



Vertical thermo-haline structure of the Baltic Sea cold intermediate layer

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Main characteristic features of vertical thermo-haline structure of the cold intermediate layer (CIL) of the Baltic Sea are identified on the base of data of vertical CTD soundings in the Baltic Proper in 2004-2013. Permanently existing components (i.e. the components which are observed during the entire period of the presence of the CIL in the vertical thermo-haline structure of the sea) are: (i) quasi-homosaline sublayer, with water salinity typical for that in the upper mixed layer in winter period, and water temperature irregularly changing with depth; (ii) the underlying sublayer with increasing salinity and low temperature (the gradient sublayer); and (iii) the core of CIL (the minimum temperature), which is located close to the interface between these sublayers.

It is argued that the homosaline sublayer is formed by local mechanisms - vertical wind-wave and convective mixing and advection from nearby shelves and neighbouring regions. Advection is supported by (i) long-lasting winds and (ii) horizontal convection due to differential warming / cooling of shallower regions. The gradient sublayer is formed by waters with T,S - parameters typical for that of the upper mixed layer of south-western sea basins (Barnholm and Arcons basins) at the beginning of spring warming-up period (March). It is suggested that the up-estuary propagation of these waters (with salinity about 7.5-8.5 psu) above the pycnocline is driven by the estuarine salinity gradient. This branch of circulation of intermediate waters is overlooked in classical estuarine circulation model of the Baltic Sea, however it is important for sea-scale transport of upper-layer contaminants, microplastics, organic matter etc. towards intermediate and deep sea layers. The investigations are supported by Russian Science Foundation via grant number 15-17-10020.