Using Argo data to improve biogeochemical models, a case study for the Nordic Seas and the Arctic operational model

We present a framework that links in situ observations from the BGC-Argo array to biogeochemical models. We utilize the physical and biogeochemical dataset from the Argo array to identify potential sources of model errors and to improve and validate model configurations. Improved model configurations can then be employed in 3D models with a range of applications from regional to global operational and climate scale models. With this framework, we build simulations along the BGC-Argo trajectories, imitating the observed physical conditions along the track. The framework is built in a water-column (1D) Lagrangian structure and enables us to focus on the biogeochemical model formulations and parameterizations. In this presentation, we focus on a range of BGC-Argo floats in the Nordic Seas and describe (1) how we utilized the Argo data to assess and improve the biogeochemical formulations and (2) through an ensemble of simulations how we tuned model parameters. We will showcase how effective the Argo array can be for model improvement and validation, and how we transferred the improvements from a 1D to a 3D configuration. We objectively analyzed the improvements in a North Atlantic and the Arctic configuration which is a component of the Copernicus Marine Services Arctic operational model. We utilized BGC-Argo chlorophyll a and oxygen variables, and we will also be showcasing an expansion of this method to include BGC-Argo particle backscatter and nitrate variables. The framework is generic and has implications towards improving model configurations from multidecadal hindcasts to short-term forecasts and future projections.

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