BALTEX Newsletter

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World Climate Research Programme / Global Energy and Water Cycle Experiment
WCRP GEWEX

BALTEX is coming to an end ... The successor will be launched in June 2013!

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A new research network for the Baltic Sea region

BALTEX Phase II has formally come to its scheduled end in 2012. The 7th Study Conference on BALTEX on Öland, 10-14 June 2013, will set the stage for the launch of the new programme to inherit the BALTEX legacy. The process to collect views and suggestions among the BALTEX community for a potential follow-up programme has been going on since June 2010, and a dedicated Working Group on what was tentatively termed "PostBALTEX" was installed in September 2011 to draft suggestions for a possible PostBALTEX programme. The Working Group presented their suggestions to the BALTEX Science Steering Group in Tallinn, September 2012. Finally, in January 2013, an Interim Steering Group was initiated which was given the mandate to present the new programme at the Öland conference and make arrangements for a science plan as well as a structure, terms of references and memberships for a new steering group and dedicated working groups.

New programme to be launched at 7th Study Conference on BALTEX 10-14 June 2013, Öland, Sweden

The BALTEX legacy

The new programme will grow on fertile ground. Since 20 years, BALTEX has been an important network of researchers in the Baltic Sea region. Phase I (1993–2002) was primarily dedicated to hydrological, meteorological and oceanographic processes in the Baltic Sea drainage basin, hence mostly dealt with the physical aspects of the system. Scientific focus was on the hydrological cycle and the exchange of energy between the atmosphere, the Baltic Sea and the surface of its catchment. In these days, in the early 1990s, the Baltic Sea region had just seen major political changes, and the Eastern and Western research communities were now eager to take advantage of the new political freedom to exchange expertise and data, and to establish new cooperations. The integration of researchers from both sides of the former iron curtain into a common research landscape of the Baltic Sea region was an important aspect of the first BALTEX years. BALTEX Phase II (2003–12) had strengthened reserarch related to regional climate research, biogeochemical cycles (closely related with the water and energy cycles) and overarching efforts to reach out to stakeholders and decision makers, as well as to foster communication and education.

When asked for the essence of BALTEX over all these years, active BALTEX scientists emphasized the network idea with self-organized collaboration across interdisciplinary and international

Members of the BALTEX Working Group on PostBALTEX at the meeting in Uppsala: Eduardo Zorita, Markus Meier, Thomas Neumann, Andreas Lehmann, Benjamin Smith, Piia Post, Chantal Donnelly, Carin Nilsson, Anna Ruttgersson, Marcus Reckermann (ex officio), Zita Gasunaite (from left).

borders. The development of modelling capabilities and coupled models (atmosphere, ocean, land and hydrology), and the inclusion of biogeochemical processes and the Earth system at large, were mentioned as major scientific achievements. The BACC assessments were acknowledged as an outstanding achievement, and the value for education was emphasized (some now leading BALTEX scientists started as PhD students in the BALTEX orbit in the 1990s). a high degree of freedom for independent, basic research.

Prospects for the new programme

Some aspects of BALTEX shall continue in the new programme, e.g. the strong infrastructure like secretariat, publication series, newsletter, conferences, summer schools, BACC-type assessments and a possible further international embedment in GEWEX (*www.gewex.org*) and Future Earth (*www.icsu.org/future-earth*). The new programme is envisaged as a scientific network based on a voluntary collaboration of engaged scientists from different regions and scientific disciplines around the Baltic Sea, including the human dimensions, but with an emphasis on the natural sciences. In general, there will be a holistic view on the Earth system of the Baltic Sea region, encompassing processes in the atmosphere, on land and in the sea and also in the anthroposphere. The programme can help to provide a service to society in the respect that thematic assessments give an overview over knowledge gaps which need to be filled (e.g. by funded projects). A broad support from institutions all around the Baltic Sea region will be crucial, both in terms of engaged scientists contributing to the network with their working time, but also as occasional sponsors of special events like workshops, summer schools or conferences. Regular conferences similar to the BALTEX Study Conferences will be an important component of scientific communication, and summer schools will contribute to the educational value of the new programme. Working groups (a new one on challenges for the southern Baltic Sea coasts was already proposed) will be important centres of the scientific work. It was generally suggested that the new programme should remain within the GEWEX/WCRP framework, as far as possible, with an embedment in the Future Earth initiative to be investigated. In general, the vision could be formulated as striving for an Earth System understanding of the Baltic Sea region.

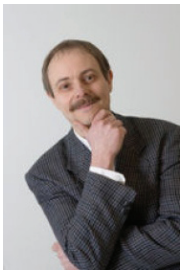
Launch of the new programme

An interim science steering group, chaired by Markus Meier of SMHI, was formed and given the mandate to prepare the launch of the new programme at the 7th Study Conference on BALTEX on Öland and lead the first year of the new programme, in which new terms of references and the structure of the new working groups and the new steering committee shall be elaborated. The name and logo of the new programme will also be uncovered at the Öland conference.

For details on the 7th Study Conference on BALTEX, 10-14 June 2013 on the Swedish Baltic Sea island of Öland, see p. 11 and *www.baltex-research.eu/oland 2013*

For details on BALTEX Phases I and II, see *www.baltex-research.eu*. A compreshensive summary of both BALTEX phases is available in Reckermann et al. (Environ. Res. Lett. 6, 2011, 045205)

Interview with Interims Chairman Markus Meier



Markus Meier of SMHI is one of the pioneers of regional climate modeling, and in particular coupled modeling encompassing also biogeochemical processes. In January 2013 he was elected Chairman of the Interims Science Steering Group of the new programme.

When did you first hear about BALTEX?

I started my PhD in 1992, and from the second year on my work was paid by a German BALTEX-related funded project at the Institute of Marine Research at Kiel University, and it was at that time that I first came in contact with BALTEX, so from the very beginning. Wolfgang Krauß was my supervisor, and he strongly promoted BALTEX, together with Erhardt Raschke. Raschke actually was the one who started it all.

What has BALTEX meant for your career as a scientist?

Quite a lot, actually. I started working and thinking as BALTEX scientist in terms of the energy and water cycle in the Baltic Sea region. Very early we produced those kinds of assessments for the whole region, from the physical point of view. Although I started my PhD on data assimilation on seasonal time scales, I got more and more interested on climate related research due to the influence of BALTEX.

How did the network develop in the early days and who contributed?

The East-West connection was very important, it was actually one of the motivations for starting BALTEX. In the beginning, it was all about the availability of data. Many data from Eastern countries were not available, partly as they were not in accessible databases and also not digitized. Then, personal connections were built up, and support was granted for Eastern scientists to generate these data and make them available. For the assessment work of course, data from the entire drainage basin were required, so this collaboration was crucial for the early BALTEX work.

Also, it was important to bring the Eastern and Western research communities together. The first BALTEX conference I attended was the conference in Visby, Gotland in August 1995, which was actually the first Study

Conference on BALTEX. It was much smaller compared to today, and it was interesting to see the different scientific cultures in the East and in the West, and it has been a great achievement of BALTEX to bring these two communities together at these conferences and also in joint projects.

Was the work on the water and energy cycle back then more related to improving weather models, or were climate models also on the agenda?

All scales were addressed from the beginning. The idea of re-analysis was taken up initially, and that was also used for the weather forecasts models. It was clear that it was the water and energy cycle we had to look at. To take into account internal variability, you have to address larger spatial and temporal scales, but many groups worked on shorter time scales for different reasons. Really, the whole community was involved, both those working with weather forecast models and those who started working with climate modeling. Climate modeling on the regional scale for the Baltic Sea region was not well developed, there were just a few people working with Baltic Sea models. There was the model from Andreas Lehmann, and I had started with a regional model for the western Baltic Sea. There were a few others back then, but really not many who went into this kind of research; also research on hydrological modeling and so on.

When you look back at the past 20 years, what would you consider as outstanding BALTEX achievements?

First of all, to make the data available, building up the data bases and sharing the available data. The collaboration with the Eastern scientists, building up a network for researchers involving all Baltic Sea countries. That had not existed before, and the communication between the Eastern and the Western scientists was very much improved due to BALTEX and the Study Conferences, and also the collaboration in joint projects and research cruises.

Then also very early, the idea of coupled modeling came up, acknowledging that the water and energy cycle comprises of the different components atmosphere, ice and ocean. This idea was very much pushed by Lennart Bengtsson and discussed extensively at the early BALTEX conferences. These models were then developed within the BALTEX community, and they are now being further improved and more and more available, e.g. at the Helmholtz-Zentrum Geesthacht, the Danish Meteorological Institute, the University of Hamburg, the Max-Planck-Institut für Meteorology, the Swedish Meterorological and Hydrological Institute, and others.

In Phase II, BALTEX opened up to other than strictly physical processes and included also biogeochemical marine and terrestrial processes. The integrative role of BALTEX was very important, e.g. the integration of physical, chemical and biological processes and also socioeconomic impacts into the BACC project. The BALTEX Working Groups were very useful although not all have by now come to a successful ending. But this is natural as BALTEX over the most part has not had a central funding and the associated scientists did all the work on a completely voluntary basis, with no money involved. The BACC work was also important in providing scientific input for political stakeholders like HELCOM and others. It is very well cited in the recent regional climate research literature. It is good that BACC is now a continuous process, with BACC II coming out in a few months. Looking at the number of scientists who contributed to both BACC assessments on an in-kind basis without any funding, shows what an incredible joint effort this is.

Also I was very much impressed by the few but very good summer schools which were organized by BALTEX. I remember the one on Bornholm in 2009 which was of very high quality and even produced a very nice text book based on the lectures given there. Both students and lecturers seemed very happy at that summer school!

What are the major challenges for Baltic Sea research in the next say 10 years and how could a programme like the BALTEX successor tackle them?

The vision of an international and interdisciplinary Earth system research network focussing on service to the scientists remains attractive. In general, all the well-established and well-proven aspects and activities of BALTEX should be continued: the secretariat, the study conferences and other outreach activities, the publications, last but not least BACC-type assessments on different topics. My observation was that people are very fond of the Study Conferences in particular.

I am very open to opening up the network towards new topics and new ideas; we should never try to act as a closed club. In the Working Group on the PostBALTEX programme we proposed the approach of "Grand Challenges". The idea is that the current research needs are regularly assessed and documented by the members of the new steering group and working groups, to be later communicated to the funding agencies and the research community at large, e.g. at the Study Conferences. This evolutionary aspect is very important.

The role of assessments has already been mentioned; this could be very helpful for HELCOM and other stakeholders. The expertise of the BALTEX research community could be used more extensively to provide necessary scientific information to stakeholders. BACC is a good example with a focus on past and future climate change and impacts, but tthe focus could be on other topics as well. For instance, models simulating environmental processes could be assessed and their set-up and protocols could be elaborated for use by

environmental managers. A well-founded scientific advice is very much appreciated and requested by stakeholders such as HELCOM.

Then, the new programme should organize summer schools at different places on a regular basis. It would be very desirable to continue the Bornholm-type of summer school on different topics. Universities also offer very good courses, but a single university may not be able to offer teaching on all aspects of the Earth system So an international teaching initiative like e.g. summer schools under the roof of the BALTEX successor programme should definitely be pursued in the future.

All in all, we should keep the tradition of BALTEX as a regional Earth System research network, addressing climate related issues on longer time scales of the whole system, and working towards coupling of the different components of the system. The success of BALTEX has been largely due to the strong infrastructure in form of the funded secretariat, so we sincerely hope that this can continue. It is unique and makes things possible like own publications and the organisation of projects, meetings, conferences, summer schools and many things more.

The new programme will be launched at the 7th and final Study Conference on BALTEX on Öland, 10-14 June 2013 (see page 11 of this Newsletter). *What can we expect?*

We will present our vision for the new programme, and of course the new name and logo. Don´t miss it!

BACC II results presented and discussed in Tallinn

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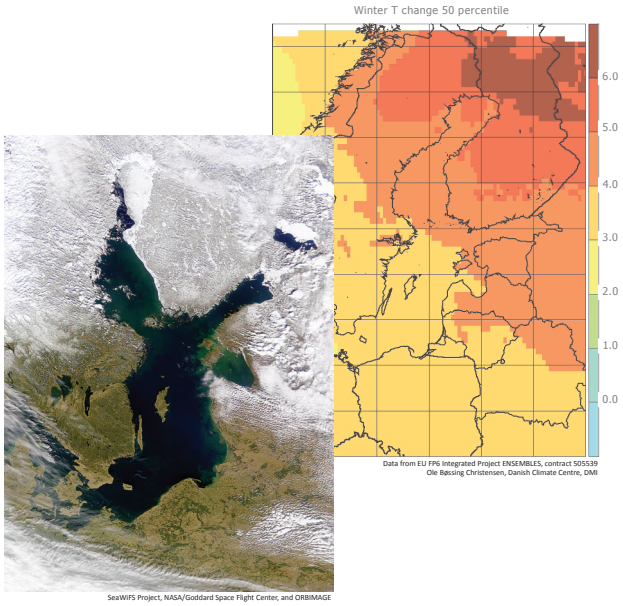
About 110 participants annended the BACC II Conference in Tallinn, Estonia on 6 and 7 September 2012. The scope of this short conference was to provide the scientific and stakeholder communities with summaries of the draft chapters for the BACC II book, which is expected to be published in late 2013.

To briefly sum up the new findings, it seems that BACC I results are confirmed and substantiated by the new information. Additional material allows to go into more detail in some issues, and some contested issues can be reconciled (e.g. sea surface temperature trends). For regional climate models (RCMs) it was evident that the ability to run multi-model ensembles seems a major addition, but clearly RCMs need further development. Homogeneity of data is



still a problem and sometimes not taken seriously enough. The question of attribution of the regional climate change signal to different drivers is a major new aspect of the BACC II book. Current knowledge reveals that attribution on the regional scale is still weak. The issue of multiple drivers on ecosystem and socio-economy changes is recognized, but more research efforts are clearly needed. Climate change is seen as a serious issue, but in many cases it remains questionable if it is a dominant issue.

A panel discussion including scientists, local and regional policy makers and a representative from HELCOM demonstrated that there is still room for improving the interface between science on the one hand, and decision makers, other stakeholders and the public on the other hand. The establishment of regional climate services could be a way to do this, a place where professionals from both sides work closely together to identify specific information needs, so that the best available scientific information can effectively be used.

HELCOM will use part of the BACC II material for a HELCOM Thematic Assessment in 2013. This collaboration between the scientific initiative of BACC and the scientific-political stakeholder HELCOM had been successful already for BACC I (2007-2008), from which also a HELCOM Thematic Assessment was published. A dedicated HELCOM workshop on climate change was organized in February 2013, see next article.

For details as well as a comprehensive summary and the presentations, look at the BACC II website and the BACC Blog.

www.baltex-research.eu/BACC2
thebaccblog.blogspot.de

HELCOM Workshop discusses recent findings and options to cope with climate change

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A HELCOM Workshop on Climate Change was organized on 5 and 6 February 2013 in Warnemünde, Germany, in conjunction with BALTEX to present the most recent climate change findings and discuss possible options for adjusting the Baltic Sea Action Plan, taking climate change into account. Presentations were given by BACC II authors and other experts, also from the adaptation, policy and management side. A podium discussion with scientists and stakeholders and expert breakout discussion rounds elaborated a number of proposals. The conclusion document together with the agenda and a list of participants can be downloaded from the BALTEX website and the BACC Blog. There is also a link to the presentations given at the workshop. See also the HELCOM website for a News Reslease and background information on the Baltic Sea Action Plan.

www.baltex-research.eu
thebaccblog.blogspot.de
www.helcom.fi

ECOSUPPORT: Decision Support for Baltic Sea Environmental Management in the light of climate change

Markus Meier (*markus.meier@smhi.de*) and **Helen Andersson** (*helen.andersson@smhi.se*), Swedish Meteorological and Hydrological Institute, Norrköping, Sweden, **Marcus Reckermann** (*marcus.reckermann@hzg.de*), International BALTEX Secretariat, Helmholtz-Zentrum Geesthacht, Germany

Climate change is a big challenge, not only for society but also for science itself. The modeling communities of atmospheric scientists, doing regional climate models, and biologists, building biogeochemical and ecosystem models, have for long lived in different worlds. But the research on climate change and its effects on the environment have forced the two communities to learn from each other and work closer together. In the Baltic Sea region, the conditions for a fruitful marriage are very good. Here, both communities are very mature and competent with a worldwide reputation in their respective fields. Moreover, the Baltic Sea is well suited for a joint modelling effort, as it is among the most intensely investigated seas in the world with a good data coverage going back to the early days of instrumental measurements. In many characteristics it can be regarded as a mini-version of the large ocean although the Baltic Sea is particularly vulnerable towards pollution and eutrophication. A recent Special Issue (AMBIO 41 (6) 2012) presents selected results from the BONUS+ project ECOSUPPORT, an ambitious attempt for an integration of the two modelling worlds.

In ECOSUPPORT, a consortium of 11 research groups from seven countries in the Baltic Sea region have collaborated for the first time to combine different types of sophisticated models across scientific disciplines, ranging from physical regional climate models to biogeochemical and ecosystem models as well as socioeconomic impacts, taking into account different climate and nutrient emission scenarios. An interdisciplinary modelling system was built to demonstrate how ecosystems may respond to the combined future impacts of possible climate change and continued eutrophication. Thus, a sound scientific basis for a revised HELCOM Baltic Sea Action Plan was intended, aiming to incorporate climate change effects in the future and, based on that, assist decision makers to find the best options for managing the environmental health of the Baltic Sea.

The project provides the best glimpse into the possible future of Baltic Sea environmental conditions to date, based on the best currently available coupled modelling techniques. Despite the high uncertainties involved, which are due to the nature and the novelty of the work, a basic conclusion seems to be that climate change does matter and should be taken into account when developing remedies against the advancing deterioration of the Baltic Sea environment. In particular, the connection between warmer temperatures, increased oxygen depletion in the deep basins, and the phosphorus cycle—which is crucial for the development of the typical cyanobacteria blooms—can be expected to be even more important in the future, and may lead to the measures of the Baltic Sea Action Plan taking effect much later than expected.

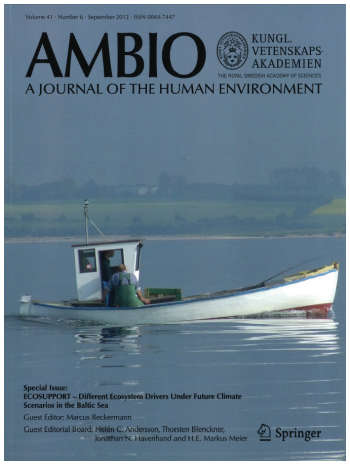
The ECOSUPPORT work plan was built on the confidence that the used models are capable to simulate changing climate. Papers in the AMBIO Special Issue reflect the following aspects:

1. the assessment of predictive skills of the models by comparing observed and simulated past climate variability (i.e. quantification of model uncertainties) and analyzing causes of observed variations (e.g. Gustafsson et al. 2012, Meier et al. 2012, Niiranen et al. 2012);

2. the performance of multi-model ensemble simulations of the marine ecosystem for 1850–2100, forced by reconstructions of the past climate (e.g. Gustafsson et al. 2012, Ruoho-Airola et al. 2012) and various future greenhouse gas emission scenarios and air and river-borne nutrient load scenarios (ranging from a pessimistic business-as-usual to the most optimistic case) (e.g. Arheimer et al. 2012, Eilola et al. 2012, MacKenzie et al. 2012, Meier et al. 2012, Neumann et al. 2012);
3. the analysis of projections for the future Baltic Sea ecosystem, using a probabilistic approach accounting for uncertainties caused by biases of regional and global climate models, lack of process description in state-of-the-art ecosystem models, unknown greenhouse gas emissions and nutrient loadings as well as natural variability (e.g. Arheimer et al. 2012, MacKenzie et al. 2012, Meier et al. 2012, Neumann et al. 2012, Niiranen et al. 2012);
4. the assessment of climate change impacts on the marine biota, like effects of ocean acidification (e.g. Havenhand 2012), biodiversity and fish populations with focus on cod, sprat and herring (e.g. MacKenzie et al. 2012, Niiranen et al. 2012),
5. a socioeconomic impact assessment (e.g. Piwowarczyk et al. 2012),
6. the generation of a free access data base of scenario model results and tools to access the database with the help of a decision support system (DSS) and finally
7. the dissemination of project results to stakeholders, decision makers and the public.

While looking at the results presented here, we should be aware that this type of research, i.e. the coupling of models from different disciplines, is still in its infancy and needs to be continued and expanded. We can hope that in 10–20 years we look back and say—it was with ECOSUPPORT and similar projects when it all really started.

This article is a based on the preface and the introductory article in the AMBIO Special Issue. All references can be found in AMBIO 41, Issue 6, September 2012: Special Issue: ECOSUPPORT – Different Ecosystem Drivers Under Future Climate Scenarios in the Baltic Sea, ISSN: 0044-7447 (Print) 1654-7209 (Online)



www.baltex-research.eu/ecosupport

link.springer.com/journal/13280/41/6/page/1

Research Articles

Shaping the future - Adaptation to climate change impacts in the urban region of Rostock, Germany

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plan Baltic

Within the project plan B:altic, a transdisciplinary scenario planning process with three stakeholder workshops was conducted in the urban region of Rostock between 2010 and 2012 to develop common strategies and measures for adaptation to climate change impacts. Plan B:altic is a multidisciplinary research group focused on the issue of „Climate Change and Spatial Development - Adaptation strategies of urban and regional planning in urban regions of the Baltic Sea coast."

Building blocks for the future

The development of urban regions depends on several factors. These were illustrated during a process of scenario planning called "Adaptation to climate change impacts in the urban region of Rostock, Germany" and clustered into future scenarios of spatial development. The first workshop discussed climate change impacts, such as the rise of sea level, rising temperatures, changes in precipitation and increasing extreme weather events in relation to 14 building blocks of the socio-ecological development, that have been regarded vital for the future of the region.

- Social aspects: demographic development, habitation
- Ecological aspects: structure of free space, water as part of the environment
- Economic aspects: Harbour and maritime economy, tourism, business development, traffic infrastructure, agriculture and forestry
- Political aspects: political priorities, relations between cities and urban regions, finances, formal instruments, alternative energies

These building blocks and their potential development paths formed the basis for the formulation of scenarios for future spatial development of the region. These scenarios were developed in an intense co-operation process between planning practitioners, politicians, stakeholder and scientists.

Scenarios: Images of the future

Four scenarios regarding the spatial development of the urban region of Rostock until 2050 have been established, all of which illustrate different images of the future. While often mistaken for prognosis, each scenario shows one of

many possible, inherently consistent pictures of the future. As a result one can overlook and discuss a spectrum of possible futures. Strategies and measures can be tested and discussed using the different scenarios. On top of that, effects of climate change can be analysed in each scenario. Contributing to adaptation strategies was the main goal of this process; however, it is vital to bear in mind the uncertainties of climate change shown in the different scenarios. The scenarios were presented and discussed in the second stakeholder workshop.

Scenario 1: „Development within limits“
In this scenario the sea level rises by 60 cm and temperature by 1,6°C. Precipitation increases during the winter season while extreme weather events occur noticeably more often. Harbour business and tourism in the summer season have taken a positive development which led to increasing landscape fragmentation in the urban region. Focus on alternative energies goes along with growing insensitivity of agriculture and decline in quality of water.

Scenario 2: „Moderate change“
In this scenario the sea level rises by 20 cm and temperature by 1°C while there is a moderate increase in extreme weather events. Soft climatic terms have led to a positive demographic development and an increase in tourism in the summer season. Besides, harbor business and maritime economy flourish. As a result free spaces were lost and water quality declined.

Szenario 3: „Climate of extremes“
In this scenario the sea level rises by one meter and temperature by 2,2°C while there is a drastic increase not only in precipitation during the winter season but also in the occurrence of extreme weather events. This has led to a loss of significance of the harbour. The city and its surrounding region compete with each other. Suburbanisation and increase in tourism take up free space and with that, also flood-prone areas are being used. Agriculture uses less vulnerable organic farming.

Scenario 4: „Diverse characteristics“
In this scenario the effects of climate change are of different intensity. While sea level rises by 60 cm and only winter precipitation increases, temperature rises by 2.2°C and extreme weather events occur excessively. Focus lies on sustainable development, parts of which are preservation of free spaces, extension of winter tourism and a regional mobility concept. Population in Rostock increases while it stagnates in regional areas. The Harbour develops in existing areas.

Climate change adaptation measures and strategies
The research group plan B:altic successfully completed the scenario-planning process with the third workshop in April 2012. In this context, a plethora of climate change adaptation strategies and measures were jointly developed by researchers and 30 regional and local stakeholders. Based on the four scenarios mentioned above and extreme weather events, the adaptation strategies and measures were evaluated as to whether they were compatible with different climate change patterns and alternative futures. As a result of this process, practitioners can choose from a myriad of practicable measures and strategic approaches which have also been addressed in the newly elaborated framework for climate change adaptation in the city of Rostock.

www.planbaltic.hcu-hamburg.de/en

Paleoclimatology in the Baltic Sea region: Relationships between sunspots, NAO, and reconstructed temperatures in SW Finland

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The North Atlantic Oscillation (NAO) is a prominent pattern of atmospheric variability affecting large areas in the Northern Hemisphere, and particularly the Baltic Sea region. The oscillation of atmospheric masses related to the NAO phenomenon produces large-scale changes in the mean wind speed and direction over the North Atlantic Ocean. A year with positive NAO phases comes with strengthened Westerlies and thus milder temperatures especially during the winter. Consequently, the NAO is frequently used to describe variations in the atmosphere over NW Europe (Hurrell 1995; Hurrell et al. 2001). Moreover, many studies have shown the possibility that the variations in the NAO and its Arctic counterpart, the Arctic Oscillation (AO), may have been driven by variations in solar activity, occurring on a decadal scale (Shindell et al. 2001; Thejll et al. 2003; Lukianova and Alekseev 2004). This relationship could represent a pathway for a solar influence on temperature variability, especially in the Baltic Sea region where the NAO influence appears strong. The modeling study of Shindell et al. (2001) demonstrates the usability of paleoclimate data in solar-climate analyses. This report provides an illustrative example of the paleoclimate approach to study the potential link between solar activity, the NAO and regional temperatures in the Baltic Sea region.

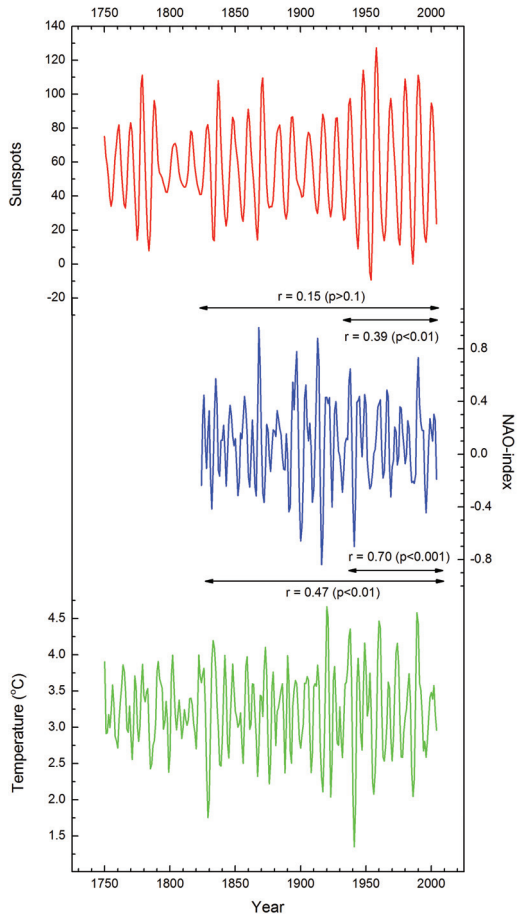

Fig. 1. Sub-series correlations (r), with Monte Carlo based statistical significance (p) of the correlations, calculated between the band-pass filtered records of sunspot numbers (Waldmeier 1961), the NAO-index (Jones et al. 1997) of spring season and reconstructed spring temperatures (Holopainen et al. 2009), calculated for the period 1825-2004 (long arrow) and 1935-2004 (short arrow).

Climatic observations made in Turku, SW Finland between 1748 and 1823 are the cornerstone of historical climatology in Finland (Holopainen 2004). Recently, the temperature data of the Turku climate archive were complemented through a paleoclimate approach using the records of plant phenological observations, the ice break-up dates of the Aurajoki River (running through the town of Turku), and estimations of the maximum annual ice cover extent in the Baltic Sea and varve thickness in Lake Pyhäjärvi. In their multi-proxy study, the records were integrated into one paleoclimate model by Holopainen et al. (2009). Spring temperatures (February-June) were reconstructed in a previous study using a network of multi-proxy evidence from SW Finland since 1750. Already in that study, the positive correlation between the reconstructed temperatures and indices of the NAO, and between temperatures and sunspots were found (Holopainen et al. 2009). Later, the temperature reconstruction was analyzed in more detail using Monte Carlo correlation analysis for significance testing (Helama and Holopainen 2012). The aim of that study was to detect potential linkages between the external (i.e. sunspots) and internal (i.e. the NAO) climatic forcing factors and regional climate variability (i.e. SW Finland) in the context of spring temperature perturbations. In this report, we shortly portray the results of the above mentioned studies to highlight recent advances of paleoclimatic studies in the Baltic Sea region.

The proxy-based temperatures were correlated separately with the records of sunspots and the NAO-index before and after decadal band-pass filtering was applied to the series. The results show that sunspots correlated positively and statistically significantly with the variations in the NAO indices especially well during the period 1935-2004 (Fig. 1). However, the correlation was weaker during the 19th century. It also became clear that sunspots and regional temperatures did not correlate with any reasonable statistical level but still, the correlations were positive. The NAO indices correlate well with the temperatures during the 20th century (Fig. 1). Noteworthy, the correlations in the NAO-temperature were weaker during earlier times. In our study, the correlations for the series before band-pass filtering were similar to the correlations after the decadal filtering, albeit the unfiltered correlations were muted (not shown).

The Monte Carlo approach shows tripartite forcing-response mechanisms which sufficiently explain much of the regional climate variability on a decadal scale. The new evidence can be used to link the sunspots and the NAO, and the NAO and regional temperatures, whereas the influence of the sunspot cycle on the temperature remains vague. Although the sunspots did not significantly correlate with the temperatures, the possibly that the NAO may have acted as a mediator between the Sun‘s output and the Earth‘s climate cannot be ruled out. The results showing a strong correlation between sunspots and NAO on a decadal scale during the later part of the 20th century were comparable to the previous studies(Thejll et al. 2003, Lukianova and Alekseev 2004). Moreover, the period of high correlations coincides with a significant increase in solar activity after the 1940s, the period which has been considered as anomalous even in the Holocene context (Solanki et al. 2004).

References

Bradley, R.S., 1999. Paleoclimatology: reconstructing climates of the Quaternary. International Geophysics Series 64. Academic Press, London.

Helama, S., 2004. Millennia-long tree-ring chronologies as records of climate variability in Finland. Doctoral dissertation, University of Helsinki.

Helama, S., Holopainen, J., 2012. Spring temperature variability relative to the North Atlantic Oscillation and sunspots - A correlation analysis with a Monte Carlo implementation. Palaeogeography, Palaeoclimatology, Palaeoecology 326-328, 128-134.

Holopainen, J., 2004. The early climatological records of Turku. Finnish Meteorological Institute, Reports 2004(8), 1-59.

Holopainen, J., 2006. Reconstructions of past climates from documentary and natural sources in Finland since the 18th century. Doctoral dissertation, University of Helsinki. Publications of the Department of Geology D16, 1-33.

Holopainen, J., Helama, S., Kajander, J. M., Korhonen, J., Launiainen, J., Nevanlinna, H., Reissell, A., Salonen V.-P., 2009. A multiproxy reconstruction of spring temperatures in southwest Finland since 1750. Climatic Change 92, 213-233.

Holopainen, J., Helama S., Timonen, M., 2006. Plant phenological data and tree-rings as palaeoclimate indicators since AD 1750 in SW Finland. International Journal of Biometeorology 51 (1): 61-72.

Hurrell, J.W., 1995. Decadal trends in the North Atlantic Oscillation: regional temperatures and precipitation. Science 269, 676-679.

Hurrell, J.W., Kushnir, Y., Visbeck, M., 2001. The North Atlantic oscillation. Science 291,603-604.

Jones, P.D., Jónsson, T., Wheeler, D., 1997. Extension to the North Atlantic Oscillation using early instrumental pressure observations from Gibraltar and south-west Iceland. International Journal of Climatology 17, 1433-1450.

Lukianova, R., Alekseev, G., 2004. Long-term correlation between the NAO and solar activity. Solar Physics 224, 445-454.

Shindell, D.T., Schmidt, G.A.,Mann,M.M., Rind, D.,Waple, A., 2001. Solar forcing of regional climate change during the Maunder Minimum. Science 294, 2149-2152.

Solanki, S.K., Usoskin, I.G., Kromer, B., Schüssler, M., Beer, J., 2004. Unusual activity of the Sun during recent decades compared to the previous 11,000 years. Nature 431, 1084-1087.

Thejll, P., Christiansen, B., Gleisner, H., 2003. On correlations between the North Atlantic Oscillation, geopotential heights, and geomagnetic activity. Geophysical Research Letters 30 (6), 1347. doi:10.1029/2002GL016598.

Waldmeier, M., 1961. The sunspot-activity in the years 1610-1960. Schulthess, Zürich. 171 p.

A short note on local snow cover variability in western Russia

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Local features of snow cover, i.e. maximum snow water equivalents (SWE_{max}) and temporal variability of SWE_{max} occurrence were investigated in the Central Forest Biosphere Reserve of the Tver region in the upper reaches of the West Dvina River in the southern taiga, Russia (56° 25‘ – 56° 37‘ N, 32° 43‘ – 33° 01‘ E; total area – 705 km^2). A significant decrease of SWE_{max} and the shift towards a later occurrence of SWE_{max} were found in the region during the period 1999-2010, but air temperature and precipitation did not significantly change.

Changes in SWE_{max} over the period 1999-2010 are significant and similar between the forest types: -8.234 mm / yr (R^2 = 0.623) in the coniferous forest and -8.301 mm / yr (R^2 = 0.473) in the deciduous forest (Fig. 1). The ratio of snow accumulation between the coniferous forest and the deciduous forest was found to be 0.88, i.e. slightly more snow accumulated in the deciduous forest. However, long-term changes of meteorological conditions over the investigation period were not significant: winter air temperature showed an average of -3.9 °C with an insignificant trend of 0.019 °C/year (R^2 = 0.001); winter precipitation showed a sum of 256 mm, with an insignificant trend of 0.014 mm / yr (R^2 = 0.000) (Fig. 1)

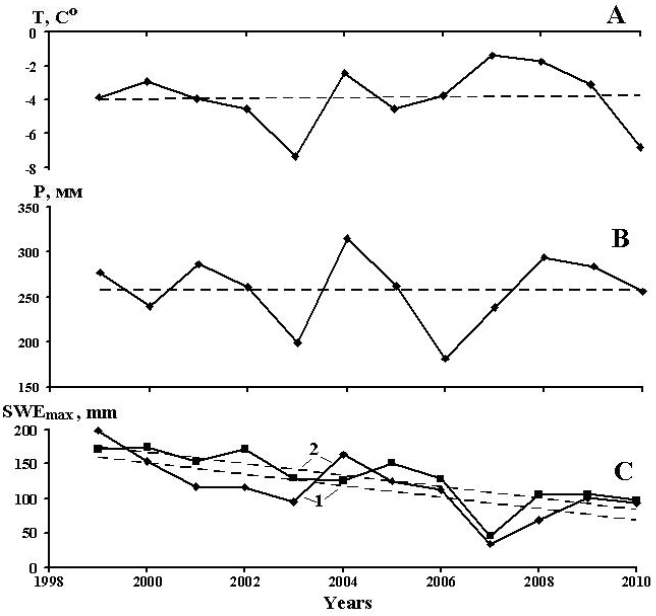

Fig. 1. Variability of air temperature (A), precipitation (B) and maximum snow water equivalents (SWE_{max}, C) in the coniferous (1) and deciduous forest (2), over the period 1999 to 2010..

Also, the temporal variability of the occurrence of SWE_{max} was analyzed. On average, the days of SWE_{max} for the coniferous and the deciduous forest differed by only one day: 20 and 19 March, respectively. However, the dates of SWE_{max} shifted towards the autumn: -9 days/10 yrs (R^2 = 0.127) in the coniferous forest and -22 days/10 yrs (R^2 = 0.319) in a deciduous forest (Fig. 2).

Thus, it was shown that the local features of meteorological conditions and snow accumulation in the upper reaches of the Western Dvina River in general correspond to processes in the northern part of the East European plain (Meleshko and Semenov 2008, Kitaev 2006). A significant long-term decrease (the last 10 years) of maximal snow water equivalents and the slight shift of its date of occurrence

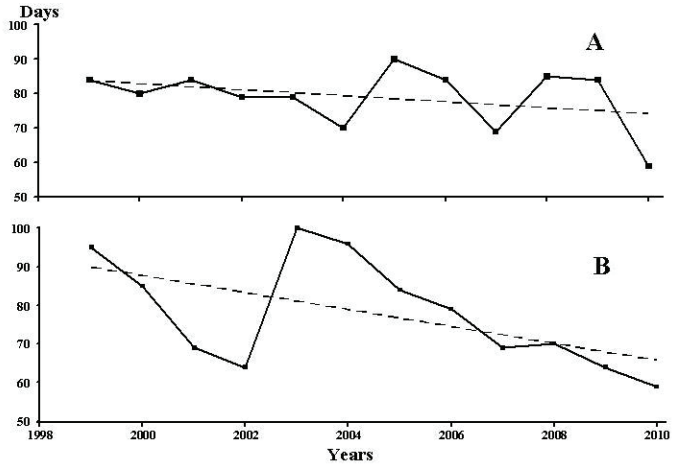

Fig. 2. Temporal variability of the maximum snow water equivalents as day of the year (starting from January 1) in the coniferous (1) and deciduous forest (2), over the period 1999 to 2010..

to earlier in the year can be explained by the general reduction of the winter snow period. The prevalence of snow water equivalent in the deciduous forest is associated with a considerable snow interception by the canopy of coniferous trees.

References

Meleshko V.P. and Semenov S.M. 2008. Assessment report on climate change and its consequences in the Russian Federation. General Summary. Federal Service for Hydrometeorology and Environmental Monitoring (ROSHYDROMET), Moscow. RSC "Planeta" 24 p.

Kitaev L.M. 2006. Relationship of seasonal variability of air temperature and snow cover in Northern Europe. Cryosphere of the Earth 3, 76-82 (in Russian).

New Publications

Edman, M., A. Omstedt, 2013. Modeling the dissolved CO_2 system in the redox environment of the Baltic Sea. Limnol. Oceanogr., 58 (1), 74-92

Kowalkowski, T., M. Pastuszak, J. Igras, B. Buszewski, 2012. Differences in emission of nitrogen and phosphorus into the Vistula and Oder basins in 1995-2008 - Natural and anthropogenic causes (MONERIS model). Journal of Marine Systems, Vol. 89, pp. 48-60.

Omstedt, A., M. Edman, B. Claremar, P. Frodin, E. Gustafsson, C. Humborg, H. Hägg, M. Mörth, A. Rutgersson, G. Schurgers, B. Smith, T. Wällstedt, A. Yurova, 2012. Future changes in the Baltic Sea acid-base (pH) and oxygen balances. Tellus, Series B, 64, 19586

Pastuszak, M., P. Stålnacke, K. Pawlikowski, Z. Witek, 2012. Response of Polish rivers (Vistula, Oder) to reduced pressure from point sources and agriculture during the transition period (1988-2008). Journal of Marine Systems 94, 157–173

Shaltout, M., A. Omstedt, 2012. Calculating the water and heat balances of the Eastern Mediterranean Basin using ocean modelling and available eteorological, hydrological and ocean data.. OCEANOLOGIA No. 54 (2), 199-232

Soomere, T., R. Weisse, A. Behrens, 2012. Wave Climate in the Arkona Basin, the Baltic Sea. Ocean Sci., 8, 287-300

Rosin, K.., S. Keevallik, 2012. Regional variation of hourly and daily totals of global radiation recorded at automatic weather stations in Estonia. Estonia Journal of Engineering, Vol. 18, pp. 76-86

Gustafsson, E., 2011. Modelled long-term development of hypoxic area and nutrient pools in the Baltic Proper. Journal of Marine Systems 94, 120-134

Keevallik, S., M. Krabbi, 2011. Temperature, humidity and wind from Estonian and Finnish radiosonde data (1993-2009). Estonia Journal of Engineering, Vol. 17, pp. 345-358

Meier, H.E.M., H.C. Andersson, K. Eilola, B.G. Gustafsson, I. Kuznetsov, B. Müller-Karulis, T. Neumann, O.P. Savchuk, 2011. Hypoxia in future climates: A model ensemble study for the Baltic Sea. Geophysical Research Letters, Vol. 38, L24608, doi:10.1029/2011GL049929

Reckermann, M., J. Langner, A. Omstedt, H. von Storch, S. Keevallik, B. Schneider, B. Arheimer, H.E.M. Meier, B. Hünicke, 2011. BALTEX - an interdisciplinary research network for the Baltic Sea Region. Environmetal Research Letters, Vol 6, No 4 045205 doi:10.1088/1748-9326/6/4/045205

Special Issues

6th Study Conference on BALTEX, held in Międzyzdroje, Island of Wolin, Poland from 14 to 18 June 2010. Oceanologia, Vol. 53 (1-TI)/11, June 2011. 16 papers.

ECOSUPPORT - Different Ecosystem Drivers Under Future Climate Scenarios in the Baltic Sea. AMBIO, Vol. 41, Issue 6, September 2012. 10 papers.

New Books

Omstedt, A.: Guide to Process Based Modeling of Lakes and Coastal Seas. Series: Praxis Books, Geophysical Sciences. Springer Verlag, Heidelberg, 2011. 310 p. ISBN 978-3642-17727-9

Pastuszak, M., Igras, J. (Eds.): Temporal and spatial differences in emission of nitrogen and phosphorus from the Polish territory to the Baltic Sea. National Marine Fisheries Institute, Institute of Soil Science and Plant Cultivation - State Research Institute Fertilizer Research Institute, Gdynia, 2012. 448 p. ISBN 978-8361650-08-9.

Reckermann, M., K. Brander, B.R. MacKenzie, A. Omstedt (Eds.): Climate Impacts on the Baltic Sea: From Science to Policy Series: Springer Earth System Sciences. Springer Verlag, Heidelberg , 2012. 216 p. ISBN 978-3-642-25727-8

Schernewski G., Hofstede J. Neumann T. (Eds.): Global change and Baltic coastal zones. Springer Coastal Research Library 1, ISBN 978-94-007-0399-5

Schmelzer, N., J. Holfort, M. Sztobryn, P. Przygrodzki (Eds.): Climatological Ice Atlas for the western and southern Baltic Sea (1961-2010) ISBN 978-3-86987-278-0, BSH No. 2338

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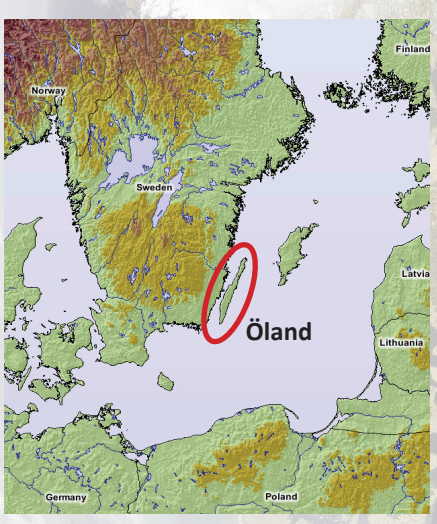

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Öland, the island of sun and wind, is located in the Baltic Sea just off the coast of Småland. It is the second largest Swedish island and features many interesting features like the Stora Alvaret, a limestone pavement which is the habitat of numerous rare and endangered species. It belongs to the UNESCO World Heritage program featuring prehistoric sites such as Gettlinge and Eketorp, numerous old wooden windmills left standing (some of which date to the 17th century) and the special geological alvar landscape.

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