

Referee comment for gmd-2014-261 “ICON-ART 1.0 - A new online-coupled model system from the global to regional scale” by D. Rieger et al.

This paper aims to document and introduce the new ICON-ART model and show its results on a few test cases. As explicitly stated in the paper, its objective is a description of the model, including the meteorological part, and a first validation of its output through a few test cases, and not yet a full assessment against observations.

This work is of excellent quality, in both scientific significance and scientific quality. The icosahedral approach is getting more and more widespread in the meteorological and climate modeling communities, but to our knowledge this the first time that a full global atmospheric composition model, aimed at operational or pre-operational status, is written in such a numerical framework. This makes this paper a very significant and interesting one. While they do not dispense for a more in-depth validation, the two applications that are presented show encouraging results. The paper is very well written and agreeable to read; the equations are presented in a clear and concise way. It was written with a very high standard English: no technical corrections were found to be made.

I have only two general comments on this excellent work:

- It would be nice if the authors explain in a bit more detail the reasons why a icosahedral approach was chosen to start with: what are its advantages in terms of computational cost/grid nesting or other?
- The authors describe all of the components of the atmospheric composition model, including some that are probably common with the meteorological model (I think of turbulent diffusion). A few physical processes were not included in this global description: microphysics, radiation and surface-atmosphere interface come to mind. It would be appreciated if the authors could rapidly introduce how these processes are taken into account in ICON-ART. As one of the stated objectives of ICON-ART is to model cloud and radiation interaction with aerosols, the microphysical and radiation parameterizations must be two critical components of the system, even though they don't formally belong to the “ART” part of ICON-ART.