GOES-14 Super Rapid Scan Operations to Prepare for GOES-R

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Advanced Satellite Products Branch (ASPB)
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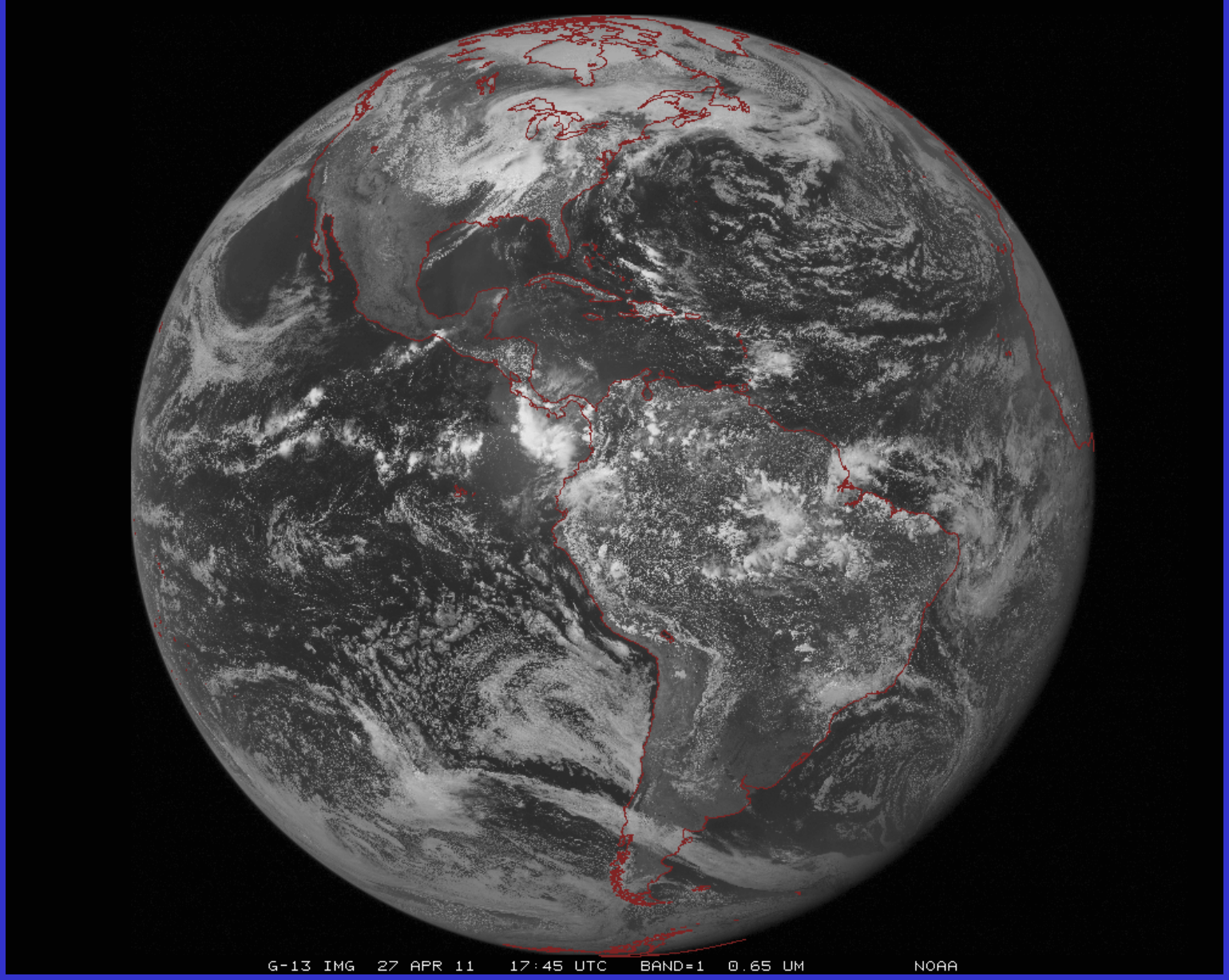
10th Annual Symposium on New Generation Operational Environmental Satellite Systems,

February 4, 2014

Outline

- ABI (Advanced Baseline Imager) Modes
  - Continuous Full Disk
  - Flex
- GOES-14
  - Post Launch Test in 2009/2010
  - SRSOR (2012 and 2013)
- GOES-13 Optimized Schedule changes
- Reference
- Summary

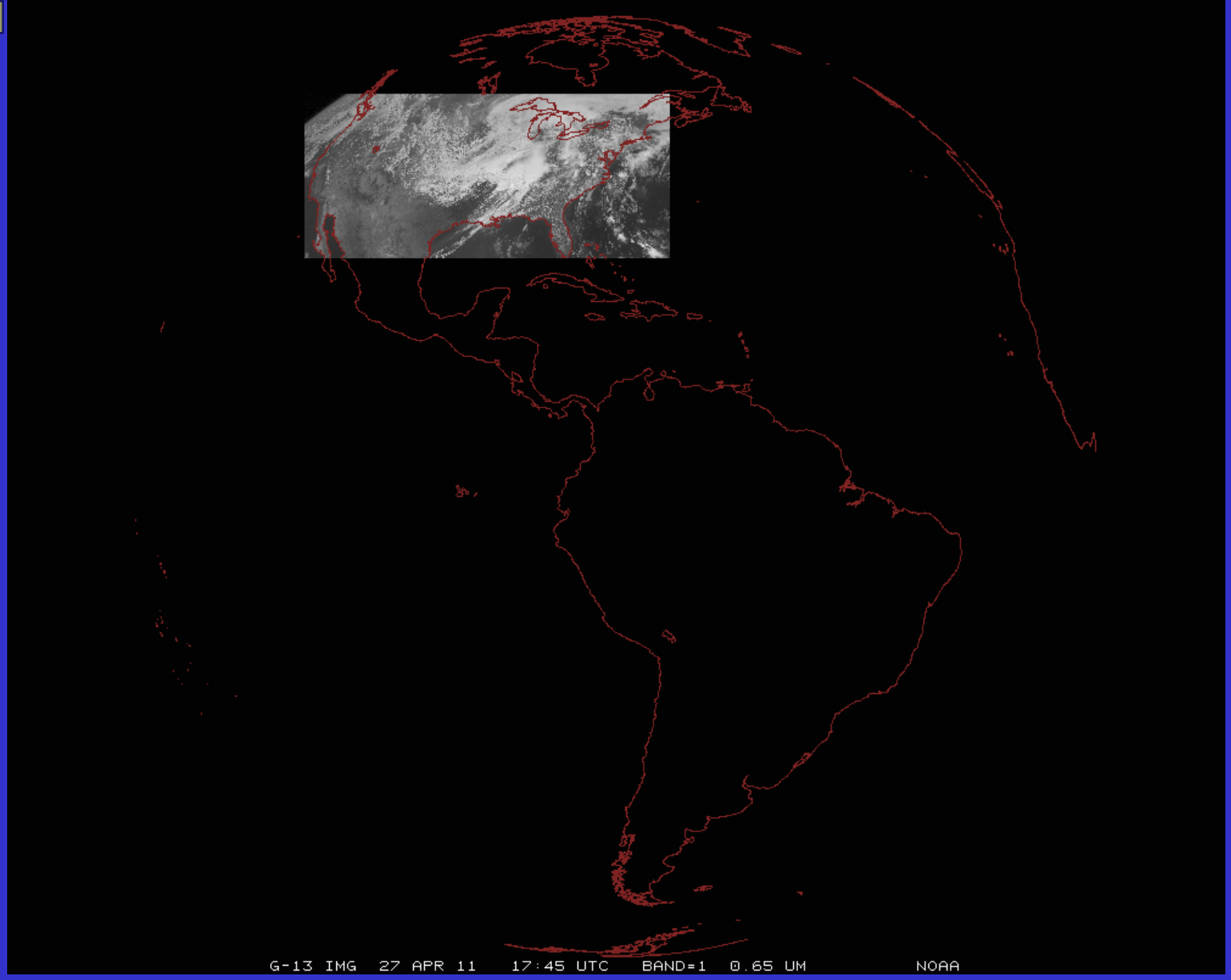
NASA



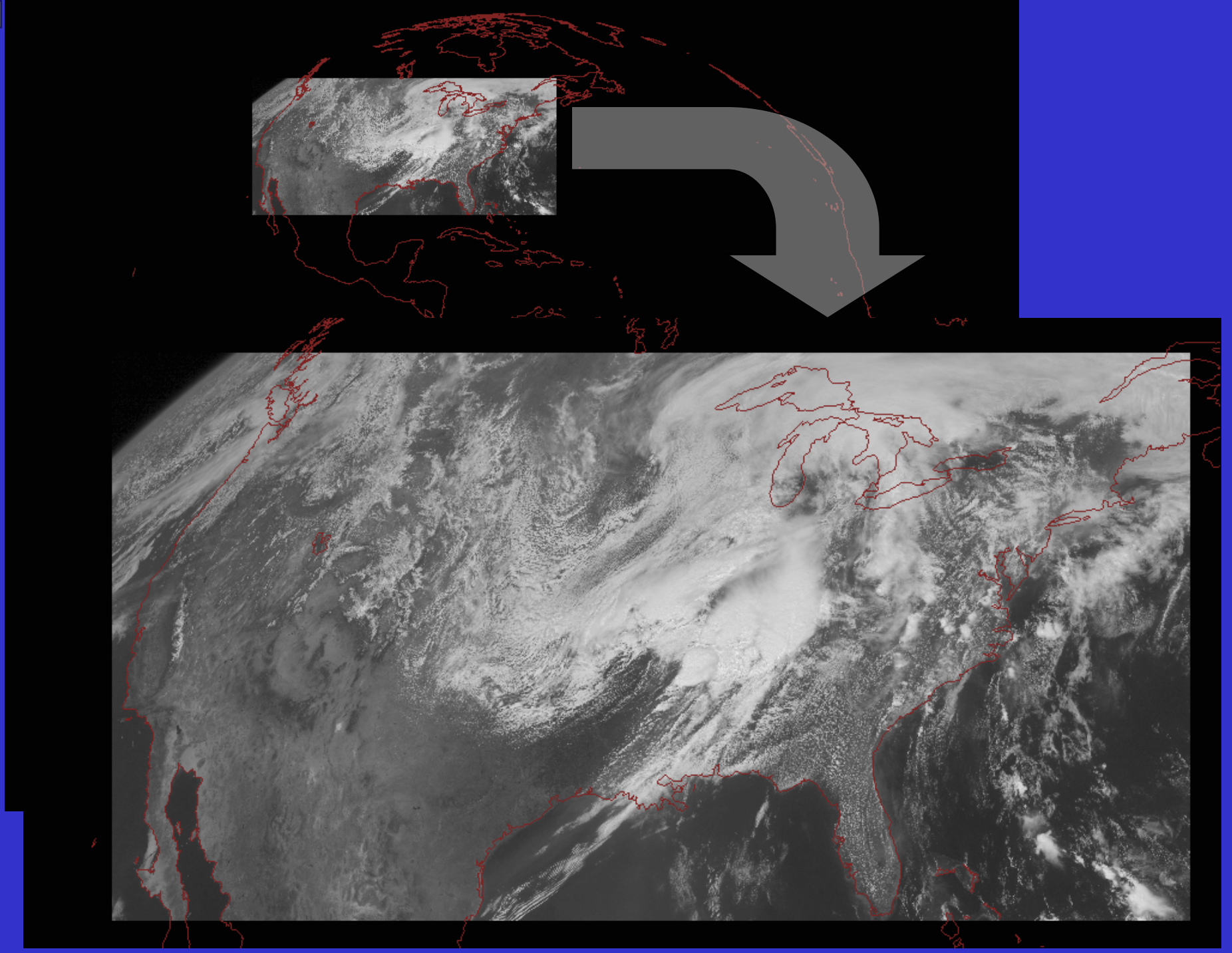
ABI scans about 5 times faster than the current GOES imager

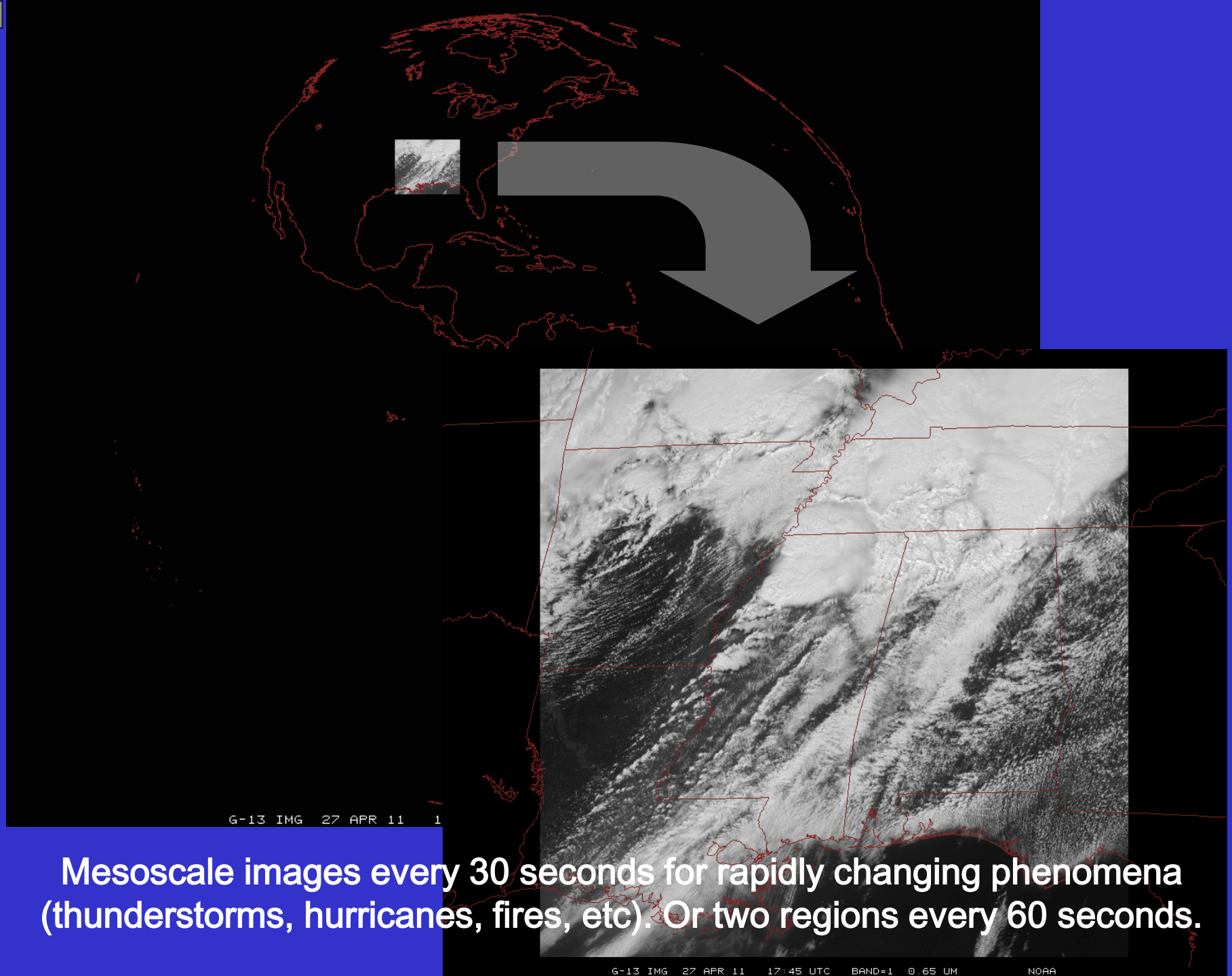
Anticipated scan mode for the ABI:

- Full disk images every 15 minutes + 5 min CONUS images + mesoscale.



ABI can offer Continental US images every 5 minutes for routine monitoring of a wide range of events (storms, dust, clouds, fires, winds, etc).
This is every 15 or 30 minutes with the current GOES in routine mode.





Mesoscale images every 30 seconds for rapidly changing phenomena (thunderstorms, hurricanes, fires, etc). Or two regions every 60 seconds.

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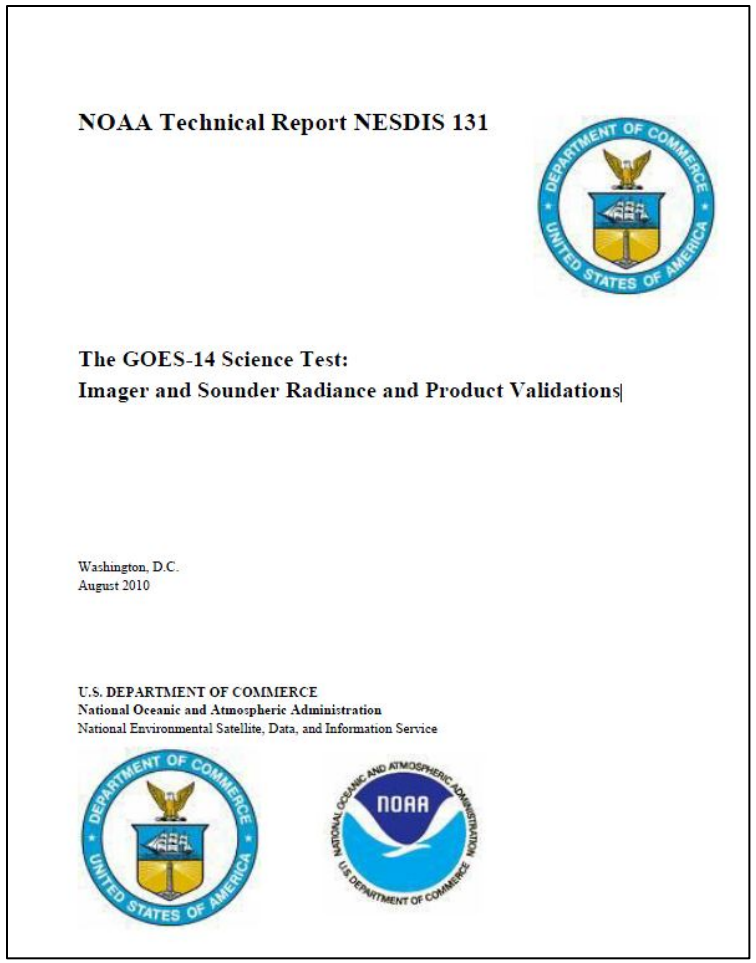
GOES-14 Science Test – December 2009



NOAA Technical Report NESDIS 131

The GOES-14 Science Test:
Imager and Sounder Radiance and Product Validations

Washington, D.C.
August 2010

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

Hillger, D.W., and T.J. Schmit, 2010: The GOES-14 Science Test: Imager and Sounder Radiance and Product Validations. *NOAA Technical Report NESDIS 131*, 1-119.

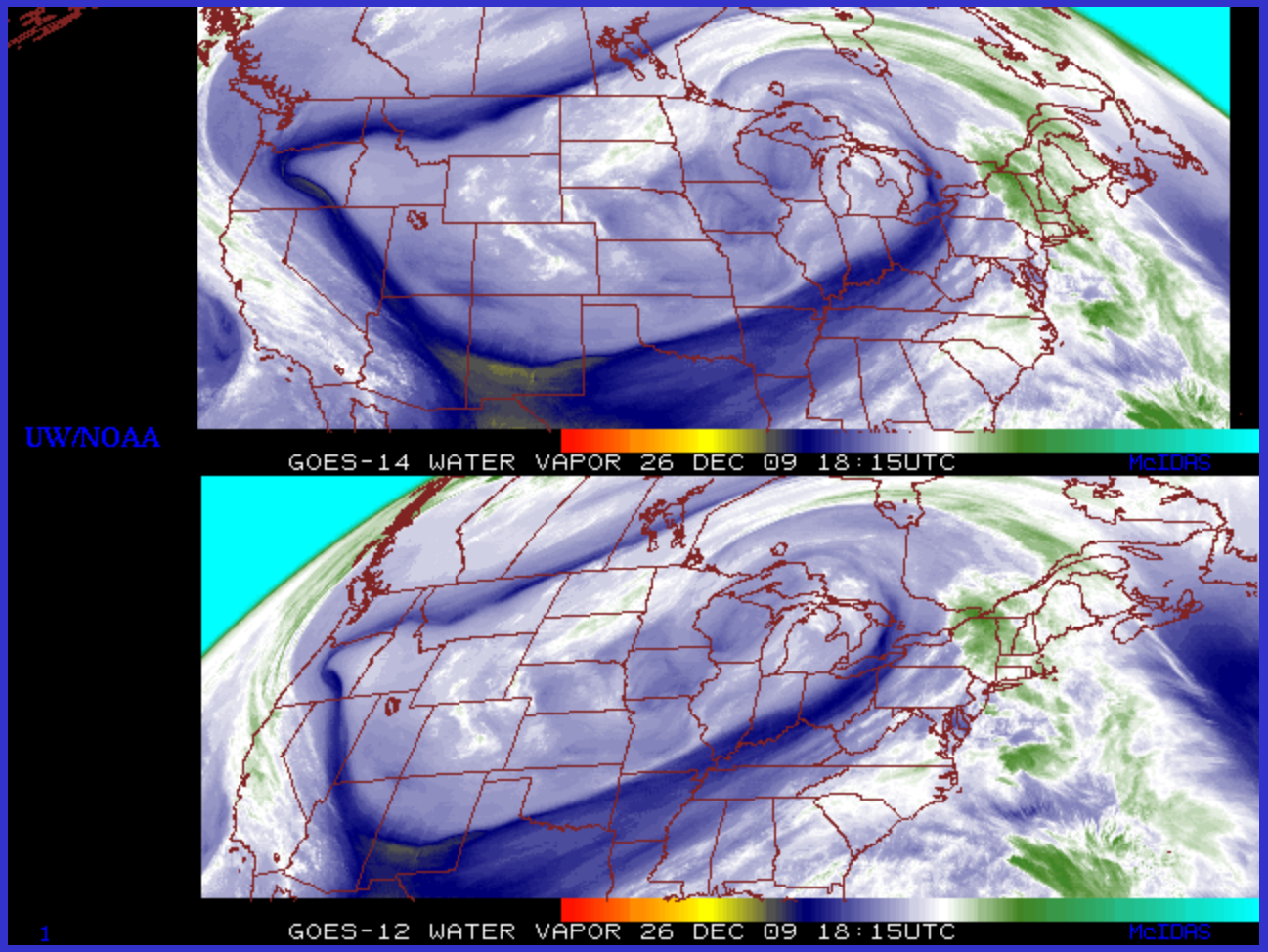
http://rammb.cira.colostate.edu/projects/goes-o/NOAA_Tech_Report_NESDIS_131_GOES-14_Science_Test_with_Corrigendum.pdf

http://rammb.cira.colostate.edu/projects/goes-o/

GOES-O Test Schedules

Test Schedule	Imager	Sounder	Purpose
C5RTN	Emulation of **GOES-East routine** operations	Emulation of **GOES-East routine** operations	Radiance and product comparisons
C4RTN	Emulation of **GOES-West routine** operations	Emulation of **GOES-West routine** operations	Radiance and product comparisons
C1CON	Continuous **5-minute CONUS** sector	26-minute **CONUS** sector every 30 minutes	Test navigation, ABI-like (temporal) CONUS scans
C2SRSO	Continuous **1-minute rapid-scan** (with center point specified for storm analysis)	26-minute sector every 30 minutes (with center point same as Imager)	Test navigation, ABI-like (temporal) mesoscale scans
C3SRSO	Continuous **30-second rapid-scan** (with center point over either Huntsville AL, Normal OK, or Washington DC areas) **three locations only**	26-minute sector every 30 minutes (with center same as Imager)	To coordinate with lightning mapping arrays in Huntsville AL, Norman OK, or Washington DC
C6FD	Continuous **30-minute Full Disk** (including off-earth limb/space view measurements)	Alternating **east and west limb/space views** every hour	Noise, detector-to-detector striping, fires, etc.
C7MOON	Capture **moon** off edge of earth (when possible)	Emulation of **GOES-East routine** operations	Test ABI lunar calibration concepts
C8	**Emulation of 2 km ABI** through spatial over-sampling (continuous 19 minutes for same sector per specific line-shifted scan strategy)	Emulation of **GOES-East routine** operations	ABI-like higher-resolution product development

GOES-14: Sample “5-min” imagery

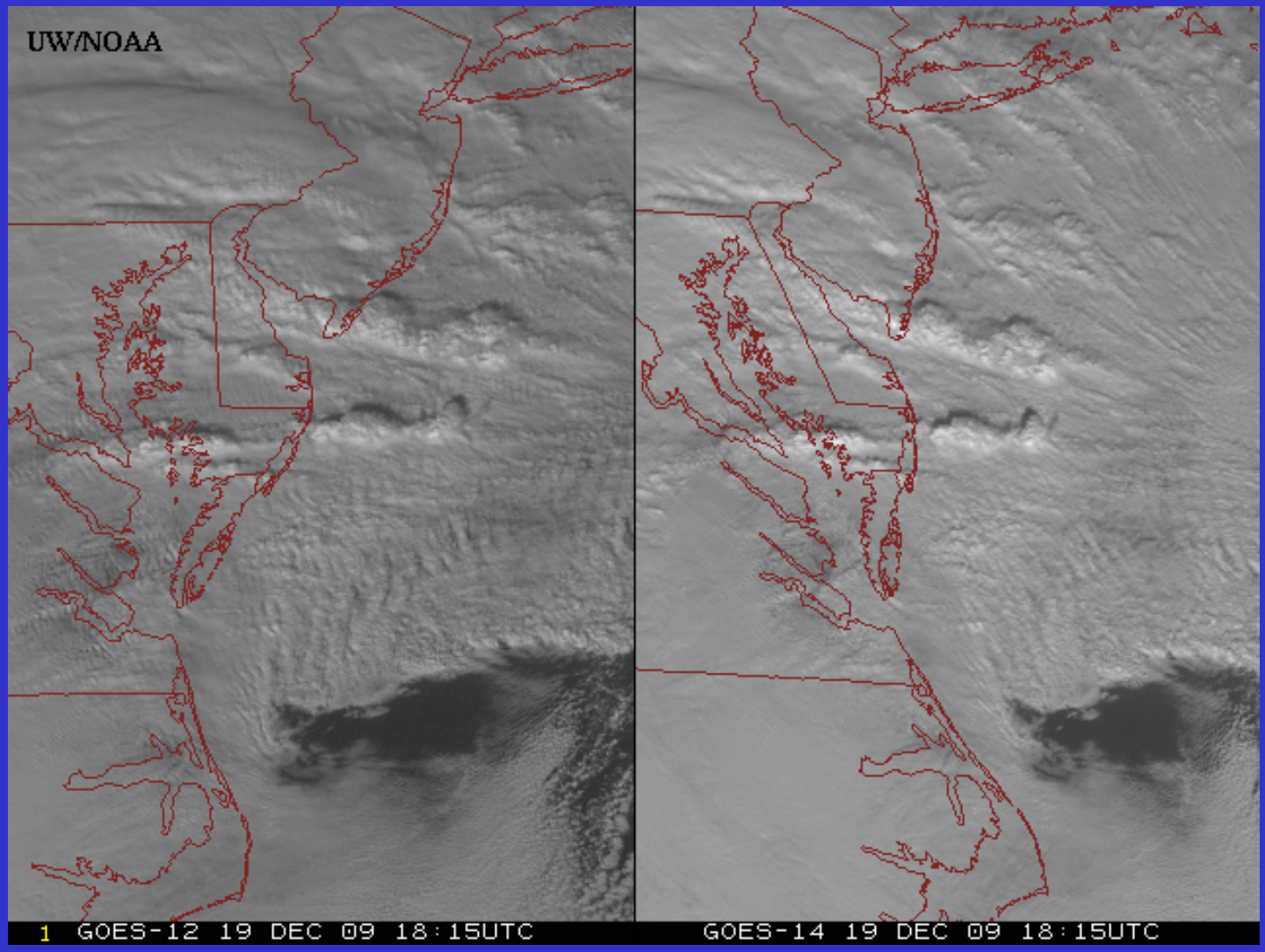


5 min
GOES-14

15 min
GOES-12

“Water vapor” data from the GOES-14 NOAA Science Test, lead by Hillger and Schmit

GOES-14: Sample “1-min” imagery



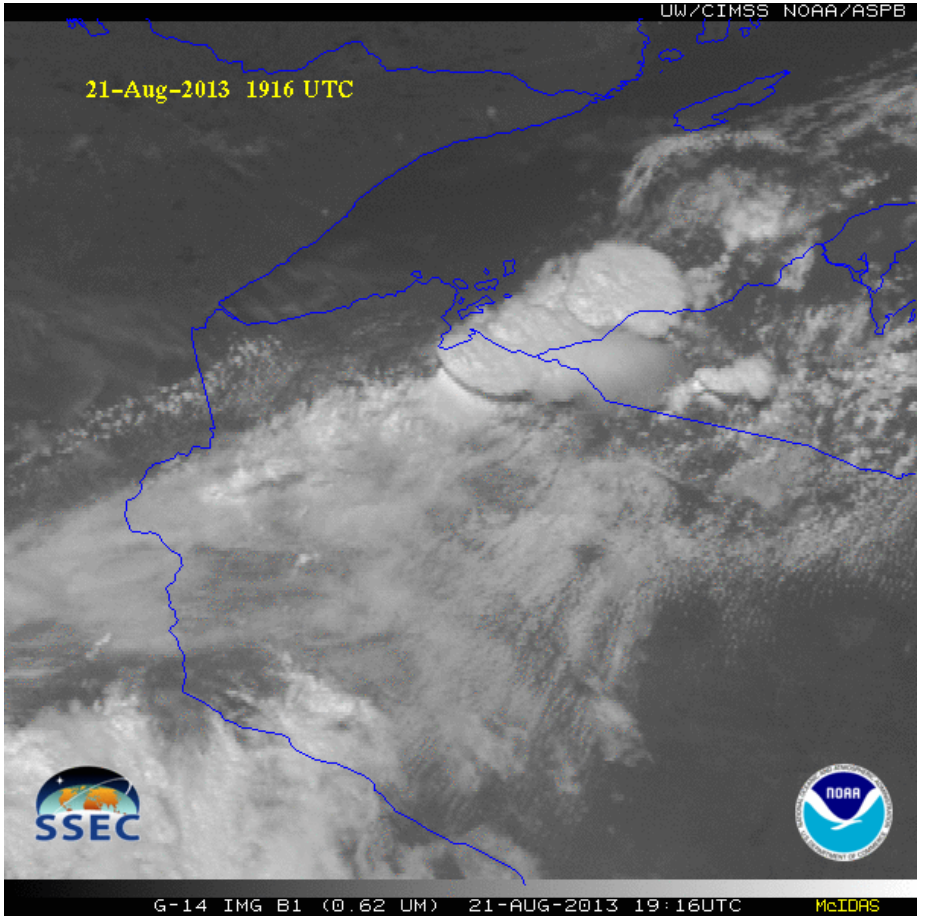
GOES-12 (15 min)

GOES-14 (~1 min)

- Visible data from the GOES-14 NOAA Science Test
- Can this type of information be used in or to validate meso-scale models?

GOES-14 Super Rapid Scan Operations to Prepare for GOES-R

- SRSOR (Super Rapid Scan Operations for GOES-R) from GOES-14 imager
- Data between mid-August and September 24th and late October 2012; and two days in June and 12 days in mid-August, 2013
  - *http://cimss.ssec.wisc.edu/goes/srsor/GOES-14_SRSOR.html and*
  - *http://cimss.ssec.wisc.edu/goes/srsor2013/GOES-14_SRSOR.html*
- GOES-14 provided very unique data and offered a glimpse into the possibilities that will be provided by the ABI on GOES-R in one minute mesoscale imagery
- Many phenomena were observed

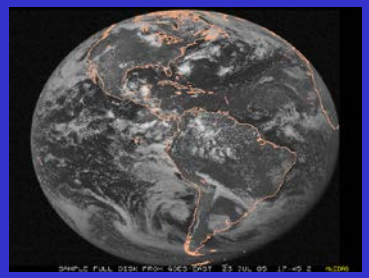


GOES-14 visible image showing rapid convective development

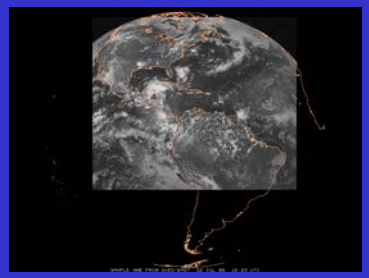
GOES Imager Schedules

http://cimss.ssec.wisc.edu/goes/blog/archives/13001

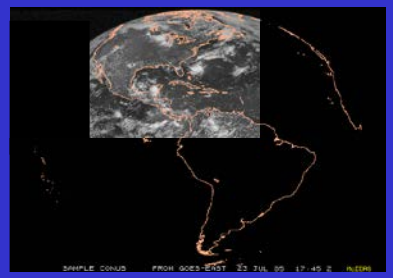
	Routine	RSO	SRSO	SRSOR	SRSOR (No FD)	*GOES-R ABI*
# of images (in 3 hrs)	16	26	56	129	157	~400
# of images covering part of CONUS (in 3 hrs)	11	21	56*	129*	157*	~400*
Finest delta-time (min)	15	5	1	1	1	0.5
2nd largest delta-time (min)	15	10	10	4	4	5
Largest delta-time (min)	30	30	30	30	15	15
Sectors Scanned (listed by size)	FD, NHE,CONUS, SHEMI	FD, NH, CONUS, SA	FD, NH, CONUS, MESO	FD, MESO	FD, MESO	FD, CONUS, MESO
Run operationally?	Yes	Yes	Yes	No	No	Yes



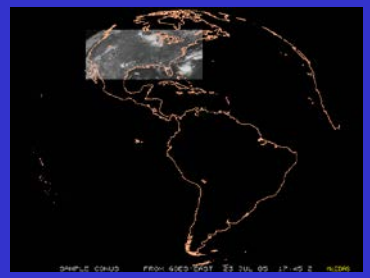
Full Disk



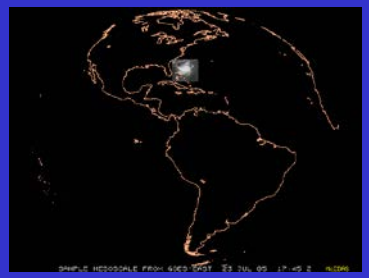
NH-Extended



N. Hemisphere

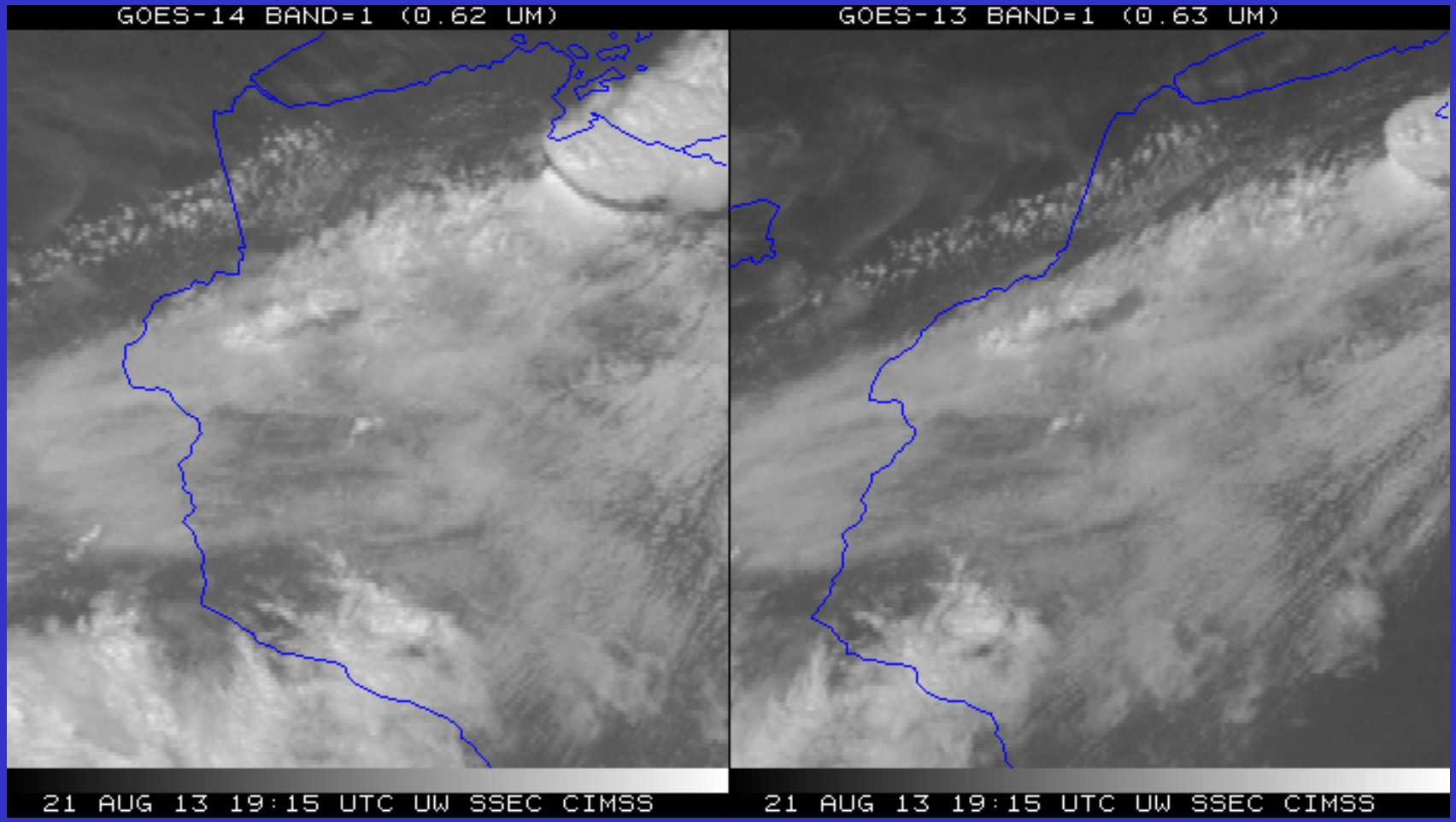


CONUS

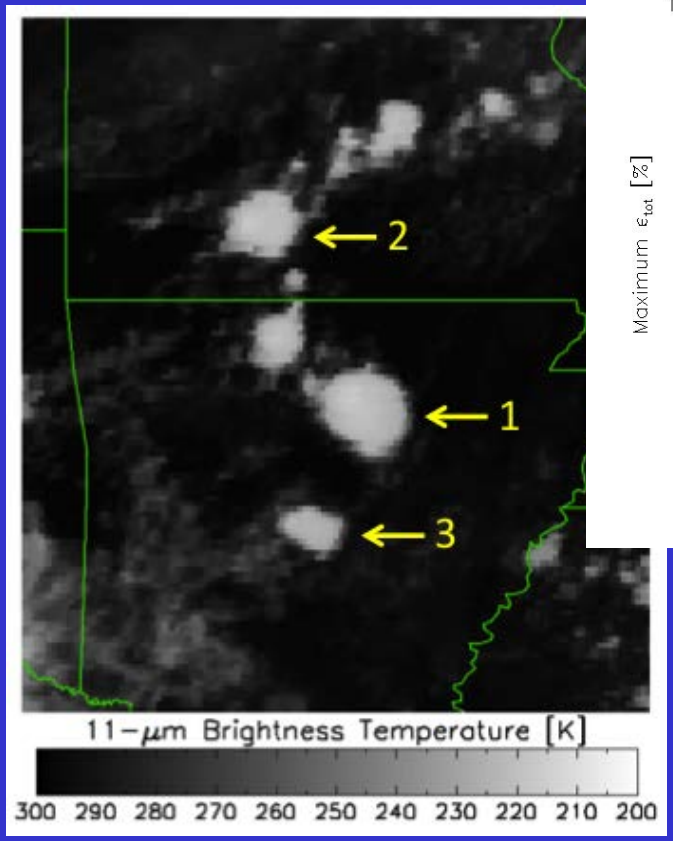


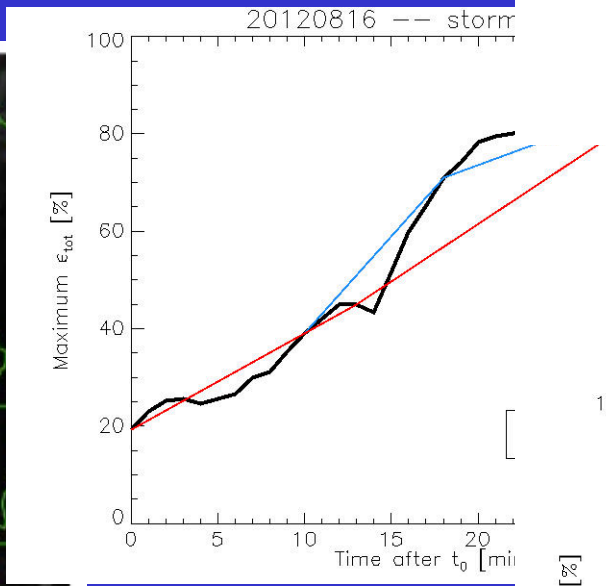
Mesoscale

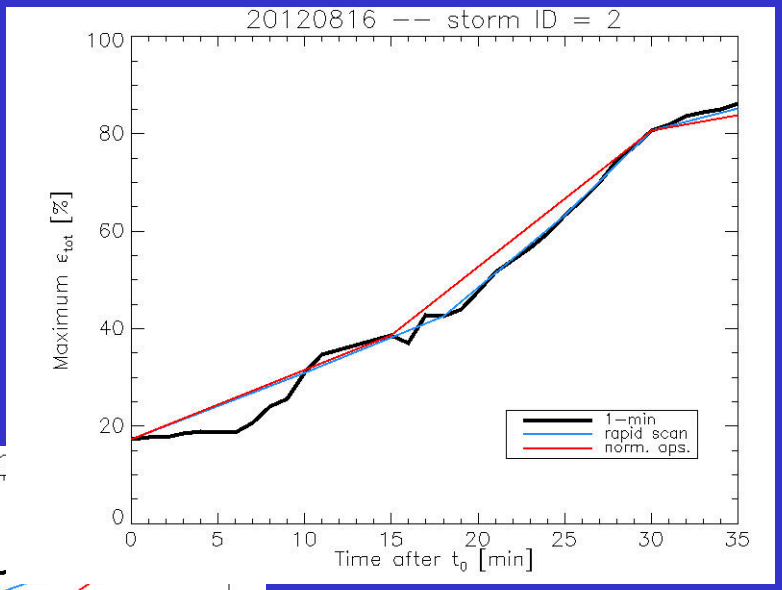
GOES-14 and -13

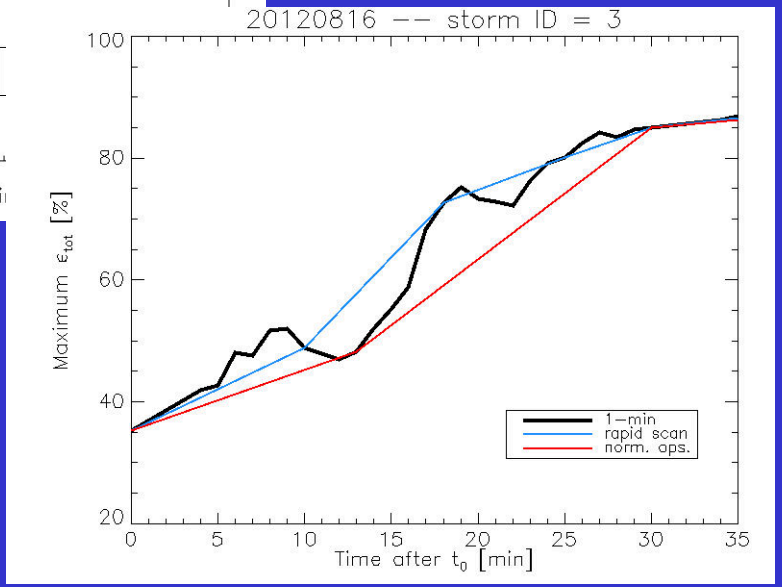


Rate of temporal cooling in the longwave infrared band

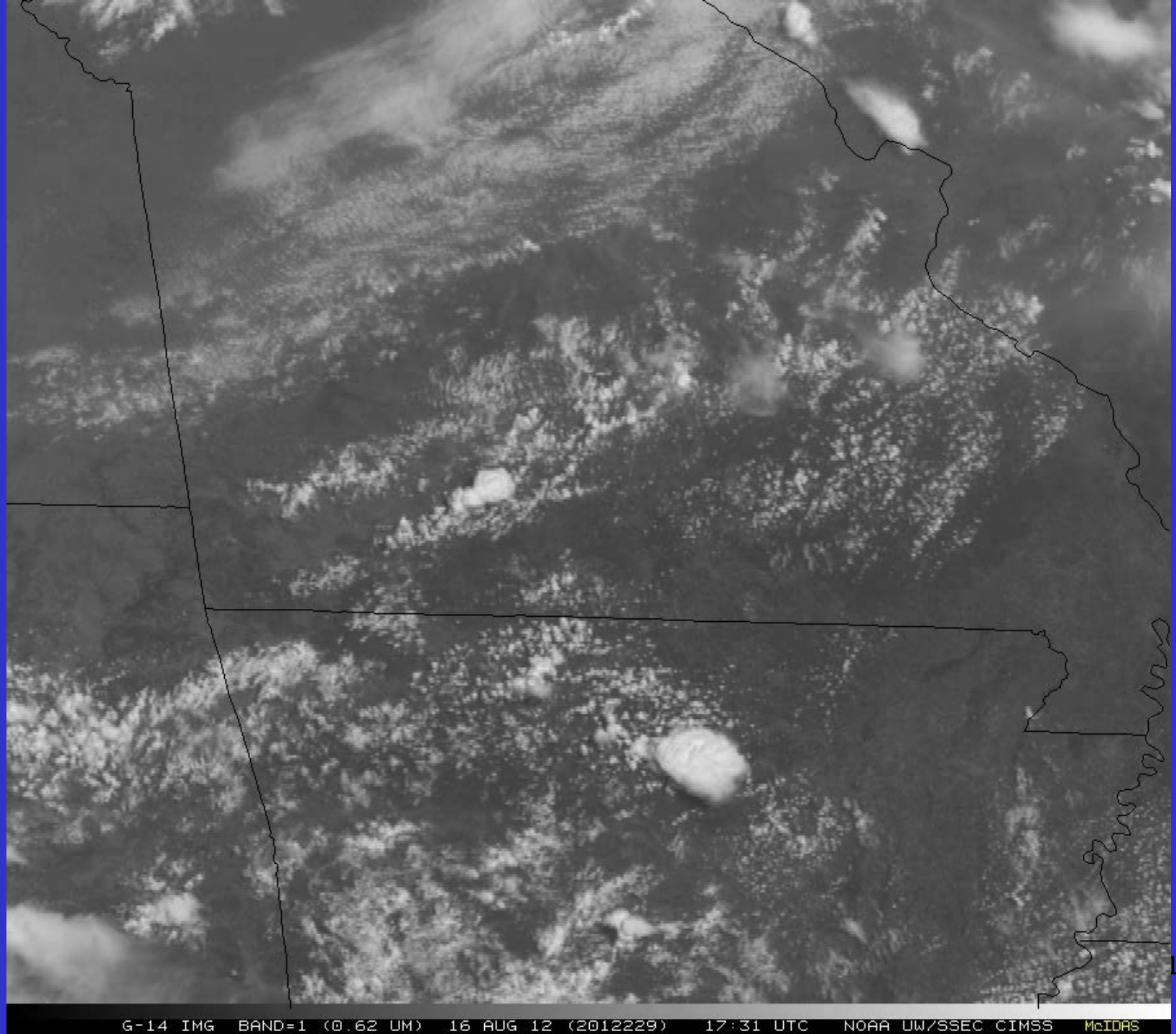








Cintineo et al., 2013 (CIMSS)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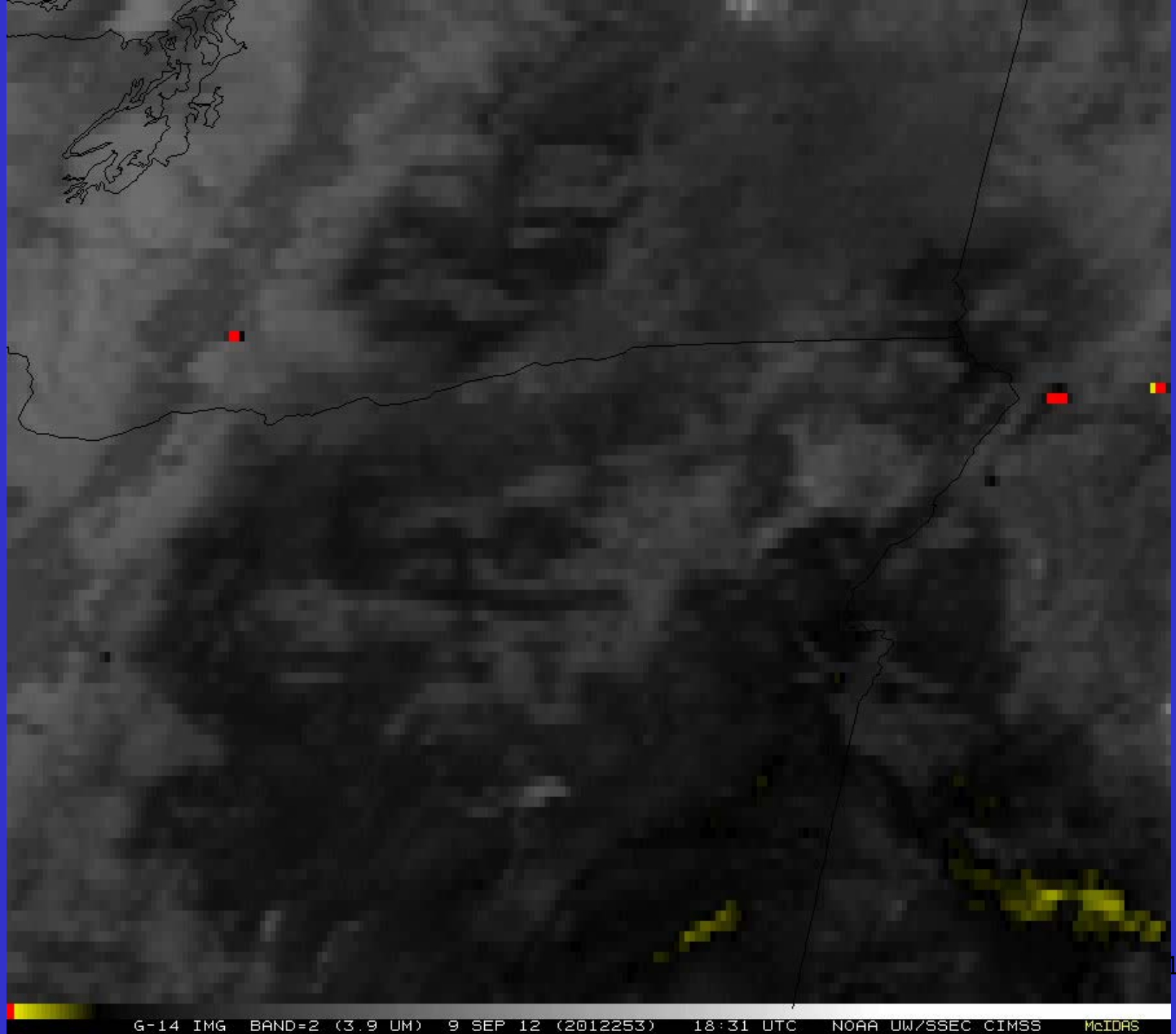
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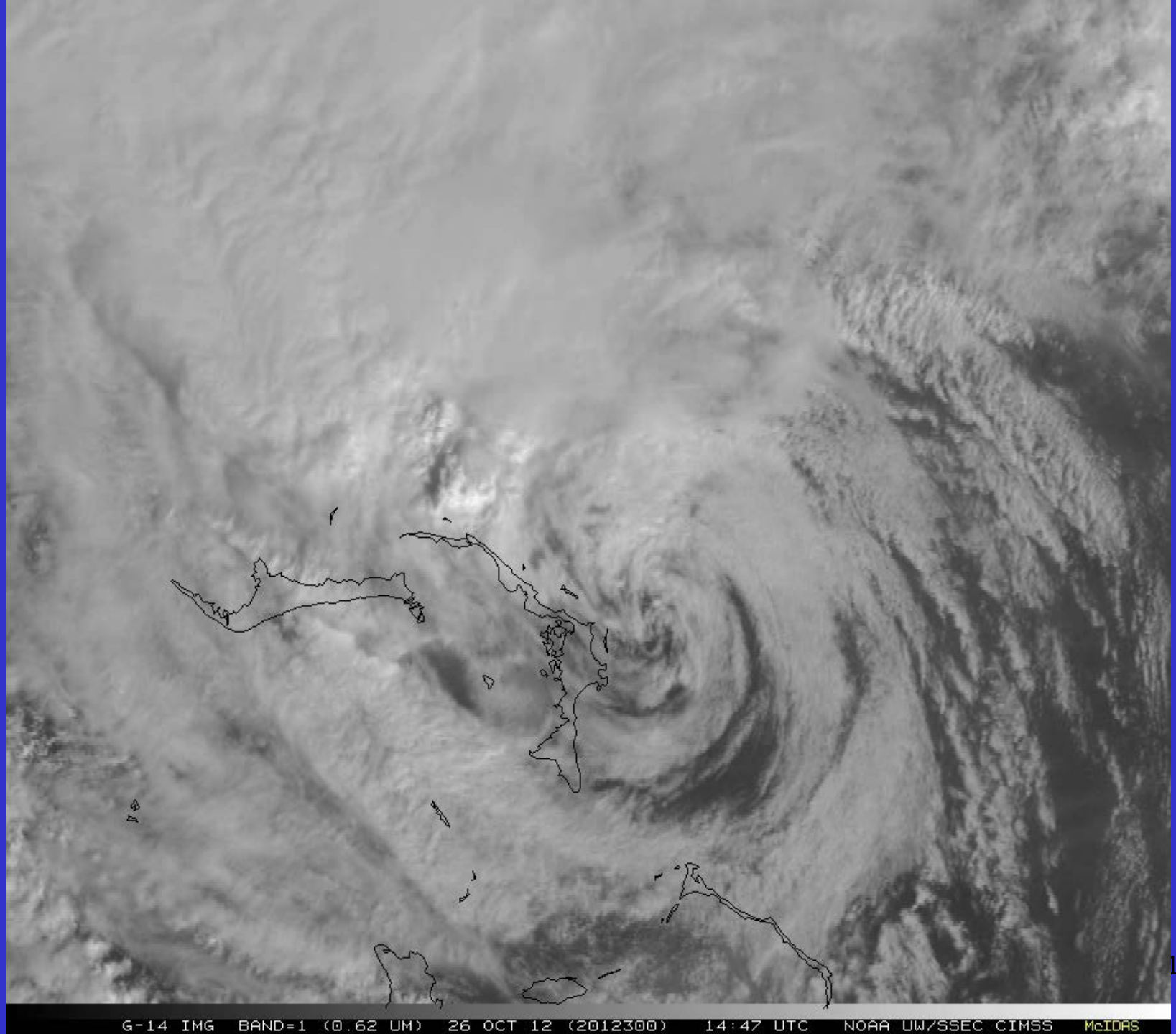
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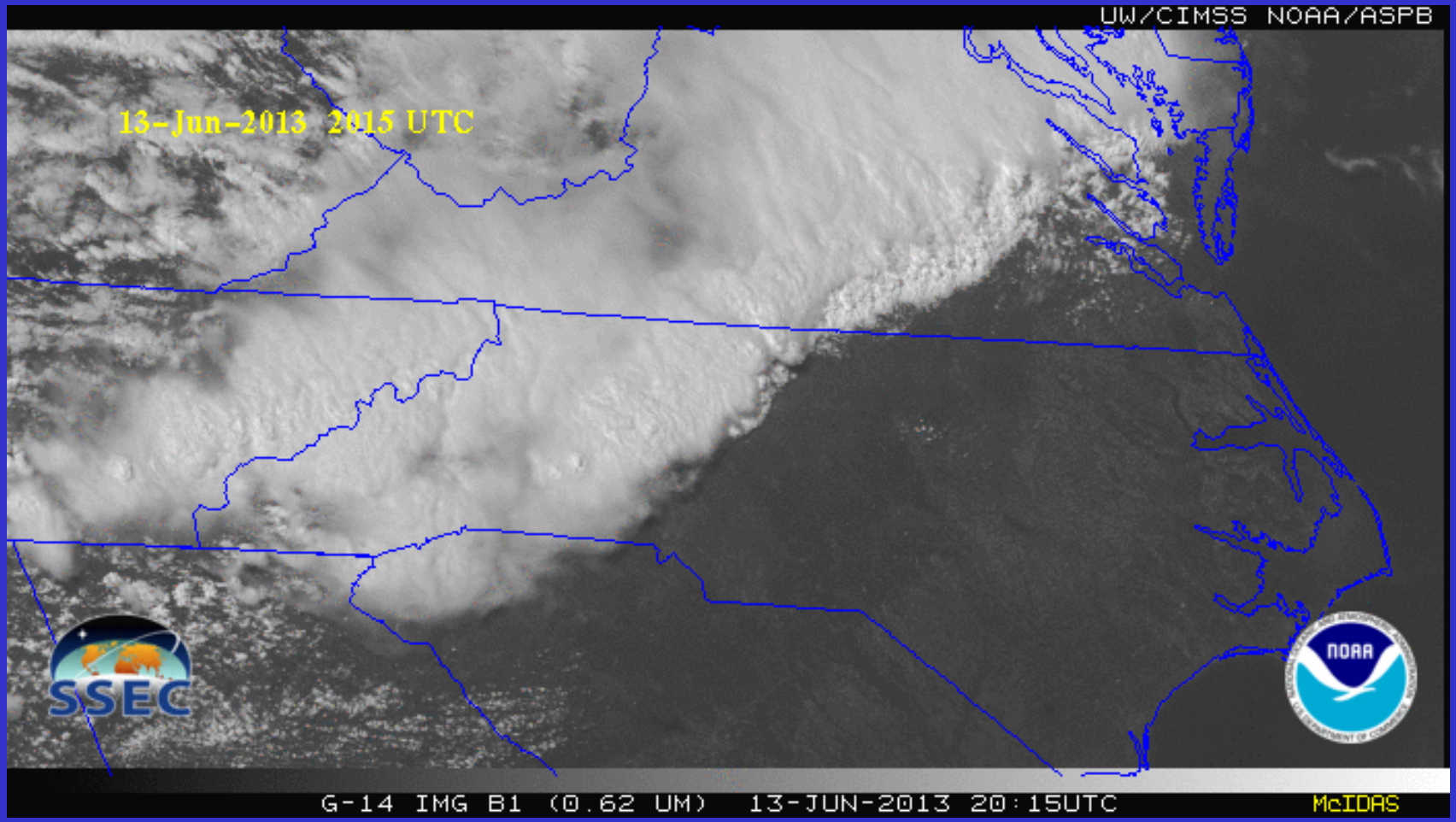
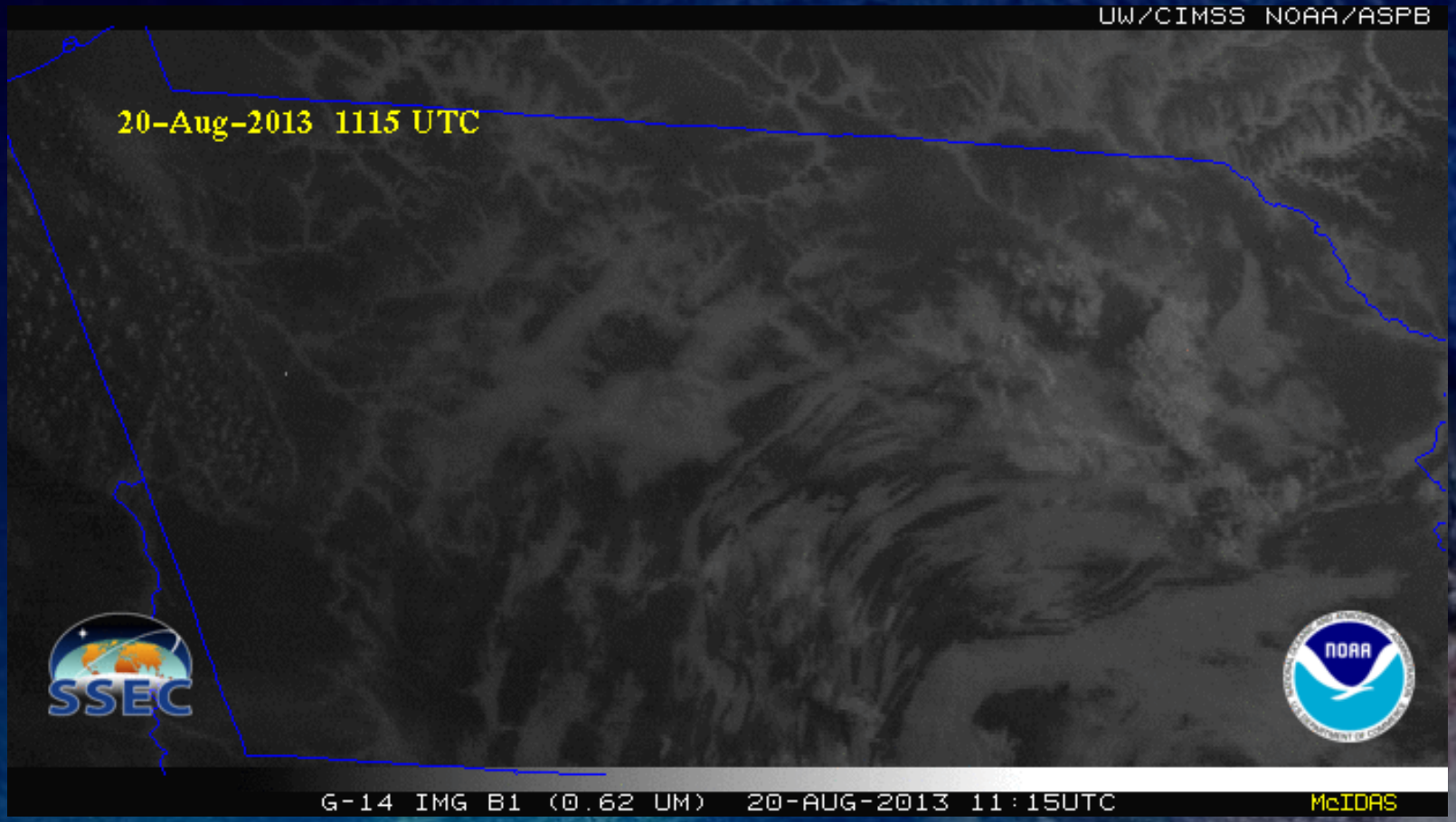
Derecho

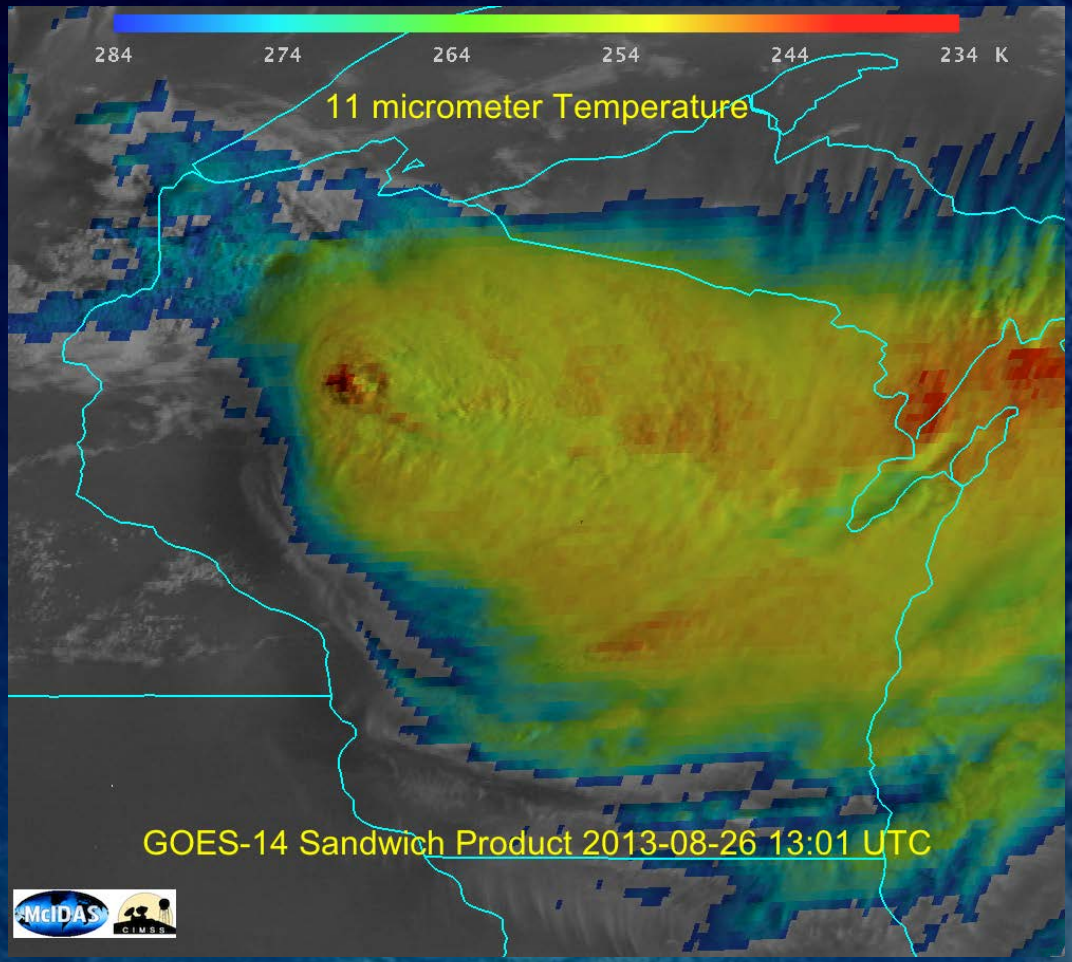

UW/CIMSS NOAA/ASPB
13-Jun-2013 2015 UTC
SSEC
NOAA
G-14 IMG B1 (0.62 UM) 13-JUN-2013 20:15UTC
McIDAS

Fog


UW/CIMSS NOAA/ASPB
20-Aug-2013 1115 UTC
SSEC
NOAA
G-14 IMG B1 (0.62 UM) 20-AUG-2013 11:15UTC
McIDAS

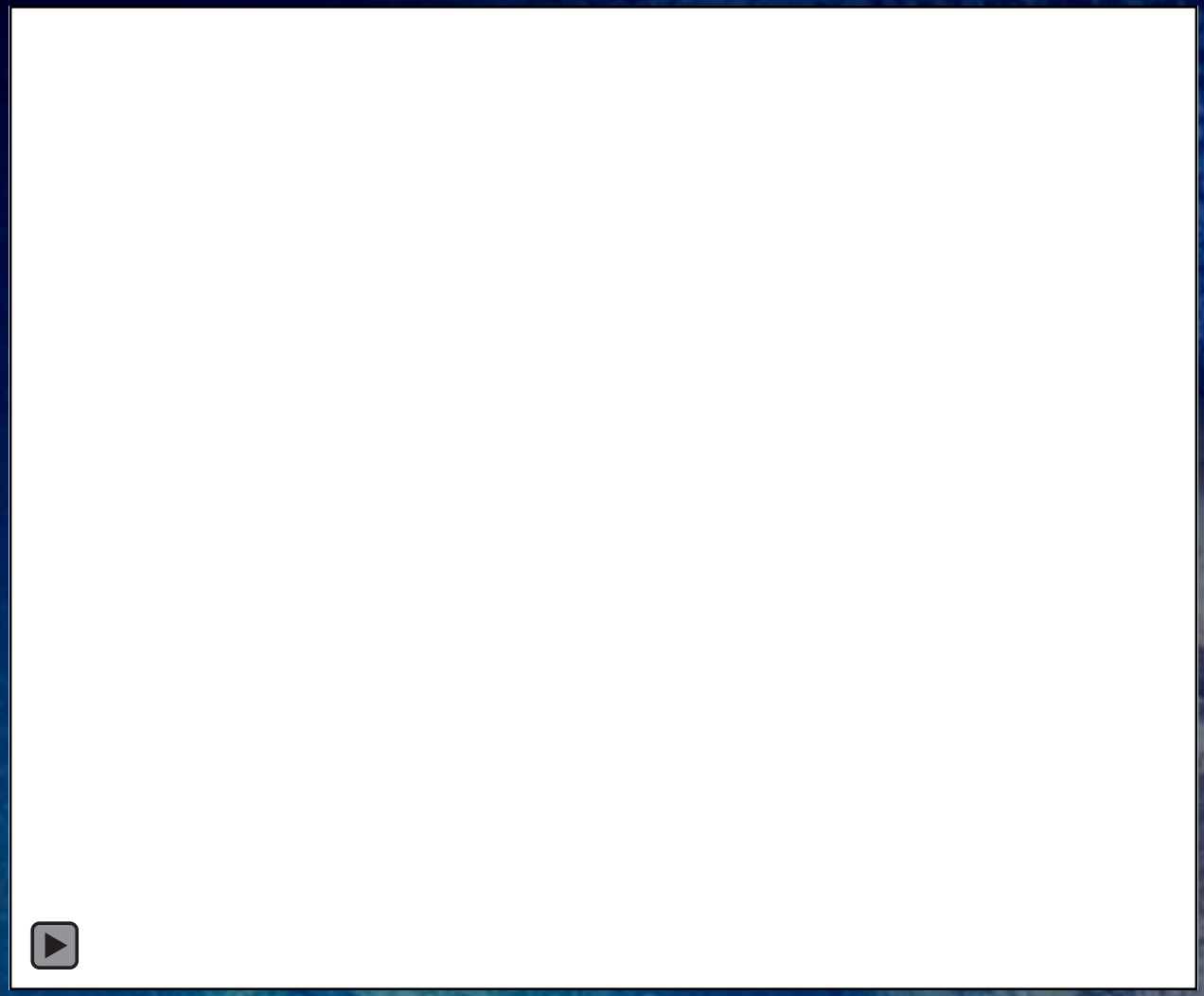
Validation – image combination

- Visible and IR ‘sandwich’ product…

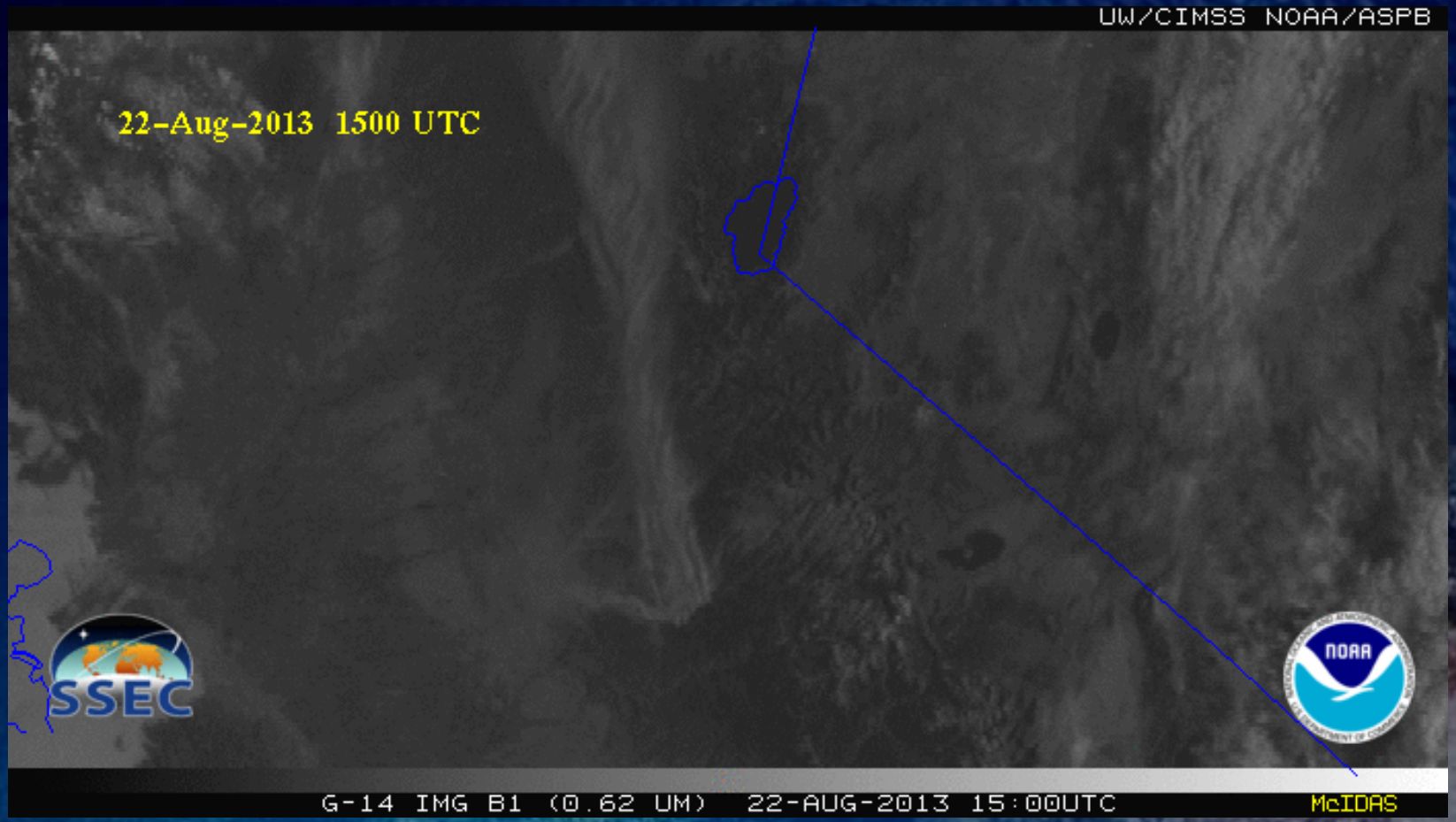


Created in McIDAS-V by Joleen Feltz; similar to the method of Martin Setvak

Visible+Infrared



CA Rim Fire


UW/CIMSS NOAA/ASPB
22-Aug-2013 1500 UTC
SSEC
NOAA
G-14 IMG B1 (0.62 UM) 22-AUG-2013 15:00UTC
McIDAS

GOES-R ABI Products

Baseline Products

Advanced Baseline Imager (ABI)

- Aerosol Detection (Including Smoke and Dust)
- Aerosol Optical Depth (AOD)
- Clear Sky Masks
- Cloud and Moisture Imagery
- Cloud Optical Depth
- Cloud Particle Size Distribution
- Cloud Top Height
- Cloud Top Phase
- Cloud Top Pressure
- Cloud Top Temperature
- Derived Motion Winds
- Derived Stability Indices
- Downward Shortwave Radiation: Surface
- Fire/Hot Spot Characterization
- Hurricane Intensity Estimation
- Land Surface Temperature (Skin)
- Legacy Vertical Moisture Profile
- Legacy Vertical Temperature Profile
- Radiances
- Rainfall Rate/QPE
- Reflected Shortwave Radiation: TOA
- Sea Surface Temperature (Skin)
- Snow Cover
- Total Precipitable Water
- Volcanic Ash: Detection and Height

Future Capabilities

Advanced Baseline Imager (ABI)

- Absorbed Shortwave Radiation: Surface
- Aerosol Particle Size
- Aircraft Icing Threat
- Cloud Ice Water Path
- Cloud Layers/Heights
- Cloud Liquid Water
- Cloud Type
- Convective Initiation
- Currents
- Currents: Offshore
- Downward Longwave Radiation: Surface
- Enhanced “V”/Overshooting Top Detection
- Flood/Standing Water
- Ice Cover
- Low Cloud and Fog
- Ozone Total
- Probability of Rainfall
- Rainfall Potential
- Sea and Lake Ice: Age
- Sea and Lake Ice: Concentration
- Sea and Lake Ice: Motion
- Snow Depth (Over Plains)
- SO_2 Detection
- Surface Albedo
- Surface Emissivity
- Tropopause Folding Turbulence Prediction
- Upward Longwave Radiation: Surface
- Upward Longwave Radiation: TOA
- Vegetation Fraction: Green
- Vegetation Index
- Visibility

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Exelis

GOES-East Optimized Schedules

Kevin Ludlum
NESDIS/OSPO GOES Scheduling (OSPO)

Matthew Seybold, Natalia Donoho
NESDIS/OSPO User Services

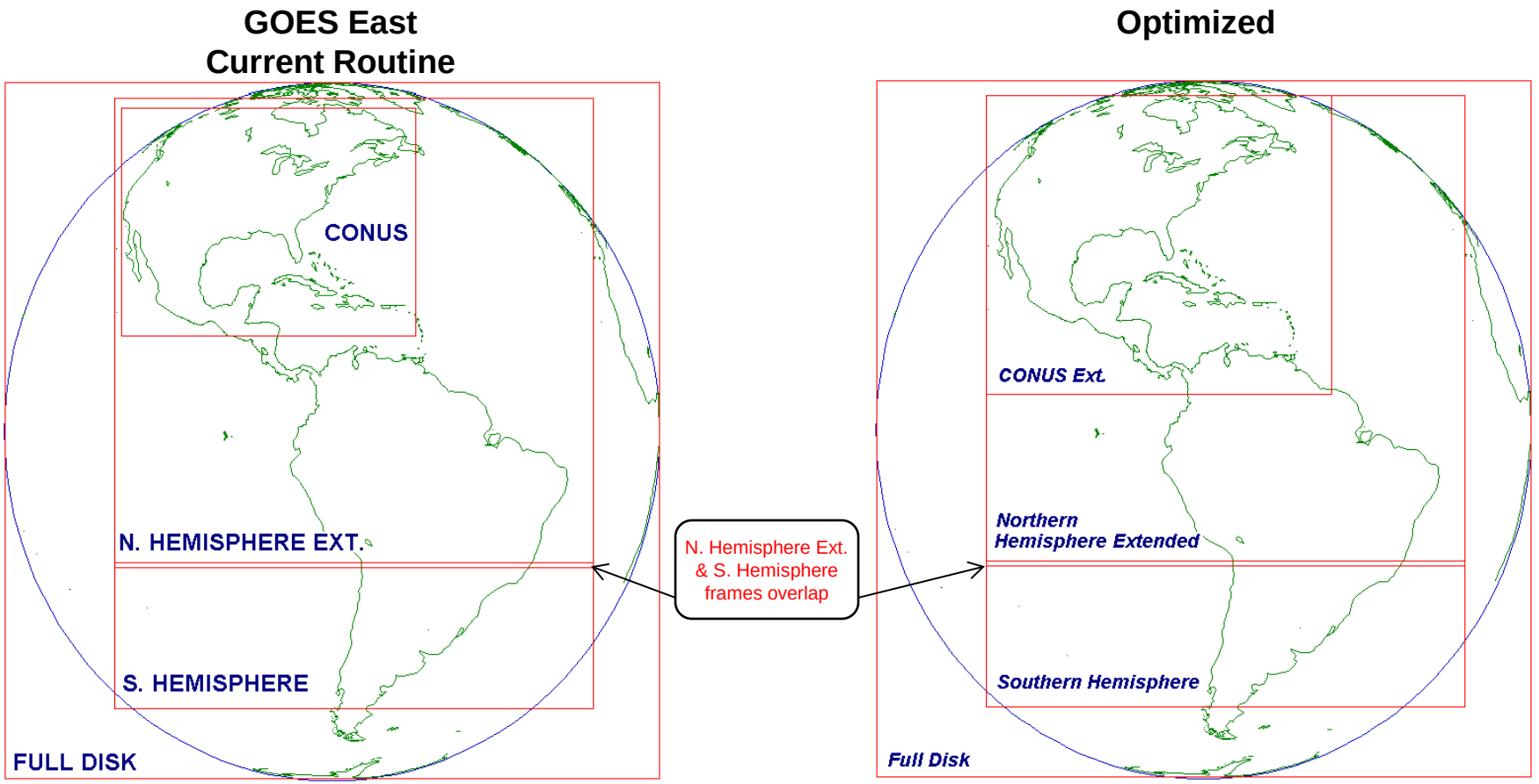
Purpose

- To utilize small schedule idle times that were required on previous satellites (GOES I-M) for INR (image navigation & registration) commanding.
- To better align command timing between Routine (ERTN), Rapid Scan (ERAP), Super Rapid Scan (ESRSO) and Full Disk (EFD) schedules.
- To schedule star navigation windows for the same time in all GOES East Schedules.

Benefits to Users

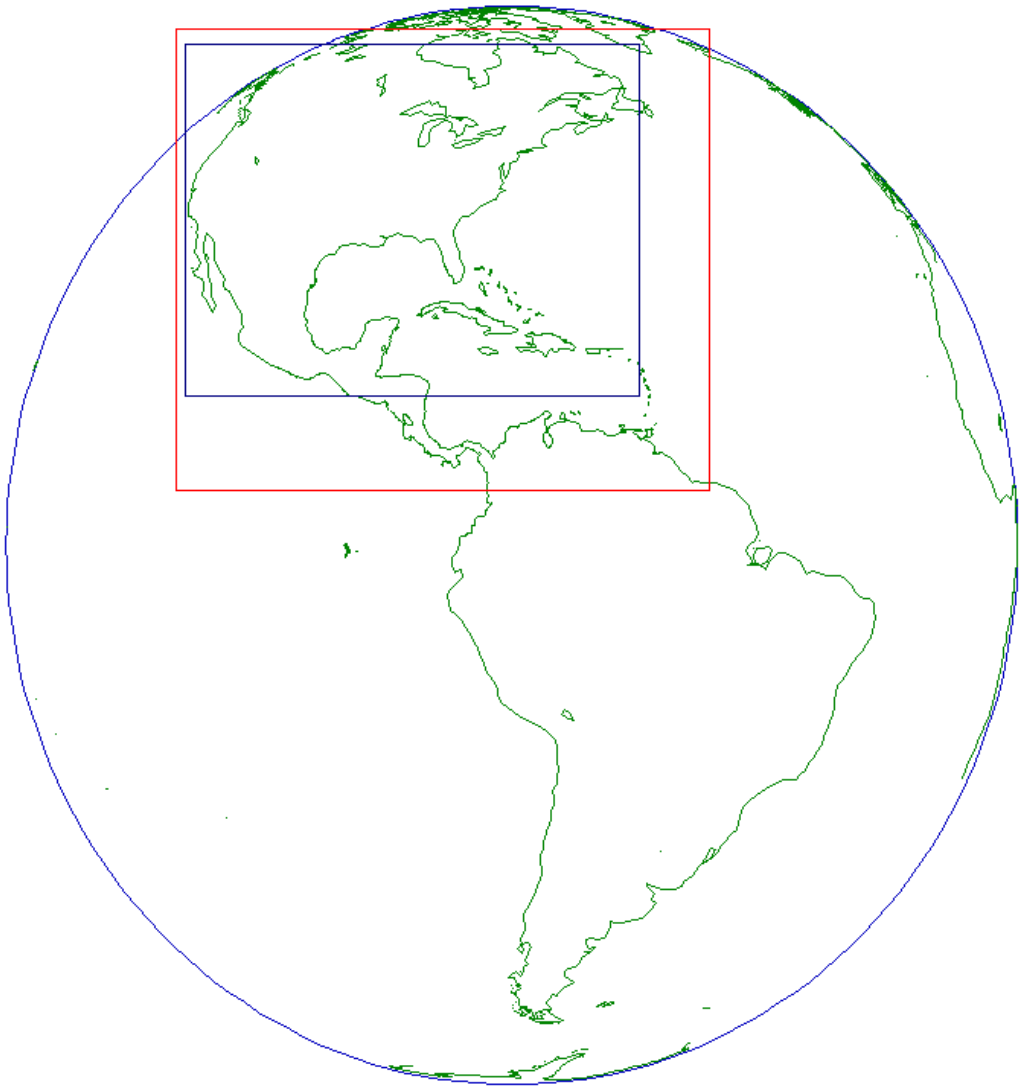
- Routine Schedule
  - The freed time will enable more coverage in areas, such as Canada, The Caribbean Sea, Central America and South America.
  - For example, a tropical cyclone in the Eastern and Southern Caribbean Sea will now be imaged twice as often - every 15 minutes instead of every half hour.
- Rapid Schedule
  - Additional coverage of Eastern Caribbean sector
- Super Rapid Schedule
  - Gain 1 additional image per ½ hour.
  - Images are spread out more in time, giving better chance of more images in the time period of interest.
- Full Disk Schedule
  - Restores southern edge of Full Disk imagery.

GOES-East Routine Frame Changes



The CONUS image in the Current Routine is replaced by the CONUS Ext. image in the Optimized Routine. This will gain beneficial coverage over more of Canada, the Caribbean Sea, East Caribbean Islands, Nicaragua, Costa Rica, Panama, Columbia, Venezuela, and Guyana. (No other frames change). Frame-dependent processing will need adjustment.

GOES-East Routine Frame Changes



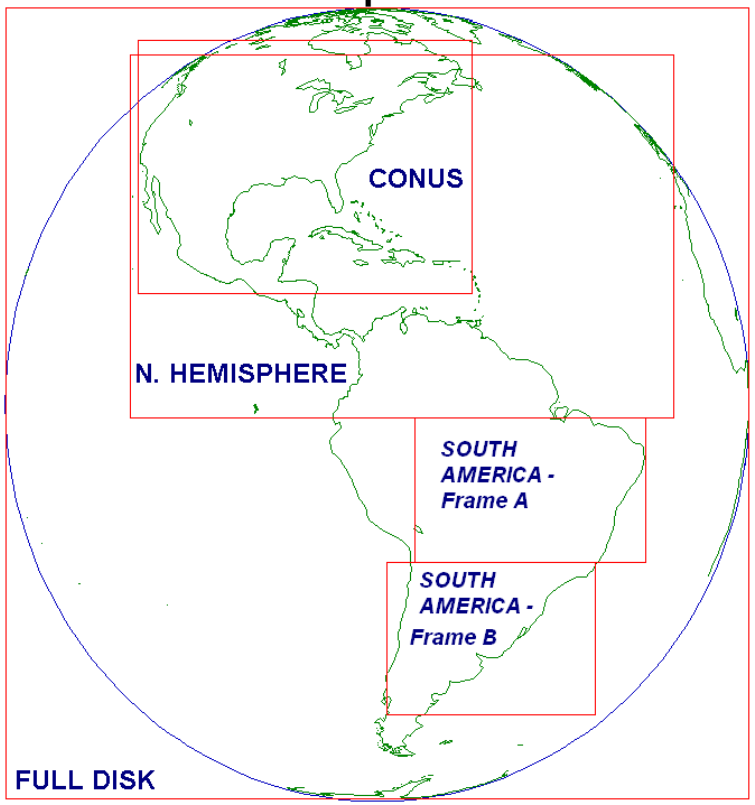
GOES-East Routine Schedule Timing Changes

Current Routine			Optimized Routine		
01:01:30	CONTINENTAL US (CONUS)	04:43	01:00:00	CONTINENTAL US (CONUS) EXT.	06:59
01:09:10	SOUTHERN HEMISPHERE	04:49	01:07:15	SOUTHERN HEMISPHERE	04:49
01:15:00	NORTHERN HEMISPHERE EXT.	14:15	01:15:00	NORTHERN HEMISPHERE EXT.	14:15
01:31:30	CONTINENTAL US (CONUS)	04:43	01:30:00	CONTINENTAL US (CONUS) EXT.	06:59
01:39:10	SOUTHERN HEMISPHERE	04:49	01:37:15	SOUTHERN HEMISPHERE	04:49
01:45:00	NORTHERN HEMISPHERE EXT.	14:15	01:45:00	NORTHERN HEMISPHERE EXT.	14:15
02:01:30	CONTINENTAL US (CONUS)	04:43	02:00:00	CONTINENTAL US (CONUS) EXT.	06:59
02:09:10	SOUTHERN HEMISPHERE	04:49	02:07:15	SOUTHERN HEMISPHERE	04:49
02:15:00	NORTHERN HEMISPHERE EXT.	14:15	02:15:00	NORTHERN HEMISPHERE EXT.	14:15
02:31:30	CONTINENTAL US (CONUS)	04:43	02:30:00	CONTINENTAL US (CONUS) EXT.	06:59
02:39:10	SOUTHERN HEMISPHERE	04:49	02:37:15	SOUTHERN HEMISPHERE	04:49
02:45:00	FULL DISK	26:06	02:45:00	FULL DISK	26:06
03:15:00	NORTHERN HEMISPHERE EXT.	14:15	03:15:00	NORTHERN HEMISPHERE EXT.	14:15
03:31:30	CONTINENTAL US (CONUS)	04:43	03:30:00	CONTINENTAL US (CONUS) EXT.	06:59
03:39:10	SOUTHERN HEMISPHERE	04:49	03:37:15	SOUTHERN HEMISPHERE	04:49
03:45:00	NORTHERN HEMISPHERE EXT.	14:15	03:45:00	NORTHERN HEMISPHERE EXT.	14:15

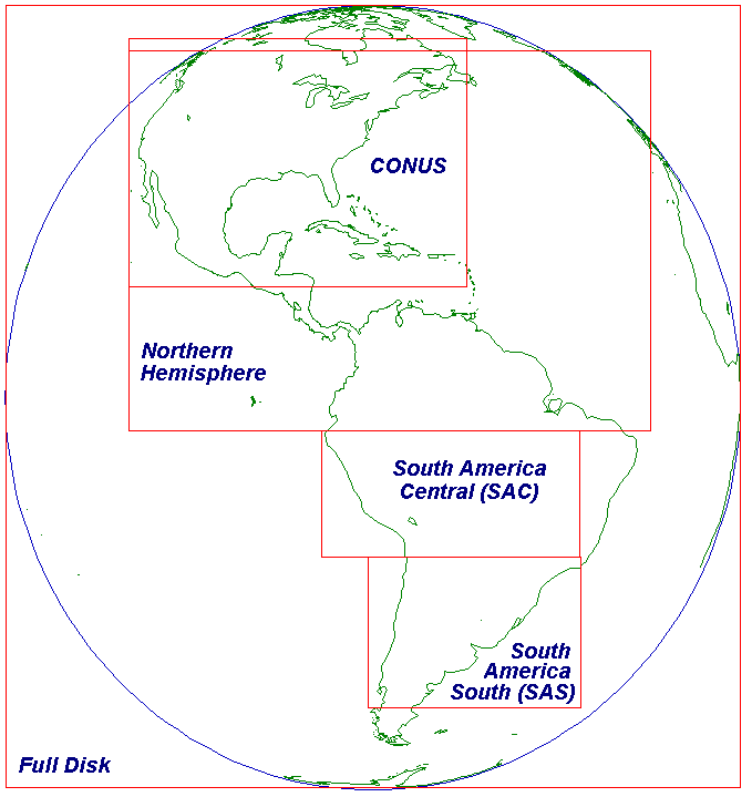
NOTE – Images will now be provided at new times in the schedule and there will be different lengths of time between images. The times are commanded times, and there could be up to a 20 second delay for processors to see the start of image. Any time-dependent processing should be modified to match the new image time stamps.

GOES-East Rapid Frame Changes

GOES East Current Rapid Scan



Optimized



Primary changes are with South America Frames, but all image frames in the Rapid Schedule have been modified, some more than others.

Going from Routine to Rapid scan will generate less coverage of the Eastern Caribbean Sea because although the Routine schedule has the new CONUS Extended, the Rapid schedule has the smaller CONUS frame. In cases, when the Eastern Caribbean is a concern/focus the Hurricane "Eastern Caribbean" Rapid sector may be called to shift the Rapid frame from CONUS to Eastern Caribbean which ensures at least 10 minute (or better) imagery. See Part 3 of Briefing for more information on Rapid frame for Eastern Caribbean.

GOES-East Rapid Schedule Timing Changes

Current Rapid

00:59:50	SOUTH AMERICA - IMAGE A	02:02
01:02:05	CONTINENTAL US (CONUS)	04:43
01:10:00	CONTINENTAL US (CONUS)	04:43
01:15:00	NORTHERN HEMISPHERE	09:44
01:25:00	CONTINENTAL US (CONUS)	04:43
01:29:50	SOUTH AMERICA - IMAGE B	02:02
01:32:05	CONTINENTAL US (CONUS)	04:43
01:40:00	CONTINENTAL US (CONUS)	04:43
01:45:00	NORTHERN HEMISPHERE	09:44
01:55:00	CONTINENTAL US (CONUS)	04:43
01:59:50	SOUTH AMERICA - IMAGE A	02:02
02:02:05	CONTINENTAL US (CONUS)	04:43
02:10:00	CONTINENTAL US (CONUS)	04:43
02:15:00	NORTHERN HEMISPHERE	09:44
02:25:00	CONTINENTAL US (CONUS)	04:43
02:29:50	SOUTH AMERICA - IMAGE B	02:02
02:32:05	CONTINENTAL US (CONUS)	04:43
02:40:00	CONTINENTAL US (CONUS)	04:43
02:45:00	FULL DISK	26:06
03:15:00	NORTHERN HEMISPHERE	09:44
03:25:00	CONTINENTAL US (CONUS)	04:43
03:29:50	SOUTH AMERICA - IMAGE B	02:02
03:32:05	CONTINENTAL US (CONUS)	04:43
03:40:00	CONTINENTAL US (CONUS)	04:43
03:45:00	NORTHERN HEMISPHERE	09:44
03:55:00	CONTINENTAL US (CONUS)	04:43

Optimized Rapid

01:00:00	CONTINENTAL US (CONUS)	04:37
01:04:50	SOUTH AMERICA CENTRAL (SAC)	02:01
01:07:05	CONTINENTAL US (CONUS)	04:37
01:15:00	NORTHERN HEMISPHERE	09:55
01:25:09	CONTINENTAL US (CONUS)	04:37
01:30:00	CONTINENTAL US (CONUS)	04:37
01:34:50	SOUTH AMERICA SOUTH (SAS)	02:05
01:37:05	CONTINENTAL US (CONUS)	04:37
01:45:00	NORTHERN HEMISPHERE	09:55
01:55:09	CONTINENTAL US (CONUS)	04:37
02:00:00	CONTINENTAL US (CONUS)	04:37
02:04:50	SOUTH AMERICA CENTRAL (SAC)	02:01
02:07:05	CONTINENTAL US (CONUS)	04:37
02:15:00	NORTHERN HEMISPHERE	09:55
02:25:09	CONTINENTAL US (CONUS)	04:37
02:30:00	CONTINENTAL US (CONUS)	04:37
02:34:50	SOUTH AMERICA SOUTH (SAS)	02:05
02:37:05	CONTINENTAL US (CONUS)	04:37
02:45:00	FULL DISK	26:06
03:15:00	NORTHERN HEMISPHERE	09:55
03:25:09	CONTINENTAL US (CONUS)	04:37
03:30:00	CONTINENTAL US (CONUS)	04:37
03:34:50	SOUTH AMERICA SOUTH (SAS)	02:05
03:37:05	CONTINENTAL US (CONUS)	04:37
03:45:00	NORTHERN HEMISPHERE	09:55
03:55:09	CONTINENTAL US (CONUS)	04:37

NOTE – Images will now be provided at new times in the schedule and there will be different lengths of time between images. The times are commanded times, and there could be up to a 20 second delay for processors to see the start of image. Any time-dependent processing should be modified to match the new image time stamps.

Proposed Testing

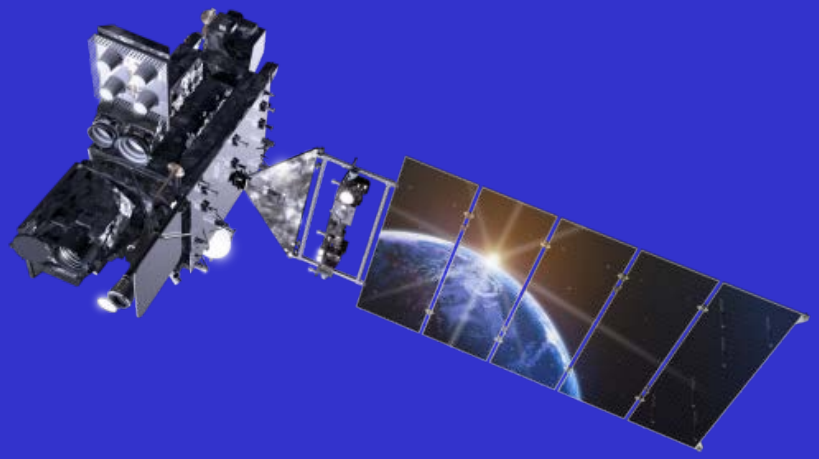
- **GOES-14 Testing: August 2013 when GOES-14 was out of storage, tested all four schedules (ERTN, ERAP, ESRSO and Full Disk). Adjustments were made to ensure the sequences ran without error, and retested successfully.**

- **GOES-13 Testing: The Products and User Services groups would like to perform two additional tests prior to transitioning to the Optimized Schedules. The tests would allow all systems to be tested operationally, as well as allow Users to see examples of the new products. Proposed test dates are as follows:**
  - **Feb 10, 1600-1900UTC replace routine imaging with Optimized routine imaging.**
  - **Feb 12, 1600-1900UTC replace routine imaging with Optimized Rapid imaging.**
  - **Later dates could also be scheduled prior to April.**

- **Pending full approvals**

Outline

- ABI (Advanced Baseline Imager) Modes
  - Continuous Full Disk
  - Flex
- GOES-14
  - Post Launch Test in 2009/2010
  - SRSOR (2012 and 2013)
- GOES-13 Optimized Schedule changes
- Reference
- Summary



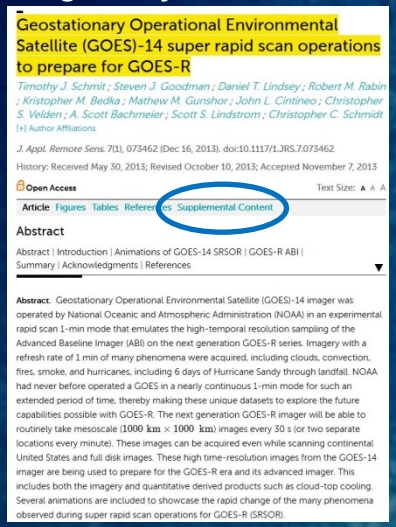
Lockheed Martin

Reference

Schmit T.J., Goodman S.J., Lindsey D.T., R. M. Rabin, K. M. Bedka, M. M. Gunshor, J. L. Cintineo, C. S. Velden, A. S. Bachmeier, S. S. Lindstrom, and C. C. Schmidt, 2013: **Geostationary operational environmental satellite (GOES)-14 super rapid scan operations to prepare for GOES-R**. *J. Appl. Remote Sens.* 0001;7(1):073462. doi:10.1117/1.JRS.7.073462.

http://remotesensing.spiedigitallibrary.org/article.aspx?articleid=1790703

Note that currently the videos do not work via the pdf or the 'video link' on-line, although they can be accessed via the 'supplemental content' link.


Geostationary Operational Environmental Satellite (GOES)-14 super rapid scan operations to prepare for GOES-R

Timothy J. Schmit ; Steven J. Goodman ; Daniel T. Lindsey ; Robert M. Rabin ; Kristopher M. Bedka ; Mathew M. Gunshor ; John L. Cintineo ; Christopher S. Velden ; A. Scott Bachmeier ; Scott S. Lindstrom ; Christopher C. Schmidt

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J. Appl. Remote Sens. 7(1), 073462 (Dec 16, 2013). doi:10.1117/1.JRS.7.073462

History: Received May 30, 2013; Revised October 10, 2013; Accepted November 7, 2013

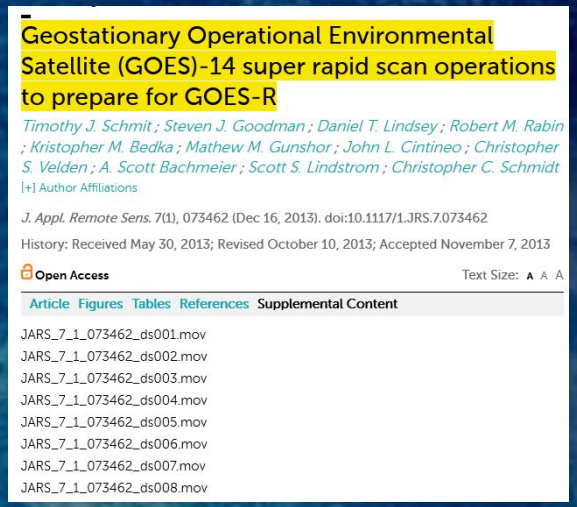
Open Access Text Size: A A A

Article Figures Tables References Supplemental Content

Abstract

Abstract | Introduction | Animations of GOES-14 SRSOR | GOES-R ABI | Summary | Acknowledgments | References

Abstract. Geostationary Operational Environmental Satellite (GOES)-14 imager was operated by National Oceanic and Atmospheric Administration (NOAA) in an experimental rapid scan 1-min mode that emulates the high-temporal resolution sampling of the Advanced Baseline Imager (ABI) on the next generation GOES-R series. Imagery with a refresh rate of 1 min of many phenomena were acquired, including clouds, convection, fires, smoke, and hurricanes, including 6 days of Hurricane Sandy through landfall. NOAA had never before operated a GOES in a nearly continuous 1-min mode for such an extended period of time, thereby making these unique datasets to explore the future capabilities possible with GOES-R. The next generation GOES-R imager will be able to routinely take mesoscale (1000 km × 1000 km) images every 30 s (or two separate locations every minute). These images can be acquired even while scanning continental United States and full disk images. These high time-resolution images from the GOES-14 imager are being used to prepare for the GOES-R era and its advanced imager. This includes both the imagery and quantitative derived products such as cloud-top cooling. Several animations are included to showcase the rapid change of the many phenomena observed during super rapid scan operations for GOES-R (SRSOR).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JARS_7_1_073462_ds002.mov
JARS_7_1_073462_ds003.mov
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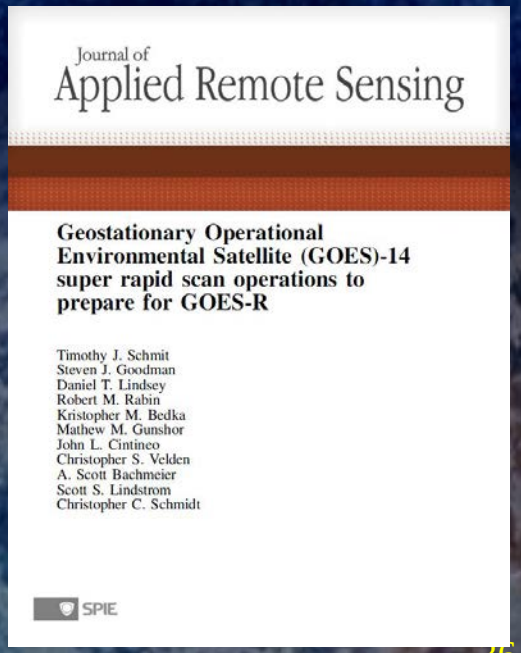
Journal of Applied Remote Sensing

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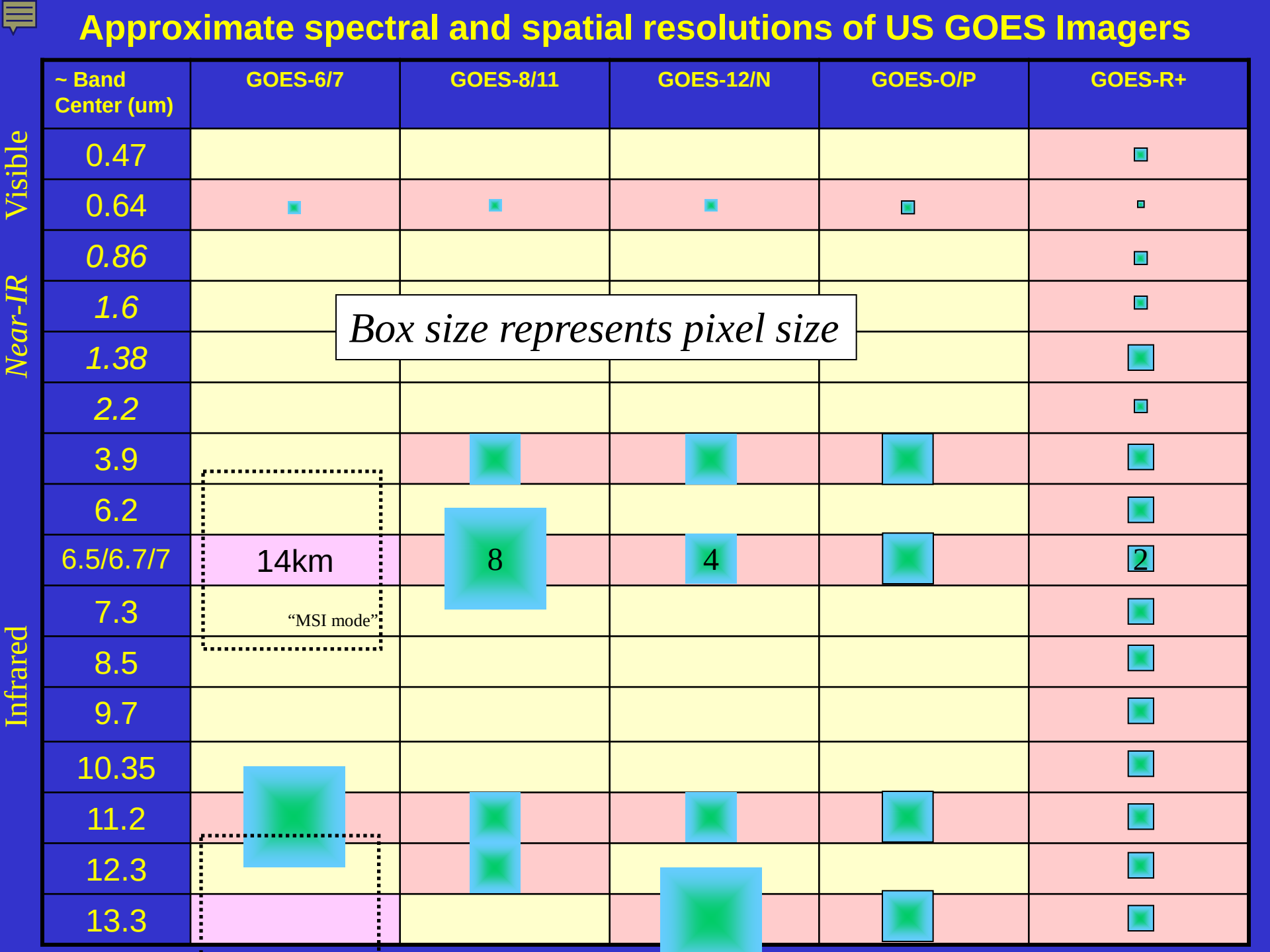
SPIE

Approximate spectral and spatial resolutions of US GOES Imagers



Summary

1. The GOES-R ABI provides mission continuity

2. Two times the image navigation quality

3. Three times the number of imaging bands

4. Four times the spatial resolutions

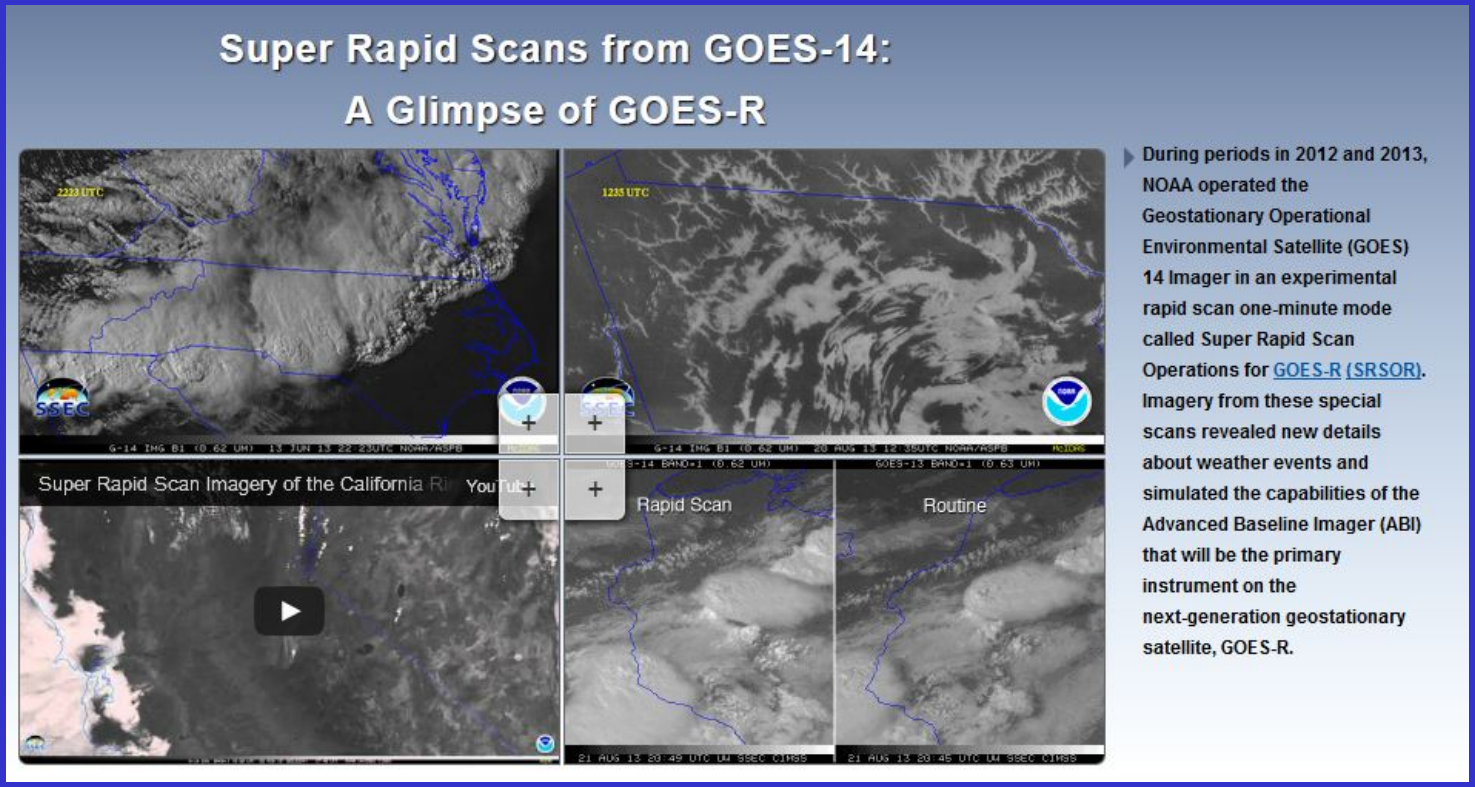
5. Five times the coverage rate
    - Special GOES-14 1-min data pathfinder

SRSOR Links

http://cimss.ssec.wisc.edu/goes/srsor/GOES-14_SRSOR.html

http://cimss.ssec.wisc.edu/goes/srsor2013/GOES-14_SRSOR.html

http://www.nesdis.noaa.gov/fourbox/09-23-13/



More information

GOES:

- http*://www.ospo.noaa.gov/Operations/GOES/schedules.html*

GOES-R:

- http://www.goes-r.gov
- http://www.meted.ucar.edu/index.htm

UW/SSEC/CIMSS/ASPB:

- http://cimss.ssec.wisc.edu/goes_r/proving-ground.html
- http://cimss.ssec.wisc.edu/goes_r/proving-ground/nssl_abi/nssl_abi_rt.html
- http://cimss.ssec.wisc.edu/goes_r/proving-ground/wrf_chem_abi/wrf_chem_abi.html
- http://cimss.ssec.wisc.edu/goes/abi/
- http://cimss.ssec.wisc.edu/goes/blog/

AMS BAMS Article on the ABI

INTRODUCING THE NEXT-GENERATION ADVANCED BASELINE IMAGER ON GOES-R

BY TIMOTHY J. SCHMIT, MATHEW M. GUNSHOR, W. PAUL MENZEL, JAMES J. GURKA, JUN LI, AND A. SCOTT BACHMEIER

The ABI will begin a new era in U.S. environmental remote sensing with more spectral bands, faster imaging, and higher spatial resolution than the current imager.

The Advanced Baseline Imager (ABI) is being developed as the future imager on the Geostationary Operational Environmental Satellite (GOES) series, slated to be launched in approximately 2012 with GOES-R (Gurka and Dittberner 2001). Similar to the current GOES imager, ABI will be used for a wide range of qualitative and quantitative weather, oceanographic, climate, and environmental applications. ABI will offer more spectral bands, higher spatial resolution, and faster imaging than the current GOES imager. ABI spatial resolution will be nominally 2 km for the infrared bands and 0.5 km for the 0.64-μm visible band. While the instrument will allow a flexible scanning scenario, two basic modes are envisioned. One mode is that every 15 min ABI will scan the full disk (FD), plus continental United States (CONUS) 3 times, plus a selectable 1000 km × 1000 km area every 30 s. The second mode is that the ABI can be programmed to scan the FD iteratively. The FD image can be acquired in approximately 5 min. Given that the current GOES imager takes approximately 25 min for a FD, this implies there will be a fivefold increase in the coverage rate.

ABI has 16 spectral bands; five are similar to the 0.6-, 4-, 11-, and 12-μm windows and the 6.5-μm water vapor band on the current GOES-8/-10/-11 imagers (Menzel and Purdom 1994; Elliott et al. 1998), and another is similar to the 13.3 μm on the GOES-I/-J/-N/-O/-P imagers and the GOES-8/-P sounders (Hillger et al. 2003; Schmit et al. 2001, 2002). Additional bands on ABI are 0.47 μm for aerosol detection and visibility estimation; 0.865 μm for aerosol detection and estimation of vegetation health; 1.378 μm to detect very thin cirrus clouds; 1.6 μm for snow/cloud discrimination; 2.25 μm for aerosol and cloud particle size estimation, vegetation, cloud properties/screening, hot-spot detection, moisture

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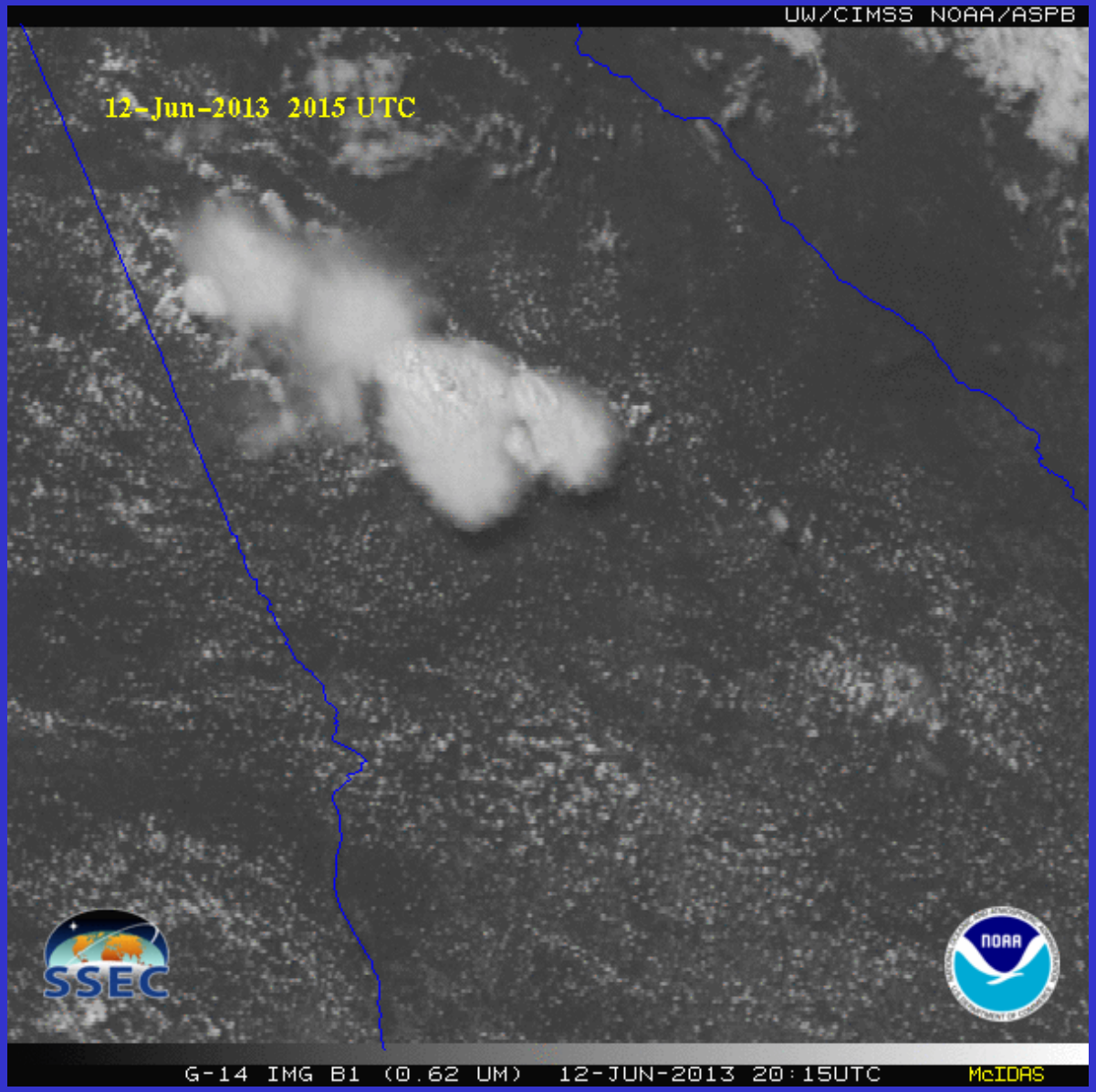
GA: SRSOR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