Goldschmidt 2026 Abstract
https://doi.org/10.46427/gold2026.35875

Tracing aerosol contamination in urban soils using lead isotopes

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Until the last years soils developed in highly anthropogenic area were not deeply investigated. With the urban and peri-urban area increases, soils are of key interest and their use are submitted to rapid changes. Scientific objectives are a better understanding of urban soils for city sustainable development. This study reports on the geochemical evolution of soils and how aerosols are incorporated into those soils. This is the first step in a long term monitoring process. To carry out this monitoring, urban soil columns were extracted and equipped in order to monitored various parameters like humidity, temperature, tension... and to collect soil solution at three different depths. Four soils profile, designed as reference soils, were analysed for geochemical parameters as well as for Pb isotopic analysis. To complete the study, rain water and Lichens were collected.The first analysis revealed variation between the four soils composition in term of major elements but also in term of trace elements. Focusing on lead concentration, the variation in soils is by a factor of 5, from 20 to 100 mg/kg. Although the geochemical difference, soils concentration in term of metals is similar for all the studied soils being enriched in the first centimetres and decreasing with the depth, indicating a deposition of aerosols contaminated in the surface likely reflecting anthropogenic activities.Lead isotopes analysis reinforced the end members described above. Indeed, the lead isotopes profiles evolved from less radiogenic in the top to more radiogenic in depth suggesting an evolution from anthropogenic component to natural component. This isotopic evolution is somehow well correlated with the concentration changes confirming the mixing is coherent at first order with those sources (anthropogenic/natural). Lichens sampled in the study area, likely representing the atmospheric input into the soils, are relatively homogeneous and coherent with the end member found at the top of the soils, i.e. less radiogenic. We will also present rain water composition as well as the soils water and evaluated the mass balance by calculation to determine the contribution of each end member along the soil profile and what can be expected in the future soil evolution.