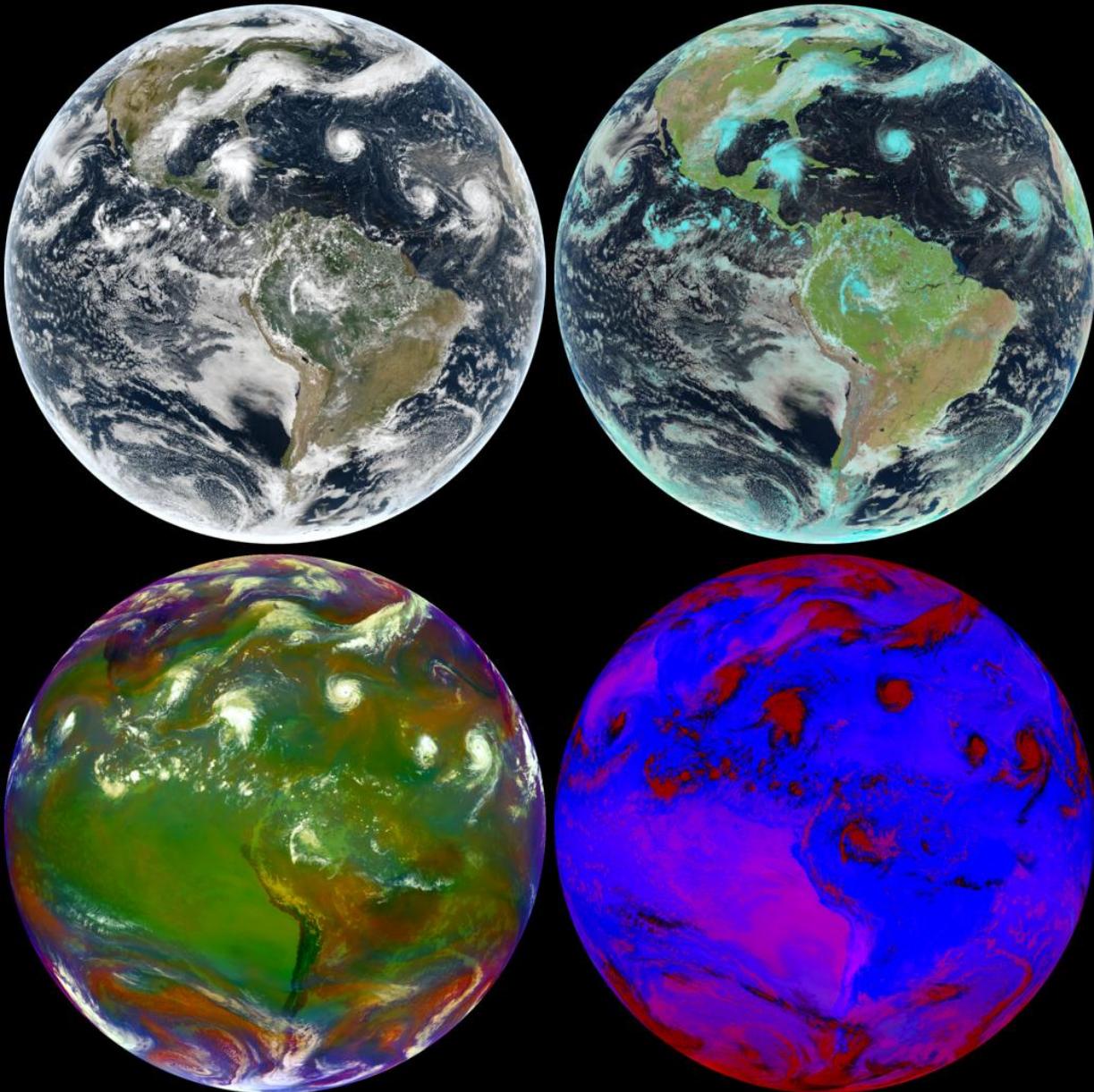


Using Satpy-Based Tools for Easy Meteorological Satellite Processing

ARM/ASR 2022

David Hoese

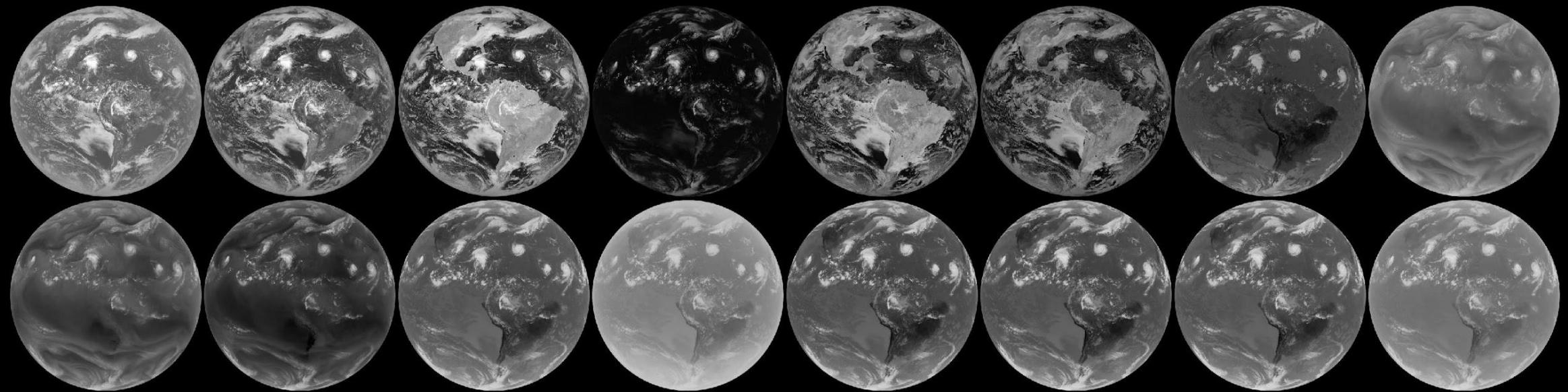
Space Science and Engineering Center
University of Wisconsin - Madison



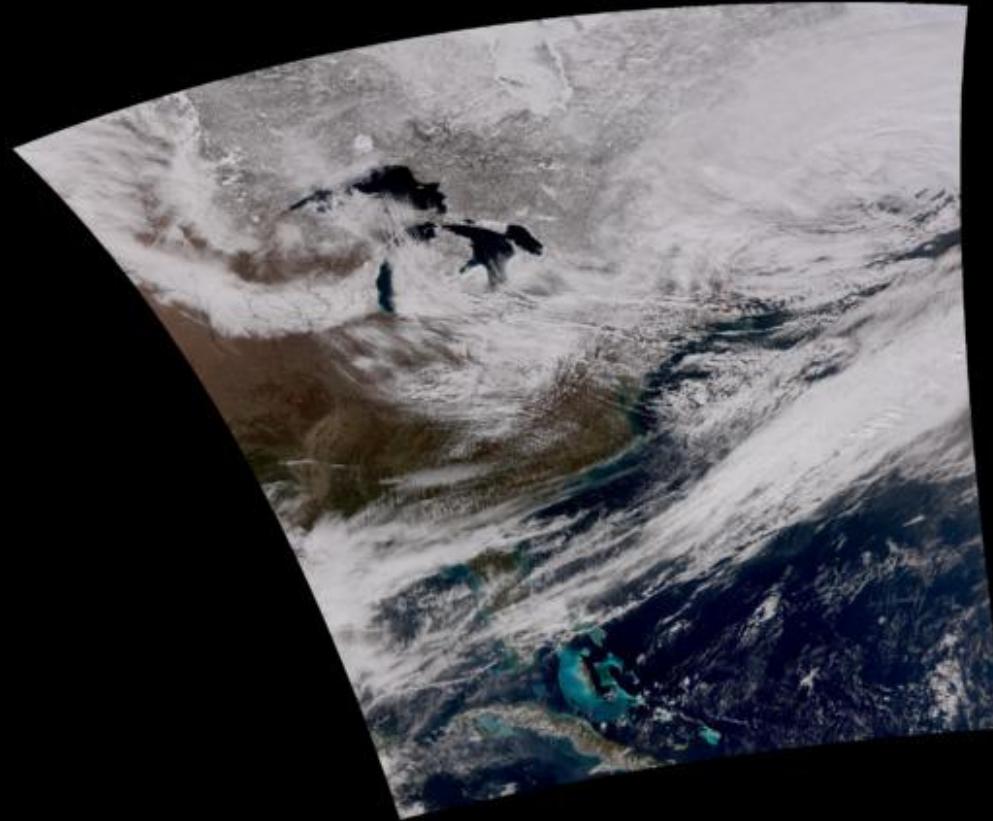
David Hoesel (Haze)

- Software Developer
University of Wisconsin – Madison
- CSPP LEO - Polar2Grid
- CSPP Geo - Geo2Grid and GeoSphere
- SIFT
- Satpy, Pyresample, VisPy, etc.

Shouldn't this be easy?



Shouldn't this be easy?

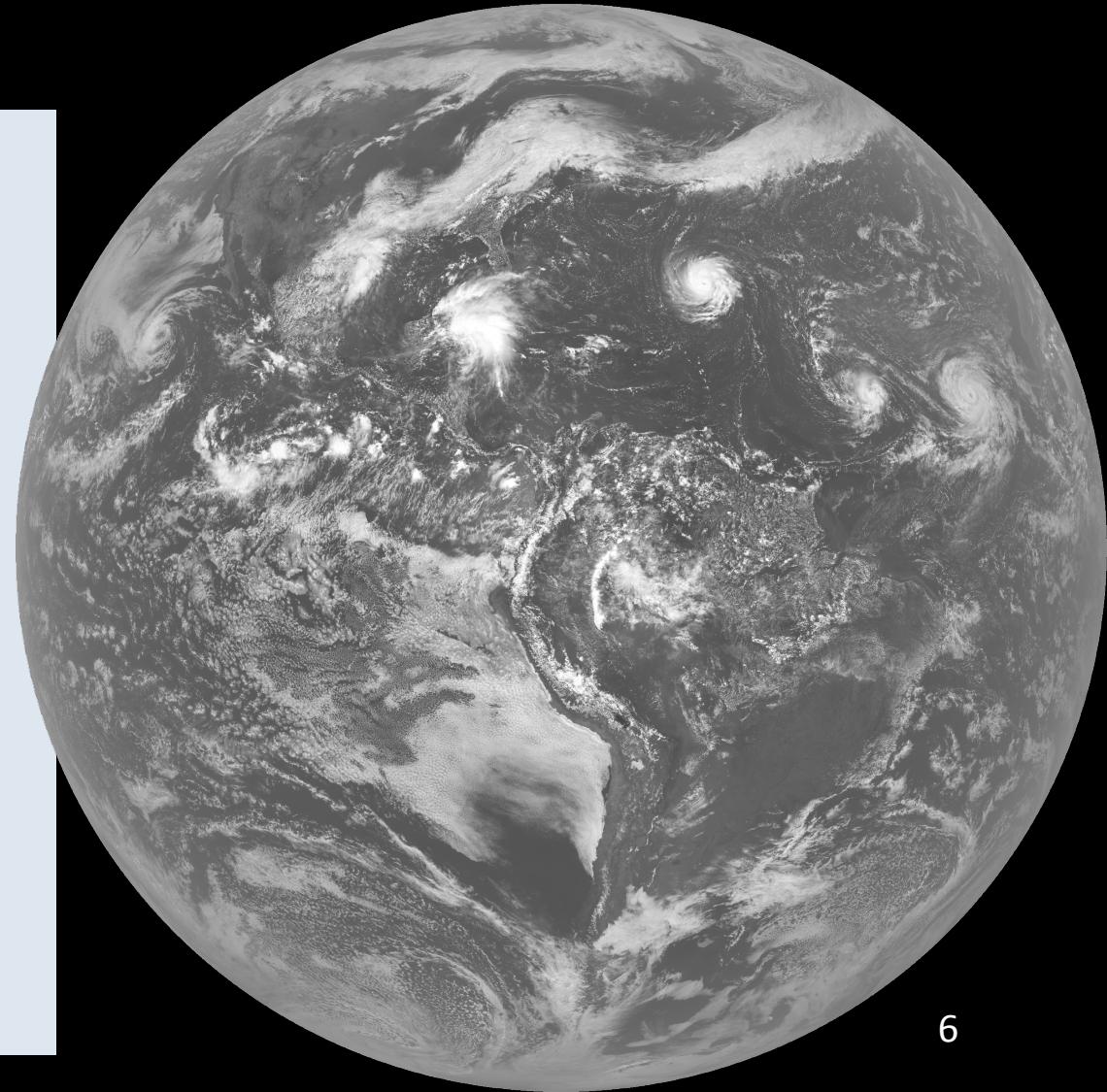


Making it easy...in Python

- Satpy
 - Maintained by global Pytroll community
 - Python library
 - For programmers and people new to programming
 - Integrates with popular scientific python libraries
(xarray, dask, cartopy, rasterio/rioxarray, etc)

SatPy makes it easier to read and use satellite instrument data

```
>>> from satpy import Scene  
>>> scn = Scene(reader='abi_l1b',  
                 filenames=[...])  
>>> scn.available_dataset_names()  
['C01', 'C02', 'C03', 'C04',  
 'C05', 'C06', 'C07', 'C08',  
 'C09', 'C10', 'C11', 'C12',  
 'C13', 'C14', 'C15', 'C16']  
  
>>> scn.load(['C01'])  
>>> scn['C01']  
<xarray.DataArray (y: 3000, x: 5000)>  
...
```



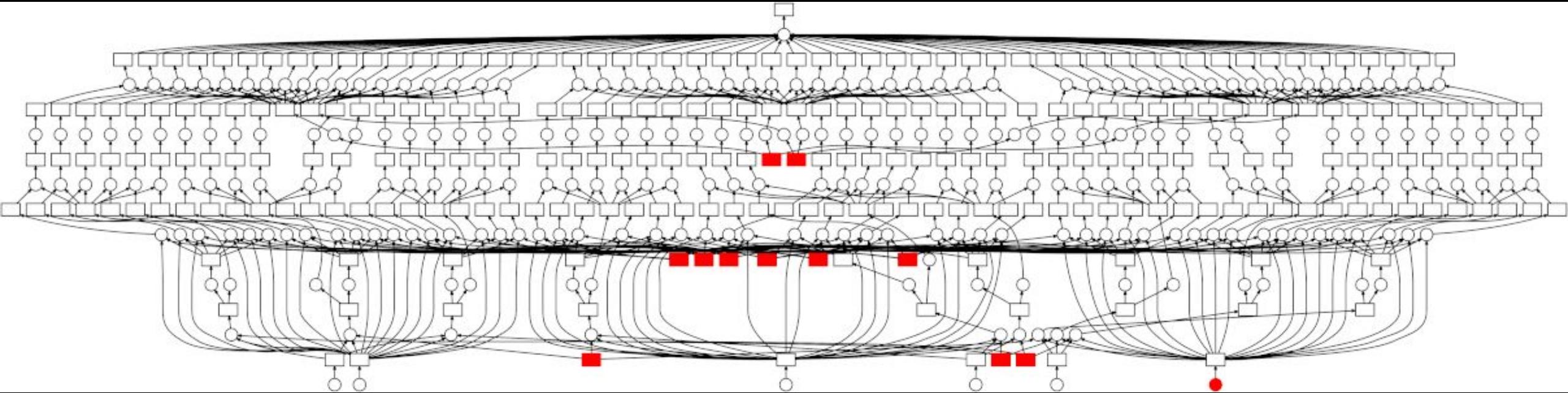
SatPy makes it easier to read and use satellite instrument data

```
>>> scn.available_composite_names()
['airmass', 'ash', 'cimss_true_color',
'cloudtop', 'convection',
'day_microphysics', 'dust', 'fog',
'natural_color', 'night_fog',
'night_microphysics', 'overview',
'true_color']

>>> scn.load(['true_color'])
>>> new_scn =
scn.resample(resampler='native')
>>> new_scn.save_datasets()
```



Parallel processing with dask



Supported Readers

SEVIRI L1B HRIT/Native/NetCDF	GOES 11-15 Imager HRIT	NUCAPS EDR Retrieval
AHI HSD/HRIT	ABI L1B/L2	CSPP ACSPO SST
AGRI L1	MiRS Retrieval	GEOCAT
MTSAT-1R JAMI HRIT	GLM L2	CLAVR-x
MTSAT-2 Imager HRIT	GCOM-W1 AMSR2 L1B	VIIRS SDR/L1B/Compact
Electro-L HRIT	MODIS L1B/L2	VIIRS EDR Active Fire
EPS-SG VII L1B/L2	MERSI-2 L1B	TROPOMI L2
AVHRR L1B AAPP	Sentinel-1 A/B SAR-C SAFE	GK2A AMI L1B
AVHRR L1B EPS	Sentinel 2A/B MSI SAFE	AAPP MAIA VIIRS/AVHRR
AVHRR L1B GAC/LAC	Sentinel 3 A/B SLSTR	MTG FCI L1C (dev)

Supported Writers

Geotiff/COG

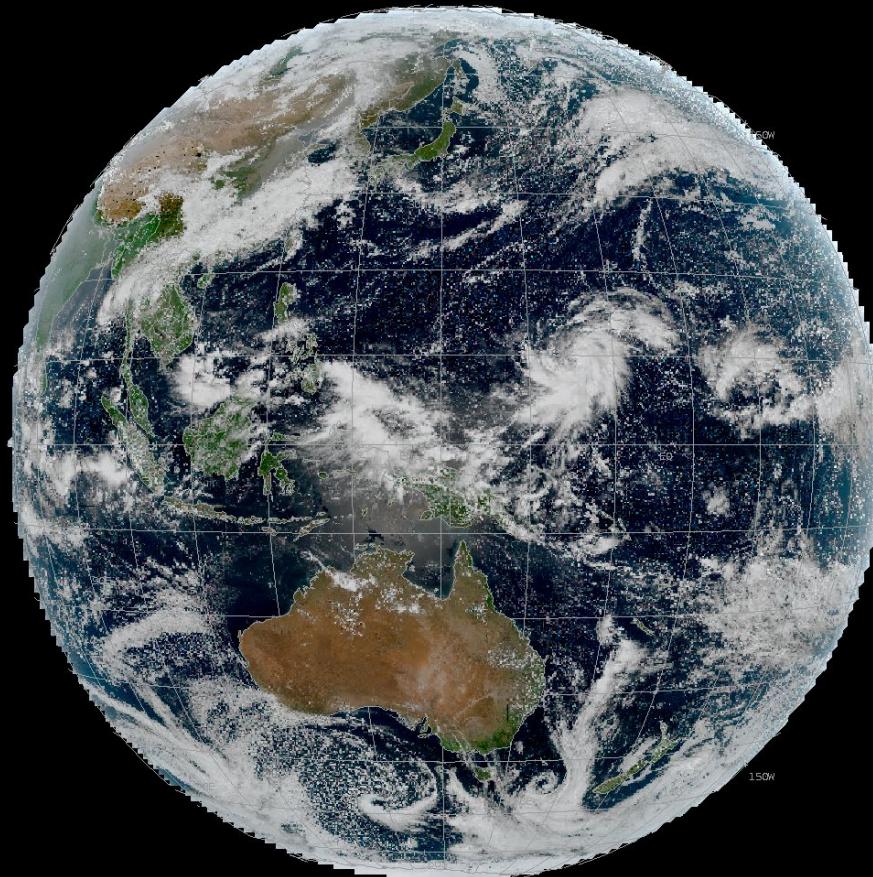
CF NetCDF

AWIPS Compatible NetCDF (awips_tiled)

Simple Image (PNG, JPEG, etc.) via Pillow

NinJoTIFF/NinJo-compatible Geotiff

MiTIFF



* Himawari-8 AHI True Color RGB (RGB): R/G/B Mon 03:00Z 22-Oct-18

“What if I don’t know Python?”

- Geo2Grid and Polar2Grid
 - Command-line interface
- SIFT
 - GUI application for data analysis
- GeoSphere
 - Interactive image viewing website

Making it easy...without coding

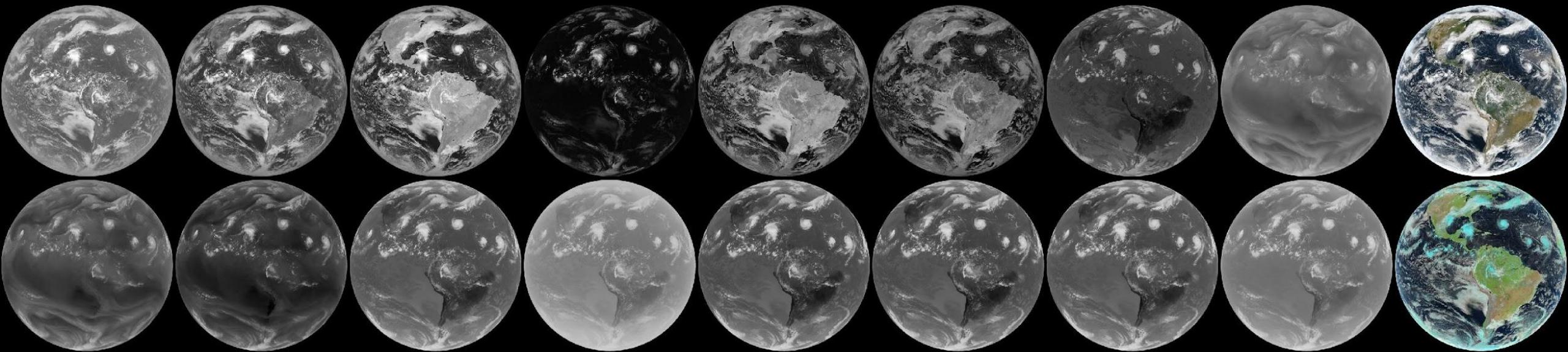
- Simple interfaces
- Simple installation
- Allow for customization
- Perform well
- Build using existing open source software

Polar2Grid/Geo2Grid make it easy

```
geo2grid.sh -r abi_l1b -w geotiff -f /path/to/files/
```

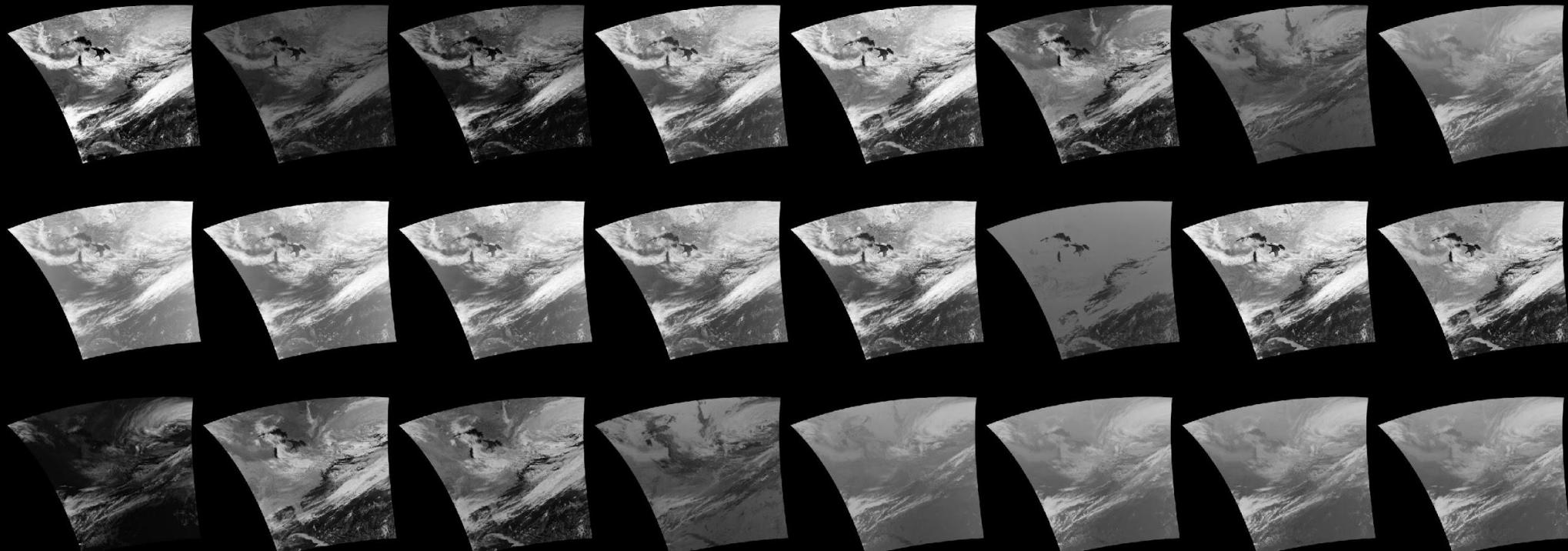
Polar2Grid/Geo2Grid make it easy

```
geo2grid.sh -r abi_l1b -w geotiff -f /path/to/files/
```



Polar2Grid/Geo2Grid make it easy

```
polar2grid.sh -r viirs_sdr -w geotiff -f /path/to/files
```



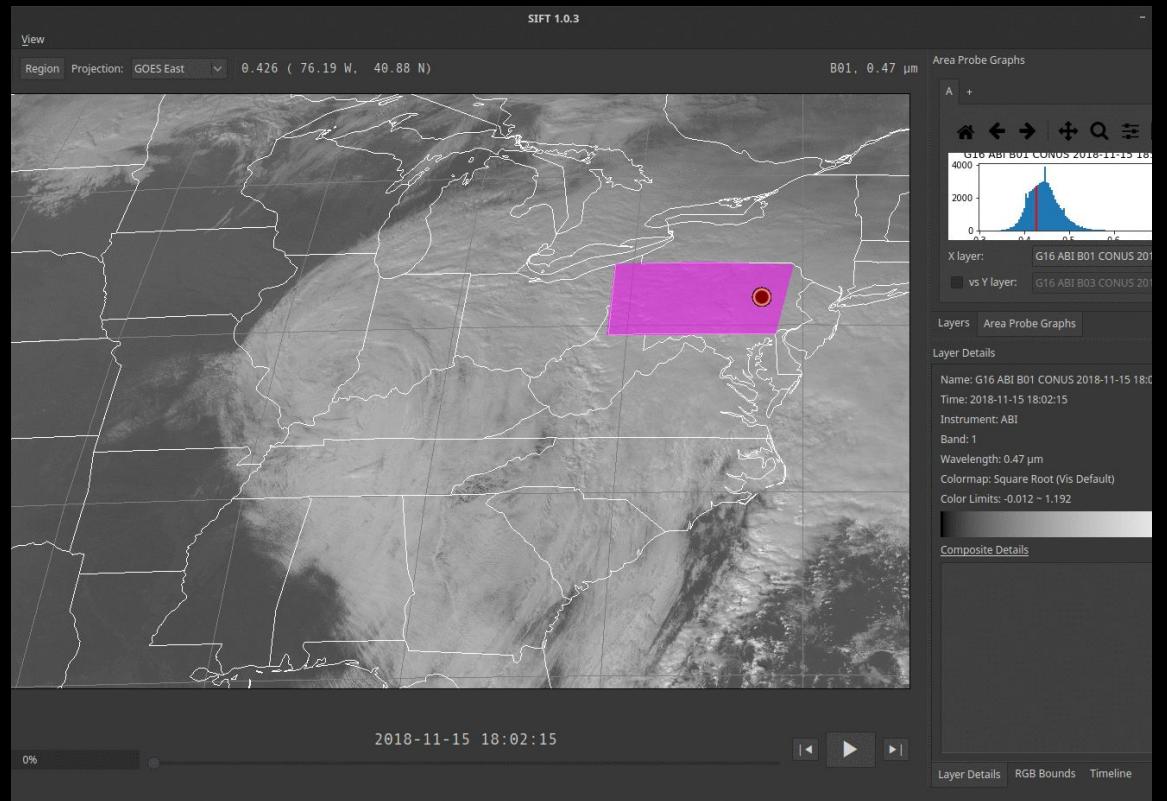
Installation is easy (Linux)

```
tar -xf CSPP_IMAPP_POLAR2GRID_V3.0.tar.gz
```

```
polar2grid_v_3_0/bin/polar2grid.sh ...
```

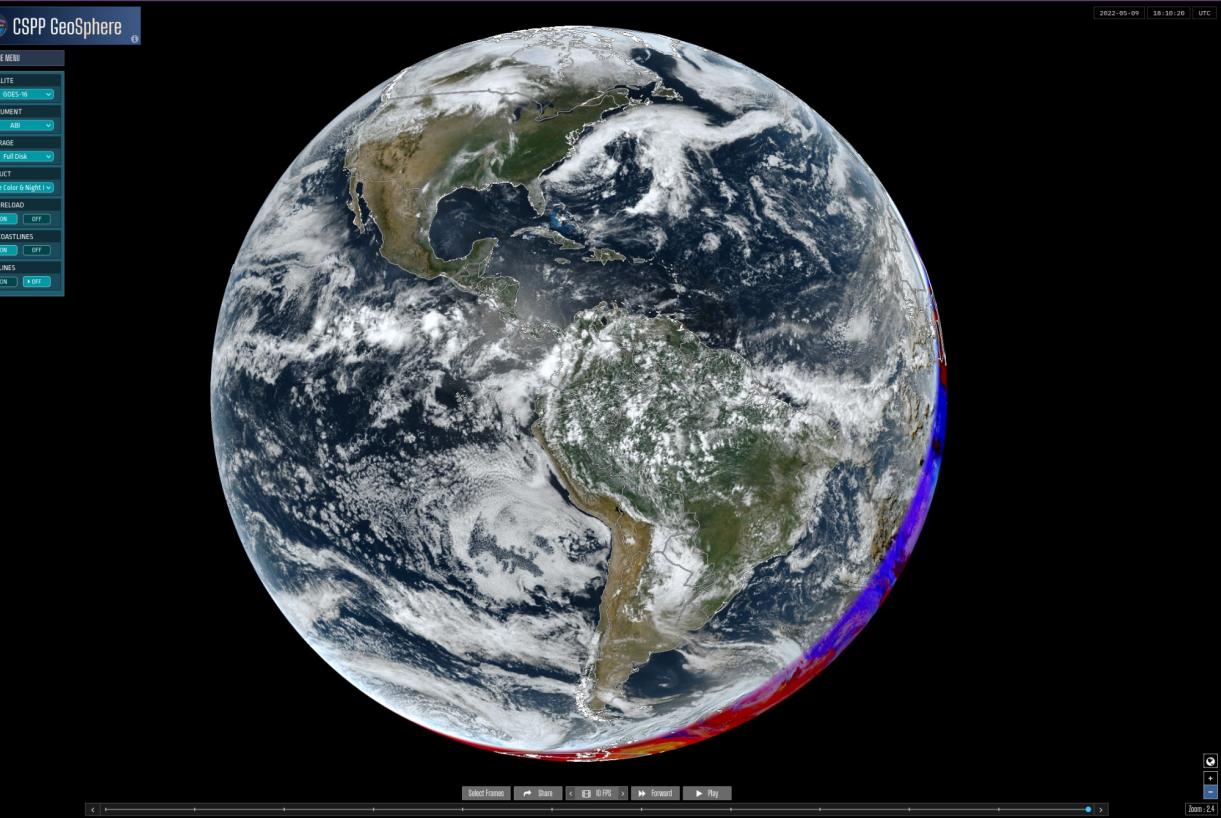
SIFT

- Pan/Zoom Map
- Point probe and region selection
- Scatter and histogram plots
- Custom colormaps
- Custom color limits
- Time step animation
- On-the-fly reprojecting
- Custom RGB creation
- Powered by VisPy, Numba, and Satpy
- Collaboration with EUMETSAT



GeoSphere

- Geo2Grid Product Display
 - C01 - C16
 - True color + night microphysics
- Pan/Zoom Map
- Animation
- Full spatial resolution (500m true color)
- Low latency
- Runs on Kubernetes cluster
- Coming soon:
 - GOES-17
 - Save to PNG or MP4
 - Performance improvements



<https://geosphere.ssec.wisc.edu/>

Contact Me

- Twitter: [djhoese](#)
- Github: [djhoese](#)
- Email: david.hoese@ssec.wisc.edu
- Code: <https://github.com/pytroll/satpy>
- Docs: <https://satpy.readthedocs.io/>
- Pytroll: <http://pytroll.github.io/>
- Slack: <https://pytroll.slack.com/>
- Mailing List: <https://groups.google.com/forum/#!forum/pytroll>
- Polar2Grid/Geo2Grid Code: <https://github.com/ssec/polar2grid>
 - Polar2Grid: <http://cimss.ssec.wisc.edu/cspp/>
 - Geo2Grid: <http://cimss.ssec.wisc.edu/csppgeo/>
- SIFT: <https://sift.ssec.wisc.edu/>
- GeoSphere: <https://geosphere.ssec.wisc.edu/>