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## Polycyclic aromatic hydrocarbons, black carbon, and molecular markers in soils of Switzerland

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### Abstract

Polycyclic aromatic hydrocarbons (PAH) were analysed in 23 soil samples (0–10 cm layer) from the Swiss soil monitoring network (NABO) together with total organic carbon (TOC) and black carbon (BC) concentration, as well as some PAH source diagnostic ratios and molecular markers. The concentrations of the sum of 16 EPA priority PAHs ranged from 50 to 619 µg/kg dw. Concentrations increased from arable, permanent and pasture grassland, forest, to urban soils and were 21–89% lower than median numbers reported in the literature for similar Swiss and European soils. NABO soils contained BC in concentrations from 0.4 to 1.8 mg/g dw, except for two sites with markedly higher levels. These numbers corresponded to 1–6% of TOC and were comparable to the limited published BC data in soil and sediments obtained with comparable analytical methods. The various PAH ratios and molecular markers pointed to a domination of pyrogenically formed PAHs in Swiss soils. In concert, the gathered data suggest the following major findings: (1) gas phase PAHs (naphthalene to fluorene) were long-range transported, cold-condensated at higher altitudes, and approaching equilibrium with soil organic matter (OM); (2) (partially) particle-bound PAHs (phenanthrene to benzo[ghi]perylene) were mostly deposited regionally in urban areas, and not equilibrated with soil OM; (3) Diesel combustion appeared to be a major emission source of PAH and BC in urban areas; and (4) wood combustion might have contributed significantly to PAH burdens in some soils of remote/alpine (forest) sites.

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