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Comparing the performance of two ecosystem models in the North Atlantic

Ute Daewel and Annette Samuelsen

Nansen Environmental and Remote Sensing Center and Hjort Centre for Marine Ecosystem Dynamics, Thormøhlensgate 47, 5006 Bergen, Norway (ute.daewel@nersc.no))

Comparing different biogeochemical models allows for understanding process interactions within model formulations and hence constitutes a good starting point for advanced model development. But 3d biogeochemical models are combinations of coupled modules, representing different aspects of the ecosystem (i.e. physics, ecosystem dynamics, carbon chemistry), and a set of different forcing fields. This creates difficulties in understanding the results from inter-model comparison studies as differences between model results might either stem from each of the modules or from the choice of the forcing fields.

Here we present an inter-model comparison study for the North Atlantic ecosystem using two different NPZD type ecosystem models (NORWECOM and ECOSMO) solved in exactly the same physical setup. This approach allows disentangling differences and uncertainties caused by the chosen NPZD model and better understanding the choice of model formulation and parameterisation. Both models were coupled to a North Atlantic version of HYCOM (HYbrid Coordinate Ocean model) forced by the ERA-interim atmospheric reanalysis.

ECOSMO is a model originally developed for the North Sea and Baltic Sea ecosystem that has previously been successfully applied to the Barents Sea ecosystem. It resolves 15 state variables including nitrate, ammonia, phosphate, silicate, oxygen, 2 types of phytoplankton, diatoms and flagellates, and 2 types of zooplankton, divided in functional groups based on their feeding preferences, DOM, detritus, opal and 3 types of sediments. This version of NORWECOM in contrast has earlier been used to simulate the North Atlantic ecosystem. It contains 11 state variables including nitrate, phosphate, silicate, oxygen, diatoms and flagellates, 2 size classes of zooplankton, 2 types of detritus, and opal.

The aim of the study is to understand the relevance of different model formulation and parameterisations for the solution of the model system and to use this information to improve our model parameterisations. We will integrate both model systems over a time period of several years and investigate the simulated nutrient dynamics and spatial production pattern on seasonal time scales both with respect to each other and to observed production and nutrient dynamics in the area.