Press Releases

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JAMSTEC

Argo's Global Array of Profiling Floats Revealed Ocean Changes -Fifteen years of ocean observations and further challenges-

The Argo Steering Team led by Dr. Toshio Suga at Research and Development Center for Global Change, the Japan Agency for Marine-Earth Science and Technology (JAMSTEC: Asahiko Taira, President) reported major achievements and future prospects of the International Argo Program with 15 years of observation results. The Argo program has provided data for global ocean environmental monitoring with Argo float networks[*1] by maintaining a global array of more than 3,000 free-drifting profiling floats that measures the temperature and salinity of the upper 2,000m of ocean.

Since the launch of the Argo Program in 2000, JAMSTEC's Research and Development Center for Global Change has been taking initiatives at observational researches using Argo floats, in close coordination with government ministries and agencies participating in the Japan Argo Promotion Committee. As a member of the International Argo Steering Team comprised of representatives from more than 30 countries, JAMSTEC has deployed over 1,000 Argo floats thus far, carrying out data quality management for researches on climate change. The number of deployed floats by JAMSTEC currently accounts for about 10% of the total floats of the whole international program.

This global array of Argo floats has provided a vast amount of oceanic observation data for 15 years, which is an unprecedented scale in the history of ocean observing networks. It has led to promote researches on ocean environmental changes as well as brought remarkable scientific results, which includes findings of changes in heat storage in the upper ocean and sea surface height across the globe. In addition, the global Argo array is highly evaluated in the Fifth Assessment Report (AR5) of the United Nations Intergovernmental Panel on Climate Change (IPCC) published in 2014 as it helped substantial progress in better understanding of ocean changes.

The Argo Steering Team is planning to expand Argo observation network to other fields by covering biogeochemical parameters in order to capture and elucidate changes in ocean ecosystem, acidification, carbon cycle and biodiversity on a global scale. It also aims to explore ocean even deeper than 2,000m and sea ice areas such as Arctic and Antarctic Oceans, where sustained monitoring is still not possible despite that they are key regions for understanding climate changes.

As a leader of the Argo program in Japan, JAMSTEC has been making a major contribution to design and development of technology for expanding Argo observation network.

The above results were published in *Nature Climate Change* on January 27, 2016 (JST).

Title: Fifteen years of ocean observations with the global Argo array
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*1 Argo float networks: The initial International Argo Plan set a target of deploying 3,000 profiling floats with distribution of one Argo float every 300km square based on past ship-based observation. The deployment was started by eight countries including Japan, U.S. and European countries. With increase of participating countries, the number of deployed floats has drastically increased. In October 2007, it achieved the deployment target of 3,000 floats. Then, in November 2011, the number of collected profiles reached one million, which is far more exceeding of the total number of ship-based data in the past. It has already become an indispensable infrastructure for climate change and ocean researches. As global observation data is accumulated, needs to improve Argo observation networks become clear for better understanding of climate and oceanic changes. Expansion of the Argo observation network to other fields is now underway.

*2 Intergovernmental Panel on Climate Change (IPCC): It is an intergovernmental body established by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) in 1988. It aims to make comprehensive assessment of human-induced climate change and its impacts, and options for adaptation and mitigation from scientific, technological, and socioeconomic perspectives. The IPCC was awarded the Nobel Peace Prize in 2007 for its work including the Fourth Assessment Report (AR4), which consists of four volumes: Working Group I Report on the Physical Science Basis; Working Group II Report on the Impacts, Adaptation and Vulnerability; Working Group III Report on Mitigation of Climate Change; and the Synthesis Report summarizing the findings of all three Working Group reports. Scientific contributions by the global array of Argo profiling floats are mentioned in the Working Group I Report. The Fifth Assessment Report (AR5) was announced in 2013-2014.

Figure 1: Argo float. The length including an antenna is 1.5-2 meters with weight of 20-40kg. Each country manufactures Argo floats conforming to the International Argo Plan.

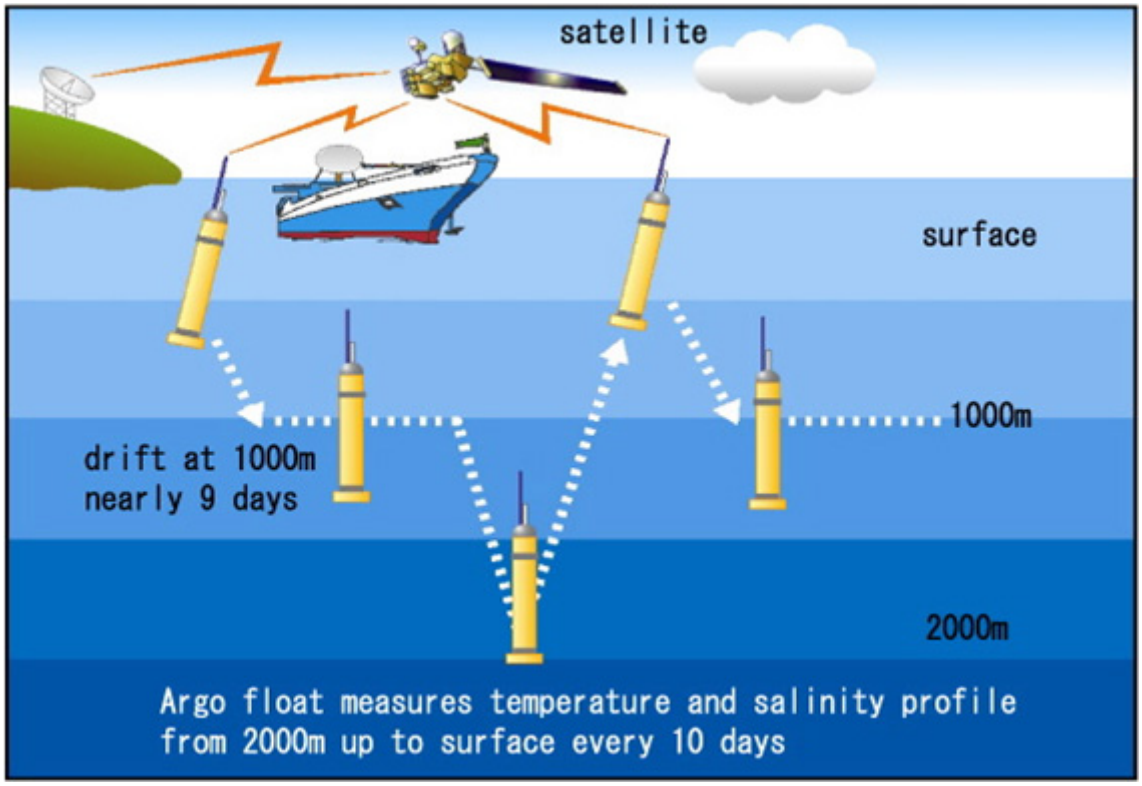

Figure 2: Observation cycle with Argo floats.
Argo floats descend to a target depth of 1000m to drift. After 10 days, submerged each float rises to the surface collecting temperature, salinity, and other data that are transmitted via satellite when the float reaches the surface. This observation cycle can be repeated for several years until the batteries run out.

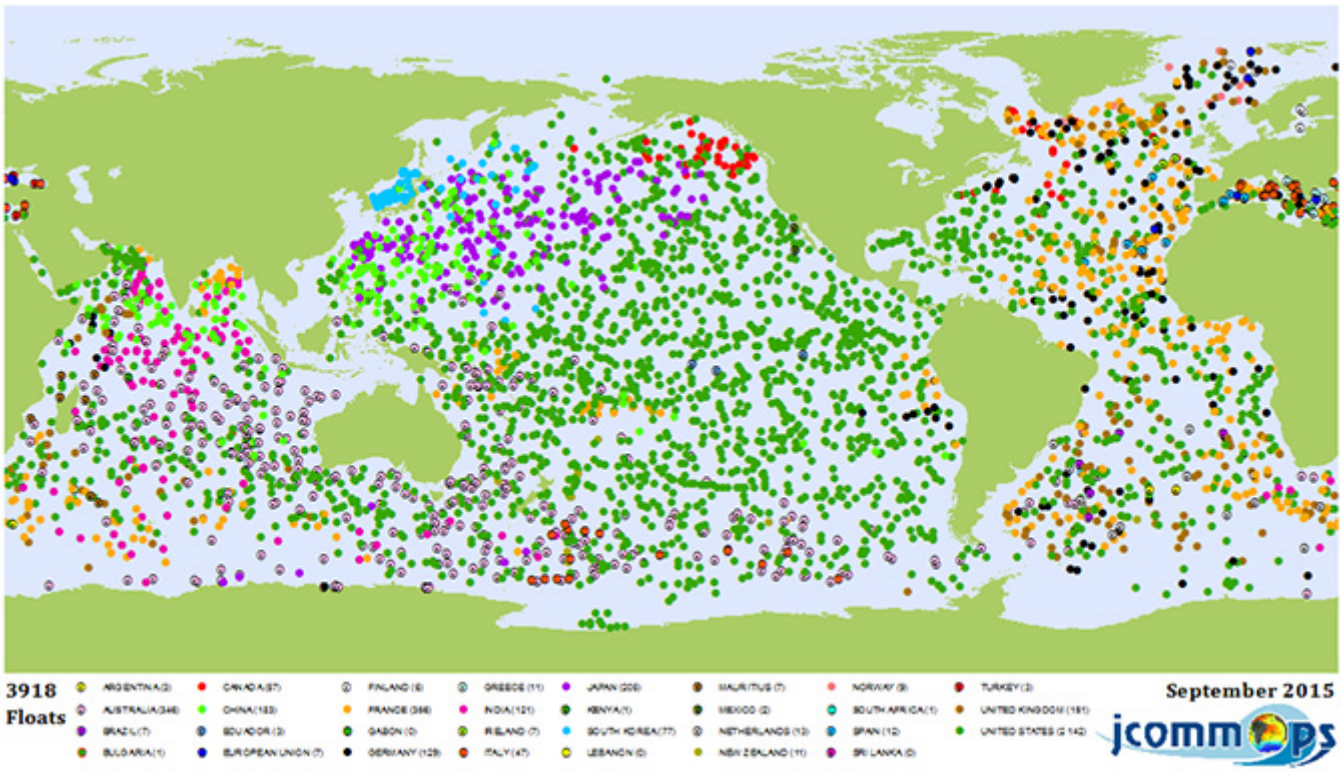

Figure 3: Argo float observation network as of September 2015 (3,918 floats in total). The map shows active Argo floats deployed by each country. JAMSTEC is deploying 150 floats mainly in the Pacific Ocean as of November 20th, 2015.

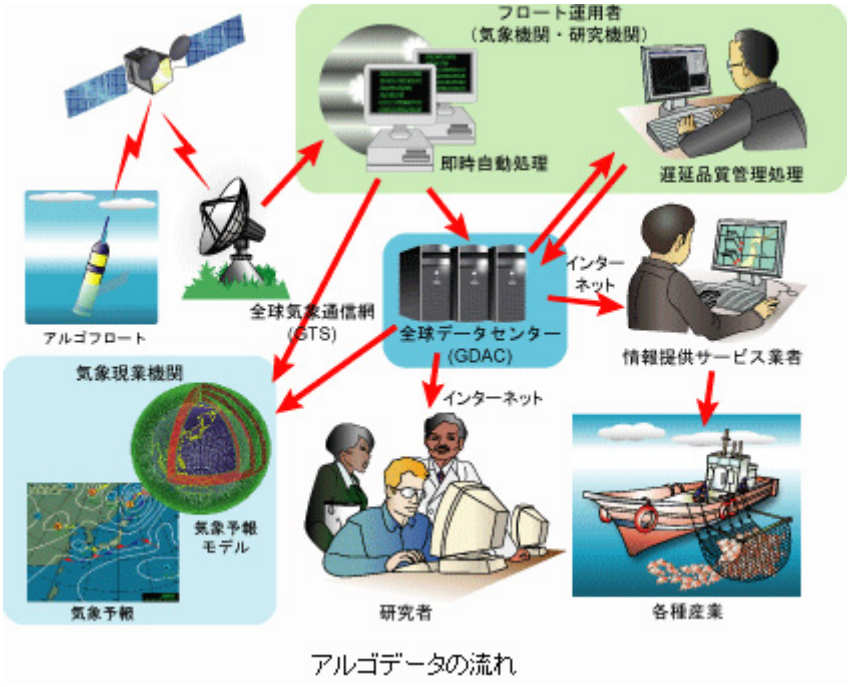

Figure 4: Argo data flow. Transmitted data by Argo floats are delivered via Internet from Argo Global Data Assembly Centres (GDAC) after immediate automatic processing and data quality management system.

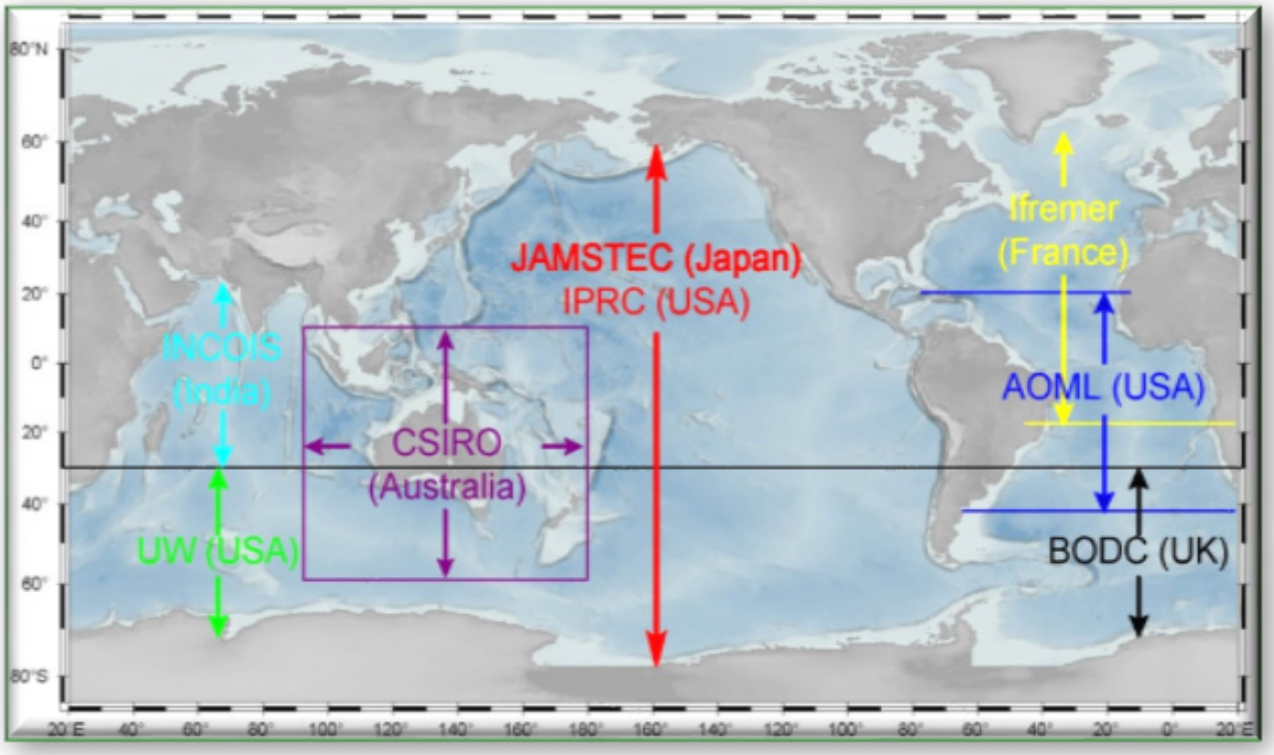

Figure 5: Map of Argo Regional Center divided by ocean basin
JAMSTEC is in charge of the Pacific Argo Regional Center (PARC) in collaboration with the International Pacific Research Center (IPRC) at the University of Hawaii, and the Commonwealth Scientific and Industrial Research Organisation (CSIRO). The PARC takes on the responsibility to validate all Argo float data in the Pacific through rigorous scrutiny and releases regional products based on these floats.

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