10th meeting of the
International Argo Steering Team

Hangzhou, China

March 22-23, 2009

Contents

Meeting Summary

The 10th meeting of the international Argo Steering Team was held in Hangzhou, China on March 22-23, 2009 and was hosted by the Second Institute of Oceanography. AST-10 focused on Argo reviewing its current status, objectives and future evolution. Dean Roemmich opened the meeting with a discussion on how well Argo has met its core mission goals, including a more detailed look at exactly how many floats are needed in both hemispheres in order for Argo to fully reach its intended target of one float per every 3 degrees latitude. Argo also needs to address the timeliness and the quality of the data based on the original design and how it might meet these targets better as well as how to address new concerns as the dataset grows and expands to possibly include new sensors and new sampling domains. The consensus developed at the meeting on these issues, and others, is included in the OceanObs09 white paper entitled "Argo – a decade of progress". Many other topics were discussed and highlights from the meeting included:

Implementation issues

The Argo Technical Coordinator reported that things are stable at the AIC now and that there is a new IT resource to help with coordinating website and other technical needs. The TC urged the AST to investigate a more formal relationship with JCOMM.

P.Y. Le Traon reported that Euro-Argo is progressing in its preparatory phase through mid 2010. Float technology is being tested and a new long-term governance and legal structure for Euro-Argo has been proposed. This structure will coordinate float procurement on a European level. Efforts will also be made to hold meetings with users to help strengthen the user community and their understanding of how to use Argo data.

The Argo core activity statement was discussed and D. Roemmich noted that the actual number of floats needed was 3200 based on the one float per three degrees latitude. He also noted that many floats are in areas outside the original Argo mission, including high latitude and marginal sea floats, but that deployers of these floats should not feel excluded from Argo. It was suggested that a proposal be made to OceanObs09 on how to cover the high latitude regions with Argo floats.

Peter Dexter, co-president of JCOMM, gave a short presentation on what JCOMM is and what might happen if Argo were to formalize its relationship with JCOMM. Some potential benefits include direct access to governments through WMO and IOC, Secretariat support for Argo, enhanced direct coordination with users such as GODAE OceanView, and a full coordinated, intergovernmental, in situ ocean observing system. Potential disadvantages include more reporting requirements and negative impacts on existing funding arrangements in some countries.

Data management issues

S. Pouliquen reported that overall, the data system is functioning well. Most real-time files are available within 24 hours and 100,000 delayed mode files were processed in the past year. DMQC-3 was held in September 2008 where there were scientists from every country represented. Progress was made towards being more uniform and consistent throughout the delayed mode quality control process. Experts on different regions presented their findings and newer dmoders were able to learn the reasons why experts were making the decisions they did on quality control. A lengthy discussion of how to correct pressure sensor offsets also occurred and it was generally agreed that offsets should be removed during delayed-mode processing.

Given the manpower challenges for dmode processing and the fact that some bad data pass through real time quality control, it is becoming more and more important that tools be used to detect bad data before the dmode quality control.

Additionally, M. Ollitrault has been working on cleaning up the trajectory files, DAC by DAC, starting with Coriolis. He has moved onto AOML and JMA now. When a DAC has reformatted their entire trajectory dataset, all files will be uploaded in one batch.

S. Diggs presented the status of the reference database for Argo and showed progress in obtaining several cruises in the past year that can be included in the reference database. It was stressed once again that high quality, recent data is needed to ensure the quality of the Argo dataset.

Technical issues

S. Riser presented work done on an APEX float where unpumped temperature measurements were taken all the way to the sea surface. The results looked promising, and with very little energy cost to the current set up using ARGOS communications.

Both PROVOR and SOLO have new floats being developed that aim to improve upon the current float models. The ARVOR is smaller, more energy efficient, uses Iridium and has performed well so far in test deployments. See the short article on the ARVOR in the newsletter. The SOLO-II is also smaller and more energy efficient and will be able to sample to 2000 m anywhere in the world ocean. A prototype will be deployed soon.

T. Suga reported on three NINJA floats equipped with fluorometers to measure larval and juvenile sardine in the mixed layer water in the Kuroshio region. The floats and sensors operated well for over a year at a parking depth of 40 dbar and a profiling depth of 500 db.

Demonstrating Argo's value

M. Ravichandran reported on the Argo User's Workshop held at INCOIS in July 2008. The goals of the workshop included interacting with Argo users in India in order to understand how Argo data is being used as well as how to improve temporal and spatial distribution of floats to better fit the needs on Indian Argo scientists. Much valuable feedback was gained from the experience and it was noted that this type of workshop is very valuable within countries and such activities should be linked to on the AST website.

The AST website is being updated to better reflect the current research and uses of Argo data. New content on these topics will be added, as well as better documentation of meetings, meeting reports and the various media available for publication use. Argo gridded datasets and data viewers will be displayed on the website as well to give users access to more diverse forms of Argo data.

M. Belbéoch and S. Diggs presented work being done to create a new Google Earth kml file on Argo. This will include a tour following an Argo float on its profiling mission, information on each float as well as stories on select floats within the Argo dataset that showcase interesting themes in oceanography. M. Scanderbeg and J. Gould will also work on this Argo "layer" to add more views of Argo data and educational content.

The third Argo Science Workshop was held immediately following the AST-10 meeting where many talks and posters showcased much of what is being done currently with Argo data. See the story in the newsletter on the ASW-3 for more details.

1 Welcome and introduction

Xu Jianping welcomed the Argo Steering Team to the Hangzhou. Local arrangements were discussed as well as an invitation to the reception dinner that evening.

Action item 1: H. Freeland to send letter of thanks to Xu Jianping and the Second Institute of Oceanography, etc. for hosting AST-10.

2 Objectives of the meeting

D. Roemmich opened the AST-10 meeting by noting that Argo is now in the process of reviewing its status, objectives and future evolution. The framework for this review is provided by the 3rd Argo Science Workshop, to be held following AST-10, and the international OceanObs09 Conference in September, which will review the status and underline the value of the integrated global ocean observing system. The Argo Program needs to develop a clear statement of its progress toward its initial targets for data coverage, quality and timeliness, and its priority activities for completing these. Based on the initial years of Argo global coverage, was the original design adequate or does it need revision? Finally, Argo should develop a blueprint for guiding its evolution during the coming decade, including possibilities for added sensors and new sampling domains. AST-10, ASW-3, and OceanObs09 are the beginning of this process, and we should take full advantage of the opportunity to present our views on "The Future of Argo".

3 Action items from AST-9

M. Scanderbeg presented the Action items from AST-9. Most items were completed, with several reported on at the meeting. The following action items were not resolved before the meeting and did not have a special place on the agenda, so they were briefly addressed.

Action item 4 (Develop regional data range checks) had no one assigned to it at AST-9. Consequently, it was difficult to know who may be working on this issue. It was suggested that perhaps some DACs or groups are already doing regional checks and that ADMT-9 would be the appropriate place to discuss the checks currently being done. Depending on these results, regional checks could be added to other DACs over time.

Action item 2: S Pouliquen will ask for demonstrations of regional checks to be presented at ADMT-10.

Action items 10 (Ask that B. Owens supplies the WMO numbers of floats that still have more than 5db pressure errors to be included in document on biases being prepared by the pressure working group) and 11 (Ask B. Owens to work with J. Willis to qualify this group of floats with large errors and investigate whether this data needs to be flagged as '3') were brought up again. D. Roemmich pointed out that WHOI now has additional help with DMQC and this issue is being resolved.

Action item 22 (The AST recommends testing APEX float air bladders before deployment if possible. S. Riser can provide details on this test process) was discussed and S. Riser reported that Teledyne Webb Research has improved their air bladders and this problem has been reduced. Riser still tests all his APEX air bladders before deployment, but the issues seem to have improved.

Action item 29 (Argo co-chairs will discuss Argo floats vs. Argo equivalent floats in regards to the issue of floats masquerading as Argo floats when they are not part of the Argo program) was discussed again. It was suggested that, if possible, the float manufacturers stop putting Argo labels on all floats they sell. The idea of programs putting the labels on themselves, but some programs buy directly from Webb and have the floats shipped from there. Therefore, it was agreed that the co-chairs will approach the float manufacturers and request that they apply Argo labels only to floats that specifically state they are part of the Argo data stream.

Action item 3: AST co-chairs to contact float manufacturers and ask them to apply Argo labels only to floats that specifically state they are part of the Argo data stream.

4 Implementation issues

4.1 AIC Report

The Argo Technical coordinator, M. Belbeoch, presented an update on the Argo Information Centre.

In 2008 Korea started to fund the AIC. The Argo TC started to work (30%) on SOT coordination, as of Feb. 2009, while a new I.T. resource started to work at JCOMMOPS as of August 2008. He recalled briefly the role of JCOMMOPS, and explained in details the main TC activities during the year 2008. He presented then the latest developments made at the AIC, including new metadata management (via a synchronization with GDAC detailed index files), new GIS data production and Support/Feedback Centre. The AIC website audience was then presented and TC concluded that the website was reaching its international target and was regularly used by Argonauts, and sometimes by a larger public. He presented the plans to develop a new generation of web services during 2009-2010 with the aim to:

- integrate the technical elements of the information system better

- design a new structure for the JCOMMOPS website(s)

- analyze, in depth, the results of the websites audience tracking

- use more interactivity in navigation (thanks to new technologies)

- develop a profile based service: "My JCOMMOPS" with reporting features.

While the I.T. resource is being trained on technologies, technical specifications will be written by the TC and presented to AST/ADMT.

He reminded the AST that Argo will need to make progress to harmonize the practices on the instrumentation, in particular to help new and existing Argo groups that request support. He proposed then to establish an inventory of "Common Practices" and share the expertise on float set-up further.

Some AST members expressed their apprehension about seeing a set of "standard" depth levels for Argo floats emerging too soon, while some members supported the idea of attempting to document and recommend common practices within Argo.

TC recalled that the plans were less ambitious than some AST members could have thought at first, and should help to share the Argo knowledge base and to improve float lifetime.

He presented then an update on the IOC Res. XLI-4 issues and invited AST members to continue the efforts in notifying deployments and ensure optimal transparency for Argo.

He recalled that many contacts were established with countries willing to participate in Argo Donor Programmes. In particular Peru was strongly motivated to interact with Argo.

He concluded giving some perspectives on the Argo infrastructure, which need obviously more resources, and on the need to cooperate within JCOMM to make it happen. In particular, TC will

proactively seek funding to create a position of "Ship Coordinator" within JCOMMOPS, serving all the programs.

He recalled that by cooperating closer with JCOMM, Argo will keep its identity, and that it will keep progressing beyond the debate on the semantics of the word "operational". In particular, Argo is already cooperating within JCOMM, through the AST representation within the JCOMM Observation Programme Area and through its technical coordinator acting within JCOMMOPS.

The TC presented finally a brief status of the Argo array.

More information and full 2009 Planning in the AIC report (see Appendix).

Following the TC's report, there was further discussion of whether the idea of common practices for float technology would be helpful. There were conflicting views that providing information on how to set up floats might make it seem too easy and would result in floats being poorly programmed. Many, including the co-chairs felt it would be best for new float deployers to speak to current float deployers for guidance. EuroArgo will be making a central location where an expert will be based to help float deployers order floats and get started in the program. The ATC still feels it would still be good to make a document with the common practices stated as he is concerned about losing this information when experts leave Argo.

D. Roemmich asked why the beached floats were still problematic. ATC would like more feedback on the status of these floats to find out if they are being rescued or are still needing attention.

S. Piotrowicz expressed frustration because the Argo TC post is seen as a low priority within IOC. He felt that the situation with the ATC does not need to be so temporary and uncertain. He thought IOC should be able to adjust to different fiscal year schedules to fund the ATC contract.

Action item 4: Argo co-chairs to write letter to Executive Secretary at IOC requesting a yearly contract for ATC and help with stabilizing funding when programs contributing to ATC have different fiscal years and times of donation arrival.

It was noted by the TC that his Terms of Reference still have not been updated.

Action item 5: M. Scanderbeg to obtain most recent ToR for ATC and pass to Argo co-chairs for updating and approval.

4.2 EuroArgo update

P.Y. Le Traon made a summary of Euro-Argo activities. The Euro-Argo preparatory phase started in January 2008 and will end in mid 2010. The objective is to set up and organize a long-term contribution of Europe to Argo. Euro-Argo had its first annual meeting in Hamburg (BSH) last January. Several reports on infrastructure description, costs, float technology, deployment issues, data processing issues and improvements, impact of Argo data were produced. Float technology tests (e.g. ARVOR-Iridium, Argos3, sea ice and O2 sensors) are carried out and user meetings are run every year to strengthen the Argo user community in Europe (Southampton in 2008, Trieste in 2009). A future long-term governance and legal structure for Euro Argo (post 2010) has been proposed. It will aim at coordinating European contributions to Argo (including links to international Argo and AIC funding). It should allow us to procure floats (includes logistics and test facilities) at European level through a central facility to complement nationally procured floats. Final decision should be taken by the end of 2009. The

long-term contributions of different European countries have also been revised. New countries are expected to contribute but European Commission (EC) funding will be needed to reach the 250 floats/year goal. There are good prospects for the post 2013 time period through GMES. The situation for the next 3 years is more complex and will be discussed with the EC and GMES at the end of April, 2009.

S. Riser asked if there would be money for research purposes as part of the EuroArgo initiative and P-Y Le Traon stated that at this time, the money was only for float procurement, deployment, processing and analysis. EuroArgo is planning on a central office with a staff of 2-5 people to help with central float procurements and deployments. While this is separate from the AIC, the eventual goal would be to have one contribution to the AIC from EuroArgo.

4.3 Argo core activity discussion

D. Roemmich motivated the need for re-examining the Argo core activity statement (See Appendix 6 for updated Core activity statement per Action item 7), which was drafted by J. Gould following AST-9. Roemmich showed a plot of the number of floats needed per degree latitude vs. the actual number of floats per degree latitude, excluding grey listed, high latitude and marginal seas floats. This makes the actual number of floats needed about 3200 and not 3000. Currently, Argo is around 600 floats short of this goal, and largely in the southern hemisphere. One problem that exists for some funding agencies is that they see from various Argo statistics on websites that Argo has met its float target and thus, inferring that funding can be flat or reduced. The core activity statement will be updated to more explicitly state the regions where Argo floats should be deployed. The idea was discussed to divide Argo floats into three groups: floats included in the original design, extension floats and Argo-equivalent floats. It was recognized that floats that are currently deployed in the marginal seas and at high latitudes should not feel excluded from Argo. In general, there was consensus that floats at high latitudes should be added to the Argo core activity statement, but a plan is needed to decide on the number of floats necessary to cover this region. It was suggested that a proposal be submitted to OceanObs09 that describes the floats needed to cover the high latitude regions.

Action item 6: Jon Turton will add a statement to the core activity statement to reflect that the current mission excludes floats north and south of 60 degrees.

Action item 7: Pending J. Turton's revisions, the Core activity statement is accepted by AST and will be posted on the AST website. (Appendix 6)

4.4 Update commitments table

AST members updated the commitments table and the expected number of float deployments in 2009 is above 800, consistent with the number of floats needed to sustain the array. It was noted that it would helpful to know if the numbers of floats estimated by each country were actually being deployed in that year.

Action item 8: M. Scanderbeg will update commitments table with statistics comparing estimated float deployments vs. actual float deployments.

4.5 JCOMM and Argo

Peter Dexter, co-president of JCOMM, made a short introductory presentation on the origins, rationale, structure, goals and priorities for the Commission. He noted that JCOMM, as a major subsidiary body of both WMO and IOC, is a coordination mechanism only, relying on national agencies in Member States for implementation, that it provides a bridge between meteorology

and oceanography, and that it is focused on coordinating (and regulating where appropriate) an end-to-end, operational oceanographic and marine meteorological observing, data management and services system. Recognizing that the AST, through its co-chairs, already participates in and contributes actively to the work of the JCOMM Observations Programme Area Coordination Group, Dexter then outlined some of the potential issues involved if Argo, through the AST, were to formally become a part of JCOMM. These include, on the potential benefits side: direct access for Argo to Governments, through WMO and IOC; some Secretariat support for Argo; enhanced direct coordination with users, including GODAE Oceanview and ET/OOFS; and the presentation to Member States of an intergovernmental, fully coordinated, in situ ocean observing system. Potential disadvantages include possible new reporting requirements, as well as negative impacts on existing funding arrangements in some countries. As outlined by Dexter, a future formal status of the AST within JCOMM would place it as a panel within the Observations Programme Area, while retaining existing full self-management rights.

4.6 JCOMM Observations Programme Area

Following on from the general presentation on JCOMM, Candyce Clark, JCOMM Observations Programme Area (OPA) Coordinator, made a short presentation specifically on the work of the OPA and on the status of the in situ observing system coordinated through JCOMM. She recalled that the initial system requirements are those for climate, detailed in the GCOS Implementation Plan (GCOS-92), although the system as implemented also supports a range of other activities and programs, including weather and ocean prediction, marine hazard warnings, transportation, environmental monitoring and management, etc. The system is a composite one, bringing together the efforts of a number of different implementation bodies, including the AST, with the integrated system being greater that the sum of the different parts. Implementation is taking place in a stepwise fashion over a number of years, with the total system being some 61% completed in February 2009. Implementation coordination is conducted through the JCOMM Observations Coordination Group, of which the AST is a key member. Clark outlined some of the results of the most recent session of the OCG (Paris, March 2009), and concluded by stressing the importance of system monitoring, undertaken by JCOMMOPS (of which the AIC is a major part), supported by the Observing System Monitoring Centre, operated by NOAA.

Discussion followed the two JCOMM talks that focused on formalizing Argo's relationship with JCOMM. D. Roemmich asked what concrete gains would result from being strongly connected to JCOMM. P. Dexter said the gains would come from having intergovernmental status. He felt that this would help with longer term funding. Some countries pointed out there could be financial difficulties if Argo had a more formal relationship with JCOMM, because research funds would be lost if the program was seen as operational.

Action item 9: Argo co-chairs will write to each country to see how it would affect them to formalize the existing JCOMM relationship.

Action item 10: AST will maintain a dialogue with JCOMM to explore formalizing the Argo/JCOMM relationship.

5 Data Management issues

5.1 Feedback from ADMT-9

S Pouliquen reported on Argo data Management activities since AST 9. The full report at ADMT8 can be found on ADMT www site (http://www.coriolis.eu.org/cdc/meetings/Argo-DM-report-9th.pdf).

The real time data stream is performing according to requirement and 90% of the data are made available within 24h. 240 new active floats were entered in the data management system as well as 600 historical floats. About 3000 floats are transmitting good data in real-time. Delayed mode processing is moving and 100 000 profiles were processed in delayed mode last year which correspond to the amount of new profiles acquire by Argo. The main issue is that it's difficult to dedicate additional manpower to process the delayed mode backlog. It's important to continue the training of delayed mode operators through DMQC workshops if we want to guarantee the quality of the Argo DM dataset. The new developments are presently ongoing to improve the Argo data quality between real-time and delayed mode processing. This is the work that is carried on within ARCs or Coriolis GDAC using comparison with climatology, with Altimetry or neighbors observations. These lists of anomalies are gradually included in AIC reports.

Progress has been made on trajectory files at Coriolis in cleaning up the data, first at Coriolis, then with AOML and starting with JMA. M Ollitrault will show the results at ASW3 and consistency checks will be built from this experience at the GDACs. The decision has been taken to standardize the technical files to allow enhanced monitoring of the Argo fleet and allow surface pressure correction and trajectory work more easily. The format was adopted, the file checker has to be updated by the US-GDAC and then DACs will reformat their files and submit them in one batch for each DAC according to a schedule that need to be consolidated.

As a summary S Pouliquen pointed out that as real time processing is automatic and bad data may be passing through it's important to set up tools to detect bad data in the Argo dataset earlier than DMQC. There are still bad flagging/data in delayed mode files and it’s urgent to review this delayed mode dataset… Moreover some training on the method needs to be continued. Finally manpower is an issue in data management and must be taken into account while setting priorities.

In the discussion that followed, it was requested that the greylist needs to be examined more closely and that, in fact, more floats need to added to greylist.

Per the DMQC-3 workshop’s request, the AST provided guidance on the changing of real time flags when delayed mode correction is done.

Action item 11: AST recommends changing of RT flags with DM correction

D. Roemmich expressed concern that the time line to apply the pressure correction is too long. He stated that Argo is going to be embarrassed by this if it is not fixed.

Action item 12: Co-chairs to speak to China and KORDI to find out time table for DACs to correct technical files.

S. Pouliquen asked what the process is when a new parameter is added to floats (i.e. Oxygen). This is a problem because currently there are different ways that oxygen is reported. She wondered what the process is to standardize new types of data to be included into the data stream. H. Freeland stressed that no new types of data are to be added to the data stream unless the AST agrees with the new parameter. The TC stated that float deployers need to notify the AIC when floats are deployed with exotic sensors.

Action item 13: Argo open data policy implies that all data parameters should be made available in a consistent format. ADMT to work on updating user manual for new parameters.

Action item 14: D. Gilbert to work with T. Kobayashi and V. Thierry to ensure DACs are processing oxygen data according to recommendations.

The next discussion was on the topic of trajectory files. The AST stated that to have the trajectory work sustained in the future we need a leader who can dedicate significant time on trajectory data to steer the work. Things need to be done at a DAC level since they have access to the raw ARGOS messages that need to be decoded and checked carefully. No leader emerged for this project. Currently M. Ollitrault will continue working with AOML and JMA to find problems with those trajectory files.

H. Freeland mentioned there is a problem with duplicate cycles in the mulitprofile files. S. Pouliquen stated it would always be harder to have an accurate multiprofile database because these are built after the profile files and assembled from them.

Action item 15: Additional check needed at DAC level to ensure cycle number is correct and to prevent repeat profiles in multiprofile files (DACs & S. Pouliquen)

5.2 Other Delayed Mode QC

5.2.1 Report/Follow-up from DMQC-3

DMQC-3 was held in Seattle in September 2008. 30 scientists from 11 countries attended the workshop. Many of those in attendance had not previously attended a delayed-mode workshop, an indication that more countries are now making progress in their delayed-mode activities. There were several goals of the workshop, including reviewing known float failure modes and errors, examining complex regions that pose special problems for salinity calibration, and discussing progress using recent versions of delayed-mode software and the use of Argo profiles in the Argo reference data base. Progress was made in addressing all of these issues. In addition to these items, considerable time was spent in discussing the process of adjusting pressure sensor offsets, especially at the sea surface. A general consensus was reached that these offsets mostly should be removed during the delayed-mode process, but it was noted that many groups also carry out real-time pressure corrections; meeting participants were generally supportive of both real-time and delayed-mode correction schemes.

Action item 16: S. Riser to ask if Annie Wong would organize another DMQC meeting in about 18 months since past meeting.

5.2.2 Status of APEX surface pressure correction

A series of results communicated by J. Willis was presented by D. Roemmich, in which satellite altimetry was used to compare groups of floats in order to detect systematic group-to-group differences in pressure. First, correlations between altimetric height and T(z) were developed using post-2004 deployed float groups that are believed to have correct pressure (APEX -SBE corrected for surface pressure drift, SIO SOLO-SBE, PROVOR-SBE). Then, these correlations were applied to suspect groups to estimate mean temperature errors, which were then converted to pressure errors. It was found that the suspect groups do indeed have systematic pressure errors, as shown in Appendix 5. The overall impact of these errors on the Argo array was also estimated, and may be 1-2 dbar for 2003-2004, decreasing to near zero in subsequent years. Dr Willis also identified a set of APEX floats thought to have large negative pressure drift (Appendix), and a second set that appeared "anomalous" in comparison to altimetric height. It was stressed that these calculations are preliminary, and more conclusive results are needed for evaluation of pressure bias in the Argo array.

Action item 17: D. Roemmich will thank J. Willis for his work on surface pressure offsets and encourage him to provide more conclusive results to the upcoming ADMT-10.

5.2.3 Progress on Argo Reference Database

SUMMARY: All along, it was a social (not technical) problem.

There are lessons of success from the rich history of global oceanographic programs that teach us that what we think is new, is really the same old problem. High quality data are best acquired through personal interaction and trust.

For at least 7 years (2002: Argo DM, Ottawa), Argo program participants needed help with acquiring high-quality CTD profiles for use in its delayed mode QC effort:

"For updating the climatological database with recent data, Argo should seek help from CLIVAR and its hydrographic program office."
Report of the Argo Data Management Meeting, Ottawa, 18-20 Sep, 2002

The problem was seemingly simple: Ask for CTD data from member states and these data would appear in the QC database within months. This approach had limited success. The CCHDO, US-NODC and Coriolis organized themselves into a single tri-agency entity, but the results were disappointing. Most of the CTD PIs never got around to sending their data on in a timely manner.

It was time for a different approach from the recent past. The WOCE program was very successful in tracking cruise data by establishing a relationship with each PI before the observations were made. This Data Information Unit (DIU) constantly monitored the progress of each cruise and reminded each scientist to submit their data to the appropriate center. In addition, the DIU served as a clearinghouse for data information for the responsible centers and helped the PIs make contact with the appropriate individuals to help get data to the that data center on schedule. The US Repeat Hydrography program has successfully used this "advance contact method" to insure the delivery of cruise data within 5 weeks from the last day of the expedition.

The CCHDO has recently started a sub-project pilot program called SEAHUNT. With a simple, intuitive graphical web interface, SEAHUNT has had reasonable success with tracking cruises and resulting data prior to the expedition. The first and only request to each PI is to allow the release of their data to the Argo program for the DMQC-DB by phone calls and email messages. So far, 100% of the scientists contacted in this way have given permission for the Argo program to use their data.

In addition to project SEAHUNT, the CCHDO and AIC-TC have managed to build a list of all Argo float deployments locations with CTD observations made by the deployment groups. This list has yielded several significant sets of CTD cruise data from the SOFINE, DIMES and cDRAKE programs.

Although we are trying new methods of getting CTD data, it is worth mentioning that Coriolis is having success by acquiring CTD data through pre-existing agreements with various international partners. The US-NODC added over 300,000 profiles to its database in 2008.

So, how have we done? Well, a year has passed since AST-9 (Exeter, UK). At that meeting, the CCHDO promised to add at least 4 cruises to the DMQC database. All four of those cruises, plus four more, are in the process of being re-formatted by CCHDO staff and submitted to Coriolis.

By all appearances, the new strategy for appears to be working well. The CCHDO is still resource limited - only one FTE is assigned to this project and we still need scientific direction for our efforts on subjects such as a specific geographic focus and pre-cruise identification.

D. Roemmich said he saw two requirements for reference data: a high quality, historical dataset for DMQC purposes and simultaneous float/CTD casts within a few years (since 2003). Simultaneous casts and float profiles can be used to start comparing DMQC quality and consistency.

Action item 18: M. Scanderbeg will work with S. Diggs to find number of collocated shipboard CTD from 2003-2008 and Argo profiles

D. Roemmich wanted to know if S. Diggs was limited by his time available to get recent CTD data or by people not giving it. S. Diggs said he was limited by time for the most part as he is the only person working on this right now.

5.3 ARCs

Silvia Garzoli reported on the latest activities of the South Atlantic Argo Regional Center. As part of the Training Activities, AOML is conducting in conjunction with the US Navy a "National Workshop on Data Analysis" in Lagos Nigeria, 20 to 26 March 2009. The training will take place at the Nigerian Institute for Oceanography and on board the USS Nashville. The workshop will include presentations and interactive training sessions on processing and use of the Argo data conducted by Claudia Schmid.

The report also included activities on the final steps of the quality control of the Argo data. AOML created a prototype page that shows the results of the delayed post QC analysis based on comparisons with climatology and buddies surrounding the profiling floats. This page will be made available to the community in the month of April.

6 National Reports

D. Roemmich and H. Freeland asked if the current format for national report requests was sufficient. In general, the AST members agreed it was reasonable and most members said they read reports before attending the meetings. M. Scanderbeg suggested formalizing her request for bibliography citations.

Action item 19: M. Scanderbeg will add a formal request to National report guidelines for list of Argo related publications, including non-English publications, from each country.

7 Technical issues

7.1 Float technology progress – S. Riser

Several float technology issues were discussed. It was noted that more APEX groups have started replacing the standard alkaline batteries with lithium batteries. The manufacturer of the

floats is at this point resolute in refusing to sell floats with lithium batteries, so it is up to individual float groups to make the change themselves. The University of Washington group has offered to provide instruction for any group wanting to learn how to make the change. It was noted at the meeting that Webb Research Corp. is likely to soon discontinue selling the APF-8 APEX float controller; this is good news, as the successor (APF-9) is superior in its handling of surface pressure measurements. At the AST9 meeting in 2008 it was noted that an unusually large number of APEX floats had shown pre-deployment bladder leaks. This problem has disappeared in the past year, as Webb changed the manufacturing process for the bladders. It was also noted that there are now APEX floats available that can sample temperature all the way to the sea surface in order to get a better estimate of SST; this measurement consumes very little energy and can be used even with floats using ARGOS communications.

In the past year the number of floats showing the Druck micro-leak problem has increased from 5% of recently deployed floats to about 15%. This number is too high and the specific defect that leads to this problem must be found and fixed quickly. To that end, engineers at SeaBird have been working with the pressure sensor manufacturer to locate the problem and eliminate it.

The AST members were very encouraged by the results of measuring unpumped T near the surface, especially with such a small cost of one ARGOS message.

This was a brief discussion about correcting surface pressure in real time. Some pointed out that Argo is not correcting surface pressure in real time because of a small offset (in the tenths of a decibar) when some floats are offset by decibars. S. Riser pointed out that there are a small number of floats with large decibar offsets and he feels that surface pressure should be corrected in delayed mode when a trend can be fit to the surface pressure.

7.1 V. Float technology progress – Thierry

V. Thierry reported on technological developments done both at Ifremer (Coriolis, France) and at AWI (Germany). Most developments are done within the Euro-Argo projects.

The ARVOR is the new float dedicated to CTD measurements for Argo. It is now manufactured, as for the PROVOR, by the NKE Company. Weight and size of the ARVOR float is reduced compared to the PROVOR in order to facilitate deployments, to reduce manufacturing costs and energy consumption. Ten instruments were manufactured and intensively tested in 2008. Two ARVORs were successfully deployed in southern ocean during the Track cruise. They are cycling every 2 days to assess their performance and have already performed 5 cycles. Eight more ARVOR floats will be deployed in the Atlantic this summer.

The successful deployments of PROVOR floats equipped with Iridium transmission for transmitting the large amount of data collected by additional sensors (optode + transmissiometer for a Provcarbon float and radiometer + transmissiometer + fluorimeter for a Provbio float) show the success of the first iridium communication fitted out on PROVOR float. In addition, the Iridium satellite downlink capability has been successfully used for the first time on a PROVOR float to modify its mission parameters or to recover it after short mission duration.

The design of an ARVOR-Iridium model began, using the same antenna as PROVOR multisensors. Developments and first experience at sea should be done in 2009. Developments for the use of Argos-3 transmission also began. The objective in 2009 is to implement this

transmission on ARVOR, as an alternate way to Iridium. An experiment at sea should be done at the end of the year.

PROVOR-DO is a PROVOR float fitted with an Aanderaa oxygen sensor. Improvements have been done after sea experiences (WP10-Carbocean, Flops, Ovide). The optode has been moved from the bottom to the top of the float, for better operation. The software has been improved to take into account some possible negative measurements of oxygen due to imperfect factory calibration. A software bug has also been corrected to measure oxygen above 327umol/l. Those improvements have been implemented in two floats that are currently tested.

Additional developments are underway. They concern

- the development of a “deep” (3500 db) PROVOR floats
- the development of a new Ice Sensing Algorithm (ISA) for the deployments of Nemo floats (manufactured by the Optimare company) under ice in the Arctic.

7.1 Float technology – Suga

Three NINJA floats equipped with fluorometer, FLNTU, were deployed in April/May 2008 as part of the intensive observation of the "Studies on Prediction and Application of Fish Species Alteration (SUPRFISH)" sponsored by the Agriculture, Forestry and Fisheries Research Council (AFFRC), Japan. The main aim was to make Lagrangian measurement following larval and juvenile sardine in the mixed layer water in the Kuroshio region; floats had to drift in the mixed layer. The NINJA floats were also equipped with a shutter for preventing the optical sensor unit from biofouling. The floats and the sensors have been operated normally so far with the parking depth of 40 dbar, the profiling depth of 500 dbar and the profiling cycle of 5 days almost for one year, which demonstrate that the depth control mechanism and algorithm work well even in the mixed layer and the shutter functions properly and effectively. Furthermore a new data compression method was introduced, which enables data transmission from more than 200 depth levels using ARGOS system; the data compression was done by reporting a full value at every 5 levels and otherwise reporting difference from that.

7.1 Float technology – Hosoda

JAMSTEC has been developing Deep-NINJA, the aim of which is to observe deeper ocean than 3000 dbar, in cooperation with TSK (Tsurumi-Seiki Co. LTD). This float consists of oil tank, pump and 50 cm3 cylinder, 3-way-valve, piston and 500 cm3 cylinder, motor and brake. Repeated motions of pump and 3-way-valve produce a maximum buoyancy of 500 cm3.
Buoyancy control system worked well at 3,000 dbar when the whole float was tested inside the high pressure tank. Only the part of 500 cm3 cylinder and piston was put inside the high pressure tank and confirmed to work well up to 3,500 dbar. Buoyancy control ability is about 500 cm3 and float needs extra buoyancy produced by a syntactic foam collar when it is tested in the real ocean.

7.1 Float technology - Roemmich

D. Roemmich provided a status report on development of the SOLO-II float by Scripps’ Instrument Development Group. SOLO-II will be a smaller (by 40 cm), lighter (19 kg compared to 30 kg for the earlier instrument), and more efficient version of the SOLO profiling float, capable of profiling from 2000 m anywhere in the world. Battery life will be 200 cycles, and the instrument can be expanded for additional cycles or sensors. SOLO-II uses a reciprocating pump, also used in the Spray Glider produced by the same group, and capable of future

development for missions deeper than 2000 m. Prototype versions of SOLO-II are now being extensively tested in the laboratory over the full operating pressure range. Initial ocean deployments are expected in about 2 months once lab testing is successfully completed.

8 Demonstrating Argo's value

8.1 Report on Argo User's Workshop at INCOIS

The first Indian Argo User's workshop was organized during July 20-22, 2008 in INCOIS, Hyderabad. The prime objective of the workshop was to take stock of utilization of Argo floats by Indian Scientists. The workshop will also provide opportunity to understand the requirement of modification in temporal and spatial distribution of floats and need of deploying additional sensors. 63 Scientists from 17 Institutions participated in this workshop. The major outcome of this workshop is as follows:

- Argo data has been widely utilized to understand the Indian Ocean dynamics, especially Indian Ocean Dipole events, understanding the monsoon system in relation to heat content, buoyancy flux of the Indian Ocean and for validation of OGCMs.
- Studies need to be initiated to assimilate Argo floats in OGCMs for better forecast of various ocean variables at different time scales.
- In the Bay of Bengal, Argo floats with 5 days cycling period need to be deployed. These observations are to be sustained over a long period by deploying new floats as and when required. These observations are required for studying the intra-seasonal variations of thermo-haline structure.
- New Iridium floats with an additional high-resolution CTD are to be deployed in the Bay of Bengal. This additional CTD sensors measures P, T, S at very fine resolution (2 m) from 200 m up to the surface.
- Quality control methods followed by various institutions need to be pooled. All such Institutions are asked to provide feedback on quality of data to INCOIS.

After seeing the value for India in holding a users workshop, several other countries also volunteered that they hold similar workshops including Canada, Japan and France. It was suggested that all these workshops, as well as other regional activities have links from the AST website.

Action item 20: AST members to designate links to regional activities not on ARC homepages.

8.2 Report on GODAE Final Symposium/OceanView

About 450 participants attended the GODAE final symposium. Plenary papers gave a very good summary of GODAE achievements and there was a good discussion on the future of GODAE (GODAE OceanView and links with JCOMM). Proceedings have been distributed and all papers and presentations are available on the GODAE WWW site (www.godae.org). A special issue on GODAE achievements will be published in Oceanography Magazine in July 2009. The first GODAE OceanView Science Team meeting will be held in Toulouse on June 8, 9 and 10 following the second GODAE OSE/OSSE workshop (June 4 and 5).

8.3 Upcoming science meetings

8.3.1 3rd Argo Science Workshop

The 3rd Argo Science Workshop took place immediately following the AST-10 meeting in Hangzhou, China. The workshop that included over 40 talks and over 45 posters was a great success. The many talks and discussions during the workshop will help inform the OceanObs09 white paper.

8.3.2 OceanObs09

The upcoming ASW-3 and OceanObs09 were discussed together as the workshop is providing material for the white paper being submitted to OceanObs09. The draft white paper topics were distributed to various AST members.

8.3.3 Operational Oceanography session at IAPSO

IAPSO will host a special one-day session on "Argo and Operational Oceanography" 19-29 July 2009 in Montréal. From the Argo Steering Team both Howard Freeland and Toshio Suga are co-conveners, but only Suga-san will be able to attend. http://www.moca-09.org/e/99-home_e.shtml

8.3.4 PICES 18

The PICES Annual meeting will take place October 23-November 1st, Jeju Island, Korea. The overall theme of the Congress is "Understanding ecosystem dynamics and pursuing ecosystem approaches to management." and has several sessions of likely interest to Argo colleagues. However notable is the session: "S7-State of the art of real-time monitoring and its implication for the FUTURE oceanographic study".

As the technology for the Ocean Sciences and Engineering is advanced rapidly, the real-time data production will revolutionize the field investigation and laboratory analysis in many ways, which will have the impact over the entire oceanographic paradigm in the end. This session will review the state of art technology for the ocean investigation on real-time and/or near real-time basis and will discuss the impact on the research and educational horizons made possible by it. Each nation will demonstrate their ocean monitoring network and their application. The exhibits from ocean monitoring companies are to occur in conjunction with this session.

Argo was asked to be a co-sponsor of this session and tentatively Howard Freeland is listed as an invited speaker giving a review of Argo to PICES. If anyone else has an urgent desire to present this paper then they should feel welcome to discuss it with Howard.

8.4 Argo web site changes

M. Scanderbeg presented a draft of the new AST website (http://www.argo.ucsd.edu/index_nav_sd.html). The main changes include the removal of frames to facilitate easier access to all pages and tracking by Google Analytics, reorganization of current pages and the addition of several pages to demonstrate Argo's value. The changes were made after looking at other international science programs for inspiration. A new category was created called "documents" to contain the bibliographies, newsletters, brochures, user group reports, etc. In response to requests from users, a new page displays old meeting websites and information. The photo page was expanded to include a movie page as well. Both pages need better organization and calibration in order to better serve users and the

increasing media requests. Two new pages will be added to give links to gridded temperature and salinity fields based on Argo data and to link to freely available data viewers to look at Argo data. Finally, the Research Use page will be split into two pages to reflect the different ways Argo data are being used. The first page, “Global change analysis” will focus on ways that Argo is contributing to global, climate change research. Topics like global heat storage, steric sea level and temperature among others. The second page, “New insights from Argo” will focus on research being done in other areas. The webpage should be live in early June.

Action item 21: Use OceanObs09 paper to provide content for global change analysis and insights into Argo pages. M.Scanderbeg

Action item 22: M. Scanderbeg to expand on media page on AST website with M. Belbeoch when he arrives in April.

8.5 Google Ocean

S. Diggs and M. Belbeoch presented the plans for including Argo status and products under the Google Ocean content offer.

The AST recognized this initiative as a high priority for Argo considering the potential audience.

Through this "Argo layer, it is planned to:

- provide general information on the Argo programme via a "tour".

- improve the existing Argo balloons for the 3000 floats including all float details, data plots, links to products, space of promotion for institutions implementing Argo, oceanographers float stories and educational content (adopted floats).

- include T/S/Anomalies products at key levels.

The Argo/GO task team (Argo TC, M. Scanderbeg, S. Diggs, J. Gould) will take immediate steps to develop these products.

In particular the TC will go to Scripps in April to finalize the content with M. Scanderbeg and S. Diggs, discuss technical issues with the Google Team, and formalize the partnership with Google.

It was suggested that the static layers and text in the Google Earth balloons be translated into other languages.

Action item 23: AST encourages Google Earth team (ATC, S. Diggs, M. Scanderbeg) to continue developing Argo layer.

8.6 Next Argonautics Newsletter

M. Scanderbeg presented ideas for the next Argonautics newsletter and requested further articles from AST members. H. Freeland will write an article on ASW-3, M. Scanderbeg will write a summary of AST-10, and S. Pouliquen will write a summary of ADMT-9. Additionally, S. Riser agreed to write an article on the surface pressure offset issue, explaining the problem, steps being taken to solve it and what it might mean for the Argo dataset. P-Y LeTraon agreed to write an article on GODAE Oceanview and M. Ollitrault will write an article on the work being

done on the trajectory files. V. Thierry will write an article on ARVOR, and if ready, an article on SOLO II will be contributed. C. Schmid and S. Garzoli will contribute an article on C. Schmid's meetings in Nigeria. An article will be contributed on the Pacific Marine Data and Observations Training Workshop. If ready, an article on the draft Argo layer for Google Ocean will be included. The draft of the editorial written by D. Roemmich on Argo data quality and global change analysis was reviewed.

Action item 24: AST members to review editorial draft for upcoming Argonautics newsletter and provide comments to D. Roemmich by end of April.

9 Argo outreach activities

10 Future meetings

10.1 ADMT-10

The dates of this meeting still need to be set. It was suggested to perhaps have the meeting the week following OceanObs09. Many people have a busy October meeting schedule already.

10.2 AST-11

Scripps Institution of Oceanography offered to host AST-11 in their new conference forum facilities.

Action item 25: Argo co-chairs to investigate procedures for visitors from non-visa waiver countries to get US visas. Depending on the procedure, Scripps will host the meeting.

11 AST membership and Terms of Reference

The AST reviewed the draft Terms of Reference written by John Gould and edited by H. Freeland and D. Roemmich. It was noted that ADMT co-chairs and the Argo Technical Coordinator should be added to the executive group. J. Turton suggested that Steering Team membership also be extended to include national Argo Programme Managers, in addition to the national Argo science leads where these are different people. P-Y LeTraon would like a more explicitly stated link to GODAE OceanView and suggested linking to the ATC's terms of reference.

Action item 26: Argo co-chairs to redraft AST ToR and circulate to AST before publication on AST website.

Argo Steering Team Meeting (AST-10)
Zhejiang Hotel, Hangzhou China, March 22-23 2009
Host: Second Institute of Oceanography

Meeting of Argo Steering Team Executive, Saturday March 21, 1 p.m. (Roemmich, Freeland, Ravichandran, Wijffels, Suga, Thierry, Pouliquen, Ignaszewsky, Scanderbeg, Belbéoch, Xu)

Provisional agenda: Begin at 9 a.m. on Sunday March 22

1. Welcome and local arrangements (Xu)
2. Objectives of the meeting
   How well has Argo achieved its initial targets for data coverage, quality and timeliness?
   How will the AST use outcomes of ASW-3 and OceanObs09 to guide the evolution of Argo?
3. Action items from AST-9 (Scanderbeg)
4. Implementation issues
   - 4.1 AIC Report (Belbéoch)
   - 4.2 EuroArgo update (LeTraon)
   - 4.3 Update commitments table (Scanderbeg)
     Can present float numbers and coverage be maintained or improved?
   - 4.4 JCOMM and Argo (Dexter), JCOMM Observations Programme Area (Clark) including JCOMM Observing Program Support Centre.
5. Data Management related issues
   - 5.1 Feedback from ADMT9 (Pouliquen/Ignaszewski)
   - 5.2 Other Delayed Mode QC
     - 5.2.1 Report/Follow-up from DMQC-3 (Riser; R/T flag changes?)
     - 5.2.2 Status of APEX surface pressure correction (info from DACS, J. Willis)
     - 5.2.3 Progress on Argo Reference Database (Diggs)
   - 5.3 ARCs (Garzoli)
   - 5.4 Status of trajectory data (V. Thierry)
6. Other issues arising from National Reports; review/revise reporting format.
7. Technical issues
   - 7.1 Float technology progress (Riser, Shikama/Hosoda, Thierry, Roemmich, Suga)
   - 7.2 Other technical reports
8. Demonstrating Argo's value
   - 8.1 Report on Argo User's Workshop at INCOIS (Ravichandran)
   - 8.2 Report on GODAE Final Symposium (LeTraon)
   - 8.3 Upcoming science meetings
     - 8.3.1 3rd Argo Science Workshop (Freeland)
     - 8.3.2 OceanObs 09
     - 8.3.3 Operational Oceanography session at IAPSO (Freeland)
     - 8.3.4 PICES 18
   - 8.4 Argo web site changes (Scanderbeg)
   - 8.5 Google Ocean (Belbeoch, Diggs, …)
   - 8.6 Next Argonautics Newsletter (Scanderbeg, Roemmich)
9. Argo outreach activities
10. Future meetings
    - 10.1 ADMT-10
    - 10.2 AST-11 (Scripps?)
11. AST Membership and Terms of Reference
12. Other business

List of Participants for AST-10, Hangzhou, China

S. No	Name	Institution and Address	Nationality
1	Dr. Ariel TROISI	Av. Montes de Oca 2124, Buenos Aires, ARGENTINA C1270ABV	Argentina
2	Esmee VAN WIJK	9B Liverpool Crescent, West Hobart, Tasmania, Australia, 7000	Australia
3	Dr. Peter DEXTER	700 Collins Street, Melbourne Docklands, VIC, AUSTRALIA 3008	Australia
4	Dr. Howard John FREELAND	Institute of Ocean Sciences, 9860 West Saanich Road, BC, V8L 4B2.	Canada
5	Dr. Denis GILBERT	Institut Maurice-Lamontagne, 850 route de la mer, Mont-Joli, Quebec, Canada G5H 3Z4	Canada
6	Dr. Anh TRAN	12W061-200 Kent Street, Ottawa, Ontario, CANADA K1A 0E6	Canada
7	Dr. XU Jianping	The Second Institute of Oceanography, State Oceanic Administration, People's Republic of China No. 36, Baochubei Road, 310012, Hangzhou, China	China
8	Dr. LIU Zhenghong	The Second Institute of Oceanography, State Oceanic Administration, People's Republic of China No. 36, Baochubei Road, 310012, Hangzhou, China	China
9	Dr. Sylvie POULIQUEN	Responsable Coriolis / Head of Coriolis, IFREMER, BP70, 29280 Plouzané Cédex, France	France
10	Mr. Mathieu BELBÉOCH	JCOMMOPS, 8-10, rue Hermès,Parc technologique du Canal , 1526 Ramonville Cédex	France
11	Dr. Pierre-Yves LE TRAON	Program Director Operational Oceanography Systems, IFREMER Centre de Brest B.P. 70 29280 Plouzané Cédex	France
12	Dr. Virginie THIERRY	Laboratoire de Physique des Océans, IFREMER, BP70, 29280 Plouzane Cédex	France
13	Dr. Muthalagu RAVICHANDRAN	Indian National Centre for Ocean Information Services, (INCOIS), "Ocean Valley", P.B No.21,IDA Jeedimetla P.O, Hyderabad - 500 055, India.	India
14	Dr. Shigeki HOSADA	2-15, Natsushima, Yokosuka, Kanagawa, 237-0061, Japan, Institute of Observational Research for Global Change (IORGC),Japan Agency for Marine-Earth Science and Technology (JAMSTEC)	Japan
15	Dr. Taiyo KOBAYASHI	2-15, Natsushima, Yokosuka, Kanagawa, 237-0061, Japan, Institute of Observational Research for Global Change (IORGC),Japan Agency for Marine-Earth Science and Technology (JAMSTEC)	Japan
16	Dr. Kazuhiko HAYASHI	Marine Division 1-3-4 Ote-machi, Chiyoda-ku Tokyo 100-8122 JAPAN	Japan

17	Dr. Toshio SUGA	2-15, Natsushima, Yokosuka, Kanagawa, 237-0061, Japan, Institute of Observational Research for Global Change (IORGC),Japan Agency for Marine-Earth Science and Technology (JAMSTEC) & Tohoku University	Japan
18	Dr. Pil-Hun CHANG	National Institute of Meteorological Research (METRI) Korea Meteorological Administration (KMA) 45 Gisangcheong-gil, Dongjak-gu, Seoul 156-720 KOREA	Korea
19	Dr. Moon-Sik SUK	Korea Ocean Research & Development Institute (KORDI), Ansan, P.O.Box 29, 425-600, Korea	Korea
20	Dr. Jeong-Sik KIM	45 Gisangcheong-gil, Dongjak-gu, Seoul, Republic of Korea, 156-720	Korea
21	Dr. Eugenio FRAILE-NUEZ	Instituto Espanol de Oceanografia, Avenida Tres de Mayo, 73, 38005 Santa Cruz de Tenerife, ESPANA	Spain
22	Dr. Pedro VELEZ-BELCHI	Instituto Espanol de Oceanografia, Avenida Tres de Mayo, 73, 38005 Santa Cruz de Tenerife, ESPANA	Spain
23	Dr. Matt MARTIN	Met Office, Fitzroy Rd, Exeter, Devon, EX1 3PB, UK	UK
24	Dr. Jonathan David TURTON	Laboratory address: Met Office, Fitzroy Rd, Exeter, Devon, UK, EX11 1LR	UK
25	Megan Carvel SCANDERBEG	Scripps Institution of Oceanography, University of California San Diego, 9500 Gilman Drive, La Jolla California 92093-0230.	USA
26	Dr. Stephen R. PIOTROWICZ	NOAA/ Ocean.US, 2300 Clarendon Boulevard, Suite 135, Arlington, Virginia, 22201.	USA
27	Prof. Stephen Craig RISER	School of Oceanography, Box 355350, University of Washington, Seattle, Washington 98195.	USA
28	Prof. Dean ROEMMICH	Scripps Institution of Oceanography, University of California San Diego, 9500 Gilman Drive, La Jolla California 92093-0230.	USA
29	Dr. Silvia GARZOLI	4301 Rickenbacker Causeway, NOAA/AOML, Miami, Florida, USA 33149	USA
30	Candyce CLARK	NOAA, Climate Program Office, 1100 Wayne Avenue #1202, Silver Spring, MD, USA, 20910	USA
31	Steve DIGGS	Scripps Institution of Oceanography, University of California San Diego, 9500 Gilman Drive, La Jolla California 92093-0230.	USA

List of Action Items from AST-10

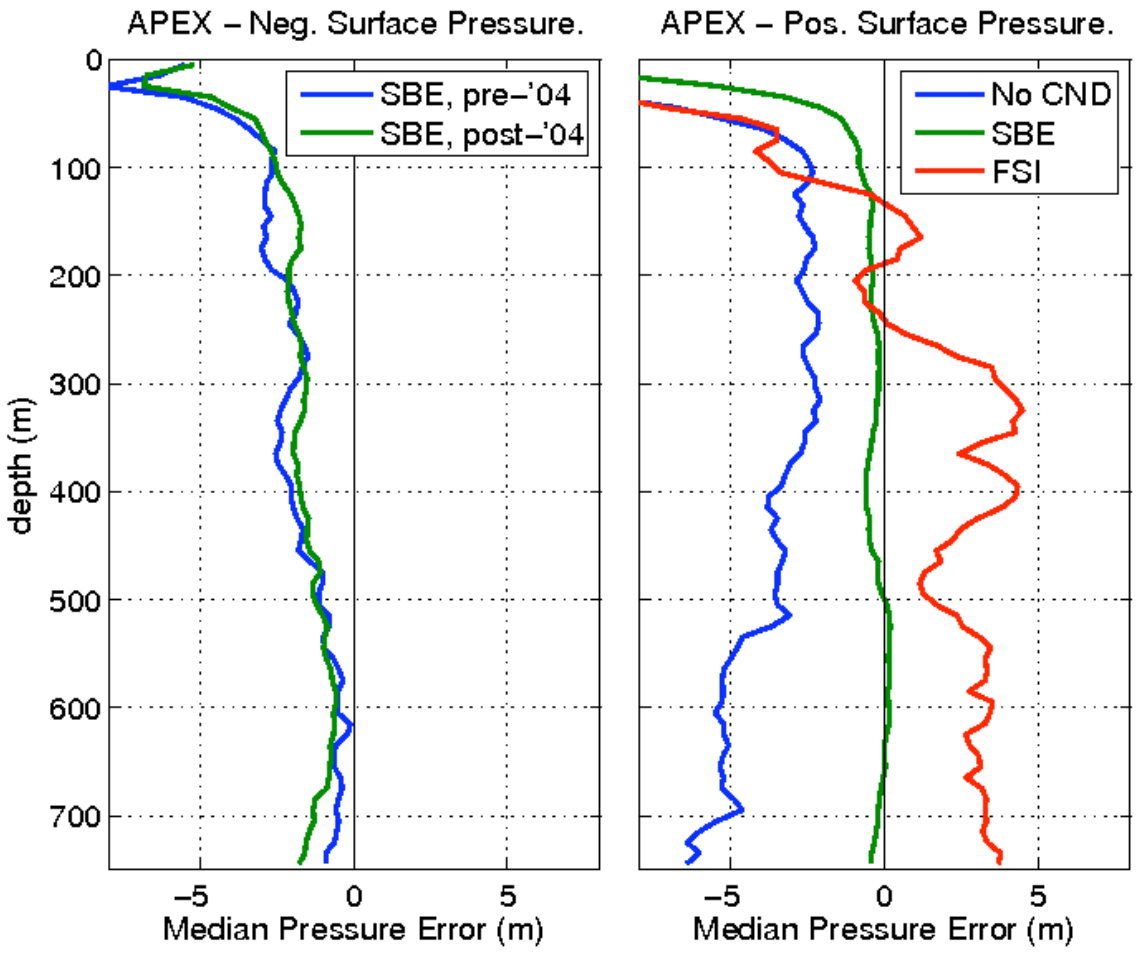
	Action	Responsibility	Status
1	H. Freeland to write thank you letter to J Xu for hosting AST-10.	H. Freeland	Done
2	S Pouliquen will ask for demonstrations of regional checks to be presented at ADMT-10.	S. Pouliquen	
3	AST co-chairs to contact float manufacturers and ask them to apply labels only to floats that specifically state they are part of the Argo data stream.	AST Co-chairs	
4	Argo co-chairs to write letter to Executive Secretary at IOC requesting a yearly contract for ATC and help with stabilizing funding when programs contributing to ATC have different fiscal years and times of donation arrival.	AST Co-chairs	
5	M. Scanderbeg to obtain most recent ToR for ATC and pass to Argo co-chairs for updating and approval.	M. Scanderbeg	
6	Jon Turton will add in 60N/S requirement to the Argo Core Activity Statement.	J. Turton	Done
7	Core activity statement is accepted by AST and will be posted on website.	M. Scanderbeg	
8	M. Scanderbeg will update commitments table with statistics comparing estimated float deployments vs. actual float deployments.	M. Scanderbeg	
9	Argo co-chairs will write to each country to see how it would affect them to formalize the existing JCOMM relationship.	AST Co-chairs	
10	AST will maintain a dialogue with JCOMM to try formalizing relationship. Co-chairs will explore taking on some responsibilities of formal JCOMM membership.	AST Co-chairs, AST members	
11	AST recommends changing of RT flags with DM correction.	DMQC operators	
12	Argo co-chairs to speak to China and KORDI AST members to find out time table for DACs to correct technical files.	AST Co-chairs	
13	Argo open data policy implies that all data parameters should be made freely available in a consistent format. ADMT to work on updating user manual for new parameters.	ADMT Co-chairs	
14	D. Gilbert to work with T. Kobayashi and V. Thierry to ensure DACs are processing	D. Gilbert, T. Kobayashi, V.	

	oxygen data according to recommendations.	Thierry, DACs	
15	Additional check needed at DAC level to ensure cycle number is correct and to prevent repeat profiles in multiprofile files	DACs, S. Pouliquen	
16	S. Riser to ask if Annie Wong would organize another DMQC meeting in about 18 months since past meeting.	S. Riser	Done – A. Wong discussing DMQC meeting possibilities with S. Pouliquen and B. King
17	D. Roemmich will thank J. Willis for his work on surface pressure offsets and encourage him to provide more conclusive results to the upcoming ADMT-10.	D. Roemmich, J. Willis	
18	M. Scanderbeg will work with S. Diggs to find number of collocated shipboard CTD from 2003-2008 and Argo profiles	M. Scanderbeg, S. Diggs	
19	M. Scanderbeg will add a formal request to National report guidelines for list of Argo related publications, including non-English publications, from each country.	M. Scanderbeg	
20	AST members to designate links to regional activities not on ARC homepages.	AST members	
21	Use OceanObs09 paper to provide content for global change analysis and insights into Argo pages.	M. Scanderbeg	
22	M. Scanderbeg to expand on media page on AST website with M. Belbeoch when he arrives in April.	M. Scanderbeg, M. Belbeoch	
23	AST encourages Google Earth team (ATC, S. Diggs, M. Scanderbeg) to continue developing Argo layer.	Google Earth team	
24	AST members to review editorial draft for upcoming Argonautics newsletter and provide comments to D. Roemmich by end of April.	AST members	
25	Argo co-chairs to investigate procedures for visitors from non visa waiver countries to get US visas. Depending on procedure, Scripps will host mtg.	AST Co-chairs	
26	Argo co-chairs to redraft AST ToR and circulate to AST before publication on AST website.	AST Co-chairs	

	2004 Argo deployed	2004 Argo equiv deployed	2005 Argo deployed*	2005 Argo equiv deployed	2006 Argo deployed	2006 Argo equiv	2007 Argo estimated	2007 Argo deployed	2007 Argo equiv	2008 estimated	2008 Argo deployed
Argentina					12						
Australia	4		64		45		65	47	0	55	65
Brazil	0		3					4			
Canada	30		29		38		25	18		22	25
Chile	0		2**	2		4					
China	8		0		6		50			32	16
Costa Rica	0		2***								
Denmark	0		0								
Ecuador								3			
European Union	15		7		3			8			
France	85		89		65		65	32		68	90
Germany	27	18	56	19	35	1	37	22	13	50	61
India	33		43		15		50	38		40	15
Ireland	0		0							4	4
Japan	119		98	12	98	18	95	80	15	95	76
Korea (Republic of)	32		37		33		27	13		29	29
Mauritius	2•		0		2						
Mexico	0		2°								
Netherlands	3		4		4		6	4		9	13
New Zealand	2		1		3		2	2			2
Norway	0		0		2						
Russia	2		0								
South Africa	0		0								
Spain	2		4		1					20	
UK	45		28		24		45	31	2	35	29
USA	396	38	455	38	475	21	410	381	29	360	326
Subtotals	803	56	854	71	861	44		683	59		751
Total	859		925		905		877	742		819	833

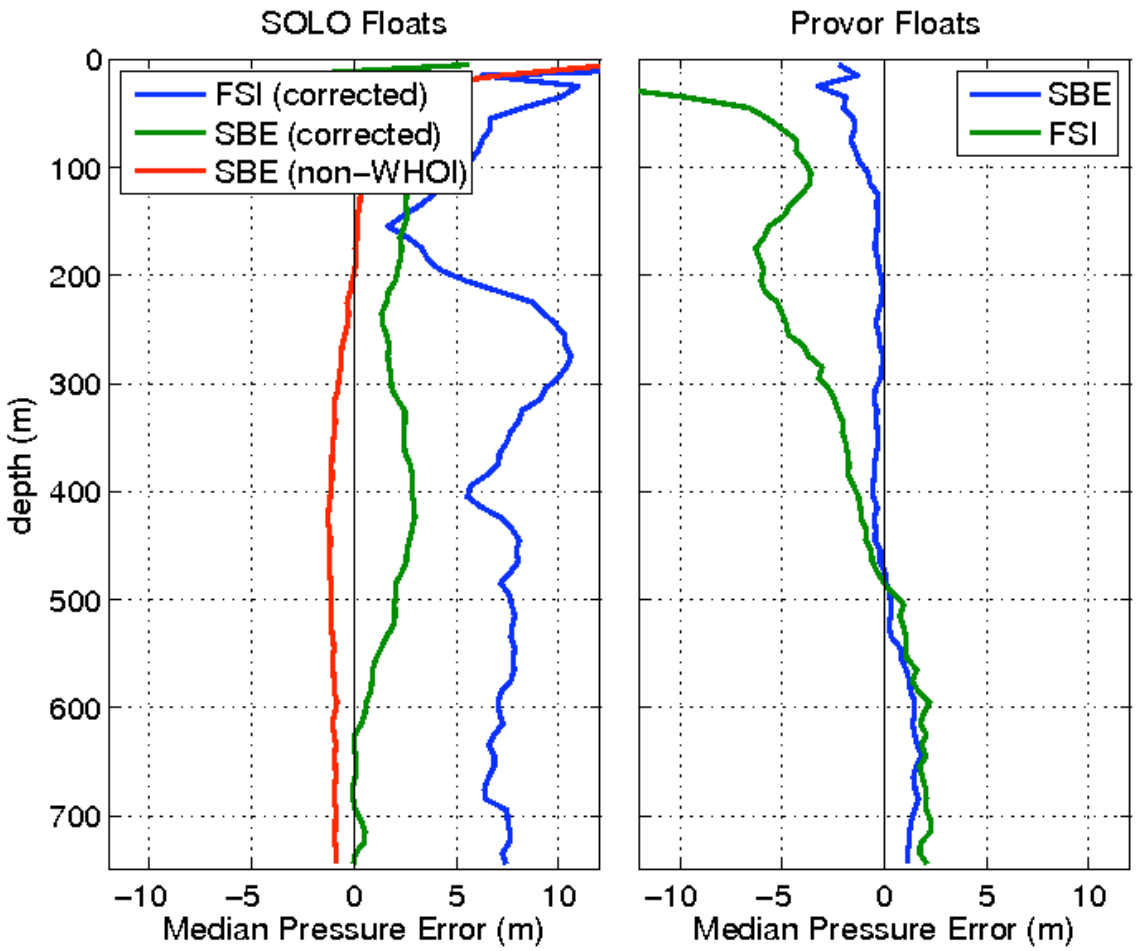
·Donated by UK
*Numbers compiled from AIC website
**Donated by Canada
***Donated by Spain
°1 float donated by Spain

2008 Argo equiv deployed	2009 estimated	2010 estimated		Notes
			Argentina	
	50		Australia	at least 50/year until 2011
			Brazil	
	28		Canada	
4			Chile	
	60		China	50 per year 2008-2012
			Costa Rica	
			Denmark	
			Ecuador	
			European Union	
	65		France	65 floats/year for 2009 & beyond
10	57		Germany	50 floats per year during 2007 to 2012
	40		India	40 floats per year during 2008-2012
			Ireland	
16	101		Japan	To 2008 15 equiv beyond 2008
			Korea (Republic of)	
			Mauritius	
			Mexico	
	6	8	Netherlands	
	2		New Zealand	
			Norway	
			Russia	
			South Africa	
	20		Spain	
	35		UK	possibility for more each yr
10			UN (ice tethered profilers)	
42	360		USA	
82				
	824			



Number of profiles

APEX neg p0, pre-2004:	**15122**
APEX neg p0, 2004 and later:	**54404**
APEX pos p0, NO CND:	**8581**
APEX pos p0, SBE:	**218824**
APEX pos p0, FSI:	**3561**



Number of profiles

SOLO FSI (corrected):	**9052**
SOLO SBE (corrected):	**40163**
SOLO SBE (non-WHOI):	**58731**
PROVOR SBE:	**29875**
PROVOR FSI:	**11452**

Suspected “large negative drift” APEX*

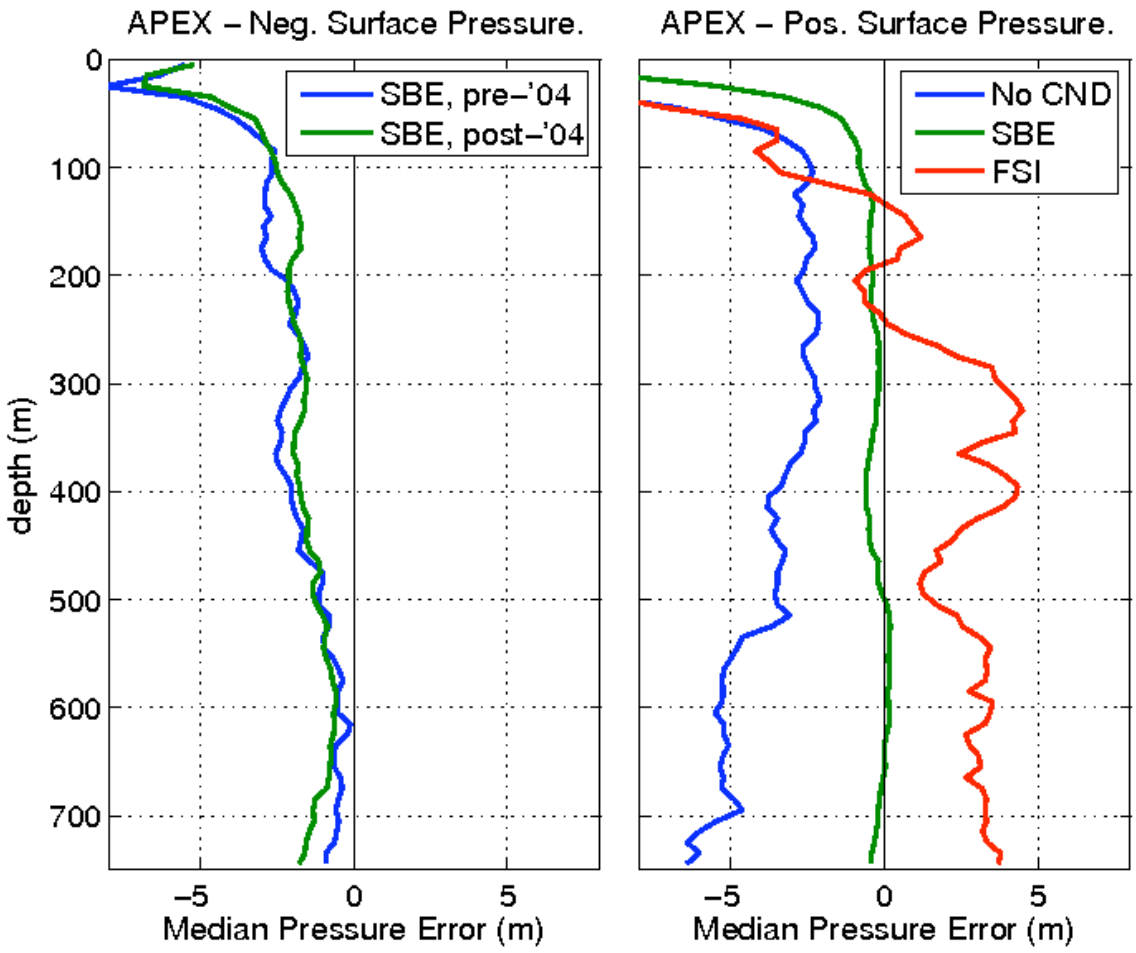
WMO ID	PI
1900175	Jon Turton
1900310	JAMSTEC
1900457	Jon Turton
1900507	Jon Turton
1900681	Jon Turton
2900105	Stephen Riser
2900338	K.RADHAKRISHNAN
2900398	Charlie Horton
2900634	Yong-Hoon Youn
2900637	Yong-Hoon Youn
3900161	Stephen Riser
3900403	Gregory C. Johnson
39037	Steve Riser
4900350	Juergen FISCHER
4900352	Juergen FISCHER
4900449	Gregory C. Johnson
5900250	Stephen Riser
5900351	Susan Wijffels
5900377	Kensuke Takeuchi
5900458	Gregory C. Johnson
5900485	kensuke Takeuchi
5900578	Stephen Riser
5900684	Stephen Riser
5900984	Gregory C. Johnson
5900998	Nobuyuki Shikama
5901024	Gregory C. Johnson
5901611	Susan Wijffels

“Suspicious”

1900158	Stephen Riser
1900191	Stephen Riser
1900266	Stephen Riser
1900280	Jon Turton
1900283	Jon Turton
1900344	Jon Turton
1900435	Charlie Horton
19019	Steve Riser
2900096	Charlie Horton
2900103	Stephen Riser
2900351	K.RADHAKRISHNAN
2900429	Yong-Hoon Youn

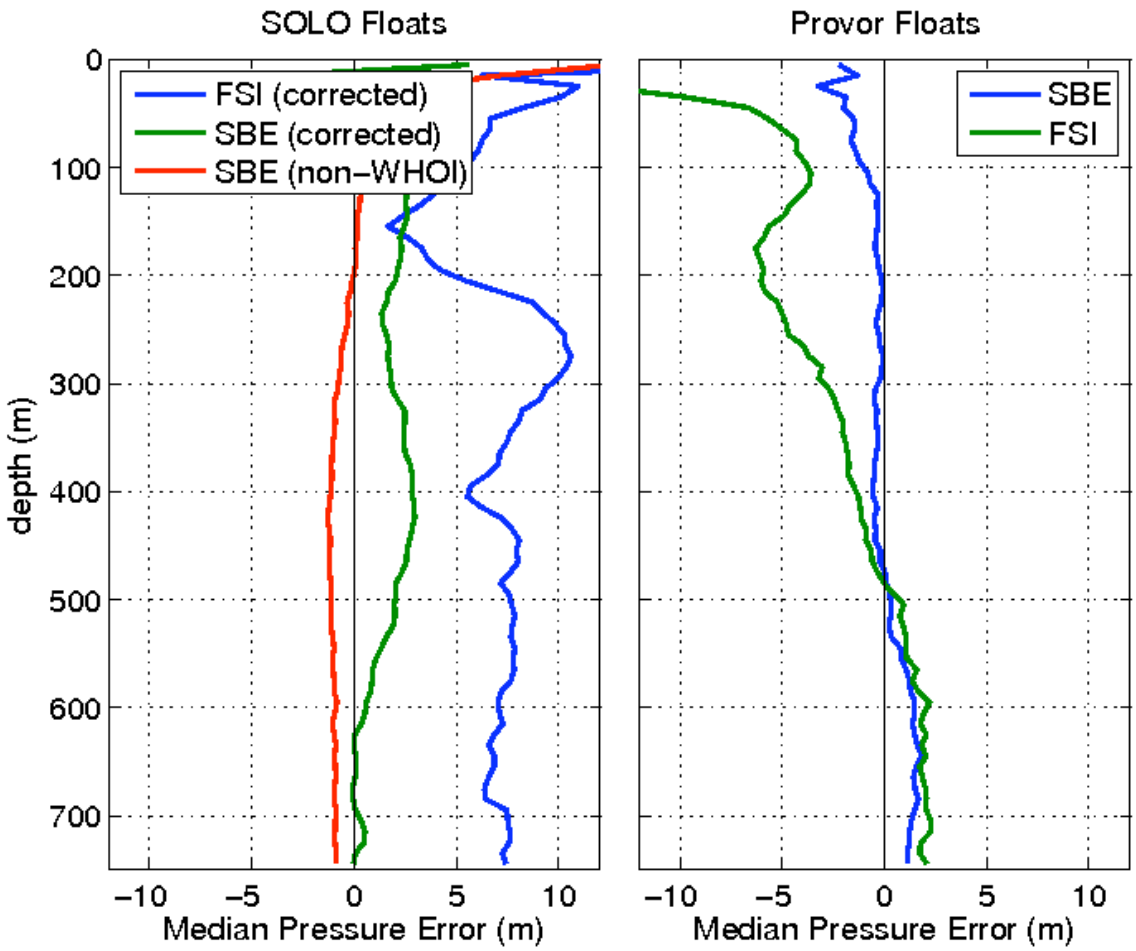
2900493 K.RADHAKRISHNAN
2900652 JAMSTEC
2900671 JAMSTEC
2900685 JAMSTEC
2900704 JAMSTEC
2901079 SHAILESH NAYAK
2901096 Jon Turton
29036 Koichi ISHIKAWA
3900092 Jon Turton
3900101 Stephen Riser
3900105 Stephen Riser
3900117 Jon Turton
3900124 JAMSTEC
3900644 Gregory C. Johnson
39031 Steve Riser
4900254 Howard Freeland
4900342 Stephen Riser
4900344 Stephen Riser
4900394 kensuke Takeuchi
4900404 Howard Freeland
4900405 Howard Freeland
4900447 Gregory C. Johnson
4900448 Gregory C. Johnson
4900450 Gregory C. Johnson
4900468 Gregory C. Johnson
4900490 Howard Freeland
4900493 Howard Freeland
4900496 Howard Freeland
4900507 Howard Freeland
4900572 Breck Owens
4900672 K.RADHAKRISHNAN
4900831 Gregory C. Johnson
4900916 JAMSTEC
4901066 Howard Freeland
5900244 Stephen Riser
5900293 JAMSTEC
5900296 kensuke Takeuchi
5900379 JAMSTEC
5900380 kensuke Takeuchi
5900385 JAMSTEC
5900420 Stephen Riser
5900426 Stephen Riser
5900486 kensuke Takeuchi
5900492 kensuke Takeuchi
5900493 kensuke Takeuchi
5900498 kensuke Takeuchi

5900501 JAMSTEC
5900502 JAMSTEC
5900539 Gregory C. Johnson
5900548 Stephen Riser
5900559 Stephen Riser
5900574 Stephen Riser
5900577 Stephen Riser
5900580 Stephen Riser
5900582 Stephen Riser
5900658 kensuke Takeuchi
5900668 Gregory C. Johnson
5900686 Stephen Riser
5900701 Stephen Riser
5900710 Gregory C. Johnson
5900822 kensuke Takeuchi
5900883 Gregory C. Johnson
5900939 Stephen Riser
5901099 Stephen Riser
5901188 Susan Wijffels
5901206 Nobuyuki Shikama
5901210 Nobuyuki Shikama
5901302 Gregory C. Johnson
5901377 Stephen Riser
5901504 JAMSTEC
5901550 JAMSTEC
5901551 JAMSTEC
5901608 XU JIANPING
6900372 Loic GOURMELEN



Number of profiles

APEX neg p0, pre-2004:	**15122**
APEX neg p0, 2004 and later:	**54404**
APEX pos p0, NO CND:	**8581**
APEX pos p0, SBE:	**218824**
APEX pos p0, FSI:	**3561**



Number of profiles

SOLO FSI (corrected):	**9052**
SOLO SBE (corrected):	**40163**
SOLO SBE (non-WHOI):	**58731**
PROVOR SBE:	**29875**
PROVOR FSI:	**11452**

Suspected “large negative drift” APEX*

WMO ID	PI
1900175	Jon Turton
1900310	JAMSTEC
1900457	Jon Turton
1900507	Jon Turton
1900681	Jon Turton
2900105	Stephen Riser
2900338	K.RADHAKRISHNAN
2900398	Charlie Horton
2900634	Yong-Hoon Youn
2900637	Yong-Hoon Youn
3900161	Stephen Riser
3900403	Gregory C. Johnson
39037	Steve Riser
4900350	Juergen FISCHER
4900352	Juergen FISCHER
4900449	Gregory C. Johnson
5900250	Stephen Riser
5900351	Susan Wijffels
5900377	Kensuke Takeuchi
5900458	Gregory C. Johnson
5900485	kensuke Takeuchi
5900578	Stephen Riser
5900684	Stephen Riser
5900984	Gregory C. Johnson
5900998	Nobuyuki Shikama
5901024	Gregory C. Johnson
5901611	Susan Wijffels

“Suspicious”

1900158	Stephen Riser
1900191	Stephen Riser
1900266	Stephen Riser
1900280	Jon Turton
1900283	Jon Turton
1900344	Jon Turton
1900435	Charlie Horton
19019	Steve Riser
2900096	Charlie Horton
2900103	Stephen Riser
2900351	K.RADHAKRISHNAN
2900429	Yong-Hoon Youn

2900493 K.RADHAKRISHNAN
2900652 JAMSTEC
2900671 JAMSTEC
2900685 JAMSTEC
2900704 JAMSTEC
2901079 SHAILESH NAYAK
2901096 Jon Turton
29036 Koichi ISHIKAWA
3900092 Jon Turton
3900101 Stephen Riser
3900105 Stephen Riser
3900117 Jon Turton
3900124 JAMSTEC
3900644 Gregory C. Johnson
39031 Steve Riser
4900254 Howard Freeland
4900342 Stephen Riser
4900344 Stephen Riser
4900394 kensuke Takeuchi
4900404 Howard Freeland
4900405 Howard Freeland
4900447 Gregory C. Johnson
4900448 Gregory C. Johnson
4900450 Gregory C. Johnson
4900468 Gregory C. Johnson
4900490 Howard Freeland
4900493 Howard Freeland
4900496 Howard Freeland
4900507 Howard Freeland
4900572 Breck Owens
4900672 K.RADHAKRISHNAN
4900831 Gregory C. Johnson
4900916 JAMSTEC
4901066 Howard Freeland
5900244 Stephen Riser
5900293 JAMSTEC
5900296 kensuke Takeuchi
5900379 JAMSTEC
5900380 kensuke Takeuchi
5900385 JAMSTEC
5900420 Stephen Riser
5900426 Stephen Riser
5900486 kensuke Takeuchi
5900492 kensuke Takeuchi
5900493 kensuke Takeuchi
5900498 kensuke Takeuchi

5900501 JAMSTEC
5900502 JAMSTEC
5900539 Gregory C. Johnson
5900548 Stephen Riser
5900559 Stephen Riser
5900574 Stephen Riser
5900577 Stephen Riser
5900580 Stephen Riser
5900582 Stephen Riser
5900658 kensuke Takeuchi
5900668 Gregory C. Johnson
5900686 Stephen Riser
5900701 Stephen Riser
5900710 Gregory C. Johnson
5900822 kensuke Takeuchi
5900883 Gregory C. Johnson
5900939 Stephen Riser
5901099 Stephen Riser
5901188 Susan Wijffels
5901206 Nobuyuki Shikama
5901210 Nobuyuki Shikama
5901302 Gregory C. Johnson
5901377 Stephen Riser
5901504 JAMSTEC
5901550 JAMSTEC
5901551 JAMSTEC
5901608 XU JIANPING
6900372 Loic GOURMELEN

Argo Information Centre

TC Report – AST10

Feb. 2009 M. Belbeoch

AIC, *http://argo.jcommops.org*
belbeoch@jcommops.org

1. Background

The international Argo Information Centre (AIC) is participating in the activities of the Argo Project Office and of the JCOMM in situ Observing Platform Support centre (JCOMMOPS).
The AIC is funded on a yearly basis via voluntary contributions from Australia, Canada, China, France, Germany, India, the United Kingdom and the United States.
In 2008 **Rep. of Korea** also began providing funds for the AIC.
IOC of UNESCO is also actively seeking new funding sources for the AIC.

JCOMMOPS (and its AIC component) faces the challenge of strengthening its infrastructure, integrating the existing services better and eventually extending its operations to new observing systems. In the context of the development of JCOMMOPS, it has been proposed to extend the Argo TC activities to the Ship Observation Team (VOS, SOOP), as of Feb. 2009.

In return, this permits to:
- stabilize Argo/SOT TC position (with a funding under pressure)
- hire a new I.T expert to work (half-time) for JCOMMOPS, as of September 2008.
- Develop further synergies with SOT (and SOOP in particular)

JCOMMOPS looks forward to serving Argo, DBCP, OceanSITES and SOT better than ever, thanks to this new resource.

On the other hand, the results/progress made on the extension/relocation of JCOMMOPS into a JCOMM Observing Program Support Centre will be provided in item 4.4.
From the inside perspective, JCOMMOPS identified the need for a dedicated resource (at least 1/2 time Coordinator) working on ship and cruise related information in order to capitalise on shared deployment resources and further develop cooperation between programs.
This could help in organizing more donor programmes, proactively identify new deployment opportunities and eventually assist in retrieval procedure of beached instruments.

2. AIC

TC Activities
The TC supports the Argo community on a wide range of issues that could be summarized in three keywords: **Assistance**, **Monitoring**, and **Cooperation**.
Many of these issues became routine activities:

- Network status monitoring
- Data management status monitoring
- Monthly Reporting
- Assistance to deployment planning, float retrieval, data distribution
- Assistance to national programmes (ad hoc stats, maps, …)
- Support Centre (user desk, QC feedback relay)
- Information System technical maintenance
- Information System content management (float metadata, contacts, documents, news, …)
- International Cooperation, Donor Programmes
- JCOMMOPS Administration, development
- Links with SOT, DBCP, OceanSITES, IOC, WMO, JCOMM
- Media needs (photos, articles)
- Assistance to new programmes (Marine Mammals, ITP)

It has gradually became difficult to free working time for new developments, network status - in depth - analyzes, technical assistance on instrumentation (see “Common Practices” below). The naturally growing Argo activities (a good sign), the new TC responsibilities on SOT, and the management of a new I.T expert did not help.
A student will work 4 months at the AIC (April-August 2008) on float lifetime statistics.

TC 2008 Missions

Brest, France, Euro Argo (January)
Exeter, UK, AST9 (February)
Paris, France, ABE-LOS (April)
Southampton, UK, Euro Argo Users Workshop (June)
St Petersburg, Russian Fed., JCOMM SOOS (July)
Honolulu, USA, ADMT9 (October)
Nice, France, GODAE final (November)

TC 2009 Missions

JCOMM OCG, Paris (March)
AST10, ASW3 Hangzhou (March)
Libreville, Gabon (April)
Geneva, SOT (May)
Euro Argo, Italy (June)
OceanObs09, Italy (September)
JCOMM III, Morocco (November)

Visit to new AIC contributors: India, Germany, Rep. of Korea when possible.
Visit AOML/SOOP chair

Monthly Report

The monthly report continues to be enhanced and improved each month. Argonauts have regularly provided feedback to the AIC between the reports.
TC starts to work on the report by the end of each month, and release it as soon as possible, after a set of checks and communications with float operators.
10 Reports were made in 2008.

It permits in particular:

- To solve regular problems of WMO/Argos Id duplicates. That is why it is important to notify deployments in advance. Once data distribution started such problems are harder to fix.
- To detect floats that distribute data without having been properly notified at the AIC (rare)
- To check that data distribution was not stopped when a float is back on line –sometimes after 2 years ...
- To keep an eye on floats that were deployed and that can’t be tracked by the AIC
- To track a number of data management issues
- To relay feedback from users to data producers (Altimetry QC)

Remarks:

- The feedback on beached floats is (too) rare
- The deployment plans could be updated more often (but it is improving)
- The GTS data distribution seems de-prioritized
- The metadata files anomaly list is far too long (not really progressing)

- New issues were identified regarding Data Management (duplicates at GDACs, problems in PARAM_QC values, missing profiles) and more feedback is required to solve them.

It is planned to generate most of the content of this report automatically in order to save time (formatting) and avoid human errors.
Do not hesitate to send your inputs for this monthly report.

In addition other checks (in Argos database) permit to identify profiling floats that were not deployed under an Argo programme and attract new groups in Argo.
It permits also to detect floats deployed under a national Argo programme that were simply forgotten (no notification and no data distribution).

Information System

The logistical contract between JCOMMOPS and its host, CLS, covers now all expenses (hardware, software) and includes the maintenance and the monitoring of the whole system. This streamlined support from the host takes up less working time for the TC.
No major developments were made in 2008 but many products were slightly improved. The (Oracle) database server will be migrated to a new machine (or cluster) this year to be operational as of January 2010. The new architecture will be ready to host the next generation of JCOMMOPS web services.
In 2009-2010, the JCOMMOPS web services (and in particular the AIC) will be re-designed. Technical specifications are being written while our new I.T. resource is being trained on technologies used by our existing Information System. New web technologies are being explored as well.
One of the main difficulties is that JCOMMOPS web services target very different user communities: program managers, researchers, technical groups, operational teams, data managers, etc. In addition, whilst most of the web users know that information they are looking for exists, they have difficulties finding it on the websites. JCOMMOPS aims to clarify access to information and develop a web based toolbox that will be used for many years to come.
These issues are being addressed by:

- integrating the technical elements of the Information System better
- designing a new structure for the JCOMMOPS website
- analysing, in depth, the results of the websites audience tracking set up a year ago
- using more interactivity in navigation (thanks to new technologies)
- developing a profile based service: "*My JCOMMOPS*"

Of course the Argo community (and in particular the AST/ADMT) will be consulted as appropriate.

Network Planning & Monitoring

A few details were fixed on the planning interface and WMO Id duplicates checks were strengthen. Float operators are invited to use the AIC Planning interface as their own planning tool. The level of reliability of a plan (draft, probable, certain, confirmed, etc) will be clarified. The next version of the AIC website will definitely make this task easier.

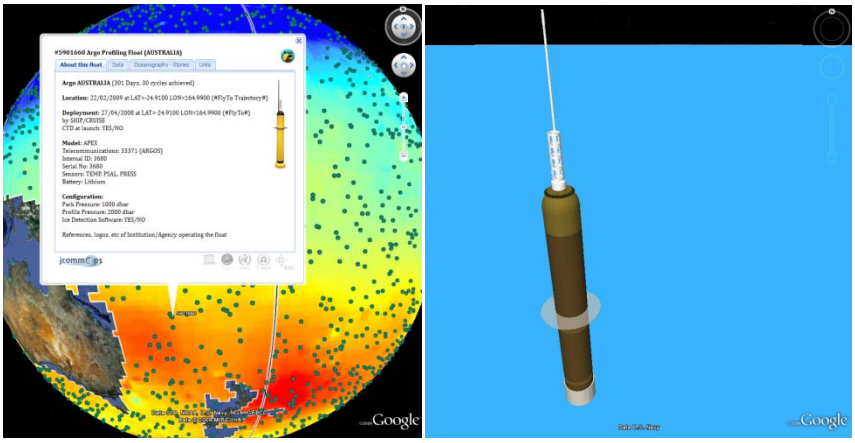
The bi-daily generation of GIS files was fully reviewed (except for trajectories).

- ⇨ More metadata in GIS files
- ⇨ Intersection between Maritime Zones (polygons) and deployment plans (points)
- ⇨ New density layers (with non-grey-listed floats)
- ⇨ New monthly maps and daily GIS layers (telecom, grey-list, sensors)
- ⇨ Export in Text, GIS, GE formats: http://argo.jcommops.org/FTPRoot/Argo/Status/

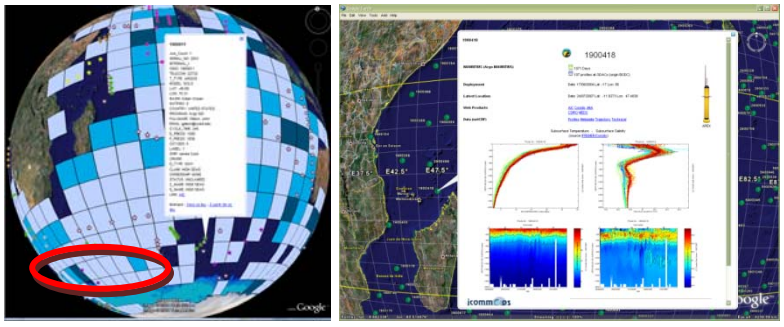
Argo & Google Ocean

Thanks to privileged contacts between Scripps and Google, we are planning to include Argo status and products under the Google Ocean content offer. We have here an opportunity to make the Argo network highly visible within GO so we need to make quick progress and adapt pour products targeting a general public audience.
Our challenge will be to make this useful also for the Argo community, as far as possible.
We are basically planning to:

1) Provide general information on Argo on a generic 3D float,
2) Improve the existing Argo balloon for the 3000 floats,
   including all float details, data plots, links to products, oceanographers float stories and educational products ("adopted" floats),
3) Include T/S/Anomalies monthly (Argo only) products at key levels



The draft Argo balloon template on a T-Anomaly overlay, and the 3D float model designed by Scripps team



Existing GE layers:
http://argo.jcommops.org/FTPRoot/Argo/Status/ARGO_FULL.kmz

In addition we will make sure that all Argo national/regional initiatives will have a good space of visibility in there.
Once the Argo GO layers will be operational, JCOMMOPS will pursue the effort for the other elements of the GOOS.
This will be presented and discussed in details within the AST as part of item 8.5.

Task Team: Argo TC, M. Scanderbeg, S. Diggs, J. Gould.

New metadata

Coriolis GDAC has made available a new index file that is used by the AIC to monitor more closely the status of real-time and historical data distribution at GDACs, and to gather additional metadata.
ftp://ftp.ifremer.fr/ifremer/argo/etc/argo_profile_detailled_index.txt.gz

Additional Requirements that were submitted to Coriolis GDAC:

- ⇨ add CYCLE information so the AIC can compare these metadata with the ones gathered at the notification step, synchronize the two metadata sets and make (finally) lifetime plots based on the distance profiled.
- ⇨ add N_LEVELS (to make an inventory of "Common Practices")
- ⇨ first/last date of netCDF file update (to monitor delays)

AIC website audience

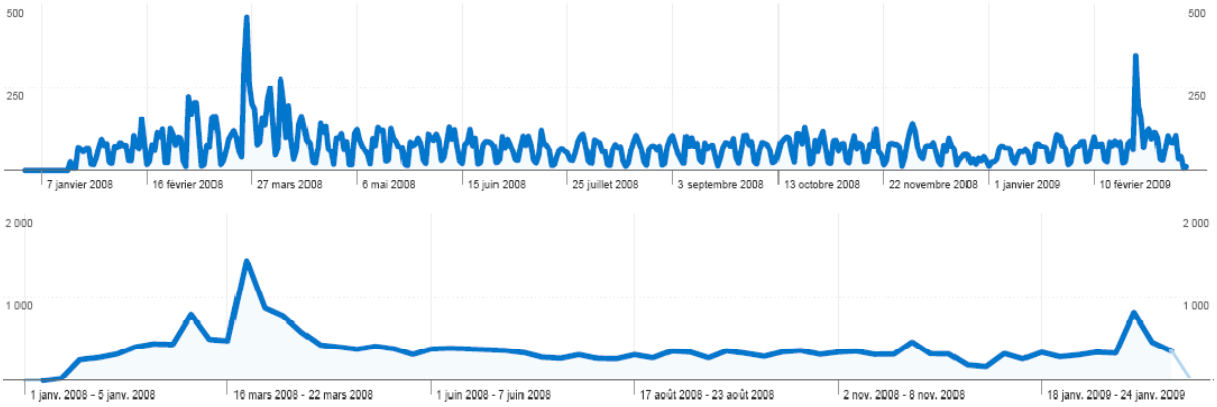
The website is rather stable, but delays can occur twice a day (6, 18 UTC) when the whole system is refreshed and fed with heterogeneous data sources. The monitoring system set up within CLS operational team has been gradually tuned and operators are now used to restarting the JCOMMOPS web services when required. This can happen a few times a week (generally at the time above) and seem to have become less frequent.

Late January 2008 an audience tracking system (Google Analytics) was set up to monitor AIC website traffic. The AIC can not intervene with this tracking which ensures its impartiality. The numbers can be interpreted in many ways, as the definition of one website user or one page view is not simple, especially on dynamic websites. However, the different trends are extremely useful for planning the next version of the AIC web services.

2008 Usage Statistics:

- AIC website visits: ~100 times/day, ~500/week, ~2000/month.
- 26126 visits in 2008, from 135 countries
- ~800 pages views / day, ~10000/month, ~120 000 / year.

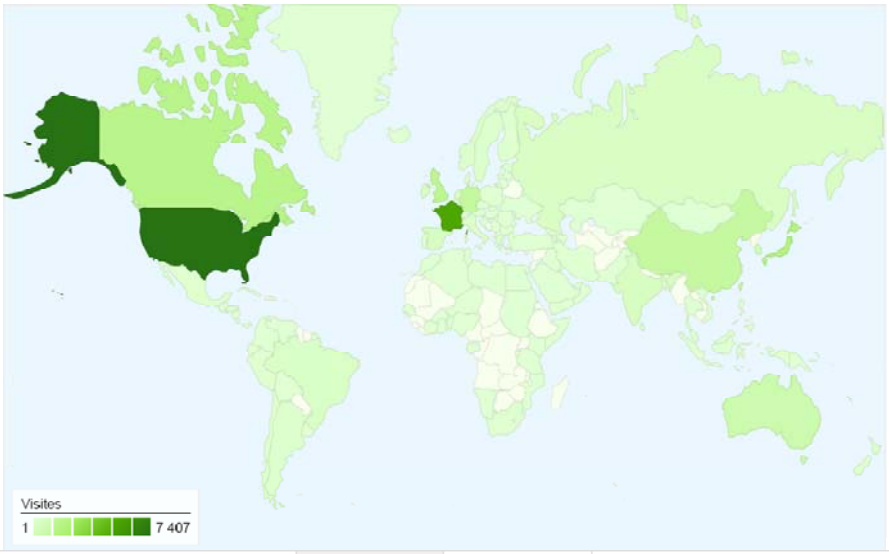
A substantial peak was noted in March 2008; probably because of the AST meeting or the effects of the 3000th float communication campaign. Another one occurred in February 2009 when the Argo documentary (ArteTV, French/German) was programmed.



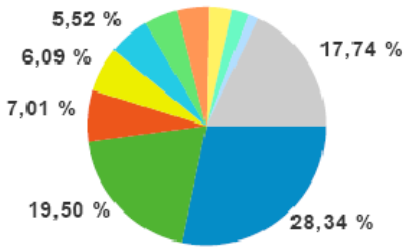
AIC Visits / day & week

- Most of the traffic is direct (31%) or comes from referring sites (63%). Only 6% of comes from search engines. No particular efforts are made to reference the AIC site in search engines.
- 4.5 avg. pages/visit, 3.5min avg. time on site.

- User's language is mainly English (50%), then French (18%), Japanese (7%), German (5%), Chinese (5%).
- The geographic distribution of users shows a clear international audience which is surprisingly proportional to Argo national contributions.
  Many non-Argo countries have been visiting the site as well.



United States	7 407	28,34 %
France	5 097	19,50 %
Japan	1 832	7,01 %
Canada	1 592	6,09 %
United Kingdom	1 442	5,52 %
Germany	1 191	4,56 %
China	1 130	4,32 %
Australia	853	3,26 %
South Korea	582	2,23 %
India	375	1,43 %
Spain	363	1,39 %
Russia	334	1,28 %
Ireland	301	1,15 %



AIC Visits by country

Brazil	295	1,
Taiwan	294	1,
Netherlands	263	1,
Sri Lanka	163	0,
Italy	157	0,
Sweden	155	0,
Norway	145	0,
Argentina	134	0,
Switzerland	110	0,
New Zealand	106	0,
Belgium	105	0,
Chile	101	0

- Main features used are:
  - the float search engine
  - the deployment planning interface
  - the News section (the float of the month has great success)
  - the Map Room and Interactive Map
  - the monitoring tools (country, program, data flow)
  - the documents/meetings/contacts sections
  - the global search engine

- From the FTP logs we can notice that the Argo status files (text, Google Earth files) are regularly used.

The AIC website seems to reach its international target and is regularly used by Argonauts.

Site is sometimes used by a larger public.
There is a growing interest from developing nations, especially from Africa.

AST#9 Meeting Action List

1) Item 13: Altimetry QC
- ⇨ Done (see below)

2) Item 28: mission statement by basin
- ⇨ Waiting more guidance from AST
- ⇨ Waiting ASW#3 outcomes for marginal seas requirements

3) Item 29: Argo/Argo equivalent floats
- ⇨ Proposal:

to add some information in the Argo metadata files that would permit to identify official Argo floats and equivalent contributions to Argo.
Why not adding also the program name as registered at the AIC?

4) Automate update of float map on Wikipedia.
- ⇨ Impossible. Update has to be manual. Done ad hoc.
- ⇨ More important to work on Google Ocean.

Common Practices
The TC was requested by new and existing Argo groups to assist them in the set up of their instruments. Considering the technical constraints and interactions this is not an easy issue. We need some documentation and resources to address those needs.

As Argo is to be sustained for many decades to come, then we can assume new groups will join the program and will gradually develop their expertise, but we should provide guidance as far as possible, for those who need it, on key parameters: depth table, surface time, etc.
Some contributions to Argo are (and will be) made by groups that will never develop such in-house expertise on instrumentation and that just want to deploy n units per year in contribution to a global programme, outside of any particular research project.
The AST needs to ensure that it can support and encourage these contributions.

When the TC is asked to assist, it is his role to help to transfer expertise from experienced groups to those who need it. This assistance is required **today** by new countries such as South Africa, that make a lot of efforts to fund 2 floats per year, and that need guidance to fill in settings table that manufacturer send to them.

While there were some valuable inputs and valid concerns of some AST members about the need to let "oceanography guide our choices", or some apprehension about seeing a "standard" Argo float emerging too soon, some others members, and the main float manufacturer supported the idea of attempting to document and recommend common practices in Argo.

All oceanographers in Argo know which levels they would like to sample, not all are aware of the constraints of the Argos system. You can see then some floats settings that are not adequate and resulting in poor profiles, long time at surface, and so shorter lifetimes.

A minimum of documentation on common practices could help manufacturers in the long run to reduce the costs of development and provide instruments that meet Argo requirements in terms of reliability.

As we want to strengthen the array without having to deploy more floats than expected, this initiative might allow us to improve float lifetimes, or at least to have a better view on the existing fleet.

Being part of JCOMM Argo will need to address the issue of documenting "instrument ~~best~~ common practices" for the JCOMM Observation Programme Area in the next few months.
Argo has produced a complete set of documentation for the data management, but we have next to nothing for the instrumentation. This initiative aims simply to start filling this gap, starting with the following:

- ⇨ The TC proposes discussing this issue openly at the AST meeting
- ⇨ The TC proposes establishing an **inventory of "Common Practices"** on instrumentation
- ⇨ The TC proposes sharing further existing software used to set up floats
- ⇨ The AST could define the basins that have specific requirements in terms of oceanography (this could be related to action item 28)
- ⇨ Then we could see if some recommendations can be agreed upon. And at the very least we would have a knowledge base that will be useful.

3. Data Management

Metadata

It is planned to work on metadata related to the telecommunication raw data formats.
A classification was made by CLS and Coriolis for the formats they handle and the AIC will manage this information soon.
It would be good to include these metadata in the netCDF files.

Data Distribution

CLS is acting as a DAC for GTS processing for a number of programmes that have no link to a GTS centre. It is recalled that this can be done as appropriate only if CLS receives the manufacturer's manual describing the Argos data format. The same remark applies to Coriolis and AOML, processing float data from many Argo groups.

WMO IDs

AIC is now supporting WMO in allocating WMO IDs for most of Argo components. Every 3 years large ranges of IDs are reserved by the AIC, based on national requirements, and allocations are made ad hoc. Requests and allocations are archived in the AIC database. This allows another set of controls over duplicates.
WMO Id blocks were already reserved for France, China, Korea, India, Netherlands, UK, USA and Spain.
Float operators are strongly encouraged to use the AIC for WMO Id requests.
Hence Argo will have full control on this information, essential to data distribution.

It is planned to develop on-line tools to request and obtain automatically new WMO Id allocations.

Support/Feedback Centre

The AIC website HELP section was reviewed to clarify access to the support/feedback centre.

Only Coriolis (and AST website) have promoted the address http://support.argo.net and its email support@argo.net.

The requests received so far concern the following subjects:

- Access to regional dataset
- Technical issues with AIC, GDACs website access
- Technical issues with data access (ASCII data, large datasets, empty metadata files, netCDF format, etc)
- General question on Argo (grounding, sampling, planning, etc)

A particular request permitted to identify a problem on incorrect values for PROFILE_PARAM_QC.
All requests were generally processed within 24h.
Other feedbacks received concern:

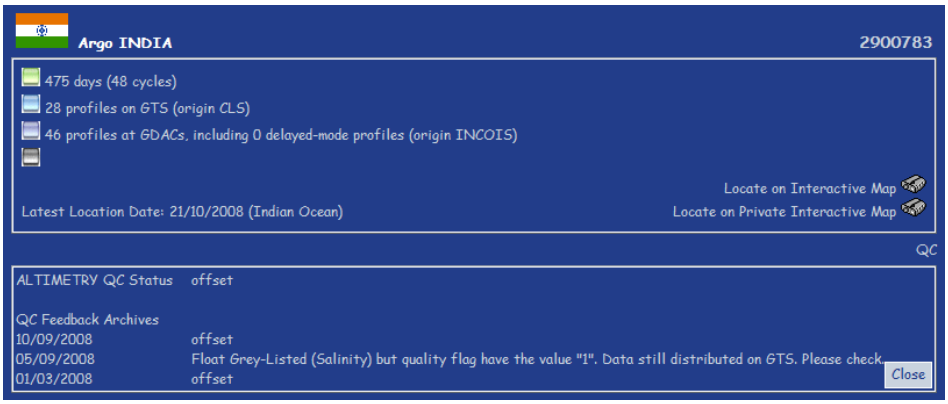
- Grey-listed floats with incorrect flag values
- Duplicates profile at GDACs (same data / different cycle number)
- Same dates for different profiles

Altimetry QC is made every 4 months by Coriolis/CLS, loaded in the AIC database, archived as a global QC feedback and linked to each platform.
Float search engine was upgraded to take into account this information on data quality:

- Query Page has more search criteria (Altimetry QC "flagged", "Fixed", "Comment")
- Results Page has more metadata ("Altimetry QC")
- Float Detail Page summarizes all QC feedback archives

	Status	WMO ID	Telecom ID	Model	Program	Date	GDAC	GTS	Altimetry QC	Age
1		5901290	64187	SOLO	Argo SIO	13/10/2008			spike	769
2		5900975	54447	SOLO	Argo SIO	15/10/2008			spike	1242
3		5901875	75085	SOLO	Argo SIO	17/10/2008			spike	200
4		5901263	64159	SOLO	Argo SIO	18/10/2008			FIXED	716
5		5901250	64174	SOLO	Argo SIO	15/10/2008			FIXED	744
6		5901110	58903	SOLO	Argo SIO	18/10/2008			FIXED	1001
7		3900303	49918	SOLO	Argo SIO	20/10/2008			FIXED	1430
8		3900220	45764	SOLO	Argo SIO	19/10/2008			FIXED	1688
9		3900273	45808	SOLO	Argo SIO	20/10/2008			FIXED	1511
10		3900225	45769	SOLO	Argo SIO	20/10/2008			FIXED	1671

Altimetry QC status for SIO floats.
Whenever a float is no more flagged by QC it is tagged "FIXED".



Here an example with float 2900783.
All QC feedbacks are summarized (global as "Altimetry QC" or individual).

The only missing element is the automatic forwarding of feedback records to the appropriate Argo contact points. For now, and to have more perspective on the type of feedback received, the TC forwards manually the information to the contact points.
It is proposed to automatically forward this information to DAC generic email addresses and delayed-mode operators. Should PIs or ARCs be notified as well?

Other sources of QC feedback could be interesting (e.g. GTSPP).
The Support Centre will be improved gradually according to the nature of requests/feedback received.

ADMT#8Meeting Action List:

1) Provide access to the support@argo.net question/answer database to AST/ADMT chairs. Completed.
All information is publicly available.
Most interesting question/answers are tagged "FAQ".
⇨ Address TO BE PROMOTED.
2) Establish an Argo user mailing list. Completed: argo-du@jcommops.org
⇨ Need to subscribe appropriate users. To be promoted.
3) Provide to AST chairs the list of operators that notify with delay their floats. Completed. Dedicated product developed (see above). Table 3 of monthly report can be regularly checked.
4) Include J. Gilson report on suspicious floats/profile detected. No input for now.
5) Modify the text to the Support Centre to encourage users to report on data quality. Completed.
6) Argo forum to be set up. Completed. http://groups.google.fr/group/argo-forum

ADMT#9Meeting Action List:

1) Calculate time delay for getting RT/DM files onto the GDACS. Investigate files slowly arriving
⇨ Need to complete GDAC detailed index files
2) Monitoring the floats sending good data to be included in AIC report
⇨ Done
3) Coriolis and AIC to monitor the resubmission of profiles after feedback
⇨ Need to complete GDAC detailed index files
4) ARCS and AIC to help CCHDO by providing point of contacts when they are aware of CTD cruises interesting for the Reference Database.
⇨ Done in monthly AIC Report. New list/maps of CTD made at float launch, including contact points. Float search engine modified accordingly.

4. International Issues

The Resolution XLI-4 of the IOC Executive Council recognized Argo as a "programme" to be sustained, "acknowledged"" the work of the AIC (within JCOMMOPS) and adopted the "Guidelines for the Implementation of Resolution XX-6 of the IOC Assembly regarding the deployment of profiling floats in the high seas".

While the implementation of the guidelines will be followed up by the IOC secretariat, it is strongly recommended to continue the efforts in notifying in advance the deployments plans through the AIC procedure.
Hence it is recalled to each Argo programme to:

- Designate a person (representing the Institution/Country) to enter the deployment plans in the AIC website
- Regularly update the information
- Notify the plans when they are finalized
- Make sure that the information entered is correct
- Not deploy Argo floats directly into EEZs without any kind of agreement
- ... and to not hesitate to request TC support.

To be noted that following the Resolution XLI-4, many National Argo Focal Points were updated.

Donor Programmes
These Argo initiatives, generally encouraged and coordinated by the AIC, and others led by National Argo programmes (US Argo/SIO & Pacific Islands , US Argo/AOML & Africa) are being recognized at IOC/WMO/JCOMM level. Member States will be invited to reserve a percentage of their platforms for donation purposes. Given the resources available for such initiatives, it is recommended to prepare joint initiatives between Argo, DBCP, etc.

Kenya: following the last outcomes of the DBCP XXIV Meeting, Kenya delegation confirmed that dedicated funding was identified to launch the 5 floats in 2009 (by June). If this can't be done, a US Navy ship could deploy the floats. Apparently it will be done by the US ship and UW will send an expert in Kenya to prepare and oversee the launching.

Gabon: floats being transferred. Draft deployment plans ready. TC (and US Argo program manager) will:
- Take receipt of 3 floats (transferred from a US Navy ship)
- Participate in related social event and present Argo
- Finalize deployment plan and train local staff to deployment
- Prepare 2010 Training Workshop (in French) for African countries

Morocco: Programme initiated**.** Letters sent to most of Departments. Still waiting official reply. (Launch of 3000th float at JCOMM III seems impossible)
- ⇨ No reliable contact points. TC will give up soon.

Peru, Ivory Coast, Indonesia, Cape Verde, Sri Lanka, Togo, and Rep. Dominican are waiting for a donor programme.

ADMT #10
JCOMMOPS is pleased to host the next session of the ADMT in Toulouse/France.
CLS has kindly agreed to support the meeting organization.
To be noted the potential overlap with the JCOMM III meeting to be held (in Morocco) the two first weeks of November 2009. Mid October seems to be a good time window.

5. Planning

Beyond AIC routine activities, and AST/ADMT suggestions and action items, planning for 2009 can be summarized as follow:

- Continue to produce/improve the AIC Monthly Report
- Continue to encourage/assist float operators to notify of deployment plans. Think in ways to facilitate the procedure

- Develop the Google Ocean Argo Layer
- Finalize specification of new AIC/JCOMMOPS website
- Migrate JCOMMOPS database on a new server
- Start developments of new web services

- Work on new GDACs metadata: delays, cycles, data formats
- Exploit detailed index files to develop appropriate monitoring tools

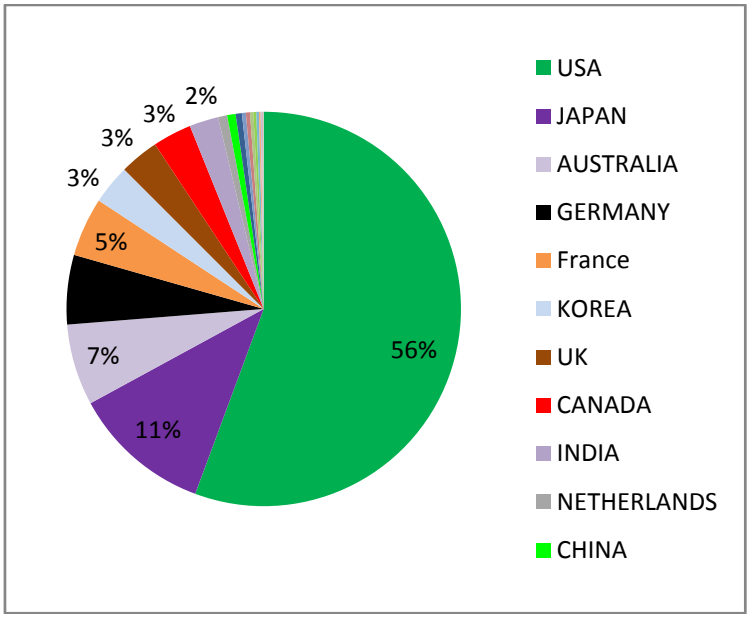
- Work on Argo Common Practices
- Update documentation for JCOMM
- Work (with AST and JCOMM) on new monitoring products demonstrating how Argo is meeting its requirements.

- Continue to assist in the float retrieval activities
- Continue to foster participation by new countries through donor programmes

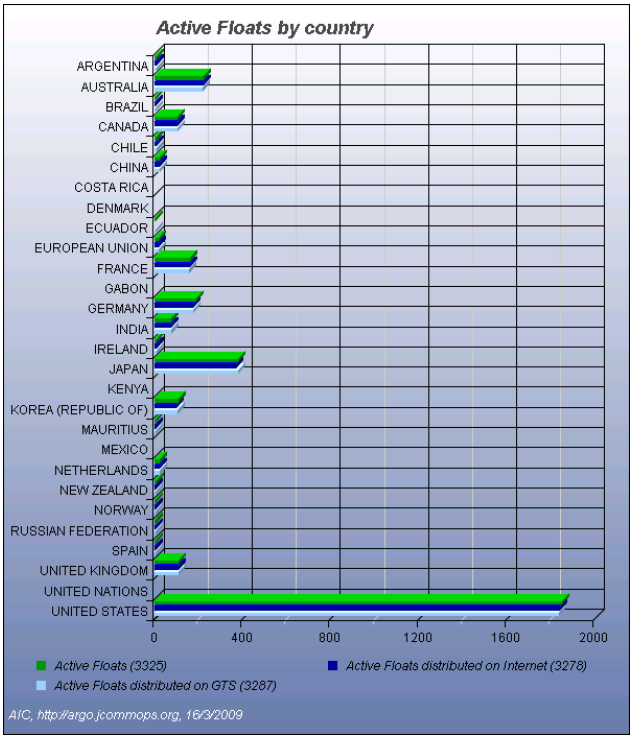
- Investigate possibilities to strengthen JCOMMOPS resources (ship coordinator)

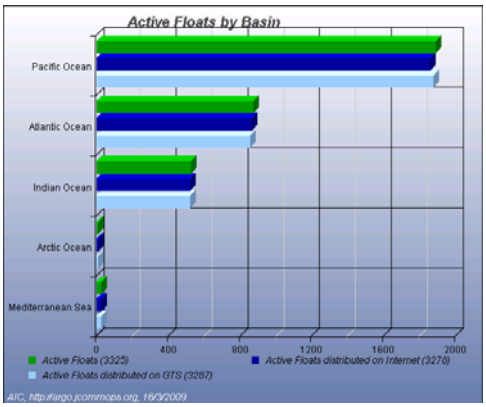
Annex: Argo Status, a few metrics

- Refer to the latest AIC monthly report for additional statistics. http://argo.jcommops.org/FTPRoot/Argo/Doc/2009-02-AIC.pdf
- Download the global Argo pdf status here (should be useful during AST meeting). http://argo.jcommops.org/FTPRoot/Argo/Maps/2009-02-all.pdf



National contributions (% of active floats)



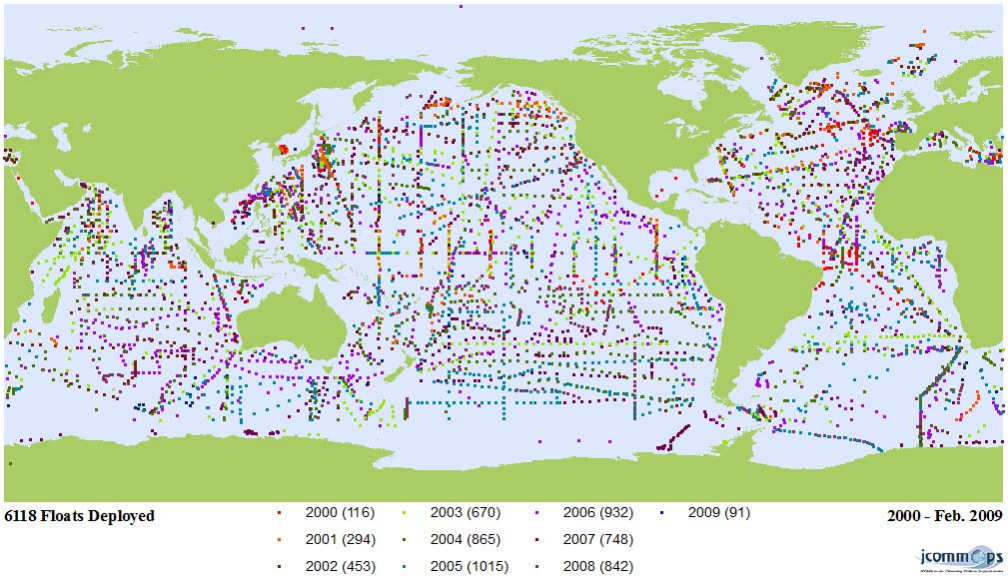


A dozen countries are sustaining the global network,
and another dozen takes care of regional gaps.
1800 floats are operating in the Pacific, 800 in the Atlantic, and 400 in the Indian Ocean.

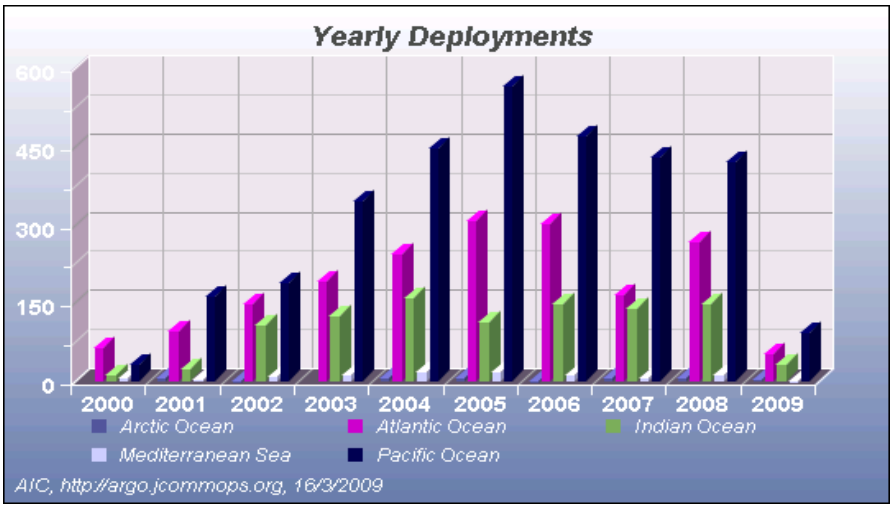
COUNTRY	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
UNITED STATES	21	10	16	70	129	150	315	443	513	520	419	390	**2996**
JAPAN	1	12	12	6	40	76	129	118	107	116	102	92	**811**
FRANCE	0	0	6	11	12	7	34	85	89	51	36	90	**421**
GERMANY	0	3	3	22	21	14	27	46	65	36	35	71	**343**
UNITED KINGDOM	0	0	0	0	30	37	37	45	28	24	33	29	**263**
CANADA	2	0	1	0	30	38	31	30	28	38	18	25	**241**
AUSTRALIA	0	0	4	6	0	12	8	5	62	46	43	68	**254**
KOREA (REPUBLIC OF)	0	0	0	0	16	25	32	32	37	33	9	29	**213**
INDIA	0	0	0	0	0	11	23	30	45	15	31	15	**170**
EUROPEAN UNION	0	0	0	1	10	70	4	17	16	20	8	0	**146**
CHINA	0	0	0	0	0	5	16	8	0	6	0	16	**51**
NETHERLANDS	0	0	0	0	0	0	0	3	4	4	4	13	**28**
NEW ZEALAND *	0	0	0	0	2	2	0	2	1	3	2	2	**14**
ARGENTINA *	0	0	0	0	0	0	0	0	0	12	0	0	**12**
NORWAY	0	0	0	0	0	3	6	0	0	2	0	0	**11**
SPAIN	0	0	0	0	0	0	7	2	1	1	0	0	**11**
BRAZIL *	0	0	0	0	0	0	0	0	4	0	4	0	**8**
CHILE	0	0	0	0	0	0	0	0	4	4	0	4	**12**
IRELAND	0	0	0	0	0	0	2	0	0	0	0	4	**6**
~~DENMARK~~	0	0	0	0	5	0	0	0	0	0	0	0	**5**

MAURITIUS *	0	0	0	0	0	0	1	2	0	2	0	0	**5**
~~**RUSSIAN FEDERATION**~~	0	0	1	0	0	2	0	2	0	0	0	0	**5**
ECUADOR *	0	0	0	0	0	0	0	0	0	0	3	0	**3**
COSTA RICA *	0	0	0	0	0	0	0	0	2	0	0	0	**2**
MEXICO *	0	0	0	0	0	0	0	0	2	0	0	0	**2**
TOTAL	**24**	**25**	**43**	**116**	**295**	**452**	**672**	**870**	**1008**	**933**	**747**	**848**	

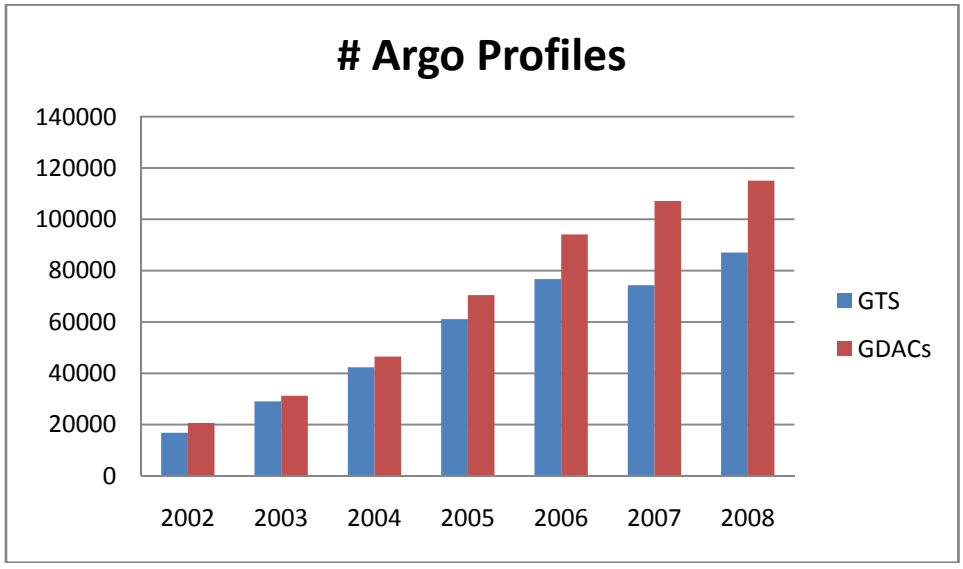
14 countries deployed floats in 2008.
In green the contributions that have substantially increased,
in blue the one that have maintained the same level ,
in red the ones that decreased.
Cross-out countries have apparently stopped their contribution (3 years without deployment).
(*) Argo Donor Programmes.



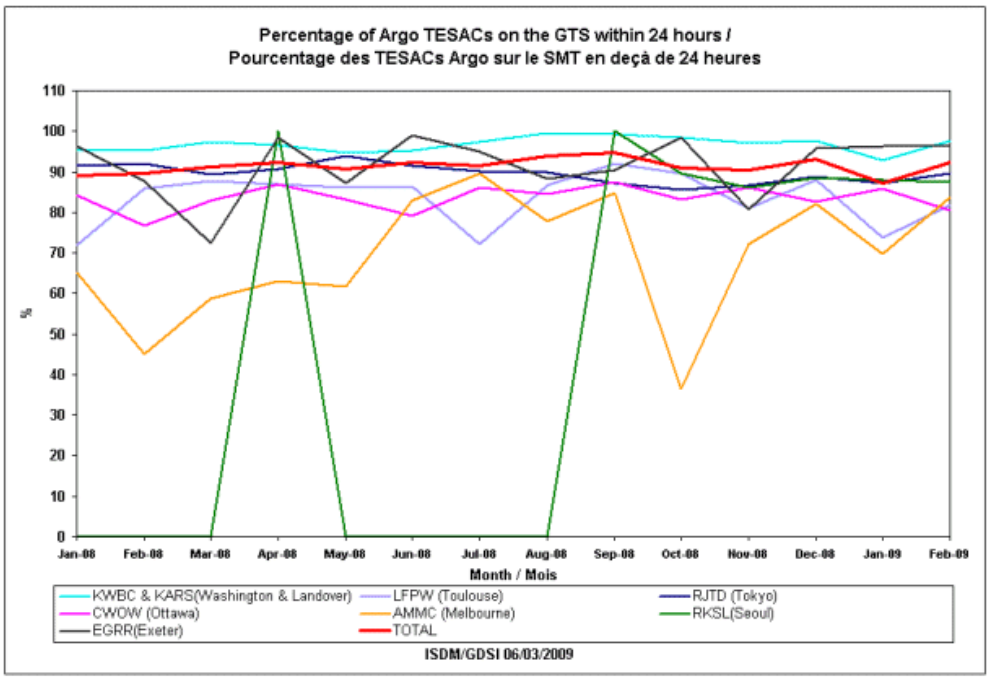
Argo yearly deployments.



2008 is a good year for Argo, especially in the Atlantic Ocean with increased contributions from France and Germany.



At least 10% of profiles in 2008 were lost for operational users: 87079 profiles were distributed on GTS, while 97574 were distributed at GDACs (no grey-list and PARAM_QC='A'). This is not so bad compared to other observing programs but there is still room for improvement.



90% of the float data were distributed with 24h in 2008 on the GTS. (Source: ISDM) Problems on Korean and Australian nodes were resolved.
To be noted that some users requested to improve as far as possible the timeliness for ocean forecasting. New generations of telecommunications systems may be the key.

Argo Australia Report – 2008 Activities

Report to the Argo Steering Team, 2009
Susan Wijffels and Ann Thresher,
The Australian Center for Atmosphere, Weather and Climate Research: a joint partnership between the Australian Bureau of Meteorology and CSIRO

.

1. Status of implementation

Floats deployed and their performance

Between January 2008 and March 2009, Australia Argo deployed 81 Argo floats in Australian waters. Two of these had iridium transmitters and the rest had standard Argos transmitters. Australia currently has 229 operating floats though 5 of these are reporting suspect data that is not being distributed to the GTS. We have therefore exceeded the stated plan to have 180 operating floats by the end of 2009 and are well on our way to attaining the ultimate goal of 240 operating floats operated by Argo Australia in the South Indian, Pacific and Southern Oceans. Australian floats in Figure 1, below, are pink circles with a dot in the centre.

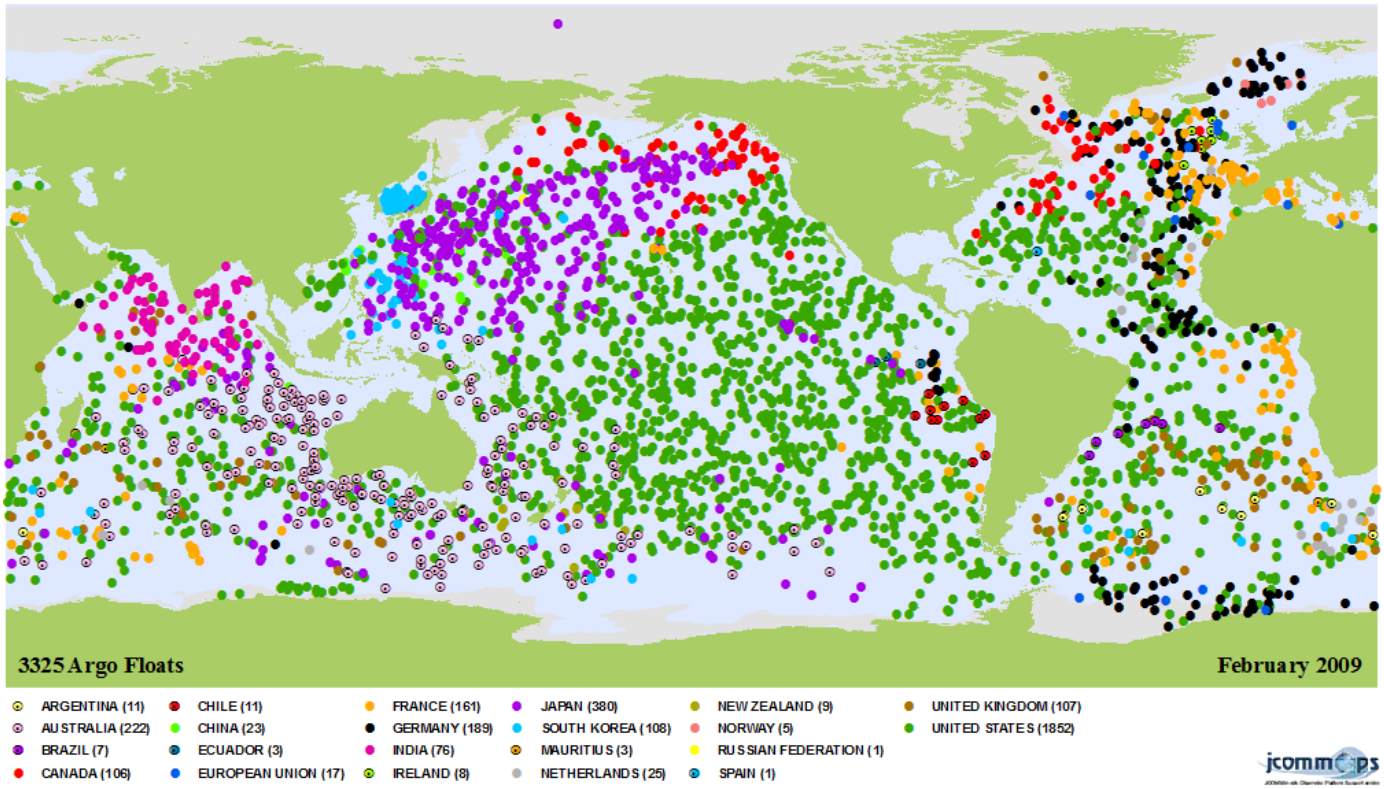


Figure 1. Location of active floats globally, colour-coded by country.

Webb Research Corporation has been sold to Teledyne and is now operating as Teledyne Webb Research. Operations continue as before and personnel have not changed. This stability is reassuring.

APEX performance in the Australian array has been excellent – we now have 14 floats that have operated for more than 6 years profiling to 2000db. These floats all have mixed alkaline/lithium battery packs encouraging us to hope that floats with full lithium packs will last even longer. Only 4 floats of that cohort have failed.

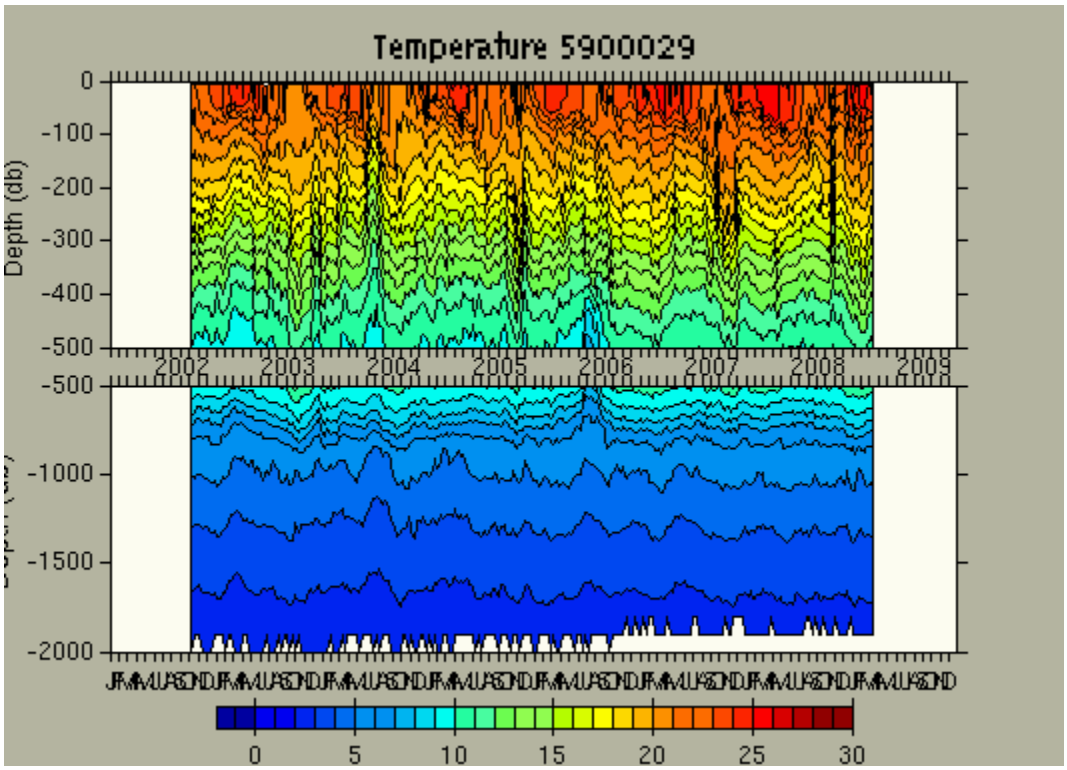


Figure 2: Temperature profiles from one of our first cohort of APEX installed with mixed alkaline-lithium battery packs, demonstrating continuous profiling to 2000db at low latitudes for over 6 years.

Following on from our experience with a bad batch of floats last year, all of that group have now failed to report after extremely rapid battery drain caused by a programming error. We have received 2 floats in compensation from the manufacturer.

Both iridium floats deployed are operating well – it is too early to assess any reliability or longevity difference between these and the Service Argos Floats.

A float that was picked up (unbeknown to us) in 2004 has been returned to CSIRO after spending the intervening years in a shed. This float also appeared to have a severe fault – it had failed to report after deployment and apparently drifted at the surface until washing up on King Island in Bass Strait, where it was found. When examined, it was clear that

the batteries were completely drained and the memory had been cleared. We are taking an in-depth look at this float and will eventually return the board to Webb Research for their input. It appears there was a catastrophic failure between the first profile and the test messages (which all were normal). Not even the Argos ID survived in memory so the float couldn't report. This was one of another batch of questionable floats. One other float from this group also disappeared immediately after deployment and we suspect a similar failure. Though this software/hardware version is no longer in production, it might well tell us something about failure modes and how to prevent it in future.

Status of contributions to Argo data management:

The technical file naming scheme designed by Vito Dirita and presented at ADMT-9 by Ann Thresher has been approved subject to the GDACs implementing file format checkers that can handle the new format files. The Argo community has been extensively consulted about names and a final set has been defined. The software already generates the new format files and they are ready to be delivered.

Real time processing: This year, the big challenge for RT development was to adapt and deliver the Australian ArgoRT software to our Indian counterparts at INCOIS. Their software currently doesn't provide enough metadata in the right format to allow proper processing. Many of their files were incomplete or in error. By implementing ArgoRT, they will become compliant and can generate all the required files. This has been a long job but a successful one – currently 85% of their floats are being processed using ArgoRT. The remaining 15% are either Provor floats which can not yet be decoded by the software or a few floats with some problems that will be sorted out as soon as possible.

An Analysis of Pressure Errors in APEX floats in the global array: An analysis of the APEX fleet data was carried out (by Paul Barker) to identify profiles at the GDAC which were not corrected for reported drifts of surface pressure and also to identify those APEX floats which may have a negative drifting pressure sensor (but are uncorrectable due to truncation of surface reports). Diagnostic plots, float cohort lists and suggested actions were made available for DACs via ADMT-9 and the web. Currently DACs are working toward correcting these biases in floats with positive drifting sensors, which is an urgent issue. DACs need to also identify floats with possibly negative drifting sensors so that a list can be maintained at the GDACs for exclusion in certain global calculations (such as ocean heat content). A pressure-corrected December 2008 version of the Argo data set will soon be made available by CSIRO, once documentation of the problem is completed.

Status of delayed mode quality control process

There are 20086 CSIRO profiles in total at the GDAC. Of these, 11467 are real time R files of which 3444 are eligible for processing (Figure 3).

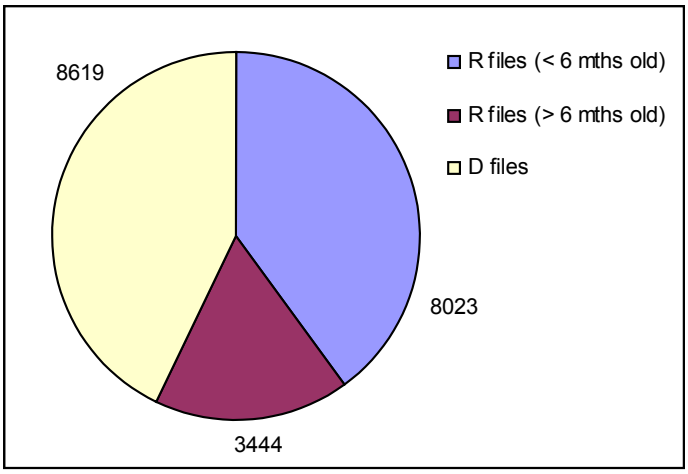


Figure 2. R files are real-time files, D files are delayed mode versions

CSIRO have currently processed 71% (8619) delayed mode files from a total of 12063 eligible files (i.e. those greater than 6 months old) (Figure 4).

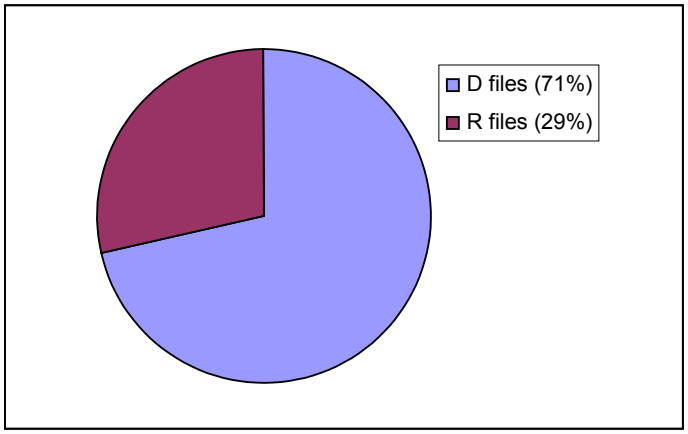


Figure 3. D and R are defined as for figure 2.

Reference Data

We have developed an in-house software tool which uses nearby Argo data to help assess salinity drift in the delayed mode assessment. This tool is extremely useful in making decisions on salinity drift in historically data sparse regions such as the Coral Sea and the Southern Ocean and is now used routinely to assess drift for all Australian floats.

During 2009 we will implement OW and replace WJO in the delayed mode data processing stream. The intent is to include the new Argo CTD reference data set and the Argo profile reference data set when we make this transition.

Resource/manpower

We currently have 1.5 people dedicated to DMQC. In the past year we have had a change of personnel in our Argo programming position and therefore, during the transition there

has been a delay in processing the backlog of profiles. Jeff Dunn was brought on board in late 2008 as the new DMQC programmer in order to streamline the delayed mode quality control process. His role involves rewriting and cleaning up existing code, writing and testing new software, website development, documentation and developing gridded Argo products. We expect that by July we will have our new DMQC processing system set-up and our backlog of profiles dealt with.

Documentation
A considerable effort has gone into creating html documentation for each float. This is one third complete and these documents will be made available online to the Argo community as soon as the entire dataset is complete (most likely by June). An html template has been created which produces a single html file for each float containing all the relevant DMQC plots and including basic float specifications and a summary of overall data quality.

Outreach activities
We are also creating and hosting a website to promote Argo to data users, the scientific community and the general public. There will be examples of Argo data, a "latest news" section with recent deployments and features including the new Iridium floats etc.

2. Present level of and future prospects for national funding for Argo

Over the past two years, Argo Australia has been part of the the Australian Government initiative: an Australian Integrated Marine Observing System (IMOS) for research infrastructure funded under the National Collaborative Research Infrastructure Initiative. Through IMOS, and if levels of support from our participating partners remains steady, Argo Australia will be funded at a 50-60 float/year level for 4 years to maintain an array of around 220-240 Argo floats. However, substantial resources are contributed by CSIRO and the Australian Department of Climate Change via the Australian Climate Change Science Program (ACCSP), which has an uncertain future.

Human resources: Australian Argo requires approximately 100% of a engineer and 75% of a technician for float checkout and preparation, test development; 50% of a full-time operations officer for float shipping coordination and deployment training; delayed – mode data processing requires 150% fulltime data experts but we have been working on a large back-log and hope this level can be reduced as the processing becomes more routine.

3. Summary of deployment plans (level of commitment, areas of float deployment)

Argo Australia currently has 66 floats either in the lab or on order. It is likely that we will order a further 40-50 before the end of the year, funded by IMOS and CSIRO. The map below (Figure 5) shows where deployment plans have been made for some of these, though 20 are still unallocated spatially and we will examine gaps before deciding where to put them.

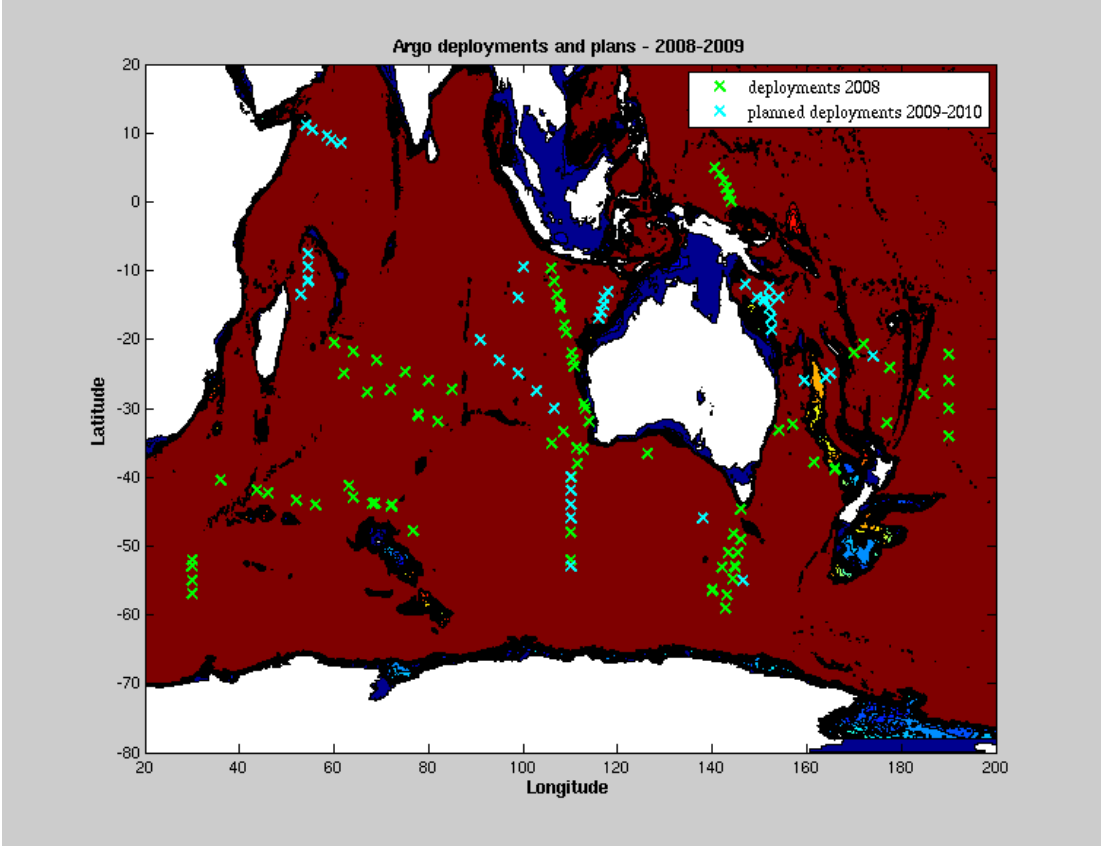


Figure 5. Locations of float deployments over the last year - green 'x'. Planned deployment locations of fiscal floats-on-hand or ordered- cyan 'x'.

4. Summary of national research and operational uses of Argo data as well as contributions to Argo Regional Centers.

- Argo data are routinely used in the operational upper ocean analyses of Neville Smith at the Australian Bureau of Meteorology (http://www.bom.gov.au/bmrc/ocean/results/climocan.htm). These analyses are also used to initialize an experimental seasonal rain forecasting system.
- The dynamical seasonal forecasting system POAMMA heavily uses Argo data – Oscar Alves, Australian Bureau of Meteorology
- CSIRO Marine and Atmospheric Research, in collaboration with the Bureau of Meteorology Research Center, has developed an ocean model/data assimilation system for ocean forecasting and hindcasting. Argo data is the largest *in situ* data source for this system. Ocean forecasts and reanalysis products are now routinely published and are available via the Bureau of Meteorology website or the PI (www.marine.csiro.au\~griffin) : David.Griffin@csiro.au
- Many students in the CSIRO/University of Tasmania graduate program are utilizing Argo data in their thesis studies. It's use is becoming widespread for studies of subduction in the Southern Ocean (Sloyan, Rintoul), generation of modern era climatologies (Ridgway and Dunn), ocean warming and its role in

sea level rise (Church, Domingues, Wijffels, Barker), in ocean observing system studies (Oke and Schiller), Ocean salinity changes (Durack/Wijffels)

- Developing model-based gridding techniques to produce an Argo-gridded data set (Dunn, Oke, Tchen, Wijffels) and a new global Argo climatology

5. Issues to be raised with the Argo Steering Team

Southern Hemisphere coverage: While Argo has made tremendous progress internationally, the array density remains biased towards the Northern Hemisphere - coverage in the SW Indian and South Atlantic. We would like to see basin coordinators target these regions. Australia will endeavour to assist with deployment in these regions.

Pressure Bias Corrections: We urge DACs to urgently correct the pressure errors floats where possible and report floats with unknown pressure errors to the GDACs so that a list of these are available to users. Argo must be seen as a reliable means to track the global ocean heat content IN REAL TIME.

Canadian National Report on Argo-2008

1. Status of implementation (Major achievements and problems encountered in 2008)

1.1 Floats deployed and their performance

During 2008, Canada deployed 25 floats: all were APEX floats and of these 11 were deployed in the Atlantic and 14 in the Pacific. Significant financial support from the Canadian Ice Service, Environment Canada permitted enhanced coverage of the northern Labrador Sea and northern North Pacific. As of writing in February 2009 three floats seem to have failed with the rest continuing to supply good data. Two of the failures appear to be instrumental since the floats failed after only 1 and 3 profiles respectively. The third float had moved into shallow water on the Labrador Slope where sea ice was present. This float may return later in the spring. One of the floats deployed in the Pacific Ocean was our first attempt to track a float communicating through the CLS/America RUDICS interface to Iridium. We consider this to be a great success. We thank Steve Riser's group for their assistance training a technician to prepare a float for deployment with Iridium comms and lithium batteries.

The Atlantic effort focussed on the Slope Water and Labrador Sea. The Pacific effort included deployments in the Gulf of Alaska and the Bering Sea. We are grateful to JAMSTEC for allowing us to deploy 6 floats from the R/V Mirai. At the time of writing we expect to have 20 floats on hand at the start of the new fiscal year. We are hoping to use assistance from Russia to deploy 6 floats in the far western Bering Sea and we welcome other international collaboration.

1.2 Status of contributions to Argo data management

ISDM (formerly MEDS) continues to acquire data from 110 active Argo floats of which 3 floats are presently late in reporting. Data are issued to the GTS and GDACs every 6 hours. We increase the frequency of acquiring data from the Argos server to hourly if we fail to access the system at a specific 6 hour interval. On average 84% of 2008 data were issued to the GTS within 24 hours of the float reporting. We sent approximately 3870 delayed mode quality-controlled profiles to GDACs in February 2008. We have roughly 6 month's worth of profiles ready for delayed mode quality control at this time. Our website is updated daily automatically. Several MatLab routines used to generate maps and tracks for the website were revamped during a migration of MatLab codes from UNIX to Windows. The website located at http://www.meds-sdmm.dfo-mpo.gc.ca/isdm-gdsi/argo/index-eng.html displays float tracks, temperature, salinity and oxygen contour plots and technical information for each float.

ISDM has been transmitting Argo data in BUFR format under header IOPX02 since January 19, 2009. We offer assistance to data centers that would like us to verify their BUFR messages before putting them on the GTS. So far we have verified BUFR messages generated by CLS and US Argo. The development of Java software to write Argo NetCDF file has been completed. We adjusted pressure and recorded adjusted pressure in the PRES_ADJUSTED field of the NetCDF file for our entire set of real-time data. We also created software to decode data from our first Iridium float (Q4901105) communicating via the CLS/America RUDICS interface.

The next Argo development activity for ISDM is to set up a process to receive Argo BUFR messages and detect time delays and discrepancies between Argo messages transmitted in BUFR and TESAC format. We also need to develop a decoding program for newly- purchased APEX floats with APF9 controllers.

2. Present level of, and future prospects for, national funding for Argo including a summary of the level of human resources devoted to Argo.

During 2008 the Canadian Argo program was primarily funded as a research effort. It has been our early intention to move funding to a more routine or operational basis but that has not yet occurred. We are continuing to pursue this. The funding in 2008 including the much appreciated contribution from the Canadian Ice Service was adequate to maintain and slightly enhance the Canadian contribution to the international effort.

Funds to purchase floats typically appear very late in our fiscal year and at the moment we know we will have 28 floats available for launch starting March 31st, 2009.

3. Summary of deployment plans (levels of commitment, areas of float deployment) and other commitments to Argo (data management) for the coming year (and beyond where possible).

Detailed deployment plans are not yet known as it was only very recently that it became known how many floats we would have on hand. We expect to deploy 14 floats in each of the Atlantic and Pacific sectors with deployments biased towards the far northern regions of both oceans, with most going into the Bering and Labrador Seas. We are hoping to collaborate with Russia to achieve the deployments in the far western Bering Sea.

4. Issues that Canada wishes to be considered and resolved by AST regarding the international operation of Argo.

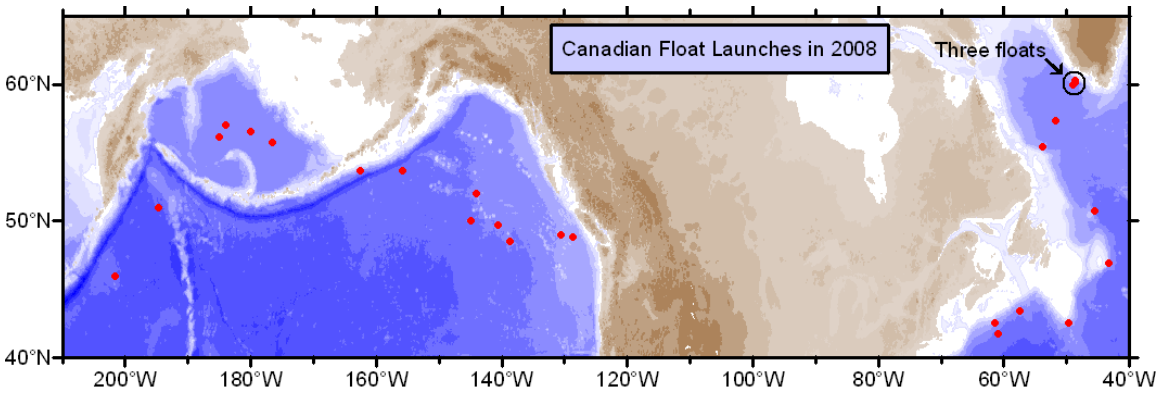
The delivery of delayed mode, quality controlled Argo data to GDACs has improved significantly in the past 12 months. Despite this, we believe that there is still some room for improvement in the timely delivery of delayed mode data.

We are very keen to see a permanent Argo program office established and wish to encourage the Argo Executive and IAST to make this happen. We believe that the ATC (Argo Technical Coordinator) and AD (Argo Director) positions should be co-located. We note that JCOMM is working to provide an Observing Programme Support Centre. This may be a suitable location as operations will be run in concert with other ocean observation programs.

As noted above, our current funding is still without long-term stability. We feel that it may be useful to hold an Argo Steering Team meeting some time in the foreseeable future in Canada. Specifically, we offer to host the AST-11 meeting at the Bedford Institute of Oceanography in Dartmouth, Nova Scotia.

Appendix – summary of Canadian float launches during calendar 2008.

	Launch Date	WMO-ID	Comms	Ocean Basin	Launching Vessel	Still Operating?
1	03/02/2008	4901064	Argos	P	Tully	Yes
2	10/02/2008	4901072	Argos	P	Tully	Yes
3	11/02/2008	4901065	Argos	P	Tully	Yes
4	16/05/2008	4901090	Argos	A	Hudson	No
5	23/05/2008	4901095	Argos	A	Hudson	No (?)
6	23/05/2008	4901094	Argos	A	Hudson	Yes
7	25/05/2008	4901093	Argos	A	Hudson	Yes
8	27/052008	4901092	Argos	A	Hudson	Yes
9	28/05/2008	4901091	Argos	A	Hudson	Yes
10	01/06/2008	4901102	Argos	A	Hudson	Yes
11	02/06/2008	4901101	Argos	A	Hudson	Yes
12	07/06/2008	4901105	Iridium	P	Tully	Yes
13	09/07/2008	4901097	Argos	P	Laurier	No (ice)
14	10/07/2008	4901104	Argos	A	Teleost	Yes
15	11/07/2008	4901096	Argos	P	Laurier	Yes
16	16/08/2008	4901099	Argos	P	Tully	Yes
17	23/08/2008	4901100	Argos	P	Tully	Yes
18	12/10/2008	4901085	Argos	P	Mirai	Yes
19	12/10/2008	4901086	Argos	P	Mirai	Yes
20	16/10/2008	4901087	Argos	P	Mirai	Yes
21	16/102008	4901088	Argos	P	Mirai	Yes
22	18/10/2008	4901078	Argos	A	Hudson	Yes
23	21/10/2008	4901089	Argos	P	Mirai	Yes
24	30/10/2008	4901098	Argos	P	Mirai	Yes
25	06/12/2008	4901103	Argos	A	Hudson	Yes



China National Report for the AST-10 Meeting

Submitted by Jianping Xu

The Second Institute of Oceanography, SOA

1. The status of implementation (major achievements and problems in 2008)

➢ floats deployed and their performance

The China Argo Project has been supported or funded by the Ministry of Science and Technology, the State Oceanic Administration, and the National Natural Science Foundation of China. In 2008, 16 Argo floats were deployed in the northwestern Pacific by the China Argo Real-time Data Center. Totally 51 floats have been deployed since 2002, and 22 floats are still active as of January, 2009. All the active floats are Apex profilers.

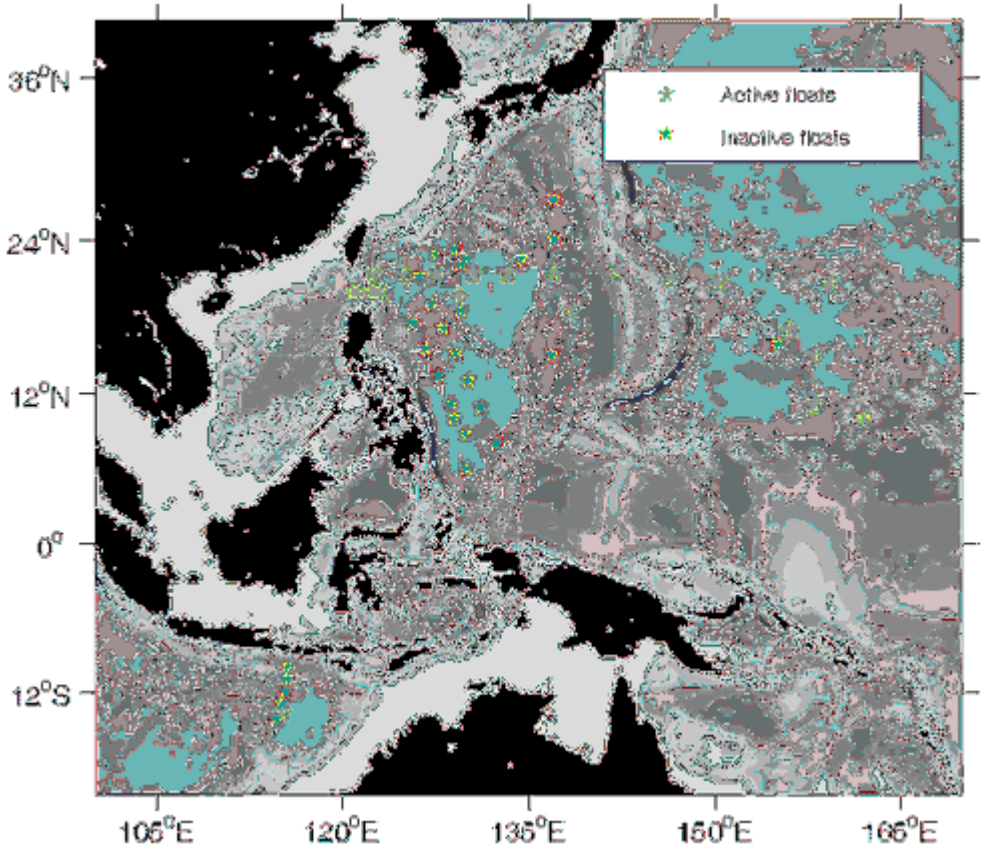


Fig.1 The launch positions of profiling floats during 2002-2008.

➢ technical problems encountered and solved

Almost all the floats deployed during 2006-2008 are active. No technical problems were found. Regardless of the technical problems, the averaged lifetime of Apex floats with Alkaline battery is

about 840 days, while those floats with Alkaline and Lithium battery packs have an averaged lifetime of 875 days (here all the floats were deployed before 2006). It should be pointed out that 5 out of 6 Apex floats installed with Alkaline and Lithium battery packs are still active. To prolong the lifetime of the Apex profilers, we sent two technicians to learn about lithium battery packs installation at UW. We are going to install lithium battery packs in the China Argo Real-time Data Center.

- **status of contributions to Argo data management**

The China Argo Real-time Data Center processed over 600 profiles from the 26 floats this year. All the data were submitted to GDACs within 24 hours through RTQC. CLS is still entitled to insert our data into GTS.

- **status of delayed mode quality control process**

China Argo Real-time Data Center implements DMQC using WJO method and thermal mass correction. A total number of 1862 D-files have been submitted to GDACs, which accounts for 80% of all the profiles. OW tool with Coriolis reference dataset will be used early this year.

2. Present level of and future prospects for national funding for Argo

China Argo deployment is now funded by the Ministry of Science and Technology (MOST) and the State Oceanic Administration (SOA). A 10-15 float/year level for 4 years has been funded for 2008-2011. However, the present support to float deployment is from some kind of Argo related research program, which results in limited number of floats deployed in recent years. We are trying to make China Argo project be brought into the operational activities of the ocean monitoring system of the SOA.

In China Argo Real-time Data Center, one person devotes to data processing (both RTQC and DMQC), which occupies 90% time of his work. We need a full time technician for float checkout, lithium battery packs installation and deployment training.

3. Summary of deployment plans

China Argo has 18 Apex profilers ready for deployment. In addition, 20 Apex floats have been ordered from WRC. So there will be 38 floats to be deployed in 2009. We are seeking the right cruise to deploy these floats. We plan to deploy them mainly in the northwestern Pacific Ocean.

4. **Summary of national research and operational uses of Argo data as well as contributions to Argo Regional Centers**

- The Ministry of Science and Technology and the State Oceanic Administration granted 2 research programs in 2007, based on the global Argo real-time observation to study the formation and variation of the upper layer structure in the subtropical Pacific Ocean, the heat and salt exchange between the Pacific Western Boundary Current and the coastal seas.
- Argo data are used in an ocean data assimilation system at the National Marine Environmental Forecasting Center (http://www.nmefc.gov.cn/NewsShow.aspx?FID=20081113125648859113&CID=20081222114941699974). These monthly products have a horizontal resolution of 2°×1° in the tropical Pacific ocean.
- Argo data have been used in the BCC-GODAS System at the Chinese Academy of Meteorological Sciences, and the product is released at the website of IRI/LDEO, Columbia University (http://iridl.ldeo.columbia.edu/SOURCES/.CMA/.BCC/.GODAS/).
- The China Argo Real-time Data Center monthly collects global Argo profiles from GDACs, and implements quality control before releasing on the ftp server. Argo data are widely used in many institutes and universities in China related to ocean sciences.

5. **Issues that your country wishes to be considered and resolved by the Argo Steering Team**

It's suggested that AST should conscientiously treat and handle the issue about floats drifting into coastal countries' EEZ. At present, Argo member states should respect the Resolution XX-6. It's a challenging task to maintain over 3000 floats in the global ocean for a long time, and gaps in the polar regions and some open oceans need to be filled. The purpose of the Argo Program is to meet the pressing need for T/S profiles in open ocean waters of the global ocean. For this reason, AST should restate the essence of Argo design in member states, and restrict the program to be extended into marginal seas and EEZs.

6. **CTD cruise data added to the reference database**

The China Argo Real-time Data Center has submitted 10 CTD casts to CCHDO and Coriolis data center during 2006-2008. These CTD cruise data were observed at Argo deployments. We will continue to collect CTD data at float deployment, and upload to CCHDO and Coriolis.

ARGO National Report 2008 – The Netherlands

1) **Status of implementation**

   The Dutch Argo program, run by the Royal Netherlands Meteorological Institute (KNMI), started with three deployed floats in 2004. One of them is still working. Since then 28 more floats have been purchased and deployed, bringing the total to 31. Six floats have stopped working.

   KNMI is involved in EuroArgo.

2) **Present level of (and future prospects for) national funding for Argo including summary of human resources devoted to Argo**.

   In their observation strategy adopted in 2006 KNMI has expressed the intention to sustain a fleet of approx. 30 floats. Given a lifetime of about 4 years for a float this means purchase of about eight floats per year, plus communication. However, funding for float procurement has to compete with investments in other observational programs. At the moment (09 Jan.) it seems that only 4 or 5 floats can be purchased in 2009.

   One person (Andreas Sterl) is working on ARGO. He does so besides his other duties.

3) **Summary of deployment plans** (level of commitment, areas of float deployment) and for other commitments to Argo for the coming year (and beyond where possible).

   Four floats will be deployed, preferably in the Atlantic Ocean.

4) **Summary of national research and operational uses of Argo data**

   Nothing done yet.

5) **Issues that your country wishes to be considered (and resolved) by AST regarding the international operation of Argo**

   Nothing.

6) **CTD data uploaded to CCHDO**

   Unknown.

French National report on Argo – 2008
10th ARGO Steering Team meeting
March 2009
V. Thierry

1. The status of implementation (major achievements and problems in 2008)

- floats deployed and their performance:

90 floats were deployed in 2008.

- technical problems encountered and solved:

ARVOR
Arvor is a new float specially dedicated to CTD measurements for Argo. This development has been achieved to facilitate deployment (smaller, lighter weight <20 kg) and to reduce manufacturing costs.
Transfer of the Arvor prototype for industrialization (NKE manufacturer) has been achieved and 10 instruments were manufactured in May. Intensive tests were done during the 2nd part of the year including tests achieved in real conditions by executing whole missions in a pressure tank until 2100 dbars, tests performed in a pool and tests of Argos transmission. Two floats were also tested at sea in September in the Mediterranean Sea from Thetys ship. The floats successfully made 2 cycles each until 2000 dbars. Finally, 2 floats have been shipped to the South Indian Ocean (track09 cruise) in December to be deployed for long term at the end of February 2009. These floats will cycle every 2 days at 2000m depth.

In order to spend less time at surface for data transmission, the design of an iridium model began, using the same antenna as Provor multisensors. A smaller modem has been tested and the software development has begun. The objective is to do the first tests in spring 2009. The deployment of 2 instruments should be done in the Mediterranean Sea within the EuroArgo framework.

Reflexions on the use of Argos3 satellite transmission has begun. Few tests have been done with the new modem PMT from CLS Argos. The objective in 2009 is to implement this transmission on Arvor, as an alternate way to Iridium. An experiment at sea should be done at the end of the year.

PROVOR multi-sensors

- ProvorDO is a PROVOR float fitted with an Aanderaa oxygen sensor. Improvement has been done after sea experiences (WP10-Carbocean, Flops, Ovide). The optode has been moved from the bottom to the top of the float, for better operation. The software has been improved to take into account some possible negative measurements of oxygen due to perfectible factory calibration. A software bug has also been corrected to measure oxygen above 327umol/l. These corrections will be implemented in the new floats.

- The successful deployments of Provor floats equipped with Irridium transmission to transmit the large amount of data collected by additional sensors (optode + transmissiometer for a Provcarbon float and radiometer + transmissiometer + fluorimeter for a Provbio float) show the success of the first iridium communication fitted out on Provor float. In addition, the Iridium satellite downlink capability has been successfully used for the first time on a Provor float to modify its mission parameters or to recover it after short mission duration.

- **status of contributions to Argo data management:**

Coriolis continue to process French floats in RT and DM. French Coriolis data center processes data coming from 991 floats including 355 active floats in February 2009 (about half Provor , half Apex) ,

deployed by 10 countries (Chile, China, Costa Rica, France, Germany, Mexico, Netherlands, Norway, Russia, Spain and the European Union) and operated by different scientific projects (Good-Hope, Mersea, MFSTEP, Tropat, Weccon…) The detail can be found on the Coriolis web site (http://www.coriolis.eu.org/cdc/scientific_projects.htm). Data are processed and distributed according to Argo recommendations
Coriolis operates one of the GDAC in close collaboration with FNMOC/ISA. Coriolis also coordinates the North-Atlantic ARC activities and in particular the float deployment in Atlantic

2. Status of delayed mode quality control process

Statistics on all delayed mode data loaded in the Coriolis database for end of February (02/27/2009) are presented on Figures 1 and 2.
Figure 1 presents the status of the Coriolis floats. 31475 delayed mode profiles are present in the Coriolis DAC that represents about 49% of the total number of profiles available. 25% of the floats cannot be processed for various reasons (only temperature sensor, float too young, etc..). Among the remaining floats that must be controlled in delayed mode, 26% of the floats are currently under consideration by the PIs and 7% of the floats are problematic and must be considered carefully.

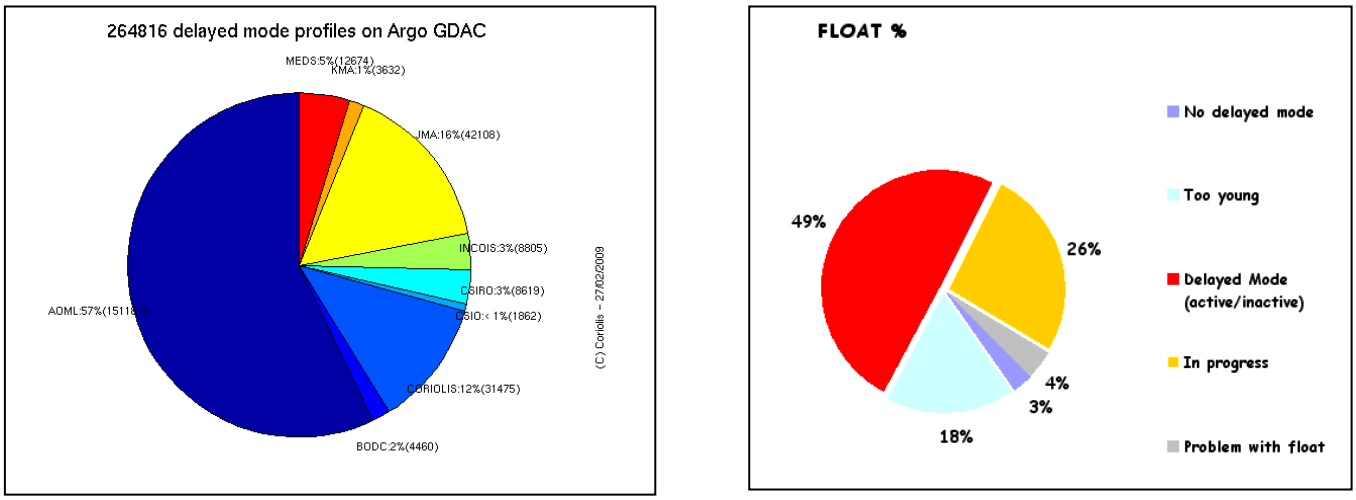


Figure 1: (Left panel) Delayed mode statistics. (Right panel) Status of the delayed mode process at the Coriolis DAC.

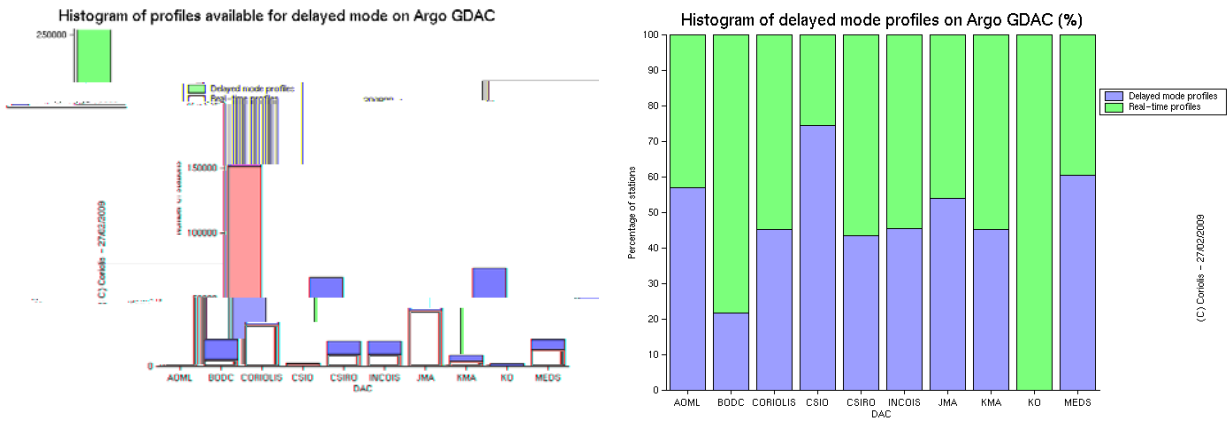


Figure 2: Histogram of profiles available for delayed-mode on Argo GDAC. (Left) Number of pofiles; (Right) percentage.

The delayed-mode quality control of Coriolis floats is done within different scientific projects. Some of them have been able to provide DM data within a reasonable time frame while other have more difficulties because of the unavailability of the PIs, because complementary studies are needed or because of the lack of data in the reference database. This is especially the case for floats in the southern ocean, although the OW method is now able to take fronts into account.
Reports on the delayed mode quality control of some floats (Ovide project for instance) are available on the following Web page: http://www.ifremer.fr/lpo1/ovide/data/argo_profiling_floats.htm. A link to those pages and to any other reports concerning Coriolis floats will be available soon through the Coriolis web site.

3. Present level of and future prospects for national funding for Argo including a summary of the level of human resources devoted to Argo.

Since 2000, France has provided a significant contribution to the growing Argo array. 420 French floats and 68 floats co-funded by European Union have been deployed in different geographic areas. The deployments meet specific French requirements but they also contribute to the global array.

Year	Man/Year	French floats
2001	3	11
2002	6	12
2003	9	7 (+4)
2004	15	34 (+20)
2005	15	85 (+18)
2006	12	89 (+11)
2007	12	65 (+15)
2008	12	32
Total(2000-2008)		***420 (+ 68)***
2009	**12**	**60**

Tableau 1: (*Man/year* column) Man power dedicated to Argo for float preparation and data management activities within French Argo. (*French floats* column) French floats contributing to Argo deployed by year. Numbers in brackets are the additional floats co-funded by EU within the Gyroscope, MFSTEP and Mersea projects. Estimated value is given for 2009.

The French Argo Project is funded by the ministry of Research and by local administrations (Britanny region, Finistère department, city of Brest) mostly trough Ifremer and in a lesser proportion by the ministry of Defense through SHOM. Ifremer and SHOM plan to buy between about 50 and 15 floats respectively in 2009 and beyond. As part of the Euro-Argo preparatory phase, Ifremer works with its funding ministry (mainly research ministry) to agree on a long-term funding level and commitment. Together with its European partners, Ifremer also works with the European commission to set up a long term EC funding to Argo.
In 2008, two scientists joined the Coriolis project to set up the research and development component of the project.
Overall the level of support, additional to float purchase, is as indicated in Tableau 1 (man power for float preparation and data processing).

4. Summary of deployment plans (level of commitment, areas of float deployment) and other commitments to Argo (data management) for the upcoming year and beyond where possible.

According to the current deployment plan, 52 floats will be deployed in 2009 in the Mediterranean Sea, in the North and South Atlantic Oceans, in the Southern Ocean and in the Pacific Ocean (Figure 3) and 13 deployments from ship of opportunity are under considerations.

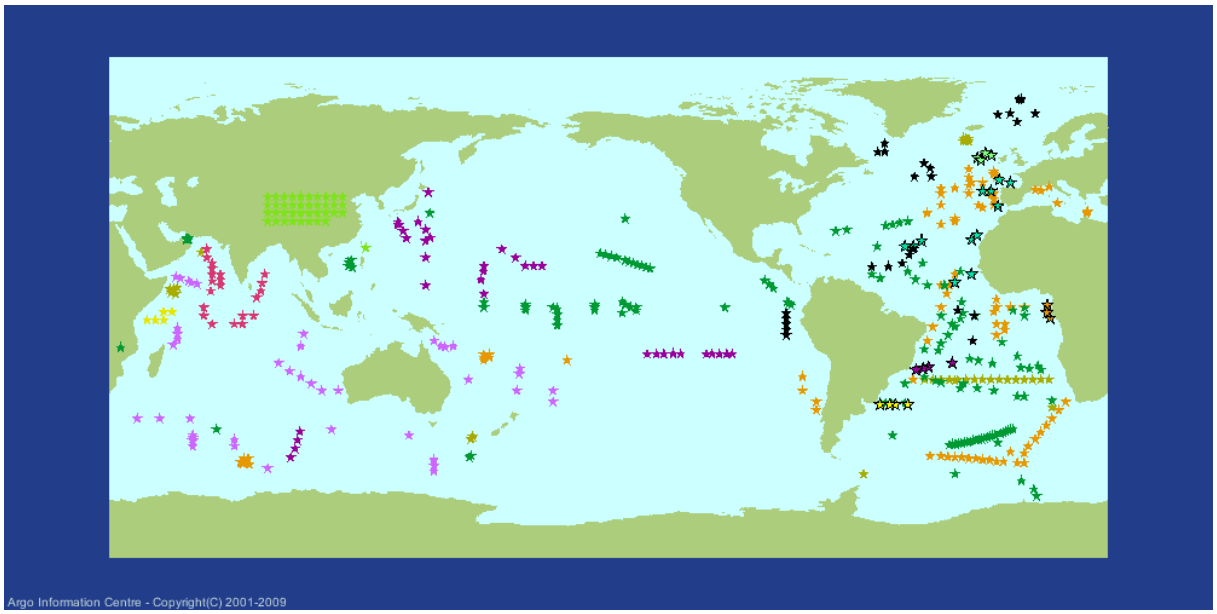


Figure 3: Deployment plan. The orange stars represent the French deployment plan for 2009.

Coriolis will continue to run the Coriolis Dac and the European GDAC as well as coordinating the North Atlantic Arc activities. Within the Euro-Argo project development will be carried out to improve anomalies detection at GDAC both in RT and DM, to monitor in real time the behavior of the European fleet and to improve data consistency check within NA-ARC.

France also contributes to the funding of the AIC.

5. Summary of national research and operational uses of Argo data as well as contributions to Argo Regional Centers.

Operational ocean forecasting. All Argo data (alongside with other in-situ and remotely sensed ocean data) are routinely assimilated into the MERCATOR operational ocean forecasting system run by the MERCATOR-Ocean structure. Assessments have clearly demonstrated the positive impact of Argo data on ocean analyses and predictions.

Ocean science. Argo data are being used by many researchers in France to improve the understanding of ocean properties (e.g. circulation, heat storage and budget, and mixing), climate monitoring and on how they are applied in ocean models (e.g. improved salinity assimilation, …). List of scientific publications is available trough the Argo web site (http://www-argo.ucsd.edu/FrBibliography.html) The French Argo Users' Group provides a forum for engagement between these scientists and the French Argo program.

A key aspect of the French Argo program is to develop the capabilities to fully exploit all Argo data for operational forecasting as well as research applications. Therefore Coriolis has developed together with MERCATOR (The French operational oceanography forecast centre) a strong connection with the French research community via the Mercator-Coriolis Mission Group (GMMC). It consists of about one hundred researchers (with some turnover each year) following a scientific announcement of opportunities and call for tender. Its task is to support the Mercator and Coriolis scientific activities and to participate in product validation. As part of the scientific announcement of opportunities mentioned previously (GMMC), PIs can be selected to deploy floats within their scientific experiments. The list of experiments during which floats were deployed are available through the Coriolis web site (http://www.coriolis.eu.org/cdc/scientific_projects.htm). Additional projects are also funded by Coriolis and Euro-Argo for data analysis.

6. Issues that your country wishes to be considered and resolved by the Argo Steering Team regarding the international operation of Argo. These might include tasks performed by the AIC, the coordination of activities at an international level and the performance of the Argo data system.

GERMAN ARGO PROGRAMME

PRESENT STATUS AND FUTURE PLANS

B. Klein, BSH
January 26, 2009

1. Background and organization of German Argo activities

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

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

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

1.1 Deployed floats

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

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

Year	Deployed floats
2000	27
2001	21
2002	14
2003	27

2004	45
2005	65
2006	36
2007	39
2008	72
2009	~57

Floats deployed by Germany as a contribution to Argo since 2000

1.2 Float Development

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

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

1.3 Data management

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

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

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

1.4. Operational and scientific use of Argo data

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

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

2. Funding

2.1 Existing funding for German Argo

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

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

Table 3. Previous and future funding for German Argo.

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

Germany will to contribute to the Argo global array at the level of about 50 floats per year. Requests for financial contribution have been included in the national budgets for 2009-2013, but final budget negotiations will be carried out on an annual basis. As part of the Euro-Argo preparatory phase, BSH will work with its funding ministry to agree on a long-term European structure.

3. Summary of deployment plans for 2009

Float deployment in 2009 will be performed in co-operation with the German research institutes. The main goal is to support the global array in the Atlantic ocean. A preliminary map of the planned deployment positions in the Atlantic is given below. The deployment

areas cover particularly data sparse regions in the Atlantic, the Nordic Seas and the Mediterranean. Six additional floats will be deployed in the Weddell Sea, deployment positions will be assigned later this year.

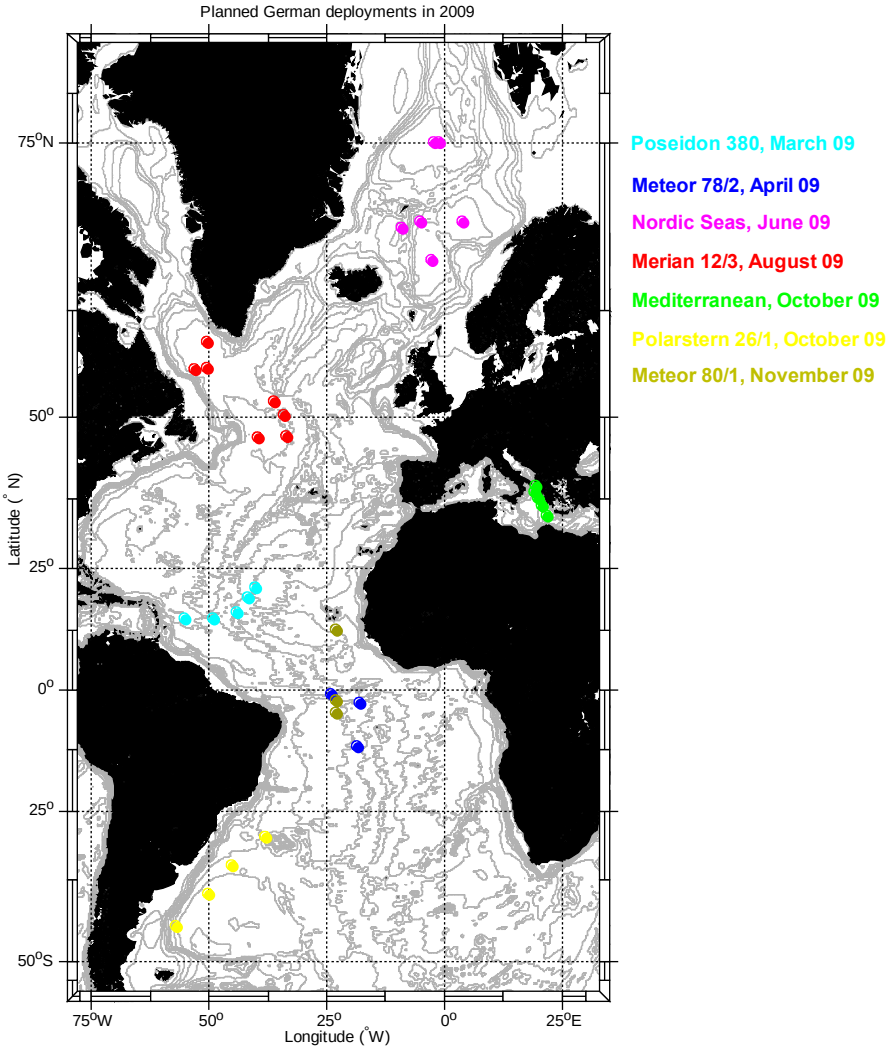


Fig. 1:Preliminary plan for deployment of German floats in 2009. Deployments will start in mid March 2009 earliest. Six more floats (not included in this map) will be deployed in the Weddell Sea at the end of 2009.

Argo Steering Team Meeting (AST-10)

National Report – India

(Submitted by M. Ravichandran)

Organization of Indian Argo Project

a) The Indian Argo Project, fully funded by the Ministry of Earth Sciences (MoES), Government of India is implemented by the Indian National Center for Ocean Information Services (INCOIS) of MoES at Hyderabad.
b) The Indian Argo Project for the year 2007-2012 envisages (a) Deployment of 200 Argo floats in the Indian Ocean, (b) Argo Data Management Activities, (c) Development of Ocean Data Assimilation System, (d) Analysis and utilization of Argo data and (e) Capacity Building at National level.
c) Several R&D Institutions including the National Institute of Oceanography at Goa, NCAOR, Goa, Space Applications Centre, Ahmedabad, National Remote Sensing Centre, Hyderabad, Indian Institute of Tropical Meteorology, Pune, National Centre for Medium range Weather Forecasting (NCMRWF), New Delhi, Centre for Mathematical Modelling and Computer Simulation (C-MMACS), Bangalore participate in the utilization of Argo data. Efforts are underway to encourage and enable academic institutions in this endeavour. National level Argo utilization meeting was conducted during July 21-23, 2008.

1. Status of Implementation

a. Float deployed and their performance

During the year 2008-09, 15 floats were deployed in the northern Indian Ocean taking the total to 168. In addition, 30 floats are being planned to be deployed in the northern Indian Ocean during April-June 2009.

Out of 168 floats deployed so far, 83 floats are active. Out of these 83, active floats 65 floats are less than 2 years old.

b. Technical problems encountered and solved

Eight of Indian floats have completed the normal cycle of 255 and still providing data. This has resulted in the cycle rollover. With the help of CSIRO this problem was successfully eliminated and now the profiles cycles are adjusted accordingly.

c. Status of contributions to Argo data management

- ***Data acquired from floats***

All active floats data are acquired, processed and sent it to GDAC.

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

- ***Data issued to GDACs after real-time QC***
  All the active floats data are subject to real time quality control and are being sent to GDAC. Software for Real Time processing of Argo data is acquired from CSIRO and implemented at INCOIS. We take this opportunity to thank the CSIRO team for sharing the software with INCOIS.

- ***Web pages***
  INCOIS is maintaining Web-GIS based site for Indian Argo Program. It contains entire Indian Ocean floats data along with trajectories. Further details can be obtained by following the link: http://www.incois.gov.in/incois/argo/argo_home.jsp.

- **Statistics of Argo data usage**
  Argo data is widely put to use by various Organisations/ Universities/Departments. INCOIS Argo web page statistics (for the past one year) are as shown below

Pages	Hits	Visitor
Argo Web-Gis	3340	1318
Data downloads	6427	351
Live Access Server	273	62
Argo products	691	263

d. Status of Delayed Mode Quality Control process

- INCOIS started generating and uploading D files to GDAC from July 2006, and as of today, profiles belonging to all eligible floats have been subjected to DMQC. John Gilson's GUI is extensively used at different stages of DMQC. It is appreciated that he extended whole hearted support in setting up the GUI and slight modifications required due to platform change.
- Number of Real time profiles from INCOIS DAC : 20,008.
- 66.41 % of FLOATS are DMQCied for INCOIS DAC.

Major hurdles for DMQC are

- Lack of sufficient CTD profiles from North Indian Ocean is still a critical problem, when decision is to be taken for the complicated cases.
- The second major issue is the Manpower.

e. Trajectory files status:

A total of **140 trajectory** netcdf files were processed and uploaded to the GDAC. The process of generation of trajectory netcdf files undergoes quality checks like position, time, cycle number, etc., and corresponding quality status is assigned to each parameter. Finally a visual check is performed to verify that there are no missing cycles without cycle numbers and to check the surface time intervals.

2. Present level of and future prospects for national funding for Argo including a summary of the level of human resources devoted to Argo.

Indian Argo Project is a 5 year Program from April 2007 to March 2012 fully funded by MoES, Govt. of India. Funding is secured upto 2012 for deployment of 200 Argo floats (40 floats per year), Data management activities, Data analysis, etc.

3 Permanent and 2 temporary scientific/technical personal are working under Indian Argo project, which include personal for deployment of Argo floats, Data system, Analysis of Data, etc. Efforts are underway to get more manpower.

3. Summary of deployment plans and other commitments to Argo for the upcoming year and beyond where possible.

India committed to deploy floats in North Indian Ocean wherever gap exists. Also plans to deploy few tens of floats in the Southern Indian Ocean. 10 floats with ARGOS and 20 floats with iridium will be received during April 2009. After ascertaining the gap region and cruise plan of MoES research vessels, these floats will be deployed.

4. Summary of national research and operational uses of Argo data as well as contributions to Argo Regional Centers

The first Indian Argo User's workshop was organised during July 20-22, 2008 in INCOIS, Hyderabad. The prime objective of the workshop was to take stock of utilization of Argo floats by Indian Scientists. The workshop will also provide opportunity to understand the requirement of modification in temporal and spatial distribution of floats and need of deploying additional sensors. Sixty three

Scientists from 17 Institutions participated in this workshop. The major outcome of this workshop is as follows:

- Argo data has been widely utilized to understand the Indian Ocean dynamics, especially Dipole event, understanding the monsoon system in relation to heat content, buoyancy flux of the Indian Ocean and for validation of OGCM.
- Studies need to be initiated to assimilate Argo floats in OGCM for better forecast of various ocean variables at different time scales.
- In the Bay of Bengal, Argo floats with 5 days cycling period need to be deployed. These observations are to be sustained over a long period by deploying new floats as and when required. These observations are required for studying the intra-seasonal variations of thermo-haline structure.
- New Iridium floats with an additional high-resolution CTD are to be deployed in the Bay of Bengal. This additional CTD sensors measures P, T, S at very fine resolution (2 m) from 200 m upto the surface.
- Quality control methods followed by various institutions need to be pooled. All such Institutes to provide feedback on quality of data to INCOIS.

5. Issues that your country wishes to be considered and resolved by the Argo Steering Team regarding the international operation of Argo. These might include tasks performed by the AIC, the coordination of activities at an international level and the performance of the Argo data system. If you have specific comments, please include them in your national report.

- Nil

6. As part of an action item from AST-9 aimed to improve CTD cruise data being added to the reference database by Argo PIs, it is requested that you include the number and location of CTD cruise data uploaded by PIs within your country to the CCHDO website in the past year. These cruises could be used for Argo calibration purposes only or could be cruises that are open to the public as well.

326 CTD profiles acquired during research cruise for the North Indian Ocean region have been supplied to CCHDO.

Publications

Rao, A.D. , Joshi, M., M. Ravichandran, Oceanic upwelling and downwelling processes in waters off the west coast of India, ***Ocean dynamics***, Volume 58, Issue 3-4, November 2008, Pages 213-226.

Gopalakrishna, V. V., R. R. Rao, K. Nisha, M. S. Girishkumar, T. Pankajakshan, M. Ravichandran, Z. Johnson, K. Girish, N. Aneeshkumar, M. Srinath, S. Rajesh, and C. K. Rajan (2008), Observed anomalous upwelling in the Lakshadweep Sea during the summer monsoon season of 2005, ***J. Geophys. Res***., 113, C05001, doi:10.1029/2007JC004240.

M. J. McPhaden, G. R. Foltz, T. Lee, V. S. N. Murty, M. Ravichandran, G.A. Vecchi, J. Vialard, J. D Wiggert, and L.Yu, Ocean- Atmosphere Interactions During Cyclone Nargis, ***EOS***, Vol. 90, No. 7, 17 February 2009.

Rao, A. D., M. Joshi, and M. Ravichandran (2009), Observed low-salinity plume off Gulf of Khambhat, India, during post-monsoon period, ***Geophys. Res. Lett***., 36, L03605, doi:10.1029/2008GL036091.

K. Nisha, Suryachandra A. Rao, V. V. Gopalakrishna, R. R. Rao, M. S., Girishkumar, T. Pankajakshan, M. Ravichandran, S. Rajesh, K. Girish, M., Anuradha, S. S. M. Gavaskar, V. Suneel and S. M. Krishna, Reduced near-surface thermal inversions in 2005-2006 in the Southeastern Arabian Sea (Lakshadweep Sea), ***Journal of Physical Oceanography***, 2009 (in Press).

ARGO National Report Ireland

Authors: Sheena Fennell, Kieran Lyons, Fiona Grant

The status of implementation (major achievements and problems in 2008)

In 2008, Ireland deployed the first four floats of the Irish Argo programme. An ERDF (European Regional Development Fund) grant was used to procure 12 floats - four floats will be deployed each year over the lifetime of Euro Argo PP.

The first four floats were deployed in the Rockall Trough in March 2008 from the R.V. Thalassa in conjunction with the Marine Climate Change team, headed by Glenn Nolan.

Floats deployed and their performance

Four floats were deployed from the R.V. Thalassa during March 2008 at the following locations.

Float ID	Deployment Date	Latitude	Longitude
6900647	2/3/2008	54.11	-14.45
6900648	2/3/2008	54.39	-15.69
6900649	29/2/2008	53.00	-15.51
6900650	29/2/2008	53.60	-16.58

Their tracks throughout the year can be seen from the diagrams below.

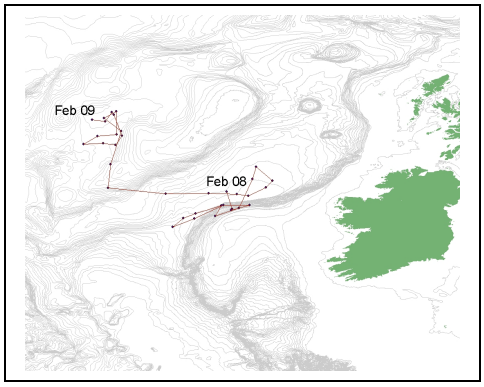


Figure 1: WMO 6900647

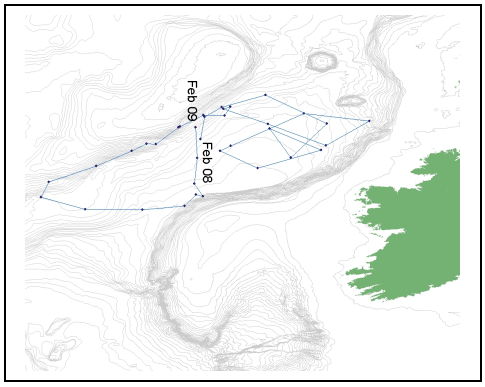
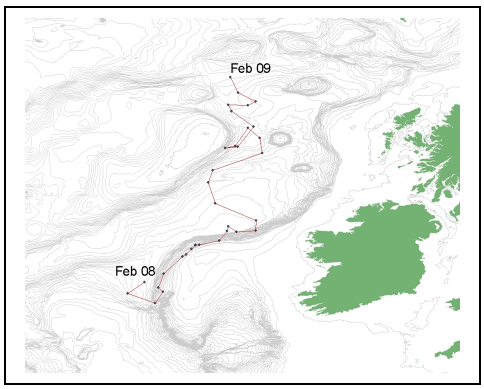


Figure 2: WMO 6900648



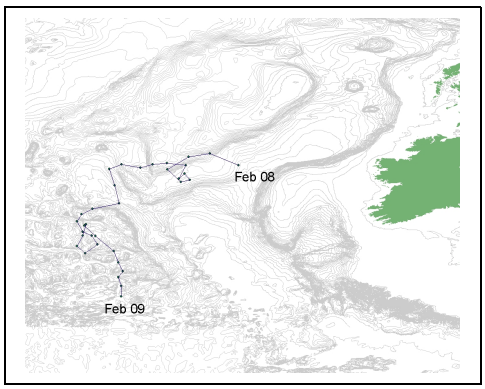


Figure 3: WMO 6900649 Figure 4: WMO 6900650

Technical problems encountered and solved

Float	Technical Problem	Resolution
6900647	During August it was noticed that the salinity data was not comparing well with the model output developed in the Marine Institute.	BODC placed the float on the grey list until the 27/12 when it was reinstated.

Status of contributions to Argo data management

The MI have secured agreement from the BODC to facilitate the delivery of 'real-time' Argo data and validate the 'delayed-mode' data from the Irish floats. The cost of the data delivery and processing is currently being provided by the Marine Climate Change programme in the MI. The Climate Change Programme is in place for a period of two years (until September 2009).

Status of delayed mode quality control process

While there is an agreement with BODC for perform delayed mode processing on the Irish Argo floats, this has not yet been completed due to a backlog of work within BODC.

Present level of and future prospects for national funding for Argo including a summary of the level of human resources devoted to Argo

The Irish Argo programme is managed by the Marine Institute (MI). During the Euro-Argo PP, MI staff will be lobbying to secure longer term funding for the infrastructure. The MI are WP leaders for Implementation Strategies in the ESONET NoE project and are WP leaders for the Business Planning and Legal Work aspects of EMSO PP. It is envisaged that mechanisms to leverage additional funding for large scale infrastructures may be identified in these projects which may also benefit the case for Euro-Argo.

The Marine Institute requested a budget for Argo floats as part of the Marine Climate Change programme 2009-2013 for continuation of the Euro Argo programme as part of the GCOS component of the UN IPCCC. The budget request was for ~6 floats per year over the five year period. This went to cabinet in September/October for approval, but December 2008, the MI received news that this funding would not be forthcoming.

At the same time the MI has been in contact with GMES national representatives and important updates were supplied to the Higher Education Authority in Ireland. The MI submitted a response describing current Irish involvement in the projects on the ESFRI Roadmap and the likely scale of resources involved, should Ireland decide to participate in the construction and implementation of these projects in the years ahead.

In January 2009, the MI contacted national representatives for the FP7 (Space) committee in relation to a proposed call for funding in 2010. We have received confirmation that this initiative has been prioritised for Ireland, and is supported by our ESFRI national delegates who are interested in how funding can be secured for the construction of research infrastructures on the ESFRI Roadmap.

We continue to keep a watching brief for any national funding opportunities specifically relating to Euro-Argo.

One section manager (Glenn Nolan), one team leader (Fiona Grant) and two Science and Technical Officers (Kieran Lyons and Sheena Fennell) are responsible for the delivery of the

Euro Argo programme in Ireland. The programme is overseen by the Director of Ocean Science Services, Michael Gillooly.

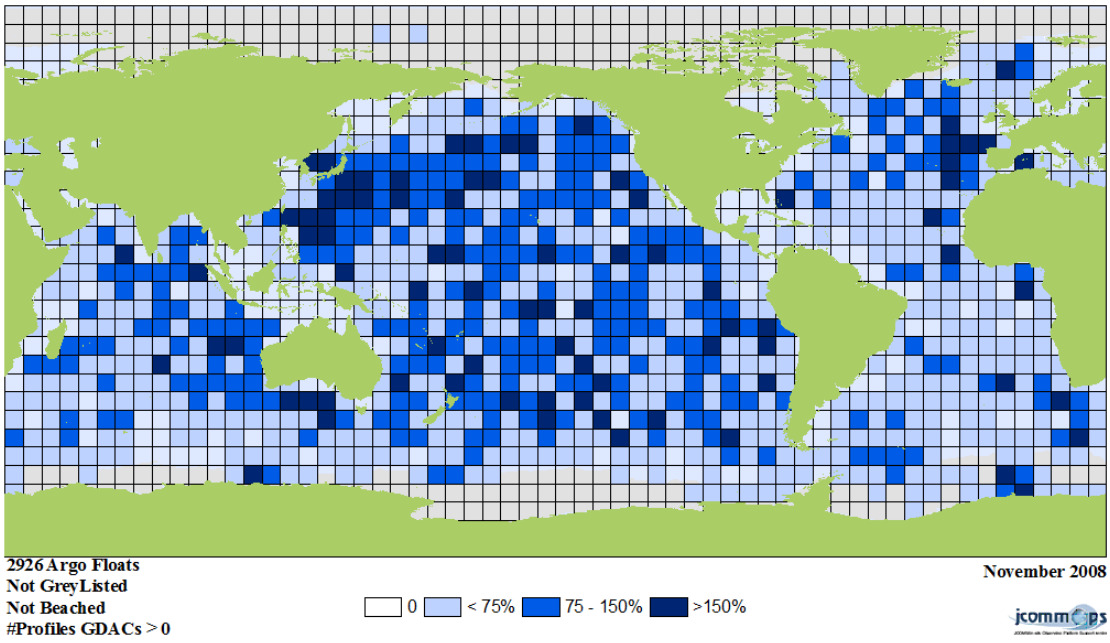
Summary of deployment plans (level of commitment, areas of float deployment) and other commitments to Argo (data management) for the upcoming year and beyond where possible.

During 2009 four more Argo floats were deployed during the standard section ICES cruise on the R.V. Celtic Explorer at the following locations.

Float ID	Deployment Date	Latitude	Longitude
6900651	11/2/2009	55.59	-13.95
6900652	12/2/2009	54.81	-11.84
6900653	8/2/2009	52.99	-15.63
6900654	9/2/2009	53.93	-16.89

Prior to deployment, the MI consulted the Argo Network Age (6x6) and Argo Network Density (6x6) maps to get a better indication of where a deployment could better contribute to the global array.

From the map below, we identified that there was less than 75% coverage of the array in the Rockall Trough for floats returning good data.



MI staff have been requested to reference the deployment planning tools prior to identifying cruises for future deployments. Four floats remain to be deployed in 2010. No funding for floats beyond this timeframe has yet been secured. Given the current economic uncertainties in Ireland and abroad, we think it unlikely that Ireland will be able to secure significant national funding for the array in the short to medium term.

BODC are continuing to provide data management support for the Irish Argo floats.

Summary of national research and operational uses of Argo data as well as contributions to Argo Regional Centers.

As part of WP5, a project was developed to routinely compare Argo profiles with the Marine Institute North Eastern Atlantic ROMS Model. On a weekly basis, the ARGO temperature and salinity profiles are compared with model temperature and salinity profiles from the same

location and closest time stamp. Profile plots and validation metrics are created (bias, skewness and RMS of difference; correlation coefficient). These are all available on http://www.marine.ie/home/services/operational/oceanography/ModelValidation.htm

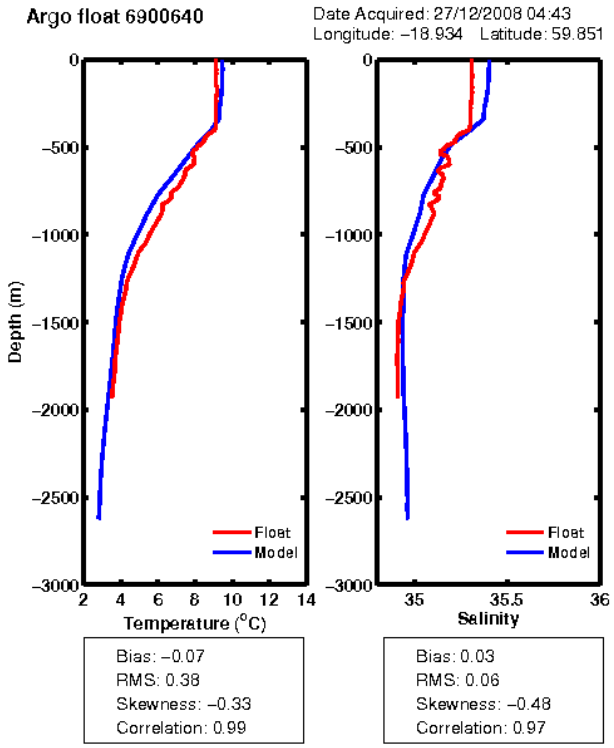


Figure 1: ARGO profile vs. model comparison

Issues that your country wishes to be considered and resolved by the Argo Steering Team regarding the international operation of Argo. These might include tasks performed by the AIC, the coordination of activities at an international level and the performance of the Argo data system. If you have specific comments, please include them in your national report.

The relevant issues for Ireland are being addressed through Euro-Argo.

As part of an action item from AST-9 aimed to improve CTD cruise data being added to the reference database by Argo PIs, it is requested that you include the number and location of CTD cruise data uploaded by PIs within your country to the CCHDO website in the past year. These cruises could be used for Argo calibration purposes only or could be cruises that are open to the public as well.

The MI will be submitting all available CTD cruise data to ICES in spring 2009 (March-April). The AST could seek to update the CCHDO database by liaising directly with ICES to collect CTD data from multiple countries at one source.

Japan National Report

(Submitted by Toshio Suga)

1. The Status of implementation (major achievements and problems in 2008)

1.1 Floats deployed and their performance

Japan Agency for Marine-Earth Science and Technology (JAMSTEC) deployed 74 floats from January 2008 to December 2008: 72 APEXs and 2 POPSs (Polar Ocean Profiling System). All the APEXs were deployed with the aid of R/Vs of 13 domestic organizations. Two APEXs among these 74 floats have a Sea-Bird oxygen sensor and a Wetlab chlorophyll sensor. Three Iridium-APEXs were deployed east off the Philippines in the North Pacific Ocean in May 2008 aiming to observe upper oceanic responses to typhoons with frequent profiling mission (1day cycle, 500db profiling). These three Iridium-APEXs are still working.

POPS is an ice-based drifting buoy with a PROVOR float moving up and down along a 1000m cable. The observed data (temperature-salinity profiles of every 3 days, 3-hourly GPS position, atmospheric temperature and pressure) is transmitted to Iridium Satellites and distributed to GTS via JMA. The Arctic Research Group of JAMSTEC deployed two POPSs in the Arctic Sea in September and October 2008. Another POPS is planned to be deployed near the North Pole in April 2009.

Besides these floats deployed during 2008, two APEXs equipped with two different oxygen sensors (Optode3830 and SBE43) were deployed in the Yamato Basin, Japan Sea late January 2009. The data from these floats will be used to evaluate sensor biases, drifts, etc. The layer below 300-500 m in this basin is occupied by Japan Sea Proper Water, which is vertically and horizontally homogeneous deep water with small temporal variability. The region is thus ideal for the evaluation of oxygen sensors.

Among JAMSTEC's 704 floats (621 APEXs, 72 PROVORs, 11 NINJAs) deployed in the Pacific, Indian and Southern Oceans, from 1999 to the end of January 2009, 328 floats (all APEXs) are now in normal operation, 376 floats (296 APEXs, 70 PROVORs, 10 NINJAs) terminated their mission, 5 floats (all APEXs) are transmitting on the beaches after stranding and 9 floats (6 APEXs, 2 PROVORs, 1 NINJA) were recovered.

The Japan Meteorological Agency (JMA) deployed 4 APEXs as Argo equivalent floats in the seas around Japan from January 2008 to December 2008, whose data have been used for operational ocean analysis and forecast. Among 42 floats (14 PROVORs, 28 APEXs) which JMA deployed from 2005 to 2008, 26 floats (6 PROVORs, 20 APEXs) are active at the end of December 2008, while 9 floats (3 PROVOR, 6 APEXs) terminated the transmission in 2008. JMA deployed 9 APEXs in January and February 2009.

The Fisheries Research Agency deployed 4 isopycnal-APEXs with AANDERAA Oxygen sensor in the Kuroshio-Oyashio region of the Northwestern Pacific as Argo equivalent floats, aiming to trace source waters of the North Pacific Intermediate Water. The 4 floats are still active. The Fisheries Research Agency conducted a series of field experiments using a Slocum Glider manufactured by Webb Research during 2008 and improved its hardware and software according to the results of the experiments.

Tohoku University deployed 8 floats as Argo equivalent flotas: 3 NINJJAs having a Wetlab chlorophyll sensor and an unti-biofouling shutter with the parking depth of 40 dbar (5-day cycle), 4 APEXs having a Sea-Bird oxygen sensor and a Wetlab chlorophyll sensor (3-day cycle), and an

APEX with an AANDERAA oxygen sensor (3-day cycle). The seven floats with a chlorophyll sensor were operated aiming to understand relationship between physical environment and primary production, under the "Studies on Prediction and Application of Fish Species Alteration (SUPRFISH)" sponsored by the Agriculture, Forestry and Fisheries Research Council (AFFRC), Japan. Five floats (one APEX with oxygen and chlorophyll sensors, 3 NINJAs and one APEX with AANDERAA oxygen sensor) are still active. One APEX with oxygen and chlorophyll sensors terminated the transmission after 34th profile. Two APEXs with oxygen and chlorophyll sensors were recovered to inspect failure of sensor or transmission. The recovery work was successfully done with the aid of R/V Kaiyo-Maru belonging to Fisheries Agency of Japan and R/V Taka-Maru belonging to National Research Institute of Fisheries Engineering, Fisheries Research Agency.

JAMSTEC was informed by AIC in February 2008 that the Philippine Coast Guard in Dumaguete City, Negros Island safely kept an Argo float which had been caught in a local fisherman's nets in 2006. This float was deployed by JAMSTEC in March 2003 and still transmitting. JAMSTEC sent a technician to Philippine, and took off the batteries and sent it back to Japan safely in May 2008. The commander of the Philippine Coast Guard in Dumaguete City was very collaborative and mentioned future support in similar cases.

1.2 Technical problems encountered and solved

Among 6 Wetlab chlorophyll sensors (FLNTU) on APEXs deployed during 2008, two on JAMSTEC floats and four on Tohoku University floats went wrong after 3-26 profiles. One Tohoku University float out of the five was recovered by R/V Taka-Maru in order to inspect the Wetlab sensor. The float was sent back to the manufacturer for detailed inspection.

While one of the FLNTUsensors on NINJA went wrong after the 6th profile, the other 2 FLNTU sensors on NINJA are still working well. Although the chlorophyll sensors on APEXs and NINJAs are all FLNTU, those on NINJAs are not an OEM version.

One Tohoku University APEX with a Wetlab chlorophyll sensor was recovered before the sensor failed because ARGOS signal level was very low. This float lied on the sea surface due to the air left in a cowling of the bladder, which caused the continual failure of transmission.

APEXs purchased by JMA and JAMSTEC in 2008 have a controller board of APF-9; these floats were started to be deployed in December 2008. Negative pressure offset can be properly corrected for these floats.

1.3 Status of contributions to Argo data management

The Japan DAC, JMA has operationally processed data from all the Japanese Argo and Argo-equivalent floats including 363 active floats as of February 6, 2009. Nine Japanese PIs agree to provide data to the international Argo. All profiles from those floats are transmitted to GDACs in netCDF format and issued to GTS using TESAC and BUFR code after real-time QC on an operational basis. Argo BUFR messages have been put on GTS since May 2007.

1.4 Status of delayed mode quality control process

JAMSTEC has submitted the delayed-mode QCed data of 42,106 profiles to GDACs as of January 2009. Among these data, the ones of about 15,000 profiles were provided within a year. JAMSTEC has continued the operation of delayed-mode QC for the floats of Japanese PIs other than JAMSTEC. The remaining backlog of about 12,000 profiles will be cleared by this operation.

2. Present level of and future prospects for national funding for Argo including a summary of the level of human resources devoted to Argo.

Japan Argo had been conducted in a 5-year program from FY1999 to FY2004, as a part of Millennium Project implemented under cooperation among the Ministry of Education, Culture,

Sports, Science and Technology (operation: by JAMSTEC), the Ministry of Land, Infrastructure and Transport, JMA and Japan Coast Guard.

After the Millennium Project terminated in March 2005, JAMSTEC has continued the operation until FY2008 nearly in the same scale (about 80 floats to be deployed every year) under its mid-term program. While new mid-term program for FY2009-2013 will start in April 2009, JAMSTEC will try to continue the operation nearly the same scale. JMA will continue to deploy 15 floats around Japan every year for operational ocean analysis and forecast.

3. Summary of deployment plans (level of commitment, areas of float deployment) and other commitments to Argo (data management) for the upcoming year and beyond where possible.

In FY2009, it has been proposed that JAMSTEC will deploy about 80 floats in total in the Pacific, Indian, and Southern Oceans. JMA will continue to deploy 15 floats around Japan every year for operational ocean analysis and forecast.

JMA continues serving as the Japan DAC for the upcoming year. JAMSTEC continues running the Pacific Argo Regional Center for the upcoming year.

4. Summary of national research and operational uses of Argo data as well as contributions to Argo Regional Centers.

Many groups in JAMSTEC, JMA, Fisheries Research Agency and Japanese universities are using Argo data for oceanographic researches on water mass production and transport in the Pacific Ocean, the mid-depth circulation, the mixed layer variation, the barrier layer variation and so on. Japanese fisheries research community has started their biogeochemical studies using Argo floats equipped with chlorophyll and/or oxygen sensors.

The global Argo TESAC messages are used for operational ocean analyses and forecasts by JMA. Various oceanographic charts in the sea adjacent to Japan based on the output of the Ocean Comprehensive Analysis System are operationally distributed through the JMA web site (in Japanese) for national use. Numerical outputs of the system are available from the NEAR-GOOS Regional Real Time Data Base (http://goos.kishou.go.jp/) and the Japan GODAE server (http://godae.kishou.go.jp/) operated by JMA. Monthly Diagnosis and Outlook of El Nino-Southern Oscillation based on the outputs of the Ocean Data Assimilation System and the El Nino Prediction System (an ocean-atmosphere coupled model) are also operationally distributed through the JMA web site (in Japanese) and the Tokyo Climate Center web site (http://ds.data.jma.go.jp/tcc/tcc/products/elnino/). JMA is planning to expand the ocean monitoring and prediction area for climate to the tropical Indian Ocean.

JAMSTEC is providing a variety of products and some information about consistency check of float data related to delayed-mode QC for the Pacific Argo Regional Center (PARC) web site as a main contributor. JAMSTEC will support the activities of the Southern Ocean ARC (SOARC) in the Pacific sector of the SOARC.

5. Summary of the number and location of CTD cruise data to the CCHDO website.

Data of 996 CTD casts conducted by JMA in the western North Pacific during 2008 were uploaded to the CCHDO website.

Korean National Report on Argo-2008

Deployment in 2008 and Future Prospect

National Institute of Meteorological Research of Korea Meteorological Administration (METRI/KMA) and Korea Ocean Research and Development Institute (KORDI) are involved in the International Argo Program since 2001. In 2008, METRI/KMA deployed 10 floats in the Northwest Pacific Ocean and 5 floats in the East/Japan Sea, and KORDI deployed 3 floats in the drake passage, Antarctic Ocean and 11 floats in East/Japan Sea. Since 2001, Korea Argo has kept its steady course, deploying 214 floats until 2008. At present, 110 floats are active.

In 2009 total of 18 floats are planned for the deployment; 11 floats in the Pacific Ocean and 7 floats in the East/Japan Sea. In addition, METRI/KMA has a plan to deploy 12 floats in 2010. It is expected that METRI is able to secure funding to maintain the current level of float launch for the next several years. KORDI's fund is seriously reduced, it is hard to expect adding new floats and there is a high risk in data service beyond 2009.

Status of Argo data management

METRI's RTQC Argo data with TESAC and NetCDF format are transmitted into GTS network and GDAC respectively. In addition, METRI/KMA has done the preparation for transmission of BUFR formatted Argo data, and the transmission will be started in coming spring. Submission of KORDI's RTQC Argo data to GDAC is not smoothly working. Re-processed data for total period with NetCDF format were relayed to GDAC and we are waiting for automatic uploading.

Korea Oceanographic Data Center (KODC) is in charge of delayed mode QC (DMQC) and has worked on the DMQC for Korean Argo data in the North Pacific, the East/Japan Sea and the Antarctic Ocean. As of December 2007, KODC sent 2040 delayed mode profiles, 53.8% of total 4393 profiles in the North Pacific and 1578 delayed mode profiles, 52.4% of total 3352 profiles in the East/Japan Sea, to the GDACs. KODC also made a reference

database for the East/Japan Sea, which was named as EJSHB (East/Japan Sea Hydrobase), and added 278 CTD profile data to EJSHB in 2008. Delayed mode file in the East/Japan Sea is going to be submitted to GDACs. In relation to DMQC in the Antarctic Ocean, KODC asked ADMT group for assistance.

Research and operational uses of Argo data

METRI has a long-term plan to develop the operational ocean forecasting system for the East Asian Sea as well as the Global Ocean. For the purpose, METRI has been developing the data assimilation for their model system. This year, ARGO data will be assimilated to the Regional Ocean Model (ROMS) adopting Ensemble Kalman Filter. In addition, 3-D VAR method will be tested for the Global Ocean Model (MOM4). Also, KORDI uses Argo data for scientific research and a data assimilating-model to understand circulation in East/Japan Sea. In addition, researches on the variability of heat content in the mixed layer, data assimilation and other application for ocean modeling are actively carried out by several universities in Korea.

Real time ARGO observations are being used in KOPS model for the East Sea region. Following figure (Fig.1) shows the current location of the each ARGO float deployed in the East Sea (only live floats are shown in the figure). Profiles are being updated every 2 days and used for data assimilation purpose. For any given day of model run, observations available in recent 10 days prior to the model date are used.

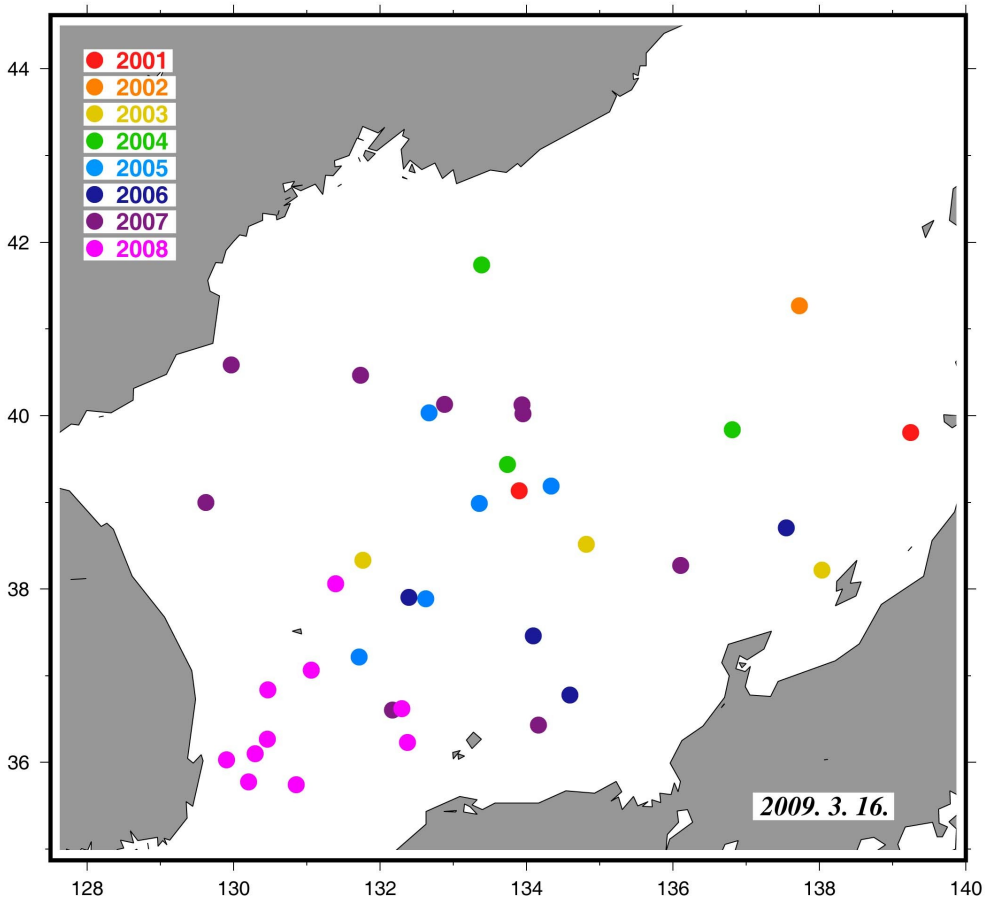


Fig.1: Current locations of ARGO floats in the East Sea

Some observations have errors and some have missing values for some depths in between, these observations are removed from the data assimilation by using quality control checks.

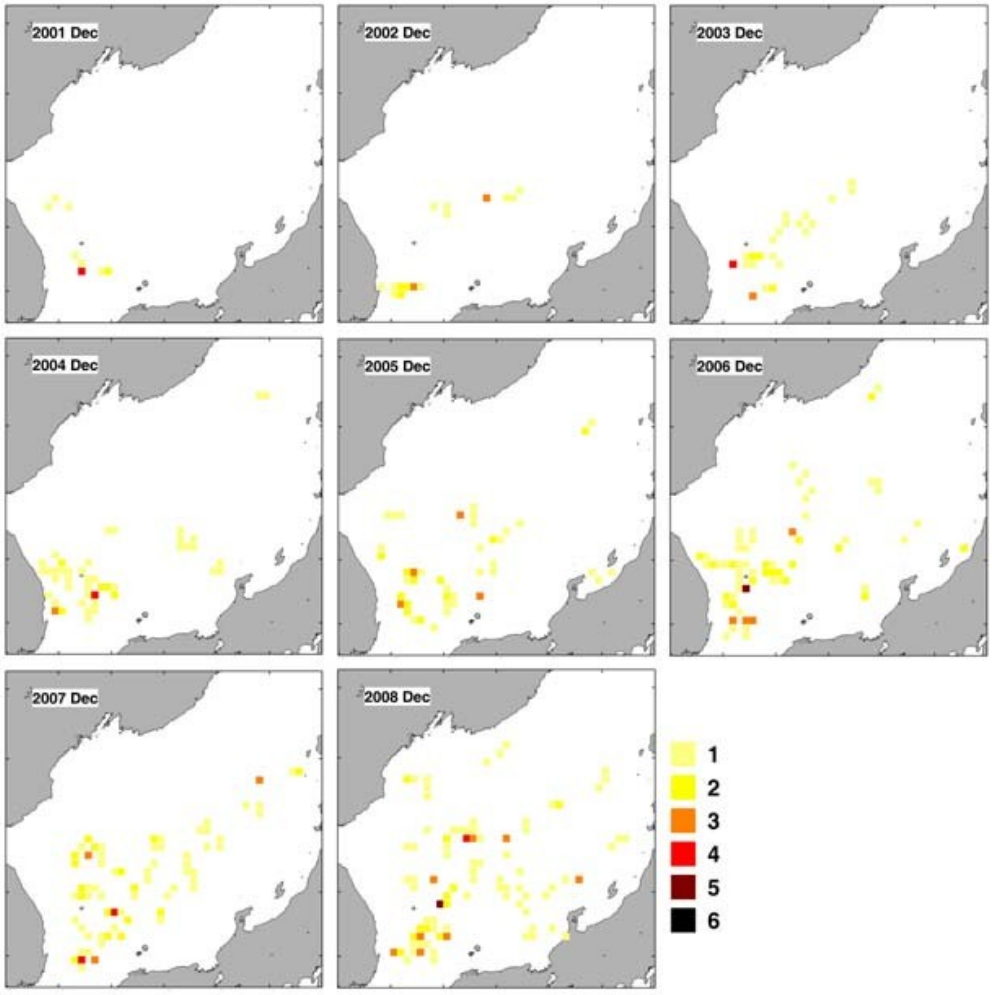


Fig. 2: No. of observations per grid (0.25 X 0.25) in the East Sea are shown for each December from 2001 to 2008.

The distribution of ARGO observations were very sparse during 2001 (since this is the beginning of the program) and increased year by year. The available observations are shown per each 0.25 X 0.25 Deg. grids are shown in the above figure (Fig. 2). The ARGO observations are relatively dense in the southwestern part of the East and very few observations are available in the northern part of the East Sea.

New Zealand National Report February 2009

NIWA is the New Zealand participant in Argo. NIWA has purchased 2 floats per year since 2001, with no floats being purchased in 2003 because of float availability. We have also deployed floats for other providers and are collaborating on large deployments by contributing towards vessel costs.

New Zealand's floats

NIWA has purchased sixteen floats and deployed 14 floats to date. The last two floats will be deployed in March 2009. Purchases and deployments are likely to continue at the 2 floats/year level.

Information on the New Zealand floats, designated (WMO#) 2039 (5900106), 2042 (5900109), 2137 (5900205), 2138 (5900206), 2331 (5900631), 2332 (5900632), 2463 (5901028), 2547 (5901227), 2555 (5901239), 2585 (5901271), 2693 (5901763), 2659 (5901804), 2739 (5901843), 2750 (5901853), 2859 (5902224) and 2860 (5902225) can be found at: http://sio-argo.ucsd.edu/weqpac_web.html.

The data from the NZ floats are administered by Scripps Institution of Oceanography and are available on the Argo Global Data Assembly Centers (GDACS).

Providing deployment opportunities

NIWA has provided deployment opportunities for other nation's floats in the southwest Pacific and Southern Ocean. This is a very important contribution to Argo, given that these regions had poor float coverage and limited deployment opportunities from commercial vessels.

In an ongoing collaboration, NIWA is funding 15% of the vessel costs of R/V Kaharoa deploying floats for University of Washington and Scripps Institution of Oceanography. NIWA's larger research vessel, R/V Tangaroa has also deployed floats in the southern ocean as part of the same collaboration. These voyages, dating back to 2004 have deployed around 550 floats, primarily in the South Pacific but also in the eastern Tropical Pacific and Indian oceans.

Additional R/V Kaharoa deployment voyages are in planning stages.

Finally, NIWA is also available to facilitate float deployments being mobilized out of New Zealand ports- an example being acting as the shipping contact and storage facility for floats loaded on the Australian vessel "Southern Surveyor" in January 2009.

Status of Argo Norway, Feb-2008

The Institute of Marine Research (IMR) is involved in the international Argo programme with contribution of Argo floats, ship time for deployment and user of the data. At present, IMR is the only institution in the Argo Norway.

1. The status of implementation

At present we have in total deployed eleven Argo floats where seven floats are still active. Three floats were deployed in 2002, while six were deployed in 2003. Two more floats that include oxygen and fluorescence sensors were deployed in April 2006. These additional sensors have so far performed well.
Regarding the "Delayed mode" we have in the past not done anything special with that. However, the Argo German will do delayed mode quality control for all floats in the Nordic Seas including our floats.

2. Present level of and future prospects for national funding for Argo

The funding has so far been self-financed (i.e. funded by our institute). The total float purchase has cost about 160kEURO. There are not devoted any funding for scientific analysis, but a person is partly working with the Argo floats regarding collecting data. The scientific analysis is instead done in other financed projects.

IMR has running contact with the Norwegian Research Council that supports the EU-funded ESFRI-project "Euro Argo", which IMR is a partner in, and will in collaboration with IMR work to get a long-term commitment from the Ministry of Education and Research. The Ministry has started a new programme for research infrastructure and during the autumn this year it will be decided if we will get any long-term commitment from the Ministry. In addition we will within few days make an internal proposal to our institute for purchasing 4 floats per year.

3. Summary of deployment plans

At present we have no plans for further deployment of Argo floats due to lack of financial support. However we will deploy some (4?) floats for Argo Germany in the Nordic Seas this summer.

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

ARGO Norway focuses on both research topics and marine climate monitoring of the Nordic Seas. Approximately 3 scientists in 3 projects are directly involved in Argo Norway but several other people contribute regarding technical expertise, data management, ship time for deployments, and processing and analysing the data. There is also an increased interest in the Argo data at other Norwegian institutes.

The present scientific topics are mainly within the Nordic Seas (Norwegian, Iceland and Greenland Seas) and include:

- Studies of the deep ocean circulation in the Nordic Seas. These studies have so far brought new insights in the circulation of the Nordic Seas.
- Water mass changes and also in relation with biological activities. This topic is also one of the reasons that we have included both oxygen and fluorescence sensors on two Argo floats.

UK ARGO PROGRAMME
REPORT FOR ARGO STEERING TEAM 10TH MEETING, MARCH 2009

The UK Argo programme is undertaken by a partnership between the Met Office (who manage the programme), the National Oceanography Centre Southampton (NOCS), the British Oceanographic Data Centre (BODC) and the UK Hydrographic Office (UKHO).

The most important issue for the UK programme is in securing continuing and ongoing funding for UK Argo and ensuring the long-term delivery of data from the global 3,000 float Argo array.

Floats deployed and their performance

Floats deployed. The UK Argo programme was initiated in 2000, with our first Argo floats deployed in January 2001. Since then, 268 UK floats (including 5 donated to Mauritius) have been deployed as shown in Table 1 and Figure 1 below. (Argo equivalent floats are those that have been procured using research grants rather than from designated UK Argo funding.)

Year	UK Argo floats		Argo equivalent floats	Floats donated to Mauritius
	Apex	Provor		
2001	25	2	2	
2002	33	1	4	
2003	17	5	15	1
2004	33	12		2
2005	27	1		
2006	24			2
2007	27	4	2	
2008	28	1		
2009 (estimated)	40			

Table 1. Numbers of UK floats contributing to Argo deployed by year (including floats donated to and deployed by Mauritius).

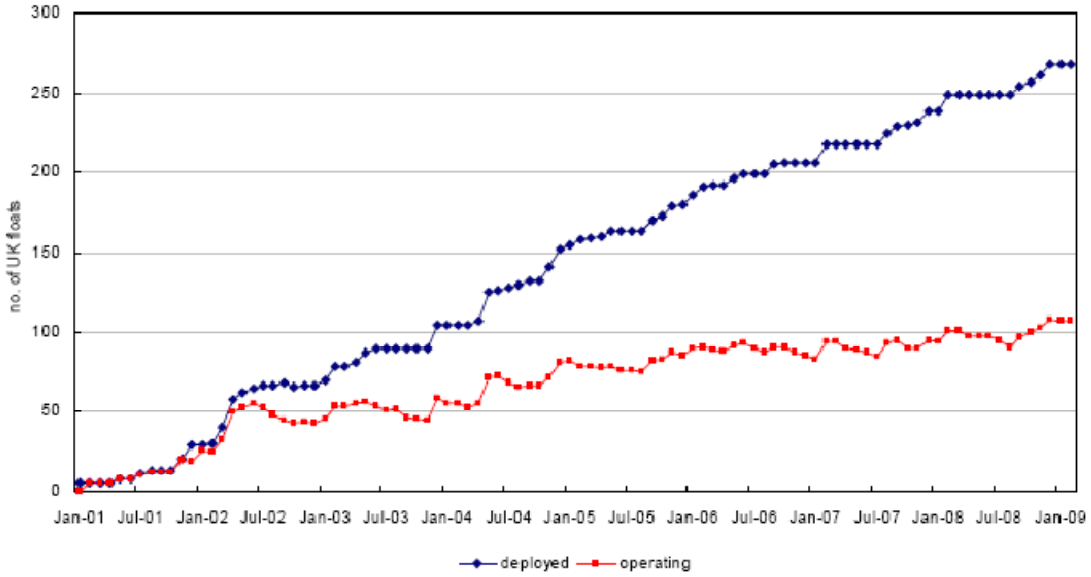


Figure 1. Number of UK floats deployed that contribute to Argo and the number operating by month.

The number of floats operating has increased steadily to over 100, with 107 floats operating at end February 2009. There has been a distinct improvement in the survival of our Apex floats deployed from 2004 to those deployed in earlier years in terms of cycles completed (normalised to 2,000m for floats that make shallower profiles or only profile to 2,000m intermittently, with invalid cycles due to pressure transducer failure discounted and deployment failures omitted). Only 30-40% of floats deployed before 2004 made more than 100 cycles, although our longest-living float (from 2002) reached 185 cycles before expiring. However, for floats deployed in 2004 and 2005 around 70% and 75% exceeded the 100 cycle mark. For floats deployed in 2006 81% have exceeded 50 cycles, and in 2007 79% have exceeded 40 cycles.

Similarly for the Provor floats the survivability of the floats deployed after 2004 has been much better than those deployed in 2001 and 2002.

Hence despite the reduced number of floats deployed from 2005 the number of operating floats has continued to increase.

Float enhancements. In 2007 and 2008 a number of floats were fitted with lithium batteries, 14 in each year of which 23 are presently operating. One failed on deployment, one after 3 profiles and one after 29 cycles (suspected due to a slow water leak). The other 2 early failures were most likely due to damage from Antarctic ice. All Southern Ocean floats now considered at risk of ice are now specified with ice-avoidance capability. So far 8 floats with ice-avoidance have been deployed (in 2007 and 2008) and all are presently operating.

In 2008 two Apex floats with near surface temperature measurement capability (unpumped measurements) have been deployed and these have shown the ability to record near surface thermal structure (examples shown below) and are being evaluated by the Hadley Centre for climate application, these additional data are not as yet being distributed to GTS.
(See poster for Argo Science Workshop.)

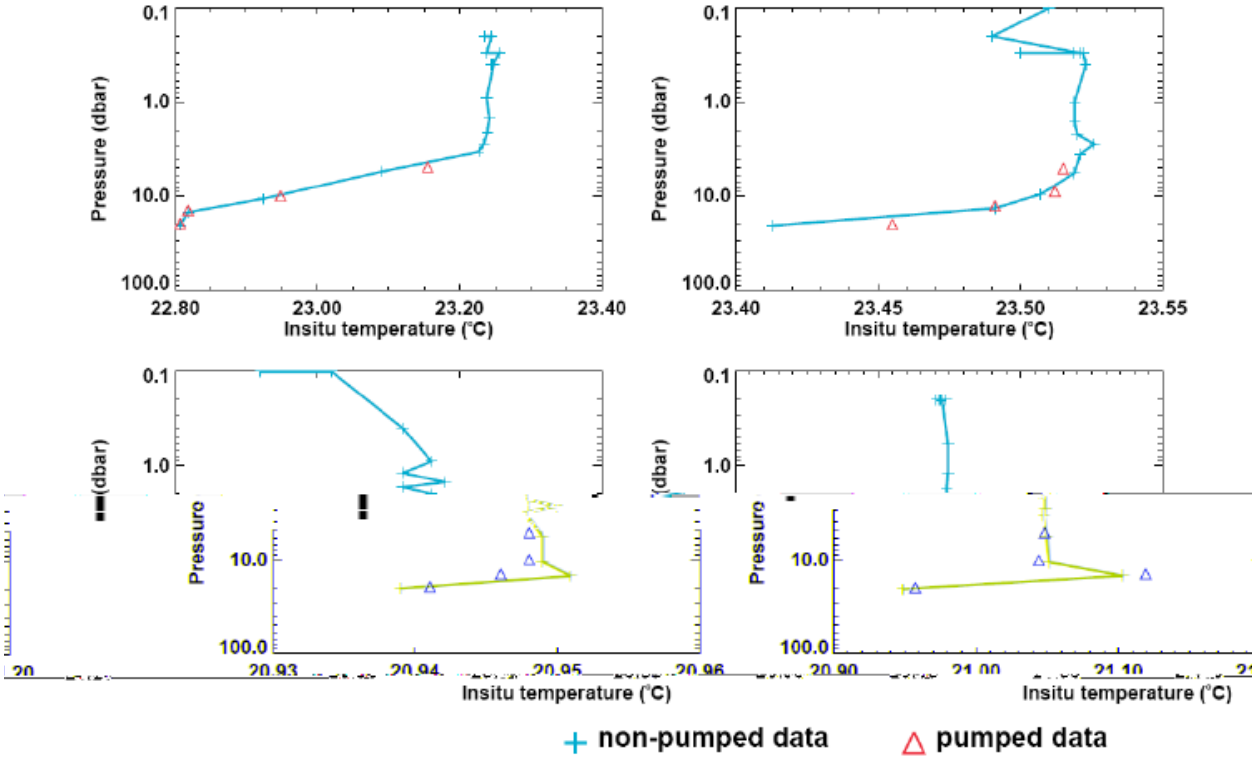


Figure 2. Examples of near surface data collected from Apex floats with near surface temperature recording, from the first 2 profiles from floats 1901072 (top) and 1901073 (bottom).

Technical/engineering web-site. We have established a partnership with CSIRO, Australia to develop an engineering web-site for UK and Australian Apex floats (see http://www.cmar.csiro.au/argo/tech/) enabling the performance of deployed UK (and Australian) Apex floats to be monitored and assisting failure cause diagnosis.

Deployment plans for 2009

As at early February 2009, we have 16 deployments scheduled and hope to make around 40 deployments during the year, as shown in Table 2 (below).

Floats scheduled for deployment (16)	
South Atlantic	16 Apex along 26S section to be deployed from RRA James Cook during March/April (4 with near surface temperature capability)

Floats planned for deployment (13)
4 Apex for south-east Atlantic (plan to deploy from SA Agulhas in September)
3 Apex for South Atlantic (~15S, 25W) during Atlantic Meridional Transect (Oct/Nov)
6 Apex for Southern Ocean (Drake Passage section, Nov/Dec) (2 with ice-avoidance)

Floats with deployments still to be planned (20)
9 Apex for north-east Atlantic (Iceland Basin/Rockall Trough)
2 Apex for north-east Atlantic (26N) (with near surface temperature capability)
1 Apex for Arabian Sea
4 Apex for Somali Basin
4 Apex for South Indian Ocean (~30S)

Table 2. Floats deployed and available for deployment in 2009.

Data management

Real-time. The UK Argo Data Centre, established at BODC, processes all our float data. An automatic system processes the data in real-time and generates the profile data in WMO TESAC and BUFR and Argo netCDF formats. The TESAC/BUFR messages are relayed to GTS via the Met Office (EGRR). Almost 100% of GTS messages are available within 24h. Occasional disruptions happen due to email server failures and server problems. Data in netCDF format are also sent (by FTP) to the two GDACs. The real-time processing system operates every 12 hours and delivers data twice daily. The data are also available from the UK Argo Data Centre web-site via an interactive map interface. In addition the technical files are updated once a week and these files are used by CSIRO Marine to populate the technical web-site.

Delayed-mode. Delayed-mode processing is carried out by BODC with support from the UKHO. A new member of staff began work on delayed mode QC (25% of his time) at the start of the year. Much of the work in 2008 has been working on identifying and correcting pressure sensor issues with our Argo floats. A total of 5,688 delayed-mode profiles have now been submitted, this is about 27% of all our profiles eligible for delayed mode qc (i.e. excluding floats that have been operating for less than 18 months). The UKHO are taking the lead on processing the Arabian Sea floats (~2,000 profiles).

Southern Ocean. We work with 3 other organizations to operate a Southern Ocean Argo Regional Centre (SOARC), and to cover the entire Southern Ocean - BODC (Atlantic Ocean Sector), CSIRO ('Australian' sector), JAMSTEC (Pacific Ocean Sector) and the University of Washington (Indian Ocean Sector). BODC hosts the main SOARC data and information web pages. These pages contain an animation of the Met Office Forecast Ocean Assimilation Model (FOAM) outputs (potential temperature, salinity and velocity at 5m and around 1,000m depth) and an interactive map giving information on last known positions, deployment positions and direct links to both GDACs ftp sites.

Operational and scientific use of Argo data

Operational ocean forecasting. All Argo data (alongside other in-situ and remotely sensed ocean data) are routinely assimilated into the FOAM operational ocean forecasting system run by the National Centre for Ocean Forecasting (NCOF). The FOAM predictions are used by the Royal Navy and also provide forcing for high resolution models of the north-west European shelf-seas. Experiments have shown that Argo data has a significant positive impact; without Argo data temperature errors are up to 40% larger and salinity errors near the surface are over twice as large, even when all other in situ data sources are assimilated. During 2008 a new version FOAM-NEMO, based on the European NEMO (Nucleus for European Modelling of the Ocean) has been developed and will be used for further assessments of the impact of Argo (and altimeter) data. This work is being carried out as part of our input to GODAE.

Seasonal to decadal prediction. Seasonal forecasts provide long-range warning of weather conditions, both for the UK and for developing countries (e.g. forecasts for drought conditions in the Sahel, East African rainfall). They are based on both statistical techniques and coupled ocean-atmosphere models. Argo data are used in the GloSea (Global Seasonal) coupled model run for seasonal forecasting. Although initialising the model with Argo data improves the accuracy of its predictions of surface temperature, the models are not presently any more accurate than the statistical techniques as they are still experimental and this is an area of continuing research and development.

The Hadley Centre DePreSys (Decadal Prediction System) is being developed for climate predictions on decadal timescales. Idealised model experiments have demonstrated that observations of temperature and salinity in the upper 2,000m, as potentially provided by Argo, are sufficient to enable skilful predictions of the Atlantic Meridional Ocean Circulation on decadal timescales. Furthermore, additional observations below 2,000m increase the overall skill, especially at longer lead times. Model experiments have also shown that predictions of upper ocean temperatures from March 2007 to August 2008 are more accurate when the model is initialised with the full Argo array than when it is initialised with sub-sampled observations typical of historical periods.

Climate monitoring and prediction. The Hadley Centre HadGOA dataset is a new ocean analysis of historical temperature and salinity. Variables are on a 2-degree grid and computed on number of fixed isotherms and fixed depths at monthly resolution. The data is available for scientific research at http://hadobs.org. The HadGOA analyses will soon include near real-time updates using Argo data.

Ocean science. Argo data are also being used for various scientific studies within the NERC and University community. This includes many scientists from beyond the UK Argo community. The UK Argo Users' Group has provided a forum for engagement between these scientists and the UK Argo programme, and this activity is now being taken forward in the context of a European Argo Users Group under the Euro-Argo project.

Funding

UK Argo is funded by the Department for Energy and Climate Change (DECC) (previously from the Department for Environment Food and Rural Affairs – Defra), the Ministry of Defence (MoD) and the Natural Environment Research Council (NERC).

NERC funding is agreed to March 2012 through the Oceans2025 programme, with the expectation that it will continue after this time. This covers effort at NOCS and BODC on data

processing and science leadership (but is not presently at a level sufficient to cover all our data processing requirements and commitments). Funding through the Met Office is from MoD and DECC. The MoD funding is part through the Integrated Climate Programme and part through the Defence Oceanography Programme. The MoD Argo funding is not ring-fenced within either of these programmes. In addition MoD also funds UKHO support for data processing. The DECC (ex-Defra) funding has, for the last few years, been agreed on an annual basis although the principle of a multi-year agreement (2 or possibly 3 years) has been accepted.

These various arrangements fall short of the longer-term commitments that would be needed to provide secure and sustained funding for the UK contribution to Argo (and Euro-Argo). Our aspiration for UK Argo is to contribute to the global programme to at least a GNP level based share (~5%), i.e. to deploy 40 – 50 floats each year. Considerable time and effort has been (and continues to be) expended in trying to secure longer-term funding for UK ocean observations that have been committed to international programmes such as the GOOS, GCOS and the GEOSS; with Argo as a pressing example for the need for a solution. This has so far been unsuccessful as there is currently no mechanism within UK Government to transition funding from research to operational funding lines. The problem is exasperated by the fact that the priority for government is (regulatory) monitoring that is mandated to meet European directives; Argo (and other climate observing) is accepted as important but regarded as optional. Hence it is likely that funding for Argo for the next few years will continue to be requested from existing research budgets, at least until the next government (Comprehensive Spending Review) funding cycle.

Euro-Argo

Both the Met Office and NERC are involved in the Euro-Argo project (January 2008 to June 2010) to develop and recommend a European infrastructure to enhance the collective ability of the European nations to contribute to Argo, to the level where ‘Europe’ has the capacity to deploy ~250 floats per year, and to process the resulting data. Such a European contribution would support approximately 25% of the global array and provide an additional 50 floats per year for enhanced coverage in the European and marginal seas. This will require long-term funding commitments from the European partners (~150 floats per year) and from the EU (via GMES, ~100 floats per year). The Met Office and NERC are leading on several Euro-Argo work packages (3. Financial Work and 6. Strengthening the User Community respectively) and the Met Office also lead on the Impact Studies and Demonstration Cases task.

USA Report to AST-10, Hangzhou China, March 2009
(Submitted by Dean Roemmich)

Organization:

U.S. Argo is supported through the multi-agency National Ocean Partnership Program (NOPP). The project is presently being carried out by a U.S. Float Consortium that includes principal investigators from six institutions (SIO, WHOI, UW, NOAA/AOML, NOAA/PMEL, FNMOC). Float production, deployment and data system functions are distributed among these institutions on a collaborative basis. Following two years of pilot activity supported by ONR and NOAA (FY99, FY00), and a 5-year (FY01-05) full implementation phase under NOPP, the Argo project is now in the third year of a five-year continuation, supported by NOAA and (for FNMOC participation) the Navy.

In addition to U.S. Argo floats, Argo-equivalent floats have been provided from a number of U.S. Sources, including University of Hawaii, PMEL, AOML, NAVOCEANO, and Florida State University.

The present 5-year cycle of U.S. Argo implementation will end in mid-2011.

Support level:

The support level for U.S. Argo is aimed at providing half of the global Argo array. The target level is 1500 active floats, based on a deployment rate of about 410 floats per year. There were 316 floats funded in FY02, 344 in FY03, 410 in FY04, 410, in FY05, 390 in FY06, 368 in FY07 and about 360 in FY08. With level funding, further incremental reductions in float numbers are likely.

The U.S. Argo effort includes float production and deployment, technology improvement, communications, data system development and implementation for real-time and delayed-mode data streams, and participation in international Argo coordination and outreach activities.

Status:

As of February 23, 2009, there are 1847 active U.S. Floats (Argo Information Centre, see Fig 1), including 1764 from U.S. Argo float providers (SIO, UW, WHOI, PMEL) plus 83 Argo-equivalent floats provided by partnering programs. During 2008 there were 368 floats deployed by U.S. Argo (Fig 2). The large number of active U.S. Argo floats (1847) relative to the target number of 1500 reflects the high deployment rate in 2005-2006, to clear a backlog of instruments funded but not deployed earlier. A concern for the international array is that the number of U.S. floats is likely to decrease toward the 1500 float target number.

The major focus of the U.S. effort in 2008 was to help achieve Argo's objective of a global array by increasing float density in sparsely sampled regions. The majority (257 out of 368) of U.S. float deployments during the year were in the Southern Hemisphere. This included a major cruise deploying 98 floats in the South Pacific, jointly staged with New Zealand Argo on R/V Kaharoa.

Out of 1773 Argo floats presently active in the Southern Hemisphere, 68% (1212 floats) have been provided by the U.S. Priorities for float deployments are established by the U.S. Argo Science Panel, comprised of members of the Float Consortium and representatives of Argo data user groups. The highest priority is deployment of a global Argo array. Specific plans for 2009 float deployments, as they evolve, are posted on the AST web site's deployment planning links. A major U.S./New Zealand deployment cruise in the South Indian Ocean is planned in late 2009 on R/V Kaharoa.

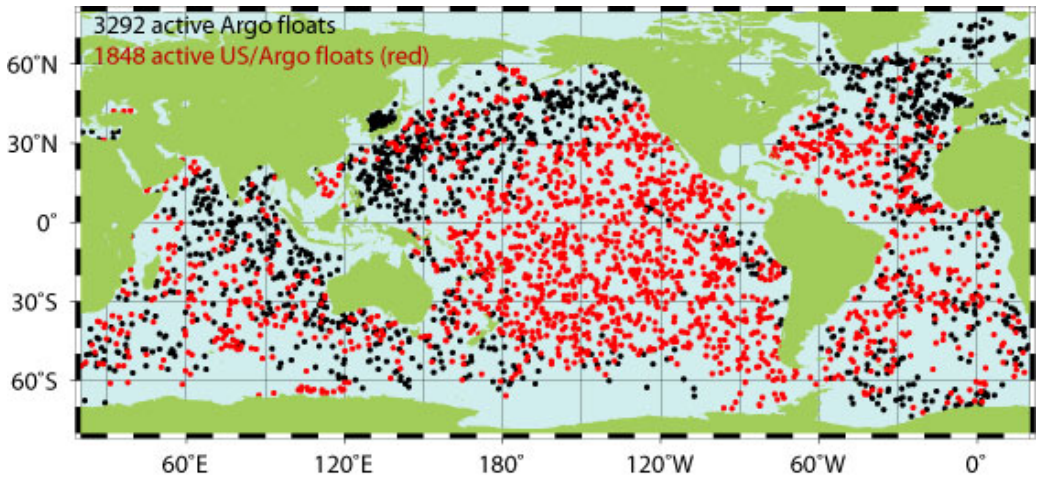


Fig 1. Positions of all active Argo floats in black, with positions of active U.S. Argo floats in red, 24 February 2009.

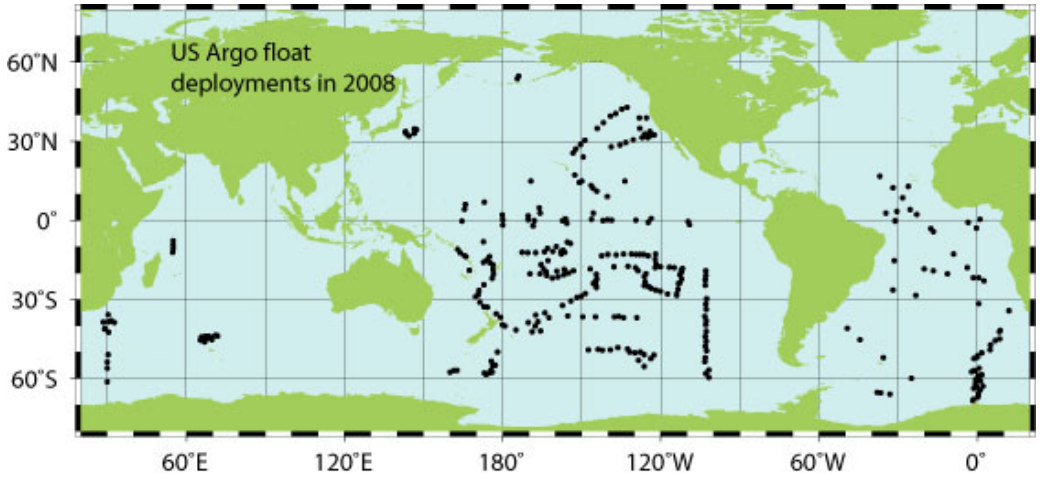


Fig 2. Positions of U.S. Argo deployments during 2008.

A continuing effort in U.S. Argo is aimed at technology improvement: for increased float lifetime and improved performance. Ongoing improvements in reliability have been demonstrated in recent years. Out of 396 U.S. Argo (PMEL, SIO, UW, WHOI) floats deployed in 2004, 226 remain active as of 23/02/2009. Floats deployed in 2004 have an average age of about 4.7 years. Floats deployed in 2005 and 2006 appear to be doing even better. A goal of U.S. Argo is to extend average float lifetimes beyond 4 years.

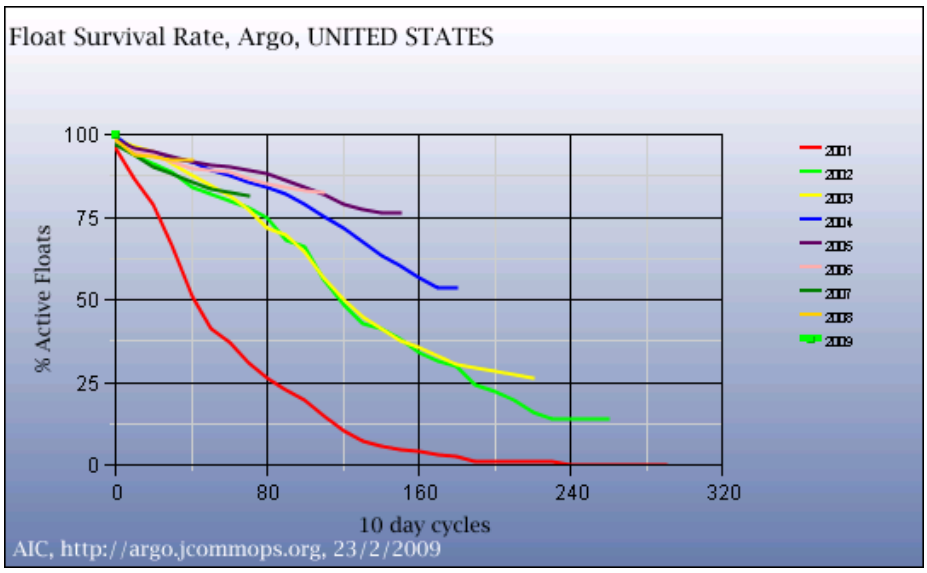


Fig 3. Survival rate for U.S. floats, including Argo-equivalent, by year of deployment (source: AIC).

The U.S. Argo Data Center is based at NOAA/AOML. Real-time data from all U.S. Argo floats are transmitted via the GTS. GTS transmission uses computers housed at Service ARGOS (U.S.) and operating round-the-clock, running software developed at AOML to implement internationally-agreed quality control tests. The AOML data center serves as the national focus for data management and is the conduit for delayed-mode data to pass between the Pis and the GDACs. During 2009, U.S. goals in data management include elimination of the backlog in delayed-mode quality control (Fig 4).

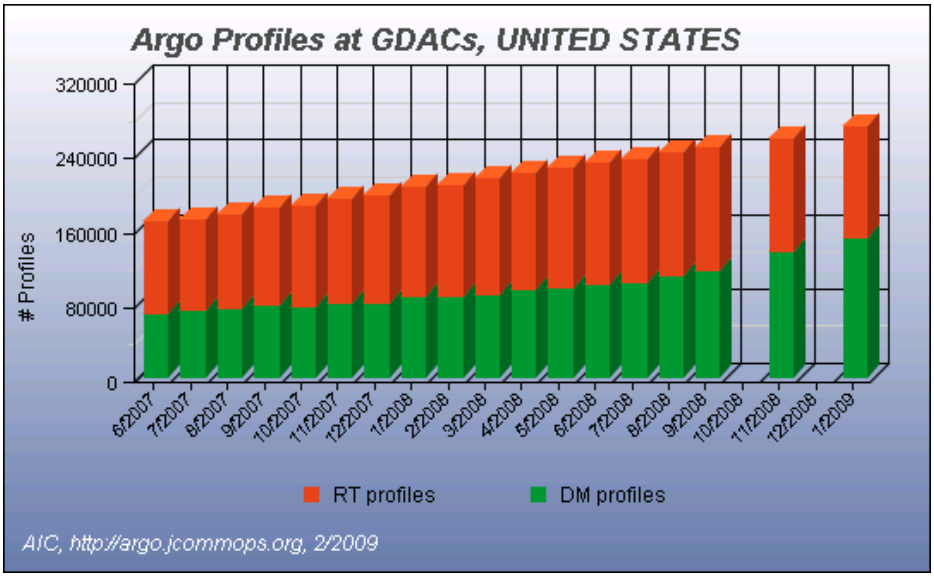


Fig 4. Number of profiles held at GDACs for U.S. floats (source: AIC), including those with delayed-mode and real-time levels of quality control. Roughly 58,000 of the RT profiles are less than one year old and not yet eligible for DM processing.

In addition to the national DAC, a Global Data Assembly Center (GDAC) is run as part of the GODAE server, located at FNMOC/Monterey. The two GDACs at FNMOC/Monterey and IFREMER/Brest are mirror images in their assemblies of Argo data from all international partners, and are responsible for

dissemination of the data.

Several U.S. institutions participate in Argo Regional Center activities, including AOML's role as focus for the South Atlantic ARC.

Uses of Argo data

The impressive breadth of Argo applications, both research and operational, in the U.S. is well illustrated by the publications list and operational centers referenced at www-argo.ucsd.edu. A significant structural issue in U.S. Argo continues to be the lack of funding targeted specifically at Argo research (or even more broadly at research based on the sustained ocean observing system).

Issues

The U.S. Argo Science and Implementation Panel held its annual meeting in Dec 2008. Some issues discussed there included:

- The need for dedicated ship-time for Argo deployments in remote regions.
- Eliminating the DMQC backlog.
- Consistency in decision-making in DMQC.
- “Mission creep”: Is Argo pursuing reasonable and feasible objectives?
- Development of a Reference Database.
- Number of data decoders maintained by DACs.
- Understanding float failure modes.
- Re-seeding of greylisted floats.