



Development of a multi-data assimilation scheme to integrate Bio-Argo floats data with ocean colour satellite data into the CMEMS MFC-Biogeochemistry

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The Mediterranean Sea is a very promising site to develop and test the assimilation of Bio-Argo data since 1) the Bio-Argo network is one of the densest of the global ocean, and 2) a consolidated data assimilation framework of biogeochemical variables (3DVAR-BIO, presently based on assimilation of satellite-estimated surface chlorophyll data) already exists within the CMEMS biogeochemical model system for Mediterranean Sea.

The MASSIMILI project, granted by the CMEMS Service Evolution initiative, is aimed to develop the assimilation of Bio-Argo Floats data into the CMEMS biogeochemical model system of the Mediterranean Sea, by means of an upgrade of the 3DVAR-BIO scheme.

Specific developments of the 3DVAR-BIO scheme focus on the estimate of new operators of the variational decomposition of the background error covariance matrix and on the implementation of the new observation operator specifically for the Bio-Argo float vertical profile data. In particular, a new horizontal covariance operator for chlorophyll, nitrate and oxygen is based on 3D fields of horizontal correlation radius calculated from a long-term reanalysis simulation. A new vertical covariance operator is built on monthly and spatial varying EOF decomposition to account for the spatiotemporal variability of vertical structure of the three variables error covariance. Further, the observation error covariance is a key factor for an effective assimilation of the Bio-Argo data into the model dynamics. The sensitivities of assimilation to the different factors are estimated.

First results of the implementation of the new 3DVAR-BIO scheme show the impact of Bio-Argo data on the 3D fields of chlorophyll, nitrate and oxygen. Tuning the length scale factors of horizontal covariance, analysing the sensitivity of the observation error covariance, introducing non-diagonal biogeochemical covariance operator and non-diagonal multi-platform operator (i.e. Bio-Argo and satellite) are crucial future steps for the success of the MASSIMILI project. In our contribute, we will discuss the recent and promising advancements this strategic project has been having in the past year and its potential for the whole operational biogeochemical modelling community.