P36 Model uncertainty in North American Rapid Refresh Ensemble: multi-physics vs. stochastic approach

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With growing evidence that initial/boundary condition perturbations are not sufficient to entirely explain forecast uncertainty, the role of model error is receiving increasing attention. Currently in the North American Rapid Refresh Ensemble (NARRE), the model-related uncertainty is addressed by using a multi-dycore and multi-physics approach. The multi-dycore includes use of the WRF-ARW and NEMS-NMMB dynamic cores. The physics packages included are those suites that are used in current operational systems (e.g., RAP and NAM). Stochastic physics is an alternative that will minimize system maintenance required for mixed physics approach.

The goal of this study is to assess how NARRE performs when using stochastic physics to address model uncertainty instead of the multi-physics approach. First, we will focus on the WRF-ARW component and RAP operational physics suite only. We will experiment with stochastically perturbing parameters within the RAP convective scheme (Grell-Freitas), the land surface model scheme (RUC), and the Planetary Boundary Layer (PBL) scheme (MYNN). The stochastic pattern is modeled after existing stochastic parameterizations in WRF-ARW, leading to spatially and temporally correlated parameter perturbations. The performance of an ensemble created by stochastically perturbing parameters in the RAP convective scheme will be compared to an ensemble that involves various convective parameterizations. Similar comparisons will be performed for an ensemble created by stochastically perturbing the land surface and PBL schemes. Ensemble performance will be evaluated in terms of bias, skill, accuracy, reliability and sharpness. Preliminary results from this study will be presented at the workshop.