



## **Modelling the Baltic Sea ocean climate on centennial time scale; temperature and sea ice**

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The Baltic Sea has undergone large and sometimes rapid climate change in the past ranging from a generally cold little ice age to a generally warmer present. The little ice age ended in 1877 in the Baltic Sea region and the temperature has since increased more than 0.7°C during the past century. This directly impacts the maximum ice extent as it is dependent on the mean winter air temperature. Still, the range of the natural variability is not fully understood. It is of great interest to understand how the Baltic Sea will respond to future climate change, whether caused by natural variability or in combination with anthropogenic influences. Recent breakthroughs in climate research related to the Baltic Sea have made meteorological datasets on centennial timescales available. These datasets originate from high quality station data from 1893 and onwards and gridded multi-proxy reconstructions spanning the period 1500-2001. Using a process oriented coupled basin model we here investigate whether or not these datasets are suitable as forcing when modelling horizontally and vertically integrated water temperature and maximum ice extent of the Baltic Sea. The results are encouraging and are in good agreement with independently measured and historical data used as validation. The results indicate that the 20<sup>th</sup> century was the warmest century in the region with the least maximum ice extent of the last 500 years. On a decadal time scale, the 1990s, 1930s, and 1730s were the warmest decades and comparable in terms of both water temperature and maximum ice extent. Even though different climate forcing mechanisms may operate on the climate system today compared to over the last half millennium, it cannot clearly be stated that the region is experiencing climate change outside the natural limits of the past 500 years.