

# L'Istituto di Scienze dell'Atmosfera e del Clima ISAC-CNR

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**Giornate della ricerca @DMF  
Lecce, 7 May 2024**





The Institute of Atmospheric Sciences and Climate of the National Research Council is **the largest research institute in Italy focused on atmospheric sciences.**

- It has headquarter in Bologna and **seven divisions in Italy.**
- ISAC-CNR manages **five atmospheric observatories**, some included in international networks (ACTRIS, ICOS) and contributors to the GAW-WMO programme.
- Contributor to the **atmospheric observations in the Arctic and Antarctic.**

**ISAC-CNR** has approximately **250 units of personnel over the national territory, 23 of them operates at the division of Lecce.**

## CAFCA

Atmospheric composition, climate forcing and air quality

## IMPEACH

Impacts on Environment, Cultural Heritage and Human Health

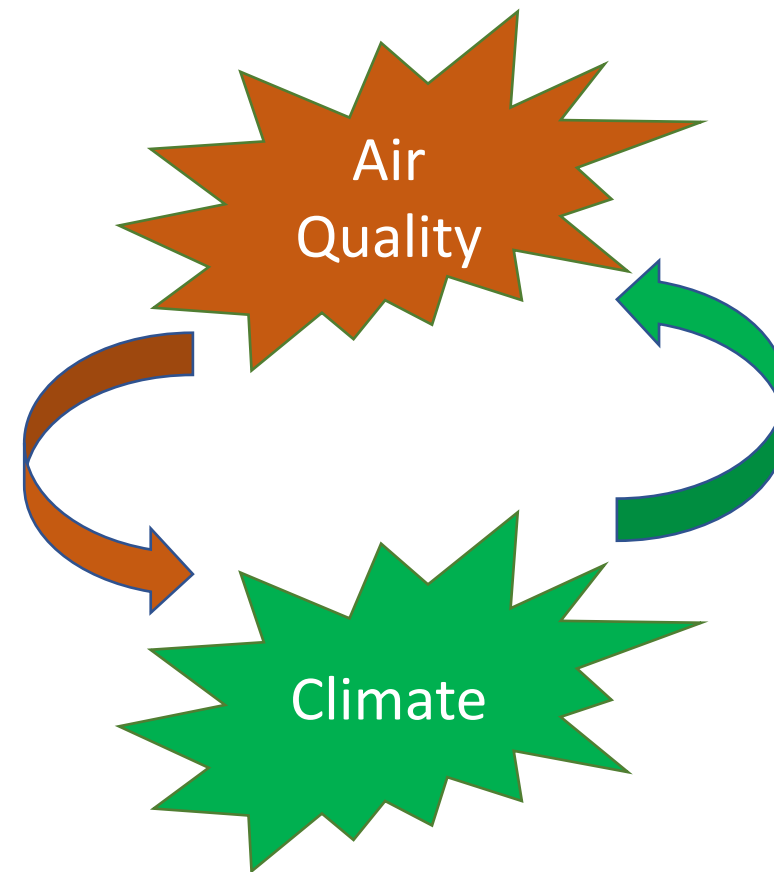
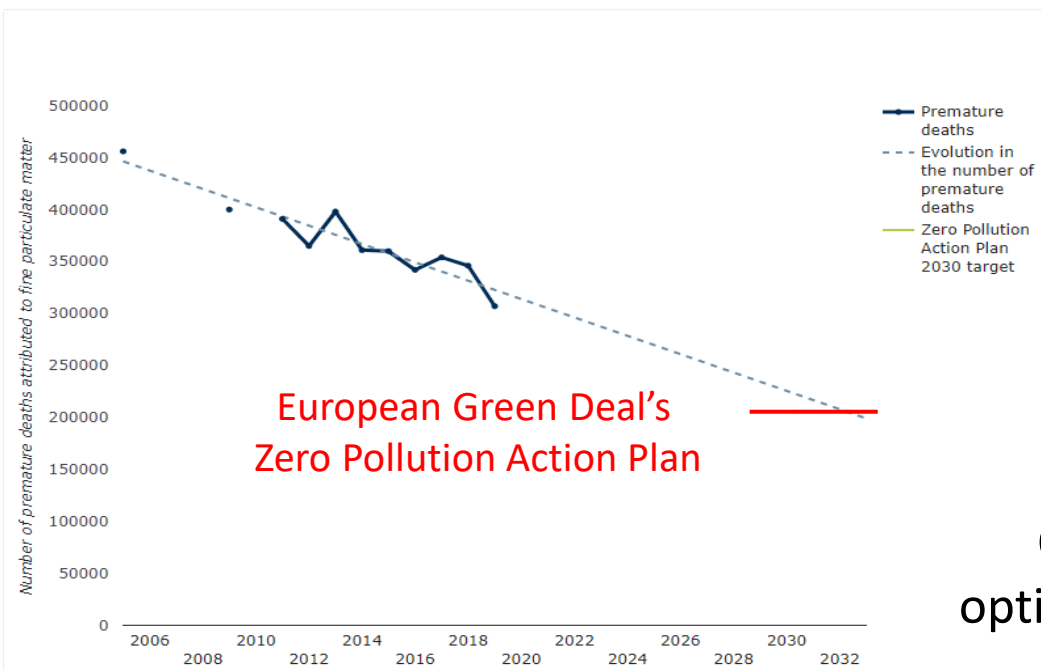
## CAMEO

Climate And Meteorology, modelling and Earth Observations

The relationship between air quality and health is complicated and depending on pollutant concentrations, toxicity of pollutants, and exposure.

In Europe it is estimated about 307,000 premature deaths per year (2019), of which 50,000 in Italy due to PM<sub>2.5</sub>. Decreasing trend with 33% reduction from 2005.

Figure 1. Premature deaths attributed to PM<sub>2.5</sub> in the EU-27 from 2005-2019, and distance to the target of a 55% reduction in the 2005 levels of premature deaths



Several components of particulate matter are relevant for both aspects.

**One Health:** an integrated, unifying approach to balance and optimize the health of people, animals and the environment. – WHO

## ECO Environmental-Climote Observatory



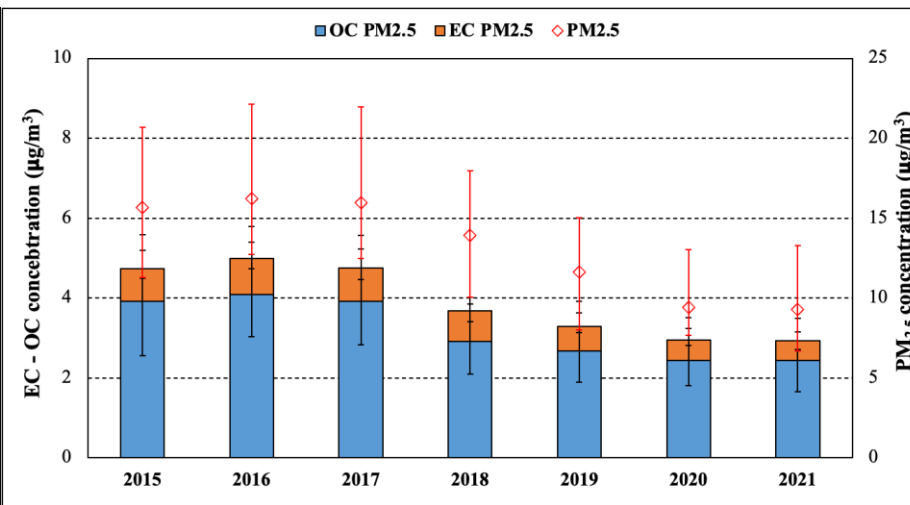
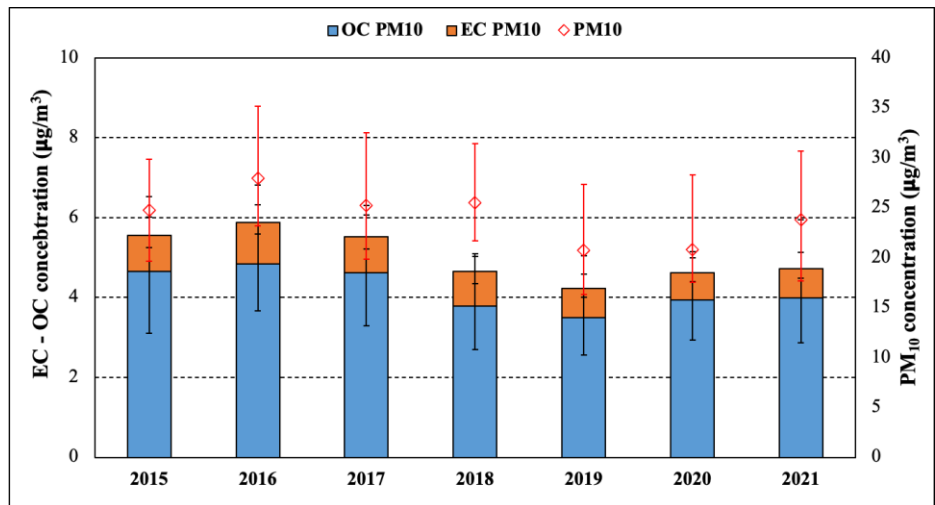
ISTITUTO DI SCIENZE DELL'ATMOSFERA E DEL CLIMA  
Sede di LECCE  
OSSERVATORIO  
CLIMATICO - AMBIENTALE



## MAGA – Exploratory platform Mobile Laboratory for Gas and Aerosol measurements

Part of ACTRIS network ([www.actris.eu](http://www.actris.eu)) and regional station of GAW-WMO (<https://community.wmo.int/en/activity-areas/gaw>).

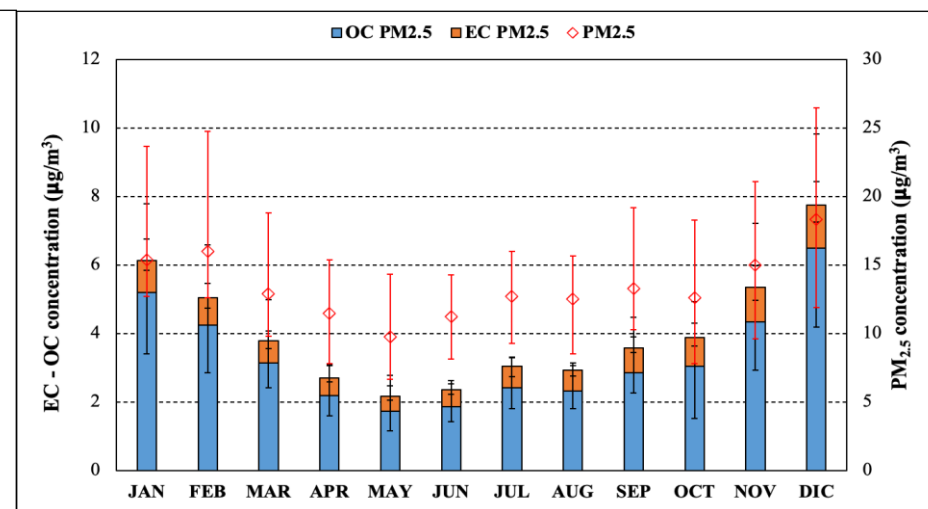
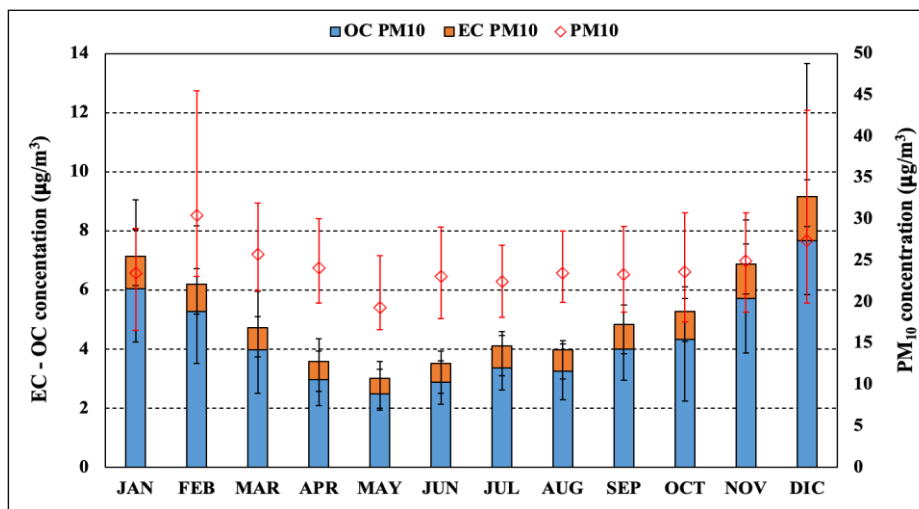




On average, OC and EC represented the 17.4% and 3.5% of PM<sub>10</sub> mass, and the 23.0% and 5.3% in PM<sub>2.5</sub>.

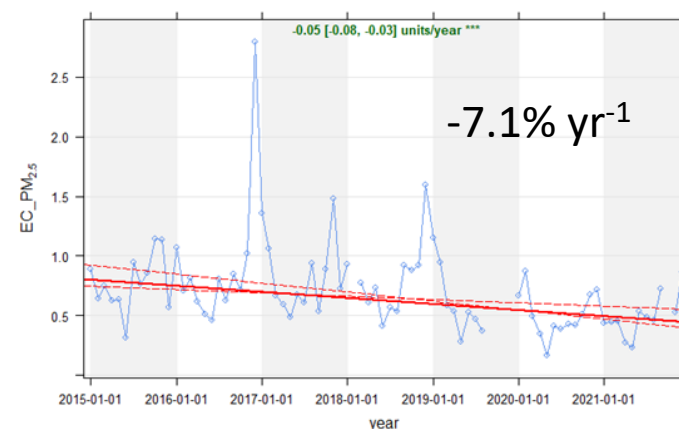
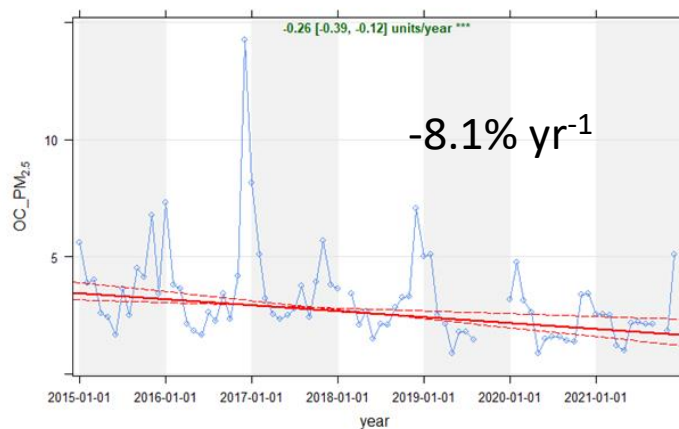
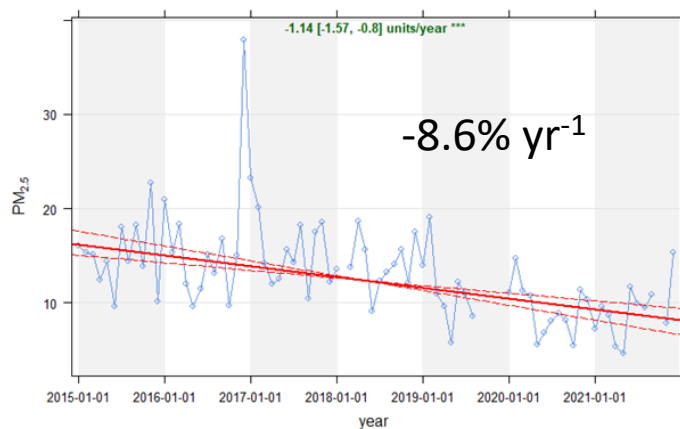
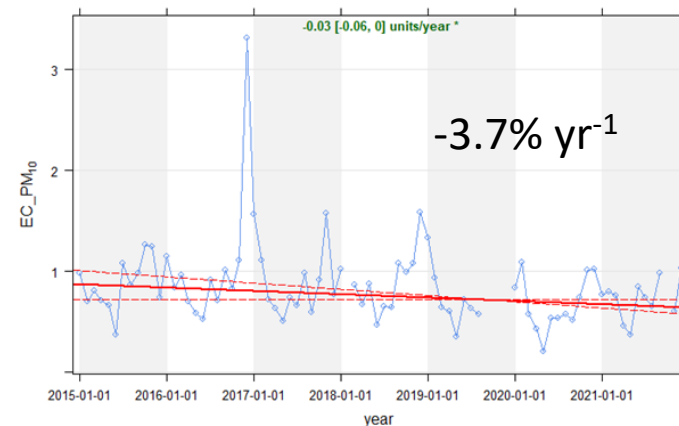
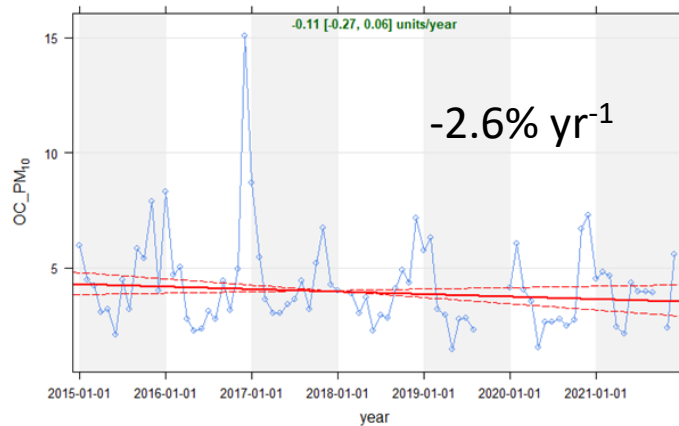
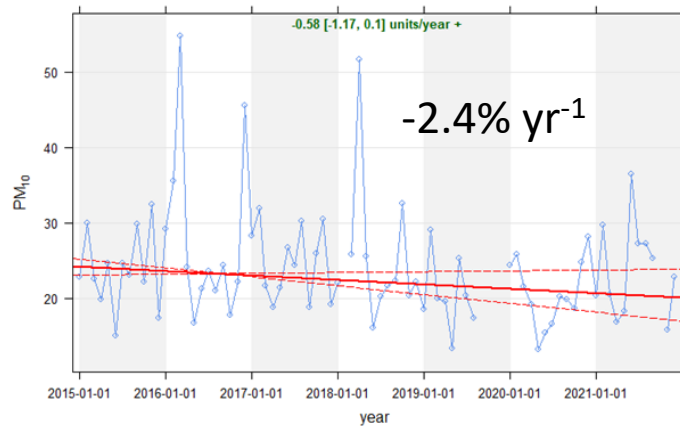
OM accounted for 27.8% for PM<sub>10</sub> and 36.7 % for PM<sub>2.5</sub>.

Similar seasonal trend is already observed in this site [4].



A good correlation was observed in this site between OC and EC in PM<sub>10</sub> and in PM<sub>2.5</sub> fractions (Pearson 0.85/0.84,  $p < 0.05$ ): the time series of EC and OC concentrations are modulated by meteorology, increasing in this way the correlation between the two chemical species.

[4] Cesari et al., 2018. Atmos. Res. 200, 97-108.



Trend decrescenti

**Test di omogeneità e breakpoints:** Standard Normal Homogeneity test (SNHT), Buishand Range test, Buishand U test e Pettitt test;

**Trend analysis:** Mann-Kendall test modificato e Theil-Sen's estimator

Significance level: \* $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ ; +  $p < 0.1$   
Slope of trends in  $\text{m}^2\text{g}^{-1}$  per year, and slope range (as min and max) in brackets.



Campionatore Gemini Doppio canale con condizionatore, Dado Lab srl

Campionatore doppio canale SWAM (Fai Instruments) installato su Laboratorio Mobile



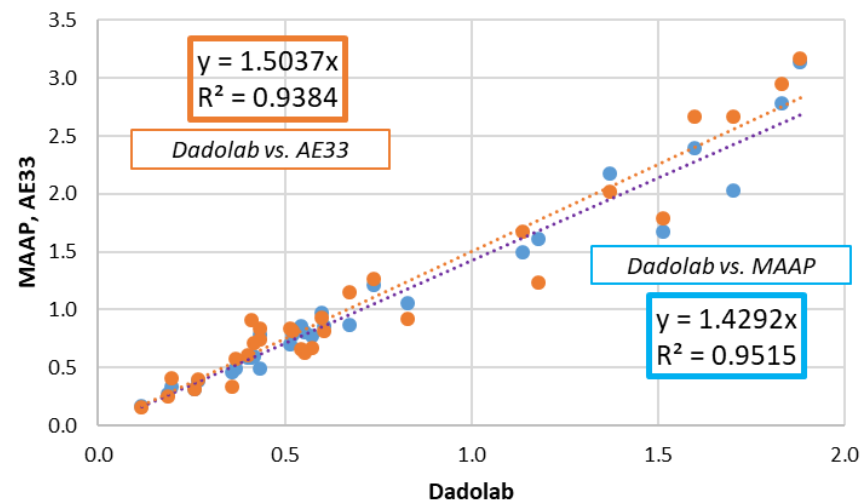
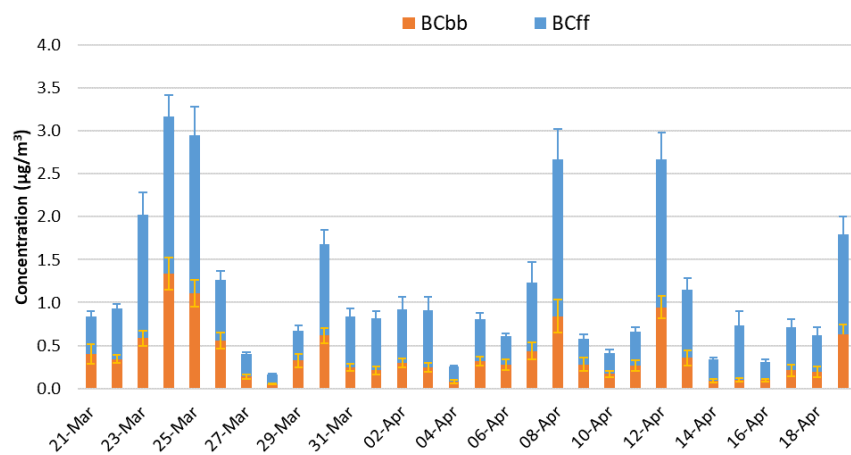
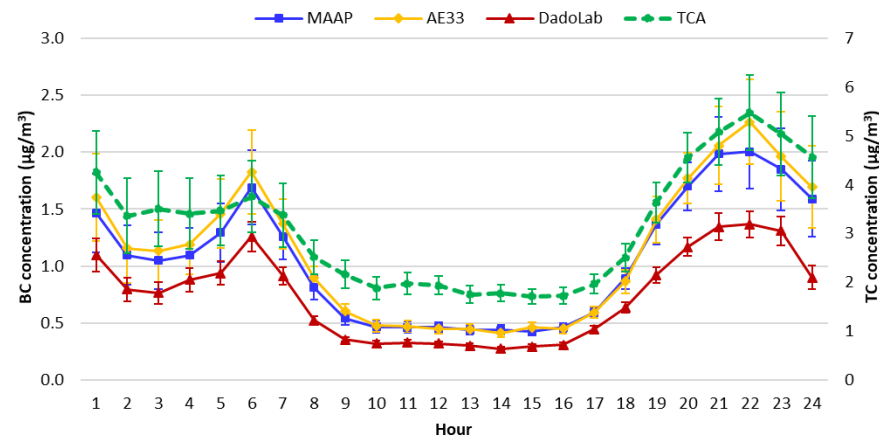
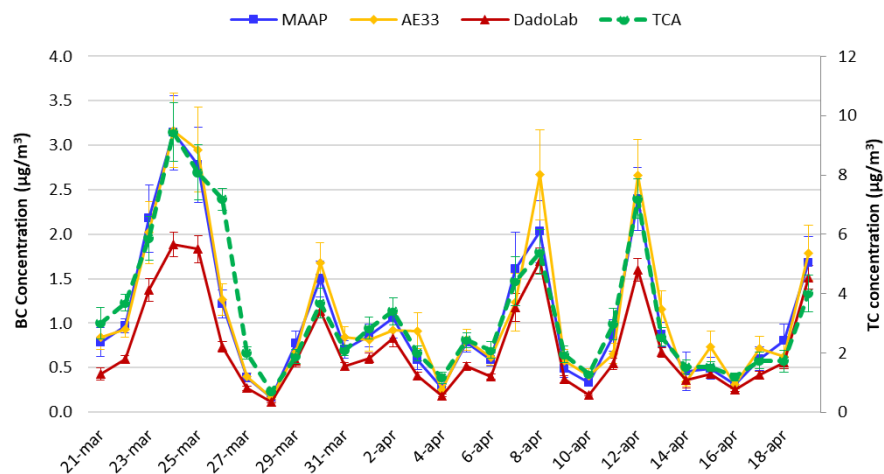
Etalometro AE33, Magee Scientific

TCA, Model TCA08, Magee Scientific



Campionatore doppio canale SWAM, Fai Instruments

Campagna intensiva  
21/03/23-19/04/23



	MAC (m <sup>2</sup> /g)
DadoLab	10
MAAP	6.6
AE33	7.7

Misure di ECOC ottenute da metodo integrato «TC-BC» (TCA08+AE33) da confrontare con misure offline da analisi termo-ottica



The availability of long-term observations allows to better characterise the role of specific events on the composition of the atmosphere.

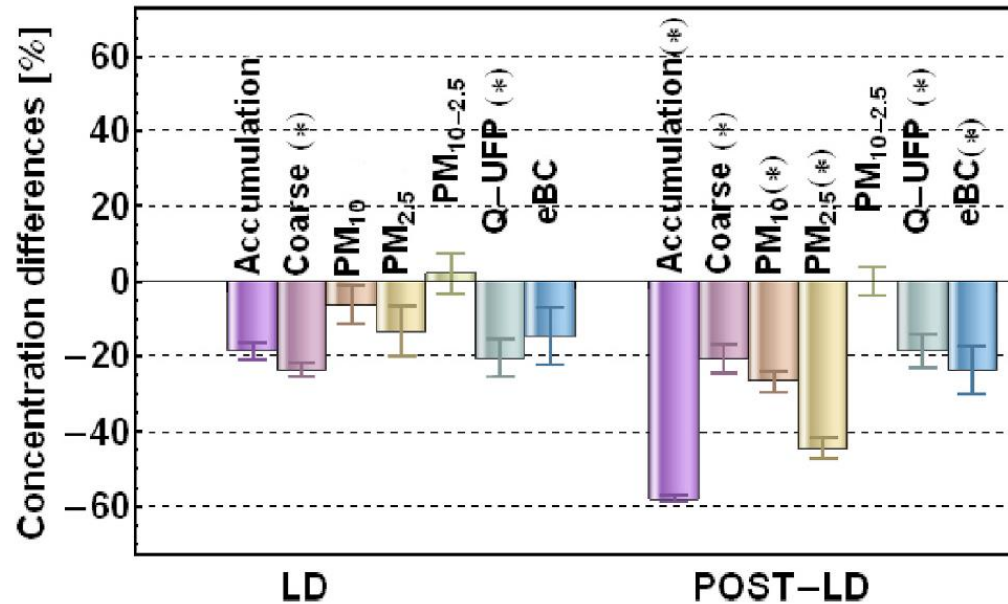
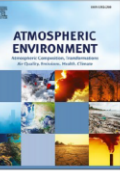
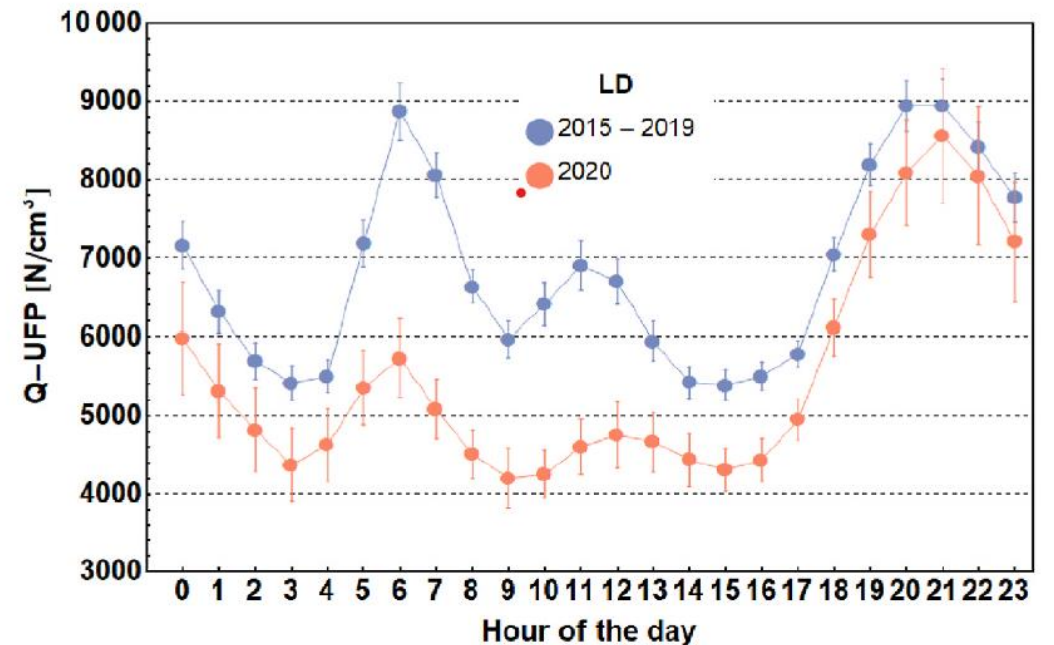


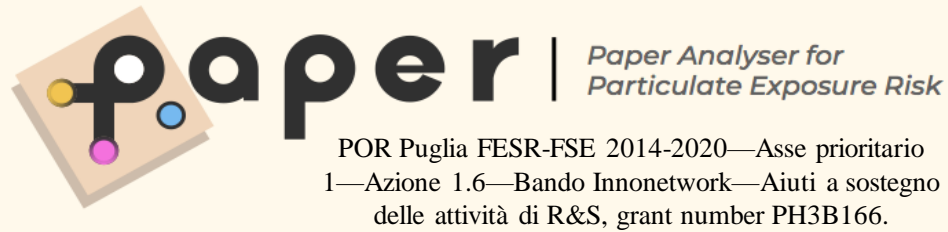
Fig. 5. Relative differences of mean concentrations measured in 2020 and those measured in the reference years (2015–2019) during LD and POST-LD periods. Error bars represent the standard errors. (\*) Indicate differences statistically significant ( $p < 0.05$ ).



Concentration and size distribution of atmospheric particles in southern Italy during COVID-19 lockdown period

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 Maria Rachele Guascito<sup>b,c</sup>, Daniele Contini<sup>b</sup>





## Motivation

The mechanisms that determine toxicity are not yet fully known. **Oxidative potential (OP)** is a possible integrated indicator of the toxicological effects of atmospheric particulate matter (PM) that **needs further research to understand more deeply its correlation with in vitro toxicity.**

## Objectives of this study

- To investigate the correlation of  $PM_{10}$   $OP^{DTT}$  with intracellular oxidative stress.
- To investigate the correlation between acellular and cellular endpoints and the influence of  $PM_{10}$  sources.
- To analyse the correlations between toxicological indicators and whether these are site-dependent.



Characterisation of the correlations between oxidative potential and in vitro biological effects of  $PM_{10}$  at three sites in the central Mediterranean

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Maria Elena Giordano<sup>a</sup>, Roberto Caricato<sup>a</sup>, Anna Rita De Bartolomeo<sup>a</sup>, Adelaide Dini<sup>b</sup>,  
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Three measurement campaigns for the collection of daily PM<sub>10</sub> samples in different measurement sites in the period winter 2019 - summer 2020.

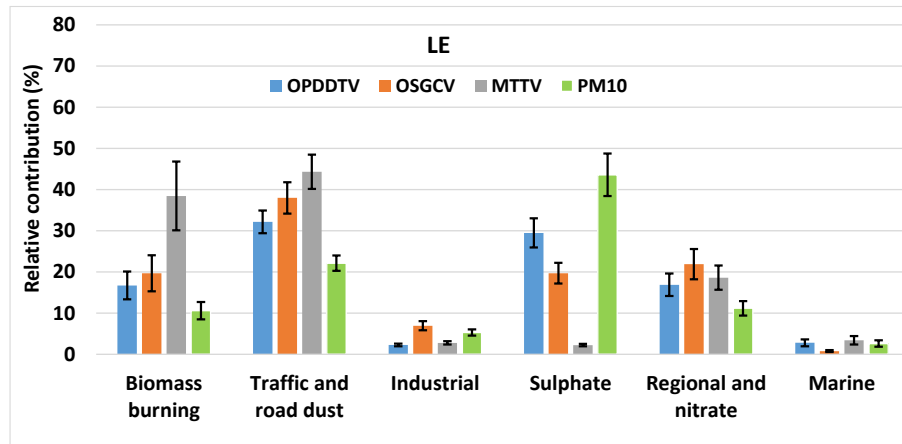
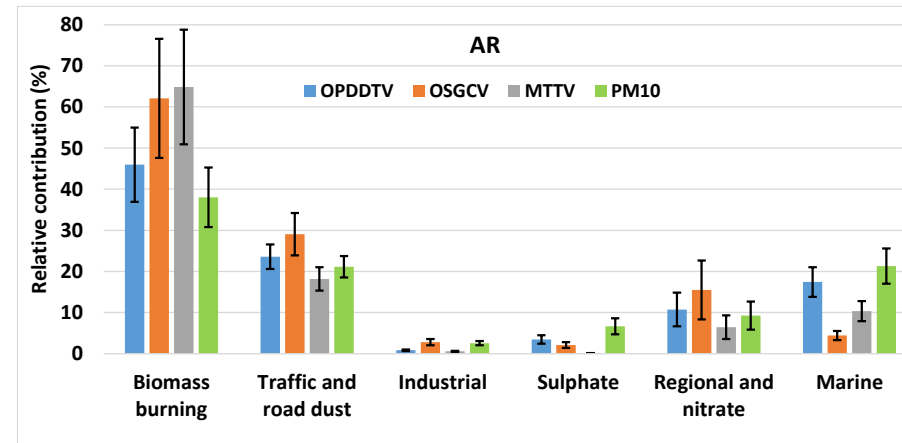
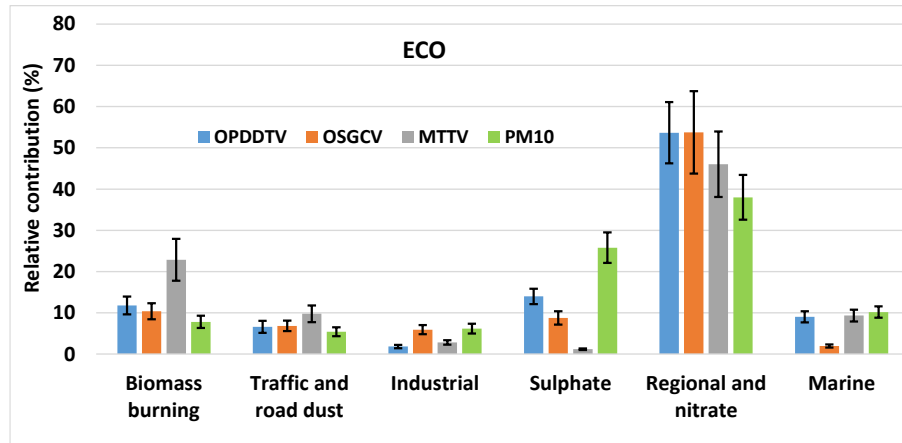
- Extra-urban area Climatic-Environmental Observatory (ECO), ISAC-CNR, Lecce
- Urban area of Lecce (LE)
- Urban area of Aradeo (AR)



Three daily PM<sub>10</sub> samples were collected in parallel:

- two low volume 2.3 m<sup>3</sup>/h on quartz and Teflon supports;
- one medium volume 12 m<sup>3</sup>/h on quartz supports.





- Biomass combustion, traffic and regional/nitrate sources have relevant intrinsic contributions to the three toxicity indicators **with relative contributions higher than PM<sub>10</sub>**.
- Sulfate and marine aerosol have **higher contributions to PM<sub>10</sub> than contributions to toxicological indicators**.

The different roles of the sources in urban and background areas is the cause of the dependency of the correlations observed at the three sites.

**Possible synergic and antagonistic effects.**

# THANKS FOR THE ATTENTION!!

With the support of  
the projects



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