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Short-range cloud/precipitation forecasts from the US NOAA 3-km HRRR model

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More accurate cloud and precipitation forecasts will be implemented in the US NOAA HRRR (3km, High-Resolution Rapid Refresh) and RAP (13km, Rapid Refresh, HRRR-parent) hourly-updated models in spring 2018. Current HRRR/RAP predictions from NCEP show a deficiency in cloud attenuation and excessive convective precipitation. These future improvements result from better radar/cloud assimilation and better PBL physics. Reduced latent heating from reflectivity (ZDR), related to assumed convective-storm lifetime, was found to be essential for precipitation forecast improvements. Introduction of hybrid mass-flux and eddy-diffusivity (EDMF) and improved subgrid-scale clouds into the MYNN PBL scheme were shown to be essential for improved cloud and boundary-layer depth accuracy.

In this paper, we describe data assimilation improvements (radar latent-heating, satellite/METAR cloud retention) essential for these upcoming NOAA/NCEP changes. We also describe improvements to the boundary-layer, cloud microphysics, and land-surface schemes designed to address cloud/precipitation forecast deficiencies.

This physics suite for the HRRR/RAP models, found to be increasingly effective for mesoscale phenomena, is also in an ongoing refinement cycle for global 7-10-day application with NOAA's global models (GFS, FV3). The HRRR/RAP physics suite (including the Grell-Freitas convection parameterization) is now being found to be approximately equivalent in skill to that from current operational NOAA global model physics. These results will also be reported in this presentation.