Detailed history of atmospheric pollution in South America as recorded by trace elements in the Quelccaya ice core

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Reconstructions of past trace-metal deposition are extremely important to address questions linked to changes in land-use, climate, aeolian dust and to identify spatial patterns and temporal trends in global trace-metal associated with anthropogenic activities. The tropical Andes are particularly interesting because they host a long mining history associated with mineral exploitation and environmental impacts. The glacio-chemical record preserved in the ice of the Quelccaya ice cap, located within the southern Peruvian Andes offers a unique opportunity to geochemically constrain the composition of the tropical atmosphere at sub-annual resolution through time. Two ice cores were retrieved from the ice cap in 2003 (Summit Dome core, (QSD; 5670 m asl, 168.68 m) and North Dome core (QND; 5600 m asl, 128.57 m). Determination of twenty trace elements (Ag, Al, As, Bi, Cd, Co, Cr, Cu, Fe, Mn, Mo, Pb, Rb, Sb, Sn, Ti, Tl, U, V, and Zn) was performed by Inductively Coupled Plasma Sector Field Mass Spectrometry (ICP-SFMS, Element 2) over the first 120 m of the QND core, spanning the time period between 1990 AD and 1500 AD. As, Bi, Cd, Cu, Mn, Mo, Pb and Zn show different increases in concentration and crustal enrichment factors over this time period pointing to varying anthropogenic sources.

Geochemistry of urban soils in Karlstad, central Sweden – preliminary results

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As a part of the European project URGE (Urban Geochemistry), in collaboration with EuroGeoSurveys Geochemistry Expert Group (EGS-GEG), surface soils were surveyed in the urban area of the municipality Karlstad in central Sweden to assess geochemical patterns of potentially toxic metals and other elements that can be considered dangerous at elevated concentrations.

306 surface (<10 cm depth) soil samples were collected from Karlstad town and analysed with aqua regia (AR) digestion by ICP-MS. The results show elevated concentrations of Cd, Cu, Pb, Sb and Zn in industrial parts of the town and in the harbour, while playgrounds, residential districts and recreation areas show lower concentrations. Broadly defined greenfields show more variation in metal concentrations, most likely due to the wider spread of potential sample sites in this category. The results display a mixed and complicated relationship between the geological background and anthropogenic overprint, with elevated concentrations in areas with historical and present industrial activity. The geochemical patterns of Ni, Cr and Co are similar and possibly related to the presence of mafic rocks within the extent of the town (especially in the southern part of Karlstad). Elevated As levels occur randomly in greenfield areas indicating a rather natural origin of these anomalies. Higher concentrations of Pb, Cd and Ni in the city centre can be related to traffic. High Cu and Zn contents in the town's central parts point to the long-term use of copper-zinc construction details in buildings, e.g. gutters and roof elements. Elevated Hg concentrations in several places by the Klara river may indicate the pollution related to sewage and fertilizers and affinity of Hg to bind to organic matter-rich bank sediments.

The results from this study can be further used by the local authorities for future planning of the infrastructure and slum-clearance of contaminated land. Potential health risks for inhabitants who reside and work in contaminated areas can also be assessed, with the aim to specify and inform the public about possible precautionary measures.

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