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REGIONAL AIR POLLUTION TRANSPORT AND ITS INFLUENCE TO POLLUTION HOTSPOT IN THE CZECH REPUBLIC

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INTRODUCTION

Upper Silesian Industrial Region (USIR) represents large area with enormous concentration of industry and poor air quality. Dominant part of USIR is located in the Polish Silesian Province and small part in Moravian-Silesian Region in the Czech Republic where one of the European air pollution hotspots is the city Ostrava (Pokorná et al., 2015). Elevated air pollution level has been associated with cardiovascular and respiratory diseases in adults and children and other health consequences (WHO, 2013).

The aim of the study was to find out the local effect and the regional air pollution transport effect on the air quality of the Ostrava Radvanice district, the problematic air pollution hot spot.

EXPERIMENTAL SETUP

Sampling sites were located at urban industrial site Ostrava-Radvanice a Bartovice and suburban site Ostrava-Plesná in the winter period 6.2.2014-6.3.2014.

24h mass concentrations of PM₁₀ and PM₁ were determined and size resolved mass concentrations of atmospheric aerosol (AA) were measured by cascade impactors. Chemical analyses of PM₁₀, PM₁, and size resolved AA were performed. Meteorological parameters from nearest monitoring stations were used to determine the association between air pollution level and meteorological situation.

RESULTS AND CONCLUSIONS

Higher average mass concentrations of PM and chemical species were measured in Radvanice than in Plesná, except NO₃⁻, SO₄²⁻, and NH₄⁺, in both PM fractions. Na⁺ and Ca²⁺ in PM₁ were four times higher and Ca²⁺ and Mg²⁺ in PM₁₀ even fifth times higher in Radvanice than in Plesná (Table 1). It suggests that Radvanice site was influenced by a close industrial zone (IZ) located in the southwest (SW) direction from measurement station.

To investigate the influence of the IZ in Radvanice, ratios between mass concentrations measured in Plesná and Radvanice were calculated (Figure 1) during SW and northeast (NE) wind directions (WDs). During SW WD mass concentrations were higher in Radvanice than in Plesná and thus the influence of the IZ was evident. This

finding was also confirmed by increased mass concentrations of specific chemical species which are generally produced by the industrial sources. The effect of the regional air pollution transport was evident in Plesná during NE WD when the mass concentrations of the most of species were increased.

Tab. 1: Average 24h mass concentrations and STD for selected species.

(µg.m ⁻³)	Radvanice		Plesná	
	PM ₁	PM ₁₀	PM ₁	PM ₁₀
PM	29.4±9.2	55.0±18.0	28.8±15.5	39.6±22.4
OC	11.3±8.5	14.6±13.6	7.0±4.3	9.7±6.6
EC	2.1±1.8	3.3±3.6	2.3±1.3	2.5±1.6
NO ₃ ⁻	2.2±1.0	4.1±1.9	3.1±1.3	4.6±2.0
SO ₄ ²⁻	2.3±1.1	4.3±2.4	3.2±2.0	4.6±3.2
NH ₄ ⁺	1.5±0.7	2.1±1.4	2.3±1.2	3.0±1.8
(ng.m ⁻³)				
Ca ²⁺	66±43	780±554	15±9	155±123
Na ⁺	267±222	468±180	61±66	212±118
Mg ²⁺	6±8	123±103	2±1	27±16
Fe	261±262	-	83±95	-

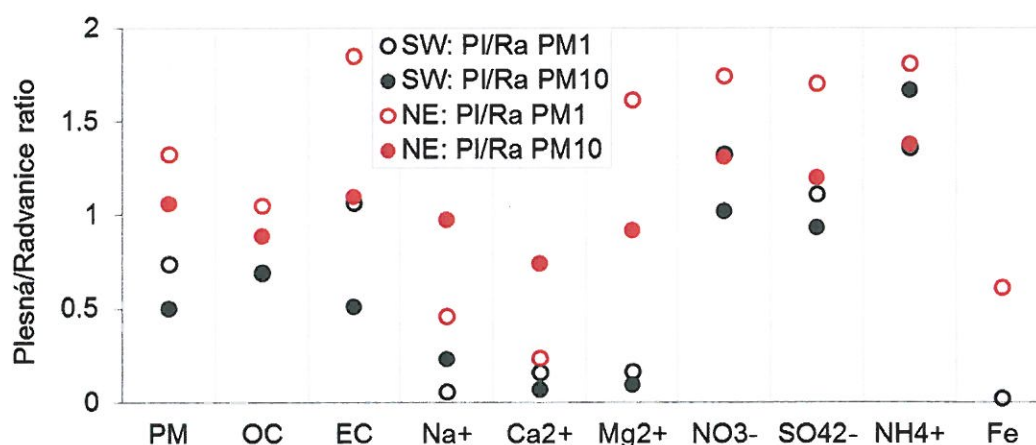


Fig. 1: Ratios between mass concentrations at Plesná and Radvanice sites.

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