



Access to CAMS Products

COPERNICUS ATMOSPHERE
MONITORING SERVICE



European
Commission

Vincent Henri Peuch (ECMWF)



Copernicus EU



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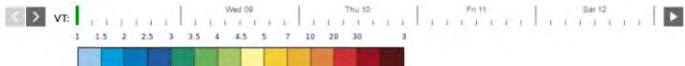
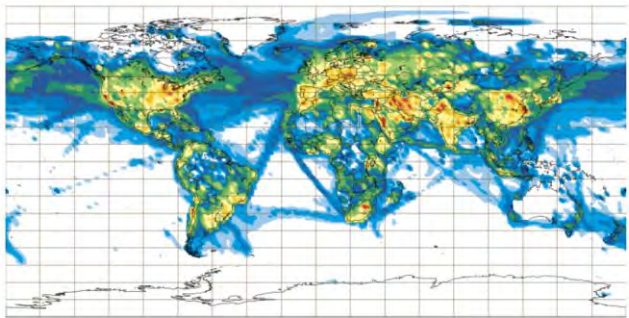
www.copernicus.eu



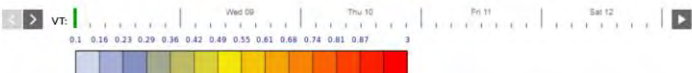
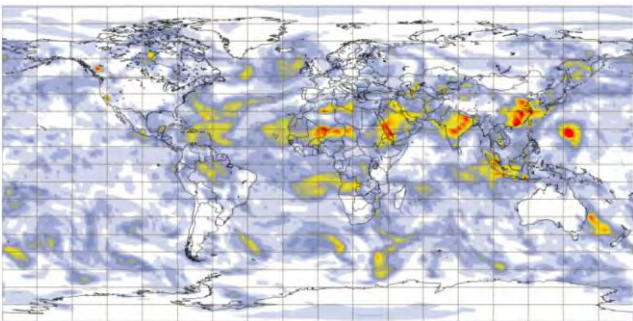
Visualizing <https://atmosphere.copernicus.eu/charts/cams/>

NO₂

Nitrogen dioxide at surface [ppbv] (provided by CAMS, the Copernicus Atmosphere Monitoring Service)
Tuesday 8 Oct, 00 UTC T+3 Valid: Tuesday 8 Oct, 03 UTC

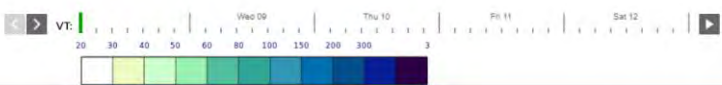
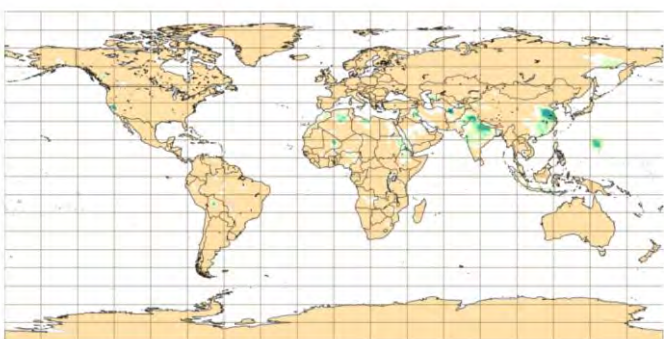


Aerosol optical depth at 550 nm (provided by CAMS, the Copernicus Atmosphere Monitoring Service)
Tuesday 8 Oct, 00 UTC T+3 Valid: Tuesday 8 Oct, 03 UTC



PM_{2.5}

PM_{2.5} - fine particulate matter [$\mu\text{g} / \text{m}^3$] (provided by CAMS)
Tuesday 8 Oct, 00 UTC T+3 Valid: Tuesday 8 Oct, 03 UTC

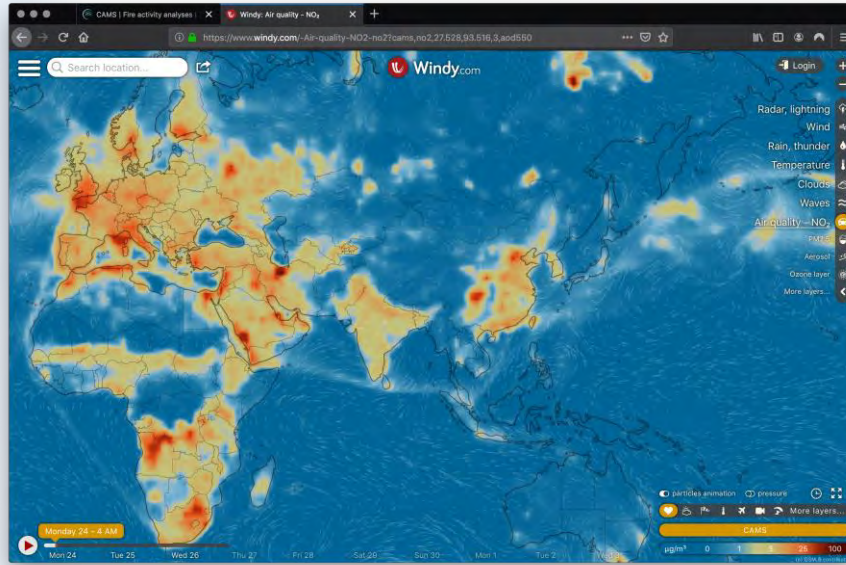


Latest CAMS 5-day global forecasts visualized

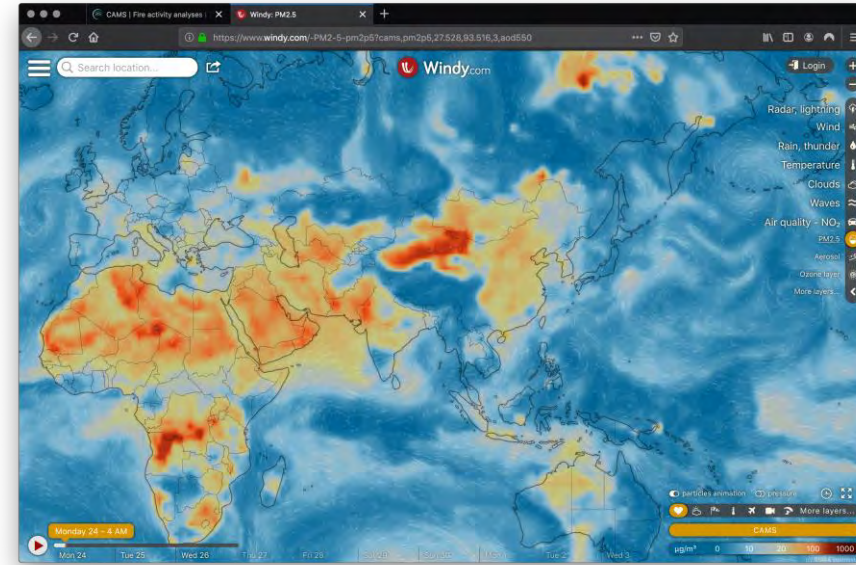


Visualizing CAMS forecasts on Windy.com

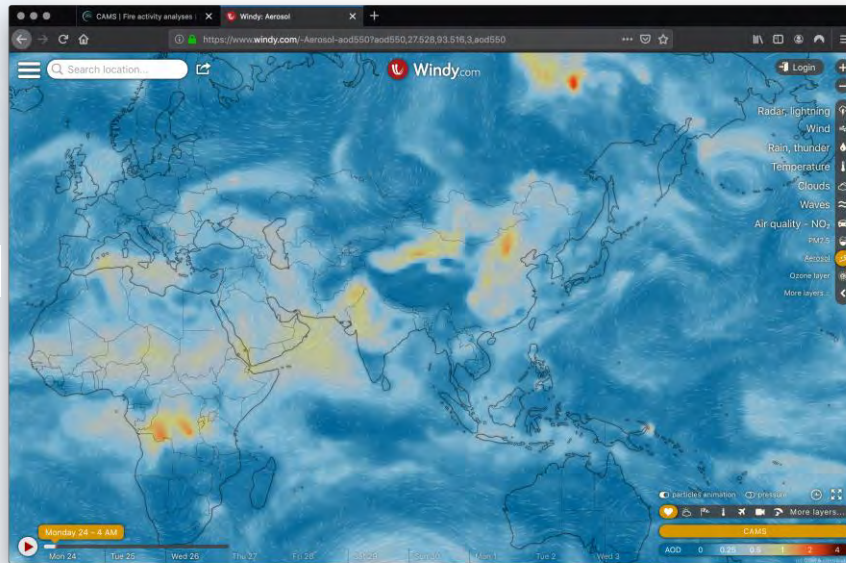
NO₂



PM_{2.5}



AOD



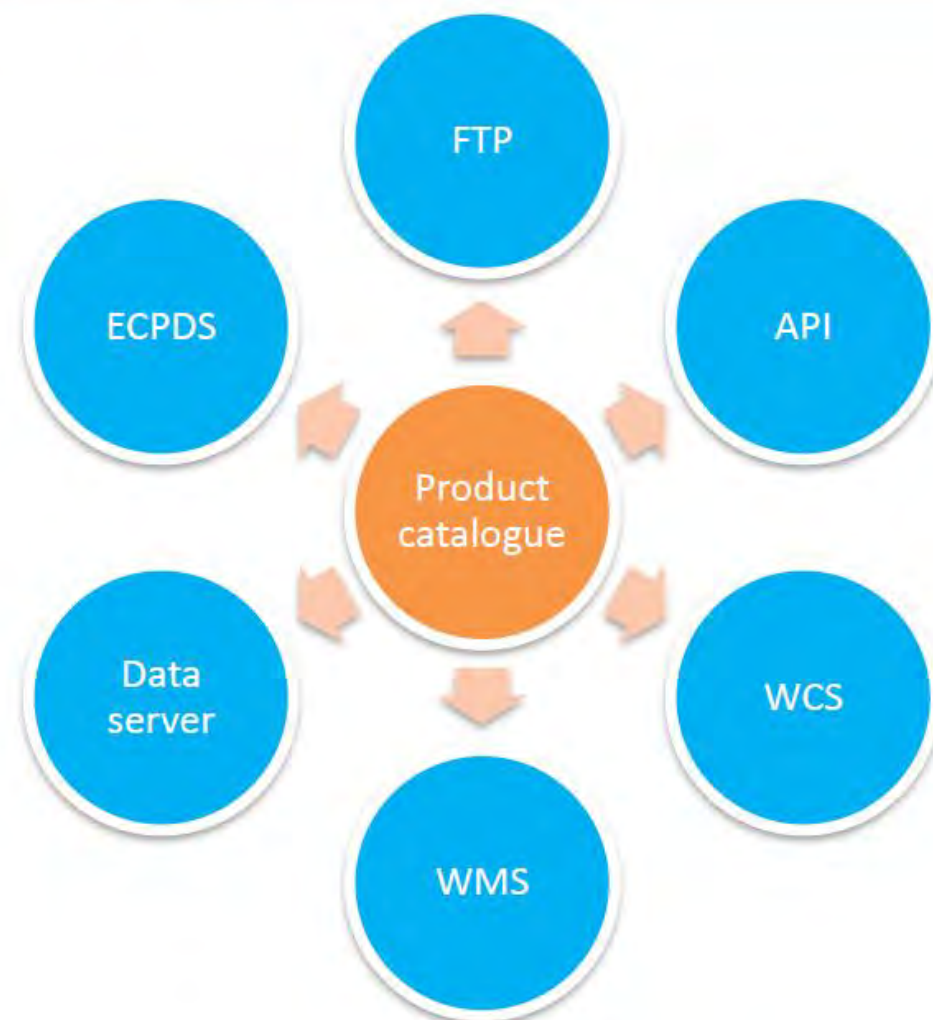
Some CAMS 5-day global forecasts visualized via website and mobile app of windy.com



Atmosphere
Monitoring

How to access CAMS products

- ✓ CAMS data is geographically distributed
- ✓ Product catalogue is the key entry point:
<http://atmosphere.copernicus.eu/catalogue>
- ✓ Stay tuned - the Atmosphere Data Store (ADS) is coming soon!
 - ✓ One stop shop to access CAMS data and probably more in the future





Atmosphere
Monitoring

CAMS user support (cont.)

atmosphere.copernicus.eu/user-support

- ▶ User Forum
- ▶ Knowledge Base
- ▶ Online Documentation
- ▶ User Training

“Exceptional & professional!”



User Forum



Knowledge Base



Online documentation



User training



Atmosphere
Monitoring

Accessing CAMS data: Online catalogue

The screenshot shows the 'Data' section of the Atmosphere Monitoring Service website. The page has a clean, professional layout with a white background and blue accents. At the top, there is a navigation bar with links for 'DATA', 'ABOUT US', 'WHAT WE DO', and 'SEARCH'. Below this, a banner area features the logos of the European Commission, Copernicus, and ECMWF. The main heading 'Data' is prominently displayed, followed by a paragraph explaining the service's core mission. A world map with a color-coded overlay is shown on the left, representing atmospheric data. To the right of the map, the 'Data catalogue' section provides a brief description and two buttons: 'Access the catalogue' and 'Service Product Portfolio'. A small orange question mark icon is located in the bottom right corner of the page.

Implemented by ECMWF as part of The Copernicus Programme

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Atmosphere Monitoring Service

DATA ABOUT US WHAT WE DO SEARCH

European Commission

Copernicus Europe's eyes on Earth

IMPLEMENTED BY ECMWF

X close

Data

At the core of our service is providing access to data and tools related to atmospheric monitoring. We also support our users by providing quality assurance information and advice on how to use and interpret data.

Data catalogue

We provide an extensive catalogue of data visualisations in the form of maps and charts. These data come from a variety of sources but is directly searchable using the catalogue.

[Access the catalogue](#) ►

[Service Product Portfolio](#) ►

?

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



Atmosphere
Monitoring

Accessing CAMS data: Online catalogue

<http://atmosphere.copernicus.eu/catalogue>

The screenshot shows the 'Catalogue' page of the Atmosphere Monitoring Service. The page features a search bar on the left with a 'Search' button. Below the search bar, there is a list of product families including 'Global reanalyses', 'Atmospheric emissions', 'Atmospheric concentrations', 'Atmospheric fluxes', 'Atmospheric deposition', 'Atmospheric chemistry', 'Atmospheric physics', 'Atmospheric radiation', 'Atmospheric noise', 'Atmospheric quality', 'Atmospheric safety', 'Atmospheric security', 'Atmospheric sustainability', 'Atmospheric transparency', 'Atmospheric trust', 'Atmospheric visibility', 'Atmospheric vitality', 'Atmospheric vibrancy', 'Atmospheric vitality', 'Atmospheric vibrancy', 'Atmospheric vitality', 'Atmospheric vibrancy'. The main content area displays two search results:

- Global forecasts of aerosol - sulphates** (#1)
This service provides daily global forecasts of aerosol mass mixing ratios up to five days in advance.
Parameter: Sulfates concentration
Buttons: More details, Data Download
- Global forecasts of aerosol - black carbon** (#2)
This service provides daily global forecasts of aerosol mass mixing ratios up to five days in advance.
Parameter: Black carbon concentration
Buttons: More details, Data Download

The top right of the page shows 'Total results: 263 BETA'. The bottom right corner has a question mark icon.

Products
found

Search criteria based on:

- Product family** – analysis, forecast (global/regional, emissions/fluxes).
- Parameter family** – aerosol, greenhouse gas, reactive gas, radiation
- Parameter** – e.g. organic matter aerosol concentration/AOD for smoke



Accessing CAMS data: Online catalogue

The screenshot shows the 'Global forecasts of aerosol - sulphates' page in the Atmosphere Monitoring Service online catalogue. The page features a world map with blue and yellow data points representing aerosol mass mixing ratios. To the right of the map, there is a description of the service, its theme, product family, parameter, geographical area, time coverage, and metadata. At the bottom, there are four icons representing different services: Data download, Verification results, Validation reports, and Contact us. The page is part of the Copernicus programme, implemented by ECMWF.

atmosphere.copernicus.eu

Catalogue | Copernicus

Implemented by ECMWF as part of The Copernicus Programme

Atmosphere Monitoring Service

News Events Press Tenders Help & support

DATA ABOUT US WHAT WE DO SEARCH

DATA ► CATALOGUE

Catalogue

Global forecasts of aerosol - sulphates

[Back to catalogue index](#)

This service provides daily global forecasts of aerosol mass mixing ratios up to five days in advance

Theme: Air quality and atmospheric composition

Product family: Global forecasts

Parameter: Sulfates concentration

Geographical area: (-180, 180, -90, 90)

Time coverage:

Metadata: [XML](#)

Data download

Verification results

Validation reports

Contact us

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Accessing CAMS data

Surface or 3-D fields

ECMWF

Public Datasets Select dataset+ Current activity+ Help+

CAMS Near-real-time

Type of level

- Model levels
- Pressure levels
- Surface

Atmospheric composition

- Reanalysis
- Near-real-time
- Global Fire Assimilation System

Select a month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2012											
2013											
2014											
2015											
2016											
2017											
2018											
2019											

Select time

00:00:00 06:00:00 12:00:00 18:00:00

Select All or Clear

Select step

-0 -3 -6 -9 -12 -15 -18 -21 -24 -27 -30 -33 -36 -39 -42 -45
-48 -51 -54 -57 -60 -63 -66 -69 -72 -75 -78 -81 -84 -87 -90 -93
-96 -99 -102 -105 -108 -111 -114 -117 -120

Select All or Clear

Select parameter

2 metre dewpoint temperature	2 metre temperature
10 metre U wind component	10 metre V wind component
Albedo	Black Carbon Aerosol Optical Depth at 550nm
Convective precipitation	Dust Aerosol Optical Depth at 550nm
Dust emission potential	Forecast albedo
GEMS Total column ozone	Geopotential
High cloud cover	Land-sea mask
Large-scale precipitation	Lifting threshold speed
Low cloud cover	Mean sea level pressure
Medium cloud cover	Organic Matter Aerosol Optical Depth at 550nm
Particulate matter d < 1 um	Particulate matter d < 2.5 um
Particulate matter d < 10 um	Sea Salt Aerosol Optical Depth at 550nm
Sea surface temperature	Snowfall
Sulphate Aerosol Optical Depth at 550nm	Total Aerosol Optical Depth at 469nm
Total Aerosol Optical Depth at 550nm	Total Aerosol Optical Depth at 670nm
Total Aerosol Optical Depth at 865nm	Total Aerosol Optical Depth at 1240nm

Time period

Analysis time

Forecast time

Parameter

<https://apps.ecmwf.int/datasets/data/cams-nrealtime/>



Accessing CAMS data

ECMWF

Contact Mark Parrington

Public Datasets Select dataset Current activity Help

CAMS Global Fire Assimilation System

Select a month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2003											
2005											
2007											
2009											
2011											
2013											
2015											
2017											
2019											

Select parameter

☐ Altitude of plume bottom	☐ Altitude of plume top	☐ Injection height (from IS4FIRES)
☐ Mean altitude of maximum injection	☐ Wildfire Flux of Acetaldehyde (C2H4O)	☐ Wildfire Flux of Acetone (C3H6O)
☐ Wildfire Flux of Ammonia (NH3)	☐ Wildfire Flux of Benzene (C6H6)	☐ Wildfire Flux of Butanes (C4H10)
☐ Wildfire Flux of Butenes (C4H8)	☐ Wildfire Flux of Dimethyl Sulfide (DMS) (C2H6S)	☐ Wildfire Flux of Ethane (C2H6)
☐ Wildfire Flux of Ethanol (C2H5OH)	☐ Wildfire Flux of Ethene (C2H4)	☐ Wildfire Flux of Formaldehyde (CH2O)
☐ Wildfire Flux of Heptane (C7H16)	☐ Wildfire Flux of Hexanes (C6H14)	☐ Wildfire Flux of Hexene (C6H12)
☐ Wildfire Flux of Higher Alkanes (CnH2n+2, C>=4)	☐ Wildfire Flux of Higher Alkenes (CnH2n, C>=4)	☐ Wildfire Flux of Isoprene (C5H8)
☐ Wildfire Flux of Methanol (CH3OH)	☐ Wildfire Flux of Octene (C8H16)	☐ Wildfire Flux of Pentanes (C5H12)
☐ Wildfire Flux of Pentenes (C5H10)	☐ Wildfire Flux of Propane (C3H8)	☐ Wildfire Flux of Propene (C3H6)
☐ Wildfire Flux of Terpenes (C5H8)n	☐ Wildfire Flux of Toluene (C7H8)	☐ Wildfire Flux of Toluene_Jump (C7H8+ C6H6 + C8H10)
☐ Wildfire Flux of Xylene (C8H10)	☐ Wildfire combustion rate	☐ Wildfire flux of Black Carbon
☐ Wildfire flux of Carbon Dioxide	☐ Wildfire flux of Carbon Monoxide	☐ Wildfire flux of Hydrogen
☐ Wildfire flux of Methane	☐ Wildfire flux of Nitrogen Oxides NOx	☐ Wildfire flux of Nitrous Oxide
☐ Wildfire flux of Non-Methane Hydro-Carbons	☐ Wildfire flux of Organic Carbon	☐ Wildfire flux of Particulate Matter PM2.5
☐ Wildfire flux of Sulfur Dioxide	☐ Wildfire flux of Total Carbon in Aerosols	☐ Wildfire flux of Total Particulate Matter
☐ Wildfire fraction of area observed	☐ Wildfire overall flux of burnt Carbon	☐ Wildfire radiative power

Select All or Clear

View the MARS request Retrieve GRIB Retrieve NetCDF

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Time period

Parameter

Download

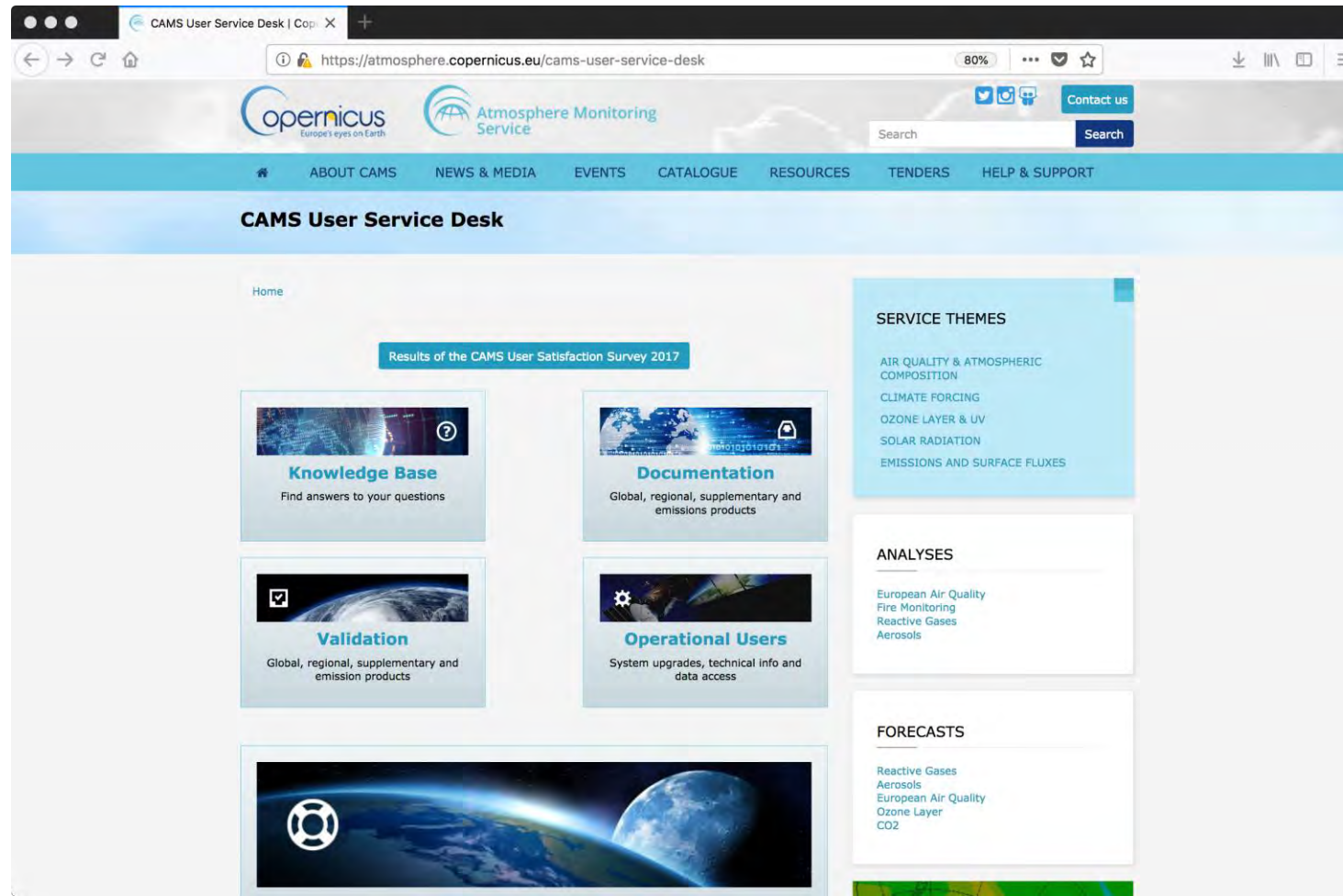
<https://apps.ecmwf.int/datasets/data/cams-nrealtime/>



Atmosphere
Monitoring

Further information and user support for CAMS

- Further information: <http://atmosphere.copernicus.eu/> | [@CopernicusECMWF](#) [@ECMWF](#)
- User support: <https://atmosphere.copernicus.eu/cams-user-service-desk/>





Copernicus Knowledge Base

Created by Daniel Varela Santoalla, last modified by Anabelle Guillory on Sep 22, 2016



Pages / Copernicus Knowledge Base

What are the changes from the MACC Reanalysis to the CAMS interim Reanalysis, to the CAMS Reanalysis?

Created by Anabelle Guillory, last modified on Sep 19, 2016

CAMS reanalysis strengths compared to the MACC reanalysis

- Newer model cycle (CY42R1)
- Higher temporal resolution
- Longer 48-forecasts from 0 UTC
- Chemistry routines included in IFS
- More chemical analysis fields available
- All chemistry archived in MARS
- Newer, reprocessed satellite retrievals assimilated
- Ozone and aerosols are used interactively in radiation scheme.

CAMS reanalysis strengths compared to the CAMS interim reanalysis

- Newer model cycle (CY42R1)
- Higher temporal and spatial resolution
- Longer 48-forecasts from 0 UTC
- More chemical analysis fields available
- Newer, reprocessed satellite retrievals assimilated
- Ozone and aerosols are used interactively in radiation scheme.

Comparison table

This table highlights major differences between the CAMS reanalysis, the MACC reanalysis and the CAMS interim reanalysis. There are many additional differences, in particular changes to the computation of individual atmospheric parameters (due to the change in the assimilation system from 36r1 to 40r2 to 41r2), differences due to changes in the assimilated atmospheric composition datasets that are not listed here.

	MACC reanalysis	CAMS interim reanalysis	CAMS reanalysis
Exp ID	exp=rean, class=mc	exp=eac3, class=mc	exp=eac4, class=mc
Period covered	2003 – 2012	2003 – present	2003 – present (though only 2003 - 2016 released so far)
Production Period	March 2010 – Feb 2012	Dec 2014-Dec 2016, then continued in NRT	Jan 2017 – Dec 2018, then continued in near real-time
Assimilation system	IFS Cycle 36r1 4D-Var	IFS Cycle 40r2 (2003-2015) 4D-Var IFS Cycle 41r1 (2016 - ...) 4D-Var	IFS Cycle 42r1 4D-Var
Spatial resolution	80 km globally (T255), 60 levels to 0.1 hPa	110 km globally (T159), 60 levels to 0.1 hPa	80 km globally (T255), 60 levels to 0.1 hPa
Output frequency (temporal resolution)	6-hourly analysis fields 3-hourly forecast fields from 0 UTC up to 24 hours	6-hourly analysis fields 3-hourly forecast fields from 6 and 18 UTC up to 12 hours	3-hourly analysis fields 3-hourly forecast fields from 0 UTC up to 48 hours 1 hourly surface forecast fields from 01T77 on to 48 hours



Help and support | Copernicus

https://atmosphere.copernicus.eu/help-and-support#

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DATA ABOUT US WHAT WE DO

Help and support

We are committed to helping our users to make best use of the CAMS data. We therefore provide a range of channels for getting the necessary help and support.

24/7 Knowledge Base

The Knowledge Base provides documentation and answers to frequently asked questions.

Contact us

copernicus-support@ecmwf.int
or
login to the [CAMS Enquiry Portal](#)

Mailing lists

CAMS uses email mailing lists to inform users about changes to its forecast services, such as system upgrades and potential changes to the timing of the product availability.

Quality Assurance

We continually check the accuracy of our products against independent observations in quarterly reports.

Documentation

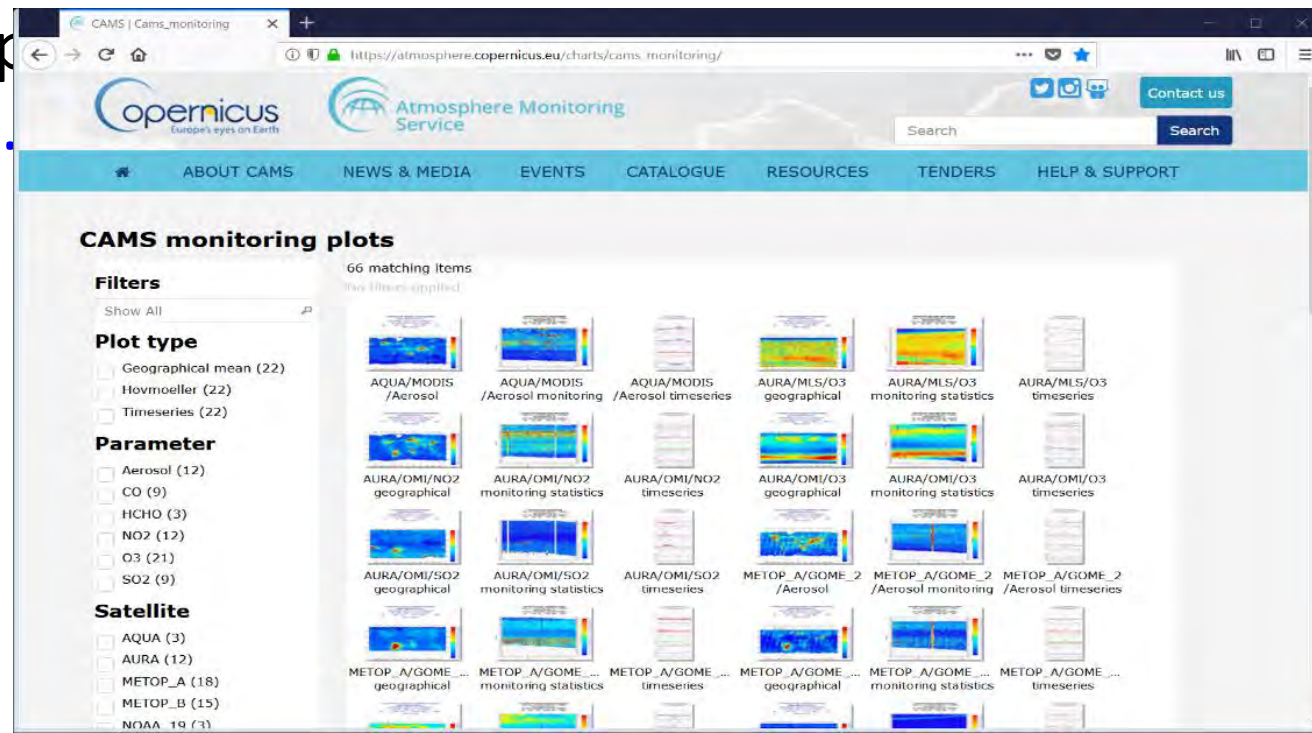
We provide documentation on our data products describing the underlying production systems.

Training

CAMS provides training to its users through workshops and on-line resources.

Summary

- TROPOMI/Sentinel-5P are monitored by CAMS
- O3 data have been operationally assimilated since Dec 2018
- Assimilation tests with NO2, CO and SO2 are under way
- Monitoring products available in the Copernicus Atmosphere Monitoring Service





A t m o s p h e r i c D a t a S t o r e

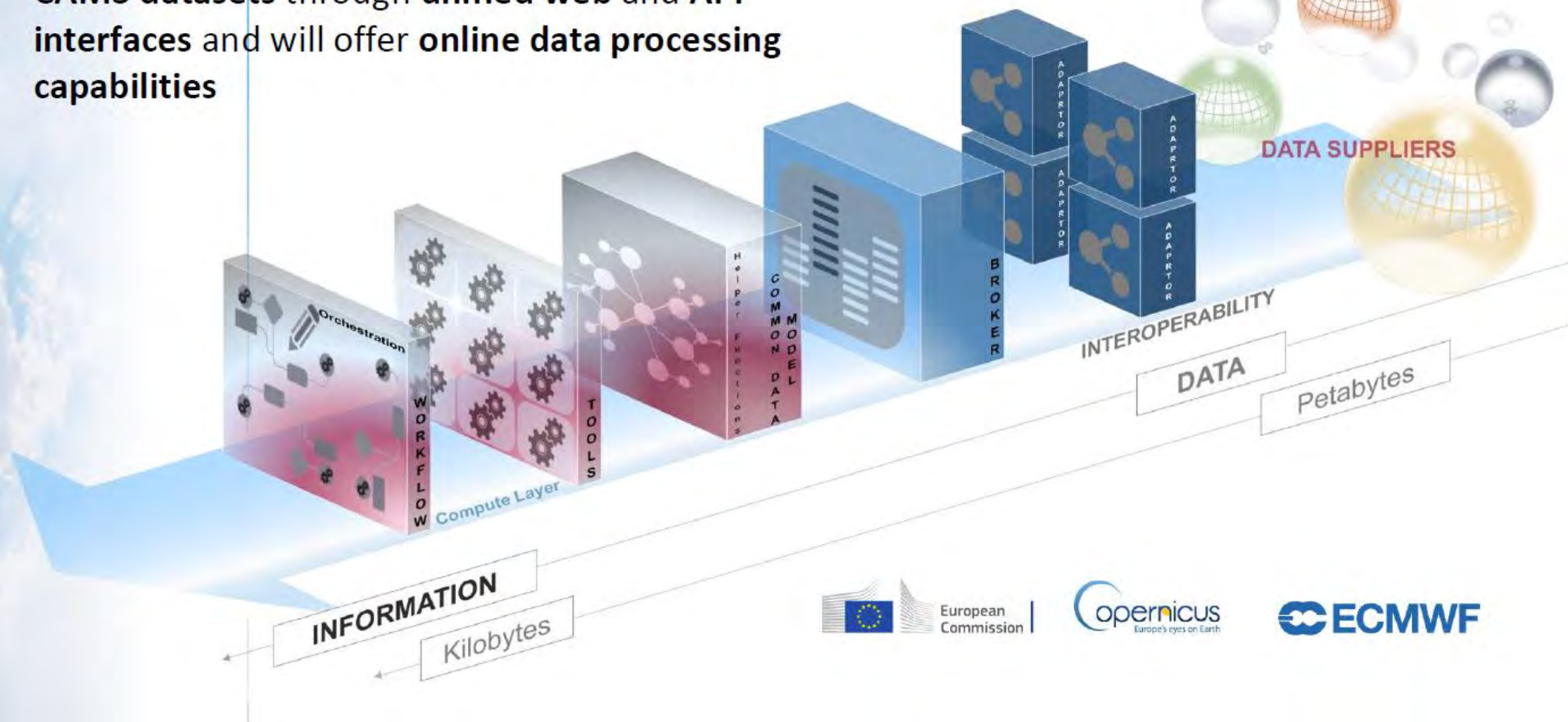
- Little brother of Climate Data Store (cds.climate.copernicus.eu)
- Will contains CAMS products on atmospheric composition
- Promises very fast download times for certain data sets
- Toolbox for simple data processing and visualisation
- Launch November 2019.



Atmosphere
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What is the ADS?

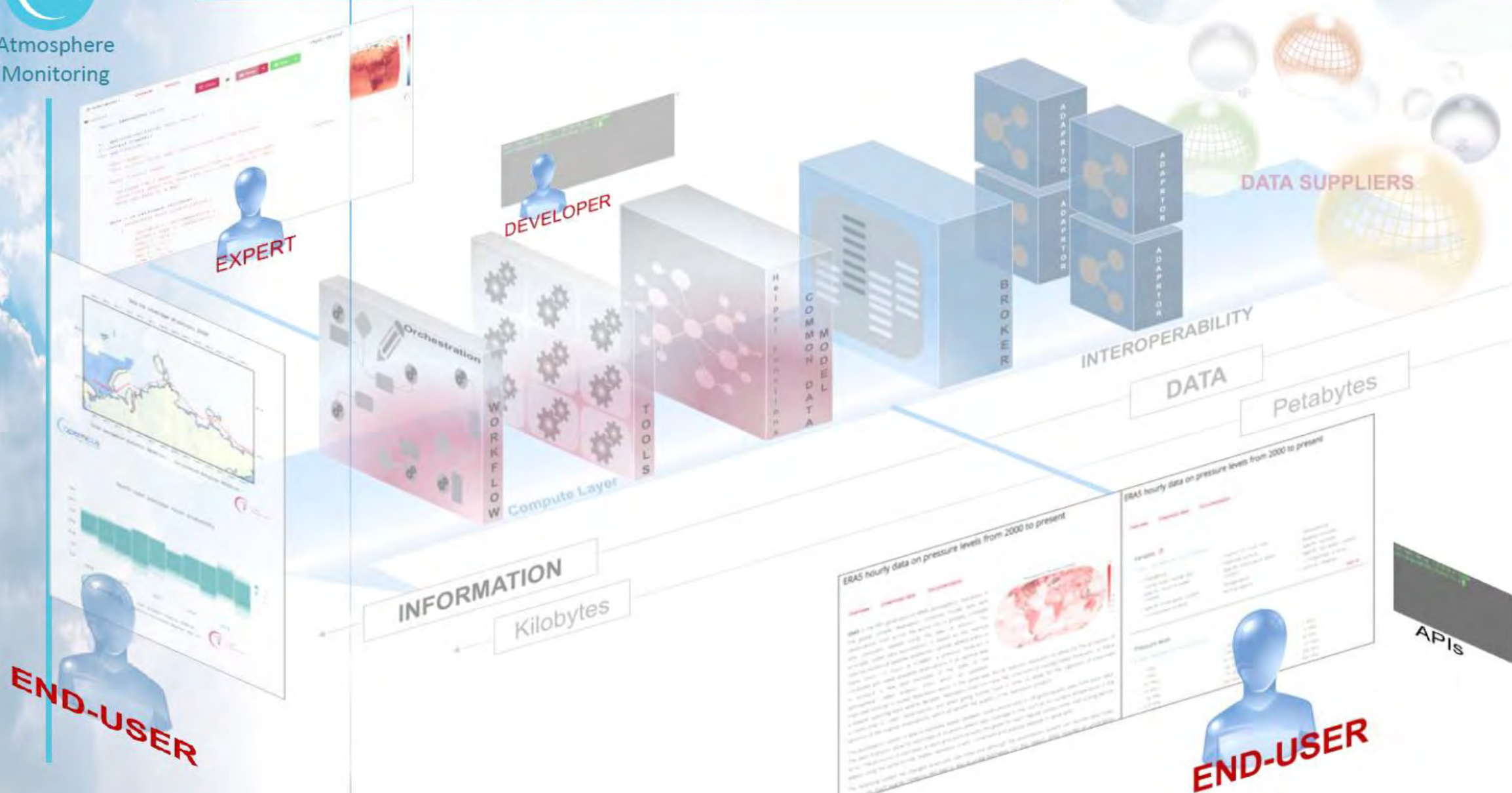
The ADS is a **modular** and **distributed data and information system** which will provide access to **all CAMS datasets** through **unified web and API interfaces** and will offer **online data processing capabilities**





Atmosphere
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Multitude of interfaces





Atmosphere
Monitoring

A D S release timeline

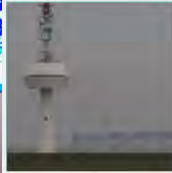
- Launch by the middle of November
- All CAMS products available by Q1 2020
- Will start working on toolbox examples and first applications



THE ATMOSPHERE MOOC

<https://www.atmospheremooc.org/course-overview>**Week 1 - Our Fragile Atmosphere and the Challenges We Face**

This first week provides an overview of why we monitor the atmosphere, the types of parameters we measure, and gives an introduction to Copernicus.

**Week 2 - Pollution, Air Quality and Health**

This week looks at air quality, and the different methods that we can use to measure it. It also looks at international policy for air quality and health.

**Week 3 - Large Scale Changes - Ozone and GHGs**

This week looks at how we monitor GHGs from both satellites and in-situ measurement methods

**Week 4 - Long Range Pollution Transport**

How emissions from natural and anthropogenic sources such as volcanoes, wildfires and dust storms can be transported long distances.

**Week 5 - Open Data and Emerging Data Services**

This last week in the course takes a look at Copernicus missions and strategies for the future

