



MARINE HYDROPHYSICAL INSTITUTE
Russian Academy of Sciences
<http://mhi-ras.ru>

Sensitivity of modeling results of the Black Sea level to the choice of boundary conditions on the free surface

Olga Dymova, Sergey Demyshev
olgadym@yahoo.com

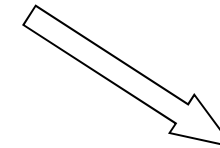
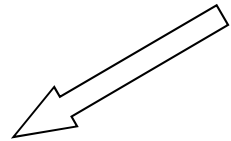
**INTERNATIONAL YOUNG SCIENTISTS SCHOOL AND CONFERENCE
on Computational Information Technologies for Environmental Sciences
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NUMERICAL EXPERIMENTS

MHI-model [1]

1. Resolution – $0.02^\circ \times 0.015^\circ$ ($\approx 1,6$ km);
27 z-levels
2. Vertical mixing – Mellor-Yamada
turbulence closure model 2.5
3. Bathymetry – ODB MHI
4. Forcing – SKIRON 2011
5. Rivers and straits
6. Initial fields – climatic U, V, ζ, T, S



Experiment 1:

linearized kinematic condition
on the sea surface

$$w|_{z=0} + \frac{\partial \zeta}{\partial t} = \frac{Pr - Ev}{\rho_0}$$

Experiment 2:

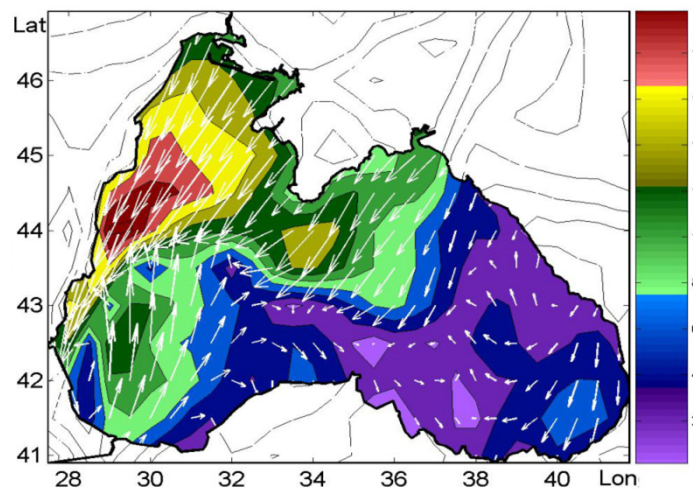
full kinematic condition
on the sea surface

$$w|_{z=0} + \frac{\partial \zeta}{\partial t} + u \frac{\partial \zeta}{\partial x} + v \frac{\partial \zeta}{\partial y} = \frac{Pr - Ev}{\rho_0}$$

SEA LEVEL MODELING

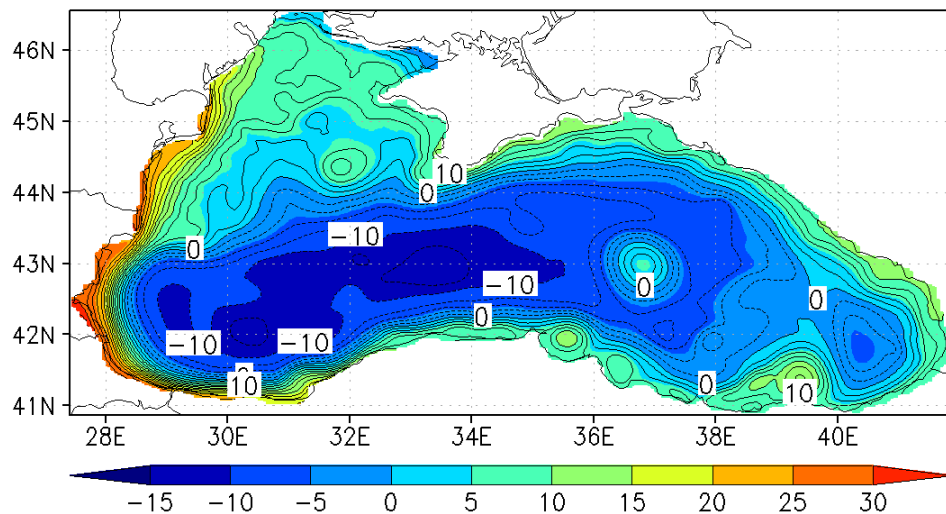
Storm on 18th October, 2011

Wind speed (m/s) on 17.10.11 by
[http://dvs.net.ru/mp/data/vel/jpg/wind/wind_](http://dvs.net.ru/mp/data/vel/jpg/wind/wind_bs_nomad_2011101712.jpg)
[bs_nomad_2011101712.jpg](http://dvs.net.ru/mp/data/vel/jpg/wind/wind_bs_nomad_2011101712.jpg)



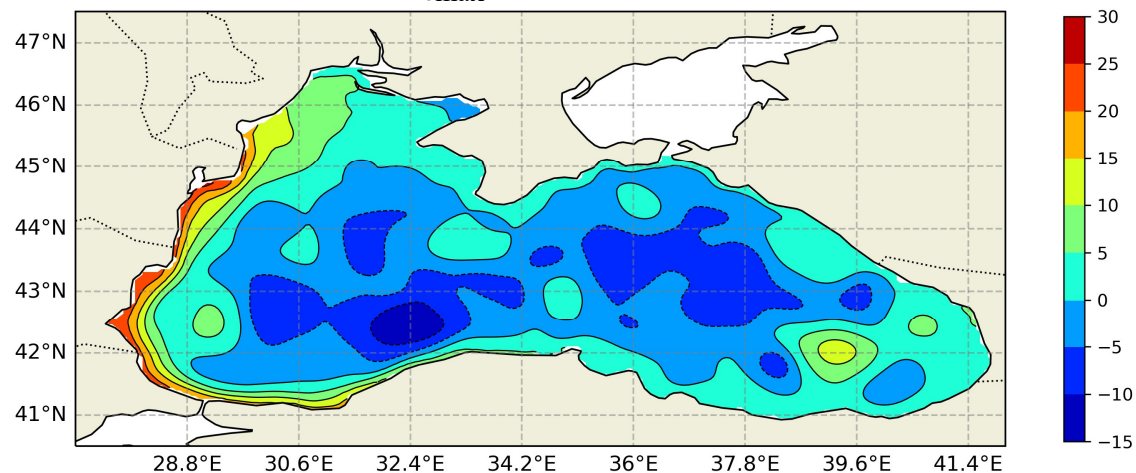
Experiment 1

$\zeta_{\max} = 33.2$ cm



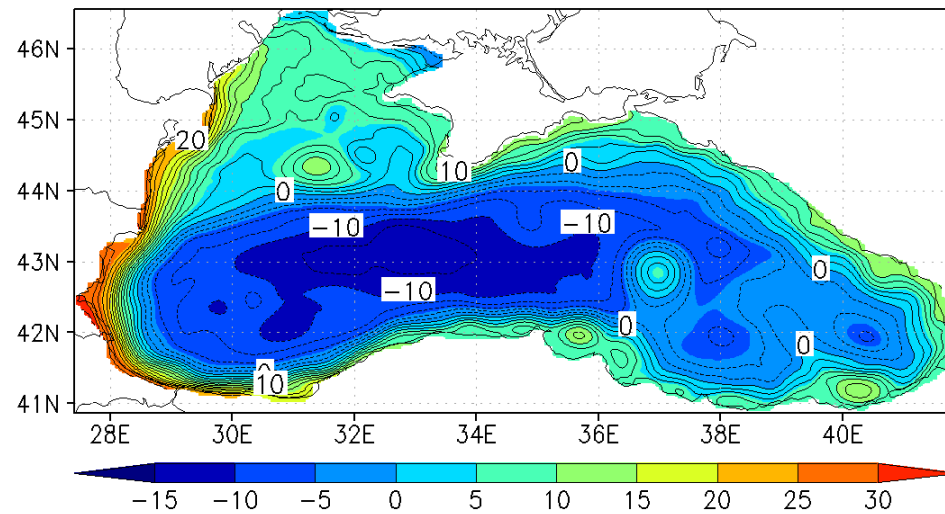
Sea level with altimetry assimilation by
Marine Predictions Centre of MHI (<http://www.innovation.org.ru>)

$\zeta_{\max} = 32.9$ cm

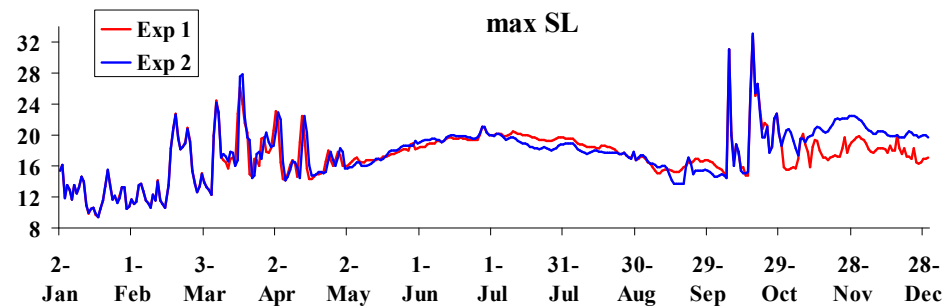
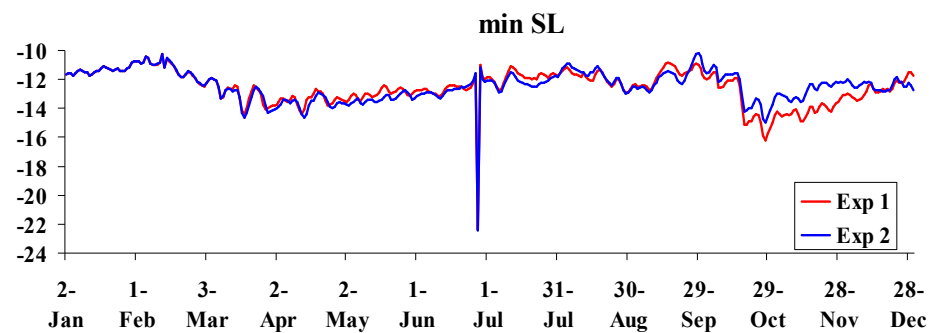
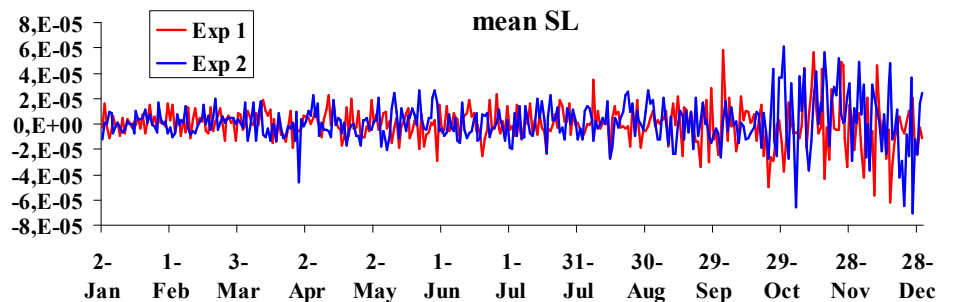


Experiment 2

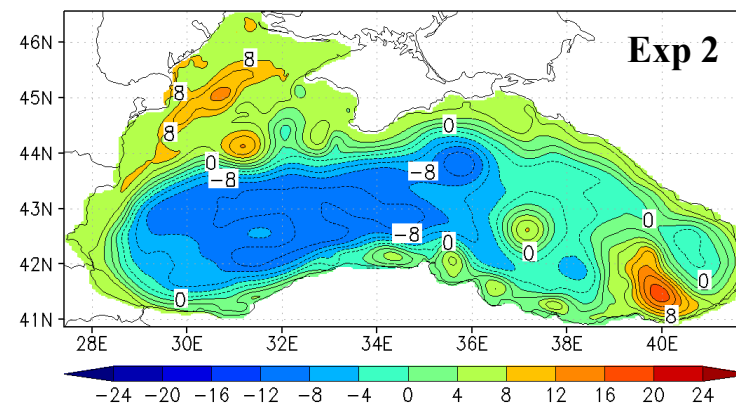
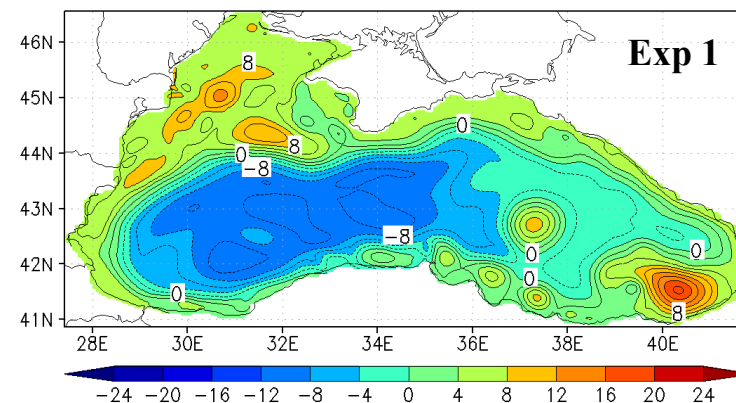
$\zeta_{\max} = 32.8$ cm



SEA LEVEL statistic (cm)



August 10, 2011



$$\Delta\zeta = \zeta_1 - \zeta_2$$

