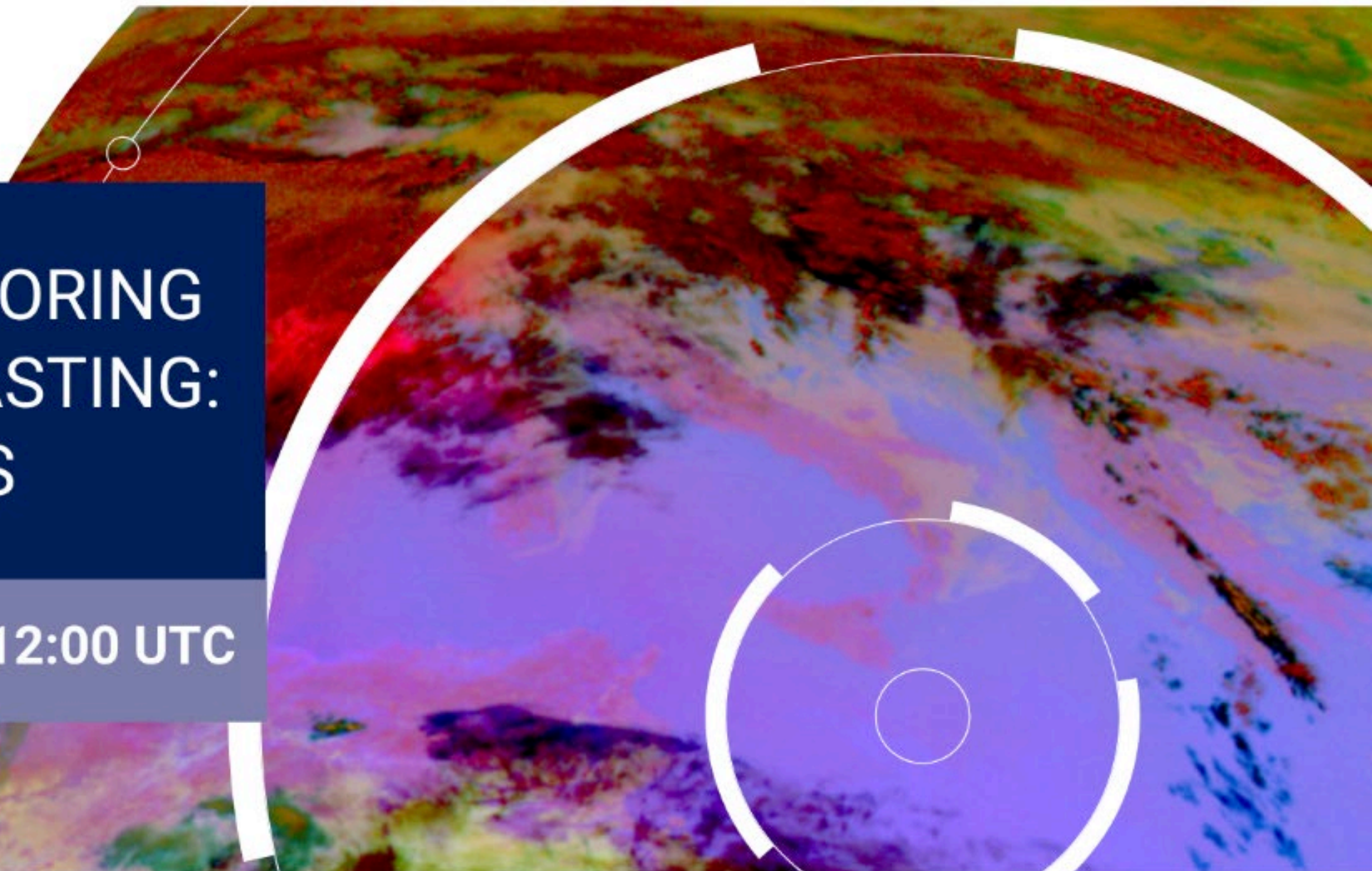


SHORT COURSE

DUST MONITORING AND FORECASTING: 2023 EVENTS

2 MAY 2023, 12:00 UTC





- **Part I:** Introduction to satellite remote sensing of aerosols (Anu-Maija Sundstroem) (~ 20 minutes)

QA

- **Part II:** Practical data exploration of satellite and model data for dust monitoring and forecasting (~ 50 minutes)

QA



Slido.com
#EUMSC37

- Platform: **<https://training.ltpy.adamplatform.eu>**
- Register: **<https://login.ltpy.adamplatform.eu/>**
- Notebooks on Gitlab:
https://gitlab.eumetsat.int/eumetlab/atmosphere/atmosphere/-/tree/master/90_workshops/202305_dust_short_course



Overview of data access systems



EUMETView and EUMETCast

EUMETSAT DATA SERVICES

API access

Download queue

My Views

Log in



EUMETView

▼

Eumetsat View *

ⓘ

Add layers +

▼

Layers

Dust RGB - MSG - 0 degree

ⓘ

⌵

×

Natural Colour RGB - MSG - 0 d...

ⓘ

⌵

×

Precipitation rate at ground by ...

ⓘ

⌵

×

High Rate SEVIRI IR10.8 µm Im...

ⓘ

⌵

×

▼

Overlays

Coastlines

Boundaries

Labels (dark)

Labels (light)

>

Basemap

>

Projection

EUMETView:
<https://view.eumetsat.int/>

EUMETCAST:
Multi-service dissemination
system available to users in
Europe and Africa

2000 km

-142.014, -58.383

February 2021

March 2021

Days

Dust RGB - MSG - 0 degree



EUMETSAT Earth Observation Portal:
<https://eoportal.eumetsat.int/>

EUMETSAT Data Store:
<https://data.eumetsat.int/>



MONITORING WEATHER AND CLIMATE FROM SPACE

EARTH OBSERVATION PORTAL - MY ACCOUNT

MY DATA ACCESS [JWAGEMANN]

MY PROFILE

MY DATA LICENCES

HELP

LOGOUT

My Data Access



EUMETSAT DATA STORE
Single point of access to search and download products from a growing catalogue of EUMETSAT's meteorological, climate and ocean data through Web User Interface (WebUI) and Application Programming Interfaces (API).

Access



EUMETVIEW
Online Map Service with functionalities for displaying visualizations and creating, animating and downloading maps from across the EUMETSAT product range.

Access



EUMETSAT DATA TAILOR
Service for tailoring EUMETSAT data to user applications offering the capability to aggregate, filter layers, reproject, extract regions of interest, produce quick looks, and convert to popular and highly interoperable GIS formats.

Access



EUMETSAT SFTP DATA ACCESS FOR COPERNICUS SENTINEL-6
Download service via internet for Copernicus Sentinel-6 data.

Subscribe



EUMETCAST SATELLITE
Access to near real-time data through DVB satellite with a guaranteed service level. Available data: Meteosat, Metop, Jason, Copernicus Sentinel-3 data and third party products.

Subscribe



EUMETCAST TERRESTRIAL
Access to near real-time data through terrestrial networks. Restricted to agencies only. Available data: Meteosat, Metop, Jason, Copernicus Sentinel-3 data and third party products.

Subscribe



DATA CENTRE
Ordering and delivery service for data with latency of more than 3 hours, historical and long-term archive data. Available data: Meteosat, Metop, Jason and Copernicus Sentinel-3 data.

Access



DIRECT DISSEMINATION
Metop Direct Readout Service

Subscribe



DATA SERVICES

Data Access / Advanced search results

msg seviri level 1.5

PLATFORM

☐ MSG (3)

SENSOR TYPE

☐ Optical (3)

SENSOR

☐ SEVIRI (3)

ACCESS

☐ Download (3)

DATA POLICY

☐ EUMETSAT Meteosat >3hr latency & Metop (3)
☐ EUMETSAT Meteosat <3hr latency (3)

FORMAT

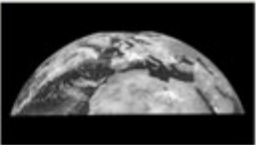
☐ Native (3)

TIME

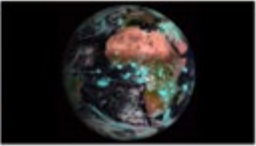
From:
To:

Apply time filter

We've found 3 results



Rapid Scan High Rate SEVIRI Level 1.5 Image Data - MSG
Rectified (Level 1.5) Meteosat SEVIRI Rapid Scan image data. The baseline scan region is a reduced area of the top 1/3 of a nominal repeat cycle, covering a latitude range from approximately 15 degrees to 70 degrees. The service generates repeat cycles at 5-minute intervals (the same as currently used for weather radars). The dissemination of RSS data is similar to the normal dissemination, with image segments based on 464 lines and compatible with the full disk Level 1.5 data scans. Epilogue and prologue (L1.5 Header and L1.5 Trailer) have the same structure. Calibration is as in Full Earth Scan. Image rectification is to 9.5 degreesE....
[learn more](#)
Access Data



High Rate SEVIRI Level 1.5 Image Data - MSG - 0 degree
Rectified (Level 1.5) Meteosat SEVIRI image data. The data is transmitted as High Rate transmissions in 12 spectral channels. Level 1.5 image data corresponds to the geolocated and radiometrically pre-processed image data, ready for further processing, e.g. the extraction of meteorological products. Any spacecraft specific effects have been removed, and in particular, linearisation and equalisation of the image radiometry has been performed for all SEVIRI channels. The on-board blackbody data has been processed. Both radiometric and geometric quality control information is included. Images are made available with different ...
[learn more](#)
Access Data



High Rate SEVIRI Level 1.5 Image Data - MSG - Indian Ocean
Rectified (Level 1.5) Meteosat SEVIRI image data. The data is transmitted as High Rate transmissions in 12 spectral channels. Level 1.5 image data corresponds to the geolocated and radiometrically pre-processed image data, ready for further processing, e.g. the extraction of meteorological products. Any spacecraft specific effects have been removed, and in particular, linearisation and equalisation of the image radiometry has been performed for all SEVIRI channels. The on-board blackbody data has been processed. Both radiometric and geometric quality control information is included. Images are made available with different ...
[learn more](#)
Access Data

Showing 3 of 3



Copernicus Atmosphere Data Store (ADS)

copernicus.eumetsat.int

Copernicus Atmosphere Data Store:
<https://ads.atmosphere.copernicus.eu/>

[Login/register](#)

[Home](#) [Search](#) [Datasets](#) [Support](#)

Atmosphere Data Store

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

Welcome to the Atmosphere Data Store

Dive into this wealth of information about the Earth's past, present and future Atmosphere.

It is freely available and functions as a one-stop shop to explore Atmosphere data. [Register for free](#) to obtain access.

We are constantly improving the services and adding new datasets. For latest announcements, watch the posts.

All▼Search



Atmosphere Data Store API



Access the ECMWF Support Portal



Access the ADS Data Store

CAMS global reanalysis (EAC4) monthly averaged fields

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

[Overview](#) [Download data](#) [Documentation](#)

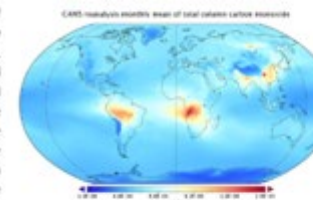
EAC4 (ECMWF Atmospheric Composition Reanalysis 4) is the fourth generation ECMWF global reanalysis of atmospheric composition. Reanalysis combines model data with observations from across the world into a globally complete and consistent dataset using a model of the atmosphere based on the laws of physics 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	Surface, total column, 1 model level and 25 pressure levels.
Vertical resolution	The lowest model level, Pressure levels: 1000, 950, 925, 900, 850, 800, 700, 600, 500, 400, 300, 250, 200, 150, 100, 70, 50, 30, 20, 10, 7, 5, 3, 2, 1 hPa
Temporal coverage	2003 to 2022
Temporal resolution	monthly
File format	GRIB (optional conversion to netCDF)
Versions	Only one version
Update frequency	Twice a year with 4-6 month delay

Contact

[ECMWF Support Portal](#)

Licence

[Licence to use Copernicus Products](#)

Publication date

2020-02-06

Related data

[CAMS global atmospheric composition forecasts](#)

[CAMS global greenhouse gas reanalysis \(EGG4\)](#)

[CAMS global greenhouse gas reanalysis \(EGG4\) monthly averaged fields](#)

[CAMS global radiative forcing - auxiliary variables](#)

[CAMS global radiative forcings](#)

[CAMS global reanalysis \(EAC4\)](#)



Sentinel-5P Pre-Operations Data Hub:
<https://s5phub.copernicus.eu/>



Barcelona Dust Regional Center – THREDDS Download server

copernicus.eumetsat.int



Overview

The WMO Barcelona Dust Regional Center provides access to high-quality dust information for the benefit of society. This information is useful to predict the occurrence of Sand and Dust Storms (SDS), as well as to manage their effects and impacts. In this context, the Center offers a wide range of dust products, both models and observations, that serve the need for detailed dust information on a regional scale. A detailed description of all the products offered on the Center's website can be found in the User Guide.

USER GUIDE 



Daily Dust Products

Dust forecasts and dust-related observational products

[EXPLORE PRODUCT](#)

Dust Products Catalogue

Inventory of available dust observational and modelling products

[EXPLORE PRODUCT](#)



Data Download

Access and download the numerical data of dust forecasts

[EXPLORE PRODUCT](#)

Barcelona Dust Regional Center –
THREDDS Download Server:
[https://dust.aemet.es/products/
data-download](https://dust.aemet.es/products/data-download)



Contact Team

Overview Product info Validation & QA Data access Documents Links

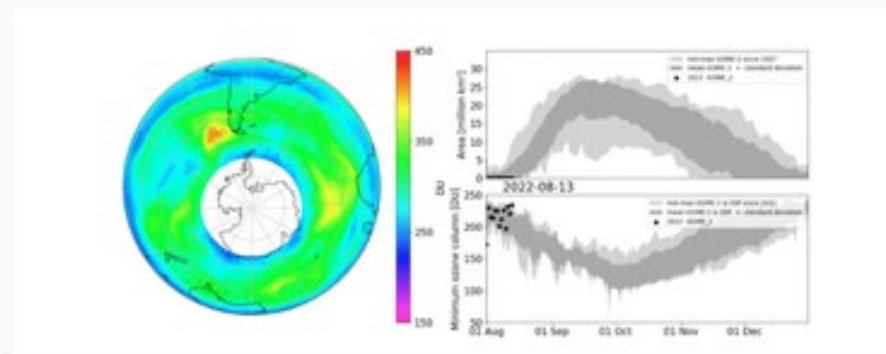
EUMETSAT Satellite Application Facility on Atmospheric Composition Monitoring

TOP STORY: Ozone hole above Antarctica

The ozone hole is developing above Antarctica. The animation shows the area of the ozone hole and the minimum value measured with the GOME-2 instrument for the period 1 August - 17 December 2022.

GOME-2 can't observe ozone during the polar night, therefore the data around the pole are missing up to the 22 September. Due to the data gap, the size and depth of the ozone hole are underestimated until then.

Animation: DLR



Latest news

13 December 2022

The latest [AC SAF Operations Reports](#) have been updated.

21 November 2022

DLR ATMOS ftp server will have a service outage due to system upgrade on 29 November, 10:00-12:00 CET.

25 October 2022

AC SAF Operations Report 1/2022 has been [published](#).

23 June 2022

New AC SAF Service Specification (issue 1.6) has been [published](#).

18 May 2022

NRT IASI [HNO₃](#) and [total O₃ / O₃ profile](#) products are now available.

[News archive](#)

EUMETSAT AC SAF:
<https://acsaf.org/>



Additional training resources offered by EUMETSAT



Self-contained collection of notebooks
related to a specific application example

Accessible in form of a **Jupyterbook** and a
dedicated Jupyterhub instance





Dust Aerosol Detection, Monitoring and Forecasting

Search this book...

Dust Aerosol Detection, Monitoring and Forecasting

OBSERVATIONS

Remote Sensing - Satellite

Ground-based (remote sensing and in-situ)

FORECAST MODELS

Introduction to forecast models

CAMS global atmospheric composition forecasts

CAMS European Air Quality Forecasts and Analyses

SDS-WAS regional dust forecasts

PRACTICAL CASE STUDY

Exercises - Introduction

Solutions

Powered by [Jupyter Book](#)

Dust Aerosol Detection, Monitoring and Forecasting



Fig. 1 Impressions of dust storms (Source WMO)

What is the course about?

This course is a Python-based training that provides you a hands-on introduction to satellite-, ground- and model-based data used for dust monitoring and forecasting. The course is divided in three parts: **Observations**, **Forecast Models** and a **Practical case study**. The first two chapters provide you an overview of different data types and an example how to access, load and visualize the data. Both chapters serve as basis for the third chapter, which consists of guided exercises where you perform an analysis of a real-world dust event more in detail.

After completing the course you should:

- have a **good understanding** of different observations and model-based data used for dust aerosol detection and monitoring
- know the **advantages and limitations** of each dataset
- know how to **access, process and visualize** the data with Python

<https://dust.trainhub.eumetsat.int>
<https://dust.ltpy.adamplatform.eu>



EUMETSAT TrainHub – EUMETSAT's Jupyter Notebook Portal

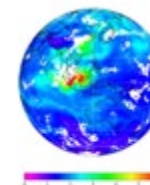
copernicus.eumetsat.int

Different application domains

<https://trainhub.eumetsat.int/>

Link to executable version of the notebook

The screenshot shows the EUMETSAT TrainHub interface. On the left, there is a search bar and filter sections for Theme (Atmosphere), Subtheme (Atmospheric Composition), Platform (Metop-A, Metop-B, Metop-C, Sentinel-3, Sentinel-5P), Sensor (GOME-2, IASI, OLCI, SLSTR, TROPOMI), and Tags (Absorbing Aerosol Height, Absorbing Aerosol Index, Aerosol Optical Depth, Ammonia, Carbon monoxide concentration, Dust aerosol optical depth, Dust concentration, Fire Radiative Power). The main area displays six notebook thumbnails with titles like 'Explore AC SAF Metop-A/B GOME-2 - Tropospheric Nitrogen Dioxide L2 - Part 1', 'Explore AC SAF Metop-A/B GOME-2 - Tropospheric Nitrogen Dioxide L2 - Part 2', 'Explore AC SAF Metop-A/B GOME-2 - Tropospheric Nitrogen Dioxide L3', 'Explore AC SAF Metop-B GOME-2 - Absorbing Aerosol Height L2', 'Explore PMAp - Aerosol Optical Depth L2', and 'Explore Metop-A/B IASI - Ammonia L2'. Each thumbnail includes a small visualization and a brief description of the notebook's content.



Explore Metop-A/B IASI - Carbon Monoxide

PUBLISHER: JULIA WAGEMANN

This notebook lets you discover Level 2 Carbon Monoxide information from the Metop-A/B IASI instrument.

TAGS:
ATMOSPHERE ATMOSPHERIC COMPOSITION METOP-A METOP-B IASI
CARBON MONOXIDE CONCENTRATION (TOTAL COLUMN)

[Open via Jupyter](#)

[Open on GitHub](#)

Search functionality based
satellite / sensor / variables

Overview of notebooks
available per domain

Static rendering of the
notebook

2.3.2 IASI - Level 2 - Carbon Monoxide (CO)

The *Infrared Atmospheric Sounding Interferometer (IASI)* is an instrument onboard the Metop-A/B satellites. It provides information on the vertical structure of temperature and humidity as well as main atmospheric species.

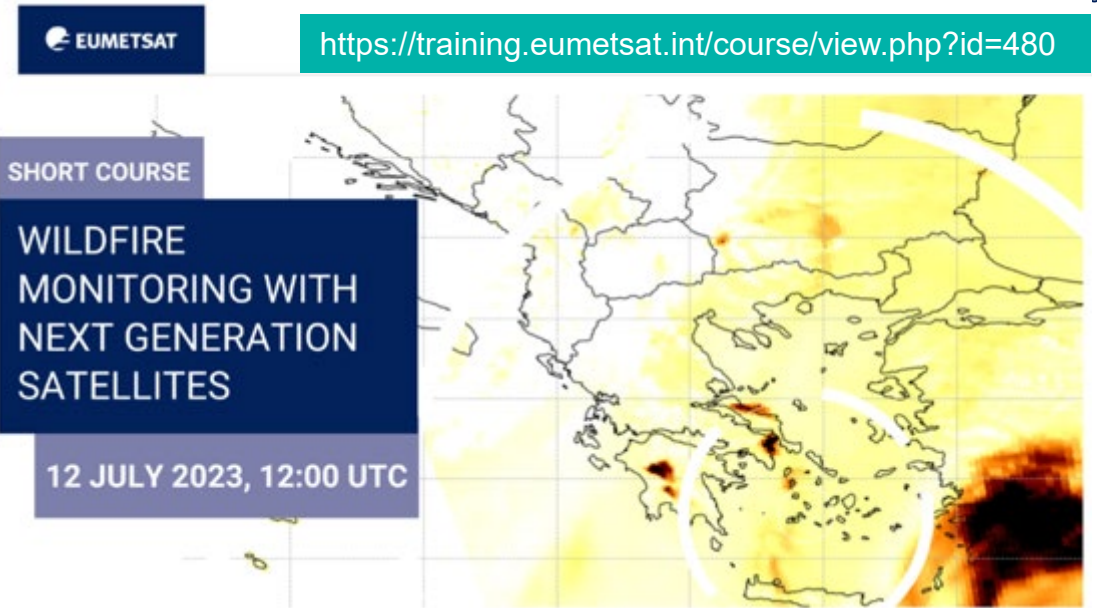
IASI data are distributed via:

- the EUMETSAT data centre/Earth Observation Portal, and
- external services, e.g. AERIS.

IASI Level 2 data are disseminated in 300K. originally AERIS implemented the *IASI portal*, which provides the data in 'txt' and 'netCDF'. This notebook shows you how you can load, browse and visualize Carbon Monoxide data from the IASI instrument.



Upcoming



Past





Thank you!