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Carbon budget of the Baltic Sea

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The last few decades in the mankind history are characterized not only by the very rapidly socio-economic transformation but also because of the, resulting from this progress, environment degradation. The greenhouse effect is one of the most appreciable among all the symptoms. It is believed that people emit to the atmosphere approximately 10.4 Pg of carbon each year and approximately 30-35 % of this amount is stored in the ocean. Among them, shelf seas are responsible for about 20 % of all marine carbon dioxide uptake, while they constitute only 7 % of the whole sea surface.
On the European shelf the Baltic Sea seems to be particularly important as regard CO2 cycle. The Baltic Sea, together with the transition zone of the Danish Straits and the Kattegat, form a unique system through which transport of organic and inorganic carbon species takes place from land to the North Sea and further to deep Atlantic Ocean.
The Baltic Sea is semi-enclosed shelf sea. Hydrology of the Baltic is well established. This distinctive features make possible the evaluation of the CO2 uptake using the budgeting approach. However, it requires accurate estimation of the all carbon inflows and outflows in the Baltic Sea, based on the accurate hydrological fluxes and carbon concentrations. These include: exchange with the North Sea, riverine runoff, precipitation, sedimentation and carbon return flux from the sediments, coastal point sources, and fish catching. If all these fluxes are added, assuming negative signs for the outputs and positive for the inputs, the rate of the atmosphere/water CO2 flux results. The sign of the result will point at its direction. This approach was used to establish CO2 flux through atmosphere/water interface for the Baltic in the period 2006-2008.
Obtained results imply very high temporal and spatial variability of carbon inputs/outputs to/from the Baltic Sea. Rivers are the major source of both: inorganic (6.8 Tg C year-1)* and organic carbon species (4.1 Tg C year-1)*. When carbon export from the Baltic Sea is considered two fundamental fluxes should be mentioned: net carbon export to the North Sea and net carbon deposition to the sediments, constituting respectively: -7.7 Tg C year-1 and -2.6 Tg C year-1. Since the majority of the carbon inputs and outputs balance one another only slight imbalance of the Baltic Sea carbon budget was observed. This was attributed to the net CO2 emission to the atmosphere at the level of 1.1 Tg C year-1.
*on the basis of BALTIC-C database (financed by BONUS, Baltic Organisations Network for Funding Science EEIG).