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The Impact of Mixed-Phase Microphysical Processes on the Turbulence in Low-level Clouds in the Arctic

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The proper representation of Arctic mixed-phased clouds remains a challenge in both weather forecast and climate models. Amongst the contributing factors is the complexity of turbulent properties of clouds. While the effect of evaporating hydrometeors on turbulent properties of the boundary layer has been identified in other latitudes, the extent of similar studies in the Arctic has been so far limited.

Our study focus on the impact of heat release from mixed-phase microphysical processes on the turbulent properties of the convective low-level clouds in the Arctic. We employ high-resolution simulations, properly constrained by relevant measurements.
Semi-idealised model cases are based on convective clouds observed during the recent campaign in the Arctic: ACLOUD, which took place May--June 2017 over Fram Strait. The simulations are performed in Dutch Atmospheric Large Eddy Simulation (DALES) with double-moment mixed-phase microphysics scheme of Seifert & Beheng.

The results indicate an enhancement of boundary layer turbulence is some convective regimes.
Furthermore, results are sensitive to aerosols concentrations. Additional implications for the role of mixed-phase clouds in the Arctic Amplification will be discussed.