

Intercomparison of the Cross-Track and Conical Scanning

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The NOAA Advanced Microwave Sounding Unit (AMSU) and DMPS Special Sensor Microwave Imager/Sounder (SSMIS) instruments have similar temperature and water vapor sounding channels but different cross-track and conical scan geometries. For cross-track scanning, the angle of earth incidence varies, resulting in angle-dependent weighting function and satellite measurements for a given frequency. For conical scanning, a fixed angle of incidence and a vertical axis of rotation are used, in which the viewing area and slant path remains nearly constant. The differences in this scan geometry can result in differences in impacts on model forecasts. Distinct bias correction and quality control schemes also must be utilized for AMSU and SSMIS data due to differences in error characteristics of the satellite data. These error characteristics and different bias correction and quality control schemes associated with AMSU and SSMIS data can further result in different impacts on Numerical Weather Prediction (NWP). To quantify characteristics of cross-track and conical scanning satellite microwave sounding impacts, AMSU and F16 SSMIS measurements are assimilated separately into National Centers for Environmental Prediction (NCEP) Global Forecast System (GFS) associated with Gridpoint Statistical Interpolation (GSI) subsystem. In this process, the current bias correction and quality control schemes for AMSU and SSMIS data in GSI are assessed, and the data usage in GSI and impacts of each instrument of measurements on various analysis variables and forecast score in GFS are estimated by carrying out a set of assimilation experiments for both winter and summer seasons. Since the original F16 SSMIS atmospheric sounding channels display persistent radiance anomalies, the F16 SSMIS data used in this study is corrected using both the Calibrated Temperature Data Record (CTDR) by applying the Naval Research Laboratory (NRL) and United Kingdom Met Office (UKMO) unified SSMIS preprocessor and the National Environmental Satellite, Data, and Information Service (NESDIS) SSMIS preprocessor.

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