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Long-term model study of nutrient and detritus dynamics in the Baltic Sea

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Eutrophication resulting from direct and indirect input of nutrients is considered one of the major environmental problems in the sub-basins of the Baltic Sea. Stronger eutrophication is manifested through increased summer cyanobacteria blooms and expanding hypoxia. It has been recognized that cycling of organic matter is a considerable source of nutrients in the Baltic Sea. Nutrient pools in the sediments have increased over the last decades.
Our study aims at understanding the eutrophication of the Baltic Sea by looking at spatial patterns and temporal variation of biogeochemical parameters. We are focusing on spatial detritus dynamics during the period of 40 years in the Baltic Sea.
Model simulations were performed using a three-dimensional free-surface hydrodynamic model GETM coupled with the ERGOM biogeochemical model. The model domain covers the entire Baltic Sea area and the period modelled is 1966-2006.
Our results show that nutrient and detritus dynamics differ between shallow and deep areas. Seasonal cycle is dominant in the shallow areas (water depth less than 60 m approximately) and nutrients – organic matter are recycling there. Deep areas, however, could be storage areas of organic matter where halocline acts as a kind of barrier for nutrients to be transported to the upper layer. Still, nutrients are mixed from the upper halocline into the upper layer and fuel primary production there. Deep areas therefore become important source of nutrients especially during MBIs. Horizontal transport of nutrients from upstream basins of the Baltic Sea is a considerable source of nutrients for downstream basins.