P54 A new subgrid-scale orographic drag parameterization suite for the RAP/HRRR model.

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The operational 13-km Rapid Refresh (RAP) and 3-km convection-allowing High-Resolution Rapid Refresh (HRRR) are hourly-updating forecast models. These forecast systems are heavily used in support of short-range forecasting interests within the contiguous United States. The next-generation experimental versions of RAP and HRRR are currently based on WRF Model Version 3.9. In this version, developed at NOAA-GSD, we are currently developing a suite of subgrid-scale parameterizations for the models that represent drag forces imparted to the atmosphere by unresolved topography. Such parameterizations are commonly used in coarse-grid models, and we are evaluating their benefits at the finer grid scales of the RAP/HRRR. The large-scale (horizontal grid spacing 5km) gravity wave drag and low-level blocking schemes have long been part of the WRF model. We recently discovered an issue with the low-level blocking scheme as coded in WRF that caused the drag to be overestimated, especially in regions with little to no topography. We have proposed a fix to this issue. We have added two new drag parameterizations: a small-scale (horizontal grid spacing ~1km) gravity wave drag parameterization for waves in stable boundary layers (Steeneveld et al. 2008), and a turbulent form drag parameterization (Beljaars et al. 2004). Since the drag suite parameterizes phenomena caused by two separate horizontal scales of subgrid topographic variations, we have introduced an additional set of static data in order to accommodate both scales. The goal of our work is to improve the low-level wind speeds and related fields produced by the RAP/HRRR forecasts. We will show preliminary forecast results with the new drag parameterizations and analyze their behavior at various horizontal grid resolutions. The end goal is to have a fully scale-adaptive drag suite that can be applied at any mesoscale configuration.