London Earth: soil chemistry of the UK's largest city

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Summary: London Earth is the British Geological Survey's soil geochemical survey of the Greater London area. Comprising over 6400 sample sites collected at a density of four sites per square kilometre (black dots on maps), it is the most extensive and comprehensive urban geochemical mapping project carried out to date. The objective is to give insight into the environmental impacts of urbanisation and industrialisation, as well as to characterise the geochemical baseline of the UK's most populous city. Soil baseline geochemical data from the London Earth project is a valuable resource to local government, environmental agencies, developers, academics and the general public. More detailed local studies are required to assess any potential risks to health and environmental damage in their proper geogenic and anthropogenic context.

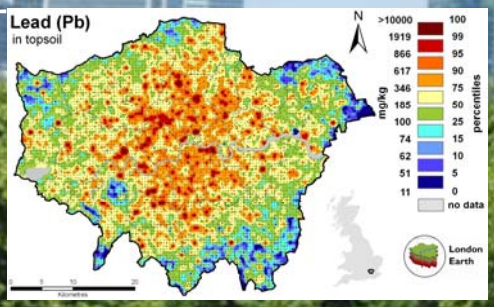
Soil sampling

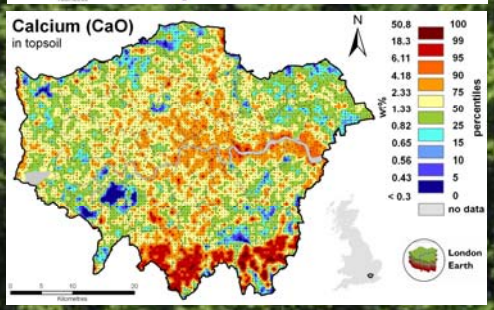
Sample preparation and analysis

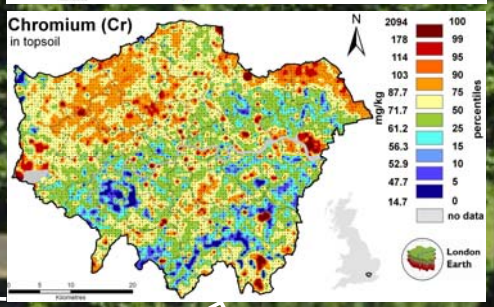
Topsoil samples (5–20 cm) were dried and sieved to <2 mm, then milled and pressed into pellets and analysed by X-ray fluorescence spectrometry (XRFS). Resulting data for over 50 elements were subject to rigorous quality control procedures to ensure accurate and comparable data.

Results

Presentation



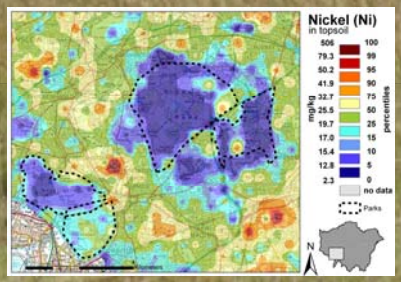




Interpretation

Pristine parks

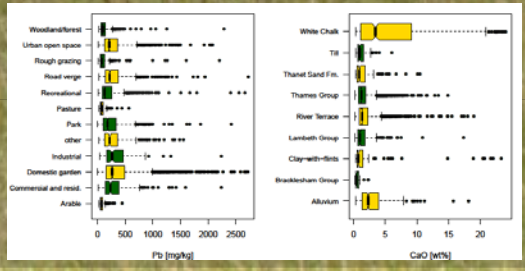
Consistently lower baseline concentrations of metals are measured within the historic Royal Parks (e.g. Bushy and Richmond) of south-west London. As displayed by detailed map of Ni in topsoils below. Throughout the urban evolution of London these parks have avoided significant residential or industrial activity and remain free of imported soil, wastes or 'made ground'. Consequently, comparison of geochemical baselines within and outside the parks can help to provide an indication of long-term anthropogenic geochemical modification of London's soils.



Geological and man-made controls

Substantial anthropogenic modification to soil concentrations is evident across the urban area. A notable feature is the 'central zone' of higher concentrations of, for example, Pb (above map and graph below) as well as Sb, Ca, Zn, Cu, Sn and As in the oldest, most intensely urbanised parts of the city. In the case of Pb, domestic waste, including coal ash, paint and ceramics, are likely sources along with the legacy of leaded petrol usage.

Despite man-made influences, a strong geological control on soil chemistry is observed for many elements. This is particularly evident in south London where high baseline concentrations of e.g. Ca (above map and graph below), Ce Mn, Nd, P, Sr etc. relate to the outcrop of Cretaceous Chalk and across the north of London. Along the north-eastern boundary, high baseline concentrations for a number of elements such as Cr (map above), Al, Fe, Mg, K, La, Ti, Ga and Rb are associated with the outcrop of Palaeogene clays.



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For more information download the abstract at http://nora.nerc.ac.uk/15033/ or visit the London Earth web pages at www.bgs.ac.uk/gbase/londonearth