Geoscientific Model Development Discussions

Geosci. Model Dev. Discuss., referee comment RC5
https://doi.org/10.5194/gmd-2022-248-RC5, 2022

Reply on AC3

Anonymous Referee #3

Referee comment on "Strategies for Conservative and Non-Conservative Monotone Remapping on the Sphere" by David H. Marsico and Paul A. Ullrich, Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2022-248-RC5, 2022

>> Thanks for the response.

1. Many readers of this paper, including myself, will desire to compare which remapping method is the best from a monotonicity. The picture needs to be improved to help them understand intuitively. For example, it is proposed to unify the axis (y-axis in Figures 1-4, 9-11, and 12) and color range (Figures 5 and 7) for comparison between figures. In addition, in order to distinguish the dense lines in Fig. 9-11, more distinct markers should be used or a table containing actual error values ââshould be included (suggested to add as a supplementary material).

Thank you for the suggestion. I've attached an updated version of Figure 3, but with a consistent y-axis for each subfigure. Is this what you had in mind? The figure is called "FvtoFV_Errors.pdf". We can also include the actual error norms for the figures 9-11 as a supplement.

Can you clarify what you mean by color ranges for figures 5 and 7? Figures 5 and 7 use the same color schemes and are bounded between 0 and 1 (except figure 5a, in order to show the overshoots and undershoots)

>> It seems hard to aware that the color scheme in figure 5a is not bounded on purpose. It would be nice if there was a mention of this in the text or caption. The modified figure reflects the reviewer's intention well.

2. In the remapping result of the vortex case (Fig. 5), I would like to comment on the reason why a very conspicuous irregular pattern occurs around (0°E, 90°N). In particular, I wonder why these errors are weakened (Fig 5b) when a local bound is applied.

Yes, there are significant errors in the remapped field when CAAS is not applied. This is because high-order methods lead to overshoots and undershoots of the global bounds. Applying CAAS with local bounds preservation will prevent these overshoots/undershoots because the remapped fields are constrained to like between 0 and 1.

>> I'm still wondering why the patterns that are removed from the CAAS local bound (fig 5b) are not removed when using the local-p bound (fig 5c).

3. It could be out of purpose of this study, but it is curious about efficiency, another

desirable property of the remapping operator. I wonder how long each of the remapping methods used in this study takes to calculate. Also, if possible, I would like to hear answers about whether there is a dependency on the data-type of variable.

The non-integrated schemes are significantly faster than their integrated counterparts. This is because the non-integrated schemes do not rely on the overlap mesh, but the integrated versions do. The overlap mesh can be very large, and it therefore takes much longer to iterate over.

It took approximately half an hour to generate the offline maps for the integrated schemes for a cubed sphere source mesh with 1,382,400 faces and for a target mesh with 16,200 faces. It never takes more than a few minutes to generate the maps for the non-integrated schemes. There does not seem to be a dependency on the data-type.

>> I think this answer will help me a lot. Thank you.