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Convection over Southern Scandinavia: a Modeling Perspective

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Understanding ice microphysics processes within storms is key to developing parameterizations that accurately represent them in models. In this study, we analyze the ice formation pathways of a convective system observed over southern Scandinavia during the airborne TPEx campaign (Konjari et al., 2025). Using the ICOsahedral Nonhydrostatic (ICON) modeling framework (version 2024.7), we performed a high-resolution simulation (400 m horizontal, 150 m vertical) with the ice-mode implementation that differentiates between five formation mechanisms (Lüttmer et al., 2025). We identified and tracked convective cells using tobac (Tracking and Object Based Analysis of Clouds, Heikenfeld et al., 2019), analyzing only those whose complete life cycles were captured. For each stage of the life cycle (developing, mature, and dissipating) we examined the importance of each formation pathway by altitude, further distinguishing between the convective core and the anvil and analyzing overshoots as a sub-case. Our results suggest, for example, that homogeneous drop freezing was the most important source of the ice crystals in the overshooting anvil of the convection. Additionally, we compare our conclusions to the ones made by Konjari et al. (2025) based on observations of the same study case.

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