



C A M S

Regional Air Quality



Outline

- Regional quality forecasting in CAMS
- Data access:
 - Pollutants: maps and data
- Fire emissions and smoke dispersion
- Bulgarian AQ use case
- Tools to view data
- Summary



General

- Air quality forms a significant risk factor for health conditions
- Various source of pollutants (anthropogenic & natural)
 - Industry, energy production, transportation
 - Agriculture, waste burning
 - Wildland fires
 - Pollen
 - Volcanoes, sea salt
- Regulated: NO_x, SO_x, O₃, CO, PM₁₀, PM₂₅
- Other species in CAMS: NH₃, NMVOC, PAN, Grass, Birch and Olive pollen
- Different models -> Different errors: Ensemble



Available data and models

- Global atmospheric composition forecasting system operated at ECMWF (~50km)
- Ensemble of 7 regional models 4-days forecast validated daily (~10km)
- Downstream models (few km)

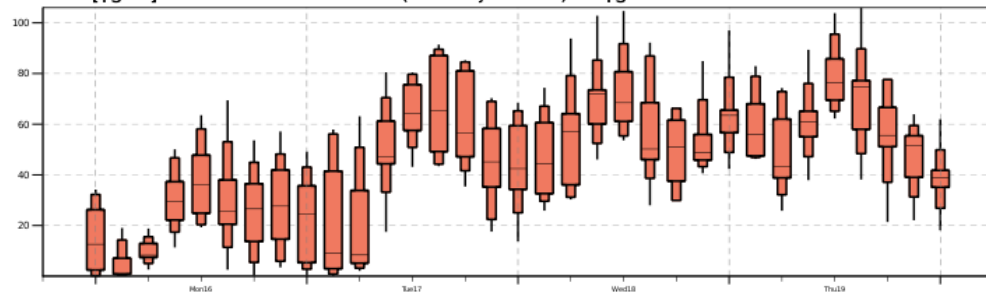
CAMS EPSGRAM

Saint_Petersburg(59.94°N, 30.31°E)

Forecast Monday 16 April 2018 00 UTC

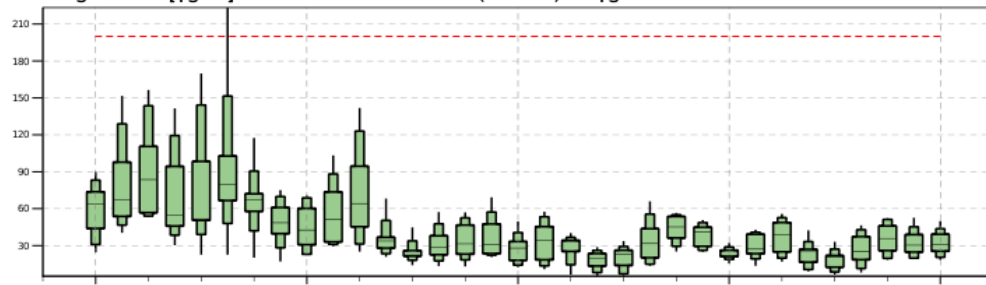
Ozone [$\mu\text{g}/\text{m}^3$] N=7

threshold ("max daily 8h mean")=120 $\mu\text{g}/\text{m}^3$

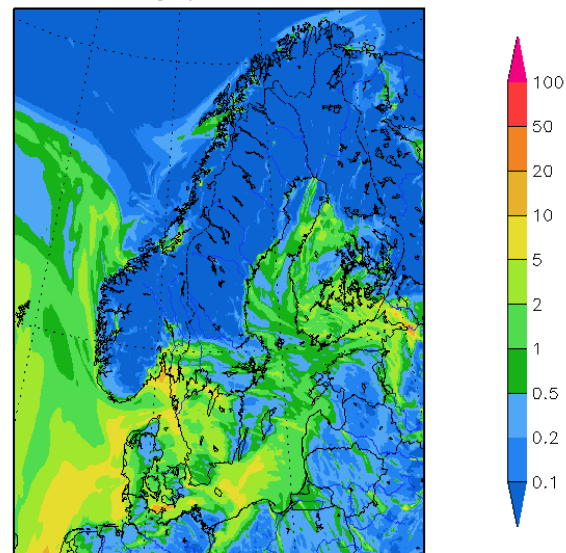


Nitrogen Dioxide [$\mu\text{g}/\text{m}^3$] N=7

threshold ("1h max")=200 $\mu\text{g}/\text{m}^3$



Forecast for NO₂ gas. Last analysis time: 20180416 00
Concentration, $\mu\text{gN}/\text{m}^3$, 13:00 17 APR 2018

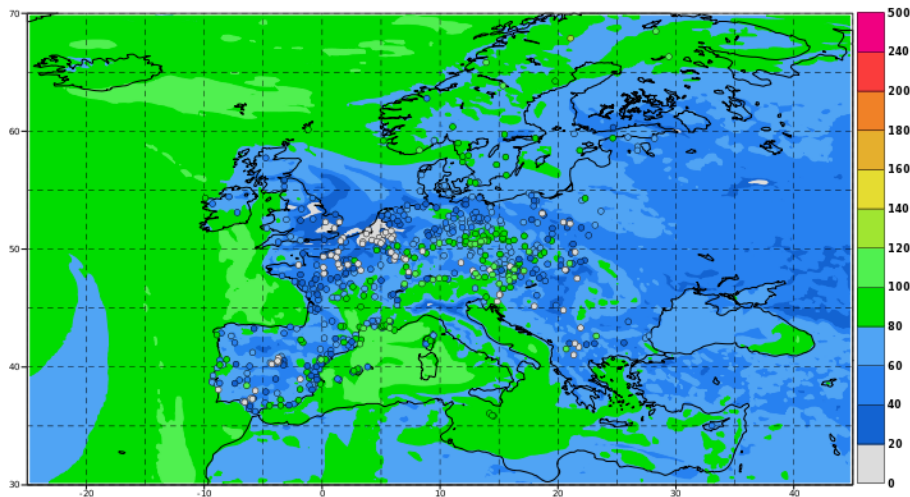




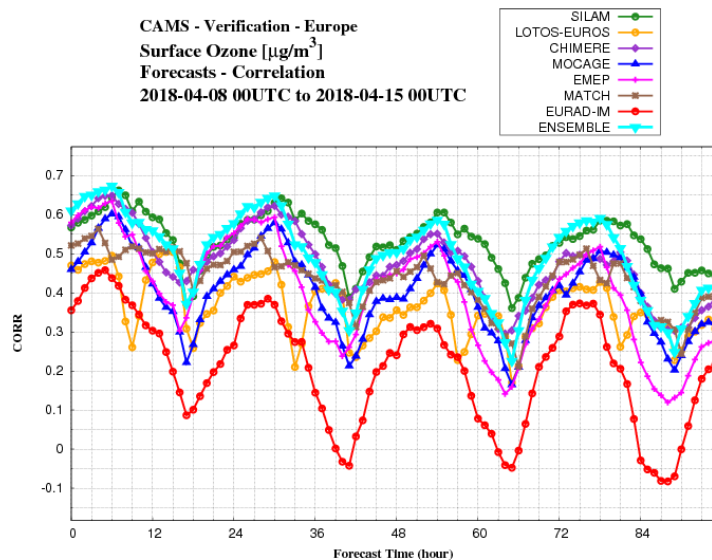
Validated forecasts

- <http://www.regional.atmosphere.copernicus.eu/>
- Daily evaluation against ~1000 stations over Europe
- Maps, scores, Taylor diagrams, etc..

Saturday 14 April 2018 00UTC CAMS Verification t+003 VT: Saturday 14 April 2018 03UTC
Model: ENSEMBLE Median Height level: Surface Parameter: Ozone [$\mu\text{g}/\text{m}^3$]



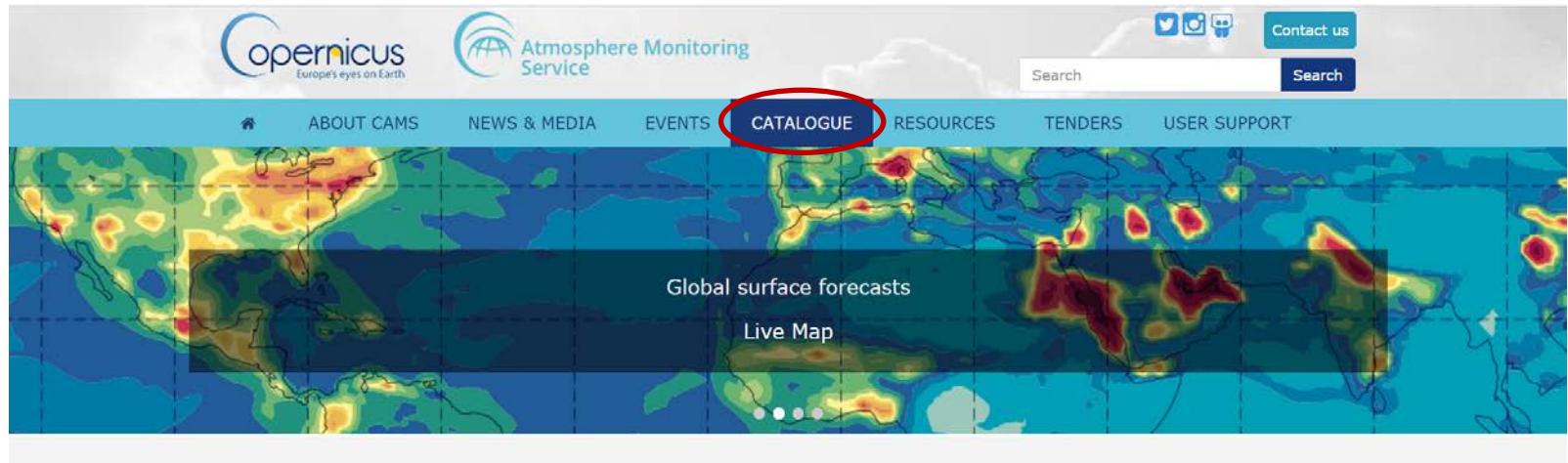
CAMS - Verification - Europe
Surface Ozone [$\mu\text{g}/\text{m}^3$]
Forecasts - Correlation
2018-04-08 00UTC to 2018-04-15 00UTC





Hands-on demo

- This demonstration will show how to view and extract **an ensemble surface forecast for O_3** for one year.
- Have a look at CAMS catalogue:
([**https://atmosphere.copernicus.eu/catalogue#/**](https://atmosphere.copernicus.eu/catalogue#/))





Hands-on demo/Surface forecast

The screenshot displays the Copernicus Atmosphere Monitoring Service (CAMS) Catalogue. The header includes the Copernicus logo, the text 'Europe's eyes on Earth', and the 'Atmosphere Monitoring Service' logo. A navigation bar contains links to 'ABOUT CAMS', 'NEWS & MEDIA', 'EVENTS', 'CATALOGUE', 'RESOURCES', 'TENDERS', and 'USER SUPPORT'. A search bar is located in the top right corner.

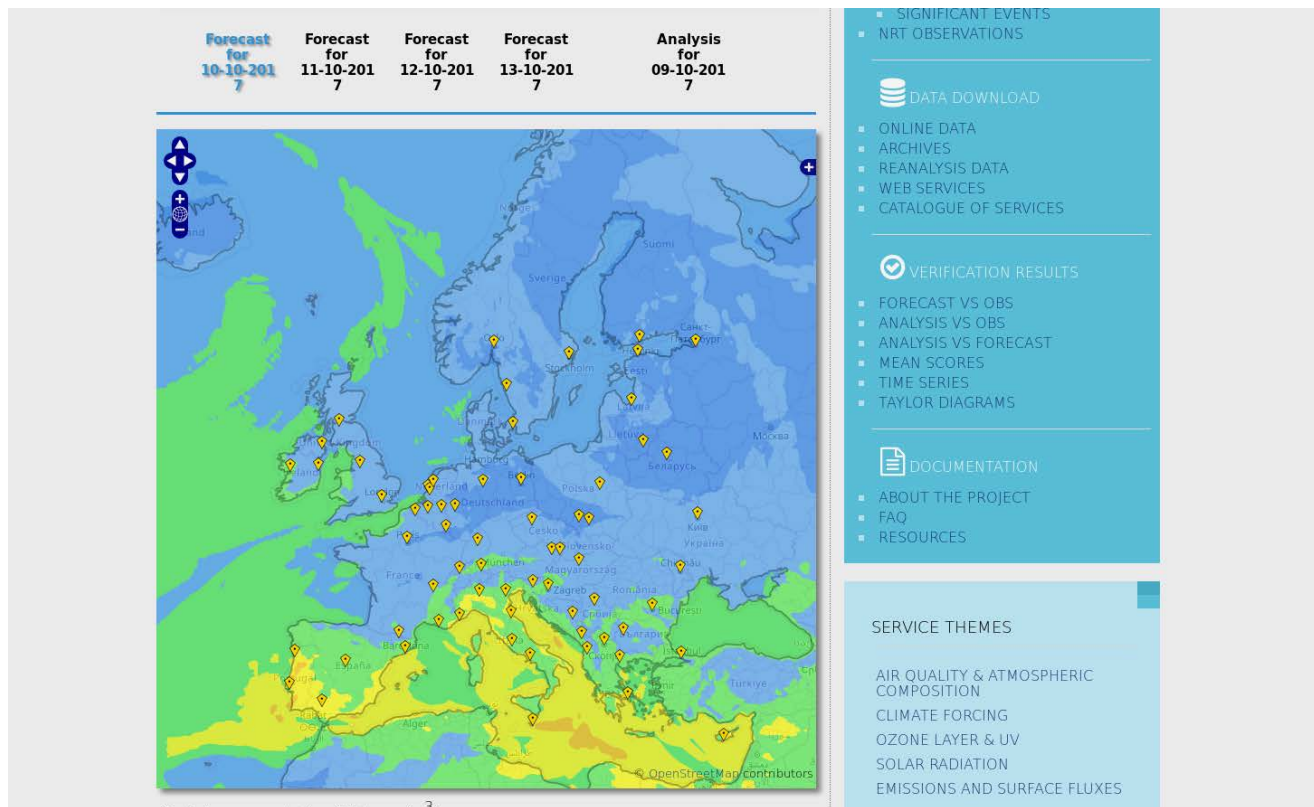
The main content area is titled 'Catalogue'. On the left, there is a sidebar with a search box and a 'Reset' button. Below this, the 'PRODUCT FAMILY' section lists various categories, with 'Regional forecasts' highlighted by a red circle. The 'PARAMETER FAMILY' section lists 'Aerosol', 'Greenhouse gas', and 'Radiation'.

The main content area shows 'CURRENT FILTERS:' with 'Product family: Regional forecasts' selected. Below this, it states 'Total results: 87'. A red box highlights the first result, 'European-scale air quality forecast from model ensemble - ozone'. This result includes a map of Europe, a description of the service, and a 'Data Download' button, which is circled in red. The parameter 'Ozone' is also listed.

Below the highlighted result, another result is partially visible: 'European-scale air quality forecast from model ensemble - carbon monoxide'.



Interactive maps





Data access

▼ About the ENSEMBLE model

DOWNLOAD CAMS EUROPEAN AIR QUALITY DATA

About European air quality DATA ACCESS:

Data issued by the Ensemble model and partner models are available for download after reading and accepting the **CAMS data licence terms**.



[DOWNLOAD ONLINE DATA \(less than 30 days old\)](#)



[DOWNLOAD ARCHIVED DATA \(more than 30 days old\)](#)



[DOWNLOAD REANALYSIS DATA \(yearly average, seasonal statistics, ...\)](#)



[WEB-SERVICES \(registration required\):](#)



▼ READ MORE

FORECASTS

Reactive Gases
Aerosols
European Air Quality
Ozone Layer
CO₂





Form for data access

EUROPEAN AIR QUALITY - DOWNLOAD ONLINE DATA



CAMS Regional Air Quality - Online data (less than 30 days old)

Select a model ⁱ:

ENSEMBLE

Select a type for your data ⁱ:

ANALYSIS

Select a species ⁱ:

CO

Select a type of level ⁱ:

Surface

Select a time step package ⁱ:

From -24H to -1h

Select a reference time ⁱ:

2017-10-10T00:00:00Z

Select a format for your data ⁱ:

NetCDF

Get data:

☒ In order to download CAMS data products, the CAMS data license available [here](#) must be accepted

DOWNLOAD ^{info}

https://download.regional.atmosphere.copernicus.eu/services/CAMS50?token=__M0bChV6QsoOFqHz31VRqnpr4GhWPtcpaRy3oeZjBNSg__&grid=0.1&model=ENSEMBLE&package=ANALYSIS_CO_SURFACE&time=-24H-1H&referencetime=2017-10-10T00:00:00Z&format=NETCDF&licence=yes



PRODUCT FAMILY ▾

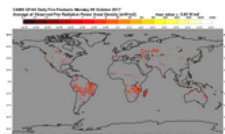
- ☐ Anthropogenic emissions
- ☐ Climate forcings
- ☐ Fire emissions
- ☐ Global analyses
- ☐ Global forecasts
- ☐ Global reanalyses
- ☐ Greenhouse gas fluxes
- ☐ Interim regional reanalyses
- ☐ Policy support
- ☐ Regional analyses
- ☐ Regional forecasts
- ☐ Solar radiation

PARAMETER FAMILY ▾

- ☐ Aerosol
- ☒ Fire
- ☐ Greenhouse gas
- ☐ Radiation
- ☐ Reactive gas

PARAMETER ▾

Total results: 1



NRT Biomass burning emissions of carbon and various trace species based on assimilated Fire Radiative Power (FRP) (GFAS)

More details



Data Download

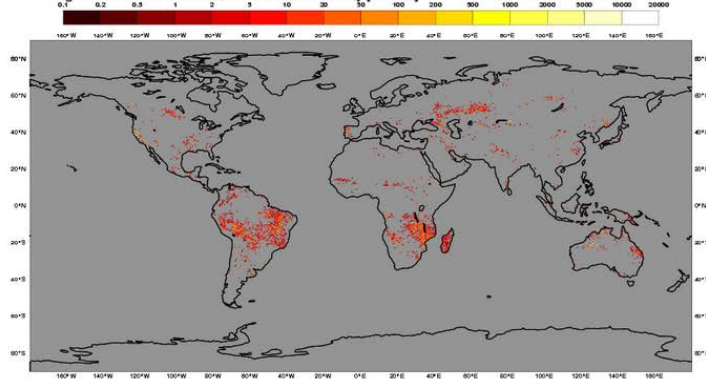
NRT Biomass burning emissions of carbon and various trace species based on assimilated Fire Radiative Power (FRP) (GFAS)

[Back to index](#)

CAMS GFAS Daily Fire Products Monday 09 October 2017

Average of Observed Fire Radiative Power Areal Density [mW/m²]

max value = 3.65 W/m²



This service provides daily biomass burning emissions of various aerosol, greenhouse gas, and chemical species based on Fire radiative Power (FRP) satellite observations

Theme: Emissions and fluxes

Product family: Fire emissions

Parameter: Fire Radiative Power

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

Time coverage:

Metadata: [XML](#)



Data download



Plots



Contact us

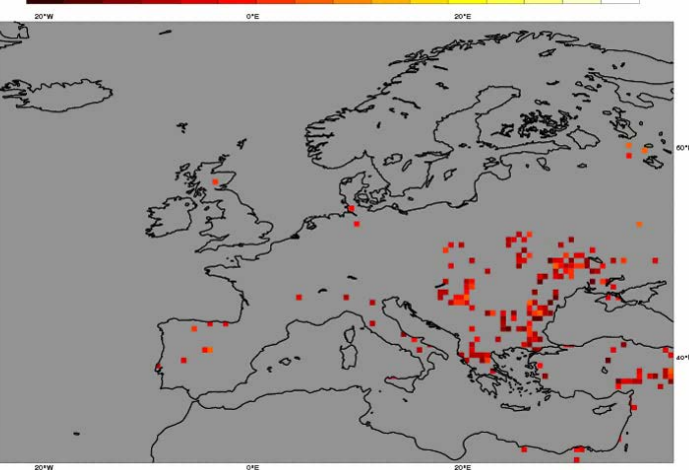


Fire emissions and pollution

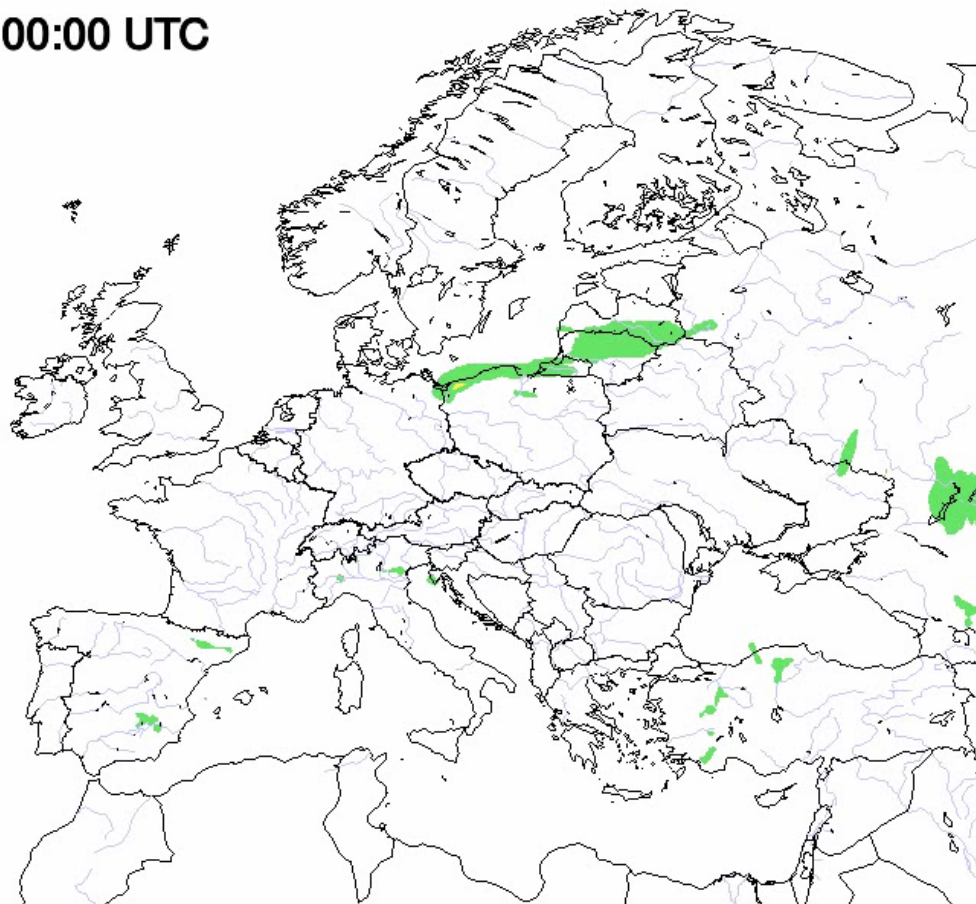
CAMS GFAS Daily Fire Products Saturday 01 October 2016

Average of Observed Fire Radiative Power Areal Density [mW/m^2]

max value = $1.16 \text{ W}/\text{m}^2$



2018-04-01 00:00 UTC



↑ GFAS FRP (emissions)

Silam simulations of fire PM→

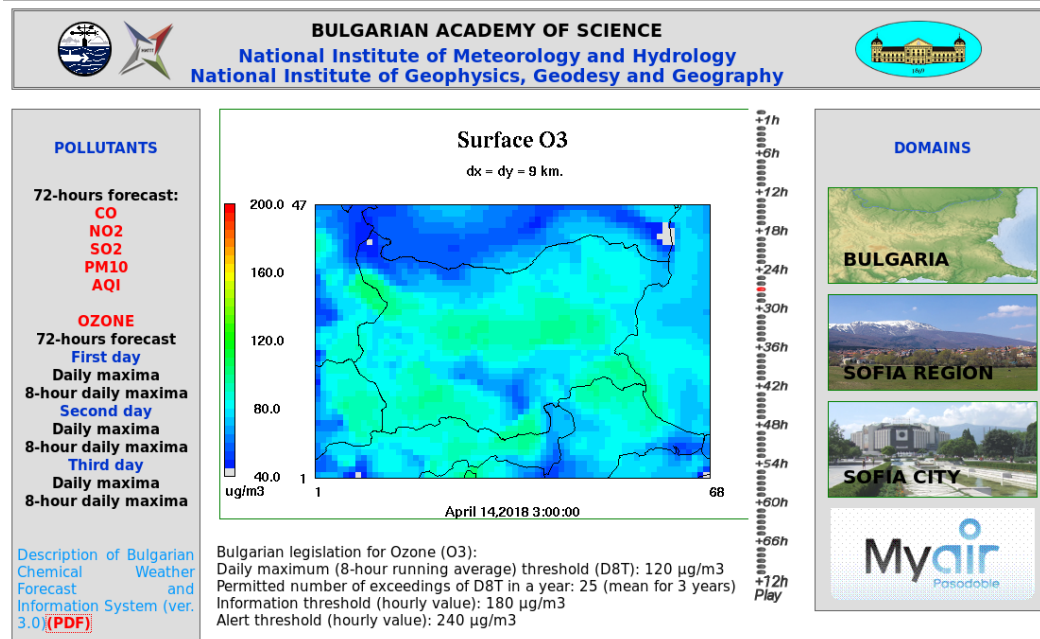




Use case: AQ forecast for Bulgaria

<http://www.niggg.bas.bg/cw3/index.php>

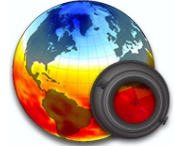
- 4 days daily forecast
- Since 2012
- WRF-CMAQ
- Boundaries from CAMS-SILAM domain
- Only needed subset downloaded





- **Panoply:**

- Panoply is developed by the NASA
- It plots geo-referenced arrays from netCDF, HDF, GRIB, and other datasets
- Panoply is a cross-platform application that runs on Macintosh, Windows, Linux and other desktop computers.
- Download link: <http://www.giss.nasa.gov/tools/panoply/>



- **QGIS:**

- QGIS is an Open Source Geographic Information System (GIS).
- QGIS is an official project of the Open Source Geospatial Foundation (OSGeo).
- It runs on Linux, Unix, Mac OSX, Windows and Android
- It supports numerous vector, raster, and database formats and functionalities.
- Download link: <https://www.qgis.org/en/site/forusers/download.html>



- **Others:**

- GrADS, Python, others



S u m m a r y

- Plenty of AQ information available
- Both reanalysis and forecasts
- Scales from global to European to regional
- Various tools to access the data in different formats
- Feel free to explore
 - <https://atmosphere.copernicus.eu>
- Each application needs specific data in specific format
- More detailed and/or specific data from CAMS members
- Feel free to ask more!