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## The Argo Program: Observing the Global Ocean with Profiling Floats

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## Abstract

The Argo Program has created the first global array for observing the subsurface ocean. Argo arose from a compelling scientific need for climate-relevant ocean data; it was made possible by technology development and implemented through international collaboration. The float program and its data management system began with regional arrays in 1999, scaled up to global deployments by 2004, and achieved its target of 3000 active instruments in 2007. US Argo, supported by the National Oceanic and Atmospheric Administration and the Navy through the National Oceanographic Partnership Program, provides half of the floats in the international array, plus leadership in float technology, data management, data quality control, international coordination, and outreach. All Argo data are freely available without restriction, in real time and in research-quality forms. Uses of Argo data range from oceanographic research, climate research, and education, to operational applications in ocean data assimilation and seasonal-to-decadal prediction. Argo's value grows as its data accumulate and their applications are better understood. Continuing advances in profiling float and sensor technologies open many exciting possibilities for Argo's future, including expanding sampling into high latitudes and the deep ocean, improving near-surface sampling, and adding biogeochemical parameters.

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## References

Bishop, J.K.B., R.E. Davis, and J.T. Sherman. 2002. Robotic observations of dust storm enhancement of carbon biomass in the North Pacific. *Science* 298(5594):817–821. [[CrossRef](#)]

Davis, R.E., J.T. Sherman, and J. Dufour. 2001. Profiling ALACEs and other advances in autonomous subsurface floats. *Journal of Atmospheric and Oceanic Technology* 18:982–993. [[CrossRef](#)]

Domingues C.M., J.A. Church, N.J. White, P.J. Gleckler, S.E. Wijffels, P.M. Barker, and J.R. Dunn. 2008. Improved estimates of upper-ocean warming and multi-decadal sea-level rise. *Nature* 453:1,090–1,093.

Gaillard, F., E. Autret, V. Thierry, and P. Galaup. In press. Quality control of large Argo data sets. *Journal of Atmospheric and Oceanic Technology*.

Gille, S. 2008. Decadal-scale temperature trends in the southern hemisphere ocean. *Journal of Climate* 21:4,749–4,765.

Gould, J. 2005. From Swallow floats to Argo: The development of neutrally buoyant floats. *Deep-Sea Research II* 52/3–4:529–543. [[CrossRef](#)]

Guinehut, S., P. Le Traon, and G. Larnicol. 2006. What can we learn from global altimetry/hydrography comparisons? *Geophysics Research Letters* 33, L10604. [[CrossRef](#)]

Johnson, G.C., and J.M. Lyman. 2008. Global Oceans: Sea Surface Salinity. In *State of the Climate in 2007*. D.H. Levinson and J.H. Lawrimore, eds., *Bulletin of the American Meteorological Society* 89(7):S45–S47.

Johnson, G.C., S. Mecking, B.M. Sloyan, and S.E. Wijffels. 2007a. Recent bottom water warming in the Pacific Ocean. *Journal of Climate* 20:5,365–5,375.

Johnson, G.C., J.M. Toole, and N.G. Larson. 2007b. Sensor corrections for Sea-Bird SBE-41CP and SBE-41 CTDs. *Journal of Atmospheric and Oceanic Technology* 24:1,117–1,130.

Klatt, O., O. Boebel, and E. Fahrbach. 2007. A profiling float's sense of ice. *Journal of Atmospheric and Oceanic Technology* 24:1,301–1,308.

Nerem, R.S., B.J. Haines, J. Hendricks, J.F. Minster, G.T. Mitchum, and W.B. White. 1997. Improved determination of global mean sea level variations using TOPEX/POSEIDON altimeter data. *Geophysical Research Letters* 24:1,331–1,334.

Riser, S.C., and K.S. Johnson. 2008. Net production of oxygen in the subtropical ocean. *Nature* 451:323–326. [[CrossRef](#)]

Roemmich, D., O. Boebel, H. Freeland, B. King, P.-Y. LeTraon, R. Molinari, W.B. Owens, S. Riser, U. Send, K. Takeuchi, S. Wijffels, and others. 1999. *On the Design and Implementation of Argo: An Initial Plan for a Global Array of Profiling Floats*. International CLIVAR Project Office Report 21, GODAE Report 5. GODAE International Project Office, Melbourne, Australia, 32 pp. Available online at: [http://w3.jcommops.org/FTPRoot/Argo/Doc/Argo\\_Design.pdf](http://w3.jcommops.org/FTPRoot/Argo/Doc/Argo_Design.pdf) (accessed April 10, 2009).

Roemmich, D., J. Gilson, R. Davis, P. Sutton, S. Wijffels, and S. Riser. 2007. Decadal spin-up of the South Pacific subtropical gyre. *Journal of Physical Oceanography* 37(2):162–173. [[CrossRef](#)]

Roemmich, D., and J. Gilson. 2009. The 2004–2007 mean and annual cycle of temperature, salinity and steric height in the global ocean from the Argo Program. *Progress in Oceanography* 82(2): 81–100. [[CrossRef](#)]

Schmid, C., R.L. Molinari, R. Sabina, Y.-H. Daneshzadeh, X. Xia, E. Forteza, and H. Yang. 2007. The real-time data management system for Argo profiling float observations. *Journal of Atmospheric and Oceanic Technology* 24(9):1,608–1,628.

Willis, J.K., D.P. Chambers, and R.S. Nerem. 2008. Assessing the globally averaged sea level budget on seasonal to interannual timescales. *Journal of Geophysical Research* 113, C06015. [[CrossRef](#)]

Wong, A.P.S., G.C. Johnson, and W.B. Owens. 2003. Delayed-mode calibration of autonomous CTD profiling float salinity data by theta-S climatology. *Journal of Atmospheric and Oceanic Technology* 20:308–318. [[CrossRef](#)]

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