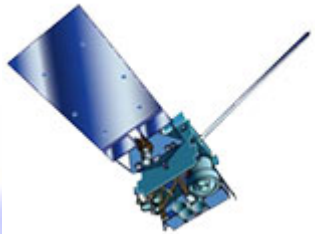
STAR's Presentations at the 2007 AMS Annual Meeting

San Antonio, TX
14 – 18 January 2007

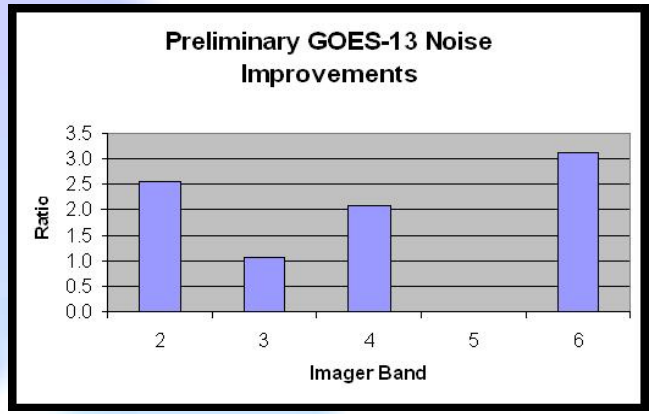
1. Hillger and Schmit
2. Hillger and DeMaria
3. Kuligowski
4. Kuligowski and Davenport
5. Lindsey and Grasso
6. Maturi et al.
7. Maturi et al.
8. Reale and Dutton
9. Schmit et al.
10. Schmit et al.
11. Schmit et al.
12. Souiservon, Jelenak and Chang
13. Sun et al.
14. Wang and Cao
15. Wolf, Zhou and Goldberg
16. Zhan et al.
17. Zheng et al.
18. Zhou, Wolf and Goldberg
19. Zhu et al.

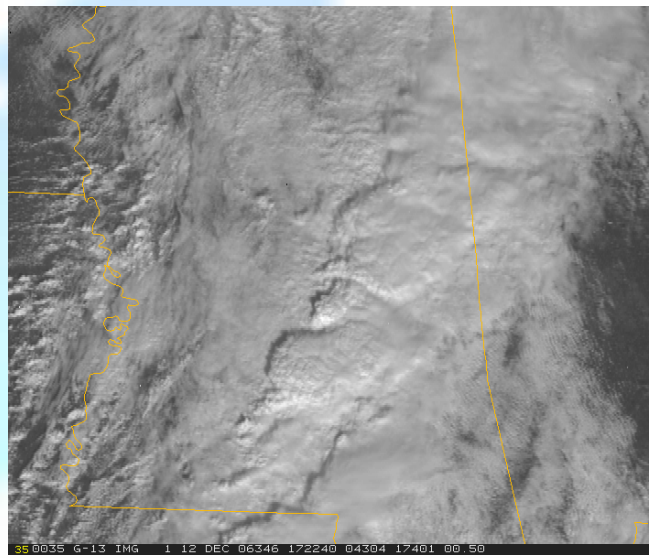
An Overview of the GOES-13 Science Test



Don Hillger and Tim Schmit
AMS Annual Meeting, 14-18 January 2007

- Participants
  - **Satellite Operations, NESDIS, and Cooperative Institutes (CIRA and CIMSS)**
- Calendar
  - **Launched: 24 May 2006**
  - **Science Test: 7-28 December 2006**
  - **3-week plus duration**
- Tests
  - **Daily test schedules for both Imager and Sounder**
  - **Tests (noise, striping, E-W emissivity, product testing, rapid-scan, ABI-simulation, etc.)**
- Web Page
  - http://rammb.cira.colostate.edu/projects/goes_n/
- Final Report
  - ***NOAA Technical Report***
  - **Expected distribution 6 months after end of Science Test**



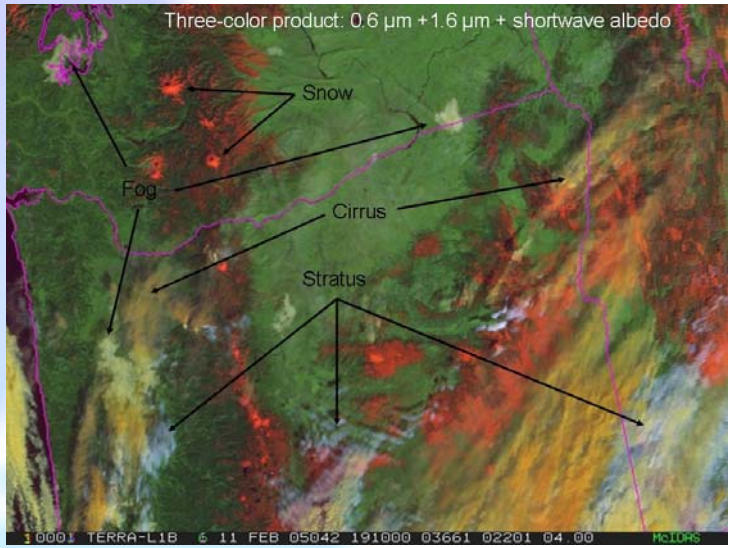


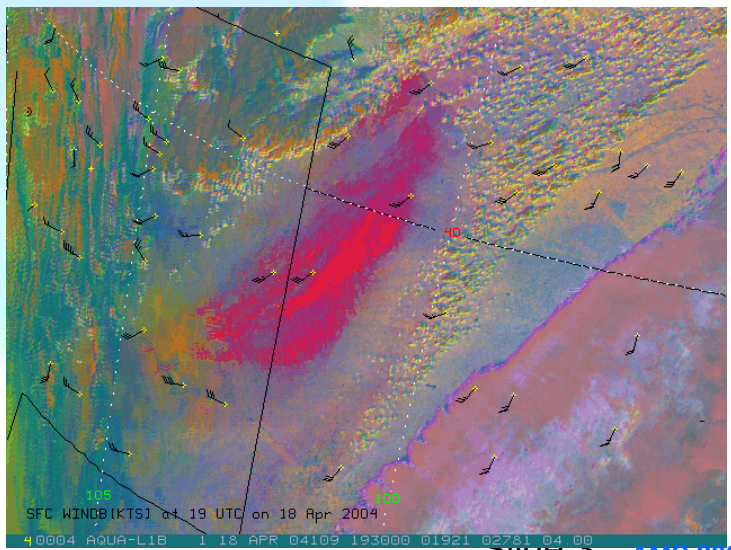
30-second Rapid Scan over Huntsville AL
http://rammb.cira.colostate.edu/projects/svr_vis/g13_30secloop2.asp

GOES-R ABI Color Product Development

Don Hillger and Mark DeMaria – AMS Annual Meeting, 14-18 January 2007

- New product development for GOES-R Advanced Baseline Imager (ABI) Risk Reduction
  - **Initial focus**
    - **daytime fog/stratus product**
    - **blowing-dust detection product**
  - **Apply thee-color techniques**
  - **Utilizing MODIS and MSG proxy data**
- Web-based demonstration planned
  - **Quasi-operational product forum**
- Future applications
  - **volcanic ash and smoke monitoring**





Thee-Color Product Name	Red component	Green component	Blue component
Modified 3-color fog/stratus product	0.6 µm albedo	1.6 µm albedo	Shortwave (3.9 µm) albedo
Modified 3-color blowing-dust product (8.7, 3.9, 10.8, and 12.0 µm)	PCI-2 (of 4 PCIs)	PCI-4 (of 4 PCIs)	PCI-3 (of 4 PCIs)

3rd Symposium on Future National Operational Environmental Satellites:
Poster – The GOES-R Hydrology Algorithm Team: Progress and Plans

R. J. Kuligowski

- GOES-R Algorithm Working Group (AWG)
  - Develop, demonstrate, recommend end-to-end capabilities for GOES-R ground segment
  - Provide sustained post-launch validation and product enhancements
- Hydrology Algorithm Team
  - One of 16 Algorithm Teams
  - Provide recommended, demonstrated, and validated algorithms for processing GOES-R observations into
    - Probability of rainfall (0-3 h)
    - Rainfall potential (0-3 h)
    - Rainfall Rate / QPE
  - Members from NOAA, NASA, ESSIC, UC-Irvine
- Basic Steps
  - Intercompare candidate QPE and nowcasting algorithms using SEVIRI data and ground validation over Europe, Africa, South America
  - Select (and modify, as needed) the best-performing algorithms
  - Code and document to meet operational specs

21st Conference on Hydrology:

Oral – The New NESDIS Hydro-Estimator Algorithm

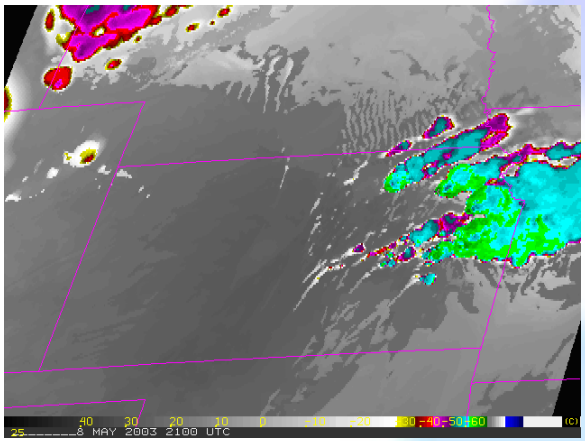
R. J. Kuligowski and J. C. Davenport

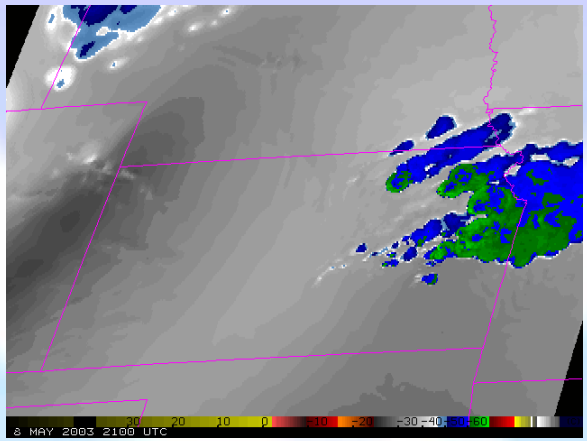
- Background
  - Original Hydro-Estimator replaced the Auto-Estimator in 2002 as NESDIS' operational automated satellite rainfall algorithm
  - Limitations of the Hydro-Estimator sometimes necessitate significant manual intervention by SAB analysts; much of the benefit of an automated algorithm is lost
- Approach
  - Gathered 6 weeks of collocated satellite and radar-rain gauge data from May and August-October 2003
  - Used statistical analysis to improve selection of HE predictors and their relationships with observed rain / no rain discrimination and rainfall rate
- Results
  - Far more challenging than initially anticipated, in part due to deficiencies in the assumption that cloud-top height is related to rainfall rate
  - Improved version is nearly complete and almost ready for operational testing

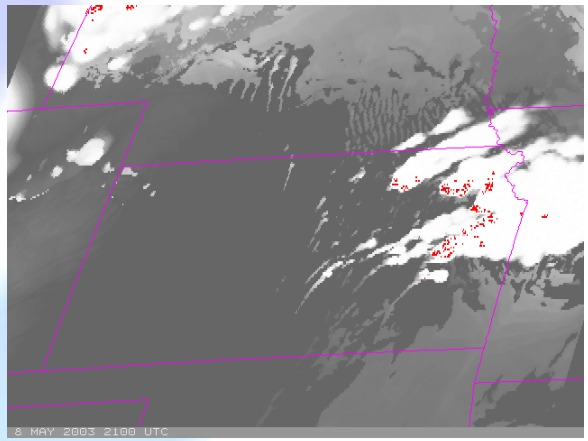
Modeling GOES-R 6.185-10.35 µm brightness temperature differences above cold thunderstorm tops

Daniel T. Lindsey, NOAA/NESDIS/RAMMB

Louie Grasso, CIRA







- Synthetic imagery has been created by using a cloud model and an observational operator to simulate a severe weather outbreak from 8 May 2003
- GOES-R ABI's 6.185 and 10.35 µm channels are shown above, and regions where their difference is positive are colored red (above right)
- This is an example of a simulated GOES-R product; it is very important that additional products of this nature are created before the launch of GOES-R
- Sensitivity tests also performed to explain the mechanism behind positive differences (shown on poster)

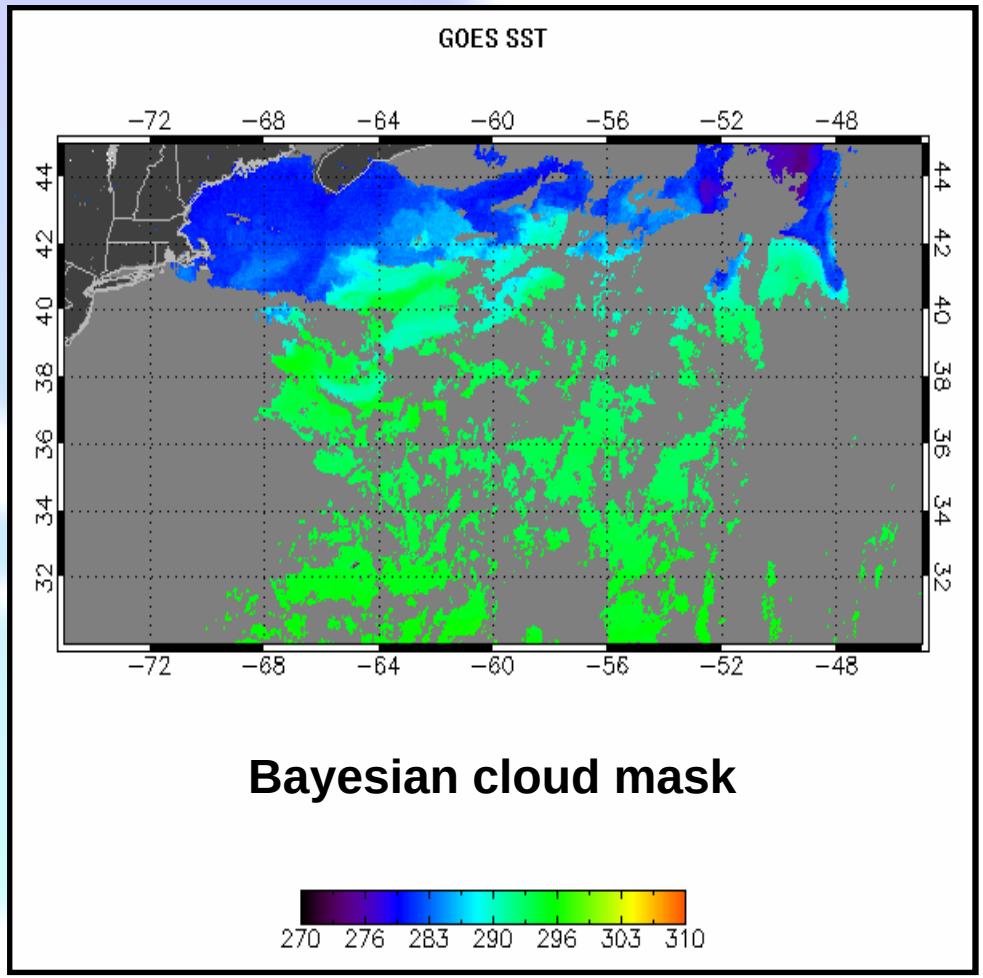
23rd Interactive Information Processing Systems (IIPS) Satellite Applications Session:

ORAL– Bayesian Cloud Mask for GOES-SST Operational Products

E. Maturi, A. Harris, C. Merchant, C. Old, J. Mittaz

Application of Bayes Theorem to…

- Estimate the probability of a particular pixel being clear of cloud
- Inputs include:
  - Satellite observed brightness temperature (BT)
  - A measure of local texture
  - Channel BTs calculated for the given location and view angle
- Applies
  - NCEP GFS Surface and upper air data
  - CRTM fast radiative transfer model
- Result is used in generation of
  - Operational GOES-11/12 SST Products
- Future improvements
  - Radiance bias correction to improve match between modeled & observed BTs (also improves SST retrieval)
  - Extension to SEVIRI and ABI



Third Symposium on Future National Operational Environmental Satellites:

P1.33– Adapting Operational GOES-SST Algorithms to MSG-SEVIRI for GOES-R Risk Reduction

E. Maturi, A. Harris, W. Smith, J. Mittaz

- GOES-SST Algorithms extended to SEVIRI data
  - Radiative Transfer Methodology (RTM)
  - Bayesian Cloud Mask
  - Radiance Bias Correction techniques
- Methods for RT Bias Correction
  - Expected *vs.* observed brightness temperatures distributions as modeled using NWP fields
  - RTM and cross-instrument comparisons of hyperspectral and broadband radiometer data
    - Test on AIRS/MODS and IASI/AVHRR
- Validation
  - Radiance data will be collected, reprocessed to SST and compared to the operational product
- Results
  - Operational MSG-SEVIRI SST Algorithms (including radiance bias methodology) in place to test on ABI data when they become available

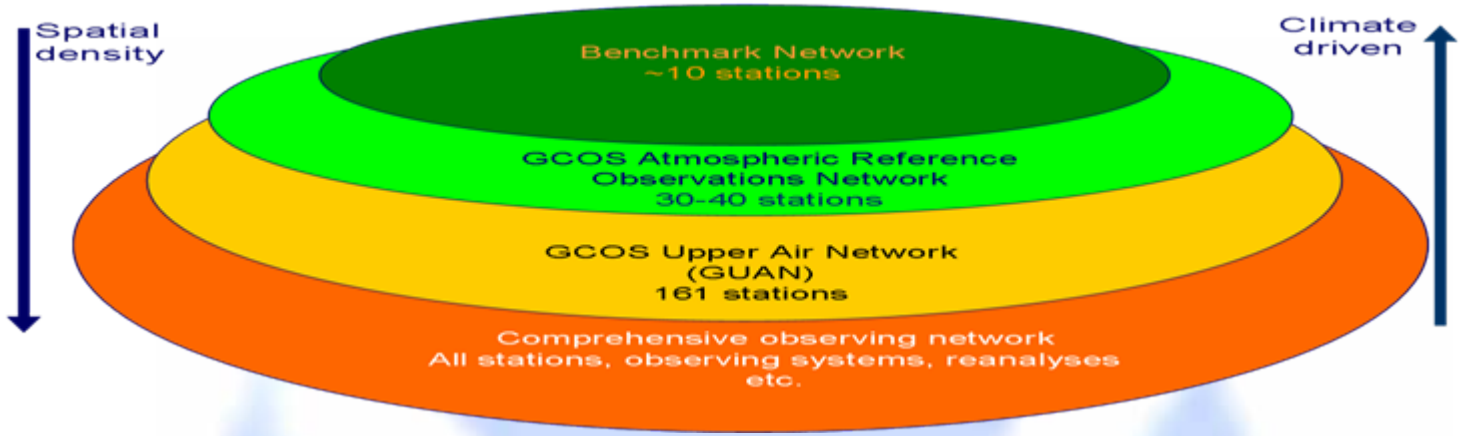
3.5 A Candidate GCOS Atmospheric Reference Observations Network (GARON) Consisting of ARM, BSRN and WMO Reporting Sites and Satellite / In-situ Data Collection Strategies

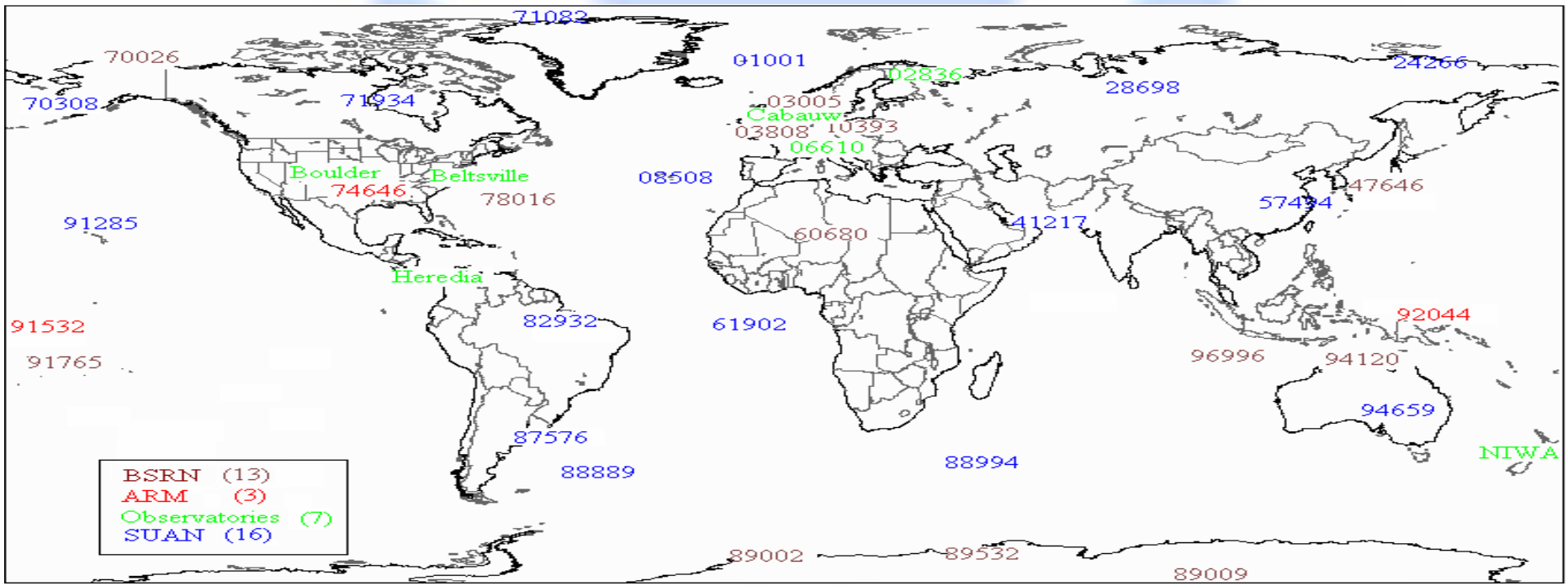
* Tony Reale
NOAA/NESDIS
Washington DC
(tony.reale@noaa.gov)

Ellsworth G. Dutton
NOAA, Earth System Research Laboratory, Global Monitoring Division
Boulder, CO 80305

87th AMS Annual Meeting, San Antonio
14th Symposium on Meteorological Observation and Instrumentation
2:30 PM Tuesday, Jan 16th

NOAA/GCOS Workshops (Boulder-05, Seattle 06) to define reference network for Climate…





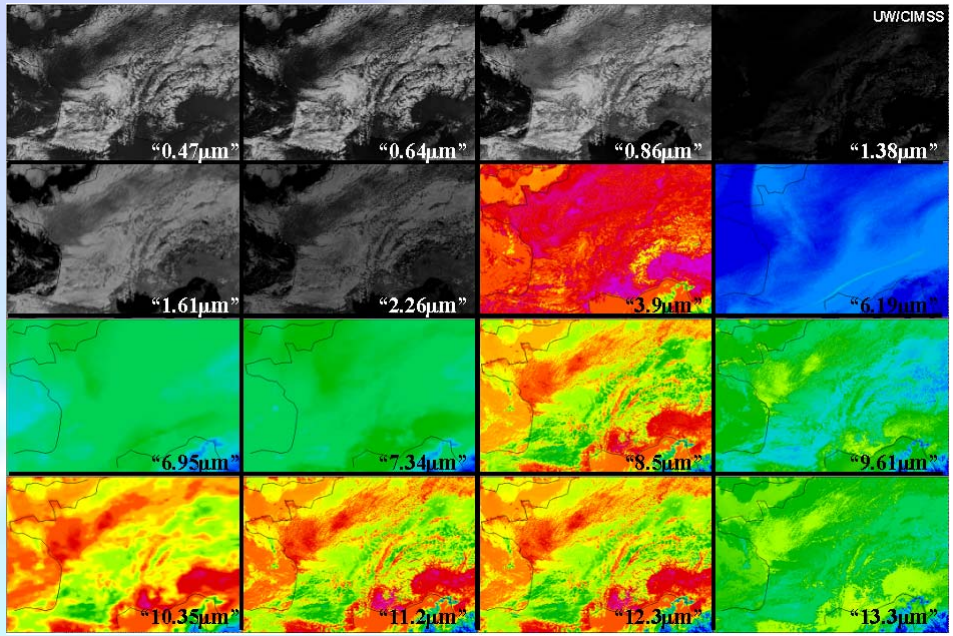
Reference Network Mandate: Characterize measurements? *Synchronized data?*
Monitor Climate?

Third Symposium: Future National Operational Environmental Satellite Systems:

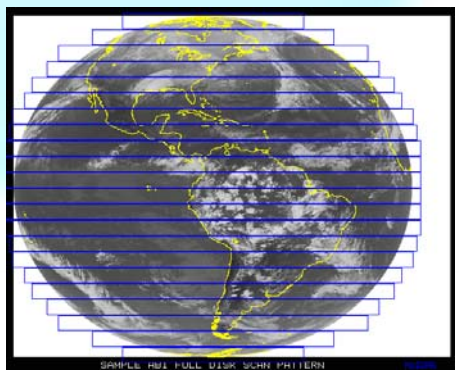
Oral – The ABI (Advanced Baseline Imager) on GOES-R

Timothy J. Schmit, J. Gurka, W. P. Menzel, and M. M. Gunshor

- **The ABI improves over the current GOES Imager -- spectral, temporal, spatial and radiometric performance.**
- **Improved Spectral Coverage**
  - **16 bands**
- **Improved Spatial resolution**
  - **0.5 – 2 km**
- **Improved Spatial coverage**
  - **Routine Full disk/CONUS scans**
- **Improved Temporal coverage**
  - **5 times faster scanning**
- **Improved Radiometrics**
  - **Visible on-orbit calibration**



16 spectral bands



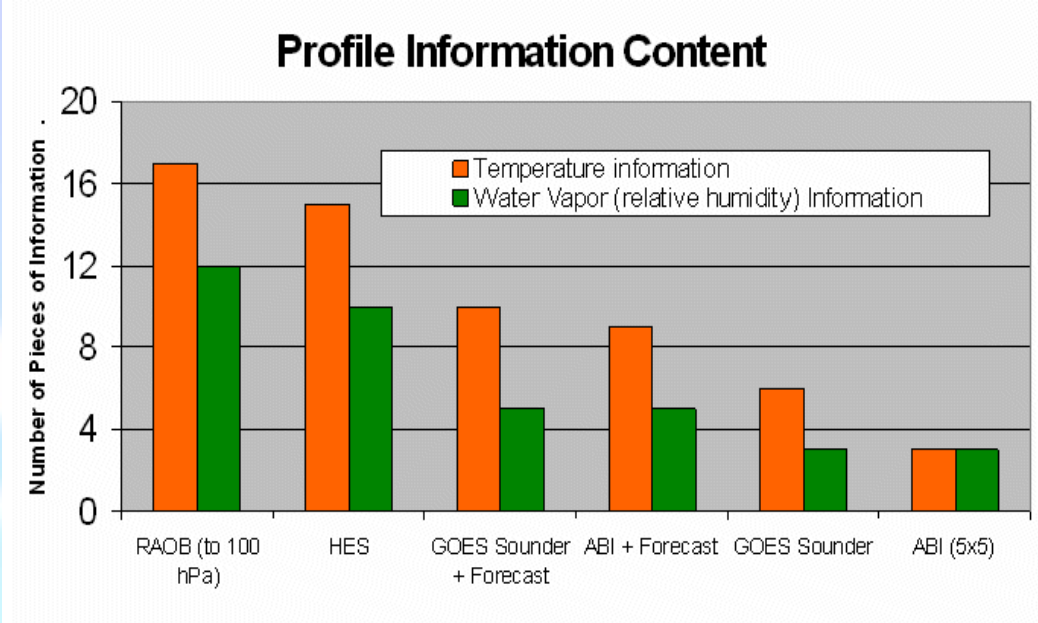
Full Disk with stepped-edge

Third Symposium: Future National Operational Environmental Satellite Systems

Poster – The GOES-R ABI (Advanced Baseline Imager) and continuation of GOES-N class sounder products

Timothy J. Schmit, James J. Gurka, Jun Li, Kevin Schrab

With no HES (Hyperspectral Environmental Suite) on GOES-R, the question becomes how to produce legacy GOES Sounder products. These can be generated from ABI data with comparable attributes as today's sounder, when using short-term numerical model forecasts. High-spectral resolution IR data are still needed to improve the products.



Relative vertical information. In general, the moisture content information is similar between the ABI and the current GOES Sounder. This information content analysis does not account for any spatial or temporal differences.

Third Symposium: Future National Operational Environmental Satellite Systems:

Poster – GOES-R BASELINE INSTRUMENTS

Timothy J. Schmit, James J. Gurka, Thomas M. Renkevens, Mat Gunshor and Jun Li

GOES-R baseline instruments:

- **ABI** Advanced Baseline Imager
- **GLM** Geostationary Lightning Mapper
- **SIS** Solar Imaging Suite
- **SEISS** Space Environment In-Situ Suite
- **MAG** Magnetometer
- **AUX** Auxiliary Services

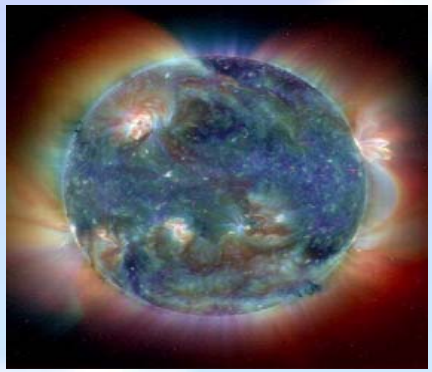
  LRIT--Low Rate Information transmission

  EMWIN--Emergency Managers Weather Information Network

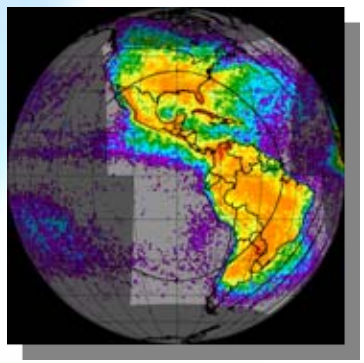
  DCS--Data Collection System

  SAR-- Search and Rescue

HES de-manifested from GOES-R



Simulated SXI (Solar X-ray Imager) image: (Courtesy of SOHO EIT, a joint NASA/ESA program; and Steve Hill/NOAA SEC).



Lightning Climatology, NASA

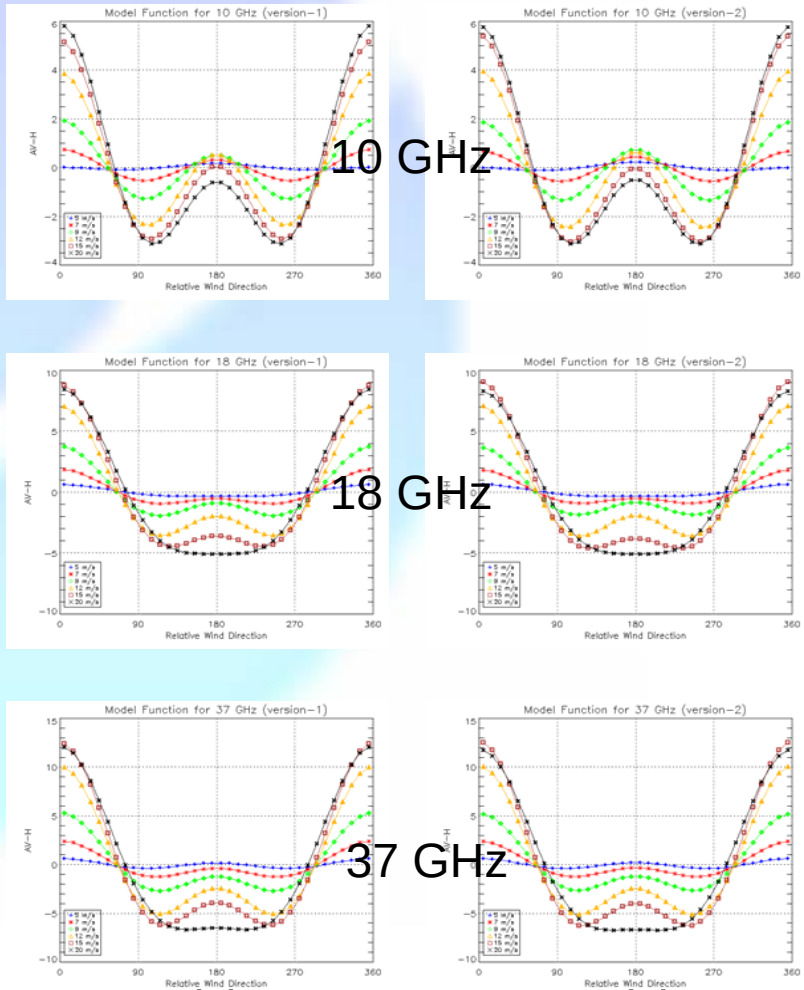
The great amount of information from the GOES-R series will both offer a continuation of current product and services, and also allow for improved or new capabilities.

11th Symposium on Integrated Observing and Assimilation Systems for the Atmosphere, Oceans, and Land Surface:

Poster – An Ocean Surface Wind Vector Model For WindSat Microwave Radiometer Using Dual-Polarization

S. Soisuvarn, Z. Jelenak and P. S. Chang

- Objective
  - Develop GMF using WindSat's V- and H-Pol brightness temperature measurement (10,18 and 37 GHz).
  - GMF are a function of SST, wind speed and wind direction.
- Data and Approach
  - QuikSCAT wind vector used as a surface truth.
  - SST surface truth from (1) GDAS and (2) WindSat's retrieved.
  - TB combination (**A***TB_V-TB_H) less sensitive to the atmosphere.
    - **A** parameter being a function of frequency, brightness temp, and SST
- Conclusion and Future Work
  - WindSat's retrieved SST may used in the GMF without external source
  - Implement the GMF with 3rd and 4th Stokes' parameter wind vector retrieval.



14th Symposium on Meteorological Observation & Instrumentation

Talk – MODIS Infrared channel Spectral response Function calibration with Co-located AIRS

Haibing Sun, W. Wolf, C. Barnet, Lihang. Zhou and M. Goldberg

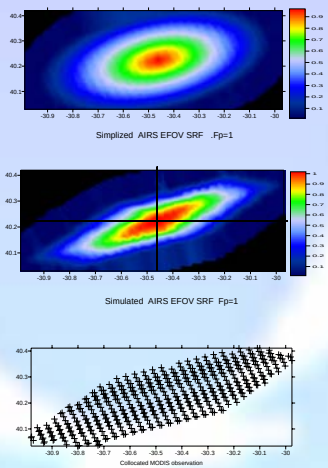
Algorithm:

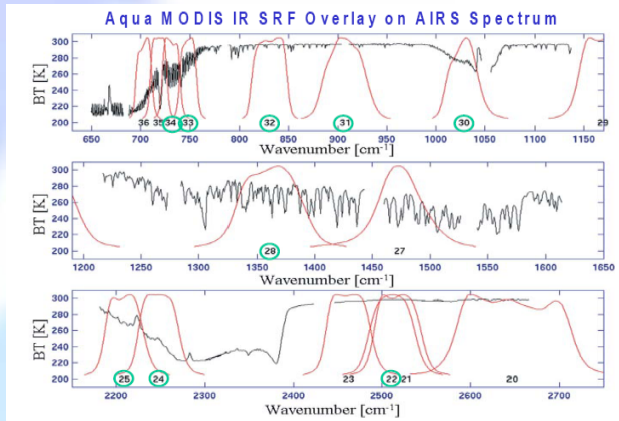
Individual MODIS IR channel :

$$Rad_{MODIS} = \sum_i Rad_{AIRS} W_i$$

The noise constraint is necessary

and very important in this algorithms.

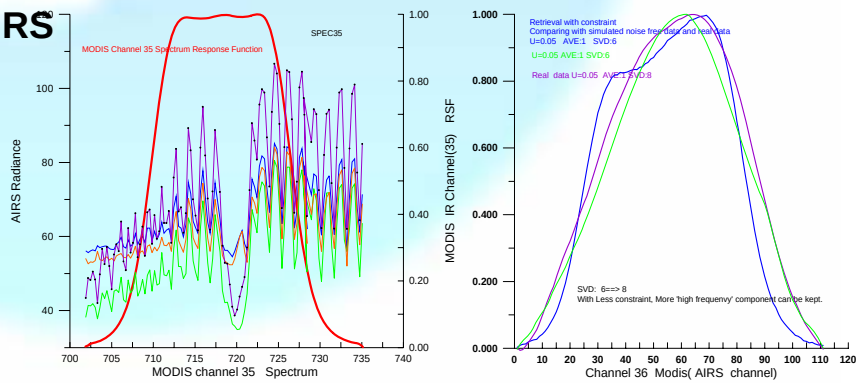




Data set Optimization: Co-located MODIS–AIRS Date/ Uniform sense. Apply the AIRS spatial response function

Deficient Matrix Equation Optimization:

Constraint Retrieval algorithm : Constraint Retrieval/Selection.

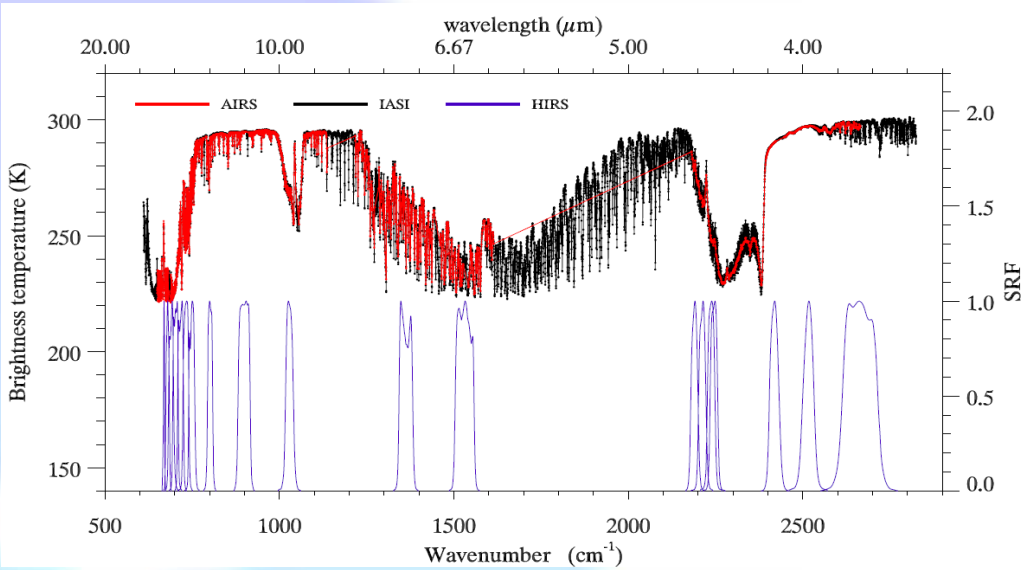


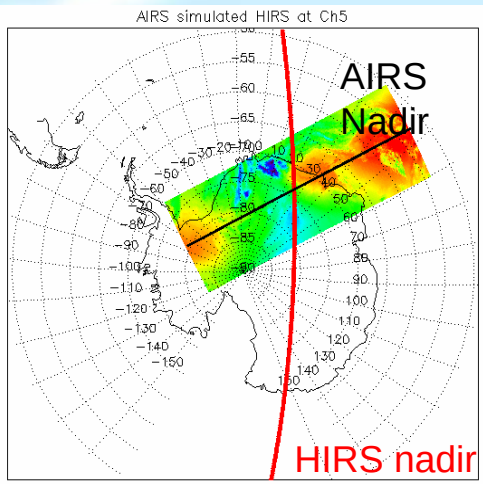
14th Symposium on Meteorological Observation and Instrumentation:

Presentation – On-orbit Verification of Infrared Sounders on Metop-A

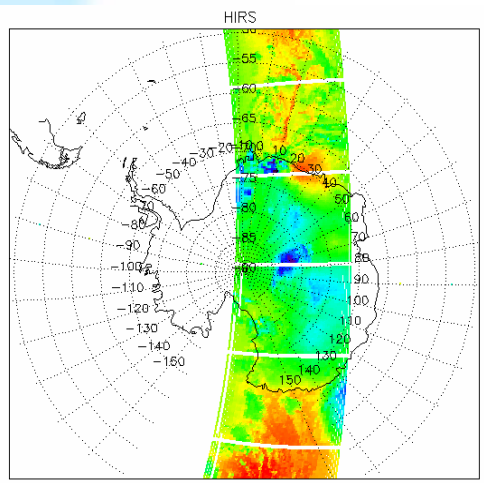
Likun Wang and Changyong Cao

- Using Simultaneous Nadir Overpass (SNO) observations
  - AIRS vs. HIRS/Metop-A
  - AIRS vs. IASI
  - Occur in the polar regions
  - Mid to low end of BT range
  - Preliminary results
- Inter-sensor calibration
  - HIRS vs. IASI on Metop-A
  - On the same satellite
  - Covers all BT range
- Purpose:
  - Better characterize the biases between instruments
  - Establish calibration links for infrared sounding data including historical HIRS data





AIRS convolved HIRS Ch5



HIRS Ch 5

Third Symposium on Future National Operational Environmental

Poster 1.19 – GOES-R AWG Integration Team (AIT): Interface with the System Prime

W. W. Wolf, Lihang Zhou, M. Goldberg

- **Interface with the System Prime**
  - **Coordinate activities between the AWG and the System Prime.**
  - **Deliver/Migrate AWG product systems to the System Prime.**
  - **Work with the System Prime to test the migrated product systems.**
  - **Aid the System Prime with the integration of the product systems into the GOES-R operational framework.**

- **AIT Will Deliver Product Systems and Will Provide**:
  - **System flowcharts.**
  - **Code breakdowns.**
  - **Points of parallelization within the code.**
  - **Combined product systems.**

- **Information Required by the AIT from the System Prime:**
  - **Interface between AWG Product Systems and the operational framework.**
  - **Error handling calls.**
  - **Tools used in the operational environment.**
  - **Specific operational functions.**

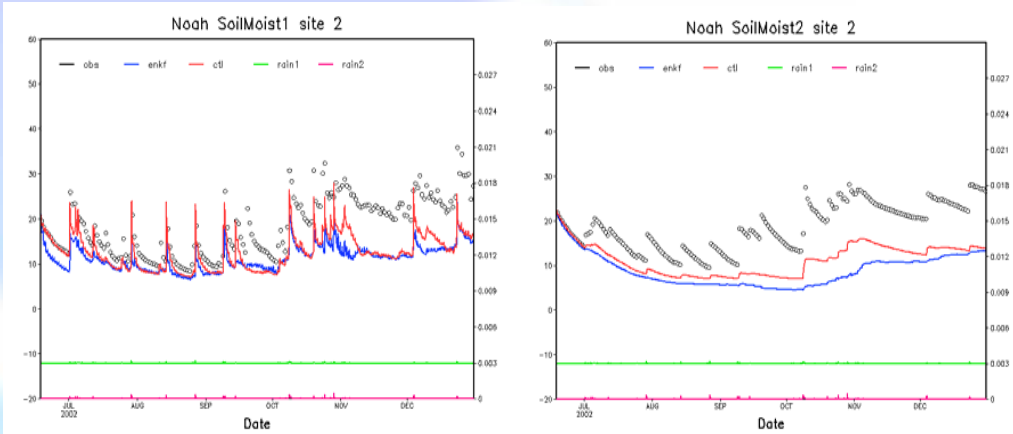
21th Conference on Hydrology

Oral – Impact of Observational Data Preprocessing on their Assimilation in NASA's Land Information System Using Ensemble Kalman Filter

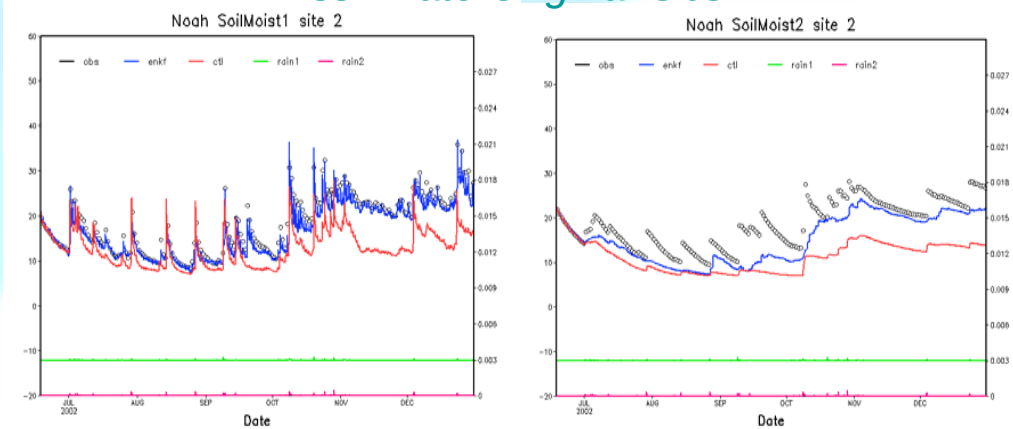
X. Zhan, W. Crow, S. Kumar, P. Houser, C. Peters-Lidard

- LIS and EnKF DA:
  - LIS runs LSMs (Noah, CLM, etc)
  - Kalman filter DA implemented to assimilate land obs to LSMs
  - Good research platform for land impact and comparison studies
- Observation Data
  - Biased SM, Ts, & other obs.
- Observation Data
  - Bias corrections: shift, norm., cdf
  - Perfect run for SM "truth" & "obs"
  - Perturbed run as "control"
  - Assimilate obs to control run
  - Compare output with "truth"
- Result:
  - Matching cdfs may not help
  - Bias shifting & norm not useful

Assimilate CDF Matched Obs



Assimilate Original Obs

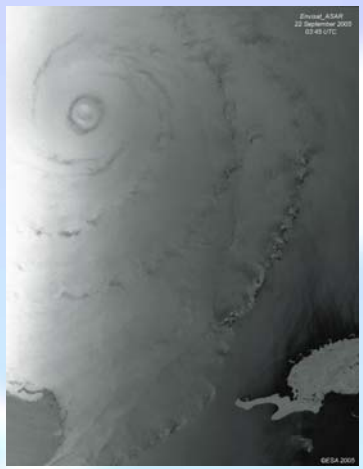


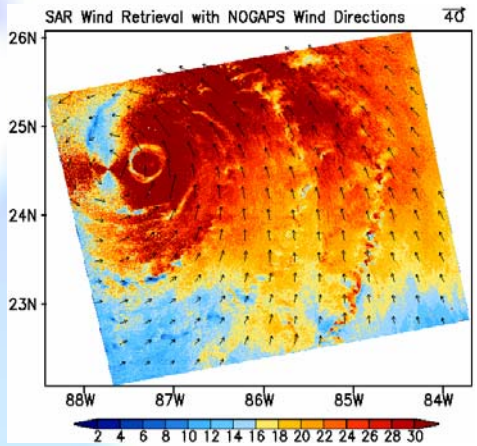
11th Symposium on Integrated Observing and Assimilation Systems for the Atmosphere, Oceans, and Land Surface (IOAS-AOLS):

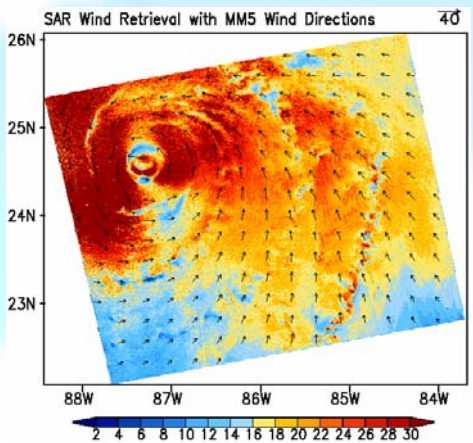
Oral – **Applications in Exploiting Synthetic Aperture Radar for Hurricane Initialization and Simulation**

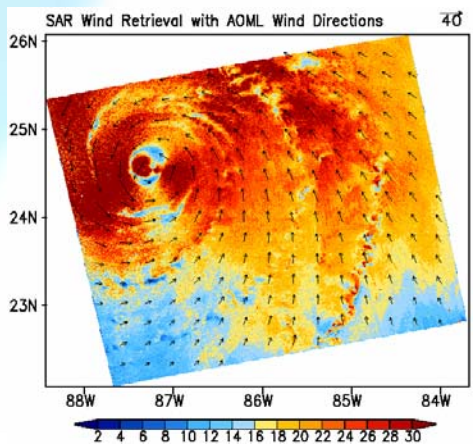
W. Zheng, X. Li, C-Z. Zou and W. Pichel

- SAR wind retrieval with CMOD5:
  - SAR image: fine structure
  - NOGAPS: misplace the location
  - MM5 & AOML: similar but some difference
  - C-band SAR: two heavy rain bands cause higher radar backscatter (red dots), and no significant impacts over other region
- Impact study for Rita case
  - Improvement of model initialization with SAR wind retrieval (WRF-3DVAR)
  - 60-h simulations with WRF







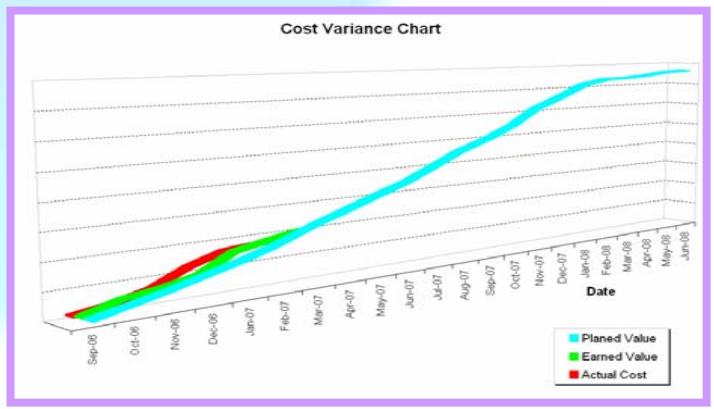


Third Symposium on Future National Operational Environmental

Poster 1.20 – GOES-R AWG Integration Team (AIT): Interface with the AWG Application Teams

Lihang Zhou, W. W. Wolf, M. Goldberg
Shuang Qiu, Pete Keenh, and Qingzhao Guo

- **GOES-R AWG:**
  - End-to-end capabilities for the GOES-R Level 2 product systems
  - Algorithms for numerous products required for Atmosphere, Land and Ocean
  - Fifteen AWG teams
- **GOES-R AWG AIT Provides:**
  - Coding standards & guidelines
  - Code review & code examples
  - Software for the creation and standardization of the input and output data formats
  - Standard libraries for all Product Teams to use
  - More efficient processing systems
  - Website as a center location of all the relate information
- **Quality Assurance:**
  - Ensure the standards, guidelines are adopted by the product development teams
  - Configuration Management
  - Monitoring and Validation Tools
  - Project schedules and reports

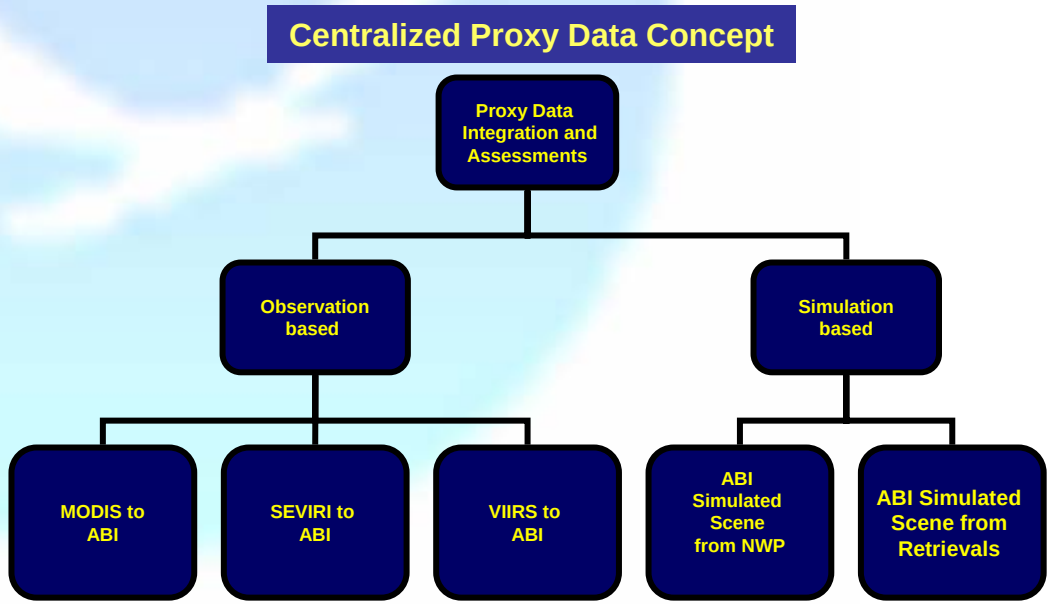


Third Symposium on Future National Operational Environmental Satellites :

Poster – GOES-R Proxy Data Management System

T. Zhu, F. Weng, M. Kim, M. Goldberg, CIRA Team, P. Dong, B. Ruston

- **Vison**
- The GOES-R Algorithm Working Group (AWG) program requests a high quality of proxy data for algorithm developments, testing and assessments. The central tasks in the proxy data management system will be:
  - delivery of simulation and observation-based GOES- R levele1B data,
  - development of visualization tools for various formats of proxy data,
  - design of a GOES-R Observing System Simulation Experiment (OSSE) framework for demonstrating the potential impacts of GOES-R data on NWP forecasts.



- **GOES-R Proxy Dataset**
  - MSG SEVIRI data,
  - ABI simulated from SEVIRI,
  - GOES-08/10 matchup with SURFRAD,
  - MODIS land surface emissivity daily,
  - AERONET and MODIS mtachup data,
  - Cloudsat data matched with ECMWF and MONDIS,
  - Mesoscale model (MM5) simulation data.