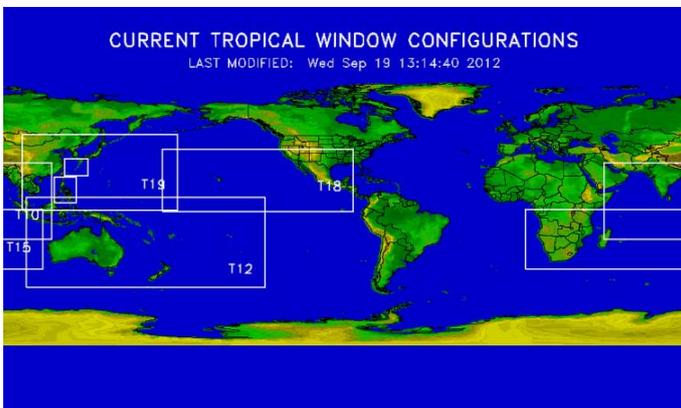
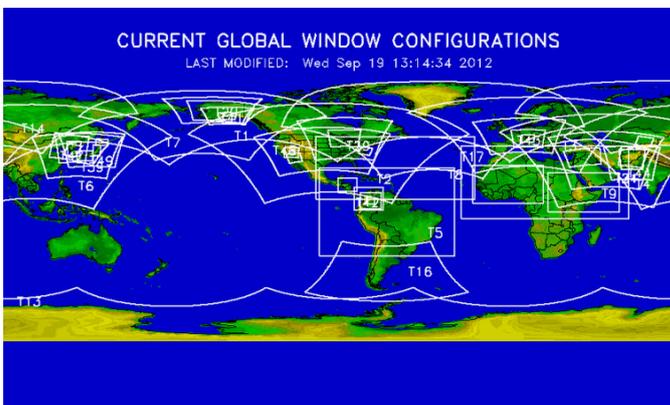


## News in This Quarter Science Update

### Big Changes Forecast for the Air Force Weather Agency



The Air Force Weather Agency runs its regional forecast model in many areas around the globe, as shown in above maps.

Since 2007, the Air Force Weather Agency (AFWA) has been utilizing the Weather Research & Forecasting (WRF) regional model as its numerical weather prediction model of choice. From the first operational WRF model run, AFWA has employed the three-dimensional variational analysis (3DVAR) data assimilation (DA) system developed at the National Center for Atmospheric Research (NCAR) to produce the initial conditions for the forecast.

At AFWA, a number of domains are available with principal theaters running 4 times per day and others running 2 times

per day. The WRF model is initialized using the United Kingdom Meteorological Office Unified Model (UM). The UM model is run 4 times per day and pre-processed for initialization conditions to each WRF grid. The WRF model also incorporates surface characterizations from the Land Information System (LIS) and the Navy Sea Surface Temperature analysis. Data assimilation is run 8 times a day for the core theaters and 4 times a day for the others (i.e., twice per model cycle run, once for a 6-hour “spin-up” run and once for a subsequent “free forecast”). This is done to incorporate the maximum number of available observations. Surface, upper air and aircraft observations are the primary conventional observations used, while Global Positioning Satellite-Radio Occultation data, satellite cloud drift wind and sea surface wind speed are equally important components in regions where these conventional data are limited. In our larger domains, AFWA processes approximately 100K conventional observations per model cycle.

AFWA is in the process of migrating from its current data assimilation system to the Gridpoint Statistical Interpolation (GSI) DA system developed at the National Centers for Environmental Prediction (NCEP) and used operationally in the suite of models used at NCEP. These include the Global Forecast System, North American Model, Hurricane WRF, and Rapid Refresh models. The NOAA Earth Systems Research Lab (ESRL), NASA Global Modeling and Assimilation Office (GMAO), and NCEP Environmental Modeling Center (EMC) provide a robust R&D support system to AFWA’s new DA system—GSI. Transitioning to the GSI for data assimilation, AFWA will be able to leverage the additional R&D work done at JCSDA and the community at large. Once adopted operationally, AFWA anticipates being able to contribute code necessary to assimilate some of the unique data types used at AFWA.

AFWA considered the possibility of using a direct initialization data feed from NCEP; however, given the stringent time constraints under which AFWA operates to support its worldwide mission and the addition of DoD-unique observations, relying on the datasets compiled and made available through NCEP was not viable. Therefore, in order to utilize GSI in AFWA’s operational environment, much of the observation pre-processing code developed over the years at EMC had to be ported to work within AFWA’s data processing and storage architecture. EMC and AFWA technicians collaborated to successfully port a majority of the code for use at AFWA. Efforts are now starting to formally integrate the EMC code into the AFWA



infrastructure. First, working directly with EMC, AFWA's DA team developed a WRF-GSI prototype and began running a parallel experiment for comparison to AFWA's operational configuration. Second, code provided by EMC allowed AFWA to begin testing its assimilation of satellite radiance data. In addition, AFWA is now in the process of requesting a large array of meteorological satellite data for use in our assimilation system.

Following the paradigm used with the GSI DA code, AFWA is leading the charge to baseline the observational pre-processing code used at NCEP, making it community code maintained by the Developmental Testbed Center (DTC). Overall, adoption of GSI and baselining the pre-processing helps reduce duplication of effort and improves synergy amongst multiple organizations—research & operations—for future collaboration. Completing the transition to GSI will enhance AFWA's characterization capabilities through advanced data assimilation. In this way, better characterization of the initial environment will lead to improved forecast model output supporting Department of Defense interests world wide.

(Jason Martinelli, AFWA)

deployed in polar orbits in 2018. The COSMIC-2 receivers, being developed by JPL, will be much more capable than those on COSMIC-1, resulting in at least double the soundings per payload. Up to 12,000 radio occultation soundings, providing high quality information on atmospheric temperatures will be produced each day after both constellations are fully deployed. At its peak, COSMIC-1 provided about 2500 profiles per day. The COSMIC-1 fleet is now more than six years old, and some of its six satellites are partially or completely disabled, mainly due to failing batteries.

On the research front, NCEP continues to work on improving the use of the GPS RO data from COSMIC and other missions. More specifically, efforts are now focused on improving the assimilation of the low-level observations in the presence of large gradients of refractivity. Future efforts will address the higher-level stratospheric observations.

(Lidia Cucurull, NOAA/NCEP)

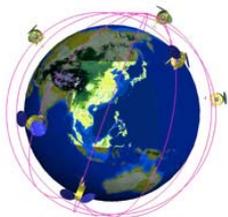
## JCSDA 2013 Federal Funding Opportunity

The Fiscal Year 2013 Federal Funding Opportunity for JCSDA external grants on Research in Satellite Data Assimilation for Numerical Environmental Prediction is now in the final stages of preparation/approval and should be posted on-line and at the JCSDA website shortly. The announcement calls for proposals for scientific projects in the following areas:

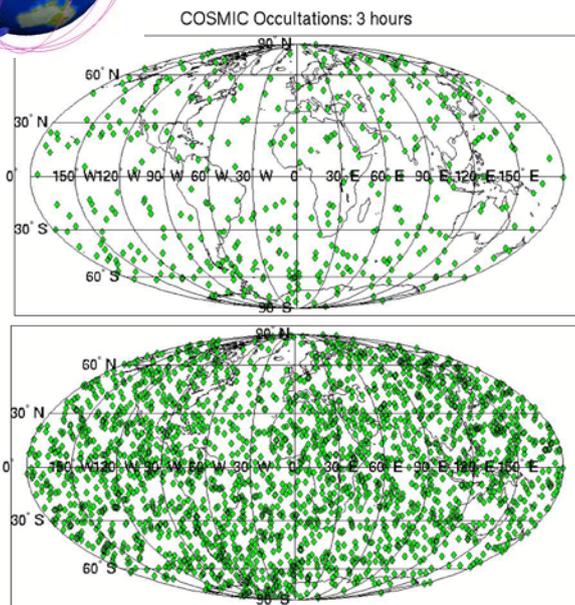
1. Testing and integration of existing, fully validated and operationally-generated quality control parameters and satellite products, into U.S. operational data assimilation models (for weather, ocean or land) with an aim to improve the forecast skill (using global and/or regional metrics). Preference will be given to sensors and/or parameters with a likelihood of providing a positive impact on U.S. operational forecast skills.
2. Assimilation of surface-sensitive channels and cloud or rain-impacted radiances, from both microwave and infrared sensors.
3. Upgrade of Line by Line modeling in support of the U.S. Community Radiative Transfer Model, with a focus on bringing this LBL capability to modern standards and incorporating recent updates. Coordination with JCSDA's CRTM team is expected.

Total funding is anticipated to be approximately \$500,000 per year. Individual annual awards in the form of grants or cooperative agreements are expected to range from \$90,000 to \$150,000. It is anticipated that 3-5 awards will be made. Project duration will be 1-3 years, with funding for multi-year projects contingent on satisfactory progress in prior years and funding availability. Letters of Intent to propose will be due by Nov. 1, and full proposals by Jan. 2, 2013. Proposers should follow application and submission directions spelled out in the FFO.

(Sid Boukabara, JCSDA)



## Cosmic Corner



Comparison of number of occultations for COSMIC-1 (top) and COSMIC-2 (bottom) for a 3-hour period. (Credit: UCAR)

With the participation of the US Air Force, the COSMIC-2 program is moving forward. The first phase, a launch of six satellites into equatorial orbit, is scheduled for 2016. Taiwan has awarded a contract to Surrey, U.K., to build these spacecraft. The US Air Force, UCAR, NOAA and JPL are studying possibilities to fund the second six satellites, to be



## Report from the 2012 Summer Colloquium



*Students and lecturers of the Colloquium at their farewell dinner.*

The 3rd Joint Center for Satellite Data Assimilation Summer Colloquium was held in Santa Fe, NM from July 24 – August 3, 2012. The objective of these Colloquia is to foster the education of the next generation of data assimilation scientists. Eighteen graduate students and recent post-docs, as well as one more-senior scientist, took part, selected by the JCSDA Executive Team from a pool of 27 applicants. A substantial fraction of the students have research interests beyond weather, including air quality and aerosols, climate, oceans, and ecosystem production.

The program and format were based on the successful 2009 Summer Colloquium. However, due to limited funding and more stringent travel restrictions for federal employees, many of the speakers stepped up to cover multiple topics. A major change in the program was to offer the students the opportunity to make short presentations on their own research. Most took advantage of this chance, which helped maintain high energy and focus during the second week of the Colloquium.

With this small and intimate group, interaction between the presenters and the participants was lively, informal, and continuous. The setting in Santa Fe provided reasonably priced dining, multiple museums and galleries, outdoor markets, and live entertainment all within walking distance of the hotel, which helped maintain cohesiveness from start to finish. On the average, four of the lecturers were on hand every day. Several individuals rented vehicles privately and organized a group expedition to the Bandelier National Park on the weekend.

Prospects for future collaboration with the student participants are strong. Two of the students currently are engaged in collaborative projects with researchers affiliated with the Global Modeling and Assimilation Office (GMAO) at NASA/GSFC. Another is already an employee of the Naval Research Laboratory (NRL) exploring the possibility of moving into satellite data assimilation work. One of the

recent graduates has extensive experience in radiative transfer modeling and working knowledge of the JCSDA's Community-based Radiative Transfer Model.

The JCSDA is grateful to the Cooperative Institute for Research in the Atmosphere (CIRA) for providing logistics support, including handling the travel arrangements for sponsored travelers (16 of the students and most of the non-federal employee lecturers). In addition, the CIRA staff completed contract arrangements with the Hilton Santa Fe Historic Plaza Hotel for guest rooms, a conference room and presentation equipment, and group breakfasts, lunches, and coffee on the nine working days. Kudos are due also to Ken Carey, who handled preliminary negotiations with the hotel. The program and the lecture materials are posted on the JCSDA website. In addition, the students have created a group on Facebook open to themselves and the lecturers, where they continue to interact with one another. (Jim Yoe, JCSDA)

## Joint Center Annual Science Workshop



*Venue for Annual Science Workshop: The auditorium of the new NOAA Center for Weather and Climate Prediction.*

The Joint Center's 10<sup>th</sup> Workshop on Satellite Data Assimilation, which reviews ongoing and planned scientific developments sponsored by the Center, will be held on October 10 -12, 2012, in the auditorium of the new NOAA Center for Weather and Climate Prediction at the University of Maryland's Research Park adjacent to its College Park campus. The Workshop will include both oral presentations (in plenary sessions) and posters. Focusing on topics



related to the Center's scientific priority areas, the plenary session subjects will include: Radiative Transfer Modeling and Validation, Assimilation of Data from Advanced Sensors, Cloud and Precipitation Data Assimilation, Land Data Assimilation, Ocean Data Assimilation, Regional Data Assimilation, OSSEs and OSEs, and Atmospheric Composition. Break-out sessions will concentrate on plans and progress for the science priority areas and how ongoing efforts can be better coordinated.  
(Sid Boukabara, JCSDA)



## A Note from the Director

*Let me start by congratulating our European colleagues from EUMETSAT for the recent successful launch of their second polar orbiter MetOp-B. Several of our NOAA collaborators are*

*involved in the early cal/val efforts and in preparing to eventually ingest the data in our models, and we hope to continue building on the success we have had with using the data from its predecessor, MetOp-A.*

*Based on everything I have seen and heard (see also separate note elsewhere in this newsletter), the 2012 JCSDA Summer Colloquium held in Santa Fe from July 24 to August 3 ended up being a success, enjoyed by lecturers and participants alike. I attended the last two days of the first week myself, and I was impressed with the level of engagement and interest that I saw in the group of students. At this point in time it appears likely that we will be doing these events on a semi-regular basis in the future, and we remain open to your feedback on how to improve them.*

*We are pleased to be able to tell you that the JCSDA External Research program is getting back on track and that a new announcement administered by NOAA on behalf of JCSDA will be published shortly (see status report elsewhere in this newsletter). The fact that we were unable to issue an announcement in 2012 has been a cause for great concern to myself and the rest of JCSDA management, and we will do our best to avoid skipping a year again in the future. We are making progress toward finding an operating model that will let several agencies collaborate on issuing these opportunities according to a calendar that is sustainable both for us in the Joint Center management and the funding agencies and predictable for you in the external research community. I hope to be able to report on the final outcome of our discussions on this issue in one of the next issues of this newsletter.*

*The annual JCSDA Science Workshop is imminent and in a few days we will be welcoming many of you to a brand new venue for it in the NOAA Center for Weather and Climate Prediction in College Park. We have held this workshop in a number of different venues over the last 8-10 years – some more suitable than others - and I think that most of you will like what will most likely be our permanent venue from now on. As far as the workshop format is concerned we continue to make tweaks and adjustments based on our own experience as well as the feedback we receive from you. We also continually try to strike the right balance between a closed progress meeting for JCSDA-funded investigators and a more open forum that involves also researchers who are interested in what we do, but only loosely (if at all) affiliated with us. External interest in participating in this meeting remains very strong, and I am inclined to accommodate that to the extent possible.*

*Finally, I want to remind you of the Special Symposium on the Joint Center for Satellite Data Assimilation at the AMS Annual Meeting in Austin January 2012. The Workshop is embedded in the 3<sup>rd</sup> Conference on the Transition from Research to Operations and will take place on Tuesday January 8 (all day). The deadline for submission is behind us, and the program is all but finalized. We will kick off the Symposium with a Panel discussion in the morning with high level participation from all Joint Center partners. The second highlight will be a lunch-time keynote given in a town hall format by Dr. Kathryn Sullivan, Deputy Administrator of NOAA. The remainder - and bulk - of the program is reserved for contributed presentations, many of them given by our own investigators. We have been very pleased with the interest from both invitees and contributors, and we look forward to this very first foray into having our "own" presence at the AMS meeting.*

Lars Peter Riishojgaard, Director, JCSDA

## Upcoming Seminars



JCSDA seminars are generally held on the third Wednesday of each month at the NOAA Center for Weather and Climate Prediction, 5830 University Research Court, College Park, MD. Presentations are posted at

<http://www.jcsda.noaa.gov/JCSDASeminars.php> prior to each seminar. Off-site personnel may view and listen to the seminars via webcast and conference call. Audio recordings of the seminars are posted at the website the day after the seminar.

Check <http://www.jcsda.noaa.gov/JCSDASeminars.php> for updates.



<i>Upcoming Seminars</i>			
<i>Date</i>	<i>Speaker</i>	<i>Affiliation</i>	<i>Title</i>
Oct. 16, 2012	Krzysztof Wargan	NASA/Global Modeling and Assimilation Office	Ozone Data Assimilation
Nov 2, 2012	Craig Bishop	Naval Research Laboratory	Hidden Error Variance Theory and its Use In Hybrid Data Assimilation
Nov. 14, 2012,	Al Gasiewski	University of Colorado	Developments in Radiative Transfer Modeling, Microwave Observing Systems, and Radiance Assimilation over Clouds
Dec. 12, 2012	Ben Ruston	Naval Research Laboratory	Impact of NPP Satellite Assimilation in U.S. Navy Global Modeling System

Editor's Note: Unsolicited articles for the JCSDA Quarterly Newsletter are encouraged as are suggestions for seminar speakers or topics. Please send them to [George.Ohring@noaa.gov](mailto:George.Ohring@noaa.gov).