

Pytroll Workshop

...

Valladolid, June 24th 2016



Background

- Small teams
- Same needs
- Same tools

Principles

- Modularity
- Reusability
- Maintainability
- KISS

Ease of use

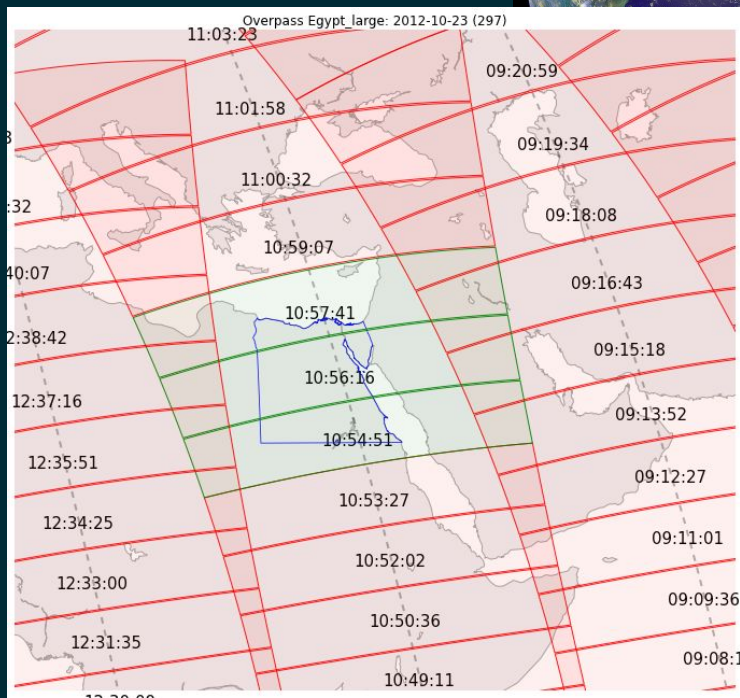
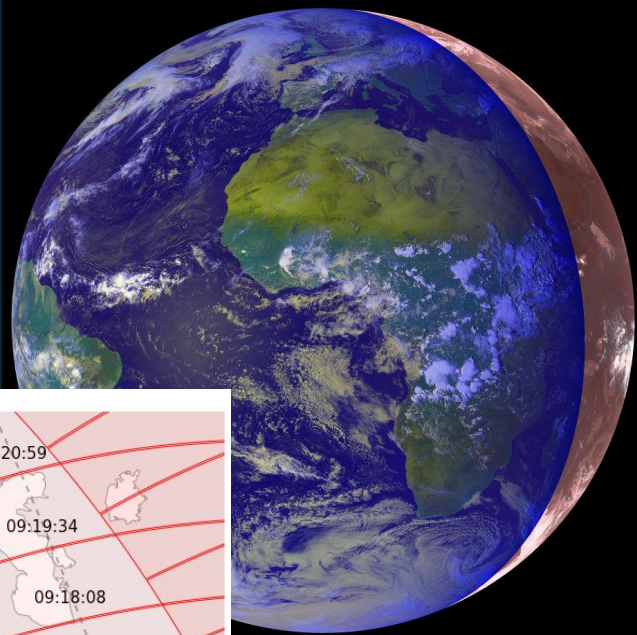
What is Pytroll ?

- Collection of FOSS python packages
- For weather satellite data reading/processing/writing



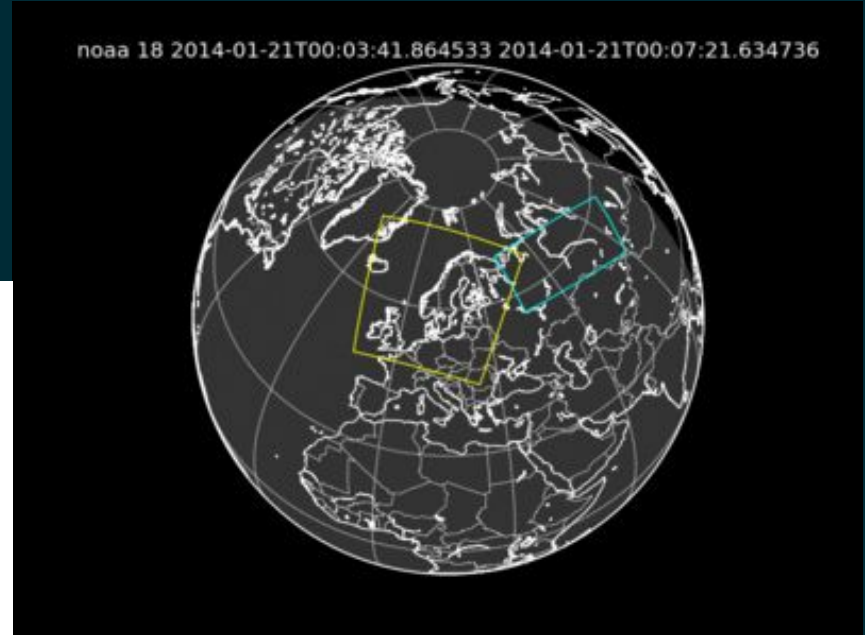
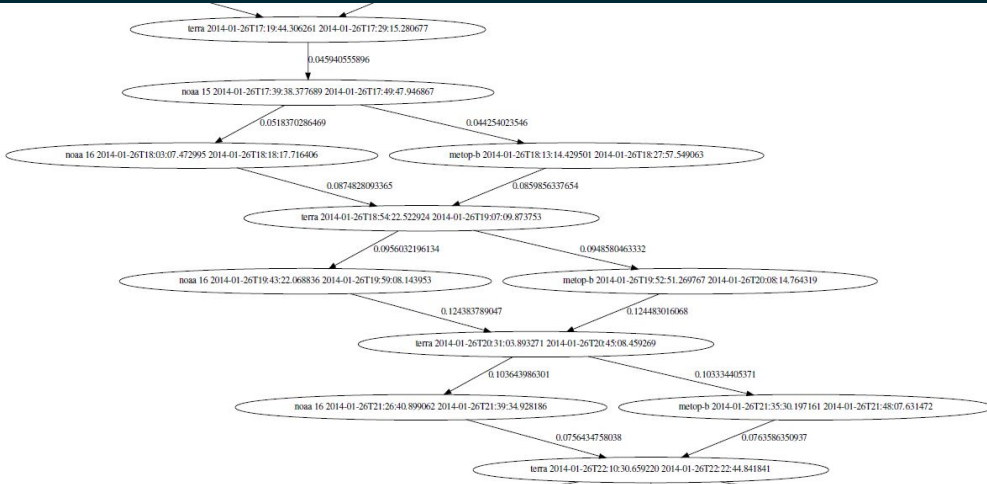
Pyorbital: get to know your satellite

- Use SGP4 to compute satellite position and velocity
- Within 3.5mm
- Astronomical computations



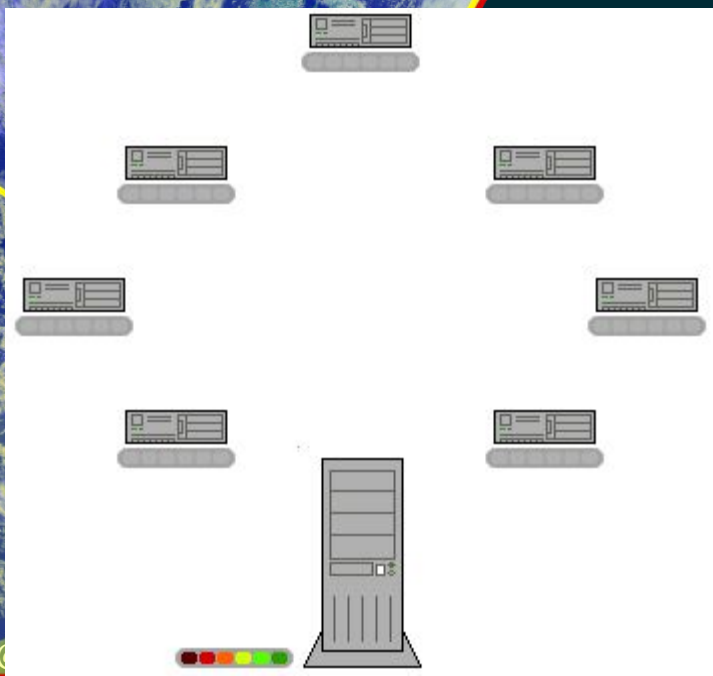
Pytroll-Schedule: Know when to look up

- Based on area of interest
- Give a different weight to each satellite



Trollcast: Sharing the raw data

- Bittorrent-inspired data sharing
- Zero timeliness
- Peer-to-peer



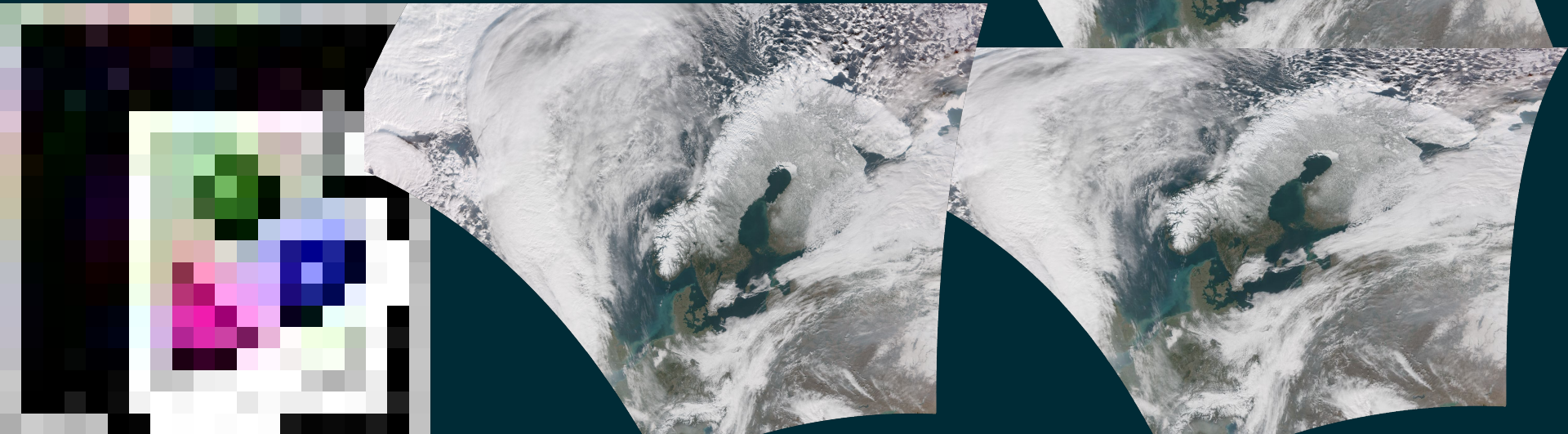
Trollcast: Sharing the raw data

- Works with HRPT (NOAA satellites)
- Prototyped with CADU (Metop, EOS, NPP, FY3, ...)

Running in Finland, Norway, Sweden, Iceland, being setup in Latvia

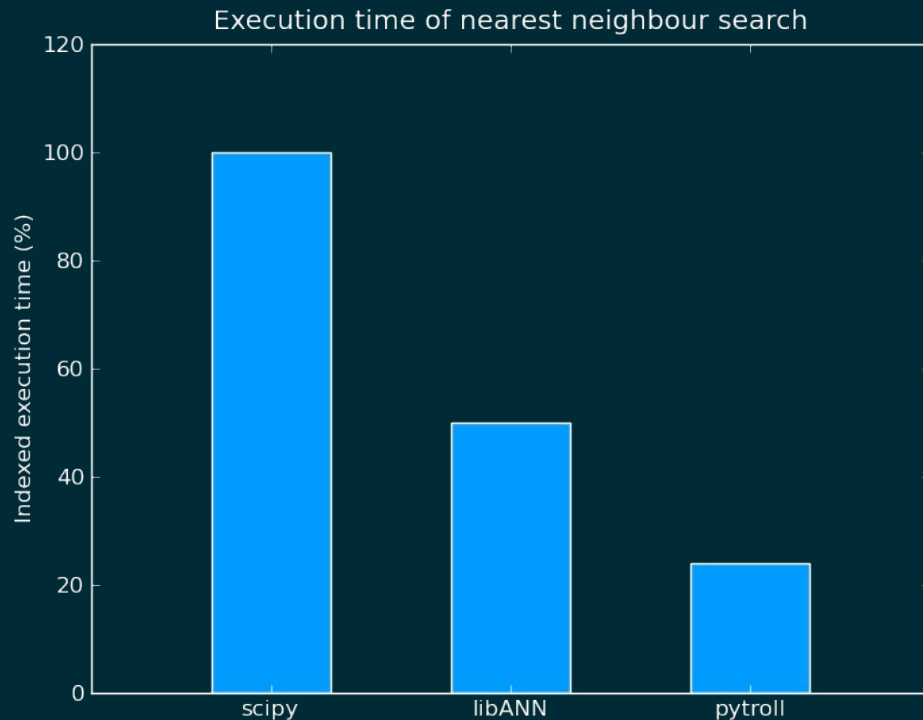
Pyresample for resampling

- Unprojected & Grid
- Proj.4, more than 130 different projections



Pyresample for resampling

- Nearest-neighbour (KDTree)
- EWA
- (Gradient search)

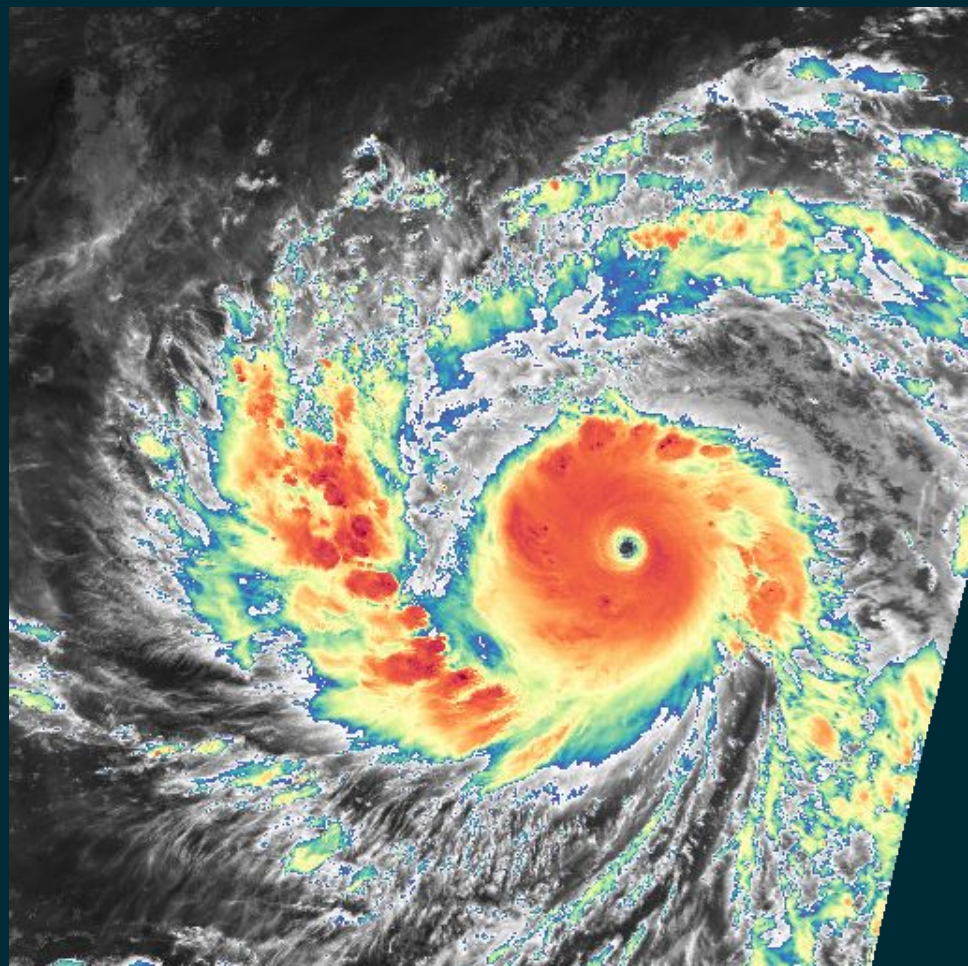


Trollimage

- Colorization

David Borland, Russell M. Taylor II, 2007
Rainbow Color Map (Still) Considered Harmful

Brewer, et al., 2009.
ColorBrewer 2.0:
Color Advice for Cartography



Pycoast

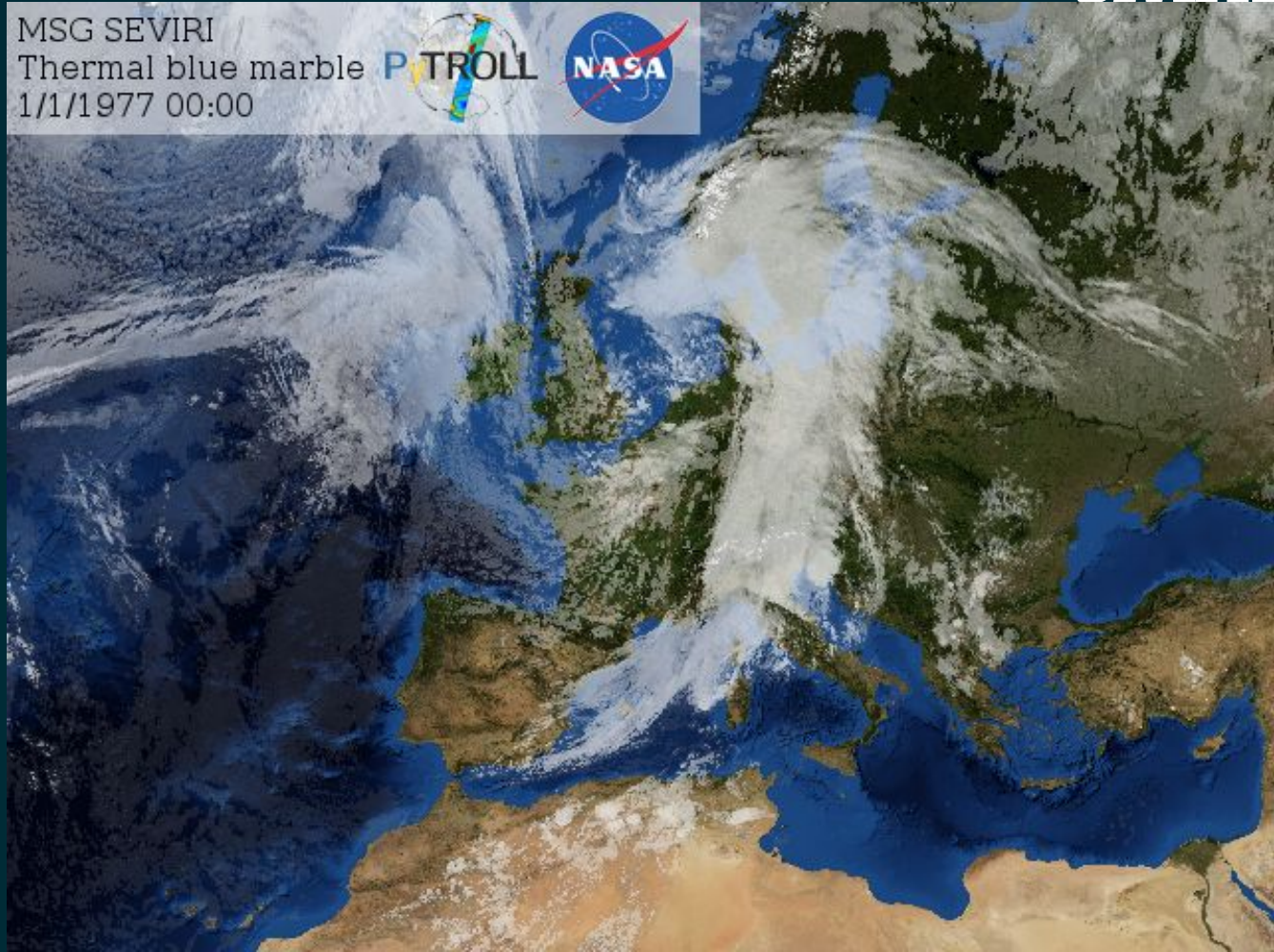


Pycoast



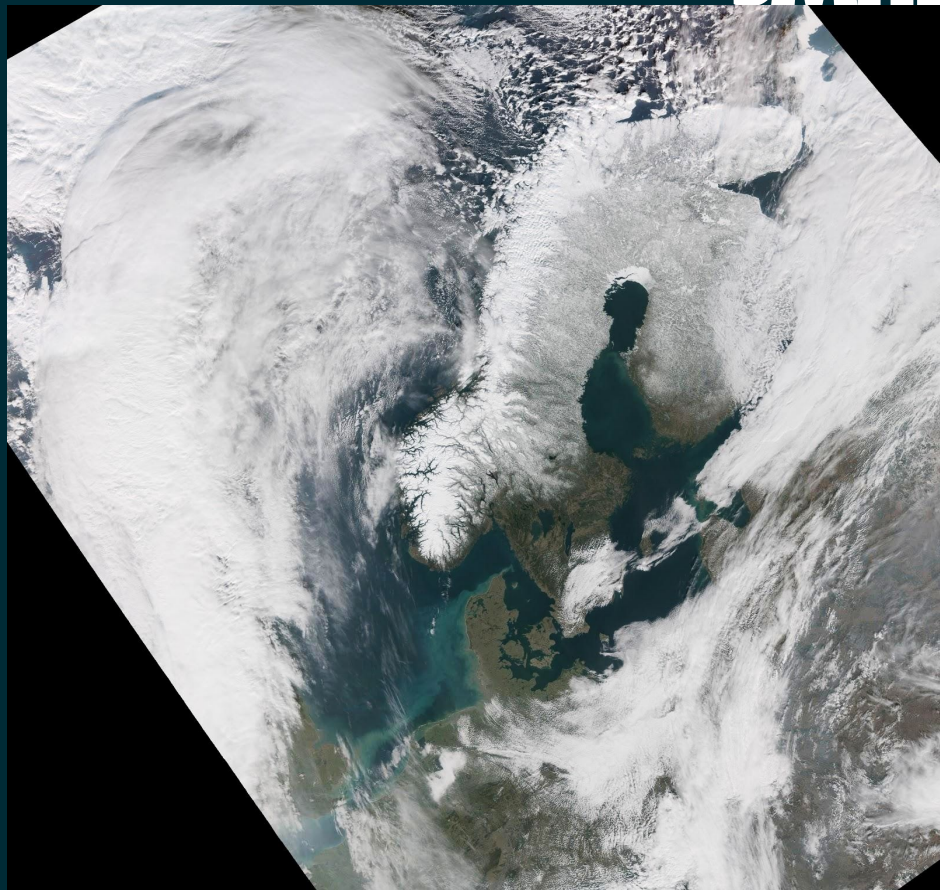
Pydecorate

MSG SEVIRI
Thermal blue marble
1/1/1977 00:00



Mpop and SatPy

- High level processing for satellite data
- Both GEO and LEO
- Indexing by name or wavelength
- Many built-in composites



SatPy example

```
from glob import glob
from satpy.scene import Scene

# Load data by filenames
files = glob("/data/viirs_data/*.h5")
scn = Scene(reader="viirs_sdr", filenames=files)
```


SatPy example

```
from glob import glob
from satpy.scene import Scene

# Load data by sensor
scn = Scene(sensor="modis", base_dir="/data/terra_data/")
```

SatPy example

```
# Automatically load composites and their dependencies
scn.load(["true_color"])

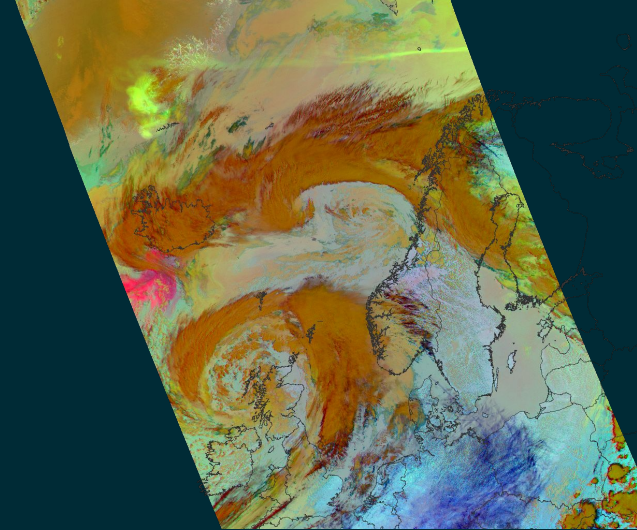
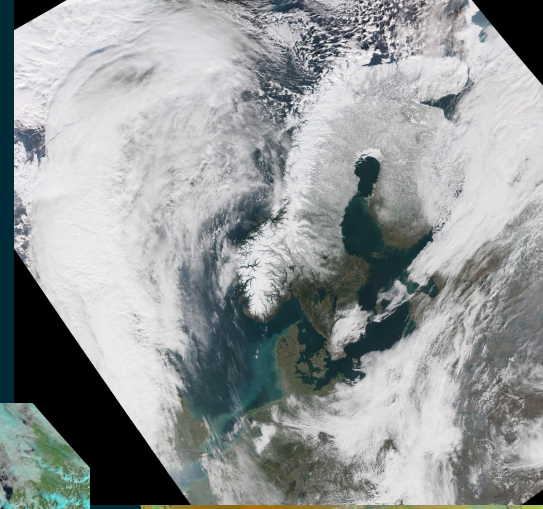
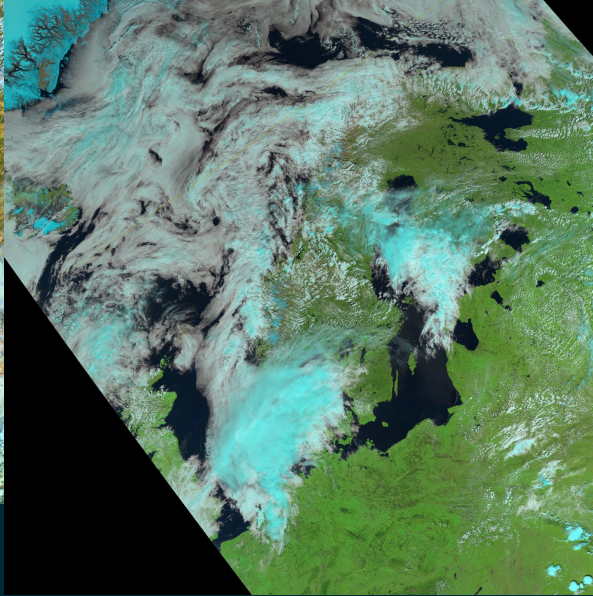
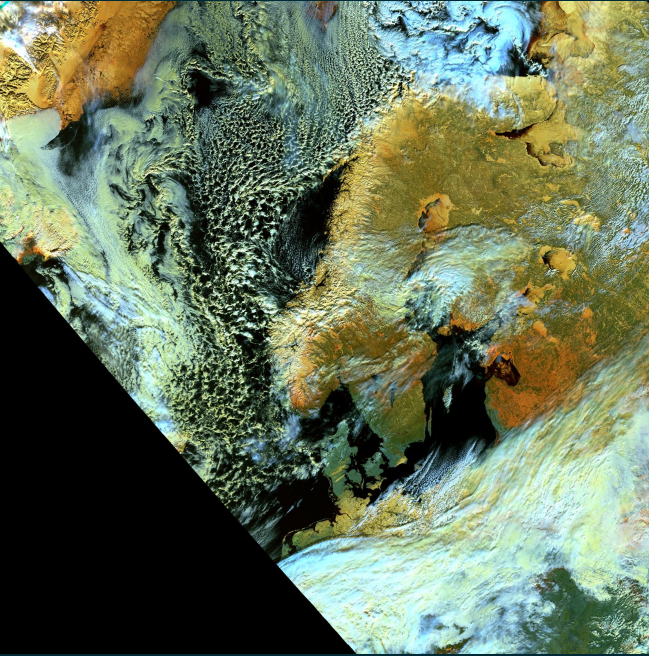
# Resample multi-band data to a uniform grid
rs_scn = scn.resample("euron1")

# Save RGB geotiff
rs_scn.save_dataset("true_color")
```

Satellite data formats

- HDF4 - MODIS L1B
- HDF5 - VIIRS (SDR, Compact, L1B)
- HDF5 - FY3
- NetCDF - NWCSAF
- AAPP
- NOAA GAC
- Metop PDF
- HRIT/LRIT
- SAR
- ...
- **Add your own reader!**

Mpop/SatPy built-in composites



Output data formats

- NetCDF/CF
- GeoTIFF
- NinjoTIFF
- PNG, JPeG, ...

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[Sök](#)

SMHI [Vädret](#) [Klimat](#) [Data](#) [Professionella tjänster](#) [Kunskapsbanken](#) [Forskning](#) [!\[\]\(43e165fd0a30e03a39afb86038cd3ee5_img.jpg\) Risk Sverige](#)

Vädret i Sverige

Varningar

10-dygnsprgnos

Meteorologens kommentar

Snödjup

UV-index idag

Årstdiskarta

Flödesläget

Brandriskprognos - 5 dygn

Observationer

Max/minvärden

Vattenföring

Vattenstånd i de stora sjöarna

Vädret i Sverige (tidigare version)

SMHIs väder för mobila enheter

Nederbörd och molnighet

Radar/blixt, Sverige

Radar, Norden

Satellit, Norden

Satellit, Europa

Satellit, Jorden

Hav och kust

Hav- och kustväder

Kustväder

Sjöväderprognos

Havsobservationer

Havsvattenstånd

Havsvågor

Kustobservationer

Algsituationen

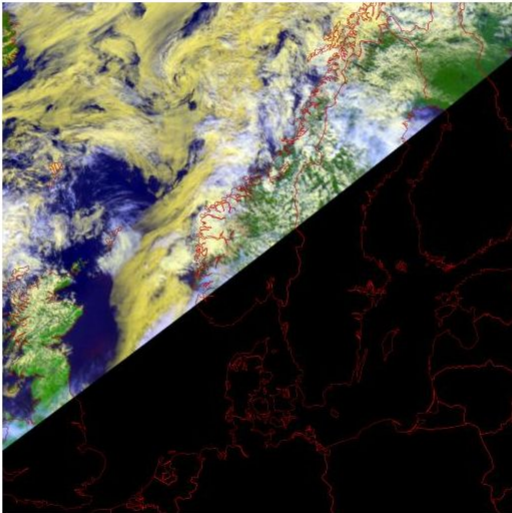
Is till havs

Luftkvalitet

Marknära ozon

Fjäll

Fjällväder



BILDER FRÅN POLÄRA SATELLITER

06-23 16:07
06-23 15:41
06-23 14:59
06-23 14:39
06-23 14:01
06-23 13:54
06-23 13:52
06-23 13:19
06-23 13:03
06-23 12:58
06-23 12:13
06-23 11:41

IR-bilder

FÖRKLARING

Blåvitt = höga moln, ofta tunna
Vitt = medelhöga moln, tjocka höga moln eller nysnö/glaciär
Gult = låga moln, is eller "gammal snö"

PROFESSIONELLA TJÄNSTER

Varningssystem för eldistributörer
Var förberedd på extremt väder med kundanpassade sms- och e-postvarningar för kraftig bläst, snö och åska.
[Larmtjänst för åska, kraftig bläst och snö](#)

LÄR DIG MER

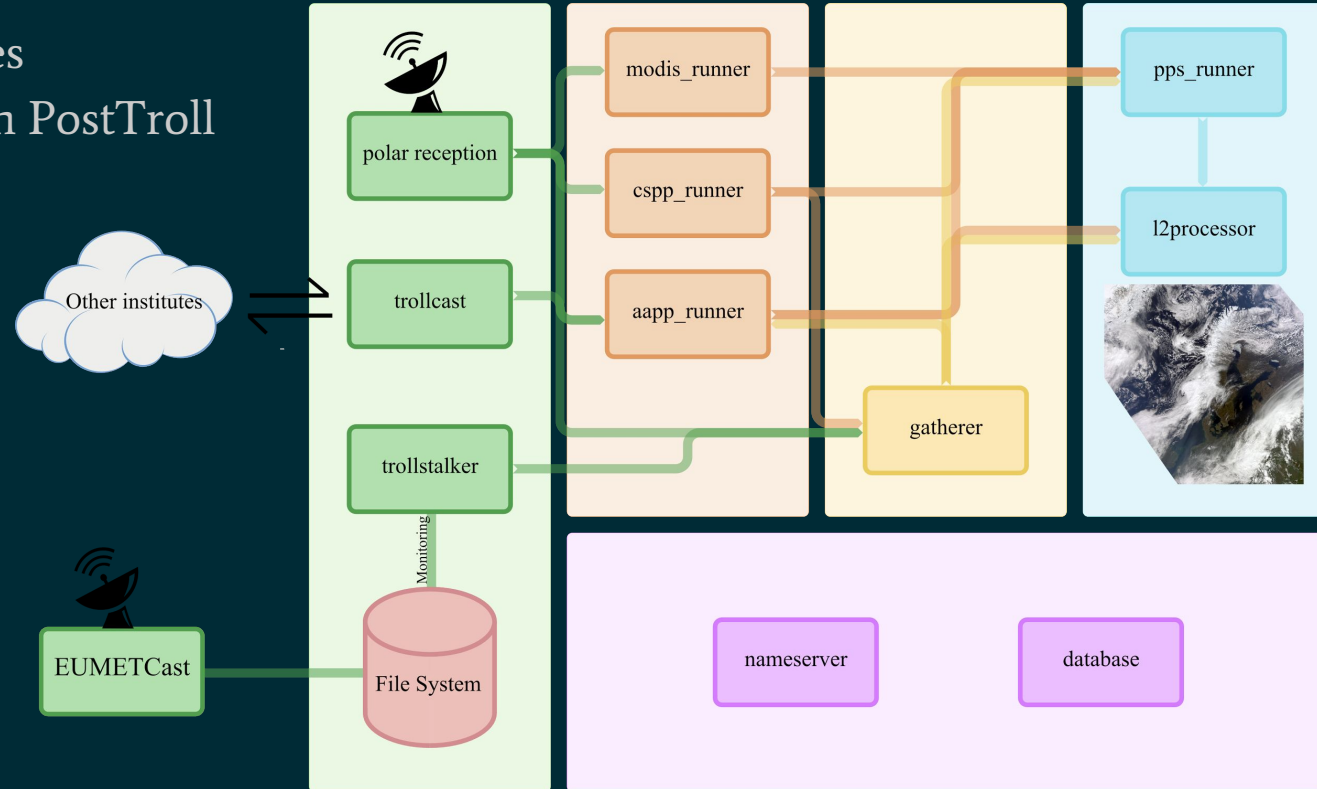
Typer av satelliter
SMHI tar emot data från de europeiska satelliterna METEOSAT och MetOp samt de amerikanska NOAA satelliterna.
[Typer av satelliter](#)

FORSKNING

Forskning inom vädersatellit
Inom SMHIs forskning för fjärranalys drivs flera projekt inom satellit och radar. De flesta är samarbeten mellan olika länder främst inom Norden eller Europa.
[Forskning inom vädersatellit](#)

Trollduction for batch processing

- Independent modules
- Communication with PostTroll



Pytroll doesn't support [some feature/format] !

DIY

- Tutorials
- Look at the code
- Talk to us for help (slack, mailing list)

Sharing your work

- Talk to us
- Github is great

The screenshot shows the GitHub repository page for `pytrol / satpy`. The repository is described as "Python for weather satellite data" with a link to <http://satpy.readthedocs.org/en/latest/>. It has 1,490 commits, 2 branches, 0 releases, and 9 contributors. The "Code" tab is selected, showing a list of files and their commit history. The files include `doc`, `etc`, `satpy`, `utils`, `.bumpversion.cfg`, `.gitchangelog.rc`, `.gitignore`, `.travis.yml`, `LICENSE.txt`, `MANIFEST.in`, `README`, `README.rst`, `changelog.rst`, and `setup.cfg`. The commit history for each file is shown, including the commit message and the time since the last commit.

Repository: `pytrol / satpy`

Python for weather satellite data <http://satpy.readthedocs.org/en/latest/> — Edit

1,490 commits 2 branches 0 releases 9 contributors

Your recently pushed branches:

- `feature-yaml` (about 1 hour ago) [Compare & pull request](#)

Branch: `develop` [New pull request](#) [Create new file](#) [Upload files](#) [Find file](#) [Clone or download](#)

File	Commit Message	Time
<code>doc</code>	Document the <code>__init__.py</code> files also	4 months ago
<code>etc</code>	Add OMPS <code>so2_trm</code> dataset	an hour ago
<code>satpy</code>	Rename "scaling_factors" to "factor" in reader configuration	18 hours ago
<code>utils</code>	Script to generate external calibration files for AVHRR instruments	a year ago
<code>.bumpversion.cfg</code>	Rename to <code>satpy</code>	4 months ago
<code>.gitchangelog.rc</code>	Add config files for release utilities	6 months ago
<code>.gitignore</code>	Add <code>.gitignore</code> with python and C patterns	2 months ago
<code>.travis.yml</code>	Post travis notifications to #satpy	4 months ago
<code>LICENSE.txt</code>	Fix rpm building	a year ago
<code>MANIFEST.in</code>	Fix the manifest file to include the config files.	7 months ago
<code>README</code>	Add symlink from <code>README.rst</code> to <code>README</code> .	4 years ago
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Pytroll is FOSS

Release early, release often

Packages available on

- Pypi
- Github

```
> pip install satpy
```

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International collaboration

Pytroll Workshops

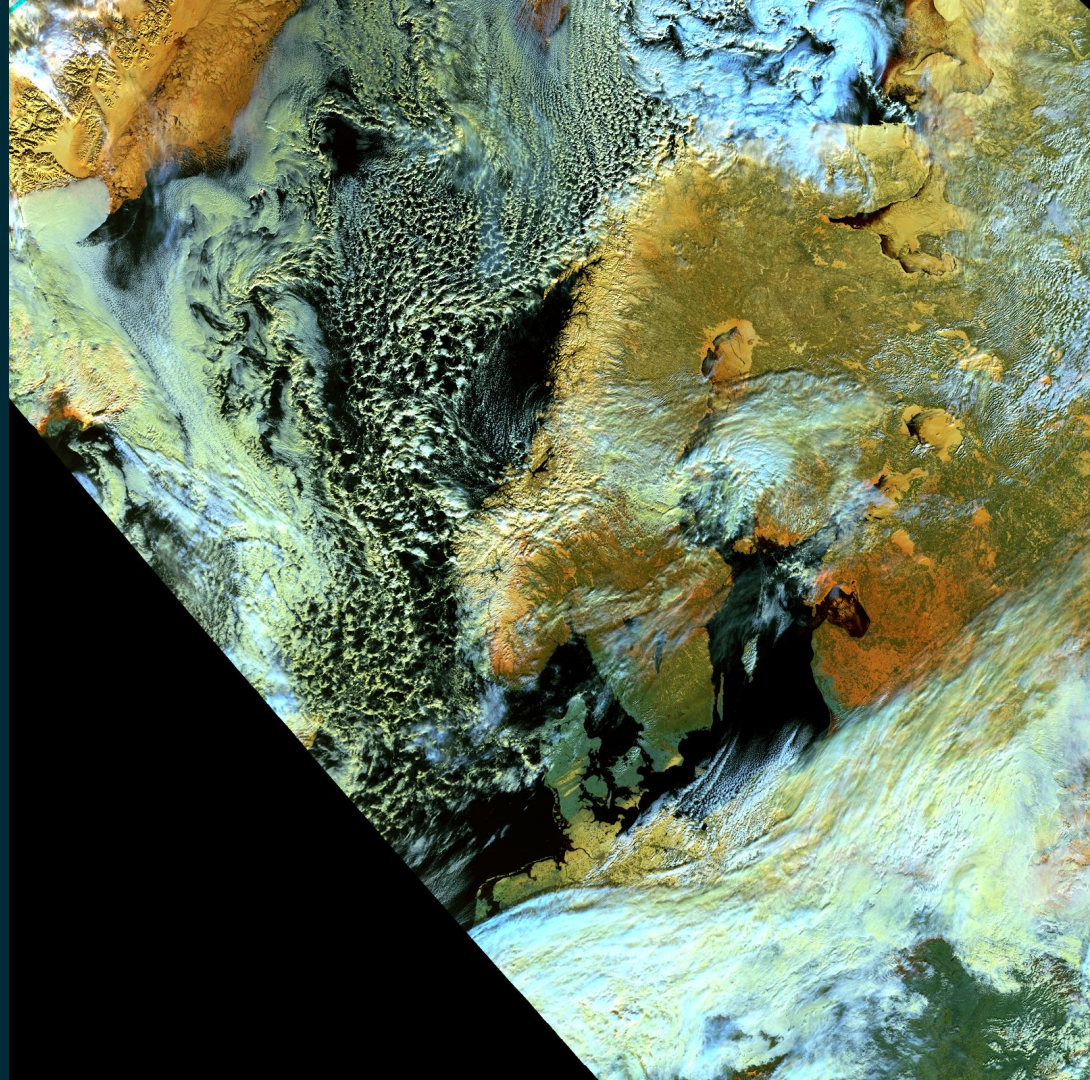
- SMHI
- DMI
- FMI
- SSEC
- DWD
- MeteoSwiss
- KNMI
- Met.No
- ...



www.pytroll.org

[Pytroll@Slack](#)

[Pytroll@Gitub](#)



Questions ?

- What kinds of applications are you interested in seeing developed?
- What types of data/algorithms are needed for your potential and/or existing application and information needs?
- Provide information on the actual or potential use of the presented algorithms/product/application in the context of your organization's needs.
- Are there particular challenges/shortcomings/unmet needs? Where can things be made better?
- Are there opportunities for collaboration with other attendees and workshop leads? (regional applications, data sharing, etc.)
- Discuss scenarios with the broader group to identify innovative ideas, potential improvements, etc.