# Seasonal variation of aerosol δ $^{13}$C isotopes at Seoul and Baengnyeong, Korea

HYUK KIM, KWANG-SU PARK, SEOK-MIN YU, SEAM NOH, KWANG-SEOL SEOK, YOUNG-HEE KIM

Chemicals Research Division, Environmental National Institue of Environmental Research (NIER), Incheon, 22689, Republic of Korea

The origins of carbon in the atmospheric aerosols are combustion and biogenic emission. Combustion emission include the emissions from fossil fuels, biomass/biofuel and forest fires. Biogenic emission include BVOCs(Biogenic volatile organic compounds) and emitted particles from terrestrial plants and marine organism. We collected $PM_{2.5}$ samples for analyzed the carbon isotope from a rural(Baengnyeong Island), an urban(Seoul) and urban Tunnel in Korea from 2014 to 2016. The mass concentrations of $PM_{2.5}$ at Seoul and Baengnyeong were higher in spring than other seasons. The $\delta^{13}C$ values showed distinctive seasonal variations with sinusoidal patterns at both sites. $\delta^{13}C$ in winter was lower than in summer and $\delta^{13}C$ values in Baengnyeong were higher than those of Seoul. During winter, coal combustion is one of the major C sources due to residential heating with increasing of carbon concentrations. $\delta^{13}C$ values in winter at Baengnyeong (−22.6 ± 0.9‰) were within the range of coal combustion(−24‰ to −21‰), which is explained by the influence of coal combustion from China. , $\delta^{13}C$ values in winter at Seoul (−23.9 ± 1.3‰) were still within the range of coal combustion but they were quite different with those of Baengnyeong. $\delta^{13}C$ values in winter at Seoul (−23.9 ± 1.3‰) were still within the range of coal combustion but they were quite different with those of Baengnyeong. In summer, the $\delta^{13}C$ values of Seoul (−25.2 ± 0.5‰, range: −26.3‰ to −24.3‰) were within the range of the combustion of liquid fuel (−28‰ to −24‰). It is quite similar to the $\delta^{13}C$ of road tunnels in Seoul (−25.2 ± 0.2‰). A one of sample showed very high $\delta^{13}C$ of -13.2‰ at baengnyong, that is similar to the value for biomass burning of C4 plants (-17‰ to -9‰). Backward trajectory on this day shows the input of air masses directly from North Korea.