Parmuzin E.I., Agoshkov V.I., Zakharova N.B.
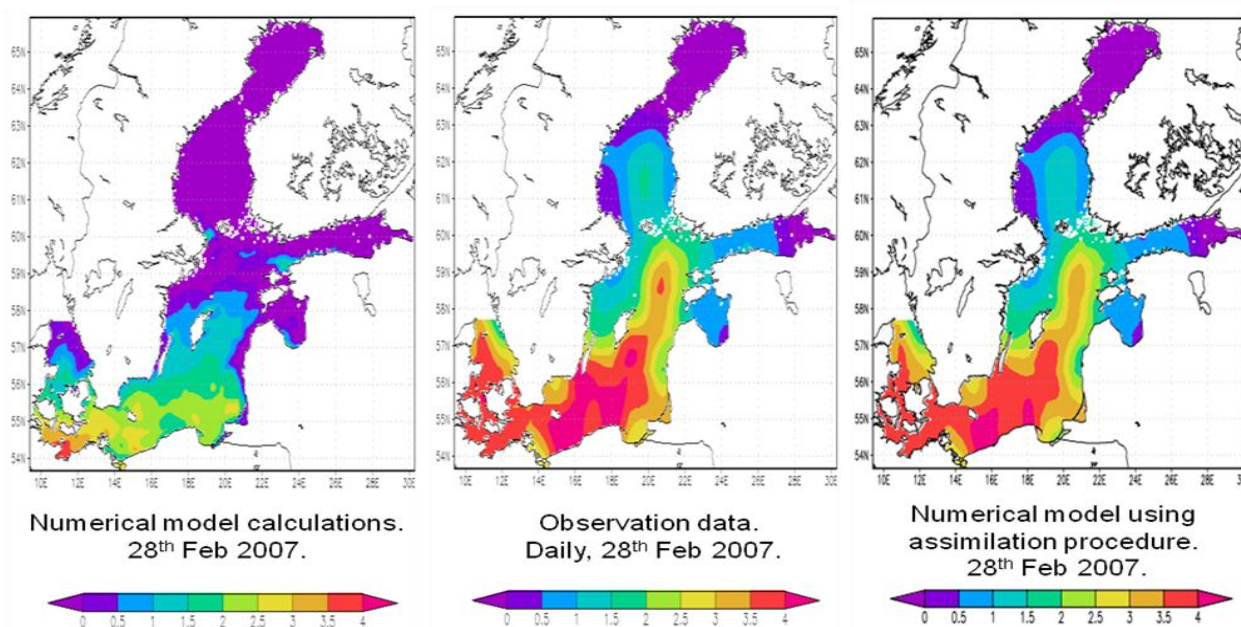
Institute of Numerical Mathematics RAS

Variational data assimilation problem for the Baltic Sea thermodynamics model

The most versatile and promising technology for solving problems of monitoring and analysis of the natural environment is a four-dimensional variational data assimilation of observation data. The development of computational algorithms for the solution of data assimilation problems in geophysical hydrodynamics is important in the contemporary computation and informational science to improve the quality of long-term prediction by using the hydrodynamics sea model. These problems are applied to close and solve in practice the appropriate inverse problems of the geophysical hydrodynamics.

In this work the variational data assimilation problems in the Baltic Sea water area were formulated and studied [1]. We assume, that the unique function which is obtained by observation data processing is the function and we permit that the function is known only on a part of considering area (for example, on a part of the Baltic Sea).

Numerical experiments on restoring the ocean heat flux and obtaining solution of the system (temperature, salinity, velocity, and sea surface height) in the Baltic Sea primitive equation hydrodynamics model [2] with assimilation procedure were carried out. In the calculations we used daily sea surface temperature observation from Danish meteorological Institute, prepared on the basis of measurements of the radiometer (AVHRR, AATSR and AMSRE) and spectroradiometer (SEVIRI and MODIS). The spatial resolution of the model grid with respect to the horizontal variables amounted to 0.0625*0.03125 degree. The results of the numerical experiments are presented.

Numerical model calculations. 28th Feb 2007.

Observation data. Daily, 28th Feb 2007.

Numerical model using assimilation procedure. 28th Feb 2007.

References:

[1] Agoshkov V.I., Parmuzin E.I., Zakharova N.B., Zalesny V.B., Shutyaev V.P., Gusev A.V. Variational assimilation of observation data in the mathematical model of the Baltic Sea dynamics // Russ. J. Numer. Anal. Math. Modelling, 2015, V. 30, No. 4, PP. 203–212.

[2] Zalesny V.B., Gusev A.V., Chernobay S.Yu., Aps R., Tamsalu R., Kujala P., Rytkönen J. The Bal-tic Sea circulation modelling and assessment of marine pollution, Russ. J. Numer. Analysis and Math. Modelling, 2014, V 29, No. 2, pp. 129–138.