SIFT: A Python-based user interface for visualizing meteorological satellite imagery

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CIMSS

SSEC

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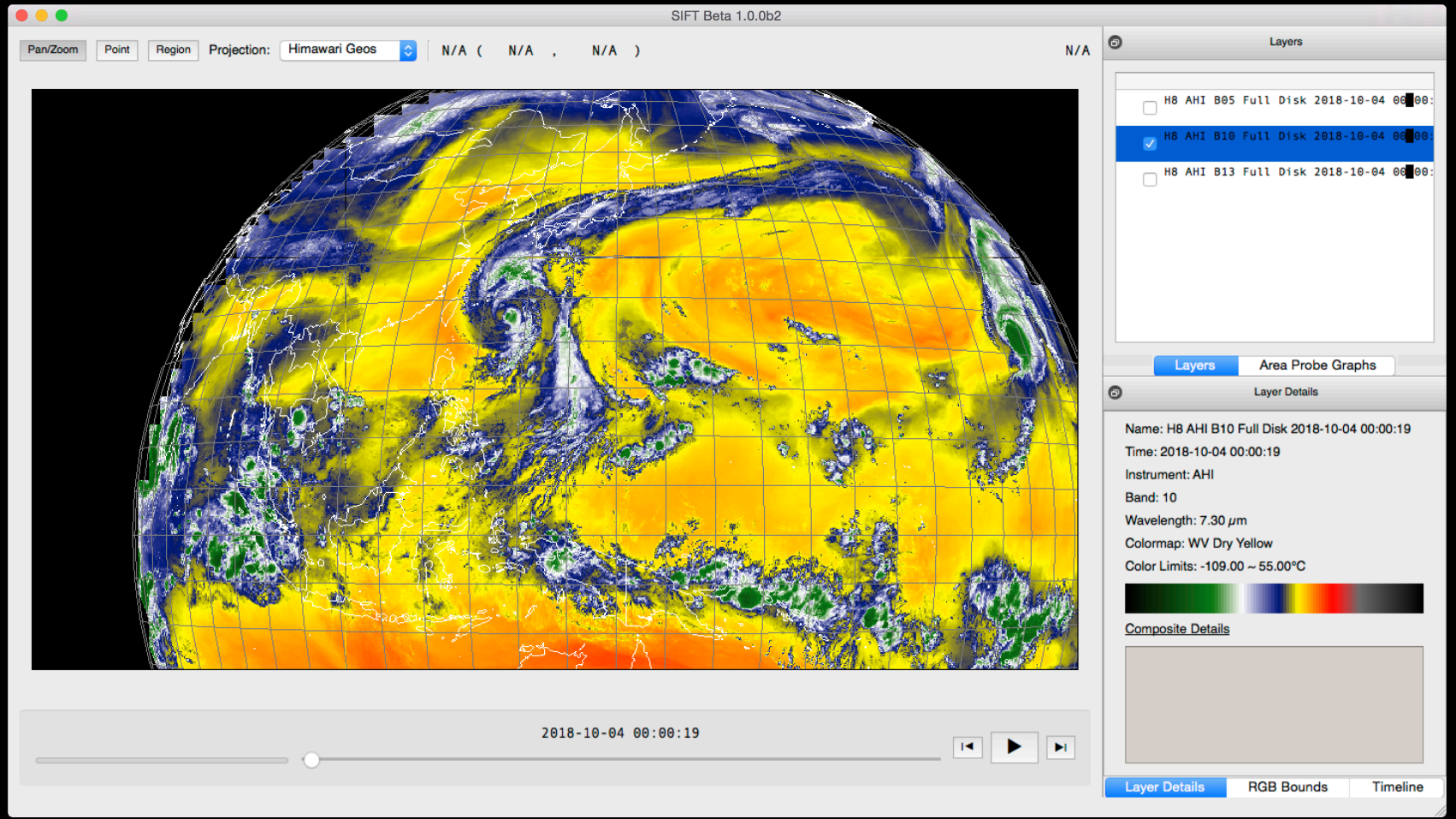
Typical Software Complaints

- Complex user interface
- Simple tasks are not intuitive to complete
- Difficult to find/create the right data format(s)
- Cannot use the same software for different satellites or data sets
- Cost
- Poor performance
- Cannot easily export images or animations for presentations or papers
- International colleagues use different software
- Not for all major operating systems

Satellite **I**nformation **F**amiliarization **T**ool

An easy graphical user interface for meteorological satellite users


SIFT Beta 1.0.0b2
Pan/Zoom
Point
Region
Projection:
Himawari Geos
N/A (N/A , N/A)
N/A
Layers
H8 AHI B05 Full Disk 2018-10-04 00:00:
H8 AHI B10 Full Disk 2018-10-04 00:00:
H8 AHI B13 Full Disk 2018-10-04 00:00:
Layers
Area Probe Graphs
Layer Details
Name: H8 AHI B10 Full Disk 2018-10-04 00:00:19
Time: 2018-10-04 00:00:19
Instrument: AHI
Band: 10
Wavelength: 7.30 μm
Colormap: WV Dry Yellow
Color Limits: -109.00 ~ 55.00°C
Composite Details
Layer Details
RGB Bounds
Timeline
2018-10-04 00:00:19

About SIFT

- Open source
- Based on Python
- Originally developed for the United States National Weather Service (NWS) in 2015
- Now open to community development
- Free (GPLv3 license)

About SIFT

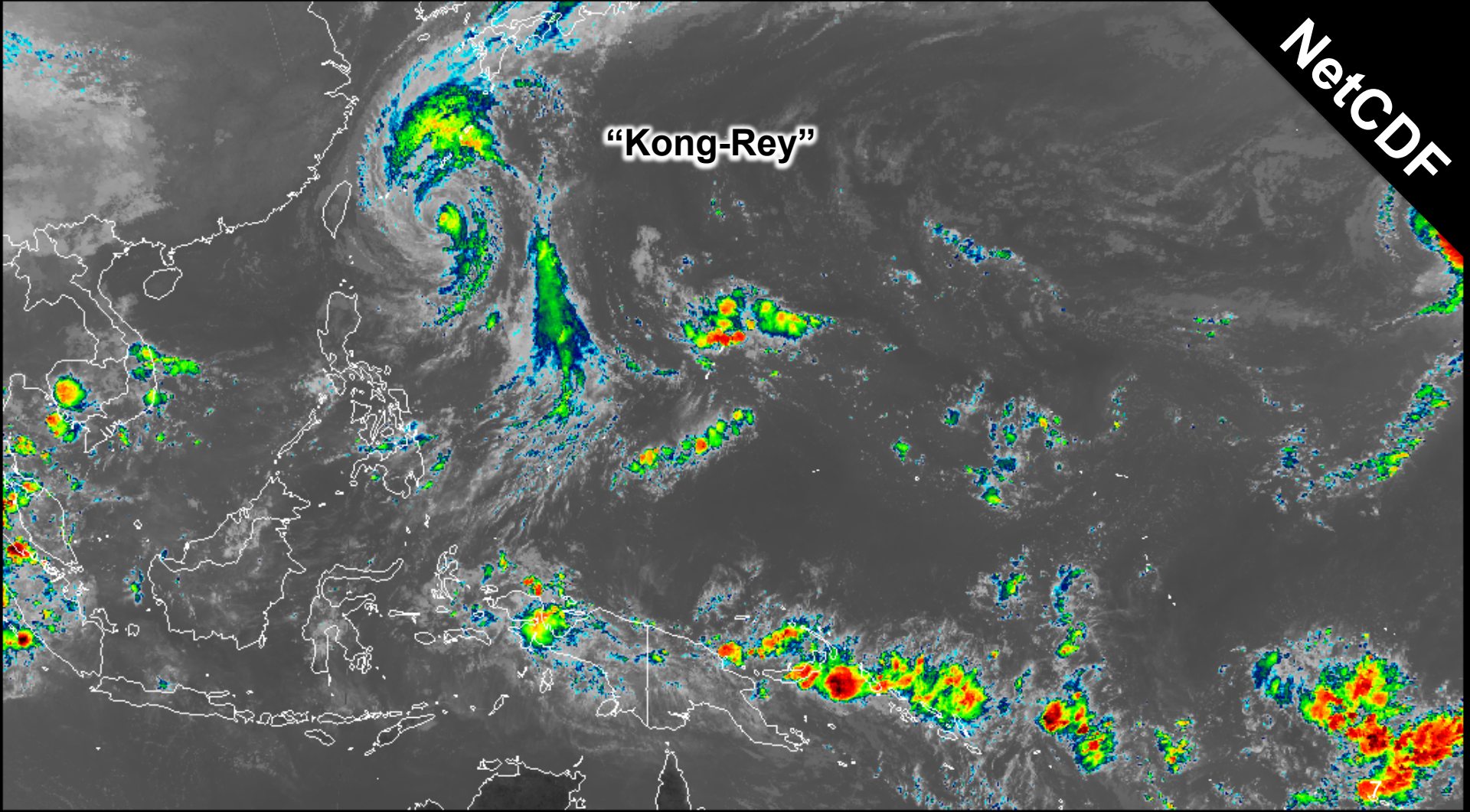
Current operating systems supported:

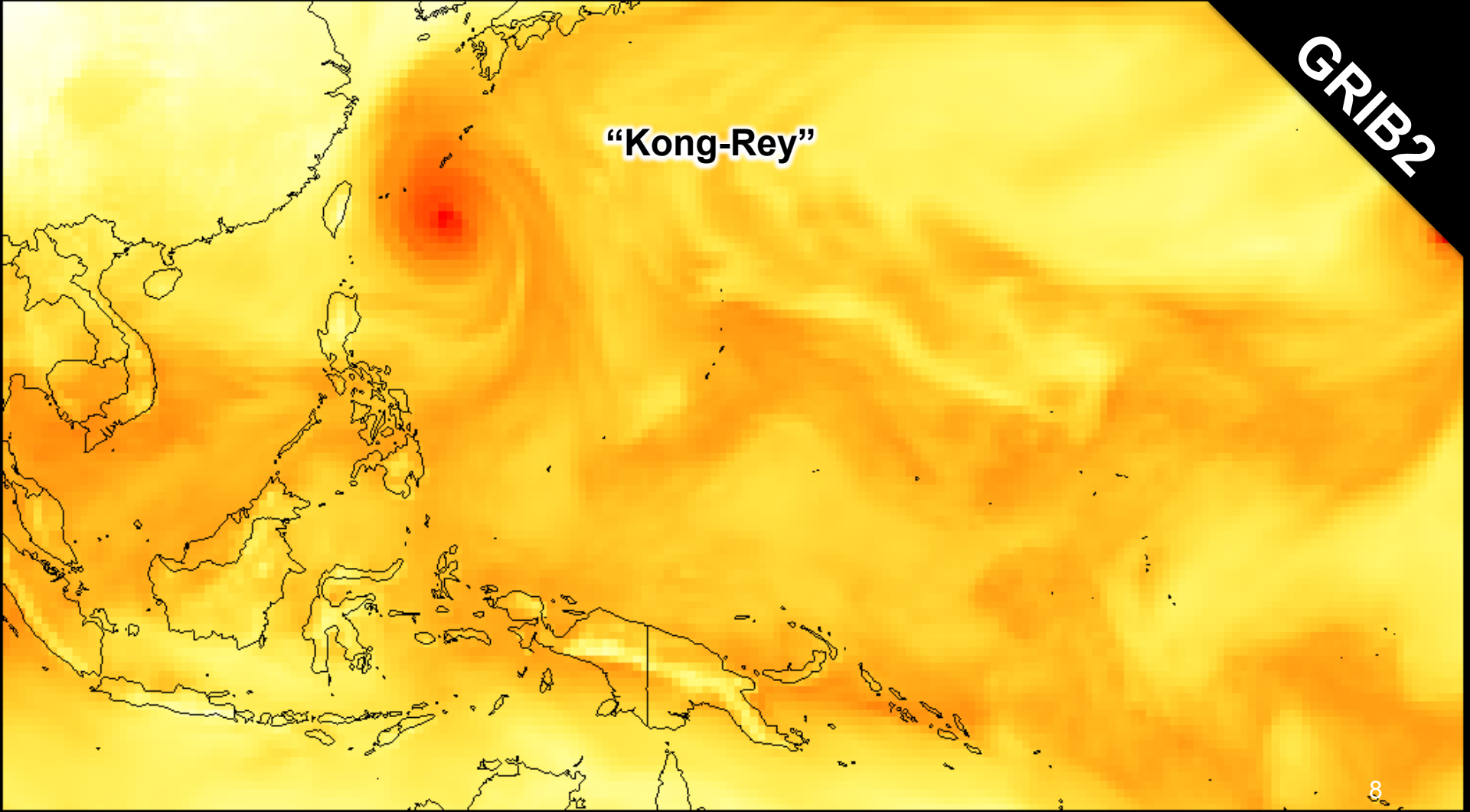
- Windows
- MacOS
- CentOS/RedHat Linux

A developer version is also available.

Current data formats supported:

- GOES-16/17 ABI L1b NetCDF
- Himawari-8/9 AHI (after conversion to netCDF)
- Gridded Binary (GRIB2)


“Kong-Rey”
NetCDF
H8 AHI B13 Full Disk 2018-10-04 00:00:20
SIFT

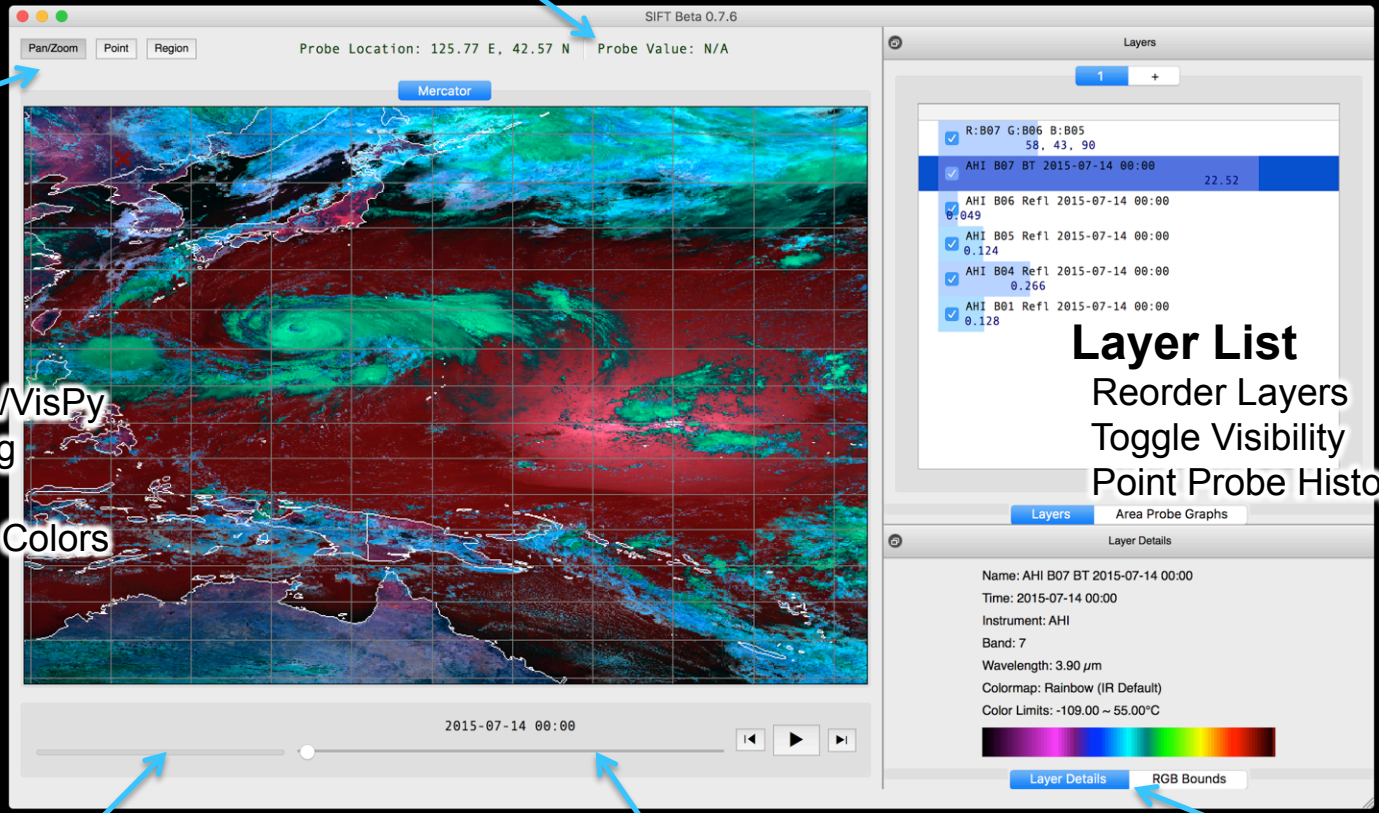

GRIB2
“Kong-Rey”
8
NWP GFS pwat @ 0hPa 2018-10-04 00:00Z +00h
SIFT

SIFT Features

- Loop across multiple bands or multiple times
- Create Red-Green-Blue (RGB) composites
- Calculate arithmetic composite for multiple bands
- Change or customize color enhancements
- Compare fields over a user-defined area using a density plot
- Click to probe layers at a lat-lon coordinate

Point Probe Results

Tools
- Pan/Zoom
- Point Probe
- Area Selector



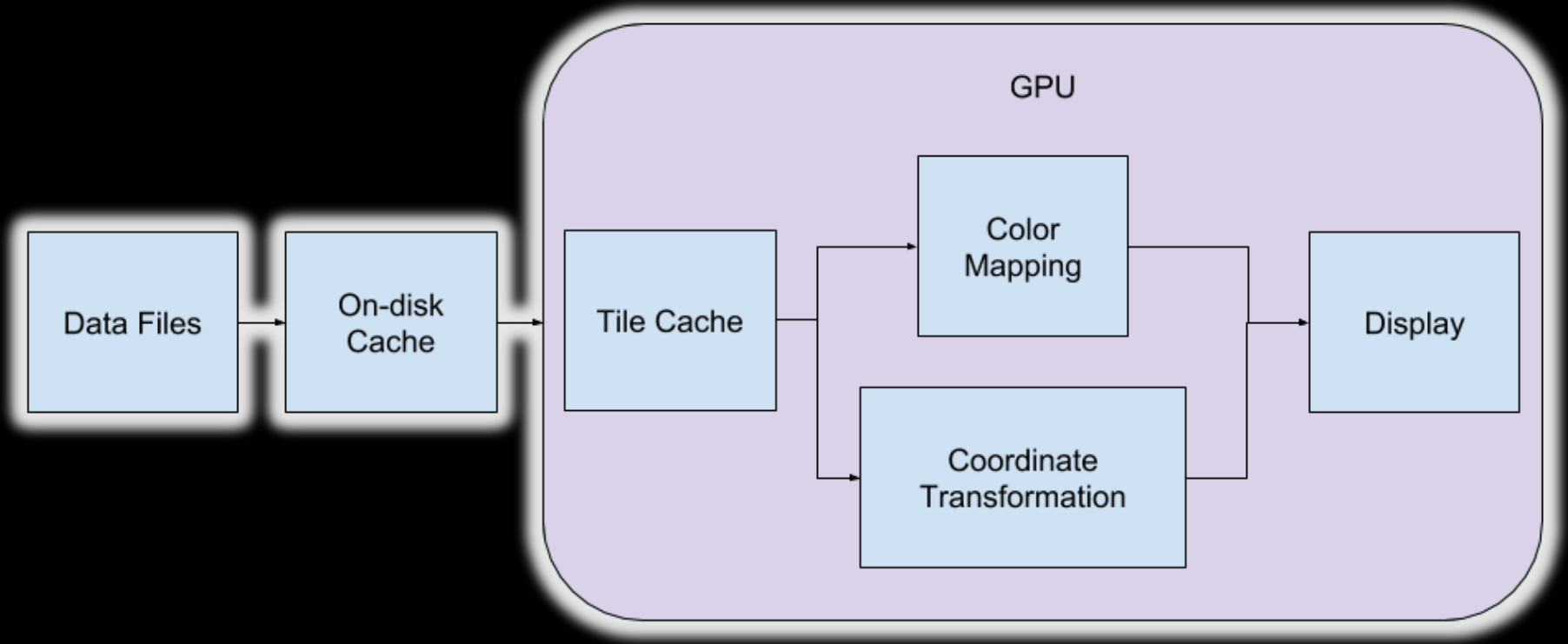
Map Display
- Powered by OpenGL/VisPy
- Panning and Zooming
- Dynamic Resolution
- Configurable Outline Colors

Layer List
- Reorder Layers
- Toggle Visibility
- Point Probe Histogram

Background Task Status

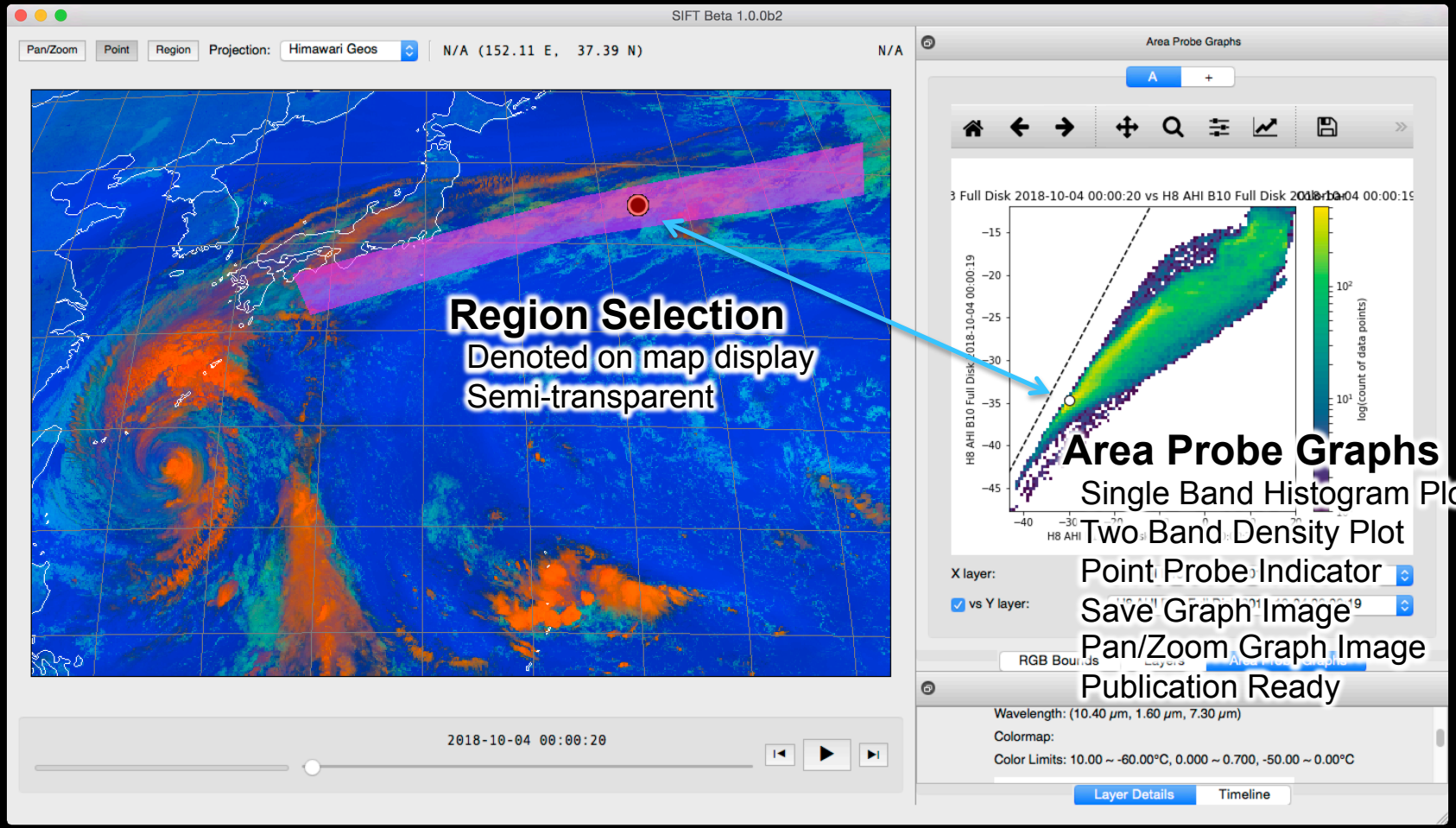
Animation Control
- Step-through or Autoplay
- Adjustable Speed Control

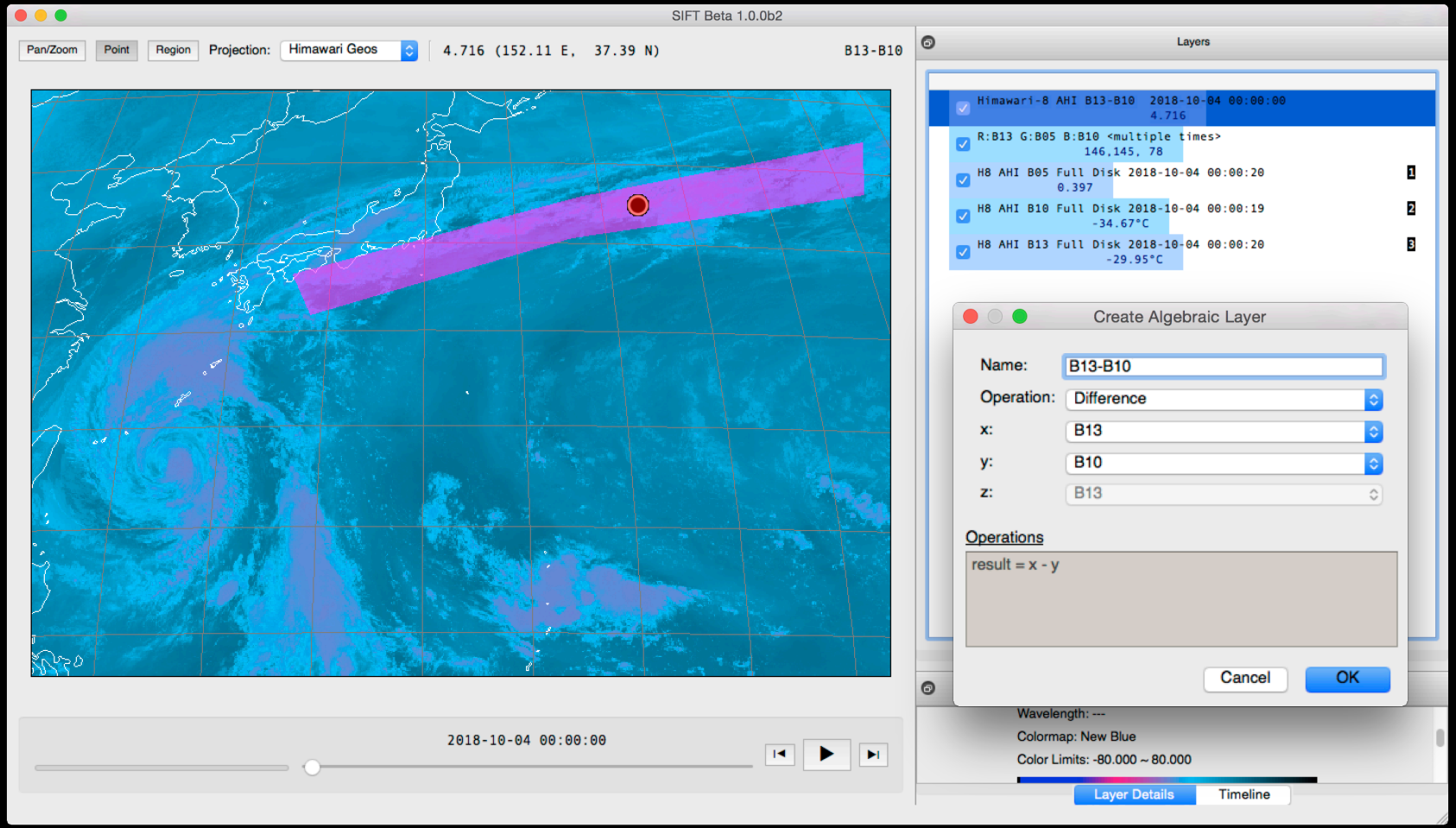
Layer Metadata
- Band Information
- Color Bar and Limits


Data Files
On-disk Cache
GPU
Tile Cache
Color Mapping
Coordinate Transformation
Display

Science Package Dependencies

Name	Purpose	SIFT Usage
numpy	Efficient array and matrix math	Data array container and efficient calculations; fast memory-mapped data caching and access
vispy	High level OpenGL python library	Map and data visualization
numba	Numerical expression compiler	Efficient probe area extraction and data transforms
satpy	Meteorological satellite data processing python library	Read GRIB and other satellite data formats
imageio	Easy pythonic image and video generation	Export animations and images using ffmpeg and pillow
matplotlib	Interactive scientific plotting	Probe graphics
pyproj	Geographical Information System (GIS) map projection math	Coordinate systems transforms

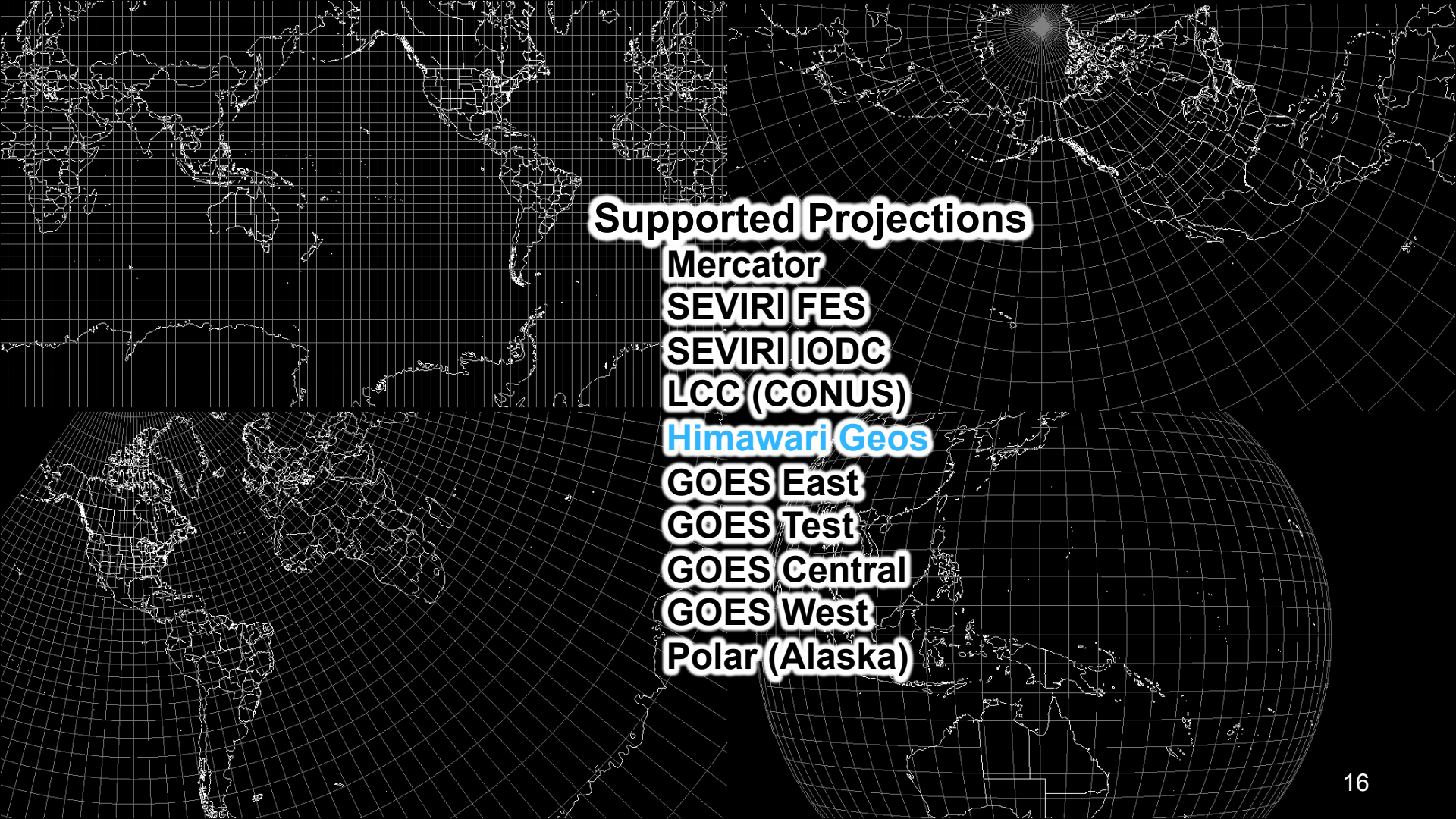

SIFT Beta 1.0.0b2
Pan/Zoom
Point
Region
Projection:
Himawari Geos
N/A (152.11 E, 37.39 N)
N/A
Region Selection
Denoted on map display
Semi-transparent
2018-10-04 00:00:20
Area Probe Graphs
A
+
Full Disk 2018-10-04 00:00:20 vs H8 AHI B10 Full Disk
H8 AHI B10 Full Disk 2018-10-04 00:00:19
H8 AHI
log(count of data points)
X layer:
vs Y layer:
RGB Bounds
Area Probe Graphs
Wavelength: (10.40 μm, 1.60 μm, 7.30 μm)
Colormap:
Color Limits: 10.00 ~ -60.00°C, 0.000 ~ 0.700, -50.00 ~ 0.00°C
Layer Details
Timeline
Area Probe Graphs
Single Band Histogram Plot
Two Band Density Plot
Point Probe Indicator
Save Graph Image
Pan/Zoom Graph Image
Publication Ready


SIFT Beta 1.0.0b2
Pan/Zoom
Point
Region
Projection:
Himawari Geos
4.716 (152.11 E, 37.39 N)
B13-B10
Layers
Himawari-8 AHI B13-B10 2018-10-04 00:00:00
4.716
R:B13 G:B05 B:B10 <multiple times>
146,145, 78
H8 AHI B05 Full Disk 2018-10-04 00:00:20
0.397
H8 AHI B10 Full Disk 2018-10-04 00:00:19
-34.67°C
H8 AHI B13 Full Disk 2018-10-04 00:00:20
-29.95°C
Create Algebraic Layer
Name:
B13-B10
Operation:
Difference
x:
B13
y:
B10
z:
B13
Operations
result = x - y
Cancel
OK
2018-10-04 00:00:00
Wavelength: ---
Colormap: New Blue
Color Limits: -80.000 ~ 80.000
Layer Details
Timeline

Download SIFT

1.0.4 installers are available

http://sift.ssec.wisc.edu/


Supported Projections
Mercator
SEVIRI FES
SEVIRI IODC
LCC (CONUS)
Himawari Geos
GOES East
GOES Test
GOES Central
GOES West
Polar (Alaska)

Develop SIFT

- Seeking new software developers
  - https://github.com/ssec/sift/ for code, issues, requests
  - No contributing guide yet
- Make SIFT better, faster, and stronger
- Contribute ideas or resources for new features
  - Long wish list
  - Desire to support all geostationary weather satellites
- Help expand our user and support base

Thank You

Download SIFT: http://sift.ssec.wisc.edu/

Develop SIFT: https://github.com/ssec/sift/

Send inquiries: **Jordan Gerth, jordan.gerth@ssec.wisc.edu**

For a demonstration, visit **Booth #233**
University of Wisconsin Space Science and Engineering Center

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