

# Status of Argo Bulgaria, 1<sup>st</sup> March 2013

The Bulgarian Argo activities are framed by the BulArgo “Development of national research infrastructure as a component of Argo network” project, funded by the Bulgarian National Science Fund. It comprises a consortium of three research organizations: the Institute of Oceanology in Varna, Sofia University “St. Kliment Ohridski” and the National Institute of Meteorology and Hydrology in Sofia. The focus of the ongoing research program is the monitoring of the Black Sea.

## 1. The status of implementation

Bulgaria was first involved in the Argo activities in December 2009, when one French PROVOR float (#5902291) was deployed in the deep part of the Black Sea by the R/V Akademik operated by the Institute of Oceanology in Varna. Latter, in March 2011, three APEX floats (#6900803, #6900804 and #6900805) were deployed in the Black Sea by the same vessel. The floats were purchased by the BulArgo project; one of the floats was equipped by an oxygen sensor. Currently, the data are available at the Institute of Oceanology website ([http://www.gissserver.io-bas.bg/Web\\_argo](http://www.gissserver.io-bas.bg/Web_argo)).



Figure. Locations of surfacing of the 3 BulArgo floats since 18 March 2011.

Four Italian floats (WMO 6901959, 6901960, 6901961 and 6901962) were deployed in 2012 in the Western Black Sea from the board of R/V Akademik by the Institute of Oceanology, Varna. These floats were Arvor-L instruments manufactured by NKE in France. They were programmed to perform sampling between the surface and 700/1500 dbar once every 5 days, as well as to collect observations at the parking depth of 200 dbar. The floats measure temperature and salinity at each ascent. They transmit data by the standard Argos satellite system when being at sea surface. One of the floats (WMO 6901960) stranded on the Southern Bulgarian coast (near the city of

Primorsko) after 26 cycles of operation. It was successfully recovered, refurbished and repaired and is now ready to be re-deployed. The other floats are still collecting data as of the end of February 2013.



### **Delayed mode**

At present the standard procedures for real time and delayed mode data processing and quality control are performed at the French Argo Data Centre Coriolis. However, the procedures are being revised by the competent staff to account for the Black Sea regional characteristics. A M.Sc. thesis on the quality control procedures is under preparation. The QC includes specific range of the values control; comparison with climatological profiles, comparison with other Argo floats data, temperature and salinity gradients check, check of stability of the vertical stratification. The standard QC flags are assigned to each profile. The data coming from the float with the oxygen sensor are still under validation.

### **2. Present level of and future prospects for national funding for Argo**

BulArgo project which covers the period 2010-2013 is financed by the Bulgarian National Science Fund initially with 200 kEuro. Unfortunately due to the financial crisis the overall sum was decreased by 40% for the second half of the project. Thus four floats in total will be deployed in the Black Sea in the frame of this activity. The logistics will be provided by the Institute of Oceanology in Varna. The BulArgo project comprises a consortium of three research organizations: Institute of Oceanology in Varna, Sofia University (SU) "St. Kliment Ohridski" and National Institute of Meteorology and Hydrology in Sofia.

Extensive collaboration with the Bulgarian Ministry of Education, Youth and Science during the Euro-Argo preparation phase project has lead to an agreement at ministerial level that Bulgaria joins the Euro-Argo ERIC as a full member, thus a support for the membership fee and the deployment of 3 floats per year in the Black Sea has been ensured. Additionally to the Bulgarian national funding, IO-BAS and SU were funded in the frame of the EC FP7 PERSEUS, SIDERI and E-AIMS

projects, for multiple activities (technical, administrative, capacity building, training and education, establishment of user community) related to Argo.

### **3. Summary of deployment plans**

Bulgarian activities focus on the Black Sea. Float deployment in 2013 will follow the national plans in the frame of BulArgo (one float). Additional deployments are foreseen of one float with T/S sensor and IRIDIUM communication and 2 floats with biogeochemical sensors provided by FP7 PERSEUS and E-AIMS projects respectively. The stranded Italian float which was retrieved in 2012 will be re-deployed. Bulgarian scientists are in contact with the Turkish scientists, who also plan float deployment in 2013.

### **4. Data management**

The data from the floats deployed under the BulArgo project are available at the Institute of Oceanology website ([http://www.gissserver.io-bas.bg/Web\\_argo](http://www.gissserver.io-bas.bg/Web_argo)). The standard procedures for real time data processing and quality control are performed at the French Argo Data Centre ([www.coriolis.eu.org](http://www.coriolis.eu.org)). Collaboration with the scientists at MedArgo data center is ongoing to allow for processing data also in MedArgo. At the moment the data quality procedures are being revised by experts to account for the Black Sea regional characteristics.

### **5. Summary of national research and operational uses of Argo data**

The key objectives to use the Argo data in the Black Sea involve:

- Development of adequate data quality control procedures taking into account the Black Sea peculiarities
- Study of the temperature and salinity changes near the sea surface and in the deep layers
- Assimilation of the Argo data in a Black Sea circulation model
- Evaluation of chemical properties
- Validation of satellite- derived SST products
- Quantification of the steric effects in the Black Sea
- Getting new insight about the deep circulation of the Black Sea
- Strengthening of the users' community and use of data for educational purposes at university level.

### **6. Issues we wish to be considered and resolved**

The influence of the aggressive compounds on the float functioning.

How to prevent the capture of the float in the coastal eddies, which could lead to the standing on the beach?

### **7. Bulgarian contribution to Argo bibliography in 2012**

Palazov, A., V. Slabakova, E. Peneva, V. Marinova, A. Stefanov, M. Milanova, G. Korchev, 2012, BulArgo activities in the Black Sea, Proceedings of Third International Scientific Congress of TU-Varna, 4-6 October 2012, Varna, Bulgaria