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Numerical simulations of the local circulation at the border between water masses with different absorption capabilities

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Non-uniform spatial distribution of radiant heating rate (RHR) is induced by sufficiently high gradient of the absorption coefficient in the horizontal direction, which could be caused, for example, by presence of phytoplankton in a body of water. This brings about that local maxima and minima in the temperature field occur. Temperature gradient results in the horizontal pressure gradient, which forces the local circulation. The flow patterns occurring at the border between water masses with different absorption properties are investigated. Two cases of simple, continuous absorption distributions, which describe vertical and inclined planes of sharp changes in the water absorption value, are considered. The numerical model's momentum equations assume a steady state, include vertical eddy viscosity and velocity advection. In the numerical model there is also resolved equation of heat transport with temperature advection and diffusion.

The numerical solution of the circulation after short period of water heating in the investigated area is obtained. After longer time of heating, obtained values of velocities, especially the vertical one, seem to be highly unrealistic. The main conclusion of the presented analysis is, that in order to obtain proper values of the flow velocities after longer period of water heating, the transport of optical sea water properties should be take into consideration. Future work will also concern nonsteady state of the flow in the domain of investigation.