Geosci. Model Dev. Discuss., 8, C158–C160, 2015
www.geosci-model-dev-discuss.net/8/C158/2015/

Geoscientific Model Development Discussions
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Interactive comment on "ICON-ART 1.0 – a new online-coupled model system from the global to regional scale" *by* D. Rieger et al.

Anonymous Referee #2

Received and published: 13 March 2015

The paper of Rieger at al. describes the first version of a new nonhydrostatic modeling system ICON using ICOsahedral Nonhydrostatic coordinates. The extension of ICON with the ART model (Aerosol and Reactive Trace gases) leads to the very first version of the new model ICON-ART 1.0.

The paper describes the the basic equations and physics of ICON-ART 1.0 and present three examples of model applications concerning Bromoform and Dibrommethane, aiming on global scale, and the Eyjafjalajökull eruption in spring 2010, which is more representing the regional scale. Model results had been compared to observations and the results of other regional/global scale models described in the literature. In addition an annual run for sea salt particles has been performed as a third example.

The paper address relevant scientific modeling questions within the scope of GMD and

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EGU in an excellent way. The combination of a meteorological forecast model with icosahedral non-hydrostatic coordinates (ICON) and a model for aerosols and reactive gases (ART) for the global and regional scale is a substantial advance in modeling scale interactions as well as the interactions of physical and chemical processes. The physical concepts and parametrizations as well as the numerical methods are described excellent and very detailed. The mathematical formula to explain the details of the model are also very detailed and clear.

There is evidently a very good knowledge to related work in the field and the results are discussed with relation to this related work in a very good way. The overall presentation is well structured, the abstract gives a good summary of the paper, the language is fluent and precise.

The modeling system ICON-ART 1.0 has to my opinion a high potential for further developments in the scientific issues relevant for the climate system as well as for regional air quality modeling, I'm sure that the modeling system ICON-ART 1.0 will open the door to further developments in this direction leading to ICON-ART 1.1, 2.0, X.X and so on. I would like to encourage the authors very much to proceed in this way. I wish the first author and the whole team much success in taking the further steps.

I have some very minor remarks on the paper:

Abstract, line 17/18:

"The pattern of the simulated distribution of volcanic ash particles shows an agreement with previous studies".

Why not "good agreement" as for Bromoform and Dibrommethane ?

p. 572, line 1 - 6

It might be interesting to know the approximate horizontal and vertical resolution. It is mentioned later in the text (about 40 km horizontal, and on p. 592, line 10 in the context of the discussion concerning the volcanic ash plume, a vertical resolution of 300 m is

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given).

In the description of the run for bromocarbons (p.589, line 6) a number of 90 levels up to 75 km altitude, time step of 72 s is given.

It might be helpful to clarify this point of horizontal and vertical grid spacing with respect to the different model runs which have been performed.

Is the vertical grid spacing varying with altitude or is it constant ?

What is the upper boundary ?

The authors mention the problems with computing time, what is the computing time e.g. for an annual run as performed for sea salt ? Or for the other applications shown ?

p. 586, line 11

The term VSLS is used before it is explained on p.588, line 6. Better to explain it with the first usage on page 586.

p.591, line 21

"after some tuning ..."

Is the "tuning" performed in some systematic way or just by trying several factors and then take some which is just leading to reasonable results ?

Interactive comment on Geosci. Model Dev. Discuss., 8, 567, 2015.