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BIO ARGO floats: tools for operational monitoring of the Black Sea

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The assessment of ecological status in the context of the Water Framework Directive (WFD) and Marine Strategy Framework Directive (MSFD) requires comprehensive knowledge and understanding of the physical and biogeochemical processes that determine the functioning of marine ecosystems. One of the main challenges however is the need of data with frequency relevant to the spatial and temporal scales of the ecological processes. The majority of in situ observations that are commonly used for ecological monitoring of the Black Sea are generally based on near-shore monitoring programs or irregular oceanographic cruises that provide either non-synoptic, coarse resolution realizations of large scale processes or detailed, but time and site specific snapshots of local features. These gaps can be filled by two independent sources: satellite observation and profiling floats.
In fact satellite ocean color sensors allows for determination at synoptic scale of water quality parameters through its absorption properties. However the satellite ocean color methods have a number of limitations such as: measurements can only be made during daylight hours; require cloud-free conditions and are sensitive to atmospheric aerosols; provide information only for the upper layer of the ocean (approximately the depth of 10% incident light); algorithms developed for global applications are a source of large uncertainties in the marginal seas and costal areas. These constrains of the optical remote sensing observations can be avoided by using miniature biogeochemical sensors and autonomous platforms that offer remarkable perspectives for observing the "biological" ocean, notably at critical spatiotemporal scales which have been out of reach until recently (Claustre et al., 2010).
In the frame of "E-AIMS: Euro-Argo Improvements for the GMES marine Service" 7 EC FP project two Bio Argo floats were deployed in the Black Sea. Beside the traditionally CTD the floats were equipped with biogeochemical sensors (oxygen, irradiance, chl-a and backscattering). The selection of the deployment locations was limited only to the Bulgarian Black Sea waters, so that the optimal deployment strategy that has been chosen was the floats to be deployed in the maximum distant positions from each other along the Black Sea geostrophic current at depth $\sim$ 1800 m. Coincident biogeochemical and in-water radiometric measurements were collected at the time of each float deployment to ensure intercalibration of the instruments mounted on the floats and as well as to find empirical relationship between optical data and biogeochemical variables. The data obtained form Bio floats will be used to: investigate the seasonal evolution of oxygen in the upper layers, including the subsurface oxygen maximum; study the seasonal and inter annual dynamics of phytoplankton blooms in the deeper Black Sea; cross validation of satellite derived Chl-a and backscattering.

References: Claustre et al. (2010). Bio-optical profiling floats as new observational tools for biogeochemical and ecosystem studies: potential synergies with ocean color remote sensing. Proceedings of the "OceanObs'09: Sustained Ocean Observations and Information for Society" Conference, Venice/Italy.