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Geoscientific Model Development Discussions

Interactive comment on "An orthogonal curvilinear terrain-following coordinate for atmospheric models" *by* Y. Li et al.

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We appreciate the editor's constructive comments and the detailed suggestions. Our reply is given below.

1. The authors should not claim that these new coordinates will reduce PGF errors as they have not yet tested this. They can claim that it _might_ reduce these errors.

Response:

Yes, we will do this. The title of the revised manuscript may be changed into "An orthogonal curvilinear terrain-following coordinate and its preliminary tests using 2-D idealized advection experiments". The revised manuscript will be only focused on reducing the advection errors by the Os coordinate through "the smoothed vertical layers"

and "the orthogonal and terrain-following vertical grids". Moreover, we will investigate the contributions of these two aspects respectively by new experiments.

2. Set your work in the context of the papers given by reviewer 2.

Response:

Yes, we will do this.

3. Make the paper much shorter. The reader is initially only interested in the results of the advection tests. Once you have convinced the reader that these coordinates are worthwhile (if and when you write a paper solving the Euler or similar equations) then readers may be more interested in finding out how the coordinates are generated. So make the section on generating the coordinates very short and refer to supplementary material for the details.

Response:

Yes, we will do this.

4. Make sure that your comparisons between orthogonal and non-orthogonal cords are like for like. So for a useful comparison, two simulations should have coordinate layers at the same height but with different x locations. Then you only really need one or two of these.

Response:

Yes, we will do this. And we think that the OsBr1 and the Cs experiments are the two simulations have coordinate layers at the same height but with different x locations (see red and black lines shown in the Fig. 8 of the original manuscript). We will do further comparisons between the results obtained by the OsBr1 and Cs, and also implement new experiments to compare the OsBr2 or OsBr3 with the corresponding hybrid σ coordinate.

5. Remove all information that is not relevant to the advection tests that you present.

Response:

Yes, we will do this.

6. Referee 1 suggests "The impact of steep mountains up to those supported by one point only should be investigated, also the impact of steepness on stability. C One of the coordinates concentrates the curvature to a small area near the mountain, which in current tests has no velocity different from 0. The impact of this area should be investigated by using velocities different from 0 right to the top of the mountain." I believe that model developers should stick to standard test cases where possible. Therefore I would suggest reproducing the results from the Schar et al, 2002 MWR(2459-2480) (fig 4) test case using similar resolution to other studies and then modifying the test case by moving the non-zero velocity and the tracer right down to the top of the mountain and by decreasing the resolution until the mountain is represented by one point.

Response:

Yes, we will do this. The experiments in the revised manuscript are given as follows:

(1) Reproducing the experiments of Schär et al. (2002);

(2) Implementing experiments of moving the non-zero velocity and the tracer right down to the top of the mountain;

(3) Decreasing the resolution of the experiments until the mountain is represented by one point.

7. Remember that not all readers will read every word. Readers will start with the abstract and then the figures and their captions. So try to put all the salient points in the figures and their captions. The remainder of the paper should give the necessary detail and a little discussion.

Response:

Yes, we will revise the presentation of the figures and their captions.

8. As the lead author knows, I am interested in this work. However in its present form there are too many uncertainties. Given the GMD format of allowing the publishing of supplementary material and data, one possibility for testing these new coordinates for more complete equation sets might be for you to publish a list of (x,z) coordinates of the grid points. This would allow other model developers to use your grids to solve more complete equation sets with their models. I for one would be intersted in doing this. (If I used a grid based on your coordinate system I would include you as a co-author on any initial publication)

Response:

Thank you very much again for your interest. We would love to publish the list of (x, z) coordinates of the grid points created by the OS coordinate as the supplementary data of the revised manuscript. And we are happy to see that people like these grids and use them to solve more equations.

Interactive comment on Geosci. Model Dev. Discuss., 6, 5801, 2013.