

Fourth Meeting of the
Pacific Argo Regional Center (PARC)

Thursday October 26, 2006
KORDI, Ansan, S. Korea

The fourth meeting of the Pacific Argo Regional Center (PARC) was held just prior to the 7th Argo Data Management meeting (Tianjin, November 2006). The PARC meeting was graciously hosted by Dr. Moon-Sik Suk and the Korea Ocean Research and Development Institute (KORDI). It was held at KORDI in Ansan, S. Korea. The meeting brought together representatives from Korea, Japan and the US. Unfortunately members from other contributing countries were unable to attend (see Table One for a complete list of attendees).

Dr. Suk (KORDI) began the meeting by providing an overview of the broad range of activities being carried out at KORDI. These activities go well beyond argo, and KORDI has quite an extensive ocean research program.

Jim Potemra (IPRC) acted as chair for the meeting and provided an overview of the Regional Center terms of reference and gave a brief review of PARC activities to date. These are summarized next, followed by presentation notes from the meeting.

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Table One. PARC meeting participants.

1.0 Background

Regional centers were first established within the Argo program to fulfill certain tasks that either could not be done by argo PIs nor national DACs, or were beyond their scope. The original charge to regional argo centers were divided into two groups, necessary and optional tasks. Necessary tasks included:

1. compare all argo data in the region with each other and with recent CTD data,
2. give feedback to PIs to alert them to apparent problems in their data,
3. develop climatologies, and
4. prepare and distribute argo data products.

Additional optional tasks included:

1. provide scientific q/c to countries that cannot do it,
2. coordinate float deployment, identify needs for deployment,
3. develop new q/c tests for the region,
4. compare argo data with model output and assimilations, and
5. document procedures

At the 7th Argo Science Team meeting (Hyderabad, Jan 2006), the tasks to regional centers were modified. The requirements are now:

1. perform regional analysis of all the Argo data in the area to assess its internal consistency interannually and compared to CTD,
2. provide feedbacks to PIs, and
3. provide documentation.

Optionally,

1. develop climatologies
2. prepare and distribute Argo data products
3. provide scientific Q/C
4. coordinate Argo float deployment
5. develop new q/c tests
6. compare argo data with model output

2.0 PARC History

The idea of a regional center to coordinate Argo activities in the Pacific was put forth at a meeting at UH/IPRC in late June 2004. The Pacific Regional Argo Center (PARC) was thus established in 2004 by an agreement between JAMSTEC (Shinya Minato), IPRC (Peter Hacker) and CSIRO (Ann Thresher).

The second PARC meeting occurred in late August 2005 with Minato and Hosoda (JAMSTEC), Hacker, DeCarlo, Yuan, Yoshiari, and Potemra (UH/IPRC) participating. The discussion centered around the design of a PARC web page, and it was decided that IPRC would host the page, but JAMSTEC would provide input.

The third PARC meeting was held following the 6th Argo Data Management meeting (Tokyo, Nov 05). The meeting was called by Shinya Minato in order to coordinate the content for the recently established PARC web page. The meeting was open to everyone at the ADM06 meeting, and representatives from Korea, China, Japan, Australia and the US attended.

3.0 4th PARC meeting notes

Each group present gave an overview of their activities, including IPRC, JAMSTEC and KORDI. J.J. Park from Seoul National University also gave a presentation on his ongoing Argo-related activities.

3.1 Pacific Region Overview: There are several agencies operating argo floats in the Pacific. The table below (Table Two) lists the floats as of October 20, 2006. Of the 1,974 floats (including “dead” floats), most are managed by the US DAC. The table highlights the wide-range of participants that would have to be included in a regional center. This list would be even longer if all the Pacific countries (with an interest in ocean observations) were included. It was requested that each of the participants provide input to complete the table. This would then allow for more easy coordination with float PIs.

PI Country (DAC)	No. Floats	PI Institute
US	1165	Scripps, UW, NOAA, IPRC, WHOI, Navy, URI
Japan	583	JAMSTEC, JMA, MRI, Tohoku U., NIPR, HNF, TNFRI, NRIFS, ORI
Canada	108	
Korea	68	KMA, KORDI
Australia	31	CSIRO
China	27	
France	20	
Unknown	11	
Chile	9	
New Zealand	8	
Costa Rica	2	
Mexico	1	

Table Two. Argo floats summarized by PI. The first column gives the PI’s country, and thus the responsible DAC; the second column gives the total number of floats for each country; the third column gives the PI institution.

3.2 IPRC Activities: The IPRC is a research organization, and within the IPRC is the Asia-Pacific Data-Research Center (APDRC). The APDRC works to provide the necessary data serving infrastructure for scientific research, particularly climate-related research. As such, the APDRC’s contribution to PARC can be similar, i.e., the APDRC can provide data serving capabilities, including web page design, development and hosting, as well as assist in data product development.

On the server-side, the APDRC runs two different servers for in-situ data sets (e.g., argo floats). Both have been developed at NOAA/PMEL. The older server, called EPIC, allows users to browse, via the web, in-situ products including argo floats, FNMOC realtime CTD casts and others. The data can be selected and subset via a graphical interface or user text entry. Profile results from individual floats can be displayed, or contour plots can be made from floats along a strait line. The newer server is called DCHART. DCHART was first introduced at the 6th Argo Data Management meeting in

November 2005 (presentation by Joe Sirot). The APDRC has since installed and configured DCHART on its system. DCHART has all the functionality of EPIC, but it can work with DAPPER (an OPeNDAP server for in-situ data), so DCHART can display data from remote sites. Finally, the APDRC has developed a tool to selectively download a user-defined subset of Argo data in netcdf format. This utility, called TSANA, provides data in netcdf format and includes a pointer file so users can read the provided download straight into Matlab, Java Ocean Atlas, or other client software.

The APDRC is also working to produce data products. One such product is the YoMaHa05 dataset of deep velocities estimated from Argo trajectory files. This data set is available on the APDRC web page. The APDRC is also working to develop a data set of temperature and salinity gridded onto standard depth levels. This product will be used in a variety of research activities including data assimilating models.

In summary, the IPRC/APDRC contribution to PARC will be two-fold: data serving and product development. In this way, the APDRC can leverage funded activities to the PARC initiative (APDRC is presently funded by NOAA to develop ocean products for a variety of users). In this way, the APDRC's work in the regional argo center will be "product-driven". However, it was stated that through product-development, most of the regional center required and optional functions will be met. Key to this will be the identification of users, and then the identification of products.

Finally, it was noted that another potential activity of regional centers could be outreach. This would include providing argo products to Pacific nations that do actively maintain floats, as well as education (including K-12 and undergraduate). The APDRC has been working with the Pacific Islands Applied Geoscience Commission (SOPAC). Through this collaboration, the APDRC has provided a server to the SOPAC secretariat in Suva, Fiji. SOPAC users now have the capability to browse, plot and perform analyses on a subset of the APDRC data sets (including argo). (Shikama, JAMSTEC, described an educational outreach program in Japan; this is detailed in section 3.3).

3.3 JAMSTEC Activities: Tomoaki Nakamura, JAMSTEC Argo Data Team (JAT) leader, gave a presentation outlining the argo activities in JAMSTEC. He explained how JAMSTEC is responsible for delayed-mode activities, while JMA does realtime argo operations for Japan. Nakamura also reported that JAMSTEC is funded to deploy about 90 floats per year until March 2009. JAMSTEC uses the WJO software to do DMQC, and uses the SeHyD data set for climatology. In the past two years about 33,000 profiles have been checked in this manner.

There are two main argo web pages maintained in Japan. The central Japan argo page has links to the JMA page (realtime argo) and the JAMSTEC page (delayed-mode). There is also a PARC page that provides some argo-based products. A list of all Pacific-related argo web pages is given at the end of this document.

Dr. Kobayashi gave a brief overview of the SeHyD data set, and explained how it came about in conjunction with the Indian Ocean HydroBase (IOHB) data set. SeHyD was

constructed using both N. Pacific HydroBase and the World Ocean Database 2001 (WOD01). Dr. Kobayashi noted that SeHyD does not include marginal seas.

Finally, Dr. Shikama described a successful outreach activity wherein JAMSTEC works with local fisheries schools that have their own sea-going capabilities. Through this program, JAMSTEC can introduce and educate students on the deployment, analysis and utility of argo floats. It was agreed that this is an excellent example of an argo outreach activity.

3.4 KORDI Activities: Dr. Mook-Sik Suk, Director of the Center for Marine Environment and Climate Change, gave an overview of the argo activities in Korea. He noted that there is a collaboration between KORDI and KMA, who maintain the floats and provide qc'd data, and the Korean fisheries agency (National Oceanographic Research Institute, NORI). Dr. Suk then showed a wide array of argo-based products that KORDI is now regularly producing for floats in the East Japan Sea and at higher latitudes in the region of the Antarctic Circumpolar Current (ACC); two regions of interest to KORDI researchers. Dr. Suk also mentioned that there are now two DACs in Korea (KORDI and KMA), since as of last month KORDI has been doing realtime q/c of argo floats.

Next, Jong Jin Park, Seoul National University, gave a presentation on his work involving argo data. Park has been involved in many aspects of argo data including using profile data to look at forcing effects on the ocean as well as with trajectory data from argo float to estimate inertial currents in the ocean. Park identified the CREAMS data set for comparison to argo float data.

3.5 Group Discussion: The remainder of the PARC meeting was devoted to a group discussion about RDAC activities. First, the data products available at each of the DACs was investigated, to see if somehow the PARC could coordinate, e.g., by providing links, to these sites. The DAC list includes:

1. Coriolis (France) <http://www.coriolis.eu.org/>
2. MEDS (Canada) http://www.meds-sdmm.dfo-mpo.gc.ca/MEDS/Prog_Int/Argo/ArgoHome_e.html
3. JAMSTEC (Japan) http://www.jamstec.go.jp/J-ARGO/index_e.html
4. CSIRO (Australia) <http://www.per.marine.csiro.au/argo/index.html>
5. AOML (US) <http://www.aoml.noaa.gov/phod/ARGO/HomePage/>
6. BODC (UK) <http://www.bodc.ac.uk/projects/international/argo/>
7. MOST/SOA (China) http://www.argo.org.cn/english/china_argo/china.html
8. INCOIS (India) http://www.incois.gov.in/Incois/argo/argo_home.jsp
9. KORDI, MOMAF, NFRDI, NORI, KMA (Korea) <http://argo.metri.re.kr/>

Next, the different efforts at the other RDACs were discussed to see how other regional centers were progressing. The RDAC list is:

1. North Atlantic (NARDAC): France (IFREMER/Coriolis), USA (AOML) <http://www.coriolis.eu.org/cdc/Argo-NARDAC.htm>

2. S. Atlantic (SARDAC): AOML
<http://www.aoml.noaa.gov/phod/sardac/index.php>
3. Pacific Ocean (PARC): Japan (JAMSTEC), USA (PMEL, IPRC)
<http://apdrc.soest.hawaii.edu/argo/index.html>
<http://www.jamstec.go.jp/ARGORC/>
4. Southern Ocean (SORDC): UK (BODC), Australia (CSIRO/BOM)
http://www.bodc.ac.uk/projects/international/argo/southern_ocean/
5. Indian Ocean: India (INCOIS), Australia (CSIRO/BOM) USA (PMEL, IPRC)
www.incois.gov.in/Incois/argo/argo_dataregional.jsp

Finally, there was a discussion about the action items from the 3rd PARC meeting:

Action 1. Put the following onto the PARC top-page: (1) terms of reference of RC, (2) Country Names and flags involved, (3) functional responsibility of each RDAC, and (4) regions of responsibility (for RC's role 1) on the PARC top page. (**IPRC**)

Status: This has been done, but will need to be updated with the new requirements.

Action 2. Make two links, one with contact lists for PI's, the other with "regional centers" from the button "regional center partners" on the left of the page. Other button-links to (1) include a page with the other RDACs, and a more general link to Argo people, and (2) a page with "documents/ meeting" which would include copies of the PARC meetings and more general Argo documentation. (**IPRC**)

Status: This has not yet been done.

Action 3. Make (1) a location map and operation status table of the floats in their responsibility. They are sent to or picked up by IPRC. (**CSIRO**)

Status: Unknown.

Action 4. Make a more detailed table (float QC table) as a template (note that this can be modified at a later time) that will show the float q/c status and other important float information. (**JAMSTEC**)

Status: Completed and supplied on the JAMSTEC page.

Action 5. Make SeHyD available via the web page and make it available to everyone. (**JAMSTEC**)

Status: This has been done. It was suggested to make a wider distribution to provide them from PARC website. However other issues (e.g., update of the climatologies, preparation of more detail manuscripts of them) will have to wait until Dr. Kobayashi returns from a year's stay at Southampton, UK.

Action 6. Gather information concerning (1) deployment plan of Argo floats, (2) volunteer ships of opportunity for deployment and/or recovery, and (3) CTD data, as far as possible, and put them on the web page to make it available to everyone. (**All members of the PARC**)

Status: As yet undone due to manpower limitations.

4.0 Summary of Outstanding Issues

In conclusion, there was a roundtable discussion about outstanding issues within PARC. These are presented here as an itemized list. Rather than having an action item list, the group discussed a range of items and made some suggestions for future work.

4.1 Problems/Issues: There were several issues brought up with regard to PARC activities, most fit into two categories. First, it was recognized that the Pacific is very large, and several countries are involved. Perhaps it makes sense to separate the PARC activities into dynamical or geographical regions. Second, PI's track their own floats and have their own web pages. Is there a need to repeat, and/or group these? Is there willingness on the part of the PI's? A dialogue should be started with the PI's who have floats in the Pacific to see what they can provide and what their needs are.

4.2 Suggestions:

1. It was recognized that the main, essential task of all RDACs is internal consistency checking of DMQC procedures and data. At present this is not being done in the Pacific, but the JAT agreed to initiate this for PARC.
2. The IPRC agreed to attempt to compile, through the web page, all the argo products being made for the Pacific. It was recognized, however, that there needs to be a concerted effort to identify future products; who are the users and what is needed/desired by them?
3. As for climatologies, to date there is only SeHyD and HydroBase. It was unclear whether further products would be made, and if so, by whom.
4. Outreach efforts were felt to be key to the future success of argo, and JAMSTEC will continue with the outreach to schools, while the APDRC will continue to work with Pacific Island nations through SOPAC.
5. It was not clear to the attendees exactly what was meant by peer review of DMQC procedures. A clarification will be requested at the DMT meeting in Tianjin.
6. The issue of deployment planning was not discussed.
7. A common, and not to be understated comment was the concern for funding (and manpower) to continue PARC. This is a real concern that should be addressed in a future meeting. A useful process might be to first identify useful products, then potential funding agencies. In developing products, other requirements of regional centers might be met.
8. It was noted that the cumulative list of PARC participants needs to be updated (given as Table Three).
9. It was also noted that the table of float PI's (Table Two) needs to be completed.
10. It was agreed that Potemra will give the presentation of PARC activities at the upcoming DMT meeting.
11. Finally, it was suggested that the next PARC meeting be held in conjunction with the next DMT meeting, where and whenever that will be.

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Table Three. PARC participants.