

Review of the revised GMDD Manuscript: Adaptive Cartesian Meshes for Atmospheric Single-Column Models, a study using Basilisk 18-02-16

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Comments from Reviewer 3 (3rd review):

The newly revised manuscript (September 2018) has greatly improved, answered almost all of the questions from the 2nd review, and cleaned up most of the erroneous equations. However, two sign errors remain in the current version of the manuscript. As before, the authors need to check whether these sign errors were present in the calculations, or whether these are typos in the manuscript. In case the errors are in the code, the results need to be reproduced. I also have a few more clarifying questions, and suggest a few corrections of the text.

Detailed comments:

1) Page 4, lines 4 & 5, and Eq. (3) and page 5, Eq. (12): As I pointed out in my 2nd review the definition of $\theta_{v,ref}$ is vague. My earlier review asked what you meant by ‘reference value’? The authors provided a satisfactory answer in their reply to my review comment, but none of this information made it into the manuscript. For example, the reply stated that a constant $\theta_{v,ref}$ value (however, it is not provided) is used in the ABL case, and that the GABLS tests define this reference profile. Therefore, the manuscript still lacks clarity. It makes it impossible to reproduce the ABL results (provide $\theta_{v,ref}$), and the authors should point to the GABLS tests for their specific $\theta_{v,ref}$ definitions. Please add the information from the reply to the manuscript.

2) Page 5, Eq. (13) and line 17: Do you refer to the same spatially- and time-dependent K coefficient that is defined in Eq. (8)?

3) Page 5, Eq. (15): The K diffusion coefficient as defined in Eq. (8) has a time dependency. Indicate in Eq. (15) whether K gets evaluated at time level n or the future time level n+1.

4) Page 6, line 5: the expression for the ‘pressure gradient force vector’ must be $-\frac{1}{\rho}\nabla p$, and not just the negative gradient $-\nabla p$ as currently displayed.

5) Page 6: I had already pointed out the sign error in the geostrophic relationship in my 2nd review, but these errors are still present. The right hand side of Eq. (17) must read $-\frac{1}{\rho}\nabla p - f(\vec{k} \times \vec{u})$ and Eq. (18) must read $\vec{U}_{geo} = \frac{1}{\rho f} \vec{k} \times \nabla p$. If the sign errors are present in the code, the results need to be reproduced.

6) Page 6, line 9: It is incorrect to define the symbol \times as the ‘vector outer product operator’ (which leads to a matrix). The symbol is the ‘cross product’ (leading to a vector).

7) Page 7, end of line 10: typo, should read ‘... of a choice ...’