Improved Impact of Atmospheric Infrared Sounder (AIRS) Radiance Assimilation in Numerical Weather Prediction

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Improvements to global and regional numerical weather prediction (NWP) have been demonstrated through assimilation of data from NASA's Atmospheric Infrared Sounder (AIRS). Current operational data assimilation systems use AIRS radiances, but impact on regional forecasts has been much smaller than for global forecasts. Retrieved profiles from AIRS contain much of the information that is contained in the radiances and may be able to reveal reasons for this reduced impact. Assimilating AIRS retrieved profiles in an identical analysis configuration to the radiances, tracking the quantity and quality of the assimilated data in each technique, and examining analysis increments and forecast impact from each data type can yield clues as to the reasons for the reduced impact. By doing this with regional scale models individual synoptic features (and the impact of AIRS on these features) can be more easily tracked.

This project examines the assimilation of hyperspectral sounder data used in operational numerical weather prediction by comparing operational techniques used for AIRS radiances and research techniques used for AIRS retrieved profiles. Parallel versions of a configuration of the Weather Research and Forecasting (WRF) model with Gridpoint Statistical Interpolation (GSI) that mimics the analysis methodology, domain, and observational datasets for the regional North American Mesoscale (NAM) model run at the National Centers for Environmental Prediction (NCEP)/Environmental Modeling Center (EMC) are run to examine the impact of each type of AIRS data set. The first configuration will assimilate the AIRS radiance data along with other conventional and satellite data using techniques implemented within the operational system; the second configuration will assimilate AIRS retrieved profiles instead of AIRS radiances in the same manner. Preliminary results of this study will be presented and focus on the analysis impact of the radiances and profiles for selected cases.

To be presented at: 18th Conference on Satellite Meteorology, Oceanography and Climatology / First Joint AMS-Asia Satellite Meteorology Conference at the 92nd Annual American Meteorological Society Meeting in New Orleans, LA, 22-26 January 2012.