BALTEX – An environmental research network for the Baltic Sea basin

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Centre for Materials and Coastal Research

What is BALTEX?

BALTEX is an **environmental research network** dealing with the
Earth system of the entire Baltic Sea catchment including terrestrial and marine ecosystems

Scientific disciplines (in Phase II):

- Meteorology
- Hydrology
- Climatology
- Oceanography
- Biogeochemistry

Important elements are **climate variability and change** and related impacts on ecosystems

Prominent Phase II outcome: → the **BACC project**

BALTEX

Global Energy and Water Cycle Experiment

World Climate Research Programme

World Meteorological Organisation

The roots of BALTEX

Helmholtz-Zentrum Geesthacht
Centre for Materials and Coastal Research

BALTEX was founded in 1992 as part of the GEWEX programme of WCRP

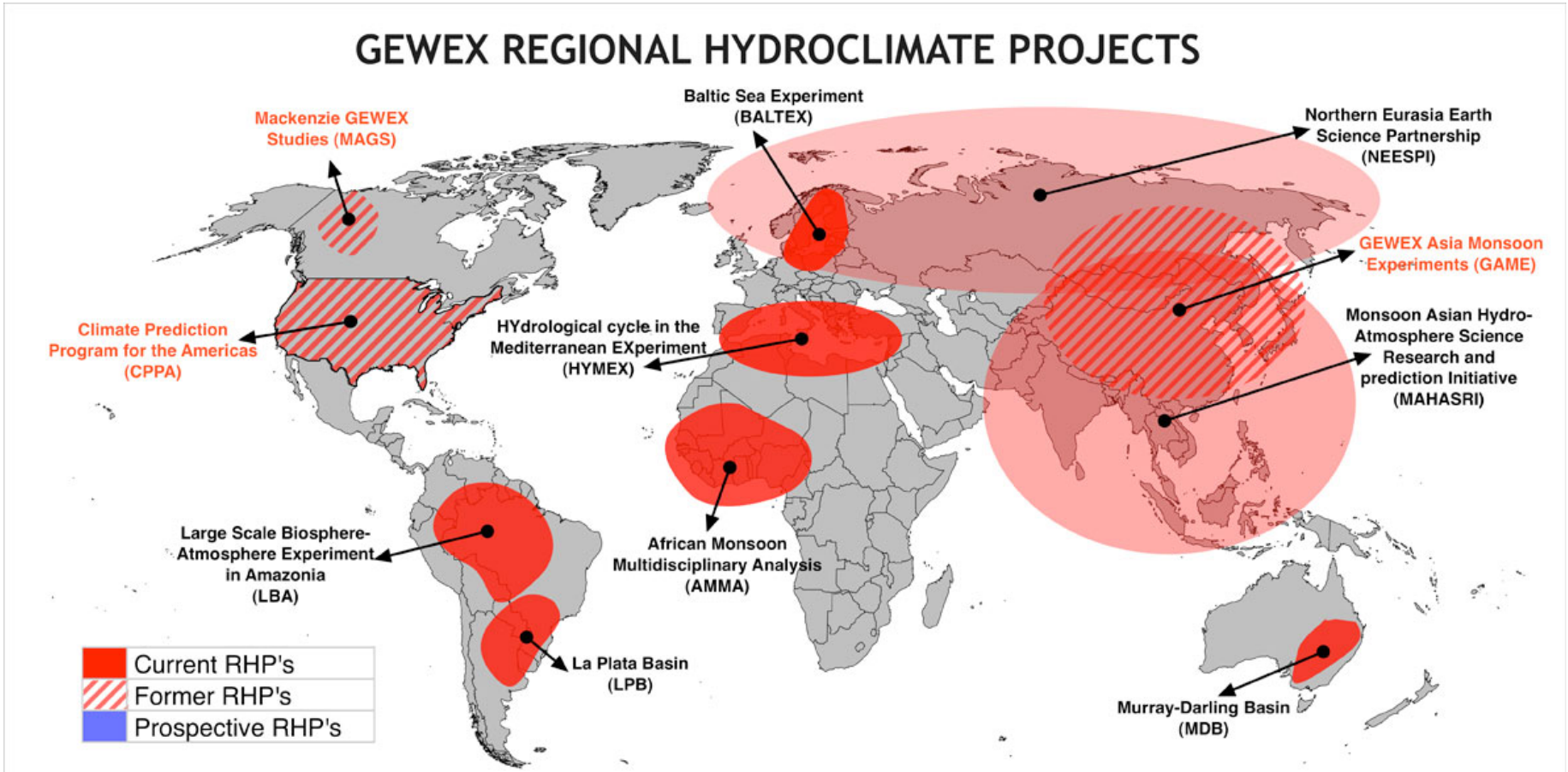
Focus:
The **hydrological cycle** and the **exchange of energy** between the atmosphere and the surface of the Earth (**pysical part of the climate system)**

Major disciplines: Meteorology, Oceanography, Hydrology

Major outcomes: Building of research and observation network; development of coupled regional models (Baltimos, RCAO)

The roots of BALTEX

Helmholtz-Zentrum Geesthacht
Centre for Materials and Coastal Research



- **CEOP (Coordinated Energy and Water Cycle Experiment) is re-named to GHP (GEWEX Hydroclimatology Panel); GHP is home for Regional Hydroclimate Projects (RHPs) like BALTEX**
- **Post 2013: GEWEX to become GREW (Global and Regional Energy and Water project)**
- **Mission statement: To develop improved observational, diagnostic and modeling capabilities focusing on land-atmosphere interactions to measure and predict global and regional energy and water variations, trends, and extremes such as heat waves, floods and droughts; and provide the science underpinning climate services.**
- **11 "Imperatives" grouped into 4 areas: Data, Analysis, Modelling, Applications**
- **Revised GREW-GHP criteria for Regional Hydroclimate Projects (RHPs) to be approved and executed for all present and candidate projects after 2012 or so**

All current RHP's must apply for initiation phase status. At their discretion, existing RHPs may also apply for immediate transitioning to full working phase, by provision of documentation to the GHP that all the Section 3 requirements are being met. Final approval is subject to the decision by the GEWEX Scientific Steering Group.

- **BALTEX Phase I: 1993 - 2002**
- **BALTEX** Objectives (Initial Implementation Plan 1995):
  - To explore and model the various mechanisms determining the space and time variability of **energy and water budgets** of the BALTEX region and this region's interactions with surrounding regions
  - To relate these mechanisms to the **large-scale circulation systems in the atmosphere** and oceans over the globe
  - To develop **transportable methodologies** in order to contribute to basic needs of **climate, climate impact, and environmental research**

Major disciplines: **Meteorology, Hydrology, Oceanography**

Studies related to **process understanding, budget and flux estimation**

Phase I mostly dealt with the physical part of the Climate System

BALTEX Science Steering Group: 24 members from 9 countries

More than 50 participating research organisations in Europe and beyond
National Hydro-Meteorological Services participate actively at all levels

BALTEX Science Steering Group (BSSG):

21 members from around the Baltic Sea basin

International BALTEX Secretariat

at the Helmholtz-Zentrum in Geesthacht

Working Groups

- Radar
- Data Management
- Regional Climate Modeling
- „POSTBALTEX“

Data centres

at the Helmholtz-Zentrum in Geesthacht

Publications

- 644 peer-reviewed journal articles
- 8 books
- 6 special BALTEX journal issues
- 50 International Baltex Secretariat Publications (Project reports, Meeting minutes)
- Newsletter (#14 from April 2011)

- **Numerous Workshops, Group meetings**

- **International Study Conferences (120 to 180 participants)**
  - 1995: Gotland
  - 1998: Rügen
  - 2001: Åland
  - 2004: Bornholm
  - 2007: Sareemaa
  - 2010: Wolin
  - 2013: Öland

… with >700 presentations, and 6 special journal issues

BALTEX Newsletter

No. 13 October 2009

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

Summer climate on Bornholm - BALTEX co-organizes interdisciplinary Summer School

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At the peak of the summer, from 27 July until 5 August 2009, BALTEX, the Danish Technical University (DTU Aqua) and the University of Gothenburg co-organized a Summer School on the island of Bornholm. 20 students from across the Baltic Sea region and different scientific disciplines participated in good spirit and took the opportunity to learn both discipline-specific and interdisciplinary skills related to the topic of the course: "Climate Impacts on the Baltic Sea – From Science to Policy".

Participants in the Summer School on Bornholm, 2009

The challenge of climate change in the Baltic Sea region has different facets, and the aim of the course was to provide a true interdisciplinary approach to tackle this challenge. Scientific knowledge, assessment and advice are needed in order to make effective decisions on policy and management actions which will achieve society objectives for the marine and coastal ecosystems of the Baltic Sea.

The main purpose of this summer school was to help students develop skills in and understanding of the observation, modelling, projection and interpretation of physical and biological changes in the Baltic Sea. The course focussed on the quantitative scientific aspects of climate change impacts in the Baltic Sea, but interaction and communication between scientists and policy makers was also among the goals. An interdisciplinary view will be increasingly in demand as the societal pressures on marine ecosystems remain high or perhaps increase as climate changes. Thus, one main objective of the course was to demonstrate how discipline-specific knowledge can contribute to real management solutions at the ecosystem level, and how that knowledge can help achieve wider goals related to ecosystem-based approaches to management.

Students were assigned activities to develop their discipline-specific knowledge, learn how the knowledge could be translated to management and policy actions, and improve general scientific skills (i.e. oral and written presentation of scientific results; organisation and structuring of group work; collaboration with colleagues from different nations and disciplines). The course contained lectures, exercises, discussion tutorials and group exercises. One type of group exercise was discipline-specific (e.g. related to

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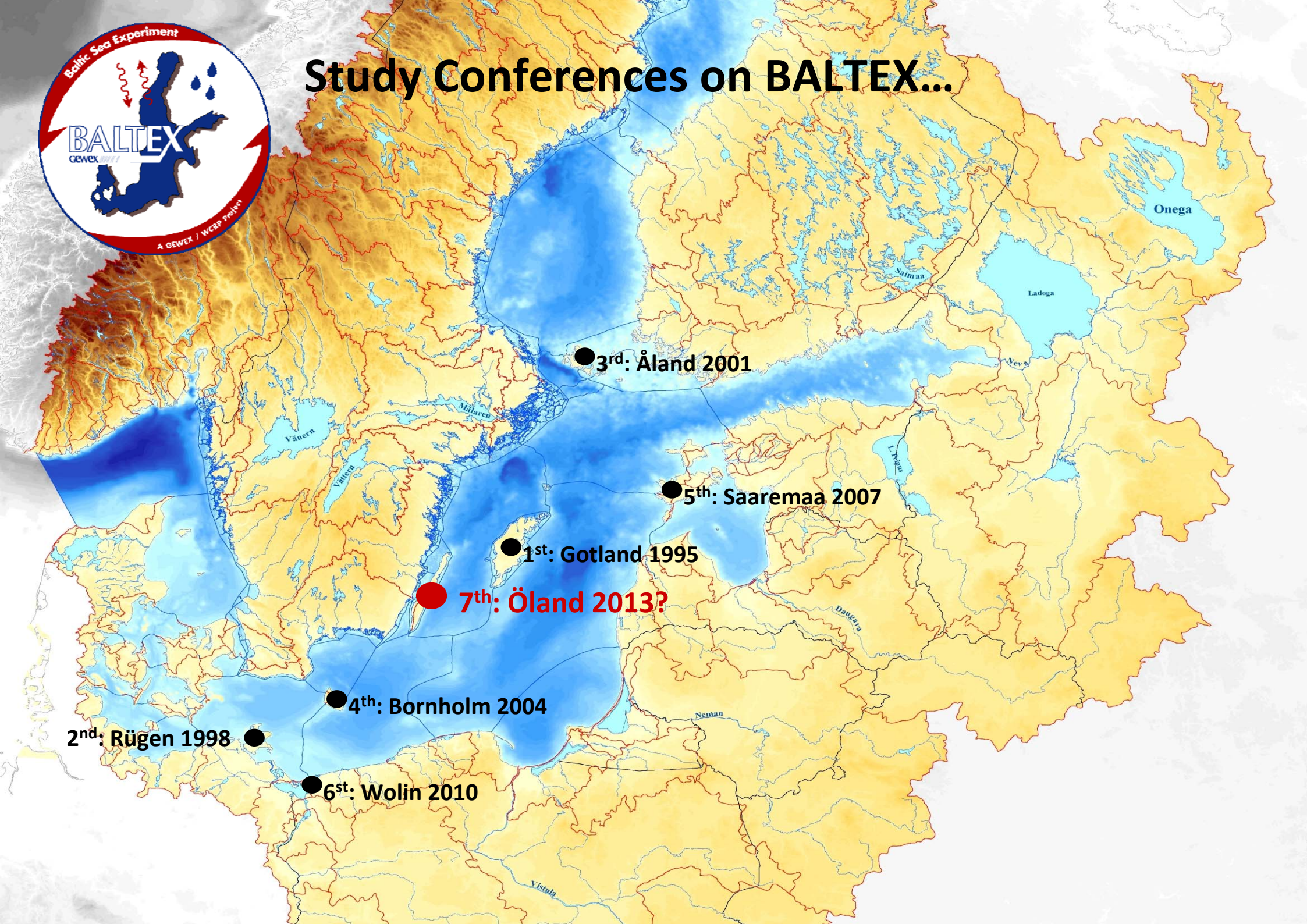
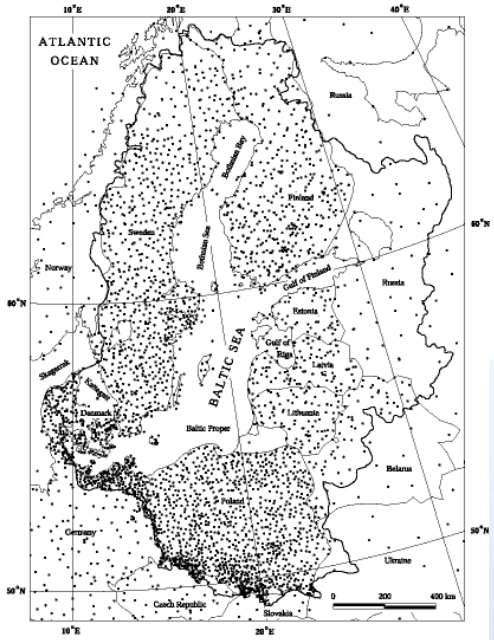

Baltic Sea Experiment
BALTEX
GEWEX
A GEWEX / WCRP Project
Study Conferences on BALTEX…
3rd: Åland 2001
5th: Saaremaa 2007
1st: Gotland 1995
7th: Öland 2013?
4th: Bornholm 2004
2nd: Rügen 1998
6st: Wolin 2010
Onega
Ladoga
Saimaa
Vänern
Mälaren
Vättern
Neva
L. Peipus
Daugava
Neman
Vistula

Programme Elements of BALTEX Phase I

(Initial Implementation Plan 1995)

- Collection of *in situ* and Remote Sensing data ←
- Re-analysis of existing data sets
- Assimilation of data sets
- Process studies including field experiments
- Numerical experiments and coupled modelling ←

Collection of *in situ* and Remote Sensing data



Rain gauge stations

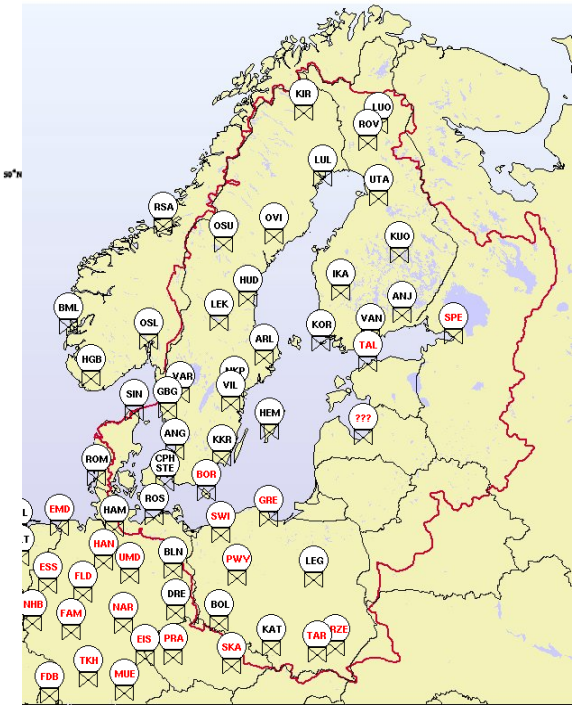
A unique precipitation data set established

Pre-PIDCAP (- 1995): 350-400 stations

PIDCAP (1995): 4400 stations

Post-PIDCAP (1996 -): 3000-3700 stations

BALTEX Meteorological Data Centre (BMDC) at World Data Center for Climate



37 Contributing radars (black)
25 Candidate radars (red)
7 countries presently active

Continuous production of datasets since 1999:

- 2 km composite, every 15 min
- 3 and 12-hour gauge-adjusted accumulation
- Wind profiles, every 15 min

Innovative quality control methods

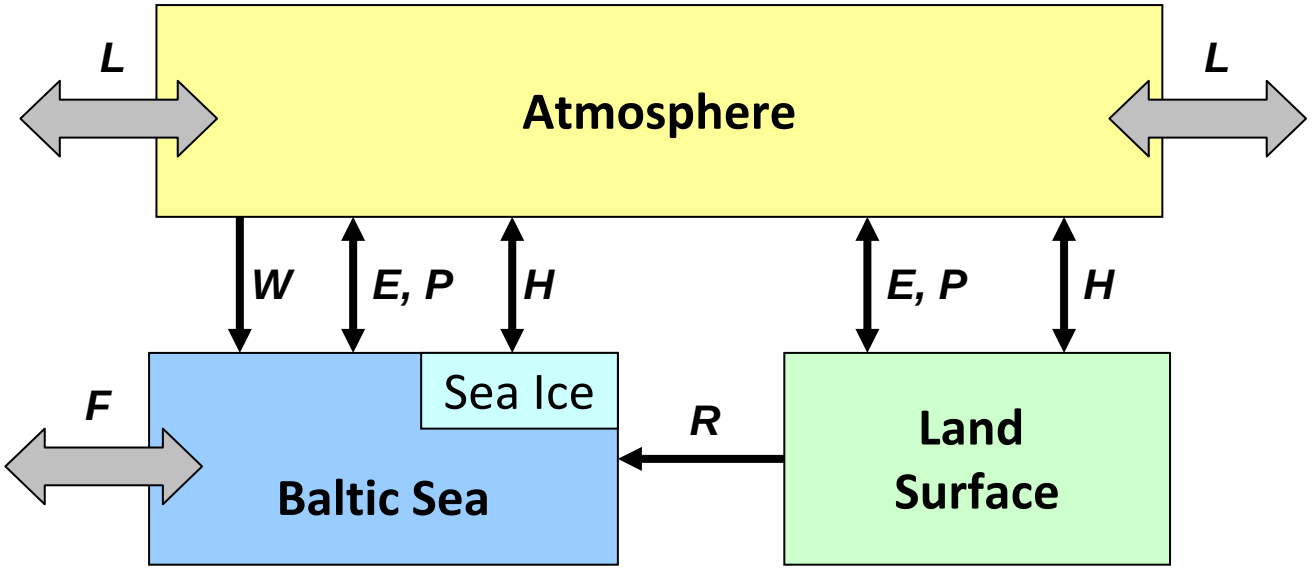
BALTEX Radar Data Centre (BRDC) at SMHI

3 and 12-hour gauge-adjusted Accumulated Precipitation

Important BALTEX Phase I (1992-2003) goal

…to develop comprehensive **coupled regional models** for the atmosphere, the land surface including rivers and lakes, and the Baltic Sea including sea ice; capable of realistically modelling the water and energy cycles of the BALTEX region.

The „BALTEX Box“



Two coupled model systems developed:

→ **BALTIMOS** (BALTEX Integral Model System) by the Max Planck-Institute for Meteorology in Hamburg, Germany

www.baltimos.de

Max-Planck-Institut für Meteorologie
Max Planck Institute for Meteorology

DEKLIM

→ **RCAO (Rossby Centre Regional Atmosphere-Ocean)** at the Rossby Centre of the Swedish Meteorological and Hydrographical Institute (SMHI), Norköpping, Sweden

Rossby Centre

SMHI

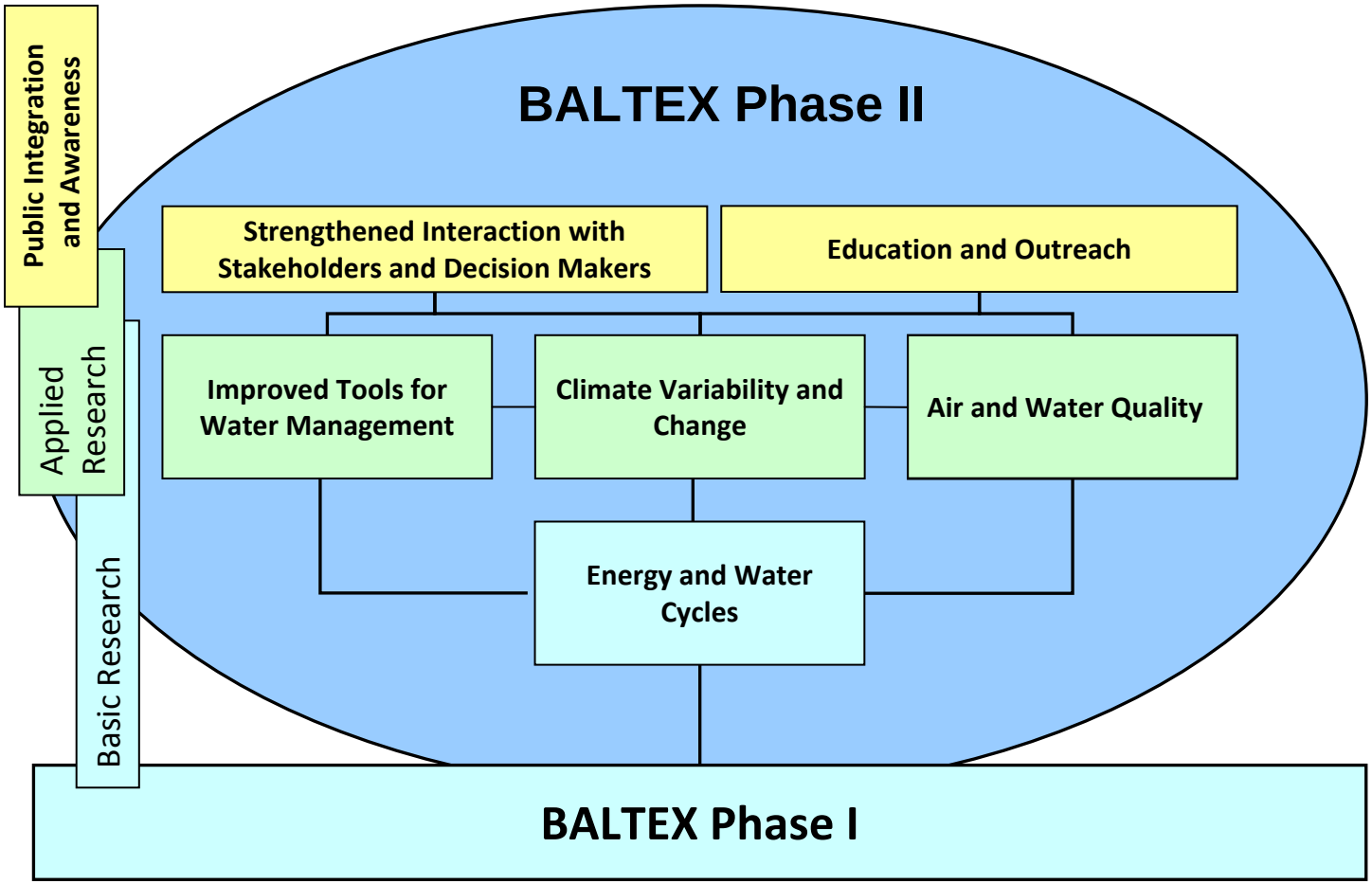
Two coupled models established during BALTEX Phase I to be applied and extended in BALTEX Phase II …

- … to re-analyse climate variability in the past and calculate future scenarios
- … to provide more realistic statistics of extreme events
- … to incorporate modules describing the transport of pollutants and nutrients
- … to include biogeochemical processes and cycles
- … to contribute to establishing regional Earth System Models

Major oceanographic achievements of BALTEX Phase I …

… cited from Omstedt, Elken, Lehmann, Piechura in Progress in Oceanography 63, 2004
„Knowledge of the Baltic Sea physics gained during the BALTEX and related programmes“

- Meteorological, hydrological, oceanographic and ice data now available for the research community
- Progress in understanding
  - the strong impact of large scale atmospheric circulation on water mass circulation and exchange, sea ice evolution, and changes in oceanographic conditions of the Baltic Sea,
  - the importance of strait flows in the exchange of water in and out of the Baltic Sea
  - intra-basin processes
- Oceanographic models introduced in water and energy studies
- Development of turbulence and 3D ocean circulation models
- Improved ice modelling
- Understanding the need for coupled atmosphere-ice-ocean-land models


Public Integration and Awareness
Applied Research
Basic Research
BALTEX Phase II
Strengthened Interaction with Stakeholders and Decision Makers
Education and Outreach
Improved Tools for Water Management
Climate Variability and Change
Air and Water Quality
Energy and Water Cycles
BALTEX Phase I

Objectives of BALTEX Phase II (2003-2012)

1. Improved understanding of **energy and water cycles** under changing conditions
2. Analysis of **climate variability and change**, and provision of regional climate projections over the Baltic Sea basin for the 21st century

BACC

3. Provision of improved **tools for water management**, with an emphasis on extreme hydrological events and long-term changes
4. **Biogeochemical cycles** in the Baltic Sea basin and transport processes within the regional Earth system under anthropogenic influence

BONUS PORTAL

Baltic - C

ECO SUPPORT

AMBER

5. Strengthened **interaction with decision-makers**, with emphasis on global change impact assessments
6. **Education and outreach** at the international level

BALTEX projects funded by BONUS PORTAL

Baltic-C

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

Gothenburg University (Anders Omstedt) and 6 parties from 4 countries

www.baltex-research.eu/baltic-c/

ECOSUPPORT

Advanced modeling tool for scenarios of the Baltic Sea ecosystem to support decision making

SMHI (MarkusMeier) and 10 parties from 7 countries

www.baltex-research.eu/ecosupport/

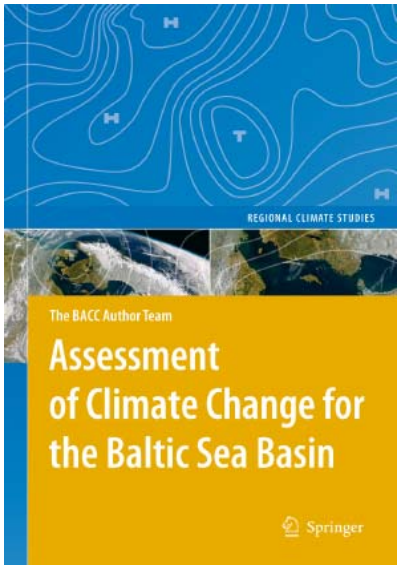
Amber

Assessment and Modelling of Baltic Ecosystem Response

Baltic Sea Research Institute Warnemünde (Joachim Dippner) and 10 parties from 4 countries

www.io-warnemuende.de/amber.html

BACC Book published in January 2008



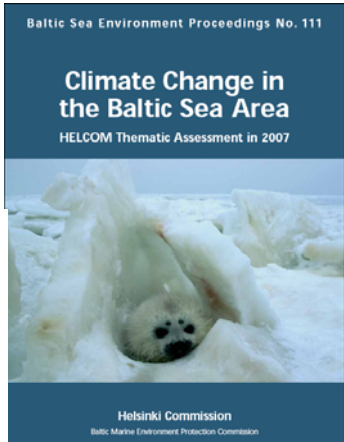
Background
Regional climate change assessments needed (IPCC has been doing global climate change assessments since 1990); the Baltic Sea basin is a convenient region due to the vast amount of material available (also partly inaccessible previousely).

Purpose
of BACC is to provide the scientific community and the public with an **assessment of ongoing and future climate change** in the Baltic Sea Basin. This is done by reviewing and assessing **published scientific knowledge** on climate change in the Basin.

→ **84 authors from 13 countries contributed on a voluntary basis. > 2000 references, ~ 10 % non-English literature**

→ **No interest or influences from political organizations or NGOs; strictly scientific, no additional or external funding**

→ **Stakeholder involvement: Helsinki Commission (HELCOM) involved**



BACC II: An update to BACC to be published in 2013

1st BACC II Lead Author Team Meeting in Gothenburg, Sweden 23-24 November 2010

- → **New lead authors and contributing authors**
- → **Extended scope (socio-economic impacts, urban regions, attribution studies)**

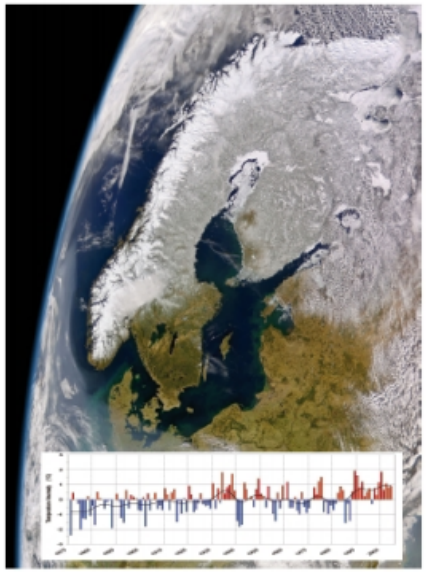
www.baltex-research.eu/BACC2/

thebaccblog.blogspot.com

Helmholtz-Zentrum Geesthacht
Centre for Materials and Coastal Research

A BSSSC / BALTEX Conference

Adapting to Climate Change
Case Studies from the
Baltic Sea Region



Hamburg
Germany
31 May 2011

International Conference for regional policy makers and administrators ("practitioners")

In collaboration with the
"Baltic Sea States Subregional Cooperation" (BSSSC) and the City of Hamburg

3 Sessions

→ **The Science Basis**
(BACC, Hans von Storch)

→ **From Science to Politics**
(Norddeutsches Klimabüro, planBaltic, BalticClimate)

→ **Case Studies**
(Practitioners from the entire Baltic Sea region)

Summary

BALTEX is a truely interdisciplinary research programme, encompassing Meteorology, Hydrology, Oceanography, Climatology, Biogeochemistry

BALTEX is about communication among scientists (networking)

BALTEX is about conveying scientifically sound information to stakeholders and decision makers („knowledge broker“) (HELCOM, BSSSC)

BALTEX Phase II terminates in 2012/2013; Successor programme in open discussion

BALTEX website: www.baltex-research.eu