Project: **1545**

Project title: **Aerosol-climate modelling with ICON-HAM for CleanCloud**

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Report period: **2025-11-01 to 2026-10-31**

Within the EU project CleanCloud, a set of experiments with ICON-HAM was set up to investigate how aerosol-cloud interactions shape the climate system. The model configuration, including the aerosol input and the experiment design, was prepared and tested on the HPC platform.

In the first 4 months the model was set up and tested with several shorter simulations. It served to check the technical setup, the stability of the model, and the consistency of the output, and it allowed the analysis workflow to be tested end to end before committing to a more expensive production simulation. In the second quarter a new aerosol group of primary marine organis aerosols (PMOA) was added in the HAM model code, utilizing emissions similar to primary sea salt emissions, but making use of information from an ocean surface model predicting the chemical composition in oceanic surface. The PMOA simulations using this source were tested. Next to the emission, the microphysics were updated and several new developments included into the ICON-HAM built. During the summer 2026 a first test run for the long time period was carried out successfully.

A first test run covering five years was carried out successfully. Evaluations of the test simulation results revealed biased results and problems in the model fields, which were traced back to occurence of NaN values in the PMOA emissions fields. This issue meant that the experiments depended on revised input data from partners. In parallel, further additional development was implemented into the ICON-HAM version by colleagues from ETH. This work is a prerequisite for a robust and reproducible long-term simulation, with the planned 30-year simulation which is still pending.

Despite the delay, the preparatory work has put the project in a good position. The five-year test run provides a validated baseline for the technical setup and the evaluation tools, and the problems that surfaced in the input data have been identified and resolved. Once the corrected input data are available and the remaining development steps are completed, the two present-day 30-year simulations can be launched without further major changes to the workflow in the last months of 2026. The additiona simulations originally planned for 2026 are now planned fort he ne wallocation period in 2027.