Particulate matter measurements in Macedonia for health impact assessment

Poster · September 2016

CITATION
1

READS
161

8 authors, including:

Isabell Katharina Rumrich
National Institute for Health and Welfare, Finland
20 PUBLICATIONS **65** CITATIONS
SEE PROFILE

Mirjana Dimovska
Institute of Public Health of the Republic of Macedonia; Ss. Cyril and Methodius U…
16 PUBLICATIONS **22** CITATIONS
SEE PROFILE

Dragan Gjorgjev
Institute of public health North Macedonia
137 PUBLICATIONS **241** CITATIONS
SEE PROFILE

Aneta Stefanovska
Ministry of environment and physical planning, Skopje, Republic of Macedonia
2 PUBLICATIONS **17** CITATIONS
SEE PROFILE

22nd European Aerosol Conference, Tours 2016

Particulate matter measurements in Macedonia for health impact assessment

I.K. Rumrich[1,2], M. Dimovska[3]; D. Gjorgjev[3] S. Lappi[4], A. Stefanovska[5], N. Golubov[5], R.O. Salonen[1], and O. Hänninen[1]

[1]Department of Health Protection, National Institute for Health and Welfare, Kuopio, Finland; [2]Department of Environmental and Biological Sciences, University of Eastern Finland, Kuopio, Finland; [3] National Public Health Institute, Skopje Macedonia; [4] Finnish Meteorological Institute, Helsinki Finland; [5] Ministry of Environment and Physical Planning, Skopje, Macedonia

isabell.rumrich@thl.fi

Introduction

Solid fuel combustion is a common heating source in Macedonia. Small scale combustion in combination with lacking legislation for other emissions lead to high air pollution levels in the Skopje valley. It is suspected that current air quality has significant impact on the population health. To investigate this topic further, risk assessment investigations have been introduced within the EU-funded Twinning project “Further strengthening the capacities for effective implementation of the acquis in the field of air pollution” (MoE 2016). Measured monthly mean concentration of particulate matter (PM) will be used in a pilot study on health impact assessment. The aim of the present work was to assess the correlations between the measured monthly particulate matter mass concentrations ($PM_{2.5}$ and PM_{10}) from different air quality monitoring stations, in order to evaluate their usability in the health impact assessment study.

Method

Monthly PM data were available from the national air quality monitoring network for the period of January 2012 to February 2016. $PM_{2.5}$ was measured at two stations only (both within the city of Skopje) and PM_{10} at nine stations (4 Skopje city, 1 Skopje region, 4 outside Skopje region). Missing monthly values were imputed using the average $PM_{2.5}$ or PM_{10} concentration calculated from measurements in the corresponding month of the other years at the same monitoring station. In addition, the average monthly ratios $PM_{2.5}$:PM_{10} were calculated for the two stations in Skopje having parallel measurements of these two PM parameters with continuously acting instruments.

Results

A summary description of the monthly $PM_{2.5}$ and PM_{10} data for the whole monitoring period of Jan 2012 – Feb 2016 is shown in Figure1. The $PM_{2.5}$:PM_{10} ratios at the two stations within Skopje city ranged between 0,61 in spring and 0,67 in autumn. Overall, the correlations in PM data between the different monitoring stations were high (Table 1). The correlation in $PM_{2.5}$ between the two stations in Skopje was excellent (R^2>90%).

The same applied to the PM_{10} stations within the city of Skopje, where only one monitoring station showed correlation lower than 90% with the others (Gazi Baba; R^2>80%). all the Skopje region monitoring stations as well as the monitoring stations outside Skopje region showed generally intercorrelations higher than 70%. Only PM_{10} data from the station of Kavadarci, correlated poorly with the other stations. The rural background station of Lazaropole, located on a mountain, showed an inverse correlation with all the other monitoring stations.

Conclusions

The limited size of the newly started national air quality monitoring programme in Macedonia poses challenges for air pollution exposure assessment. High $PM_{2.5}$ and PM_{10} intercorrelations, however, suggest that the PM_{10} data can be used to improve spatial coverage of PM exposures. Most likely due to same sources, PM pollution levels have similar monthly profiles to those in Skopje city also at the three urban monitoring sites outside Skopje.

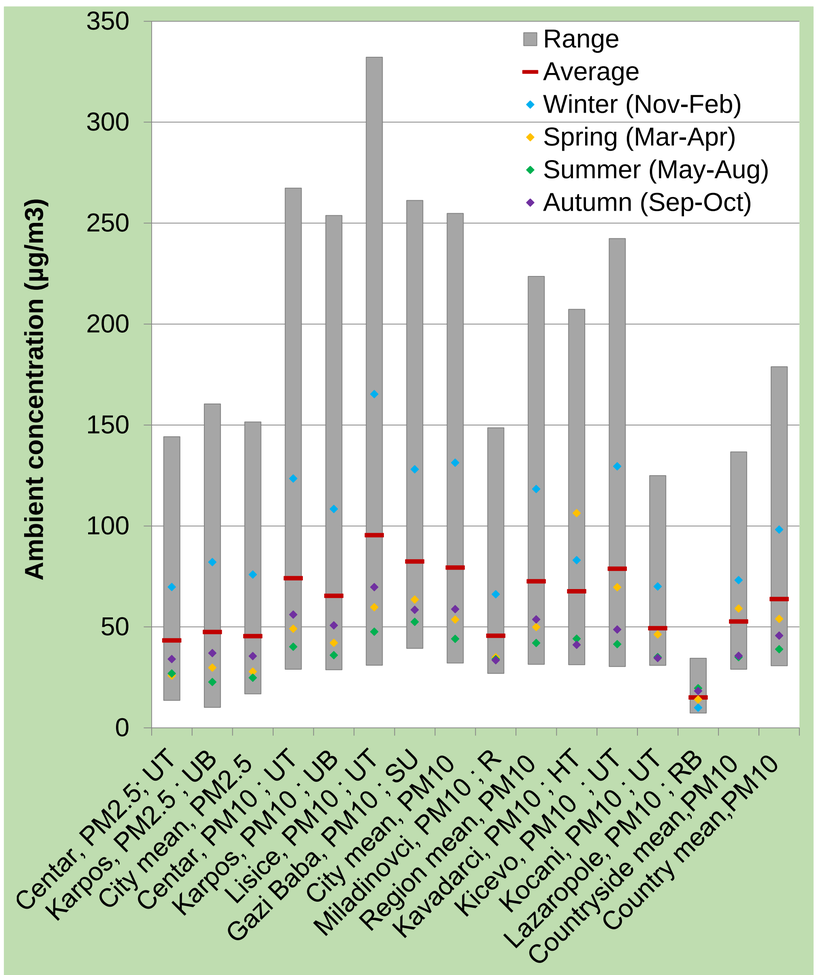

Figure 1. Summary of the monthly PM data (in µg/m^3) measured in Jan 2012-Feb 2016 at Macedonian air quality monitoring stations

UT – urban traffic site, UB – urban background site, SU - suburban site, RB - rural background site, HT – heavy traffic, R - refinery

Table 1. Correlation matrix of the arithmetic means of the measured PM (Jan 2012 – Feb 2016). Column names correspond to row names by number. UT – urban traffic site, UB – urban background site, SU - suburban site, RB - rural background site; HT – heavy traffic, R -refinery

		1	2	**3**	4	5	6	7	**8**	9	**10**	11	12	13	14	**15**	**16**
1	Centar, $PM_{2.5}$; UT	1,00															
2	Karpos, $PM_{2.5}$; UB	0,93	1,00														
3	**City mean, $PM_{2.5}$**	**0,98**	**0,98**	**1,00**													
4	Centar, PM_{10}; UT	0,95	0,95	**0,96**	1,00												
5	Karpos, PM_{10}; UB	0,94	0,93	**0,95**	0,98	1,00											
6	Lisice, PM_{10}; UT	0,92	0,93	**0,94**	0,97	0,94	1,00										
7	Gazi Baba, PM_{10}; SU	0,82	0,87	**0,87**	0,90	0,83	0,93	1,00									
8	**City mean, PM_{10}**	**0,93**	**0,94**	**0,96**	**0,99**	**0,96**	**0,99**	**0,94**	**1,00**								
9	Miladinovci, PM_{10}; R	0,73	0,76	**0,76**	0,79	0,78	0,81	0,89	**0,84**	1,00							
10	**Region mean, PM_{10}**	**0,93**	**0,94**	**0,95**	**0,98**	**0,96**	**0,99**	**0,95**	**1,00**	**0,87**	1,00						
11	Kavadarci, PM_{10}; HT	0,20	0,28	**0,24**	0,31	0,28	0,33	0,42	**0,34**	0,36	0,35	1,00					
12	Kicevo, PM_{10}; UT	0,76	0,82	**0,80**	0,88	0,84	0,89	0,90	**0,90**	0,82	0,91	0,49	1,00				
13	Kocani, PM_{10}; UT	0,73	0,82	**0,79**	0,84	0,81	0,86	0,89	**0,87**	0,82	0,88	0,51	0,96	1,00			
14	Lazaropole, PM_{10}; RB	-0,53	-0,65	**-0,61**	-0,62	-0,58	-0,63	-0,67	**-0,64**	-0,59	-0,65	-0,39	-0,73	-0,77	1,00		
15	**Not Skope region, PM_{10}**	**0,63**	**0,71**	**0,69**	**0,77**	**0,73**	**0,78**	**0,83**	**0,80**	**0,75**	0,81	**0,78**	**0,93**	**0,92**	**-0,68**	**1,00**	
16	**Country mean, PM_{10}**	**0,88**	**0,91**	**0,91**	**0,96**	**0,93**	**0,97**	**0,95**	**0,98**	**0,87**	0,98	**0,49**	**0,95**	**0,93**	**-0,68**	**0,90**	**1,00**

UNIVERSITY OF EASTERN FINLAND

This work was supported by the EU Twinning Programme, Academy of Finland, Nordforsk, Juho Vainio Foundation, and by the participating institutes.

References

MoE, 2016
http://airquality.moepp.gov.mk/?lang=en#.

Terveyden ja hyvinvoinnin laitos • Institutet för hälsa och välfärd • National Institute for Health and Welfare

This project is funded by the European Union

Twinning Project: *Further Strengthening the Capacities for Effective Implementation of Acquis in the Field of Air Qiality*