



Продукти на Европейски § Световни центрове за КАВ

доц. д-р Емилия Георгиева, НИМХ

Air Quality Modelling, 24 September 2021
online Workshop

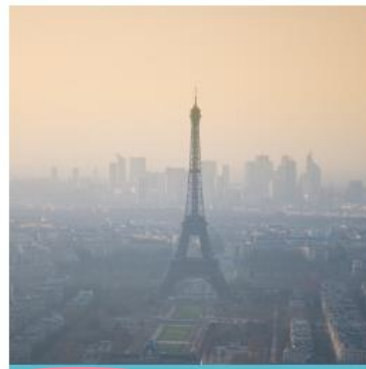
Прогностични модели за замърсяване в Европа – фокус върху:

- Продукти за атмосферно замърсяване на системата Коперник (**CAMS**)
- Продукти за пясъчни бури на Регионалния Център на Световната метеорологична организация за Северна Африка, Близкия Изток и Европа (**WMO SDS-WAS RC NA ME EU**)

Услуги за наблюдение на атмосферата

Today's air quality forecasts

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



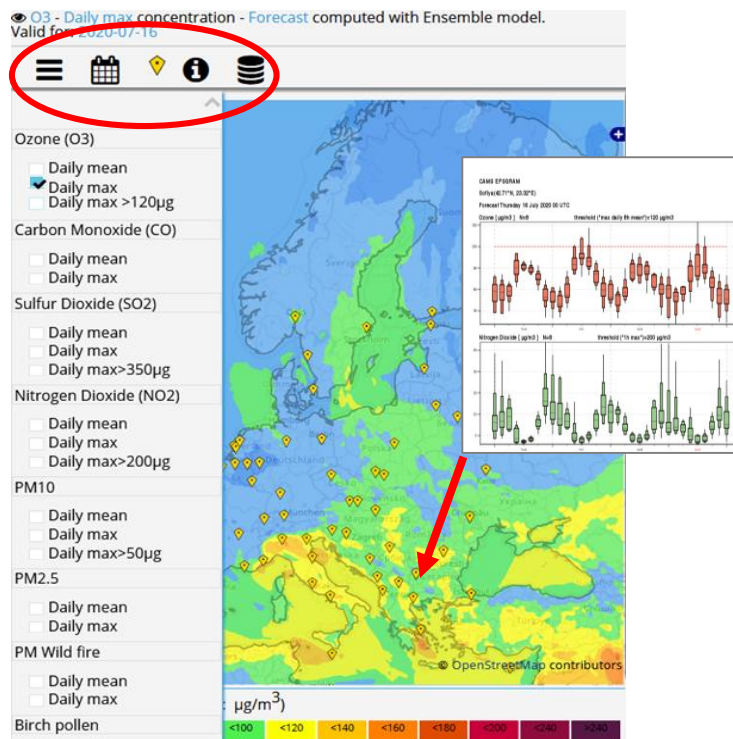
Europe



Worldwide

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

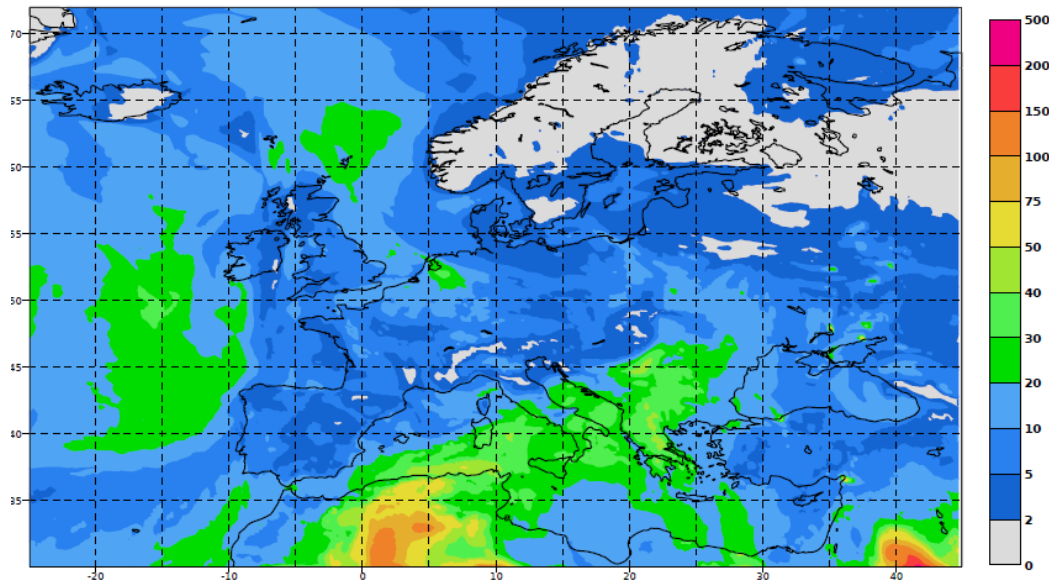
Прогноза за КАВ в Европа



- **Ensemble** modelling: 9 модела
- 10 км x 10 км, за 8 височини: 0м - 5000 м
- за всеки 1 час, 4 дни напред
- аерозоли и газове: O3, CO, **NO2**, SO2, **PM10**, **PM2.5**, **DUST**, и др.
- Минерален прах, различни полени, ФПЧ от пожари
- Карти и *epsgrams* (часови изменения от Ensemble – в БГ само за **СОФИЯ**)

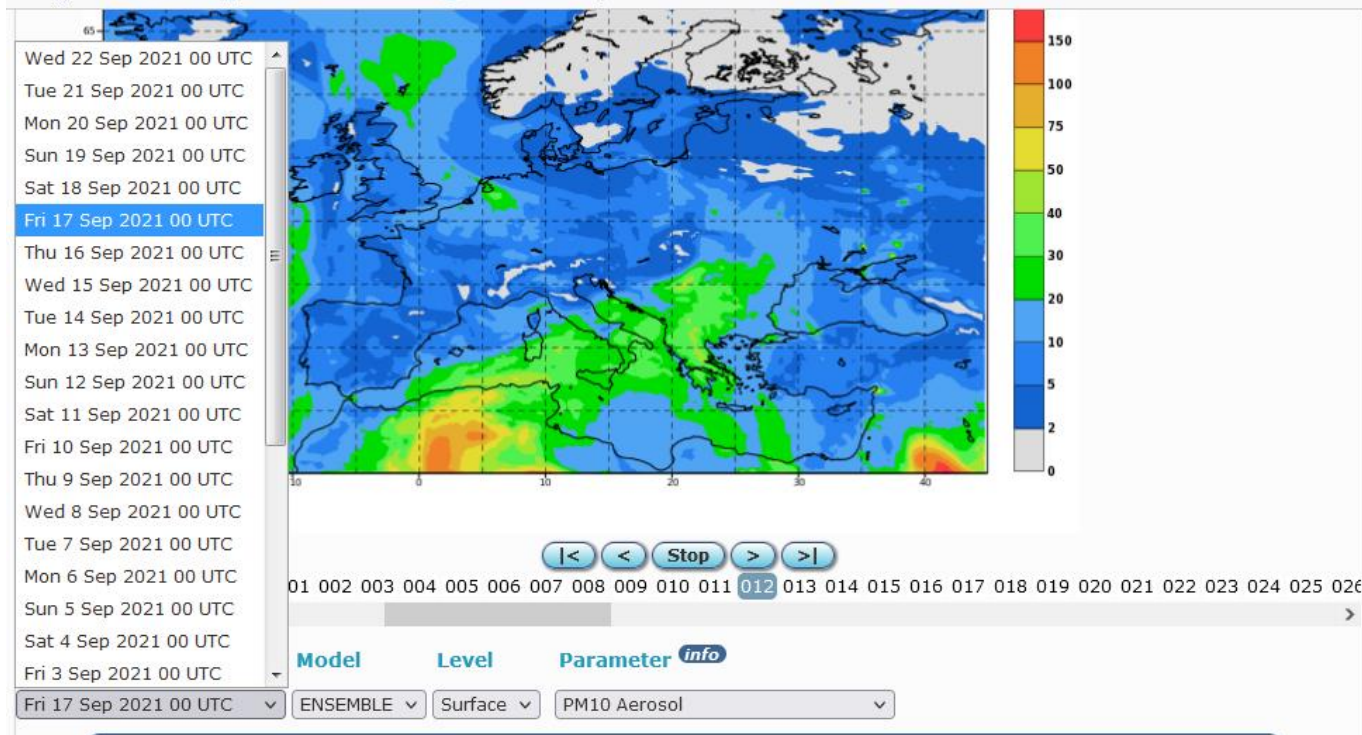
| Анализ и Прогноза (дни-28)

Friday 17 September 2021 00UTC CAMS Forecast t+012 VT: Friday 17 September 2021 12UTC
Model: ENSEMBLE (N=9) Height level: Surface Parameter: PM10 Aerosol [$\mu\text{g}/\text{m}^3$]



- Друга възможност за визуализация – карти за всеки час от **изминалите 28 дни**
- **Пример: ФПЧ10**
- **За 17.09.2021 12:00**

Онлайн анимация (часови полета)

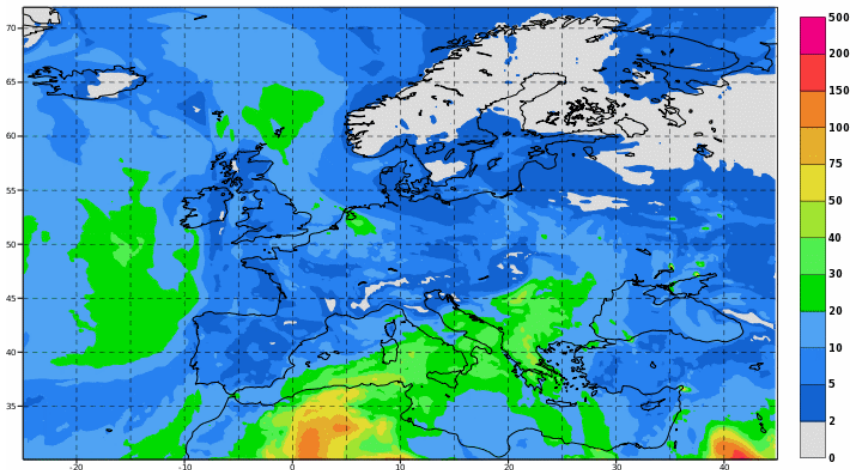


Изборът на последователни часови интервали дава идея за преноса

Съвместен анализ на замърсители 17.09.21 12:00 до 18.09.21 12:00

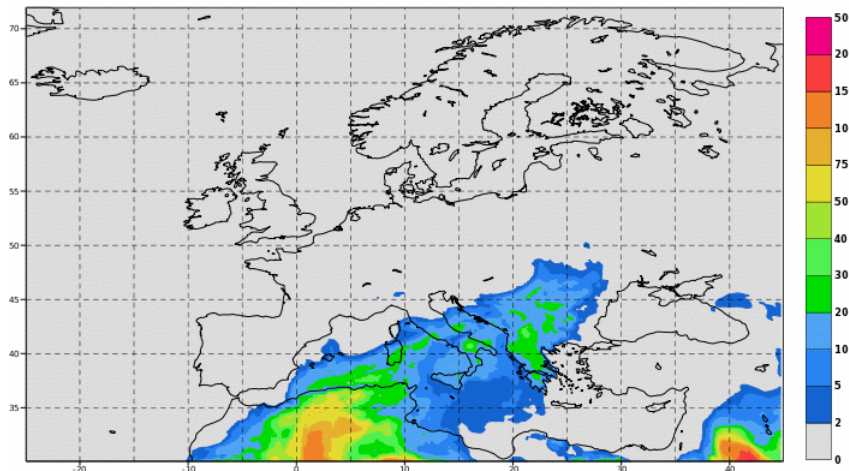
ФПЧ10

Friday 17 September 2021 00UTC CAMS Forecast t+012 VT: Friday 17 September 2021 12UTC
Model: ENSEMBLE (N=9) Height level: Surface Parameter: PM10 Aerosol [$\mu\text{g}/\text{m}^3$]



Прах от Сахара

Friday 17 September 2021 00UTC CAMS Forecast t+012 VT: Friday 17 September 2021 12UTC
Model: ENSEMBLE (N=9) Height level: Surface Parameter: Dust dry [$\mu\text{g}/\text{m}^3$]



Съчетаването на прогнози за различни параметри позволява
идентифициране на източниците и типа замърсяване

Ретроспективен анализ – реанализ

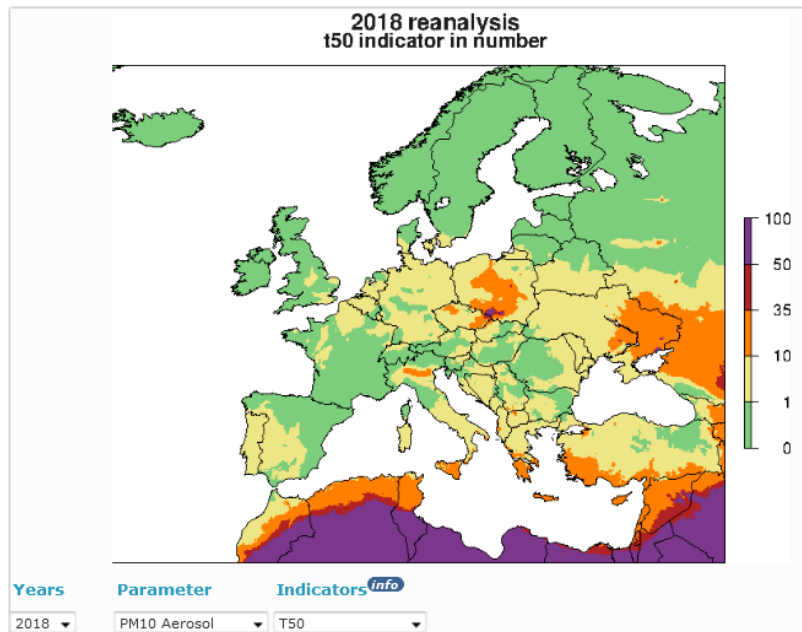
<https://www.regional.atmosphere.copernicus.eu/>

EUROPEAN AIR QUALITY SERVICES

- OTHER AIR QUALITY MAPS
 - ENSEMBLE MODEL
 - HOURLY FORECASTS & ANALYSES
 - EPSGRAMS
 - PARTNER MODELS
 - HOURLY FORECASTS
- TENDERS HELP & SUPPORT
- DAILY MEAN AND MAXIMUM
- REANALYSES
 - ENSEMBLE REANALYSIS
 - SIGNIFICANT EVENTS
 - NRT OBSERVATIONS
- OTHER DATA ACCESS

Warning: data soon available only through Atmosphere Data Store

 - REANALYSIS DATA
- VERIFICATION RESULTS
 - FORECAST VS OBS
 - ANALYSIS VS OBS
 - ANALYSIS VS FORECAST
 - MEDIAN SCORES
 - TAYLOR DIAGRAMS
- TIME SERIES
 - HOURLY TIME SERIES
 - DAILY TIME SERIES
- DOCUMENTATION
 - ABOUT THE PROJECT
 - FAQ
 - RESOURCES



- 2012-2018
 - O₃, NO₂, SO₂, CO
 - PM₁₀, PM_{2.5}
 - Специфични индикатори за п.д. норми
- t50 = брой дни с PM₁₀ > 50 μg m⁻³, 2018*

Подкрепа на анализи и решения
<https://policy.atmosphere.copernicus.eu/>

CAMS Air Control Toolbox:

ефект от редуциране на емисиите

Source Contribution to EU cities:

прогноза за хим. състав на ФПЧ и приноса на отделни сектори и страни (за столиците в ЕС)

CAMS Air Quality Reports:

Годишни ; Анализ на тенденции и епизоди O₃, ФПЧ, NO₂

CAMS Policy workshops

презентациите са в помощ на използване на продуктите

CAMS –Policy Support Products #2

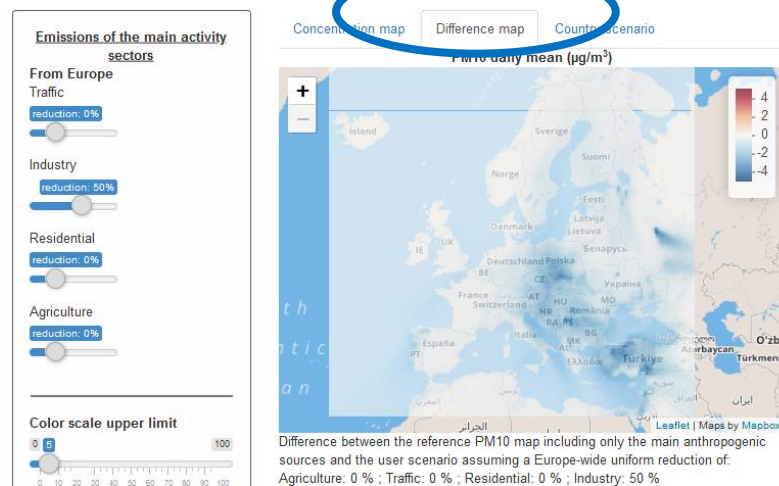
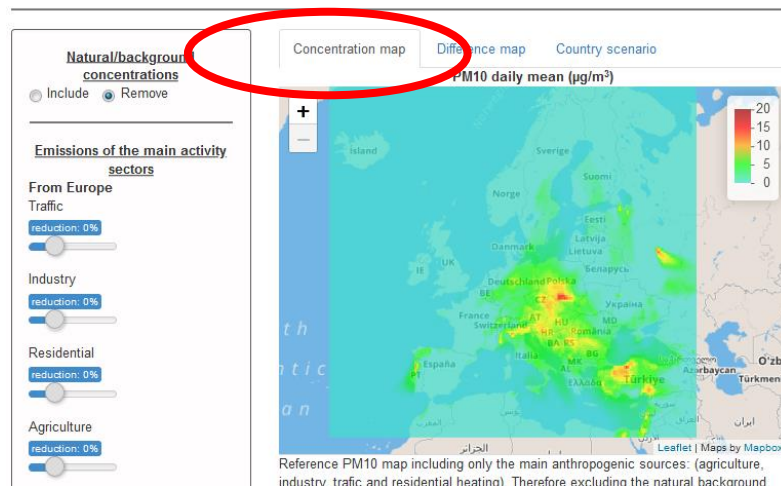
https://policy.atmosphere.copernicus.eu/CAMS_ACT.php



Ефект от редуциране на емисиите CAMS Air Control Toolbox

Field: Daily Concentrations
Pollutants: PM10
Forecast Base Time: 2020-07-19
Valid Time: 2020-07-20

Daily Concentrations
PM10
2020-07-19
2020-07-20



Например: Какви ще са ФПЧ10 „утре“ , ако намалим емисиите от индустрията с 50% ?
PM10, PM2.5, NO2, O3

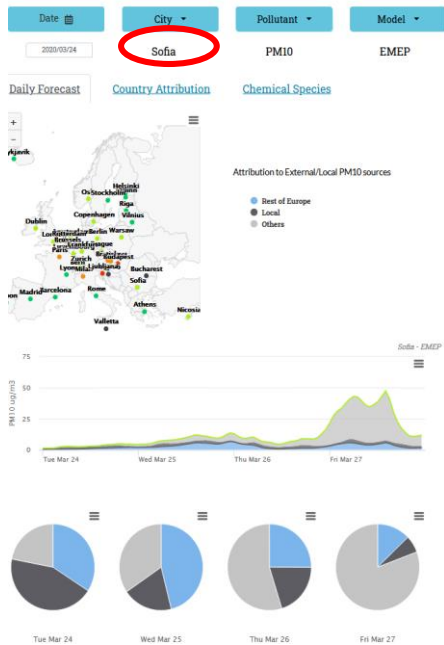
CAMS –Policy Support Products #3

<https://policy.atmosphere.copernicus.eu/DailySourceAllocation.php>



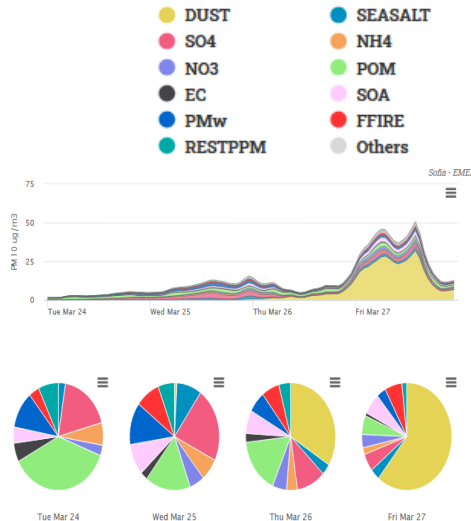
Принос на различни източници към ФПЧ10

БГ, ЕС или други

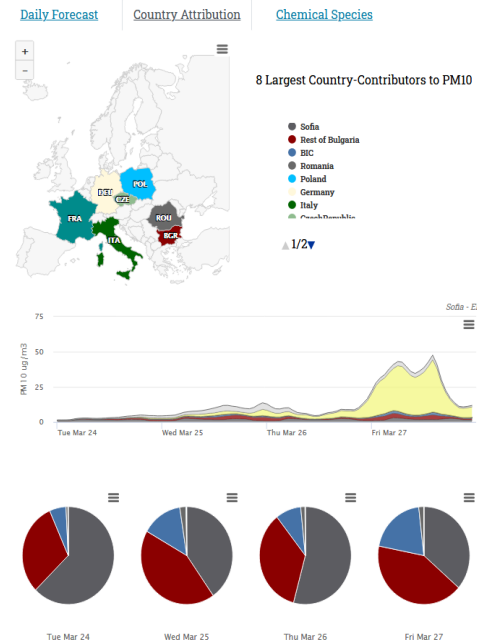


ХИМ. СЪСТАВ

Chemical Species in PM10



ОТДЕЛНИ СТРАНИ



CAMS –Policy Support Products #4

<https://atmosphere.copernicus.eu/european-air-quality-information-support-covid-19-crisis>



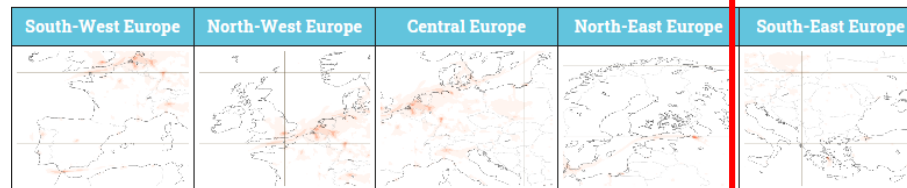
Услуги във връзка с COVID-19

карти за средно-дневни PM10, PM2.5, NO2, O3 за 5 района на Европа

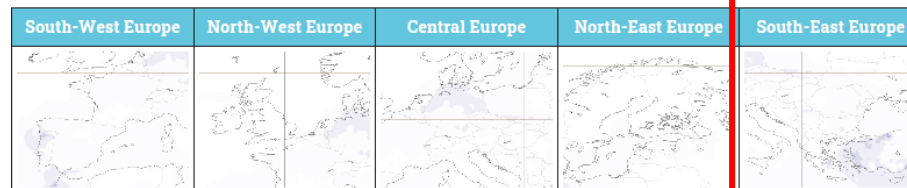
10 x 10 км

CAMS REG – ANALYSIS – (dd-2) (отчита измервания!)

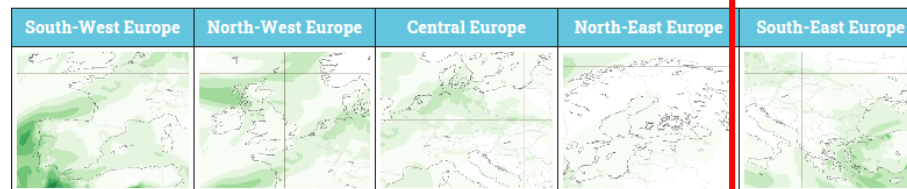
NO₂ – Nitrogen Dioxide [$\mu\text{g}/\text{m}^3$]



PM2.5 – Particulate Matter with diameter smaller than 2.5 micrometres [$\mu\text{g}/\text{m}^3$]



PM10 – Particulate Matter with diameter smaller than 10 micrometres [$\mu\text{g}/\text{m}^3$]



European Air Quality information in support of the COVID-19 crisis

CAMS –Policy Support Products #5

<https://atmosphere.copernicus.eu/european-air-quality-information-support-covid-19-crisis>

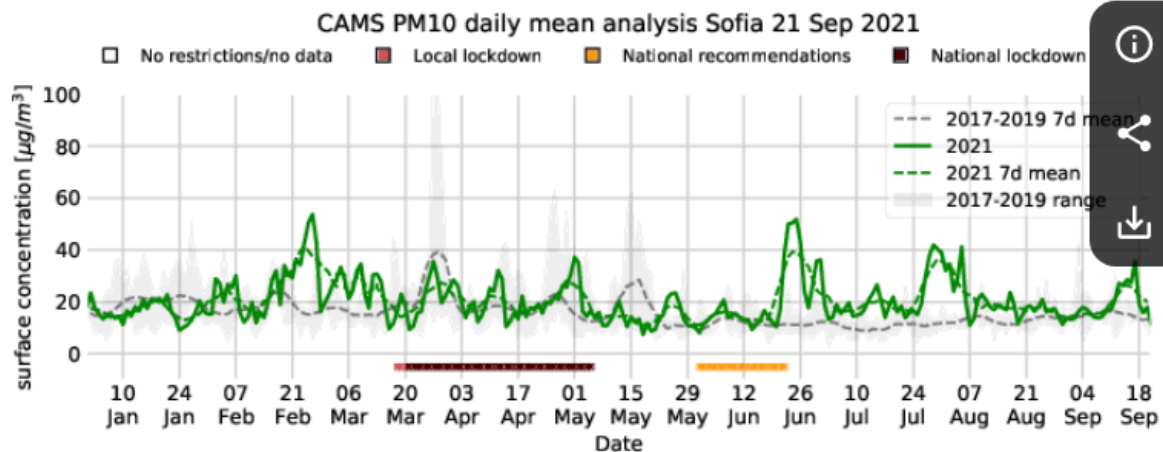


Услуги във връзка с COVID-19

Бърза визуализация на ефекта от рестрикции за 50 града

Еволюция от януари 2020 сравнение с нива от (2017-2019)

NO2 PM2.5 **PM10** O3



Lockdown data source: Oxford COVID-19 Government Response Tracker

@CopernicusECMWF

Atmosphere Data Store

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 to the ADS and its Toolbox.

We are constantly improving the services and adding new datasets. For more information, please consult the [catalogue](#), our [FAQ](#) or the [CAMs forum](#).

 × All ▾ Search

Atmosphere Data Store

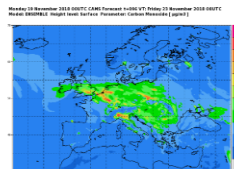
<https://ads.atmosphere.copernicus.eu/cdsapp#!/dataset/cams-europe-air-quality-forecasts?tab=form>

CAMS European air quality forecasts

Overview **Download data** Documentation

This dataset provides daily air quality analyses and forecasts for Europe.

CAMS produces specific daily air quality analyses and forecasts for the European domain at significantly higher spatial resolution (0.1 degrees, approx. 10km) than is available from the global analyses and forecasts. The production is based on an ensemble of nine air quality forecasting systems across Europe. A median ensemble is calculated from individual outputs, since ensemble products yield on average better performance than the individual model products. The spread between the nine models are used to provide an estimate of the forecast uncertainty. The analysis combines model data with observations provided by the European Environment Agency (EEA) into a complete and consistent dataset using various data assimilation techniques depending upon the air-quality forecasting system used. In parallel, air quality forecasts are produced once a day for the next four days. Both the analysis and the forecast are available at hourly time steps at seven height levels.



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

DATA DESCRIPTION	
Data type	Gridded
Horizontal coverage	Europe (east boundary=25.0° W, west=45.0° E, south=30.0° N, north=70.0°)
Horizontal resolution	0.1°x0.1° (10 km x 10 km)
Vertical coverage	Surface, 50m, 250m, 500m, 1000m, 2000m, 3000m, 5000m
Temporal coverage	three-year rolling archive
Temporal resolution	1-hourly
File format	GRIB, NetCDF
Update frequency	daily
MAIN VARIABLES	

CAMS European air quality forecasts

Overview **Download data** Documentation

Variable ?

At least one selection must be made

- | | | |
|---|--|--|
| <input type="checkbox"/> Ammonia | <input type="checkbox"/> Birch pollen | <input type="checkbox"/> Carbon monoxide |
| <input type="checkbox"/> Dust | <input type="checkbox"/> Grass pollen | <input type="checkbox"/> Nitrogen dioxide |
| <input type="checkbox"/> Nitrogen monoxide | <input type="checkbox"/> Non-methane VOCs | <input type="checkbox"/> Olive pollen |
| <input type="checkbox"/> Ozone | <input type="checkbox"/> Particulate matter < 2.5 µm (PM2.5) | <input type="checkbox"/> Particulate matter < 10 µm (PM10) |
| <input type="checkbox"/> PM2.5, anthropogenic fossil fuel carbon only | <input type="checkbox"/> PM2.5, anthropogenic wood burning carbon only | <input type="checkbox"/> PM10, wildfires only |
| <input type="checkbox"/> Ragweed pollen | <input type="checkbox"/> Secondary inorganic aerosol | <input type="checkbox"/> Peroxyacyl nitrates |
| | | <input type="checkbox"/> Sulphur dioxide |

Select all

Model ?

- | | | | |
|---|----------------------------------|--------------------------------|--------------------------------------|
| <input checked="" type="checkbox"/> Ensemble median | <input type="checkbox"/> CHIMERE | <input type="checkbox"/> EMEP | <input type="checkbox"/> LOTOS-EUROS |
| <input type="checkbox"/> MATCH | <input type="checkbox"/> MOCAGE | <input type="checkbox"/> SILAM | <input type="checkbox"/> EURAD-IM |
| <input type="checkbox"/> DEHM | <input type="checkbox"/> GEM-AQ | | |

Select all Clear all

Level ?

At least one selection must be made

- | | | | |
|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| <input type="checkbox"/> 0 | <input type="checkbox"/> 50 | <input type="checkbox"/> 250 | <input type="checkbox"/> 500 |
| <input type="checkbox"/> 1000 | <input type="checkbox"/> 2000 | <input type="checkbox"/> 3000 | <input type="checkbox"/> 5000 |

Select all

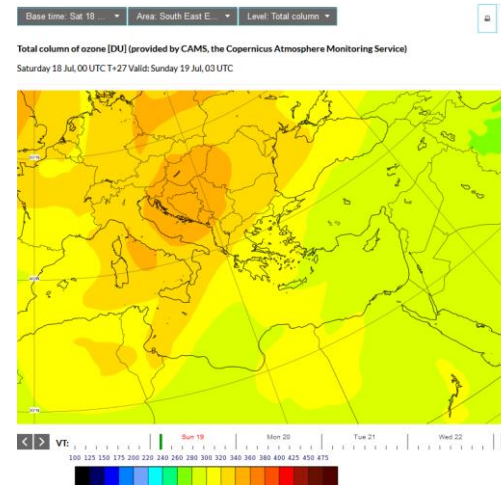
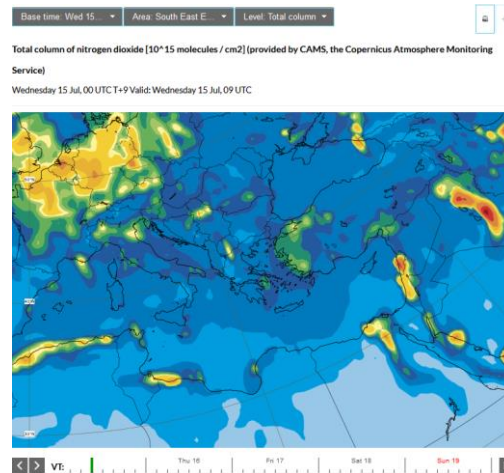
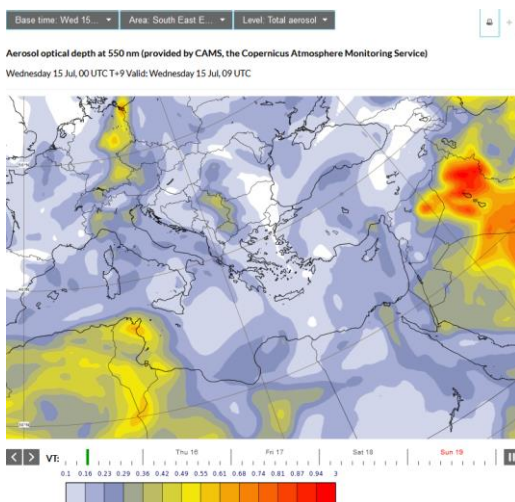
CAMS – Глобални прогнози за хим. състав



CAMS - Global

Хим. състав в колона от атмосферата – 5 дни; 29 региона, CO, CO₂, SO₂, CH₄, HCHO, PM₁₀, PM_{2.5}, UVindex

ЮИ Европа



AOD – aerosol optical depth

NO₂ total column

O₃ total column

Прашни бури

<https://sds-was.aemet.es/forecast-products/dust-forecasts>

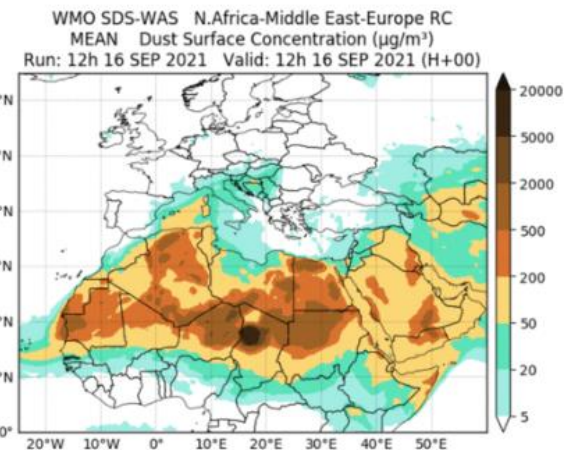
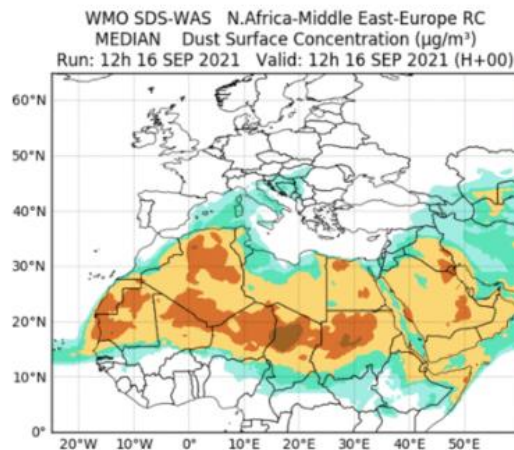
Ансамбъл от
модели
0.5° x 0.5°

Карти за

- ФПЧ10
- Аерозолен индекс (аерозоли в атм.колона)

Прогноза за 60ч
напред

Dust surface concentration:



Прах във ФПЧ10 – медиана и средна стойност

| Въпроси ?



Благодаря за вниманието !

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В презентацията са използвани продукти от CAMS – уеб страница и свързани документи, както и от SDS_WAS NA ME EU Reg Centre