Polynyas and leads are openings in the pack ice due to divergences in ice drift and to the local melting. In winter they are the major source of brine during freezing and a locus for gas exchange. Heat exchange at the open water surface of a lead or polynya is 2 orders of magnitude greater than that through surrounding snow covered pack ice, so even a small percentage of these features and of thin ice can dominate regional heat budgets in winter.

The central theme of our work is the study of the influence of polynyas and leads on the atmospheric boundary layer structure. Modification of atmospheric boundary layer during advection from sea ice to water and visa versa (off-ice and on-ice flows) can be of large magnitude and is associated with intensive energy exchange between the surface and the atmosphere. The surface fluxes of sensible heat can reach the values higher than 500 W/m² in cases of cold air outbreaks and above polynyas. The dynamics of boundary layer during off-ice, on-ice, and parallel to ice flows is investigated by numeric modeling in order to validate various parameterizations of turbulent exchange on different spatial resolution. The effect of open leads within sea ice on the near-surface atmospheric temperature is estimated using the 1D atmospheric model coupled with a thermodynamic snow/sea ice model. Modeling results will be compared with observations. The work was sponsored by RFBR grant.