

MMM SEMINAR SERIES



Evaluating ice crystal growth in supercooled clouds in ICON-LES

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The ice phase in clouds is essential for precipitation formation over continents. The underlying processes for ice growth are still poorly understood, leading to large uncertainties in precipitation forecasts and climate simulations. One crucial aspect is the Wegener-Bergeron-Findeisen (WBF) process, which describes the growth of ice crystals at the expense of cloud droplets leading to a partial or full glaciation of the cloud. In the CLOUDLAB project, we employ glaciogenic cloud seeding to initiate the ice phase in supercooled low-level clouds in Switzerland using uncrewed aerial vehicles with the goal to investigate the WBF process. An extensive set-up of ground-based remote sensing and balloon-borne in situ instrumentation allows us to observe the formation and subsequent growth of ice crystals in great detail. In this study, we compare the seeding signals observed in the field to those simulated using a numerical weather model in large-eddy mode (ICON-LEM). We first demonstrate the capability of the model to accurately simulate and reproduce the seeding experiments across different environmental conditions. Second, we investigate the WBF process in the model by comparing the simulated cloud droplet and ice crystal number concentration changes to in situ measurements. In the field experiments, simultaneous reductions in cloud droplet number concentrations with increased ice crystal number concentrations were observed with periods showing a full depletion of cloud droplets. The model can reproduce the observed ice crystal number concentrations most of the time, but not the observed fast reductions in cloud droplet number concentrations. Our detailed analysis shows that the WBF process appears to be less efficient in the model than in the field. In the model, exaggerated ice crystal number concentrations are required to produce comparable changes in cloud droplet number concentrations, highlighting the inefficiency of the WBF process in ICON.

Thursday, 9 May 2024, 2:00PM

Refreshments 1:45PM

Please also join colleagues for refreshments and informal discussion after the seminar until 3:30pm

NCAR-Foothills Laboratory, 3450 Mitchell Lane

FL2-1022, Large Auditorium

Seminar will also be live webcast

<https://operations.ucar.edu/live-mmm>

Participants may ask questions during the seminar via Slido.