Geochemical properties of aerosol in Lhasa, central Tibetan Plateau

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This study presents the first detailed investigation on airborne trace metals at Lhasa, central Tibetan Plateau, and assesses their major sources. The mean elemental concentrations were generally comparable with other urban cities. The extent of the anthropogenic contribution was estimated by the degree of enrichment of these elements compared to the average crustal composition (EF). EF calculation showed elements of anthropogenic origin (Cr, Mn, Co, Ni, Cu, Zn, Ga, Cd and Pb) were obviouslly enriched.

Result of factor analysis on elements in conjunction with EF calculation demonstrated that re-suspended road dust, traffic emission and waste incineration were major contributors of anthropogenic metals in the atmosphere at Lhasa.

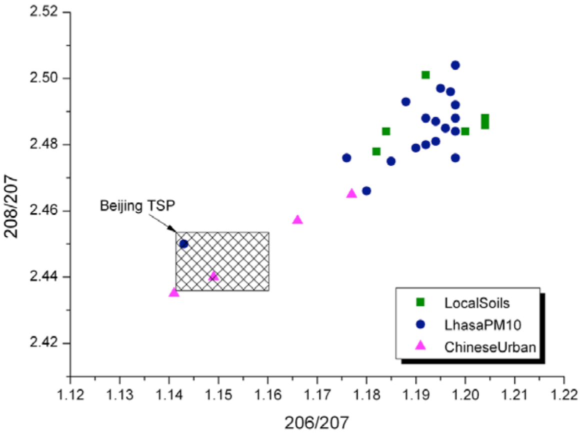

Figure 1: Scatter plot of ^{208}Pb/^{207}Pb vs. ^{206}Pb/^{207}Pb for PM$_{10}$ in Lhasa [1]

The Pb isotopic composition of aerosols and soils collected from urban areas in Lhasa [Fig. 1] indicated that the atmospheric Pb mainly originates from natural background.

Funded by NSFC 40830743, 40605034.

[1] Bollhöfer & Rosman (2001) *Geochimica et Cosmochimica Acta* **65**, 1727–1740.

Variable isotope fractionation during microbial metabolism of lactate

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Addition of electron donor to impacted groundwater systems to produce redox conditions favorable for contaminant degradation or immobilization has become a widely utilized remediation practice. However, ensuring that the microbial pathways stimulated will produce opimal biogeochemical conditions in the subsurface can be problematic. To examine the effects of differing electron acceptors on microbial communities at a Cr-contaminated groundwater site at DOE's Hanford Reservation in Washington, a series of small-scale column experiments with sediment from the site are being conducted with lactate as the primary electron donor and different electron acceptors (e.g. nitrate or sulfate). As part of this study, the isotopic compositions of the lactate and any microbial metabolites are being tracked during the experiments as a potential indicator of microbial activity during biostimulation in the field. Preliminary results indicate that the different microbial processes result in varying magnitudes of carbon isotope fractionation. After ~100 days, more than 60% of the nitrate in the columns with nitrate added had been reduced (~50% to nitrite) and about 50% of the lactate was metabolized (with ~40% accumulating as pyruvate). The residual lactate in these columns was shifted to higher δ^{13}C values, giving a net fractionation factor of 0.991. For the sulfate columns, very limited sulfate reduction was observed, but signficant levels of lactate metabolism did take place in 3 of 6 replicate columns. In one column, lactate utilization ranged between 0 and 15% with ~50% accumulating as pyruvate. Carbon isotope fractionation of the residual lactate was up to 4.5‰, giving a relatively large fractionation factor of 0.978. In the other two active columns, the lactate was completely fermented to acetate plus propionate, with a relatively small net fractionation factor for the residual organic carbon of 0.995. This fractionation effect is the aggregate of several reactions in addition to lactate metabolism (eg., further metabolism of the propionate and acetate). Overall, these results indicate that carbon isotope fractionation of organic compounds added to groundwater systems could be a useful method for identifying dominant pathways of carbon metabolism in the subsurface.