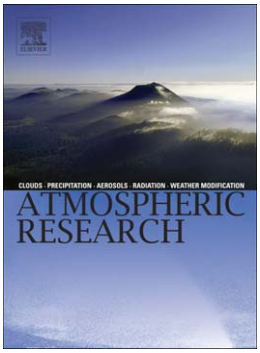

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Chemical characteristics and source of size-fractionated atmospheric particle in haze episode in Beijing

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Abstract: The abundance, behavior and source of chemical species in size-fractionated atmospheric particle were studied with a 13-stage low pressure impactor (ELPI) during high polluted winter episode in Beijing. Thirty three elements (Al, Ca, Fe, K, Mg, Na, Si, Sc, Ti, V, Cr, Mn, Co, Ni, Cu, Zn, Ga, Ge, As, Se, Sr, Zr, Mo, Ag, Cd, In, Sn, Sb, Cs, Ba, Hg, Tl and Pb) and eight water soluble ions (Cl^-, NO_3^-, SO_4^{2-}, NH_4^+, Na^+, K^+, Ca^{2+} and Mg^{2+}) were determined by ICP/MS and IC, respectively. The size distribution of TC (OC + EC) was reconstructed. Averagely, 51.5±5.3% and 74.1±3.7% of the total aerosol mass was distributed in the sub-micron (PM_1) and fine particle ($PM_{2.5}$), respectively. A significant shift to larger fractions during heavy pollution episode was observed for aerosol mass, NH_4^+, SO_4^{2-}, NO_3^-, K, Fe, Cu, Zn, Cd and Pb. The mass size distributions of NH_4^+, SO_4^{2-}, NO_3^- and K were dominated by accumulation mode. Size distributions of elements were classified into four main types: (I) elements was enrich within the accumulation mode (<1μm, Ge, Se, Ag, Sn, Sb, Cs, Hg, Ti and Pb);(II) those mass (K, Cr, Mn, Cu, Zn, As, Mo and Cd) was resided mainly within the accumulation mode, ranged from 1-2μm; (III) Na, V, Co, Ni and Ga were distributed among fine, intermediate and coarse modes; and (IV) those which were mainly found within particles larger than 2.7μm (Al, Mg, Si, Ca, Sc, Tl, Fe, Sr, Zr and Ba). $[H^+]_{cor}$ showed an accumulation mode at 600 - 700 nm and the role of Ca^{2+} should be fully considered in the estimation of acidity. The acidity in accumulation mode particles suggested that generally gaseous NH_3 was not enough to neutralize sulfate completely. PMF method was applied for source apportionment of elements combined with water soluble ions. Dust, vehicle, aged coal combustion and sea salt were identified and the size resolved source