

ST4 Oxidative Potential of PM



Participants: CNRS, PSI, ICL, UOB, NOA, FORTH, CSIC

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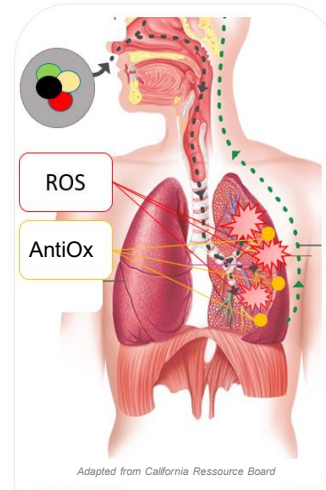


*RI-URBANS (101036245), Final Science Meeting, September 8-9, 2025
Barcelona, Spain*



The RI-URBANS Study

- Reinforce air quality monitoring capacities
- Evaluate the health effects of new air quality metrics



Novel AQ parameter

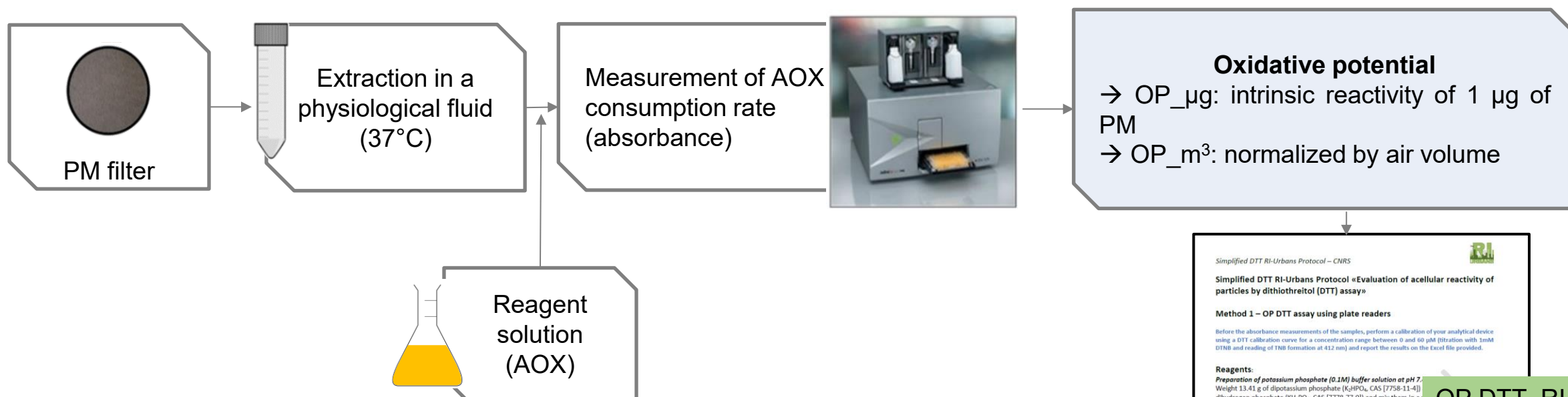
- The **oxidative potential of PM** measures PM capacity to induce oxidative stress in biological media
- ✗ Limited number time-series analyses
- ✗ City-scale only
- ✗ Different protocols and assays

RI-Urbans outcomes for OP measurements:

- Development of 2 simplified OP protocols
- 2 International intercomparisons of offline protocols

Development of 2 simplified OP assays available for the OP community

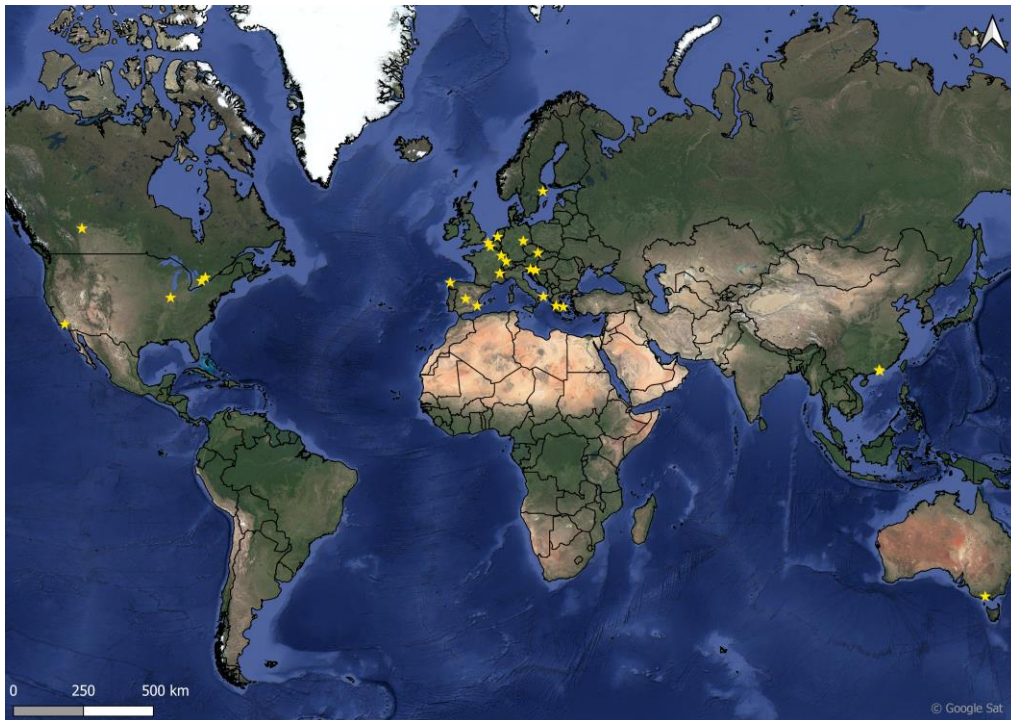
- Two indirect OP assays: dithiothreitol (DTT) + ascorbic acid (AA) on PM filters
- Simplified protocols, proposed by IGE, were discussed, amended and **adopted/voted** by the **RI-Urbans task members**.



2 OP intercomparisons within RI-Urbans/Actris context

- Two intercomparison exercises based on:
 - 2 simplified OP protocol AND all “home” OP protocols existing in the participating groups on board.
 - Standard solutions and real filter samples
- Objectives :
 - To evaluate the commonalities and discrepancies of the OP results obtained by the RI-Urbans OP SOP and OP home protocols.
 - To get an idea of the most used OP tests among groups, to test the homogeneity of the results, to get a first baseline of how far or close our practices are!
- Intercomparisons took place in 2023 and in 2025

2 international OP intercomparisons within RI-Urbans timeline



- OP DTT in 2023 : 18 participating labs
- OP AA in 2025 : 26 participants out of 30 manifestations of interest
 - 18 from the EU region (Croatia, Czech Republic, France, Germany, Greece, Italy, Slovenia, Spain, Sweden, Switzerland, The Netherlands)
 - 2 from the US
 - 3 from Canada
 - 2 from Hong Kong and China
 - 1 from Australia



Results

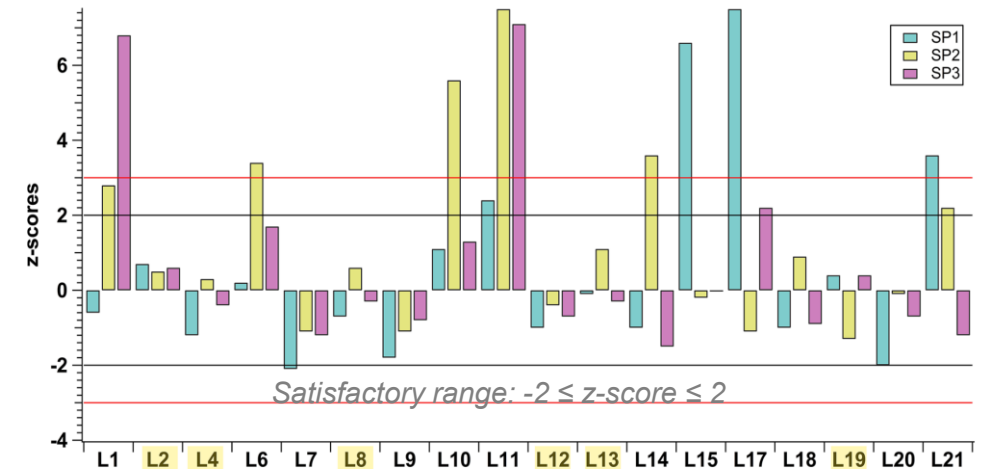
✓ **Independent** data evaluation by the European Joint Research Centre (JRC) =>Thanks!

- **ILC1: OP DTT**

9 participant (50%) were in the satisfactory interval
No groups had an action signal for all 3 samples

- **ILC2: OP AA**

14 participants (54%) in the satisfactory interval
9 groups have an action signal for at least 2 samples



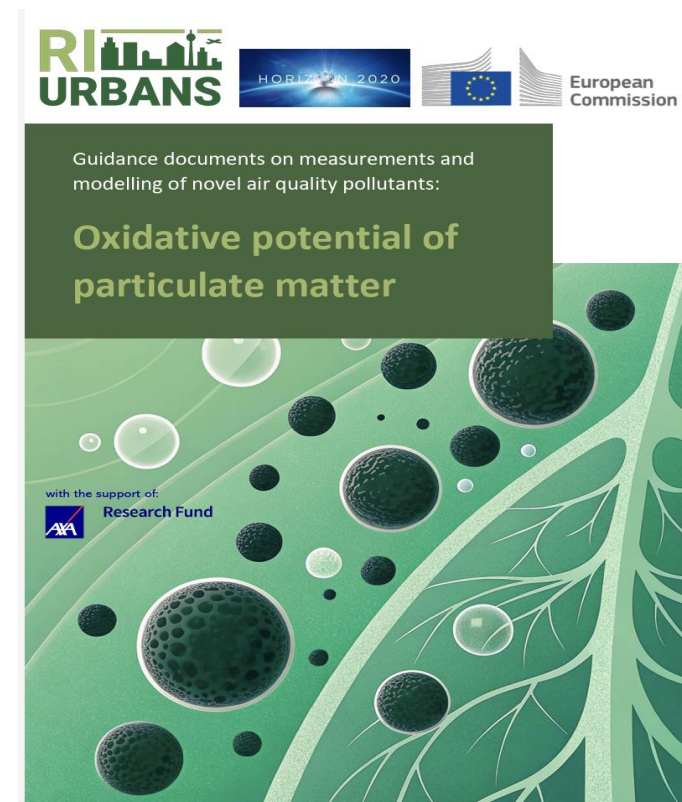
Dominutti et al., 2024

✓ **Less variability in the ILC2 than the ILC1 SOP** protocol

✓ **Ranking** of OP activity of samples respected fr 83% of participants in ILC1 (3 samples) vs 73% in ILC2 (4 samples).

What is comprized in the ST4 for OP of PM?

1. An **Harmonized OP^{DTT} protocol** , RI-URBANS' SOP
2. Results of the first intercomparison
3. Overview of current knowledge between sources, OP and health
4. **Recommendations** for measurements of OP of PM for **other assays**
5. **General recommendations for further standardization** of other protocols for oxidative potential of PM including:
 - Suitable **sampling** procedure
 - **Storage** of samples
 - **Laboratory conditions**
 - **Sample extraction**
 - Reaction
 - Development of a **reference material** with a certified “OP” value
 - Reports of the results, **units**



https://riurbans.eu/wp-content/uploads/2024/07/ST4_OP-2.pdf



Conclusions: which follow up for a ST4 OP “2.0” ?

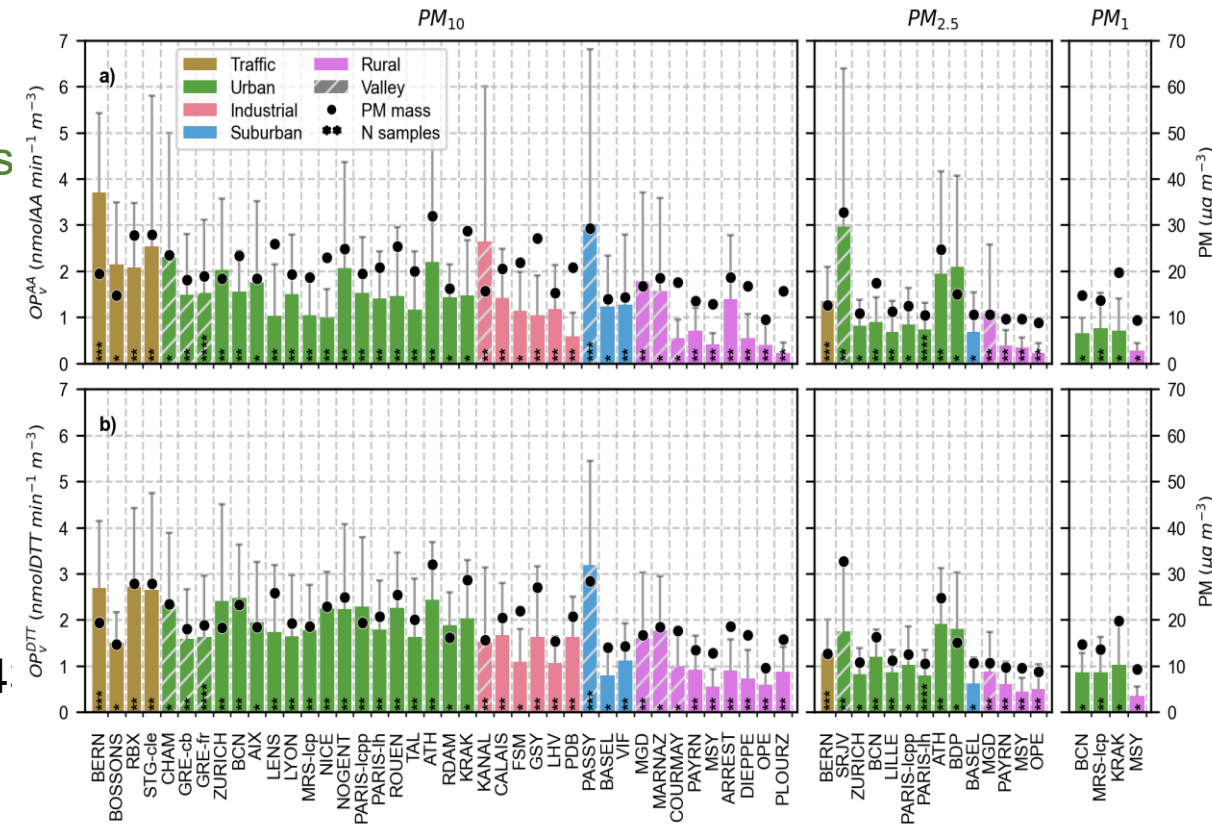
- Publication of the results of the second intercomp
RI-URBANS' SOP **OP^{AA} protocol**, *Marsal et al., in prep*
Recommendations for extraction of the samples
- Could include recommendations for running **multiple complementary assays** in parallel.
- Could include the set up for OP in chambers, special conditions (PM+gaz phase)
- Could contribute to establish a new service for ACTRIS Topical Center OP unit

This could take place in **ACTRIS-Next , hopefully!**

Conclusions: strong interest for harmonized protocols

- Multiple requests to **train other groups with RI-Urbans SOP**, already two labs welcomed at IGE in 2025-26
- Harmonized protocols will allow **long-term time series** to be meaningful (ongoing work in Grenoble, Bern, Rotterdam, Barcelona, Paris)
- Harmonized protocols allow to extract robust **intrinsic OP for each PM sources**, pioneer work in RI-Urbans health pilots
- Harmonized protocols make great papers! Tassel et al., just accepted in Nature, with 11000 samples on 4 EU sites with the same protocols, so go OP community!

--> a **milestone for EU thresholds!**



Tassel et al., 2025

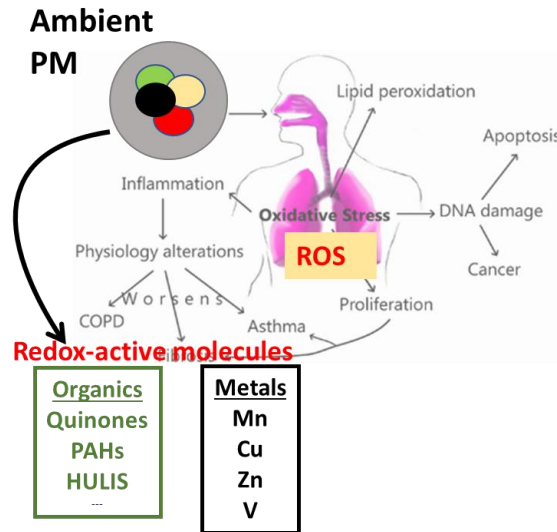
Thank you!

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Back up slides

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From Reactive Oxygen Species to Oxidative Potential of PM?



ROS

Exogenous (carried/ induced by PM)

Endogenous (cell-mediated oxidant generating capacity
=> biological pathway to PM exposure)

- Oxidative Potential : **ability of particles to oxidize the lung environment by exogenous ROS**

Key home message: Assessing the OP of PM serves as an **initial step / proxy in the induction of oxidative stress** and understanding subsequent downstream processes.