ATS/CIRA Colloquium

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ATS 101 Hosted by Chris Kummerow

Modeling Research and Development at NOAA/GSL

The Global Systems Laboratory (GSL) in NOAA seeks to improve numerical prediction (NWP) across all weather hazards including severe convective weather, intense rainfall, winter storms, landfalling tropical systems and other phenomena such as smoke from wildfires. GSL's vision is "Research today for better forecasts tomorrow" with stakeholder interests across a diverse portfolio including aviation, severe, renewable energy, hydrological and air-quality sectors. Model development on the regional scale has emphasized frequent data assimilation cycles with hourly-updating forecasts in the 13-km Rapid Refresh (RAP) and 3-km High-Resolution Rapid Refresh (HRRR) systems.

The NWP systems developed at GSL are based on community modeling, data-assimilation, and post-processing software. GSL has contributed to the development of the Rapid Update Cycle (RUC) land-surface model, MYNN PBL parameterization, Grell-Freitas convective parameterization and a gravity wave drag scheme. This development is continuing with FV3, NOAA's global and regional NWP model as part of the Unified Forecast System (UFS) including the upcoming operational replacement of the RAP/HRRR known as the hourly-cycled Rapid Refresh Forecast System (RRFS) in collaboration with other organizations including NOAA's Environmental Modeling Center (EMC). A goal is to provide a scale-aware physics suite and multiscale coupled data assimilation, including use of more novel observations, that performs well across model grid spacings from O(10 km) to O (100 m), including in complex terrain. Additionally, the future of convective-allowing NWP systems will include two-way coupled ensemble analyses and forecasts to increase deterministic forecast skill and provide uncertainty information for forecast applications. Ensemble diversity and design continues to be an emphasis of research including initial-condition and lateral boundary perturbations along with a mix of stochastic perturbations across multiple physics suites.

This presentation will provide an overview GSL's model development activities related to data assimilation and physics for UFS model systems including both deterministic and ensemble forecast capabilities.

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