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Lead isotopes as a tracer of pollution in soils in Lower Silesia (SW Poland)

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Distribution of Pb and its isotopic composition in different types of soils in Lower Silesia were characterized in order to identify the sources of Pb pollution. The analysed soils included:

- 6 soil profiles derived from different parent rocks (granite, tonalite, granodiorite) with different Pb concentrations (Tyszka et al. 2012). The soils were located far from pollution centers.

- 4 soil profiles located close to or on historical slag deposits (Kierczak et al. 2013);

- 10 soil profiles situated close to a large Cu smelting site affected mainly by contamination with emitted fly ashes (Tyszka et al. 2012).

- 4 soil profiles situated in a major urban area in Wrocław city close to a busy road and 3 profiles outside Wrocław city and close to the same road.

The profiles close to the road and in Wrocław city were affected by pollution with leaded petrol, which was observed in 15 cm of the uppermost soil. The petrol pollution is characterized by the lowest Pb207/Pb206 ratio of those occurring in Lower Silesia. The material of slag, fly ashes and coal have similar isotopic characteristic of the rato of Pb207/Pb206 = 1.18 and such is the value observed commonly in the uppermost parts of all other soil profiles. The soils developed on the slag heap show the largest enrichments in Pb and Pb207/Pb206 = 1.18 in the B horizons. Interestingly, most of the soil profiles located far from the pollution centres also have the ratio Pb207/Pb206 = 1.18 in the upper horozons (O and sometimes also A horizons). That's the case for soils derived from parent rock with strongly variable Pb content and different Pb isotope ratios, but generally higher that 1.20. That may suggest that natural weathering of basement rocks also brings Pb207/Pb206 ratio down and both natural and anthropogenic signals are mixed in the uppermost soil horizons. However, our research shows that combined observations of Pb concentration, its isotope composition as well as its distribution within the profile forms a specific pattern that may be used to reconstruct sources and processes involved in Pb pollution.