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A H-N model for the calculation of steady wind- and density-driven circulation in the Baltic Sea. 1. Theoretical bases. Steady wind-driven circulation in a homogeneous basin.

Abstract

   The theoretical principles of a hydrodynamic - numerical model (H - N) are described and the computation results of flows in a constant - density sea basin were performed.
  The H - N model is based on a non - stationary, linearised system of equations of motion (with a constant vertical turbulent momentum exchange coefficient), the continuity equation and hydrostatic equations, in which flows are generated by time - constant exciting forces (wind tangential stress and a stress generated by the spatial non - homogeneity of the density of water.
  The sea level is determined from a numerically calculated system of equations for the mass transport and sea level, and the horizontal components of the current from an analytical Ekman - type solution.
  The uniqueness of the solution of the system of equations for mass transport and sea level with assgned boundary and initial conditions was demonstrated.
  The preparation of the numerical grid, bathymetry and the wind field for the requirements of the H - N models is discusses, as are the results of calculated wind driven flows for a westerly wind with constant velocity and the computed wind field for August.
  With the aid of the linearity of the H - N model equations, the influence of the atmospheric pressure gradients and the circulation caused by inflows from the main Baltic rivers on steady wind driven flow fiels in the Baltic could be evaluated. It was shown that in the presence of strong winds the influence of river water inflows on the water circulation in a sea area of homogeneous density can be neglected.