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BOOK OF ABSTRACTS

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Correlation between airborne radionuclides and selected trace elements in suburban environment

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Adverse health effects of ionizing radiation raise a concern related to the inhalable radionuclides in the ambient air, but the additional risk comes from the coarse, fine and ultrafine atmospheric particulate matter with complex predominantly non-radioactive trace elements. Assessment of these two pollutant categories usually includes different approaches and research methodologies although both obey to similar processes and influences in the atmospheric environment. Physical-chemical characteristics and correlations of Pb-210, Be-7 and Cs-137 activity concentrations in total suspended particles and selected trace elements concentrations in the fine fraction (PM2.5) of atmospheric particulate matter, observed at the suburban monitoring station have been a subject of this study. Radionuclides data, reported in the national annual radioactivity monitoring reports, had been obtained by gamma spectrometry analysis (HPGe) of monthly composite samples, collected on daily basis, using cellulose filters and high-volume sampler (air flow about 50m^3/h). Fine particulate aerosol fraction within our research had been sampled by European reference low-volume sampler (2.3 m^3/h) with nozzles passing the particles with aerodynamic diameter less than 2.5 μm onto preconditioned PTFE filters. In this case daily aerosol samples were analyzed by non-destructive nuclear analytical technique to obtain simultaneously concentrations of trace elements. The statistics of radionuclides and trace elements concentrations was done and correlations and mid-term trends have been analyzed and discussed based on the knowledge on the radionuclides origin in the atmosphere, nuclear data, meteorological and precipitation data at the sampling site. Results have shown various correlations between the cosmogenic Be-7 and naturally occurring Pb-210 (Rn-222 descendant, from U-238 radioactive series) with Al, Si, Fe, Pb, Ca, elements pointed as tracers of soil-related factor in source apportionment receptor analysis (EPA PMF). Although the observed correlations and meteorological parameters have shown a dominantly natural origin of these elements, the industrial emissions might still contribute in some extent. Differences between elemental lead and radionuclide Pb-210 concentration allow us to distinguish shares coming from local soil and from the antropogenic activities in the investigated environments. This study has shown a capacity of naturally occurring radionuclides to be the tracers of processes in lower layers of atmosphere or the indicators of pollution origin, especially in boundary urban areas.

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