COSMIC

PIs and Co-PIs: Lidia Cucurull

NWP Center Collaborators: J. Derber, R. Treadon, J. Purser

Accomplishments

■The JCSDA has developed, tested and incorporated into the next generation of NCEP's Global Data Assimilation System (GSI/GFS) the necessary components to assimilate two different type of GPS RO observations (**refractivity** and **bending angle**). These components include:

–complex forward models to simulate the observations (refractivity and bending angles) from analysis variables and associated tangent linear and adjoint models

–Quality control algorithms

–Error characterization models

–Data handling and decoding procedures

–Verification and impact evaluation procedures

–COSMIC data became operational at NCEP on May 1st 2007 (just one year after launch!)

Future Plan

■Finalize the analysis of the impact of COSMIC for selected periods.

■Update the GSI/GFS GPS RO code to a generalized vertical coordinate.

■Improve the diagnostic files for the GPS RO observations.

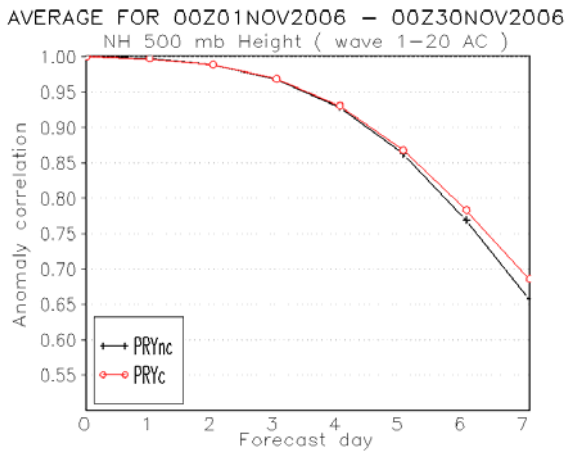
■Analysis and tuning of the code in order to assimilate data from CHAMP and GRAS (when available).

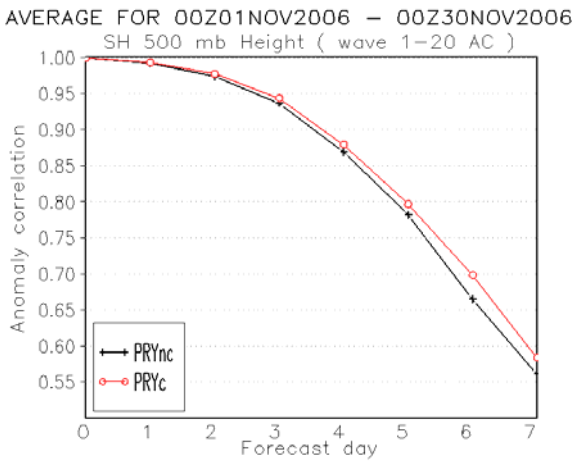
■Further tuning of the bending angle.

■Assimilation of bending angle instead of refractivity in operations.

■Evaluation (and future implementation) of non-local forward operators.

- The plots show the anomaly correlation as a function of the forecast day for two different experiments:
  - PRYnc (assimilation of operational obs),
  - PRYc (PRYnc + COSMIC refractivity)
- We assimilated around 1,000 COSMIC profiles per day





Assimilation of WindSat data in the GFS

PIs and Co-PIs: Li Bi, Tom Zapotocny, Michael Morgan

NWP Center Collaborators: Russ Treadon, Dennis Keyser

Accomplishments

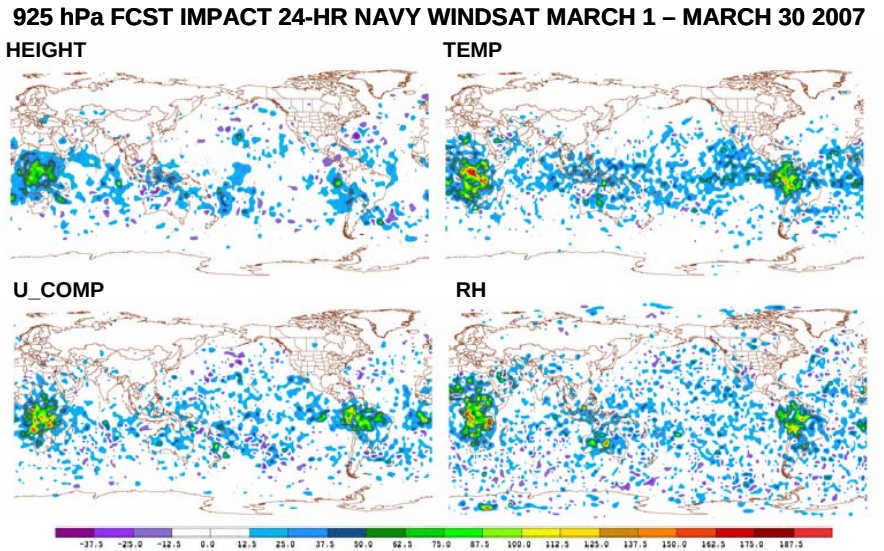
Develop quality control and assimilation procedures for the Navy and NESDIS WindSat retrievals

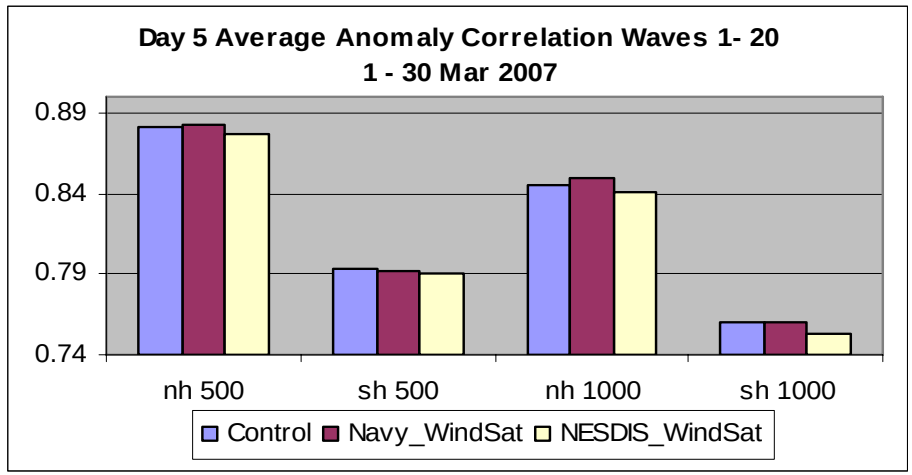
*** Tested forecast impact of Navy and NESDIS WindSat retrievals with positive results**

Recommend quality control modifications for WindSat assimilation

Future Plan

Develop the direct assimilation of the WindSat radiances into the GFS





Evaluating the NCEP Global and Regional Modeled Cloud Vertical Structure Using MODIS and CLOUDSAT Data

PIs and Co-PIs: Zhanqing Li

NWP Center Collaborators: Brad Ferrier, Yu-Tai Hou, Steve Lord

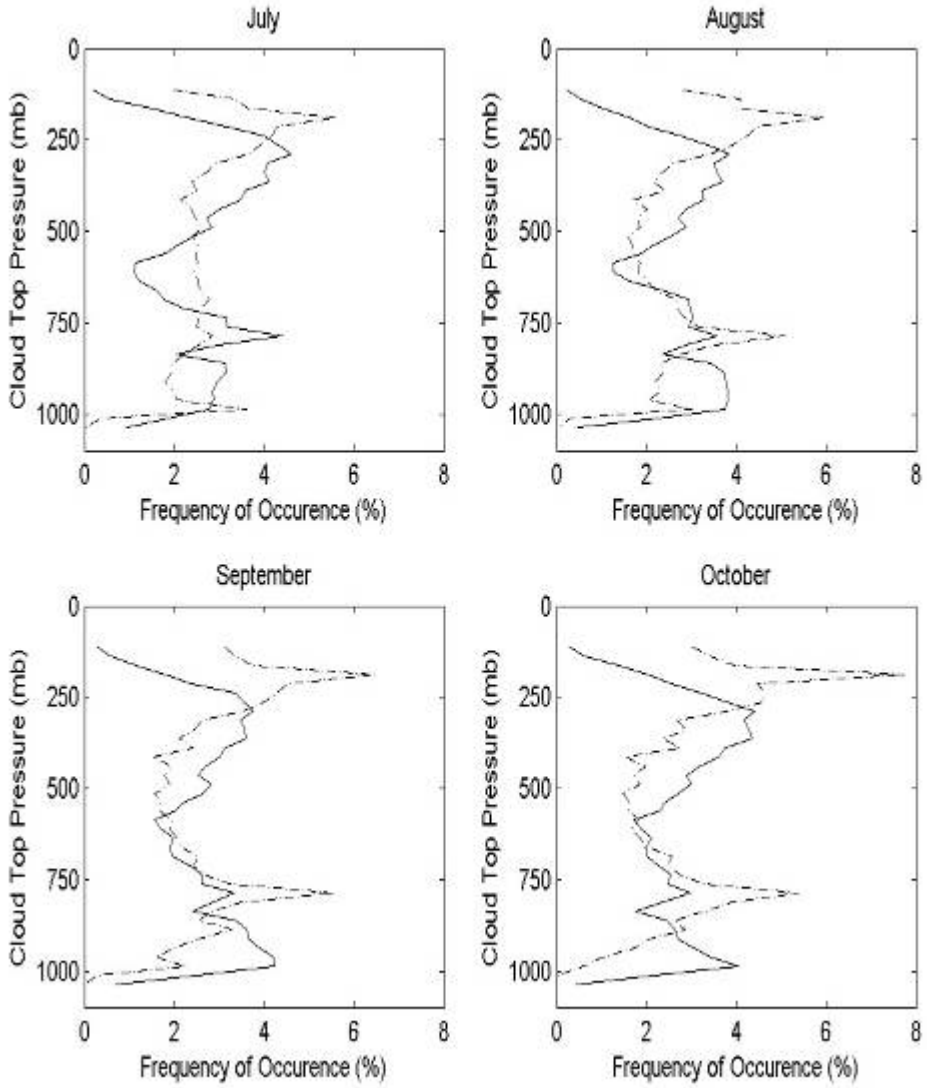
Accomplishments

1. **Generation of daily cloud layer products from MODIS**
2. **Matched satellite and NCEP/NAM cloud data**
3. **The agreement in cloud amount is very good for high clouds, good for mid-clouds, poor for low clouds.**

Future Plan

1. **Understanding the causes for the discrepancies**
2. **Further validation of both model and satellite cloud products**
3. **Similar investigation for the NCEP global model**

Comparison of cloud vertical structure between NAM model (dashed lines) and MODIS retrievals (solid lines).



Atmospheric Motion Vector Experiments

PIs and Co-PIs: Tom Zapotocny, John LeMarshall, James Jung, Chris Redder

NWP Center Collaborators: Russ Treadon

Accomplishments

Expected Error (EE) added to BUFR files

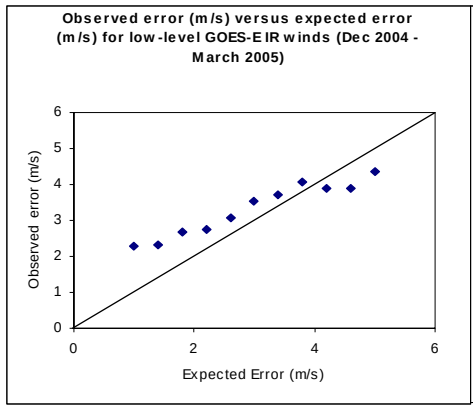
Able to use EE within the GSI for quality control

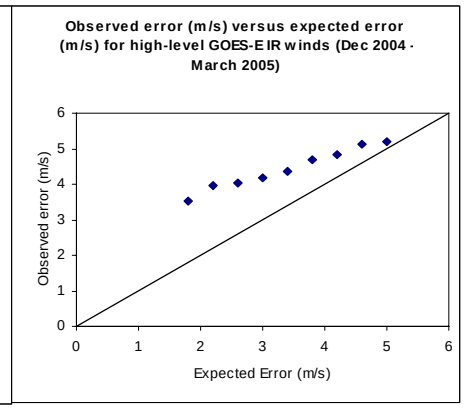
*** Preliminary assimilation tests started with GSI**

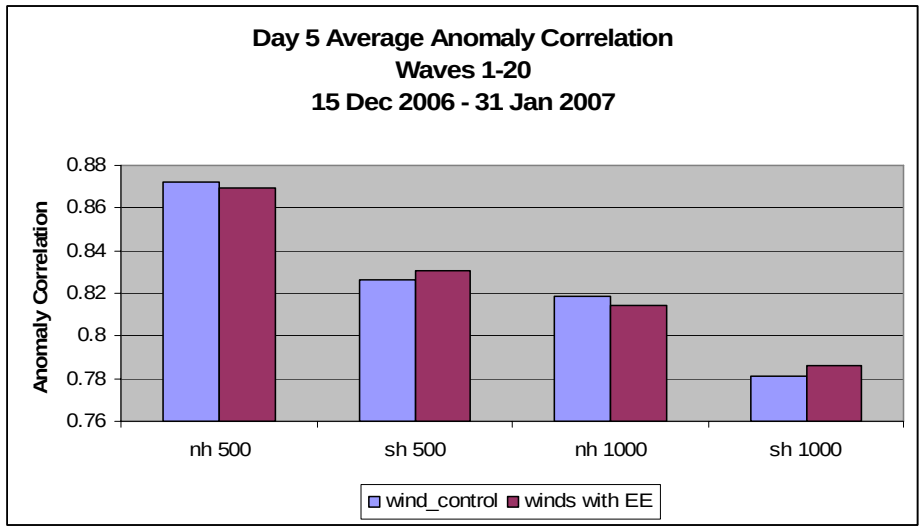
Future Plan

Continue assimilation tests to improve anomaly correlation scores.

Investigate possible correlations with EE and height assignment method.







AIRS Surface Emissivity Experiments

PIs and Co-PIs: James Jung, Tom Zapotocny and John LeMarshall

NWP Center Collaborators: Russ Treadon

Accomplishments

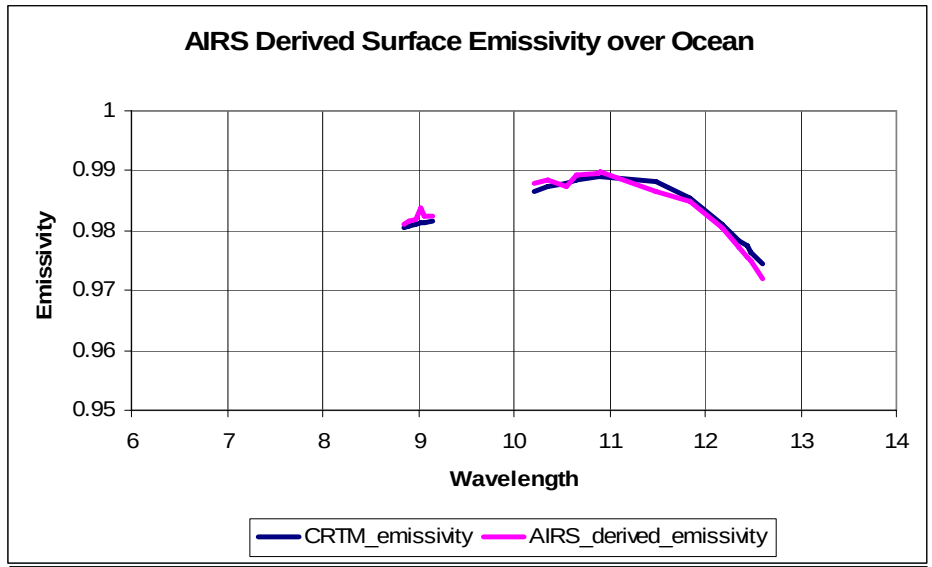
Results are consistent with ocean surface emissivity model developed by Wu and Smith (1997).

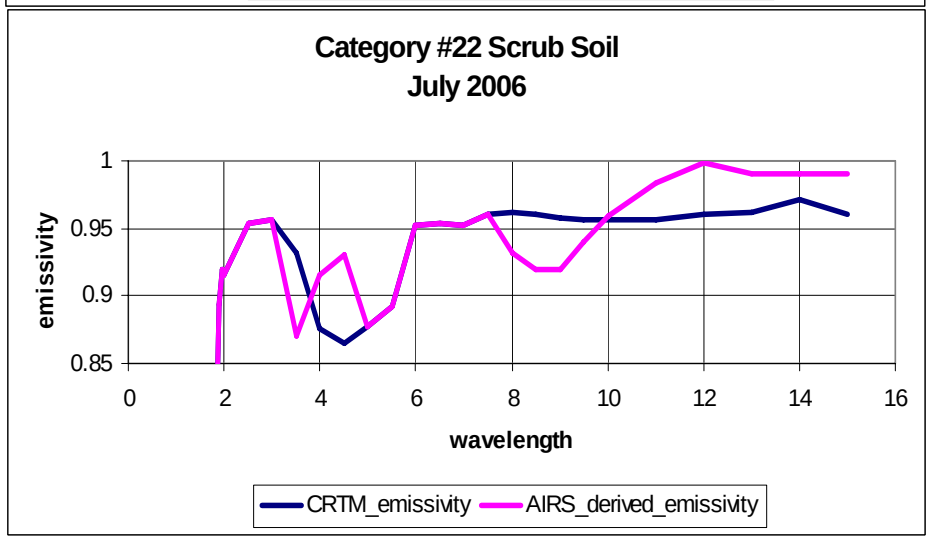
•Able to calculate reasonable land surface emissivity for the various categories used by the GSI.

Future Plan

Test various methods to reduce computational noise

Improve spectral resolution





Impact study of DMSP F-16 SSMIS radiances in NCEP global data assimilation system

Masahiro Kazumori
NOAA/NWS/NCEP/EMC
Japan Meteorological Agency

Conclusions

- Preprocessed UKMO SSMIS data and recalibrated NESDIS SSMIS data have comparable quality with AMSU-A data
- Assimilation experiments with cloud cleared SSMIS radiances (UKMO and NESDIS) in GSI were carried out.
- Impacts on forecast
  - Positive: A.C. of Z500,Z1000(not shown), T200 A.C. for both hemisphere, RMSE of T,Z (1000-10hPa)
  - Neutral: Vector Wind(Trop. not shown), Fits to RAOB (most of element,1day,2day),TPW
  - Negative: Above 10hPa,T,Z (UKMO SSMIS)
- In NCEP GDAS, assimilation of preprocessed (recalibrated) SSMIS data can improve forecast accuracy especially in medium range forecasts
- Operational NWP centers need one well-calibrated SSMIS data in real time data base.
- Contributed correction algorithms should be merged
  - Promised by fall 2007

Thinning WindSat Data Using Support Vector Regression

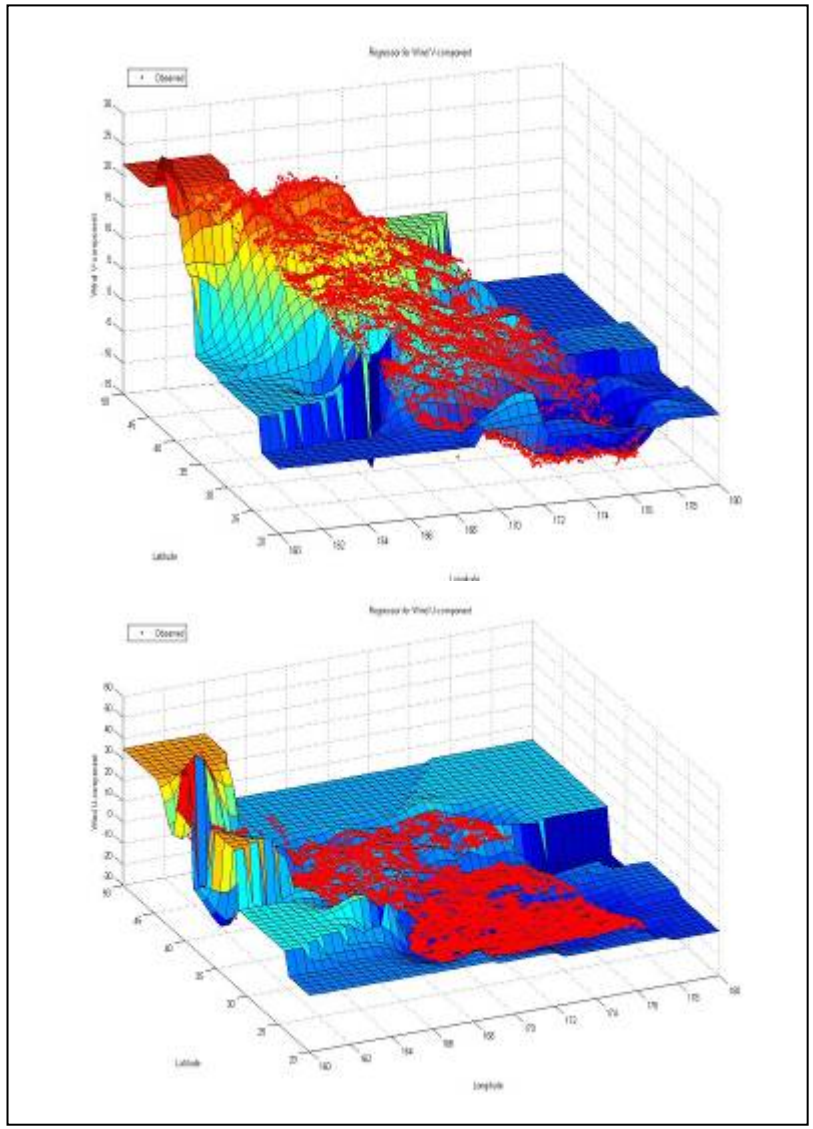
PIs and Co-PIs: M. Richman and L. Leslie

NWP Center Collaborators: JCSDA

Accomplishments

•Thinning the data to fewer than 8% (1000 support vectors out of 13540) with the possibility of reconstructing the ocean surface wind vector field with high accuracy (Correlation coefficient over 93%).

•Contribute in developing a MATLAB Toolbox able to achieve training speeds reaching 3000 vectors per seconds, which is roughly 11 millions vectors per hour. The code can be even faster if it is vectorized or pipelined.



Future Plan

•To use the points selected by the SVM and assimilate those into numerical weather prediction models.

•To use different data sets from different satellites

SATELLITE CHANNEL SELECTION WITH A DATA ASSIMILATION ADJOINT

Accomplishments

*** Adjoint-based observation impact system (Langland and Baker) has been developed for routine monitoring of observations in operational data assimilation at NRL-FNMOC**

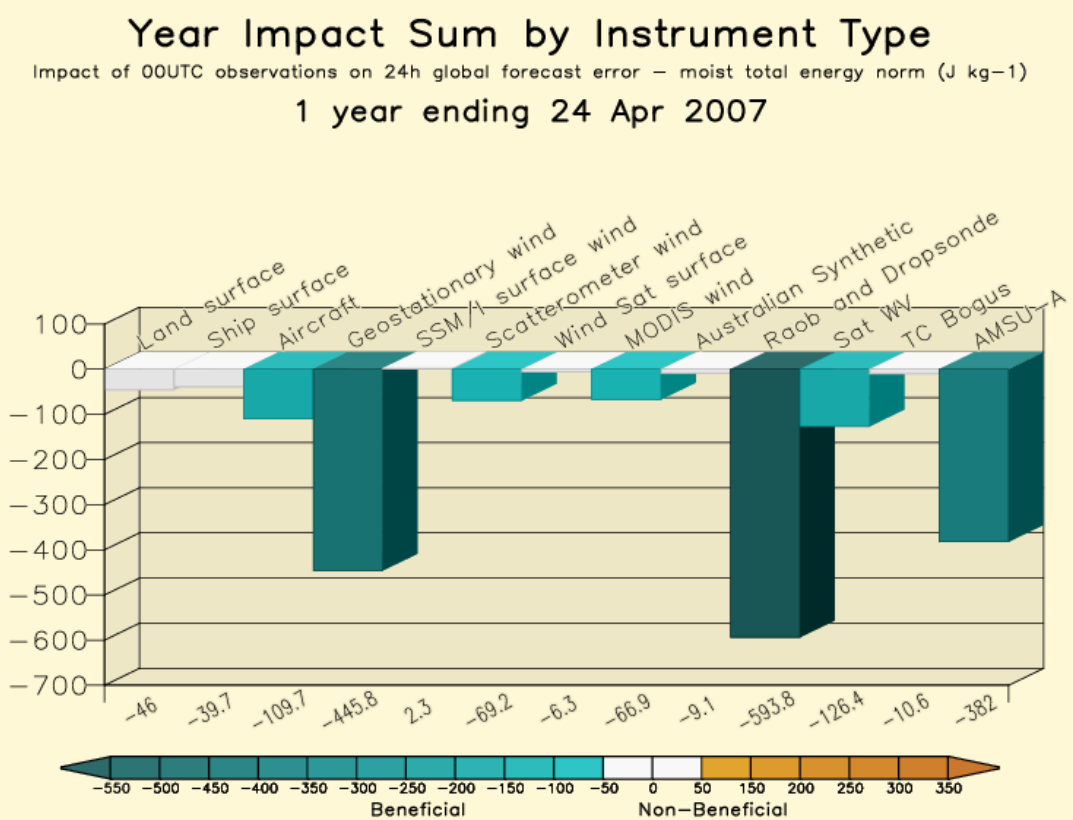
System is used for quality-control and beta -> ops decision-making

Also used for selection of AIRS and SSMIS channels

http://ob_sens.nrlmry.navy.mil/obsens_main_od.html

PIs and Co-PIs: Rolf Langland and Nancy Baker

NWP Center Collaborators: Ben Ruston and Gary Love



Future Plan

Continue monitoring observation impact. AIRS and SSMIS channel selection. NAVDAS-GEOS5-Canadian inter-comparison study.

Discussion Summary

- Success stories; template for future collaboration
- COSMIC
  - CHAMP used as proxy for development
  - Resources committed early on
  - Person identified
  - Good coordination between instrument group and NWP developer
  - Immersion in JCSDA and NWP operational data assimilation environment
- SSMIS – successes and lessons learned

Instrument Teams

- JCSDA deputy directors take lead role for each class of sensors (e.g., IR sounders)
- Teams identified with focal points in each agency
- Tracking during each phase of development through to implementation across agencies
- Identification of gaps in science and funding
- Communication with sponsors
- Possibilities for collaboration/leveraging international efforts

High Priority Areas with Inadequate Funding

- Advanced IR sounders: AIRS, IASI, CrIS
- OSSEs and OSEs
- Microwave Imager/sounder (e.g. SSMIS)
- Wind Sounders (ADM)
- Air quality and environmental monitoring
- Research satellites (MLS)