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Characteristics of the Baltic Sea Cold Intermediate Layer on the base of field data

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Cold Intermediate Layer (CIL) is observed in the Baltic Sea deep areas (depth more than ∼60 m) from March to September/October and is easily identifiable at depths 30-60 m by its low temperature (∼2-4 C). The main objectives of the work were (i) to develop a criterion of allocation of the CIL in general thermo-haline structure, (ii) to define the CIL using this criterion on the basis of real field data for 2004-2006 years and (iii) to analyze a range of its characteristics (temperature, salinity, density, thickness, location, stability at interfaces, etc.) after those winters (of different severity).
Even though cold intermediate layers are often found in inland seas with strong pycno/halocline (the Black Sea, the Marmara Sea, the Mediterranean), quite different criteria of their allocation are used. For the Baltic, there isn't commonly used criterion. It has been found most convenient to use the following one: the CIL in the Baltic Sea is to be defined as a layer between maximum negative and maximum positive temperature gradient within vertical water column. With this definition, allocation of the CIL on vertical temperature/salinity/density profiles was performed using field data obtained in 2005-2006 during cruises of r/v "Professor Stockman" (P.P.Shirshov Istitute of Oceanology RAS; data courtesy Dr.V.Paka, Dr.D.Dorohov) in the Baltic Sea coastal zone and of r/v "Gauss" (Baltic Sea Research Institute at Warnemuende; data courtesy Dr.R.Feistel) in the Baltic Proper.
Analysis of mean annual data, published on CD with the book "State and Evolution of the Baltic Sea 1952-2005" (data of IOW), has demonstrated that from about 80 quadrates (1' x 1') of the Baltic Sea area, in 43 quadrates water temperature within the CIL is lower than the lowest water surface temperature. This shows that the CIL contains waters advected horizontally. In order to find spatial correlations, T-S analysis was applied, demonstrating that the CIL waters might drift from south-western rather than northern areas, since water salinity increases towards Danish Straits whilst low temperature is commonly found in winter in coastal areas allover the Baltic Sea. Conclusions are: (i) the Baltic CIL contains waters, advected from shallow areas; (ii) most possibly, spring transition of a water temperature in upper layer across the temperature of the maximum density is important for the formation of the CIL. The suggested criterion of the Baltic CIL allocation is convenient for its description and useful for understanding of the mechanisms of its formation.
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