Geoscientific
Model Development
Discussions

Interactive comment on "A High-order Staggered Finite-Element Vertical Discretization for Non-Hydrostatic Atmospheric Models" *by* J. E. Guerra and P. A. Ullrich

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Thank you Daniel for your feedback. I would like to reply to your comments here:

1) and 3) We will be removing this from the paper. The fields depend on the order of the basis functions within the element and not on the placement of the nodes. However, we are adding a grid stretching feature to Tempest. This way, grid clustering (of elements) near the boundary can be specified directly.

2) We do have a variety of tests running on the sphere, including the baroclinic wave. We're in the process of verifying these before we go into a similar study into the effects of the high-order vertical coordinate. For larger scale and tests on the sphere we will

be looking closely at how closely balanced states are maintained. Definitely more to come soon.

4) I will look further into this point. Variables that are staggered in the grid allow the advection scheme to "see" $2\Delta z$ modes. I am not aware of an advection scheme that can accomplish this without the use of filters or dissipation targeted at the spurious modes. We'll discuss your question further.

Interactive comment on Geosci. Model Dev. Discuss., doi:10.5194/gmd-2015-275, 2016.