

Analysis of PM₁₀ from the air quality monitoring using INAA

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Even though the air quality in the studied region (the Czech-Polish region located in the northeast part of the Czech Republic) has improved since 2000, the level of PM₁₀ concentration is not satisfactory and still exceeds the air pollution limits. Pollution in this area varies due to meteorological conditions, pollution sources, and geographical conditions. Measured data were gained by the high-volume sampler (SAM Hi 30 AUTO WIND) which captures PM₁₀ on glass fiber filters (Whatman GF/A, Ø 150 mm) depending on wind conditions. Thus, the sampler can collect particles from eight basic wind directions, during calm and smog situations. The sampling device is located cca at 90 m above the ground level. Due to that, the local pollution sources (such as public transfer) do not affect the measurement, and the transmission of the pollution within the region can be investigated.

Instrumental neutron activation analysis was used to determine the elemental composition of sampled PM₁₀. Twenty samples and two field blank filters (from September and December 2019) were analyzed. Mass fractions of 21 elements from September and 19 from December were determined. Because the glass fiber filters have high blank values not all elements could be used for further analysis. Elements were processed using a PCA and correlation analysis, which enabled together with meteorological data, to find out the pollution sources. It was found that pollution came from the southwest/west direction during September and originated most likely from the metallurgic complex (steel and iron production, coking plant, metal foundry, generation plant). In December pollution came from the north/northeast direction. This pollution is connected to the transboundary transfer from Poland and originated possibly from local heating, coal combustion, and metallurgy.

The present work may be served as baseline data to follow up any potential dynamics in the future.