Geophysical Research Abstracts,
Vol. 10, EGU2008-A-06595, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-06595
EGU General Assembly 2008
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Dynamical processes in the Black Sea. Simulation and forecast.

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A 3D baroclinic prognostic basin-scale and nested-grid regional models of sea dynamics developed at the Institute of Geophysics (Tbilisi/Georgia) are used for modelling and studying of hydro and thermodynamic processes in the Black Sea. The models are based on a full system of ocean hydrothermodynamic equations in z-coordinates using hydrostatic approximation. A two-cycle splitting method regarding physical processes, coordinate planes and lines is used for solution of model equation systems.

The basin-scale model with 5 km resolution is applied for simulation of inner-annual variability of Black Sea circulation processes under forcing of different averaged atmospheric circulation types (24 wind types) including storm winds and almost still conditions. The results of numerical experiment have shown that under the influence of strong non-stationary of atmospheric processes water circulation in the upper layer of the Black Sea undergoes significant qualitative and quantitative changes. The upper 20-30 meter layer of the sea is especially sensitive to variability of atmospheric circulation. Below this layer at any atmospheric wind forcing the Black Sea circulation almost always receives general cyclonic character with internal cyclonic rotations and coastal anti-cyclonic eddies.

The high-resolution regional nested grid model (1 km spacing) was used for simulation and forecasting of hydrophysical fields in the Georgian near-shore zone during 22-26 July 2005. During these five days the pilot experiment on operational functioning of the Black Sea Nowcasting/Forecasting System has been carried out in the framework of International project ARENA for the fist time in the Black Sea region. The regional

model was nested in a basin-scale model of Marine Hydrophysical Institute (MHI, Sevastopol/Ukraine). All input data required for 2-days forecasts in the Georgian near-shore zone were obtained from MHI by Internet in near-real time regime. Comparison of results of forecasts calculated by model of MHI and high-resolution regional model showed that the regional model describes well formation and evolution of small coastal eddies, which cannot be identified by the basin-scale model.