Baltic-C: Building predictive capability regarding the Baltic Sea organic/inorganic carbon and oxygen systems

Baltic-C kick off
November 2008

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FINNISH METEOROLOGICAL INSTITUTE
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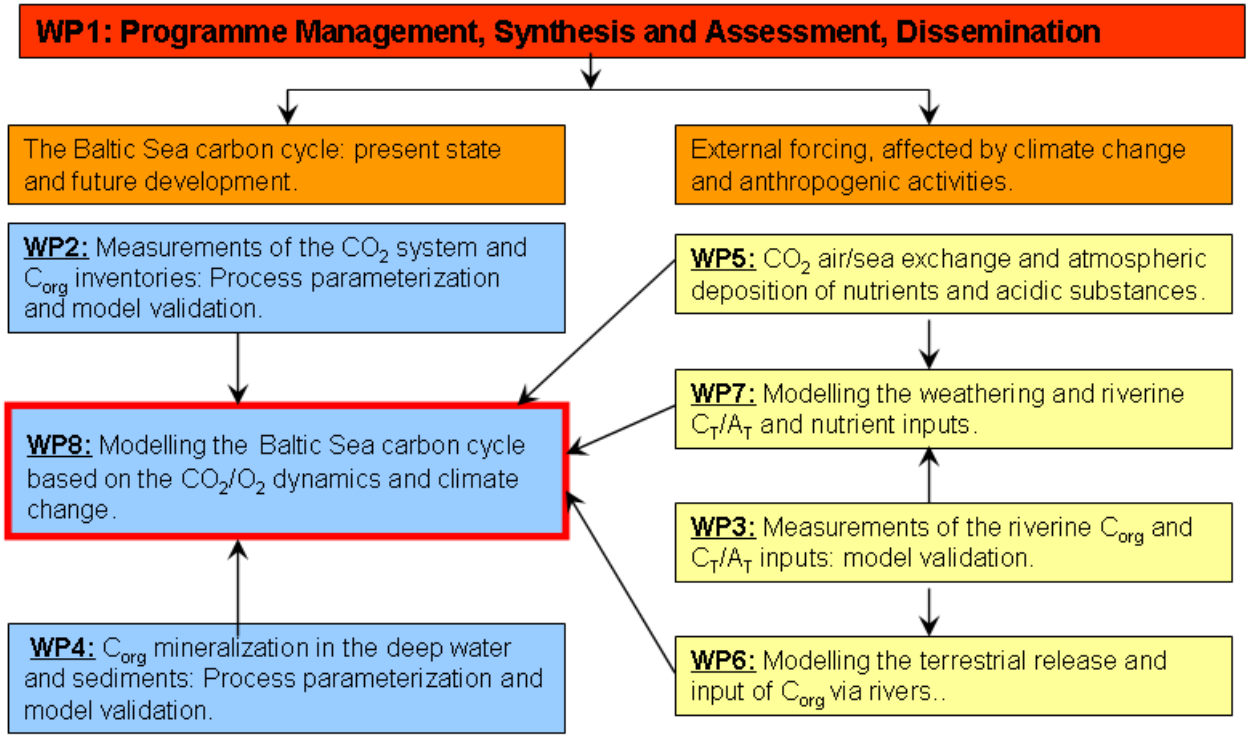
WP1. Programme management, synthesis and assessment, dissemination (Anders Omstedt, University of Gothenburg, Sweden, and participant code 1).

Anders Omstedt

David Rayner



WP1. Programme management, synthesis and assessment, dissemination (Anders Omstedt, University of Gothenburg, Sweden, and participant code 1).

- ***Task 1.1:*** *Programme management.* The programme will be managed via the University of Gothenburg, Sweden. A **Scientific Steering Committee** consisting of the project coordinator and principal scientists; an **International Advisory Group** representing the University of Gothenburg, BONUS, BALTEX, HELCOM, and the Swedish Water District Authority will support the social science and environmental economics aspects of the project. Baltic-C is also linked to CarboOcean and the SOPRAN Project, the German contribution to the IGBP SOLAS Project.

- ***Task 1.2:*** *Workshop and estimated environmental economics aspects.* A joint workshop with scientists from the University of Gothenburg, BONUS, HELCOM, and the Swedish Water District Authority will be organized in which Baltic-C developments are discussed in an EAM framework. Environmental economics responses to the different modelled future projections will be defined based on changes in nutrient load and in the Baltic Sea CO_2 carbon cycle. Due to budget cuts this workshop will be organized outside the Baltic-C program and at a later phase (D1 outside Baltic-C).

- ***Task 1.3:*** Synthesis and assessment of Baltic Sea CO_2 system.The Baltic-C assessment will provide the scientific community and water management authorities with an assessment of ongoing climate change in the Baltic Sea. (D2, D3).

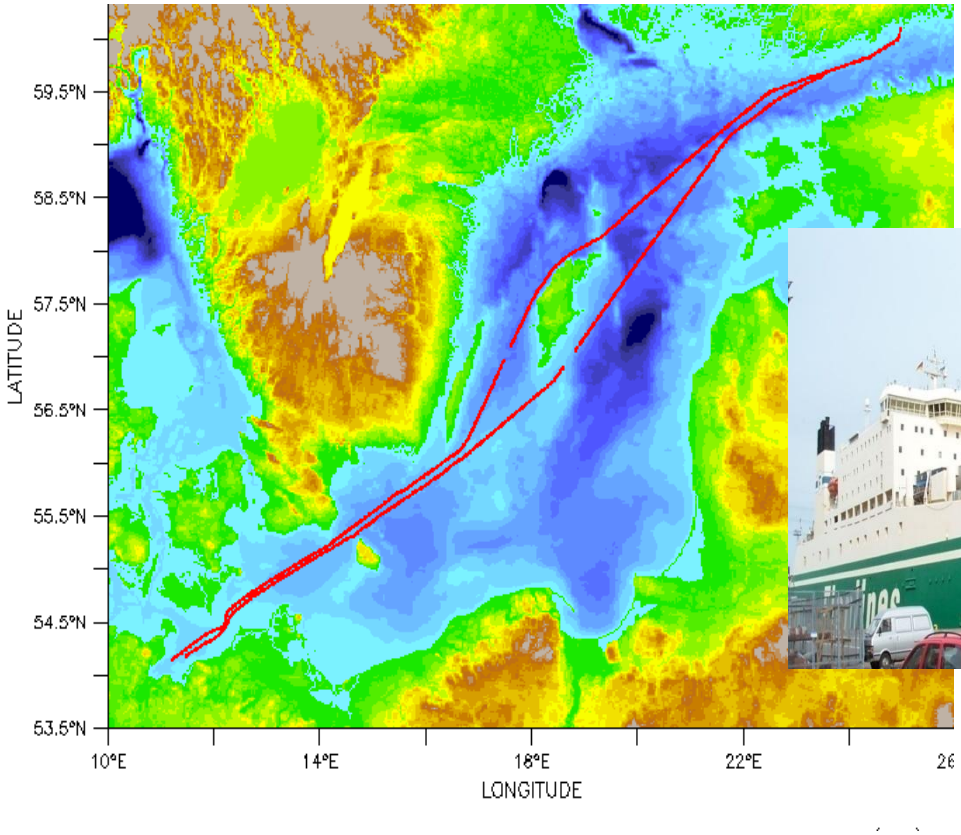
- ***Task 1.4:*** *Dissemination.* Results will be disseminated in cooperation with the BONUS, BALTEX Secretariat, Baltic Nest Institute, HELCOM, and Swedish Water District Authority. To develop interdisciplinary training for involved scientists, a one–two-week exchange program will be held each year. The Baltic-C program will also be involved in creating an interdisciplinary marine graduate summer school of the highest international calibre in cooperation with BONUS, BALTEX, and EUR-OCEANS (D4).

WP2. Measurements of the Baltic Sea CO_2 system and carbon inventories (Bernd Schneider, Baltic Sea Research Institute, Germany; participant code 2).

Bernd Schneider

Anne Loeffler

Bernd Sadkowiak



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WP2. Measurements of the Baltic Sea CO_2 system and carbon inventories (Bernd Schneider, Baltic Sea Research Institute, Germany; participant code 2).

- ***Task 2.1:*** *Recording surface water pCO_2 and O_2 using a fully automated measurement system deployed on VOS "FINNMAID".*

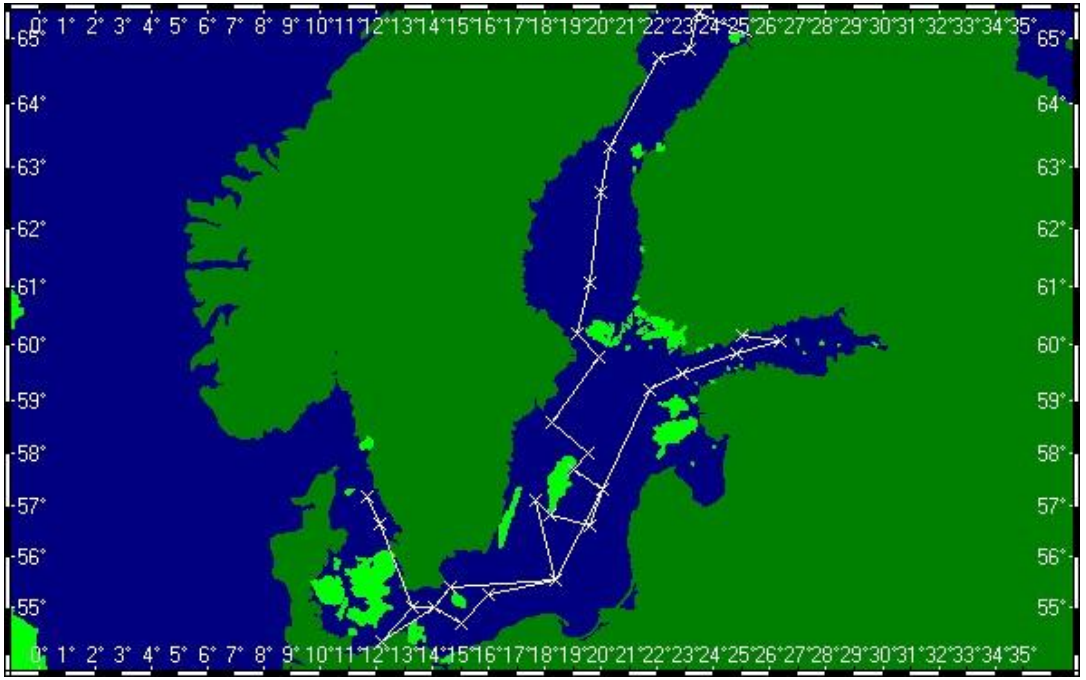
- ***Task 2.2:*** *Determining the organic/inorganic carbon and oxygen pools in different Baltic Sea sub-regions.*

- ***Task 2.3:*** *Compiling and evaluating CO_2/carbon data collected by previous research and monitoring programmes.*

WP3. Inventory of river runoff data (Matti Pertillä, Finnish Institute of Marine Research, Finland; participant code 3).

Matti Pertillä

Laura Joensuu



Baltic-C cruise 12.1 – 7.2.2009

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WP3. Inventory of river runoff data (Matti Pertillä, Finnish Institute of Marine Research, Finland; participant code 3).

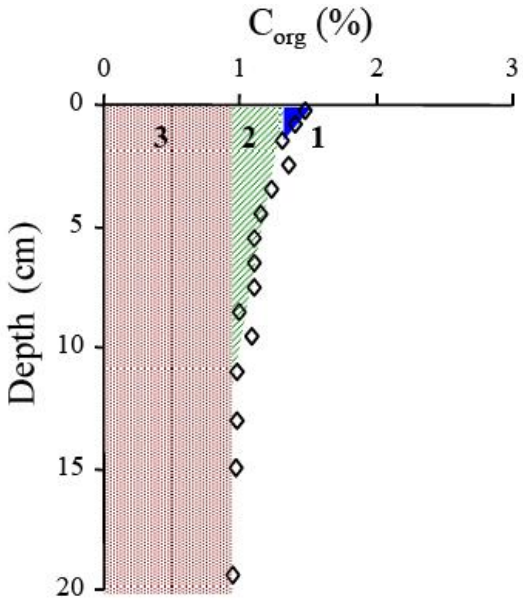
- ***Task 3.1:*** *Evaluating the river input concentrations from existing monitoring and research data.*
- ***Task 3.2:*** *Evaluating river concentrations from marine data.*
- ***Task 3.3:*** *Measuring input concentrations.*

WP4. Mineralization of organic material, deepwater–sediment interaction (Janusz Pempkowiak, Institute of Oceanology, Polish Academy of Sciences, Poland; participant code 4).

Janusz Pempkowiak

Anna Maciejewska

Aleksandra Szczepańska



Karol Kuliński

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WP4. Mineralization of organic material, deepwater–sediment interaction (Janusz Pempkowiak, Institute of Oceanology, Polish Academy of Sciences, Poland; participant code 4).

- ***Task 4.1:*** *Establishing remineralization rate constants for organic matter based on existing data.*

- ***Task 4.2:*** *Collecting new experimental data to improve and extend the rates provided in task 4.1*

- ***Task 4.3:*** *Establishing loads of carbon species passing across the sediment–water interface over the entire Baltic.*

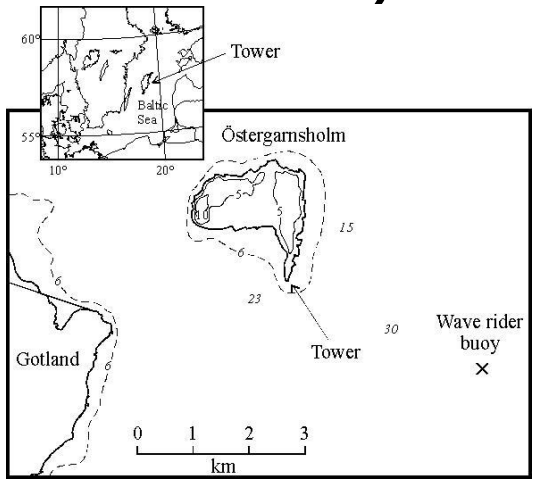
Task 4.4: *Determining remineralization rate constants at the sediment surface and in the water column, based on CO_2 concentrations in Gotland Sea deep water*

WP5. Atmospheric forcing (air–sea interaction, scenarios) (Anna Rutgersson, Uppsala University, Sweden; participant code 5).

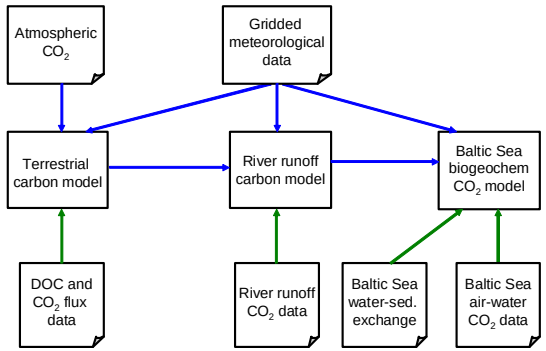
Annna Rutgersson

Björn Carlsson

Maria Norman



a)



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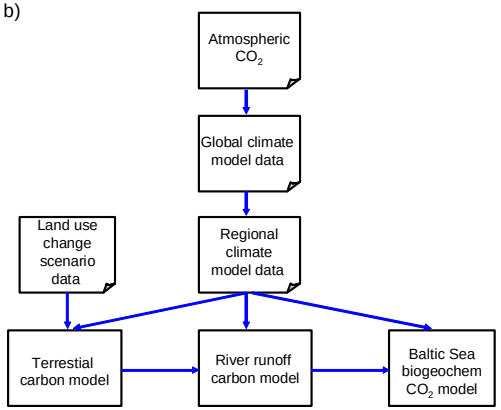
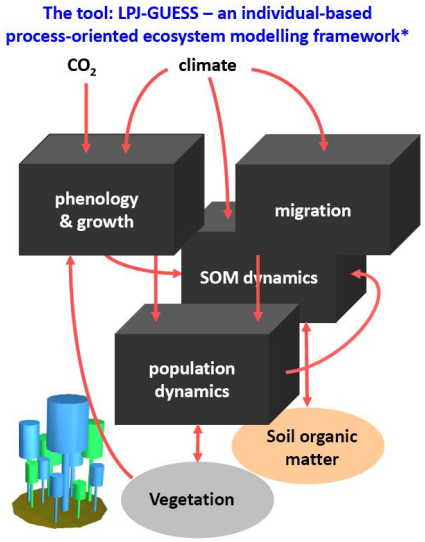


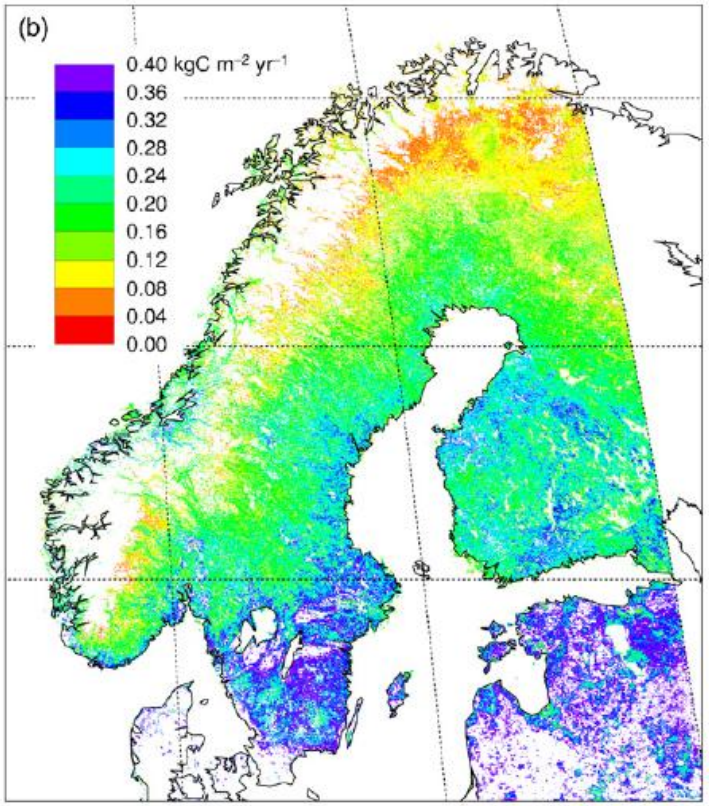
WP5. Atmospheric forcing (air–sea interaction, scenarios) (Anna Rutgersson, Uppsala University, Sweden; participant code 5).

- ***Task 5.1:*** *Air–sea interaction.*
- ***Task 5.2:*** *Acid deposition.*
- ***Task 5.3:*** *Climate scenarios and land-use data*

WP6. Modelling the organic matter input from terrestrial vegetation and soils (Benjamin Smith, Lund University, Sweden; participant code 6).

Benjamin Smith





WP6. Modelling the organic matter input from terrestrial vegetation and soils (Benjamin Smith, Lund University, Sweden; participant code 6).

- ***Task 6.1:*** *Terrestrial carbon model setup, validation, and coupling to the river runoff carbon model (WP7).*

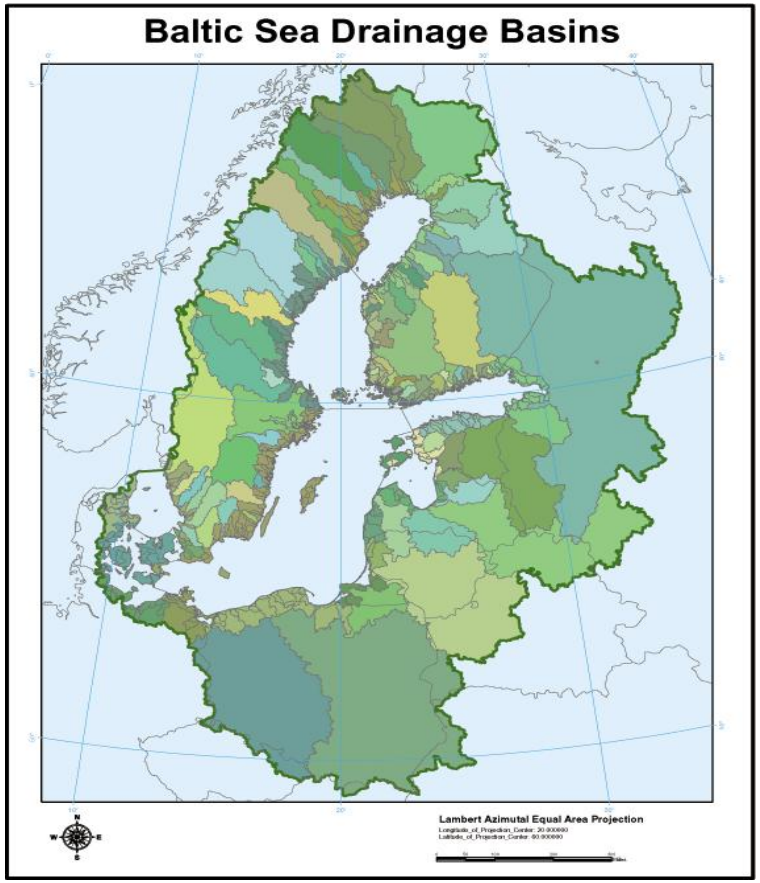
- ***Task 6.2:*** *Modelling present and past changes in vegetation structure and functioning and in dissolved organic carbon export.*

- ***Task 6.3:*** *Modelling possible future changes in vegetation structure and functioning and in dissolved organic carbon export.*

WP. 7. Modelling the input A_T, C_T, Ca, and C_{org} from all rivers to the Baltic Sea (Christoph Humborg, Stockholm University, Sweden; participant code 7).

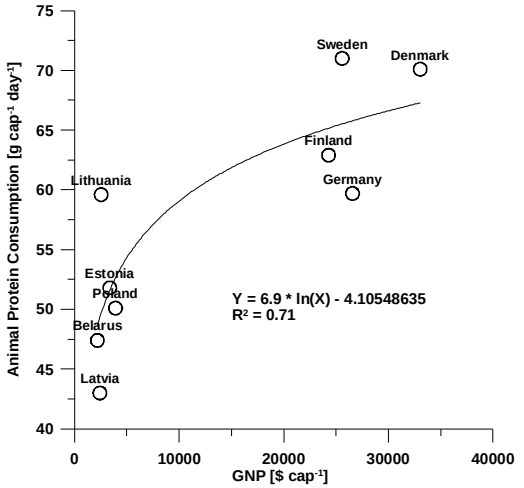
Christoph Humborg

Magnus Mörth



CSIM model

87 major catchments and 21 costal strips



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WP. 7. Modelling the input A_T, C_T, Ca, and C_{org} from all rivers to the Baltic Sea (Christoph Humborg, Stockholm University, Sweden; participant code 7).

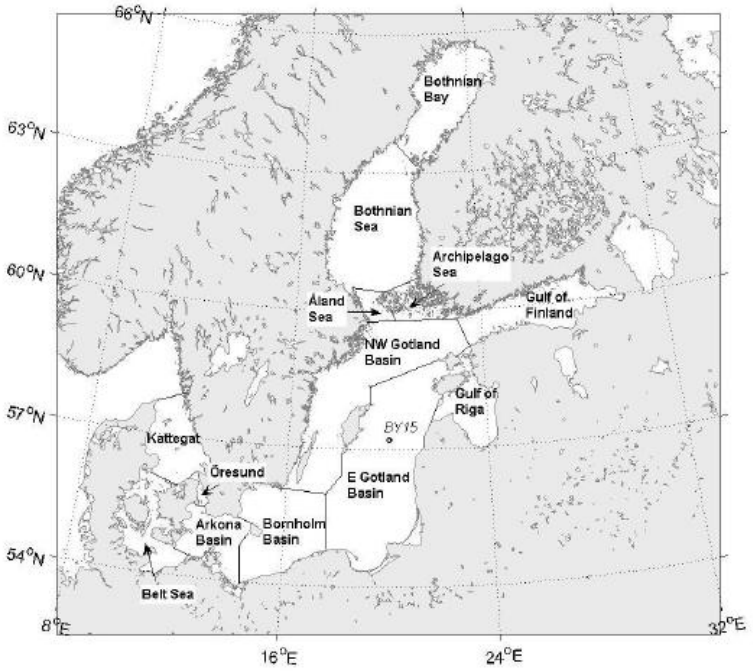
- ***Task 7.1:*** *Compilation of river chemistry and hydro-meteorological forcing data*.
- ***Task 7.2:*** *Model calibration and validation of A_T, C_T, Ca and Corg inputs.*
- ***Task 7.3:*** *Scenario analyses of A_T, C_T, Ca and C_{org} inputs as a function of land cover change and changes in river discharge as an effect of regional climate change.*
- ***Task 7.4:*** *Scenario analyses on effects of regional climate change on N and P fluxes from 83 major watersheds forming the Baltic Sea catchment*.
- ***Task 7.5:*** *Scenario analyses on changes in land cover types (agricultural vs. forest vs. wetlands) and land use patterns (changes in fertilizer use and livestock density) on N and P fluxes from 83 major watersheds forming the Baltic Sea catchments.*

WP8. Modelling the Baltic Sea physical-biogeochemical system based on the CO_2/O_2 dynamics and climate change (Anders Omstedt, University of Gothenburg, Sweden, and participant code 1).

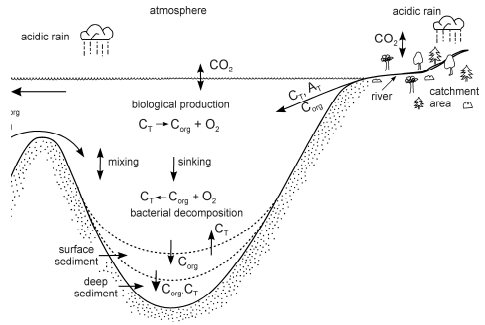
Moa Edman

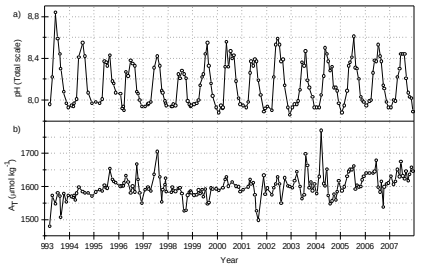
Erik Gustafsson

Karin Wesslander



PROBE-Baltic model





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WP8. Modelling the Baltic Sea physical–biogeochemical system based on the CO_2/O_2 dynamics and climate change (Anders Omstedt, University of Gothenburg, Sweden; participant code 1).

- ***Task 8.1:*** *Modelling present and past changes of the Baltic Sea CO_2 system*.

- ***Task 8.2:*** *Modelling possible future changes in the Baltic Sea CO_2 system*.

Timing and deliverables

Time Schedule of Baltic-C Work Packages, Deliverables per Work Package and Milestones (Month 1 - Month 36)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
WP 1																																				
Deliverables												D1																								D2
Deliverables												D4																								D3
WP 2																																				
Deliverables						D10						D5												D6												
Deliverables												D7												D8												
Deliverables												D9												D8												
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WP 3																																				
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WP 4																																				
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WP 8																																				
Deliverables																		D36						D37												

Milestones												M1						M3						M5												M6
Milestones												M2						M4																		M7

Baltic-C Mt	X											X												X					X							
Baltic-C Ws												X																								
Baltic-C Ss									X																											
Baltic-C Frn						X				X																										

Baltic-C meetings

Baltic-C workshop on calculating environmental costs

Baltic-C summer school (in cooperation with BALTEX and EUROCEANS)

Baltic-C field measurements

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Preliminar Baltic-C results

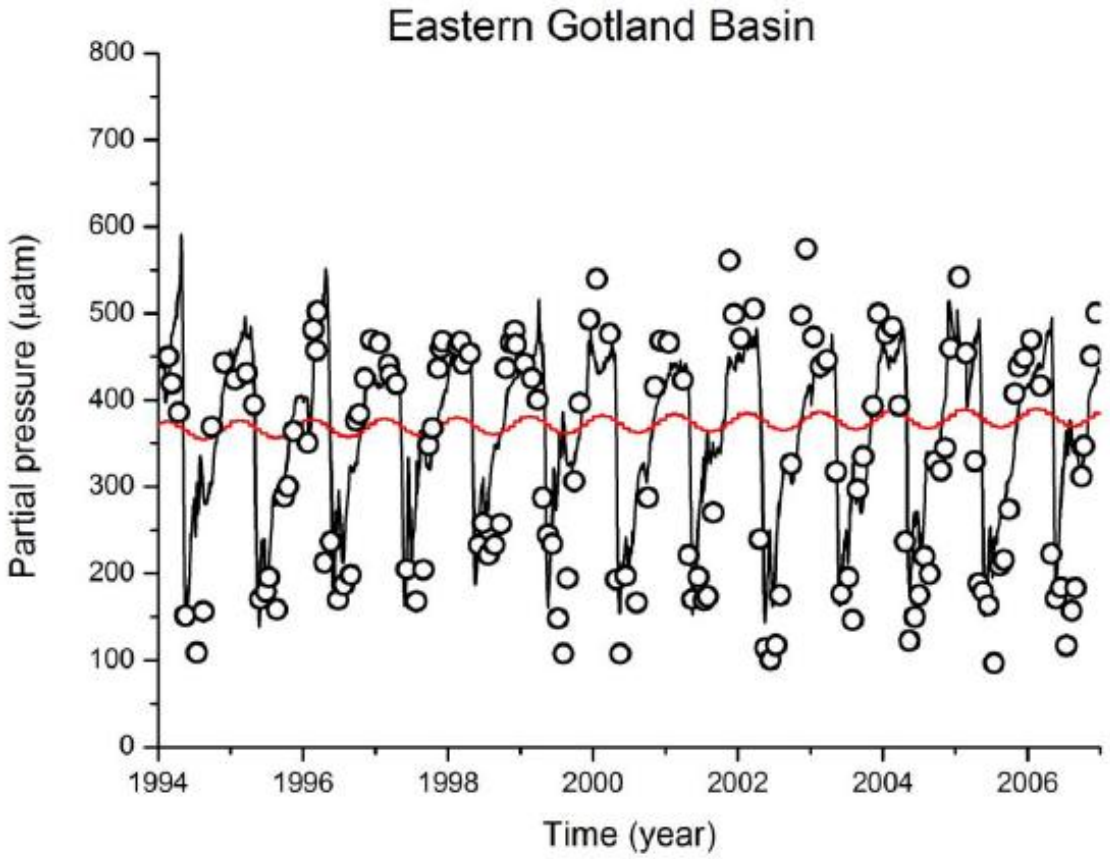
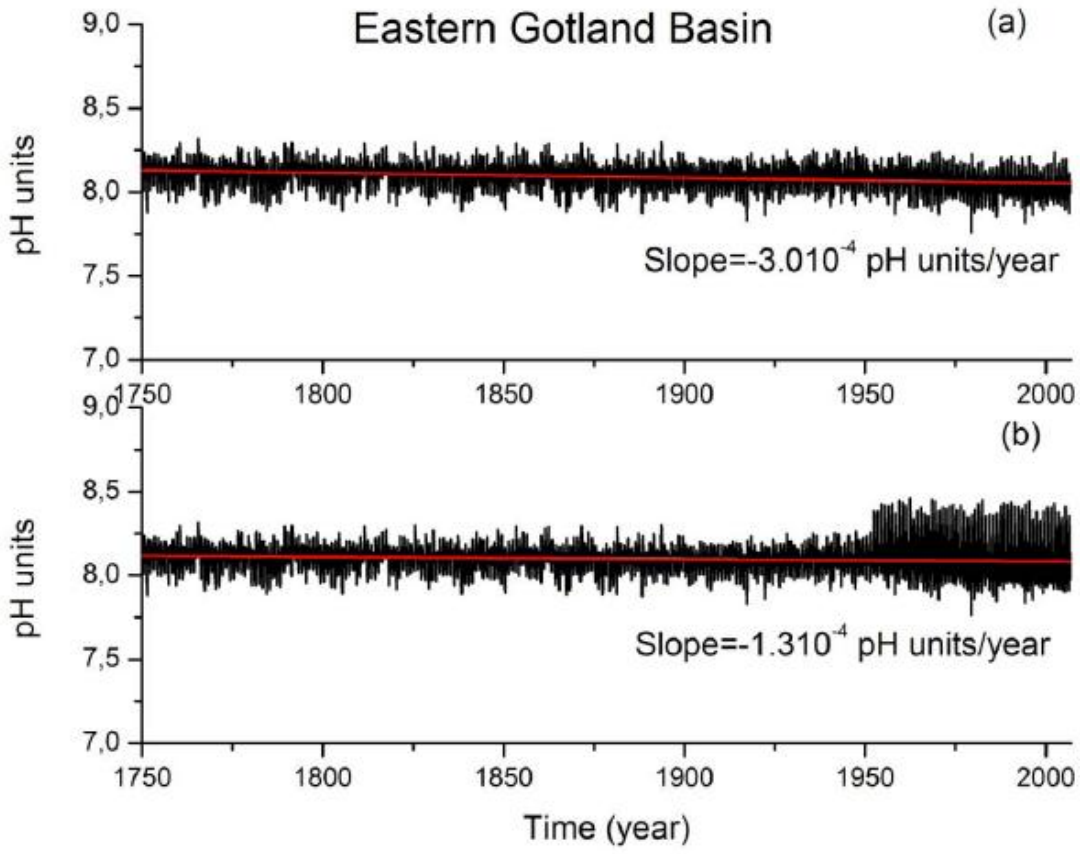


Fig. 6. Surface water partial CO_2 pressure calculated from observations (circles) and from the model (line). The red curve illustrate the partial pressure in the atmosphere.

Omstedt,Gustafsson and Wesslander, 2009

Preliminar Baltic-C results: Calculations implies that eutrophication has damped acidification in Baltic proper



pH change
about -0.1
No eutrophication

pH change
about 0.0
With eutrophication

Fig. 10. Calculated pH in the surface layer (black lines) and linear trends (red lines). Model assumptions are that anthropogenic CO_2 emissions start in 1750 and without(a) and with eutrophication (b).

Omstedt,Gustafsson and Wesslander, 2009

Thanks to all that have made BONUS possible!

Organic Carbon ↔ CO_2 ↔ pH ↔ Alkalinity

Baltic - C

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