

COPERNICUS EARTH OBSERVATION

DATA VISUALISATION WORKSHOP SERIES



PROGRAMME OF THE
EUROPEAN UNION



IMPLEMENTED BY



Air Quality and Wildfires

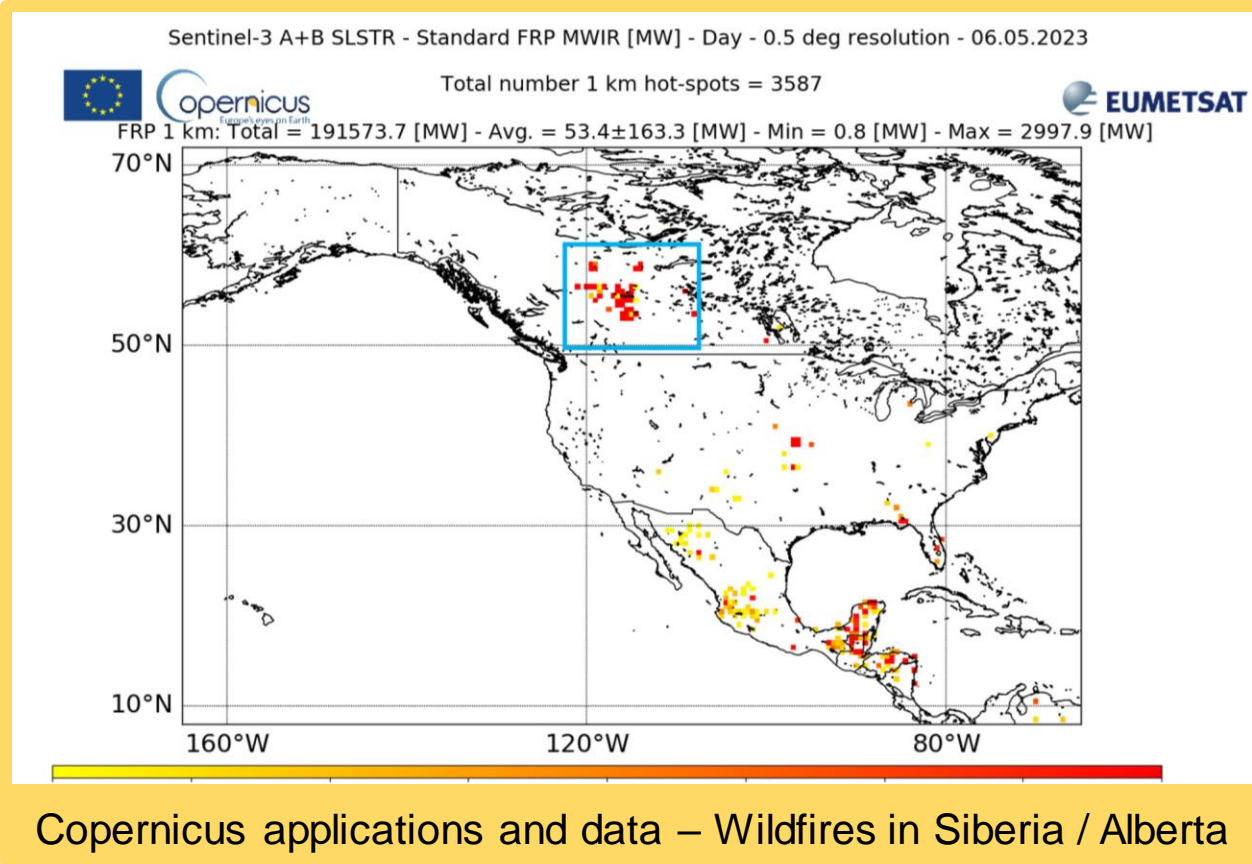
Practical Example: Visualising Copernicus Atmosphere Monitoring Service and Sentinel data on Dust and Wildfires

Dr. Julia Wagemann, MEE0 s.r.l. for EUMETSAT

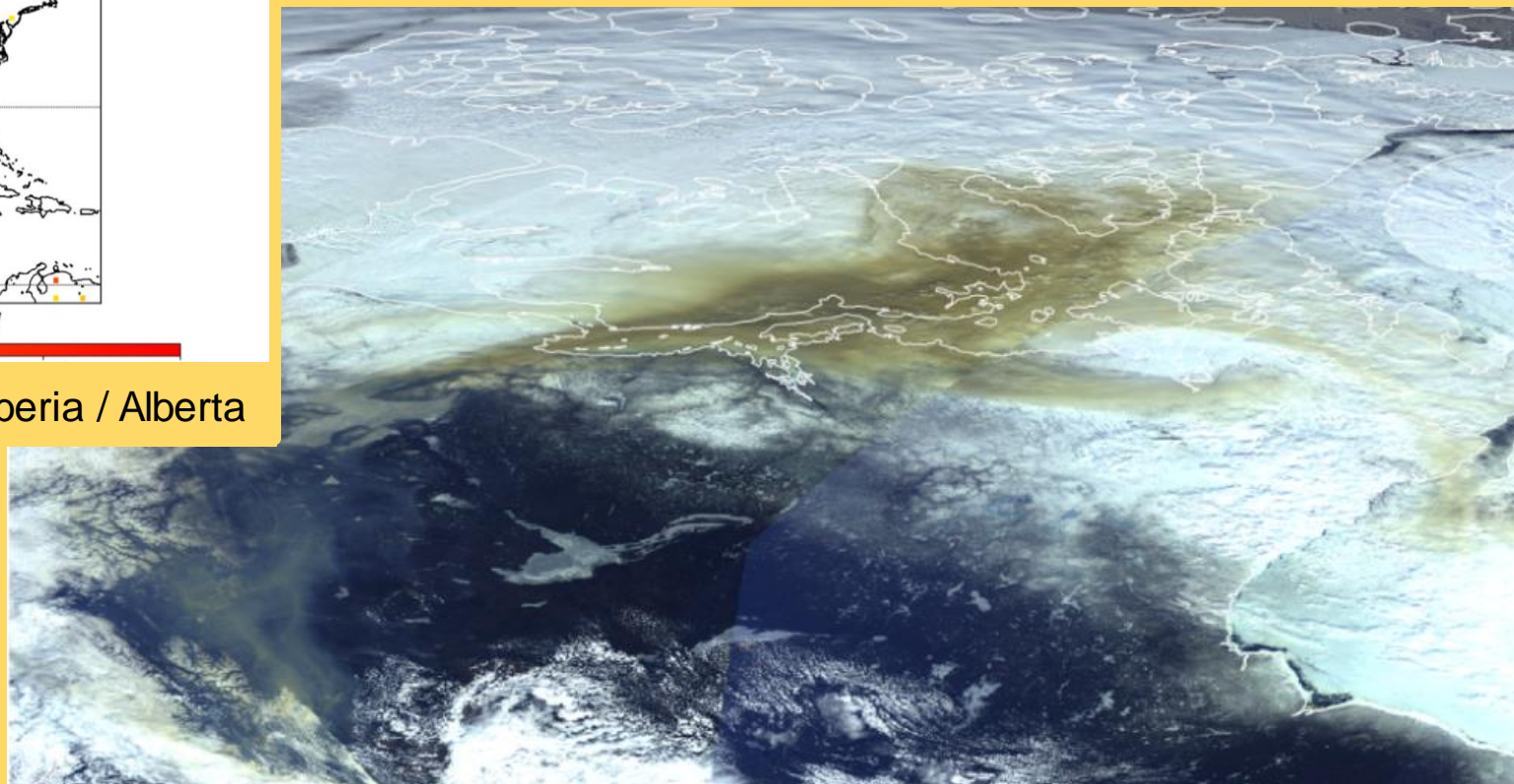


Wildfires

Copernicus applications and data – Wildfires in Siberia / Alberta - May 2023



Case study
First major fire events at
high latitude (11 May 2023)



Sentinel-3 OLCI Level-1B RGB – 7 May 2023

Dust storms

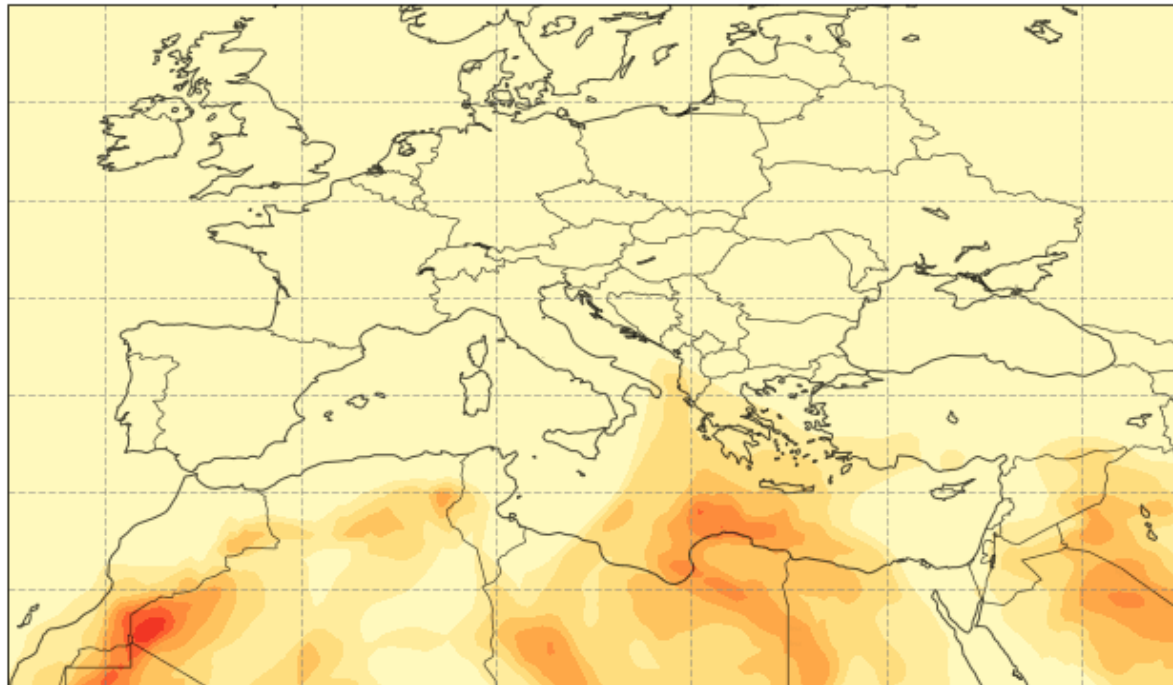


Credit: AFP via GettyImages

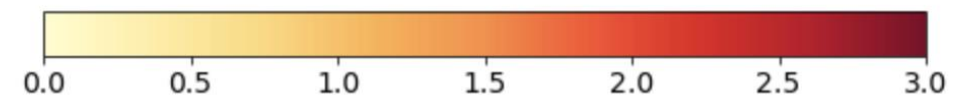
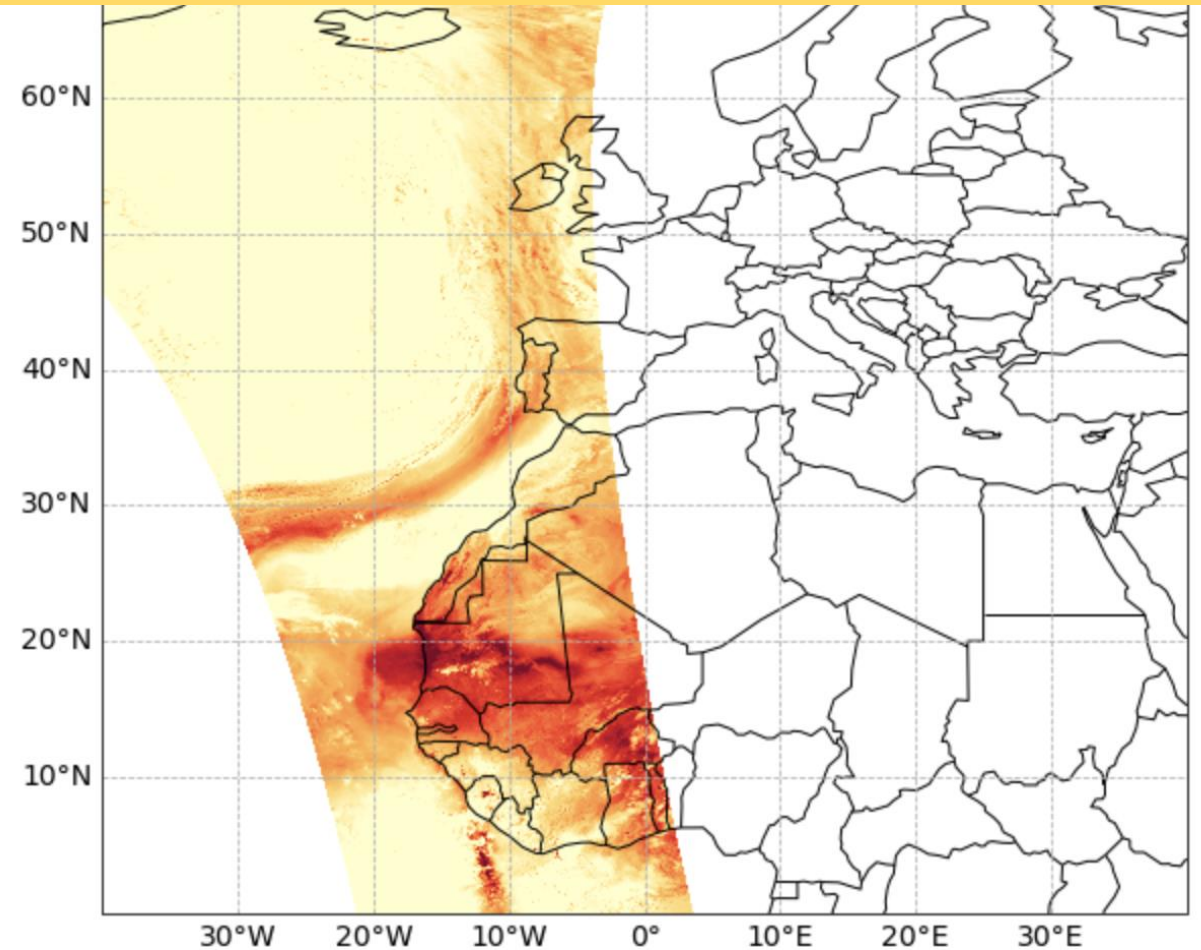
Copernicus applications and data – Dust storms – April 2023

CAMS dust forecast - 11 Apr 2023

CAMS Forecast Dust Aerosol Optical Depth at 550nm
20230511T00 valid for 20230511T00



Sentinel-5P TROPOMI L2 Ultraviolet Index (UVAI) – 3 Apr 2023



Thematic modules on dust and fire monitoring

Analyse and visualise real-world events for a specific application area



FANGS - Fire Applications with Next-Generation Satellites

Search this book...

FANGS - Fire Applications with Next-Generation Satellites

CALIFORNIA, USA 2020

Monitoring fires with next-generation satellites from MTG and Metop-SG

Monitoring smoke transport with next-generation satellites from Metop-SG

MEDITERRANEAN 2021

Forecasting pre-fire risk with next-generation satellites

Monitoring active fires with next-generation satellites

Assessing post-fire impacts with next-generation satellites

REFERENCES

Functions

FANGS - Fire Applications with Next-Generation Satellites

FANGS - Fire Applications with Next-Generation Satellites features Python-based training support material and application cases on fire detection and monitoring of the fire life-cycle. The developed training support material makes use of proxy and simulated data, including data from precursor instruments of the **Meteosat Third Generation (MTG)** and **EUMETSAT Polar System - Second Generation (EPS-SG)** satellite missions. The EPS-SG satellite mission comprises the upcoming **Metop Second Generation (Metop-SG)** satellites, Metop-S and Metop-I.

The course is based on [Jupyter notebooks](#), which allow for a high-level of interactive learning, as it makes code, instructions and visualisations available in the same location.

Executable notebooks are available on a dedicated **Jupyterhub-based course platform**:

- [Register](#)
- Access the course notebooks on the [Jupyterhub-based course platform](#)



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



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>



FANGS – Fire Applications with Next-Generation Satellites



FANGS – Fire Applications with Next-Generation Satellites

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- Features two wildfire case studies from the USA and Europe covering the full fire life-cycle (from pre-fire risk, active fire monitoring to assessing post-fire impacts)
- Features 17 different satellite and model-based products for wildfire monitoring, incl.:

Dust Aerosol Detection, Monitoring and Forecasting



Dust Aerosol Detection, Monitoring and Forecasting

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Dust Aerosol Detection, Monitoring and Forecasting

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- Introduction to forecast models
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Powered by Jupyter Book

Dust Aerosol Detection, Monitoring and Forecasting




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- 22 educational notebooks
- Divided in observation data (satellite and ground-based), forecast models and practical case study
- In total:
 - 6 satellite datasets (Level 1 to Level 3)
 - 3 ground-based measurements
 - 3 model forecast data (global and regional)
- 5 practical exercises (with solutions!)

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



EUMETSAT TrainHub

Different domains

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

EUMETSAT TrainHub

Discover and explore EUMETSAT data, products and services, including Copernicus data provided by EUMETSAT in an interactive and hands-on way.

The EUMETSAT TrainHub provides you access to Jupyter notebook training resources offered by EUMETSAT. You can browse as such as Atmosphere, Climate, Land Surface, Marine or Weather.

Overview of training notebooks available

Discover our notebooks



Atmospheric Composition



Climate



Land

EUMETSAT TRAINHUB

Search

Filters Enabled

THEME: Atmosphere SUBTHEME: Atmospheric Composition

Theme *

☒ Atmosphere (49)

Subtheme *

☒ Atmospheric Composition (49)

Platform *

☐ Metop-A (21)
☐ Metop-B (22)
☐ Metop-C (8)
☐ Sentinel-3 (14)
☐ Sentinel-5P (10)

Sensor *

☐ GOME-2 (17)
☐ IASI (9)
☐ OLCI (7)
☐ SLSTR (9)
☐ TROPOMI (11)

Tags *

☐ Absorbing Aerosol Height (2)
☐ Absorbing Aerosol Index (5)
☐ Aerosol Optical Depth (5)
☐ Ammonia (1)
☐ Carbon monoxide concentration (total column) (1)
☐ Dust aerosol optical depth (1)
☐ Dust concentration (1)
☐ Fire Radiative Power (8)
☐ Fire Weather Index (4)
☐ Environmental (2)

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-A/B/C GOME-2 - Absorbing Aerosol Index L3

Explore AC SAF Metop-B GOME-2 - Absorbing Aerosol Height L2




Explore PMAp - Aerosol Optical Depth L2

Explore Metop-A/B IASI - Ammonia L2

Explore Metop-A/B IASI - Carbon Monoxide

Search functionality based on notebook metadata

WEkEO Notebook Portal



ATMOSPHERE CLIMATE COMMUNITY CONTRIBUTIONS LAND MACHINE LEARNING MARINE

Search

Filters Enabled

DOMAIN:
atmosphere

Domain ^

☒ atmosphere (14)

☐ climate (2)

☐ community contributions (1)

☐ land (3)

☐ machine learning (2)

☐ marine (3)

Copernicus Service ^

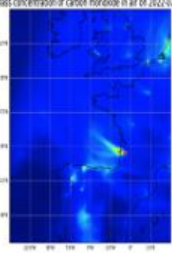
☐ CAMS (1)

☐ CAMS (Atmosphere) (4)

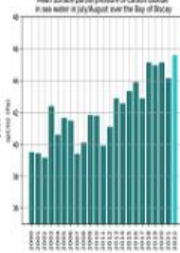
☐ CMEMS (1)

Visualise the impacts of wildfires on vegetation cover and ocean parameters


Mass concentration of carbon monoxide in air on 2022-07-18



Mass surface partial pressure of carbon dioxide in sea water in July/August over the Bay of Biscay




Estimation of vegetation loss during Summer 2022




This Jupyter Notebook, part of our series WEkEO4Universities, investigates the immediate effects of the Summer 2022 wildfires on CO2 and pH while also teaching how to retrieve and visualize data from Wfkeo

WEkEO Harmonized Data Access (HDA) API - How-To



This notebook is a step-by-step guide on how to search for and download data from WEkEO using the HDA-API.

Welcome to WEkEO Jupyter Lab



This notebook provides you an orientation to the WEkEO Jupyter Lab environment.

<https://notebooks.apps.mercator.dpi.wekeo.eu/>

Training resources for Copernicus Atmosphere Applications

Notebook portals

- EUMETSAT TrainHub - <https://trainhub.eumetsat.int>
- WEkEO Notebook Portal - <https://notebooks.apps.mercator.dpi.wekeo.eu/>

Thematic application modules

- Dust Aerosol Detection, Monitoring and Forecasting - <https://dust.trainhub.eumetsat.int>
- Fire Applications for Next-Generation Satellites - <https://fire.trainhub.eumetsat.int/>

Training content

- Learning Tool for Python on atmospheric composition (LTPy)
 - https://nbviewer.org/urls/gitlab.eumetsat.int/eumetlab/atmosphere/atmosphere/raw/master/00_index.ipynb
- WEkEO4Atmosphere
 - <https://github.com/wekeo/wekeo4atmosphere>
- Copernicus Atmosphere Monitoring Service (CAMS) Data Tutorials
 - <https://ecmwf-projects.github.io/copernicus-training-cams/intro.html>

Thank you!

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@JuliaWagemann



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