FY 2008 AOP vs. Goals and Priorities
Joint Center for Satellite Data Assimilation (JCSDA)
July 25, 2008

Highest priority short-term goal for JCSDA:

"Contribute to making the forecast skill of the operational NWP systems of the JCSDA partners internationally competitive by assimilating the largest possible number of satellite observations in the most effective way"

Metrics

The performance of JCSDA will be monitored via two types of quantitative indicators:

I. Forecast skill measures:
   a. A composite JCSDA skill index calculated from key forecast parameters for each system operated by the JCSDA partners.
   b. 500 hPa anomaly correlation coefficients at day 5, both hemispheres.

II. Satellite data utilization measures:
   a. Total number of satellite observations assimilated on average per 24-hour period in a fixed set of partner data assimilation systems.
   b. Total number of individual satellite sensors contributing to forecast skill.

Highest priority JCSDA activities in support of the goal, listed in no particular order:

1. Data impact assessment. For each major system change and each major change to the Global Observing System, a comprehensive suite of data denial experiments for all major component of the observing system should be carried out. A sustained data impact assessment effort involving both Observing System Experiments (data denial) and adjoint sensitivity tools is a necessary tool for monitoring progress and overall health of the systems and for tracking how well we are doing compared to other centers.

2. CRTM maintenance and development. Radiative transfer simulation is a critical element of modern satellite data assimilation, and the Community Radiative Transfer Model is the most important jointly owned and operated JCSDA system component. A sustained effort to maintain and develop the CRTM, involving contributions and staff from all partners, is a vital part of the Joint Center's effort to improve the utilization of current sensors and to prepare for the assimilation of data from future sensors.

3. Monitoring and improvement of satellite data utilization. Dedicated personnel within each JCSDA partner must be assigned to each major satellite data type, e.g. infrared sounding, microwave sounding, feature tracking winds, surface winds, GPSRO. The work of the staff assigned to a given data type does not stop once these data become operational for the first time. Success in NWP requires continuous monitoring and fine-tuning of the assimilation of each individual data type. In order to facilitate the

exchange of information and avoid unnecessary duplication of effort, the Joint Center will create and maintain a central repository containing information from all partners about calibration, bias correction, quality control, data screening, typical impact and observation minus background statistics for all major satellite sensors.

4. Preparation for new sensors. Issues related to data flow, data formatting, CRTM performance and error covariance modeling must be resolved and assimilation efforts must be resourced well in advance of launch of upcoming sensors. A robust OSSE effort must also be developed in order to be able to assimilate simulated measurements from the new sensors before they are launched.

Key Milestones

The key JCSDA milestones for FY08 are summarized below. The corresponding JCSDA goals and priorities listed above are also indicated as well as the responsible lead organizations. The status of each milestone, as of April 04, 2008, is also highlighted.

1st Quarter:

Under I:

- Implement Zeeman splitting into the Community Radiative Transfer Model (CRTM) – **NESDIS, JCSDA, NCEP (I, 2, 3) – Completed**

Under I, II:

- Develop and assess the impact of SSMIS from NRL Unified Preprocessor (UPP) in WRFVAR – **AFWA (I, II, 1) – Underway**
- Develop and assess the impact of WindSat in WRFVAR – **AFWA (I, II, 1) – Underway**
- Implement the JMA high resolution winds into the NCEP GFS – **JCSDA, NCEP (I, II, 1, 3) – Completed**
- Complete the QuikSCAT hurricane evaluation and begin the ASCAT evaluation – **NCEP (I, II, 1, 3) – Completed**
- Conduct a preliminary IASI forecast assessment using all fields of view in the NCEP GFS – **NESDIS/CIMSS, JCSDA, NCEP (I, II, 1, 3, 4) – Completed**

Under (2):

- Modify the CRTM and test for Climate Reanalysis – **NESDIS, JCSDA, NCEP, NASA (2) – Completed**

Under (3):

- Implement SBUV-8 ozone data into the NCEP GFS – **JCSDA, NCEP (3) – Completed**

Miscellaneous:

- Test MLS temperature retrieval data ingest in GSI **– NASA** – **Completed**
- Apply the coupled LIS/GFS/GDAS in the JCSDA test bed – **NASA, NCEP** – **Completed**

2nd Quarter:

Under I:

- Test improved QC and super-ob procedures for geo-winds, including rapid-scan obs – **NRL (I, 1, 3)** – **Completed**
- Validate JCSDA's CRTM with Zeeman splitting for higher-peaking microwave channels and improve the Zeeman correction – **NRL, JCSDA (I, 2, 3)** – **TBD (Pat)**

Under I, II:

- Complete the assessment of SSMIS in WRFVAR – **AFWA (I, II, 1) – Underway**
- Complete the assessment of WindSat in WRFVAR – **AFWA (I, II, 1) – Underway**
- Implement AMSU-A/B, AIRS, SSMIS operationally in COAMPS – **NRL, JCSDA (I, II, 1, 3) – In progress**

Miscellaneous:

- Add new observation types to NAVOBS – **NRL, JCSDA** – **TBD (Pat)**

3rd Quarter:

Under I:

- Assess the impact of MODIS wind latency on forecast skill – **NASA (I, 1, 3)** – **TBD (Michele)**
- Implement improved microwave and IR radiances over land operationally in NOGAPS– **NRL, JCSDA (I, 1, 3) – In progress**
- Evaluate impact of assimilating microwave and infrared SST on high-resolution forecasts of tropical cyclone structure and intensity – **NRL (I, 1, 3)** – **TBD (Pat)**

Under II:

- Test SSMIS radiance assimilation for higher peaking channels – **NRL (II, 1)** – **Completed**
- Demo assimilation of AIRS/IASI surface sensitive channels – **NRL, JCSDA (II, 1, 3)** – **Completed**

Under I, II:

- Develop and assess the impact of AIRS in WRFVAR – **AFWA (I, II, 1, 3) – NCAR assessment ongoing**
- Develop and assess the impact of COSMIC in WRFVAR – **AFWA (I, II, 1, 3) – NCAR assessment ongoing**
- Implement AIRS/IASI cloud-free radiances operationally in NOGAPS – **NRL, JCSDA (I, II, 1, 3, 4) – In progress**

Miscellaneous:

- Convene the Sixth JCSDA Science Workshop – **NESDIS, JCSDA – Completed**
- Assist in OPTEST of altimeter significant wave height assimilation in global WW3 – **NRL, JCSDA** – **Delayed**
- Develop and test adjoint for NAVDAS-AR (4DVAR) – **NRL** – **Completed**
- Optimize NAVDAS-AR to ingest, QC, and assimilate current and future sensors, using generalized observation operators (especially for satellite radiances) – **NRL, JCSDA** – **Completed**
- Provide an improved AMSR-E soil moisture product to EMC for assessment – **NESDIS, JCSDA – Completed**
- Submit the recommended FY08 proposal selections under the Federally Funded Opportunity (FFO) Program – **JCSDA – Completed**

4th Quarter:

Under I:

- Refine QC and data selection algorithms for AIRS in the GSI based on MODIS and CALIPSO data – **NASA (I, 1, 3)**
- Implement GPS refractivity operationally in NOGAPS – **NRL, JCSDA (I, 1, 3)**
- Test satellite channel-selection procedures for AIRS in NAVDAS-NOGAPS – **NRL, JCSDA (I, 1, 3)**
- Assess impact of different observing systems on NAVDAS-AR/NOGAPS – **NRL (I, 1, 3)**

Under II:

- Demo assimilation of AIRS/IASI surface sensitive channels – **NRL, JCSDA (II, 1, 3)**
- Complete the investigation on the integration of the CRTM into the AFWA operational LIS for direct radiance assimilation – **AFWA, NASA, NCEP (II, 2)**
- Apply LIS coupled to GFS/GDAS and implement a LIS-based attribute in the operational GFS/GDAS suite – **NASA, NCEP (II, 3)**

Under I, II:

- Complete the assessment of AIRS in WRFVAR – **AFWA (I, II, 1)**
- Complete the assessment of COSMIC in WRFVAR – **AFWA (I, II, 1)**

- Test assimilation of WindSat wind vectors in COAMPS and determine the impact on forecast skill – **NRL (I, II, 1)**
- Document results from tests of AIRS cloud-cleared radiances in GEOS-5/GSI – **NASA (I, II, 1, 3)**
- Complete IASI forecast assessment in the NCEP GFS – **NESDIS/CIMSS, JCSDA, NCEP (I, II, 1, 3, 4)**

Under 2:

- Release the CRTM with trace gas components – **NESDIS, NCEP, JCSDA (2)**

Under 3:

- Implement SBUV ozone operationally in NOGAPS – **NRL (3)**

Miscellaneous:

- Test a revised cycling assimilation algorithm for a real-time MLS and compare against standard MLS products – **NASA**
- Implement a Quicklook retrieval algorithm for MLS temperature retrievals – **NASA**
- Test the impact of MLS Quicklook ozone data on ozone analyses by comparison with analyses produced using the regular MLS ozone product in GSI – **NASA**
- Document the effects of MLS Quick-look ozone data on meteorological analyses and forecasts – **NASA**
- Develop and evaluate the capability of MODIS-based skin temperatures and snow data assimilation in the AFWA operational Land Information System (LIS) – **AFWA, NASA**
- Demo 1DVAR technique to retrieve marine wind speed, total precipitable water, surface emissivity from WindSat and SSMIS (include humidity profiles and cloud liquid water) for assimilation – **NRL, JCSDA**
- Transition improved bias corrections of altimeter significant wave heights to operational WW3 – **NRL**
- Perform wave height assimilation experiments for regional applications of WW3 – **NRL**
- Transition NAVOBS web page and statistical software – **NRL, GMAO**
- Implement MODIS over-land Aerosol Optical Thickness operationally in NAAPS – **NRL, JCSDA**
- Demonstrate assimilation of MODIS aerosol size parameters in NAAPS – **NRL**
- Investigate radiative transfer codes for future aerosol assimilation – **NRL, JCSDA**
- Transition NAVDAS (3DVAR) to COAMPS-OS operations – **NRL**
- Develop the 4DVAR framework for COAMPS and adapt observation operators

for satellite data – **NRL, JCSDA**

FY08 Spending Plan

An FY08 spending plan will be provided separately.

Unfunded Investment Opportunities (by priority)

- Hire additional support staff to prepare for new and, in some cases, current satellite instruments so that data access, BUFR code generation, and data quality control are accelerated. Specifically, support staff are needed to run forecast impact experiments, work with satellite surface wind data, handle data assimilation interface issues, prepare and test satellite altimeter data, work with satellite cloud and precipitation data, and perform OSSEs.
- Hire additional staff to support community codes such as the CRTM and the GSI. Support includes code maintenance across multiple organizations and users, integration and testing of new codes, and helpdesk-level interaction with users.
- Provide the capability to conduct high resolution parallel testing of new satellite instrument data which will accelerate the transition to operations by increasing the size of the NCEP R&D computer.
- Funding these items will accelerate the evaluation and parallel testing of data from OMI, ASCAT, GOME-2, GRAS, and other instruments and also allow rapid transition into operations. This will improve analysis and forecast quality using current space-based assets.

Challenges

- The most significant challenge the JCSDA is facing is obtaining the funding needed to hire the additional support staff listed under the first and second bullets above.
- Obtaining funding for the additional computing mentioned under the third bullet above is also a significant challenge.