

CDS & ADS Training

CADS Team – ECMWF

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Europe's eyes on Earth

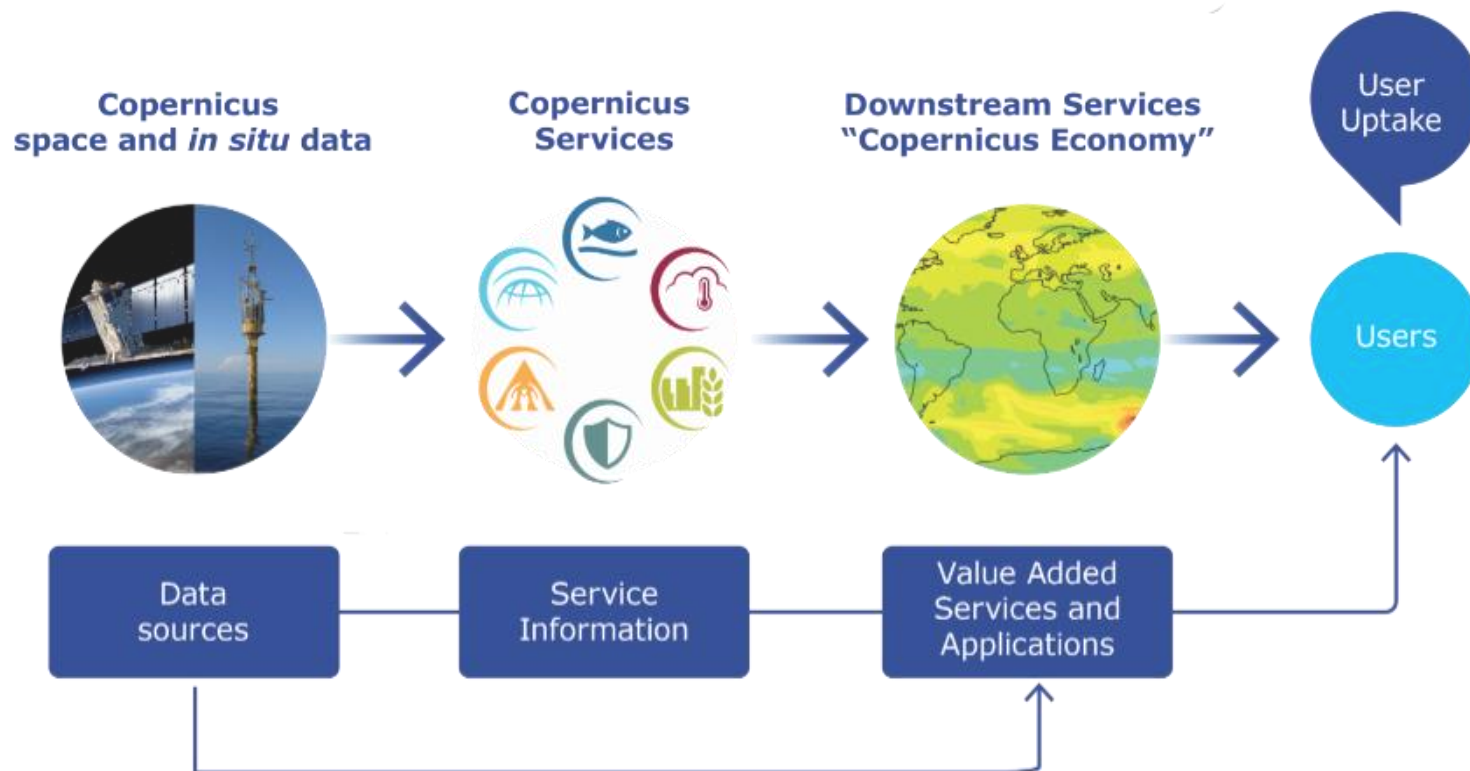


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<https://www.copernicus.eu/>

Copernicus is the **European Union's Earth Observation Programme**

Combines **satellite** observations and **in-situ** measurements.

Services transform this raw data into **value-added geo-information products**.

ECMWF entrusted to implement **Climate Change (C3S)** and **Atmosphere Monitoring (CAMS)** services.

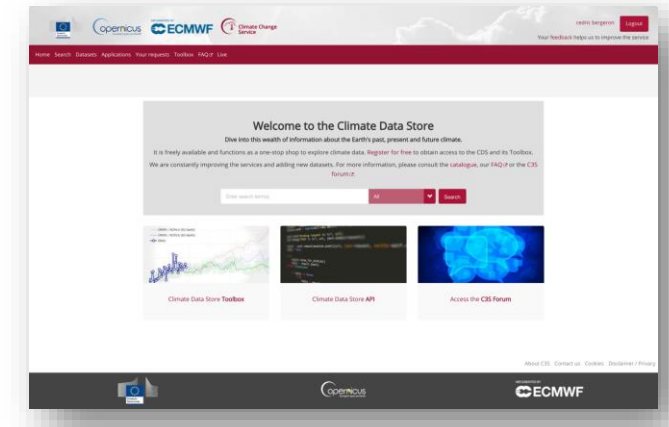
Together with EUMETSAT, Mercator and EEA, **ECMWF** also implements the **DIAS** platform **WEKEO**

Climate and Atmosphere Data Stores (CDS/ADS)

The **Climate Data Store (CDS)**, is an online **open** and **free** service supporting the **implementation** of **Climate Change Service (C3S)**.

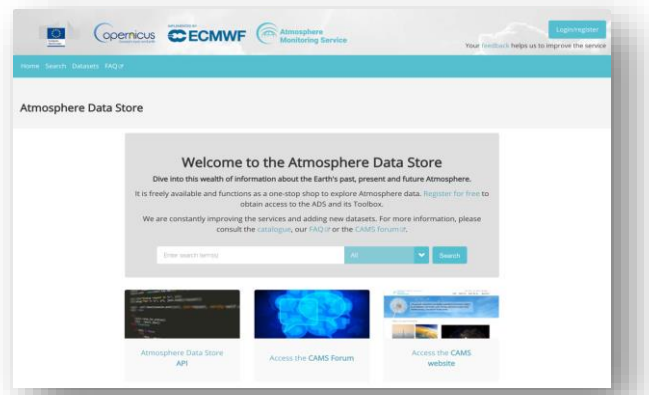
- Wide range of climate **datasets** and **applications** via a **searchable catalogue**.
- **CDS** catalogue also include a set of datasets from **Copernicus Emergency and Management Service (CEMS)**
- **Toolbox** allows users to interact with the data and **build** their own applications, maps and graphs.
- **Evaluation and Quality Control (EQC)** function

<https://climate.copernicus.eu/>



<https://cds.climate.copernicus.eu>

<https://atmosphere.copernicus.eu/>



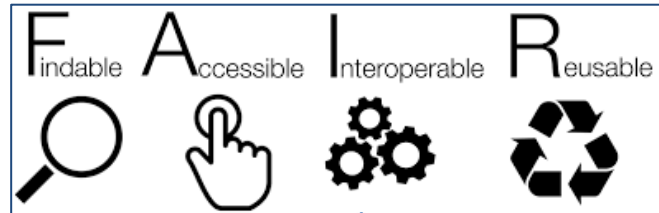
<https://ads.atmosphere.copernicus.eu>

The **Atmosphere Data Store (ADS)** is replacing the CAMS Catalogue as the main point of access to **Atmosphere Monitoring Service (CAMS)** data

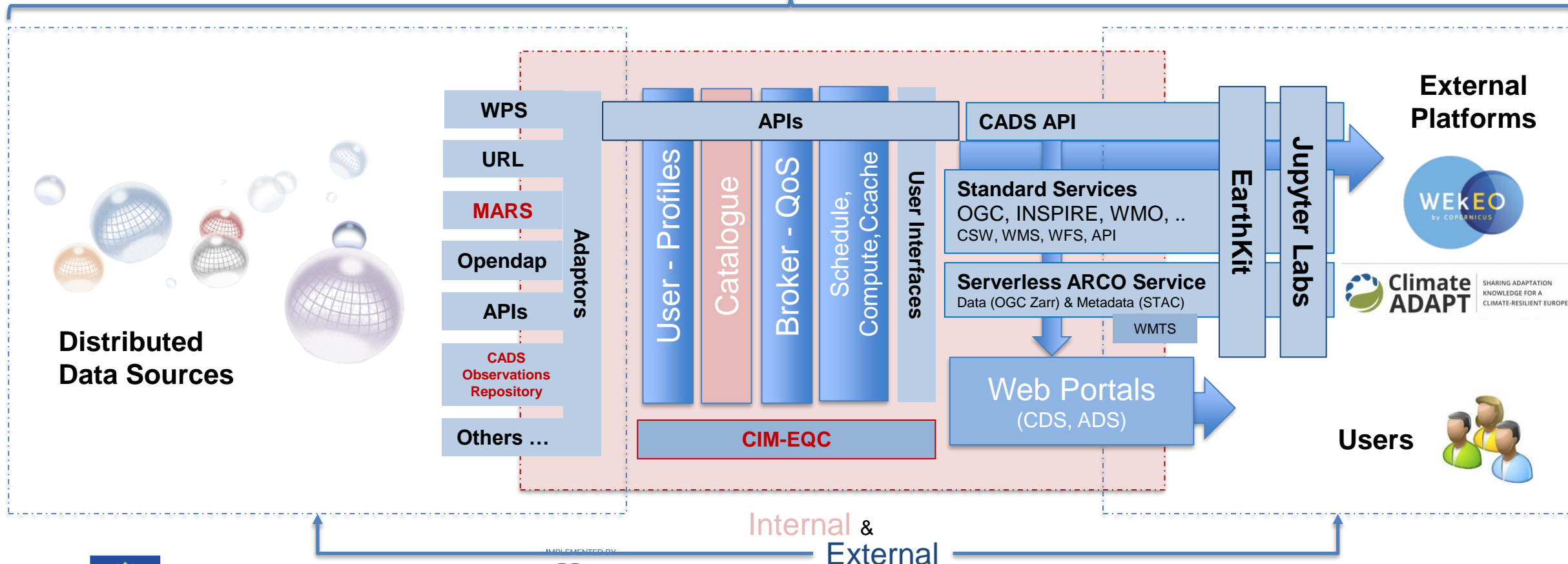
- **Shared underlying infrastructure (CADS),**
- **Supporting teams and work methodologies.**

CADS Architecture & FAIR Principles

Fully extensible, configurable,
plug-in infrastructure



Driven by a **FAIRest platform vision**
ECMWF co-chairs OGC Climate Resilience DWG

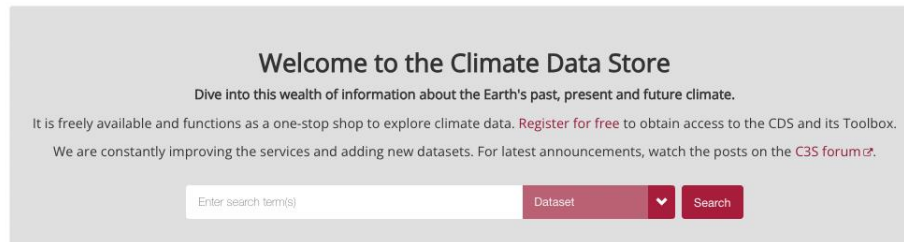


Home and registration



1

Log-in or create an account in case not yet registered



2

Search and discover the catalogue of datasets and applications



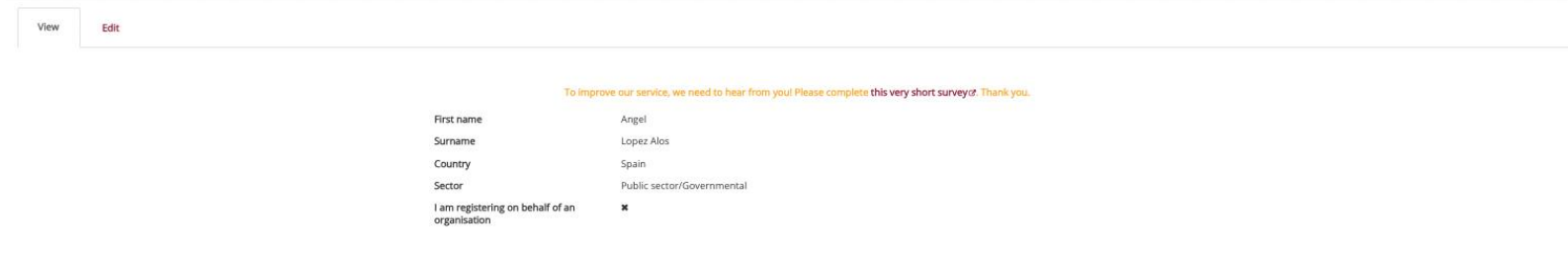
3

Consult the Knowledge Duck whenever required

Profile



1 Access your profile



2 Check your accepted T&C

Terms & Conditions

- Fire CCI licence
- GPCP product licence
- Additional licence to use non European contributions
- SST CCI ensemble dataset licence
- CORDEX licence
- E-OBS product licence
- NASA-CERES-EBAF licence
- EFAS datasets licence
- Licence to use Copernicus Products
- Data protection and privacy statement
- NOAA/NCEI HIRS OLR licence
- Copernicus Sentinel data licence
- GRUAN data policy
- Creative Commons Attribution 4.0 International Public Licence
- Copernicus Global Land product licence
- ESA CCI Essential Climate Variable products' licence
- WUODC data policy
- UZH Glaciers licence
- MODIS licence
- CCI product licence
- SST CCI datasets licence
- VITO licence
- EUMETSAT OSI SAF products licence
- CMIP5 terms of use
- Global land observations data policy
- Terms of use of the Copernicus Climate Data Store
- GHG-CCI Licence
- CEMS-FLOODS datasets licence

3 Here is your UID and API Token



Discover the catalogue

Search and filter

1

Reanalysis is split in several catalogue entrances

2

The screenshot shows the Copernicus Data Catalogue search results for the query 'ERAS'. The page header includes logos for the European Union, Copernicus, ECMWF, and the Climate Change Service, along with a 'Login/register' button. The navigation bar contains links for Home, Search, Datasets, Applications, Toolbox, Support, and Live. The search results are displayed under the 'Search results' heading, with a message: 'To improve our service, we need to hear from you! Please complete this very short survey. Thank you.' The search bar contains 'ERAS' and the results are filtered by 'All', 'Applications', 'Datasets', and 'Providers'. The results are sorted by 'Relevancy' and show 1-20 of 30 results for 'ERAS' and 'Reanalysis'. The first result is 'Complete ERA5 global atmospheric reanalysis', which is a Dataset, Atmosphere (surface), Atmosphere (upper air), Global, and Reanalysis. The second result is 'Thermal comfort indices derived from ERA5 reanalysis', which is a Dataset, Reanalysis, and Global. The third result is 'ERA5-Land hourly data from 1950 to present', which is a Dataset, Reanalysis, Global, Land (hydrology), and Land (biosphere). The fourth result is 'ERA5-Land monthly averaged data from 1950 to present', which is a Dataset, Reanalysis, Global, Land (hydrology), and Land (biosphere). The fifth result is 'ERA5 hourly data on pressure levels from 1940 to present', which is a Dataset, Atmosphere (surface), Atmosphere (upper air), Global, and Reanalysis. The sixth result is 'ERA5 hourly data on single levels from 1940 to present', which is a Dataset, Atmosphere (surface), Atmosphere (upper air), Global, and Reanalysis. Each result includes a brief description and a thumbnail image.



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Dataset overview

ERA5 hourly data on pressure levels from 1940 to present

To improve our service, we need to hear from you! Please complete [this very short survey](#). Thank you.

- Overview
- Download data
- Metadata
- Quality assessment
- Documentation

ERA5 is the fifth generation ECMWF reanalysis for the global climate and weather for the past 6 decades. Data is available from 1940 onwards. ERA5 replaces the ERA-Interim reanalysis.

Reanalysis combines model data with observations from across the world into a globally complete and consistent dataset using the laws of physics. This principle, called data assimilation, is based on the method used by numerical weather prediction centres, where every six hours (12 hours at ECMWF) a previous forecast is combined with newly available observations in an optimal way to produce a new best estimate of the state of the atmosphere, called analysis, from which an updated, improved forecast is issued. Reanalysis works in the same way, but at reduced resolution to allow for the provision of a dataset spanning back several decades. Reanalysis does not have the constraint of issuing timely forecasts, so there is more time to collect observations, and when going further back in time, to allow for the ingestion of improved versions of the original observations, which all benefit the quality of the reanalysis product.

ERA5 provides hourly estimates for a large number of atmospheric, ocean wave and land-surface quantities. An uncertainty estimate is sampled by an underlying 10-member ensemble at three-hourly intervals. Ensemble mean and spread have been pre-computed for convenience. Such uncertainty estimates are closely related to the information content of the available observing system which has evolved considerably over time. They also indicate flow-dependent sensitive areas. To facilitate many climate applications, monthly-mean averages have been pre-calculated too, though monthly means are not available for the ensemble mean and spread.

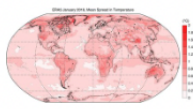
ERA5 is updated daily with a latency of about 5 days. In case that serious flaws are detected in this early release (called ERA5T), this data could be different from the final release 2 to 3 months later. In case that this occurs users are notified.

The data set presented here is a regridded subset of the full ERA5 data set on native resolution. It is online on spinning disk, which should ensure fast and easy access. It should satisfy the requirements for most common applications.

An overview of all ERA5 datasets can be found in [this article](#). Information on access to ERA5 data on native resolution is provided in [these guidelines](#).

Data has been regridded to a regular lat-lon grid of 0.25 degrees for the reanalysis and 0.5 degrees for the uncertainty estimate (0.5 and 1 degree respectively for ocean waves). There are four main sub-sets: hourly and monthly products, both on pressure levels (upper air fields) and single levels (atmospheric, ocean-wave and land surface quantities).

The present entry is 'ERA5 hourly data on pressure levels from 1940 to present'.



DATA DESCRIPTION		
Data type		Gridded
Projection		Regular latitude-longitude grid
Horizontal coverage		Global
Horizontal resolution		Reanalysis: 0.25° x 0.25° Mean, spread and members: 0.3° x 0.3°
Vertical coverage		1000 hPa to 1 hPa
Vertical resolution		37 pressure levels
Temporal coverage		1940 to present
Temporal resolution		Hourly
File format		GRIB

MAIN VARIABLES		
Name	Units	Description
Divergence	s ⁻¹	This parameter is the horizontal divergence of velocity. It is the rate at which air is spreading out horizontally from a point, per square metre. This parameter is positive for air that is spreading out, or diverging, and negative for the opposite, for air that is concentrating, or converging (convergence).
Fraction of cloud cover	Dimensionless	This parameter is the proportion of a grid box covered by cloud (liquid or ice) and varies between zero and one. This parameter is available on multiple levels through the atmosphere.
Geopotential	m ² s ⁻²	This parameter is the gravitational potential energy of a unit mass, at a particular location, relative to mean sea level. It is also the amount of work that would have to be done, against the force of gravity, to lift a unit mass to that location from mean sea level. The geopotential height can be calculated by dividing the geopotential by the Earth's gravitational acceleration, g (9.80665 m s ⁻²). The geopotential height plays an important role in synoptic meteorology (analysis of weather patterns). Charts of geopotential height plotted at constant pressure levels (e.g. 300, 500 or 850 hPa) can be used to identify weather systems such as cyclones, anticyclones, troughs and ridges. At the surface of the Earth, this parameter shows the variations in geopotential (height) of the surface, and is often referred to as the orography.
Column mass mixing ratio	kg kg ⁻¹	This parameter is the mass of ozone per kilogram of air, in the ECMWF Integrated Forecasting System (IFS). There is a simplified representation of ozone chemistry (including representation of the chemistry which has caused the ozone hole). Ozone is also transported around in the atmosphere through the motion of air. Naturally occurring ozone in the stratosphere helps protect organisms at the surface of the Earth from the harmful effects of ultraviolet (UV) radiation from the Sun. Ozone near the surface, often produced because of pollution, is harmful to organisms. Most of the IFS chemical species are archived as mass mixing ratios (kg kg ⁻¹).
Potential vorticity	K m ² kg ⁻¹ s ⁻¹	Potential vorticity is a measure of the capacity for air to rotate in the atmosphere. If we ignore the effects of heating and friction, potential vorticity is conserved following an air parcel. It is used to look for places where large wind storms are likely to originate and develop. Potential vorticity increases strongly above the tropopause and therefore, it can also be used in studies related to the stratosphere and stratosphere-troposphere exchanges. Large wind storms develop where a column of air in the atmosphere starts to rotate. Potential vorticity is calculated from the wind, temperature and pressure across a column of air in the atmosphere.
Relative humidity	%	This parameter is the water vapour pressure as a percentage of the value at which the air becomes saturated (the point at which water vapour begins to condense into liquid water or deposition into ice). For temperatures over 0°C (273.15 K) it is calculated for saturation over water. At temperatures below 0°C it is calculated for saturation over ice. Between -20°C and 0°C this parameter is calculated by interpolating between the ice and water values using a quadratic function.
Specific cloud ice water content	kg kg ⁻¹	This parameter is the mass of cloud ice particles per kilogram of the total mass of moist air. The total mass of moist air is the sum of the dry air, water vapour, cloud liquid, cloud ice, rain and falling snow. This parameter represents the average value for a grid box. Water within clouds can be liquid or ice, or a combination of the two. Note that 'cloud frozen water' is the same as 'cloud ice water'.
Specific cloud liquid water content	kg kg ⁻¹	This parameter is the mass of cloud liquid water droplets per kilogram of the total mass of moist air. The total mass of moist air is the sum of the dry air, water vapour, cloud liquid, cloud ice, rain and falling snow. This parameter represents the average value for a grid box. Water within clouds can be liquid or ice, or a combination of the two.
Specific humidity	kg kg ⁻¹	This parameter is the mass of water vapour per kilogram of moist air. The total mass of moist air is the sum of the dry air, water vapour, cloud liquid, cloud ice, rain and falling snow.
Specific rain water content	kg kg ⁻¹	The mass of water produced from large-scale clouds that is of raindrop size and so can fall to the surface as precipitation. Large scale clouds are generated by the cloud scheme in the ECMWF Integrated Forecasting System (IFS). The cloud scheme represents the formation and dissipation of clouds and large-scale precipitation due to changes in atmospheric quantities (such as pressure, temperature and moisture) predicted directly by the IFS at spatial scales of a grid box or larger. The quantity is expressed in kilograms per kilogram of the total mass of moist air. The total mass of moist air is the sum of the dry air, water vapour, cloud liquid, cloud ice, rain and falling snow. This parameter represents the average value for a grid box. Clouds contain a continuum of different sized water droplets and ice particles. The IFS cloud scheme simplifies this to represent a number of discrete cloud droplets/particles including cloud water droplets, raindrops, ice crystals and snow (aggregated ice crystals). The processes of droplet formation, phase transition and aggregation are also highly simplified in the IFS.
Specific snow water content	kg kg ⁻¹	The mass of snow (aggregated ice crystals) produced from large-scale clouds that can fall to the surface as precipitation. Large scale clouds are generated by the cloud scheme in the ECMWF Integrated Forecasting System (IFS). The cloud scheme represents the formation and dissipation of clouds and large-scale precipitation due to changes in atmospheric quantities (such as pressure, temperature and moisture) predicted directly by the IFS at spatial scales of a grid box or larger. The mass is expressed in kilograms per kilogram of the total mass of moist air. The total mass of moist air is the sum of the dry air, water vapour, cloud liquid, cloud ice, rain and falling snow. This parameter represents the average value for a grid box. Clouds contain a continuum of different sized water droplets and ice particles. The IFS cloud scheme simplifies this to represent a number of discrete cloud droplets/particles including cloud water droplets, raindrops, ice crystals and snow (aggregated ice crystals). The processes of droplet formation, phase transition and aggregation are also highly simplified in the IFS.
Temperature	K	This parameter is the temperature in the atmosphere. It has units of kelvin (K). Temperature measured in kelvin can be converted to degrees Celsius (°C) by subtracting 273.15. This parameter is available on multiple levels through the atmosphere.
U-component of wind	m s ⁻¹	This parameter is the eastward component of the wind. It is the horizontal speed of air moving towards the east. A negative sign indicates air moving towards the west. This parameter can be combined with the V component of wind to give the speed and direction of the horizontal wind.
V-component of wind	m s ⁻¹	This parameter is the northward component of the wind. It is the horizontal speed of air moving towards the north. A negative sign indicates air moving towards the south. This parameter can be combined with the U component of wind to give the speed and direction of the horizontal wind.
Vertical velocity	Pa s ⁻¹	This parameter is the speed of air motion in the upward or downward direction. The ECMWF Integrated Forecasting System (IFS) uses a pressure based vertical coordinate system and pressure decreases with height, therefore negative values of vertical velocity indicate upward motion. Vertical velocity can be useful to understand the large-scale dynamics of the atmosphere, including areas of upward motion/ascent (negative values) and downward motion/subsidence (positive values).
Vorticity (relative)	s ⁻¹	This parameter is a measure of the rotation of air in the horizontal, around a vertical axis, relative to a fixed point on the surface of the Earth. On the scale of weather systems, troughs (weather features that can include rain) are associated with anticlockwise rotation (in the northern hemisphere), and ridges (weather features that bring light or still winds) are associated with clockwise rotation. Adding the effect of rotation of the Earth, the Coriolis parameter, to the relative vorticity produces the absolute vorticity.

Help

[Get help](#)

Licence

Licence to use Copernicus Products

Publication date

2018-08-14

Resource updated

2023-11-14

References

Citation

Acknowledgement

DOI: 10.24381/cds.bd9915cd9

Related data

Complete ERA5 global atmospheric reanalysis

ERA5 hourly data on pressure levels from 1950 to 1978 (preliminary version)(deprecated 2023-08-15)

ERA5 hourly data on single levels from 1940 to present

ERA5 hourly data on single levels from 1950 to 1978 (preliminary version)(deprecated 2023-08-15)

ERA5 monthly averaged data on pressure levels from 1940 to present

ERA5 monthly averaged data on pressure levels from 1950 to 1978 (preliminary version)(deprecated 2023-08-15)

ERA5 monthly averaged data on single levels from 1940 to present

ERA5 monthly averaged data on single levels from 1950 to 1978 (preliminary version)(deprecated 2023-08-15)

Extreme precipitation risk indicators for Europe and European cities from 1969 to 2019

Flood risk indicators for European cities from 1989 to 2018

Mass-consistent atmospheric energy and moisture budget monthly data from 1979 to present derived from ERA5 reanalysis

Related applications

Daily statistics calculated from ERA5 data

ERA5 explorer

Heat wave days for Europe derived from ERA5 reanalysis

Heating and cooling degree days from 1979 to 2100

1 Discover the dataset

2 References, licences, other

3 Related data & applications



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Download form

The screenshot shows a web interface for downloading data. At the top, there are logos for Copernicus, ECMWF, and Climate Change Service, along with a user profile for Angel Lopez Alos and a Logout button. The main title is "Glaciers distribution data from the Randolph Glacier Inventory for year 2000". Below this, there are tabs for Overview, Download data, Metadata, and Documentation. The "Download data" tab is active, showing several form fields: "Version" with a radio button selected for "5.0" and another for "6.0"; "Variable" with a dropdown menu set to "All available variables"; "Format" with radio buttons for "Zip file (.zip)" and "Compressed tar file (.tar.gz)"; and "Terms of use" with a link to "UZH Glaciers Extent licence" and an "Accept terms" button. Below the form, there are buttons for "Hide API request" and "Not yet toolbox compatible", and a "Please check mandatory fields" message. A code block shows the API request format:

```
import cdsapi
c = cdsapi.Client()
c.retrieve(
  'init=glaciers-extent',
  {
    'variable': 'alt',
    'format': 'zip',
    'version': '5_0',
  },
  'download.zip')
```

1 Check if you are registered

2 Make your selection

3 Accept the license

4 Check the API Request

5 Submit your request

Your request

Home Search Datasets Applications Your requests Toolbox Support Live

Your requests

To improve our service, we need to hear from you! Please complete this very short survey. Thank you.

All Queued In progress Failed Unavailable Complete

Auto refreshed : 19:07:57

Product	Submission date	End date	Duration	Size	Status
ERAS hourly data on single levels from 1940 to present	2023-11-14 19:06:46	2023-11-14 19:06:52	0:00:05	8.3 MB	Download

Open request form
Request ID: 833262dd-954a-4bf8-ac5f-85a2bb263609

Product type: Reanalysis
Variable: 10m u-component of wind, 2m dewpoint temperature
Year: 1940, 1946
Month: January
Day: 01
Time: 00:00
Whole available region:
Format: GRIB

Request profile

CORDEX regional climate model data on single levels	2023-11-13 16:43:03	2023-11-13 16:44:13	0:01:10	438.3 MB	Download
---	---------------------	---------------------	---------	----------	----------

- 1 Check status of your request
- 2 Download data
- 3 Request ID for tracking
- 4 Check in case of error
- 5 Resubmit or use a s template

- 6 Explore the execution profile

API

Home Search Datasets Applications Your requests Toolbox Support Live

How to use the CDS API

To improve our service, we need to hear from you! Please complete this very short survey. Thank you.

The Climate Data Store (CDS) Application Program Interface (API) is a service providing programmatic access to CDS data. In this page you will find explanations and examples showing how to use the CDS API.

For troubleshooting, check Common Error Messages for CDS Requests.

For Windows users, please read How to install and use CDS API on Windows.

For macOS users, please read How to install and use CDS API on macOS.

For Linux users, please proceed as follows:

1. Install the CDS API key
2. Install the CDS API client
3. Use the CDS API client for data access

Install the CDS API key

1. If you don't have an account, please self register at the CDS registration page and go to the steps below.
2. If you are not logged, please login and go to the step below.
3. Copy the code displayed beside, in the file `$HOME/.cdsapirc` (in your Unix/Linux environment).

```
url: https://cds.climate.copernicus.eu/api/v2
key: 77:b284df3d-1e70-46ee-89aa-4ce13c2c38b0
```

Install the CDS API client

The CDS API client is a python based library. It provides support for both Python 2.7.x and Python 3.

You can install the CDS API client via the package management system `pip`, by running on Unix/Linux the command shown in the box beside.

```
$ pip install cdsapi
```

1 Install the API Key

2 Install the API Client

3 Re-use the Request API



Help & Support

Home Search Datasets Applications Your requests Toolbox Support Live

Help and Support

To improve our service, we need to hear from you! Please complete this very short survey! Thank you.

How can we help you today?

0:00 / 2:23

We provide a dedicated user support service to aid Copernicus Climate Change Service data discovery, dissemination, understanding and use by all users.

Virtual assistant

Documentation Center

Community

- 1 Access to Help & Support
- 2 Virtual Assistant
- 3 Documentation center
- 4 Forum
- 5 Training
- 6 Contact-us

Support portal

<https://confluence.ecmwf.int/site/support>

The screenshot shows the top navigation bar with the ECMWF logo, 'Support Portal Home', and 'My requests'. A search bar on the right contains the text 'Búsqueda'. Below the navigation is a large banner with the text 'Welcome to ECMWF Support Portal' and 'Support for users of ECMWF, Copernicus Atmosphere Monitoring Service (CAMS) and Copernicus Climate Change Service (C3S)'. The main content area features a large heading 'Search ECMWF documentation' and a search input field with the placeholder text 'e.g. how to download data'. Below the search field, a message states: 'If you cannot find the solution to your issue, you can create a support request with us by selecting the appropriate category below.'

ECMWF staff only



Microsoft & Windows (see more)



Linux & Apple (see more)



HR/ERP Cirrus (see more)



Other Internal (see more)



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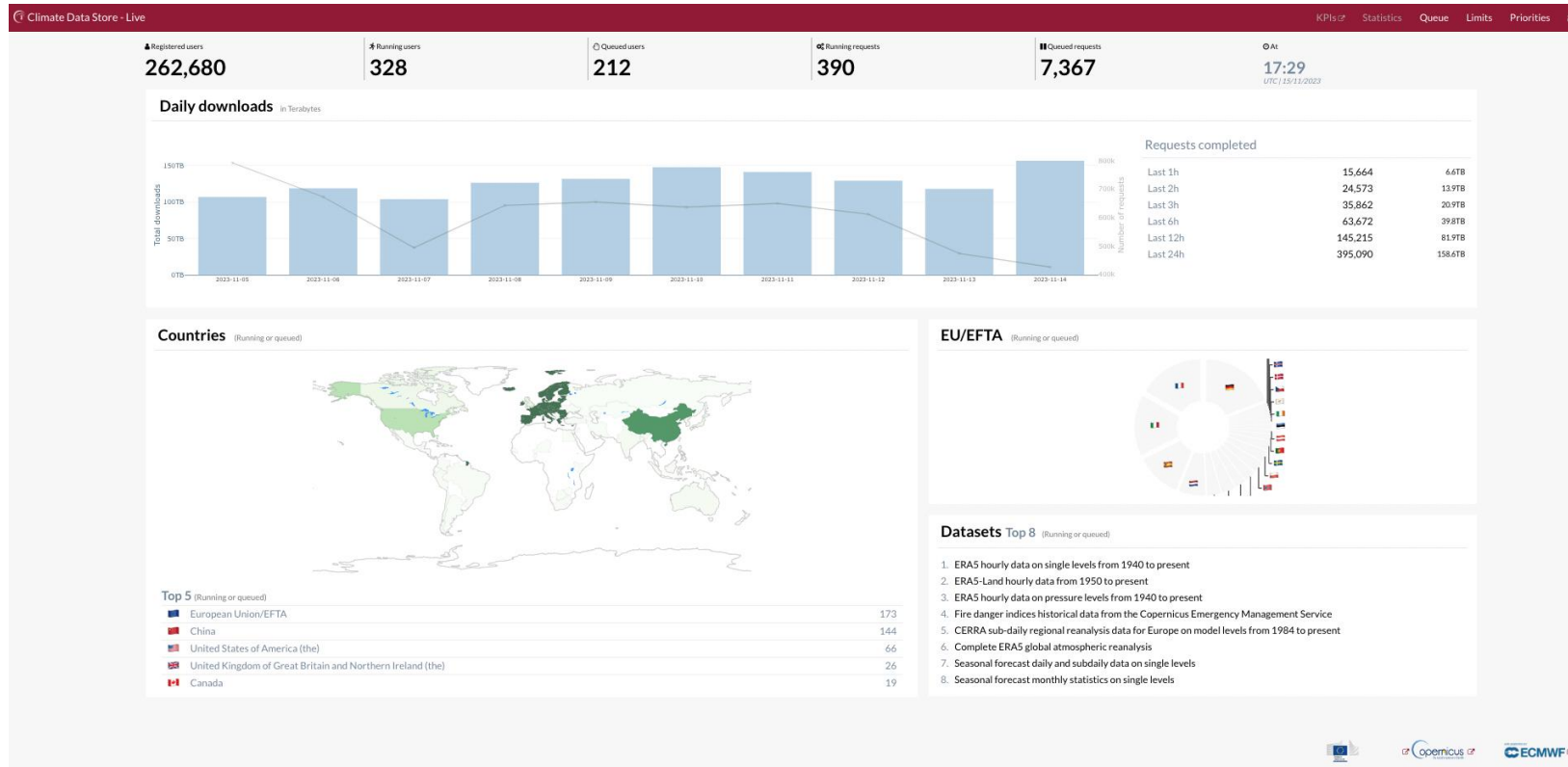
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Live status

<https://cds.climate.copernicus.eu/live/>



1 Overall Statistics

2 Queue Status

3 Limits

Applications

1 Explore the catalogue of applications

2 Check and reuse the source code behind

3 Access related data and applications

Toolbox

<https://cds.climate.copernicus.eu/cdsapp#!/toolbox>



1 Access the toolbox area

2 Discover available options, documentation, applications, API and Toolbox Editor

To improve our service, we need to hear from you! Please complete this very short survey! Thank you.

Toolbox Documentation

Access the full set of documentation material, including tutorials, how-to guides and a glossary.

Toolbox Editor

Enter your personal workspace where you can craft, edit and run applications.

API

Consult the API reference library for explanations of the individual Toolbox tools.

Application Gallery

Browse a wide range of existing applications and gain inspiration for your own creations.

Toolbox editor

The screenshot displays the Toolbox Editor interface. At the top, there are logos for Copernicus, ECMWF, and Climate Change Service, along with a user profile for Angel Lopez Alos and a Logout button. A navigation bar includes Home, Search, Datasets, Applications, Your requests, Toolbox, and Support Live. A survey notice is present: "To improve our service, we need to hear from you! Please complete this very short survey! Thank you."

The main interface is divided into three sections:

- Toolbox Editor:** A sidebar on the left lists applications and examples. The main area shows a code editor with the following code:

```
1 import cds toolbox as ct
2
3
4 - layout = {
5     'output_align': 'bottom'
6 }
7
8 - variables = {
9     'Near-Surface Air Temperature': '2m_temperature',
10    'Eastward Near-Surface Wind': '10m_u_component_of_wind',
11    'Westward Near-Surface Wind': '10m_v_component_of_wind',
12    'Sea Level Pressure': 'mean_sea_level_pressure',
13    'Sea Surface Temperature': 'sea_surface_temperature',
14 }
15
16 @ct.application(title='Plot Map', layout=layout)
17 @ct.input.dropdown('variable', label='Variable', values=variables.keys())
18 @ct.output.figure()
19 def plot_map(variable):
20     """
21     Application main steps:
22
23     - set the application layout with output at the bottom
24     - select a variable name from a list in the dropdown menu
25     - retrieve the selected variable
26     - compose a title
27     - show the result on a map using the chosen title
28
29     """
30
31     data = ct.catalogue.retrieve(
32         'reanalysis-eras-single-levels',
33         {
34             'variable': variables[variable],
35             'product_type': 'reanalysis',
36             'year': '2018',
37             'month': '08',
38             'day': '15',
39             'time': '12:00',
40         }
41     )
42
43     title = '{}'.format(' ', join([text.capitalize() for text in variable.split('_')]))
44     fig = ct.cdplot.geomap(data, title=title)
45
46     return fig
47
```
- Plot Map:** A panel on the right showing a world map titled "Near-surface air temperature". A dropdown menu is set to "Near-Surface Air Temperature". A color scale on the right indicates temperature in degrees Celsius, ranging from -60 to 60.
- Footer:** A small note at the bottom right says "Use tested browsers: Chrome 60, Firefox 52, Safari 10.1, Edge 15".

1 Check examples

2 Edit the code

3 Display the results



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Training Material



Copernicus Climate Change Service (C3S) Data Tutorials

Climate Data Store (CDS)

CDS tutorial

Tutorials on Reanalysis

Climatology

Heatwave Analysis

Tutorials on Observations

Outgoing Longwave Radiation

Tutorials on Climate Projections

Climate Projections (CMIP6)

Climate Projections (CORDEX)

Tutorials on Seasonal Forecasts

Seasonal Forecast Anomalies

Seasonal Forecast Verification

Tutorials on Climate Indices

Windchill Index Calculation

Tutorials on Bias Correction

Python library (ibicus) and tutorials on bias correction

Tutorials using EFFIS and GloFAS data

Visualising Fire Weather Index (FWI)

Observing floods with GloFAS



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Contents

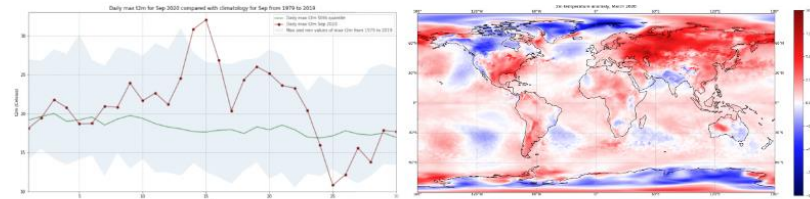
How to run these tutorials

Contents

Copernicus Climate Change Service (C3S) Data Tutorials

Discover how to access and handle data of the past, present and future climate!

This website contains Jupyter notebook based tutorials that demonstrate how to access and process the wide variety of climate data provided by the [Climate Data Store \(CDS\)](#) of the [Copernicus Climate Change Service \(C3S\)](#). Each tutorial provides interactive examples of common workflows to derive information about the past, present and future climate. They include code in Python and content in Markdown to provide clear, engaging and practical instructions on data handling which can be run in various cloud environments without any need for installation. You are invited to experiment with these tutorials and tailor them to your needs to extract results meaningful to you! The tutorials are accessed using an Application Program <https://ecmwf-projects.github.io/copernicus-training-c3s/intro.html>



How to run these tutorials

The tutorials are in the form of [Jupyter notebooks](#). At the top of each notebook you will find links to a selection of cloud-based services to run, edit, export or create new notebooks. These include the following:

Binder	Kaggle	Colab
Binder may take some	Requires (free) registration with	Requires Google account, and installation

1

Access Jupyter notebooks on use of C3S data on the Climate Data Store

<https://ecmwf-projects.github.io/copernicus-training-c3s/intro.html>

2

Access e-learning resources at ECMWF

<https://learning.ecmwf.int/>



PROGRAMME OF THE EUROPEAN UNION



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WEkEO

<https://www.wekeo.eu/>

The screenshot displays the WEkEO web application interface. At the top, there is a navigation bar with links for SERVICES, DATA, COMPUTING, USE CASES, and SUPPORT. A search bar is located in the top right corner. The main content area is divided into several sections:

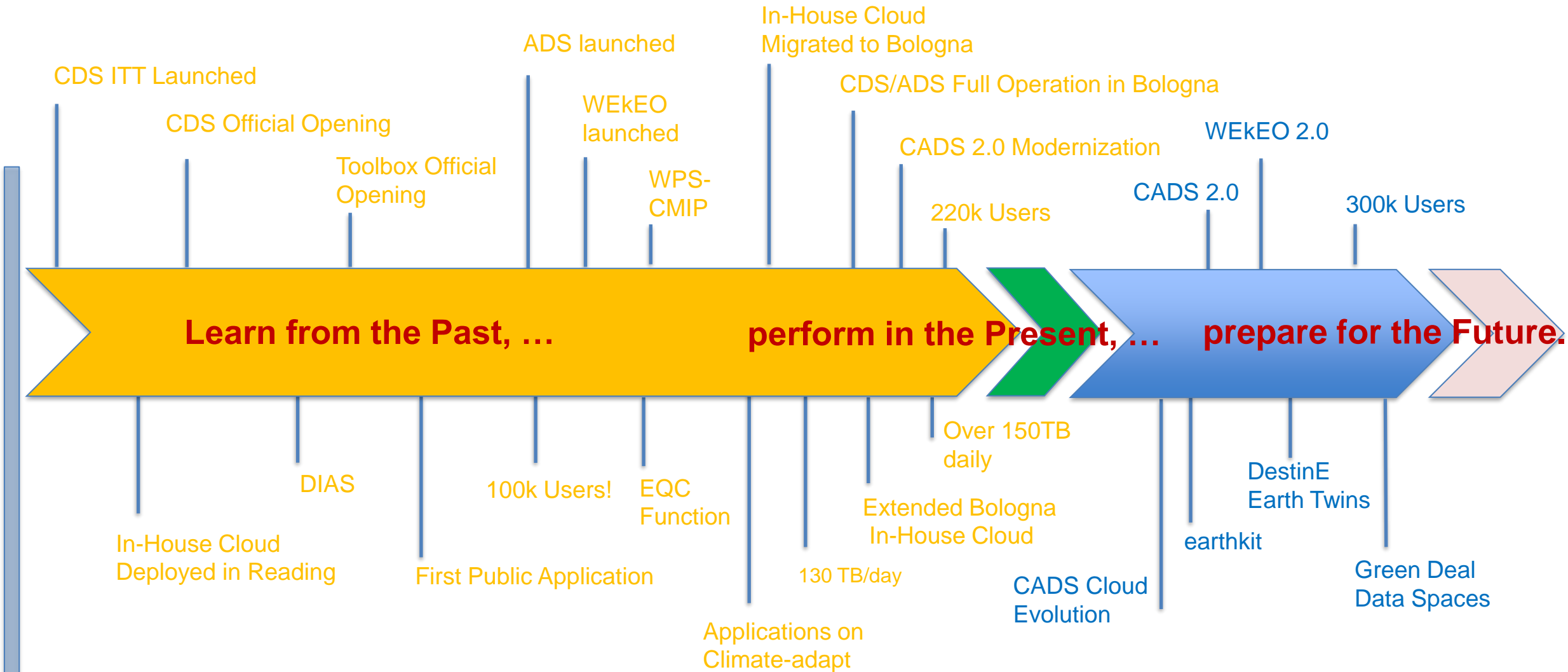
- Map:** A satellite-style map showing wind speed data. A layer titled "10 metre U wind component m/s" is active, with a date of 10/11/2023 and a time of 23:00. A color scale from -5 to 10 m/s is visible.
- Catalogue:** A central panel titled "Catalogue" with 24 datasets. It includes a "Filters" section with options for "FREE-TEXT SEARCH" (set to "seasonal"), "FEATURED", "FAVOURITES", "COPERNICUS SERVICE" (set to "C3S (Climata)"), "AREA" (set to "Global"), "TIME" (set to "Past"), "TAGS" (set to "Climate"), "ORIGINATING CENTRE", and "DATA POLICY". The dataset list includes:
 - Temperature and precipitation gridded data for global and regional domains derived from in-situ and satellite observations:** Provides high-resolution gridded temperature and precipitation observations.
 - Carbon dioxide data from 2002 to present derived from satellite observations:** Provides observations of atmospheric carbon dioxide (CO2) amounts.
 - Methane data from 2002 to present derived from satellite observations:** Provides observations of atmospheric methane (CH4) amounts.
 - Sea ice edge and type daily gridded data from 1978 to present derived from satellite observations:** Provides daily gridded data of sea ice edge and sea ice type.
- Quick shortcuts to WEkEO services:** A sidebar on the right with links to:
 - JupyterHub:** Process data in WEkEO infrastructure.
 - WEkEO Drive:** Store and share your work with others.
 - Virtual machines:** Manage your WEkEO infrastructure.

1 Discover and access other Copernicus resources

2 JupyterHub

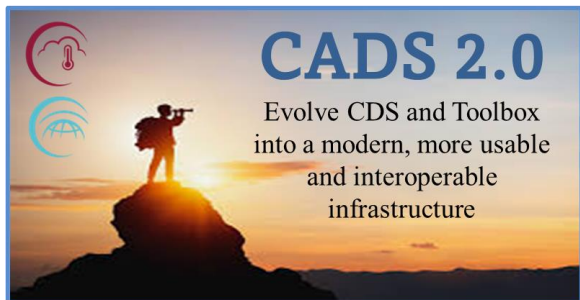
3 Virtual Machines (IaaS)

CADS an infrastructure in continuous evolution

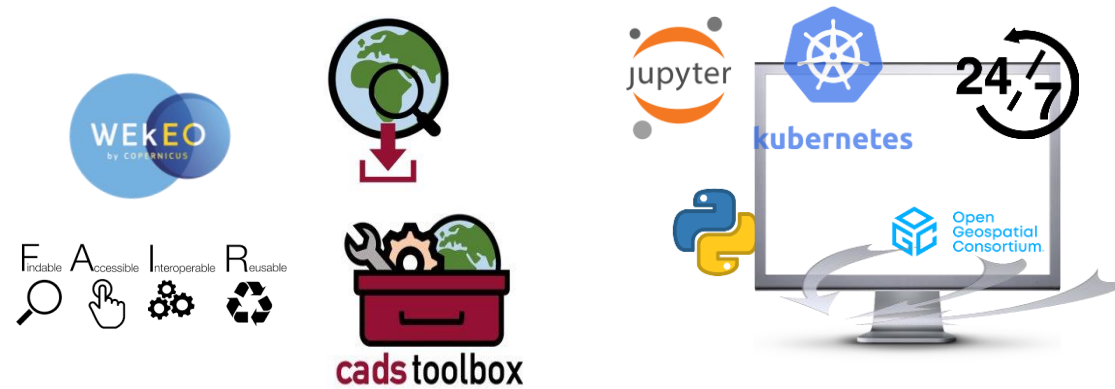


CADS 2.0

Currently under development
Expected release Q1-2 2024



- Engage with a **broader user community**.
- Capitalize **experience, feedbacks, lessons learned, know-how** and advanced technologies.
- Make the current services **more accessible (FAIRest)**



- Advanced use of **Cloud Computing**
- Ensure compatibility with **state-of-the-art solutions** - machine learning, data cubes and interactive notebooks.
- **Strengthen synergies** with **WEkEO** other platforms
- Improve **work methodologies** (ingestion, cloud resources)



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Europe's eyes on Earth

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earthkit

The screenshot shows the earthkit documentation website. The left sidebar contains a search bar and a navigation menu with sections for COMPONENTS (Overview, earthkit-data, earthkit-maps, earthkit-meteo) and INSTALLATION (Installation, License). The main content area has a 'Welcome to earthkit's documentation' header, a 'Warning' box stating the project is BETA and experimental, and a paragraph describing earthkit as a new open-source Python project led by ECMWF. Below this, it lists components (earthkit-data, earthkit-maps, earthkit-meteo) and installation instructions. A 'MongoDB Atlas' advertisement is also visible.

<https://earthkit.readthedocs.io/en/latest/>

- 1 Discover the new earthkit project
- 2 Install and use
- 3 Contribute



Thanks!



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