Geoscientific Model Development Discussions

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Comment on gmd-2021-442

Sundararaman Gopalakrishnan (Referee)

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-RC1, 2022

Multiple same-level and telescoping nesting in GFDL's dynamical core by Mouallem et al documents the implementation of the telescopic nesting technique within the FV3 dynamical core for "System for High-resolution modeling for Earth-to-Local Domains (SHiELD)" model and for potential implementation in the Unified Forecast System (UFS). The authors have systematically studied the impacts of improved resolution that could be attained via telescopic nesting on a case of hurricane Laura and nested-grid simulations of an atmospheric river striking the US West Coast. This work is well motivated and well written. I believe this is an important development for the UFS, as well. This work should be accepted for a publication. I have only some minor suggestions that the authors may wish to consider before submitting the final version.

(1) Since this is an important document, it may be worthwhile to discuss the grid structure, grid staggering and the variables on staggered grid. A figure showing the nested grid inside the parent grid may be useful. Where and which variables are placed on A, C and D grids? How does the feedback occur? Similarly the grid structure related to boundary conditions updates may be useful.

(2) Was the same physics used all the way from 200 km grid length (C48) to 1.4 km grid resolution (C768_2n3)? What about the horizontal diffusion and/or divergence damping coefficients for various resolutions? A table for physics along with k_split and n_split for various resolutions and perhaps other namelist changes for different grid resolutions may add more information to readers and model users.

(3) The section on Atmospheric river looks little rushed. This section needs more description. Figure 12 may need improvements because it does not provide much information.