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Simulation of convective precipitation in idealized and realistic supercell cases with the P3 cloud microphysics scheme in ICON

Friday 21 March 2025 12:30 (15 minutes)

Many uncertainties exist in the parameterization of microphysical processes in bulk schemes. The Predicted Particle Properties (P3) bulk scheme lets ice particles seamlessly evolve in a more natural way without the necessity of conversion between pre-defined ice-phase categories. Therefore microphysical processes like riming, which is the key process in hail production, can be formulated more realistically. In this study the P3 scheme was coupled to the Icosahedral Nonhydrostatic model (ICON) via the new Community Interface ComIn. The recent version 5 of P3 (Cholette et al., J.A.M.E.S, 2023) is able to run with three moments and multiple categories for the ice phase, allowing the simulation of hail without numerically diluting it in areas of new ice nucleation. The correct physics-dynamics coupling behavior was tested comparing P3 with ICON' s traditional 2-moment bulk scheme in an idealized splitting supercells testcase. The different approaches in handling the condensation of both schemes were explored, including their impacts for different cloud condensation nuclei (CCN) concentrations. Further, a realistic case study of isolated supercells on 10 Nov 2018 in Central Argentina from the RELAMPAGO-CACTI campaign was set up with ICON and both schemes at storm-resolving resolutions. A custom CCN parameterization was developed using aerosol measurements of CACTI to constrain this sensitivity pathway. Finally a forward operator is used to compare polarimetric simulated fields to polarimetric radar measurements of RELAMPAGO. Sensitivities to perturbations of microphysical parameters in the P3 scheme will be shown.

VAT

Session

Enhancing Process Understanding: Model parameter estimation

Preferred Contribution Type

Oral Presentation

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