



*part of the integrated global observation strategy*



## **6th ARGO DATA MANAGEMENT MEETING**

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## 1. Objectives of the meeting

The 6<sup>th</sup> Argo Data Management meeting was hosted by JMA and the Director General of JMA welcomed the participants to Tokyo.

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

- Review the actions decided at 5<sup>th</sup> 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 after San Diego meeting and take necessary actions to move to systematic implementation
- Contribute to the status on Argo program by setting up a set of robust metrics for documenting 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)
  - the visibility to scientific and operational results achieved thanks to Argo program and ensuring the visibility of these metrics.
- Review the Regional Data Centre status, their implementation plan and the difficulties they are experiencing. Clarify their responsibilities on Reference Database for DMQC, their relationships with GDACs and their role in regional Delayed Mode QC
- Review and take steps to put in place appropriate Argo data archive functions including the detailed specification of possible distribution of Argo data and analysis tools via DVD
- Determine what “messages” need to be passed to the CLIVAR/IOCCP/Argo global hydrography workshop starting November 12th.
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52 persons from 10 countries attending this meeting. All countries involved in Argo data management were represented.

The status of the actions from the previous meeting has been updated and is attached in Annex3. 21 actions were closed, 6 were underway and status was addressed in the relevant agenda points and 2 were cancelled, 1 was transferred to AST. The 6<sup>th</sup> meeting action list is in Annex 4.

## 2. Status of Argo program (M Belbéoch)

M Belbéoch first presented the status of the Argo program. Nearly 900 floats were deployed in 2005 and new countries from South America have joined the project. The network is young as 50% is less than 1 year. The Argo label to put on floats has been redesigned by UCSD as a self-descriptive label understandable by people unable to read. A study is underway to try to estimate the evolution of the number of float to deploy to reach the target of 3000 floats and maintain it. Germany has deployed a new profiler called Nemo that is able to survive under ice. A lot of work is required at present at the project office to prepare the 2<sup>nd</sup> Argo scientific workshop in Venice in March 2006

M Belbéoch then presented the new features at AIC. A new design has been done to ease user access to the information, to allow polar projection (<http://w4.jcommops.org/website/Argo>), and to improve float notification in order to be able to generate some statistics on the network at AIC. M Belbéoch highlighted the fact that some tools are available at AIC to generate its own statistics on a batch of selected floats. This could be useful to Argo participant to monitor the network they are in charge of.

### **3. Real Time Data Management**

#### ***3.1. Data availability status***

A brief update on the status of the processing of NAVO floats at AOML was provided. Meta-data for the floats have been provided to AOML. AOML is processing the current data for active floats and is working through the historical data.

A list of the floats that have arrived only on the GTS has been sent to the appropriate DACs by S Pouliquen. The DACs are requested to provide a plan for reducing this backlog.

The removal of floats from the GDAC GTS directory after a DAC assumes responsibility for the float is done manually. It is important that the DACs inform the Coriolis & USGODAE GDACs when they start processing a float that used to be in the GTS directory so that duplicates can be avoided.

The following links at the AIC provide useful information to monitor the real-time data flow:

*See AIC www site under Data System/Monitoring/Global Data System Statistics*

#### ***3.2. Distribution on GTS***

A Tran presented the status of Argo data on the GTS. 85% of the Argo data is on the GTS within 24 hours of observation. It was noted that the timeliness of the KWBC (Landover) GTS node is not as bad as it appears. AOML inserts data onto the GTS using both KARS (Washington) and KWBC; KARS is used for the observations that are not passed to the visual QC, which is the vast majority, and KWBC is used for those that are put on the GTS after visual QC. Combining the statistics for KARS and KWBC would produce a more complete picture of the timeliness.

The source of duplicates on GTS was shown to be the LFPW (Toulouse) node. CLS has discovered the source of the error and is in the processing of correcting the duplicate and partial profile problems.

The status of other GTS problems were presented:

- o the misreporting of instrument codes has been corrected
- o the reporting of unrealistic depths appears to have been corrected (there were still a few in September but none in October)
- o there are still observations on the GTS reporting pressure in the Tesac messages (depth should be reported) ( See Dacs below)

M Ignaszewski presented the results of a comparison of GTS and GDAC data, focused primarily on the “profile gap” problem. In all cases, the GDAC has full profiles but the GTS sometimes has profiles with many missing depth levels. Observations from BODC (only some floats), ARGO-CNDC, and INCOIS are affected. CLS has accepted an action to investigate and correct the problem.

Other anomalies found during the comparison include:

- o pressure reported on the GTS: BODC, ARGO-CNDC, and INCOIS floats processed by CLS and KMA floats.
- o observation time differences between GTS and GDAC
  - o AOML and JMA – differences will be investigated
  - o INCOIS has variable and sometimes large differences – will be investigated
  - o KMA has a constant 9 hour offset – will be investigated and corrected
- o Instrument type code differences were noticed for KMA floats

AOML provided the following explanations:

- o AOML time differences: in files transmitted to GDAC the time was the time of the first transmission while AOML always puts the time of first position fix into the GTS files.
- o University of Washington(UW) sometimes adds drift depth to the profile (probably only when the drift depth is recorded shortly before ascent). AOML is not doing this because they feel it's

not robust(e.g. problems with park&profile floats and the potential gain is minimal). This is only visible for the non-Argo floats where UW is doing the GTS transmission and AOML the GDAC submission

AOML is encouraged to find a common way of processing the floats with UW

Some observations were not found (by M Ignaszewski) on the GTS but this may not be the fault of the DACs. DACs were asked to review the list of “missing observations” in the document on the meeting website. Some NAVO floats had one more vertical level on GTS. AOML will investigate.

It was also noted that the observations in the GTS directory of the GDACs have depth levels instead of pressure levels. This will be corrected by Coriolis/GDAC for all of the observations and a message will be posted to the Argo-DM mailing list when completed.

### **3.3. Distribution to GDAC**

C. Coatanoan presented the status of the QC checks performed at the Coriolis GDAC. The Coriolis GDAC has been performing a variety of QC checks on the current data and informing the appropriate DACs when problems are found.

In general, there has been a significant decrease in the percentage of anomalies since May 2005 but there are still some anomalies. (It was noted that only recent data is used to produce the statistics and that when meta-data problems are found no other checks are performed.)

Several examples of the problems found in meta-data contents were presented. Meta-data problems prevent the distribution of the floats data on the GDAC. The DACs are contacted when the problems are discovered and requested to make corrections. All Dacs agreed to correct the contents of their metadata according to the User Manual (*Note from Mark Ignaszewski: The fact that the US GDAC did not detect and send automatic messages for these problems indicates that the GDACs have some inconsistencies in the format checking software that must be corrected.*)

Examples of data values with incorrect QC flags were also presented. Several types of errors were seen and include negative pressure values not properly flagged, bad (or doubtful) data not properly flagged, and end of profile not properly detected. Some floats should have clearly been on Black List

Finally, a study in which the same profiles were processed by the QC software at each DAC were presented. The results show that the DACs do not produce the same QC results for identical input data. This point was further discussed later.

DACs are encouraged to continue cooperating with the Coriolis GDAC when they receive the anomaly reports and take appropriate action to decrease the number of anomalies as some are recurrent. About 10 profiles per day are detected as anomaly.

There was much discussion following this presentation. It was decided that a few of the tests needed to be more rigorously specified. T Carval, C Schmid, A Tran, and T Yoshida volunteered to rewrite the specifications for these tests. Dacs agreed to update their procedure to be coherent with this more accurate specification.

It was also decided that the ADMT should have a standard test dataset for the validation of the real-time QC processing. The Coriolis DAC volunteered to provide this dataset; the target date for the dataset is the end of 2005. All DACs agreed that they would process the test dataset through their real-time QC and certify the results.

JAMSTEC reported finding a KESS float where the deep level reported in the trajectory file was not in the profile file. This will be followed up by AOML and possibly other DACs.

### **3.4. Trajectory**

B King presented a follow up to last years discussion of trajectory files and the problems found in them. There has not been much progress in the last year on this subject; everyone has been more focused on delayed-mode QC issues.

Many problems were reported as part of the study from last year, though only APEX floats were studied. Progress toward correcting the problems:

- o BODC: believed to be in good shape
- o Coriolis, JMA, MEDS: most of the known problems have been fixed
- o CSIRO: not currently submitting trajectory files because of known problems but working to correct this situation
- o ARGO-CNDC, KMA: the problems have not been fixed yet
- o INCOIS: have started to work on the problem

The correct procedures for determining the trajectory parameters for floats other than APEX need to be documented. This has to be addressed by AST

It was also reported that LAUNCH\_TIME is being reported in local time in some cases. The times should be reported in UTC. DACs are requested to check on this and correct where necessary. It was also mentioned that some real-time tests ( like impossible speed) were not correctly implemented by some Dacs. Dacs were requested to update their system.

### **3.5. Gdac Services status**

#### **3.5.1. Coriolis GDAC**

T Carval described the new features available at the Coriolis GDAC. The Coriolis GDAC is now scanning meta-data files for “highly desirable” parameters. The results of the scans are sent to the DACs weekly.

A couple of points were made during discussion of this issue:

- o “fill values” are acceptable in some cases to satisfy the checking
- o when the launch position is either missing or estimated, the QC codes 8 and 9 (as appropriate) are acceptable

A subscription service is available through the Coriolis GDAC:

- o the user registers and specifies the subscription parameters
- o the user then receives an e-mail with a link to the data when data is available for retrieval

A new feature that will allow users to retrieve all data for a float that has ever entered a user-specified region is now in testing and should be available by the end of 2005.

An OpenDAP server has been implemented.

#### **3.5.2. USGODAE GDAC**

M Ignaszewski described the new features available at the US GDAC. A minor change to the USGODAE Argo Data Browser was implemented. The LAS interface has many new Argo-specific selection criteria and output options.

The GTS tree is now fully mirrored and the DACs can now perform automated format checking.

The US GDAC is currently working to implement a Dapper server and CDFSync. (Both systems are discussed further later in this report.)

### **3.5.3. GDAC Discussion**

The synchronization of the GDACs and concerns about data corruption during file transmission were discussed. The GDACs have accepted that improvements to the synchronization are a very critical need and will give very high priority.

Some GDAC operations are currently performed manually at the GDACs. The GDACs will explore methods to automate these tasks so that they will be more robust.

It was also mentioned that there have been user requests for the GDACs to provide a mechanism that will allow for automated retrieval of updated data files. CDFsync may be a solution but other possibilities will be explored.

## ***3.6. Format Issues***

### **3.6.1. BUFR**

T Yoshida presented the status of the effort to transition Argo GTS to the BUFR format. The WMO began the experimental exchange of maritime data (Category 4) in 2005 and expects to begin the operational exchange of data in 2007 with parallel distribution continuing until 2012.

The proposed BUFR template includes these features:

- o the vertical coordinate will be pressure
- o the full resolution profile will be distributed
- o only a subset of the meta-data will be included

The goal is to complete the proposed template by the first week of December and present it to the WMO at the next meeting. E Charpentier will be contacted to see if he will be present at the meeting and would be willing to present the template.

### **3.6.2. Highly Desirable Parameters**

It was requested that the concept of highly desirable parameters be extended to the trajectory files. It was agreed that this will be pursued and B King will oversee the development of the list of highly desirable parameters for the trajectory files.

PLATFORM\_MODEL was discussed as one example. It was decided that the setting of this parameter would be standardized and that a table would be added to the user manual describing the allowed settings.

### **3.6.3. Format Changes**

M Ignaszewski presented the status of implementing format changes agreed upon at the last meeting. These include changes to the parameters in the meta-data files, increasing the length of the parameter name variables, the change to the definition of the PROFILE\_<PARAM>\_QC variables, and the changes to the trajectory file history section.

Removing the history section from the multi-profile files was proposed and accepted. This will solve the problem of file size explosion in the multi-profile files.

It was decided that the parameter name length and PROFILE\_<PARAM>\_QC can proceed immediately and does not need to be synchronized.

The following schedule was discussed for the remaining format changes:

- o the DACs and GDACs will prepare for the changes during December
- o the changes will be announced at the beginning of January 2006
- o implementation will take place at the end of January 2006

#### **3.6.4. Variable Mission Parameters**

There was a discussion of the effect of Iridium floats on the data system. Iridium floats will have the capability to have their mission parameters changed during operation. The current meta-data format can handle this situation but the DACs will have to remind their PIs to keep the meta-data files up-to-date.

#### **3.6.5. Technical Files**

As part of the presentation on the APEX workshop, described next in this report, it was pointed out that it is important to have complete technical files at the GDACs to allow monitoring of the Argo array. A critical element in the process will be to standardize the parameter names in the technical files. Currently, the names are completely unregulated and it is difficult to interpret the information in the files.

The ADMT would like to be able to present the solution to this issue at the AST meeting in January. A Thresher (CSIRO) will oversee the actions.

### **3.7. APEX Workshop**

N Shikama presented the results of the APEX workshop held in September 2005. It was reported that 5 pathologies account for 80% of the Apex failures; these are energy flu, grounding, symptomless failures, Druck sensor defect, and motor back-spin. Continued development of the float technology seems to have solved most of these problems. Energy flu continues to be the most significant problem.

Five recommendations were presented to improve the reliability of APEX floats. These were:

- o use Park-and-Profile (PnP) missions
- o use a mid-level parking depth (~1000 db)
- o deploy floats away from islands and coasts
- o monitor hydrographic and engineering data systematically
- o avoid large field trials for new applications

New developments in the APEX floats were presented including the APF-9 controller and Iridium floats. These two developments will allow high-resolution profiling, adaptable mission parameters, drift-phase sampling (T-P only), and new sensors.

New sensors technologies were described including a comparison of the two oxygen sensor technologies and an acoustic rain and wind gauge.

New float technologies were presented including a new Jamstec float under development that uses a new buoyancy engine and the POPS float for under ice sampling.

### ***3.8. Coordination, Communication, Monitoring the Argo Data Management System***

The need for a problem reporting mechanism was discussed. While it is clear that something is needed, there was no clear consensus what the mechanism should be. The ADMT chairs and Technical Coordinator will discuss this further and decide how to proceed.

User registration was also discussed. It has been decided that there will not be mandatory registration due to concerns about driving users away. Instead, a voluntary user registration will be implemented at the GDACs (and AIC?). Better tracking of the users of the FTP and Web sites would be desirable.

Monitoring of the Argo array was also discussed. The AIC provides tools that can be used to perform this function. A standard set of information displays will be developed from these that will allow the status to be assessed quickly and easily.

## **4. Delayed mode data management**

### ***4.1. Summary of the 1<sup>st</sup> delayed mode workshop in San Diego***

B King made a summary of the 1<sup>st</sup> Delayed mode workshop in San Diego that has covered delayed mode QC for Salinity, Temperature, and pressure parameters. He explained the DM process and the role of the Delayed mode operators and the PIs in the decision of correction to apply to a float profiles. The complete report is available at [http://www.ifremer.fr/argo/.....](http://www.ifremer.fr/argo/)

From these statistics made on the 31<sup>st</sup> October on the availability of Dfiles at GDAC, we can see that some delayed mode processing have started. About 23% of the eligible profiles (ie older than 1 year) have been processed. Some countries like Canada are up-to-date, for others like in USA, Scripps and University of Washington, the process is really started and backlog is under recovery, For others like France, Australia and Japan, Dfiles will be delivered in coming weeks. For others like India/China/UK only test files were submitted. Korea will start in 2006. The GTS files which represent 19% of the network, will never be provided in delayed mode until the country which deployed them finds a delayed mode operator and a PI to process them.

| DAC                    | Total<br>>1 yr old | D-files<br>>1 yr old | % of files<br>>1 yr old | Total<br><1 yr old |
|------------------------|--------------------|----------------------|-------------------------|--------------------|
| <b>USA/AOML*</b>       | 44074              | 19322                | 44%                     | 28574              |
| <b>UK/BODC</b>         | 6307               | 395                  | 6%                      | 2533               |
| <b>France/Coriolis</b> | 19013              | 3954                 | 21%                     | 8424               |
| <b>China/ARGO-CNDC</b> | 646                | 275                  | 43%                     | 268                |
| <b>Australia/CSIRO</b> | 2423               | 0                    | 0%                      | 1497               |
| <b>India/INCOIS</b>    | 3317               | 0                    | 0%                      | 2245               |
| <b>Japan/JAMSTEC</b>   | 19995              | 1445                 | 7%                      | 8539               |
| <b>Korea</b>           | 1716               | 0                    | 0%                      | 917                |
| <b>Canada/MEDS</b>     | 6981               | 6860                 | 98%                     | 2108               |
| <b>GTS</b>             | 24832              | 0                    | 0%                      | 1190               |
| <b>TOTAL</b>           | 129304             | 31557                | 23%                     | 56295              |

\*For US Argo (AOML): SIO = 97%, UW=75%, PMEL=8%, WHOI=0%

As BS method was an adaptation of WJO method, including features that were necessary in some areas, it was decided at San Diego DM workshop to try to merge the two methods into one that could be used by everybody. This action was undertaken by B Owens and A Wong and succeeds.

The following changes were implemented in WJO methods:

- Interpolate climatology onto float observed  $\theta$  values
- Potential Vorticity as an option in weighting function for climatology mapping
- Use limiting criteria to choose 10 surfaces for fit:
  1. shallowest & deepest pressure surfaces ( $P >$  user input e.g. 200)
  2. Minimum & maximum theta surfaces (nearest observation, i.e. do not interpolate on to a theta surface)
  3. Minimum & maximum Salinity surface
  4. Depths with 2 smallest variances of  $\theta$  and Salinity
- Fit drift as a piece-wise linear function
  1. allow up to 5 break points to be inserted in the time series
  2. Choose optimal number of break points based on statistical AIC test

The Beta version is available for test. New diagnostic plots were added. At the moment the software doesn't adjust single profiles. The automatic piece-wise fit should save a lot of time for the generic floats but for the difficult cases, the delayed mode operator has the option to manually specify break points. Nonetheless, break points provided automatically by the methods should give a first objective suggestion of the break points even though they can be overwritten.

#### 4.2. National progress on delayed mode processing

Then each country reported the delayed mode activity progresses and the remaining problems they wanted the group to address.

- **France/ CORIOLIS** (C. Coatanoan & V. Thierry). Coriolis team has implemented the piece-wise processing of floats using BS method and this has improved the corrections proposed by the method. Nonetheless the team has decided to develop additional decision tools, comparing statistically a float series to the other recent data available at Coriolis (float, ctd., mooring) to distinguish a sensor drift from a real signal in some cases. The reference database has been updated with some recent CTD. North Atlantic floats should be delivered to GDAC in coming weeks. There is still work to be done for the South Atlantic and southern ocean. It was suggested to use Flag=2 in some case and a proposal was made later. First test feedback to realtime were conducted and results were presented later in the meeting..

- **Canada** (A Tran on behalf of R. Perkin). Canada has first added recent data to the reference database both in Pacific and Atlantic. They have implemented the piece -wise processing using WJO method . They submitted all their profiles in august 2005. Next step will be to QC O<sub>2</sub> data. It was suggested also to use the temperature measures with the O2 sensor to detect problems on the CTD temperature.
- **Japan/Jamstec** (S. Minato & T. Kobayashi). Jamstec perform a QC on position and pressure prior to the salinity adjustment with WJO method. More than 7000 profiles have been processed but only 10% were sent to GDACs. Jamstec have compared the results provided by WJO & BS methods: they were in good agreement in most cases but in few cases they were not and an investigation is on the way. Annie Wong suggested to force WJO method to process the same levels as the ones chosen for BS methods to reduce the discrepancies.
- **Australia/CSIRO** (Tseviet Tchen) Australia has merged Hydrobase1 with WOD2001 in a unique reference dataset. A lot of profiles have been processed according to the method defined at San Diego. However, Australia differed the submission to GDAC after the meeting because of thermal initial lag correction they wanted to implement. They reported that the method works pretty well except in some cases that needed to be investigated.
- **USA** (A. Wong) : the 4 USA groups involved in Argo have now a delayed mode operator. These persons have processed 95% done at Scripps, 40% at University of Washington. WHOI team is starting now as they first have focused their activities on the merging of WJO&BS software. For PMEL the software is in place and test files have been sent to Aoml
- **UK/BODC** (Rebecca McCreadie & B. King): The software is in place and test files have been submitted to GDAC. Backlog will not be recovered by the end of 2005
- **China/ARGO-CNDC** (Liu Zenghong& Ji Fengying). ARGO-CNDC have tested both WJO and BS methods and got better results with BS method when comparing with nearby shipboard CTD. Both methods have problems in marginal seas. ARGO-CNDC has implemented piece-wise processing of float series. They have improved mapping scale in the areas where they have deployed floats. They also have tested different reference databases (WOD98, WOD10, SeHyD) and confirmed that real improvement was seen when nearby recent CTD were included in DB. Therefore they recommend making CTD when deploying from research vessels. .About 300 profiles were sent to GDACs
- **India/Incois** ( M Ravichadran on behalf Sudheer Joseph) The main problem is to resolve the quality of the reference database in the India area of interest where reference data are not converging at deep layer. INCOIS has first collected additional CTD and put them in the reference database. They made a run of WJO method with WOD01 plus additional CTD datasets and additional Argo reference data sets: This run resulted in much reduction of the calibration error bar and produced an apparently better calibration. However these results have to be checked further for chances data feedbacks as the addition is done only after a visual inspection
- **KOREA/KORDI** (JY Yang & JJ Park) They have installed the WJO software. They are first facing the problem of lack of data in their area of interest (Eastern Japan Sea). They have included recent CTD. And will study the possibility to include Argo floats in the reference DB. No data were provided yet to GDACs.

The conclusion of the DM operator reports was that a lot of progress has been made and that all delayed mode operators are using similar methods to process their floats. This should lead to a consistent way of processing the good or easy floats (clear offset/drift). However there is still a long way to go on for the most difficult ones. There was a consensus that a small portion of the difficult floats will probably never be corrected. There were concerns expressed about the consistency of the submitted data and it was suggested to perform a peer review of the submitted data; B King proposed to do it prior to the next delayed mode workshop next summer. It was highlighted that Regional Data Center should take this task over when they would be set up. It was emphasized that experience should continue to be shared in order to progress on DM activities. Annie suggested using the delayed mode team email list to discuss on difficult cases when help is needed. Moreover, it was decided to add to the delayed-mode QC manual a guide book with documented examples that should help the DM

operator. Annie accepted to lead this activity. Finally everybody agreed that it would important to hold a second delayed mode workshop before next summer.

The creation of a reference database that would include "good" Argo profiles has to be addressed by AST, if possible prior to this DM workshop. This would mean attaching a group approval to such data rather than using individual PI judgment. The criteria for making these group approvals should be similar to that of the individual expert. Valid criteria might include (1) age of the float, (2) stability of T/S from the float, (3) consistency of the float T/S with neighboring floats or with very recent shipboard CTDs. We know from calibration checking by several groups that initial calibration of SBE salinity sensors is accurate. In most regions of the ocean, Argo data is now the largest (by far) source of profiles. We also know that in many regions there are substantial changes in intermediate water T/S characteristics relative to WOCE. Therefore we cannot ignore nearby Argo in the DM process, because if we did then we would tend to adjust Argo T/S back to WOCE data, and in doing so would remove important climate signals.

#### **4.3. Technical issues**

Provor and Solo correct automatically the pressure measurements taking into account the measured surface pressure. Therefore the conductivity is made as the correct pressure

N Shikama presented the result of the technical workshop on APEX floats and the danger of using the technical information "SURFACE-PRESSURE" in an automatic mode because of erroneous values transmitted in extreme cases such as float stuck in sediments, or not enough buoyancy to surface at previous cycle. It was decided to use next cycle "SURFACE PRESSURE" to adjust PRES if there is evidence that values reported in "SURFACE PRESSURE" represents significant sensor-related drift or offset. The conclusion of DM workshop in San Diego was not to recompute the salinity when the pressure is corrected. This will be revisited off-line within the DM group. Only some Dacs (CSIRO-JMA) are adjusting in Real-Time small offset of APEX and putting in Press or Press-Adjusted parameter. A Tresher will be in contact with Webbs to know what to do in Real Time and will report to the group by email.(action) .

D. Roemmich presented on behalf of G Jonhson a proposal of correction of thermal inertial lag on SBE41 and SBE41CP sensors. Thermal inertia lag is due to the difference of T between intake and time when the salinity is measured, therefore in high temperature gradient/ strong thermoclines area the error that can be important and exceed Argo specification. It looks like a salinity spike at the base of the mix-layer and/or an offset throughout the thermocline. The correction to apply is for SBE41CP and SBE41. G Johnson provides a matlab routine to make the correction ( need to be adapted to the platform and SBE sensor used). Even if the uncertainty on the correction is large, G Jonhson recommends to make the correction because it correct the offset generated and cleans up the profile of some density inversion. To perform this correction it is important to have in the! metadata file which sensor is on board (SBE41 SBE41CP). Dac have to check their metadata file to document properly the sensor onboard their floats..ADMT team will refer to AST to recommend or not to apply it either in Delayed mode or real time...In real time it may clean the profiles and ease realtime Qc by removing some spikes...

#### **4.4. Feedback to real-time**

There is a request from operational users that the float data are corrected in realtime if this information available. To be able to correct cycle N we need to run the method on [N-6months ; N+6months] but the proposed corrections are only applied to [N- 6 ;N ]. The correction in realtime will be put in the PSAL\_ADJUSTED in Rfile. Two proposals were made

- Canada proposed to take the last correction validated by the PI and to apply it as a constant offset to the profiles processed in realtime until a new correction is available 6 month later. The processing chain is ready and MEDS plan to start before the end of 2005.

- France proposed to apply the correction calculated by the method for month [N; N+6] and to extrapolate the correction (offset + slope) calculated at month N+6months From the study conducted by v Thierry, it seems reasonable to extrapolate for floats that have "stable" behavior. For "non stable" or pathological" floats it was suggested to put them on the grey list.

After discussion, it was decided to apply the Canadian method as it was safe. However the Coriolis proposal sound promising and an enhanced study on a larger number of floats should be conducted prior to the next DM workshop. According to the results the method could be revisited.

**NOTE:** Whenever a <PARAM>\_ADJUSTED variable is set for one of the parameters, the \*\_ADJUSTED variables should be set for all of the parameters that are measured. If no adjustment is made for a parameter, then the original values are put into the <PARAM>\_ADJUSTED variable. For example, if a salinity correction is applied to the real-time data and PSAL\_ADJUSTED is set but pressure and temperature are not adjusted, PRES\_ADJUSTED and TEMP\_ADJUSTED should be set to the PRES and TEMP values, respectively.

#### **4.5. Reference DataBase**

Argo need to have a reference database regularly updated by recent high quality CTD to be able to process ARGO data.

Taiyo Kobayashi from JAMSTEC presented work done to introduce SeHyd by Jamstec in reference database and it has improved the corrections. Sudheer Joseph has introduce good Argo data and it improved the processing in the Arabian Sea . In Nation report section a few countries have added recent CTD to their reference database. The results of DMQC is highly influenced by the quality of the reference database. We should find a way to put in common our efforts towards a unique reference database.

We agreed that we should not duplicate within Argo the World Data Centers for Oceanography or CLIVAR efforts to gather high quality CTD data. J Swift/UCSD head of CCHDO is funded at least until end 208 to locate, collect, quality control CTD for climate and scientific applications. Old and New data are available on CCHDO WWW site. A full time person is working on metadata. The CCHDO team is willing to help Argo as long as they will manage to have the data flow to their center. CCHDO has a good knowledge of the USA cruises but very few of other country cruises. The privileged interface is through national data centers but they can handle data coming directly from Pis.

Argo Director should be able to provide to CCHDO the list of PIs liable of providing recent CTD data.

In order to make data flow to CCHDO , RDAC agreed to work with the countries collaborating to the RDAC to make their data available. These data can be low resolution CTD (1 data every 10m) and access restricted to Argo DMQC activity. In that case CCHDO will qualify these data and make them available only to Argo. Coriolis proposed to host the common reference database and update it with the new data coming from CCHDO or other RDAC. Coriolis will maintain the reference DB documentation to indicate which cruises have been added and eliminate duplicates. The common reference data base will be available for DMQC activities only through FTP, password protected.

#### **4.6. Miscellaneous format issues.**

- <PARAM>\_ADJUSTED\_QC = '2' needs more definition.

In the delayed mode manual, it is mentioned to assign the QC flag "2" to probably good data. As we are working toward consistency of the delayed mode dataset we agreed that it would be useful to provide more guidelines to Pi on the assignation of flag "2". The following are some cases where a flag '2' should be assigned:

- adjustment is based on unsatisfactory reference database;
- adjustment is based on a short calibration window (because of sensor transition, or end of sensor life) and therefore may not be stable

- evaluation is based on insufficient information;
- sensor is unstable (e.g. magnitude of adjustment is too big, or sensor has undergone too many sensor behaviour changes) and therefore data are inherently of mediocre quality.
- When a float present pressure problems.

We also agreed to re-compute PROFILE\_<PARAM>\_QC if <PARAM>\_ADJUSTED\_QC is available.

The DM operators agreed that file-checker GDAC should control the content "not empty" for calibration parameters in D-files. Mark will prepare the checker to handle these checks and DM operator will provide the parameters for which the content has to be checked and a warning sent to the Dac manager...

The issue is that Dfiles will have several versions because the Delayed mode processing will induce the revision of the file in term of new version of PSAL. Therefore we would like to be able to assign a different version to a file went PSAL content has been changed. T Carval & M Ignaszewski will work on a proposal. This information will be necessary for users that recover regularly data on a float or an area .

#### **4.7. Documentation**

##### User manual

The version 2.01b was distributed to ADMT participants and reviewed during the meeting

T Yoshida proposed to add a new entry to the parameter DATA\_MODE:

- R Real Time
- A: Adjusted profile in real-time data
- D Delayed mode

The file name will remain Rfile just the DATA\_MODE will change from R to A in a Param-Adjusted parameter will exists. The proposal was adopted both for profile and trajectory files

A table was initiate to unify technical parameter names. This table will be updated for Apex/Provor/Solo floats and the format group will make a proposal. Australia recommended that an electronic ascii version of this table was available and maintained at GDAC.

This revised version of the manual was approved and the official Argo format will be the one described in this manual when the change will have been made at RDAC ie end of January.

##### QC Manual:

In the description of delayed mode QC the following points have to be added:,

- Recommendation for flag "2" according to §4.6 of this report
- Recomputation of PROFILE-PARAM-QC
- For Apex float PRES correction according to §4.3 of this report sea-surfacePressure use...
- Feedback to realtime according to §4.4 of this report

##### Improvement of Real Time tests

The definition of the real-time tests ( spike, density inversion, gradient) have been updated to be less ambiguous. Final version is available in the QC manual document The Dacs will have to update their QC toward this clearer specification...

## **5. PMEL tools to support Argo data: J Sirott**

J Sirott described PMEL tools that include support for Argo data. There are three types of tools that support different types of access:

- Dapper: provides programmable access to the Argo data set
- Dchart: provides easy browsing of the Argo data set via a web browser
- CDFsync: tool to keep two netCDF datasets synchronized

Dapper is an open-source web server that provides distributed access to in-situ data via the OPeNDAP protocol. Dapper handles the Argo netCDF formats as well as others (for instance, EPIC and COARDS netCDF). Dapper can perform space/time/attribute queries on the dataset and the data are returned as OPeNDAP sequences. There are several Dapper clients available including GrADS, Matlab, NcBrowse, and Java Ocean Atlas.

Dchart is a web-browser-based OPeNDAP client that provides intuitive access to Dapper datasets (which could include the Argo GDAC data). Users can quickly and easily select, preview, and download data.

CDFsync is an rsync-based tool that allows the rapid synchronization of netCDF in-situ files over a network. CDFsync is optimized for netCDF files and file lists of thousands to millions of files.

More information about these tools are available at

dapper.pmel.noaa.gov/dapper,  
dapper.pmel.noaa.gov/dchart, and  
[www.epic.noaa.gov/epic/software/dapper](http://www.epic.noaa.gov/epic/software/dapper)

## **6. RDACs: provide an information on what done and what is planned**

Rdac have all started to develop with their own priority. Some started 18 month ago , others only 2 weeks ago therefore their level of achievement is inhomogeneous.

### ***6.1. Atlantic ( S Pouliquen & C Shmidt)***

The North Atlantic RDAC started only 3 weeks ago. 8 countries agreed to contribute (Canada, France, Germany, Italy, Netherlands, Spain, UK and USA) coordinated by Coriolis team. Italy agreed to coordinate the RDAC activities for the Mediterranean Sea.

There is a lot of overlap between North and South Atlantic RDAC and therefore we have decided to share our efforts on some activities. The main NAARDAC objectives are :

- Common with SAARDAC, Close link with SORDAC
  - Atlantic contribution to the global Argo reference data base for quality control
  - Logistics for deployment (deployment opportunity , deployment plans)
- Specific to NAARDAC
  - Consistency of the Argo data from the North Atlantic
  - Sharing expertise
  - Products delivery

The consistency of the network will be processed by AOML and Coriolis with their in-house statistical method and comparison of the results will be done in 2006. NAARDAC contributors recommend that RDAC perform this activity in a consistent way within ARGO. The following products will be made available.

- T 1 S weekly analysis perform with Argo data combined with other networks
- Regional climatology/mean sea state for the North Atlantic before end of 2005
- Current products are planned.
- Links to national products will be made.

One important benefit the group expect is on networking activities and sharing of expertise of instrumentation, deployment methodology, data processing, improvement of RT and delayed mode QC procedure in the North Atlantic and Med Sea . These improvements will be reported to the Argo Delayed Mode group

C Schmid on behalf of S Garzoli summarized the SAARDAC activities that evolved from two meetings held earlier this year (for detail see the meeting report on SAARDAC www site <http://www.aoml.noaa.gov/phod/sardac/>).SAARDAC has decided to split the work into three main areas:

- Logistics, specifically deployments (vessel opportunities, local logistic support, float donation program,...)
- Data center activities: Standardize QC procedures. Improve Climatology, ease access to In-Situ data (GTS profiles, Drifters, NODC,...) by eventually providing products on CDROMs for countries with limited internet connections. Provide products such as mapped mixed layer properties, ...
- Capacity Building: to train people in float deployment and data processing.

Another meeting is planned in Ghana in 2006 for training on data analysis and interpretation.

### ***6.2. Indian ( M Ravichandran)***

INCOIS coordinate the IORDAC to which CSIRO also contribute. INCOIS acquire the Indian ocean from GDAC and make them available on RDAC. A float failure monitoring has been put in place. An action to collect recent CTD data in Indian ocean was set up and these data will be made available in the Argo Reference database. Study to improve DMC in Indian ocean have been conducted and more guidelines on usage of ARGO data in reference database are expected from AST.. It was suggested to add good Argo data (according to the definition of § 4.6) to the reference database. IORDAC has started to generate value added products for Indian ocean . INCOIS ensure of monitoring Argo data usage and the float deployment coordination in the area.

### ***6.3. Pacific ( James T Potemra))***

The Pacific Argo Regional Center (PARC) is a collaboration of Jamstec, CSIRO, and IPRC. The second meeting of the participants was held in August 2005. Topics discussed at the meeting included the initial design and functionality of the PARC website, the completion of hydrobase2 by WHOI, and the QC of historical datasets by CSIRO.

The products are focusing on climate, near-real-time products for island nations, and high-resolution regional modeling. The examples given include support for the PRIDE project in the Pacific Islands and high-resolution regional modeling around the Hawaiian Islands (which will be extended to other islands in the future).

The issues that PARC is addressing include:

- identification of users and the products they would like to see
- clearer definition of specific regions of interest
- identification of additional partners
- funding

During the ensuing discussion the following points were made:

- user-demand is driving the choice of products that they produce
- more nations should be included in the process

- not all of the functions of an RDAC are currently available but they are being addressed

PARC requested guidance on the serving of Argo data on their website: the guidance given was that as long as the data was an exact copy of the GDAC dataset, redistribution of the Argo data in a format more useful for their users was acceptable.

#### **6.4. Southern Ocean (*R McCready*)**

The SORDAC is a collaboration between the UK (BODC) and CSIRO. BODC is handling the Atlantic and Indian Ocean sectors and CSIRO is handling the Australian sector of the Souther Ocean. The Pacific Ocean sector is not covered at this time and additional collaborators are sought.

The reference dataset is an important issue for this region; the CCHDO dataset is of great interest.

There was not a lot of progress made by the SORDAC during the past year because of the high priority placed on advancing the real-time and delayed-mode data systems. The participants hoped that significant progress will be seen in the coming year.

The SORDAC participants would like to see:

- more participants
- more Southern Ocean CTD data to improve the reference dataset
- a meeting of the RDAC to ensure the activities of all RDACs are coordinated.

The need for a separate RDAC for the Southern Ocean was discussed; it was suggested that perhaps the other RDACs could handle the Southern Ocean sectors their basins. The general consensus was that, due to the unique characteristics of the Southern Ocean (east-west coherence of the features, water-mass characteristics, reference dataset considerations, etc), having a small group of experts focused on this region would be advantageous. This question may be reexamined at a later time as the SORDAC evolves.

#### **6.5. Discussion**

All RDAC agreed to send the additional reference data they have collected to CCDHO in order to build the ARGO reference database

It would be interesting to have the RDAC progressing in same direction in a consistent way. However they will progress at their speed and we will probably don't have much benefit from a specific workshop at list not yet. Probably a forum or mailing list to share experience and progress would be more useful. Issue to be revisited next year.

### **7. GADR**

Charles Sun presented the status of the GADR including the GADR operations, the accomplishments during the past year, the access statistics, the status of the CD/DVD, and future plans. Among the operations provided, it was noted that NODC is safeguarding the ARGO data from GDACs on a monthly basis.

The major accomplishments included:

- A new version of the Argo Data Explorer has been implemented
- NdEdit, a sub-setting tool, was completed.
- The 2<sup>nd</sup> draft of the Argo Global Data Resource 2006 CD/DVD has been completed and is ready for distribution. It is available for review online. At present it includes both real-time

and delayed mode data. At last ADMT meeting it has been decided that it would not be good for ARGO to issue a DVD with non-corrected float data and therefore the distribution has to be delayed until mid-2006 when delayed process will have recovered most of the backlog. NODC has secured the funding to be able to burn DVD and distribute it during 2006 and distribute on demand.

It may be useful to distribute a CD/DVD containing real-time Argo data for people with poor internet connection. NODC offered to produce customized CD/DVDs as a service. It was noted that it may be beneficial to include all available data in the area (not only Argo) on a customized CD/DVD and therefore it would probably be more useful for NODC to provide tools to RDACs to generate on demand media to serve this community.

NODC has detected some corruption during file transfer. A recommendation to implement a CRC32 checksum was presented. The GDACs have agreed to take this for action. CDFsync (described earlier) was suggested as the long term solution.

## **8. Other topics**

At the meeting there was a proposal from USA either at AOML/Miami or at PRC/Hawaii. After the meeting China made an offer to host in Tianjin near Beijing.

We finally agreed to accept our Chinese colleagues' invitation and to meet next year in China.

## **9. ANNEX1: Agenda of the 6<sup>th</sup> Argo Data Management Meeting**

### **10. Objectives of the meeting**

- *Review the actions decided at 5<sup>th</sup> 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 after San Diego meeting and take necessary actions to move to systematic implementation*
- *Contribute to the status on Argo program by setting up a set of robust metrics for documenting 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)
  - visibility to scientific and operational results achieved thanks to Argo program and ensuring the visibility of these metrics.
- *Review the Regional Data Centre status, their implementation plan and the difficulties they are experiencing. Clarify their responsibilities on Reference Database for DMQC, their relationships with GDACs and their role in regional Delayed Mode QC*
- *Review and take steps to put in place appropriate Argo data archive functions including the detailed specification of possible distribution of Argo data and analysis tools via DVD*
- *Determine what "messages" need to be passed to the CLIVAR/IOCCP/Argo global hydrography workshop starting November 12th.*

**Schedule:** Meeting will start at 9am and finish around 1730 on Tuesday and Wednesday. We plan to finish around 1400 on Thursday to allow people to catch plane more easily.

### **Tuesday 8<sup>th</sup> November**

**The meeting will be opened by the Director General of JMA**

- **Status of Argo program (30mn)**  
*What's new at AIC, status on the Actions. Improvement needed?*  
 5<sup>th</sup> meeting Actions: 1-3-19
  - Status of Argo program (M Belbéoch)
  - What's new at AIC? (M Belbéoch)
- **Real Time Data Management (2hours)**  
*Review the Argo real time data stream, the status of actions from ADMT-5 and identify new actions needed to improve the volume, timeliness of delivery and quality and ease of Argo RT data.*  
 5<sup>th</sup> meeting Actions: 7-8-9-10-11-14-26
  - Real-time availability: 15mn
    - Argo floats only available on GTS and not at GDAC ( Navocean in particular) action 7
    - Historical Dataset action 8
  - GTS status: 15mn
    - Timeliness of data delivery: Review evidence provided by the MEDS statistics on the timeliness of data delivery via GTS. (A Tran) actions 9-10

- Status of the "profile gap" problem on GTS
- Distribution to GDAC (C Coatanoan) Actions 11-14- 26: 1hour
  - Status of problems detected at Coriolis GDAC (C Coatanoan)
  - Efficiency of RT tests and DAC uniformity: density inversion, result of the comparison of the Test Cases...
  - Standardized handling procedures for floats that fail RTQC tests
  - RT QC subroutine sharing
  - Reduction of multiple submission at GDAC
  - Statistical tests in RT?
- Trajectory from Argo data (B King) 30mn
  - Correction of DAC data action 15
  - Proposal for a trajectory product
  - Consider any evidence for difficulty of access being a deterrent to Argo data use
- **GDAC Services (1h)**  
*What's new at GDACs and Improve services for users.*  
 5<sup>th</sup> meeting Actions: 28
  - What's new at Coriolis and US Gdacs (T Carval, M 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.*  
 5<sup>th</sup> meeting Actions: 16-22-23-24-27
  - BUFR Format (T Yoshida) 15mn
  - "Highly" desirable metadata fields/ extension to other file types. 15mn
  - History section 15mn
  - Other changes 5mn
  - Format change protocol implementation (Mark Ignaszewski) 10mn
  - Technical Files 30mn
    - Outcome of the Apex workshop (N Shikama)
    - Will Iridium increase the technical information to be handled
- **Coordination, Communication, Monitoring the Argo Data Management System (1H)**  
*Now that the ARGO Data Management System is in place, we probably have to improve the communication around ARGO and make synthetic information available to users in a more user friendly way. Some actions have been identified at the 5<sup>th</sup> ADMT meeting but implementation didn't progress much for reasons that need to be identified and problems solved.*  
 5<sup>th</sup> meeting Actions: 4-19-20-25
  - Problem reporting
  - Implementation of the set of metrics specified at last ADMT meeting to monitor the performance of the data system and take steps to construct and distribute these metrics in a routine manner
  - User monitoring/ User Registration.
  - Access to scientific products.

*Meeting will end at 17h30. A reception will be hosted by JMA on Tuesday evening starting from 18:00 at the KKR hotel Tokyo which is facing to the meeting venue across the street.*

## Wednesday 9<sup>th</sup> November

- **Delayed mode data management (one day)**

*Review the delayed mode QC actions decided at San Diego meeting  
5<sup>th</sup> ADMT Action 30. DM Workshop Actions.*

- a). San Diego workshop summary and action items progress update (B. King & A. Wong) [40mn] SD Actions 1-2-3

- b). DACs delayed-mode progress reports and feedbacks [45mn +15mn discussion]

SD Action 11

*Each Dac will give a 5mn summary on what is working when applying San Diego recommendations, what improvements have to be done to achieve this goal, what are the remaining problems. All details about DM activities in each Dac will be written in National Report.*

- CORIOLIS (C. Coatanoan & V. Thierry)
- MEDS (R. Perkin)
- JAMSTEC (S. Minato & T. Kobayashi)
- CSIRO (Tseviet Tchen)
- USA (A. Wong)
- BODC (Rebecca McCreadie & B. King)
- China (Liu Zenghong)
- INCOIS (Sudheer Joseph)
- Korea (JY Yang & JJ Park)
- Discussion

- c). Statistics on percentage of eligible profiles submitted as D files; current status of the delayed-mode data stream (D. Roemmich). [20mn] SD Action 17

- d). Technical issues about delayed-mode qc that still need clarification. [30mn]

- Need to determine a reasonable critical value of SeaSurfacePressure to correct profile pressures. Input from APEX Workshop? (S. Minato & N. Shikama) SD Action 5

- e). Other instrument failure modes and corrections. Can these be dealt with in real-time?[30mn]

- Thermal inertia lag (G. Johnson, to be presented by D. Roemmich)

- f). Applying salinity drift and offset adjustment in real-time. Discuss implementation problems with real-time DACs. [1 hour] SD Actions 9-10

- Ron Perkin and Anh Tran to make a presentation on their real-time salinity adjustment experience with MEDS data.
- CORIOLIS to present hindcast study on real-time salinity adjustment.

- g). RDACs and reference database: how to update it and how to keep a central master copy.

[1 hour] SD Actions 7-8-15-16

- Introduction of SeHyd by Jamstec in reference DB( Taiyo Kobayashi)
- CCHDO J Swifts
- Discussion

- h). Miscellaneous format issues. [40mn]
  - <PARAM>\_ADJUSTED\_QC = '2' needs more definition.
  - What is the final word on PROFILE\_<PARAM>\_QC?
  - Do we need some basic content checks for delayed-mode netcdf files in FNMOC's format check routines? SD Action 6
  - Version control of D data at the GDACs? SD Action 13
- i). Finalise the Argo QC Manual and the Argo Users Manual (A. Wong & T. Carval). [20mn] SD Action 12

## ***Thursday 10<sup>th</sup> November***

- **Dapper : can this tool ease Argo data distribution at GDAC: J Sirott (30mn)**
- **RDACs: provide an information on what done and what is planned (3h30)**  
*Each RDAC is invited to provide information on the progress made during the past year especially to start implementing the mandatory activities*
  - RDACS status and plan (30mn per RDAC)
    - Atlantic ( S Pouliquen & B Molinari)
    - Indian ( M Ravichandran)
    - Pacific ( P Hacker ?)
    - Southern Ocean ( R McCready)
  - Reference database for DMQC (1 hour)
  - Interfaces with GDAC and other RDACs (30mn)
- **GADR (1h)**  
*Status on Argo DVD, plans for regional versions. GADR progress to comply with Argo requirements.*
  - The Argo DVD, issue of regional versions (C Sun)
  - Status of the Archiving centre (C Sun)
- **Other topics**  
Place of the next meeting..

## **11. Annex2: List of Attendants**

| Name                     | Institution/Organisation           | e-mail                               |
|--------------------------|------------------------------------|--------------------------------------|
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## **12. Annex 3: 5th meeting action list**

21 actions were closed, 6 are underway and status was addressed in the relevant agenda points and 2 were cancelled, 1 was transferred to AST.

|   | Action  | Target Date                                | Responsibility      | Status   |
|---|---|--|---------------------|--|
| 1 | AIC to implement official email list for Argo-DM, Argo-Delayed mode from mailing list presently available at Ifremer                                    | Nov 2004                                   | AIC                 | OK   |
| 2 | Milestones DACs and US GDAC to update AIC status within 2 weeks   | Mid Oct 2004                               | DAC GDAC managers   | Ok   |
| 3 | www. Argo.net have to be accessible on all browser and a non-flash version should be made available   | Before being released                      | AIC                 | OK   |
| 4 | GDAC to implement register form when user try to download data (Model provided by J Gould) and propose a statistic from these forms and log information | GDAC managers                              | March 2005          | Cancelled and revisited at 6 <sup>th</sup> meeting   |
| 5 | Argo DM overview document to be written by Project Director and published on Argo new letter and GDAC WWW sites   | J Gould<br>+GDAC managers                  | Dec 2004            | Ok   |
| 6 | Update Argo DM documentation to provide 3 documents: User handbook, Argo QC, Format User manual   | S Pouliquen and M Ignaszewki to coordinate | March 2005          | User manual has been approved at 6th ADMT<br><br>QC document is OK<br><br>Format document is obsolete and no more visible on Argo www site |
| 7 | USA are encourage to find a way to get Navoceane to send their data to GDACs as it's the last significant Pi not included in this data stream           | Project Office or USA DAC manager ?        | As soon as possible | Navoceane float are know provided to Gdacs by AOML. The historical backlog is under processing   |
| 8 | Inventory of historical floats for which data have only been received by GTS to be issued and sent to DACs managers to take appropriate actions         | AIC+ T Carval and than DAC managers        | November 2005       | Mail sent on the 13 <sup>Th</sup> July<br><br>Action taken at Dacs level. A monitoring of the status will                                  |

|    |   |  |                  |  |
|----|---|--|------------------|--|
|    |   |  |                  | be done at Coriolis GDAC   |
| 9  | Toulouse GTS Node is generating most of the duplicates detected on GTS. CLS and/or Coriolis have to find the reason and take appropriate actions.                   | CLS and T Carval   | December 2004    | The bug has finally been identified at CLS and correction is under implementation.   |
| 10 | Toulouse GTS node is still the one who is providing only half of the profiles within 24h. CLS and/or Coriolis have to find the reason and take appropriate actions. | CLS and T Carval   | December 2004    | OK the Toulouse node is now performing as well as the other nodes  |
| 11 | a report summarizing the problems encountered while checking data at Coriolis GDAC should be sent biannually to DACs for actions                                    | C Coatanoan<br><br>DAC to correct their RT QC process if necessary | March 2005       | Report has been issued and action taken at DAC level the question was revisited at 6th ADMT meeting and a set of actions was decided |
| 13 | DAC to provide their grey list and GDAC to provide a consolidated argo grey list on FTP and WWW GDACS   | DAC + GDAC managers  | December 2004    | The grey list is available at Coriolis GDAC.<br><br>US-Gdac has to copy it on its FTP site.  |
| 14 | Update the RT qc manual with the additional tests on profile and trajectory – Define the test ordering and document interaction between tests                       | T Carval + volunteers  | December 2004    | OK   |
| 15 | Detection of bad cycle naming from trajectory files   | T Carval + volunteers  |                  | Dacs have undertaken action to clean the files. A new action was raised at 6th ADMT to verify the consistency of these files;        |
| 16 | Finalize draft proposal for BUFR format ...   | T Yoshida+ Bufr group  | Next WMO meeting | Draft has been prepared and will be presented at   |

|    |  |  |               | next WMO session   |
|----|--|--|---------------|--|
| 17 | Define a strategy to improve reference data set for Delayed Mode users by connecting to other international programs and improving data sharing among Argo network.DAC and RDAC activities regarding reference data base for DM to be coordinated. A proposal to be issued | Project Office together with RDAC coordinators |               | Underway at Project Office level. Action revisited at 6 <sup>th</sup> ADMT meeting and a solution proposed with CCHDO. |
| 18 | To summarize the delayed mode experience and questions raised by ADMT to AST for the 2005 delayed mode workshop  | ADMT Cochairs                                  | February 2005 | OK   |
| 19 | Float statistics table to be generated according to report guidelines  | AIC+ T Carval + B Keeley + J Gould             | February 2005 | NO guidelines provided by Project Office   |
| 20 | AST www site to point to the relevant Argo scientific products that are available at Nation level  | J Gould  | December 2004 | underway   |
| 21 | Velocity fields from trajectory should address all the type floats with the help of AST designated working group . Provide to DAC guidance to fill properly the trajectory files   | JJ Park  | October 2005  | ???  |
| 22 | Metadata: update the format with additional parameters if necessary and define the mandatory fields  | Argo-Dm group                                  | December 2004 | The list have been finalized beginin of September  |
| 23 | Implement warning mechanism on mandatory fields checking for metadata as well as a periodical check of the GDAC ftp site   | GDAC managers + DAC manager for corrections    | March 2005    | Modify the checker at GDAC to send warning when Highly desirable fields defined at action 22 are not filled properly.  |
| 24 | Update the format of history section for trajectory file   | C Schmid + Argo-dm                             | December 2004 | Format agreed<br><br>Implementation to be coordinated by Mark  |
| 25 | Implement an improved problem reporting system   | M Ignaszewski                                  | December 2004 | ?????  |
| 26 | Standardize the handling procedures when profiles fail the automatic tests   | M Ignaszewski                                  | March 2005    | Some email discussions after Christine report has clarified some   |

|    |  |                                   |                                   |   |
|----|--|-----------------------------------|-----------------------------------|---|
|    |  |                                   |                                   | issues. Other are to be put at ADMT agenda.   |
| 27 | DAC to implement the format changes for parameter name an parameter_profile _qc .<br>GDAC to patch the existing FTP sites according to schedule to be agreed by DAC and to modify file checker | DAC and GDAC managers             | From Mid November till March 2005 | Pending to be coordinated by Mark...  |
| 28 | GDAC to study the possibility to ask for all profiles of a float that has ever been in an area for a period of time  | GDAC manager                      | October 2005                      | Specification underway at Coriolis GDAC   |
| 29 | Found a volunteer to Pacific area of the Southern Rdac   | Project Office L esley R          | As soon as possible               | ????  |
| 30 | Summarize the Delayed mode problems encountered by the DACs applying AST recommended method  | Project Office and ADMT co-chairs | Delayed Mode workshop             | SanDiego meeting report available<br>Action list has been used to define DM-day on the agenda |

**13. Annex 4: 6th meeting action list**

|    | Action   | Target Date  | Responsibility                                    | Status |
|----|--|--|---|--------|
|    | <b>General Actions</b>   |  |   |        |
| 1  | Update User Manual and QC manual   | December 2005  | T Carval & Annie Wong                             |        |
| 2  | Dfiles version tracking system to be defined   | March 2006   | Mark Ignaszewski and Thierry Carval               |        |
| 3  | Make GDAC synchronization more robust  | March 2006   | GDACs   |        |
| 4  | Implement voluntary user registration at the GDACs and AIC   | January 2006   | GDACs, ATC  |        |
| 5  | DACs to report the status and plans to reduce the backlog of GTS-only files on the GDAC to ADMT chairs | January 2006   | ADMT chairs and DACs                              |        |
| 6  | Define monitoring requirements and implement them at the AIC   |  | ADMT chairs, Technical Coordinator                |        |
| 7  | Design and implement a simple problem reporting system   |  | ADMT Chairs, ATC, GDAC managers                   |        |
|    | <b>AST Actions</b>   |  |   |        |
| 8  | AST to define whether or not thermal inertial lag should be corrected in real time by DACS             | AST meeting January 2006   | D Roemmich  |        |
| 9  | AST to provide guidelines to include "good" Argo Profile in the reference database                     | AST meeting January 2006 or prior to 2 <sup>nd</sup> DM workshop | D Roemmich  |        |
|    | <b>Format Actions</b>  |  |   |        |
| 10 | Control that the information on Sensor is properly defined in metadata files                           | End 2005   | Dac Managers                                      |        |
| 11 | DM operator to provide the list of "highly desirable" fields to be filled in Dfiles                    | December 2006  | B King and A Wong to coordinate with DM operators |        |
| 12 | GDAC to update file checker to check the "highly desirable" Dfile fields                               | January 2006   | Mark Ignaszewski and Thierry                      |        |

|    |  |                        |   |  |
|----|--|------------------------|---|--|
|    |  |                        | Carval                                  |  |
| 13 | Define list of “highly desirable” parameters for trajectory files  | May 2006               | B King                                  |  |
| 14 | Standardize technical file parameter names   | January 2006 (for AST) | A Thresher (coordinator)                |  |
| 15 | Implement the format changes that were agreed  | January 2006           | Mark & Thierry to coordinates with DACs |  |
| 16 | Finalize BUFR format and present it to WMO   | December 2005          | T Yoshida and E Charpentier             |  |
|    | <b>Real-time QC Actions</b>  |                        |   |  |
| 17 | Contact WEBB to clarify the usage of SURFACE-PRESSURE technical parameter in Realtime  | End 2005               | A Tresher                               |  |
| 18 | Dac to implement in realtime last constant offset calculated in DMQC   | ASAP                   | All Dacs                                |  |
| 19 | Continue the study on extrapolation in realtime of last (slope,offset) calculated in delayed mode  | 2nd DM workshop        | V Thierry /B King                       |  |
| 20 | Develop standard QC test dataset   | December 2005          | Coriolis                                |  |
| 21 | Validate proper real-time QC checks using standard test dataset  |                        | Coriolis to coordinate with DACs        |  |
|    | <b>Delayed-Mode QC Actions</b>   |                        |   |  |
| 22 | Dac to test the Merged WJO-BS method for DMQC  |                        | Volunteer Dacs : Coriolis               |  |
| 23 | Peer review of the Dfiles available on Gdacs   | March 2006             | B King to coordinate                    |  |
| 24 | Provide with the DelayedMode QC manual a cookbook with a set of documented example that should help the DM operators to process consistently | January 2006-          | A Wong to coordinate                    |  |
| 25 | Organize the second DM workshop  | Mid 2006               | AnnieWong et Brian King to coordinate   |  |
|    | <b>Reference Dataset Actions</b>   |                        |   |  |
| 26 | Argo director to provide to CCHDO list of PIs liable to provide recent CTD   | Jan 2006               | J Gould                                 |  |

|    |  |               |                         |  |
|----|--|---------------|-------------------------|--|
| 27 | Dac to make sure recent CTD transferred to CCHDO   | ASAP          | All Dacs                |  |
| 28 | Coriolis to organize with CCHDO CTD transfer to provide a global reference database for ARGO | March 2006    | J Swift and S Pouliquen |  |
|    | <b>Data Problem Actions</b>  |               |                         |  |
| 29 | Vertical coordinate of GTS profiles on the GDACs to be converted to pressure                 |               | Coriolis GDAC           |  |
| 30 | Resolve "profile gap" problem  | December 2005 | CLS                     |  |
| 31 | On GTS implement conversion from pressure to depth   | December 2005 | CLS & KMA               |  |
| 32 | Investigate and solve time differences between GTS and GDAC profiles                         | January 2006  | AOML, JMA, INCOIS & KMA |  |

#### **14. National Reports**

- Australia
- Canada
- China
- France
- Germany
- India
- Japan
- Korea
- Netherlands
- Norway
- United-Kingdom
- USA
  
- Coriolis GDAC
- USGODAE Gdac
- NODC Gadr

**Australian Argo National Report**  
**for the 6th Argo Data Management Meeting**  
**A cooperative project between CSIRO Marine and Atmospheric Research**  
**(CMAR), the Australian Bureau of Meteorology (BoM) and the Antarctic**  
**Climate and Ecosystem Cooperative Research Center (ACE-CRC)**

Argo Australia has had a very successful year. With the help of Japanese, Korean, Indonesian and Australian agencies and commercial shipping companies, we have launched 51 Argo profilers since October 2004. Of the 83 profilers deployed since our program began in 1999, 63 are still functional; three remain grey listed.

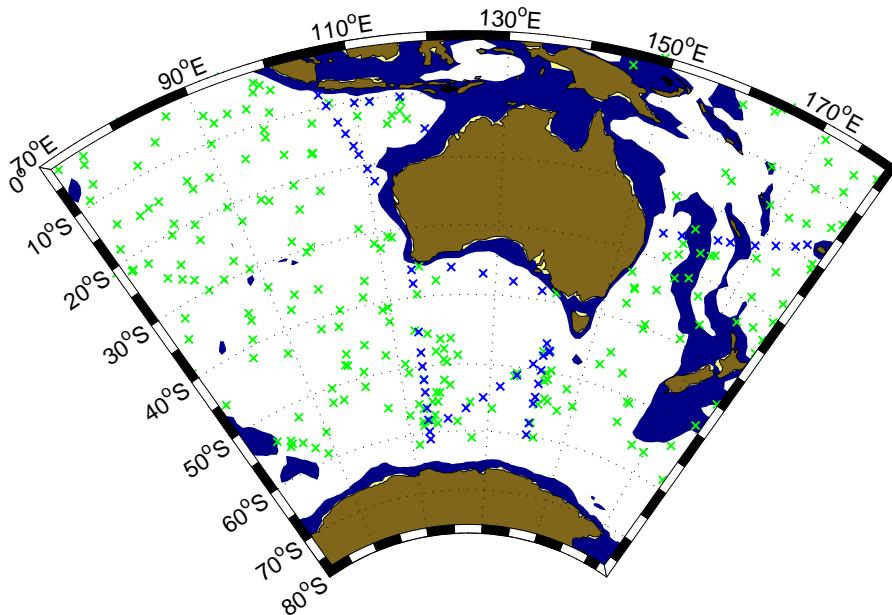


Figure 1: Australian Argo deployments between October 2004 and October 2005. Deployments are shown in blue, existing array in green. Depths less than 200m are shaded.

For the first time we are using ice detection software on our Southern Ocean floats. Of these, two have been caught in the ice and both have reappeared when the ice cleared so the software appears to be working well. We have also launched two floats with O<sub>2</sub> sensors and they are working well. Soon, we will launch a further two O<sub>2</sub> sensor equipped profilers with the addition of a transmissometer on each, expanding the range of data we can collect, particularly from the Southern Ocean. We are planning to add a fluorometer but are waiting to see how the technology works for others before committing ourselves. I suspect we will be using a fluorometer within 2 years, if not next year.

We have developed CSIRO-MAT, a Matlab compatible format containing all the most useful float information. This has now been extended to the worldwide Argo array and can be directly imported into Matlab. All files are available from CSIRO's ftp site: <ftp://ftp.marine.csiro.au/pub/argo/csiromat>

Because Argo has become an important data source for Australian researchers, BOM has undertaken an analysis of data available in real-time at GODAE and Coriolis. They have found some interesting discrepancies with data arriving sooner at GODAE than at Coriolis, and both centres having data that does not appear at the other centre. The mirrors don't appear to be totally effective. This report will be available at the meeting.

We have hired an expert scientist to oversee our delayed mode QC; see further details of our progress below. We have also changed the profile of Argo within CSIRO by hiring a scientist in charge of operations for Argo/SOOP in addition to the scientist responsible for data management. Our commitment to Argo is significant and we hope to expand on this base in the future.

- Raw Argo float data is currently acquired from all active floats through automated ftp to Service Argos. We perform the real-time QC tests and then additionally perform a real-time salinity calibration. The data is then sent to the GTS by the Bureau of Meteorology who have hired a new scientist to oversee this process. CSIRO also monitors the data stream and acts as backup to the BoM in case of problems. As a result, we have delivered 84% of the profiles to the GTS within the requisite 24 hour time window. 13% of the profiles that didn't make it "in time" are from floats that had just been deployed and had not yet been programmed.
- CMAR currently generates the V2 netCDF files which are then submitted daily to the two GDACs. This is partially transferred to BoM and will be completely transferred in the near future.
- Real-time data is immediately available for delayed mode QC, both directly from the CMAR processing site and through a mirror of the GODAE GDAC site which is updated daily.
- DM QC has begun and a further report is below. We anticipate much of our DM profiles to be submitted by the end of the year.
- Web pages are automatically updated when each float reports. The latest plots of temperature, salinity and positions are available at:  
<http://www.per.marine.csiro.au/argo/index.html>
- Use of Argo data has spread in Australia in the last year. We are using Argo oxygen data to look at biological responses to changes in the seasonal mixed layer in the Southern Ocean. The float data should also be useful for studying the ventilation of water masses in the Southern Ocean. There have only been 2 oxygen equipped floats deployed in our region and they have only done about 25 profiles each so far. It is very early days and we are still looking at the data quality. One float was drifted down as far as 64S and the ice avoidance software stopped it surfacing over winter. This float just started retransmitting at the end of September. There is a plan to deploy more O<sub>2</sub> equipped floats with additional biogeochemical sensors (Fluorometer, transmissometer) in the next couple of years.

### Uses of Argo Data:

- Argo data are being used in ocean forecasting and reanalysis through the Bluelink projects to predict ocean circulation in real-time.  
<http://www.marine.csiro.au/bluelink/index.htm>
- Argo data are now a primary in situ data feed for the routine subsurface ocean data analyses performed by the Ocean & Marine Forecasting group at the Australian Bureau of Meteorology's Research Centre:  
<http://www.bom.gov.au/bmrc/ocean/results/climocan.htm#subsurface>
- A new project at BoM called OceanMaps will evolve into our operational oceanographic forecast. After altimeter data, Argo is one of the biggest data inputs. The developers have decided to use Argo-netcdf format as their "base" format, converting all GTS data into an Argo compatible netcdf.  
<http://www.bom.gov.au/bmrc/ocean/BLUElink/OceanMAPS/>
- David Griffin at CMAR has developed a nice program to perform Argo-altimeter comparisons.  
(<http://www.marine.csiro.au/remotesensing/oceancurrents/profiles/>)
- Helen Phillips and Peter Oke are working on forming routine Argo global temperature and salinity anomaly maps
- Katsurou Katsumata and Susan Wijffels have looked for signatures of internal waves in floats south of Indonesian.

Further links to products include:

SST analysis: <http://www.bom.gov.au/marine/sst.shtml>

"JAFOOS" subsurface analyses :  
<http://www.bom.gov.au/bmrc/ocean/JAFOOS/UOT.html>

## 2. Delayed Mode QC

The delayed-mode QC work was delayed during 2004 due to logistics reasons. It became operational in mid-2005 and all eligible profiles will be QCed by the end of this year.

The DMQC processes conducted at CSIRO take into account:

- the effect of pressure on salinity
- sensor mass thermal lag correction

We believe that once we have collected enough evidence that all situations are covered in an exhaustive way, some of these adjustment items could be shifted into the real-time mode.

Examples of profiles whose DMQC is of particular interest will be shown and discussed during this meeting.

It is worth noting that most Matlab code used for DMQC has been made portable between the Unix/Linux and Windows platforms, significantly easing operation overhead and reducing maintenance cost.

#### 4. Regional Centre Functions

Our RDAC activities remain second priority to completing DMQC for national floats. After December 2005 we believe we will have more manpower to devote to developing RDAC activities. We hope to participate in the Southern Ocean RDAC in which the UK is taking the lead. In the Tasman Sea area, we will overlap with the activities of the Pacific RDAC which is a cooperative effort between JMA and IPRC. A meeting will be held after the Argo DM meeting to further development of this RDAC.

We are beginning coordination with IPRC, JMA and BODC and hope that this collaborative approach will benefit all parties, resulting in better and faster development of our RDAC capabilities.

## **Argo National Data Management Report for Canada – 2005**

### **1. Status**

Data acquired from floats: Currently, we are tracking 103 active floats. Of these, 33 may be in trouble or may have failed. We are also currently tracking 4 oxygen floats. Oxygen data currently aren't quality controlled. The PI is working on the QC tests for oxygen data.

Data issued to GTS: All of the data are issued to the GTS. On average 85% of data are issued to the GTS within 24 hours of the float reporting. Longer delays are usually caused by incomplete sets of messages received from the floats, or the messages transmitted failed the CRC check. Occasionally, the longer delay is due to missing good position or network disruption at the GTS node. However, all of the data delayed are issued to the GTS.

Data issued to GDACs after real-time QC: we are sending files to the GDACs on the same schedule as they are issued to the GTS.

Data issued for delayed QC: MEDS routinely send data to the PI on the same schedule as the data are issued to the GTS.

Delayed data sent to GDACs: the PI is routinely using the Wong et al software which produces "R" and "D" NetCDF files. He regularly returns the data to us. MEDS has the software that transforms the data into the latest format version of NetCDF, updates our database and sends the delayed mode files to the GDACs. We sent 6110 files to GDACs.

Web pages: we maintain pages that show float tracks, and all of the data collected for all of the Canadian floats. Both real-time and delayed mode data are also available to download, but we alert viewers that the official version resides at the GDACs. 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, the number of messages transmitted, report of floats that distributed more than one TESAC in 60 hours and the statistic of Canadian float performance.

Readers may go to:

[http://www.meds-sdmm.dfo-mpo.gc.ca/meds/Prog\\_Int/Argo/ArgoHome\\_e.html](http://www.meds-sdmm.dfo-mpo.gc.ca/meds/Prog_Int/Argo/ArgoHome_e.html)

to have more information

## 2. Delayed Mode QC

Ron Perkin at IOS continues to handle the delayed mode quality control processing for all of the Canadian floats. He brings the data into the Wong et. al. software as "source" matrices and graphically views the profiles from each float to flag any additional outliers before they get into the fitting process. As a result of the April 2005 Argo Delayed Mode Workshop in San Diego, he rebuilt the reference database and reviewed all of the Canadian Argo data. He only released "D" files for those data that are more than 6 months old and the data have gone through a full processing smoothing and hand-editing procedure. For others data that are less than 6 months, they are returned to MEDS as "R" files. All of the data from Ron have been archived at MEDS and send to GDACs.

## 3. GDAC Function

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

## 4. Regional Centre functions

Canada has no regional centre functions. However, Canada provides a view of the state of the Argo array in the Gulf of Alaska, and some appreciation of changing conditions there as seen by Argo. These are available at the web page:

[http://www.pac.dfo-mpo.gc.ca/sci/osap/projects/argo/LineP\\_e.htm](http://www.pac.dfo-mpo.gc.ca/sci/osap/projects/argo/LineP_e.htm)

# Argo National Data Management Report

China Argo Datacenter

The 6<sup>th</sup> Argo Data Management Team Meeting, JMA, Japan

## 1. Status

Until now, 29 Argo floats have been deployed by China, but only 8 floats are active.

949 profiles from 27 floats (two floats have no measurements) have been processed by the end of October 2005. Argos messages from active floats are being transferred to the DAC in real-time. All profiles are passed through RTQC system, which was the same as AOML's.

CLS was authorized to issue all profiles to the GTS, However many profiles were in incomplete recordings probably due to incorrect decoding. All the profiles are issued to GDACs in netCDF format after RTQC.

At present, we have collected about 4GB global Argo data from 1996 to October 2005, All Argo data are processed and quality controlled by China argo data center. The China Argo website (<http://www.argo-cndc.gov.cn>) and (<http://www.argo.org.cn>).were set up in Chinese and English. The Website are updated every day and provide Argo data and products, which include netCDF raw data, Near real-time data, meta data, trajectory data, delayed-mode data and products.

Chinese users can access the dataset by FTP every day. The dataset CDs are made every 3 months and delivered to the users, which include 55 oceanographers and 29 colleges and institutes.

Argo data are extensively used in research and application, more results of research and application are obtained.

- ✧ Scientists in the Chinese Academy of Meteorological Science are using Argo data to improve the ocean data assimilation model, for the purpose of improving the air-sea coupled model of the tropical Pacific Ocean.

- ✧ Researchers in the National Climate Center of China are using Argo assimilation data to improve the global air-sea coupled model in order to increase the accuracy of short-term climate forecast.
- ✧ Researchers in Ocean University of China are using Argo data to study the meso-scale eddy effects on the wintertime vertical mixing in the formation region of the North Pacific Subtropical Mode Water.
- ✧ The Second Institute of Oceanography is applying Argo data to analyze and study the upper ocean response to the tropical cyclones in the Northwestern Pacific, and also found that there existed an anti-cyclonic eddy in east of Mindanao Island of Philippines by analyzing the trajectories and TS series.
- ✧ China National Marine Data & Information Service have combined Argo data and GTSPP data to improve the ocean data assimilation model.
- ✧ In addition, scientists in the China Meteorological Administration and National Marine Environment Forecasting Center will apply the Argo data to service operation of ocean environment and weather forecasting.

## 2. Delayed-mode QC

Not only WJO delayed-mode QC software, but also BS software have been applied for calibration all of the Chinese floats salinity data. Because the historical dataset and the temperature levels, which are selected for calibration, are all different, the calibration of the salinity data and the calibration error are some kind of different. We selected shipboard CTD casts near the floats to evaluate the calibrated salinity, and find BS method is more accurate. Since the two methods are all statistical model, we suggest that a CTD cast should be carried out when a float is deployed by R/V. At the same time, neither of two calibration methods can calibrate salinity measurements well when the float moves into some marginal seas.

We also study the effect of mapping scale, sliding window and reference dataset to the results of salinity calibration in the Pacific ocean, and conclude that, the values of calibration are not sensitive to the choice of mapping scale, but calibration errors are different. Furthermore, shipboard CTD casts are used to evaluate the results of WJO DMQC.

Two criterions are used to evaluate the results by both the software: (1) The optimal values of calibrated salinity agree with true values within calibration errors; (2) Calibration errors should be less than  $\pm 0.01$ , which satisfies the goal of the Argo project for salinity measurement accuracy. We have begun to send netCDF files through delayed-mode QC to GDACs from September 2005. In the tropical, subtropical and sub arctic Pacific, both WOD2001 and SeHyD can used as the reference dataset, while in the mixed water region between sub arctic and subtropical water, WOD2001 is the better choice as reference.

# argo data management

Argo data management  
November 2nd, 2005  
Ref : cordo/dti-rap/05-145  
Version 1.1

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## ARGO DATA MANAGEMENT REPORT FRENCH DAC

# Argo National Data Management Report of France

November 2005

## Introduction

This document is the annual report of the French Argo Data Assembly Centre (DAC) for 2005.

The French DAC is supported by the Coriolis project , a joint project for operational oceanography.

## 1. Status of the DAC

- Data collected from floats
  - 540 floats including 311 active instruments
  - 28395 profile files, including 5407 delayed mode profiles
  - 532 trajectory files
  - 532 technical data files
- Description of the 540 floats :
  - 311 active floats in October 2005
  - Provor (264), Apex (254), Metocean (12), Nemo (10)
  - 33 versions of floats : 13 versions of Provor, 17 versions of Apex, 2 versions of Nemo, 1 version of Metocean
  - Deployed by 8 countries (Denmark, France, Germany, Italy, Netherland, Norway, Russia, Spain)
  - Operated by 22 scientific projects (Good-Hope, Mersea, MFSTEP, Tropat, Weccon...)

During the past year, in coordination with CLS Argos we have processed Apex 28 bits format floats which are not hosted by a national DAC.

We also quality control the data circulating on GTS from floats with no national DAC.

- Data issued to GTS

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

- Data issued to GDACs after real-time QC

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

Technical data are regularly issued to the GDACs

- 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 data sent to GDACs

Annie Wong et al method has been adapted to North Atlantic environment to produce the delayed mode data for Gyroscope project (Lars Boehm). This year, the method has evolved with Christine Coatanoan and Virginie Thierry . A total of 5407 delayed modes profiles was sent to the GDAC.

- Web pages

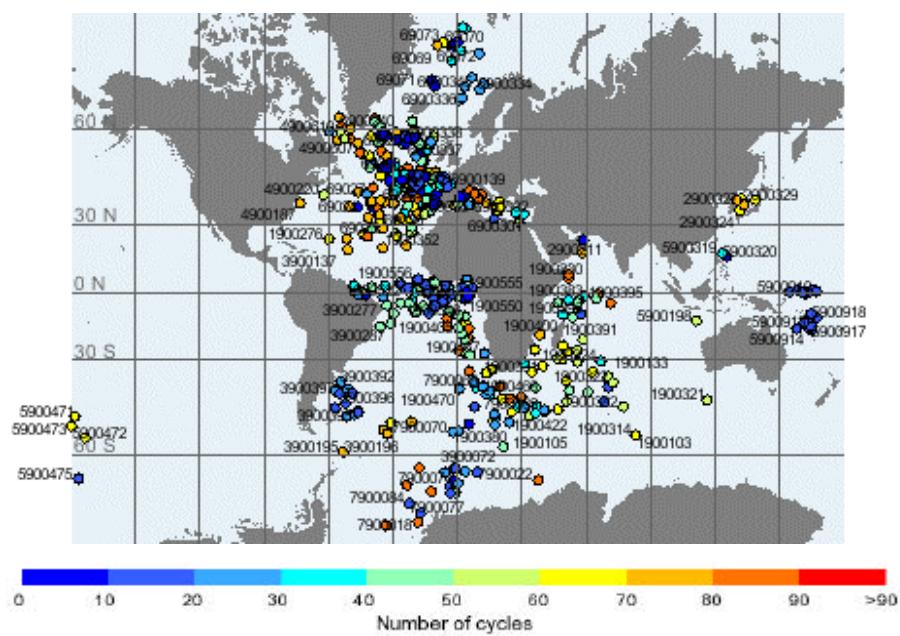
The web site of the French DAC is available at : <http://www.coriolis.eu.org/cdc/>

It provides :

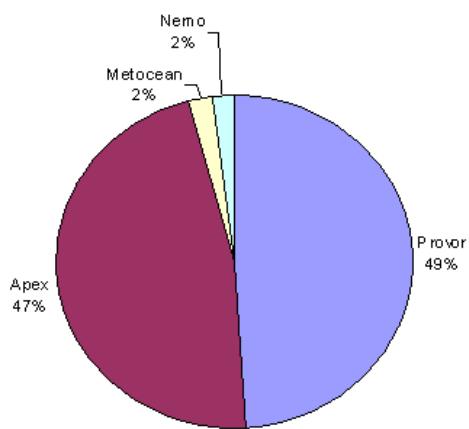
- Individual float description and status (meta-data, geographic map, graphics : section, overlayed, waterfall, t/s charts)
- Individual float data (profiles, trajectories)
- FTP access ;
- Data selection tool ;
- Global geographic maps ;
- Weekly North Atlantic analyses (combines Argo data and other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

Since last report, new functionalities have been implemented on the Coriolis web site:

- Floats monitoring statistics:  
[http://www.coriolis.eu.org/cdc/coriolis\\_floats\\_monitoring.htm](http://www.coriolis.eu.org/cdc/coriolis_floats_monitoring.htm)



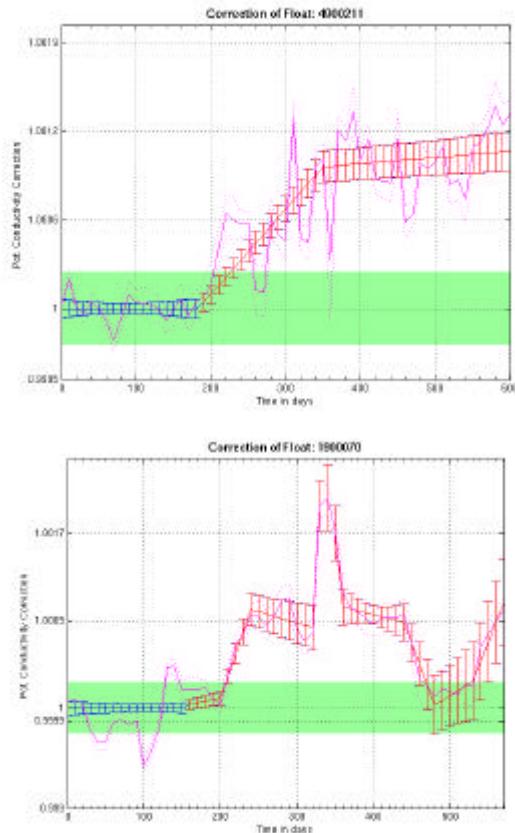
Coriolis DAC : geographical distribution of floats in October 2005



Coriolis DAC : type of floats in October 2005

## 2. Delayed Mode QC

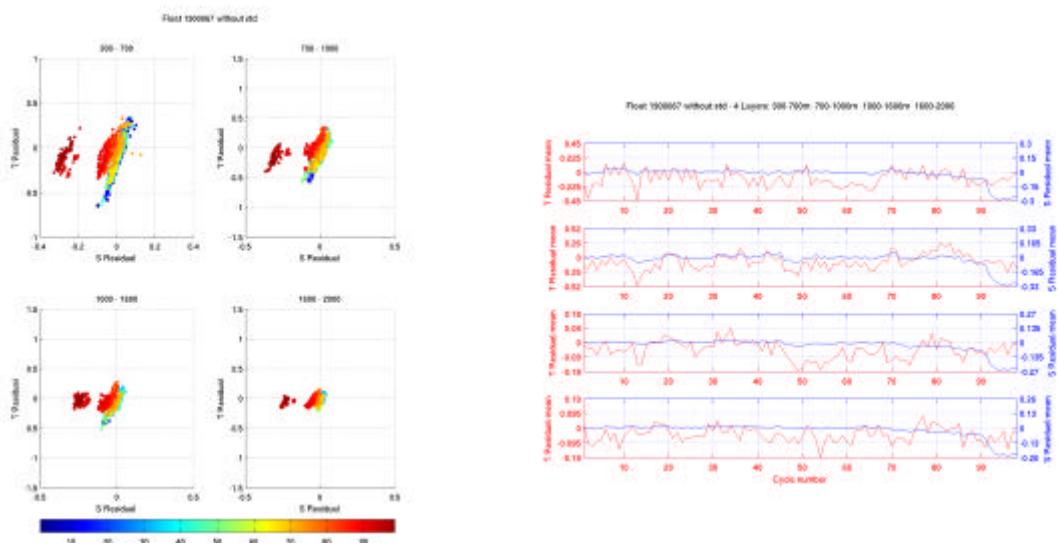
At the Coriolis data center, the data proceed through the Böhme and Send's software. Some changes in a few programs has been done to implement the decisions of the April 2005 Argo Delayed Mode Workshop in San Diego. The main modification concerns the 12-month sliding window. We now split the data series in various segments as shown in Figure 1. The characteristics of the correction applied on each segment are saved for different purposes (creation of the "D" files, statistics, re-processing of the DMQC, etc).



**Figure. 1.**

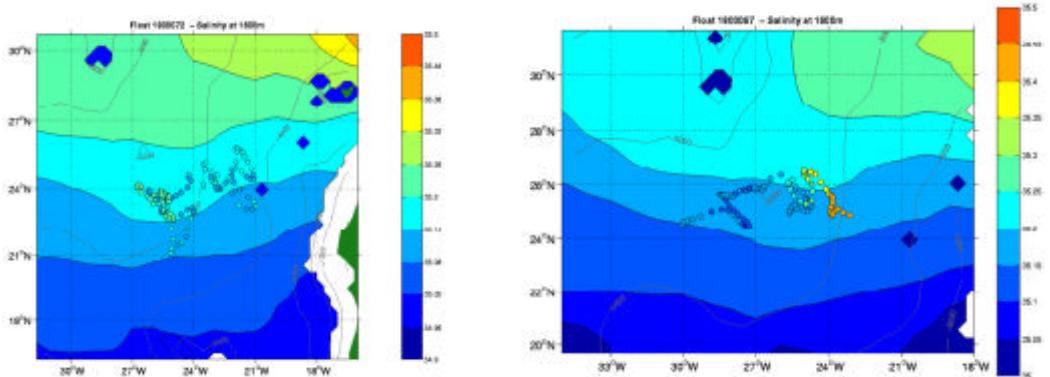
Complementary diagnostic plots have been developed to compare DMQC results with temperature and salinity fields of the weekly analysis performed at Coriolis..

The residual values (difference between float data and analysis) allow to follow for some levels possible drifts or offsets (Figure 2). The method of the differences is used to make comparison between measurement points and objective analysis fields : using the temporal closer objective analysis, getting grid points around the float, making horizontal and vertical interpolations and difference with the measurement point. Plots for some levels (Figure 2) present differences for all measurements points and mean cycle by cycle.



**Figure 2.** a) Residual values (temperature versus salinity) for some levels. b) Residual values averaged over different range depths versus float cycles.

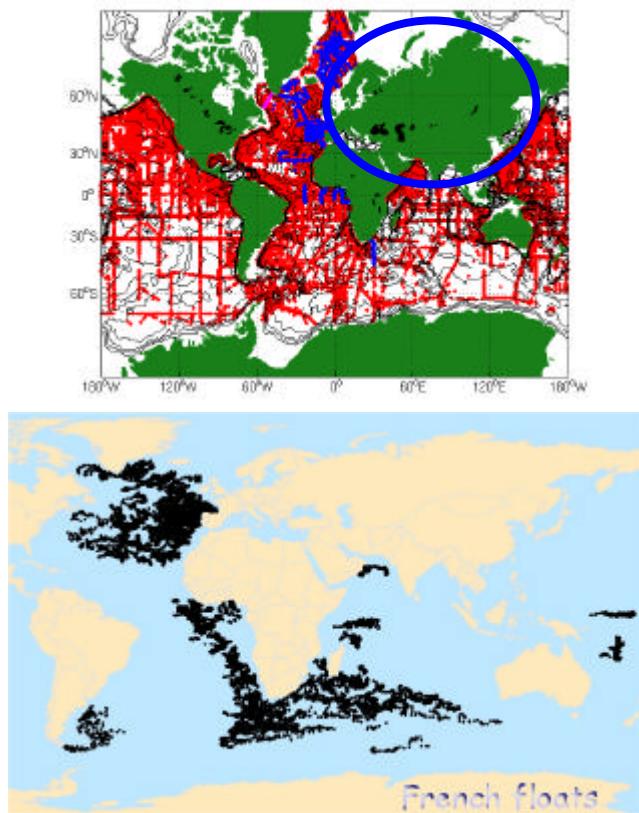
As shown Figure 3, the float salinity is also compared to a mean salinity field.



**Figure 3.**

Discussions with the PI have allowed to assess actions to be done on the floats even if for specific cases, more studies must be developed because the correction to be applied is not very clear.

At this time, we have focused the delayed mode on the North Atlantic Ocean (Figure 4). For the floats deployed in the South Oceans, we have problems to process all the float data in delayed mode QC because of the lack of data in the reference database.



**Figure 4.** a) WOD01 Reference database (red) and recent CTD data (blue and magenta). b) French floats which have to be processed in DMQC.

For the German floats, the delayed mode QC is carried out by the BSH centre, like some contacts have took place, between the Coriolis and BSH centers, on the use of the Böhme and Send's software. Some exchanges are also in progress to share recent CTD data and to provide them in the framework of the RDAC.

For the North Atlantic Ocean, the French floats have been reviewed using the results of the April 2005 Argo Delayed Mode Workshop. The "D" files are under construction and will be send to the GDACs in the next weeks.

### 3. GDAC functions

The French GDAC is supported by the Coriolis project, a joint project for operational oceanography.

See French GDAC report ref. CORDO/DTI-RAP/05-146.

## 4. Regional centre functions

Partners involved in Argo Activities in the North Atlantic (80N to 20S) have decided to collaborate with each other and the South Atlantic Argo Regional DAC (SAARDAC) to establish the North Atlantic Argo RDAC (NAARDAC)."

They have decided to work together in six main directions

- Ensure consistency of the Argo data from the North Atlantic, independent of float provider, using statistical tools to detect potential outliers and provide feedback to DACs and PIs
- Facilitate development of a Reference Data Base for delayed mode quality control by establishing a low resolution CTD database that includes the most recently collected data (i.e., those not yet available through Clivar or NODC).
- Logistics for deployment : inform on vessel opportunities and of compile float deployment plans in collaboration with South Atlantic RDAC
- Capacity building in Mediterranean Sea and Tropical area to train interested countries on float deployment and/or data processing
- Product delivery: The main product of the RDAC will be a consistent Argo delayed mode dataset for the North Atlantic. However some scientific products such as temperature and salinity weekly analysis, improved mean sea state of the ocean for Argo period, currents calculated from floats , .... will be made available thought NARDAC with clear documentation.
- Coordination with other RDACs

The countries involved are at present :

- Canada
- France
- Germany
- Italy
- Netherlands
- Spain
- United-Kingdom
- USA

North Atlantic Regional Data Centre meeting :

<http://www.coriolis.eu.org/cdc/argo/NARDACMeetingReport-October2005-V1.0.pdf>

## **ARGO Germany National Data Management Report (Status October, 2005)**

### **1. Status**

The numbers are for the whole German ARGO program, with details for the individual projects at participating institutions: METRANA, central North Atlantic (BSH, Hamburg), WEDDEX, Weddell Sea (AWI, Bremerhaven), TROPAT, tropical Atlantic (IFM-GEOMAR, Kiel)

- Data acquired from floats: 1732 profiles (METRANA: 629, WEDDEX: 476, TROPAT: 627) from 114 active floats (METRANA: 42, WEDDEX: 42, TROPAT: 30) in 2005 to date, expecting a further 302 profiles (METRANA: 195, WEDDEX: 60, TROPAT: 47) until the end of the year.
- Data issued to GTS: All float data are directly reported by Coriolis with the following exceptions: 23 profiles from 2 Nemo floats (METRANA), 181 profiles from 12 NEMO floats (WEDDEX).
- Data issued to GDACs after real-time QC: same as GTS.
- Delayed data sent to GDACs: None yet, but approximately 8000 profiles by Jan/Feb, 2006 (METRANA: 3700 profiles from 36 floats by end 2005; WEDDEX: 2000 profiles from 60 floats by February, 2006; TROPAT: 2300 profiles from 38 floats by Jan/Feb 2006).
- German ARGO web page online at [www.german-argo.de](http://www.german-argo.de) since 30<sup>th</sup> May, 2005 with links to sub-project summaries at participating institutions.
- Statistics of Argo data usage: 4 regions of scientific application (tropical Atlantic, central North Atlantic, Weddell Sea, Northern Seas), 6 National ARGO and related Pis (2 at AWI, Bremerhaven; 1 at IFM, Hamburg; 1 at BSH, Hamburg; 2 at IFM-GEOMAR, Kiel).
- Products generated from Argo data: planned for the future, in conjunction with Regional DACs.

## **ARGO Germany National Data Management Report, October, 2005**

### **2. Delayed Mode QC**

METRANA: added recent CTD cruises along the A2 section to augment the historical data base, approximately 750 CTD profiles between 1998-2005. All floats have been run through the delayed mode QC already to check if there are problems.

WEDDEX: added the data of approximately 20 CTD cruises which were performed in the Weddell Gyre area between 1980 and 2005 to augment the historical data base.

However, these data are strongly biased to the Prime-Meridian, hence both, the spatial and the temporal data distribution of the reference database are still insufficient in the Weddell Sea. Therefore, we have started to add profile data from reliable floats, i.e. floats in areas of sufficient reference data. This will successively expand the database.

TROPAT: added approximately 3100 CTD station profiles from various cruises in the tropical Atlantic between 1988-2004. Currently implementing duplicate station checking algorithm to exclude additional stations already included in WOD01. There is a particular need for more up-to-date CTD data in the equatorial eastern and north-eastern tropical Atlantic. Some floats have already been run preliminarily through the DMQC check. With the availability of delayed mode data, German ARGO will well be pre-operational at the beginning of 2006.

### **3. GDAC Functions**

N/A

### **4. Regional Centre Functions**

N/A

## Argo National Data Management Report (2005) – India

### 1. Status

- ***Data acquired from floats***

India has deployed 107 floats so far. Out of these 74 floats are active. All the active floats are processed and sent to GDAC.

- ***Data issued to GTS***

Presently we do not have GTS access and hence we could not send Indian floats data to GTS. We have requested ARGOS CLS to send Indian floats data to GTS.

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

Data from all the active floats (74) are being sent to GDAC after real-time QC within 24 hours of acquisition

- ***Data issued for delayed QC***

All the Indian floats are subjected to DMQC. We are still testing a suitable procedures to enable the calibration of floats since the floats in the North Indian Ocean was hindered by non-convergent TS relationship and lack of good quality of historical salinity data sets.

- ***Delayed data sent to GDACs***

All the Arabian Sea floats will be sent to GDAC after suitable DMQC by June 2006.

- ***Web pages***

INCOIS maintain Web-GIS based site for Indian Argo Programme. It contains entire Indian Ocean flats data with trajectory. For further details, readers may refer [http://www.incois.gov.in/Incois/argo/argo\\_home.jsp](http://www.incois.gov.in/Incois/argo/argo_home.jsp)

Argo floats deployed by India are processed and made available at INCOIS website. Data from floats deployed by other countries in Indian Ocean are received from GDAC and made available from INCOIS website in ASCII format.

Users can download data from selected number of floats, region, depth, parameters and / or more.

- ***Statistics of Argo data usage***

Presently, Argo data are used by India Meteorological Department for their operational use. During the last one year many scientific users from different Organization (INCOIS, NIO, SAC, C-MMACS, NRSA, IITM, NCMRWF, IISc, etc) started analyzing data for different applications. Efforts are underway in assimilating argo data in OGCM. INCOIS Argo web page statistics (for the last one year) are given below

| Page                | Hits | Visitors |
|---------------------|------|----------|
| Argo Array WEBGIS   | 4065 | 575      |
| Argo Data Downloads | 5566 | 59       |
| Argo Products       | 328  | 35       |

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

Please refer RDAC functions.

## 2. Delayed Mode QC

Dr. Sudheer Joseph at INCOIS continues to handle the Delayed mode quality control (DMQC) processing for all the floats in the North Indian Ocean. DMQC of Argo data for the Northern Indian Ocean in general and Arabian Sea in particular was hampered by non convergent TS relationships and lack of good quality salinity measurements in the historical datasets. The problems faced in carrying out delayed mode quality control of Argo data from this basin was already presented in the Delayed mode quality control workshop held at Scripps Institute of Oceanography La Jolla during April (7-13) 2005. This was acknowledged by the DMQC workshop and suggested an experiment to be carried out by addition of good Argo data in to the reference database. This responsibility was taken up by INCOIS and below is a brief report on the exercise carried out during April to Present. Figure 1 shows the locations of the float chosen for experiment.

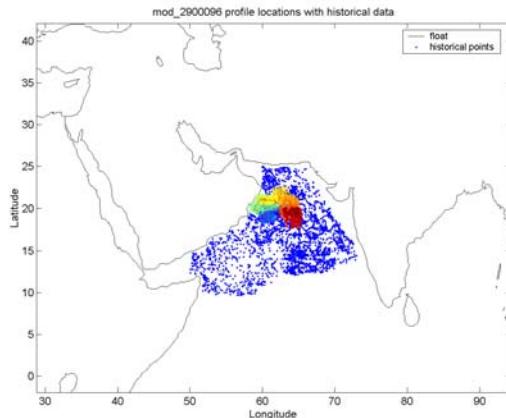


Figure 1

1. Criteria used for addition of Argo data sets to the reference data base
  - a. Argo data with quality flag of 1 for all the parameters
  - b. Profiles which are deeper than 900 dbar

- c. Three parameters (P, T and S) from each profile were plotted and visually examined for any apparent problems by checking waterfalls, P Vs T, P Vs S, T Vs S, contour plots and deeper salinity time series with 2x standard deviation bars.
- d. Profiles with long vertical sampling gaps at deeper layers were avoided.

In Indian Ocean, floats are deployed with different profiling strategies. Many are having shallow regular profiling and occasional deep profiling. This is a set back for building up reference data base as only deeper profiles can contribute to better calibration. However all the profiles which are deeper than 900 dbar were selected for inspection of other obvious problems. A Matlab routine is made which look for floats falling in a given WMO grid and generate decision support graphs and the reference data sets in the required format (xxxxxx\_prof.nc)

## 2. Experimental results

After preparation of the reference data sets by inclusion of Argo data, WJO was run under 3 conditions for floats which had obvious salinity drifts.

- a. Run with WOA 2001 based historical CTD data sets with additional Argo reference data sets. This run resulted in much reduction of the calibration error bar (Fig. 2) and produced an apparently better calibration. However, these results have to be checked further for chances of data feedback as the addition is done only after a visual inspection.

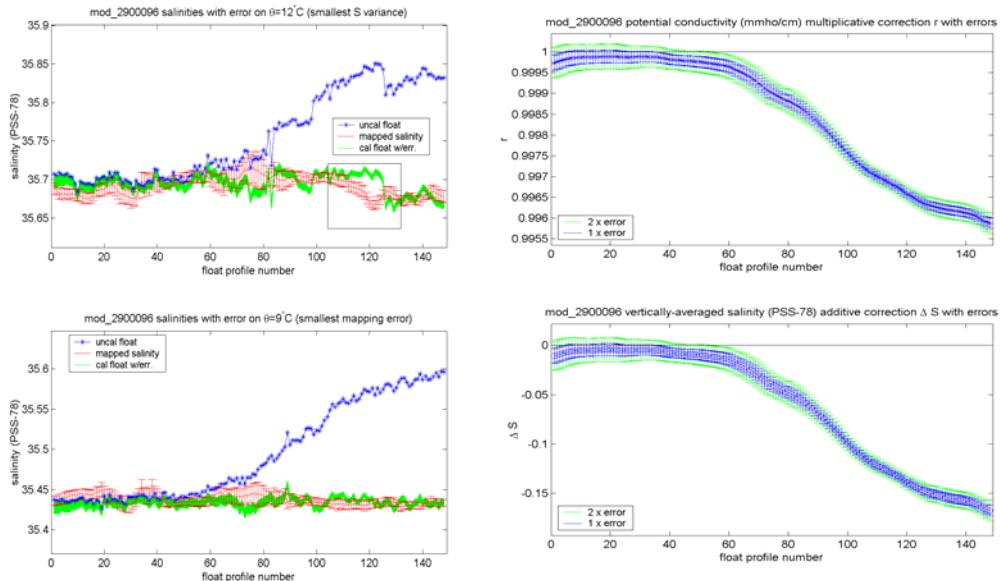


Figure 2.

- b. Run with only Argo data as reference data base. This run further reduced the calibration error and mapping error (Fig. 3)

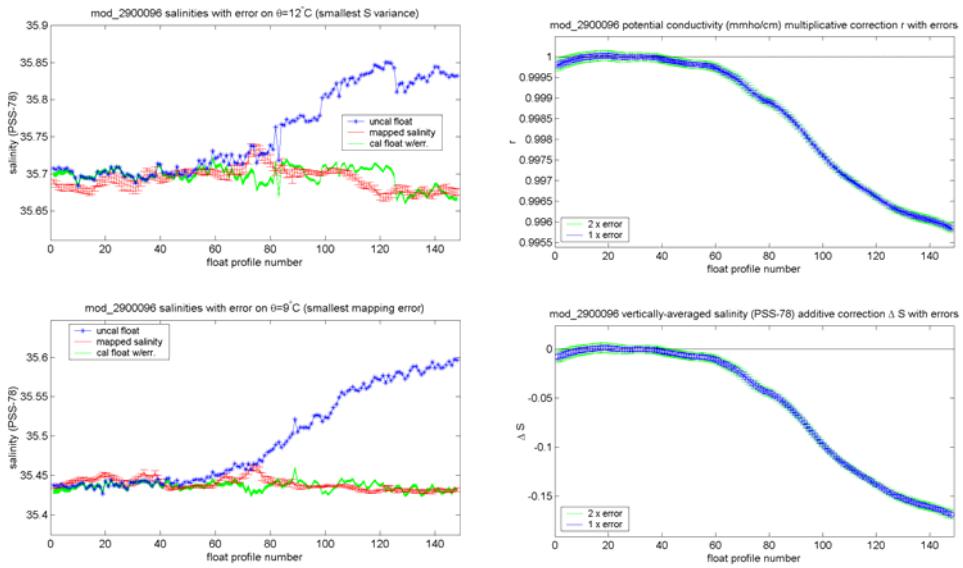


Figure. 3

- c. Run with WOA-2001 only as reference dataset. This run produced much bigger calibration error bars compared to the other two runs (Fig. 4)

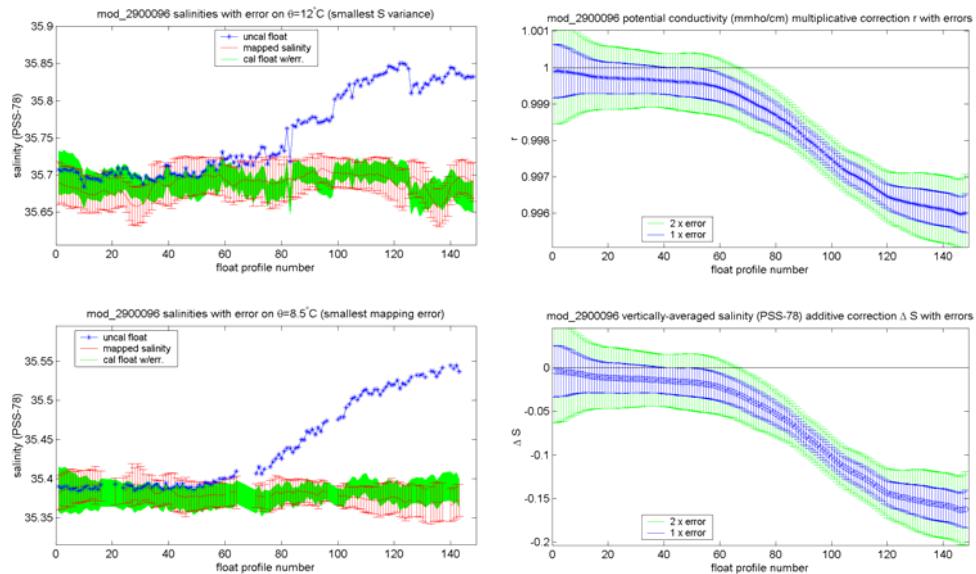


Figure 4

### 3. GDAC Functions

India has no GDAC function.

#### **4. Regional Centre Functions**

- a. Acquisition of Argo data from GDAC other than Indian floats, real-time QC and made available at INCOIS web based services
- b. Acquiring CTD profiles from Research vessels for improving Indian ocean hydrology
- c. Delayed mode Quality control  
(Refer 2.0 above)
- d. Value added products

Two products Viz. (i) time series plots for a specific float (water fall, time series of temperature and salinity, TS plot, trajectory etc ) and (ii) spatial plot using objective analysis for different parameters (Heat content upto different depths, Mixed layer depth, depth of 20 and 26 deg isotherm, SST, SSS, etc) are being prepared for the Indian Ocean region and made available via WEB.  
([http://www.incois.gov.in/Incois/argo/products/argo\\_frames.html](http://www.incois.gov.in/Incois/argo/products/argo_frames.html))
- e. Regional co-ordination for Argo floats deployment plan for Indian Ocean.

## Argo National Data Management Report – Japan, 2005

### 1. Status

The Japan DAC, Japan Meteorological Agency, has processed data from 491 profiling floats including 319 active floats as of 25<sup>th</sup> October 2005. There are ten Japanese PIs who agreed to provide data to the international Argo data management. ARGOS messages from the active floats are being transferred to the DAC in real-time. All profiles from those floats are transmitted to GDACs in netCDF format and issued to GTS in TESAC form after real-time QC. Conversion of the Argo TESAC messages to BUFR, using BUFR template for TESAC, is planned to start November 2005 in accordance with the JMA's code migration plan, while distribution of TESAC continues until the migration complete. Argo BUFR messages will be issued to GTS after the adoption of a BUFR template for Argo.

JAMSTEC applies delayed QC to Japanese Argo data. During the last 12 months(2004.10-2005.09), it issued 7246 delayed-mode profiles of 9019 acquired and sent 768 of them to GDACs.

JMA and JAMSTEC established Argo web sites. The former shows global float coverage, global profiles based on GTS TESAC messages, and status of Japanese floats (<http://argo.kishou.go.jp/>). JAMSTEC shows the tables, trajectories and the profiles of all floats that it is responsible for and provides search function for the profiles (<http://www.jamstec.go.jp/ARGO/>). JAMSTEC also provides GDAC mirros site (<ftp://ftp.jamstec.go.jp/pub/argo/>) and Pacific Regional Center web site (<http://www.jamstec.go.jp/ARGORC/>).

JMA uses Argo data for its operational oceanographic and climate prediction models. Surface temperature (observations at the shallowest level) data are useful sources of for its operatinal SST analysis and ground truth for satellite observations. Oceanographic products such as currnt, subsurface and surface temperature maps are operationally provided on the JMA web site. JAMSTEC generates oceanographic products such as temperature, salinity, density, dynamic height anomaly and relative geostrophic current by using an Optimal Interpolation technique. JAMSTEC also provided mixed layer properties, statistics on the technical side of a profiling float, and some scientific statistics on auto-correlation coefficient of temperature and salinity profiles.

### 2. Delayed Mode QC

JAMSTEC's delayed mode QC procedures for profile are as follows:

- 1) **Bit Error Repair**, if possible,
- 2) position (LATITUDE, LONGITUDE) and time (JULD, JULD\_LOCATION) correction
- 3) **Visual QC**,
- 4) pressure correction using surface pressure and subsequent salinity

recalculation,  
5) salinity adjustment using WJO.

It is found that surface pressure value is sometimes doubtful at Apex WS. But both Apex and Provor floats should have the profile pressure with the same meaning at the starting point of operational and scientific use. What can we do for it ?

During the past year, JAMSTEC has renewed internal system of dQC and its web page on the database. We are making netCDF files by checking a log from netCDF-maker (codes which compare those with RnetCDF files and report a log if any) by hands.

A gray list of the floats which are judged to start reporting abnormal data have been developed by JAMSTEC and JMA. The gray list criteria and delayed-mode flag for doubtful pressure measurements are shown in **Appendix A**.

### 3. Regional Centre Functions

A portal web site for the Pacific Argo Regional Center will be established by IPRC in November 2005. It will link to each web site of the three Pacific Regional Centers such as CSIRO, IPRC and JAMSTEC. JAMSTEC will provide float location map, float status table, T and S anomalies of all floats and the OI products for the area of interest.

## **Appendix A.**

### **Grey list criteria**

Abnormal salinity drift and offset is judged by the salinity increase or decrease by the amount of 0.03 at around 2000db from the deployment.

Abnormal pressure is judged by the critical value of 2200db. If a float starts to report larger value, such as 3000db, it is nominated as a candidate. If subsequent cycle reports larger values and profile get shallower, it is listed in the table.

### **Delayed-mode flag when the pressure values are doubtful**

1. When PRES>2200db or PRES\_QC=4 (by rQC),  
flags of PRES, TEMP and PSAL = 4
2. When the maximum depth is shallower than 500db,  
flags of PRES, TEMP and PSAL = 4
3. Otherwise, profiles P-T, P-S, T-S of a cycle are compared with previous ones.
  - ✓ When the discrepancies are seen in all three figures,  
    ✧ flag of PRES, PSAL and TEMP = 3
  - ✓ When the discrepancies are seen in P-T and P-S figures but small in T-S,  
    ✧ flag of PRES = 3 and flag of PSAL, TEMP = 2
  - ✓ When they can be considered as normal (discrepancies are small),  
    ✧ flag of PRES, PSAL = 2 and flag of TEMP = 1

Subsequent pressure correction using Surface Pressure is not performed in the cases that

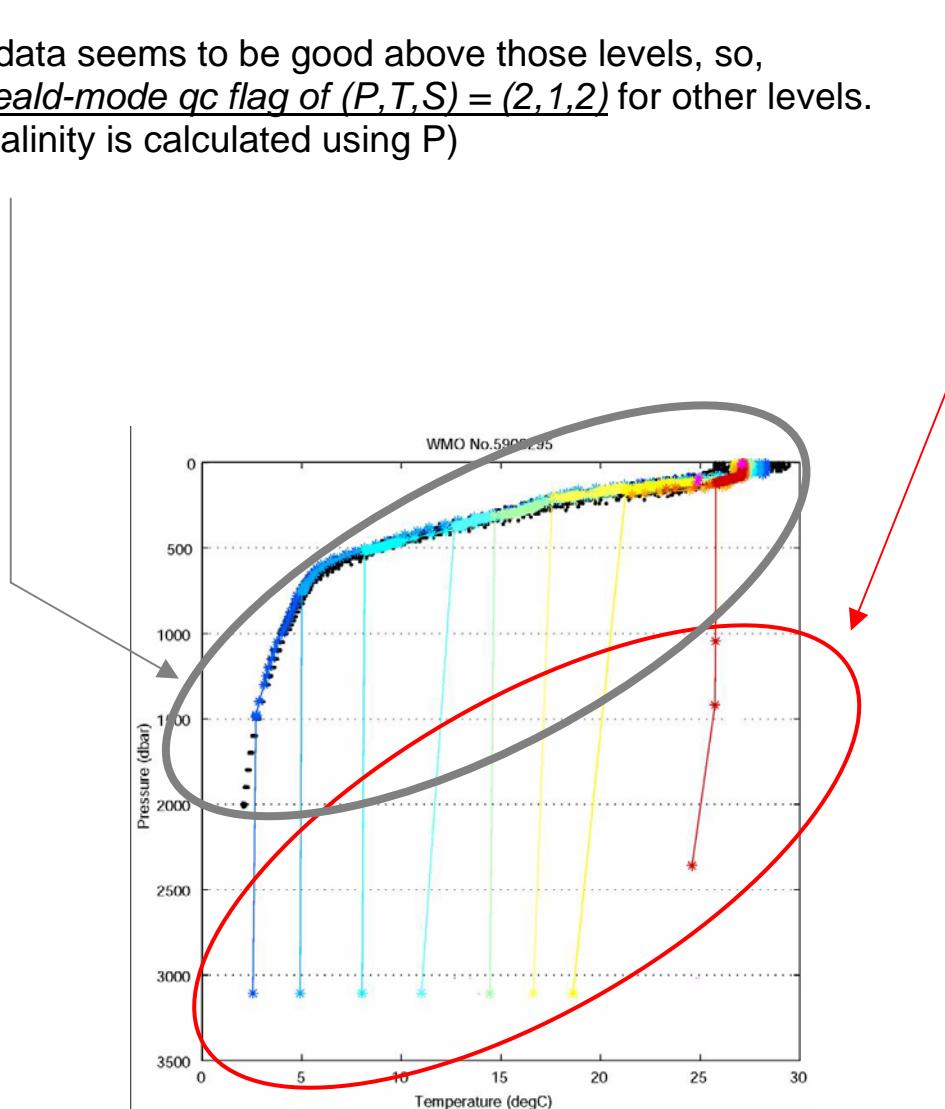
- ✧ Surface Pressure is abnormal,
- ✧ flag of PRES = 3 or 4.

## Flags to (P,T,S) of the profile having abnormal pressure

A couple of floats that have problematic e-circuit (Druck) suddenly start to report abnormal pressure in (P,T,S) profiles. Abnormal pressure is judged visually or by the critical value of 2200db.

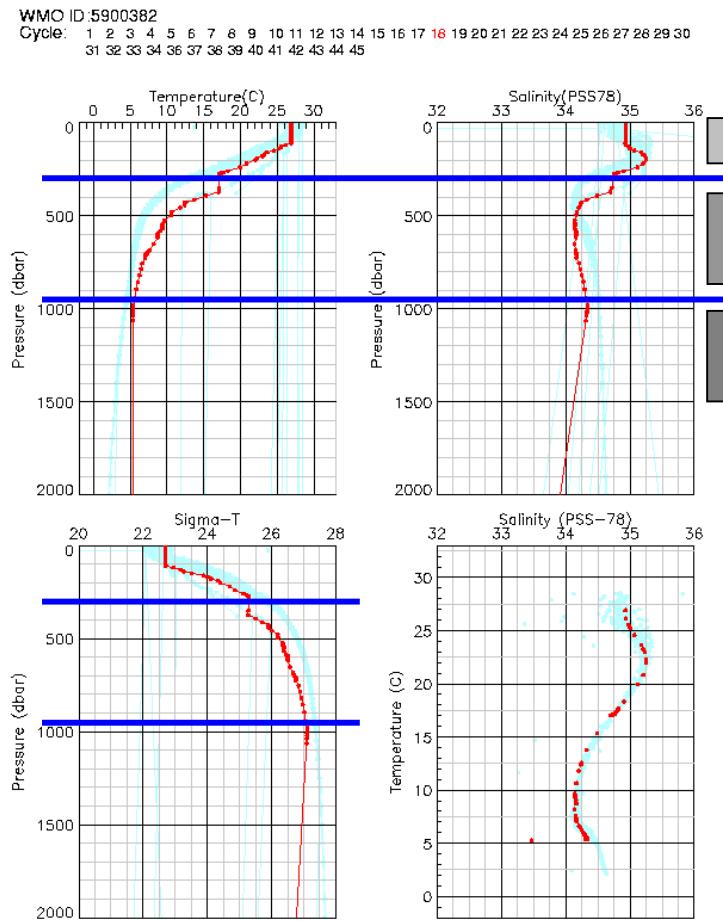
When pressure sensor of a float seems to have hardware trouble,  
delayed-mode qc flag of (P,T,S) = (4,4,4)  
for abnormal pressure levels.

But all data seems to be good above those levels, so,  
delayed-mode qc flag of (P,T,S) = (2,1,2) for other levels.  
(Note salinity is calculated using P)



*Compare P-T, P-S, T-S with previous,*

- When normal (discrepancies are small),  
flag of (P,T,S) = (2,1,2)
- When a gap is seen only in P-T and P-S (normal T-S)  
flag of (P,T,S) = (3,2,2)
- When a gap is seen in all three figures,  
flag of (P,T,S) = (3,3,3)



# Korea Argo National Data Management Report

## 6<sup>th</sup> ARGO data management meeting

### 1. Status

- Data acquired from floats

#### Deployment of Korea ARGO floats

| 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(3)   |
|       | KORDI        | 5(3)                                 | 1(0)              | 2(0)                     | 8(3)                               |         |
| 2002  | KMA          | 5(2)                                 | 10(1)             |                          | 15(3)                              | 25(6)   |
|       | KORDI        | 6(3)                                 |                   | 4(0)                     | 10(3)                              |         |
| 2003  | KMA          | 5(4)                                 | 10(5)             |                          | 15(9)                              | 33(23)  |
|       | KORDI        | 8(6)                                 |                   | 10(8)                    | 18(14)                             |         |
| 2004  | KMA          | 5(5)                                 | 10(10)            |                          | 15(15)                             | 37(30)  |
|       | KORDI        | 12(7)                                |                   | 10(8)                    | 22(15)                             |         |
| 2005  | KMA          | 5(5)                                 | 10(10)            |                          | 15(15)                             | 33(33)  |
|       | KORDI        | 10(10)                               |                   | 8(8)                     | 18(18)                             |         |
| Total |              | 64(45)                               | 48(26)            | 34(24)                   | <b>KMA 70(42)<br/>KORDI 76(53)</b> | 146(95) |

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.

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

- Data issued to GDACs after real-time QC

Real-time QC system for ARGO data from METRI/KMA was developed in February, 2004.

METRI/KMA is developing an automatic real time QC system in which local characteristics in the vertical temperature and salinity distributions are considered.

In built RT-QC system at KORDI is flexible enough to handle data from different type of profilers. Prior to communicating the ARGO datasets to GDAC, we need to check the QC products with that of CLS, France. In the meanwhile, the KORDI ARGO dataset is processed by CLS, France for dissemination to GDAC.

- Data issued for delayed QC

In order to carry out higher level of DMQC, the KODC have been collecting and analyzing data of the serial oceanographic observations which are carried out bi-monthly on 69 fixed stations from 8 lines in the East/Japan Sea, since 1961.

- Delayed data sent to GDACs

In 2006, the KODC will send delayed data to GDACs after delayed QC using a program and manual QC by specialists. KORDI has been developing delayed mode QC schemes and salinity calibration methods for data obtained in the East/Japan Sea. Data with delayed mode QC will be distributed next year.

- Web pages

The KMA has operated and upgraded a ARGO web page , which consists of RT Q.C data linked to KMA(<http://argo.metri.re.kr>). The KODC has also developed temperature offering system for Korean distant water fisheries in near real-time using ARGO data. Its webpage is <http://kodc.nfrdi.re.kr>.

KORDI has launched its ARGO webpage (<http://argo.kordi.re.kr>)

- Statistics of Argo data usage ( operational models, scientific applications, number of National PIs... )

National PIs are Dr. Yong-Hoon Youn from KMA and Dr. Moon-Sik Suk from KORDI.

Many scientists have applied the ARGO data to the researches for data assimilation, intermediate level circulation of the East/Japan Sea, global statistics of inertial motions, upper ocean response to tropical storms and fisheries through the project “A study on the monitoring of the global ocean variability with ARGO program”.

- Products generated from Argo data ...

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- You-Soon Chang, Homan Lee, Jang-Won Seo, and Yong-Hoon Youn, 2003: Error analysis with Argo data : On the ability of an OGCM to simulate the temperature and salinity in the western Pacific. 1st Argo Science Workshop, 12-14, Nov. 2003, Tokyo.
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- Park, JongJin, Kuh Kim, and William. R. Crawford, 2004, Inertial currents estimated from surface trajectories of ARGO floats. *Geophysical Research Letter*, 31, L13307,doi:10.1029/2004GL020191.
- Park, JongJin, K. Kim, and B. A. King, 2004, Global Statistic of Inertial Motions, *Geophysical Research Letter*, 32, L14612, doi:10.1029/2005GL023258.
- You-Soon Chang, Yong-Hoon Youn, 2005, Application of ARGO data. The 3rd Korea-Russia Joint workshop on climate change and variability, June 7-8, 2005, KMA, Korea
- Park, JongJin, K. A. Park, K. Kim, and Y. H. Youn, 2005, Upper ocean response to Typhoons and Tropical Storms: Salinity change, AMS annual meeting, Sandiego, USA.

Yong-Hoon Youn, You-Soo Chang, Homan Lee, and Ji-Ho Kim, 2006, ARGO program and data application in METRI/KMA, 2<sup>nd</sup> Argo Science Workshop, submitted

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

## 2. Delayed Mode QC

The KODC plays a pivotal role in maintaining the ARGO DMDB, whereas the PIs are responsible for DM and dissemination of the DM-QC data to GDAC after communicating with the KODC.

WJO software has been installed and applied to test calibration for a number of floats in the East/Japan Sea at KODC. Meaningful results of the calibration could not be made due to inadequate WOD01 climatology. In order to improve the climatology in this region, high resolution CTD data have been collected in the East/Japan Sea observed by National Fisheries Research and Development Institute since 1994. The improved climatology made better calibration results.

## Argo National Data Management Report - **NETHERLANDS**

### 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 **regularly via CORIOLIS**
- Data issued to GTS **done by CORIOLIS**
- Data issued to GDACs after real-time QC **done by CORIOLIS**
- Data issued for delayed QC **n/a**
- Delayed data sent to GDACs **n/a**
- Web pages **short description of Argo project and Dutch contribution (in Dutch), see <http://www.knmi.nl/~sterl/argo.html>.**
- Statistics of Argo data usage ( operational models, scientific applications, number of National Pis... ) **n/a**
- Products generated from Argo data ... **none yet**

### 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 .)

**No DM DC done yet. Shortage of manpower and experience.**

**Is there any possibility to have it done by other groups or Data Centres? Would improve homogeneity of resulting product and would be more efficient.**  
**Funding would have to be discussed.**

### 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 **None**

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

## **Argo Norway**

Institute of Marine Research (IMR) in Norway is so far, as we know, the only institute in Norway that have deployed Argo floats. We have deployed nine Argo floats (Apex type) in the Norwegian Sea. Three floats were deployed in June 2002 and six floats in August 2003. All floats are drifting at 1500 m depth, in deep water masses. The parking depth at 1500 m depth was chosen due to the bottom topography for the area. The CTD-profiling is performed from the parking depth at 1500 m depth to the surface every ten days. There are no other sensors than pressure, temperature and conductivity on the floats. Except for one float that was deployed in 2002, the floats are still operative. All floats have worked well giving good data and new insight of the current patterns.

Regarding the “Delayed mode” we have in the past not done anything special with that. However, just recently we made an agreement with IFREMER where they will do the quality check for us. IFREMER will then, afterwards, make the high-quality data and the meta-data available on the internet. Unfortunately we do not have any high-resolution data in the vertical.

At present, we have ordered two new Argo floats (APEX) that will be deployed in the Norwegian Sea next year, probably in March. Both these floats will also, in addition, include fluorescence and oxygen sensors. At present we have only written popular science articles and no peer-review publications.

# UK Argo National Data Management Report

6<sup>th</sup> Argo Data Management Meeting

## 1. Status

- *Data acquired from floats* – Data from all UK floats is received at BODC by automatic download from the CLS database once every 24 hours.
- *Data issued to GTS* – All UK data is issued to the GTS by CLS.
- *Data issued to GDACs after real-time QC* – All UK data received at BODC is passed through the agreed real-time quality control tests within 24 hours of the data arriving at BODC. All data that has been processed at BODC is queued for transferred to both GDACs which occurs daily. Any file that fails to be transferred is queued for the next transfer attempt the next day.
- *Data issued for delayed QC* – All UK float data is ready to be subjected to delayed mode quality control procedures.
- *Delayed data sent to GDACs* – The WJO software has been installed at BODC and floats are beginning to be pushed through it. Delayed-mode data are now being sent to the GDACs.
- *Web pages* – BODC hosts the main data information and access pages. These pages contain for example of 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. This site is currently being updated and will be going live at the end of September 2004.
- *Statistics of Argo data usage* – At least 8 research grant funded projects are currently running in the UK that make use of Argo data. Scientific applications that use Argo data are looking at long-term monitoring, seasonal variability and climate change.
- *Products generated from Argo data* - none

## 2. Delayed Mode QC

A system is in place at BODC to enable delayed mode data to be provided to the GDACs. The organisation of performing delayed mode quality control is shown in the diagram below. The first UK delayed-mode netCDF files have been sent to the GDACs.

Good progress has been made in implementing the decisions of the DM QC workshop. Work has been carried out on the Southern Indian Ocean floats, and all have passed through the WJO software. We have rehearsed the correct action to be taken for a variety of cases and are confident that we understand what is required. Discussions with the PI have taken place and been valuable in assessing the correct actions to be taken. We intend to make this a priority over the next few months and hope that significant progress will be made by the end of February 2006.

## 3. GDAC Functions

The UK does not run a GDAC.

#### **4. Regional Centre Functions**

The Southern Ocean Regional Data Centre (SORDAC) is currently a collaborative effort between BODC and CSIRO. Exchange of personnel took place in 2004 and it is planned to take place again in the future. Some progress has been made over the year, in particular BODC have developed a SORDAC website, which includes monthly images from FOAM, and have continued to investigate sources of CTD data to improve the reference data set for the region. A prototype GIS has been developed and will be available soon. The UK has attended the both the South and North Atlantic RDAC meetings during the year.

# Argo National Data Management Report of United States

September 11th 2004 - October 31st 2005

## 1. Status

- **Data acquired from floats:**

a- September 2004 to October 2005

|                             |        |
|-----------------------------|--------|
| Floats deployed:            | 518    |
| Floats failed on launch:    | 10     |
| Floats reporting:           | 971    |
| Profiles quality controled: | 38,142 |

b- 1997 to October 2005

|   |      |
|---|------|
| Floats deployed:                                      | 1456 |
| Floats failed on launch:                              | 37   |
| No reports more than 30 days,<br>considered inactive: | 448  |

- **Data issued to GTS:**

During the reporting period, Service Argos and AOML put 33,323 profiles on GTS.

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

During the reporting period, 38,142 netcdf profiles, technical and trajectories netcdf files and 518 meta netcdf files have been issued to both GDACs. Total numbers of netcdf files issused: 114,944

- **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](ftp://ftp.aoml.noaa.gov/phod/pub/ARGO_FTP/argo/nc)

- **Data sent to GDACs after delayed QC:**

20,570 delay mode profiles and 107 trajectories files have been submitted.

- **Web pages:**

The URL for the US Argo Data Assembly Center is:

<http://www.aoml.noaa.gov/phod/ARGO/HomePage/>

It provides links to:

- Documentation.
- Operations.
- South Atlantic Regional Data Assembly Center
- FTP Services.
- On-demand Web Access profiles.
- Related Sites.

- Products generated from Argo data are available through two web sites:  
<http://www.aoml.noaa.gov/phod/sardac/products/> currently shows three products are derived from hydrographic profiles collected by Argo floats and other instruments:
  - Maps and cross-sections that depict the annual mean state in the upper ocean.
  - Seasonal climatologies of temperature and salinity (maps, sections and scatter plots of the profiles, for 30°S-40°S, provided by Ariel Troisi).
  - Properties of the mixed layer (thickness, temperature and heat storage rate) as monthly fields.
- <http://www.aoml.noaa.gov/phod/ARGO/Operations/html/> shows profiles, sections, trajectories and pressure records for individual floats processed at the US Argo DAC.

## 2. Delayed mode QC

### Scripps group:

After the DM Workshop, Scripps re-ran all of Scripps's previously run data and in the process bringing up-to-date those floats still alive. The actual number of processed delayed-mode profile files (D files) didn't increase greatly due to ending the processing 18 profiles before the last cycle, rather than ending the processing only 10 profiles before the last cycle (Running\_Const 18 versus 10). The latter was used versus previous submission. All data have been loaded together and visually inspected to make sure there aren't any outliers. There are ~60 newer floats that are pending until longer time series are accumulated.

As of Oct 05, the GDAC has 10412 D files from Scripps. That means 95% of Scripps backlog has been cleared, and the remaining 5% (about 500 profiles) are expected to be cleared by Dec 05.

Additional items:

- 1) Scripps adopted Greg Johnson's thermal lag correction for all of Scripps data. It made a noticeable improvement at the base of the mixed layer in poleward located floats, as well as moved thermocline waters towards historical in tropical locations.
- 2) Scripps used a Running\_const of 18 for all floats.
- 3) Noted break points, Running\_const, temperature levels used within WJO in the calibration comment variable. Also noted correction for Thermal Lag.

### University Washington group:

By July 2005, UW has accumulated more than 20,000 Argo profiles. After the DM Workshop in April, a delayed-mode quality control system, together with a diagnostic webpage, the SIO GUI, and netcdf writing facilities, were set up in-house at UW. All UW Argo profiles, including the 1717 D files that were released to GDAC before the DM Workshop, were re-run according to agreement from the DM Workshop. In Oct 05, 8386 D files were submitted to AOML to be sent to GDAC.

These D files have been checked for pressure offsets, temperature errors, salinity drifts and offsets, and visual flagging of thermal lag error spikes at base of mixed layer has been done. 40% of UW backlog has now been cleared, and the remaining 60% (>10,000 profiles) are expected to be cleared in the next 6 months.

### **PMEL group:**

The PMEL Argo group is wrapping up the investigation into the magnitude of conductivity cell thermal lag errors in SBE-41 and SBE-41CP salinity data and work on how to correct them. PMEL has passed a correction subroutine for this error along to Argo groups at Scripps and CSIRO for use and evaluation, since both groups expressed a concern about the error and an interest in attempting to correct it. Dean Roemmich has kindly agreed to give a presentation on the subject at ADMT-6. PMEL is now prepared to share this subroutine with other groups. We hope to write a journal article on our analysis and results shortly.

We are still working to get an Argo DMQC system up and running routinely at PMEL. With a lot of much appreciated help and advice from John Gilson, we think we finally have the whole system working. As a trial, we have run the system on 96 profiles from one float and 103 profiles from another float. We have just contacted AOML to pass these trial D files for these profiles back to them. We plan to await their inspection of and feedback on the trial D files before we begin clearing the PMEL DMQC backlog in earnest. Our procedure now consists of the following steps:

1. Automated correction of any pressure drifts and the effect of these pressure drifts on salinity.
2. Automated correction of conductivity cell thermal lag errors.
3. Visual inspection and modification of quality control flags for adjusted pressure, temperature, and salinity using the SIO GUI.
4. Running the WJO system and adjusting run parameters to get appropriate recommended salinity adjustments.
5. Accepting or rejecting the WJO recommendations on the basis of comparison with nearly historical and Argo float profiles using the SIO GUI.

### **WHOI group:**

After the DM Workshop, a big effort has been spent at WHOI on merging the two calibration methods: WJO and BS, into one improved and more-automated system that includes objective splitting of float series into discrete segments. The merged system is now in place and is being trailed at WHOI. The delayed-mode backlog will begin to clear as the merged and improved system is finalized.

## **3. RDAC**

The South Atlantic Argo Regional Data Assembly Center (SARDAC) is coordinating the effort of countries with interest in the Atlantic from 20°N to 40°S.

The web site for the South Atlantic Regional Data Assembly Center (<http://www.aoml.noaa.gov/phod/sardac>) provides background information, the report from the meeting with interested countries in May 2005, links to products and data servers.

**Deployment opportunities** provided by countries participating in SARDAC.

- R/V Puerto deseado Mar del Plata, Argentina October 2005 and March 2006.
- R/V SQA Agulhas - Cape Town, South Africa, November 30, 2005

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

**Training and education:** A workshop in Ghana is proposed for 2006 to address issues relating to regional capacity to use newly available Argo float technology to monitor, predict and mitigate the adverse impacts of variations in ocean temperatures, salinity and currents on the Atlantic countries of Africa (Morocco south to South Africa).

Specifically, the workshop will:

- Address the integration of Argo data with other satellite and in-situ observations to fully utilize the ocean observing system
- Train participants from 10 or more western African countries in Argo float technology and its application to monitor conditions in the eastern Atlantic
- Train participants in data management, quality control and reporting to international Argo standards
- Review the availability of temperature and salinity profile data for ARGO calibration and QC purposes
- Encourage data collection and collation (SST, SSS, T and S profile data) through guidance from regional center and provision of data products.
- Demonstrate tools for the integration of SST, SSS, T and S profile and surface current from Argo data and other in situ (e.g., XBT, CTD) and satellite (e.g., altimetry, SST, ocean color) data collected in the region to generate operational data products,
- Enhance both human and infrastructure capacity of local scientists in operational oceanography
- Provide inputs to policy makers with respect to coastal and shelf sea management in the region
- Assess capacity needs and assist with capacity building (including cross-training and technology transfer).
- Make recommendations to regional operational centers in Africa (meteorology and oceanography) about applications of Argo data combined with other oceanographic observations to climate variability and change, climate prediction and oceanic analyses (e.g., for Red Tide forecasts)
- Targeted towards scientists at operational centers and relevant research institutions in East and southern Africa.

# argo data management

Argo data management  
October 30<sup>th</sup>, 2005  
Ref : cordo/dti-rap/05-146  
Thierry Carval

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## ARGO DATA MANAGEMENT REPORT FRENCH GDAC

# ARGO

part of the integrated global observation strategy



## **Introduction**

This document is the annual report of the French Argo Global Data Assembly Centre (GDAC) for 2005.

### **Argo GDAC Functions**

#### **National centres reporting to you**

Currently, 9 national DACs submit regularly data to the French GDAC.

In February 2005, the CSIO DAC (China) started to send data and meta-data.

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 30<sup>th</sup>, the following files were available from the GDAC FTP site :

- AOML, USA
  - File types: meta-data, trajectory, technical and profile
  - 1456 meta-data files accepted
  - 76053 profile files accepted including 20764 delayed mode profiles
  - 1407 trajectory files accepted
  - 1406 technical data files accepted
- BODC, United Kingdom
  - File types: meta-data, trajectory and profile
  - 170 meta-data files accepted
  - 9175 profile files accepted, including 396 delayed mode profiles
  - 159 trajectory files accepted
  - 0 technical data files accepted
- CSIO, China (HZ)
  - File types: meta-data, trajectory, technical and profile
  - 24 meta-data files accepted
  - 961 profile files accepted, including 340 delayed mode profiles
  - 24 trajectory files accepted
  - 24 technical data files accepted
- Coriolis : Denmark, France, Germany, Italy, Netherland, Norway, Spain
  - File types: meta-data, trajectory, profile and technical
  - 558 meta-data files accepted
  - 28395 profile files accepted, including 5407 delayed mode profiles
  - 532 trajectory files accepted
  - 532 technical data files accepted
- CSIRO, Australia
  - File types: meta-data, trajectory, profile and technical
  - 83 meta-data files accepted
  - 4085 profile files accepted, including 0 delayed mode profile
  - 31 trajectory files accepted
  - 80 technical data files accepted
- INCOIS, India
  - File types: meta-data, trajectory and profile
  - 107 meta-data files accepted
  - 4412 profile files accepted, including 0 delayed mode profile
  - 105 trajectory files accepted

- 0 technical data files accepted
- JMA, Japan
  - File types: meta-data, trajectory, profile and technical
  - 490 meta-data files accepted
  - 29525 profile files accepted, including 751 delayed mode profiles
  - 489 trajectory files accepted
  - 490 technical data files accepted
- KMA, Korea
  - File types: meta-data, trajectory, profile and technical
  - 59 meta-data files accepted
  - 2750 profile files accepted, including 0 delayed mode profile
  - 53 trajectory files accepted
  - 53 technical data files accepted
- MEDS, Canada
  - File types: meta-data, trajectory, technical and profile
  - 152 meta-data files accepted
  - 9392 profile files accepted, including 6971 delayed mode profiles
  - 149 trajectory files accepted
  - 149 technical data files accepted
- GTS (data collected by GTSP)
  - File type : meta-data, profile
  - 406 meta-data files accepted
  - 28354 profile files accepted, 0 delayed mode profile

## 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>
- **New feature** : OpenDAP data access for Argo data  
Using OpenDAP, Argo data appears to you as a local file, like a network file system over the web.  
[http://www.coriolis.eu.org/cdc/opendap-dods\\_distribution.htm](http://www.coriolis.eu.org/cdc/opendap-dods_distribution.htm)  
<http://www.ifremer.fr/cgi-bin/nph-dods/data/in-situ/argo>

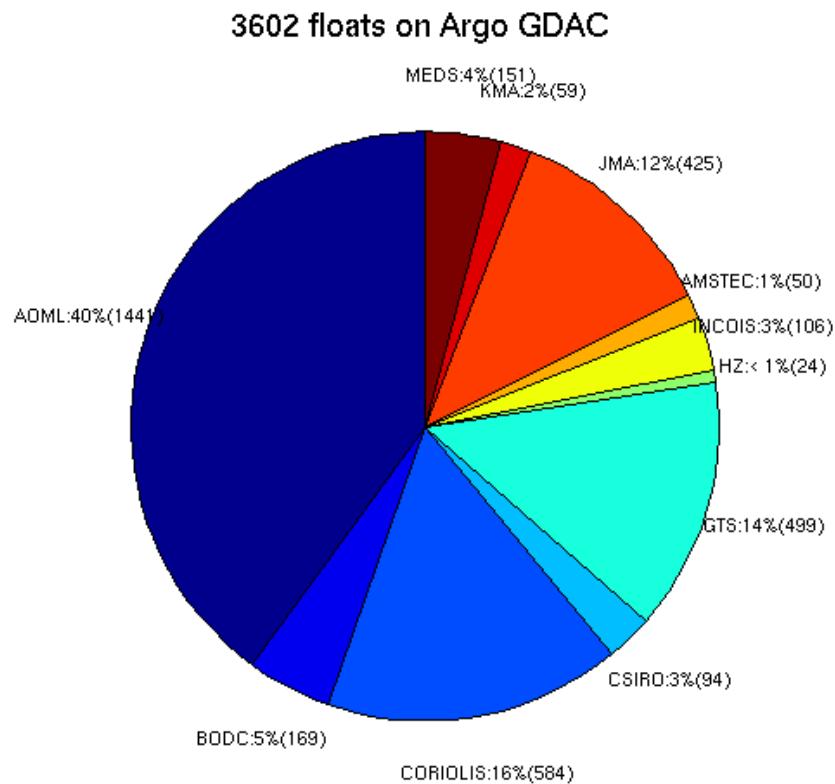
## Operations of the www server

Ifremer maintains a web site with real-time and delayed mode data or meta-data collected by GDAC. The following features are available :

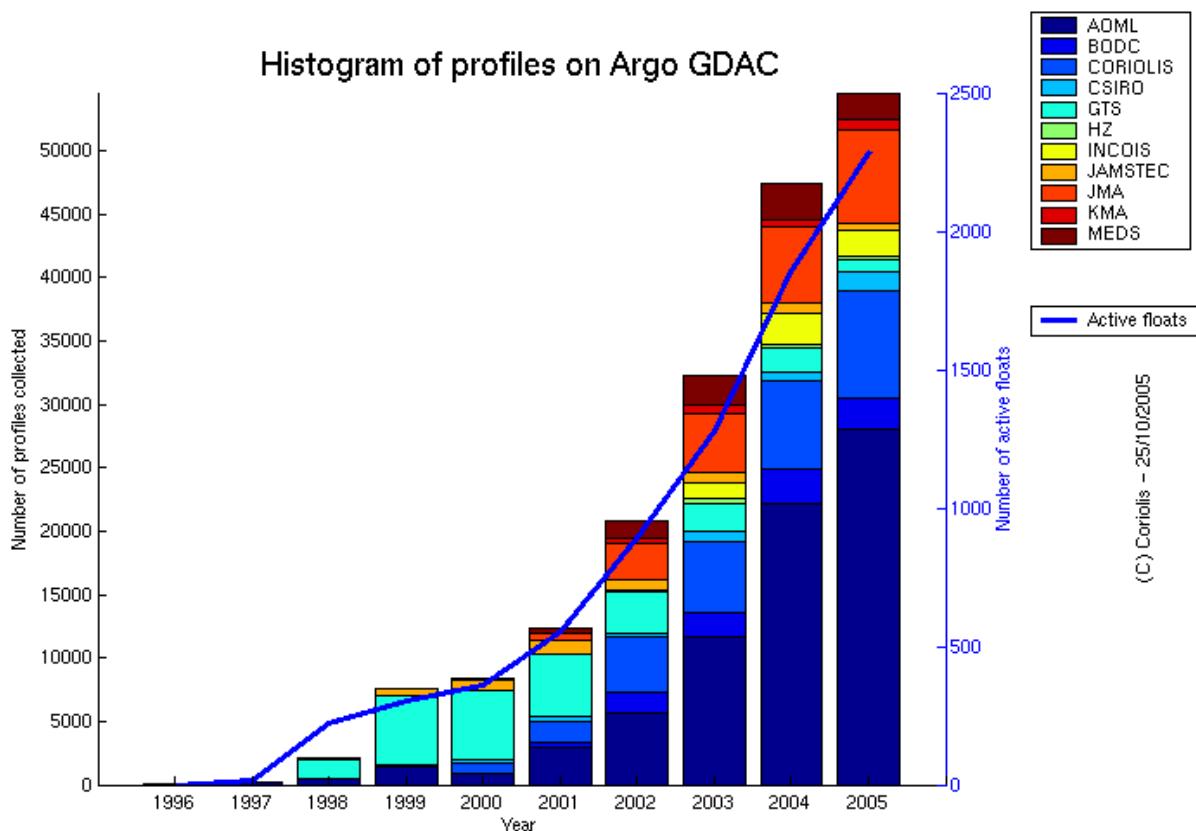
- Display of Argo profiling floats
  - <http://www.coriolis.eu.org/cdc/floats/cdcFloats.asp>
  - Display all active/old floats per ocean
  - Display technical informations and graphics for floats and measurements
  - Distribute data in Argo NetCdf format or medatlas Ascii format.
- Web data selection interface :
  - <http://www.coriolis.eu.org/cdc/dataSelection/cdcDataSelections.asp>
  - Select data by date, location and meta-data informations
  - Select Argo data and additional profiles from GTSPP program (XBT, CTD, buoys)
  - Distribute data in Argo NetCdf format or medatlas Ascii format.
- Display GDAC monitoring statistics  
[http://www.coriolis.eu.org/cdc/argo\\_gdac\\_monitoring.htm](http://www.coriolis.eu.org/cdc/argo_gdac_monitoring.htm)
- **New feature** : meta-data files monitoring  
Once a week, a global monitoring of Argo meta-data files is performed.
  - A list of 24 highly desirable meta-data parameters is defined.
  - For each float of each DAC, each missing or incorrect highly desirable parameter is pointed out
  - [http://www.coriolis.eu.org/cdc/argo\\_gdac\\_monitoring.htm](http://www.coriolis.eu.org/cdc/argo_gdac_monitoring.htm)
- **New feature** : Argo data area selection  
The user enters the boundaries of an area. For each float that crossed this area, all profile data are delivered to user.

## Data synchronization

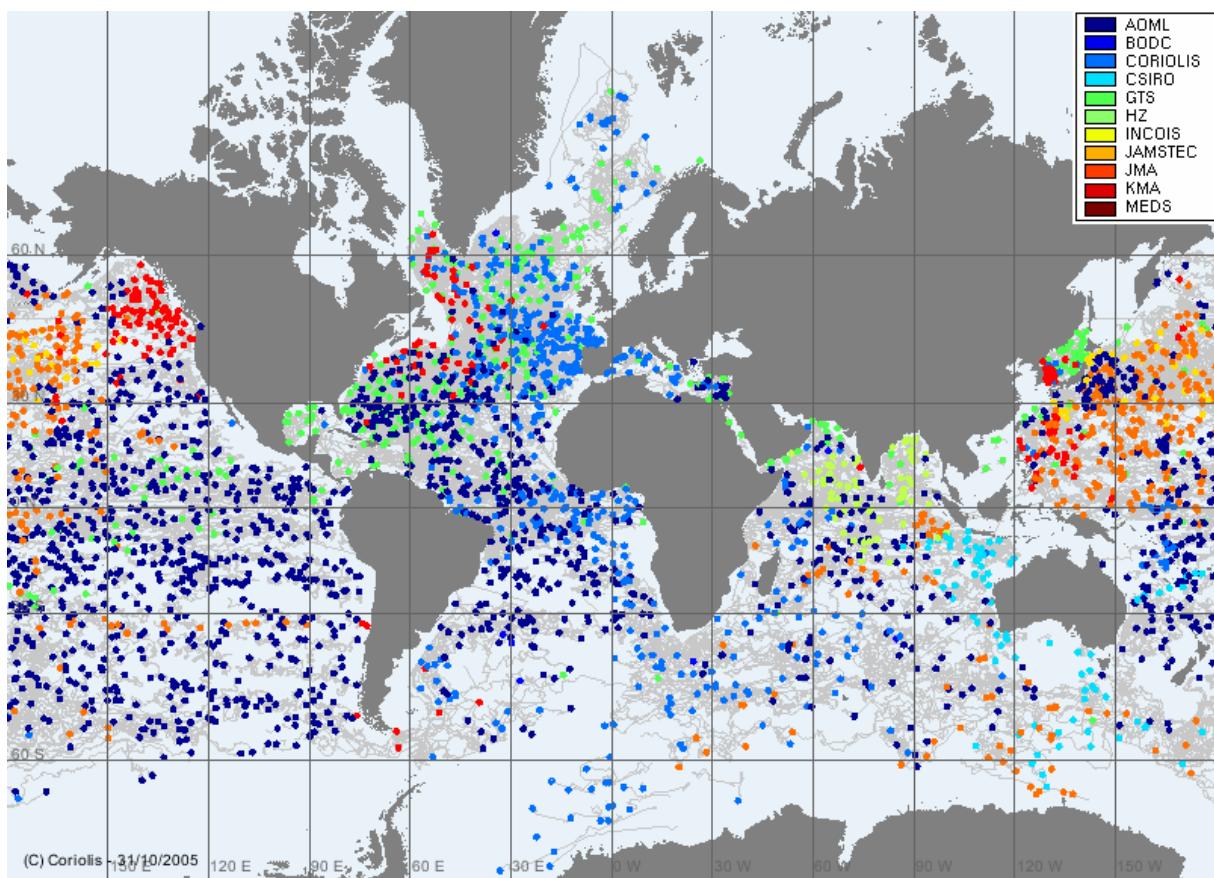
- Implemented on 20/02/2003, the synchronization with US-GDAC is performed once a day.



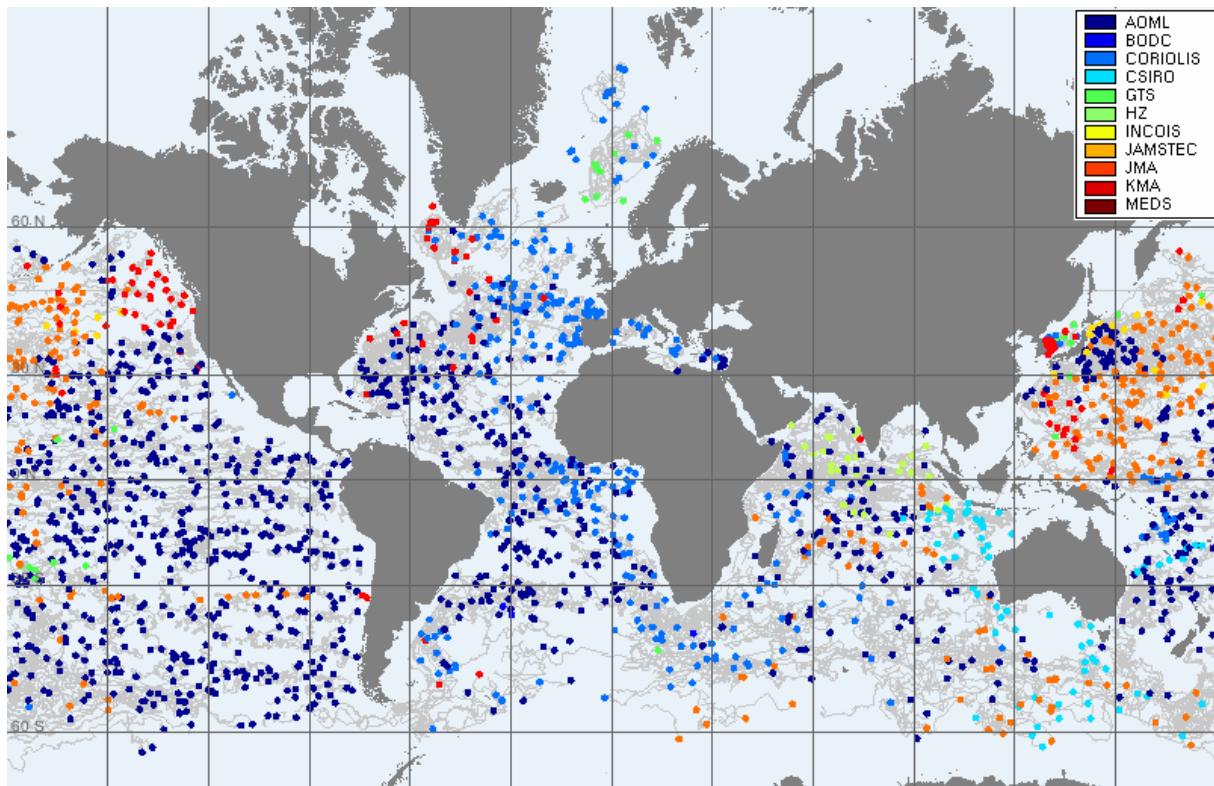
Argo GDAC : floats distribution per DAC in October 2005



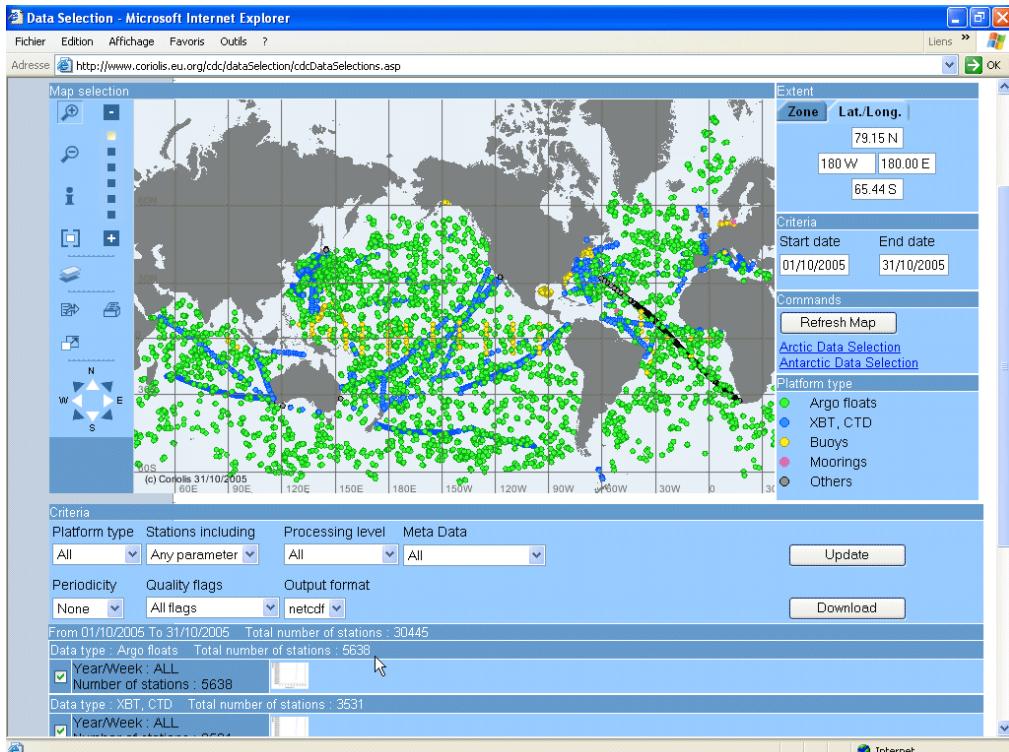
Argo GDAC : profiles distribution per DAC in October 2005



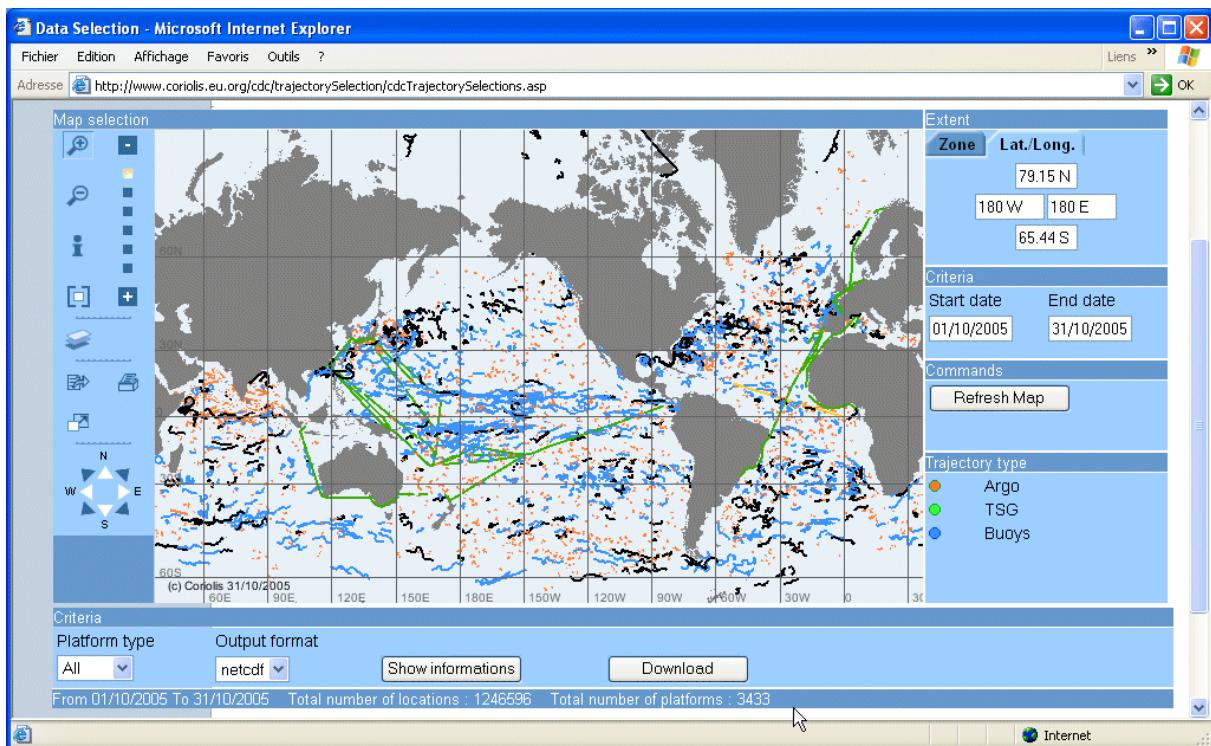
Argo profiling floats available from GDAC in October 2005  
(This map includes active and old floats)



Active Argo profiling floats available from GDAC in October 2005



Argo and other GTSPP profile data available from the data selection interface, for the month of October 2005  
(green dots : Argo profiles, blue dots : GTSPP XBT profiles, yellow dots : GTSPP buoys)



Argo and other trajectory data available from the data selection interface, for the month of October 2005  
(Orange lines : Argo trajectories, blue lines : DBCP buoy trajectories, green lines : Gosud thermosalinographs)

The screenshot shows a Microsoft Internet Explorer window with the title "metadata weekly report - Microsoft Internet Explorer". The address bar contains the URL "http://www.coriolis.eu.org/cdc/metadataArgo/cdcMetadataArgos.asp". The page header features the Coriolis logo and navigation links for "THE PROJECT", "DATA SERVICE", "DEPLOYMENT", "INSTRUMENTATION", "ACQUISIT® FROM RESEARCH VESSELS", and "APPLICATIONS & PRODUCTS". Below the header is a breadcrumb trail: Home > data service > argo > argo gdac monitoring > meta-data monitoring. A table lists DAC names, file counts, and the number of anomalies. The anomalies column uses orange bars to represent the count. A message at the bottom says "You can download the report [here](#)".

| Dac Name | Number of file | Number of anomaly |
|----------|----------------|-------------------|
| aoml     | 1441           | 35                |
| bodc     | 170            | 170               |
| coriolis | 558            | 558               |
| csio     | 24             | 0                 |
| csiro    | 83             | 83                |
| gts      | 421            | 421               |
| incois   | 107            | 0                 |
| jma      | 490            | 490               |
| kma      | 61             | 31                |
| meds     | 151            | 7                 |

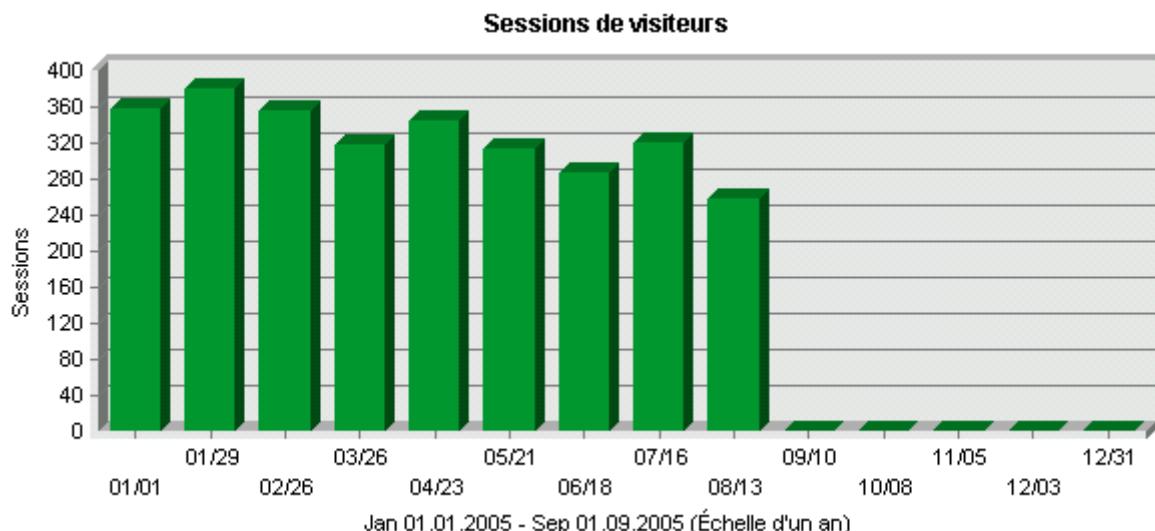
#### New feature : meta-data files monitoring

A list of 24 highly desirable meta-data parameters is defined. For each float of each DAC, each missing or incorrect highly desirable parameter is pointed out

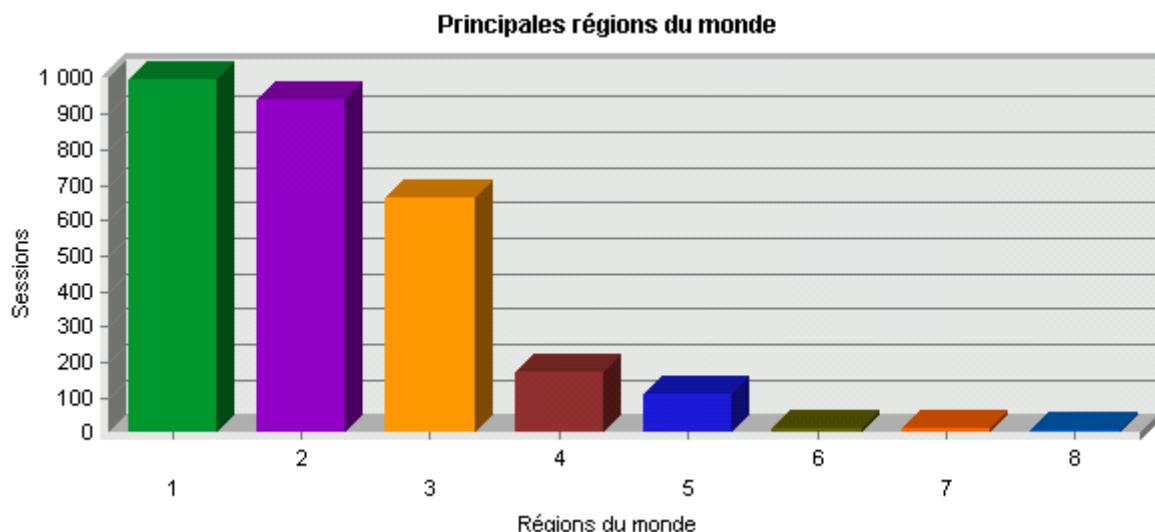
## Use statistics from GDAC FTP site

From January to September 2005, the GDAC FTP server recorded

- 2 942 sessions
- 353 different visitors
- 2 908 061 file transfers.
- 11 918 daily file transfers (average)

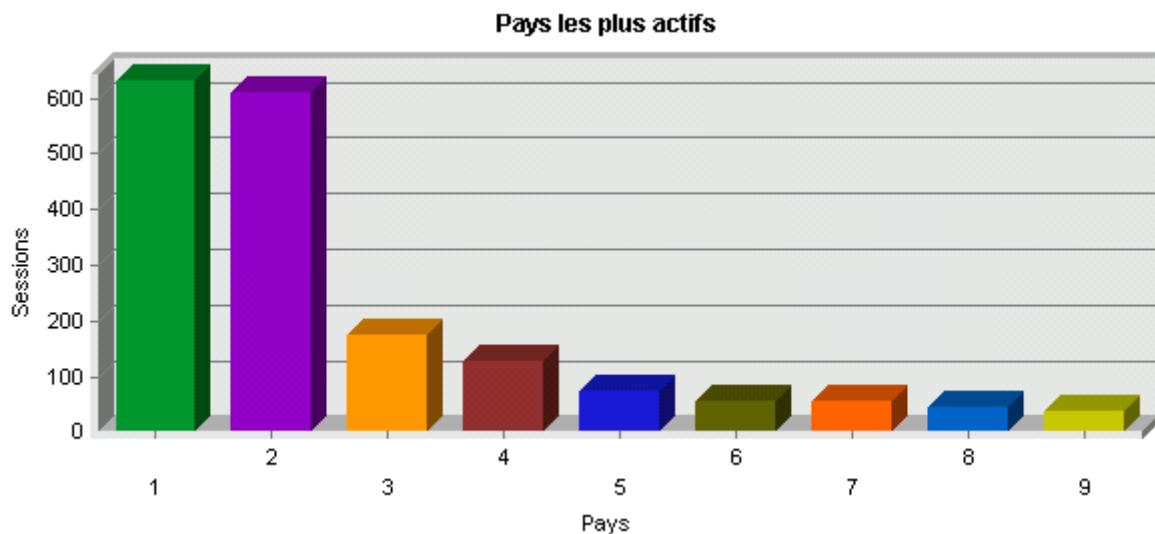


Number of FTP sessions on GDAC, from January to September 2005



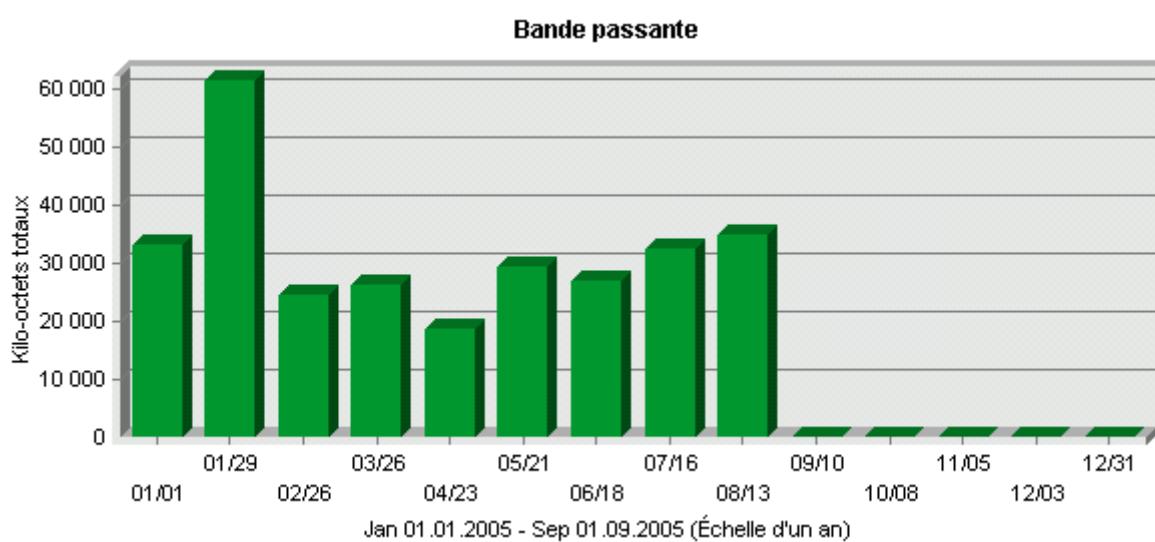
Origin of FTP sessions, main areas, from January to September 2005

1 : unspecified origin, 2 : Occidental Europe, 3 : North America, 4 : Northern Europe, 5 : Asia, 7 : Australia, 8 : Southern America

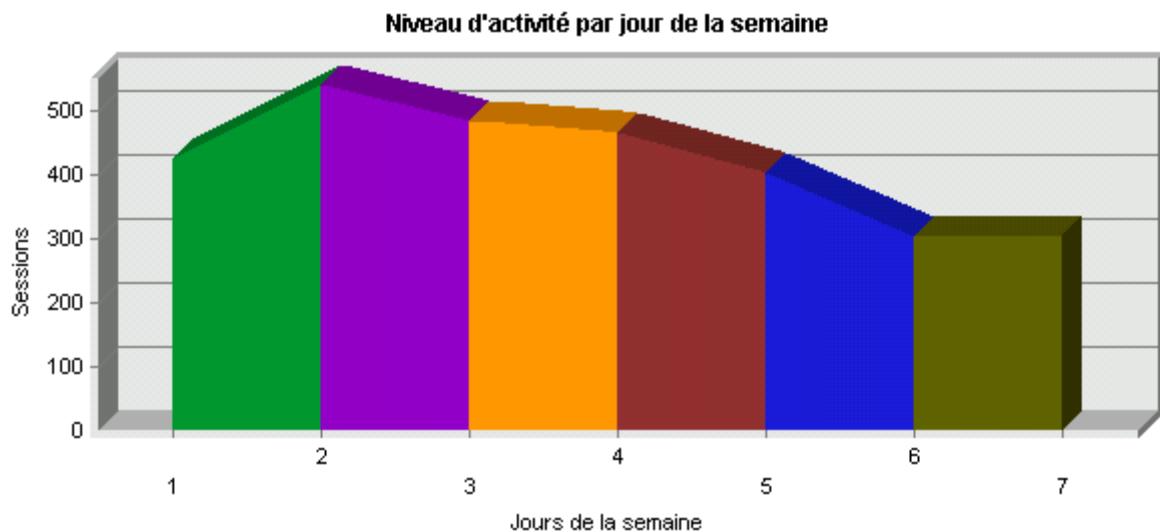


Origin of FTP sessions, main countries, from January to September 2005

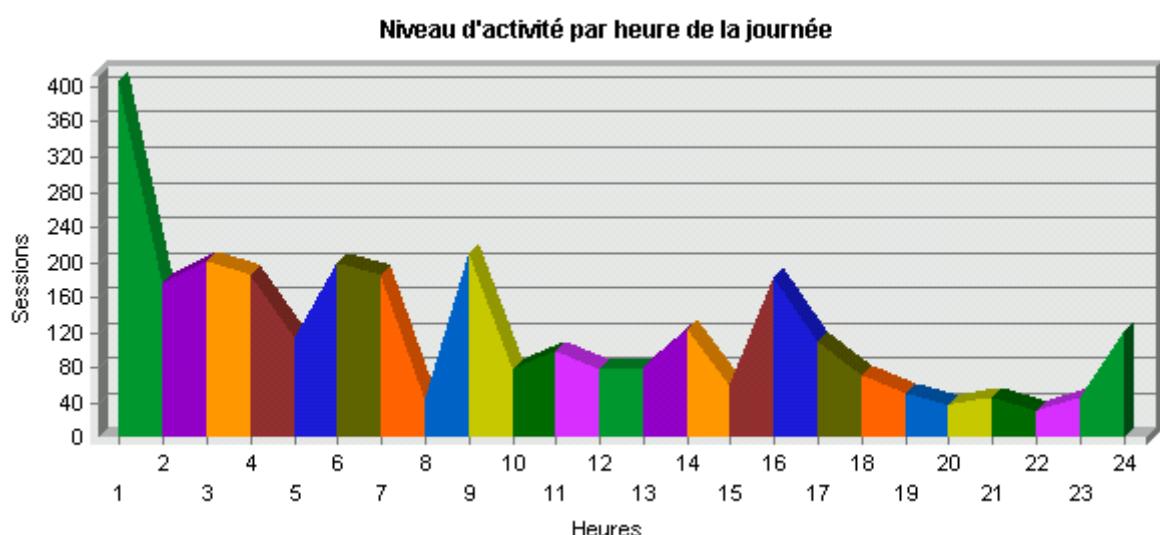
1 : France, 2 : USA, 3 : Norway, 4 : Germany, 5 : Japan, 6 : Netherlands, 7 : Canada,  
8 : Spain, 9 : United Kingdom



FTP monthly bandwidth, from January to September 2005



FTP activity level per day of the week, from January to September 2005  
(1 : Monday – 7 : Sunday)



FTP activity level per hour of the day, from January to September 2005

# **US GDAC Annual Report**

## **ADMT #6**

November 2005

### **DACs reporting**

#### **Summary:**

- 9 DACs (plus the GTS) reporting
    - China (CSIO) added this year
  - 3,411 total floats (2,030 active)
  - 186,083 profile files (32,988 delayed-mode)
- (as of October 31, 2005)

#### **Detail:**

##### Australia (CSIRO)

- Reporting: Meta-data, Technical, Trajectory, and Profile data
- 80 floats (65 active)
- 3,940 profile files

##### Canada (MEDS)

- Reporting: Meta-data, Technical, Trajectory, and Profile data
- 150 floats (69 active)
- 9,107 profile files (6,971 delayed-mode)

##### China (CSIO) -- added during 2005

- Reporting: Meta-data, Technical, Trajectory, and Profile data
- 24 floats (8 active)
- 915 profile files (340 delayed-mode)

##### France (IFREMER)

- Reporting: Meta-data, Technical, Trajectory, and Profile data
- 531 floats (304 active)
- 27,343 profile files (3,954 delayed-mode)

##### India (INCOIS)

- Reporting: Meta-data, Technical, Trajectory, and Profile data
- 107 floats (63 active)
- 5669 profile files

#### Japan (JMA)

- Reporting: Meta-data, Technical, Trajectory, and Profile data
- 487 floats (318 active)
- 28,632 profile files (751 delayed-mode)

#### Korea (KMA)

- Reporting: Meta-data, Technical, Trajectory, and Profile data
- 63 floats (40 active)
- 2,660 profile files

#### UK (BODC)

- Reporting: Meta-data, Trajectory, and Profile data
- 160 floats (91 active)
- 8856 profile files (396 delayed-mode)

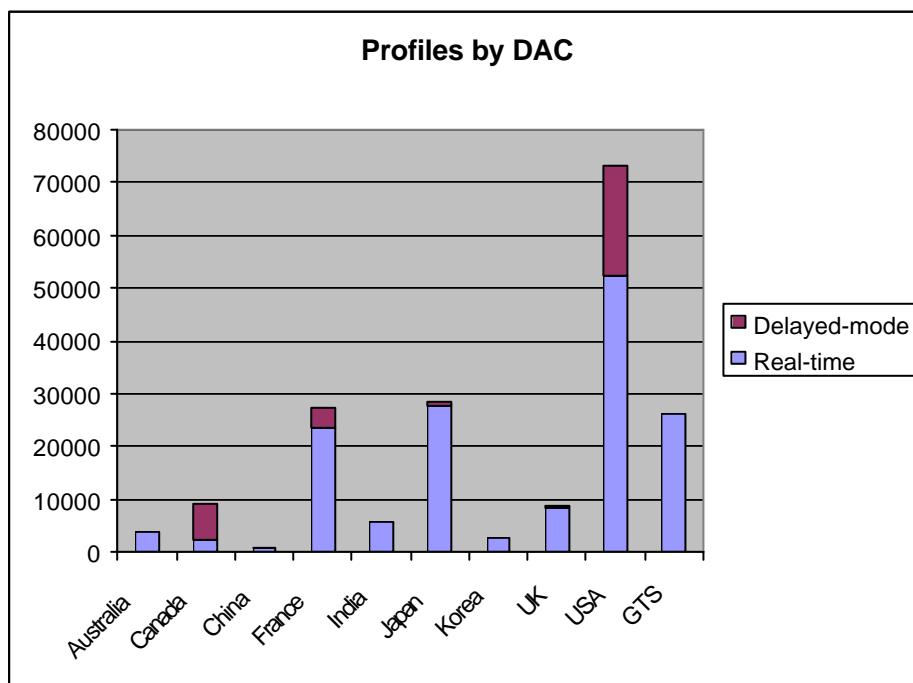
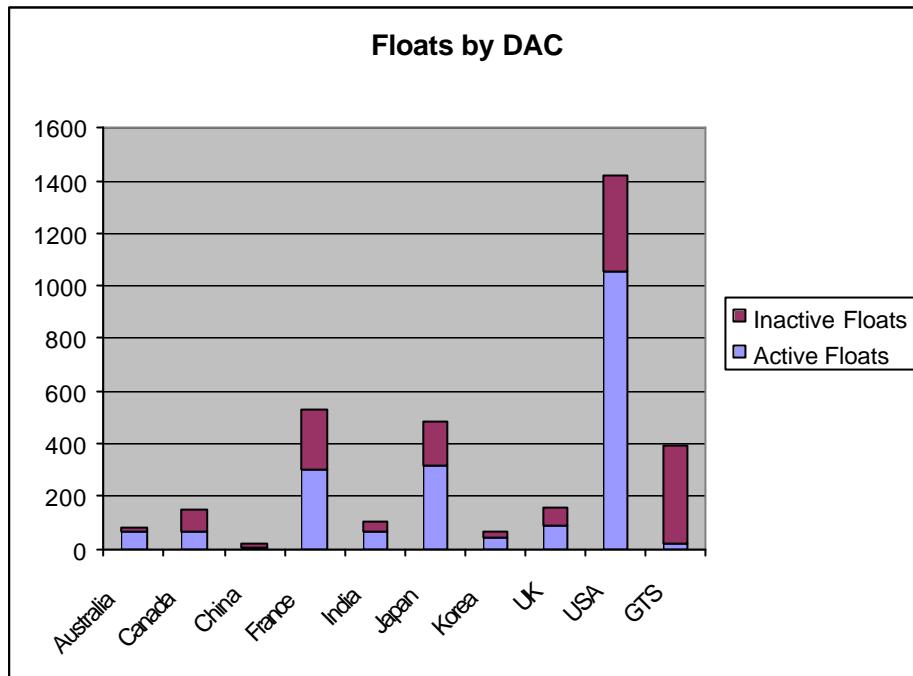
#### USA (AOML)

- Reporting: Meta-data, Technical, Trajectory, and Profile data
- 1418 floats (1057 active)
- 72,989 profile files (20,576 delayed-mode)

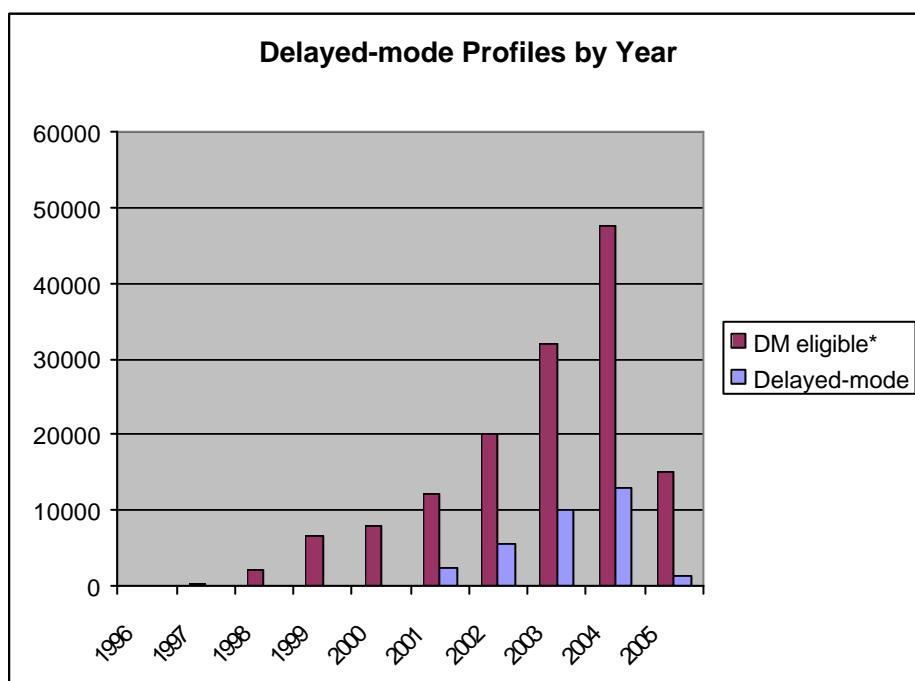
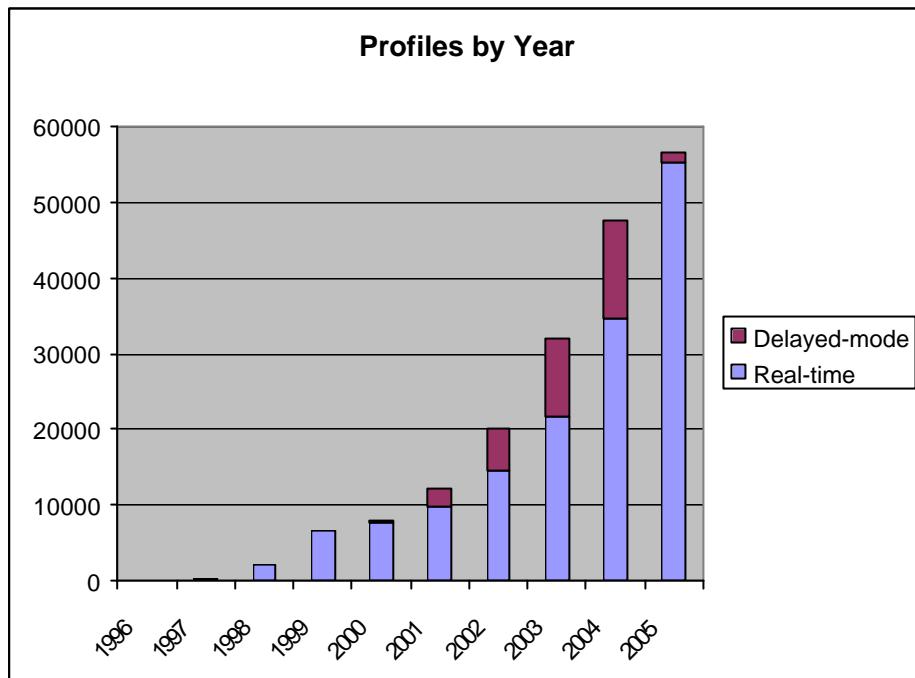
#### GTS

- Reporting: Profile data
- 449 floats (36 active)
- 24,145 profile files
- Less than 2% of the active floats

## Floats and Profiles by DAC



## Profiles by Year



(\* Note: DM eligible profiles are those older than 6 months)

## FTP Server Operation

- Processing of incoming DAC files: every 30 minutes
  - includes updates to index files
- Generation of float multi-profile files: every 1 hour
- Generation of geographic multi-profile files: every 6 hours (00, 06, 12, 18 UTC)
- Generation of latest-data multi-profile files: every 12 hours (00, 12 UTC)
- Synchronization with French GDAC: every 12 hours (00, 12 UTC)

## WWW Server Operation

The Argo Web interface consists of:

- HTTP and FTP direct access to all GDAC data and metadata files
- OPeNDAP access to all GDAC NetCDF data and metadata files
- Custom Data Browser Application:
  - Allows selection of profiles by:
    - region, time, DAC, Float ID, and Delayed-mode status
  - Generates an optional location plot for selected profiles
  - Provides quick preview plots of salinity and temperature profiles, and float track
  - Provides download of profile, trajectory or technical data for all, or a selected subset of matching profiles/floats
- Live Access Server
  - Provides extensive selection criteria
  - Generates plots for property/depth (waterfall), property/property, pie (surface expression of profile data), Gaussian filled, or metadata (time/location)
  - Generates ASCII tab delimited table output for selected profiles
  - Generates Ferret/COARDS compatible NetCDF output for selected profiles
  - Generates Float Operations plots: Float Track, and Waterfall Plots
  - Custom Argo plot options
- Dapper OPeNDAP server installation under development

## Synchronization

- Meta-data, Trajectory, and Profile files being synchronized with the French GDAC twice per day at 0000 and 1200 UTC.
- GTS files present on US GDAC are retrieved only through synchronization with French GDAC. (Coriolis formats GTS files into Argo NetCDF format.) GTS files are fully synchronized.
- Detailed synchronization discrepancy report being generated for further discussion with the personnel with the French GDAC.

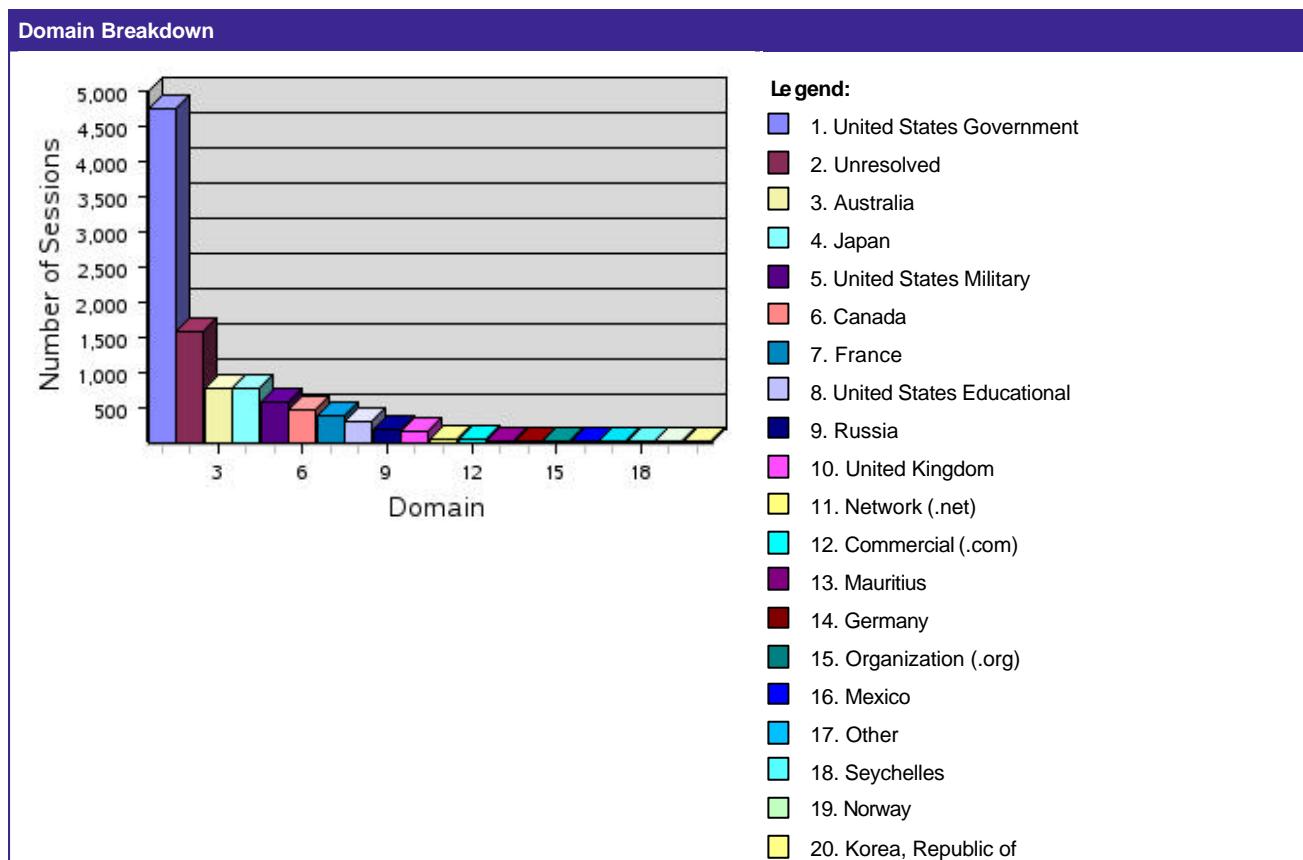
# Usage Statistics

## FTP Statistics

USGODAE FTP: Domain Summary

September 1, 2004 - September 1, 2005

Filters Applied: Directories that contain argo



|    | Domain                    | Last Session                | Downloads        | Sessions     |
|----|---------------------------|-----------------------------|------------------|--------------|
| 1. | United States Government  | Sept. 1, 2005 at 11:00 p.m. | 2,345,778 (4.0%) | 4,730 (4.5%) |
| 2. | Unresolved                | Sept. 1, 2005 at 10:04 p.m. | 1,914,216 (3.2%) | 1,573 (1.5%) |
| 3. | Australia                 | Sept. 1, 2005 at 7:00 p.m.  | 338,639 (0.6%)   | 754 (0.7%)   |
| 4. | Japan                     | Sept. 1, 2005 at 9:12 a.m.  | 1,442,670 (2.4%) | 752 (0.7%)   |
| 5. | United States Military    | Sept. 1, 2005 at 2:08 a.m.  | 13,300 (0.0%)    | 562 (0.5%)   |
| 6. | Canada                    | Sept. 1, 2005 at 3:12 p.m.  | 1,567,185 (2.7%) | 454 (0.4%)   |
| 7. | France                    | Sept. 1, 2005 at 9:04 p.m.  | 165,652 (0.3%)   | 366 (0.4%)   |
| 8. | United States Educational | Sept. 1, 2005 at 11:42 p.m. | 1,246,097 (2.1%) | 305 (0.3%)   |
| 9. | Russia                    | Sept. 1, 2005 at 5:40 a.m.  | 832 (0.0%)       | 169 (0.2%)   |

|     |                     |                             |               |            |
|-----|---------------------|-----------------------------|---------------|------------|
| 10. | United Kingdom      | Sept. 1, 2005 at 10:15 p.m. | 52,259 (0.1%) | 157 (0.2%) |
| 11. | Network (.net)      | Aug. 26, 2005 at 1:50 a.m.  | 45,796 (0.1%) | 49 (0.0%)  |
| 12. | Commercial (.com)   | Aug. 31, 2005 at 1:19 a.m.  | 211 (0.0%)    | 34 (0.0%)  |
| 13. | Mauritius           | April 5, 2005 at 7:07 a.m.  | 1,229 (0.0%)  | 25 (0.0%)  |
| 14. | Germany             | April 4, 2005 at 11:43 a.m. | 1,881 (0.0%)  | 11 (0.0%)  |
| 15. | Organization (.org) | Aug. 18, 2005 at 11:26 a.m. | 16 (0.0%)     | 7 (0.0%)   |
| 16. | Mexico              | Aug. 19, 2005 at 6:41 p.m.  | 110 (0.0%)    | 6 (0.0%)   |
| 17. | Other               | July 27, 2005 at 10:00 a.m. | 4,957 (0.0%)  | 4 (0.0%)   |
| 18. | Seychelles          | June 27, 2005 at 12:22 p.m. | 1,816 (0.0%)  | 4 (0.0%)   |
| 19. | Norway              | April 29, 2005 at 3:20 p.m. | 30 (0.0%)     | 4 (0.0%)   |
| 20. | Korea, Republic of  | Oct. 22, 2004 at 6:44 a.m.  | 5,407 (0.0%)  | 3 (0.0%)   |

Domains represented: 20 out of 66 (30.3%)      Downloads represented: 9,148,081 out of 59,009,626 (15.5%)  
 Domains matching filters: 34      Sessions represented: 9,969 out of 104,154 (0.0%)

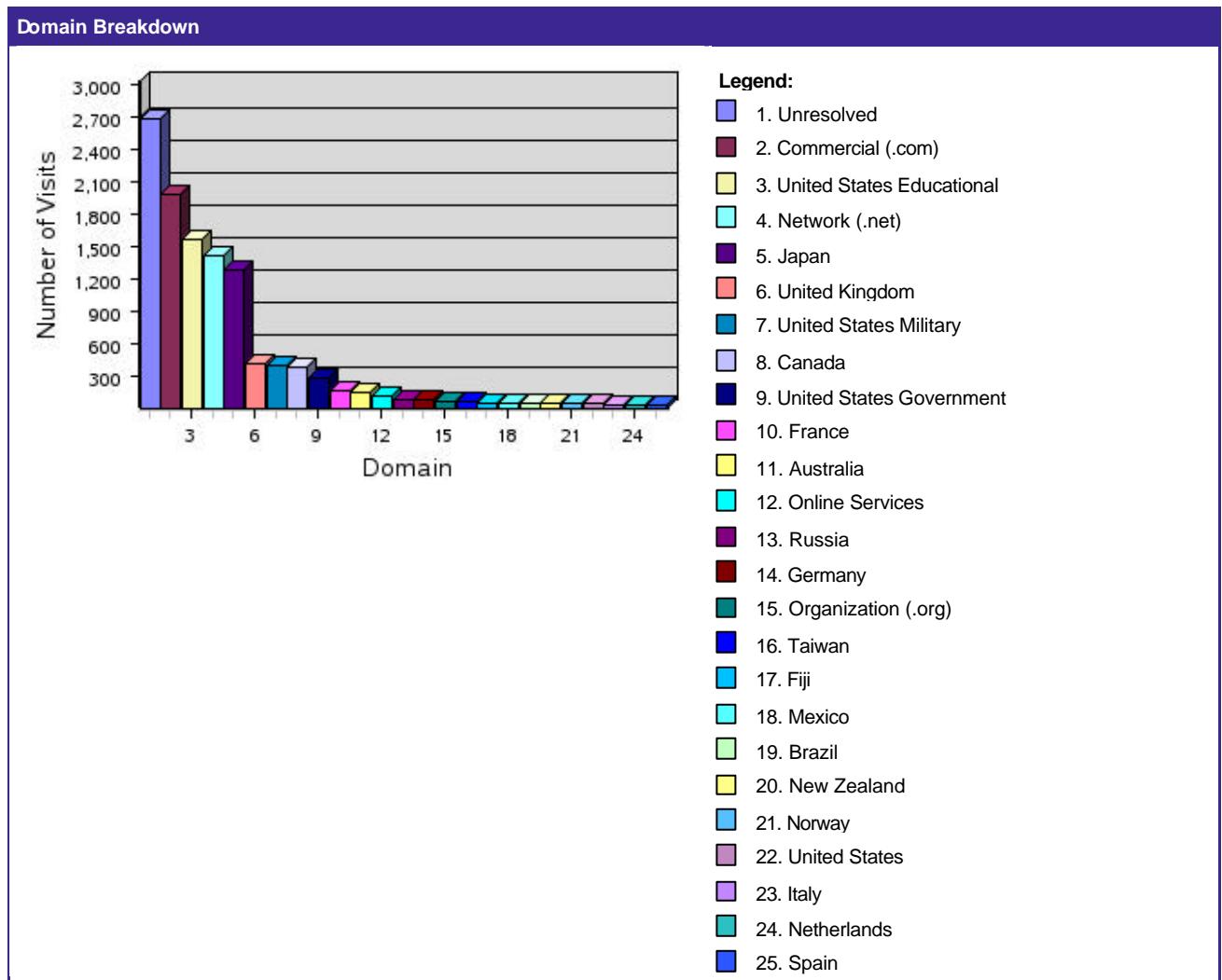
Report generated on Nov. 1, 2005 at 9:24 p.m. using NetTracker® 6.0 Enterprise  
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## HTTP Statistics

USGODAE-WEB: Domain Summary

September 1, 2004 - September 1, 2005

Filters Applied: Pages that contain argo



|    | Domain                    | Last Visit                  | Views         | Visits       |
|----|---------------------------|-----------------------------|---------------|--------------|
| 1. | Unresolved                | Sept. 1, 2005 at 5:07 p.m.  | 40,478 (0.3%) | 2,674 (0.5%) |
| 2. | Commercial (.com)         | Sept. 1, 2005 at 11:43 p.m. | 3,239 (0.0%)  | 1,973 (0.4%) |
| 3. | United States Educational | Sept. 1, 2005 at 8:58 p.m.  | 39,867 (0.3%) | 1,562 (0.3%) |
| 4. | Network (.net)            | Sept. 1, 2005 at 7:27 p.m.  | 26,108 (0.2%) | 1,411 (0.3%) |
| 5. | Japan                     | Sept. 1, 2005 at 6:28 a.m.  | 3,716 (0.0%)  | 1,271 (0.2%) |
| 6. | United Kingdom            | Sept. 1, 2005 at 1:35 p.m.  | 2,322 (0.0%)  | 404 (0.1%)   |
| 7. | United States Military    | Sept. 1, 2005 at 6:33 p.m.  | 9,730 (0.1%)  | 398 (0.1%)   |

|     |                          |                             |               |            |
|-----|--------------------------|-----------------------------|---------------|------------|
| 8.  | Canada                   | Sept. 1, 2005 at 11:29 a.m. | 1,867 (0.0%)  | 376 (0.1%) |
| 9.  | United States Government | Sept. 1, 2005 at 11:39 p.m. | 23,719 (0.2%) | 278 (0.1%) |
| 10. | France                   | Aug. 27, 2005 at 12:41 p.m. | 606 (0.0%)    | 158 (0.0%) |
| 11. | Australia                | Aug. 30, 2005 at 6:38 a.m.  | 779 (0.0%)    | 147 (0.0%) |
| 12. | Online Services          | Aug. 28, 2005 at 5:22 a.m.  | 398 (0.0%)    | 110 (0.0%) |
| 13. | Russia                   | Aug. 26, 2005 at 12:14 a.m. | 565 (0.0%)    | 83 (0.0%)  |
| 14. | Germany                  | Aug. 29, 2005 at 7:31 a.m.  | 152 (0.0%)    | 80 (0.0%)  |
| 15. | Organization (.org)      | Aug. 25, 2005 at 3:58 a.m.  | 195 (0.0%)    | 60 (0.0%)  |
| 16. | Taiwan                   | Aug. 29, 2005 at 7:03 a.m.  | 281 (0.0%)    | 59 (0.0%)  |
| 17. | Fiji                     | Sept. 1, 2005 at 3:25 a.m.  | 383 (0.0%)    | 45 (0.0%)  |
| 18. | Mexico                   | July 26, 2005 at 9:33 p.m.  | 141 (0.0%)    | 43 (0.0%)  |
| 19. | Brazil                   | Aug. 9, 2005 at 5:00 p.m.   | 183 (0.0%)    | 39 (0.0%)  |
| 20. | New Zealand              | Aug. 26, 2005 at 6:17 p.m.  | 267 (0.0%)    | 35 (0.0%)  |
| 21. | Norway                   | Aug. 26, 2005 at 11:53 a.m. | 95 (0.0%)     | 35 (0.0%)  |
| 22. | United States            | Aug. 24, 2005 at 12:46 p.m. | 117 (0.0%)    | 35 (0.0%)  |
| 23. | Italy                    | Aug. 29, 2005 at 8:52 a.m.  | 37 (0.0%)     | 26 (0.0%)  |
| 24. | Netherlands              | Aug. 30, 2005 at 11:04 a.m. | 44 (0.0%)     | 25 (0.0%)  |
| 25. | Spain                    | Aug. 29, 2005 at 10:53 p.m. | 46 (0.0%)     | 21 (0.0%)  |

Domains represented: 25 out of 172 (14.5%)      Views represented: 155,335 out of 12,761,461 (1.2%)  
 Domains matching filters: 71      Visits represented: 11,348 out of 537,101 (2.1%)

Report generated on Nov. 1, 2005 at 8:32 p.m. using NetTracker® 6.0 Enterprise  
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# **Global Argo Data Repository Annual Report for 2005**

Prepared by Charles Sun ([Charles.Sun@noaa.gov](mailto:Charles.Sun@noaa.gov))

US National Oceanographic Data Center

2005-10-25

## **1. Executive Summary**

This report is intended to be used as US NODC's (National Oceanographic Data Center) input for team discussions at the 6<sup>th</sup> Argo data management team annual meeting from November 8 to 10, 2005 at Japan Meteorological Agency, Tokyo, Japan. The report summarizes the user statistics and major accomplishments of the Global Argo Data Repository since the 5<sup>th</sup> Argo data management team meeting in 2004 at Southampton, UK. It also describes issues regarding the Argo data format consistency and the effectiveness and efficiency of transferring files between the NODC and the US Argo Global Data Assembly Center located at Monterey, CA. Suggestions for resolving the issues are also included in the report.

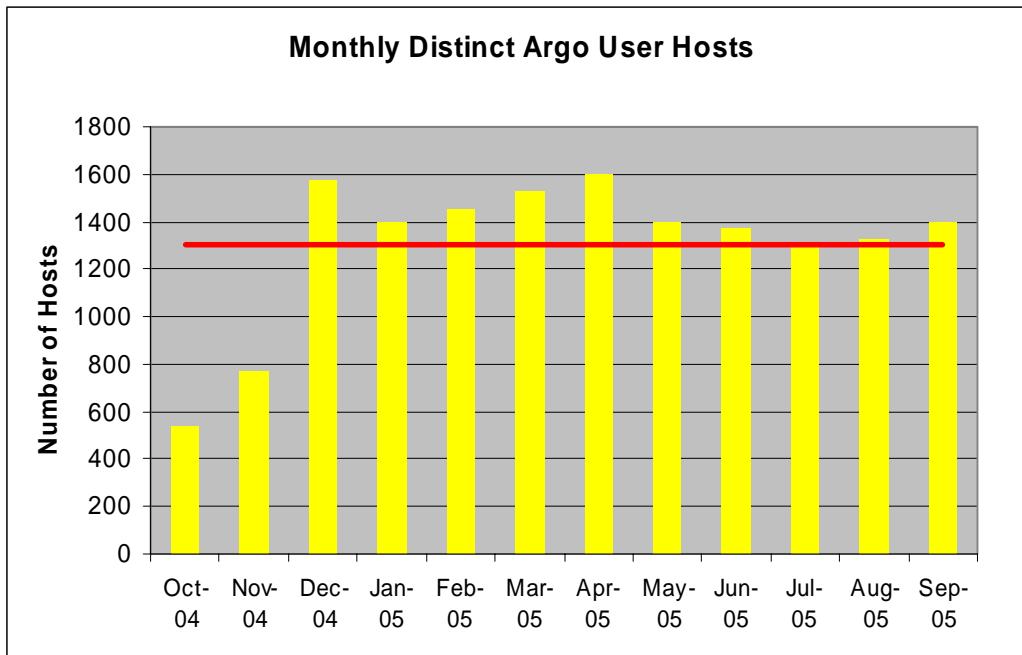
## **2. Introduction**

The NODC continues to operate the Global Argo Data Repository (GADR) for managing and archiving the Argo data and information. The NODC performs six primary functions for the Argo data:

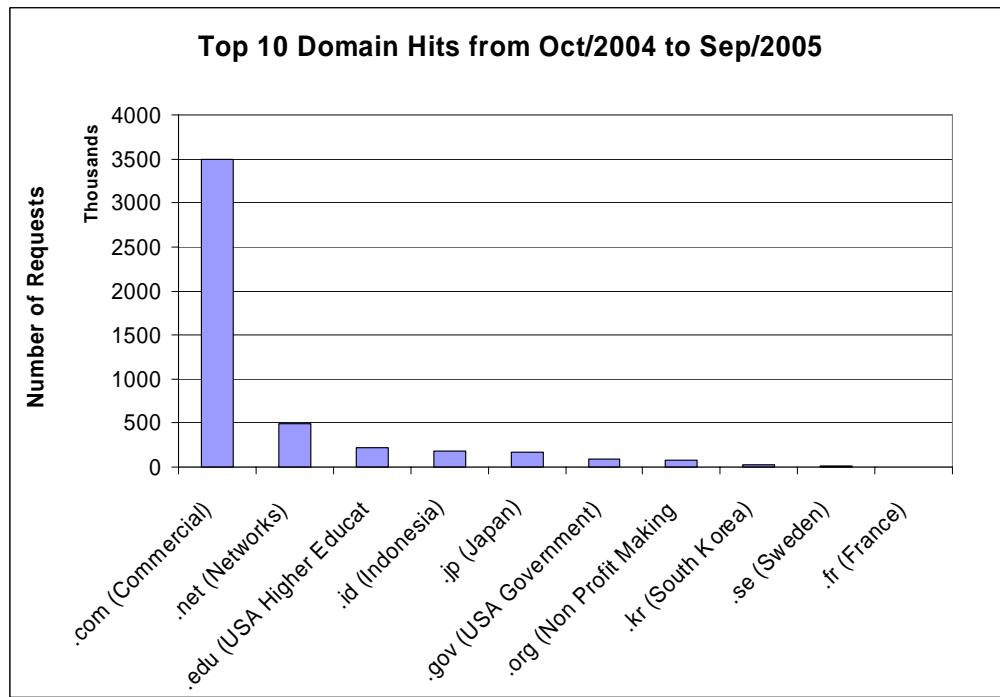
- Archive delayed-mode profiles, metadata, trajectory and technical information received from the GDAC on a monthly basis.
- Provide tools to allow transformation of Argo netCDF data into other forms.
- Provide use statistics, data system monitoring information and problem reporting facility.
- Provide 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. GADR HTTP Server Statistics**

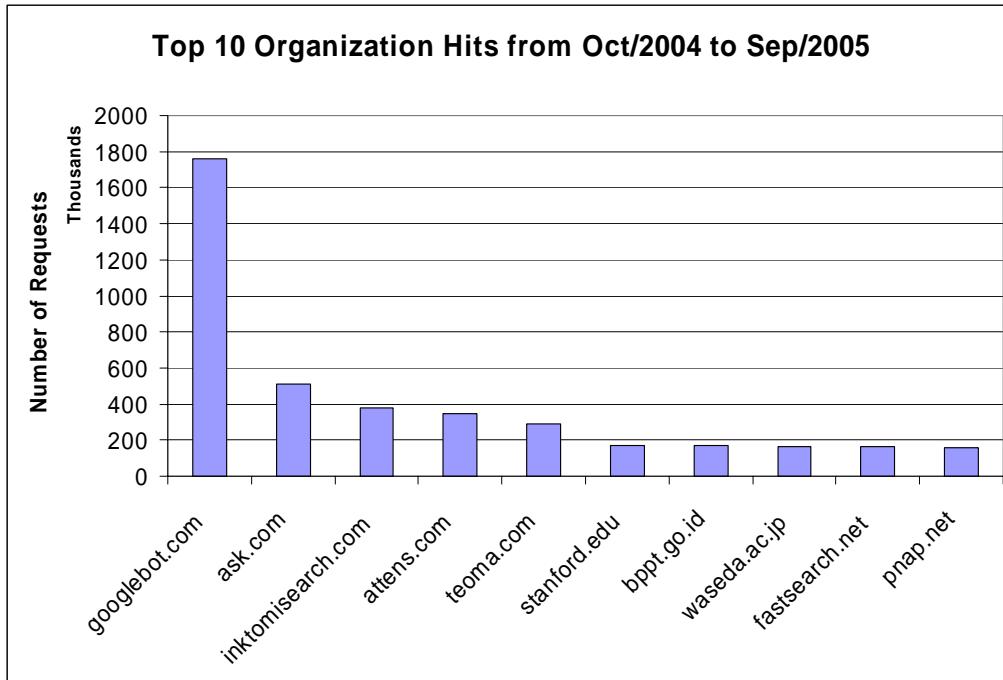
The GADR received 222,685 requests for the NODC's version of the Argo profile data in October 2004. The number increased to 510,673 in September 2005. The monthly average of file requested is 398,829 over the past 12 months. The number of distinct hosts served by the GADR increased dramatically from 537 to 1,393 during the same period. The following figure illustrates the number of monthly distinct hosts served by the GADR from October 2004 to September 2005. The heavy line in the figure shows the monthly average of 1304 unique hosts over the past 12 months.



#### 4. GADR User Domain Breakdown

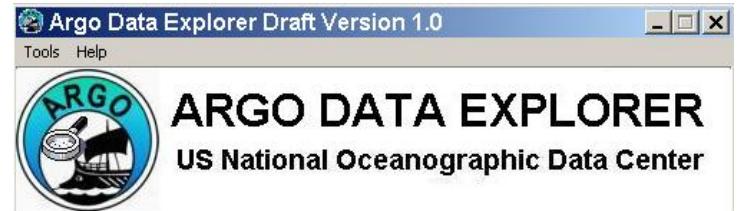


## 5. GADR User Organization Breakdown



## 6. Major Accomplishments

- 6.1. Argo Data Explorer (ADE) Version 1.2 released — A Java application that allows transformation of the Argo NetCDF format to the ASCII text format.



URL: <http://www.nodc.noaa.gov/argo/tools/ade/index.htm>

- 6.2. Completed the Argo NdEdit tool — A Java application that allows users to search/sub-set an Argo inventory file on Argo CD/DVD.URL:  
<http://argo.nodc.noaa.gov/dvd/tools/ane/index.htm>
- 6.3. Completed the 2<sup>nd</sup> draft version of the Argo Global Data Resource 2006, DVD edition (<http://argo.nodc.noaa.gov/dvd/welcome.htm>)
- 6.4. Completed the 2<sup>nd</sup> draft version of the Argo Global Data Resource 2006, CD edition (<http://argo.nodc.noaa.gov/cd/welcome.htm>).

## 7. Issues

- 7.1. Data transferring between GADR and US GDAC

Current file transfer method relies on FTP transfers and file timestamps – the last modified date of files at the GDAC is checked and if a file timestamp has changed the entire file is downloaded to the archive center. While this has the benefit of simplicity, it can be time consuming and not infrequently times out and must be completely reinitiated. These transfers can also be unstable and the completeness and integrity of the files download have not been verified.

Although the file transferring issue addressed here is targeted between the NODC and the US GDAC server, it can be applied to other Argo data centers as well. We suggest the approaches described the following sections to be considered by the Argo data management team for improving the file transfers between the GADR and the US GDAC with a potential use for file transferring between the Argo DACs (data assembly centers) and the GDAC.

#### 7.1.1. Use rsync or CDFSync to improve file transfer speed.

rsync is an open source (<http://www.opensource.org/>) utility that provides fast incremental file transfer. rsync is freely available under the GNU General Public License version 2 (<http://samba.anu.edu.au/rsync/GPL.html>). CDFsync is a program, developed by Joe Sirott of the NOAA's Pacific Marine Environmental Laboratory, which allows users to rapidly synchronize a set of netCDF files over a network. Fast synchronization times are achieved by only transmitting the differences between files. It is built on the open source rsync program, but contains a number of optimizations.

#### 7.1.2. Adapt a cyclic redundancy check (CRC) checksum algorithm to verify if the files transferred are not damaged.

cksum is typically used to ensure that files transferred by unreliable means have not been corrupted, by comparing the cksum output for the received files with the cksum output for the original files (typically given in the distribution). It is unlikely that an accidentally damaged file will produce the same checksum as the original file. The NODC has developed a Java-based program, known as “CRC32checksum.java”, to calculate the checksum of a file by using the java.util.zip package. The source code list can be found in the Appendix of the report.

### 7.2. File Format Structure Consistency

The NODC found that an Argo GDAC multi-profile netCDF format file with the filename of 31855\_prof.file located in the dac/aoml directory is inconsistent. The N\_PARAM variable in the file has a value of 4, but the STATION\_PARAMETERS variable has only two valid parameter codes, PRES and TEMP, and two codes with empty spaces. It is suggested that the two empty spaces should be filled in with “PSAL” and “CNDC”.

#### 7.3. Duplicated float identification numbers

The NODC discovered that there some float WMO identification numbers appeared in the gts directory are duplicated with floats in either the aoml or jma directories. The duplicated float identification numbers, as the date of October 5, 2005, are listed below and are needed to be resolved.

|                          |                          |                          |
|--------------------------|--------------------------|--------------------------|
| gts/2900080 aoml/2900080 | gts/2900371 aoml/2900371 | gts/6900102 aoml/6900102 |
| gts/2900093 aoml/2900093 | gts/2900372 aoml/2900373 | gts/2900547 jma/2900547  |
| gts/2900095 aoml/2900095 | gts/2900373 aoml/2900373 | gts/2900548 jma/2900548  |
| gts/2900096 aoml/2900096 | gts/2900374 aoml/2900374 | gts/2900549 jma/2900549  |
| gts/2900362 aoml/2900362 | gts/2900376 aoml/2900376 | gts/2900550 jma/2900550  |
| gts/2900364 aoml/2900364 | gts/2900392 aoml/2900392 | gts/2900551 jma/2900551  |
| gts/2900365 aoml/2900365 | gts/2900394 aoml/2900394 | gts/4900653 jma/4900653  |
| gts/2900366 aoml/2900366 | gts/2900398 aoml/2900398 | gts/4900654 jma/4900654  |
| gts/2900368 aoml/2900368 | gts/5900056 aoml/5900056 | gts/4900655 jma/4900655  |
| gts/2900369 aoml/2900369 | gts/6900101 aoml/6900101 | gts/4900656 jma/4900656  |

## 8. Conclusions

The NODC will continue to operate the Global Argo Data Repository and collaborate with the Argo partners for managing and archiving the Argo data and information in 2006. We will disseminate data and tools to the science and management communities, policy makers, conservation groups and resource users world-wide.

## Appendix . CRC32checksum source code listing

```
/**  
 *  Name of the File: CRC32checksum.java  
 *  
 * Copyright Notice  
 *  
 * As required by 17 U.S.C. 403, third parties producing copyrighted works  
 * consisting predominantly of the material produced by U.S. government  
 * agencies must provide notice with such work(s) identifying the U.S.  
 * Government material incorporated and stating that such material is not  
 * subject to copyright protection. The information on government web pages  
 * is in the public domain unless specifically annotated otherwise (copyright  
 * may be held elsewhere) and may therefore be used freely by the public.  
 * ======  
 */  
  
import java.io.*;  
import java.util.*;  
import java.text.*;  
import java.util.zip.CRC32;  
import java.util.zip.Checksum;  
  
/**  
 * -----  
 * This routine used to calculate the checksum of a file using the  
 * java.util.zip package.  
 *  
 * @author Charles Sun, Ph.D. (Charles.Sun@noaa.gov)  
 * @version $Revision: 1.0 $Date: 2005/10/21$  
*/  
public class CRC32checksum {  
    /**  
     * Return the software version number.  
     *  
     * @return VERSION  
     *  
     */  
    public static String getVersion(){  
        final String VERSION = "1.0";  
        return VERSION;  
    }  
    /**  
     * Return the software version number.  
     *  
     * @return VERSION  
     *  
     */  
    public static String getVersionDate(){  
        final String VERSION_DATE = "2005-10-21";  
        return VERSION_DATE;  
    }  
  
    /**  
     * Return the software name.  
     *
```

```

* @return PROGRAM_NAME
*
*/
public static String getProgramName() {
    final String PROGRAM_NAME = "CRC32checksum";
    return PROGRAM_NAME;
}

static long getChecksumValue(Checksum checksum, String fname) {
    try {
        BufferedInputStream is = new BufferedInputStream(
            new FileInputStream(fname));
        byte[] bytes = new byte[1024];
        int len = 0;

        while ((len = is.read(bytes)) >= 0) {
            checksum.update(bytes, 0, len);
        }
        is.close();
    } catch (IOException e) {
        e.printStackTrace();
    }
    return checksum.getValue();
}

static void getHelp() {
    System.err.println("Usage: java CRC32checksum "+<file_name> | "+
        "<directory> <inventory_file>");
    System.exit(1);
}

static void getChecksum(String dirName, String fileName) {
    File dir = new File(dirName);
    boolean isDir = dir.isDirectory();
    if (isDir) {
        // dir is a directory
        System.out.println("# Title : Compute CRC32 checksum and byte"+
            " counts");
        System.out.println("# Description : This file contains the "+
            "CRC32 checksum and byte counts of each file");
        System.out.println("# Project : ARGO");
        System.out.print("# Date this file was created : ");
        DateFormat df1 = DateFormat.getDateInstance(DateFormat.LONG);
        Date date = new Date();
        String s1 = df1.format(date);
        System.out.println(s1);
        System.out.println("# file,CRC32_checksum,byte");
        String record = null;
        int recCount = 0;
        String poundSign = "#";
        try {
            FileReader fr = new FileReader(fileName);
            BufferedReader br = new BufferedReader(fr);
            record = new String();
            while ((record = br.readLine()) != null) {
                if (!(record.startsWith(poundSign))) {
                    String[] elements = record.split(",");

```

```

        String file = elements[0];
        String full_path = dirName+"/"+file;
        long cs = getChecksumValue(new CRC32(), full_path);
        File ncFile = new File(full_path);
        // Get the number of bytes in the file, ncFile
        long length = ncFile.length();
        System.out.println(file+", "+cs+", "+length);
    }
}
} catch (IOException e) {
// catch possible io errors from readLine()
    System.out.println("an IOException error!");
    getHelp();
}
} else {
// dir is a file
    System.out.println("# file,CRC32_checksum,byte");
    long cs = getChecksumValue(new CRC32(), dirName);
    File file = new File(dirName);
    // Get the number of bytes in the file
    long length = file.length();
    System.out.println(dirName+", "+cs+", "+length);
}
}

/**
 * entry point to the class and application.
 * @param args Array of String arguments.
 */
public static void main(String[] args) {
if (args.length == 0) {
// prompt the user to enter the name of the directory where the Argo
// inventory file is located.
    System.out.print("Enter the directory name of the Argo data: ");
// open up standard input
    BufferedReader br = new BufferedReader(new InputStreamReader(System.in));
    String dirName = null;
// read the directory name from the command-line;
// need to use try/catch with the
// readLine() method
    try {
        dirName = br.readLine();
    } catch (IOException ioe) {
        System.out.println("IO error trying to read the directory name!");
        System.exit(1);
    }
    String fileName = null;
    System.out.print("Enter the name of the Argo inventory file: ");
    try {
        fileName = br.readLine();
    } catch (IOException ioe) {
        System.out.println("IO error trying to read the directory name!");
        System.exit(1);
    }
    getChecksum(dirName,fileName);
}

```

```
        System.exit(0);
    } else if (args.length == 1) {
        if (args[0].startsWith("-h")) getHelp();
        if (args[0].startsWith("-help")) getHelp();
        String dirName = args[0];
        String fileName = null;
        getChecksum(dirName,fileName);
    } else if (args.length == 2) {
        String dirName = args[0];
        String fileName = args[1];
        getChecksum(dirName,fileName);
    }
}
```