

The Copernicus Climate | Atmosphere Data Store



Climate Change

Cedric BERGERON, ECMWF

cedric.bergeron@ecmwf.int

11-12 June 2020, ECMWF Copernicus Workshop

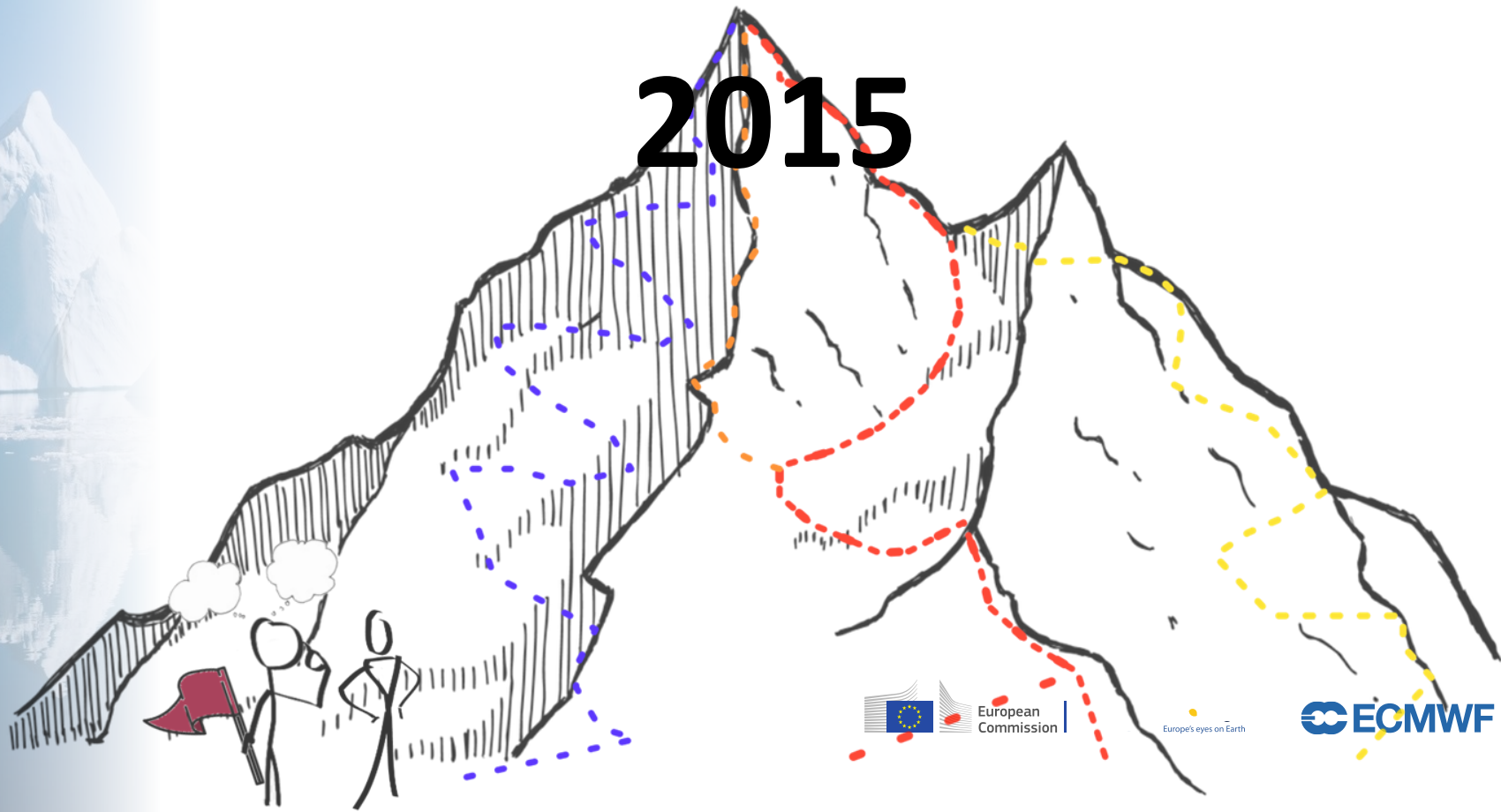




Climate
Change

What was the ambition?

2015



Europe's eyes on Earth





Being at the heart of C3S

Climate
Change

Evaluation & QC function

from European commission
e.g., FP7 Space call

from other bodies e.g., MS, ESA,
Eumetsat, EEA, WMO..

Consistent Climate Data Store

Sectoral Information System

Selected set
of information for
customer DGs

MS and other
users & customers

Outreach & Dissemination

Monitoring, QC of the service and feedbacks to
production or R&D

Education, general public and authorities,
reports, media, bulletin

Implementing Stakeholders requirements

ECMWF Copernicus Workshop February 2014

*“The CDS data-base should be **distributed**, providing access to the data that reside in local archives. The data store should not duplicate **existing databases**, but rather **provide improved access** to them, via a **one-stop shop**, generate and maintain a documented European catalogue.”*

*CCCS should adopt the most **open** possible **data policy**, with CDS data having open access and maximum traceability. **Software** developed under CCCS should also be **freely available**. CCCS should adopt and comply with **existing standards** regarding data formats and exchange protocols.*

*“The CDS should include existing as well as **newly generated data***

*... CCCS should, in general, not only include or provide access to existing data, but also support **some ‘production’ capabilities**”*

*“The CDS should include datasets covering the time scales of CCCS interest (past, present and future): **observations, reanalyses, seasonal forecasts** possibly decadal forecasts, and longer term centennial **projections** (scenarios)”*



Climate
Change

Being a marketplace

amazon.co.uk All ▾ usb 128gb

Deliver to Germany

Best Sellers Today's Deals Prime Video Books Help New Releases Home & Garden

Amazon Prime | 30-day free trial

1-16 of 771 results for "usb 128gb"

Sort by: Featured ▾

Amazon Prime

☒ prime

☐ Free UK Delivery by Amazon

FREE Delivery on orders over £10 for books or over £20 for other categories shipped by Amazon

Department

Computers & Accessories

USB Flash Drives

Memory Stick Cards

Accessories

External Data Storage

[See All 3 Departments](#)

Avg. Customer Review

★★★★★ & Up

★★★★☆ & Up

★★★☆☆ & Up

★★☆☆☆ & Up

★☆☆☆☆ & Up

Brand

☐ SanDisk

☐ Kingston

☐ Integral

☐ Lexar

☐ PNY

☐ WANSENDA

☐ Hama

☐ EVOTOP

☐ Verbatim

☐ EASTRULL

☐ KEXIN

☐ Lio SHAAAR

☐ HooToo

International Shipping

☐ International Shipping Eligible

Subscription Option

☐ Subscribe & Save

Flash Drive Capacity

☐ Up to 2GB

☐ 4GB

☐ 8GB

☐ 16GB

☐ 32GB

☐ 64GB & More

Feature Keywords

☐ Encryption

☐ Metal

☐ High Speed

☐ Key Ring

☐ Micro

☐ Lifetime Warranty

☐ Key Chain

[See more](#)

Global Store

☐ Amazon.com Selections

KEXIN

Enjoy your efficient data storage from KEXIN

[Shop KEXIN >](#)



KEXIN USB Flash Drive 16GB 5 Pack USB Memory Stick 2.0 Swivel USB Stick USB...

★★★★☆ 602

[prime](#)



KEXIN USB Flash Drive 32GB Metal USB Memory Stick 2.0 Heart Shape USB Stick...

★★★★☆ 452



KEXIN USB Flash Drive 32GB USB Memory Stick 2.0 Swivel USB Stick USB...

★★★★☆ 865

Sponsored



Sponsored

Integral 128GB USB Memory 2.0 Flash Drive Courier Blue INF128GBCOU

★★★★☆ 970

£10⁹⁹ £12.49

[prime](#) Get it Saturday, Jun 6



Sponsored

Integral 128GB USB Memory 2.0 Flash Drive Black

★★★★☆ 383

£13¹⁹

[prime](#) Get it Saturday, Jun 6



SanDisk SDCZ50-128G-B35 128 GB Cruiser Blade USB 2.0 Flash Drive - Black (Standard Packaging)

★★★★☆ 70,482

£15⁸⁴ £24.79

£2.01 delivery

More buying choices

£13.49 (22 used & new offers)



SanDisk Ultra 128 GB USB Flash Drive USB 3.0 Up to 130 MB/s Read

★★★★☆ 40,668

£16⁵⁸

£2.03 delivery

More buying choices

£15.50 (77 used & new offers)

Multiple Data
providers



European
Commission

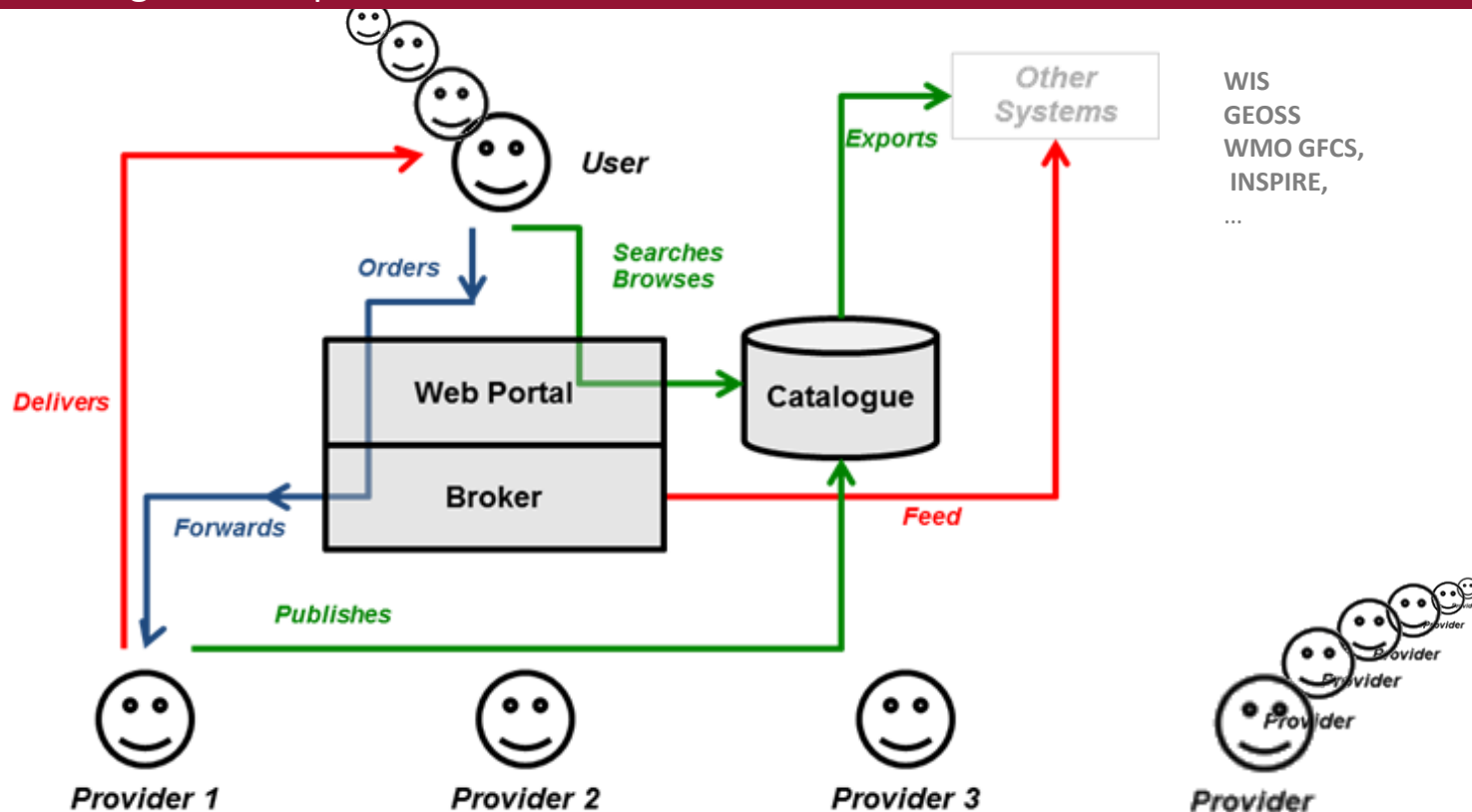
Europe's eyes on Earth





Climate
Change

Being simple, robust and scalable



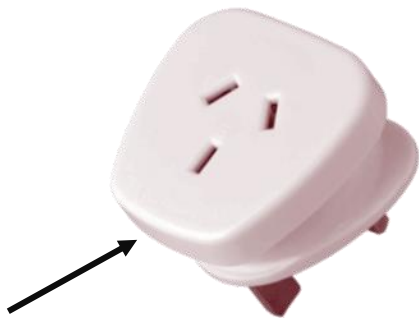


Climate
Change

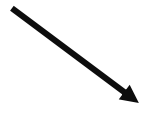
Being flexible

- **Adaptors** are a common programming pattern
- **Adaptors** provides a unified interface to existing systems
- A **adaptor** for each protocol:
 - http, ftp, OpenDAP, WPS, ESGF,...

*Unified
interface*



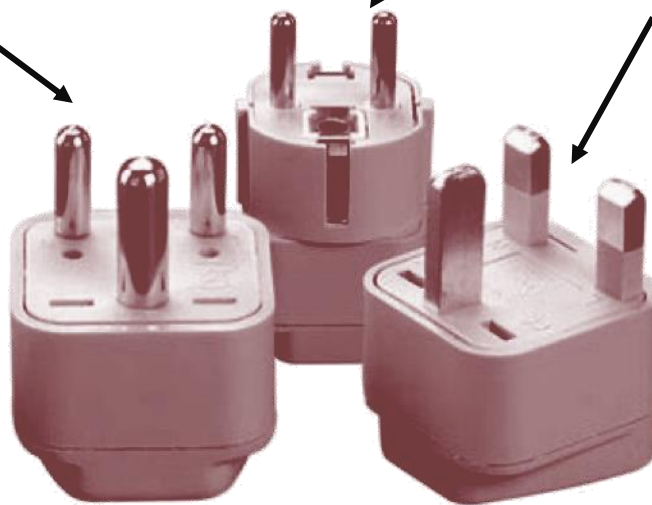
FTP



OpenDAP



MARS API

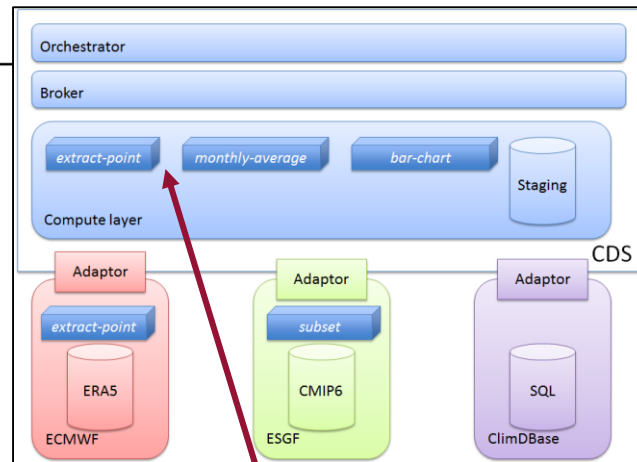




Climate
Change

Being more than a catalogue

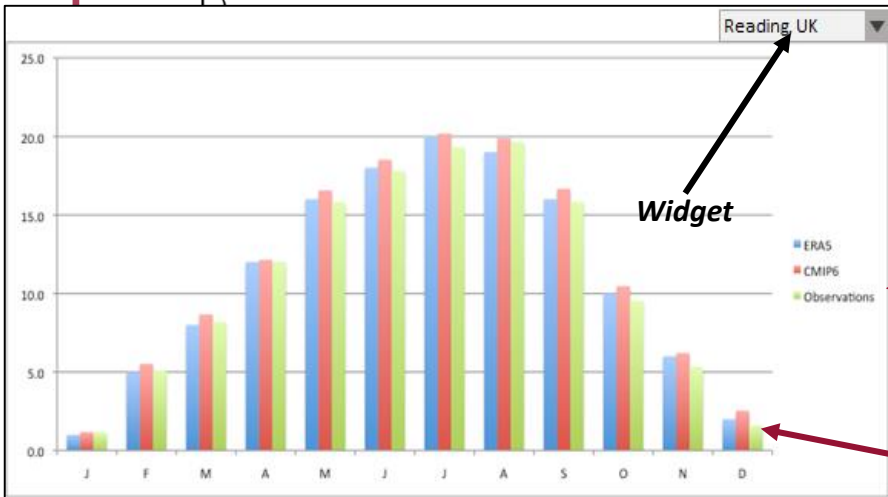
```
bar-chart(  
  monthly-average(  
    extract-point(ERA15, temperature, 51N, 1W, interpolate)  
  ),  
  monthly-average(  
    extract-point(  
      subset(CMIP6, temperature, 52N, 2W, 50N, 1W),  
      51N, 1W, interpolate),  
    monthly-average(  
      retrieve(SQL, Reading)  
    )  
  )  
)
```



Tools = Computer programs

Workflow = Scripting

Application = Control + Visual results



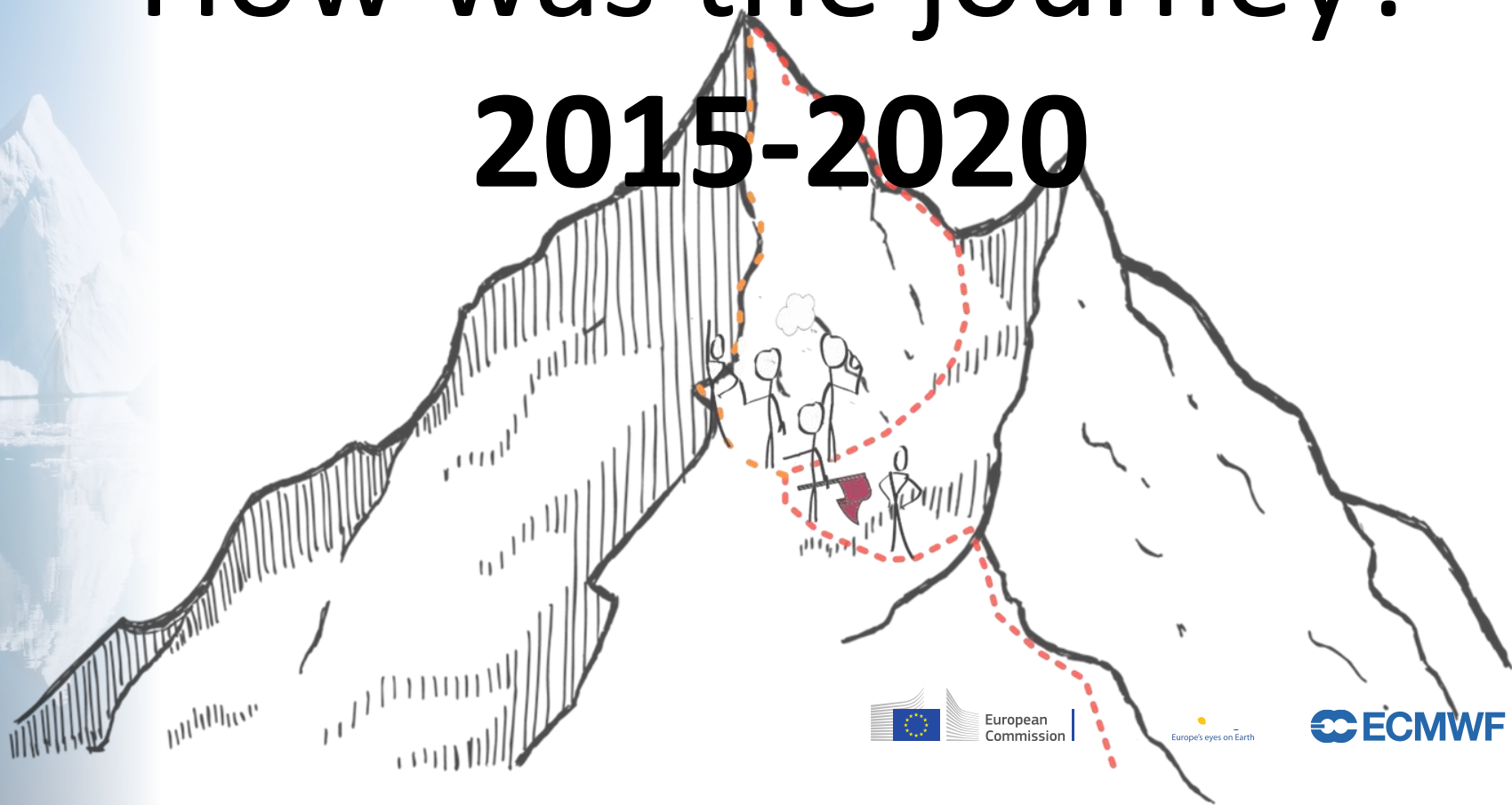
Europe's eyes on Earth



Graph combining results from several tools/sources

How was the journey?

2015-2020





Climate
Change

Vision driven... User driven...

- Make data discovery, access easy and relevant for users
- Provide scalable data access
- Provide online capabilities to process the data to users
- Provide easy-to-use online applications for users
- Enable reproducible research

► Spend less time handling the data



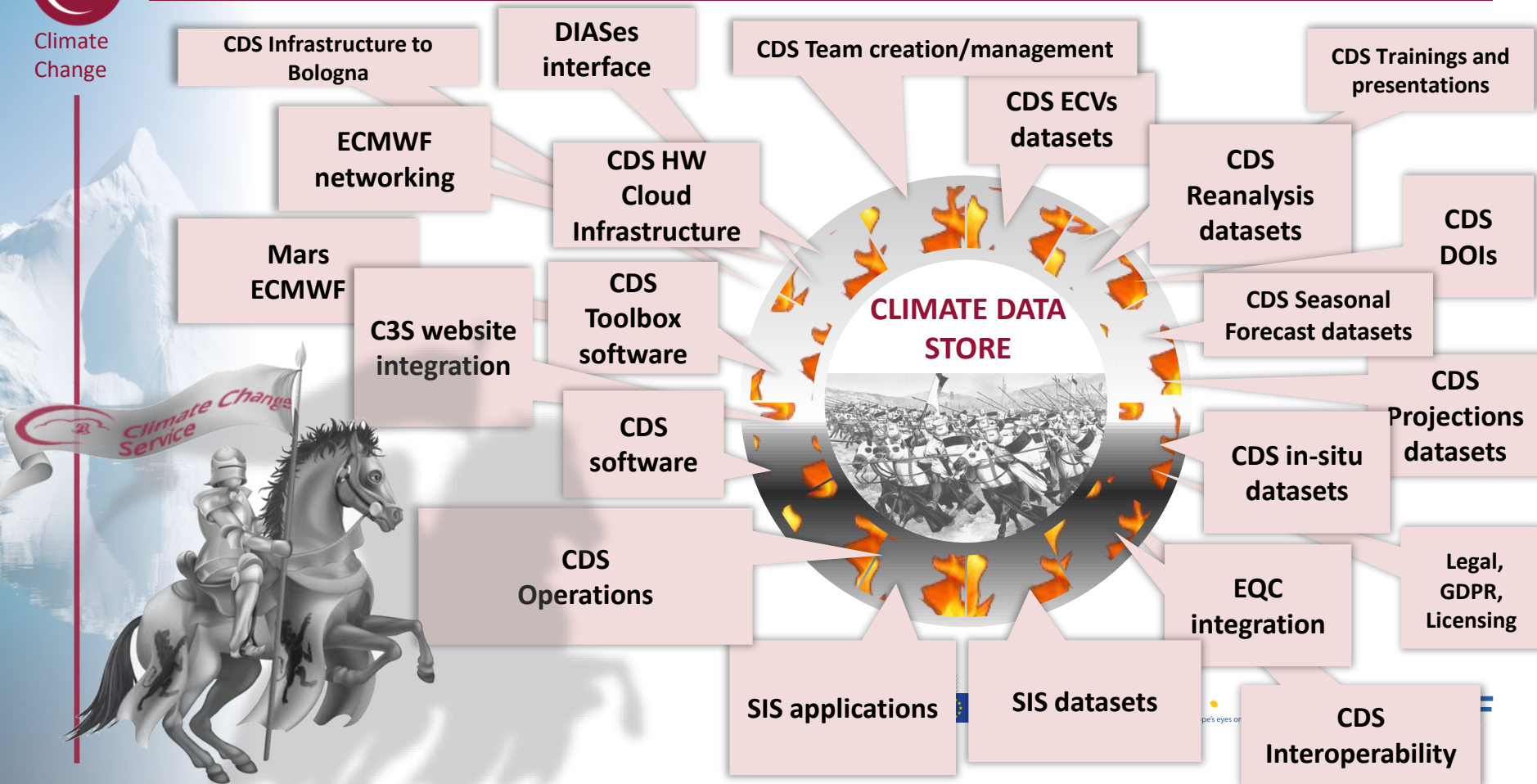
Europe's eyes on Earth





Climate
Change

... facing many battlefronts(Challenges)





Climate
Change

What has been achieved? 2020



Europe's eyes on Earth

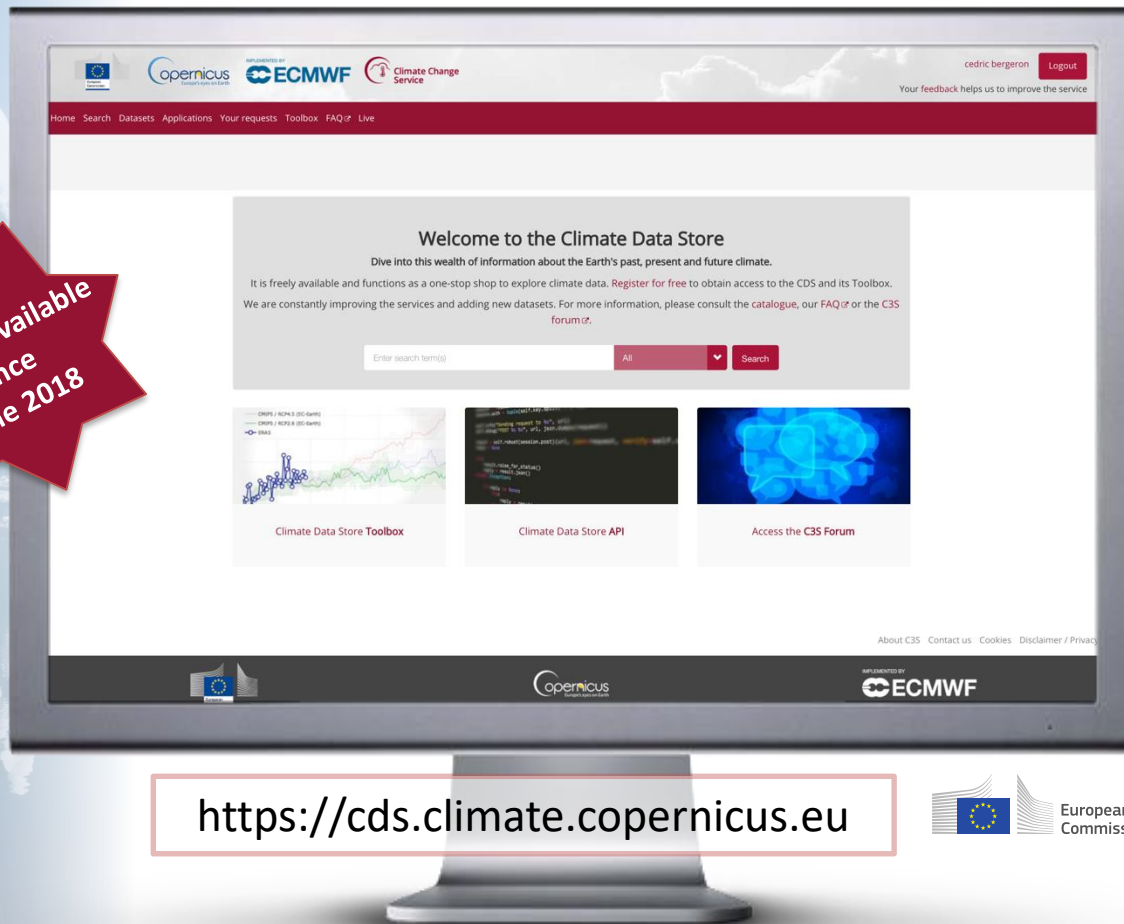




Climate
Change

The CDS has been implemented ...

Publicly available
since
June 2018



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

The **Climate Data Store** also called CDS, is an **online open and free** service.

It allows users to browse and access the wide range of climate datasets via a searchable catalogue...

... It allows users to build their own applications, maps and graphs



Europe's eyes on Earth

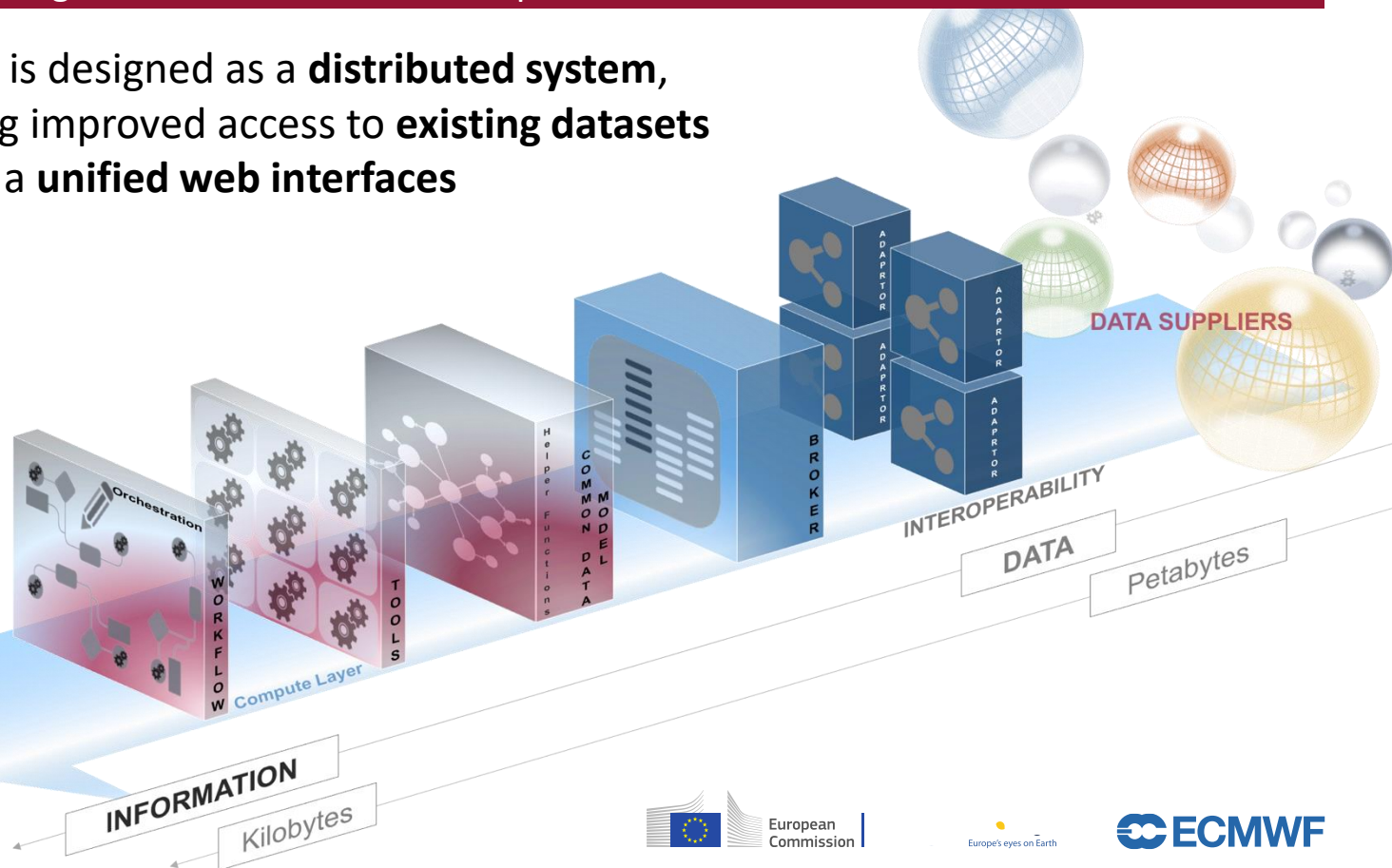




Climate
Change

... following its initial concept

The CDS is designed as a **distributed system**,
providing improved access to **existing datasets**
through a **unified web interfaces**

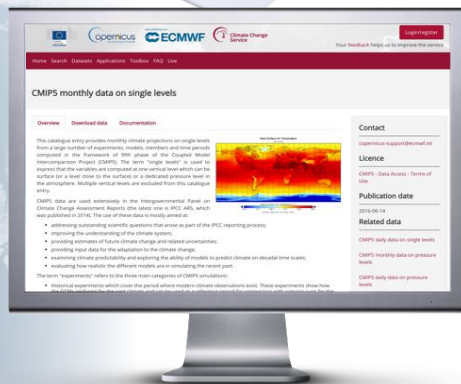




Climate
Change

... providing a FAIR data access

Distributed Data providers



Harmonised, simple, consistent and reliable online system

For Findable | Accessible | Interoperable | Reusable data



Europe's eyes on Earth





Climate
Change

... with an integrated catalogue and search engine

Home Search Datasets Applications Your requests Toolbox FAQ Live

Search results

era5

Showing 1-7 of 7 results for era5 Copernicus C3S

Relevancy	ERA5-Land monthly averaged data from 1981 to present
Title	ERA5-Land monthly averaged data from 1981 to present
Type	
Product type	
Variable domain	
Spatial coverage	
Temporal coverage	
Sector	
Explorers	
Provider	

ERA5-Land monthly averaged data from 1981 to present

ERA5-Land hourly data from 1981 to present

ERA5 monthly averaged data on pressure levels from 1979 to present

ERA5 hourly data on pressure levels from 1979 to present

ERA5 monthly averaged data on single levels from 1979 to present

ERA5 hourly data on single levels from 1979 to present

Monthly climate explorer for COVID-19

Meteorological data are from ERA5 reanalysis: hourly data on single levels and pressure levels and monthly

datasetsearch.research.google.com/search?query=era5&docid=E76Wq@F1P3U31AAAAA%3D%3D

era5

Plus de 100 ensembles de données trouvés

ERA5-Land hourly data from 1981 to present

ERA5 monthly averaged data on single levels from 1979 to present

ERA5 atmospheric reanalysis

ERA5-Land hourly data from 1981 to present

Identifiant unique

Ensemble de données mis à jour

Ensemble de données fourni par

Licence

GOSS Portal

era5

ERA5 explorer

ERA5-Land hourly data from 1981 to present

ERA5 hourly data on pressure levels from 1979 to present

Thermal comfort indices derived from ERA5 reanalysis

Interoperable





Climate
Change

... and a consistent and simple meta(data) access (1)

Download form



Sea ice monthly and daily gridded data from 1978 to present derived from satellite sensors

Overview

Overview Download data Quality assessment Documentation

This dataset provides daily values for sea ice **concentration**, sea ice **edge** and sea ice **type** and monthly values for sea ice **thickness**. These four variables are important markers for climate change studies since sea ice greatly influences the surface albedo and exchanges of energy, moisture and carbon. The sea-ice distribution, including polynyas and margins, also has an important influence on marine ecosystems. Changes in the distribution of sea ice affect these ecosystems and a number of activities such as shipping, logistic and tourist operations.

Sea ice edge, sea ice concentration and sea ice type were computed from satellite passive microwave brightness temperatures from the series of SMMR, SSM/I and SSMIS sensors. Sea ice thickness were computed from Ku-Band radar altimeter measurements collected during the Envisat and CryoSat-2 satellite missions. Ice thicknesses from Envisat satellite (October 2002 to October 2010) have less coverage and higher uncertainty than thicknesses from CryoSat-2 satellite (November 2010 - March 2015), however the combined dataset provides a valuable unique observational record of sea ice variability.

From 1978 up to April 2015 the data records provided by this dataset have sufficient length, consistency, and continuity to detect climate variability and change. From April 2015 onwards, satellite data were processed using the same algorithms and processing environment but consistency and continuity have not been extensively verified.

This dataset is produced on behalf of C3S, with the exception of sea ice concentration which is produced at the EUMETSAT Satellite Application Facility on Ocean and Sea Ice (OSI SAF).



Copyright (2015) EUMETSAT

DATA DESCRIPTION	
Data type	Gridded
Horizontal coverage	Sea ice concentration and edge: global ocean split in Northern and Southern hemisphere (Lambert EA projection). Sea ice thickness and type: northern hemisphere (Lambert EASE2 projection).
Horizontal resolution	Sea ice concentration and edge: 12.5 km grid resolution (true spatial resolution is about 40-50 km respectively). Sea ice thickness and type: 25 km grid resolution (true spatial resolution is about 1-10 km and 4 respectively).
Temporal coverage	Sea ice concentration: 1978 to present. Sea ice thickness: 2002 to present. Sea ice edge: 1979 to present. Sea ice type: 1979 to present.
Temporal resolution	Sea ice concentration, edge and type: daily (every second day in the period 1978-1987). Sea ice thickness: monthly (Arctic winter months from October - April).

Contact

copernicus-support@ecmwf.int

Licence

Licence to Use Copernicus Products
EUMETSAT OSI SAF products licence

Publication date

2018-06-14

EQC Information

Sea ice monthly and daily gridded data from 1978 to present derived from satellite sensors

Overview Download data Quality assessment Documentation

- Product user guide for sea ice thickness. (2.9M PDF)
- Product user guide for sea ice type and edge. (1.2M PDF)
- Product user guide for sea ice concentration. (487.8K PDF)

The above documents summarize the characteristics of the dataset(s) in a concise manner with focus on: space and time extent and resolution, data formats, metadata and flags, description of variables, strengths and limitations.

- Algorithm theoretical baseline document for sea ice thickness. (2.1M PDF)
- Algorithm theoretical baseline document for sea ice concentration. (489.5K PDF)
- Algorithm theoretical baseline document for sea ice type and edge. (2.9M PDF)

The above documents provide in-depth documentation on the algorithms used to derive the dataset(s).

- Product quality assessment report for sea ice thickness. (2.7M PDF)
- Product quality assessment report for sea ice concentration. (478.7K PDF)
- Product quality assessment report for sea ice type and edge. (1.1M PDF)

The above documents provide the latest report on data quality obtained according to methodologies described in the product quality assurance document.

Contact

copernicus-support@ecmwf.int

Licence

Licence to Use Copernicus Products
EUMETSAT OSI SAF products licence

Publication date

2018-06-14

Sea ice monthly and daily gridded data from 1978 to present derived from satellite sensors

Overview Download data Quality assessment Documentation

Year

At least one selection must be made

<input type="checkbox"/> 1978	<input type="checkbox"/> 1979	<input type="checkbox"/> 1980	<input type="checkbox"/> 1981	<input type="checkbox"/> 1982	<input type="checkbox"/> 1983
<input type="checkbox"/> 1984	<input type="checkbox"/> 1985	<input type="checkbox"/> 1986	<input type="checkbox"/> 1987	<input type="checkbox"/> 1988	<input type="checkbox"/> 1989
<input type="checkbox"/> 1990	<input type="checkbox"/> 1991	<input type="checkbox"/> 1992	<input type="checkbox"/> 1993	<input type="checkbox"/> 1994	<input type="checkbox"/> 1995
<input type="checkbox"/> 1996	<input type="checkbox"/> 1997	<input type="checkbox"/> 1998	<input type="checkbox"/> 1999	<input type="checkbox"/> 2000	<input type="checkbox"/> 2001
<input type="checkbox"/> 2002	<input type="checkbox"/> 2003	<input type="checkbox"/> 2004	<input type="checkbox"/> 2005	<input type="checkbox"/> 2006	<input type="checkbox"/> 2007
<input type="checkbox"/> 2008	<input type="checkbox"/> 2009	<input type="checkbox"/> 2010	<input type="checkbox"/> 2011	<input type="checkbox"/> 2012	<input type="checkbox"/> 2013
<input type="checkbox"/> 2014	<input type="checkbox"/> 2015	<input type="checkbox"/> 2016	<input type="checkbox"/> 2017	<input type="checkbox"/> 2018	<input type="checkbox"/> 2019

Select all

Month

At least one selection must be made

<input type="checkbox"/> January	<input type="checkbox"/> February	<input type="checkbox"/> March	<input type="checkbox"/> April	<input type="checkbox"/> May	<input type="checkbox"/> June
<input type="checkbox"/> July	<input type="checkbox"/> August	<input type="checkbox"/> September	<input type="checkbox"/> October	<input type="checkbox"/> November	<input type="checkbox"/> December

Select all

Variable

At least one selection must be made

<input type="checkbox"/> Sea ice concentration	<input type="checkbox"/> Sea ice edge	<input type="checkbox"/> Sea ice type	<input type="checkbox"/> Sea ice thickness
--	---------------------------------------	---------------------------------------	--

Sea ice monthly and daily gridded data from 1978 to present derived from satellite sensors

Overview Download data Quality assessment Documentation

Any inconsistency be found, please report to copernicus-support@ecmwf.int

The Evaluation and Quality Control (EQC) function of C3S. EQC encompasses a framework for the quality harmonization across all dataset types available through the C3S. During the EQC process, the data are checked for consistency and reliability.

Sea ice concentration

Variable: Sea ice concentration

Latest updated on 12/05/2020

INTRODUCTION	USER DOCUMENTATION	ACCESS	INDEPENDENT ASSESSMENT
Dataset overview	User guide	Toolbox compatibility	Data check
Sea ice and edge	Sea ice thickness, edge and type	Sea ice concentration	Expert evaluation
	Uncertainty quantification		Dataset maturity
Validation			Summary of independent assessment
Inter-comparison			

Coming very soon
(still under validation)

Europe's eyes on Earth



Documentation



Climate
Change

... and a consistent and simple meta(data) access (2)



Login/register

Your feedback helps us to improve the service

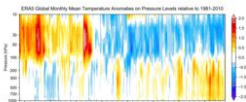
Home Search Datasets Applications Toolbox FAQ Live

ERA5 monthly averaged data on pressure levels from 1979 to present

Overview Download data Quality assessment Documentation

ERA5 is the fifth generation ECMWF reanalysis for the global climate and weather for the past 4 to 7 decades. Currently data is available from 1979. When complete, ERA5 will contain a detailed record from 1950 onwards. ERA5 replaces the ERA-Interim reanalysis.

Reanalysis combines observations into globally complete fields using the laws of physics with the method of data assimilation (4D-Var in the case of ERA5). 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 dramatically over time. They also indicate flow-dependent sensitive areas.



The native resolution of the ERA5 atmosphere and land reanalysis is 31km on a reduced Gaussian grid (T1639) and 63km (TL319) for the ensemble members. Ocean-wave products are produced at 0.36 degrees and 1 degree for the ensemble. The atmospheric component consists of 137 levels in the vertical from the surface up to 1 Pa (about 80km). This spans the troposphere, stratosphere and mesosphere. There are both analysis fields and short forecast fields that link the assimilation windows used in 4D-Var. A detailed description can be found in the online ERA5 documentation. The full data set resides in the MARS tape archive.

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

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 two main sub sets: data on pressure levels and data on single levels. The data on pressure levels contain 16 atmospheric quantities on 37 pressure levels from 1,000 hPa (surface) to 1 hPa (around the top of the stratosphere). Single-level data are available for a number of atmospheric, ocean-wave and land surface quantities.

Data is available on their hourly (three-hourly) resolution. To facilitate many climate applications, monthly-mean averages have been pre-calculated as well. Though, no monthly means are available for ensemble mean and spread.

Monthly mean updates are available about 3 days after the end of the month. Initial release date, i.e. data no more than three months behind real time, is called ERA5T. In the event that serious flaws are detected in ERA5T, this data could be different to the final ERA5 data. In practice, though, this will be very unlikely to occur. Based on experience with the production of ERA5 so far (and ERA-Interim in the past), our expectation is that such an event would not occur more than once every few years, if at all. In the unlikely event that such a correction is required, users will be notified as soon as possible.

The record in this page links to the "ERA5 monthly averaged data on pressure levels".

DATA DESCRIPTION	
Data type	Gridded
Horizontal coverage	Global
Horizontal resolution	Reanalysis: 0.25°x0.25° Ensemble members: 0.5°x0.5°
Vertical coverage	1000 hPa to 1 hPa
Vertical resolution	37 pressure levels
Temporal coverage	1979 to present
Temporal resolution	Hourly

Download form

ERA5 monthly averaged data on pressure levels from 1979 to present

Overview Download data Quality assessment Documentation

Product type

At least one selection must be made

☐ Monthly averaged reanalysis

☐ Monthly averaged ensemble members

☐ Monthly averaged reanalysis by hour of day

☐ Monthly averaged ensemble members by hour of day

Select all

Variable

At least one selection must be made

☐ Divergence

☐ Geopotential

☐ Potential vorticity

☐ Specific cloud ice water content

☐ Specific humidity

☐ Specific snow water content

☐ Ice component of wind

☐ Vertical velocity

☐ Fraction of cloud cover

☐ Ocean mass mixing ratio

☐ Relative humidity

☐ Specific cloud liquid water content

☐ Specific rain water content

☐ Temperature

☐ Vorticity (relative)

Select all

Pressure level

At least one selection must be made

☐ 1 hPa

☐ 2 hPa

☐ 3 hPa

☐ 5 hPa

☐ 7 hPa

☐ 10 hPa

☐ 101 hPa

☐ 1015 hPa

Select all

Contact
copernicus-support@ecmwf.int
Licence
Licence to Use Copernicus Products
Publication date
2019-04-18

Overview

Contact

copernicus-support@ecmwf.int

Licence

Licence to Use Copernicus Products

Publication date

2019-04-18

EQC Information

ERA5 monthly averaged data on pressure levels from 1979 to present

Overview Download data Quality assessment Documentation

This is a new feature, work in progress. Should any inconsistency be found, please report to copernicus-support@ecmwf.int

The EQC encompasses a new reanalysis and Quality Control (QC) function of CIS. EQC encompasses a specific quality harmonized across all dataset types available through the CIS. The dataset is scrutinized and data are checked for usability and reliability.

Fraction of cloud cover

Geopotential

Ocean mass mixing ratio

Potential vorticity

Relative humidity

Specific cloud ice water content

Specific cloud liquid water content

Specific humidity

Specific rain water content

Select all

Coming very soon
(still under validation)

EQC Contact us Cookies Disclaimer Privacy

ERA5 monthly averaged data on pressure levels from 1979 to present

Overview Download data Quality assessment Documentation

• ERA5 reference?

Reference for the ERA5 reanalysis.

• ERA5 data documentation?

Detailed information relating to the ERA5 data archive can be found in the web link above.

Contact
copernicus-support@ecmwf.int
Licence
Licence to Use Copernicus Products
Publication date
2019-04-18

Documentation



Climate
Change

... with a robust CDS API access

<input type="checkbox"/> 07	<input type="checkbox"/> 08	<input checked="" type="checkbox"/> 09
<input type="checkbox"/> 13	<input type="checkbox"/> 14	<input type="checkbox"/> 15
<input type="checkbox"/> 19	<input type="checkbox"/> 20	<input type="checkbox"/> 21
<input type="checkbox"/> 25	<input type="checkbox"/> 26	<input type="checkbox"/> 27
<input type="checkbox"/> 31		

Format ?

☒ Zip file (.zip)

Terms of use

☒ GHG-CCI Licence

[View terms](#)

Hide API request

Show Toolbox request

Please go to [the documentation page](#) for information on how to use the API.

```
import cdsapi

c = cdsapi.Client()

c.retrieve(
    'satellite-methane',
    {
        'format': 'zip',
        'processing_level': 'level_2',
        'variable': 'xch4',
        'sensor_and_algorithm': 'sciamachy_wfmd',
        'year': '2004',
        'month': '03',
        'day': '09'
    },
    'download.zip')
```

```
import cdsapi

c = cdsapi.Client()

c.retrieve(
    'satellite-methane',
    {
        'format': 'zip',
        'processing_level': 'level_2',
        'variable': 'xch4',
        'sensor_and_algorithm': 'sciamachy_wfmd',
        'year': '2004',
        'month': '03',
        'day': '09'
    },
    'download.zip')
```

pip install cdsapi



<https://cds.climate.copernicus.eu/api-how-to>



Climate
Change

... with providers visibility (new)

Home Search Datasets Applications Toolbox FAQ Live

Search results

Showing 1-3 of 3 results for **EUMETSAT SAF**

EUMETSAT Satellite Application Facilities
Utilising specialist expertise from the EUMETSAT Member States, Satellite Application Facilities (SAFs) are dedicated centres of excellence for processing satellite data. They form an integral part of...

Sea ice monthly and daily gridded data from 1978 to present derived from satellite sensors
This dataset provides daily values for sea ice concentration, sea ice edge and sea ice type and monthly values for sea ice thickness. These four variables are important markers for climate change stud...

Surface radiation budget from 1982 to 2015 derived from satellite observations
This catalogue entry provides a single entry for surface radiation budget variables derived from satellite observations. The radiation at the Earth's surface in the solar wavelength range is an Essen...

Sort by: Relevancy
Title
Type

Product type
Satellite observations (3)

Variable domain
Atmosphere (surface) (2)
Ocean (physics) (1)

Spatial coverage
Global (3)

Temporal coverage
Past (3)

Provider
Copernicus C3S (66)
Copernicus CEMS (5)
ESA CCI (2)
EUMETSAT SAF (3)

About C3S Contact us Cookies Disclaimer / Privacy

Search per ECV
providers

Clear multi-source
ECV datasets

Home Search Datasets Applications Toolbox FAQ Live

Surface radiation budget from 1982 to 2015 derived from satellite observations

Warning: This product is under development, this page may contain misleading information

Overview Download data Documentation

Variable

☐ C3S
☐ ESA Cloud CO
☒ CM SAF

☒ Surface incoming shortwave radiation flux
☐ Surface incoming longwave radiation flux
☐ Surface downwelling longwave radiation flux

Time aggregation
☐ Monthly mean
☒ Daily mean

Contact
copernicus-support@ecmwf.eu

Licence
EUMETSAT CM SAF products licence
Licence to Use Copernicus Products

Publication date
2020-02-01

Providers
visibility and
mapping

Home Search Datasets Applications Toolbox FAQ Live

EUMETSAT Satellite Application Facilities

Overview

Utilising specialist expertise from the EUMETSAT Member States, Satellite Application Facilities (SAFs) are dedicated centres of excellence for processing satellite data. They form an integral part of the distributed EUMETSAT Application Ground Segment.

The eight EUMETSAT SAFs provide users with operational data and software products, each one for a dedicated user community and application area.

EUMETSAT Secretariat supervises and coordinates the overall activities of the SAF network, ensuring that the SAFs in operations are providing reliable and timely operational services related to the meteorological and environmental issues.

The SAF Network manages and coordinates interfaces between the SAFs themselves and between SAFs and other EUMETSAT systems, overseeing the integration and operations of SAFs into the overall ground segment infrastructure. During this process EUMETSAT ensures that services are delivered in the most reliable and cost-effective way.

For more information, please refer to the EUMETSAT SAFs website or each of the SAF Projects listed in the following table.

Brokered SAF datasets to C3S:

SAF project	SAF contact	Data source	Spatial coverage	Spatial resolution	TCDR	KCDR	Temporal resolution	Instrument	Variables	License	SAF DOI	CDS Catalogue
CM SAF	contact.cmsaf@dwd.de	CM SAF CLARA-A2	Global	0.25°	01/1982-12/2018		Monthly (Daily for individual variables)	AVHRR	- Surface downwelling shortwave flux - Surface upwelling shortwave flux	link		link (Please select C3S SAF products)
OSI SAF	osi.saf.prod@met.no		Global	12.5km	01/1978-12/2015	01/2016-01/2020	Monthly (Daily for individual variables)	SAMX10, AMSR1 and SSMIS	- Sea ice concentration	link		link (Please select C3S SAF products)

Record updated 2020-02-10 18:06:15 UTC

About C3S Contact us Cookies Disclaimer / Privacy



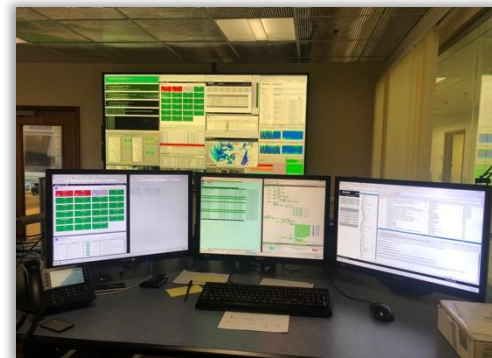
Europe's eyes on Earth





Climate
Change

... in an highly Operational infrastructure

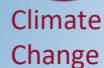


On-Premises Private Cloud

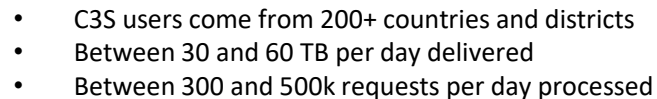
72+ nodes, 4000+ CPUs, 13TB RAM

3.9 PB usable (of which 380TB SSD)

Monitoring
Capacity building
backups



Registered users
45 531



So far in Q2 2020:

- 12,403 active users
- 3,081 TB data delivered



Climate
Change

... providing a toolbox

Distributed Data providers



Online capabilities to process the data
and develop applications



Europe's eyes on Earth





Climate
Change

... with a workflow editor

The screenshot shows the CDS Toolbox editor interface. At the top, there are logos for the European Union, Copernicus, ECMWF, and the Climate Change Service. The user is logged in as 'cedric.bergeron'. The interface includes a navigation bar with links like Home, Search, Datasets, Applications, Your requests, Toolbox, FAQ, and Live. The main area is divided into three panels: a left sidebar with a 'Toolbox Editor' and a list of applications, a central code editor, and a right panel showing the output of the script. The code in the editor is a Python script that imports 'cdstoolbox as ct', sets an application title to 'Hello World!', and uses 'ct.catalogue.retrieve()' to fetch 2m temperature data for a specific location and time. The output panel shows a world map with a color scale for temperature and the text 'Hello World! 01 January 2017'.

CDS Toolbox editor

This screenshot shows the CDS Toolbox editor with a more complex Python script. The script imports 'cdstoolbox as ct' and defines a function 'def temp_cumsum(year)'. It uses 'ct.catalogue.retrieve()' to get 2m temperature data for the Chateau de Rouillac, Pessac-Leognan region. The script then calculates the Growing Degree Days (GDD) for the year 2017, where GDD is defined as the sum of positive temperature anomalies above 10°C. The output panel displays a line graph titled 'Growing degree days (>10) for the Chateau de Rouillac, Pessac-Leognan'. The graph shows the cumulative GDD over the course of the year, starting at zero and rising to approximately 2500 by the end of the year.

Python based
workflows

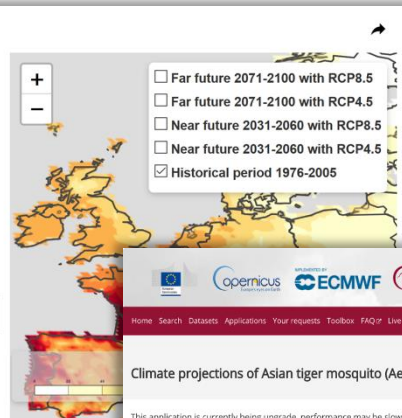




Climate
Change

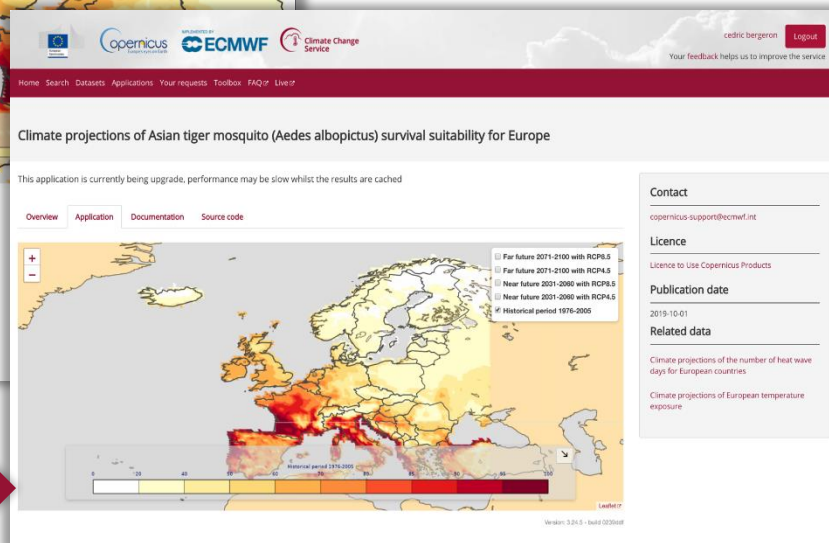
... transforming workflows into public applications

```
> Vectors3-Livemap Console History Your queue
Layout Copy Save Run
128
129
130
131
132 @ct.application(title='', layout={'output_align':'bottom'}) #, fullscreen=True)
133
134 @ct.output.livemap(click_on_feature=region_timeseries)
135
136 def retrieve_app():
137     # load data
138     datas = [ct.catalogue.retrieve('sis-health-vector',
139                                   {'variable':'suitability',
140                                    'experiment':Scenario.lower().replace('.', '_'),
141                                    'ensemble_statistics':'ensemble_members_average',
142                                   })
143             for Scenario in scenarios ]
144
145     # Fetch land sea mask from Temperature statistics data,
146     # this will be replaced with a direct livemaps land sea mask when available
147     SL_req = ['sis-temperature-statistics',
148              {'variable':'average_temperature',
149               'period':'year',
150               'statistics':'time_average',
151               'experiment':'rcp4_5',
152               'ensemble_statistics':'ensemble_members_average'}]
153     sea_land_mask = ct.catalogue.retrieve(*SL_req)
154
155
156     sea_land_mask = ct.cube.select(sea_land_mask, extent= [-25, 40, 34, 72])
157     mask = sea_land_mask > 0
```



CDS Toolbox editor

CDS Catalogued
public application



Embedded application
in a third party website

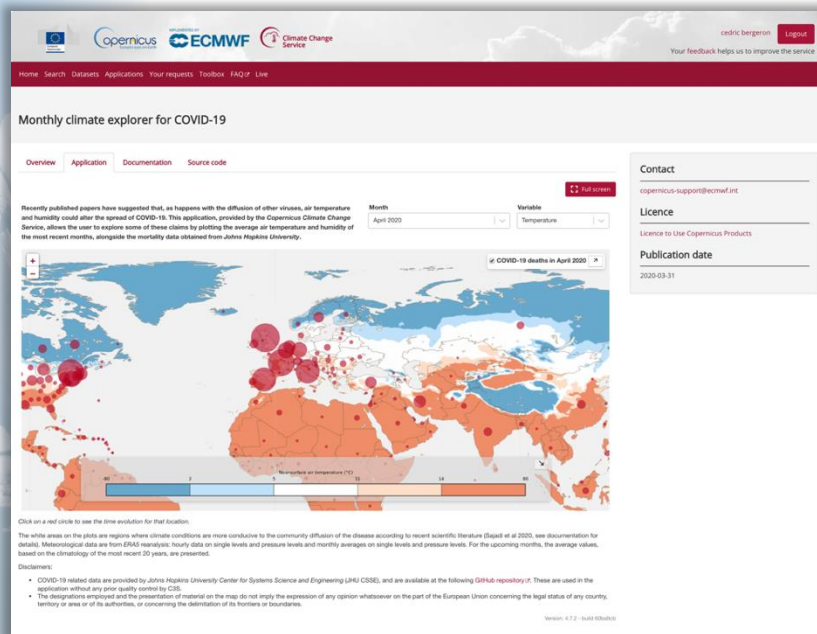




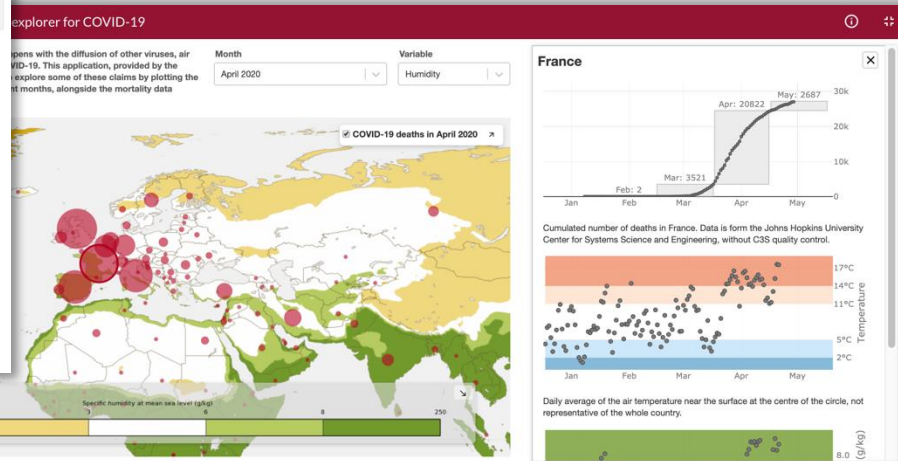
Climate
Change

... transforming workflows into public applications

Fast Toolbox application development in the COVID-19 crisis context



Improved visualisation tools and caching system
(for a very fast response time)



Copernicus

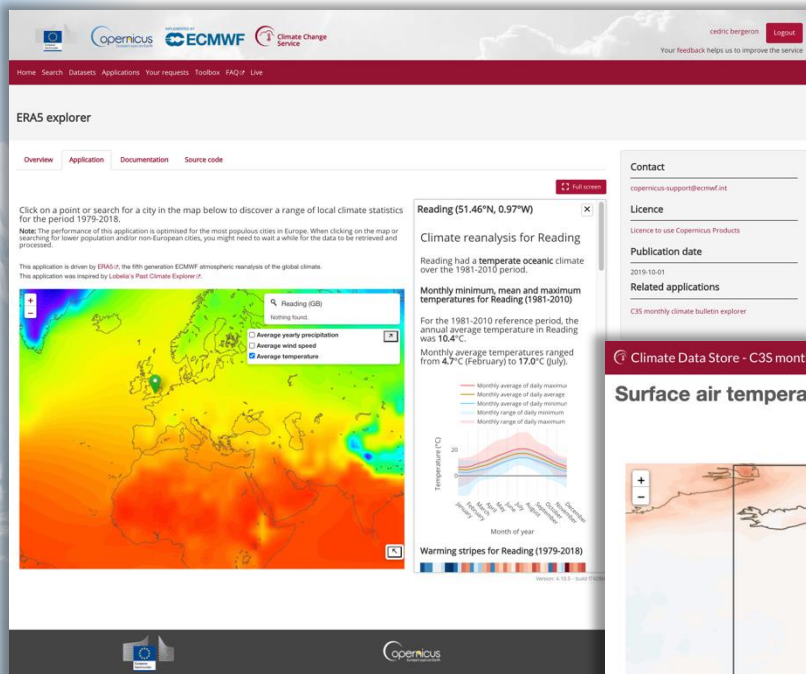
IMPLEMENTED BY
ECMWF

Version: 4.7.2 - build 60460



Climate
Change

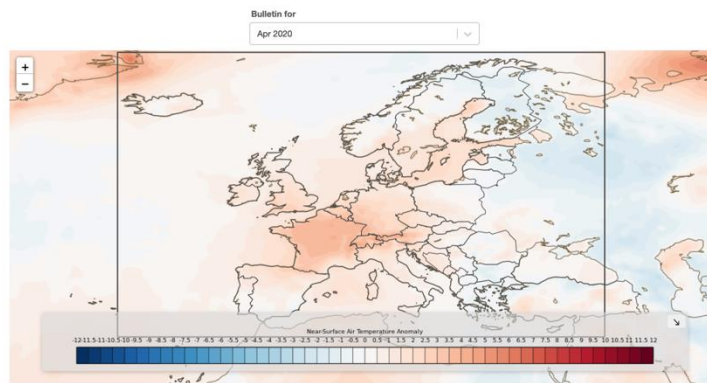
... transforming workflows into public applications



Datasets explorers

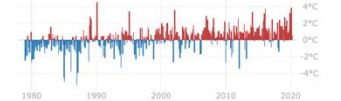
Climate Data Store - C35 monthly climate bulletin explorer

Surface air temperature anomalies relative to 1981-2010

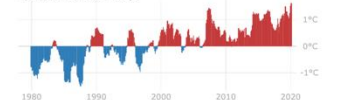


Europe

Monthly anomalies - Europe



12-month anomalies - Europe



Europe surface air temperature anomalies relative to the 1981-2010 average, from Jan 1979 to Apr 2020. The first graph shows the mean anomalies for every month and the second graph shows the running 12-month averages. Data source: ERA5. Credit: Copernicus Climate Change Service/ECMWF.

Version: 4.10.5 - build 174284

About CDS Contact us Cookies Disclaimer Privacy



Copernicus
Climate Change Service

ECMWF



Climate
Change

... with a better documentation

CDS Toolbox documentation - Welcome to the CDS Toolbox documentation

Welcome to the CDS Toolbox documentation

The Climate Data Store (CDS) Toolbox is the path to a wealth of past and future climate information. Free and available to everyone, the Toolbox links raw data to online computing power through a programming interface. In your own online workspace you can create applications in Python (a programming language) and run them on the CDS servers, allowing you to retrieve the data you are interested in, make the calculations you require and display the results in the format that suits your needs. You can download graphs, maps and data, and also share your online creations with other users.

The Toolbox is aimed at a wide range of users, from amateur climate enthusiasts through to students, researchers and software developers. To make use of the Toolbox, you will need a basic working knowledge of Python and access to the internet. You will not need a particularly powerful computer or a lot of storage, as the calculations and the data processing take place online within the CDS.

Getting started with your own applications

Applications can range from a simple graph of annual average temperatures in your home town to a programme for predicting the positions of future shipping lanes in the Arctic. As you grow more confident with the Toolbox, you will be able to build increasingly sophisticated workflows to answer your climate questions and further your research.

The CDS Toolbox Documentation is the key to getting you up to speed. With tutorials, guides and a gallery of applications, the learning material will give you the essential skills for interacting with the data store. Below is an example of a typical application that a new user might produce. It has a drop-down menu to select the year of interest, and provides an output in the form of a download link to a dataset processed with the Toolbox. Underneath the output you can see the associated Python script, and you can open the complete application in the Toolbox [here](#).

Mean daily temperature - Europe (0.25° x 0.25°)

Choose a year and click the link below to download the processed data.

Year:

[Download processed data \(see also CDS Toolbox documentation\)](#)

Export worksheets as csv

```

def get_data(year):
    """Get the mean daily temperature for Europe (0.25° x 0.25°) for a given year.
    The data is returned as a list of lists, where each inner list represents a day.
    The first element of each inner list is the date, and the second element is the temperature in Celsius.
    The data is returned as a list of lists, where each inner list represents a day.
    The first element of each inner list is the date, and the second element is the temperature in Celsius.
    """
    # Get the data from the CDS
    data = cds.api.get('reanalysis/era5/temperature/2m_mean/0.25/0.25/1950-2020')
    # Filter the data for the selected year
    data = data.sel(year=year)
    # Convert the data to a list of lists
    data_list = []
    for day in data.days:
        date = day.strftime('%Y-%m-%d')
        temp = data[day].to_numpy().flatten().tolist()
        data_list.append([date, temp])
    return data_list

```

CDS Toolbox documentation - How-to guides

How-to guides

Toolbox user interface

- Changing the layout of the Toolbox Editor
- Reading and interpreting documentation descriptions
- Sharing an application
- Tagging revisions and restoring an old version of your code

Retrieve data

- Retrieving data
- Retrieving time series and extracting point information
- Using output widgets

Process data

- Using mathematical operations and unit conversion (to be published)
- Calculating climatologies and anomalies (to be published)
- Resampling and aggregate data (to be published)
- About the common data model (to be published)
- Selecting and filtering data (to be published)

Magics contour plot

Plot data

An easier and teaching CDS Toolbox documentation

CDS Toolbox documentation - Tutorials

Tutorials

Tutorial 1 - Getting started with the CDS Toolbox

This introductory tutorial gives an overview of the CDS Toolbox for new users. It provides a comprehensive tour of the Toolbox Editor, and includes exercises on creating, copying and running simple applications.

Tutorial 2 - Set up a CDS Toolbox application

This tutorial describes the standard structure of a Toolbox workflow. Both mandatory and optional building blocks are covered, and there are also tips on effective application development.

Tutorial 3 - Create a climate graph application

Using the example of a climate graph, this tutorial shows the step-by-step process of building an application. The entire Python script is covered, from data retrieval and data processing, through to defining a location and producing a multi-panel chart.

CDS Toolbox documentation - Application gallery

Application gallery

The application gallery shows a variety of examples of applications created using the CDS Toolbox. These include time series plots, maps, and contour plots, demonstrating the range of data and visualizations that can be generated.

<https://cds.climate.copernicus.eu/toolbox/doc/index.html>

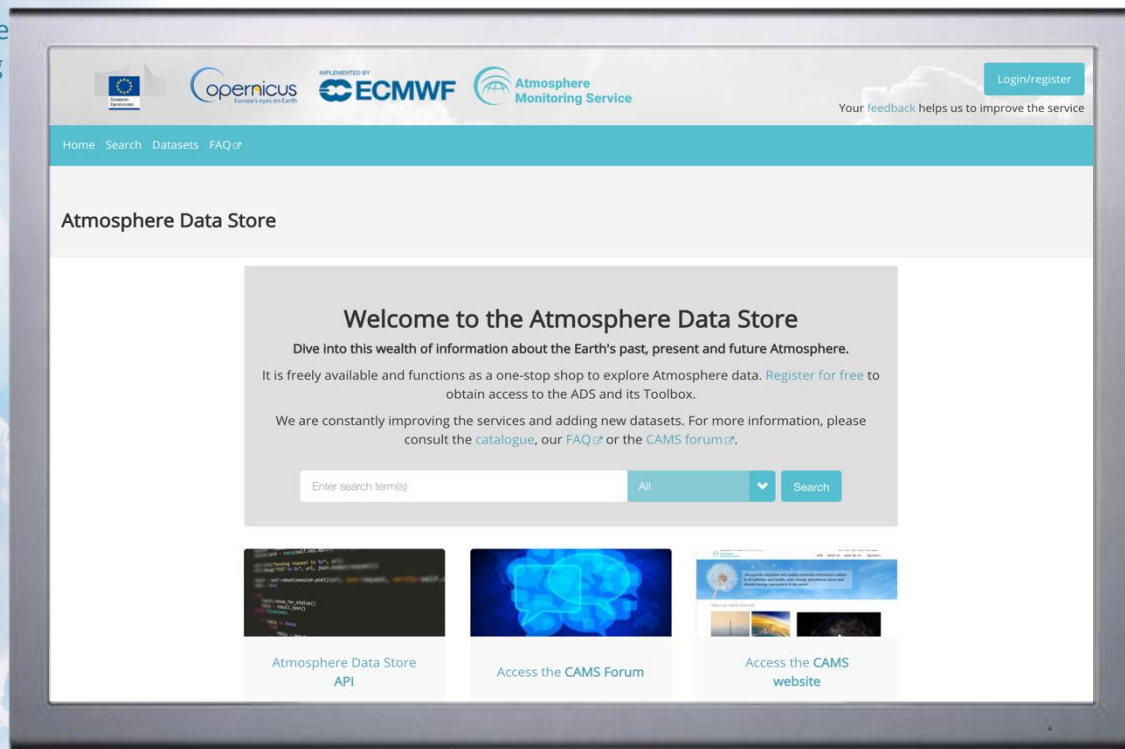


Atmosphere
Monitoring

The ADS has been implemented ... (1)

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

It uses the Climate Data Store technology and infrastructure



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





The ADS has been implemented ... (2)

The screenshot displays the ADS search results page. At the top, there are logos for the European Commission, Copernicus, and ECMWF, along with the text 'Atmosphere Monitoring Service' and a 'Login/register' button. Below the header, a navigation bar contains 'Home', 'Search', 'Datasets', and 'FAQ'. The main content area is titled 'Search results' and features a search bar with the text 'Search dataset'. To the left of the search results, there are filters for 'Sort by' (Relevancy, Title) and 'Variable domain' (Variable domain, Parameter family, Spatial coverage, Product type, Temporal coverage). The search results list several datasets, each with a 'CAMS' icon and a title. The datasets listed are: 'CAMS global reanalysis (EAC4)', 'CAMS global reanalysis (EAC4) monthly averaged fields', 'CAMS global inversion-optimised greenhouse gas fluxes and concentrations', 'CAMS solar radiation time-series', and 'CAMS European air quality forecasts'. Each dataset entry includes a brief description. At the bottom of the page, there are links for 'About CAMS', 'Contact us', 'Cookies', and 'Disclaimer / Privacy'.

In the current Beta version, data access is available to the Global Reanalysis, the Regional Analyses and Forecasts, the Solar Radiation Service, and the Inversion-optimised Greenhouse Gas Fluxes



The ADS has been implemented ... (3)

Home Search Datasets FAQ

CAMS global reanalysis (EAC4)

Overview Download data Documentation

Overview

EAC4 (ECMWF Atmospheric Composition Reanalysis 4) is the fourth generation ECMWF global reanalysis of atmospheric composition. Reanalysis combines model data with observations from across the world into a globally complete and consistent dataset using a model of the atmosphere based on the laws of physics and chemistry. This principle, called data assimilation, is based on the method used by numerical weather prediction centres and air quality forecasting centres, where every so many 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 to allow for the provision of a dataset spanning back more than a decade. 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.

The assimilation system is able to estimate biases between observations and to sift good-quality data from poor data. The atmosphere model allows for estimates at locations where data coverage is low or for atmospheric pollutants for which no direct observations are available. The provision of estimates at each grid point around the globe for each regular output time, over a long period, always using the same format, makes reanalysis a very convenient and popular dataset to work with.

The observing system has changed drastically over time, and although the assimilation system can resolve data holes, the initially much sparser networks will lead to less accurate estimates. For this reason, EAC4 is only available from 2003 onwards.

Although the analysis procedure considers chunks of data in a window of 12 hours in one go, EAC4 provides estimates every 3 hours, worldwide. This is made possible by the 4D-Var assimilation method, which takes account of the exact timing of the observations and model evolution within the assimilation window.

More details about the products are given in the Documentation section.

DATA DESCRIPTION	
Data type	Gridded
Horizontal coverage	Global
Horizontal resolution	0.75°x0.75°
Vertical coverage	Total column, model levels 1 - 60, pressure levels 1000, 950, 925, 900, 850, 800, 700, 600, 500, 400, 300, 250, 200, 150, 100, 70, 50, 30, 20, 10, 7.5, 5, 3, 2, 1 hPa
Temporal coverage	2003 to 2019
Temporal resolution	3-hourly
File format	GRIB, NetCDF

MAIN VARIABLES	
Name	Units
10m u-component of wind	m s ⁻¹
10m v-component of wind	m s ⁻¹
2m dewpoint temperature	K
2m temperature	K
Acetone	kg kg ⁻¹
Acetone product	kg kg ⁻¹
Aldehydes	kg kg ⁻¹
Amine	kg kg ⁻¹
Ammonia	kg kg ⁻¹
Ammonium	kg kg ⁻¹

Contact: copernicus-support@ecmwf.int

Licence: Licence to use Copernicus Products

Publication date: 2020-02-06

CAMS global reanalysis (EAC4)

Overview Download data Documentation

Download form

Fast vs slow data

PLEASE NOTE: any data labelled as "slow-access" is stored on tape instead of disk. Retrieval of this data will be MUCH SLOWER than disk-resident data. You should not select any tape-resident data unless absolutely required for your purposes.

Surface data

To obtain surface values of three dimensional (multi-level) variables, select the variable required and model level 60.

Variable

At least one selection must be made

Fast-access main variables (single-level)

<input type="checkbox"/> 10m u-component of wind	<input type="checkbox"/> 10m v-component of wind
<input type="checkbox"/> 2m dewpoint temperature	<input type="checkbox"/> 2m temperature
<input type="checkbox"/> Black carbon aerosol optical depth at 550 nm	<input type="checkbox"/> Dust aerosol optical depth at 550 nm
<input type="checkbox"/> Land-sea mask	<input type="checkbox"/> Mean sea level pressure
<input type="checkbox"/> Organic matter aerosol optical depth at 550 nm	<input type="checkbox"/> Particulate matter d < 1 µm
<input type="checkbox"/> Particulate matter d < 2.5 µm	<input type="checkbox"/> Particulate matter d < 10 µm
<input type="checkbox"/> Sea salt aerosol optical depth at 550 nm	<input type="checkbox"/> Sulphate aerosol optical depth at 550 nm
<input type="checkbox"/> Surface Geopotential	<input type="checkbox"/> Total aerosol optical depth at 469 nm
<input type="checkbox"/> Total aerosol optical depth at 469 nm	<input type="checkbox"/> Total aerosol optical depth at 550 nm
<input type="checkbox"/> Total aerosol optical depth at 675 nm	<input type="checkbox"/> Total aerosol optical depth at 870 nm
<input type="checkbox"/> Total column carbon monoxide	<input type="checkbox"/> Total column formaldehyde
<input type="checkbox"/> Total column hydroxyl radical	<input type="checkbox"/> Total column nitric acid
<input type="checkbox"/> Total column nitrogen dioxide	<input type="checkbox"/> Total column nitrogen monoxide
<input type="checkbox"/> Total column peroxyacetyl nitrate	<input type="checkbox"/> Total column sulphur dioxide

CAMS global reanalysis (EAC4)

Overview Download data Documentation

- CAMS Reanalysis data documentation
- Overall description of CAMS Reanalysis dataset.
- Known issues
- Information about known issues found within the CAMS global reanalysis dataset
- Evaluation and quality assurance (EQA) reports
- Detailed validation reports
- Data citation

Inness et al. (2019), <http://www.atmos-chem-phys.net/19/3515/2019/>

Contact: copernicus-support@ecmwf.int

Licence: Licence to use Copernicus Products

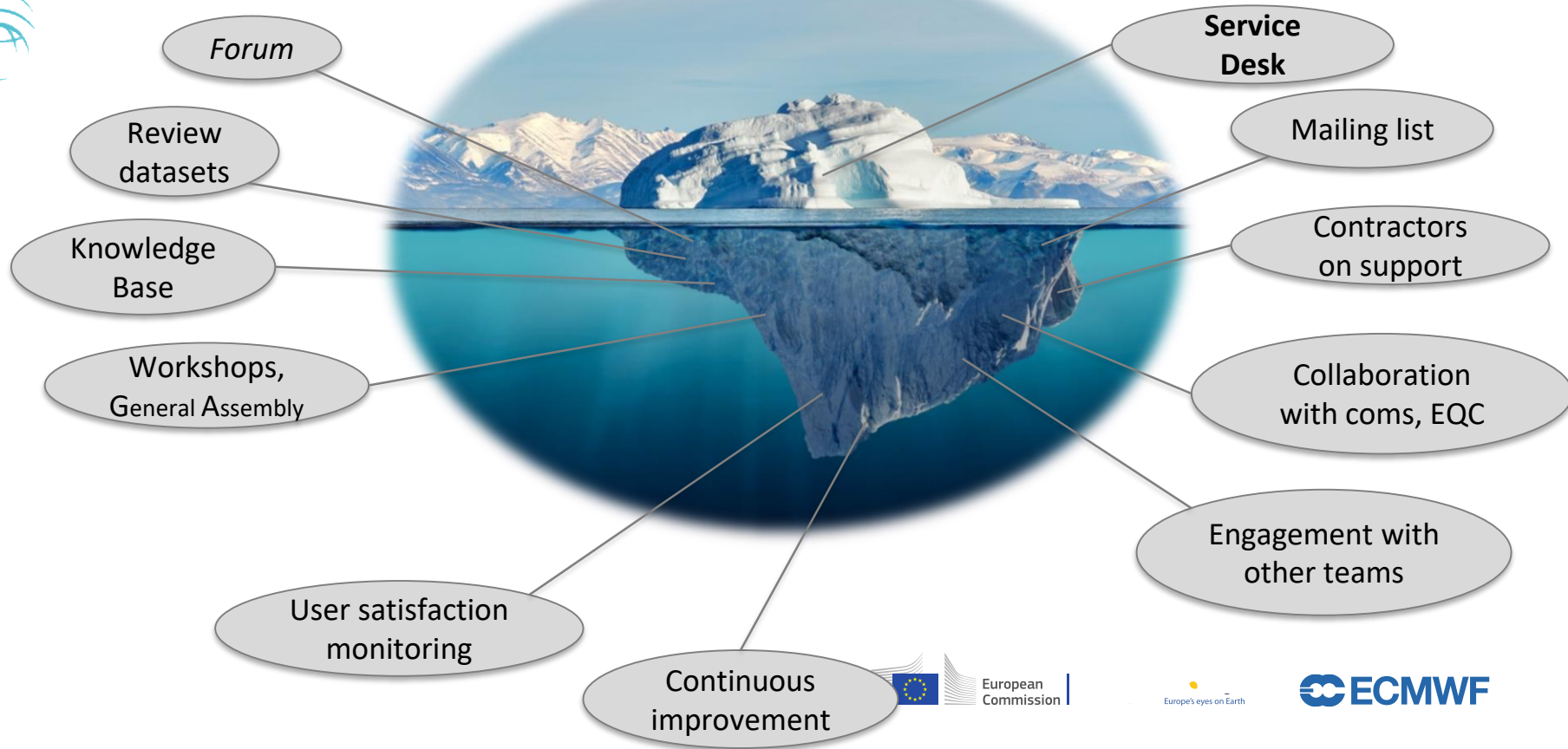
Publication date: 2020-02-06

About CAMS Contact us Cookies Disclaimer / Privacy

Documentation



... both services taking benefits of The ECMWF
Copernicus user support





... both services taking benefits of The ECMWF
Copernicus user support

Service Desk

2,873 C3S tickets
(+3% against Jun 18 - May 19)

Knowledge Base

363,213 hits (~90% C3S, +43%
against Jun 18 – May 19)

User support in numbers (Jun19-May20)

Forum (opened in May 19)
31,046 hits (~90% C3S)

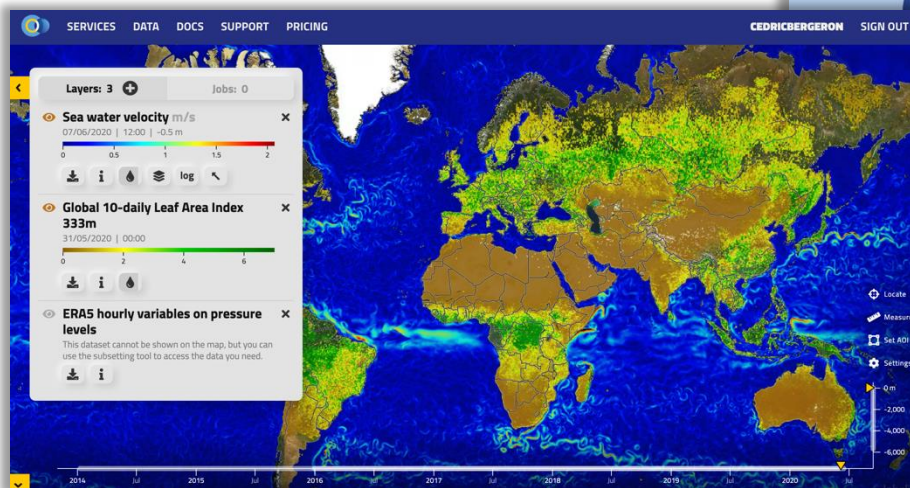
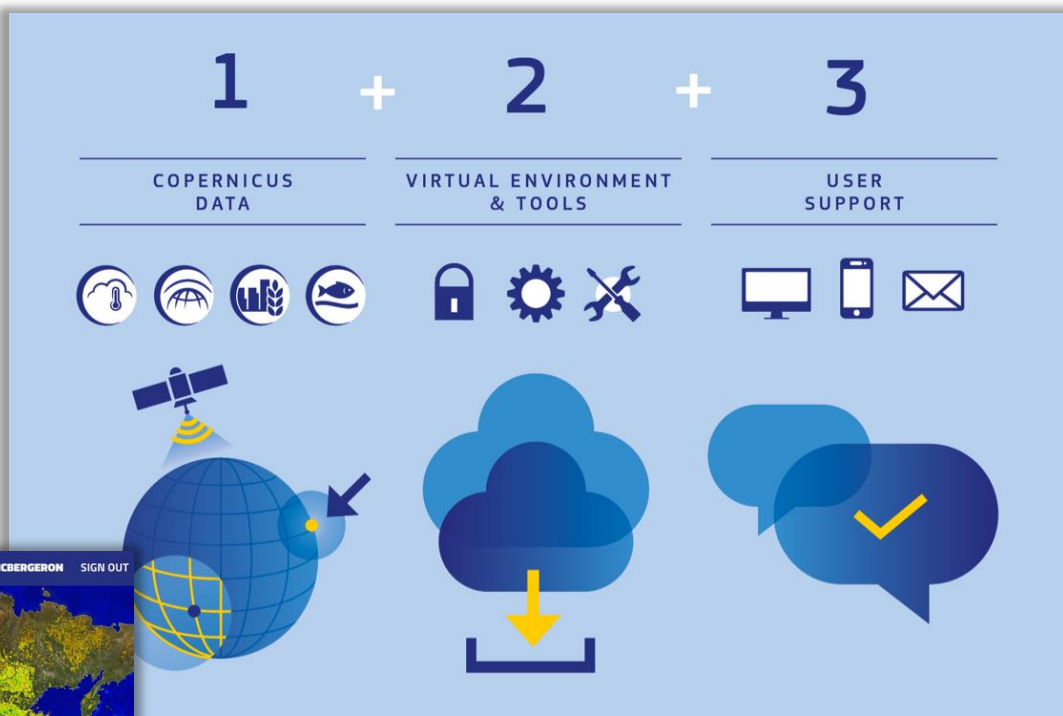
User Satisfaction
95% satisfied

The CDS/ADS and WEkEO





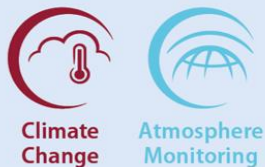
EUMETSAT, ECMWF and MERCATOR Océan have jointly developed the **WEkEO** Data Information and Access Service (DIAS) to provide fast and easy online access to Copernicus data and products.





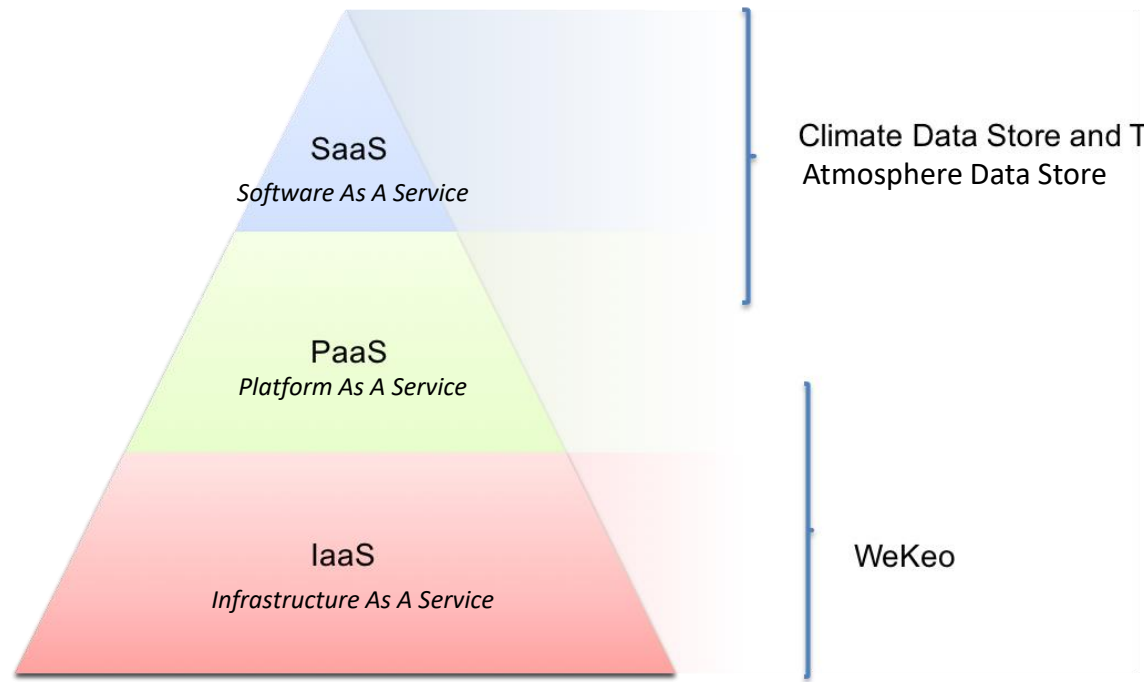
WEkEO , the Copernicus DIAS Service

WEkEO is being developed in a stepwise approach, minimising the risks, capitalising on user feedback and strongly involving industry through procurement





WEkEO , the Copernicus DIAS Service



Climate Data Store and Toolbox
Atmosphere Data Store

WeKeo





Climate
Change

What next?





Climate
Change

... finishing Cop 1.0 and then Cop 2.0



kubernetes

Enhanced continuity

More datasets
More applications
More tools
More efficient
...



Offline Toolbox



Europe's eyes on Earth





Climate
Change

Thank you

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

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

<https://wekeo.eu>

