

## Project title: **ICE2DYN: From Ice Microphysics to Midlatitude Dynamics and Predictability**

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### **Abstract**

Ice microphysical processes affect the dynamics of clouds, precipitation formation and radiation transfer in the atmosphere. Recent modeling studies demonstrate that clouds containing ice particles substantially influence weather and climate through their microphysical and radiative effects. However, the representation of ice microphysics in weather and climate models is uncertain, and this uncertainty can affect the evolution of atmospheric flow across scales. The ICE2DYN project aims to investigate how cloud ice microphysical processes and their uncertainties affect the dynamics of extratropical cyclones, which drive the midlatitude weather and influence the large-scale predictability. To this end, the ICE2DYN project combines high-resolution numerical simulations with observational data from the NAWDEX and upcoming NAWDIC field campaigns, and together with advanced forecasting and diagnostic tools to address the following questions:

- How do ice microphysical processes affect the microphysical, macrophysical, and dynamical properties of clouds within extratropical cyclones?
- How strongly do uncertainties associated with ice microphysical processes affect the dynamics of extratropical cyclones?
- What are the implications of ice microphysical processes for midlatitude predictability?

The synergy between modeling and field observations within the ICE2DYN project provides an opportunity to validate process-level mechanisms. The project's findings will demonstrate the impact of accurately representing cloud-ice microphysics on the dynamics of extratropical cyclones. This will contribute to a better understanding of midlatitude dynamics and support the broader goal of reducing model uncertainty in numerical weather prediction.