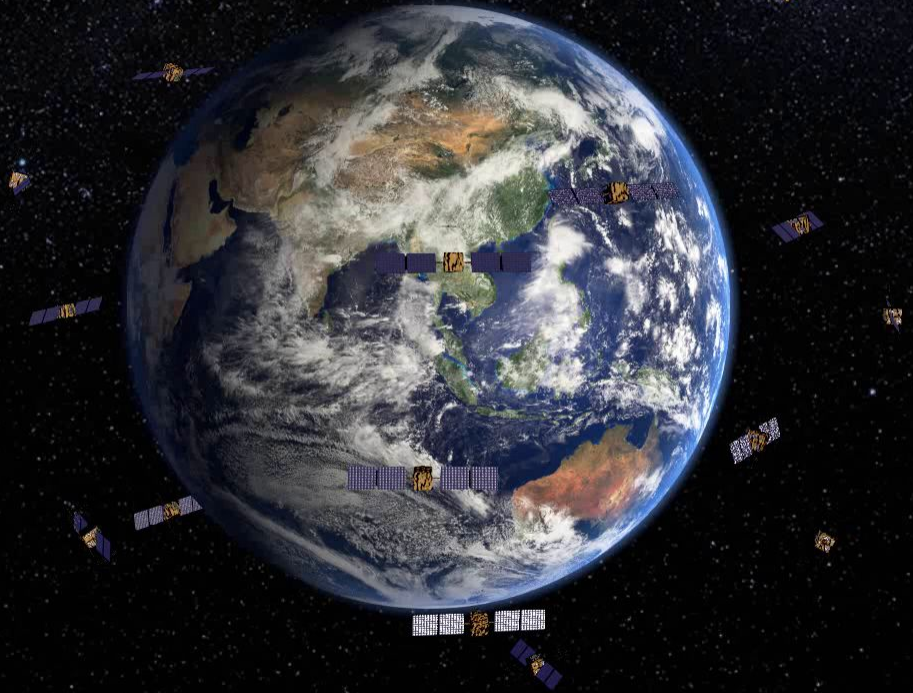
The Open Data Cube (ODC): a very intuitive tool to catalog, retrieve and analyse earth observation data



Aurelio Vivas Meza
aa.vivas@uniandes.edu.co
Research Assistant
Universidad de los Andes, Bogotá Colombia

Image taken from Alex Held CSIRO (2017) Presentation

Instructions

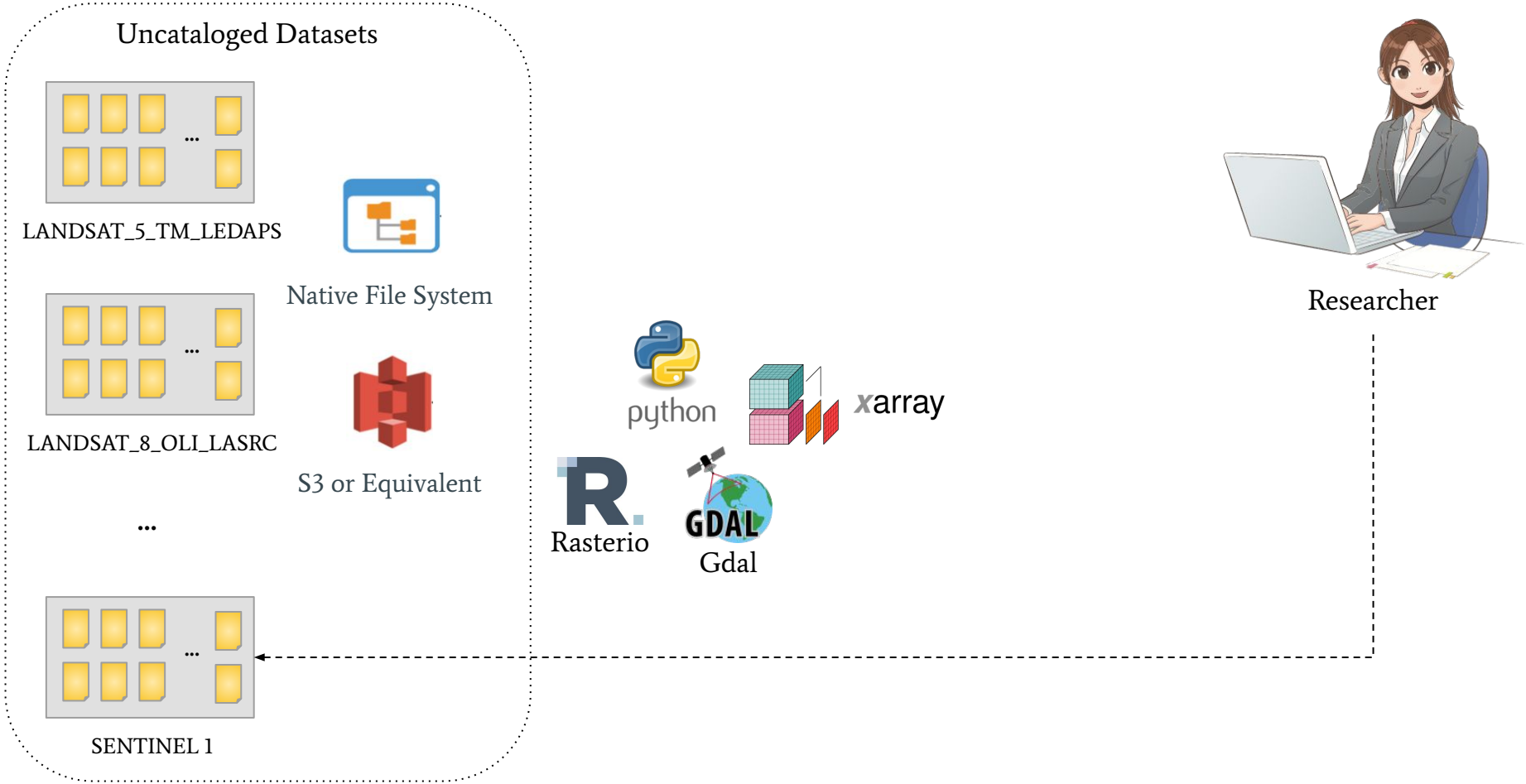
1. All the material of this talk will be available at the following link
    a. This presentation
    b. All references of this presentation
    c. Notebooks
    d. Python scripts

https://github.com/DonAurelio/geopython-2021

Agenda

“Look deep into nature, and then you will understand everything better” - Albert Einstein

- Traditional satellite image processing workflow
- The Open Data Cube
- Satellite image processing workflow with the Open Data Cube
- Deployment of the Open Data Cube
- Running a NDVI analysis in the Open Data Cube


Uncataloged Datasets
LANDSAT_5_TM_LEDAPS
Native File System
LANDSAT_8_OLI_LASRC
S3 or Equivalent
...
SENTINEL 1
python
xarray
Rasterio
GDAL
Gdal
Researcher

Uncataloged Datasets

LANDSAT_5_TM_LEDAPS

LANDSAT_8_OLI_LASRC

...

SENTINEL 1

Native File System

S3 or Equivalent

python

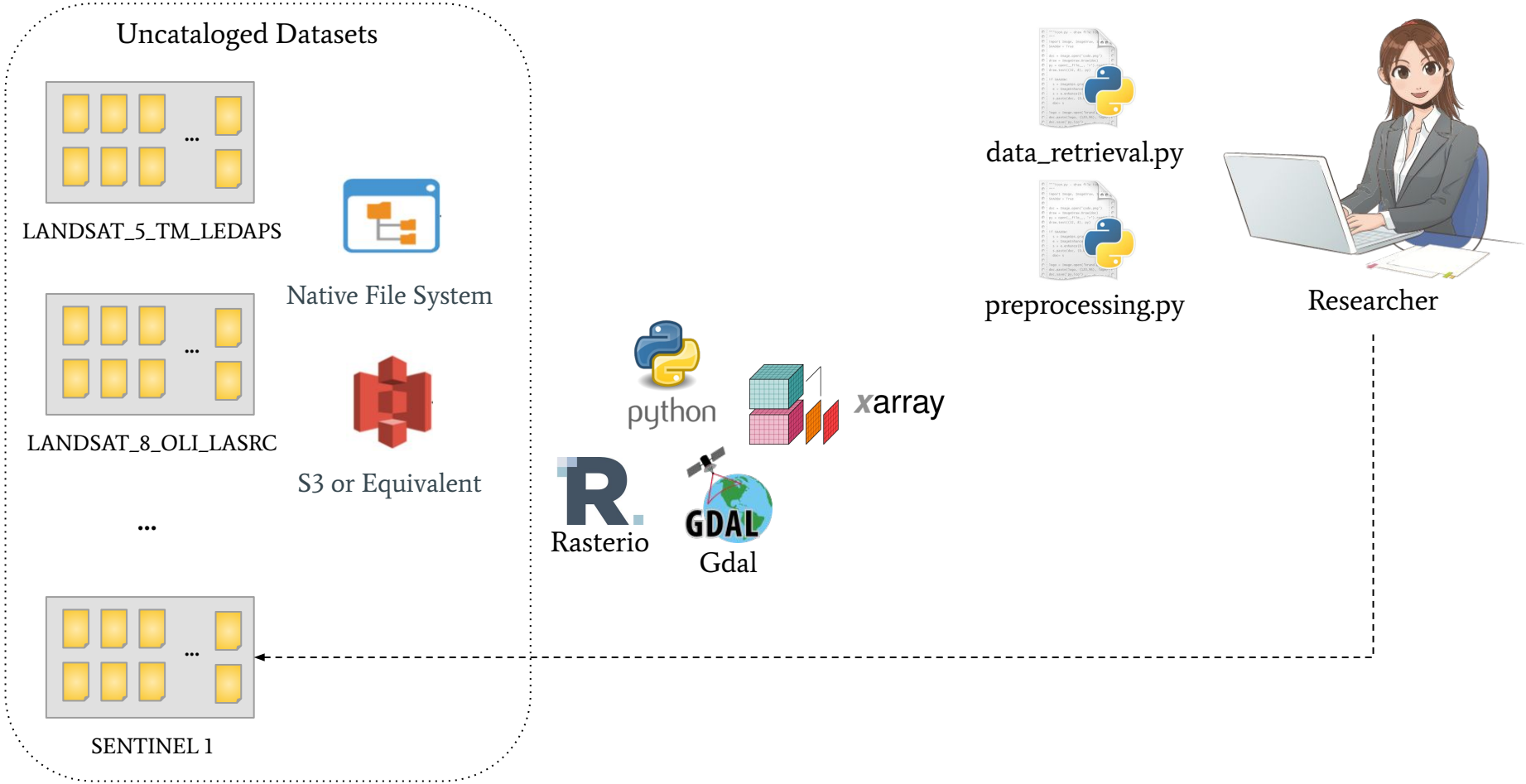
xarray

Rasterio

Gdal

data_retrieval.py

Researcher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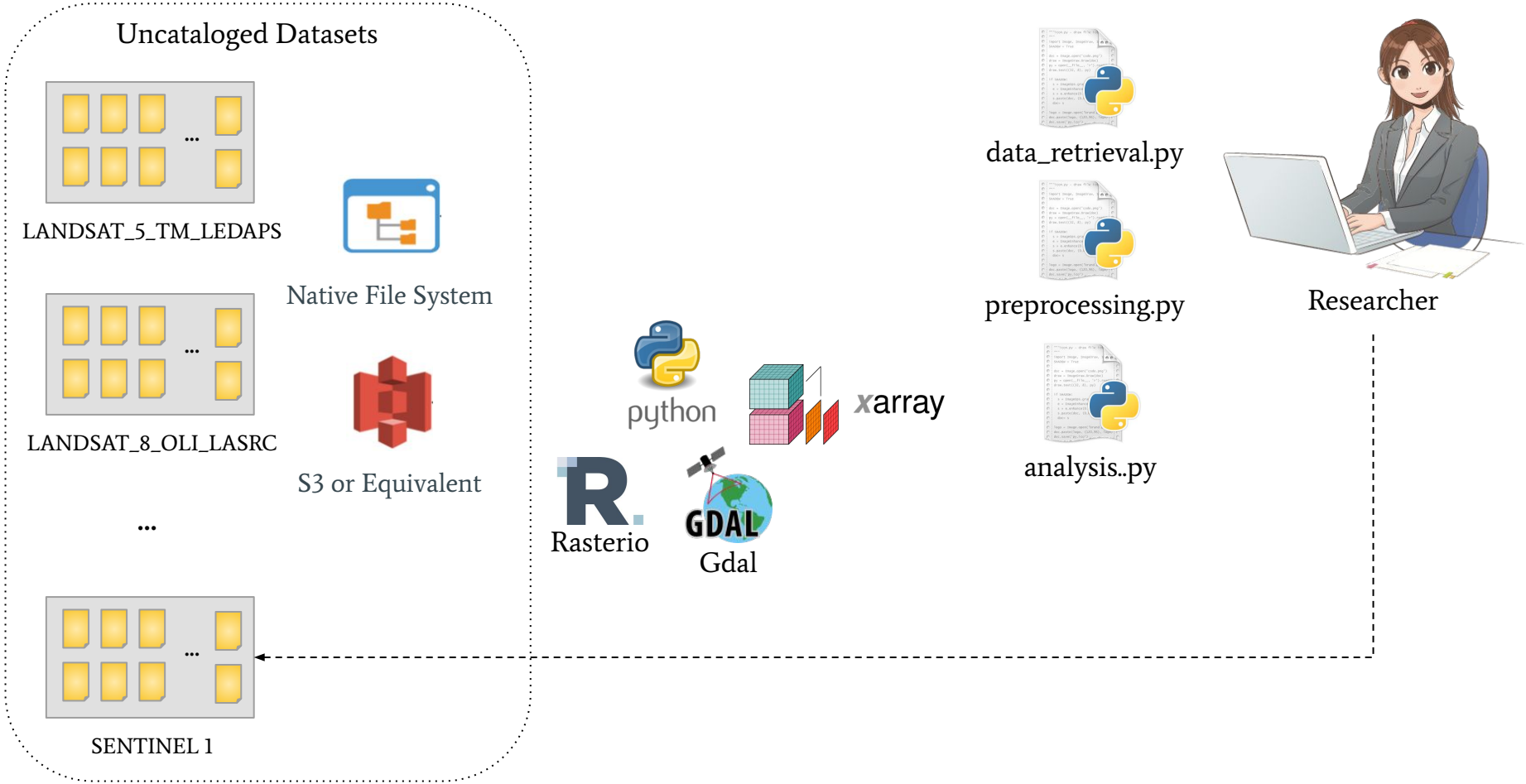
preprocessing.py
Researcher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S3 or Equivalent
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Gdal
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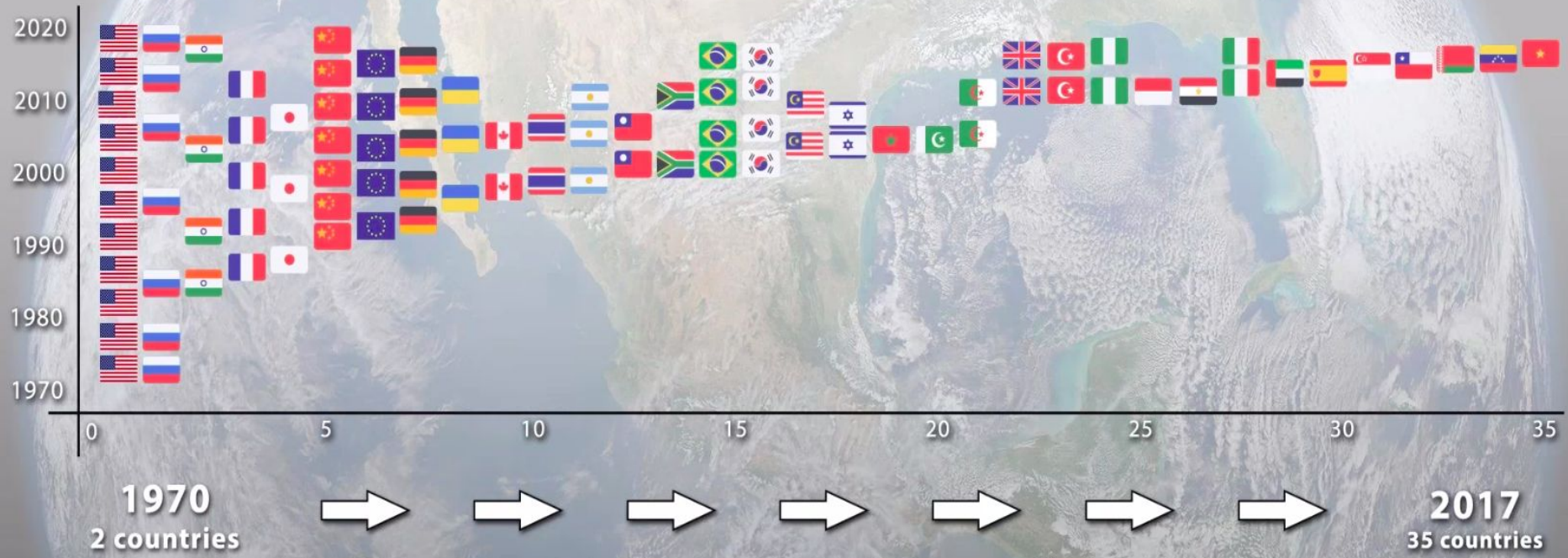
preprocessing.py
analysis..py
Researcher

“Earth observation data is growing rapidly.”

Reference: https://landsat.gsfc.nasa.gov/article/imaging-past

EARTH OBSERVATION SATELLITE LAUNCHES



1970
2 countries

2017
35 countries

197 EO satellites

178 Optical, 19 SAR

“Combined, Landsats 7 and 8 satellites collect about 1,200 scenes that take up about 1 terabyte of data every day”

Reference: https://landsat.gsfc.nasa.gov/article/imaging-past

Uncataloged Datasets

LANDSAT_5_TM_LEDAPS

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LANDSAT_8_OLI_LASRC

S3 or Equivalent

...

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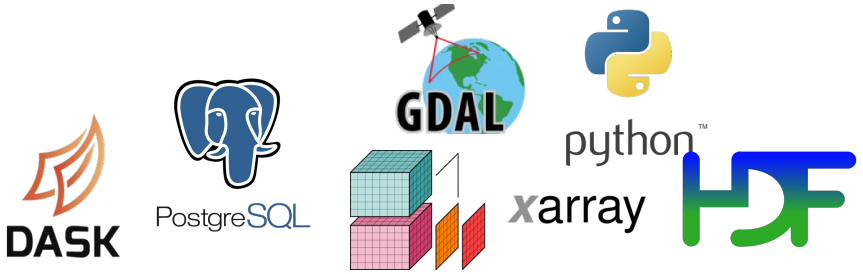
The Open Data Cube

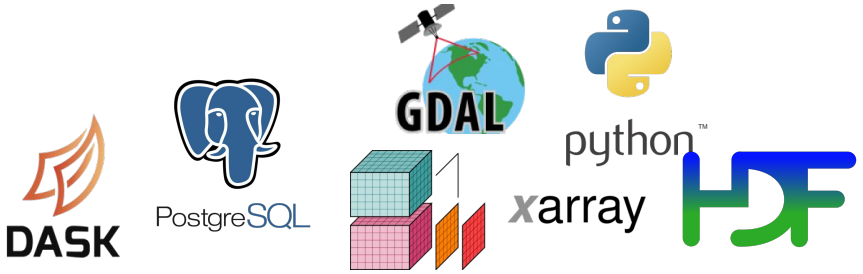
- “The ODC is a software library and set of command line tools”



Reference: https://medium.com/opendatacube/what-is-open-data-cube-805af60820d7

The Open Data Cube

- “The ODC is a software library and set of command line tools”
- “It is also a community of people and organisations building capability for working with earth observation data”



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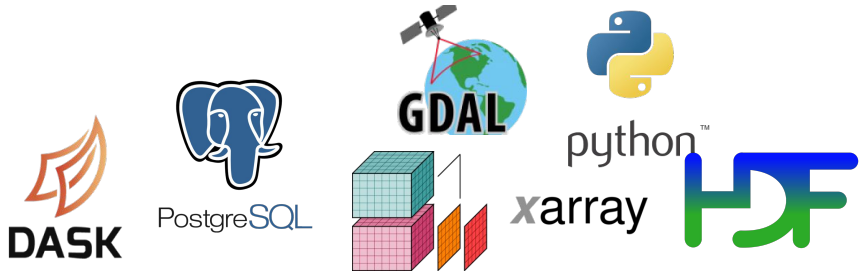
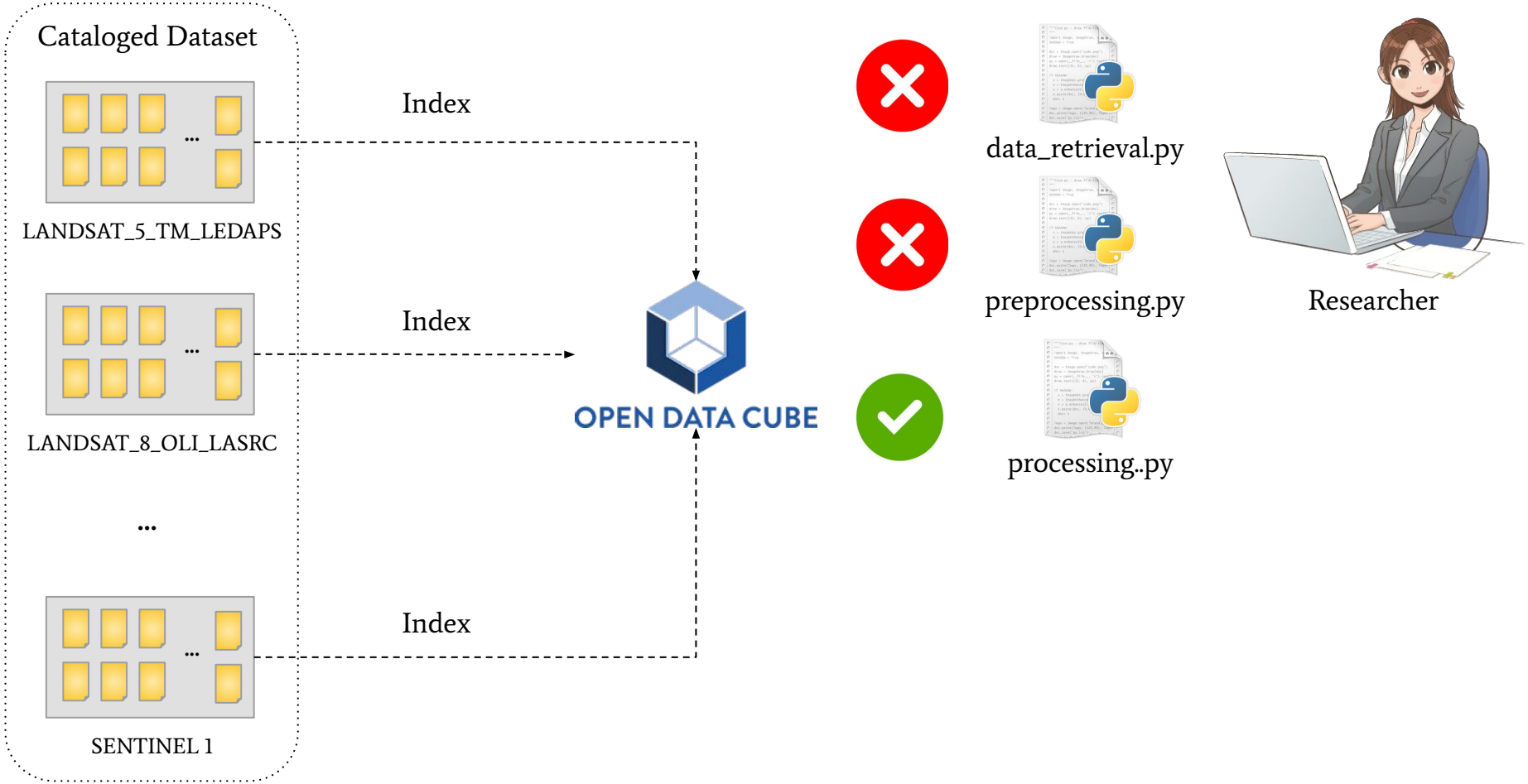
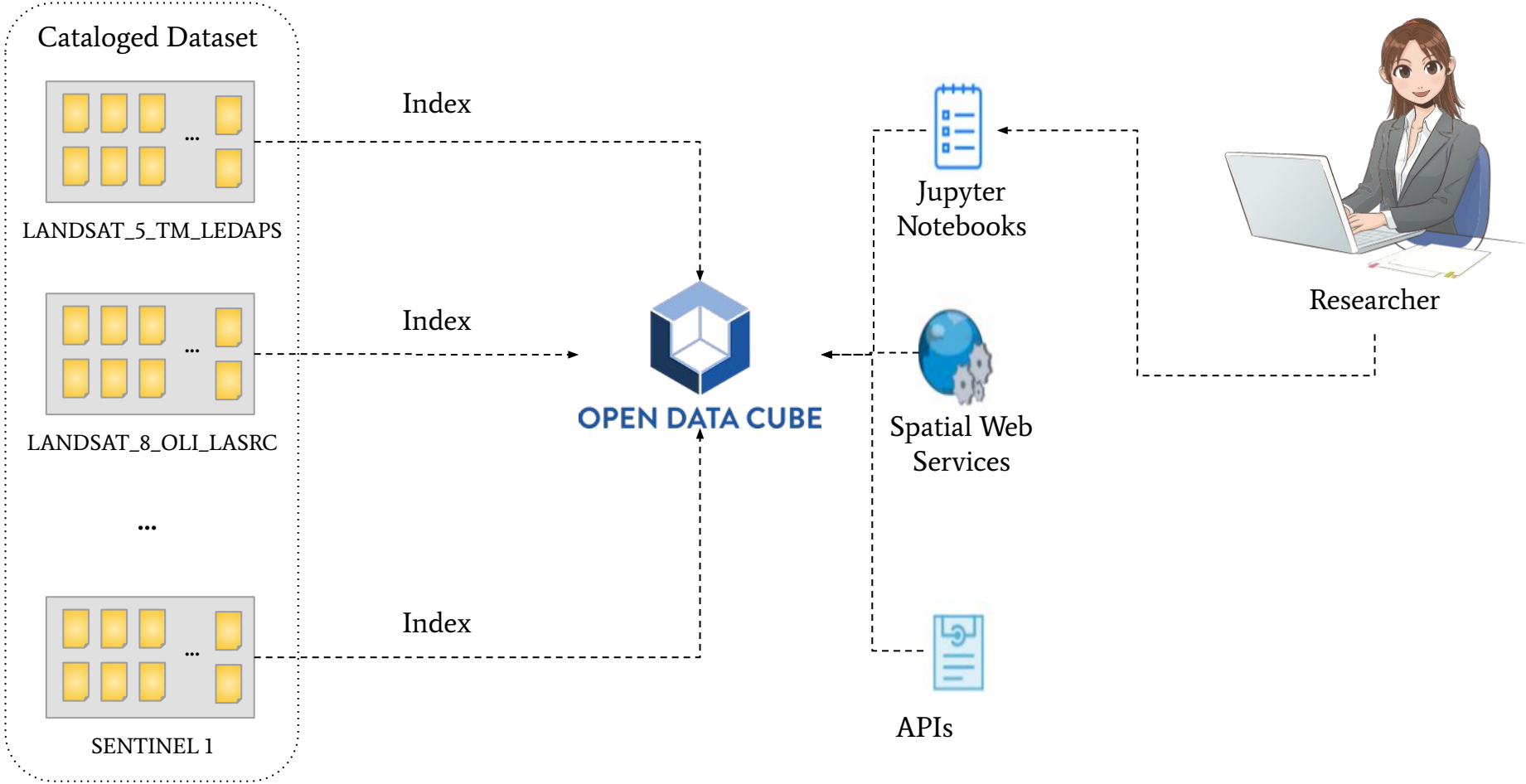
The Open Data Cube

- “The ODC is a software library and set of command line tools”
- “It is also a community of people and organisations building capability for working with earth observation data”
- It allows to efficiently catalogue, retrieve and analyze ready analysis earth observation data.

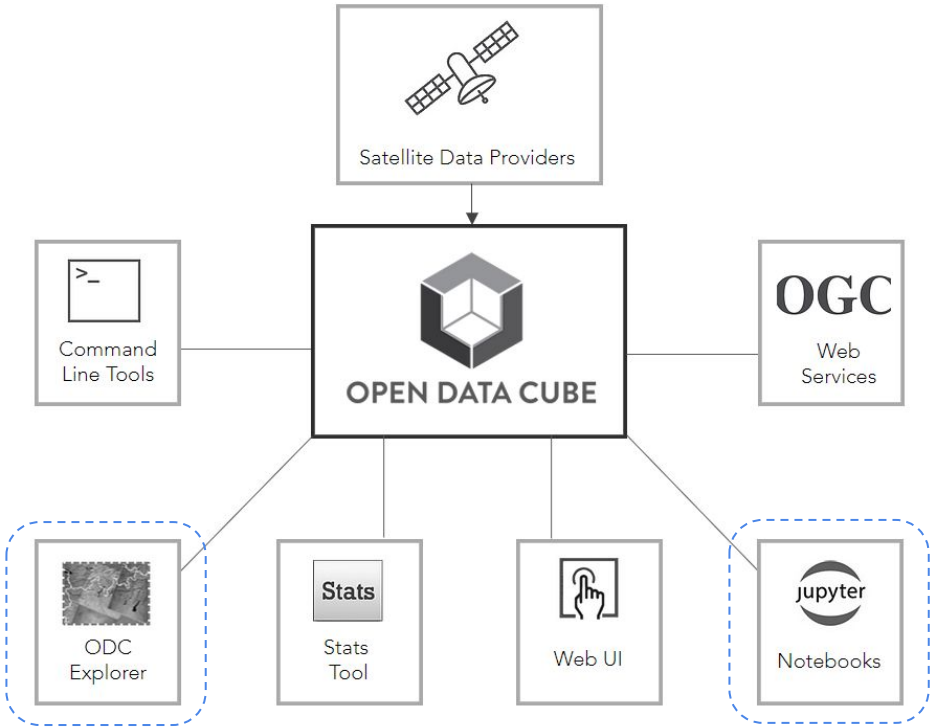


Reference: https://medium.com/opendatacube/what-is-open-data-cube-805af60820d7

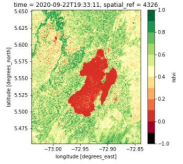

Cataloged Dataset
LANDSAT_5_TM_LEDAPS
LANDSAT_8_OLI_LASRC
SENTINEL 1
Index
Index
Index
OPEN DATA CUBE
data_retrieval.py
preprocessing.py
processing..py
Researcher

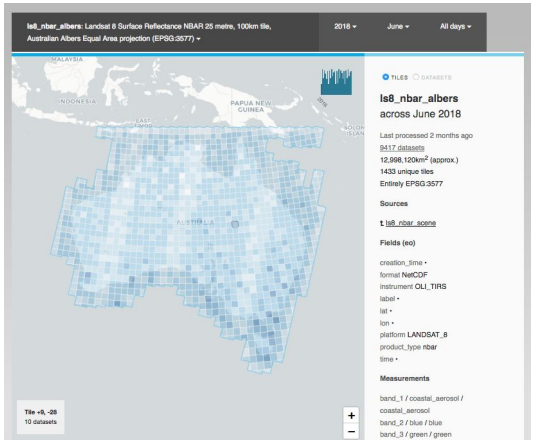

Cataloged Dataset
LANDSAT_5_TM_LEDAPS
LANDSAT_8_OLI_LASRC
SENTINEL 1
Index
Index
Index
OPEN DATA CUBE
Jupyter Notebooks
Spatial Web Services
APIs
Researcher

The Open Data Cube - Ecosystem




```
In [127]: # Definición de colores para cada rango establecido en 'bounds'
cmap = mpl.colors.ListedColormap(
    [
        '#000000',
        '#a50026',
        '#d73027',
        '#f46d43',
        '#fdae61',
        '#fee08b',
        '#ffffbf',
        '#d9ef8b',
        '#a6d96a',
        '#66bd63',
        '#1a9850',
        '#006837'
    ]
)

# Rangos de valores establecidos
bounds = [-1.0, -0.2, 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0]

# Genera una capa de normalización de los datos basada en los intérvalos establecidos en 'bounds'
norm = mpl.colors.BoundaryNorm(bounds, cmap.N)

# Muestror imágen de la variable de datos ndvi
masked_dataset.ndvi.plot(cmap=cmap,norm=norm,figsize=(5,5))

Out[127]: <matplotlib.collections.QuadMesh at 0x7fe79a4d20b8>
```





Reference: https://www.opendatacube.org/data-cube-applications

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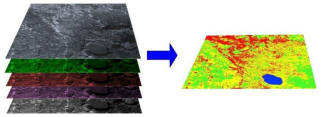
Remote Sensor

- Landsat 5, 7, 8,
- Sentinel 1, 2,



Scenes
(Raw Data)

Ground Station

Storage (Raw Data)

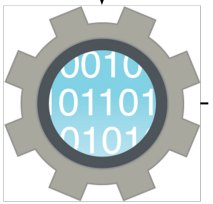
Sistema de Archivos

S3

opernicus
Europe's eyes on Earth

USGS
science for a changing world

1. Download



Scenes
(ARD)

3. Indexing

- Radiometric Corrections
- Atmospheric Corrections
- Further Corrections

2. Pre processing

Researcher

4 Analysis

OPEN DATA CUBE

File System

Database

Scenes Storage (ARD)

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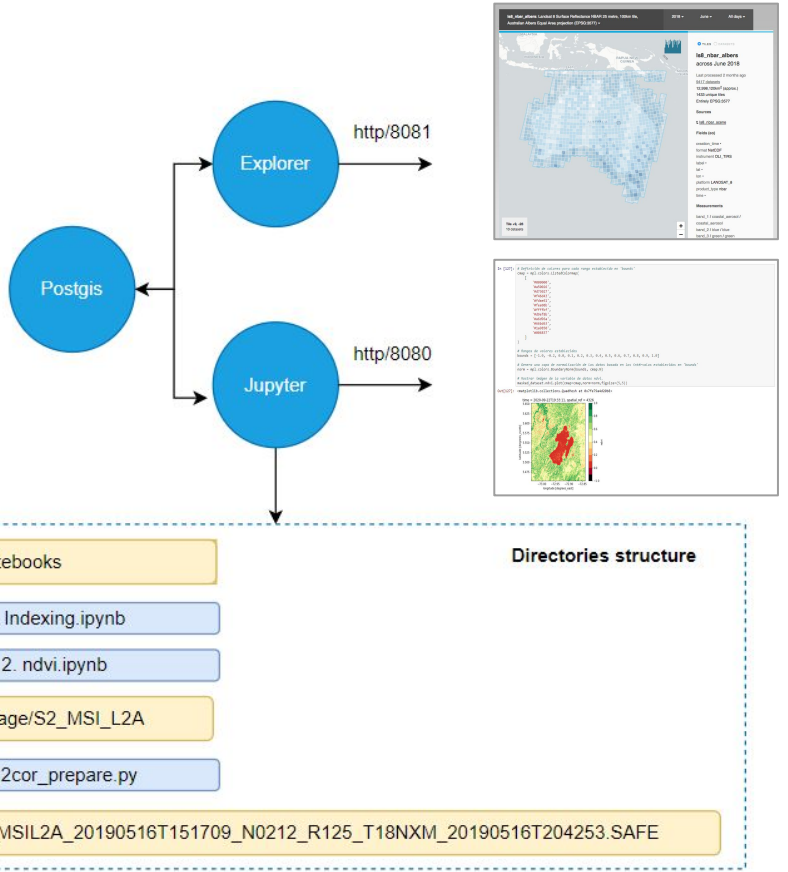
Open Data Cube - Deployment

- The documentation
- Cube in a box
  - Local installation
  - Cloud installation



Let’s enjoy the cube .....

¡Thanks!

...

Questions?