

openEO Platform: Enabling analysis of large-scale Earth Observation data repositories with federated computational infrastructure

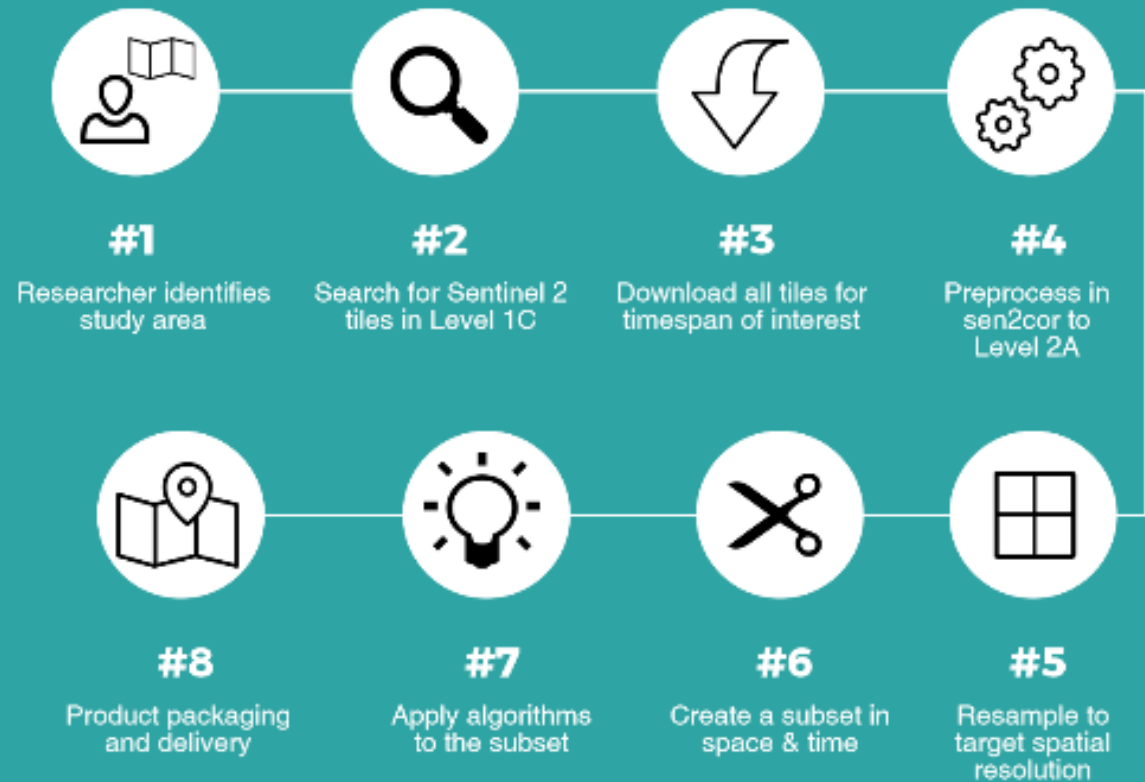


B. Schumacher, J. Dries, A. Jacob, M. Claus, M. Rossi, C. Briese, P. Griffiths, M. Mohr, S. Lippens, V. Ardizzone, D. Thiex, E. Pebesma
15th of June 2022, EODC Forum Vienna, Austria

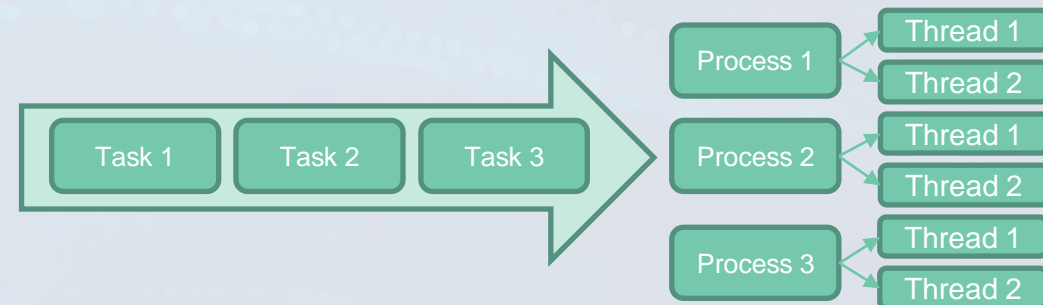
Why do we need openEO? The Data Management Burden...



Traditional remote sensing product process for Sentinel-2



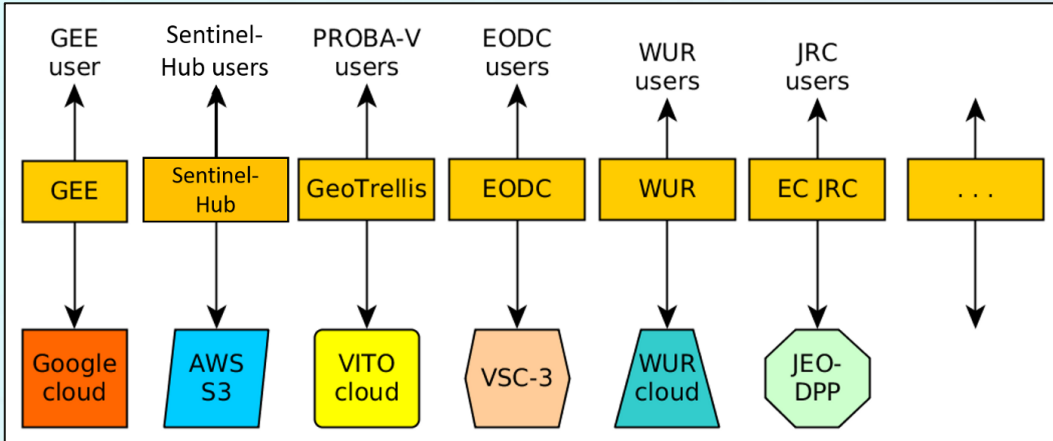
Allocated CPU	Allocated MEM	Status
8200 / 9600 (85%)	520GB / 1007.3GB (52%)	ON
4700 / 5600 (84%)	444GB / 503.6GB (88%)	ON
5200 / 5600 (93%)	358GB / 503.6GB (71%)	ON



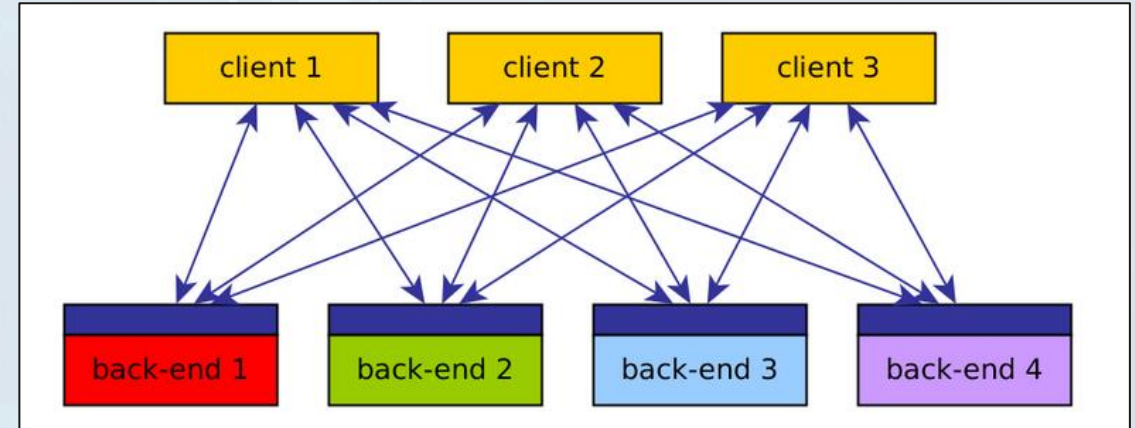
Credits: H. Kristen – ESA open Science 2017

How does it work?

Situation before openEO:



openEO API:



Driving concepts for addressing the **capability gap in Europe**:



Enabling simplicity: intuitive analytics & programming libraries, dynamic resource allocation, federated cloud environments



Providing transparency: Transparency of source code, scientific integrity & reproducibility, clarity & prior estimation of costing, confidentiality of IPR;



Pixel to continental scalability: pixel-level data access, scalable “building block” processes, clear roadmap for continental-global scale processing;

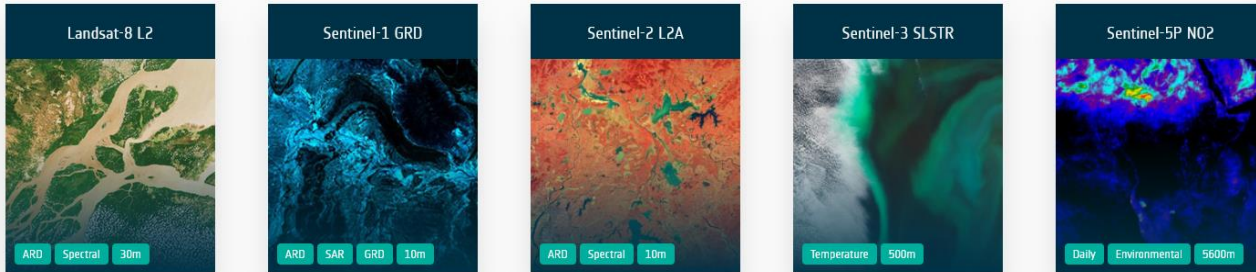


What is openEO Platform?

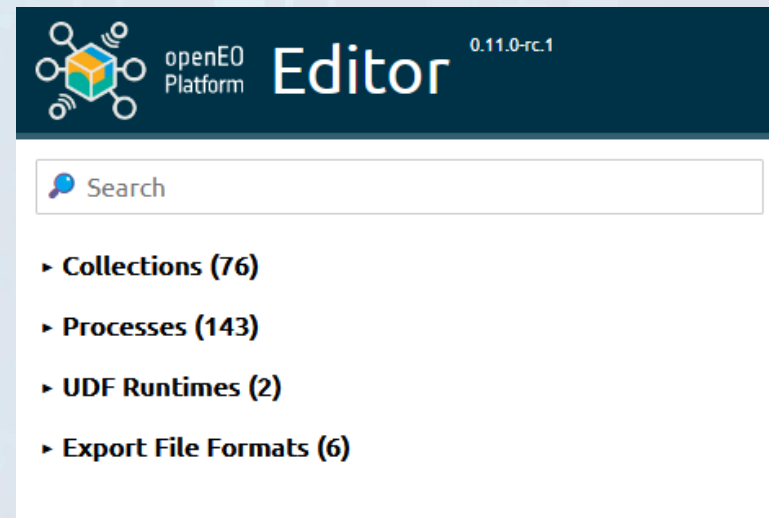


DATA COLLECTIONS

Below you can find a selection of our major data collections. You can also browse through [all available data collections](#).



-> openEO Platform provides intuitive programming libraries to process a wide variety of Earth Observation datasets.



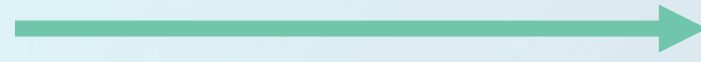
-> Run your earth observation analysis on our federated infrastructure!



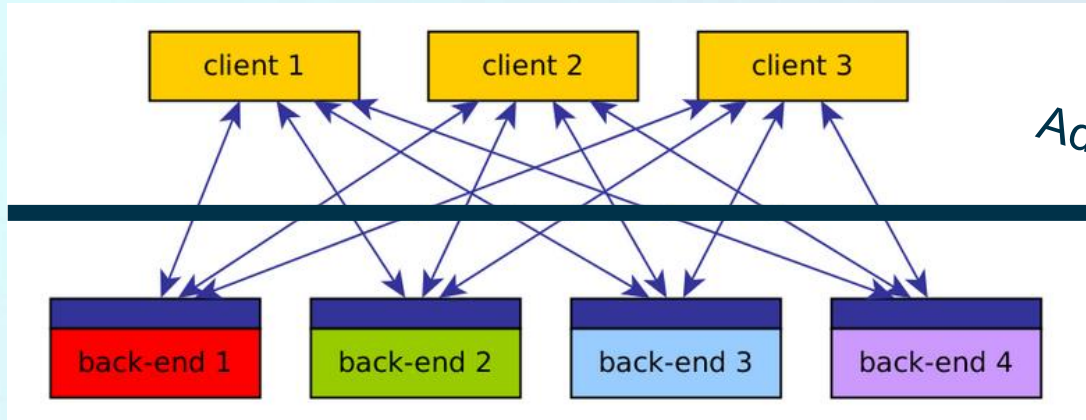
How does it work?



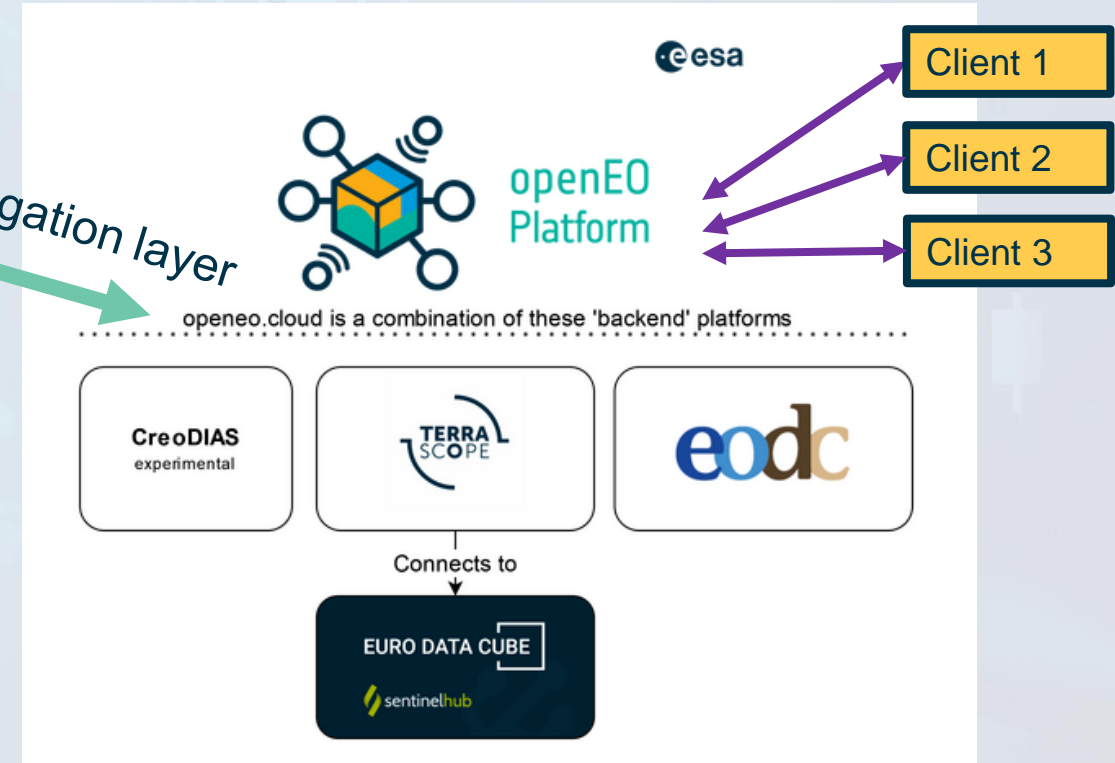
openEO API:



openEO Platform:



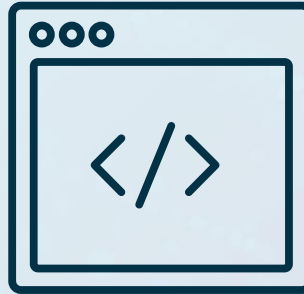
Added aggregation layer





JupyterLab (Python)

<https://lab.openeo.cloud/>



Web Editor (graphical)

<https://editor.openeo.cloud/>



R - Client

<https://docs.openeo.cloud/getting-started/r/>



Python - Client

<https://docs.openeo.cloud/getting-started/python/>



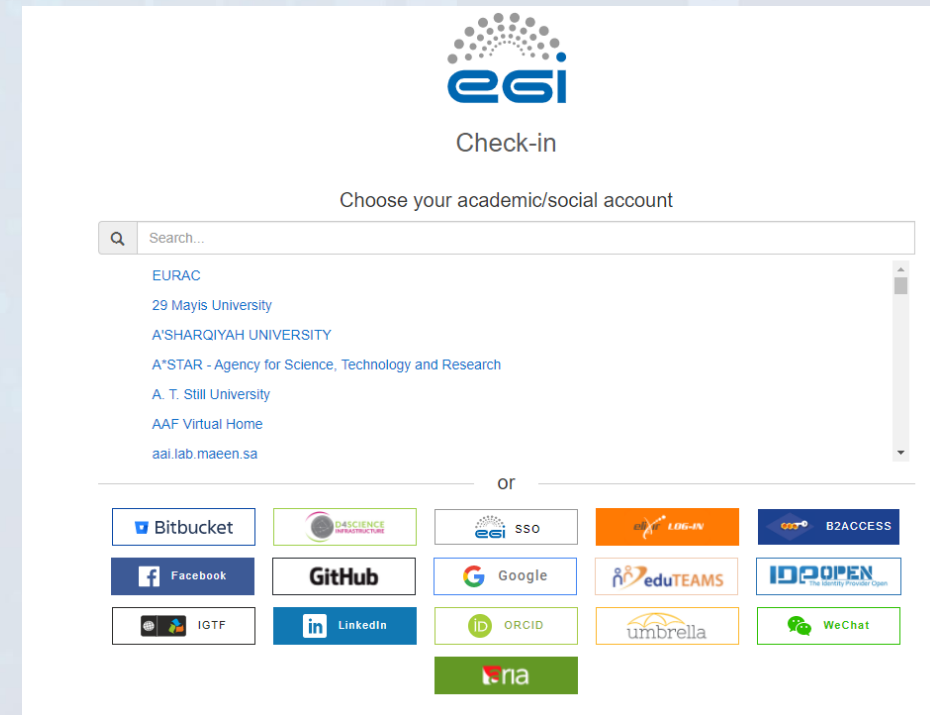
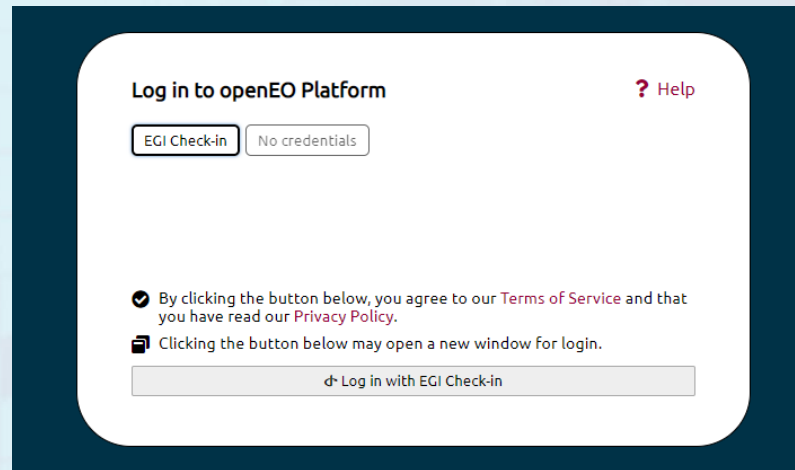
JavaScript - Client

<https://docs.openeo.cloud/getting-started/javascript/>

Federation – Single Sign On



- openEO supports OIDC as main authentication mechanism
- EGI check-in as common setup:
 - Linked to several identity providers
 - Operated as Virtual organisation
 - Supported by all federated backends



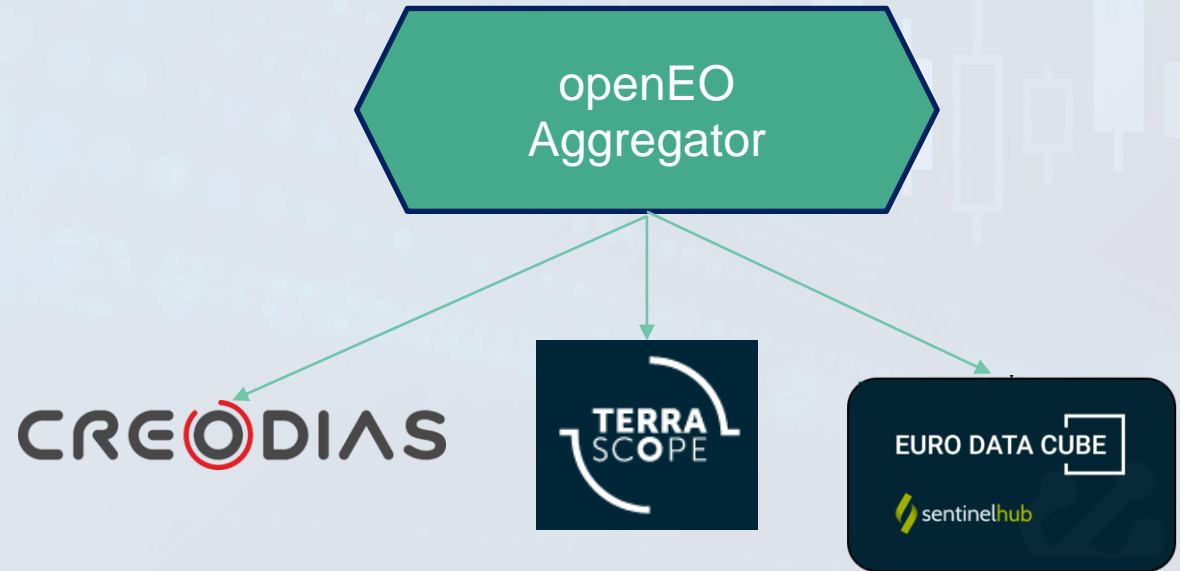
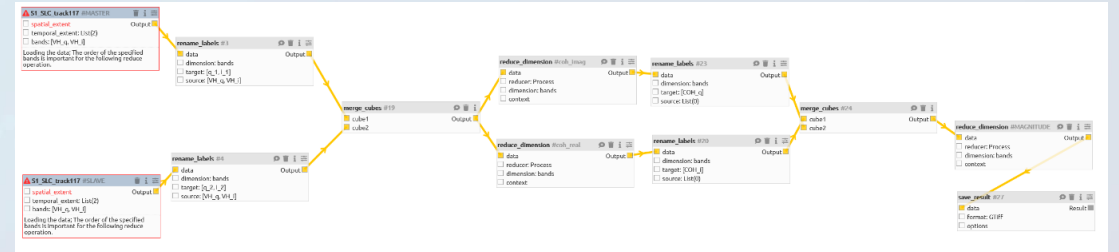
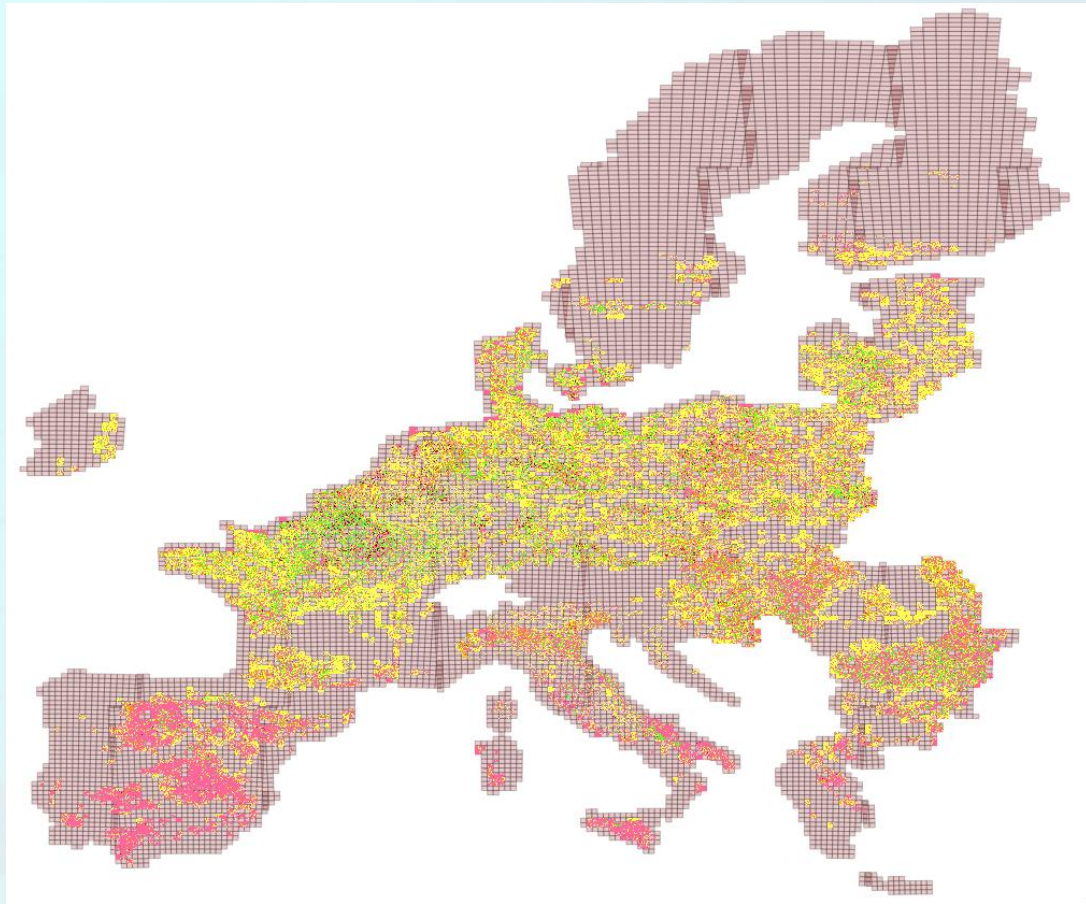


- Analysis-Ready Data creation for Sentinel 1 and Sentinel 2 Data
- Forest Change Detection
- Land Cover Classification
- Forest Canopy Mapping
- Crop Classification
- Vessel detection (in planning)
- Crop health (in planning)

Use Case: Distributed Parallel Processing



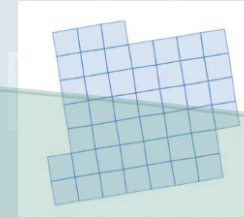
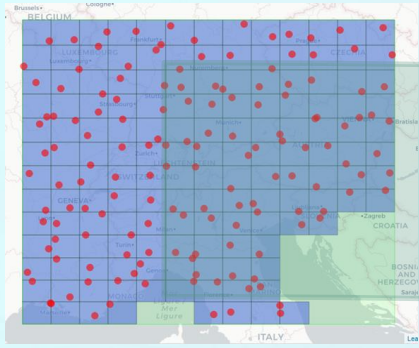
Example from the continental crop mapping use case



Use Case: Federated Processing



Example from forest canopy mapping use case



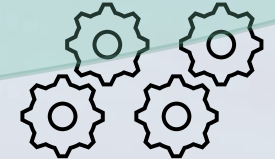
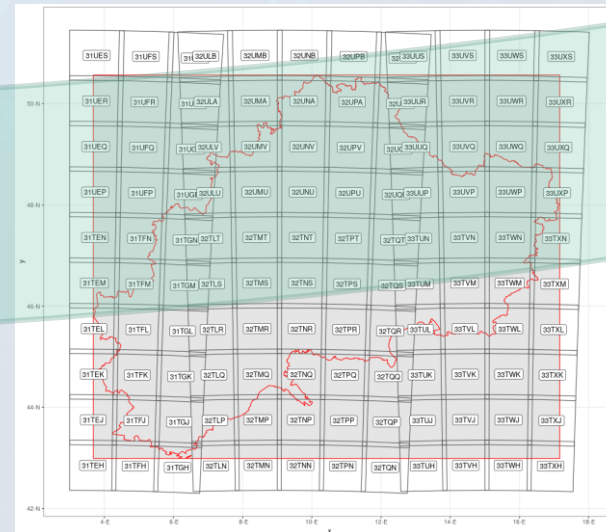
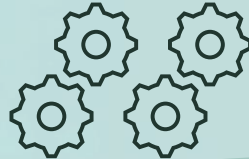
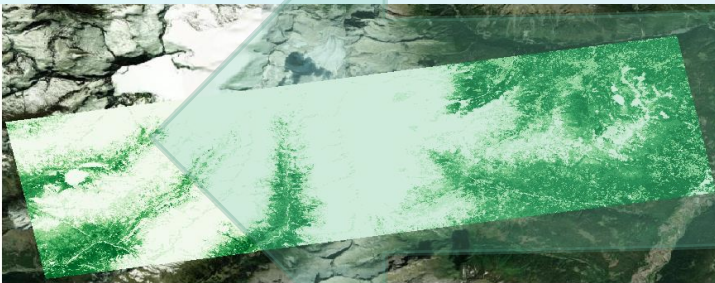
```
{
  "type": "FeatureCollection",
  "features": [
    {
      "id": "0",
      "type": "Feature",
      "properties": {
        "target_canopy_cover": 0.11879472061957692
      },
      "geometry": {
        "type": "Polygon",
        "coordinates": [
          [
            [
              7.789984363622556,
              50.307135155710036
            ],
            [
              7.789984363622556,
              50.307135155710036
            ]
          ]
        ]
      }
    }
  ]
}
```

eurac research



150 x 35 kb
= 5,25 MB
to transfer

eurac research

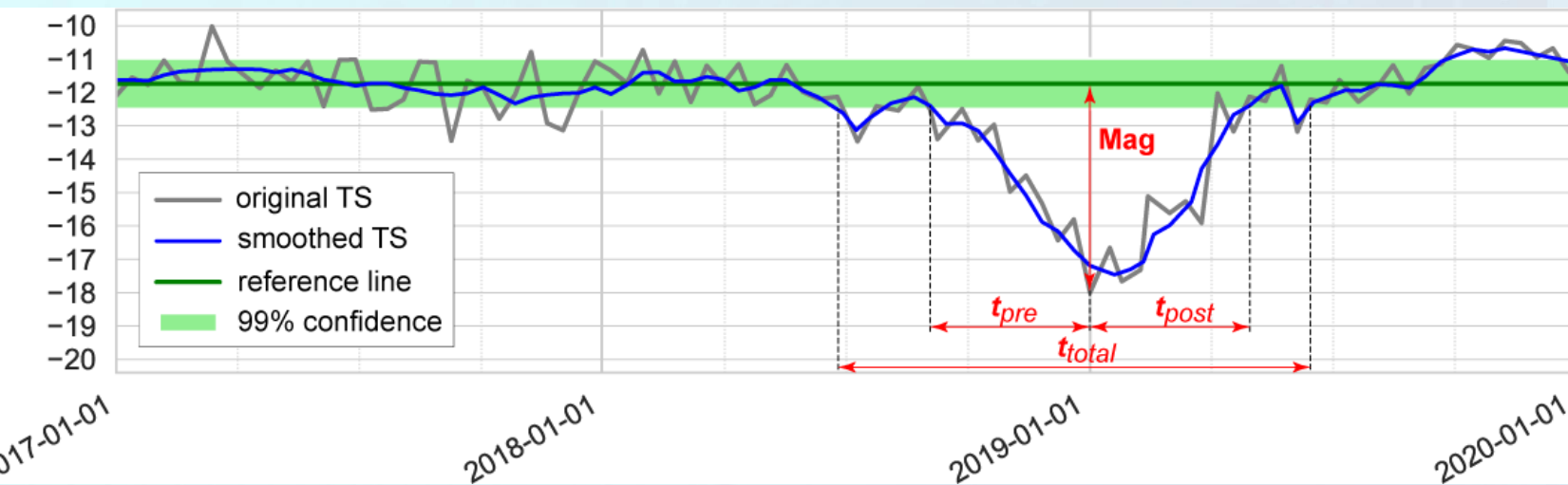


“Use Cases” from the community

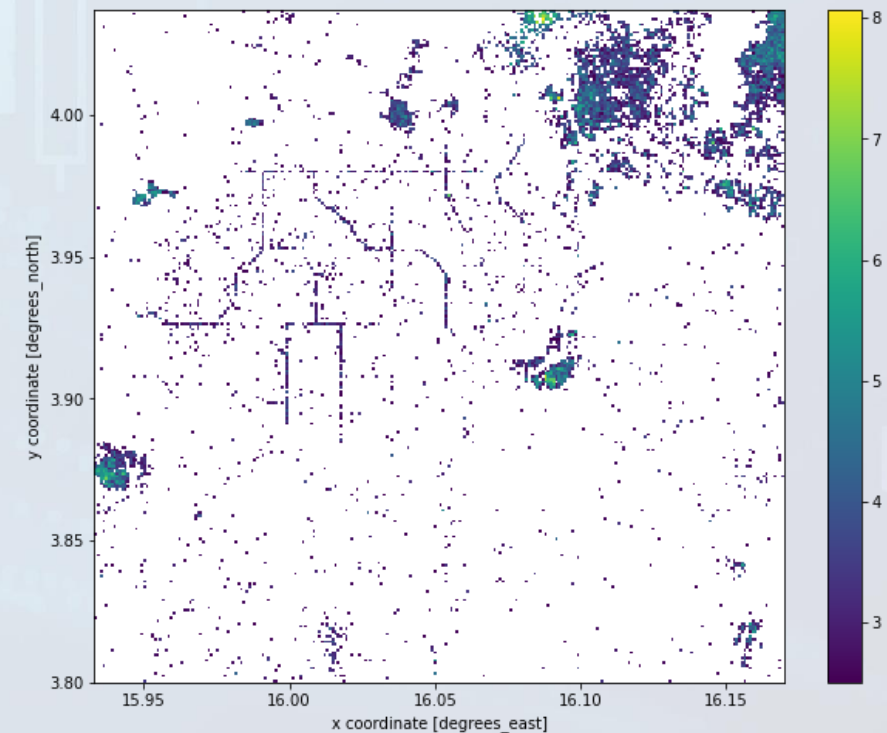


Selective Logging Sites in the Central African Rep.

Methodology: Sentinel-1 Signal Disturbance Features

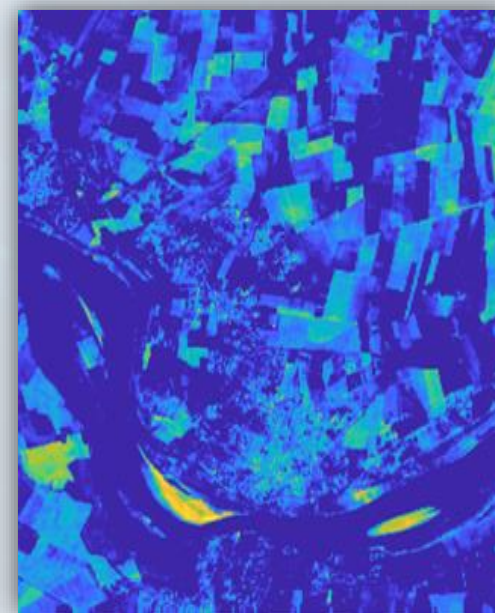
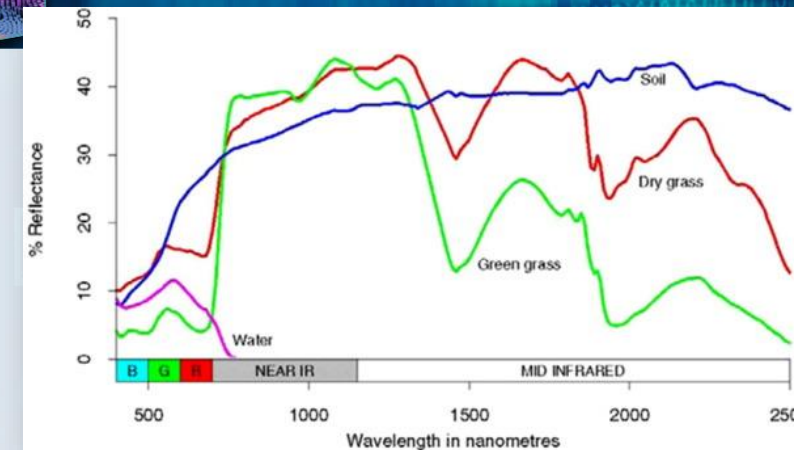


Disturbance Magnitude > 2.5 (dB)



“Use Cases” from the community

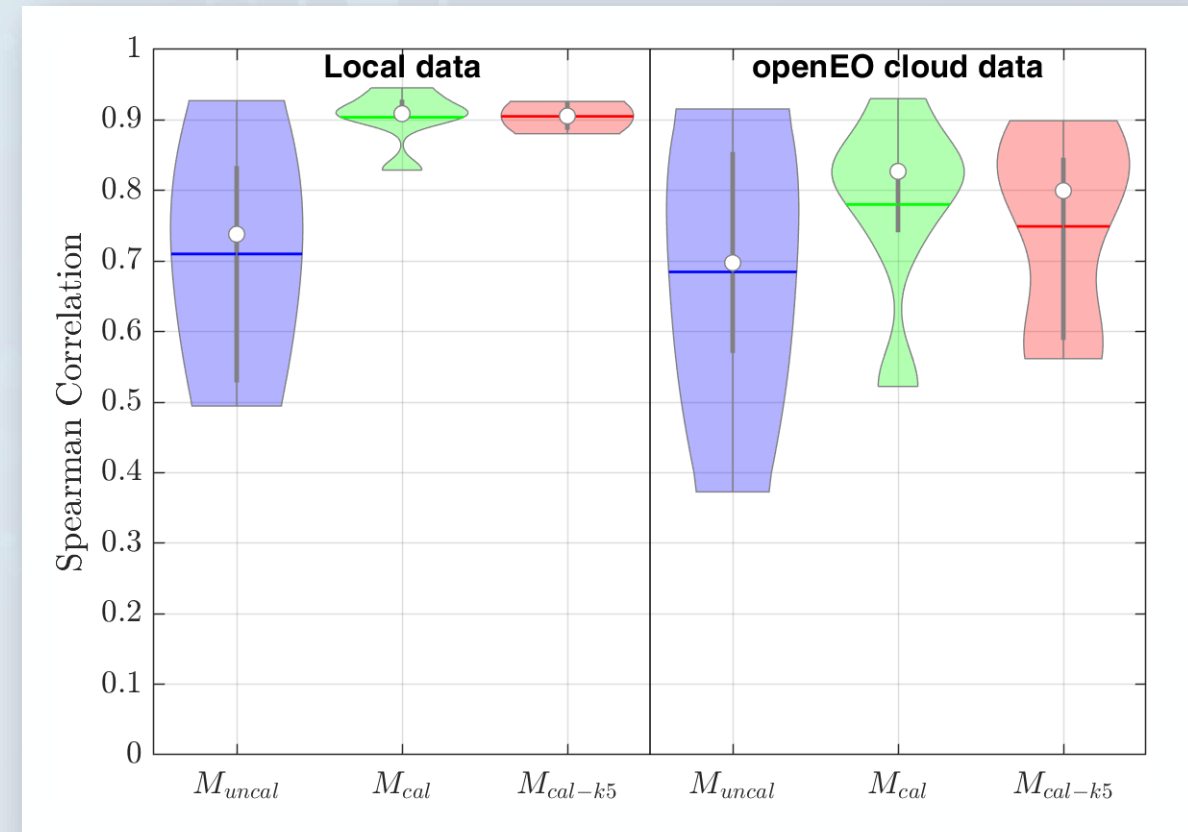
River discharge from Sentinel 2 imagery



“Use Cases” from the community



- Po (Italy): 2 stations
- Rhein (Germany): 2 stations
- Mississippi (USA): 2 stations



Active User Community



Masked Sentinel 2 standard deviation

openEO Platform python

paolo.filippucci openEO Platform Early Adopter

Hi, I have a question regarding the calculation of the reflectance standard deviation working with spyder, but the standard deviation I obtain with the function "sd" is I obtain by downloading them. Is there any problem with the NaN ingestion? I paste below the code I'm using.

```
import openeo
from openeo.processes import is_nan,
import numpy as np
```

Issue with spatial mean operation

openEO Platform python

paolo.filippucci openEO Platform Early Adopter

Hi, I wanted to extract the spatial average of a cloud-masked Sentinel-2 datacube, and I noticed several issues. I decided to report them below for your knowledge:

1. When the average is downloaded as csv file, the obtained values need to be sorted, since the time variable is not consecutive
2. if the average is operated through the instruction `datacube.aggregate_spatial(rect, lambda pixels:`

Which is the right function to apply sd

openEO Platform python

paolo.filippucci openEO Platform Early Adopter

Hi I am trying to calculate the temporal standard deviation of the NIR reflectance from Sentinel-2, in order to use the obtained product to create a mask. I have found two ways to do so: The operation:

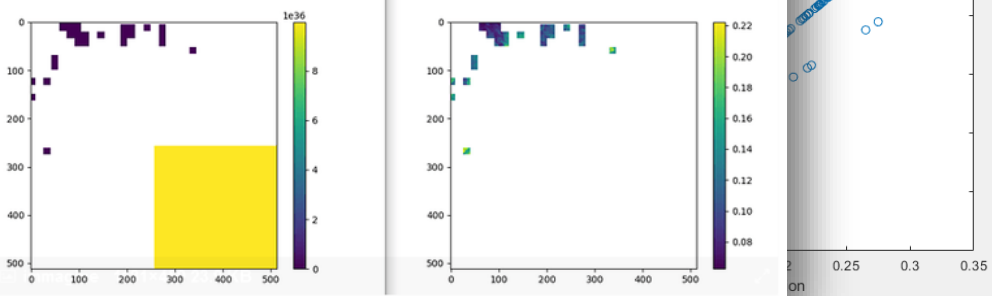
Issue with masking procedure

openEO Platform python

paolo.filippucci openEO Platform Early Adopter

Hi everyone, I need to apply a kernel to a Sentinel-2 dataset and to mask the clouds. I applied all the operation, but it seems that there is an issue on masking the dataset after the kernel application.

This is my code:



Month 9 MAY - 9 JUN

Last Updated: 8 Jun 2022 20:10

83 users

Username	Received	Given	Topics	Replies	Viewed	Read	Visits
stefaan.lippens Stefaan Lippens openEO Platform Developer	5	0	0	38	32	146	18
jeroen.dries Jeroen Dries openEO Platform Developer	7	0	1	18	19	129	20
paolo.filippucci Paolo Filippucci openEO Platform Early Adopter	1	0	2	18	16	119	14
m.mohr Matthias Mohr openEO Platform Developer	7	13	1	17	20	162	17
javier.martinez JAVIER MARTÍ... openEO Platform Early Adopter	2	14	4	11	10	50	8
kyr Christos;Χρήστος Kyranoud... openEO Platform Early Adopter	0	0	4	10	14	76	8
michele.claus Michele Claus openEO Platform Developer	5	1	0	7	14	123	10
benjamin.schumacher Benja...	5	2	3	7	13	57	15
milutin.milenkovic Milutin Mile... openEO Platform Early Adopter	0	0	1	6	10	61	7
jaapel Jaap Langemeijer openEO Platform Early Adopter	0	0	0	5	6	39	4
equiros Elia Quirós openEO Platform Early Adopter	1	0	0	5	0	5	14
datascience Hendrik Wagenseil openEO Platform Early Adopter	2	2	0	4	7	40	4
lukas.weidenholzer Lukas Wei... openEO Platform Developers	1	0	1	3	12	46	7
bryanvallejo16 Bryan Vallejo openEO Platform Early Adopter	0	1	0	3	1	10	14
peterjames.zellner Peter Jame... openEO Platform Developer	1	4	1	2	9	70	9
florian.lahn Florian Lahn openEO Platform Developer	3	0	0	2	5	42	6



Questions? Comments? – Get in touch!



Thank you for your attention!

- > Website: <https://openeo.cloud/>
- > Documentation: <https://docs.openeo.cloud/>
- > Forum: <https://forum.openeo.cloud>

- > openEO API: <https://openeo.org/>

