Geophysical Research Abstracts
Vol. 12, EGU2010-8375, 2010
EGU General Assembly 2010


# Seasonal dynamics of the pelagic variables in the southern Baltic Sea (Gdansk Deep)

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This paper presents a one-dimensional Coupled Ecosystem Model 1D CEM. The 1D CEM model consists of six coupled equations: five diffusion-type equations for phytoplankton, zooplankton, pelagic detritus and nutrients (phosphate and total inorganic nitrogen) and one ordinary differential equation for detritus at the bottom. The temporal changes in the phytoplankton biomass are caused by primary production, respiration, mortality, grazing by zooplankton and sinking. The zooplankton biomass is affected by ingestion, excretion, respiration, fecal production, mortality, and carnivorous grazing. The changes in the pelagic detritus concentration are determined by input of: dead phytoplankton and zooplankton, natural mortality of predators, fecal pellets, and sinks: sedimentation, zooplankton grazing and decomposition. The nutrient concentration is caused by nutrient release, zooplankton excretion, predator excretion, detritus decomposition and benthic regeneration as sources and by nutrient uptake by phytoplankton as sinks. However, the benthic detritus is described by
phytoplankton sedimentation, detritus sedimentation and remineralisation. The particulate organic carbon concentration is determined as the sum of phytoplankton, zooplankton and pelagic detritus concentrations, all expressed in carbon concentrations.
Particulate Organic Carbon (POC) is an important component in the carbon cycle of estuarine systems. In our study, we assess the POC concentration in the southern Baltic Sea, in Gdańsk Deep, for 2007. Our analysis was based on a 1D CEM Model and the experimental data (POC measurements). Observed large fluctuations of POC suggest its appreciable seasonal variability. The maximum concentration of POC fluctuated between 870 mg C m-3 (1030 mg C m-3 for 2008) in May and 580 mg C m-3 (410 measurement) in September, coinciding with the period of maximum dead organic matter flow and phytoplankton biomass. The results of the numerical simulations described here is in good agreement with the mean observed values. The difference in the POC concentration between the modelled and mean observed values is equal to 3 - 28 % and depend on the month for which the calculations were made. In the paper, bacteria were not simulated, hence the modeled POC results could be lower in the first half of the year. This work was supported by the Polish state Committee of Scientific Research (grant No N N305 111636).