



## Variations in Pb concentrations and Pb-isotope ratios in soils collected along an east-west transect across the United States

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Soil A-horizon and C-horizon samples were collected along a 4000 km long transect cutting the USA from the west to the east coast. For purposes of site selection, the transect was divided into approximately 40-km segments. For each segment, a 1-km<sup>2</sup> target area was selected at random. Soil A- and C-horizon samples were collected at a site within each target area that was most representative of the surrounding landscape. The samples were air-dried at ambient temperature, disaggregated, and sieved through a 2-mm stainless steel screen. The <2-mm material was crushed to <150  $\mu\text{m}$  in a ceramic mill prior to chemical analysis. Lead was analyzed in all the A- and C-horizon samples by inductively coupled plasma-mass spectrometry following a 4-acid digestion. The complete dataset can be found in Smith et al., 2005. Pb-isotope ratio measurements were carried out on 159 soil A-horizon and 137 soil C-horizon samples on an inductively coupled sector field plasma mass spectrometer (SF-ICP-MS; ELEMENT 1, Finnigan MAT) in the laboratory of the Geological Survey of Norway (NGU), following a 7 N HNO<sub>3</sub> digestion. Lead concentrations along the transect show (1) generally higher values in the soil A-horizon than the C-horizon (median 21 vs. 16.5 mg/kg), (2) an increase in the median value of the soil A-horizon for the central to eastern U.S. (Missouri to Maryland) when compared to the western U.S. (California to Kansas) (median 26 vs. 20 mg/kg) and (3) a higher A/C ratio for the central to eastern US (1.35 vs. 1.14). Lead isotopes show a distinct trend across the U.S., with the highest <sup>206</sup>Pb/<sup>207</sup>Pb ratios occurring in the centre (Missouri, median A-horizon: 1.245; C-horizon: 1.251) and the lowest at both coasts (e.g. California, median A-horizon: 1.195; C-horizon: 1.216). The soil C-horizon samples show generally higher <sup>206</sup>Pb/<sup>207</sup>Pb ratios than the A-horizon (median C-horizon: 1.224; A-horizon: 1.219). The <sup>206</sup>Pb/<sup>207</sup>Pb isotope ratios in the soil A horizon show a correlation with the total feldspar content for the same 2500-km portion of the transect from east-central Colorado to the Atlantic coast that shows steadily increasing precipitation. No such correlation exists in the soil C horizon. The data demonstrate the importance of climate and weathering on both Pb concentration and <sup>206</sup>Pb/<sup>207</sup>Pb isotope ratios in soil samples and natural shifts thereof in the soil profile during soil-forming processes. The results of this study demonstrate that often none of above two requirements for the use of Pb isotopes in environmental sciences will be met.

### REFERENCES

Smith, D.B., Cannon, W.F., Woodruff, L.G., Garrett, R.G., Klassen, R., Kilburn, J.E., Horton, J.D., King, H.D., Goldhaber, M.B., Morrison, J.M., 2005. Major- and trace-element concentrations in soils from two continental-scale transects of the United States and Canada. U.S. Geol. Surv. Open-File Rep. 2005-1253.