

Geosci. Model Dev. Discuss., author comment AC3  
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## Reply on RC3

Hiromasa Yoshimura

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Author comment on "Improved double Fourier series on a sphere and its application to a semi-implicit semi-Lagrangian shallow-water model" by Hiromasa Yoshimura, Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2021-168-AC3>, 2021

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[Reply on RC3]

We are very grateful to the referee #3 for the useful comments. They help to improve the paper quality. Below, we will reply to the specific comments.

### Major comments

**As the other reviewers noted, the tests seem to be randomly chosen. I recommend the author to investigate at least the convergence (error vs horizontal resolution) and conservation (energy, vorticity, etc.). Avoid visual comparison where possible and conduct quantitative evaluation. The errors should be given in standard error norms by numerical values.**

- Thank you for the advice. We will investigate the convergence and conservation and give the errors by numerical values.

**The presentation of the paper can be improved. For example, Subsection 5.2 and 5.4 are short and 5.3 is of two long paragraphs. Author's intention for the tests should be provided. The author discusses the pole problem, but Figures 4, 7 and 9 are shown in longitude–latitude; Figure 9 omits the polar region. It would be nice to add a diagram to show the differences of expansion visually.**

- Thank you for the advice. We will modify the paper according to the comments. We will show the global region including the polar region in Figure 9. Figure 2 shows the differences of the DFS expansions. We will also show the same figure for the SH expansion for comparison.

### Minor comments

**Page 1, Line 21: more accurate rather than good**

**Page 1, Line 25:  $O(N^3)$  memory usage, unless calculated on-the-fly**

**Page 2, Line 4: Alternatively (avoid repeating the same word, another).**

- Thank you for the advice. We will modify the texts according to the comments.