Near-Real-Time Production of Simulated GOES-R Advanced Baseline Imager Data for User Readiness, algorithm validation and ground system testing

Brad Pierce (NESDIS/STAR/CRPD/ASPB)

Contributions from:
Todd Schaack, Marek Rogal, Kaba Bah, Tom Greenwald, Allen Lenzen, Jim Nelson, Jason Otkin, Jim Davies and Eva Borbas, (UW-Madison/CIMSS)
Tim Schmit and Andrew Heidinger (NESDIS/STAR/CRPD/ASPB)
Jo Zajic (NASA/GSFC/SGT INC)

Presented at the July GOES-R Science Seminar on Wednesday 7/25/14

Background

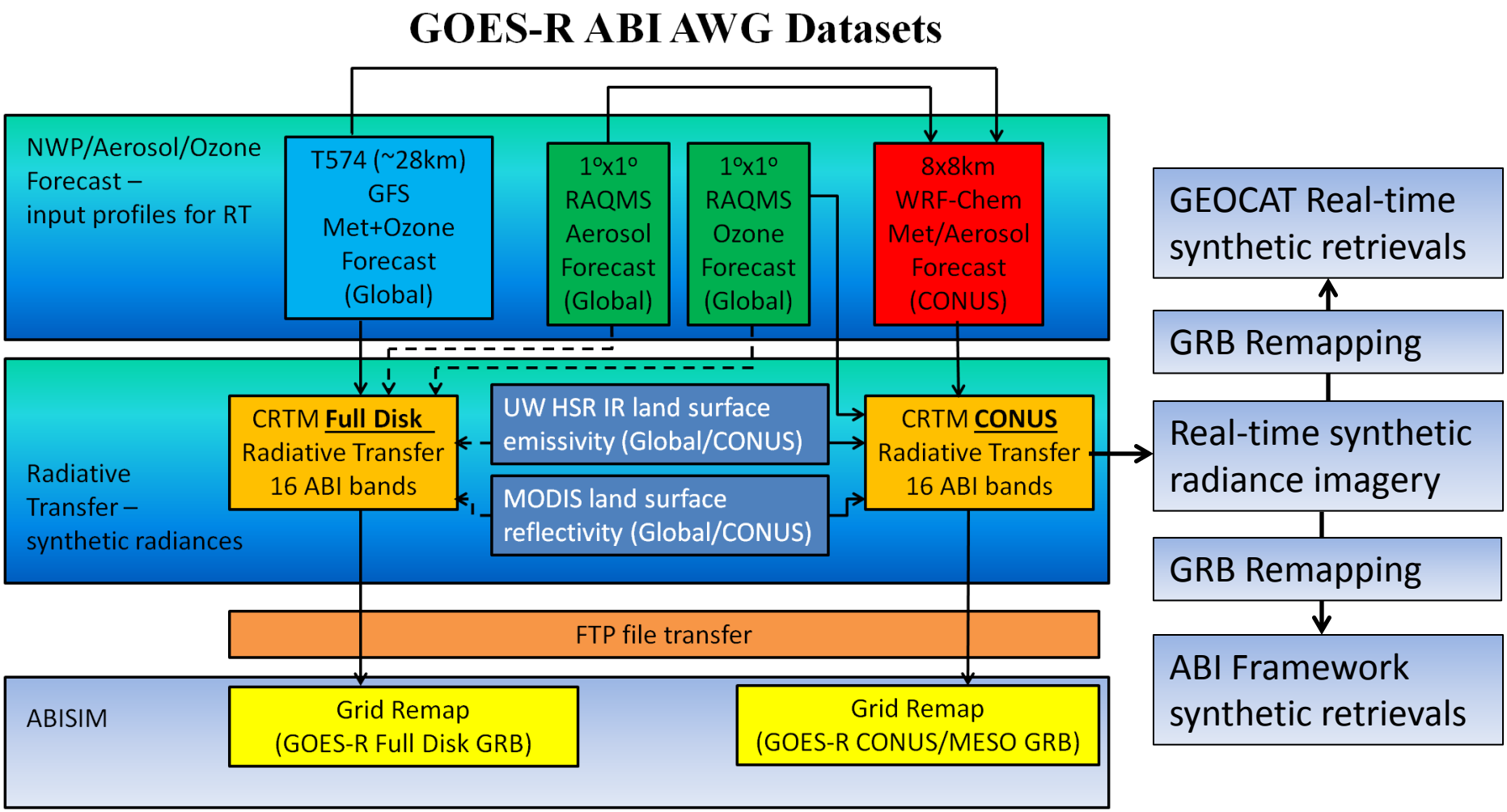
GOES-R AWG real-time proxy system has been developed to:

1. Provide near-real-time proxy ABI data from WRF-Chem (CONUS) and GFS (Full Disk) forecasts using the Community Radiative Transfer Model (CRTM) for all 16 ABI bands. (CONUS data includes imagery, products, RGB airmass, and true color imagery)
2. Remap CONUS imagery to the ABI Fixed Grid Format, compatible with GOES-R Re-Broadcast Level 1b data
3. Provide a validation system for verification of simulated ABI radiances and derived products

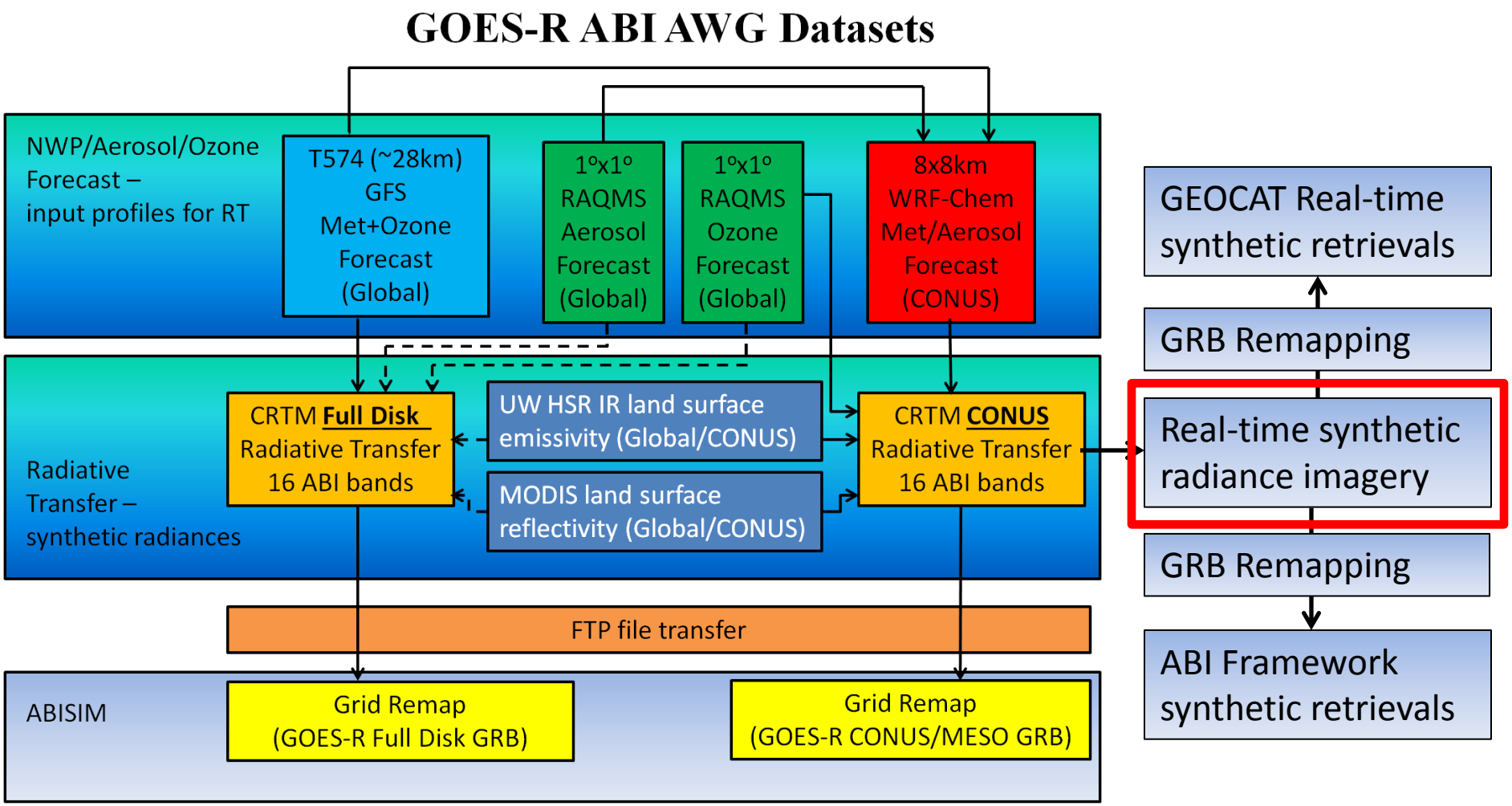
Impact:

1. System allows forecasters and other users to prepare for the new information that the ABI will provide making use of the future GOES ReBroadcast (GRB) data and GOES-R ABI algorithms
2. These data will be used for GOES-R pre-launch activities, such as testing GOES-R ground system throughput, and providing synthetic ABI imagery and products to AWIPS users

GOES-R ABI Real-time Proxy Data Processing Stream



GOES-R ABI Real-time Proxy Data Processing Stream

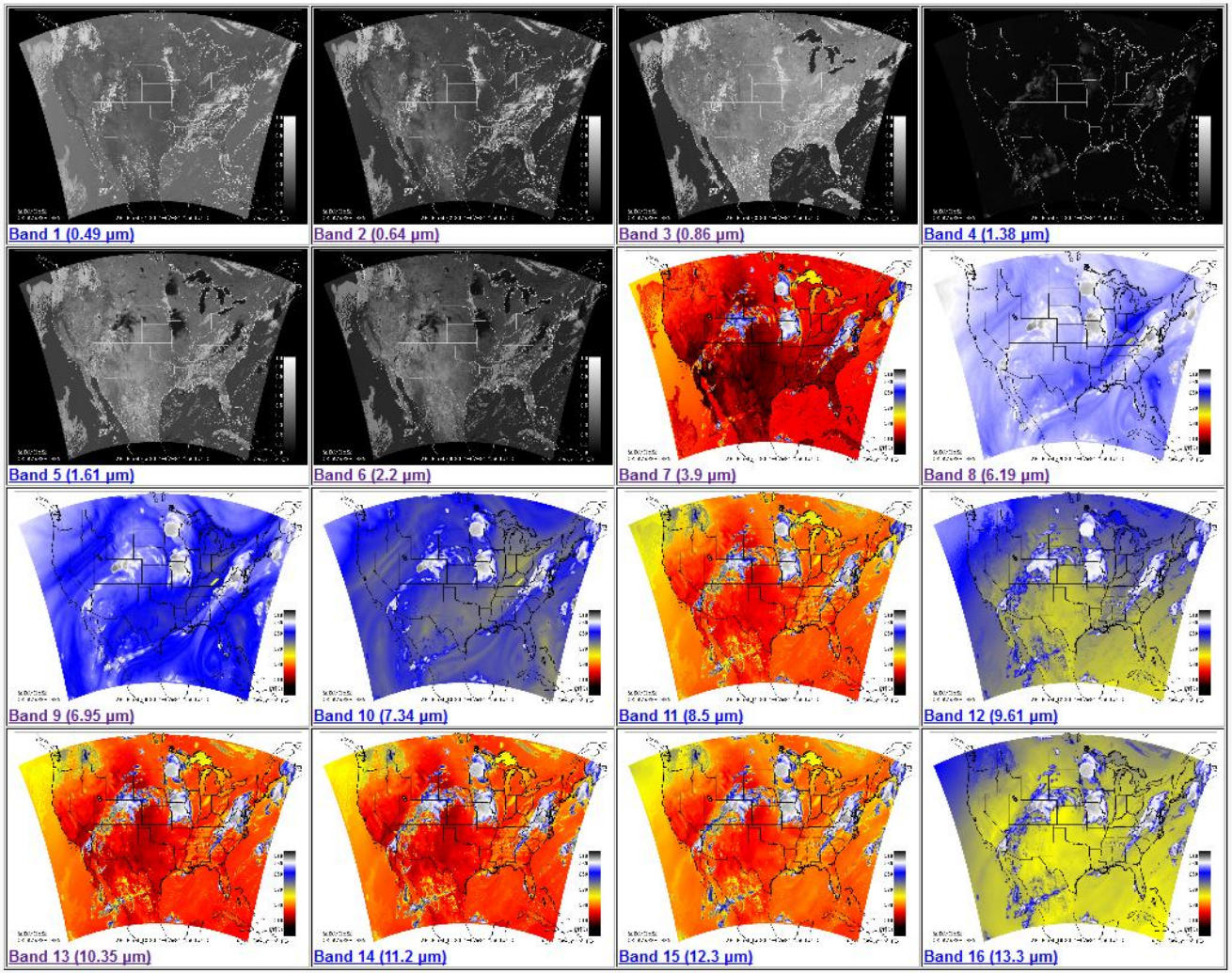


GOES-R Activities at CIMSS / SSEC

» Home » Proving Ground

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

Click on band for time loop.



http://cimss.ssec.wisc.edu/goes_r/proving-ground/wrf_chem_abi/wrf_chem_abi.html

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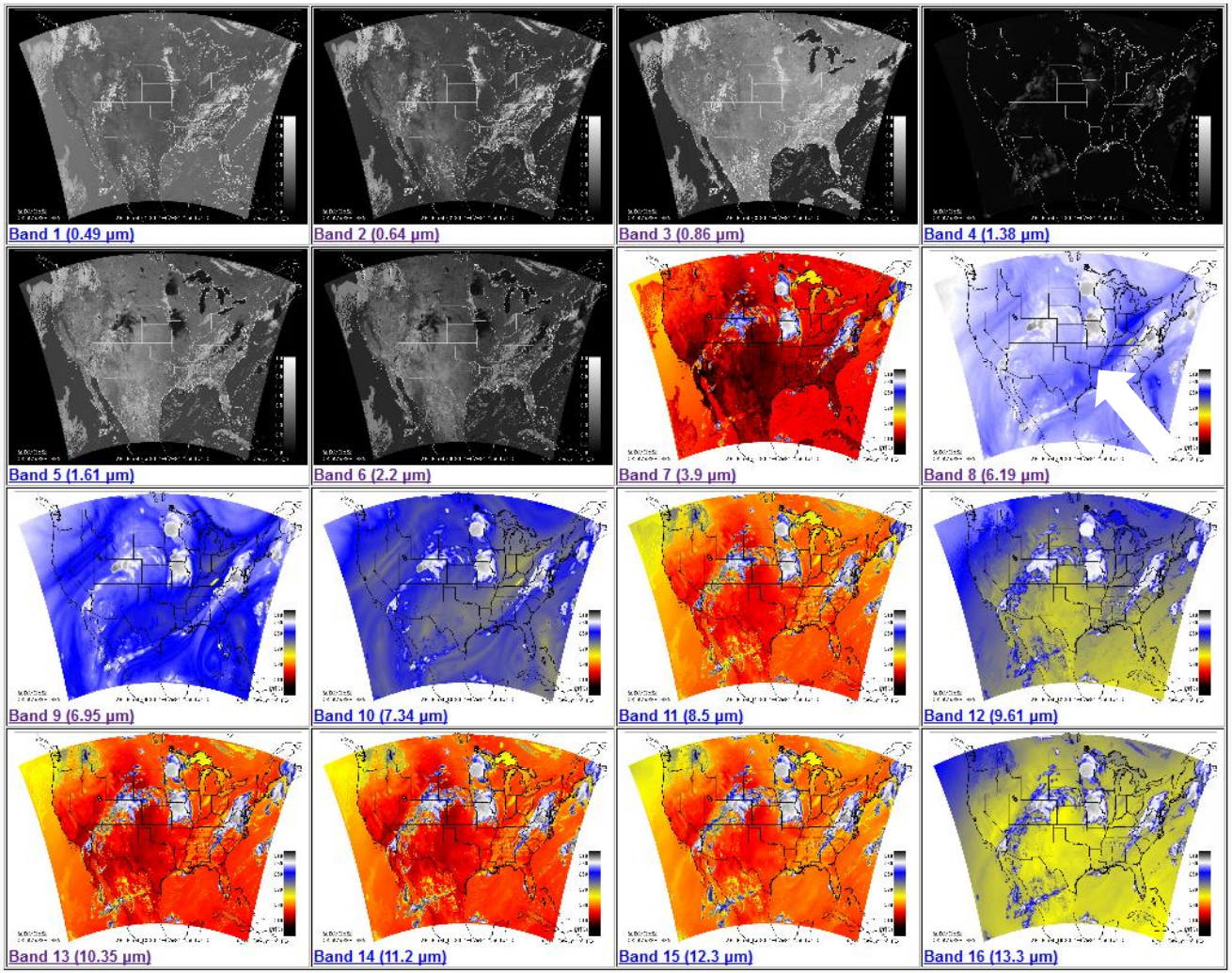


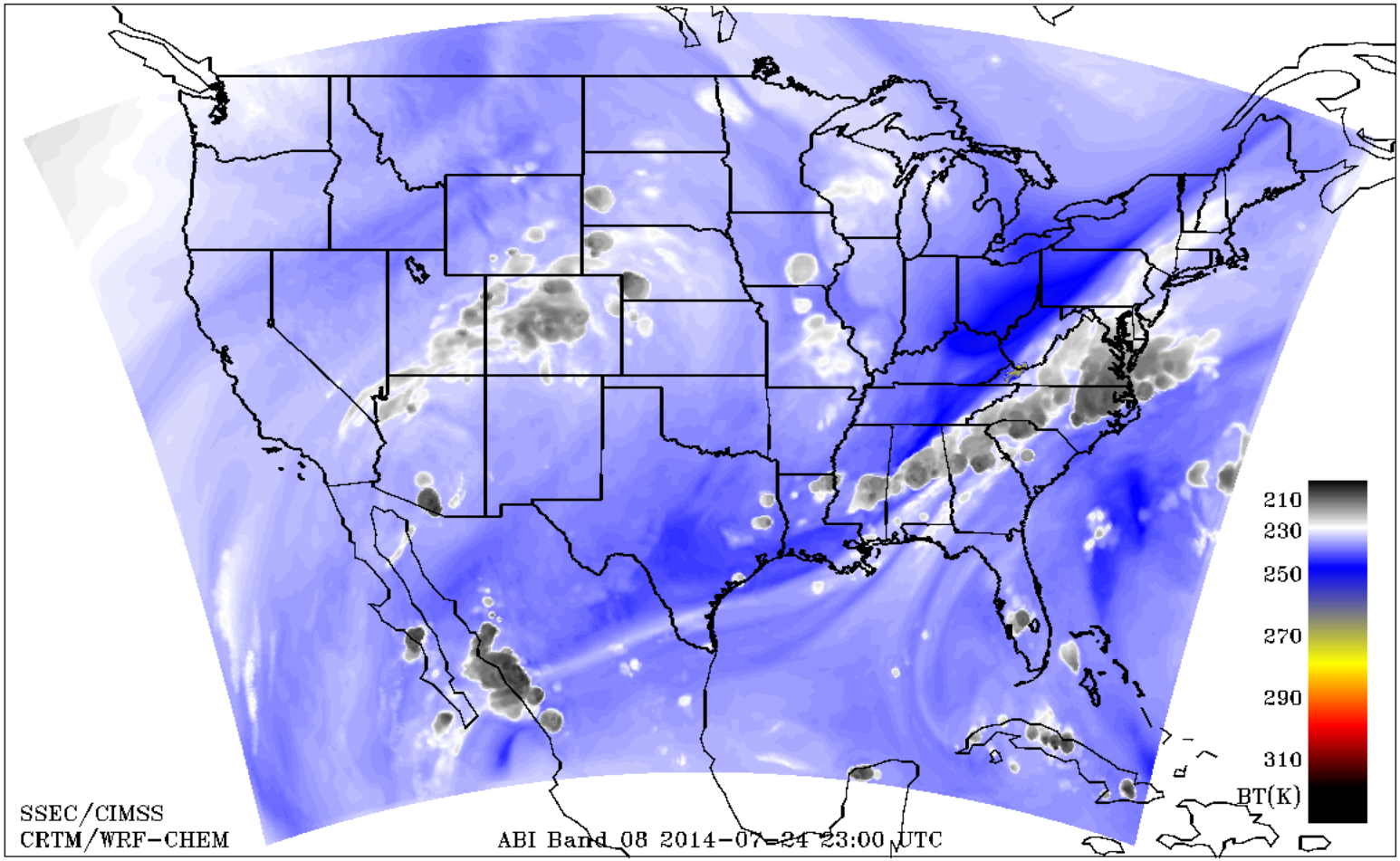
http://cimss.ssec.wisc.edu/goes_r/proving-ground/wrf_chem_abi/wrf_chem_abi.html

GOES-R Activities at CIMSS / SSEC

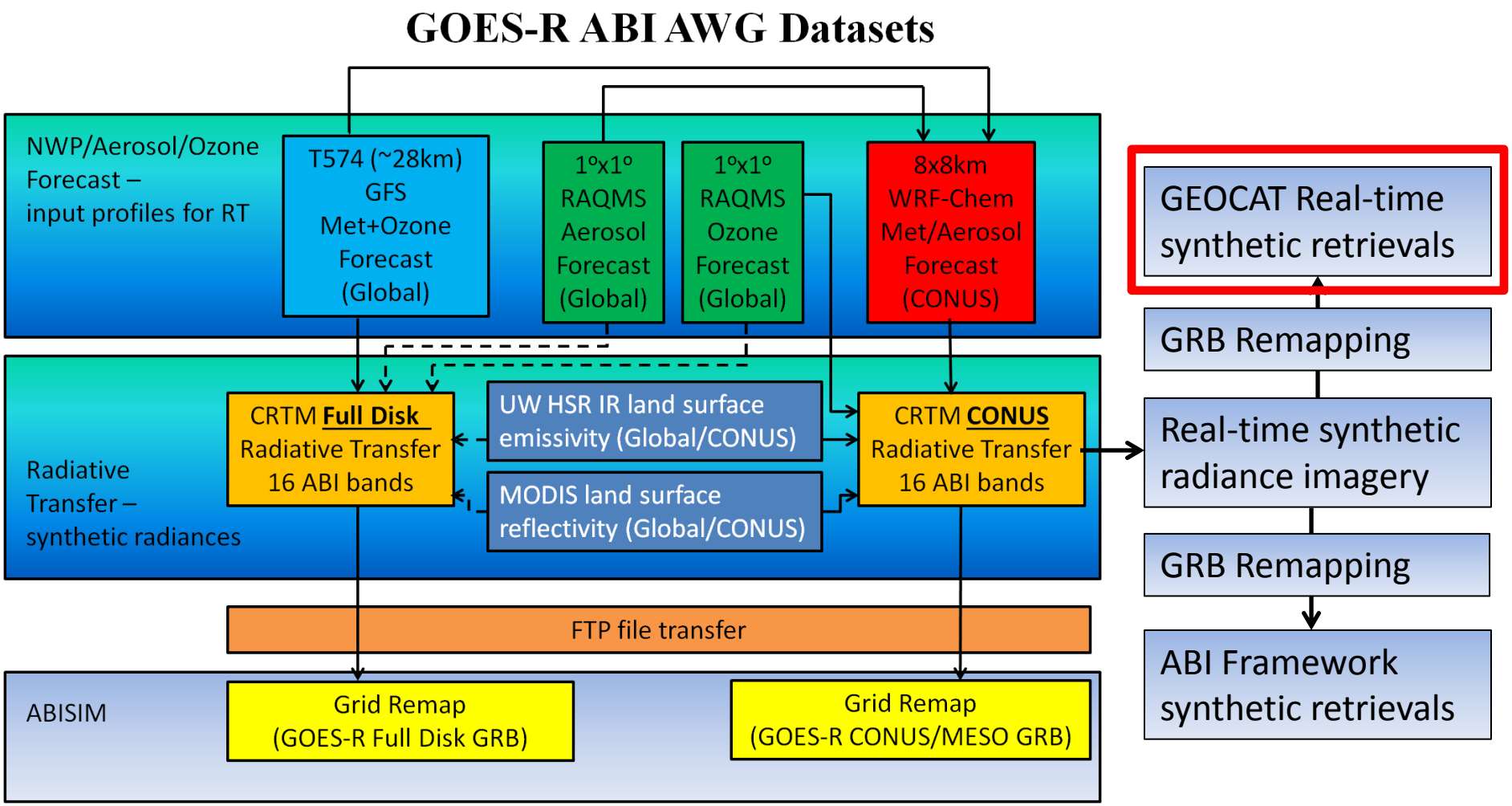
» Home » UW/CIMSS WRF Chem ABI Realtime

ABI Band 08 (6.19 µm) - Upper Level Water Vapor

Start | Set Animation Speed | < | > | Rock | Zoom | Show



GOES-R ABI Real-time Proxy Data Processing Stream



GOES-R Activities at CIMSS / SSEC

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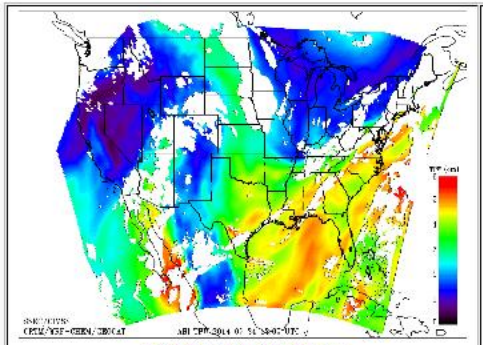
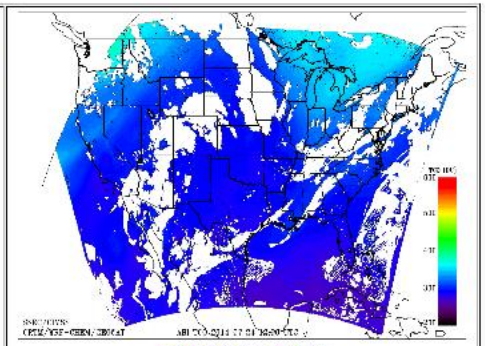
GOES-R Proving Ground UW/CIMSS WRF Chem Simulated Products

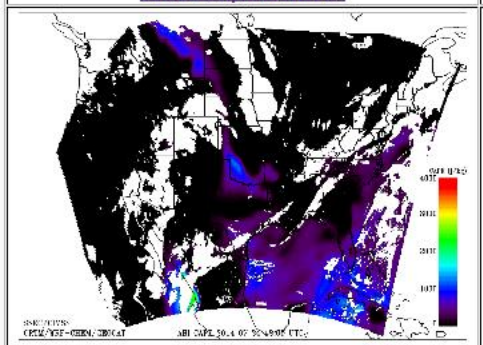
Click on product thumbnail or description for time loop.



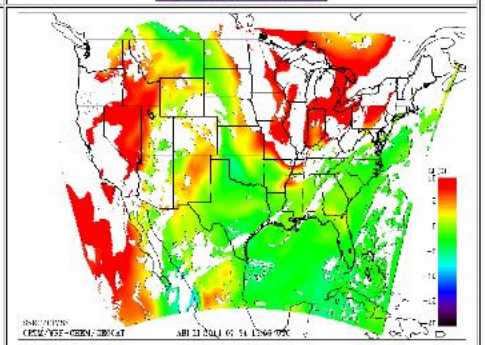
Total Precipitable Water



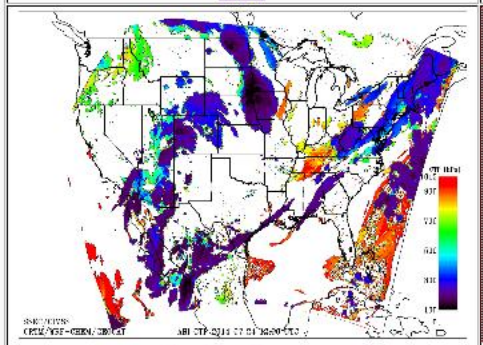
Total Column Ozone



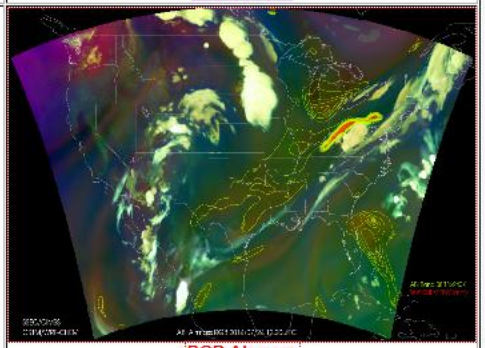
CAPE



Lifted Index



Cloud Top Pressure



RGB Airmass

http://cimss.ssec.wisc.edu/goes_r/proving-ground/wrf_chem_abi/ABI-PRODUCTS/wrf_chem_abi_prod.html

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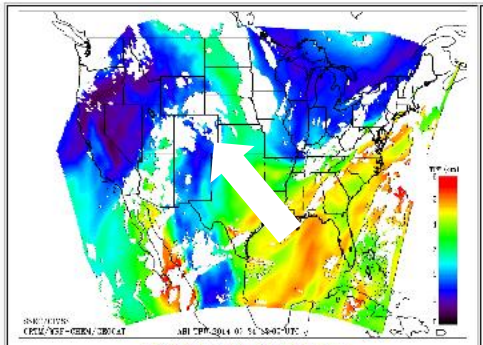
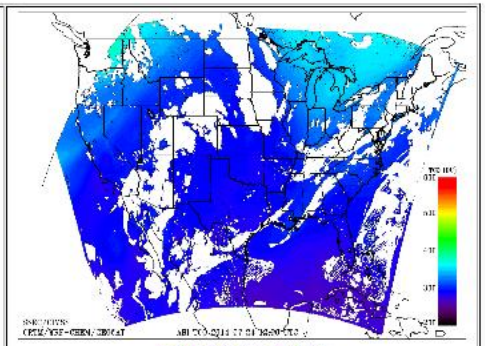
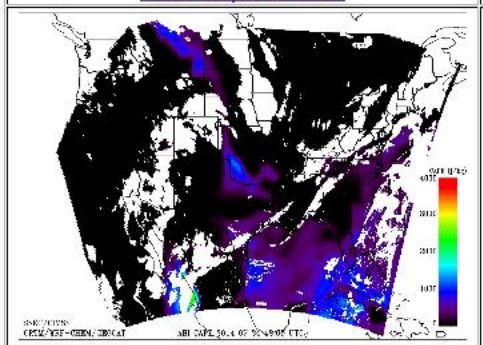


Total Precipitable Water



Total Column Ozone



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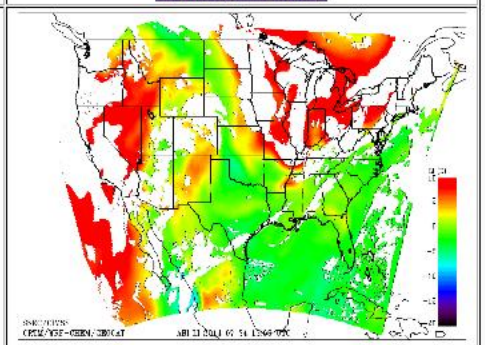

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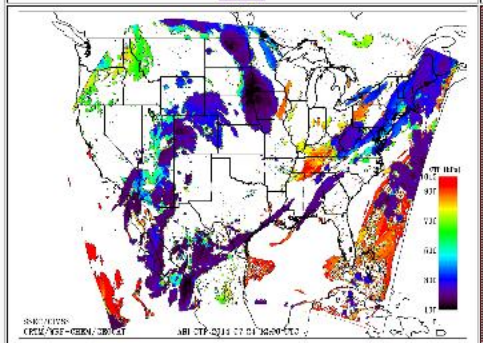
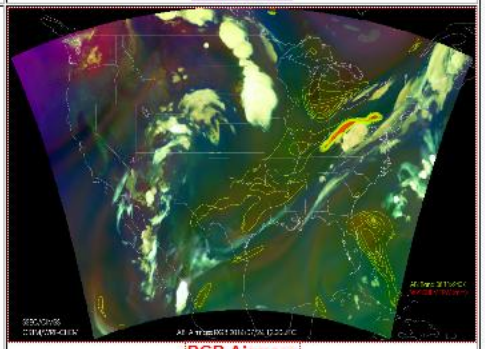


Cloud Top Pressure



RGB Airmass

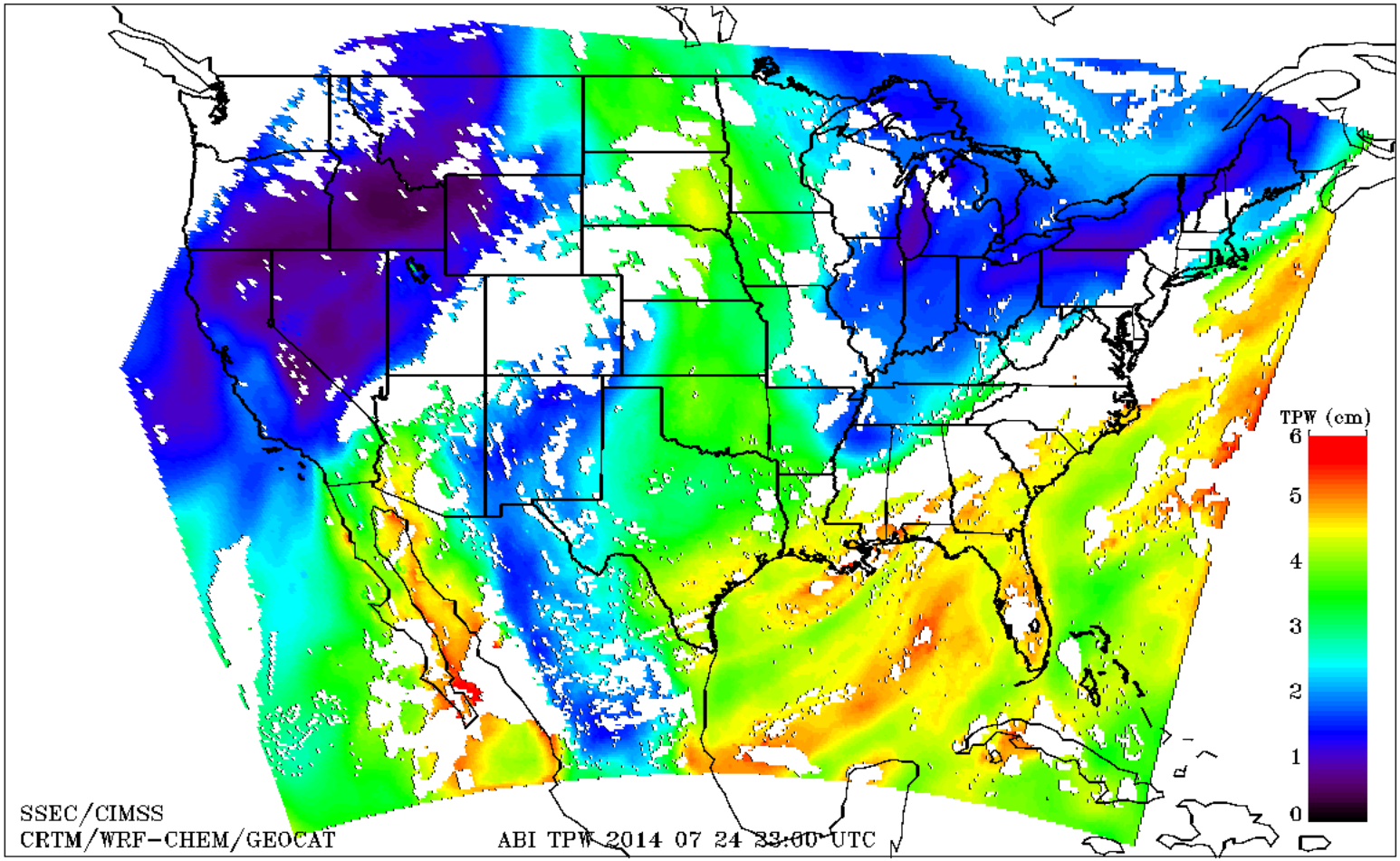
http://cimss.ssec.wisc.edu/goes_r/proving-ground/wrf_chem_abi/ABI-PRODUCTS/wrf_chem_abi_prod.html

GOES-R Activities at CIMSS / SSEC

» Home » UW/CIMSS WRF Chem ABI Realtime

Total Precipitable Water

Start | Set Animation Speed | < | > | Rock | Zoom | Show



GOES-R Activities at CIMSS / SSEC

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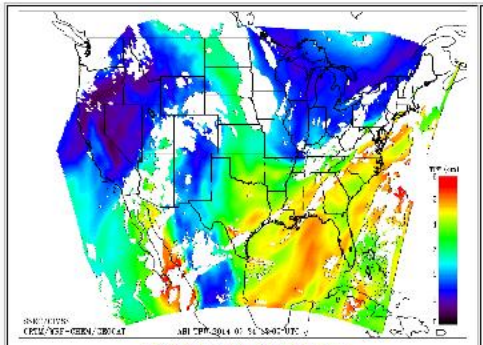

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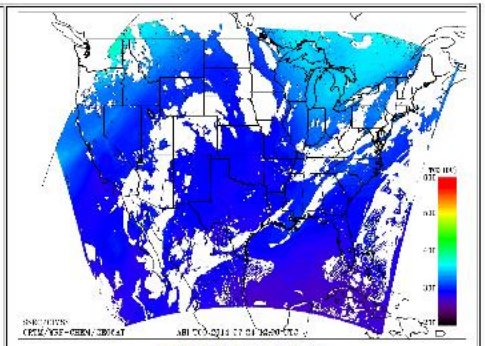

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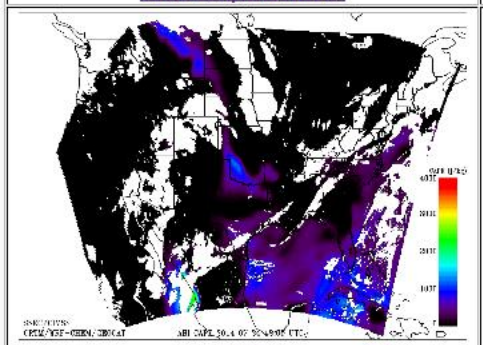

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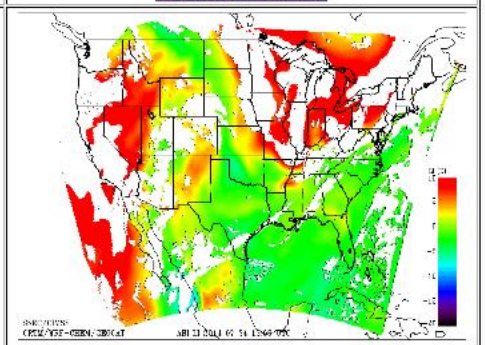

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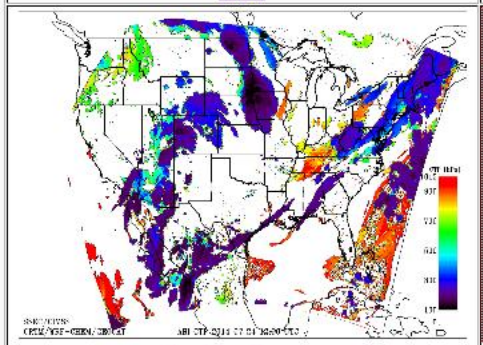
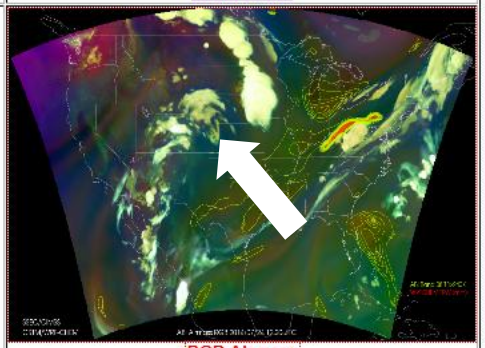


Cloud Top Pressure



RGB Airmass

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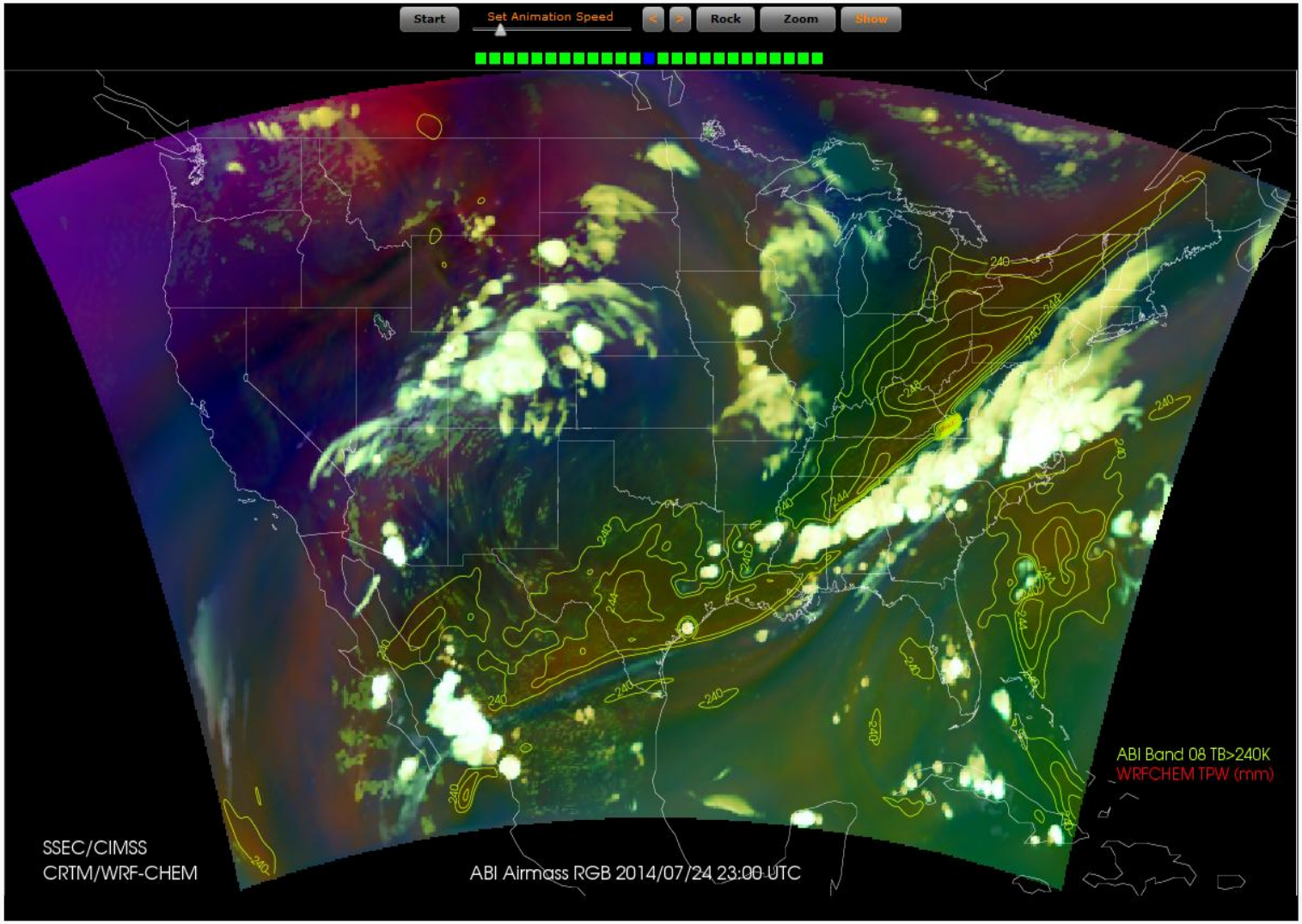
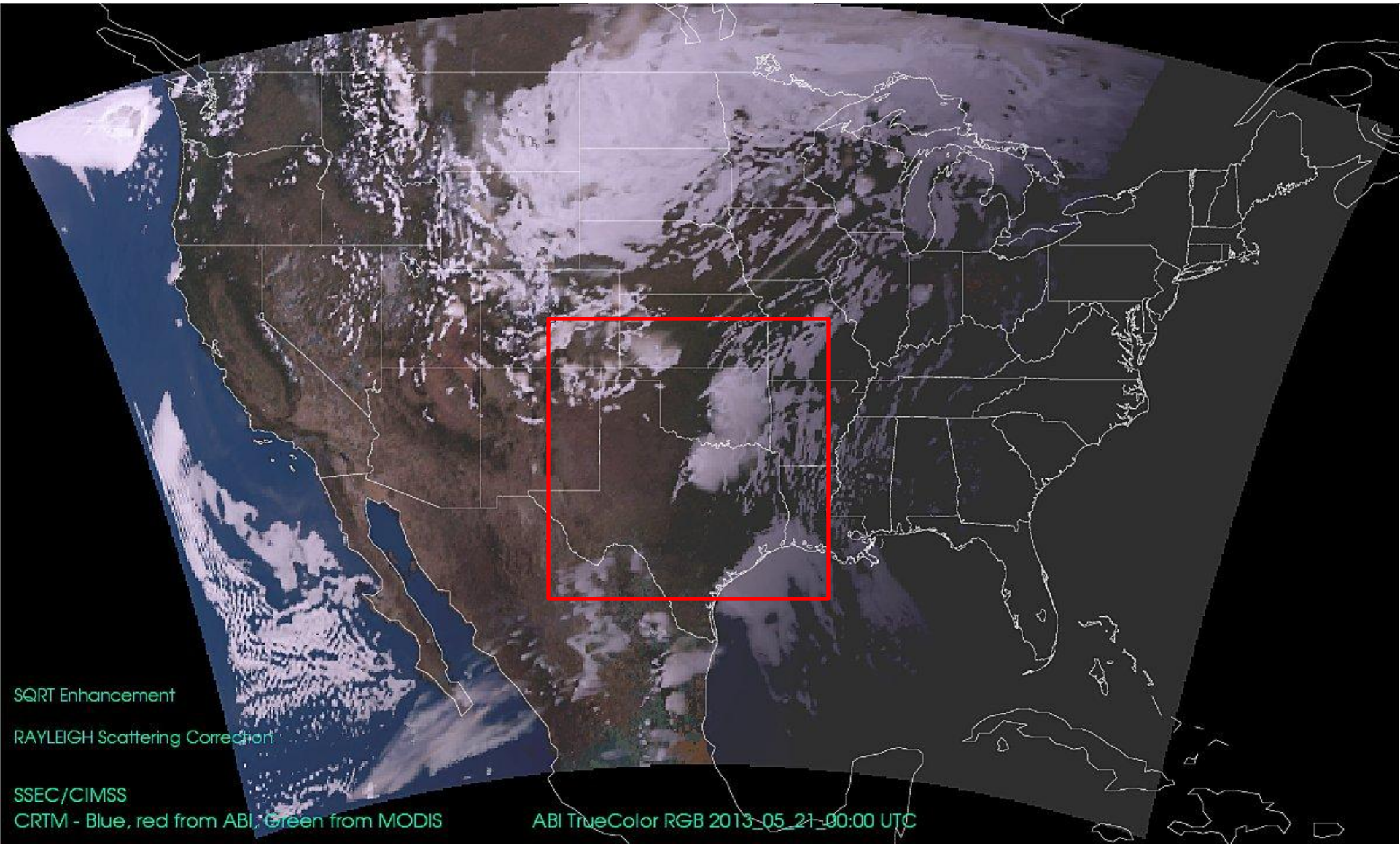
ABI Airmass RGB with ABI band 08 Brightness Temperature and WRF-Chem TPW overlaid



Validation: Moore OK Tornado Case Study
12Z May 20 to 12Z May 21, 2013



ABI Band 08

ABI Band 09

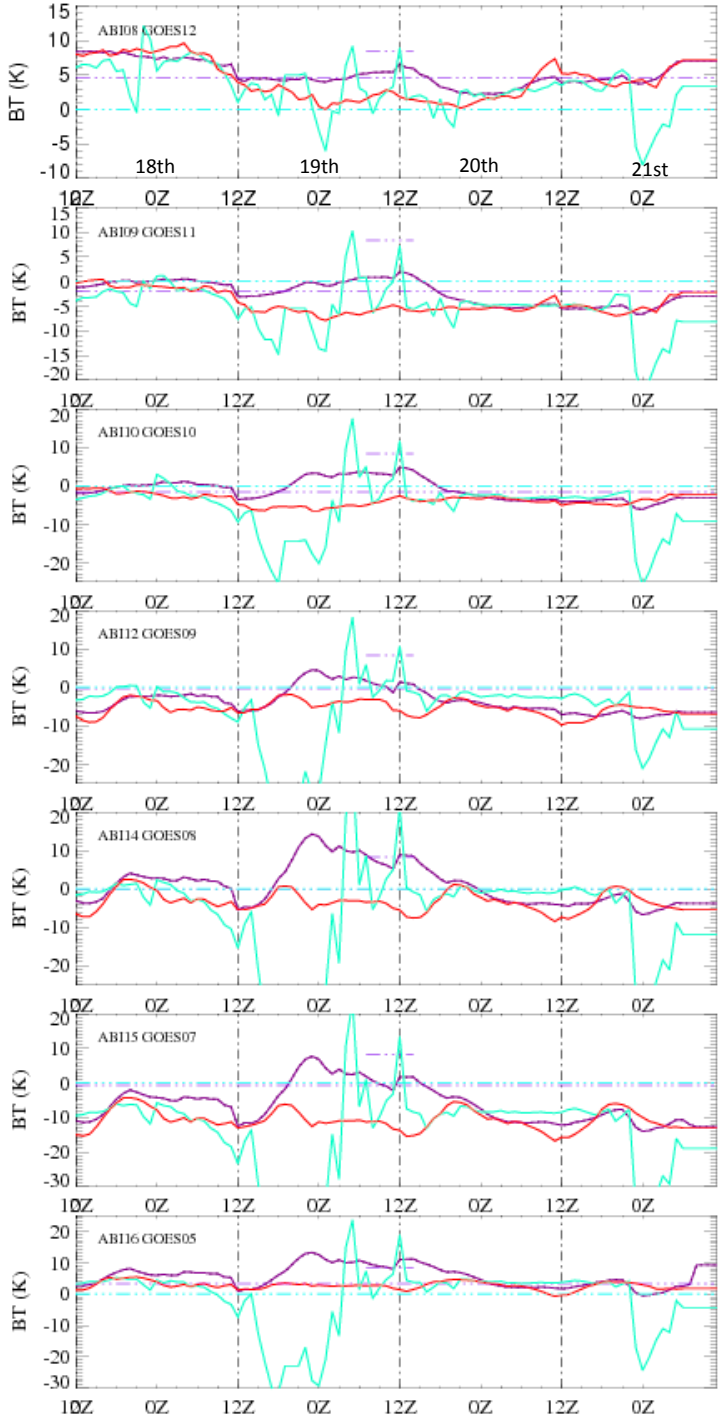
ABI Band 10

ABI Band 12

ABI Band 14

ABI Band 15

ABI Band 16



Comparison with GOES Sounder Channels

Synthetic ABI – GOES Timeseries

Red=All pixels
Black=Clear Pixels
Green=Cloudy pixels

Largest biases for cloudy pixels around 18Z May 18, and 00Z May 21st

ABI Band 08

ABI Band 09

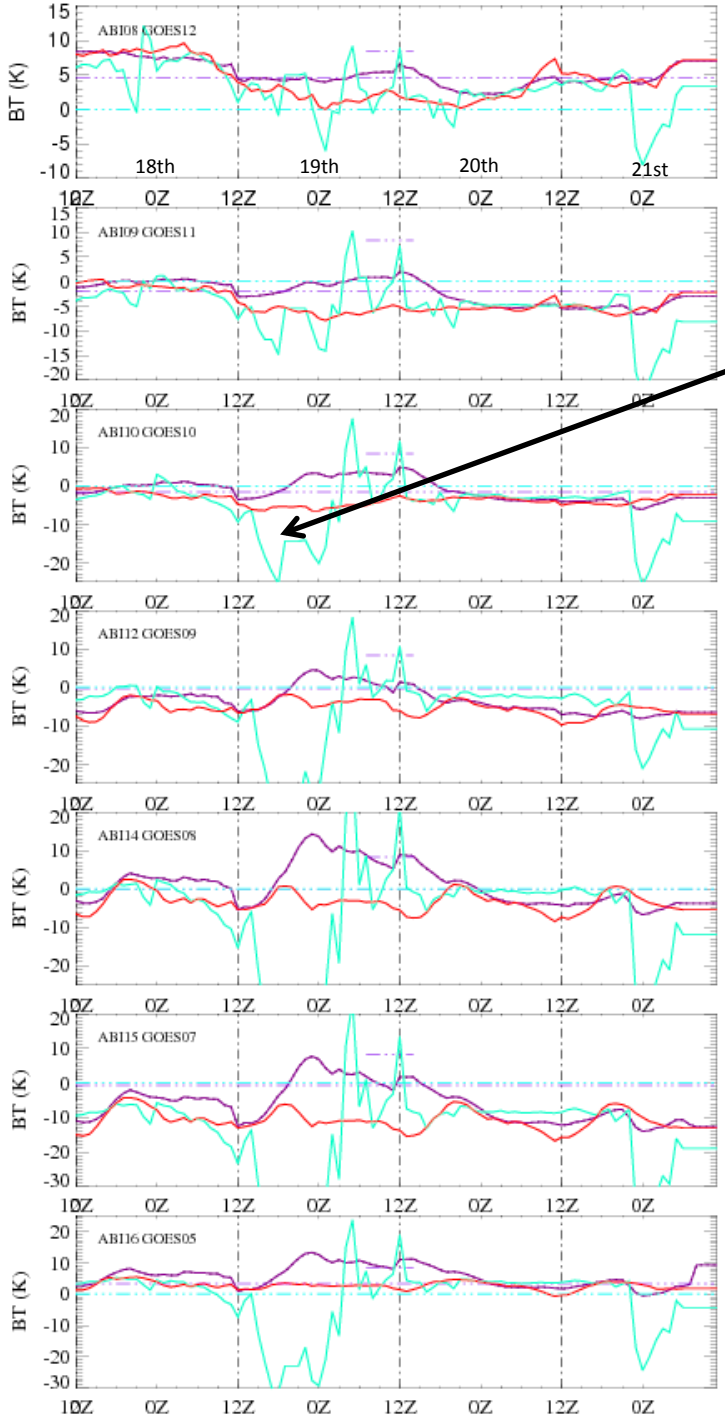
ABI Band 10

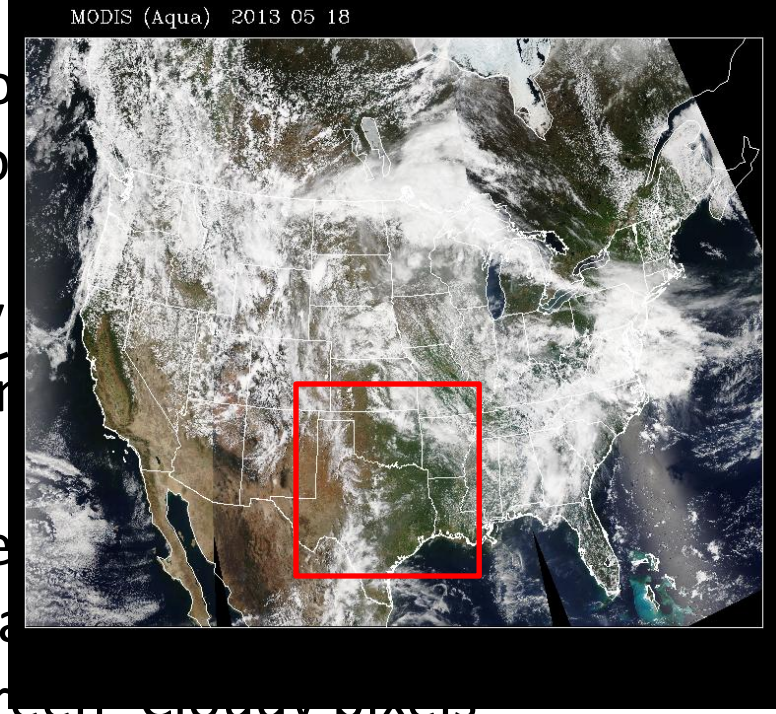
ABI Band 12

ABI Band 14

ABI Band 15

ABI Band 16





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Largest biases for cloudy pixels around 18Z May 18, and 00Z May 21st

ABI Band 08

ABI Band 09

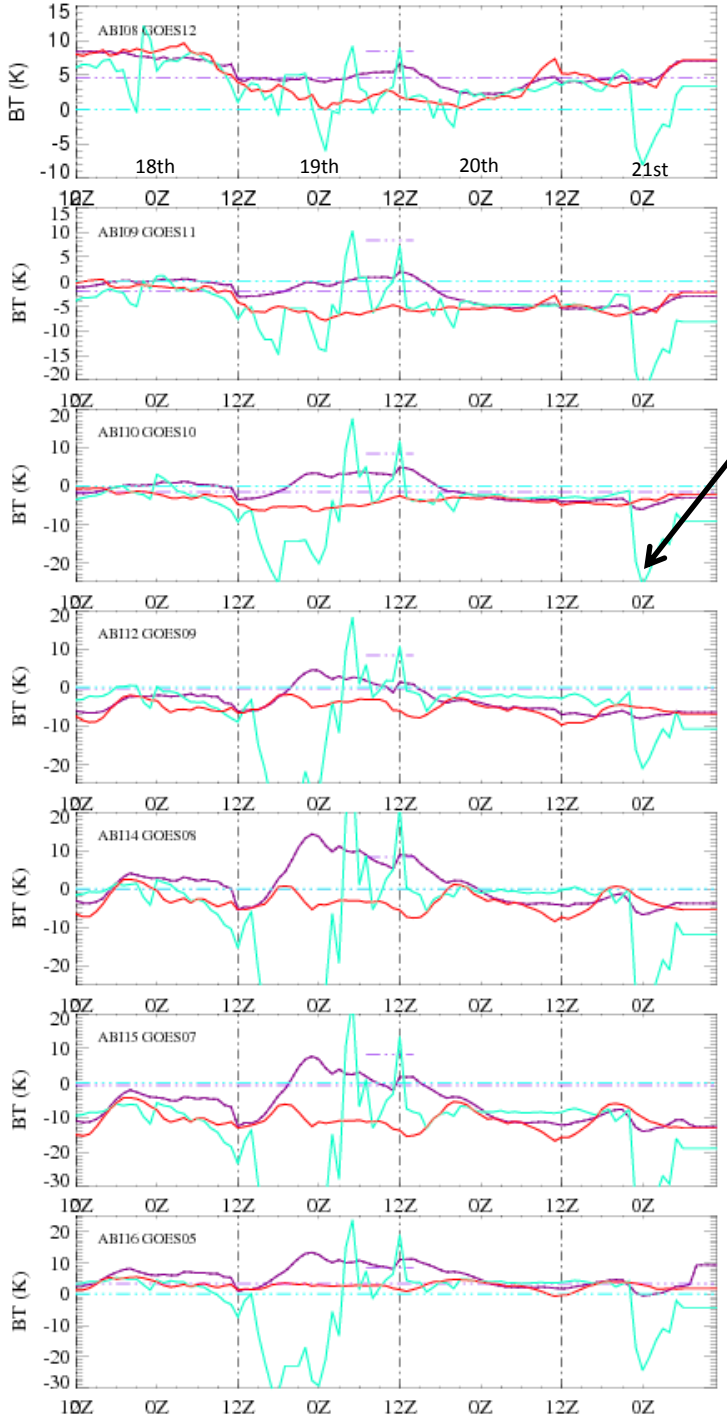
ABI Band 10

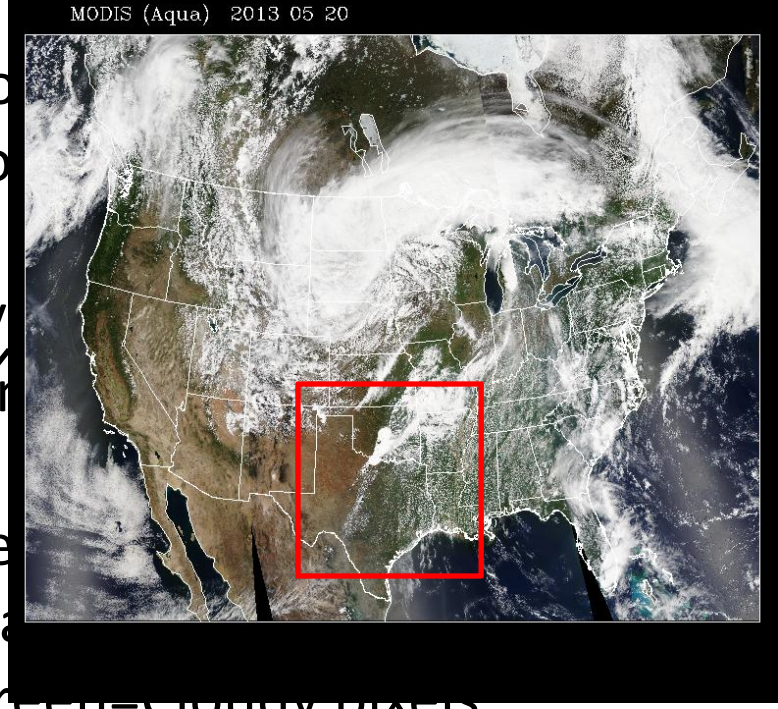
ABI Band 12

ABI Band 14

ABI Band 15

ABI Band 16





Co
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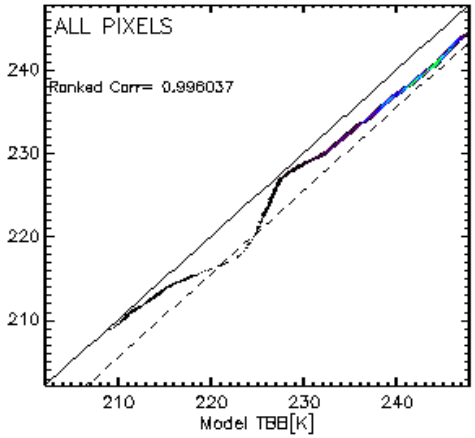
Re
Bl
Green=cloudy pixels

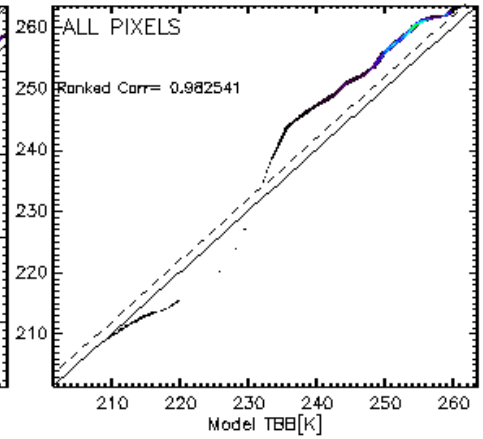
Largest biases for cloudy pixels around 18Z May 18, and 00Z May 21st

Comparison with GOES Sounder Channels
Synthetic ABI – GOES Ranked Correlation

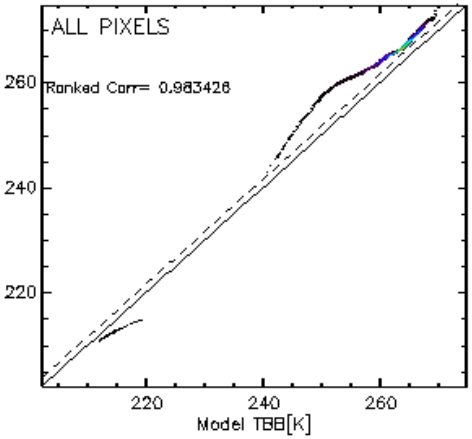
ABI Band 08



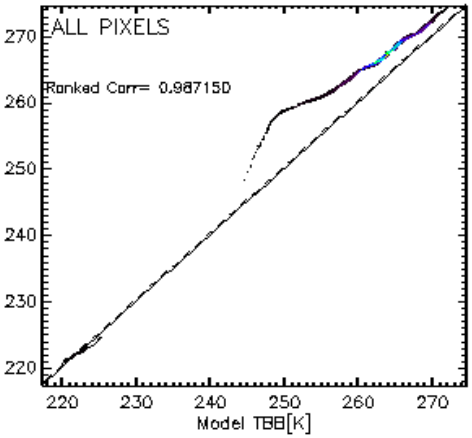
ABI Band 09



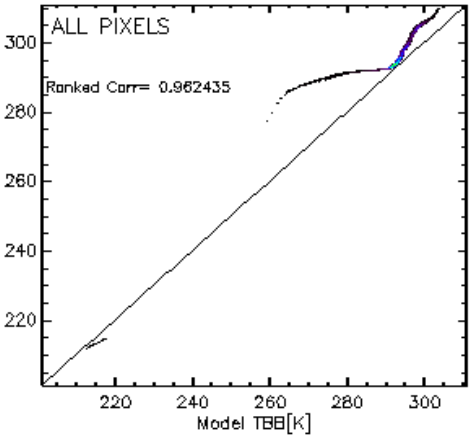
ABI Band 10



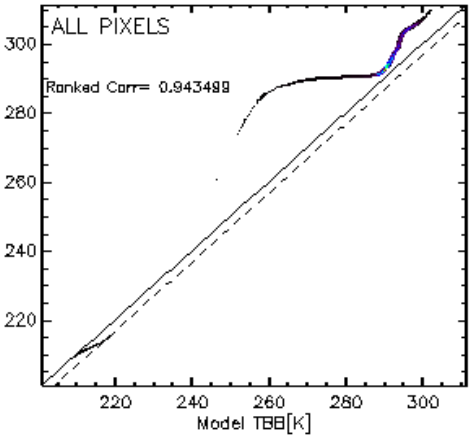
ABI Band 12



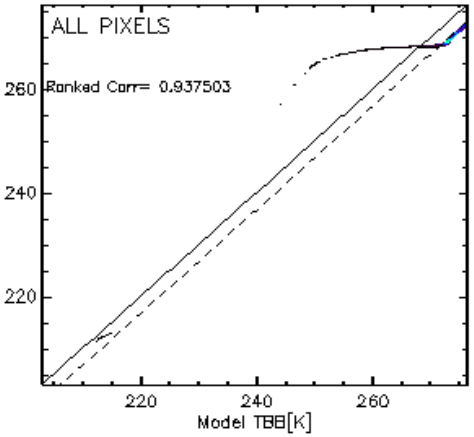
ABI Band 14



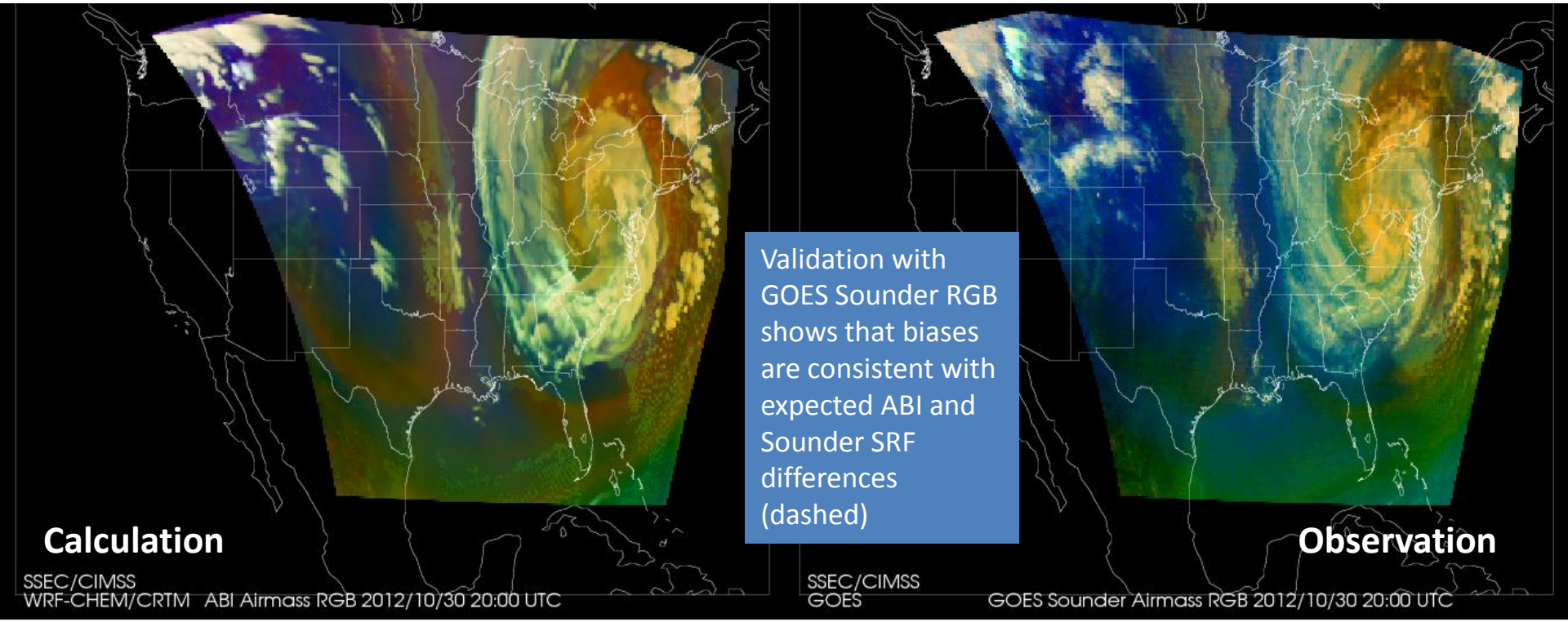
ABI Band 15



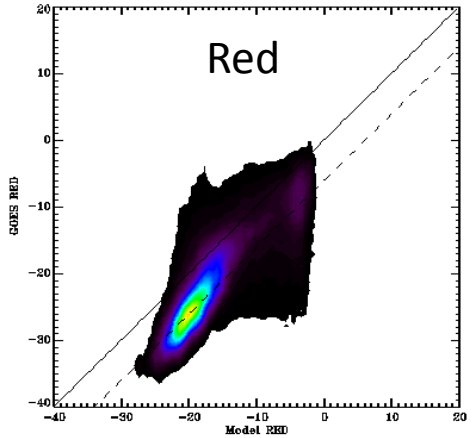
ABI Band 16

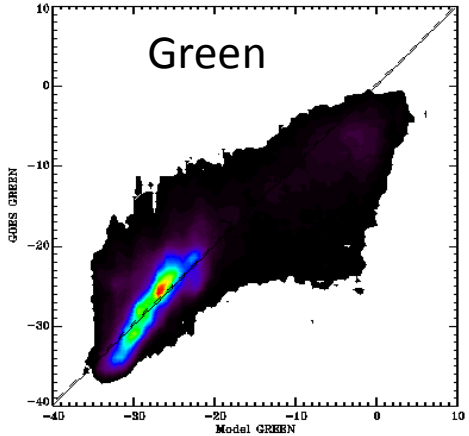


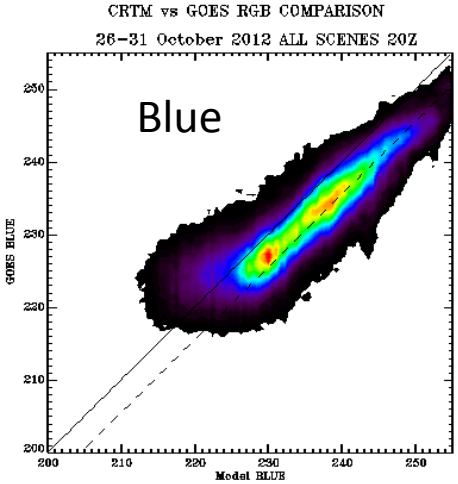
WRF-CHEM Proxy Hurricane Sandy simulation vs GOES Sounder Airmass RGB October 26-31, 2012.



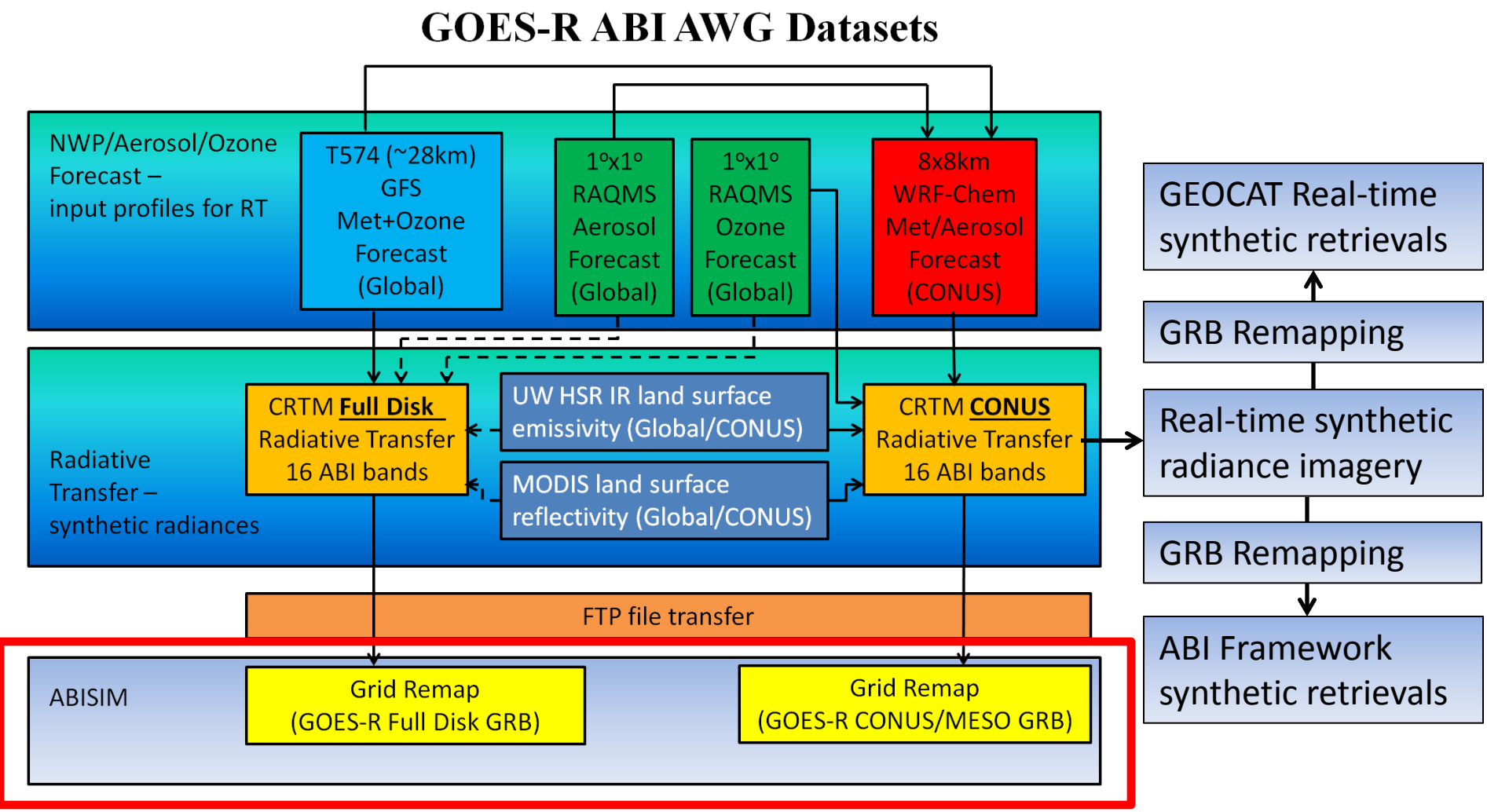
Validation of proxy ABI RGB airmass vs GOES Sounder







GOES-R ABI Real-time Proxy Data Processing Stream



GOES-R Ground Segment
Data Operations System Test (DOST)
Data Simulation Development
ABI AWG/UW-Madison Data Set (AAWDS)

Domain sizes:

- GFS GOES-E/W Full Disk Domain (880x587)
- WRF-CHEM GOES-E/W Conus Domain (625X421)

Time resolution:

- GFS GOES-E/W Full Disk (3hr, 8/day)
- WRF-CHEM GOES-E/W Conus (1hr, 24/day)

ABISIM – ABI Simulator (Kim Pham and Joe Zajic)

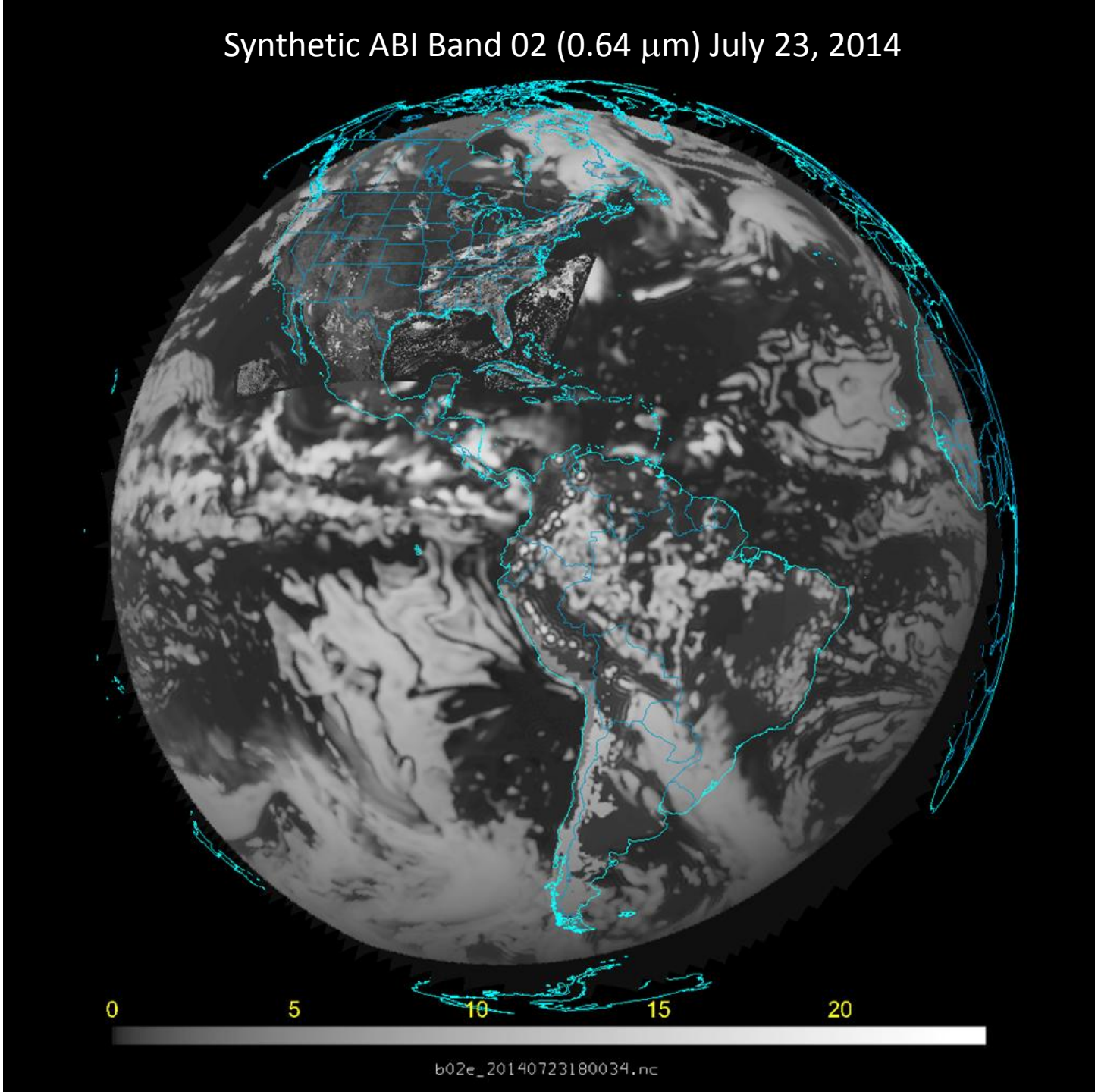
Assembly: *AAWDS is interpolated spatially and temporally to ABI product specs and timeline from native AAWDS resolutions (8km/1hr over CONUS, 28km/3hr rest of full disk) then divided into blocks according to PG block specifications*

Output: *Scan Mode (4) Full Disk, Flex Mode (3) Full Disk, CONUS, and Mesoscale L1B PG blocks sampled at the full ABI 0.5, 1.0, and 2.0 km nadir resolutions.*

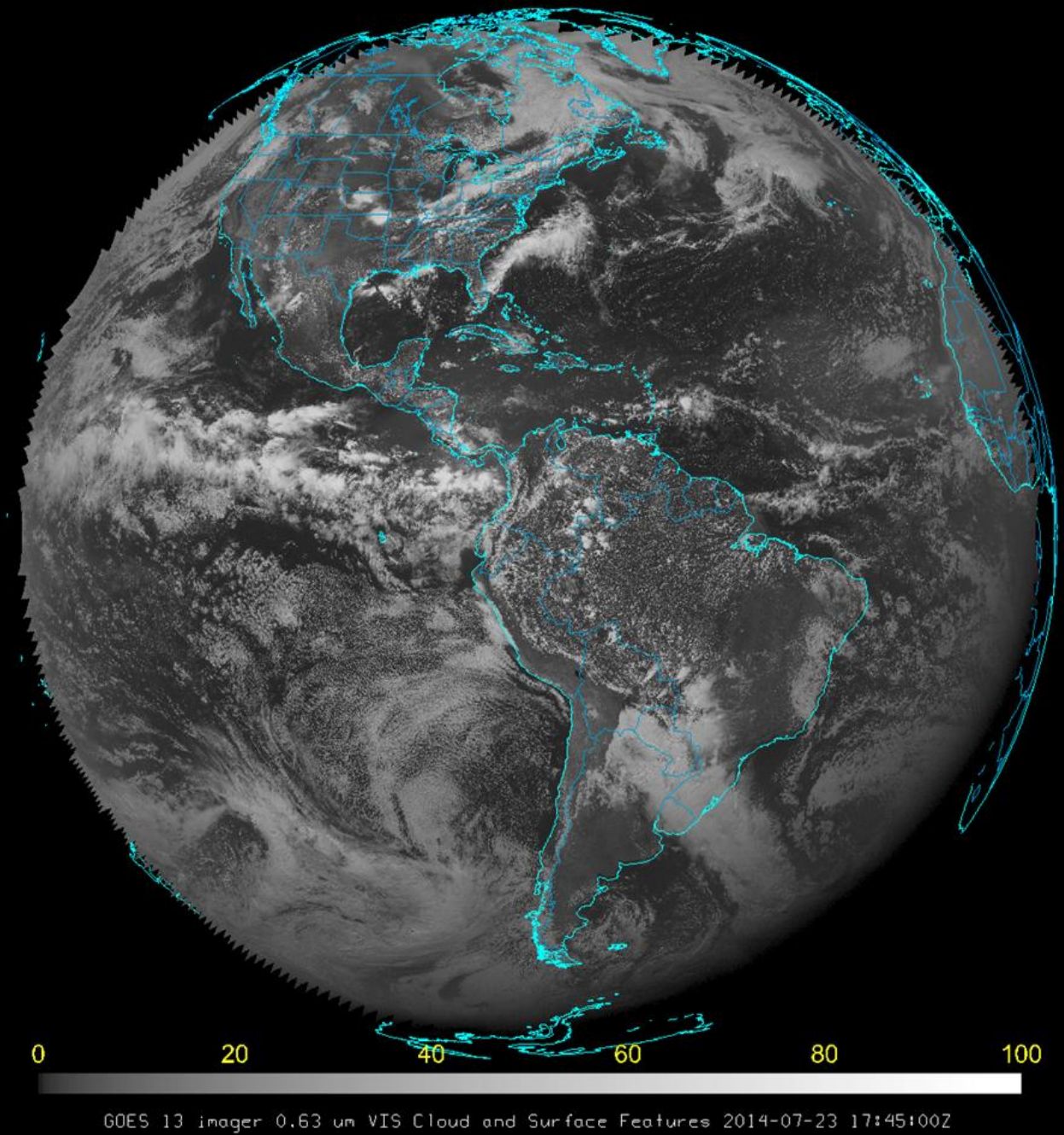
GOES East:
Simulated and Observed
18Z July 23, 2014

ABISIM (radiance)

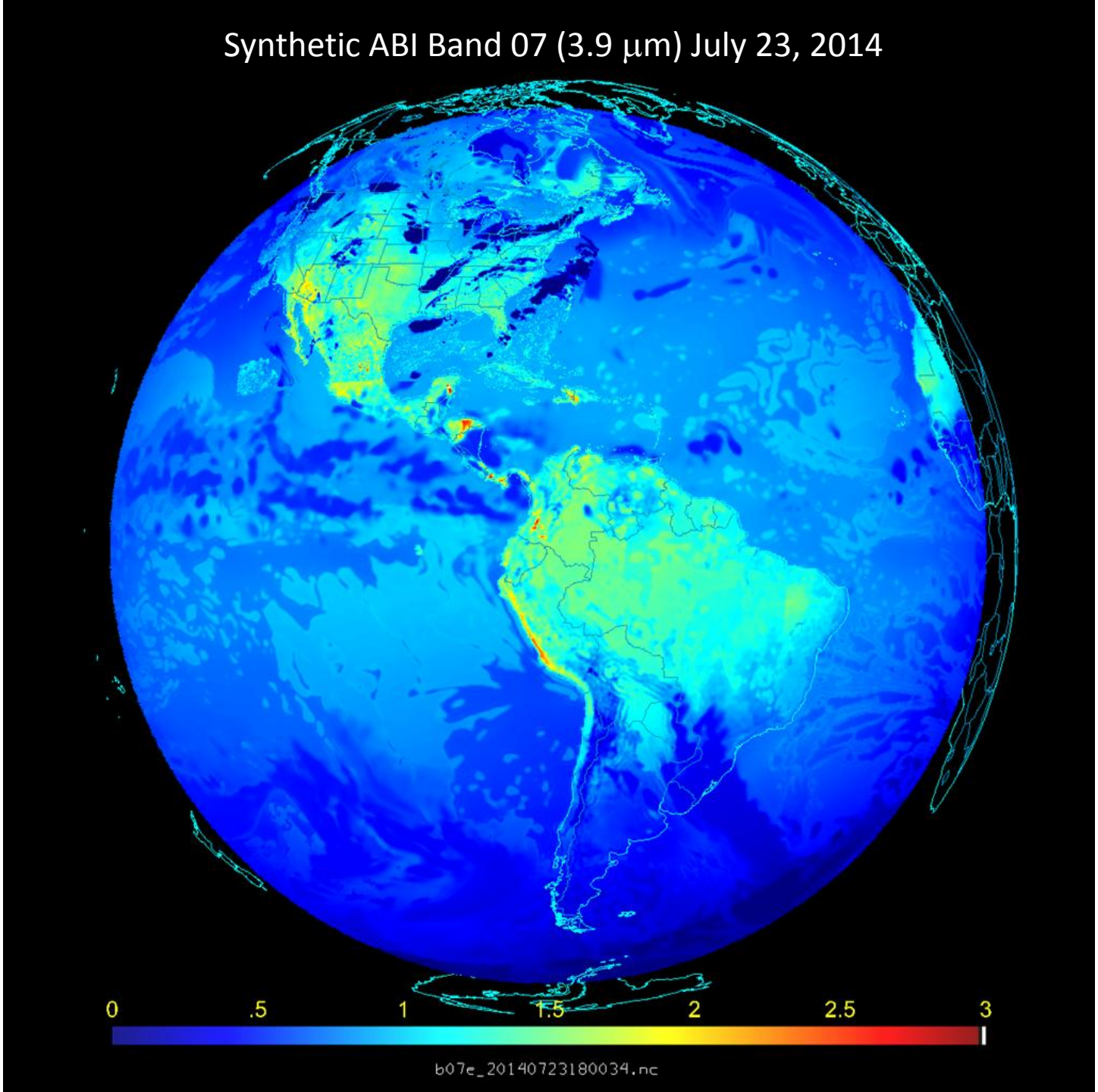
Synthetic ABI Band 02 (0.64 μm) July 23, 2014



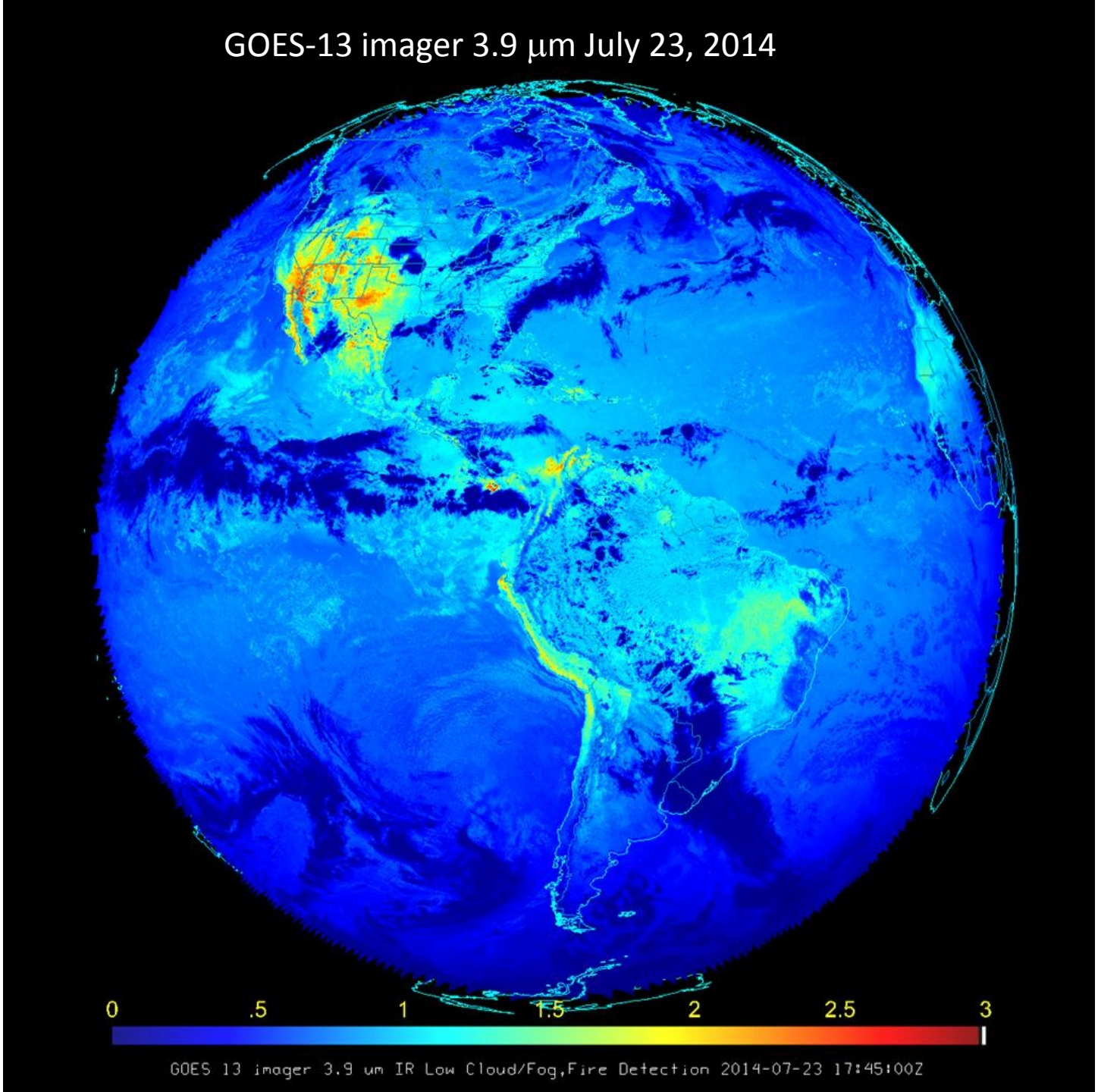
GOES-13 imager 0.63 μm July 23, 2014



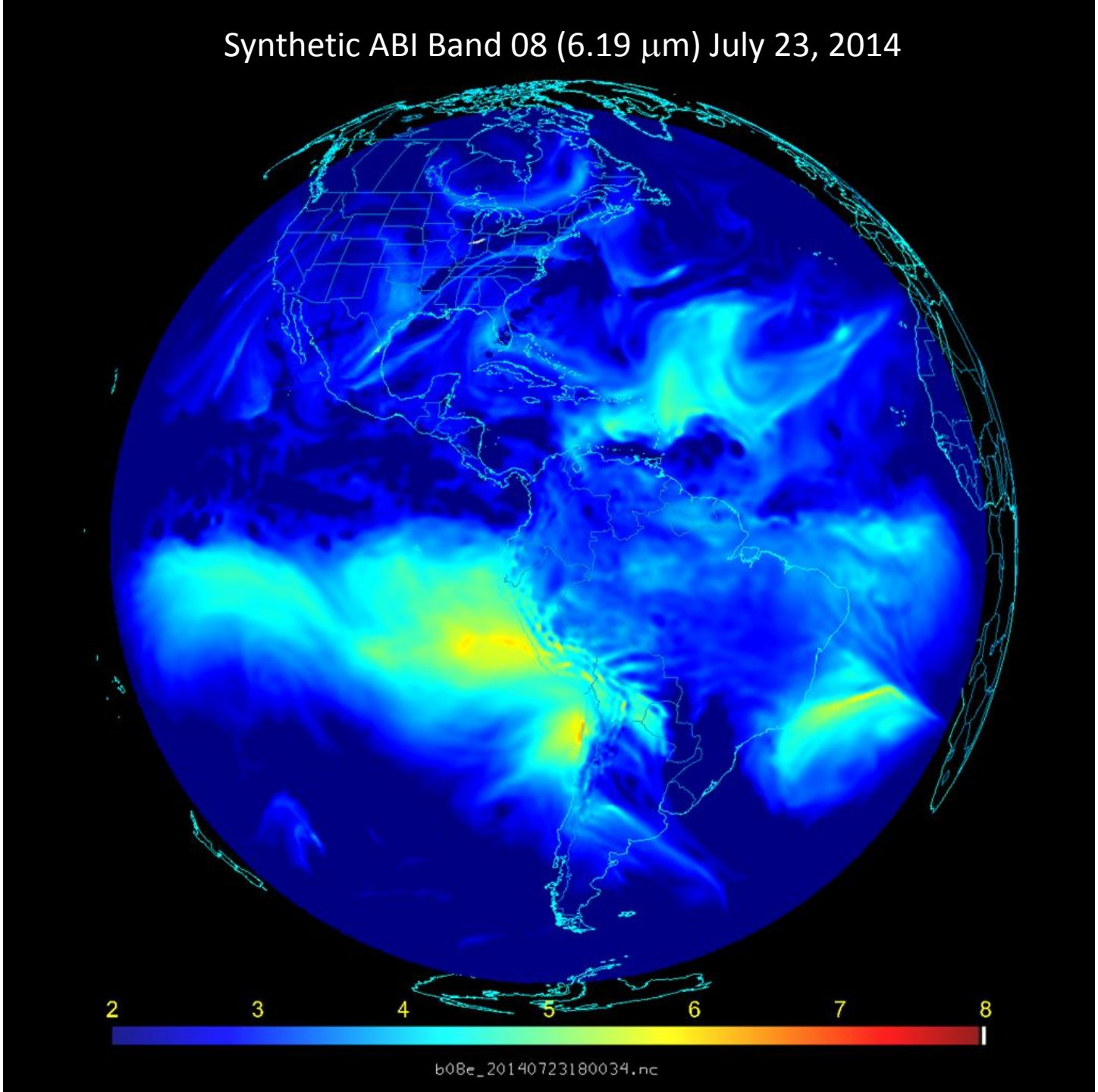
Synthetic ABI Band 07 (3.9 μm) July 23, 2014



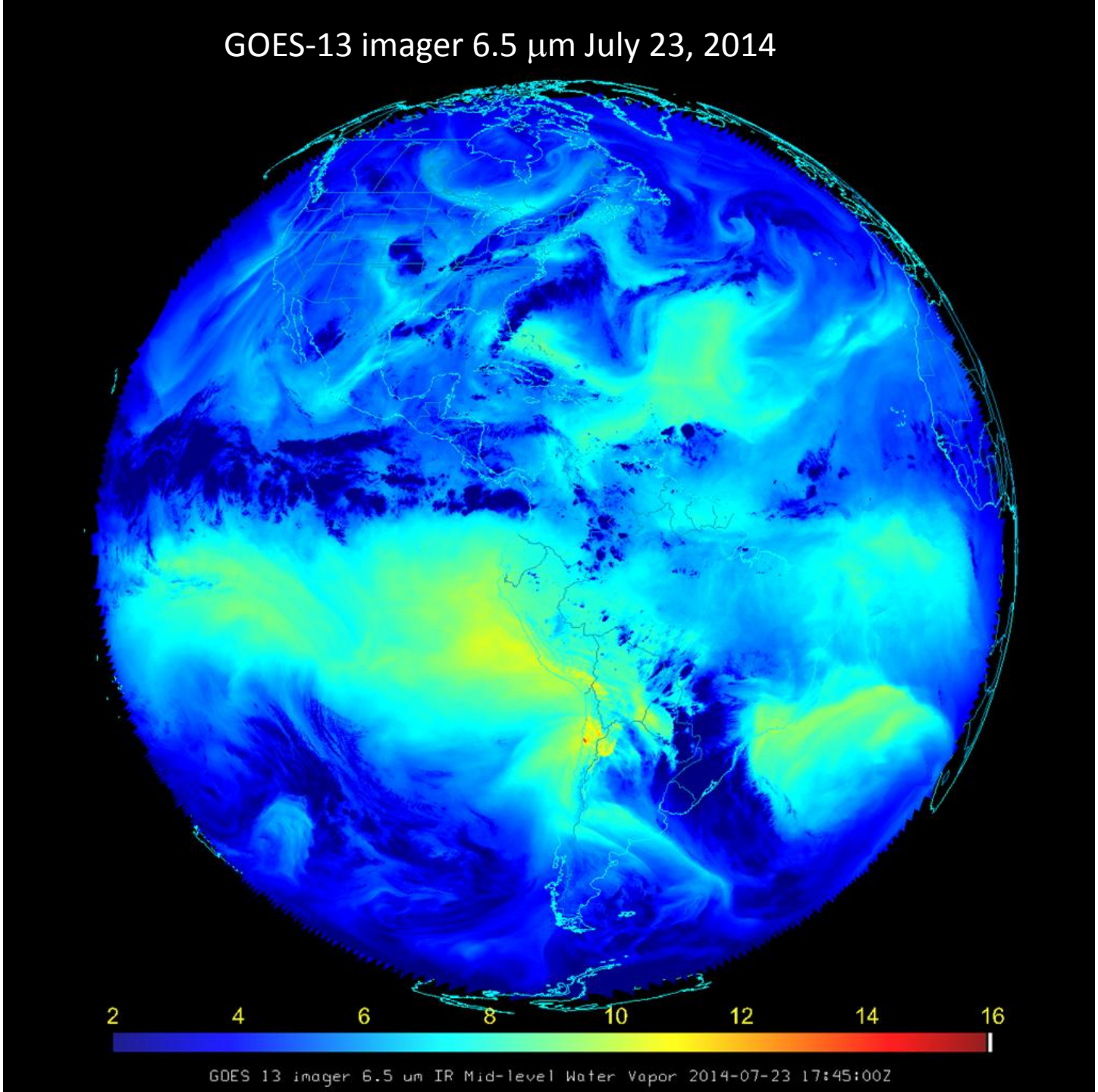
GOES-13 imager 3.9 μm July 23, 2014



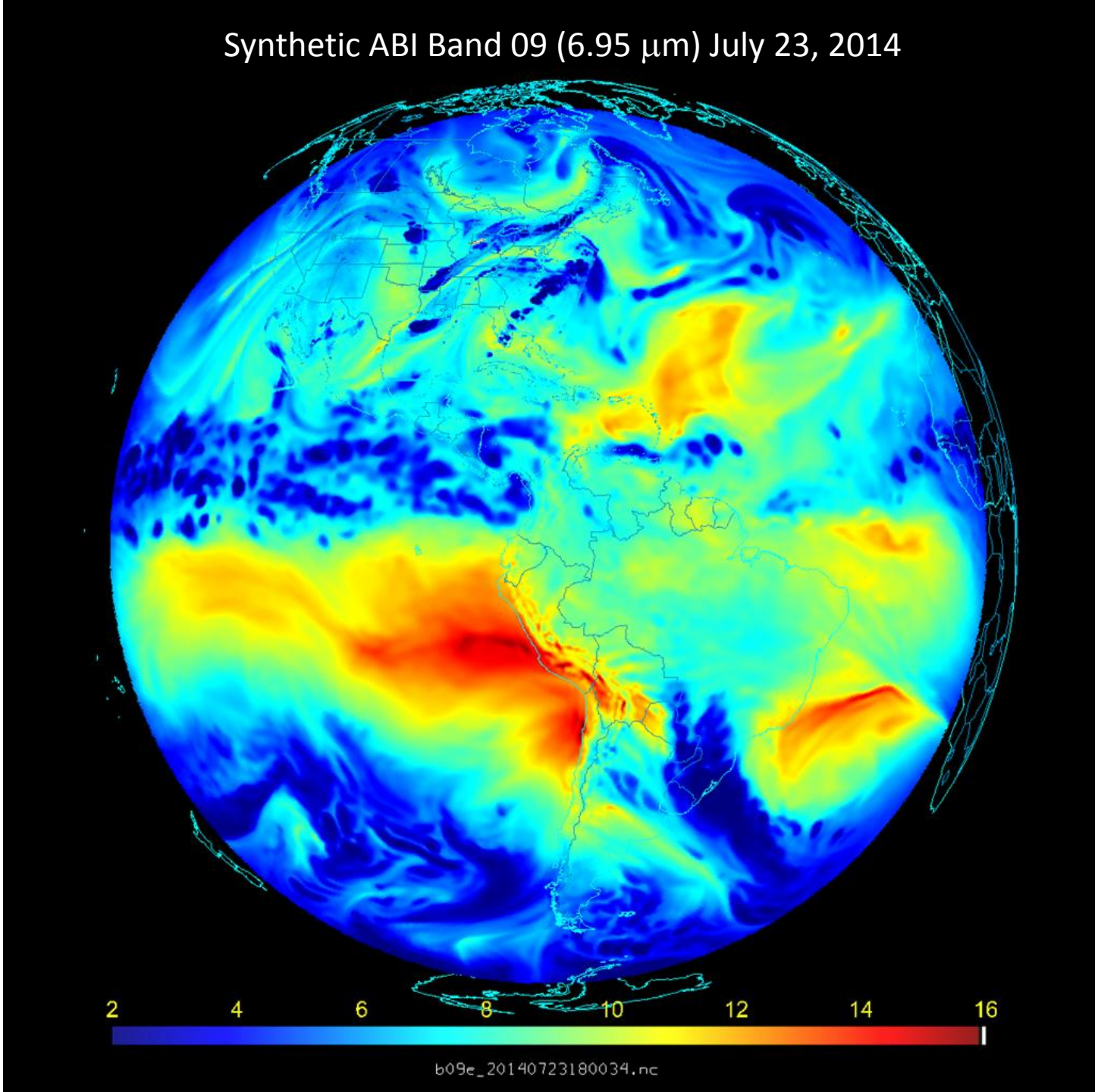
Synthetic ABI Band 08 (6.19 μm) July 23, 2014



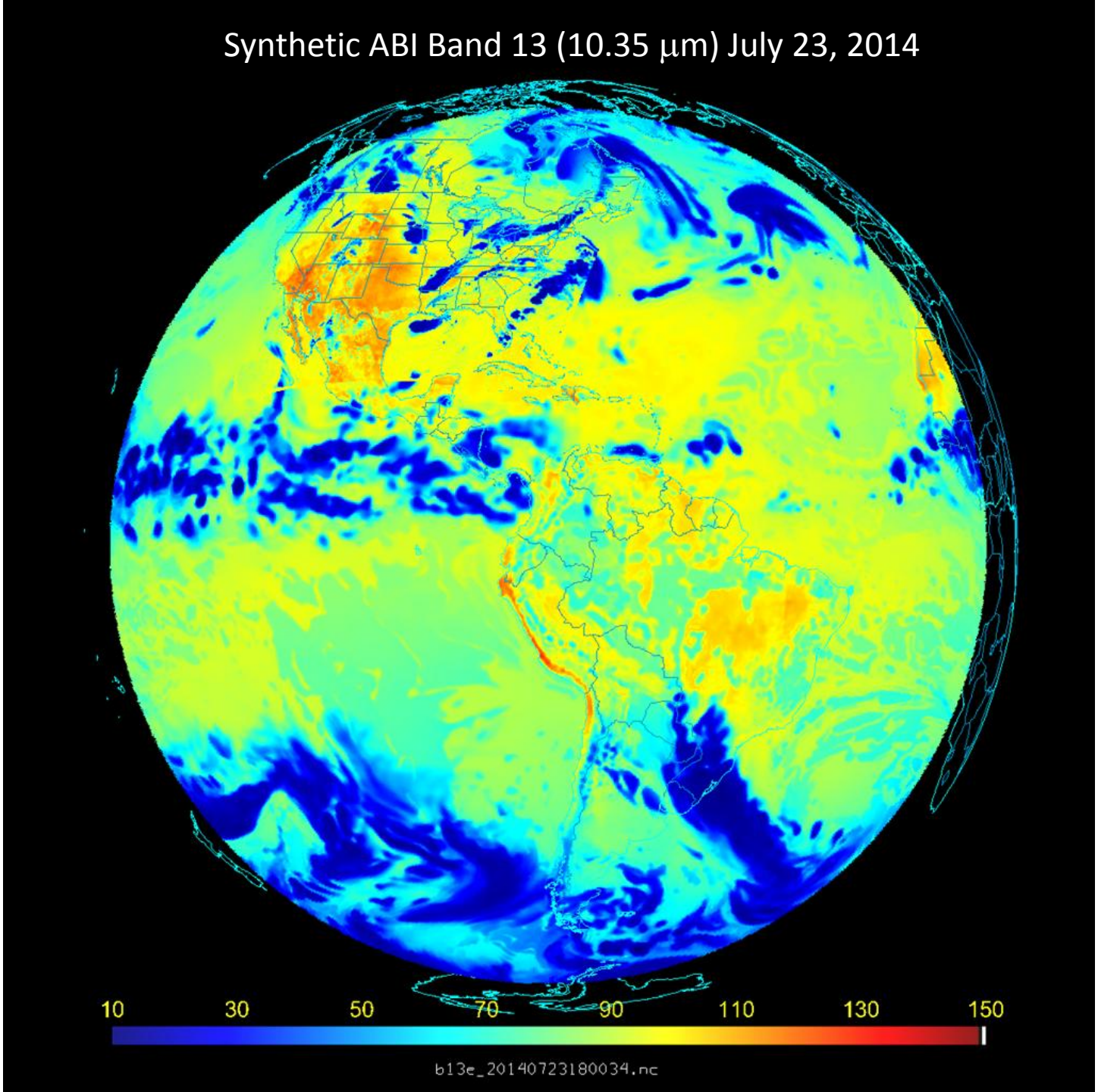
GOES-13 imager 6.5 μm July 23, 2014



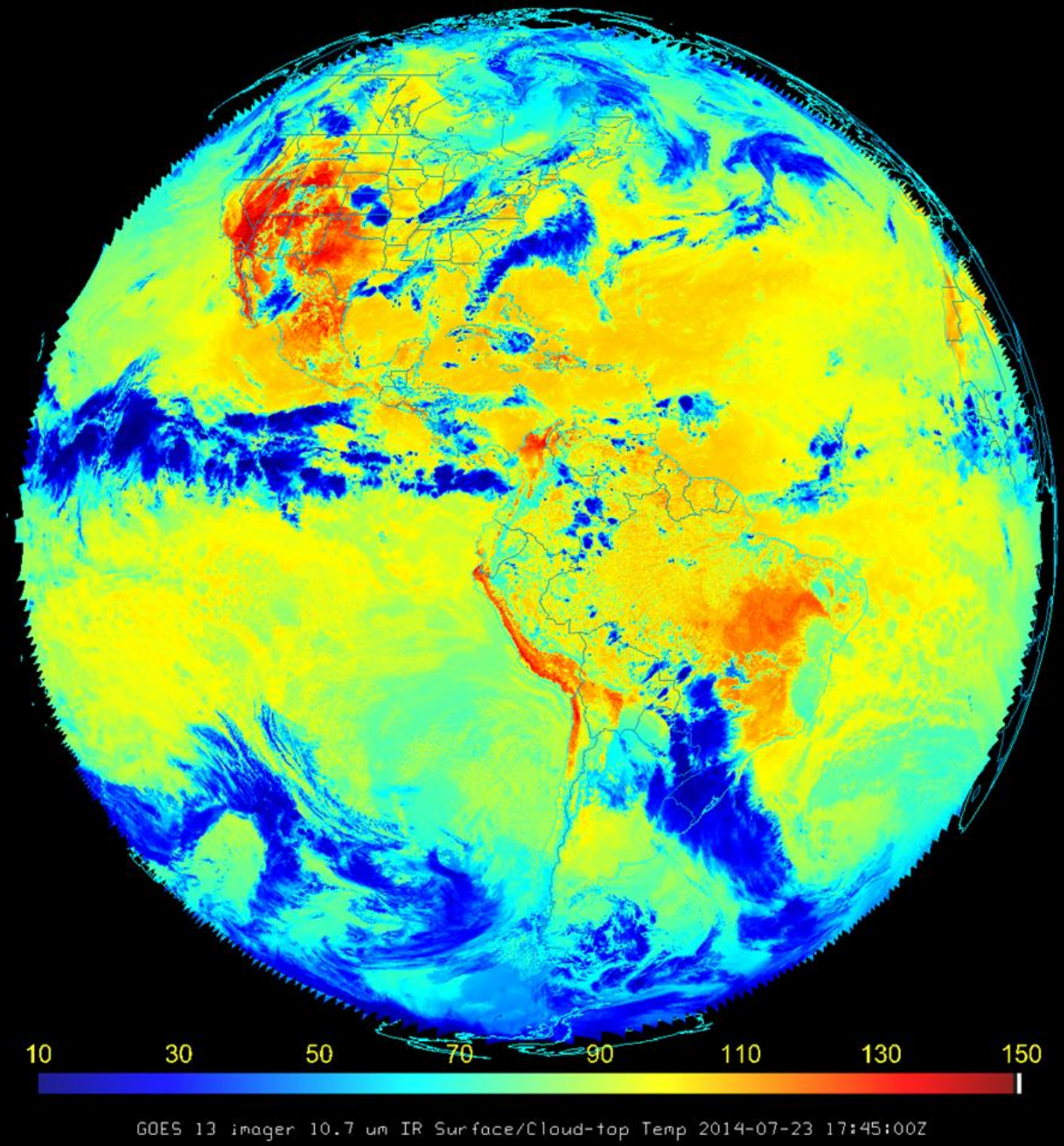
Synthetic ABI Band 09 (6.95 μm) July 23, 2014



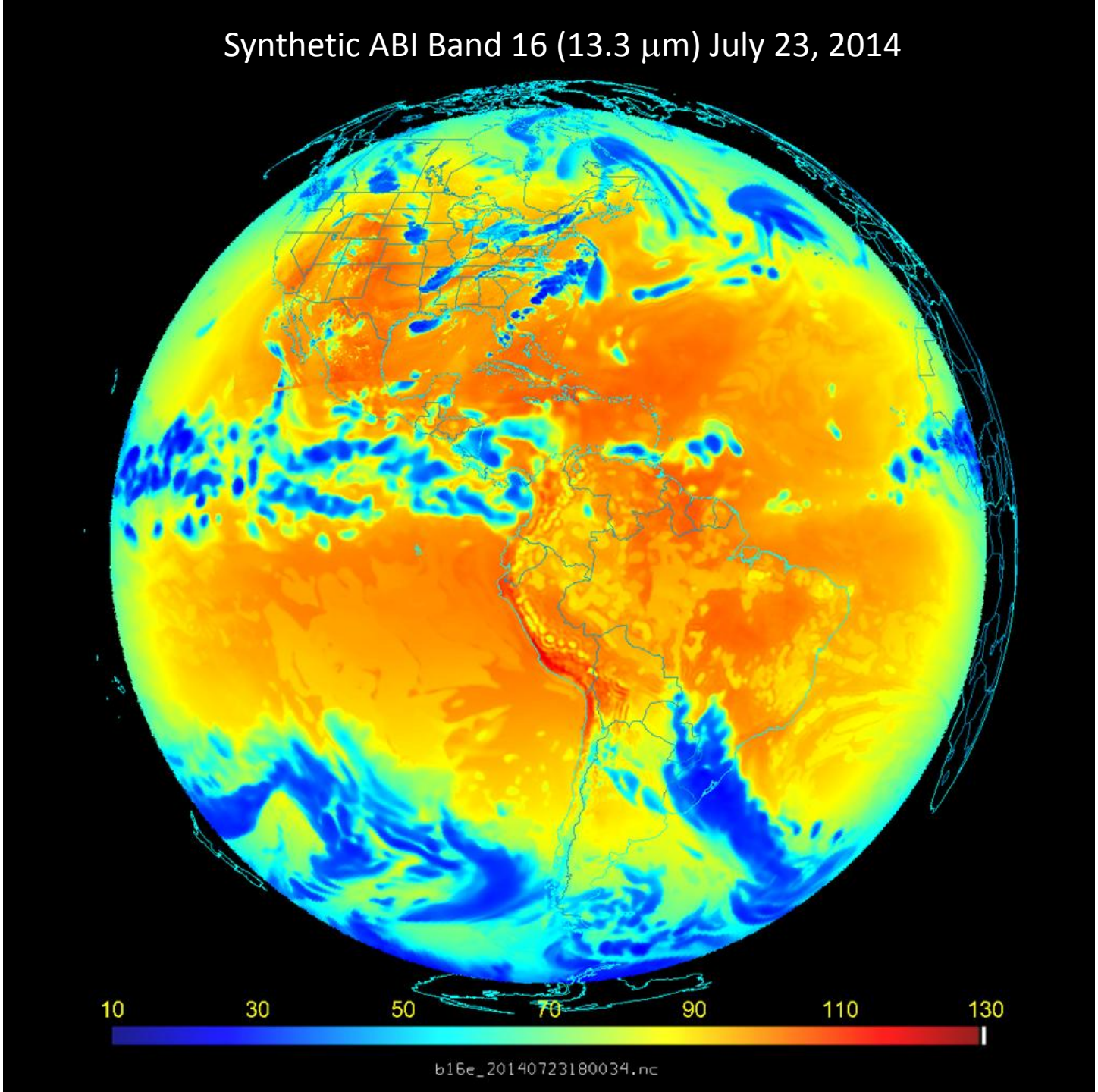
Synthetic ABI Band 13 (10.35 μm) July 23, 2014



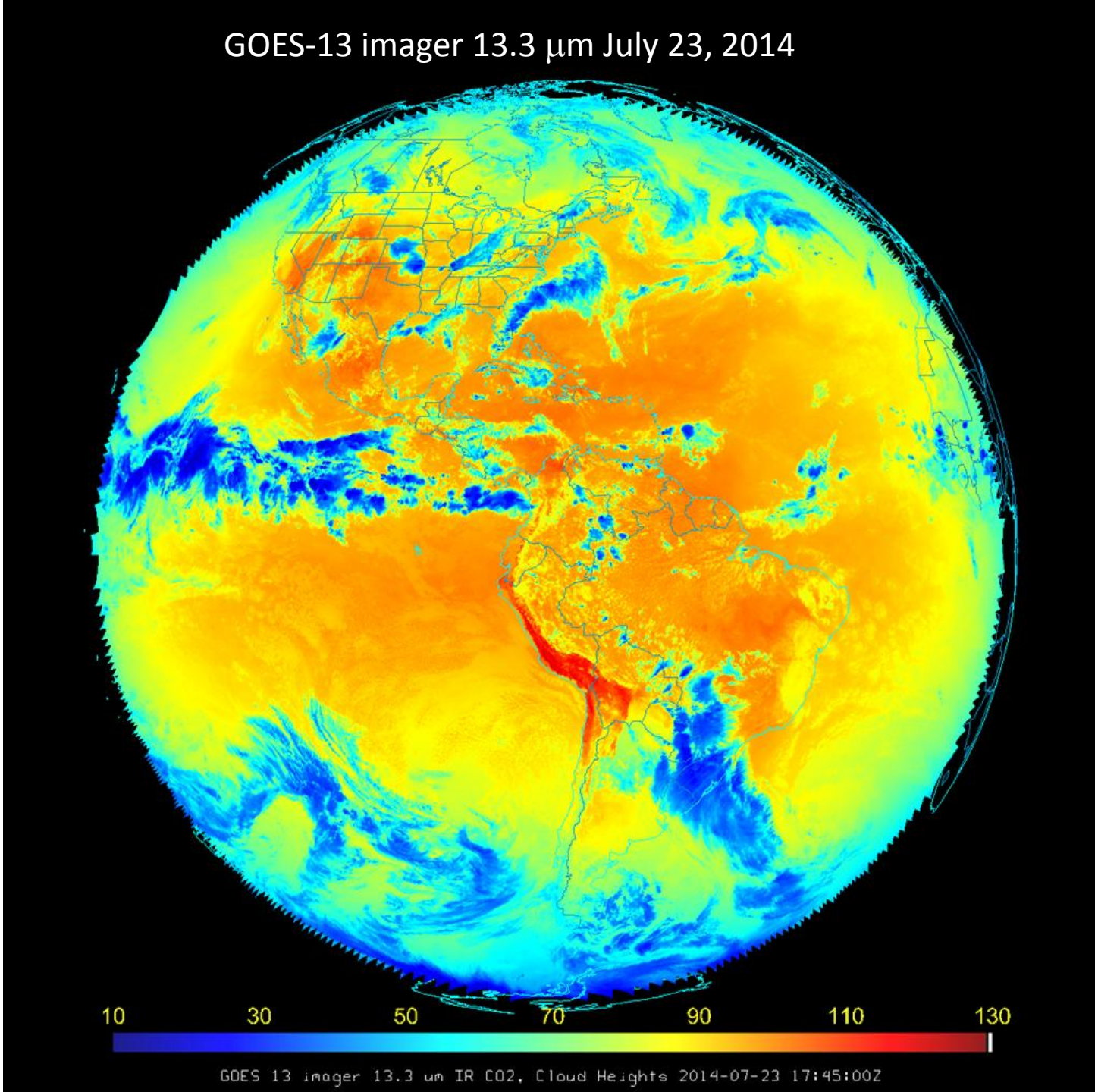
GOES-13 imager 10.7 μm July 23, 2014



Synthetic ABI Band 16 (13.3 μm) July 23, 2014



GOES-13 imager 13.3 μm July 23, 2014



Future Development

- GFS Full Disk Proxy
  - Inclusion of RAQMS Aerosols
  - Inclusion of UW HSR Emissivity
  - Inclusion of MODIS BRDF Reflectance
  - Inclusion of MODIS wildfire signatures
- WRF-CHEM CONUS Proxy
  - 15minute imagery for testing ABI AMV algorithm
  - Inclusion of GOES wildfire signatures

GOES-R ABI Real-time proxy data access

Realtime synthetic radiance imagery:
http://cimss.ssec.wisc.edu/goes_r/proving-ground/wrf_chem_abi/wrf_chem_abi.html

Realtime synthetic retrievals:
http://cimss.ssec.wisc.edu/goes_r/proving-ground/wrf_chem_abi/ABI-PRODUCTS/wrf_chem_abi_prod.html

Realtime synthetic GRB data:
ftp://ftp.ssec.wisc.edu/ABI/REALTIME_PROXY/

Realtime data (on native GFS and WRF-CHEM grid) for GOES-R Ground System Testing:
ftp://ftp.ssec.wisc.edu/ABI/REALTIME_PROXY/DOST/