Response to editor - EGUSPHERE-2025-3400

Dear Dr. Ojha,

Thank you for the positive assessment of our response to the reviews. Below, we address your comments in detail.

Comment 1) The title "The Atmospheric Composition Component of the ICON " suggests that this is the only module. There seems some other options can also be coupled to ICON for computing aerosols / composition, with different complexities. The title may be updated to reflect this.

We fully agree that ICON can be coupled to other external aerosol and chemistry models with different levels of complexity. Our intention with the title “The Atmospheric Composition Component of the ICON Modeling Framework” is not to imply that ART is the only possible option for representing atmospheric composition in ICON. Rather, the title reflects the specific role of ART as the native and fully integrated atmospheric composition component within the ICON modeling framework.

This designation is justified for the following reasons:

1. Technical and organizational integration: ART is developed as an integral part of the ICON code base. It resides within the ICON repository, follows the same license, interface design, development standards, and CI/CX infrastructure, and is fully synchronized with the ICON release cycle. In contrast to externally coupled models, ART is natively embedded in ICON and co-developed alongside its dynamical core and physical parameterizations.

2. Operational use: ART is used operationally for dust and pollen forecasting at the German Weather Service (DWD) and for pollen forecasting at MeteoSwiss. This operational deployment demonstrates its maturity, robustness, and long-term maintenance within the ICON framework.

3. ICON partnership governance: ART is part of the formal collaboration agreement among the ICON partner institutions (KIT, DWD, MPI-M, DKRZ, and C2SM), underlining its role as the atmospheric composition component jointly developed and maintained within the ICON consortium.

To avoid ambiguity, we have clarified in the introduction that ICON can also be coupled to external composition models, while retaining the title to emphasize ART’s role as the natively integrated component. The following sentence has been added to the introduction (page 2):

„While ICON can be coupled to external aerosol and chemistry models, ART represents the natively and fully integrated atmospheric composition component developed and maintained within the ICON modeling framework. “

Comment 2) The section 6.3 discusses that ART can be accelerated using GPUs. This is an important aspect. If you have any experiments comparing performance / speed between CPU vs GPU, you may mention here to add quantitative aspect to this section / discussion.

A systematic and quantitative comparison of CPU versus GPU performance for ICON-ART with OEM is currently the subject of ongoing work. GPU acceleration of the OEM framework, including application

examples and detailed speedup analyses, is documented in a dedicated manuscript that is presently under internal review and planned for submission to GMD. To avoid duplication and premature reporting of results, we do not include quantitative performance metrics in the present manuscript, but we acknowledge their importance and refer readers to this forthcoming study. We have added the following sentence to Section 6.3 (pages 34 and 35):

"A systematic quantitative evaluation of CPU versus GPU performance for ICON-ART with OEM, including detailed speedup analyses, is currently underway and will be presented in a forthcoming dedicated study."