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Annual distribution and atmospheric deposition of ^{210}Po and ^{210}Pb in aerosols from Busan, the largest port city in Korea

JAEEUN LEE, HYUNMI LEE, HUISU LEE AND INTAE KIM

Korea Institute of Ocean Science and Technology

Presenting Author: jaeeun1018@kiost.ac.kr

The annual distributions of radionuclides, ^{210}Po and ^{210}Pb, were investigated in Busan in South Korea where the largely affected by port infrastructure. Aerosol samples were collected from April 2019 to February 2020 using a high volume air sampler. The average activities of ^{210}Po and ^{210}Pb ranged 0.01 to 0.4 mBq m^{-3} (average 0.13±0.2 (1 σ) mBq m^{-3}, n=90) and 0.1 to 1.7 mBq m^{-3} (average 0.65±0.9 (1 σ) mBq m^{-3}, n=91), respectively. Contrast to ^{210}Pb activities (relatively consistent in entire sampling period), ^{210}Po activities especially varied upto 3 factors, those are remarkably higher in fall and winter relative to those in summer season. The substantially higher ^{210}Po in fall and winter seems to be attribute to input of anthropogenic ^{210}Po from broad port area surrounded by maritime infrastructure (e.g., shipyard, trade warehouse, factories, ship anchorage, and etc.), together with the changes in seasonal wind direction. In our study area, both ^{210}Po level and related dry depositional fluxes were comparable or slightly higher (approximately 1-2 times) than those in other regions worldwide. We also attempted to quantify the aerosol residence time based on ^{210}Po-^{210}Pb tracer. The aerosol residence time using ^{210}Po-^{210}Pb pair in our study area estimated to be 41 to 48 days. These results imply that aerosols occurred in harbor city could cause a crucial impact in individuals and surrounding society, and the impact is likely to last for more than weeks to months.