

The European Commission's science and knowledge service

Joint Research Centre

Fairmode technical meeting:WG1 Spatial representativeness

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information from
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Zagreb 27-29/06/2016



Outline

- **Scope and Objectives of the Intercomparison Exercise**
- **Timeline and Progression**
- **Datasets**
- **Participation**
- **Treatment of Results**
- **Extension with virtual stations for SR and Station Classification**
- **Discussion**

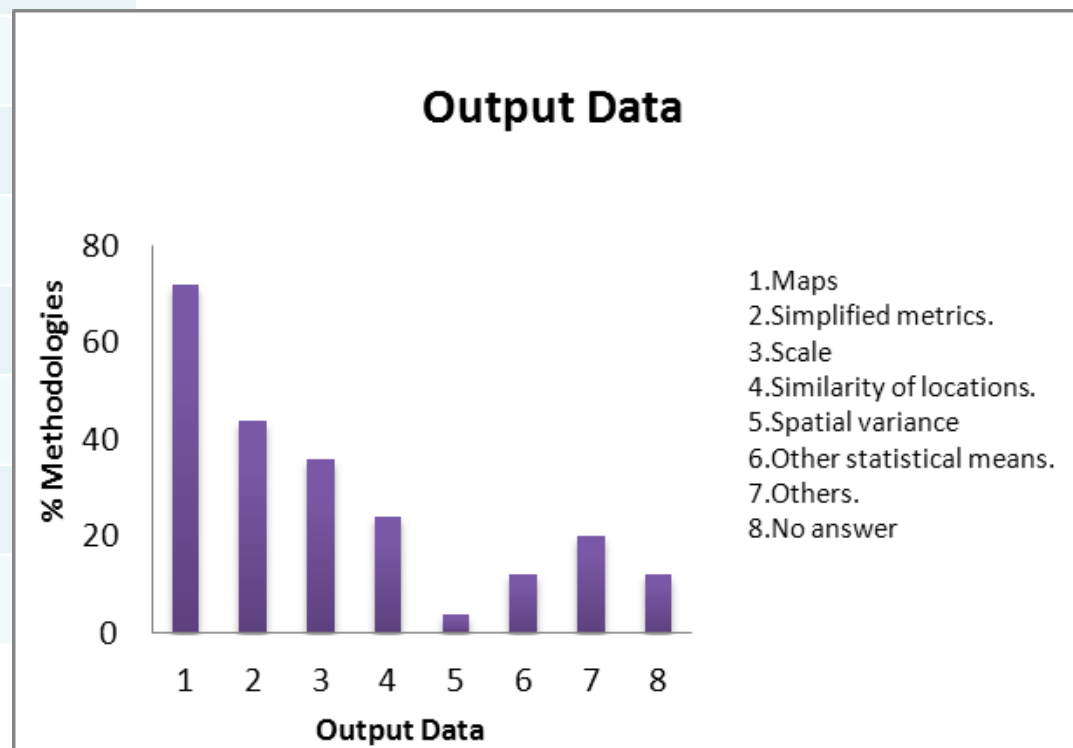
Work Plan and Objective

The intercomparison exercise on spatial representativeness (SR) methods shall:

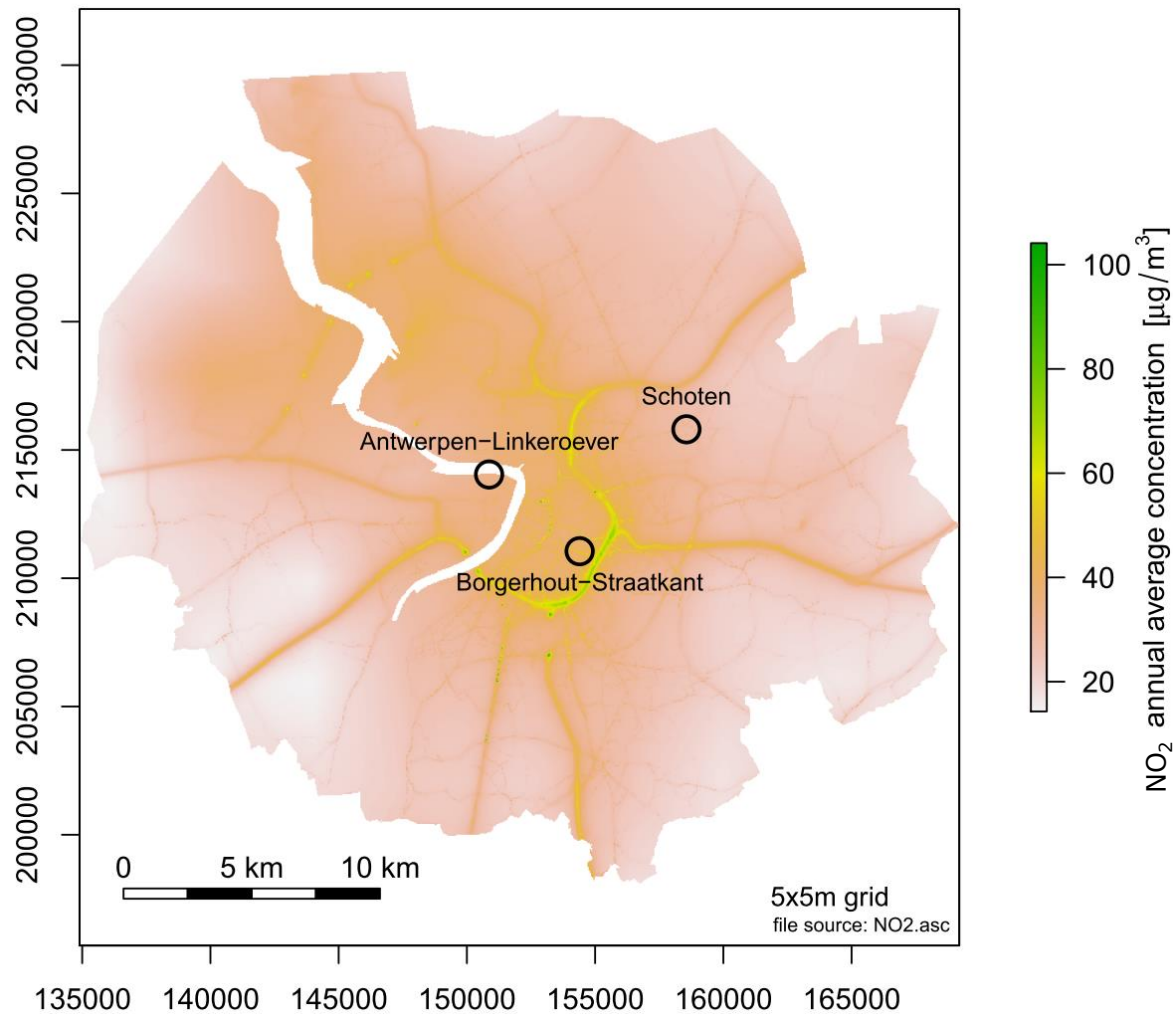
- Be executed by different groups, but on the **same shared dataset**.
- Cover as much as possible the **whole range of procedures** which are in use today - ranging from methods with moderate complexity, used for pragmatic purposes, to those which involve higher levels of data requirements and computational efforts.

Recall of methodologies – Output data

Output Data	Number of Methodologies
Maps	18
Simplified metrics	11
Scale	9
Similarity of locations	6
Spatial variance	1
Other statistical means	3
Others	5
No answer	3



Initial scope of the intercomparison exercise



1 traffic site

Borgerhout-Straatkant
SR: NO₂ and PM₁₀

2 urban background sites

Antwerpen-Linkeroever
Schoten
SR: NO₂ and PM₁₀

*Additional virtual stations -
industrial stations at the
harbour*

Classification of stations?

A) Progression & Past Dates

Jan. / Feb. 2015

- ❑ Distribution of questionnaires for the feasibility study

Feb. 2015

- ❑ FAIRMODE Plenary Meeting in Baveno (IT)
 - Presentation of the survey and of first outcomes



June 2015 & FAIRMODE Technical Meeting

- ❑ Final reporting on the results of the feasibility study
 - Identification of candidate methods and possible participants
 - Detailed discussion on means and operation (datasets, timeframe...)

since Nov. 2015

- ❑ Definition of datasets (selected for the city of Antwerp)

since Jan. 2016

- ❑ Preparation of AQM simulations to be performed by VITO

B) Future Dates

Feb. 2016

- ❑ Simulations based on the RIO-IFDM-OSPM model chain
 - Done by VITO (W. Lefebvre, H. Hooyberghs, S. Janssen, B. Maiheu)

April 2016

- ❑ Inspection of datasets by JRC



May 2016 (tentative)

- ❑ Official distribution of datasets
 - Datasets to be made available to participants for download from the FAIRMODE homepage

June 2016

- ❑ FAIRMODE Technical Meeting
 - Possibility to discuss and answer questions on technical details, means and operation (datasets, timeframe ...)

Sept. 2016 (tentative), with possibility to postpone to October on request

- ❑ Return of the SR results provided by participants
 - Uploading facility made available on ftp site

Presentation Dataset - VITO

Dataset 9 – Adding noise, virtual stations

- 341 virtual monitoring points with hourly data has been extracted from the RIO-IFDM-OSPM model chain outputs
- simulate virtual monitoring stations with daily averages for PM_{10} , and virtual diffusive samplers with to 2-weeks averages for NO_2 and O_3
- Diffusive samplers should have higher uncertainties than reference values while the temporal variability of these virtual monitoring is equal or lower than the temporal variability of the existing monitoring stations in Antwerp

Dataset 9 – Adding noise, virtual stations

- *Air quality - Assessment of uncertainty of a measurement method under field conditions using a second method as reference, ISO 13752: 1998 (E).*

$$\tilde{y} = \beta_0 + \beta_1 \cdot x$$

$\beta_0 = 0$ and $\beta_1 = 1$, no correction for bias (!)

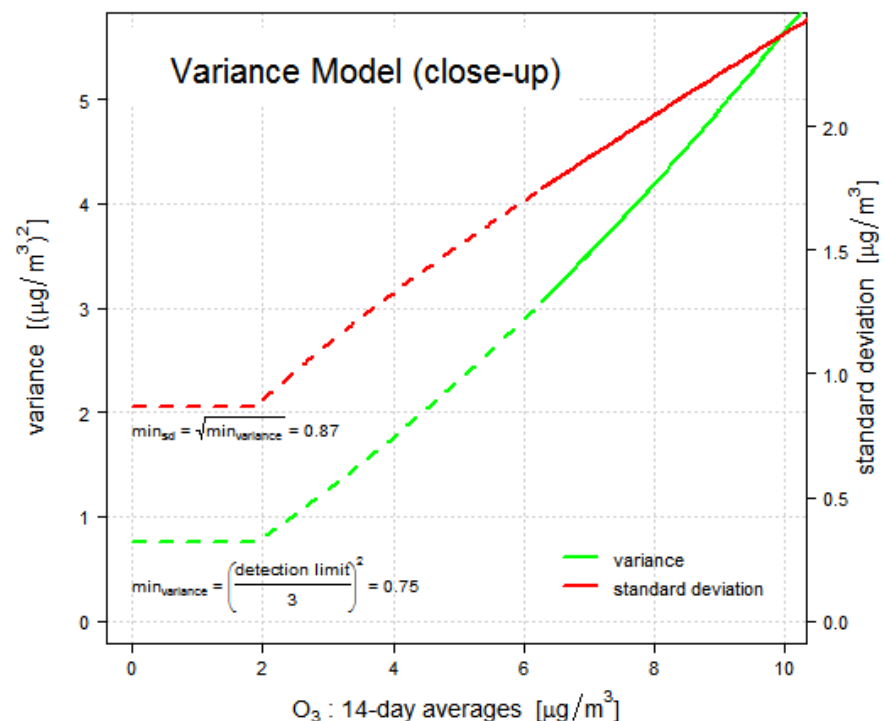
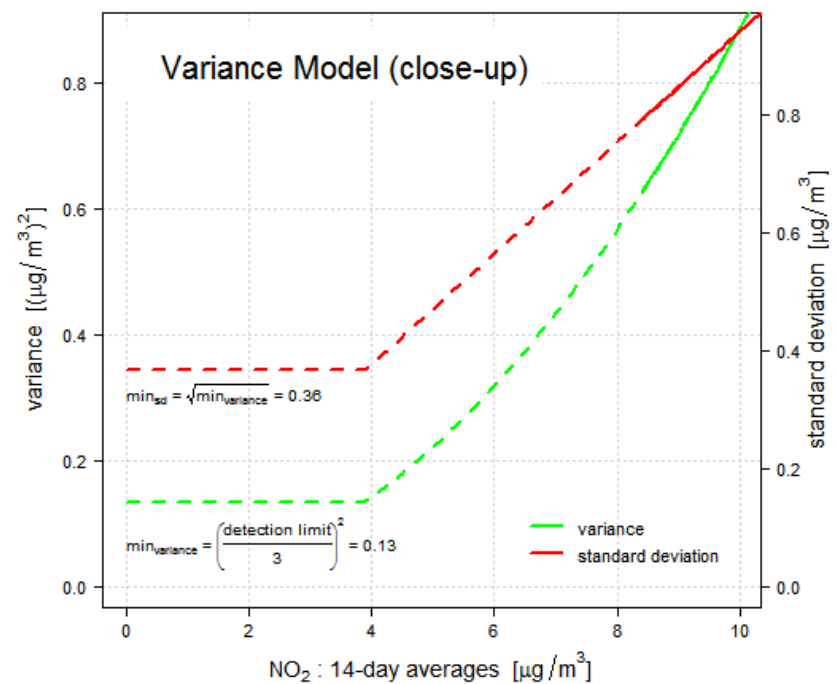
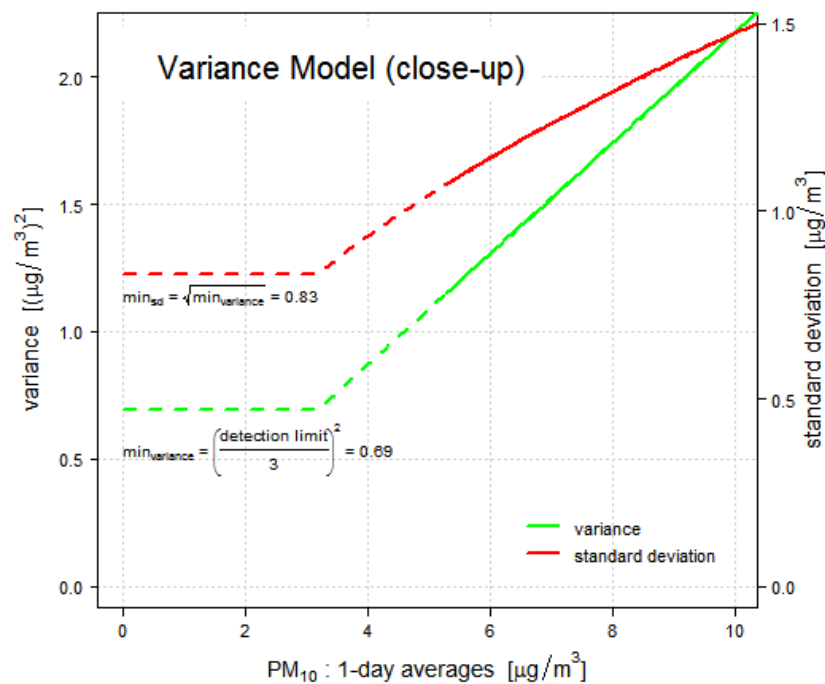
$$s^2 = \alpha_0^2 + \alpha_1^2 \cdot x + \alpha_2^2 \cdot x^2$$

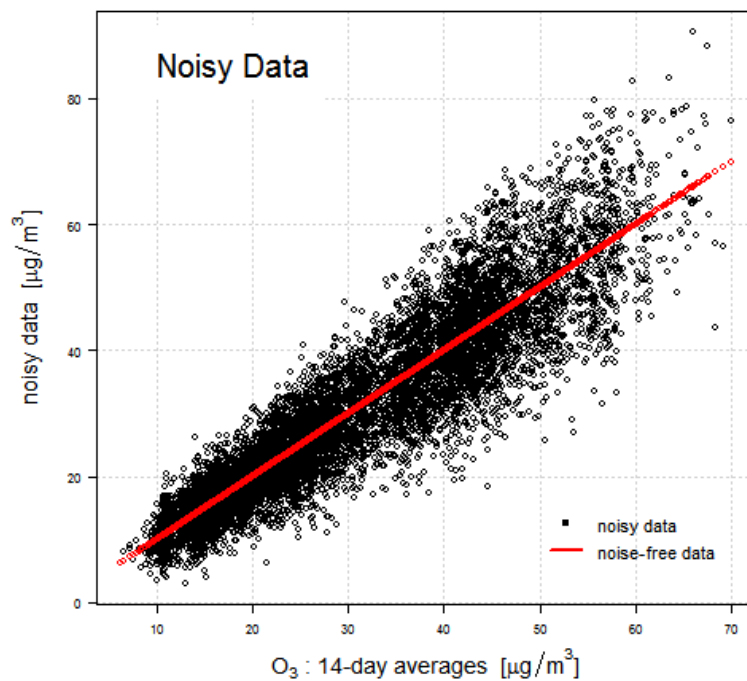
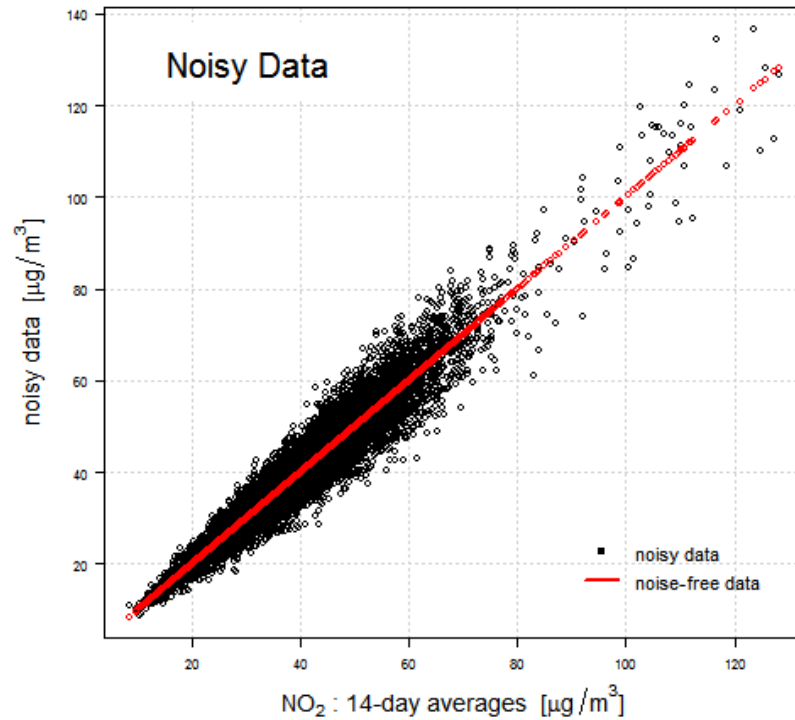
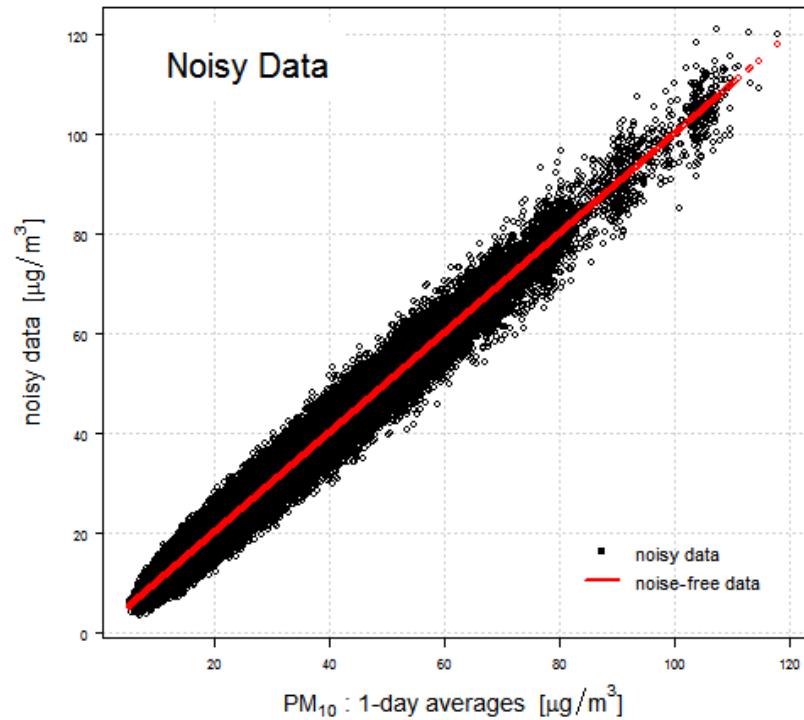
- α_0 , α_1 and α_2 values:
- NO_2 and O_3 from studies of 2-week Radiello samplers
- For PM_{10} , the valuation the 2015 JRC-AQUILA Field Comparison Exercise for PM_{10} and $\text{PM}_{2.5}$

Gerboles M., Detimmerman F., Amantini L., De Saeger E.: Validation of Radiello diffusive sampler for monitoring NO_2 in ambient air, Commission of the European Communities, EUR 19593 EN, 2000

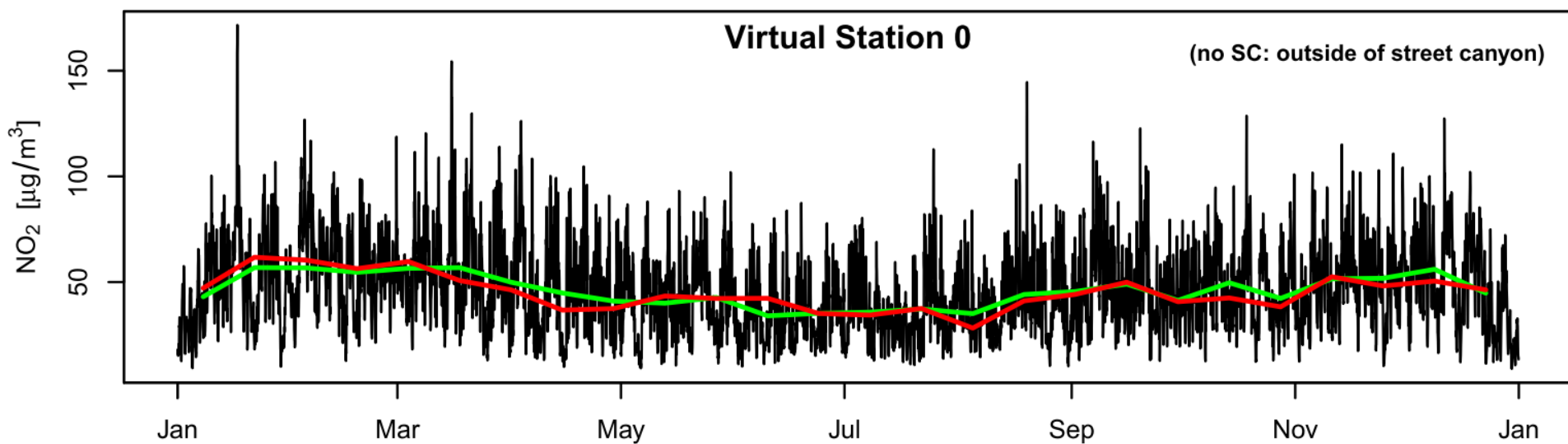
Detimmerman, F., Gerboles, M., Amantini, L., de Saeger, E.: Validation of Radiello diffusive sampler for monitoring ozone in ambient air, Commission of the European Communities, EUR 19594 EN, 2000.

Lagler F., Barbieri M., Borowiak A., Putaud J.P. (2016, in preparation): Evaluation of the Field Comparison Exercise for PM_{10} and $\text{PM}_{2.5}$, Ispra, February 13th – April 9th, 2015.





Dataset 9 – Adding noise, virtual stations



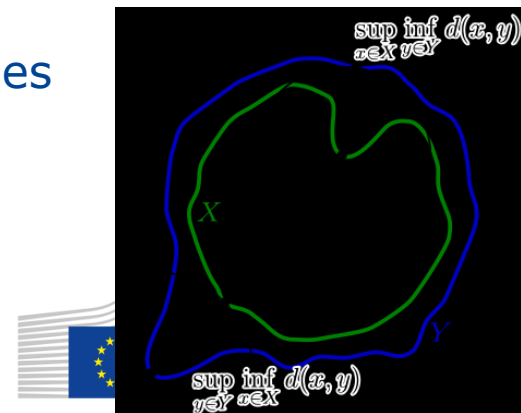
Expert	Institution	Country	Dataset
Jutta Geiger	LANUV, FB 42	Germany	
Wolfgang Spangl	Umweltbundesamt Austria	Austria	
Jan Duyzer	TNO	Netherlands	
David Roet	Flemish Environment Agency (VMM)	Belgium	
Antonio Piersanti	ENEA	Italy	Received
Maria Teresa Pay	Barcelona Supercomputing Center	Spain	
Ana Miranda	University of Aveiro	Portugal	Withdraw
Florian Pfäfflin	IVU Umwelt GmbH	Germany	Withdraw
Ronald Hoogerbrugge	National Institute for Public Health and the Environment	Netherlands	Received
Fernando Martin	CIEMAT	Spain	Received
Daniel Brookes	Ricardo-AEA	UK	Missing SA
Laure Malherbe	INERIS	France	Received
Stephan Henne	Empa	Switzerland	Withdraw
Stijn Janssen	VITO	Belgium	Received
Roberto San Jose	Technical University of Madrid (UPM)	Spain	
Jan Horálek	Czech Hydrometeorological Institute	Czech Republic	
Kevin Delaney	Irish EPA	Ireland	Mail Received
Lars Gidhagen	Swedish Meteorological and Hydrological Institute	Sweden	Withdraw
Hannele Hakola	Finnish Meteorological Institute	Finland	
Tarja Koskentalo	Helsinki Region Environmental Services Authority	Finland	
Erkki Pärjälä	City of Kuopio, Regional Environmental Protection Services	Finland	Mail received
Miika Meretoja	City of Turku / Environmental Division	Finland	Received

Results expected from participants

Nº	Output	Number of Methodologies	Output requested	In all cases, even from descriptive methods?
1	SR Maps	18	Shape files - concentration similarity threshold used to estimate the extent of SR. In addition please answer to other rows (2 to 6) if possible	<p style="text-align: center;">SR in km²</p> <p style="text-align: center;">A shape/raster file of the SR</p> <p style="text-align: center;">The associated population in the area (shape file?)</p> <p style="text-align: center;">Standard deviation of all concentration values in the area of representativeness</p>
2	Simplified metrics	11	Metrics definition, metrics values. Please report the concentration similarity threshold if relevant	
3	Scale	9	Scale definition, scale description and values if any. Please report the concentration similarity threshold, if relevant	
4	Similarity of locations	6	Gives the characteristics used to evidence similarity, their values and where possible report shape files. Please report the concentration similarity threshold if relevant	
5	Spatial variance	1	Variance values. If relevant give the concentration similarity threshold	
6	Other statistical means	3	Description of statistical method and values (e. g. pattern recognition, index of representativeness and other statistics). Please report the used concentration similarity threshold if relevant	
7	Others	5	Description of the method photos with qualitative description and station categorization	
8	No answer	3		

Data treatment

- For the metrics (area in km², standard deviations of values in the area, spatial variance, population) we can carry out a r/R exercise (ISO 5725, ISO 13528) that can give repeatability, reproducibility, outliers ...
- What is the measurement (sic) uncertainty if the AQMS values is attributed to all sites in the area of representativeness
- What is the reference area of representativeness, the intersection of all area (minimum area) or the cumulative area of representativeness. Compute a ratio of SR of each method / reference SR
- Still looking for a index of similarity of the shapes of SR on which to apply a cluster analysis (*Hausdorff distance up to isometry ...*)

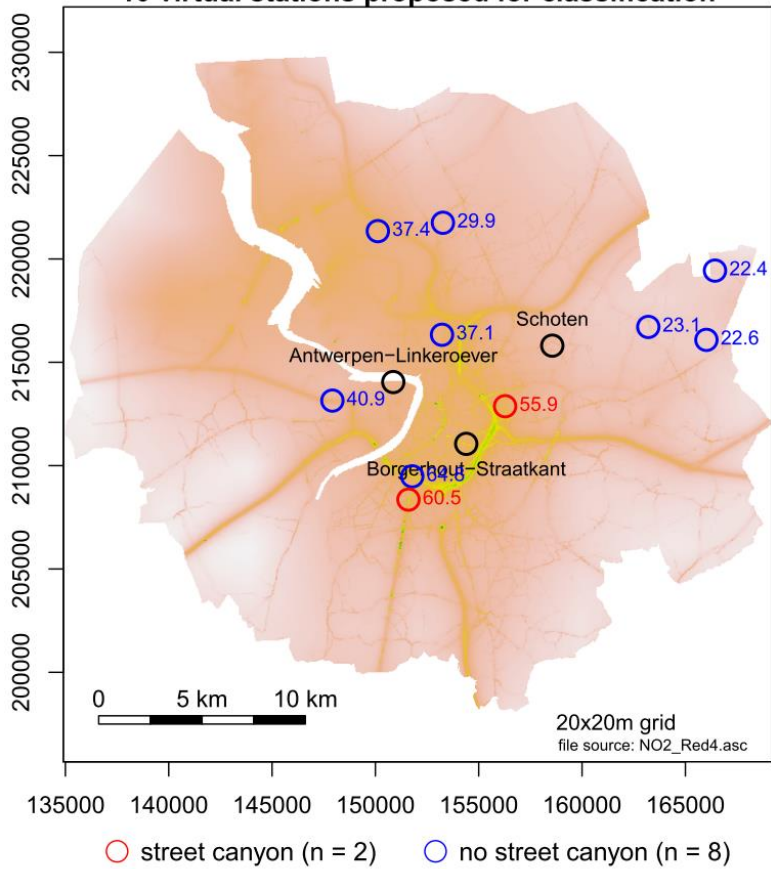


Should the IE be extended to SR and station classification?

- ❑ To be discussed.
 - We propose to open this possibility to those participants who would like to (with no obligation for the others)
 - We need a minimum number of participants
 - Feed back requested (not a lot of feed back since Feb 2016)
- ❑ Can this be seen feasible for the full set of ca 340 virtual stations (automatic processing?) or should a reduced set be defined?
 - We consider that a combined setting of tasks ((a) full set of 340 points, plus (b) reduced set for those who cannot report on such a high number) could be most useful.

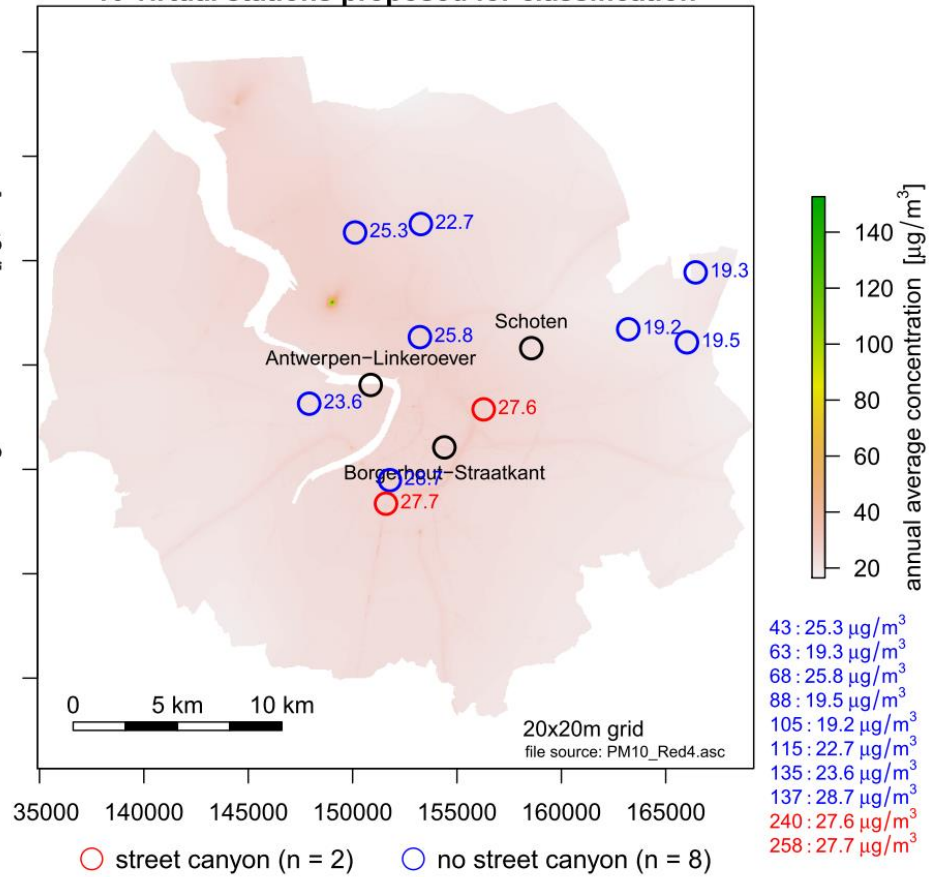
NO₂

10 virtual stations proposed for classification



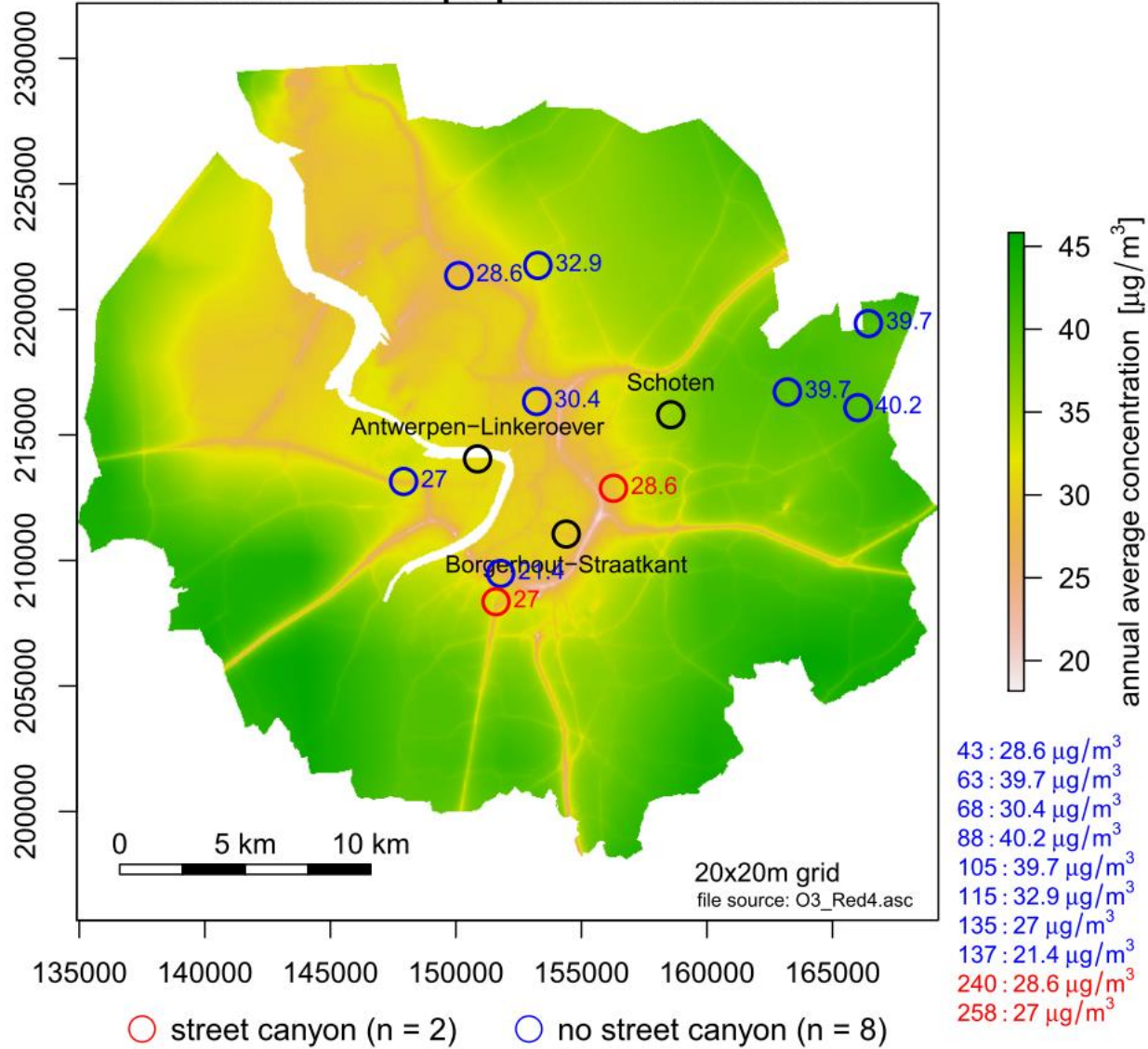
PM₁₀

10 virtual stations proposed for classification



Ozone

10 virtual stations proposed for classification



Virtual stations

Virtual station label	Site type	Annual PM ₁₀ µg/m ³	Annual NO ₂ µg/m ³	Annual O ₃ µg/m ³	Population in the cell	Corine, in the cell
43	No street canyon	37.4	37.4	28.6	0	27
63		22.4	22.4	39.7	0	24
68		37.1	37.1	30.4	0	5
88		22.6	22.6	40.2	4.6	12
105		23.1	23.1	39.7	23.6	2
115		29.9	29.9	32.9	8.7	20
135		40.9	40.9	27.0	0.4	20
137		64.8	64.8	21.4	0	2
240	Street Canyon	55.9	55.9	28.6	167.2	1
258		60.5	60.5	27.0	191.3	2

Thank you for your attention!

Discussion, Questions and Suggestions?



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