

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

region. 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



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.

risks. 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.