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Numerical simulation of convective boundary layer above polynyas and leads.

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Arctic region is very important as one of drivers for global atmosphere circulation. Meanwhile, results of modern global atmospheric models, both climatic and weather forecasting differs significantly from each other and observations in this region. One of the reasons for these uncertainties can be inaccurate simulation of ice and snow cover distribution, which accuracy depends in turn on variety of factors. Among others, appropriate parameterizations of atmospheric boundary layer over inhomogeneous surface, not explicitly resolved at the atmospheric model grid, can decrease these inaccuracies. The main objective of these parameterizations is to calculate surface heat and water vapor fluxes, averaged over the whole model cell. However, due to great differences in structure of boundary layers formed over cold ice and relatively warm open water, which cause nonlinear dependencies,the parameterizations suggested to the moment can hardly be regarded as applicable for "complete" set of synoptic scenarios .

The present paper attempts to improve standard mosaic method of flux aggregation, which is still common in climate models [1]. The main idea is to derive heat fluxes using data from numerical experiments, explicitly reproducing most of sub grid (for global models) turbulence motions spectra, and compare with fluxes calculated using mosaic method implying the part of model domain to be a global model cell. The study is based on idealized high resolution ($\sim$10 m) experiments with typically observed surface parameters (temperature and roughness), ice-open water distribution, initial temperature and wind profiles distribution included in Large Eddy Simulation model of Insitute of Numerical Mathematics RAS [2],[3]. Analysis of other boundary layer characteristics such as its height, eddy diffusivity profiles, kinetic energy is presented. The modeling results are compared with field experiments' data gathered at White Sea.

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