



Spring re-stratification in the Baltic Sea: linking in-situ and satellite data

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Spring re-stratification in the Baltic Sea is a complicated process: the winter-time two-layered density (salinity) stratification of estuarine nature is step-by-step replaced by the summer-time three-layered thermo-haline stratification with the Cold Intermediate Layer (CIL) in-between the salty bottom waters of oceanic origin and warmed and freshened surface waters. During this time period, a fast and strong changes in thermo-haline structure develop through the vivid activity of thermohaline intrusions, observed within and immediately below the pycnocline and are remarkable by their extremely low temperature. We report field observations of such cold/saline intrusion activity above the shelf, in intermediate layers, and within the upper pycnocline of the Gdansk Bay (south-eastern part of the Baltic Sea) in early spring (March and April 2013) and demonstrate that they are most probably caused by the large-scale exchange processes within the sea water body. Characteristic features of the intrusions are analyzed. T,S-analysis of vertical profiles from HELCOM monitoring stations and data of the Arkona basin buoy for March-April 2013 suggest that the intrusion waters were formed in the western part of the Bornholm Basin in March. Numerical simulation results from Copernicus reanalysis allow tracing the possible way of propagation of the intrusion waters. Remote sensing data highlight the aquatories with the coldest surface waters in March-April 2013, which potentially could be the source regions for the observed intrusions. It is hypothesized that intensification of intrusion activity in intermediate layers is every-spring phenomenon, being a part of the whole process of transfer from winter-time to summer-time vertical stratification in the Baltic Sea.