COSMIC/MMM SEMINAR

Importance of Satellite Microwave Radiance Observation Characteristics for Their Assimilation in NWP Models

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Abstract: The Advanced Technology Microwave Sounder (ATMS) onboard Suomi National Polar orbiter Partnership (S-NPP) satellite combines Advanced Microwave Sounding Unit-A (AMSU-A) and Microwave Humidity Sounder (MHS) onboard NOAA and Meteorological Operational Satellite Program of Europe (MetOP) satellites to simultaneously provide collocated radiance measurements of the atmospheric temperature and moisture profiles under almost all weather conditions except for heavy precipitation. The two lowest frequency ATMS window channels 1-2 (23.8GHz and 31.4 GHz) are the same as AMSU-A channels 1-2 and the other two high-frequency ATMS window channels 17-18 (88.2GHz and 165.5GHz) are similar to MHS window channels 1-2. These four ATMS window channels can be used together for identifying both liquid and ice cloudy radiances. This important feature of ATMS proved to be important for improving the forecast skill of severe weathers populated with clouds (e.g., hurricanes) through satellite microwave radiance assimilation (Zou et al., 2013). Assimilation of microwave radiance data in numerical weather prediction (NWP) models has traditionally been carried out with AMSU-A and MHS data in two separate data streams since the launch of NOAA-15 in 1998. Inspired by the ATMS data assimilation success, a new approach was proposed to combine AMSU-A and MHS radiances into one data stream for their assimilation. It was shown that the spatial collocation between AMSU-A and MHS field of views (FOVs) allows for an improved quality control of MHS data, especially over the conditions where the liquid-phase clouds are dominate. It was found that the quantitative precipitation forecast (QPF) skill associated with landfall hurricanes was significantly improved by the one data stream approach, resulting from a closer fit of analyses to AMSU-A and MHS observations is obtained, especially for AMSU-A surface-sensitive channels (Zou et al., 2017). A shortcoming was also found for S-NPP ATMS whose radiance observations displayed a clear across-track striping noise, which was not found in AMSU-A radiances. Three algorithms were subsequently developed for mitigating the ATMS striping noise for the upper-level sounding channels (Qin et al., 2013), for an operational implementation (Ma and Zou, 2015) and for surface sensitive channels (Zou et al., 2017). Impacts of striping noise mitigation on observation error variances were also quantified for assimilation of destriped ATMS radiance observations.

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http://www.fin.ucar.edu/it/mms/fl-live.htm
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SPECIAL DATE & TIME

Wednesday, 23 August 2017, 11:00 AM

Refreshments 10:45 AM

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