STAR Center for Satellite Applications and Research
formerly ORA — Office of Research and Applications

The ABI (Advanced Baseline Imager) on the GOES-R series

Timothy J. Schmit

NOAA/NESDIS/Satellite Applications and Research

Advanced Satellite Products Branch (ASPB)

Kaba Bah, Mathew M. Gunshor, Jun Li, Scott Bachmeier, etc.

CIMSS, Madison, WI

James J. Gurka, Steve Goodman, etc.

GOES-R Program Office

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CIMSS
UW-Madison

Also Thanks to…

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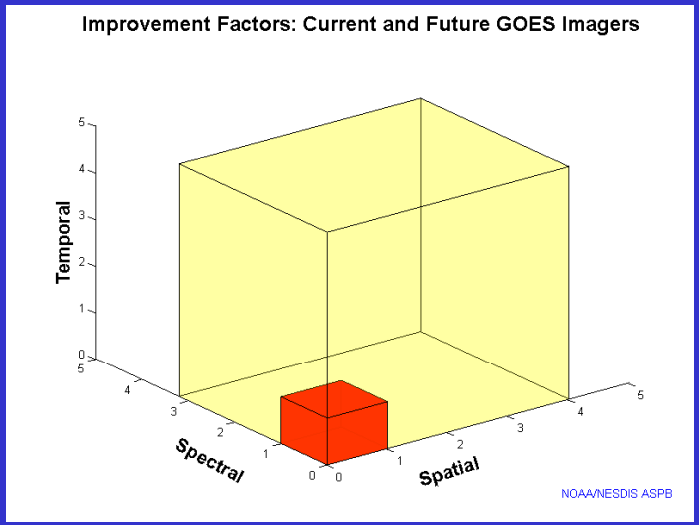
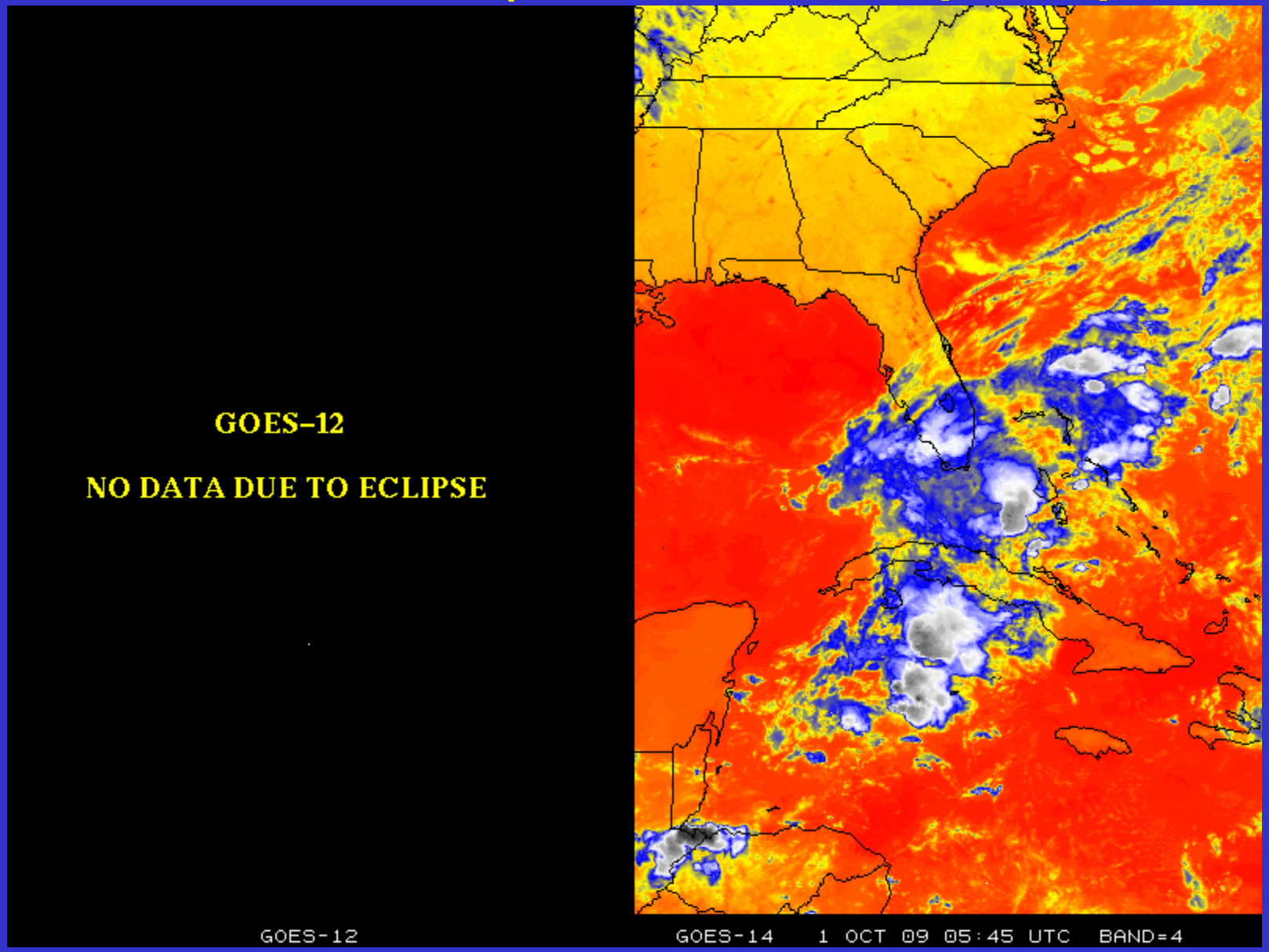
Overview

- GOES-14
- ABI (Advanced Baseline Imager)
  - Temporal
  - Spatial
  - Spectral
  - Imagery
- Summary
  - More information

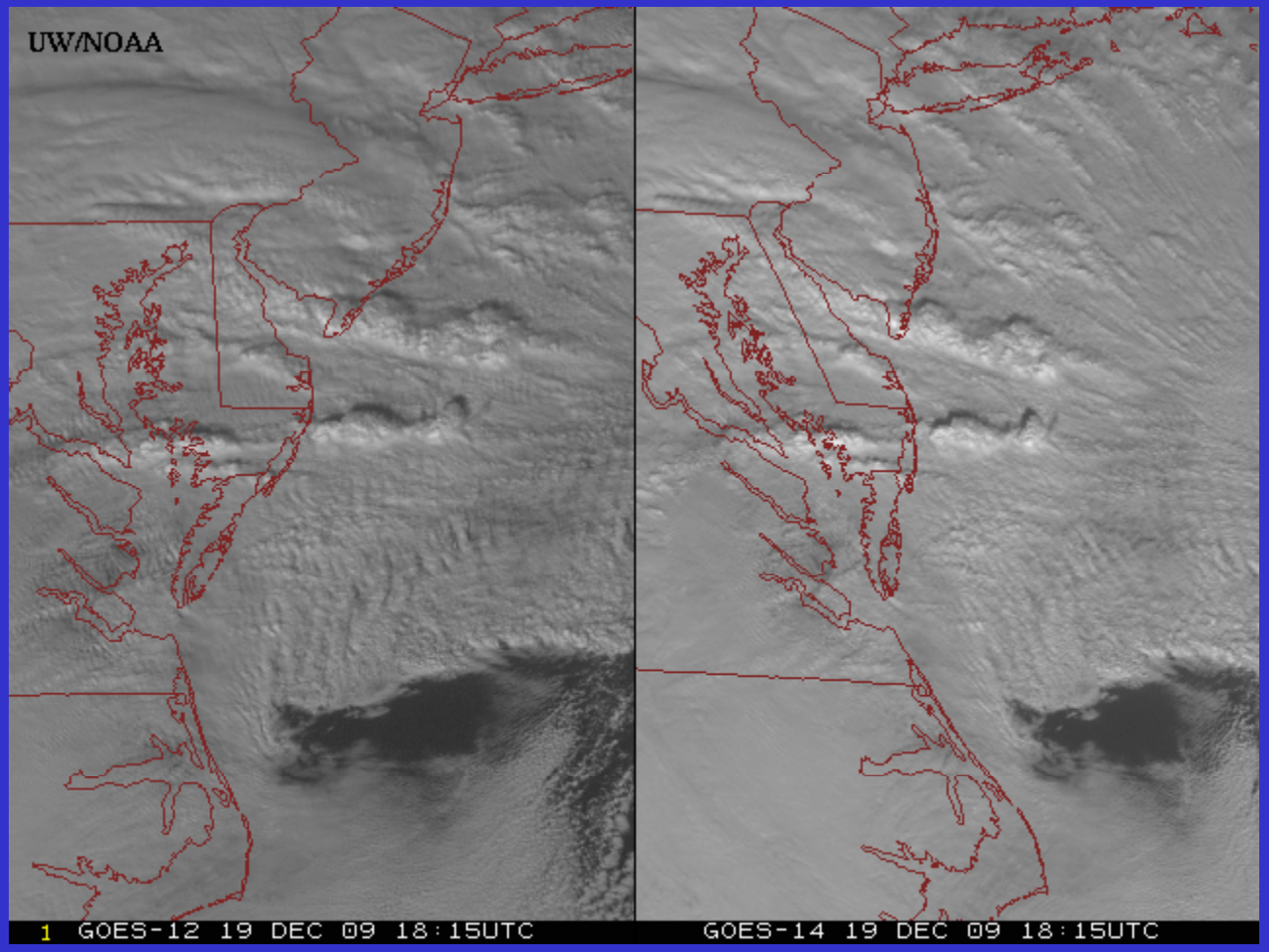


GOES-12/14 (Around eclipse period)



GOES-12 GOES-14

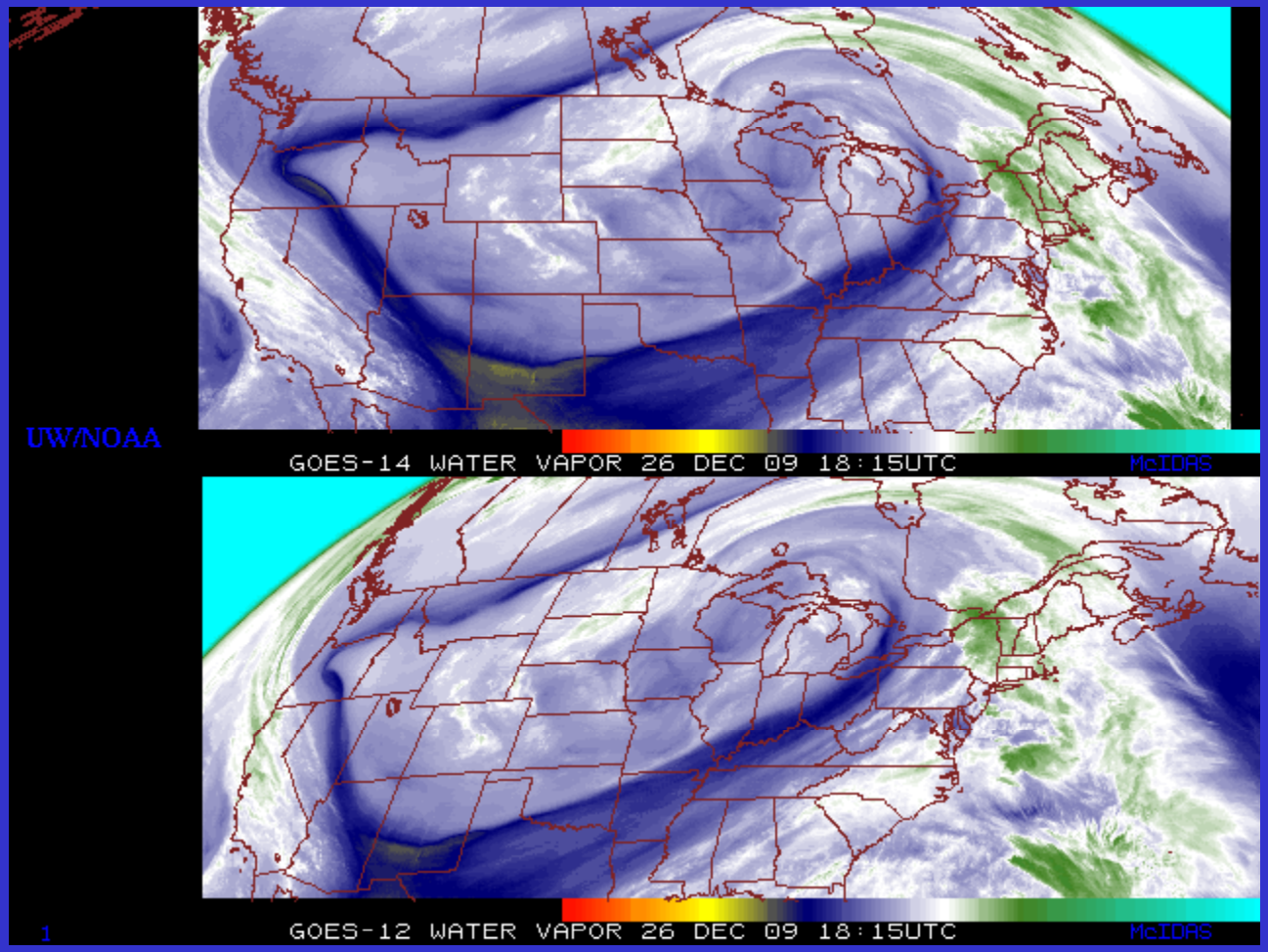
GOES-14: Sample “1-min” imagery



GOES-12 GOES-14

Visible data from the recent NOAA Science Test, lead by Hillger and Schmit

GOES-14: Sample “5-min” imagery

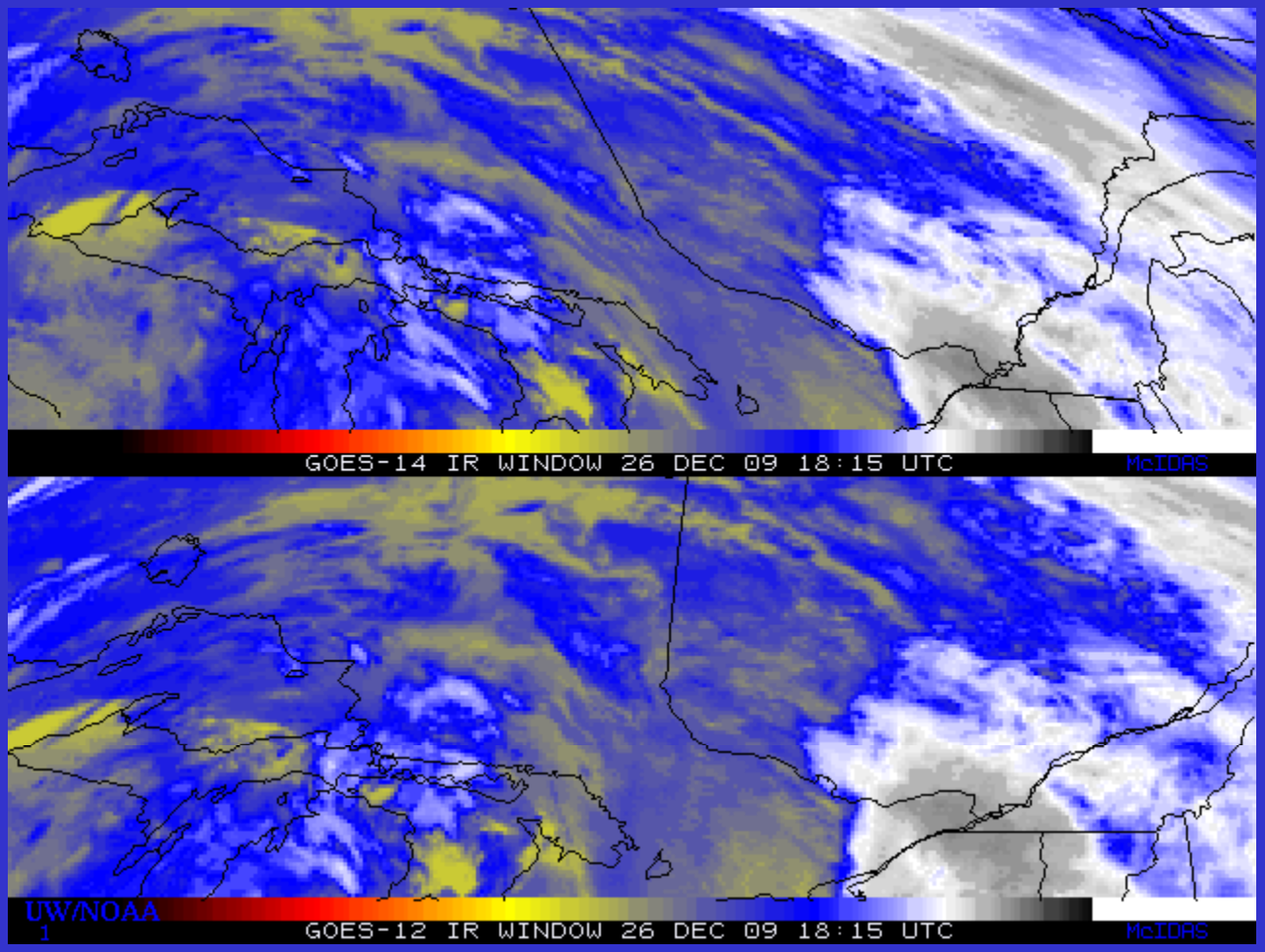


GOES-14

GOES-12

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

GOES-14: Sample “5-min” imagery



GOES-14

GOES-12

IR window data from the recent NOAA Science Test, lead by Hillger and Schmit

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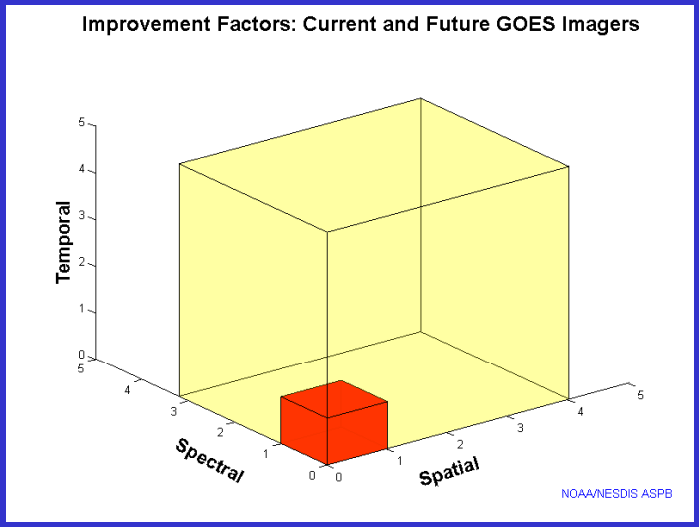
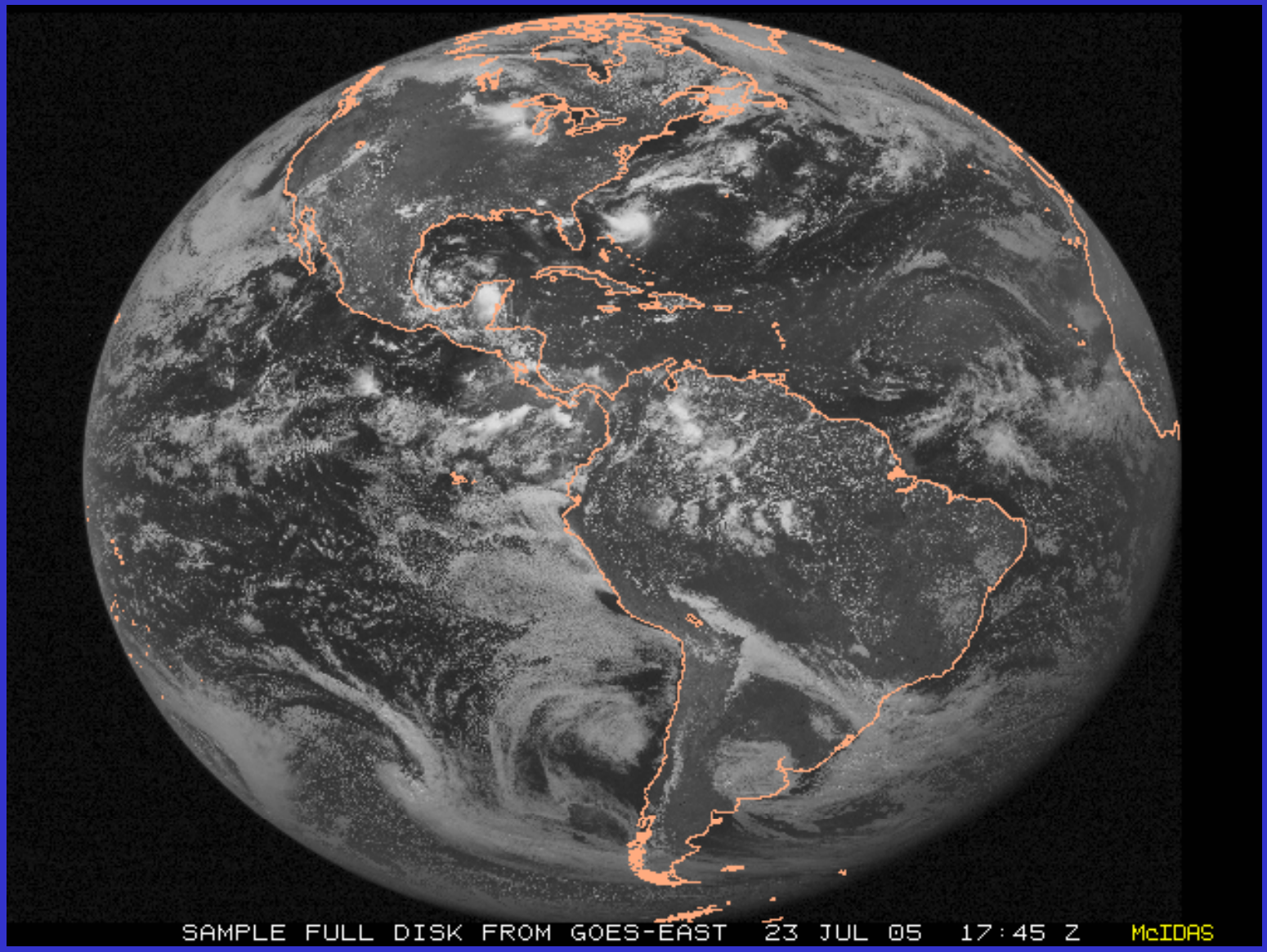


The Advanced Baseline Imager:

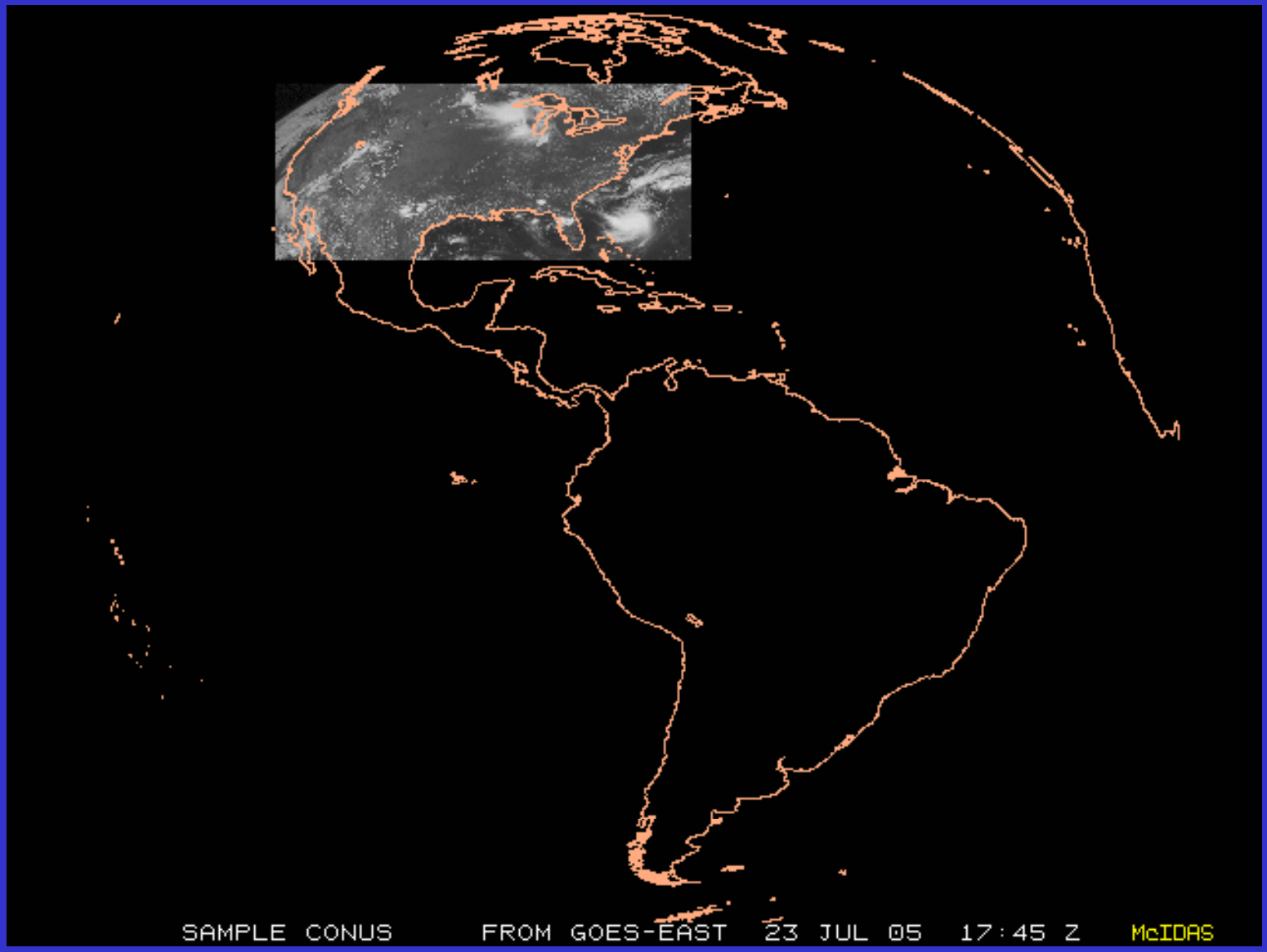
	ABI	Current
Spectral Coverage		
	16 bands	5 bands
Spatial resolution		
0.64 μm Visible	0.5 km	Approx. 1 km
Other Visible/near-IR	1.0 km	n/a
Bands (>2 μm)	2 km	Approx. 4 km
Spatial coverage		
Full disk	4 per hour	Scheduled (3 hrly)
CONUS	12 per hour	~4 per hour
Mesoscale	Every 30 sec	n/a
Visible (reflective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



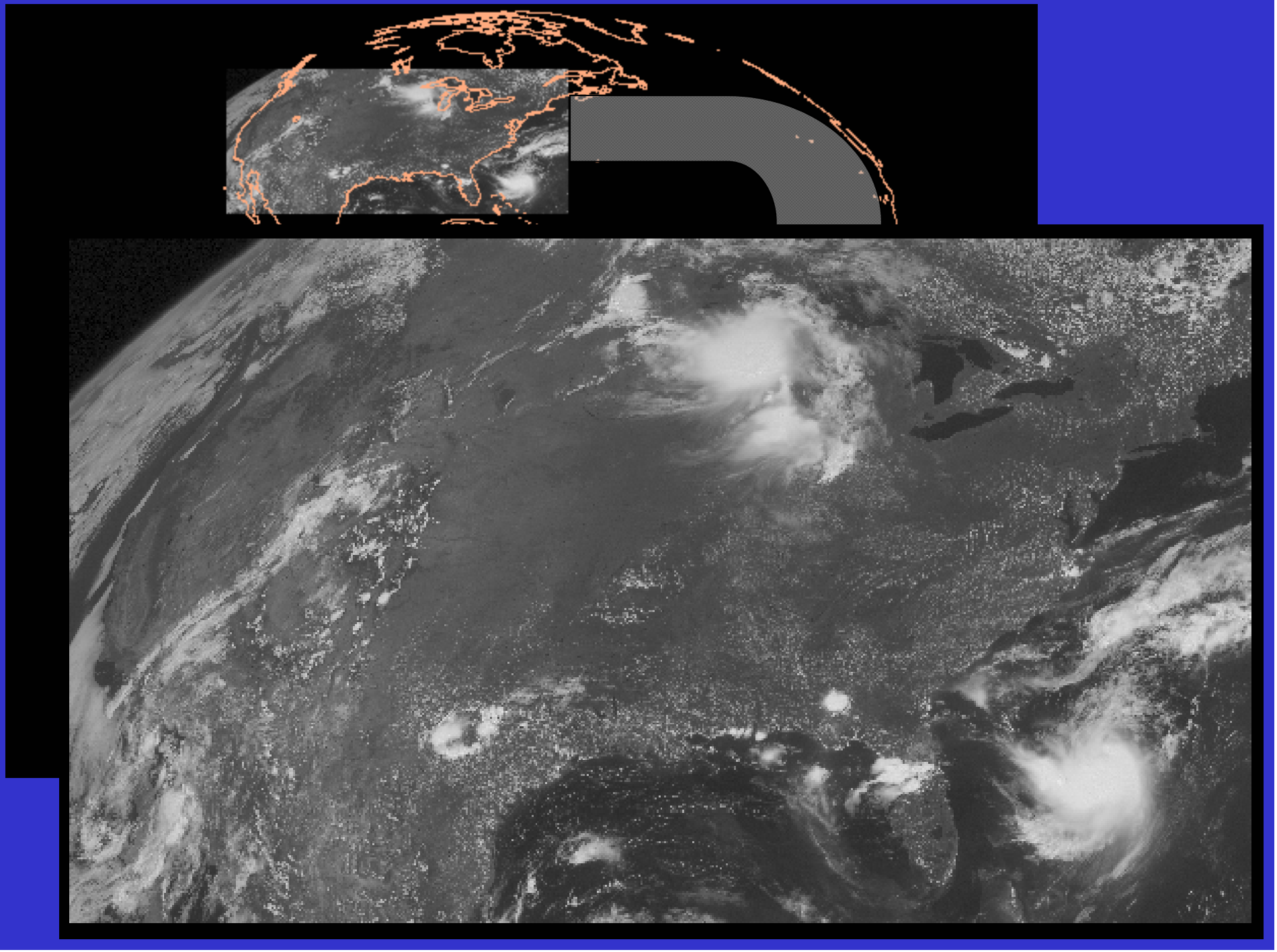
ABI scans about 5 times faster than the current GOES imager

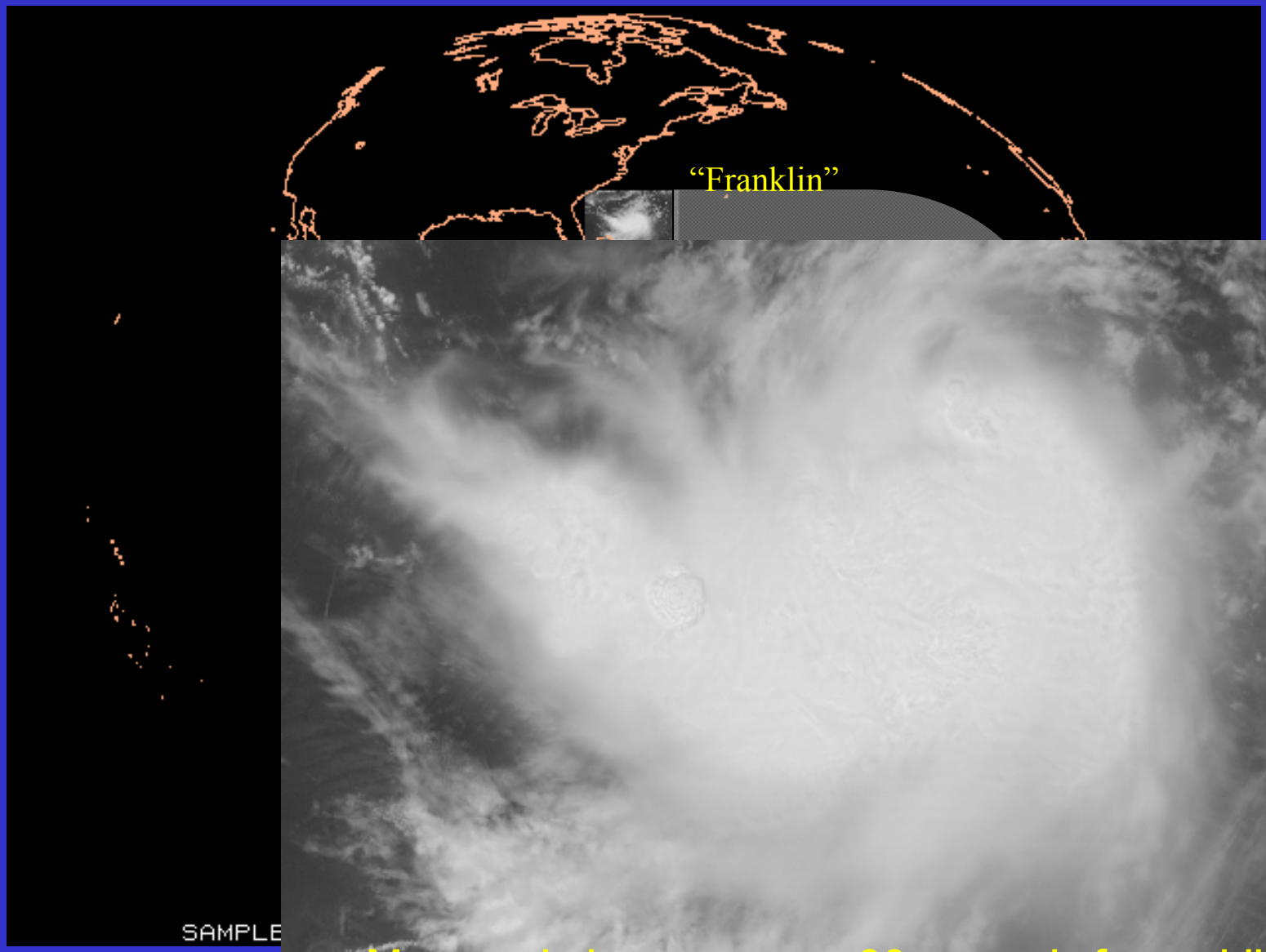
There are two anticipated scan modes for the ABI:

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

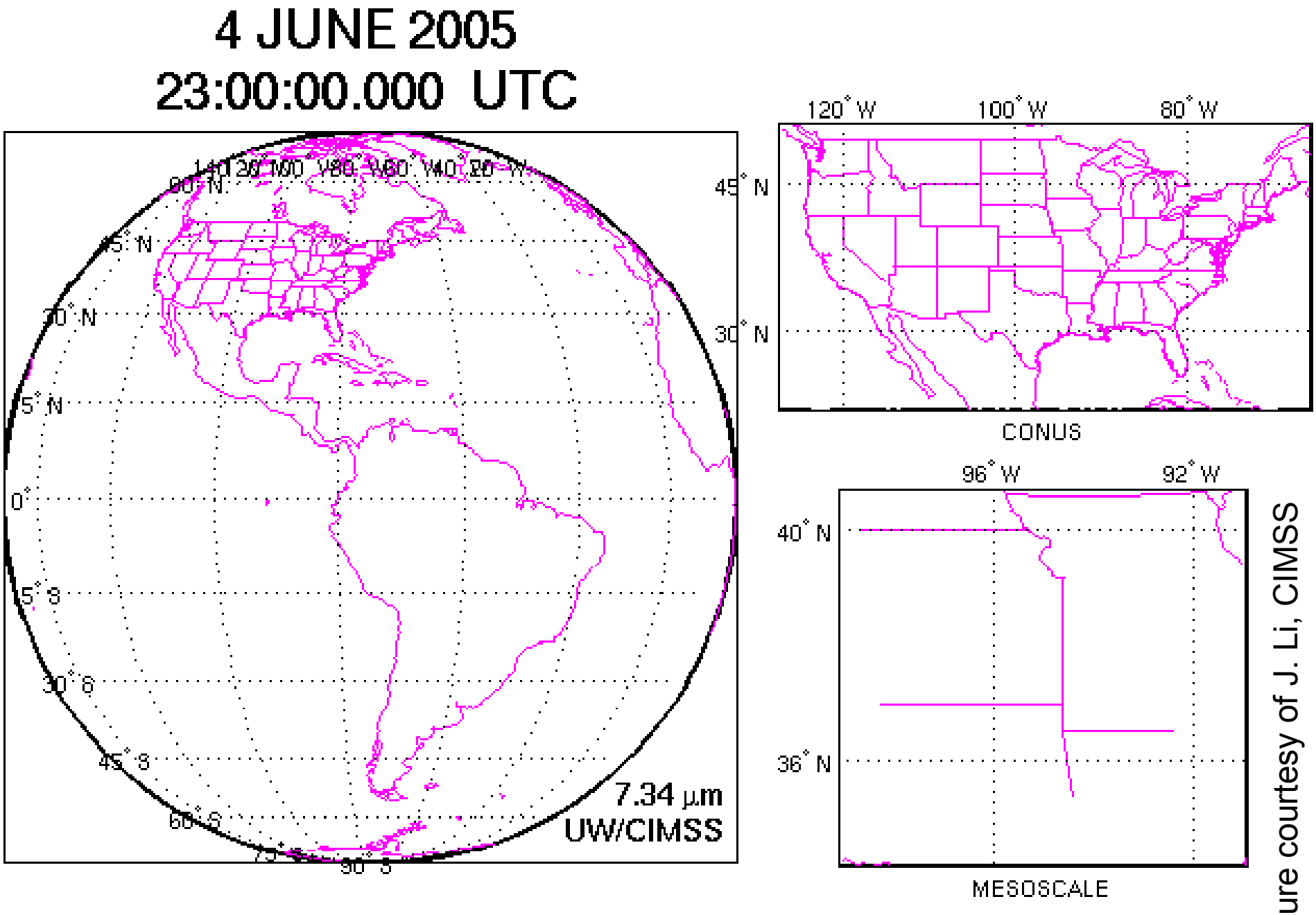


ABI can offer Continental US images every 5 minutes for routine monitoring of a wide range of events (storms, dust, clouds, fires, winds, etc).
This is every 15 or 30 minutes with the current GOES in routine mode.





Mesoscale images every 30 seconds for rapidly changing phenomena (thunderstorms, hurricanes, fires, etc). Current GOES can not offer these rapid scans while still scanning other important regions



Concept of flex mode scanning animation

Figure courtesy of J. Li, CIMSS

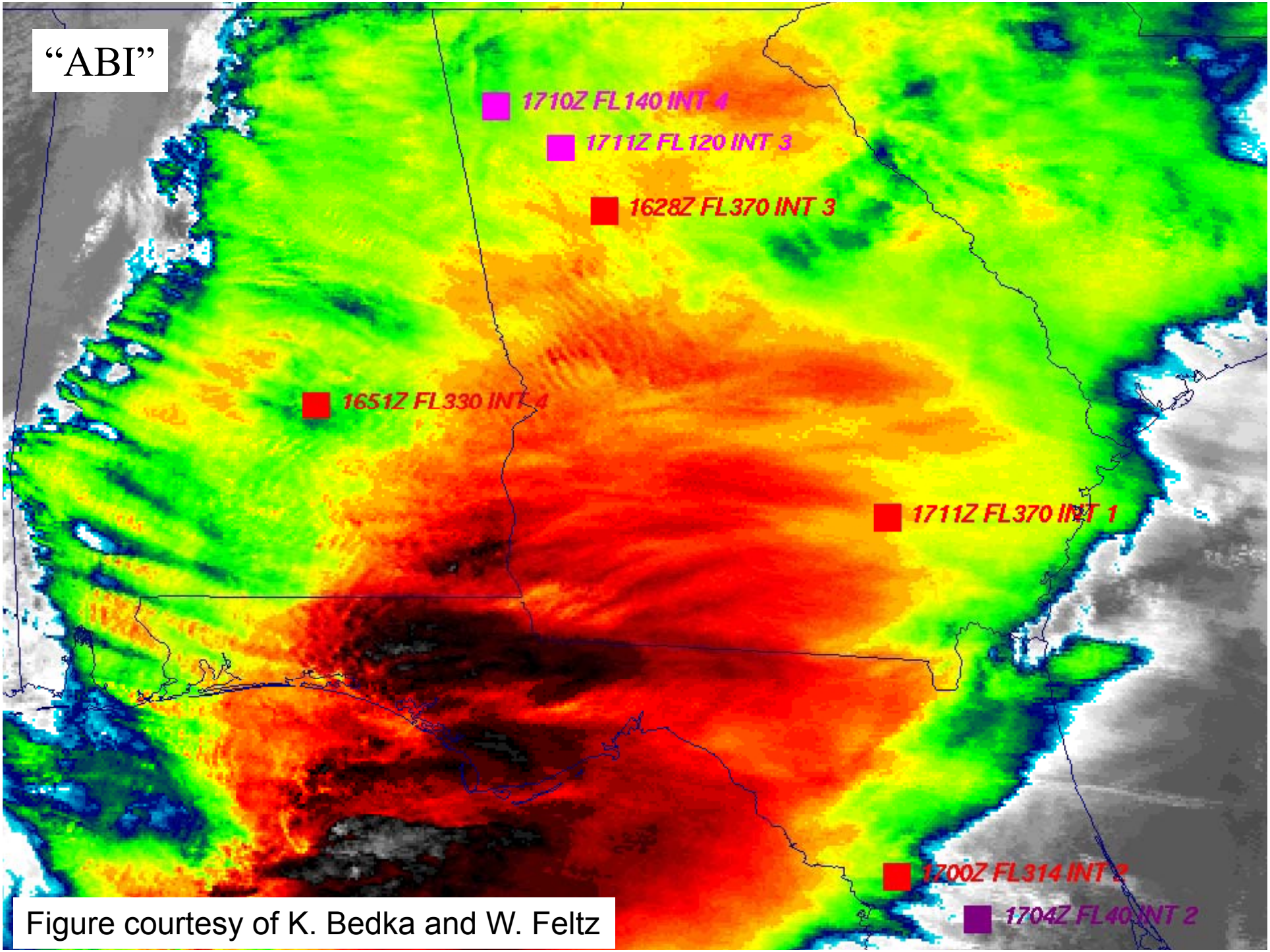


Figure courtesy of K. Bedka and W. Feltz

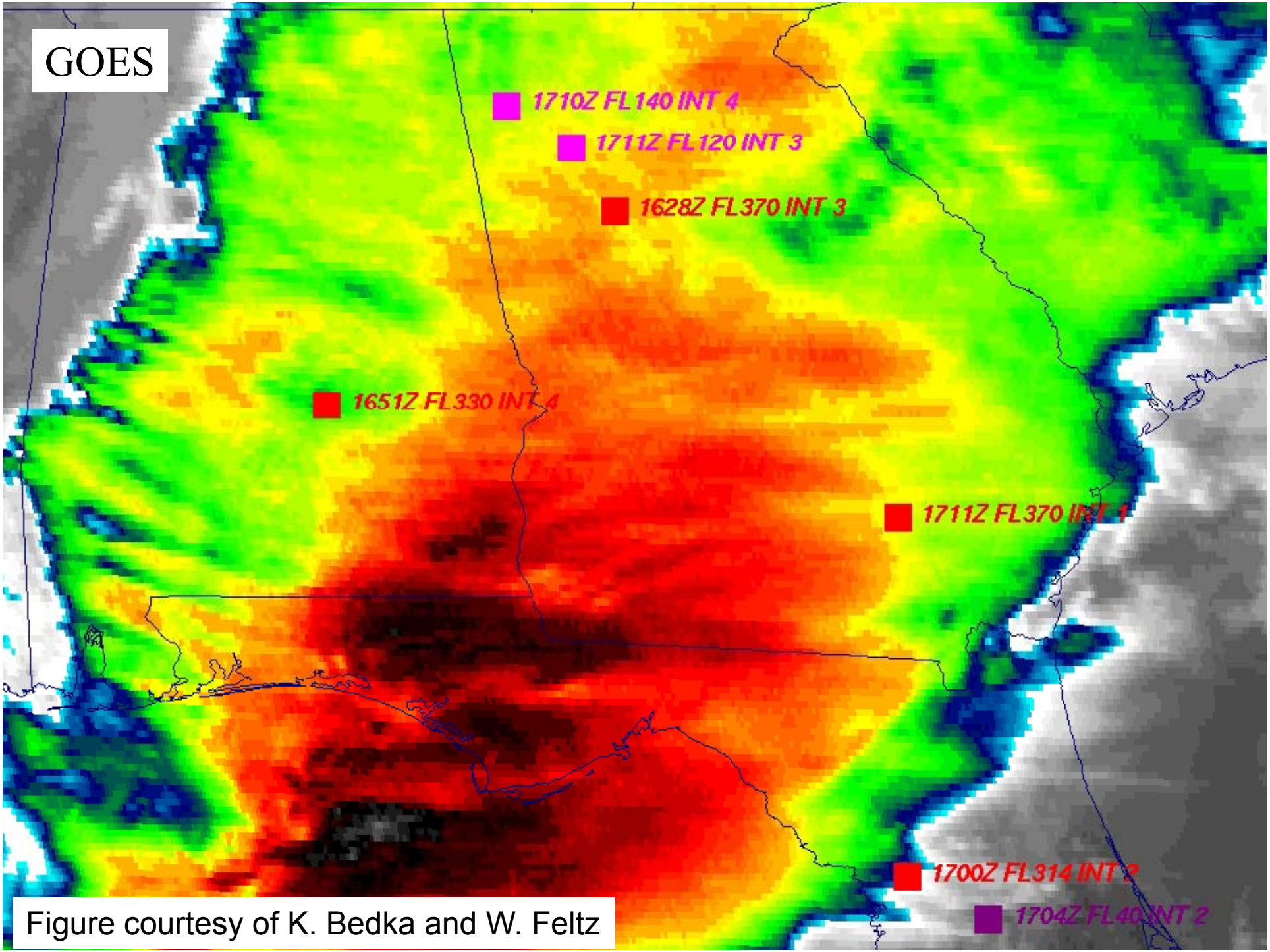


Figure courtesy of K. Bedka and W. Feltz

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

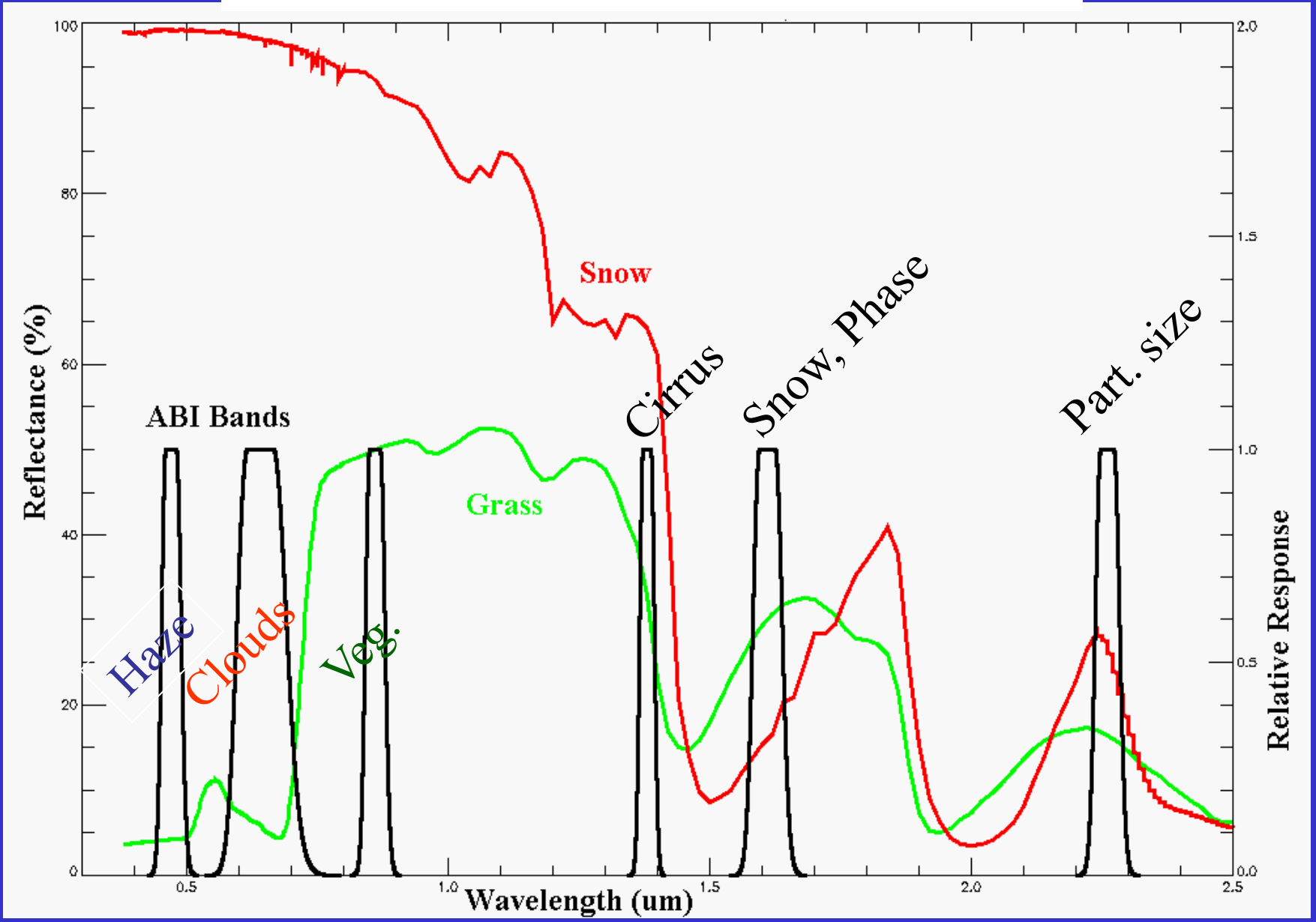
Schmit et al, 2005

ABI IR Bands

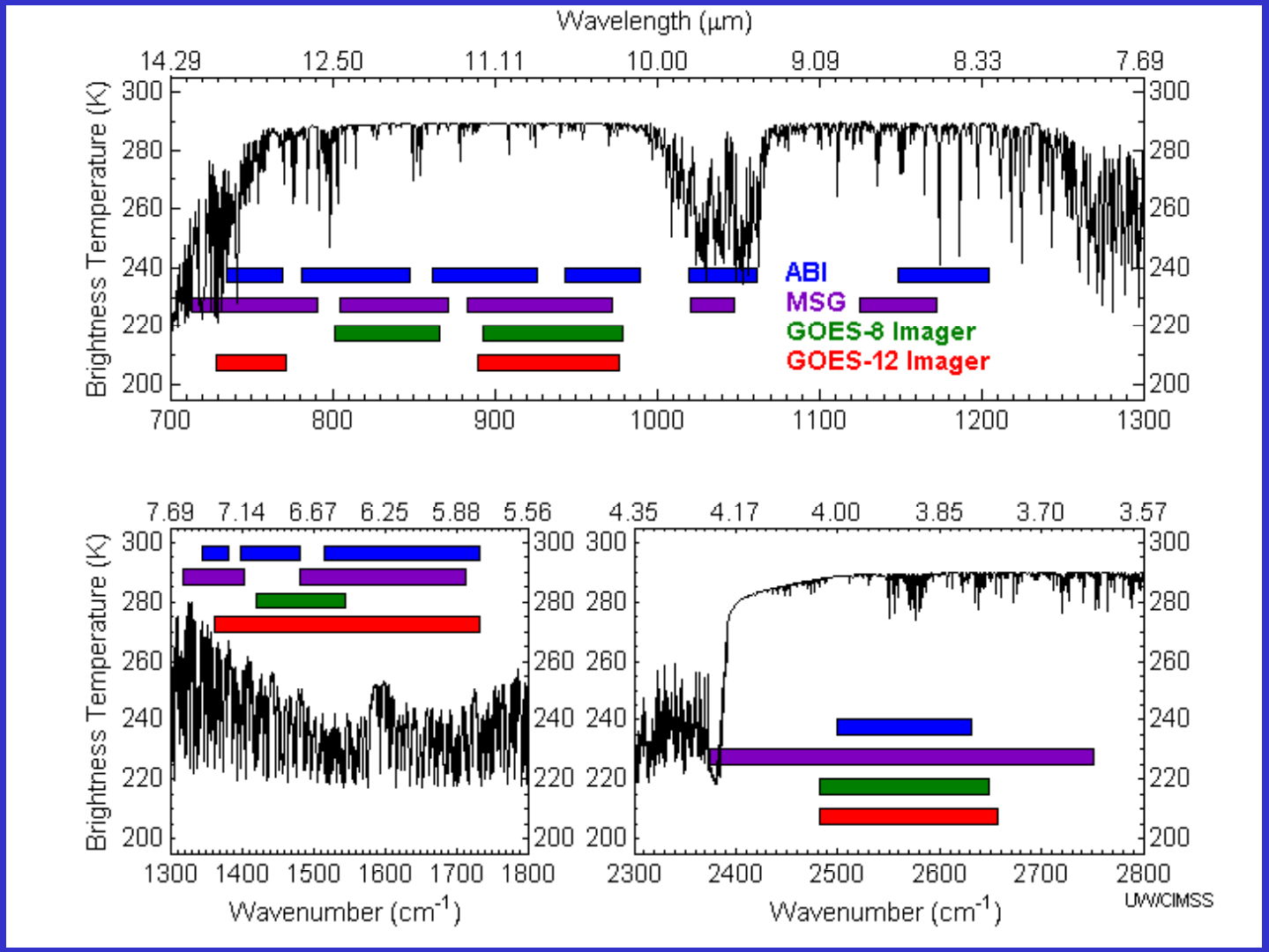
7	3.80–4.00	3.90	2	Surface and cloud, fog at night, fire, winds
8	5.77–6.6	6.19	2	High-level atmospheric water vapor, winds, rainfall
9	6.75–7.15	6.95	2	Midlevel atmospheric water vapor, winds, rainfall
10	7.24–7.44	7.34	2	Lower-level water vapor, winds, and SO_2
11	8.3–8.7	8.5	2	Total water for stability, 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

Visible and near-IR channels on the ABI

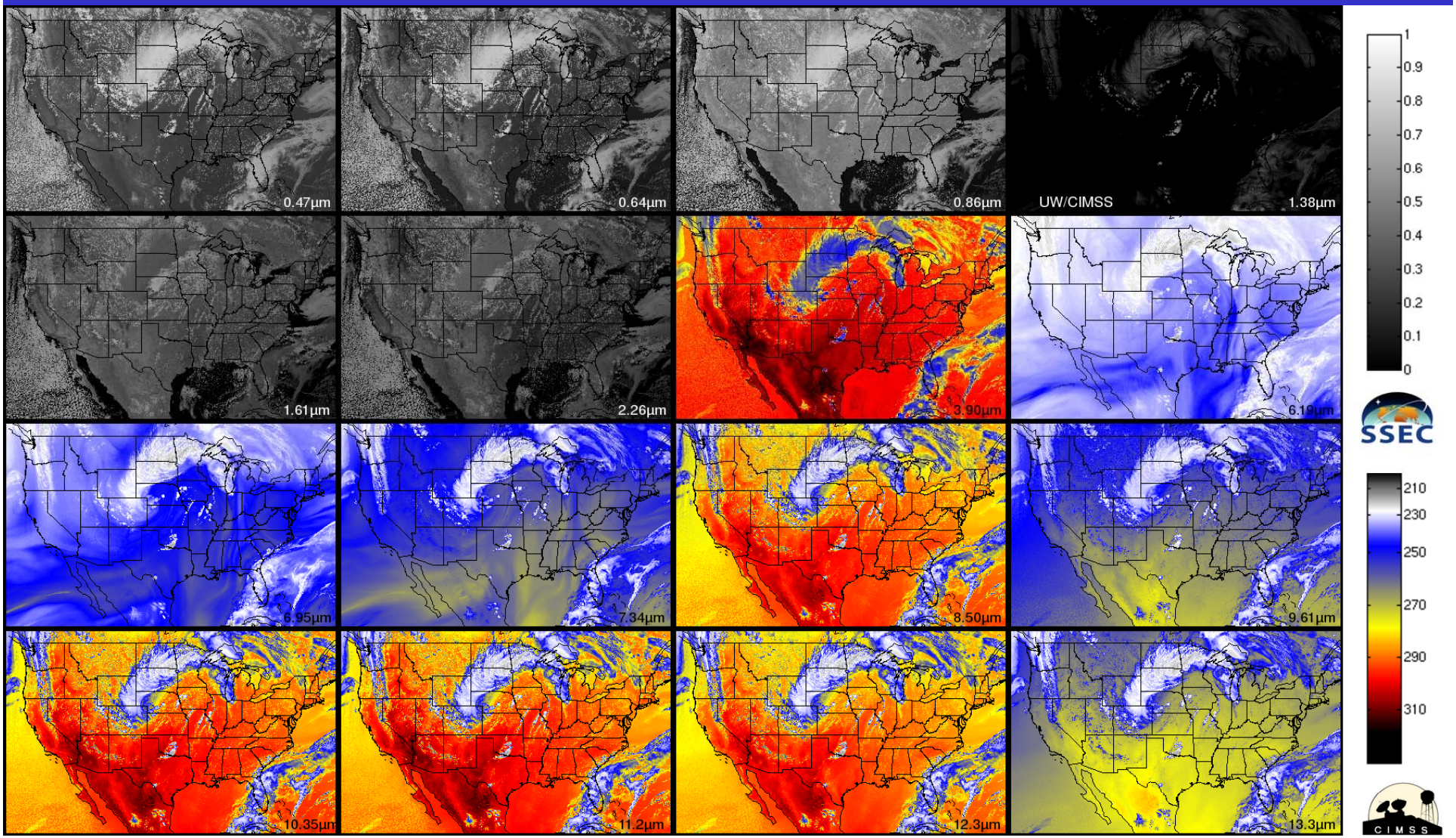


The ABI visible and near-IR bands have many uses.



While there are differences, there are also many similarities for the spectral bands on MET-8 and the Advanced Baseline Imager (ABI). Both the MET-8 and ABI have many more bands than the current operational GOES imagers.

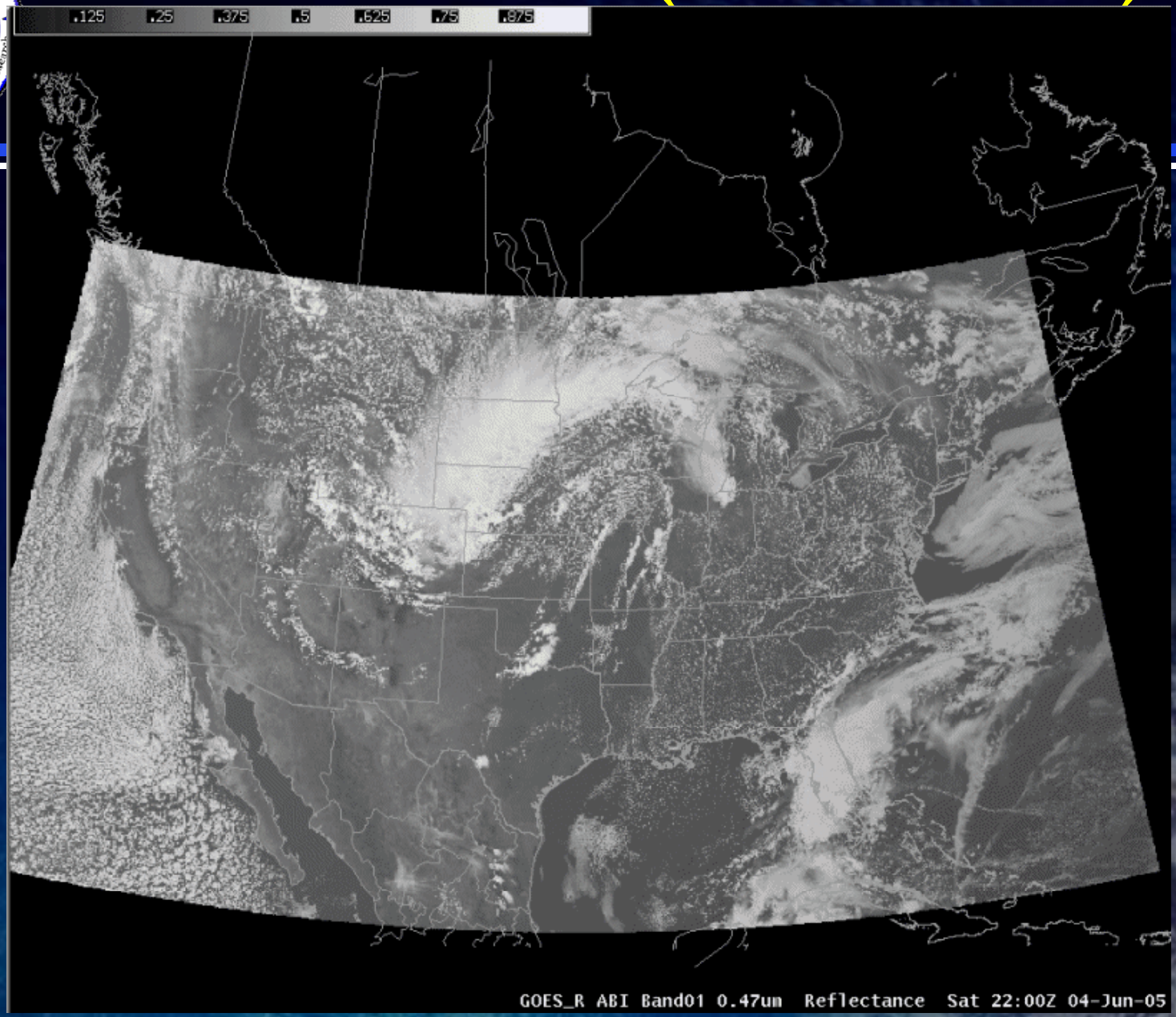
ABI bands via NWP simulation (CIMSS AWG Proxy Team)



ABI band data for 2005 June 04 22:00 UTC

J. Oktin et al., CIMSS

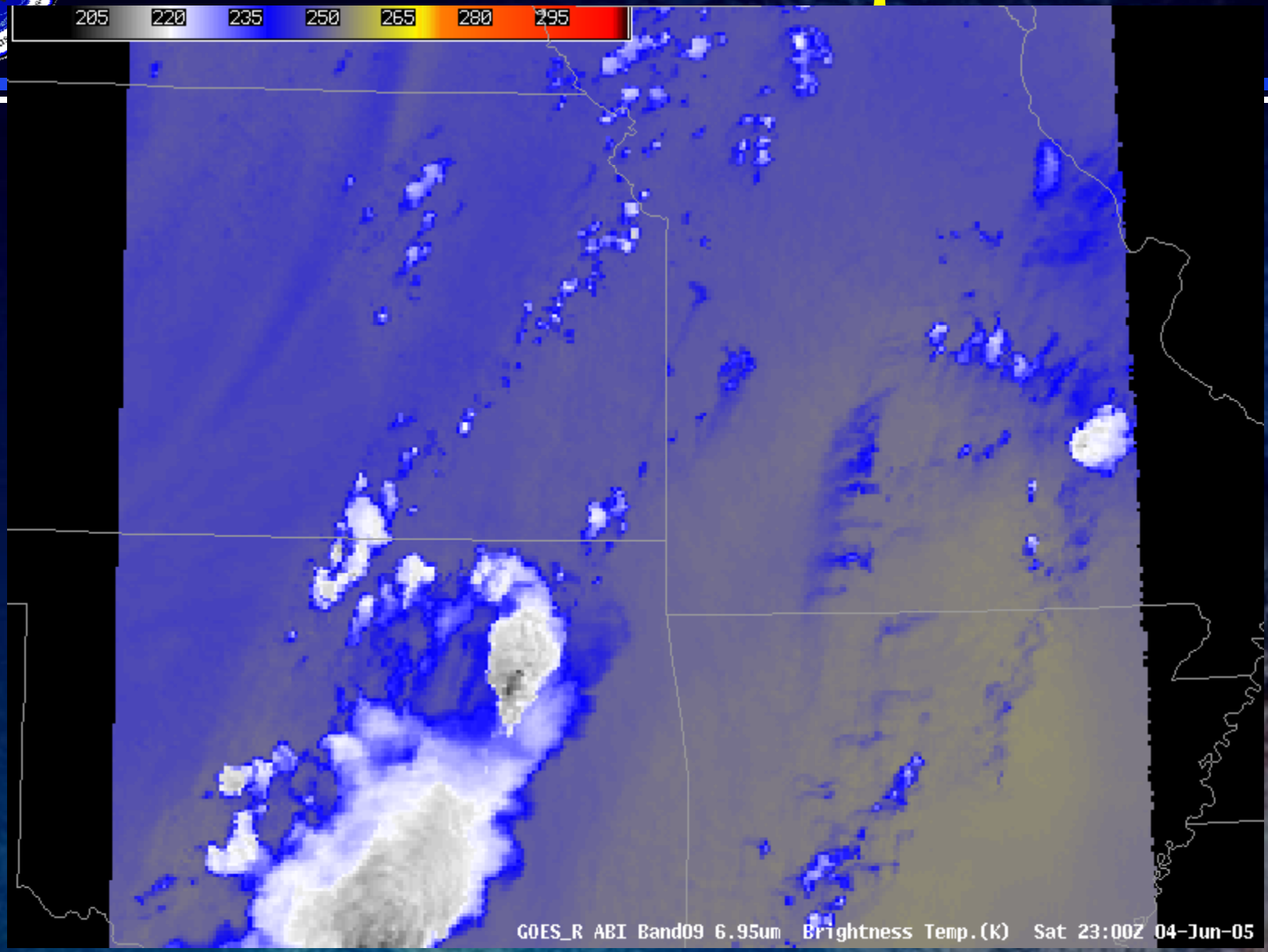
ABI in AWIPS (via netCDF)



Simulated Advanced Baseline Imager (ABI) bands shown; in the legacy AWIPS.

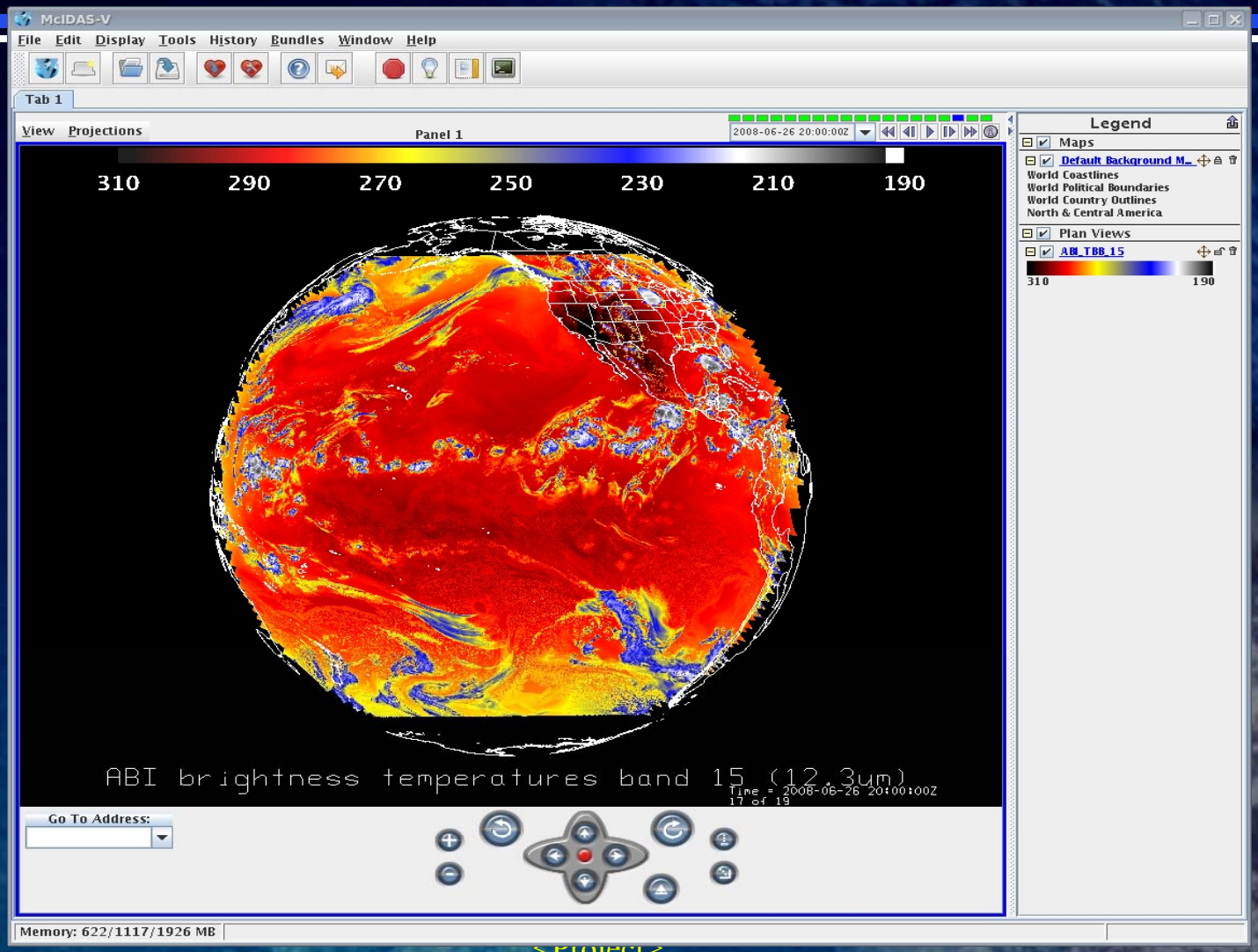
J. Oktin et al., CIMSS

1-min Simulated ABI ‘mesoscale’ loop



Full disk simulation

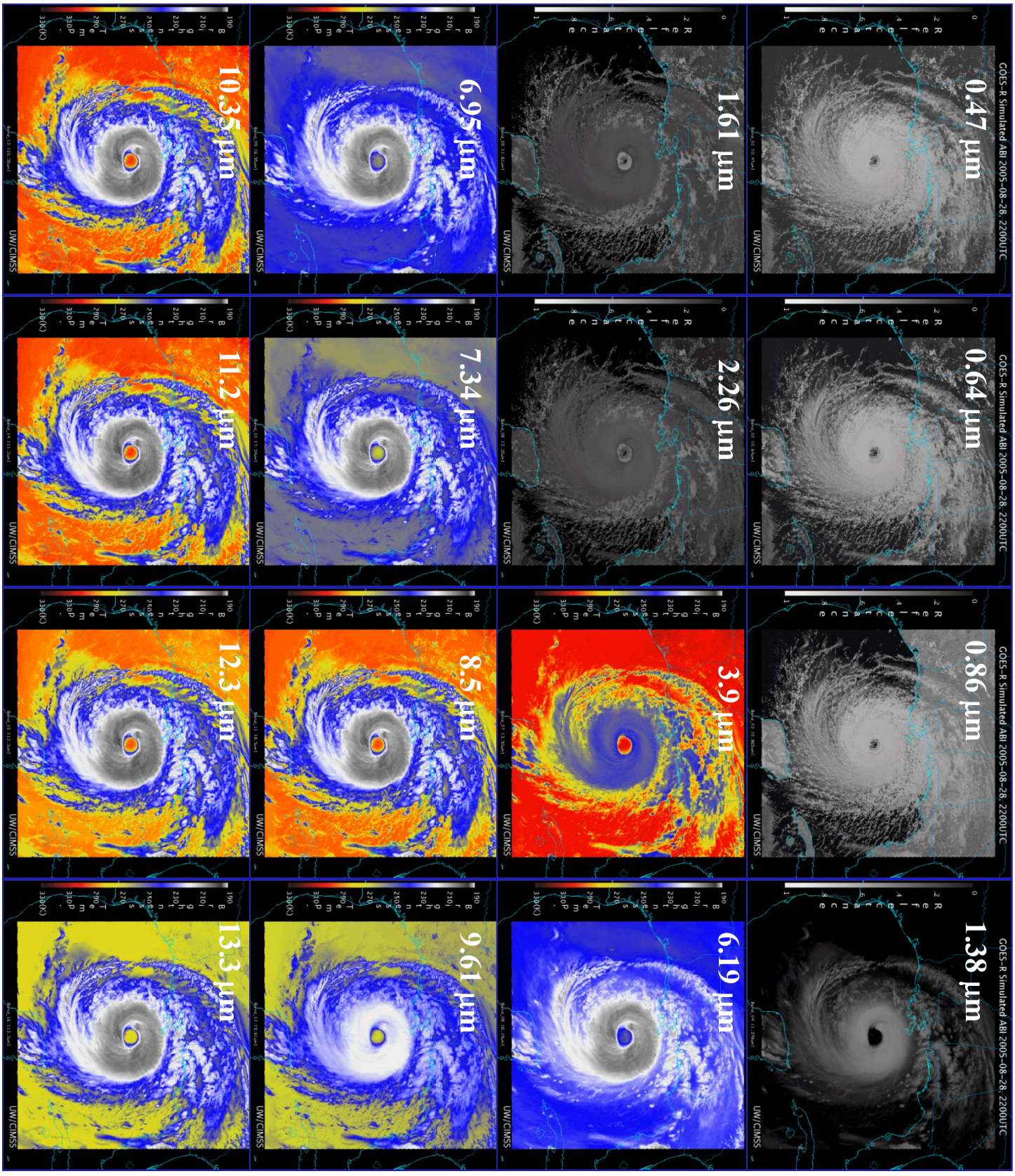
ABI band 15 (12.3um) **June 26 2008** at 20:00UTC.



<Project>

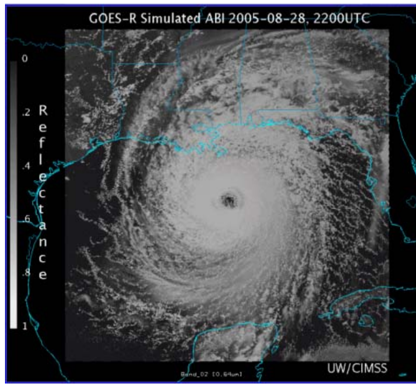
J. Oktin et al., CIMSS

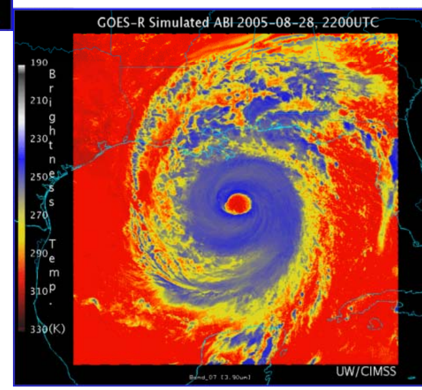
AWG Proxy ABI Simulations of Hurricane Katrina

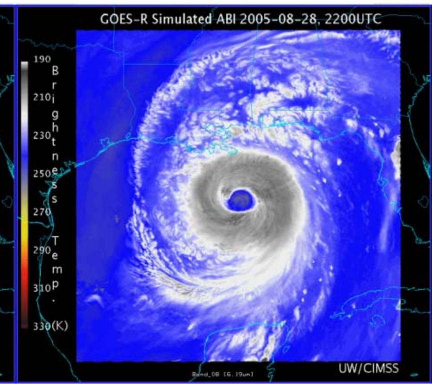


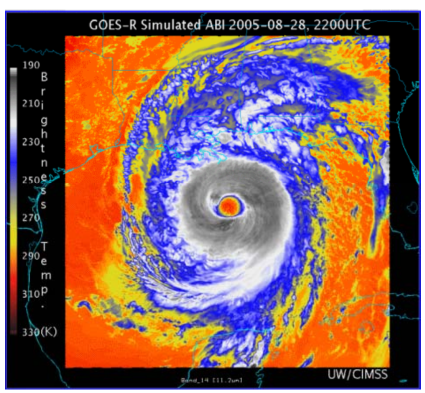
NOAA/NESDIS STAR and GOES-R Imagery Team

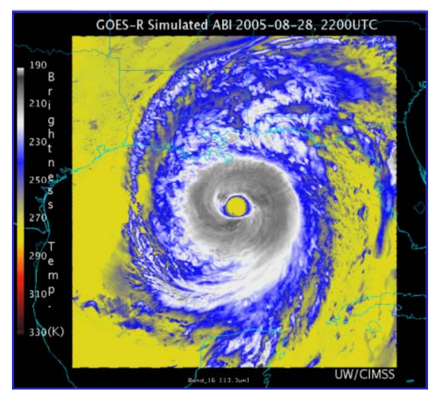
Corresponding current Imager bands of Hurricane Katrina





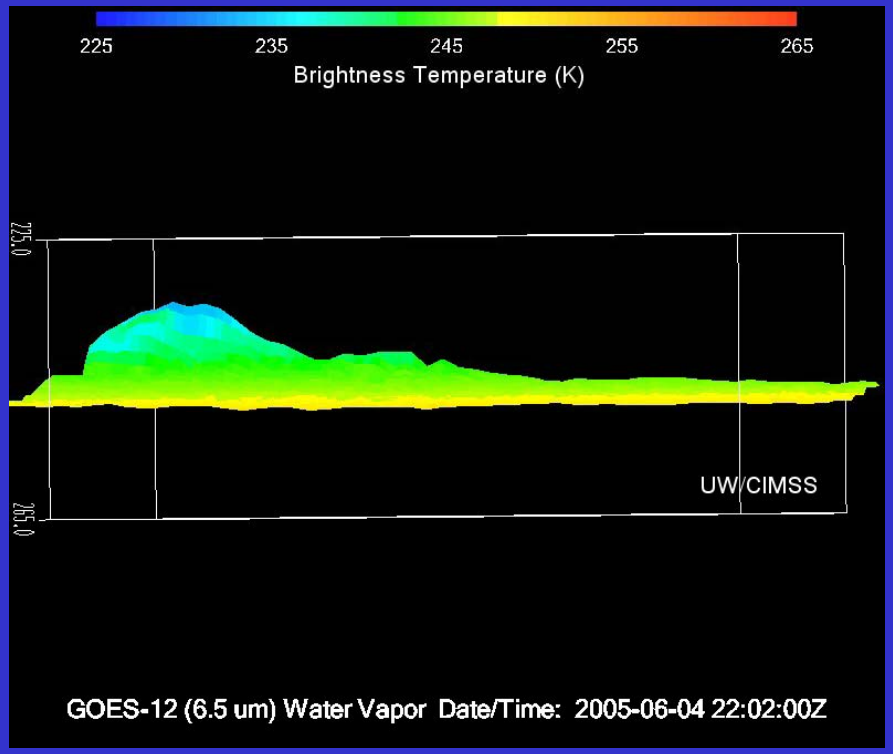


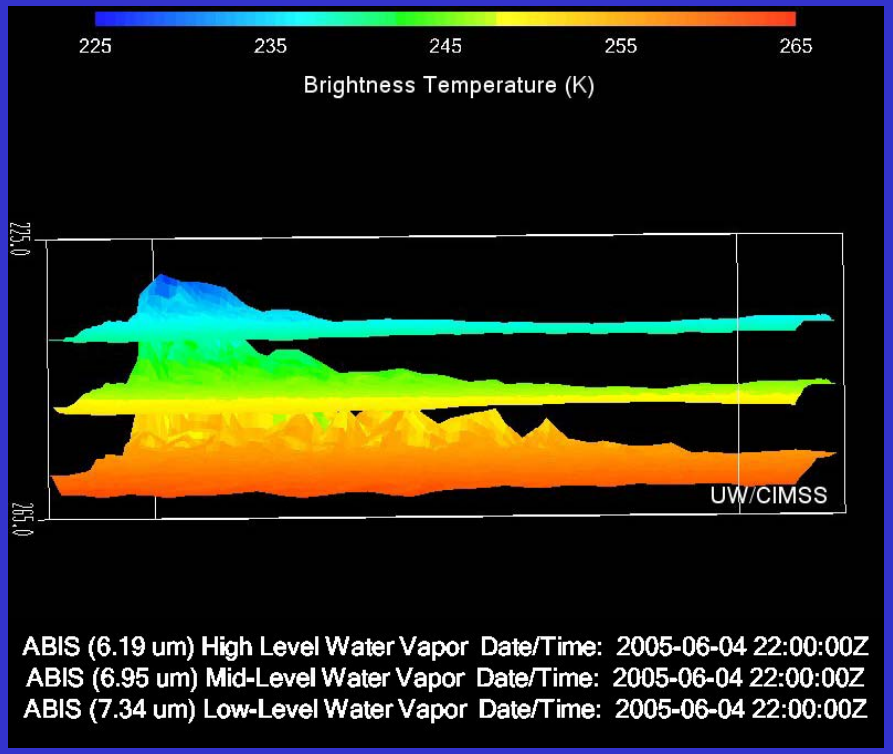




NOAA/NESDIS STAR

Three ABI water vapor bands



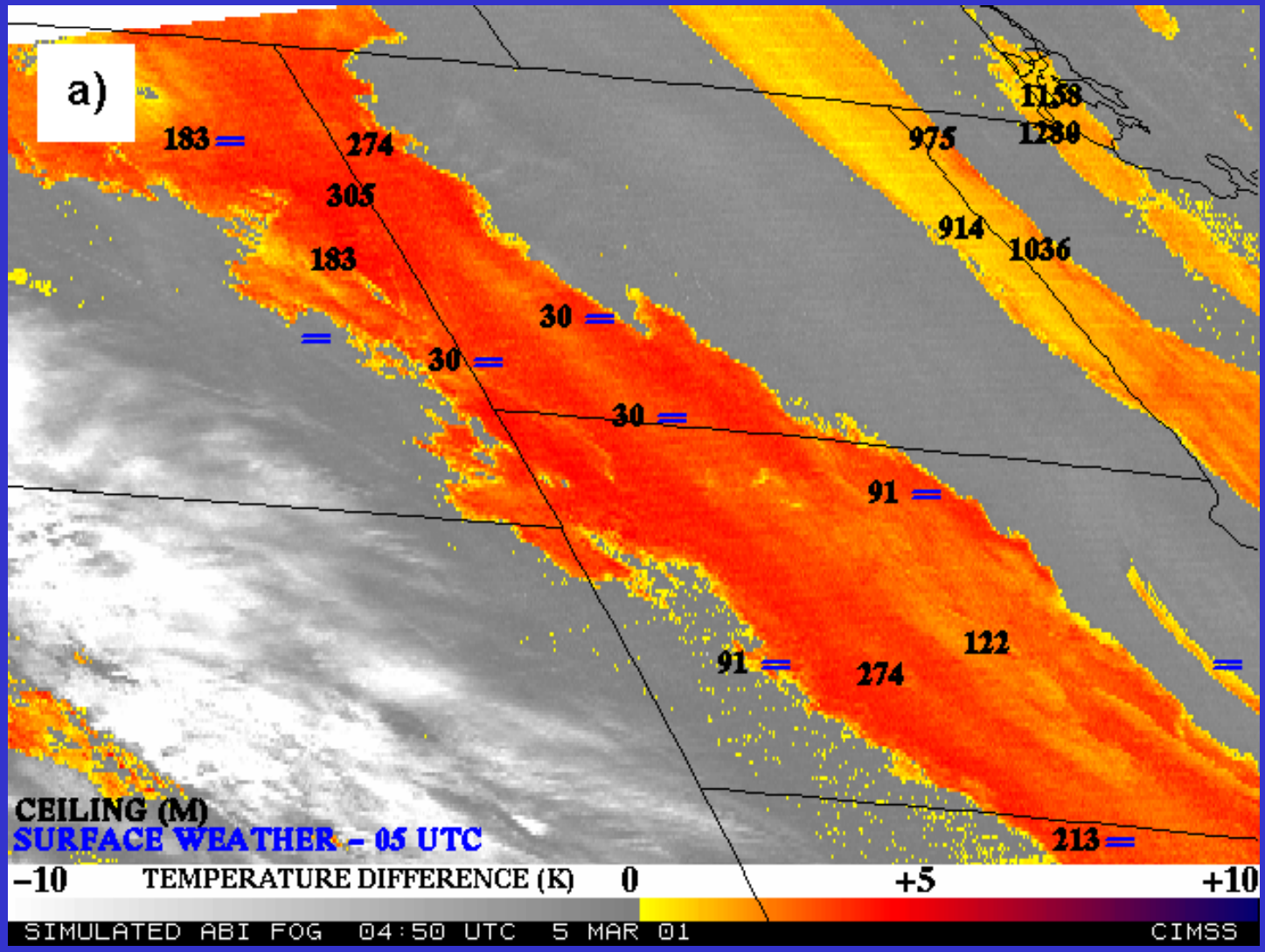


Current GOES

Future GOES

Images from J. Feltz

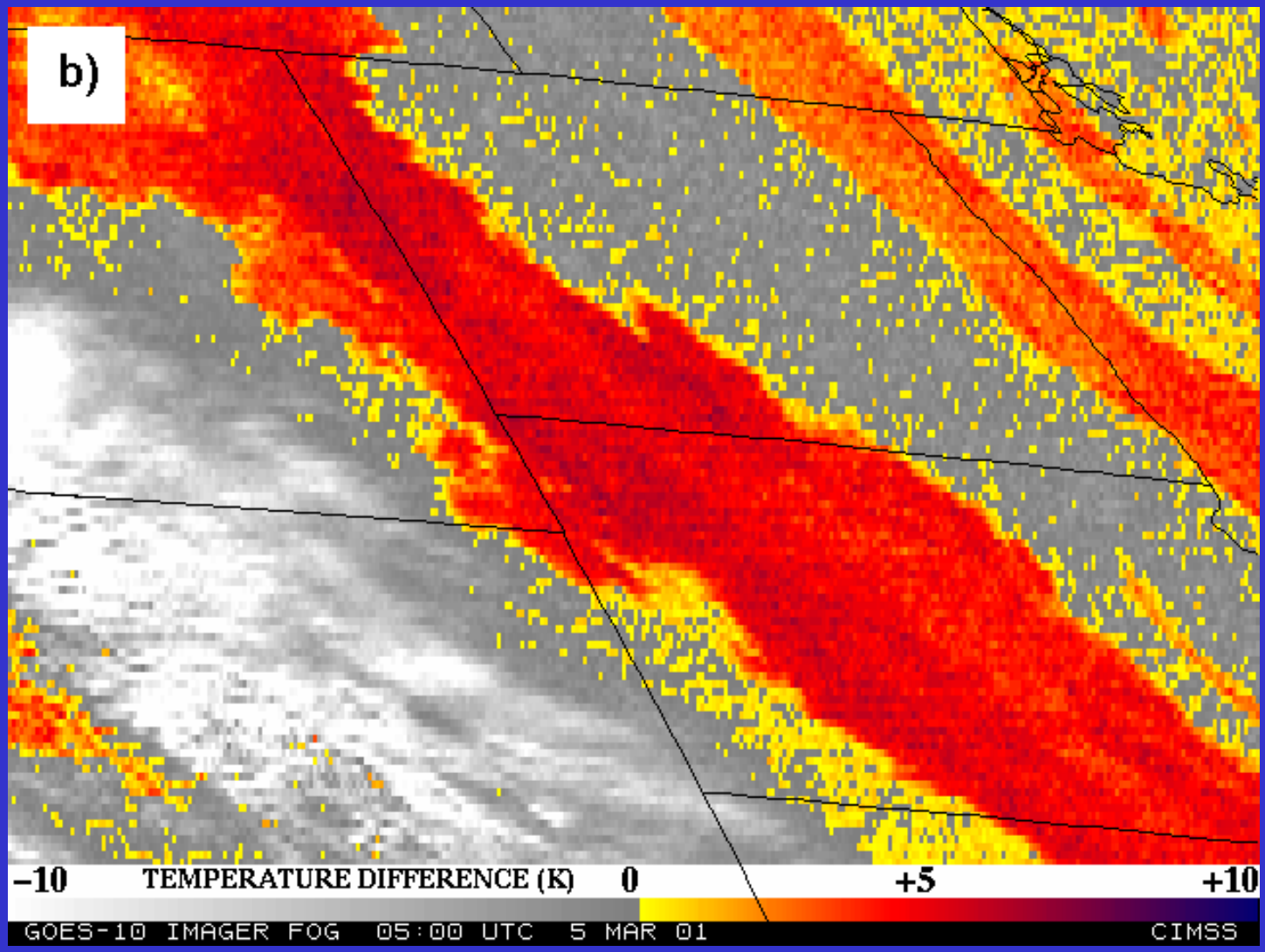
Nocturnal Fog/Stratus Over the Northern Plains



"ABI" 4 minus 11 μm Difference

ABI image (from MODIS) shows greater detail in structure of fog.

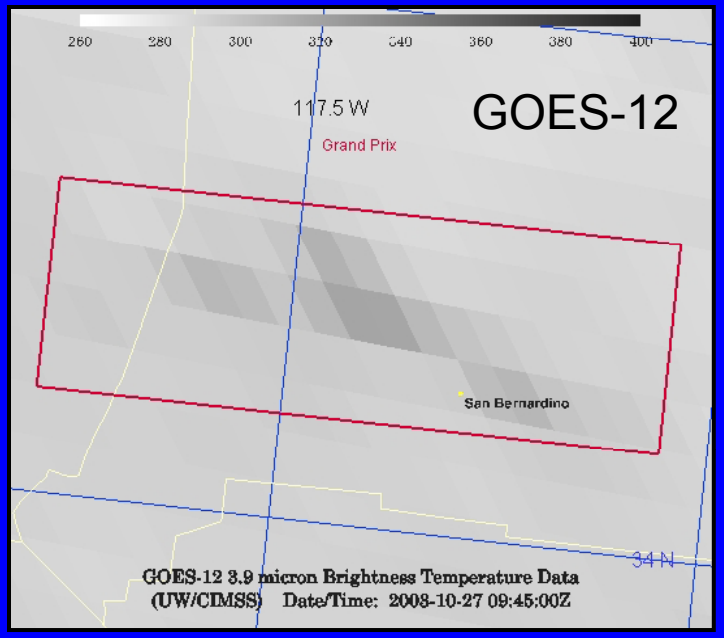
Nocturnal Fog/Stratus Over the Northern Plains

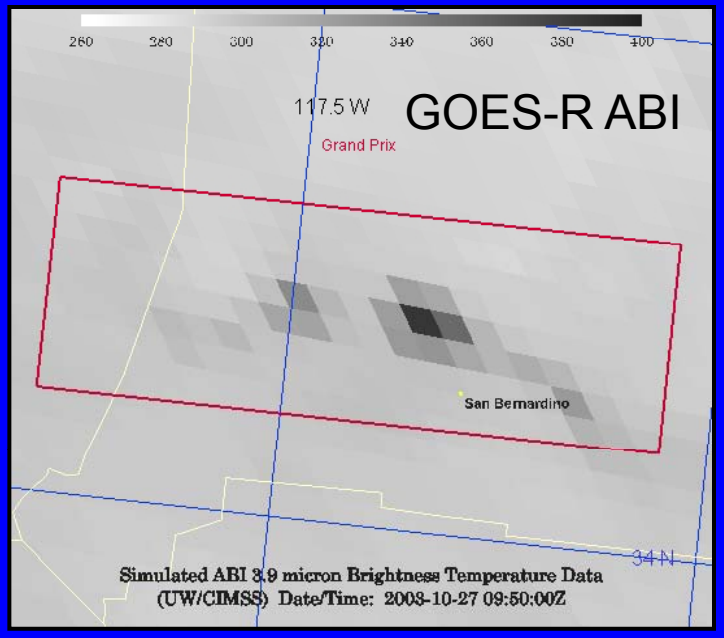


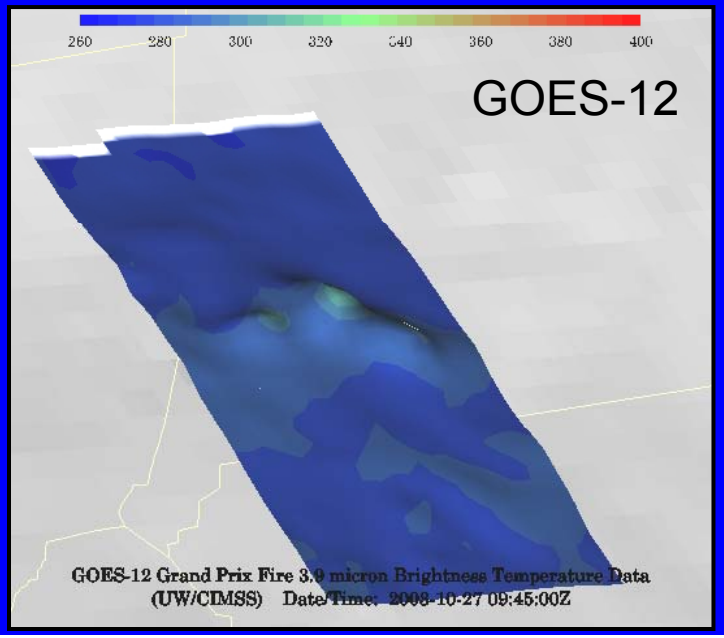
GOES-10 4 minus 11 μm Difference

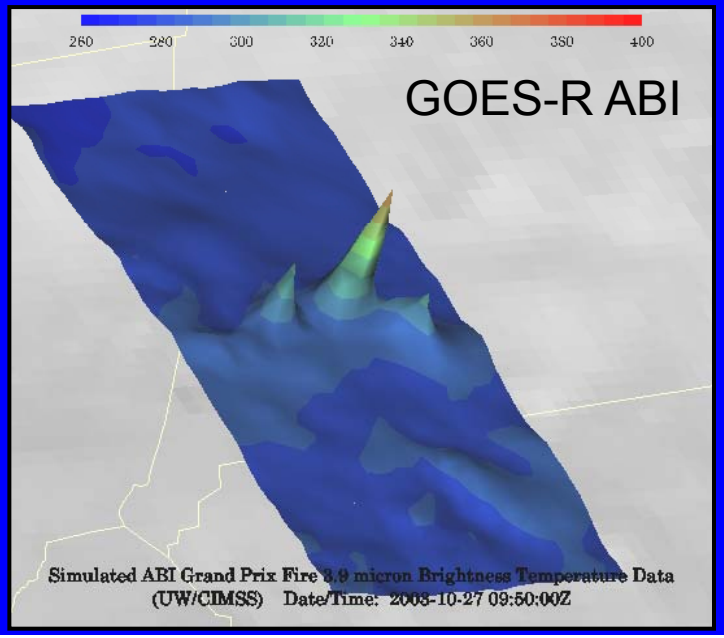
ABI image (from MODIS) shows greater detail in structure of fog.

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







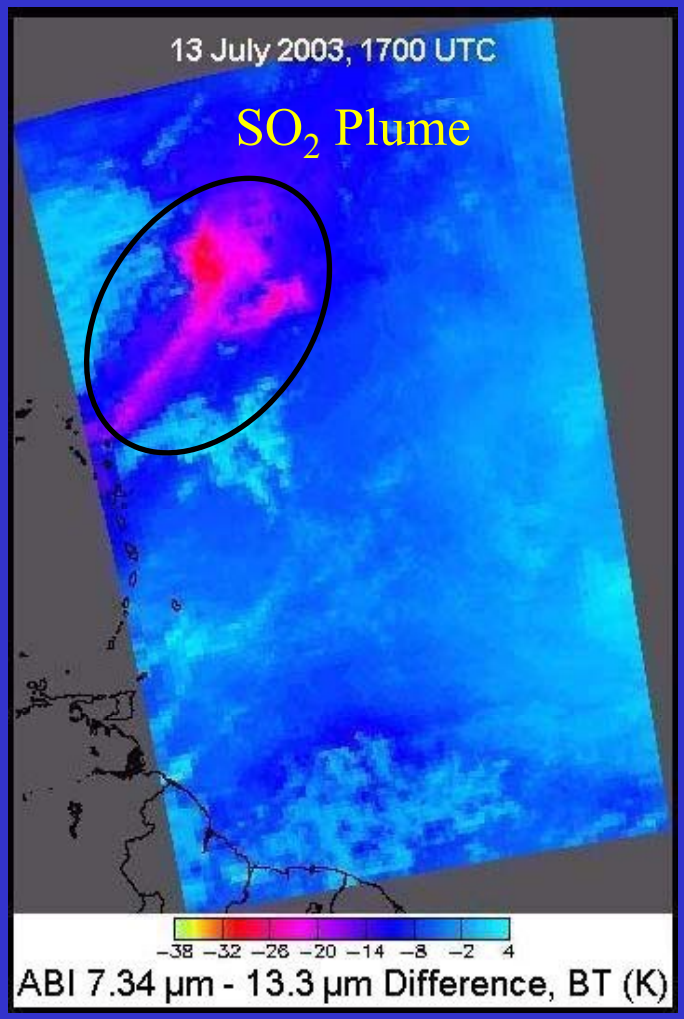


GOES-R ABI will detect SO2 plumes

Water Vapor Band Difference convolved from AIRS data sees SO_2 plume from Montserrat Island, West Indies

Current GOES Imager
No skill in monitoring

Current GOES Imager can not detect SO_2



ABI 7.34 µm – 13.3 µm

Figure courtesy of Kris Karnauskas

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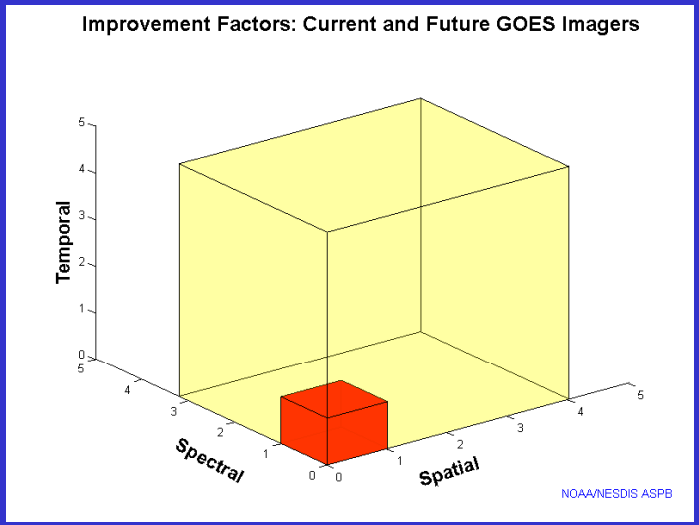
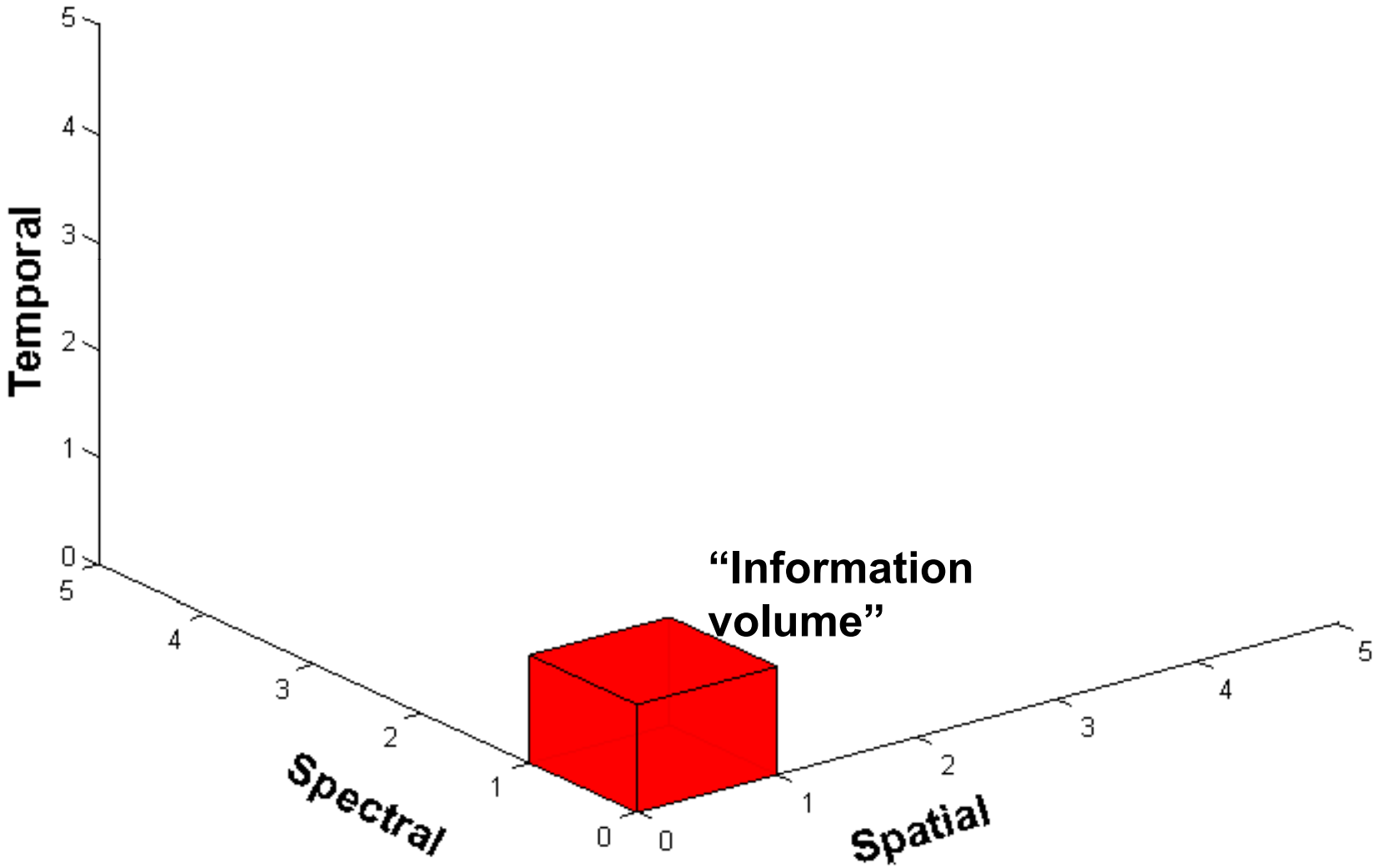
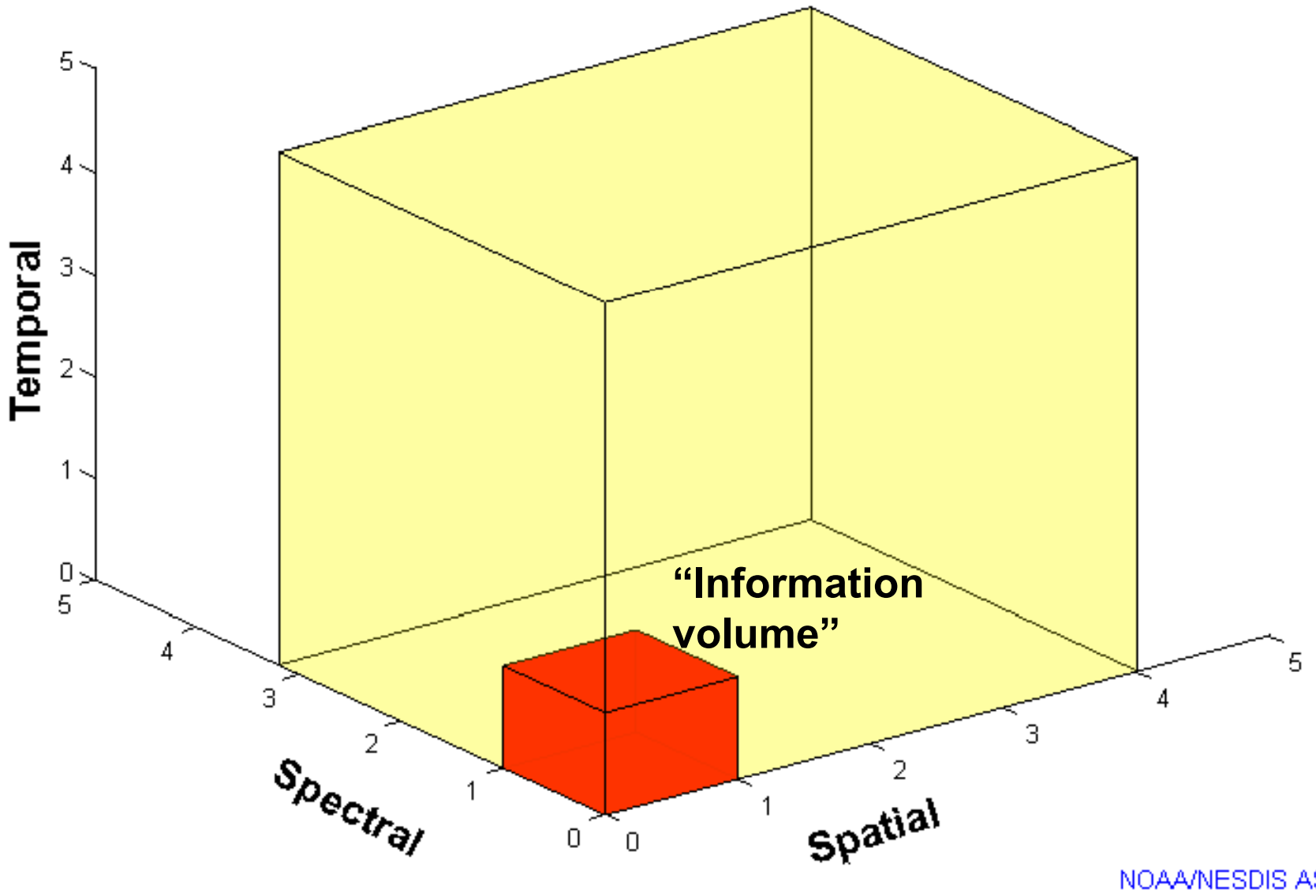


Current attributes: defined to be 1

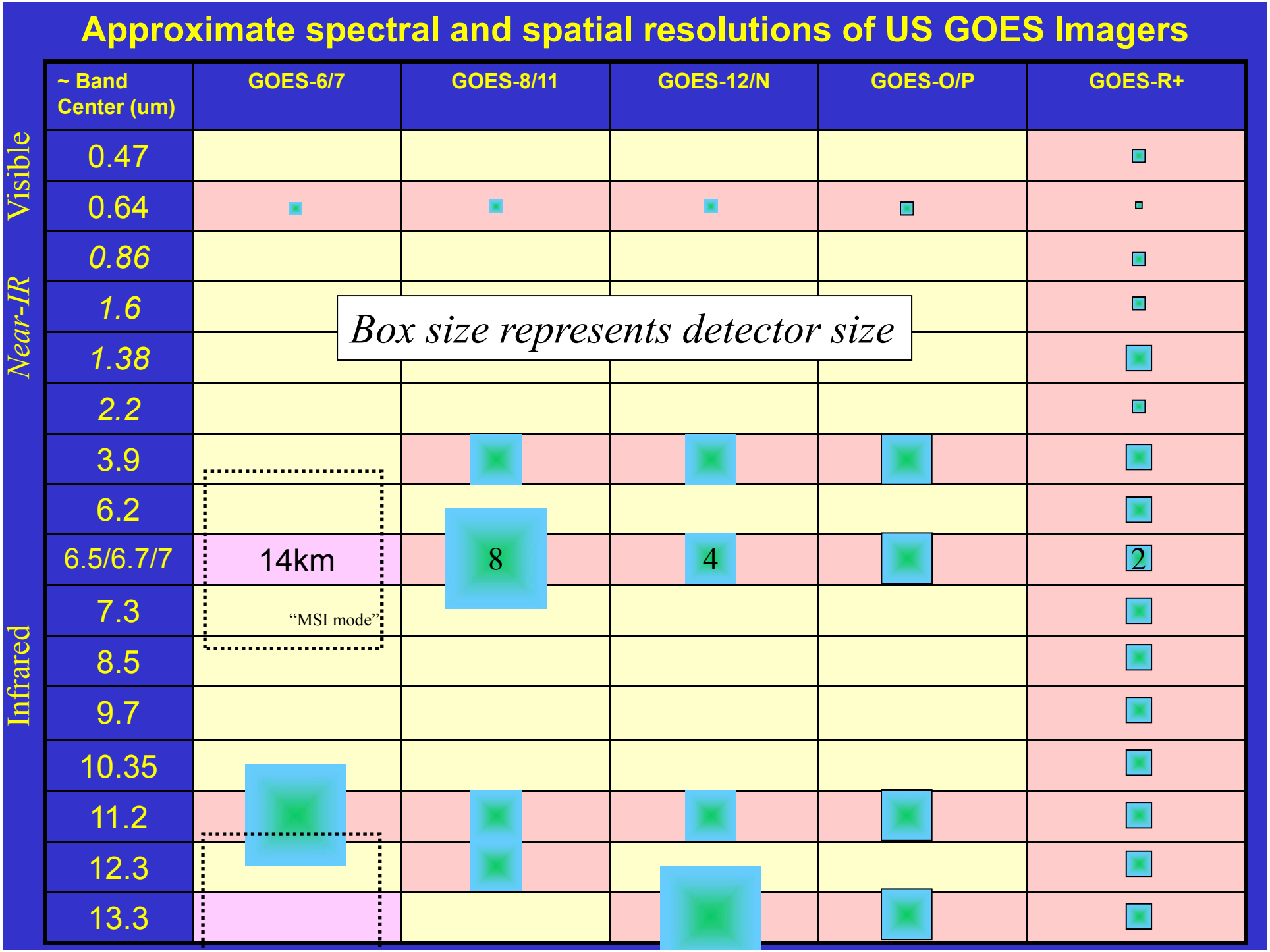


Improved attributes with the Future GOES Imagers



NOAA/NESDIS ASPB

Approximate spectral and spatial resolutions of US GOES Imagers



More information

GOES-R:

- http://www.goes-r.gov
- http://www.meted.ucar.edu/index.htm
- http://cimss.ssec.wisc.edu/goes_r/proving-ground.html

GOES and NASA:

- http://goespoes.gsfc.nasa.gov/goes/index.html
- http://goes.gsfc.nasa.gov/text/goes.databookn.html

UW/SSEC/CIMSS/ASPB:

- http://cimss.ssec.wisc.edu/goes_r/awg/proxy/nwp/
- http://cimss.ssec.wisc.edu/goes/abi/
- http://cimss.ssec.wisc.edu/goes/abi/wf
- http://cimss.ssec.wisc.edu/goes/blog/
- http://www.ssec.wisc.edu/data/geo/

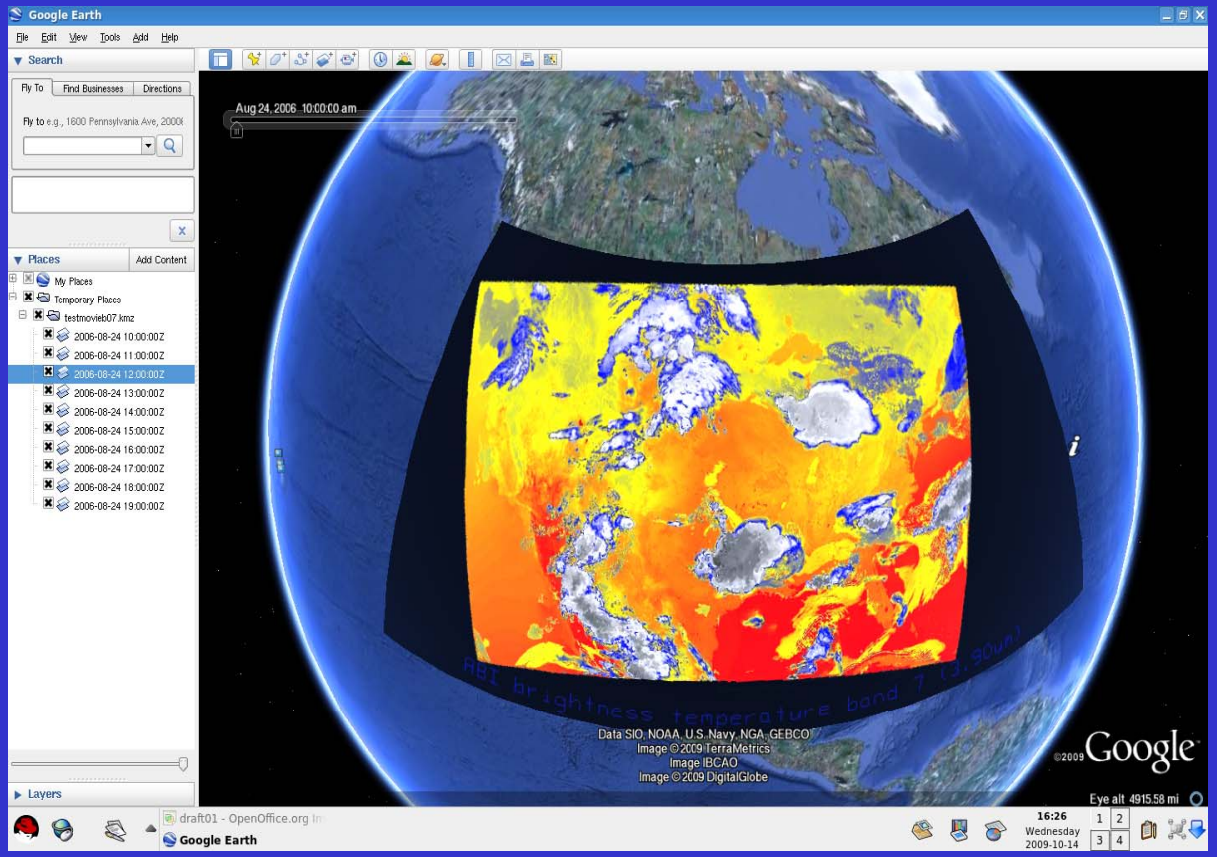

ARTICLES

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

AMS BAMS Article on the ABI (Aug. 2005)

Google Earth

- Sample ABI simulated data are available in google Earth format:
  - http://cimss.ssec.wisc.edu/goes/abi/loops/links.html



(preliminary)

Summary

- The ABI on GOES-R will improve over the current instrument in many aspects (spatial, temporal, spectral), plus improved image navigation and registration and radiometer performance.
- These improvements will greatly assist a host of applications.
- Thank you for your time.
- Contact information:
  - tim.j.schmit@noaa.gov

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- The authors would like to thank the entire GOES-R team; both within the government, industry and academia.

- The views, opinions, and findings contained in this presentation are those of the authors and should not be construed as an official National Oceanic and Atmospheric Administration or U.S. Government position, policy, or decision.