Zn isotopes fractionation upon sorption onto iron oxides

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Zn isotopes have been recently used in environmental studies to track anthropogenic inputs and pathways of Zn in continental environments [1-7]. All these studies have shown the existence of a large range of $^{66}Zn/^{64}Zn$ ratios, interpreted as an evidence of varying isotopic compositions of Zn sources and/or of isotopic fractionation of Zn associated with precipitation/dissolution reactions or biological complexation. However, very few of these studies considered the possible influence of sorption reactions, which are ubiquitous in Earth's surface environments.

The results presented here show that sorption on 2-Lines ferrihydrite (Fh2L) and goethite fractionates Zn isotopes with an enrichment of the heavy isotopes on the solids [8]. Fractionation is larger for sorption on Fh2L [$(\Delta^{66/64}Zn)_{sorbed\text{-}aqueous}$ around +0.53 ‰] than on goethite [$(\Delta^{66/64}Zn)_{sorbed\text{-}aqueous}$ around +0.29 ‰]. The difference between both Fe-oxyhydroxides is related to structural differences between Zn complexes on the surface of goethite (octahedral Zn) and Fh2L (tetrahedral Zn), as evidenced by EXAFS spectroscopy.

These results show the importance of accounting for reactions at the mineral/water interface when dealing with the isotopic distribution of Zn (and likely of other non-traditional stable isotopes like Cr, Fe, Ni and Cu) at the Earth's surface.

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Chemical characteristics of long-range transboundary air pollutants from Asian continent observed at two remote sites and one urban site in Korea

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In order to investigate the chemical characteristics of long-range transboundary air pollutants from Asian continent, intensive measurements had been conducted at two remote sites (Deokjeok island and Jeju island) and one urban site (Seoul) in Korea during spring (20 May-1 June), summer (11-23 August), and fall (9-21 October) seasons of 2008. $PM_{2.5}$ /PM_{10} mass, water-soluble inorganic aerosol, carbonaceous aerosol, and heavy metal aerosol composition were measured based on the filter based sampling. Aerosol number size distribution and concentrations of criteria gaseous pollutants were also measured with an online optical particle counter and gas monitors, respectively. Based on the results of satellite aerosol retrieval and Hysplit back-trajectory analyses, severe cases of long-range transboundary air pollution events were observed three times during the intensive measurement periods. It was found that air pollutants during those event periods were originated mainly from the industrial areas (Shanghai to Beijing region) of north-eastern China and transported across the Yellow Sea in the lower troposphere at altitudes 1 ~ 5 km above sea level. It was also found that sulfate and organic carbon aerosol concentrations increased predominantly by 2.7 ~ 3.4 and 2.3 ~ 3.8 times higher compared to those observed during relatively clean days. Higher concentrations of K, Cr, Mn, Fe, Ni, Cu in PM2.5, and Cr, Mn, Zn, Hg, Pb in PM10 were also observed. Observed aerosol chemical concentrations were also compared with those simulated by Models-3/CMAQ model v4.5. Meteorological and atmospheric environmental conditions were analyzed to investigate the causes and impacts of those severe long-range transport events.