

# GOES-R/JPSS Program



## CIMSS/ASPB Participation GOES-R/JPSS Proving Ground Status

Wayne Feltz, Mike Pavolonis, Tim Schmit, Andy Heidinger, Jordan Gerth, Scott Bachmeier, Scott Lindstrom, Justin Sieglaff, Lee Counce, Robert Aune, Gary Wade, Brad Pierce, Kaba Bah, Will Straka, Jason Otkin, Sarah Monette, Chris Velden, Ralph Petersen, Russ Dengel and Chris Schmidt

May 6, 2013





# Satellite Proving Ground @ CIMSS/ASPB



- Demonstration of Satellite PG applications at National Center Testbeds/Demonstrations and NWS WFO
- New simulated WRF-Chem Proxy ABI products
- AWIPS-2 status
- Training
- GOES Imager Schedule updates
- Upcoming meetings/conferences



## Satellite Liaison: Bill Line (New)

- **HWT Products:**

- Simulated Cloud and Moisture Imagery (Otkin/Sieglaff/Lindsey – CIMSS/CIRA)
- Legacy Temperature and Moisture Profiles (Petersen/Line - CIMSS)
- Cloud Top Cooling (Feltz – CIMSS)

- **Continue streamlining formats for AWIPS-2**

- **Plan for NOAA HWT 2013**

- 6 – 10 May – Lee Cronic, Amanda Terborg
- 13 – 17 May – Jordan Gerth, Amanda Terborg, Wayne Feltz
- 20 – 24 May – Jason Otkin, Chad Gravelle, Bill Line

- **UW-CIMSS satellite applications “Boot Camp” will be held 8-19 July 2013**

### Satellite Liaison: Amanda Terborg

- **Aviation Weather Testbed Summer Demo: August 12 – 23, 2013**
  - WRF Simulated ABI Imagery
  - GOES Cloud Top Cooling
  - GOES(-R) Overshooting Top
  - Thermodynamic NearCasting
  - GOES(-R) Cloud Top Height and Cloud Top Temperature
- **CIMSS participants**
  - 12-16 August Justin Sieglaff
  - 12-14 August Wayne Feltz
  - 19-23 August Jordan Gerth
- **VIIRS data now available for AWC but not tested in operations yet**



# 3) NWS Operational PG and WFO Interactions



## Satellite Liaison: Chad Gravelle

- Continued coordination of GOES-R Fog/Low Stratus products into operations (West Coast evaluation begins later this month with SEW, EKA, LOX, MTR).
- Coordinated 2013-2014 PG NWS TC demonstration plan.
- Convective Cloud-Top Cooling (part of “convective-initiation toolbox”) evaluation with CR and ER WFOs begins later this month, intermountain West WFO evaluation in June.
- Assisted in distributing VIIRS bands (including DNB) to local WFO, Monterey and Louisville.
- Assisted CRH and ERH with successful display of Fog/Low Stratus products in AWIPS 2.
- Working through NWS Operational PG regarding content of Proving Ground AO and how it relates to ongoing GOES-R PG activities.



- **Automated ash cloud alerts from AVHRR and MODIS will be provided to the VAAC and CWSU soon (training needs to be updated first).**
- **VIIRS NetCDF files verified to be AWIPSII compatible**
- **VIIRS VISIT NWS training module under development**
- **Polar2grid tool being expanded for GEOCAT AK products**
- **OCONUS meeting 17-21 June 2013 Participant list:**
  - **CIMSS: Wayne Feltz, Jordan Gerth, Ralph Petersen, Liam Gumley, Chad Gravelle, and Amanda Terborg**
  - **ASPB: Jeff Key and Mike Pavolonis**

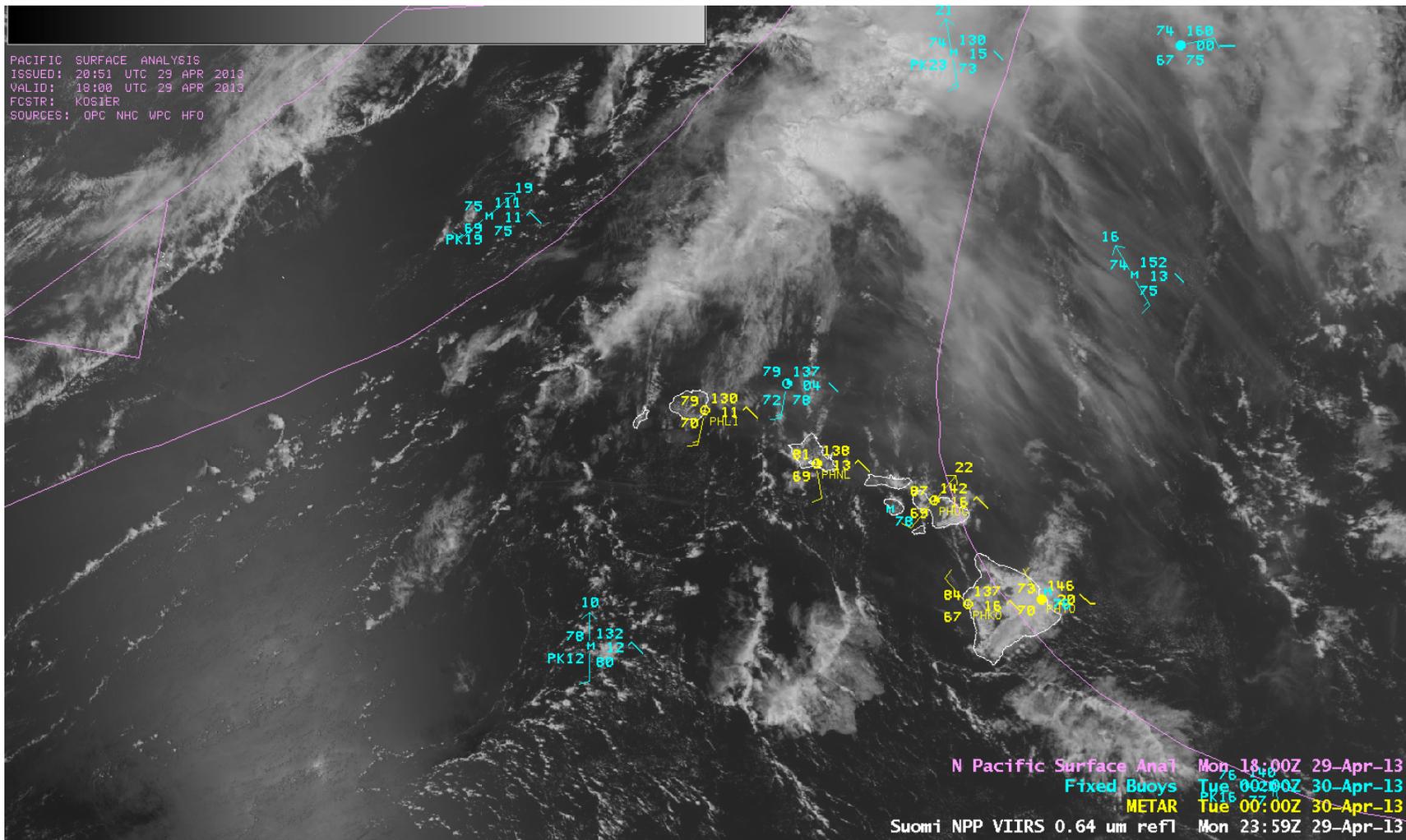


## 5) Pacific Region/Hawaii Demonstrations



- As part of a visit during the week of April 29<sup>th</sup>, Jordan Gerth met with Roy Huff and Steve Businger, as well as NWS Honolulu and Pacific Region management, to discuss plans for the new visiting scientist program
- Jordan demonstrated existing VIIRS imagery and MIMIC product to a few staff members at NWS Honolulu
- More information about the visiting scientist program will be forthcoming from Bill Ward; invited scientists will be scheduled according to product priority and seasonal relevance (e.g., cloud top cooling in winter months)
- Eric Lau and Jordan plan to travel to Pago Pago after the OCONUS meeting in June to expand PG activities to American Samoa





Suomi NPP VIIRS 0.64 um imagery with surface observations, April 29, 2013

Credit: Scott Bachmeier



# 5) Pacific Region/Hawaii Demonstrations



- Satellite system (L/X-band antenna) data science training tentatively scheduled for August 19 through August 23 at the University of Hawaii at Manoa
- Transition to AWIPS II at NWS Honolulu not expected until early 2015
- ORI (CIRA) and QPE (NESDIS/SPoRT) are now available in AWIPS at NWS Honolulu; MODIS tested in AWIPS II at PRH
- GOES Sounder Derived Product Imagery (DPIs) for Hawaii are tentatively scheduled to be operationally produced and disseminated in August (per Jim Heil)
- Volcanic ash and SO<sub>2</sub> (from MODIS) will be made available later this year, per existing plan





# 6) Satellite Proving Ground for Marine, Precipitation, and Hazardous Weather Applications



## Satellite Liaison: Michael Folmer

- UW-CIMSS providing Overshooting-Top/Enhanced-V products (same methods as SPC delivery), N-AWIPS displayed at OPC, WPC, and SAB. Will be working with TAFB to get the product down there (Trip in late May)
- Cloud top height, phase, and temperature from GOES imager are in progress for display within N-AWIPS and AWIPS
- The Washington VAAC is now receiving SEVIRI based GOES-R volcanic ash products via a McIDAS ADDE server and automated alerts will soon be distributed
- GOES sounder total precipitable water and stability indexes (new operational version) now available via NESDIS
- Coordinated CIMSS GOES-R PG collaborations with 2013-2014 Satellite Proving Ground for Marine, Precipitation, and Hazardous Weather Applications demonstrations
- Other GOES-R PG decision support products requested within plan available once approved by NOAT governance process



- ***Hurricane Intensity Estimate (HIE) Algorithm***  
Calculates tropical cyclone intensity (MSLP and max surface wind) objectively from proxy ABI IR-window channel imagery.
- ***Tropical Overshooting Tops (TOTs)***  
Employs IR-window channel imagery to identify convective protrusions above cumulonimbus anvils associated with very strong tropical convection updrafts, which can be related to tropical cyclone formation and intensification. Could also be important for marine and aviation applications.
- ***Saharan Air Layer (SAL) Product***  
Uses a split window (10.8 and 12.0  $\mu\text{m}$ ) algorithm to identify and track dusty dry air masses (SAL), which can negatively impact tropical cyclone activity.



# Hurricane Intensity Estimate (HIE)



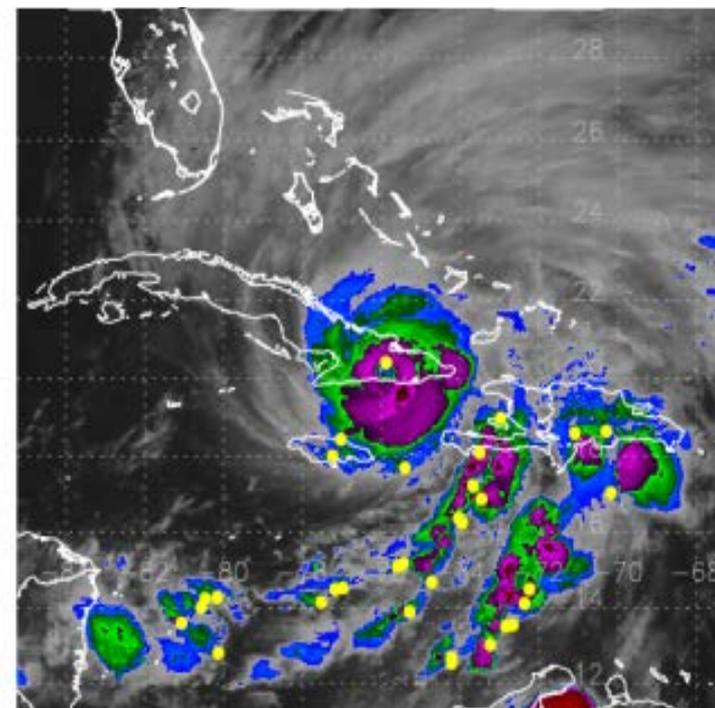
- Purpose of the **HIE** is to provide TC analysts with a completely objective and operationally-proven tool to estimate TC intensity using GOES-R ABI IR imagery.
- The **HIE** has been demonstrated to NHC/TAFB specialists within the GOES-R Proving Ground since the 2010 Atlantic TC season.
  - As proxy data for GOES-R, the **HIE** employs 15-minute IR imagery from Meteosat-9/10 and GOES-East (CONUS sector).
- Algorithm heritage based on the Advanced Dvorak Technique (ADT)
  - Developed by UW-CIMSS, used operationally by NHC
- Systematic verification of **HIE** is underway as part of PG feedback
- Helped to upgrade Michael (2012) to major hurricane

HURRICANE MICHAEL DISCUSSION NUMBER 13  
NWS NATIONAL HURRICANE CENTER MIAMI FL AL132012  
...WHILE SUBJECTIVE ESTIMATES WERE NEAR 90 KT AT 0600 UTC...OBJECTIVE ESTIMATES FROM ADT **AND THE GOES-R HIE PRODUCT** HAVE RECENTLY BEEN BETWEEN 107 AND 110 KT. A BLEND OF THESE DATA GIVE AN INITIAL WIND SPEED OF 100 KT...MAKING MICHAEL THE FIRST MAJOR HURRICANE OF THE SEASON.

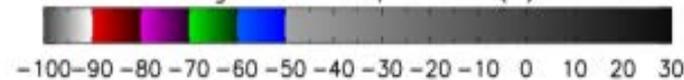


- Training provided to NHC and TAFB in April to increase familiarity with the product
  - Feedback addressed algorithm tuning currently underway.
- Objectively identifies TOT locations using cold IR pixels relative to neighbors, to isolate and quantify active vigorous tropical convection.
- As proxy data for GOES-R, the TOT algorithm employs IR imagery from Meteosat-9/10 and GOES-East.
- Research underway to associate TOT trends with TC genesis and rapid intensification, and as a potential predictor in statistical prediction models.
- Feedback in 2012
  - Useful for TAFB tropical wave analysis
  - Some false and missed TOT detection in TCs Nadine and Ernesto
    - Algorithm tuning underway

Example from 2012 NHC Proving Ground – Hurricane Sandy



Brightness Temperature (C)



GOES-E color-enhanced IR image and identified TOTs (yellow dots) at 0615UTC on 25 Oct., 2012

**NWS Milwaukee focal point: Steve Davis**

- **CIMSS GOES-R Local Area Demonstration with MKX will continue again this summer and fall (anticipated to begin in June after MKX has transitioned to AWIPS II)**
- **2013 activities plan in progress**
- **Anticipated GOES-R products to be demonstrated in 2013 include:**
  - **Convective Cloud Top Cooling (coordinated with Chad Gravelle)**
  - **Nearcasting**
  - **Sky Cover (Extension of Cloud and Moisture Imagery)**
- **Anticipated JPSS products to be demonstrated in 2013 include:**
  - **Day/Night Band**



[http://cimss.ssec.wisc.edu/goes\\_r/proving-ground/wrf\\_chem\\_abi/wrf\\_chem\\_abi.html](http://cimss.ssec.wisc.edu/goes_r/proving-ground/wrf_chem_abi/wrf_chem_abi.html)

GOES-R -- CIMSS

cimss.ssec.wisc.edu/goes\_r/proving-ground/wrf\_chem\_abi/wrf\_chem\_abi.html

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**GOES-R Activities at CIMSS / SSEC**

>> Home >> Proving Ground

**GOES-R Proving Ground UW/CIMSS WRF Chem Simulated ABI Bands 1-16**

Click on band for time loop.

 Band 1 (0.49 μm)	 Band 2 (0.84 μm)	 Band 3 (0.86 μm)	 Band 4 (1.38 μm)
 Band 5 (1.61 μm)	 Band 6 (2.2 μm)	 Band 7 (3.9 μm)	 Band 8 (6.19 μm)
 Band 9 (6.95 μm)	 Band 10 (7.34 μm)	 Band 11 (8.5 μm)	 Band 12 (9.61 μm)
 Band 13 (10.35 μm)	 Band 14 (11.2 μm)	 Band 15 (12.3 μm)	 Band 16 (13.3 μm)

## Airmass RGB

### Ranges and Enhancements:

Beam	Channel	Range	Gamma
Red	WV6.2 - WV7.3	-25 ... 0	1.0
Green	IR9.7 - IR10.8	-40 ... +5	1.0
Blue	WV6.2	+243 ... +208	1.0

## GOES-R Bands

**Red: Band 08 (6.19) – Band 10 (7.34)**

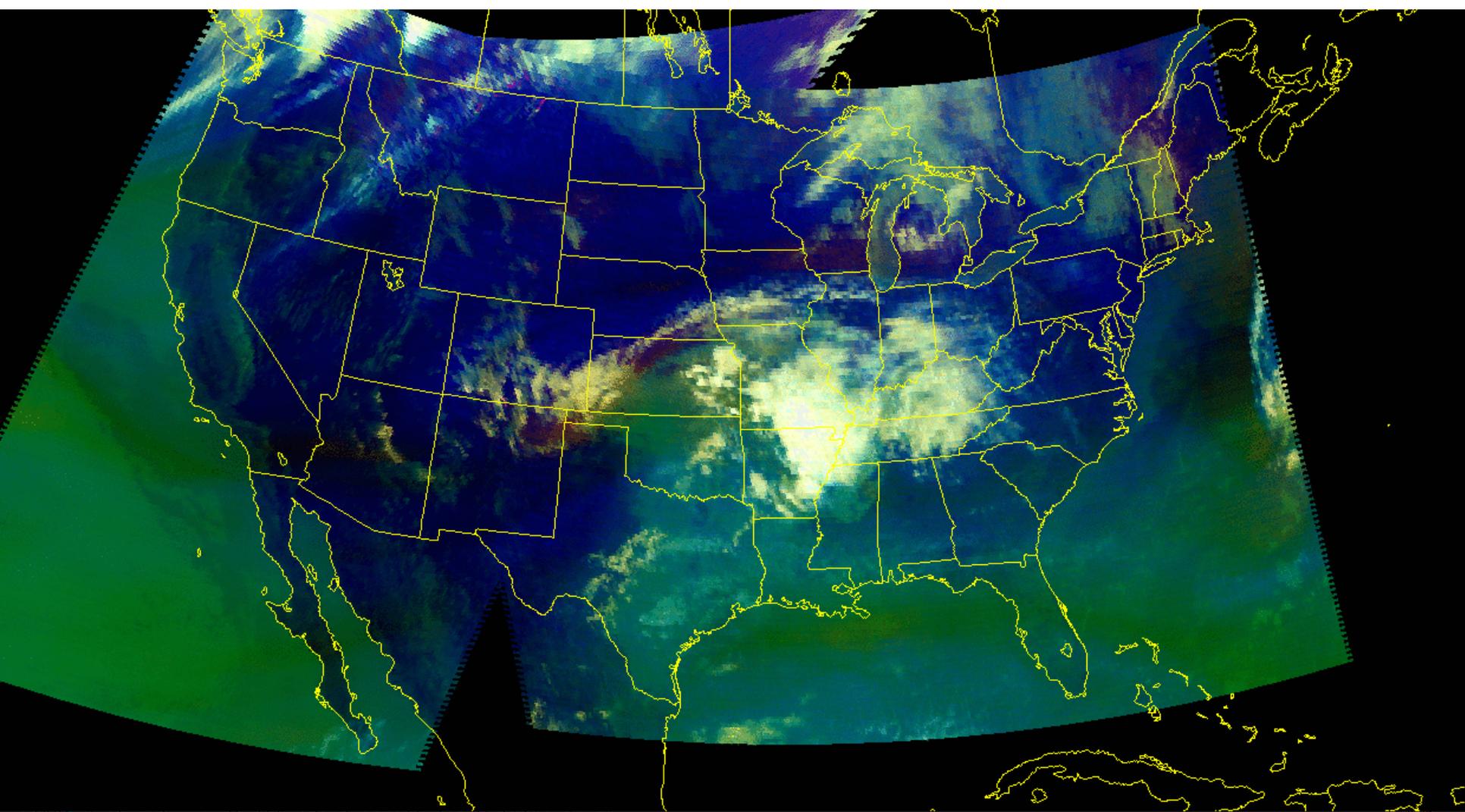
**Green: Band 12 (9.61) – Band 14 (11.2)**

**Blue: Band 08 (6.19)**





# GOES Sounder-Based Red-Blue-Green (RGB) Air Mass Product (18Z April 26, 2013)



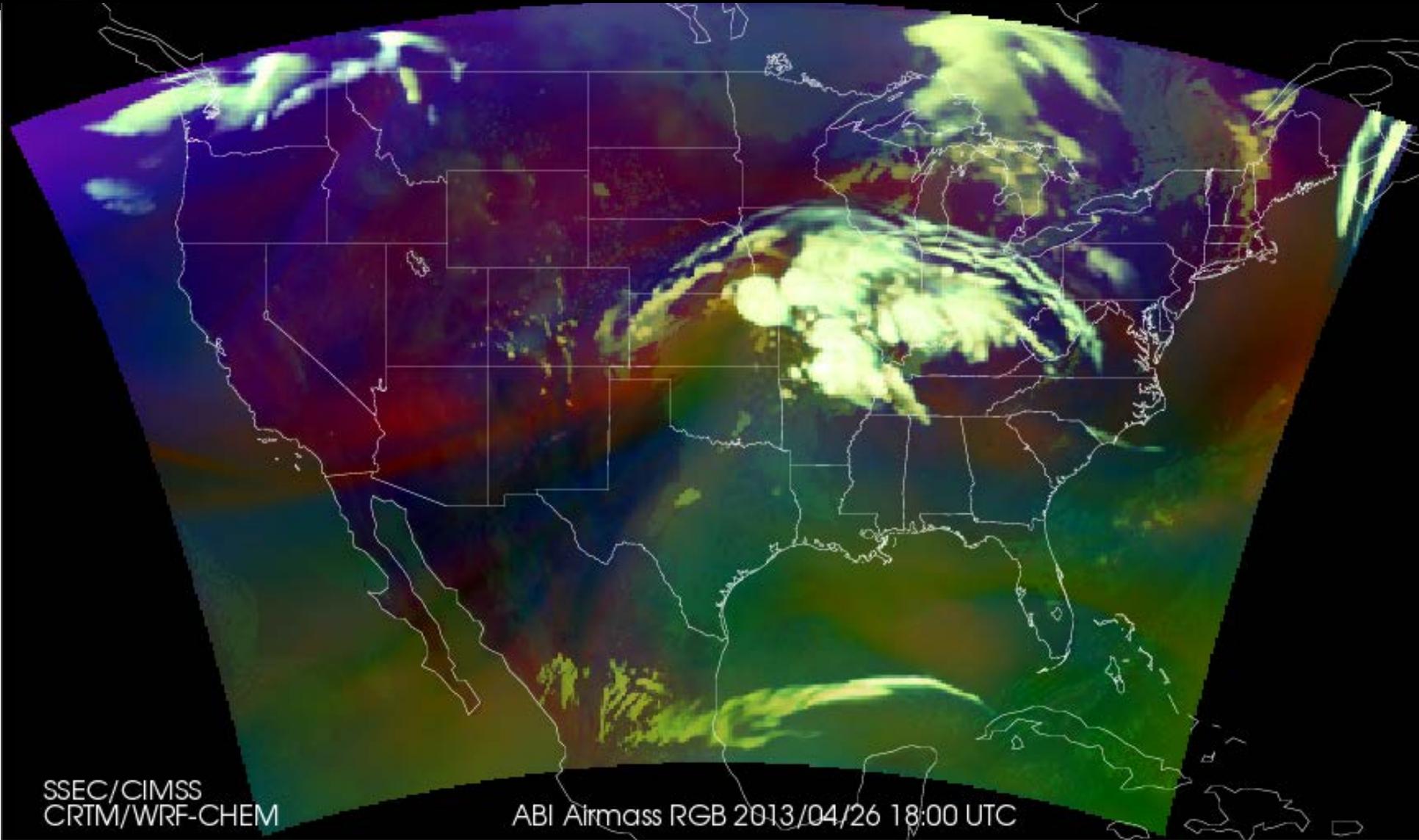
1 0001 G-15 SND 1 26 APR 13116 180100 01207 09381 01 00

McLDRS





# ABI Imager-Based Red-Blue-Green (RGB) Air Mass Product (18Z April 26, 2013)



**Red: Band 08 (6.19) – Band 10 (7.34)**

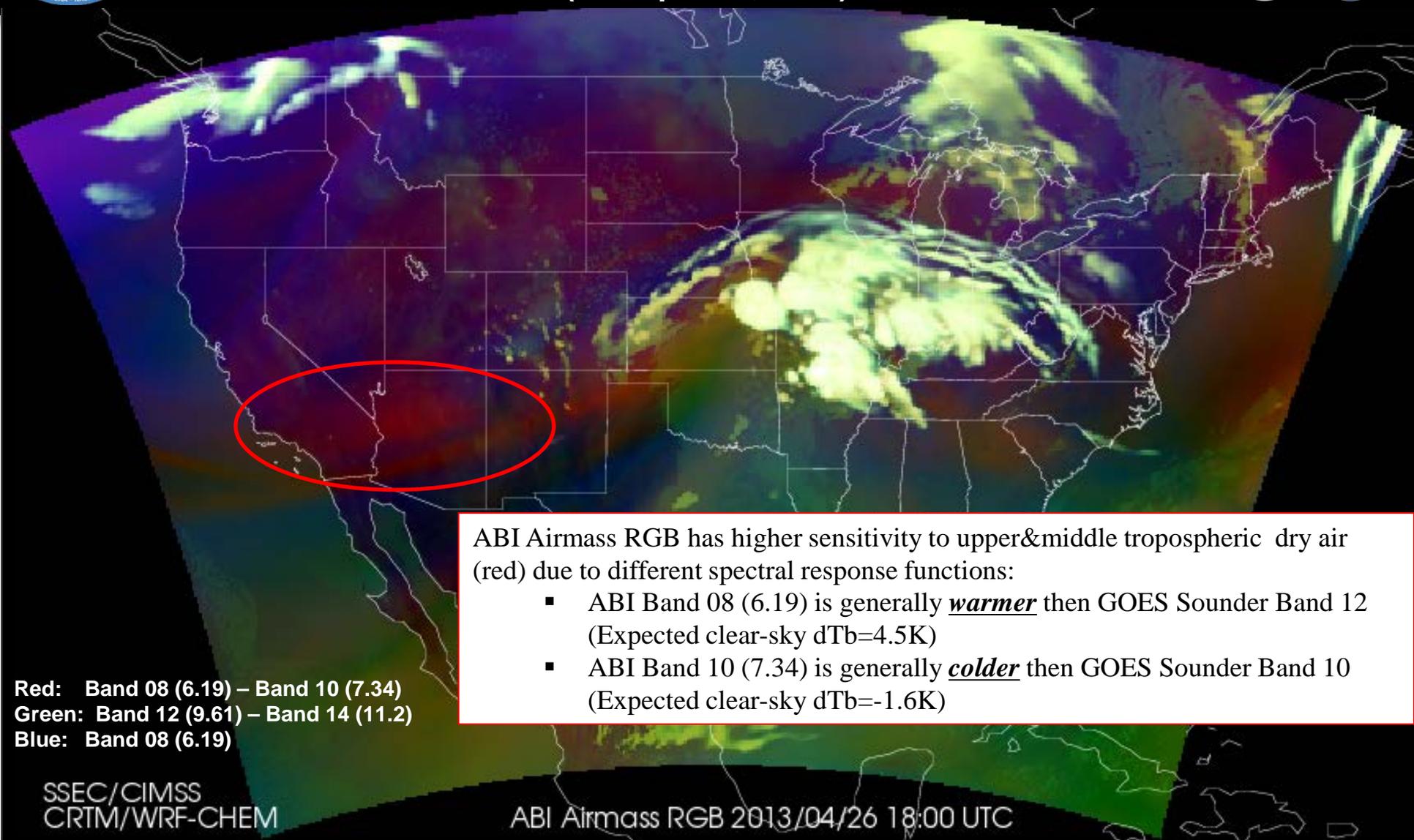
**Green: Band 12 (8.65) – Band 14 (11.2)**

**Blue: Band 15 (12.4) – Band 16 (13.7)**





# ABI Imager-Based Red-Blue-Green (RGB) Air Mass Product (18Z April 26, 2013)



ABI Airmass RGB has higher sensitivity to upper&middle tropospheric dry air (red) due to different spectral response functions:

- ABI Band 08 (6.19) is generally **warmer** then GOES Sounder Band 12 (Expected clear-sky dTb=4.5K)
- ABI Band 10 (7.34) is generally **colder** then GOES Sounder Band 10 (Expected clear-sky dTb=-1.6K)

Red: Band 08 (6.19) – Band 10 (7.34)  
Green: Band 12 (9.61) – Band 14 (11.2)  
Blue: Band 08 (6.19)

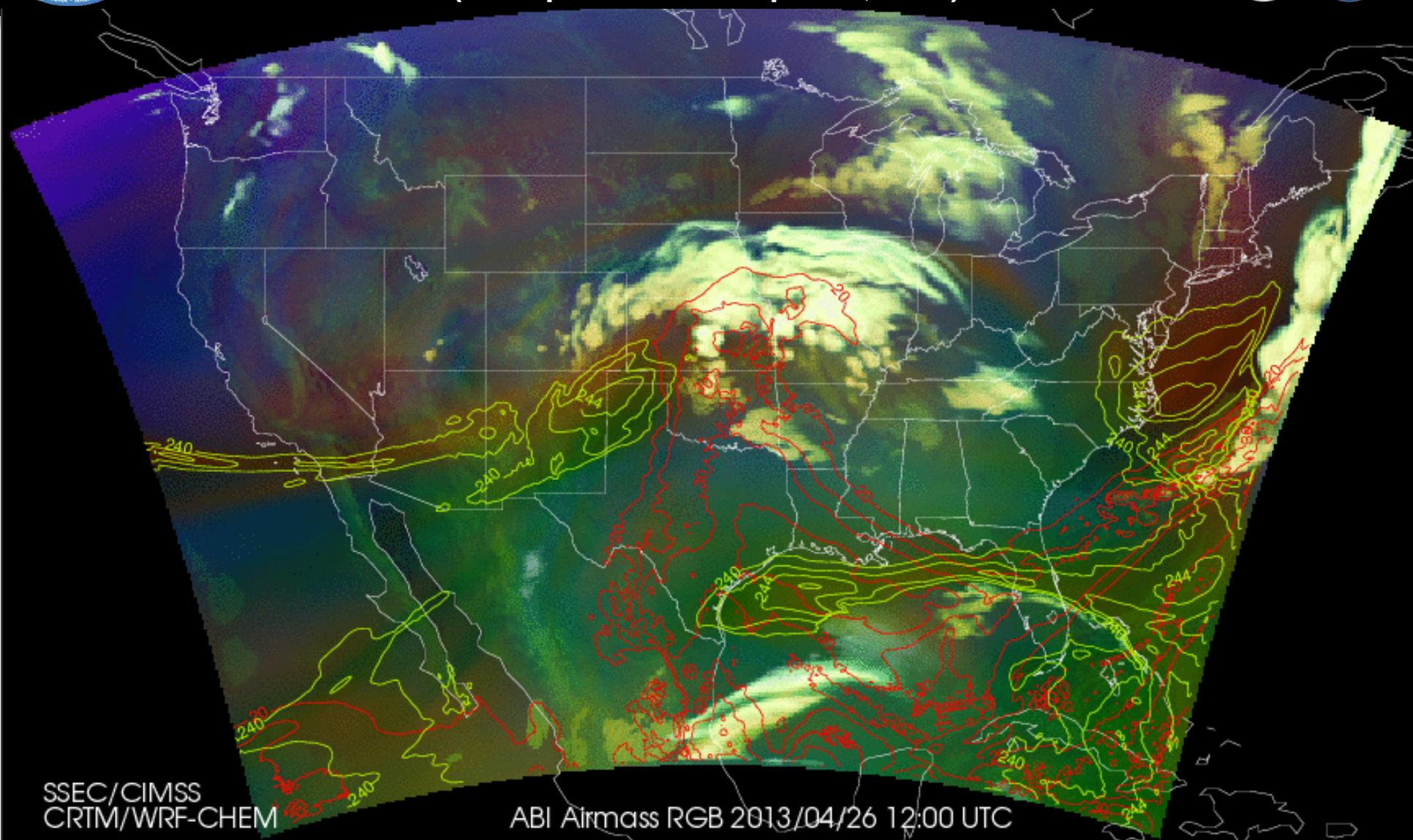
SSEC/CIMSS  
CRTM/WRF-CHEM

ABI Airmass RGB 2013/04/26 18:00 UTC





# ABI Imager-Based Red-Blue-Green (RGB) Air Mass Product (12Z April 26 to 12Z April 27, 2013)



SSEC/CIMSS  
CRTM/WRF-CHEM

ABI Airmass RGB 2013/04/26 12:00 UTC

**Yellow: ABI Band 08 (6.19)  $T_b > 240K$  (upper tropospheric dry air)**  
**Red: WRF-CHEM Total Precipitable Water (TPW)**



## Direct Broadcast VIIRS in AWIPS

- **Kathy Strabala was part of 2 town hall meetings describing utility of VIIRS DB data in AWIPS at AMS meeting in Austin, Texas**
  - “Assessment of Pre-Operational Data from the VIIRS Instrument on Suomi-NPP”
  - “Early Successes from the Suomi-NPP Mission”
- **Polar2grid version 1.0 publically released through the CSPP website (<http://cimss.ssec.wisc.edu/cspp/>)**
  - **Reprojects and reformats VIIRS SDR data to AWIPS NetCDF and GeoTIFF**
- **VIIRS Satellite Imagery in AWIPS" VISITview lesson has been completed and placed on the VISIT training calendar:**  
[http://rammb.cira.colostate.edu/training/visit/training\\_sessions/viirs\\_satellite\\_imagery\\_in\\_awips/](http://rammb.cira.colostate.edu/training/visit/training_sessions/viirs_satellite_imagery_in_awips/)

- Attending AWIPS II developers' forum conference calls, discussions pertaining to the GOES-R Proving Ground, and meetings of the EPDT
- Ingested test files of MODIS imagery collected from L/X-band antenna in Honolulu into AWIPS II
- Testing of locally-produced netCDF4 files containing VIIRS imagery
- Jordan Gerth and Lee Cronic coordinated with Darrel Kingfield to assure CIMSS products (CTC/OTTC and Nearcasting) were ingesting and displaying as expected in AWIPS II
  - Jordan developed bug fix to handle files with valid times between 1 and 9 minutes after the top of the hour
- Investigating performance of regionalsat plug-in
- Enhancement written for scaling byte array to real numbers via XML
- Confirming functionality of WWLLN enhancements in AWIPS II baseline (working as expected, including with AvnFPS)

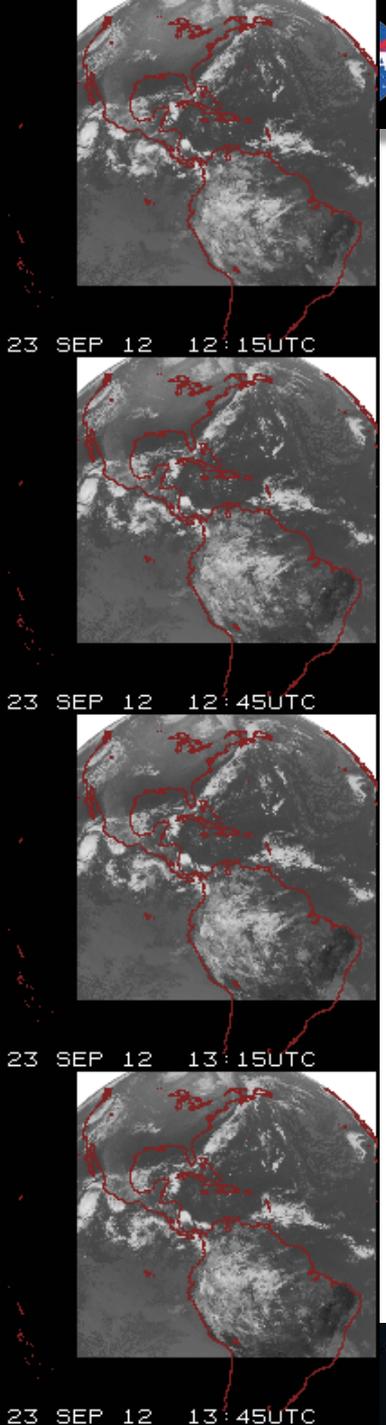
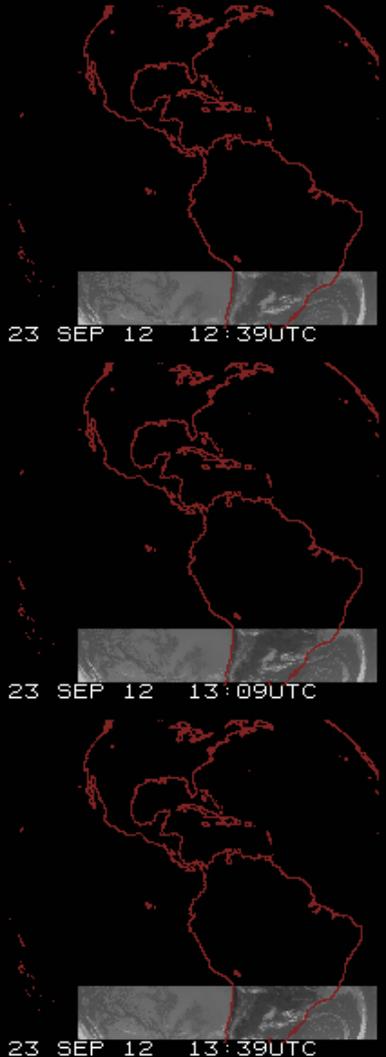
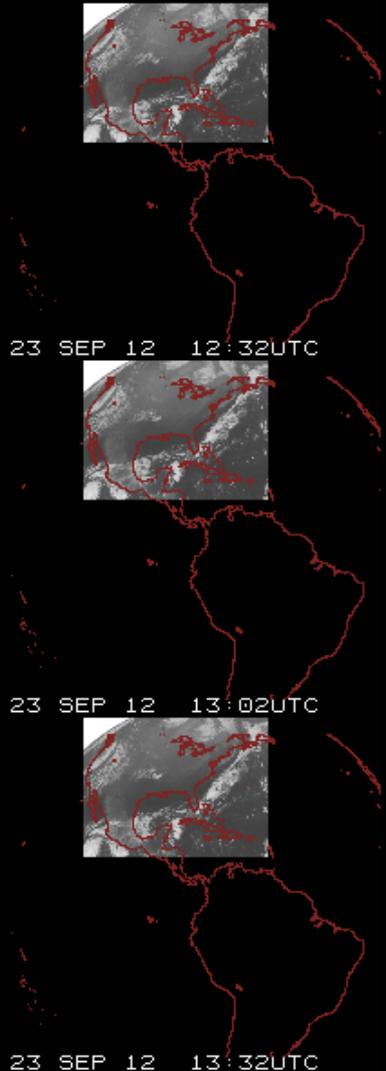
- In-person training on VIIRS products in AWIPS at CTP, LSX and on FLS at CTP
- Short Articulate Presenter modules developed for HWT on CTC and NearCast
  - [http://www.ssec.wisc.edu/~scottl/NearCast\\_HWT\\_Training\\_2013/player.html](http://www.ssec.wisc.edu/~scottl/NearCast_HWT_Training_2013/player.html)
  - [http://www.ssec.wisc.edu/~scottl/UWCTC\\_HWT\\_Training\\_2013/player.html](http://www.ssec.wisc.edu/~scottl/UWCTC_HWT_Training_2013/player.html)
- ‘Fog blog’ at <http://fusedfog.blogspot.com>
  - 129 separate entries
  - >21000 hits ; ~100 hits per day.
  - 1-3 new entries per week.

# Examples of Sub-CONUS sectors for GOES-13 Imager

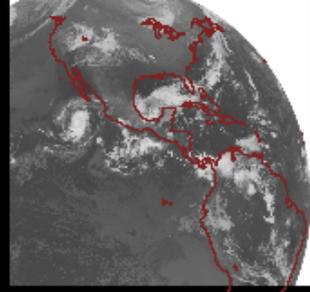
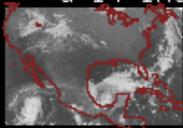
- Extra Sub-CONUS images (similar to GOES-West)
- New schedule was tested with GOES-14 data
- Stay tuned for implementation schedule



# Routine (current)



# Routine with Sub-CONUS



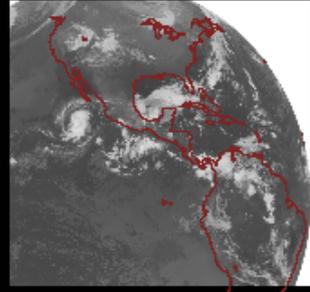
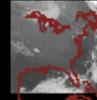
Sub-CONUS

24 SEP 12 12:00UTC

24 SEP 12 12:05UTC

24 SEP 12 12:10UTC

24 SEP 12 12:15UTC



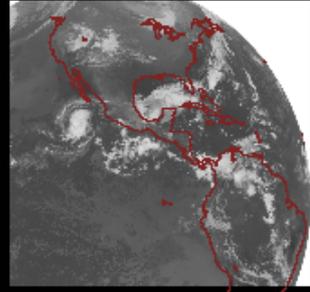
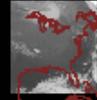
Sub-CONUS

24 SEP 12 12:30UTC

24 SEP 12 12:35UTC

24 SEP 12 12:40UTC

24 SEP 12 12:45UTC



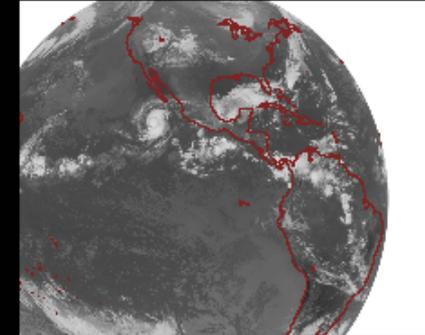
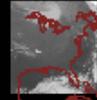
Sub-CONUS

24 SEP 12 13:00UTC

24 SEP 12 13:05UTC

24 SEP 12 13:10UTC

24 SEP 12 13:15UTC



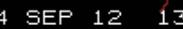
Sub-CONUS

24 SEP 12 13:30UTC

24 SEP 12 13:35UTC

24 SEP 12 13:40UTC

24 SEP 12 13:45UTC



## Proposed GOES-13 Schedule additions

- The following slides show the proposed routine and rapid schedule changes for the GOES-13 the GOES East Operational Satellite. The proposed start date is May 14<sup>th</sup>, 2013 during the 15:34 UTC housekeeping period.
  - All approved changes have be tested using GOES-14 when out of storage in 2012.
  - This would be a gain of two sub-conus images per hour for non-full disk hours and one sub-conus image per hour for full disk hours in the routine schedule.
  - This would be a gain of one short southern hemisphere image per hour for non-full disk hours in the rapid schedule.
- 
- A few notes:
    - Any items in **Red** are proposed changes from the current sequence.
    - XX – represents the hour of day.
    - Need a start date, and coordination with User Community.

From Kevin Ludlum



# Proposed GOES-13 Routine (ERTN) Schedule additions

## Current Full Disk Hour

XX:45:00	FULL DISK	26:11
XX:15:00	N. HEMISPHERE EXTENDED	14:15
XX:31:30	CONUS	4:48
XX:39:10	SOUTHERN HEMISPHERE	4:33

## PROPOSED Full Disk Hour

XX:45:00	FULL DISK	26:11
XX:15:00	N. HEMISPHERE EXTENDED	14:15
XX:30:00	CONUS	4:45
XX:34:50	SOUTHERN HEMISPHERE	4:33
XX:39:25	CONTINENTAL US (SUB-CONUS)	2:01

## Current Non-Full Disk Hour

XX:45:00	N. HEMISPHERE EXTENDED	14:15
XX:01:30	CONUS	4:48
XX:09:10	SOUTHERN HEMISPHERE	4:33

## PROPOSED Non-Full Disk Hour

XX:45:00	N. HEMISPHERE EXTENDED	14:15
XX:00:00	CONUS	4:45
XX:04:50	SOUTHERN HEMISPHERE	4:33
XX:09:25	CONTINENTAL US (SUB-CONUS)	2:01
XX:15:00	N. HEMISPHERE EXTENDED	14:15
XX:30:00	CONUS	4:45
XX:34:50	SOUTHERN HEMISPHERE	4:33
XX:39:25	CONTINENTAL US (SUB-CONUS)	2:01

From Kevin Ludlum



# Proposed GOES-13 Rapid (ERAP) Schedule additions

## Current Full Disk Hour

XX:45:00	FULL DISK	26:11
XX:15:00	N. HEMISPHERE	9:44
XX:25:00	CONUS	4:43
XX:30:10	SHORT S. HEMISPHERE	1:45
XX:32:04	CONUS	4:43
XX:40:00	CONUS	4:43

## PROPOSED Full Disk Hour

XX:45:00	FULL DISK	26:11
XX:15:00	N. HEMISPHERE	9:44
XX:25:00	CONUS	4:43
<b>XX:30:00</b>	<b>CONUS</b>	<b>4:43</b>
<b>XX:34:50</b>	<b>SHORT S. HEMISPHERE</b>	<b>1:45</b>
<b>XX:36:40</b>	<b>CONUS</b>	<b>4:43</b>

## Current Non-Full Disk Hour

XX:45:00	N. HEMISPHERE	9:44
XX:55:00	CONUS	4:43
XX:00:10	SHORT S. HEMISPHERE	1:45
XX:02:04	CONUS	4:43
XX:10:00	CONUS	4:43
XX:15:00	N. HEMISPHERE	9:44
XX:25:00	CONUS	4:43
XX:30:10	SHORT S. HEMISPHERE	1:45
XX:32:04	CONUS	4:43
XX:40:00	CONUS	4:43

## PROPOSED Non-Full Disk Hour

XX:45:00	N. HEMISPHERE	9:44
XX:55:00	CONUS	4:43
<b>XX:00:00</b>	<b>CONUS</b>	<b>4:43</b>
<b>XX:04:50</b>	<b>SHORT S. HEMISPHERE</b>	<b>1:45</b>
<b>XX:06:40</b>	<b>CONUS</b>	<b>4:43</b>
XX:15:00	N. HEMISPHERE	9:44
XX:25:00	CONUS	4:43
<b>XX:30:00</b>	<b>CONUS</b>	<b>4:43</b>
<b>XX:34:50</b>	<b>SHORT S. HEMISPHERE</b>	<b>1:45</b>
<b>XX:36:40</b>	<b>CONUS</b>	<b>4:43</b>

From Kevin Ludlum



# Proposed GOES-13 Routine schedule compared to Rapid schedule

## Routine Full Disk Hour

XX:45:00	FULL DISK	26:11
XX:15:00	N. HEMISPHERE EXTENDED	14:15
XX:30:00	CONUS	4:45
XX:34:50	SOUTHERN HEMISPHERE	4:33
XX:39:25	CONTINENTAL US (SUB-CONUS)	2:01

## RAPID Full Disk Hour

XX:45:00	FULL DISK	26:11
XX:15:00	N. HEMISPHERE	9:44
XX:25:00	CONUS	4:43
XX:30:00	CONUS	4:43
XX:34:50	SHORT S. HEMISPHERE	1:45
XX:36:40	CONUS	4:43

## Routine Non-Full Disk Hour

XX:45:00	N. HEMISPHERE EXTENDED	14:15
XX:00:00	CONUS	4:45
XX:04:50	SOUTHERN HEMISPHERE	4:33
XX:09:25	CONTINENTAL US (SUB-CONUS)	2:01
XX:15:00	N. HEMISPHERE EXTENDED	14:15
XX:30:00	CONUS	4:45
XX:34:50	SOUTHERN HEMISPHERE	4:33
XX:39:25	CONTINENTAL US (SUB-CONUS)	2:01

## RAPID Non-Full Disk Hour

XX:45:00	N. HEMISPHERE	9:44
XX:55:00	CONUS	4:43
XX:00:00	CONUS	4:43
XX:04:50	SHORT S. HEMISPHERE	1:45
XX:06:40	CONUS	4:43
XX:15:00	N. HEMISPHERE	9:44
XX:25:00	CONUS	4:43
XX:30:00	CONUS	4:43
XX:34:50	SHORT S. HEMISPHERE	1:45
XX:36:40	CONUS	4:43

This comparison shows how the routine and rapid schedules are similar. This is a better alignment than current, and is a benefit to daily operations.





## CIMSS Proving Ground Posters April 8-12, 2013

1. Overview of the GOES-R Proving Ground Activities at the National Hurricane Center – Christopher Velden et al.
2. Near-Real-Time validation of simulated GOES-R ABI radiances and derived products, using the WRF-Chem model forecast over CONUS for all 16 ABI bands. – Marek Rogal et al.
3. Satellite Training Activities: What's new and what's being recycled? VISIT, SHyMet and WMO Vlab – Connell et al.
4. Overview of UW-Madison SSEC/CIMSS GOES-R Proving Ground Activities – Feltz et al.
5. Improving very-short-range Forecasts of the Pre-Convective Environment and Heavy Precipitation Events using operational Satellite Observations – Petersen et al.
6. Applications Of A Satellite-Based Objective Overshooting Convective Cloud Top Detection Product – Bedka et al.
7. Introduction of a New Suite of Fog/Low Stratus Products into NWS Operations – Pavolonis et al.
8. Use of GOES-R Imagery in the Detection Volcanic Ash and the Production of Aviation Warnings in Alaska – Heinricks et al.
9. GOES @ 60 West – A Wisconsin Perspective – Schmit et al.
10. Satellite-Observed Signatures Associated With Moderate to Severe Turbulence Events – Terborg et al.
11. Current capabilities for identifying turbulence from real-time satellite imagery – Wimmers et al.
12. Training in the NOAA Satellite Proving Ground – Getting Users Ready for Rapid Changes – Spayd et al.





# Other Conferences/Meetings



## 2013

- O-CONUS 17-21 June Fairbanks, Alaska
- EUMETSAT/AMS 16-20 Sept Vienna, Austria
  - [http://www.eumetsat.int/Home/Main/News/Conferences\\_and\\_Events/820209?l=en](http://www.eumetsat.int/Home/Main/News/Conferences_and_Events/820209?l=en)

## 2014

- AMS Annual meeting 2-6 Feb Atlanta, GA

