USE OF NEUTRON ACTIVATION ANALYSIS TO CHARACTERIZE PM_{10} SAMPLED ON THE TOP OF A FORMER MINING TOWER

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ABSTRACT

In order to characterize the pollution in a heavily polluted region in the Czech-Polish borderland (Ostravsko-karvinská agglomeration) and to identify the pollution origin, the Instrumental Neutron Activation Analysis (INAA) was employed. Specially designed high-volume sampler (SAM Hi 30 AUTO WIND) was used to collect PM_{10} samples in dependence on airflow conditions. The sampler was located on the top of a former mining tower in 90 m AGL. This allowed the elimination of the influence of local sources and investigation of the regional pollution transport. From April 2018 to March 2019, 111 PM_{10} samples from eight basic wind direction, calm and 2 smog situations were sampled. The sampled particulate matter was analysed using the neutron activation analysis providing information on the content of 34 elements. This information – together with the PM_{10} concentrations and meteorological data (measured and modelled) – was used to characterize the pollution origin in the region. A significant difference in the element composition was observed – elemental concentrations were dependent on both the season and the sampling direction. Contribution of three industrial sources, two ironworks and a cement plant was identified, showing that – though not detected by ground air pollution monitoring – these sources have a significant impact on the pollution transfer in the region. The measurements also confirmed that the PM_{10} cross-border pollution inflow from Poland plays a crucial role during the winter season and contributes significantly to the air pollution in the studied region.