



BALTEX Survey on

Biogeochemical Modelling Activities in the Baltic Sea Basin

<p>Model Name</p>	<p>Full name: Production-Destruction of Organic Matter Model Acronym: ProDeMo Actual version: 2 Note: Version ProDeMo coupled with 3D Baltic hydrodynamic model is named Baltic Ecohydrodynamic Model (BEM)</p>								
<p>Model Description</p>	<p>A 3D coupled ecological-hydrodynamic model includes parameterisation of water sediment interactions. This version of the model contains of 18 state variables divided into several functional groups: phytoplankton, zooplankton and detritus as well as the cycles of three nutrients: nitrogen, phosphorus and silicon. The phytoplankton is composed as autotrophs: spring diatoms, autumn diatoms, dinoflagellates, blue-green algae and other summer species. The zooplankton is treated as one group of heterotrophs grazing on autotrophs. Detritus pool consists of dead material which undergoes processes of mineralization. Dissolved oxygen as well as sediment state variables (nitrogen, phosphate and silicon) are also included in the model.</p> <p>A “sigma transformation” approach was applied in the model, making it possible to divide the vertical profile in each point of the sea, irrespectively of its depth, into equal number of layers. The implementation of the model was performed in object-oriented style (in C ++ language).</p>								
<p>State Variables</p>	<table border="1"> <thead> <tr> <th>State Variable</th> <th>Description</th> <th>Unit</th> </tr> </thead> <tbody> <tr> <td>[C_{S-DIAT}]</td> <td>Carbon in spring diatoms (biomass)</td> <td>[gC/m³]</td> </tr> </tbody> </table>	State Variable	Description	Unit	[C _{S-DIAT}]	Carbon in spring diatoms (biomass)	[gC/m ³]		
State Variable	Description	Unit							
[C _{S-DIAT}]	Carbon in spring diatoms (biomass)	[gC/m ³]							

FIG. PRODEMO MODEL SCHEME

	[C _{A-DIAT}]	Carbon in autumn diatoms (biomass)	[gC/m ³]
	[C _{DINOFLL}]	Carbon in dinoflagellates (biomass)	[gC/m ³]
	[C _{BGA}]	Carbon in blue-green algae (biomass)	[gC/m ³]
	[C _{others}]	Carbon in others summer species (biomass)	[gC/m ³]
	[C _{ZOOP}]	Carbon in zooplankton (biomass)	[gC/m ³]
	[N-NO ₃]	Nitrate nitrogen	[gN/m ³]
	[N-NH ₄]	Ammonium nitrogen	[gN/m ³]
	[P-PO ₄]	Phosphate phosphorus	[gP/m ³]
	[Si-SiO ₄]	Silicate silikon	[gSi/m ³]
	[DO]	Dissolved Oxygen	[gO/m ³]
	[C _{DETR}]	Carbon in detritus	[gC/m ³]
	[N _{DETR}]	Nitrogen in detritus	[gN/m ³]
	[P _{DETR}]	Phosphorus in detritus	[gP/m ³]
	[Si _{DETR}]	Silicon in detritus	[gSi/m ³]
	[N _{SED}]	Nitrogen in the sediment	[gN/m ²]
	[P _{SED}]	Phosphorus in the sediment	[gP/m ²]
	[Si _{SED}]	Silicon in the sediment	[gSi/m ²]
On a scale between 1 and 10, please classify your model	1 Biogeochemical cycling, matter fluxes 2 3 4 5 Marine ecosystem model including phyto-, zooplankton and water-sediment interaction 6 7 8 9 10 Ecosystem functioning		
Dimension (0D, 1D, 2D, 3D)	3D (sigma coordinate in vertical)		
Modeled Area (Marine, terrestrial, combined)	Marine		
Coupled to hydrological component	Coupled with 3D hydrodynamic model based on Princeton Ocean Model (POM) taking into account runoff		
Suited for climate change sensitivity studies	Yes		
Publications	Ołdakowski B., Renk H., 1997, The conception and structure of the Production-Destruction of Organic Matter Model; verification tests for the Gulf of Gdańsk, Oceanol. Stud., 26 (4), 99-122. Jędrasik J., 1997, A model of matter exchange and flow of energy in the Gulf of Gdańsk ecosystem - overview, Oceanol. Stud., 26 (4), 3-20. Ołdakowski B., Kowalewski M., Jędrasik J. Szymelfenig M., 2005, Ecohydrodynamic Model of the Baltic Sea, Part I: Description of the ProDeMo model, Oceanologia, 47 (4), 477-516 Jędrasik J., Szymelfenig M., 2005, Ecohydrodynamic model of the Baltic Sea, Part II: Validation of the model, Oceanologia, 47 (4), 543-566. Kowalewski M., 2005, The influence of the Hel upwelling (the Baltic Sea)		

	on nutrient concentration and primary production – the results of an ecohydrodynamic model, Oceanologia, 47 (4), 567–590
Institute	Institute of Oceanography, University of Gdańsk, Al. Marszałka Piłsudskiego 46, 81-378 Gdynia, Poland
Developer, E-Mail	Jan Jędrasik, e-mail: ocejj@univ.gda.pl Marek Kowalewski, e-mail: ocemk@univ.gda.pl Bogdan Ołdakowski, e-mail: bogdan@actiaforum.pl Adam Krężel, e-mail: oceak@univ.gda.pl
Web Site	http://model.ocean.univ.gda.pl/indexeng.html

Remarks:

At present model is developing (version 3) towards: mode of multi-layer sediment and vertical migration of phyto- and zooplankton.