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Modeling study of role of organic matter production and destruction on the carbonate system seasonal changes in the Barents Sea

Evgeniy Yakushev and Kai Sørensen
Norwegian Institute for Water Research, Norway (eya@niva.no)

This work aimed in studying of the role of seasonality of the biogeochemical processes of organic matter production and decay in the seasonal changes of the carbonate system (pH, pCO2, aragonite saturation). Data received at a transect Tromsø – Spitsbergen with a Ferrybox equipped SOOP vessel was used for verification. A 2D simplified vertical model was used to parameterize the hydrophysical processes of at a Coast-Open Arctic section. The biogeochemical processes were parameterized using OxyDep, simplified biogeochemical model aiming time scales seasonal and larger, that considered inorganic nutrient (NUT), dissolved (DOM) and particular (POM) organic matter and biota (BIO). Dissolved inorganic carbon (DIC) and alkalinity (Alk) were considered as independent model parameters. DIC changes were correlated with NUT using Redfield ratio, Alk was changed in the marine boundary of the modeled transect. The carbonate system equilibration was considered as a fast process and calculated at every time step using an iteration procedure. The carbonate system modeling was described on the base of standard approach (Dickson, 2010). According to the model estimates the summer formation of DOC and POC and their further destruction can play a compatible role in the carbonate system seasonal dynamics. Modeled seasonal variations of pH ($\sim$0.2) are close to the observed ones t, i.e. 7.94-7.99 in February and 8.04-8.16 in August (pH(Tot)).The received results allowed to demonstrate that the upper layer water pCO2 varies from 480 ppm in winter to minimum values of 280 ppm during the OM production period. Therefore summer invasion of CO2 should be replaced by winter evasion. The received results can be helpful for planning of expedition studies and analyzing of the archived field data, as well as for elaborating of the interannual and multidecadal changes models.