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Assment of pollution source and contribution on urban dust and PM10 using metal concentration and dual isotope ratios in a complex industrial area, South Korea

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The metal concentrations and isotopic compositions (^{13}C, $^{207/206}Pb$) of urban dust and PM_{10} were analyzed in a residential area, surrounded by various types of industrial factories and logistical yards, to determine the contributions of the main pollution sources (i.e., cement, coal, coke, manganese, zinc, and soil, among others). The metal concentrations (Zn, Cd, Pb, Mn) of PM_{10} in the study area were significantly different from those of the control area. In addition, the metal concentrations of urban dust in the study area were significantly higher in comparison with the control area, especially the Mn and Zn ions, suggesting that these ions are the main pollution sources in aerosol particles. The analyzed isotopic (^{13}C, $^{207/206}Pb$) values of the pollution sources were highly different depending on the characteristics of each source, such as cement(–19.6‰, 0.8594‰), Zn ore(–24.3‰,0.9175‰), coal(–23.6‰,0.8369‰), coke(–27.0‰, 0.8739‰), Mn ore(–24.9‰, 0.9117‰), soil(–25.2‰, 0.7743), respectively. As a result of the evaluated contributions of pollution source on urban dust and PM_{10} through the Iso-source and SIAR models using stable isotope ratios(^{13}C, $^{207/206}Pb$), we found that the largest contribution of Mn ore(20.4%) and Zn ore(20.3%) derive from industrial factories and logistical yards. Our results may indicate that metal concentrations and their stable isotopic compositions can predict environmental changes as a powerful tool to trace the past and present pollution history in complex industrial area associated with peri-urban regions.