Report of the Argo Data Management Meeting, Ottawa, 18-20 Sep, 2002

The meeting began at 0900 on 18 September.

The welcome was given by Dr. Savi Narayanan, Director of the Marine Environmental Data Service (MEDS) on behalf of Dr. W. Watson-Wright, Assistant Deputy Minister of Science in the Department of Fisheries and Oceans, DFO, Canada. Dr. Narayanan noted that there were over a dozen countries and agencies represented at the meeting and this was always a good indication of the international interest and support for a project. She explained that the DFO was the primary governmental agency in Canada for carrying out ocean research. She remarked that DFO's mandate to understand Canada's ocean and aquatic resources, protection of the marine and freshwater environment, management and protection of fisheries resources, and maritime safety, commerce and ocean development. She noted that Data are a valuable resource that can be used and re-used to help in answering questions relating to DFO's mandate and that the department is committed to managing the data and information returned from its scientific research. She then reviewed the organization of Argo in Canada. Two PIs, Allyn Clarke at the Bedford Institute of Oceanography and Howard Freeland and the Institute of Ocean Sciences are responsible for the data. The MEDS is responsible for the data management activities acting as the Data Assembly Centre, DAC, for Canada. They are tracking about 50 floats at present in 3 oceans. Canada is committed to buying, deploying and tracking additional floats. She noted that Argo is an extremely important program as it permits sustained, in-situ observations to define the state of the ocean on its broadest scales. Argo complements conventional ship based, line mode sampling and will only succeed through international cooperation. She expressed her wish for success of the meeting, knowing that there was still much to be done to make Argo an operational program.

Bob Keeley, the local host and co-chair, thanked Dr. Narayanan for her presentation. He informed the meeting of the working hours and other local arrangements. He noted that he and his co-chair, Sylvie Pouliquen, would be sharing chairing duties for the different agenda items. Arrangements were made to provide a tour of MEDS to interested participants. Participants were provided an opportunity to modify the agenda and it is shown in annex 1. Finally, participants introduced themselves. A complete list is given in annex 2.

1. Review of National system development and milestone updates

Before the meeting, national reports were received from a number of countries. Additional written reports were invited for inclusion in the meeting report. Oral presentations of these reports were not made. Instead participants were invited to add remarks to supplement their reports. These reports are included in annex 3.

France noted that they provide DAC services to others, and consequently report included information on floats deployed and operated by Germany, the U.K., Denmark and the European Union.

Because both Chile and Peru were attending for the first time, they were invited to present information about the Argo programme in their countries. A summary of their presentations is included in annex 3 with the other national reports.

2. Review GDAC operations

a. ftp & www implementation

Thierry Carval presented a brief review of the operations of the Argo data system because there were so many new participants to the meeting. He then went on to describe the operations of the French GDAC. Details of their operations can be found in Annex 4. He noted that presently the ftp site was updated every 24 hours, but the www site was updated more quickly. He described their intentions to include a new "geo" directory for antarctic floats and that this would need to be coordinated with the US GDAC.

He explained the differences between the "geo" and "latest data" directories. In the geo directory, the day subdirectories are by observation day. in the latest data directory, the subdirectories is by day of processing. He explained that this latter use of day of processing was consistent with providing clients with the most recently received data. Since delayed mode data will be replacing real-time versions, the day of processing accurately indicates when the data were received.

At the last meeting, it was stated that it would be desirable to have all of the data from a single float to be built into a single file rather than the four file types presently used (profile, trajectory, technical and metadata). Limitations in the structure of netCDF make this difficult without greatly expanding file sizes (see discussions on ease of use later for more details). If there is a strong request from users for this to be done, GDACs will undertake the study. Users are encouraged to contact the GDACs.

In response to questions, Thierry noted that the data present in the "geo" and "latest data" directories were copies made from the files uploaded by the DACs to the "dac" directory. He also noted that the GDACs have software to ensure what appears in the "geo" and "latest data" directories are exact copies of what was received. He reminded the meeting that DACs are responsible for the individual profile files, and the float trajectory, technical and metadata files only. The files appearing in the other directories are the GDAC responsibility.

At present, trajectory data only reside in the "dac" directories. Uwe Send asked how a client could get access to float data from a geographic area like the Atlantic Ocean in a way similar to profiles. Thierry remarked that at present there was no way to do this. He also noted that this would be very difficult to do since trajectory files contained all of the surface drift information for a float., and a float may well cross from one geographic area to another. However, he suggested that such a request for data may be better met through the use of the www server rather than the ftp server. IFREMER expected this server to be providing profile data by October of this year and trajectory information a few months after.

Mark Ignaszewski explained that the US GDAC is online and operating in fully automated mode. The site is compliant with “US GODAE/IFREMER Data Servers”, Version 2.2 and the data files are compliant with version of the file specification as documented in the “Argo Data Users Manual”, Version 1.0. There are three DACs currently online: Canada, Japan, and the United States. The French DAC is expected online soon.

A Web interface has been added to site that allows the user to retrieve data based on position and time.

New addresses have been established for the US GODAE Server and, therefore, for the US GDAC. The web address is www.usgodae.org/argo/argo.html; the ftp address is

ftp://usgodae.usgodae.org/pub/outgoing/argo (or ftp://usgodae1.usgodae.org/pub/outgoing/argo/if coming from behind a firewall). (The old addresses still work for the moment.)

He went on to provide additional details about the US GDAC operations (again details can be found in annex 4). He noted that his ftp server is updated hourly and has the same structure as found at IFREMER. He noted that there is still no synchronization between the two GDACs but that this was expected by the end of 2002. He also noted that he was still carrying out manual notifications of problems found in files uploaded from the DACs to the GDAC, simply to check his notification process. The files on his server conform to version 2 of the Argo netCDF format.

The www interface was just installed and may still have a few problems. He expected to have a Live Access Server V6 up and running perhaps by the end of 2002.

The discussion noted that a number of DACs had recently started to send real-time data to the GDACs. These versions of the data are more complete than the data derived from the GTS and found in the "gts" directory on the ftp servers. The meeting asked that the GDACs remove the GTS versions of the data whenever the real-time data was also received directly from the DACs. This will remove any confusion over versions of the data and ensure that the clients get the best available version.

Before the next AST meeting , a status report of the data from floats that GDACs receive only through the GTS will be made. Considering this status, a decision will be made to keep or not this directory on the GDACs ftp servers.

Some DACs noted that they were having problems building netCDF files and asked if it would be possible to share software, or receive some other kind of assistance from other DACs. No simple solution was found to this, since each DAC had their own computing environment to operate in. The variation in environment meant that sharing software was not likely, although advice was always available. Both GDACs also have software that checks the structure of the netCDF files to ensure that files sent to them conform to the latest version of the Argo format. All available software written either by GDACs or DACs will be provided on the ftp site as example for people to start with netCDF files.

Other participants noted that some countries or agencies may not be able to support DAC functions and asked what should be done. In this case, we already have an example in the French DAC providing services to others. Any country or agency wishing to find out what services they might use should contact either co-chair of the Data Management Team (Sylvie Pouliquen or Bob Keeley).

In designing the GDAC operations, it was thought that there should be a delay of up to one hour between the time files were uploaded to the GDACs and when they appeared on the servers. The meeting decided this was not necessary and that removing this delay would allow for automatic processes to function more efficiently. Appropriate changes will need to be made in the documentation.

Mark noted that in most profile files, the first element in the pressure and data arrays were measurements made at the surface. However, he had found some files that recorded temperature and salinity measurements with the first element of the pressure array being the deepest pressure. The format specifications document makes no mention of ordering of the data. The meeting decided that profiles should be ordered from surface to bottom and requested that all DACs take this into consideration.

Bob Keeley noted that the netCDF format records pressures. However, the TESAC code form used on the GTS requires data be reported by depth. It is important that each DAC submitting data to the GTS make the conversion from pressure to depth using the standard UNESCO

algorithm (UNESCO Technical Papers in Marine Science No. 44, Algorithms for computation of fundamental properties of seawater, 1983).

b. Tools to ease data use

Howard Freeland presented some comments on using the data obtained from GDAC ftp servers. His premise was to use the ftp server to acquire profile data on a regular basis for a relatively small area of an ocean. He noted a few problems that he encountered including the following.

- There is a single inventory file at present and as the volume of data grows, this file will become substantial in size.
- The daily files in the "geo" directory contain data from whole oceans, and without and efficient inventory, clients may choose to download daily files only to find out no data exists in their area of interest.
- Even if some data do exist, the multi-profile daily files have large amounts of wasted space consumed by null values.
- To new users, netCDF files are "user hostile" and something needs to be done to help them.

In discussions, a number of points were brought up. It was noted that the ftp site is perhaps better configured for those clients that will be downloading larger volumes of data and have the necessary tools and experience with netCDF. In contrast, the www site when implemented likely will be better suited to provide data from smaller areas or restricted time periods. The multi-profile files do exhibit large numbers of null values, but this is a consequence of the netCDF structure and data being presented in daily files.

The GDACs also noted that they intend to produce an ASCII version of the data and that this should help users inexperienced in netCDF. It was remarked that desirable properties on an ASCII format would be that it easily moves into Matlab and spreadsheet applications.

It was suggested that one strategy to help users wishing smaller amounts of data but on a regular basis, would be for the GDACs to offer a subscription service. A client might provide their area of interest, type of data desired, a desired format and perhaps other criteria and the GDACs would provide regular uploads of data meeting their criteria. There are different ways to implement such a service (e.g. the UCAR LDM) and problems of unsubscribing that would need to be resolved. The GDACs were requested to consider if such a service is possible and how it might be implemented.

The meeting concluded that the first priority for the GDACs is to implement their www servers since this would provide an alternative to the basic ftp servers currently operating.

c. Float Ids

Mark noted that the inclusion of the letter Q in a float identifier has undesirable consequences.

- The Q is only added to data placed on the GTS, but it does not form part of the float identifier used by the WMO.
- DACs keep or remove the Q when sending data to the GDAC and this inconsistency is not good.
- There is confusion when looking for data from a particular float whether the Q designator is to be used or not.
- When GTS dissemination uses BUFR instead of TESAC, there is no need to use the Q designator.

The AIC strongly supported these views and urged the meeting to eliminate the use of the Q in any references to float identifiers. The meeting agreed. All DACs are instructed to remove the Q

in float identifiers in netCDF files. MEDS is requested to remove the Q when it forwards GTS data to the GDACs. Appropriate changes in Argo GDAC and DAC documentation must be made.

3. Products

a. Classes of products

This discussion classified products into three categories

- Data related - such as maps of the temporal and spatial coverage of floats, timeliness reports, etc.
- Network related - such as an assessment of the adequacy of the coverage of floats
- Science related - such as maps of temperature or salinity fields, etc.

The purpose of the products in the first two categories is to measure how well Argo is meeting its goals, whereas the last category is for research purposes. It was agreed that science products are appropriately left to the scientific community to generate, but the other two classes should be produced by the data system. It was also noted that the data system should be careful about generating products that appeared to be science related because this would likely be one of the earlier such products available from Argo and may give the impression that participants to Argo have first access to the data. This is not the message to be presented to the international community.

It was remarked that a number of data and network related products currently are being generated by DACs and GDACs. It was agreed that all these should be evaluated to evaluate which are the most effective and which are still not being generated by anyone. This is a task handed to the products working group. Membership of the group is shown in annex 6.

b. Data CDs for groups with poor internet access

Charles Sun of the US NODC presented a proposal of what the CDs for Argo could look like. Some of the attributes he suggested included inclusion of the Ocean Data View software that is included on the WOCE Data Resource DVDs, a number of other data visualization tools, data files, etc.

In the discussion certain attributes were decided. These included the following.

- The medium used should be CD rather than DVD.
- Internet links to Argo sites, such as the AIC, would be useful since not all of the users would have limited access to the Internet.
- The CD should have the same layout and tools as the GDAC servers. This will familiarize users with the GDAC structures and so make it easier for them when they are able to access the GDACs.

It was somewhat difficult to judge exactly what such users would want. Belbeoch had already attended a meeting of such users approximately one year ago, and Keeley was shortly to be attending a meeting to discuss "Potential Application of Ocean Observations for Pacific Island Nations". Their experience should help to guide what would be the more appropriate contents and they agreed to contribute their experience. The group emphasized that this CD production needed to keep in mind that the target audience were those with poor Internet access.

Questions were raised about what might be the cost of such a CD, how often it should be produced and what updated versions might contain. It was agreed that to useful the update frequency needed to be more often than yearly. It was not clear how many such CDs would be required, how they would be distributed or what might be the costs. It was suggested that rather than having one site create the updates, it may be better to create a template of the CD. This template would be distributed to any group wishing to create CDs for local or regional use.

It was agreed that a working group (see annex 6) should prepare a draft version of the CD for evaluation by the group and the AST. The draft should be circulated to members of the data management Team by December of 2002 with the target of having the CDs produced by September 2003. It was agreed that the time period of the data coverage should start 1 Jan 1999. This working group should also address the questions raised and resolve what should be done at least to begin.

4. Data format issues

a. ASCII version for groups who cannot use netCDF

At a SEREAD meeting, it was remarked that the netCDF format was too complex for some Argo data users. It was suggested that a simpler ASCII form might be used. The committee agreed that it was important to define an ASCII format available on GDAC www sites when users ask for data. It was decided that the Format Working Group would look at this issue trying to use, if possible, an existing format or at least adapt one. In the meantime the MEDATLAS format will be available at the Coriolis GDAC.

b. Metadata file format

The point was made to standardize the metadata files available at GDACs. Some DACs provide metadata in netCDF, others in ASCII (mainly ncdump of the netCDF file). It was agreed that all DACs will send metadata in the netCDF format described in the "User Manual". However, GDACs will define an XML view of this netCDF file that will facilitate the user access to these metadata files on the ftp sites.

c. BUFR

Keeley noted that little time had been spent on this issue. He had contacted the WMO to find out their current plans for assigning data in BUFR to different bulletins on the GTS. This is important since it is the bulletin headers that help a user to narrow down what data to decode. He noted that this was still being sorted out.

Keeley noted that writing data into BUFR is at least as complicated as writing into netCDF. There is no international library of BUFR routines, and so anyone needing to do so would have a significant amount of software development to undertake. He suggested that one consideration may be to have the conversion of Argo data into BUFR be centralized, or at least limited to a few sites. Woodward informed the meeting that Service Argos was building a subsystem in their software to put data into BUFR in preparation for the conversion of drifting buoy data distribution to BUFR in about 2 years time.

At other meetings, Keeley had informally polled some Argo users and heard that there was not a large demand at present to put data into BUFR. This was the general view of the meeting as well. The meeting agreed that encoding into BUFR would permit GTS distribution of all of the Argo data, not just profiles, but that this was not high on the list of priorities to be done at this time. Keeley was asked to continue to work at this, but on a lower priority basis.

5. Real-time QC

a. Review of effectiveness

Tran and Keeley presented results of their review of the effectiveness of the real-time QC procedures. They looked at the data that had arrived at MEDS from the GTS and passed these

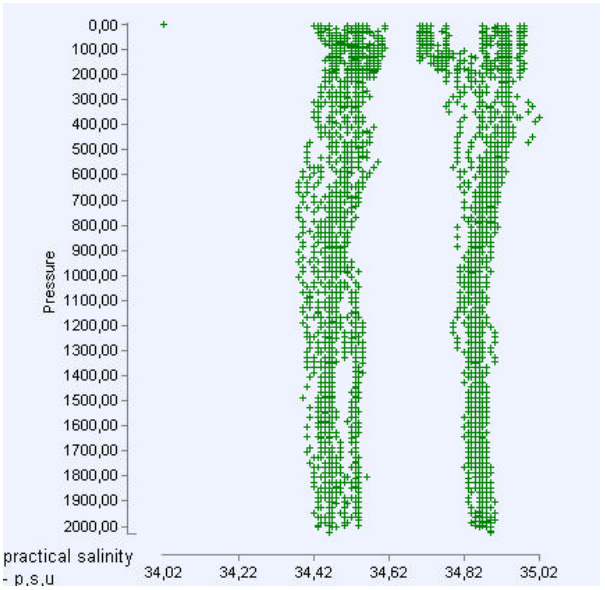
profiles through the automatic QC procedures agreed to at the last meeting. It was expected that some of the profiles would fail since it was known that not all data were passing through the agreed procedures yet. They examined approximately one year of data. They found that there were a number of instances where the Top and Bottom Spike Test was flagging good data as bad. This was exclusively at the top of the profile and was a result of too stringent rules being applied. The group debated the desirability of automatic tests having criteria set to be more effective at catching bad data at the expense of flagging good data or vice versa. In the end it was agreed that this test should be removed immediately from the automated procedures. It was also agreed that a working group should address this problem to come up with better criteria for this test and other tests that would be effective at detecting bad data.

b. Climatology test

A study conducted by Claudia Schmid, using a climatology test based on WOA98 (plus standard deviations provided by Levitus), and the NCEP analysis, concluded that 3% of good temperature profiles and 6% of good salinity profiles had questionable values that could delay their being sent to the GTS within 24 hours of observation. Problems occur, for example, in regions with strong and variable fronts and eddies (e.g. Gulf Stream) and regions with large interannual variability (e.g. eastern tropical Pacific). In addition, the salinity maximum of the subtropical underwater in the float data examined is often larger than in the climatology (while looking perfectly fine). At the present time most regions have adequate climatology for temperature. However, there is such a scarcity of historical salinity that much more work is required to establish a reliable climatology.

The conclusion was that it was better to pass some bad data rather than hold back good data to make the 24-hour target. Moreover, data assimilators have their own QC before assimilation so they prefer to have access to more data even if some are bad. Considering the above mentioned failure rates of good profiles, it does not seem appropriate to let a climatology test delay the transmission of data to the GTS. However, the results of this test can be made available to the community in the netCDF files posted to the GDACs.

However the main difficulty is to detect a sensor drift in real-time because, especially if the drift is evolving slowly, most assimilation centers would not reject these data. Greg Johnson and Annie Wong agreed to study the possibility to detect a drift in real-time data and, to provide the DAC with an adjustment that may be applied to data before sending to the GTS. The result of this study will be presented at the next Data Management meeting in 2003.



Salinity jump between two cycles

In the meantime we have to provide the information to users by inserting comments about suspicious floats in the metadata file. Another way of notifying users of suspect floats may be to use the DBCP Buoy QC mailing list. A proposal will be drafted by Keeley and Pouliquen and sent to DACs to get their views.

c. Additional tests

No additional tests for profiles were proposed.

There was discussion about developing tests to quality control trajectory data. There were a number of unresolved questions, such as how to determine the locations where a float surfaces as compared to where it first reports, where it sinks, etc. There are no agreed procedures for making these determinations and so the co-chairs will raise the question with the AST and seek their advice on how to proceed.

d. CLS implementation

Bill Woodward presented the actions being undertaken by Service Argos in support of Argo. He noted that at the US offices in Largo, Maryland, AOML installed its software to process, automatically quality control and distribute the data to the GTS in real-time. Much of the data from US floats pass through this system. He noted, however, that at CLS in Toulouse, France, they were wanting a more streamlined solution and were contracting to have software developed to do this in the future.

The meeting agreed that both in the USA and in France, CLS had to apply the Real-time QC tests before inserting data onto the GTS. CLS/France should apply the AOML real time QC procedure while they are developing a more integrated solution. DACs who are using CLS services to put data on the GTS were encouraged to send data in netCDF rapidly to both GDACS.

The meeting recommended that Argo should also have a better representation at DBCP so that recommendations coming from them that affect Argo are properly vetted to meet Argo needs.

6. Delayed Mode QC

Several presentations were made on different aspects of the scientific (delayed-mode) quality control process. A discussion of the present status, areas of consensus, and plans for implementation and improvement followed these. Conclusions were:

- The scientific QC process should include at least two (or three) steps – one is a salinity recalibration process using a standard climatological database. Following salinity recalibration, another step is examination of individual profiles by a P.I. or equivalent salinity expert. These steps should be carried out in an equivalent manner everywhere.
- The salinity recalibration process will be based on the system developed by PMEL (Wong et al, 2002), with appropriate regional adaptations.
- The climatological database to be used initially for salinity recalibration should be discussed and agreed by participating regional centres for each ocean. For example, a suggestion was presented by JAMSTEC for constructing a Pacific database using data from WOD98 and Hydrobase. WOD98 contains more recent data but the internal QC of Hydrobase is more rigorous.
- For updating the climatological database with recent data, Argo should seek help from CLIVAR and its hydrographic program office.
- Regional adaptations and improvements to the recalibration system should be discussed and agreed by participating regional centres. Those regional centres will be responsible for making the recalibration software and climatological dataset widely available (distribution might be via the AIC).
- The roles and responsibilities of regional centres need to be described and widely available. This needs to include descriptions of how regional data will be compiled, how data from floats moving into and out of regions are handled, standardizing on climatology.
- An effective process for feeding information on salinity recalibration back into the real-time data stream should be studied. It was noted that real-time recalibration will be sub-optimal, but in principle it's possible to make significant improvement to salinity estimates from many floats (see item 5b).
- In cases where the P.I. or salinity expert rejects or changes recalibration information, a reason should be provided in the data file. A set of guidelines should be developed to assist salinity experts and improve the uniformity of this procedure across the data system. Profile examination by salinity experts requires a substantial commitment of resources, but is necessary in Argo.
- The details of the scientific QC process needs to be sorted out before delayed mode data start moving into the GDACs.
- The technique for documenting the results of the QC process needs to be clarified. A small working group consisting of Schmid, Wong, Keeley, Gronell, and Carval will undertake this).
- Specific instructions and examples are needed to show how to insert information from scientific quality control into Argo netCDF data files (corrected salinity, salinity error, flags, comments). The first step to be implemented will be transfer of salinity recalibration information between regional centres and DACs. It was noted that for floats needing correction to pressure data, that correction should be done prior to the salinity correction.

There are a number of issues raised here and there is no one solution for them all, nor is there enough experience to be able to carry out some of the tasks mentioned. Some of the work will proceed through the WG dealing on QC Process Documentation, and the Formats WG. For those issues for which there is no immediate solution, the co-chairs will try to organize email discussions, meetings or seek advice from the AST.

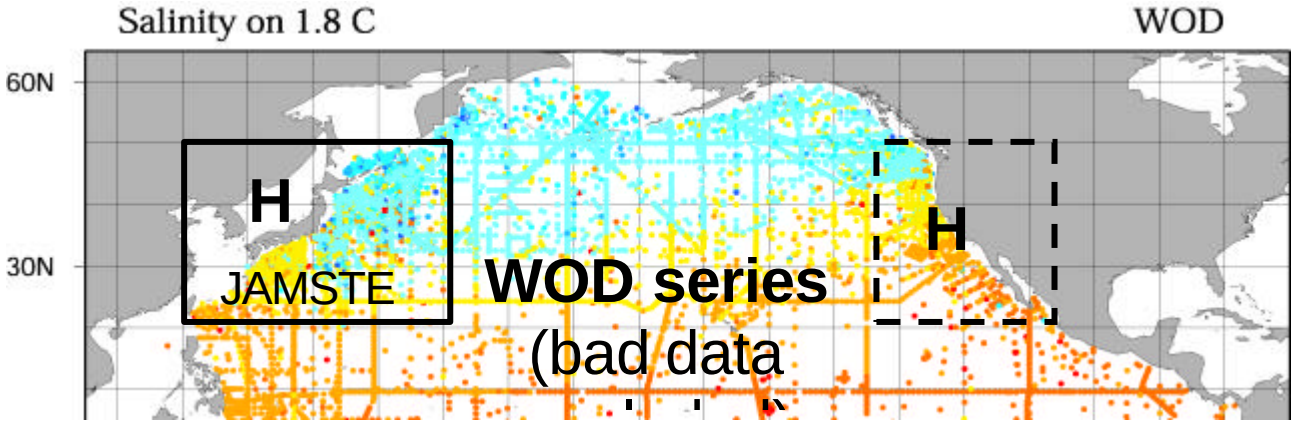


Figure 1: Schematic of JAMSTEC suggestion for merging WOD and Hydrobase climatological databases. For each ocean basin, regional data centres involved in salinity recalibration should reach agreement on the best climatological database.

a. Adoption of Wong procedures

The PMEL salinity correction system for Argo floats was first presented at AST-3 in March 2001 and again at the Data Management Meeting at Brest in November 2001. At AST-4 in March 2002, it was recommended that international Argo partners test the system. This system is presented in detail in Wong et al. (Wong, A. P. S., G. C. Johnson, and W. B. Owens (2003) Delayed-mode calibration of autonomous CTD profiling float salinity data by theta-S climatology. Journal of Atmospheric and Oceanic Technology,). A preprint of this article and diagnostic plots from the system as applied to U.S. floats are available at http://floats.pmel.noaa.gov/argo. At this meeting, we focused on how the system provides both a salinity corrections and an error estimate for the corrected salinity based on the theta-S climatology statistic, and how the system takes temporal variability of theta-S relations into account. We showed an example where the system works well, and where it does not work well, and demonstrated how tuning some of the system parameters could improve the system performance. We also indicated, based on French, Japanese, and UK experience, how improving the theta-S climatology can also greatly improve system performance. Planned improvements to the current system include making the length of the calibration time-series variable, allowing for discontinuities in the float calibration, tuning mapping spatial scales and the calibration time-series variable, adding screening of near-surface points, and incorporating improved climatological data sets as available. Outstanding issues after these improvements are made include how to incorporate sub optimal salinity correction projections into the real-time QC process and how to update the climatological database with new CTD data. An even more distant issue is how to build a system for intercomparing float salinity data to make an internally consistent database, more of a reanalysis issue than a delayed-mode quality control issue.

b. JAMSTEC experience

S. Minato and T Kobayashi made a presentation. They showed the results of their work testing the Wong procedures using float data from the North and Subtropical Pacific. For climatology, they used a combination of World Ocean Database 98 (WODB98) and Hydrobase. They made a number of interesting comments including the following.

- They requested a step by step standardization of the process for carrying out scientific quality control

- They found that there were a significant number of occurrences where the CRC result was in error.
- They requested a clear description of how to include test results and information into the History structure in the netCDF file.
- They noted that in he subtropical Pacific, the 1500 db level was too shallow for calibrations.

c. Gould experience

Gould reported application of WONG et al DM QC process to floats from Indian Ocean deployed on 32S.

Motivation was
a) to get experience of using the system
b) to apply the system to a "typical" ocean area (i.e. one with a sparse climatology)
c) UK interest in the area is that it is one in which decadal scale changes from anthropogenic impacts might be first detected.

Results are typified by float 09315. It migrated from an area with a recent 1990s climatology to one where the climatology is over 30 years old. In that time the ocean has changed and this means that the application of Wong et al forced the calibration away from the truer uncalibrated values.

Adding more recent (from deployment cruise and from WOCE to the WOD'98 climatology improved matters.

Conclusions reached were
- Using recent CTD data, the detection limit for temporal changes is 0.01 (based on spatial variability) i.e. over 3 months can't distinguish between calibration offsets and ocean changes.
- Software is geared to handle slow drifts. Profiles with sudden offsets present problems. (e.g on first few profiles - settling in)
- Recent, high quality climatology on WOCE scales is essential to make the "Wong et al" method work
- This is recognised by Wong et al but tools to ingest recent CTD data are needed
- DM QC centres need speedy access to ship-based CTD data.
- Even sparse data are helpful
- Unless salinity sensors improve greatly we will need to keep gathering CTD data on WOCE scales to enable Argo to look at spatial scales of decadal change.
- Data runs of longer than 3 months are needed to increase confidence in corrections. This has implications for DM QC timescales.

Discussion suggested that a role for regional date centres would be to update climatologies and to ingest recent CTD data. This requires partnerships with research programmes (CLIVAR) and its data system (probably continuing to use WOCE Hydrographic Programme Office)

d. British Oceanographic Data Centre (BODC)

Representatives from the BODC made a number of general comments. Included in them were the following points.
- If regional data centres construct their own climatology there will be chaos.
- The description of the Data State Indicators is confusing. It seems overly complex and will require some clarification in order to be effective.

7. AIC web site

a. List of national contact points

Participants were urged to be sure that the appropriate national contact points for the data system were known by the AIC.

b. Revised web site

The AIC was established in early 2001 to serve the Argo community, under the auspices of IOC & WMO, assisting as appropriate in the implementation of a global network. The web site provides the formal mechanism for informing designated contact points in Member States about float deployments, shows how to track float positions, and gives access to float data, in compliance with the IOC Resolution XX-6. All material included on the website is free.
Administration, development, and maintenance of this web based information system are done by the Technical Coordinator (TC). CLS, which is hosting a dedicated server, provides operational Internet connection, mail server, firewall and backups. Some extra costs (regarding the basic logistic contract with CLS), including hardware and software have been covered through the integration within JCOMMOPS.

The Argo TC presented the AIC website developments. The committee was asked for feedback about possible problems of access, page loading times, etc., and to suggest future upgrades or developments.

Beyond the real-time Monitoring System (interactive & dynamic maps), the website provides:
- General information on Argo
- Tools for national and international coordination
- Tools for assisting network implementation
- Tools for assisting Data Management
- JCOMMOPS integrated tools (Argo, DBCP & SOOP)
- Materials for communication
- Documentation
- Links
- Homepage http://argo.jcommops.org
- Forum http://forum.jcommops.org
- FTP ftp://ftp.jcommops.org
- General Mailing List argo@jcommops.org
- Technical Mailing List argo-tech@jcommops.org

The Argo TC proposed to gather different tools (pieces of code, software, etc.) to convert data formats, and to design a dedicated web page for their distribution. This should assist new Argo participants in their data processing. National Argo websites host some pages with products (maps, graphs, etc.) for their platforms. The Argo TC advised that the URLs to access these pages should be based only on the WMO ID and not on a mixture of Argos, WMO and internal Ids.

The meeting noted that a lot of improvements have taken place on the AIC web site and most of the information is now available. A number of additional comments were made as follows.
- Users asked to have the floats currently operating listed in order of most recent first.
- The web site has still the problem of the maps cut in the middle of Pacific Ocean that has to be solved.
- In the monitoring pages users asked for weekly updates to the map presently done monthly and would appreciate time history of floats operating on a monthly basis.
- In the notification form the TC was requested to add an "are you sure button", before sending the email all around the world.

- For the documents referenced on the AIC site and not maintained by AIC it was asked to point to the master sites rather than duplicate the file on AIC.
- AIC proposed to set up a tool to help on finding deployment opportunities. The committee encouraged AIC to continue on this way.
- AIC issues a letter once a month in which there is place for country reports. Users/PIs/DACs are invited to send their contribution to the TC. The Argo Science Team should study how to send this letter to a wider community than the Argo one.

c. Milestones

The meeting noted that the milestone application on AIC is a good tool to see how the network and data system is becoming operational. DACs are encouraged to update their page regularly.

8. Long Term Archive plan

Charles Sun presented a proposal for the operations of the long-term archive for Argo. He described functions being designed at the US NODC to build what they are calling the Global Argo Data Repository, GADR. He described a number of functions including the following.

- a web site with links to documents, DACs, GDACs.
- a web site providing on-line access to the data with sub setting and data visualization tools, multiple format generation capabilities
- an archive maintained in Oracle.
- download capabilities and schedules to capture data from the GDACs.
- quality checking software for data acquired from the GDACs.
- capabilities to integrate data from other instruments with Argo data.

A number of questions and comments were raised in the discussion. These included

- The proposed web site shows a high degree of duplication with AIC (documents, list of DACs or GDACs)
- The Argo ASCII format will be decided by formats working group
- Are QC procedures needed at all at GADR?
- What distinguishes the data on the GDACs from the data at the GADR?
- Where does someone get oldest to newest data?
- Is there a clear boundary between the functions performed by the GDACs and the functions performed by the GADR?

The meeting came to following conclusions about the operations of the GADR.

- If problems are detected in the data downloaded to the GADR, they will undertake no changes. They need to contact the originator, either through the DAC or the PI directly, to inform them of the problem found and let them resolve the issue.
- The GDACs should hold all of the Argo data and they are the source. The GDACs said that they will provide access to all the archive as long as they are funded and they have no plans to remove data from their ftp and www sites.
- The GADR should safeguard versions of the Argo data and information found at the GDACs.
- The Argo data at the GADR should be up-to-date with the data on the GDACs.
- The GADR should provide users with data sets on demand that integrates Argo data with other types of data collected.
- The suite of tools to permit sub setting and visualization of data on the GADR should be identical or similar to those found at the GDACs.
- CD or other hard copy generation of Argo data should be done in cooperation with the GDACs

The meeting decided that the functions of the GADR needed to be further refined and formed a working group to do this. (see annex 5)

There was some discussion about what can or should be done about other groups outside of the Argo data system setting up servers for Argo data. The hazard is that these servers may be out of date with the versions of data offered and this could cause confusion. It was accepted that such a situation may very well arise but that there was no mechanism for the data system to control such actions. The best that we can do is ensure users of the Argo data system are consistently pointed to the GDACs as the master source of data, and to request servers outside the data system to do the same.

9. Review of documents

The meeting was asked to comment on all of the documents that were already available. These include

- The Data Management Handbook
- Users manual for formats
- Format descriptions - metadata, profile, trajectory
- GDAC operations
- Real-time QC procedures

It was noted that it will be necessary for authors / editors of these manuals to make certain updates as a result of decisions taken at this meeting. Additional comments were as follows.

- The Data Management Handbook needs a clearer description of the data flow in the Argo data system, and more polished diagrams illustrating the data flow
- The Users manual for formats did not have a properly descriptive name. Since this manual included not only the format description but also the user manual it should be called the Argo Data Format and User Manual.
- The Format descriptions manual be removed from distribution since all of its information was contained now in the Users Manual just discussed.
- Text in the Format descriptions manual had some minor errors that needed corrections. Those noting the errors should provide them to Carval.

Additional documentation would be needed for parts of the data system being developed. So, we would need documentation on the recommended scientific quality control procedures, and a document describing operations of the GADR. It was also suggested that a Frequently Asked Questions, FAQ, be including at the GDACs to help guide users on the best way to access data, either on the ftp or www servers.

Finally, it was noted that the current suite of documentation exists only in English but that Argo includes a number of non-English speaking countries. It was agreed that the co-chairs should investigate what might be done to have the manuals translated into other languages.

The format of the metadata file was raised once again. At the moment, these files are in netCDF but some participants thought this was inconvenient. The GDACs will provide an XML version of the netCDF metadata files on the ftp sites.

Charles Sun had asked PMEL to review the Argo formats and he informed the meeting of their comments. They noted that

- A lot of attribute type information is embedded in variables as character data. Most programs that read netCDF files (with the exception of ncBrowse) do not deal well with character variables.
- Because there are no dimension variables for position or time, it is necessary to manually associate a variable (that defines an axis, for example, depth) with temperature. ncBrowse can do this association, but it is necessary to use the “New Map...” button to create a mapping.

- The Argo netCDF files do not specify a “CONVENTIONS” attribute. This attribute can be used by software, for example, EPIC, to determine how to read the file.

Other comments related to the format were as follows.

- We need to be sure the text in the user manual is very clear about what is placed in fields. For example there is some additional clarity needing to describe what is included in the field for the position and time of the profile.
- The QC flags should be written as arrays but under the current format specification these are character strings.
- The software written by the GDACs only carried out checks of the structure of profile files. It was noted that some checks would be necessary to ensure the content also made sense.

10. Other business

A few additional points were discussed:

- Paul Hill of Seimac asked to attend. He would like a forum where his company can show off what capabilities they have. This is not the only industry representative who would like to present technical development to Argo community. Perhaps the AST could organize a technical meeting at the occasion of a conference where many Argo actors will be present. This may also help new countries starting with floats to have an easy access to technical information.
- Schmid pointed out that a profile that fails a QC test because of a salinity offset will be flagged but we want scientific QC to look at these and generally they would not look at data flagged wrong. Carval, Gronell, and Wong will propose a way set up a correct data flow for scientific QC (see item 6).
- Roemmich emphasized that the next challenge for the Argo data system is to set up the delayed mode loop. For next AST meeting, he wants examples of floats whose data passed through scientific semi-automated and expert QC and results in standard Argo format in at least one Argo basin. PMEL will do it over Pacific, CORIOLIS proposed to do it over Atlantic. Data system members should help in getting the data to the experts and storing the information they produce.

11. Time and Place of Next Meeting

Mark Ignasewski offered to host the next Data Management Team meeting in Monterey sometime in the October to December time frame of 2003. This was accepted.

Keeley proposed that the Data Management meeting to be held after Monterey should overlap a day with the AST meeting. This would allow for direct contacts between the two teams to see how each was working. This was taken under consideration.

The meeting adjourned at 1400 on Sep 20. A complete list of action items is given in annex 5. Working groups and members are given in annex 6.

Annex 1: Agenda for Argo DM meeting

18 Sep, 2002 at 0900
Welcome

1. Review of National system development and milestone updates
2. Review GDAC operations
    d. ftp & www implementation - Carval, Ignaszewski
    e. Tools to ease data use - Freeland / Keeley
    f. Float Ids - Ignaszewski

3. Products - Molinari
    a. Classes of products
    b. Data CDs for groups with poor internet access – Belbeoch / Sun

4. Data format issues
    d. ASCII version for groups who cannot use netCDF - Belbeoch
    e. Metadata file format - Ignaszewski
    f. BUFR - Keeley

19 Sep, 2002 at 0900

5. Real-time QC
    a. Review of effectiveness - Keeley
    b. Climatology test - Schmid
    c. Additional tests - Roemmich / Keeley
    d. CLS implementation - Woodward

6. Delayed Mode QC
    e. Adoption of Wong procedures – Roemmich
    f. JAMSTEC experience - Minato
    g. John Gould experience
    h. UK

7. AIC web site - Belbeoch
    d. List of national contact points
    e. Revised web site
    f. Milestones

20 Sep, 2002 at 0900

0930, Welcome – Assistant Deputy Minister (ADM), DFO Science

8. Long Term Archive plan - Sun

9. Review of documents
    a. Handbook - Pouliquen
    b. Users manual for formats - Carval
    c. Format descriptions - metadata, profile, trajectory - Carval
    d. GDAC operations - Pouliquen
    e. Real-time QC - Keeley

10. Other business
    a. Using DAC QC flags in scientific QC
    b. Review scientific QC discussions

11. Time and Place of Next Meeting

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Annex 3: National DAC Reports

Australian National Argo Data Report

1. Status

Data is currently acquired from 5 active floats. Another 10 will be deployed in September. A further 10 floats will be deployed, in cooperation with the Australian Bureau of Meteorology, as opportunities become available over the next 6 months.
Data from 4 of the active floats are being put on the GTS through our link with the Australian Bureau of Meteorology. Data from the fifth float is of dubious quality and will not be distributed until we can improve it.
We are currently writing the programs to encode the float data into the required netCDF format for GDAC distribution. We should have this completed by early November at the latest.
The data being distributed to the GTS has already undergone real-time QC: pressures are adjusted for pressure sensor drift (up to 10db) and salinities have been calibrated against deep recent CTD data from the region.
Our data is being looked at by the PI (Susan Wijffels) but no formal delayed mode QC is being done at the present time.
All our data is available on our web pages (http://www.marine.csiro.au/~waring/cooe/float_status.html), through the link to "current status". We also have raw and calibrated profile plots and both temperature and salinity sections for each float. The calibrated data in ascii form is available through a link from the profile plot page.

2. Delayed Mode QC

Salinity drifts are determined using recent CTD data from the region (WOCE and JADE cruises): comparisons are done on deep potential temperature surfaces.
Float data are then compared with a high resolution regional climatology, to help check for pressure/temperature drifts. For instance, one of our floats appears to be suffering from a large pressure sensor drift, though we are not sure if this is correctable in delayed mode.
We currently do no delayed-mode checks on the drift data.

Canadian National Argo Data Report

1. Status

Data acquired from floats. We are presently tracking 48 active floats. Of these, 5 may be in trouble or may have failed.

Data issued to GTS. All data are issued to the GTS. Although there are variations, more than 85% of the reports are issued to the GTS within 24 hours. Longer delays are usually caused by incomplete messages received from the floats.

Data issued to GDACs after real-time QC. We have spent a great deal of time working with both GDACs to issue data to them in the agreed format. At the same time, software was being developed at the GDAC to check the format of the incoming data. Combining these two activities meant that corrections were needed both in the files written and in the software. This delayed our successful transmission until mid August. We are now routinely sending files to the GDACs on the same schedule as they are issued to the GTS.

Data issued for delayed QC. MEDS has been issuing data to the PIs on a regular basis for some time now. The PIs are working to accept the data, transform them to a form they can work with and send them back to MEDS. At the moment, no data have been returned to MEDS, but we

expect to have a sample file returned from our PI on our west coast fairly soon. We would hope to start routine transfers by the end of this year.

Our PIs are also working to implement delayed mode QC techniques. At the moment these are not those suggested by Annie Wong.
Delayed data sent to GDACs. This has not yet happened.
Web pages. MEDS maintains pages that show float tracks, and some aspects of the data collected for all of the Canadian floats, active or dead. Data are available for Canadian floats as well, but we alert viewers that the official version resides at the GDACs.

We also show some simple information about the global programme including the positions of float reports each month, the success rate of meeting the 24 hour target for getting data to the GTS, number of floats reporting, and some statistics on how long floats report continuously.

Readers may go to
http://www.meds-sdmm.dfo-mpo.gc.ca/meds/Prog_Int/argo/ArgoHome_e.html
to see the pages.

2. Delayed Mode QC

Howard Freeland is implementing delayed mode QC on the west coast. When suitable processing is established this will be transferred to the east coast. A trial run on a few floats has taken place and we are revising procedures so that we can meet the QC requirements of MEDS. We are examining each profile to eliminate spikes or mark unlikely observations. Also we are comparing the temperature and salinity in deep water, to look for offsets and drifts which will be corrected as best we can. We have no present expectations that the objective techniques developed by Annie Wong will be implemented as we simply do not have the resources or expertise either to implement it or to run such a system

At BIO, each profile obtained in the North Atlantic is compared visually against recent climatology and the appropriate Oceans Feature Analysis or SST product. The magnitude and direction of the deep and surface drift is also evaluated in terms of the circulation elements consistent with the surface oceanographic data products. This provides a gross check on the functioning of the SeaBird CTD sensors. These checks are currently being carried out by Allyn Clarke.

We will try to move from a visual comparison to a quantitative comparison early this winter based on the deep T/S properties of the profiles and begin maintaining salinity anomaly time series for each float against temperature and geographic position within the regional climatologies. We will examine these time series for possible salinity sensor drifts assuming to the first order that temperature and pressure remain well calibrated.

3. GDAC Functions
Canada has no GDAC functions

4. Regional Centre Functions

On the west coast it is expected that in the near future we will endeavour to offer standardised products concerning the state of the ocean in the Gulf of Alaska. This is likely to be implemented early in 2003. Will this then constitute us as a “Regional Centre”?

Chilean National Argo Data Report

In 2000, Chile nominated a national contact point for the ARGO Project in accordance with IOC resolution XX-6 to be able to handle information about buoy deployments that may drift into its EEZ.

At present, Chile has not immediate plans to buy and/or deploy Argo buoys offshore Chile. However, in terms of operational international cooperation with the Argo community , expected Chilean activities might be similar as previous participation in operational scientific programs as (ISOS,TOGA,WOCE), in terms of :

- Deployment facilities onboard Chilean Naval vessels on regular scheduled tracks (e.g. southern summer suply vessels to the Antarctic). This can be worked out if a formal requirement is made through the proper channels .
- Provide assistance regarding custom requirements at ports to facilitate the entry and transit of scientific equipment (ARGO buoys) to deploying vessels

On the other hand, data management activities at its national Data Center (CENDOC) calls for an active participation in the present and future meeting to get acquainted for ARGO data handling and quality control procedures in order to be prepared to answer future national user requirements as well as to handle in real time the data coming from buoys entering its EEZ. Near plans to be a more active data center, is set to cooperate with GDAC in order to produce and provide national users with ARGO data products in CD for those national users having problems to access the internet. Also, to pass the knowledge of ARGO activities to national user through links at CENDOC´s web page as well as technical information transference through local workshops to the ocean national data manager community.

Ricardo L. Rojas
National contact point for ARGO in Chile

French National Argo Data Report

Status of the DAC

Coriolis Data centre process Argo floats for the french projects, a part of the Argo european community and for a chinese float.

Data acquired from floats
Coriolis is able to process Provor (Martec and Metocean) and Apex floats in real-time. We actually process 113 floats:
French floats (Shom and Coriolis): 9
German floats: 19
UK floats (Provor only): 3
Danish floats: 5
European Union program Gyroscope: 77

The total amount of Argo profiles processed at the Coriolis data centre is 4117.. Since the beginning of the activity the Coriolis data centre has processed data coming from 135 floats.

Data issued to GTS: All the data processed at Coriolis are pushed on the GTS by the way of Meteo-France
Data issued to GDACs after real-time QC: As the Coriolis data centre is running as DAC and GDAC all the data processed at the Coriolis (DAC) are available on the GDAC Coriolis. For the time being only profiles and trajectories are available; Metadata will be available after this meeting when the question between Netcdf or text will be solved.
Data issued for delayed QC: No delayed QC has been applied to the data processed at the Coriolis data centre
Delayed data sent to GDACs: No delayed data have been sent to the GDAC.

Web pages: Version 1 of the Coriolis data centre is presently running with the associated web pages. We are looking for the exhaustive data set (processed by Coriolis and received from the GTS)
Version 2 of the Coriolis data centre will run by the end of september with the associated data selection tools

2. Delayed Mode QC
Annie Wong software has been tested by Y Desaubies and his team within the Gyroscope project and has given interesting results (presented at the Iast meeting). Delayed mode QC will be performed when procedures have been approved by the Argo Science Team and a Regional Center set up at Coriolis.

4. Regional Centre Functions
Not yet set up

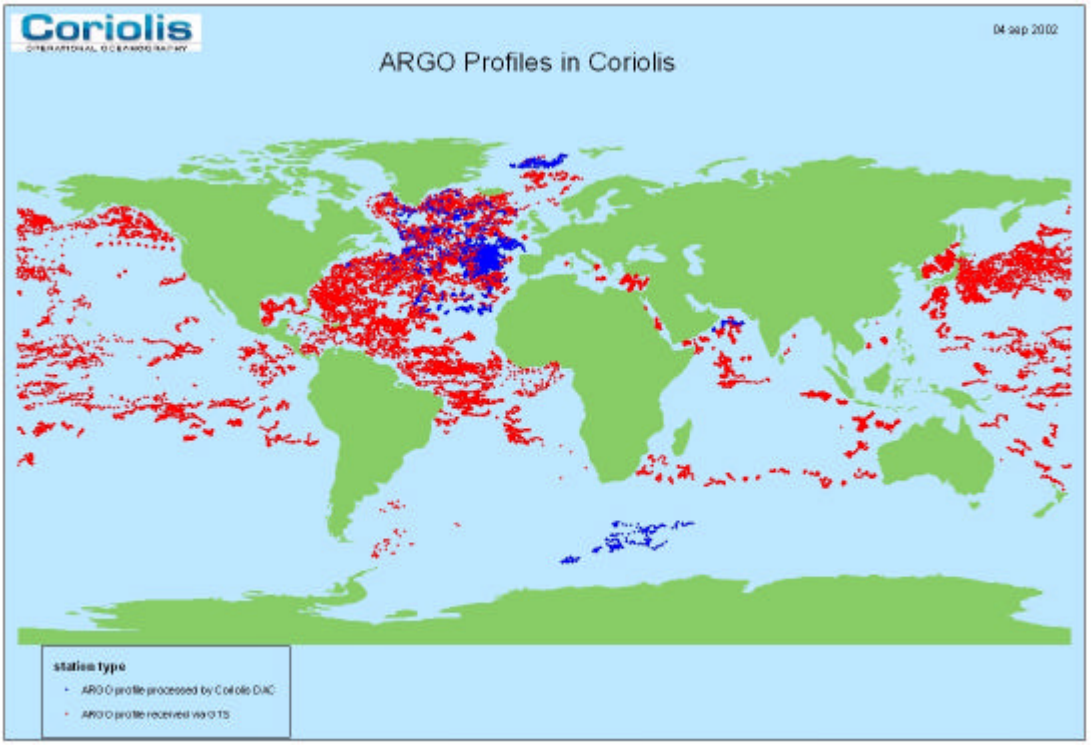

Fig 1: 23.789 profiles from 809 different Argo floats in the Coriolis database

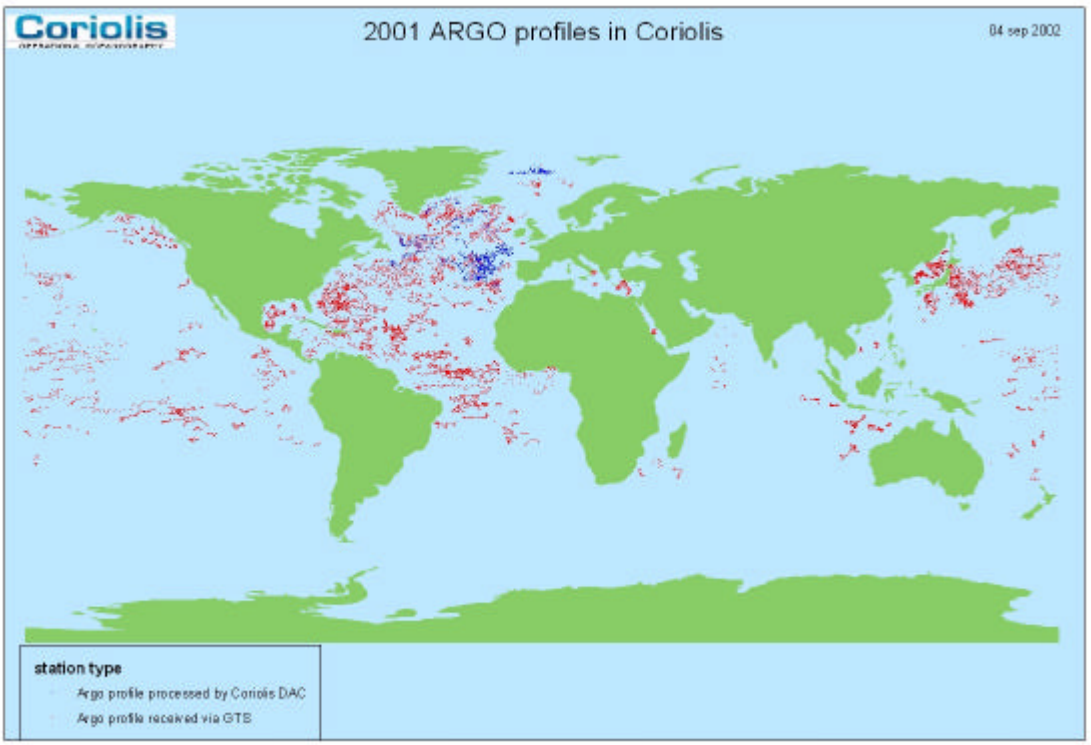

Fig 2: Coriolis Argo profiles acquired in 2001

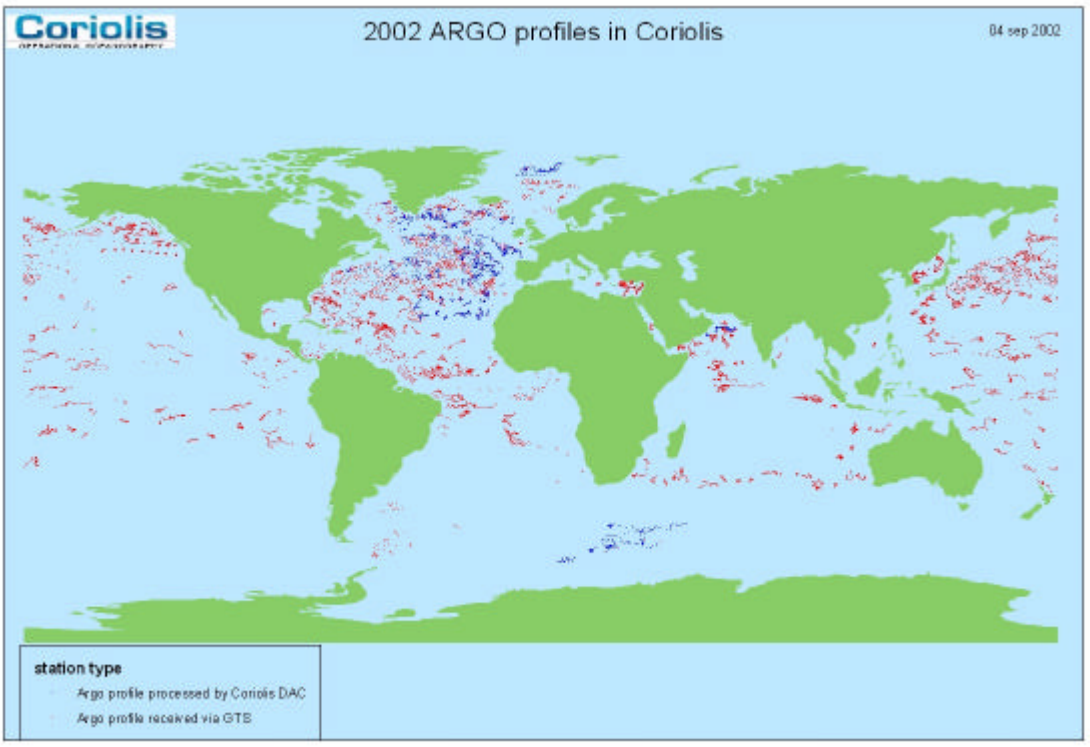

Fig 3: Coriolis Argo profiles acquired in 2002

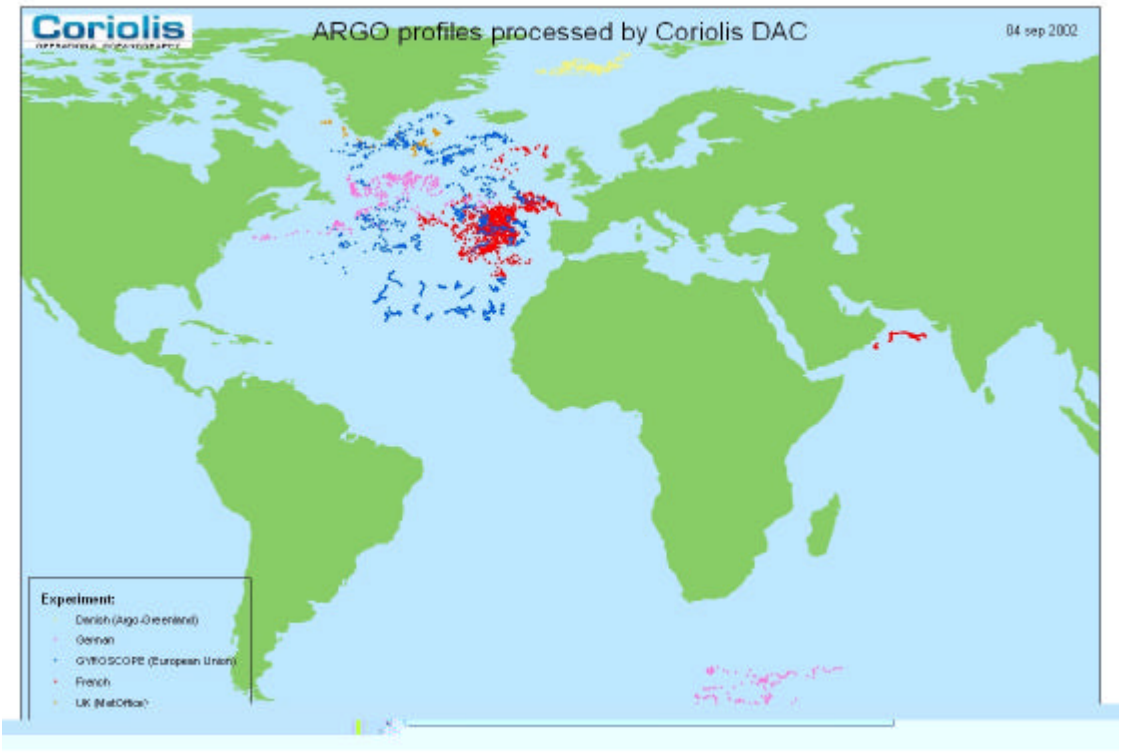

Fig 4: Argo profiles processed by Coriolis (DAC function)

Japanese National Argo Data Report

1. Status

Data acquired from floats. All Japan Argo floats data are transmitted to national data center via PIs in real time.

- Data issued to GTS: Operational
- Data issued to GDACs after real time QC : NetCDF profile files have been issued to both GDACs since the end of August 2002.
- Data issued for delayed QC: Operational
- Delayed data sent to GDACs: The Argo data handling system is under remodeling as to issue them as soon as the standard delayed mode QC procedures are defined.
- Web pages:
  - Real time data center provides followings through the Web page (http://argo.kishou.go.jp).
    a. Japan Argo netCDF files
    b. Global and regional distribution map based on the GTS data
    c. TS profile graphics (based on the GTS data)
    d. TESAC messages
    e. Monthly mean sub-surface temperature distribution in the Pacific Ocean
  - Delayed mode data center provides followings through the Web page http://www.jamstec.go.jp/ARGO/).
    a. Trajectories and Profiles of Argo Profiling Floats operated by JAMSTEC/FORSGC
    b. Float ascent schedule of Argo Profiling Floats operated by JAMSTEC/FORSGC
    c. Search Function of all Japan Argo float by Area/Period or by WMO ID
    d. Table of all floats deployed by JAMSTEC/FORSGC
    e. Float Coverage Map

f. Argo Technical Report FY2001

2. Delayed Mode QC

Delayed Mode QC is done by JAMSTEC. Documentation is in preparation.

- Position check for profile files: Best position data possibly reach after real time data processing. In the case, position data is replaced.
- Bit error recovery: Argos messages with CRC errors are regained by correcting bit errors. In these cases missing values are replaced by the regained values.
- Climatology check for the profiles: P-T, P-S, T-S curves are compared with climatology (WOA98, Hydrobase, etc.). They are used to omit obviously erroneous profile.
- Post calibration for the retrieved floats: 3 floats have been retrieved so far and recalibration was done. We will continue making efforts to retrieve floats in the future.

3. GDAC Functions
None

4. Regional Centre Functions

JAMSTEC/FORSGC has tested PMEL salinity correction scheme with/without high quality data set based on Hydrobase for the North Pacific. The output seems good when we use high quality historical data set or data set containing lots of deep profiles.

In implementing Delayed Mode QC and in designing and building Regional Center we strongly expect standardization of delayed mode QC procedures (one of the recommendations of AST4) to be defined at this meeting, at least (1) climatology check, (2) Wong's salinity correction.

Now the JAMSTEC FTP server is ready for mirroring the GDAC in FNMOC and IFREMER. It will be open to the public after two GDACs are synchronized.

Korean National Argo Data Report

1. Status

- Data acquired from floats
  a. Status of Argo floats(2001): In 2001, 18 Argo floats equipped with APEX-CTD were deployed.. 8 in the East/Japan Sea, 8 in the Northwestern Pacific, 2 in the Antarctic Ocean by the Korea Meteorological Research Institute/Korea Meterological Administration (METRI/KMA) and Ministry of Maritime Affairs & Fisheries (MOMAF) through the Korea Ocean Research & Development Institute(KORDI).
     o One float of APEX-TD deployed by KORDI/MOMAF in the Northwestern Pacific is not acquired WMO ID.

  b. Plan of deployment(2002): In 2002, 25 floats are planned for deployment. Five floats were deployed in East/Japan Sea from July 28 to August 2 by METRI/KMA. These floats are preset at the parking depth of 800 db with 7 days cycle. In September, 10 floats will be deployed at 2000 db with 10 days cycle in the Northwestern Pacific by METRI/KMA.

     Six floats were deployed in East/Japan Sea from 2nd to 3rd, September in 2002 by KORDI/MOMAF using R/V Haeyang 2000 of National Oceanographic Research Institute(NORI) of Korea. These floats had preset to have 700 db of a parking depth and 10 days cycle. The KORDI/MOMAF has a plan to deploy four floats at the Antarctic Ocean.

Korea has a plan to deploy about 90 Argo buoys from 2003 to 2005.

Year	Organization	Deployed area			TOTAL
		East/Japan Sea	Northwest Pacific	Antarctic Ocean & Others	
2001	KMA	3	7		18
	MOMAF	5	1	2	
2002 (plan)	KMA	5	10		25
	MOMAF	6		4	
2003 (plan)	KMA	5	10		30
	MOMAF	6		9	

Data issued to GTS: Within 24 hours of data collection, the profile data are broadcasted on the GTS by KMA and KORDI.

Data issued to GDACs after real-time QC: KMA and KORDI carry out RTQC. The KMA has issued all data from the Argo floats to GTS and is receiving all public data via GTS with TESAC messages. In the future the KMA is responsible for the real-time data management in Korea.

Data issued for delayed QC: The KMA is carrying out CTD observation in the same time deploying the floats and later on, it will carry out DMQC. The National Oceanographic Research Institute (NORI) will carry out CTD observation at the Sea deployed the floats for DMQC.

Delayed data sent to GDACs: At present the KORDI and KMA send DM data(netCDF format) to GDACs using FTP/WWW. In the future, the KODC will send delayed data to GDACs after carrying out a higher level of DMQC using a program and manual QC by the specialists.

Web pages: Web pages for DM data : The KODC already has opened a testing Web page (http://210.102.75.48/argo_home_nfrdi/index.htm) in Korean only at this situation. It will be served in English in the future and upgraded continuously. Web pages for RT data : It will be open for national RT data center around the end of September 2002. The professor Kuh Kim of Seoul National University operates Argo homepage (http://eastsea.snu.ac.kr/pfloat.html) for Profiling Floats in the East/Japan Sea.

2. Delayed Mode QC

The KODC will carry out DM center in Korea. The KODC is responsible for the ARGO DMDB and has developed a program in order to control ARGO DMDB and data QC in Korea. The KODC will carry out a higher level of DMDB QC using this program and manual QC by the specialists.

UK National Argo Data Report

Introduction/Background

The aim of the UK Argo project is to establish an operational system by 2003 with the capacity to deploy about 50 floats each year (maintaining about 100-150 floats in the water at any one time), and to capture all Argo data in real time in support of operational ocean forecasting, as well as

processing UK float data in delayed mode for climatological and hydrographic purposes. Funding is being provided by the Department for Environment, Food and Rural Affairs (DEFRA), the Ministry of Defence (MoD) and the Natural Environment Research Council (NERC). Participating organisations include the Met. Office (Ocean Applications with technical assistance from Observations Supply branch on procurement and deployment of floats), the Southampton Oceanography Centre (SOC), the British Oceanographic Data Centre (BODC) and the UK Hydrographic Office (UKHO). Following completion of the pilot project it is hoped that there will be a joint long-term commitment from DEFRA and MoD for the continued operational funding of Argo floats.

Current uk argo float status

A total of 67 floats have been deployed since the beginning of the Argo project from VOS, research ships, Royal Navy vessels and aircraft (45 since the last Data Management Meeting). The UK have now deployed 13 floats in the Irminger Sea, 3 in the Rockall area to the west of Scotland, 5 in the Norwegian Sea, 6 in the Arabian Sea, 5 in the south-west Indian Ocean, 25 across the Indian Ocean at latitude 33^{o}S, 3 in the South Atlantic and 5 in the north Indian Ocean. Of the 67 UK (Argo and Argo-equivalent) floats deployed to date, 7 have failed on deployment. In 2 of these cases, failure has arisen because of problems with air deployment and was not related to the float. In 4 cases the float was deployed normally but never reappeared after 10 days, in the other case the float stuck at the surface and subsequently failed. One other float is "dead" as it has not reported since November 01. Another 3 floats are currently offline but not yet assumed to be dead. (One of our "active" floats in the Irminger Sea (49006) went offline for 3 months during
spring before reappearing.)

Real-time data flow

For the UK float data, CLS are creating GTS bulletins containing TESAC messages and forwarding these to Meteo-France for quality control and insertion onto the GTS. The UK Met. Office retrieves these data from the GTS for use with their Forecasting Ocean-Atmosphere Model (FOAM). No data is at present issued to the GDACs after real-time QC. BODC aim to have this occurring by the beginning of November 2002.

Delayed Mode data flow

BODC are now operating as an Argo ‘Delayed-mode’ Data Centre acting as the ‘delayed-mode’ centre for UK floats in the Argo programme regardless of their location. The Data Centre reports regularly on the progress to the UK Argo Expert Group, seeking advice and guidance from the Expert Group as and when required. Scientific guidance is provided by SOC.

UK delayed-mode data management is a collaboration between BODC and the UKHO. Prior to June this year the raw (hexadecimal) data were received by ftp at SOC with scientists at SOC translating these to pressure, temperature and salinity. At the beginning of June this was transferred to BODC who now have an automatic system that translates this data and makes it available in ASCII format (via their public ftp site) within 24 hours of being received. Back-up CD-ROMs of the raw data ftp messages are sent to BODC monthly. We are now processing 83% of all the UK floats making their data available on our ftp site within 24 hours. This should be up to 100% of the UK floats by the end of October 2002, with a 95% delivery rate.

BODC are presently developing the software required to deliver the data in NetCDF and envisage this to be in place by the beginning of December 2002 resulting in supplying the GDACs with full resolution data within 48 hours of receiving the data.

A working practise has been established between BODC and the UKHO for the delayed mode QC although it is not yet in operation. Once data has been translated BODC will visually screen

all profiles flagging data appropriately. Once a month this data will be supplied to the UKHO who will check the data against other data held by UKHO in the area for the same time period. This check will examine the data parameter values and the form of the profile against the envelope created by other data profiles. Any data which does not fall within or close adjacent to the envelope and any profiles whose form does not correspond to the other data in the area will be considered suspect. The checks will take into account the numbers of profiles defining the envelope in determining the validity of the data. Although not possible initially, as more experience is gained, it should be possible to define, temporally and geographically, the data envelope which is used for these comparison checks. Data will be flagged to show the results of these checks but data will not be amended. UKHO will take up to 60 days to do this and will then return the data to BODC for final QC before BODC supplying final versions of the data to the GDACs.

A set of web pages describing the UK Argo project with a link to the UK data held at BODC is hosted by BODC. These pages are currently under review and a new site, with extra functionality and links to GDACs is planned to be launched by the New Year 2003. Web pages describing the UK Argo project are also available at the Met. Office and SOC.

Southern Ocean Regional Data Centre

BODC is in the process of setting up a regional Southern Ocean Argo Data Centre and a web site is already live. In doing so, BODC will collaborate with the international Argo community in the management, exchange and dissemination of data; including the development and adoption of common protocols and procedures and the operation of the Southern Ocean regional data centre. Scientific guidance will be provided by SOC. Present UK plans place a high priority on floats being deployed in the Southern Ocean.

Basin scale regional quality control will be carried out and products tailored to best meet the scientific requirements of community will be generated. Work to be undertaken includes:

- Comparison of float data to analogous data obtained by different techniques to evaluate biases and drifts. Candidate data for comparison are XBTs, XCTDs and CTDs, particularly from repeat sections.
- Comparison with climatologies (e.g. World Ocean Atlas, WOCE Atlases)
- Comparisons will include profile to profile comparison between neighbouring (in time and space) measurements
- Comparison of analysed fields based on one type of data and/or difference between profiles and analysed fields.
- Comparisons may result in the proposal of new corrections or “calibrations”, which are fed back to the PI.

Once biases, drifts and errors have been removed, in consultation with the PI, a “best image” of the measured fields “based on data only” can be produced. Possible products include the following:

- Time series for a platform (temperature, salinity vs time, depth)
- Trajectories
- Statistics (number of float-days per degree square)
- 3D gridded data (temperature, salinity)
- 2D gridded data (mixed layer depth)
- Results of intercomparison of data sets and biases (or sensor drift) estimation.
- Summaries of results of systematic comparison of data from floats found in the neighbourhood of reference data sets (e.g. climatologies, repeat CTD/XBT sections)

USA National Argo Data Report

1. Status

- Data acquired from floats:: AOML has processed data from 225 floats. On September 10, 2001, there were 121 floats reporting and 93 floats for which messages were not received in the last 30 days. AOML has processed 4490 profiles from September 1, 2001 to September 10, 2002.
- Data issued to GTS:: Since 1997, 7675 QC'ed profiles were put on the GTS.
- Data issued to GDACs after real-time QC:: As of September 10, 2002, 7993 netCDF profile files have been issued to both GDACs.
- Data issued for delayed QC: Data is put daily in the public area of the FTP site: ftp://ftp.aoml.noaa.gov/phod/pub/ARGO_FTP/argo/
- 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
  - FTP Services
  - On-demand Web Access profiles
  - Links to Related Sites

US NODC Argo Data Report

1. Status

The Argo Data Management team requested that the U.S. National Oceanographic Data Center (NODC) establish a unique center that will perform as a long-term repository for Argo data at the ad hoc international Argo Data Management meeting at the IFREMER in Brest, France from October 3 - 5, 2000. In respond to the request, the U.S. NODC completed the critical design and functional requirements of the Global Argo Data Repository (GADR). A prototype presentation of the GADR Web site has been implemented at http://sunspot.nodc.noaa.gov/argo/. The GADR Web server provides a unified, graphical user interface based tools for efficient access and retrieval of Argo data via the Internet. While the GADR is established to provide immediate service to all types of users with high speed Internet access, there are other users who will not be able to get the data in this way. The Argo repository has also developed a strategy for issuing Argo data on digital versatile discs (DVDs) as alternate means for providing users to get Argo data and information. Readers may go to http://sunspot.nodc.noaa.gov/argo/argo_dvd.htm to see the conceptual layout design of the Argo DVDs.

2. Delayed Mode QC

The US NODC has no delayed mode QC functions. But, we will perform quality assurance (QA) tasks to assure that the QC requirements stated by the Argo Science and Argo Data Management Teams are met.

3. GDAC Functions

The US NODC has no GDAC functions.

4. Regional Centre Functions

The US NODC has no regional centre functions.

Annex 4: GDAC Reports

France

National centres reporting:

- Canada (MEDS): Routine data updates began 09 September 2002. File types: meta-data, trajectory, technical and profile. 1550 files received but not yet accepted. Problems with naming conventions
- Japan (JMA): Routine data updates began 27 August 2002. File types: meta-data, profile. 60 floats currently online, 995 profile data files online (as of 13 Sept), 323 files not yet accepted
- United States (AOML): Routine data updates began 11 September 2002. File types: meta-data, trajectory, technical and profile. 72 floats currently online, 4601 profile data files online (as of 13 Sept), 3392 files not yet accepted
- France (IFREMER): Routine data updates began 12 June 2002 for ftp version 2. File types: meta-data, trajectory, profile. 114 floats currently online, 2800 profile data files online
- Australia (CSIRO): Meta-data and profile sample files received on 5 September 2002. GTS (data collected by GTSPP). Routine data updates began 12 June 2002 for ftp version 2. File type : profile. 680 floats currently on line, 19424 profile files online

Operations of the ftp server

- Operations automated with profile data files
- Main operations will be automated in October 2002
- Address: ftp://ftp.ifremer.fr/ifremer/argo

Remaining issues:

- Index files: format, layout (global only, global and weekly, other)
- Meta-files: format, handling (automatic updates through the "submit" mechanism or manual via e-mail to the GDAC)
- Informational attributes in the Argo netCDF files: how strict should adherence to the standard be enforced?

Operations of the www server

- We display profilers and profile information
- We disseminate profile data in Coriolis netCdf format
- Under test : a web interface with the following features :
- Display technical information and graphics for floats and measurements
- Disseminate data in Argo netCdf format
- Select data by date, location and meta-data information
- Eventually, LAS V6 will become a visualization and selection interface.
- Data synchronization
- Not yet implemented
- Use statistics

USA GDAC

National centres reporting

- Canada (MEDS): Routine data updates began 19 August 2002. File types: meta-data, trajectory, technical and profile. 54 floats currently reporting, ~1250 profile data files online (as of 05 Sept)
- Japan (JMA): Routine data updates began 3 September 2002. File types: meta-data, profile. 82 floats currently reporting, ~1800 profile data files online (as of 05 Sept)
- United States (AOML): Working with DAC on format compliance. Expect routine data updates by 16 September 2002

- France (IFREMER): Implementation effort to begin 9 September 2002. Expect routine data updates by 16 September 2002

Operations of the ftp server

- Operating fully automated with all major functions
- New address: usgodae.usgodae.org

The old address (usgodae.fnmoc.navy.mil) still works.
NOTE: When accessing the ftp site from behind a firewall, users should use the address ftp://usgodae1.usgodae.org

Remaining issues:

- Index files: format, layout (global only, global and weekly, other)
- Meta-files: format, handling (automatic updates through the "submit" mechanism or manual via e-mail to the GDAC)
- Informational attributes in the Argo netCDF files: how strict should adherence to the standard be enforced?

Operations of the www server

- We currently offer access to Argo GDAC files through FTP and HTTP.
- In development: A web interface to select profiles by date and location. This will also be able to generate P-T and P-S plots for individual profiles.
- Eventually, LAS V6 will become the visualization and selection interface.
- Data synchronization: Not yet implemented
- Use statistics

Annex 5: Action Items

Action	Target Date	Responsibility
GDACs to create a new subdirectory in the "geo" directory for Antarctic data. The definition of Antarctic needs to be agreed between them and appropriate documentation written to let clients know. (agenda 2a)	ASAP	Carval, Ignasewski
GDACs to ensure the geographic limits for the "geo" directory is properly documented both on their ftp site and in the GDAC documentation (agenda 2a)	ASAP	Pouliquen/Carval, Ignasewski
GDACs to remove versions of profile data derived from the GTS when the data are received directly from the DACs. (agenda 2a)	March, 2003	Carval, Ignasewski
GDACs to remove any built in delays between receiving data from DACs and posting those data to the servers. (agenda 2a)	ASAP	Carval, Ignasewski
DACs to ensure profile data are presented ordered from surface to bottom. (agenda 2a).	ASAP	DACs
DACs and others sending profile data to the GTS as TESACs must convert pressures to depths using the standard UNESCO algorithm. (agenda 2a)	ASAP	DACs
GDAC to design an ASCII format for the metadata. (agenda 4b)	End 2002	Carval/ Ignasewski
GDACs to consider if a data subscription service is feasible and how it might be implemented. (agenda 2b)	March, 2003	Pouliquen, Ignasewski
Co-chairs to provide AST with their Team's list of priorities for validation and list of questions needing AST advice.	March, 2003	Pouliquen, Keeley
All DACs to remove use of the Q designator in float identifiers. (agenda 2c) MEDS to remove the Q from float identifiers when GTS data sent to GDACs. (agenda 2c) Co-chairs to ensure changes are made in GDAC and DAC documentation to reflect no use of Q. (agenda 2c)	Nov 2002 ASAP ASAP	DACs Keeley Keeley, Pouliquen
Products working group to evaluate present data and network related products from all DACs and GDACs. (agenda 3a)	March, 2003	Molinari
Working group to draft and circulate the CD for countries lacking good access to the Internet. (agenda 3b)	Dec, 2002	Sun and others
Complete version 1 of CD (agenda 3b)	Sep, 2003	Sun and others
Provide CD WG with experiences from meeting with groups with poor internet access (agenda 3b)	ASAP	Belbeoch, Keeley
RTQC WG to look how to modify the top and bottom test to stop overflagging of good data (agenda 5a).	ASAP	Keeley and others
RTQC WG to propose tests that are better matched to the working characteristics of profiling floats (agenda 5a).	March, 2003	Keeley and others
BUFR WG to report on progress (agenda 4c).	Sep,	Keeley and

	2003	others
GADR WG to refine specifications and report on progress (agenda 8).	March, 2003	Sun and others
Editors of documentation to make required updates (agenda 9).	ASAP	Pouliquen, Carval, Keeley
Comments on formats to be provided to the Formats WG for consideration (agenda 4b)	ASAP	All
Investigate how to get Argo documentation translated into other languages (agenda 9).	Sep, 2003	Pouliquen, Keeley
Investigate the feasibility of detecting a drift in salinity or temperature and providing correction factors to DACs to modify data before insertion on the GTS (agenda 5b)	Sep, 2003	Wong, Johnson
Draft a proposal on how use could be made of the DBCP Buoy QC facility to notify users of suspect data in floats (agenda 5b)	Sep, 2003	Keeley, Pouliquen
Clarify how the results of the QC process will be properly recorded in the Argo data structure (agenda 6)	Sep, 2003	Schmid and others

Annex 6: Working groups and members

CD production
- Charles Sun - chair
- Ann Gronell
- Sylvie Pouliquen

GADR Specifications
- Charles Sun - lead
- Sylvie Pouliquen
- Reyna Sabrina
- Peter Hacker

Real-time QC
- Bob Keeley – lead
- Loic Petit de la Villéon
- DACs

Scientific QC:
- Dean Roemmich- lead
- Annie Wong
- Claudia Schmid
- Bob Keeley
- Loic Petit de la Villéon
- Takashi Yoshida
- Shinya Minato

Formats
- Thierry Carval – lead
- Stephen Loch
- Bob Keeley
- Charles Sun
- Joe Linguanti

Products
- Bob Molinari – lead
- DACs

BUFR
- Bob Keeley – lead
- (others)

QC Process Documentation
- Claudia Schmid – lead
- Annie Wong
- Ann Gronell
- Thierry Carval
- Bob Keeley