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.