MMM SEMINAR SERIES

Promises and challenges in ensemble-based convection-permitting assimilation of all-sky satellite radiances

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The focus of the talk will be on the potential of assimilating all-sky satellite radiances from both IR and MW sensors for severe weather and tropical cyclones. I will first present the impacts of assimilating GOES-R all-sky infrared brightness temperatures on tropical cyclone analysis and prediction were demonstrated through a series of convection-permitting OSSE and real-data experiments using an WRF-based ensemble Kalman filter. Assimilation of the simulated high temporal and spatial resolution infrared radiance observations not only constrained well the thermodynamic variables, including temperature, moisture and hydrometeors, but also considerably reduced analysis and forecast errors in the wind fields. The potential of all-sky radiances is further demonstrated through an additional proof-of-concept experiment assimilating real-data infrared brightness temperatures from GOES-13 and Himawara-8. We developed an empirical flow-dependent adaptive observation error inflation (AOEI) method to limit erroneous analysis increments where there are large representativeness errors, as is often the case for cloudy-affected radiance observations. Meanwhile, to better assimilate all-sky microwave radiance from polar-orbiting satellites, we begin to modify the Community Radiative Transfer Model (CRTM) to ensure that the cloud and precipitation particle scattering properties for calculating microwave radiances are consistent with the particle properties and size distributions internal to microphysics parameterization schemes. Using microphysics-consistent cloud scattering properties generates much greater variety in the simulated brightness temperature fields across the different microphysics schemes than the traditional use of effective radius. The use of microphysics-consistent cloud scattering properties in the CRTM will help developing a more self-consistent tool for analyzing and constraining microphysics schemes, and to improve all-sky microwave radiance assimilation for convection-permitting analysis and prediction. Preliminary MW radiance assimilation experiments will also be presented. Also discussed will be the challenges and promises in assimilation of synthetic GOES-R observations for severe continental convective storms, in particular with regards to covariance localization across scales, and across variables.

This seminar will be webcast live at:
http://ucarconnect.ucar.edu/live
Recorded seminar link can be viewed here:
https://www.mmm.ucar.edu/events/seminars

NOTE SPECIAL DATE AND TIME
Friday, 23 June 2017, 11:00 AM
Refreshments 10:45 AM
NCAR-Foothills Laboratory
3450 Mitchell Lane
Bldg. 2, Main Auditorium, Room 1022