Abstract View

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A Model for the Exchange of Water and Salt Between the Baltic and the Skagerrak

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ABSTRACT

A model for the exchange of salt and water between the Baltic and the Sea (the Skagerrak) is presented. Because of strong inter-basin interactions in the Baltic entrance area, the model must include the Kattegat and the Belt Sea. These are modeled by horizontally homogeneous two-layer sub-models. The most prominent dynamical properties of the sub-models are wind-driven entrainment flows and rotational-baroclinic, hydraulic controls. The model is driven by a meteorologically forced barotropic transport Q_h [calculated from the freshwater supply to the Baltic (Q_f) and the sea level fluctuations in the Kattegat], and turbulent entrainment flows coupled to the wind speed W and, in the Belt Sea, also to the barotropic transport. The most important bathymetric features of the basins are included.

The model equations are integrated numerically for a test period of 1½ years. The stratification in the Kattegat, as well as in the Belt Sea, is quite well predicted. It is found that approximately one-half of the salt transport into the Baltic is carried out by the dispersive mode associated with the barotropic fluctuations.

The effects of (short-term) changes in the external parameters Q_h, Q_f, W S_{2K} (the salinity of the Skagerrak water) upon the stratification in the Belt Sea and the Kattegat are also investigated. Finally, the effects of long-term changes in the external parameters upon the surface salinity of the Baltic are investigated.

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