ECOSUPPORT

WP2 Workshop meeting in Göteborg September 15 2009
Time: 9.00-15.00
Rapporteur: Kari Eilola

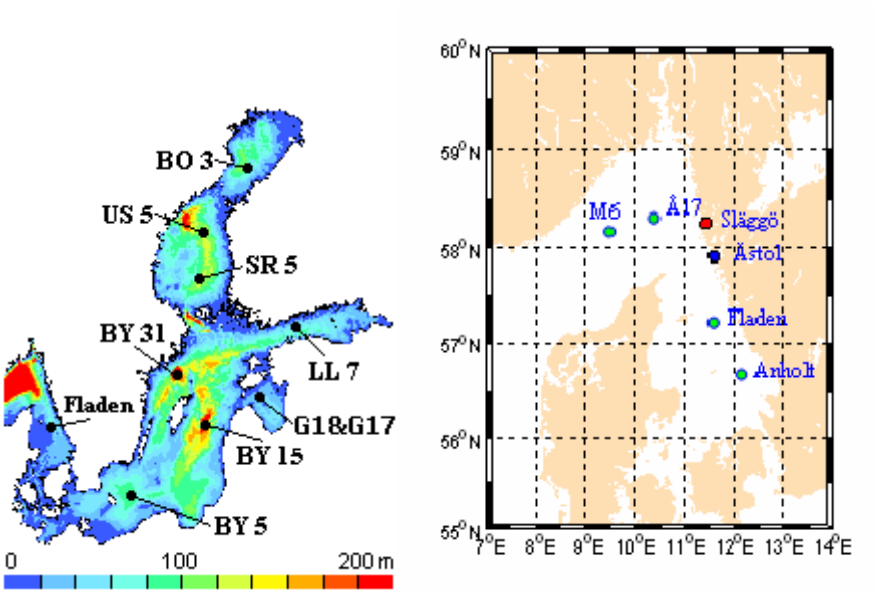
Participants

Kari	Eilola	SMHI
Bo	Gustafsson	BNI
Oleg	Savchuk	BNI

The basis for the following document was discussed in Göteborg on September 15 2009.

The aim is to have a common set of figures that may be used for model validations and for discussions about uncertainties that are due to different model performances and setups.
The figures will be used for discussions within the WP2 workshop meeting in Norrköping in October 2009. The discussions at that meeting could for instance point out how we may address the uncertainties in the future scenarios etc..
From the large set of figures a smaller selected set will be presented by Bo Gustafsson at the general ECOSUPPORT meeting in Norrköping in October 2009.

Kari note: While I have been producing this document I have added a section called "oxygen dependence" that due to shortness of time was not discussed by Bo, Oleg and I. I have also included maps and suggestions of stations to the document.

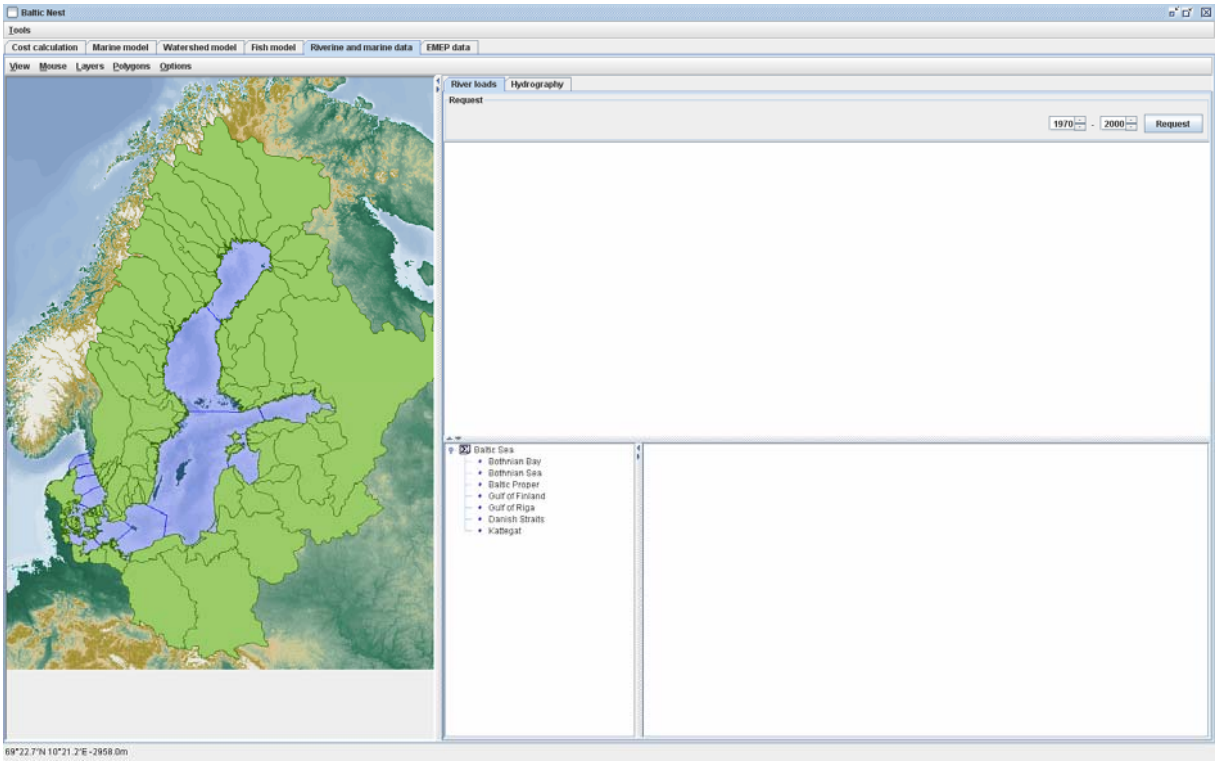


Position of some stations in the Baltic Sea and Kattegat

Suggested list of Stations Lat and Lon in degrees and minutes and in degrees.
Method suggestion: 3D-models make average of 4 or 9 points around the stations

Station Number	Station name	Lat	Lon	Lat°	Lon°
1	Anholt E	5640	1207	56.67	12.12
2	Bornholm deep BY5	5515	1559	55.25	15.98
3	Gotland deep BY15	5720	2003	57.33	20.05
4	Gulf Finland LL7	5951	2450	59.85	24.83
5	Bothnian Sea SR5	6103	1934	61.05	19.57
6	Bothnian Bay F9	6444	2204	64.73	22.07

NOTE: The list of stations may change slightly when Bo and Oleg look into the availability of data.



The basin boundaries of the BALTSEM model according to NEST (http://nest.su.se/).

Suggested list of Basin numbers.

Basin Number	Basin name
1	Kattegat
2	Baltic straits including Öresund and the Great Belt
3	Baltic proper including Arkona basin, Bornholm basin, East and West Gotland Seas
4	Gulf Finland LL7
5	Bothnian Sea SR5
6	Bothnian Bay F9

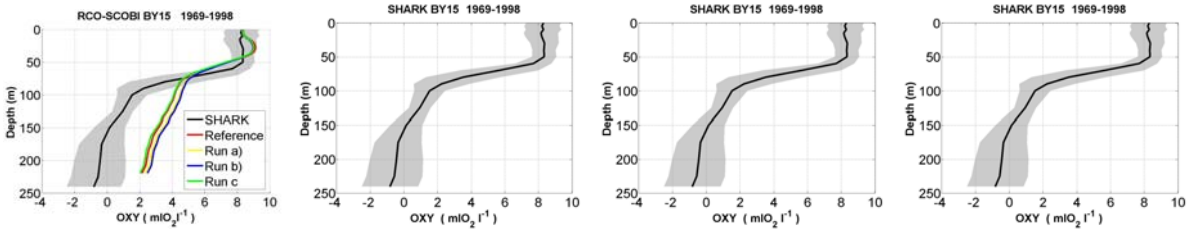
Please provide Kari one table giving the volumes and areas of modelled sub basins

Make table (table name:basins_bed.asc, basins_scobi.asc, …) including volumes and areas from all basins with space separated columns in ASCII format according to:

Basin number	Basin Volume (km^3)	Basin Area (km^2)
1		
2		
3		
4		
5		

State variables

Annual average and standard deviation

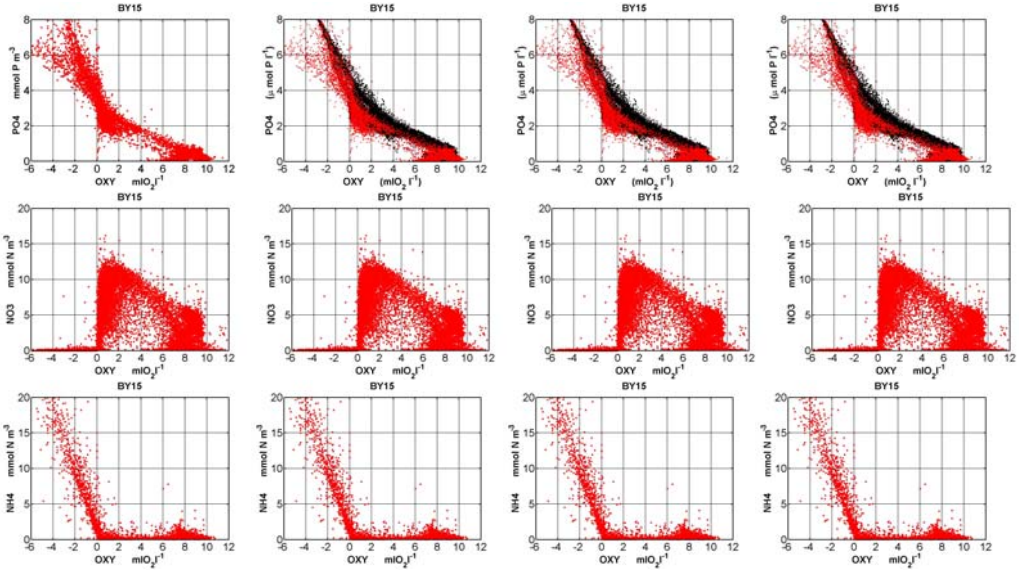


Four figures: One with observed mean and std together with the means from all models, and one figure for each model with std shown.

Time period: 1970-2006
Statistical period: Annual
Vertical layers: Model dependent
Stations: Anholt E, By5, By 15, LL7, SR5(?), F9(?)
Variables: S, T, O2, PO4, NO3, NH4.
Responsible: Kari does plots. Bo makes data set from bed
Data format: Make table (table name:annual_bed.asc, annual_scobi.asc, …) including results from all stations with space separated columns in ASCII format according to:

Station number	Model Depth (m)	S		T (°C)		O2 (ml/l)		PO4 (µmol/l)		NO3 (µmol/l)		NH4 (µmol/l)	
		Mean	Std	Mean	Std	Mean	Std	Mean	Std	Mean	Std	Mean	Std
1	0												
1	Depth of next depth cell ...												
1	Bottommost depth cell												
.	0												
.	Depth of next depth cell ...												
.	Bottommost depth cell												
6	0												
6	Depth of next depth cell ...												
6	Bottommost depth cell												

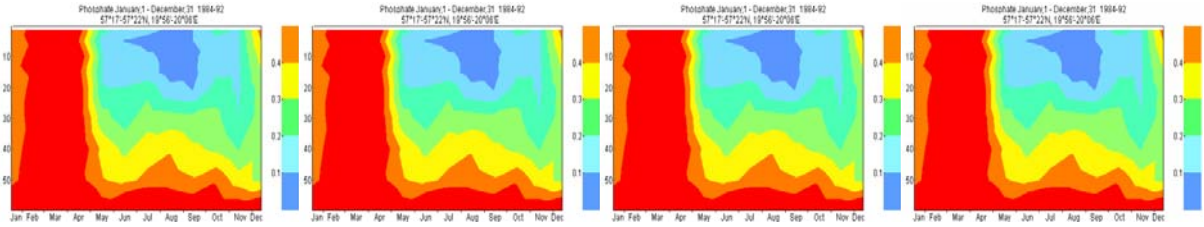
Oxygen dependence



Figures of nutrient concentrations relative to oxygen. Four figures showing observations and the three models separately.

Method:	Make scatter plot of PO4, NO3 and NH4 against OXY. Include data from all depths.
Time period:	1970-2006
Station:	BY5 and BY15.
Vertical layers:	-
Variables:	PO4, NO3, NH4, OXY.
Colours and scales:	Use black dots for model results.
Responsible:	Everyone plot their own figures. Send to Kari. Oleg makes figures based on data from bed
Data format:	-

Seasonal variability in surface waters



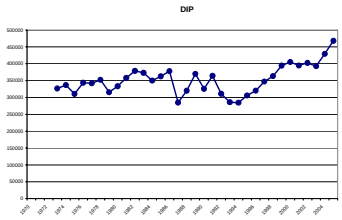
Four figures: Observations and the 3 models. Average month for the period 1970-2006

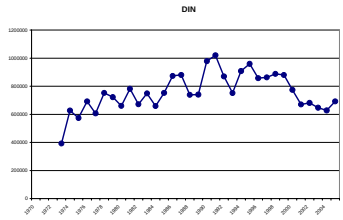
Time period: 1970-2006
Statistical period: Monthly
Vertical layers: Model dependent
Stations: Anholt E, By5, By 15, LL7, SR5 (?), F9(?)
Variables: T, PO4, NO3.
Responsible: Kari does plots. Bo makes data set from bed
Data format: Make table (table name:seasonal_bed.asc, seasonal_scobi.asc, …) including results from all stations with space separated columns in ASCII format according to:

Station	Month	Model Depth (m)	T (°C)		PO4 (µmol/l)		NO3 (µmol/l)	
			Mean	Std	Mean	Std	Mean	Std
1	1	0						
1	1	Depth of next depth cell ...						
1	1	Bottommost depth cell						
1	.	0						
1	.	Depth of next depth cell ...						
1	.	Bottommost depth cell						
1	12	0						
1	12	Depth of next depth cell ...						
1	12	Bottommost depth cell						
...	…	…						
6	1	0						
6	1	Depth of next depth cell ...						
6	1	Bottommost depth cell						
6	.	0						
6	.	Depth of next depth cell ...						
6	.	Bottommost depth cell						
6	12	0						
6	12	Depth of next depth cell ...						
6	12	Bottommost depth cell						

Pools of nutrients:

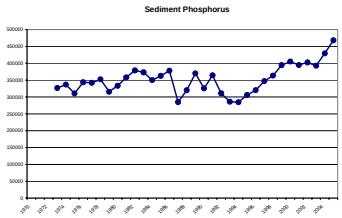
In water

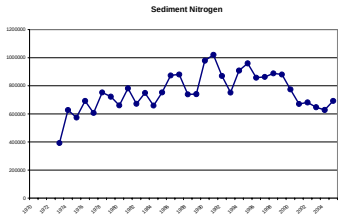




Annual average pools of DIN and DIP. Two figures including observation based and all 3 model based estimates.

In sediment



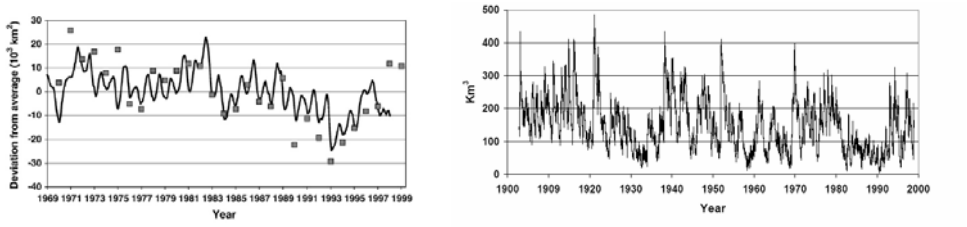


Annual average pools of N and P. Two figures including all 3 model based estimates.

Method:	In order to compare figures we will compute volume average concentrations in water for each model and compute the total pools of DIP and DIN by using the volumes estimated in the BED data base.
Time period:	1970-2006
Statistical period:	Annual
Basins:	Kattegat, Baltic straits, Baltic proper, Gulf of Finland, Gulf of Riga, Bothnian Sea, Bothnian Bay.
Vertical layers:	Vertical integration
Variables:	DIN and DIP and sediment N and P.
Responsible:	Kari does plots. Oleg makes data set from bed
Data format:	Make table (table name:pools_bed.asc, pools_scobi.asc, …) including results from all stations with space separated columns in ASCII format according to:

Basin number	Year	DIN (tons)	DIP (tons)	Sediment N (tons)	Sediment P (tons)
1	1970				
1	…				
1	2006				
…	…				
6	1970				
6	…				
6	1970				

Hypoxic area variation and cod spawning volume (reproductive volume).



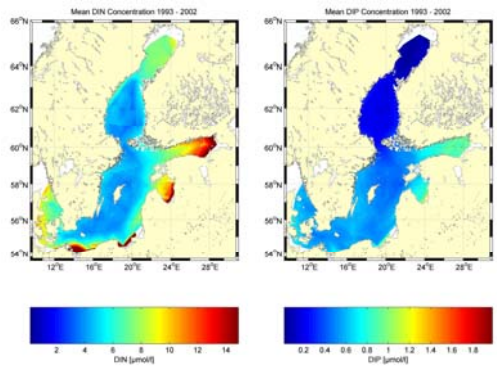
Two figures, one showing the annual average area covered with oxygen < 2ml/l and one showing the water volume with oxygen > 2ml/l and salinity > 11 psu, including estimates from BED data and all three models.

Annual averages for the period 1970-2006.
Compute annual mean oxygen and then extract the area.
For the Baltic proper inside the straits (i.e. excluding Gulf of Finland and Riga).
Responsible: Kari plot. Oleg makes data series from BED.

Method:	Compute annual mean salinity and oxygen concentrations at all depth levels. Then extract the size of the area covered with oxygen < 2ml/l and also the water volume with oxygen > 2ml/l and salinity > 11 psu.
Time period:	1970-2006
Statistical period:	Annual
Basins:	For the Baltic proper inside the straits and excluding the Gulf of Finland and the Gulf of Riga.
Vertical layers:	-
Variables:	Oxygen and salinity.
Responsible:	Kari does plots. Oleg makes data set from bed
Data format:	Make table (table name:hypoxrv_bed.asc, hypoxrv_scobi.asc, …) with space separated columns in ASCII format according to:

Year	Hypoxic Area (km^2)	Reproductive volume (km^3)
1970		
…		
2006		

Horizontal variation of nutrients



Method:	Compute winter means of DIN and DIP for the surface layer.
Time period:	1970-2006 (? Oleg will check availability of data)
Statistical period:	Winter (feb-april?, Oleg will check availability of data)
Basins:	Horizontal model resolution.
Vertical layers:	Surface (0-10m average)
Variables:	DIN and DIP.
Colours and scales:	Oleg will give examples of figure format that could be used.
Responsible:	Everyone plot their own figures. Send to Kari. Oleg makes figures based on data from bed
Data format:	-

Fluxes

Units in tons yr^{-1}. Kari may if needed use information about volumes and areas from the models to convert values e.g. to g m^{-2} yr^{-1}.

Biogeochemical

Method:	For each basin compute vertically integrated fluxes and make annual means.
Time period:	1970-2006
Statistical period:	Annual
Basins:	Kattegat, Baltic straits, Baltic proper, Gulf of Finland, Gulf of Riga, Bothnian Sea, Bothnian Bay.
Vertical layers:	-
Variables:	See list below.
Responsible:	Kari does plots. Oleg makes list of available comparable values from literature (This may e.g. be a range so the data table may have only one dummy year).

1. Primary production (phytoplankton growth including cyanobacteria) Convert units to gC m^{-2} yr^{-1} strictly using Redfield molar ratio C:N:P=106:16:1.
2. Nitrogen fixation (only given as nitrogen input).
3. Pelagic inorganic nutrient uptake to primary production (see point 1) N.
4. Pelagic inorganic nutrient uptake to primary production (see point 1) P.
5. Pelagic inorganic nutrient regeneration (remineralisation) N.
6. Pelagic inorganic nutrient regeneration (remineralisation) P.
7. Sedimentation (net sedimentation) of N.
8. Sedimentation (net sedimentation) of P.
9. Pelagic denitrification.
10. Benthic denitrification.
11. Inorganic N release from the sediment.
12. Inorganic P release from the sediment.
13. Permanent burial of N.
14. Permanent burial of P.

Data format:	Make table (table name:biofluxes_literature.asc, biofluxes_scobi.asc, …) with space separated columns in ASCII format according to:

Basin number	Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	1970														
1	…														
1	2006														
…	…														
6	1970														
6	…														
6	1970														

Nutrient loads from land and atmosphere

List the bioavailable fractions of nutrient supplies actually entering the model basins.
Responsible: Kari does plots.
Data format: Make table (table name: loads_scobi.asc, …) with space separated columns in ASCII format according to:

Basin number	Year	Land				Atmosphere			
		DIN	DIP	TotN	TotP	DIN	DIP	TotN	TotP
1	1970								
1	…								
1	2006								
…	…								
6	1970								
6	…								
6	1970								

Transports
Between basins. To be further discussed at the meeting in October.