



Minutes of
1st Meeting
of the Baltic Earth
Interim Science Steering Group

held at

**Strand Hotell
Borgholm, Öland, Sweden**

9 June 2013

Edited by

Marcus Reckermann



A new flag in the Baltic sky



Launch of Baltic Earth at the 7th Study Conference on BALTEX

Contents

	Page
Decisions	4
Action Items	4
List of Annexes	5
1. Introduction.....	6
2. Approval of the agenda	6
3. The new Baltic Earth Interim Science Steering Group (BE-ISSG).....	6
4. Baltic Earth Senior Advisory Board (BE-SAB).....	6
5. Working groups	7
6. Summary of suggestions given during the Baltic Earth Panel Discussion on Öland, 12 June 2013	9
7. Science Plan.....	10
Next meetings	10
Abbreviations and Acronyms	10
Annex 1: Baltic Earth Interim Steering Group Meeting Draft Agenda	12
Annex 2: List of participants.....	13
Annex 3: Draft Terms of References of the Interim Science Steering Group (ISSG) of Baltic Earth	14
Annex 4: Baltic Earth Panel Discussion at the 7 th Study Conference on BALTEX, Borgholm, Sweden, 12 June 2013.....	16
Annex 5: Article for GEWEX Newsletter, August 2013.....	23

Decisions

1. The Baltic Earth Interim Steering Group (BE-ISSG) is installed and active. It has a mandate until June 2014. A science plan will be produced by then. For membership see Annex 2.
2. Working Groups (WGs) for each Grand Challenge (GC) with chairs resp. vice chairs are initiated, see Item 5.
3. A Baltic Earth Senior Advisory Board (BE-SAB) will be installed. Membership and terms of references will be drafted by November 2013.
4. Baltic Earth is to continue the BACC process. A new BACC SSC with new co-chairs will be initiated following the publication of the BACC II book.
5. A Baltic Earth Summer School together with DTU Aqua and the Bert Bolin Climate Centre at Stockholm University is envisaged. DTU Aqua had been the lead partner of the BALTEX Summer School in 2009 on Bornholm. Piia Post, chair of the WG on Education, will lead the preparation.
6. The Grand Challenge on “Anthropogenic changes and impacts on the Earth system of the Baltic Sea region” is postponed to a later phase.
7. A final BALTEX Newsletter will be produced in combination with an initial Baltic Earth Newsletter, still in 2013.

Action Items

1. A Baltic Earth Science Plan is to be prepared by June 2014 (3rd Meeting of the BE-ISSG in Lund, Sweden). A *writing team* is to be identified by 2nd BE-ISSG Meeting in Sopot, November 2013.
2. Terms of Reference for the BE-ISSG to be drafted (*Markus Meier*). Task completed, see Annex 3.
3. Terms of References and goals for the WGs to be drafted (*Markus Meier together with the WG chairs*), by 2nd BE-ISSG Meeting in Sopot, November 2013.
4. Members for the SAB to be proposed to Markus Meier until 15 October 2013 (*all*) and Draft Terms of References to be drafted (*Markus Meier with Anna Rutgersson and Marcus Reckermann*) by 2nd BE-ISSG meeting in Sopot, November 2013.
5. It should be sounded in which way the EU-ERA Joint Programme Initiatives (JPI) could be relevant for Baltic Earth (*all*) by 2nd BE-ISSG Meeting in Sopot, November 2013.
6. An article on Baltic Earth will be written by *Markus Meier* and *Anna Rutgersson* for EOS to advertise the new programme also beyond the Baltic Sea region
7. Upon request by the GEWEX Project Office, *Marcus Reckermann* wrote a short article on the launch of the new programme at the 7th Study Conference on BALTEX. Task completed, see Annex 5.
8. For *Gregor Rehder* and *Karol Kulinski*, with support from *Marcus Reckermann*, to prepare for a half-day scientific seminar in connection with the 2nd BE-ISSG Meeting in Sopot, November 2013.
9. To initiate the planning of a Baltic Earth Workshop on “Competing drivers for changes in the Earth system of the Baltic Sea region” (working title).
10. Special sessions on Baltic Earth topics and BACC II results should be presented at the international conferences of EGU, AGU, ASLO, and others (*all*). *Remark: At the ASLO conference in Honolulu in February 2014, the session “002 - Understanding Coupled Human-*

Natural Systems: Multi-disciplinary Approaches for Addressing Sustainability of the Marine Environment” was initiated by Hans von Storch and others. In this session, experience of interdisciplinary networks in different parts of the world will be presented and discussed, with the Baltic Sea particularly named. Contributions to this session by the BALTEX and Baltic Earth communities are welcome.

<http://www.sgmeet.com/osm2014/sessionschedule.asp?SessionID=002>

11. Propose articles for the combined BALTEX/Baltic Earth Newsletter (*all, by 28 October 2013*).

List of Annexes

- Annex 1: 1st Baltic Earth Interim Science Steering Group Meeting Agenda
- Annex 2: Participants of the meeting
- Annex 3: Draft Terms of References for BE-ISSG
- Annex 4: Transcript of the Panel Discussion on Baltic Earth at the Öland Conference
- Annex 5: Article in upcoming GEWEX Newsletter on the launch of Baltic Earth

1. Introduction

Baltic Earth, the BALTEX successor programme, was launched at the 7th Study Conference on BALTEX in Borgholm on Öland, Sweden, on 10 June 2013. The name and logo of the new programme was unveiled in the presence of H.M. King Carl XVI Gustaf, King of Sweden. The programme was outlined at the conference by Markus Meier, Anna Rutgersson and Marcus Reckermann. Following this, a panel discussion with prominent scientists from the Baltic Sea and BALTEX research communities as well as representatives of international programmes was held, with vivid participation from the audience. The transcript of this panel discussion is available in Annex 4 to these minutes.

PostBALTEX activities which led to the finalisation of BALTEX and the launch of Baltic Earth can be followed in the meeting minutes of the BALTEX Science Steering Group (#24 - #30), available for download at www.baltex-research.eu/publications, and the minutes of the four WG on PostBALTEX meetings, all available for download at www.baltic-earth.eu/publications.

On the evening of the first day of the conference, the 1st meeting of the Baltic Earth Interim Science Steering Group (BE-ISSG) was held. It was a short 2h meeting which focused on the setup of the steering and working groups and the definition of the next steps. For participants, see Annex 2.

2. Approval of the agenda

The agenda for the 1st BE-ISSG meeting (Annex 1) was approved.

3. The new Baltic Earth Interim Science Steering Group (BE-ISSG)

As of this meeting, the BE-ISSG is active and working. Markus Meier (chair) and Anna Rutgersson (vice-chair) act as chairpersons. The group size of currently 21 (see list of participants in Annex 2) can be further modified when it is required to warrant the efficient work of the group. The primary task of this group is to define research and outreach priorities such as Grand Challenges, to draft a science plan and terms of reference for the SSG, to install Working Groups (WGs) and approve their members and terms, and to prepare for a transition to a permanent Baltic Earth Science Steering Group (BE-SSG). The BE-ISSG has a mandate for one year until the Lund Workshop on Regional Climate Modelling, 16-19 June 2014, where the 3rd BE-ISSG meeting will take place. At this meeting and prior to it, a self-evaluation should be done by BE-ISSG members, and also externally by the newly to be installed Senior Advisory Board (SAB). Necessary modifications in structure, memberships and content should be carried out then, and a permanent SSG is to be installed. The process how this will be performed is to be discussed and elaborated by the BE-ISSG at its 2nd meeting in Sopot in November 2013. Terms of reference for the SAB should be drafted by Markus Meier, Anna Rutgersson and Marcus Reckermann prior to the 2nd BE-ISSG meeting in Sopot in November 2013, where they should be discussed and decided.

4. Baltic Earth Senior Advisory Board (BE-SAB)

The installation of a Senior Advisory Board (SAB) was recommended by the ISSG. The SAB's tasks would be to give recommendations to the BE-SSG on strategic and scientific issues. Recommended members as of this meeting are outstanding senior scientists, and representatives of the international organisations and the European level, e.g. HELCOM, ICES, BONUS, GEWEX, Future Earth, as well as possibly a representative of the host institute of the International Baltic Earth

Secretariat (IBES). Nevertheless, the group size should be kept small, with not more than 5-7 individuals, so that a selection process will be necessary.

The detailed tasks, terms and potential members of the SAB need to be further discussed. All BE-ISSG members should send recommendations for SAB members and their view on the tasks and terms to Markus Meier until 15 October 2013.

5. Working groups

Working Groups (WGs) will represent the units where the actual scientific work is undertaken. It was decided that there should be one Working Group for each of the currently defined Grand Challenges, and that each BE-ISSG member should be part of at least one Working Group. Workshop meetings (virtual or physical) of the specific working groups should be carried out regularly to discuss and carry out the work. WGs should be chaired by one BE-ISSG member and co-chaired by one or two vice-chairs.

Goals of WGs should be clearly defined by the WG chairs and vice chairs, and Terms of Reference be drafted, which should be approved by the BE-ISSG at the next BE-ISSG meeting in Sopot, 11-13 November 2013. Experiences from BALTEX WGs should be taken into account whenever appropriate. WGs should as precisely as possible define outputs and deliverables to be achieved in a given time period. Joint research projects, reports and assessments with workshops could be potential outcomes and deliverables.

Following an open discussion, the following chairs and vice-chairs for the following WGs responsible for the individual GCs were appointed. WG chairs are free to invite further external members.

1 WG on Salinity dynamics in the Baltic Sea

Andreas Lehmann (chair), **Kai Myrberg** (vice)

2 WG on Land-Sea biogeochemical feedbacks in the Baltic Sea region

Gregor Rehder (chair), **Karol Kulinski** (vice), **Benjamin Smith** (vice)

3 WG on Natural hazards and extreme events in the Baltic Sea region

Anna Rutgersson (chair), **Jari Haapala** (vice), **Martin Stendel** (vice)

4 WG on Understanding sea level dynamics using remote sensing

Eduardo Zorita (chair), **Anders Omstedt** (vice), **Birgit Hünicke** (vice)

5 WG on Understanding regional variability of water and energy exchange

Franz Berger (chair), **Sergej Zhuravlev** (vice), **Irina Partasenok** (vice)

6 WG on Outreach and communication

Carin Nilsson (chair), **Hans von Storch** (vice), **Marcus Reckermann**, **Joanna Wibig**, **Heikki Tuomenvirta**, **Dennis Bray**, **Insa Meinke**, **Markus Meier**

8 WG on Education

Piia Post (chair), **Markus Meier** (vice), **Marcus Reckermann**

The Grand Challenge on “Anthropogenic changes and impacts on the Earth system of the Baltic Sea region” was postponed to a later phase; the relevant anthropogenic factors should be part of the other GCs and treated there together with the natural drivers. However, this topic was acknowledged as very relevant, and a workshop/conference was recommended to be carried out in the near future on competing drivers for changes in the Baltic Sea region Earth system. In this respect, also a BACC-type assessment was suggested to look for gaps in knowledge, also the use of RCMs for land use and aerosol modelling should be promoted.

Existing BALTEX working groups will continue until their scheduled end:

Working Group on the Utility of Regional Climate Models

This is the continuation of an old working group with a new focus on regional coupled atmosphere-ice-ocean models in the Baltic Sea region (including the North Sea). The aim is to produce an assessment to be presented at the 3rd Lund Regional-scale Climate Modeling Workshop, 16-19 June 2014.

Chair: Markus Meier.

Participants (confirmed):

1. MPI:

Dmitry Sein (dmitry.sein@gmail.com),
Uwe Mikolajewicz (uwe.mikolajewicz@zmaw.de)

2. University of Hamburg, ZMAW

Thomas Pohlmann (thomas.pohlmann@zmaw.de) not confirmed yet,
Daniela Jacob (daniela.jacob@zmaw.de)

3. DWD, BikF (Biodiversity and Climate Center), Goethe University Frankfurt:

Pham van Trang (Trang.Pham-van@dwd.de),
Jennifer Brauch (Jennifer.Brauch@dwd.de)

4. Geomar Kiel:

Thomas Raub (thomas.raub@zmaw.de),
Andreas Lehmann (alehmann@ifm-geomar.de)

5. SMHI:

Markus Meier (markus.meier@smhi.se),
Christian Dieterich (christian.dieterich@smhi.se),
Semjon Schimanke (semjon.schimanke@smhi.se),
Shiyu Wang (shiyu.wang@smhi.se),
Ralf Döscher (ralf.doscher@smhi.se),
Matthias Gröger (matthias.groger@smhi.se)

6. DMI:

Ole Bøssing Christensen (obc@dmi.dk),
Tian Tian (tian@dmi.dk)

7. HZG:

Ha Hagemann (Ha.Hagemann@hzg.de),
Burkhardt Rockel (burkhardt.rockel@hzg.de),
Eduardo Zorita (eduardo.zorita@hzg.de)

Working Group on the Assessment of Scenario Simulations for the Baltic Sea 1960-2100

The aim is to assess the existing BSAP scenarios for the Baltic Sea and compare model results.

Chair: Markus Meier

Participants (confirmed):

1. Rene Friedland, Baltic Sea Institute, Warnemünde, Germany (rene.friedland@io-warnemuende.de)
2. Bo Gustafsson, Stockholm University, Sweden (bo.gustafsson@su.se)
3. Bärbel Müller-Karulis, Stockholm University, Sweden (barbel.muller.karulis@su.se)
4. Oleg Savchuk, Stockholm University, Sweden (oleg.savchuk@su.se)

5. Thomas Neumann, Baltic Sea Institute, Warnemünde, Germany (thomas.neumann@io-warnemuende.de)
6. Matthias Gröger, Swedish Meteorological and Hydrological Institute, Norrköping (matthias.groger@smhi.se)
7. Anders Omstedt, University of Gothenburg (anom@gvc.gu.se)
8. Vladimir Ryabchenko, Russian Academy of Science, Institute of Oceanology, St. Petersburg (vlarabchenko@yandex.ru)
9. Markus Meier, Swedish Meteorological and Hydrological Institute, Norrköping (markus.meier@smhi.se)
10. Kari Eilola, Swedish Meteorological and Hydrological Institute, Norrköping (kari.eilola@smhi.se)
11. Ivan Kuznetsov, Swedish Meteorological and Hydrological Institute, Norrköping (ivan.kuznetsov@smhi.se)
12. Helen Andersson, Swedish Meteorological and Hydrological Institute, Norrköping (helen.andersson@smhi.se)

6. Summary of suggestions given during the Baltic Earth Panel Discussion on Öland, 12 June 2013

This is a short summary of the main issues mentioned during the discussion. A comprehensive transcript of the discussion is available in Annex 4.

General comments on the programme

- Programme should be built upon practical questions
- Grand Challenges should be more concrete and feasible on short time scales
- Grand Challenges should be formulated in a concise and understandable way
- Grand Challenges should be linked to the needs of society
- Fundamental research needed to understand vulnerability of the society
- Research assessments needed sensu BACC (low-cost high-interest actions)
- Fill data gaps but look for societal relevance
- Take in new external expert groups
- Balance between new and broad topics on the one side and focussing on concrete and short projects on the other side
- Communication and Outreach as important challenge
- Continue as GHP in GEWEX
- Vision of Baltic Earth should trigger financial support
- Joint Programming Initiatives (JPIs) of the EU could be a possible funding perspective besides BONUS
- Keep ambitious goals but be realistic in implementing targets

Specific comments or suggestions on current and potential Grand Challenges or topics

- Flooding due to extreme precipitation
- High-resolution (temporal) data for extreme precipitation events
- Flooding due to rivers
- Flooding due to rising sea level,
- Environmental problems (oil spills, eutrophication)
- Improve climate models
- Further integrate biogeochemistry in the sea and on land into models

- Work towards an interactive land-vegetation model
- Integrate physical-human interactions
- Study the combined impacts of economic change and climate change
- Integrate land surface and catchment
- Study land use as forcing of environmental change
- Include hydrogeology, agriculture, fisheries, traffic
- Disentangle natural variability, climate change and other man-made causes for
 - extreme precipitation and floods
 - flood damages
 - cold winters (4 in a row in Finland)
 - sea level

7. Science Plan

An elaborated Baltic Earth Science Plan is envisaged to be written by the BE-SSG. This will be discussed and decided at the 2nd BE-ISSG meeting in Sopot, November 2013.

Next meetings

- 2nd BE-ISSG Meeting in Sopot, Poland 11-13 Nov 2013. A half-day scientific workshop will be organized in connection with the meeting by Karol Kulinski and Gregor Rehder.
- 3rd BE-ISSG Meeting in Lund, Sweden, 16-19 June 2014. This meeting will take place in connection with the 3rd Lund Regional-scale Climate Modelling Workshop.

Draft minutes by Marcus Reckermann, 28 August 2013

Corrections and amendments by Markus Meier, 9 September July 2013

Revised minutes by Marcus Reckermann, 17 September 2013

Abbreviations and Acronyms

AGU	American Geophysical Union
ASLO	Association for the Sciences of Limnology and Oceanography
BACC	BALTEX Assessment of Climate Change for the Baltic Sea basin
BALTEX	The Baltic Sea Experiment
BE-ISSG	Building predictive capability regarding the Baltic Sea organic/inorganic carbon and oxygen systems (a BONUS+ project)
BE-SSG	A scientific journal of the human environment
BONUS	Joint Baltic Sea research and development programme
BSAP	Baltic Sea Action Plan
BSSG	BALTEX Science Steering Group
DMI	Danish Meteorological Institute
DTU	Danish Technical University
DWD	Deutscher Wetterdienst (German Weather Service)
EGU	European Geosciences Union
EU-ERA	European Union - European Research Area
GC	Grand Challenge
GEWEX	Global Energy and Water Cycle Experiment
GHP	GEWEX Hydroclimate Panel
HELCOM	Helsinki Commission for the protection of the Baltic Sea

HZG	Helmholtz-Zentrum Geesthacht
IBES	International BALTEX Baltic Earth Secretariat
ICES	International Council for the Exploration of the Sea
MPI	Max-Planck-Institute
RCM	Regional Climate Model
SAB	Senior Advisory Board
SMHI	Swedish Meteorological and Meteorological Institute
ZMAW	Zentrum für Marine und Atmosphärische Wissenschaften

Annex 1: Baltic Earth Interim Steering Group Meeting Draft Agenda**Draft agenda**

- 1 Welcome and introduction
- 2 Terms of References of the SSG, see attachment
- 3 Members of the Senior Advisory Board, SAB
- 4 Terms of References of the SAB
- 5 Implementation of Grand Challenges and related working groups
- 6 Terms of References of the Working Groups
- 7 Outreach and communication activities
- 8 Summer School perhaps in collaboration with DTU Aqua and Bert Bolin Climate Center
- 9 Next meeting in Sopot, Poland in October 2013
- 10 Others

Annex 2: List of participants

Jari Haapala, Finnish Meteorological Institute, Helsinki, Finland, jari.haapala@fmi.fi

Sirje Keevallik, Tallinn University of Technology, Marine Science Institute, Tallinn, Estonia, sirje.keevallik@gmail.com

Karol Kulinski, Institute of Oceanography, Sopot, Poland, kroll@iopan.gda.pl

Andreas Lehmann, GEOMAR, Kiel, Germany, alehmann@geomar.de

Markus Meier (chair), SMHI, Norrköping, Sweden, markus.meier@smhi.se

Kay Myrberg, Finnish Environment Institute, SYKE, Helsinki, Finland, kai.myrberg@ymparisto.fi

Anders Omstedt, University of Gothenburg, Sweden, Anders.Omstedt@gvc.gu.se

Irina Partasenok, Republic Hydrometeorological Centre, Minsk, Belarus, irina-danilovic@yandex.ru

Piia Post, University of Tartu, Estonia, piia.post@ut.ee

Marcus Reckermann, International Baltic Earth Secretariat, Helmholtz-Zentrum Geesthacht, Germany, marcus.reckermann@hzg.de

Gregor Rehder, Baltic Sea Research Institute, Warnemünde, Germany, gregor.rehder@io-warnemuende.de

Anna Rutgersson (vice-chair), Uppsala University, Sweden, Anna.Rutgersson@met.uu.se

Benjamin Smith, Lund University, Sweden, ben.smith.lu@gmail.com

Martin Stendel, Danish Meteorological Institute, Copenhagen, Denmark, mas@dmi.dk

Hans von Storch, Helmholtz-Zentrum Geesthacht, Germany, hvonstorch@web.de

Eduardo Zorita, Helmholtz-Zentrum Geesthacht, Germany, eduardo.zorita@hzg.de

Sergey Zhuravlev, Saint-Petersburg State University, Russia, hydromod@gmail.com

Members of the BE-ISSG, but not present at this meeting:

Juris Aigars, University of Latvia, Riga, Latvia, juris.aigars@lhei.lv

Franz Berger, German Weather Service, Lindenberg, Germany, franz.berger@dwd.de

Inga Dailidienė, Department of Geophysical Sciences, Klaipeda University, Lithuania, inga.dailidienne@ku.lt

Carin Nilsson, Lund University, Sweden, carin.nilsson@cec.lu.se

Annex 3: Draft Terms of References of the Interim Science Steering Group (ISSG) of Baltic Earth

Drafted by Markus Meier, 7 July 2013

Edited by Marcus Reckermann, 22 August 2013

Tasks of the ISSG are to

- undertake the overall planning, monitoring and coordination of Baltic Earth,
- regularly review and update the science plan including the Grand Challenges, and to assess Baltic Earth actions and achievements against the provisions of the science and implementation plans,
- suggest and approve members and chairs of Baltic Earth panels, including the ISSG and the External Advisory Board, with qualified majority,
- suggest and approve chairs of Baltic Earth Working Groups , with qualified majority,
- initiate, supervise and review the work of Baltic Earth Working Groups,
- review developments relevant for Baltic Earth at international levels, suggest related actions for Baltic Earth, and report, or organize the reporting, to the relevant panels at international levels,
- interact with the various national and international authorities important for Baltic Earth,
- establish and maintain links to other relevant projects and programmes and assure cooperation whenever possible and adequate,
- establish and maintain links to stakeholders, policy-makers and the public in order to i) create awareness of Baltic Earth, ii) make Baltic Earth results available for use, iii) exchange advise concerning Baltic Earth results, related requirements, and their application for the benefit of society,
- undertake suitable steps to both promote funding possibilities at national and international levels,
- actively initiate or support related funding proposals in support of the Baltic Earth,
- initiate and prepare Study Conferences on Baltic Earth on a regular basis (every 4 years)
- initiate and prepare Baltic Earth symposia and workshops on relevant topics
- meet at least annually, with E-Mail communication between meetings.

Term

- for chairpersons: 1 year (June 2013-June 2014)
- for members: 1 year (June 2013-June 2014)

Election and approval

- criteria for a membership in the ISSG are scientific excellence, an active contribution to ISSG meetings, conferences, workshops, summer schools, working groups and projects, as well as gender, country, institutional and scientific discipline balance,
- new members need to be identified and suggested by at least one member,

- suggestion of a candidate needs to be communicated to all members at least 4 weeks prior to election and approval by a qualified majority of the ISSG,
- approval by ISSG is normally done at a regular ISSG meeting, in important cases approval and election may be by E-mail between ISSG meetings,
- final official approval by the ISSG chair.

Decisions

- The “qualified majority” is 2/3 of the elective ISSG members present at a meeting,
- A minimum of ½ of all ISSG members must be present at a meeting in order to take decisions, this may include votes submitted prior to the meeting to the ISSG chair

Annex 4: Baltic Earth Panel Discussion at the 7th Study Conference on BALTEX, Borgholm, Sweden, 12 June 2013

Summary from audio recording by Marcus Reckermann. Original audio recording available through MR.

Panel members:

Jüri Elken, Physical Oceanographer from Tallinn University of Technology and Director of Marine Systems Institute in Tallinn, Estonia; formally worked together with the late Wolfgang Krauss (one of the BALTEX initiators) from IfM Kiel. He has been a BALTEX Science Steering Group member for many years.

Marie-Jose Gaillard, Palaeo-Ecologist at Kalmar University, Sweden; her expertise is in vegetation and land cover changes in the past (holocene, ca. 11.000 years); she is particularly interested in the interfaces vegetation-humans-climate. Her connection to BALTEX is through BACC II where she is a lead author of Chapter 6: Attributing causes of regional climate change.

Markus Meier, Professor of Physical Oceanography at Stockholm University and SMHI, Sweden; he started as PhD student of Wolfgang Krauss and an early BALTEX student; he is particularly interested in coupled physical-biogeochemical processes and climate variability, and climate variability and change; he is currently the chair of the Baltic Earth Interim Science Steering Group (BE-ISSG).

Anders Omstedt, Professor of Physical Oceanography at University of Gothenburg, Sweden; he has been active in BALTEX from very beginning (also as Science Steering Group member), and organized the 1st Study Conference Visby 1995; his scientific interests are water and heat budget of the Baltic Sea, nutrient and carbon cycling and the Baltic Sea acid-base balance.

Jan Polcher, Laboratoire de Météorologie Dynamique du CNRS in Paris, France and GEWEX-GHP co-chair; his experience in coordinating the AMMA project on regional climate and hydrological processes in Africa taught him much on how climate and society and economical systems interact.

Anna Rutgersson, Professor of Meteorology, with a particular interest in atmospheric forcing of the Baltic Sea region; she is a lead author of BACC II Chapter 2: Climate change during the last 200 years, and presently co-chair of BEISSG.

Martin Visbeck, Professor of Physical Oceanography at Geomar Kiel, Germany, Speaker of Future Ocean, and member of the Future Earth transition team; his particular interest is in the integration of marine, natural and social sciences.

The discussion was introduced and moderated by **Benjamin Smith**, Professor at Lund University, Sweden, and an ecologist and ecosystem modeler, primarily interested in terrestrial ecosystem functioning and interactions with climate, with a particular focus on the contribution of population and community processes to ecosystem dynamics; he has been member of the BALTEX Science Steering Group member, and is currently member of the BEISSG.

The panel discussion was divided in a question and answer part, with Ben asking specific questions to panel members; then an open discussion part including the audience, which was encouraged to

share questions and opinions on Baltic Earth. Ben stressed that the scientific and outreach focus of Baltic Earth is still in development and any input is welcome.

Initial questions to panelists

Q1: “Earth System Science”, is this a buzz word for what was done already in BALTEX Phase II or is it a fundamental change?

Markus Meier: There will be changes. We need to widen up the science. Some components have been missing. We were successful in developing regional coupled climate models, atmosphere, sea ice and ocean on the physical side; some success already in integrating system components of biogeochemistry in the sea, but an interactive land-vegetation is missing in the model systems, there are many more examples. So we have started to work towards Earth System Science, but we should continue, we are not finished.

Q2: Anders, you were the BSSG chair when BSSG constituted a group of young scientists to work up a new programme. Is it a revolution these youngsters have come up with, has it completely overturned the BALTEX traditions and experiences, or was it in line what the BSSG expected?

Anders Omstedt: Of course you never know what you get when you ask a group of young people, but I am completely satisfied with the result, we fully rely on this group, there are so many good scientists in it, so I am very pleased.

Q3: Jan, do you have any experience in the transition process GEWEX has undergone which can be pointed out to Baltic Earth as guidance?

Jan Polcher: Most RHPs (Regional Hydroclimate Projects) and GEWEX in general have moved from a sheer physical perspective to a more physical-human combination; how the human system interacts with the physical world. What Markus Meier showed in his presentation certainly goes into that direction, and I would support to do that. Societies are in need of this evaluation of the combined factors of human economic changes and climate change.

Q4: Marie-Jose, you are the newcomer to the group with a new field of research relevant for Earth System Science on the regional scale, bringing in environmental issues. Do you see BALTEX or Baltic Earth as something to contribute to and get something back, and if so, do you have an example?

Marie-Jose Gaillard: Absolutely yes. We have something to contribute and to gain in such a programme as palaeoecologist. There is the very successful sub-programme of IGBP called PAGES (Past Changes), with links to other IGBP programmes; those who know PAGES have understood the value of having this long-term perspective for all the questions we are asking. I was very impressed by BALTEX and BACC, this should continue, using the strength of surveys, understanding knowledge; continue monitoring, it is absolutely needed for detection and attribution work, must continue and improve. What was missing in the last years? Attention was emphasized on the Baltic Sea, the sea, not so much on catchment. This should be included more, land use as forcing as to the net effect of land use and other forcings over long prehistorical time periods; this is very important to understand the presence.

Q5: Martin, the concept of Grand Challenges as components in the new programme is also present in Future Earth and other new programmes. Can you help us to define what a Grand Challenge really is and how operational it can be in a programme like this.

Martin Visbeck: Use it in its “weak” form. In its “hard” form, a Grand Challenge is something which is really difficult which no single institution or nation can achieve. Do not expect to have the problem solved within a 3-4 years period. You may address them programmatically as long step challenges, like the water and energy cycle over the Baltic Sea region for which some aspects are not yet solved, so I would encourage you to continue this type of Grand Challenge,

Q6: Six Grand Challenges (GCs) to start to think about in the coming year; GCs sound like research questions, scientifically formulated; if we compare this with the challenges reported by Martin Visbeck on societal needs such as how do we feed 9 billion people; do we have a different concept of challenges, do we focus more on researchable questions in Baltic Earth?

Anna Rutgersson: What we have done in Baltic Earth when formulating these GCs is to enhance the link to society as compared to BALTEX and listen to society, what are the major challenges for society, and then act upon that. My opinion is that this should be a scientific programme working on scientific questions which are also relevant to society.

Q7: Jüri, from your experience, how can funding agencies be involved in the Grand Challenges and in the research questions?

Jüri Elken: Most scientists are attached (i.e. payed by) to funding agencies which are unified in e.g. BONUS, in the Baltic Sea research community. For GEWEX and Future Earth, the role is not as clear. If we go for the whole spectrum of Earth system science in Baltic Earth it may be beyond the scope of BONUS. The problem is also that BONUS funds confined projects but Baltic Earth is about long-term research which is more than a specific project. GCs must be formulated in a way that scientists are still interested, otherwise they will not participate, but questions should be understandable for the tax payers and decision makers. I like the salinity GC, it is a very wide and relevant topic, but it needs to be explained. If it is only salinity then it is only for the students who learn how to determine salinity, but the whole story of the water and energy cycle in the atmosphere is behind this, soil moisture in the catchment, river discharge, biogeochemical processes, so the short title should be more explained in detail. The other important draft title is on natural hazards, but imagine an emergency situation when we need to act immediately, and if the title is as long as it is now, the emergency is there and the reader is dead before finishing reading the title.

Open discussion with the audience

Lennart Bengtsson: I am impressed by the progress in BALTEX research since I was active. Concerning the future of the programme: Martin Visbeck’s presentation was so impressive, I had to write “Amen” under my notes on his presentation. Monty Python did something on education of children: “Well kids, tomorrow we will split the atom, then we will cure all remaining diseases, and then we will fix the Black Hole in the Universe”. I make the point for more “pedestrian” objectives; here is an example from my experience: first we had reasonable forecast for 2 days, then we were brave and said we should be able to make usable forecasts for 6 days... That was objective of ECMWF, now they

can make 8 days. There are many remaining practical problems, for instance the flooding of rivers in the catchment basin in the recent days. We need to understand to what extent this is due to climate change or what is due to natural variability, what is caused by human activities of other kinds. Mojib Latif on TV said that it is climate change, but I am not sure that we should be sure about this; we need to investigate this much more carefully.

Another problem is sea level rise in the Baltic Sea. There is a high variability; in some cases the water level was 3m above normal, causing serious problems in the southern Baltic Sea. Also here we need to find out what the natural variability is and what climate change is. Then eutrophication is important, and a potential oil spill would be a complete disaster. So there is no lack in “pedestrian” objectives; keep the rather concrete objectives in mind, and then we can afterwards demonstrate that we were successful. You cannot say in 25 years that you have fixed these very general problems, so stay concrete with doable objectives.

Mikko Alestalo: I would like to follow Lennart’s line and add one more practical problem, that is snow. We had 4 severe winters in a row and have been drowning in snow for the past 4 winters in Helsinki; is this natural variability or is it something new? This is something to be tackled. There are hints and signs: the Arctic Ocean is warming; early winter precipitation in Eurasia has been very strong lately, and late spring- early summer precipitation has been very weak. So there are signs which have been observed; so I would like to add the severe winters in a row to Lennart’s list.

Jerzy Dera: BALTEX for the first time linked hydro-meteorological science with physical oceanographic science; the first phase achievements were good and clear. But now Baltic Earth is wider which is very good, so many more aspects must be taken into account e.g. agriculture, fisheries, traffic, etc. Everything is linked and dependent on the other, so I recommend all these other kinds of science to be involved in this programme.

Jan Polcher: My comment on “pedestrian” objectives: I like it, but be warned: it is limited in its vision. If you fix yourself a concrete objective, it means you know where the vulnerabilities are but the issue is we don’t know where the vulnerability of our society is. E.g. if the current floods in Germany are linked to the changes in land use, we didn’t know that, and it’s not an improved weather forecast which is going to help, but changing our habits concerning land use is going to solve the problem. We also need fundamental research on the state of the environment and its sensitivity to climate extremes or change; this is not easy to frame in a pedestrian way...

Martin Visbeck: Put the focus on solvable objectives, pass solutions out of the science community; make assessments of ongoing phenomena, use the global framework of climate services; combine the science with the ability of the services to pass on knowledge.

Zbigniew Kundzewicz: BALTEX was dominated by ocean sciences, but for Baltic Earth, land is very important, so I am glad to see extremes as a GC. Floods are the major hydrological extreme in the Baltic Sea region, and it’s nice to see the interdisciplinary approach.

Sten Bergström: Firstly, what happened to the idea of data centers, precipitation data, radar data? My second comment: The most costly event in the Baltic Sea region in the past 20 year was the Copenhagen flood of 2011. 150mm rain in 2h; 1 billion € in 2h for insurance companies. We need to look at extreme events at higher temporal resolutions than 24 h, maybe down to hours or even

minutes; this is what is costly for megacities. So focus on extremes, not only river flow but also extreme precipitation.

Anders Omstedt: We are now much more open-minded with data, they are much more distributed among institutions, also for freely available. Hydrology data need to be considered also in the future; but we must rely on national institutes and the community because it costs so much to do this, and we hope SMHI takes the lead on hydrographical data to be freely available.

Sten Bergström: Yes, that is already decided, next year (forced by the EU).

Markus Meier: The data centres still exist but are sleeping; we plan to re-establish data centres with meta-databases; many other data centres are now available e.g. in BONUS; we should link the different initiatives.

Anna Rutgersson: We should identify gaps in the data, make sure they are filled in order to be able to fulfill the GCs.

Viesbeck: WCRP and Future Earth subscribe to fully open data policies, data should be free and openly shared around the world, this is also an EU directive.

Anna Rutgersson: I agree that extreme precipitation is an important subject to be taken up in Baltic Earth.

Ragnar Elmgren: I am an outsider but admirer of BALTEX; I would like to take up Visbeck's idea of "co-design" of the research; scientists preparing GCs on extremes etc. should talk to politicians and NGOs on what they see as big problems. If you frame the GC as answers to societal problems, then you can explain why we need the basic science, why we need to fill data gaps; politicians want to know why the data gaps must be filled; make GCs more obvious as efforts to answer the needs of society, then you get a better chance for funding.

Barry Broman: Share data from the beginning, build this into education.

Jan Polcher: I would like to challenge Martin, we cannot co-design our science, we don't know where our vulnerability to climate change is; vulnerability depends on the structure of economy and society; 150 mm is no big deal in Bombay but in Copenhagen; so for them it's difficult to ask the right questions. Our research should identify the challenges of climate change for our society.

Hans-Jörg Isemer: There is a new EU funding scheme which may be interesting for Baltic Earth: Joint Programming Initiatives (JPIs); 2 of 10 may be relevant for Baltic Earth, one on seas and oceans, one on climate. Ministries and financial agencies in the countries design these programmes, so leading scientists should be in close contact to national funding agencies, and look at the objectives and issues.

Martin Visbeck: Yes, BONUS is great but expand on this. JPIs are to streamline national funding schemes and research capabilities towards joint objectives on the European level, this is also what Baltic Earth attempts to do; they are asking scientists where the funding should go; they are looking for input at collective level, so for Baltic Earth it would be good to have clear vision of research needs and communicate that to JPIs for discussions; co-design is dialogue.

Tarmo Soomere: Baltic Earth should develop principles which can be used everywhere, aim at much higher levels, provide some science for the world.

Anders Omstedt: The Baltic Sea community has been arrogant; the world does not need to learn from us, we should be humble; others also do good things, maybe better.

Bernd Schneider: Who will implement the science plan? In BALTEX Phase II, biogeochemistry was not well acknowledged. How will you improve this in Baltic Earth?,

Markus Meier: There are Working Groups (WGs) around the GCs, and WG chairs and co-chairs are members of the SSG; progress within each group will be discussed; WGs and GCs with no activity will be dropped. We want to be active, we want scientists to be involved in the GCs, and we want more scientists and disciplines to join.

Kai Myrberg: Concerning stakeholder interactions, an advantage of Baltic Earth is the cooperation with the EU and with Russia; the EU is very interested to collaborate with Russia and new challenges. Secondly, there is a coalition of the Baltic Sea states and the Gulf of Finland Year. Contact the Baltic Sea ambassadors, they give money, I have experience.

Anders Omstedt: I would like to respond to Bernd Schneider: Science plans are important as they create a vision, but this takes time; many people opposed the inclusion of biogeochemistry in the BALTEX Phase II science and implementation plan, but in the past 10 years there were tremendous improvements in addressing these issues in the BALTEX community, so be patient, it takes a while.

Gregor Rehder: Biogeochemistry was not a BALTEX issue in the beginning, for historical reasons, so the question is how do we cover all relevant disciplines for Earth system science? BALTEX has been very strong in the field of hydrology, oceanography, meteorology, and has a good standing in the community, something to build on. But we need to grow and include experts from the other disciplines. This implies the danger of losing focus, but on the other hand there is the need to open up. So how do you do both?

Martin Visbeck: Excellent question. Strike that balance smartly. Don't take on areas where you don't have the depth to do yourself. This means you may have to forge new partnerships; there are communities in the Baltic Sea area that can do that work. I read the GCs as invitation for new communities to contribute; if not this is dangerous because you soon lose credibility in the community.

Uldis Bethers: Will Baltic Earth involve of hydrogeology? Deep groundwater is an important issue.

Marcus Meier: I am absolutely against any walls, we should make flexible GCs, and make the research agenda according to the problems of society, and try to give concrete answers. In principle all disciplines are included in Earth system science, also of course hydrogeology. Other research communities should be engaged to contribute and collaborate with the existing Baltic Earth community. Of course interdisciplinary communication is not easy as I know it from experience; we speak different languages; it is nevertheless important to present the science in the right way.

Final statements of panelists

Marie-Jose Gaillard: Baltic Earth should continue and improve the BALTEX work in terms of scientific understanding, but also on communication and outreach etc. It is phantastic what has been done in this respect. It should also include risks and adaptation, involve socio-economic sciences; a true co-design of the programme would work in an ideal world, but don't be naïve in this, be careful. Outreach, communication and education have been phantastic in BALTEX, continue and improve it, but become known better outside your own community.

Jüri Elken: Define the scope of disciplines more explicit. E.g., economics are a quite popular topic in BONUS; lots of successful proposals treated economic issues. Regarding stakeholder involvement I recommend flexible informal networks, as things are progressing quite fast. There will be a BONUS scientific update this autumn, and there have been some consultations. Also JPIs are relevant and important; at the moment the call design for 2014 is going on. Finally I would like to recommend what Hans von Storch said: go for low-cost high-interest actions like BACC.

Anders Omstedt: I wish the new programme good luck.

Martin Visbeck: I like Baltic Earth; I am impressed by the process. Keep your ambitious goals but be realistic on implementation targets.

Markus Meier: Thanks for the extremely nice discussion; my wish for Baltic Earth is: be as active as possible, the success depends on you.

Anna Rutgersson: Keep the scientific relevance but also broaden the scientific community. This is a big challenge which we need to discuss further.

Jan Polcher: I congratulate you for the transition to Baltic Earth. Widening the community is a good and important move and I'm sure that GEWEX and GHP will be happy to welcome you under the new identity. Also open up to the human sciences; help understand vulnerability and what type of information is needed and available how this information can be used.

Annex 5: Article for GEWEX Newsletter, August 2013



BALTEX Transitions to Baltic Earth

Marcus Reckermann and the Baltic Earth Interim Science Steering Group
International Baltic Earth Secretariat, Helmholtz-Zentrum, Geesthacht, Germany

The Baltic Sea Experiment (BALTEX), one of the original GEWEX continental-scale experiments, has been an active research project in the Baltic Sea region for the past 20 years (see *GEWEX News*, August 2012). As BALTEX approached the scheduled ending date for its Phase II, the Science Steering Group agreed that it was time for a follow-on program with a new name and younger steering group to carry the torch forward.

After two years of careful preparation that included the participation of relevant institutions, stakeholders, and researchers, the successor to BALTEX was launched at the 7th Study Conference on BALTEX held on the Swedish island of Öland on 10-14 June 2013. Baltic Earth was unveiled on the first day of the conference in the presence of H.M. King Carl XVI Gustaf, King of Sweden. With this final conference, the BALTEX community returned to the country where the first Study Conference took place in 1995 (on the island of Gotland).

The 7th Study Conference on BALTEX

The Conference was attended by 120 participants from 14 countries mostly in the Baltic Sea Basin (Sweden, Finland, Russia, Belarus, Estonia, Latvia, Lithuania, Poland, Germany, and Denmark), as well as other countries, including The Netherlands, France, Italy, the United Kingdom, and the United States. The 110 papers presented spanned the scope of BALTEX research, including water and energy cycles, climate variability and change, water management and extremes, and biogeochemical cycles under anthropogenic influence. Most of the papers addressed cross-discipline topics, underlining the interdisciplinary nature of the conference and BALTEX in general. In addition to the topical sessions, there were sessions on European Union-funded BONUS+ projects and contributions from the GEWEX Hydroclimatology Panel. A panel discussion on Baltic Earth began after two presentations on GEWEX and Future Earth.

It was a great honor to welcome some of the founding members of BALTEX at the conference, including Ehrhard Raschke, Lennart Bengtsson, and Sten Bergström, who each presented their recollections of BALTEX. Other founding members present included Jerzy Dera and Valery Vuglinsky. During the conference dinner, these and other members of the BALTEX research community were honored at a special ceremony. Photos and presentations are available at: <http://www.baltic-earth.eu/oland2013>.

Baltic Earth

Baltic Earth inherits the BALTEX network, infrastructure, and scientific legacy. The goal of Baltic Earth is to achieve an improved Earth system understanding of the Baltic Sea re-

gion. This means that the research disciplines of BALTEX will continue to be relevant, but will have a more holistic view that encompasses processes in the atmosphere, land, and sea, as well as in the anthroposphere. Specific Grand Research Challenges are being formulated that will represent interdisciplinary research questions to be tackled by the new program in the coming years. Scientific assessments of particular research topics, compiled by expert groups (similar to the approach of the BALTEX Assessment of Climate Change for the Baltic Sea Basin), will help to identify gaps and inconsistencies in current knowledge.

A science plan is being developed by the Interim Science Steering Group (ISSG) and will be available in the summer of 2014. The ISSG is being led by Markus Meier of the Swedish Meteorological and Hydrological Institute and Anna Rutgersson of Uppsala University in Sweden. The science plan will respond flexibly to a continuously on-going definition of core research questions that are identified as key scientific issues, or Grand Challenges for research. These will be identified at upcoming conferences and by assessing existing knowledge in specific research fields by dedicated working groups. Research foci are planned for periods of about 3-4 years. Baltic Earth will communicate with stakeholders and research funding agencies to promote funding relevant to the Grand Challenges.

The continuity in basic research fields, structure (secretariat, conferences, publications), and network (people and institutions) is symbolized by the Baltic Earth logo. Similar to but distinct from the BALTEX logo, it features blue and green arrows that stand for the fluxes between the atmosphere, the sea, and the land surface.

Some of the provisional topics for Baltic Earth Grand Challenges are summarized below.

- 1. Salinity dynamics in the Baltic Sea.** Includes the water and energy cycle, which is elementary in understanding the local ecosystem. A decrease of 2-3 salinity units is expected by the end of the century. Regional precipitation patterns (runoff), atmospheric variability (wind), saline water inflows, and the exchange between the sub-basins and turbulent mixing processes will be investigated in more detail. New climate projections from improved coupled atmospheric and oceanographic model systems are needed.
- 2. Land-sea biogeochemical feedbacks in the Baltic Sea region.** Issues related to eutrophication and acidification. A lot of experimental data and sophisticated model tools are available but there is a lack of process understanding, and representative process parameterizations. The processes occurring within the drainage area greatly influence the functioning of the Baltic Sea ecosystem.
- 3. Natural hazards and extreme events in the Baltic Sea region.** Natural hazards have complex origins, and presently the capability to predict extreme events is very limited. This is generally well recognized regarding infrastructures related to dam safety and urban flooding risks.



Markus Meier (left), Chair of the Baltic Earth Interim Science Steering Group, Marcus Reckermann (middle), Head of the International BALTEX Secretariat, and Anna Rutgersson (right), co-chair of the Baltic Earth Interim Steering Group uncover the new Baltic Earth logo.

However, the range of ecosystem services at risk, including biodiversity and vital societal functions such as drinking water supply, is poorly defined. Many natural hazards have hydrometeorological origins (storms, waves, flooding, droughts) and can potentially be better understood. On the other hand, man-made structures can alter the impacts of extreme events like floods (e.g., through river regulations, land reclamation, dams, soil sealing, and sewage systems in urban areas). All of these factors need to be taken into account when estimating potential impacts.

4. **Understanding sea level dynamics using remote sensing.** The global mean sea level shows large variations at regional scales, which are reflected in the heterogeneous pattern of sea-level trends over the past 30 years. The large uncertainties in future global sea level are thus magnified when considering regional scenarios for sea level change. Currently, there are no comprehensive scenarios for rising sea level in the Baltic Sea. The complex bathysphere of the Baltic Sea, and the influence of the North Sea and the Baltic Sea catchment area present challenges for the prediction of sea level rise that are distinct from the global average.
5. **Understanding regional variability of water and energy exchange.** This topic contributes to the WCRP Grand Challenges and GEWEX Science Questions, and continues some BALTEX research areas that were left open (e.g., efforts for an improved understanding of cloud-aerosol-feedback mechanisms, cloud processes, and atmospheric boundary layer processes for improved modeling capabilities; the diagnosis of natural variability of energy and

water components, including changes in extremes; the observation of atmospheric processes and characterization of uncertainties using conventional meteorological and hydrological observations; and surface and satellite-based remote sensing techniques).

Within these Grand Challenges, anthropogenic changes and impacts will be treated together with the natural drivers. In addition to the scientific challenges, outreach and education are expected to be strong components of Baltic Earth. Dedicated working groups on outreach, communication and education have been created. Their tentative aims are threefold:

1. Provide an arena for scientific exchange and discussion to communicate findings within the Baltic Earth research community internally and externally to other researchers and society;
2. Provide an arena for integrating discussions with actors in society as a step to continuously developing the challenges to advertise Baltic Earth and make the research and researchers visible; and
3. Communicate the importance of the Grand Challenges to funding agencies and promote funding of relevant research. Major educational activities will be the organization of summer schools in the Baltic Sea region on specific Baltic Earth topics.

Baltic Earth will build upon the successes of BALTEX, including the international scientific network and interdisciplinary collaboration. We expect the new program to live up to the standard that BALTEX has set over the past two decades.