

Advanced techniques for satellite microwave data assimilation and application to global and regional NWP

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The Joint Center for Satellite Data Assimilation (JCSDA), through an inter-agency partnership between NOAA NESDIS, NOAA NCEP, NASA, and the U.S. Department of Defense, supports the advancement of data assimilation of current and future satellite observations. Within JCSDA's support to facilitate operations to research (O2R) and research to operations (R2O) of state-of-the-art data assimilation and forecast systems, is its core mission to accelerate and improve the use of satellite data and assess the impact of satellite observing systems on both global and regional NWP forecasts. Here, we present recent efforts supported by the JCSDA to advance and increase satellite observations assimilated within the GSI analysis system used to initialize both the Global Forecast System (GFS) model and regional Hurricane WRF (HWRF) model at NOAA NCEP. Specifically, the use of a 1d-variational (1dvar) preprocessor within the GSI will be discussed. The 1dvar preprocessor is applicable to current and future microwave satellite sounders and imagers including those from POES and MetOp AMSU-A and MHS, NPP/JPSS ATMS, DMSP F16-F20 SSMI/S, GCOM-W AMSR2, and GPM GMI. The capability of the 1dvar preprocessor includes increased quality control of the microwave radiances to be assimilated, and also to provide surface emissivity or hydrometeor (cloud, rain) information to the assimilation system which may increase the number and types of observations that can be assimilated. The information provided by the 1dvar preprocessor could be considered complimentary to ongoing GSI development efforts both inside and outside of the JCSDA associated with the assimilation of surface sensitive channels over non-ocean surfaces as well as cloudy radiance assimilation. Advancement in the assimilation of these types of observations should have significant positive impact on both global NWP forecast and regional NWP and tropical cyclone track and intensity forecasts. Current status of the implementation of the 1dvar preprocessor in the GSI will be shown, along with examples and benefits from the quality control information it may provide, followed by discussion of its overall utility in data assimilation.