

## News in This Quarter

### JCSDA Partner Agencies: Focus on NOAA/NESDIS



Previous Quarterlies summarized satellite data assimilation activities at the US Air Force and US Navy; in this issue, we look at NESDIS. The NOAA/NESDIS Office of Research and Applications (ORA) provides full spectrum science and operational support to national and international NWP centers to conduct state-of-the art satellite data assimilation experiments. ORA scientists work closely with their counterparts at NCEP to:

1) develop fast radiative transfer models, a core component of satellite data assimilation, 2) prepare for operational use of data from upcoming advanced satellite missions, and 3) conduct studies to evaluate the impact of current and planned satellite instruments on weather prediction accuracy. Data assimilation teams are assembled and matrix managed across ORA Divisions and Branches. As listed below, each science team focuses on various tasks.

#### Radiative Transfer Modeling:

- Update radiative transfer models for new instruments
- Update surface emissivity models
- Develop advanced radiative transfer (RT) models that include the effects of aerosol, cloud, and precipitation particles
- Develop and test 1D-variational assimilation schemes that use advanced RT models

#### Advanced Instruments:

- Prepare for early access to advanced satellite data (e.g. AMSR-E, SSM/IS, IASI, ATMS, CrIS)
- Prepare the data in the format needed by NCEP and other NWP centers
- Provide early diagnostics on instrument biases and develop bias correction techniques
- Test and develop NWP unique algorithms

#### Satellite Products:

- Upgrade vegetation greenness fraction, and snow products for NWP model initialization
- Prepare a suit of high-quality satellite derived cloud products for NWP model validation
- Develop new products (e.g. soil moisture, land surface temperature, solar insolation) from advanced sensors

#### Impact Studies:

- Conduct impact studies on MODIS derived winds
- Conduct Observing System Experiments for AIRS, AMSU, HIRS, and winds from GOES using the NCEP forecast system
- Improve 1D-variational (1dvar) scheme for Weather Research and Forecast (WRF) Model applications to advance hurricane prediction capabilities
- Use a cloud resolving model to improve cloud forecasts

To insure effective coordination with JCSDA partners and NOAA Line Offices and the smooth functioning of the Center, the ORA Director, Dr. Marie Colton, has appointed an administrative support team for JCSDA Budget Planning, Quarterly Newsletters, Seminar Series, and Website Maintenance.

(Fuzhong Weng, NESDIS).

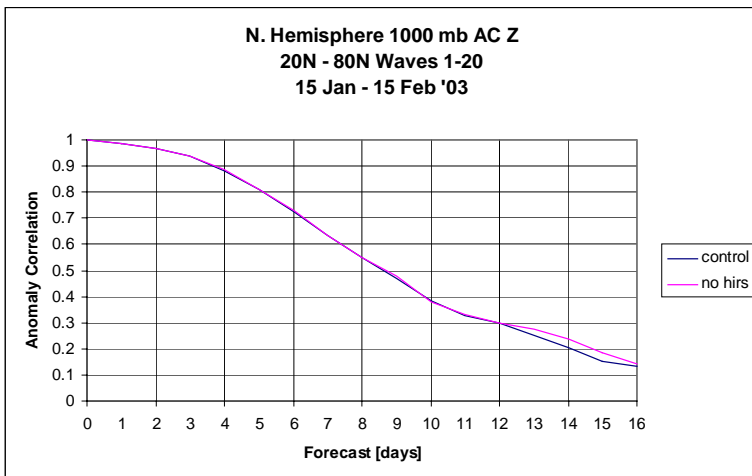
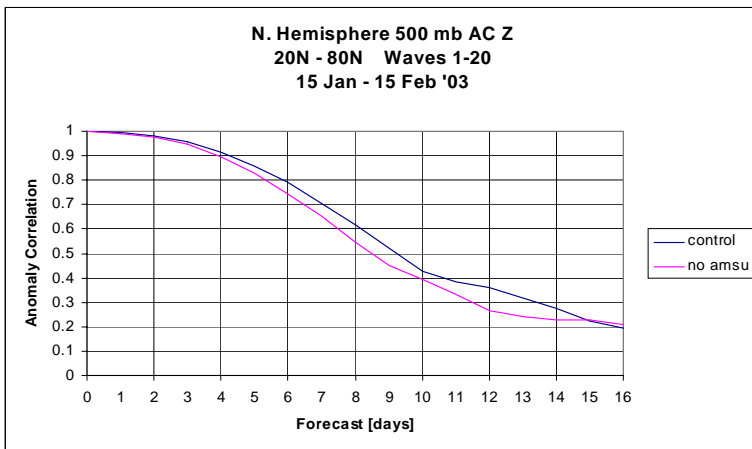
### Science Update: Observing System Experiments with NCEP's Global Forecast System

Observing System Experiments (OSEs) with NCEP's Global Forecast System (GFS) show that assimilation of data from three orbiting AMSU instruments reduces the errors of 24-hour predictions of upper air temperatures and relative humidities by as much as 25 – 40 %. The study also indicates an improvement of 0.1 in anomaly correlation (AC) for 500 hPa heights at forecasts longer than 8 days – the equivalent of about a half-day extension of forecast capability – when the AMSU data are added to assimilation stream. These OSEs are being conducted to evaluate the impact of various operational observing systems on NCEP's global forecasts. Both winter and summer 6-week periods are being evaluated, with the last 4 weeks being used to generate impact statistics. The NCEP Global Data Assimilation System (GDAS) is run at the full operational resolution of T254 (55 km) and 64 levels. The following observing systems are being evaluated by denying each system separately in the Global Data Assimilation System: all AMSU data, all HIRS data, and data from one

AMSU instrument. Impact statistics are the percent change in root-mean-square (rms) errors in sea-level pressure, and mandatory level (100-1000 hPa) relative humidity, temperature and zonal wind. In addition, geopotential height anomaly correlations at 500 and 1000 hPa for both the Northern and Southern Hemispheres, and tropical rms wind vector error at both 200 and 850 hPa are calculated. Results indicate that the largest forecast difference between the control experiment and the denied experiment is obtained from the three-way AMSU denial.

Many experiments are planned; results from the first two are shown below. The control run includes all satellite and conventional data. In the first experiment, all satellite microwave data (AMSU-A and AMSU-B) are removed from the assimilation process, and in the second experiment all IR (infrared) satellite data (HIRS) are deleted. The results obtained here are completely consistent with those obtained at the ECMWF and the UK Met Office, namely that AMSU data have a much larger impact on global forecast scores than HIRS data

(Steve Lord, NCEP/EMC, and Tom Zapotocny, Jim Jung, CIMSS)



## Meet Jianjun Xu



Jianjun Xu recently joined the JCSDA as a University Corporation for Atmospheric Research (UCAR) Visiting Scientist in a position funded by the Air Force Weather Agency (AFWA). Jianjun will be a member of the team that is

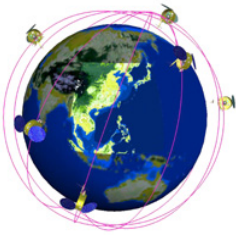
developing the tools to assimilate real-time satellite-based cloud and precipitation information into the Weather Research and Forecast (WRF) system. The WRF system is a mesoscale model that is being jointly developed by Air Force Weather Agency, NOAA/NCEP, NCAR, NOAA/Forecast Systems Laboratory and University of Oklahoma. After familiarizing himself with the JCSDA satellite data assimilation code, he'll assist in developing a testing code infrastructure for evaluating advanced radiative transfer models for clouds and precipitation. This code will be part of the system that will generate data assimilation statistics relevant to cloud analysis, cloud properties, and verification of these statistics against existing observations in the WRF development program.

After receiving his Ph. D. from the Nanjing Institute of Meteorology, Jianjun joined the faculty of the Institute. In 2000, he came to the United States and held positions as a postdoc at New Mexico Institute of Mining and Technology and research scientist at the Department of Hydrology and Water Resources at the University of Arizona. For the last 5 years he has performed research on mesoscale modeling and the North American monsoon, remote sensing and four dimensional variational data assimilation, and climate variability on multiple time scales.

## USAF Brigadier General Stickford Visits JCSDA

Brigadier General Thomas E. Stickford, Director of Weather, Deputy Chief of Staff for Air and Space Operations, USAF, toured the Joint Center for Satellite Data Assimilation on March 10. Colonel Neil Wyse, Colonel John Lanicci, and Lieutenant Colonel Michael Farrar accompanied General Stickford. Dr. Louis Uccellini, Chair of the JCSDA Management Oversight Board, briefed General Stickford on JCSDA organizational developments, recent accomplishments, and some challenging issues in the satellite data assimilation area. During his visit, General Stickford met with Dr. Jianjun Xu (see Meet Jianjun Xu in this issue), a visiting scientist at JCSDA from the Air Force Weather Agency (AFWA).

## Cosmic Corner



An article in Issue 5 (December 2003) introduced Lidia Cucurull and her work to develop procedures for the assimilation of atmospheric limb soundings that first will become available operationally from GPS radio occultation (GPSRO) sensors beginning with the Constellation of

Satellites for Meteorology, Ionosphere, and Climate (COSMIC) in late 2005. Because these observations are based on a measurement principle quite different from those that govern the more familiar near-nadir passive radiometric sounders, they are expected to provide complementary information. Of course, to exploit that potential, significant alterations in the familiar assimilation methodology are needed. The COSMIC Corner will be a regular feature of the Quarterly to keep abreast of the mission, researchers, data, and, especially, progress made toward the incorporation of GPSRO observations in operational numerical weather prediction.

Another member of the team is Dr. Martin Lohmann, who came to UCAR from the Danish Meteorological Institute with NESDIS support in October 2003. Martin's current work is focused on improving the quality of GPSRO stratospheric refractivity retrievals and the assignment of error covariances to them through the reduction of ionospheric noise. He is developing a new approach which allows dynamic error covariance estimation for each single occultation, for which testing has shown better performance than the conventional technique currently implemented in the COSMIC Data Analysis and Archive Center (CDAAC) system. Martin will visit the World Weather Building in April, 2004, and will join the team "on site" later this year.

(Jim Yoe, NESDIS)

## Outlook for Next Quarter

### Workshop and Meeting Announcements

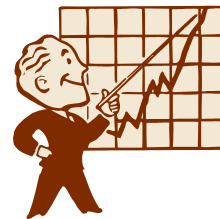
*JCSDA 2<sup>nd</sup> Workshop on Satellite Data Assimilation, April 15-16, Camp Spring, MD.* This workshop will review the ongoing and planned scientific developments sponsored by JCSDA and plan and coordinate future efforts.

*JCSDA 2<sup>nd</sup> Annual Meeting of Science Steering Committee (SSC), April 20-21, Silver Spring, MD.* The SSC provides scientific guidance to the JCSDA Director on proposals submitted to the JCSDA for scientific projects. The Committee also reviews JCSDA scientific priorities and

projects annually and provides a report to the JCSDA management. Representatives of the major national and international NWP centers will attend the Committee's meeting.

*NOAA/NESDIS/Office of Research and Applications Workshop on Air Quality Applications of Satellite Data, May 4, Camp Spring, MD.* Issues to be discussed include: satellite data in air quality monitoring, air quality forecasts with chemical data assimilation, algorithms to enhance pollutant information in the troposphere, including the planetary boundary layer, and products from advanced next generation instruments to be flown on NPP, NPOESS, and GOES-R platforms.

*JCSDA 1<sup>st</sup> Advisory Panel Meeting, June 17,* after the 50<sup>th</sup> Anniversary of NWP event at the University of Maryland, the JCSDA Advisory Panel will meet and advise the JCSDA Management Oversight Board of Directors on major policy issues and directions related to satellite data assimilation in weather prediction. The Panel is composed of scientists and scientific managers from a broad spectrum of national and international organizations.



### Upcoming JCSDA Seminars

4/21/04	Ron Errico	NASA Goddard Global Modeling and Assimilation Office	Tentative title: Issues in Assimilation of Precipitation Observations
5/19/04		Open	
6/16/04	Anthony Weaver	Climate Modeling and Global Change Group European Centre for Research and Advanced Training in Scientific Computing (C.E.R.F.A.C.S.)	Tentative title: Global Ocean 3D-Var And 4D-Var

Please submit news items 2 weeks prior to the end of each quarter to [george.ohring@noaa.gov](mailto:george.ohring@noaa.gov)