Geoscientific Model Development Discussions

Geosci. Model Dev. Discuss., referee comment RC2
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Comment on gmd-2021-442

Anonymous Referee #2

Referee comment on "Multiple same-level and telescoping nesting in GFDL's dynamical core" by Joseph Mouallem et al., Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2021-442-RC2, 2022

Review comments on "Multiple same-level and telescoping nesting in GFDL's dynamical core" by Mouallem et al.

Manuscript ID: gmd-2021-442

Recommendation: Accept with minor revisions

General comments:

This manuscript documented the effort and work developing and expanding the multiple same-level and telescopic nesting capabilities for the GFDL's FV3 dynamical core. Experiments were conducted for both global and regional configurations to demonstrate the effectiveness and advantages of using the multiple and telescopic nesting capabilities. Overall, the manuscript is well organized and prepared. I only have a few minor concerns (see details in the specific comments below) before the manuscript can be accepted for publication.

Specific comments:

- In terms of the multiple same level nesting, it is mentioned in Section 3.1 that, there is no limit on the number of nests at a particular level. However, it is not clear whether or not the same level nests can overlap with each other. If so, how the over-lapped areas are treated, especially when the two-way nesting feedback is turned on?
- Also, related to the two-way nesting feedback, it is stated (lines 127-128) that "At this moment, only temperature, surface pressure and the three wind components are used

for the two-way updates." Could the author comments, why only these variables are currently considered/implemented for two-way nesting feedback? How about other prognostic variables (3-d pressure or geopotential height, 3-d microphysics tracer variables, surface variables, etc.)? In the meantime, have the authors considered/compared among different nesting settings, for example, full two-way nesting feedback vs partial (say 50%) two-way nesting feedback vs one-way nesting without feedback?

- In Table A1, It looks to me that, the parent and multiple and telescopic nested domains all use the same dt_atmos (physic time step), though they may have different dynamics and acoustic time steps (when using different k_split/n_split settings). Is this (using the same dt_atmos for parent and nests) a requirement/limitation for the current nesting implementation in the FV3 dynamical core, or one could choose to use different dt_atmos values for different parent/nested domains?

Technical comments/corrections

- Page 1, abstract, line 4: Change "… were able capture …" into "… were able to capture …".
- Page 4, Figure 1 caption: Correct "one nest on the second level and on nest on the third level".
- Page 3, line 83: Please provide the full term for SAS.
- Page 5, line 120: Fix "… the next boundary conditions from from the parent grid at the next remapping time step. Linear interpolation processes in not conservative by nature …".
- Page 5, line 133: Fix "(East cost)".
- Page 22, line 252: Fix "he size …".