

France, Switzerland - Real-time comparison of four particulate matter size fractions in personal breathing zone of Paris subway workers: A six-week prospective study

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Overview

Identification

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10.16909-DATASET-28

Version

VERSION DESCRIPTION
Version 1.1

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2022-04-19

Overview

ABSTRACT

We developed a Bayesian spline model for the real-time mass concentrations of PM₁₀, PM_{2.5}, PM₁, and PM_{0.3} measured simultaneously in personal breathing zone of Parisian subway workers. The measurements were performed by GRIMM, gravimetric method, and DiSCmini during the workers' work-shifts over two consecutive weeks. The PM_{0.3} concentrations were more than an order of magnitude lower compared to the other PM and showed the highest temporal variation, followed by PM₁. The PM_{2.5} raised the highest exposure concern: 15 stations out of 37 had higher mass concentrations compared to the reference. Twelve of these also had significantly higher PM₁ mass concentration. Station PM levels were not correlated with the annual number of passengers entering the station, year of station opening or renovation, or the number of platforms and tracks. The correlation with the number of station entrances was consistently negative for all PM sizes. The number of correspondence concourses was negatively correlated with PM_{0.3} and PM₁₀ and positively correlated with PM₁ and PM_{2.5}. Almost all studied environments had higher PM exposure compared to the study room, although the highest levels of PM were measured outdoors. The highest PM₁₀ exposure was observed at the station platform, followed by the subway cabin and train, while ticket counters had the highest PM_{0.3}, PM₁, and PM_{2.5} mass concentrations. Compared with gravimetric and DiSCmini measurements, GRIMM results showed some discrepancies, with an underestimation of exposure levels. Therefore, we suggest to use GRIMM, calibrated by gravimetric methods, for PM sizes above 1µm, and a DiSCmini for sizes below 700nm.

KIND OF DATA

One script of statistical analysis using R (Suppl_file_1_BUGS_model.R)

Four Excel files:

The first one (File1_PM_daily_summary.xlsx) presents the summary statistics of particle mass concentration per day.

The second file (File2_Calibrated_PM10_&_PM25_Bayesian_Spline_coefficients.xlsx) presents the Summary statistics for coefficients δ and $\sigma(\text{Day})$, Summary statistics for coefficients $\mu\delta(\text{Job})$ and $\sigma\delta(\text{job})$, Summary statistics for coefficients $\alpha(\text{Station})$ and Summary statistics for coefficients $\beta(\text{Environments})$ obtained using the calibrated PM_{2.5} and PM₁₀ time-series

The third file (File3_All_PM_Bayesian_Spline_Coefficients.xlsx) presents the same summary statistics for coefficients δ and $\sigma(\text{Day})$, Summary statistics for coefficients $\mu\delta(\text{Job})$ and $\sigma\delta(\text{job})$, Summary statistics for coefficients $\alpha(\text{Station})$ and Summary statistics for coefficients $\beta(\text{Environments})$ but using row time-series data for PM_{0.3}, PM₁, PM_{2.5}, and PM₁₀

Finally, the fourth file (File4_All_PM_Bayesian_Spline_Coefficients.xlsx) regroups the descriptive summary of Particulate Number Concentration (PNC) of PM_{0.3} for the following variables: days, stations, environments and events.

Each Excel sheet contains the descriptive summary for one variable and is named accordingly

UNITS OF ANALYSIS

Particle Mass Concentration ($\mu\text{g}/\text{cm}^3$)

Particle Number Concentration ($\#/ \text{cm}^3$)

KEYWORDS

Subway, Underground workplace, Exposure, Particulate matter, Ultrafine particles, Exposure assessment, Bayesian Inference

Coverage

GEOGRAPHIC COVERAGE

Paris, France

Producers and Sponsors

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Sampling

Sampling Procedure

Questionnaires

Overview

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Data Collection Mode

Questionnaires

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Data Editing

Data Appraisal

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