



Ground based observations: status & data access points and digital tools. Pt2

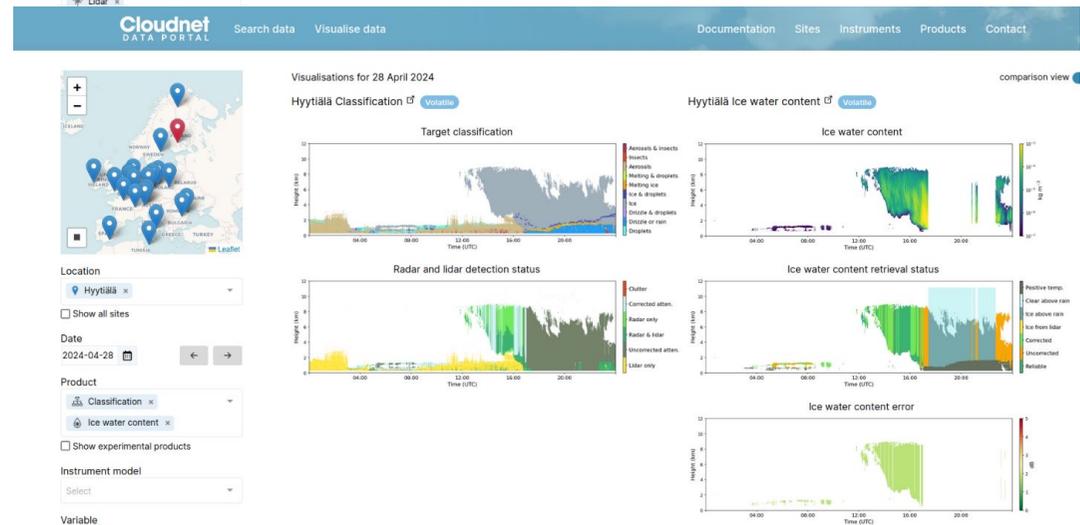
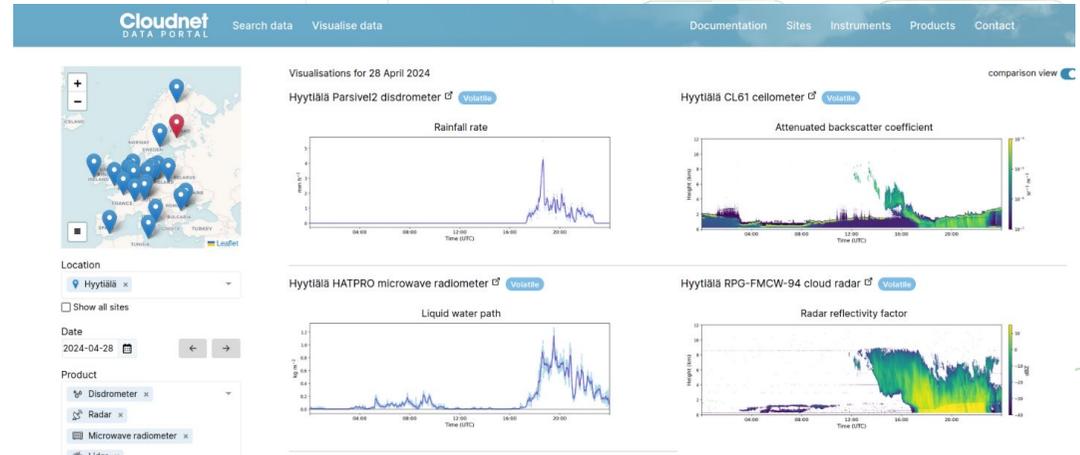
Lise Eder Murberg (NILU) – lemu@nilu.no

Markus Fiebig, Lucia Mona, Claudio Dema

IR0000032 – ITINERIS, Italian Integrated Environmental Research Infrastructures System
(D.D. n. 130/2022 - CUP B53C22002150006) Funded by EU - Next Generation EU PNRR-
Mission 4 "Education and Research" - Component 2: "From research to business" - Investment
3.1: "Fund for the realisation of an integrated system of research and innovation infrastructures"



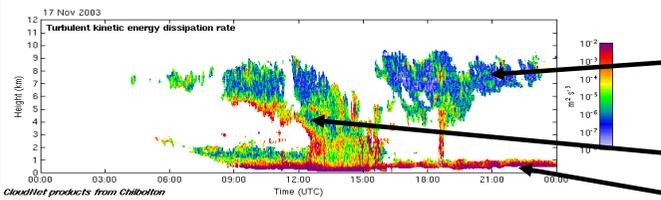
ACTRIS CLU Unit: Cloud remote sensing



ACTRIS cloud profiling

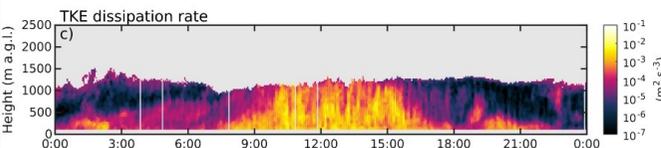
Vertical winds and turbulent properties:

- Boundary layer and in-cloud (Radar and Doppler lidar)

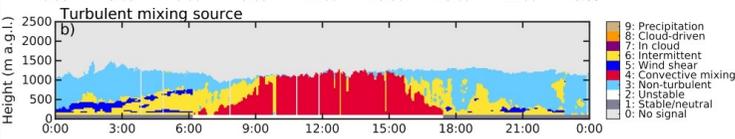


Weak turbulence:

- Cirrus
- Strong turbulence
- Evaporating ice
- Stratocumulus

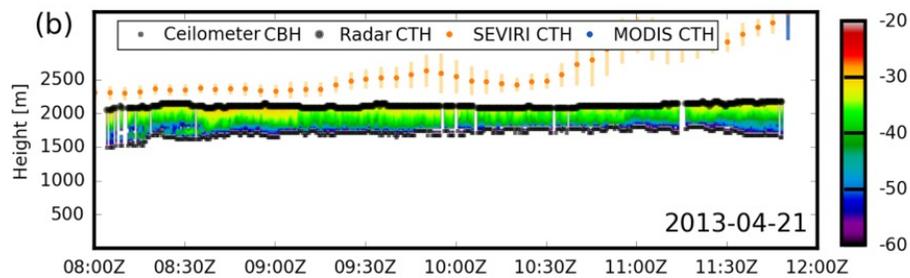


Boundary layer dynamics



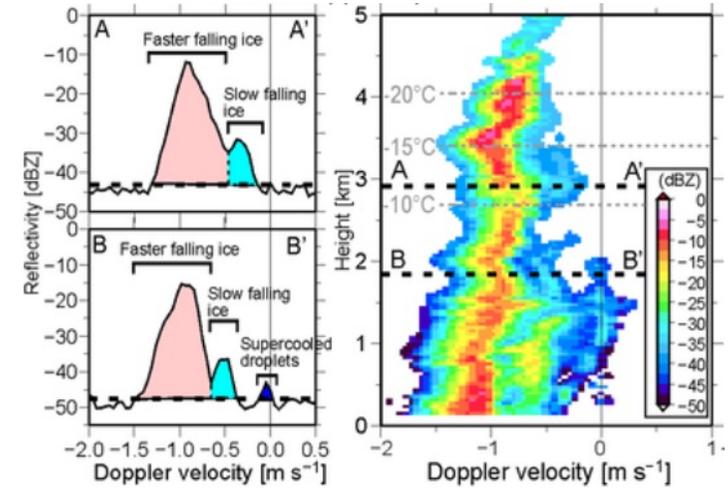
Identify vertical mixing and diagnose source

Evaluate satellite retrievals (e.g. cloud top height)

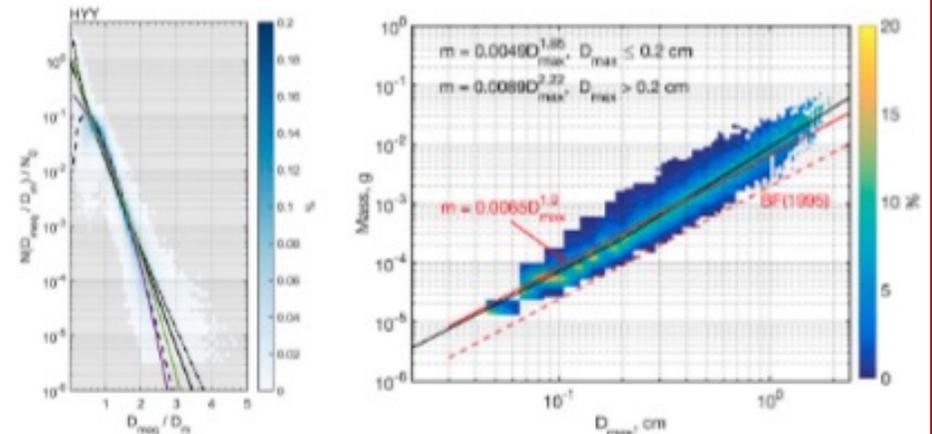


Cloud microphysics: Doppler spectra, surface disdrometer

Multiple hydrometeor modes, phases in same volume



Size distributions, mass-density, particle shape



ACTRIS GRES Unit: Trace gas remote sensing

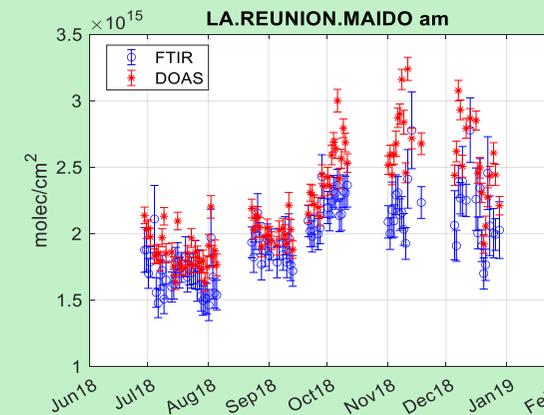
🌐 **The GRES Unit** facilitates the dissemination of highest-standard reference data of **several key trace gases using ground-based remote sensing techniques** (NDACC affiliation).

🌐 Data from 10 National Facilities (land platforms)

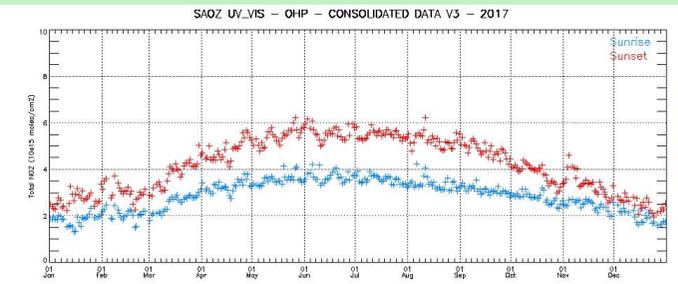
🌐 Data from various parameters:
- O₃, C₂H₆, NO₂, H₂CO, N₂O, NH₃, .. columns or profiles

Instruments:

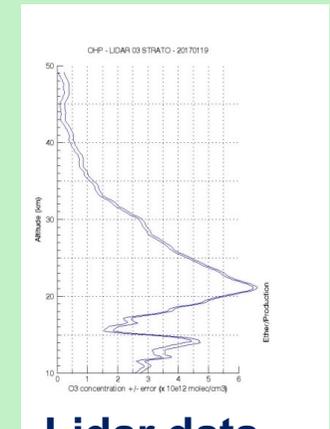
- The GRES unit is structured in one unique database including measurements issued from **4 operational support** to ACTRIS National Facilities:
 - **FTIR** (Fourier-Transform Infrared),
 - **UVVIS** (UV_visible) spectrometers : MAX-DOAS and SAOZ
 - Ozone Dial (Differential Absorption) **LIDARS**



FTIR data



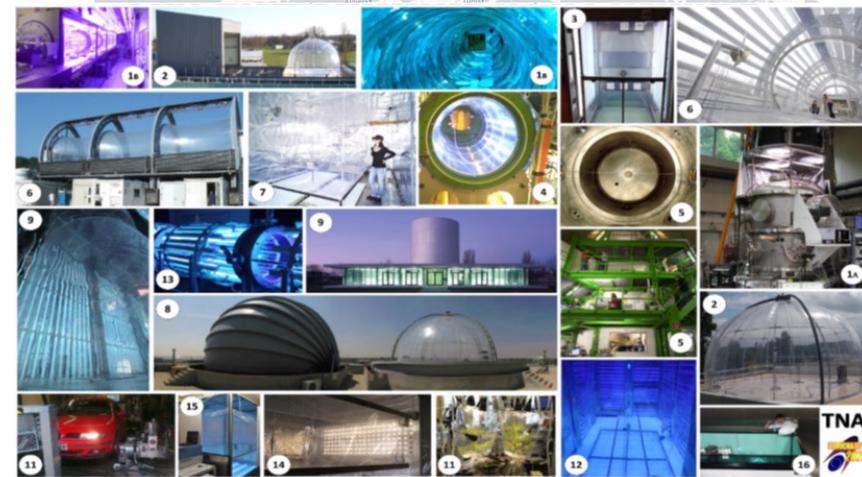
SAOZ data



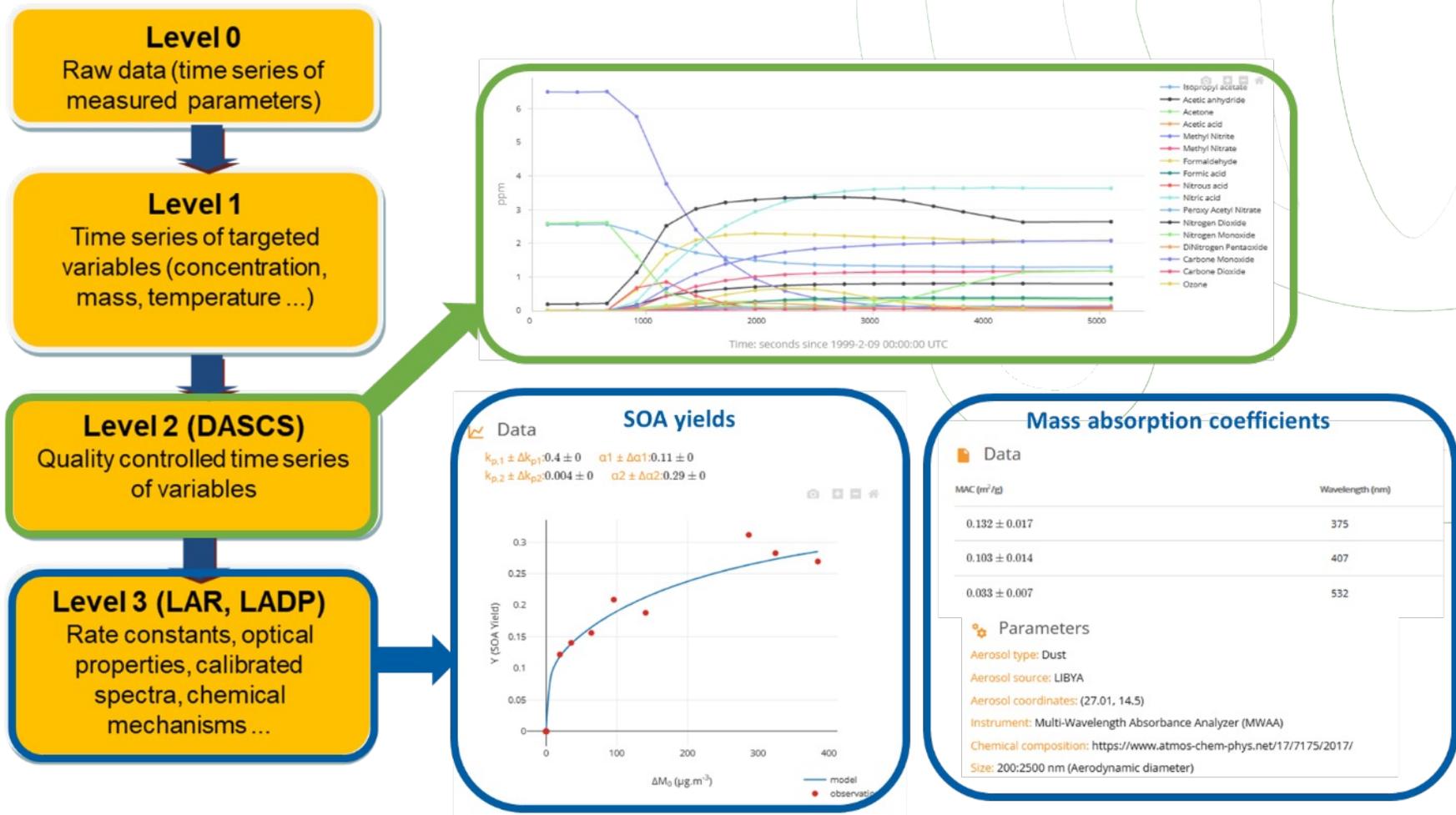
Lidar data

ACTRIS ASC Unit: Atmospheric Simulation Chambers

- **Atmospheric simulation chambers are exploratory platforms designed to investigate atmospheric processes under controlled and realistic conditions**
- Since 2005, they are structured in infrastructure activities funded by the EC (EUROCHAMP-1, EUROCHAMP-2, EUROCHAMP-2020, ACTRIS-IMP)
- **Chambers are platforms of the ERIC ACTRIS**
- **EUROCHAMP DC becomes ACTRIS ASC DC Unit and provides:**
 - data & data products from chamber experiments
 - in free and open access
 - from 26 European chambers



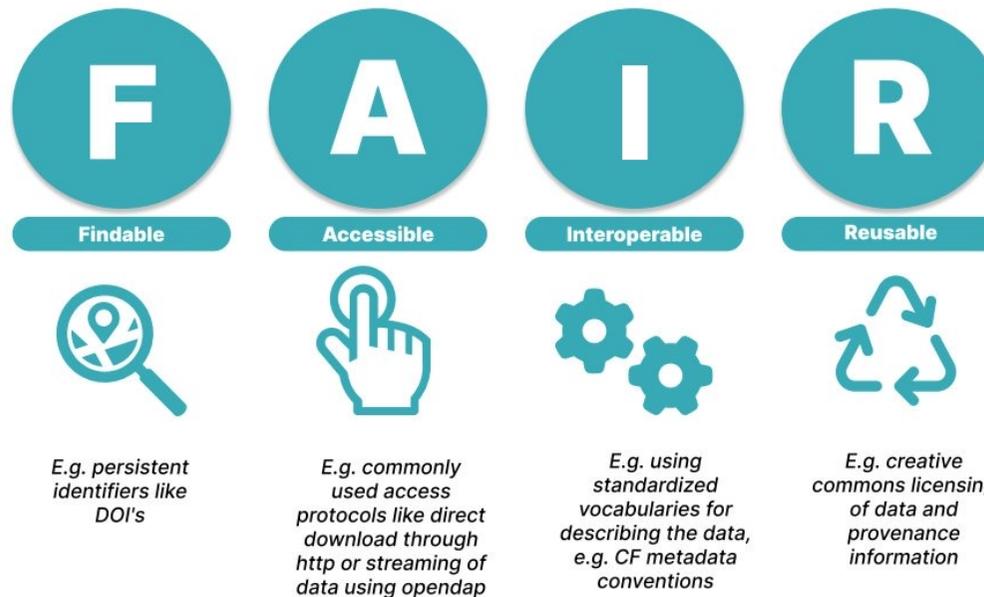
ACTRIS ASC DC unit: data levels



FAIR – Findable, Accessible, Interoperable, Reusable



| FAIR Data Management



Why:

- Requirement by the EU commission and research funding agencies in Europe and the US

As a data provider:

- You will be ensured long term storage of data using commonly used standards and formats as well as distribution of the data through third party actors like WMO WIS, EOSC and others.

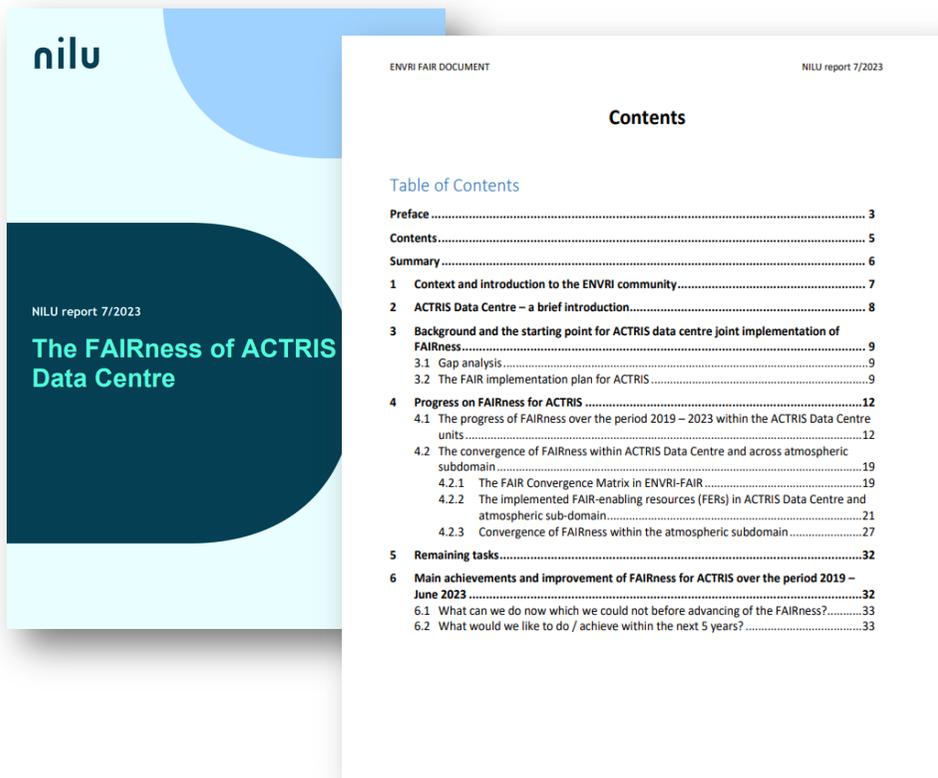
Report on FAIRness of ACTRIS Data Center Implementation over 2019-2023



Document the **achievements and convergence** of FAIRness within ACTRIS Data Centre and across atmospheric subdomain (ACTRIS, ICOS-atm, SIOS-atm, IAGOS, EISCAT-3d)

Explains

- FAIR Implementation Profile (FIP)
- FAIR-enabling resources (FERs) in ACTRIS Data Centre and full atmospheric sub-domain
- FAIRness gap analysis and assessments
- Convergence of FAIRness within the atmospheric subdomain and common solutions



*Implementation as part of ENVRI-FAIR and ACTRIS-Norway
Lund Myhre et al, 2024 NILU Brage: The FAIRness of ACTRIS Data Centre (unit.no)*

ACTRIS Vocabulary



- Needed improved vocabulary to be able to talk across the units and with user communities
- Avoid misunderstandings in communication, data exchange, ...
- [Skosmos: ACTRIS Vocabulary \(nilu.no\)](https://vocabularies.actris.nilu.no/)

The screenshot displays the ACTRIS Vocabulary web interface. At the top, there is a navigation bar with links for 'Vocabularies', 'About', 'Feedback', 'Sparql Endpoint', 'REST API', and 'Help', along with a language selector set to 'English'. The main content area is titled 'ACTRIS Vocabulary' and includes a search bar. On the left, there are two tabs: 'Alphabetical' and 'Hierarchy'. Below the 'Alphabetical' tab, a list of terms is shown, including 'data source', 'data use metrics', 'facility', 'licence', 'manufacturer', 'object group', 'object of interest', 'product type', 'quality control', 'spatial coverage', 'timeliness', 'variable constraints', 'variable geometry', 'variable group', 'variable matrix', and 'variable property of interest'. The right side of the interface is titled 'Vocabulary information' and contains a table of metadata. Below this, there are sections for 'Resource counts by type' and 'Term counts by language'.

Property	Value
TITLE	ACTRIS Vocabulary ACTRIS vocabulary
DESCRIPTION	Controlled vocabulary of terms used in ACTRIS
CREATOR	https://orcid.org/0000-0002-3380-3470
CONTRIBUTOR	https://orcid.org/0000-0001-5158-8703 https://orcid.org/0000-0001-8301-1319 https://orcid.org/0000-0001-9834-5100 https://orcid.org/0000-0002-8712-4262 https://orcid.org/0000-0002-8981-0805 https://orcid.org/0000-0003-2972-2851 https://orcid.org/0000-0003-4157-0838
LICENSE	https://creativecommons.org/publicdomain/zero/1.0/
TYPE	http://www.w3.org/2004/02/skos/core#ConceptScheme
URI	https://vocabulary.actris.nilu.no/actris_vocab/

Resource counts by type	
Type	Count
Concept	4981
• Deprecated concept	0

Term counts by language			
Language	Preferred terms	Alternate terms	Hidden terms
English	4982	1841	0

ACTRIS Data and Data Policy



- **ACTRIS Data** are data from observational National Facilities and exploratory National Facilities complying with the procedures established within ACTRIS.
- **ACTRIS Data Policy:** “As open as possible, as closed as necessary”
 - Access to ACTRIS data is free-of-charge and ACTRIS data should be fully available for others to use with as few restrictions as possible.
- **License:** It is intended to use Creative Commons license **CC BY 4.0** for **ACTRIS data and metadata** and **AGPL** for software and digital tools developed by Topic Centre and/or Data Centre.

Attribution 4.0 International (CC BY 4.0)

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How ACTRIS In Situ / EBAS Landing Pages Implement FAIRness



<https://doi.org/10.48597/AMG9-62FQ>

F1: (Meta)data have eternal PID.
F4: Metadata include PID

A1: (Meta)data retrievable by PID with standardised protocol

I3: (Meta)data include qualified references

R1.1: (meta)data have data usage license.

R1.2: (meta)data document provenance.

R1.3: (meta)data meet domain-relevant community standards.

- Page content and presentation carefully crafted to follow ENVRI-FAIR recommendations.
- Example: citation string recommendation

Aerosol light scattering at Birkenes II

1 January 2010 - 1 January 2023

Download

Summary Data coverage

Product information

Variable(s) aerosol_light_scattering_coefficient, aerosol_light_backscattering_coefficient, relative_humidity, temperature, pressure

Product type [Observation](#)

Instrument type(s) [Nephelometer](#)

Timeliness [Scheduled](#)

Start time 1 January 2010

Stop time 1 January 2023

Framework NILU, GAW-WDCA, ACTRIS, EMEP

Instrument model(s) TSI/3563

Facility information

Facility name Birkenes II (NO0002R)

Facility type [Observation platform, fixed](#)

Coordinates [58.38853°N, 8.252°E](#)

Altitude 219.0 m

File information

PID <https://doi.org/10.48597/BPPN-MZBH>

Filename BPPN-MZBH.nc

Format(s)

Filesize

Version

Last modified

Data Access

Metadata access

Provenance (to be completed)

Software

Version history

Citation & acknowledgements

License [CC BY 4.0](#)

Citation string Fiebig, M., Lunder, C. NILU, GAW-WDCA, ACTRIS, EMEP, 2010-2023, Aerosol light scattering at Birkenes II, data hosted by EBAS at NILU, DOI: <https://doi.org/10.48597/BPPN-MZBH>

Please include the following information in your publication. You may edit the text to suit publication standards.

Acknowledgements

Data used in this <study/report/figure/etc> were accessed from EBAS (<https://ebas.nilu.no/>) hosted by NILU. Specifically, the use included data affiliated with the framework: NILU, GAW-WDCA, ACTRIS, EMEP

Originator(s)

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Chris, Lunder Norwegian Institute for Air Research

Principal investigator(s)

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Chris, Lunder Norwegian Institute for Air Research

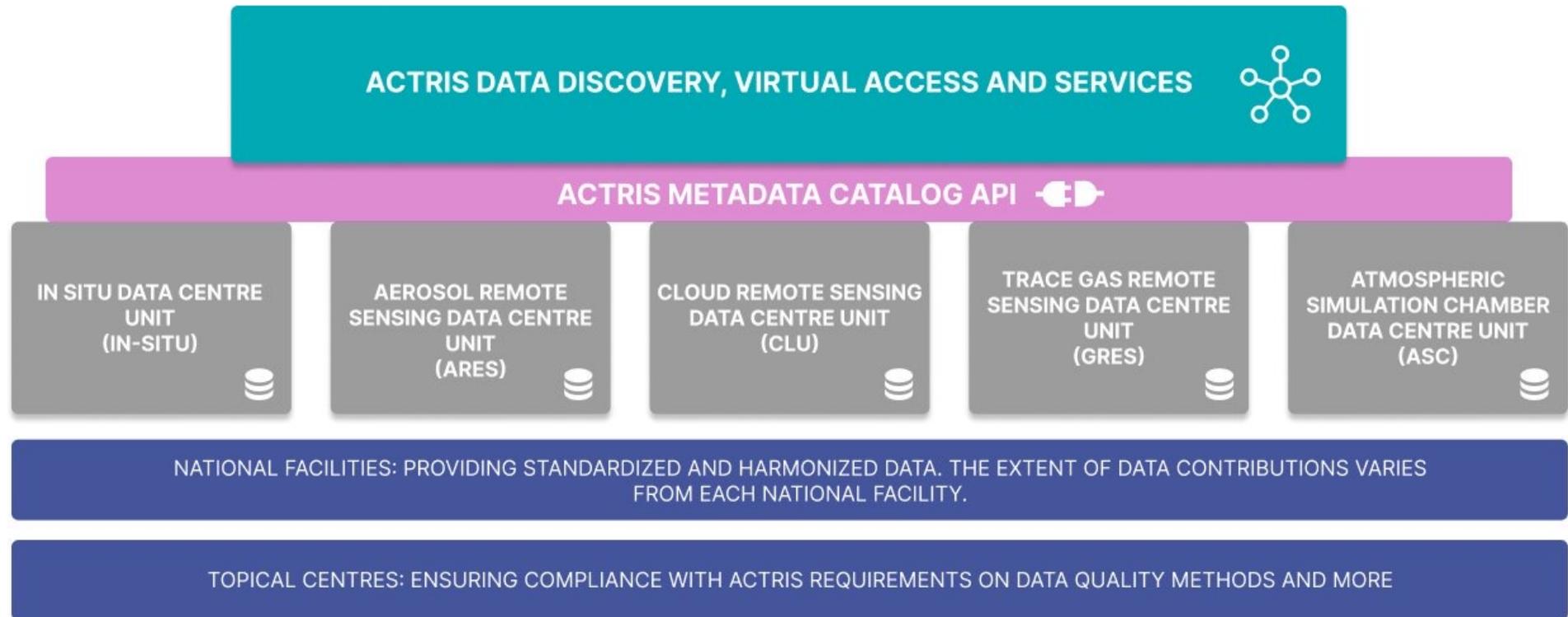
Catalog <https://thredds.nilu.no/thredds/catalog.html>

Dataset	Size	Last Modified
EBAS/		--
ACTRIS_NRT/		--
EBAS_DOI/		--
EBAS_NRT/		--

TDS installation for EBAS data at ATMOS see [Info](#) [Documentation](#)



Technical architecture of ACTRIS Data Centre



Data Access Points: ACTRIS Data Portal



The screenshot displays the ACTRIS Data Centre website interface. At the top, there is a teal navigation bar with the ACTRIS logo on the left and links for Home, Data, Services, About, and Documentation on the right. A 'VRE' button and a shopping cart icon labeled 'item(s)' are also present. Below the navigation bar is a yellow banner announcing the 'Beta release of new ACTRIS data portal September 2024'. The main content area features a large background image of a globe with data overlays. The title 'ACTRIS Data Centre' is prominently displayed. Below the title are four blue rectangular buttons, each with an icon and text: 'Data' (database icon) with the description 'Search for data in the ACTRIS data catalog'; 'Services' (gears icon) with 'Access ACTRIS Data Center tools and services'; 'About' (info icon) with 'Find out more about the ACTRIS Data Center'; and 'Documentation' (book icon) with 'Get more information about the data and services'. At the bottom of the page, there is a dark footer with links for Privacy Policy, Data Policy, Feedback, and Statistics, and a copyright notice: © 2023-2024 ACTRIS.

Data Access Points: ACTRIS metadata catalog REST API

<https://prod-actris-md2.nilu.no/index.html>



ACTRIS metadata catalog REST API 2.0.0 OAS 3.1
/swagger/2.0.0/swagger.json

This is the API documentation for the ACTRIS metadata catalog. In order to add or delete metadata in the catalog, you need to be a registered data provider and create an API token. Please contact the ACTRIS Data Centre (DVAS unit) if you have any questions or need an API token.

[Authorize](#)

contacts

- GET** /contacts/ Returns a list of all contacts
- GET** /contacts/{last_name}/{first_name}/metadata Returns a single contact

countries

- GET** /countries/ Returns a list of all currently available countries
- GET** /countries/{country_code} Fetch a specific country.

facilities

- GET** /facilities/ Return a list of all facilities
- GET** /facilities/geojson Get facilities Geojson
- GET** /facilities/{identifier} Return a single facility
- DELETE** /facilities/{identifier} Delete facility.
- POST** /facilities/add Add a new facility
- PUT** /facilities/{identifier}/update Update a facility.

metadata

- DELETE** /metadata/delete/pid/{pid} Delete a single metadata record
- POST** /metadata/delete/bulk Deletes a set of metadata records.
- DELETE** /metadata/delete/all/{provider_id} Delete all metadata records for a given provider



ACTRIS Services



The screenshot displays the ACTRIS data portal interface. At the top, there is a teal navigation bar with the ACTRIS logo on the left and links for Home, Data, Services, About, and Documentation on the right. A 'VRE' button and a shopping cart icon labeled 'item(s)' are also present. Below this is a yellow banner announcing the 'Beta release of new ACTRIS data portal September 2024'. The main content area has a white background with a search bar and a filter menu. The filter menu includes 'All', 'Services', 'Visualisation tools', 'APIs', 'Data products', and 'Softwares'. The search bar contains 'Access Rights - All' and a search icon. The main content area displays three search results:

- @VOC@**: Web-based tool checking for VOC data. Access Rights: Restricted. Product Type: Visualisation tool. Includes a thumbnail image of a data visualization with a red '@VOC@' watermark.
- A global analysis of climate-relevant aerosol properties retrieved from the network of GAW near-surface observatories**: By Paolo Laj*, Alessandro Bigi et al. <https://doi.org/10.21336/7f34-8j17>. Access Rights: Open. Product Type: Data product. Includes a thumbnail image of a world map with data points.
- ACSM Network visualization tool**: Includes a thumbnail image of a network visualization.

At the bottom of the page, there is a dark footer with links for Privacy Policy, Data Policy, Feedback, and Statistics, and a copyright notice: © 2023-2024 ACTRIS.

Data Access Points: NRT In-Situ data



Click on station to plot data

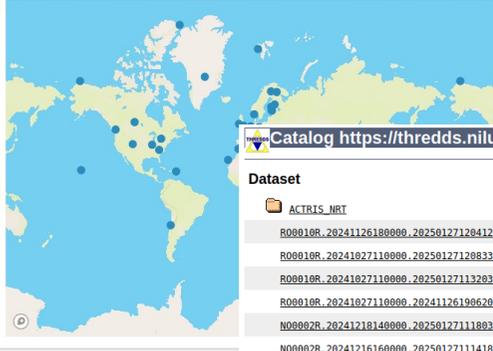


This service has been funded or supported by NILU - Norwegian Institut Monitoring and Evaluation Programme (EMEP), the WMO Global A



EBAS Near-Real-Time Data

Click on station to plot data



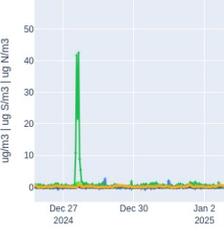


Station Birkenes (NO0002R) at latitude 58.39 and longitude 8.25

Catalog https://thredds.nilu.no/thredds/catalog/actris_nrt/catalog.html

Dataset	Size	Last Modified
ACTRIS_NRT		
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HU0802R_20241112130800_20250127112608_dms...11w.1h.FI03L UHEL DMPS_PUS_01_NRT.FI03L_DMPS_PUS_01.level1.5.nc	3.550 Mbytes	2025-01-27T13:04:32.985Z
GR0100B_20241126160800_20250127110605_filter_absorption_photometer...9w.1h.GR05L Magee AE33_DEM_dry_NRT.GR05L_abs_coef_AE33_v1_ECACv1.level1.5.nc	648.2 Kbytes	2025-01-27T12:56:26.429Z
GR0100B_20241029180800_20250127110109_filter_absorption_photometer...13w.1h.GR05L Magee AE33_DEM_dry_NRT.GR05L_eBC_v1.level3b.nc	468.0 Kbytes	2025-01-27T12:56:26.097Z
GR0100B_20241029180800_20241126170910_filter_absorption_photometer...4w.1h.GR05L Magee AE33_DEM_dry_NRT.GR05L_abs_coef_AE33_v1.level1.5.nc	361.4 Kbytes	2025-01-27T12:56:26.017Z

aerosol_mass_spectrometer - Birken



ATMO-ACCESS: Aerosol distribution and source analysis



Developed by N. Evangeliou (ne@nilu.no) and S. Eckhardt (sec@nilu.no) (NILU) under ATMO-ACCESS, EU grant agreement No 101008004

FLEXPART Model Run

Request access to FLEXPART model run

FLEXPART products

For support and more information please

STATION YEAR MONTH PROD

NO0002R 2023 January Footprint

Footprint emissions from 31-Jan-2023 21:00
Lowest release height: 0 m

Surface concentration (ng m^{-3})

02-Jan-2023 05-Jan-2023

DOM

Info on FLEXPART products for the webpage

- First button from the left selects the respective output.
- Second and third buttons are currently deactivated and should be skipped.
- Fourth button selects different products, namely "Footprint" (emission probability), "Sea-spray" (modelled concentrations), "Agriculture" (modelled concentrations), "Min. dust" (modelled concentrations), "Road dust" (modelled concentrations), "Fibers" (modelled concentrations), "Continental spec" (timeseries plot showing the contribution of dust from each continent), "Age spec" (timeseries plot showing how fresh your plume is), "Source Spec" (timeseries plot showing the quantified contribution from each emission sector).
- Final button on the right selects the projection (regional, global, polar).
- Buttons FIRST, -10, PREV, NEXT, +10, LAST navigate between different samples.
- Buttons VIEW PLOT and NETCDF (for map products) or VIEW DATA (for spectrum products) switch between plot visualization and links for download the data.
- Map products (Footprint, Sea-spray, Agriculture, Min. dust, Road dust, Fibers) are in gridded arrays and are given in netCDF format, while spectrum products (Source Spec, Continental Spec, Age Spec) are given in ascii format.
- Map products can be plotted also with commercial tools (try NASA's free program PANOPLY if you cannot plot with Python, Matlab, R, etc.), while timeseries plots with tools like MS excel.

Explanation of products included in the webpage

- **Footprint:** Footprint emissions sensitivity showing the probability of any release occurring in any grid-cell to reach the receptor (station) for 30 days particle tracking. In newer versions of the product, the average column trajectory of the footprint is plotted on each map as a function of the height of the plume center (gray colorbar on the right). Each colored circle represents each day backward in time from the release. In addition, there is a timeseries plot under the map showing the plume height versus time backward in time (black line) and on the right secondary axes, the percentage of particles in the planetary boundary layer (PBL) in magenta color and the percentage of particles in the stratosphere (STRA) in blue. Each circle represents days backward from the release date and time.
- **Sea-spray:** Modelled contribution to surface microplastic concentrations from oceanic emissions plotted on a map (three projections). Sea-spray emissions include emissions from bubble bursting and wave break on the shore (similar to sea spray aerosol emissions) from Evangeliou et al. <https://doi.org/10.1016/j.jhazmat.2022.128585>.
- **Agriculture:** Modelled contribution to surface microplastic concentrations from agricultural activity. Agricultural emissions include sources such as those from nets and other material used in agriculture from Evangeliou et al. <https://doi.org/10.1016/j.jhazmat.2022.128585>.
- **Min. dust:** Modelled contribution to surface microplastic concentrations from mineral dust. These emissions are based on the assumption that microplastics deposited in dust reservoirs can be resuspended similar to dust (Evangeliou et al. <https://doi.org/10.1016/j.jhazmat.2022.128585>).
- **Road dust:** Modelled contribution to surface microplastic concentrations from road dust. These emissions include sources of road microplastics such as Tyre and Brake Wear (TBWP) and pavement paints (Evangeliou et al. <https://doi.org/10.1016/j.jhazmat.2022.128585>).
- **Fibers:** Modelled contribution to surface microfibrers concentrations. These emissions include sources of fibers from human population (Evangeliou et al. <https://doi.org/10.1016/j.jhazmat.2022.128585>). Though, their contribution to PM10 is rather small due to their larger sizes.
- **Continental Spec:** Timeseries plot of modelled concentrations in 3h resolution showing the continental contribution (OCE: Ocean, GNL: Greenland, SA: South America, CA: Central America, NA: North America, AFR: Africa, EUR: Europe, RUS: Russia, ASI: Asia excluding Russian part, AUS: Australia) to surface dust.
- **Age Spec:** Timeseries plot of modelled concentrations in 3h resolution showing the age contribution of the plume to surface dust. The latter shows how "fresh" or "old" the air arriving at the receptor is.

What is a VRE - Virtual Research Environment?



- Online environment helping researches collaborate and perform data-driven research.
- Features usually include:
 - Collaboration support (web forums and wikis)
 - Document hosting: Examples etc.
 - Discipline-specific tools: Data analysis, Visualization etc.
 - Teaching tools: Presentations, Slides, Videos etc.
- Does not require the user to setup anything or download any inputs!
 - Example: The user is not required to download python itself or any python packages needed for examples, this is already available on the VRE.

ACTRIS VRE Jupyter Hub

- VRE page on ACTRIS Data Portal – possible to see all examples without running them.
(<https://data.actris.eu/vre>)
- ACTRIS VRE Jupyter Hub – python workspace where you can run and edit the ACTRIS notebook examples and create your own code.
- Github repository for examples <https://github.com/ACTRIS-Data-Centre/actris-jupyter-hub>
 - Using nbgitpuller to pull workspace: <https://nbgitpuller.readthedocs.io/en/latest/link.html>
 - Merging behavior: <https://nbgitpuller.readthedocs.io/en/latest/topic/automatic-merging.html>

ACTRIS ITINERIS

Home Data Services About Documentation VRE 113 item(s)

Beta release of new ACTRIS data portal September 2024

Welcome to the ACTRIS Virtual Research Environment (VRE)

The ACTRIS VRE provides a cutting-edge platform for accessing, analyzing, and sharing atmospheric data. Designed for researchers in the ACTRIS community, the VRE integrates data and computational resources in a cloud-based environment, powered by JupyterHub. By using Python-based tools and pre-built examples, researchers can streamline their workflow and collaborate effectively.

File Edit View Run Kernel Tabs Settings Help

Introduction to ACTRIS Jupyter Hub Search with ACTRIS Data Portal

Filter files by name

Name	Modified
static	5d ago
actris-jupyter-hub / Search and access /	
Search with ACT...	2d ago
Explore ACTRIS ...	2d ago
Access ACTRIS In...	5d ago
Access ACTRIS C...	5d ago

ACTRIS DC

Access ACTRIS Data through the ACTRIS Data Portal

The goal of this notebook is to provide a guide on how to access data through the ACTRIS (Aerosols, Clouds, and Trace gases Research Infrastructure) Data Portal. By following this notebook, users will gain the necessary skills to access and utilize the atmospheric data available through the ACTRIS Data Portal. This knowledge will enable them to conduct their own research and analysis in the field of atmospheric science. The Data Portal represents a human interface to search and access of all ACTRIS data.

Let's get started!

Import libraries

```
[1]: # Library for working with netCDF files
import xarray as xr

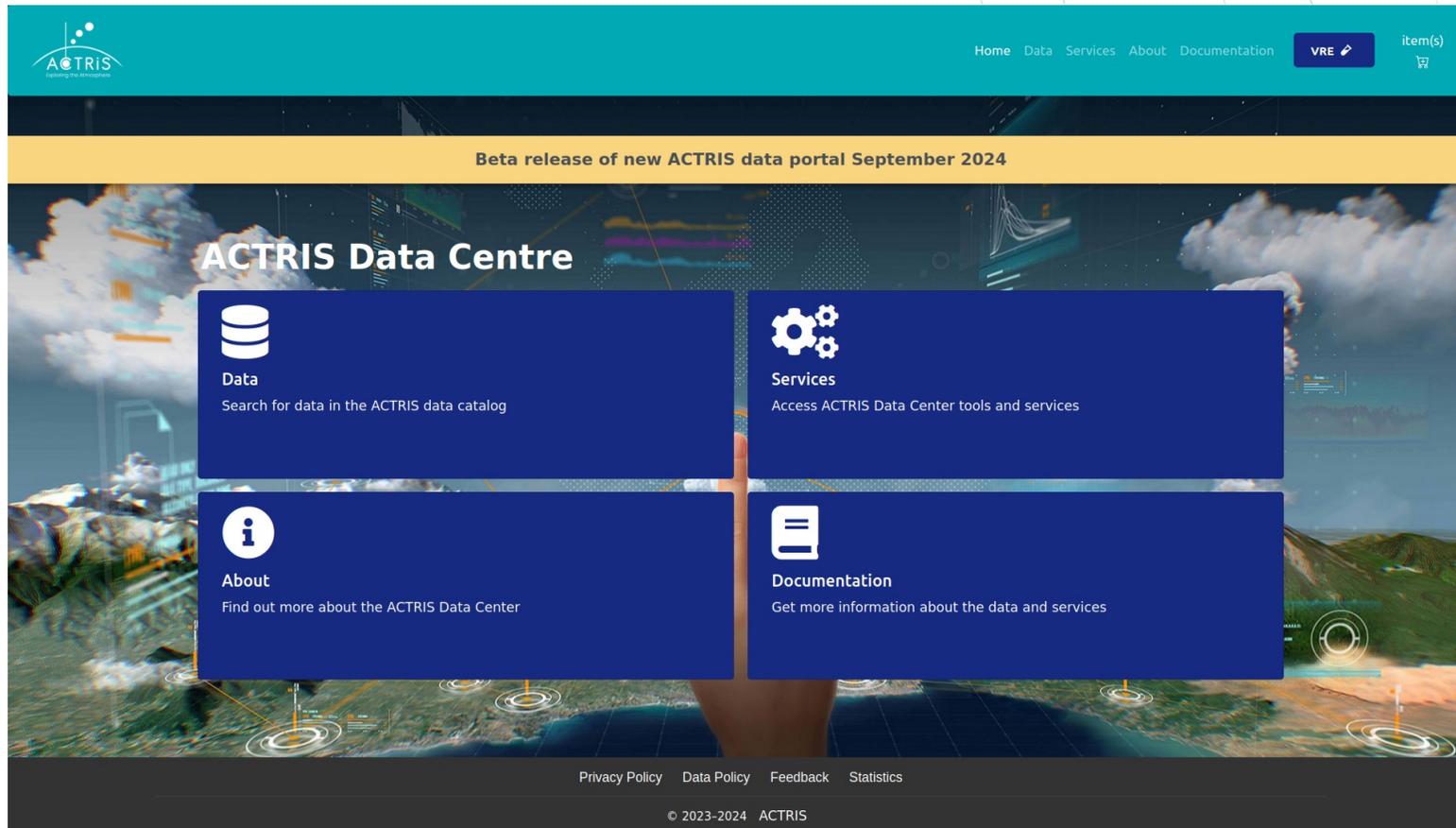
# Libraries for working with JSON files, making HTTP requests, and handling file system operations
import json
import requests
import os

# Library for plotting data
import matplotlib.pyplot as plt
```

Access the ACTRIS Data Portal

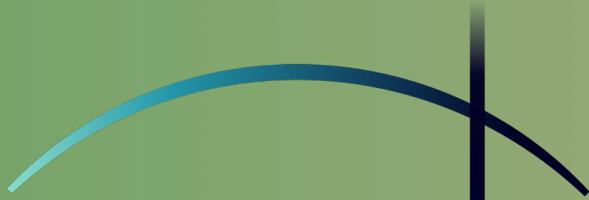
Simple 0 2 Python 3 (ipykernel) | Idle Mem: 217.39 MB Mode: Command Ln 1, Col 1 Search with ACTRIS Data Portal.ipynb 1

Demonstration of the portal & show case of services





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ACTRIS

THANKS!

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(D.D. n. 130/2022 - CUP B53C22002150006) Funded by EU - Next Generation EU PNRR-
Mission 4 “Education and Research” - Component 2: “From research to business” - Investment
3.1: “Fund for the realisation of an integrated system of research and innovation infrastructures”



Use cases: Canadian Wildfires 2023

Forslag til stasjoner:

- Jungfrauoch (ser eventen)
- Monte Cimone (ser ikke eventen pga fjellene)
- Bra, begge har data for filter absorption photometer + FLEXPART products
- PNSD – BB har distinkt størrelsesdist. Accumulation mode.



Use cases: Desert Dust Jan-Feb 2024

🌐 Forslag til stasjoner:

- Hohenpeissenberg
- Leipzig

- Hvilke variabler fra in-situ, see NRT flow: PNSD?

- APS data coarse mode. (ikke NRT)
- Absorption
- SSA

- Hvilke variabler fra aerosol remote sensing:

