

News in This Quarter

AMSR-E Experiments Show Positive Forecast Impact

Assimilation of radiances from the NASA Earth Observing System Advanced Microwave Scanning Radiometer (AMSR-E) over the oceans leads to improved medium range forecasts in the Southern Hemisphere and neutral impacts in the Northern Hemisphere forecasts according to parallel forecast experiments conducted at the JCSDA.

The impact of the AMSR-E radiances was investigated in the National Centers for Environmental Prediction (NCEP) global data assimilation system (GDAS). The conically scanning AMSR-E observes the radiances from the atmosphere and surface of the Earth using 6 frequencies in the microwave region from 6.9GHz to 89GHz. The low frequency channels (6.9GHz and 10.7GHz) are sensitive to sea surface wind speeds and sea surface temperature and much less sensitive to hydrometeors in the atmosphere than the SSM/I instrument, which lacks these low frequency channels. Thus, the AMSR-E's information on sea surface wind and sea surface temperature can be assimilated under all weather conditions.

For the assimilation experiments, a new microwave ocean emissivity model was developed that substantially increases the emissivity accuracies at the low frequencies over that of the current operational model. The new emissivity model is a two-scale ocean roughness model with the coefficients derived from the satellite measurements. Figure 1 shows a comparison of the new model and operational emissivity model (FASTEM) in terms of the differences between the simulation and observed AMSR-E brightness temperatures.

In the assimilation experiments, the new emissivity model was applied for the channels below 20 GHz and FASTEM was used for the channels above 20 GHz. AMSR-E radiances from 10.7GHz to 36.5GHz (both polarizations) over the oceans were assimilated with the NCEP Gridpoint Statistical Interpolation (GSI) analysis system. The resolution of the forecast model was T382L62, and the experiment period was for 12 August – 11 September 2005.

The improvements in anomaly correlation at 500hPa, a measure of forecast accuracy, in the Southern Hemisphere are shown in Figure 2. Neutral impacts were found for the Northern Hemisphere and the Tropics.

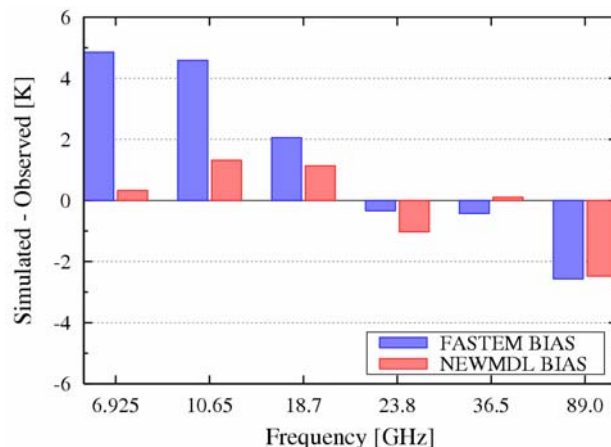


Figure 1. Differences between simulated and measured AMSR-E brightness temperatures for horizontally polarized channels. The statistics were calculated from 1-5 December 2005. Red bars indicate the bias of the new emissivity model and the blue bars indicate that of operational model (FASTEM).

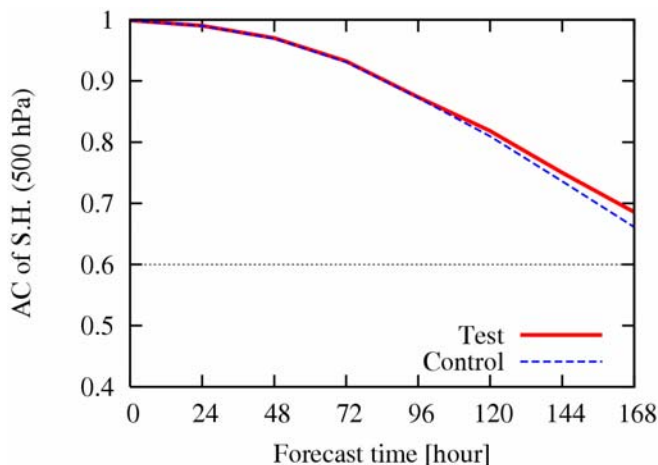


Figure 2. Averaged anomaly correlation coefficient of 500 hPa geopotential height for the Southern Hemisphere. The statistics are computed for 12 August - 11 September 2005, with 31 cases at the initial time to 24 cases for the 168 hour forecast. Red line is for Test and blue line is for Control.

These results suggest that with its all weather capability and large scan swath, AMSR-E adds substantial new information about ocean winds beyond what SSM/I and QuikSCAT already provide to the operational model. The new emissivity model enables more reliable extraction of this information.

This work was performed by JCSDA Scientific Visitor Masahiro Kazumori



NESDIS Rolls Out Plans for Integrated Instrument Calibration/Validation System

NESDIS scientists unveiled plans for an Integrated Instrument Calibration/Validation System (ICVS) for satellite radiance observations at a Preliminary Design Review (PDR) September 20, 2006. When fully implemented, the system will provide the JCSDA and its partner agencies with more accurate satellite radiance observations for all the channels of all the instruments that the agencies assimilate. The system is being developed in response to the increasing demand for more accurate satellite radiances for numerical weather and climate applications. Satellite instrument calibration/validation is rapidly evolving due to growing user awareness of calibration impacts on products, concerns with data consistency among the increasing number of satellite radiometers, the development of enabling methodologies for intersatellite calibration, and the evolution of information technology.

The core components of the integrated system include: 1) On-orbit and prelaunch instrument characterization and long-term monitoring of instrument performance; 2) Intersatellite calibration of radiances using the simultaneous nadir overpass (SNO) and simultaneous conical overpass (SCO) methods; 3) Forward calculation of radiances using state-of-the-science radiative transfer models and in situ atmospheric profiles for validation and resolving spectral response related biases; 4) On-orbit spectral calibration using hyperspectral data and atmospheric absorption features; 5) Intra-satellite calibration, or calibration between instruments on the same satellite, and inter-channel calibration; 6) Vicarious calibration at selected sites and using atmosphere for instrument scan asymmetry characterization; and 7) Cross platform calibration from POES to NPOESS, GOES, and GOES-R. More details can be found at

<http://www.orbit.nesdis.noaa.gov/smcd/spb/calibration/icvs/index.html>.

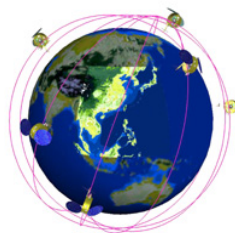
(Changyong Cao, NESDIS)

JCSDA's van Delst at Met Office



During a three week visit to the UK Met Office in August/September, Paul van Delst, the Technical Co-Lead for JCSDA's Community Radiative Transfer Model (CRTM), and Met Office scientist Roger Saunders integrated the RTTOV atmospheric gas absorption algorithm into the CRTM, which currently uses the

CompactOPTRAN atmospheric absorption algorithm. All four models - forward, tangent-linear, adjoint and K_matrix - were installed. Initial test results for HIRS and AIRS are very encouraging with the temperature Jacobians matching extremely well. Further analyses are needed of the water vapor and ozone Jacobians in both the CompactOPTRAN- and RTTOV-based CRTM results. The visit was funded by the EUMETSAT Satellite Application Facility on Numerical Weather Prediction (NWP-SAF) as a visiting scientist mission, and follows up on Roger's visit to the JCSDA in April/May 2006, when the collaboration was initiated.



Cosmic Corner

The six COSMIC satellites are all healthy and currently producing 1000 - 1200 Radio Occultation soundings daily. Two spacecraft have reached their final orbit, and a third is now being raised. When all six are in their final orbits optimal global coverage will result, and downlink bottlenecks will be minimal, increasing the number of occultation soundings available for use in analysis and NWP.

At the JCSDA all codes for assimilating bending angle and refraction have been converted for use in hybrid coordinates. Comparisons are being made between COSMIC observations and the Gridpoint Statistical Interpolation analysis to refine the COSMIC quality control procedure, and tuning is being conducted to estimate representative errors. An experiment to evaluate impact assessment in the NCEP Global Forecast System (GFS) is already underway. Operational assimilation of COSMIC in the GFS will commence as part of the next operational implementation, expected in January, 2007.

(J. Yoe and L. Cucurull, JCSDA)



The North American and Asian THORPEX communities, along with interested scientists from other regions, have developed planning documents for a THORPEX Pacific-Asian Regional Campaign (T-PARC), see: <http://www.ucar.edu/nathorpe/THORPEX/PARC.html>. The plans include a broad range of studies, starting with computer simulations to refine the design of the experiments, a field phase including special in-situ observations and special use of satellite information over a large area including eastern Asia and the west- and mid-Pacific, and post-experiment analysis of the field results. The studies aim at (a) a better understanding of atmospheric processes important in the development of high impact weather over the western Pacific, and the downstream



evolution of disturbances leading to significant weather events over the continental US and the Arctic region; (b) improving observing, data assimilation, and numerical modeling / ensemble procedures used to forecast such events; and (c) an outreach to the user community to ensure that the improved forecasts of high impact weather are used to their fullest potential.

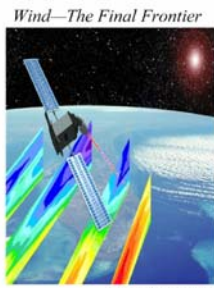
Upcoming THORPEX-related meetings of interest:

Second THORPEX International Science Symposium, 4-8 December 2006, Landshut, Bavaria, Germany, http://www.wmo.ch/thorpe/2nd_Symposium.html

THORPEX Special Session on "Bridging the studies of weather and climate", under the AMS Forum: Climate Variations and Change Manifested by Changes in Weather, 14-18 January 2007, San Antonio, Texas, <http://www.ametsoc.org/meet/annual/call.html#weather>

THORPEX session - NP5.04 Predictability of high impact weather (THORPEX) - at the General Assembly of the European Geosciences Union (EGU), Vienna, Austria 15 - 20 April 2007, <http://meetings.copernicus.org/egu2007/>

THORPEX is an international research program to accelerate improvements in the accuracy of 1 to 14 day weather forecasts for the benefit of society and the economy. (Zoltan Toth, NCEP)



Lidar Winds Update

Atmospheric Dynamics Mission (ADM) Workshop: JCSDA Director John Le Marshall and NASA's JCSDA Deputy Director, Lars Peter Riishogjaard, along with almost 100 other scientists and engineers from all over the world, attended the Atmospheric Dynamics Mission

(ADM) Workshop at the European Space and Technology Center in the Netherlands, 26 -28 September 2006. Scheduled for launch by ESA in late 2008, the ADM-Aeolus Mission will provide global observations of wind profiles from space. The meeting covered History and Future of Wind Lidar, the Scientific Objectives of the Mission, the ALADIN (Atmospheric Laser Doppler Instrument) Payload, the Aeolus Ground Section, and ADM-Aeolus Data Processing. There were also a number of presentations related to the application of ALADIN data and several papers describing Observing System Simulation Experiments (OSSEs), collectively showing the value of these wind observations. A more complete summary of the workshop may be found at http://www.esa.int/esaLP/SEMrgVKKKSE_LPadmaeolus_0.html

John gave a keynote address on the use of Wind Observations in Atmospheric Dynamics and in Numerical Weather Prediction, which covered current satellite types able to produce wind vectors. He also reported on the detailed OSSE work that had been done within the Joint Center using synthetic Doppler Wind Lidar data.

Analyses within the Joint Center, namely in the NCEP and Goddard analyses suite, already contain codes to handle Line-of-Sight Lidar Wind Observations. Lars Peter, who conducted a session on Research and Application Potential of the ADM-Aeolus Mission, is also the representative for the JCSDA on the ADM Mission Calibration and Validation Team. Overall preparations for the mission are well advanced.

The ESA Announcement of Opportunity for the ADM Science Team will be released in March 2007. ESA will provide access to level 1 data to Science Team Members.

Preliminary Design for Doppler Wind Lidar: A NASA preliminary instrument reference design for a space-based (DWL) was created by the Instrument Synthesis & Analysis Laboratory (ISAL) at the NASA Goddard Space Flight Center (GSFC), September 11 - 15, 2006. The ISAL study found "no technology tall poles" and was initiated by NASA in anticipation of the upcoming National Research Council Decadal Survey on Earth Sciences and Applications from Space, expected in December 2006. A preliminary mission reference design for a DWL is scheduled to be developed in early October 2006 by the GSFC Integrated Mission Design Center.

(John Le Marshall and Wayman Baker, JCSDA)

Federal Funding Opportunity Update



A total of 40 letters of intent to submit proposals were received by the JCSDA in response to the announcement of the FY 07 Federal Funding Opportunity to support external research and development. Of these, 25 received encouragement for the submission of full proposals. By the deadline of 5 p.m. EDT on October 2, 2006, 25 proposals had been received. These are currently undergoing review to confirm that minimum requirements for applications have been satisfied. Merit review will begin as soon as possible, and will be complete by early December, 2006. The JCSDA external grant program is funded by NOAA, NASA, and DoD. (J. Yoe, JCSDA)



JCSDA Visitor Implements Cloud Detection Techniques



During his recent short-term visit to the JCSDA, Will McCarty, a Ph. D. Student at the University of Alabama in Huntsville, implemented two new techniques for cloud contamination determination within NCEP's Gridpoint Statistical Interpolation (GSI) 3D-VAR framework. The first determines Cloud Top Pressure (CTP) by applying a traditional CO₂ slicing technique using a subset of the AIRS channels available in the operational data stream. The CTP is then compared to the transmittance profiles of the individual AIRS channels to determine if cloud contamination is an issue for any of the channels. The second approach, the CO₂ sorting technique, directly analyzes the nature of the radiances rather than relying on a physical retrieval to assess cloud contamination. His stay was part of a collaborative effort between the JCSDA and NASA's Short-term Prediction Research and Transition (SPoRT) Center to investigate cloud contamination in AIRS radiance data within the NCEP GSI system. Will's NASA Earth System Science Fellowship research and dissertation work will investigate these GSI refinements and the resulting forecast impacts in the Weather Research and Forecasting Nonhydrostatic Mesoscale Model (WRF-NMM) model.

Outlook for Next Quarter

Upcoming JCSDA Seminars



Date	Speaker	Agency	Subject
10/18/06	Christa Peters-Lidard	NASA GSFC	NASA's Land Information System
10/24/06	Stefan Kinne	MPI	A Satellite-based Aerosol Data Set
11/15/06	Dale Barker	NCAR	Ensemble Filter and 4D-Var Assimilation in WRF

Suggestions for speakers and topics are always welcome; please send them to george.ohring@noaa.gov.

Please submit news items 2 weeks prior to the end of each quarter to george.ohring@noaa.gov



Special Issue of the Journal of Atmospheric Sciences

The JCSDA is working with the American Meteorological Society to publish a Special Issue of the Journal of Atmospheric Sciences in 2007. The Special Issue will contain papers on the

Assimilation of Satellite Cloud and Precipitation Observations in Numerical Weather Prediction Models resulting from a JCSDA sponsored international workshop in 2005.