SMHI

ECO SUPPORT

Minutes of the Workshop **"The marine ecosystem in changing climate – on the added value of coupled climate-environmental modeling for the Baltic Sea"**

Location and time: SMHI, Norrköping, 16. October, 10:00-17:00
Rapporteur: Ulrike Löptien

Presentations:

10:05-12:25 Presentations (max 15 min plus 5 min for questions), chair: Brian MacKenzie

Markus Meier, SMHI: Impact of changing climate on biogeochemical cycles in the Baltic Sea – An introduction

Introduction of the ECOSUPPORT-project:

- Impact of changing climate and nutrient loads on the Baltic Sea Ecosystem+support for decision makers
- Multi-model ensemble of transient-climate simulations of the Baltic-sea (including biogeochemical+Food-Web-Models)
- Hind-cast period 1960-2007 (forcing: RCAO with boundary conditions taken from ERA40)
- Four transient simulations 1960-2100 (RCAO+global climate models)
- Scenarios will by chosen by selecting the models with the smallest biases (some examples are given)
- RCO/SCOBI is introduced and some former results are presented

Bo Gustafsson, Baltic Nest Institute: First results from coupled physical-biogeochemical modelling within the BONUS+ project ECOSUPPORT (An advanced modeling tool for scenarios of the Baltic Sea ECOsystem to SUPPORT decision making)

Intercomparison between the models used in ECOSUPPORT:

- Simulation periods: 1961-2006 (Hind-cast), 1850-2006 ('pristine'), 1960-2100 (Scenarios)
- Ecosystem-models: BALTSEM, ERGOM, RCO-SCOBI
- Key differences between the model designs
- Comparison of the first simulations during the hind-cast period
- Large scale fluctuations are generally described within the natural variability
- The validation will be repeated with updated forcing and finally improved model versions

Christoph Humborg, Baltic Nest Institute: First results from the BONUS+ project RECOCA (Reduction of Baltic Sea Nutrient Inputs and Cost Allocation within the Baltic Sea Catchment)

Introduction to RECOCA:

- Objective: simulate possible future riverine nutrient loads to the Baltic Sea, estimate cost functions for reductions in these loads and for improvements in ecological indicators and suggest cost allocation schemes for riparian countries.
- PCL5 based on national approaches is inconsistent => need for a consistent description of nutrient land-sea fluxes
- Net Anthropogenic nutrient inputs (NANI): Food+Feed budgets, N-fixation, Fertilizers, Atmospheric Decomposition => scenarios, determine thresholds when the system starts to leak
- building up detailed data base+simulate export to the Baltic Sea => which areas are sensitive +cost minimisation

Ivan Kuznetsov, Baltic Sea Research Institute, Warnemünde: Simulation of the carbon cycle in the Baltic Sea

Including total Alkalinity +Carbon into ERGOM:

- MOM 3nm, 77 vertical layers + ERGOM
- Alkalinity: conservative tracer influenced by river-input and boundary conditions
- Comparison with observations
- The problem to find good observations for Alkalinity is addressed

Anders Omstedt and Anna Rutgersson, Gothenburg and Uppsala University: Building predictive capability regarding the Baltic Sea organic/inorganic carbon and oxygen system

Future modelling plans (Baltic-C-project):

- Regional scenarios including pH, CO_2 and oxygen
- A lot of scenarios should be used to predict the uncertainties of the simulation concerning the underlying assumptions and test the sensitivity of the system

Zhenwen Wan, Danish Meteorological Institute: Modeling Study on the seasonality of Ecosystem Dynamics in the Baltic Sea

Modeling attempts of inclusion of ERGOM in CMOD:

- CMOD: Baltic Sea+ North Sea, 6nm (includes data assimilation)
- First validation plots of temperature, salinity, nutrients, oxygen and phytoplankton

Agneta Andersson, Umeå University: Effect of increasing load of allochtonous organic carbon and inorganic nutrients on the efficiency of a marine pelagic food web

Empirical and observational study concerning enhanced NP- and NPC inflow into the Northern Baltic Sea:

- Enhanced nutrient-inflow (N and P) leads to increased phytoplankton growth (as expected) while enhanced NPC-inflow seems to reduce it!

- Suggested mechanisms: either light limitation duo to brownish DOC-rich waters or changes in the bacteria/phytoplankton-ratio.

13:15-14:35 Presentations (max 15 min plus 5 min for questions), chair: Thorsten Blenckner

Jan Marcin Weslawski, Institute of Oceanology, Sopot: Biological valorization of the Southern Baltic Sea

The idea of biological valorization and surveys in Poland:

- What are popular pre-judgements about the Baltic Sea and how to prevent them?

Per Jonsson, Gothenburg University: Dispersal of marine organisms in the Baltic Sea estimated from Lagrangian trajectories driven by ocean circulation models

Use of the oceanographic model RCO to follow possible trajectories of larvae:

- Underlying questions: how open or closed are marine societies? Can we improve the design of protected areas? Will the connectivity between different areas change under future climate conditions?

Inari Helle, Helsinki University: IBAM - Integrated Bayesian risk analysis of ecosystem management in the Gulf of Finland

Introduction of the project IBAM:

- Integrates the major known risk factors in the Gulf of Finnland (e.g. eutrophication, oil spills, climate change) and tries to estimate the economic consequences
- development of an integrative environmental design for a support system (e.g Bayesian quota for hering)
- For this purpose PDFs of some climate variables e.g. salinity and temperature would be nice to obtain for future climate
- The 'modelling community' states that such PDFs will be very difficult or even impossible to provide.

Anna Gårdmark, Swedish Board of Fisheries: Biological Ensemble Modelling to improve fisheries science and management

How to predict the future fish population:

- Using 8 fish-models of different complexity (statistical, single-species model up to a process orientated multi-species model)
- Calculation of different scenarios concerning fishery and climate change (downscales IPCC-scenarios)
- The input of some transient scenarios would be nice!

14:35-15:00 **Coffee + Poster**

15:00-17:00 Discussion of collaboration and data exchange, chair: Brian MacKenzie

Exchange of data:

- A general interest to standardize scenarios that can be used by different BONUS projects (e.g. Baltic-C, Planfish, ECOSUPPORT).
- Markus Meier shows the **available GCM- scenarios** distributed by the Rossby-Centre (**SMHI**) and highlights the simulations that will probably be used in ECOSUPPORT
    - ECHAM5 A1B – 50km horizontal resolution – version 2+3 (different initial conditions)
    - ECHAM5 A2 – 50 km resolution
    - HadCM3 A1B – 50km resolution – reference version
- 50 km horizontal resolution is chosen due to consistency (some scenarios are available at higher resolutions but not all of them)
- The criteria for **choosing the global scenarios** that are fitting best for the regional scenario simulations are discussed. Here the 'best' models should be chosen by a minimal bias under present day conditions in the Baltic Sea region. Parameters of greatest interest are defined as:
    - Air temperature (over sea),
    - Wind speed (over sea),
    - Sea level pressure (over sea),
    - Sea level in Kattegat
    - P-E or P (over land and over sea)
    - Minor important: Specific humidity, cloudiness (over sea)

- The quality of the listed parameters in different climate scenarios will be included in a report from ECOSUPPORT which will be available during spring/summer 2010
- **Run-off:** No hydrological data are available so far; SMHI will run the HYPE-model in the future
- Present day forcing (1960-2006) from **RCA** is available but has some temperature bias compared to observations. The coupled version **RCAO** (which is also available) seems to be better with respect to the atmosphere forcing fields compared to RCA with the same resolution (50 km) and is thus recommended. Unfortunately, no RCAO experiment with the higher resolution of 25 km is available. The quality of wind fields is improved with increasing resolution.
- Some model data based on reconstructions are freely available from **Gothenburg University** (promised by Anders Omstedt): **daily data 1958-2006, 1870-now, 1500-2000** (e.g. SST, bottom temperature, surface salinity, bottom salinity, oxygen+some meteorological parameters); Infos: www.oceanclimate.se/products.htm -> Supporting material); comments about the quality are welcome and wanted
- The **Baltic-NEST-institute** is willing to put up a standard for **nutrient loads** since it would be good to compare scenario simulations based on the same nutrient loads
- Anders Omstedt will provide Swedish Temperature data to Frederik Schenk
- A **joint PH- and Alkalinity-database** would be nice since the data need to be quality checked which should not be repeated by each institute again (this issue will be discussed more in detail on a meeting in Warnemünde)

- The local model of the German Meteorological Service (DWD) is used in its climate version **(CLM)** to simulate the regional climate of today (1960-2000) and future decades in Europe (2001-2100) (included in ENSEMBLES): two scenarios can be downloaded already via DKRZ.
- Zooplankton-data (or other biological data) as well as pH-observations are very welcome to SMHI (would be nice for model validation).
- Everybody is **welcome to take part in the model inter-comparison** coordinated by ECOSUPPORT

Future joint stakeholder activities:

- Brian MacKenzie suggest to provide some movies e.g. of oxygen inflow and consumption that can be used from everybody for public presentations
- Jan Marcin Weslawski suggests to talk to teachers and provide them with some teaching material; this suggestion was appreciated and considered as very useful for ECOSUPPORT
- Markus Meier will organize a workshop for PHD-students about climate modelling next autumn (in the context of the project AMBER - no financial support can be provided).