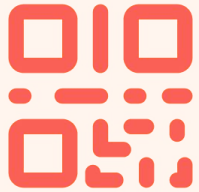


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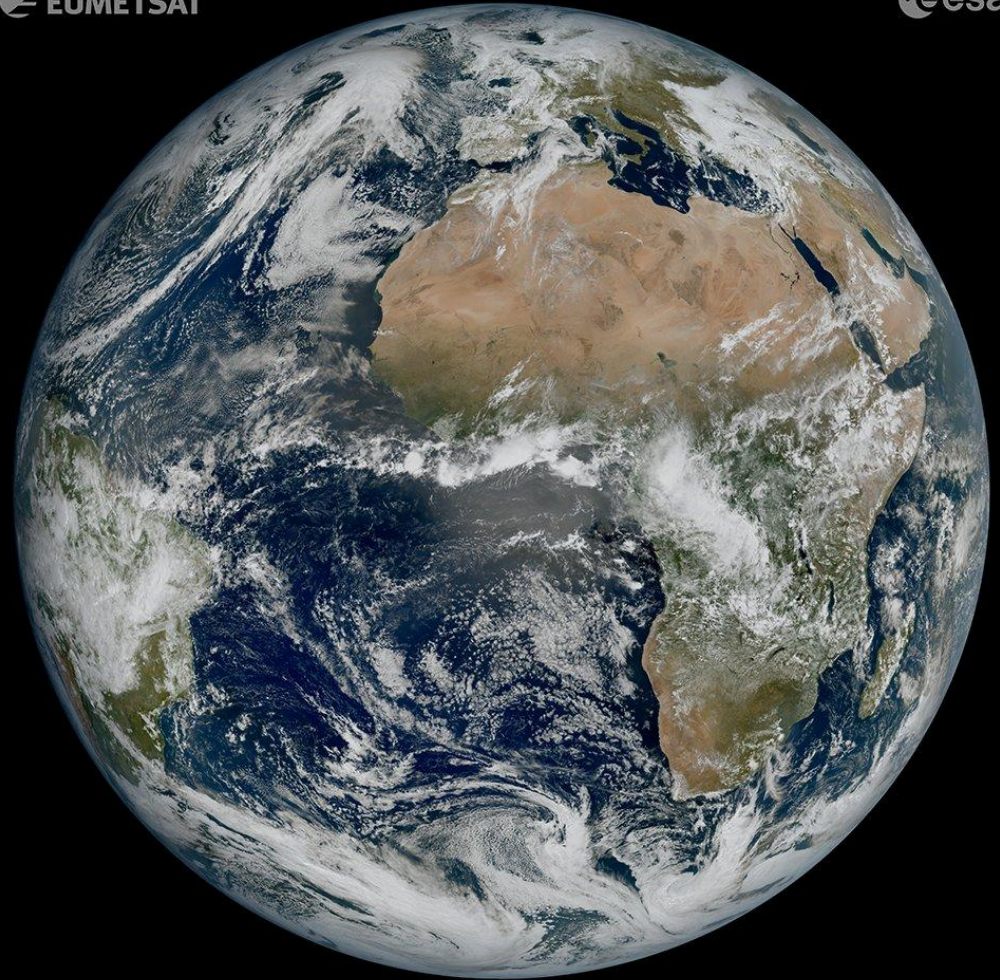
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Pytroll for MTG-I1

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martin.raspaud@smhi.se



About me

- Software engineer
- Research leader in SMHI's Meteorological R&D
- Works with open source software



About Pytroll

- Free
- Open-source
- Python
- Libraries

slido



Do you know Pytroll?

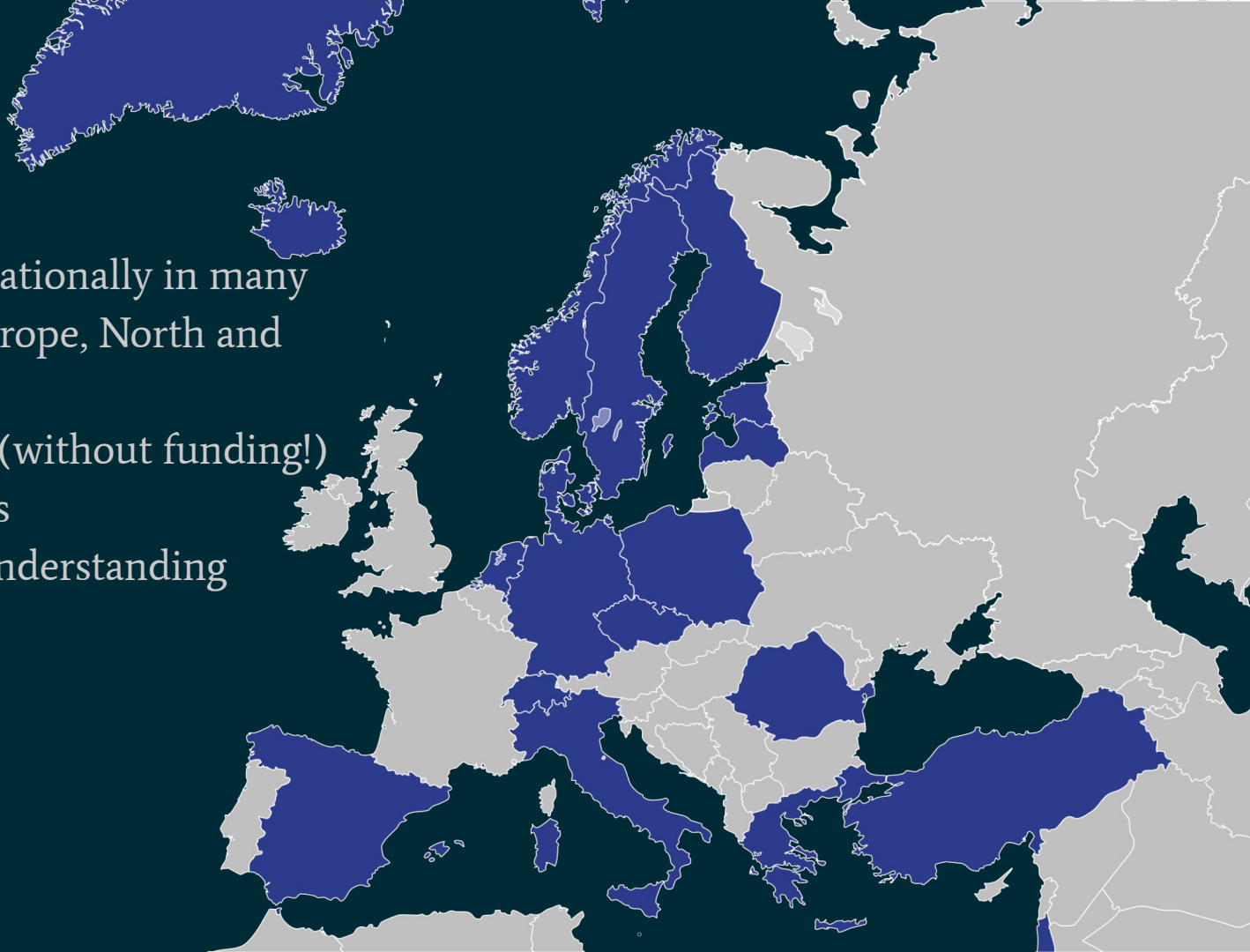
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Reading, Processing, Saving

- Support more than 90 satellite data formats
- Support of remote files
- Many built in composites, corrections, and resampling algorithms
- Saving to popular images, gis and data formats

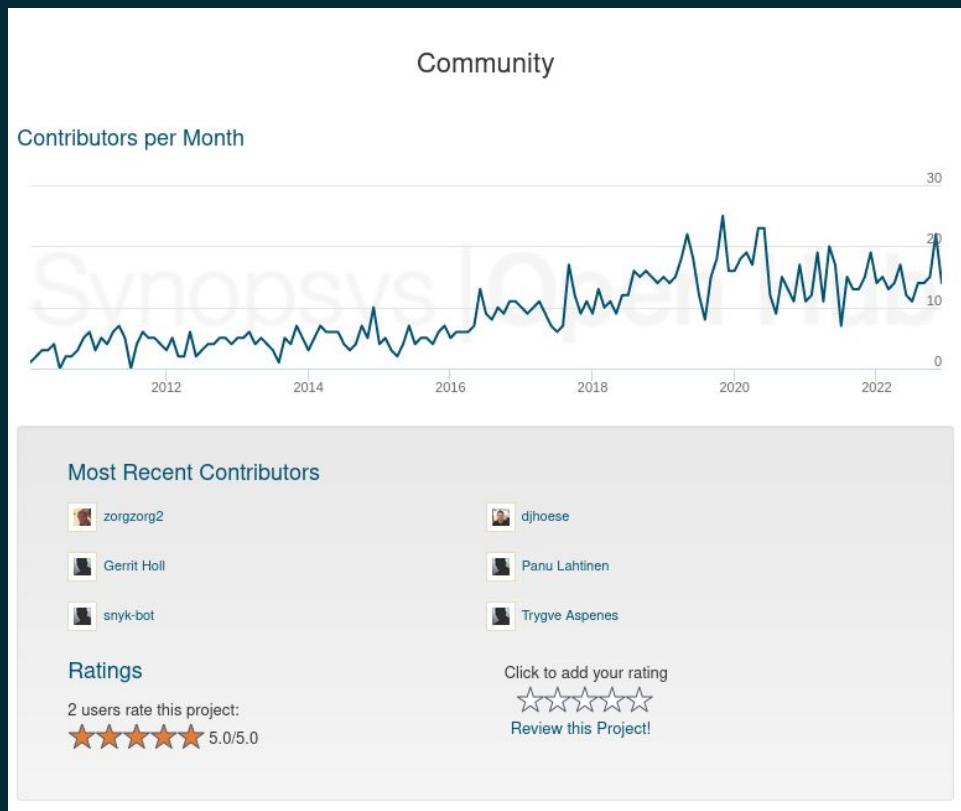
Community?

- Pytroll is used operationally in many institutes across Europe, North and South America
- Active community (without funding!)
- Many contributions
- Memorandum of understanding



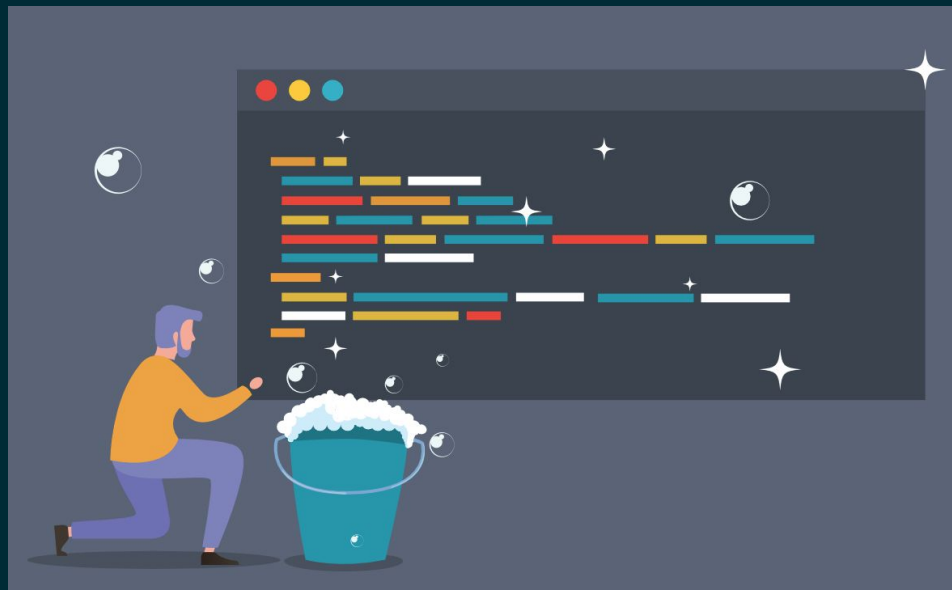
Our users

- NMSs
- Researchers
- Commercial companies
- Enthusiasts



How do we thrive

- Community mail/chat
- Bi-yearly hackathons
- Keeping high coding standards
 - Clean code
 - Testing
 - Documentation



What can Pytroll do for me?

- Reading
- Resampling
- Creating composite



Satpy example

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

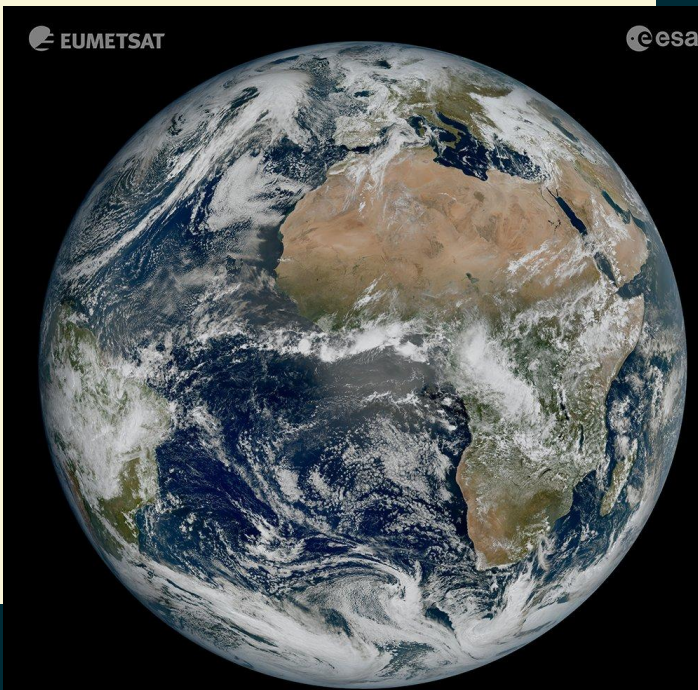
# Load data by filenames
files = glob("/data/my_fci_rc/*.nc")
scn = Scene(reader="fci_l1c_nc", filenames=files)
```

Satpy example

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

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

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



A satellite view of Earth from space, showing a coastline with white clouds and turquoise water. The background is a dark blue gradient.

Needs to run operationally

- 24/7
- Moving files around
- Processing many GB
- To generate images and scientific products
- In near real time

PyTroll used in research

- High quality data processing
- Uses python scientific stack
- Reproducible
- Reliable
- Traceable
- Open Science!



Google Scholar

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PyTroll: An open-source, community-driven Python framework to process earth observation satellite...
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Py4cats—Python for computational Atmospheric spectroscopy
F Schreier, S Gimeno Garcia, P Hochstuhl, S Sikuli - Atmosphere, 2019 - mdpi.com
Radiation is a key process in the atmosphere. Numerous radiative transfer codes have been developed spanning a large range of wavelengths, complexities, speeds, and accuracies. In the infrared and microwave, line-by-line codes are crucial esp. for modeling and analyzing ...
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Satellite-based rainfall retrieval: From generalized linear models to artificial neural networks
L Beusich, L Foresti, M Gabella, U Hamann - Remote Sensing, 2018 - mdpi.com
In this study, we develop and compare satellite rainfall retrievals based on generalized linear models and artificial neural networks. Both approaches are used in classification mode in a first step to identify the precipitating areas (precipitation detection) and in ...
☆ 99 Cited by 16 Related articles All 5 versions 90

GOES-16 observations of blowing snow in horizontal convective rolls on 24 February 2019
A Kennedy, C Jones - Monthly Weather Review, 2020 - journals.ametsoc.org
On 24 February 2019, strong winds behind an Arctic cold front led to widespread blowing snow across the northern Great Plains including areas in eastern North/South Dakota and western Minnesota. Impacts of the event ranged from blizzard conditions in northwest ...
☆ 99 Cited by 5 Related articles All 4 versions

Synergy of satellite remote sensing and numerical ocean modelling for coastal geomorphology diagnosis
M Benincasa, F Falchi, C Zedler, G Sammartino - Remote Sensing, 2019 - mdpi.com
Sediment dynamics is the primary driver of the evolution of the coastal geomorphology and of the underwater shelf clintforms. In this paper, we focus on mesoscale and sub-mesoscale processes, such as coastal currents and river plumes, and how they shape the sediment ...
☆ 99 Cited by 4 Related articles All 6 versions 90

Detecting anthropogenic cloud perturbations with deep learning
D Watson-Paris, S Sutherland, M Christensen - arXiv preprint arXiv:2019.2019 - arxiv.org
One of the most pressing questions in climate science is that of the effect of anthropogenic aerosol on the Earth's energy balance. Aerosols provide theseeds' on which cloud droplets form, and changes in the amount of aerosol available to a cloud can change its brightness ...
☆ 99 Cited by 2 Related articles All 6 versions 90

A large-scale analysis of pockets of open cells and their radiative impact
D Watson-Paris, S Sutherland, M Christensen, P Siler - 2020 - essoar.org
A convolutional neural network was used to detect occurrences of pockets of open cells (POCs). Trained on a small hand-logged dataset and applied to 13 years of satellite imagery the neural network is able to classify 8,491 POCs. This extensive database allows the first ...
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Introducing Students to Scientific Python for Atmospheric Science
S Arms, J Chastang, M Grover - Bulletin of the American Meteorological Society, 2020 - journals.ametsoc.org
Within the geoscience community, enthusiasm for the scientific Python ecosystem continues to grow (Nagpal and Gabrani 2019). As software tools created with Python continue to emerge and mature, researchers and educators are able to leverage their knowledge of the ...
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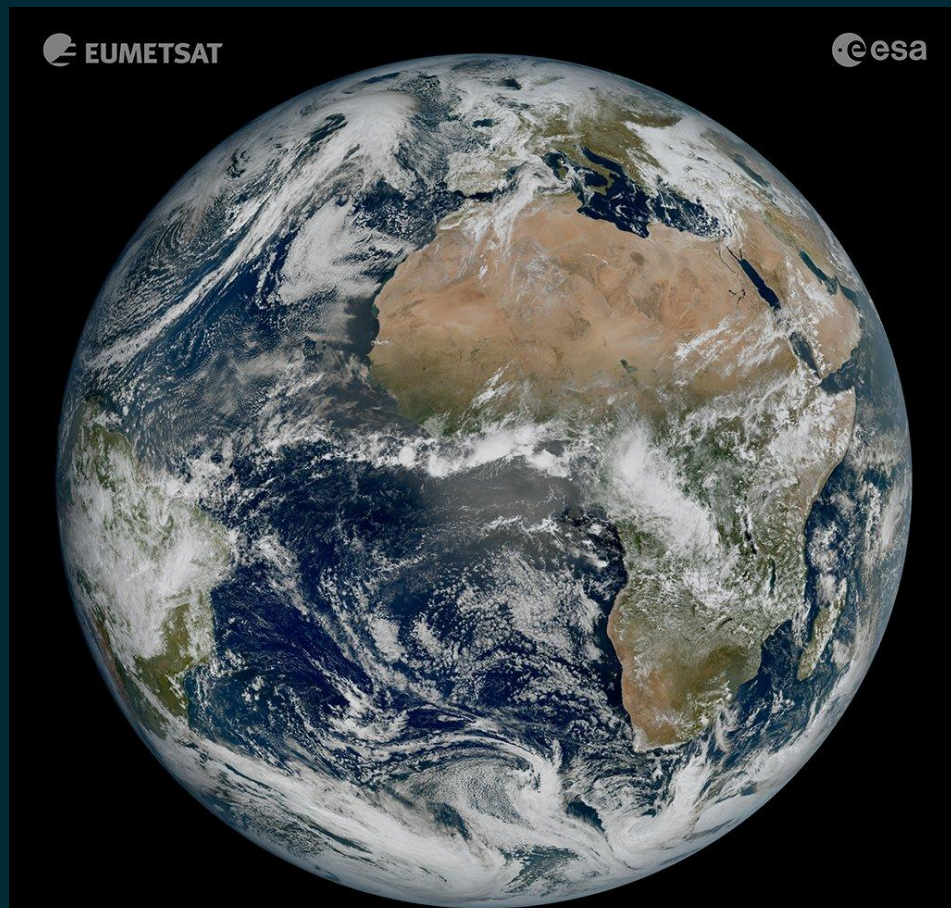
SIFTing through satellite imagery with the Satellite Information Familiarization Tool
JJ Gerth, RK Garcia, DJ Hoese, SS Lindstrom - 2020 - repository.library.noaa.gov
The Satellite Information Familiarization Tool (SIFT) is freely available open-source software that is based on a graphical user interface (GUI) for displaying, animating, and interrogating images from "new-generation" geostationary weather satellites, requiring little to no ...
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Record-Low Cloud Temperatures Associated With a Tropical Deep Convective

Pytroll quality for MTG I1

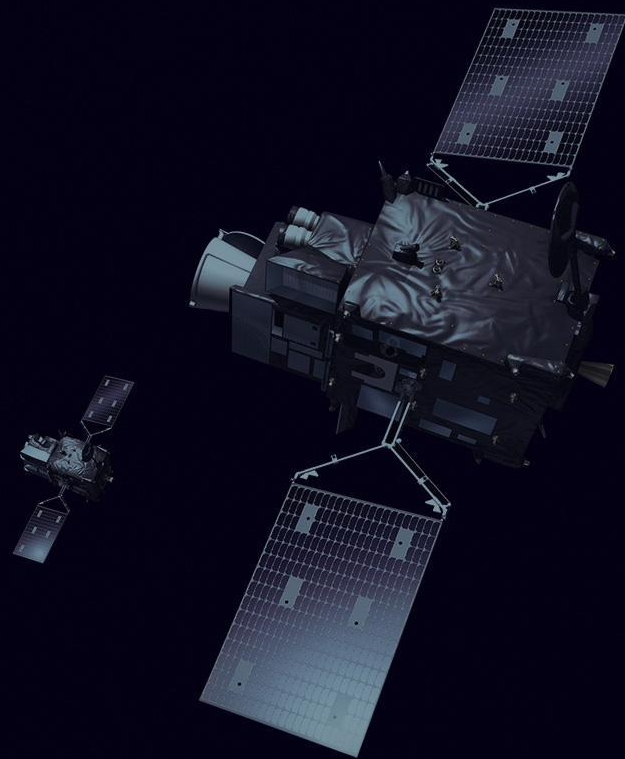
For MTG-I1

- Reader for FCI data
- Reader for LI data
- Thanks to contributions from devs at EUMETSAT



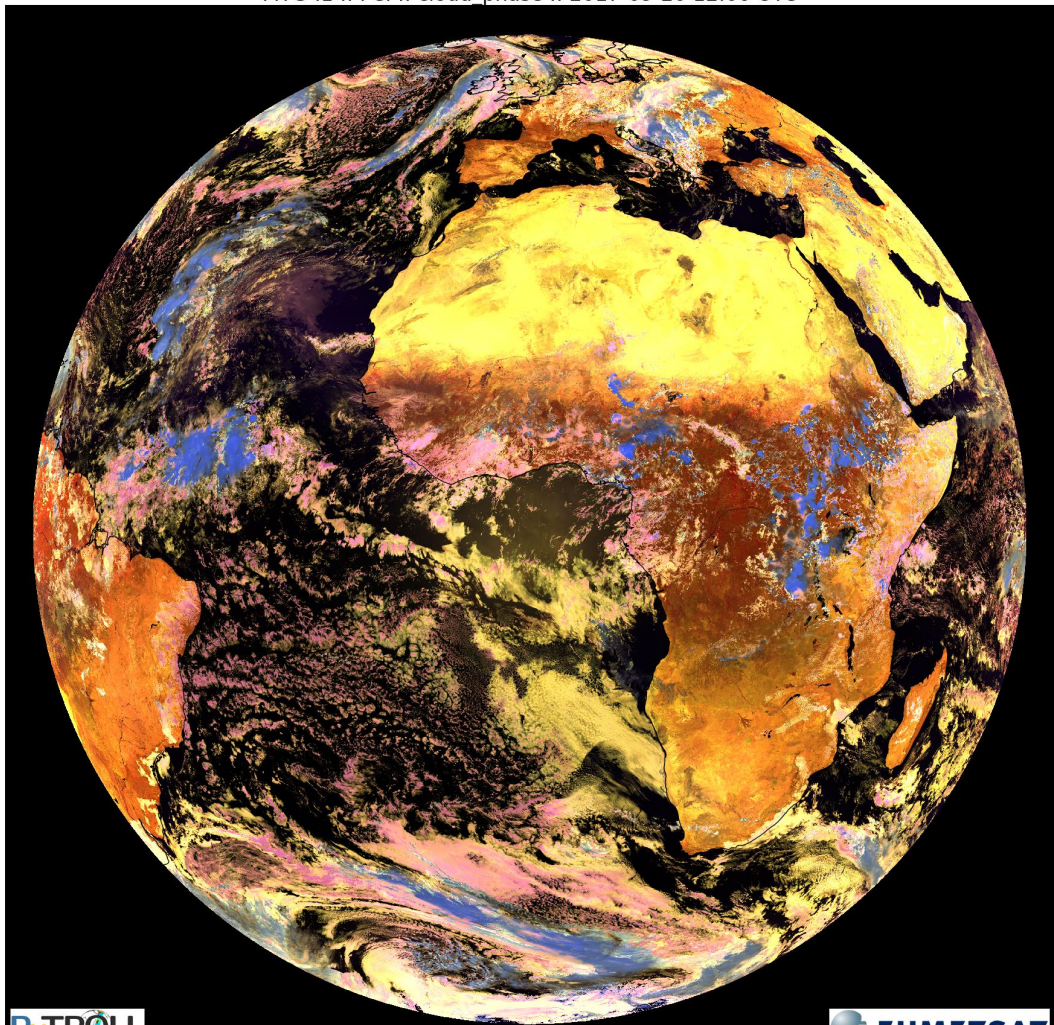
For MTG-I1

- Support remote files
- Distributed processing
- Same composites...
- And new ones!



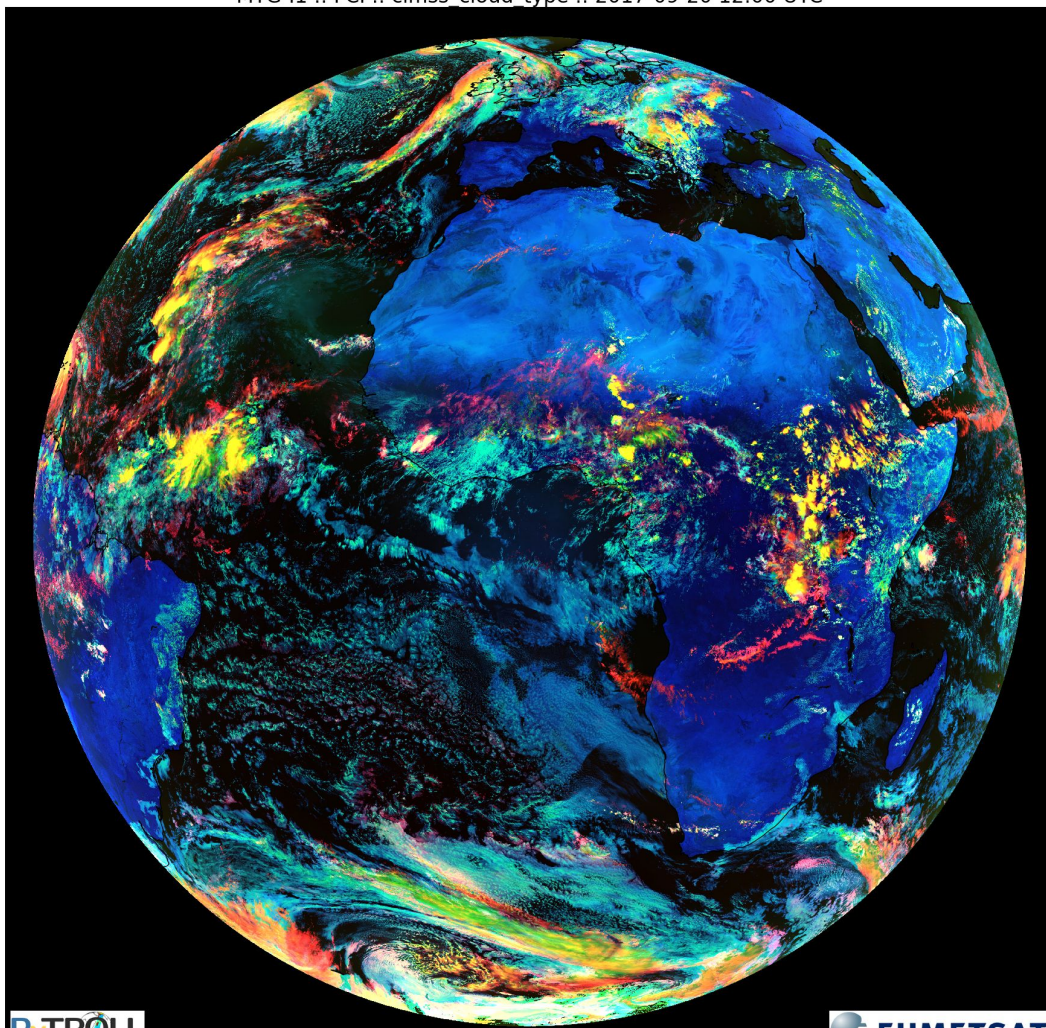
RGBs with Satpy

```
1 from satpy.scene import Scene
2 from glob import glob
3
4 filenames = sorted(glob("/path/to/my/FCI/data/*"))
5
6 global_data = Scene(
7     filenames=filenames,
8     reader="fci_llc_nc",
9 )
10 composites = ["airmass", "dust",
11              "true_color", "cloud_phase",
12              "cimss_cloud_type"]
13
14 global_data.load(composites)
15 global_data.save_datasets()
```



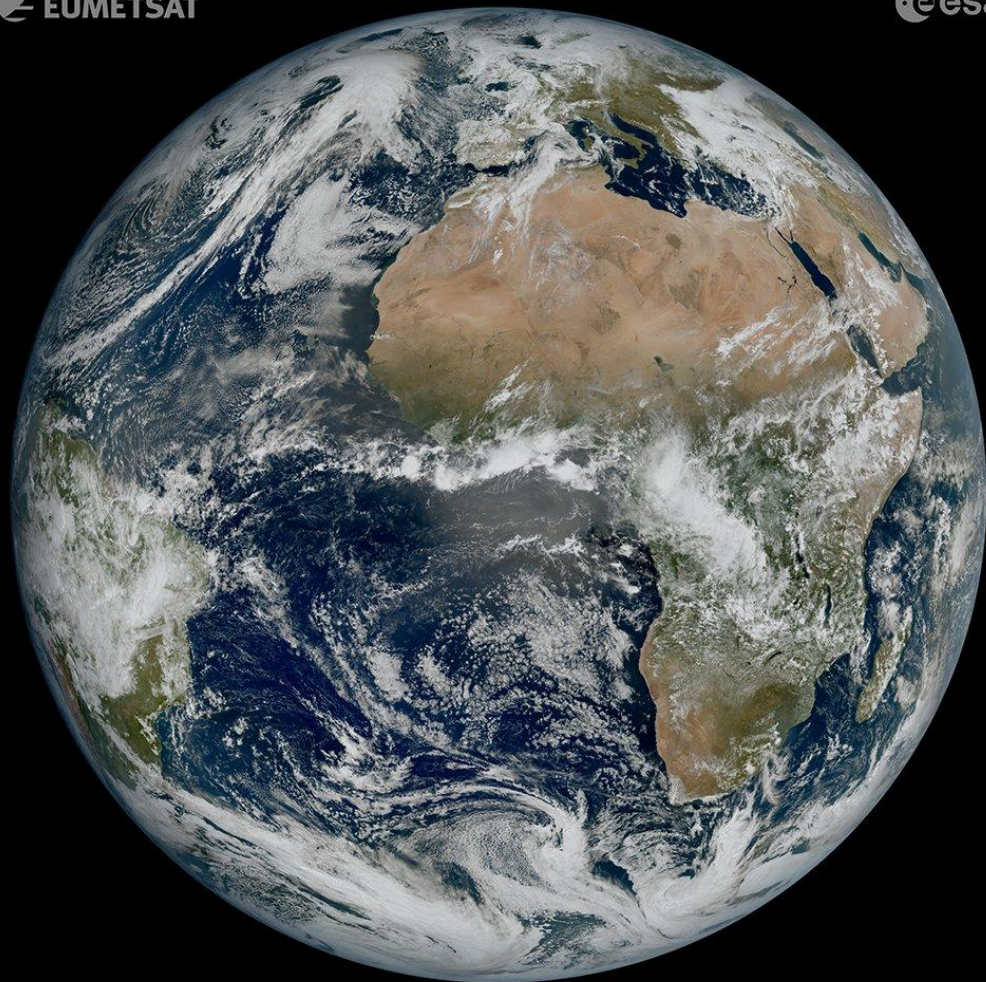
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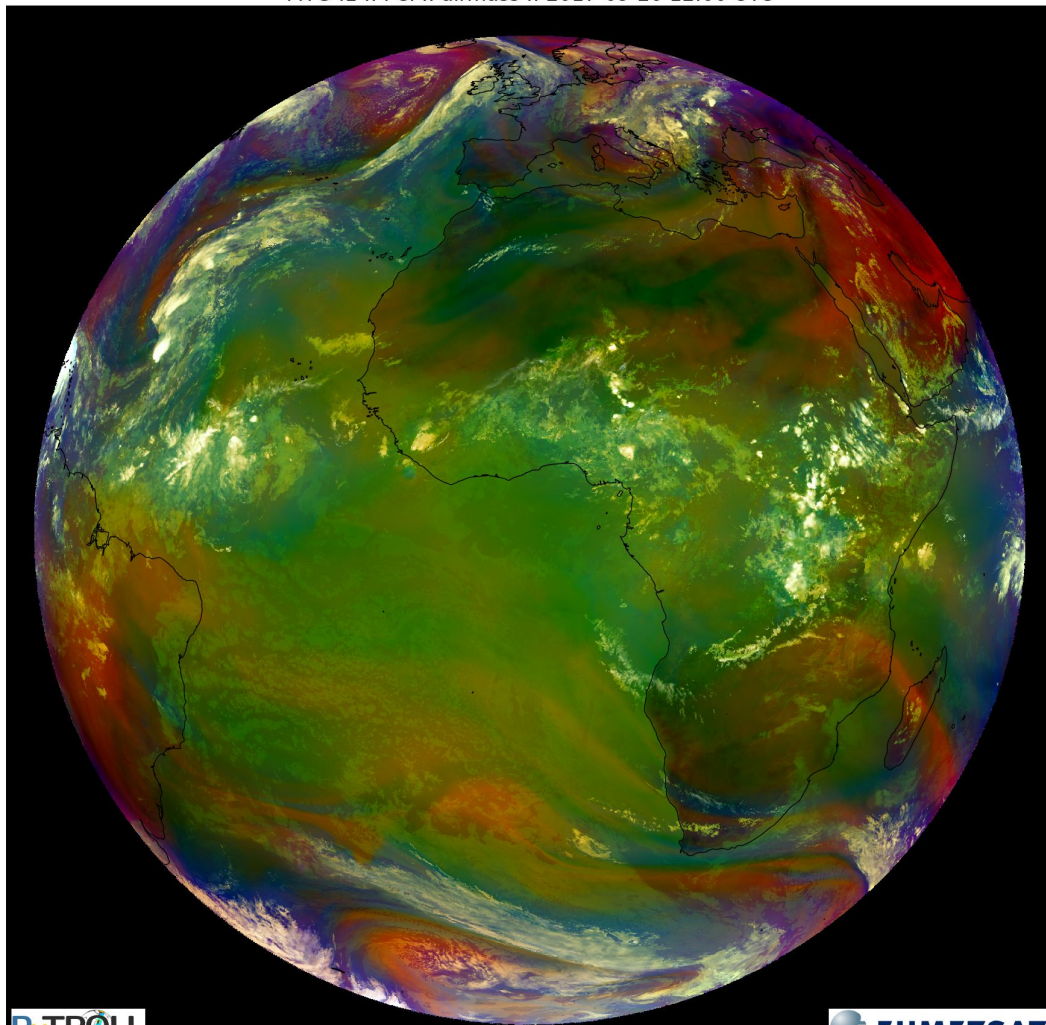
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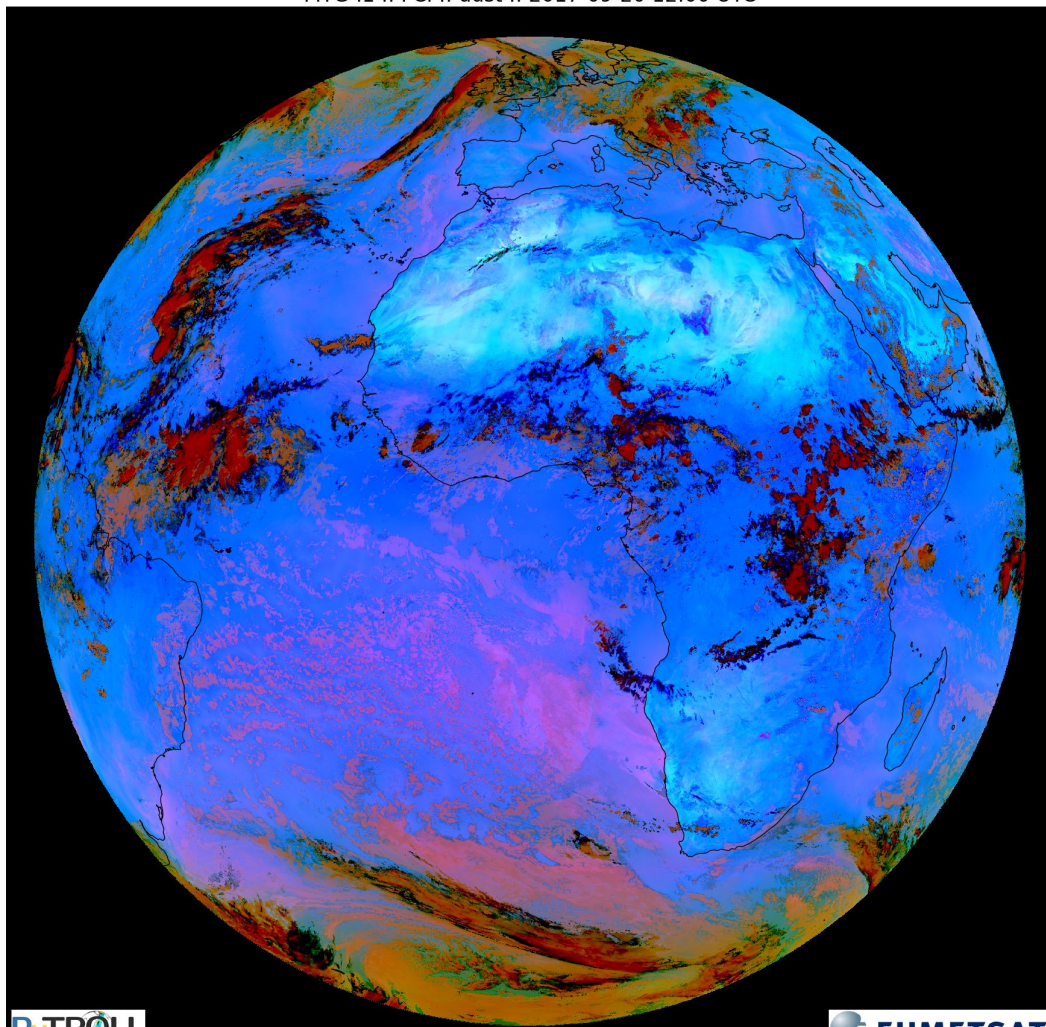
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13
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15 global_data.save_datasets()
```



Plans for the future

- Live test on the EWC
- Tweaks

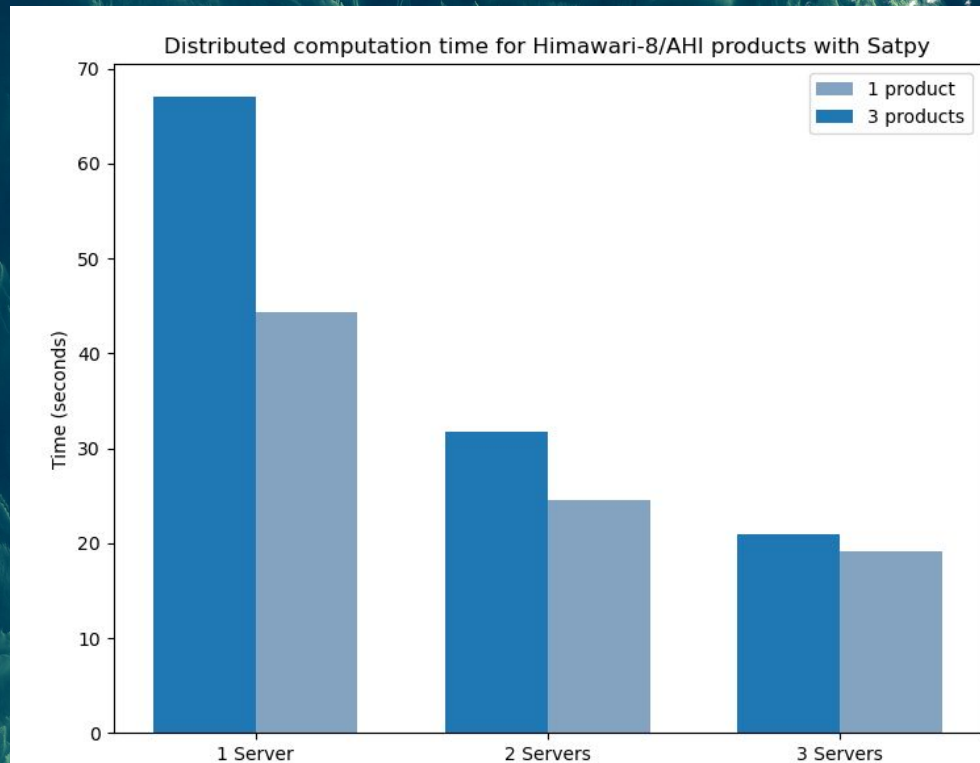


Dask distributed



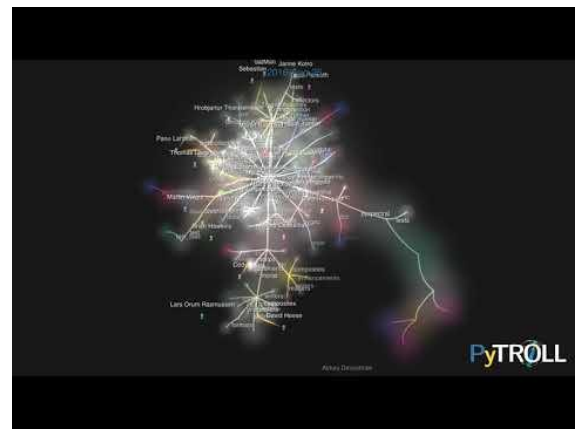
DASK

- Client/Server architecture
- Works automatically on regular dask code
- Works on clusters



What can you do for Pytroll?

- Spread the word
- Use it
- Contribute



www.pytroll.org

[Pytroll@Slack](https://pytroll.slack.com)

[Pytroll@Github](https://pytroll.github.io)

pytroll@googlegroups.com

[Pytroll@Fosstodon.org](https://pytroll.fosstodon.org) [PytrollOrg@Twitter](https://twitter.com/PytrollOrg)

Thanks !

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Audience Q&A Session

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