



# Training event on Atmospheric Composition Data Exploitation.

## ICOS data training and challenge

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**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”



## ICOS – all about reliable data

Integrated Carbon Observation System  
Informs:

- Scientists
- Policy makers
- General public

Generate high quality observation data

Transparent – open data

From raw to elaborated data products

Clear data lifecycle

Community based

Catalyser of biogeochemical science

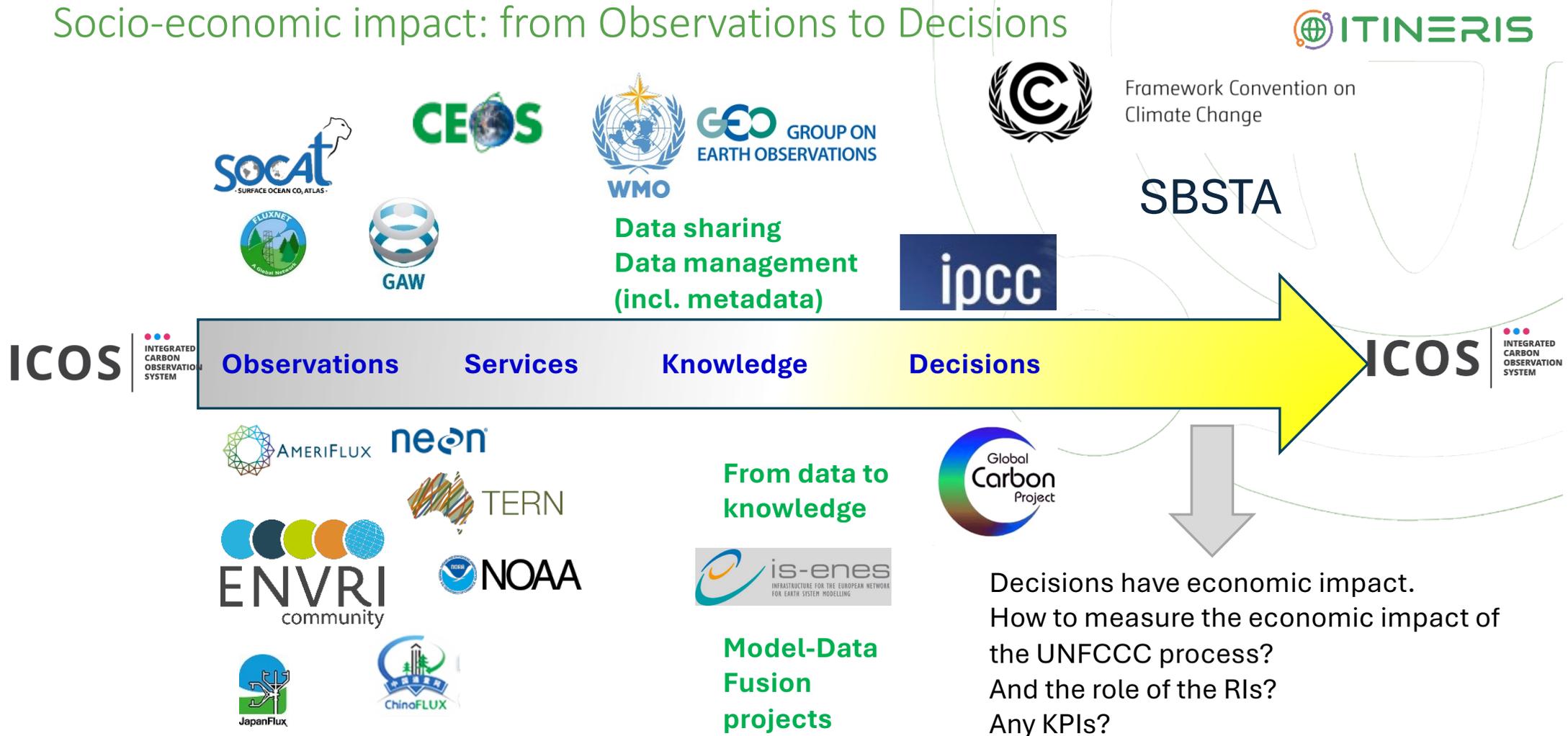
Improve knowledge and inform on

- Anthropogenic and natural fluxes
- Detect climate feedbacks
- Emission trends

Timely and factual information, beyond debate!



# Socio-economic impact: from Observations to Decisions



# Integrated Carbon Observation System (ICOS)

Scientific mission:

- Increase fundamental understanding of carbon cycle, greenhouse gas budgets and perturbations, and underlying processes
- Increase ability to predict future changes
- Verify the effectiveness of policies aiming to reduce greenhouse gas emissions
- Foster technical and scientific innovation
- Contribute to education and capacity building

<https://www.icos-ri.eu>



## ICOS RI Services to members

- Uniform station design (meeting or exceeding global standards)
- Community defined common measurement protocols, standardized instrumentation
- Central data processing at (distributed) Thematic Centers (TC)
  - Full processing chain from raw to full QC'ed product, traceable, transparent
  - PI's contribute metadata, check data, add quality flags
- Central Calibration lab (Germany)
  - Flask and  $^{14}\text{CO}_2$  analysis
  - Provision & reassignment of spiked natural air working standards and targets (WMO scales)
- Station networks run by nations -> monitoring station assemblies
- Legal representation in ERIC, Head Office (Finland) plus Carbon Portal (Sweden)
  - Central administration
  - Coordination, together with heads of TCs and MSA chairs
  - Communication
  - International strategy and relations: WMO GAW, SOCAT, Fluxnet, GEO Carbon and GHG Initiative
  - Central data portal, open access, attribution and usage tracking
- Financial contributions by member states
  - Membership, partially dependent on GDP
  - Station contribution, dependent on domain, Class (I, II, associated)
- Nations contribute to 80% of HO, CP, TC, CAL, rest from member contribution



## ICOS Stations



**179 measurement stations**

103 Ecosystem stations

47 Atmosphere stations

29 Ocean stations

including two stations on Greenland,  
one in French Guyana, La Reunion, Cape Verde, Canary Islands,  
DR Congo

**16 member states**

Ireland, Greece and Hungary joined 2022  
Portugal, Estonia, Poland, Slovenia in progress

Stations need to go through tedious certification process  
(Labelling) before it can label itself as ICOS station and the data  
gets status of ICOS quality data, today 124 are labelled



# Atmosphere domain (FR/FI)

## ATMOSPHERE THEMATIC CENTRE

Metrology lab



Data centre



Mobile lab



 ITINERIS



# ICOS atmosphere station classification

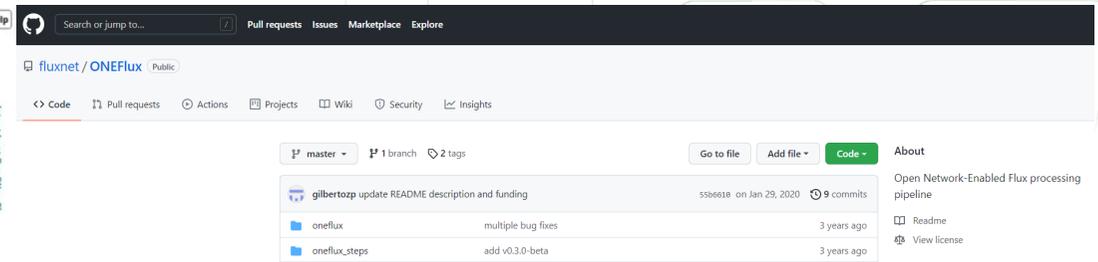
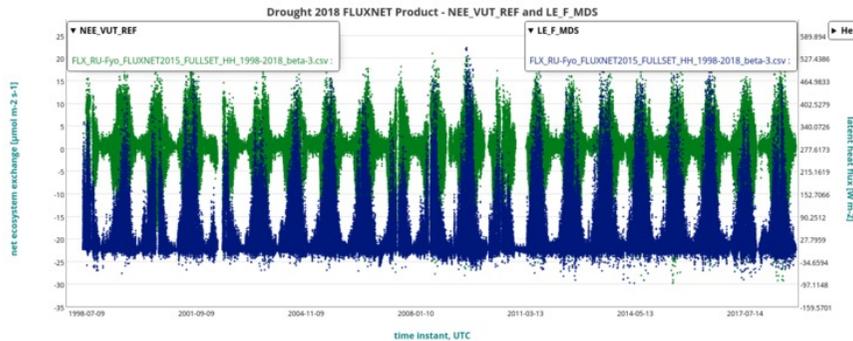
Category	Gases, continuous	Gases, periodical	Meteorology, continuous	Eddy Fluxes
<b>Class 1</b> Mandatory parameters	<ul style="list-style-type: none"> <li>• CO<sub>2</sub>, CH<sub>4</sub>, CO : at each sampling height</li> </ul>	<ul style="list-style-type: none"> <li>• CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, SF<sub>6</sub>, CO, H<sub>2</sub>, <sup>13</sup>C and <sup>18</sup>O in CO<sub>2</sub>: weekly sampled at highest sampling height</li> <li>• <sup>14</sup>C (radiocarbon integrated samples): at highest sampling height</li> </ul>	<ul style="list-style-type: none"> <li>• Air temperature, relative humidity, wind direction, wind speed: at highest and lowest sampling height*</li> <li>• Atmospheric Pressure</li> <li>• Planetary Boundary Layer Height**</li> </ul>	
<b>Class 2</b> Mandatory parameters	<ul style="list-style-type: none"> <li>• CO<sub>2</sub>, CH<sub>4</sub> : at each sampling height</li> </ul>		<ul style="list-style-type: none"> <li>• Air temperature, relative humidity, wind direction, wind speed: at highest and lowest sampling height*</li> <li>• Atmospheric Pressure</li> </ul>	
Recommended parameters***	<ul style="list-style-type: none"> <li>• <sup>222</sup>Rn, N<sub>2</sub>O, O<sub>2</sub>/N<sub>2</sub> ratio</li> <li>• CO for Class 2 stations</li> </ul>	<ul style="list-style-type: none"> <li>• CH<sub>4</sub> stable isotopes, O<sub>2</sub>/N<sub>2</sub> ratio for Class 1 stations: weekly sampled at highest sampling height</li> </ul>		<ul style="list-style-type: none"> <li>• CO<sub>2</sub> : at one sampling height</li> </ul>

\* Atmospheric temperature and relative humidity recommended at all sampling heights

\*\* Only required for continental stations.

\*\*\* Recommended for its scientific value but support from ATC in terms of protocols, data base, spare analyzer will not be ensured as long as the parameters are not mandatory.

# Ecosystem domain (IT/FR/BE)



### ETC Executive Committee Unit

- Communication and interaction with the ICOS ecosystem stations and other Central Facilities
- Organization of the annual assessments of ETC operations
- Planning of the medium and long term activities

### Data Unit

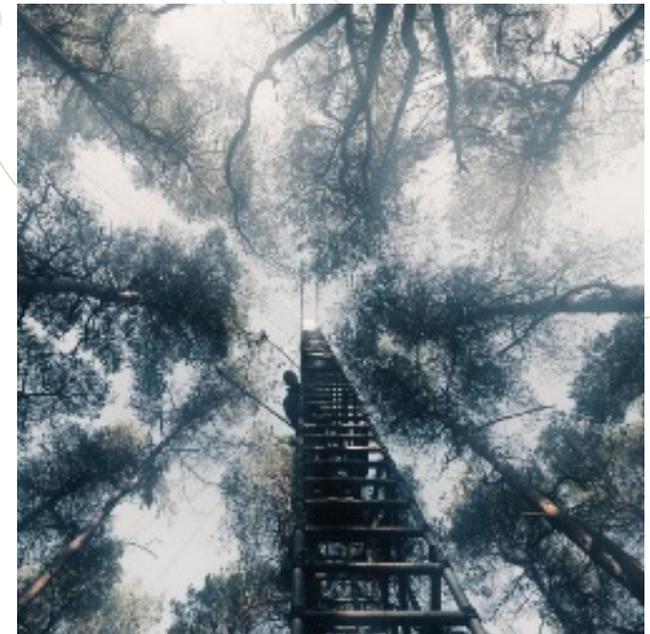
- Near real time data/metadata collection
- Automatic data QA/QC and processing
- Data sharing, distribution and archiving
- Development of tools for data exploration and validation
- Alert service in case of data problems or inconsistencies

### Test Unit

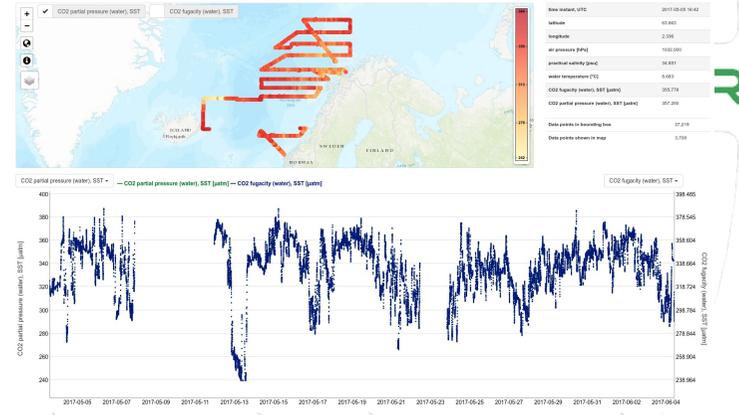
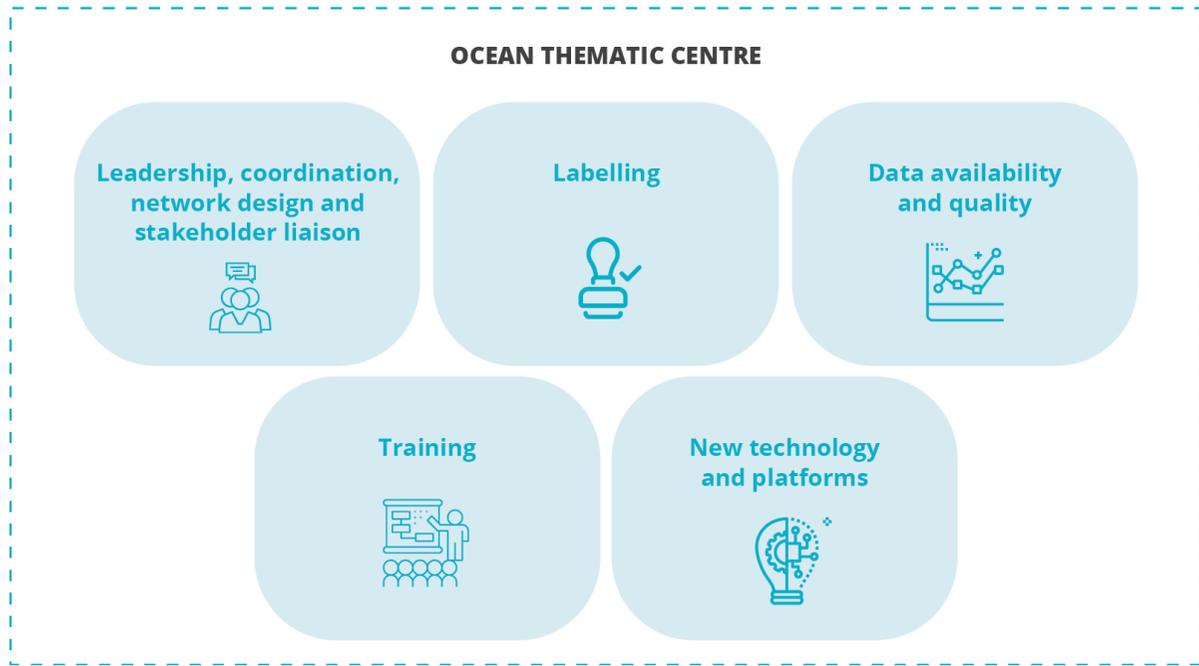
- Evaluation of new sensors and prototypes
- New methods developments
- Interactions with instrument manufacturers and research centers
- Roving system management for sites validation and parallel measurements

### Network Unit

- Assistance to the ICOS ecosystem stations
- Evaluation of the ICOS station performances
- Training sessions for site managers and technicians
- Soil and vegetation sample analysis and storage
- Organisation of the Workgroups for protocol development



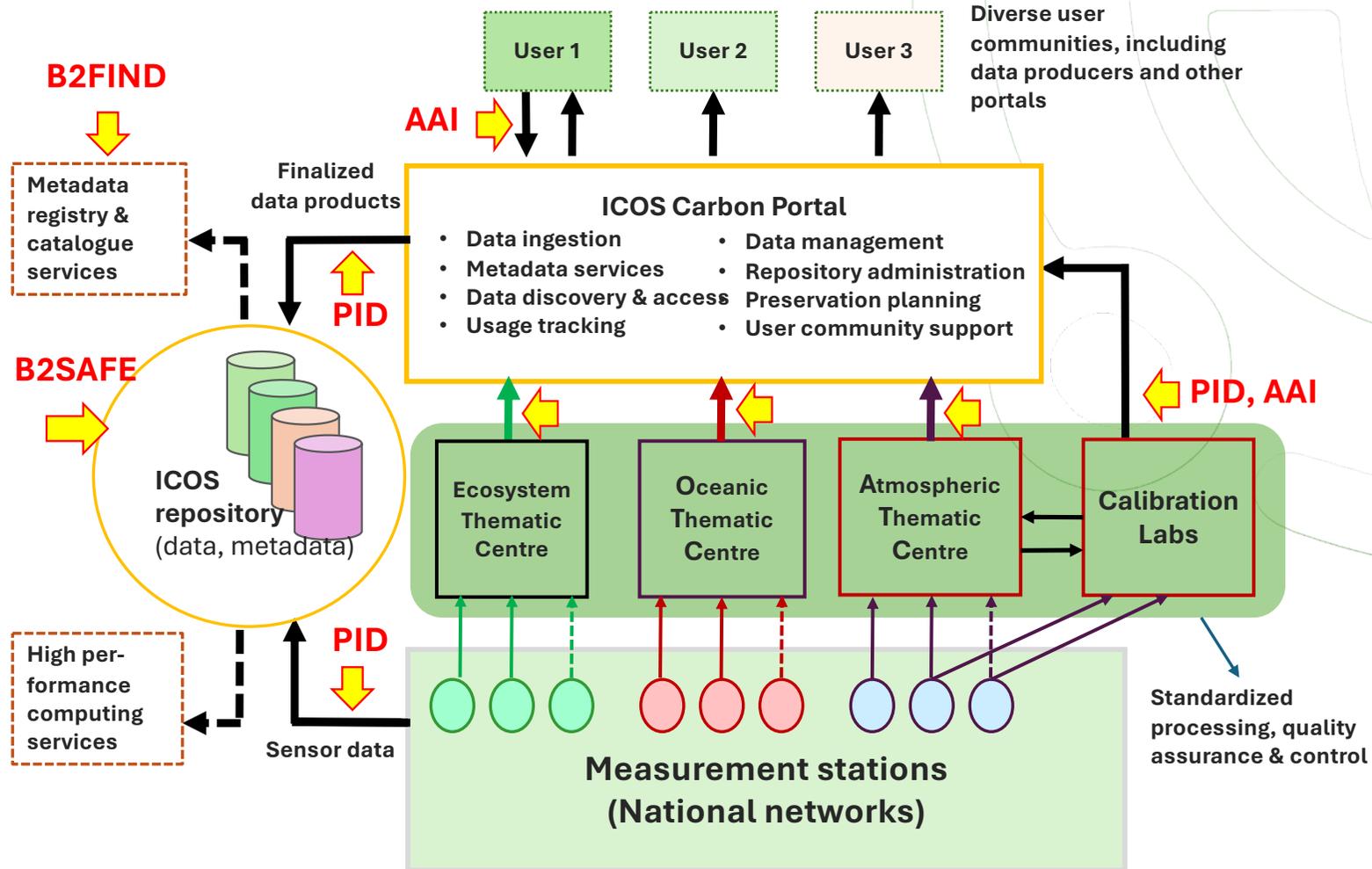
# Ocean domain (NO/UK)



RIS

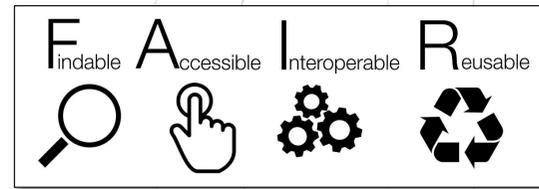


# ICOS data flow, common services

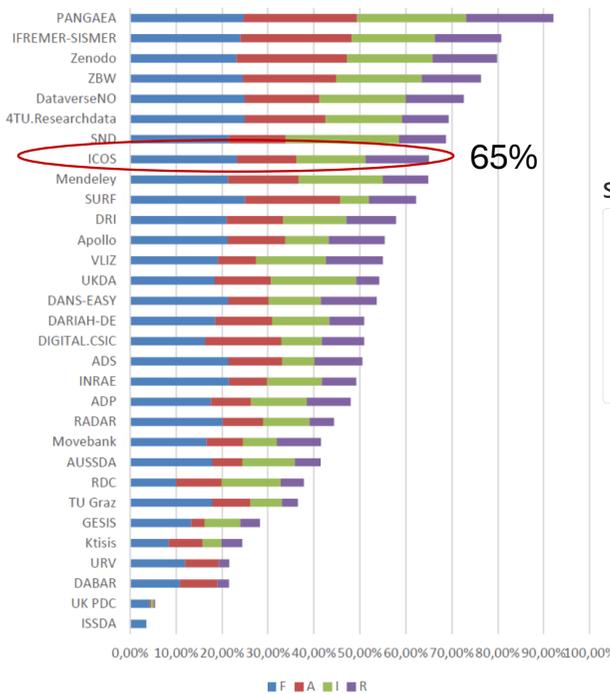


# F.A.I.R. and easy

- 🌐 Collaborate on FAIRness with environmental RIs (ENVRI FAIR) and in framework of EOSC (e.g. EOSC FUTURE)
- 🌐 User friendly interfaces based on FAIR services: Search Portal, DOI GUI, STILT footprint tool, Download Stats, Data preview, Download data cart
- 🌐 Services based on user demands and feedback
- 🌐 Service availability 99.9% (2022-2024)



ICOS FAIRness level assessed by F-UJI tool 2020



ICOS FAIRness level assessed by F-UJI tool 2025

Summary:



# ICOS Data



## 🌐 Level 0

- raw sensor output (either mV or physical units)

## 🌐 Level 1/NRT

- calibrated and automatically Quality Assured data

## 🌐 Level 2

- final observation data products

## 🌐 Level 3

- (Contributed) elaborated data products

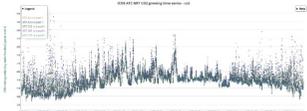
All ICOS data CC BY 4.0

<https://www.icos-cp.eu/data-products>

ICOS Near Real Time Observational Data (Level 1)

**ICOS Near Real-Time (Level 1) Atmospheric Greenhouse Gas Mole Fractions of CO<sub>2</sub>, CO and CH<sub>4</sub>, growing time series starting from latest Level 2 release**

Near Real-Time growing time series containing data from the atmospheric network of ICOS Research Infrastructure for the stations shown below in the tables. This collection contains the NRT hourly averaged data for the mole fractions of CO<sub>2</sub>, CO and CH<sub>4</sub>, measured at the relevant vertical levels of the measurements stations, starting from the latest date of final released Level 2 data or the date of labelling.



ICOS Final Fully Quality Controlled Observational Data (Level 2)

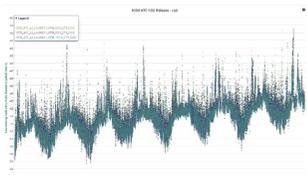
**NEW: ICOS release 2023-1 of Level 2 Ecosystem data**

This is the 2023-1 release of the ICOS final quality data product for eddy covariance fluxes and meteorological observations at 61 labelled ICOS stations in the ecosystem domain. The archives contain more detailed description of the different data files contained in the archives.



**NEW: ICOS Atmosphere Release 2023-1 of Level 2 Greenhouse Gas Mole Fractions of CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, CO, meteorology and <sup>14</sup>CO<sub>2</sub>, and flask samples**

This 2023-1 release contains data from the atmospheric network of ICOS Research Infrastructure for 38 stations with atmospheric composition data at all available vertical levels at stations Birkenes, Cabauw, Gartow, Helgoland, Hohenpeißenberg, Hyltemossa, Ispra, Izaña, Jungfraujoch, Jülich, Karlsruhe, KFešín u Pacova, La Réunion, Lampedusa, Lindenberg, Lutjewad, Monte Cimone, Norunda, OPE, Ochsenkopf, Pallas, Plateau Rosa, Puijo, Puy de Dôme, La Réunion, Ridge Hill, Saclay, SMEAR-II Hyytiälä, Station Nord, Schausland, Steinkimmen, Svartberget, Torfhaus, Trainou, Utö - Baltic Sea, Westerla



# ICOS Data Portal

- > 2 million data objects
- F.A.I.R.
- Persistent identification
- Open: CC BY 4 licence
- Faceted dynamic search
- Previews
- Linked open data
- Open source
- GUI and machine-machine

<https://data.icos-cp.eu/portal/>



The screenshot displays the ICOS Data Portal interface. At the top, there is a navigation bar with the ICOS logo and the text 'Integrated Carbon Observation System'. Below this, a search bar and user account options are visible. The main content area is titled 'ICOS data portal Search, preview, download data objects'. On the left, there is a 'Filters' sidebar with various search criteria such as 'Data origin', 'Project', 'Theme', 'Station of origin', 'Station class', 'Ecosystem type', 'Responsible country', 'Data submitter', 'Sampling height (meters)', 'Data types', 'Data type', 'Keyword', and 'Data level'. The main area shows a table of data objects with columns for 'Data object', 'Size', 'Submission time (UTC)', 'From time (UTC)', and 'To time (UTC)'. The table lists various data objects with their respective sizes and timestamps.

Data object	Size	Submission time (UTC)	From time (UTC)	To time (UTC)
ICOS_ATC_L2_L2-2024.1_PRS_10.0_CTS_MTO.zip	996 KB	2024-06-27 15:07	2020-11-06	2024-03-31 23:00
ICOS_ATC_L2_L2-2024.1_LMP_2.0_CTS_MTO.zip	891 KB	2024-06-27 15:05	2020-01-30	2024-03-31 23:00
ICOS_ATC_L2_L2-2024.1_LMP_10.0_CTS_MTO.zip	731 KB	2024-06-27 15:05	2020-01-30	2024-03-31 23:00
ICOS_ATC_L2_L2-2024.1_JPR_60.0_CTS_MTO.zip	1 MB	2024-06-27 15:03	2017-12-10	2024-03-31 23:00
ICOS_ATC_L2_L2-2024.1_JPR_40.0_CTS_MTO.zip	2 MB	2024-06-27 15:03	2017-12-10	2024-03-31 23:00
ICOS_ATC_L2_L2-2024.1_JPR_100.0_CTS_MTO.zip	2 MB	2024-06-27 15:03	2017-12-10	2024-03-31 23:00
ICOS_ATC_L2_L2-2024.1_CMN_8.0_CTS_MTO.zip	2 MB	2024-06-27 15:01	2018-05-01	2024-03-31 23:00
ICOS_ATC_L2_L2-2024.1_PRS_10.0_CTS_CO2.zip	164 KB	2024-06-27 13:36	2022-09-01	2023-08-01 23:00
ICOS_ATC_L2_L2-2024.1_PRS_10.0_CTS_CO2.zip	528 KB	2024-06-27 13:36	2020-11-06	2024-03-31 23:00
ICOS_ATC_L2_L2-2024.1_PRS_10.0_CTS_CH4.zip	556 KB	2024-06-27 13:36	2020-11-06	2024-03-31 23:00
ICOS_ATC_L2_L2-2024.1_LMP_8.0_CTS_CO2.zip	642 KB	2024-06-27 13:33	2020-01-30	2024-03-31 23:00
ICOS_ATC_L2_L2-2024.1_LMP_8.0_CTS_CO2.zip	752 KB	2024-06-27 13:33	2020-01-30	2024-03-31 23:00
ICOS_ATC_L2_L2-2024.1_LMP_8.0_CTS_CH4.zip	714 KB	2024-06-27 13:33	2020-01-30	2024-03-31 23:00
ICOS_ATC_L2_L2-2024.1_JPR_60.0_CTS_CO2.zip	1 MB	2024-06-27 13:27	2017-12-15	2024-03-31 23:00
ICOS_ATC_L2_L2-2024.1_JPR_60.0_CTS_CO2.zip	1 MB	2024-06-27 13:27	2017-12-15	2024-03-31 23:00
ICOS_ATC_L2_L2-2024.1_JPR_60.0_CTS_CH4.zip	1 MB	2024-06-27 13:27	2017-12-15	2024-03-31 23:00
ICOS_ATC_L2_L2-2024.1_JPR_40.0_CTS_CO2.zip	1 MB	2024-06-27 13:27	2017-12-15	2024-03-31 23:00
ICOS_ATC_L2_L2-2024.1_JPR_40.0_CTS_CO2.zip	1 MB	2024-06-27 13:27	2017-12-15	2024-03-31 23:00
ICOS_ATC_L2_L2-2024.1_JPR_40.0_CTS_CH4.zip	1 MB	2024-06-27 13:27	2017-12-15	2024-03-31 23:00
ICOS_ATC_L2_L2-2024.1_JPR_100.0_CTS_CO2.zip	1 MB	2024-06-27 13:27	2017-12-15	2024-03-31 23:00

# ICOS Data Portal

## 🌐 Metadata standards:

- ISO19115
- schema.org
- json
- Rdf

## 🌐 Content negotiation at landing pages

## 🌐 Trusted repository, persistent storage

## 🌐 Versioning

## 🌐 Collections

## 🌐 Rich metadata

<https://data.icos-cp.eu/portal/>

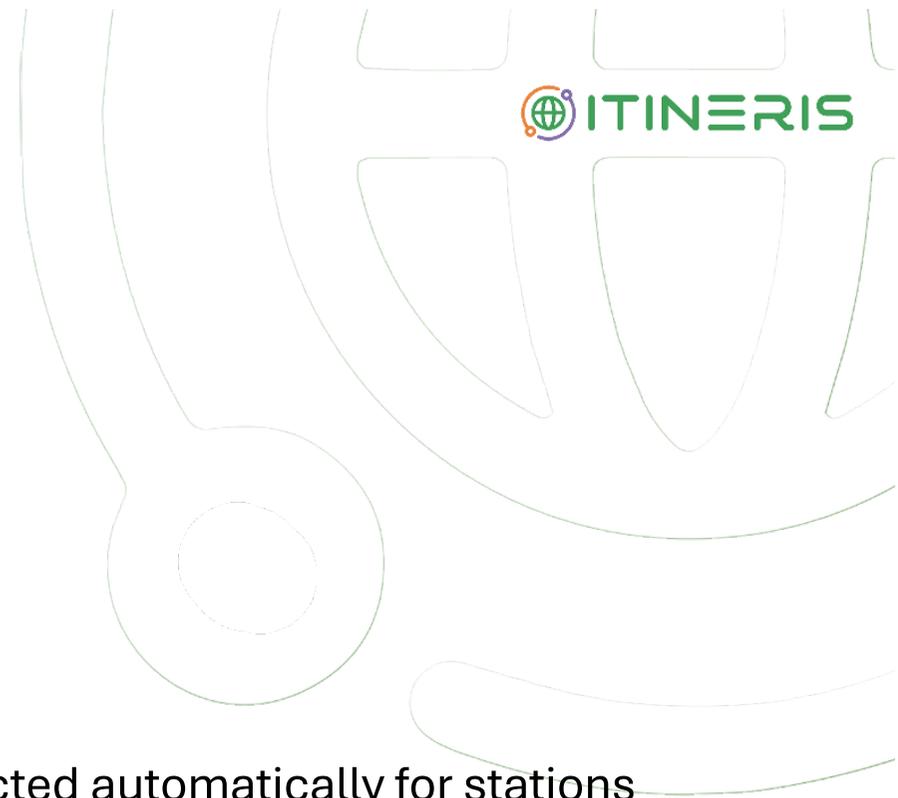


The screenshot displays the ICOS Data Portal interface. At the top, there is a navigation bar with links for 'ABOUT & CONTACTS', 'OBSERVATIONS', 'DATA & SERVICES', 'SCIENCE & IMPACT', 'RESOURCES', and 'NEWS & EVENTS'. Below the navigation bar, the main content area is titled 'ICOS data portal Search, preview, download data objects'. On the left side, there is a 'Filters' panel with various search criteria: 'Data origin', 'Project' (set to 'ICOS'), 'Theme' (set to 'Atmospheric data'), 'Station of origin' (4 items), 'Station class' (set to 'ICOS'), 'Ecosystem type' (0 items), 'Responsible country' (set to 'Italy'), 'Data submitter' (set to 'Atmosphere Thematic Centre'), 'Sampling height (meters)', 'Data types', 'Data type' (5 items), 'Keyword' (153 items), and 'Data level' (set to '2'). On the right side, there is a map of Europe with numerous red dots representing station locations. The map is titled 'Search results Compact view Stations map'.

## Rich metadata

### Describes using linked data approach:

- Usual DC terms (title, description, size, etc)
- Keywords
- Distribution (licence, download url)
- Data type, connects to format, domain, data level
- Data provenance
  - Acquisition
  - Production
- Link to station and organizational metadata
- Contributor, instrument and role information collected automatically for stations
- Variable information for previewable variables
- Geospatial information
- Versions (link to older data versions)
- Collection info



# Rich metadata



**DOI** 10.18160/0HYS-FF7X ([target](#), [metadata](#))  
**PID** 11676-yWrK\_XMoAoVfM\_xeQEHoXW ([link](#))  
**Description (Abstract)** This data package contains high accuracy CO2 dry air mole fractions from 39 ICOS European observatories at in total 95 observation levels, collected by the ICOS Atmosphere Thematic Centre (ATC) and provided by the station contributors. The package includes the 2025.1 FastTrack update of the Globalview EU data product and is intended for use in carbon cycle inverse modeling, model evaluation, and satellite validation studies. Please report errors and send comments regarding this product to the ObsPack originators. Please read carefully the ObsPack Fair Use statement and cite appropriately. Please review the release notes for the associated Obspack product at [www.esrl.noaa.gov/gmd/ccgg/obspack/release\\_notes.html](http://www.esrl.noaa.gov/gmd/ccgg/obspack/release_notes.html). Metadata for this product are available at <https://commons.datacite.org/doi.org/10.18160/0HYS-FF7X>. Please visit <http://www.gml.noaa.gov/ccgg/obspack/> for more information on Obspack.

**Data affiliation** [European ObsPack](#)  
**Part of** [European Obspack compilation of atmospheric carbon dioxide, methane and nitrous dioxide data from ICOS European stations for the period 1972-2025; obspack\\_466\\_GV\\_v11\\_ICOSFT2025.1\\_20250120](#)  
**Citation** ICOS RI, Bergamaschi, P., Colomb, A., De Mazière, M., Emmenegger, L., Kubistin, D., Lehner, I., Lehtinen, K., Leuenberger, M., Lund Myhre, C., Marek, M.V., O'Doherty, S., Platt, S.M., Plaß-Dülmer, C., Ramonet, M., di Sarra, A., Apadula, F., Arnold, S., Chen, H., Conil, S., Couret, C., Cristofanelli, P., Di Iorio, T., Forster, G., Frumau, A., Haszpra, L., Heliász, M., Hoheisel, A., Kneuer, T., Larmanou, E., Laurila, T., Leskinen, A., Lindauer, M., Lopez, M., Lunder, C., Mammarella, I., Manca, G., Manning, A., Marklund, P., Meinhardt, F., Molnár, M., Mölder, M., Müller-Williams, J., Ottosson-Löfvenius, M., Piacentino, S., Pitt, J., Rivas-Soriano, P., Scheeren, B., Schumacher, M., Sha, M.K., Steinbacher, M., Sørensen, L.L., Vermeulen, A., Vitková, G., Conen, F., Kazan, V., Roulet, Y.-A., Biermann, T., Delmotte, M., Heltai, D., Hensen, A., Hermansen, O., Kominková, K., Laurent, O., Levula, J., Montagu, S., Pichon, J.-M., Schmidt, M., Sferlazzo, D., Smith, P., Stanley, K., Trisolino, P., Zazzeri, G., ICOS Carbon Portal, ICOS Atmosphere Thematic Centre, ICOS Flask And Calibration Laboratory, ICOS Flask And Calibration Laboratory, ICOS Central Radiocarbon Laboratory, 2025. European Obspack compilation of atmospheric carbon dioxide data from ICOS stations for the period 1972-2025; obspack\_co2\_466\_GV\_ICOSFT2025.1\_20250120. <https://doi.org/10.18160/0HYS-FF7X>

**Previous version** [View previous version](#)  
**File name** co2\_cmn\_surface-insitu\_443\_allvalid.nc  
**File size** 2 MB (1820346 bytes)  
**Number of data rows** 102827  
**Data type** [Obspack CO2 time-series result](#)  
**Data level** 2  
**Licence** [ICOS CCBY4 Data Licence](#)

Statistics	
Downloads	2
Previews	0

Submission	
Submitted by	<a href="#">Carbon Portal</a>
Publication time (UTC)	2025-01-23 14:22:55
Submission started (UTC)	2025-01-23 14:22:53

Technical information	
Format	<a href="#">NetCDF (time series)</a>
Good flag values	R, U, O
Encoding	<a href="#">plain file</a>
SHA-256 hashsum (hex)	fb25ab2bf5cca00a1588533fc5e40484e5d62c7e26c2e47e8aa6a9c0105b6f3b
SHA-256 hashsum (base64)	+yWrKXMoAoVfM_xeQEHoXWLH4mwuR-iqapwBBbz

**Coverage** Lat: 44.1936, Lon: 10.6999, Alt: 2165.0 m  
**Station** Monte Cimone

**Metadata** [JSON](#) • [RDF/XML](#) • [RDF/Turtle](#) • [XML \(ISO 19115-3:2016\)](#)

**Keywords** [CO2](#) [ICOS](#) [Obspack](#) [WMO CO2 X2019](#)  
 atmospheric dry air co2 mole fraction time series

## Acquisition

**Station** [Monte Cimone](#)  
**Start time (UTC)** 2011-02-11 06:30:00  
**Stop time (UTC)** 2025-01-22 23:30:00  
**Sampling height** 8.0

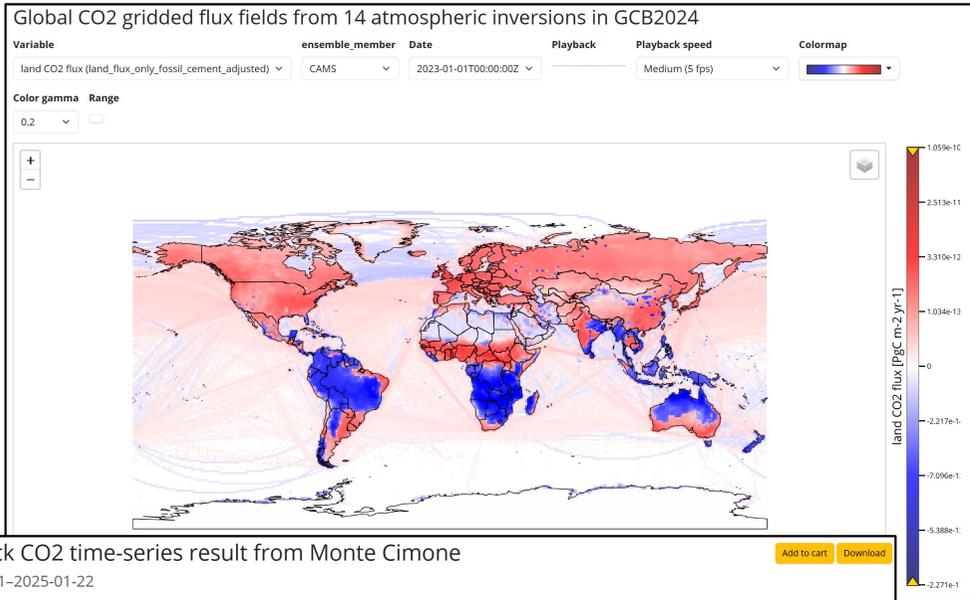
## Production

**File made by** [Carbon Portal](#)  
**Host organization** [Carbon Portal](#)  
**Production time (UTC)** 2025-01-23 13:45:59  
**Comment** European Obspack observational timeseries in netcdf format of ambient mole fraction of co2 in dry air calibrated using the WMO GAW calibration scale WMO CO2 X2019, composed of (all whenever available) historical PI QCed data, ICOS Level 2 data and ICOS NRT data  
**Contributors** [Paolo Cristofanelli](#), [Simonetta Montagu](#), [Pamela Trisolino](#), [Alessandro Bracci](#), [Maurizio Busetto](#), [Francescopiero Calzolari](#), [Cosimo Frattilucci](#)  
**Source object** [ICOS\\_ATC\\_L1\\_FAST\\_TRACK\\_L1-FastTrack-2025.1\\_CMN\\_8\\_0\\_CTS\\_CO2.zip](#)  
**Source object** [ICOS\\_ATC\\_L2\\_L2-2024.1\\_CMN\\_8\\_0\\_CTS\\_CO2.zip](#)  
**Source object** [ICOS\\_ATC\\_NRT\\_CMN\\_2024-04-01\\_2025-01-22\\_8\\_0\\_590\\_CO2.zip](#)  
**Source object** [ICOS\\_ATC\\_OBSPACK-Europe-L2-2024\\_CMN\\_8\\_0\\_CTS\\_CO2.zip](#)

## Previewable variables

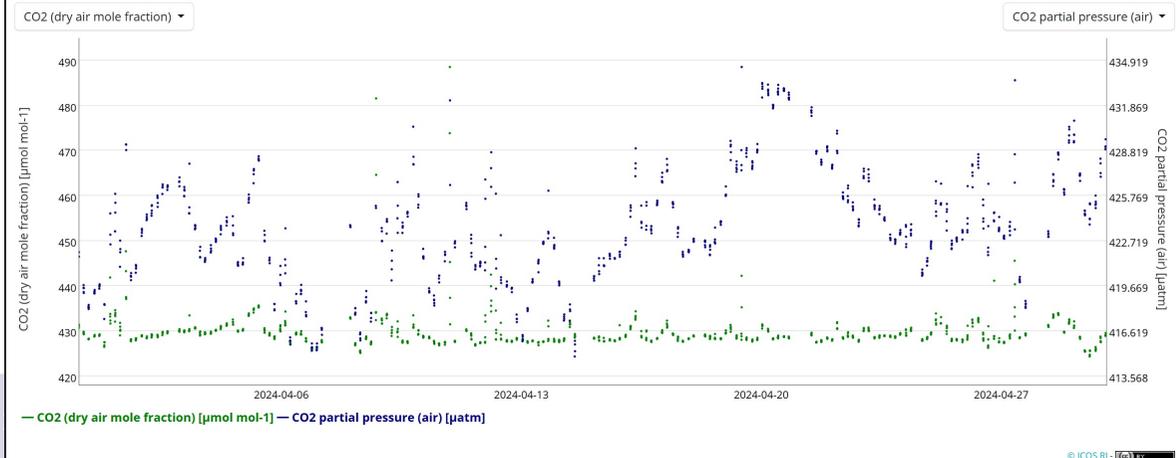
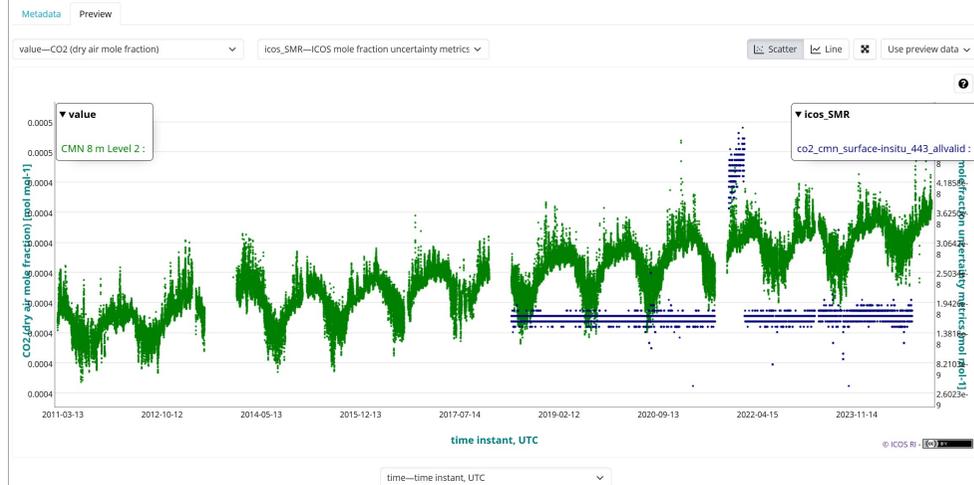
Name	Value type	Unit	Quantity kind	Preview
time	time instant, UTC			
value	CO2 (dry air mole fraction)	mol mol-1	portion	<a href="#">Preview</a>
qc_flag	quality flag			
icos_datalevel	data level (Obspack)		natural number	<a href="#">Preview</a>
value_std_dev	standard deviation of gas mole fraction	a.u.	portion	<a href="#">Preview</a>
icos_LTR	ICOS mole fraction uncertainty metrics	mol mol-1	portion	<a href="#">Preview</a>
icos_STTB	ICOS mole fraction uncertainty metrics	mol mol-1	portion	<a href="#">Preview</a>
icos_SMR	ICOS mole fraction uncertainty metrics	mol mol-1	portion	<a href="#">Preview</a>

# Previews



## Obspack CO2 time-series result from Monte Cimone

2011-02-11–2025-01-22



# Upload GUI

<https://meta.icos-cp.eu/uploadgui/>

Upload require authorization

Use API or command line (cUrl)

- Provide metadata package in json tied to datatype

GUI provides easy interface to upload

Create collection

Automate DOI generation (pre-minting)

- Collect contributor info
- Collect Geo information
- Connect to DOI GUI service

Training event on Atmospheric Composition Data Exploitation. – Potenza – January 28-30, 2025

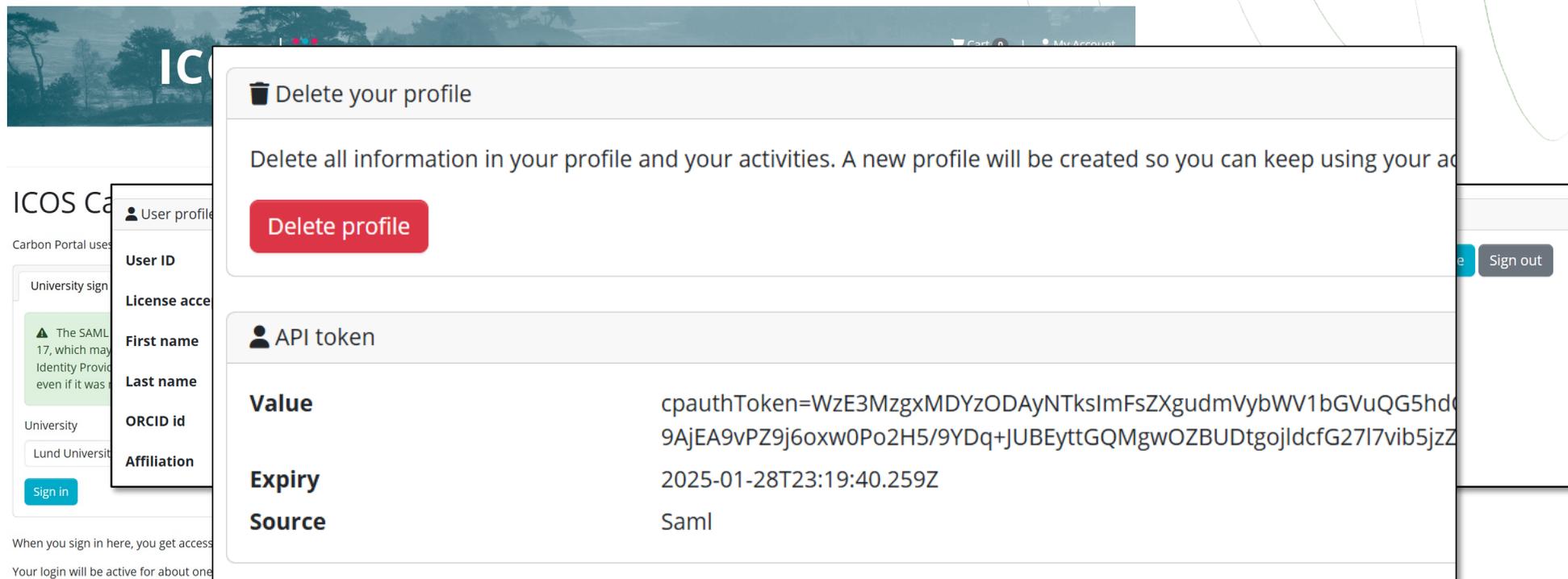
The screenshot displays the ICOS Upload GUI interface. At the top, there is a navigation bar with the ICOS logo and the text 'Integrated Carbon Observation System'. Below the navigation bar, there is a search bar and a 'Create a new draft DOI' button. The main content area is titled 'Upload' and contains several form sections:

- About:** Submitter ID (dropdown), New Item/Update (radio buttons), Metadata url (text input), Item type (radio buttons), File name (text input), Previous versions (one hex or base64 hashsum per line) (text input), Partial upload (checkbox), Pre-existing DOI (text input).
- Production:** Creator (text input), Contributors (list of names with 'x' buttons), Host organisation (text input), Comment (text area), Creation date (text input), List of sources (one hashsum per line) (text input), Documentation (text input).
- Data:** Level (radio buttons), Data type (dropdown), Keywords linked to this data type (list of keywords), Extra keywords (list of keywords), Number of rows (text input), Licence (dropdown), Moratorium (text input).
- Station-specific time series:** Station (dropdown), Location/Ecosystem (dropdown), From (UTC) (text input), To (UTC) (text input), Sampling point (dropdown), Sampling height (text input), Instrument (text input).

<https://meta.icos-cp.eu/uploadgui/>

# Authentication and user settings

<https://cpauth.icos-cp.eu/>



**Delete your profile**

Delete all information in your profile and your activities. A new profile will be created so you can keep using your account.

**Delete profile**

**API token**

Value	cpauthToken=WzE3MzgxMDYzODAyNTksImFsZXgudmVyYWV1bGVuQG5hd09A9vPZ9j6oxw0Po2H5/9YDq+JUBEyttGQMgwoZBUDtgojldcfG27I7vib5jzZ
Expiry	2025-01-28T23:19:40.259Z
Source	Saml

Data search and download are freely accessible for everyone and can be performed without signing in, but one benefit of signing in is bypassing the ICOS data licence acceptance needed for every download. For full access to your [user profile](#) (available when signed in). More info on the ICOS data licence: <https://data.icos-cp.eu/licence>.

You can sign in with your institutional login through eduGAIN (preferred) or, if that does not work, through the social or password login. For the password login you should first create an account here, using the tab 'My Account'. Please be aware that the email address with which you sign in will be the user id that identifies you to our services.

# Services: Download statistics



<https://data.icos-cp.eu/stats/>

## ICOS Data Usage Statistics

Data object specification filter

Data types:

Project:

Data level:

Stations:

Contributors:

Submitters:

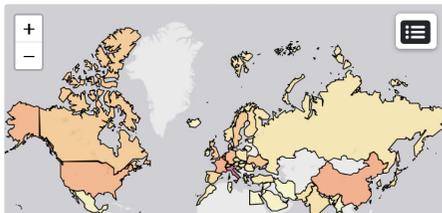
Download country:

Data origin:

Download dates: From  To

Search options:  Include gray listed IPs

### Downloads from country



Data objects 1 to 100 of 33,674

Downloads Previews Pylib

File Name	Landing Page	Count
FLX_IT-BCI_FLUXNET2015_FULLSET_2004-2020_beta-3.zip	ITMjdK8gpDRCKYo0o_Zfwj4B	534
FLX_IT-MBo_FLUXNET2015_FULLSET_2003-2020_beta-3.zip	TpS_6HENQ5y5MMG8jkkAmajp	524
FLX_IT-Cp2_FLUXNET2015_FULLSET_2012-2020_beta-3.zip	IM-nq-nQl9rVregwPNL1KMm7	522
FLX_IT-Ren_FLUXNET2015_FULLSET_1999-2020_beta-3.zip	FtQL1DIZRGGLO7apld7s78r	516
FLX_IT-SR2_FLUXNET2015_FULLSET_2013-2020_beta-3.zip	bqA7N1QkO90Oz0QqzsUWsknk	492
FLX_IT-BF_FLUXNET2015_FULLSET_2019-2020_beta-3.zip	7eL4KnCc24Def2-FhVs_mXt	489
FLX_IT-Tor_FLUXNET2015_FULLSET_2008-2020_beta-3.zip	Z_2oXYGQMwWFrMgVZMHDFbrP	485
FLX_IT-Lsn_FLUXNET2015_FULLSET_2016-2020_beta-3.zip	ZqCEukhXjHFFPERG4LLR8Y3u	481
ICOS_ATC_NRT_PRS_2022-03-01_2022-07-11_10.0_692_CH4.zip	CyK669zhSWtqxQQzTmf9XdU	479
FLX_IT-Cp2_FLUXNET2015_FULLSET_2012-2018_beta-3.zip	rwQA6jHqWwNupwq_3IzaHKCR	386
FLX_IT-Tor_FLUXNET2015_FULLSET_2008-2018_beta-3.zip	JIt_1nk33KY6tS6kIQxa8jIw	374
FLX_IT-SR2_FLUXNET2015_FULLSET_2013-2018_beta-3.zip	hDeuA1exq9Xqclo9TsN26ma	366
FLX_IT-BCI_FLUXNET2015_FULLSET_2004-2018_beta-3.zip	ZlyRmcEjYm22mRpBjwUHmS1b	354
FLX_IT-Lsn_FLUXNET2015_FULLSET_2016-2018_beta-3.zip	VWtOqgP39wfkEYAT_2x-Ckwl	329
ICOS_ATC_L2_L2-2020.1_CMN_8.0_CTS_CO2.zip	a5jn7fKEo4dz8f4pKmqRqHPM	285
ICOS_ATC_L2_L2-2020.1_CMN_8.0_CTS_CO.zip	M6XCocBsPDTnlUv_6gGNZ2EX	206
ICOS_ATC_L2_L2-2021.1_CMN_8.0_CTS_CO2.zip	2UT5sQ_SNZdj6DFMxyyYJBLf	204
ICOS_ATC_L2_L2-2021.1_CMN_8.0_CTS_CH4.zip	D_xwBYaUA-pigw4ixFw_IhEV	195
ICOS_ATC_L2_L2-2019.1_CMN_8.0_CTS_CO2.zip	sWYM2-EyoxcleyzIojhW2-0X	193
ICOSSETC_IT-Cp2_ARCHIve_L2.zip	cj7vFX233Yl4rLffPUneh_h	188
ICOS_ATC_L2_L2-2021.1_CMN_8.0_CTS_CO.zip	Ctmjt3Rutw_00OTGB7dpYIKH	182
ICOS_ATC_L2_L2-2019.1_CMN_8.0_CTS_CH4.zip	MpForQHnpL3BMDDAGaAeafc	181

### Downloads per time period



### Downloads

Download statistics in CSV format

# Services: DOI & Trajectory forecast



<https://www.icos-cp.eu/forecast/>

## Carbon Portal DOI minting service

As an admin, you can create, update, and delete draft and published DOIs.

- Published DOIs are in blue.
- Drafts are in yellow.

[Read about advanced search queries](#)

Search DOI

10.18160 Ne

694 DOIs

- ▶ 10.18160/1JA9-VJEV | Warm winter 2020 ecosystem eddy covariance flux product from Davos
- ▶ 10.18160/8FBV-1K18 | Warm winter 2020 ecosystem eddy covariance flux product from Tharandt
- ▶ 10.18160/D86P-B2W5 | Warm winter 2020 ecosystem eddy covariance flux product from Lamasquere
- ▶ 10.18160/KVAC-KYEX | Warm winter 2020 ecosystem eddy covariance flux product from Gebesee
- ▶ 10.18160/ZOGF-MCWH | Part of: Supplemental data to: Adcock et al, 2023: 12-years of continuous atmospheric O<sub>2</sub>, CO<sub>2</sub> and APO data from Weybourne Atmospheric Observ
- ▶ 10.18160/RQ8P-2Z4R | Data supplement to: Tian et al (2023): Global Nitrous Oxide Budget 1980-2020, Earth Syst. Sci. Data Discuss. [preprint], <https://doi.org/10.5194/essd->
- ▶ 10.18160/XWNX-9FWC | Warm winter 2020 ecosystem eddy covariance flux product from Svartberget

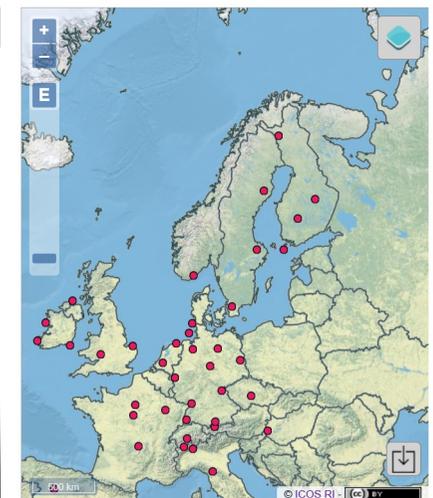
<https://doi.icos-cp.eu>

[Home](#) > [Data & Services](#) > [Tools](#) >

## Forecast of airmass backtrajectories at ICOS stations and beyond

Station

Backward trajectory for station PlateauRosa10; arrival 2025-01-29 18:00 UTC



# Sparql endpoint GUI

<https://meta.icos-cp.eu/sparqlclient/>



## Carbon Portal SPARQL Client

Access to SPARQL endpoint

```
1 prefix cpmeta: <http://meta.icos-cp.eu/ontologies/cpmeta/>
2 prefix prov: <http://www.w3.org/ns/prov#>
3 select ?station ?stationId ?lat ?lon ?stationName ?speciesList ?heightsList ?speciesHeightsList where{
4 {
5   select
6     ?station
7     (group_concat(distinct ?varName; separator='|') as ?speciesList)
8     (group_concat(distinct ?height; separator='|') as ?heightsList)
9     (group_concat(distinct ?speciesHeight; separator='|') as ?speciesHeightsList)
10  where{
11    ?spec cpmeta:hasDataTheme <http://meta.icos-cp.eu/resources/themes/atmosphere> ;
12    cpmeta:hasAssociatedProject <http://meta.icos-cp.eu/resources/projects/icos> ;
13    cpmeta:containsDataset ?ds .
14    filter(?ds != <http://meta.icos-cp.eu/resources/cpmeta/atcMeteoTimeSer>)
15    ?ds cpmeta:hasColumn ?col .
16    filter exists {[] cpmeta:isQualityFlagFor ?col}
17    ?dobj cpmeta:hasObjectSpec ?spec ;
18        cpmeta:wasAcquiredBy/prov:wasAssociatedWith ?station ;
19        cpmeta:hasSizeInBytes ?size ;
20        cpmeta:wasAcquiredBy/cpmeta:hasSamplingHeight ?height .
21    FILTER NOT EXISTS {[] cpmeta:isNextVersionOf ?dobj}
22    ?col cpmeta:hasColumnName ?varName .
23  {
24    {FILTER NOT EXISTS {?dobj cpmeta:hasVariableName ?actVar}}
25    UNION
26    {
27      ?dobj cpmeta:hasVariableName ?actVar
28      filter(?actVar = ?varName)
29    }
30  }
31  bind(concat(?varName, '/', str(?height)) as ?speciesHeight)
32 }
33 group by ?station
34 }
35 ?station cpmeta:hasStationId ?stationId ; cpmeta:hasName ?stationName ;
36 cpmeta:hasLatitude ?lat ; cpmeta:hasLongitude ?lon .
37 }
38 order by ?stationId
```

Select predefined request

ATC species and sampling heigh

Return type

JSON CSV XML TSV or Turtle

# STILT Footprint tools

- 🌐 STILT LPDM
- 🌐 ERA5 meteorology 1x1
- 🌐 3hr footprints at 1/12x1/8
- 🌐 CO2 and CH4
- 🌐 STILT Worker:
  - DIY footprint
- 🌐 STILT Viewer
  - View animated footprint
  - Modelled mole fractions
  - Measured mole fractions when available

Requires login (ATMO ACCESS VA)

<https://stilt.icos-cp.eu/worker/>

STILT calculation service Job starter

Existing STILT stations

Start new STILT run

Submitted STILT jobs

To keep our services free for you, ATMO-ACCESS deeply values feedback from users. We hope you will spend a few minutes on this feedback schema to feed our requested usage monitoring. Your opinions and feedback will help the ATMO-ACCESS team to understand what we're doing well and where we need to get better. The feedback will be used by the VA management and the development team, in strategic decision and project coordination.

Give us Feedback

This project has received funding from the European Union's Horizon 2020 research and innovation programme through the ATMO-ACCESS Integrating Activity under grant agreement No 101008004. ©Copyright ATMO-ACCESS - 2021 - SEDOO (Service de Données DMF)

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STILT results viewer

STILT results viewer

Station filter: ICOS ObsPack All

CO2 CH4

Primary Y-axis: CO2 observed CO2 STILT CO2 background

Secondary Y-axis: Biospheric CO2 Anthropogenic CO2

CO2, Ispra (60 m, lat: 45.81, lon: 8.63)

total CO2 (ppm)

Footprint: 2021-07-02 09:00

2021-07-31 09:00: co2.observ: 429.997

To keep our services free for you, ATMO-ACCESS deeply values feedback from users. We hope you will spend a few minutes on this feedback schema to feed our requested usage monitoring. Your opinions and feedback will help the ATMO-ACCESS team to understand what we're doing well and where we need to get better. The feedback will be used by the VA management and the development team, in strategic decision and project coordination.

Give us Feedback

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<https://stilt.icos-cp.eu/viewer/>

# Jupyter Hub



- VRE
- Free for all
- Register
- Share data
  - Fileshare
  - Project space
- Collaborate
- Access to CP data
- Use CP Python lib
- Bring code to data!
- Many cores and memory

<https://jupyter.icos-cp.eu/>

The screenshot shows a Jupyter Hub interface. On the left is a file browser for the directory '/ itineris /'. It lists several files and folders, including 'data', 'img', 'challenge.ipynb', 'ex1\_data.ipynb' (which is selected), 'ex1a\_atmo\_data.ipynb', 'ex2\_station.ipynb', 'ex3\_multisource.ipynb', 'ex4\_ocean.ipynb', 'ex6b\_STILT\_footprint\_animation.ipynb', 'ex6c\_STILT\_timeseries.ipynb', 'ex7\_ObsPackData.ipynb', 'ex8\_HRfluxes.ipynb', 'how\_to\_authenticate.ipynb', and 'itineris\_notebooks.zip'. The right pane shows a notebook titled 'challenge.ipynb' with the following content:

## ICOS Carbon Portal Python Libraries

This example uses a foundational library called `icoscp_core` which can be used to access time-series ICOS data that are *previewable* in the ICOS Data Portal. "Previewable" means that it is possible to visualize the data variables in the preview plot. The library can also be used to access (meta-)data from [ICOS Cities](#) and [SITES](#) data repositories.

General information on all ICOS Carbon Portal Python libraries can be found on our [help pages](#).

Documentation of the `icoscp_core` library, including information on running it locally, can also be found on [PyPI.org](#).

Note that for running this example locally, authentication is required (see the `how_to_authenticate.ipynb` notebook).

### Example: Access metadata and data of a single data object

#### Import the ICOS modules

```
[ ]: 1 from icoscp_core.icos import meta, data
```

#### Fetch full data object metadata

```
[ ]: 1 landing_page_uri = 'https://meta.icos-cp.eu/objects/TdVqdZB7vJN58FjxSck3I2_M'  
2 dobj_meta = meta.get_dobj_meta(landing_page_uri)
```

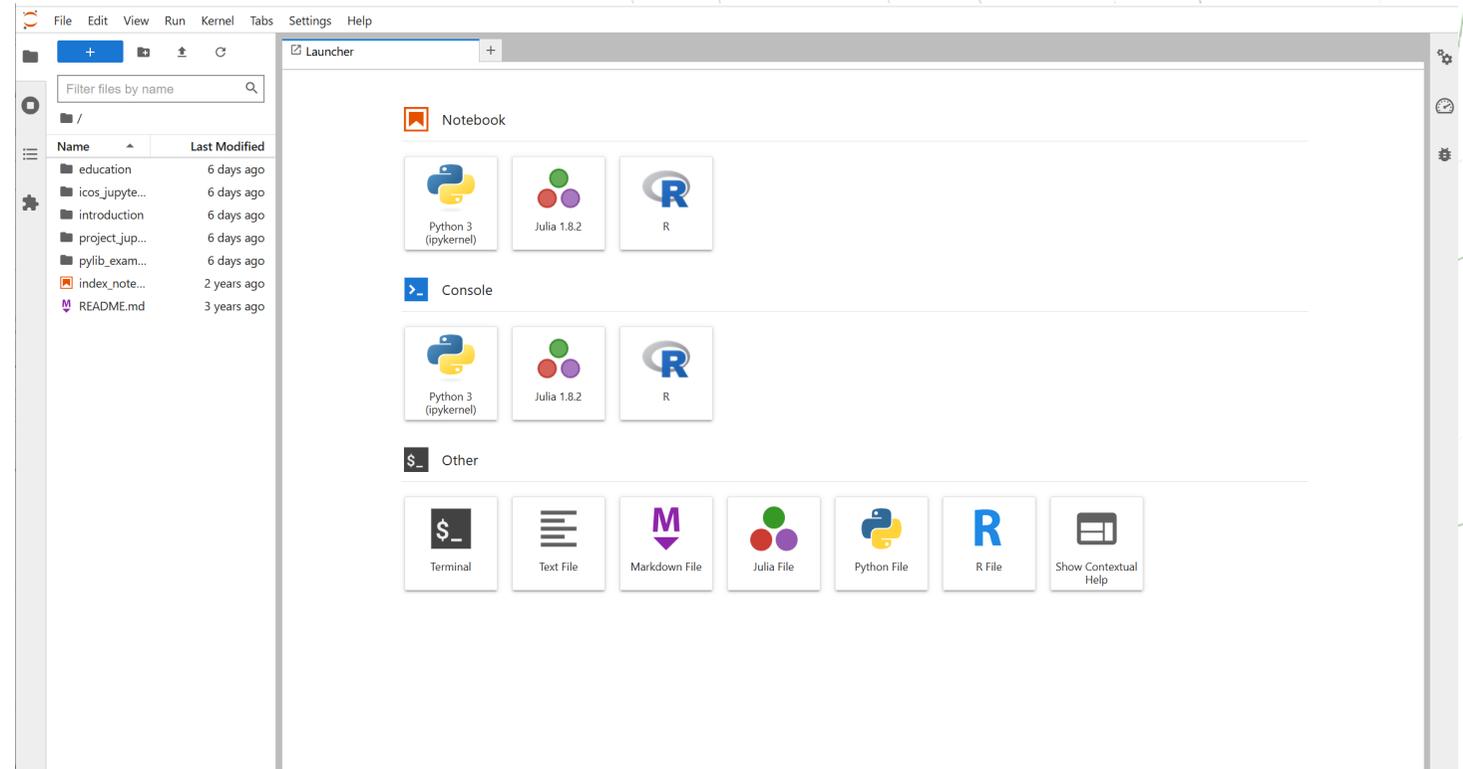
#### Access metadata properties

Log: itineris/ex1\_data.ipynb x  
+ Add Checkpoint Clear Log Log Level: Warning v  
No log messages.

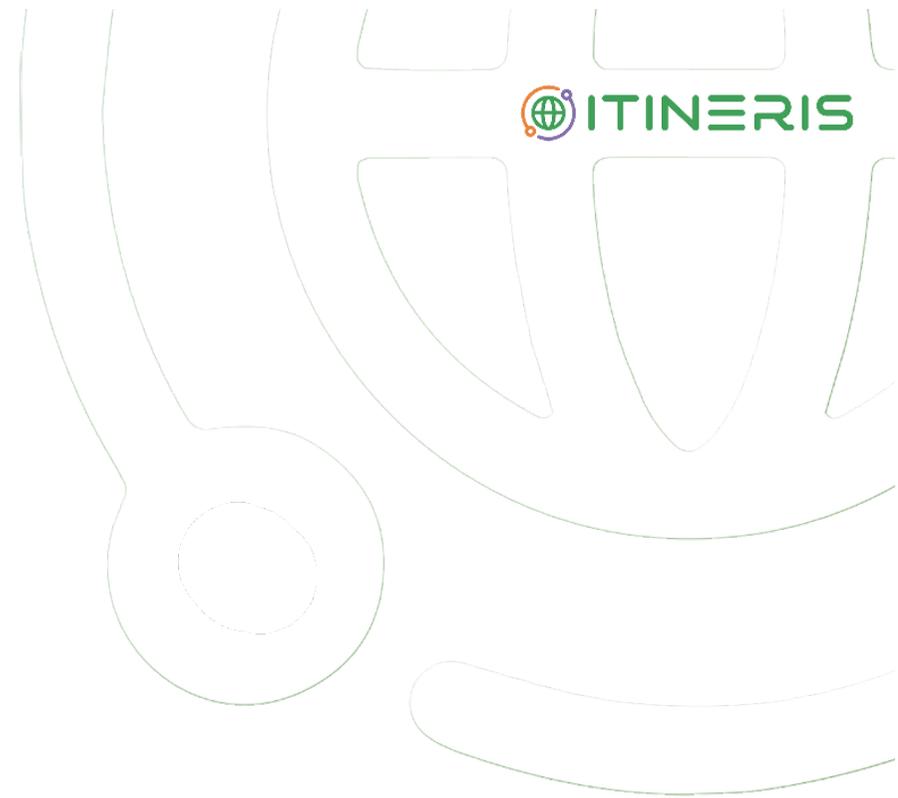
# Exploredata

- VRE
- Free for all
- No registration
- Share data
- Access to CP data
- Use CP Python lib
- Bring code to data!
- Single core
- 2 GB memory
- Non persistent

<https://exploredata.icos-cp.eu/>



# Live demonstration



# Practical

🌐 Browse to <https://exploredata.icos-cp.eu>

🌐 On the logon screen:

- Fill in your name: `firstname.lastname`
- Use password: `francis`
- Check the two checkboxes
- Press the Sign in button
- Wait a little, server is starting

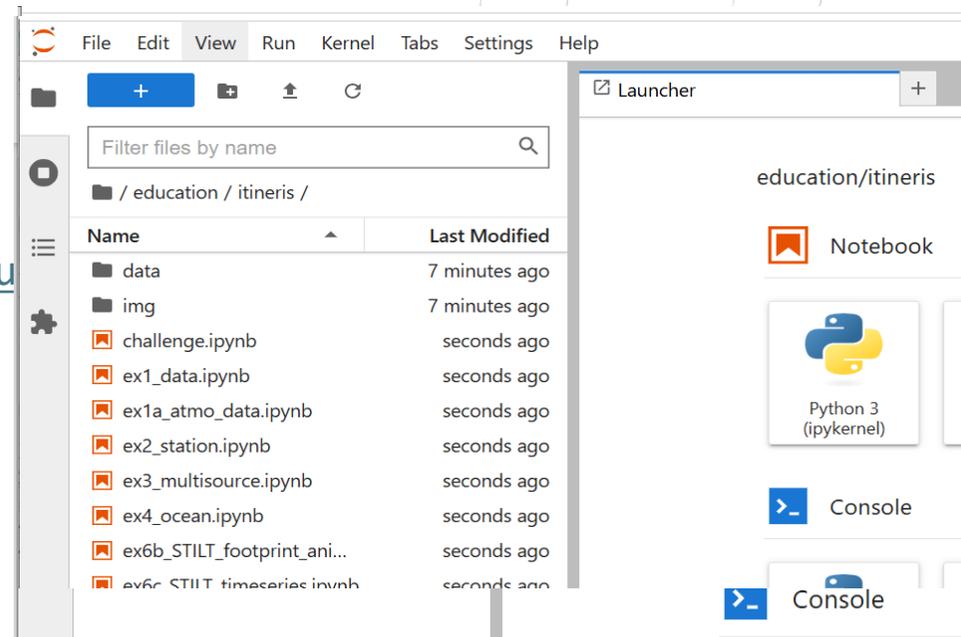
🌐 Open the folder education

🌐 Enter the itineris folder in the left column

🌐 Open one of the notebooks in that folder

🌐 **NB: When you log out you lose all changes! (Repeat above steps)**

🌐 You can close the browser or tab, at next opening you can continue where you left



ITINERIS



# THANKS!

**IR0000032 – ITINERIS, Italian Integrated Environmental Research Infrastructures System**  
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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”



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Ministero  
dell'Università  
e della Ricerca

