Ice effects on the cloud dynamics (Ovchinnikov, Korolev, Fan)

**ISDAC FLT31: Initial profiles and model’s setup**

LES, 50 m horizontal and 20 m vertical grid size, 256x128x120 domain, $\Delta t=2$ s
Bin microphysics for liquid and ice
Liquid-only dynamics spin-up for 2 hrs
Elevated mixed-layer with temperature inversion at the top and slightly stable and moister layer below
ISDAC FLT31: Base case cloud properties \((N_i=0.5 \text{ L}^{-1})\)

Near liquid saturation

Ice supersaturated

deposition

sublimation
Sensitivity to $N_i$

Stable LWP for the BASE, increasing for NO_ICE, decreasing for HI_ICE

BASE: $N_i = 0.5 \text{ L}^{-1}$

NO_ICE: $N_i = 0 \text{ L}^{-1}$

HI_ICE: $N_i = 2 \text{ L}^{-1}$
Changes in profiles 30 min after the appearance of first ice

Changes from the NO_ICE
Linear versus non-linear responses to changes in $N_i$

- Initial changes in LWC and $Q_{rad}$ are proportional to $N_i$
- Changes in buoyancy flux and vertical velocity variance are non-linear