



Review of the Copernicus Marine Service Global biogeochemical reanalysis: modelling, Ocean Color and Carbonates data assimilation and validation against BGC-Argo-based in situ datasets.

The operational production of data-assimilated biogeochemical state of the ocean is one of the challenging core projects of the Copernicus Marine Service. In that framework, Mercator Ocean International is in charge of developing a global $\frac{1}{4}^\circ$ biogeochemical reanalysis simulation, covering the period from 1993 to the present. The system supporting this reanalysis simulation, to be commissioned in 2025, is based on the biogeochemical model NEMO-PISCES, in an offline coupling with the dynamical ocean ($1/12^\circ$ coarsened to $1/4^\circ$ resolution) from the Mercator Ocean global physical reanalysis system (embedding physical data assimilation). This BGC simulation shall benefit from the assimilation of satellite Ocean Colour data (Chlorophyll concentration), and from Machine-Learning-extended-SOCAT-based Carbonates surface data (dissolved inorganic carbon and total alkalinity). In addition, a relaxation toward some dynamical and climatological fields is required to mitigate the impact of some misconstrained processes (e.g. vertical velocities) in this physical data-assimilated forcing. The aim of this presentation is to give an overview of the developments made in this 30-year global biogeochemical simulation, from the modelling and coupling specifications, the data assimilation performances and limitations, to the use of novel metrics based on the BGCArgo Neural-Network-extended dataset, to provide a global 4D exploration and validation of the biological Carbon pump, the Carbon uptake and Oxygen-related key biogeochemical processes.

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