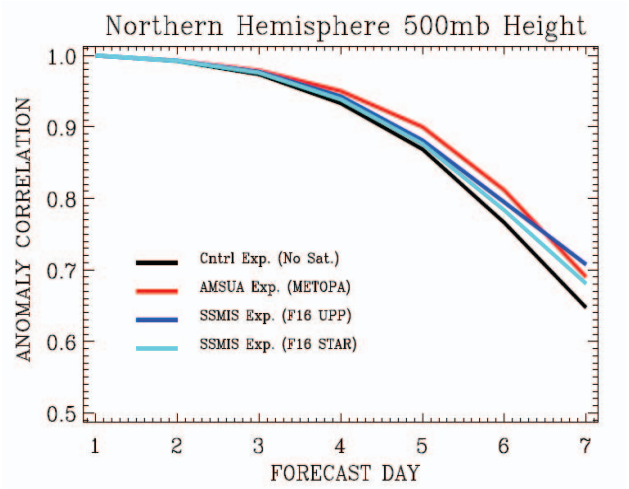
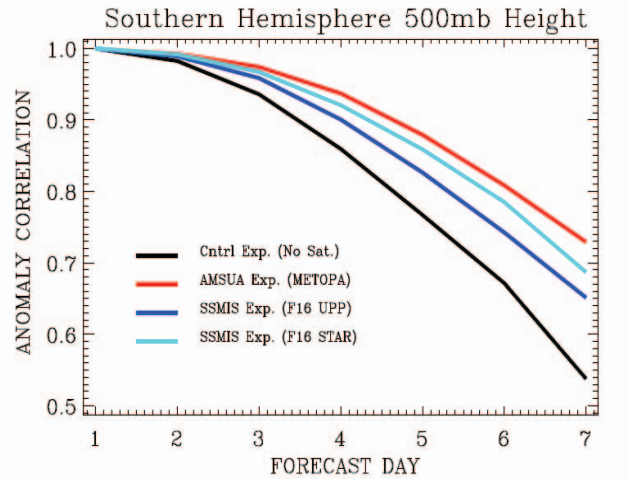
**Comparing the forecast impacts from assimilating SSMIS and AMSU data in NCEP Global Forecast System (GFS)**

Fuzhong Weng
Center for Satellite Applications and Research
and
Banghua Yan
University of Maryland

On October 18, 2003, the US Defense Meteorological Satellite Program has successfully launched its F-16 satellite with the Special Sensor Microwave Imager/Sounder (SSMIS) on board. This is a first instrument combining the microwave imager with temperature and water vapor sounding capabilities into a single scanning geometry. Unfortunately, this instrument has several major anomalies from its antenna emission and calibration target instability which seriously affects the data quality. Several algorithms have been developed at NRL and NOAA for corrections of these anomalies (Kunkee et al., 2008; Yan and Weng, 2009). After a removal of its calibration anomalies, SSMIS data are now being more useful for retrievals and data assimilation. The second SSMIS on board F17 has some similar anomalies from its antenna subsystem and even more solar contamination on its calibration target. Because of these calibration uncertainties, NOAA has delayed uses of the F16 and F17 SSMIS data in its global forecast system until the calibration process is completed




The SSMIS on F18 satellite, which was launched in October, 2009, is now functioning very well. This new instrument plus our current AMSU/MHS allow us for accurately assessing and comparing the impacts from assimilating two distinct microwave sounding systems (conical vs. cross track scanning) in the global medium

range forecast. In this study, an identical set of microwave sounding channels at 50-60 GHz is selected from SSMIS and AMSU-A/MHS to perform the data assimilation experiments. It has been demonstrated that the SSMIS sounding channels from F16 satellite produce some significant positive impacts as measured from 500 anomalous correction coefficient (ACC) as shown in the figure. Comparing the control run (no satellite data), both AMSU-A and SSMIS temperature sounding channels improve the forecast skills in both northern and southern hemispheres. For the northern hemisphere, the calibration algorithm from NRL/Metoffice Unified Processing Package (UPP) produces better forecasts than that from NESDIS/STAR algorithm. For the southern hemisphere, the STAR calibration algorithm performs better than the UPP. Also, the impact from SSMIS is further close to that from AMSU-A. Our further tests also show the impacts from the UPP data in the southern hemisphere can be much improved if the bias correction is made separately in the northern and southern hemispheres (Figure is omitted here).

This study highlights the needs for a diversity of microwave observing systems for weather and climate applications. Although the conical sounding system deployed today has relatively higher noises that the cross-track system, it is unique for user applications due to its constant viewing angle and uniform field of view (FOV) across the scan. The conical sounder can work alone to image directly the thermal and moisture structures of weather systems at the radiance and brightness temperature level without much relying on a retrieval system.

B. Yan, and F. Weng, 2009: Assessments of F16 Special Sensor Microwave Imager and Sounder Antenna Temperatures at Lower Atmospheric Sounding Channels, *Advances in Meteorology (AM*), in press.

D., Kunkee, G. A. Poe, D. J. Boucher, S. Swadley, Y. Hong, J. Wessel, E. Uliana, 2008: Design and Evaluation of the First Special Sensor Microwave Imager/Sounder (SSMIS), *Trans. Geoscience and Remote Sens*, **46**, 863-883.