

## **Expanding the Unified Forecast System to include the MPAS dynamical core**

Ligia Bernardet (NOAA/OAR/GSL and DTC), Dom Heinzeller (UCAR/JCSDA), Jun Wang (NOAA/NWS/EMC), Kevin Viner (NOAA/NWS/EMC), Dustin Swales (NOAA/OAR/GSL), and Dan Rosen (NCAR/CGD)

The Unified Forecast System (UFS) Short-Range Weather (SRW) Application (App) team, along with the Rapid Refresh Forecast System (RRFS) and Warn-on-Forecasting System (WoFS) teams, have identified shortcomings of UFS-based convective-allowing predictions. These problems pose a risk to the feasibility of using the current UFS code base for research and development of convective-allowing models. Previous research (Carley et al. 2023) was conducted to identify the causes of the problem and indications are that it relates to deficiencies in the Finite-Volume Cubed-Sphere dynamical core (dycore) at those scales.

Given that the UFS SRW App, RRFS, and WoFS teams chose to explore the Model for Prediction Across Scales (MAPS) as an alternative, an effort was undertaken to scope out in broad terms the inclusion of a generic new dycore in the UFS and to focus the majority of its work on the MPAS dycore. Similarly, since the drive for a new dycore comes from the UFS SRW App, RRFS, and WoFS teams, we kept in mind the use of the MPAS dycore for all UFS Apps, while focusing primarily on convective-allowing applications.

The vision is to use the MPAS dycore without using the entire MPAS standalone model. This arrangement, which parallels the inclusion of the MPAS dycore in the atmospheric component of CESM, will allow the UFS to retain core parts of its infrastructure, such as its workflow, the connection with physics via the Common Community Physics Package (CCPP), I/O, post processing capability, and product generation. In this poster we detail the various areas of work needed to bring a new dycore into the UFS and attempt to estimate the resources for adding the MPAS dycore to the UFS.