Geophysical Research Abstracts
Vol. 21, EGU2019-4862, 2019
EGU General Assembly 2019

Influence of global mean sea level rise on salt water inflow events

Sandra-Esther Brunnabend, Ulf Gräwe, Xaver Lange, and H. E. Markus Meier

Leibniz-Institute for Baltic Sea Research Warnemünde, Section Physical Oceanography and Instrumentation, Rostock, Germany (sandra.brunnabend@io-warnemuende.de)

The Baltic Sea is a semi-enclosed sea and consists of brackish water with a salinity of about 7 g/kg. It sporadically experiences salt water inflow events through the Danish straits with strong inflows occurring once per year on average. An increase in mean sea level, which is expected to rise similarly to the projected global mean sea level (GMSL), impacts the dynamics of these salt water inflow events. Therefore, we use a regional setup of the ocean circulation model GETM spanning over the western Baltic Sea and having a spatial resolution of 600 meter to investigate the response of GMSL rise to inflow events during the years 1980 to 2015. As case study, the processes of a recent inflow event in December 2014 are additionally simulated with a model setup, using a horizontal resolution of 200 meter. It is analyzed how transports of volume and salt would differ, if GMSL would be one meter higher than present day sea level. Hence, a simulation is performed with the same model setup as the reference simulation, only the bathymetry of the model setup is deepened by one meter.
The results of the reference model simulations are evaluated by comparisons with observations. For example, salinity and temperature at two stations located at the Darss Sill and in the Arkona Basin agree well. In addition, the volume transport through the Öresund, computed from sea surface height in Viken and Klagshamn, have a correlation of 0.96 with observations during the years 2014 and 2015 (nudging of sea surface height is applied at the model boundaries).
A detailed analysis of the change in the physical processes with one meter GMSL rise will be presented. However, first analyses of the inflow event in December 2014, simulated with the 600m GETM model setup, show that the duration of this event did not change. However, the volume of high saline water (> 17 g/kg) in the Arkona Basin increased by about 10.7% during the inflow event. In addition, results show similar relative changes in volume and salt transport through the Danish straits (at Darss Sill and Drodgen Sill), and a less than 2% higher relative salt transport than volume transport when considering only the transports where salinity is greater than 17 g/kg. These results suggest a quite linear increase in salt inflow with increasing volume transport through the Danish straits during this inflow event.