# Experimental approaches to reduce emission modelling uncertainty

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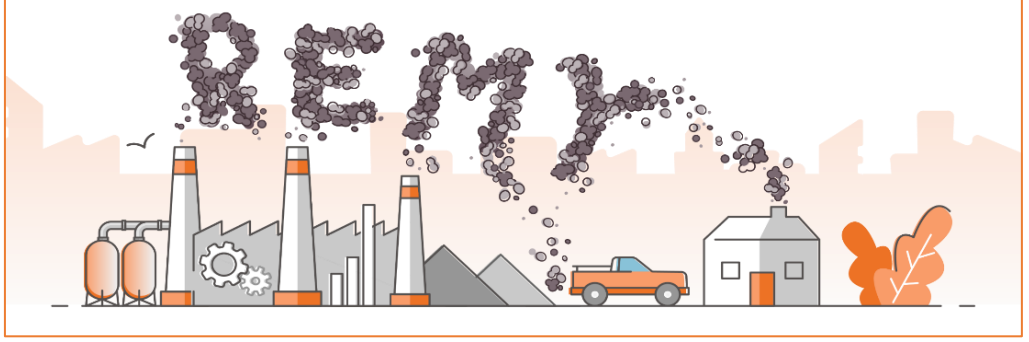
## TOPIC

Road dust resuspension is an important source of PM but not real exhaustively studied so the aim of this thesis is to reduce the modeling uncertainties for atmospheric particles apportionment study.

## ASSOCIATED PROJECT:

This Thesis is associated with a Life preparatory project named **LIFE-REMY** with the object of provide the recommendations to support modeling groups in reducing modelling uncertainties related to emission processing.



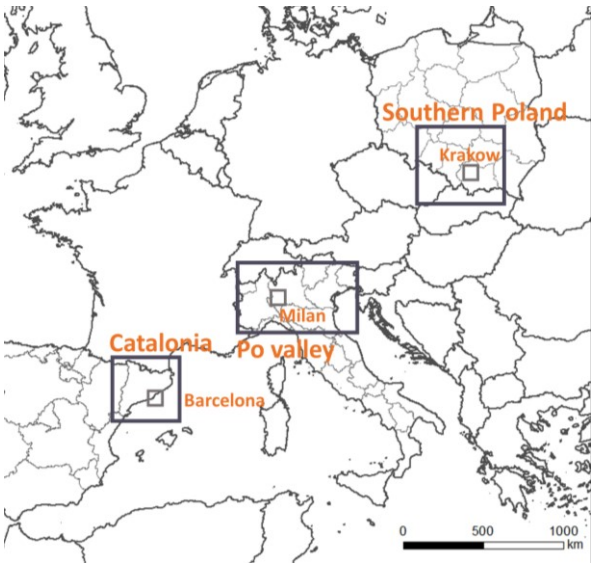

## EXPERIMENTAL APPROACH

### 1) Identification of the source types of PM using the PMF analysis

PMF is a multivariate factor analysis tool that decomposes a matrix of speciated sample data into two matrices: factor contributions (G) and factor profiles (F).

$$x_{ij} = \sum_{k=1}^{p} g_{ik} f_{kj} + e_{ij}$$


## LIFE-REMY'S REGIONAL AND URBAN AREAS




## LIFE-REMY'S DATASETS FROM 2017 TO 2020

| STUDY AREA $PM_{10}$ – $PM_{2.5}$ | METALS; IONS | OC/EC | |
|---|---|---|---|
| SPAIN<br>Barcelona (urban)<br>Montseny (rural) | 24h | 24h | NON-REFRACTORY SUBMICROMETRIC<br>Urban: 30min |
| ITALY<br>Pascal (urban)<br>Schivenoglia(rural) | 24h | 24h | SUGARS 7days |
| POLAND<br>Skavina (urban)<br>Rokitno (rural) | 7 days | 24h | PAHs 7days |

### 2) Road dust resuspesion: three different approaches will be follow:

A) Vertical profiles of PM concentrations

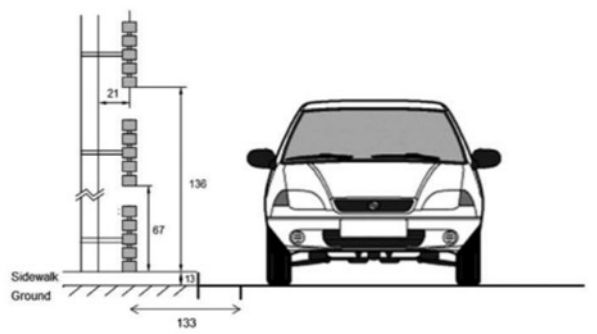



**Fig. 2.** Array of 3 samplers at one location. Distances (in cm) and referred to location exit 4 (heights change slightly at other locations).

Amato *et al 2012*

B) Traffic asphalt porosity and other traffic features

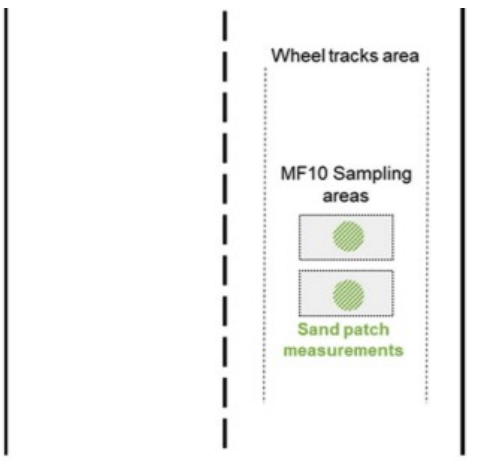
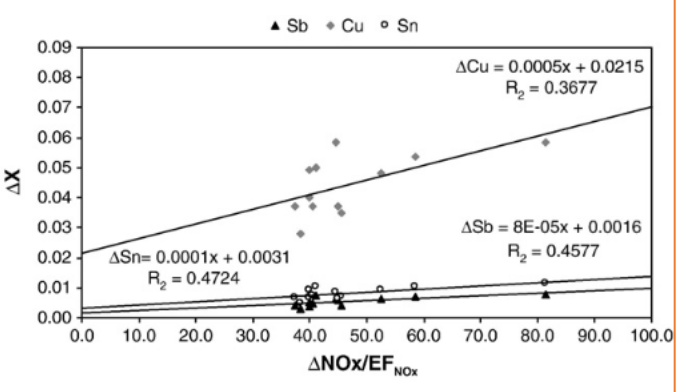



**Fig. 1.** Placement of the sampling area within the road.

Padoan *et al 2018*

C) Atmopheric pollutant gradient




Amato *et al 2010*

## GOALS

The goal is to Compare source apportionment (SA) information obtained by source-oriented dispersion modelling (SMs) and receptor modelling (RMs) and integrate them as much as possible in order to increase the level of knowledge reducing the existing uncertainties of the SMs approach.

The datasets will be processed by EPA PMF software and analyzed in order to identify gaps in emission inventories and causes of non-modelled mass of PM and of specific components. Moreover the apportionment of non-modelled fraction of PM and Verify the correctness of chemical modules, mostly concerning the gas-to-particle conversion of semi-volatile compounds.