The Copernicus Climate Data Store:

Climate Data and Tools

Eddy Comyn-Platt e.comyn.platt@ecmwf.int

Climate Change

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Copernicus Climate Change service - C3S

- The **Copernicus Climate Change** service provides information to increase the knowledge base to support **adaptation** and **mitigation** policies.
  - Health – e.g. prevalence of mosquitos
  - Tourism – e.g. length of ski season
  - Industry – e.g. efficiency of ports
  - Energy – e.g. strength of wind/tidal/river flow
  - Agriculture – e.g. length of growing season

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The Climate Data Store: vision

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

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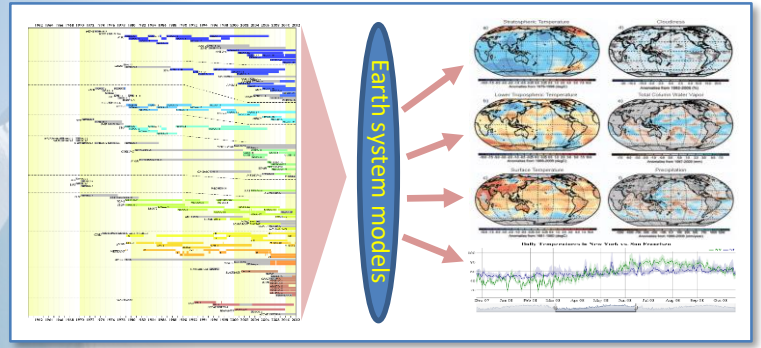
What kind of data?

Access to past, present and future climate information

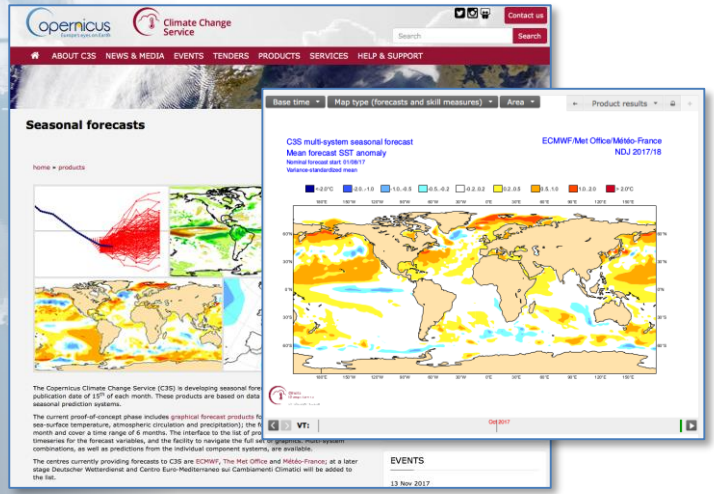


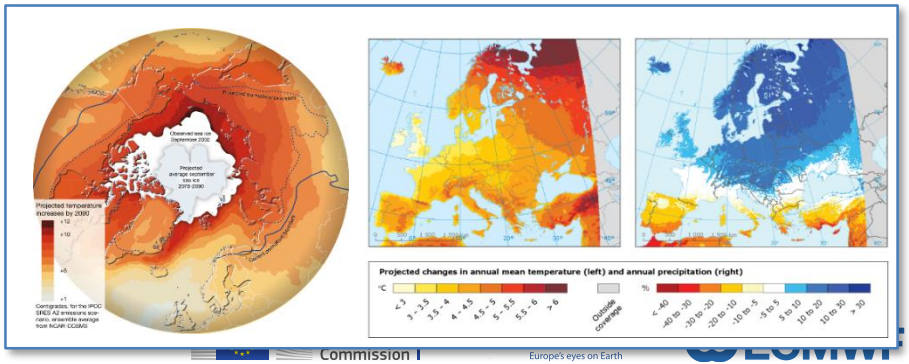
Observations (*in situ* and satellite)

Forecasts and reanalysis model output

Climate model simulations

Global and pan European





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The Climate Data Store: concept

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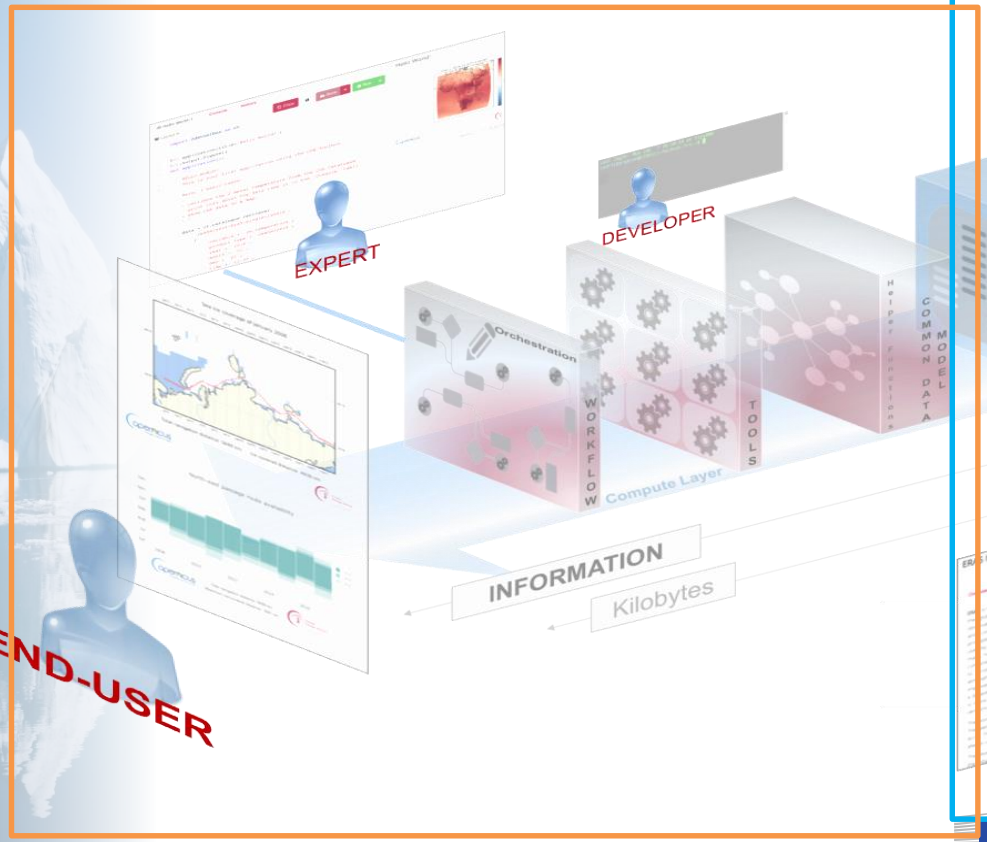

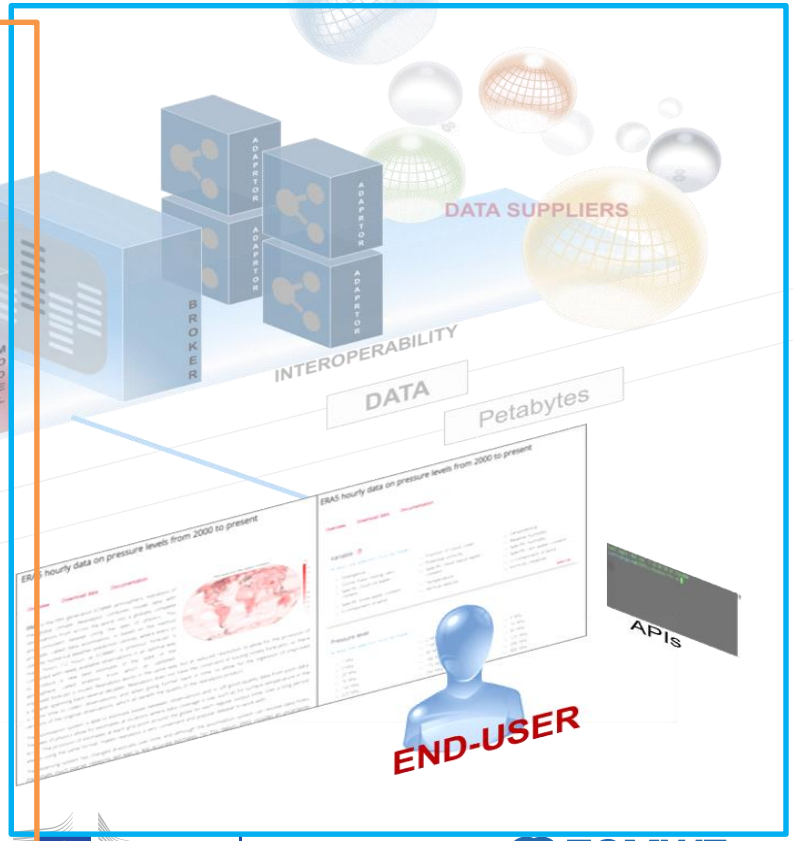

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The Climate Data Store: performance

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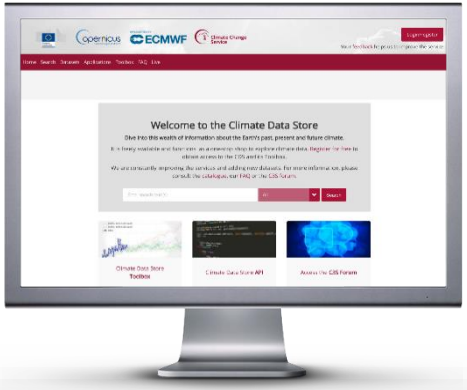
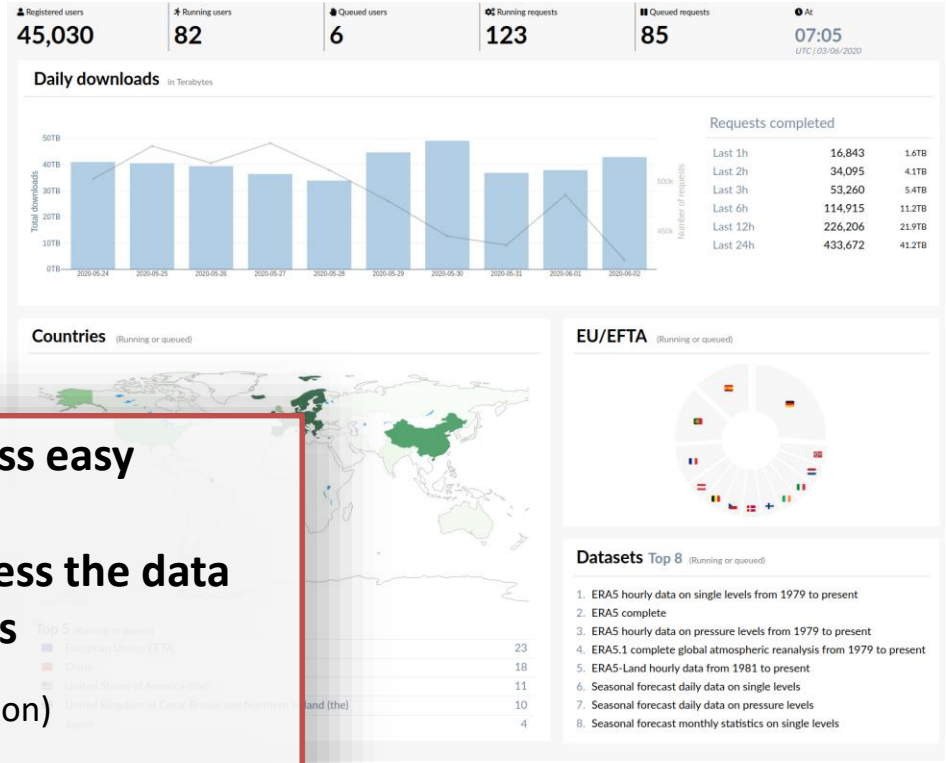
45,000+ registered users





- **Make C3S datasets discovery, access easy and relevant for users**
- **Provide online capabilities to process the data and develop applications**
- **Provide scalability** (datasets, computation)
- **Enable reproducible research** (provenance, DOIs, etc)

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The Climate Data Store: data access

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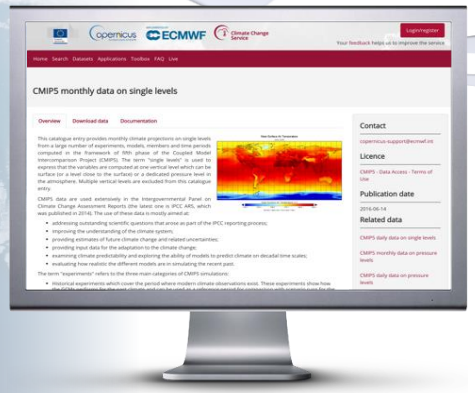
Distributed Data providers



Harmonised, simple, consistent and reliable online system

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The Climate Data Store: Global reanalysis data

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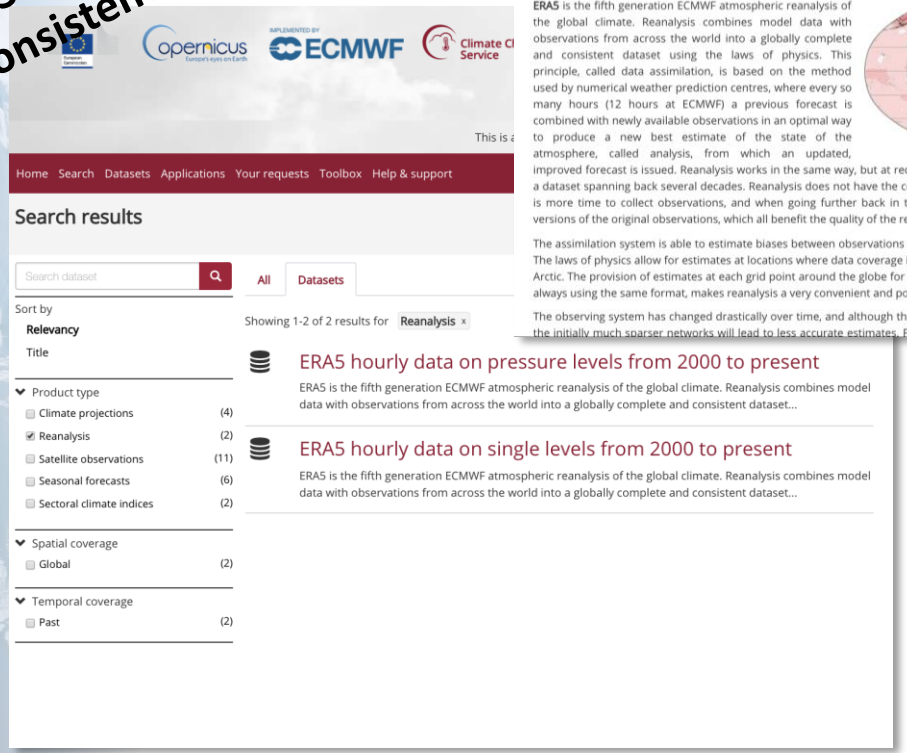
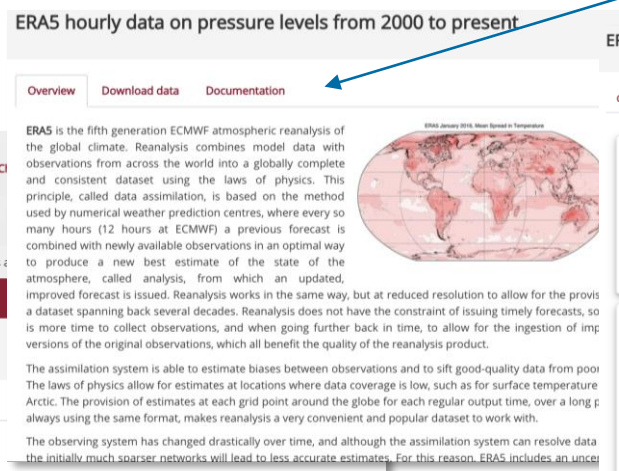
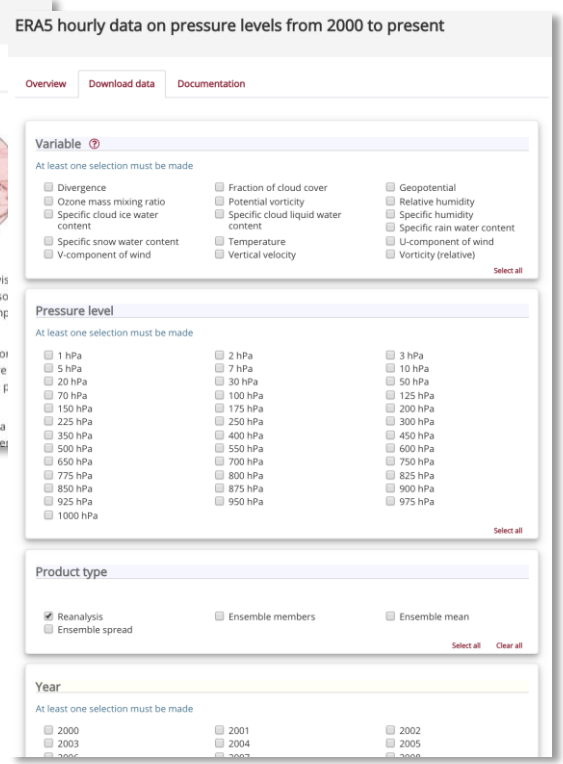
Simplicity and consistency are key

Quality Evaluation will come soon (2020)







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The Climate Data Store: Seasonal forecasts

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Simplicity and consistency are key

Home Search Datasets Applications Your requests Toolbox FAQ Live

Search results

Search dataset

All | Applications | Datasets

Sort by
Relevancy
Title

Product type
- Satellite observations (4)

Variable domain
- Atmosphere (composition) (4)
- Land (biosphere) (4)
- Land (cryosphere) (2)
- Land (hydrology) (2)
- Ocean (physics) (7)

Spatial coverage
- Global (4)

Temporal coverage
- Past (4)

Showing 1-4 of 4 results for Satellite observations × Atmosphere (composition) ×

Carbon dioxide data from 2002 to present derived from satellite sensors

Carbon dioxide (CO2) is a naturally occurring Greenhouse gas, but one whose abundance has been increased substantially above its pre-industrial value of some 280 ppm by human activities, primarily bec...

Aerosol properties gridded data from 1995 to present derived from satellite observations

This data set provides observational records of aerosol properties obtained from observations collected by various satellite instruments. Aerosols are minor constituents of the atmosphere by mass, but...

Ozone monthly gridded data from 1970 to present

This dataset provides estimates of the montly mean values of the ozone concentration, mixing ration and mole content over the globe from a large set of satellite sensors. Most of the ozone data produc...

Methane data from 2002 to present derived from satellite sensors

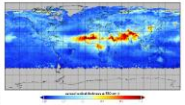
Methane (CH4) is the second most significant greenhouse gases that has increased in concentration in the atmosphere directly due to human activities, from the viewpoint of the radiative forcing of cli...

Aerosol properties gridded data from 1995 to present derived from satellite observations

Overview | Download data | Documentation

This data set provides observational records of aerosol properties obtained from observations collected by various satellite instruments. Aerosols are minor constituents of the atmosphere by mass, but critical components in terms of impact on climate. Aerosols influence the global radiation balance directly by scattering and absorbing radiation, and indirectly through influencing cloud reflectivity, cloud cover and cloud lifetime.

The main variables provided by this dataset are: aerosol optical depth, fine mode aerosol optical depth, dust aerosol optical depth, single scattering albedo, aerosol layer height and aerosol extinction coefficient. These variables are derived from observations from several sensors using a set of different processing techniques. This provides the possibility to derive a large set of complementary aerosol properties needed to describe the complex nature of atmospheric aerosols. Furthermore, different algorithms have their specific strengths and weaknesses, meaning that datasets originating from the same sensor but processed by different algorithms provide a way to evaluate uncertainties (e.g. areas of good or bad agreement between them). Altogether, the aerosol properties dataset is very extensive and offers a choice of complementary options - which is appropriate depends on the intended application.



Selected observational records in this dataset are extended in time on a semi-annual basis. At the moment of extending, these records are up-to-date until five months behind present time.

This dataset is produced on behalf of C3S.

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

DATA DESCRIPTION	
Data type	Gridded
Horizontal coverage	Global
Horizontal resolution	2.5° x 2.5° for aerosol extinction coefficient 1° x 1° for all other variables
Temporal coverage	June 1995 to present with 5 month delay
Temporal resolution	5-daily composite for the aerosol extinction coefficient Daily and monthly for all other variables
File format	NetCDF
Conventions	Climate and Forecast (CF) Metadata Convention v1.6 Attribute Convention for Dataset Discovery (ACDD) v1.3
Update frequency	6 months Full mission reprocessing every 2-3 years

MAIN VARIABLES		
Name	Units	Description
Aerosol extinction coefficient	Dimensionless	Aerosol extinction coefficient (AEX) is the fraction of radiant flux (or light) absorbed and scattered by aerosol present in a volume of atmosphere, per unit length. Extinction coefficients are provided on multiple levels through the atmosphere.
Aerosol layer height	km	Aerosol layer height (ALH), provides the average altitude of the aerosol loading. It can be interpreted as the height level at which the largest aerosol extinction is observed. Aerosol layer height is is derived from observations collected by different sensors.
Aerosol optical depth	Dimensionless	Aerosol optical depth (AOD), or sometimes Aerosol optical thickness) is a measure of the degree to which transmission of light through a volume of atmosphere is reduced due to extinction (scattering and absorption) by aerosol. It is equivalent to the integral of the extinction coefficient over a vertical column of unit cross section. Typical global average aerosol optical depth is about 0.15; in rare cases atmospheric aerosol optical depth can reach 3. Typically aerosol optical depth observations are reported at the mid-visible reference wavelength of 550 nm.
Dust aerosol layer height	km	Aerosol layer height specific to dust type aerosol.
Dust aerosol optical depth	Dimensionless	Dust aerosol optical depth (DAOD) is the part of total aerosol optical depth resulting from the presence of mineral dust particles (emitted from deserts such as the Sahara and potentially transported in the atmosphere over thousands of kilometers). Dust aerosol optical depth is helpful for constraining the type of aerosol.
Fine mode aerosol optical depth	Dimensionless	Fine mode aerosol optical depth (FMAOD) is the part of total aerosol optical depth resulting from the presence of aerosol particles with diameter smaller than 1 micrometer (this includes mostly secondary aerosols from combustion and fires such as sulfates, nitrates, black and brown carbon). Fine mode aerosol optical depth is helpful for constraining the type of aerosol.
Single scattering albedo	Dimensionless	Single scattering albedo (SSA), provides the fraction of total aerosol extinction that results from scattering (as opposed to absorbtion) of light by aerosol particles. Typical values range from 0.8 for strongly absorbing aerosol types (e.g. soot) to 1 for non-absorbing aerosol types (e.g. sea salt). Single scattering albedo is helpful for constraining aerosol the type of aerosol.

Aerosol properties gridded data from 1995 to present derived from satellite observations

Overview | Download data | Documentation

Time aggregation
At least one selection must be made
- Daily average
- Monthly average
- 5-daily composite

Variable
At least one selection must be made
- Aerosol optical depth
- Dust aerosol optical depth
- Aerosol layer height
- Aerosol extinction coefficient
- Fine-mode aerosol optical depth
- Single scattering albedo
- Dust aerosol layer height

Select all

Sensor on satellite
At least one selection must be made
- AATSR on ENVISAT
- SLSTR on SENTINEL 3A
- POLDER on PARASOL
- IASI on METOPA
- GOMOS on ENVISAT
- ATSR2 on ERS2
- SLSTR on SENTINEL 3B
- MERIS on ENVISAT
- OLCI on SENTINEL 3A

Algorithm
At least one selection must be made
- ADV (AATSR dual view)
- ORAC (Optimal Retrieval of Aerosols and Clouds)
- SWANSEA (Swansea University)
- ULB (Universite Libre de Bruxelles)
- AERGOM (Algorithm for stratospheric Aerosol extinction retrieval from GOMOS observations)
- IMARS (Infrared Mineral Aerosol Retrieval Scheme)
- ENS (Product based on an ensemble of algorithms)
- GRASP (General Retrieval of Aerosol and Surface Properties)
- SDV (SLSTR dual vieew)
- S4M (SeaWiFS algoritm for MERIS sensor)
- MAPIR (Mineral Aerosol Profiling from thermal Infrared Radiances)
- XBAER (Extensible Bremen Aerosol Retrieval)
- DLR (xxxxxxxxxxxxx)
- LMD (Laboratoire de Météorologie Dynamique)

Year
At least one selection must be made
- 1995
- 1997
- 1999
- 2001
- 2003
- 2005
- 2007
- 2009
- 2011
- 2013
- 2015
- 1996
- 1998
- 2000
- 2002
- 2004
- 2006
- 2008
- 2010
- 2012
- 2014
- 2016

The Climate Data Store: API data access

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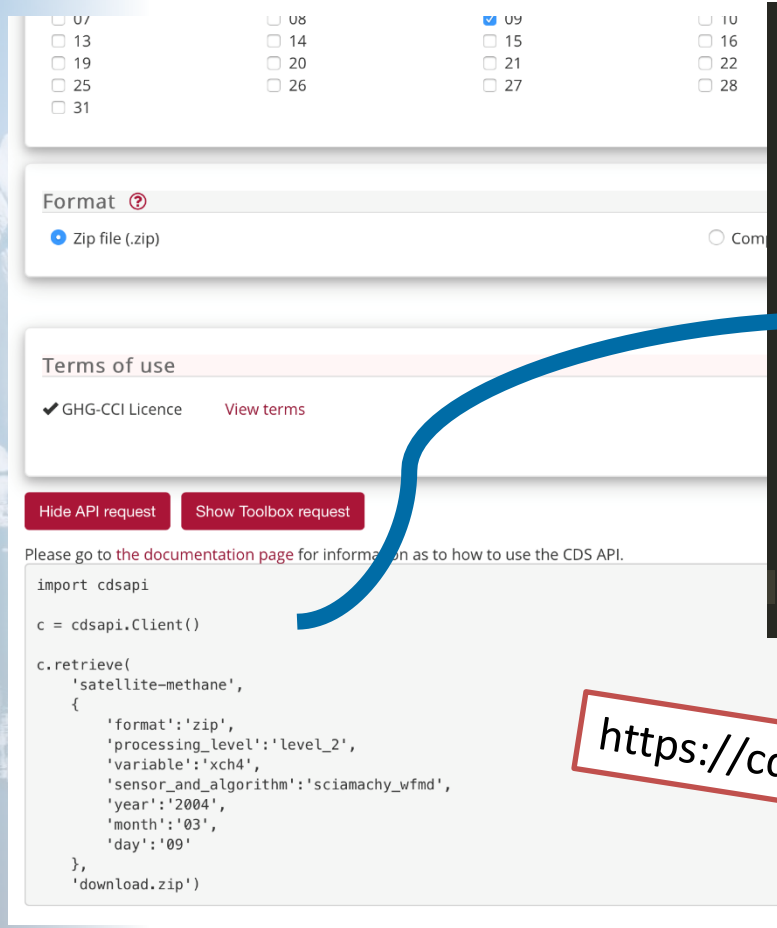


```python
import cdsapi

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')
```

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

pip install cdsapi

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The Climate Data Store: online processing

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Distributed Data providers

[My First Workflow demonstration document]

Online capabilities to process the data and develop applications

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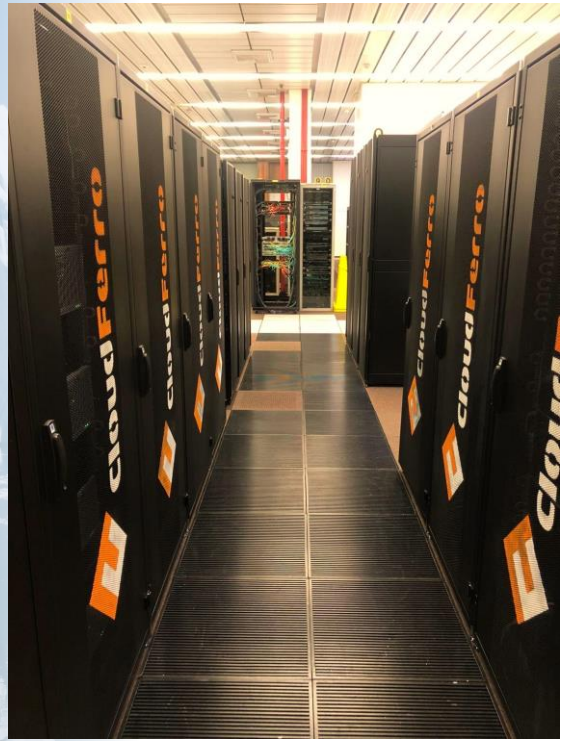
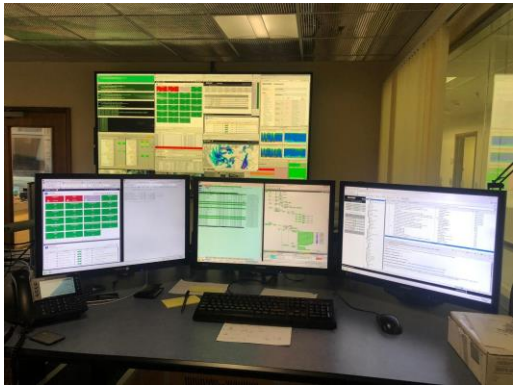
The Climate Data Store: an operational system



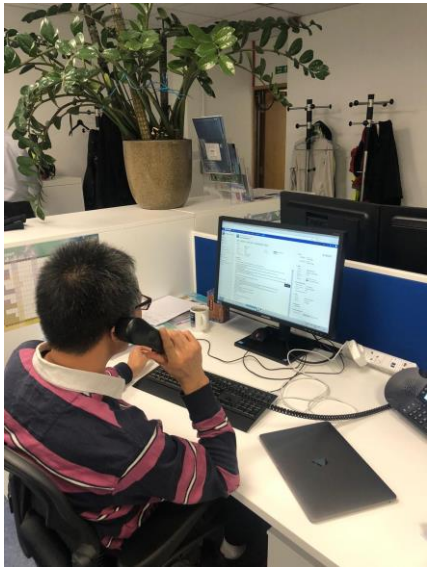
On-Premises Private Cloud

72+ nodes, 4000+ CPUs, 13TB RAM

3.9 PB usable (of which 380TB SSD)



Monitoring, Capacity building, reporting, backups, …



Support, help desk

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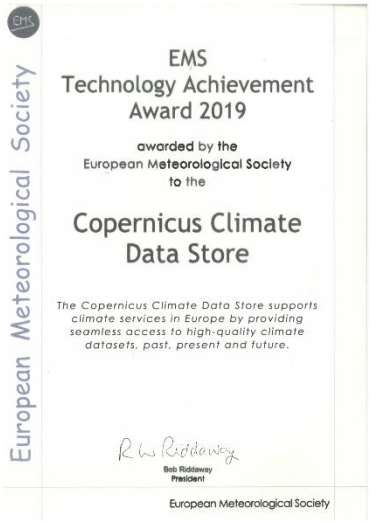
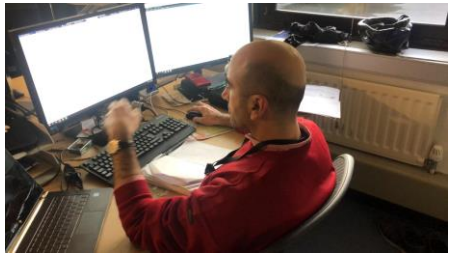
The Climate Data Store: an operational system



A dedicated DevOps team



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Thank you

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