Ground based observations: status & data access points and digital tools. Pt2
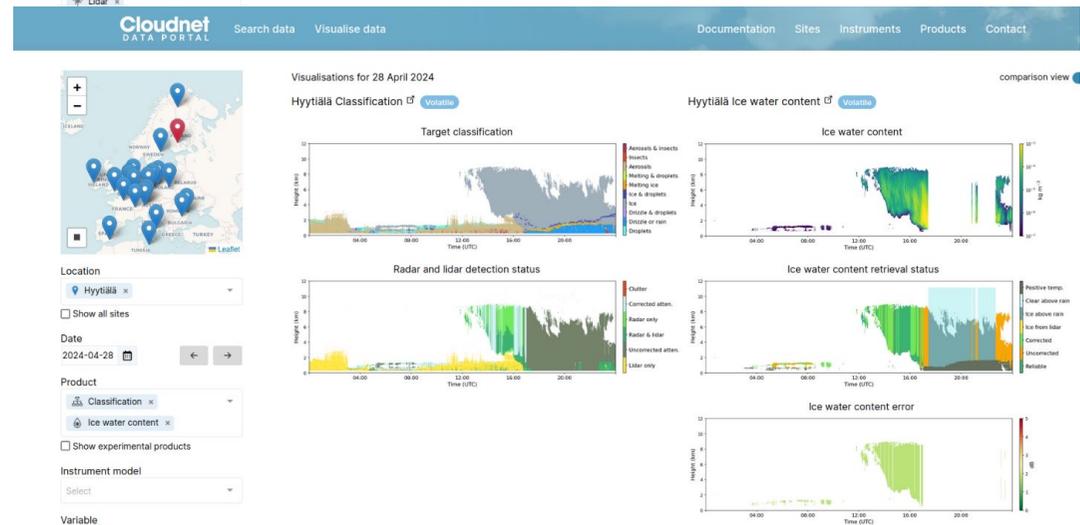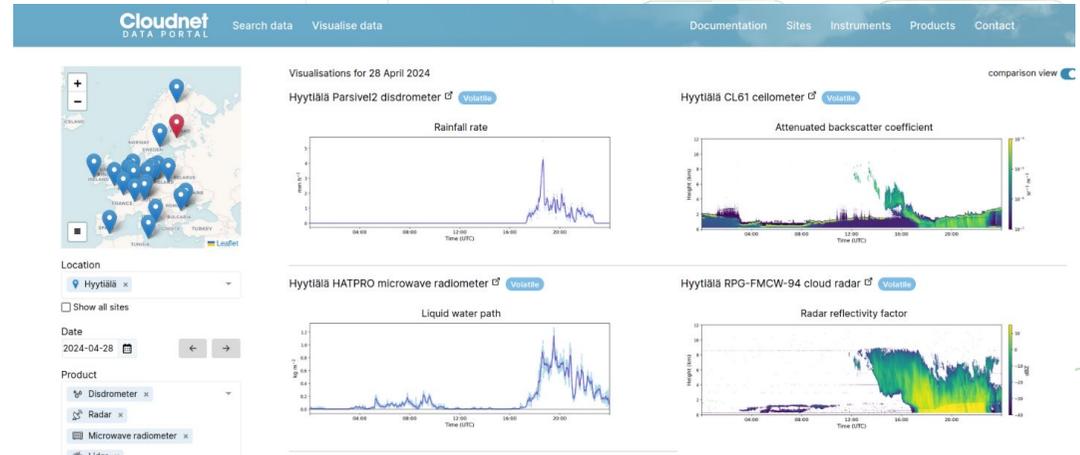
Lise Eder Murberg (NILU) – lemu@nilu.no

Markus Fiebig, Lucia Mona, Claudio Dema

Finanziato dall'Unione europea
NextGenerationEU

Ministero dell'Università e della Ricerca
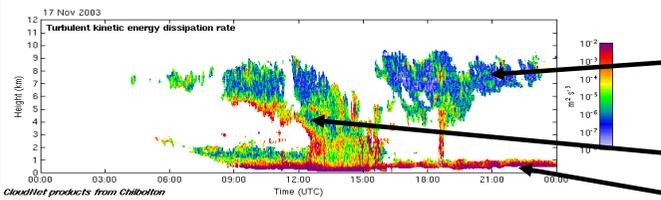
Italiadomani

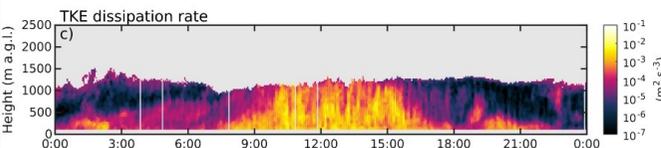# ACTRIS CLU Unit: Cloud remote sensing

ACTRIS cloud profiling

Vertical winds and turbulent properties:
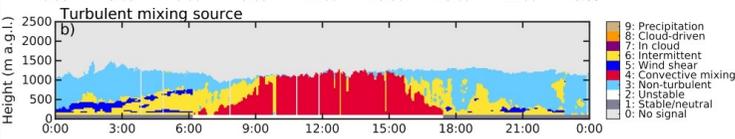- Boundary layer and in-cloud (Radar and Doppler lidar)

Weak turbulence:
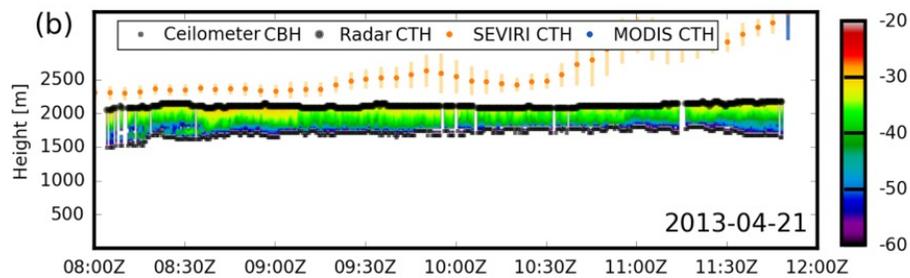- Cirrus

Strong turbulence
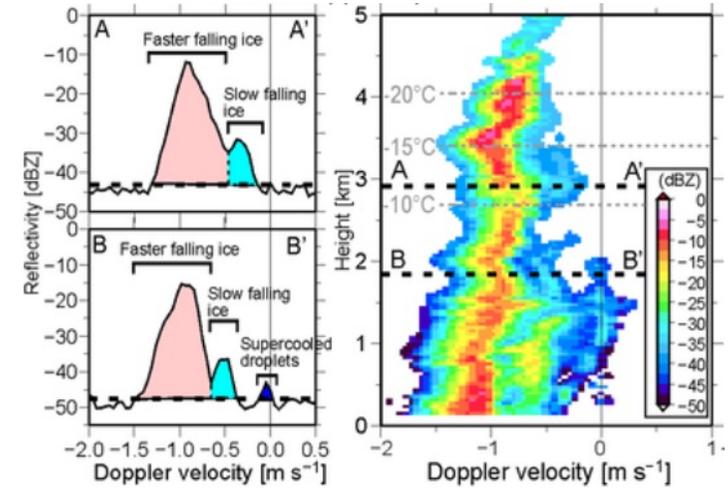- Evaporating ice
- Stratocumulus

Boundary layer dynamics

Identify vertical mixing and diagnose source

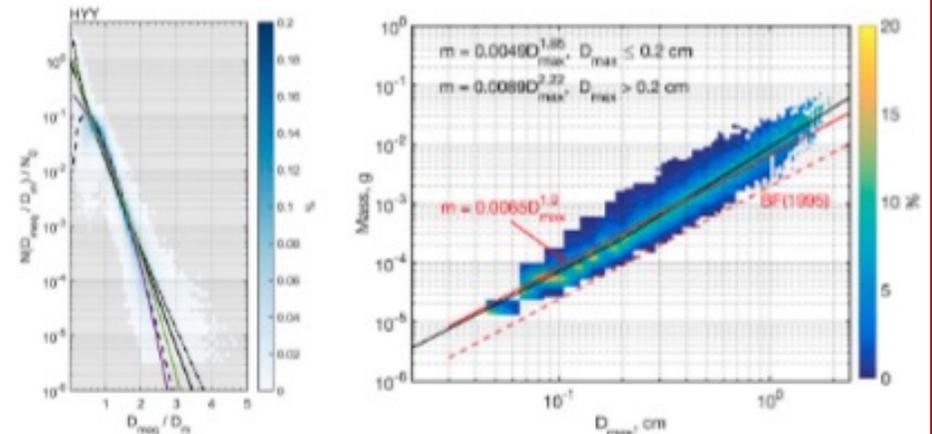## Evaluate satellite retrievals (e.g. cloud top height)

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
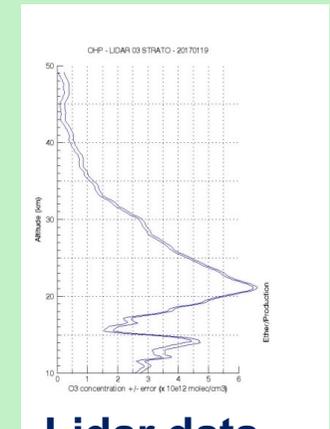
Instruments:

- 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
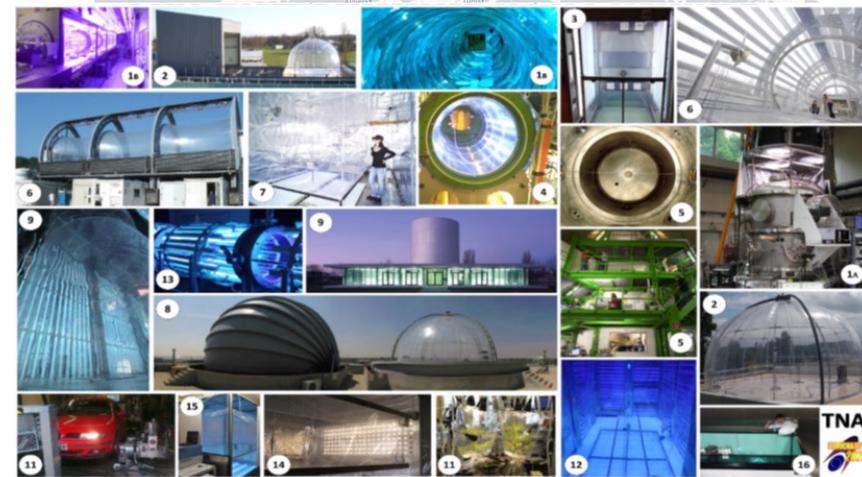 - Ozone Dial (Differential Absorption) **LIDARS**
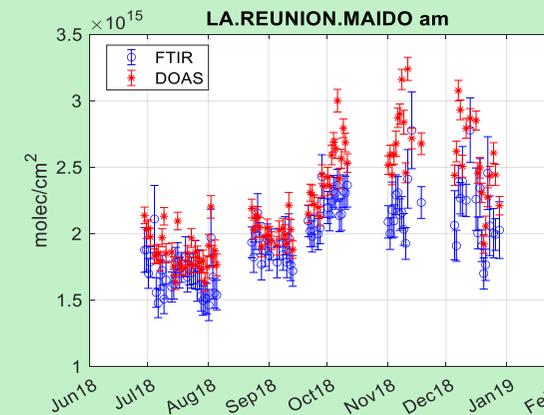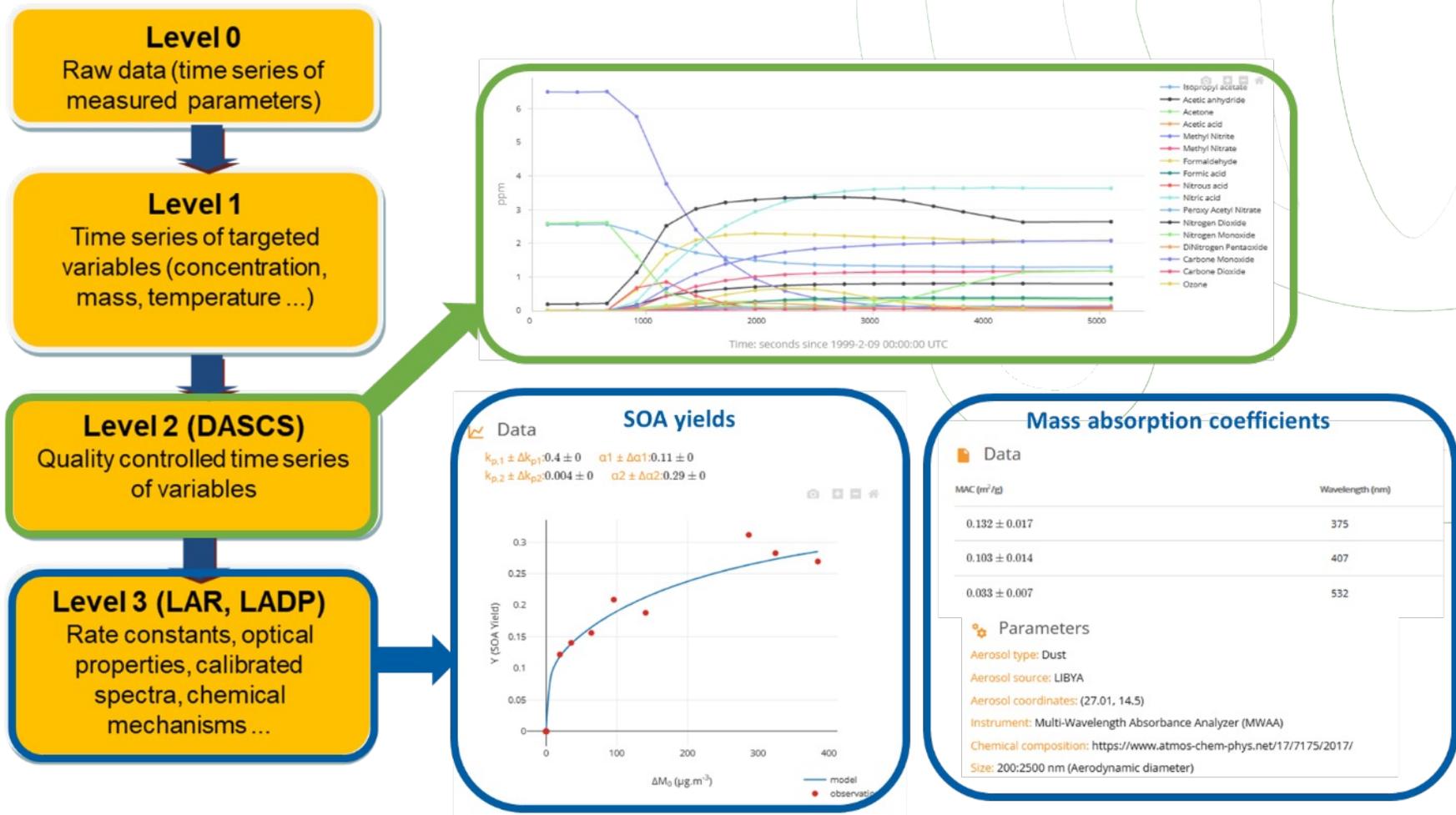

FTIR data
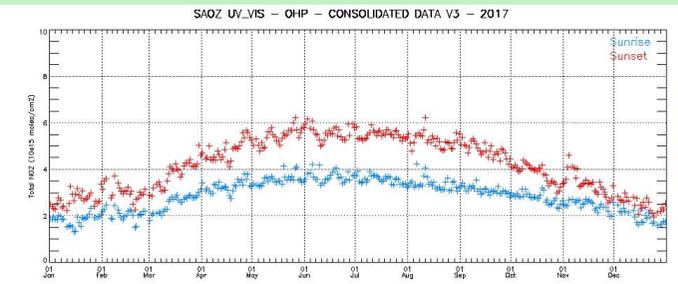
SAOZ data

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

Level 0
Raw data (time series of measured parameters)

Level 1
Time series of targeted variables (concentration, mass, temperature ...)

Level 2 (DASCS)
Quality controlled time series of variables

Level 3 (LAR, LADP)
Rate constants, optical properties, calibrated spectra, chemical mechanisms ...

SOA yields

📈 Data

$k_{p,1} \pm \Delta k_{p1}$:0.4 ± 0 $\alpha 1 \pm \Delta \alpha 1$:0.11 ± 0
$k_{p,2} \pm \Delta k_{p2}$:0.004 ± 0 $\alpha 2 \pm \Delta \alpha 2$:0.29 ± 0

Mass absorption coefficients

📄 Data

MAC (m²/g)	Wavelength (nm)
0.132 ± 0.017	375
0.103 ± 0.014	407
0.033 ± 0.007	532

⚙ Parameters

Aerosol type: Dust
Aerosol source: LIBYA
Aerosol coordinates: (27.01, 14.5)
Instrument: Multi-Wavelength Absorbance Analyzer (MWAA)
Chemical composition: https://www.atmos-chem-phys.net/17/7175/2017/
Size: 200:2500 nm (Aerodynamic diameter)

FAIR –
Findable, Accessible, Interoperable, Reusable

FAIR Data Management

Findable

E.g. persistent identifiers like DOI's

Accessible

E.g. commonly used access protocols like direct download through http or streaming of data using opendap

Interoperable

E.g. using standardized vocabularies for describing the data, e.g. CF metadata conventions

Reusable

E.g. creative commons licensing of data and provenance information
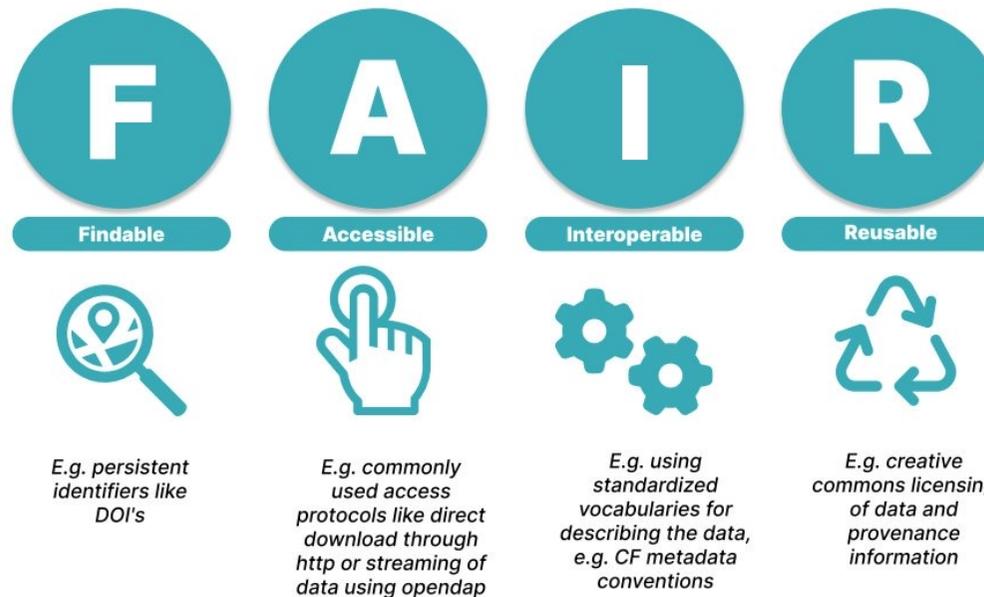
Why:
- Requirement by the EU commission and research funding agencies in Europe and the US

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

NILU report 7/2023

The FAIRness of ACTRIS Data Centre

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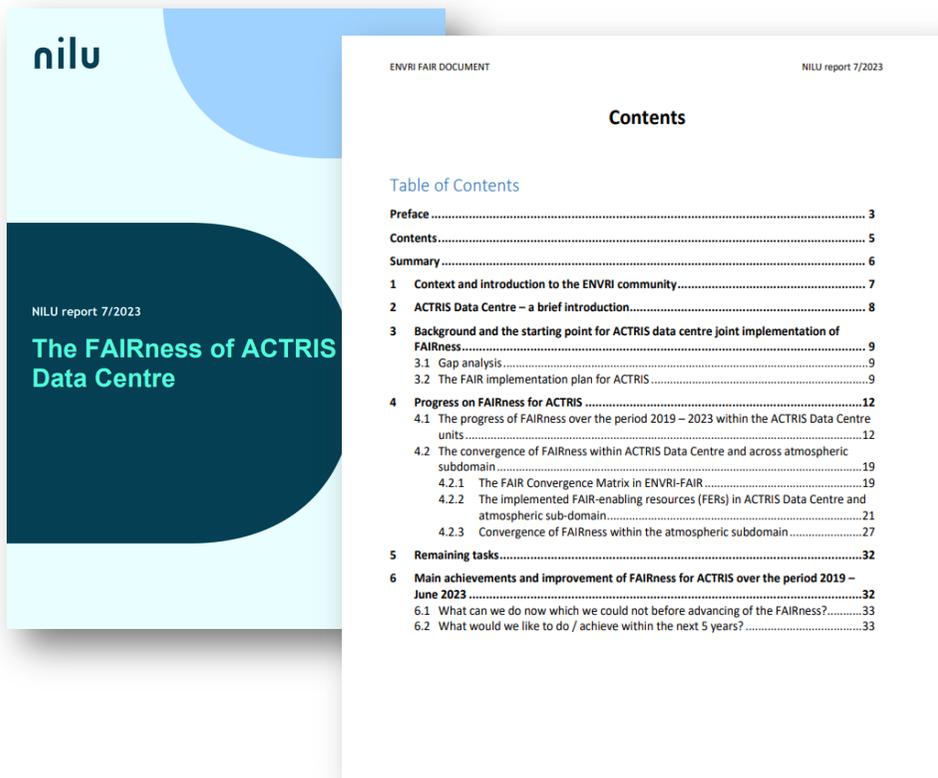
Implementation as part of ENVRI-FAIR and ACTRIS-Norway
Lund Myhre et al, 2024 NILU Brage: The FAIRness of ACTRIS Data Centre (unit.no)

ACTRIS Vocabulary

- Needed improved vocabulary to be able to talk across the units and with user communites

- **Avoid misunderstandings in communication, data exchange, ...**
- Skosmos: ACTRIS Vocabulary (nilu.no)

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.

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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**

Technical architecture of ACTRIS Data Centre
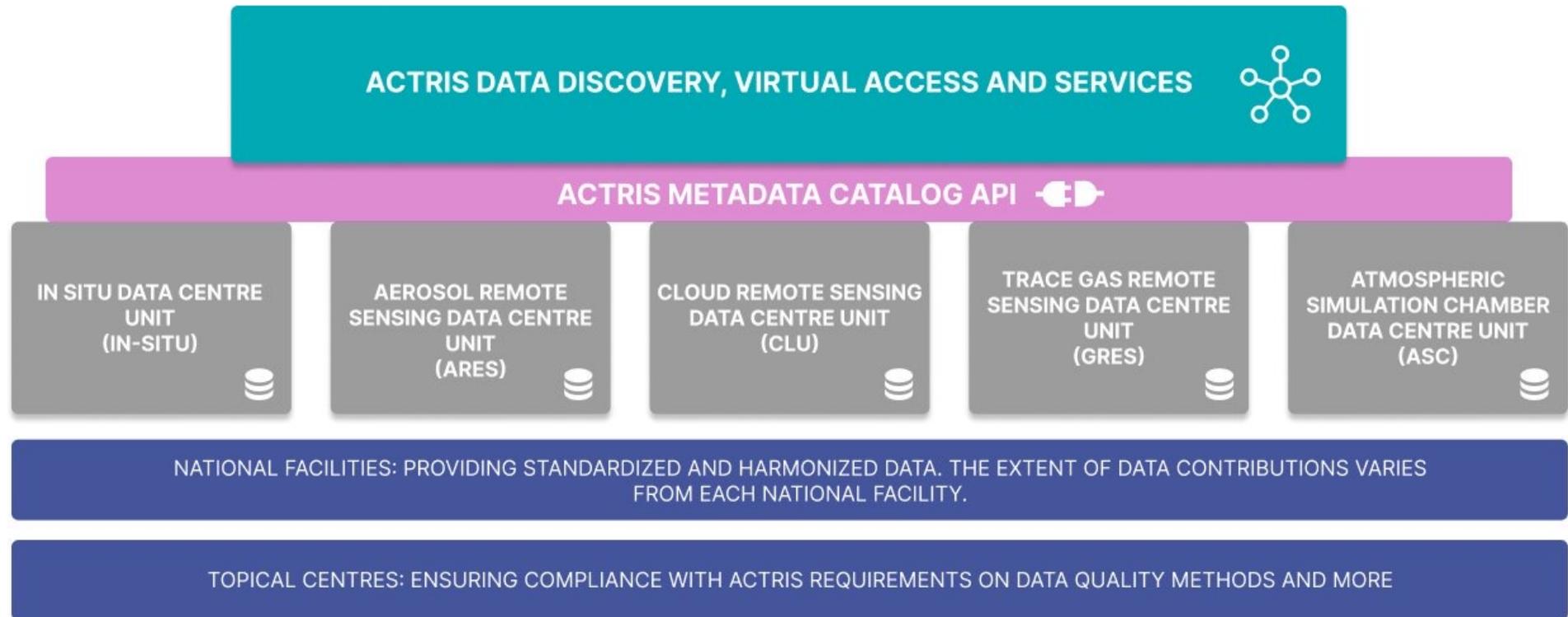
Data Access Points: ACTRIS Data Portal

Data Access Points:
ACTRIS metadata catalog REST API

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

ACTRIS Services

Data Access Points: NRT In-Situ data

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

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

Demonstration of the portal & show case of services
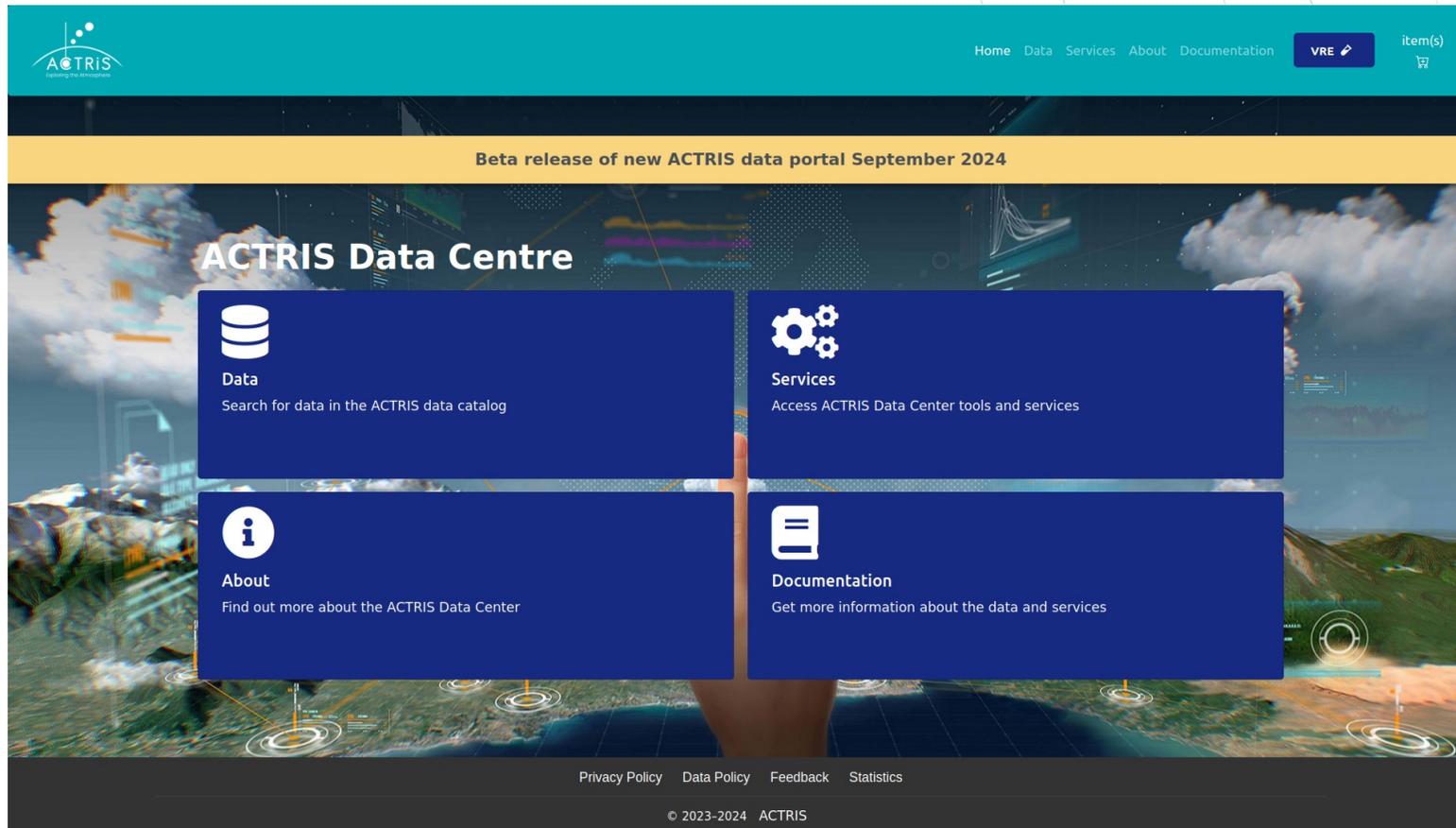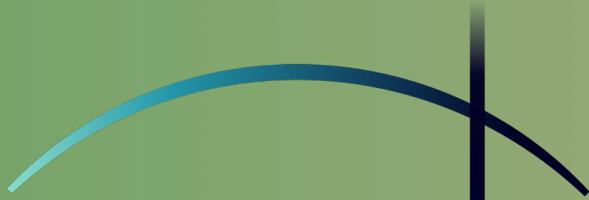
THANKS!

Use cases: Canadian Wildfires 2023

- Forslag til stasjoner:
  - Jungfraujoch (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: