

Heavy metals, especially lead, deposition recorded in an ombrotrophic peat bog near Manchester, United Kingdom

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Lindow Moss, near Manchester (England), is a famous ombrotrophic bog where several ancient bodies have been found (Stead et al., 1986).

Apart from these archeological interests, the location of the peat bog represents a great opportunity to study heavy metals emissions in this region with a long industrial history.

Methods

A peat core representing up to 4,000 years of peat accumulation was taken and subsampled into 2cm slices. Major and trace elements were analysed with XRF and for Zn and Pb in the deeper samples with GFAAS following acid digestion. Lead isotope ratios were measured using TIMS.

Results (fig.1)

The Sr concentration shows that atmospheric deposition strictly influences the upper part of the peat bog chemistry. There are three periods of pronounced Pb enrichment, as revealed by the crustal enrichment factor (EF) calculated using Ti. Possible causes of Pb enrichment include Pb production, coal combustion and the use of leaded gasoline.

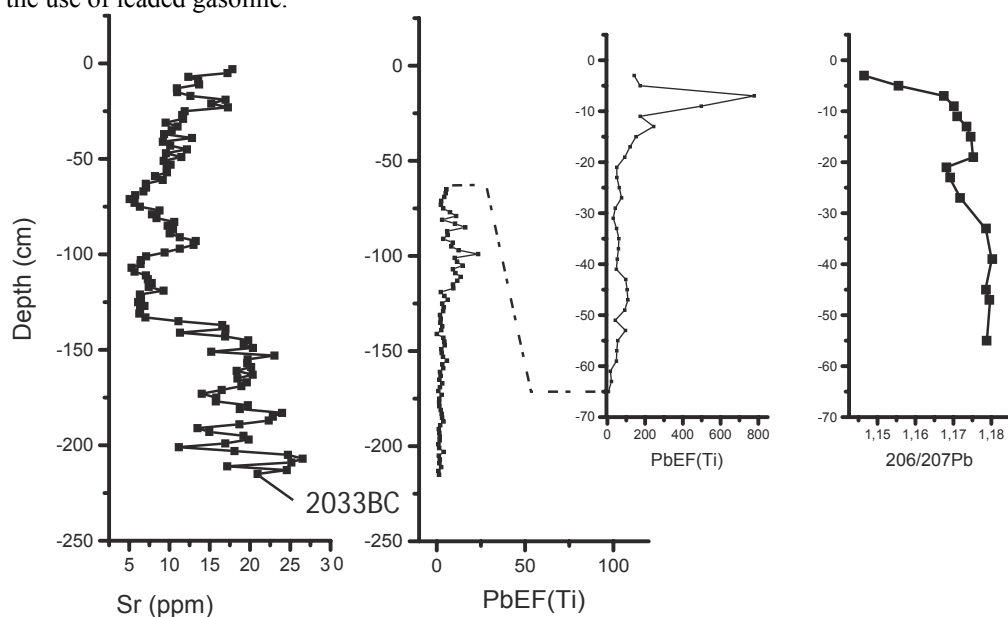


fig 1: Sr concentration, Pb enrichment factors (vs. crustal composition), and ²⁰⁶Pb/²⁰⁷Pb

Discussion

The upper increase of Pb concentration in European bog profiles is traditionally correlated with a decrease of the ²⁰⁶Pb/²⁰⁷Pb ratio and interpreted as the introduction and use of leaded gasoline. In the Lindow Moss profile, however, the recent decline in Pb EF (top 10cm) is characterised by a decline in ²⁰⁶Pb/²⁰⁷Pb. This unusual feature may be due to local Pb sources such as aviation fuel, as the Lindow Bog is located so close (3km) to the Manchester Airport.

The first peak in Pb EF (~100cm) probably dates from Roman Periods: lead isotope ratios (²⁰⁶Pb/²⁰⁷Pb: 1,170-1,176) show that lead deposition could not only be interpreted by long-range transport of lead from Rio Tinto Mines in Spain (²⁰⁶Pb/²⁰⁷Pb: ~1,165) but also by local English mines with more radiogenic lead.

While Pb is certainly a global atmospheric pollutant, these results indicate that local Pb sources may be very important.

Reference:

Stead I. M., Bourke J. B., and Brothwell D. (1986) Lindow Man, the body in the bog, New York, Cornell University.