

Polar2Grid

Reprojecting Satellite Data Made Easy

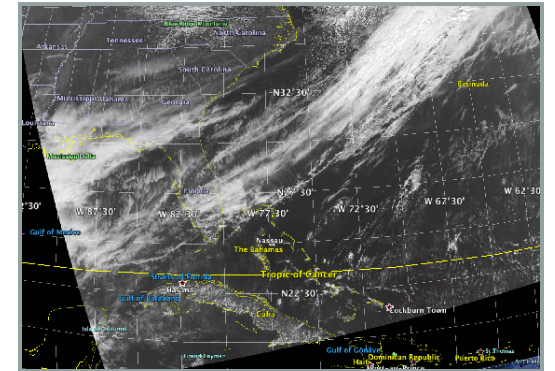
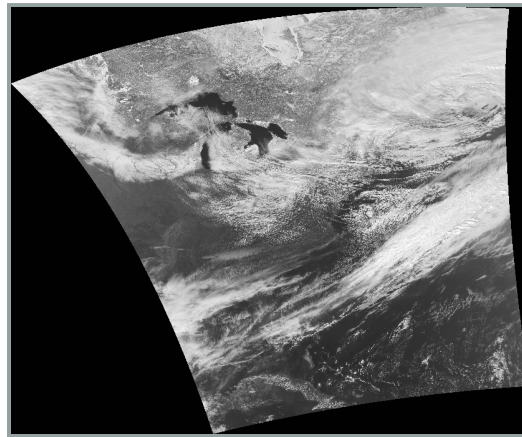
By David Hoese



Outline

- What is Polar2Grid?
- Features and Examples
- SatPy
- Future Plans

What is Polar2Grid?



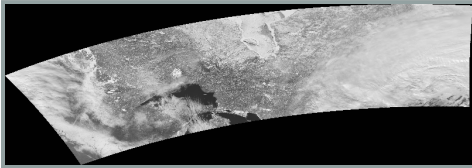
What is Polar2Grid? - Point A to Point B

- science data swath
- longitudes
- latitudes



- gridded image data
- projection definition
- width
- height
- cell width
- cell height
- upper-left X coordinate
- upper-left Y coordinate

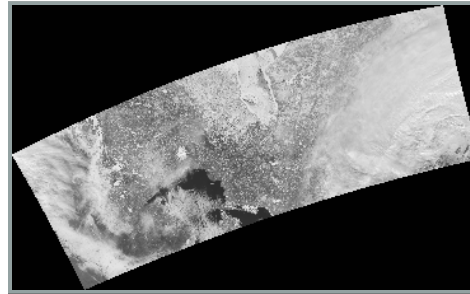
What is Polar2Grid? - Grids and Projections



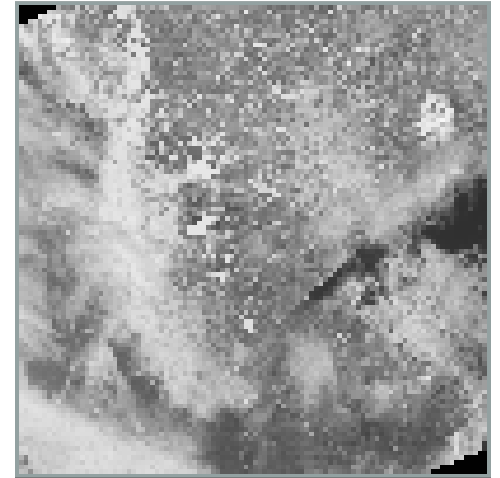
Lat/Lon



Polar
Stereographic

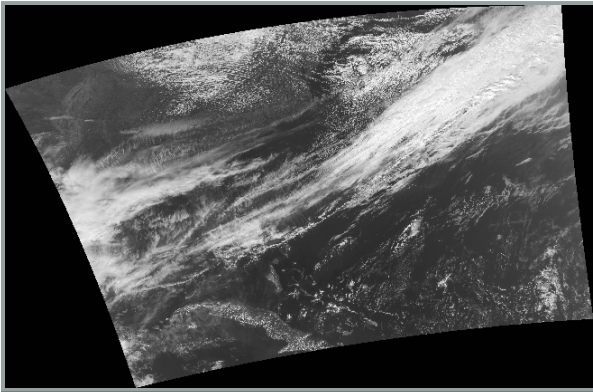


Lambert
Conformal
Conic

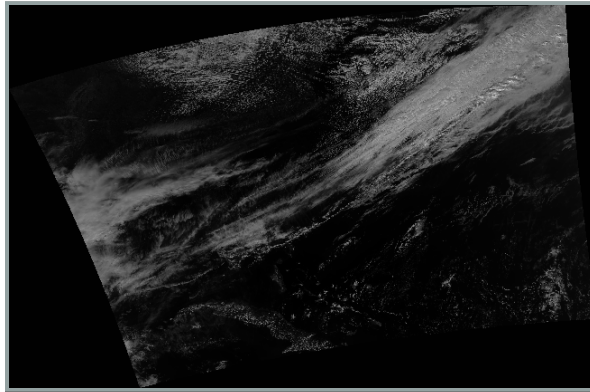


Lambert
Conformal
Conic

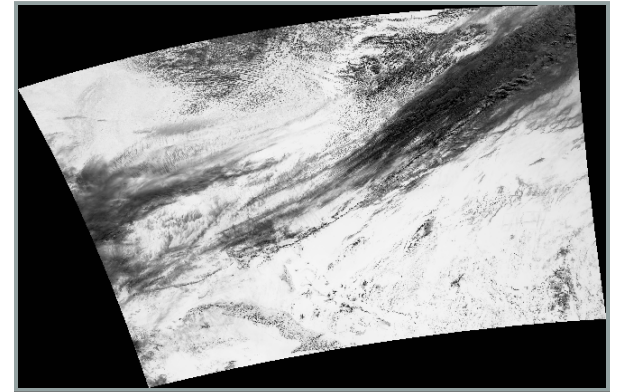
What is Polar2Grid? - Rescaling



Square Root

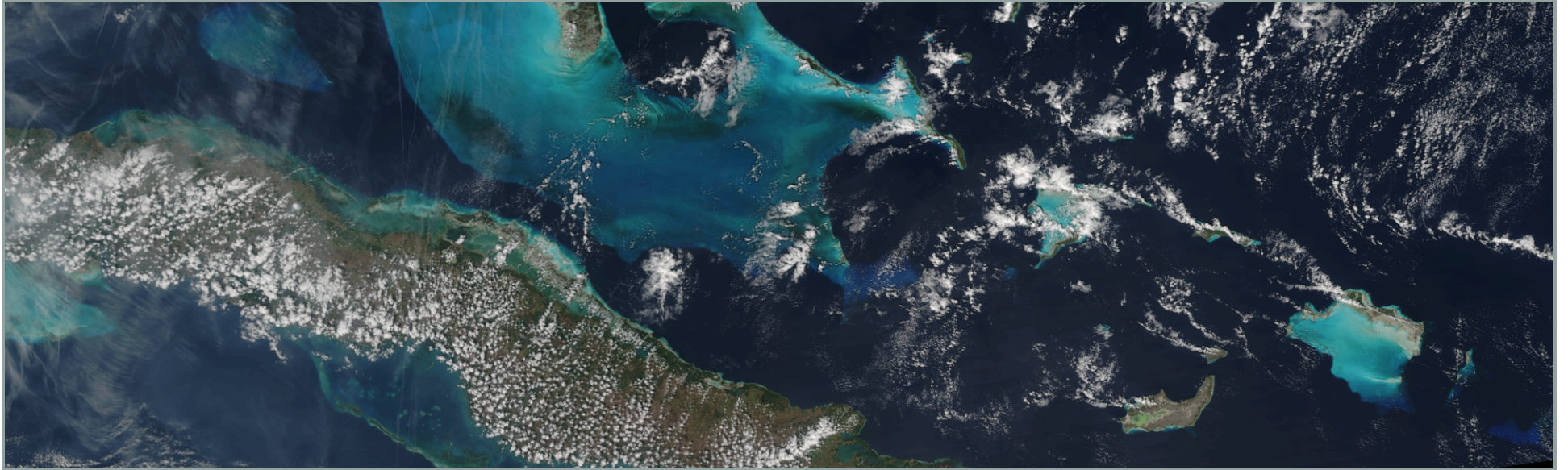


Linear



Inverse

What is Polar2Grid? - RGB



Why use Polar2Grid? - 3 Main Steps

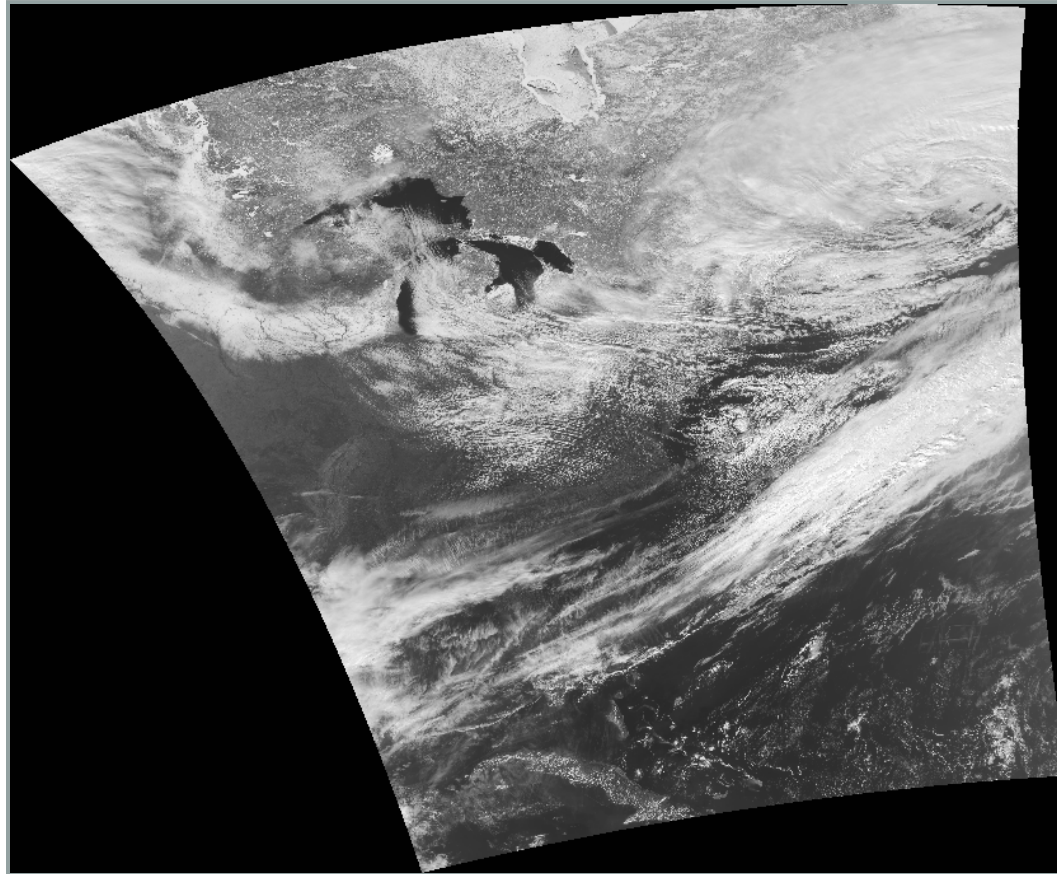
Frontend



Remapper



Backend



```
viirs2gtiff.sh -f /path/to/files -p i01  
# 52 seconds - 7 granules
```

Why use Polar2Grid? - Installation

Download and Unpack:

```
tar -xzf polar2grid-2.0.0.tar.gz
```

Make Pretty Pictures:

```
viirs2gtiff.sh ...
```

```
polar2grid.sh viirs gtiff ...
```


Features: Remapping

- EWA vs Nearest Neighbor
- Builtin Grids
- User Grids
- Static vs Dynamic Grids

```
211e, proj4,  
+proj=lcc +a=6371200 +b=6371200 +lat_0=25 +lat_1=25 +lon_0=-95 +units=m +no_defs,  
5120, 5120, 1015.9, -1015.9, -123.044deg, 59.844deg
```

```
lcc_fit, proj4,  
+proj=lcc +datum=WGS84 +ellps=WGS84 +lat_0=25 +lat_1=25 +lon_0=-95 +units=m +no_defs,  
None, None, 1000, -1000, None, None
```

```
p2g_grid_helper.sh grid_name -95 45 1000 -1000 5000 5000
```

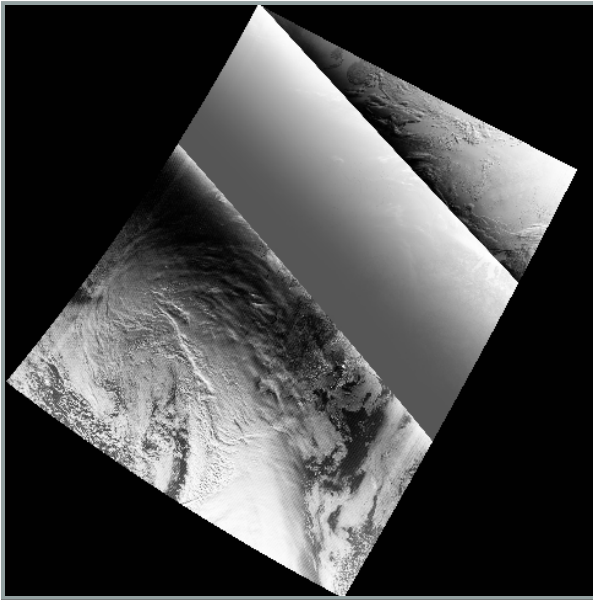
Features: Backends

- Geotiff
 - PNG Copies
 - KMZ Files
 - Compression
- AWIPS II (replaces AWIPS I)
- NinJo
- Flat Binary
- HDF5

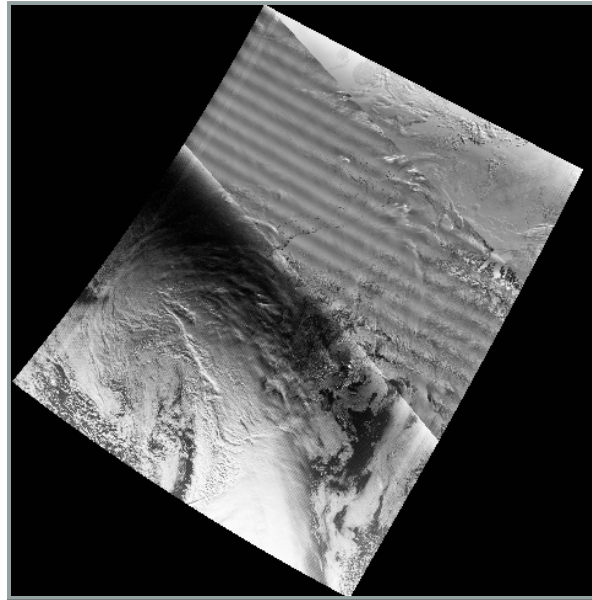
Features: Frontends

- VIIRS SDR
- VIIRS L1B

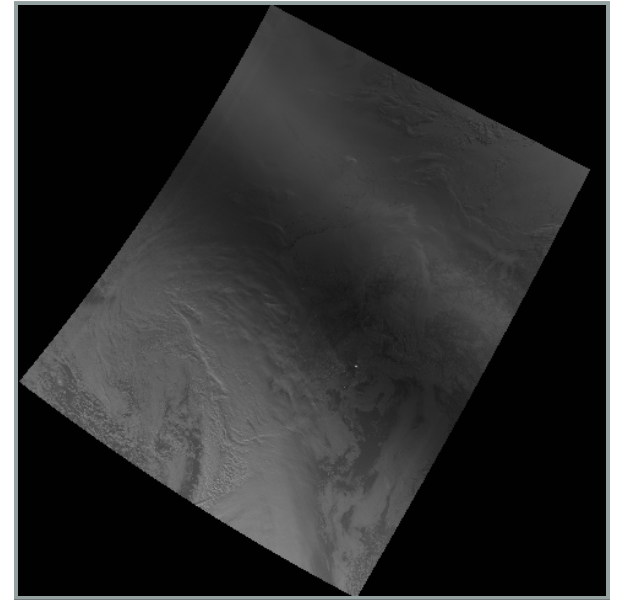
Features: Frontends - VIIRS DNB



Histogram



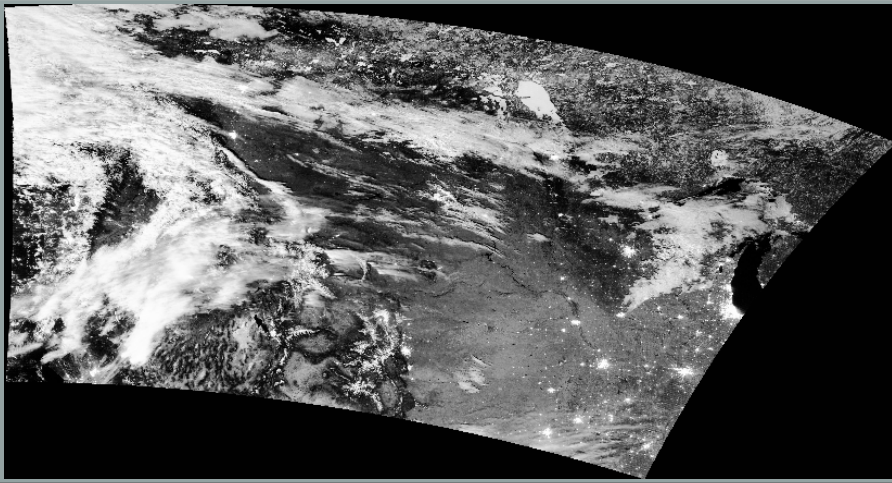
Adaptive



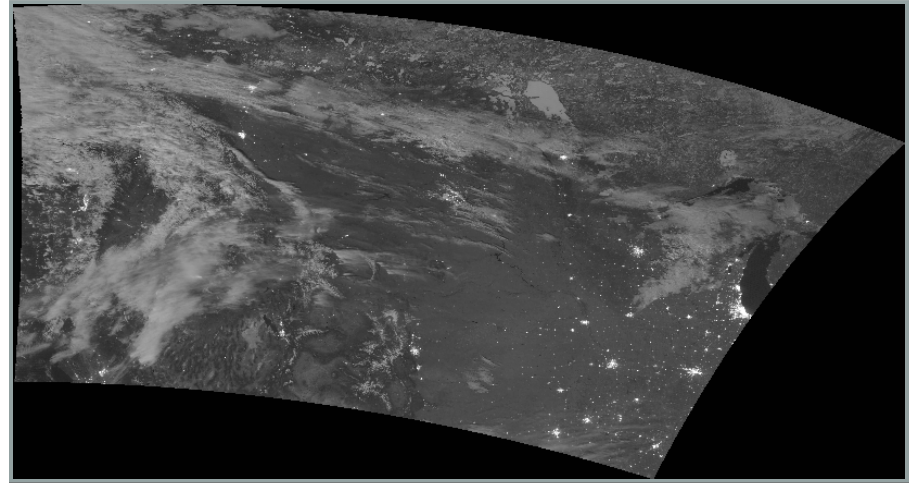
Erf/Dynamic

```
viirs2gtiff.sh -f /path-to-files/ -g 203 -p histogram_dnb  
adaptive_dnb dynamic_dnb
```

Features: Frontends - VIIRS DNB Night



Adaptive

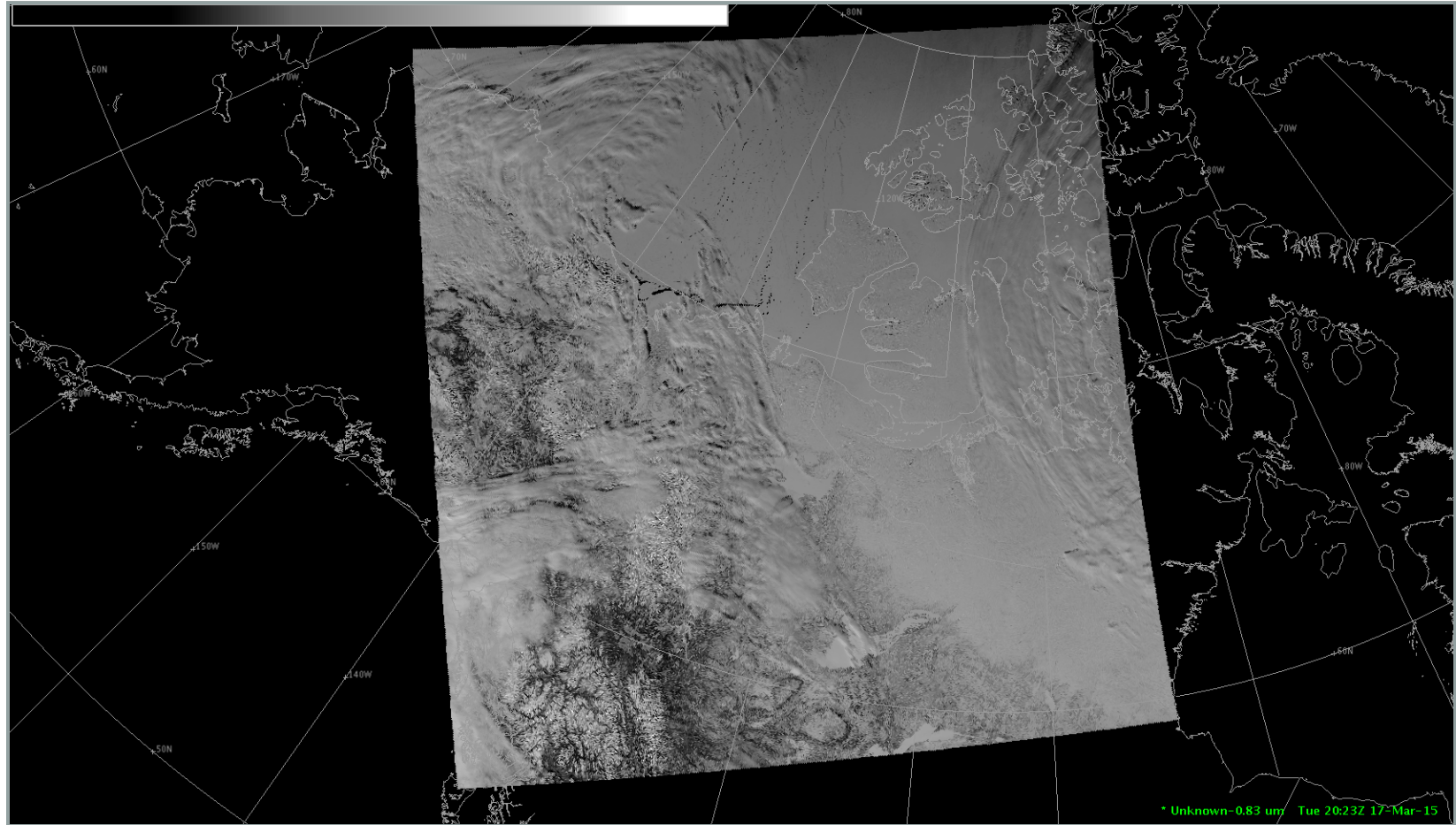


Dynamic

Features: Frontends

- VIIRS SDR
- VIIRS L1B
- MODIS L1B

Features: Frontends - MODIS

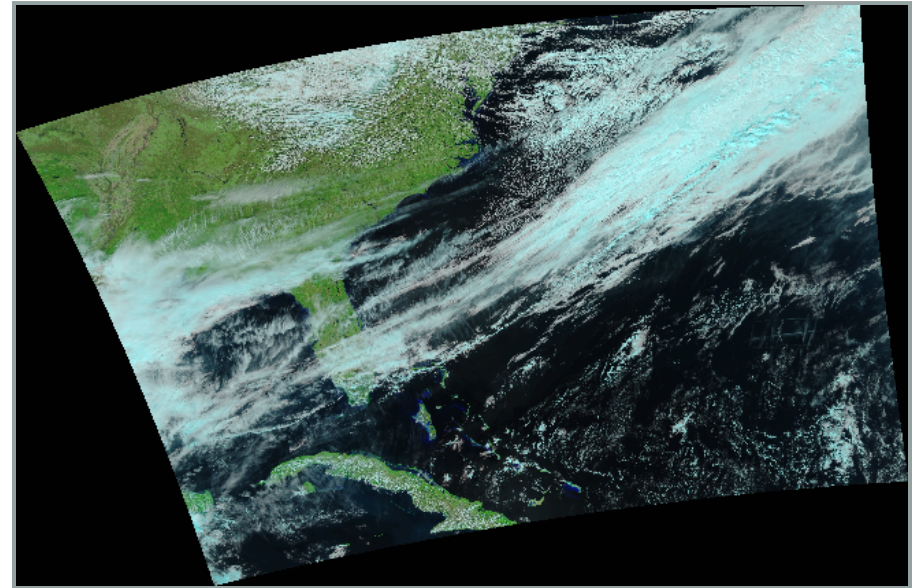
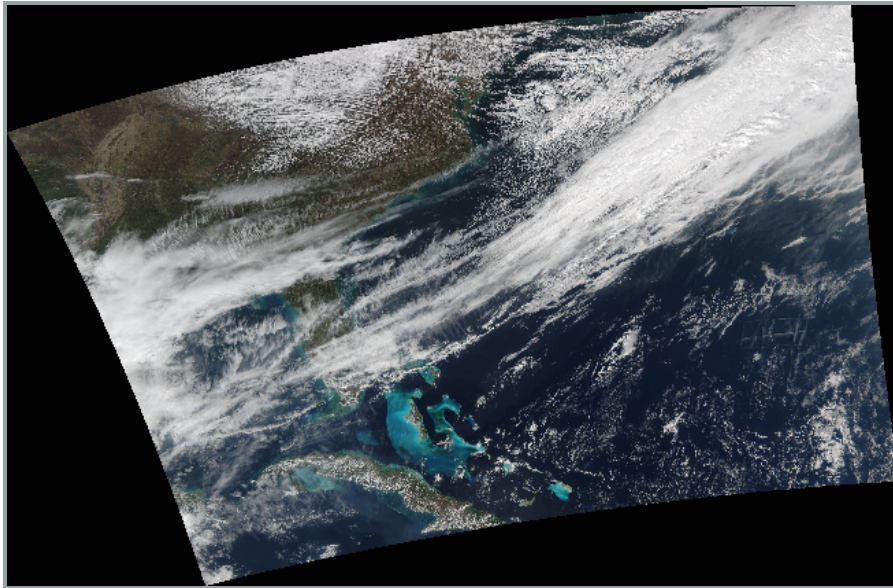


```
modis2awips.sh -f /path-to-files/ -p visible_02 -g 203
```

Features: Frontends

- VIIRS SDR
- VIIRS L1B
- MODIS L1B
- Corrected Reflectance (CREFL)

Features: Frontends - CREFL

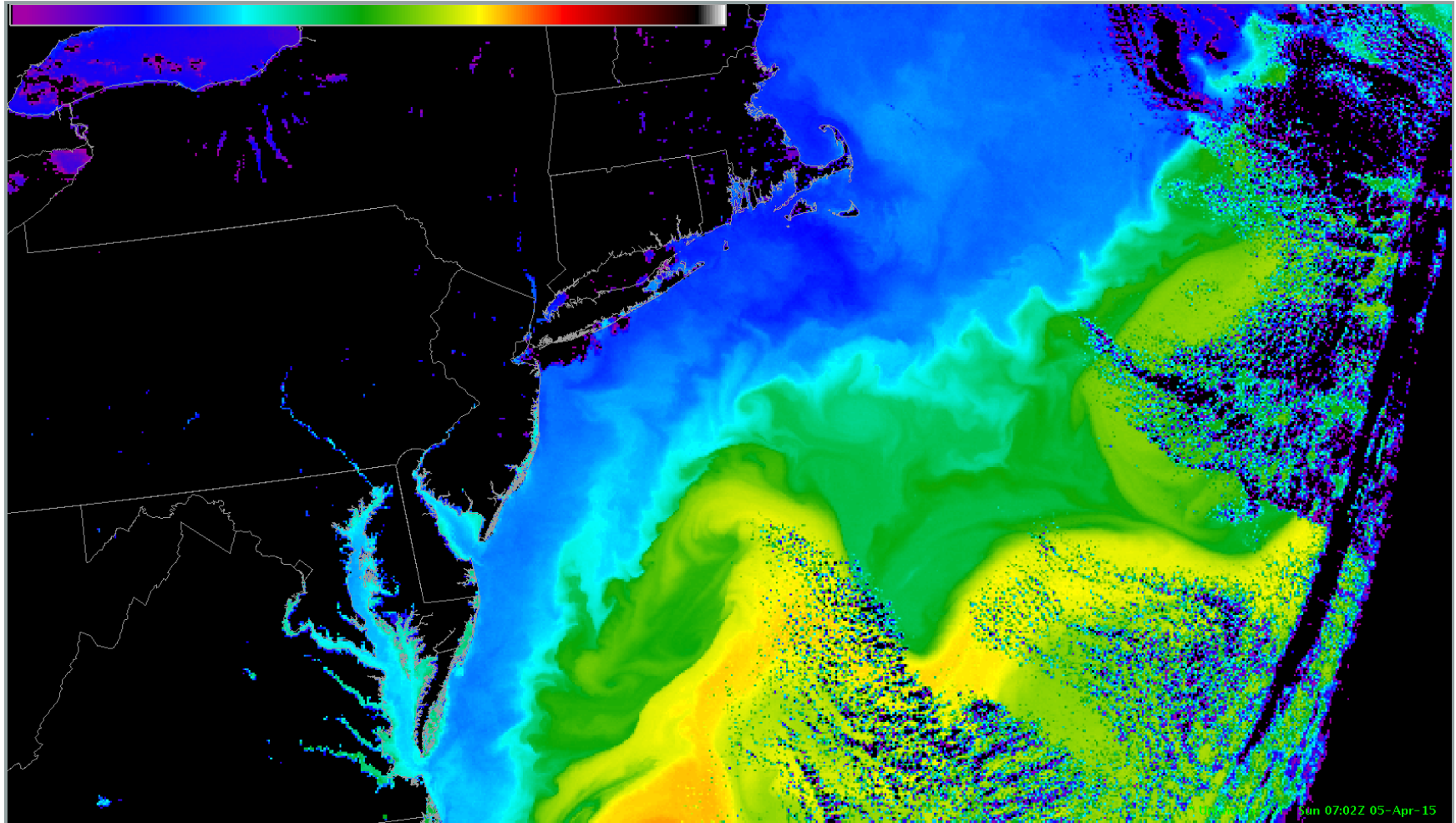


```
crefl2gtiff.sh -f /path-to-files/
```

Features: Frontends

- VIIRS SDR
- VIIRS L1B
- MODIS L1B
- Corrected Reflectance (CREFL)
- Advanced Clear-Sky Processor for Oceans (ACSPO)

Features: Frontends - ACSPO

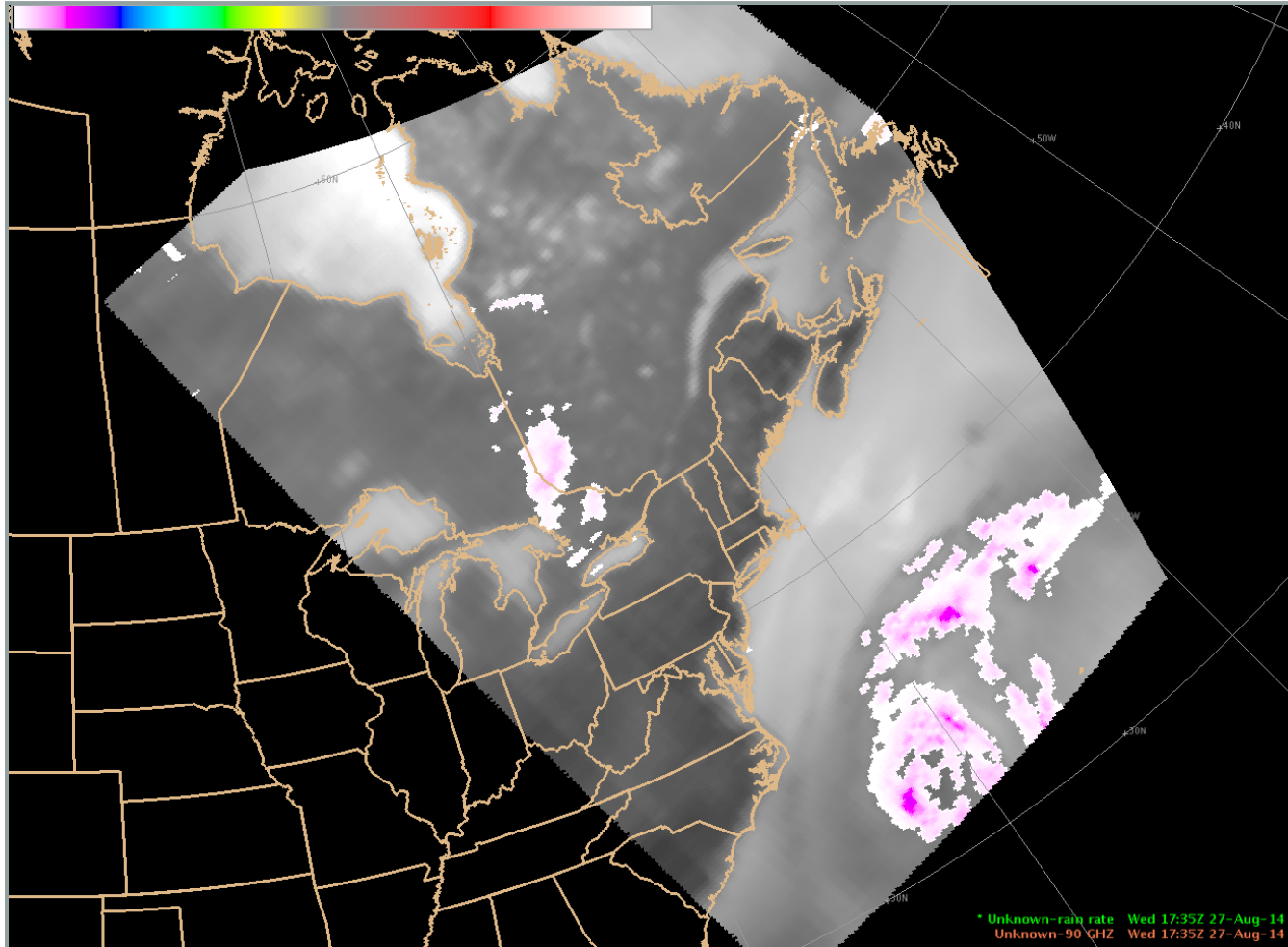


```
acspo2awips.sh -g 211e -f /path-to-files/
```


Features: Frontends

- VIIRS SDR
- VIIRS L1B
- MODIS L1B
- Corrected Reflectance (CREFL)
- Advanced Clear-Sky Processor for Oceans (ACSPPO)
- Microwave Integrated Retrieval System (MIRS)

Features: Frontends - MIRS

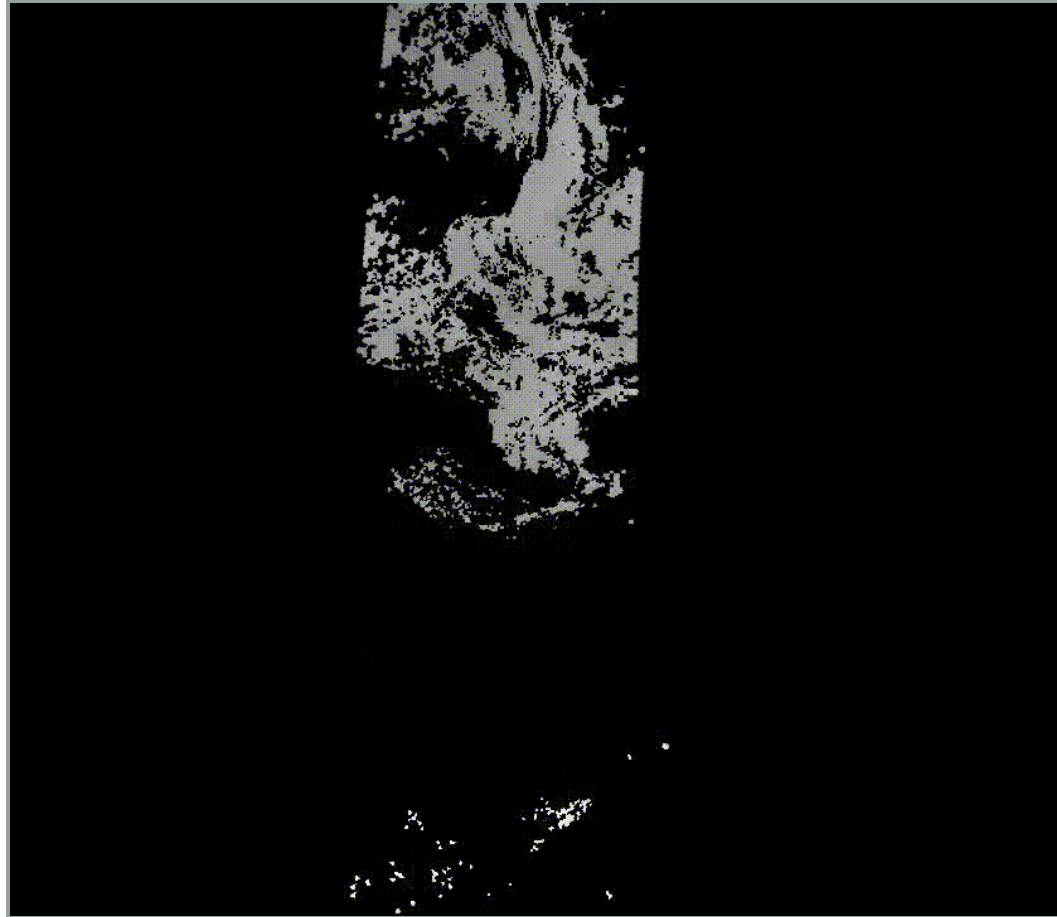


```
mirs2awips.sh -f /path-to-files/ -g 211e
```

Features: Frontends

- VIIRS SDR
- VIIRS L1B
- MODIS L1B
- Corrected Reflectance (CREFL)
- Advanced Clear-Sky Processor for Oceans (ACSPPO)
- Microwave Integrated Retrieval System (MIRS)
- Dual Regression Retrieval (DR-RTV): AIRS, CrIS, IASI
- NUCAPS

Features: Frontends - DR-RTV

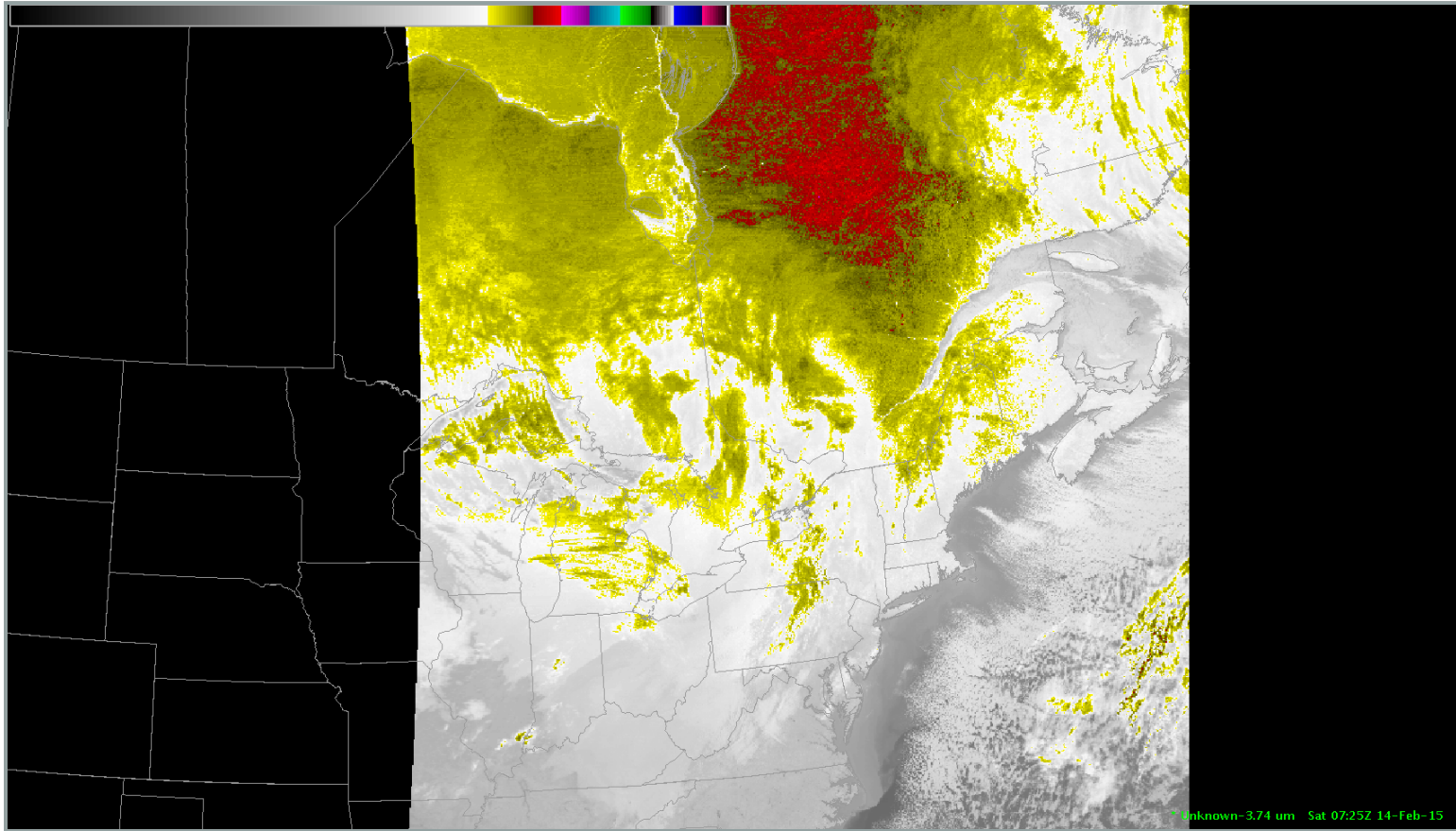


```
drstv2gtiff.sh -f /path-to-files/ -g 203_10km
```

Features: Frontends

- VIIRS SDR
- VIIRS L1B
- MODIS L1B
- Corrected Reflectance (CREFL)
- Advanced Clear-Sky Processor for Oceans (ACSPPO)
- Microwave Integrated Retrieval System (MIRS)
- Dual Regression Retrieval (DR-RTV): AIRS, CrIS, IASI
- NUCAPS
- AVHRR L1B

Features: Frontends - AVHRR



```
avhrr2awips.sh -f /path-to-files/ -g 211e -p band2_vis band3b_bt
```

Glue Scripts

```
viirs2gtiff.sh -g grid_name -f /path-to-files/
```

viirs2awips.sh

viirs2binary.sh

viirs2hdf5.sh

viirs2ninjo.sh

modis2awips.sh

modis2binary.sh

modis2gtiff.sh

modis2hdf5.sh

avhrr2awips.sh

avhrr2binary.sh

avhrr2gtiff.sh

avhrr2hdf5.sh

mirs2awips.sh

mirs2binary.sh

mirs2gtiff.sh

mirs2hdf5.sh

acspo2awips.sh

acspo2binary.sh

acspo2gtiff.sh

acspo2hdf5.sh

drrtv2awips.sh

drrtv2binary.sh

drrtv2gtiff.sh

drrtv2hdf5.sh

crefl2awips.sh

crefl2binary.sh

crefl2gtiff.sh

crefl2hdf5.sh

crefl2ninjo.sh

```
polar2grid.sh viirs gtiff -g grid_name -f /path-to-files/
```


Polar2Grid: The Early Years

- viirs2awips → polar2awips → polar2grid
- New Features → Ugly Code
- Premature Optimization → Ugly Code
- Ugly Code →
- Rewriting → Collaboration
- MPOP → SatPy



SatPy

- New python library from the PyTroll Team
- Still in Beta
- Easy to install

```
pip install satpy
```

- Sensible Defaults
- Configurable
- Polar2Grid's supporting library
- Joint Effort

SatPy Features

```
# Load the SatPy library
from satpy import Scene
from glob import glob

# Provide your files
my_files = glob("/path/to/files/*.h5")
scn = Scene(reader="viirs_sdr", filenames=my_files)

# Load the bands you want to work with
scn.load(["I01", "true_color"])

# Resample to a grid
new_scn = scn.resample("211e")

# Save as a geotiff or other format
new_scn.save_datasets()
```

SatPy Features (cont.)

```
# Load other datasets
scn.load(["M05", "M07"])

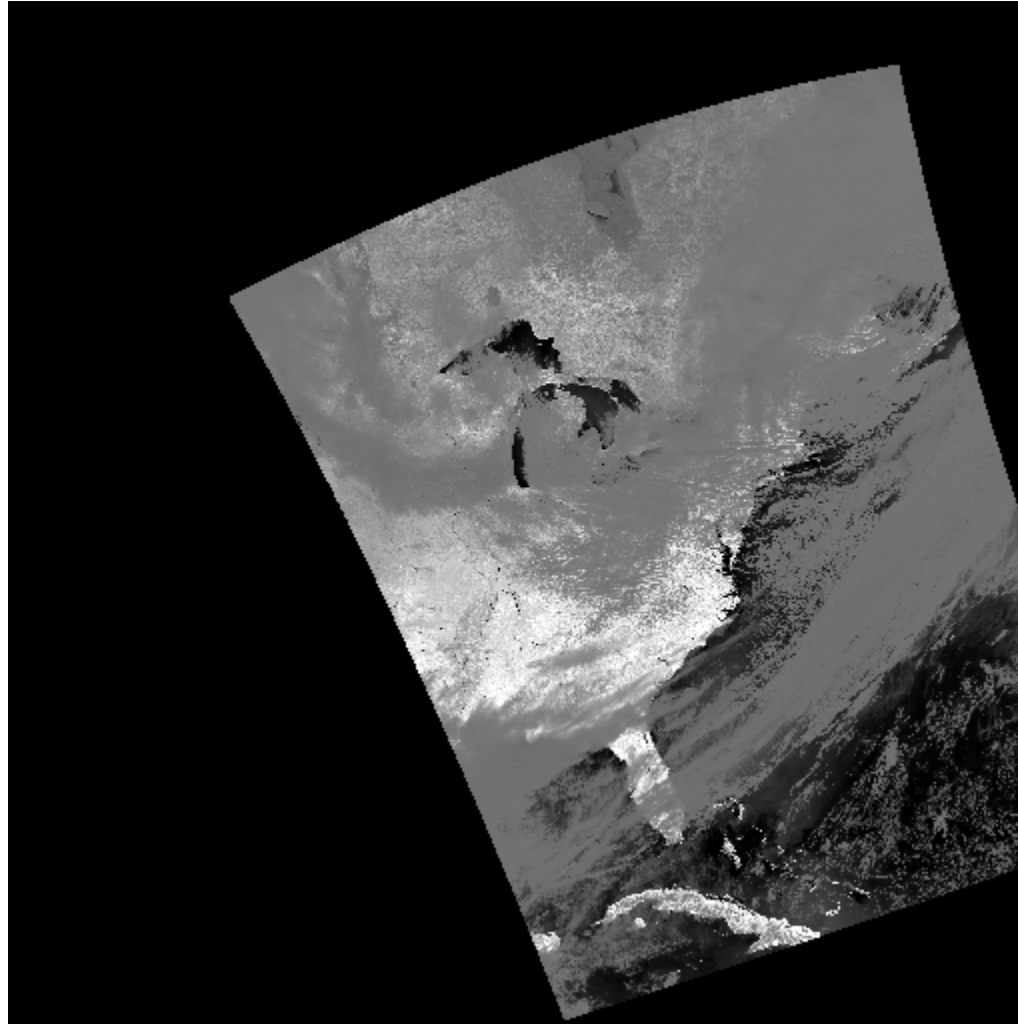
# Treat datasets like a numpy masked array with metadata
print(scn["M05"].info["standard_name"])
print(scn["M05"].info["wavelength_range"])
print(scn["M05"].min(), scn["M05"].max())

# Create new datasets
scn["ndvi"] = (scn["M07"] - scn["M05"]) / (scn["M07"] + scn["M05"])

# Resample as usual
new_scn.resample("211e")

# Show image in pop up window
new_scn.show("ndvi")
```

SatPy Features (cont.)



Future Plans

- Continue replacing Polar2Grid internals
- More Readers and Writers
- New grid configuration format
- Python 3 Compatibility in Polar2Grid
- Better Documentation
- More Unit Tests and Continuous Integration
- User Feedback

Questions?

P2G Download: <http://cimss.ssec.wisc.edu/cspp/>

P2G Github: <http://github.com/davidh-ssec/polar2grid/>

P2G Documentation: <http://www.ssec.wisc.edu/software/polar2grid/>

SatPy Github: <http://github.com/pytroll/satpy/>

SatPy Slack: <https://pytrollslackin.herokuapp.com/>

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