Using GOES-14 to Showcase GOES-R ABI Scan Scenarios

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Madison, WI

+ Many, many others…

College Park, MD

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Thanks to…

- Steven J. Goodman, Daniel T. Lindsey, Robert M. Rabin, Kristopher M. Bedka, John L. Cintineo, Christopher S. Velden, A. Scott Bachmeier, Scott S. Lindstrom, Mathew M. Gunshor, Christopher C. Schmidt
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- Don Hillger
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- EUMETSAT, JAM, KMA, etc.
- Ana Carrion, Ninghai Sun, Lori Brown, etc.

Outline

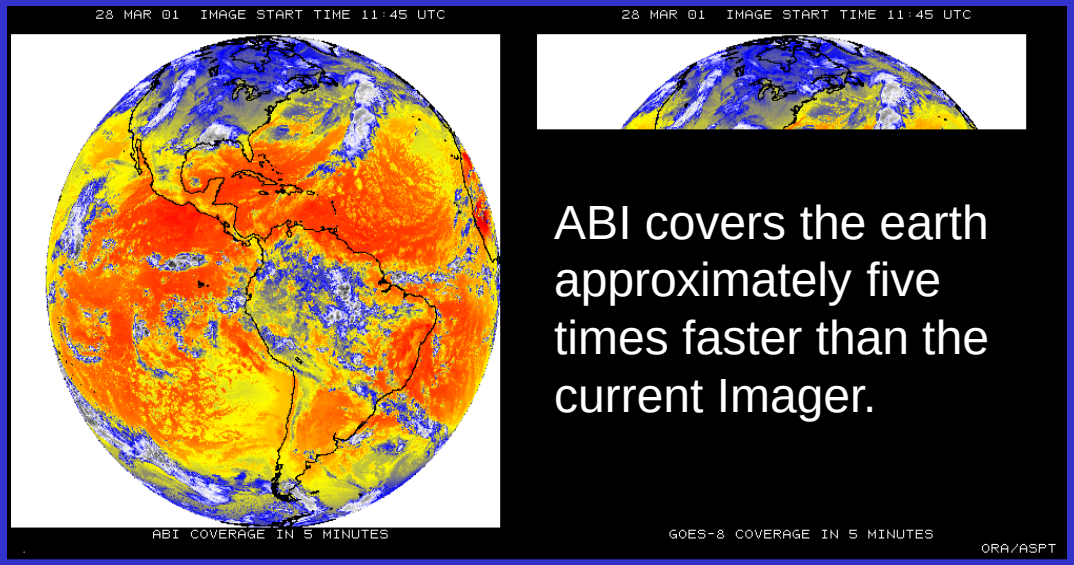
- GOES-R Overview
- GOES-14
  - PLT in 2009/2010
  - SRSOR (2012 and 2013)
- ABI (Advanced Baseline Imager) Modes
  - Flex
  - Continuous Full Disk
  - Hybrid, etc.
- Other advanced geo images
- GOES-13 Optimized Schedule changes
- Reference
- Summary

GOES-R Overview

- Advanced Baseline Imager (ABI)
- No dedicated Sounder
- Geostationary Lightning Mapper (GLM)
- Space Weather
  - Space Environmental In-Situ Suite (SEISS)
  - Solar Ultra Violet Imager (SUVI)
  - Extreme Ultra Violet/X-Ray Irradiance Sensor (EXIS)
  - Magnetometer
- Communications
  - GOES Rebroadcast (GRB)
  - Low Rate Information Transmissions (LRIT)
  - Emergency Managers Weather Information Network (EMWIN)
  - Search and Rescue (SAR)
  - Data Collection System (DCS)

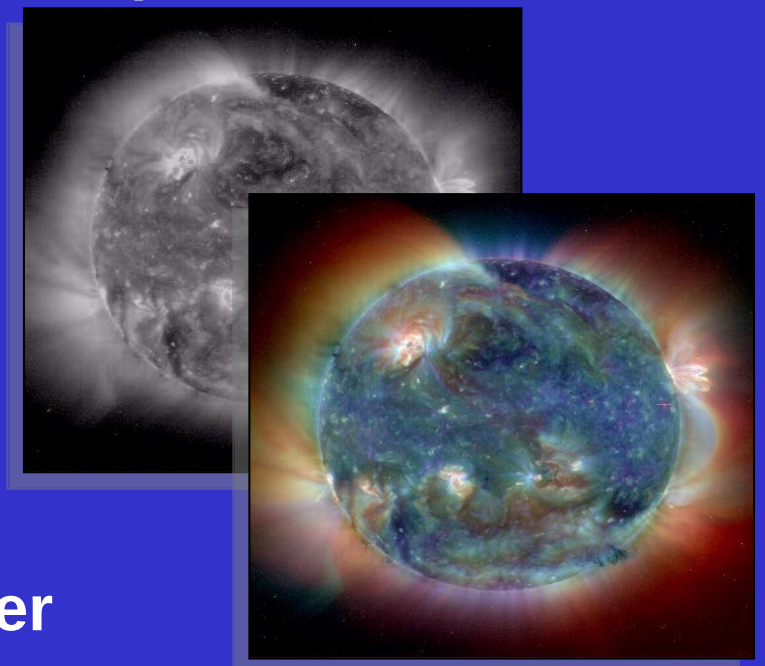
GOES-R main instruments

ABI – Advanced Baseline Imager



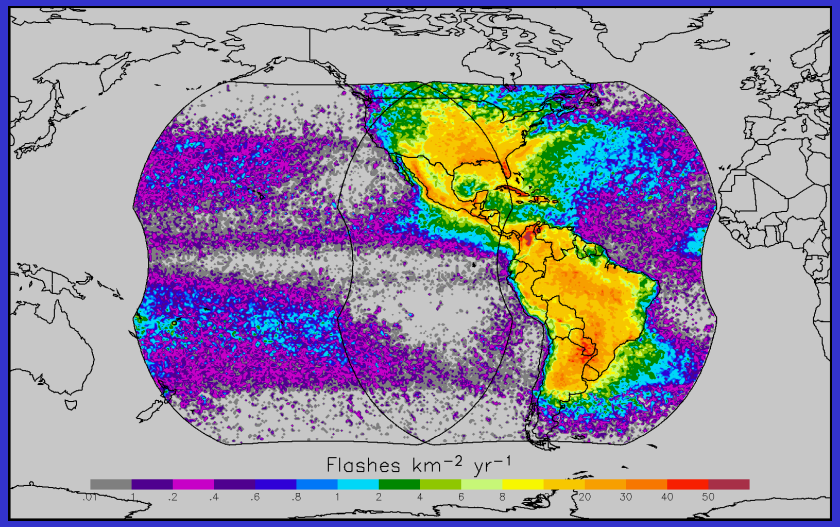
ABI covers the earth approximately five times faster than the current Imager.

Space Weather/Solar

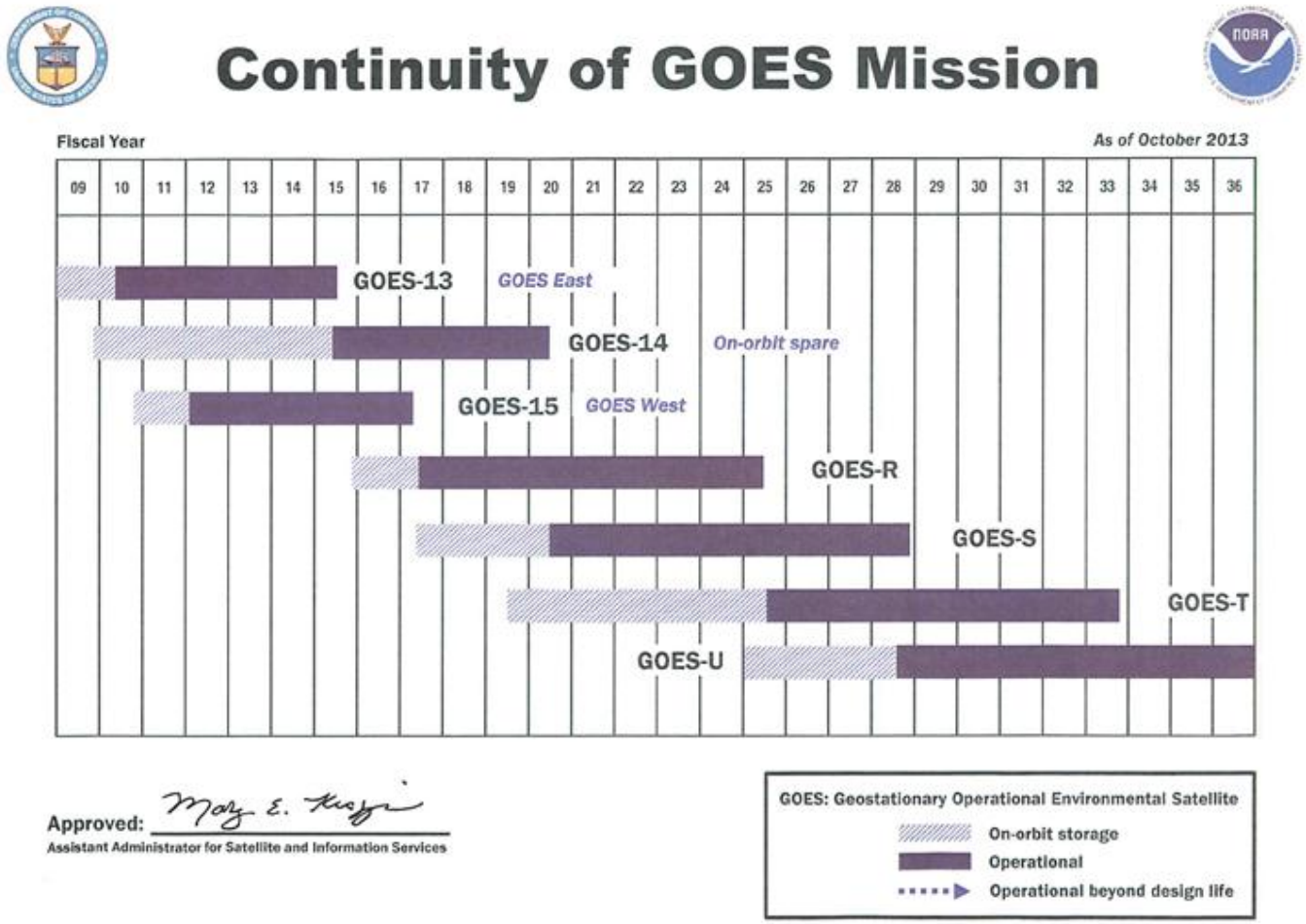


Images courtesy of SOHO EIT, a joint NASA/ESA program

Geostationary Lightning Mapper



GOES-S (East?): Operational mid-2020



The Advanced Baseline Imager:

	ABI	Current
Spectral Coverage		
	16 bands	5 bands
Spatial resolution		
0.64 μm Visible	0.5 km	Approx. 1 km
Other Visible/near-IR	1.0 km	n/a
Bands (>2 μm)	2 km	Approx. 4 km
Spatial coverage		
Full disk	4 per hour	Scheduled (3 hrly)
CONUS	12 per hour	~4 per hour
Mesoscale	Every 30 sec	n/a
Visible (reflective bands)		
On-orbit calibration	Yes	No

ABI Visible/Near-IR Bands

Future GOES imager (ABI) band	Wavelength range (μm)	Central wavelength (μm)	Nominal subsatellite IGFOV (km)	Sample use
1	0.45–0.49	0.47	1	Daytime aerosol over land, coastal water mapping
2	0.59–0.69	0.64	0.5	Daytime clouds fog, inso-lation, winds
3	0.846–0.885	0.865	1	Daytime vegetation/burn scar and aerosol over water, winds
4	1.371–1.386	1.378	2	Daytime cirrus cloud
5	1.58–1.64	1.61	1	Daytime cloud-top phase and particle size, snow
6	2.225–2.275	2.25	2	Daytime land/cloud properties, particle size, vegetation, snow

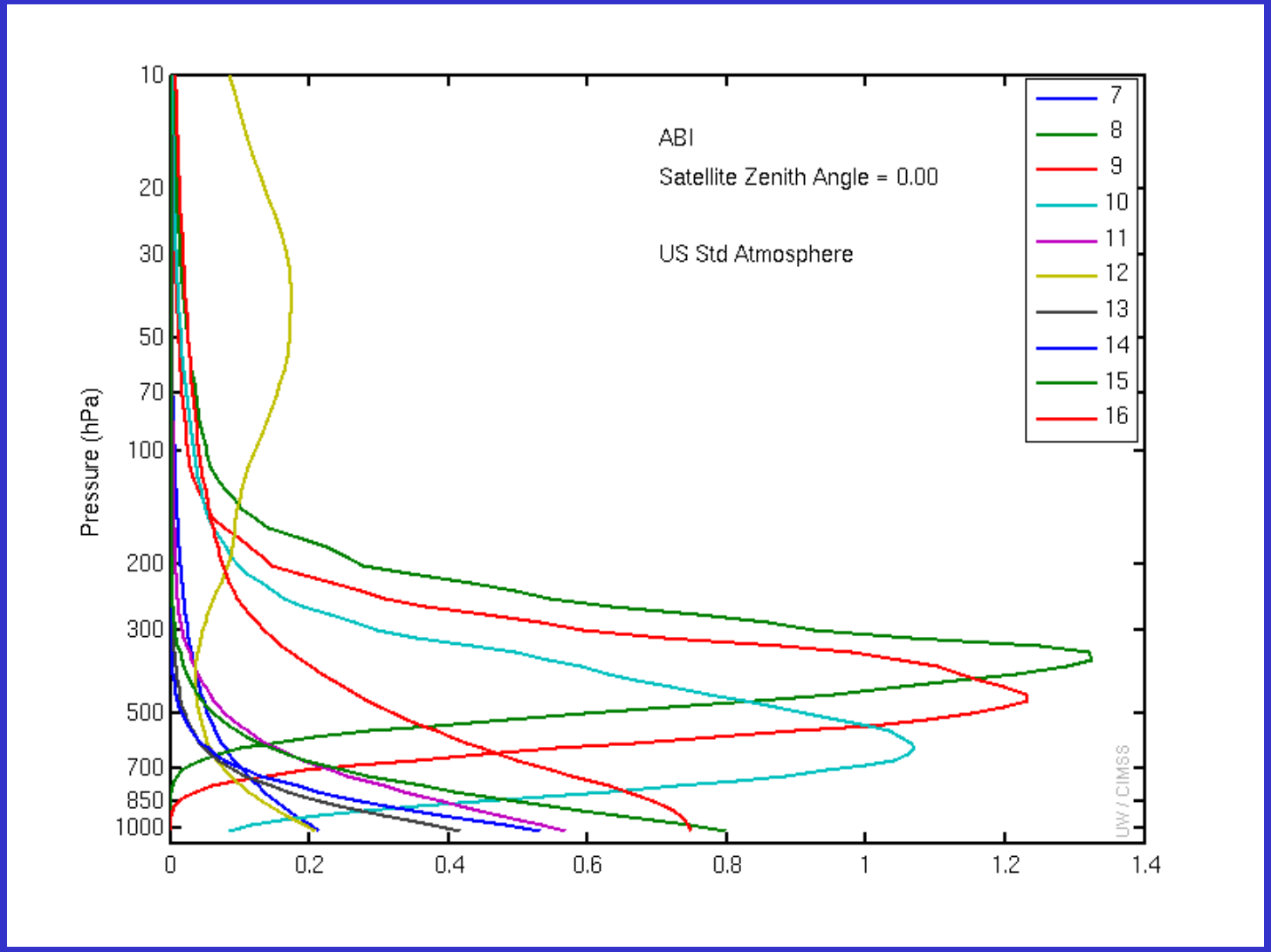
Schmit et al, 2005

ABI IR Bands

7	3.80–4.00	3.90	2	Surface and cloud, fog at night, fire, winds
8	5.77–6.6	6.19	2	High-level atmospheric water vapor, winds, rainfall
9	6.75–7.15	6.95	2	Midlevel atmospheric water vapor, winds, rainfall
10	7.24–7.44	7.34	2	Lower-level water vapor, winds, and SO_2
11	8.3–8.7	8.5	2	Total water for stability, cloud phase, dust, SO_2 rainfall
12	9.42–9.8	9.61	2	Total ozone, turbulence, and winds
13	10.1–10.6	10.35	2	Surface and cloud
14	10.8–11.6	11.2	2	Imagery, SST, clouds, rainfall
15	11.8–12.8	12.3	2	Total water, ash, and SST
16	13.0–13.6	13.3	2	Air temperature, cloud heights and amounts

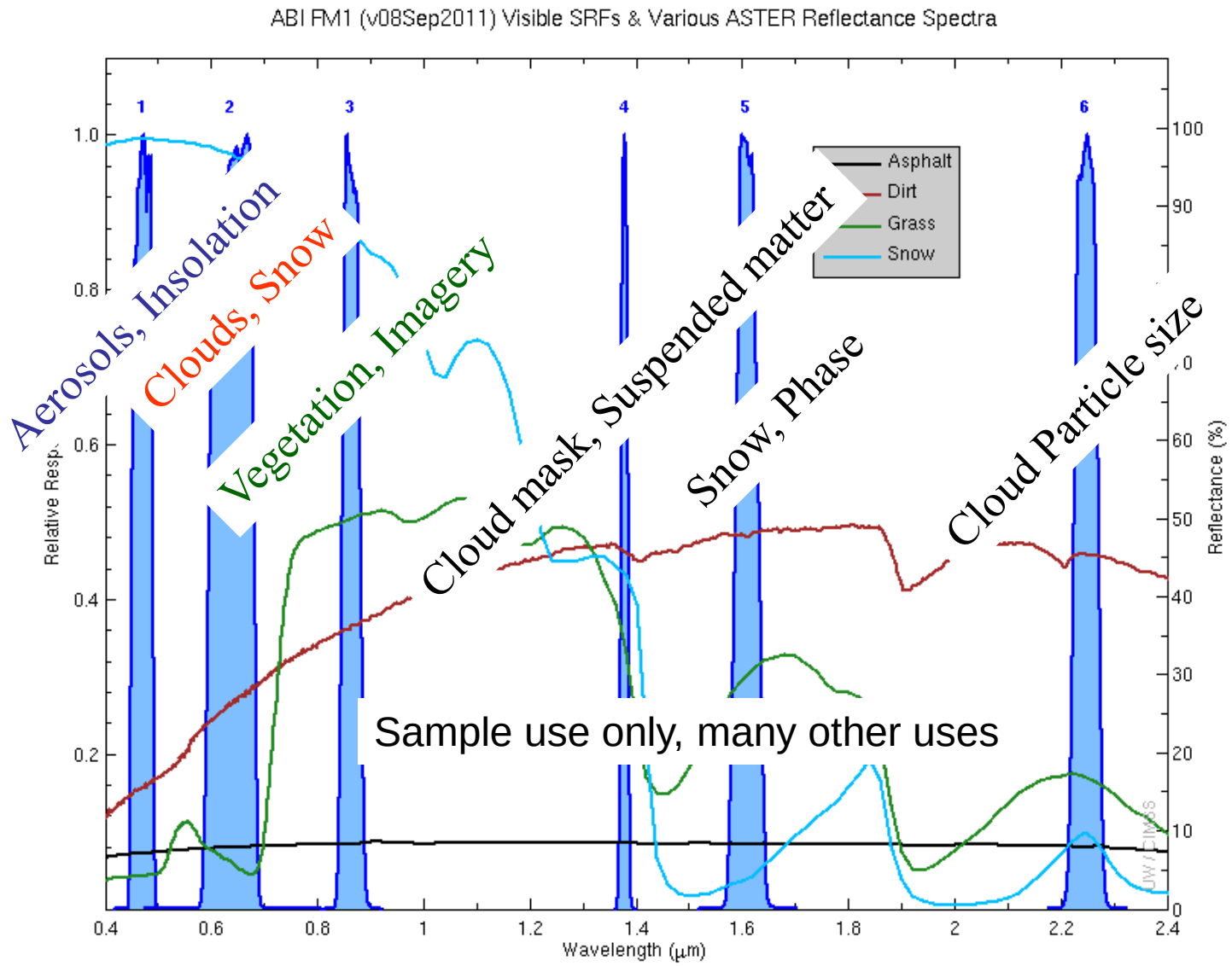
Schmit et al, 2005

ABI IR Weighting Functions



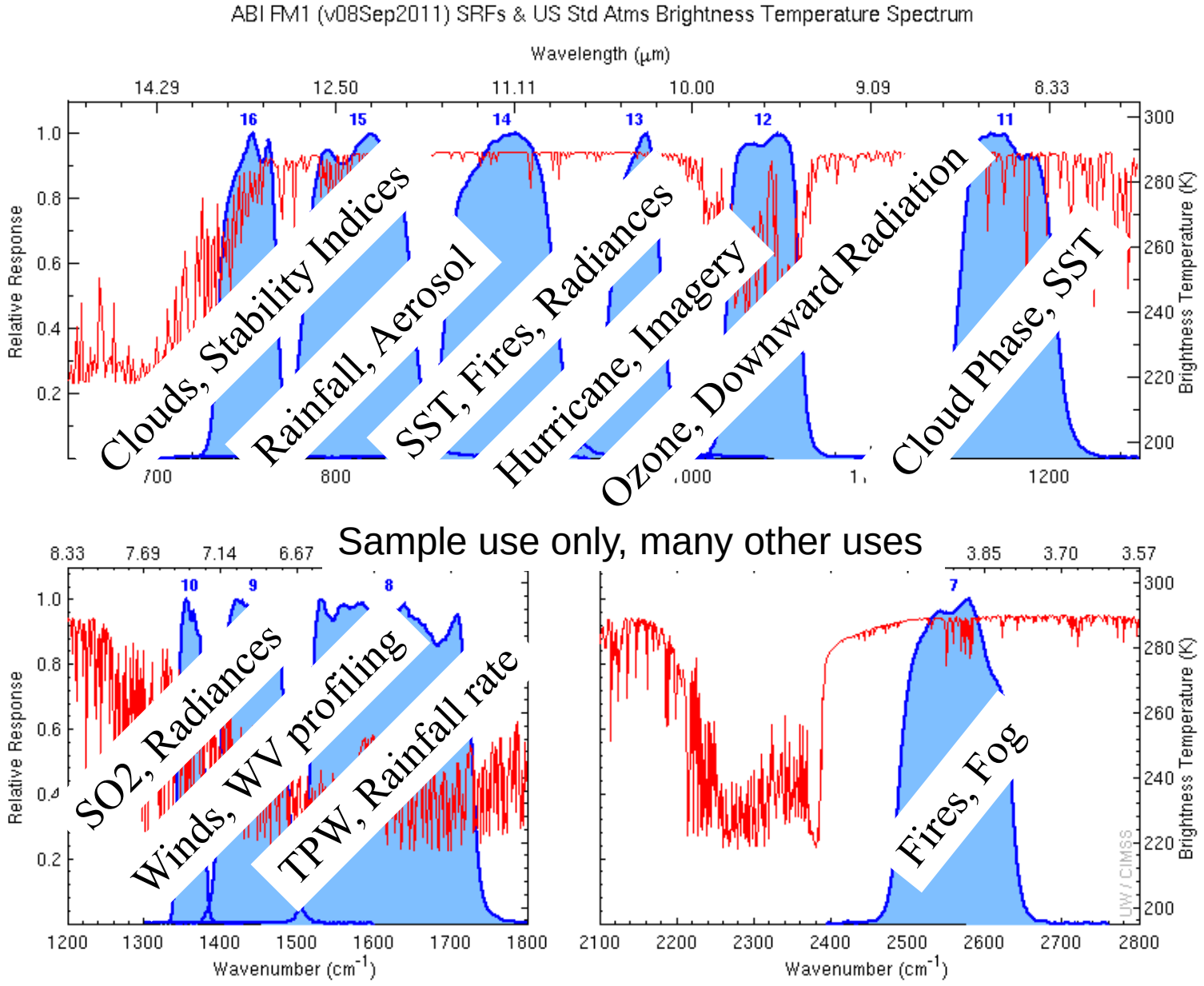
Clear-sky

Visible and near-IR channels on the ABI



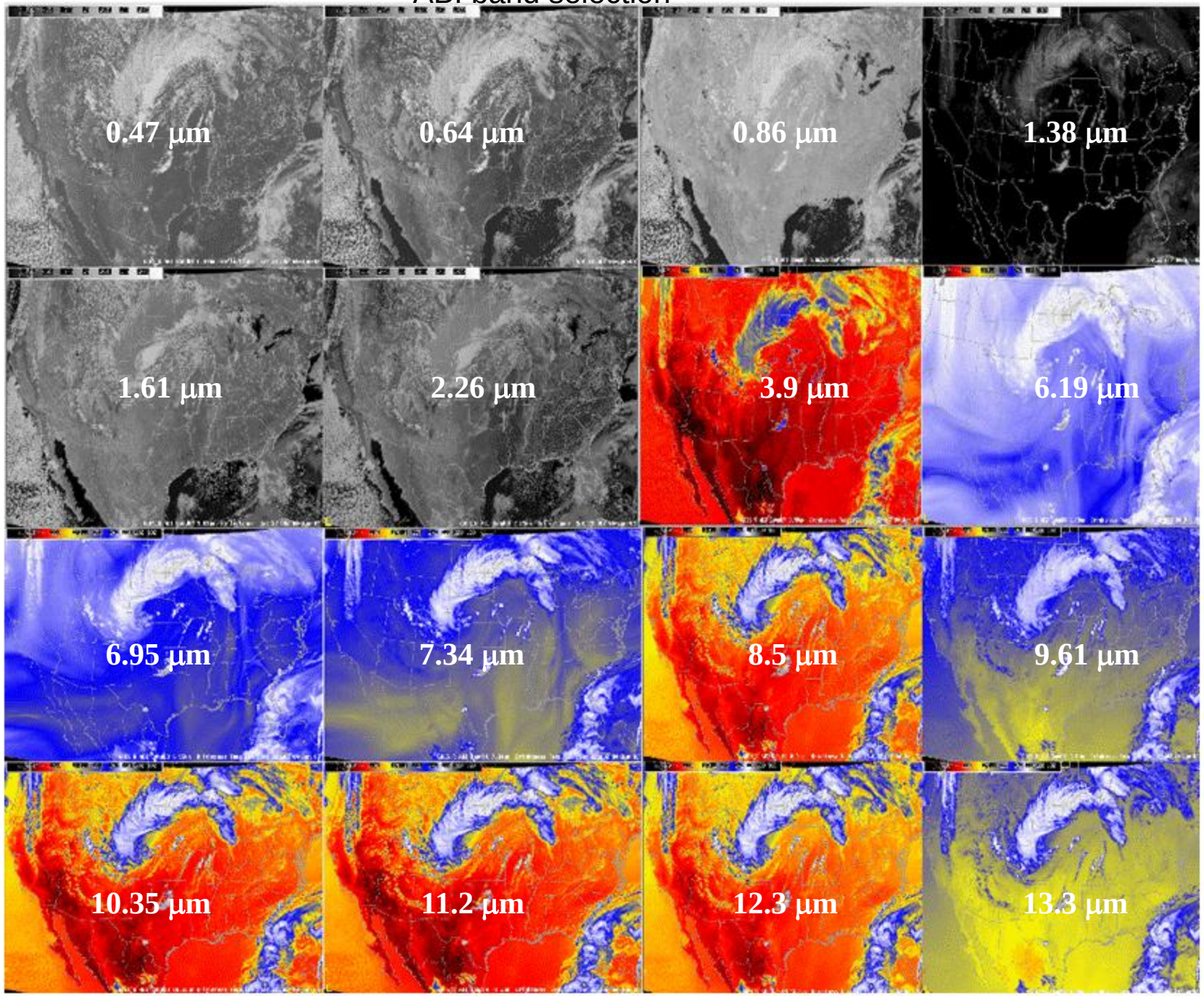
The ABI visible and near-IR bands have many uses.

The IR channels on the ABI

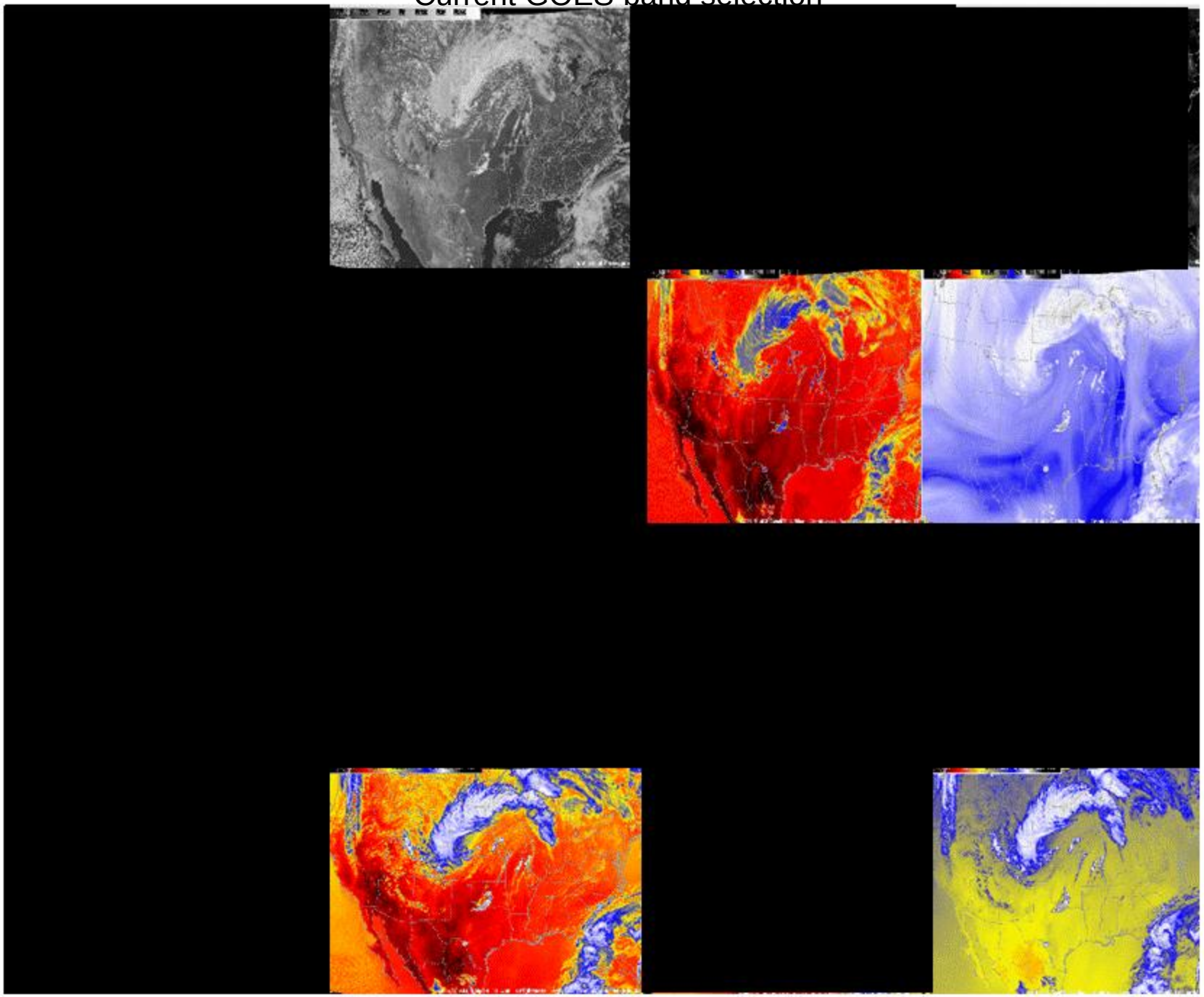


ABI has many more bands than the current operational GOES imagers.

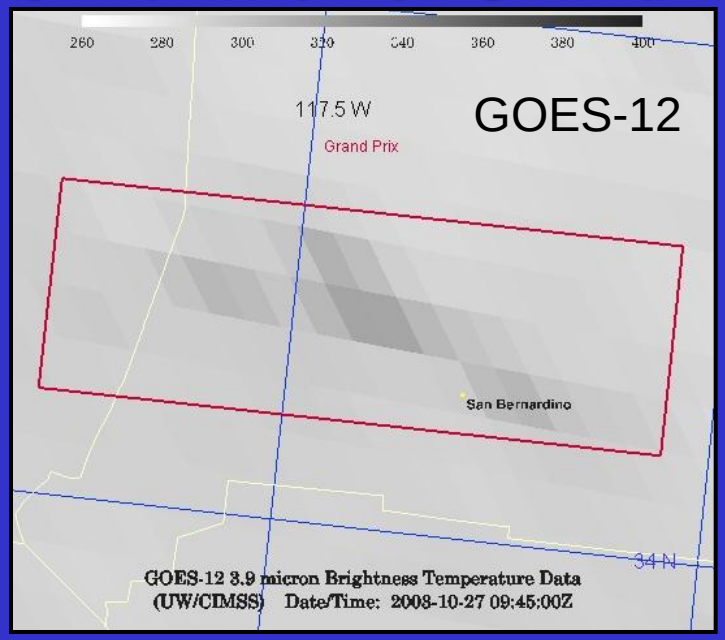
ABI band selection

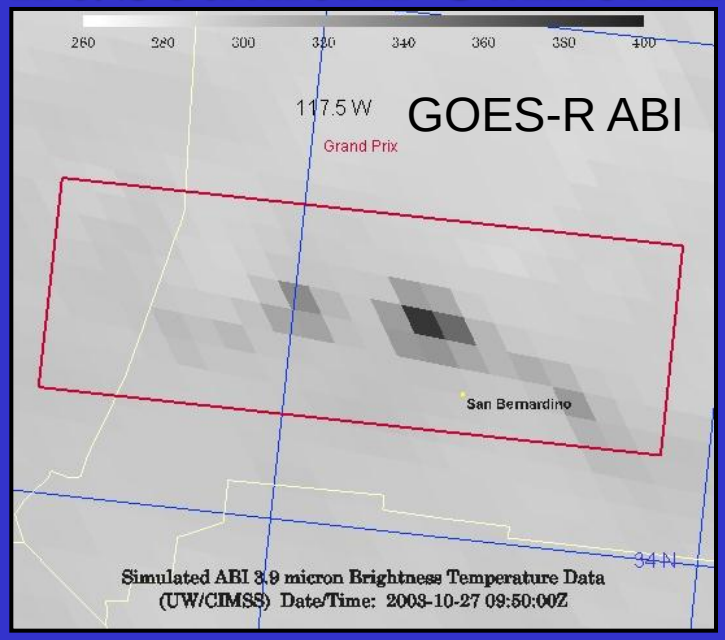


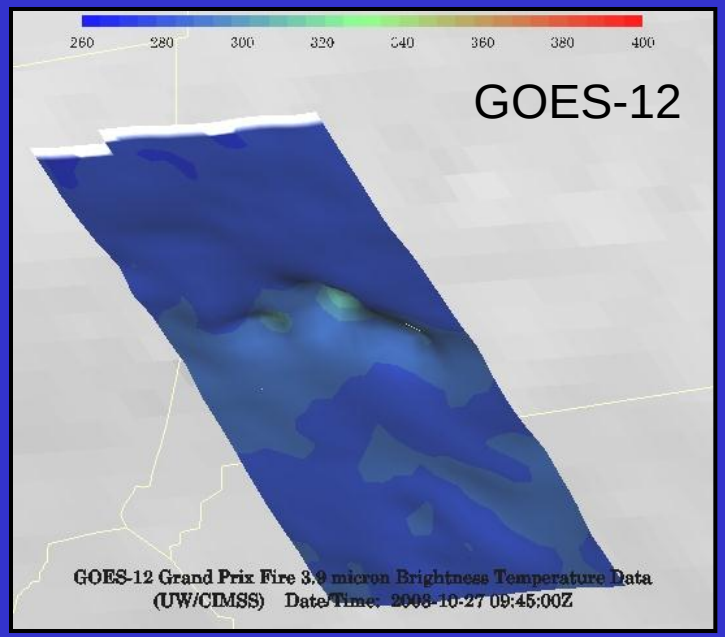
Current GOES band selection

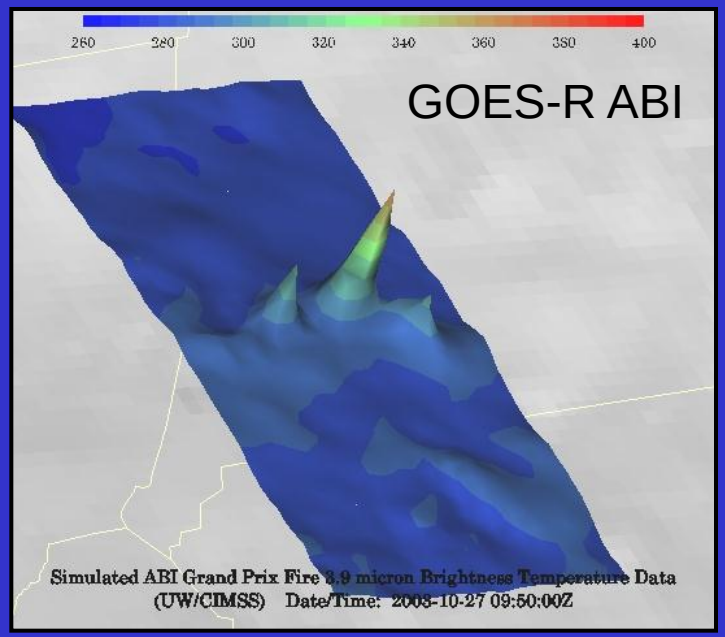


GOES-12 and GOES-R ABI
Simulation of Grand Prix Fire/Southern California

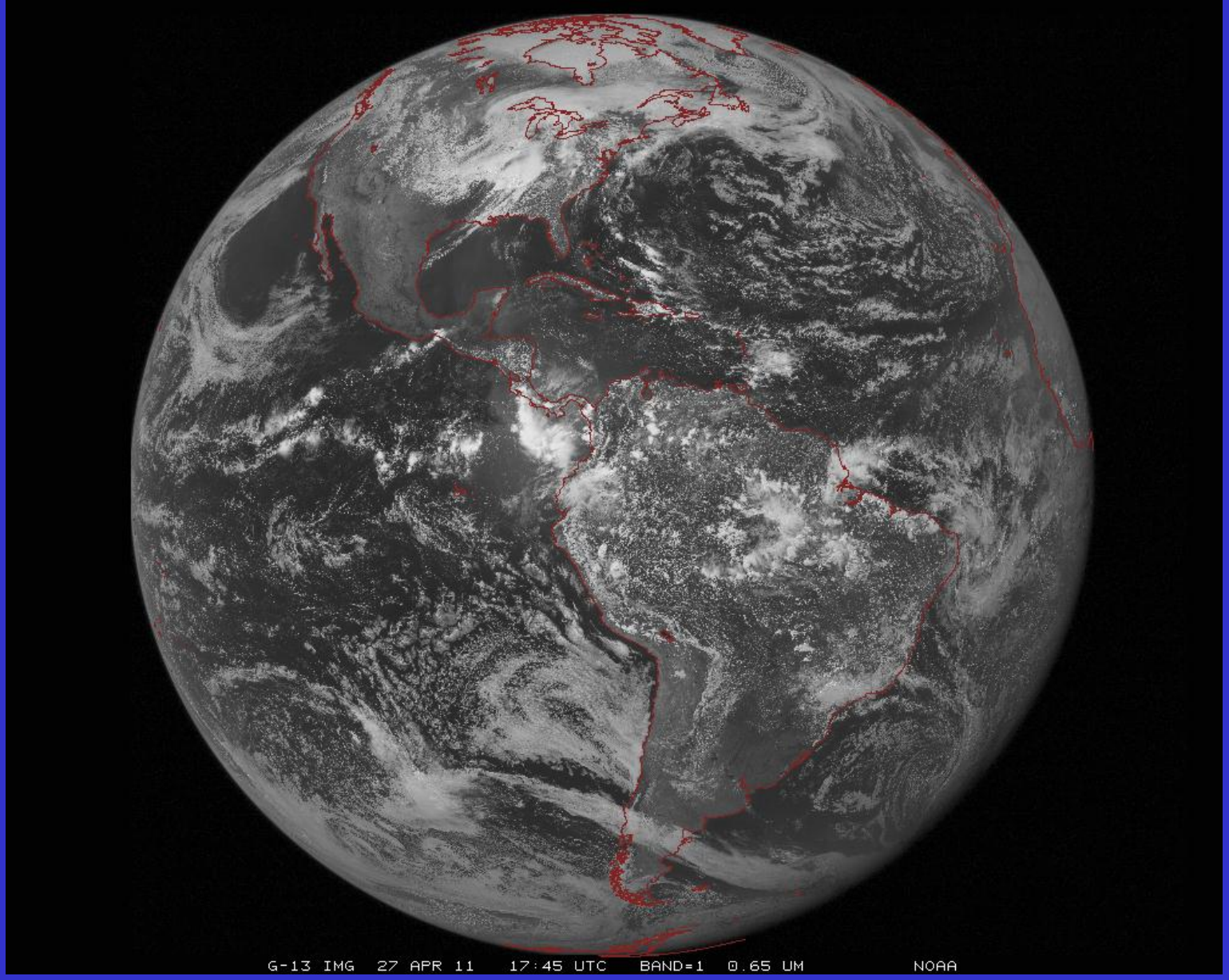








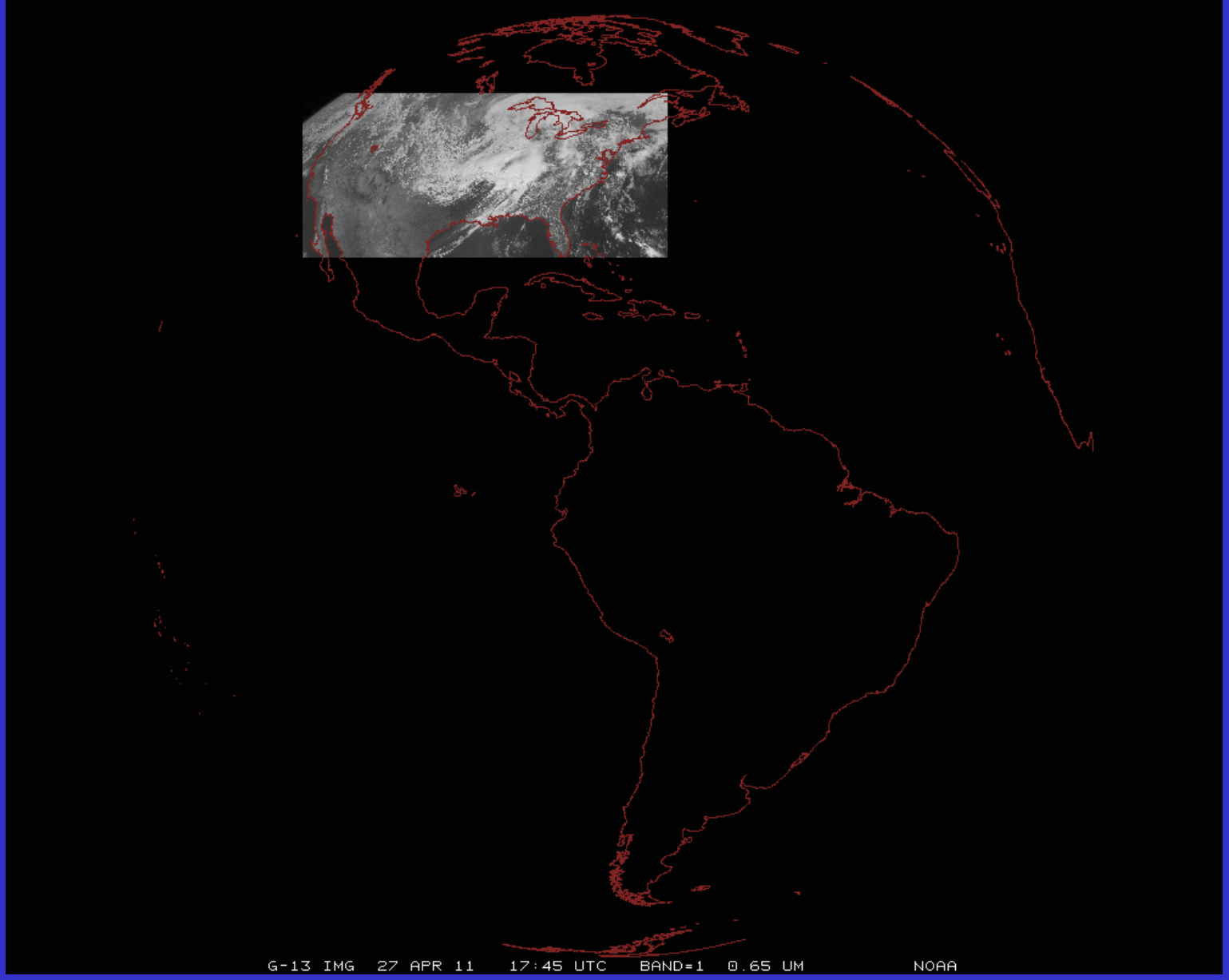
J. Feltz



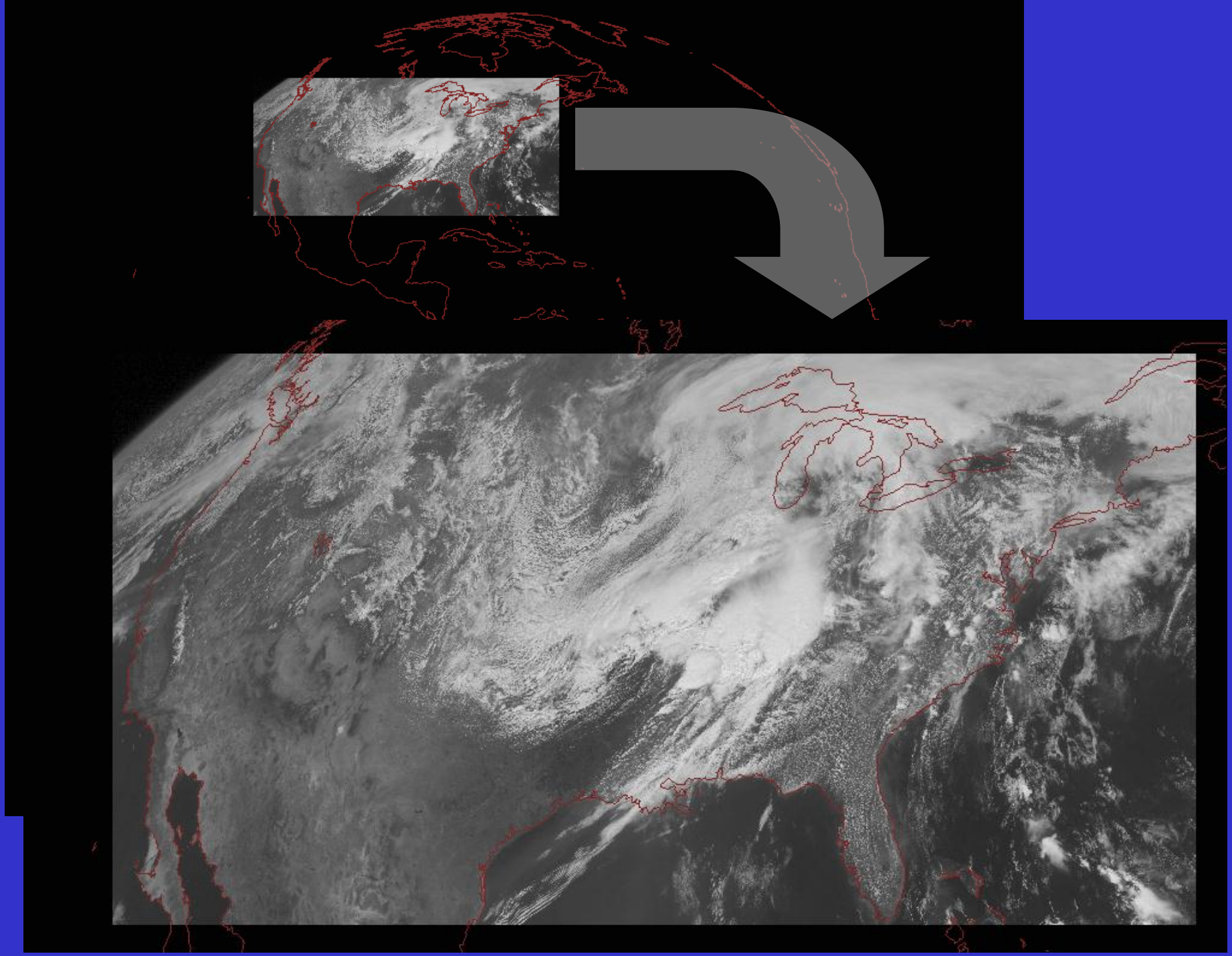
ABI scans about 5 times faster than the current GOES imager

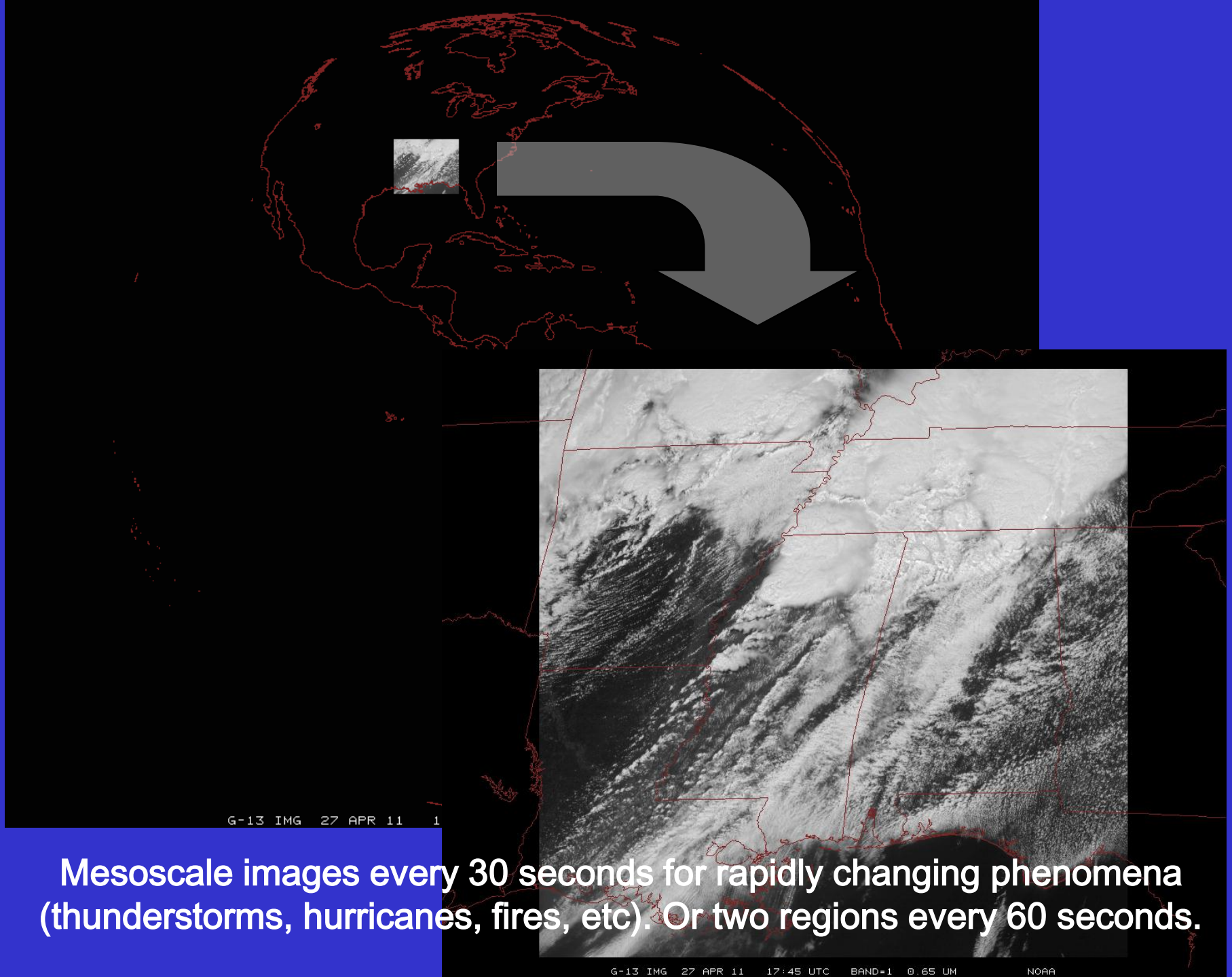
Anticipated scan mode for the ABI:

- 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

Don Hillger, Deb Molenar, Dan Lindsey, John Knaff

NOAA/NESDIS/Satellite Applications and Research

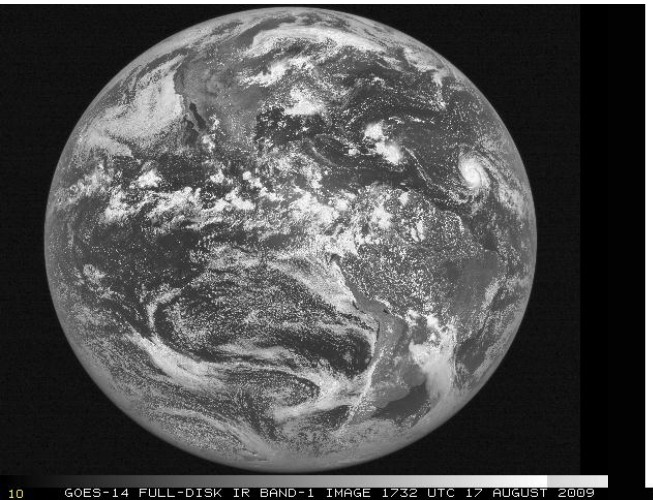
Regional And Mesoscale Meteorology Branch (RAMMB)

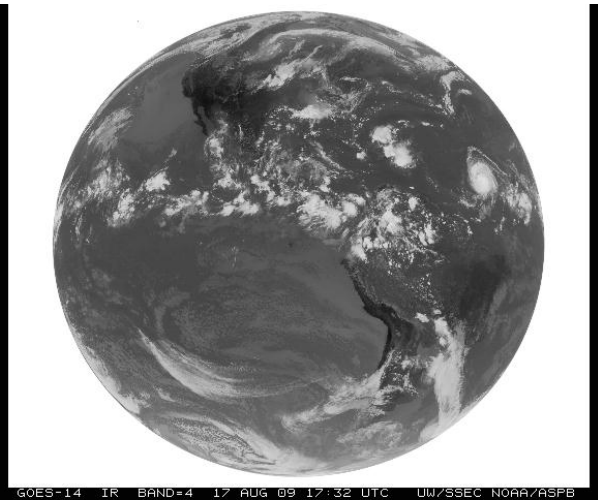
Dave Watson, Mike Hiatt, Dale Reinke, etc.

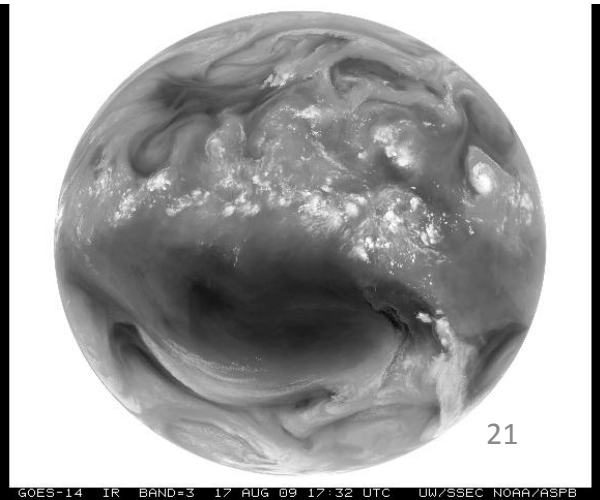
CIRA, Colorado State University

Fort Collins CO

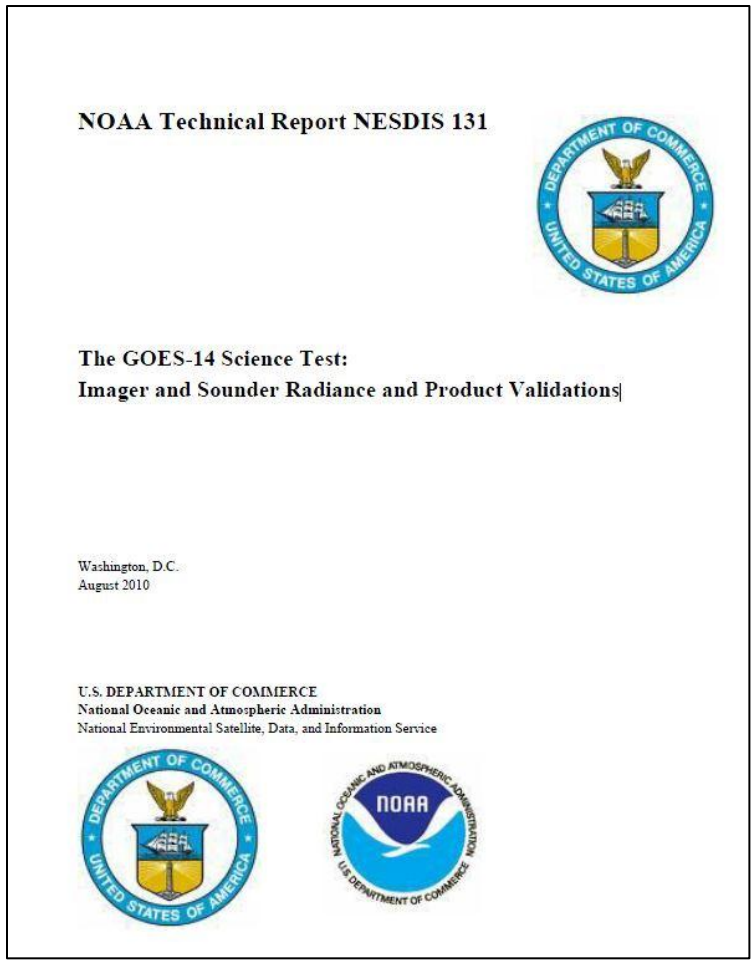
Don Hillger and Tim Schmit co-lead the NOAA Science Test







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.

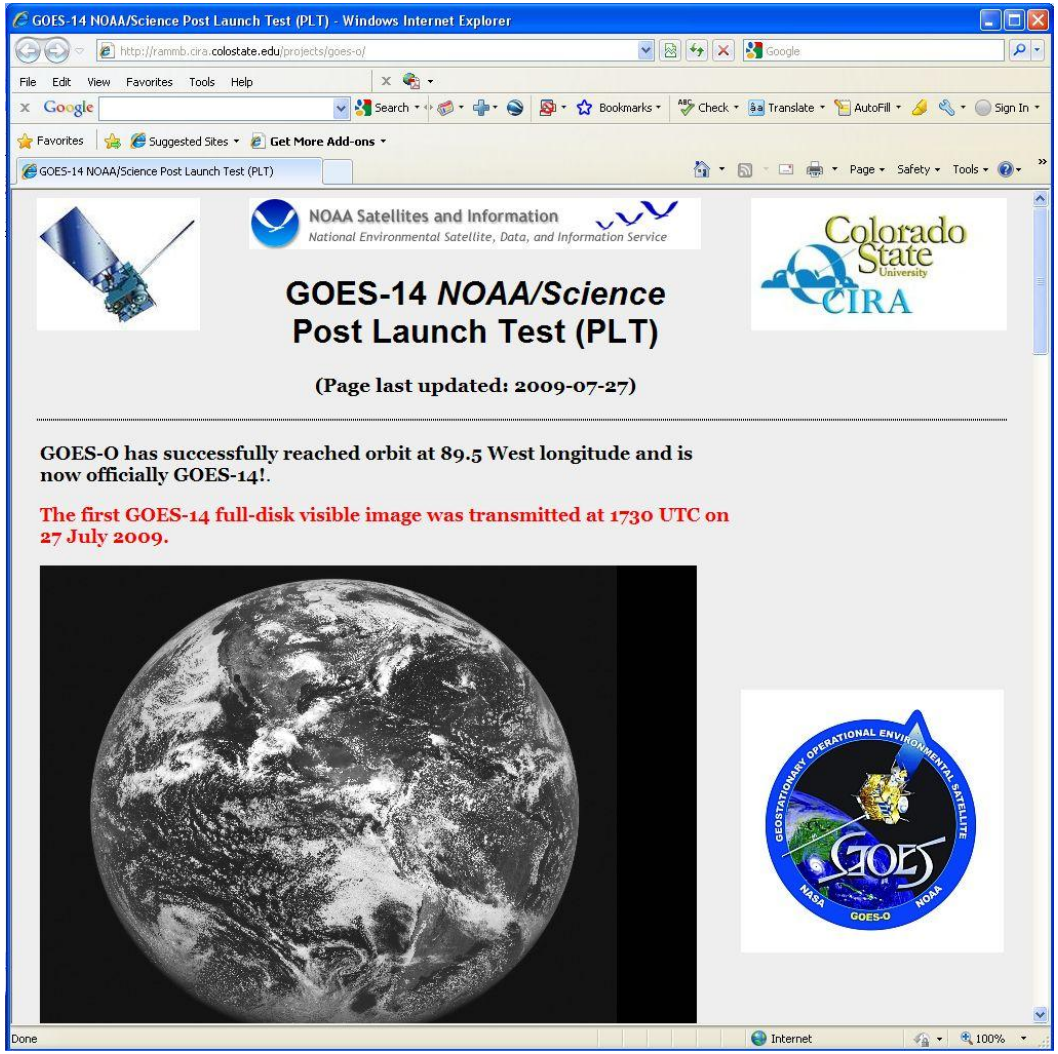
http://rammb.cira.colostate.edu/projects/goes-o/NOAA_Tech_Report_NESDIS_131_GOES-14_Science_Test_with_Corrigendum.pdf

GOES Science Test Goals

For all GOES check-outs, the goals of the Science Test include:

1) **To assess the quality of the GOES radiance data**. This is accomplished by comparison to other satellite measurements or by calculating the signal-to-noise ratio compared to specifications, as well as assess the striping in the imagery due to multiple detectors.
2) **To generate products from the GOES data stream and compare to those produced from other satellites.** These included several Imager and Sounder products currently used in operations.
3) **Rapid-scan imagery of interesting weather cases** are collected with temporal resolutions as fine as every 30 seconds, a capability of rapid-scan imagery from GOES-R that is not implemented operationally on current GOES.

GOES-14 NOAA/Science Test Website

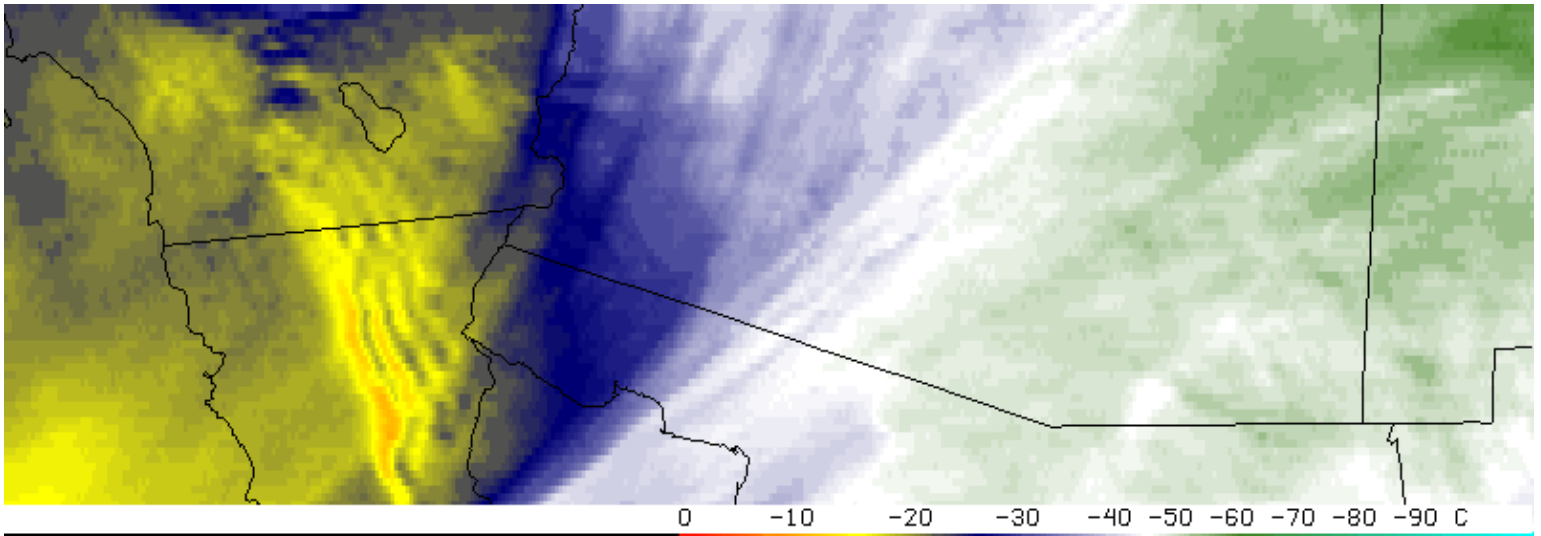


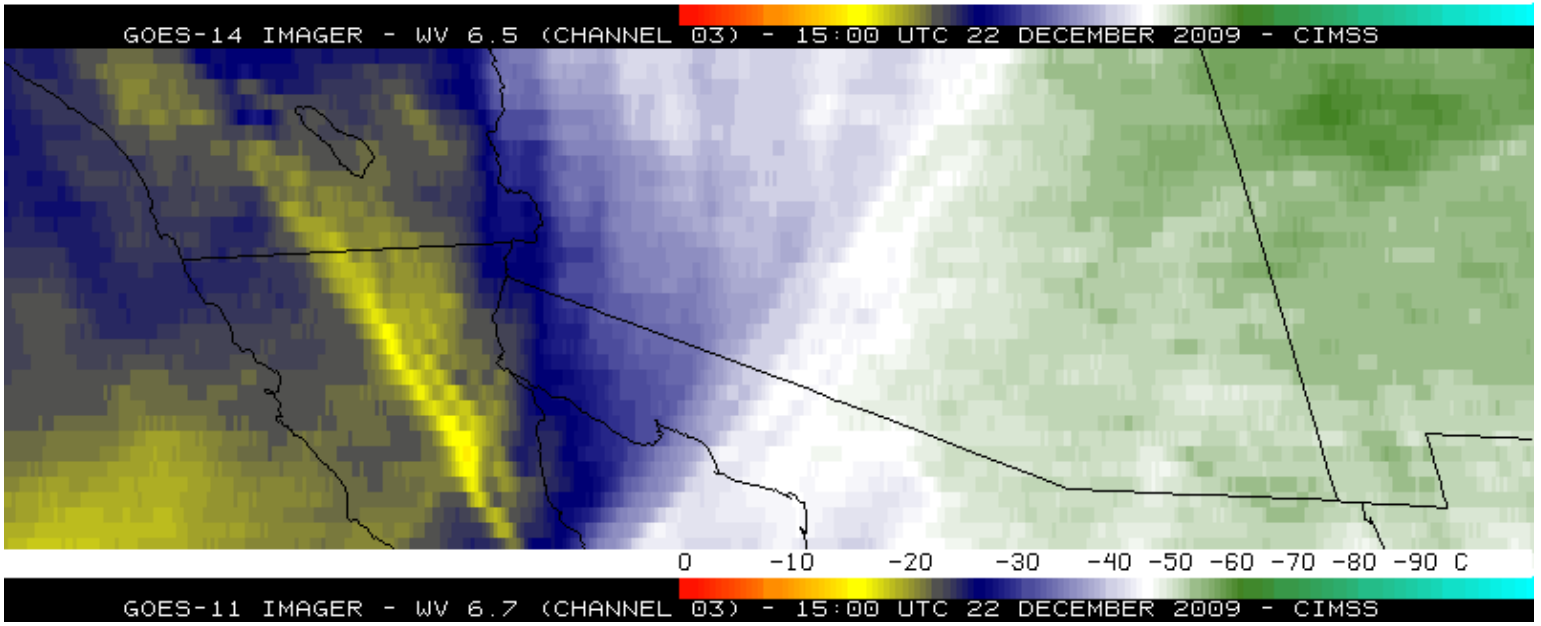
http://rammb.cira.colostate.edu/projects/goes-o/

GOES-O Test Schedules

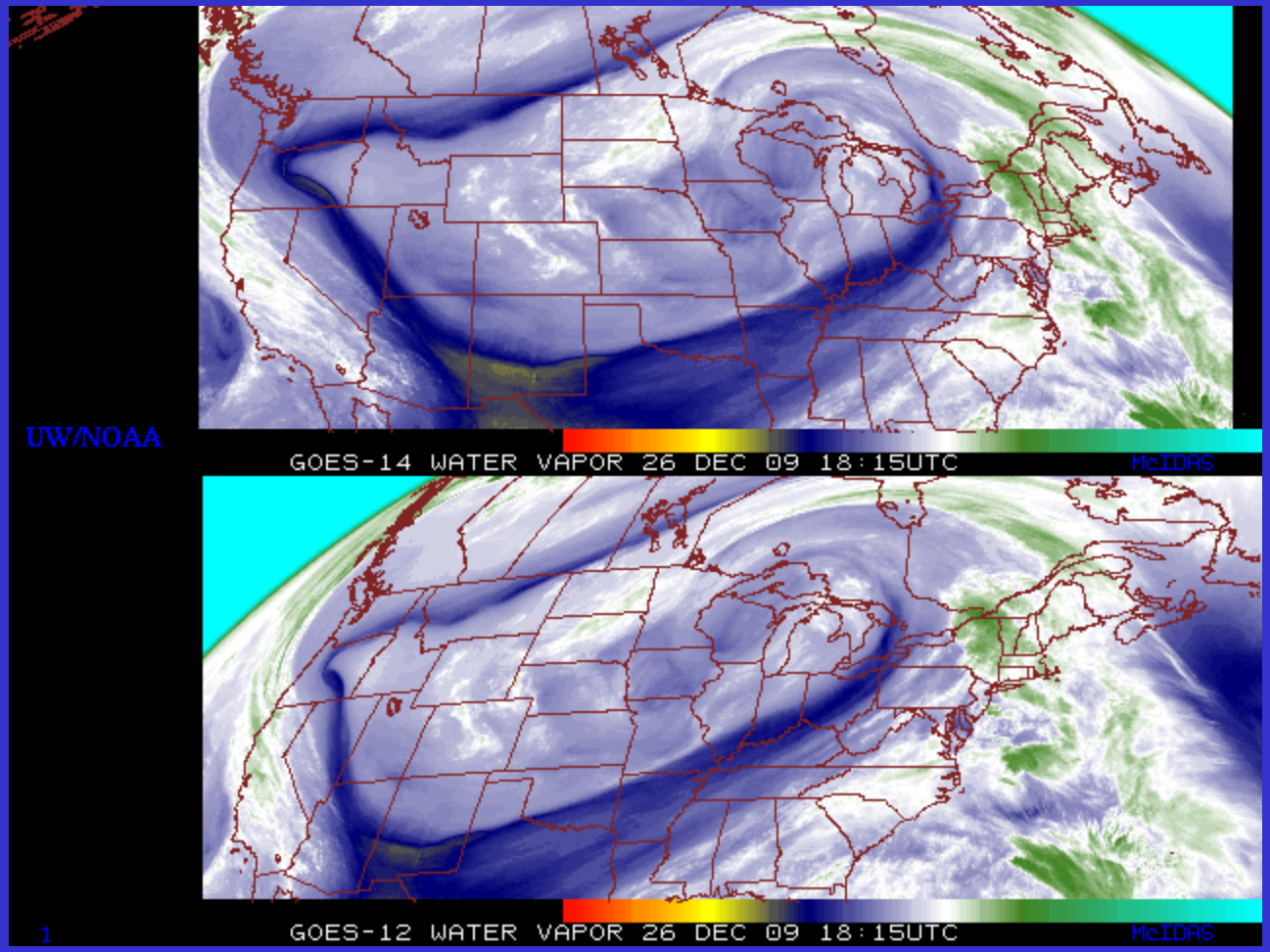
Test Schedule	Imager	Sounder	Purpose
C5RTN	Emulation of **GOES-East routine** operations	Emulation of **GOES-East routine** operations	Radiance and product comparisons
C4RTN	Emulation of **GOES-West routine** operations	Emulation of **GOES-West routine** operations	Radiance and product comparisons
C1CON	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

“4km” “WV” Imager





GOES-14: Sample “5-min” imagery

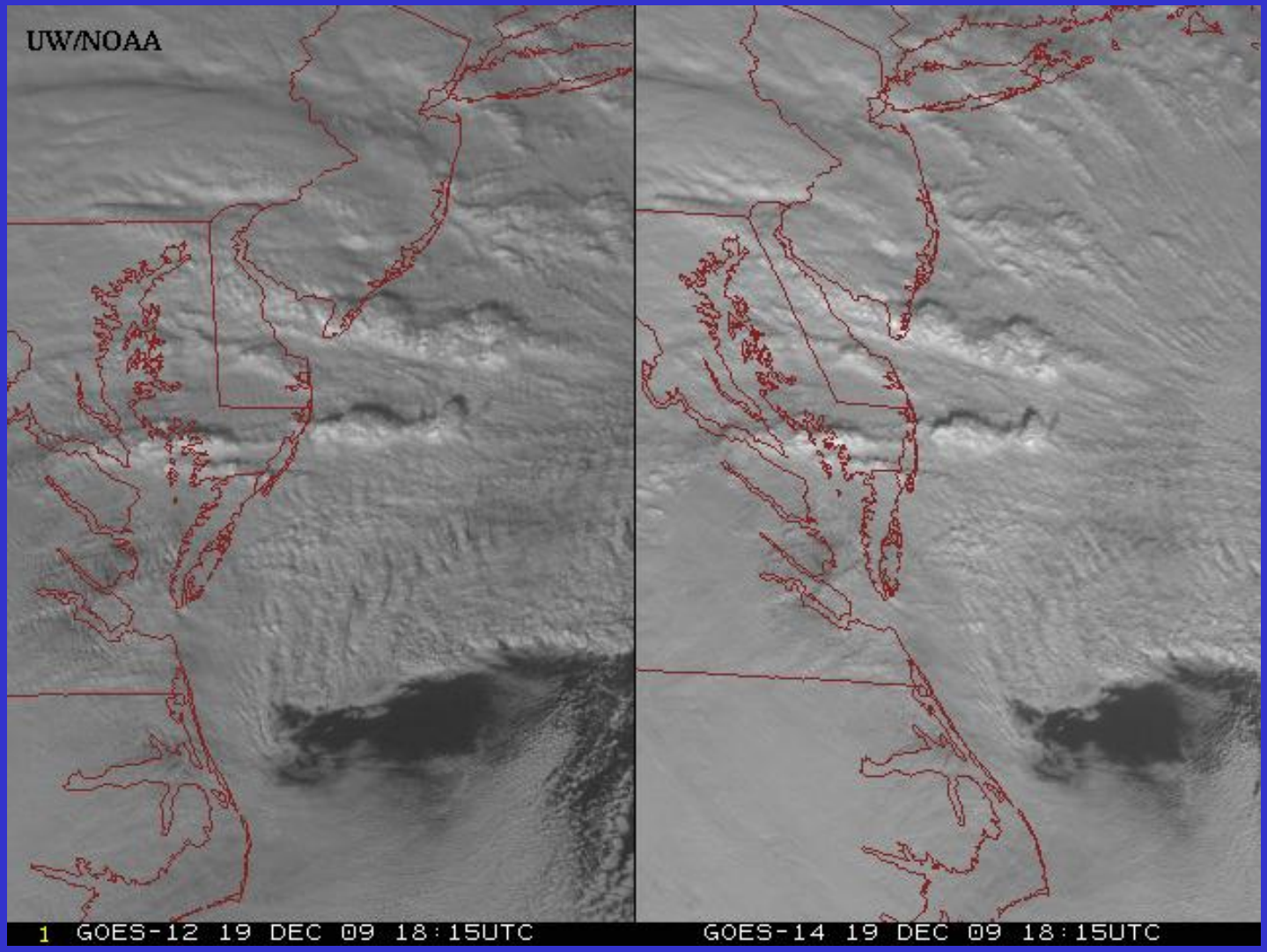


5 min
GOES-14

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



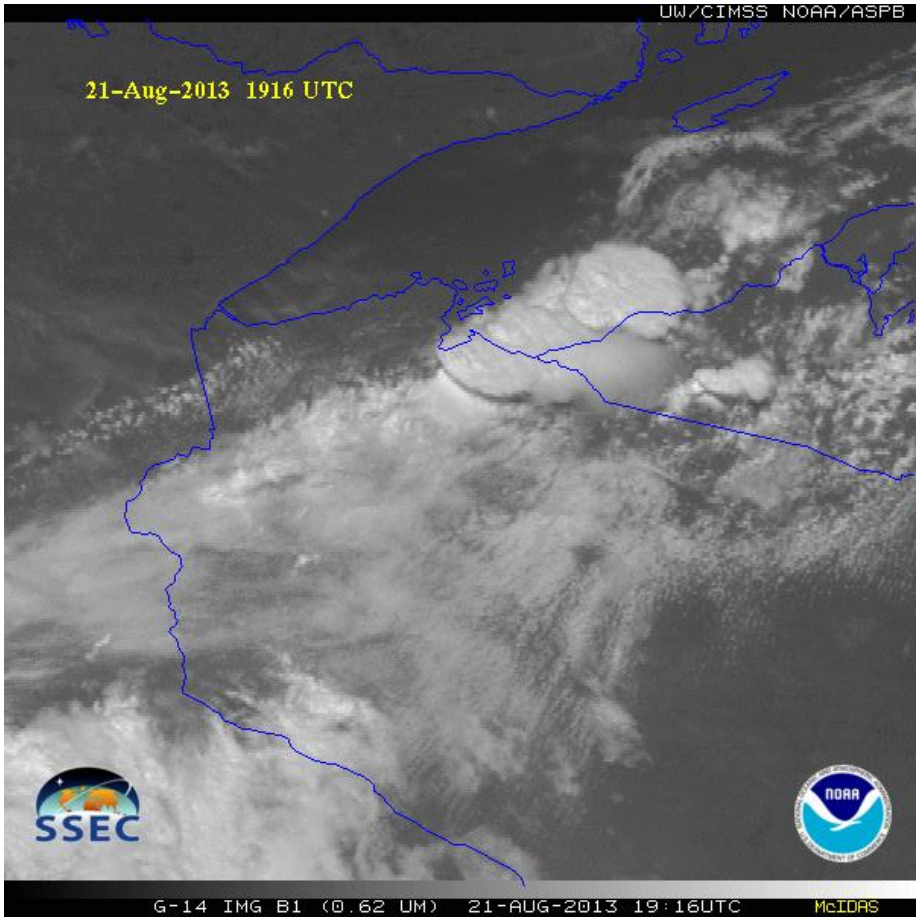
GOES-12 (15 min)

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

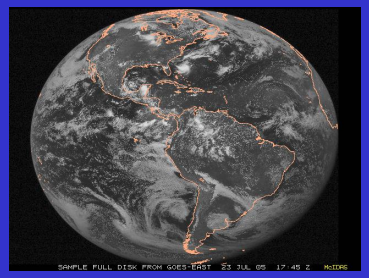


GOES-14 visible image showing rapid convective development

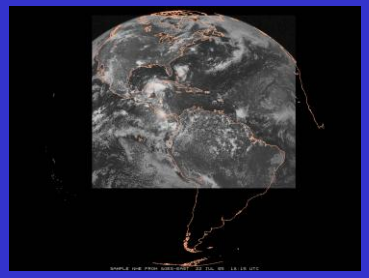
GOES Imager Schedules

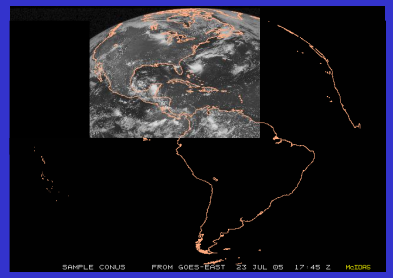
http://cimss.ssec.wisc.edu/goes/blog/archives/13001

	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

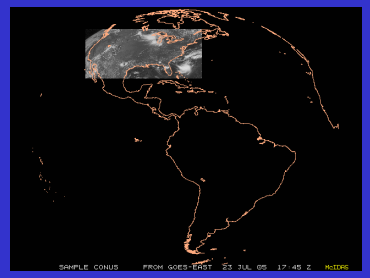


Full Disk

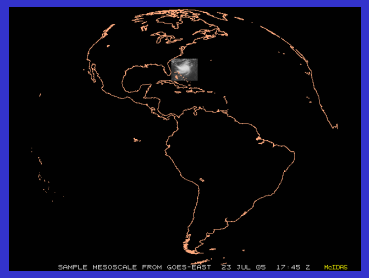

NH-Extended



N. Hemisphere

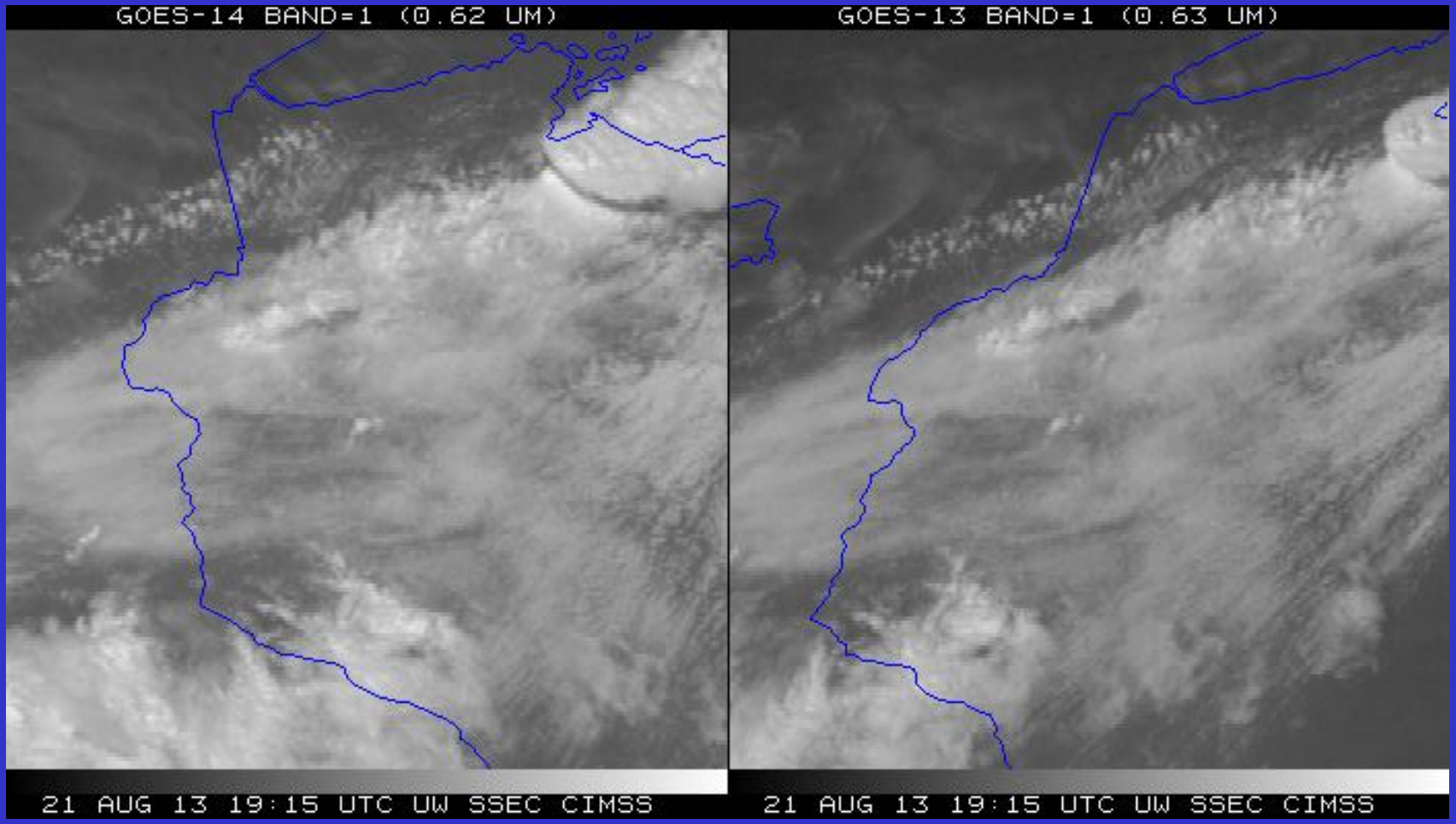


CONUS

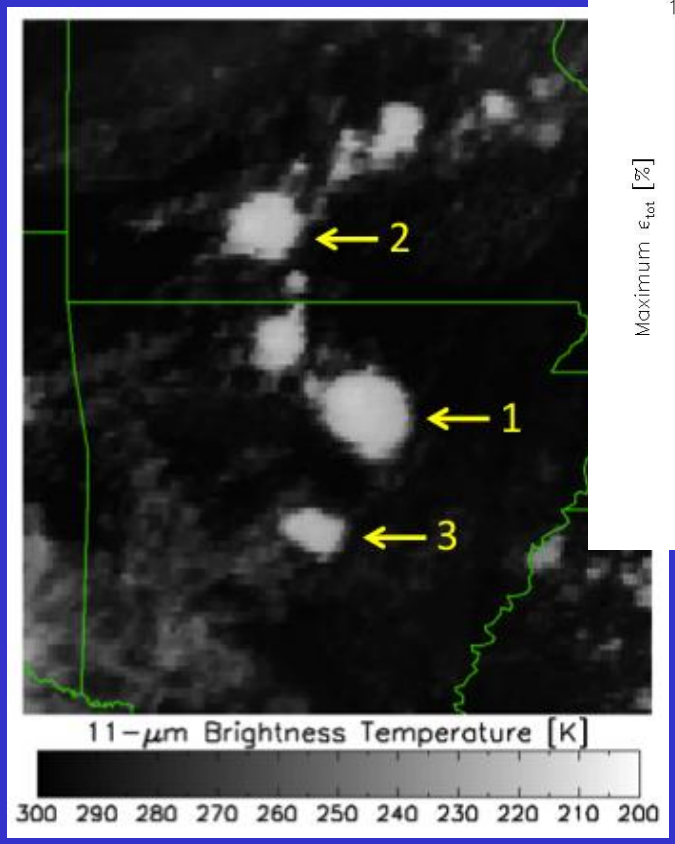


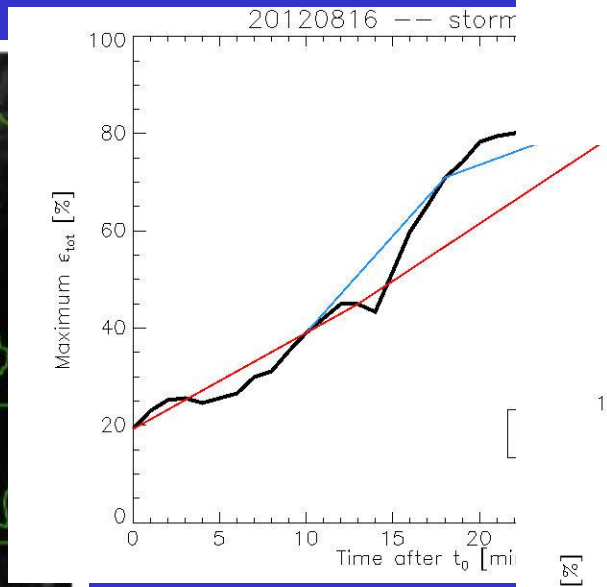
Mesoscale

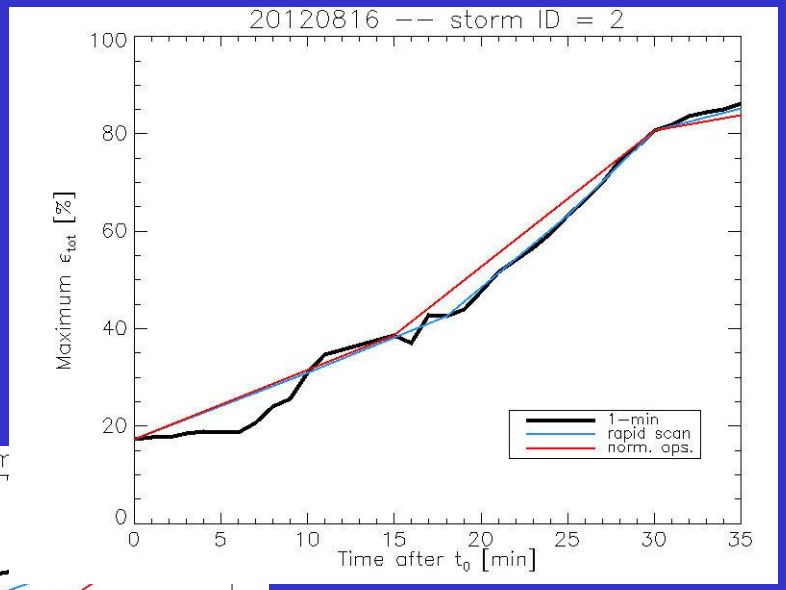
GOES-14 and -13

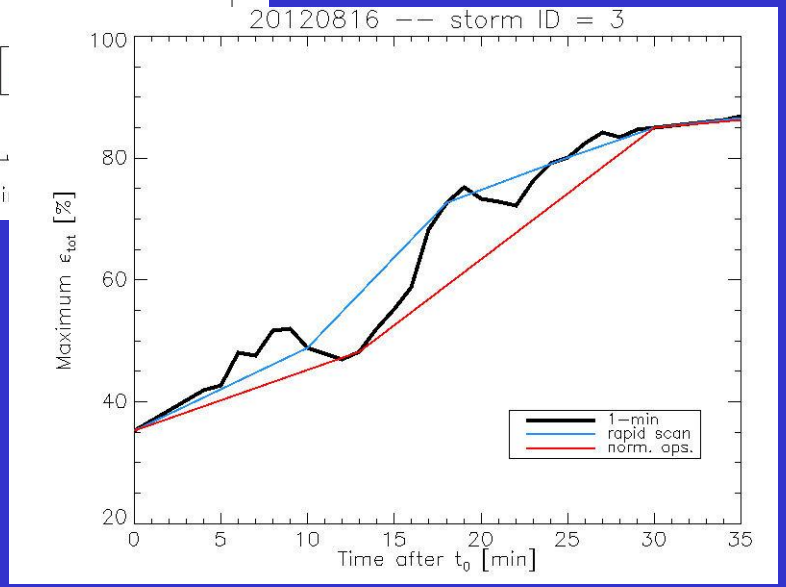


Rate of temporal cooling in the longwave infrared band

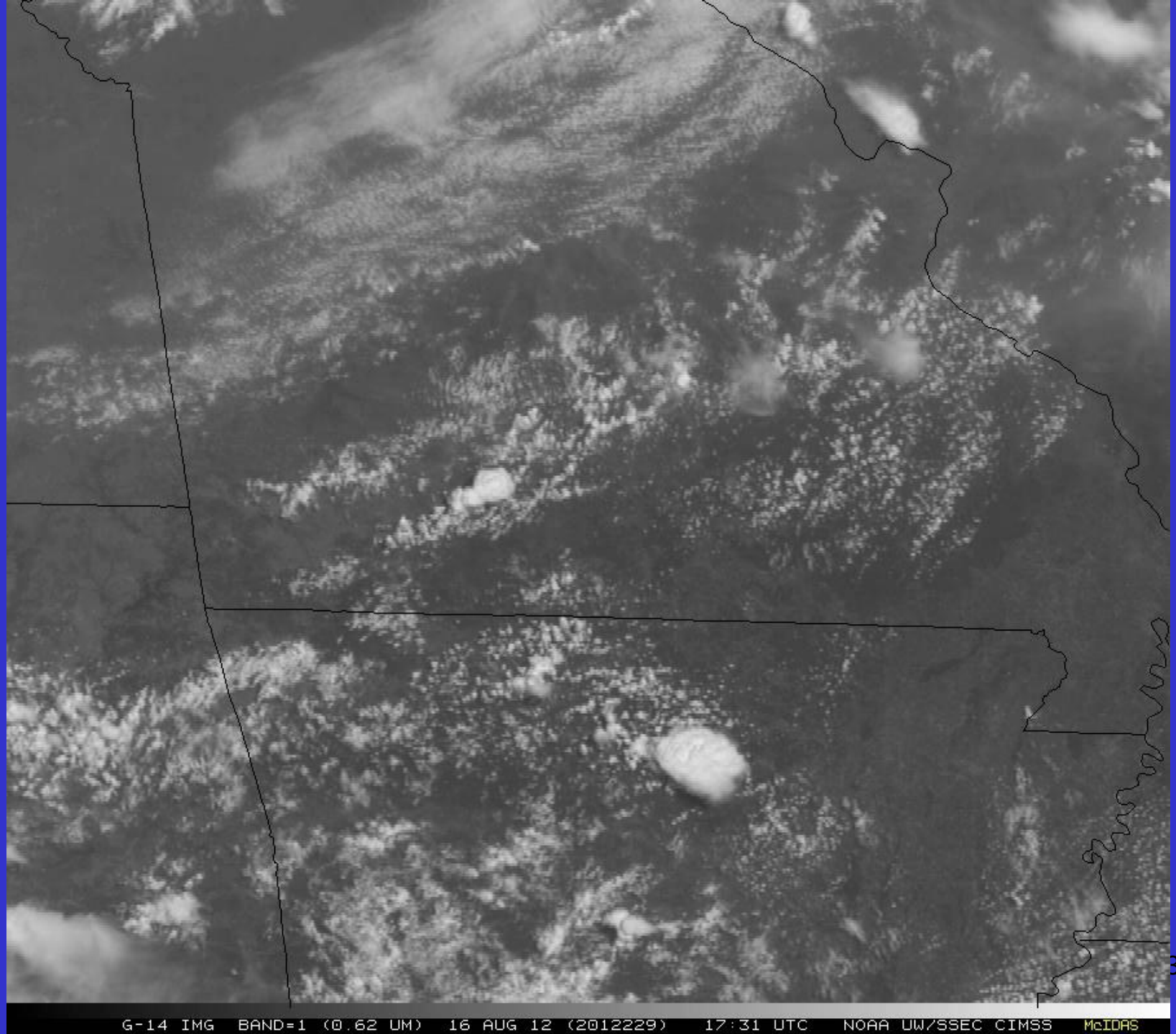


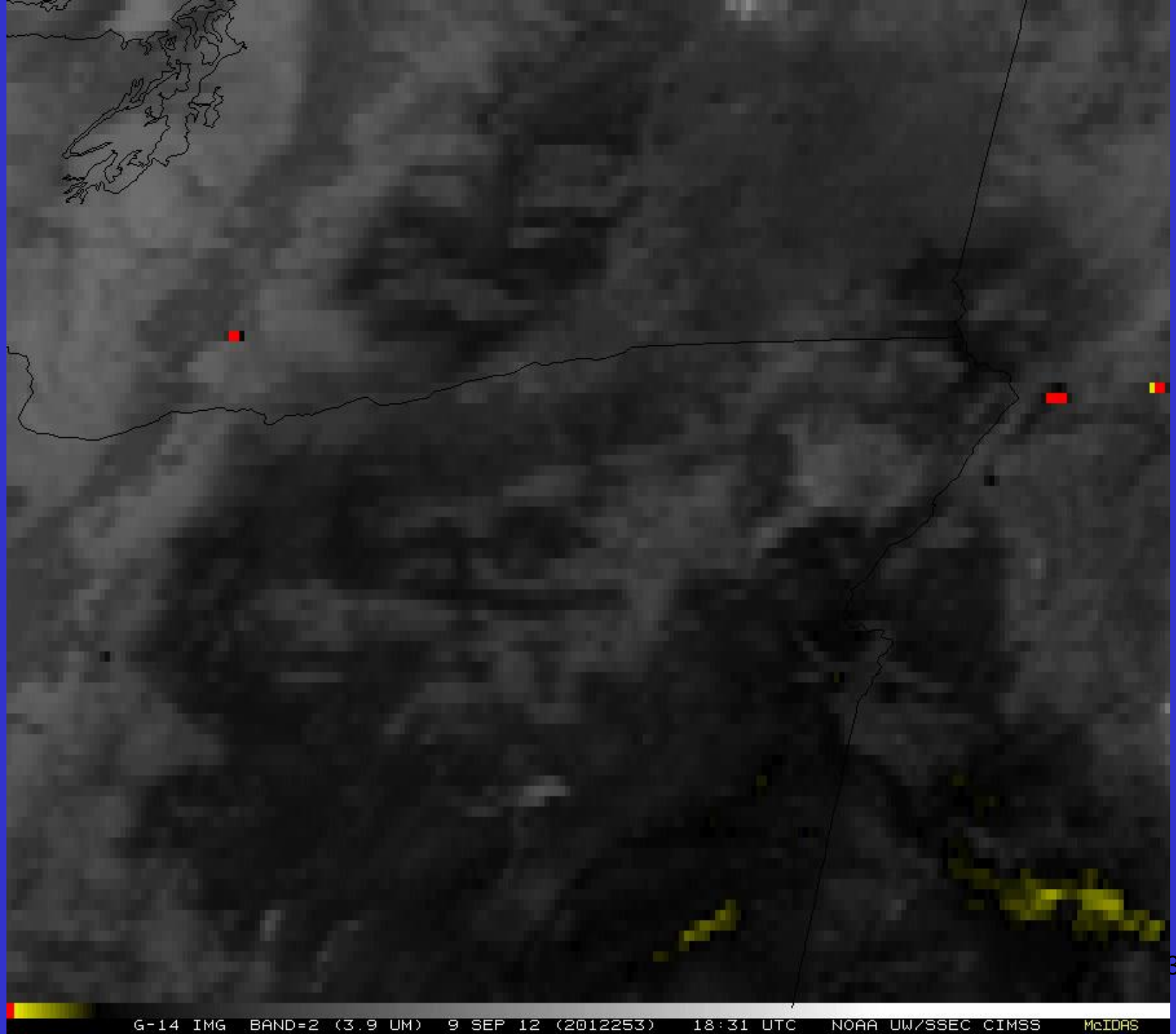






Cintineo et al., 2013 (CIMSS)


G-14 IMG BAND=1 (0.62 UM) 16 AUG 12 (2012229) 17:31 UTC NOAA UW/SSEC CIMSS McIDAS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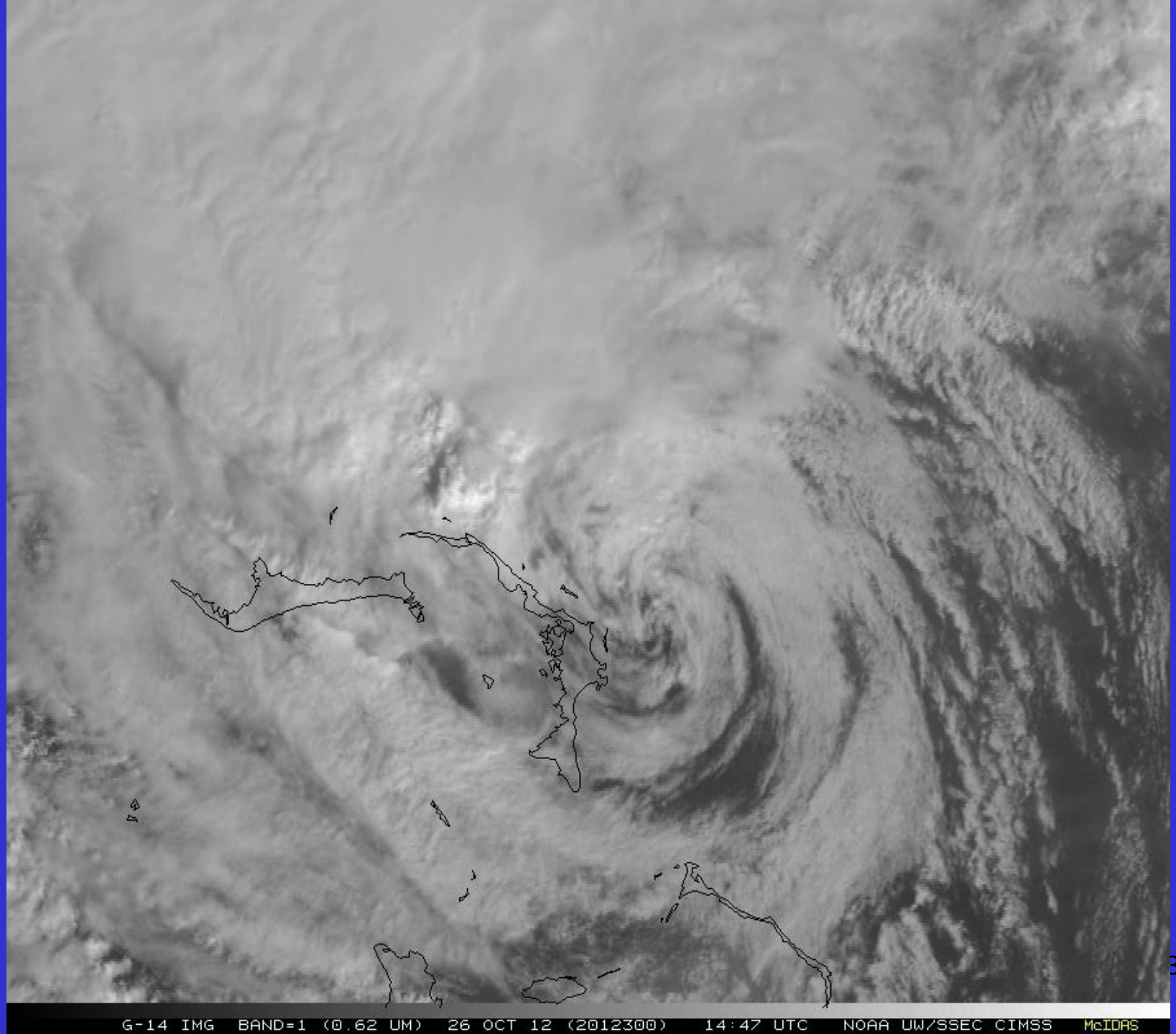
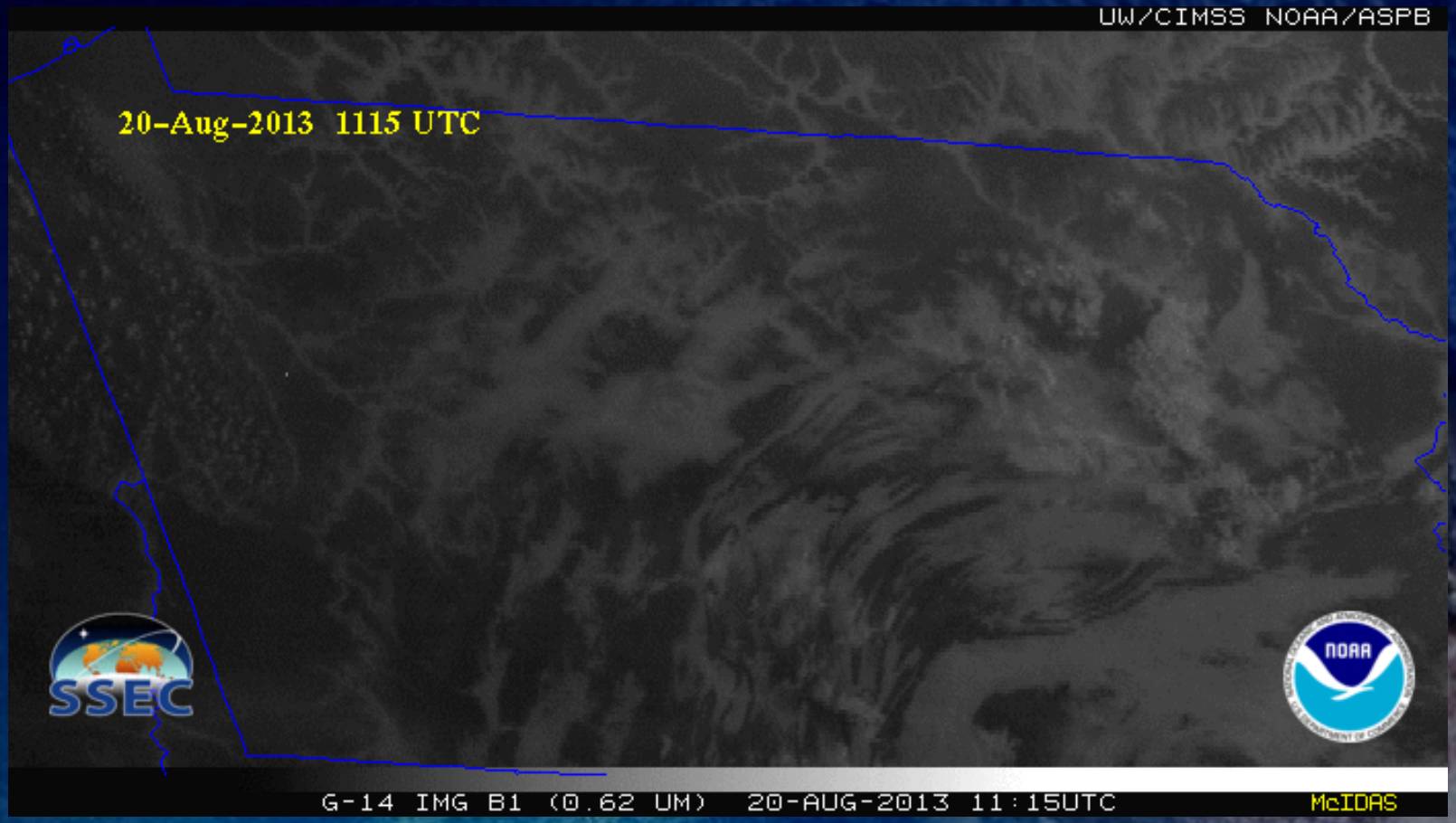

G-14 IMG BAND=1 (0.62 UM) 26 OCT 12 (2012300) 14:47 UTC NOAA UW/SSEC CIMSS McIDAS

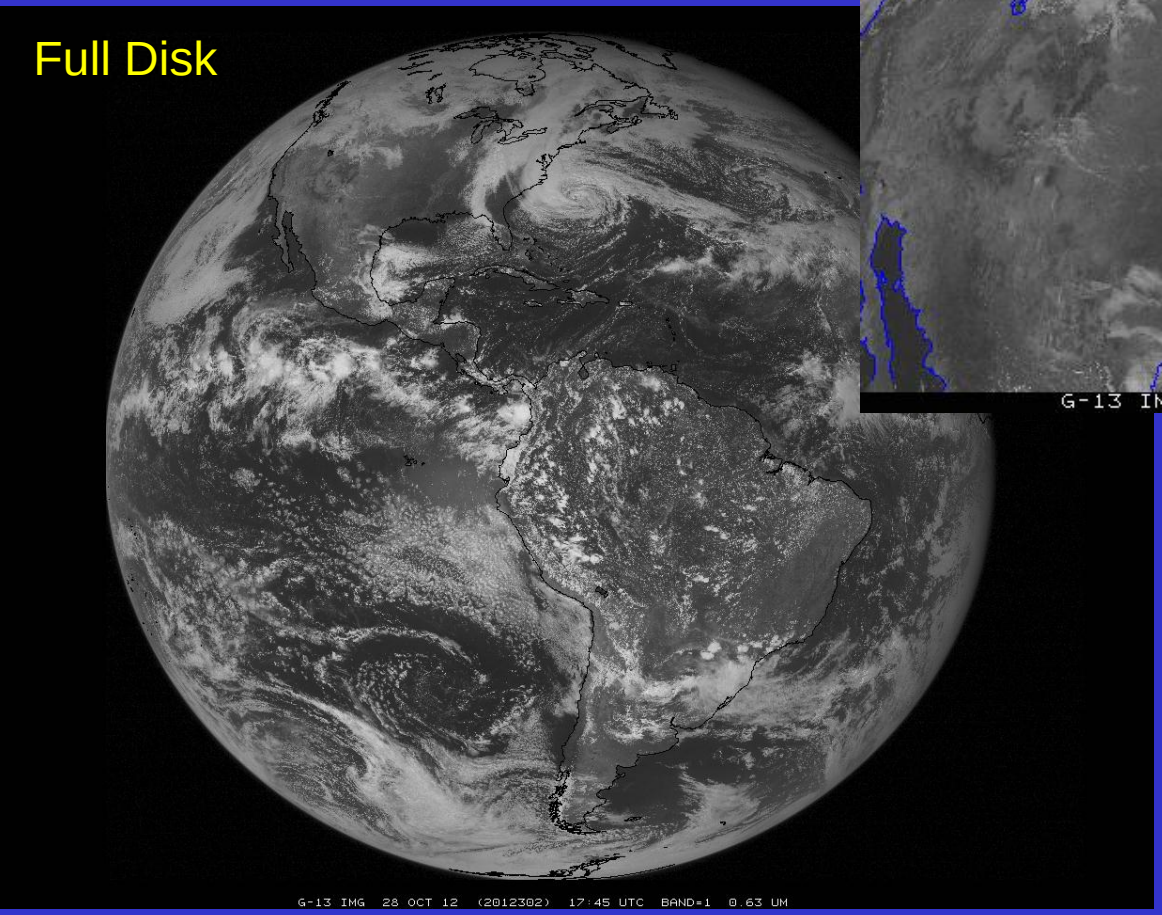
Fog

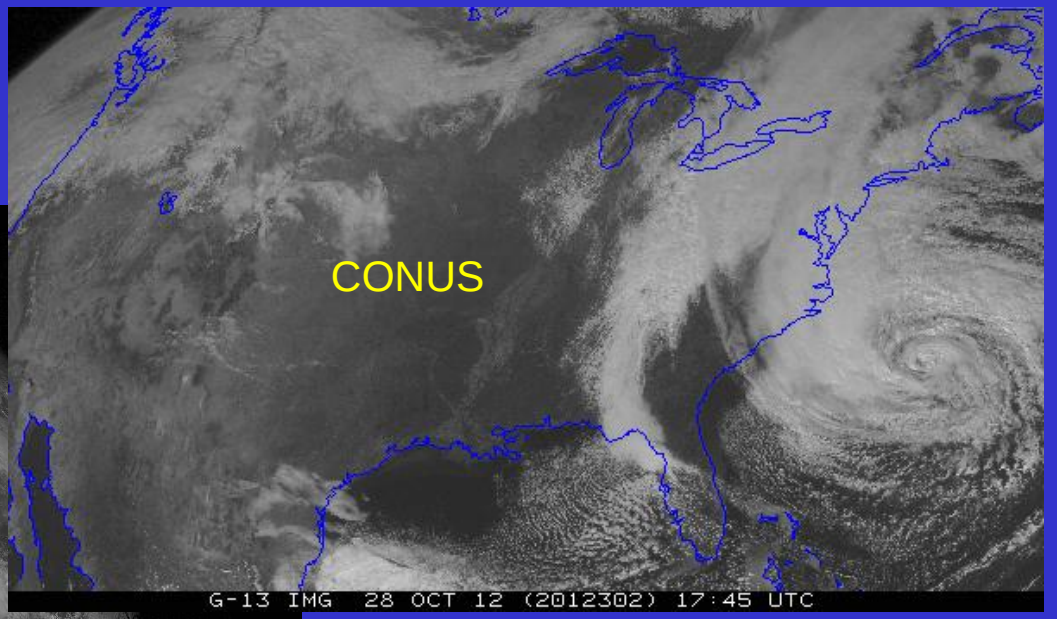

UW/CIMSS NOAA/ASPB
20-Aug-2013 1115 UTC
SSEC
NOAA
G-14 IMG B1 (0.62 UM) 20-AUG-2013 11:15UTC
McIDAS

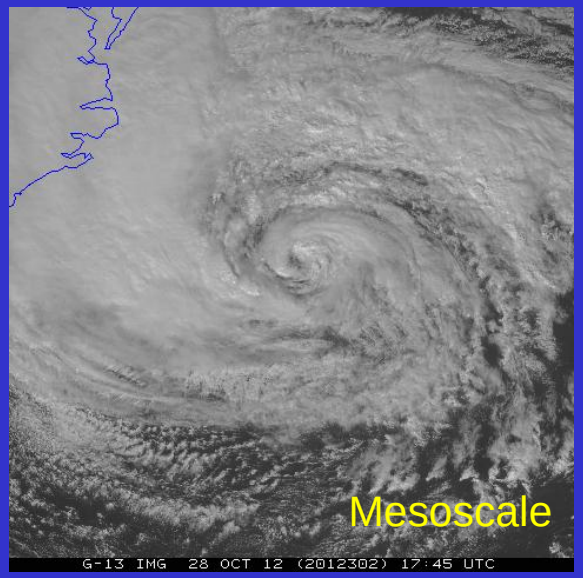
Outline

- GOES-R Overview
- GOES-14
  - PLT in 2009/2010
  - SRSOR (2012 and 2013)
- ABI (Advanced Baseline Imager) Modes
  - Flex
  - Continuous Full Disk
  - Hybrid, etc.
- Other advanced geo images
- GOES-13 Optimized Schedule changes
- Reference
- Summary

GOES-R ABI GOES-East







Possible scan modes for the east ABI (per hour):

Continuous FD--Full disk scan every 5 minutes, OR

FLEX--Full disk scan every 15 mins + continuous 5-min "PACUS" images + two selectable Mesoscale areas with continuous 1-min scans,

Possible ABI Modes of Operation
(assuming GOES-West positioning)

- **Continuous Full Disk** : Provides uninterrupted scans of the full disk every 5 minutes.

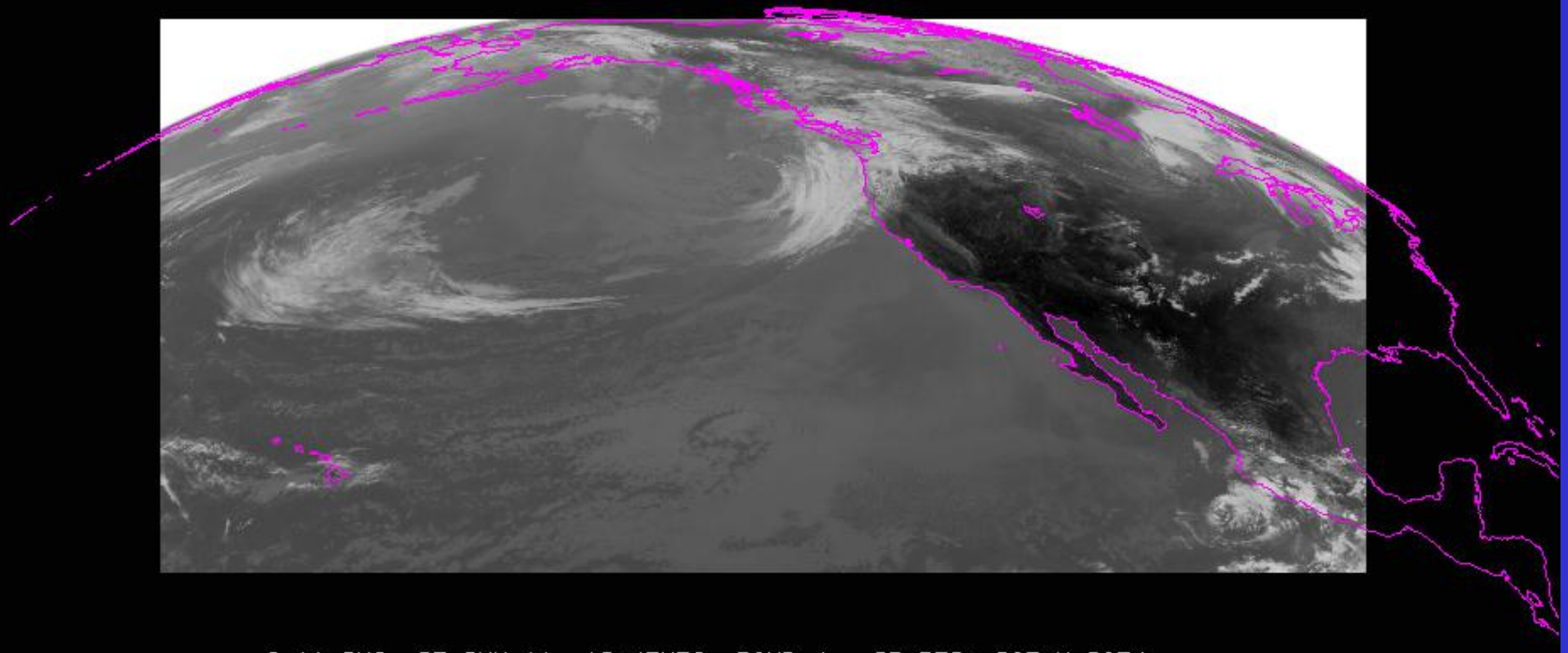
- **Flex** : Provides a FD scan every 15 minutes, a CONUS every 5 minutes, and a Mesoscale every 30 seconds (or two Mesoscale areas with 1-min. scans)

  Mesoscale: Provides coverage over a selectable 1000x1000km box with a temporal resolution of 30 seconds. Option: Two Meso areas with 1-min. scans, with one “fixed” over Hawaii.

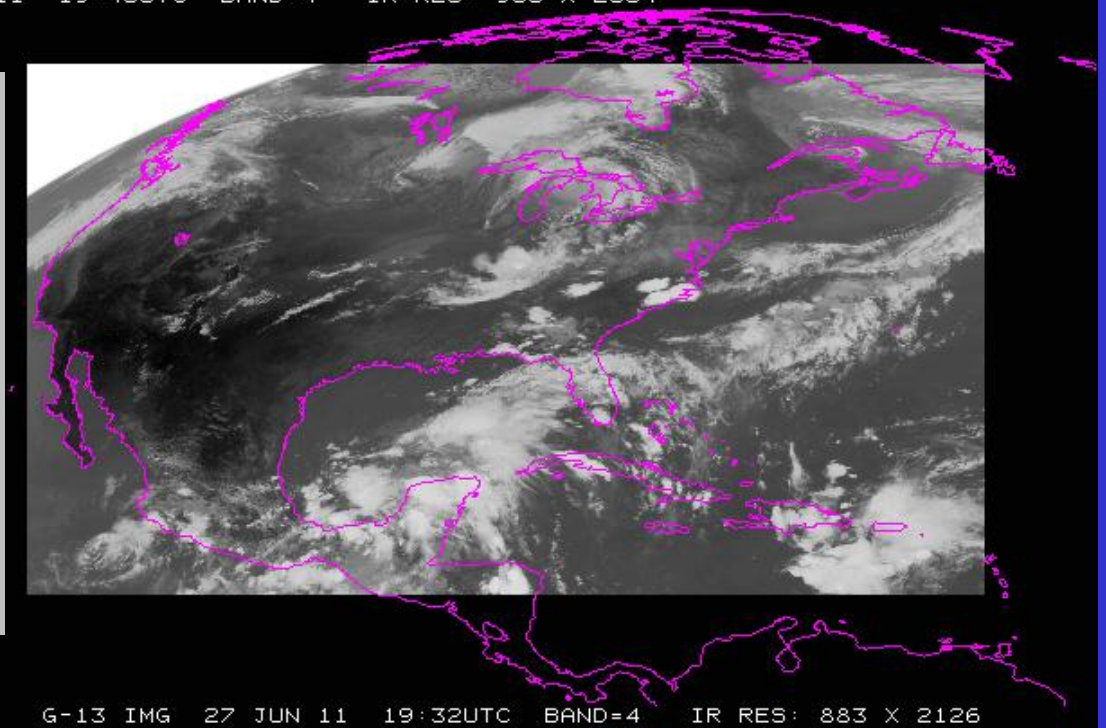
  CONUS: Provides coverage that includes southern Alaska, the western continental US, and northeastern Pacific Ocean regions (but not Hawaii) every 5 minutes. Referred to as “PACUS” (note quotes)

- **Hybrid** : Provides “PACUS” coverage every 5 minutes, a FD scan every 15 minutes (except every 5 minutes near the top of every hour), and Mesoscale coverage every 30 seconds (except for a 15-min. period near the top of every hour, when it becomes 5-min.)

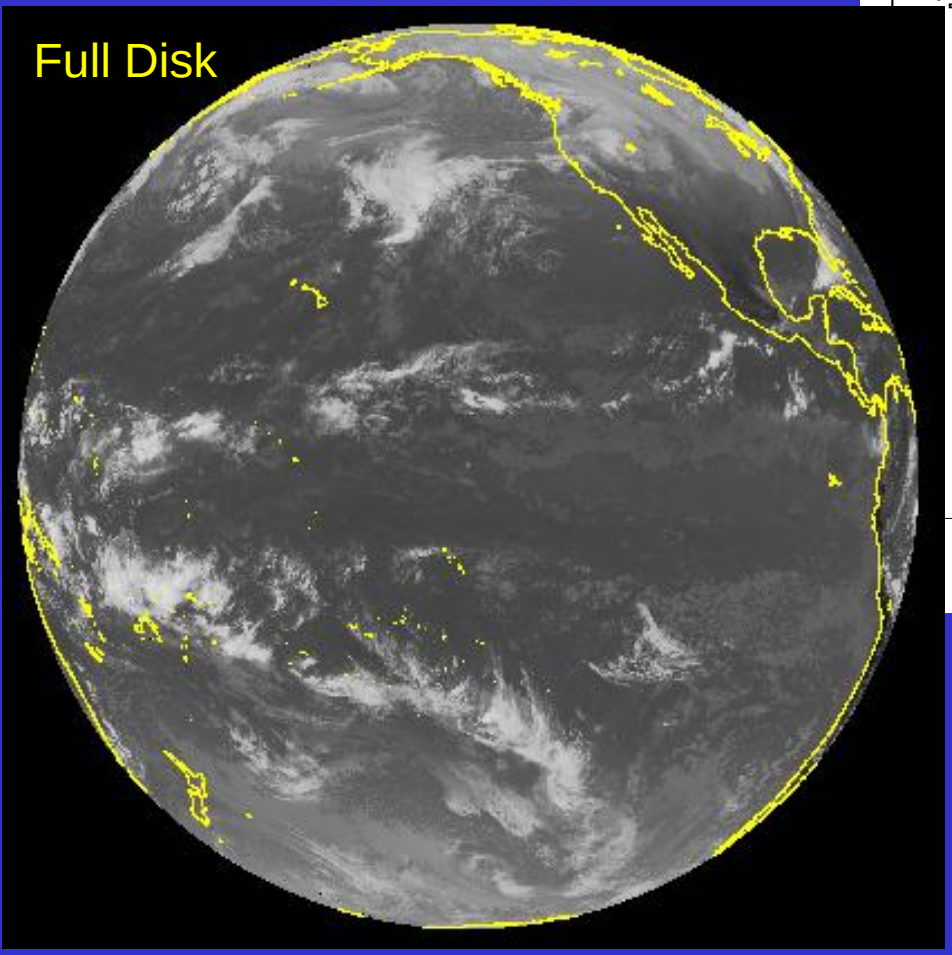
ITT scan mode video: http://www.youtube.com/watch?v=p8SgXJSMOfc&feature=player_embedded

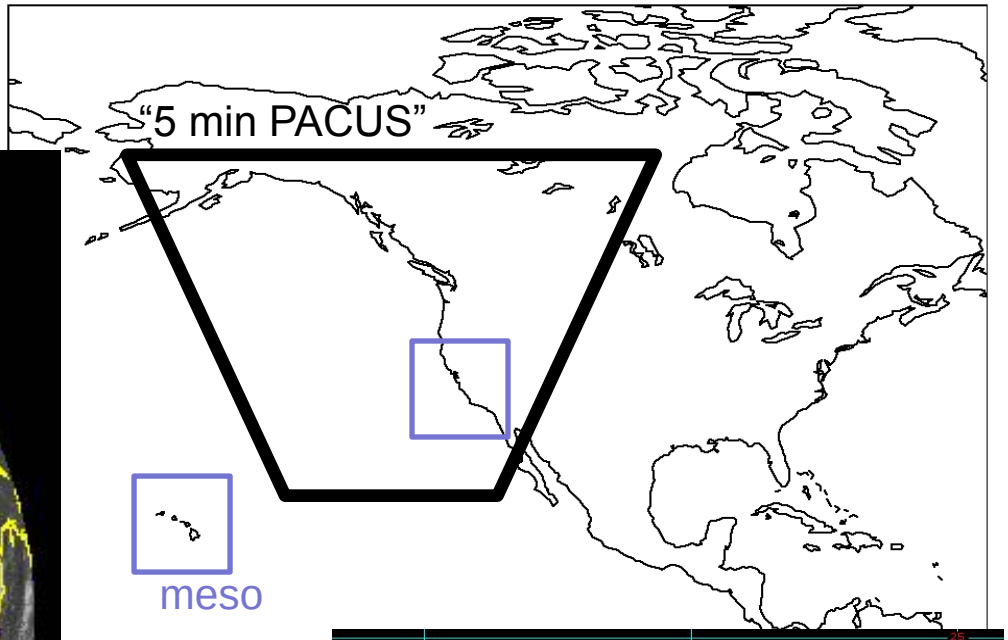


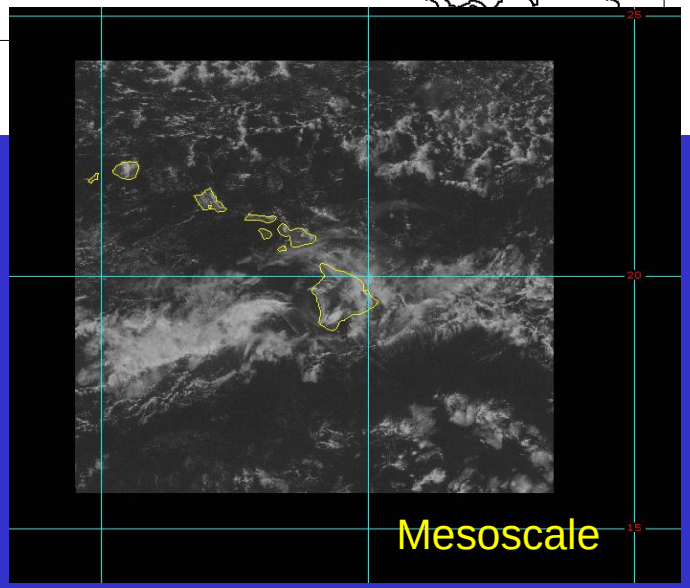
Current GOES Imager scans: GOES-W PACUS (upper) and GOES-E CONUS (right). Note that PACUS is one-third larger. These regions are sub-selected for AWIPS.



GOES-West





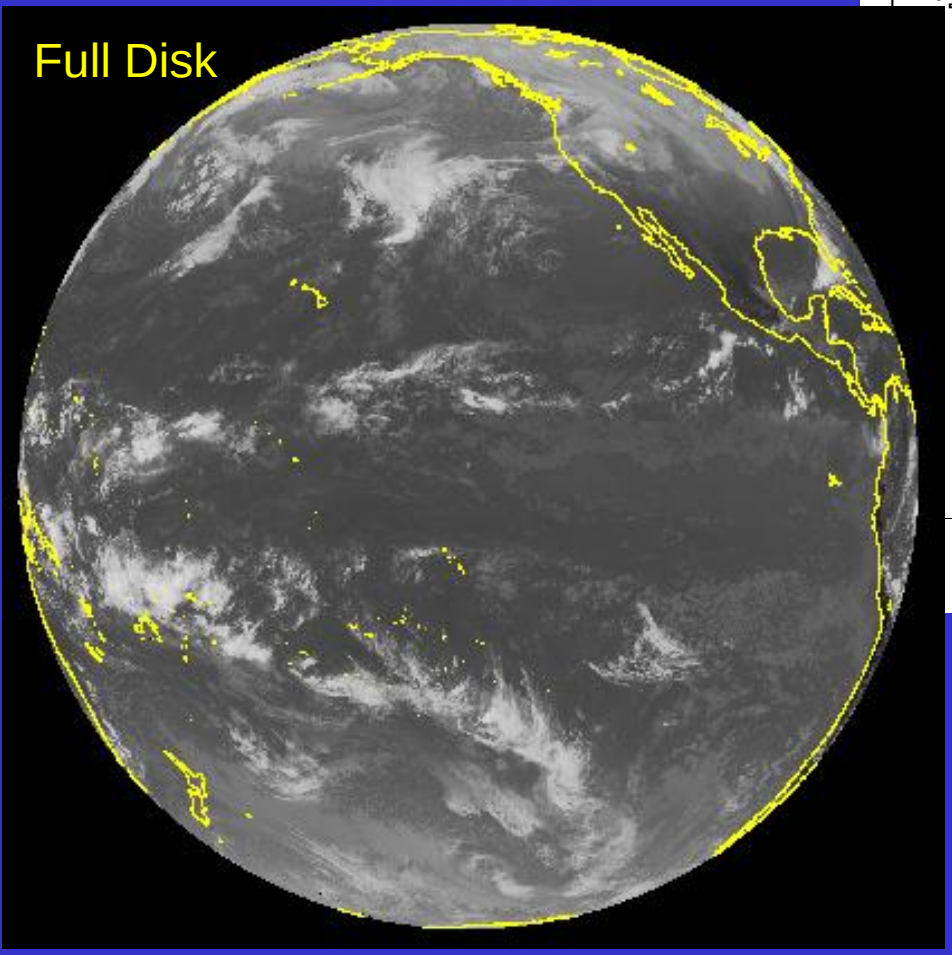


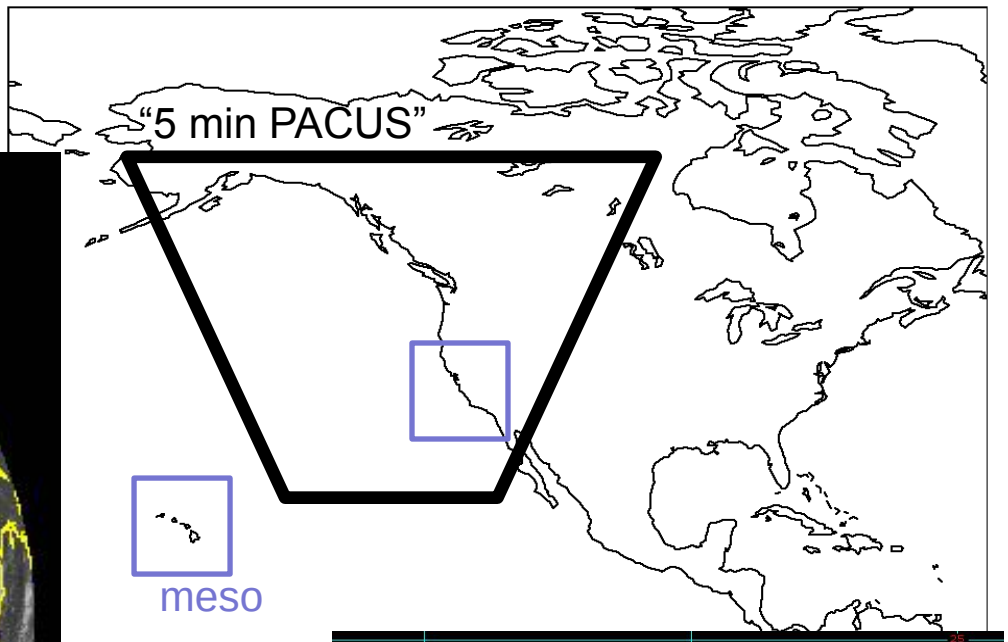
Possible scan modes for the west ABI (per hour):

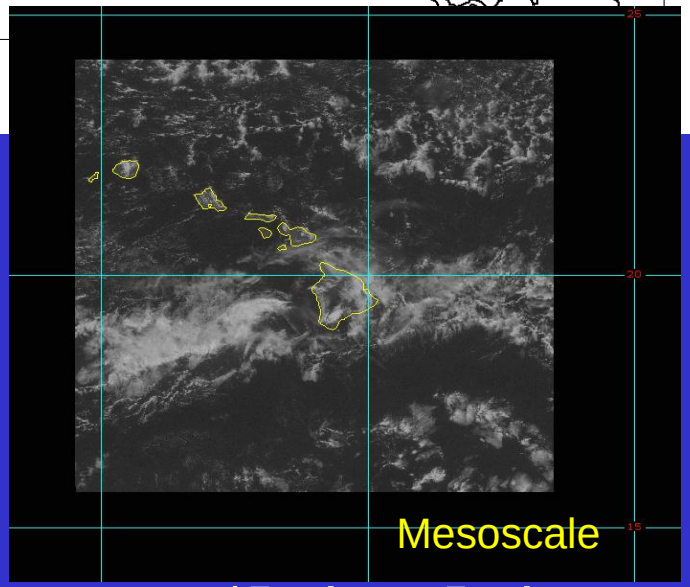
Continuous FD--Full disk scan every 5 minutes, OR

FLEX--Full disk scan every 15 mins + continuous 5-min “PACUS” images + two selectable Mesoscale areas with continuous 1-min scans, OR…

GOES-West



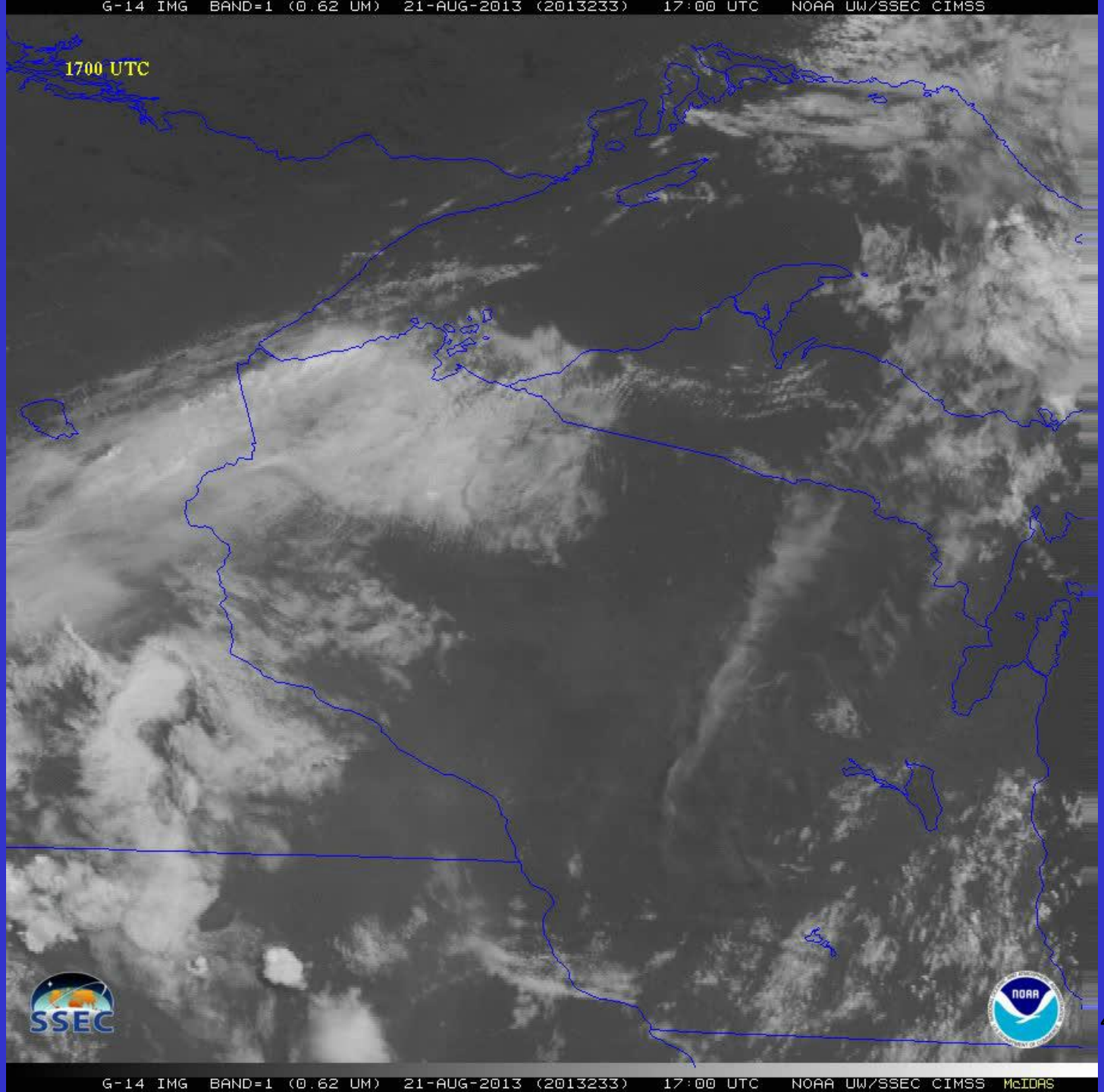




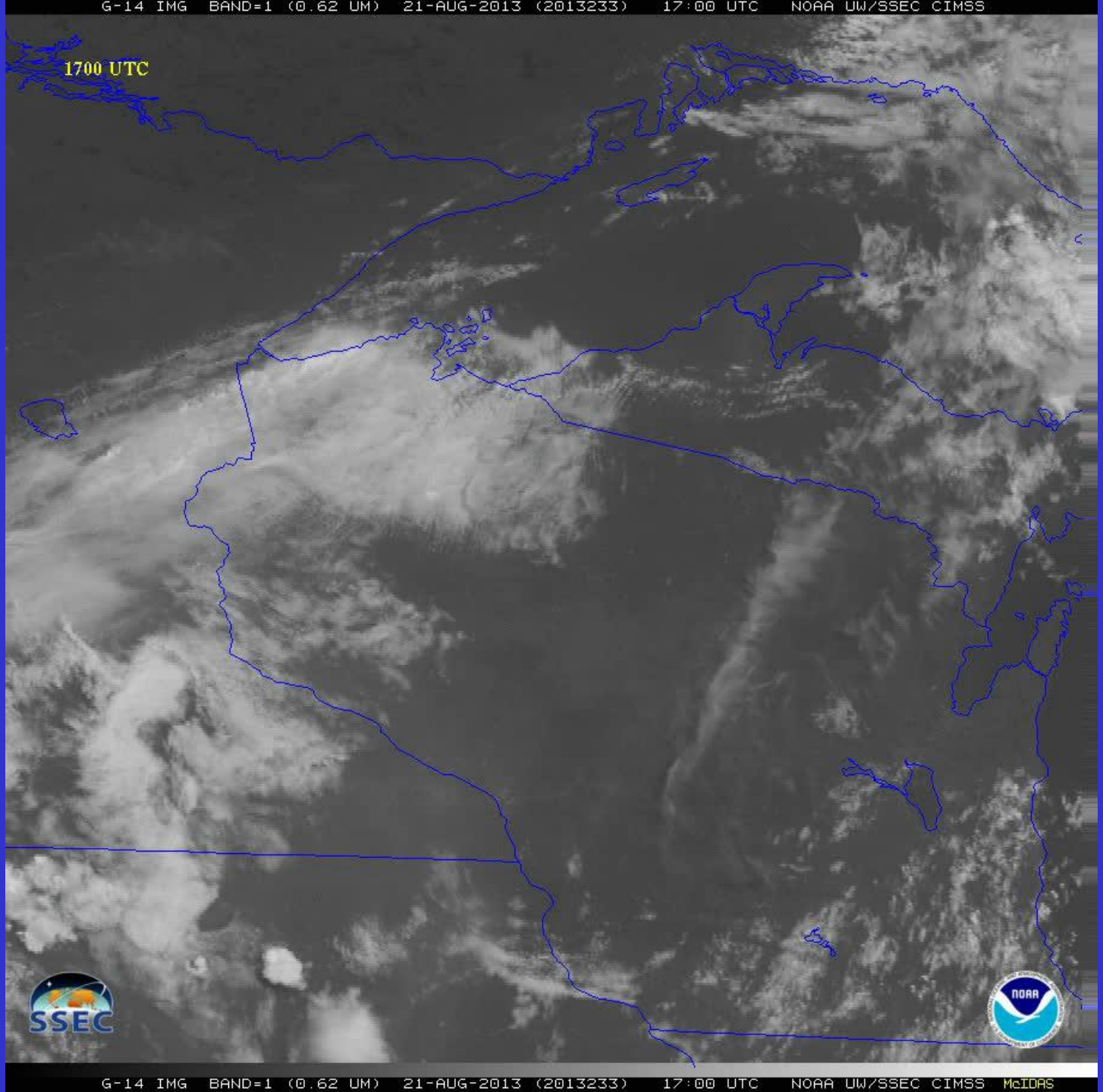
Possible scan modes for the west ABI (per hour):

Hybrid - For ¾ of the hour: FLEX mode (Full disk scan every 15 mins + 5 min “PACUS” images + two 1-min. mesoscales); for ¼ of the hour: FD mode (5-min. FD scans for AMV production)

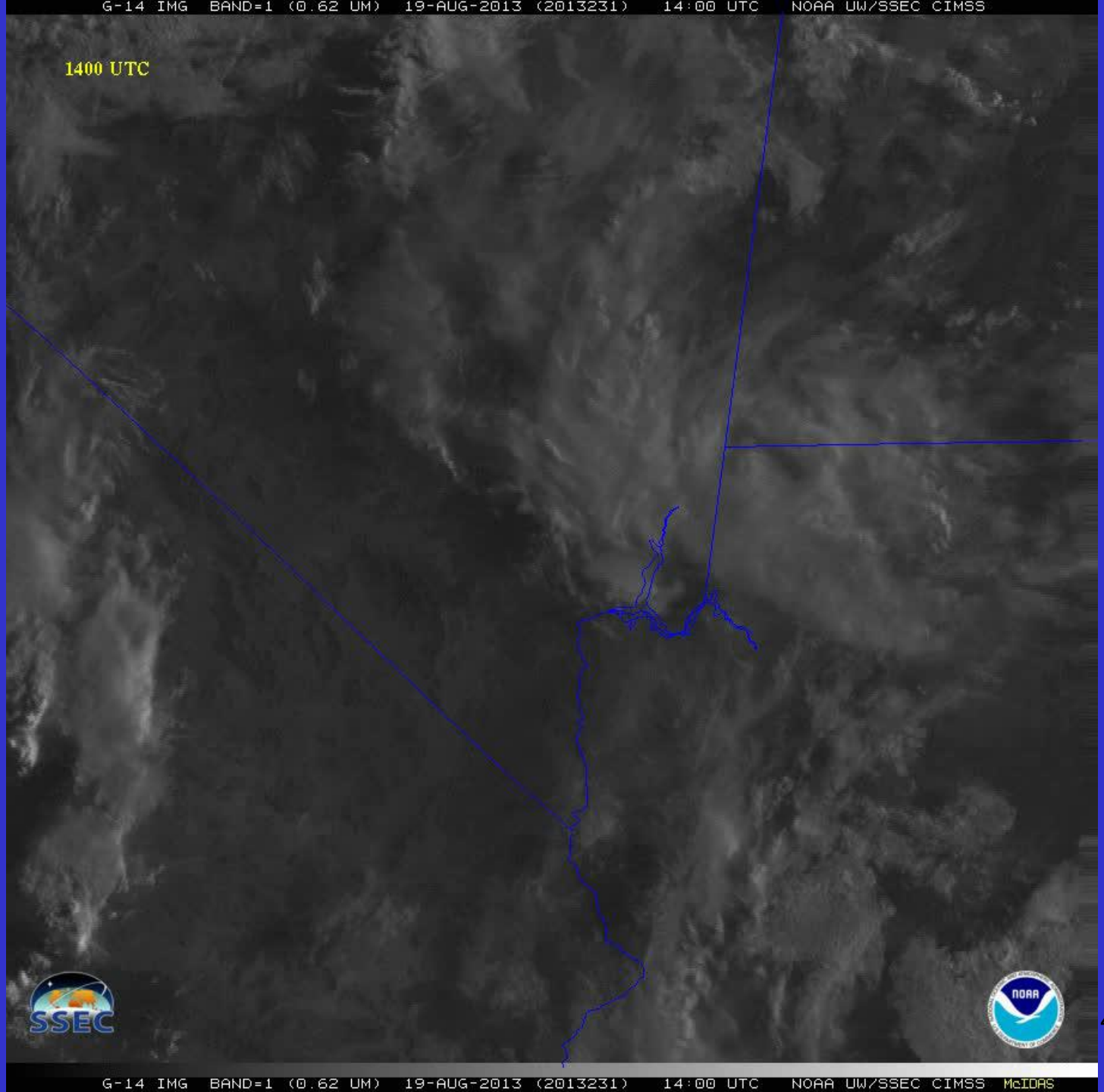
~ mode 3 (mpeg)


G-14 IMG BAND=1 (0.62 UM) 21-AUG-2013 (2013233) 17:00 UTC NOAA UW/SSEC CIMSS
1700 UTC
SSEC
NOAA
G-14 IMG BAND=1 (0.62 UM) 21-AUG-2013 (2013233) 17:00 UTC NOAA UW/SSEC CIMSS McIDAS

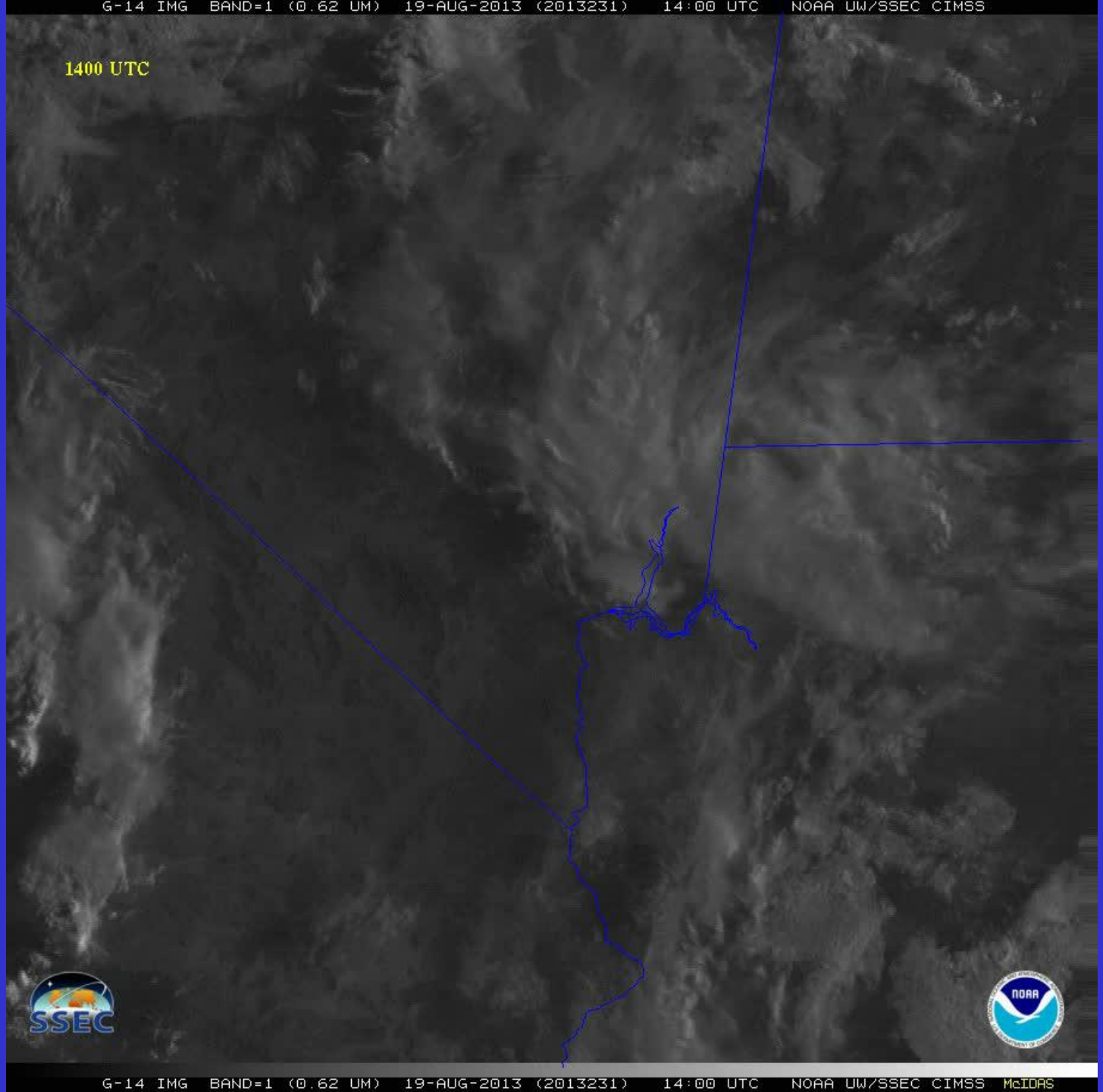
~ mode 3.25 (mpeg)



~ mode 3 (mpeg)


G-14 IMG BAND=1 (0.62 UM) 19-AUG-2013 (2013231) 14:00 UTC NOAA UW/SSEC CIMSS
1400 UTC
SSEC
NOAA
G-14 IMG BAND=1 (0.62 UM) 19-AUG-2013 (2013231) 14:00 UTC NOAA UW/SSEC CIMSS McIDAS

~ mode 3.25 (mpeg)



Summary of ABI Operational Scan Mode Alternatives

Continuous FD mode of operations would be great for large-scale animations and improved cloud-track wind derivation, but no 'super-rapid-scan' (SRS) imaging for mesoscale events.

Flex mode of operations would provide unique opportunities for mesoscale imaging (SRS), but would be sub-optimal for cloud-tracked winds over most of the viewing region (important for global NWP).

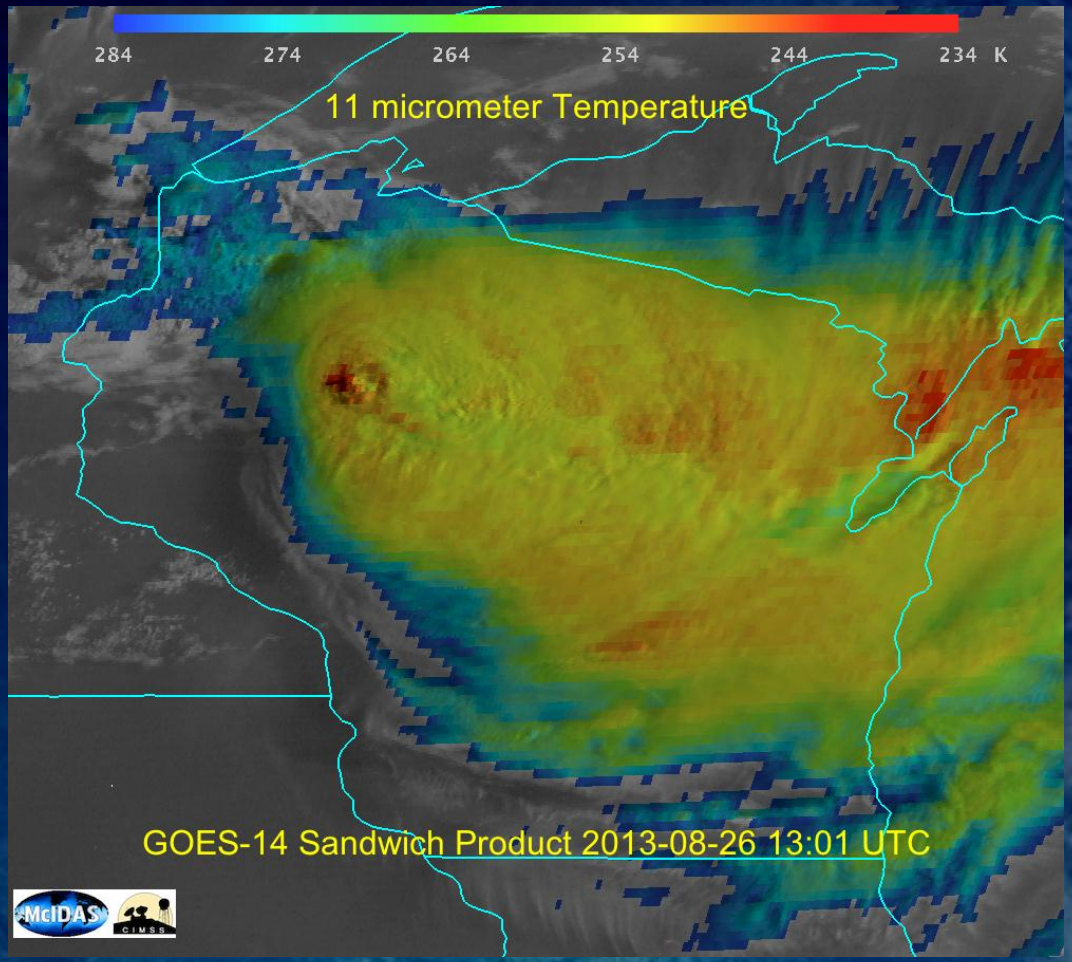
Hybrid mode of operations would allow improved cloud-tracked winds and mesoscale sampling, but with interruptions to the SRS animations (and any derived products)

Are there other options?

- 10 min FD and many (30 sec) meso?
- A Northern Hemi scan option (say every 2.5 min) with a FD every 15 min?
- Assume that GOES-East and –West could be operated differently

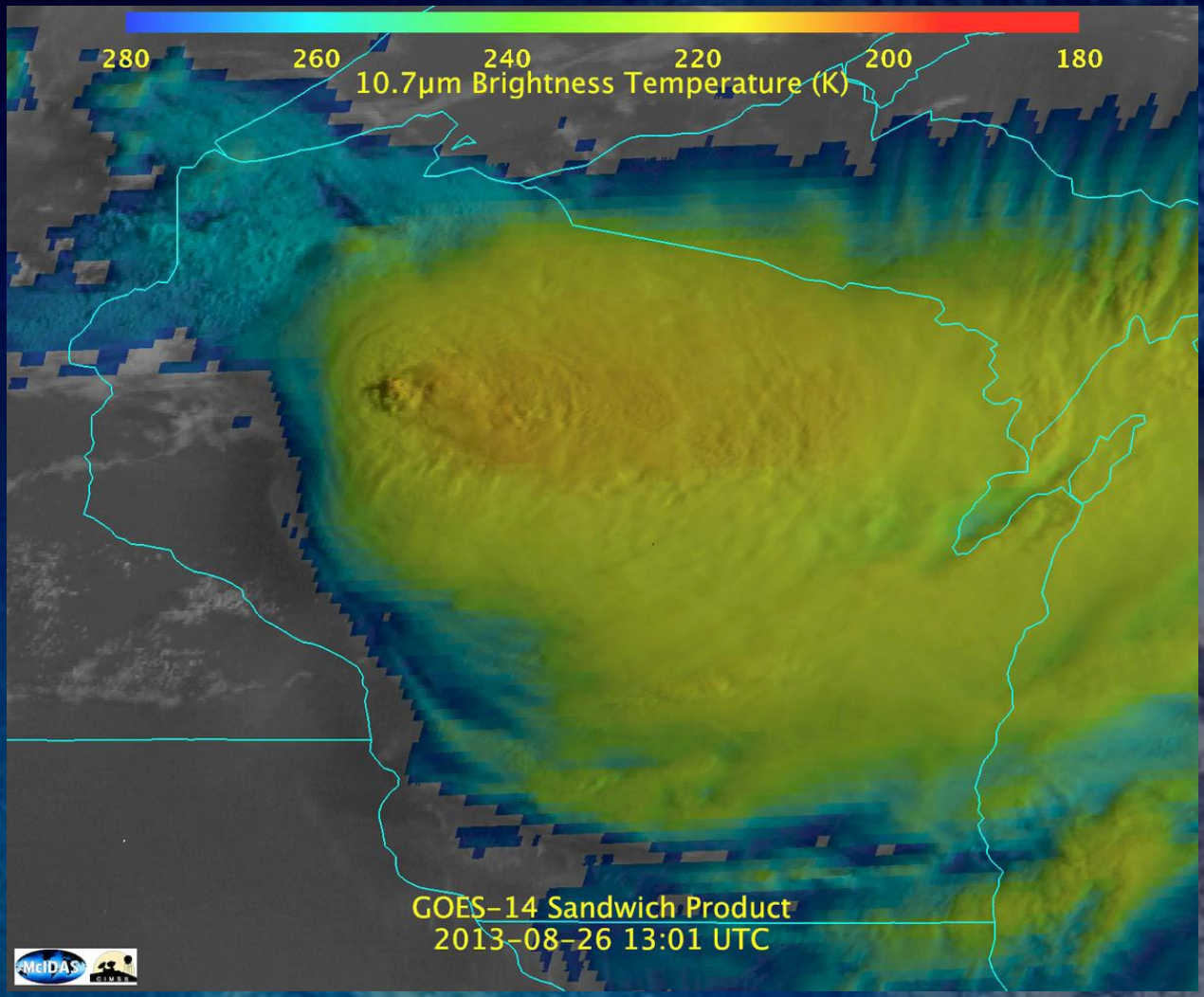
Validation – image combination

- Visible and IR ‘sandwich’ product…

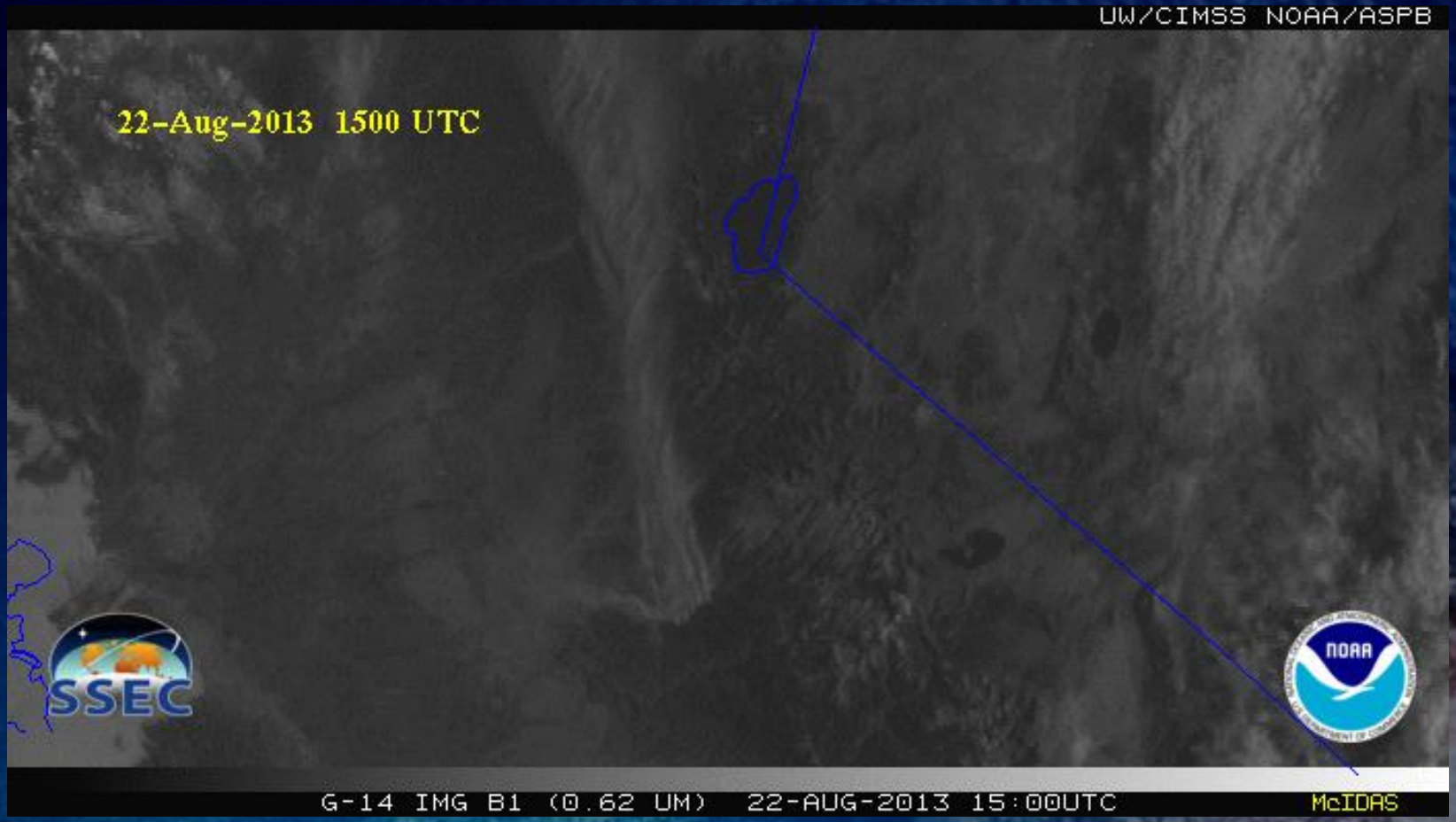


Created in McIDAS-V by Joleen Feltz; similar to the method of Martin Setvak

Vis+IR


280
260
240
220
200
180
10.7μm Brightness Temperature (K)
GOES-14 Sandwich Product
2013-08-26 13:01 UTC
McIDAS

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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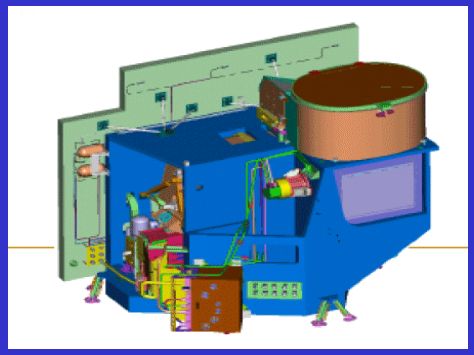
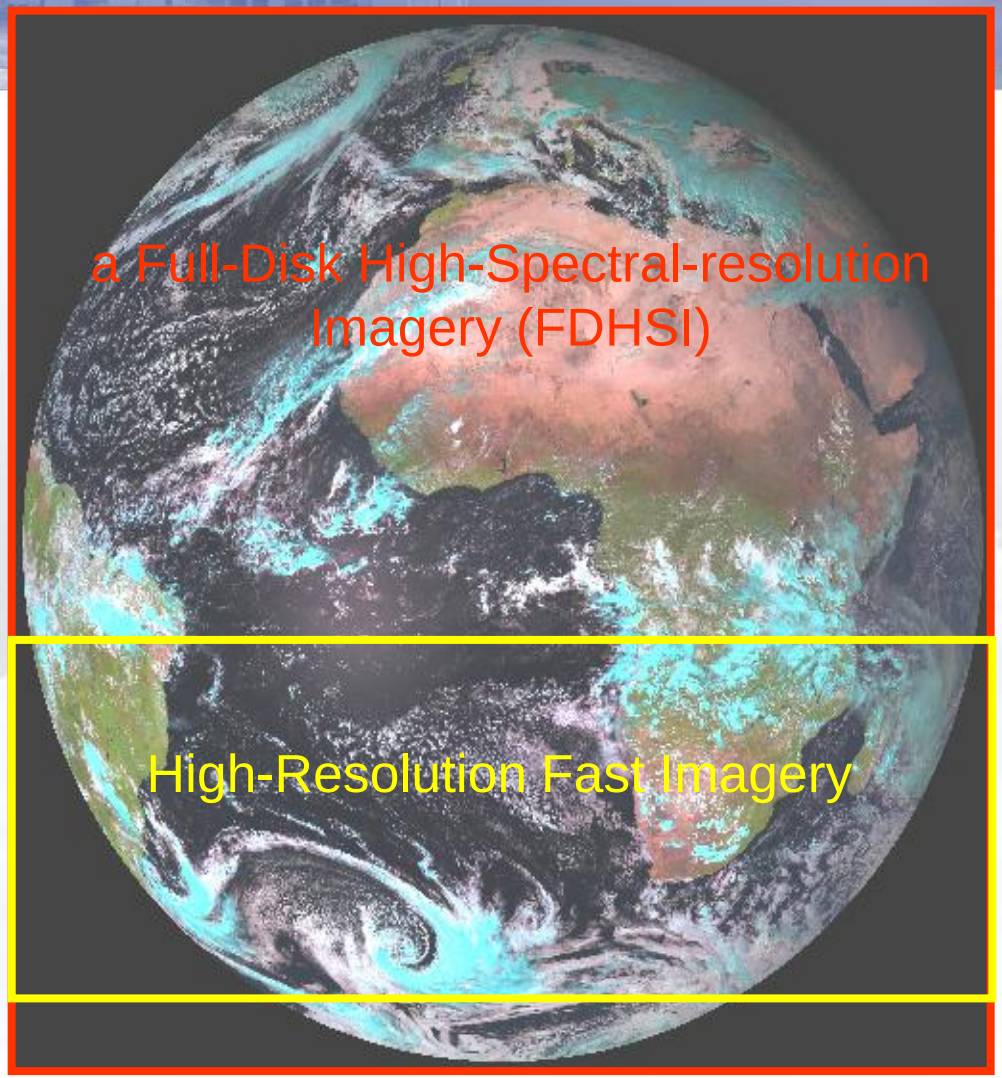


Figure courtesy of ITT Industries

From MSG-SEVIRI to MTG-FCI

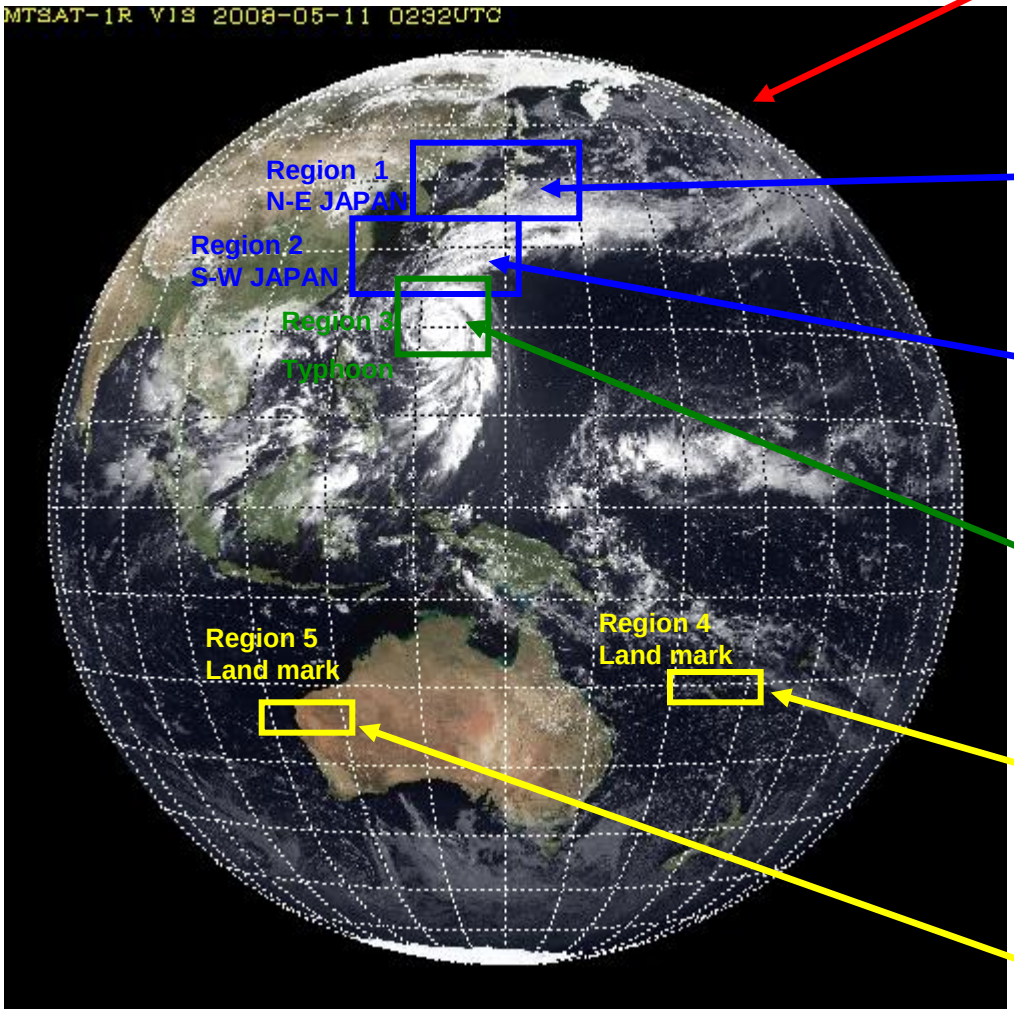


MTG FCI outbids MSG SEVIRI observations on cloud, aerosol, moisture and fire:

- by adding new channels
- by improving temporal-, spatial-, and radiometric resolution

	Coverage	Repeat cycle
FDHSI mission	18°x18°	10 min
HRFI mission	1/4 FD	2.5 min

AHI Sectored Observations in 10 minutes



Full disk
Interval : 10 minutes (6 times per hour)
23 swath

Region 1 JAPAN (North-East)
Interval : 2.5 minutes (4 times in 10minutes)
Dimension : EW x NS: 2000 x 1000 km
2 swath

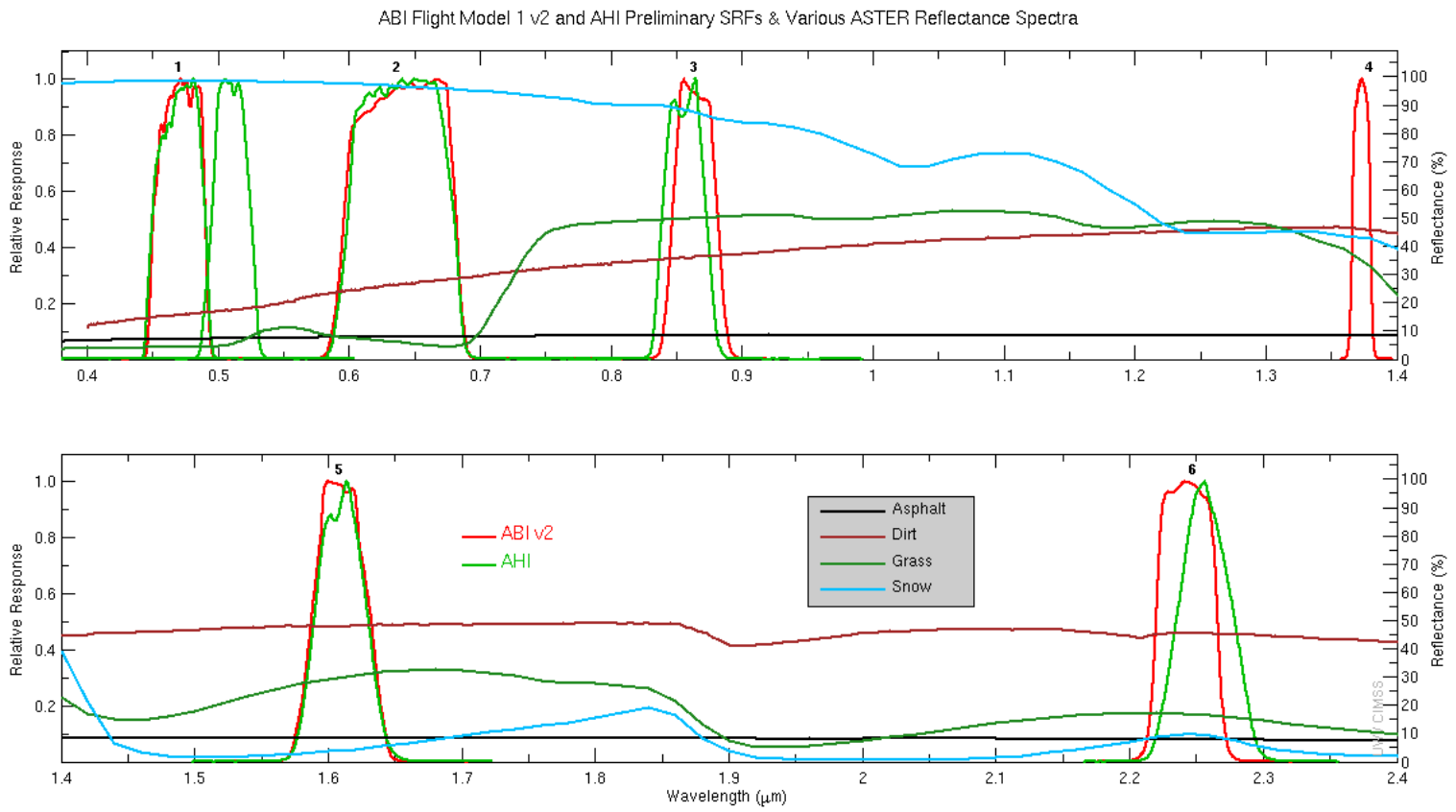
Region 2 JAPAN (South-West)
Interval : 2.5 minutes (4 times in 10minutes)
Dimension : EW x NS: 2000 x 1000 km
2 swath

Region 3 Typhoon
Interval : 2.5 minutes (4 times in 10minutes)
Dimension : EW x NS: 1000 x 1000 km
2 swath

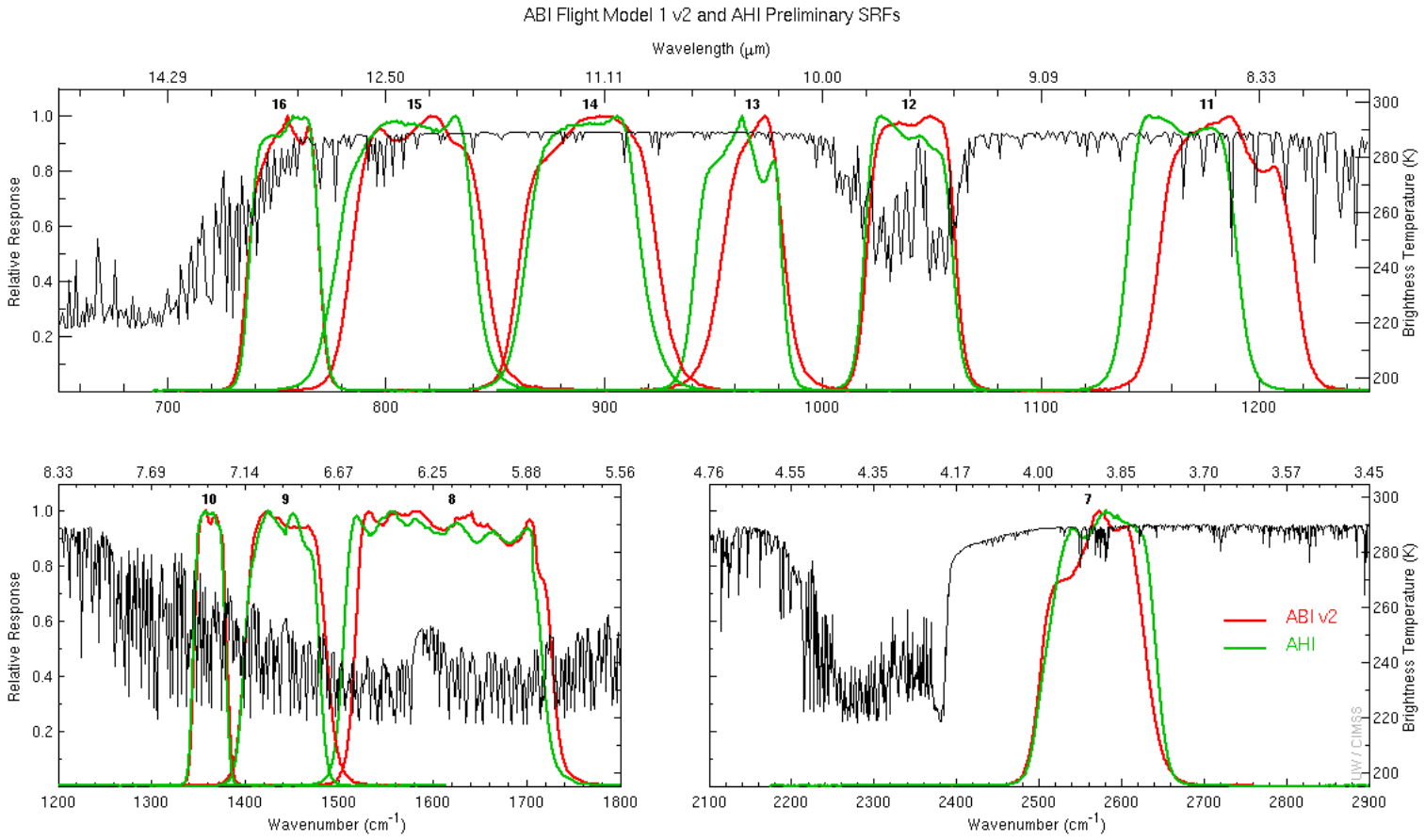
Region 4 Land mark
Interval : 0.5 minutes (20 times in 10minutes)
Dimension : EW x NS: 1000 x 500 km
1 swath

Region 5 Land mark
Interval : 0.5 minutes (20 times in 10minutes)
Dimension : EW x NS: 1000 x 500 km
1 swath

Spectral Response Functions



Spectral Response Functions

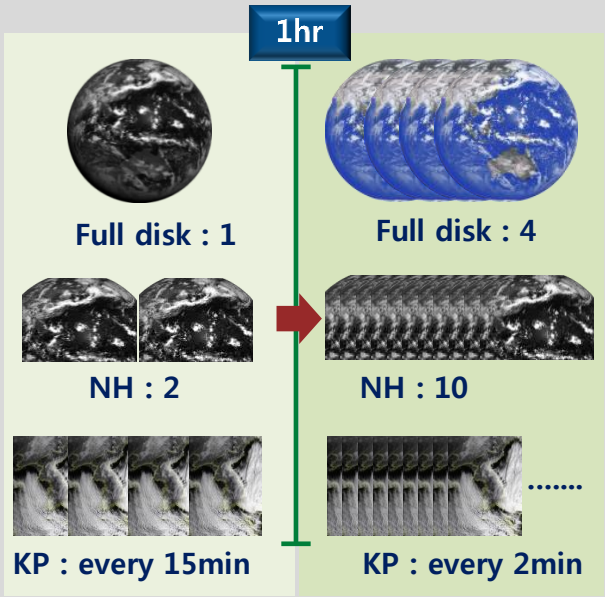


4.3 COMS & GEO-KOMPSAT-2A

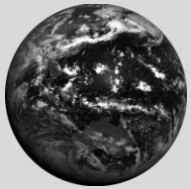
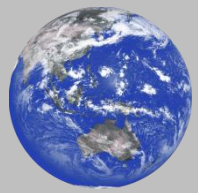
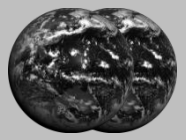
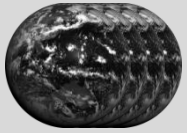
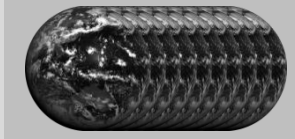
resolution 4times upgrade

COMS	Geo-KOMPSAT-2A
VIS 1km	VIS 0.5~1km
IR 4km	IR 2km

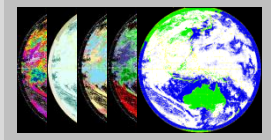
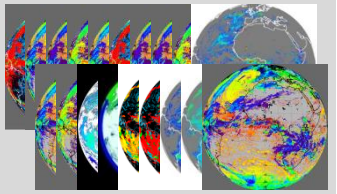
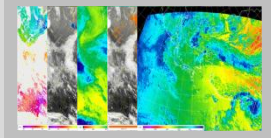
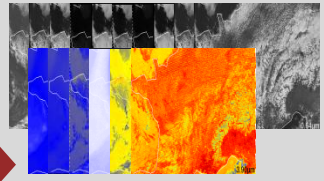
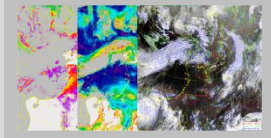
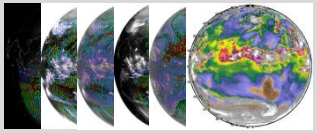
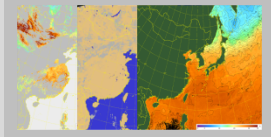
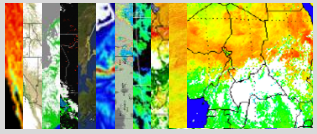
Observation frequency 4 times



channel 3times increase

	COMS	Geo-KOMPSAT-2A
	1 (Black and white)	4 (color image)
VIS		
SW IR	O	2 
IR	4 	10 
	5 channel	16 channel

products 3.5 times increase

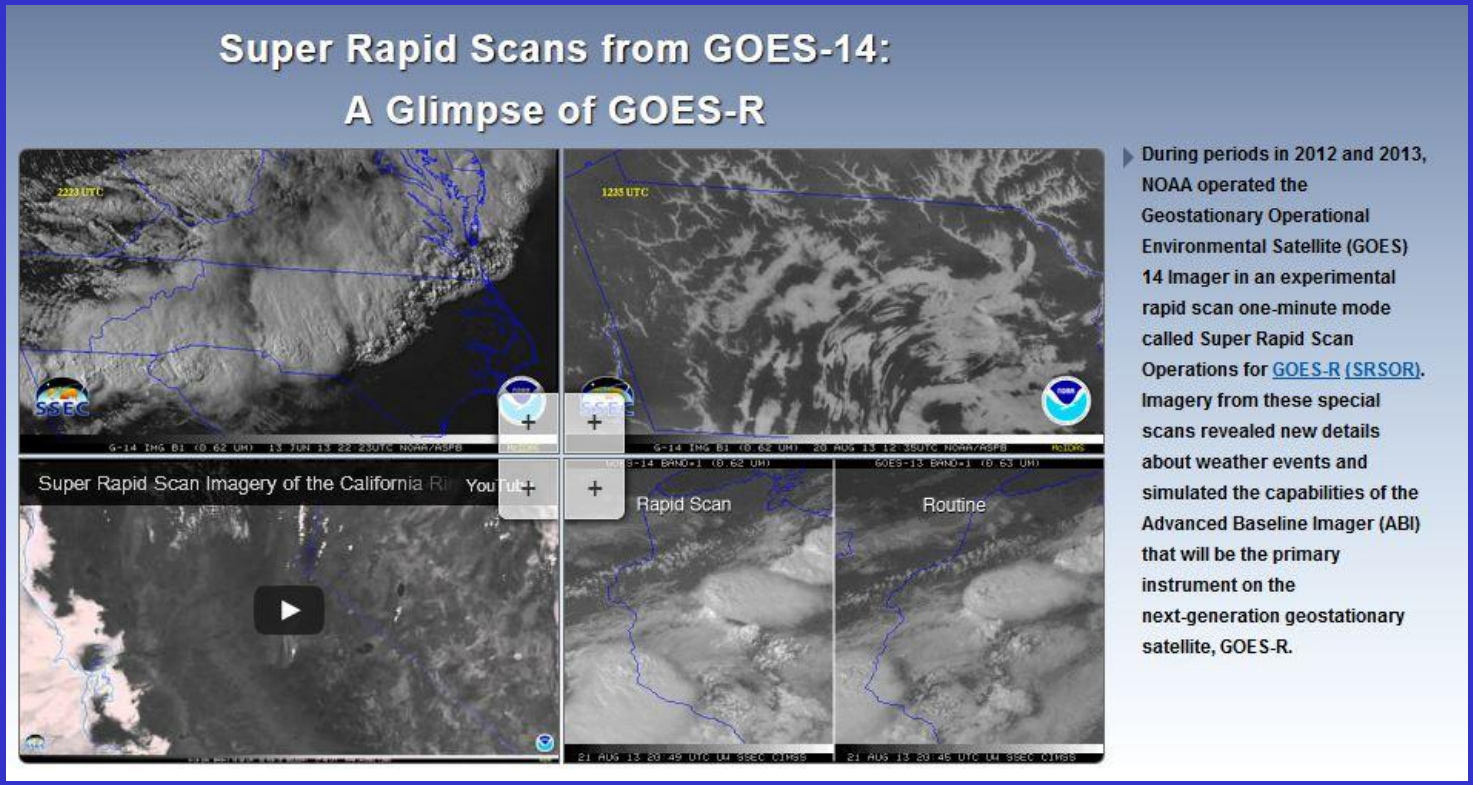
COMS	Geo-KOMPSAT-2A
Cloud/pre. : 5 	Cloud/pre. :19 
Aerosol : 5 	Aerosol : 16 
AMV : 3 	AMV : 6 
Land sfc. : 3 	Land sfc. : 11 
Total : 16	Total : 52

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-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
- (ABI WES guide with simulated images)
- 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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CORRESPONDING AUTHOR: Timothy J. Schmit, 1225 West Dayton St., Madison, WI 53706
E-mail: Tim.J.Schmit@noaa.gov
DOI:10.1175/BAMS-86-8-1079
In final form 14 March 2005

Outline

- GOES-R Overview
- GOES-14
  - PLT in 2009/2010
  - SRSOR (2012 and 2013)
- ABI (Advanced Baseline Imager) Modes
  - Flex
  - Continuous Full Disk
  - Hybrid, etc.
- Other advanced geo images
- GOES-13 Optimized Schedule changes
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- Summary

Exelis

GOES-EAST Optimized Schedules

Kevin Ludlum
NESDIS/OSPO GOES Scheduling (OSPO)

Matthew Seybold, Natalia Donoho
NESDIS/OSPO User Services

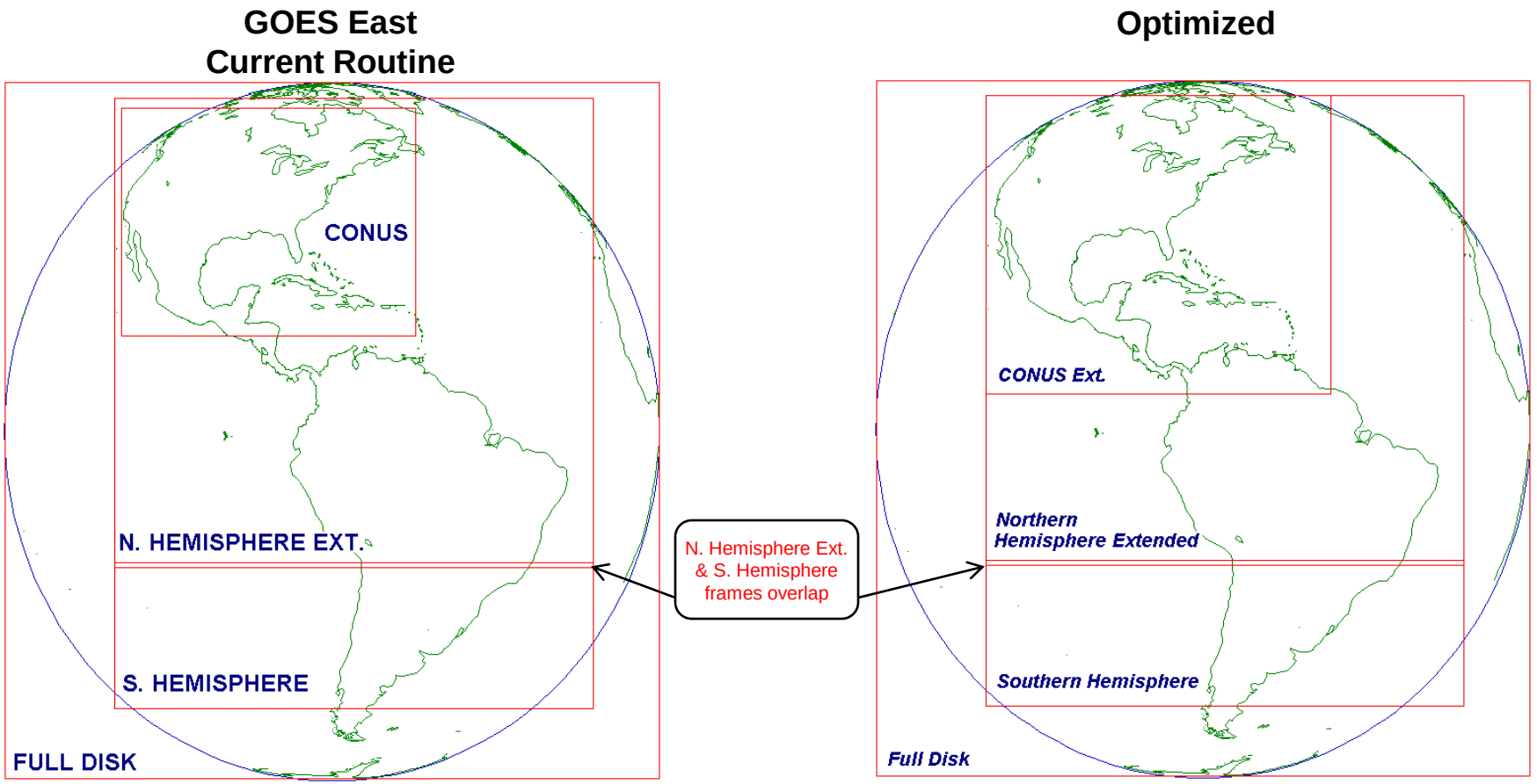
Purpose

- 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
  - Confirmed 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.

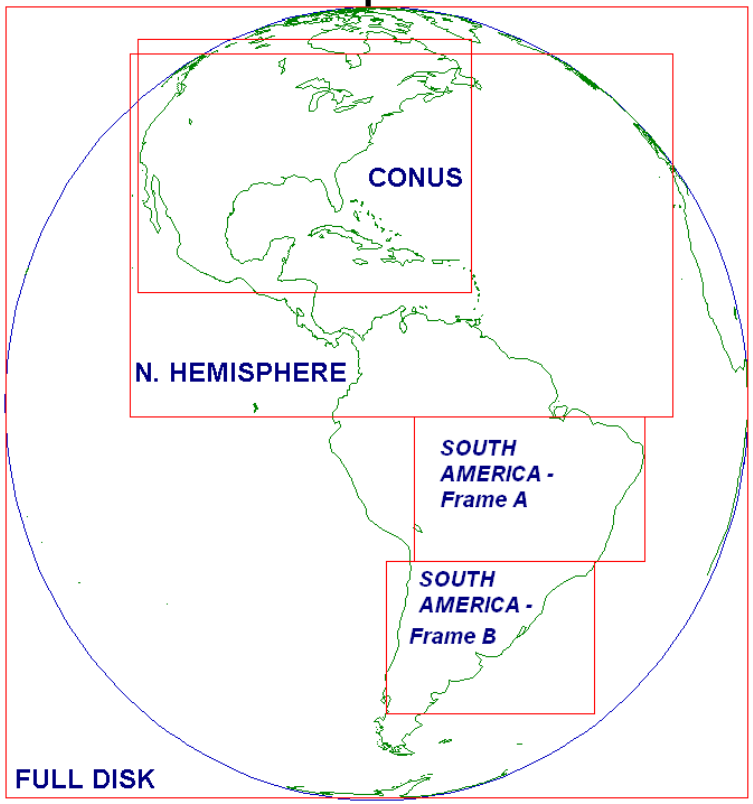
Routine Schedule changes



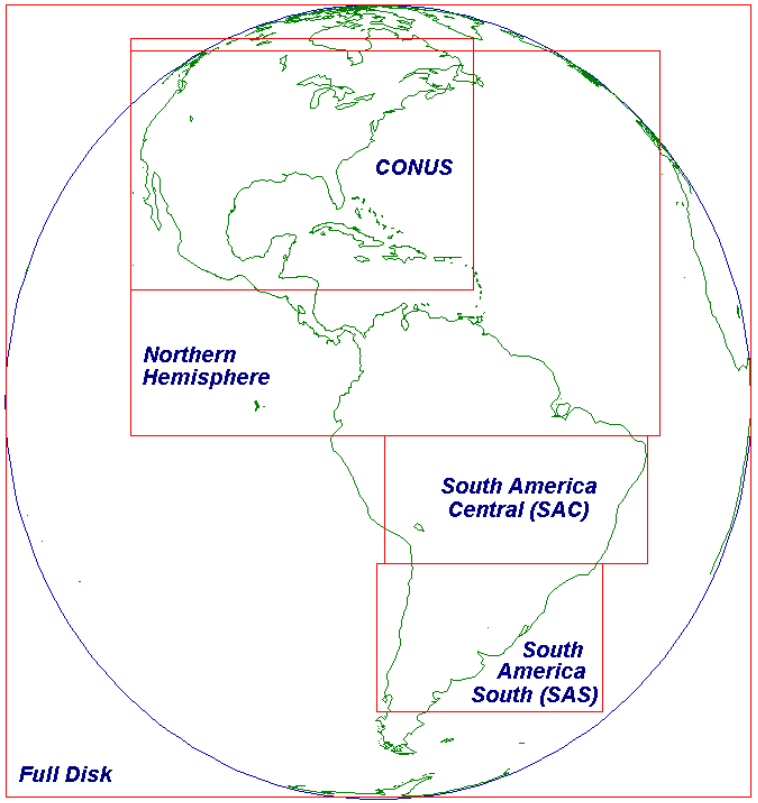
The CONUS image in the Current Routine is replaced by the CONUS Ext. image in the Optimized Routine. This will gain beneficial coverage over more of Canada, the Caribbean Sea, East Caribbean Islands, Nicaragua, Costa Rica, Panama, Columbia, Venezuela, and Guyana. (No other frames change)

Rapid Scan Schedule changes

GOES East Current Rapid Scan



Optimized



All image frames in the Rapid Schedule have been modified, some more than others.

More details on testing, timing, and the transition will be forthcoming.

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

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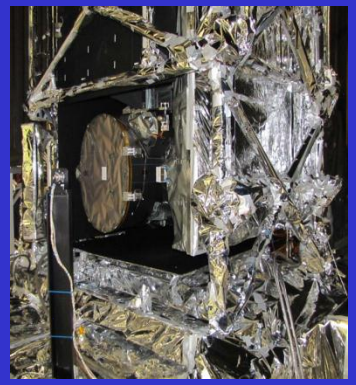
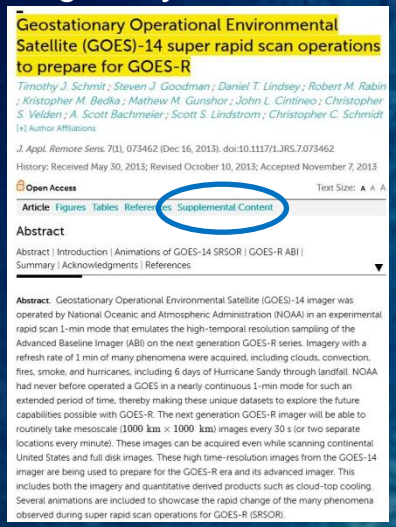


Reference

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

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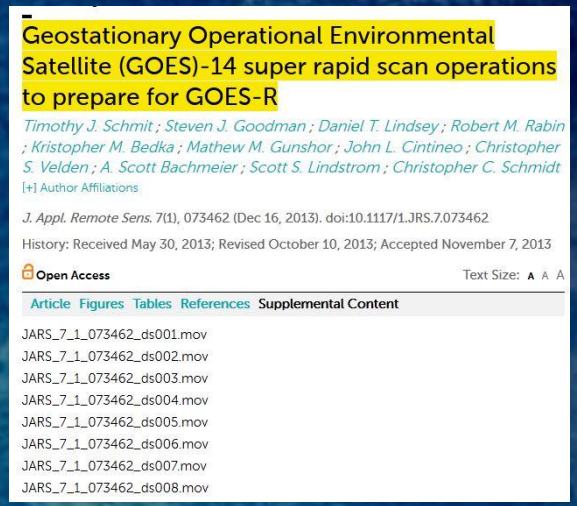
Article Figures Tables References Supplemental Content

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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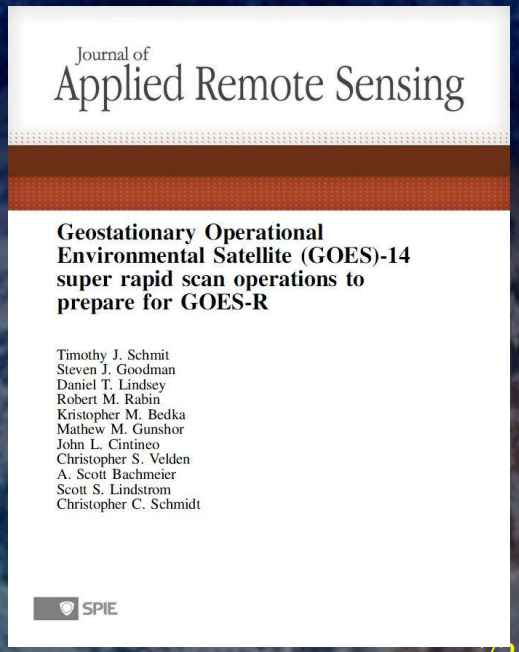
Journal of Applied Remote Sensing

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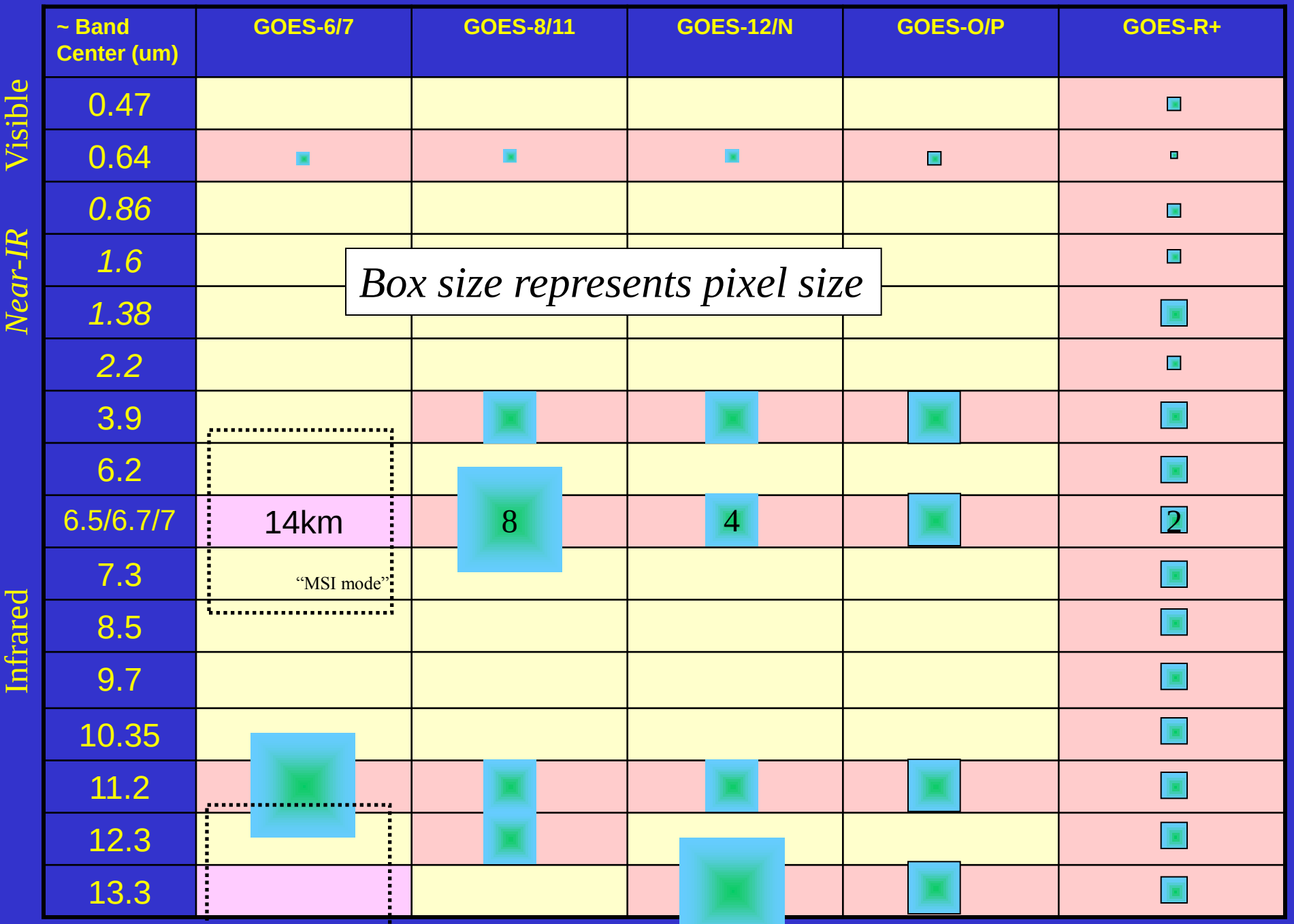
Approximate spectral and spatial resolutions of US GOES Imagers



Summary

1. The GOES-R ABI provides mission continuity

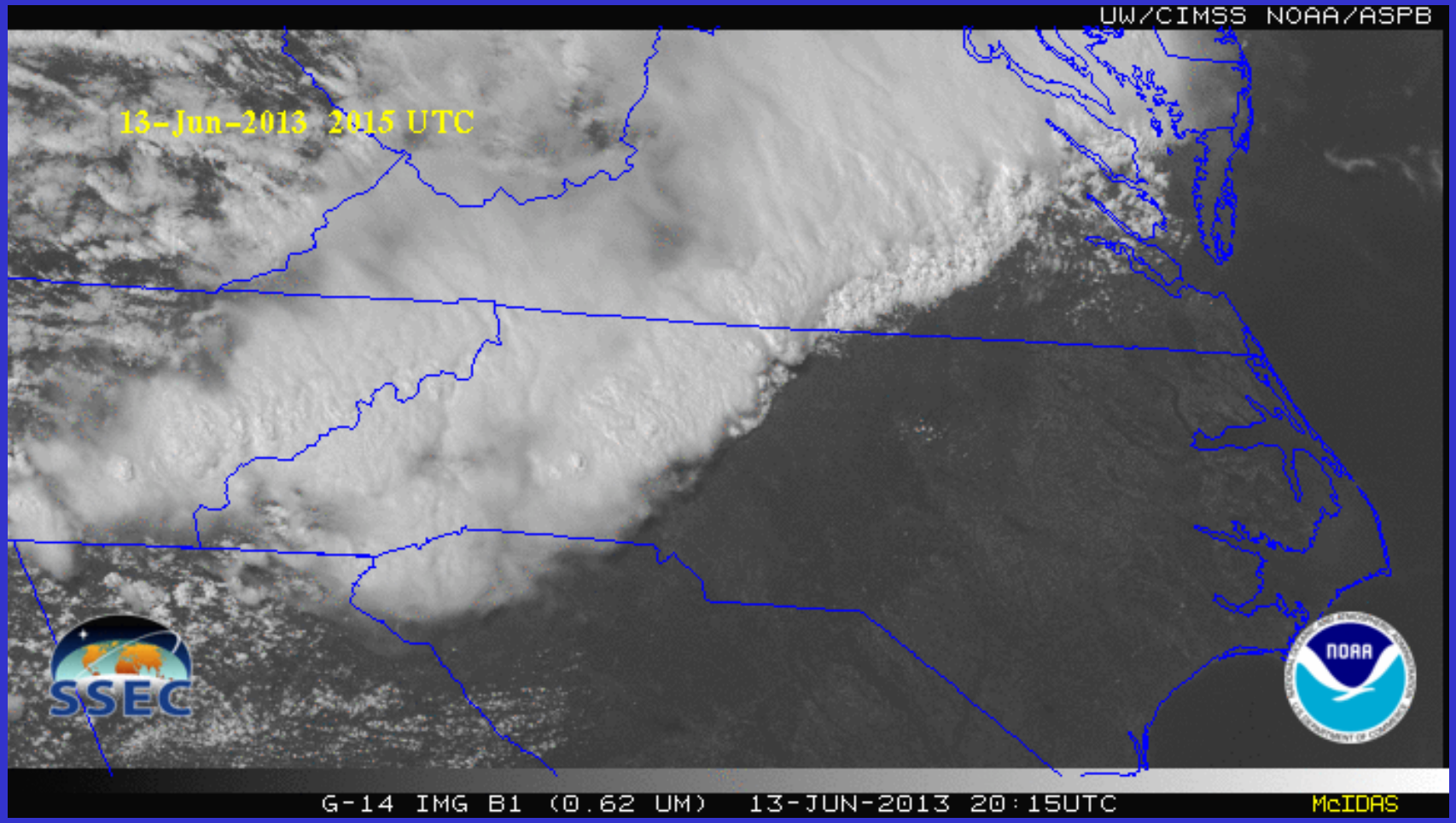
2. Two times the image navigation quality

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

Derecho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