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Estimation of PM2.5 Contribution in Emission Sources over Local Governments for Policy Support in Korea

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Currently the Korean government is focusing on fine particulate matter as a top priority. Korea has high population density and concentrated industrial complex in its limited land space. Transported pollutants from China are also greatly affected. For better air quality management, it is important to understand source and contribution relation to target pollutant. The air quality analysis representing the mutual contribution among the local regions enables to understand the substantive state of the air quality of a region in association with neighboring regions.
Under this background, the contribution concentration of PM2.5 by source categories (e.g., point, mobile and area) and pollutants (NO_x, Sox, NH3, VOC and PM2.5) was analyzed using WRF and CMAQ/BFM for 17 local governments. Contribution concentration of NH3 presents very high compared to NO_x, Sox, VOC and PM2.5. Domestic NH3 emissions account for 90% of the total from livestock and agriculture-related emissions, NH3 reacts with sulfuric acid and nitric acid in the atmosphere to produce secondary air pollutants, and most of them are fine particles having a size of PM2.5 or less. The results show that the control of NH3 would be very critical in PM2.5 management.
In major metropolitan cities, 'NO_x disbenefit' characteristic of increasing PM2.5 concentration was observed due to the reduction of NO_x emission. This suggests that the reduction of emissions at the national level, including neighboring local governments, is meaningful rather than managing only the emissions of the local area in order to improve the PM2.5.
Based on the results of these contribution concentration and emissions by local governments, the conversion rates of PM2.5 were estimated regarding source categories and each pollutant. The conversion rate means how much PM concentration is generated by one ton of emissions. This can be used to examine the effects of improvement of air quality policies such as emission control.