

Workshop on Air quality Monitoring and Management

Friday 17th December



Air quality basics – Copernicus program

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Basics of air quality

Definitions

Air Pollution

“The atmospheric condition where substances are present in concentrations that are a concern, or even an immediate danger for human health, ecosystems or infrastructure.”

Air Pollutants

Substances which, when present in the atmosphere in sufficient concentration, may harm human, animal, plant or microbial health, or damage infrastructure or ecosystems.

Air Quality

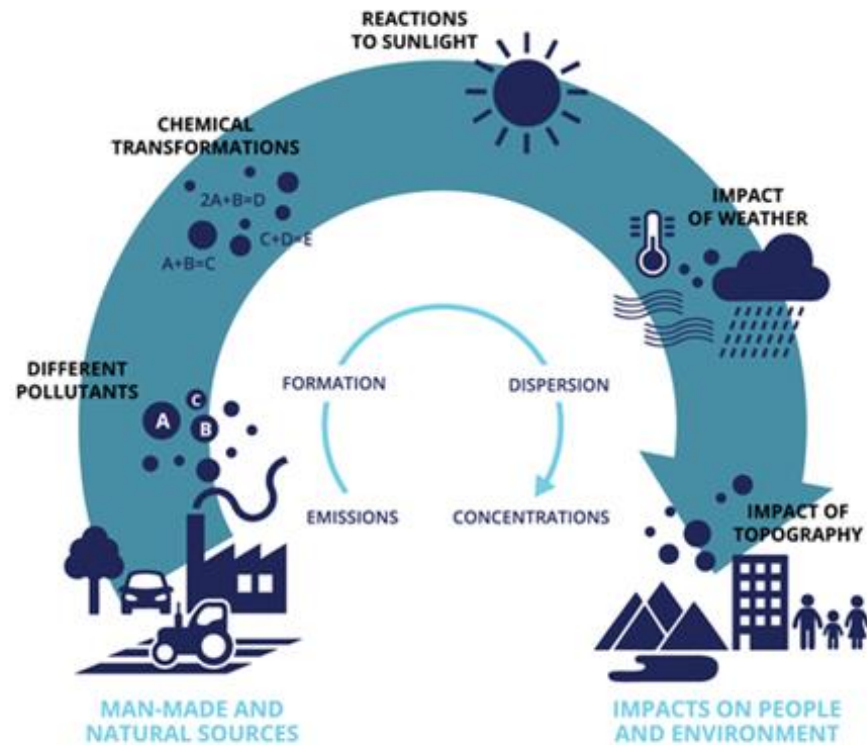
Refers to the degree to which the air is suitable for humans and the environment.

Breathable air is the first requirement for surviving! In terms of **Air Quality**: Survival time differs depending on the type and concentration of the air pollutant and the exposure of the receptor.

Basics of air quality

Cycle and Sources

From emissions to exposure



Man-made or anthropogenic sources

- Agricultural activities, energy production, waste, coal mining, transportation, fuel combustion (businesses, public buildings, households)

Natural sources

- Volcanoes, dust storms, sea-spray

Basics of air quality

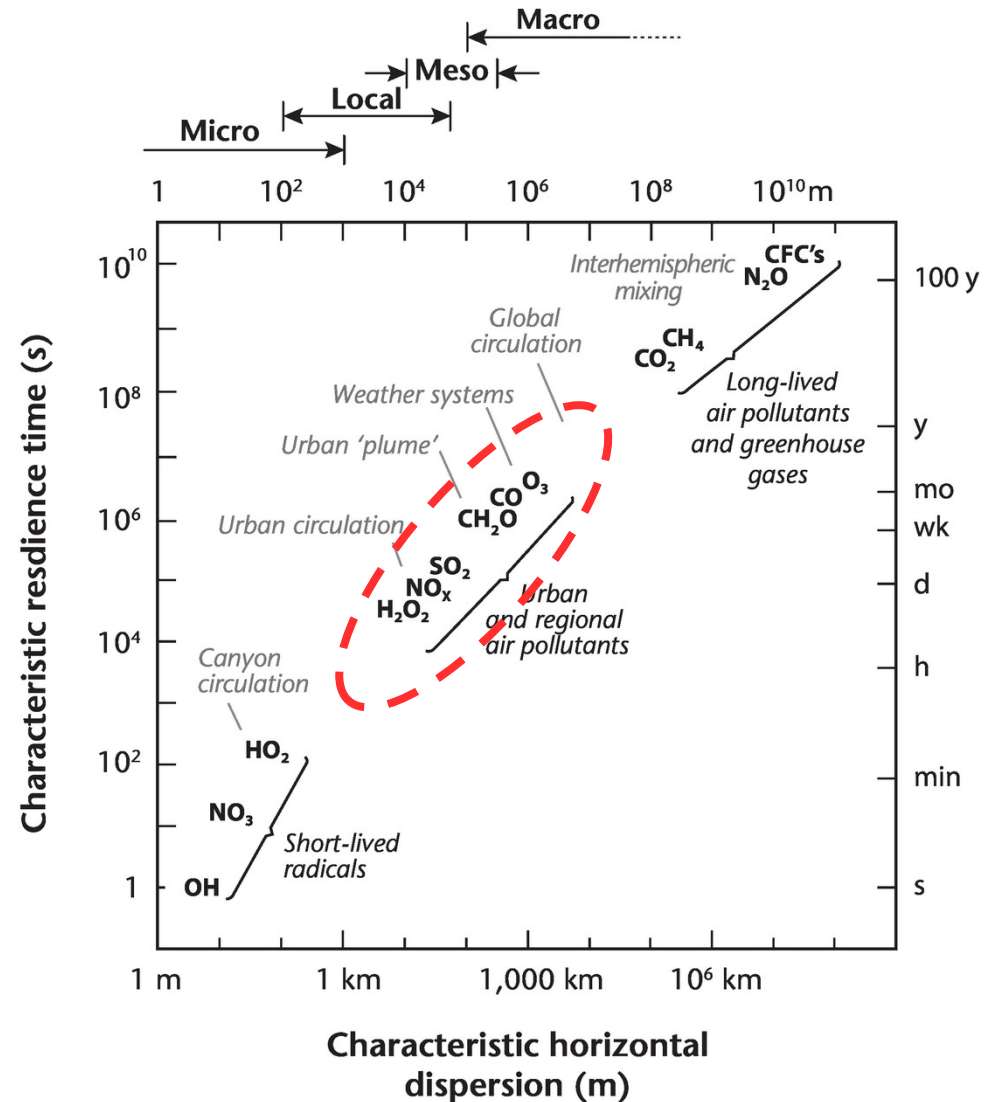
Basic Air Pollutants & Timescales

Carbon Monoxide (CO)

- Emission sources
 - Combustion
- Climate Impacts
 - Contribution to O₃ and CO₂

Nitrogen Oxides (NO_x)

- Emission sources
 - Fuel combustion, Soils
- Climate Impacts
 - Production of O₃, eutrophication, fertilization



Sulphur Dioxide (SO₂)

- Emission sources
 - Volcanoes, combustion (coal, diesel, fuel oil), Industrial processing
- Climate Impacts
 - 'acid rain', particulate matter

Ozone (O₃)

- Emission sources
 - Formation from VOCs and NO_x
- Climate Impacts
 - Reduced primary productivity, changes in radiative budget

Basics of air quality

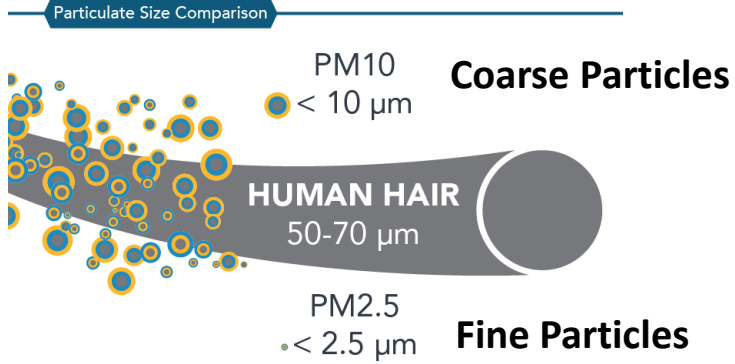
Basic Air Pollutants & Timescales

Carbon N

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- C
- Climate
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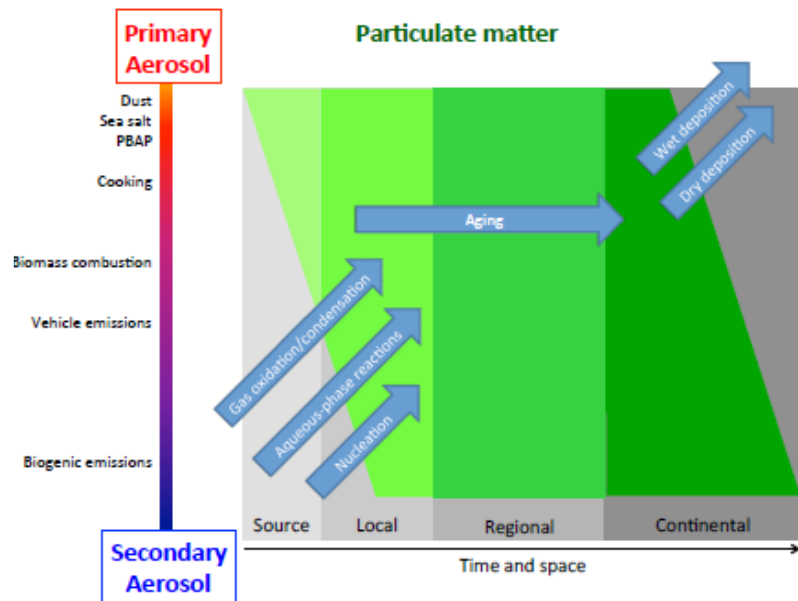
Nitrogen

- Emiss
- F
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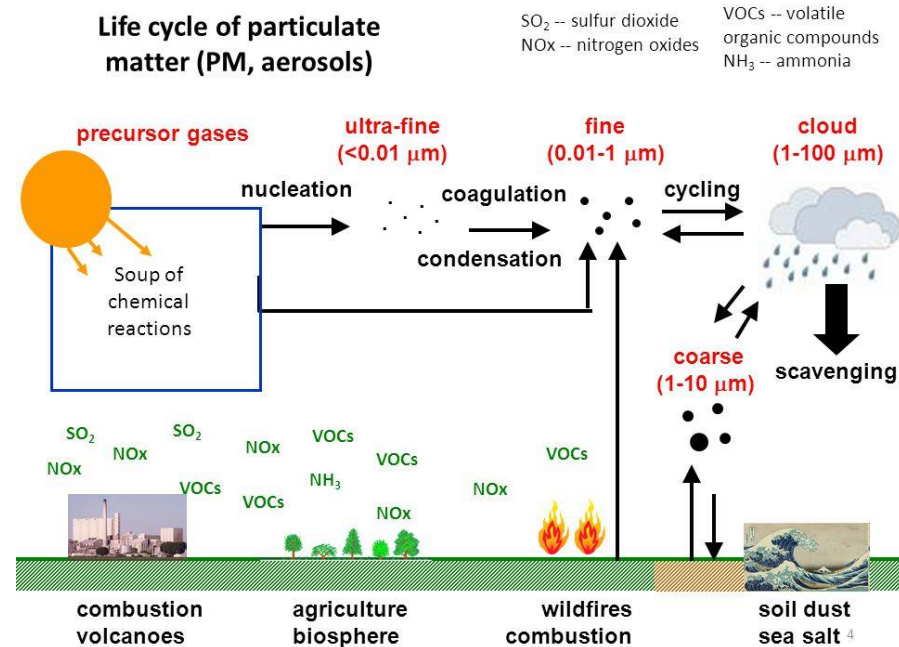


Particulate Matter (PM_x)

- Emission sources
 - Combustion, during mechanical abrasion, formation from condensation of gas-phase species, sea-salt and desert dust.
- Climate Impacts
 - Changes in the radiative transfer in atmosphere, reduction of visibility, variation of albedo



Life cycle of particulate matter (PM, aerosols)



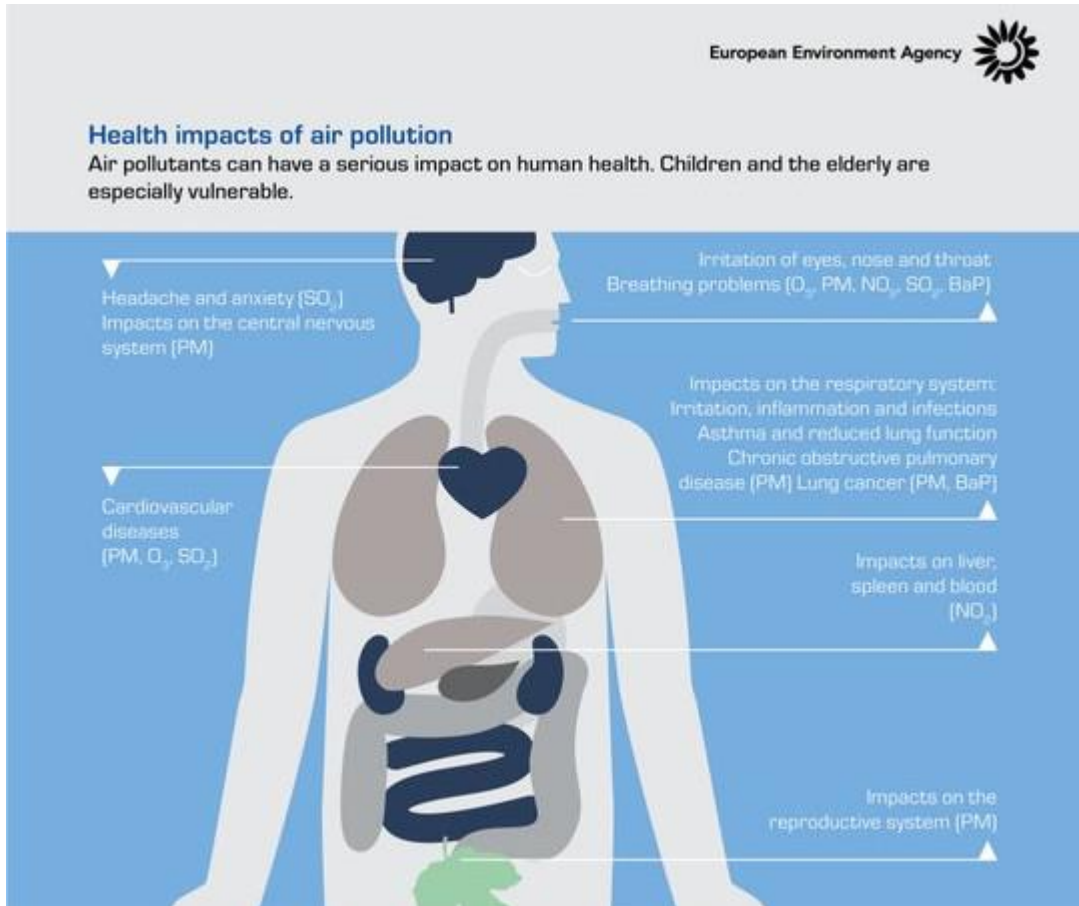
(coal, industrial

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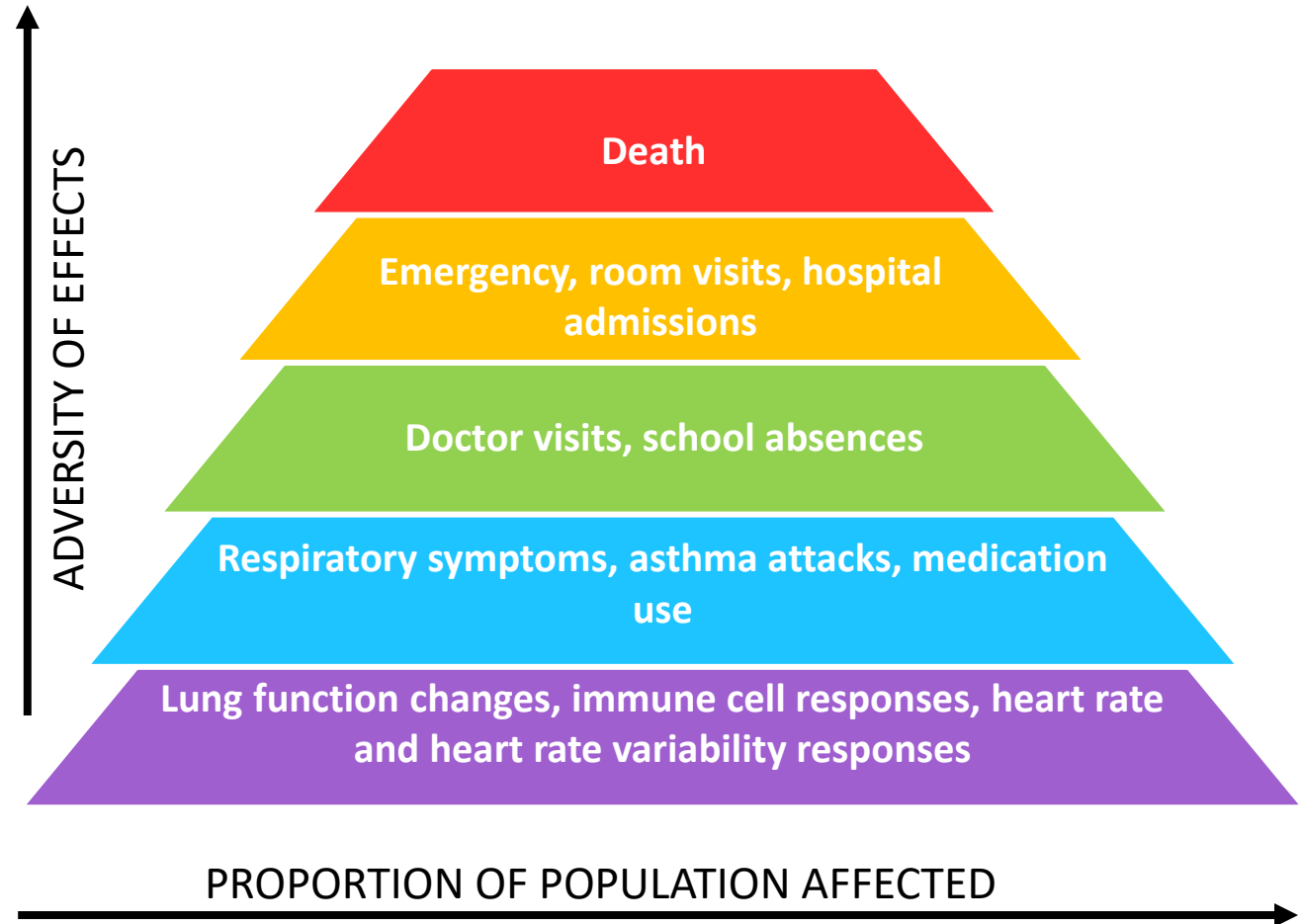
NO_x

activity, t.

Air Pollution vs. Health



Source: EEA



Copernicus Program

Europe's eyes on Earth

Copernicus is the EU Earth observation program, looking at our planet and its environment to benefit all European citizens.

It offers information services that draw from **satellite Earth Observation and in-situ (non-space) data**.

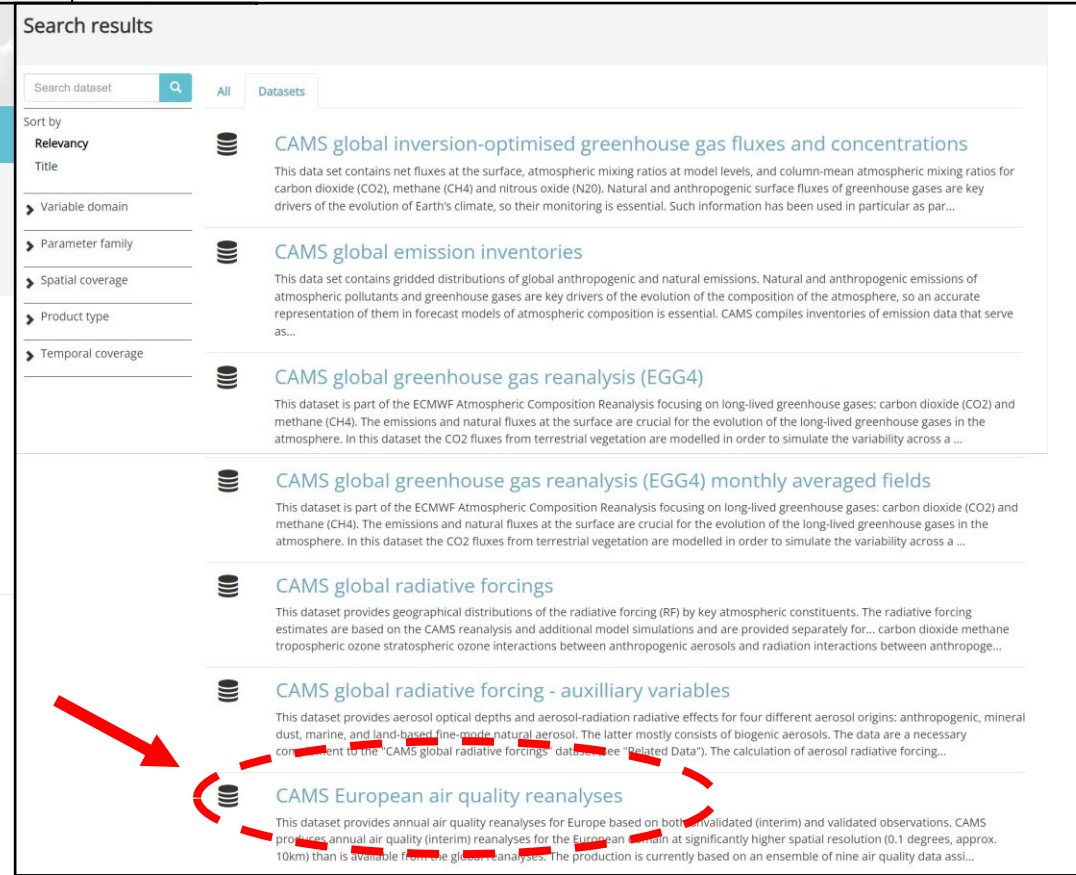
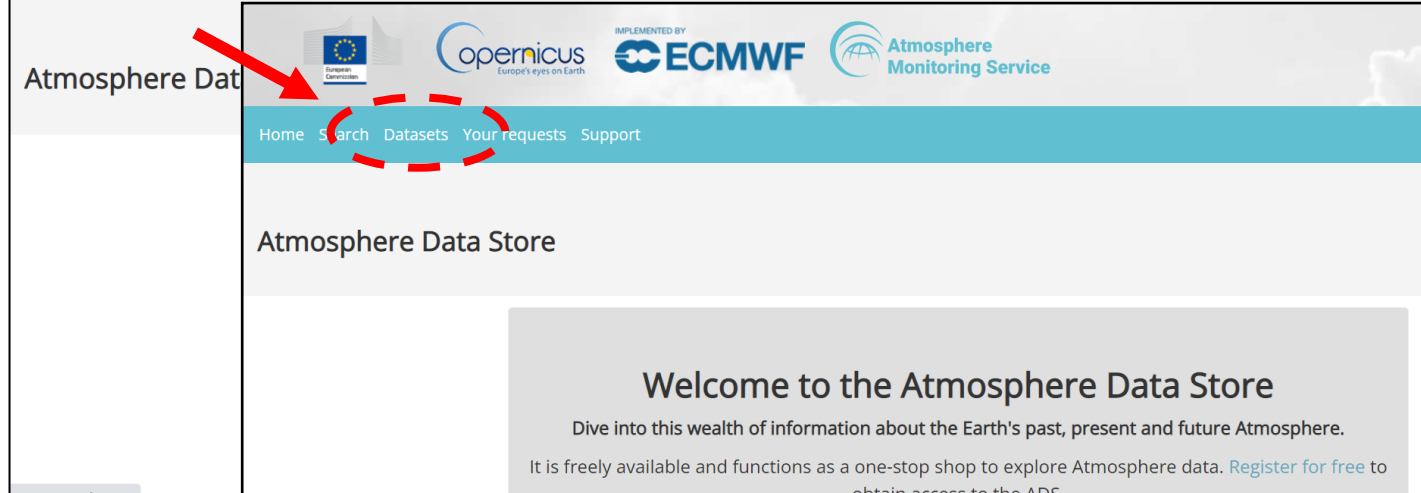
The information services provided are **free** and **openly** accessible to users.



Copernicus Program Atmosphere Data Store

<https://ads.atmosphere.copernicus.eu/#!/home>

Create an account and login



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.

We are constantly improving the services and adding new datasets. For latest announcements, watch the posts on the [CAMS forum](#).



CAMS European air quality reanalyses

This dataset provides annual air quality reanalyses for Europe based on both unvalidated (interim) and validated observations. CAMS produces annual air quality (interim) reanalyses for the European domain at significantly higher spatial resolution (0.1 degrees, approx. 10km) than is available from the global reanalyses. The production is currently based on an ensemble of nine air quality data assi...

CAMS European air quality forecasts

Overview | Download data | Documentation

Variable ?

<input type="checkbox"/> Alder pollen	<input type="checkbox"/> Ammonia	<input type="checkbox"/> Birch pollen
<input checked="" type="checkbox"/> Carbon monoxide	<input type="checkbox"/> Dust	<input type="checkbox"/> Grass pollen
<input type="checkbox"/> Mugwort pollen	<input checked="" type="checkbox"/> Nitrogen dioxide	<input checked="" type="checkbox"/> Nitrogen monoxide
<input type="checkbox"/> Non-methane VOCs	<input type="checkbox"/> Olive pollen	<input checked="" type="checkbox"/> Ozone
<input checked="" type="checkbox"/> Particulate matter < 2.5 µm (PM2.5)	<input checked="" type="checkbox"/> Particulate matter < 10 µm (PM10)	<input type="checkbox"/> PM10, wildfires only
<input type="checkbox"/> Peroxyacyl nitrates	<input type="checkbox"/> Ragweed pollen	<input type="checkbox"/> Residential elementary carbon
<input type="checkbox"/> Secondary inorganic aerosol	<input checked="" type="checkbox"/> Sulphur dioxide	<input type="checkbox"/> Total elementary carbon

[Select all](#)

Type

Analysis Forecast


Time ?

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<input type="checkbox"/> 20:00	<input type="checkbox"/> 21:00	

Area

Full model area

Restricted area ?



Model ?

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<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		

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Level ?

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[Select all](#)

Date

Start:

End:

Leadtime hour ?

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Format ?

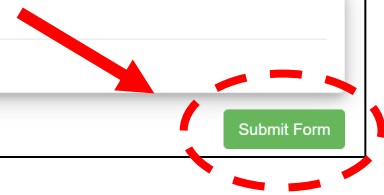
GRIB NetCDF

[Clear all](#)

Terms of use

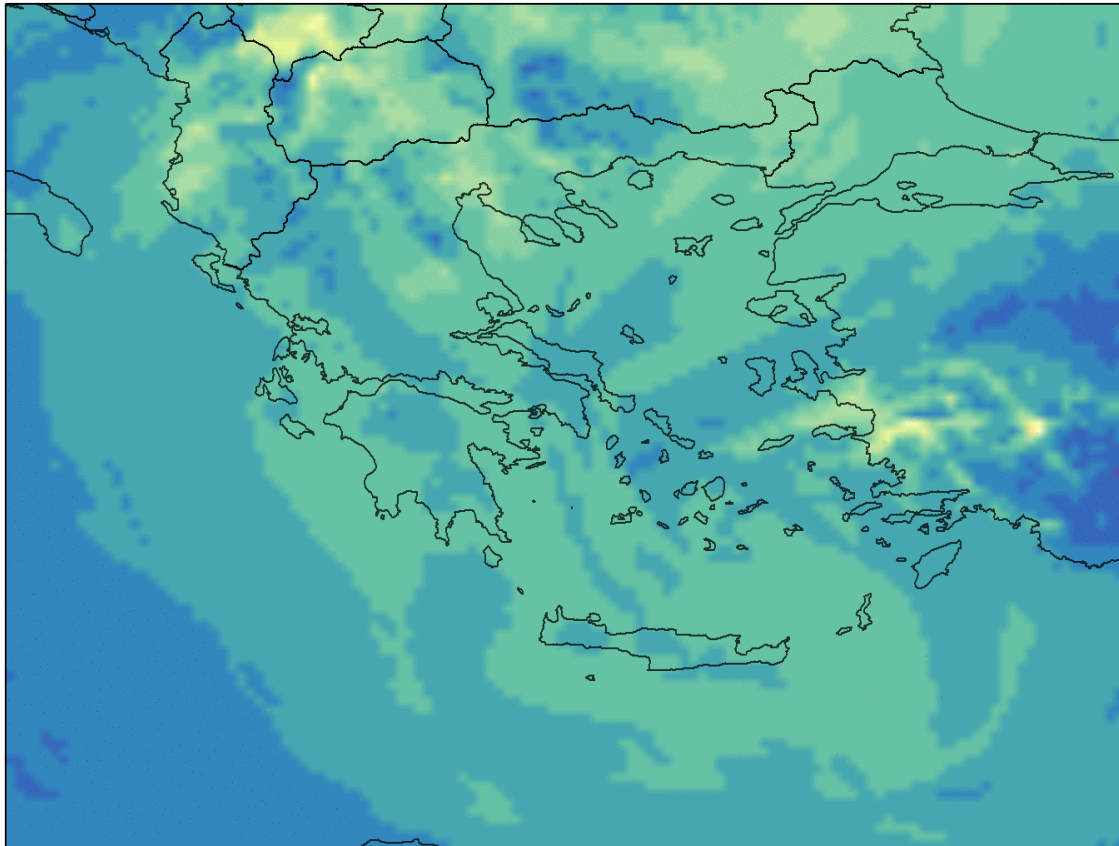
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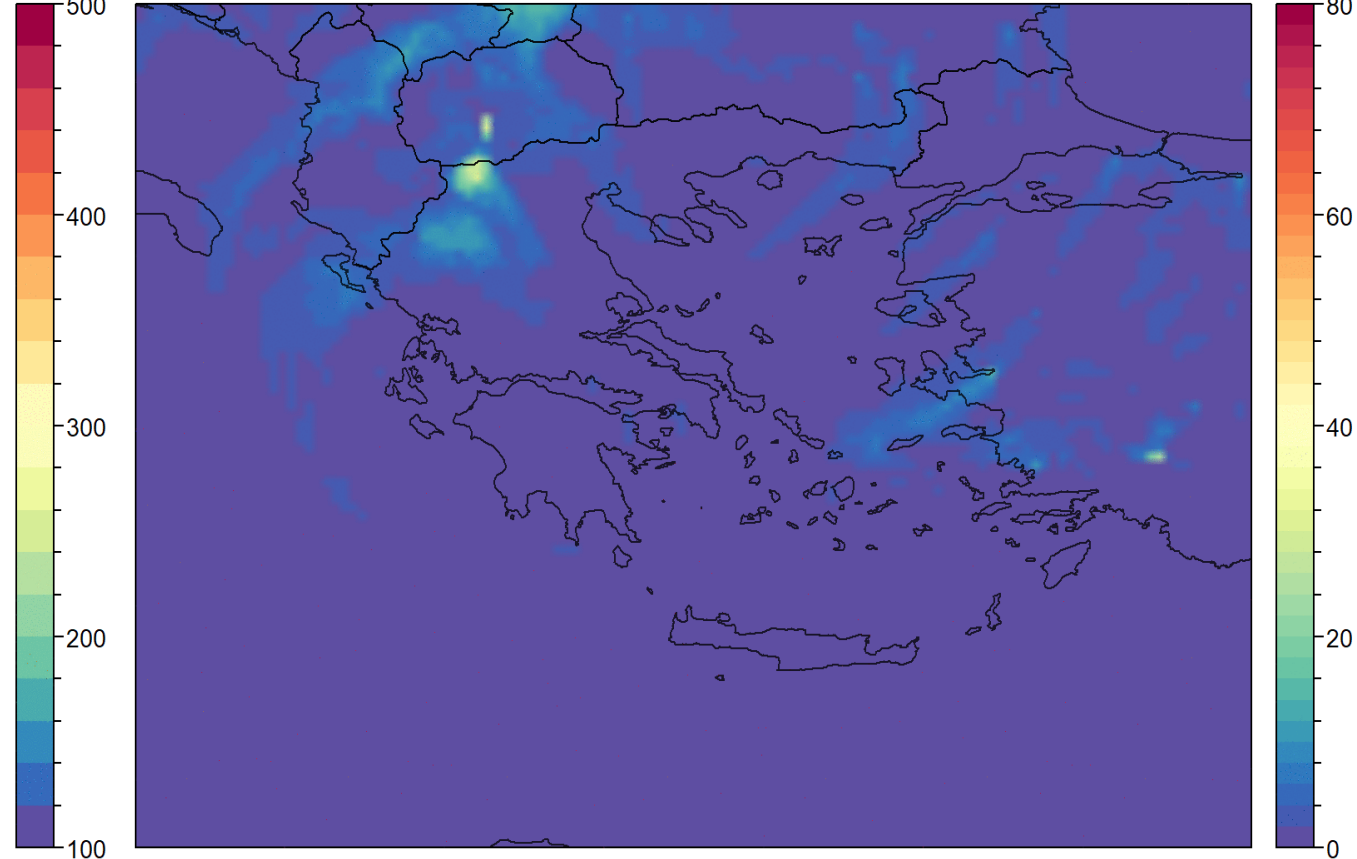
Carbon Monoxide (CO)

Carbon Monoxide, CO ($\mu\text{g}/\text{m}^3$) 2021-12-15 00:00



Sulphur Dioxide (SO₂)

Sulphur Dioxide, SO₂, ($\mu\text{g}/\text{m}^3$) 2021-12-15 00:00



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Air Pollutants – Forecasts

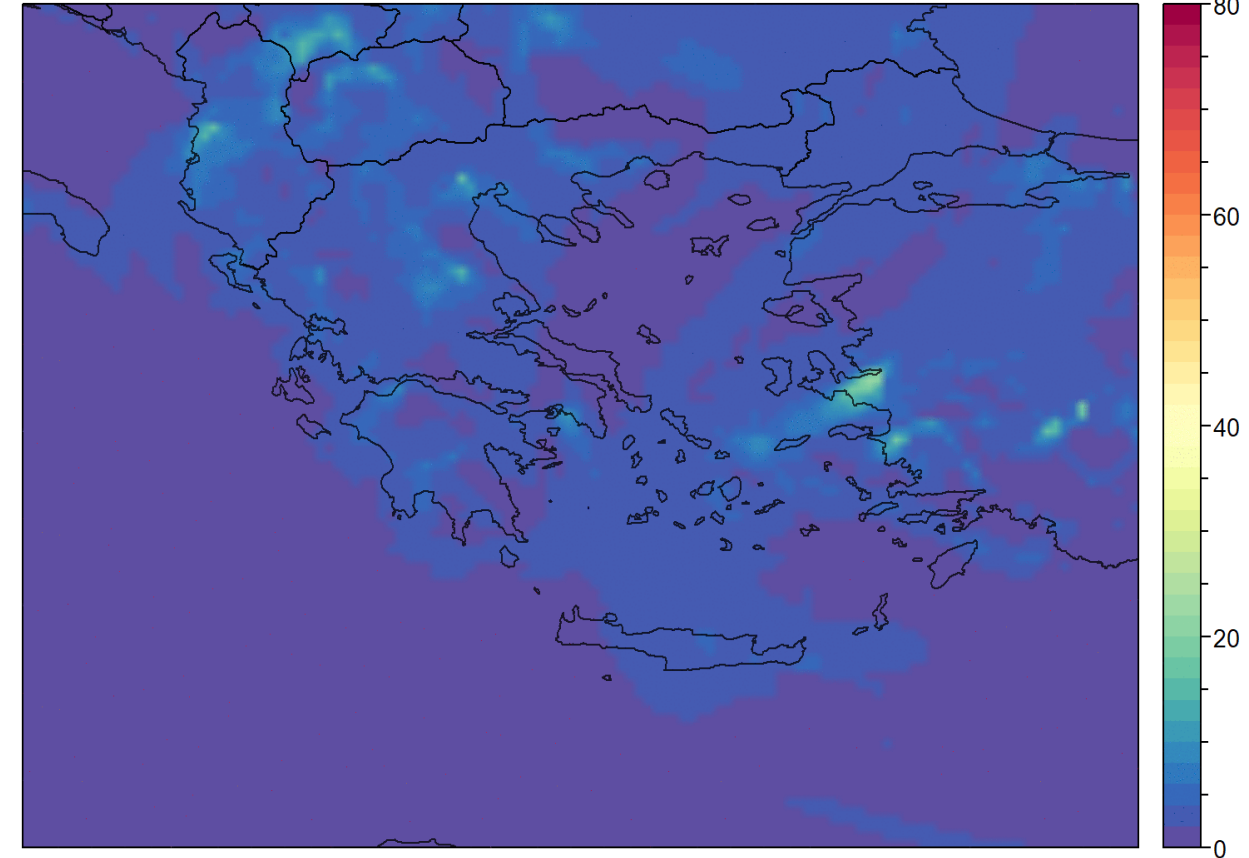
Nitrogen Monoxide (NO)

Nitrogen Monoxide, NO ($\mu\text{g}/\text{m}^3$) 2021-12-15 00:00



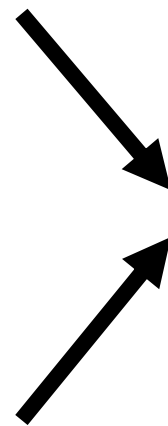
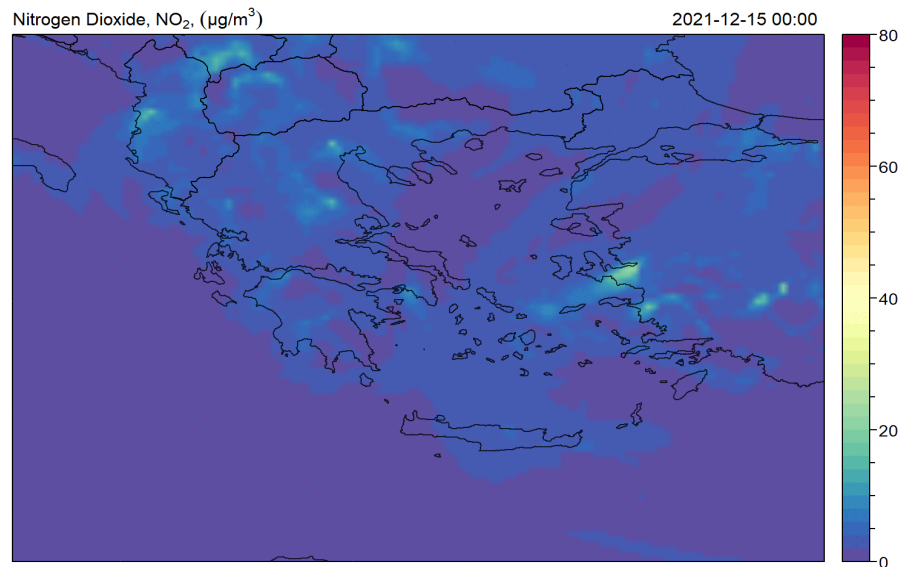
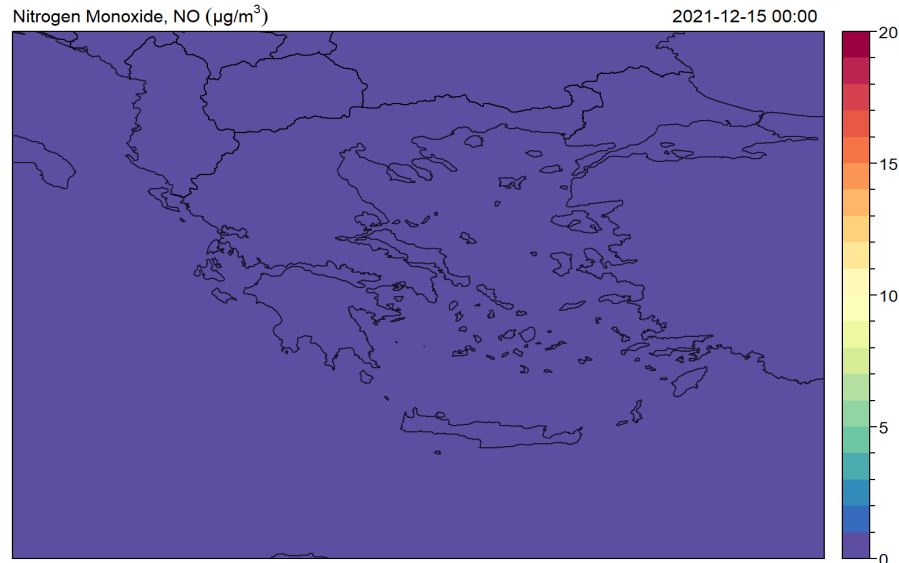
Nitrogen Dioxide (NO₂)

Nitrogen Dioxide, NO₂, ($\mu\text{g}/\text{m}^3$) 2021-12-15 00:00

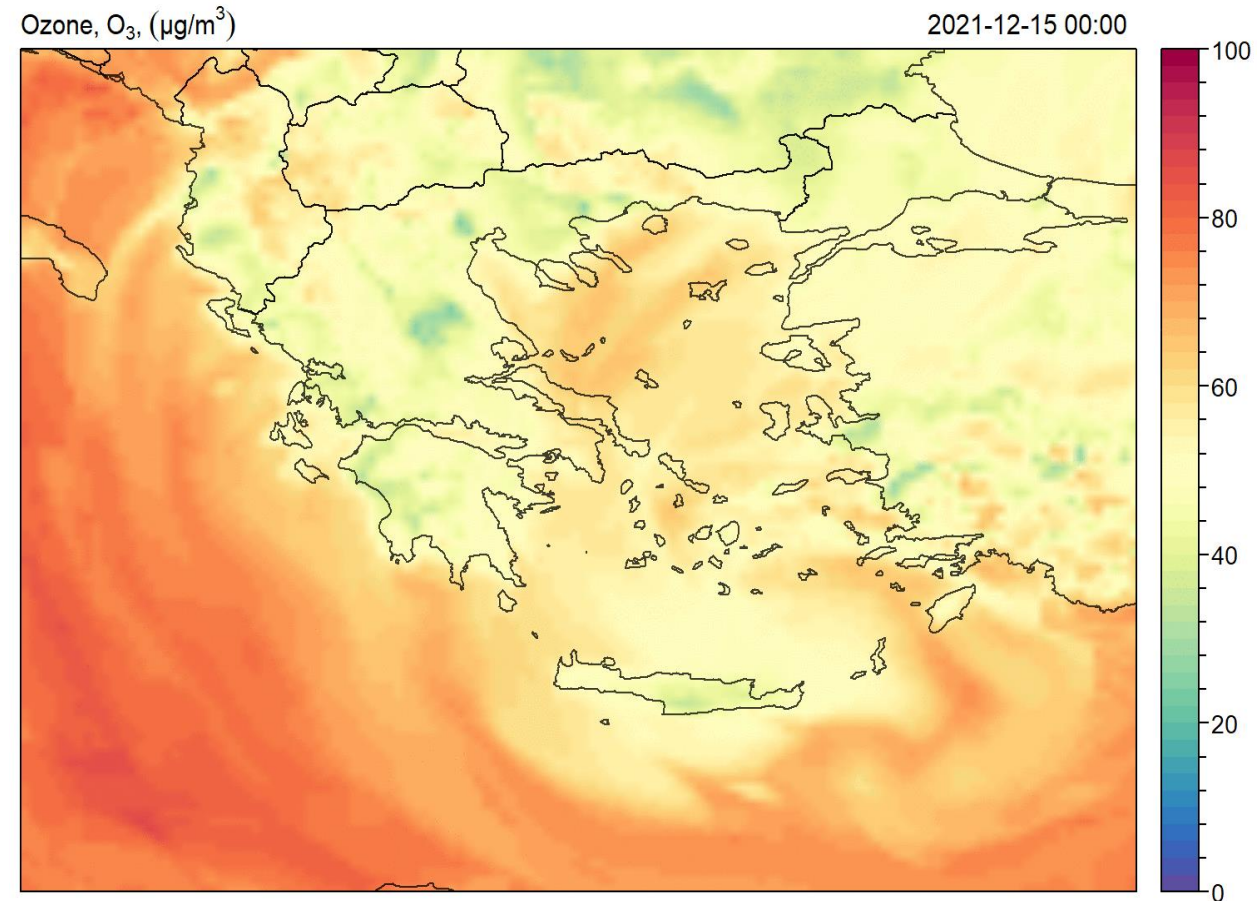


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Air Pollutants – Forecasts



Primary Pollutants (Precursors) & Ozone (O₃)



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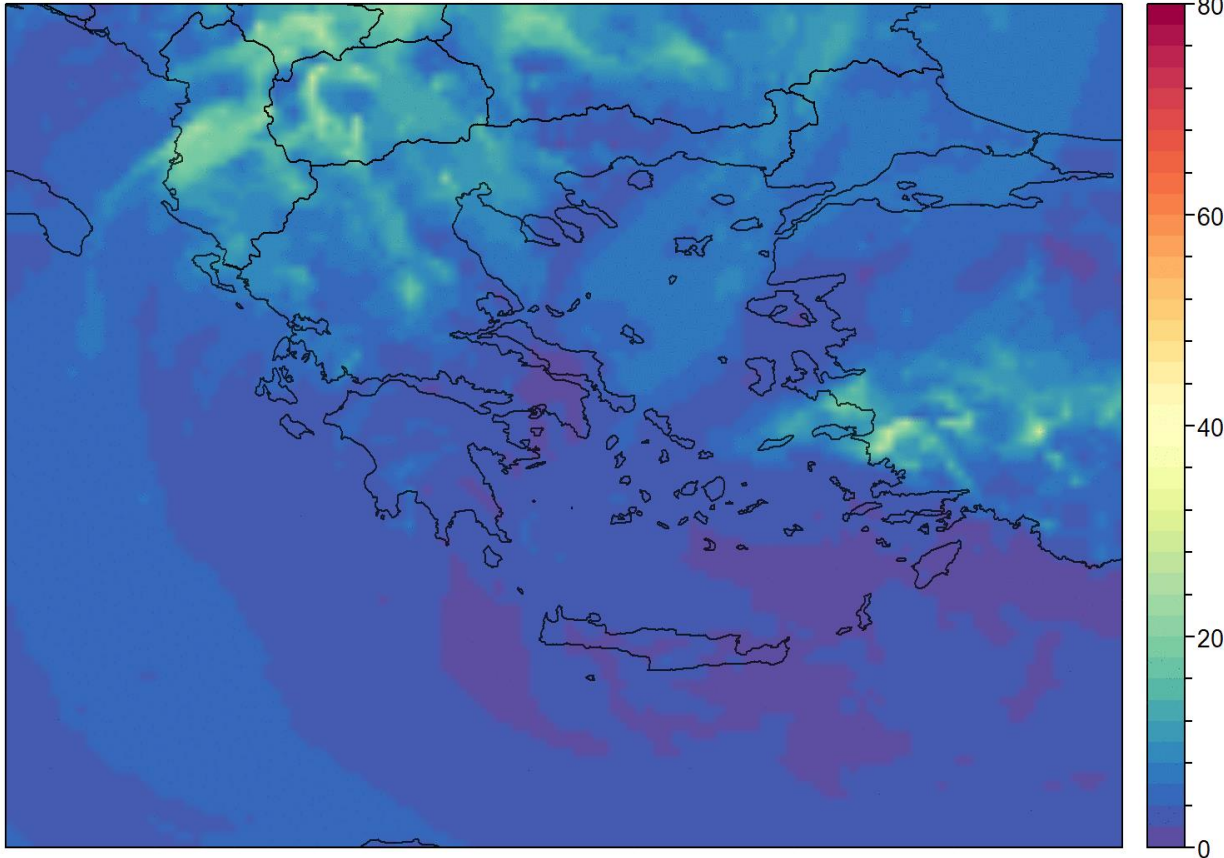
Air Pollutants – Forecasts

PM_{2.5}

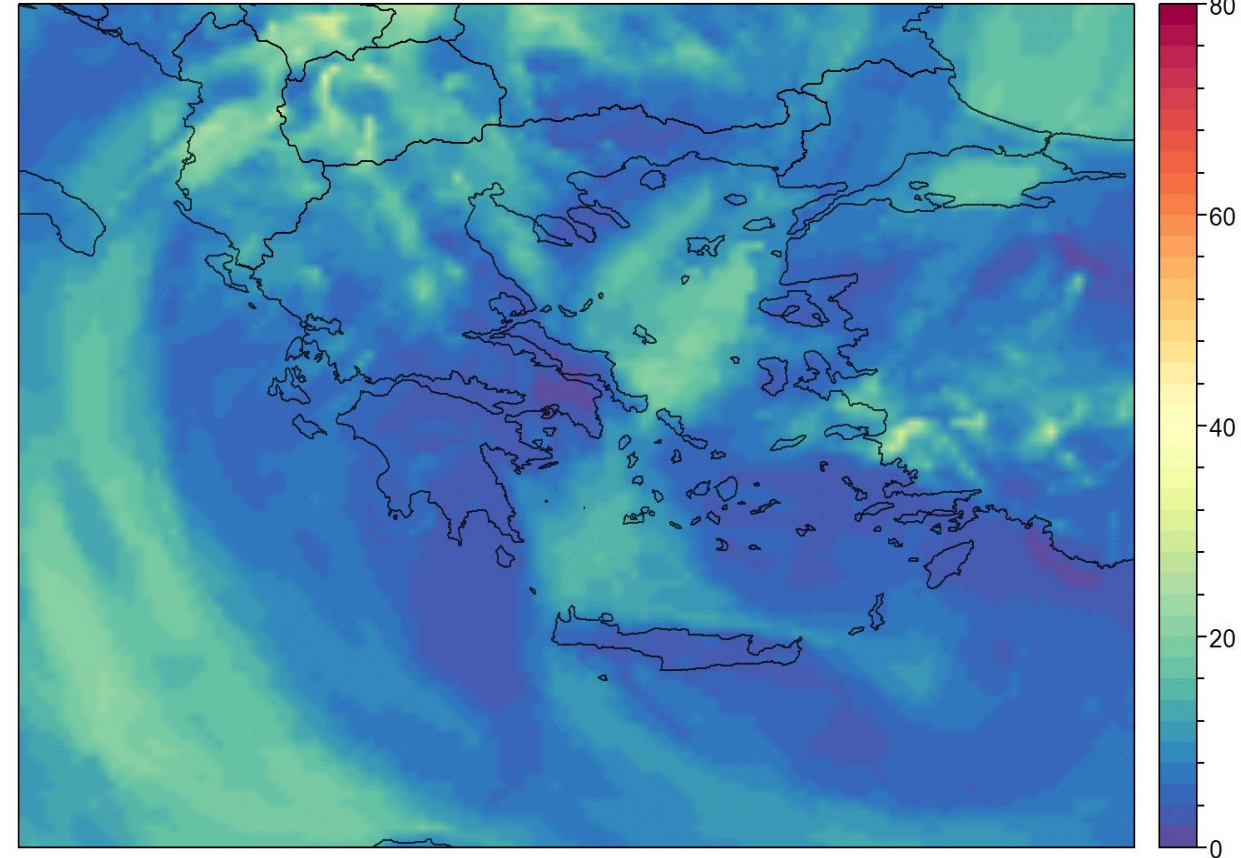
Particulate Matter

PM₁₀

Particulate Matter with $d < 2.5 \mu\text{m}$, PM_{2.5}, ($\mu\text{g}/\text{m}^3$) 2021-12-15 00:00



Particulate Matter with $d < 10 \mu\text{m}$, PM₁₀, ($\mu\text{g}/\text{m}^3$) 2021-12-15 00:00



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Thank you!