Geophysical Research Abstracts
Vol. 18, EGU2016-15634, 2016
EGU General Assembly 2016


# Disentangling the role of atmospheric and oceanic conditions in the occurrence of major Baltic inflows: The importance of haline stratification in the Belt Sea.

Katharina Höflich (1), Andreas Lehmann (1), and Kai Myrberg (2)

(1) GEOMAR Helmholtz Centre for Ocean Research Kiel, Germany (khoeflich@geomar.de), (2) SYKE Finnish Environment Institute / Marine Research Centre, Helsinki, Finland

The Baltic Sea is a semi-enclosed body of water connected to the North Sea only via the shallow and narrow Danish Straits. Of special importance to the salinity dynamics of the Baltic Sea are so-called major Baltic inflows (highly saline barotropic inflows), that also comprise the only process by which oxygen is supplied to below halocline water masses. Large barotropic inflows (or large volume changes) of the Baltic Sea can be identified from the sea level at Landsort, where the number of large barotropic inflows is found to exceed the number of major Baltic inflows. The occurrence of major Baltic inflows is typically attributed to a sequence of large-scale easterly and westerly atmospheric circulation patterns, that have recently also been linked to the occurrence of large barotropic inflows in general. In this context the widely accepted view that atmospheric conditions (and hence the evolution of the sea level in the North Sea – Baltic Sea system) are of exclusive importance to the occurrence of major Baltic inflows becomes questionable. In this study we attempt to disentangle the role of oceanic and atmospheric conditions to the occurrence of highly saline barotropic inflows, with special focus on the role of the hydrographic conditions in the Belt Sea. For the period 1979—2015 and using a realistic three-dimensional numerical ocean model of the Baltic Sea we find that the salinity of the barotropic inflow significantly depends on the availability of saline water masses in the Belt Sea. However, detailed investigation on the time evolution of the single barotropic inflow reveals differences in the rapidness and magnitude of the inflow events. Both are in fact good predictors for the salinity of the inflow, highlighting that within the set of large barotropic inflows also differing atmospheric conditions must play some role in the formation of the salinity of the inflowing water mass. In order to further specify the importance of the hydrographic conditions in the Belt Sea, sensitivity experiments with the major Baltic inflow of December 2014 are perfomed. It is shown that under identical atmospheric boundary conditions the salinity of the inflowing water depends fundamentally on the availability of saline water masses in the Belt Sea. We conclude that oceanic conditions in the hydrographic field of the Belt Sea are indeed more important to the occurrence of major Baltic inflows than has previously been thought.