

News in This Quarter



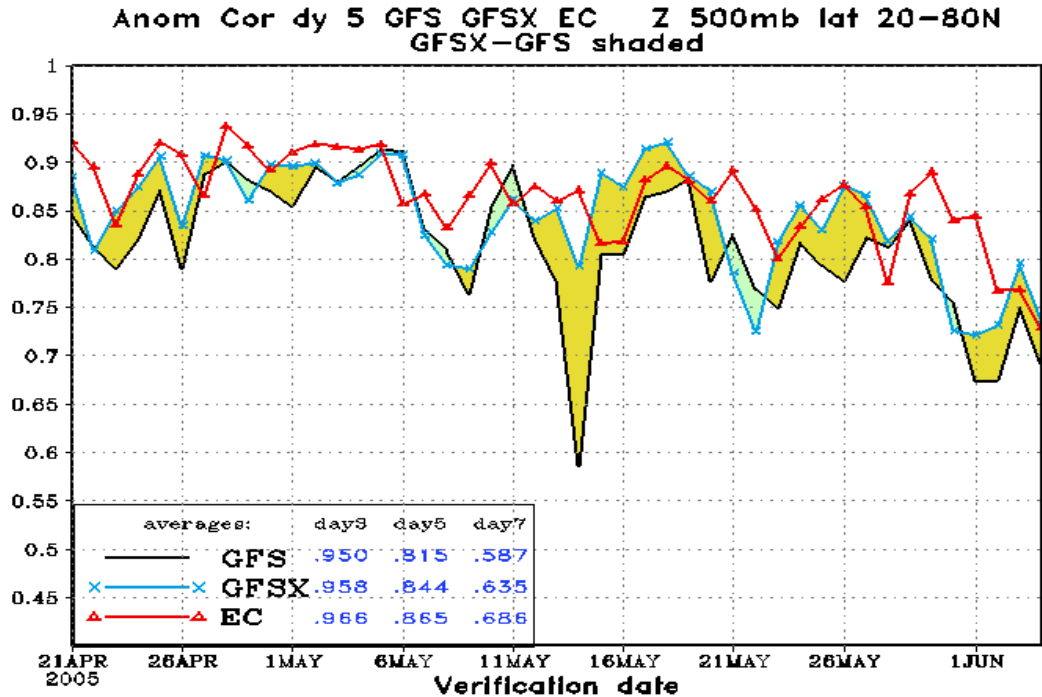
NCEP Upgrades its Global Forecast System

NCEP implemented a number of important changes to its Global Forecast System (GFS) on May 31, 2005. As a result of these upgrades, the gap in accuracy, as measured by 500mb anomaly correlation between ECMWF and NCEP forecasts has been cut in half. The new forecast system has finer horizontal resolution, and vertical resolution beyond 3.5 days, uses observations from a new generation of infrared sounders - NASA's Atmospheric Infrared Sounder (AIRS) - has enhanced quality control, implements improved microwave surface emissivities, uses new sea-ice and land surface models, modified vertical diffusion, and enhanced mountain blocking, as detailed below:

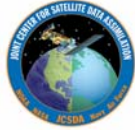
- The horizontal resolution is increased from approximately 50 km to approximately 35 km in both the analysis and forecast models (105km to 70km beyond 7.5 days).
- The information content of assimilated IR sounding data is substantially enhanced with the addition of the NASA AQUA AIRS data and the amount of microwave sounding data increases with the use of NASA AQUA AMSU.
- The quality control of infrared sounding radiances is improved by the addition of a new cloudiness algorithm, where estimates of percent cloudiness are obtained using the observed IR brightness temperatures, simulated IR brightness temperatures, and brightness temperature sensitivities computed from the CRTM (Community Radiative Transfer Model). An estimate is also made of the cloud top pressure. This

information is then used in subsequent quality control decisions for assimilating the IR observations.

- A new microwave emissivity model over snow and ice, developed by NESDIS/ORA scientists is added. The improved model allows a noticeable increase in the amount of microwave sounding observations assimilated over snow and ice covered surfaces.
- The new sea-ice model predicts sea-ice/snow thickness, the surface and ice temperature structure, and fractional ice cover. Albedo and surface fluxes of heat and moisture are treated separately for ice and open water.
- The new land surface model uses four sub-surface layers and has improved treatment of frozen soil, ground heat flux, and energy/water balance at the surface. Also, there are reformulated infiltration and runoff functions and an upgraded satellite-based vegetation fraction.



Yellow shaded areas indicate improved forecasts by the new NCEP Global Forecast System (GFSX-blue) compared to the old system (GFS-black). The gap between accuracies of NCEP and ECMWF (EC-red) forecasts is halved with the new system (see box).



- Finally, a change to the mountain blocking scheme is made, with reduced background vertical diffusion, which uses a value of 10% of the mountain variance to enhance mountain blocking dissipative forces.

Forecasts are improved using the new system, as shown in the accompanying figure. Comparison of 500 mb geopotential height anomaly correlation, for forecast day 5, verifying during April 21-June 3, for the old GFS (black) and new GFSX (blue) show a consistent forecast improvement for the new GFSX in the NH ('yellow' shading) and more mixed results in the SH (not shown). Northern Hemisphere 3, 5, and 7 day forecasts show that the difference between the old GFS and the ECMWF (red) scores is halved by the new GFSX.

International Items



Assimilation of Satellite Data at the Met Office, UK

The Met Office provides numerical weather prediction (NWP) products in support of a wide range of civil and military activities, both globally and for the UK region. These include the provision of short-range global NWP products in support of its role as a World Aviation Forecast Centre. Currently the Met Office runs the following NWP models:

- a global model (50 km resolution), out to 5 days,
- a North Atlantic / European regional model (12 km), out to 48 hours,
- a UK area model (currently 12 km, soon to be 4 km), out to 36 hours,
- crisis area regional models in support of military activities.

Satellite data are assimilated into all these models. A 4D-Var assimilation system is used for the global model. 3D-Var is currently used for other models, and work is under way to introduce 4D-Var into these models also. As at other global NWP centers, the importance of satellite data for NWP skill has increased greatly in recent years.



Satellite data now have at least as much impact as other observations, even for short-range forecasts in the Northern Hemisphere; in the medium-range, and at all ranges in the Tropics and Southern Hemisphere, they have more impact.

The Met Office currently assimilates satellite data as follows:

Global model:

- ATOVS radiances from NOAA satellites, received via NESDIS (global data) and via the EUMETSAT Advanced Retransmission Service, EARS (data covering much of the Northern Hemisphere and available within 30 minutes),
- AMSU-A radiances from Aqua,
- AIRS radiances (cloud-free only) from Aqua,
- atmospheric motion vectors (AMVs) from geostationary satellites,
- AMVs from MODIS on Terra and Aqua,
- SSM/I retrieved surface wind speeds,
- Quikscat ambiguous wind vectors,

In addition, SSTs retrieved from AVHRR data and sea-ice analyses from SSM/I data are important inputs into the NWP analysis of surface fields.

North Atlantic / European regional model:

- ATOVS radiances from NOAA satellites, received via EARS,
- AMVs from Meteosat-5, -6 and -7, and GOES-12,
- SSM/I retrieved surface wind speeds,
- Quikscat ambiguous wind vectors.

UK area model:

- ATOVS radiances from NOAA satellites, received via the local ground station at Met Office HQ,
- AMVs from Meteosat-6 and -7,
- cloud amount and cloud top-height retrieved from Meteosat imagery, via the 3D cloud analysis in the "Nimrod" nowcasting system.

Crisis area regional models in support of military activities:

- ATOVS radiances from NOAA satellites,
- SSM/I retrieved surface wind speeds,
- Quikscat wind vectors,
- AMVs from geostationary satellites.

Work in progress to improve our assimilation of satellite data includes:

- AMVs - increased quantity (including Meteosat-8) and improved assimilation methods,
- AIRS radiances – improved assimilation methods,
- SSMIS radiances – both as SSM/I follow-on, and to provide back-up for AMSU,
- ATOVS:
 - full-resolution AMSU-B data in limited area models,
 - improved use in cloudy areas and over land,
- radio occultation data from CHAMP,
- GPS total column water vapor data.

For the longer term, work is under way to:

- prepare for Metop (launch 2006), where the goals are:



- continuity for ATOVS data and scatterometer data (ASCAT),
- early operational use of IASI and GRAS,
- prepare for COSMIC (launch 2006),
- prepare for NPP (launch 2008),
- prepare for Doppler wind lidar data from ADM/Aeolus (launch 2008),
- assimilate cloud-affected AIRS/IASI radiances,
- assimilate precipitation information in microwave radiances,
- improve assimilation of cloud information from geostationary imagery,
- assimilate various remotely sensed data in NWP models of 1-4 km resolution.

(John Eyre, Met Office)

(AOs) in 2003 and 2004. The meeting opened with a plenary session attended by all participants, during which the Director John LeMarshall, reviewed major accomplishments of the JCSDA during the past year and set the objectives for the Workshop. Concurrent break-out sessions followed, devoted to Advanced Instruments, Ocean Data Assimilation, Land Data Assimilation, and Radiative Transfer. Overall the quality of the talks was very high, befitting the research being summarized, and led to productive discussions. One suggestion for future Workshops was to provide more time for investigators to interact with one another, particularly those working in different focus areas.

(J. Yoe, NESDIS)

International Cloud/Precipitation Workshop



The Joint Center for Satellite Data Assimilation sponsored an International Workshop on the Assimilation of Satellite Cloud and Precipitation Observations in NWP Models, at the National Conference Center, Lansdowne, VA, on May 2-4, 2005. The focus of the Workshop was on how to use satellite observations to improve the initialization of clouds and precipitation in weather forecast models. To date, assimilation of satellite measurements has centered on the clear atmosphere, but satellite observations in the visible, infrared, and microwave provide a great deal of information on clouds and precipitation. Since clouds and precipitation often occur in sensitive regions for forecast impacts, such improvements are likely necessary for continuing significant gains in weather forecasting. The Workshop brought together 45 international experts in: cloud/precipitation remote sensing, radiative transfer in cloudy or precipitating atmospheres, modeling clouds and precipitation in NWP models, and assimilating cloud and precipitation observations. These scientists critically reviewed current capabilities in these fields, listed impediments to progress, and evolved recommendations to accelerate the development of cloud and precipitation assimilation systems in NWP. The overarching recommendation: cloud and precipitation assimilation require combined effort between observation, modelling and data assimilation communities. A workshop summary is being prepared for AGU's EOS, and it is planned to publish key papers from the workshop in the AMS Journal of the Atmospheric Sciences.



David Burridge, former Director of ECMWF, has been appointed Director of the THORPEX Executive Board (EB) and the

International Program Office (IPO). Co-chairs for the THORPEX Working Groups (WG), including the four research WGs, have been appointed. Currently the WGs are being formed, based on recommendations from WMO member countries.

On June 6-7, under the leadership of the US co-chair of the North American THORPEX Regional Committee, a workshop was held to discuss plans for a THORPEX-IPY Pacific Predictability Experiment. Tentative plans were drawn up, with a more detailed outline to be developed during the next few months. The experiment would include both laboratory (Observing System Simulation Experiments) and field work, with the field phase scheduled to take place during the International Polar Year (IPY), August – December 2008.

THORPEX is a 10-year long World Weather Research Program (WWRP) developed under the auspices of the World Meteorological Organization (WMO) with the objective of accelerating improvements in the quality and utility of high societal impact weather forecasts over the 1-14 days time range.

(Zoltan Toth, NCEP)

3rd JCSDA Workshop on Satellite Data Assimilation

The annual JCSDA Workshop on Satellite Data Assimilation was held in the World Weather Building on April 20-21, 2005. A summary presentation was made for each of the projects supported by the JCSDA during the past year, including both internal directed research and the external projects which had been selected through the Announcements of Opportunity



International TOVS Study Conference



The 14th International TOVS Study Conference (ITSC-14) was held in Beijing, China, 25-31 May 2005. Brilliantly hosted by the National Satellite Meteorological Center (NSMC) of China, the Conference drew about 150 international participants representing the atmospheric sounding and NWP user communities. Some 76 oral papers and 91 poster papers were presented at the conference on the following topics:

- ATOVS Radiance Studies
- ATOVS Retrieval Studies
- ATOVS Cloud Studies
- Climate applications
- NPOESS Preparation
- Radiative Transfer and Surface Models
- Operational Applications
- Use of ATOVS in NWP
- International Status Reports
- Direct Reception/Software Packages
- Preparations for METOP
- Future Instruments

JCSDA scientists and university investigators supported by the JCSDA made significant contribution to the conference. The conference was ably organized and co-chaired by Tom Achtor, U. Wisc., and Roger Saunders, Met Office. Lou Dongfeng, NSMC, did a superb job on the local arrangements.

The International TOVS Working Group (ITWG) is convened as a sub-group of the Radiation Commission of the International Association of Meteorology and Atmospheric Sciences (IAMAS). ITWG continues to organize International TOVS Study Conferences (ITSCs) which have met every 18-24 months since 1983. Through this forum, operational and research users of TIROS Operational Vertical Sounder (TOVS) data from the NOAA series of polar orbiting satellites and other atmospheric sounding data have exchanged information on methods for extracting information from these data on atmospheric temperature and moisture fields and on the impact of these data in numerical weather prediction and in climate studies. They have also prepared recommendations to guide the directions of future research and to influence relevant programs of WMO and other agencies (NASA, NESDIS, and EUMETSAT).

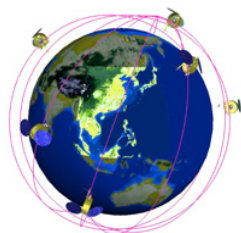
Cosmic Corner

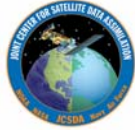
The past quarter has been seen a good deal of activity related to COSMIC. Martin Lohmann of the JCSDA traveled to Taipei, Taiwan, where he served as one of the instructors for the ROCSAT3/COSMIC Science Summer Camp from May 30 to June 3, 2005. Martin discussed methods

being developed to estimate errors in radio occultation soundings, and how these methods may need to be modified

when applied to data collected using open-loop tracking instead of phase-locked loops.

The COSMIC Interagency Advisory Group (IAG) met in Silver Spring, MD, on June 26, 2005 to review the status of the mission and preparations for COSMIC data use, in particular when assimilated for numerical weather prediction. At the IAG it was announced that the launch of COSMIC will be delayed from December 2005 until March 2006. Extra time is required to assemble the last of the 6 COSMIC satellites, since some of its components were “borrowed” to replace balky counterparts from satellites 1 through 5. Finally, a



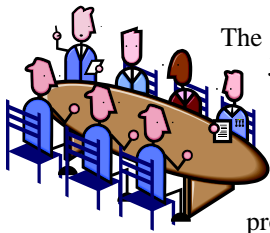


GPS/RO Data Users Workshop is being planned in the Washington, DC area August 22-24, 2005. Program details and on-line registration may be reached by following this link: <http://www.cosmic.ucar.edu/gpsro2/index.html> (J.Yoe, NESDIS)

working with M. Sengupta on a JCSDA grant to develop an all-weather observational operator .

The Fulbright program, established in 1946, is sponsored by the U.S. Department of State. The highly prestigious program sends 800 U.S. faculty and professionals abroad each year to lecture and conduct research in a wide variety of academic and professional fields.

JCSDA 3rd Annual Meeting of Science Steering Committee



The Science Steering Committee of the JCSDA, chaired by Paul Menzel, met at the University of Maryland on April 26 and 27. Composed of working scientists, the SSC reviews JCSDA scientific priorities and projects annually and provides a short report to the JCSDA management, MOB, and the advisory panel.

Outlook for Next Quarter

Upcoming Events

- Gene Poe and his team of SSMIS scientists will be visiting the JCSDA on July 27. In addition to a JCSDA seminar, they will meet with JCSDA scientists for detailed discussions on SSMIS
- GPS/RO Data Users Workshop in the Washington, DC area August 22-24, 2005

Dr John LeMarshall, the JCSDA Director, summarized the significant achievements of the past year and laid out priorities for the coming year. JCSDA representatives reviewed the results of research accomplished under the JCSDA's extramural Announcement of Opportunity and directed research programs, and synergistic activities at the major US NWP Centers.



Upcoming JCSDA Seminars

The SSC indicated that the JCSDA had made excellent progress on its projects and had responded very well to SSC's guidance from the previous year. The SSC provided new guidance in the form of specific recommendations for a number of different development areas.

JCSDA Grantee Vukicevic wins Fulbright Award

Tomislava (Tomi) Vukicevic, Colorado State University (CSU) research scientist, and a JCSDA grantee, has been selected as a Fulbright Scholar to teach at the University of Beograd in Serbia and Montenegro. Tomi, who is originally from Yugoslavia and still has family in the area, applied for the Fulbright as an opportunity to support promising new scientists in her native land. She will assist the University of Beograd in rebuilding its once world-class atmospheric science program and write a textbook in collaboration with a graduate student and colleagues from the University of Reading, England.

JCSDA Seminars			
Date	Speaker	Affiliation	Title
7/27/05	Donald Boucher David Kunkee Steve Swadley Gene Poe	Aerospace Aerospace NRL NRL	SSMIS
8/3/05	Catherine Prigent	Observatoire de Paris	Microwave Surface Emissivity

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

Tomi teaches graduate courses in the Atmospheric Science Department and conducts research at CSU's Cooperative Institute for Research in the Atmosphere (CIRA). She directs the Data Assimilation group at CIRA, where she is currently

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