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Global ocean biogeochemical modelling with FESOM2-REcoM

Ozgur Gurses, Judith Hauck, Moritz Zeising, and Laurent Oziel
Alfred Wegener Institute, Climate Dynamics, Bremerhaven, Germany (ozgur.gurses@awi.de)

Marine biogeochemistry models are generally coupled to a physical ocean model. The biases in these coupled models can be attributed to simplified and empirical representation of biogeochemical processes, insufficient spatial mesh resolution which has an impact on the transport and mixing of biogeochemical substances in the ocean, and a deficit of physical parameterizations that intent to mimic unresolved processes such as eddies. Ocean Biogeochemical models based on variable mesh resolution proved to be convenient tools due to their computational efficiency and flexibility. Unlike standard structured-mesh ocean models, the mesh flexibility allows for a realistic representation of eddy dynamics in certain regions. Here, we present preliminary results of the coupling between the Finite-volumE Sea ice-Ocean Model (FESOM2.0) and the biogeochemical model REcoM2 (Regulated Ecosystem Model 2) in a coarse spatial resolution global configuration.
Surface maps of the simulated nutrients, chlorophyll a and net primary production (NPP) are comparable to available observational data sets. The control simulation forced with the JRA55-do data set reveals a realistic spatial distribution of nutrients, nanophytoplankton and diatom NPP, carbon stocks and fluxes.
FESOM2 utilizes a new dynamical core based on a finite-volume approach. The computational efficiency is about 2-3 times higher than the previous version FESOM1.4, whereas the quality of the simulated ocean and sea ice conditions and representation of biogeochemical variables are comparable in the two models. Thus, the new coupled model FESOM2- REcoM2 is very promising for ocean biogeochemical modelling applications.