Geoscientific Model Development Discussions

Geosci. Model Dev. Discuss., author comment AC3
https://doi.org/10.5194/gmd-2022-225-AC3, 2022

Reply on RC2

James Kent et al.

Author comment on "A mixed finite-element discretisation of the shallow-water equations" by James Kent et al., Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2022-225-AC3, 2022

Thank you for your review.

Regarding motivation, we have rewritten parts of the introduction to takes these points into account. We have stressed the need for massively parallel models for the future of weather and climate forecasting, and have discussed the benfits of mixed finite-element methods over finite-volume.

The transport scheme in section 4 is actually 3rd order in space and time. The temporal order comes from the SSPRK3 algorithm.
The spatial order comes from the quadratic reconstruction of the field at flux points. The fitting of the polynomial is
such that the integral of the polynomial is equal to the integral of the variable within each cell. We have made this clearer in the text in section 4.

We have significantly rewritten large parts of the mountain test case section. We use a high-resolution semi-implicit semi-Lagrangian scheme as a reference to produce error plots, which we then compare with other models in the literature. We also look at the error convergence with
resolution. We have extended the energy and potential enstrophy statistics to 50 days, and provided a plot of the day 50 potential vorticity.

We have removed the text "and the interested reader is referred there for more information" and have used scientific notation in the error norm table.