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# Comparative analysis of the vernal and wintry thermally-induced structural front in the Baltic Sea on base of field data

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This study is a continuation of thermally-induced structural front investigation (a direct analogue of the lacustrine thermal bar – front, associated with the temperature of maximum density, Tmd = 3.98°C for the fresh waters) in the Baltic Sea during spring and winter periods. The manifestation and specific features of the vernal structural front after winters of varying severity were examined (Demchenko et al., 2011). The Baltic Sea exhibits 2 layers of salinity stratification, consisting of an upper freshened layer (down to a depth of 70 m in the Baltic proper) that is almost homogeneous in terms of salinity, and a more salty deep layer below the permanent pycno(halo) cline. The spring thermal front travels only to the upper layer, with the halocline playing the role of a 'liquid bottom'. The speed of structural front propagation is derived from an interplay of 3 physically different factors: (1) south–north variations in incoming solar radiation, (2) bottom and pycnocline topography, and (3) significant variation of the Tmd-value due to large horizontal salinity differences (increasing in a northerly direction). In the present study a comparative analysis of thermal structure in presence of the Tmd during spring and winter periods was performed. The following field data were analyzed (1) Subsurface temperature, salinity and chlorophyll-a along the sections Travemüende - Gdynia – Helsinki and Travemüende - Helsinki performed by Finnish Environment Institute for the spring 2010 and winter 2010-2011. (2) Subsurface temperature and salinity, measuring every hour during spring period 2010 and winter period 2010-2011 in the MARNET stations (Arkona basin, Darss Sill, courtesy of the BSH, www.bsh.de). It was concluded, that after severe winter 2010/2011 the vernal structural front, associated with the Tmd, has the same features as after severe winter 2002/2003. Thermal structural front is formed in winter as well; its specific features were revealed. The thermal front, developing near the gentle slopes, is much shaper in comparison with the front in the open Baltic. The two-phase propagation of the thermal front was observed; the speed of the Tmd was estimated for both seasons: vernal thermal front moves faster.
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