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The effects of meteorological conditions on the concentration of air pollutants in Seoul

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It has been known that exposure to high levels of air pollutants has caused public health hazard such as cardiac and respiratory morbidity and mortality. Concern on public health due to air pollutants in Seoul is increasing because of frequent occurrence of poor air quality due to not only its own expansion of industrialization and urbanization but also transboundary pollutants and dusts from China.
In this study, PM2.5 concentrations measured at 25 stations across Seoul from 2012 to 2016 were analyzed. It is defined as high concentration case if the daily average of PM2.5 concentration is higher than 50 ug/m3. Total 92 days were defined as high concentration cases but there were much more cases such that concentration sustained over 50 ug/m3 relatively for a long time in a day.
The effects of meteorological conditions such as pressure, temperature, humidity, wind speed, wind direction, and vorticity on the concentration of PM2.5 in Seoul was investigated and high concentration cases were classified as two types of stagnant case and long-range transport case. Stagnant cases were caused by poor ventilation and accumulation of local source due to stable atmospheric conditions, low wind speed, negative vorticity, and high pressure system over the southeastern China. Long-range transport cases occurred when atmosphere was less stable, wind was relatively high, vorticity was positive, and high pressure system was located over the western China which caused westerlies or northwesterlies and advected air masses to Korean peninsula.
Back trajectory was calculated for the last 72hr of high concentration days using HYSPLIT model to trace back the origin of air pollutants. Also, the effects of radiative fluxes, temperature, and humidity on the formation of secondary pollutants were investigated. Aerosol optical depth from moderate-resolution imaging spectroradiomter (MODIS) were used to analyze the spatial characteristics of aerosols.