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Geoscientific Model Development Discussions
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Interactive comment on "ASAM v2.7: a compressible atmospheric model with a Cartesian cut cell approach" *by* M. Jähn et al.

M. Jähn et al.

jaehn@tropos.de

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Thank you very much for your research on accuracy tests and suggestions on corresponding examples.

Due to the brevity of the time given until the revised version has to be submitted, we are not able to do a comparison study with an independent model. However, we have now added a stringent advection test reported by Berger and Helzel (2012, Sec. 6.1.). The test problem describes the advection of a smooth bump by a radial wind field in an annulus. One full rotation is reached at t = 5 s. Figure 1a-d shows the difference fields between the analytical and numerical solution for different mesh sizes. Figure 1e shows the final field after 5 s integration time for N = 400 (N ... number of grid points per spatial direction). For a fixed time step our advection scheme with the Koren limiter

shows second order convergence in the L1 norm (Figure 2). We will add this example to our revised version.

We also performed additional simulation runs with different resolutions for the cold bubble with orography.

Regarding your comments about the paper: 1. The model can also be used with spherical or cylindrical grids. The stability problems with the grid convergence in special points (the pole problem) in both grids are handled through the implicit time integration both for advection an the yet faster gravity and acoustic waves.

2. We will change this imprecise formulation.

3. A logically rectangular grid has the same logical structure as a regular Cartesian grid. Especially it has the same number of nodes, faces etc. and the same neighbor relations.

4. This issue was already mentioned by the first referee. We changed this in our manuscript for more clarification.

We are going to submit our revised version within the next week and like to summarize our changes: - complete revisions of certain paragraphs as mentioned in the referee's and editor's comments - clearer description of the discretization and numerical scheme - additional and higher quality figures - only test cases with cut-cell interaction, including conservation and accuracy tests - "real case experiment" section removed - new abstract, introduction and outlook according to the changes

Reference: Berger, M. and Helzel, C. (2012): A Simplified h-Box Method for Embedded Boundary Grids. Siam J. Sci. Comput., 34(2), A861–A888.

Interactive comment on Geosci. Model Dev. Discuss., 7, 4463, 2014.

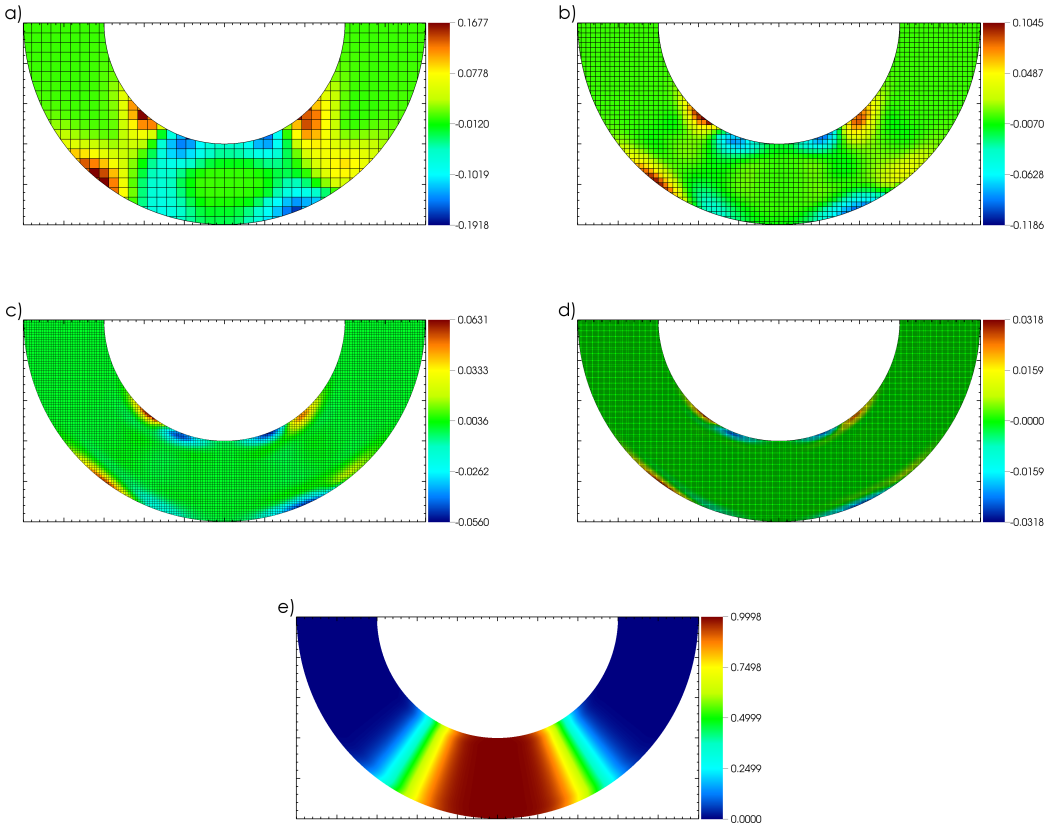

Fig. 1. Difference tracer field after one rotation for a) N=50, b) N=100, c) N=200, d) N=400, e) Tracer field after one rotation for N=400.

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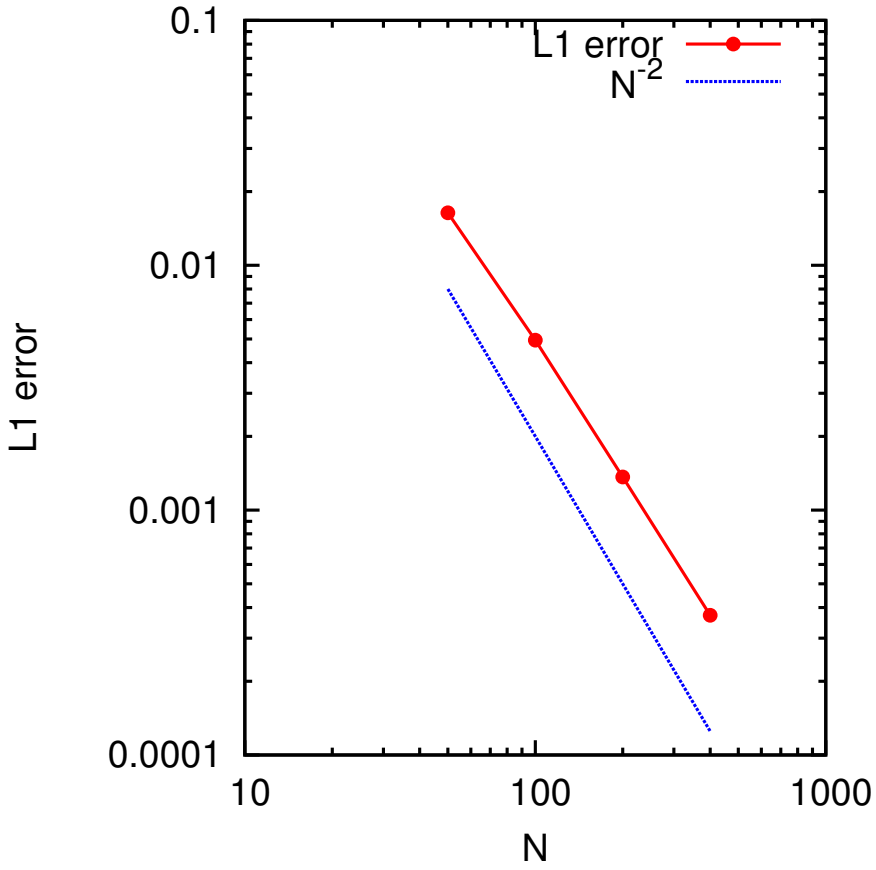

Fig. 2. L1 error norm for different grid spacings.

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