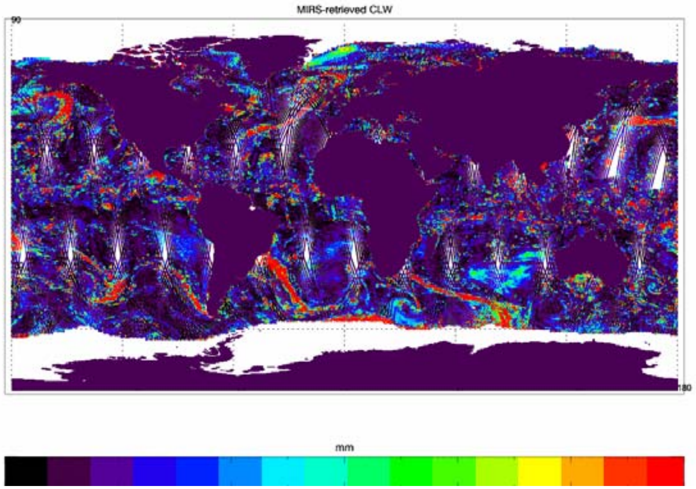
14th Conference on Satellite Meteorology and Oceanography:

Poster – Microwave Variational Retrieval of Surface and Atmospheric Parameters: Application to AMSU/MHS and SSMI/S sensors

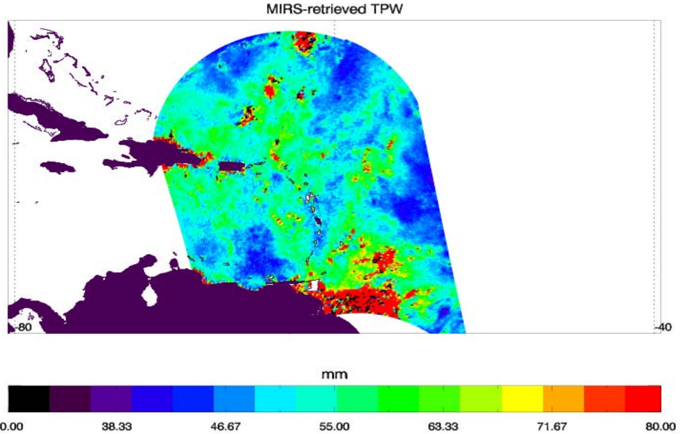
Sid-Ahmed Boukabara, Fuzhong Weng and Quanhua Liu

- **Optimal Estimation Iterative Algorithm (1DVAR):**
  - Radiometric & Geophysical flexibilities
  - Moderately non-linear & non-Gaussian pb.
  - All-weather, All-surface assimilation
  - CRTM is the Forward Operator
  - Retrieval of T, Q, Cloud and Precipitation parameters profiles
  - Retrieval of Emissivity Spectrum
  - Use of EOF decomposition
- **Tested Configurations**
  - NOAA-18, AMSU/MHS (Daily processing)
  - DMSP F16 SSMI/S
  - NPP/NPOESS ATMS (In simulation)
- **Future Activities**
  - Continue validation in clear/cloudy skies (On-going)
  - Extend retrieval over land (covariance) (On-going)
  - Validation in rainy conditions & over land
  - Operational Implementation

Ex. NOAA-18 Cloud Liquid Water



Ex. SSMI/S Total Precip. Water



14th Conference on Satellite Meteorology and Oceanography:

Toward an Integrated System for the Calibration/Validation of Multisensor Radiances from Operational Satellites

C. Cao, F. Weng, M. Goldberg, X. Wu, and J. Sullivan

- Traditional piece-meal calibration approach can no longer meet the user demand for highly accurate radiances:
  - Numerical Weather Predictions
  - Climate trending (ex: mid-tropospheric temperature, NDVI, Aerosols)
- An Integrated Cal/Val system is desirable
  - Eight major components (Figure 1)
  - End-to-end calibration/validation from prelaunch, postlaunch, forward calculations, to retrieval of geophysical products, and feedbacks to the calibration
  - Radiometric, spectral, geometric calibration
  - Intersatellite calibration
- Example applications
  - NOAA-18 cal/val (HIRS bias and noise)
  - NDVI long-term time series analysis (Figure 2)

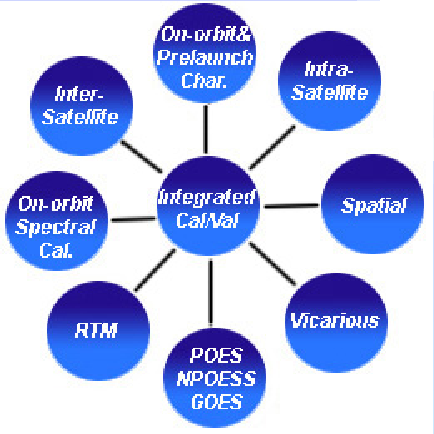


Figure 1. Major components for the Integrated Cal/Val System

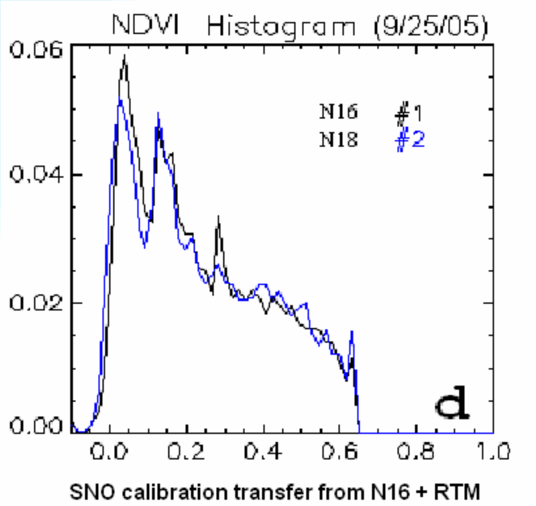


Figure 2. Matching the NDVI between N16 and N18 requires SNO analysis with radiative transfer calculations

Courtesy of Guo & Kogan

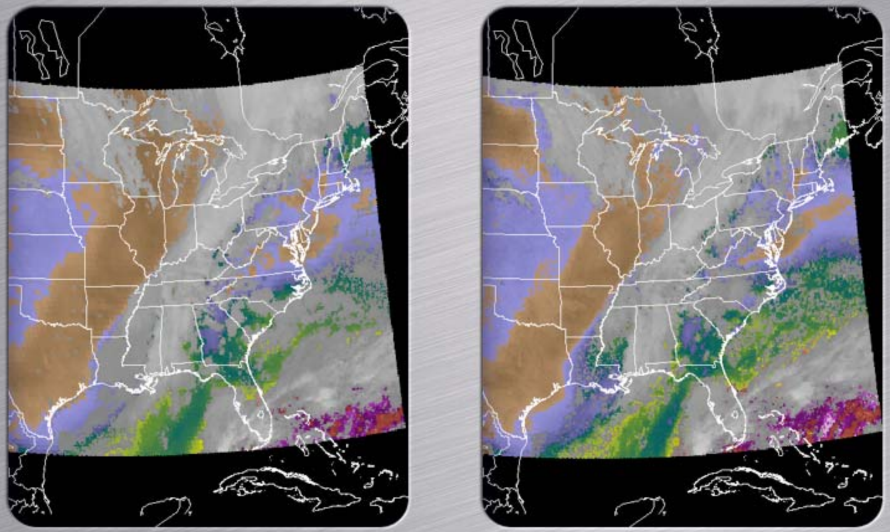
14th Conference on Satellite Meteorology and Oceanography:

Poster – GOES Sounder Single Field of View Products

J. Daniels, G. Gray, T. Schmit, G. Wade, J. Nelson, A. Schreiner, C. Holland

- **New product system became operational November 1, 2005**
  - Heritage 5x5 (~ 50km) retrieved products replaced by new 1x1 (~ 10km) retrieved products
  - Physically-based temp/moisture retrievals
    - Hayden et al, 1988; Ma et al, 1999
    - Clear-sky scenes
  - Cloud retrievals (CTP, ECA, CTT) in cloudy scene
    - CO2 slicing; window methods
  - Product Formats
    - BUFR
    - Derived Product Imagery
- **Product Uses**
  - Operational NWP Data Assimilation Systems
  - AWIPS: Nowcasting by Field Forecasters
- **Product Quality (Validation/Comparisons)**
  - vs. radiosondes, GPS moisture observations
  - Cloud retrievals (Imager vs. sounder)
  - Product quality maintained at higher resolution
  - Better depiction of gradients
  - Better coverage
    - Find more clear pixels to do temp/moisture retrievals
- **User Readiness**
  - 1x1 DPI Imagery being distributed over AWIPS
  - NCEP/EMC currently evaluating the full resolution temp/moisture retrievals and cloud retrievals in their regional and global NWP systems

GOES Sounder Derived Product Imagery on AWIPS
Total Precipitable Water *(CIMSS Enhancement)*



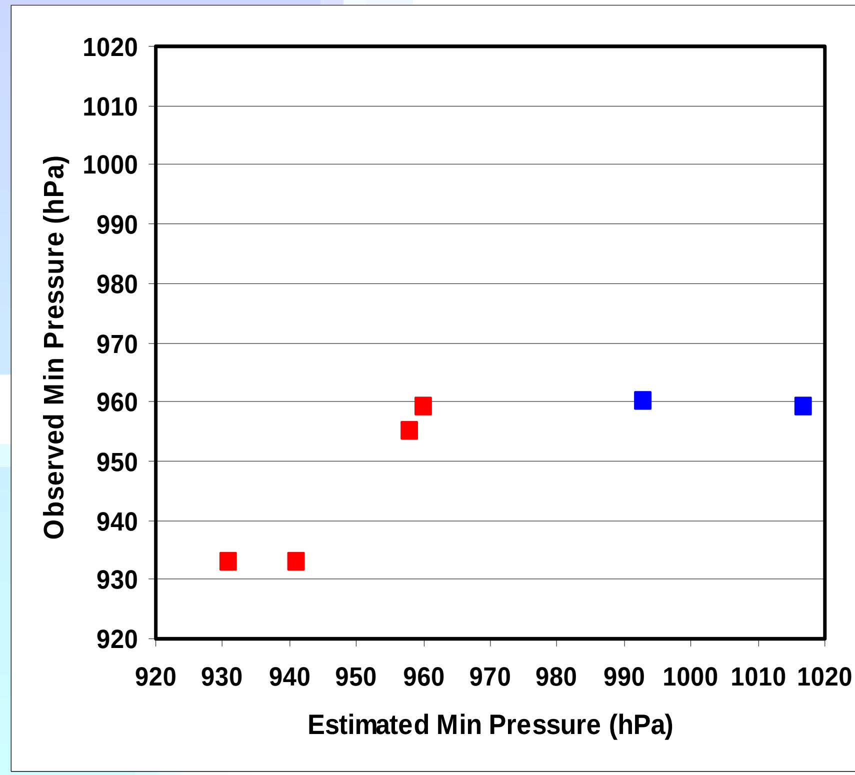
Changed from 5x5 to Single Field of View at 15 UTC on 01 November 2005

14th Conference on Satellite Meteorology and Oceanography:

Poster – Tropical Cyclone Applications of Next-Generation Operational Satellite Soundings

M. DeMaria, D. Hillger, C. Barnett and R. DeMaria

- **Part of GOES-R Risk Reduction and IPO/IGS Projects**
  - Use proxy data to demonstrate GOES-R and NPOESS tropical cyclone products
    - AIRS/AMSU for ATMS/CrIS and HES
    - MODIS/AVHRR/MSG for VIIRS, ABI
    - GFO, Jason, Envisat for NPOESS altimetry
    - Numerical model output
- **Applications**
  - Hurricane eye soundings for intensity estimation (HES, ATMS/CrIS)
  - Wind field retrievals using hydrostatic/balance constraints (HES, ATMS/CrIS)
  - Improved Dvorak intensity method (VIIRS/ABI)
  - Intensity forecasting (altimetry)
- **Results of eye soundings for hurricanes Lili and Isabel**
  - Method works will for large clear eye (Isabel)
  - Cloud contamination effects for Lili



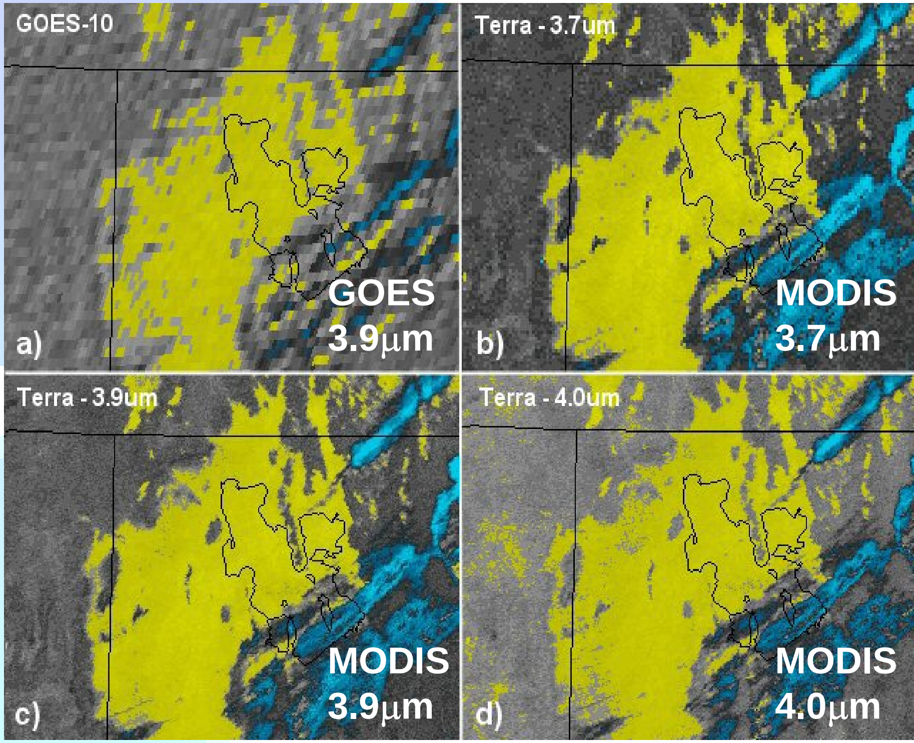
Min pressure from hydrostatic integration of AIRS/AMSU soundings versus observed min pressure for hurricanes Isabel (red) and Lili (blue)

14th Conference on Satellite Meteorology and Oceanography:

Poster – Evaluation of MODIS Shortwave IR Bands for Optimum Nighttime Fog Detection

Gary Ellrod

- Bi-spectral technique based on IR window (11μm) - SWIR BTD
  - Evaluated MODIS SWIR bands:
    - **3.7μm, 3.9μm, 4.0μm, 4.5μm**
- Best detection with 3.7μm Band
  - Good contrast with cloud-free areas
  - Less false detection from desert
  - 3.9μm only slightly worse
- Implications for operational use
  - Best fog detection with MODIS, AVHRR, MTSAT, VIIRS
  - Adjust GOES-R ABI wavelength?
    - **Effect on other products (fires)**

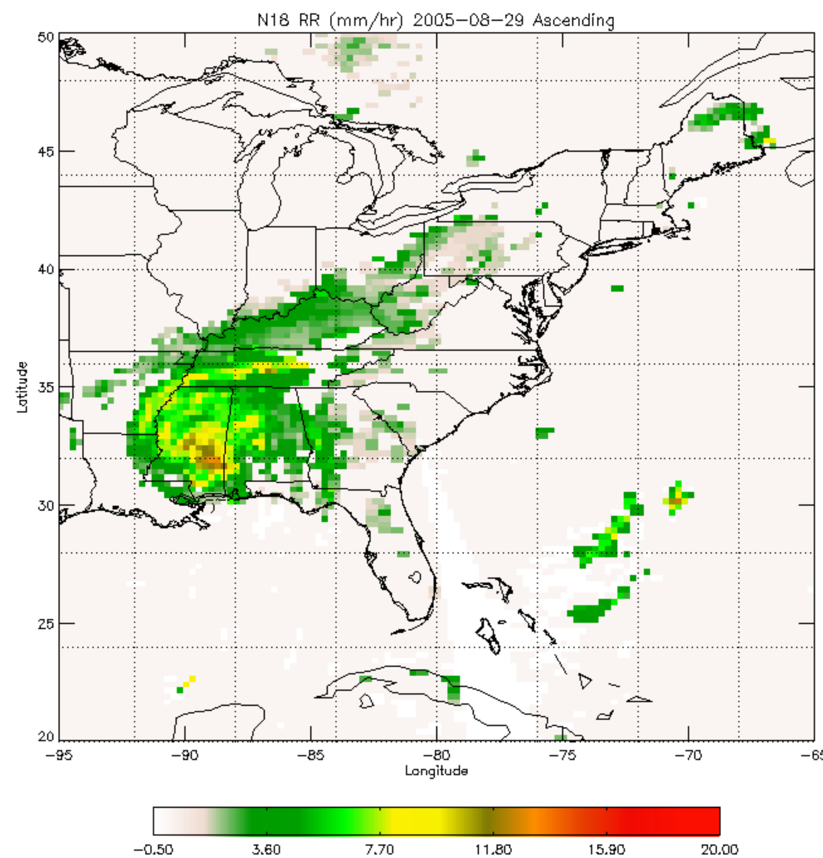


14th Conference on Satellite Meteorology and Oceanography:

Poster – Current Status of AMSU Operational Precipitation Product

R. Ferraro, C. Kongoli, P. Pellegrino, H. Meng, F. Weng

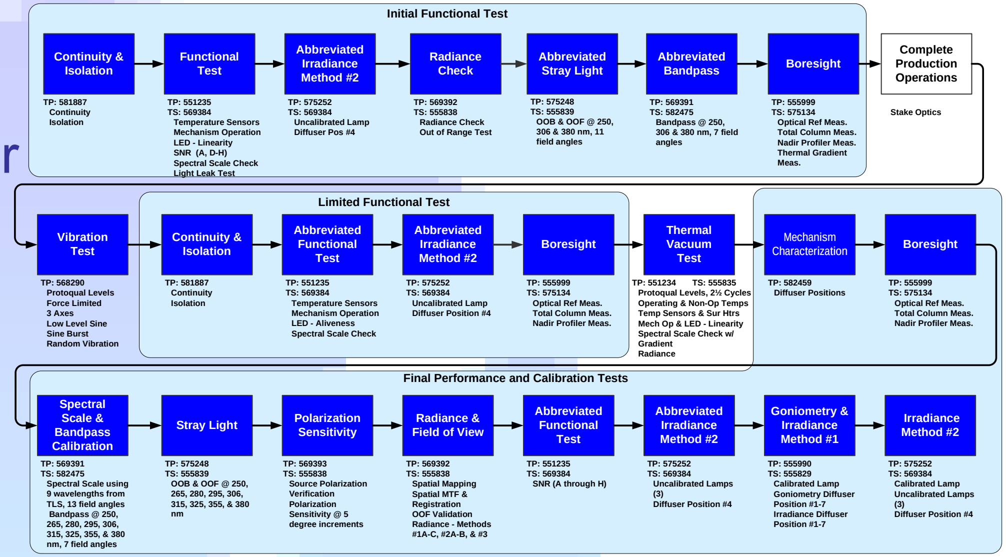
- Algorithm based on Weng & Zhao IWP/De retrieval:
  - Utilizes AMSU and MHS 89 and 150 GHz
  - Also relies on AMSU-A for background
  - Rain rate is quadratic fit to IWP
- Operational generation
  - NOAA-15, 16, 17 & 18
  - Swath, pentad and monthly products
  - Latest feature includes falling snow identification over land
    - Snowfall rates being developed
- Future improvements
  - Better treatment of coastlines
  - Emission signature over ocean

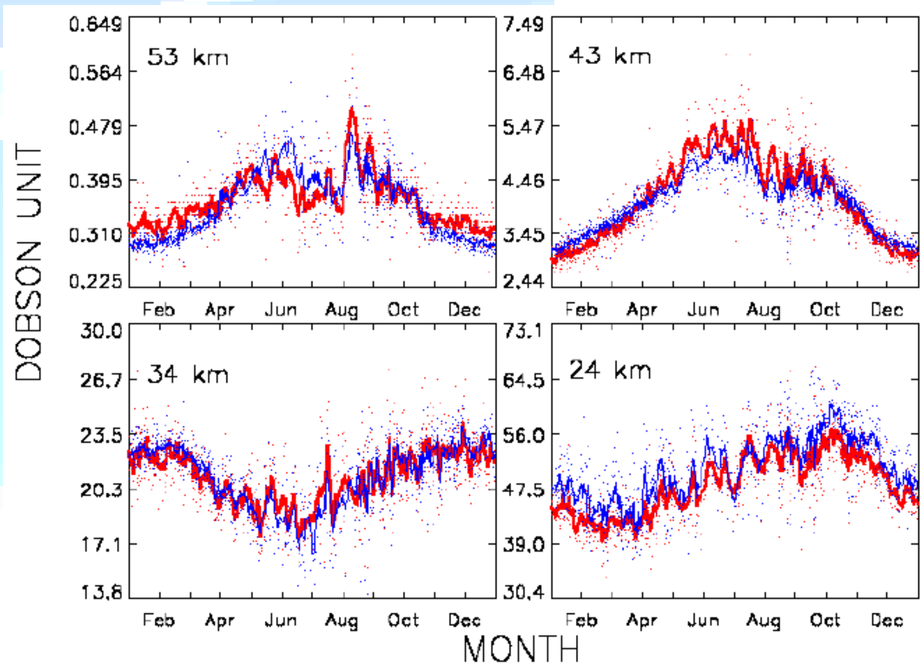


NPOESS/GOES-R Session
Cal/Val Plans for OMPS by L. Flynn

TALK OUTLINE

- Testing by instrument manufacturer
  - Verify performance/ requirements on-ground
  - Traceability of standards
- SDR parameters and gap work
- C/V Task Network and analysis
- Bundled EDR products
- In-orbit calibration and design heritage
- Soft calibration and algorithm design heritage
- Current inter-comparisons and results
- Limb profiler challenges



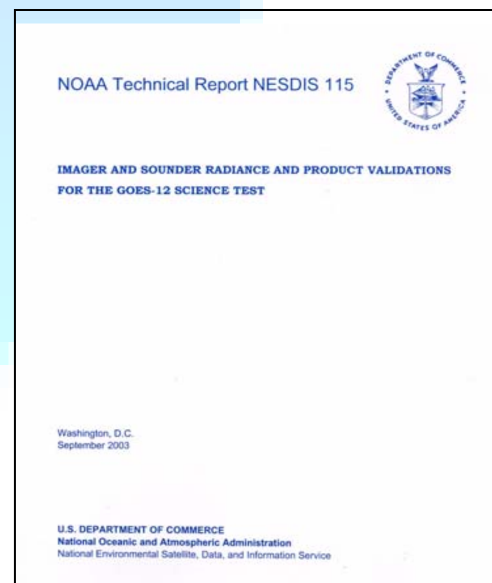


14th Conference on Satellite Meteorology and Oceanography:

Poster 6.3: An Overview of GOES-N Science Test

D. Hillger, D. Lindsey, J. Knaff, T. Schmit, J. Daniels

- GOES-N Science Tests
  - **NESDIS and Cooperative Institute involvement (CIRA, CIMSS)**
  - **Commence 4-6 weeks after launch**
  - **About 5 weeks duration**
- Planning
  - **Proposed Schedules for both Imager and Sounder**
  - **Proposed Tests (noise, striping, etc.)**
- Final Report
  - ***NOAA Technical Report***
  - **Expected distribution 12 months after completion of Science Tests**


NOAA Technical Report NESDIS 115

IMAGER AND SOUNDER RADIANCE AND PRODUCT VALIDATIONS FOR THE GOES-12 SCIENCE TEST

Washington, D.C.
September 2003

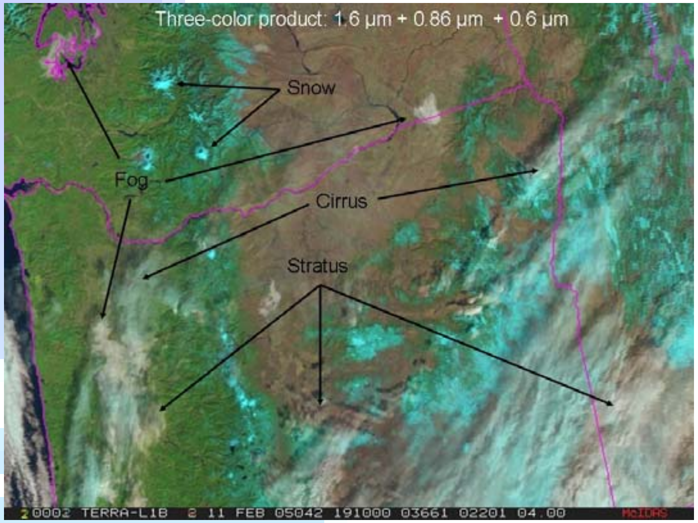
U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Environmental Satellite, Data, and Information Service

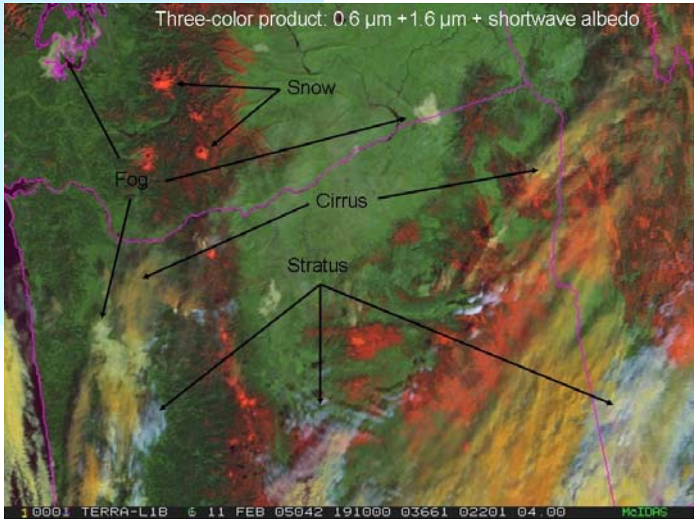
14th Conference on Satellite Meteorology and Oceanography:

Poster 6.6: GOES-R ABI New Product Development

D. Hillger

- New product development for GOES-R Risk Reduction
  - **Initial focus on fog/stratus product**
  - **Thee-color techniques**
  - **Utilizing MODIS and MSG data**
- Web-based demonstration planned
  - **Quasi-operational forum**





Thee-Color Product Name	Red component	Green component	Blue component	Image Example
MSG "natural" color product	1.6 µm	0.86 µm	0.6 µm	Figure 1b
MSG "day snow-fog" product	0.8 µm*	1.6 µm*	3.9 µm (solar/reflected part only)*	Not shown
Modified thee-color fog/stratus product	0.6 µm albedo	1.6 µm albedo	Shortwave (3.9 µm) albedo	Figure 1c

NOAA Satellites and Information
National Environmental Satellite, Data, and Information Service
Office of Research and Applications

14th Conference on Satellite Meteorology and Oceanography: P4.10

Application of SNO Method to POES and EOS Satellite Instruments

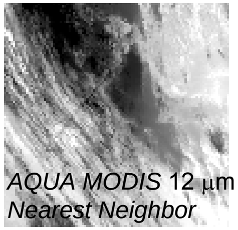
R. Iacovazzi, Jr. (*ERT, Inc.*), C. Cao (*NOAA*), and P. Ciren (*QSS*)

Goal: Assess Intercalibration Biases of 1) EOS-Aqua MODIS & N18 AVHRR and 2) EOS-Aqua & N18 AMSU-A

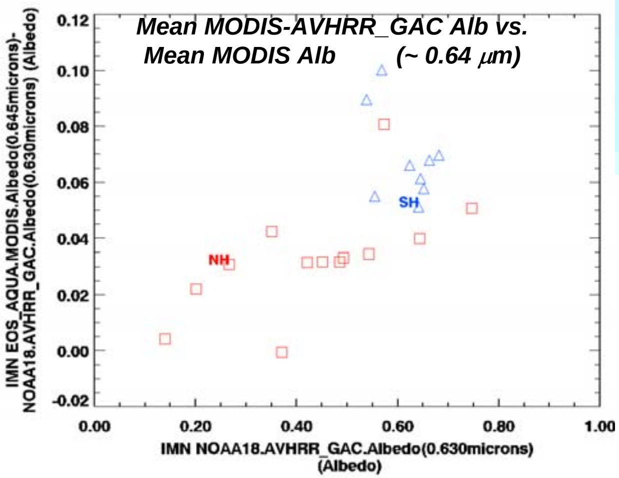
Method: Analyze SNO events between N18 and EOS-Aqua instruments, where SNO defined as intersatellite overpass of same location within 30 sec.

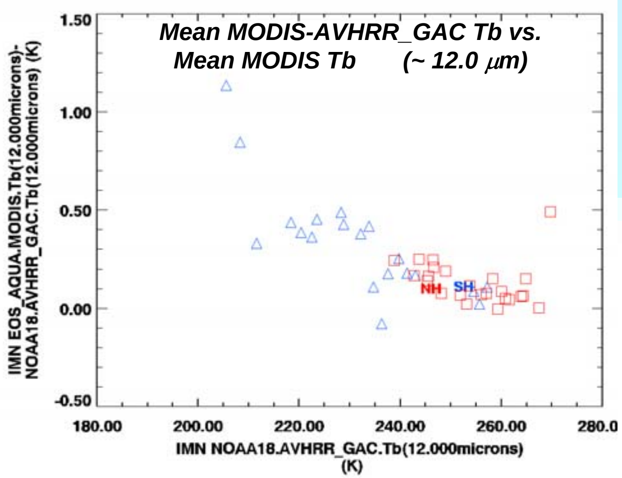
Results from Scene-Avg. SNO Data:

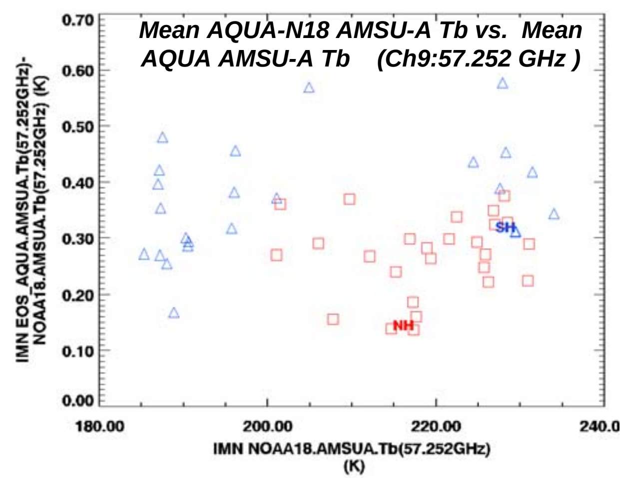
- Albedo or Tb from MODIS and Aqua AMSU-A1 can have a significant high bias.
- Albedo (Tb) difference between MODIS and AVHRR can have significant Trend/Corr with respect to MODIS Alb (Tb).
- No Trend/Corr of ΔAlb (ΔTb) vs. ΔGeoloction, ΔScantime, STD[Alb (Tb)]



08/24/2005 SNO
-79.8^o S, 29.8^o E







14^{th} Conference on Satellite Meteorology and Oceanography:

Poster – Production and preliminary evaluation of operational Sea Surface Temperature (SST) and Aerosol Products from NOAA-18 AVHRR/3

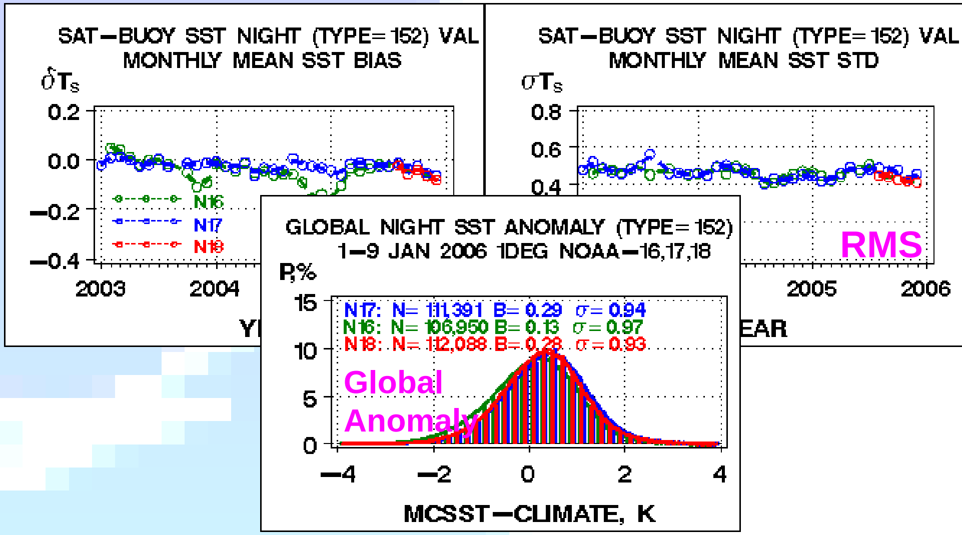
A. Ignatov, J. Sapper, W. Pichel, X. Li, Y. Kihai

N18 (May 2005) AVHRR products over global ocean
SST: Physical-Statistical (trained vs buoy SST)
Aerosol: Physical (RTM-based LUTs)

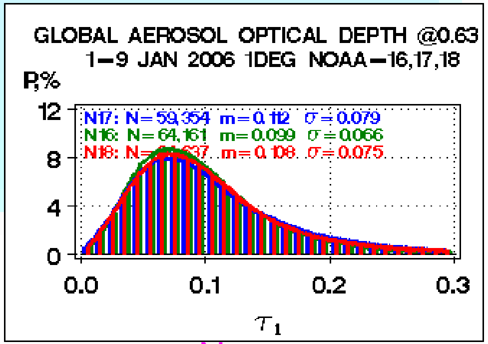
Both utilize common Main Unit Task preprocessor

- SST
  - Day: Non-linear at 11 & 12 μm
  - Night: Multi-Channel at 3.7, 11, & 12 μm
- Aerosol
  - Single-channel at 0.63, 0.83, 1.6 μm
  - Daytime (anti-solar ½swath outside glint)
- Future improvements
  - Redesign for MetOp (mid-2006)

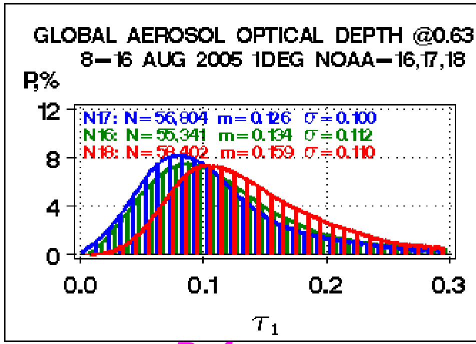
Nighttime SST from N16/17/18: Val & Consistency



Aerosol from N16,17,18: Consistency Checks



Now



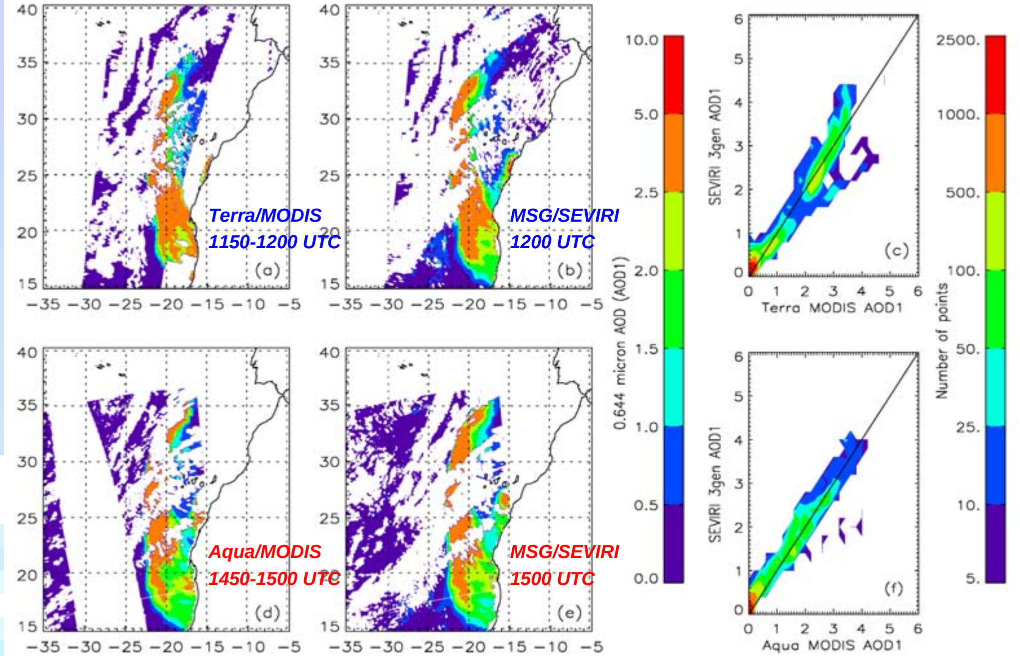
Before

14th Conference on Satellite Meteorology and Oceanography:

Poster – Aerosol retrievals from MSG SEVIRI over ocean using AVHRR-like algorithm

H. Brindley (Imperial College, UK) and A. Ignatov (NESDIS/STAR, US)

Meteosat Second Generation (Aug 2002): SEVIRI aerosol bands @ 0.63, 0.83, 1.6 μm close to AVHRR
GERB: Draw upon CERES aerosol experience &
Employ AVHRR-like aerosol product in GERB chain

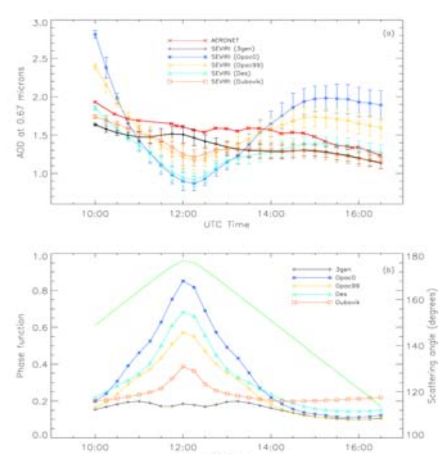


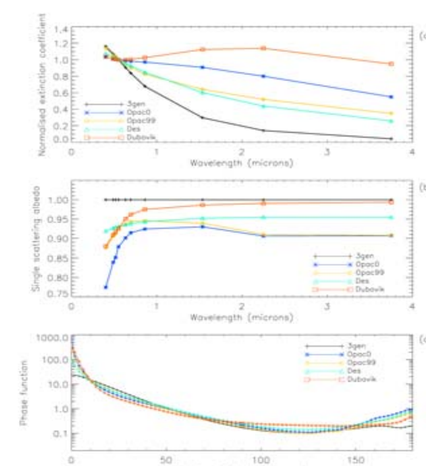
Implementation with MSG/SEVIRI

- Look-up-tables adjusted to SEVIRI bands
- Mask: EUMETSAT + IC (dust detection)

Testing

- Against Terra and Aqua/MODIS
- Against AERONET
- Different aerosol models tested





Future work

- Implement aerosol product in GERB processing chain
- Test/Improve quality of MPEF/IC Mask
- Use for GOES-R Risk reduction

14th Conference on Satellite Meteorology and Oceanography: Poster

ANALYTIC CONSTRUCTION OF INSTANTANEOUS FIELD OF VIEW ELLIPSOIDS ON AN ARBITRARY EARTH PROJECTION

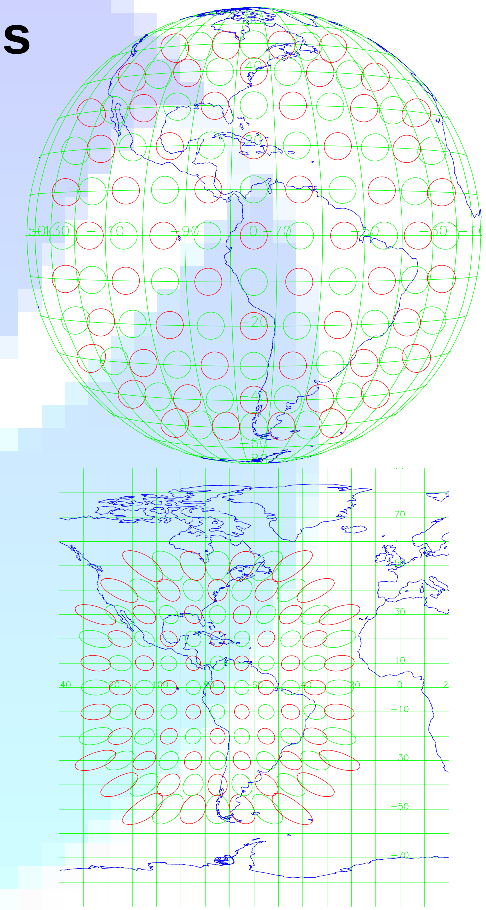
Thomas J. Kleespies

- Uses spherical and plane trig to compute a polygon of arbitrary size in earth coordinates (lat-lon) that describes the intersection of a circular field of view (fov) with a spherical Earth

- User can then plot these in an arbitrary earth projection
  - Most NOAA instruments supported

- This capability does not appear to be generally available

- Future improvements
  - ★ Analytic method for determining if a specific earth location is within a specific fov
  - More accurate representation of fov in polar regions



Scan patterns of a 1.1° fov from geosynchronous orbit and as viewed in a cylindrical coordinate system.

14th Conference on Satellite Meteorology and Oceanography:

GVI-x New 25-year 4-km AVHRR Data Set for Land Cover & Climate Study

F. Kogan, D. Tarpley and W. Guo

Global Long-Term Land Data Sets (comparison table)

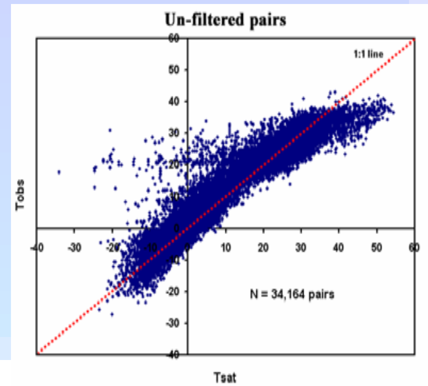
	GVI	Pathfinder	ISLSCP/ Fasier	GIMMS	GVI-x
Period	1981-2005	1981-2000	1981-2002	1981-2002	1981-2005
Resolution: Spatial Temporal	16 km 7-day	8 km 10-day	111 km 30-day	8 km 15/16-day	4 km 7-day
Projection	Lat/Long			Albers equal area	Lat/Long
Parameters available	7 NDVI C1, 2, 4, 5, SZA, SCA	1 NDVI	1 NDVI	1 NDVI	14 NDVI C1, 2, 4, 5 A1,A2,BT4 SZA,SCA, RAZ Pix.Jul. Day Pix. Time, Cloud mask
Products available	8 smn, smt VHI,VCI TCI,Climatology Drought Fire risk				8 smn, smt VHI,VCI, TCI,Climatology, Drought Fire risk
Data Precision	1-byte	1-byte	1-byte	4-byte (tiff)	2-byte (HDF)
Validation	Well done	Partial	No	Partial	No
Producer	NOAA	NOAA/NASA	Wales Univ.	NASA/Maryland Univ.	NOAA
Year produced	1985	1991	2003	2003	2005

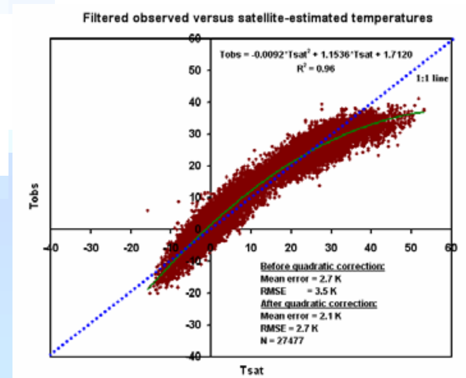
14th Conference on Satellite Meteorology and Oceanography:

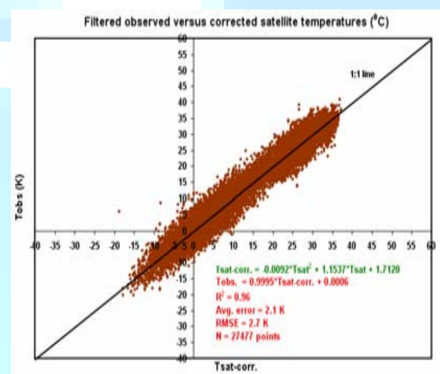
Poster – Evaluation of the AMSU Land Surface Algorithm for Skin and Shelter-Air Temperature Retrievals

C. Kongoli, P. Pellegrino, F. Weng, R. Ferraro and C. Dean

- Current Land Surface Algorithm
  - Utilizes AMSU-A channels 23, 31 and 50 GHz for maximum penetration
  - LTS Algorithm developed only for skin temperature retrievals
- Evaluation Methodology
  - Match-ups with shelter-air temperature measurements over US Great Plains
  - Developed a microwave algorithm for screening wetness, snow cover and rain
- Results and Future Work
  - Simple corrections to current LTS algorithm lead to accurate shelter-air temperature retrievals with a mean error of 2 ^{0}C
  - On-going work inter-compares more thoroughly AMSU LTS retrievals with those from GOES







	FILTERED-UNCORRECTED			FILTERED-CORRECTED			
Satellite	Bias	Mean error	RMSE	Bias	Mean error	RMSE	N
N16-DES	-0.1	2.1	2.7	0.0	1.8	2.3	4814
N16-ASC	-1.3	3.5	4.4	0.0	2.1	2.6	3591
N15-DES	0.6	2.5	3.2	0.0	2.0	2.6	4796
N15-ASC	-1.6	2.8	3.5	0.0	2.0	2.6	4325
N17-DES	1.0	3.1	4.1	0.0	2.1	2.6	5458
N17-ASC	0.0	2.4	2.9	0.0	1.9	2.4	4493
Avg	-0.2	2.7	3.5	0.0	2.0	2.5	27477

Uncorrected - Corrected

Satellite	Mean error	RMSE
N16-DES	0.3	0.4
N16-ASC	1.4	1.8
N15-DES	0.5	0.6
N15-ASC	0.8	0.9
N17-DES	1.0	1.5
N17-ASC	0.5	0.5

Coefficient sets:

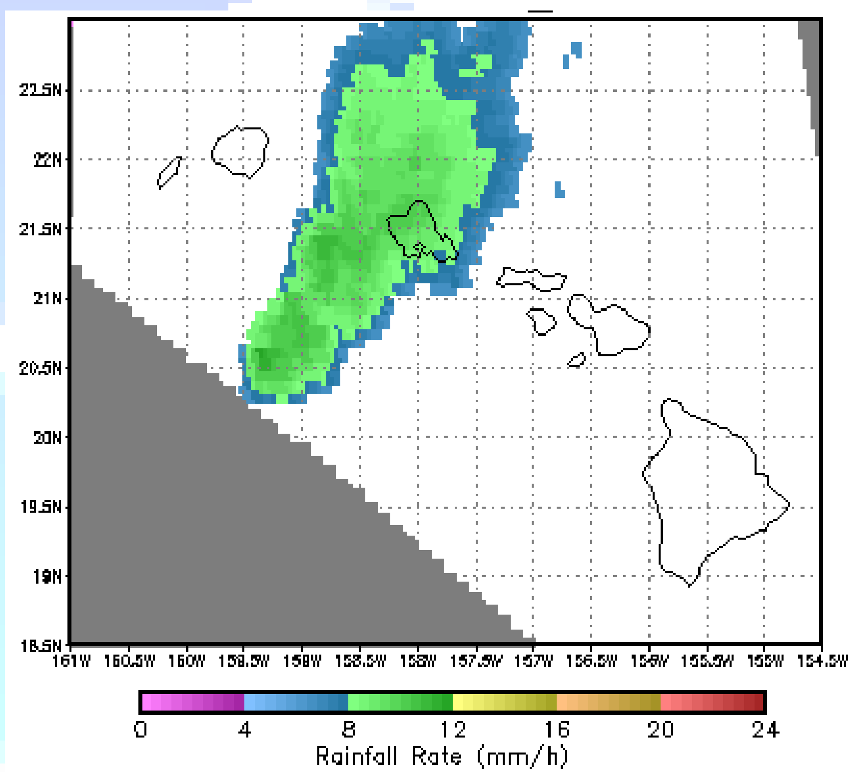
Satelite	a*Tsat2	b*Tsat	c	Corr. (R2)	F-value
N16-DES	-0.0103	1.1445	1.4304	0.96	0.00
N16-ASC	-0.0111	1.1993	2.8413	0.96	0.00
N15-DES	-0.0114	1.2050	1.0520	0.96	0.00
N15-ASC	-0.0082	1.1448	3.0305	0.96	0.00
N17-DES	-0.0111	1.2479	0.7590	0.96	0.00
N17-ASC	-0.0083	1.1061	1.5622	0.96	0.00

14th Conference on Satellite Meteorology and Oceanography:

Poster – Application of the Hydro-Estimator Rainfall Algorithm over Hawaii

R. J. Kuligowski, J.-S. Im, J. C. Davenport, R. A. Scofield

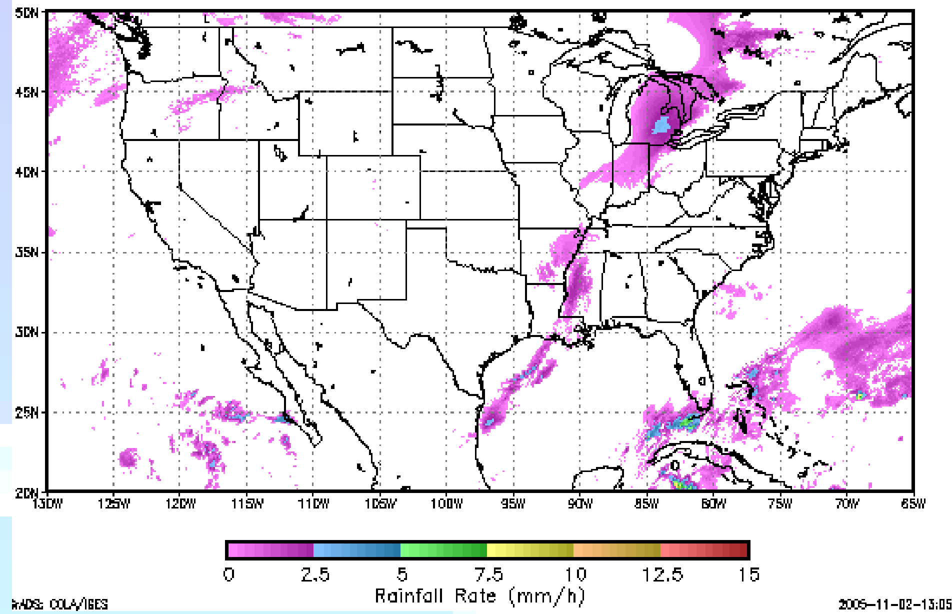
- Rainfall observation shortfalls in HI:
  - Only partial radar coverage and sparse rain gauge coverage due to topography
  - Satellite would help, but operational HE is designed primarily for cold-topped thunderstorms; HI is dominated by warm rain.
- Recalibration of the HE over Hawaii
  - Radar rain fields as calibration target
  - Predictors from GOES and Eta model model
- Preliminary results
  - Some improvement over operational HE
  - Still significant difficulty in detecting warm rain—additional development work needed



20th Conference on Hydrology:

Talk – Global Application of the Self-Calibrating Multivariate Precipitation Retrieval (SCaMPR)

R. J. Kuligowski, S. Qiu, J.-S. Im

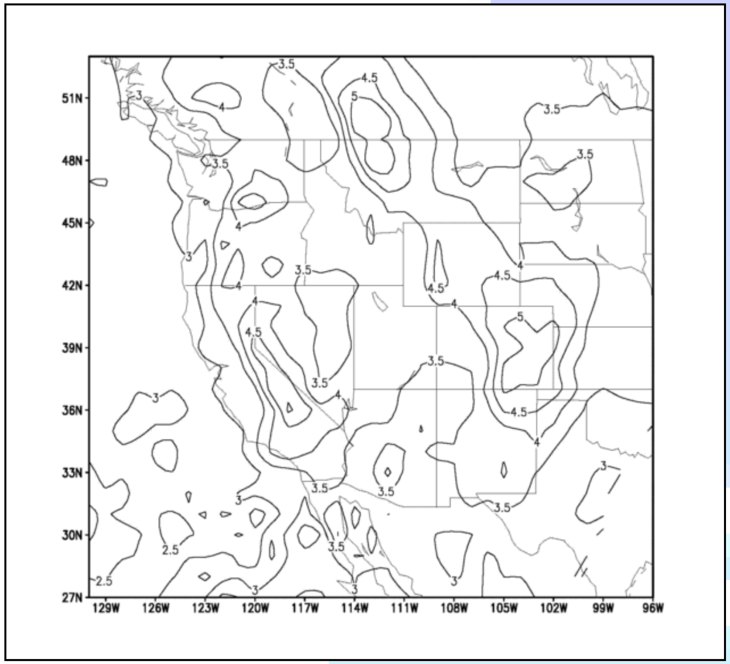


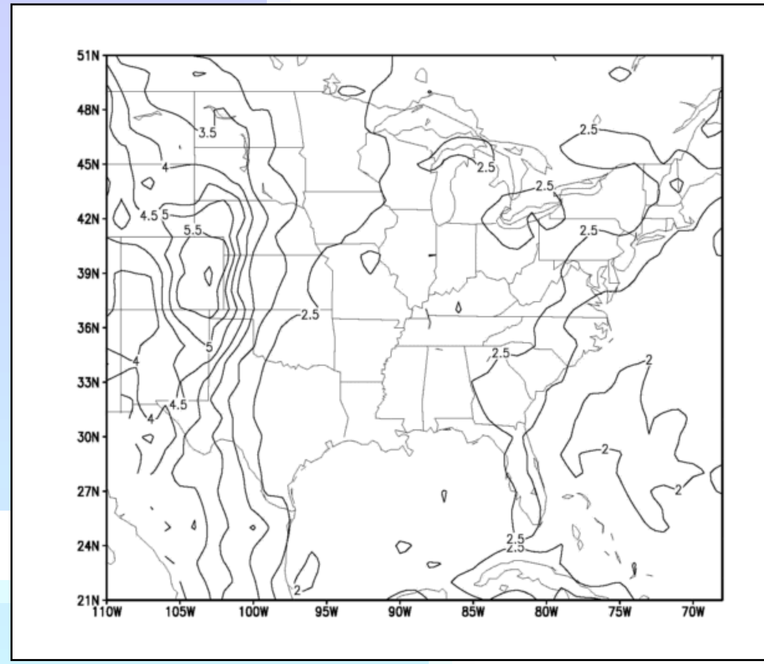
- Algorithm for calibrating IR parameters to microwave rain rates
  - Objective is to achieve accuracy of microwave with spatial/temporal resolution of IR
  - Target data are SSM/I and AMSU rain rates
  - Discriminant analysis for rain/no rain separation; regression for rain rate calibration
- Preparing to go global
  - Original CONUS-only version with same calibration everywhere
  - New two-GOES version with separate calibrations for overlapping 15°x15° boxes
  - Global implementation delayed by other needed SCaMPR fixes
- Future work
  - Complete global (60°S-60°N) implementation—take advantage of 12 channels on MSG SEVIRI
  - Add lightning data over US (NLDN) in real time—already tested

14th Conference on Satellite Meteorology and Oceanography:

Poster – A Climatological Study of Ice Cloud Reflectivity

Daniel T. Lindsey





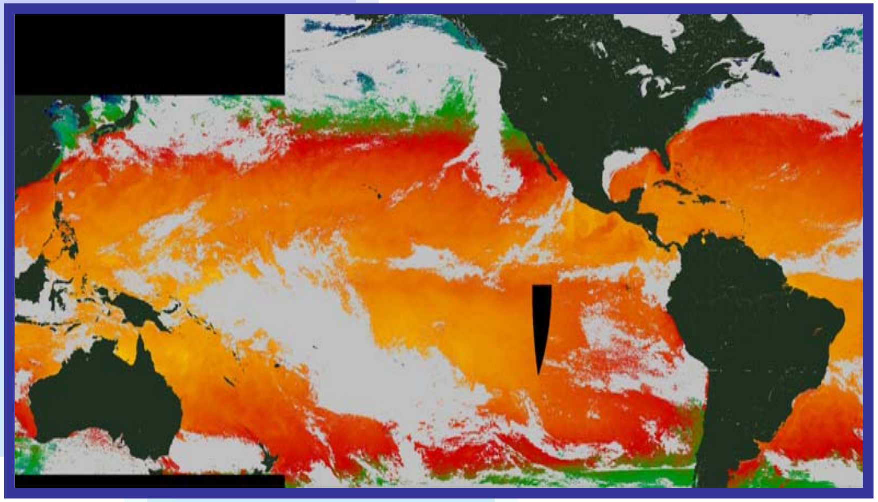
- Contours show annual mean 3.9 μm reflectivity of ice clouds from GOES
  - Large east/west gradient from the High Plains to the Eastern U.S.
  - Highly reflective ice clouds typically associated with high-based thunderstorms or mountain wave clouds
  - GOES measurements of 3.9 μm reflectivity provide information about thunderstorm updraft strength, and will be used to develop a severe weather nowcasting product

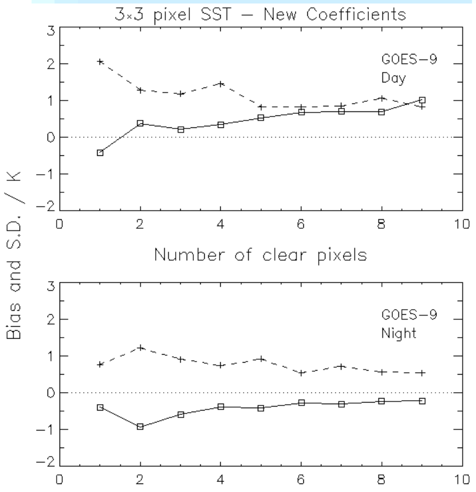
14th Conference on Satellite Meteorology and Oceanography:

Poster – Geostationary Sea Surface Temperature Products (Current and Future)

E. Maturi, A. Harris, C. Merchant, X. Li, B. Potash

- ***GOES-Imager SST Retrieval Algorithms***
  - Radiative-transfer-based SST retrieval algorithms are used to generate the GOES-9/10/12 SST retrievals.
- **Bayesian Cloud Mask**
  - Current Cloud Detection Scheme Based on Thresholds
  - Bayesian is a probability-based cloud mask
- **Validation Methodology**
  - QC'd Global drifting buoys and the TOGA TAO moored buoy array are matched with GOES-SST retrievals within one hour and 5-km
- **Future Sensors**
  - MTSAT-1R to replace GOES-9
  - Meteosat Second Generation (MSG)
  - Chinese FY2C





GOES-9 Validation

Daytime warm bias is geophysical

Nighttime cold bias (-0.2 degK) is expected for RTM-based algorithm

14th Conference on Satellite Meteorology and Oceanography:

Poster – Physical Retrieval for Precise Satellite SST Measurements-GOES-R Risk Reduction

E. Maturi, W. L. Smith, S.V. Kireev

- **Physical Retrieval Algorithm:**
  - Being developed for use with simultaneous GOES-R HES and ABI radiance measurements.
  - The goal is an accuracy of 0.2 degrees C depending on sky conditions.
  - The inverse solution of the non-linear radiative transfer equation, in its variational form, is obtained (Rogers, 2000).
  - Emissivity spectral shape is assumed (Wu and Smith, 1997).
  - The dynamically solved for emissivity magnitude, accounts for view angle and sea state variability.
  - The final iteration of the inverse solution uses on-line/off-line radiance residuals as the input measurements in order to fully satisfy the reflected sky radiation contribution to the measured radiances.
  - A final check of the surface emissivity and temperature solution is obtained using on-line/off-line radiance equations (Xie, 1993).
- **Methodology Tested:**
  - Aqua satellite Atmospheric Infrared Sounder (AIRS) and the Moderate Resolution Imaging Spectro-radiometer (MODIS) 10-14 mm radiance observations and ECMWF model atmospheric state data, as the initial state, as supplied NOAA/NESDIS for the Gulf of Mexico and western Atlantic coastal region of the eastern US on February 5, 2005.
- **Validation:**
  - An example of the accuracy of this methodology Is shown in figure 1 and 2 using AIRS data.
- **Future Work:**
  - the technique will be applied to actual AIRS and the NPOESS Airborne Sounder Testbed Interferometer (NAST-I) radiance data to assess the accuracy under real measurement conditions.
  - Simulations will be performed for a wide variety of surface and atmospheric condition initial state errors in order to provide a statistical assessment of the robustness of the algorithm under varying surface, atmospheric, and radiance measurement conditions.

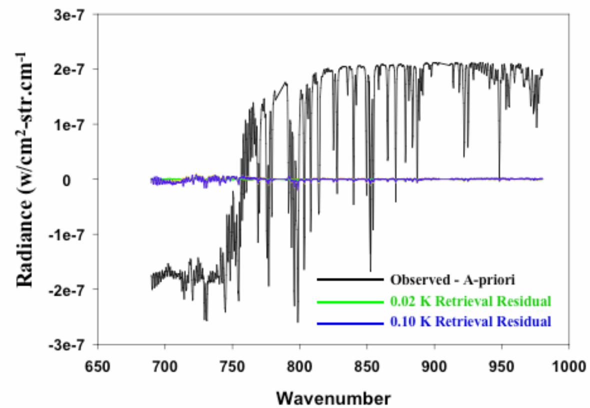


Figure 1: Radiance residuals (observed minus calculated) for the a-priori initial state and after surface temperature/emissivity and atmospheric profile retrievals assuming random measurement brightness temperature errors of 0.02 K and 0.1 K, representing nearly noise free and realistic radiance observation error condition, respectively.

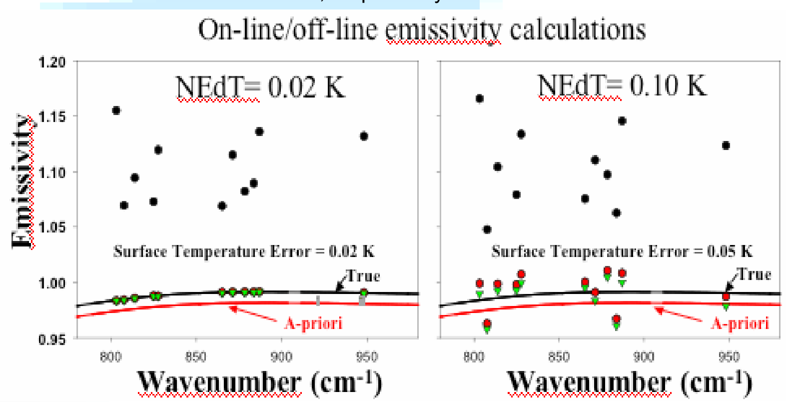


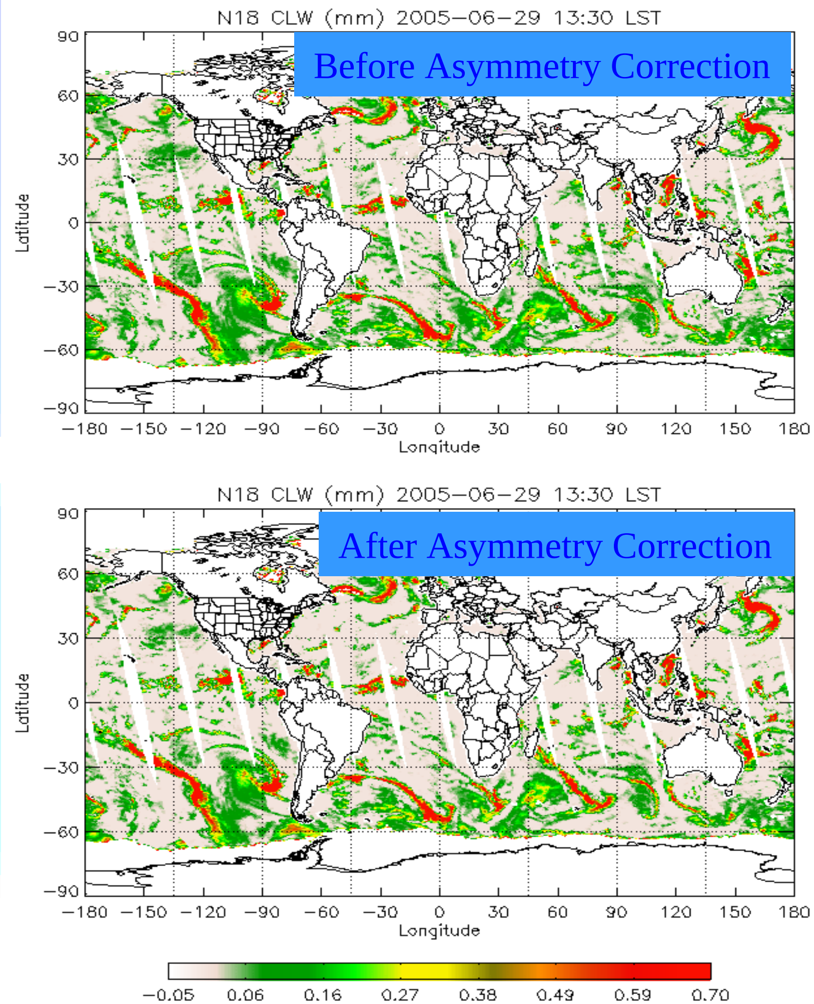
Figure 2: On-line/off-line calculations of surface emissivity from the observed radiances for the a-priori atmospheric state (black circles) and atmospheric retrievals obtained with and without the use of the on-line/off-line radiance differences in the inverse solution (red circles and green triangles, respectively

14th Conference on Satellite Meteorology and Oceanography:

Poster – Calibration/Validation of NOAA-18 AMSU-A and MHS for the Microwave Surface and Precipitation Products System (MSPPS)

H. Meng, L. Zhao, R. Ferraro, F. Weng, Q. Liu

- Asymmetry correction
  - Cross-track asymmetry in NOAA-18 AMSU-A radiances
  - Correction based on simulated T_b using 2-stream forward model
  - Correction = $\mathcal{F}$ (channel,direction,θ)
- MHS and AMSU-B differences
  - 157 GHz vs. 150 GHz; 190 GHz vs. 183 +/- 7 GHz
  - Conversion of MHS T_b to AMSU-B T_b.
    Pre-launch: simulated T_b using RTM
    Post-launch: match-up data with NOAA-16
- Validations
  - Data sources: SSM/I, GDAS, NOAA-16
  - Products: TPW, CLW, RR, (T_b)



14th Conference on Satellite Meteorology and Oceanography:

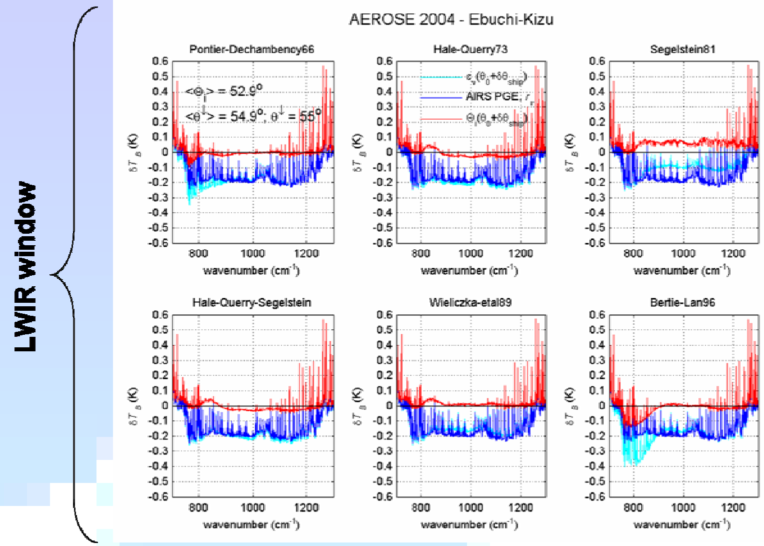
Poster – **Developments In Ocean IR Emissivity/Reflection Modeling**

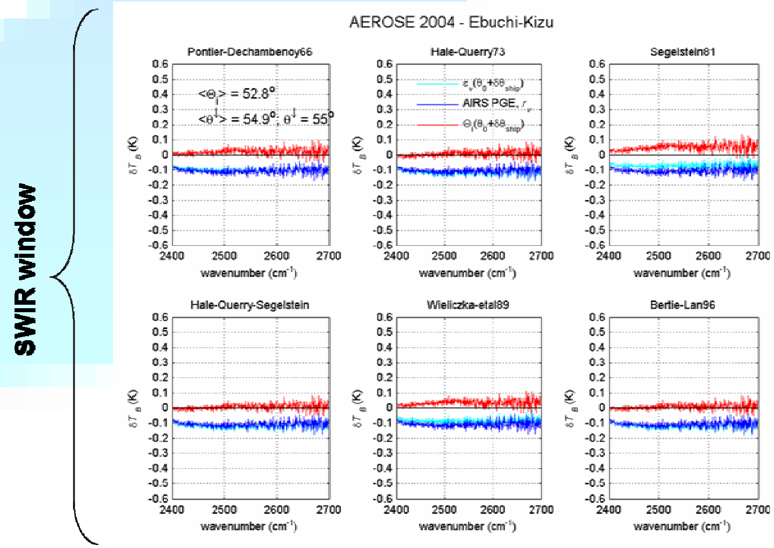
N. R. Nalli, P. J. Minnett, P. van Delst, C. D. Barnet, M. D. Goldberg

- M-AERI observations have shown that conventional **emissivity models** are incorrect at non-zero view angles (≥ 45) and wind speeds (e.g., *Hanafin and Minnett* 2005).
  - Inadequate approximation of **multiple reflections** which lead to emissivity enhancement
  - Incorrect specification of **quasi-specular reflected atmospheric radiation** (e.g., *Watts et al.* 1996; *Nalli et al.* 2001)
- We propose a new approach for calculating **surface leaving radiance** using an **ensemble mean surface geometry model**
  - **Effective incidence angles** ≡ ensemble mean facet relative incidence angle and local zenith angle of downwelling
  - Allows for a more accurate determination of the specular component of reflected radiance, and the surface leaving radiance is thus approximated as

$$R_{\nu s}(\theta_0) \approx B_\nu(T_s) - \rho_\nu(\overline{\Theta}_i)\left[B_\nu(T_s) - I_\nu^{\downarrow}(\overline{\theta})\right].$$

- Initial results show our mean geometry model (red lines), shows best agreement with M-AERI spectral observations
  - Equivalent to 0.15–0.3% correction in emissivity.
  - Will amount to a significant improvement in the context of the complete forward model



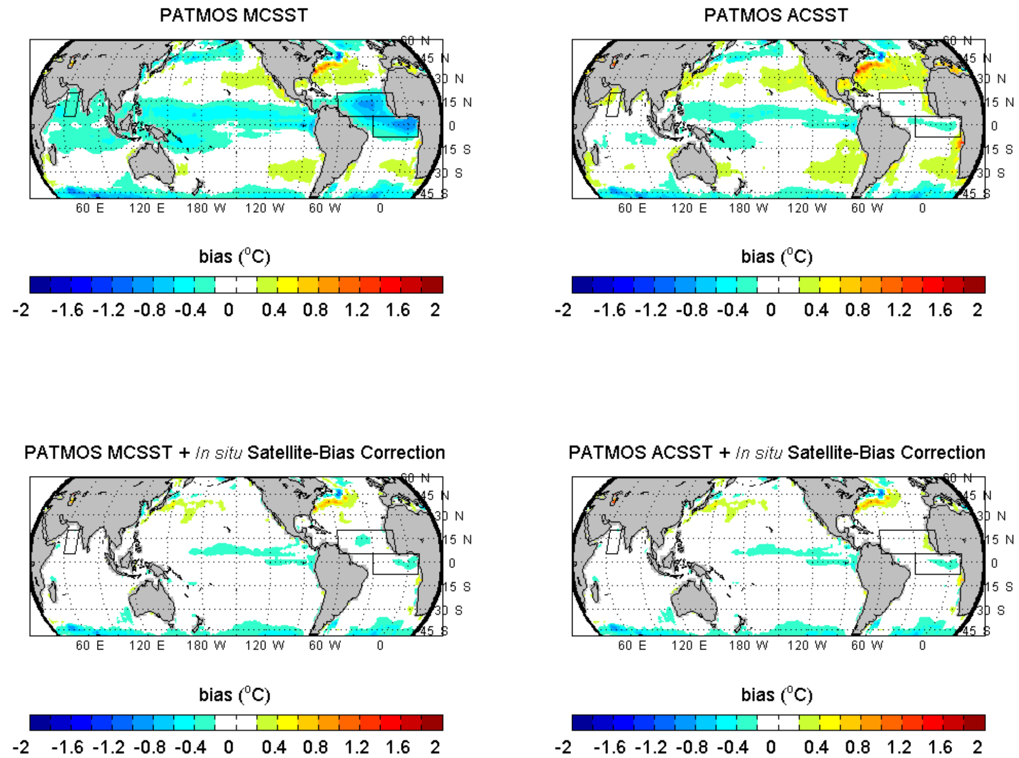


14th Conference on Satellite Meteorology and Oceanography:

Oral - SST Climate Analyses Derived from Aerosol Bias-Corrected Satellite Data

N. R. Nalli and R. W. Reynolds

- We present **daytime SST climate analyses** derived from 16 years (1985-2000) of NESDIS-reprocessed AVHRR Pathfinder Atmospheres (PATMOS) multichannel radiometric data
  - Weekly analyses produced on a 1 degree equal-angle grid
  - Uses optimum interpolation (OI) methodology
- Two satellite **bias correction** methods are employed:
  - Infrared aerosol bias correction
  - In situ correction of satellite bias
- Validation against TMI OI SST (microwave) and ERSST (in situ) datasets shows that
  - The analysis derived using the IR aerosol bias correction reduces negative aerosol bias globally, and reveals pronounced variations in diurnal warming consistent with recently published works.
  - The analyses derived from in situ correction of satellite biases alleviate biases (positive and negative) associated with both aerosol and diurnal warming, and also reduce the dispersion.
- Our work is the first attempt to mitigate the need for an in situ correction in climate analyses by correcting explicitly for daytime satellite SST aerosol biases.



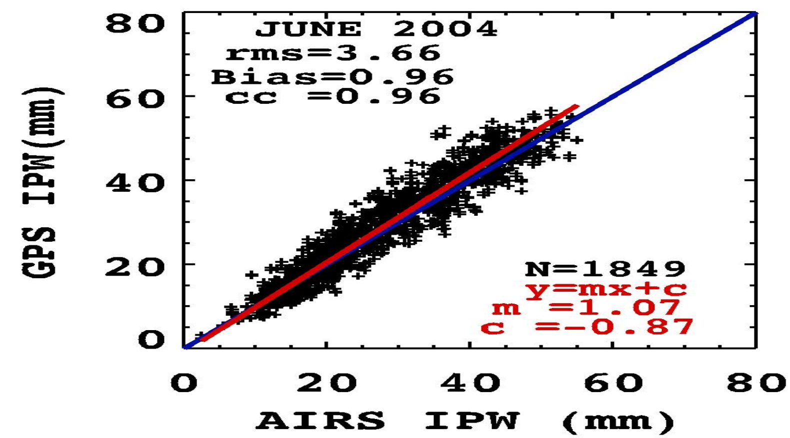
10th Conference on IOAS-AOLS:

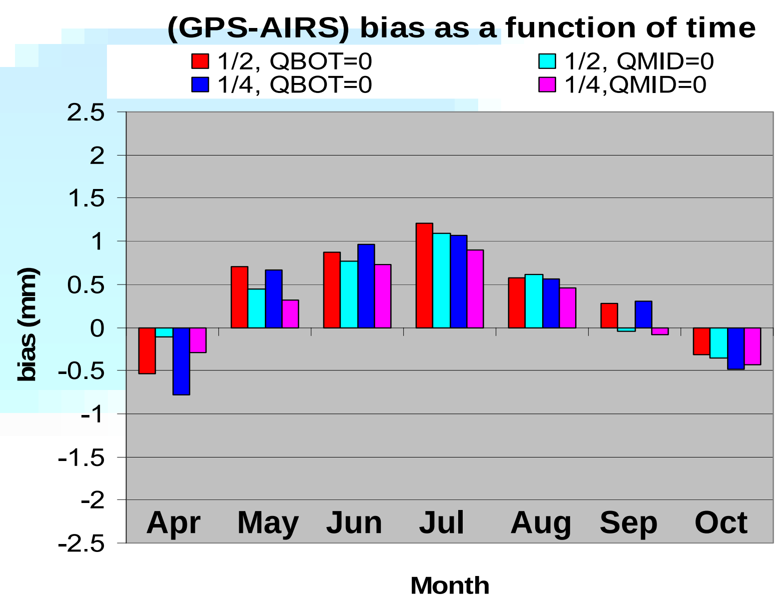
Oral – Comparison of Column-Integrated Water Vapor Measurements from Atmospheric Infrared Sounder (AIRS) and Surface-based Global Positioning System Receivers

M. K. Rama Varma Raja, S. Gutman, J. G. Yoe, L.M. McMillin, J. Zhao

- Motivation
  - GPS gives accurate IPW
  - All CONUS coverage
- Results
  - Validation; AIRS moisture product excellent
  - Seasonal dependency
  - Conservative tendency of AIRS
  - delta sfp affects delta ipw
  - Bias Correction.
- Future Work
  - Extend the analysis
  - Use GPS for future moisture data validation

  (CrIS, IASI, HES, etc.)





14^{th} Conference on Satellite Meteorology and Oceanography:

Poster – The GOES Hybrid Microburst Index

K. Pryor

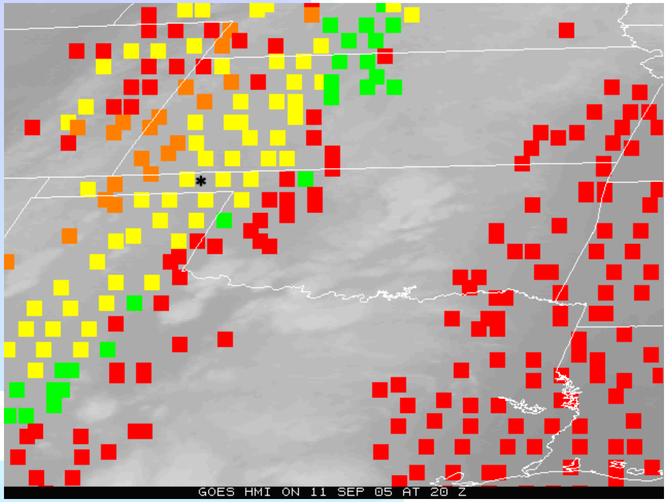
- Algorithm:

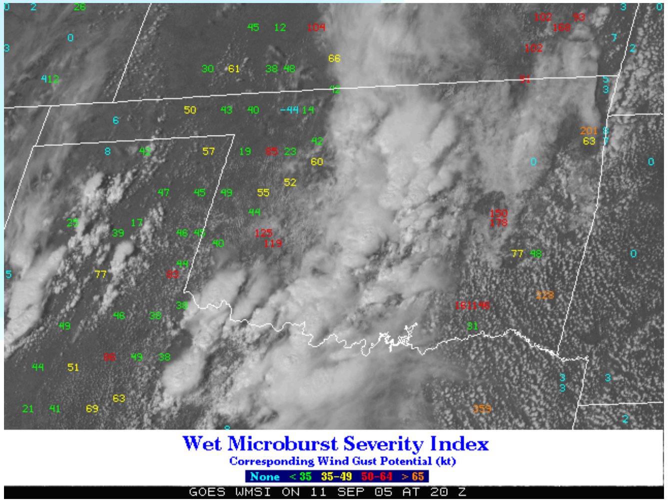
HMI = $G + (T - T_d)_{850} - (T - T_d)_{670}$

  - Derived from GOES sounder
  - Infers the presence of a convective boundary layer
  - Indicates downburst potential in a thermodynamic environment intermediate between “wet” (HP) and “dry” (LP)
  - “Hybrid” Microbursts

- Applications:
  - Use with the GOES WMSI to indicate potential downburst magnitude over the U.S. Great Plains
  - Locate dryline
    - convective initiation

11 September 2005
Beaver, OK Microburst



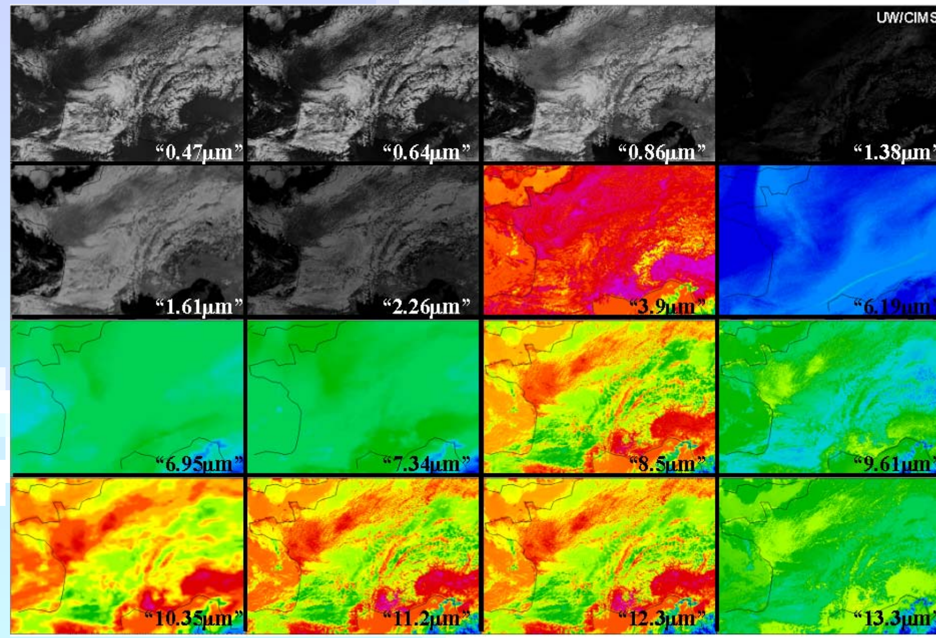


14th Conference on Satellite Meteorology and Oceanography Joint with Second Symposium: Toward a Global Earth Observation System of Systems—Future National Operational Environmental Satellite Systems:

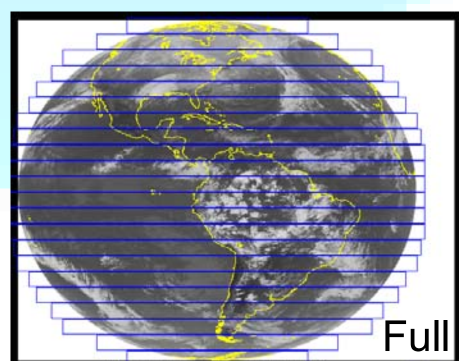
Oral – The ABI (Advanced Baseline Imager) on GOES-R

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

- **ITT completed a successful System Preliminary Design Review**
- **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



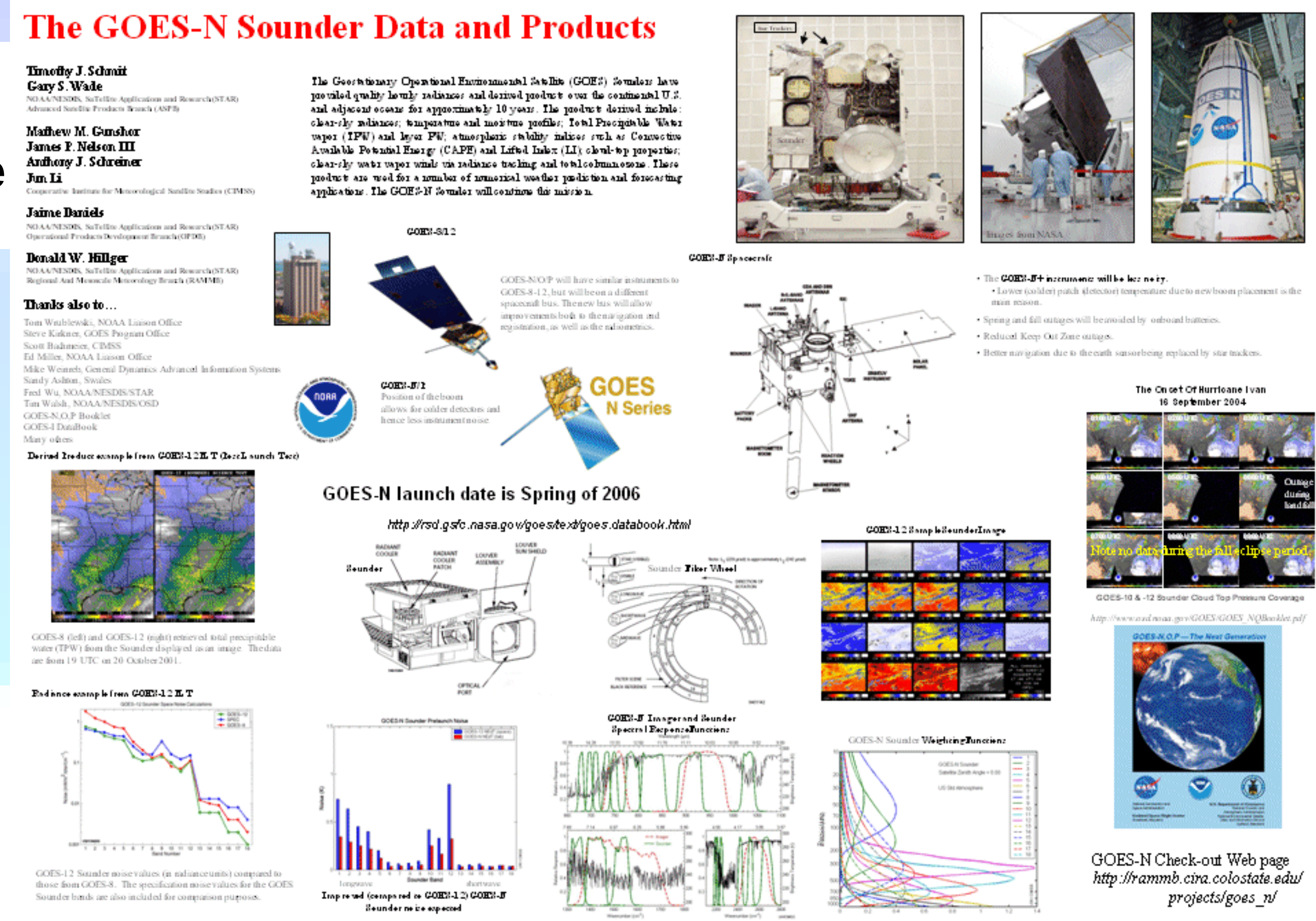
Full Disk with stepped-edge

14th Conference on Satellite Meteorology and Oceanography:

Poster – The GOES-N Sounder Data and Products

Timothy J. Schmit, Gary S. Wade, Mathew M. Gunshor, James P. Nelson III, Anthony J. Schreiner, Jun Li, Jaime Daniels, Donald W. Hillger

- **GOES-N/O/P will have similar instruments to GOES-8-12, but will be on a different spacecraft bus. The new bus will allow improvements to the navigation, registration, and the radiometrics.**
- **Spring and fall outages will be avoided by onboard batteries.**
- **GOES-N launch date is Spring of 2006. PLT sometime thereafter.**



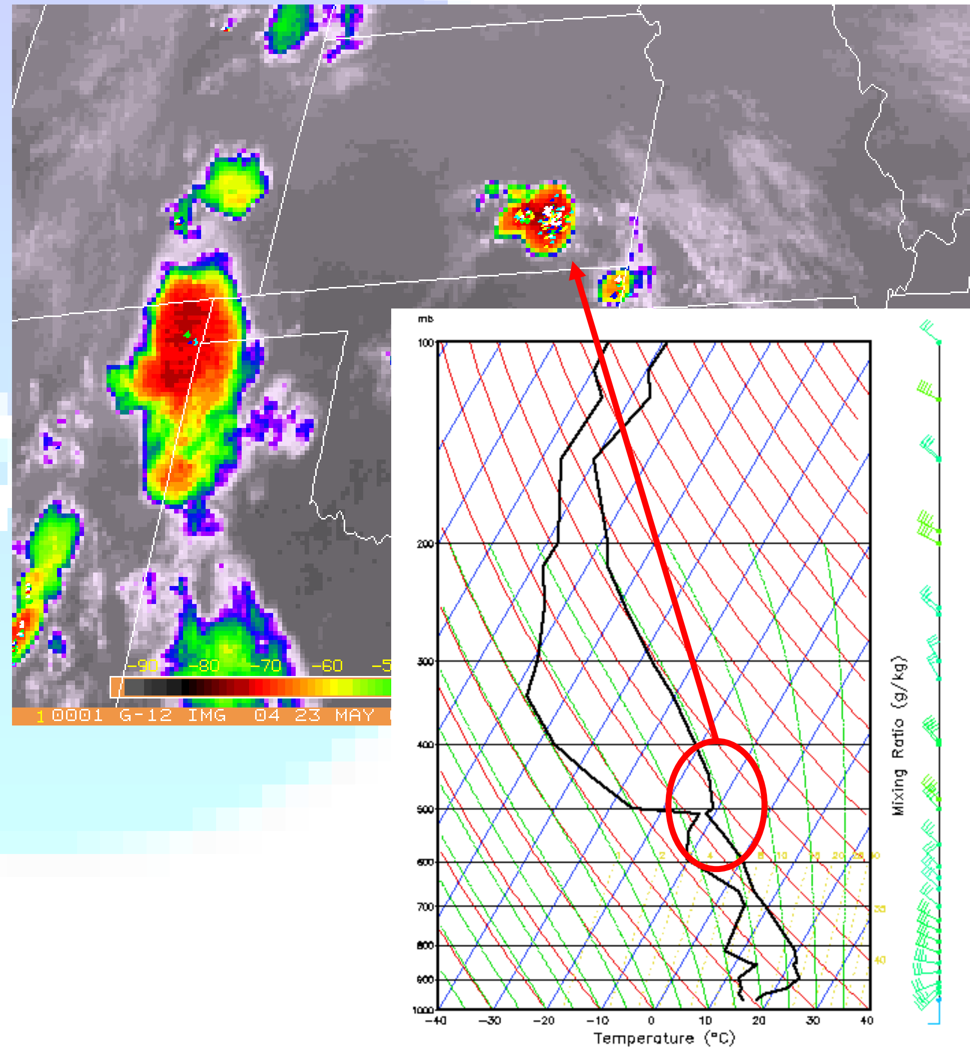
The GOES-N PLT (Post Launch Test) is an important step in preparing for operational use of the radiances and products.

14th Conference on Satellite Meteorology and Oceanography:

Talk – Satellite, Lightning, and Model Data for Nowcasting Rainfall from Mesoscale Convective Systems (MCS's)

R. A. Scofield, R. J. Kuligowski, and S. Qiu

- Numerous complementary data sources for MCS forecasting:
  - Satellite (flow patterns, moisture plumes, shortwaves, boundaries)
  - Lightning data (MCS location and trends)
  - Model data (moisture axes and gradients)
- Example from southeastern KS, 23 May 2005
  - Moisture plume confirmed by WV, Sounder, and model data
  - Stability reversal in sounding may be responsible for observed intense CG lightning

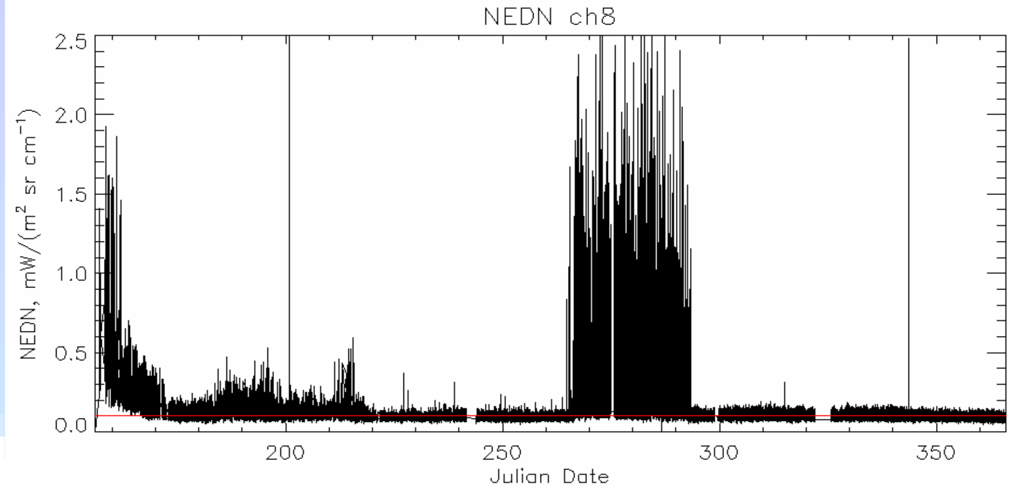


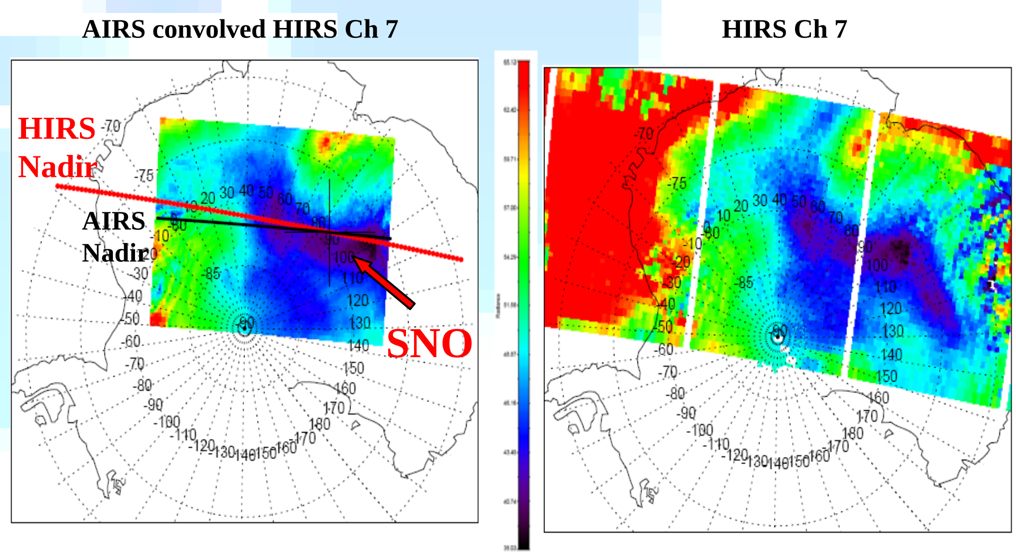
14th Conference on Satellite Meteorology and Oceanography:

Poster – **Calibration and Validation for NOAA18 HIRS/4 Radiances**

Likun Wang, Changyong Cao, and Pubu Ciren

- Near real-time instrument monitoring
  - Long-term trending of noise and instrument component temperatures
  - Used for HIRS anomaly investigation
- Inter- & intra- satellite calibration
  - NOAA18 HIRS/4 vs. NOAA17 HIRS/3
  - Aqua AIRS vs. HIRS/4
    - Convolved AIRS for HIRS
  - AVHRR vs. HIRS
    - Window channel
  - Radiative transfer calculations



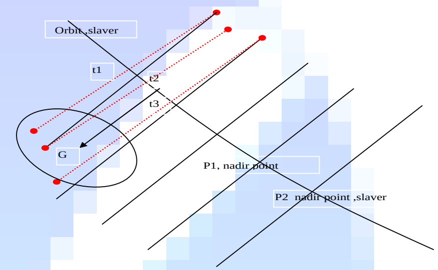


14th Conference on Satellite Meteorology and Oceanography:

Poster – CO-LOCATION ALGORITHMS FOR SATELLITE OBSERVATIONS

Haibing Sun, C. Barnet, W. Wolf, T. King, and M. Goldberg

An co-location algorithm is developed based on the Nagle's scheme for GEOSS and other projects .

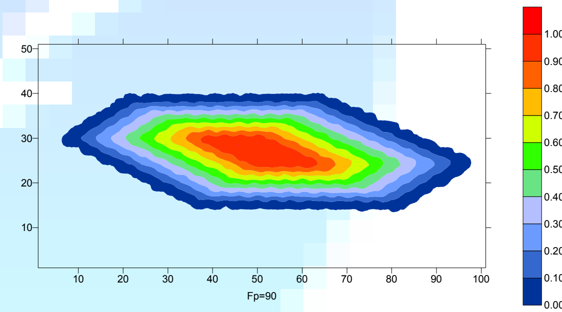


Co-location search algorithms:

-Time based co-location searching algorithms

-> Position based searching algorithms.

-Master EFOV spatial response function are introduced to address the co-location weight calculation and co-location slaver observation selection.



Operational generation

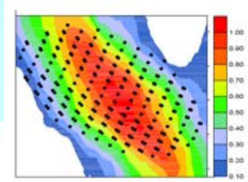
– AIRS - MODIS co-location

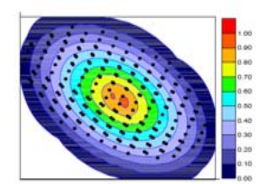
... AIRS - AVHRR co-location

Future improvements

– Spatial response function (SFR) for more instruments

– SRF database for different Latitude section.





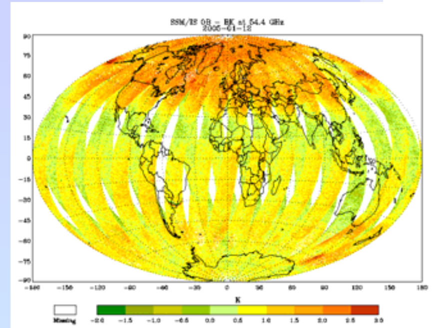
14th Conference on Satellite Meteorology and Oceanography:

Calibration of DMSP F-16 Special Sensor Microwave Imager and Sounder (SSMIS)

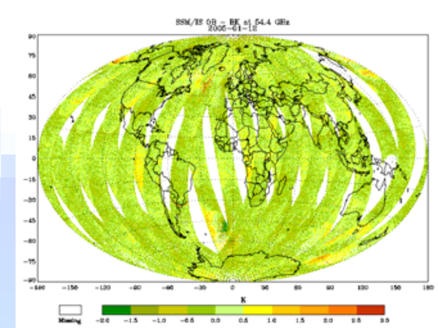
B. Yan, F. Weng, N. Sun

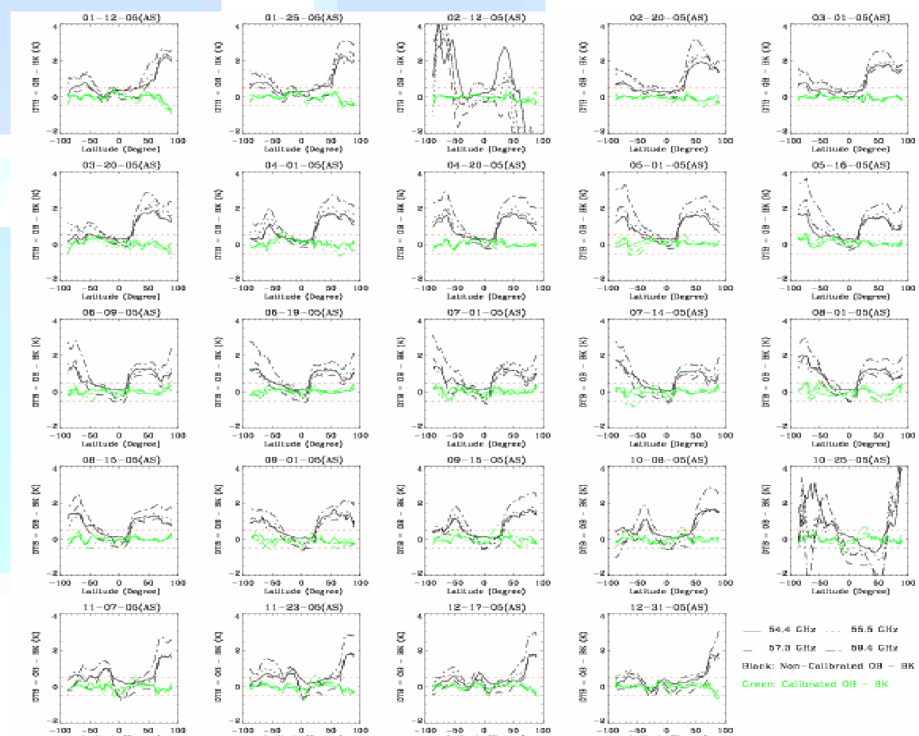
- Two outstanding calibration problems in SSMIS measurements
  - Variable antenna emission at a range from -1 to 4 K
  - Variable solar contamination in the calibration targets (warm load count, cold count, and PRT temperature)
- Calibration algorithms
  - Predictions of the SSMIS reflector temperature & emissivity (T_R & ε_R)
  - Prediction of location and magnitude of each solar contamination area in C_W & PRT temperature
  - Remove the antenna emission & solar contamination in T_A
- Future improvements
  - Better predictions of ε_R and T_R
  - More validations against CRTM simulations and N16 AMSU measurements

No CALIBRATION



New CALIBRATION



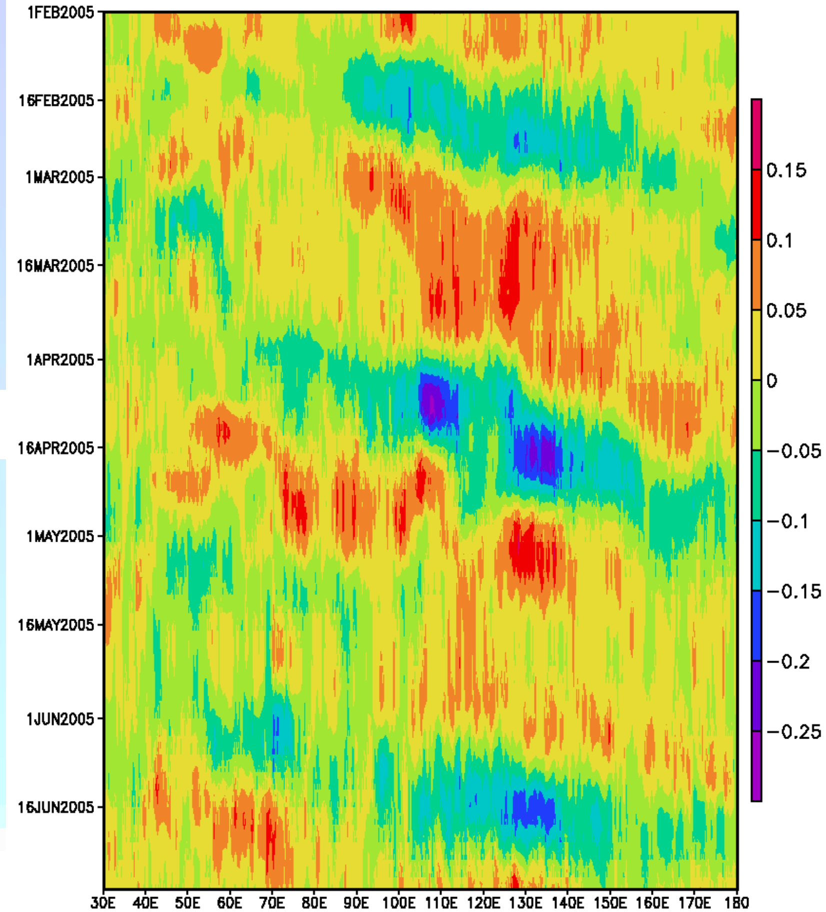


14th Conference on Satellite Meteorology and Oceanography:

Poster – AIRS Observed 3-D Structure of Atmospheric Temperature and Moisture Associated with the Madden-Julian Oscillation

L. Zhou, M. Goldberg, W. Wolf, C. Barnet

- Algorithm/Data:
  - Algorithm: AIRS Science Team Retrieval Algorithm, as discribed by: Goldberg (2003) and Susskind et al. (2003)
  - Produced by NESDIS AIRS NRT system
  - Global Grid (0.5x2 resolution), 30 layers of Temperature, 20 layers of Moisture
  - Daily, monthly, seasonally, annually mean
  - MJO anomaly by band passing
- Climate Implications:
  - Mean Seasonnal Variation
    - Vertical distributions of:
      - Temperature
      - Moisture
  - Intraseasonal Variations
    - Time series
    - 20 to 80 day band-pass filter
- Future Work:
  - Examine the quatitative accuracy and the abilities of retrivals to dipict the climate variability
  - Verify climate models' outputs



14th Conference on Satellite Meteorology and Oceanography:
Talk – Recalibration of MSU for Climate Studies Using SNO

C. Zou, M. Goldberg, Z. Cheng, N. Grody, J. Sullivan, C. Cao, D. Tarpley

- Level 0 nonlinear calibration:
  - Cold Space and Warm Target for In-orbit Calibration
  - Amount of nonlinearity measured by nonlinear coefficient μ
  - μ is determined by SNO matchups
- Generation of new 1B data and Climate Trend
  - New nonlinear coefficients significantly different from NESDIS operational
  - Overlapping temperature biases reduced by one-order of magnitude
  - Updated MSU Ch.2 trends for 1987-2004 (17 years) : **0.17 K Decade^{-1}**
- Future work
  - Recalibrate all channels for all MSU and AMSU satellites
  - Reduce errors caused by reference satellites
  - Use recalibrated MSU 1B in reanalyses