



CliMetLab and xcube on WEkEO

Introduction and Demo for the CUAG
Workshop, 13th November 2023



Implemented by



European Environment Agency





Introduction



Anna-Lena Erdmann

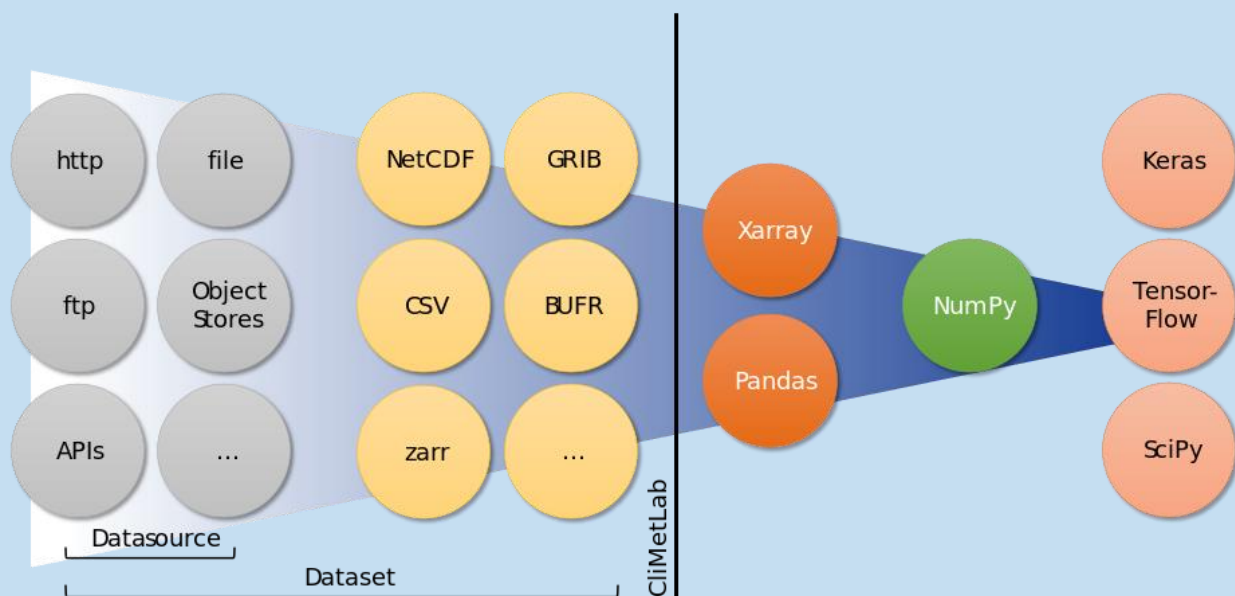
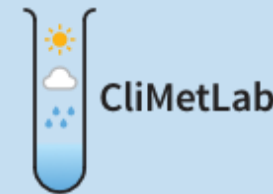


Copernicus Data Services Engineer @ EUMETSAT

Role in WEkEO: **Evolution** of tools and services, support operational activities

Presenting today the **climetlab** and **xcube** as new tools in WEkEO

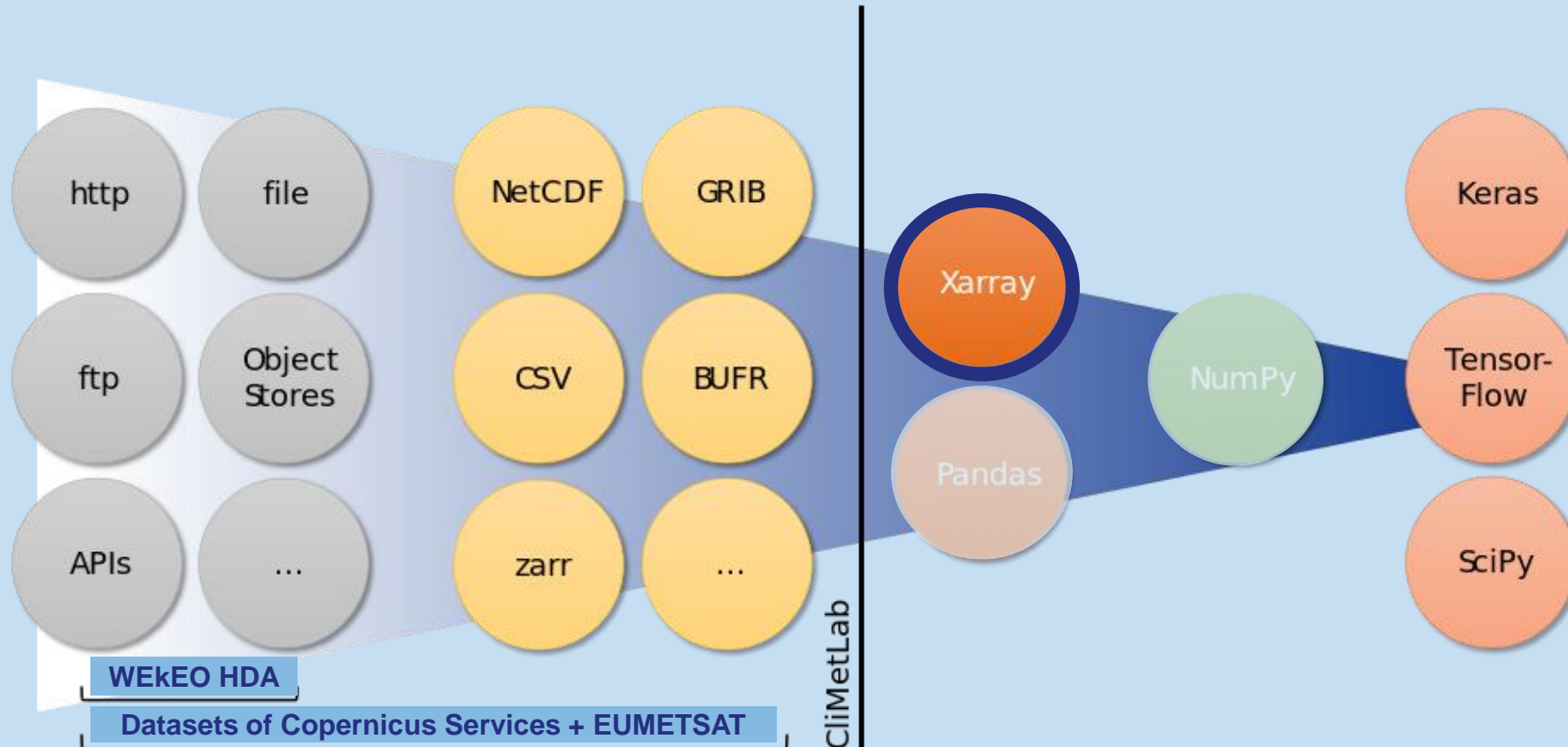
What is CliMetLab?



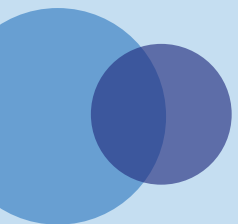
<https://climetlab.readthedocs.io/en/latest/overview.html>

- **Python** package for the use in **Jupyter Notebooks** developed by ECMWF
- Goal: **simplify** access to climate and meteorological datasets, by hiding the **access methods** and **data formats**
- Automation of download, caching and transformation in formats like **numpy, xarray and pandas**

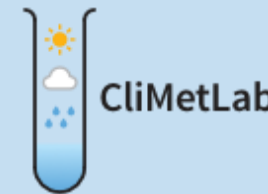
The CliMetLab WEkEO Plugins



<https://climetlab.readthedocs.io/en/latest/overview.html>

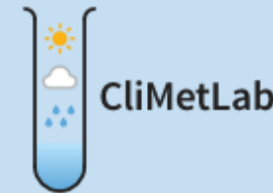


The CliMetLab WEkEO Plugins: Use Cases and Demo



- Download and analyse data from a single dataset
- Download and analyse multiple datasets
- Analyse data using standard Python libraries
- Create a data cube

Demo: CliMetLab WEkEO Plugins



The screenshot displays a JupyterLab environment. On the left, a file browser shows a directory structure with files like 'LST_CliMetLab.zarr', 'miniconda3', 's2rgb', 'storage', 'sudo', 'test_clms', 'v0_climetlab-wekeo...', 'v0-climetlab-wekeo-...', 'v1_climetlab-wekeo...', 'xcube', 'xcube-gen-bc', 'xcube-viewer', 'CliMetLab_CLMS_t...', 'CliMetLab.ipynb', 'config-spain.yml', 'config.yml', 'CUAG_Demo_CML...', 'CUAG_Demo_xCub...', 'Demo_CML_xCub...', 'ESA_Ecosystem_te...', 'HDA_Download.ipynb', 'Sentinel2.ipynb', 'Untitled.ipynb', 'Untitled1.ipynb', 'UX_Demo_CML.ipynb', 'UX_Demo_xCube.i...', 'xCube_view_cci.ipynb', and 'xCube_view_s3exa...'. The file 'CUAG_Demo_CML...' is selected. The main area shows a notebook titled 'WEkEO application using CliMetLab'. The notebook content includes a title, a paragraph about the workflow, three numbered points, a paragraph about the joint usage of HDA and CliMetLab, a 'Contents' section, and an 'Installation of packages' section. The installation section mentions that CliMetLab consists of a main package and dataset plugins, and provides instructions to install the 'climetlab' package using pip.

WEkEO application using CliMetLab

This Notebook shows a workflow of using (CliMetLab)[<https://climetlab.readthedocs.io/en/latest/overview.html>] python package to access and manipulate data from the WEkEO HDA. The usage of the CliMetLab brings two main benefits to the user:

1. the data download and the file management is not user responsibility anymore, but is automatically managed by CliMetLab
2. the data is not downloaded in the users jupyter environment, but in cache
3. different file formats are invisible to the user and a direct conversion to xArray is supported

This notebook should display the potential of the joint usage of of the HDA and the CliMetLab for an improved user experience and future implementations of serverless functions.

Contents

The notebook is structured as follows:

- [Installation of packages](#)
- [Accessing a Single Dataset Using CML](#)
- [Accessing Multiple Datasets Using CML](#)
- [Data Manipulation and Visualization in xArray](#)
- [Creation of a Data Cube](#)

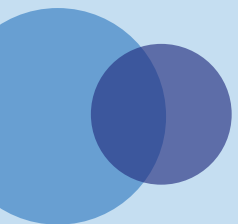
Installation of packages

ClimetLab consists of the main package called `climetlab` and dataset plugins. Each dataset plugin has to be installed separately from PyPI. There are specific dataset plugins for the WEkEO HDA.

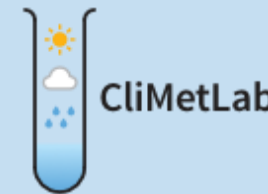
First, install the `climetlab` package.

```
[ ]: #!pip install climetlab
```

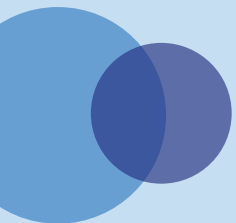
Second, install the WEkEO Plugin directly from the github repository.



Current State and Future Plan for CliMetLab WEkEO Plugins



- V1 published in Sep 2023, updated version to come next week
- 328 Supported datasets (gridded only)
- include more data formats (tiff, csv, shp)
- Expand the range of supported WEkEO Datasets

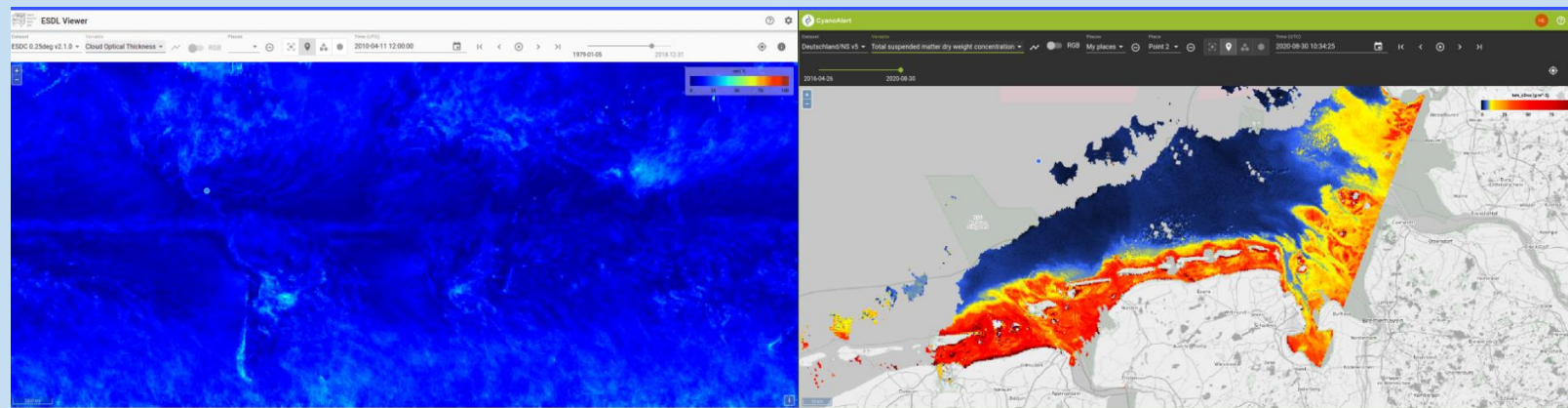


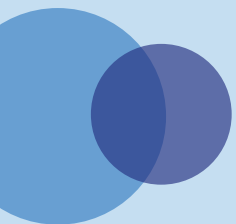
Questions / Feedback?



What is the xcube viewer?

- Plugin for the **xcube python package** developed by Brockmann Consult GmbH (<https://www.brockmann-consult.de/portfolio/xcube/>)
- Xcube: provide Earth observation (EO) data in an **analysis-ready** form to users
- **Goal** of the viewer: **publish** and **visualise** xcube datasets (data cubes) using maps and time-series charts





xcube viewer use cases and demo



- Visualizing WEkEO Data Cubes within a Jupyter Notebook
- Visualizing WEkEO Data Cubes on a VM

Demo: xcube Viewer

A screenshot of a web browser displaying a Jupyter Notebook. The browser's address bar shows 'localhost:8888/lab/tree/UX_Demo_xCube.ipynb'. The notebook interface includes a left-hand sidebar with a file explorer showing a directory structure with files like 'miniconda3', 'storage', 'test_clms', and 'xcube'. The main area of the notebook is titled 'WEkEO and xCube Viewer' and contains the following text:

This Notebook shows a workflow of using the (xCube)[<https://xcube.readthedocs.io/en/latest/index.html>] python package to interact, visualize and share datacubes which are created using Copernicus data. It should display the potential of the concept of datacubes for Copernicus data for an improved user experience and future implementations of Serverless functions.

There are several way to create datacubes. Obe way for a wide range of datasets from the Copernicus services is the usage of CliMetLab and xArray. Other, non-gridded data, such as satellite data coming from the Sentinel satellites can be preprocessed using SNAP or the data-tailor to generate datacubes. Other types of datacubes are already preprocessed by third parties and available to the public for use.

xCube and especially the xCube Viewer is a powerful tool to interact with datacubes from different sources at the same time and share data and insights with others.

Contents

The notebook is structured as follows:

- [Installation of packages](#)
- [Importing Data Cubes](#)
- [xCube Viewer inside a local Jupyter Notebook](#)
- [xCube Viewer on the VM](#)

Installation of packages

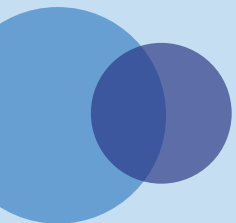
```
[ ]: #!git clone https://github.com/dcs4cop/xcube.git
    #!cd xcube
    #!pip install --no-deps --editable .

[ ]: #!pip install xcube_jl_ext
```

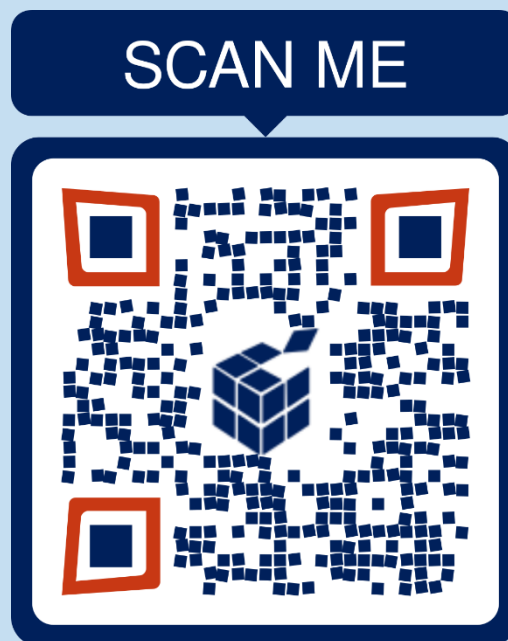
Importing Data Cubes

In this example only datacubes from the local file system are accessed. There is also the possibility to import datacubes which are located on a s3 bucket or are located in preconfigures data stores (e.g. CCI or SentinelHub).

The bottom status bar of the Jupyter interface shows 'Mode: Command', 'Ln 1, Col 1', and the filename 'UX_Demo_xCube.ipynb'.

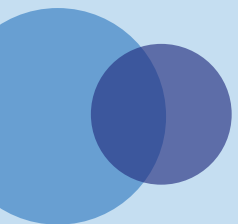


Demo: xcube Viewer



or

<http://185.226.12.118:3000/>



Current State and Future Plan for xcube Viewer and WEkEO



- Visualizing WEkEO data on the xcube viewer
- Blueprint to publish data cubes on the xcube Viewer using WEkEO VMs
- Integration of data cube creation (CliMetLab) and visualization (xcube Viewer) of WEkEO datasets
- Include xcube viewer plugin into WEkEO JupyterLab



Thank you very much!

For further questions or ideas for use cases please reach out:
annalena.erdmann@eumetsat.int