New satellites, new applications, and future expectations for GOES-R and JPSS

Jordan J. Gerth
Research Meteorologist
@jjgerth

CIMSS SSEC WISCONSIN UNIVERSITY OF WISCONSIN–MADISON

United Launch Alliance Delta II rocket
Space Launch Complex-2 at Vandenberg
Air Force Base in California
Nov. 10, 2017, at 1:47 a.m., PST

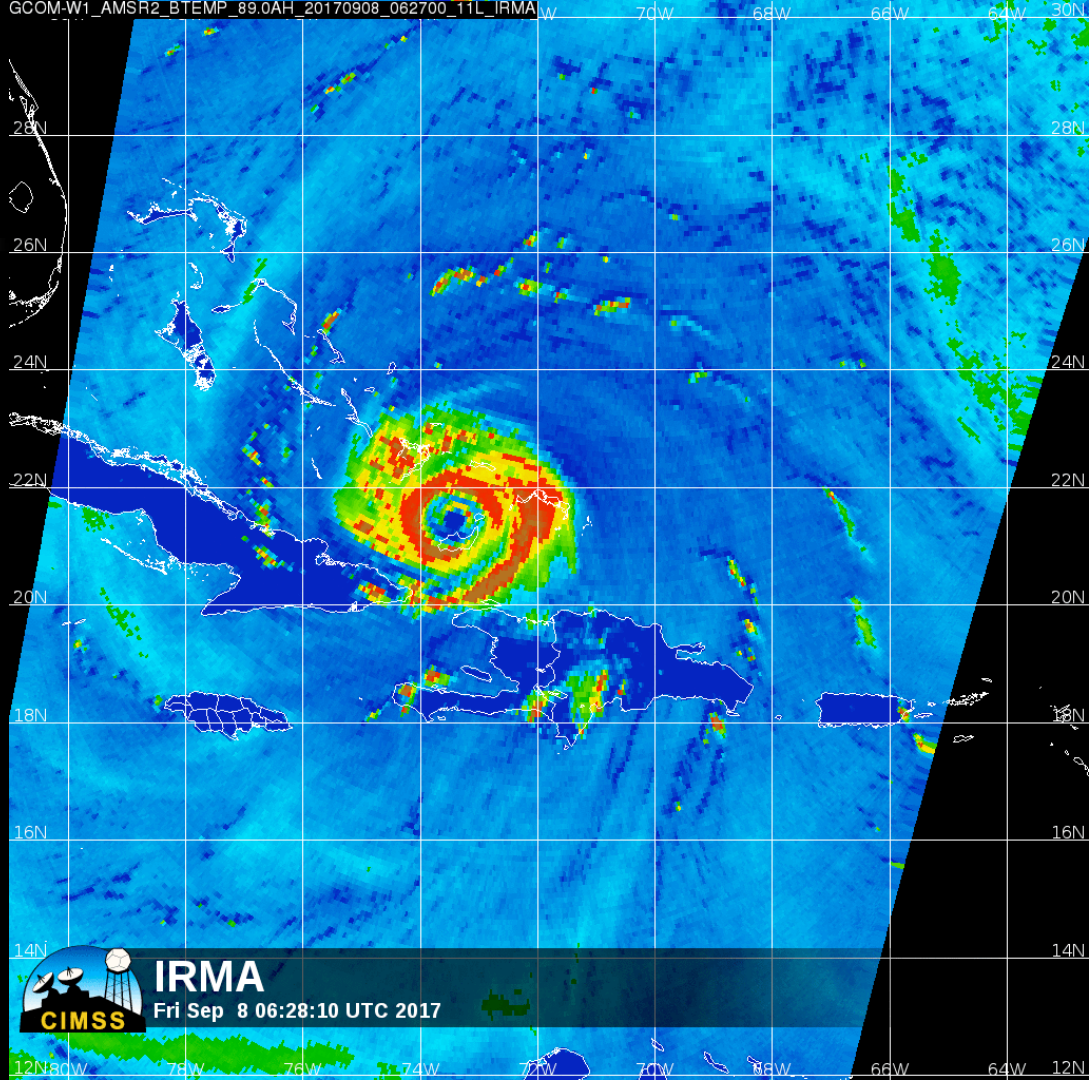
Why JPSS?

Improves global numerical weather prediction model skill

Microwave imagery from ATMS helps identify characteristics of tropical cyclones

NUCAPS profiles can complement radiosondes

Day-night band imagery illuminates nighttime scenes for meteorologists

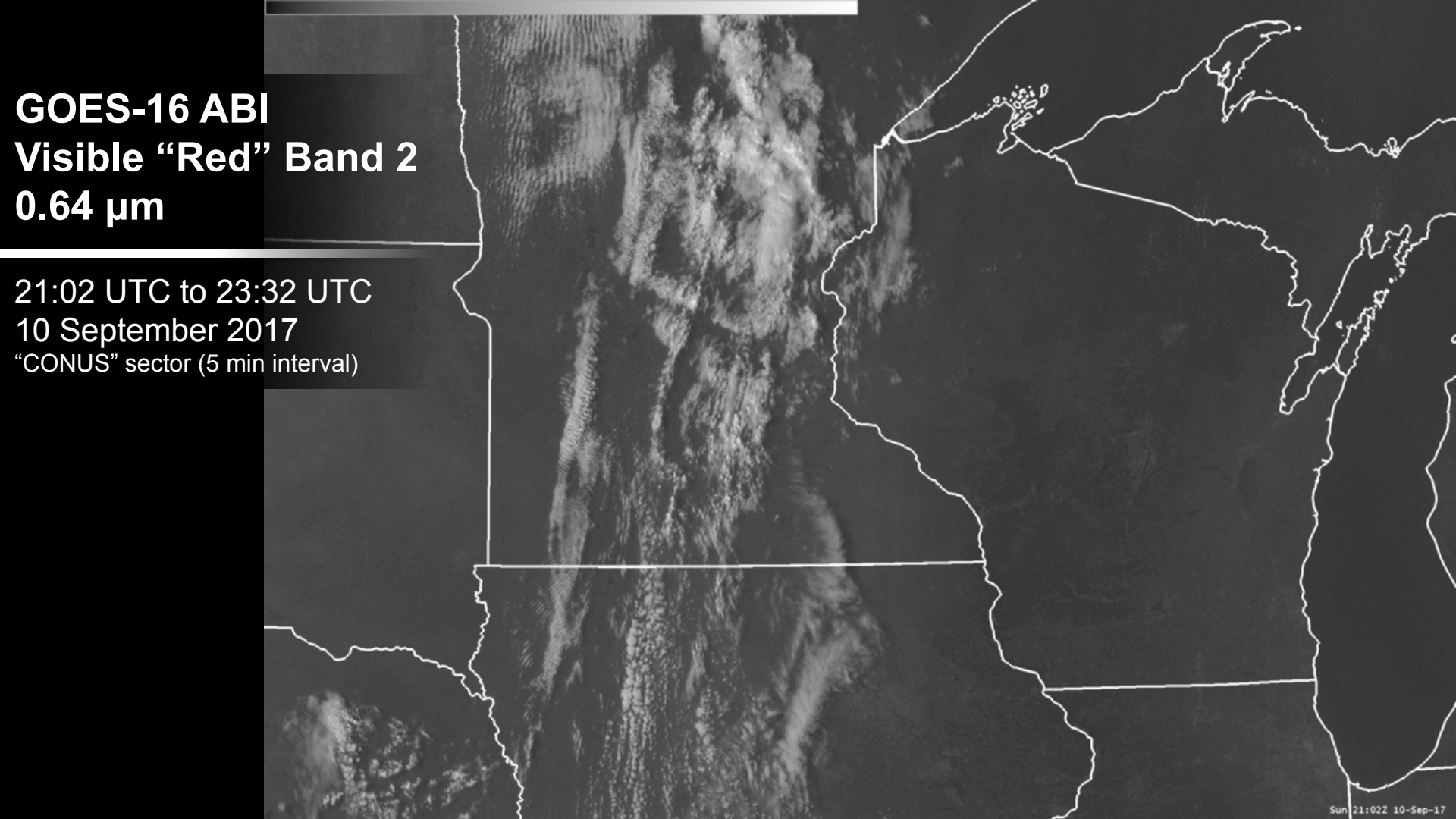


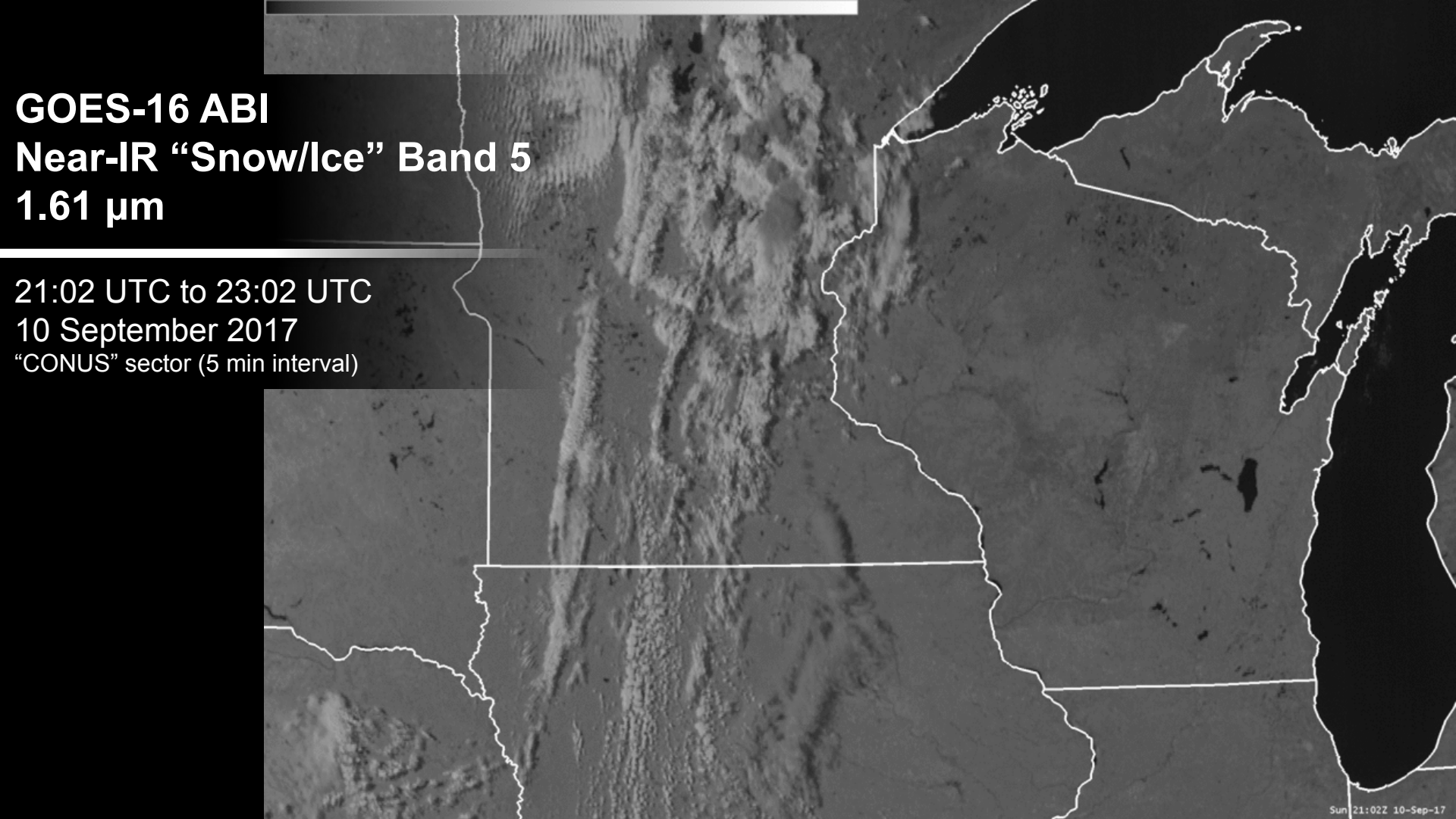
Suomi NPP VIIRS
Day-Night Band (DNB)
0.7 µm
7:10 UTC
11 September 2017
Big Pine Key
Sugarloaf Key
West
* NPP VIIRS Moderate 0.7Ref 0:13 Begn Mon 07:10Z 11-Sep-17
Credit:
Scott Lindstrom

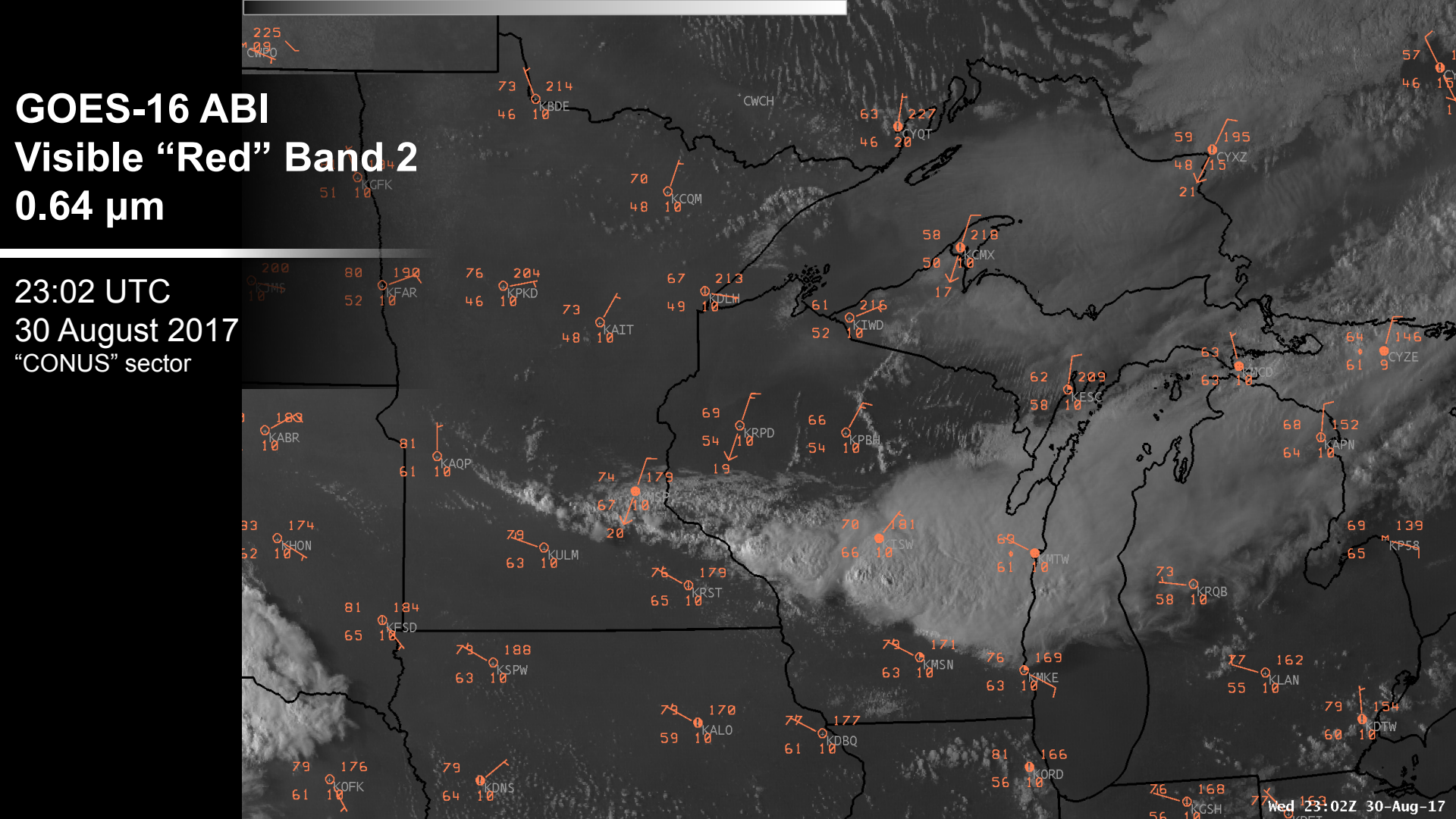
Better, Better, Better:
To the Near-Infrared, and Beyond!

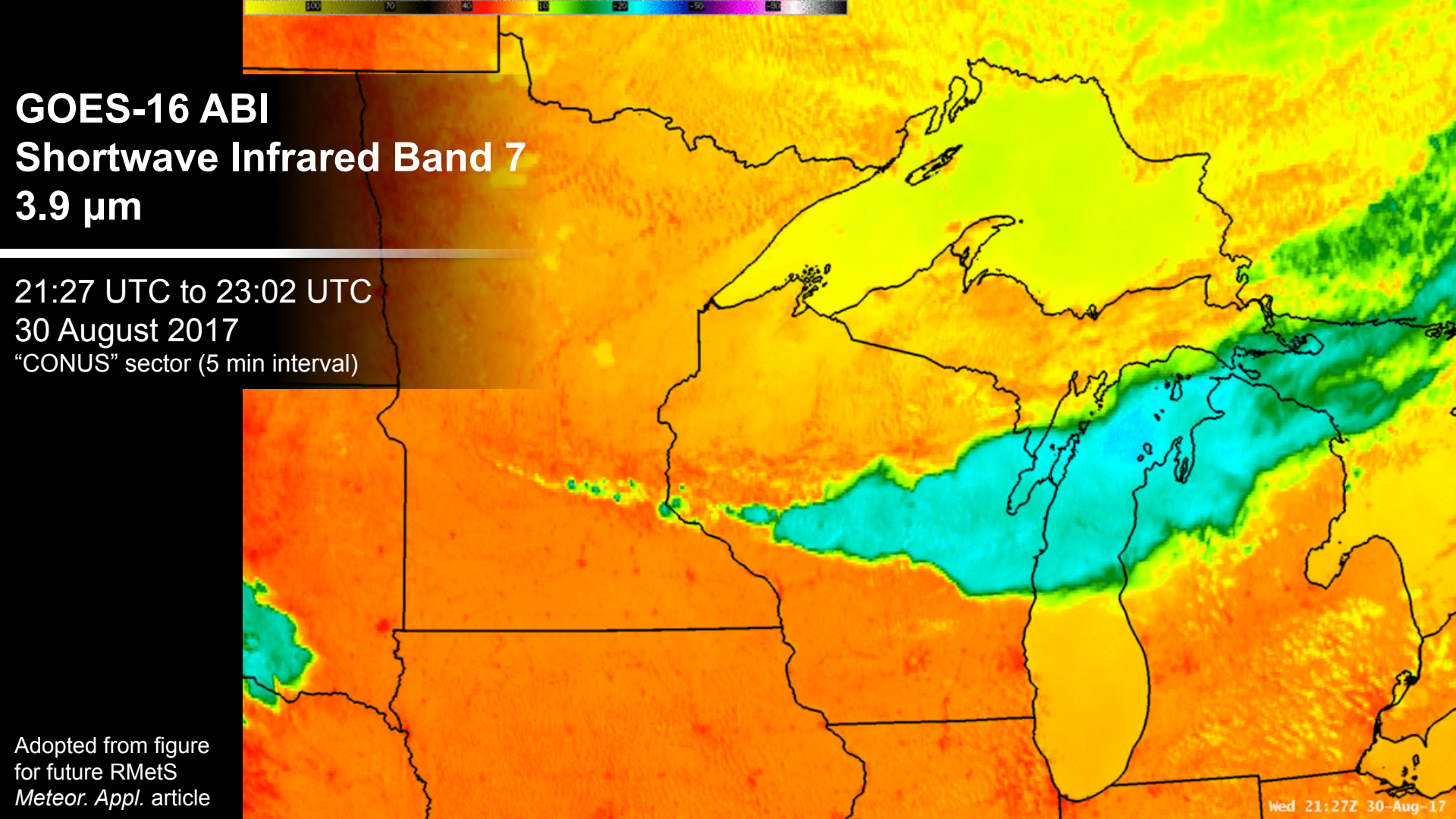
Don’t overlook these GOES-16 bands:

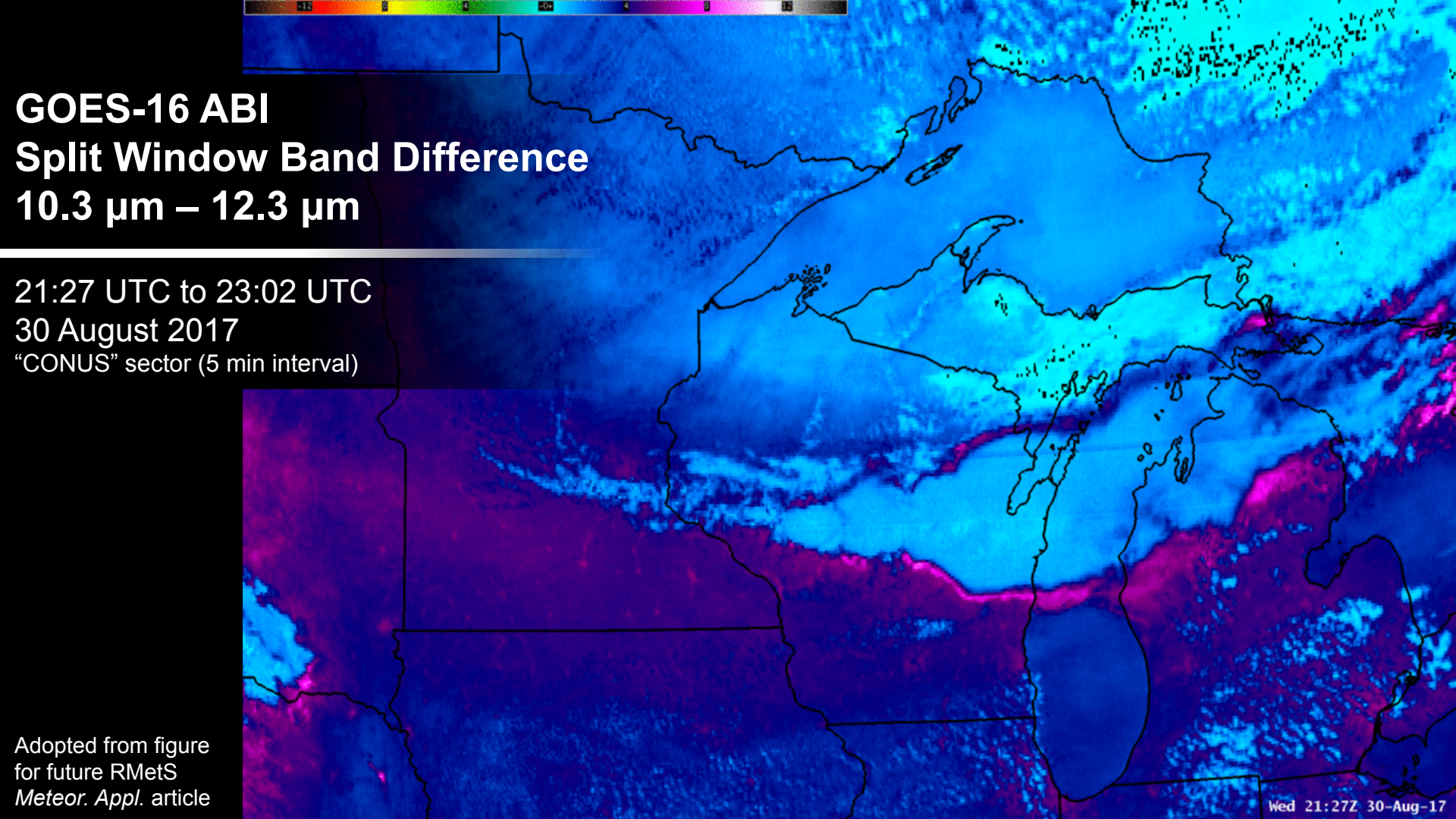
- “Snow/Ice” Band 5 (1.6 μm)
- “Shortwave Infrared” Band 7 (3.9 μm)
- “Dirty Longwave Infrared” Band 15 (12.3 μm)


GOES-16 ABI
Visible “Red” Band 2
0.64 µm
21:02 UTC to 23:32 UTC
10 September 2017
“CONUS” sector (5 min interval)
Sun 21:02Z 10-Sep-17


GOES-16 ABI
Near-IR “Snow/Ice” Band 5
1.61 µm
21:02 UTC to 23:02 UTC
10 September 2017
“CONUS” sector (5 min interval)
Sun 21:02Z 10-Sep-17


GOES-16 ABI
Visible “Red” Band 2
0.64 µm
23:02 UTC
30 August 2017
“CONUS” sector
Wed 23:02Z 30-Aug-17

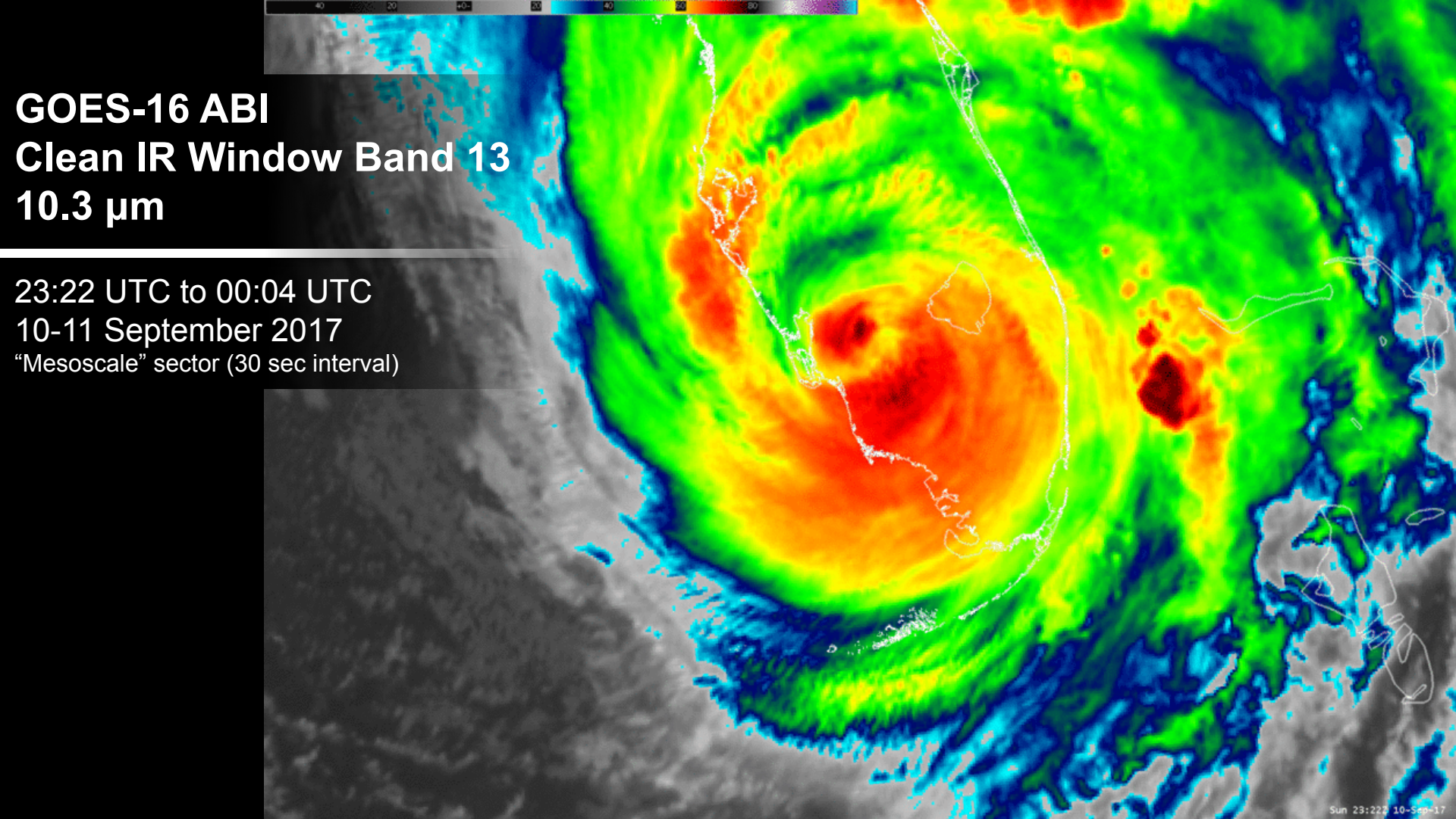

GOES-16 ABI
Shortwave Infrared Band 7
3.9 µm
21:27 UTC to 23:02 UTC
30 August 2017
“CONUS” sector (5 min interval)
Adopted from figure
for future RMetS
Meteor. Appl. article
Wed 21:27Z 30-Aug-17

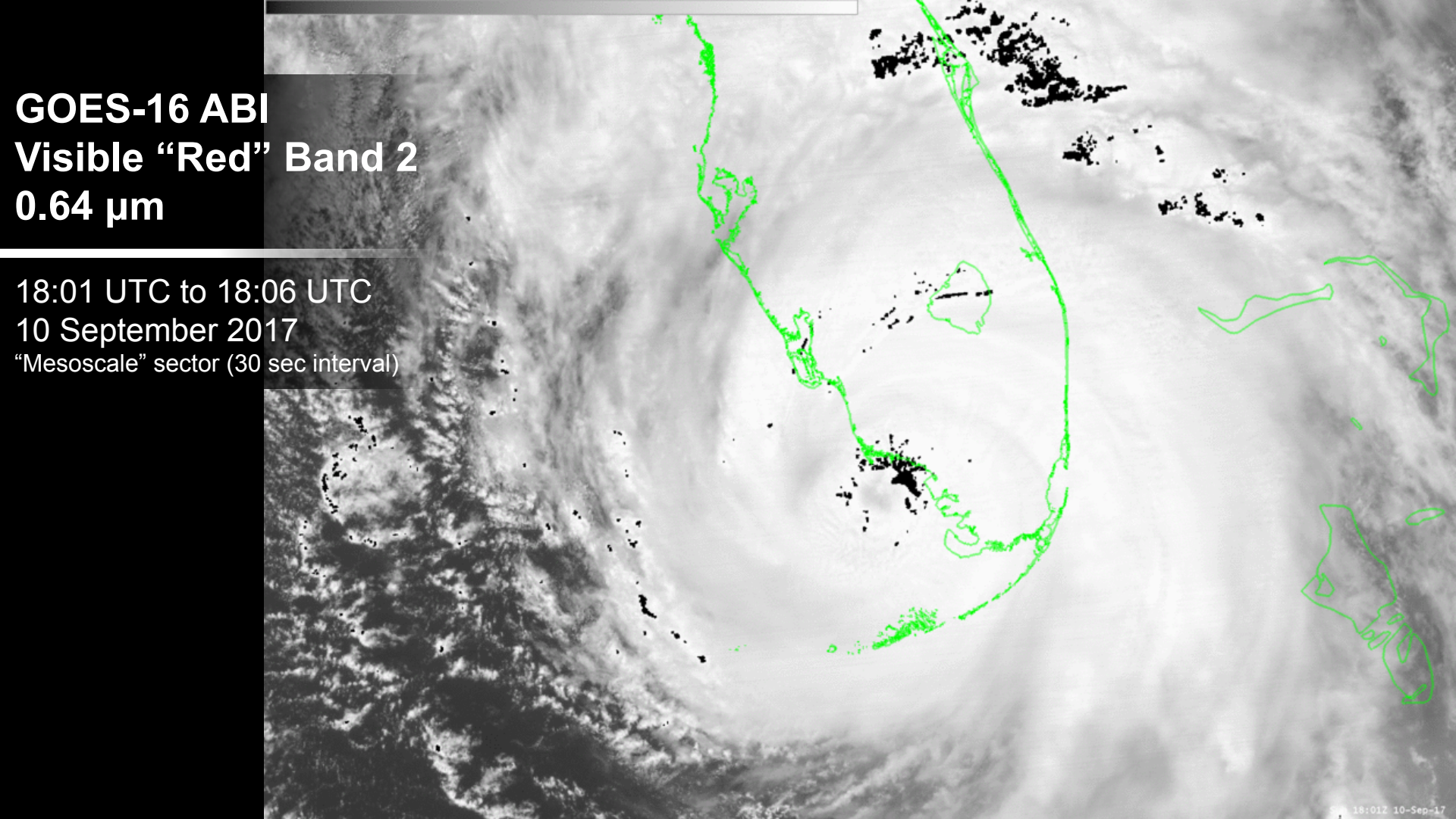

GOES-16 ABI
Split Window Band Difference
10.3 µm – 12.3 µm
21:27 UTC to 23:02 UTC
30 August 2017
“CONUS” sector (5 min interval)
Adopted from figure
for future RMetS
Meteor. Appl. article
Wed 21:27Z 30-Aug-17

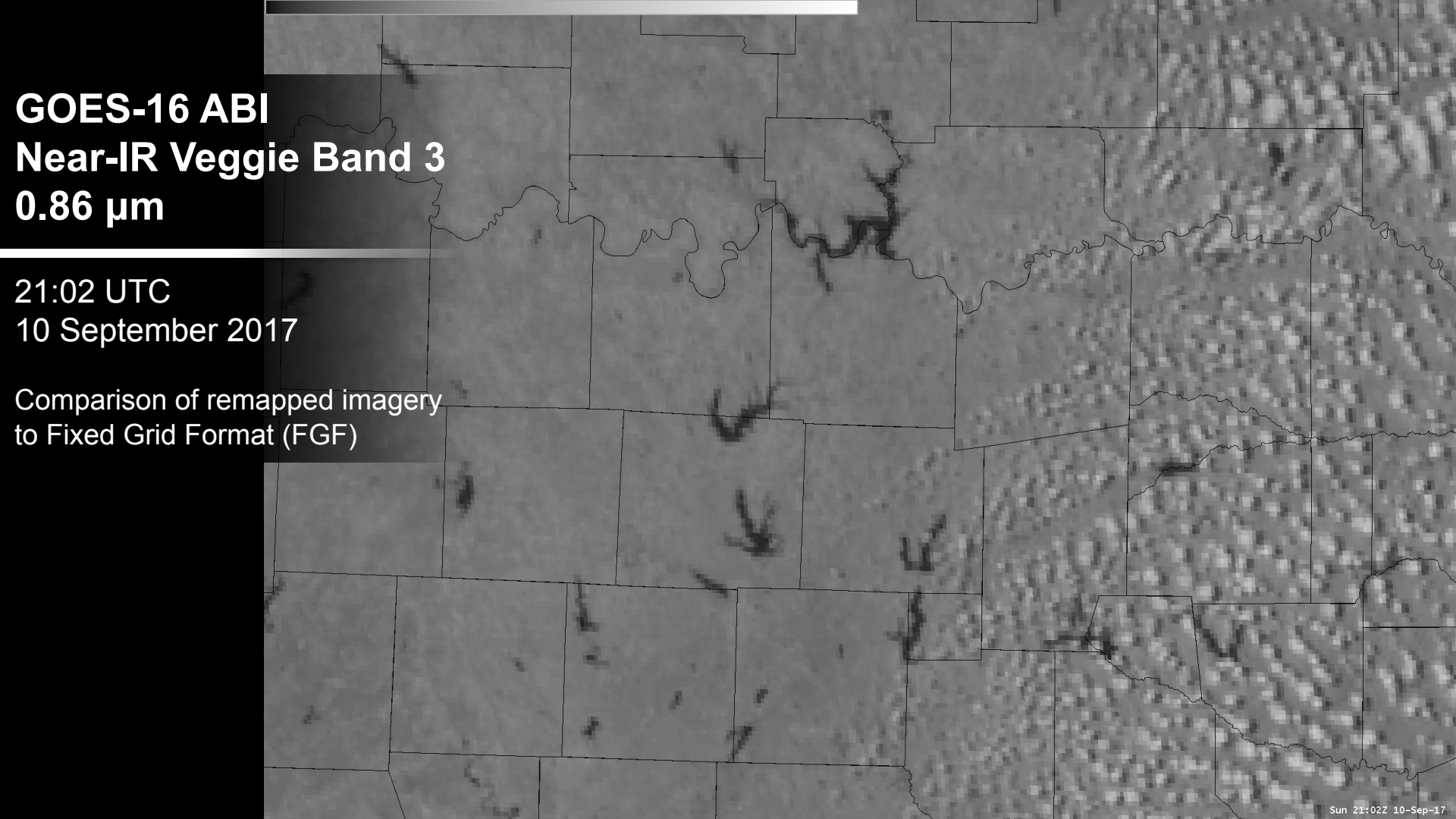
Preliminary, Non-Operational

GOES-16 imagery issues yet to resolve include:

- Time-consistent calibration for mesoscale and CONUS sector infrared bands
  - No, that storm isn't "pulsing"
- Allowing SBN/SCMI reflectance values over 100%
  - Possibility as high as 127.5%
- Sending SBN/SCMI in Fixed Grid Format (FGF)
  - Testing underway

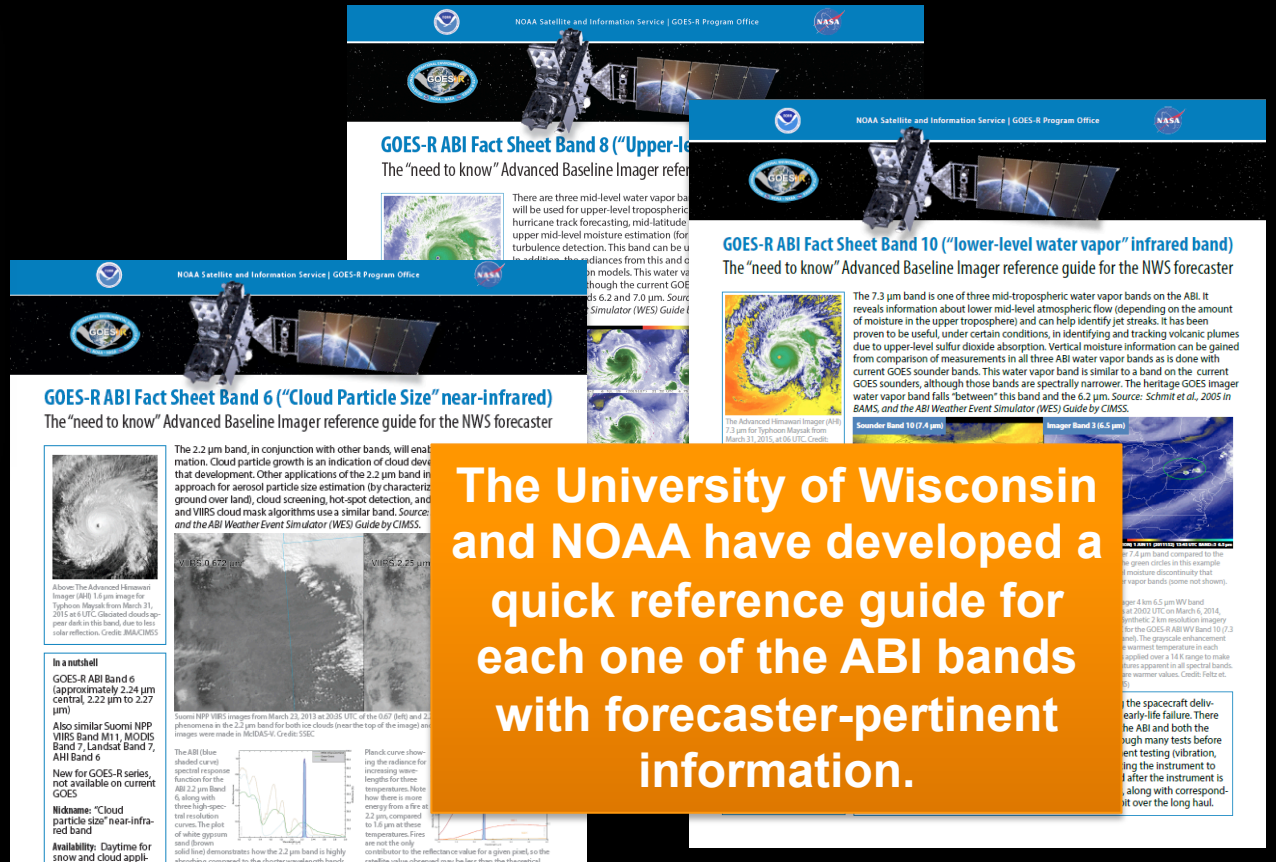

GOES-16 ABI
Clean IR Window Band 13
10.3 µm
23:22 UTC to 00:04 UTC
10-11 September 2017
“Mesoscale” sector (30 sec interval)


GOES-16 ABI
Visible “Red” Band 2
0.64 µm
18:01 UTC to 18:06 UTC
10 September 2017
“Mesoscale” sector (30 sec interval)


GOES-16 ABI
Near-IR Veggie Band 3
0.86 µm
21:02 UTC
10 September 2017
Comparison of remapped imagery
to Fixed Grid Format (FGF)
Sun 21:02Z 10-Sep-17

ABI Quick Reference Guides

goes-r.gov



The University of Wisconsin and NOAA have developed a quick reference guide for each one of the ABI bands with forecaster-pertinent information.

Satellite Information Familiarization Tool (SIFT)

Open Source Software from the Cooperative Institute for Meteorological Satellite Studies

Basic Information

- Latest version is 0.9.4
- Free downloads available for Windows, Mac, and Linux operating systems
- Can display imagery from ABI (downloadable from CLASS) and AHI
- Supports training for predominantly the National Weather Service (NWS)

Recent Developments

- Improved performance to handle multiple bands for multiple times over full disk
- Support for Lambert Conformal, Mercator, and geostationary map projections over CONUS and Pacific Basin
- Ability to customize imagery and produce RGB composites and band differences “on the fly”
- Can output image files

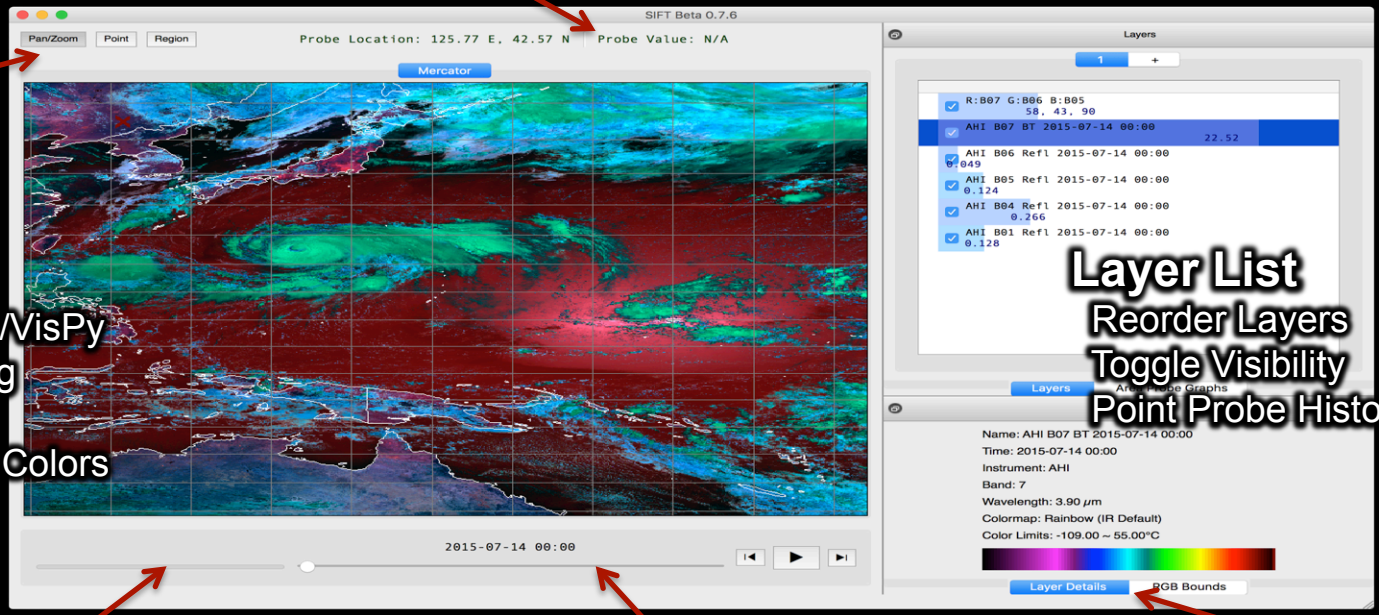
https://sift.ssec.wisc.edu/

SIFT Features and Functions

Point Probe Results

Tools
- Pan/Zoom
- Point Probe
- Area Selector

Map Display
- Powered by OpenGL/VisPy
- Panning and Zooming
- Dynamic Resolution
- Configurable Outline Colors



Layer List
- Reorder Layers
- Toggle Visibility

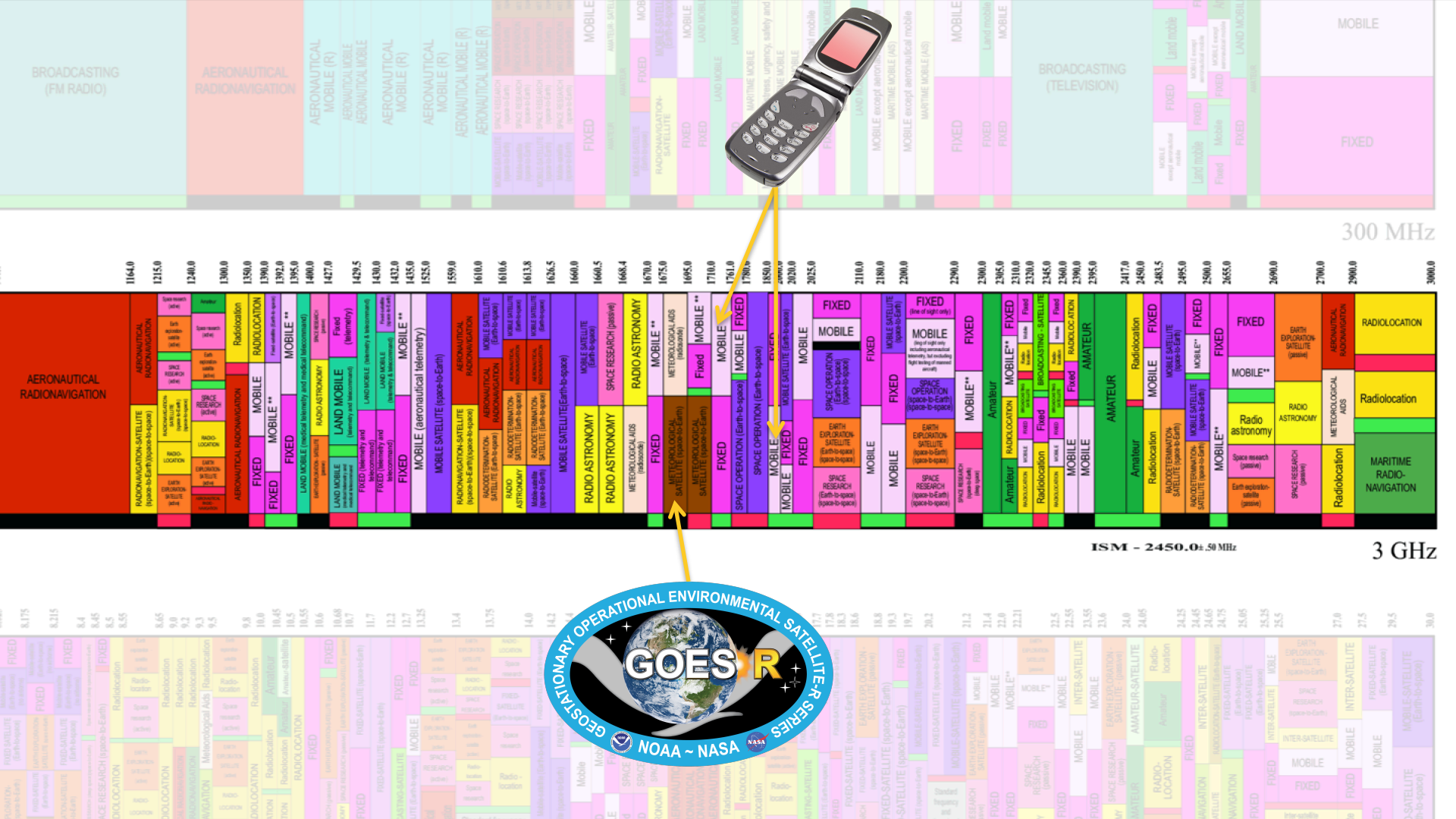
Point Probe Histogram

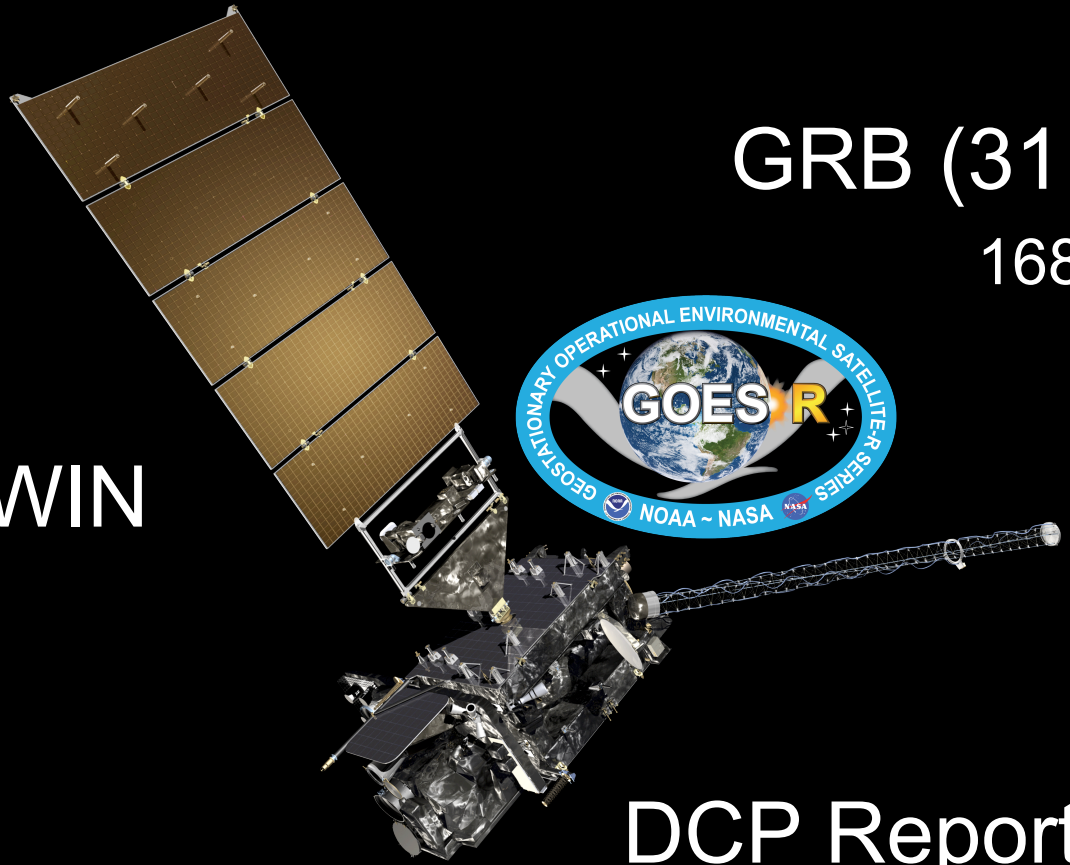
Background Task Status

Animation Control
- Step-through or Autoplay
- Adjustable Speed Control

Layer Metadata
- Band Information
- Color Bar and Limits

Radio Frequency Interference


300 MHz
3 GHz
ISM – 2450.0±.50 MHz
AERONAUTICAL RADIONAVIGATION
RADIONAVIGATION-SATELLITE (space-to-Earth)(space-to-space)
FIXED
MOBILE
MOBILE **
FIXED
LAND MOBILE (medical telemetry and medical telecommand)
MOBILE (aeronautical telemetry)
MOBILE SATELLITE (space-to-Earth)
RADIOLOCATION
AERONAUTICAL RADIONAVIGATION
RADIONAVIGATION-SATELLITE (space-to-Earth)(space-to-space)
RADIODETERMINATION-SATELLITE (Earth-to-space)
RADIO ASTRONOMY
MOBILE SATELLITE(Earth-to-space)
SPACE RESEARCH (passive)
RADIO ASTRONOMY
RADIO ASTRONOMY
MOBILE **
METEOROLOGICAL AIDS (radiosonde)
FIXED
METEOROLOGICAL SATELLITE (space-to-Earth)
MOBILE **
Fixed
MOBILE
FIXED
MOBILE
FIXED
SPACE OPERATION (Earth-to-space)
MOBILE
FIXED
MOBILE SATELLITE (Earth-to-space)
MOBILE
FIXED
FIXED
MOBILE
SPACE OPERATION (space-to-Earth)
EARTH EXPLORATION-SATELLITE (Earth-to-space)
SPACE RESEARCH (Earth-to-space)
FIXED
MOBILE
MOBILE SATELLITE (space-to-Earth)
FIXED (line of sight only)
MOBILE (line of sight only, including aeronautical telemetry, but excluding flight testing of manned aircraft)
SPACE OPERATION (space-to-Earth)(space-to-space)
EARTH EXPLORATION-SATELLITE (space-to-Earth)(space-to-space)
SPACE RESEARCH (space-to-Earth)(space-to-space)
MOBILE **
FIXED
SPACE RESEARCH (space-to-Earth) (deep space)
Amateur
AMATEUR
AMATEUR
Amateur
Radiolocation
MOBILE
MOBILE SATELLITE (space-to-Earth)
RADIODETERMINATION-SATELLITE (space-to-Earth)
MOBILE **
FIXED
MOBILE **
Radio astronomy
Space research (passive)
Earth exploration-satellite (passive)
FIXED
MOBILE **
RADIO ASTRONOMY
SPACE RESEARCH (passive)
EARTH EXPLORATION-SATELLITE (passive)
Radiolocation
METEOROLOGICAL AIDS
AERONAUTICAL RADIONAVIGATION
RADIOLOCATION
Radiolocation
MARITIME RADIO-NAVIGATION
GEOSTATIONARY OPERATIONAL ENVIRONMENTAL SATELLITE-R SERIES
GOES R
NOAA ~ NASA



GRB (31 Mbps)

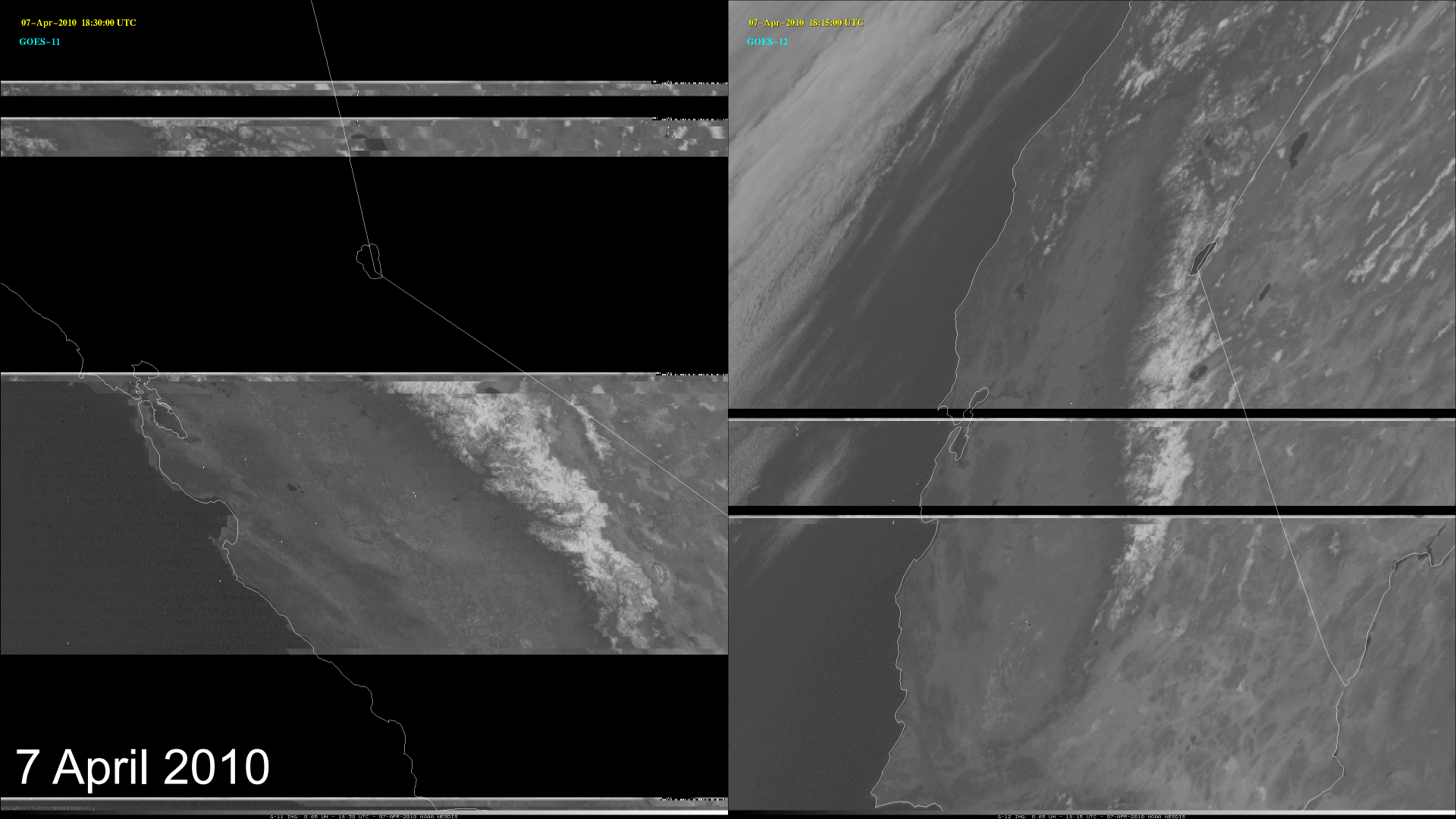
1686.6 MHz

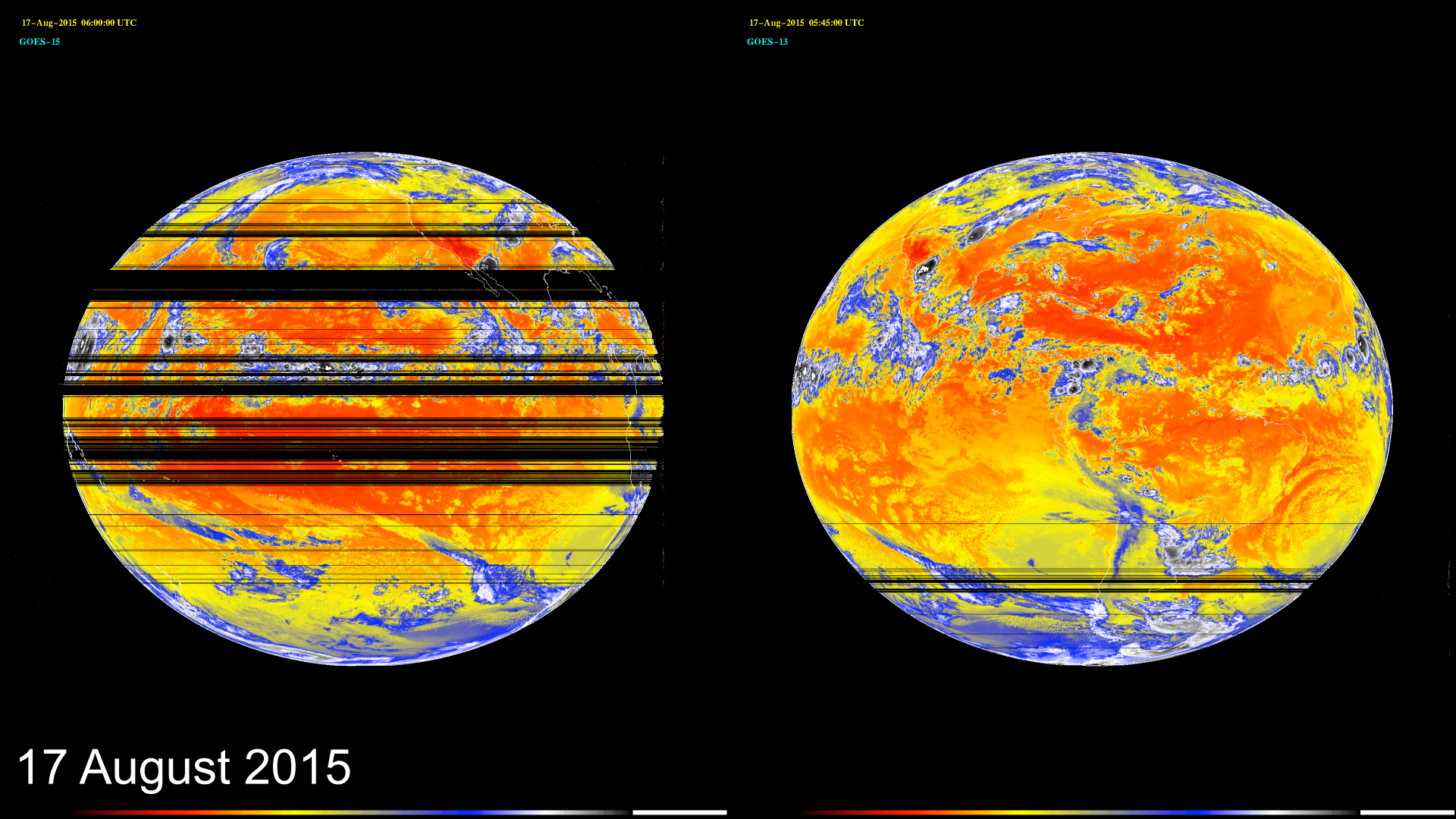
HRIT/EMWIN

1694.1 MHz

DCP Report Relay

1679.9 MHz and 1680.2 MHz


07-Apr-2010 18:30:00 UTC
GOES-11
07-Apr-2010 18:15:00 UTC
GOES-12
7 April 2010


17-Aug-2015 06:00:00 UTC
GOES-15
17-Aug-2015 05:45:00 UTC
GOES-13
17 August 2015

NWA Advocacy

- “The NWA is concerned that radio frequency interference from strong terrestrial signals will disrupt the timely and reliable receipt of meteorological data in this spectrum, negatively impacting the readiness of American communities for severe weather.”
- “The NWA opposes sharing of the 1675-1680 megahertz spectrum and requests that it be DELETED from the bandwidth under consideration in the [MOBILE NOW Act] for fixed and wireless applications.”

NWA Letter to U.S. Senator John Thune,
Chairman, Senate Committee on Commerce, Science, and Transportation
2 March 2016

FCC.gov

RM-16681

Questions? Comments?

Contact

Jordan.Gerth@noaa.gov

For more great examples, visit

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

or stop by the JPSS booth in the exhibit hall!