

## **BALTEX Survey on**

## Biogeochemical Modelling Activities in the Baltic Sea Basin

Model Name	Full name: Production-Destruction of Organic Matter Model Acronym: ProDeMo Actual version: 2 Note: Version ProDeMo coupled with 3D Baltic hydrodynamic model is named Balitc Ecohydrodynamic Model (BEM)
Model Description	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: nitro- gen, phosphorus and silicon. The phytoplankton is composed as auto- trophs: spring diatoms, autumn diatoms, dinoflagellates, blue-green al- gae and other summer species. The zooplankton is treated as one group of heterotrophs grazing on authotrophs. 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. A "sigma transformation" approach was applied in the model, making it possible to divide the vertical profile in each point of the sea, irrespec- tively of its depth, into equal number of layers. The implementation of the model was performed in object-oriented style (in C ++ language). The model was performed in object-oriented style (in C ++ language). The spring diatoms Autumn diatoms Dinoflagellate Spring diatoms Autumn diatoms Dinoflagellate Spring diatoms Autumn diatoms Dinoflagellate Spring diatoms Autumn diatoms Dinoflagellate Summer spacies The species of the space of the s
	N <sub>SED</sub> P <sub>SED</sub> Si <sub>SED</sub> Active layer 15 ▼ 15 ▼ 15 ▼ Inactive layer
	15♥     15♥     Inactive layer       FIG. PRODEMO MODEL SCHEME
State Variables	State Description Unit
	variable
	[C <sub>S-DIAT</sub> ] Carbon in spring diatoms (biomass) [gC/m <sup>3</sup> ]

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	[C <sub>A-DIAT</sub> ]	Carbon in autumn diatoms (biomass)	[gC/m <sup>3</sup> ]	
	[C <sub>DINOFL</sub> ]	Carbon in dinoflagellates (biomass)	[gC/m <sup>3</sup> ]	
	[C <sub>BGA</sub> ]	Carbon in blue-green algae (bio- mass)	[gC/m <sup>3</sup> ]	
	[C <sub>others</sub> ]	Carbon in others summer species (biomass)	[gC/m <sup>3</sup> ]	
	[C <sub>ZOOP</sub> ]	Carbon in zooplankton (biomass)	[gC/m <sup>3</sup> ]	
	[N-NO <sub>3</sub> ]	Nitrate nitrogen	[gN/m <sup>3</sup> ]	
	[N-NH <sub>4</sub> ]	Ammonium nitrogen	[gN/m <sup>3</sup> ]	
	[P-PO <sub>4</sub> ]	Phosphate phosphorus	[gP/m <sup>3</sup> ]	
	[Si-SiO <sub>4</sub> ]	Silicate silikon	[gSi/m <sup>3</sup> ]	
	[DO]	Dissolved Oxygen	[gO/m <sup>3</sup> ]	
	[C <sub>DETR</sub> ]	Carbon in detritus	[gC/m <sup>3</sup> ]	
	[N <sub>DETR</sub> ]	Nitrogen in detritus	[gN/m <sup>3</sup> ]	
	[P <sub>DETR</sub> ]	Phosphorus in detritus	[gP/m <sup>3</sup> ]	
	[Si <sub>detr</sub> ]	Silicon in detritus	[gSi/m <sup>3</sup> ]	
	[N <sub>SED</sub> ]	Nitrogen in the sediment	[gN/m <sup>2</sup> ]	
	[P <sub>SED</sub> ]	Phosphorus in the sediment	[gP/m <sup>2</sup> ]	
	[Si <sub>SED</sub> ]	Silicon in the sediment	[gSi/m <sup>2</sup> ]	
1 and 10, please classify your model	<b>sediment</b> 6 7 8 9	osystem model including phyto-, zoo interaction	plankton and water-	
Dimension	3D (sigma coordinate in vertical)			
(0D, 1D, 2D, 3D) Modeled Area (Ma- rine, terrestial, com-				
bined)	Marine			
Coupled to hydro- logical component	Coupled with 3D hydrodynamic model based on Princeton Ocean Model			
Suited for climate change sensitivity studies	(POM) taking into account runoff 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, Eco- hydrodynamic Model of the Baltic Sea, Part I: Description of the ProDeMo model, Oceanologia, 47 (4), 477516			
		Szymelfenig M., 2005, Ecohydrodyna Validation of the model , Oceanologi		

	on nutrient concentration and primary production – the results of an ecohydrodynamic model, Oceanologia, 47 (4), 567–590
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Remarks: At present model is developing (version 3) towards: mode of multi-layer sediment and vertical migration of phyto- and zooplankton.