Project: **1036**
Project title: **ArctiC Amplification: Climate Relevant Atmospheric and SurfaCe Processes, and Feedback Mechanisms, (AC)³ – University of Leipzig contribution**
Principal investigator: **Johannes Quaas**
Report period: **2023-11-01 to 2024-10-31**

This project is about four sub-projects in which Leipzig University contributes to the (AC)³ collaborative research project.

D01 is interested in the role of large-scale dynamics in Arctic climate change. We identified, for example, the role of forcings in midlatitudes on Arctic climate change and the relevant transport pathways (Mehrdad et al., 2024).

In D02, in the reporting period, we performed simulations with the ICON model to interpret observations, focusing on the duration of the AFLUX aircraft measurement campaign 19 to 23 March 2019 in the Arctic region (Fig. 1). We ran sensitivity experiments implementing changes in default model values, such as the organic ice nucleating particles concentration and the efficiency of secondary ice production and investigated their impact on ice crystal numbers. In addition, we created a simple scheme of blowing snow emission into the model and tested its sensitivity. This allowed to assess the difference in ice number concentration over sea ice and open ocean in the Arctic (Papakonstantinou-Presvelou et al., 2022) with the model sensitivity studies. A paper is submitted (Papakonstantinou-Presvelou and Quaas, submitted).

In D04, targets the role of ocean circulation for Arctic amplification, focuses currently on the transport diagnoses of water masses in the Arctic Ocean. In the reporting period, we have integrated each of CFC-11, CFC-12, and SF6 as passive tracers in the Finite-Element Sea Ice–Ocean Model version 2 (FESOM2) (Danilov et al., 2017) in order to use them as tools to study the redistribution of heat by ocean circulation and stratification within the Arctic Ocean. We performed two simulations of FESOM2 with different resolutions following the protocol of the Ocean Model Intercomparison Project phase 2 (OMIP2) (Tsujino et al., 2020) to evaluate ability of the model to represent the tracers and the impact of changing model resolution on this representation.

Project E01 is interested in the changing role of convection for Arctic amplification, but currently analyses available CMIP6 data.

In E06, some initial test simulations using water isotopes as part of the ICON atmospheric model were conducted in collaboration with colleagues from FU Berlin (Stephan Pfahl et al.) and KIT (Roland Ruhnke et al.). There are still issues with the isotope-enhanced ICON model, though, on which we currently work.

References

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Figures

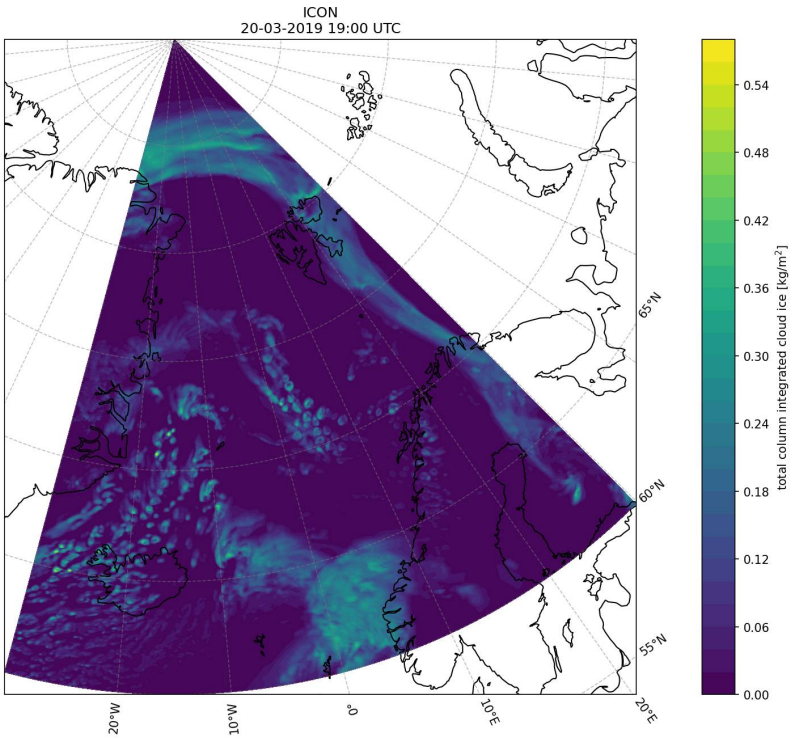

Fig. 1 Cloud ice distribution (kg m^{-2}) from the ICON simulation for comparison to HALO-(AC)³ aircraft data.