

# History of Baltic Sea Ice Climate Workshops

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## Introduction

Ice occurs in the Baltic Sea annually for seven months, from November to June. In normal winters the Gulf of Bothnia, Gulf of Finland, and Gulf of Riga are ice covered, while further south only shallow bays and coastal areas freeze over. In cold winters the whole Baltic Sea is frozen; the most recent case is from 1947 but, however, in 1987 the coverage reached up to 96% of the total area of the Baltic Sea. The ice season has a major role in the annual cycle of the Baltic Sea via its influence on the air–sea momentum, heat and gas transfer, salinity budget of the sea, light conditions, and storage and transport of pollutants. The hydrographic and illumination conditions have further a strong influence on the ecological conditions in the basin.

In spite of the importance of the ice season in the Baltic Sea, many research programmes have overlooked the ice problems in the past. In particular this has led into serious biases in the research programmes in the northern and eastern large gulfs. Also it is well known that ice and ice-related presentations in the *Baltic Oceanographers Conference* or *Baltic Sea Science Conference* series have amounted to less than 5% of the total. Baltic Sea Ice Services have held meetings since early 20th century but these meetings have focused on practical questions such as ice codes, chart formats, and information exchange and transfer.

In the beginning of the 1990s, along with the increase of climate research in the Baltic Sea region, a workshop “Baltic Sea Ice Climate” was organised by the Department of Geophysics of the University of Helsinki. The objective was to collect sea ice scientists together on topics related to climate variability and Baltic Sea ice conditions. The workshop collected 36 participants, and in fact initiated a series of conferences on this topic, at three-year interval reaching to the 7th workshop in 2011.

## **First (1993, August): Tvärminne, Finland**

The first workshop was held in the Tvärminne Zoological Station of the University of Helsinki. The organisers were Dr. Jari Haapala and the present author. Participants came from all Baltic Sea shoreline countries except Denmark, altogether 36: 5 from Estonia, 15 from Finland, 1 from Germany, 1 from Latvia, 1 from Lithuania, 4 from Poland, 6 from Russia, and 3 from Sweden. The presentations filled two and a half days, with one half-day reserved for

an excursion to the town of Hanko (Figure 1). This is a historical sea ice site since the first all-year ship route was opened between Hanko and Stockholm in 1877. Also the Russian tsar had built a railroad there from St. Petersburg because of the feasibility of Hanko as a winter harbour.



Figure 1. The participants of the First Baltic Sea Ice Workshop, gathered at the Hanko Casino in the excursion.

In the first day mathematical modelling of sea ice in the Baltic Sea and the ice climate problem were discussed, and the second day was devoted to ice and related climatological time series. In the last day other ice related topics such as remote sensing of sea ice and the St. Petersburg dam ice problems were treated. Most of the presentations were collected in the workshop proceedings, together with the workshop recommendations and decisions (Leppäranta and Haapala, 1993).

As a practical result, a decision was made to establish a data base IDA for Baltic Sea ice climate investigations, open for all researchers to contribute and to utilize (Haapala et al., 1996). The focus was on three particular ice seasons to serve for model calibration: normal (1983/1984), severe (1986/1987) and mild (1991/1992). Also an initiative was made to start joint climatological ice time series data collection and analysis, to produce results only almost ten years later (Jevrejeva et al., 2002; 2004). Finally, the participants agreed to have the second workshop in Estonia.

### **Second (1996, September): Otepää, Estonia**

The second workshop was held in the Otepää, southern Estonia, in 2–5 September 1996. The organisers were Professor Heino Mardiste and Dr. Arvo Järvet from the Department of Geography of the University of Tartu. Participants came from all Baltic Sea shoreline countries except Latvia and Lithuania, altogether 28: 1 from Denmark, 6 from Estonia, 9 from Finland, 5 from Germany, 2 from Poland, 2 from Russia, and 3 from Sweden. The presentations filled two and a half days, with one half-day reserved for an excursion in the Estonian countryside.

Mathematical modelling and ice time series formed the main theme of the workshop (see Järvet, 1999). In addition, there were several papers about local ice conditions in different coastal regions of the Baltic Sea, such as Väinameer basin west from Estonia and the river Oder estuary. Snow conditions and freezing lakes in the Baltic Sea drainage basin were also covered in the presentations.

### **Third (September 1999): Stawiska, Poland**

The third workshop was held in Stawiska, Kaszuby, Northern Poland, in 5–8 October 1999. The organisers were Dr. Marzenna Sztobryn and Ms. Ida Stanislawczyk from the Maritime Branch of the Institute of Meteorology and Water Management in Gdynia. The site was a small resort place in a picturesque lake district. Participants came altogether 23: 2 from Estonia, 8 from Finland, 3 from Germany, 9 from Poland, and in addition one representative from WMO (World Meteorological Organization), Geneva. The presentations filled two and a half days, with intensive discussions continuing until late hours.

Mathematical modelling and ice time series form the main theme of the workshop (see Sztobryn, 2002). In addition, there were several papers on environmental questions connected with sea ice.

### **Fourth (May 2002): Norrköping, Sweden**

The fourth workshop was held in the Swedish Meteorological and Hydrological Institute (SMHI), Norrköping in 22–24 May 2002. The organisers were Professor Anders Omstedt from Göteborg University and Dr. Lars Axell from SMHI. Participants came altogether 35, containing scientists and end users: 4 from Estonia, 5 from Finland, 7 from Germany, 1 from Poland and 16 from Sweden, and additionally from outside the Baltic Sea 1 participant came from Canada and 1 from Japan. The presentations filled two and a half days, with one half-day reserved for an excursion in Norrköping.

It was clearly reflected in the presentations that the long-term modelling and time series analysis had greatly progressed since the first workshop nine years earlier (Omstedt and Axell, 2003). Now in 2002 there were several ice modelling groups around the Baltic Sea, and the picture of the ice season variability as seen by the time series had become much better

understood. For future actions two important items were recognised: extension of IDA data base to include time series and calling modellers for a climatological prediction of the ice season 2049/2050. Also it was seen that the collaboration between sea ice geophysicists and sea ice biologists was rapidly expanding in the Baltic Sea region.

#### **Fifth (September 2005): Hamburg, Germany**

The fifth workshop was held in the University of Hamburg. The organiser was Dr. Corinna Schrum. Participants came altogether 23: 2 from Estonia, 3 from Finland, 8 from Germany, 1 from Poland and 3 from Sweden, and additionally from outside the Baltic Sea there were 2 participants from Canada, 1 from France and 2 from Norway. The presentations filled two and a half days, with oral and poster sessions included.

The Baltic Sea ice climate was strongly present in the workshop, but a changing was clearly seen toward a “Baltic Sea ice science workshop”, dealing with many different types of ice problems. Also there were invited talks representing other seas of the seasonal sea ice zone, namely Bohai Sea in China, a freezing sea at 37–40°N (closest to the Equator for an annually freezing sea), and Arctic shelves. The proceedings of the workshop are presently in preparation, with Dr. Corinna Schrum as the editor.

#### ***Sixth (August 2008) Lammi, Finland***

The sixth workshop was held in Lammi Biological Station, University of Helsinki in 25–27 August 2008. The site is located 130 km north of Helsinki. The organiser was Professor Matti Leppäranta from Department of Physics, University of Helsinki. Participants came altogether 28: 1 from Denmark, 3 from Estonia, 15 from Finland, 5 from Germany, 1 from Norway, 1 from Poland, and additionally from outside the Baltic Sea 2 participant came from Japan. The presentations filled two and a half days.

It was a beautiful summer week in nature environment, and the participants could enjoy the station sauna by Lake Pääjärvi. The presentations distributed rather evenly to ice processes, ice climatology and remote sensing. There were papers from basic science of Baltic Sea brackish ice to utilization of remote sensing technology in Baltic Sea ice research. The proceedings were published in the following year, covering 188 pages (Anon., 2009). One presentation was from outside the Baltic Sea, the Sea of Okhotsk, but the role of other seasonally freezing seas still is small in this workshop series.

#### ***Seventh (August 2011) Tallinn, Estonia***

The seventh workshop was held in the Marine Systems Institute, Tallinn University of Technology, Tallinn and in Naissaar island off Tallinn in 8–10 August 2011. The organiser was Dr. Ants Erm from the Marine Systems Institute. Participants came altogether 19: 7 from Estonia, 4 from Finland, 3 from Germany, 1 from Latvia, 3 from Poland, and 1 from Russia.

The workshop lasted two and half days, with one half-day reserved for an excursion in Tallin old town.

The main topics of the workshop were interaction of Baltic Sea ice with its environment (atmosphere, Baltic Sea water body and land), climatological ice time series, sea ice dynamics and lakes of the Baltic Sea drainage basin. Ice-land interaction was an important opening in that marine infrastructure construction work is strongly increasing and also coastal on-ice human activities have not yet gained enough research interests within the Baltic Sea ice community. Snow and ice conditions in the drainage basin of the Baltic Sea were also warmly wished welcome into the workshop series. In the discussions two major topics were brought in. First, new analysis of climatological ice time series to update their statistical properties up to the last winter; in particular this information is needed for the next edition of the BACC (BALTEX Assessment of Climate Change for the Baltic Sea Basin) book next year. Secondly, critical need of ice thickness data for modelling, remote sensing and operational monitoring was recognised.

### **Final remarks**

Baltic Sea Ice Climate Workshops have been organized since 1993 at three-year intervals, the first one in Tvärminne, Finland and the seventh in 2011 in Tallinn. It has been a very enjoyable and fruitful series, with significant openings into the sea ice research of the Baltic Sea. In particular, as results have come the following: IDA data bank for ice model calibration and validation has been set up, joint modelling studies have been performed, and ice time series have been jointly analysed. Also the topics discussed in the workshops have spread from geophysics into neighbouring disciplines, in particular sea ice ecology. The proceedings books of these workshops have come to a major literature source of the Baltic Sea ice research.

In Tallinn it was agreed that the eighth workshop will come in 2014, Poland. The site will be in Szczecin lagoon, organizer Dr. Tomasz Z. Olechwir, Institute of Marine Sciences, University of Szczecin.

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