The Argo Project: Global Observations for Understanding and Prediction of Climate Variability

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Project Summary

The U.S. component of the international Argo Program (http://www.argo.ucsd.edu), a global array of autonomous profiling floats, is implemented through this award. The present report covers portions of Phase 4/Year 5 and Phase 5/Year 1 of U.S. Argo, as described below.

As of November 1, 2007, the international Argo Program, including the US contribution, met its goal of building a global array of 3000 active profiling CTD floats (Roemmich and Owens, 2000, Roemmich et al, 2001, 2002, Gould et al., 2004), and established a data system to meet the needs of both operational and scientific users for data delivery in real time and delayed mode. In order to maintain the Argo array, it is necessary to replace over 25% (800) of the instruments every year. Argo is a major initiative in oceanography, with research and operational objectives, providing a global dataset for climate science and other applications. It is a pilot project of the Global Ocean Observing System (GOOS).

Phase 1 (9/99 – 9/02) and Phase 2 (7/00 – 6/02) of US Argo provided regional arrays of CTD profiling floats to demonstrate technological capabilities for fabrication and for deployment of float arrays in remote ocean locations (Phase 1) and to demonstrate the capability for manufacture and deployment of large float arrays (Phase 2). Development of the U.S. Argo Data System was carried out to make Argo data publicly available within a day of collection, to apply automated quality control procedures consistent with international Argo practices, and to provide research-quality data in delayed-mode.

Phase 3 of US Argo was a 5-year project (8/01 – 6/06) aimed at full implementation of the US component of Argo. Float deployment rates were increased to more than 400 per year beginning in CY 2004 (Fig 1). Objectives were to achieve 1500 active US Argo floats (50% of the global array), to improve the spatial distribution of floats toward the target of uniform 3° spacing, to increase the mean lifetime of floats to 4 years, to operate the near-real time and delayed-mode data systems consistent with international agreements, and to provide substantial leadership and coordination roles for international Argo.

Phase 4 of US Argo was a follow-on 5-year project (7/06 – 6/11) aimed at improving and sustaining the US component of Argo. Float deployment rates averaged around 360 per year (Fig. 1). Objectives are to sustain the array of 1500 active US Argo floats; to further improve the spatial distribution of floats through targeted deployments; to further increase the mean lifetime

of floats beyond 4 years; to continue to improve and operate the near-real time and delayed-mode data systems consistent with international agreements; and to provide substantial leadership and coordination roles for international Argo.

Phase 5 of US Argo is a 4-year follow-on project (7/11-6/15) whose objectives, in addition to sustaining the present Argo array and improving its data quality, include expansion of the array into the high latitude oceans having seasonal ice cover, improved spatial resolution in western boundary current regions, and extension of float capabilities into the deep ocean (Deep Argo). All of these extensions were strong recommendations of the OceanObs'09 scientific consensus. However, success in realizing these will depend on year-to-year availability of resources and on mean float lifetimes.

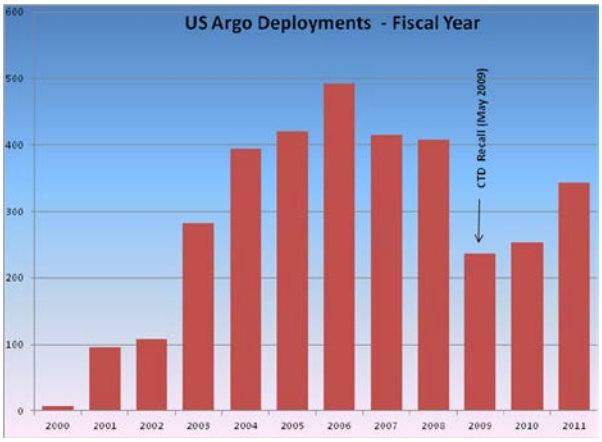

Figure 1*: Yearly deployments of United States Argo Program floats through 30 September 2011, and growth in the number of active US floats (including Argo-equivalent).*

Float production and deployment are accomplished by four facilities – SIO (production and deployment), WHOI (production)/AOML (deployment), UW (assembly and deployment), and PMEL (thorough testing and deployment of commercially manufactured floats). This distributed effort has been designed to safeguard the US contribution to the Argo Program from unforeseen problems at any one of the partner institutions. It also makes Argo success independent of the participation of any individual PI and institution or of any single float design. It allows the large amount of effort to be shared. It encourages individual, technical innovation and enhancement. While the initial focus has been on improving float technical performance, attention of the PIs will increasingly focus on demonstrating the scientific value of Argo.

The data system is also distributed. AOML is the US Argo Data Assembly Center (DAC), responsible for acquiring the float data received by satellite communications, for carrying out real-time quality control, and for distribution of data via the GTS and to the Global Argo Data Assembly Centers. The second step in data management is a semi-automated drift-adjustment of the salinity sensor carried out by each float-providing PI, using nearby high quality CTD data for comparison with float temperature/salinity data (Wong et al, 2003, Owens and Wong, 2009). The final step is individual examination of all profiles by the float-providing PIs, in order to provide high-quality data suitable for research applications.

Approximately 95% of Argo data meet the timeliness target, being available within 24 hours of collectionvia the GTS and/or internet (http://www.usgodae.org/, or http://www.ifremer.fr/coriolis/cdc/arg.htm.