gradient. At low latitude it can detect errors as small as 10 dbar, but at high latitude errors may need to be as high as 50 dbar to be detected. Therefore this method will be most useful at latitude less than 30 degrees.

Laboratory analysis of sensors that have shown this problem ashore suggests that when the PRES error is less than about 10 dbar, the offset can be assumed to be uniform with varying pressure, so a single offset can be applied to adjust data. When the sensor failure advances so the offset is greater than 10 dbar, the error may vary with both pressure and temperature, so DM operators must take great care to examine T/S properties.

DMQC-4 asked co-chair AST to consider the information provided by SBE about characterization of this error, and if appropriate to write to them and request further detailed investigation and advice.

The Druck microleak problem can affect any float type.

The second surface pressure issue is APEX APF-8 floats that Truncate Negative Pressure Drifts (TNPD). Many APEX controllers still active truncate negative surface pressure offsets to zero before telemetering ashore. This has the effect of losing information about Druck micro-leaks. A float is assumed to have entered a persistently negative pressure offset when 80% of surface pressures (after the time at which the problem is defined to start) report zero pressure offset.

The recommendation to DM operators is that
1) If there is no apparent T/S anomaly, the float may be experiencing undetectable negative pressure error. In this case, PRES_ADJUSTED_QC, TEMP_ADJUSTED_QC and PSAL_ADJUSTED_QC should all be '2'. The string "TNPD: APEX float that truncated negative pressure drift." Should be included in the SCIENTIFIC_CALIB_COMMENT, together with any other comments the DM operator wishes to include.

DM operators require guidance on how to fill PRES_ADJUSTED_ERROR for TNPD floats. J. Buck and M. Ouellet will consult the operational users in their countries to inquire how they use

PRES_ADJUSTED_ERROR and feedback a recommendation on what value (eg 10 dbar) might help users to make appropriate use of PRES data from TNPD floats with apparently good T/S.

2) If there is evidence of a T/S anomaly, it is very likely that there is a pressure problem and the flags should be '3' or '4' depending on severity of the anomaly. The float may also need to be added to the greylist.

Note that a negative PRES error will lead to a positive PSAL error, and a cold TEMP anomaly whose size depends on vertical TEMP gradient

If the float is telemetering highly erratic data, it is a sign that the microleak problem is about to reach its endpoint. Previous cycles may need to be reviewed.

At ADMT, the question was raised about whether RT DACs could flag raw data from TNPD floats as '2'. The response was that most RT DACs have no way to maintain a list of TNPD floats and assign '2' to the PARAM_QC. Therefore RT DACs will assign '1' and send data to the GTS as normal, unless the float is so bad that it is on the greylist in which case the flag is '3' as usual. Users of data that has not yet been to DMQC and who wish to be aware that a float has this problem will therefore need to consult the list of TNPD floats maintained and published by CSIRO.

Other issues considered at DMQC-4

Cell Thermal Mass. The status of CellTM corrections was reviewed; B. Klein will undertake analysis of some N Atlantic floats and advise whether the application of CellTM with present coefficients and estimated ascent rate improves data quality more often than degrading it.

D file format consistency. GDAC checking of incoming D files will soon be introduced, with files that fail being rejected. Existing D files will not be checked at the GDACs in the first instance. J .Gilson has run a reduced set of checks on the entire set of D files, and compiled a table of failures. D file generators should consult his online list and work to repair defects as soon as possible. In order to squeeze D format errors out of the system, Gilson will run his check quarterly and make the result available at Coriolis. Eventually the GDAC checker will be applied to all existing D files.

Web site The DM operators confirmed their desire to have a DM web site, maintained at Coriolis, to post information about DM practice, parameter settings used in DMQC software, etc. This should be password protected. Initially, A Wong will collate information and pass it to Coriolis for posting. The web site will be updated as DM operators supply material, but it will not be interactive.

Editing raw data flags in DM DMQC-4 confirmed that DM operators will edit raw QC flags (PARAM_QC) in delayed-mode, to preserve pointwise information about spikes, jumps, etc incorrectly flagged by automatic RT tests.

D files that haven't yet had surface pressure adjustment DM operators should fix these as soon as possible. A status table will be maintained showing which groups have applied surface pressure offset adjustment. Information about whether this has been done will also be available in the SCIENTIFIC_CALIBRATION_COMMENT.

Description of raw vs adjusted data and QC flags. DMQC-4 emphasized that our thinking about data flow has evolved over the years. The initial concept of data being 'real-time' (PARAM) or 'delayed-mode' (PARAM_ADJUSTED) has evolved. This should be formalised. For some time the DM community has considered PARAM to be 'raw' and PARAM_ADJUSTED to be adjusted/calibrated data. Thus DM operators may adjust flags that describe raw data (PARAM_QC) in delayed mode. See point above. Wong and Carval will update the descriptions of PARAM and PARAM_QC in the User's Manual and QC Manual to reflect the fact that they are 'raw' rather than only 'real-time'.

TEOS-10: King gave a review of the new equation of state algorithms from the new Thermodynamic Equation of Seawater. This was approved by IOC June 2009 for use from Jan 2010 onwards. DMQC-4 reviewed the impact of TEOS-10 on the DM process, which will be small. TEOS-10 libraries are available in Matlab & FORTRAN on the TEOS-10 web site (www.teos-10.org, or Google 'teos-10'); c language libraries will come in due course. Note that the salinity argument for the TEOS-10 algorithms is Absolute Salinity: SA =~ 1.004715 *PSAL + regional composition anomaly. The regional anomaly arises from spatial variations in composition that change density and other thermodynamic variables, but have less contribution to conductivity and therefore do not show up properly in PSAL. This anomaly is referred to as 'delta-SA' and its magnitude is up to 0.02 g/kg. The key reasons for the community to introduce TEOS-10 include:

- TEOS-10 extends algorithms to larger parameter ranges, which were not defined for PSAL & EOS80 ($0 < S < 120$; $T < 80$).
- More accurate treatment of the thermodynamics of ice.
- Units of Absolute Salinity are proper SI units, g/kg.
- No more argument over the use of 'PSU'.
- Temperature argument of official algorithms is in ITS-90 instead of IPTS-68.
- Allows inclusion of delta-SA to impact density.

In order to use the new algorithms, PSAL must first be converted to absolute salinity. In the Matlab version of the new library ('gsw' for Gibbs Seawater library, replacing the sw_ library) the calls to calculate potential temperature would be

SA = gsw_ASal(PSAL,PRES,LON,LAT)
potemp = gsw_ptmp(SA,TEMP,PRES,PRES_REF)

Note that the conversion from PSAL to SA has a regional dependence. The temperature scale for the TEOS-10 code libraries is ITS-90.

Also note: **After the introduction of the new TEOS-10 algorithms and the scientific use of Absolute Salinity, DACs continue to store and serve PSAL, exactly as they do at present**. This is by analogy with temperature, where instruments report in situ TEMP and DACs store and serve the measured TEMP, but scientists calculate and use the dynamically more relevant potential temperature. Floats will continue to report PSAL, calculated from CNDC according to the practical salinity algorithms of PSS-78, and DACs will store and serve PSAL. **Argo NetCDF files will not change**. Scientists are now encouraged to calculate and use Absolute Salinity, which is a closer approximation to the mass fraction of dissolved salt.

At some stage, DACs should switch from EOS-80 to TEOS-10 to perform the real-time tests on derived quantities such as density, and for DMQC. Since EOS-80 and TEOS-10 are very close in the parameter ranges of Argo data, this is expected to have zero impact on the outcome of RT tests. The composition anomaly part of Absolute Salinity varies slowly with geographic region. Switching to TEOS-10 algorithms is therefore not a priority from the point of view of Argo data flow, and can be done as part of the wider adoption of TEOS-10 in DACs' parent institutions.

Some derived quantities, in particular density, will be significantly offset if delta-SA is included. Delta-SA is zero in the surface North Atlantic and greatest in the North Pacific. It is therefore critical that any data centre, Argo or otherwise, that provides its users with density data calculated from Absolute Salinity and TEOS-10 makes it clear whether delta-SA has been included, and that the users make it clear in the publications that result from those data.

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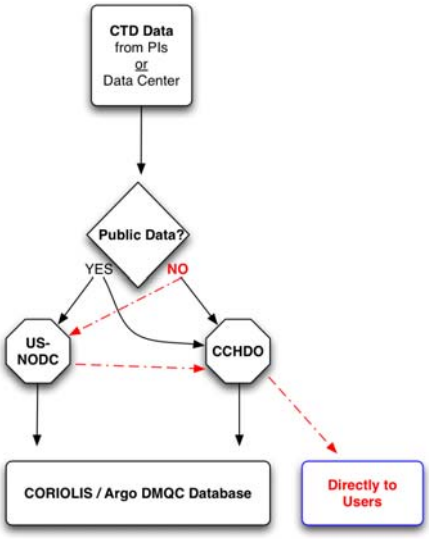
10. Reference database progress since ADMT9

A new version of the reference database is in preparation at the Coriolis data Center. This new version is based on the recently available new world ocean database (WOD 2009) of the NODC. New recent CTD, which are provided by scientists, will be added to this new version. Three cruises have been also provided by the CCHDO but without reformatting format and without quality control on the data. Most of the recent CTD are in the Southern Ocean (South Atlantic and South Indian). The new version will also integrate "pre-1990" data, actually not available in the reference database provided to the Argo DMQC. This new version should be available for the end of 2009. J Gilson has also updated the Argo profile reference database for the DM operators that need to use Argo for processing there floats.

S Diggs reminded the group of the importance for CCHDO to gather CTD both for Clivar purposes and for Argo as there are many other customers out there. The focus has been put on Southern Ocean and he identified the opportunities that existed, got feedback of Argo Pis, initiated contacts with China (along with US-NODC), GO-SHIP , …. Since the AST-10 meeting in China, the CCHDO has provided two new cruises in the Southern Ocean (I05 in the Indian Ocean and A095 in the Drake Passage. Significantly more data are expected in the near future.



Tim Boyer presented the new CTD in WOD that would be useful for Argo. The NODC gets a lot of dataset from European countries with ICES and also some CTD data in the Japan region (CD provided to NODC). The NODC has established relationships with countries like India and Brazil and expect to get better dataset from those countries.

CCHDO and US-NODC will work together to extract from the quarterly WOD updates the CTD post calibrated, deeper than 1000m that are relevant for reference DB activity. These data will be provided to Coriolis by CCHDO.

Finally, CCHDO and the AIC will work together on a coordinated strategy for discerning where there may be CTD observations at Argo float deployment locations

It was agreed that Argo should be present at IMDIS conference in Paris next March and that an abstract should be proposed focusing on need for Argo to get recent CTD from data providers.

11. Feedback from ARC meeting

The ARC meeting was held the day before ADMT and reviewed the status of the different ARCs. Regional consistency checks are proceeding at different ARCs at different paces and using different approaches. The main outcome of these consistency checks are reports to the PI and Delayed-Mode Operators (via the AIC). Concerning deployment planning there are some good tools being developed, especially the one by Euro-Argo (based on distribution, age and movement). Beta-version should be available by end of October/beginning of November by S. Schmidtko. There is also a deployment planning tool based on overlaying US cruise tracks and float density is at a web page maintained by WHOI (on UNOLS web page). AIC is looking into developing similar tools for all cruise tracks. AIC suggested that we need a dedicated deployment coordinator to keep track of the cruises and help with the deployment planning and communication with the ship owners.

Concerning education and outreach activities it's clear that resources are limited and there is a lot of work still to be done. SEAREAD is moving forward both in education and outreach. Euro-Argo is working on a web page for outreach is going to be finished in a few months. Euro-Argo made a film for Argo outreach, which will be made available through the AIC for education and outreach. Regional workshops for researchers work well (training in deployment and data analysis). There is a need for

data viewers to allow untrained users easy tools to study fields and we need more flexible software/training for research applications.

Concerning products there are activities on Argo displacements and the ANDRO atlas was presented by M. Ollitrault: main characteristics is that the measured & quality controlled parking depth is used. It was pointed out that some floats give average pressure, others give instantaneous pressures, and 29 have no recorded pressures and that differences between float types could introduce a bias, that cannot be quantified at this time.

The following list of actions was identified:

- Need list of education, outreach and training activities in each region (with materials and tools) with a centrally located summary and links to ARC or other web pages … on AST page (ARCs collate and provide information to Megan).
- Recommendation: Wikipedia can also be useful and needs to be updated and kept current. AST will take responsibility for doing this.
- Keep the internal list of products up to date. Split by model/non-model?
- Each ARC needs to document their products and provide it with links to Megan.
- Recommendation: The AST will discuss the question on how to present products in a way that Argo does not appear to be endorsing them. Need a statement for this. It has to appear on the ARCs product pages.
- Need to develop a statement that all ARCs should use to indicate that their products should be used with caution (see here for more information: http://www.argo.ucsd.edu/global_change_analysis.html).
- Recommendation: We need more and accurate information on the times/durations associated which each part of the float cycle for all float types.
- ARCs should inform AIC of new products or changes of links, so that Mathieu does not have to visit the various web pages to find out what has been changed or added.

12. GADR activities

Charles Sun of the US National Oceanographic Data Center (NODC) reported that the NODC continued to operate the Global Argo Data Repository (GADR) for preserving the Argo data transferred from the Argo US GDAC. The GDAC's files were copied from "http://www.usgodae.org/ftp/outgoing/argo/", the "geo" subdirectory was skipped, and files which are no longer present on that site are removed from the local mirror. GADR have the capability to switch smoothly to Coriolis-GDAC in case of problem at US-GDAC. Other activities of the GADR included, but were not limited to,

1. Implemented an automated procedure for acquiring the CLIVAR & Carbon Hydrographic Data Office (CCHDO) data from the Web for archive accession.
2. Produced monthly archives of the Argo data archived at the NODC and populated them at http://argo.nodc.noaa.gov/.
3. Identified the deficiency of the Argo NetCDF convention and developed a strategy for improving the convention to be 'Climate and Format (CF)' compliant.

He also reported that there were approximately 11% of requests for ASCII text format files or about 43% of bytes of the Argo data downloaded at the GADR each month during 2007 and 2008.

13. Other topics

The action list was compiled, is available in annex4, and was approved by participants.

ADMT11 will be hosted by BSH in Hamburg. There is already an offer from ISDM/Ottawa for the year after.

14. ANNEX 1 Agenda

Objectives of the meeting

- Review the actions decided at the 9th ADMT meeting to improve Real-Time data flow (considering all aspects of the system from transmission from the float to arrival at GDAC and accessibility of data by users)
- Review the status of surface Pressure correction
- Review status of Delayed-Mode quality control and Progress to reduce backlog
- Review the metrics regarding Argo program to document future (and if possible past) growth and performance of the array and the data system
- • Feedback from the Regional Argo Data Centre meeting

Schedule: Meeting will start at 9am and finish around 1730 on Wednesday and Thursday. We plan to finish around 1400 on Friday.

The meeting will be opened by C Vassal, the Chief Executive Officer of CLS company.

1. **Feedback from 10th AST meeting : (30mn) Dean Roemmich**

2. **Status of Argo Program and link with Users (1h 30)**

Status on the actions 1,2,3,4

- Review of the Action from last ADMT (S. Pouliquen)15 mn
- Argo Status (M. Belbéoch)
- Real-time Monitoring : (M. Belbeoch) Summary on major anomalies detected each month, Requested actions from . Trying to identify why some anomalies are not corrected.

3. **Real Time Data Management (2h00)**

Status on the actions :17,18,19,20,21,22,23,24,25,26

- GTS status: 30mn
  - Timeliness of data delivery: Review evidence provided by the MEDS statistics on the timeliness of data delivery via GTS. (A. Tran)
  - Status GTS problems – Action 17-18(M. Ignaszewski)
- Status of anomalies at GDAC (C. Coatanoan) 20mn
- Status on Anomalies detected with Altimetry (S. Guinehut) 30mn Why no correction or feedback provided?
- Feedback on test on upgrades of tests (Jump Test density test) (Ann Gronell, C. Schmid) - Action 23 (15mn)
- Proposal for common method for determining position and Time and attribute the appropriate QC(Ann Gronell) Action 24 (30mn)
- Use or not CRC in decoding V. Thierry

4. **Pressure Correction (2h00)**

Status on the actions : 27,28,29,30,31,32, 45,46

- Status on Tech Files updates (Actions 45-46) (A Gronell)
- Status on Pressure correction on Apex Floats in RT
- Status on Pressure correction in Apex Float in DM (A Wong B King)
- Status on WHOI Solo floats (P Robbins)

5. **Trajectory from Argo data (1h30)**

Status on the actions ,5,6,7

- Feedback on Trajectory progress since ADMT9 (B. King)
- Trajectory work done at Coriolis (M. Ollitraut)
- Specification on format checker (M. Ignaszewski, B. King)

6. GDAC Services (1h30)

Status on the actions : 8,9,10,11,12,13,14,15,16

- What's new at Coriolis and US GDACs (T. Carval, M. Ignaszewski)
- Status of Format Checking enhancements (D-Files checking) (Mark Ignaszewski)
- New needs?

7. Format issues (2H00)

Status on the actions : 43,44,45,46,47,48,49,50,51,52,53

- BUFR Format : Actions 43-44-49Status on the experimentation phase (ALL)
- Status on Meta-Files Update: Actions 50,51,52 (T. Carval)
- Status on bounced profiles format Actions 53 (C. Schmid)
- Improvement needed to be CF compliant Action 48(T. Carval)
- Oxygen Argo Data management - Action item 14 from IAST-10 (V. Thierry)
- Multiple sensors and multiple axes (T. Carval)
- Other needs?

8. Delayed mode data management (1h00)

Status on the actions 33,34,35,36,37

- Conclusion from DMQC workshop (A Wong- B King)

9. Progress on Argo Reference data base (1h00)

Status on the actions 38,39,40,41,42

- Summary of the actions since ADMT-9 (C. Coatanoan)
- CCHDO-NODC progress (S. Diggs, T. Bloyer)
- Discussion on improvement requested

10. RDACs: provide an information on what done and what is planned (1h00)

- Feedback from the ARC meeting and Endorsement of the actions proposed (J. Potemra & C. Schimd)

11. GADR (1h00)

Status on the action 54,55

- Status of the Archiving centre (C. Sun)

12. Other topics (1h00)

- Summary of the 101th ADMT actions (S. Pouliquen, M. Ignaszewski) 30mn
- Location of 11th ADMT

15. Annex2 Attendant List

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Sander	Hendrik	Optimare	Germany	hsander@uni-bremen.de
Schmid	Claudia	NOAA/AOML	USA	claudia.schmid@noaa.gov
Sirott	Joe	NOAA/PMEL	USA	joe.sirott@noaa.gov
Stawarz	Marek	BSH	Germany	marek.stawarz@bsh.de
Sun	Charles	NOAA/NODC	USA	Charles.Sun@noaa.gov
Thierry	Virginie	IFREMER	France	vthierry@ifremer.fr
Thresher	Ann	CSIRO	Australia	ann.thresher@csiro.au
Tran	Anh	ISDM/DFO	Canada	Anh.Tran@dfo-mpo.gc.ca
Udaya Bhaskar	TVS	INCOIS	India	uday@incois.gov.in
Van Wijk	Esmee	CSIRO/ACE CRC	Australia	esmee.vanWijk@csiro.au
Wong	Annie	UW	USA	awong@ocean.washington.edu

16. Annex3 ADMT9 Action List

	Action	Target Date	Responsibility	Status
	Monitoring Actions			
1	Calculate time delay for getting R-files and D-Files onto the GDAC. Investigate files slowly arriving.	Early 2009	GDACs and AIC	Progress underway, April 2009
2	DACs to verify they are prepared for cycle > 255	ASAP	DACs	AOML – done BODC – not done b/c no floats close to 255 CORIOLIS - done CSIRO – done INCOIS – done MEDS – done JMA Done KMA Done
3	Monitoring the floats sending good data to be included in AIC report	AST10	AIC	Done – new graphs showing # of good profiles in AIC report
4	Promote the email support@argo.net on ARC GDAC DACs WWW sites	AST10	ALL	BODC – will be done by AST10 Coriolis done CSIRO Done AOML done
	Trajectory Actions			
5	Coriolis to check the GDAC files according to the consistency test agreed to warn DACs of anomalies in their data	End 2008	Thierry Carval & M. Ollitrault	Started Feedback sent to AOML DAC in February
6	DAC to clean up their files according to the warning issued in previous action	AST10	All DACs potentially	CORIOLIS – done Aoml working with M Ollitrault
7	Revise the RT TRAJ file description	End Nov 2008	Thierry Carval and Brian King	Done user manual V2.2
	GDAC Actions			
8	Coriolis (And US-GODAE?) to investigate why multi-profile files are not processed for Kordi Floats	15 November	T. Carval (& M. Ignaszewski ?)	Done
9	Coriolis (& Us-GDAC?) to investigate why the list of floats mentioned in AIC report have disappeared	15 November	T. Carval (& M. Ignaszewski?)	Solved . IT was GTS files that have been hidden in GDACs
10	Automate file removal according to the agreed procedure	AST10	GDACs	Done at Coriolis explained in user manual V2.2 US GDAC – not done still manual

	Action	Target Date	Responsibility	Status
11	Modify the "latest data" directory to handle a sliding of 3 months and separate R and D data.	AST10	GDACs	Coriolis: started Target date: ADMT10 US GDAC to generated new latest file on 1st September
12	Implement an MD5 signature to secure file transfer and document it	ADMT10	GDACs	Turning to operation at Cooriolis
13	US-GDAC to automate grey list submission	End 2008	M. Ignaszewski	Completed
14	DFILE checker to be tested in December with DACs and then transferred to Coriolis GDAC	AST10	M. Ignaszewski	Done sharing errors withs DACs started
15	GDAC D-files holding to be checked and anomalies provided to DAC and DM operators	January 2009	M. Ignaszewski	US GDAC: started scans
16	Document Grey list submission	End 2008	T. Carval	Done user manual V2.2
	Real-time Actions			
17	KMA, INCOIS and JMA to investigate why there is time difference of a few hours between profile on GTS and at GDAC	ASAP	KMA, INCOIS, JMA	INCOIS – in progress; working with A. Thresher JMA – knows cause of problem; depends on action 24; KMA in progress working to find the cause of the problem
18	BODC to revisit the issue of stopping sending duplicates on GTS	ASAP	Lesley Rickards	Duplicate will remain for now. Will revisit in future
19	Coriolis to provide feedback on anomalies detected by statistical analysis in text files	AST10	T. Carval & C. Coatanoan	Done
20	DAC to correct their flags according to Coriolis recommendation and resubmit them	ASAP	All DACs	Depends on action 19
21	Coriolis and AIC to monitor the resubmission of profiles after feedback	ASAP	AIC and Coriolis	Depends on action 19
22	QC manual to be updating to specify sigma0 in the density test	15 November 2008	C. Schmid T. Carval	Done Added into "Argo quality control manual" on 4 November 2008
23	New proposal made by B. King of Jump test to be tested	AST10	UW, CSIRO, BODC and all voluntary DACs	BODC not doing this test!!. CSIRO started
24	Develop a common method for determining the positions and observation times at DACs	ADMT10	DACs. Lead by Ann Thresher	Proposition issued by Ann & al to be discussed at ADMT

	Action	Target Date	Responsibility	Status
25	DACs to verify their Salinity gross range check with minimum value of 2 PSU	ASAP	DACs	AOML – code changed, but not yet implemented BODC – 30 psu threshold CORIOLIS - done CSIRO – done INCOIS – done JMA - done MEDS – done KMA done
26	Susan to provide the list of WMO where problem have been detected in Surface-Pressure offset(in tech file) or in META file and document it on AST WWW site	15 November 2008	S Wijffels	DONE
27	DACs to provide timetable on when they will have corrected their files	1st January 2009	All DACs	AOML – April KMA SEPT 09 BODC –done CSIRO – done INCOIS done JMA done MEDS – done
28	Clean the tech file for surface-pressure in tech files	AST10	DACs	AOML pending, BODC – done CORIOLIS – underway. Surface pressure management works. KMA Sept 09 JMA – done CSIRO done Meds Done
29	Do not confuse SURFACE PRESSURE with the shallowest measured pressure in the vertical profile.	ASAP	INCOIS	CSIRO done Coriolis done
30	PRES should record *raw data*. All adjusted pressures go to PRES_ADJUSTED in 'A' mode for real-time DACs.	ASAP	JMA	CSIRO done Done for JMA; will be done for JAMSTEC by AST-10 Coriolis Validation on going
31	DACs to implement RT pressure correction according to specification in the new version of the QC manual on incoming data.	AST10	DACs	Aoml pending BODC – done CORIOLIS – pending waiting for completion on action 30 KMA in progress goal OCT 09 JMA: done Meds Done

	Action	Target Date	Responsibility	Status
32	DACs to implement RT pressure correction according to specification in the new version of the QC manual for the old R-Files	AST10	DACs	AOML pending BODC – done CORIOLIS – pending waiting for completion of action 30 JMA: done KMA in progress goal Nov 09
	Delayed-Mode QC Actions			
33	ADMT chairs to indicate in report the endorsement of OW method by ADMT for DMQC	15 November	Chairs	DONE
34	DACs to look carefully at the report of Altimetry-QC as a lot of anomalies occurs in RT data and to correct their files and report to Stéphanie and Mathieu	Every 3 months when a new list is provided	All DACs	BODC Done CORIOLIS – done CSIRO done MEDS done JMA in progress
35	Stéphanie to modify her list of suspicious floats by indicating id suspicious data are RT or DM data, the Cycle or Cycle interval that has problem. Verify if grey-listed float/cycles are excluded from the list	Next run	S. Guinehut	Done on latest run: Jan 26
36	Annie to finalize DM pressure adjustment procedure to Apex float with Susan and barker and communicate the results to the DM group	Feb 2009	A. Wong	Adjustment procedure agreed upon; CSIRO and PMEL are up to date. BODC,JAmstec and UW are in progress. Status of other APEX float providers is unclear
37	Modify QC manual	15 November 2008	A. Wong	DONE
	Reference Dataset Actions			
38	CCHDO to collect CTD in sparse area in the REF DB and especially Southern Ocean	ASAP	S. Diggs	Getting more Southern Ocean Data entered into CCHDO stream now; will contact C. Coatanoan when ready
39	CCHDO to extract from WOD updates the post-calibrated CTD deeper than 1000m and provide them to Coriolis	AST10	S. Diggs and T. Boyer	
40	ARCS and AIC to help CCHDO by providing point of contacts when they are aware of CTD cruises interesting for Reference database		Arc and AIC	Done at AIC

	Action	Target Date	Responsibility	Status
41	CCHDO to provide the list of cruises he is working on to ADMT	ASAP	S. Diggs	
42	Coriolis to update the Reference database twice a year	AST10 and ADMT10	C. Coatanoan	Done
	Format Actions			
43	All DACs to transmit their BUFR file to Ann to be checked	ASAP	Anh Tran	AOML, CSIRO, CLS received and checked Other DACs???
44	JMA and Jcommops to represent Argo and the BUFR JCOMM task team		Y. Kanno, AIC	
45	Ann Thresher to finalize the first version of technical file names for ARGO floats	Mid-November	Ann Thresher	CSIRO done
46	DACs to updates their tech files	AST10	All DACs	GDAC ready to accept V2.3 file BODC – done,but not submitted CORIOLIS done CSIRO done JMA done MEDS done
47	Update user manual to put the conversion equation for Oxygen measurement	15 November	T. Kobayashi C. Schmid and T. Carval	Done
48	Identify format upgrades to be CF compliant	ADMT10	T. Carval & C. Sun	Status will be presented at ADMT10
49	Validate BUFR files on GTS	July 2009	A. Tran, Navy (NAVO and/or FNMOC)	Japan and Meds Bufr file circulated on GTS and were received by MEDS. Checking on going on what happened to CLS ones
50	Revise meta-file format taking into account the configuration data	End Nov 2008	Thierry,Claudia & argo-dm-format	Done user manual V2.2 need to be validated at ADMT10
51	Resubmit meta-files	ASAP	All DACs lead GDACs	Depends on action 50
52	Revise the user manual on meta and tech files	End Nov 2008	T. Carval & Claudia Schmid	Done user manual V2.2
53	Study the delivery of bounced profiles	ADMT10	T. Carval & Claudia Schmid and format mailing list	Done user manual V2.2

	Action	Target Date	Responsibility	Status
	GADR			
54	Move to operational the monthly image of the Argo dataset on a sliding one year window	End 2008	C. Sun	Done 01/01/09
55	Document the Preliminary QC procedure on WOD updates	ASAP	T. Boyer	Link to documentation provided on the 19/09/09

17. Annex 4 ADMT10 Action List

	Action	Target Date	Responsibility	Status
	Monitoring Actions			
1	Calculate time delay for getting R-files and D-Files onto the GDAC. Investigate files slowly arriving.	End 2009	AIC	
2	Make a page on ADMT www site on surface pressure processing and add a link to CSIRO TNPD page	AST11	Sylvie and Annie	
3	Investigate DOI index to register usage of Argo Data as it's done for publications	AST11	L. Rickards	
	Trajectory Actions			
4	Coriolis to continue work with DACs to clean TRAJ files	AST11	M. Ollitraut and DACs	
5	DACs to correct their metadata and decoders to avoid similar anomalies in the future	ADMT11	All DACs	
6	Inform on how to store dated measurements made during descent and ascent either in TRAJ or TECH (already possible in TRAJ format)	ADMT11	Thierry	
7	DACs to implement the TRAJ file format changes agreed at ADMT10 and documented in User Manual V2.3	ADMT11	All DACs	
8	DAC to plan dead float reprocessing	ASAP	All DACs	
	GDAC Actions			
9	Finalize automation file removal according to the agreed procedure and document it	End Oct09	GDACs	
10	Modify the “latest data” directory to handle a sliding of 3 months and separate R and D data.	AST11	Coriolis_GDACs	
11	GDACs have to see if they keep index file and index-detailed file and document it	End 2009	Mark and Thierry	
12	Finalize md5 set up at GDAC and document	End Oct09	GDACs	

	Action	Target Date	Responsibility	Status
13	Document feedback on RT feedback from statistical test at Coriolis in QC manual	End 2009	Thierry Carval	
14	Implement tech file synchronization	ADMT11	GDACs	
15	Document File Checker in appendix in Qc Manual	End October	Mark & Annie	
16	Turn to operation File checker with an interim period of 2 months and capability to relax it if too many files are rejected	End 2009	GDACs and DACs	
17	Update File checker to handle consistency checks and TECH file checking	ADMT11	Mark	
	Real-time Actions			
18	KMA to investigate why there is less messages from KMA on GTS in past 2 month	End 2009	KMA	
19	INCOIS, KMA and JMA to investigate why there is still some small time differences sometimes between profiles on GTS and at GDAC and correct it on RT incoming files	ASAP	INCOIS, KMA, JMA and Mark	
20	MEDS and JMA to investigate why some of the JMA BUFR messages are not seen by MEDS and FMNOC	ASAP	Anh Tran , Mark and JMA	
21	DACs to finalize the setting up of BUFR transmission and warn Anh and Mark	ADMT11	CLS, Coriolis, CSIRO, AOML, BODC,KMA, NAVO	
22	DAC to assess their flags according to Coriolis statistical test recommendations and resubmit them	ASAP	All DACs	
23	DAC to assess their flags according to Altimetry and resubmit files or provide feedback in data are good after each quarterly check	4 times a year	DACs	
24	Update QC manual and User manual to explain -when a float is introduced in the grey list -to users how to use it	End 2009	T. Carval, A. Wong	
25	-study how to keep the information of sensor failure	ADMT11	Thierry & Mathieu	

	Action	Target Date	Responsibility	Status
26	BODC to test the new Jump Test proposal made by B King at ADMT9	AST11	BODC	
27	Implement the common method for determining the positions and observation times at DAC and document it in the User Manual	ADMT11	DACs. Ann and Thierry	
28	Clean the tech file for surface-pressure	End November 2009	AOML, Coriolis, KMA, NMDIS	
29	Implement RT pressure correction on APEX	End 2009	AOML, Coriolis, CLS, KMA	
30	Process old active float that are registered at AIC and not at GDAC	ADMT11	AOML Coriolis	
31	Include pressure in global range test in QC manual and DAC to implement it	End 2009	Thierry and DACs	
	Delayed-Mode QC Actions			
32	Modify QC manual on editing raw files and revise definition of PARAM and PARAM_QC	End 2009	A. Wong	
33	DM operator to report back to DACs when a TNPD APEX float should go on grey list		DM operators	
	Reference Dataset Actions			
34	Coriolis to update Ref DB in integrated new CTD from WOD09 and pre 1990 CDTs	Dec 09	C. Coatanoan	
35	NODC/CCHDO to collect CTD in sparse area for the REF DB and especially Southern Ocean	ASAP	T. Boyer and S. Diggs	
	Format Actions			
36	Finalize Repetition_Phase description	AST11	T. Carval & Claudia , Ann	
37	Revise the user manual according to meeting decisions and emails comments	End OCT 09	T. Carval	
38	Resubmit meta-files	ASAP	All DACs lead GDACs	
39	Finalize the delivery of bounced profiles	End Nov 09	GDACs and AOML	

	Action	Target Date	Responsibility	Status
40	Resubmit Oxygen float according to new recommendations	ASAP		
41	Update TECH file naming convention to handle all the surface offset behavior and add a column to record whether an information is decoded or estimated	ASAP	Ann with Provor and Solo PIs	
42	Test the multi-axis format change proposal	AST11	Uday , Claudia, Thierry, MArk	
43	Test the CF –compliant proposal made by T Carval	AST11	Jim, Uday, Steve, Thierry, Charles	
44	Investigate the content of the existing metadata files make suggestion for improvements	ADMT11	AIC	
45	Start work with WMO to set up links between Argo GDACs and WIGOS	ADMT11	Thierry & Loic& AIC	

18. Annex5 :Calculation of the JULD_START_TRANSMISSION and JULD_ASCENT_END for APEX floats

Michel Ollitrault, Edited by Ann Thresher, Claudia Schmid, Jean-Philippe Rannou and Thierry Carval

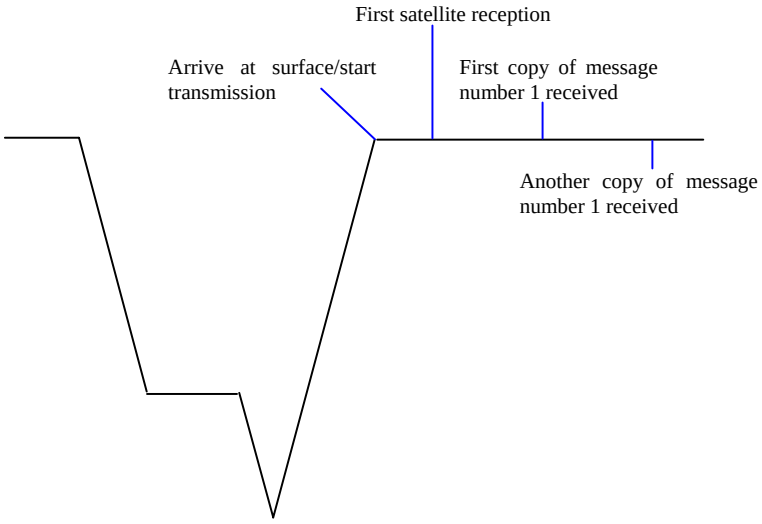


Figure 1: Float cycle showing transmission

After the float arrives at the surface, it begins transmitting. Because a satellite may not immediately see the float, typical satellite capture begins within minutes or even hours after the float surfaces.

Starting when the float arrives at the surface, *M* messages making up one complete profile are transmitted sequentially (from #1 to #M) and repeatedly until the end of the UP TIME period. One complete set of *M* messages makes up one Block of data. Thus *B* blocks of *M* messages are transmitted. These messages are received whenever a satellite 'sees' the float, therefore the blocks are not necessarily complete.

To find out when the float arrived at the surface and began transmission, it is necessary to use the information provided in 'Message 1' (APEX floats) of the profile which reports how many times the complete set or 'Block' of messages has been transmitted since the float arrived at the surface.

There are two methods that can be used to calculate surface arrival time. The preferred method, developed by Jean-Philippe Rannou, relies entirely on information provided in the transmissions received from the float. The second requires metadata.

The preferred method requires that two copies of message 1 from different blocks are received. The surface arrival time is then calculated as follows:

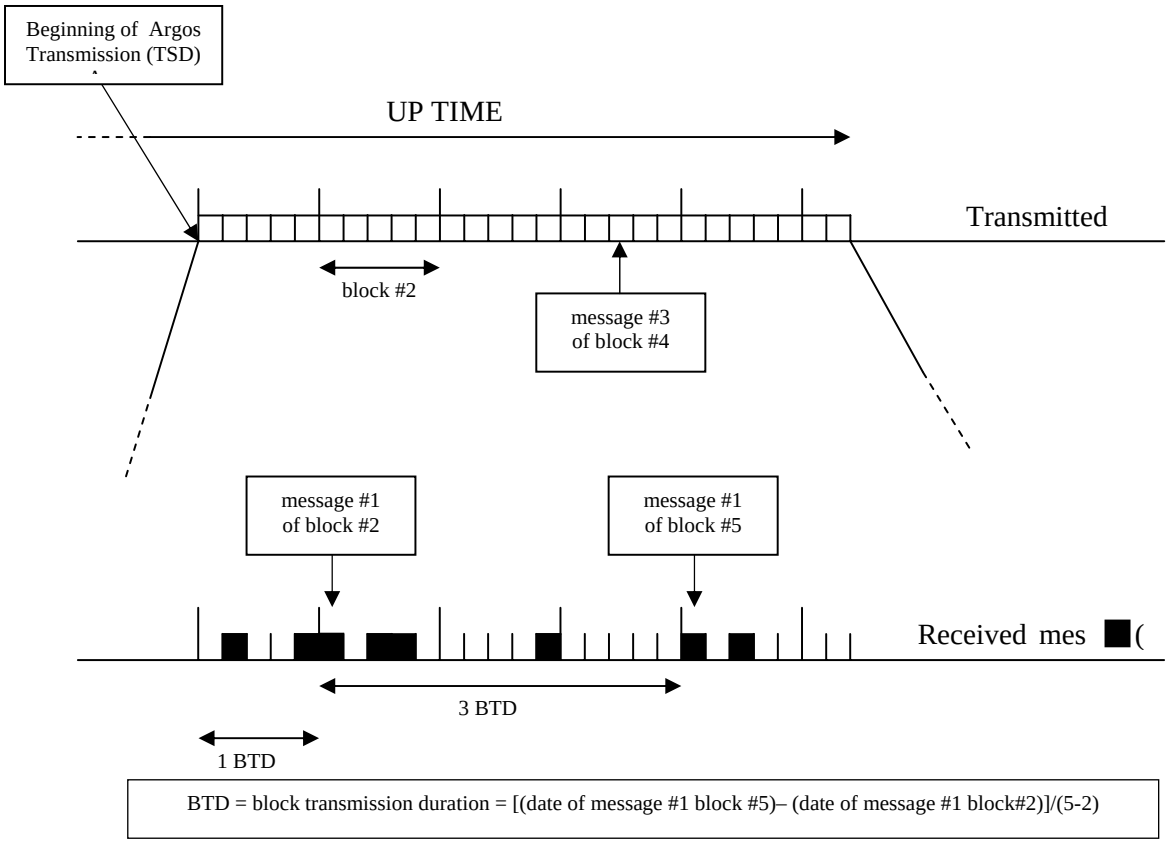


Figure 2. The preferred and more accurate method for estimating surface arrival time of the float

This method relies on receipt of TWO copies of Message 1 which passed the cyclic redundancy check. Using the time of each transmission from the Argos report, and the message block number contained in each message 1, you can calculate the amount of time it takes to transmit a complete block of *M* messages containing the entire profile.

This is calculated as shown, where N1 is the earlier block number, N2 is the later block number, and all times are in Julian days:

BTD = block transmission duration = [(time of message with N2 –
(time of message with N1]/[N2-N1]

Following from this, Surface Arrival Time, or JULD_START_TRANSMISSION is calculated as follows:

JULD_START_TRANSMISSION = time of message with N1 – [(N1 – 1) * BTD]

Only blocks with a valid CRC for message 1 should be used in these calculations but, because there are other unusual problems that can occur, the BTD should be calculated using multiple "time of message" pairs. The median value is then used to calculate JULD_START_TRANSMISSION. The same process can be used to calculate the median JULD_START_TRANSMISSION from multiple blocks, if available.

Warning : if the float transmits more than 255 blocks (this may happen with a shallow profile or on surface drift), to avoid a modulo error the N1 and N2 "time of message" pairs have to belong the same batch of 255 transmissions.

If only one copy of message #1 is received for a profile, then you must use the less reliable method. For this method, you must know the 'transmission repetition rate' for the Argos transmitter on the float AND the number of *M* messages in a complete block for the profile. The transmission repetition rate can be derived from the transmissions themselves in most cases. The way to do this is to find the smallest time differences with a window of +- 1 second (since the transmission repetition rate is usually a floating point number). Once these time differences are identified one can take the mean. Caution: we have seen floats for which the transmission repetition rate of cycle 0 is different from the transmission repetition rate of the other cycles.

This method relies on the estimation of M from the length of the profile given in message 1. This makes the method less reliable because length of the profile could be wrong.

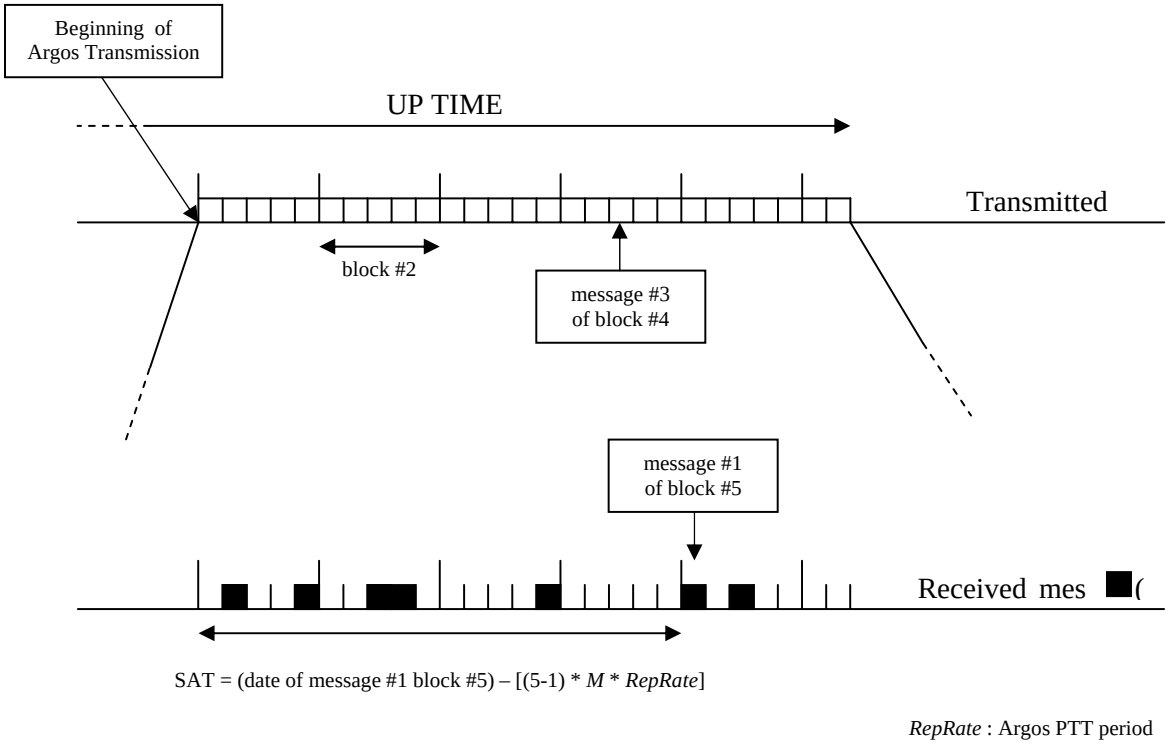


Figure 3. The second, less reliable method for estimating surface arrival time of the float

Surface Arrival Time (SAT in the figure above), or JULD_START_TRANSMISSION, for this method are calculated as follows where N is the block #, M is the total number of messages in one block, RepRate is the transmission repetition rate (seconds) of the Argos transmitter on the float and time is in Julian days:

JULD_START_TRANSMISSION = (time of message with N) –
[((N-1) * *M* * RepRate/86400)]

In practice, this last term must be expressed in terms of fraction of a day so we divide by 86400 (number of seconds in a day).

If you DO NOT receive a message #1 from a profile, then it is impossible to calculate surface arrival time. The best you can do then is to use the first date from the first message received as the approximate JULD_START_TRANSMISSION.
Suggestion: in this case JULD_START_TRANSMISSION and JULD_ASCENT_END should be fill value. They can be filled in the delayed-mode QC process based on the complete record.

JULD_ASCENT_END calculation

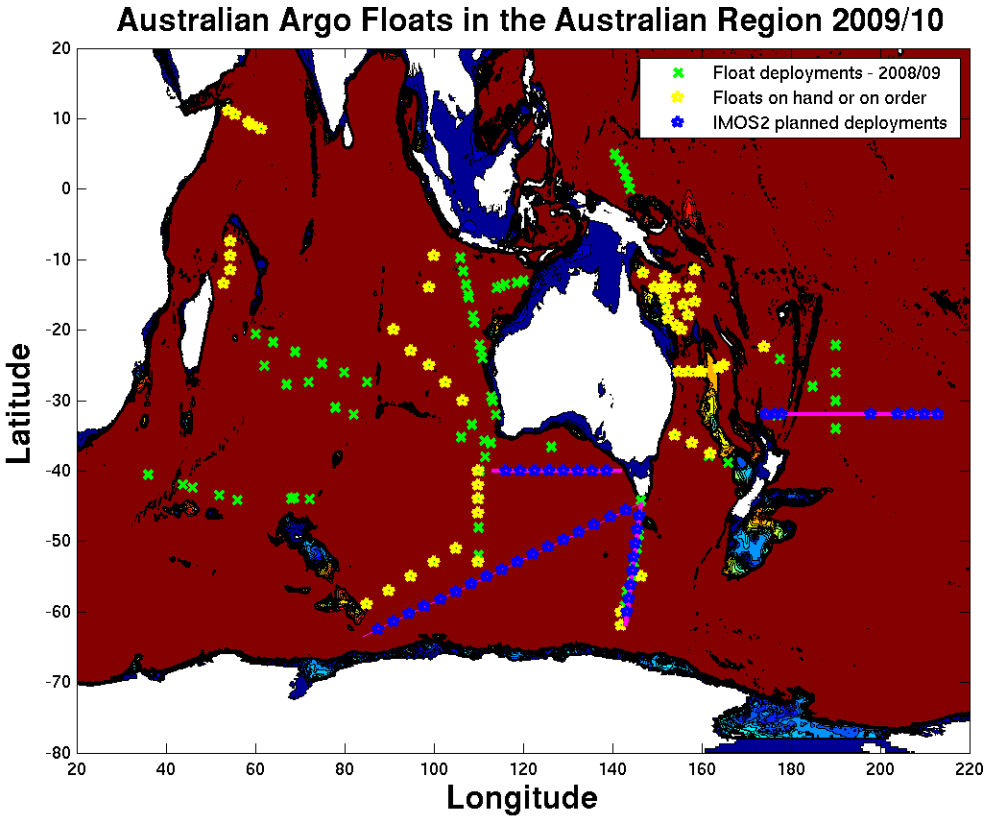
According Webb Research (the Apex floats manufacturer), the end of the float ascent occurs 10 minutes before the data transmission starts. Therefore:
JULD_ASCENT_END = JULD_START_TRANSMISSION - 10 minutes or:
JULD_ASCENT_END = JULD_START_TRANSMISSION - 0.00694444 (which is the Julian value of 10 minutes)

FOR ALL OTHER FLOAT TYPES, THE DELAY MUST BE DETERMINED AND SUBTRACTED FROM JULD_START_TRANSMISSION

19. Annex6 National Reports

Australian Argo National Data Management Report
ADMT10
Toulouse, 30/9 – 1/10 2009

Ann Gronell Thresher (CSIRO) and Chris Down (Australian BOM)



It has been an interesting year. Australia deployed 60 Argo floats in the last year (since September 2008), as well as helping Scientists from the University of Tasmania and the Antarctic Climate and Ecosystems Cooperative Research Centre deploy 8 experimental EM floats near Kerguelen. Deployments would have been higher if not for the Druck micro-leak problem. Nevertheless, we now have 218 active floats giving good data from a total of 273 deployments. We also have 101 floats either in the lab, or on order and we expect to order more once production returns to normal. We are (like most Argo participants) waiting for the CTD heads to be returned from Seabird with replacement or screened pressure sensors before we resume deployments of these floats. Deployments this next year will contain a mix of iridium and argos equipped floats, oxygen and vanilla floats, floats with the new Kistler sensors and floats with either Paine or Druck sensors. Many of our deployments will be in the Southern Ocean, helping boost coverage in extreme latitudes, assuming we receive either the floats or the replacement CTD heads in time for the deployment trips.

The past year has been mixed in terms of problems as well. Clearly the Druck microleak has affected everyone. We have 30 floats in our lab and another 30 at Webb that were held just as the problem became defined. Since then, we have received unexpected

funding from the Australian Government and ordered another 41 floats, with a further 5 oxygen float to be ordered soon. An issue for us is that the money for these new floats is tied to performance – they MUST be in the water by June next year which could be difficult depending on when the replacement CTDs are received. Many are aimed at the Southern Ocean and, once these ships leave, our opportunity for deployment is lost for this year. At this point, it looks possible but we will continue to assess the situation. We are also providing 8 floats for a Scripps/Niwa and Australian funded trip by the New Zealand vessel 'Kaharoa', which is being chartered for a dedicated deployment trip to the Indian Ocean.

Software development has continued with coding of the new Technical files using the approved names. New names are still being added to the list so please check carefully when recoding your files.

We have finished delivery of our Argo Real-time software to our Indian counterparts and it has been used to reprocess all of their floats (except for 2), making their files fully compliant with the Argo rules. One float format remains to be coded because we can't get a copy of the format manual but this only affects 2 Provor floats which failed a short time after deployment so very few profiles are affected. If anyone has the format document for FSI CTD equipped Provor floats, we would GREATLY appreciate a copy.

If anyone else is interested in our Argo Real-time software, it is a Matlab program that works from the raw Argos hex data to decode the profiles and create all required netcdf files for delivery to the GDACs and we are happy to help with getting it set up elsewhere.

In April 2009, the Australian Royal Australian Navy Defense Oceanographic Data Centre hosted the National Argo meeting in Sydney. This helps keep all Australian partners in Argo informed about developments in the program.

As mentioned earlier, in the Australian Budget in April we received funds from the Integrated Marine Observing System Education Investment Fund package to extend Argo coverage in our region to higher latitudes (the Southern Ocean) and the tropics north of Australia. This includes testing the new Kistler sensors on some of our floats as well as an extension of our oxygen equipped float fleet.

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 an established QC methodology and 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 nodes, can be accessed through this web site.

The Bureau of Meteorology replaced Lisa Cowen (who is on maternity leave) with Chris

Down who has helped get their processing working faster and more sensibly. This has made exchanging software smoother and our processing in parallel more efficient.

We have also encoded Iridium float processing for the first time and this is working well with delivery of the data to a local modem and then data exchange via ftp between BOM and CSIRO. We will soon begin exchanging EM float Iridium float data with the University of Tasmania as well. The EM floats will then become Argo floats with an Argo mission, though we will not deliver the EM data which will remain protected until further notice.

Float performance has been excellent this year with no failures on deployment and only minimal failures of existing floats. Druck Microleaks were a problem; 2 floats have been confirmed with this fault and another 3 or 4 are suspected of having bad pressure sensors. It is almost certain that more will show up in our fleet as time goes on. We are now purchasing only APF9 controllers to make identification of suspect pressure sensors easier since they report negative pressure offsets, unlike the APF8 boards.

Table 1 shows a summary of our float performance to August 2009:

Float Status	**Number of Floats**	**Range of Cycles Received before failure**
Died from battery failure (end of life):	12	79-133
Disappeared on deployment	4	0
Disappeared after grounding or running ashore	5	14-119
Druck pressure sensor failure (2 still reporting)	4	41
Program failure	6	4-63
Disappeared without apparent cause	5	22-123
Lost in ice	6	58-107
In ice (still considered active)	(2)	
Probable leak	2	21
Still active giving good data	217	
Grey listed	9	
Total deployed	273	

Table 1. Float performance and reasons for failure over the entire program life (1999 – present).

1. Real-Time Status

- Data acquired from floats – all data is acquired from floats 4 times a day and all floats reporting are processed immediately.

- Data issued to GTS – Data is issued to the GTS immediately after the float data is

decoded, QC'd and processed by the Bureau of Meteorology and CSIRO. Processing of GTS data by the Bureau of Meteorology changed in June 2008. Data delivery to the GTS increased from every 6 hours to hourly which improved TESAC delivery within the 24 hour window from approximately 60% to over 80%. Because we process the floats after they have been on the surface for up to 18 hours, this is probably the best we can do. In October 2008, performance suffered, dropping to less than 40% being delivered within the required time frame. This was due to staff being away, a change in the automation settings and failure of our backup delivery system. Performance has been much better since then.

- Over the 12 months to August 2009, 70% of all profiles were delivered to the GTS within 24 hours of the float surface time. However, as mentioned above, in early June 2008, the Bureau switched from 6-hourly TESAC bulletins, to an hourly, on-demand bulletin service. This resulted in a significant improvement in delivery timeliness, with the average from June now running at 84%.

  The Bureau has also tested the delivery of BUFR messages but there are delivery issues with their node. Once we are ready to proceed, I will pursue this with them.

- Data issued to GDACs after real-time QC – Data is sent to both GDACs as soon as the data is decoded, QC'd and processed. At present, both CSIRO and BOM are submitting the data as backup for each other. This ensures that the data is delivered without delay if one of our systems fails. Our software tends to know when one of us is away so the redundancy is vital.

- Data issued for delayed QC – Data is available for delayed mode QC immediately but only considered valid for DMQC after 6 months.

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

  Home page for Argo Australia (IMOS)
  http://imos.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/;

  Information on our DMQC process and floats can be found at:
  http://www.marine.csiro.au/argo/dmqc/

  Home page for DMQC documentation of floats:

http://www.cmar.csiro.au/argo/dmqc/html/Argo_DM.html
and
http://www.cmar.csiro.au/argo/dmqc/index.html

Example DMQC documentation page for a float:
http://www.cmar.csiro.au/argo/dmqc/html/DMQCnotes_5901618.html

- Statistics of Argo data usage – Argo data is downloaded to a local mirror once a week. It is then converted to a Matlab format with an index table to help local users find the data they need.

  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.

  - 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 BMRC Ocean Analysis (http://www.bom.gov.au/bmrc/ocean/results/climocan.htm)
  - 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).

  Research Projects:
  - Determining the ongoing rate of ocean warming and ocean thermal expansion - Domingues, Church, White and Wijffels, Barker, Centre for Australian Weather and Climate Research (CAWCR)
  - Global Ocean Temperature Trends- Wijffels, Cai and Feng, CSIRO
  - BLUElink Ocean Prediction. BLUElink Team lead by David Griffin, CSIRO and Gary Brassington, BoM
  - Mixed-layer Structure and Biogeochemistry in Australia's Sub-Antarctic Zone- Tom Trull and Brian Griffiths
  - Ecosystem Modelling Team- Beth Fulton, Scott Condie, Donna Hayes, Eric Grist, Penny Johnson, Randall Gray and Roger Scott
  - Ecocspace modelling applications - Cathy Bulman. CSIRO Marine and Atmospheric Research (CMAR)
  - Seasonal climate forecasting research and applications, POAMA group, CAWCR.
  - Dynamics of Antarctic Circumpolar Current - Steve Rintoul and Serguei Sokolov, CAWRC
  - Mean circulation around Australia - Jeff Dunn and Ken Ridgway, CAWCR

- Annual and interannual salinity variations in the Indian Ocean - Helen Phillips (U. Tasmania) and Susan Wijffels (CAWCR)
- Southern Ocean subduction processes - JB Sallee, Steve Rintoul, Susan Wijffels, CAWRC
- Improving global mean climatologies by combining Argo and altimetric measurements, Ken Ridgway and Jeff Dunn, CAWRC

PhD Projects:

- Determining changes in global ocean water mass properties with inferences for changes in air sea fluxes of heat and water. Kieran Helm. University of Tasmania
- Long-term Salinity Changes and its Relationships to Atmospheric Forcing. Paul Durack, QMS, U. Tasmania
- Laura Herraiz Borreguero, Variability of Sub-Antarctic Mode Water and Antarctic Intermediate Water in the Australian sector of the Southern Ocean, QMS, U. Tasmania

Products Generated from Argo Data – some samples:

- operational upper ocean analyses of Neville Smith at the Australian Bureau of Meteorology: http://www.bom.gov.au/bmrc/ocean/results/climocan.htm
- BLUElink ocean forecasting system. http://www.bom.gov.au/oceanography/forecasts/index.shtml

2. Delayed Mode QC (DMQC) –

DMQC Software Development: 2009 saw continued re-development of the DMQC software and processing methods.

We continue the approach of creating new files in a separate directory for each processing stage. All steps are controlled by scripts to ensure that all required field modifications occur.

Surface pressure (SP) correction implementation: With each DM batch we re-examine the entire SP series for a float. We extract exact float type from a master spreadsheet, SP from tech files, Minimum Profile Pressure (MPP) from R- and D-files, and previous quality-controlled SP from D-files.

Really obvious spikes (SP>100) are removed, and values following missing profiles (which are therefore dubious) are ignored when creating a smoothed series. Gaps are filled by linear interpolation and then a simple 5-point median filter is used (with no treatment of first and last 2 points). Reported SP are replaced only if the offset > 1db. Limited extrapolation may be used at ends of series, with up to 3 values retrieved by linear trend fitted to 6 to 10 nearest good

values.

The operator is alerted to any differences between new SP estimates and previous values in D-files.

If any reported SP are negative then we infer the float does not truncate SP. Otherwise, TNDP (truncated negative drifting) is suggested to commence at the first zero after the last positive value (prior to that point a severe -ve drift is not likely to have occurred, ie previous -ve values are probably only slightly -ve.)

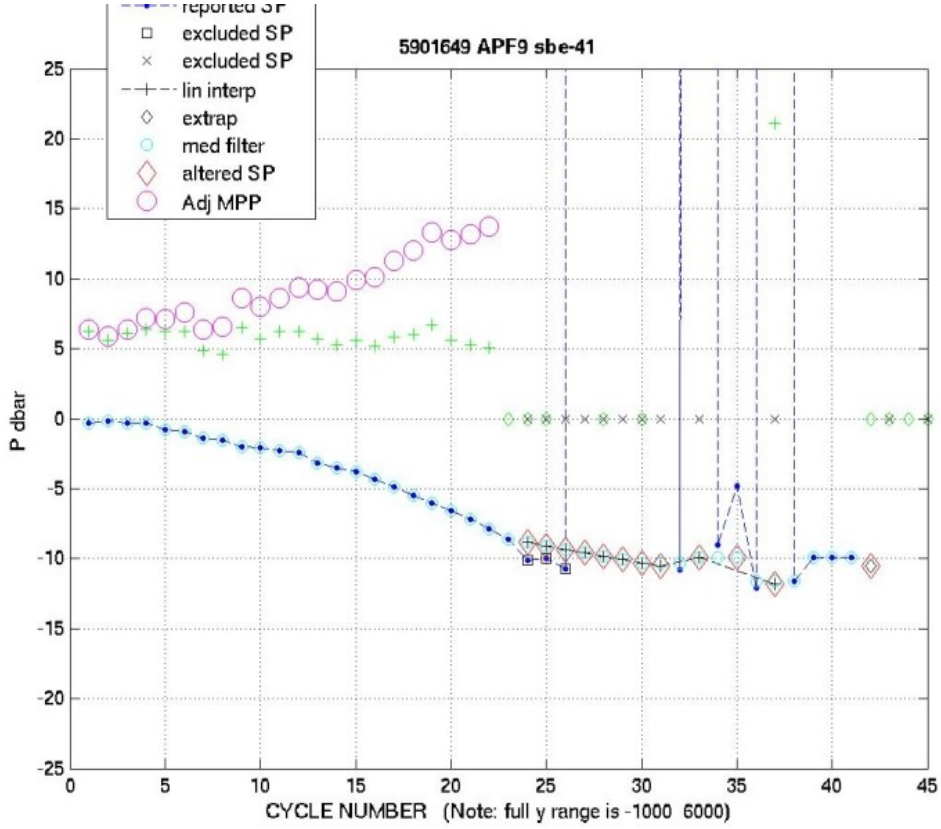
A plot is created showing the various estimates of SP and the reported and adjusted MPP, and TNDP onset if applicable. The operator verifies or modifies any point of TNDP onset, and has tools for closer inspection and modification of SP values. A float's terminating profile is given the penultimate SP value.

P-files are created, loading ADJUSTED fields (PSAL re-computed from CNDR using adjusted P.) P error is adjusted to 10db for TNDP profiles. The final SP values are recorded in the SCIENTIFIC_CALIB fields.

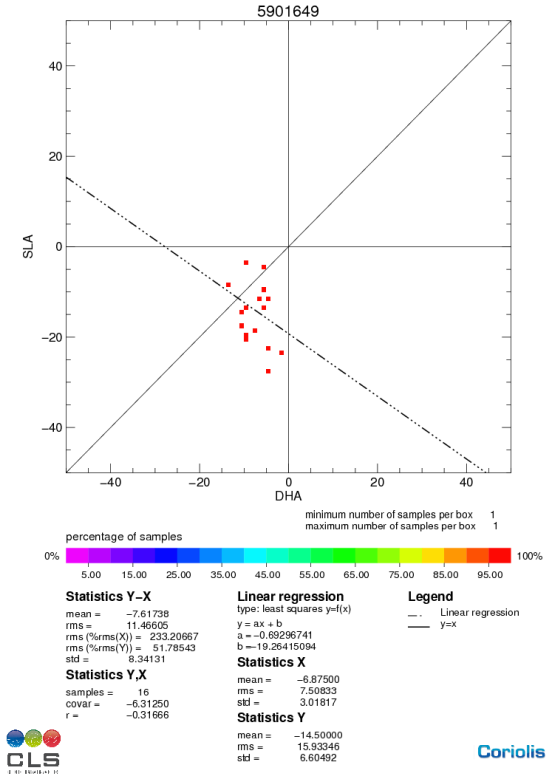
SCIENTIFIC_CALIB fields typically contain one of a small number of standard texts, depending on the type of float and nature of a profile . A simple database is maintained which, for each profile, stores codes representing these texts. Additional free-text comments can be assigned to groups of profiles. A script interrogates the database and generates and loads the contents of these fields.

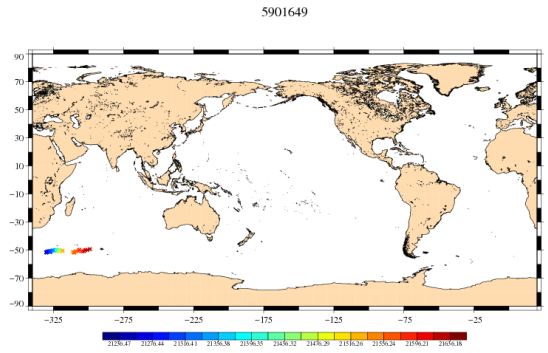
DMQC Drift Analysis: We continue to use four main checks to determine if a float is drifting; float-climatological salinity anomaly plots, comparison with nearby Argo at deep theta levels, nearby Argo TS envelope plots and Gilson screening. We find that the majority of our floats are very stable and do not require correction for salinity drift (approx. 96%). For those that do exhibit salinity drift, we have implemented the OW software. TBTO leakage seems to be increasing with 12% of our latest batch of floats affected, the profiles are corrected manually. We aim to have our DMQC software revision completed by the end of 2009 and are currently working towards a comprehensive documentation of all our procedures. We are also working with our Indian colleagues to implement our DMQC procedures on their float data.

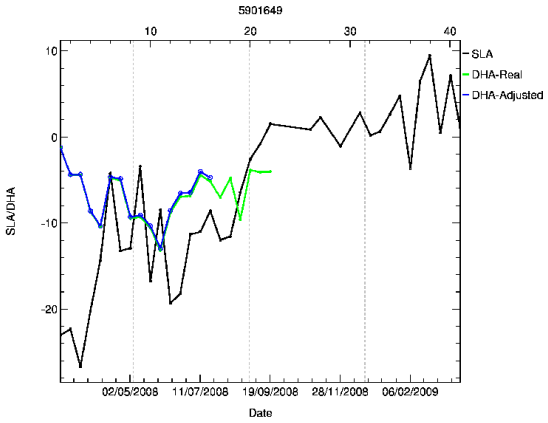
We have paid particular attention to our Druck ‘microleaker’ floats. We have several suspected DML floats. One of these has severe negative pressure drift and this is quite obvious in the pressure plot, i.e:



However, a negative pressure drift of ± 10 db results in only a small salinity offset, i.e. (0.005) and it is arguable as to whether you would easily detect a salinity drift such as this in the APF8 truncated negative drifting pressure floats where no pressure drift information is available. The altimetry analysis shows that there is an unusual SLA/DHA relationship for this float but it was not enough to trip the threshold for a 'bad float'. We have several more suspected DML floats that are in the early stages and are only showing negative drifts of 1 or 2 db. A 2.5 db pressure error only results in a 0.001 salinity offset and currently we cannot detect this kind of drift in our salinity comparisons alone.







DMQC Statistics

A further 97 floats have been processed/reprocessed through DMQC. Currently there are 23842 CSIRO profiles at the GDAC, including 12448 R files (3824 of which are eligible for processing) and 11394 D files (constituting 75 % of eligible profiles). Two floats suffered sensor failure soon after deployment and all data was set to QC=4. A further two floats suffered from salinity drift and required manual correction. No other floats showed evidence of significant salinity drift.

DMQC Website

Further effort has been put into the development of the DMQC web pages and documentation. There is now an individual DMQC page for each float that has been processed through the new software. These pages are particularly useful for other DM operators and we encourage feedback and/or questions. The IMOS Argo website has more general information of interest to the general public/other scientists such as content about the Argo program, floats, data etc. The DMQC web pages are publically available at the sites listed under Web pages above.

Argo Canada National Data Management Report
ADMT10
Sep 28-Oct 2, 2009

1. **Status**

Data acquired from Floats: We are currently tracking 120 floats. Of these, 10 may be in trouble or may have failed to report within the last 6 months. For 2009, we deployed 11 Apex floats with APF9A controller and deep profile first options.

Data issued to GTS: All of the data is issued to the GTS in TESAC format. In January 2009, we started the delivery of Argo data in BUFR format under IOPX02 CWOW headers. In March 2009, the percentage of Argo data distributed to TESAC within 24 hours failed to 55% because of server upgrade and maintenance. On average 82% of data are issued to the GTS within 24 hours for the floats reporting since September 2008.

Data issued to GDACs after real-time QC: All of the profile, technical, trajectory and meta files are transmitted to GDACs in netCDF format on an operational basis with some delay compared to the data sent on the GTS, because the two processes run on two different servers and the conversion process to NetCDF takes a long time. After some program modifications and optimization, now the time delay is reduced to 2 hours between the GTS data and the data sent to GDACs.

Data issued for delayed QC: Data are available for delayed mode QC as soon as they are sent to the GDACs but only considered valid for DMQC after 6 months.

Delayed data sent to GDACs: A total of 3312 eligible files from 58 floats had an adjustment performed on salinity (DMQC following WJO software) on September 2008 and were sent to the GDAC in March 2009. At their time of submission, the pressure fields were adjusted using all available data until March 2009.

Web pages:
http://www.meds-sdmm.dfo-po.gc.ca/meds/Prog_Int/Argo/ArgoHome_e.html

We maintain pages that show float tracks and all data collected by Canadian floats. Both real-time and delayed mode data are also available for download, but we alert viewers that the official version resides at the GDACs. 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.

Statistics of Argo data usage: We currently have three PIs. 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.pac.dfo-mpo.gc.ca/sci/osap/projects/argo/Gak_e.htm

Real-time Argo data (GTS) is also ingested, along with other data streams (PIRATA and TAO arrays, XBTs, various TESACs from CTD profiles, animal borne sensors), in an optimally interpolated product generated at ISDM using ISAS-v4.1 analysis tool (developed at IFREMER). The fields are then used to identify, in real-time, profiles that either show suspicious deviation from climatology and/or neighbours. Those profiles are re-QCed. Several defective Argo profiles are identified this way and flagged accordingly (~30 per month, from ~15 floats, on average). An update is sent to US NODC whenever a profile is re-flagged.

2. **Delayed Mode QC:**
As of September 2009, the salinity adjustment component of DMQC had been performed on 66% of eligible floats. This is a decrease compared to last year, attributed to the following changes occurring in 2008 and 2009: transfer of DMQC software from WJO to OW, delay in acquiring costly Optimization toolbox required by OW, adaptation to changes in available NetCDF Matlab toolboxes for pre-OW and post-OW formatting and a two fold internal migration of Matlab servers (impacting both Argo website and DMQC procedures) at ISDM. The re-establishment of data flow from the delayed mode production to the national archive was done for the first time in 2008/2009 since transfer of DMQC responsibilities from a Canadian regional center to ISDM in 2007 and took several months

3. **GDAC Functions**
Canada forwards TESAC data to the GDAC in Brest and NODC three times a week.

4. **Region Centre Functions**
Canada has no regional centre function.

Argo National Data Management Report 2009

The 10th Argo Data Management Team Meeting

1. Status

China Argo project deployed 15 profilers in 2009. Until now, the Chinese DAC has processed data from 61 Argo floats including 35 active floats as of July 23, 2009. This year, 639 R-files were sent to GDACs, and the total number of 2,926 profiles had been uploaded through 2002-2009. All of these profiles are inserted into GTS at CLS. The Chinese DAC switched to OW method for Argo DMQC in June, 2009， totally 2,506 D-files have been sent to GDACs.

Both the China Argo Data Center (NMDIS) and China Real-time Data Center (CSIO) has established their websites (http://www.argo.gov.cn and http://www.argo.org.cn) for Argo data inquiring and display.

The China Argo Data Center provides access to the global Argo profiles data, meta data, trajectory data and deployment information from the Argo Continuously Managed Database. The users are able to access to the data conveniently on the website including netCDF raw data, near real-time data, meta data, trajectory data, delayed-mode data and download Argo data via FTP. In order to expand the usage of Argo data, China Argo Data Center has set up an Argo trajectory data quality control system, which can eliminate abnormal location data. Based on J.J. Park method, China Argo Data Center also provides the global monthly averaged surface current and mid depth current maps derived from good Argo trajectory data. Besides these, many products of Argo data, such as waterfall maps, Argo trajectory maps are also provided. All these products can be downloaded from the website (http://www.argo.gov.cn).

The China Real-time Data Center (CSIO) maintained one website (http://www.argo.org.cn) for inquiring each float's trajectory, profiles data and meta data. An Argo database for global profiles has been established for online inquiring (http://122.224.232.190:8081/argo-web/main.jsp).The users are able to inquire Argo

profiles according to his/her input geographic range and period. The database is monthly updated.

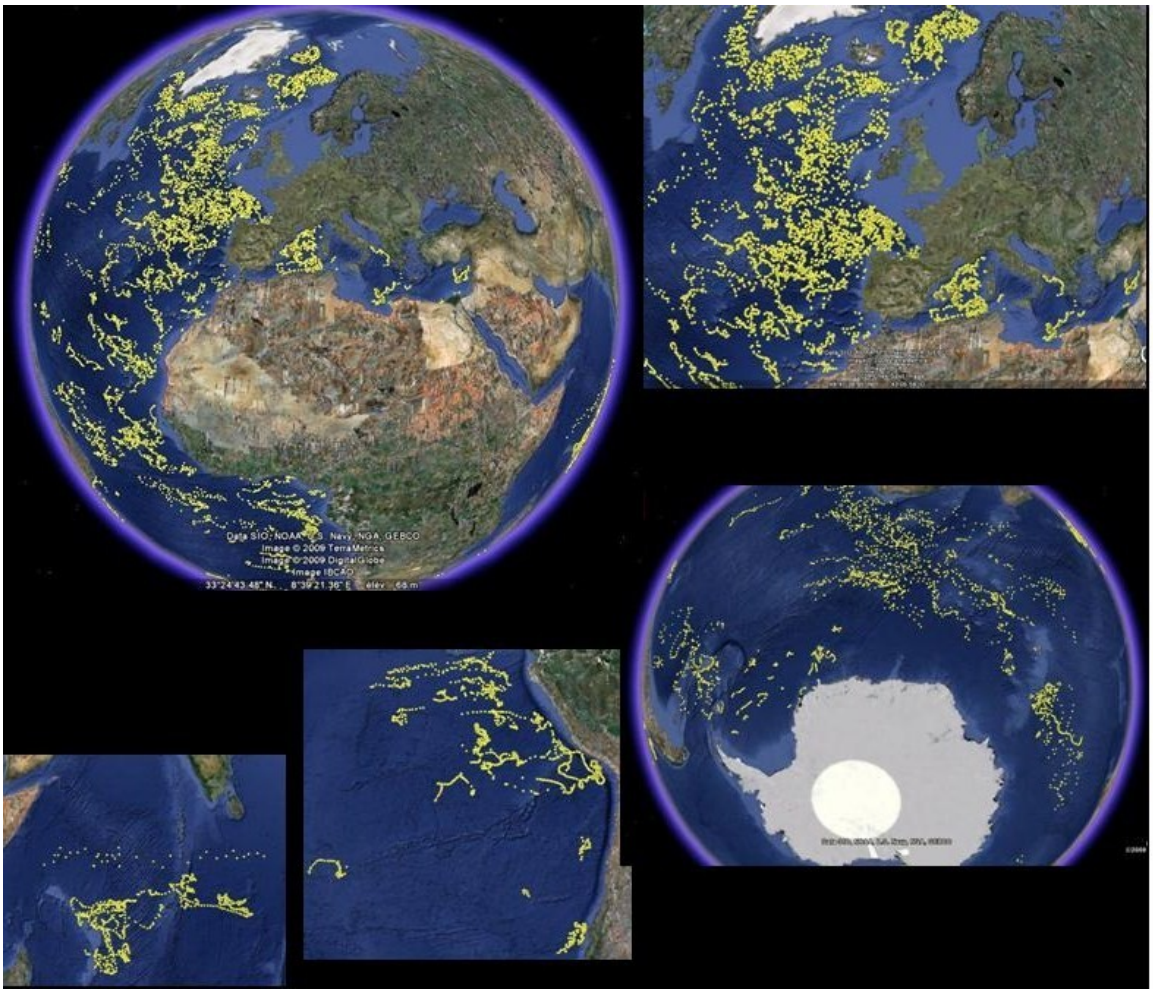
Argo data has been used in an ocean data assimilation system at the National Marine Environmental Forecasting Center. These monthly products have a horizontal resolution of 2º×1º in the tropical Pacific ocean.
Argo data also has been used in the BCC-GODAS System at the Chinese Academy of Meteorological Sciences, and the product is released at the website of IRI/LDEO, Columbia University (http://iridl.ldeo.columbia.edu/SOURCES/.CMA/.BCC/.GODAS/).

2. Delayed Mode QC

The Chinese DAC applied OW method and thermal lag calibration for Argo salinity DMQC. Some floats deployed in the west boundary current region are difficult cases in DMQC due to their variable salinity. Until now, 2,506 D-files, which represents more than 90% of all Chinese profiles, have been updated into GDACs. The lack of manpower is the most difficulty for operational DMQC.

Argo National Data Management Report 2009
Coriolis data center

Annual report August 2008 – September 2009
Version 1.1
September 24th, 2009



13 725 new Argo profiles from 436 floats managed by Coriolis DAC this current year.

Status

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

- Data acquired from floats
- Data issued to GTS
- Data issued to GDACs after real-time QC
- Data issued for delayed QC
- Delayed data sent to GDACs
- Web pages
- Statistics of Argo data usage (operational models, scientific applications, number of National Pis…)
- Products generated from Argo data …

This report covers the activity of Coriolis data centre for a one year period from August 1st 2008 to August 31th 2009.

Data acquired from floats

This year, 13 725 profiles from 436 floats where collected, controlled and distributed.
Since May 1998, 79 884 profiles from 970 floats where collected, controlled and distributed.

This year, the 436 active floats managed had 31 versions of data format:

- APEX : 19 versions
- NEMO : 3 versions
- PROVOR : 9 versions

Arvor : a new type of float.
In 2009, among 31 versions of floats, a new type of Arvor float data were processed.

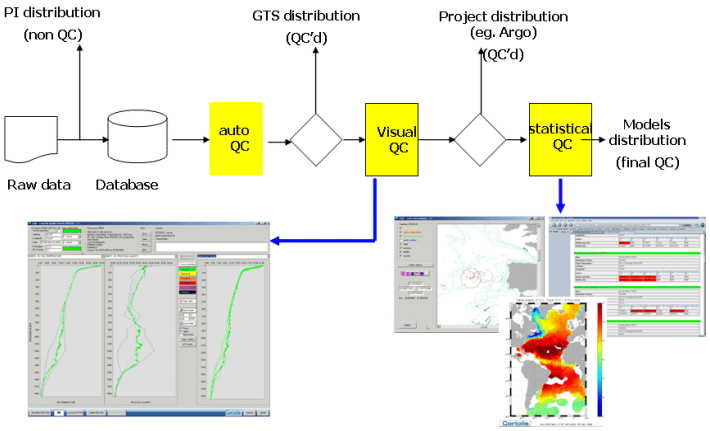
This new autonomous oceanographic profiling float has the same main characteristics and metrology than Provor.Lighter, cheaper, it is devoted to temperature and salinity measurements for Argo applications.

Its design has been performed by IFREMER and it is manufactured by NKE.
Arvor float can perform more than 200 cycles from 2000 meters depth to the surface (CTD pump in continuous mode).

It is deployable by only one person, with wireless connectivity using Bluetooth.
Two Arvor floats were deployed in February 2009 are now operating between Kerguelen island and Antarctica.
(graphics from Fabien Roquet, MNHM)

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.



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.

Data issued for delayed QC

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

Delayed mode data sent to GDACs

An Argo delayed mode profile contains a calibrated salinity profile (psal_adjusted parameter).
A total of 9 903 new delayed mode profiles where sent to GDACs this year.
A total of 41 719 delayed profiles where sent to GDACs since 2005.

Web pages

The web site of the French DAC is available at:

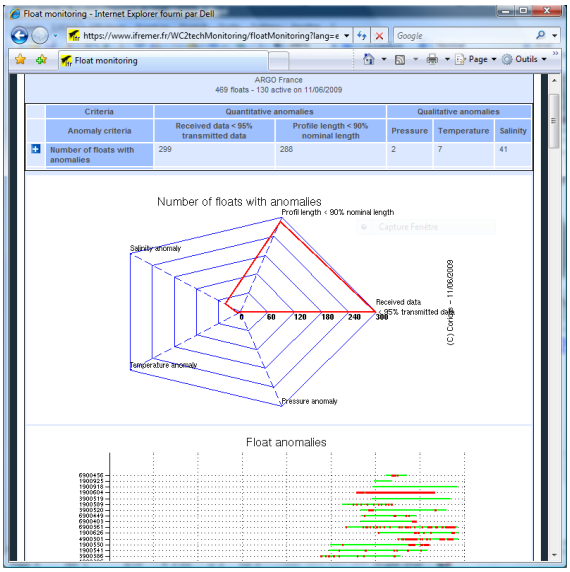
- http://www.coriolis.eu.org/cdc/argo.htm

It provides:

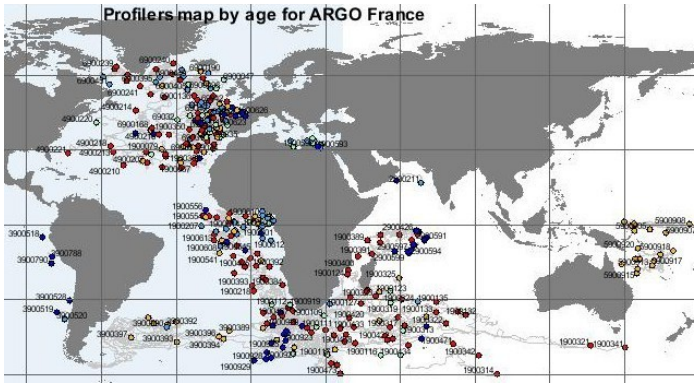
- Individual float description and status (meta-data, geographic map, graphics : section, overlayed, waterfall, t/s charts)
- Individual float data (profiles, trajectories)
- FTP access
- Data selection tool
- Global geographic maps, GoogleEarth maps
- Weekly North Atlantic analyses (combines Argo data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

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

- http://www.coriolis.eu.org/cdc/coriolis_floats_monitoring.htm



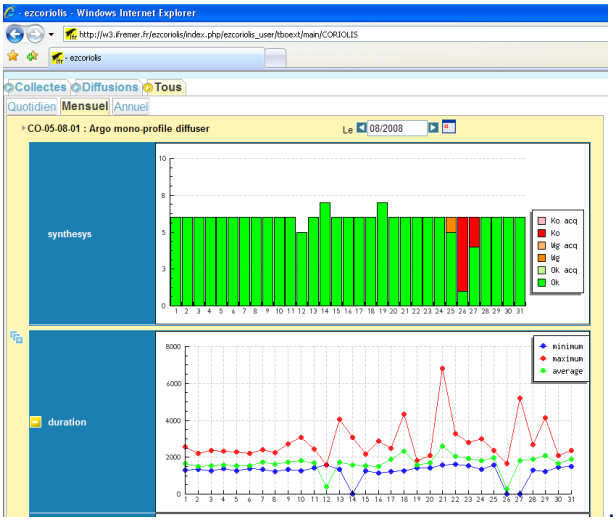
Example 1: technical monitoring of Argo-France floats



Exemple 2: age map of Argo-France floats.

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

Example 1: distribution activity on Tuesday 27th of May. An operator has to perform a diagnostic on an anomaly of Argo profile distribution (red smiley).



Exemple 2: data distribution to GDAC activity in August 2008. On August 26th, a severe capacity problem on a computer server delayed the data distribution. The problem started on August 26th at 07:40. It was fixed on August 27th at 11:39. However, despite of this problem, data files could be distributed (see first chart, no day is entirely red).

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

Operational oceanography models; all floats data are distributed to:

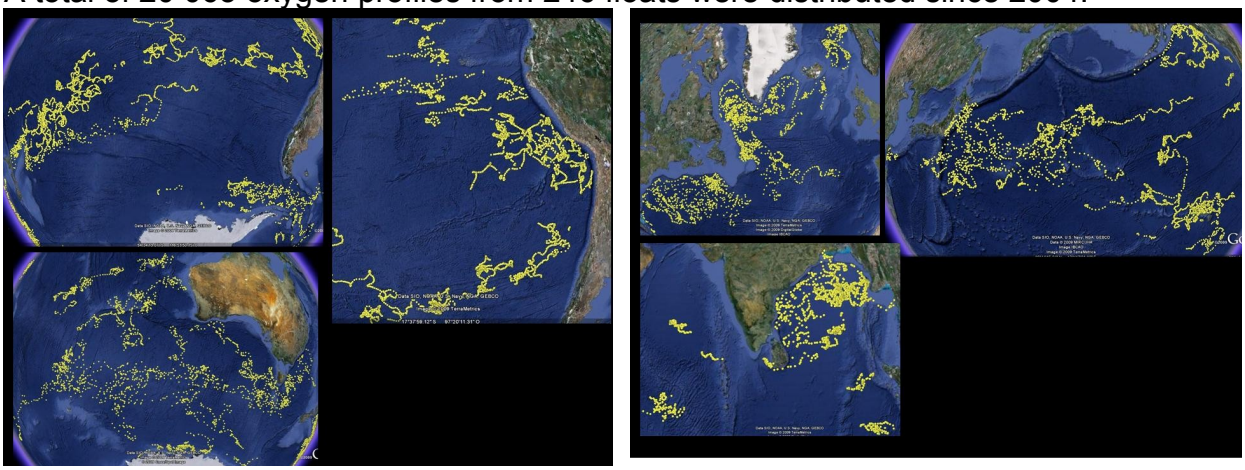
- French model Mercator (global operational model)
- French model Previmer (regional operational)
- French model Soap (navy operational model)
- EU MyOcean models (Foam, Topaz, Moon, Noos)
- EuroGoos projects

Argo projects: this year, Coriolis data centre performed float data management for 27 Argo scientific projects managed by 35 PIs (principal investigators).
List of involved Pis this year:

Michel ARHAN	Pierre-Marie POULAIN
Nicolas BARRE	Louis PRIEUR
Olaf BOEBBEL	Christian PROVOST
Bernard BOURLES	Detlef QUADFASEL
Christine COATANOAN	Gilles Reverdin
Thierry DELCROIX	Fabien ROQUET
Gérard ELDIN	Jens SCHIMANSKI
Juergen FISCHER	Sunke Schmidtko
Yves GOURIOU	Alain SERPETTE
Christoph Kihm	Sabrina SPEICH
Olaf KLATT	Andreas STERL
Birgit Klein	Einar SVENDSEN
Birgit KLEIN	Isabelle TAUPIER-LEPAGE
Jens MEINCKE	Virginie THIERRY
Yves MOREL	Virgine THIERRY
Gregorio PARRILLA	Osvaldo ULLOA
Jose-Luis PELEGRI	Jérôme VIALARD
Antoine POTEAU	

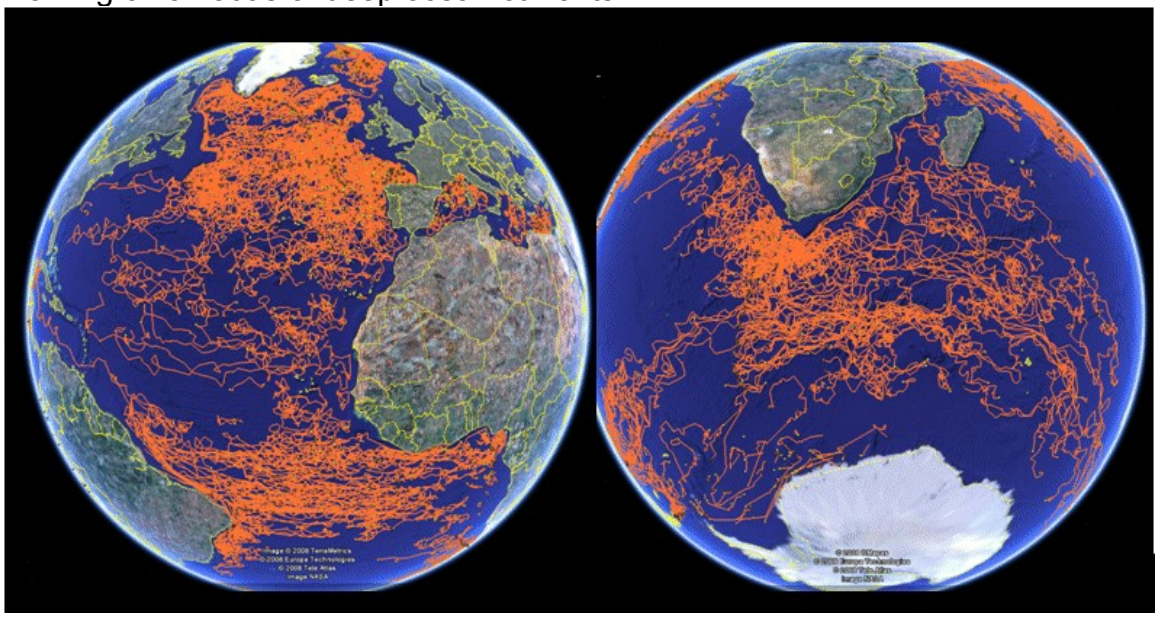
Products generated from Argo data …

Distribution of Argo oxygen observations to EU CarboOcean project.
Once a week, all Argo floats data with oxygen observations are distributed to the German data centre Pangea using the OAI inter-operability protocol (Open Archive Initiative).
This year, 6 117 new oxygen profiles from 176 floats were distributed.
A total of 20 063 oxygen profiles from 246 floats were distributed since 2004.



Oxygen profiles collected by all Argo partners since 2004 (yellow dots).

Sub-surface currents Atlas
Based on Coriolis trajectory data, Michel Ollitrault and the Coriolis team are working on an atlas of deep ocean currents.



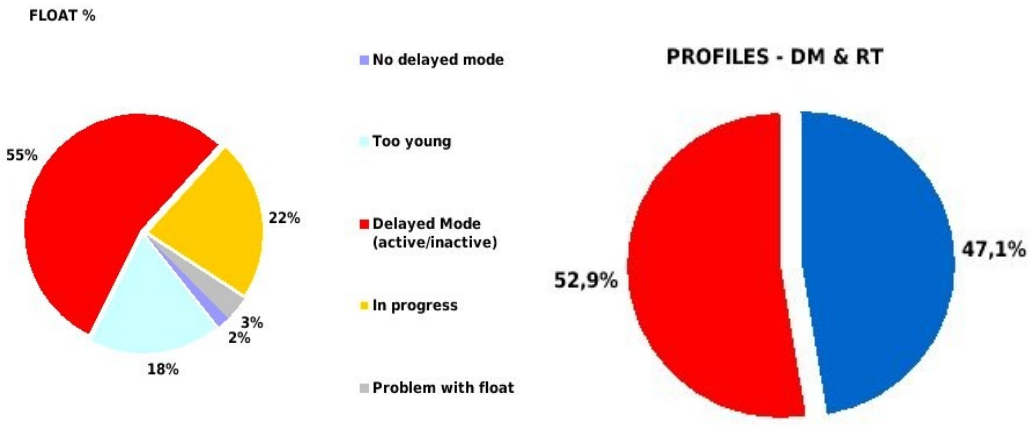
Argo trajectories from Coriolis DAC are carefully scrutinized to produce an atlas of deep ocean currents.

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 .)

Coriolis data centre, the floats have been deployed from some projects, meaning a lot of PIs. For some of them, the Coriolis data centre acts as a support to run the OW method and provide results, then waiting for the PI's decisions about the correction. In many cases, the unavailability of the PIs leads to work by intermittence and then extend the period of work on the floats. For a few projects, there are no identified operators to do DMQC, for instance the first run has been done by students which have now left institutes. Nevertheless we have made progress and some floats have been processed in DMQC or are in progress (we are finalizing delayed mode QC for some floats). Only a few projects are still waiting for PI's answers.

During the last year, 9 903 new delayed mode profiles where produced and validated by PIs.
A total of 41 719 delayed mode profiles where produced and validated since 2005.



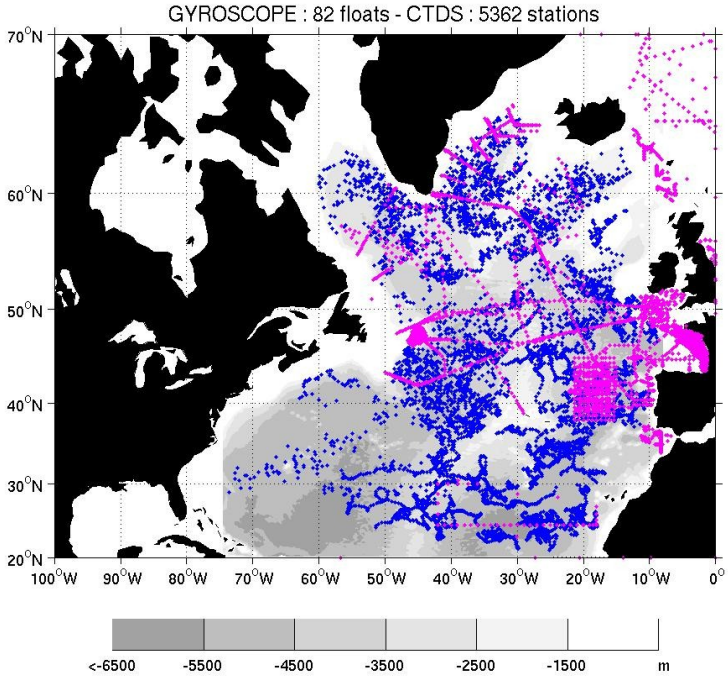
Status of the floats processed by Coriolis DAC. Left: in terms of float percent and right: in terms of profile percent (DM : delayed mode – RT : real time).

Table with % of floats processed in delayed mode and sorted by projects.
The % of the projects can take into account the young floats, which have been launched recently, then explaining not 100% for a few of them. For the others, the missing delayed mode profiles can be explained by no DM process on the floats, problem with the floats (not enough CTD data in specific area like Antarctic or problem with the profiles).

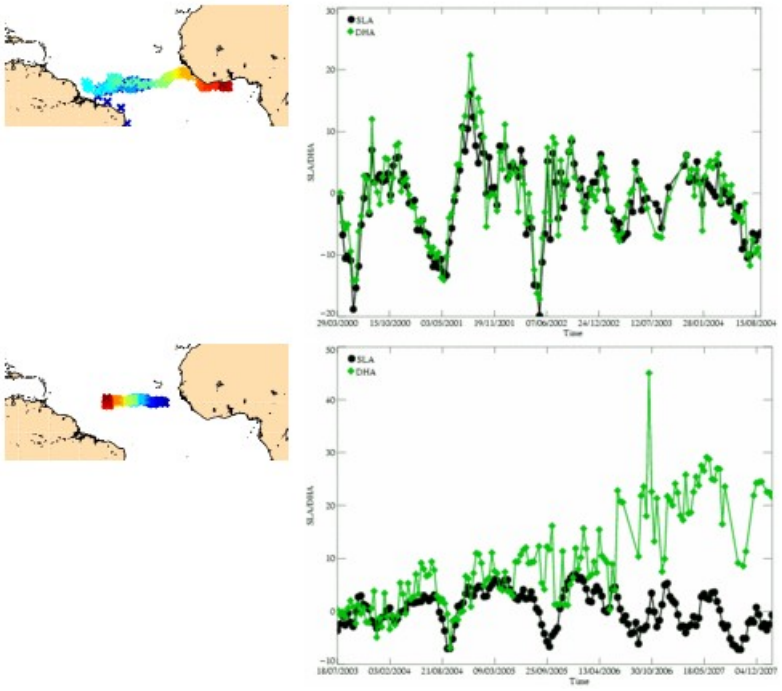
Project	% DMQC
Gyroscope	88,10
Coriolis	61,29
Argo AWI	81,97
Goodhope	56,06
Flostral	100,00
SHOM-ETOBB	84,21
Drake	40,00
Argo Spain	0,00
Cirène	0,00
IFM Geomar	74,36
Coriolis EGEE	58,62
EGYPT	0,00
CONGAS	34,21
FRONTALIS	0,00
BSH (Birgit Klein)	100,00
Argo Chile	0,00
Argo Costa Rica	0,00
Argo Greenland	100,00
Argo Mexico	100,00
Argo Norway	72,73
China argo project	100,00
Dutch Argo Program	100,00
FLOPS	13,33
IFM 2	100,00
Meridian Goodhope	100,00
MFSTEP	0,00
OVIDE	72,73
POMME	73,68
sfb460	100,00
Tropat	100,00
Weccon	96,00
WEN	32,00
Clivar Marine German Program	73,33
Circulation and Climate of the Indian Ocean	80,00

Gyroscope reprocessing

Since the Gyroscope project is finished and that the profiles have been processed with the previous method (BS), we have started a new study for the delayed mode quality control on those floats. The first step has been to check if all metadata and technical data were recorded for all the floats. In a second step, an analysis of the behaviour of those floats has been done in details comparing with the water masses circulation in the North Atlantic Ocean. After specific studies done on the pressure values, the OW method will be run on all those floats to provide new delayed mode files for this project in a few months.



Example of delayed mode activity
A comparison between Argo float observations with SLA and DHA (SLA, Sea Level Anomalies; DHA, Dynamic Height Anomalies) is now used on a routine mode, performed 4 times a year.



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 centers reporting to you
Currently, 10 national DACs submit regularly data to the French GDAC.

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

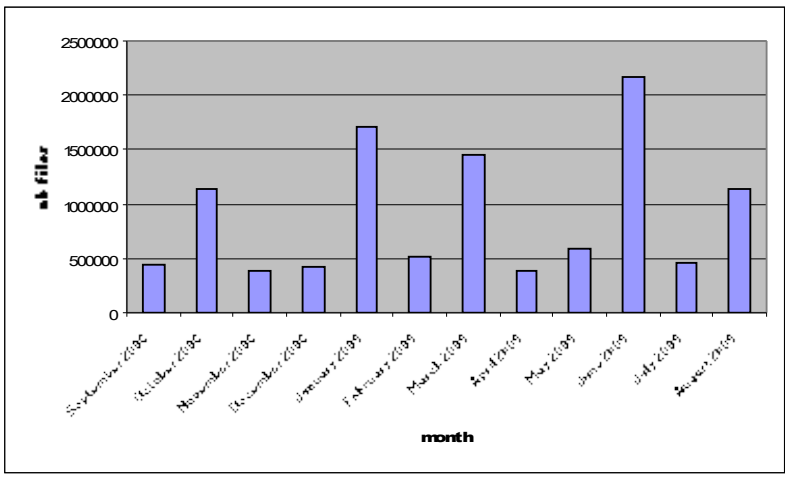
On September 20th, the following files were available from the GDAC FTP site.

DAC	Meta-data files	Profile files	Delayed mode profile files	Trajectory files
AOML	2 814	244 403	116 391	2 731
BODC	261	19 489	4 492	244
Coriolis	897	68 417	31 816	891
CSIO	46	2 090	1 860	43
CSIRO	213	17 255	8 447	208
INCOIS	168	17 162	8 720	148
JMA	786	73 290	39 827	769
KMA	99	7 483	2 138	92
KORDI	110	7 350	0	110
MEDS	242	19 330	12 502	237
Total	5 636	476 269	226 193	5 473

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

Month	Nb pages
September 2008	433020
October 2008	1145716
November 2008	385346
December 2008	422312
January 2009	1718166
February 2009	506143
March 2009	1448377
April 2009	388462
May 2009	597277
June 2009	2168066
July 2009	453717
August 2009	1144029
Total	10 810 631



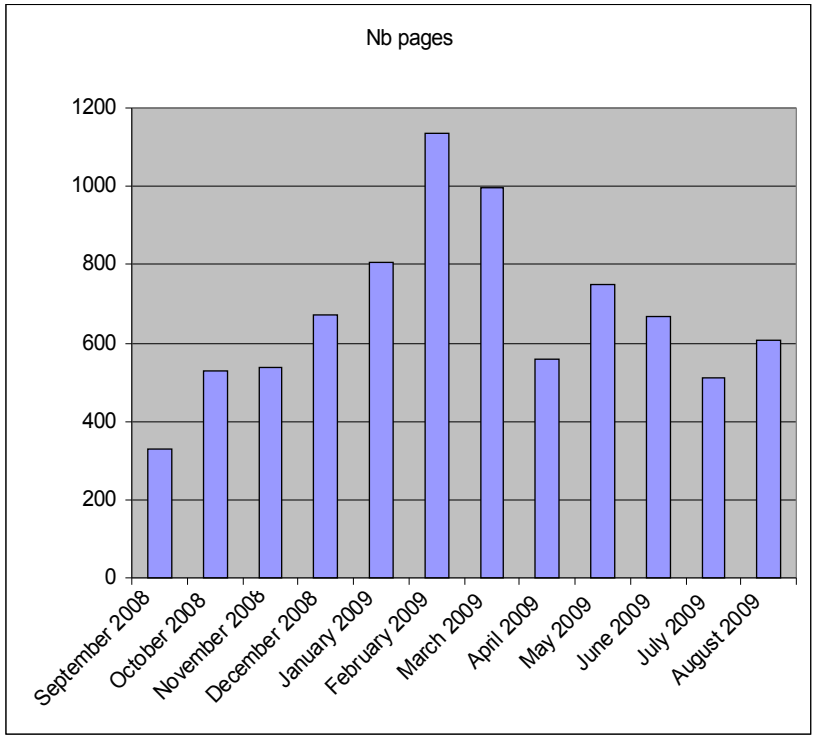
FTP server activity, number of downloaded files

Operations of the www server

The web server address is: http://www.coriolis.eu.org/cdc/argo.htm

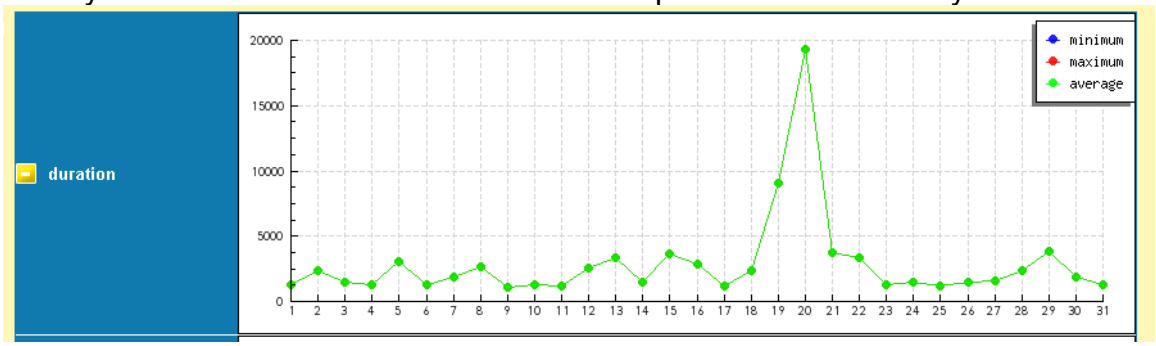
Month	Nb pages
September 2008	331
October 2008	529
November 2008	538
December 2008	671
January 2009	806
February 2009	1137
March 2009	996
April 2009	561
May 2009	749
June 2009	669
July 2009	510
August 2009	606
Total	8 103

Web server activity, number of downloaded files



Data synchronization

The synchronization with US-Godae server is performed once a day.

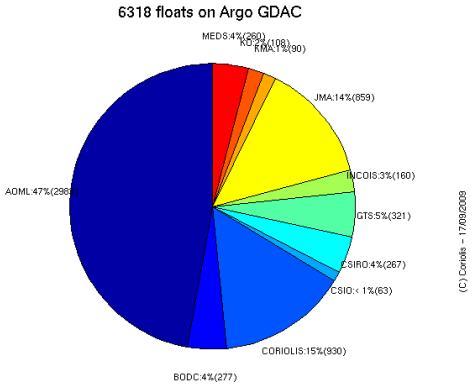


Example of synchronization monitoring : duration of the process in May 2009

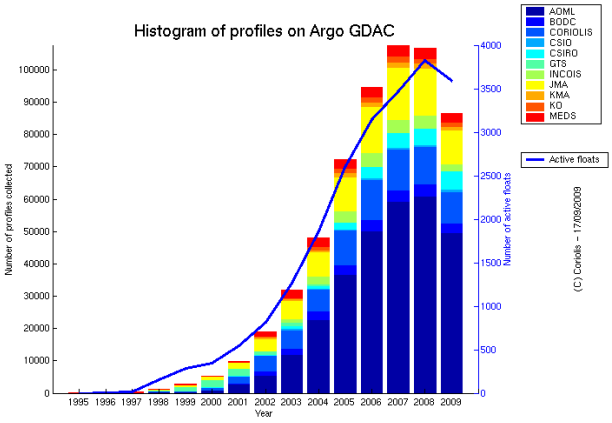
Grey list

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 grey list holds 1060 entries (21st September 2009).

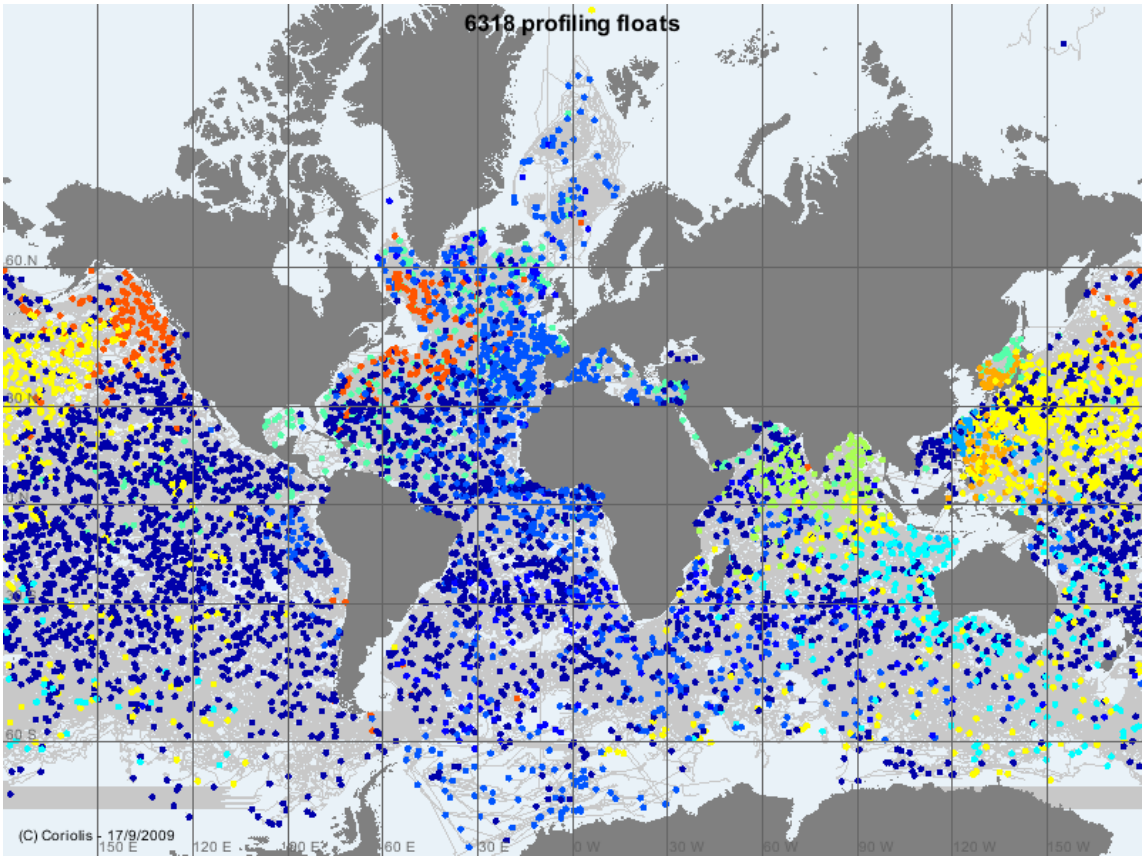
Statistics of Argo data usage : Ftp and WWW access, characterization of users (countries, field of interest : operational models, scientific applications) …



Argo GDAC : floats distribution per DAC in September 2009

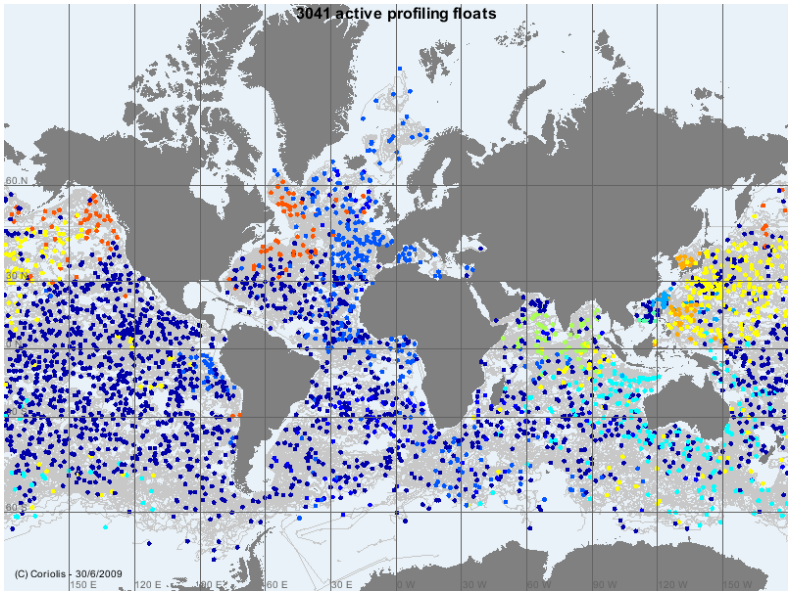


Argo GDAC : profiles distribution per DAC in September 2009[1]



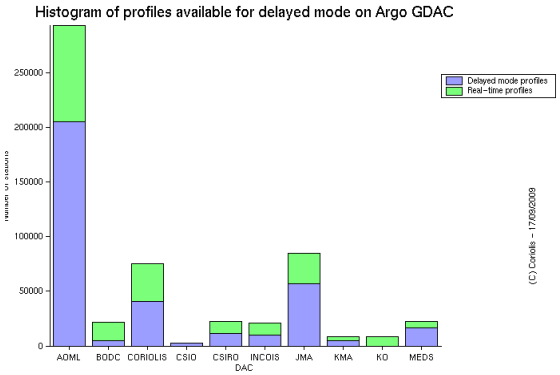
Argo floats available from GDAC in September 2009
(This map includes active and old floats)

[1] Warning : the blue line displays the total number of active floats during a year. This total is different than the floats active at a particular day.

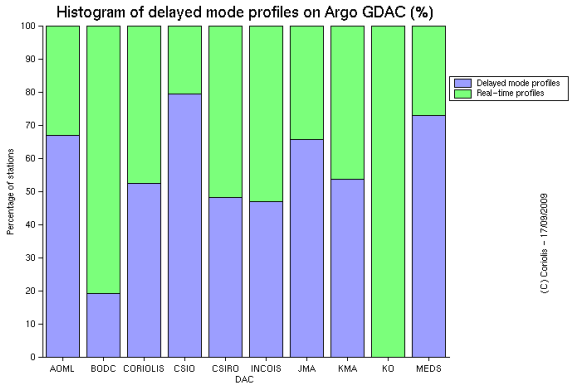


Active Argo profiling floats availables from GDAC in June 2009

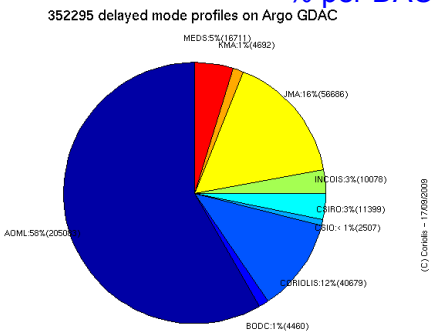
Argo GDAC : delayed-mode profiles available for delayed-mode in September 2009



Argo GDAC : delayed-mode profiles distribution per DAC in September 2009



Argo GDAC : delayed-mode profiles distribution % per DAC in September 2009



Argo profiling floats with delayed-mode profiles available from GDAC in October 2009

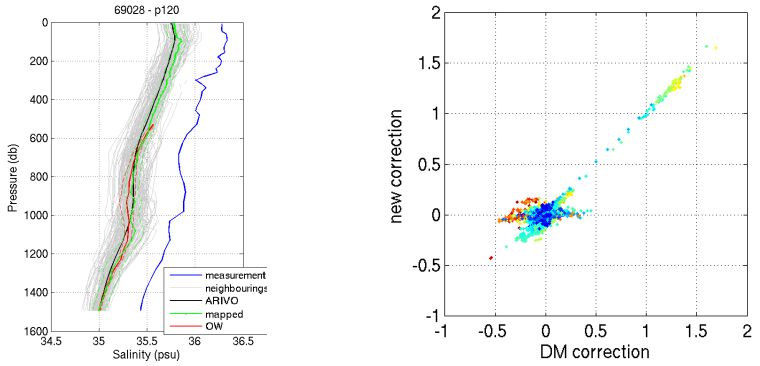
Regional Centre Functions

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

Coriolis is involved in the North Atlantic Argo regional centre. This activity is managed within the European project Euro-Argo.

This activity involves a regular monitoring of the consistency of the quality of data from various types of floats, with techniques such as objective analyses, comparison between floats and altimetry.

A new method is under study for floats salinity inter-comparison. Based on Owen & Wong method, it uses the observations of different floats in an area. This technique may prove useful in area with few CTDs available and to have a delayed mode adjustment with observations more closely related in time.



A comparison between real-time, delayed-mode and "newly" adjusted salinity profiles was performed on 200 north Atlantic floats (17 000 profiles)

CLS Argo Data Management Report 2009

Yann Bernard (CLS)

CLS 8-10 Rue Hermès - Parc Technologique du Canal - 31520 Ramonville St-Agne - FRANCE

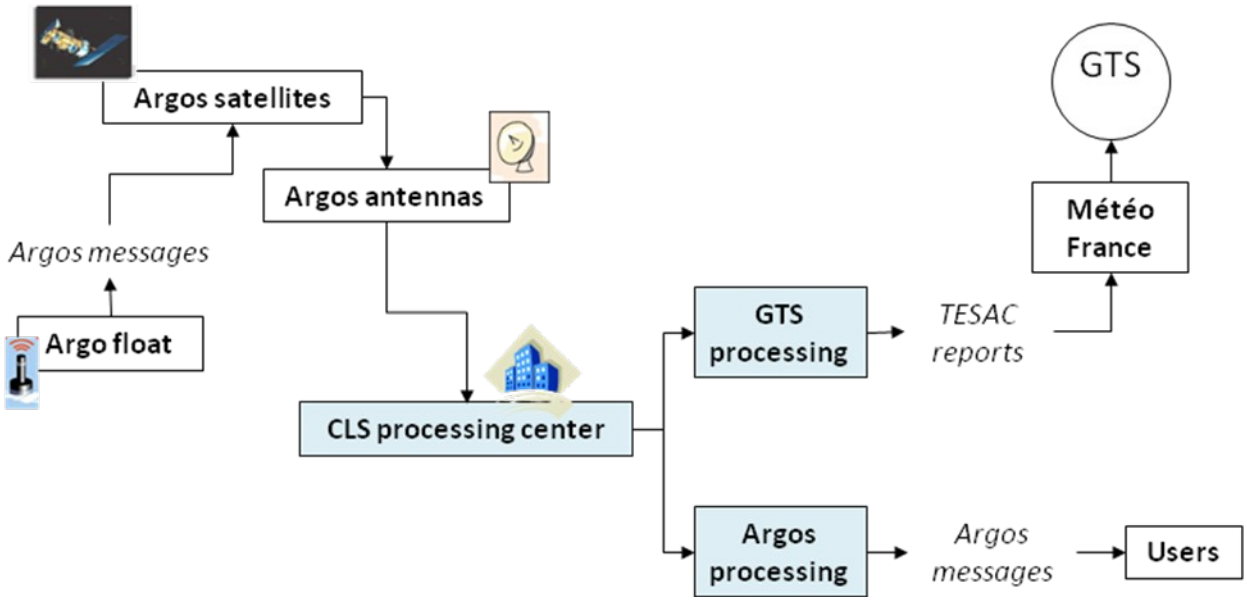
Telephone 05 61 39 47 00 Fax 05 61 75 10 14

1. CONTEXT

The CLS Company, responsible of Argos system, has a DAC (Data Assembly Center) function for Argo programs which do not have real time processing capabilities. This operational (24h/24h on 365 days/year) data processing is a free added value Argos service. Argo data are processed by CLS for GTS distribution both in CLS France and CLS America Incorporation.

CLS America is processing all the U.S. Argo floats (approximately 1,800), these includes 78 Iridium floats. CLS America converts the Argos raw data into a "phy" format (defined by NOAA/AOML) and inserts these files in real-time into the Argo server in CLS America computing center. That server is "operated" by AOML and "hosted" by CLS America. The approved Argo QC is performed on the server and then GTS bulletins are created and sent via ftp to the NWS (National Weather Service) gateway for dissemination onto the GTS. The details of U.S. floats monitoring are presented in the Argo National Data Management Report of United States provided by AOML.

In CLS (France) data processed by CLS GTS subsystem are sent via ftp to Meteo-France (Toulouse) in TESAC bulletins and then Meteo-France put them on the GTS (Global Telecommunication System). The synoptic below summarizes the Argo data flow since their transmission by the float until their dissemination on the GTS.



2. STATUS OF THE CLS DAC IN SEPTEMBER 2009

- **Data acquired from floats :**
  - 183 floats were declared in the CLS GTS database
  - 137 instruments were active in this month
  - 137 were disseminated profiles on GTS
  - 432 profiles from CLS were sent on GTS in August 2009

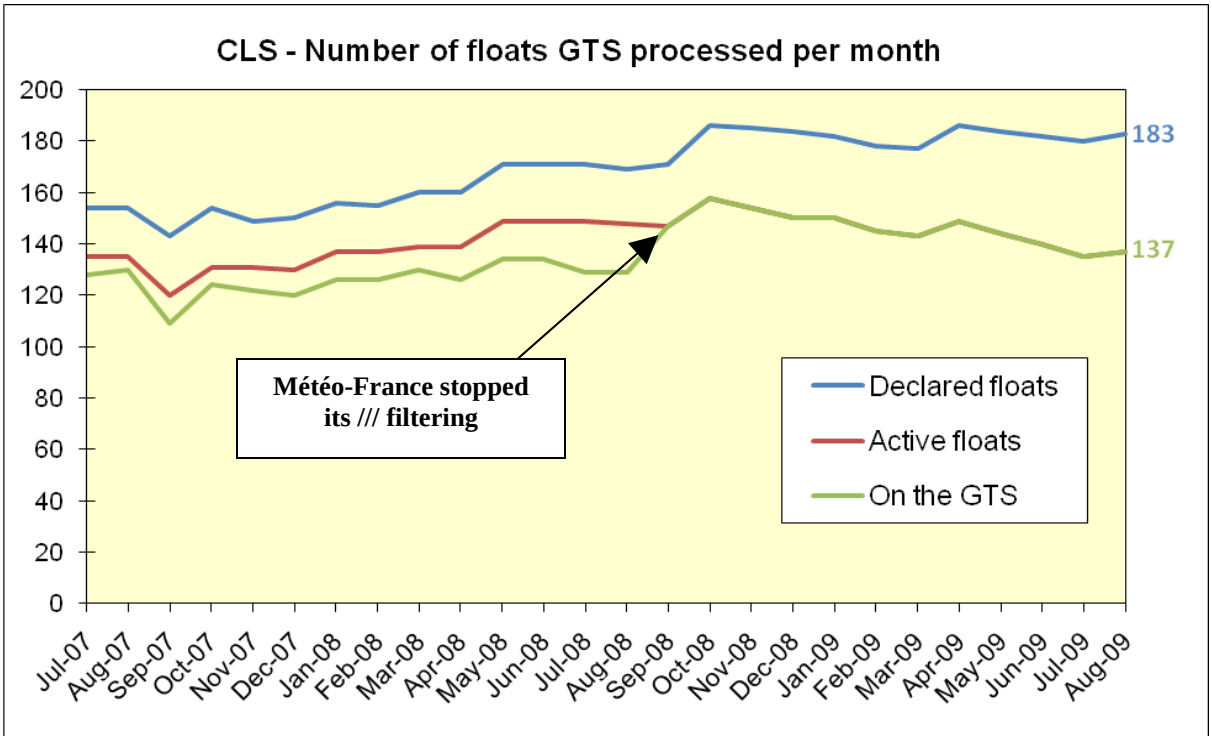
- **Description of the** 183 **floats :** CLS processed in real time floats for Argo program which are not hosted by a national DAC:
  - 90 INCOIS floats,
  - 54 KORDI floats,
  - 38 Argo China floats,
  - 1 Argo Russia floats.

All these floats are Webb Apex Research floats with 17 different data formats.

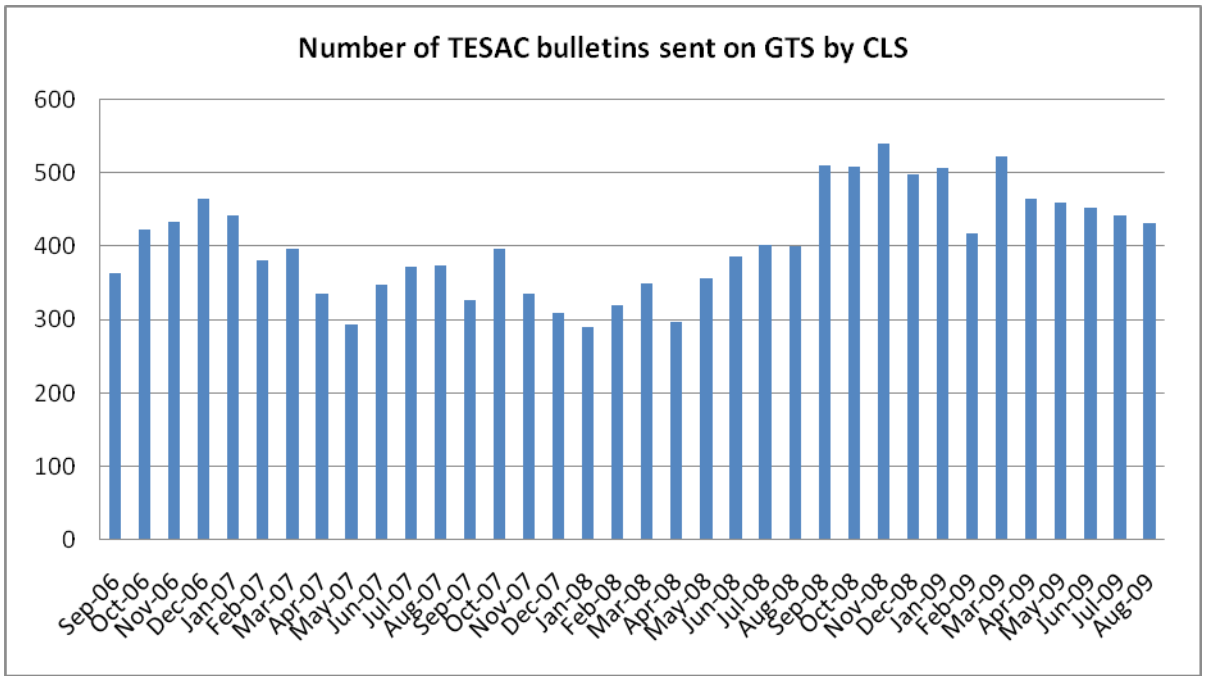
- **Data issued to GTS:** All data processed by CLS are distributed on the GTS by way of Meteo-France. This operation is automatically performed and TESAC bulletins are sent to Meteo-France every 2 minutes. Before the encoding in TESAC bulletins, Argo data are filtered by Argo QC procedure. The GTS processing at CLS is operational and in backup with the CLS America (in Largo, Washington) processing center 365 days per year, 24 hours a day.
  - 5766 profiles were relayed onto GTS between September 2008 and August 2009 (source: Météo-France)
  - 100% of TESAC produced by CLS are on the GTS (no more filtering by 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 CLS GTS data base at each beginning of month with a list (table 10: “Floats to be set up for GTS”) provided by JCOMMOPS (M. Belbeoch) in 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.
- In a monthly meeting between CLS and JCOMMOPS, all Argo requests are discussed and applied as soon as possible.



Status of CLS Argo GTS processing

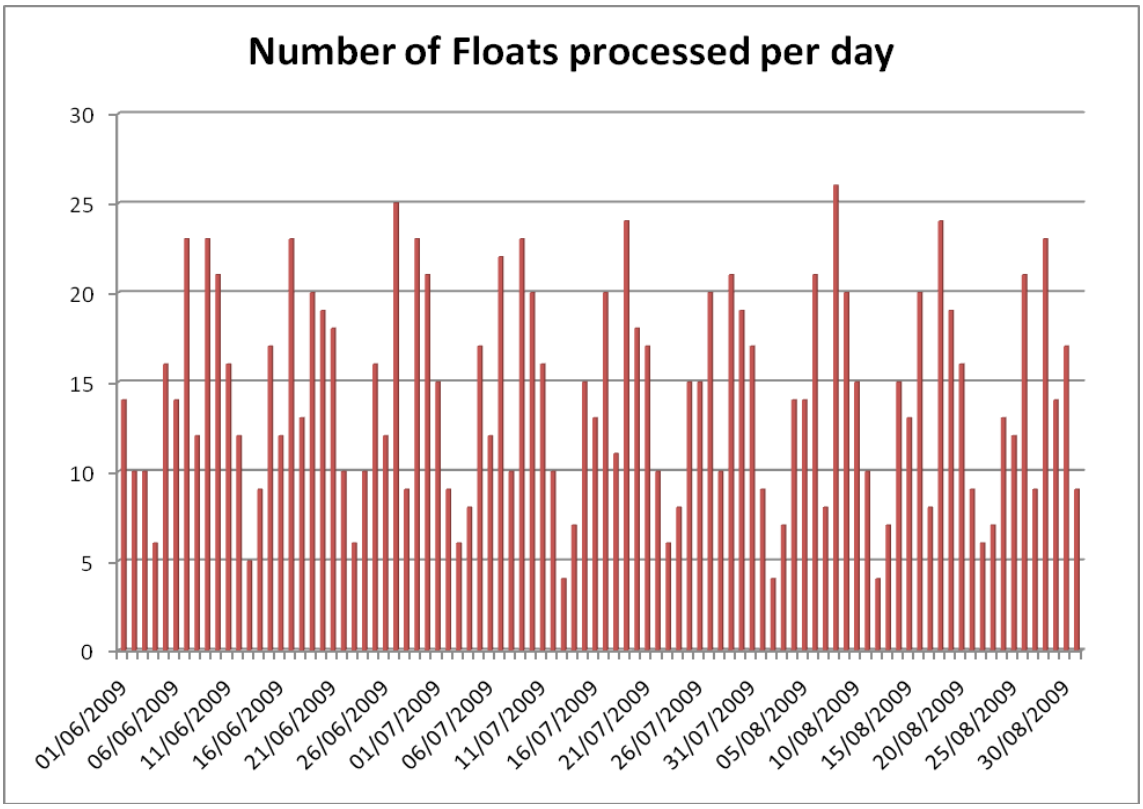


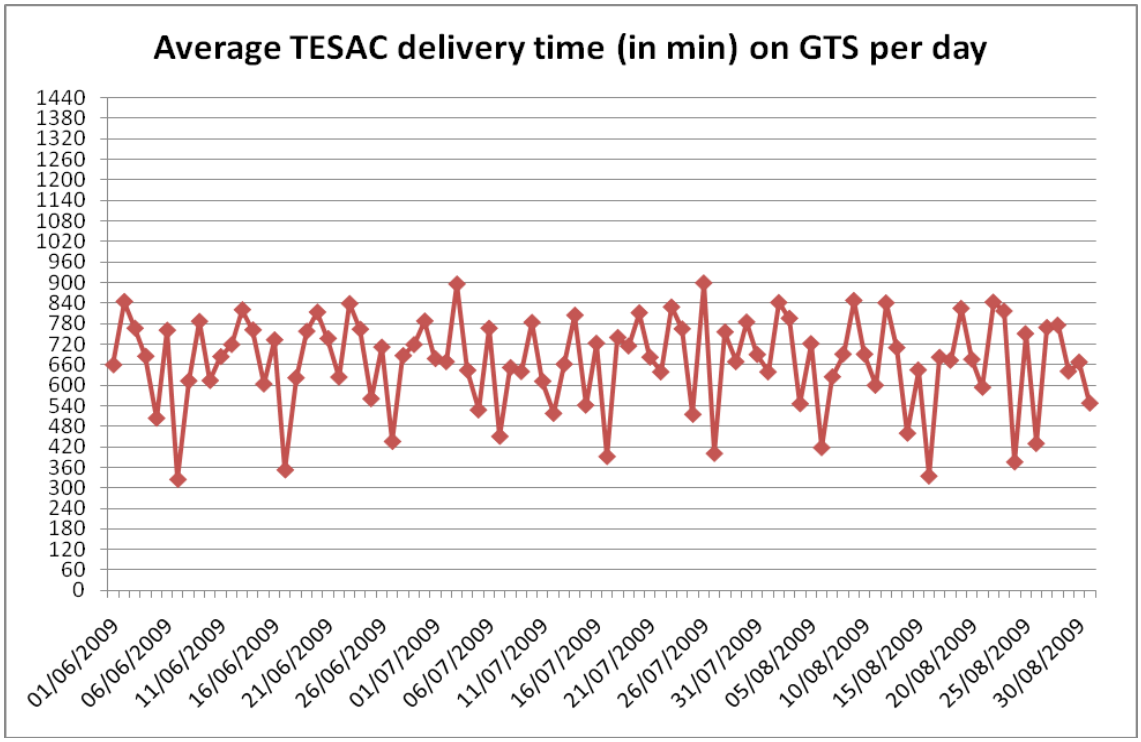
Number of profiles sent on the GTS by CLS per month

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

- **BUFR format**: BUFR bulletins are producing in addition of TESAC bulletins for all floats GTS processed by CLS.

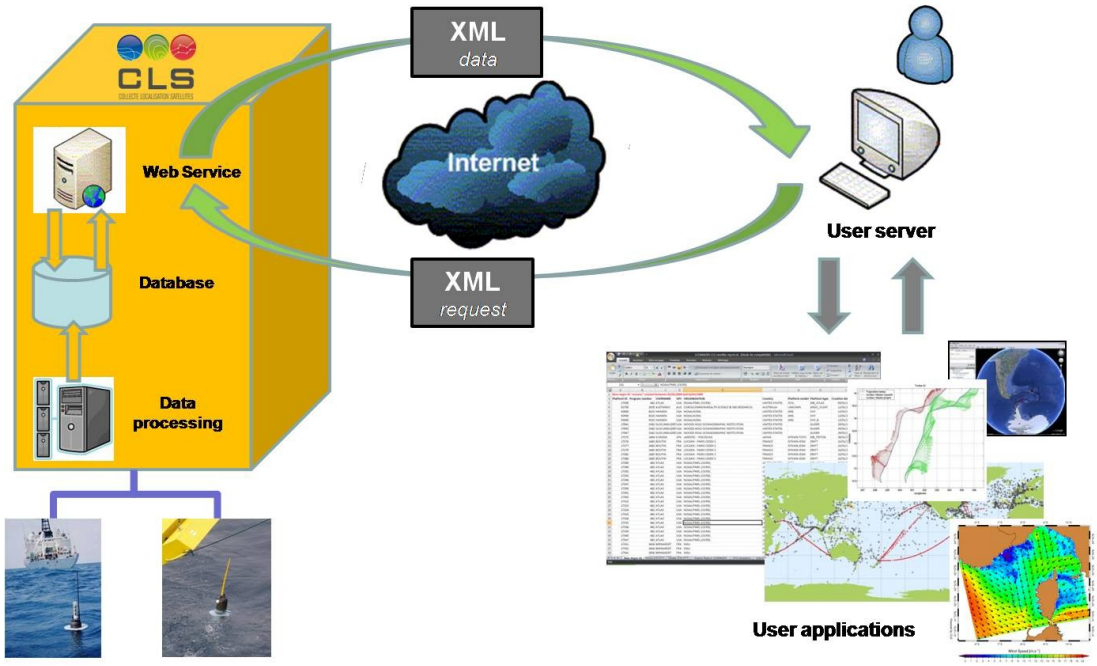
- **Time of delivery on GTS**: A monitoring delay tool, specified with JCOMMOPS is operational since September 2008 at CLS. The average time of TESAC delivery on GTS is less than 6 hours. This time is computed with date/time of observation and the date/time of bulletin sending to Météo France. It depends of the float model and especially of the number of different Argos messages necessary to build the profile (= number of points in the profile). See below statistics on last three months.


Number of Floats processed per day
30
25
20
15
10
5
0
01/06/2009
06/06/2009
11/06/2009
16/06/2009
21/06/2009
26/06/2009
01/07/2009
06/07/2009
11/07/2009
16/07/2009
21/07/2009
26/07/2009
31/07/2009
05/08/2009
10/08/2009
15/08/2009
20/08/2009
25/08/2009
30/08/2009


Average TESAC delivery time (in min) on GTS per day
1440
1380
1320
1260
1200
1140
1080
1020
960
900
840
780
720
660
600
540
480
420
360
300
240
180
120
60
0
01/06/2009
06/06/2009
11/06/2009
16/06/2009
21/06/2009
26/06/2009
01/07/2009
06/07/2009
11/07/2009
16/07/2009
21/07/2009
26/07/2009
31/07/2009
05/08/2009
10/08/2009
15/08/2009
20/08/2009
25/08/2009
30/08/2009

3. NEW PROJECTS AT CLS FOR ARGO PROGRAM

- **Argos Web Service:** a new distribution via Internet tool is under development at CLS. This web service will allow Argos users to made requests on CLS database to extract Argos data in a new XML format. (Number of days available & costs of this service will be defined soon).



- **Argos-3 on Argo floats**: CLS is currently providing its support to all floats manufacturers on Argos-3 technology integration. First prototypes will be available for evaluation at the beginning of 2010.

GERMAN ARGO PROGRAMME

PRESENT STATUS AND FUTURE PLANS

B. Klein, BSH
September 03, 2009

1. Background and organization of German Argo activities

The German Argo programme has been initialised as a partnership between three oceanographic institutions (AWI, BSH, IfM-Geomar) in Germany in 2004 and was funded by the Ministry of Research until the end of 2007. German Argo is an operational programme since the beginning of 2008 and the Ministry of Transportation is providing long-term funding for German Argo. BSH will manage the German contribution to the international programme. An expert group consisting of the BSH and partners from the oceanographic institutes has been establish to coordinate the German deployment plans.

Deployment of profiling floats started as early as 1998 within several research projects. All pre-Argo floats were declared Argo-equivalent floats and the respective data sets have been submitted to the GDACs through Coriolis. Floats deployed by IfM-Hamburg in the context of the Mersea and WEN projects have also been made available for the Argo programme.

The BSH and KDM (a consortium of German research institutes) are participants in the Euro-Argo project. Euro-Argo will aim at promoting an European contribution to Argo and establish an European structure from the various national programmes (to be defined in the Euro-Argo PP) after 2011.

1.1 Deployed floats

Since 1998, more than 320 floats have been deployed by Germany in a number of different geographic areas and programmes (ARGO_AWI, ARGO_Greenland, BSH, Clivar Marine German Programme, IFM2, IFM_GEOMAR, SFB460, TROPAT, WECCON, WEN). Deployments have focused on meeting specific German research requirements, but contributed also to the global array. The German contribution is comparable to that from other developed countries and has provided a significant contribution to the growing Argo array.

They main interest of Germany will remain in the Atlantic, but in to maintain the global array floats could also be deployed in the other oceans if necessary. Recent deployments reflect the specific research interests and range from the Nordic Seas, the subpolar North Atlantic, the tropical Atlantic to the Atlantic sector of the southern Ocean.

Year	Deployed floats
2000	27
2001	21
2002	14
2003	27

2004	45
2005	65
2006	36
2007	39
2008	72
2009	~37*

Floats deployed by Germany as a contribution to Argo since 2000. *Float deployments in 2009 are delayed due to the repair backlog for the Seabird CTDs. The total amount of floats to be deployed in 2009 depends on the clearance of this backlog.

A larger fraction of floats purchased and deployed in 2008 suffers from the microleak problem in the pressure sensor. About a third (16 floats) of the floats purchased in 2008 shows pressure drift. These floats will need a more rigorous delayed-mode processing and will probably malfunction and die prematurely. 2 Floats with extreme leaks have already died.

1.2 Float Development

Germany has mostly used APEX floats purchased from Webb Research in the past, but a smaller amount of floats are manufactured by the German company Optimare or are French Provor floats. Optimare has developed a float type suitable for partially ice covered seas in close colaboration with the AWI. These floats are equipped with an ice sensing algorithm which prevents the float from ascending to the surface under ice conditions and prevents it from being crushed. Float profiles are stored internally until they can be transmitted during ice free conditions. The ice sensing algorithm has been successfully tested in the Antarctic, in 2009 test are being performed in the Arctic also.

Most of the German floats are equipped with the standard Seabird CTD but occasionally additional sensors as Aanderaa optodes and Rafos acoustic receivers are installed.

1.3 Data management

Real-time data processing. 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. The German company Optimare provides processed data for the Nemo floats to Coriolis.

Delayed-mode data processing. The delayed mode processing is distributed between the various German institutions contributing to Argo, depending on their area of expertise. AWI is responsible for the southern Ocean, IfM-Hamburg is processing the German floats in the Nordic Sea, IfM-Geomar is covering the tropical and subtropical Atlantic and BSH is responsible for subpolar Atlantic. The sharing of delayed-mode data processing will be continued in the coming years, but BSH will cover all the German floats which have not been assigned a PI. BSH also has adopted some European floats which did not have a DMQC operator assigned to them. All German institutions have been working in close collaboration with Coriolis and delayed mode data have been provided on a 6 monthly basis. Delays in delayed-mode data processing have occurred occasionally due to changes in personal and delay in data transmission in the Southern Ocean due to ice coverage. Delayed-mode data processing follows the rules set up by the Data Management Team.

North Atlantic Argo Regional Centre (NA-ARC). Germany has contributed to the activities of the NA-ARC. Work has concentrated on acquiring recent CTD data to improve the reference data set for the North Atlantic Ocean needed for scientific QC of the float data and setting up the delayed mode processing in the different institutes.

1.4. Operational and scientific use of Argo data

A key aspect of the German Argo programme is to develop a data base for climate analysis from Argo data, to provide operational products (time series, climate indices) for interpretation of local changes and to provide data for research applications. German Argo will host an annual user workshop where research applications can be presented and requests for operational products can be specified.

Ocean science: 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 (assimilations, boundary conditions,…).

2. Funding

2.1 Existing funding for German Argo

As noted above the German Argo Project has been funded by the Ministry of Research from 2004-2007 and will be funded by the Ministry of Transportation from 2008 onwards. Funding in 2007 was meant to ensure a smooth transition into the operational phase and covered only personnel costs. Overall the level of support is indicated in the table below. Approximately 50 floats per year will be contributed to the global array by Germany. Funding from the Ministry of Transportation covers only costs related to float procurement and transmission costs, personnel will be provided by BSH. This will consist of 1 scientist and 1 technician.

Year	Float related costs	Manmonth/Year
2007	0k€	36
2008	550k€	24
2009	600k€	24
2010	600k€	24
2011	600k€	24
2012	600k€	24
2013	650k€	24

Table 3. Previous and future funding for German Argo.

2.2 On the future funding and organization for German Argo – links with Euro Argo PP

Germany will to continue contribute to the Argo global array at the level of about 50 floats per year. Requests for financial contribution have been included in the national budgets for 2009-2013. The allocation of funds for the next 5year period will be lined up for agreement in 2010. As part of the Euro-Argo preparatory phase, BSH will work with its funding ministry to agree on a long-term European structure.

3. Summary of deployment plans for 2009

The original float deployment plans for 2009 are presented below. The main goal is to support the global array in the Atlantic ocean. Due to the recall of faulty CTD sensors the deployments in the Nordic Seas and the Labrador Sea and Subpolar Atlantic were missed.

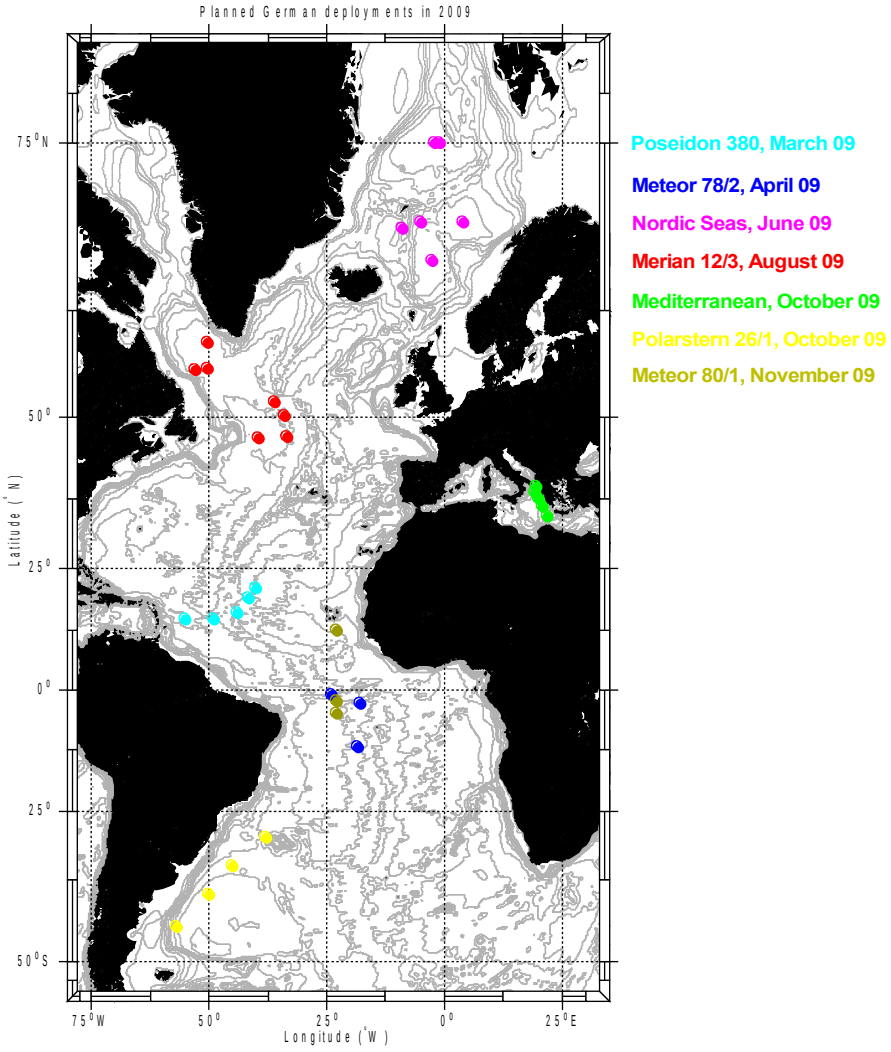


Fig. 1:Preliminary plan for deployment of German floats in 2009. Deployments will start in mid March 2009 earliest. Six more floats (not included in this map) will be deployed in the Weddell Sea at the end of 2010.

The deployment could partly be rescheduled to other ships late in 2009. Only two floats are set up for deployment in the Icelandic Basin with a Norwegian ship, an American ship will deploy the three floats in the Labrador Sea and an Icelandic ship will deploy the floats in the Subpolar Atlantic. A map of the updated deployment plans is given in Fig. 2.

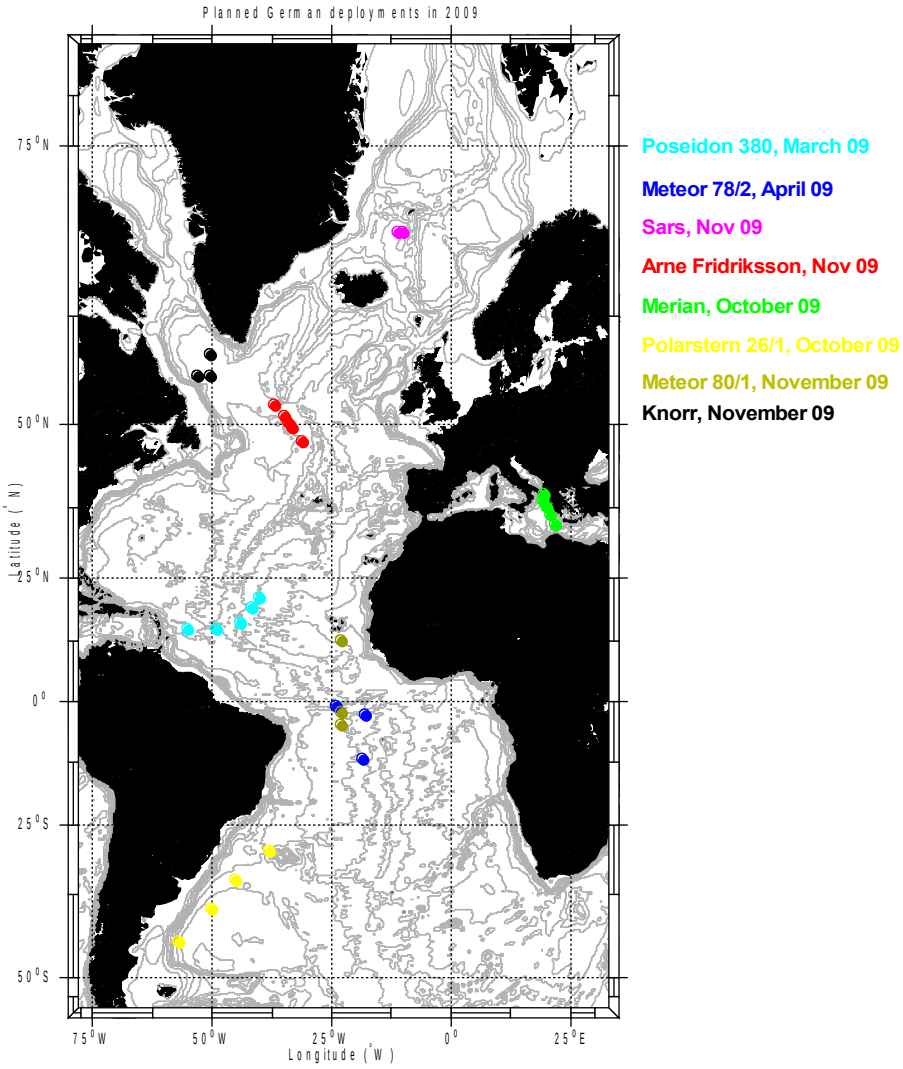


Fig. 2 revised deployment plans for 2009

Major gaps still exist in the tropical South Atlantic and the western North Atlantic. These areas will receive floats in 2010 from the annual budget of 50 floats. The Weddell Gyre which has not been serviced this year will receive 6 floats at the end of 2010. Additional floats will be deployed by the research institutes, the AWI will deploy 20 floats in the Southern Ocean and the IfM-Geomar will 10 floats in the Indian Ocean.

Argo National Data Management Report (2009) – India

1. Status

- **Data acquired from floats**
  India has deployed 7 new floats (2 APF9A, 5 APF9A with near surface temperature mission) in 2009 in the Indian Ocean taking its tally to175 floats so far. Out of these 73 floats are active. All the active floats data are processed and sent to GDAC.

- **Data issued to GTS**
  Presently we do not have GTS access and hence we are not able to send Indian floats data to GTS. Up on our request CLS ARGOS is still continuing to send Indian floats data in TESAC format to GTS.

- **Data issued to GDACs after real-time QC**
  All the active floats (73) data are subject to real time quality control and are being successfully uploaded to GDAC. The support of CSIRO in term of the Real Time S/W is highly acknowledged.

- **Data issued for delayed QC**
  In total 60% of the eligible profiles for DMQC are generated and uploaded to GDAC. Lack of manpower is hindering rapid progress in generating DMQC profiles.

- **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**
  1. A total of **155 trajectory** netcdf files were processed and uploaded to the GDAC. The process of generation of trajectory netcdf files undergoes quality checks like position, time, cycle number, etc., and corresponding quality status is assigned to each parameter. Finally a visual check is performed to verify that there are no missing cycles without cycle numbers and to check the surface time intervals.
  2. **16 (PROVOR) floats** are not eligible for the processing of the trajectory data files in current processing procedure and a new method has to be adopted.

3. **4 floats with oxygen sensors** also require another new procedure to be adopted for processing.

- **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.

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

Page	Hits	Visitors
Argo Web-GIS	2437	1177
Data download	7532	321
Live Access Server	871	327
Argo products	706	266

- **Products generated from Argo data**
  1. Value added products obtained from Argo data are continued. 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. A DVD on "Argo data and products for the Indian Ocean" is released to public for use. This DVD consists of ~ 1,00,000 profiles and products based on the Argo T/S. A GUI is provided for user to have easy access to the data.
  3. Mixed Layer Climatology based purely on Argo observation is generated and made available on INCOIS web site. All the profiles from 2001 – 2008 are used in this process.
  4. Live Access Server is also enhanced to the latest version and all products are converted to NetCDF format and are made available for user. 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. John Gilson's GUI is extensively used at different stages of DMQC. It is appreciated that he extended whole hearted support in setting up the GUI and slight modifications required due to platform change.
- Lack of enough historical background data is hindering the DMQC processing. But majority of the Indian floats are found not to have big drifts in the salinity sensors.
- About 60% of the eligible profiles are subjected to DMQC and the delayed mode profiles are uploaded on to GDAC.

3. GDAC Functions

INCOIS is not operating as a GDAC.

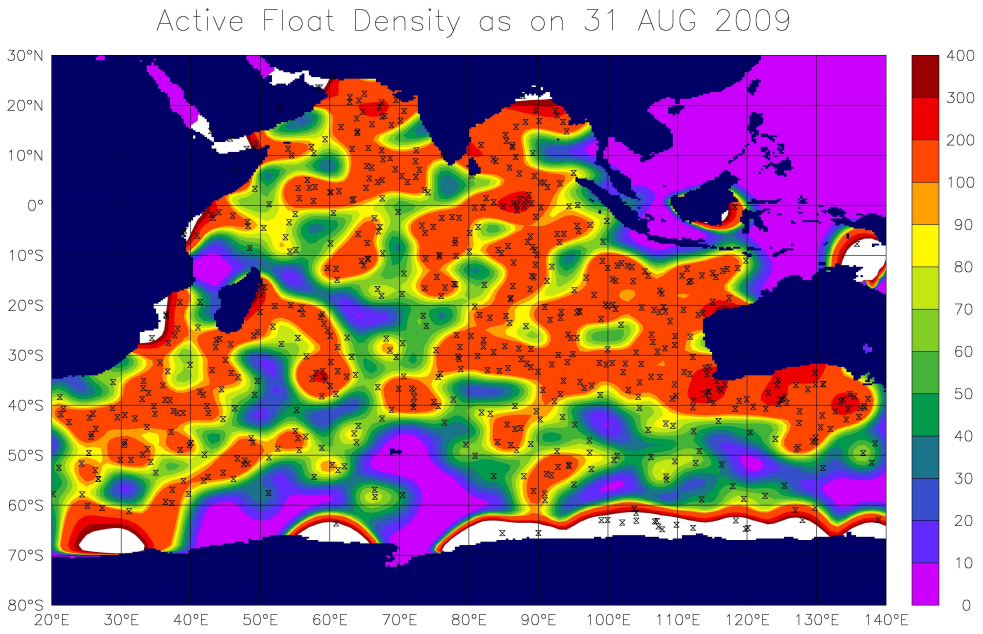
4. Regional Centre Functions

- Acquisition of Argo data from GDAC corresponding to floats other than deployed by India and made them available on INCOIS web site.
- Delayed Mode Quality Control
  (Refer 2.0 above)
- Data from the Indian Ocean regions are gridded into 3x3 box for monthly and 10 days and monthly intervals. These gridded data sets are made available through Live Access Server (LAS). Users can view and download data/images in their desired format.
- Additionally SST from TMI and Wind from Quickscat are made available on daily and monthly basis. SSHA merged product is provided on ten day basis on INCOIS Live Access Server.
- Data Sets (CTD, XBT) 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). This include the following plots:
  - Water fall plots
  - Surface pressure
  - Bottom most pressure
  - Surface temperature
  - Bottom most temperature
  - Surface salinity
  - Bottom most salinity
  - Trajectory of float
  - T/S plots.

  (ii) Spatial plots using the objectively analysed from all the Argo floats data deployed in the Indian Ocean. This includes:
  - Temperature (at 0, 75, 100, 200, 500, 1000 meters)
  - Salinity (at 0, 75, 100, 200, 500, 1000 meters)
  - Geostrophic Currents (at 0, 75, 100, 200, 500, 1000 meters)
  - Mixed Layer Depth, Isothermal Layer Depth
  - Heat Content up to 300 mts
  - Depth of 20 deg and 26 deg isotherms

  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 31 Aug, 2009 is shown below.



References:

1. **Udaya Bhaskar, T.V.S**, S. H. Rahman, I. D. Pavan, **M. Ravichandran**, and S. Nayak, 2009: Comparison of AMSR-E and TMI sea surface temperature with Argo near-surface temperature over the Indian Ocean. International Journal of Remote Sensing, 30, 2669-2684.
2. Chowdary J. S., C. Gnanaseelan, S.P. Xie, 2009: Westward propagation of barrier layer formation in the 2006-07 Rossby wave event over the tropical southwest Indian Ocean. Geophysical Research Letters, 36, L04607.
3. Nisha, K., S. A. Rao, V. V. Gopalakrishna, R. R. Rao, M. S. Girishkumar, T. Pankajakshan, **M. Ravichandran**, S. Rajesh, K. Girish, Z. Johnson, M. Anuradha, S. S. M. Gavaskar, V. Suneel, and S. M. Krishna, 2009: Reduced Near-Surface Thermal Inversions in 2005-06 in the Southeastern Arabian Sea (Lakshadweep Sea). Journal of Physical Oceanography, 39, 1184-1199.
4. Rao A.D., M. Joshi, **M. Ravichandran**, 2009: Observed low-salinity plume off Gulf of Khambhat, India, during post-monsoon period. Geophysical Research Letters, 36, L03605.

Argo National Data Management Report of Japan, 2009

1. Status

Data acquired from floats:

As of September 15th, the Japan DAC(JMA) has processed data from 870 Argo and Argo-equivalent floats including 336 active floats .

Data issued to GTS:

All the profiles which passed real-time QC are issued to GTS using TESAC and BUFR code on an operational basis. Argo BUFR messages have been put on GTS since May 2007.

Data issued to GDACs after real-time QC:

All the profile files, technical files, and meta data files are transmitted to GDACs in netCDF format on an operational basis.

Data issued for delayed QC:

During Nov.2008-Sep.2009, the ARGOS messages for **13,169** profiles were acquired via CLS for delayed QC.

Delayed data sent to GDACs:

During Nov.2008-Sep.2009, **16,677** delayed profile files (D-files) have been sent to GDACs.

Web pages:

Japan Argo

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

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

Real-time Database (JMA)

http://argo.kishou.go.jp/index.html

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

Delayed mode Database (Argo JAMSTEC)

http://www.jamstec.go.jp/ARGO/argo_web/argo/index_e.html

JAMSTEC's website was made updates in March 2009, and underwent a major upgrade of its look and handling. This site 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, etc.).

Statistics of Argo data usage:

Japanese PIs

There are 9 Japanese PIs who agreed to provide data to the international Argo data management.

- Hokkaido National Fisheries Research Institute(HNFRI)
- Japan Agency for Marine-Earth Science and Technology(JAMSTEC)
- Japan Meteorological Agency(JMA)
- Meteorological Research Institute(MRI)
- National Institute of Polar Research(NIPR)
- National Research Institute of Fisheries Science(NRIFS)
- Ocean Research Institute, The University of Tokyo(ORI)
- Tohoku National Fisheries Research Institute(TNFRI)
- Tohoku University (TU)

Operational models of JMA

MOVE/MRI.COM-G (the Ocean Data Assimilation System of JMA)

JMA has been operating the MOVE/MRI.COM-G for the monitoring of El Niño and the Southern Oscillation (ENSO). The MOVE/MRI.COM-G consists of an ocean general circulation model (OGCM) and an objective analysis scheme.
Visit
http://ds.data.jma.go.jp/tcc/tcc/products/elnino/move_mricom_doc.html
for more information.

JMA/MRI-CGCM (Coupled ocean-atmosphere General Circulation Model of JMA)

JMA has been operating JMA/MRI-CGCM for the prediction of ENSO. The oceanic part of this model is identical to the OGCM used for the MOVE/MRI.COM-G.
Visit
http://ds.data.jma.go.jp/tcc/tcc/products/elnino/jmamri_cgcm_doc.html
for more information.

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

MOVE/MRI.COM-WNP provides daily 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 is 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 are shown in http://www.jamstec.go.jp/frcgc/jcope/htdocs/jcope_system_description.html.

FRA-JCOPE

FRA-JCOPE is the model based on JCOPE which is operated by Fisheries Research Agency (FRA).

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-G and the JMA/MRI-CGCM 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://goos.kishou.go.jp/rrtdb-cgi/jma-analysis/jmaanalysis.cgi
(Please go to item 5 on the page)

- Daily 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 Surface Currents for 0.1 x 0.1 degree grid points.

Pacific Subsurface Temperatures

JMA continues operating the conventional optimal interpolation (OI) analysis system. The outputs of the system can be found on
http://goos.kishou.go.jp/rrtdb-cgi/jma-analysis/jmaanalysis.cgi
(Please go to item 6 on the page)

- Monthly mean subsurface temperatures at the depths of 100m, 200m and 400m analyzed for 0.5 degree-latitude x 1 degree-longitude grid points.

Products of JAMSTEC

MOAA (Monthly Objective Analysis using the Argo data)

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

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 will be disclosed soon.

Iridium activities:

Japan has up to now operated 9 iridium profilers as "Argo-equivalent".
The first iridium profiler operated by Japan is POPS (Polar Ocean Profiling System) which had been set up near the North Pole in April, 2006.
Afterwards, 5 and 3 Apex floats were deployed in the Indian Ocean and the Pacific Ocean, respectively. Among them, 6 Apex floats keep operating now.
JAMSTEC had set up the 2nd, 3rd, and 4th POPS in Arctic Ocean in October 2008 and in April 2009. Only the 4th POPS has been operating now.
JAMSTEC has planed to deploy 8 floats in the western part of the tropical Pacific in May, 2010.

2. Delayed Mode QC

Based on the mutual agreement by PIs in Japan, JAMSTEC has done the DMQC for all Japanese floats since 2007.
JAMSTEC has submitted the delayed mode files of 55,889 profiles to GDACs as of September, 2009.
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 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 same way as the foregoing.

The OW software is mainly operated instead of WJO. The calculation result of WJO has been used at the definitive judgment. In order to decide the best parameter value, JAMSTEC will continue to use both OW and WJO.

Dr. Kobayashi and the successive JAMSTEC data managers (Mr. Nakamura, Dr. Minato, and Dr. Shikama) made a report to explain the issues of pressure biases of Argo floats. The report is written by Japanese and it will be published in November in a domestic journal of the Oceanographic society of Japan. We hope that the details of the issue will be known widely in the Japanese community of ocean.

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/).

Reference:

Kobayashi, T. T. Nakamura, S. Minato, and N. Shikama, 2009: Identified and potential pressure biases in Argo dataset and their influences on ocean monitoring, *Oceanography in Japan* (Japanese with English abstract). (in press)

Argo National Data Management Report of Korea

The 10th Argo Data Management Team Meeting

1. Status

- Data acquired from floats

Deployment of Korea Argo floats

Year	Organization	Number of deployed Argo floats				Total
		East/Japan Sea	Northwest Pacific	Antarctic Ocean	subtotal	
2001	KMA	3	7		10	18
	KORDI	5	1	2	8	
2002	KMA	5	10		15	25
	KORDI	6		4	10	
2003	KMA	5	10		15	33
	KORDI	8		10	18	
2004	KMA	5	10		15	38
	KORDI	13		10	23	
2005	KMA	5	10		15	33
	KORDI	10		8	18	
2006	KMA	5	10		15	33
	KORDI	13		5	18	
2007	KMA					9
	KORDI	9			9	
2008	KMA	5	10		**15**	29
	KORDI	11		3	**14**	
Total	KMA	108	68	42	**100**	218
	KORDI				**118**	

※ KMA: Korea Meteorological Administration
KORDI: Korea Ocean Research and Development Institute

- KORDI deploys 5 floats in the East sea in October 2009
- KMA has a plan to deploy 12 Argo floats in late 2009. During Nov. 2008 - Sep. 2009, 1531 R-files of KMA are sent to GDAC.

- Data issued to GTS

Within 24 hours of data collection, the deployment all data of KMA Argo floats are issued to GTS. BUFR formatted ARGO data was prepared in the late 2008, but GTS distribution is still not completed.

Within 24 hours of data collection, the deployment all data of KORDI Argo floats are issued to GTS by CLS in France.

- Data issued to GDACs after real-time QC

RTQC system at KORDI is so flexible that it can handle data from different type of profilers. Prior to communicating the Argo datasets to GDAC, the KORDI ARGO dataset is processed by CLS, France for dissemination to GDAC.

KMA RTQC system produces profile data, metadata, technical data and trajectory data with NetCDF format. Those 4 types of data are transmitted into GTS network and GDAC.

- Data issued for delayed QC

During November 2006 – October 2008, KODC has acquired 8,913 profiles via GDACs for delayed QC. KORDI has also been developing delayed mode QC schemes and salinity calibration methods for data obtained in the East/ Japan Sea.

- Delayed data sent to GDACs

During Nov. 2008 – Sep. 2009, KODC has sent 1,735 delayed mode profile files to the GDACs.

- Web pages

The KMA has operated and upgraded Argo web page, which consists of RTQC data linked to KMA (http://argo.metri.re.kr). The KODC has operated webpages for distribtuion of delayed mode Argo data and oceanographic information system for pelagic fishery based on Argo data (http://kodc.nfrdi.re.kr). KORDI has also operated Argo webpage (http://argo.kordi.re.kr).

- Statistics of Argo data usage

National PIs are Dr. Sang-Buem RYU from KMA and Dr. Moon-Sik SUK from KORDI. Many scientists have applied the Argo data to the researches and operational oceanography. For example, data assimilation, circulation of the East/Japan Sea, and operation of oceanographic information system for pelagic fishery.

- Products generated from Argo data

ARGO data has been applied in the global seasonal prediction system (PNU/CME CGCM), and the products are referred to the seasonal prediction at KMA. In addition, the data has been used in the regional ocean model of METRI for producing ocean analysis fields from 2001.

2. Delayed Mode QC

Two PIs are responsible for Delayed Mode QC(DMQC) in collaboration with the Korea Oceanographic Data Center(KODC). DMQC software has been updated to the latest version of OW. As of September 2009 KODC has sent 4787 D-files(1169 in 2009) to GDACs after DMQC. In the North Pacific 2532 D-files were submitted using the SeHyD and in the East/Japan Sea 2255 D-files were using the EJSHB(East/Japan Sea HydroBase) to which 1320 CTD profiles added. Progress has been slow due to staff changes.

UK Argo National Data Management Report
ADMT10
Toulouse 30th September 2009 to 2nd October 2009

1. Status

The UK has deployed 36 floats since September 2008. The 'Druck microleak' issue stopped deployments for the most recent quarter and deployments have now resumed again using Sea-Bird CTD units equipped with screened Druck pressure sensors. Five of the floats deployed in early 2009 were equipped with Sea-Bird CTD units capable of recording near surface temperature in a sensor mode where the pump is not switched on. A comparison of these data to traditional pumped data is ongoing with the aim of including the data in the data submitted to GDACs.

The majority of our fleet of floats are APEX floats equipped with APF8 control boards. We are aware of which of these floats have been highlighted as possibly having the 'Druck microleak' issue from the list published at AST earlier in 2009. These floats are a priority for DMQC. The UK is now deploying APEX floats equipped with APF9 control boards and to date only one float is exhibiting 'Druck microleak' symptoms.

The orphan Mauritius floats processed by BODC continue to send good data and there were 4 Argo Ireland deployments (where BODC manage the data) since September 2008.

A summary of float performance for the year 2009/10 is shown in Table 1:

Table 1: Float performance 1st September 2008 to 31st August 2009

Float failure reason/issue	**Number of floats**	**Range of cycles received before failure**
Died from battery failure (end of life)	7	143-177
Druck Snowflake pressure sensor issue	2	94,176
Druck Microleak issue	1	20
APF8 floats identified as having probable Druck microleak issue	10	
Active giving good data as of 1st September 2009	130	

Our real time system has remained operational throughout the year. Our long standing real time Argo operator (Stephanie Contardo) left BODC in May 2009 with the delayed mode operator (Justin Buck) covering until Sam Jones (newly recruited) starts in October 2009. In the last year 4190 profiles were processed in real time and issued to GTS/GDACs. The real-time procedures carried out by BODC are as follows:

- *Data acquired from floats* - Data from all UK floats are received at BODC by automatic download from the CLS database every 12 hours.

- *Data issued to GTS* - Data from all UK floats are sent to the GTS every 12 hours. Almost 100% of TESAC messages are available within 24h. Disruptions happened due to email server failures and servers problems.
- *Data issued to GDACs after real-time QC* - All UK data received at BODC are passed through the agreed real-time quality control tests 1 hour after the data arrives at BODC. All data that have been processed at BODC are queued for the transfer to both GDACs which occurs twice a day. Any file that fails to be transferred is queued for the next transfer attempt. We added the real-time correction of surface pressure to our processing in early 2009 and this has also been retrospectively applied to all floats processed by BODC.
- *Data issued for delayed QC* - All UK float data are ready to be subjected to delayed mode quality control procedures.
- *Delayed data sent to GDACs* – The OW software is being used at BODC and work on sending delayed-mode data to the GDACs is ongoing.

As with previous years resources for the Argo project have been limited but the emphasis of this has switched from funding to manpower. Core UK Argo funding is jointly provided by the Ministry of Defence (MOD), the Department for Environment and Climate Change (DECC, formerly a division of DEFRA) and the Natural Environment Research Council (NERC). The MyOcean (www.**myocean**.eu.org/) and EuroArgo projects also provide funding for specific aspects of the project. We hope to make more use of this in the coming year.

As part of one of the work packages in the Euro-Argo project (http://www.euro-argo.eu/), John Gould, (NOCS, Southampton, UK) has attempted to determine the users of Argo data in the UK. It is estimated based on responses received that there are approximately 50 individual people and/or projects using Argo data. This excludes use in the UK Met Office who are major users of Argo data. This is part of the aim to strengthen the UK and European Argo data user group.

The BODC UK Argo web pages have been maintained throughout the last year and can be accessed using the following link:
http://www.bodc.ac.uk/projects/international/argo/
These pages include a list of the current status of all UK floats deployed, automatic request system for all UK float data, links to both GDACs and other Argo related sites and an interactive map giving information on last known positions, deployment positions and direct links to profile plots of the last profile reported by every float. Other information about Argo is also available.

Products generated from Argo data - Data from all Argo floats are assimilated in to the Forecasting Ocean Assimilation Model (FOAM) run at the Met Office.

Iridium present/future activities (not applicable)

2. Delayed Mode QC

Resources for DMQC of UK floats are limited and were reduced further once Stephanie Contardo left BODC in May as DMQC time was diverted to running and maintaining the real time system. When Sam Jones starts at BODC on 6th October 2009 this should enable more resource to be put toward the DMQC of Argo data.

Most of the work for the last year has been linked to the correction of pressure in the UK fleet. BODC is essentially ready to apply this correction retrospectively to all currently submitted D-files. Currently submitted D-files where full a DMQC will be required before resubmission have also been identified (i.e. floats with a significant pressure drift). The aim is to apply and submit all these data in the final quarter of 2009. BODC's DMQC process currently consists of the following:

- A review of real time screening
- Application of corrections required before DMQC such as pressure
- A visual comparison of profile data with nearby reference data
- Use of the OW software to determine drifts, the reference data is kept upto date with the data supplied from Coriolis, France and Argo profiles can the used to assist in the making of DMQC decisions where required.

The code to apply the cell thermal lag correction to profiles was been produced last year and once the final coefficients are decided we have the capability to apply this calibration in delayed mode.

Our link with the UK Hydrographic office to do the DMQC processing of UK Argo Arabian Sea floats is almost operational with processing of floats expected to commence in October 2009.

Throughout the year, as and when floats or profiles have been identified as suspicious by external users (e.g. from altimetry QC checks, GDAC checks) we have submitted corrected data.

3. GDAC Functions

This section is not applicable to BODC.

4. Regional Centre Functions

There has been insufficient resource to pursue this fully however the MyOcean project has increased the potential resource for this work. We are currently identifying contributions we can make to the regional centre work. BODC has an established link with the UK Metoffice and a UK wide numerical modelling group with the view of identifying improvements to the real time quality control of data.

BODC hosts the main data and information web pages. These pages contain an animation of the Forecast Ocean Assimilation Model outputs (potential temperature, salinity and velocity at five metres and 995.5 m) and an interactive

map giving information on last known positions, deployment positions and direct links to both GDAC ftp sites.

Argo National Data Management Report of United States

October 1st , 2008 - September 15th 2009

1. Status

- **Data acquired from floats:**

a- October 1st 2008 to September 15th , 2009

Floats deployed:	323
Floats reporting:	265
No reports more than 30 days, considered inactive:	58
Profiles quality controled:	*70,613*

b- 1997 to September 15th , 2009

Floast deployed:	3203
Floats failed on launch:	106
Floats reporting:	1764
No reports more than 30 days, considered inactive:	1271

Because of the problem with the Druck pressure sensors, during 2009 the number of deployments have been reduced to 323 compared to 427 floats deployed during last year.

- **Data issued to GTS:**

During the reporting period, Service Argos and AOML put 53,784 profiles on GTS. About 96% of profiles were available in less than 24 hours.
Notice many iridium floast are under ice and are not reporting data to GTS.

- **Data issued to GDACs after real-time QC:**

During the reporting period, 70,613 real-time netcdf profiles, technical and trajectories files , as well as 323 new meta netcdf files have been issued to both GDACs. Total numbers of netcdf files issused was about 207,900 netcdf files.

AOML have recovered and added NAVO historical data to Global Data Centers thank to the cooperation of NAVOOCEAN scientists.

We also started creating the netcdf files for the distribution on GDAC of bouncing profiles.

- **Web pages:**

The URL for the US Argo Data Assembly Center is:
http://www.aoml.noaa.gov/phod/argo/index.php
It provides links to:
- Documentation.
- Operations.

- South Atlantic Regional Data Assembly Center
- FTP Services.
- Related Sites.

- **Products generated from Argo data are available through two web sites:**
  http://www.aoml.noaa.gov/phod/sardac/products/index.php currently shows three products are derived from hydrographic profiles collected by Argo floats and other instruments:
    - Properties of the mixed layer (thickness, temperature and heat storage rate) as monthly fields.
    - Seasonal climatologies of temperature and salinity (maps, senctions and scatter plots of the profiles, for 30ºS-40ºS, provided by Ariel Troisi).
    - Maps and cross-sections that depict the annual mean state in the upper ocean.
    - Maps of altimetry and geostrophic currents.

  http://www.aoml.noaa.gov/phod/argo/opr/index.php shows profiles, sections, trajectories and pressure records for individual floats processed at the US Argo DAC. This page also shows summary tables of active and inactive floats, statistics related to data distribution via GTS, and monthly maps depicting locations of Argo and XBT profiles.

2. Delayed mode QC

Scripps Group:

Scripps Institution of Oceanography (SIO) has evaluated, as part of delayed-mode quality control (DMQC), a total of 61,622 Argo stations (profiles). This is an increase of 15,066 stations (412 float years) since the previous United States Argo National Data Management Report (October, 2008). At present, 99.3% of the SIO stations which are eligible for DMQC processing have been completed. Here we define a station as being DMQC eligible if it was sampled more than 12 months ago . The above numbers include stations from several Argo New Zealand floats for which SIO performs DMQC.

SIO expects to be able to continue to maintain a high DMQC completion percentage during the coming year and will continue to revisit each float every 6 months.

DMQC procedures mentioned in past reports were continued into 2009. Much effort was made in the past year to verify the accuracy of the time of station (variable name JULD in the profile and trajectory netcdf). The SOLO Argo float model employed by SIO, does not report the time of the station, so this data value is instead filled with the time of the first ARGOS satellite transmission. Thus it is crucial to ensure the completeness and accuracy of the ARGOS messages, including the removal of 'false' messages reported as originating from a float at the time when the float was submerged.

Scripps has reviewed the DMQC for several SIO Argo floats after they had been identified through comparisons with satellite altimetry as possibly erroneous (Guinehut et al., 2009). When deemed necessary, corrective action was taken including, but not limited to, the acceleration of DMQC processing for floats that are exhibiting near-failure

characteristics and the addition of the float to the "grey list". Additional consistency checks and regional analyses will aid DMQC processing and are welcomed.

Reference:
Guinehut, Stephanie, C. Coatanoan, A. L. Dhomps, P. Y. Le Traon, and G. Larnicol, 2009. On the Use of Satellite Altimeter Data in Argo Quality Control. *J. of Atmos. and Oceanic Tech.*, 26, 395-402.

University of Washington Group:

As of September 2009, U Washington has submitted 67,047 delayed-mode profiles to the GDACs via AOML. This represented 94% of UW profiles that were older than 12 months. During 2009, the UW salinity calibration system was upgraded from WJO to OW, and the reference database used was CTD_for_DMQC_2008V02, issued by Coriolis. Nearby "good" Argo data were also used for visual evaluation in areas where CTD data were old.

During 2009, U Washington re-processed its old D files in accordance with the agreed procedures for delayed-mode pressure adjustment for APEX floats. The procedures can be found in the Argo QC Manual Version 2.4.

PMEL group:

As of 8 September 2009, PMEL had forwarded a total of 26,724 D-files to AOML (including some younger than one year old) vs. 27,904 profiles that were older than one year. At the time that last year's report was written, PMEL had forwarded 19,667 D-files to AOML vs. 18,788 profiles that were older than one year. Thus, we are slightly behind in our DMQC this year relative to last year. However, we are currently in the midst of working through our current DMQC backlog, which we anticipate clearing this fall.

The PMEL float DMQC procedure currently consists of the following steps: Automated correction, with visual check, of reported pressure drifts, and correction for the effect of these pressure drifts on salinity. Automated correction of conductivity cell thermal lag errors following Johnson et al. (2007). Visual inspection and modification of quality control flags for adjusted pressure, temperature, and salinity using the SIO GUI. Running the WJO version 2.0 system and adjusting run parameters to get appropriate recommended salinity adjustments. Accepting or rejecting the WJO recommendations on the basis of comparison with nearly historical and Argo float profiles using the SIO GUI. We have started using OW Version1.1 with SeHyD_090408 as a historical database for recently deployed floats. We plan to update the historical database with the most recent Coriolis version when we next perform DMQC on recently deployed floats.

WHOI Group:

As of September 8, 2009. Woods Hole has submitted 47,788 delayed-mode profiles to the GDAC via AOML. Of the target group of profiles older then 12 months, 40,896 have been submitted representing 77% of the total in this group. The submitted profiles are

evenly split between floats with FSI CTD sensors and those with SBE CTD sensors. For data from floats with SBE CTD sensors and within the target group of profiles older then 12 months originating, 90% of the profiles (22,289) have been submitted with delayed-mode quality control and calibration. Floats equipped with FSI CTD sensors continue to be problematic for the DMQC process. At this point, approximately 70% (~22,000) of the FSI profiles have been deemed to be irrecoverable. Of the remaining 30%, we are still working to verify the quality of the measurements and provide calibration. In contrast, of the 25,540 delayed-mode profiles submitted for floats equipped with SBE CTD sensors, only 3% consist of profiles with no usable salinity data. Of the 301 SBE CTD equipped floats which have been processed, 56 have required some form of calibration correction.

Data acquired directly from floats: WHOI has processed and forwarded 948 real-time profiles from floats equipped with Iridium communication.

Since September 1, 2008, WHOI has launched 65 floats.The most recent float launched was May 27, 2009.Since that time no floats have been launched while problems with the SBE CTD pressure sensor are resolved.

WHOI currently has 388 active floats in the water. Of that number, 262 are quipped with SBE sensors while 126 are floats equipped with FSI CTDs which are returning unusable or questionable data.

3- Argo Regional Center

The South Atlantic Argo Regional Center (SAARC) is coordinating the effort of countries with interest in the Atlantic from 20ºN to 40ºS.
The web site for the South Atlantic Argo Regional Center (http://www.aoml.noaa.gov/phod/sardac) provides background information, the report from the meeting with interested countries in May 2005, links to products and data servers.

Data consistency check is being performed for the SAARC region and a prototype web page with the results is available:
http://www.aoml.noaa.gov/phod/sardac/post_dmqc/delay_mode.html

Deployment opertunities provided by countries participating in SAARC can be found here:
http://www.aoml.noaa.gov/phod/sardac/logistics/opportunities/index.php

A float donation program has been put in place. This program facilitates the float deployment in remote regions and provides regional data to the volunteers in participating countries (e.g. Argentina, Brazil, Kenya, Gabon).

Training and education: A workshop was held in March 20 to March 26, 2009 in Lagos Nigeria to train African scientists "National Workshop on Data Analysis in Lagos Nigeria". The workshop took place at the Nigerian Institute for Oceanography and Marine research (NIOMR) and on board of the USS Nashville.It was part of the African Partnership Station program of the US Navy and was coordinated by Augustus

Vogel. The local organizer was Regina Folorunsho from NIOMR. Two scientists from NOAA/AOML in Miami, Claudia Schmid and Rick Lumpkin, performed the training. Information on this training can be found here:
http://www.aoml.noaa.gov/phod/sardac/education/2009NigeriaTraining.html

Global Argo Data Repository Status Report of US NODC for 2009

Prepared by
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September 2009

1. Summary

The US National Oceanographic Data Center (NODC) intended to use this report as input for the tenth Argo Data Management Team annual meeting at CLS (Collecte Localisation Satellites) in Toulouse, France from 30 September to 2 October 2009. The report summarized the functions and operations of the Global Argo Data Repository (GADR), the highlights of activities and the Argo user statistics since the ninth Argo Data Management Meeting at the East-West Center in Honolulu, USA from 28 to 31 October 2008.

2. GADR Functions and Operations

The NODC operates the Global Argo Data Repository[1] (GADR), known as the Argo long-term archive, for managing and archiving the Argo data and information. The GADR performs six functions as defined at the fourth ADMT meeting in Monterey, CA:

- Archive profiles, metadata, trajectory and technical information received from the GDAC on a monthly basis.
- Provide tools to allow transformation of Argo netCDF data into other forms.
- Provide usage statistics, data system monitoring information and problem reporting facility.
- Provide data integration tools to allow client to get Argo float data combined with data collected with other instruments.
- Provide hardcopy data sets for distribution to users.
- Provide offsite storage of data.

3. Activities in support of Argo

3.1. Preserved the Argo data transferred from the Argo US GDAC – The NODC used the improved "mirror" facility of the UNIX "lftp" command. The GDAC's files were copied from "http://www.usgodae.org/ftp/outgoing/argo/", the "geo" subdirectory was skipped, and files which are no longer present on that site are removed from the local mirror.
3.2. Implemented an automated procedure for acquiring the CLIVAR & Carbon Hydrographic Data Office (CCHDO) data from the Web for archive accession.
3.3. Produced monthly archives of the Argo data archived at the NODC and populated them at http://argo.nodc.noaa.gov/.

[1] http://www.nodc.noaa.gov/argo/

3.4. Identified the deficiency of the Argo NetCDF convention and developed a strategy for improving the convention to be 'Climate and Format (CF)' compliant.

4. Usage Statistics

This analysis was produced by analog 5.24[2]. We use the following basic definitions:

a) The file might be a page (i.e., an HTML document) or it might be something else, such as an image. By default filenames ending in (case insensitive) .html, .htm, or `/ `count as pages.
b) The number of requests is the total number of files downloaded, including graphics. The total requests counts all the files which have been requested, including pages, graphics, etc. (Some people call this the number of hits). The requests for pages only count pages. One user can generate many requests by requesting lots of different files, or the same file many times.

Figure 1 shows the number of monthly requests served by the GADR from 1 September 2008 to 31 August 2009. The monthly average of distinct hosts served by the GADR is 1,509 during this time period.

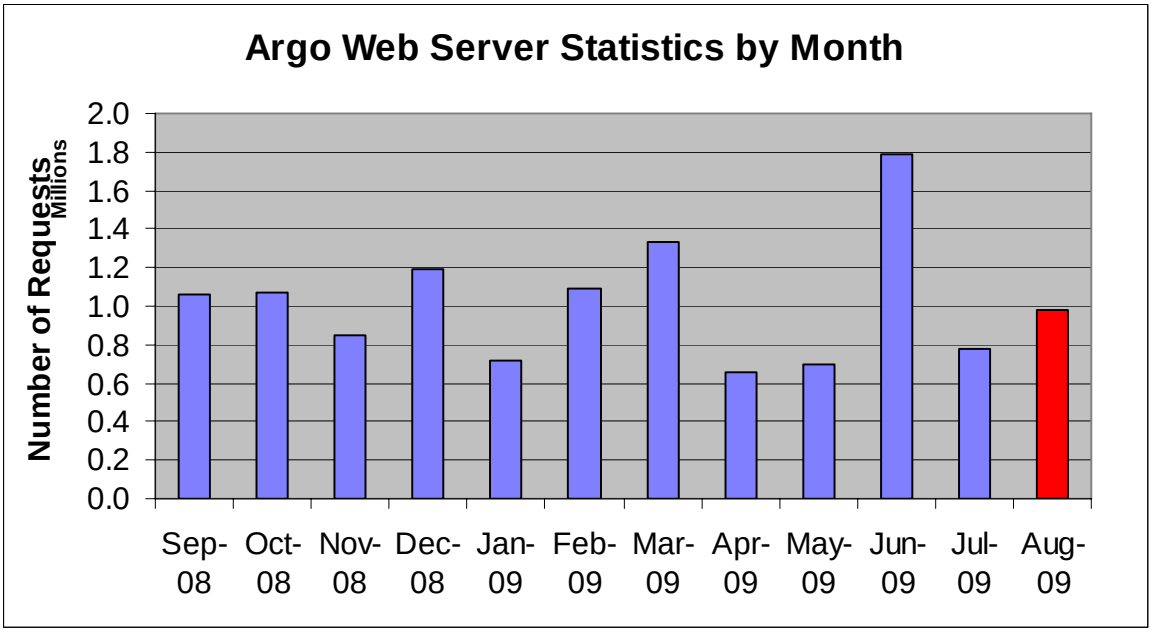

Figure 1 Numbers of distinct hosts served by the Global Argo Data Repository by each month.

The GADR receives an average of 1,006,767 requests per month in the period from January to August 2009, about 1.5% below the monthly average of 1,021,903 in 2008. However, the Argo data downloaded during the first eight month of 2009 was 54.57 GB, approximately 28.7% increased above the monthly average in 2008. Figure 2 illustrates the volume of the Argo data

[2] http://www.analog.cx

files downloaded in month from the GADR Web site over the past 12 months ending August 2009.

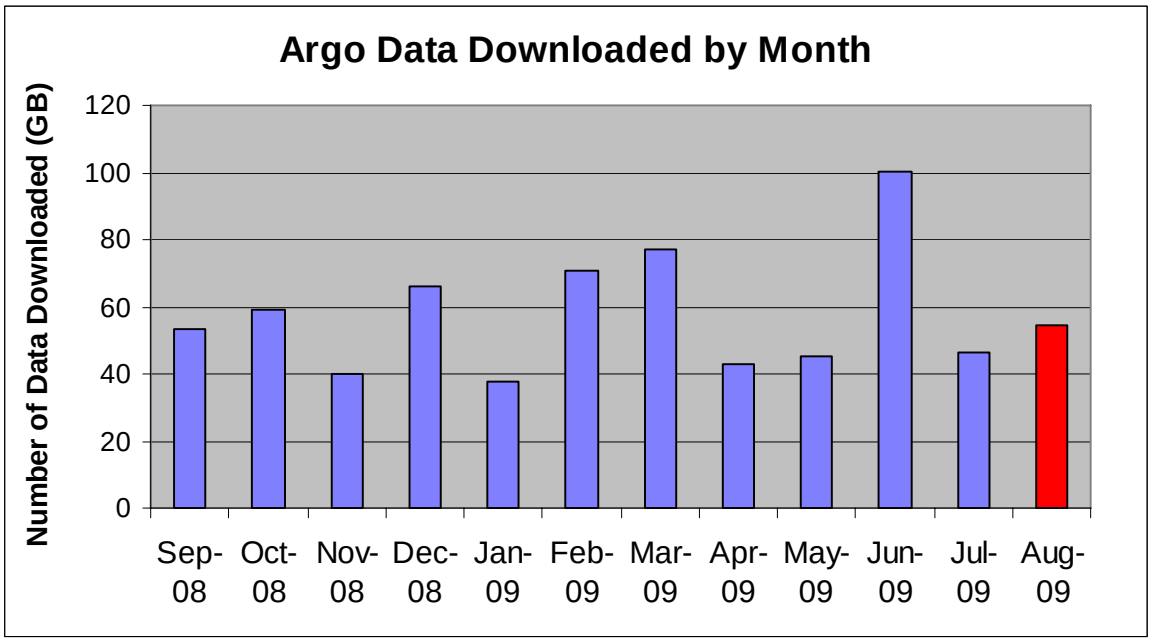

Figure 2 The volume of the Argo data downloaded from the GADR Web site from January – August 2009.

5. Future Plans
   5.1. Continue to operate the Global Argo Data Repository.
   5.2. Continue to acquire the CCHDO data via the Internet on a quarterly basis.