Seasonal changes of N-NO₃ and O-NO₃ isotope compositions in PM_{2.5} at Baengnyeong Island and Seoul, Republic of Korea: Multi-isotopic approaches for Source Identification

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The origin of particulates in the atmosphere has long been subject to debate and isotopic tools have been used to decipher the origin of particulate matter, which could help to design better management policies for its reduction. Weekly PM2.5 samples were taken from January, 2014 to November, 2015 at Seoul and Baengnyeong Island and isotopic compositions of lead, N-NO3, O-NO3, S-SO4, C, N and S isotopes in PM2.5 were analysed. Baengnyeong Island, South Korea, located in the sea west of the Korean Peninsula, approximately 180 Km from the Chinese Shandong Peninsula, is a suitable monitoring site for investigating pollutants transport from China, North Korea and South Korea. Among the isotopic results, $\delta^{15}N_{NO3}$ in PM_{2.5} of Baengnyeong Island showed distinctive seasonal patterns while Seoul didn't. Average $\delta^{15}N_{\rm NO3}$ of Baengnyeong $PM_{2.5}$ were 11.64 \pm 2.53% for winter, 0.77 \pm 3.32% for summer, 4.49 ± 2.75% for spring and 5.16 ± 1.80% for autumn, respectively. In contrast, average $\delta~\delta^{15}N_{\text{NO3}}$ of Seoul $PM_{2.5}$ was 6.14 ± 2.96‰ without seasonal changes. $\delta^{15}N_{\text{NO3}}$ values of Baengnyeong in winter period are similar to NOx emissions from coal-fired power plants and the values of Seoul were similar to those of PM25 collected from mobile sources such as highway tollgate and tunnel. Strong seasonal correlations of $\delta^{18}O_{NO3}$ with $\delta^{15}N_{NO3}$ were found and $\delta^{13}C$ patterns also indicated same pollution source contributions with nitrate isotopes.