NOAA STAR CENTER FOR SATELLITE APPLICATIONS AND RESEARCH

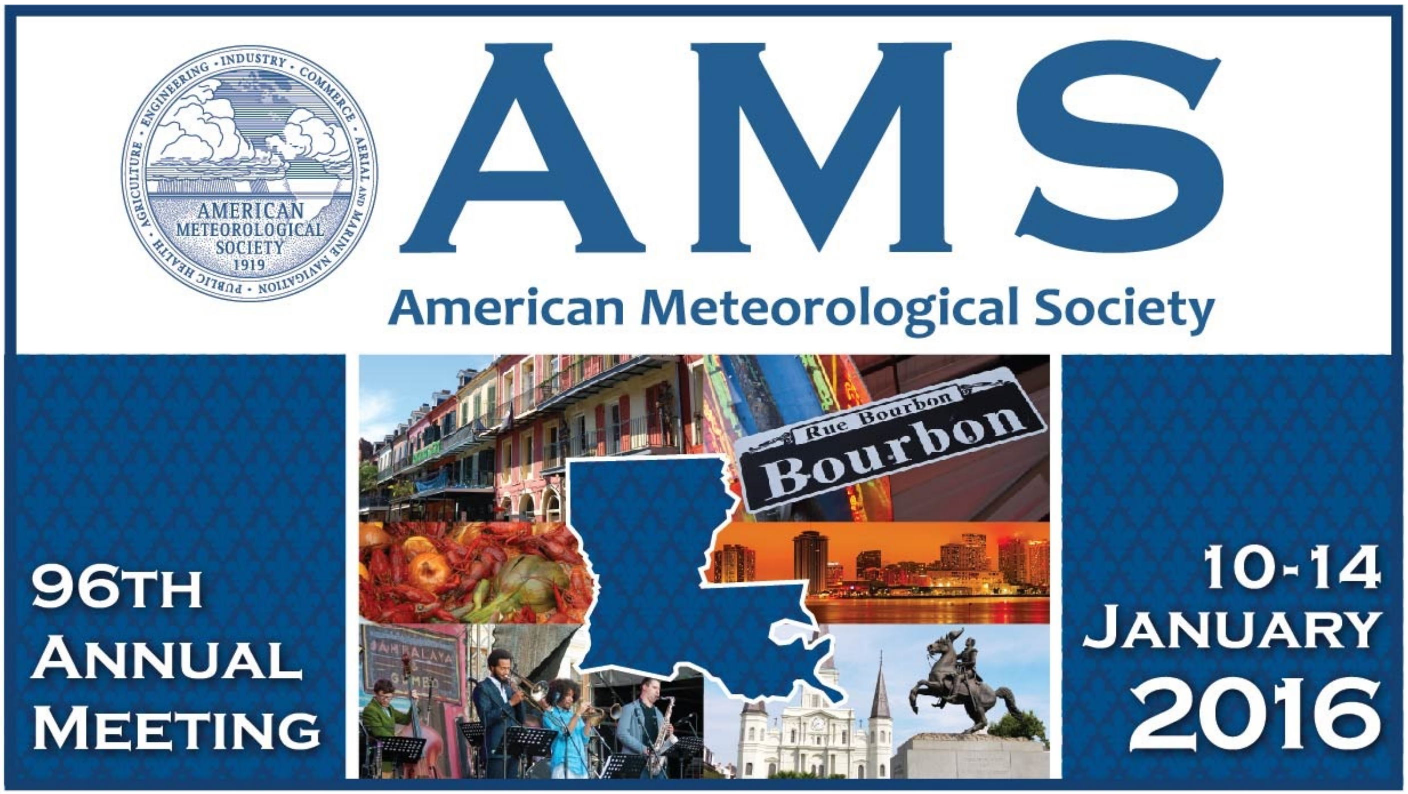
cics-md Cooperative Institute for Climate & Satellites UNIVERSITY OF MARYLAND

CIRA

CUNY NOAA - Cooperative Remote Sensing Science and Technology Center

CIMSS

# AMS Talk Summaries from STAR & CIs





**Compiled by Ralph Ferraro, STAR/CoRP/SCSB & Deb Baker, CICS-MD**

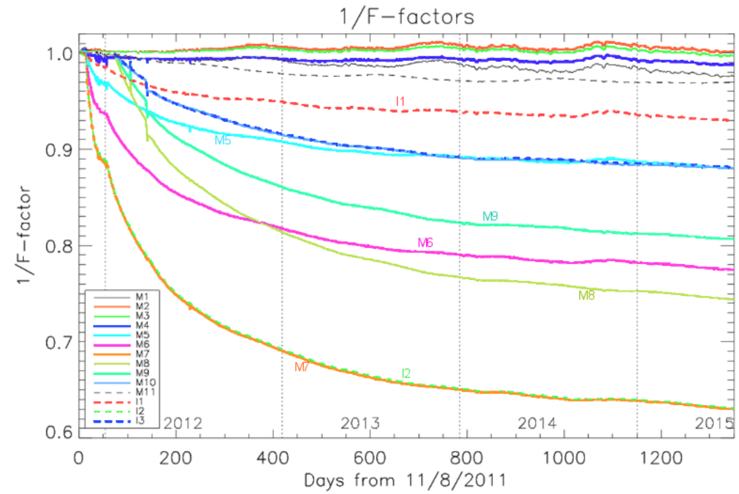
# STAR

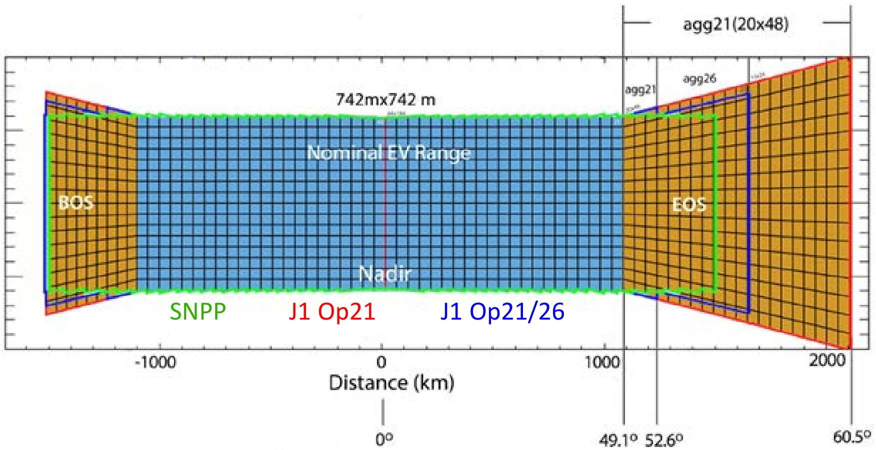
- Cao, Changyong
- Csiszar, Ivan (3)
- Hillger, Don
- Iturbide-Sanchez, Flavio
- Kalluri, Satya
- Lindsey, Dan (2)
- Nalli, Nicholas (3)
- Schmidt, Tim
- Xiong, Xiaozhen (Shawn)
- Zeng, Jian

# Suomi NPP/J1 VIIRS SDR Performance Highlights and Cal/Val Update

Changyong Cao, NOAA/NESDIS/STAR (presented by Wenhui Wang)

- SNPP VIIRS has performed well:
  - TEB: very stable based on ICVS monitoring;
  - RSB: RTA mirror degradation has leveled off since mid 2013;
  - Excellent DNB performance leads to expanding applications
- J1 VIIRS performance is comparable to that of SNPP
  - Issues resolved for J1: mirror contamination; single event upset; sync loss
  - However, there are performance waivers (13): DNB nonlinearity; DNB stray light; SWIR nonlinearity; polarization sensitivity in M1-M4, …
  - Op21 recommended as baseline for J1
  - VIIRS GEO code modified to accommodate J1 DNB AggMode change
  - Extended validation capability developed by the VIIRS SDR team.



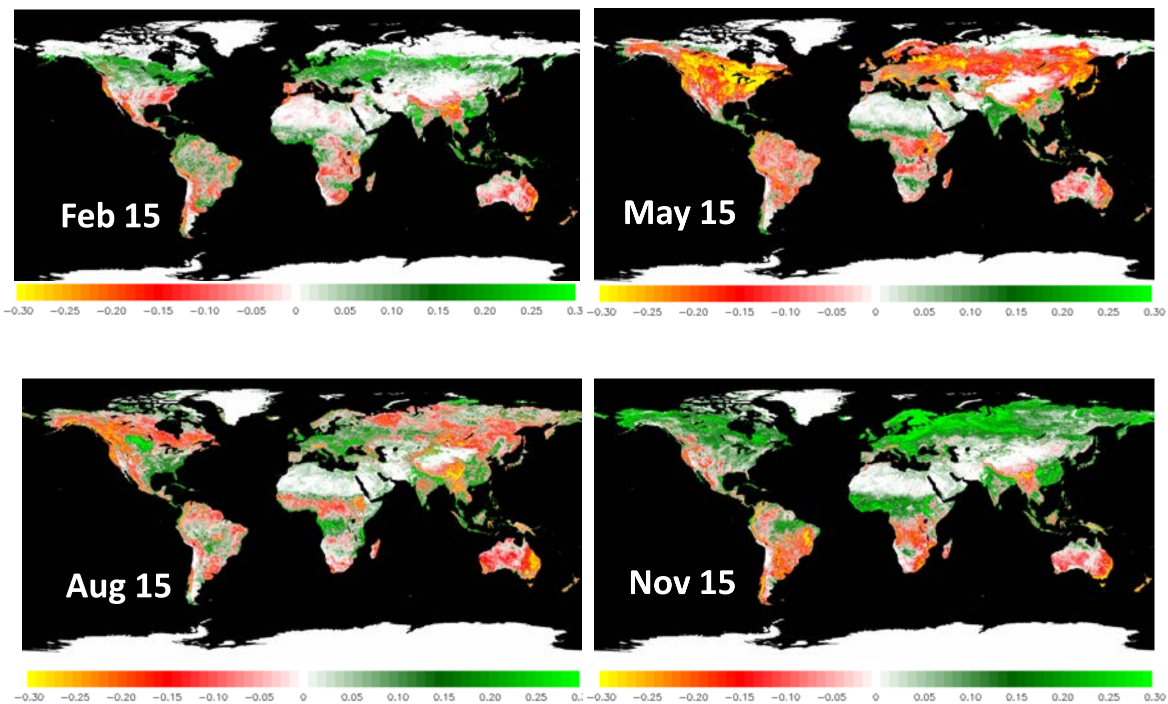
# Incorporation of near-real-time Suomi NPP Green Vegetation Fraction and Land Surface Temperature data into the NCEP Land modeling suite

I. Csiszar, M. Vargas, Y. Yu (STAR); Z. Jiang (Riverside); A. Song (UMD); M. Ek (NCEP); Y. Wu, W. Zheng, H. Wei (IMSG)

Fourth AMS Symposium on the Joint Center for Satellite Data Assimilation

- The operational real-time VIIRS Green Vegetation Fraction product is tested in NCEP models
  - Replace old multi-year AVHRR product
  - Initial tests show impact
  - Further model adjustments are necessary
- VIIRS Land Surface Temperature is ingested for model verification
  - Development of global gridded product ongoing
  - Temporal matchup issues are being worked on

***Weekly VIIRS GVF – 5-year AVHRR GVF climatology 2014***



# Operational Land Data Products from Suomi NPP and their Integration into NOAA's Enterprise Algorithm Suite

I. Csiszar, M. Vargas, Y. Yu , L. Zhou, J. Daniels, W. Wolf (STAR); M. Román (NASA GSFC)

12th Annual Symposium on New Generation Operational Environmental Satellite Systems

- Evaluation of the IDPS land algorithms is complete
  - Products achieved validated stage 1 as defined by NOAA JPSS
  - Reactive maintenance continues
  - Long-term monitoring in systematic production
- Land products are transitioning to NOAA ESPC implementation
  - Development of algorithm updates, interfaces and dependencies
  - Additional and added value products

| Product | JPSS | GOES-R | Comments |
|---|---|---|---|
| Surface Refl | IDPS >NDE | AWG Opt 2 | GOES-R: combined SR/albedo |
| Vegetation Ind | IDPS >NDE | AWG Opt 2 | TOA/TOC NDVI, TOC EVI; G: TOA NDVI |
| Green Veg. Fr. | NDE | AWG Opt 2 | High priority for NWP applications |
| Veg Health | NDE | Proposed | NDE implementation is ongoing |
| Phenology | PGRR | PGRR | Predictive capability |
| Albedo | IDPS >NDE | AWG Opt 2 | GOES-R: combined SR/albedo |
| Land Surf Temp | IDPS >NDE | AWG basel. | Key product for NWP verification |
| Active Fire | IDPS->NDE | AWG basel. | JPSS: also NGDC NightFire |
| Surface Type | External | None | Single product on a global grid. |
| Flood/St. Water | PGRR | AWG Opt 2 | Key end user applications |

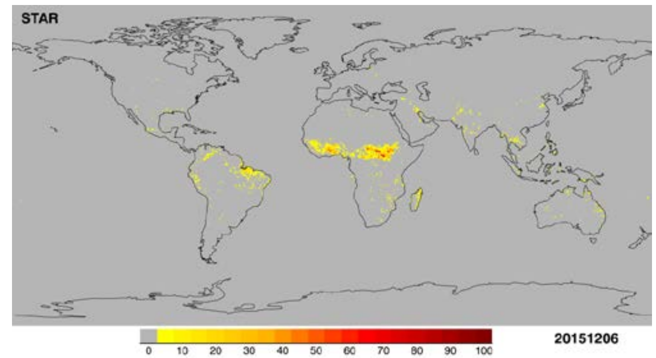
***IDPS: Interface Data Processing Segment – current, fully operational capability***
***NDE: Suomi NPP Data Exploitation – current and upcoming operational capability***
***PGRR: Proving Ground / Risk Reduction – experimental products for future operational implementation***
***AWG: Algorithm Working Group – operational capability after GOES-R launch. Option 2 product development is currently not ongoing for all products.***

# The New Operational VIIRS Active Fire Product in NOAA'S NDE System

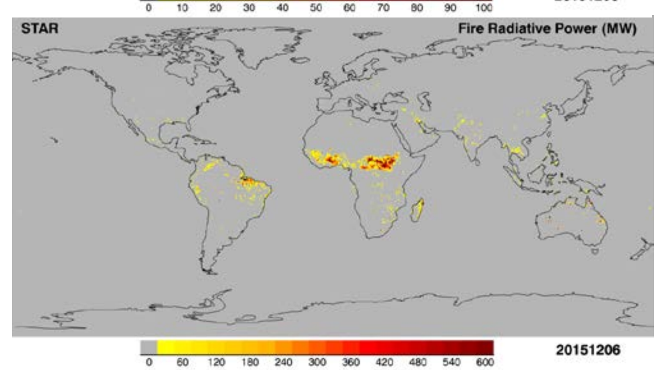
Ivan Csiszar, Walter Wolf – STAR; Wilfrid Schroeder, Louis Giglio – UMD; Marina Tsidulko – IMSG

12th Annual Symposium on New Generation Operational Environmental Satellite Systems

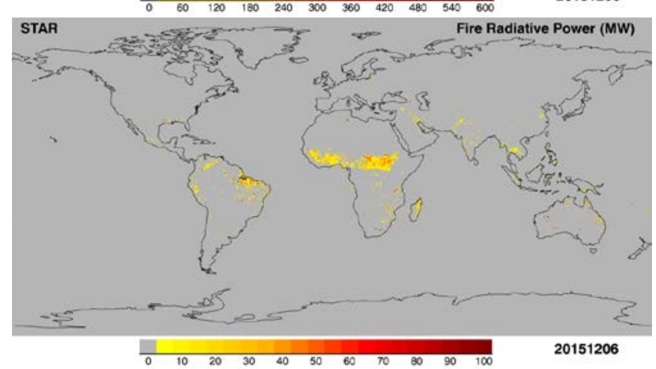
- A new VIIRS active fire product is transitioning to NOAA operations
  - Full fire mask
  - Fire Radiative Power
  - Implemented in NDE
  - Consistent with NASA science product and MODIS heritage
- Long-term science monitoring of the operational product is ongoing
  - Current IDPS product is stable
  - Interface with new product is in development




*Fire frequency*




*Integrated fire radiative power*



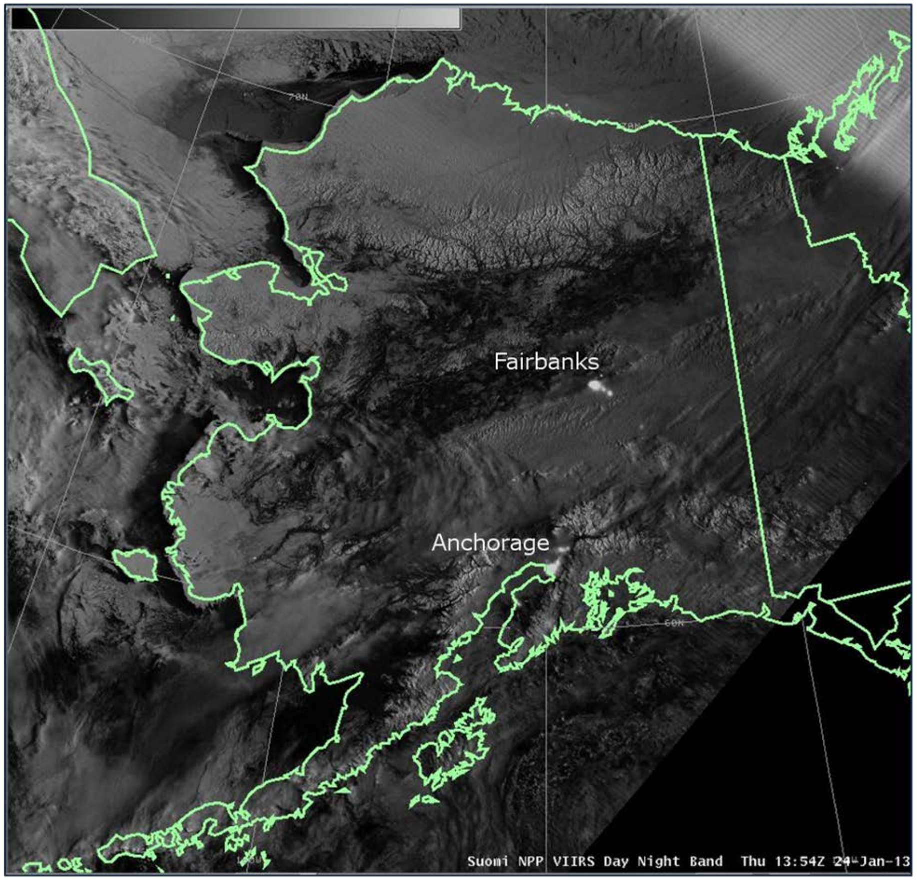

*Mean fire radiative power*

# How is VIIRS EDR Imagery Validated?

**Donald Hillger, Thomas Kopp, Curtis Seaman, Steven Miller, and Dan Lindsey**

**12th Annual Symposium on Future Operational Satellite Systems**

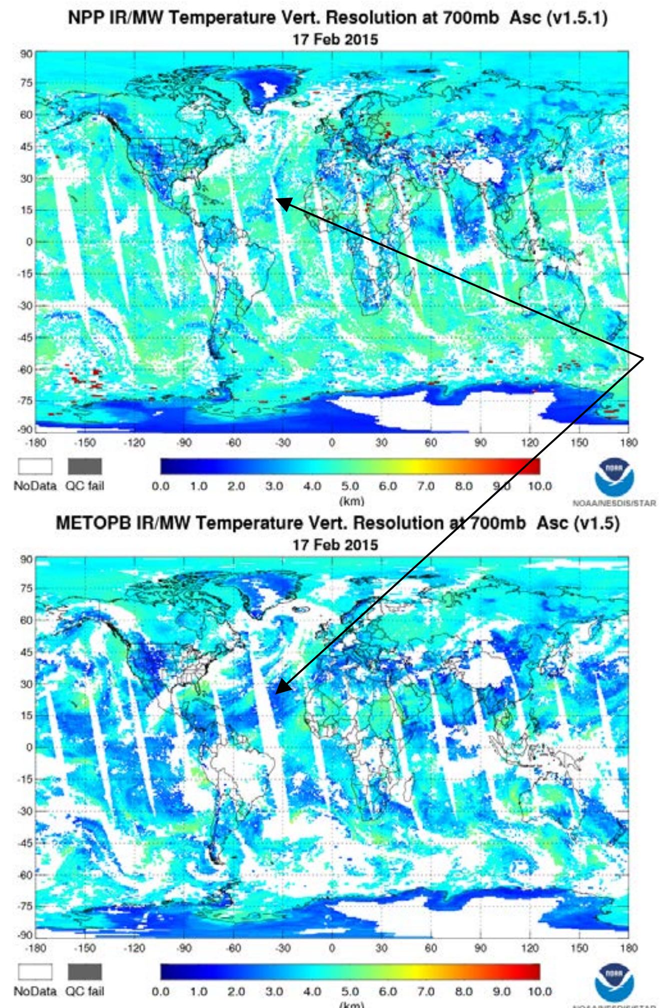
- VIIRS Imagery Cal/Val Plan updated for JPSS-1
  - 2 new KPP bands (I3 and DNB/NCC) increases KPP count from 6 bands to 8 bands
  - Alaska specifically mentioned in KPP statement
- User validation important!
  - Alaska users (in particular)
  - Non-Alaska users (important too)
- New publication
  - *Remote Sensing* article in cal/val special issue (Hillger and 10 co-authors, 2015: User Validation of VIIRS Satellite Imagery. *Remote Sens.* 8, 11, doi:10.3390/rs8010011



# Using Averaging Kernels to Study the Vertical Resolution of the CrIS and IASI Retrieval

Flavio Iturbide-Sanchez, Q. Liu, N. R. Nalli, C. Tan, A. Gambacorta and C. D. Barnet

- The NOAA-Unique Processing Retrieval System Averaging Kernels have been used as a diagnostic tool to investigate the degrees of freedom and vertical resolution of the retrieved Temperature from CrIS and IASI observations.
- It was found that Temperature DoF is larger over the Tropics than over Polar regions. Near surface, IASI tends to show larger fields of resolution, close to 2.0 km, than CrIS.



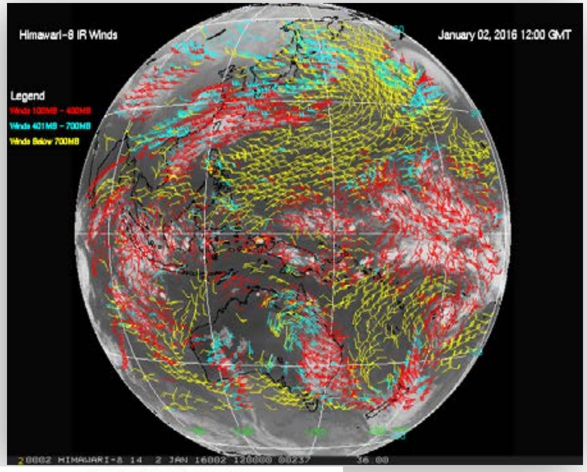

Near surface, IASI tends to show larger fields of high resolution than CrIS. Results were obtained using the FWHM method

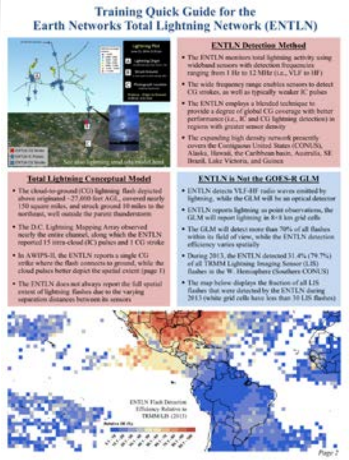
# Pathways Towards Data Exploitation and New Product Development from GOES-R

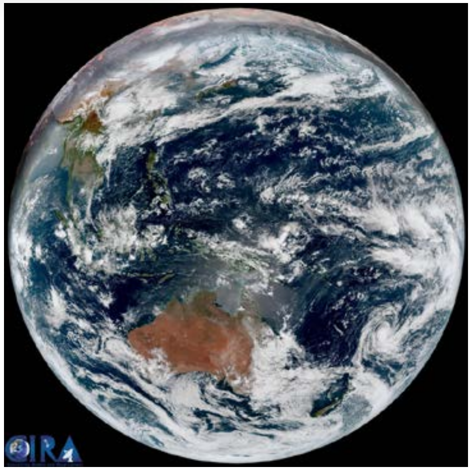
**Satya Kalluri*, Jaime Daniels*, Dan Lindsey*, Steve Goodman†**

*NOAA/NESDIS/STAR, College Park, Maryland; satya.kalluri@noaa.gov
† GOES-R Program Office, NASA GSFC, Greenbelt, Maryland

- This poster highlights Risk Reduction (RR) and Proving Ground (PG) activities for GOES-R by the STAR Cooperative Institutes including:
  - Goals of PG and RR
  - Examples of training material by SCSB
  - Examples if products generated by the GOES-R ground system
- Product validation is being conducted with simulated ABI data from the AWG proxy data team as well as AHI data from Himawari data. The poster shows examples of:
  - Imagery
  - Analysis of AMV show good agreement with in-situ data





Training Quick Guide for the Earth Networks Total Lightning Network (ENTLN)

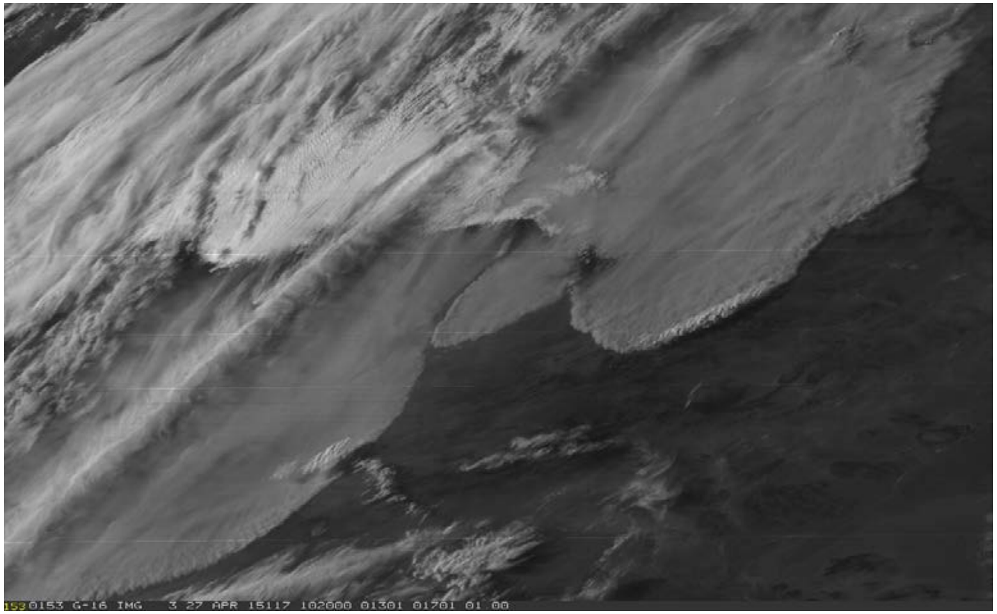


# A First Look at Imagery from Himawari-8

**Dan Lindsey, Deb Molenar, Don Hillger, Tim Schmit, NESDIS/STAR**
**Steve Miller, Curtis Seaman, CIRA**
**William Straka, CIMSS**
**Yasuhiko Sumida, JMA**

12th Annual Symposium on New Generation Operational Environmental Satellite Systems

- This poster highlighted some of the impressive new imagery from the Himawari-8 satellite
- Since Himawari's Advanced Himawari Imager is very similar to GOES-R's Advanced Baseline Imager, we are learning as much as we can about these new spectral channels before GOES-R is launched later this year



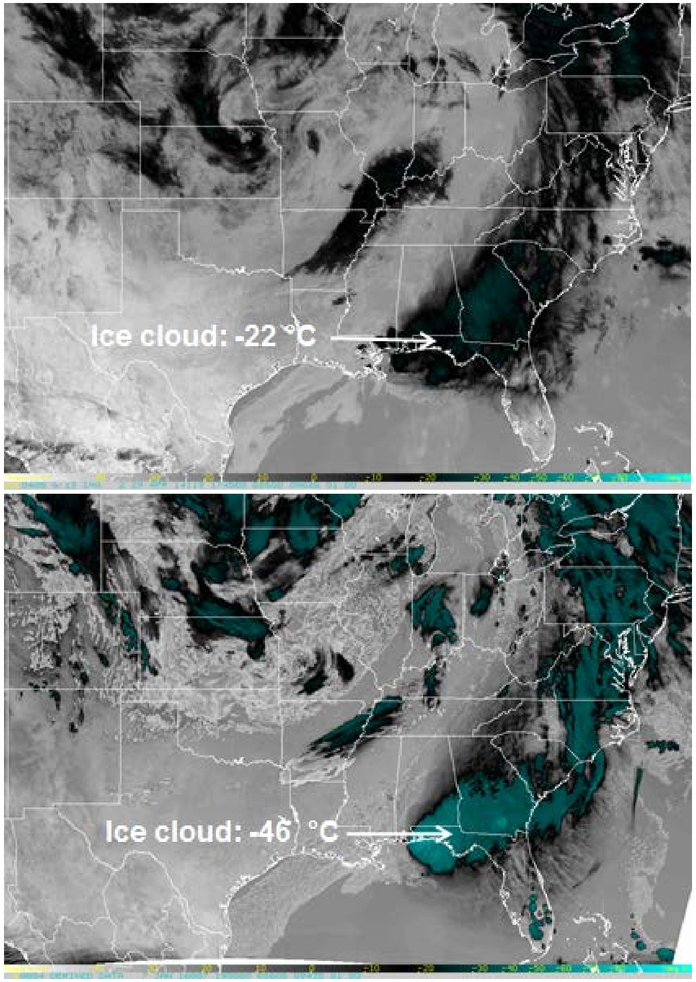
*Himawari-8 Band 3 visible image from 27 April 2015 over northwestern China showing an intense dust storm*

# Improvements to the CRTM for Cloudy Radiance Calculations

**Dan Lindsey, STAR/RAMMB**
**Louie Grasso, Yoo-Jeong Noh, Chris O'Dell, CIRA**

Fourth AMS Symposium on the Joint Center for Satellite Data Assimilation

- This project seeks to understand why the CRTM has large errors in simulating 3.9 µm brightness temps
- The images on the right show a comparison between observed GOES 3.9 µm brightness temps (top) and CRTM simulated values based on a WRF forecast (bottom)
- We've found that the discrepancy is due to an insufficient amount of solar radiation being reflected back to the satellite by ice clouds
- Initial thinking is that the problem arises due to improper distribution of model ice mass into frozen hydrometeors
  - More of the ice mass needs to go into small ice particles, less into large ice particles and snow, aggregates, graupel, etc.



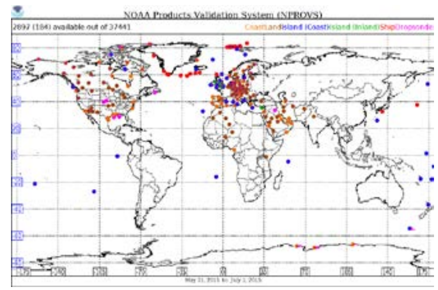
# Validation and Long-Term Monitoring of the Operational SNPP NUCAPS Sounding Products

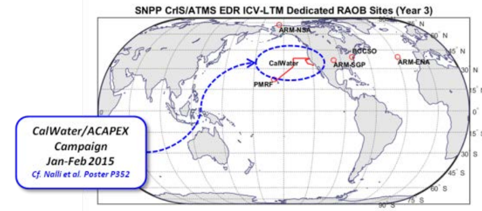
**Nicholas R. Nalli**, Q. Liu, T. Reale, C. Tan, B. Sun, C. D. Barnet, A. Gambacorta, F. Tilley, F. Iturbide-Sanchez, M. Wilson, T. King, *et al.*

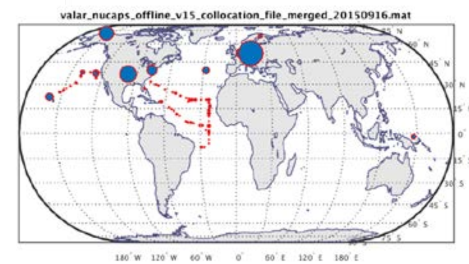
## 12th Symposium on New Generation Operational Environmental Satellite Systems

- The JPSS Cal/Val program for SNPP CrIS/ATMS sounder Environmental Data Records (EDRs) was overviewed.
  - Operational EDR algorithm: NOAA-Unique Combined Atmospheric Processing System (NUCAPS)
  - JPSS Level 1 requirements
  - Validation methodology hierarchy (*Nalli et al.*, 2013)
  - Datasets and tools used for analysis
    - STAR Validation Archive (VALAR)
    - NOAA Products Validation System (NPROVS)
- Using our datasets, tools and methodology, the NUCAPS temperature, water vapor and ozone profile EDR products are demonstrated to meet coarse-layer JPSS Level 1 requirements.
  - Temperature and water vapor profile EDRs are validated using a statistical global sample of collocated conventional, dedicated and reference radiosonde observations.
  - Ozone profiles are validated using a statistical global sample of collocated ozonesondes (dedicated and opportunistic).

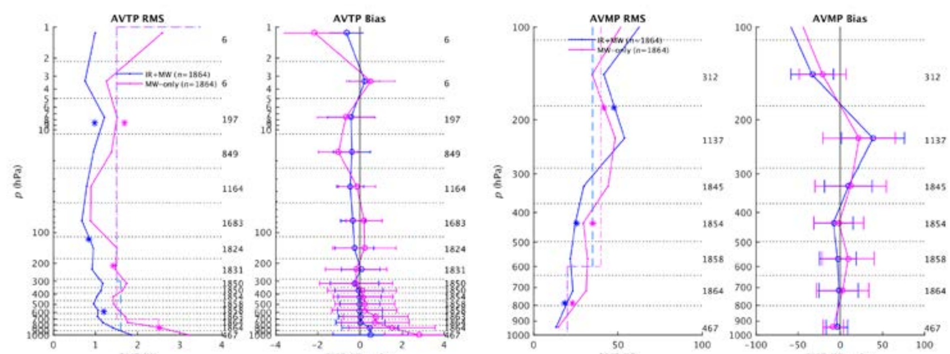
### RAOB Data Samples




### Coarse-Layer Statistical Summaries

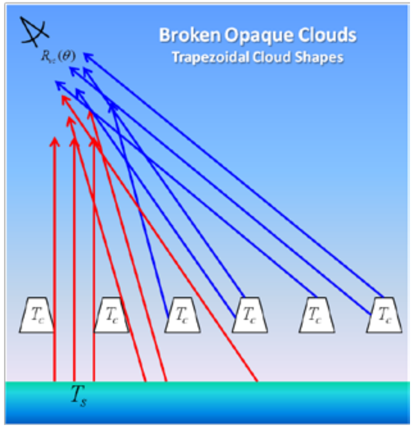


# Angular Effect of Undetected Clouds in Infrared Window Radiance Observations: Aircraft Experimental Analyses

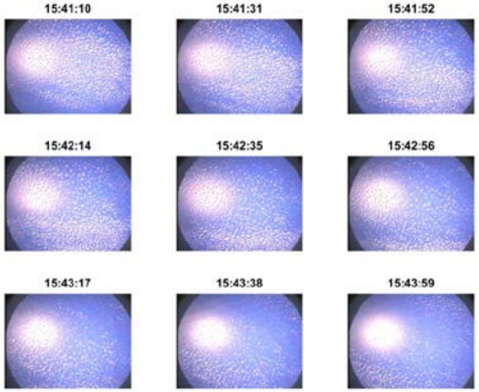
**Nicholas R. Nalli**, W. L. Smith, and Q. Liu

8th Symposium on Aerosol-Cloud-Climate Interactions

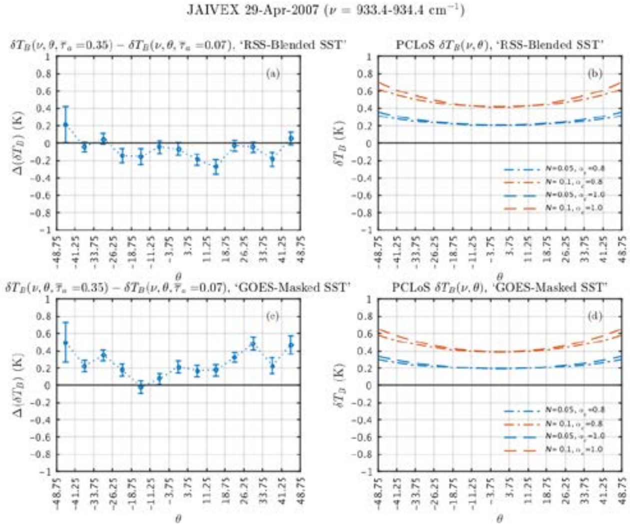
- Aircraft-based (NAST-I) hyperspectral microwindow radiance observations support hypothesis that contamination by residual clouds and/or aerosols within clear-sky observations can have a small, but measurable, concave-up impact (i.e., an increasing positive bias symmetric over the scanning range) on the angular agreement of radiance observations with calculations.
  - We observed distinct concave-up signals in double-differences of $\delta T_B$ ranging from $\simeq$0.2–0.4 K.
  - These magnitudes are consistent in magnitude with those predicted by the sensitivity equation derived by *Nalli et al.* (2012).
- We also found the impact of sunglint in LWIR microwindows can reach magnitudes of $\simeq$+0.05–0.1 K in brightness temperature
- Our work on the angular effect of clouds (*Nalli et al.,* 2012, 2013, 2016) has methodically extended the application of the PCLoS model, including three general cloud shapes, from visual based remote sensing and radiative flux applications to passive IR remote sensing applications.




All-Sky Camera Images




Double Differences



# Marine-Based Field Campaigns Supporting JPSS SNPP CrIS/ATMS Sounder Validation and User Applications

**Nicholas R. Nalli**, V. R. Morris, E. Joseph, C. D. Barnet, T. Reale, Q. Liu, D. Wolfe, C. Tan, B. Sun, F. Tilley, J. W. Smith, *et al.*

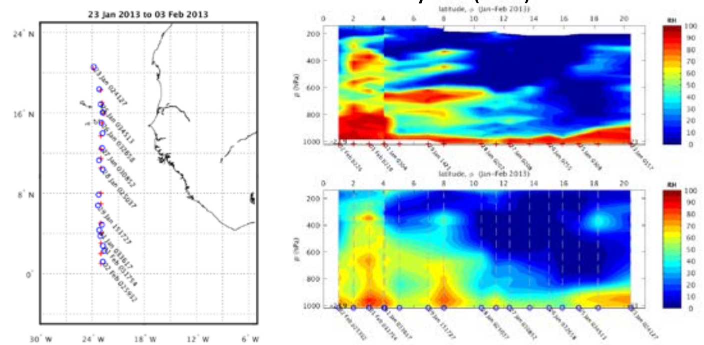
## 12th Symposium on New Generation Operational Environmental Satellite Systems

- The NOAA Aerosols and Ocean Science Expeditions (AEROSE) have compiled a multiyear set of ship-based, marine in situ cross-sectional truth measurements over the tropical Atlantic Ocean.
  - The cruise domains span a region of meteorological interest to NOAA sounder product users
    - Atlantic region: Saharan air layers (SALs), tropical storm formation, and tropospheric ozone/carbon/aerosol chemistry and transport.
    - Pacific region (CalWater/ACAPEX): atmospheric rivers (ARs)
  - There are numerous interdisciplinary applications of these data.
- AEROSE contribution to satellite sounder EDR intensive cal/val includes (e.g., Nalli et al. 2011)
  - AEROSE/CalWater domains are an important regions for observations from satellite sounder missions.
  - Oceans cover ~70% of Earth surface area and it is the satellite data over oceans that have the biggest impact on NWP.
  - Ocean-based truth data carries unique value for cal/val given that the ocean surface is far easier to characterize radiatively.
  - Ancillary data (MAERI, ozone, etc.) enable the possibility of cal/val "dissections" (Nalli et al. 2013.
- SNPP NUCAPS (and IASI) EDRs within AEROSE domain fall within JPSS Level 1 global performance specifications

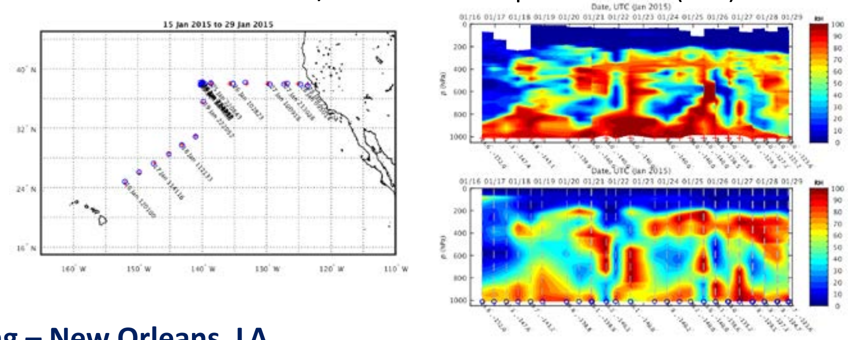
NOAA Ship *Ronald H. Brown*

NATO RV *Alliance*

AEROSE: Saharan air layers (SAL)




CalWater/ACAPEX: Atmospheric Rivers (ARs)



# The Pre-launch History of the Advanced Baseline Imager (ABI) on GOES-R

T. Schmit, NOAA NESDIS

- Invited Presentation
  - Instrument Innovators session
  - 12th Annual Symposium on New Generation Operational Environmental Satellite Systems
- Major Improvements of the ABI
  - 3x: spectral
  - 4x: spatial
  - 5x: temporal

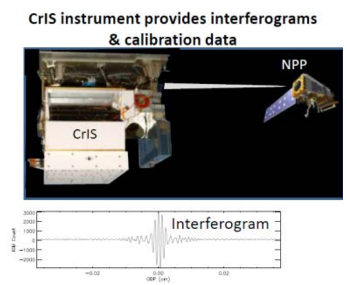
A satellite research meteorologist explaining the size of the GOES-R spacecraft. (Credit: Lockheed Martin)

# Near-Real Time Processing of S-NPP CrIS Full Spectral Resolution SDR Data at NOAA/STAR

**Xiaozhen (Shawn) Xiong [1,2], Yong Han[2], Yong Chen[2,3], Likun Wang[2,3] , Denis Tremblay[2,4], Xin Jin[1,2], Lihang Zhou[2]**

**[1]ERT, Laurel, MD 20723, USA, [2]NOAA/NESDIS Center for Satellite Applications and Research, College Park, MD 20740, USA**
**[1]ESSIC, University of Maryland, College Park, MD 20740, USA [4]Science Data Processing Inc., Laurel, MD 20723, USA**

The Cross-track Infrared Sounder (CrIS) on Suomi National Polar-orbiting Partnership Satellite (S-NPP) is a Fourier transform spectrometer that provides a total of 1305 channels in normal mode and 2211 channels in the full spectral resolution (FSR) mode for sounding the atmosphere. FSR data is available since December 4, 2014, and the resolutions in all three bands are 0.625 $cm^{-1}$ . CrIS full resolution Processing System (CRPS) has been developed to generate the near real-time FSR Sensor Data Record (SDR) at NOAA STAR using an algorithm based on CrIS Algorithm Development Library (ADL). These data are delivered to all users via STAR FTP and GRAVITE websites with a latency of 12-18 hours (Figure 1), and data quality is monitored via ICVS. Over 99.9% data have been successfully processed and achieved since December 4, 2014 to present (Fig.2).



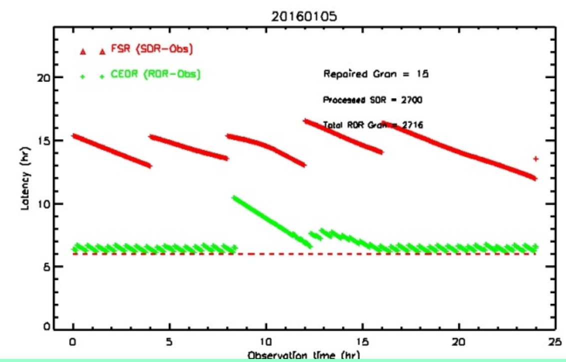
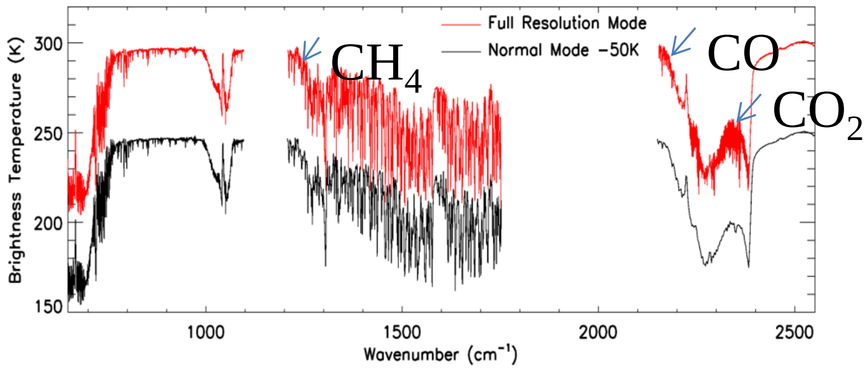




**Fig 1. Latency of CrIS FSR generation and delivery at NOAA STAR**



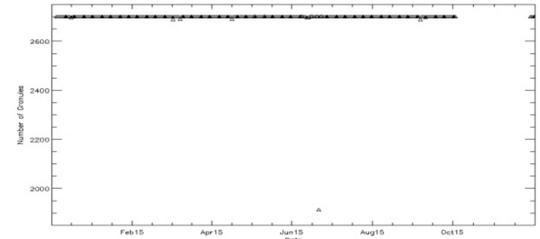



**Fig 2. Over 99.9% data has been processed since Dec.4, 2014 to present, and data is achieved at STAR**

# Evaluation of S-NPP OMPS Radiometric Calibration Update and Its Influence on SDR/EDR Products

Jian Zeng[1], Fuzhong Weng[2], Chunhui Pan[3], and Zhihua Zhang[4]

[1] ERT Inc. [2] NOAA/NESDIS/STAR [3]CICS-MD [4] IMSG Inc.

## Overview:

- Product Evaluation and Testing Element (PEATE) calibration update analysis (CBC, IRF, IRD, and RAD)
- Influence evaluations on Sensor Data Record (SDR) and Environmental Data Record (EDR), which are generated by ADL4.2 MX8.8 with updated SDR LUTs
- Simultaneous Nadir Overpass(SNO) validation between OMPS and the Global Ozone Monitoring Experiment-2 (GOME-2) on EUMETSAT METOP-A/B

## Results:

- PEATE recent calibration adjustments improve EV reflectance agreement between OMPS and GOME-2, especially for OMPS NP, which improved by ~5% compared to METOP-B and by ~4% compared to METOP-A.
- This study also shows that 95% of NM/TC EV reflectance modifications are within 1%; 82.3% of OMPS NP EV reflectance modifications are within 2%.
- OMPS TC EV reflectance modifications are smaller than the Day 1 Solar Irradiance adjustment (~78%) and the radiance calibration coefficient adjustment (99%).
- OMPS NP EV reflectance modifications are ~7% larger than the Day 1 Solar Irradiance adjustment and 0.1% larger than the radiance calibration coefficient adjustment.
- OMPS EDR Ozone vertical profile modifications caused by updated calibrations can be as high as 10% in the lower 5km in the polar region.

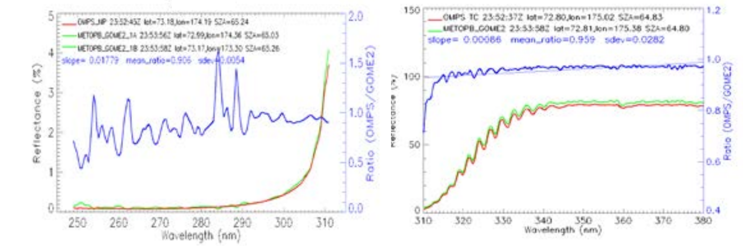



Figure 1: SNO Validation in reflectance comparisons between OMPS NP and GOME-2 Band 1A and between OMPS NM/TC and GOME-2 Band 2B.

Table 1 shows EV reflectance ratios of OMPS over GOME-2 on EUMETSAT METOP-A and METOP-B. The baseline refers to ADL4.2 MX8.8.

| PEATE CAL Update | OMPS_NP/ METOP_B | OMPS_NM/ METOP_B | OMPS_NP/ METOP_A | OMPS_NM /METOP_A |
|---|---|---|---|---|
| BASELINE | 0.905654 | 0.959161 | 0.721043 | 0.866655 |
| IRF | 0.997713 | 0.962509 | 0.794335 | 0.869832 |
| RAD | 0.867468 | 0.955949 | 0.690644 | 0.863909 |
| CBC | 0.905654 | 0.959161 | 0.721043 | 0.866655 |
| IRD | 0.905654 | 0.959161 | 0.721043 | 0.866655 |
| IRF_CBC_IRD_ RAD | 0.955644 | 0.95928 | 0.760846 | 0.867073 |

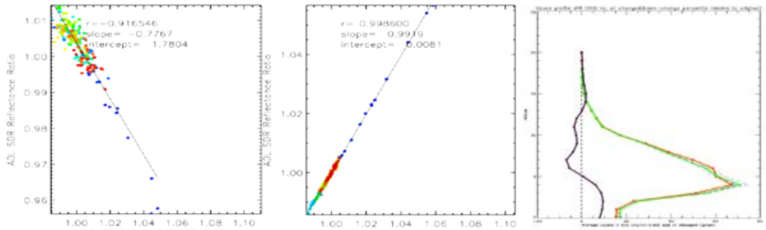


Figure 2: OMPS NM/TC Reflectance Response to Calibration Adjustments of Day 1 Solar (left) and Radiance Calibration Coefficients (middle). The right figure shows the Influence of PEATE OMPS Calibration update on Ozone vertical profile.

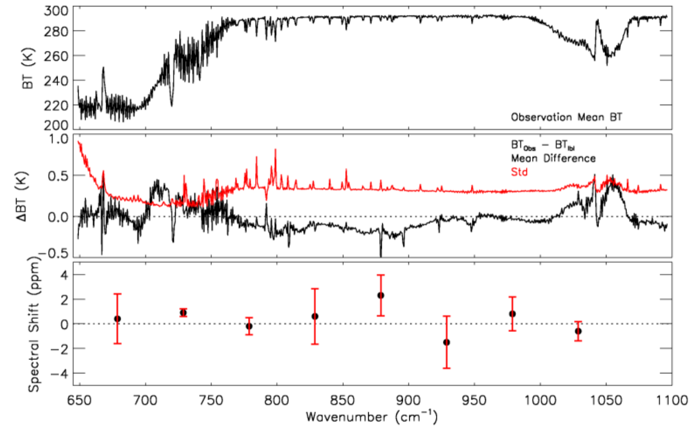
# CICS-MD

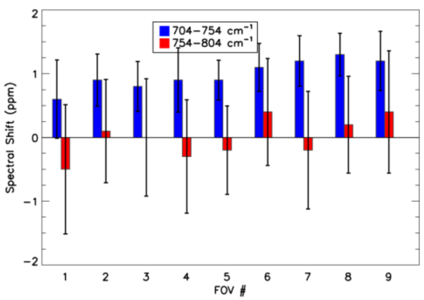
- Chen, Yong
- Fang, Li
- Folmer, Michael
- Grassotti, Chris
- Huang, Jingfeng
- Mishonov, Alexei
- Tong, Daniel
- Wang, Likun

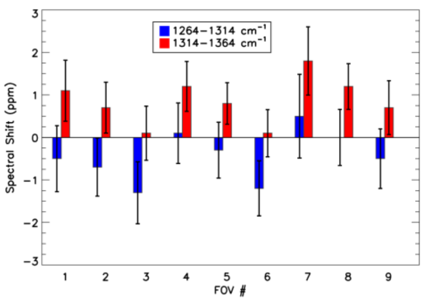
# On Hyper-Spectral Infrared Sensor CrIS Spectral Accuracy

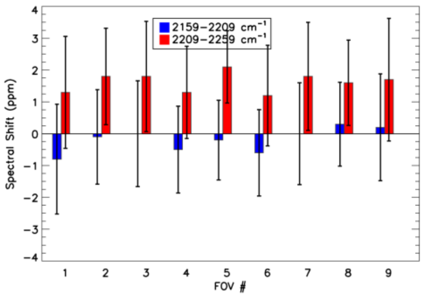
**Yong Chen[1], Yong Han[2], and Fuzhong Weng[2]**
**[1]CICS/ESSIC [2]NOAA/NESDIS/STAR**

- Quantifying the spectral accuracy of CrIS, which is directly related to the radiometric accuracy, is crucial for improving its data assimilation in the numerical weather prediction system.
- In this study, Line-by-Line Radiative Transfer Model (LBLRTM) is used to systematically evaluate the spectral accuracy of CrIS full resolution Sensor Data Records (SDR), processed at NOAA/STAR since December 2014, at different spectral ranges for all three bands.
- Based on these results, the best spectral ranges can be chosen to evaluate the spectral accuracy and stability for CrIS, IASI and future FTS infrared instruments.
- The best spectral ranges (small mean shift and small standard deviation) are: Band 1 754-804 cm$^{-1}$, and 704-754 cm$^{-1}$ at CO2 and water vapor absorption regions; Band 2 1264-1314 cm$^{-1}$, and 1314-1364 cm$^{-1}$ at high peak water vapor absorption regions; Band 3 2159-2209 cm$^{-1}$ at strong CO absorption region.



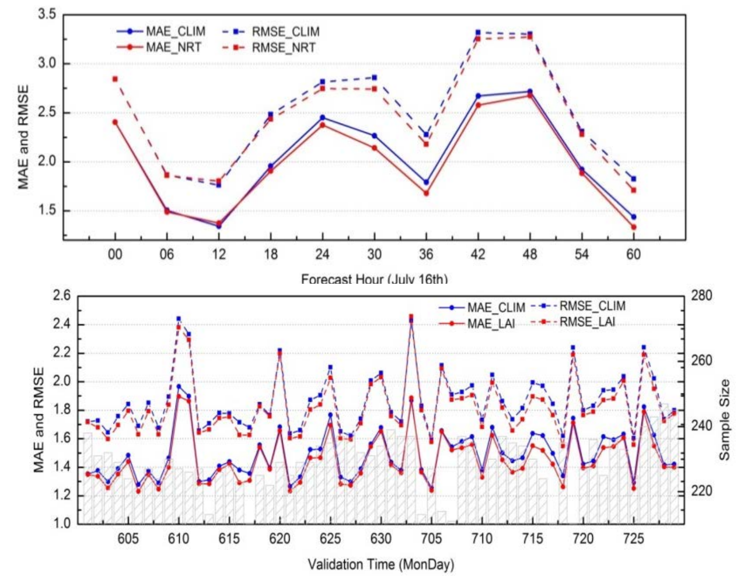

Spectral shift relative to FOV5 are within 1 ppm, absolute spectral shift relative to LBLRTM are also within 1 ppm

# Enhancing Weather Forecasts via Assimilating Real-time Satellite-based Soil Moisture and Green Vegetation Fraction

Li Fang[1,2], Christopher Hain[1,2], Xiwu Zhan[2], Jifu Yin[1,2] Weizhong Zheng[3], Jiarui Dong[3] and Michael Ek[3]
[1]UMD-ESSIC/CICS, [2]NOAA NESDIS, [3]NOAA NCEP

The 30th Conference on Hydrology

- The use of NRT GVF, which is more representative to the reality of surface green cover, can reduce the bias (both warm and cool bias) in model forecasts compared to the run using multi-year average GVF
- Greater impact by assimilating CCI SM is shown over the regions with modest and low vegetation cover, while limited improvement or even slight degradation is observed over dense vegetation areas
- The assimilation of CCI SM shows positive impact on 2 m relative humidity, temperature and precipitation forecast, especially over longer forecast hours



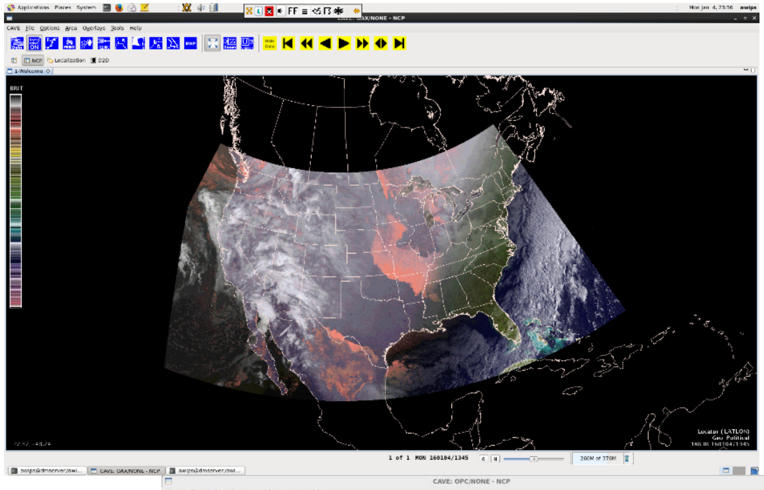

MAE and RMSE in 2 m surface temperature for NWC region
(a) for 60h forecast on July 16th; (b) over the period of June to July

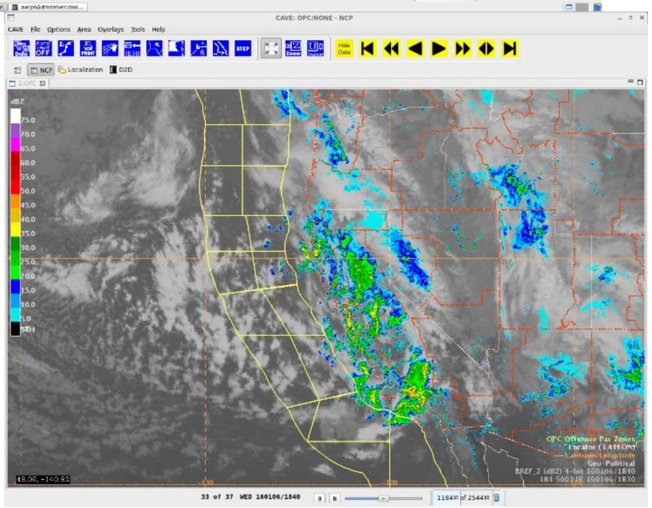
| GVF_bin | Total Sample | RH Improvement (%) | DPT Improvement (%) | SH Improvement (%) | TMP2m Improvement (%) |
|---|---|---|---|---|---|
| <20 | 162 | 60.06 | 65.28 | 62.61 | 48.77 |
| 20-40 | 297 | 55.88 | 66.31 | 69.44 | 45.45 |
| 40-60 | 237 | 51.61 | 58.63 | 64.27 | 37.55 |
| 60-80 | 214 | 53.57 | 51.86 | 53.59 | 28.97 |
| >80 | 137 | 45.29 | 41.06 | 43.95 | 24.82 |

# Preparing for GOES-R and JPSS in AWIPS II: National Centers Perspective

Michael J. Folmer and Monica Bozeman

- As the NWS/NCEP National Centers prepare for GOES-R/JPSS and AWIPS II:
  - Bit Depth Problems were identified and new enhancement curves are being created.
  - RGB “on the fly” and derived products are being investigated.
  - Transition of satellite products is non-trivial in AWIPS II, therefore it requires more configuration than legacy N-AWIPS.
- An AWIPS II Satellite Ingest and Display Project has been created to address all NCEP National Centers requirements for legacy and future satellites.



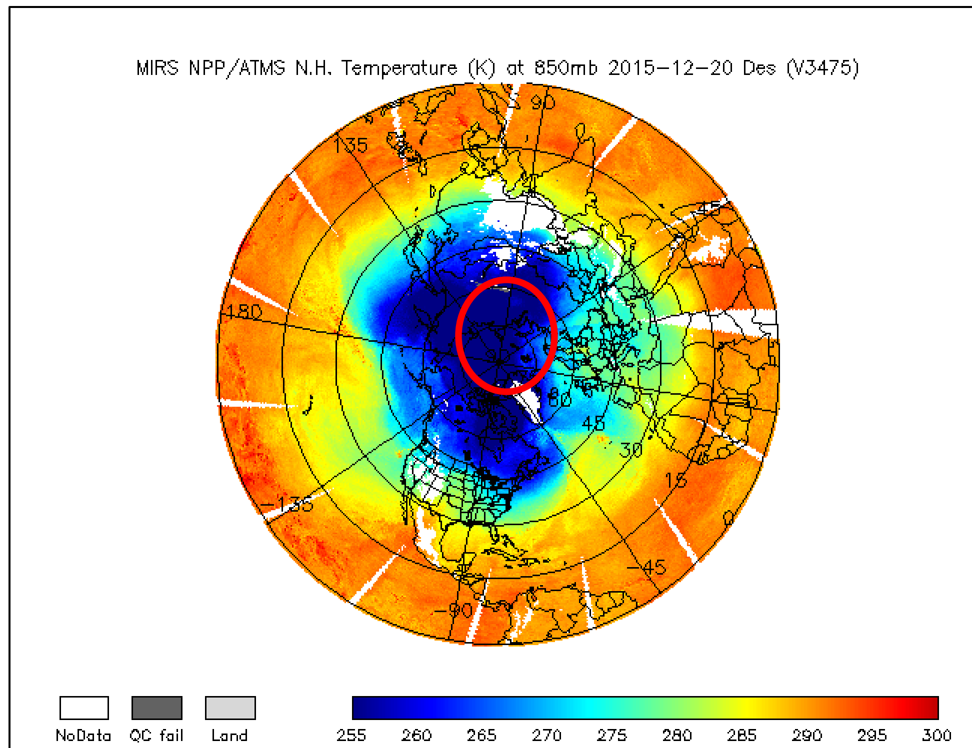


# Microwave Integrated Retrieval System (MiRS): Anomalous Arctic Warm Event of December 2015

Presented on the STAR JPSS big screen demo on 12 January

**Authors: Christopher Grassotti, Shuyan Liu, Quanhua Liu**

- MiRS sequence of daily global 850 hPa temperature retrievals from SNPP/ATMS clearly captures the extreme warm event that occurred over Arctic region on 29-30 December 2015
  - Anomalous N. Atlantic storm drove N. Pole surface temperatures to 2 degrees Celsius - more than 20 degrees C above normal



# Validation and Expected Error Estimation of Suomi-NPP VIIRS Aerosol Optical Thickness and Angström Exponent with AERONET

Huang , Jingfeng (jingfeng.huang@noaa.gov), S. Kondragunta , I. Laszlo, H. Liu, L. Remer, H. Zhang, S. Superczynski, P. Ciren, B. N. Holben, and M. Petrenko

- Land AOT EDR reached ***Validation Stage*** since **01/23/2013**;

  Ocean AOT EDR and AE EDR reached ***Validated Stage*** since **05/02/2012** (excluding the processing error period Oct 15-Nov 27, 2012);
- VIIRS Land AOT EDR:

  Global bias (-0.0008), Uncertainty (0.116),

  Expected Error [$-0.470\times\tau_A-0.010$, $-0.0058\times\tau_A+0.090$]

  VIIRS Ocean AOT EDR:

  Global bias (0.0252), Uncertainty (0.065),

  Expected Error [$-0.238\times\tau_A+0.010$, $0.194\times\tau_A+0.048$]

  VIIRS Ocean AE EDR:

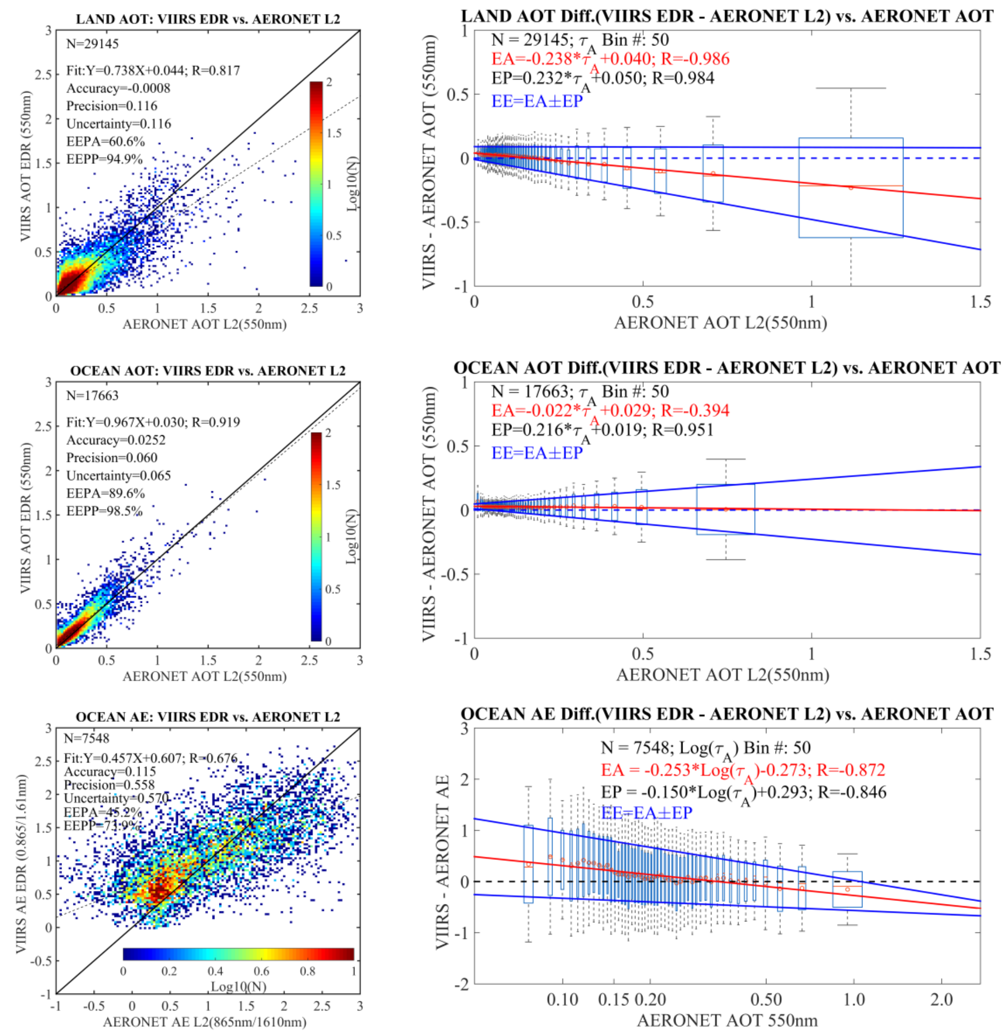
  Global bias (0.115), Uncertainty (0.570),

  Expected Error [$-0.103\times\log(\tau_A)-0.566$, $-0.403\times\log(\tau_A)+0.020$]
- Coming up --- New enterprise algorithms for JPSS1 VIIRS Aerosol Products with: *new spatial coverage over bright surfaces, wider reporting data range, better snow/snowmelt filtering, improved aerosol models, dynamically changing surface reflectance ratios, …*

(a)

(b)

(c)

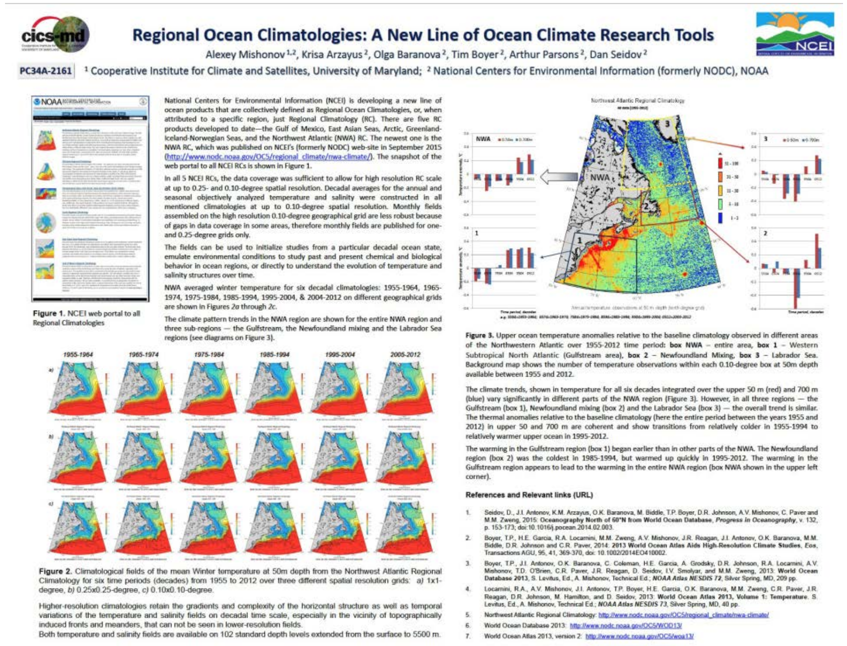


# Regional Ocean Climatologies: A New Line of Ocean Climate Research Tools

Alexey Mishonov [1,2], Krisa Arzayus[2], Olga Baranova[2], Tim Boyer[2], Arthur Parsons[2], Dan Seidov[2]

[1] Cooperative Institute for Climate and Satellites, University of Maryland; [2] National Centers for Environmental Information (formerly NODC), NOAA

- National Centers for Environmental Information (NCEI) is developing a new line of ocean products that are collectively defined as Regional Ocean Climatologies, or, when attributed to a specific region, just Regional Climatology (RC). There are five RC products developed to date—the Gulf of Mexico, East Asian Seas, Arctic, Greenland-Iceland-Norwegian Seas, and the Northwest Atlantic (NWA) RC. The newest one is the NWA RC, which was published on NCEI's in September 2015
- In all 5 NCEI RCs, the data coverage was sufficient to allow for high resolution RC scale at up to 0.25- and 0.10-degree spatial resolution. Decadal averages for the annual and seasonal objectively analyzed temperature and salinity were constructed in all mentioned climatologies at up to 0.10-degree spatial resolution. Monthly fields assembled on the high resolution 0.10-degree geographical grid are less robust because of gaps in data coverage in some areas, therefore monthly fields are published for one- and 0.25-degree grids only.
- The climate trends, shown in temperature for all six decades integrated over the upper 50 m (red) and 700 m (blue) vary significantly in different parts of the NWA region (Figure 3). However, in all three regions — the Gulfstream (box 1), Newfoundland mixing (box 2) and the Labrador Sea (box 3) — the overall trend is similar. The thermal anomalies relative to the baseline climatology (here the entire period between the years 1955 and 2012) in upper 50 and 700 m are coherent and show transitions from relatively colder in 1955-1994 to relatively warmer upper ocean in 1995-2012.
- The warming in the Gulfstream region (box 1) began earlier than in other parts of the NWA. The Newfoundland region (box 2) was the coldest in 1985-1994, but warmed up quickly in 1995-2012. The warming in the Gulfstream region appears to lead to the warming in the entire NWA region (box NWA shown in the upper left corner).



# Rapid Refreshing of Anthropogenic $NO_x$ Emissions Using Fused Ground and Satellite Observations

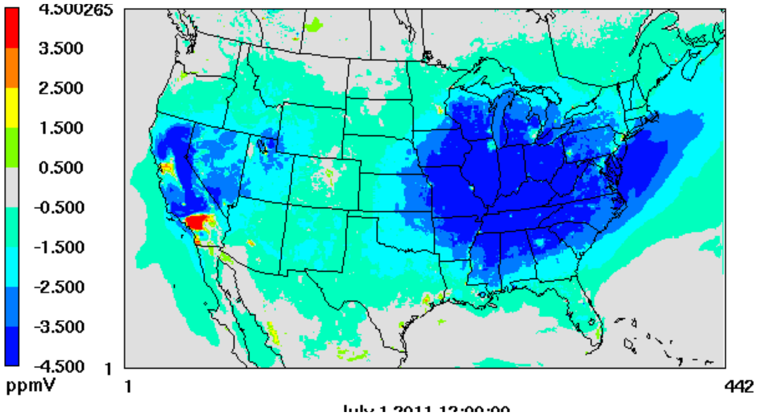
Daniel Tong, W. Chen, L. Pan, H. Kim, Y. Tang, P. Lee, J. Huang, J. McQueen, I. Stajner

- Demonstrated feasibility to use fused satellite and ground observations to rapidly update NO2 emission.

- Updated emissions Improve NOAA National Air Quality Forecast Capability (NAQFC) $O_3$ forecast performance.

- This new method is expected to be first implemented in NWS NAQFC operation starting June 2016.

**Surface $O_3$ change (ppbv) from assimilating fused observations.**




**Comparing model performance**

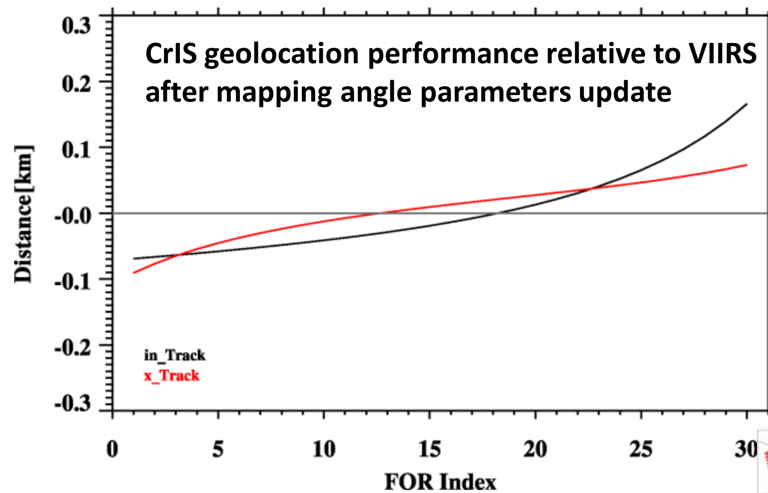
| | MB (ppbv) | | NMB (%) | | RMSE (ppbv) | |
|---|---|---|---|---|---|---|
| | Hourly | Max8 | Hourly | Max8 | Hourly | Max8 |
| Op. NAQFC | 11.9 | 9.9 | 29.7 | 20.3 | 23.1 | 21.5 |
| Fused Obs | 11.5 | 9.7 | 28.7 | 20.1 | 22.7 | 21.4 |

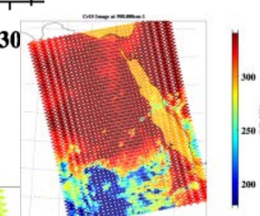
The new method outperforms the operational system by all metrics.

# Geolocation Assessment Tool and Correction Model for JPSS/SNPP Cross-Track Infrared Sounder

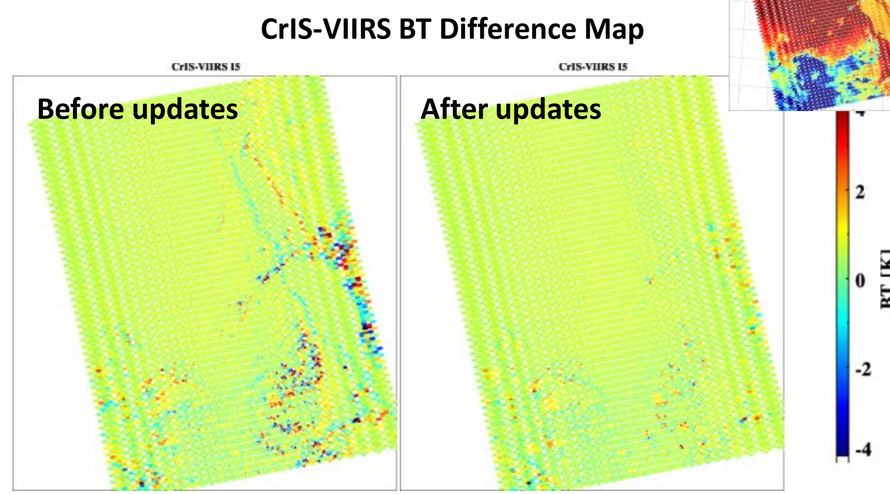
Likun Wang, CICS/ESSIC/UMD; Yong Chen, Yong Han, Xiaozhen Xiong, and Denis Tremblay

- Spatially collocated VIIRS radiances from band I5 are used to evaluate the geolocation performance of the CrIS SDR
  - Full Scan
  - Angle based Results
  - Perturbation of line-of-sight vectors



- Correction model is built up to convert assessment results into new mapping angles that are used for geolocation computation improvements
  - Post-launch geometric calibration
  - Retrieve instrument mapping angles



# CIMSS

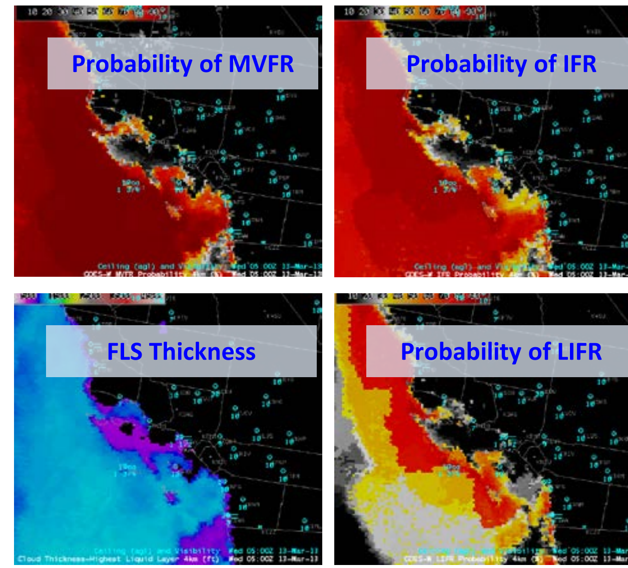
- Calvert, Corey
- Cureton, Geoff
- Feltz, Joleen
- Feltz, Michelle
- Gartzke, Jessica
- Gerth, Jordan (2)
- Gunshor, Mathew
- Lee, Yong-Keun
- Li, Jinlong
- Li, Jun (3)
- Lim, Agnes (2)
- Liu, Yinghui
- Loveless, David
- Mooney, Margaret
- Otkin, Jason (3)
- Rozoff, Christopher
- Smith, William
- Straka, William
- Taylor, Joe
- Terborg, Amanda
- Wang, Pei

# The GOES-R/JPSS Approach for Identifying Hazardous Low Clouds: Overview and Operational Impacts

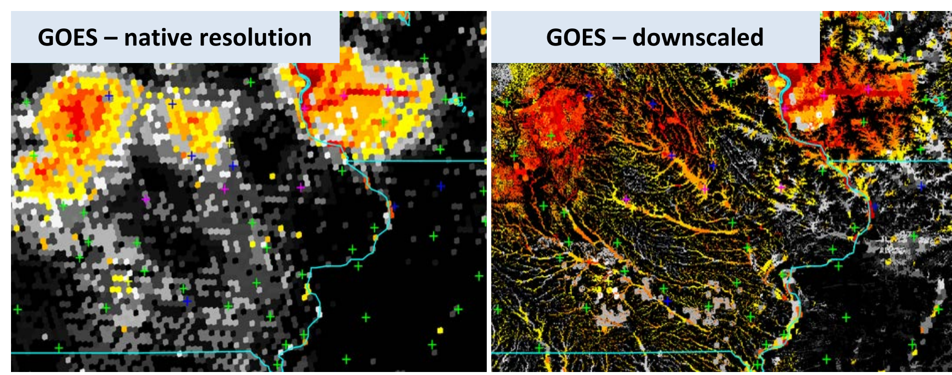
Corey Calvert (UW-CIMSS), Michael Pavolonis (NOAA/NESDIS/STAR), Shane Hubbard (UW-CIMSS) and Scott Lindstrom (UW-CIMSS)

12th Annual Symposium on New Generation Operational Environmental Satellite Systems

- **Quantitative approach for Fog/Low Stratus (FLS) detection was developed for GOES-R**
  - Fuses satellite data with static ancillary data and NWP model data using a Naïve Bayesian model
  - GOES-R product available day and night and was found to be more skillful than the night-only heritage product
  - Can be used for multiple satellite platforms including current GOES, MODIS, SNPP, Himawari and several others




- **Using high-res DEM data and LEO satellites to downscale the GEO FLS products**
  - Increases the spatial resolution of the FLS products from 4km to 1/2km
  - Allows increased ability to detect small-scale FLS events such as valley fog



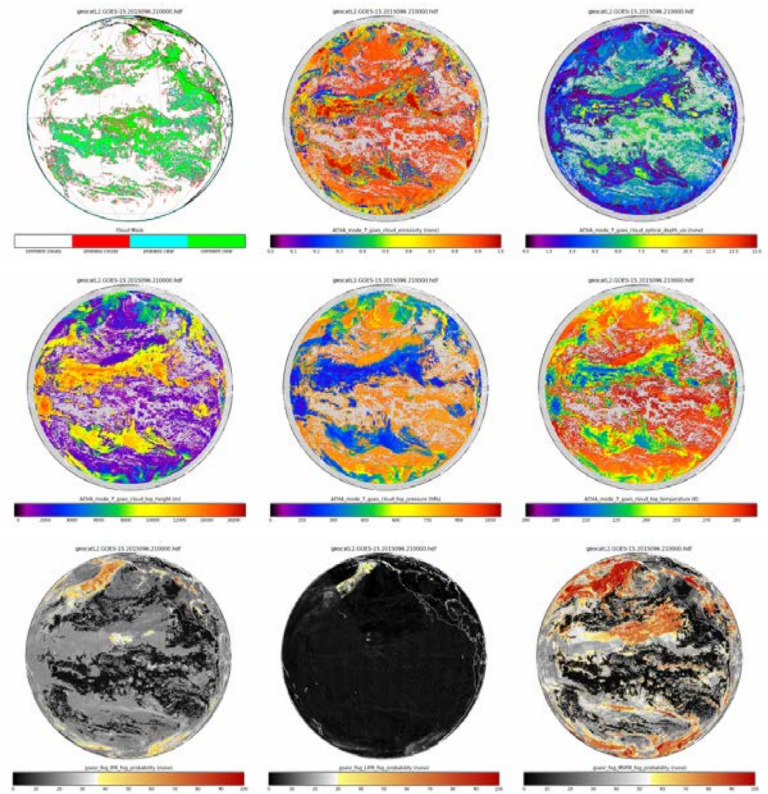
# Level-2 Products in the CSPP-GEO Direct Broadcast Package

Geoff Cureton, Scott Mindock, Graeme Martin, Liam Gumley
CIMSS

96th AMS Annual Meeting: 20th IOAS-AOLS

## The CSPP-GEO Geocat package generates products from geo satellite data.

- Allows DB users to process current-generation GOES data received on their own antennas.
- Automatic retrieval and transcoding of GFS ancillary data.
- Includes latest algs from GOES-R Algorithm Working Group.
- Currently supports GOES-13, GOES-15
- HimawariCast support (Q2, 2016)
- GOES-R support (Q3 2016)

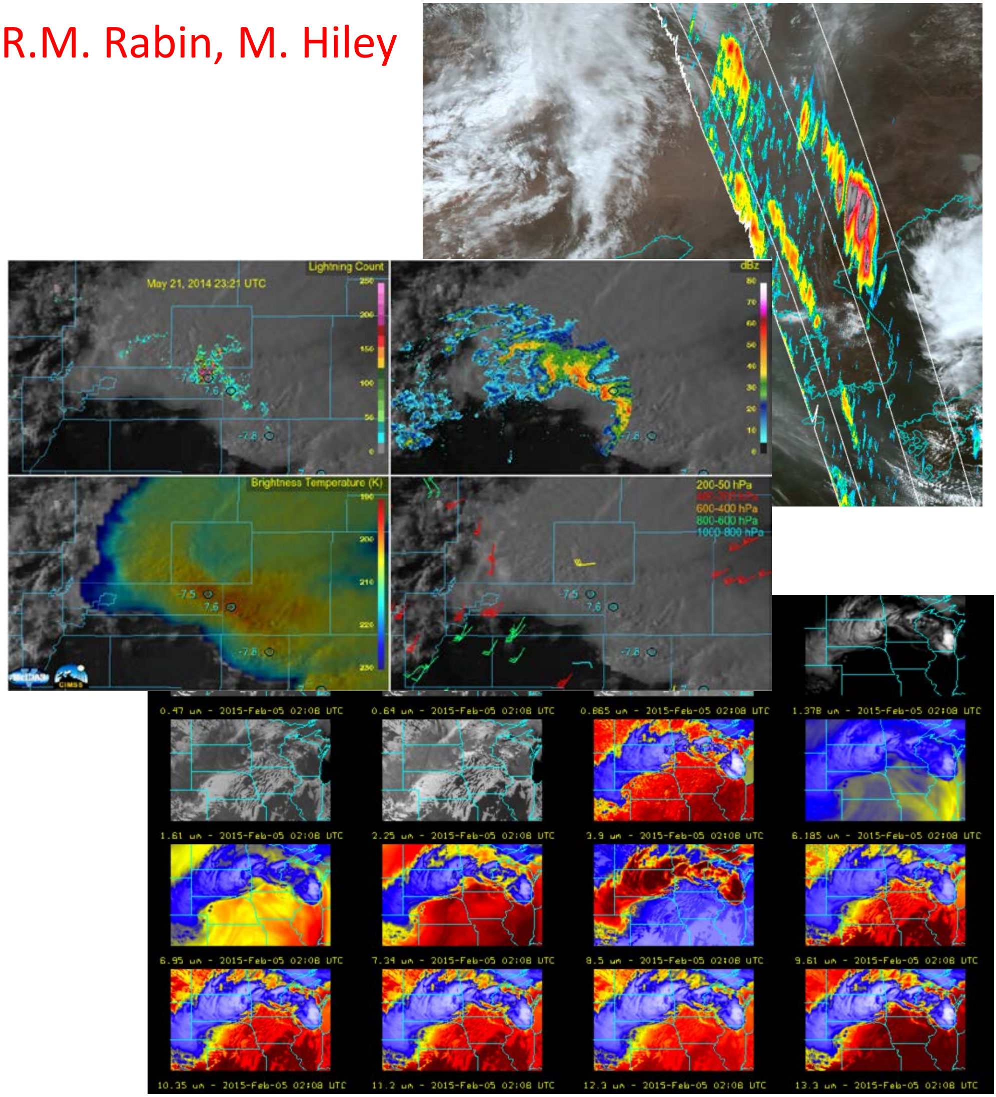


*CSPP-GEO Cloud and Fog Level-2 Products*

# Using McIDAS-V with the next Generation of Satellite Sensors

Joleen Feltz, T. Schmit, M. Gunshor, R.M. Rabin, M. Hiley

- GOES-R and Himawari
  - Straight forward Himawari-8 data access and display.
  - GOES-R Sample data can be displayed in McIDAS-V. The scripting API provides ease of use for scheduled tasks.
- Combining Sensors and Products
  - Multiple datasets from GOES-13 1 minute data are easily displayed on a common projection.
  - 3D capabilities and automated projection capabilities provide a simple way to combine satellite sensor data with other meteorological observations in a meaningful way.

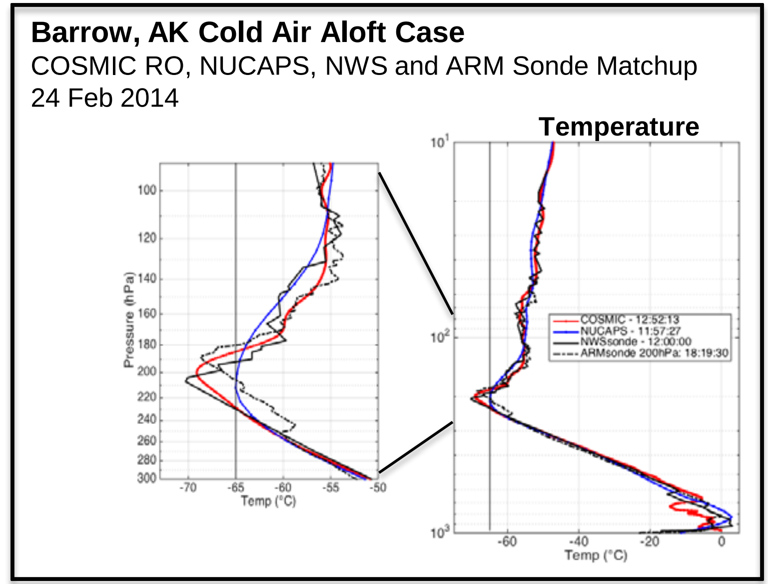


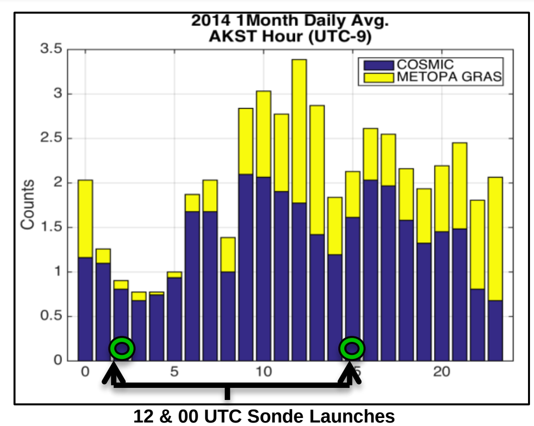
# Towards Aiding Aviation Safety: Detection of Cold Air Aloft Using COSMIC RO and AIRS Hyperspectral IR Sounder

Michelle Feltz, Robert Knuteson, Elisabeth Weisz, Nadia Smith, Wayne Feltz, Steve Ackerman
CIMSS/SSEC, University of Wisconsin-Madison

## 12th Annual Symposium on New Generation Operational Environmental Satellite Systems

- Cold air aloft is aviation safety concern
  - Forecasters expressed need for real time 3D obs.
  - PGRR proposal funded to dvlp and investigate utility of hyperspectral IR sounders in forecast challenges
- This work showed prelim. results of investigation of radio occultation (RO) data's utility in complimenting IR sounder for cold air aloft forecast challenges
  - RO helps fill in temporal gaps of the existing radiosonde network, but IR sounders provide far more observations
  - RO is more equipped to capture the vertical extent and exact temperature of the cold air than the IR sounders, but IR sounders offer great 3D visualization of cold air mass
  - **Combination of RO and hyperspectral IR sounders should be used
  - Recommended to either have some form of RO data available to NWS forecasters or to use RO data to provide an uncertainty estimate cushion on the IR sounder temperature profiles



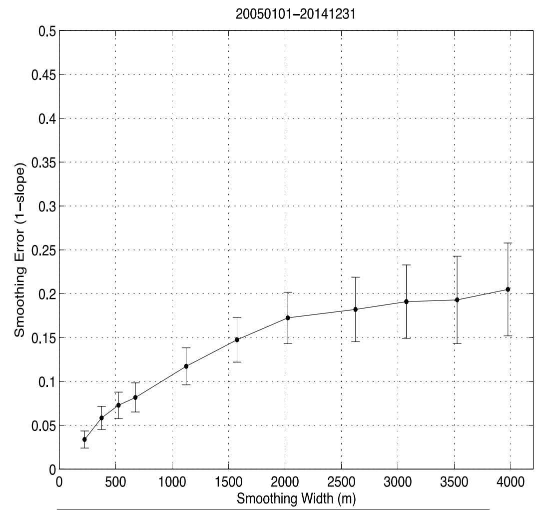



# Ten Year Climatology of CAPE Observations East of the Rocky Mountains from Hyperspectral IR Sounders

Jessica M. Gartzke, CIMSS/Univ. of Wisconsin, Madison, WI
R. Knuteson, S. A. Ackerman, W. Feltz, and G. Przybyl

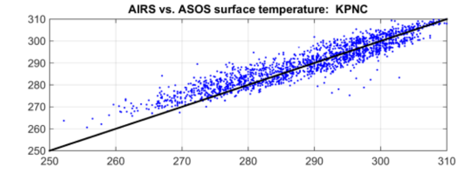
- Results

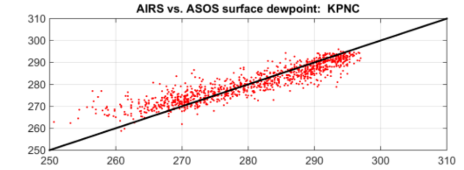
1. Timely information on the evolution of the vertical structure of the atmosphere is available from the satellite overpasses at 10:30am (EUMETSAT/METOP) and at 1:30pm (NASA Aqua and NOAA/JPSS).
2. A systematic bias found in the AIRS derived CAPE and the ERA-Interim derived CAPE is consistent with reduced vertical resolution compared to radiosondes.
3. Scatter in the AIRS and ERA-Interim CAPE values relative to radiosondes was shown to be primarily due to error in the estimate of the surface parcel dewpoint temperature. Corrections using ASOS station data in the U.S. are in progress.




AIRS soundings have a vertical resolution of 1km in temperature and 2km in water vapor. The vertical smoothing is expected to reduce the CAPE by 15 to 20%. The ERA model is also subject to this error. This is consistent with the observed systematic bias of AIRS and ERA CAPE compared to high vertical resolution radiosonde data..

On warm site (summer) when CAPE is high, fair amount of scatter but no bias for AIRS 2 meter temperature. In contrast, the AIRS estimated dewpoint is drier than the ASOS estimated dewpoint by several degrees in the summer. This is consistent with what we found at the ARM site.



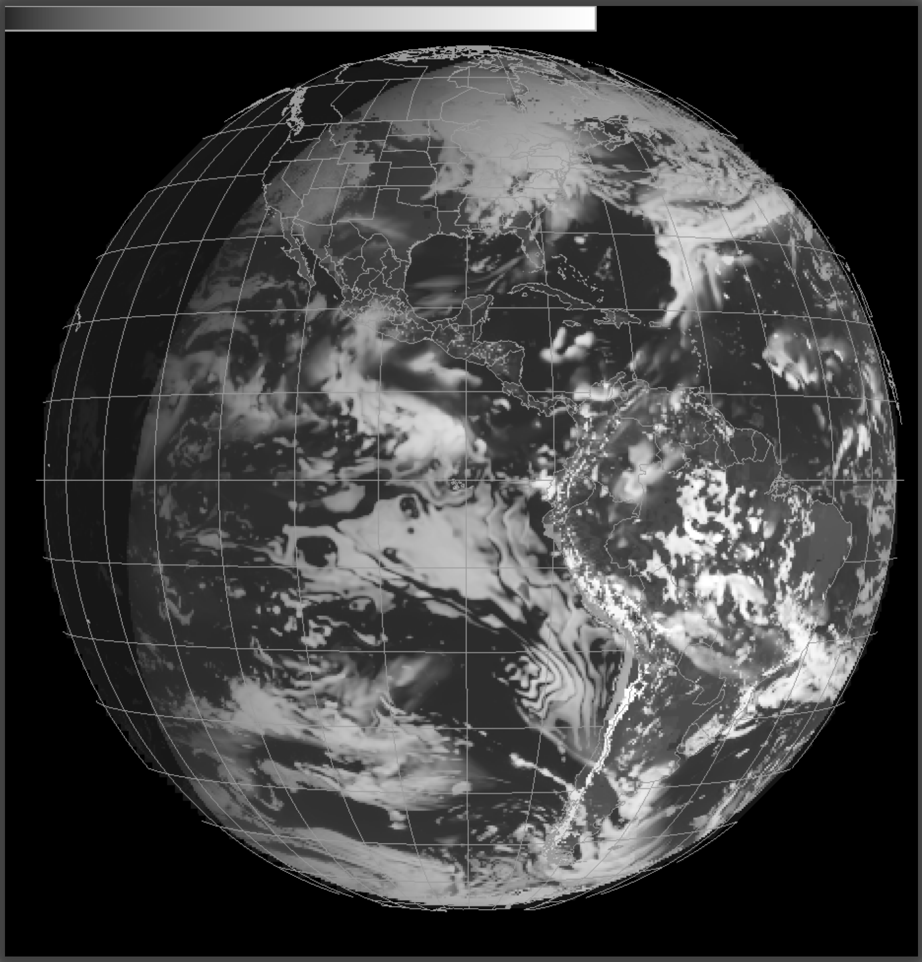



# Developing AWIPS to support forecaster demands in the new generation of satellites

***Jordan J. Gerth***, *CIMSS/Univ. of Wisconsin, Madison, WI*

32nd Conference on Environmental Information Processing Technologies

- **Value of Observations**
  - **Value = Quality of Actionable Information (Statements) – Amount of Factual Information (Data)**
  - **Value decreases when data increases without impacting a decision process.**
- **CIMSS has developed new AWIPS visualizations to:**
  - **Decrease time for National Weather Service (NWS) meteorologists to load new information**
  - **Reduce layers and other clutter on the display**
  - **Convey supporting information**



# Increased Satellite Reception and Utilization Capabilities in NWS Pacific Region

***Jordan J. Gerth**, CIMSS/Univ. of Wisconsin, Madison, WI*
***B. Ward and E. Lau**, National Weather Service, Honolulu, HI*

12th Annual Symposium of New Generation Operational Environmental Satellite Systems

- **Improved direct broadcast and rebroadcast capabilities**
- **Leverage Himawari imager as much as possible to provide regionally relevant examples in preparation for GOES-R Advanced Baseline Imager (ABI)**
- **Emphasize baseline and under-demonstrated products**
- **Redundant delivery paths and formats**
  - **Pacific Region: Where "big data" meets "big region"**

GOES-R • NOAA • JPSS
OCONUS
SATELLITE PROVING GROUND

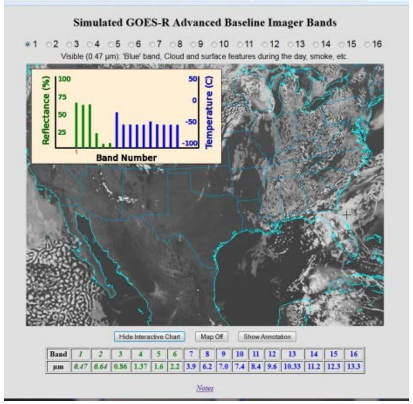
# Employing Short Courses to Prepare for the GOES-R Satellite Series

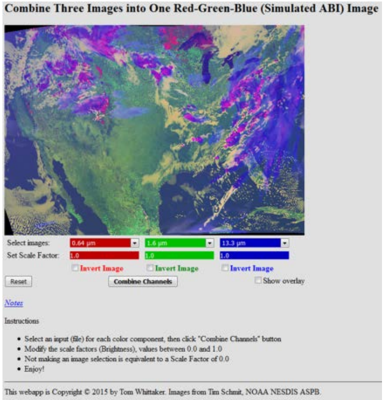
Mathew M. Gunshor[1], T. J. Schmit[2], C.C. Schmidt[1], S.S. Lindstrom[1], J.J. Gerth[1],M. Mooney[1], T.M. Whittaker[1], S.J. Goodman[3], & J.J. Gurka[3]
1. Cooperative Institute for Meteorological Satellite Studies (CIMSS); University of Wisconsin-Madison, Madison, WI USA
2. NOAA/NESDIS/STAR Advanced Satellite Products Branch (ASPB) Madison, WI USA
3. NOAA /NESDIS GOES-R Program Office

- 43rd Conference on Broadcast Meteorology
  - AMS Short course GOES-R Preview for Broadcasters
  - 9 June 2015, Raleigh, NC
- AMS 96th Annual Meeting
  - AMS Short Course on the Geostationary Operational Environmental Satellite (GOES)-R and Joint Polar Satellite System (JPSS)
  - 10 Jan 2016, New Orleans, LA

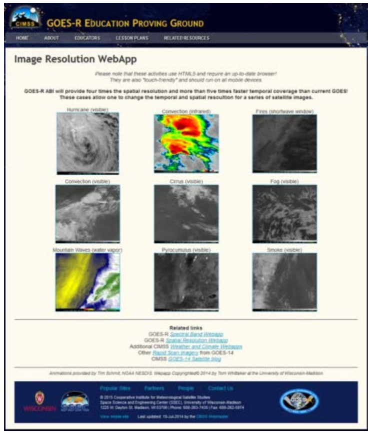
- Educational WebApps

http://cimss.ssec.wisc.edu/education/goesr/



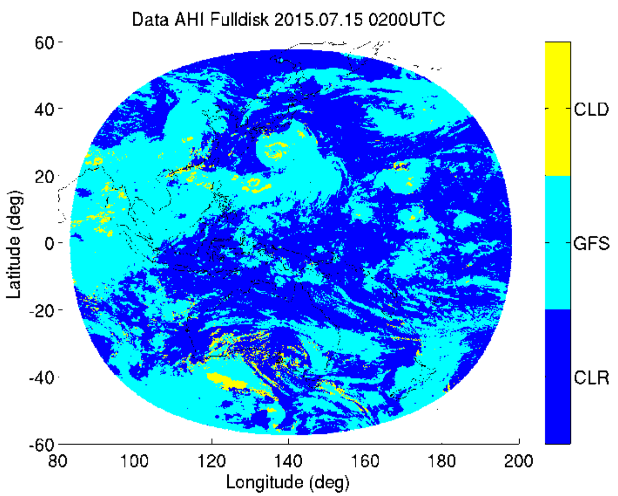



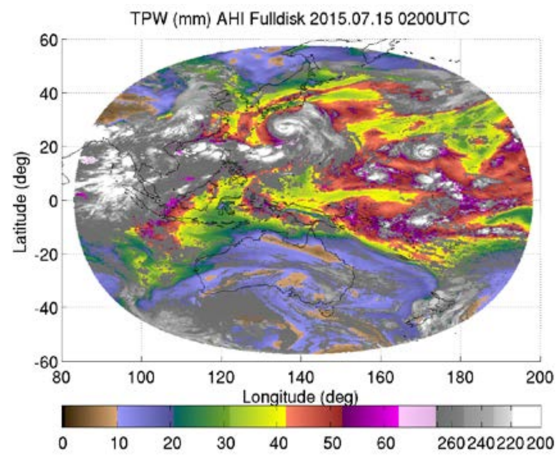


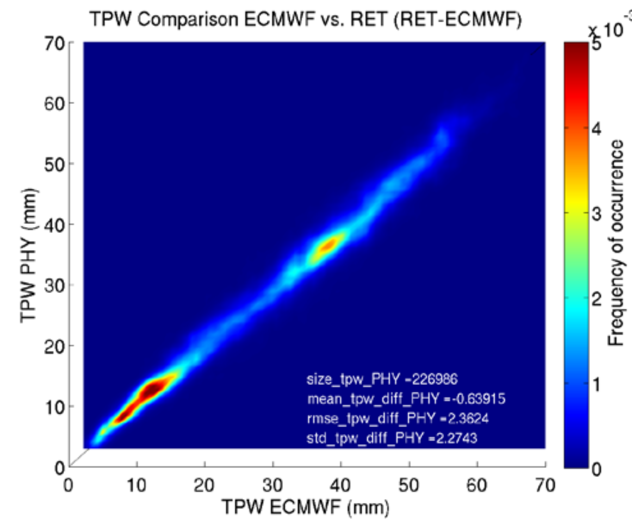


# Application of GOES-R ABI LAP algorithm to AHI onboard Himawari-8

Yong-Keun Lee[1], Jun Li[1], Zhenglong Li[1], and Timothy Schmit[2]
[1] CIMSS, University of Wisconsin-Madison, [2] NOAA/NESDIS/STAR




Left: Data mask
- CLR (blue): retrieval is successful over clear skies
- GFS (light blue): retrieval is not successful or cloudy skies (mostly cloudy skies)
- CLD (yellow) : successful retrieval in cloudy skies

Middle: Total Precipitable Water (TPW) over clear skies with window band (11 µm) brightness temperature

Right: comparison of retrieved TPW with ECMWF (bias, root mean square error (rmse), and standard deviation (std))

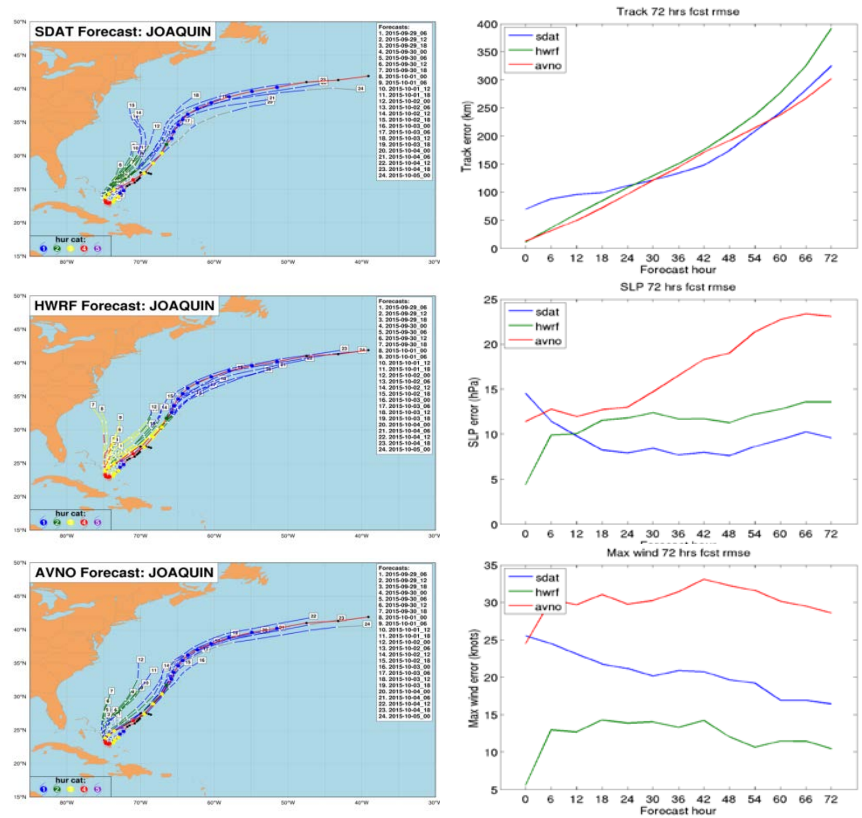
**Results**

- Due to the similarity of the infrared bands between GOES-R ABI and Himawari-8 AHI instruments, the GOES-R ABI LAP algorithm has been successfully applied to Himawari-8 AHI measurements.
- The application of GOES-R ABI LAP algorithm to Himawari-8 AHI shows that the algorithm provides reasonable retrievals.

# JPSS and GOES-R applications in a near real time regional numerical forecast system

Jinlong Li[@], Jun Li[@], Pei Wang[@], Hyojin Han[@], Feng Zhu[@], Tim Schmit[&], Mitch Goldberg[#], and Steven Goodman[*]
[@]CIMSS, [&]SaTellite Applications and Research (STAR), [#]JPSS Program Office, [*]GOES-R Program Office

- Near realtime satellite data assimilation for tropical cyclone (SDAT) system has been upgraded from 36 km to 27 km.
- Real time GOES sounder clear sky total precipitable water (TPW) data with GOES-R algorithm has been assimilated into SDAT system. High temporal TPW data can help the precipitation forecast.
- Preliminary assessments on 2015 hurricane season show that in general SDAT has the similar performances of GFS and HWRF, providing reasonable forecasts for typical hurricanes such as Danny, Erika and Joaquin.
- Continued work on better handling clouds for advanced IR/microwave sounder radiance assimilation with collocated high spatial resolution imager measurements.

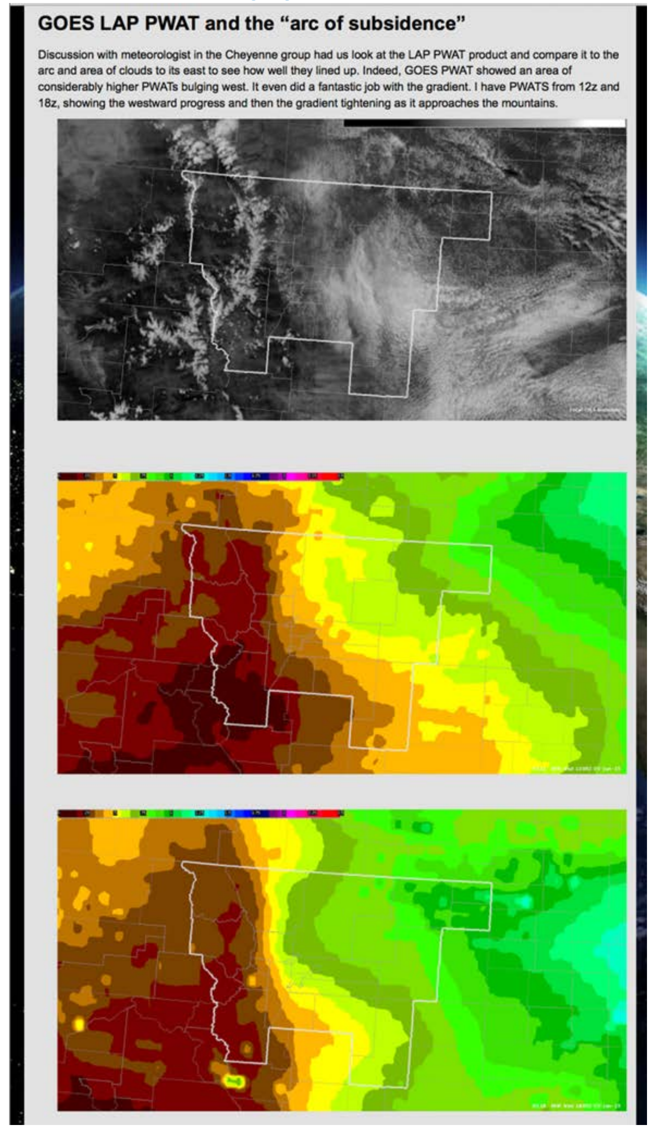



72 hours hurricane Joaquin forecasts of track, sea level pressure (SLP), and maximum wind speed from GFS, HWRF and SDAT. The starting times are from 06 UTC September 29 to 00 UTC October 5 of 2015.

# Real Time All-weather Precipitable Water Product Development from Geostationary Infrared Radiances and Applications in Weather Forecasts

Jun Li (CIMSS), Jordan Gerth (CIMSS), Timothy J. Schmit (STAR), Zhenglong Li (CIMSS), Yong_Keun Lee (CIMSS), Scott Bachmeier (CIMSS)

- Algorithms have been developed for GOES-R high temporal resolution all-weather TPW/LPW by combining the IR radiances and NWP forecasts;
- Validation with current GOES Sounder and AHI shows improved TPW/LPW over NWP forecasts;
- HWT Proving Ground (PG) application indicates that the high temporal TPW is very useful for forecasting, forecasters are particularly interested in temporal and spatial gradients.



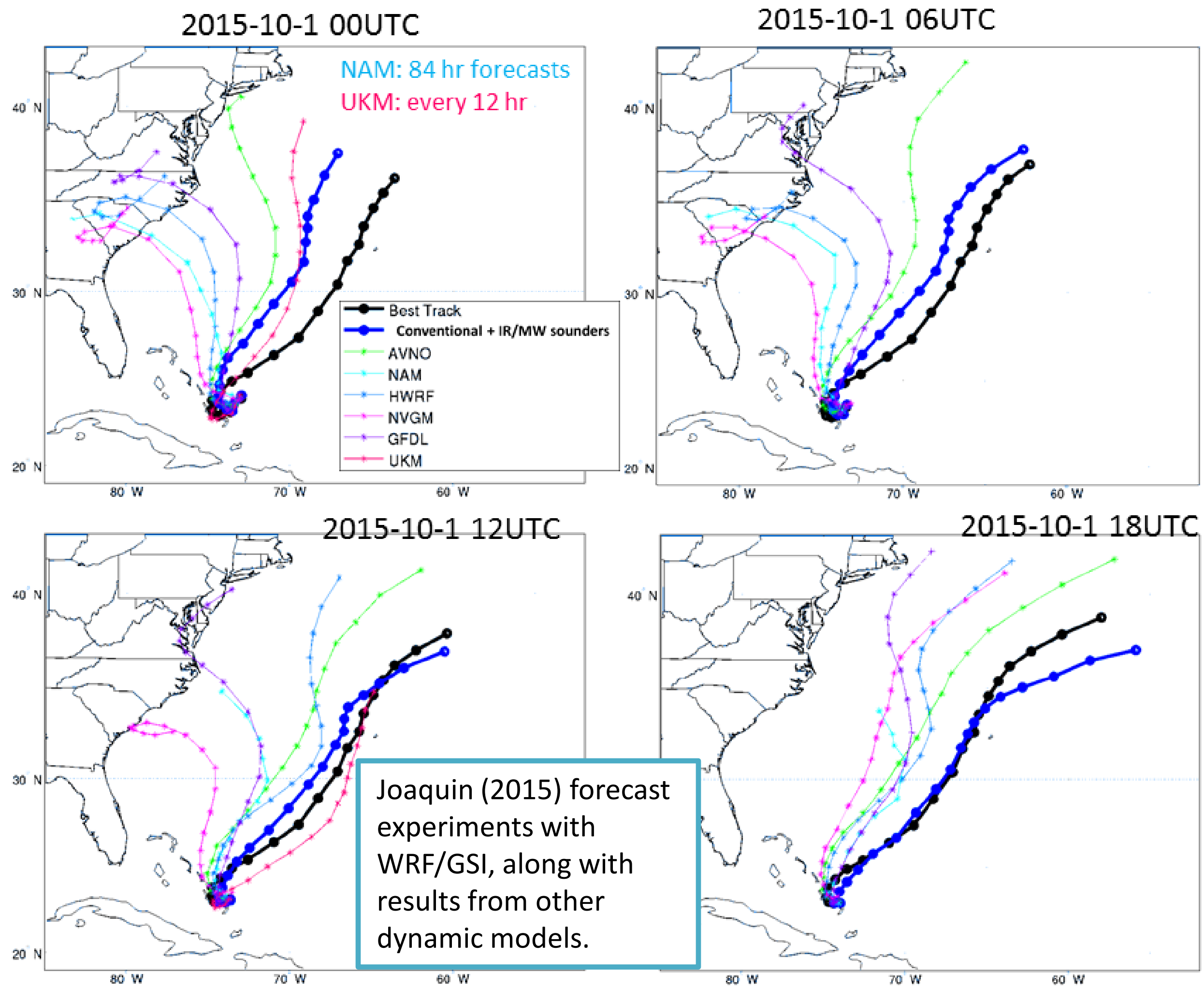

**HWT feedback from forecasters: (from slight useful to extremely useful)**

**CAPE: 87%**
**TPW: 68%**
**LI: 64%**

# On the Assimilation of Advanced Infrared Sounder Radiances in Cloudy Skies

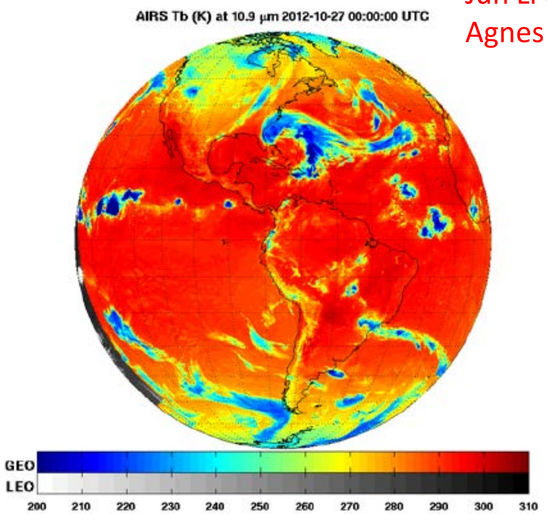
Jun Li (CIMSS), Pei Wang (CIMSS/AOS), Mitch Goldberg (JPSS), Jinlong Li (CIMSS), Zhenglong Li (CIMSS), Agnes Lim (CIMSS), and Timothy J. Schmit (STAR)

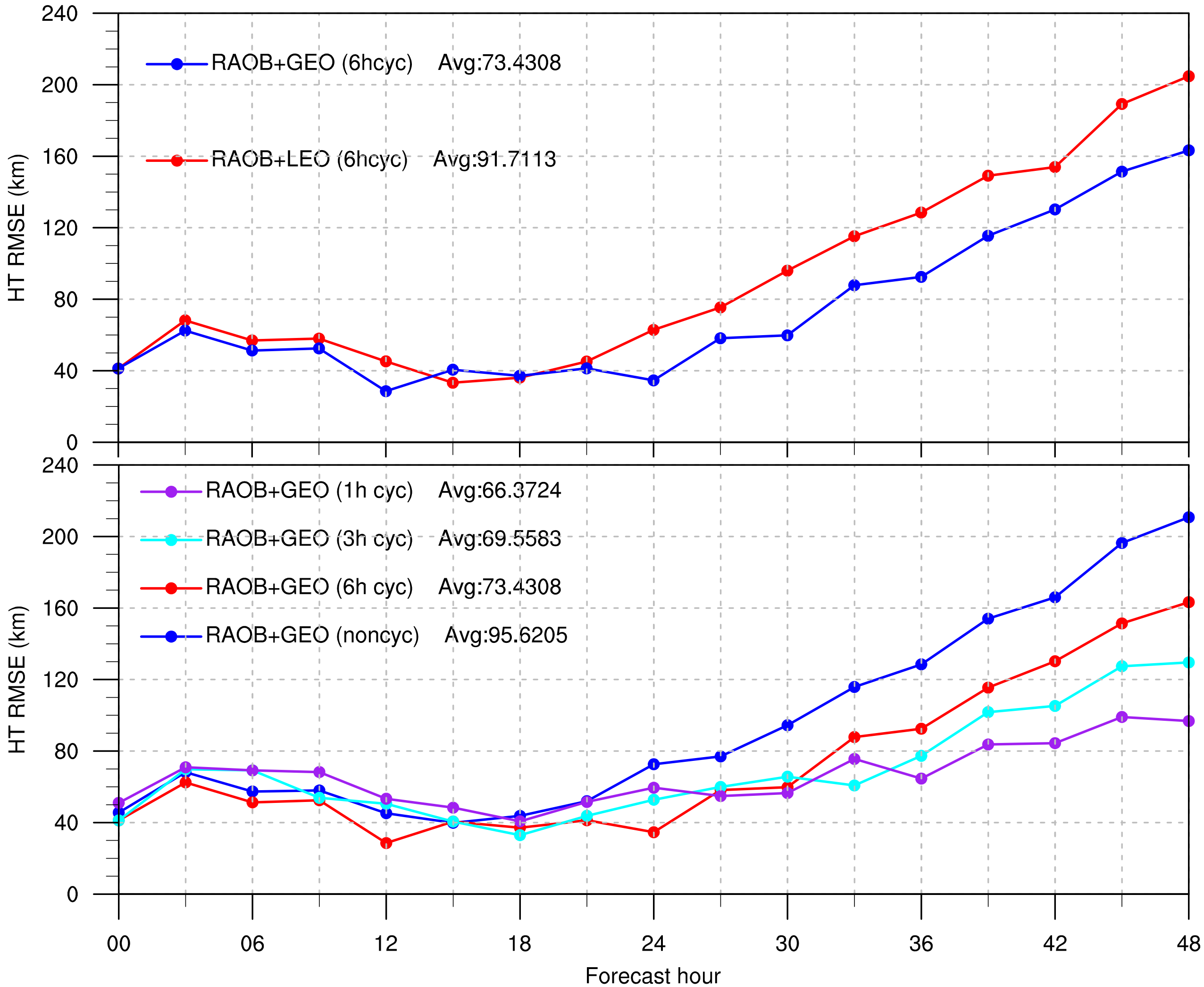
- Clear location detection has substantial impact on IR radiance assimilation, collocated imager cloud mask can improve the detection of clear location for IR radiance assimilation;
- Imager-based clear-cleared radiances (CCRs) provide value-added impact, could be an alternative approach for radiance assimilation in some cloudy skies;
- Future work
  - comparisons among CrIS CCRs (imager-based, BG-based and MW-based), CCR impact studies;
  - clear location from collocated imager plus clear channels in cloudy regions for IR radiance assimilation.



# A quick regional OSSE impact study on Geostationary Hyperspectral Infrared Sounder for Hurricane Forecasts

Jun Li (CIMSS), Zhenglong Li (CIMSS), Timothy Schmit (STAR), Feng Zhu (CIMSS/AOS) Pei Wang (CIMSS/AOS), Agnes Lim (CIMSS), Jinlong Li (CIMSS), Robert Atlas (AOML), and Ross Hoffman (AOML)




(1) Compared with LEO, GEO sounder has larger spatial coverage and higher temporal resolution for regional NWP models,

(2) The GEO larger spatial coverage has value-added impact on track forecasts over LEO,

(3) More frequent assimilation of GEO sounder leads to improved track forecasts in Sandy case study with Quick-rOSSE, indicating the advantage of high temporal resolution for assimilation.

# J7.5 Impact Analysis of LEO Hyperspectral Sensor IFOV Size on the Next Generation High-Resolution NWP Model Forecast Performance

Agnes Lim[1], Zhenglong Li[1], James Jung[1], Allen Huang[1], Jack Woollen[2], Greg Quinn[1], Fred Nagle[1], S. B. Healy[3], Jason Otkin[1], , Mitch Goldberg[4] and Robert Atlas[5]

1. Cooperative Institute for Meteorological Satellite Studies
2. IMSG/NOAA/NCEP/EMC
3. ECMWF
4. NOAA/JPSS Program Science Office
5. NOAA Atlantic Oceanographic and Meteorological Laboratory

- **To assess the impact obtained from assimilation of next generation CrIS observations with increased spatial resolution in a high resolution global mode.**
- **G5NR, OSSE, GFS T1534**
- **Conventional data – All observation types simulated except dropsondes, NEXRAD winds and satellite track winds and GPSRO**
- **Satellite radiances from current observing system (2 IASI, CrIS, AIRS, ATMS, 6 AMSU-A and 4 MHS)**
  - **Flying satellites in the simulated atmosphere**
  - **Orbit simulator developed - Generate sensor geometry use in radiance simulation for any given set of start and end time**
- **Increased number of clear FOVs with increased spatial resolution (Figure 1)**
- **OSSE Calibration step Figure 2**

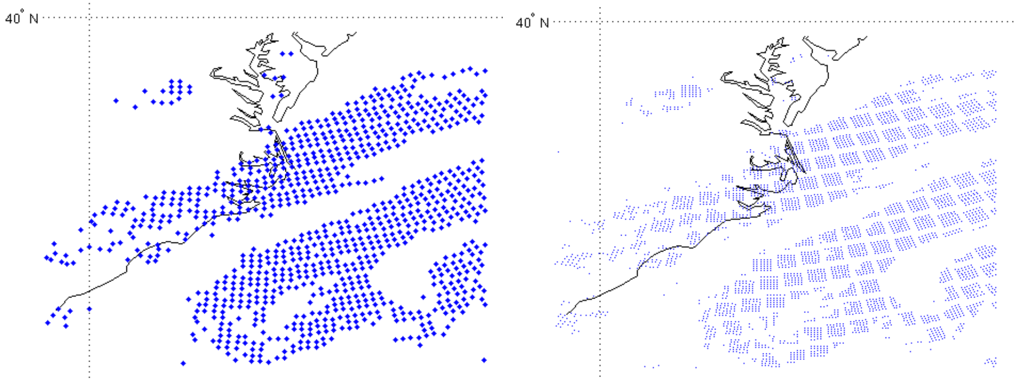



Figure 1 Clear FOVs for current CrIS (left) Clear FOVs for future CriS (right)

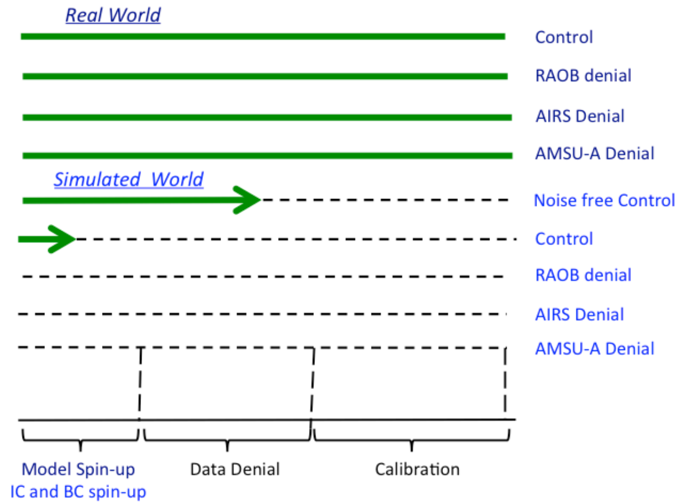



Figure 2 Assimilation Experiments for OSSE Calibration

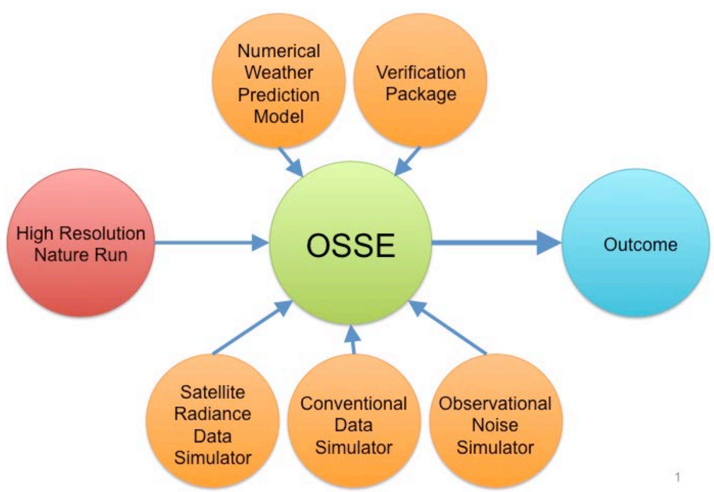
# 5.2 Analysis of CrIS FOV Sizes on the next Generation High-resolution NWP Model Forecast Performance Through an OSSE

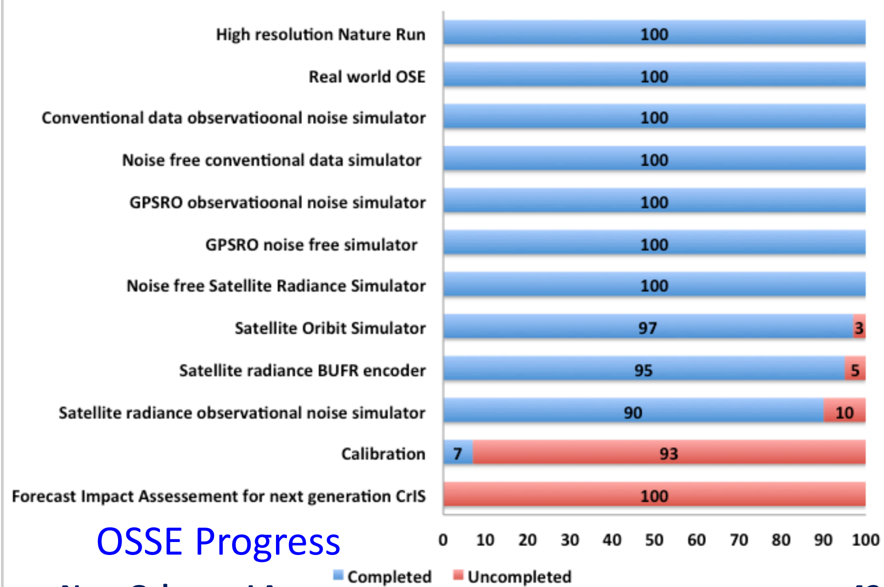
Agnes Lim[1], Zhenglong Li[1], James Jung[1], Allen Huang[1], Jack Woollen[2], Greg Quinn[1], Fred Nagle[1], S. B. Healy[3], Jason Otkin[1,], Mitch Goldberg[4] and Robert Atlas[5]

1. Cooperative Institute for Meteorological Satellite Studies
2. IMSG/NOAA/NCEP/EMC
3. ECMWF
4. NOAA/JPSS Program Science Office
5. NOAA Atlantic Oceanographic and Meteorological Laboratory

- **Assess the forecast impact of reducing CrIS FOV resolution from 14km to 7km.**
- **Allows for evaluation of forecast impact assessments of future sensors or different sensor characteristics, not only CrIS.**
- **Develop an orbit simulator for multiple sensors across multiple satellites to support satellite radiance simulation.**
- **Develop an end to end system for simulation and encoding of conventional and satellite observations into BUFR ready for assimilation.**

OSSE Framework




OSSE Progress

# A blended ice concentration product based on visible/infrared and microwave data

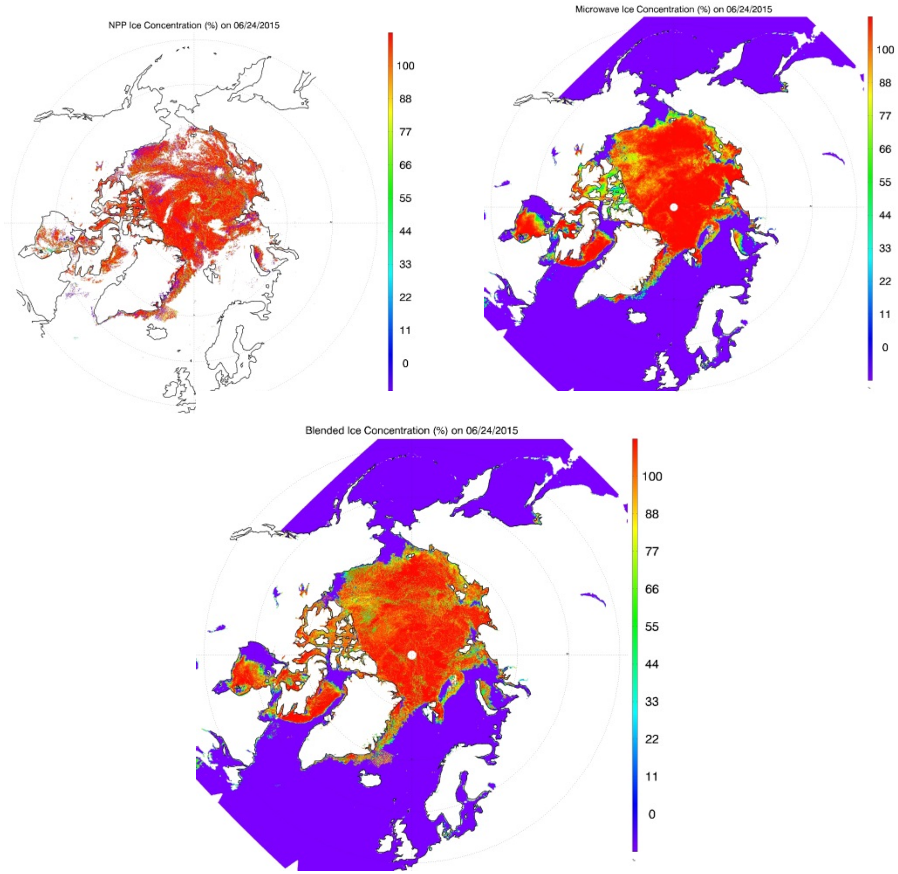
**Yinghui Liu(UW/CIMSS), Jeff Key (STAR)**

*12th Annual Symposium on New Generation Operational Environmental Satellite Systems*

- We present an blended, optimized, all-weather, high spatial resolution ice concentration and ice cover product based on passive microwave and visible/infrared ice concentration products.

- The Best Linear Unbiased Estimator (BLUE) is applied to derive the final ice concentration under clear-sky.

- Under cloudy conditions, the ice concentration is determined as the ice concentration from the microwave observations with bias correction.



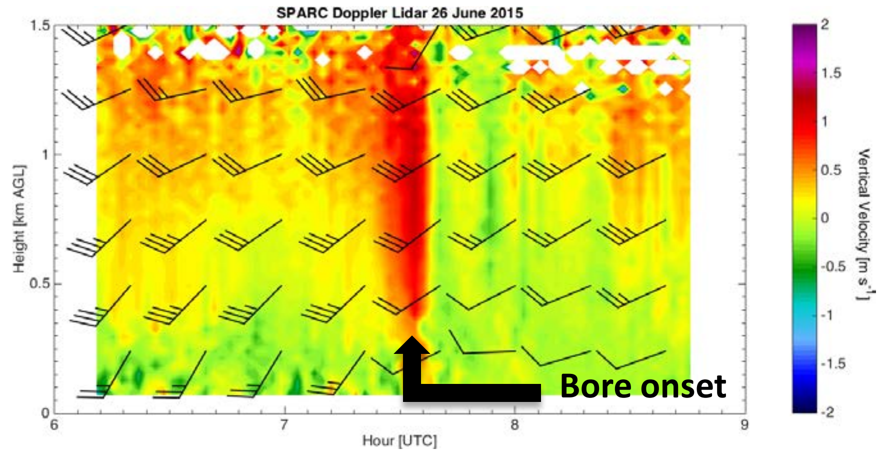

**Ice concentration from (Upper left) AMSR-2 at 6.25 km resolution and re-sampled to 1 km, (Upper right) from Suomi NPP VIIRS daily composite at 1 km using Enterprise algorithm, and (Lower) blended ice concentration on June 24th, 2015.**

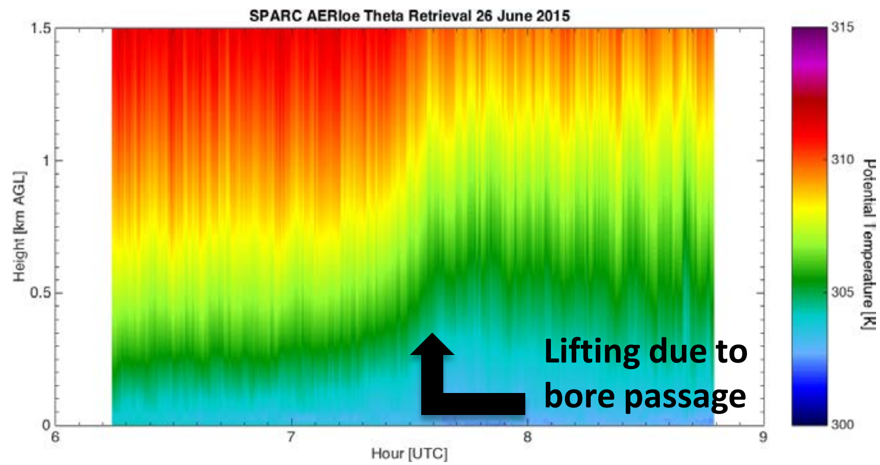
# High-Temporal Resolution Ground-Based Observations of an Eastern Kansas Bore during the PECAN Field Campaign

David M. Loveless[1], Nadia Smith[2], Christopher M. Rozoff[2], Timothy J. Wagner[2], David D. Turner[3], Wayne F. Feltz[2], Steven A. Ackerman[1,2]
[1]Department of Atmospheric and Oceanic Sciences, U. of Wisconsin-Madison
[2]Space Science and Engineering Center, Cooperative Institute for Meteorological Satellite Studies, U. of Wisconsin-Madison
[3]National Severe Storms Laboratory, National Oceanic and Atmospheric Administration

18th Symposium on Meteorological Observations and Instrumentation

- Present observations from ground-based remote sensing instruments during a 26 June 2015 bore passage
- Doppler lidar (right, top) identifies spike in vertical velocity at onset of bore passage around 0730 UTC
- AERIoe retrieved potential temperature (right, bottom) cross-section displays lifting of layer with the bore passage
- Future research: utilize these observations to analyze the bore's role in initiating convection

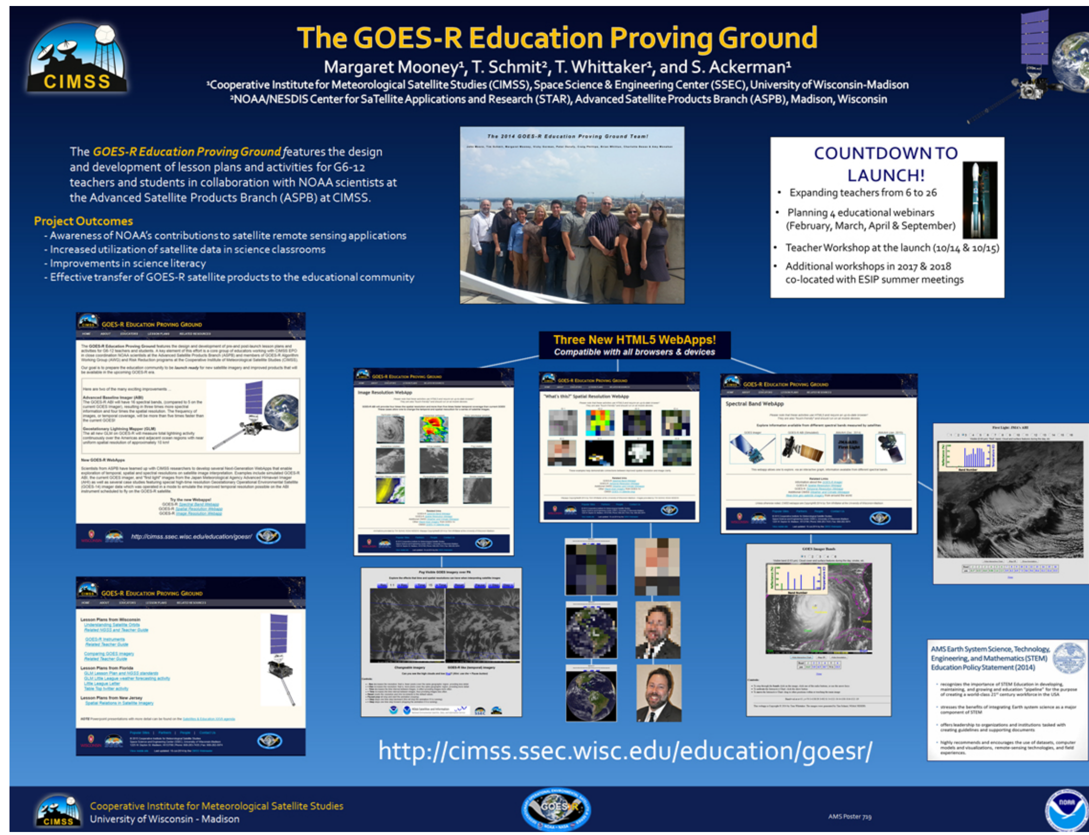


# GOES-R Education Proving Ground

M. Mooney, T. Schmit, T. Whittaker, S. Ackerman (AMS Poster 719)

- Expanding Teachers from 6 to 26
  - 4 webinars prior to launch
  - Each teacher will promote the launch
- 2-day workshop at KSC
  - October $14^{th}$ & $15^{th}$
  - 50 educators will attend & watch launch together!

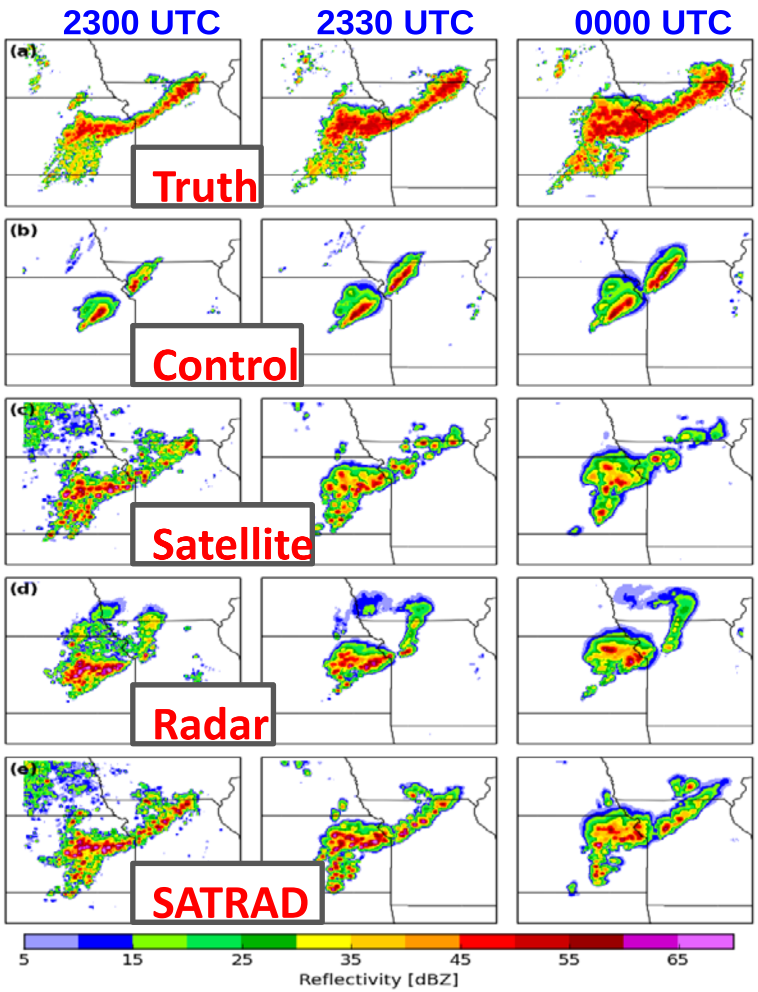


# Assimilation of GOES-R ABI Satellite and WSR-88D Radar Observations during a Convection-Resolving OSSE

**J. Otkin (UW/CIMSS), R. Cintineo, T. Jones, S. Koch, L. Wicker, and D. Stensrud**

*20th Conference on IOAS-AOLS*

- Truth simulation had a long line of thunderstorms
- Initial thunderstorm structure more accurate when satellite and radar observations were assimilated
- Best structure was obtained when both satellite and radar observations were assimilated
- Thunderstorms maintained structure longer during the SATRAD case

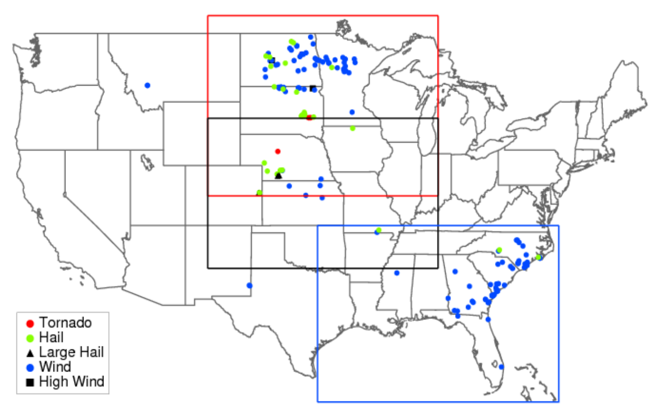


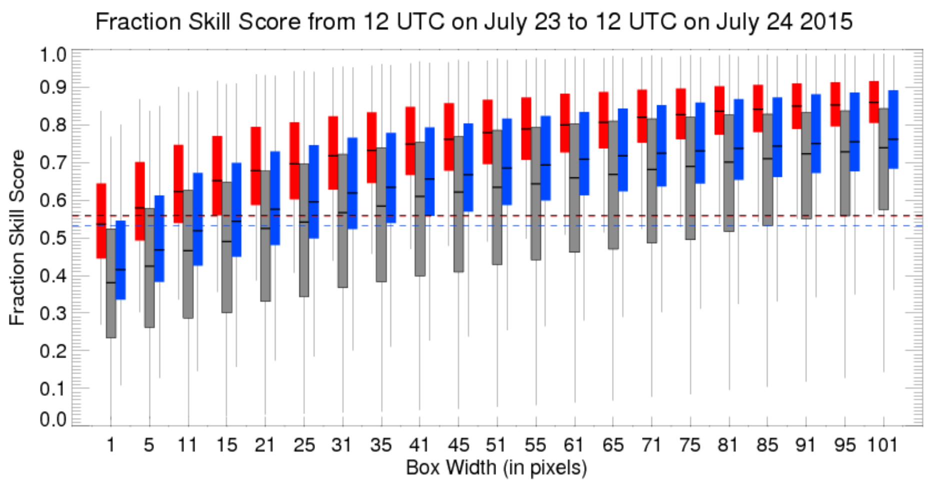
# Development of a GOES-Based Verification and Forecaster Guidance System for the High-Resolution Rapid Refresh Model

**Jason Otkin (UW/CIMSS), J. Sieglaff, S. Griffin, L. Cronce, and C. Alexander**

*15th Symposium on New GOES Systems*

- FSS computed for 3 regions with different convective modes
- Data masked using the 10th percentile of the BT distributions
- Box plot includes values for all forecast cycles and lead times
- Forecast skill highest for northern Plains in region with strongly forced convection
- Skill lowest in central U.S. because of more limited thunderstorm coverage



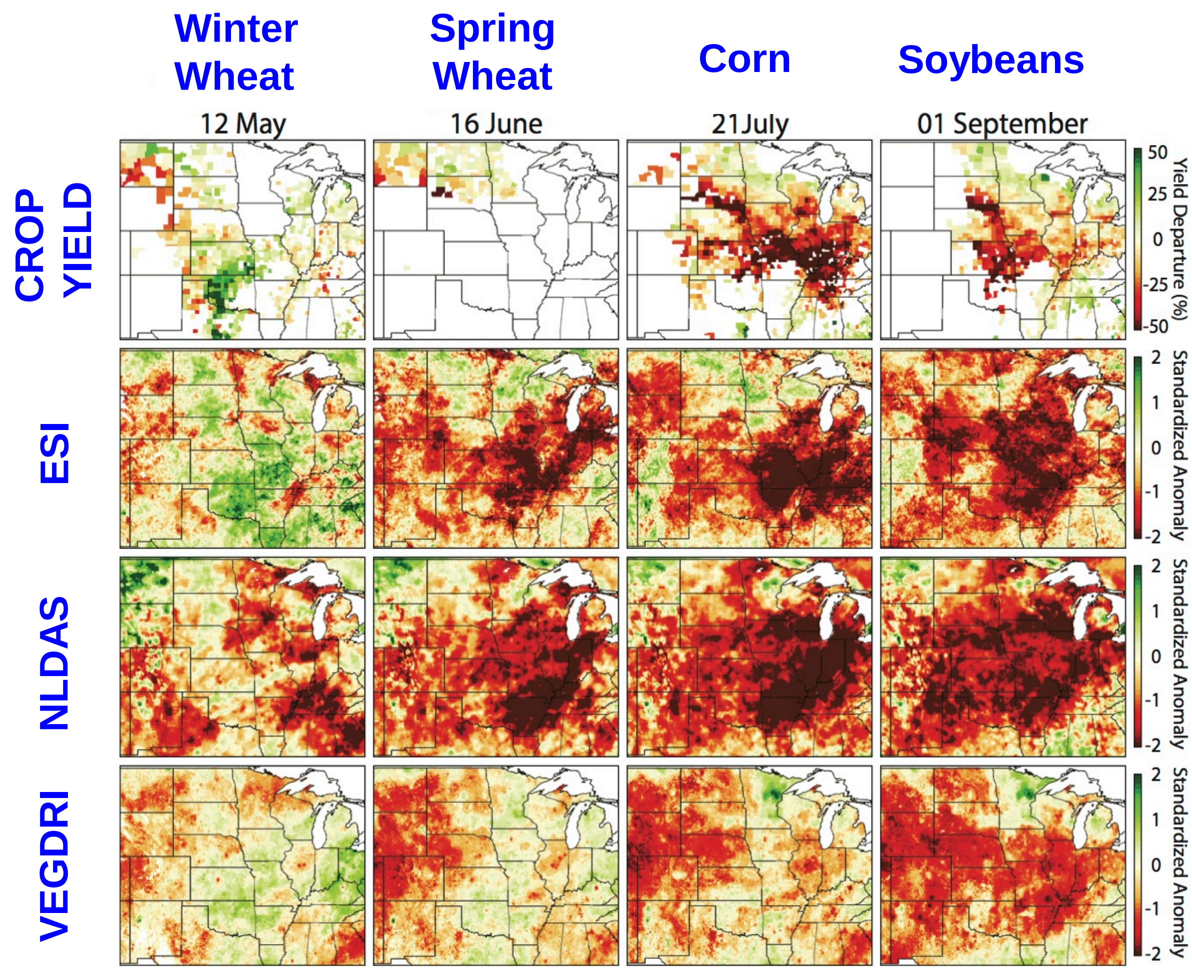



# Assessing the Evolution of Soil Moisture and Vegetation Conditions During the 2012 United States Flash Drought

**Jason Otkin (UW/CIMSS), Martha Anderson, Chris Hain, and Mark Svoboda**

*30th Conference on Hydrology*

- Drought conditions during critical crop stages during the 2012 flash drought
- Strong relationship between corn, wheat, and soybean yields and the ESI during critical crop stages
- NLDAS has strong (weak) relationship to corn/soybeans (wheat) yield

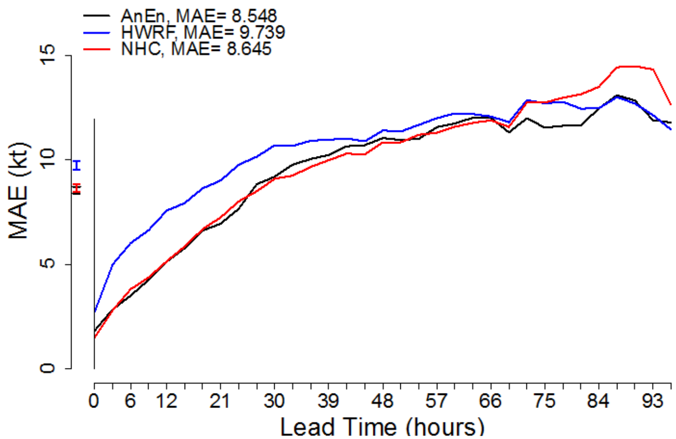


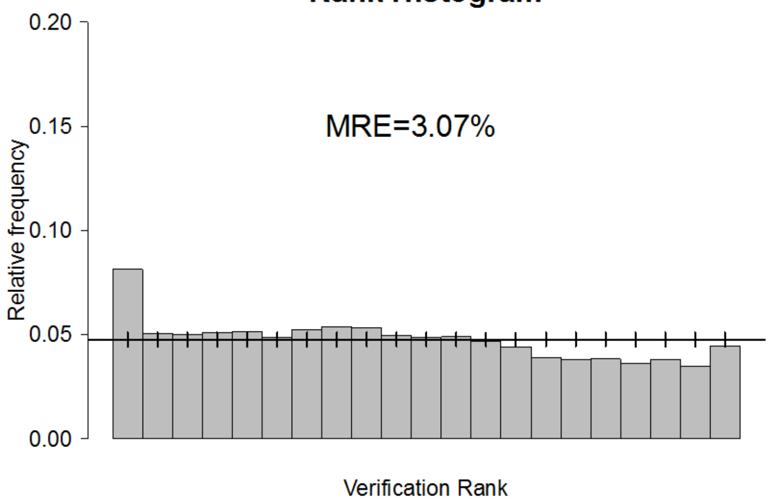
# Probabilistic Prediction of Hurricane Intensity with an Analog Ensemble

Stefano Alessandrini[1], Luca Delle Monache[1], Christopher M. Rozoff[2], William E. Lewis[2]
[1]National Center for Atmospheric Research (NCAR), Boulder, CO
[2]Space Science and Engineering Center, Cooperative Institute for Meteorological Satellite Studies, U. of Wisconsin-Madison

## Special Symposium on Hurricane Katrina, Poster Session

- We applied an Analog Ensemble (AnEn) technique (Delle Monache et al. 2011, 2013) to the problem of tropical cyclone (TC) intensity prediction.
- Using the operational HWRF and best track data, we developed a 20-member, naturally-calibrated ensemble prediction composed of analog historical forecasts from the HWRF (with the verifying observations matching each analog comprising the ensemble). It is computationally cheaper than dynamical ensembles, but produces similar benefits.
- The AnEn improves the HWRF intensity forecast by 12% in terms of maximum absolute error (MAE) in the Eastern Pacific (upper right)
- The ensemble is well calibrated, reduces bias of the deterministic HWRF forecast, and shows an excellent level of correlation between the ensemble spread and the root-mean square error. Rank histograms (right) confirm a proper level of statistical consistency.



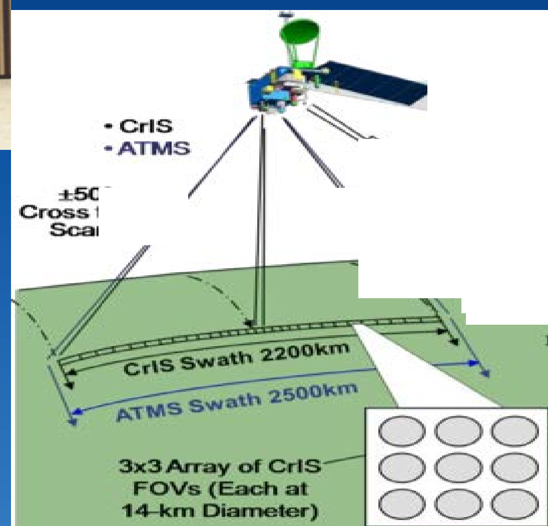
# CrIS - Evolution of the Operational Advanced Sounder

**W.L. Smith Sr.[1], H.E. Revercomb, F. Best, R. Glumb, D. Klaes, R. Knuteson, A. Larar, S. Mango, D. Tobin, D. Santek**

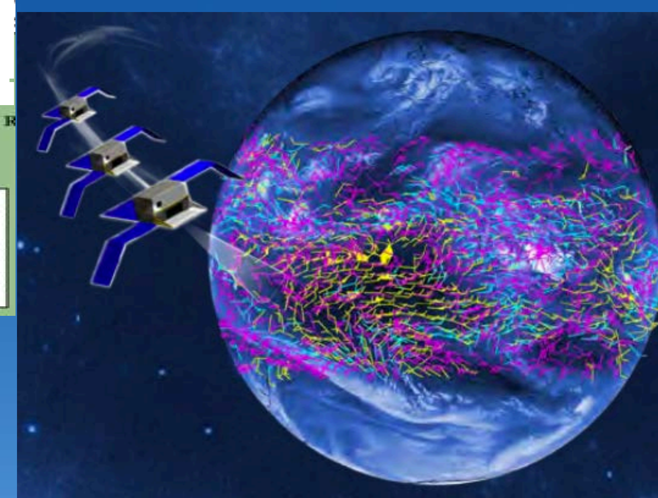
[1] CIMSS/SSEC University of Wisconsin - Madison

*UW – ER2 HIS (1985)*

*SNPP CrIS (2011)*




**WHISPER HyFI (2021)**



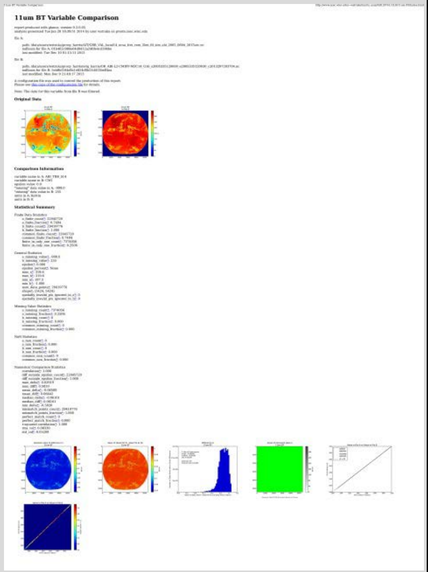
# Routine Validation of the GOES-R Multi-Satellite Processing System Framework

William Straka III[1], S. Sampson[3], R. Kuehn[1], G. Quinn[1], E. Schiffer[1], R. Garcia[1], G. Martin[1], R. Holz[1], T. Yu[3], A. Li[3], R. Rollins[3], W. Wolf[2] and J. Daniels[2]

[1]CIMSS/SSEC, University of Wisconsin-Madison, [2]NOAA/NESDIS/STAR, Camp Springs, MD 20746 USA,
[3]IMSG, Kensington, MD 20895, USA

- Product Visualization
  - McIDAS-V can visualize output from the GOES-R GS as well as testing framwork
  - McIDAS-V can be used to provide interactive comparisons between various products and satellites
- Product Verification
  - "Glance" tool can be used to compare output from various frameworks to verify proper integration
  - "Glance" output provides a variety of statistics and visual comparisons
- Real-time collocation and verification
  - Web interface that provides quick looks and validation products
  - Also provides as physically collocated quantitative performance information searchable by day or month averages.

## Example *Glance* output

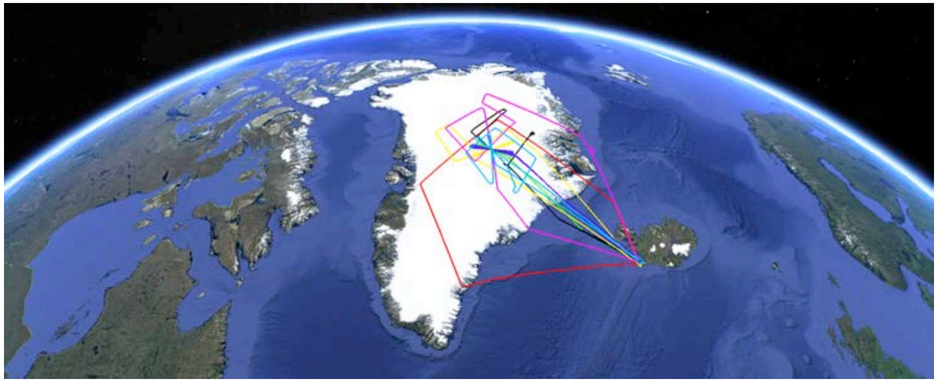

Links can be selected to provide a more detailed report of a given variable, along with the various statistics, such as how many missing pixels were in each file, the correlation between the two datasets, the mean/max/min difference, etc., as well as plots of the area of difference, a histogram of the distribution of the differences and plot of the differences

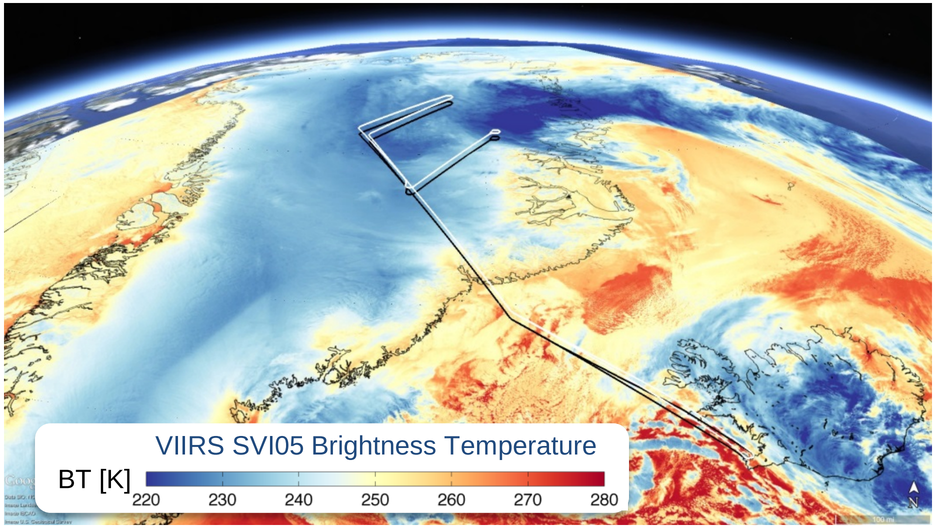
# Calibration Validation Of The Cross-track Infrared Sounder (CrIS) With The Aircraft Based Scanning High-resolution Interferometer Sounder (S-HIS)

Joe K. Taylor, D. C. Tobin, H. E. Revercomb, F. A. Best, R.K Garcia, A. Merrelli (SSEC, University of Wisconsin-Madison)
Mitch Goldberg (Joint Polar Satellite Systems Office, NOAA)

12th Annual Symposium on New Generation Operational Environmental Satellite Systems

- Purpose: To continue SNPP calibration validation with a specific focus on assessment of the calibration accuracy for cold Earth scenes, retrieval evaluation and satellite cross-validation
- Aircraft: NASA ER-2
- Payload: S-HIS (UW-SSEC), NAST-I (LaRC), NAST-M (LL), MASTER (AMES)
- S/C under-flights: SNPP, Aqua, Metop-A, Metop-B
- Base location / schedule: Keflavik, Iceland, 7-31 March, 2015
- Flight hours: ~ 42 hrs science, 65 hrs total; 7 mission science flights
- Preliminary results are very encouraging, showing campaign cold scene radiance differences to be less than those SNO-derived



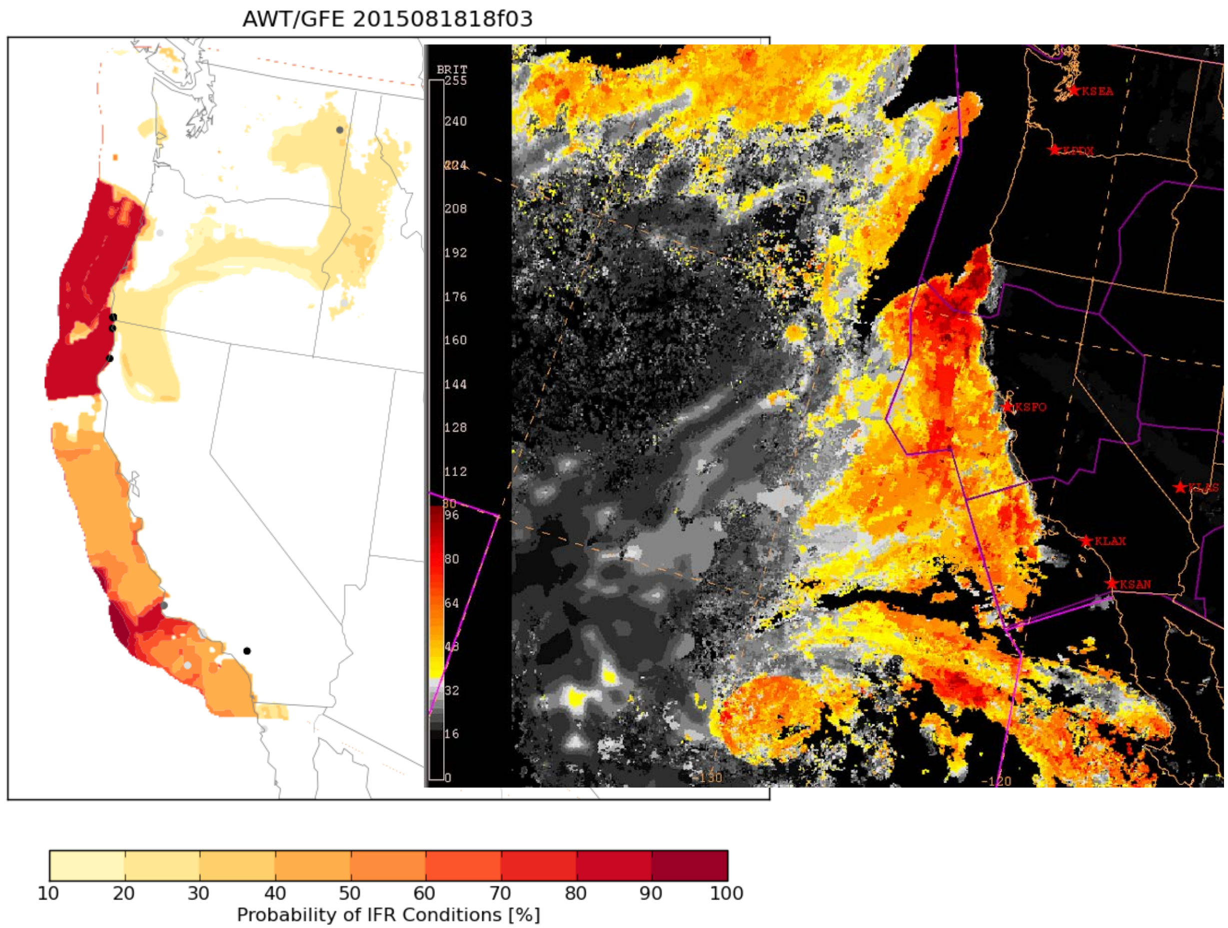


# A GOES-R Proving Ground Overview from the 2015 Summer Experiment at NOAA's Aviation Weather Center

**Amanda Terborg** - *CIMSS/Univ. of Wisconsin, Kansas City, MO*

The 5th Aviation, Range, and Aerospace Meteorology Special Symposium

- The GOES-R PG was part of the 2015 Sur Experiment at the A
  - CAWS support
  - C&V and tropical for verification
- GOES-R products te: SE15
  - NearCast Model
  - HRRR simulated sate webpage
  - ACHA cloud height a
  - Fog and Low Stratus
  - CTC/OTD



NOAA STAR CENTER FOR SATELLITE APPLICATIONS AND RESEARCH
Careers • Intranet • Contact • Skip navigation
cics-md Cooperative Institute for Climate & Satellites UNIVERSITY OF MARYLAND
CIRA
CUNY NOAA - Cooperative Remote Sensing Science and Technology Center
CIMSS

# The Impact of the High Temporal Resolution GOES/GOES-R Moisture Information on Severe Weather Systems in a Regional NWP Model

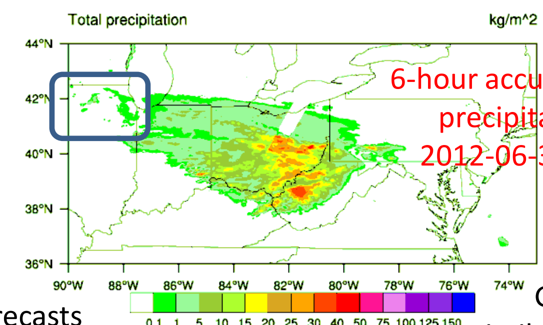

Pei Wang (CIMSS/AOS) , Jun Li (CIMSS), Yong-Keun Lee (CIMSS), Zhenglong Li (CIMSS), Jinlong Li (CIMSS),
Zhiquan Liu (NCAR), Tim Schmit (STAR) and Steve A. Ackerman (CIMSS/AOS)


96th AMS Annual Meeting: 20th IOAS-AOLS

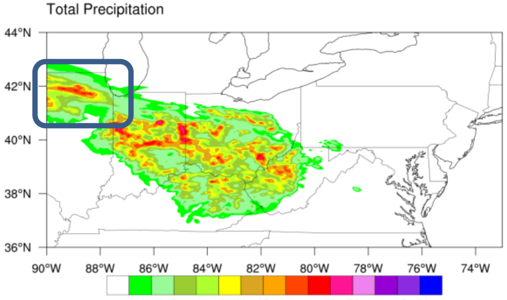
## Questions addressed in the study:

(1) How do the background fields affect the LPW assimilation?
(2) How to use the GOES/GOES-R LPW data for storm forecast in a regional NWP model?
(3) What is the impact of the GOES/GOES-R LPW data in regional NWP model, especially for the precipitation forecasts?
(4) How to assimilate GEO high temporal moisture information?

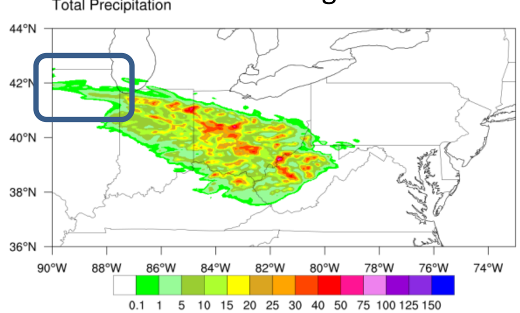
Observation




GFS as BG forecasts




GFS as BG forecasts
Assimilate GTS+High PW+Low PW





## Summary:

(1) The precipitation forecast is sensitive to the background fields, especially the moisture initialization;
(2) The total precipitable water (TPW) and three layered PW (LPW) data (High PW, Mid PW and Low PW) from GOES Sounder provide positive impact on precipitation forecasts, combining high and low PW provides best ETS for rain of 10 mm or lighter, while the TPW provides best score for rain of 10 mm or heavier;
(3) 4DVAR is helpful for assimilating high temporal moisture information for precipitation forecast.


**ETS scores of the assimilation of different layers of PW data**

| ETS scores | 0.1 mm | 1 mm | 5 mm | 10 mm |
|---|---|---|---|---|
| **GTS** | **0.5393** | **0.4978** | **0.4243** | **0.2330** |
| GTS+LPW(H) | 0.5639 | 0.5403 | 0.4447 | 0.2315 |
| GTS+LPW(M) | 0.4881 | 0.4137 | 0.3066 | 0.1770 |
| GTS+LPW(L) | 0.5446 | 0.5093 | 0.4312 | 0.2364 |
| GTS+LPW(HM) | 0.5578 | 0.5386 | 0.4486 | **0.2412** |
| GTS+LPW(ML) | 0.5335 | 0.4925 | 0.4274 | 0.2309 |
| GTS+LPW(HL) | **0.5800** | **0.5644** | **0.4510** | 0.2302 |
| GTS+LPW(HML) | 0.5434 | 0.4854 | 0.4171 | 0.2958 |

# CIRA

- Connell, Bernie
- Miller, Steve
- Musgrave, Kate
- Schumacher, Andrea

# JPSS User Readiness through Training: VISIT, SHyMet, WMO VLab and a new Liaison

**Bernie Connell, S. D. Miller, D. Bikos, E. J. Szoke, A. S. Bachmeier, S. Lindstrom, A. Mostek, B. C. Motta, L. Veeck, and J. Torres**

12th Annual Symposium on New Generation Operational Environmental Satellite Systems

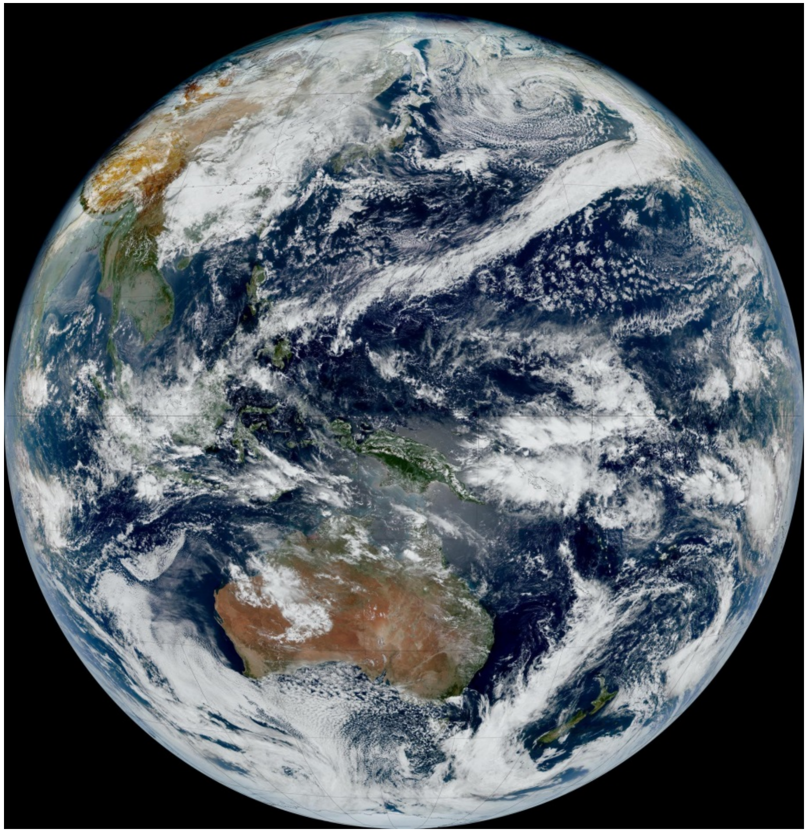
- Users: National and International National Weather Service
- Varied training approaches for varied users:
  - Knowledgeable, Capable, Skilled, Expert

# The Return of True Color to Geostationary Satellites: Transitioning from Polar, to Himawari-8, to GOES-R

Steve Miller[1], Tim Schmit[2], Curtis Seaman[1], Mat Gunshor[3], Dan Lindsey[2], Don Hillger[2], and Yasuhiko Sumida[4]

1=Colorado State Univ. / CIRA, CO; 2=NOAA/NESDIS; 3=Univ. Wisconsin-Madison / CIMSS; 4=JMA

- The Advanced Himawari Imager provides a useful proxy to GOES-R Advanced Baseline Imager for true color product development
  - Rayleigh corrections and a 'hybrid' green band have been developed for high quality AHI true color →
  - Used to train a 'green' band for GOES-R, which lacks this band
- Early results show overall good performance of the synthetic green band for ABI.
  - Greatest challenges in the coastal, shallow water zones.



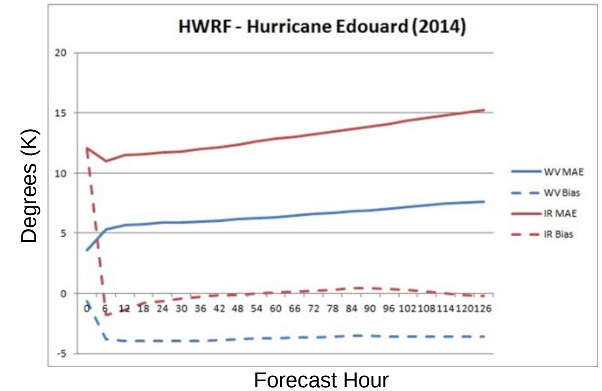
*Himawari-8 true color imagery*

# Examination of Tropical Cyclone Structure Through Synthetic Satellite Brightness Temperatures

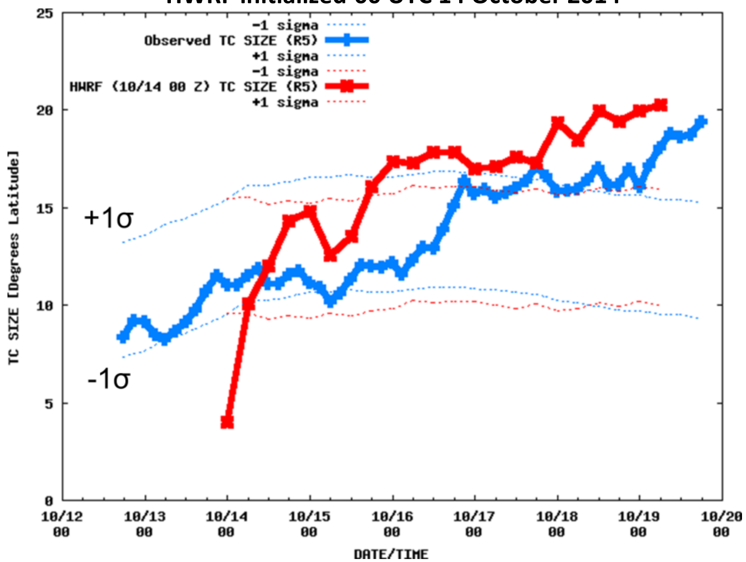
Kate D. Musgrave[1], John A. Knaff[2], Christopher J. Slocum[3], Lewis D. Grasso[1], and Mark DeMaria[4]
[1] Cooperative Institute for Research in the Atmosphere, Colorado State University, Fort Collins, CO
[2] NOAA/NESDIS/STAR/RAMMB, Fort Collins, CO
[3] Department of Atmospheric Science, Colorado State University, Fort Collins, CO
[4] NWS/NCEP/NHC, Miami, FL

20th Conference on Integrated Observing and Assimilation Systems for the Atmosphere, Oceans, and Land Surface (IOAS-AOLS) – Poster #664

- HWRF produces a cold-bias in the water vapor channel when assessing the full domain, for all forecast times
- HWRF produces a tropical cyclone that is too large when measured by infrared
  - After initial spin-up period
  - Remains too large when HWRF intensity is taken into account




Observed and HWRF Size Evolution for Hurricane Gonzalo (2014)
HWRF initialized 00 UTC 14 October 2014

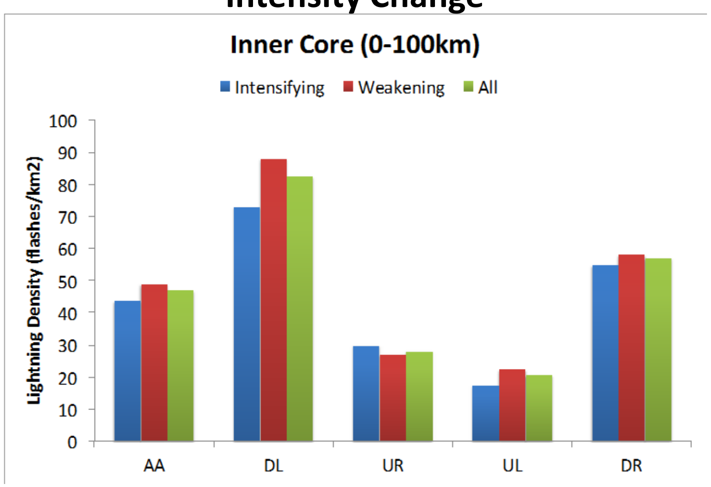


# Using Total Lightning Data to Improve Real-Time Tropical Cyclone Intensity and Genesis Forecasts

**Andrea Schumacher (CIRA / CSU) and Mark DeMaria (NOAA/NWS/NHC)**

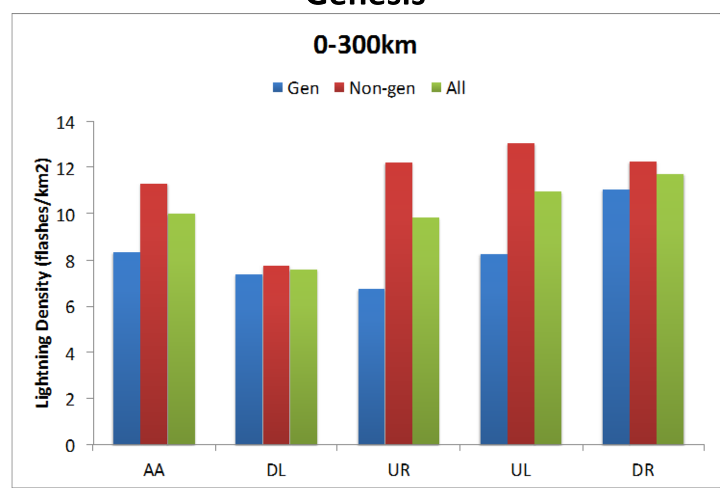
- **The relationship between tropical cyclone lightning and intensity change and genesis is still unclear**
- **GOES-R Geostationary Lightning Mapper (GLM) will provide continuous lightning flash data with a high total lightning detection efficiency**
- **In preparation for the GLM, this study seeks to…**
  - **Further examine relationship between total lightning activity and TC intensity change and genesis (statistics, case studies)**
  - **Determine how to best incorporate total lightning data into existing intensity and genesis guidance products**
- **Recent work has focused on relationships between *asymmetric* lightning predictors and TC intensity and genesis**
- **Using 2005-2014 World Wide Lightning Location Network global flashes as a proxy for GLM data, TC/disturbance-centered lightning data was divided into 4 quadrants relative to the 850-200mb vertical shear vector**
- **Results suggest asymmetric lightning predictors may provide a stronger signal than azimuthal averages currently used**

## Intensity Change




*Lightning activity in the downshear-left quadrant of the inner core may be a better predictor of TC weakening than the azimuthal average*

## Genesis




*Non-developing disturbances tend to have more lightning activity, particularly in the upshear quadrants*

# CREST

- Arend, Mark
- Carroll, Brian
- Glenn, Equisha
- Hamidi, Ali
- Hosannah, Nathan
- Khanbilvardi, Reza
- Kraatz, Simon
- Liu, Qin
- Merchant, Shakila (2)
- Nazmi, Chowdhury
- Rossow, William
- St. Pé, Alexandra
- Tippett, Shelbi
- Vant-Hull, Brian (2)

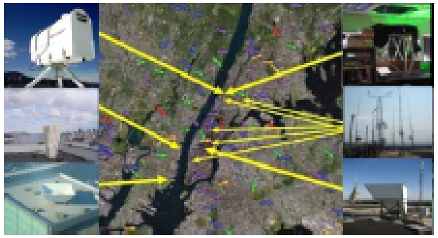
# Monitoring the urban atmosphere in NYC using ground based remote sensing vertical profilers and surface stations with applications to airborne toxins

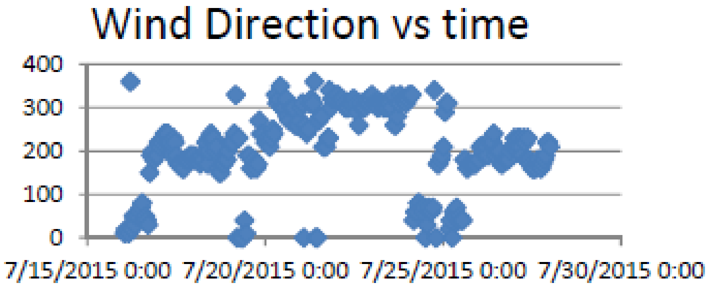
**Mark Arend**, City College of New York, New York, NY; and I. Valerio, S. Neufeld, and F. Moshary

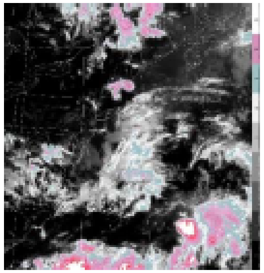
Seventh Conference on Environment and Health

- Informed regional stakeholders and federal agencies about the environmental forcings and transport of legionnaires disease
    - Surface stations (wind data) were used directly by stakeholders to help pinpoint the source.
    - Interactions with regional and federal stakeholders during a critical health event during the summer of 2015 provided a means to test research to operations capabilities
- Demonstrated capability of NYCMetNet ground based vertical profilers and surface stations for monitoring transport of airborne toxins
    - Microwave Radiometer profiles indicates high humidity and liquid water atmospheric constituents could have had a significant impact on bacterial transport
    - Doppler Lidar showed boundary layer mixing dynamics over the suspected incubation period
    - Periods of high humidity and liquid water content are also observed on water vapor satellite images

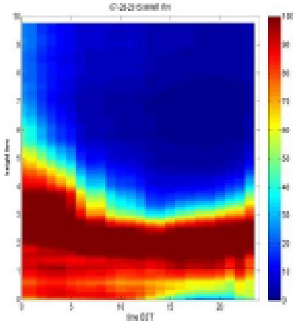
NYCMetNet





WV Satellite Image



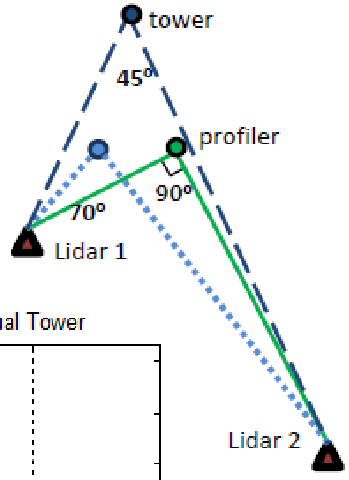
MW Radiometer profile

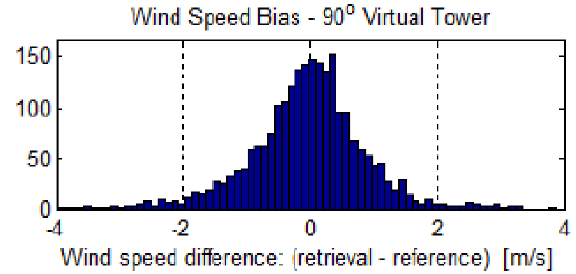
# Dual Doppler Lidar Retrievals in the Lidar Uncertainty Measurement Experiment (LUMEX)

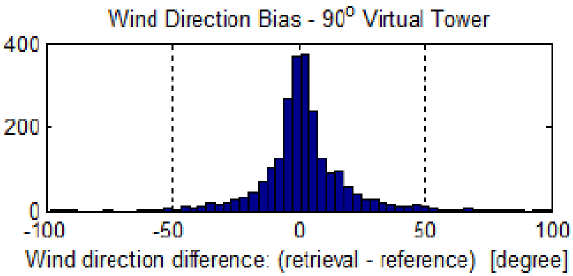
**Brian Carroll**[1], Aditya Choukulkar[2], Ruben Delgado[1], Alan Brewer[3], Julie Lundquist[4], Andreas Muschinski[5]

[1] UMBC; [2] CIRES, Boulder; [3] Chemical Sciences Division, NOAA, Boulder; [4] University of Colorado Boulder; [5] NorthWest Research Associates, Inc.

- LUMEX: Address uncertainties in Doppler lidar measurements and retrievals. Took place June–July 2014 at the NOAA Boulder Atmospheric Observatory
- Dual Doppler: Two lidars simultaneously scanning the same point in space. Greatly reduces the spatial and temporal footprint associated with single-lidar wind profile scans
  - Scan up and down to create a versatile "virtual tower" of wind measurements
- Calculated wind profile accuracy depends on many variables, and this study will quantify these dependencies to improve future research.
  - Lidar beam intersection angle
  - Dwell time at an intersection
  - Beam elevation
  - Atmospheric conditions



# Precipitation variations during the recent SST warming period in the Intra-Americas Region, 1982–2012

AMS 28th Conference on Climate Variability and Change

**Equisha Glenn**
*NOAA-CREST*
*Earth Systems Science/*
*Environmental Engineering Dept., CCNY*

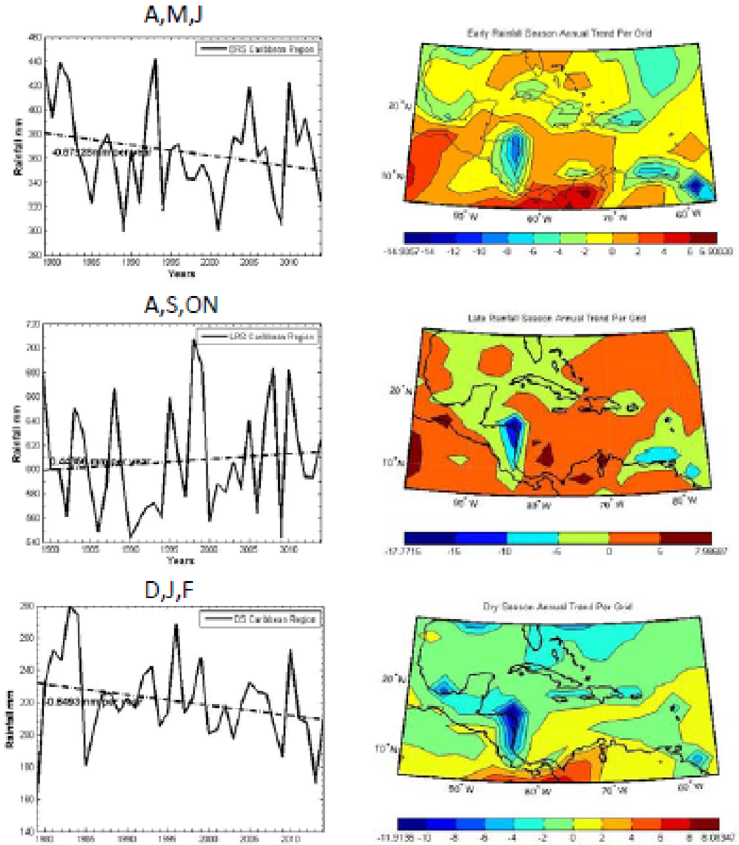
**Jorge E. Gonzalez, PhD**
*Mechanical Engineering Dept., CCNY*
*NOAA-CREST*

**Daniel Comarazamy, PhD**
*NOAA/NESDIS/STAR/SOCD*
*University of Maryland, College Park*

**Thomas Smith, PhD**
*NOAA/STAR/SCSB and CICS/ESSIC*
*University of Maryland, College Park*

IAR is a significant region of various climate activity and variability:

- SSTs and air temperatures show statistically significant regional and local warming trends within the IAR – annually and per season.
- Past 15 years (1997-2012) average precipitation for the LRS has been slightly above the climatology calculated from the year 1979 to 2012.
- Cross-correlations analysis shows significant correlations between warming Caribbean SSTs and precipitation in areas experiencing the greatest warming



# Spatial Clustering of Extreme Rainfall Events in Greater New York Area Using Weather Radar Data

Ali Hamidi [1]; Naresh Devineni [1]; James F. Booth [1]; Ralph R. Ferraro [2]; Reza Khanbilvardi [1]
1-CCNY, NOAA-CREST; 2-NOAA STAR, CICS-MD

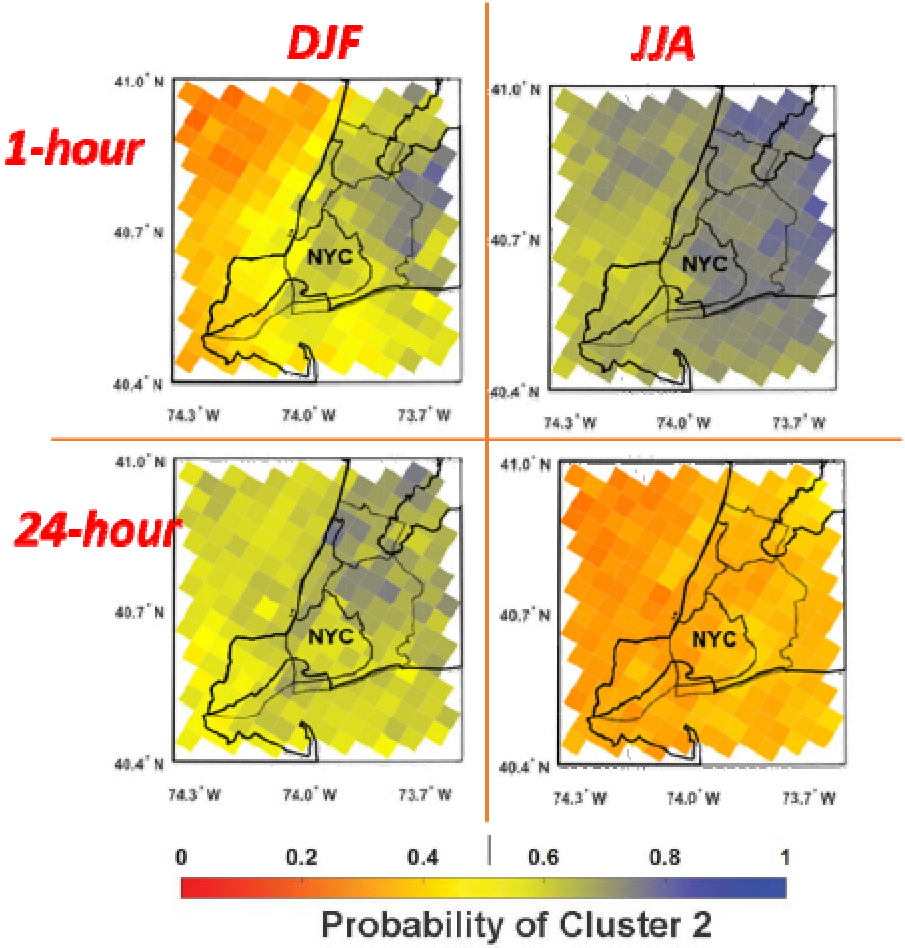
- We classified extreme events based on rainfall attributes (intensity, storm area exposure) and compared the pattern of summer vs winter and short vs long duration events by geo-referencing the probability distribution of these classifications (see the figure):

  **Cluster 1**: low intensity , small area exposure

  **Cluster 2**: high intensity , small area exposure

- There is significant separation in the intensity and area clusters.
- Clear spatial demarcation for the short duration storms during the winter season.
- Short duration summer storms are more intense with larger spatial exposure while the long duration summer storms are of low intensity and have smaller areal exposure.

- **[Verification of Results]** Events corresponding to the highest rainfall in short durations are not embedded in the corresponding long duration event, and therefore correspond to different meteorological process.
- **[Application]** Based on spatial dependency of grids that we find here, we are going to generate simulation of the events to provide probability of exceedance of rainfall over the city applicable in the context of green roofs, porous pavements and other innovations.



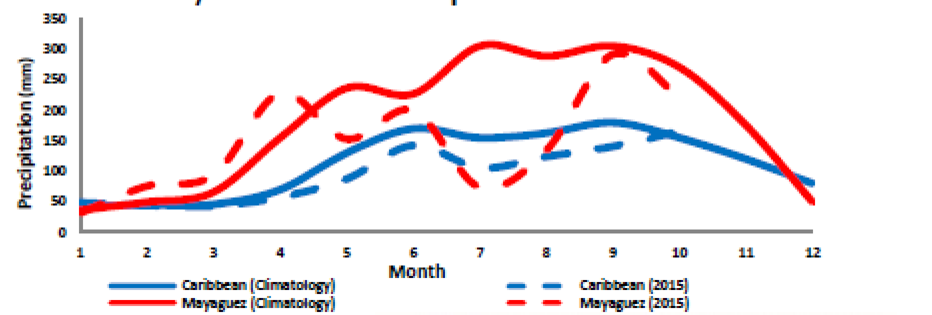
# The Convection, Aerosol, and Synoptic-effects in the Tropics (CAST) Experiment

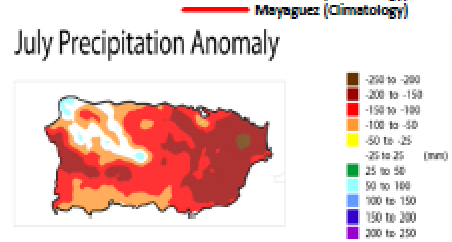
N. Hosannah[1], J. González[1], R. Rodriguez-Solis[2], H. Parsiani[2], F. Moshary[1], L. Aponte[2], R. Armstrong[2], E. Harmsen[2], P. Ramamurthy[1], M. Angeles[1], L. León[2], B. Bornstein[3], N. Ramírez[2], R. Davis[1], W. Peña[1], and D. Niyogi[4]
1 NOAA CREST and Department of Mechanical Engineering, The City College of New York
2 Department of Electrical and Computer Engineering, The University of Puerto Rico at Mayaguez
3 Department of Meteorology, San Jose State University
4 Department of Agronomy- Crop, Soil and Environmental Sciences, and Department of Earth and Atmospheric Sciences, Purdue University

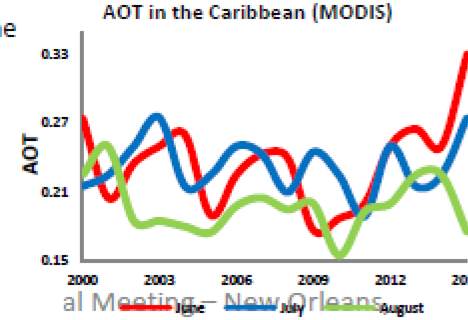
## Impacts of aerosols on storm dynamics, cloud physics, and precipitation II

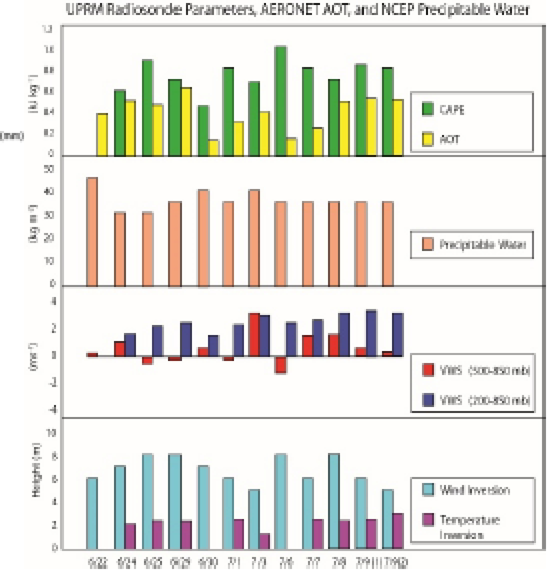
- We captured extreme drought conditions over Puerto Rico during the Summer of 2015 via an observational campaign.
  - El Niño caused reduced SSTs in the Atlantic, increased trade wind speed and VWS. Saharan dust (SD) presence in June and July was 48% and 11% higher respectively than the averages for these months over the last 15 years. SD suppressed droplet growth by condensation and collision/coalescence.

- Local dynamics further modified the atmosphere over Puerto Rico once the large scale conditions were in place.
  - With low SD (AOT < 0.21) and CAPE value of 1.1 kJ kg$^{-1}$, storms were able to form on the west coast due to afternoon seabreeze – tradewind convergence. When SD is 0.35 or greater, convective capping in the planetary boundary layer (PBL) begins to take place, and rain is suppressed.



# NOAA Educational Partnership Program
## A Unique Success Story of Education & Training in NOAA Sciences to increase Workforce Diversity in Earth System Sciences & Engineering

Reza Khanbilvardi[1], Vernon Morris[2], Paulinus Chigbu[3], and Michael Abazinge[4]
[1]NOAA-CREST, [2]NCAS, [3]LMRCSC, [4]ECSC

25th Symposium on Education

Through this paper, under the special session of promoting Diversity in Geosciences, part of the 25th Education Symposium, the authors, presented successful accomplishments and impacts of the CSC program on creating a diverse STEM workforce in NOAA related sciences

Also discussed the nationally recognized education model that has built upon key elements such as –integrating research and training, building infrastructure, community outreach and engagement, potential societal benefits of professional training and human resource development, and creating a diverse workforce of STEM professionals. The presentation will include qualitative and quantitative outcomes of the program and some success stories.

### Cooperative Science Centers
### Contributions to the Science, Technology, Engineering & Mathematics (STEM) Pool

Program implemented to address NOAA-wide issues of national significance

- Focuses on MSI community
- CSCs are partners with NOAA in advancing NOAA Sciences and contributing in all scientific core areas in NOAA-NGSP
- EPP: Student Tracking – critical component
  - CSCs have deliberate impacts on the K-12 sector
  - Research in NOAA mission critical areas underpin student training
  - Graduate Sciences Program: 20 from CSC in total pool of 59 hires

| EPP CSC Metric | Output |
|---|---|
| Total # of students, by gender, supported by CSC. | 2,047<br>F: 977<br>M: 976<br>Unidentified: 94 |
| Total # of students from underrepresented groups supported by CSC. | 1,660<br>F: 789<br>M: 783<br>Unidentified: 88 |
| Total degrees, by level, granted at CSC for students supported by CSC. | 1,234<br>Baccalaureate: 759<br>Master's: 333<br>Doctoral: 139<br>Other: 3 |
| Total # of graduated underrepresented students, supported by CSC | 942<br>F: 470<br>M: 442<br>Unidentified: 30 |
| Total # of students in the pipeline as of September 2013 | 993 |

Source: NOAA-OEd-EPP 06/30/2013
www.epp.noaa.gov

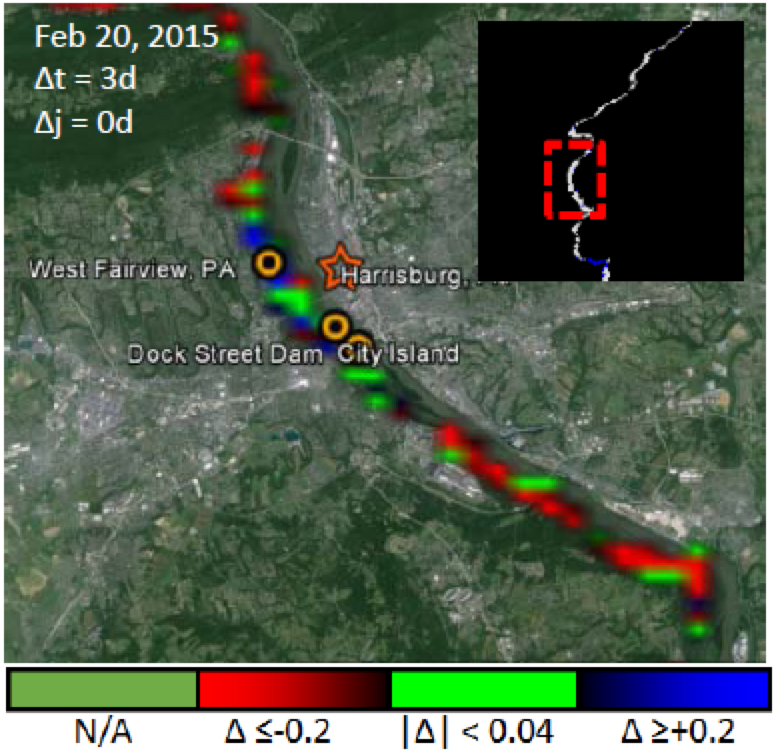
# Using river ice time series to identify ice related hazards

Simon Kraatz[1], R. Khanbilvardi[1] and N. Devineni[1]; [1]NOAA-CREST at CCNY

30th Conference of Hydrology: Hydrometeorological Extremes, Part 1

- Algorithm applied to VIIRS (WY2014)
  - Global cloud mask eff. revisit time is 20 days, VIIRS WY2014
  - Algorithm eff. revisit is 4 days for VIIRS, WY2014
  - MODIS eff. revisit is 3.7 days for all of WY2003-2015
- Δref. map identifies ice jams
  - WY2003-2015: 6 Ice jams, 5 were observed by MODIS.
  - 4/5 obs within +-1 day of jam
  - Jam locations indicated by Δref maps agree with in-situ obs (4/5)

Feb 20, 2015, NWS: On the east side of the island is still jamming and pushing on the bridges…the channel that has opened from West Fairview to the dam, is slowly filling in with chunks of floating ice.



# Determination of Planetary Boundary Layer Heights From Doppler Wind Lidar Measurements

Qin Liu[1], Thomas Rieutord[2], Alan Brewer[3], Aditya Choukulkar[2], Ruben Delgado[3]
[1] UMBC; [2] CIRES, Boulder; [3] Chemical Sciences Division, NOAA, Boulder

## INTRODUCTION

The purpose of this study is to evaluate the planetary boundary layer height retrievals from Doppler wind lidars. Analysis was applied to data collected from the two lidar systems during the July-August 2014 Discover AQ and LUMEX campaigns. This comparison aids applications in air quality and wind energy forecasting.

## METHODS

### Peak Detection Method

$$W_f(a,b) = \frac{1}{a}\int_{-\infty}^{\infty} f(z)\psi_H\left(\frac{z-b}{a}\right)dz$$

- Using Haar Wavelet Transform

- Mainly used for bt and vs range-corrected intensity profiles (Rci) and horizontal wind speed and direction Parameters to consider: value of a, b and the choice of thread for continuity test (longest, lowest, and strongest)

### Peak-based Thresholding

The BLH is defined as the highest point connected to the ground in the profile

;

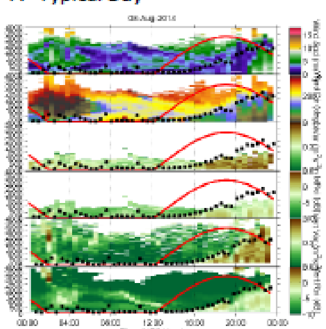
$$\tau_p = \min\left(0.9\,\sigma_w^B + 0.1\,\sigma_w{}^P,\ \sigma_w^0\right) \qquad Z_{CtG} = \max\{z\ /\ \sigma_w(z) > \tau_{P_{CtG}}\}$$

### Cluster Analysis

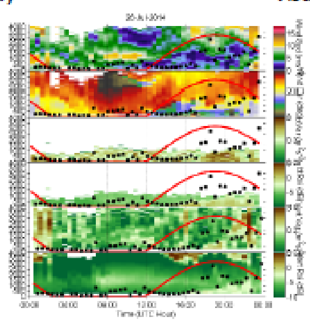
K-means Algorithm : Initialize the seeds (clusters) Calculate the distance from each point to each cluster Assign each point to the closest cluster Redefine the clusters as the centroid of points assigned Repeat the process until the intra-cluster variance no longer decreases

## RESULTS

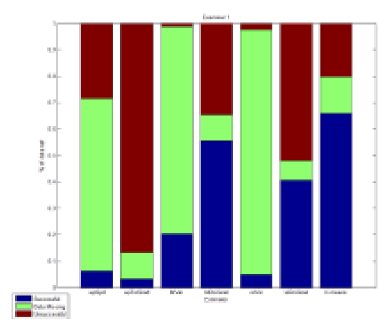
A "Typical Day"



A Bad Day



Visual Examination



According to the Visual Examination histogram, Cluster Analysis K-means result has the highest successful percentage and very high successful rate and availability rate. Peak threshold methods has highest successful rate but low availability rate. Haar Wavelet Transform method has highest availability rate but low successful rate.

Even though there are large percentage of missing data on the bt and vs variance profiles, they have relatively high successful rate. K-means (Cluster Analysis) result has the highest successful percentage since it combines the best result from each data scans based on time range of a day. wind data sets are not good estimates for boundary layer, but good for wind shear at the inversion level (LLJ). There is no wind structure that could identify the boundary layer.

# NOAA-CREST Pre-College Education & Training Model: High School Initiative in Remote Sensing of the Earth System Science and Engineering- HIRES

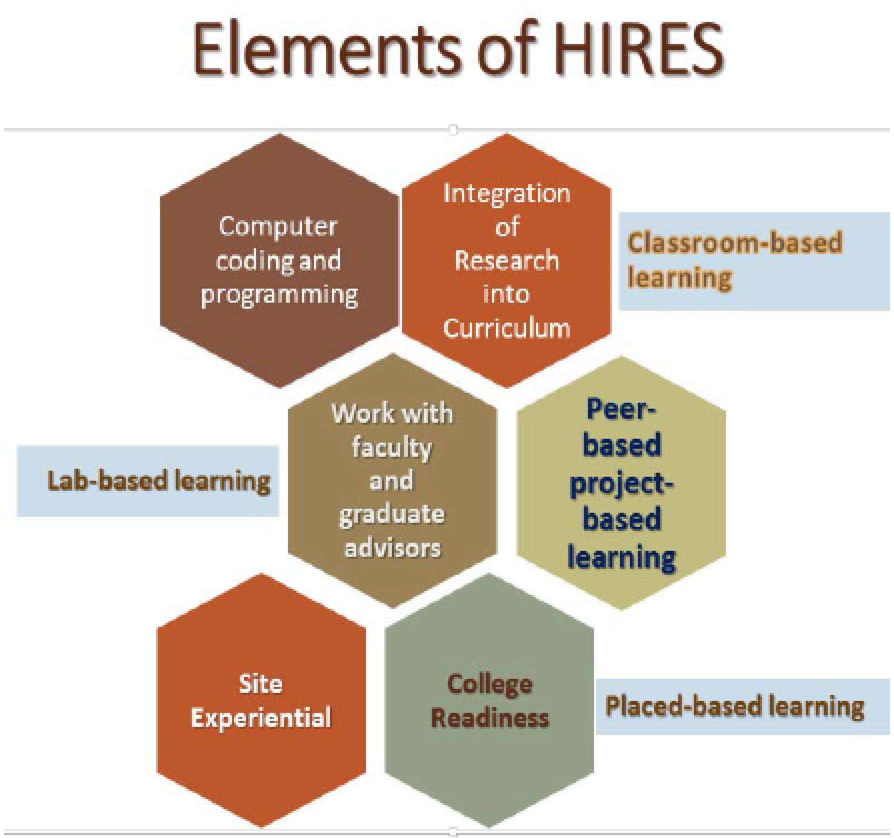
**Shakila Merchant, Reza Khanbilvardi and Emiko T.A. Morimoto**
NOAA-CREST, City College of CUNY

25th Symposium on Education

NOAA-CREST' High school initiative in Remote Sensing of the Earth System Science and Engineering (HIRES) is a unique K-12 education model that aims at creating pre-college pathways particularly for underrepresented and underrepresented groups of HS students within the 5 boroughs of the New York City Schools.

The program recruits, motivates, inspires and engages HS students (Grades 10 to 12) in a 7 week summer internship program. Critical elements of the program include - integration of research into curriculum in the field of Earth System Science and Engineering that includes introduction to GIS, MATLAB, and Python; hands-on research projects related to NOAA's missions of Climate Mitigation and Adaptation, Weather Ready Nation and Healthy and Resilient Ecosystem.

At the end of the program, students get 3 college credits, 70 hours of science research mentorship besides acquiring college-ready skill-sets. Through this paper the author shared the strategies, best practices and outcomes of the HIRES 2014 and 2015!



# Preparing a Next Generation Cadre of JPSS Scientists through Pragmatic Education and Training

**Shakila Merchant[1], Mitch Goldberg[2], Murty Divarkarla[3] and Reza Khanbilvardi[1]**
[1]NOAA-CREST, City College of CUNY, [2]NOAA/JPSS Program Science Office, [3]IM Systems Group

25th Symposium on Education

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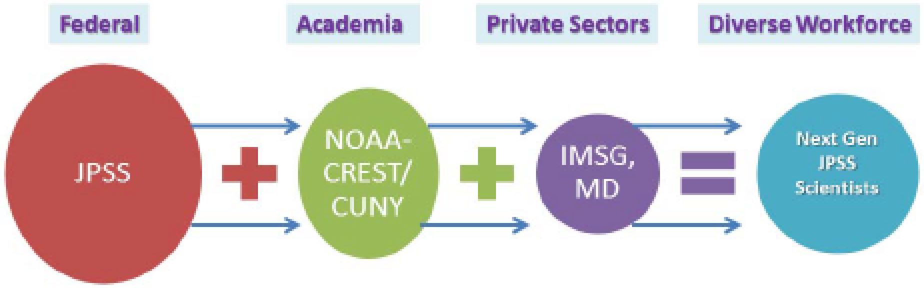
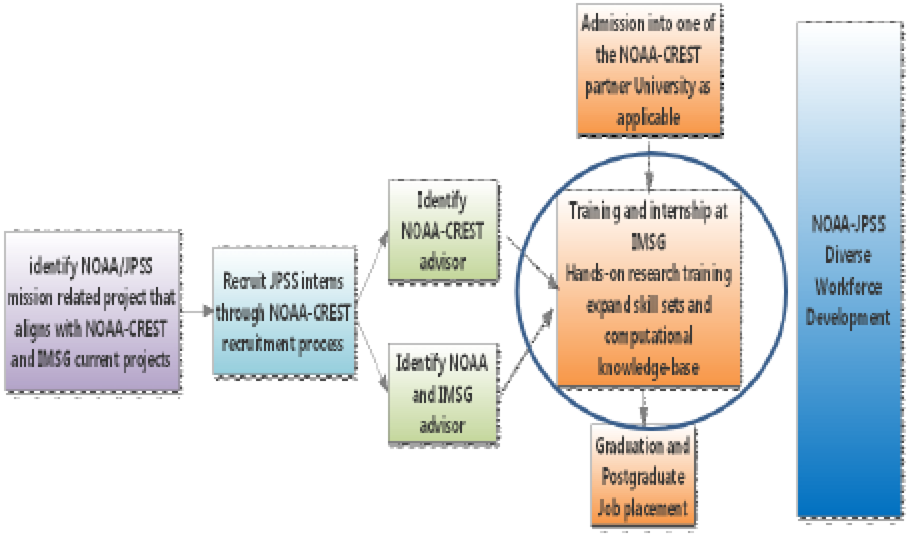


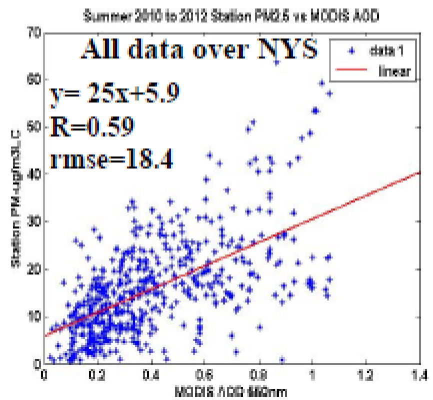
# Analysis of different aerosol plume products for identifying a useful Smoke Indicator (SI) and applying satellite AOD to predict surface $PM_{2.5}$

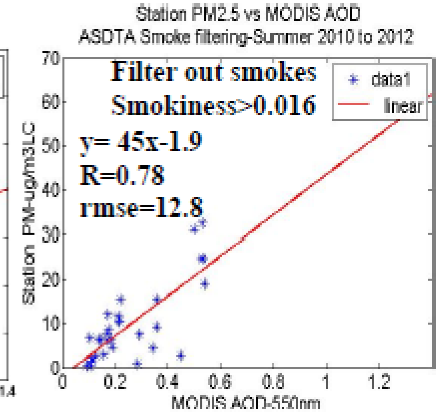
Chowdhury Nazmi[1,2], Yonghua Wu[1,2], Barry Gross[1,2], Shobha Kondragunta[3]
[1] CCNY, [2] NOAA-CREST, [3] NOAA NESDIS/STAR

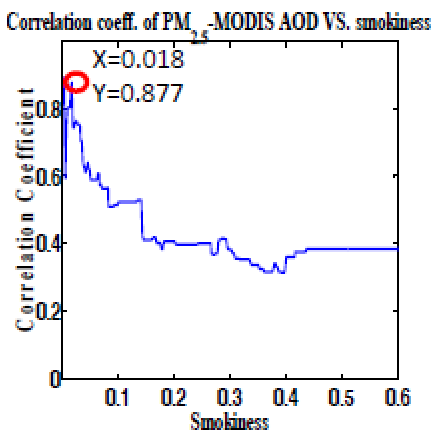
- By applying either NOAA-ASDTA or NAAPS model smoke indicator (SI) as a filter of smoke plume, there is a general improvement in the MODIS-AOD & $PM_{2.5}$ correlation over NYS.

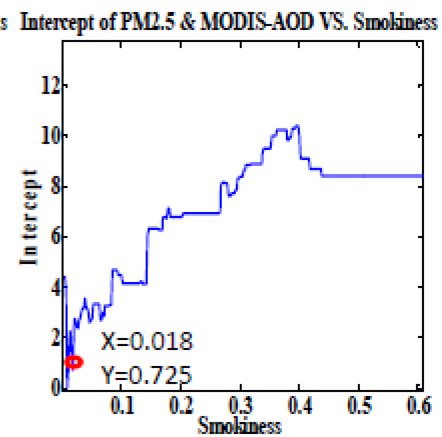
- Both the correlation coefficient and linear slope increase as the SI becomes lower while the regression intercept and RMSE decrease, which is consistent with removal of transported smokes. This implies that the SI can be used in a pre-processing mode to filter smoke cases.

➢ In the future, we plan to add the SI as an additional factor to more complex processing approaches such as NN's to improve $PM_{2.5}$ estimation, and use VIIRS-AOD products (EDR and IP) and smoke mask.



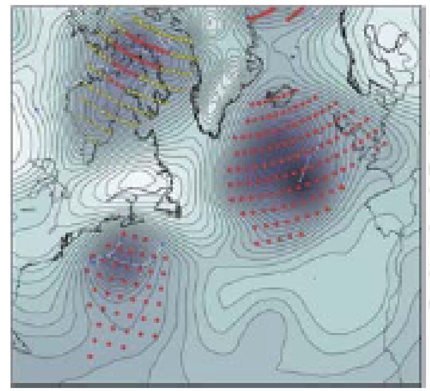



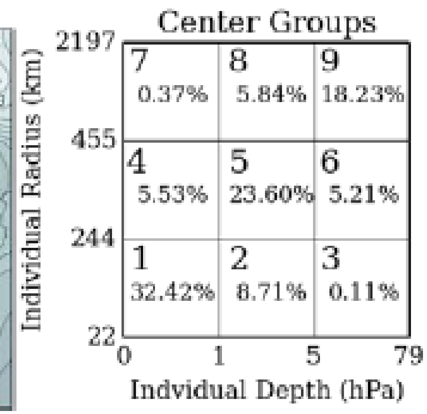



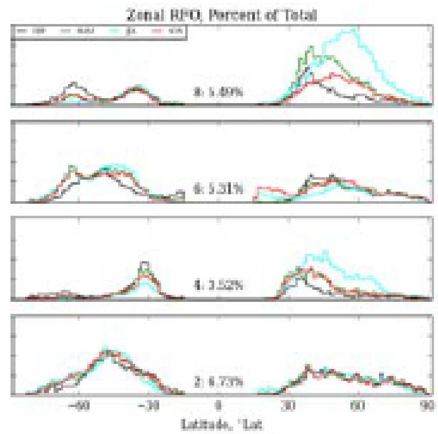
# Extratropical Cyclone Characteristics and Cloud Processes

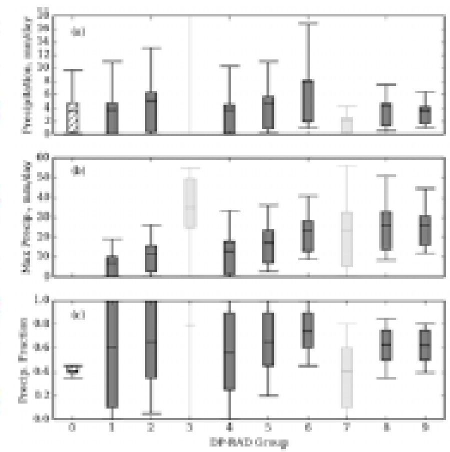
James B. Polly and William B. Rossow
NOAA-CREST

- Track cyclones and classify, studying precipitation and cloud radiative effect (CRE) associated with each group.
- Useful to classify storms by depth & radius.
  - Northern groups shift poleward in warm season.
  - Larger, weaker storms prefer warm season and land.
  - Smaller, deeper storms prefer cool season and ocean.
- Average precip. & CRE same for all groups.
  - Maximum (minimum) precip. & CRE increase (decrease) for larger, stronger groups.
  - Averaging obscures differences between storm types, differences only appreciable in extreme values.
- Next study spatial distribution of diabatic heating within the storm interior, and its effect on storm life cycle.





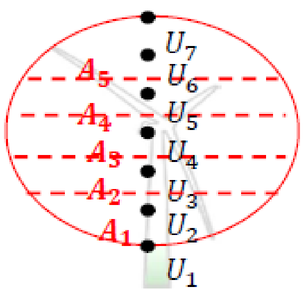



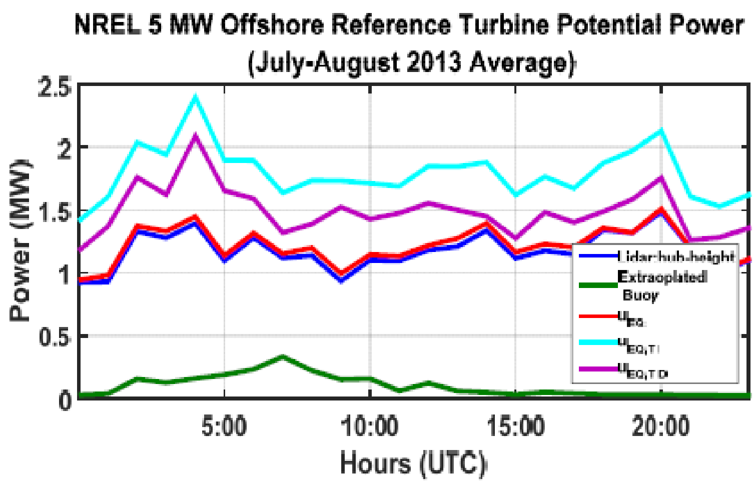
# Improving Offshore Wind Energy Resource Estimates Using Doppler Wind Lidar: Research to Operation

Alexandra St.Pé , Farrah Daham, Graham Antoszewski, Scott Rabenhorst, Ruben Delgado

- Accurately characterizing an offshore wind resource, *prior* to wind farm construction, is imperative for developing an economically viable project



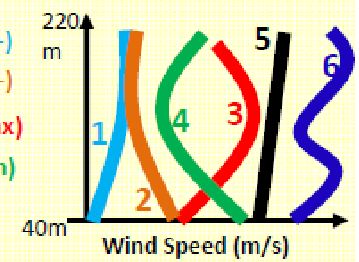

A better approximation of wind resource potential is demonstrated when using Doppler wind lidar to determine equivalent wind speed values that account for micrometeorology controls (wind speed & direction shear, turbulence) through-out turbine rotor layer .

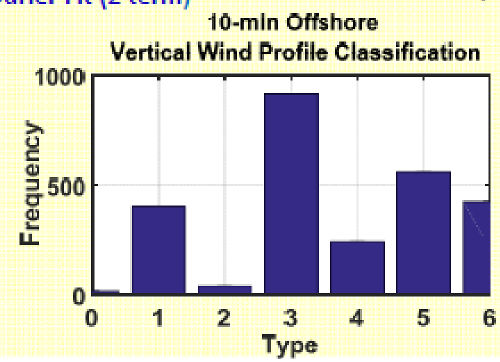



## Next Steps:

The shape of 10-min offshore wind speed profiles are classified . Relationships between *Type*, local meteorological conditions & power estimates will be evaluated next.

Type I: Logarithmic, 'power law', Fit (+)
Type II: Logarithmic, 'power law', Fit (-)
Type III: Low-Level Wind Max (LLWMax)
Type IV: Low-Level Wind Min (LLWMin)
Type V: Linear Fit
Type VI: Fourier Fit (2 term)



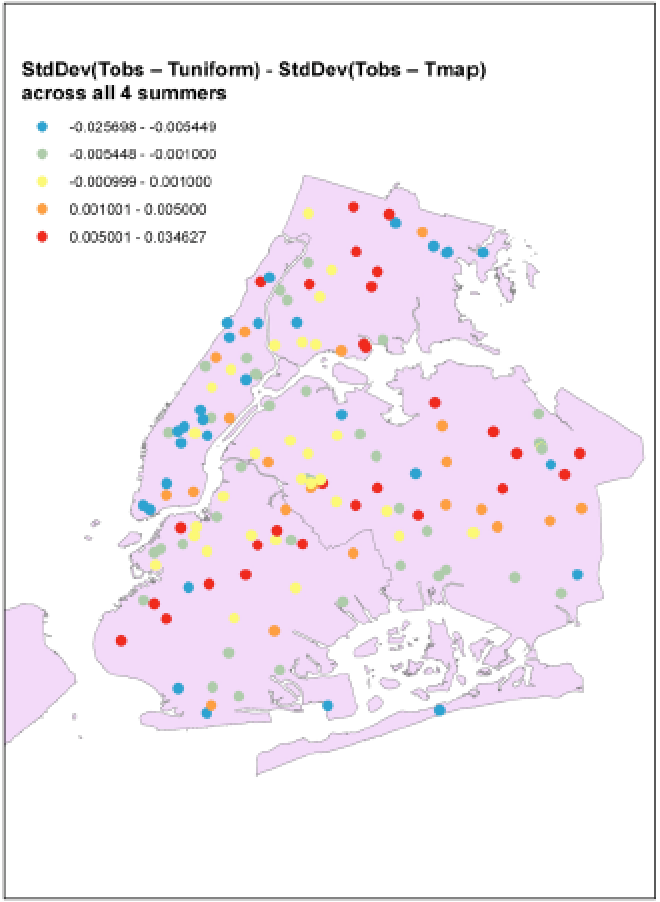



# Validation of Statistical Fine-scale Urban Temperature Model

*Brian Vant-Hull, Maryam Karimi, Estatio Guiterrez, Awalou Sossa, Louis Waxman: NOAA-CREST;*
*Sarah Johnson: NYC Dept of Public Health*

7th Conference on Environment and Health

- Statistical model derived from field campaigns
  - Temperature anomalies from surface features
  - Anomaly amplitude based on weather
- Validate on 3 months Obs
  - Model Reduces deviations by 8% on average
  - Higher elevations match better: wind effects

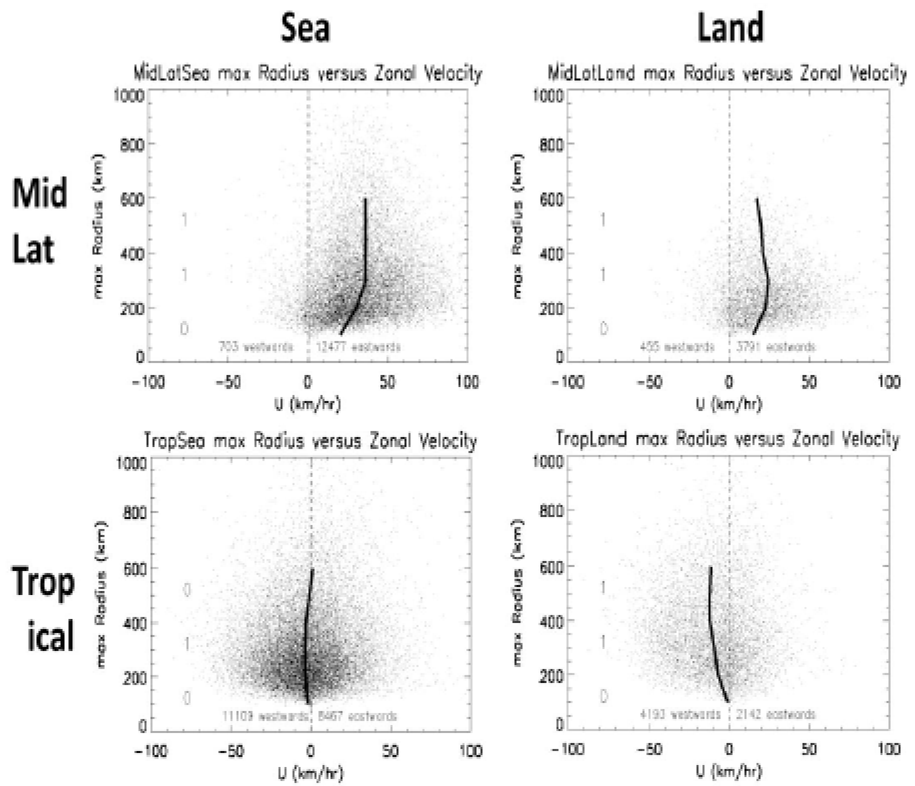


# Is the MJO Signature a Continuum?

Brian Vant-Hull, William Rossow, Cindy Pearl: NOAA-CREST

AMS 4th Symposium on Prediction of the Madden-Julian Oscillation

- Velocity Distributions
  - Distributions of zonal velocities of convective systems are bell shaped
  - Distributions are nearly centered in the tropics, strongly inclined to eastwards in midlats
- Size Effects
  - In tropical oceans, large systems have greater likelyhood to move upstream



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