Extend NCEP FV3 to Cover Thermosphere for Whole Atmospheric Modeling

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Abstract

NCEP is preparing to implement operational nonhydrostatic modeling with the FV3GFS. The fundamental reason for this implementation is to provide a better prediction system as the result of moving from an approximated hydrostatic modeling system into less approximated nonhydrostatic modeling system. Nevertheless, within NCEP, we have the Space Weather Prediction Center (SWPC), which requires whole atmospheric modeling (WAM) to couple with space weather models. To extend the GFS model top at about 60km to the thermosphere at about 600km triggers the validation of dynamic systems, including thermodynamics with additional tracer gas components as well as deep-atmosphere dynamics (DAD).

DAD is a step beyond the nonhydrostatic system with nearly non-approximation. If we believe moving from a hydrostatic to a non-hydrostatic model can provide better prediction system, then the move to DAD should provide even better or the best prediction system. This will benefit not just WAM, but all applications of GFS including weather, seasonal, and climate predictions. In this presentation, we would like to share our first step of WAM in FV3 with thermodynamics implementation along with the extended FV3 model top.