9th ARGO DATA MANAGEMENT MEETING

Honolulu
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1. Objectives of the meeting

The 9th ADMT meeting was hosted by University of Hawaii, Honolulu, USA. The meeting was opened by Dr Pr Mark Merrifield from the Ocean Department and Director of the University of Hawaii Sea Level Center. He highlighted the fact that data management has become very important in this era of global observation. He showed how the University of Hawaii was using the Argo data for their applications and research activities

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

- Review the actions decided at the 8 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 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 Argo array
    - the Argo data system (performance indicators, problem reporting)
    - the uses being made of Argo RT and DM data (user monitoring)
- Feedback from the Regional Argo Data Centre meeting

36 persons from 10 countries and 28 institutes attended the meeting.

2. Feedback from 9th AST meeting (Dean Roemmich and H. Freeland)

The achievements of the Argo Program, deploying a global array of 3000 profiling floats and developing a comprehensive data management system, are widely recognized as a major step for oceanography and climate science. Argo's open data policy and rapid delivery of high quality data are key elements contributing to the program's growth and to the breadth of its user community. While these achievements are substantial and innovative, there are further steps to be taken to realize the full potential of Argo. The top priorities for the coming years are:

(1) to increase float coverage in the southern hemisphere oceans in accord with Argo's original design criterion of 3-degree x 3-degree spacing.
(2) to identify and correct systematic errors in the Argo dataset for global studies of ocean heat content, steric sea level, salinity variability, and similar applications that require the highest quality data.

While improving and expanding Argo, it is essential to maintain the global array for a decade and longer to demonstrate the value of global subsurface ocean sampling in a wide variety of research and operational oceanography applications.

Over half of Argo's floats are in the southern hemisphere, and Argo sampling of the southern oceans is unprecedented. Argo collects more T,S profiles south of 30-degrees S in a single winter than in the entire pre-Argo half century of ocean exploration. Nevertheless, the array has substantial holes in the South Atlantic and South Indian Ocean and is too sparse globally south of 45-degrees S. Several hundred additional floats, as well as effective use of all deployment opportunities, are needed to correct this shortfall. Moreover, the increase in coverage must be achieved in spite of very tight national program funding. In order to do this, the lifetime of profiling floats must continue to increase. Some programs are already achieving the goal of 4-year float lifetime, and further advances are possible. The other necessary element is to decrease the number of floats that are providing unusable data or no profile data.

Better monitoring and quicker diagnosis of technical problems is needed to achieve these goals.

Detection and understanding of global changes in sea level, ocean heat content, and the hydrological cycle are among Argo's important and most publicly visible applications. Systematic errors in Argo data, such as a 2 decibar bias reported in a collection of floats south of Japan by Uchidaand Imawaki (JGR, 2008), are serious if present on a global scale. Time mean systematic errors in Argo data can make it inconsistent with other related datasets such as shipboard hydrography and satellite altimetry. Time-varying systematic errors can introduce spurious signals into global time-series constructed from Argo data. Several specific steps are needed for Argo to proactively pursue the issue of systematic errors:

(1) Data files need to be complete and consistent, not only profile files, but meta-, technical, and trajectory files. This information is essential, including for assessment of the quality of the Argo dataset. Corrective action is needed.
(2) The backlog in delayed-mode quality control must be eliminated. The slow pace of delayed-mode processing delays the discovery of problems, increasing their severity. It further suggests Argo is under-resourced in its data management system. Slow release of delayed-mode data is contrary to Argo's policy of timely and open availability.
(3) Assembly of reference datasets for delayed-mode processing, including recent data, is a critical step toward improved data quality. Argo depends on collaborative efforts with academic and government partners as well as with the Argo Regional Centers, to identify and process reference-quality shipboard CTD data. Recent CTD data from the southern hemisphere is a priority.
(4) Development of innovative techniques for identification of systematic problems, including Altimetric QC methods and objective analysis to identify outlier instruments, is proving to be very valuable. Further effort in this direction is encouraged.

Finally, increasing Argo's user community will help not only to demonstrate the value of the Argo Program. New users will help to define the requirements for Argo and their applications will reveal areas where improvements in data quality can be made. In the coming years Argo's user community can increase by an order of magnitude through education, outreach, and improved access to Argo data and products

Follow-up discussion:

- While the Argo program is advertising more than 3000 floats, the actual number reporting good profiles is smaller. In the future, the number of floats reporting good profiles will be promoted.
- As evidence of the need to re-prioritize resources, it was noted that the DM operator at WHOI (Paul Robbins) was hired at the expense of new floats.

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 and pointed out that most of the actions were finalized in the weeks prior to the meeting while the deadlines were much earlier. Nonetheless a lot of the actions have been either completed or started. Mostly actions related to trajectory were behind schedule because of lack of manpower. See the annex 3 for detailed status.

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 assist the co-chairs with action item tracking and "motivating" the responsible parties as target dates are approached.

3.1. Argo Status and AIC development (M Belbéoch)

The Argo technical Coordinator presented the status of the Argo array. He pointed out that there was a need to count the number of floats sending good quality data and to reflect that count on AIC website (2700 good floats amongst 3200 active floats, as of October 2008).

He recalled that the float operators made substantial progress in updating the deployment plans and invited them to continue the efforts. He highlighted that the deployment plans were consistent with the present and future gaps identified in the Argo array. He presented also a set of metrics describing the array status and highlighted the fact that the number of floats equipped with additional sensors was increasing. He presented then the status of JCOMMOPS (and the JCOMM OPSC), which is expanding its activities to OceanSITES coordination. He recalled in particular that he will shortly start technical coordination of the SOT program early 2009.

Thanks to a new I.T resource that started to work at JCOMMOPS in September 2008, new web sites will be developed in 2009-2010, with the goal to clarify access to information and better achieve integration of JCOMMOPS web services. Technical specifications of the new website(s) will be presented to the Argo community. S Pouliquen suggested that the architecture allows to adapt to the profile of the person surfing through the network (project manager, float deployer, data manager, research users, operational user..)

The AIC website audience was then presented and TC concluded that the website was reaching its international target and was regularly used by Argonauts, and sometimes by a larger public.

The Argo TC updated the list of delayed-mode operators and identified volunteers for 'orphan floats'. He will communicate the results through the appropriate mailing lists.

The co-chairs requested the ADMT to regularly use the AIC monthly report and follow up on required actions.

TC presented then the support/feedback centre and reminded the ADMT that they had to:

i) promote http://support.argo.net on all Argo websites

ii) channel all feedback on data quality (from individuals, ARCs, ..) through the AIC.

He finally proposed to host the next session of the ADMT, in Toulouse/France.

More information in the AIC report (see Annex).

3.2. Aquarius/SAC-D Salinity Satellite Summary – John Gunn

The Aquarius/SAC-D satellite Validation Data System continues the collection of Argo data profiles in preparation for the calibration/validation tasks during the satellite mission. The AVDS retrieves 250-300 near surface values of SSS daily and has done so for approximately 28 months. Concurrent match up with actual temperature (SST) satellite data established the basic functionality of the system and has been suspended until the onset of the next test phase. A 30-day simulation of SSS is currently being used for development of match-up algorithms and other software development. Simulated instrument and environmental noise sources provide an estimate of instrument performance using a GCM SSS field as input.

Analysis of thermosalinograph data was used to estimate two of the errors associated with a comparing a point source measurement such as a CTD profile with an area average measurement such as the radiometer footprints of the satellite sensor. Estimates put this error in the same range as the anticipated satellite SSS error (~0.2 psu).

Enhanced Argo float with a CTD sensor that will measure data between the surface and the normal 5 m cutoff depth of standard Argo floats is under development at the University of Washington. Six of these floats will be deployed in the Pacific warm pool in February 2009 with an additional four to be deployed soon in an as yet undetermined location. Prototypes show very good agreement between "enhanced" and "standard" CTD data.

Future developments include the development of a DBMS for a web based access to the in situ data and SSS match ups from the satellite as well as the back up data to evaluate the appropriateness of the comparison. A year-long test of the entire system will commence in May 2009, lasting until the real satellite data stream begins in May 2010 after launch.

4. Real Time Data Management

4.1. GTS status (Ann Tran and Mark Ignazewski)

In 2007, Argo floats transmitted more than 90000 TESAC messages on the GTS. 90% of the profiles transmitted on the GTS are within 24 hours of the float report. The TESAC messages are from the following GTS nodes: Washington and Landover, Toulouse, Tokyo, Ottawa, Melbourne, Seoul, and Exeter. There are some minor problems in TESAC messages such as missing salinity and/or temperature, positions are not correctly encoded, and depths are not increasing. The discrepancies in observation date and time in TESAC and the NetCDF file were found for KMA, INCOIS data centers. The time differences ranged from 9 – 12 hours. The problem of Argo TESAC duplicates on GTS is still present for BODC data center. All data centers converted pressure to depth before sending TESAC message on GTS.

As Anh Tran's report covered all the issues that Mark was going to discuss, he simply made the following notes:

- The KMA time differences are all exactly 9 hours (GTS times are later)
- The INCOIS time offset is always large, but is variable between 10-14 hours (GTS times are later)
- All of the GTS insertions now have "////" encoded for missing salinities (though Anh noted that one DAC was failing to put the proper group identifier with the group)
- AOML profiles with 900+ levels are being thinned below 300m for the GTS; only ~500 levels are on the GTS - full depth, just skipping every other level. This is limitation imposed by the TESAC message and it being handled properly by AOML.

During discussions regarding the observation times, it was discovered that DACs are using different ways of assigning the positions and times of the profiles; time of first block/first good position versus time of end of ascent/Argos location, etc. The DACs were asked to document how each DAC is doing this and, if possible, to arrive at a common technique.

AOML is processing iridium floats which are transmitting more points than the one allowed in TESAC message. The maximum number of p/t/s triplets is 829 for now (=15000 bytes). If the number of levels is more than 829, then they use sub-sampling method: they keep all the data points from the surface to 300 m and subsample every 2nd (3rd, or more) point to achieve a profile length of no more than 829 levels. The number of skipped points depends on the profiling depth and resolution. This decision to adopt this solution was made on 12-Jan-06.

4.2. Status of anomalies at GDAC

C Coatanoan presented the anomalies that are still detected when Argo profiles are submitted to GDAC. Objective analysis, performed at Coriolis, allows detection of those anomalies by comparison with climatology. Only few data have anomalies since an average of 6 profiles from 400 profiles submitted each day are detected. Some examples of anomalies were presented, mainly drift of salinity, first and last measurements on profile, bad data on part of the profile, salinity values of 0 that should not have gone through if the updated global range test for salinity endorsed at ADMT8 had been used.

A question has been asked about the threshold used for the test of gross salinity and temperature sensor drift. Should this threshold be changed to decrease the value or should we just wait for the OI test done at Coriolis to detect them. The second solution would be the best, but each DAC must pay attention to the quality control on their floats when problems are reported. Coriolis was asked to provide feedback in an ASCII file, providing enough information so that the DAC can automatically correct its profiles.

4.3. Feedback on test on upgrades of tests 8-9-11-14

C Schmid and C Coatanoan have tested the new version of these tests as defined at ADMT8. Some examples have been presented using proposed improvements at the last ADMT8, mainly iteration on tests defined in the action 29. Since it works for some cases and not for other cases, the conclusion is

that it could be 'dangerous' to update the tests with iteration. Using others complementary methods such as objective analysis, altimetry comparison seem better to improve quality control on data. Concerning the test 14, the use of sigma_0 instead of density should be done but not taking into account threshold proposed. The QC manual needs to be updated.

Overnight, B. King built a proposal to refine the Test 16 to detect jumps in salinity using delta in T and S on the deepest levels (700:2000) and assuming that jump occurs in S and not in T that it's likely to be bad salinity data. DeltaT was proposed to 0.5 and deltaS=0.15. Globally it seems to work. In some regions further tests are needed as T inversions go deeper. The Southern Ocean ARC contributors agreed to experiment with Brian's jump test. CSIRO will implement Brian's test on all their floats. UW will experiment with it for the Indian sector of the Southern Ocean. Results will be reported at ADMT-10.

5. Trajectory from Argo data

5.1. Feedback on Trajectory progress since ADMT8 (B King)

Brian King described progress towards preparing delayed-mode (DM) trajectory files. The plan is that a DM trajectory file will be produced for each float. This file will contain all the information supplied by the real time DACs in the traj.nc file, plus a significant amount of extra information either calculated by a DM process or pulled in from tech and meta files. The result should be a single file that contains all the information necessary for estimating subsurface and surface displacements, times and depths in a consistent manner, regardless of platform type, mission type or which DAC prepared the RT traj file.

At some stage in the future it may be possible to automate the process so that the 'DM' files are available in near real-time. Initially the process will need to be run in delayed mode by a central group, with significant checking by an operator who has detailed knowledge of the different platform types and mission choices.

Brian presented a proposal on the contents of new trajectory files containing extra information that are presently in tech or metafiles…The traj work will end up with a consistency check and recommendation to DACs. Brian shown what should be the delayed mode trajectory format, adding new variables from the different nc files with Error Status(transmitted or interpolated) and QC

The structure envisaged in B. King's presentation will need to be revised in response to some important additions in the RT traj file proposed by T.Carval, and in response to comments during Brian's presentation. B.King has worked with T.Carval to refine the format changes for RT traj files on Friday afternoon and a new version of the format was send by email to argo-dm people

B. King will revise the structure of DM traj files to reflect discussion at the meeting. (Ongoing, will continue to be revised as more test files are built for more platform types.)

After the meeting the following information was provided by T Kabayashi and Nakamura-san : JAMSTEC has prepared a document and of an idea of automatic QC method for Argo float positions on the sea surface on the PARC-JAMSTEC web-site : http://www.jamstec.go.jp/ARGORC/tools/JAM_RandD07_02.pdf. An execution file of the method is also available from "Tools & Link" page of PARC-JAMSTEC

5.2. Trajectory work done on Provor at Coriolis

S Pouliquen presented on behalf of M Ollitrault, JP Rannou et V Bernard the work done at Coriolis on the floats processed by the Coriolis DAC. This dataset represents about 800 floats, half of them being Provor and half Apex. The first step of this work has been to clean up the nc files (meta , traj, tech) in order to remove inconsistencies due to errors in meta files as they are filled manually, bad version used for decoding (bad information sent by Pis), anomalies in decoders especially for technical information,…

As the timing control of PROVOR missions is complex and a lot of information are provided in technical messages it's important to retrieve them and to make them accessible in timely fashion. Due

to a lack of recognition of what information was really required, and a lack of exploitation of the data to test whether information was being extracted completely and correctly, some important information for PROVORs were missing or faulty in the RT traj files while existing in the tech files. Lack of past examination of files by users meant little or no feedback to Coriolis to highlight and fix the problem. Now, a substantial new effort at IFREMER by Michel Ollitrault and Jean_Philippe Rannou to re-analyze the raw PROVOR messages has been of critical importance in assembling the necessary PROVOR data. Without this effort it would not be possible to prepare good DM trajectory files for PROVORs.

An important work has also been done on Apex floats by Ollitrault and Rannou , correcting the errors that have crept in due to the large number of different APEX data versions that have been used over the years. This challenge of evolving message structure is generic to all DACs with APEX floats. As new versions of APEX message transmission are released, DACs need to change their parsing software in response. It is easy for DACs to see when they have correctly extracted profiles. The correct extraction of technical parameters, used in DM trajectory processing, is less obvious when faulty, especially when there are few or no users processing the data to identify errors.

In addition as Provor is providing a lot of the time and parking information that are important to calculate velocity fields, Rannou and Ollitrault highlighted and corrected a number of errors in the recording of Parking Pressure. Similar anomalies were found on Apex floats. This is also critical for the correct assignment of float displacements to a parking depth.

Based on this work this have suggested changes in the format and checks at GDAC that were presented by T Carval just after.

It will be critical for the provision of high-quality trajectory data in the future that the expertise they have developed is retained and continues to be applied. Their experience should also be applied to QC of traj data held by other DACs and M Ollitrault is willing to work with the DACs that willing to do so.

5.3. Specification on format checker (T Carval)

In 2007-2008, Argo trajectories from Coriolis DAC were carefully scrutinized to produce a first version of an atlas of deep ocean currents called ANDRO (Argo New Displacements Rannou Ollitrault). To simplify and to streamline the calculation of deep ocean currents, the following changes were proposed:

- Revise the metadata file structure to include platform dependant metadata as well as record the different missions when metadata information can be changed during the life of a float (by iridium for example)
- Small but useful additions to Argo trajectory format were accepted and an update of the user manual was done;
- Simple but crucial tests of coherency between the different NetCDF files content that can be done at GDAC
  - Verify LAUCH_DATE/LAUNCH_POSITION by doing the speed test (> 3m/s) with the first cycle
  - Verify PARKING_PRESSURE using information in tech file : For Provor, use the average of PRES_ParkMinimum_dBAR and PRES_ParkMaximum_dBAR technical parameters. For Apex, use PRES_ParkMean_dBAR. If not available : compare with profile max pressure ?when available
  - DEEPEST_PRESSURE with mean deepest pressure from profiles
  - REPETITION_RATE: can be checked with cycle-times or deepest pressure using the CONFIGURATION_PARAMETER section
  - Parking time of measurements on Apex floats smaller than the cycle duration (JULD_DESCENT_START et JULD_ASCENT_END)

A proposal will be circulated at the end of the meeting by Thierry and approval before end 2008

6. GDAC status:

The US and French GDAC are stable and running smoothly.

6.1. Coriolis GDAC status

T Carval presented the status of the Coriolis GDAC and of the actions related to GDAC activities

- Since September 16th 2008 the GTS directory was removed from GDAC and hidden in the following directory: ftp://ftp.ifremer.fr/ifremer/argo/etc/gts/
  The GTS directory contains profiles from floats available from GTS only, without a DAC in charge of data-management. There are still 334 floats in the GTS directory. These floats should find a DAC and are monitored by AIC (Table 23 of the AIC monthly report). Most of them are from the US and transfer to AOML is ongoing..
- The mean salinity adjustment and its associated standard deviation are available in the profile index file : ftp://ftp.ifremer.fr/ifremer/argo/etc/argo_profile_detailled_index.txt.gz
- A file removal schema was proposed and accepted, the DACs will have the possibility to remove files from GDAC.
- A proposal to reorganize the latest_data directory of GDAC was accepted : files older than 3 months will be removed, the daily latest_data file will be split in 2 files : real-time and delayed-mode.
- To improve data transfer reliability, a numeric signature will be associated with each file of the GDAC (An MD5 numeric signature gives the possibility to check that a downloaded file is identical to the original).

6.2. US-GDAC status

The US Godae server, which hosts the US GDAC, is being moved from FNMOC to the Naval Research Laboratory – Monterey (NRL-MRY).

The benefits of this move are:

- Allow more flexibility in the development and deployment of new services than would have been possible within FNMOC.
- New hardware – faster and more reliable.
- Allow deployment of the enhanced format checker for the Argo files.

The primary impact of this move on the users is that all Internet (http and ftp) addresses referring to "fnmoc.navy.mil" will cease to function. Where possible, auto-redirects (with appropriate message) will be utilized.

The target date for this move is 3 December 2008. A down-time of 1 to 2 days is anticipated.

6.3. D-File checker status

The enhanced format checking will be available once the US GDAC move (see above) is completed. During December 2008, the checker will be available for DAC testing at the DAC "test" directory. Furthermore, the US GDAC will run batches of files through the checker and discuss the results with each DAC.

During January 2009, the enhanced format checker will be transitioned to the French GDAC and will go live late in the month. At this time, non-compliant files will be rejected at the GDAC. Note that if the rejected file was to replace a file already on the GDAC, the existing file will not be removed.

All existing files will be scanned and DACs will be encouraged to correct anomalies.

7. Format Issues

7.1. BUFFR format

The status of BUFR messages on the GTS was reviewed:

- AOML: BUFR message generation is working but has not been validated (see below).
- BODC: Sending BUFR files to the Met Office for validation.
- CLS (CSIO, INCOIS, KORDI): Will start distributing BUFR data in early 2009.
- Coriolis: Distributing BUFR message on their ftp server now. Coordinating with Meteo-France and expect GTS distribution soon.
- CSIRO: BUFR message generation is working. Will distribute on the GTS soon.
- JMA: Operational since 2007.
- KMA: Started distributing BUFR on GTS this week.
- MEDS: Their BUFR messages have been validated by their met office. Expect them to be distributed on the GTS soon.

Anh Tran volunteered to test-read BUFR files for any DAC that wants to send them to her. Several expressed interest.

Once they are on the GTS, MEDS and the US Navy (FNMOC and NAVO) will validate the GTS data.

It was noted that Kanno Yoshiaki is the ADMT representative to the JCOMMOPS Task Team.

7.2. Technical Files

Ann Thresher presented the work done in the past year on technical parameter names. The Technical names are now ready for use though some modifications might be required as DACs begin coding the changes. The naming conventions document is available through Coriolis, as is the list of names defined so far. These can be found at http://www.coriolis.eu.org/cdc/argo_rfc.htm

Review of progress so far:

- Name length 128 characters:
  TECHNICAL_PARAMETER_NAME(N_TECH_PARAM,STRING128)
- Value length 128 characters:
  TECHNICAL_PARAMETER_VALUE(N_TECH_PARAM,STRING128)
- All technical files will now have variable called 'CYCLE_NUMBER', with dimension 'N_TECH_PARAM': CYCLE_NUMBER(N_ TECH_PARAM)
- Cycle 0 to hold engineering and configuration data from test transmissions before first profile
- Cycle number to be as reported by the float, regardless of whether it's spent 10 days below the surface.
- Names must be taken from the published table unless they are new. New names must be defined and added to the table as soon as possible
- New Units must be added to the technical units table as soon as possible.
- Naming convention follows the arrangement: What is measured – When/Where measured – Units
-

Further format rules can be found in the document http://www.coriolis.eu.org/cdc/argo/Technical_Naming_Convention_Rules.doc

Problems and misunderstandings:

- don't confuse CURRENT (electrical measurement) with NOW (measurement of time),
- distinguish between CLOCK (decimal hours) and TIME (how long something lasted) and
- don't use BOTTOM or DRIFT if you mean PROFILE or PARK.
- PRESSURE refers to an internal measurement – PRES is a parameter measured by the CTD

We have agreed that variables measured during Park phase of float belong in trajectory files but they can be repeated in technical files – duplication is not a problem.

The Surface pressure offset variable is REQUIRED if measured –

- PRESSURE_SurfaceOffsetTruncated**Plus5dba**r_dBAR (for all older APF8 floats, exactly as reported by the float)
- PRESSURE_SurfaceOffsetNotTruncated_dBAR (for all other floats including the new APF8 controllers which do not truncate surface pressure).

We decided that ALL technical information is useful and should be included. Even though this will make the files larger, it will mean that important information is not lost.

To help make the table more useful, we need all words used to be well defined – e.g., "immersion"? "ETF"? "ParkMargin"? "RTCStatus"? We need help from the DACs for this.

There is a section at the end of the table containing variables that do not yet have definitions. Again, we need help from the DACs to get these defined so they can be used.

As coding begins for these names, questions will arise. Ann Thresher will coordinate any new names being added to the table for now and we will decide who will have permanent responsibility for this after the initial coding is done.

We expect all files to be submitted using the new naming conventions as soon as possible, preferably by early in 2009 but this will depend on the DAC.

A reminder – the "Table of Technical Name Equivalents" table on the web: http://www.coriolis.eu.org/cdc/argo/table_of_technical_names_equivalents_draft_final_v2.xls will be the list to be used by all DACs and will be updated quickly as more names are properly defined.

7.3. Handling Iridium floats

The discussion revolved around the need for flexibility because of new sensors and non-standard missions.

The AST reminded the group that Argo has a primary mission of measuring pressure, temperature, and salinity globally and that, if other sensors threaten that mission, those floats will have to be removed from the Argo fleet. The AST chairs will be included in all discussions involving the deployment of new parameters.

A "velocity" parameter is being reported by some of MEDS floats and the appropriate variables will be added to allow distribution of this data.

7.4. Handling two or more sensors for one parameter

Thierry Carval reviewed the method for encoding a parameter from multiple sensors on a float. There was a consensus that the wording and examples are adequate.

7.5. Other needs

Some of the oxygen data was not being properly converted to micromole/kg. Taiyo Kobayashi will provide the correct equation for inclusion the users manual

There was discussion about the need for a "point of contact" entry in the meta-data file, in addition to the "PI". The consensus was that this change is *not needed.*

It was noted that many floats are nearing the "255 cycle rollover (back to zero)". Korea is already experiencing this problem. All DACs are asked to be certain they will not start overwriting earlier cycles when this occurs.

C Schmid pointed out that AOML was processing floats for Navocean that perform bounced profiles between two normal profiles. These profiles are not located as the floats don't surface. These floats are Argo equivalent and these bounced profiles can't presently be handled by the GDACs. For the time being, AOML should continue to provide the bounced profiles directly to the countries that

request them when they enter EEZ. An action is opened to study how to handle such float on GDACS.

In the "Trajectory" section of the meeting, Thierry Carval presented a proposal for format modifications to the meta-data and technical files. There was much discussion related to this topic at that time, as it related to the trajectory files, and in the "Technical" and "Pressure" sections. A unified proposal, taking into all of the comments, will be developed.

8. Delayed mode data management activities

8.1. Status of DMQC processing

Dean reported the status of the delayed mode profile processing end of September, before the last week rush due to ADMT meeting! While progress has been made and 59% of the profiles have been processed we are still not committing to ARGO policy specifying that delayed mode profile will be available within a year from acquisition. The effort must be continued and additional man power set up when progress are really to slow…

In the meantime regional analysis to check in near real time data set consistency are encouraged.

DAC	#DM >12 mo	#tot >12 mo	%
AOML	109186	178646	61
/SIO	42069	42345	99
/UW	45109	52776	86
/PMEL	17860	19352	92
/WHOI	2332	39657	6
BODC	4492	15738	29
CORIOLIS	30548	56387	54
CSIO	1609	1619	99
CSIRO	8566	11601	74
INCOIS	8720	13548	64
JMA	37672	57897	65
KMA	2056	5737	36
KORDI	0	6037	0
MEDS	12502	15748	79
TOTAL	215351	362957	59

8.2. Feedback from DMQC3

B King gave feedback from DMQC3 on actions where ADMT activities is needed. A complete report of the DMQC3 meeting is available at http://www.coriolis.eu.org/cdc/argo_rfc.htm

The OW methods described in the manuscript published in Deep-Sea Research "An improved calibration method for the drift of the conductivity on autonomous CTD profiling float by θ–S climatology" by Owens and Wong has been endorsed by ADMT to be used by DM operators within Argo

- CELLThermoMass correction computed by Greg Johnson assumes that ascent raise is constant which is not the case in high gradient area. DACs who haven't done anything stay like that until further results are done
- Ref DB : high priority to continue to populate especially in parse area…
- The ADMT endorsed the proposal made by DMQC group to used the OW methods described in the following manuscript for delayed mode processing ;
- RT DACs are recommended to carefully study and correct the anomalies detected in the RT data with the Altimetry-QC done at Coriolis-CLS by S Guinehut. And greylist the float when necessary.

Before starting DMQC, DM operators look at the real time flags and correct then when necessary before running the OW method. There is discussion between DM-operators whether or not these RT flags should be provided back to DACs by overwriting the automatic flags assigned in RT. This will be discussed on argo-dm-dm mailing list . The RT Dac operators recommend transfer of these corrected RT flags from DM operators to them to clean up the RT datasets.

Some floats are drifting to higher salinity which is not clearly understood and any PI who is able to recover such a float is encouraged to do it

8.3. How can altimetry be used to assess Argo quality

S Pouliquen presented on the behalf of Stéphanie Guinehut a scheme to search for offsets in Argo data using satellite altimetry measurements. The main idea is to compare co-located (in time and space) Sea Level Anomalies (SLA) from altimeter measurements and Dynamic Height Anomalies (DHA) calculated from in-situ T and S profiles to detect systematic errors in the Argo data set. Altimeter measurements are from the AVISO combined maps. Argo T/S profiles are from the Coriolis-GDAC. Dynamic height is calculated using a reference level at 900-m. The mean dynamic height used to calculate DHA is from a combination of WOA annual mean climatology and a contemporaneous Argo climatology. Systematic diagnosis is then carried out for each float time series. Comparison with mean statistics allows anomalous floats to be extracted. Anomalies can be due to sensor drift, calibration offset, measurement spikes, or other strange float behavior. So far errors are detected mainly in the real-time data set. Stephanie cautioned that for now, the method was not able to extract small errors in high variability regions and very small bias (~2-3 cm) in lower variability regions.

Anomalous floats detected by the altimetry qc are shown in the AIC Monthly Report. The list is also posted on a CORIOLIS ftp site together with a figure for each float at ftp://ftp.ifremer.fr/ifremer/argo/etc/argo-ast9-item13-AltimeterComparison.

DACs should check these anomalous floats together with their delayed-mode operators and PIs and provide appropriate adjustment if needed. All delayed-mode operators are urged to read the AIC Monthly Report to check for floats that are flagged by the altimetry qc and provide feedback to Stéphanie Guinehut.

S Pouliquen indicated that Coriolis plan to run this analysis with CLS on a quarterly basis.

RT DACs indicated that they needed the following additional information in the anomaly list :

- RT or DM data that are problematic
- the cycle number or cycle interval where there is a problem

After the meeting Stephanie agreed by email to provide these information for the run that will be performed in January 09

Stéphanie was also asked to checked that she was excluding the greylist profiles and flag 3-4 data . After the meeting she provided the following information : the greylist profiles are not excluded – since if they are in the grey list, they should have flag 3-4 data.With the method, we found one float present in the grey list but still having data travelling with flag 1 values – and distributed on the GTS. Flags 2-3-4 data are excluded.

RT-Dac and DM operators have to inform Stéphanie and AIC when they have corrected the data and resubmit their profile or if the data is correct. AIC will monitor in monthly report

AST will provide suggestion for improvement and especially suggestion to process floats by groups of floats and identify the doubtful groups. Stephanie agreed to work with AST on this issue in 2009.

8.4. Report of the pressure working group

A report was submitted by S. Wijffels and P. Barker on behalf of the AST's Pressure Working Group (PWG), summarizing the present status of the group's findings and its recommended actions. The PWG is presently focused on errors in the Argo dataset resulting from surface pressure drift in APEX floats, which comprise 61% of Argo floats. PROVOR and SOLO floats, comprising most of the remaining instruments, perform cycle-by-cycle resets of surface pressure, and report the magnitude of the drifts. Most APEX floats with APF-8 controllers provide measured surface pressure values, with 5 dbar added, only in those instances where the drift of surface pressure has positive sign (55% of Argo floats). For instruments having negative drift, the surface pressure is truncated to zero, with 5 dbar being the reported value (16% of Argo floats). In the remaining 8% of floats there were missing or inconsistent data, or other problems, that prevented the PWG from making its analysis.

The PWG identified two classes of problems. The first class is due to the lack of correction or to mistakes in correction of pressure drift by most DACS in both real-time and delayed-mode processing. In spite of the positive-drifting instruments being correctable, most have not been corrected and there are many cases of wrongly corrected data (e.g. mishandling of the 5 dbar offset). The PWG urges DACs to provide accurate and consistent data in their files, and to apply surface pressure corrections to all instruments, in both real-time and delayed-mode processing.

The second (and uncorrectable) class of problems is due to the truncated negative pressure drift (TNPD) instruments. The PWG will provide a list of WMO IDs of these instruments (and of the other cohorts it has identified) so that users may exclude such instruments or not from their analyses, as appropriate. Further, it is known from studies with APEX instruments having APF-9 controllers (reporting both positive and negative surface pressure drift) that most negatively drifting Druck pressure sensors have very small drift (< 1 dbar). A few percent have much larger negative drift (tens of dbars) due to an internal problem (microleaks) in the sensor. It is believed that instruments with TNPD greater than about 10 dbar can be identified using Altimetric QC methods, and that once these instruments are identified and greylisted the remainder of the TNPD instruments will be usable for most applications. The PWG will make an assessment of the bias impacts on the Argo dataset of the problems it has identified.

Actions agreed at ADMT-9 following report from Wijffels & Barker regarding correcting pressure errors in APEX floats

1. All DACs agreed to record SURFACE PRESSURE in the tech files with either the variable name "PRES_SurfaceOffsetTruncatedPlus5dbar_dBAR"or "PRES_SurfaceOffsetNotTruncated_dBAR", depending on the type of controller used.
2. All DACs agreed to clean up their tech, profile, and trajectory files so that the cycles match, and to fill in FLOAT TYPES, SENSOR TYPES, PROJECT NAMES, LAUNCH DATE.
3. All DACs agreed to carry out real-time pressure adjustment in 'A' mode to all APEX floats. The real-time adjusted values will be recorded in the variable PRES_ADJUSTED. The raw

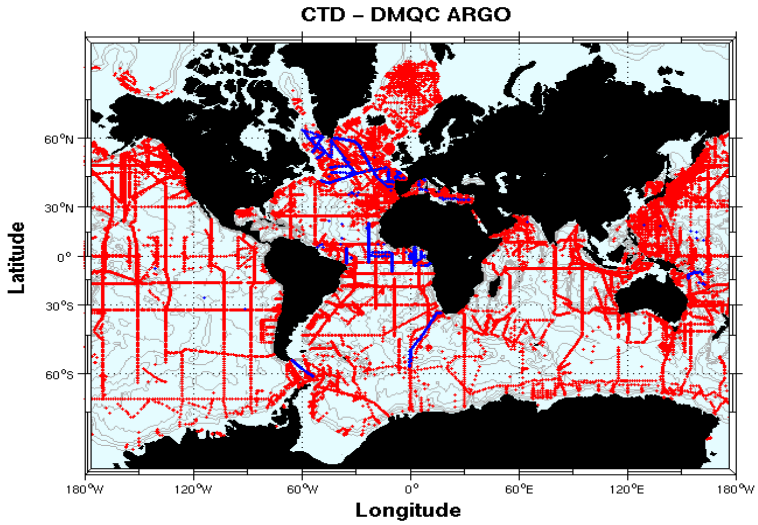
values will remain in the variable PRES. Annie Wong will lay out the details of the APEX floats real-time pressure adjustment procedure in the Argo QC Manual.

4. APEX groups with Apf-9 and the new non-negative-truncating Apf-8 controllers (that is, APEX floats that report negative surface pressure offsets) will monitor their floats for the oil microleak problem in Druck sensors, which exhibits itself with increasingly negative surface pressure offsets. These floats will go to the greylist if the pressure offset exceeds 20 dbar.
5. For APEX floats with the old negative-truncatingApf-8 controllers (that is, APEX floats that do not report negative surface pressure offsets), Annie Wong suggested 5 features to look for that may reveal negative surface pressure offsets.
   i. The reported values of SURFACE PRESSURE will be uniformly zero (after the artificial +5dbar is removed).
   ii. Stephanie's altimetry qc will show DHA significantly lower than SLA.
   iii. Cold temperature anomalies will be evident at depths below 1000dbar.
   iv. For floats that have remained in the same water mass regime, isotherm depths will shoal.
   v. For floats that have not experienced conductivity sensor drift, salinity will drift salty.
6. For delayed-mode pressure adjustment for APEX floats, Annie Wong will finalize a consistent method with Wijffels & Barker and communicate the result to all delayed-mode operators via argo-dm-dm@jcommops.org.

9. Reference database progress

9.1. Summary of the actions since ADMT-8

Since the last ADMT8, a version of the reference CTD dataset was provided at the end of July. This first version has been built from the release WOD2005 of the NODC. Data older than 1990 have not been into account; efforts should be focused on the recent CTD datasets. Following the recommendation of the DMQC-3 workshop, a second version removing the conversion of the temperature (ITS90 to ITS68) was released in October. A few recent CTD have been added to this version.



In Red WOD05 since 1990 and in blue the recent CTD provided by ARCs

Datasets are available on the Ifremer ftp site. Since this is a restricted access, users need to ask for a login/password at codac@ifremer.fr. The reference Argo dataset, built by John Gilson, is also available on the ftp site.

Recent CTD coming from ARCs and PIs should be sent directly to CCHDO which will perform quality control, remove duplicates and provide to the Coriolis data center with a dataset in a fixed format.

9.2. CCHDO's Contributions to the Argo QC database: Past, Present and Future

S Diggs presented the progress of the CCHDO contributions to Argo's DMQC database. In addition, he gave a brief summary of the progress of the cooperative efforts between US-NODC and CCHDO to increase the sheer number of CTD profiles in the DMQC database.

After reminding the group of what the CCHDO's primary responsibilities are (high quality global hydrography delivered in a consistent manner), we discussed a brief history of the relationship between CCHDO and Argo. Over the past two years, a number of strategies have been employed to get recent high-quality CTD profiles from various international sources, some more successful than others.

In general, trying to get all CTD profiles from every source was less than successful, although the CCHDO and Coriolis did manage to get one set of CTD data (from PIRATA) into the DMQC. Recently, we have refined our data search strategy to focus on very recent cruises in the Southern Ocean. These efforts have resulted in acquiring five (5) sets of cruise/CTD data that were completed in the last 24 months. These cruise data have been made available to US-NODC and Coriolis. In addition, the CCHDO will be the data manager for hydrographic data for the DIMES program and other, non-related cruises (US, UK) plan on making their CTD data available within weeks of cruise completion

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.

Looking forward, the group approved the Southern Ocean strategy, and pledged to help find new hydrographic cruises for inclusion in the Argo Reference Database. We plan on including at least 7-10 CTD cruises next year.

10. Feedback from ARC meeting

The second ARC workshop was held just prior to the ADMT meeting. Jim Potemra and Claudia Schmid organized and chaired the workshop. A separate report will be available soon. For the information of the ADMT attendees, Jim and Claudia provided a synopsis of the workshop.

The utility of ARCs was discussed, and there was general agreement that ARCs are worthwhile.. The "essential" and "optional" tasks of regional centers were reviewed, and it was agreed that these are still appropriate. Perhaps one recommendation would be for each ARC to specify:

a) who is responsible for each item

b) what resources are required,

c) a timeline and/or plan for the actions

Steve Diggs discussed the CCHDO CTD program and stressed the need for communication those organizing cruises and his program that will archive CTD data. ARCs should work more as brokers for this.

In all DACs there are activities going on regional QC that have showed that some progress. A large part of the discussion focused on how to merge results from different ARCs on the same float and how to report them to the DM operator. It was agreed that for the time being, while we are in a developing mode, suspicious data will be reported through AIC and that next year will be early enough to revisit this issue on the tools that will be operated on a regular basis…

There have been a lot of discussions about Argo products and product development and the separation between products, viewers, tools….? A catalog of gridded products described in an homogeneous way is under construction by Megan. Interesting tools should be made available through AIC

Deployment planning was discussed, with the focus on how to get information on opportunities and how to distribute the information. AIC is working on this within JCOMMOPS.

The communication with PIs (or lack thereof) remains a concern to provide feedback on data quality at basin scale and it was highlighted that dialog with DMQC operators, maybe via a joined Arc DMQC meeting prior to ADMT, would be useful.

The resources continue to be a hurdle, both in terms of personnel and funding.

11. GADR activities

Charles Sun reported the highlights of the Global Argo Data Repository (GADR) activities since the eighth Argo Data Management Meeting at the Marine and Atmospheric Research of the Commonwealth Scientific and Industrial Research Organization (CSIRO) of Australia in Hobart, Australia from 14 to 16 November 2007. The primary functions of the GADR are: to 1) archive profiles, metadata, trajectory and technical information received from the GDAC on a monthly basis, 2) provide tools to allow transformation of Argo netCDF data into other forms and 3) provide usage statistics, data system monitoring information and problem reporting facility. He reported that the GADR performs an automated procedure of "mirroring" a local Argo data set in sync with the Argo GDAC server at Monterey, CA. The automated "mirroring" script runs daily from 0:00 to about 5:00AM UTC. He suggested that the Argo GDAC at Monterey not update files during this time frame to allow for the "mirroring" procedure to complete. ADMT prefers that US-GDAC continue to be updated during this period.

The GADR received an average of 1,010,865 requests per month in the period from October 2007 to September 2008, increased from 455,909 requests per month last year over the same period of time, while the monthly-averaged Argo data downloaded increased from 17.85GB in 2007 to 39.17GB, about 119% increase, this year.

US-NODC tested providing monthly images of the ARGO dataset. This product is judged useful and it was recommended to be generated on a one year sling window.

No anomalies were found this year in ARGO data.

C Sun also reported the work done by T Boyer of quarterly WOD updates with preliminary QC. It was recommended to document this preliminary QC procedure and to work with CCHDO to extract from this dataset the CTD useful for the Reference DB.

C Sun informed the group that the GTSPP NetCDF data format will change to be compatible with ARGO in terms of variable names. There is a suggestion to work on moving ARGO format to be CF compliant by adding the appropriate attributes. A study will be conducted by Charles and Thierry this year.

12. Other topics

The action list was compiled, is available in annex4, and was approved by participants. Dean pointed out that it's important to deliver according to accepted deadlines and that some action on the dataset quality can't wait another year. Megan will help the chairs to monitor the action status progress.

ADMT10 will be hosted by JCOMMOPS and CLS in Toulouse . There is already an offer from Germany to host ADMT11 at BSH/Hamburg.

13. ANNEX 1 Agenda

Objectives of the meeting

- *Review the actions decided at the 8 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 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 Argo array*
  - *the Argo data system (performance indicators, problem reporting)*
  - *the uses being made of Argo RT and DM data (user monitoring)*
- *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 Pr Mark Merrifield from the Ocean Department and Director of the University of Hawaii Sea Level Center.

Feedback from 9th AST meeting : (30mn) Dean Roemmich

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

The Argo Technical Coordinator will report on the status of the Argo program and on the development of the Argo Information Centre. The implementation of metrics to monitor the performance of the data system will be discussed. First feedback on the user forum will be presented. Status on the actions 1,2,3,4,5,6,7,8,9,10

- ***Review of the Action from last ADMT*** *(S Pouliquen)*
- ***Argo Status ,Development of the AIC*** *(M Belbéoch)*
- ***Aquarius and Argo: (J Gunn)*** *(20mn)*

Real Time Data Management (2h00)

Review the Argo real time data stream, the status of actions from ADMT-8 and identify new actions needed to improve the volume, timeliness of delivery and quality and ease of Argo RT data.
Status on the actions :24,25,26,27,28,29,30,31,32

- **Real-time availability**: 15mn (M Belbeoch)
  - Argo floats only available on GTS and not at GDAC
  - Historical Dataset action 24
- **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 25-32(M Ignaszewski)
- **Status of anomalies at GDAC** (C Coatanoan) 20mn
- **Feedback on test on upgrades of tests 8-9-11-14** (C Schmid, Ann Gronell, C Coatanoan) - Action 29 : 30mn

Trajectory from Argo data (1h30)

Status on the actions ,11,12,13,14

- **Feedback on Trajectory progress since ADMT8** (B King)
- **Trajectory work done on Provor at Coriolis** (S Pouliquen,T Carval)
- **Specification on format checker (** T Carval)

GDAC Services (1h30)

What's new at GDACs and Improve services for users.
Status on the actions : 15,16,17,18,19,20,21,22,23

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

Format issues (2H00)

While format is pretty well standardized for measurements and qc flags, experience at GDACS shows that there are discrepancies both at metadata and technical and history levels that ought to be resolved to the benefit of the community. A lot of discussions occurred by email during the year but decisions need to be taken.
Status on the actions : 41,42,43,44,45,46

- **BUFR Format** : Status on the experimentation phase (ALL)
- **Technical Files** Action 41-42 (A Tresher)
- **Handling Iridium floats** (C Schmid?)
- **Encoding a parameter from multiple sensors on a float (T Carval?)**
- **Other needs ?**

Delayed mode data management (2h00)

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

- **Review backlog of DMQC** (Dean or Megan)
- **Feedback from DMQC-3 Workshop** (Brian and Annie)
- **How can altimetry be used to assess Argo quality** (S Guinehut)
- **Report of the pressure working group** (Susan Wijffels)
- **Discussions**
- **Updates to the Argo QC Manual** (Annie)

Progress on Argo Reference data base (1h00)

Status on the actions 38,39,40

- **Summary of the actions since ADMT-8** (C Coatanoan)
- **CCHDO-NODC progress** (S Diggs , T Boyer)
- **Discussion on improvement requested**

RDACs: provide an information on what done and what is planned (1h30)

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

GADR (1h00)

Status on the action 49

- **Status of the Archiving centre** (C Sun)

2. **Other topics (1h00)**
   - **Summary of the 9th ADMT actions** (S Pouliquen M Ignaszewski) 30mn
   - **Location of 10th ADMT**

14. Annexe2 Attendant List

15. Annex3 ADMT8 Action List

	Action	Target Date	Responsibility	Status
	Monitoring Actions			
1	Provide access to the support@argo.net question/answer database to the AST and ADMT chairs	AST9	AIC	Done http://support.argo.net
2	Establish an Argo user mailing list and a subscription form for Argo to notify users rapidly	End 2007	AIC	Created argo-du@jcommops.org
3	Provide to AST chairs the list of operators that notify with delay their floats	End 2007	AIC	Done See AIC report
4	Include in AIC report the suspicious floats/profile detected by John Gilson monitoring tools	AST9	AIC John Gilson	cancelled
8	Modify the text attached to support@argo.net to encourage people to use this email to report on data quality	End 2007	AIC	Done
9	Promote support email on GDAC ARC DAC and GADR and other national WWW	End 2007		Done at Coriolis
10	Argo forum to be set up by AIC	AST9	AIC T Tchen	Started
	Trajectory Actions			
11	Brian to provide guideline on how to correct Ascent and Descent Time for APEX and SOLO floats	End 2007	Brian King	Not done
12	Thierry to provide similar guidelines for Provor	End 2007	Thierry Carval	A proposal will be submitted at ADMT9
13	Each DAC to correct its trajectory file according to these guidelines	ASAP	All DACS	On going At Coriolis To be done at INCOIS and KMA
14	Set up format check on trajectory files	ADMT9	Brian King and Mark Ignaszewski	Not Started
	GDAC Actions			
15	GDAC to work with Kordi to establish data transfer from the Kordi DAC	End 2007	Kordi Loic Petit de La Villéon & Mark Ignaszewski	Completed

16	Hide the GTS directory from the Argo DAC directory and provide a specific index for AIC monitoring	End 2007	Thierry Carval & Mark Ignaszewski	Directory Hidden Index file to set up
17	Add a new column "Adjustment" providing the D and A file adjustment and "missing" for RT (mean of PSAL_Adjusted-PSAl on the deepest 500 meters)	AST9	Thierry Carval & Mark Ignaszewski	Made available at Coriolis GDAC on 24th October 08
18	Automate file removal between the two GDACs	ADMT9	Thierry carval & Mark Ignaszewski	Specification started a proposal will be presented at ADMT9
19	Remove history section from the files in the Latest Data directory. Notify users before !	ASAP	Thierry Carval & Mark Ignaszewski	Under development
20	Study the capability to separate in the latest data directory the new data from the updated ones	ADMT9	Thierry Carval & Mark Ignaszewski	Specification started a proposal will be presented at ADMT9
21	Advertise that at present O2 data are not QCed	End 2007	Thierry Carval & Mark Ignaszewski	Done
22	Improve File checker for realtime and delayed mode profiles checking not only the format but also the consistency of the data and transfer to Coriolis	For Test Jan-Feb 2008 Start operational March 2008	Mark Ignaszewski DACs to eventually correct their files	Dev finished . Awaiting for deployment on new US GDAC servers
23	Set up the automated greylist submission	AST9	Mark Ignaszewski	Dev finished . Awaiting for deployment on new US GDAC servers
	Real-time QC Actions			
24	Take action to process from raw data the historical floats only available via the GTS directory (table 11 & 12 from AIC report)	ASAP	Mainly AOML for USA Argo equivalent floats Remaining floats from Jamstec, Canada, India	Done for JAMSTEC floats On progress for AOML with NAVO floats
25	KMA to work with MEDS to understand why MEDS doesn't see any KMA TESSAC messages since March 2007	End 2007	Ann Tran and KMA	Corrected Dec 07
26	CLS to check why the pressure problem has reappeared	End 2007	Yann Bernard	Corrected Nov 07

27	When salinity is missing for a level, DACs were requested report the z, T, S triplet with S set to "////" rather than completely excluding the level		KMA Coriolis CLS	Done at CLS and Coriolis and KMA
28	On GTS , in TESAC message Japan, Australia and Korea to check why occasionally the depth is not increasing;	AST9	JMA KMA	Done at JMA and KMA
29	Test the proposed upgrades of tests 8-9-11-14 propose in Christine report	March 2008	AOML Coriolis CSIRO	AOML will report on tests
30	Update test 6 if the float transmits conductivity set PSAL_QC=4 if TEMP_QC=4	ASAP	All DACs	Done at CSIRO INCOIS have no such floats Done at JMA, KMA
31	Update the QC manual	End 2007	Thierry Carval	Done 21st January 08
32	Investigate the 12 hour offset on Incois data on GTS	ASAP	Incois CLS	Done at INCOIS
	Delayed-Mode QC Actions			
33	Reduce backlog of Delayed Mode file to less than 20%	ADMT9	All DM operators	On progress but only 59% target reached. Man Power is a real issue!!!
34	Make available the Plots related to DMQC for each float on FTP organized by WMO number	AST9	All DM operators	Jamstec: Plots available on own WWW
35	Program a 3rd DMQC workshop	Sept 2008	Brian King and Annie Wong	Done
36	Provide an enhance version of OW software	Feb 2008	Annie Wong	Done
37	Update the QC manual to inform DM operators that they can revisit de RT QC flags if they find errors and modify them	End 2007	Annie Wong	Done 21st January 08
	Reference Dataset Actions			
38	Provide the first version of the Argo Ref DB Argo2008-01	March 2008	Christine Coatanoan	ARGO2008V01 was issued on the 31st July 08
39	Propose and update procedure for the new CTD coming from ARC, CCHDO and NODC	ADMT9	Christine Coatanoan, Steve Diggs and Tim Boyer	Proposal will be discussed at ADMT9

40	ARC to send the collected CTD to CCHDO either as public or private access data	AST9	All ARCs	Started JAMSTEC sent to NODC CTD older than 1year INCOIS sent CTD to Coriolis and NODC AOML sent CTD to NODC .
	Format Actions			
41	All Dacs to prepare for GTS distribution in BUFR using if they want JMA converter	ASAP	All DACs except JMA who has already started	Dev done at Coriolis waiting for Meteo-France agreement to start a test Dev Done at AOML Under testing at KMA
42	Circulate the list of technical parameters so that the DAC can see if they have corresponding parameters for what they do at present. This list will be posted at ADMT WWW site.	AST9	Ann Gronell and Claudia Schmid	First version Done Updates needed while people implement
43	Propose an update procedure for the list of technical parameters when a new one is needed	ADMT9	Ann Gronell	To be formalized at ADMT9
44	Modify the User manual to take the new technical file format into account.	End 2007	Thierry Carval and Ann Gronell	Manual have been modified To be approved at ADMT9
45	DOXY measurement : fill properly the metadata : Sensor=DOXY or TEMP_DOXY , Sensor-Maker="Aanderaa" or " SEA-BIRD ELECTRONICS, INC." " Sensor-Model= "Oxygen Optode 3830" or "Oxygen SBE43F"	ASAP	ALL DACs processing DOXY	Done at CSIRO an INCOIS Done at JMA Partially done at AOML
46	DAC to update their technical files according to new specification	ADMT9	All DACs	Specification started at Coriolis Ready to go at CSIRO waiting for file checker update Idem INCOIS To be done at KMA

47	Update the file checker and provide access through test directory on US-GDAC	ADMT9	Mark Ignaszewski	
48	Reword the description of float cycle in the user manual	AST9	Thierry Carval and Ann Gronell and DACs	A proposal will be presented at ADMT9
	GADR			
49	Provide the list of float with problems on GTS to AIC on a monthly basis to be included in the monthly report	ASAP	Charles Sun and AIC	Done

16. Annex 4 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	
2	DACs to verify they are prepared for cycle > 255	ASAP	DACs	
3	Monitoring the floats sending good data to be included in AIC report	AST10	AIC	
4	Promote the email support@argo.net on ARC GDAC DACs WWW sites	AST10	ALL	
	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	
6	DAC to clean up their files according to the warning issued in previous action	AST10	All DACs potentially	
7	Revise the RT traj file description	End Nov 2008	Thierry Carval and Brian King	
	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 ?)	
9	Coriolis (& Us-GDAC?) to investigate why the list of floats mentioned in AIC report have disappeared	15 November	T Carval (&M Ignaszewski?)	
10	Automate file removal according to the agreed procedure	AST10	GDACs	
11	Modify the "latest data" directory to handle a sliding of 3 months and separate R and D data.	AST10	GDACs	
12	Implement an MD5 signature to secure file transfer and document it	ADMT10	GDACs	
13	US-GDAC to automate grey list submission	End 2008	M Ignaszewski	

14	DFILE checker to be tested in December with DACs and then transferred to Coriolis GDAC	AST10	M Ignaszewski	
15	GDAC D-files holding to be checked and anomalies provided to DAC and DM operators	January 2009	M Ignaszewski	
16	Document Grey list submission	End 2008	T Carval	
	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	
18	BODC to revisit the issue of stopping sending duplicates on GTS	ASAP	Lesley Rickards	
19	Coriolis to provide feedback on anomalies detected by statistical analysis in text files	AST10	T Carval & C Coatanoan	
20	DAC to correct their flags according to Coriolis recommendation and resubmit them	ASAP	All Dacs	
21	Coriolis and AIC to monitor the resubmission of profiles after feedback	ASAP	AIC and Coriolis	
22	QC manual to be updating to specify sigma0 in the density test	15 November 2008	C Schmid T Carval	
23	New proposal made by B King of Jump test to be tested	AST10	UW, CSIRO, BODC and all voluntary DACs	
24	Develop a common method for determining the positions and observation times at DACs	ADMT10	DACs. Lead by Ann Thresher	
25	DACs to verify their Salinity gross range check with minimum value of 2 PSU	ASAP	DACs	
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	
27	DACs to provide timetable on when they will have corrected their files	1st January 2009	All DACS	
28	Clean the tech file for surface-pressure in tech files	AST10	DACs	
29	Do not confuse SURFACE PRESSURE with the shallowest measured pressure in the vertical profile.	ASAP	INCOIS	

30	PRES should record *raw data*. All adjusted pressures go to PRES_ADJUSTED in 'A' mode for real-time DACs.	ASAP	JMA	
31	DACs to implement RT pressure correction according to specification in the new version of the QC manual on incoming data.	AST10	DACS	
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	
	Delayed-Mode QC Actions			
33	ADMT chairs to indicate in report the endorsement of OW method by ADMT for DMQC	15 November	Chairs	
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	
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	
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	
37	Modify QC manual	15 November 2008	A Wong	
	Reference Dataset Actions			
38	CCHDO to collect CTD in sparse area in the REF DB and especially Southern Ocean	ASAP	S Diggs	
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	
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	

	Format Actions			
43	All DACs to transmit their BUFR file to Ann to be checked	ASAP	Anh Tran	
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	
46	DACs to updates their tech files	AST10	All DACs	
47	Update user manual to put the conversion equation for Oxygen measurement	15 November	T.Kobayashi C Schmid and T Carval	
48	Identify format upgrades to be CF compliant	ADMT10	T Carval & C Sun	
49	Validate BUFR files on GTS	July 2009	A Tran, Navy (NAVO and/or FNMOC)	
50	Revise meta-file format taking into account the configuration data	End Nov 2008	Thierry,Claudia & argo-dm-format	
51	Resubmit meta-files	ASAP	All DACs lead GDACs	
52	Revise the user manual on meta and tech files	End Nov 2008	T Carval & Claudia Schmid	
53	Study the delivery of bounced profiles	ADMT10	T Carval & Claudia Schmid and format mailing list	
	GADR			
54	Move to operational the monthly image of the Argo dataset on a sliding one year window	End 2008	C Sun	
55	Document the Preliminary QC procedure on WOD updates	ASAP	T Boyer	

17. Annex5 National Reports

Australian Argo National Data Management Report
ADMT9
29-31 October 2008

Ann Gronell Thresher (CSIRO) and Lisa Cowen (Australian BOM)

During the past year, Australia has deployed 41 Argo floats. We now have 176 active floats from a total of 213 deployments. We also have a total of 116 floats either in the lab, on ships about to be deployed or on order. Eight of these, in partnership with the University of Tasmania, are equipped with EM current sensors, 18 have oxygen sensors and will be deployed between -35 and -55 degrees latitude to monitor circulation changes in this region and the rest are 'vanilla' floats. We expect at least 35 floats to be deployed in November 2008.

This year has been without the problems of earlier years. We have had some failures but no systematic, widespread technical problems have delayed our program. One issue we had to manage was the quality of our lithium batteries. Some cells in the packs we received from the manufacturer were bad but this could only be detected if the pack was tested under load. We now test all packs before we install them on the floats. This has not yet been responsible for premature failure of any of our floats.

The real-time software developed last year has now been working well for almost 2 years. There were a few bugs which have now been fixed which resulted in empty fields for some variables. We have also added coding for 4 new data formats, bringing to 17 the number of formats it can recognize and decode.

We have recently delivered the software to our Indian counterparts and have it working on their system. If anyone else is interested, it is a Matlab program that works from the raw Argos hex data to decode the profiles and create all required netcdf fields for delivery to the GDACS. Though it took quite a bit of time to get running, we believe the benefits are worth it.

In April 2008, the Australian Bureau of Meteorology (BOM) hosted the National Argo meeting in Melbourne. BOM has also has provided 14 of our floats as well as fantastic help recruiting ships for deployments. The Royal Australian Navy's HMAS Arunta deployed 9 floats and the RAN purchased an additional 4 floats this year, continuing their valuable contribution to the Australian Argo program.

Early in 2007, we received a funding boost from a new national initiative to provide research infrastructure, the Integrated Marine Observing System, funded by the Australian Government through the National Collaborative Research Infrastructure Strategy. With this funding, we have been able to order a total of 64 floats this year. Next year, we plan to devote funds to deployment shiptime on R/V *Kaharoa* to ensure that areas currently undersampled are seeded with floats.

Table 1 shows a summary of our float performance:

Float Status	Number of Floats	Range of Cycles Received before failure
Died from battery failure (end of life):	10	79-133
Disappeared on deployment	5	0
Disappeared after grounding or running ashore	7	14-121
Druck pressure sensor failure (still reporting)	1	130+ (27 good profiles)
Mechanical failure	3	0-36
Disappeared without apparent cause	5	40-85
Lost in ice	5	58-85
In ice (still considered active)	(3)	
Probable leak	2	21-49
Still active	171	
Grey listed	4	
Total deployed	213	

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

1. 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. Over the 12 months to September 2008, 70% of all profiles were delivered to the GTS within 24 hours of the float surface time. However 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 and hopes to have this as a part of the routine processing by the end of November 2008.

- 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

- Delayed mode data progress has been made, primarily in software development and implementation. We have also had several staff changes which have affected processing. As of 1 October, 53.3% of all our profiles have been submitted in delayed mode. This represents 68.8% of the profiles that are old enough to be considered for DM correction. The remaining profiles are the ones that are more difficult to process and require more effort or are profiles that are newer and will wait until we have new software in place.

  We have been analyzing salinity drift using WJO with WOD01 and the IOHB databases but are now looking at implementing SeaHyd. We are also using additional tools, including anomaly plots from two additional databases (CARS and G&K) and nearby Argo data to help determine if a float is drifting.

  Currently we are looking at implementing OW and the SIO GUI with the new WOD05 reference database.

  Major issues that we have:
  1). Sparse reference data - particularly in the Southern Ocean and the Coral Sea. In order to try and improve the situation we have sourced as much additional CTD data for the Southern Ocean as we could, finding 29 research cruises (14 were post 1995 with reasonable CTD data quality) from the Australian Antarctic Division (AAD) and Antarctic Climate and Ecosystems Cooperative Research Centre (ACE CRC)which were handed over to Christine Coatanon, Tim Boyer and Steve Diggs (in Dec 2007). The QC of these datasets, however, was not very good and will need to be improved before these data sets can be used effectively.

  2) Our floats inhabit highly variable oceanic regions. It is therefore difficult to determine if observed variation in salinity is caused by sensor drift or due to spatial or temporal changes in oceanographic features.

  Using a suite of tools to determine salinity drift helps - i.e. using three comparative climatologies (WJO(IOHB), CARS, G & K) and implementing and improving new software tools such as the nearby Argo comparison and a dynamic height analysis (Southern Ocean floats).

  It will take some time to implement the new software but once that is done, we expect the process to be much faster and this will improve our percentages.

- 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. Information on our float program can be found at: http://www.imos.org.au/facilities/argo-australia.html ; data on individual floats can

be found at: http://www.marine.csiro.au/~gronell/ArgoRT/; data on our DMQC process and floats can be found at: http://www.marine.csiro.au/~ttchen/argo/

- 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.

- 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

A separate document reporting Delayed mode progress and issues can be found at: http://www.marine.csiro.au/~gronell/ADMT8_web/ADMT8.html

Argo Canada National Data Management Report
ADMT 9
Oct 28- Oct 31, 2008

1. **Status**

Data acquired from floats: We are currently tracking 108 floats. Of these, 4 may be in trouble or may have failed to report within the last 6 months. Since October 2007, we deployed 25 floats. 24 of the new deployments were floats with pressure activation and deep profile first (DPF) feature and 1 was an Iridium APEX float using the CLS/Rudics system. Currently we have 12 active floats equipped with Aanderaa's oxygen sensor (optode model # 3830).

Data issued to the GTS: All of the data are transmitted on the GTS. On average 84% of data are transmitted on the GTS within 24 hours of the floats reporting in 2008. Longer delays are due to incomplete sets of messages received from the floats and network connection problems. We are expecting to send Argo data in BUFR format in November at the latest, or as soon as we receive all of the required information. Since we set up a data system to handle an Iridium float, all profiles from that float have been inserted on the GTS within 24 hours.

Data issued to GDACs after real-time QC: All of the profiles, technical, trajectory and meta files are transmitted to GDACs in netCDF format on an operational basis and at the same time as the data are sent to the GTS.

Delayed data sent to GDACs: There are about 9000 delayed mode profiles to be sent to GDAC in November or earlier.

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 in 60 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

Argo data are being incorporated in an optimal interpolation product generated at ISDM, together with other data received via GTS. The product is currently being used internally for *ad hoc* QC of various oceanographic data. The optimal interpolation software was provided by Coriolis.

On the east coast, Argo is being used as part of the routine environmental assessment system known as AZMP, or the Atlantic Zonal Monitoring Program.
http://www.meds-sdmm.dfo-mpo.gc.ca/zmp/docs_e.html

Argo data are also being used in statistical studies of the slope water region between 35^0- 48^0 N and 45^0-75^0W by Gilbert and Nault (2008).

2. Delayed Mode QC

Mathieu Ouellet has upgraded the Matlab version used at ISDM in order to render it able to work with the WJO software and the new OW software, and updated code that was no longer supported by the Matlab NetCDF toolbox. He also updated the reference database with data from JAMSTEC and Coriolis, in both softwares WJO and OW. He performed quality control of 9000 profiles from active floats and the outputs passed our format checks. We expect to send our new batch of delayed mode files to the GDACs in November 2008 or earlier.

3. GDAC Functions

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

4. Regional Centre Functions

Canada has no regional centre function.

Argo National Data Management Report 2008

The 9th Argo Data Management Team Meeting

1. Status

The Chinese DAC has processed data from 48 Argo floats including 22 active floats as of October 19, 2008. Of these floats, 16 floats were deployed in this year. The DAC is acquiring ARGOS messages from all the active floats in real-time. Over 400 observed profiles from those floats are sent to GDACs after real-time QC in 2008. All the data are inserted into GTS at CLS. Both WJO and OW methods are applied to Chinese floats by Chinese DAC. Until now, 1862 Dfiles 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 former 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.

The 2nd Argo science workshop of the National Basic Research Program ("Research on upper ocean structure, variability and prediction based on Argo global real-time ocean observing system") was held in October, 2008. It can be seen from the meeting presentations that Argo data has been used in ocean data assimilation and reanalysis, regional oceanographic research and the ocean responses to the tropical cyclones.

In order to expand the usage of Argo data, China Argo Data Center also provide many products of Argo data, such as waterfall maps, Argo trajectory

maps, global surface current and mid depth current maps which are derived from Argo trajectory data.

China has purchased 2 Iridium floats from WRC, and these 2 floats were assembled at UW under the help of Steve Riser.

2. Delayed Mode QC

Both WJO and OW methods are applied to Chinese float data by Chinese DAC. We find that the accuracy of calibration is reduced in the OW method when the CTD data are limited in some areas. More CTD data are being prepared for calibration now. The thermal lag is not obvious in Chinese Argo data because most of floats are not deployed in high latitude. Until now, obvious sensor drift or offset which need to be adjusted has been found in 4 Argo floats. 1862 Dfiles, which represents more than 90% of all Chinese profiles, have been updated into GDACs.

Argo National Data Management Report

Dutch Argo

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

- Data acquired from floats
- Data issued to GTS
- Data issued to GDACs after real-time QC

14 active floats presently, 6 floats dead, having reached their designed life time. All floats have sent/are sending data regularly. The data are issued to GTS and GDACs after real-time QC (done by Coriolis).

- Data issued for delayed QC
- Delayed data sent to GDACs

Data until 2007 have been QCed and sent to GDACs

- Web pages

http://www.knmi.nl/~sterl/Argo - Dutch only

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

no data usage, one national PI (A. Sterl, KNMI)

- Products generated from Argo data …

none

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

Delayed mode QC has been done by BSH (Brigit Klein).

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

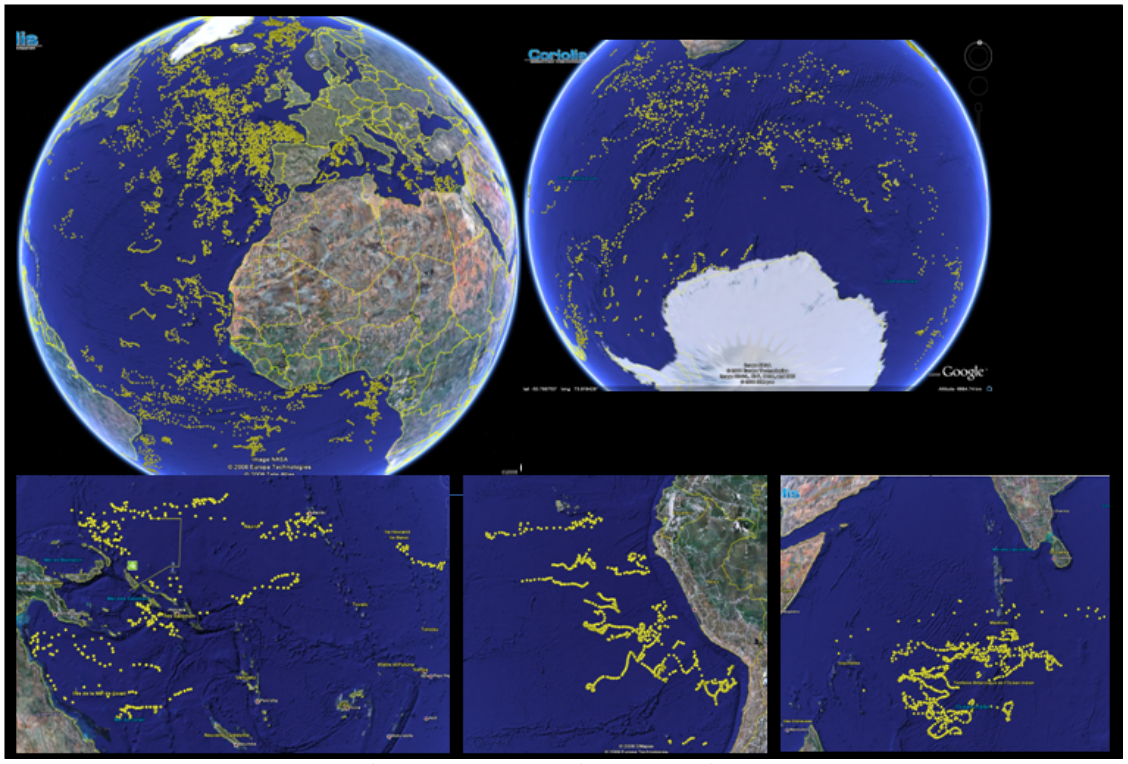
- National centres reporting to you
- Operations of the ftp server
- Operations of the www server
- Data synchronization
- Statistics of Argo data usage : Ftp and WWW access, characterization of users (countries, field of interest : operational models, scientific applications) …

n/a

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

Argo National Data Management Report

Coriolis annual report October 2007 – November 2008
Version 1.0
October 21st, 2008



New Argo profiles 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 …

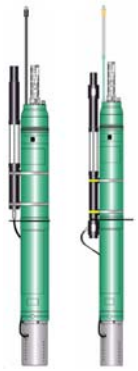
This report covers the activity of Coriolis data centre for the period between September 1st, 2007 to October 1st,2007.

Data acquired from floats

13120 profiles from 478 floats where collected, controlled and distributed this year.
A total of 66037 profiles from 871 platforms where collected, controlled and distributed since May 1998.

This year, the 478 active floats managed had 30 versions of data format:

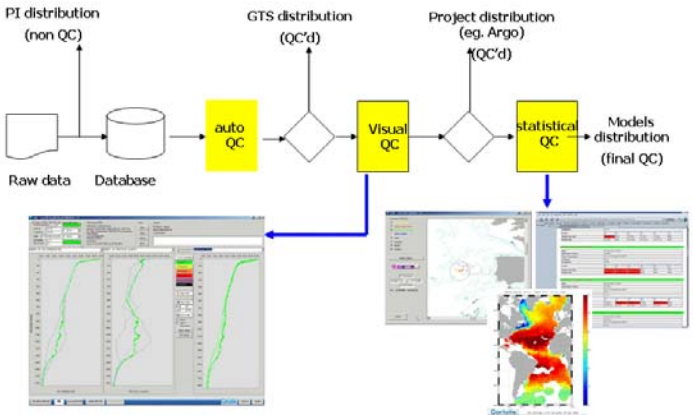
- APEX : 19 versions
- NEMO : 3 versions
- PROVOR : 8 versions



In 2008, among 30 versions of floats, 3 new types of ProvBio and ProvCarbon observations were decoded. This new generation of Provor floats provides bio-geo-chemical observations such as turbidity, chlorophyll or pCO2.

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 Mersea.

Delayed mode data sent to GDACs

An Argo delayed mode profile contains a calibrated salinity profile (psal_adjusted parameter).
15116 delayed mode profiles where sent to GDACs this year.
A total of 31 816 delayed profiles where sent to GDACs since 2005.

Web pages

The web site of the French DAC is available at:

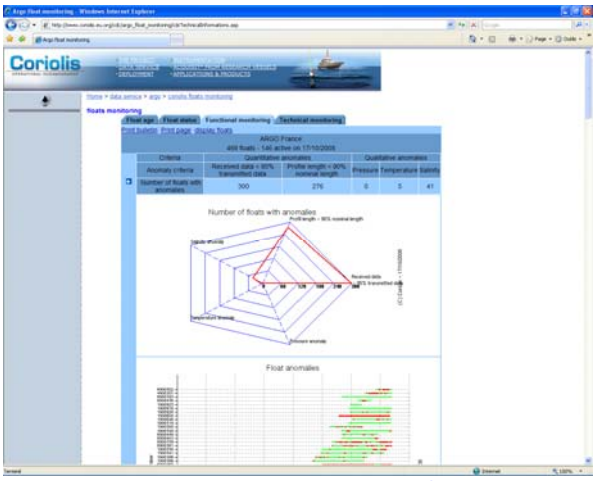
- http://www.coriolis.eu.org/cdc/argo.htm

It provides:

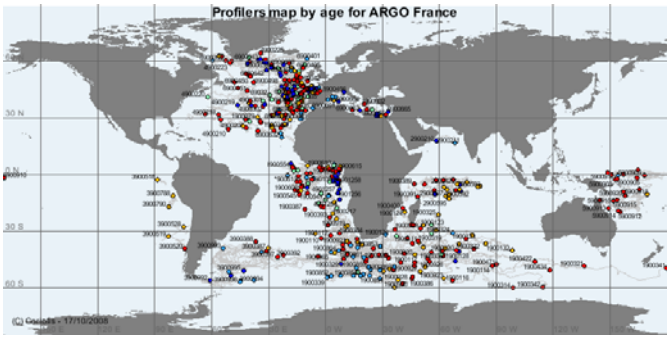
- Individual float description and status (meta-data, geographic map, graphics : section, overlayed, waterfall, t/s charts)
- Individual float data (profiles, trajectories)
- FTP access
- Data selection tool
- Global geographic maps, GoogleEarth maps
- Weekly North Atlantic analyses (combines Argo data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



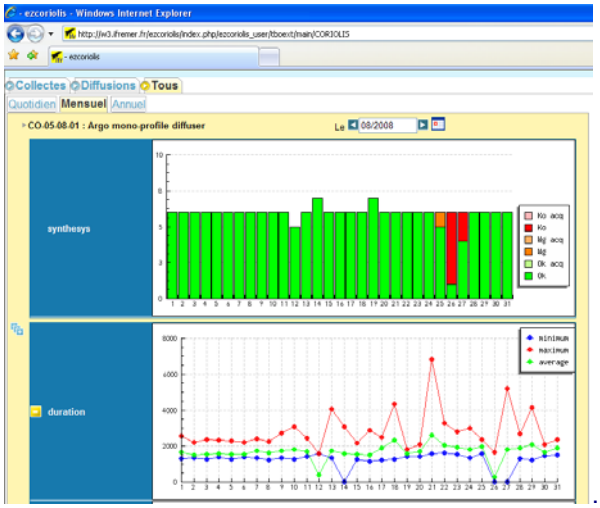
Example 1: technical monitoring of Argo-France floats



Exemple 2: age map of Argo-France floats.

Data centre activity monitoring: since the beginning of the 2008, 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:

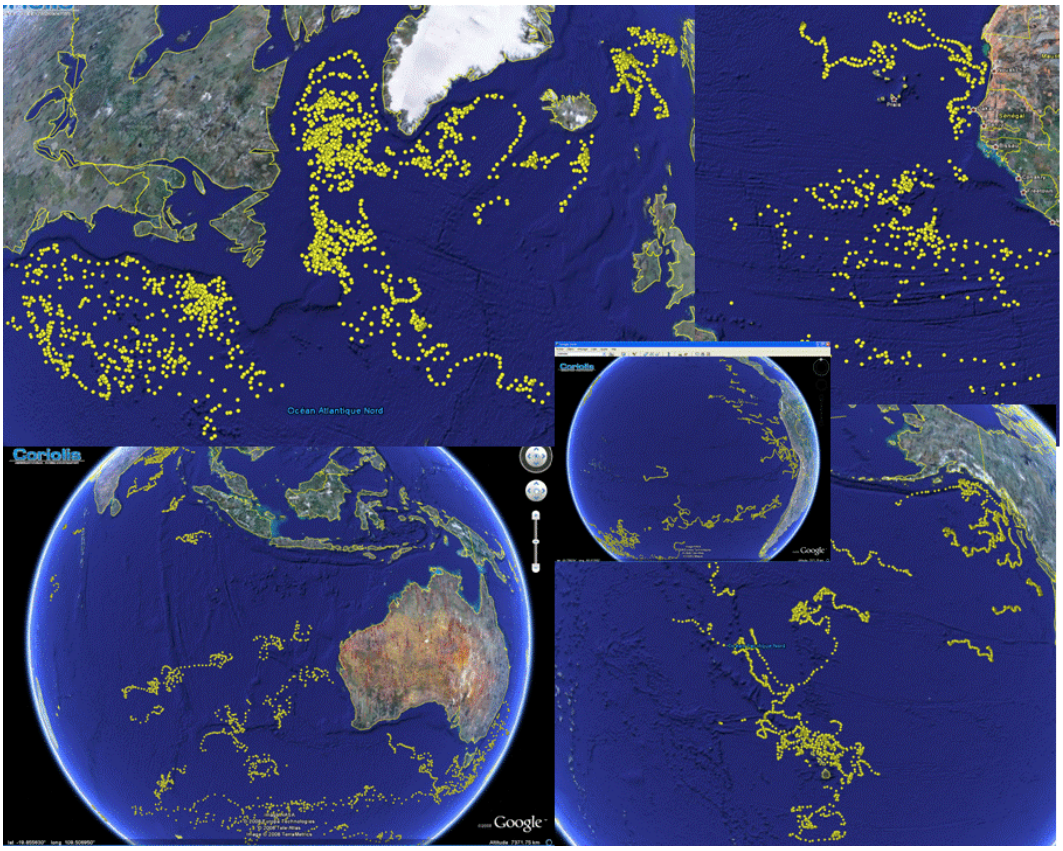
- French model Mercator (global operational model)
- French model Previmer (regional operational)
- French model Soap (navy operational model)
- EU Mersea models (Foam, Topaz, Moon, Noos)
- EuroGoos projects

Argo projects: this year, Coriolis data centre performed float data management for 31 Argo scientific projects managed by 27 PIs (principal investigators).
List of involved Pis this year :

Alain SERPETTE
Alexis CHAIGNEAU
Andreas STERL
Birgit KLEIN
Christoph Kihm
Daniel Ballestero
Detlef QUADFASEL
Dr Osvaldo ULLOA
Einar SVENDSEN
Gilles Reverdin
Gregorio PARRILLA
Isabelle TAUPIER-LEPAGE
Jens MEINCKE
Jens SCHIMANSKI
Jose Luis PELEGRI
Juergen FISCHER
Klaus-Peter KOLTERMANN
Loic GOURMELEN
Louis PRIEUR
Ochoa de la Torre
Olaf BOEBBEL
Pascale LHERMINIER
Pierre-Marie POULAIN
Sabrina SPEICH et Michel ARHAN
Serguey GLADYSHEV
Thierry DELCROIX
Virginie THIERRY.

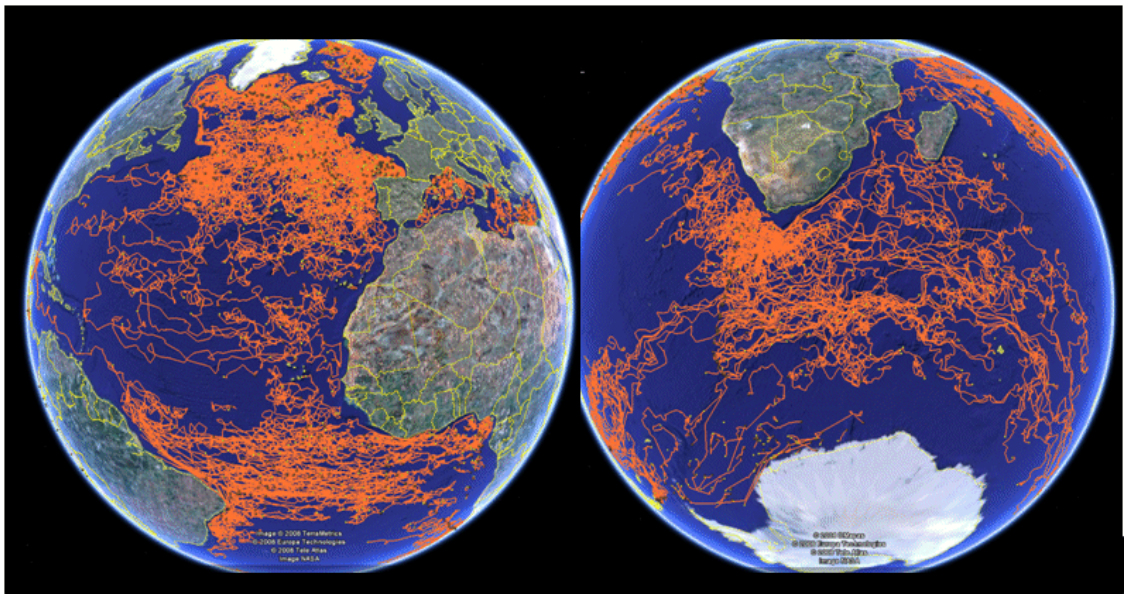
Products generated from Argo data …

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).
Today there are 14 009 oxygen profiles from 224 floats.



Oxygen profiles collected this year by all Argo partners (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.



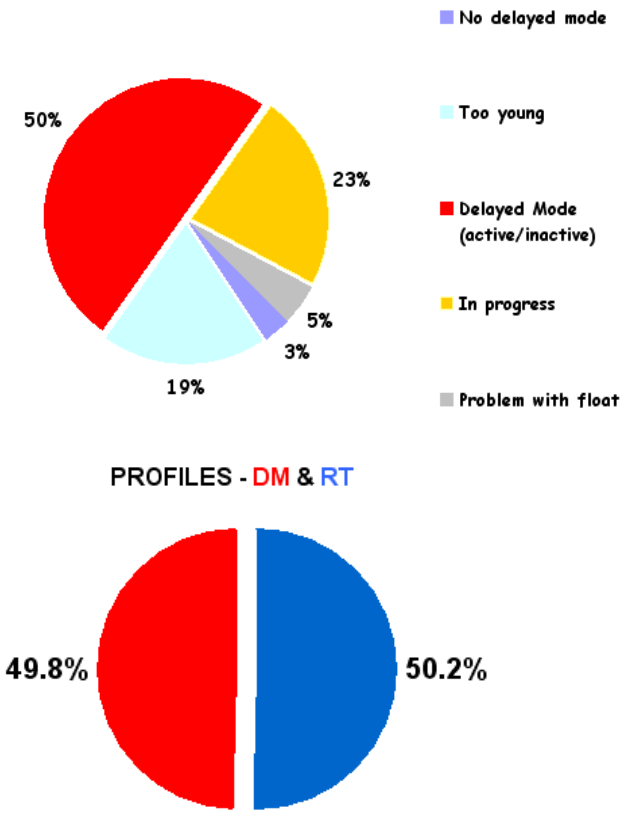
This year, Argo trajectories from Coriolis DAC where carefully scrutinized to produce a first version of an atlas of deep ocean currents.

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.

In October 17th 2008, 31 816 profiles have been processed in delayed mode quality control corresponding to almost the half of available profiles for the Coriolis DAC (including young floats).



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).

GDAC Functions

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

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

National centres reporting to you

Currently, 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).

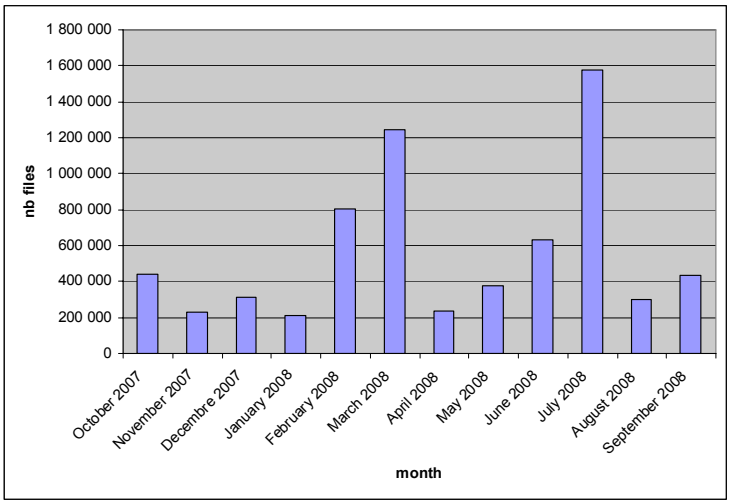
On October 20th, the following files were available from the GDAC FTP site.

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 files
October 2007	443 581
November 2007	231 633
Decembre 2007	312 397
January 2008	208 847
February 2008	805 985
March 2008	1 245 216
April 2008	238 662
May 2008	378 076
June 2008	632 104
July 2008	1 573 806
August 2008	296 873
September 2008	433 020
Total	6 800 200

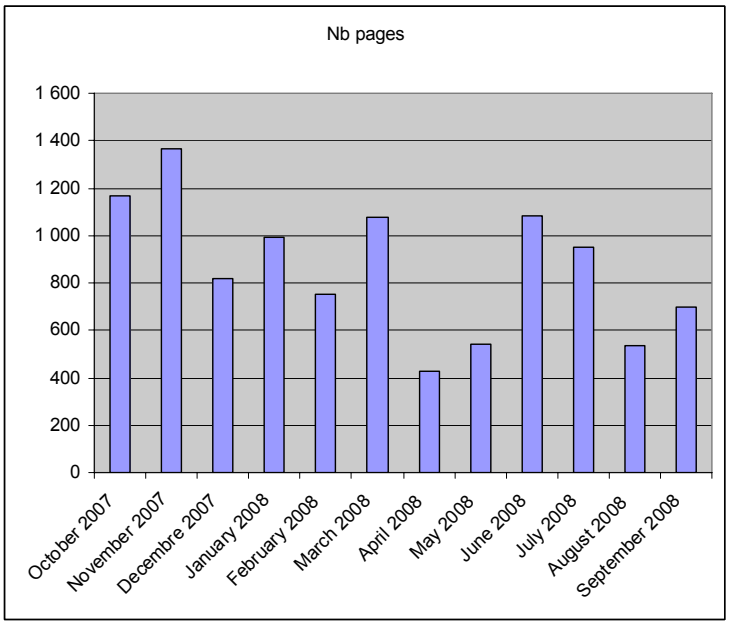


FTP server activity, number of downloaded files

Operations of the www server

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

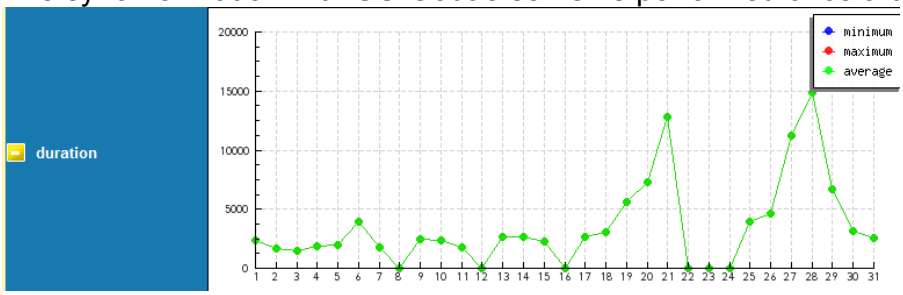
Month	Nb pages
October 2007	1 166
November 2007	1 367
Decembre 2007	817
January 2008	993
February 2008	749
March 2008	1 075
April 2008	425
May 2008	543
June 2008	1 080
July 2008	948
August 2008	536
September 2008	695
Total	10 394



Web server activity, number of downloaded files

Data synchronization

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



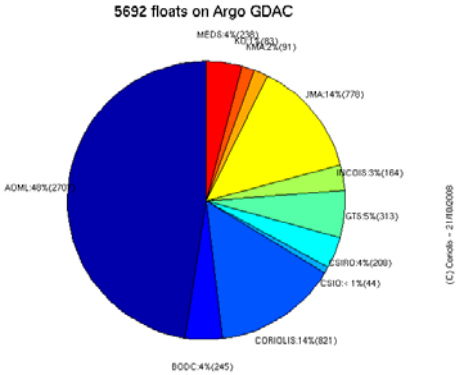
Example of synchronization monitoring : duration of the process in August 2008

Grey list

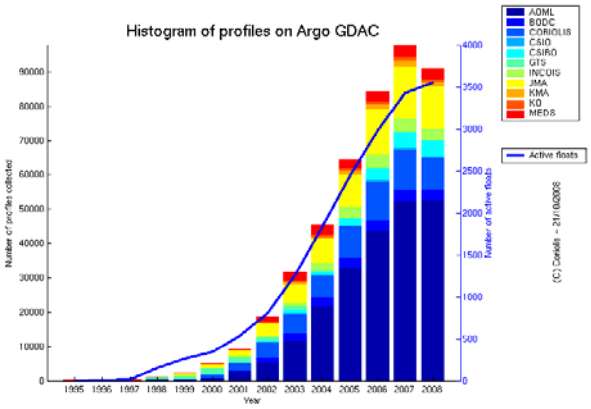
According to the project requirements Coriolis GDAC hosts a grey list of the floats which are automatically flagged before any automatic or visual quality control.

The grey list holds 845 entries (21st October 2008).

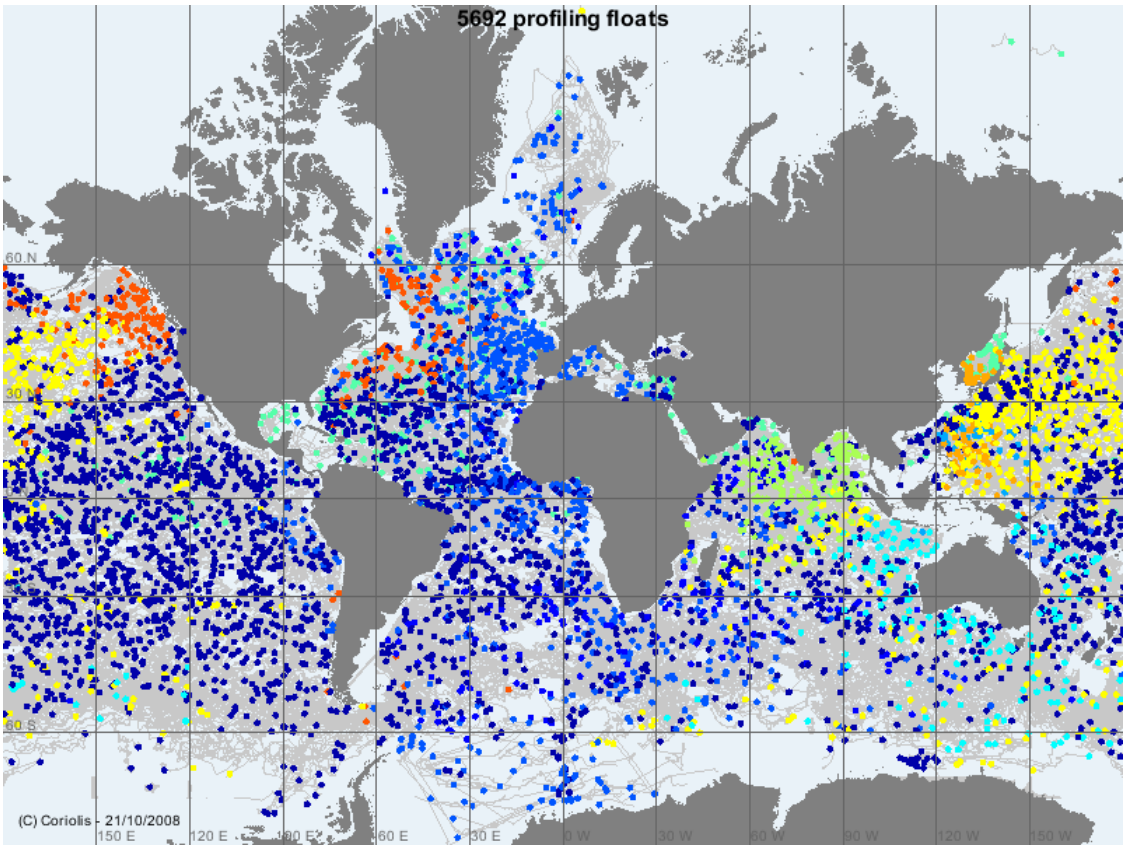
Statistics of Argo data usage : Ftp and WWW access, characterization of users (countries, field of interest : operational models, scientific applications) …



Argo GDAC : floats distribution per DAC in October 2008

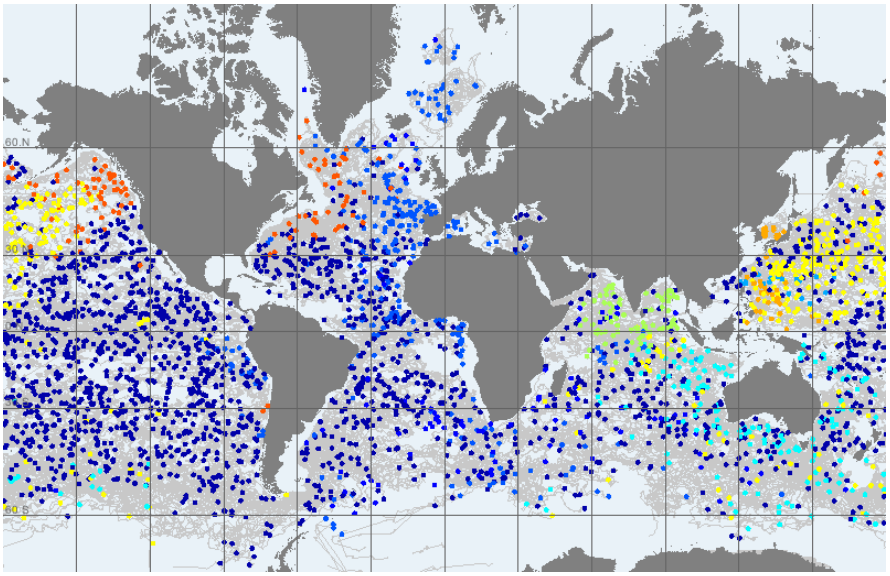


Argo GDAC : profiles distribution per DAC in October 2008[1]

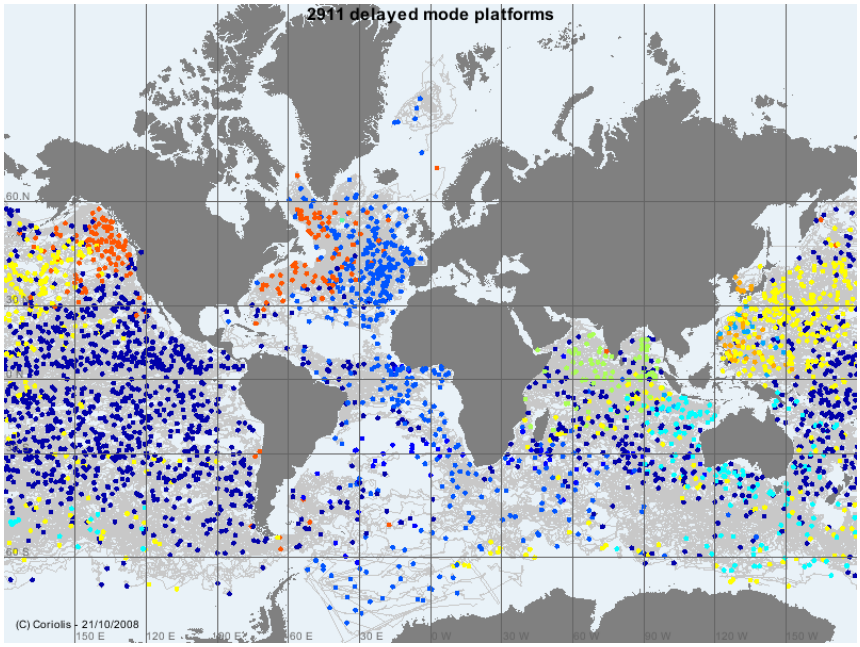


Argo floats available from GDAC in October 2007
(This map includes active and old floats)

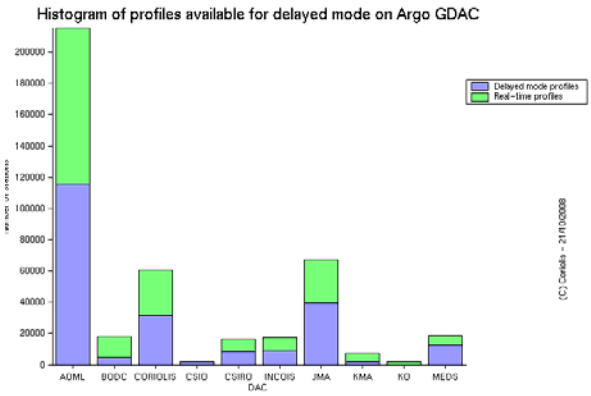
[1] Warning : the blue line displays the total number of active floats during a year. This total is different than the floats active at a particular day.



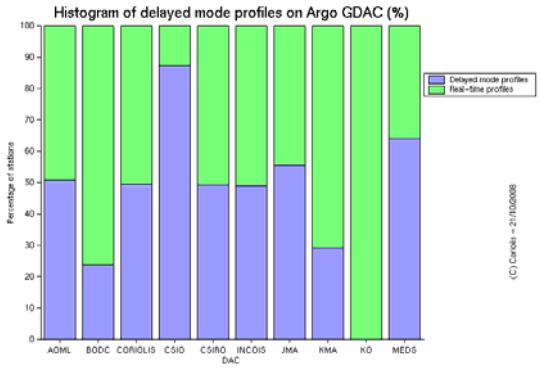
Active Argo profiling floats availables from GDAC in October 2008



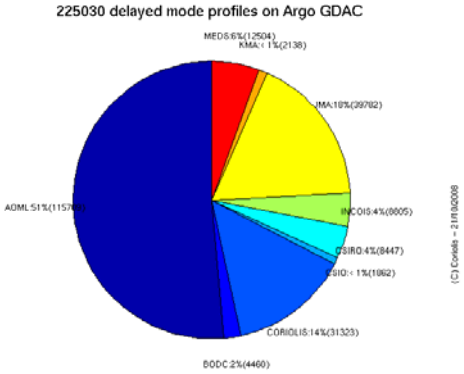
Argo GDAC : delayed-mode profiles available for delayed-mode in October 2008



Argo GDAC : delayed-mode profiles distribution per DAC in October 2008



Argo GDAC : delayed-mode profiles distribution % per DAC in October 2008



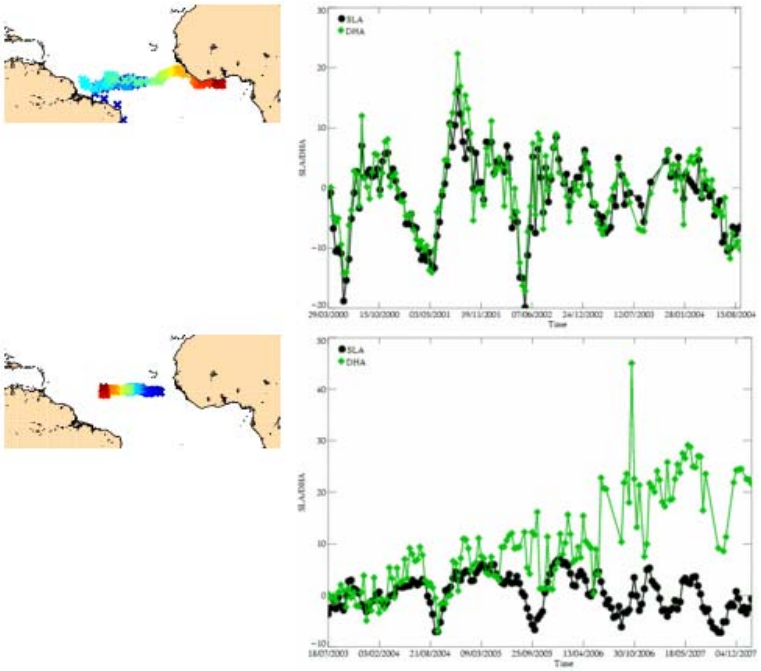
Argo profiling floats with delayed-mode profiles availables from GDAC in October 2008

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 EuroArgo.

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.



Example of NAARC activity: comparison between Argo float observations with SLA and DHA (SLA, Sea Level Anomalies; DHA, Dynamic Height Anomalies)

CLS Argo Data Management Report 2008

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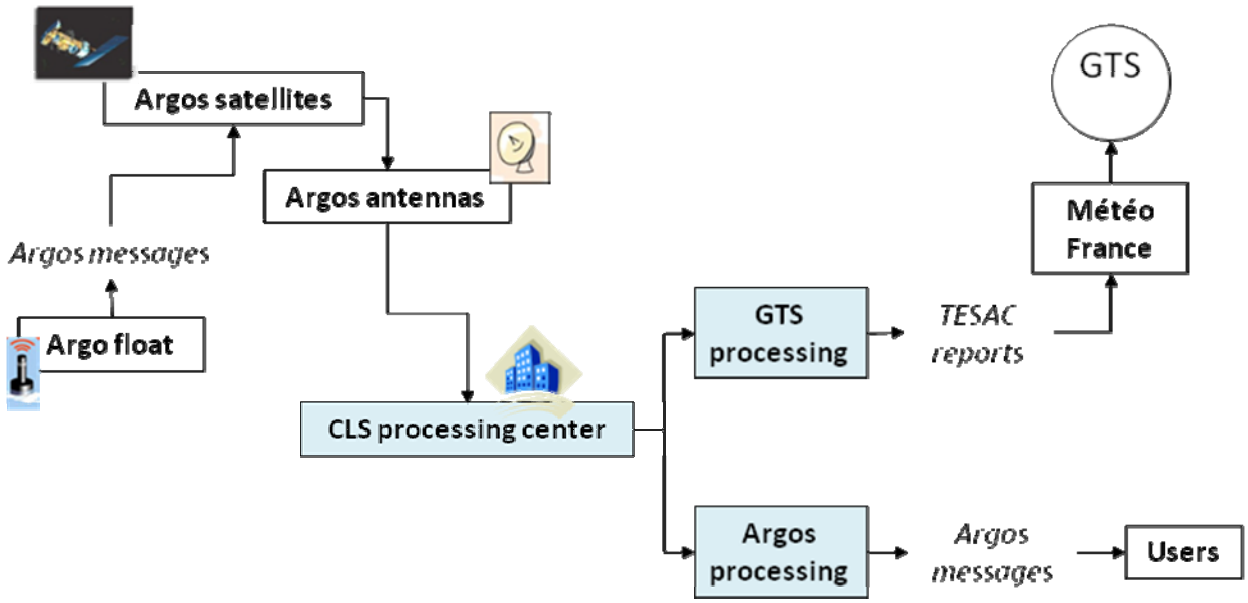
1. CONTEXT

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 115 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 but is "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 2008

- **Data acquired from floats :**
  - 171 floats were declared in the CLS GTS database
  - 147 instruments were active in this month
  - 147 were disseminated profiles on the GTS
  - 5567 profiles were processed since October 2007 at CLS

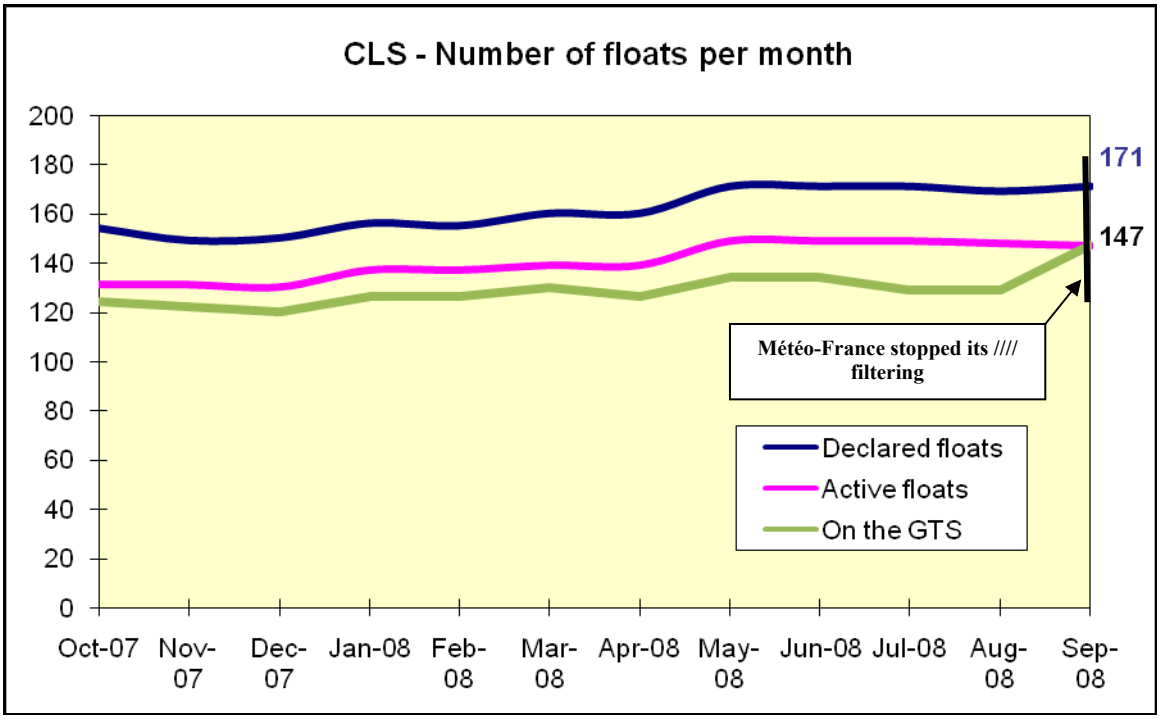
- **Description of the** 171 **floats :** CLS processed in real time floats for Argo program which are not hosted by a national DAC:
  - 100 INCOIS floats,
  - 48 KORDI floats,
  - 21 Argo China floats,
  - 2 Argo Russia floats.

All these floats are Webb Apex Research floats with 14 different data formats.

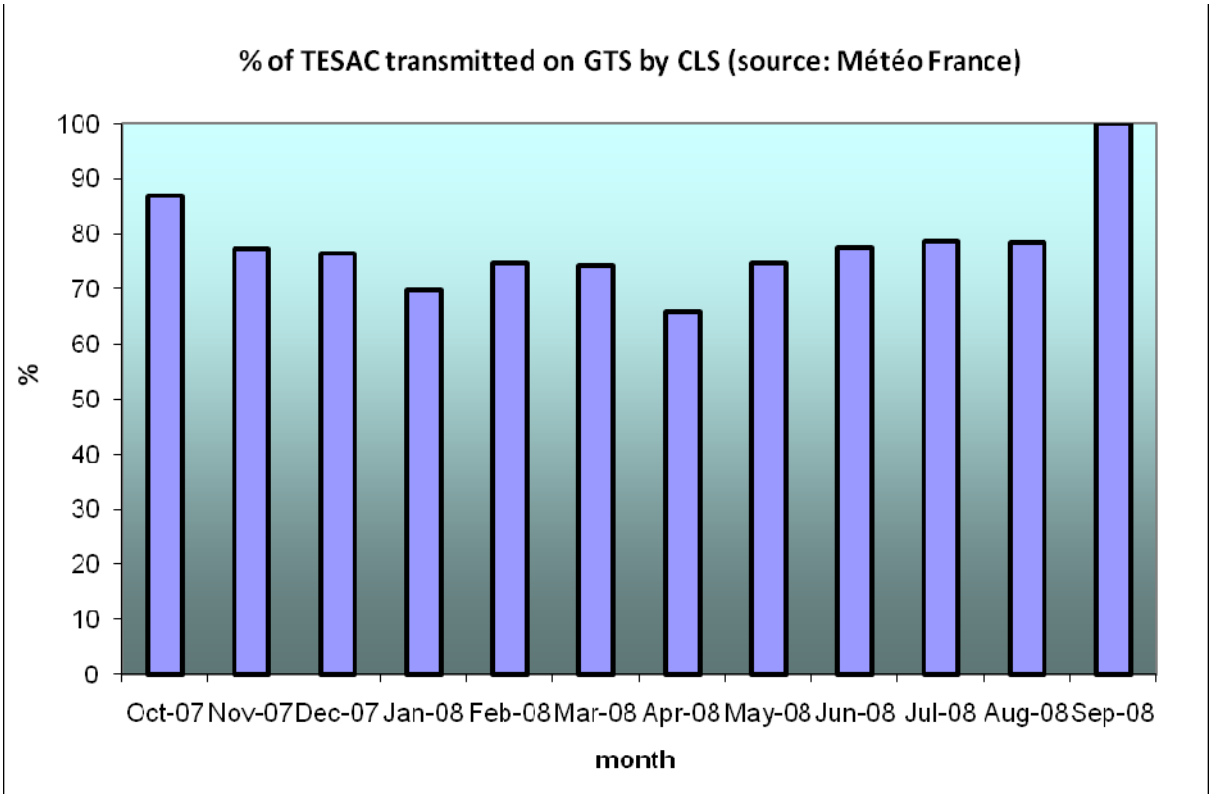
- **Data issued to GTS:** All data processed by CLS are distributed on the GTS by way of Meteo-France. This operation is automatically performed and TESAC bulletins are sent to Meteo-France every 2 minutes. Before the encoding in TESAC bulletins, Argo data are filtered by Argo QC procedure. The GTS processing at CLS is operational and in backup with the CLS America (in Largo, Washington) processing center 365 days per year, 24 hours a day.
  - 4348 profiles were relayed onto GTS since October 2007 (source: Meteo-France)
  - Note that, since August 2008, 28th Météo-France stopped its //// filtering (replace a missing value) and now 100% of TESAC produced by CLS are on the GTS (507 bulletins in September 2008 against 400 in August 2008)

- **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,

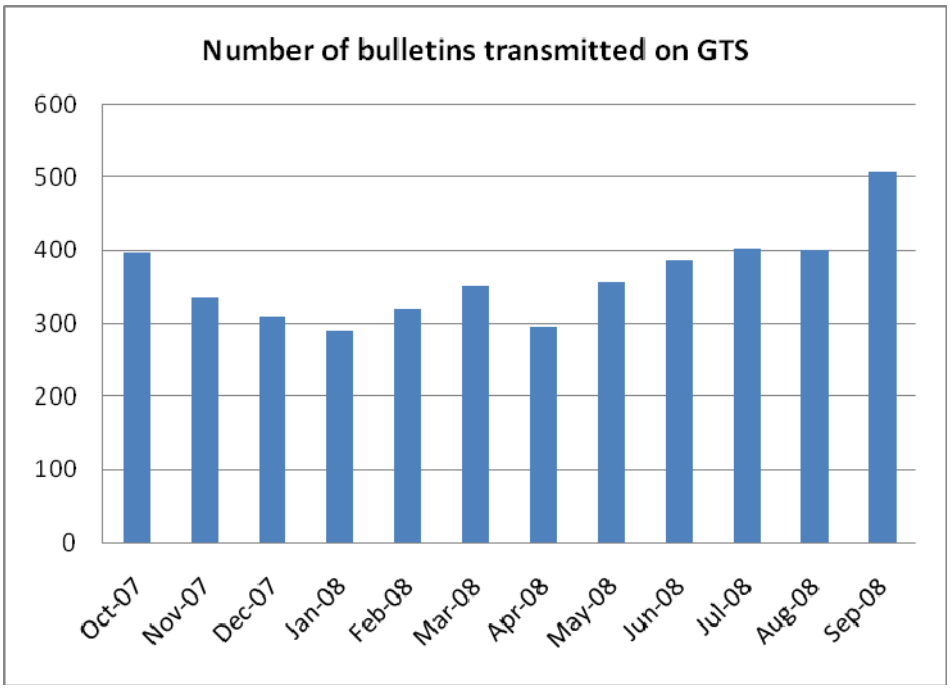
- New floats to be set up for GTS are implemented in CLS GTS data base at each beginning of month with a list (table 9: "Floats to be set up for GTS") provided by JCOMMOPS (M. Belbeoch) in the Argo Information Centre Monthly Report.
- Active floats to be grey listed are removed from the CLS GTS database at each beginning of month with a list (table 16: "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



Graphic on % of Argo profiles disseminated on the GTS (~20% of profiles were filtered, before September 2008, by Meteo-France for //// presence in TESAC reports)



Number of profiles send 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.

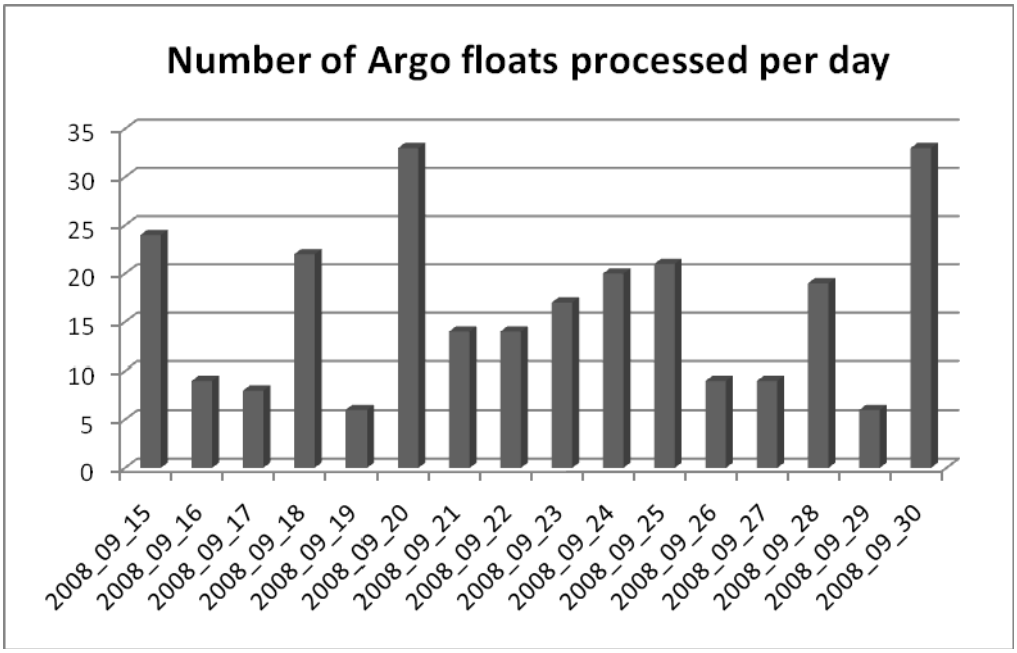
- **BUFR format**: BUFR for TESAC will be finished to implement at the end of 2008 at CLS in agreement with the last WMO specification (11/2007). Météo-France validated the WMO official BUFR template in September 2008. BUFR template uses is described below :

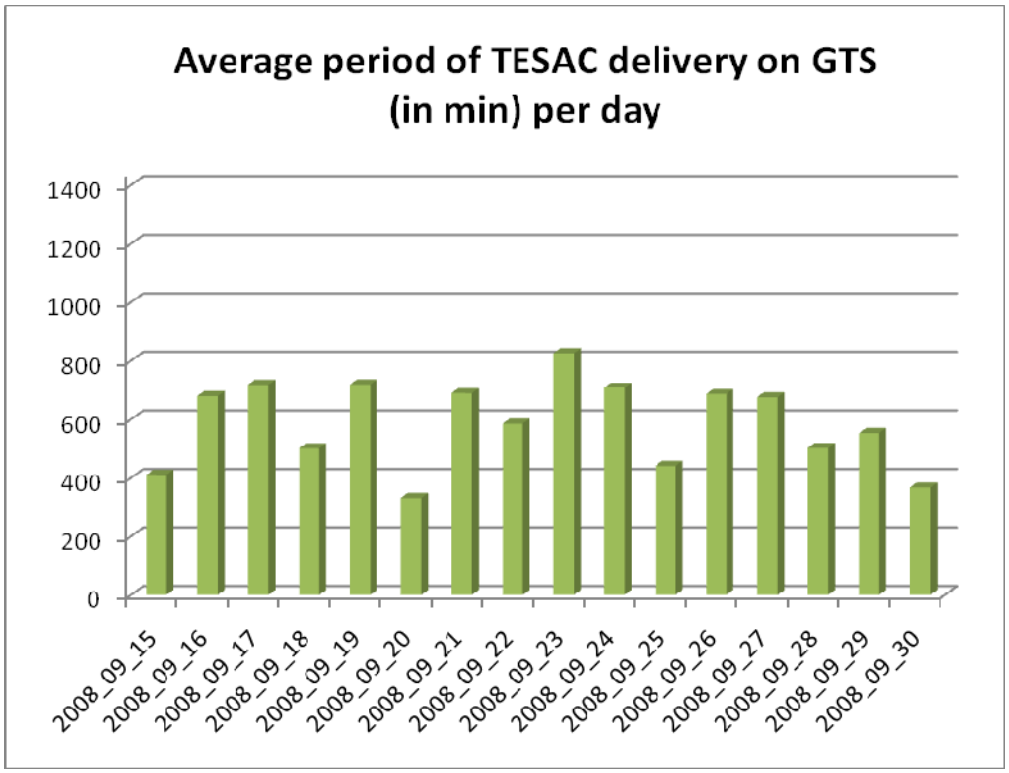
3 15 003 (template descriptor):

Descriptor	**Name**
001087	WMO Marine observing platform extended identifier
001085	Observing platform manufacturers model
001086	Observing platform manufacturers serial number
002036	Buoy type
002148	Data collection and/or location system
002149	Type of data buoy
022055	Float cycle number
022056	Direction of profile
022067	Instrument type for water temperature profile measurement
301011	Date
301012	Time
301021	Latitude and longitude (high accuracy)
008080	Qualifier for quality class
033050	Global GTSPP quality class
109000	Delayed replication of 9 descriptors
031002	Extended delayed descriptor replication factor
007065	Water pressure
008080	Qualifier for quality class
033050	Global GTSPP quality class
022045	Subsurface sea temperature
008080	Qualifier for quality class
033050	GTSPP quality class
022064	Salinity
008080	Qualifier for quality class
033050	GTSPP quality class

This will be added on all new Argo floats GTS processed by CLS. For these floats GTS data will be sent in both formats: TESAC and BUFR.

- **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 of September on last two weeks.





3. NEW PROJECTS AT CLS FOR ARGO PROGRAM

- **Iridium processing at CLS America**: CLSA has now the capability to process RUDICS (Circuit Switched Data) Iridium floats.

- **Argos-3 pilot project**: A proposition will be done at each floats manufacturer to integrate the Argos-3 PMT (Platform Messaging Transceiver). The first prototypes will be purchased by CLS and then given to Argo program to evaluate Argos-3 for use by the Argo community.

- **Delayed mode QC:** In 2008, CLS has also participated in developing a new validation tool that uses satellite altimeter data to check the quality of the Argo time series[1]. These activities are carried out under contract with the Coriolis data centre and will be continued in 2009.

[1] S. Guinehut, C. Coatanoan, A.-L. Dhomps, P.-Y. Le Traon and G. Larnicol, 2008: On the use of satellite altimeter data in Argo quality control, accepted to the J. Atmos. Oceanic. Technol.

Argo National Data Management Report

German ARGO

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

- Data aqcuired from floats

  Data acquired from floats are managed by four German groups at the Alfred Wegener Institute (Bremerhaven), the Federal Maritime Agency, BSH (Hamburg), IfM-Geomar (Kiel) and the Institut für Meereskunde, Hamburg. The BSH is the responsible operational agency for the German contribution to ARGO. The ministry of transportation provides funds for 50 floats annually through the BSH. Float deployment and delayed mode quality control are shared among the institutions. The BSH is organizing the recruitment of deployment opportunities through the support from the German research community on German research cruises and on international cruises (US, Spain) by sending BSH staff where necessary. The real time data handling is managed by Coriolis for all German floats. The four German groups perform the delayed mode QC for their area of expertise and issue the corrected data to Coriolis.

  50 new floats will be deployed within the operational German contribution to Argo until the end of the year 2008. The last deployments will be in the Southern Ocean during December. There are however additional German floats deployed for research projects and financed by the Ministry of Research. These floats have been declared Argo-equivalent and feed into the regular Argo data streams. The AWI will contributed 15 Argo-equivalent floats which will be deployed in the Southern Ocean, 4 Argo-equivalent floats have been deployed in the Nordic Seas by the Institut für Meereskunde and 5 more in the tropical Atlantic by the IfM-Geomar. At the moment there are 172 active German floats reporting data.

- Data issued to GTS

  All data form German floats are issued to the GTS by Coriolis. Please note that part of the data from the Southern Ocean have a larger time lag before they enter the GTS, because they can not be transmitted during winter time due to ice coverage.

- Data issued to GDACs after real-time QC

  All, done by Coriolis.

- Data issued for delayed QC

  All, the German groups have divided the quality control by area of expertise. The AWI will perform the quality control on floats from the operational programme in the Southern Ocean together with their Argo-equivalent floats. The operational floats in the Nordic Seas will be controlled by the Institut für Meereskunde in Hamburg together with their Argo-equivalent floats. The IfM-Geomar will be responsible for the quality control of operational floats in the tropical Atlantic together with their own Argo-equivalent floats. The BSH will take care of the quality control of the remaining operational floats and will also perform the quality control on the Dutch floats.

- Delayed data sent to GDACs

  DMQC has been slightly delayed for most German floats and D-files have been send to Coriolis by AWI, BSH and the Institut für Meereskunde with approximately 9 month intervals in 2008 due to shortage in staff and changes in dmqc software. The IfM-Geomar floats have a larger backlog due to lack of staff, but the BSH has offered to help to work on these floats and produce D-files where possible until the end of the year. It is anticipated that the situation will be back to normal in 2009 and D-floats for all floats will be send to the GDAC on a six month basis again, except for those floats trapped under the ice in the Southern Ocean which will only transmit their data only in summer.

- Web pages

  http://www.german-argo.de/
  Please note that the page is very preliminary and it is hoped to make progress towards an up-to-date web page in the very next months.

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

  There are no operational models which are operated in Germany, Argo data are however assimilated in GECCO model. There are 4 national Pis which deploy data and use data for scientific analysis and numerous Ph-D and master thesis at various universities using Argo data.

- Products generated from Argo data …

  No regular products are generated from Argo data yet, it is planned to provid gridded versions of the Argo data to research projects at the universities.

2. Delayed Mode QC

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

As noted above the German groups have divided the quality control by area of expertise. It was expected to send D-files to Coriolis on a six month basis. Due to shortage in staff the flow of D-files was not as quick as anticipated in 2008 and resulted in the production of files only after 9 month with a larger backlog of files which need to be finalized. The AWI has already changed the dmqc software to the new Wong/Owens method, BSH is presently preparing to switch the dmqc software as is the IfM-Geomar. The new reference data base constructed by Coriolis will be implemented for the next quality control. It is expected that during 2009 the production of D-files will be back on schedule. It is planned to reprocess older floats with Paine and Amtech pressure sensor where possible and correct for pressure drift. Some of the floats from the pre-Argo period might be difficult to correct due to loss of technical data.

3. GDAC Functions **–none-**
(If your centre operates a GDAC, report the progress made on the following tasks and if not yet complete, estimate when you expect them to be complete)

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

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

- 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 …

The German groups are members of the North Atlantic Regional Center and support Coriolus as the Center. The groups have been able to provide new reference data to the Regional Centre from German research cruises on very

short time scales. The groups work on regional analyses of float data with comparisons of floats from different source. They also provide expertise in real-time and delayed mode qc in marginal seas.

Argo National Data Management Report (2008) – India

1. Status

- **Data acquired from floats**
  India has deployed 15 new floats in 2008 in the Indian Ocean taking its tally to168 floats so far. Out of these 95 floats are active. All the active floats data are processed and sent to GDAC.

- **Software of CSIRO implemented at INCOIS**
  Software for Real Time processing of Argo data is acquired from CSIRO and implemented at INCOIS. With this the delay in uploading time between GTS and INCOIS DAC is likely to be minimised.
- **IOHB work initiated**
  Extension of Indian Ocean Hydro Base work taken up at INCOIS in collaboration with Dr Taiyo Kobayashi, JAMSTEC. The quality controlled CTD data from all Indian cruise is useful for enhancing the reference data set for DMQC.

- **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 (95) data are subject to real time quality control and are being successfully uploaded to GDAC.

- **Data issued for delayed QC**
  In total 64% of the eligible profiles for DMQC are generated and uploaded to GDAC.

- **Web pages**
  INCOIS is maintaining Web-GIS based site for Indian Argo Program. It contains entire Indian Ocean floats data along with trajectories. Further details can be obtained by following the link http://www.incois.gov.in/Incois/argo/argo_home.jsp. Apart from the floats deployed by India, data from floats deployed by other nations in the Indian Ocean are received from the Argo Mirror and made available in the INCOIS website. User can download the data based on his requirement.
- **Trajectory**
  1. A total of **146 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.
4. The report on 2nd Argo trajectory workshop held at (ATW-2) Korea during 27 – 28 October 2006 has proposed new checks in the trajectory format and two scientific challenges for the trajectory files. The proposals and status of implementations is given in the following tables.

Trajectory - Scientific challenges		**Status**
5	Estimation of times at end of ascent and start of descent	Code for the modules is under process and implementation takes 2-3 months
6	Estimation of position at those times by extrapolation of reported surface positions	Code for the module is under process

- **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.

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

Page	**Hits**	**Visitors**
Argo Web-GIS	2512	1047
Data download	8273	357
Live Access Server	420	123
Argo products	617	201

- **Products generated from Argo data**
  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. 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.

- Number of profiles from INCOIS DAC : 16821
- R files from INCOIS DAC : 8101
- D files from INCOIS DAC : 8720
- Eligible files for DMQC : 4410
- Not eligible files for DMQC : 3691
- DMQC % =(DMQCied floats/(total number of INCOIS floats - non eligible floats for DMQC))*100
- 66.41 % of FLOATS are DMQCied for INCOIS DAC.

3. GDAC Functions

INCOIS is not operating as a GDAC.

4. Regional Centre Functions

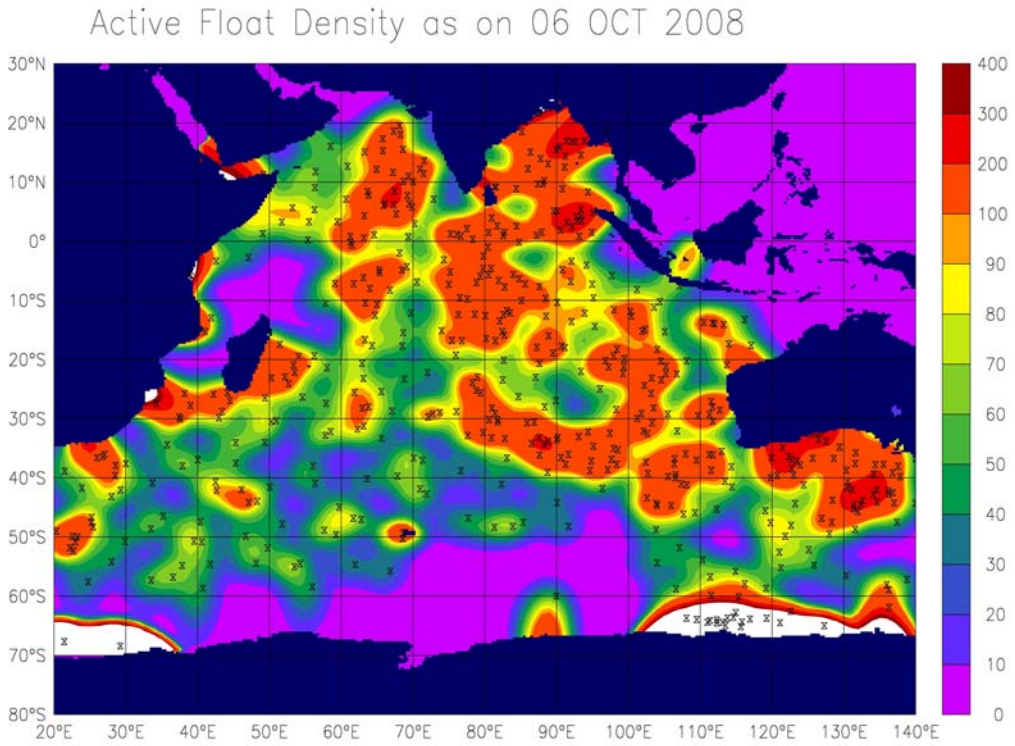
- Acquisition of Argo data from GDAC corresponding to floats other than deployed by India and made them available on INCOIS web site.
- Delayed Mode Quality Control
  (Refer 2.0 above)
- Data from the Indian Ocean regions are gridded into 3x3 box for monthly and 10 days and monthly intervals. These gridded 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) have been provided to CORIOLIS, IFREMER for integration into the Reference Data Sets, used for Delayed Mode Quality Control. CTD data sets from all the Indian cruises were supplied to NODC and CORIOLIS for enhancing the reference data base.
- 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 Oct 03, 2006 is shown below.



Status Report on MedArgo Activities (October 2008)

P.-M Poulain
OGS, Trieste, Italy

MedArgo continued to **coordinate the deployment of floats in the Mediterranean and Black Sea**s in collaboration with French (8 floats deployed in 2008), Spanish (4 floats to be deployed in later 2008 and 2009), Greek (1 float in 2009) and Italian (3 floats in 2009) colleagues. MedArgo also solicited Black Sea countries to contribute to Argo in the Black Sea.

MedArgo has worked on **defining an optimum sampling strategy for the Mediterranean and Black Seas** using historical data and numerical models. Reports are due by the end of 2008 as deliverables of task 4.4 of the EuroArgo project.

MedArgo continued to **liaise** with the Italian "Gruppo Nazionale di Oceanografia Operativa" (GNOO) and the Mediterranean Operational Oceanography Network (MOON) to guarantee full and correct use of Argo data in Mediterranean forecasting models.

MedArgo continued to **produce and distribute Mediterranean and Black Sea Argo products** (summary status tables, trajectory graphs, etc.) posted on the web in NRT. An example is shown in Figure 1 (map of all the floats active in the Mediterranean and Black Seas in September 2008).

As part of MedArgo, studies we conducted to assess the **efficiency of Argo floats in the Mediterranean Sea**. In particular, the cycling characteristics and the transmission efficiency were studied (Solari, 2008a and 2008b).

MedArgo started activities on the **delayed-mode processing of Mediterranean Argo** data following methodologies developed for Argo floats in the world's ocean. The main focus was initially on two long-lived floats in the Tyrrhenian Sea. It was found that the standard Argo delayed-mode processing method might not be appropriate for the Mediterranean Sea given that the majority of the profiles are limited to the upper 700 m and because of the significant variability (both in time and space) of the temperature and salinity, including long-term trends related to processes such as the Eastern Mediterranean Transient. The reference database includes the MEDAR-MEDATLAS II (1975-1997) database along with Italian CTD surveys in 2004-2006 (Notarstefano and Poulain, 2008).

MedArgo is continuously looking for ancillary CTD data to **build reference database** with which Argo data can be compared and validated. For instance, efforts are focused to obtain CTD data from the SESAME cruises (Transmed in 2007, BOUM in 2008), from Cypriot and Israeli cruises, etc. in order to validate Argo data throughout the Mediterranean basin.

MedArgo personnel participated, and presented communications on Mediterranean and Black Sea Argo activities, at the following relevant **conferences and workshops** in 2008:

- EuroArgo Kick-Off Meeting, Brest, France, 14-15 January 2008. (P.-M. Poulain)
- IOCCG BIOARGO Meeting, Villefranche-sur-mer, France, 7-8 February 2008. (P.-M. Poulain)

- Seminari CoNISMa-MERSEA sull'Oceanografia Operativa, Naples, Italy, 19-20 February 2008. (P.-M. Poulain)

- Argo Steering Team Meeting (AST-9), Exeter, U.K., 18-20 March 2008. (P.-M. Poulain)

- 1st Euro-Argo Users Meeting, Southampton, UK, 24-25 June 2008. (P.-M. Poulain)

- 3rd Argo Delayed-Mode Quality Control Workshop (DMQC-3), Seattle, Washington USA, 10-12 September 2008. (G. Notarstefano)

- Riunione Consiglio Scientifico GNOO, Rome, Italy, 18-19 September 2008. (P.-M. Poulain)

- BS - HOT 2008 Conference, Sofia Bulgaria 6-9 October 2008 (P.-M. Poulain)

References

Notarstefano G. and P.-M. Poulain. (2008) Delayed mode quality control of Argo floats salinity data in the Tyrrhenian Sea Rel.OGS ??/2008/OGA/??/SIRE, Trieste, Italy (in press).

Solari M. (2008a) Trattamento dei dati di posizione dei profilatori Argo nel Mar Mediterraneo per il periodo marzo 2000 - maggio 2008 (Parte I). Rel. OGS 85/2008/OGA/30/SIRE, Trieste, Italy. 47pp.

Solari M. (2008b) Trattamento dei dati di posizione dei profilatori Argo nel Mar Mediterraneo per il periodo marzo 2000 - maggio 2008 (Parte II). Rel. OGS 86/2008/OGA/31/SIRE, Trieste, Italy. 47pp.

Figures

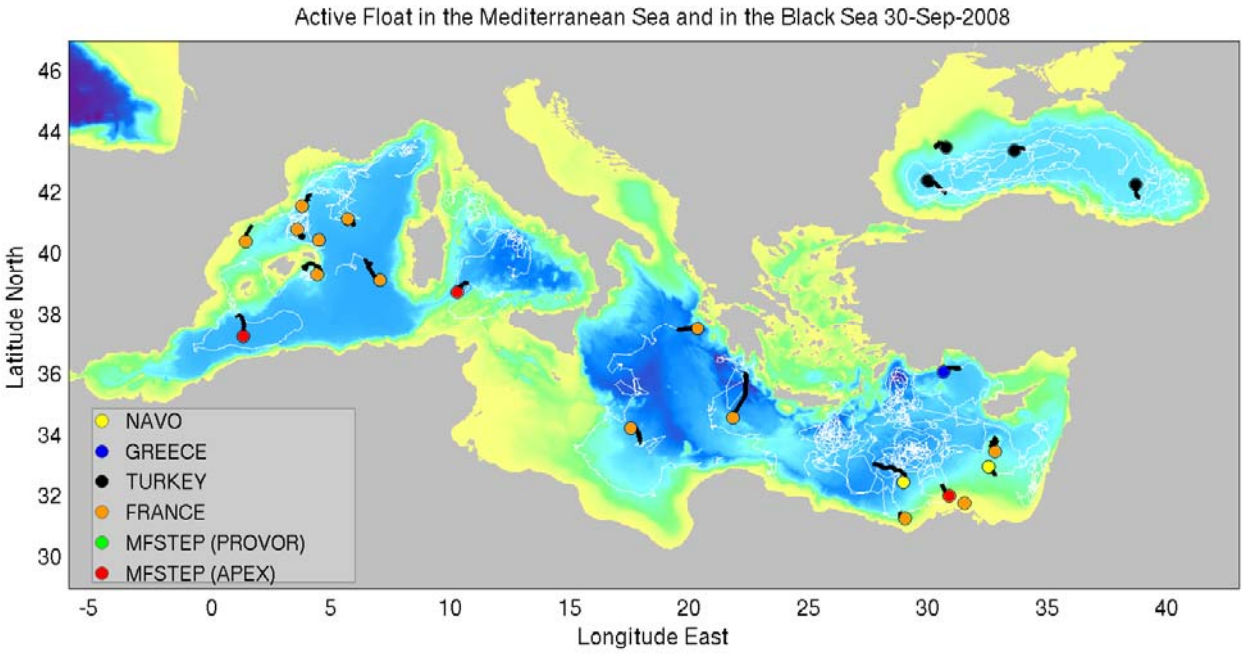


Figure 1. Positions (circled symbols) and tracks of Argo floats in the Mediterranean and Black Seas active at the end of September 2008. Trajectory segments for the entire month of September and full tracks are depicted in black and white, respectively.

Argo National Data Management Report of Japan, 2008

1. Status

Data acquired from floats:

As of October 1st, the Japan DAC(JMA) has processed data from **786** Argo and Argo-equivalent floats including **359** 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 profiles, technical and trajectory files, meta data files are transmitted to GDACs in netCDF format on an operational basis.

Data issued for delayed QC:

During Nov.2007-Oct.2008, the ARGOS messages for **14,215** profiles were acquired via CLS for delayed QC.

Delayed data sent to GDACs:

During Nov.2007-Oct.2008, **14,272** 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/J_ARGOe.html

This site shows Japanese float list, trajectory map, profile chart, and QCed float data. This site also shows global maps based on objective analysis (temperature, salinity, potential density, dynamic height, geostrophic current, etc.). JAMSTEC plan to improve the GUI and the look and feel of this site in near future.

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

JCOPE (Japan Coastal Ocean Predictability Experiment)

JCOPE is the model for prediction of the oceanic variation around Japan which is operated by FRCGC (Frontier Research Center for Global Change) of JAMSTEC. The Argo data is used by way of GTSPP. The hindcast data 6months back and the forecast data 3months ahead are disclosed on the following web site.
http://www.jamstec.go.jp/frcgc/jcope/index.html

Visit http://www.jamstec.go.jp/frcgc/eng/jcope/index.html
for more information.

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.

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 those, 7 Apex floats keep operating now.

JAMSTEC has just set up the 2nd and 3rd POPS in the Arctic Ocean in October, 2008.

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 39,212 profiles to GDACs as of October, 2008.
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 new OW software is experimentally used together with WJO, and the calculation result of OW has been used as a reference at the definitive judgment.
To decide the best parameterization value, JAMSTEC will continue the test run of OW ver.1 for a while. Afterwards, OW will be formally operated instead of WJO.

3. GDAC Functions

The JAMSTEC ftp server has been providing the mirror site of GDACs since 2003.
ftp://ftp.jamstec.go.jp/pub/argo/ifremer/
ftp://ftp.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 the 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/

Dr. Kobayashi of JAMSTEC visited INCOIS in March, 2008.
He helped the Indian ARC activity that builds the private historical data of India into the reference data set for Argo DMQC.

Argo National Data Management Report of Korea

1. Status

- Data acquired from floats

Deployment of Argo float

Year	Organization	Number of deployed Argo floats (GTS)				Total
		East/Japan Sea	Northwest Pacific	Antarctic Ocean & others	subtotal	
2001	KMA	3(0)	7(0)		10(0)	18(2)
	KORDI	5(2)	1(0)	2(0)	8(2)	
2002	KMA	5(0)	10(0)		15(0)	25(2)
	KORDI	6(2)		4(0)	10(2)	
2003	KMA	5(0)	10(0)		15(0)	33(4)
	KORDI	7(3)		11(1)	18(4)	
2004	KMA	5(4)	10(8)		15(12)	32(17)
	KORDI	11(5)		6(0)	17(5)	
2005	KMA	5(3)	10(8)		15(11)	38(27)
	KORDI	10(8)		13(8)	23(16)	
2006	KMA	5(4)	10(10)		15(14)	33(28)
	KORDI	13(9)		5(5)	18(14)	
2007	KMA	-	-	-	-	9(9)
	KORDI	9(9)			9(9)	
2008	KMA	5(5)	10(9)	-	15(14)	29(28)
	KORDI	11(11)		3(3)	14(14)	
Total		105(65)	68(35)	44(17)	KMA 100(51) KORDI 117(76)	217(117)

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

- Data issued to GTS
  - Within 24 hours of data collection, the deployment all data of KMA Argo floats are issued to GTS by KMA in Korea, and those of KORDI by CLS in France.
  - KMA is under testing GTS distribution in BUFR. It is nearly ready to begin transmission.

- Data issued to GDACs after real-time QC
  - KMA RTQC system produces profile data, metadata, technical data and trajectory data with TESAC and NetCDF format from raw data with 32byte hexa format in real time. Those 4 types of data are transmitted into GTS network and GDAC. The RTQC system was upgraded by following the suggestions in the 9th ADMT and Argo quality control manual ver. 2.3 and user's manual ver. 2.3.
  - RTQC system at KORDI is so flexible that it can handle data from different type of profilers. Prior to communicating the Argo datasets to GDACs in April 2008 by KORDI, the KORDI ARGO dataset is processed by CLS, France for dissemination to GDACs. The KORDI ARGO dataset is now rearranged under KORDI DAC at GDACs.

- Data issued for delayed QC
  - During November 2006 – October 2008, KODC has acquired 8,913 Korean Argo 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 November 2006 – October 2008, KODC has sent 2,729 delayed mode 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). KORDI has also operated Argo webpage (http://argo.kordi.re.kr), which is focused on providing deployment information and data for KORDI Argo floats. The KODC has operated webpage for distribution of delayed mode Argo data and oceanographic information system for pelagic fishery based on Argo data (http://kodc.nfrdi.re.kr).

- Statistics of Argo data usage
  - National Pis are Dr. Jang-Won Seo 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

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Oh, K.-H., Y.-G. Park, and M.-S. Suk, 2004: Accuracy and stability of temperature and salinity obtained from ARGO floats, [the Sea] J. of Korean Society of Oceanography *(in Korean)*

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You-Soon Chang, Chang-Woo Cho, and Yong-Hoon Youn, 2006, Validation of numerical model in the Pacific Ocean with ARGO data, 2nd Argo Science Workshop, submitted.

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profiling floats in the Pacific Ocean, JCOMM Scientific and Technical Symposium on Storm Surges. 2007. 10.2 -10.5

2. Delayed Mode QC

The PIs are responsible for DM and dissemination of the DMQC data to the GDACs under collaborating with the KODC. KODC submitted the delayed mode files of 2,039 profiles in the North Pacific with reference database, SeHyD, using WJO program as of October 2008. KODC have made reference database for the East/Japan Sea, EJSHB (East/Japan Sea HydroBase). 690 profiles of delayed mode in the East/Japan Sea were submitted as of October 2008. 278 CTD casts will be added to the EJSHB. KODC has made a success of installing and test of OW program in the Pacific Ocean and the East/Japan Sea. KODC are ready to switch DMQC program.

Argo National Data Management Report – ADMT9 - UNITED KINGDOM

1. Status

- *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 TESACs 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 transferred to both GDACs which occurs twice a day. Any file that fails to be transferred is queued for the next transfer attempt the.
- *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.
- *Web pages* - BODC hosts the main data information and access pages. 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.
- *Statistics of Argo data usage* – During the last year, UK metadata, trajectory and profile files have been provided to users through BODC website. About 120 requests have been made from 16 enquirers from 8 countries.
  Metadata files have been provided to University College London (UK), University of East Anglia (UK), Newcastle University (UK), Metropolitanskolen (Denmark).
  Trajectory files have been requested by St Andrews University (UK), UEA (UK).
  Profile files have been requested by UK Hydrographic Office (UK), St Andrews University (UK), UEA (UK), Newcastle University (UK), Old Swinford Hospital (UK), Xodus Group (UK), QinetiQ Ltd (UK), University of Athens (Greece), Chalmers University of Technology (Sweden), University Of New Brunswick (Canada), Ocean University (China), University of South Pacific (Fiji), Belize National Meteorogical Service (Belize).
- *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

Progress has been slow due to staff changes. A new member of staff began work on delayed mode quality control at the start of the year and 25% of his time is allocated to this. Much of the work in 2008 has been working on identifying and correcting pressure sensor issues with our Argo floats. Most of the code is complete and tested with the final scripts to do by the end of 2008; BODC should be able to submit floats under the revised code to the GDAC's before the end of 2008.

We have also been working on cell thermal mass/lag corrections of salinity. As discussed at DMQC3 this has been put on hold until new coefficients for the correction are available.

Our delayed mode software has been updated to the latest version of OW and is using the new centralised CTD and Argo profile reference databases available from Coriolis.

The UKHO are also working with us on Arabian Sea floats (-2000 profiles) with the aim of reducing our backlog. There are 12 processed floats where we are waiting for approval of the results from Brian King. Once these are approved we will then submit them to the GDAC.

3. GDAC Functions (not applicable)

4. Regional Centre Functions

Four organizations participate in the Southern Ocean Argo Regional Centre - BODC (Atlantic Ocean Sector), CSIRO ("Australian sector"), JAMSTEC (Pacific Ocean Sector) and the University of Washington (Indian Ocean Sector).

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 GDACs ftp sites.

Argo National Data Management Report of United States

October 6st 2007 - October 6th 2008

1. Status

- **Data acquired from floats:**

  a- October 2007 to October 2008

Floats deployed:	427
Floats failed on launch:	*19*
Floats reporting:	1,550
Profiles quality controled:	*69,182*

  b- 1997 to October 2008

Floast deployed:	2,678
Floats failed on launch:	82
Floats reporting:	*1,736*
No reports more than 30 days, considered inactive:	860

- **Data issued to GTS:**
  During the reporting period, Service Argos and AOML put 53,545 profiles on GTS. About 94% 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, 69,182 real-time netcdf profiles, technical and trajectories files , as well as 427 new meta netcdf files have been issued to both GDACs. Total numbers of netcdf files issused was 692,250.

  We corrected the variable PROFILE_<PARAMETER>_QC for 72,268 profiles which had a numeric values instead of letter, those files were resubmitted after correction of the variable

  We added to our processing routines the new real time corection of salinity PSAL_ADJ . This apply only to the floats with delay mode files. We reprocessed 2,750 real-time netcdf files

- **Data issued for delayed QC:**
  Data is provided to the PIs and the delayed mode QC center daily on:
  ftp://ftp.aoml.noaa.gov/phod/pub/ARGO_FTP/argo/nc

- **Data sent to GDACs after delayed QC:**
  During this period 72,411 delay mode profile files have been resubmitted and updated.

- **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 30°S-40°S, 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 has evaluated during delayed-mode quality control (DMQC) an estimated 21,239 Argo data profiles over the past year (Oct 9th, 2007 to Oct 9th, 2008). This brings the total number of SIO processed profiles to 46,556, 99.4% of eligible profiles. Profiles older than 12 months become eligible for DMQC. The above numbers include 853 Argo New Zealand profiles processed by Scripps. Of this years submissions, 17,222 profiles were first-time submissions and 4,017 were resubmissions. The most common cause for resubmission was our procedure of resubmitting all profiles upon a floats death to ensure consistency.

Scripps 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.

Additional tools and methods have been implemented during the year by Scripps. The Owens/Wong (OW) Version 1.0 salinity calibration method has been integrated with our procedures. The historical climatology used within OW has been refined by joining the SeHyD/IOHB climatologies with newer CTD profiles gathered and distributed by Coriolis within the CTD_for_DMQC_2008V01 dataset. In addition, a climatology of reference Argo floats (Argo_for_DMQC_2008V03) has been used to

calibrate salinity for some Argo floats in regions of the Southern Ocean and southwest Pacific where interannual modification of water masses has occured. Finally, JAMSTEC's position quality control (PQC) has been adopted in order to validate profile location.

University of Washington group:
As of October 2008, U Washington has submitted 48,026 delayed-mode profiles to the GDAC via AOML. This represents about 92% of UW profiles that are older than 12 months. In collaboration with Breck Owens from WHOI, the OW float salinity calibration tool Version 1.0 was released in Oct 2008. Work is now underway at UW to migrate all calibration files to the new OW system in conjunction with the newly released Coriolis delayed-mode reference database ARGO2008V01. U Washington hosted the Third Argo Delayed-mode QC Workshop in September 2008. The workshop report will be available on the Argo Data Management website.

PMEL group:
PMEL continues to DMQC float data in a timely fashion. As of 30 September 2008, 28,513 profiles from PMEL floats (including PMEL Argo equivalent floats) had been reported. Of those profiles, 18,788 were older than one year, the Argo target for DMQC. As of 30 September 2008, PMEL had forwarded a total of 19,667 D-files to AOML, 105% of the DMQC target number. This number exceeds the target because some of the D-files forwarded are for profiles younger than one year. At the time that last year's report was written, PMEL was at 93% of the target, with 10,544 D-files forwarded vs. 11,303 profiles older than one year.

Our 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. 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.

The PMEL Argo group has published an analysis sensor response errors (primarily the conductivity cell thermal mass error) and their correction for SBE-41 and SBE-41CP CTDs (Johnson et al., 2007). A matlab function for making the conductivity cell thermal mass correction is available upon request from Gregory.C.Johnson@noaa.gov.

Reference:
Johnson, G. C., J. M. Toole, and N. G. Larson. 2007. Sensor corrections for Sea-Bird SBE-41CP and SBE-41 CTDs. Journal of Atmospheric and Oceanic Technology, 24, 1117-1130.

WHOI group:

3. ARC

The South Atlantic Argo Regional Center (SAARC) is coordinating the effort of countries with interest in the Atlantic from 20°N to 40°S.
The web site for the SAARC (http://www.aoml.noaa.gov/phod/sardac) provides background information, reports from the meetings and training sessions conducted since May 2005, as well as links to products and data servers.

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

The float donation program has been continued. This program facilitates the float deployment in remote regions. It also provides regional data to the volunteers in participating countries (e.g. Argentina and Brazil).

Training and education: A training for Deployment and Data Acquisition Procedures took place in Accra, Ghana and on board of the US Navy vessel HSV Swift, March 11-13, 2008. The endeavor was conducted as part of a U.S. Navy Africa Partnership Station initiative that supports NOAA's climate research and ocean-observing efforts.

Representatives from all west African countries were invited to attend the training. Participants included oceanographers, academic professors, military personnel, graduate and postgraduate students, fisheries representatives, and geologists from Ghana, Cameroon, and Nigeria.

During the three-day session, one Argo float, three drifting buoys, and 12 XBTs were deployed from the HSV-2 Swift to gather temperature, salinity, and current measurements. More information is provided on the internet:
http://www.aoml.noaa.gov/phod/sardac/education/Training_1.html

Last stage of the delayed-mode quality control: Last stage of the delayed-mode quality control: A prototype system is being developed that compares float profiles with profiles from other instruments and climatological fields. Statistics are developed on the temperature and salinity differences between the delay_mode profiles and climatology as well as the nearby profiles (XBT/CTD/other profiling floats close in space and time) for each profile. These can be analyzed for problems with individual profiles as well as problems that may be developing for all profiles of a given float (such as a systematic offset or a sensor drift). A web site is under development to illustrate these results, allowing also for comparison of the behavior of multiple floats at the same time. Results from this system allow the identification of floats with questionable profiles, which can be analyzed in detail by the principal investigator.

Global Argo Data Repository Status Report of US NODC for 2008

Prepared by Charles Sun
with contribution from Tim Boyer

October 2008

1. Summary

The US National Oceanographic Data Center (NODC) intended to use this report as input for the ninth Argo Data Management Team annual meeting at the East-West Center in Honolulu, USA from 28 to 31 October 2008. The report summarized the Argo user statistics and the highlights of the Global Argo Data Repository (GADR) activities since the eighth Argo Data Management Meeting at the Marine and Atmospheric Research of the Commonwealth Scientific and Industrial Research Organisation (CSIRO) of Australia in Hobart, Australia from 14 to 16 November 2007.

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 4th 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. Usage Statistics

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

a) The number of distinct hosts is the number of different computers requests has come from. The host is the computer (often called the "client"), which has asked for a file.
b) 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.
c) 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,

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

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 distinct hosts served by the GADR from 1 October 2007 to 30 September 2008. The monthly average of distinct hosts served by the GADR is 2,151 during this time period.

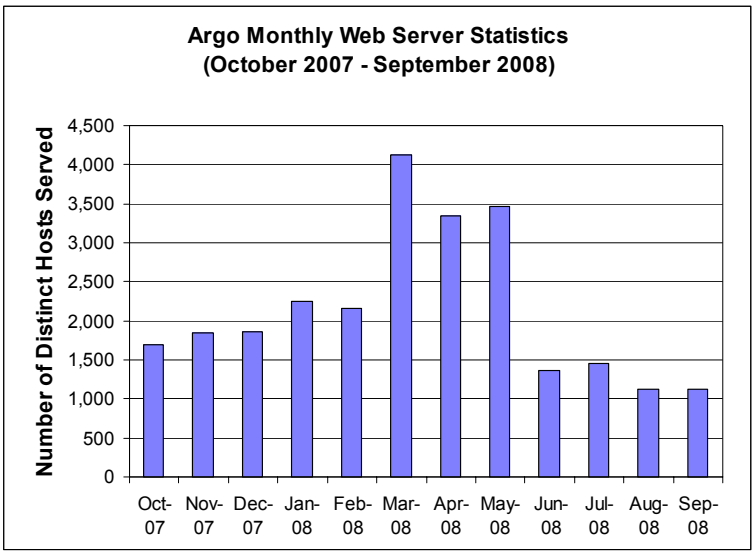

Figure 1 Monthly distinct hosts served by the Global Argo Data Repository.

Figure 2 illustrates the monthly comparison of the numbers of the Argo data files downloaded from the GADR Web site over the past 24 months ending September 2008. The GADR receives an average of 1,010,865 requests per month in the period from October 2007 to September 2008, increased from 455,909 requests per month last year over the same period of time, while the monthly-averaged Argo data downloaded increased from 17.85GB in 2007 to 39.17GB, about 119% increase, this year.

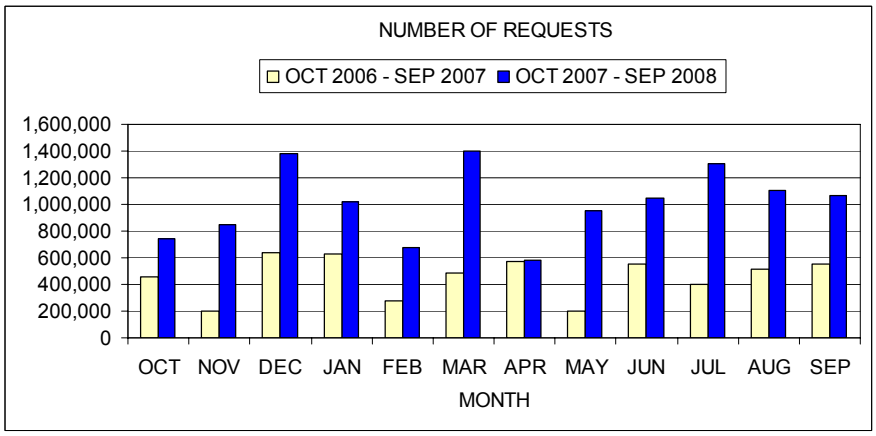

Figure 2 Monthly data transfer statistics of the Argo Data

4. Activities in support of Argo

The main support to Argo from the NODC World Ocean Database (WOD) is in relation to the Argo CTD Reference Database used for delayed-mode quality control of Argo salinity data. The quality control of Argo salinity data requires high quality CTD measurements delivered in a timely manner. The WOD provides fully quality controlled data sets approximately every 4 years. To increase the timely dissemination of more recent data to the Argo community, the WOD[3] is now updated on a quarterly schedule. The quality control is not as complete as for the full updates every 4 years and is considered preliminary. The WOD has now been updated 3 times in 2008, most recently in late September. To date, 284,244 CTD or bottle casts containing salinity data have been added in the 3 updates since WOD05. Of these, 26,767 came from the Global Temperature-Salinity Profile Program[4] (GTSPP). 33,204 of these additional casts are from cruises completed between January, 2006 and August, 2008, with 19,806 coming from GTSPP. Figure 3 shows cruise tracks of CTD/bottle casts with salinity data in the World Ocean Database taken in years 2006-2008.

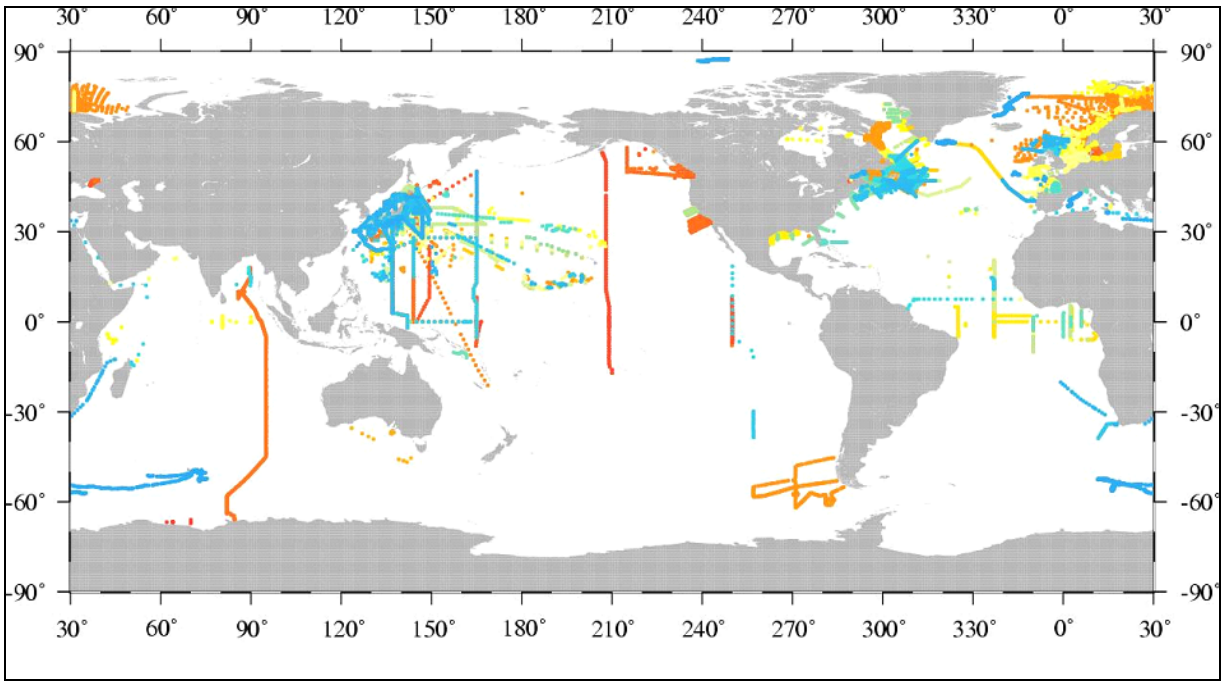

Figure 3 Cruise tracks of CTD/bottle casts with salinity data in the World Ocean Database taken in years 2006-2008

Figure 4 shows the cruise tracks of real-time CTD casts with salinity data in World Ocean Database from GTSPP taken in years 2006-2008.

[3] http://www.nodc.noaa.gov/OC5/WOD05/updates05.html
[4] http://www.nodc.noaa.gov/GTSPP/

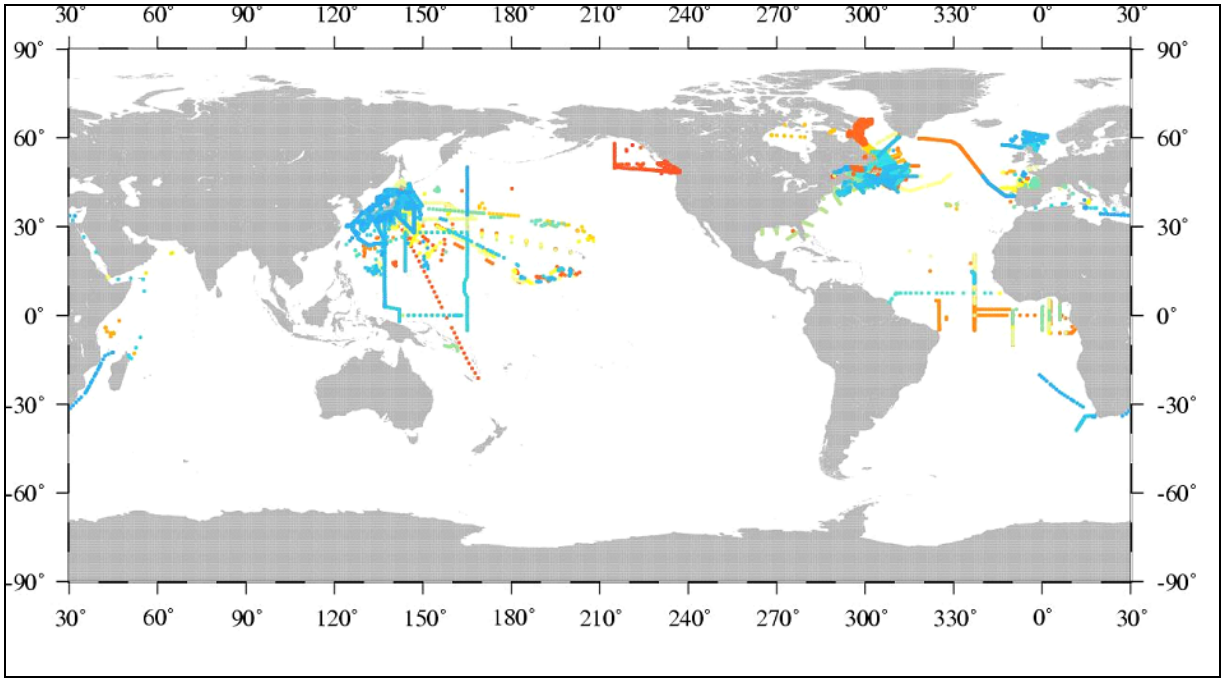

Figure 4 Cruise tracks of real-time CTD casts with salinity data in World Ocean Database from GTSPP taken in years 2006-2008.

NODC has made significant efforts to acquire recent and historical data from members of the Argo community and the larger oceanographic community. Within the Argo community, NOAA Pacific Marine Environmental Laboratory (PMEL), the Commonwealth Scientific and Industrial Research Organisation (CSIRO), and the Indian Argo Regional Center have made contributions of recent data to WOD directly. Many others have contributed directly and indirectly through National and International Data Centers, and projects such as IOC Global Oceanographic Data Archeology and Rescue Project (GODAR). There has been some disappointment voiced over a lack of recent salinity data for delayed-mode quality control. Part of this is due to the time between completion of a cruise and final calibration of the salinity data. The Argo community should decide whether it is more important to get salinity data as soon as possible after a cruise, or rather to wait for final calibrations. GTSPP real-time CTD data is a significant source for recent data. The standards of calibration and operation of CTDs of contributors to this data pool are not usually known in real-time. Also, the data are not usually of high vertical resolution. The Argo community and GTSPP managers should decide whether it is worth the effort to attempt to obtain calibration and operational information from GTSPP contributors to answer questions about data quality.

The WOD is also updated quarterly from the Argo database (US GODAE server version). Real-time data are replaced with delayed-mode data when available. Argo has high quality control standards, but some problems do escape their quality control procedures. NODC prepared a list of problems found during our quarterly updates and sent it to the Argo GDAC at Coriolis, Brest, France[5] for corrections.

[5] http://www.coriolis.eu.org//cdc/argo_problem_reporting.htm

Two functional problems which still slow down our processing of Argo data:

I. When floats are renumbered by Argo processing, or when floats exceed 255 cycles, some float data can disappear at the US GODAE server. For instance, for some Indian floats, physical cycle 256 is given cycle number 1, and the data for the original cycle number 1 is overwritten.
II. When going from real-time to delayed mode, WMO instrument type codes for some floats were altered, and they no longer match the text instrument type information. For instance float 6900271 has the following: INST_REFERENCE = "NEMO Profiling Float" ; and WMO_INST_TYPE = "846 " ; Code 846 is "Web Research/Seabird Conductivity Sensor"

For automatic processing, NODC suggests that it is easier to use the WMO code, so it is important to make sure the code matches the instrument.

5. Other Activities

5.1. Continue to preserve the Argo data transferred from the Argo US GDAC – The NODC continues to use the improved "mirror" facility of the UNIX "lftp" command. The GDAC's files are copied from "http://www.usgodae.org/ftp/outgoing/argo/", the "geo" subdirectory is skipped, and files which are no longer present on that site are removed from the local mirror. This command runs automatically daily at 12am UTC. The mirroring process completes by about 8:30 am UTC.
5.2. Monitor Argo floats reporting pressure as depth on the GTS once a month and report problem floats found to AIC, if needed.
5.3. Implement an automated procedure for acquiring the CLIVAR & Carbon Hydrographic Data Office (CCHDO) data from the Web for archive accession.
5.4. Produced a compressed archive of the Argo data archived at the NODC as of 1 October 2008 at http://argo.nodc.noaa.gov/ .

6. Future Plans
6.1. Continue to operate the Global Argo Data Repository.
6.2. Continue to acquire the CCHDO data via the Internet on a quarterly basis.
6.3. Continue to update the WOD in support of Argo on a quarterly basis.