Source apportionment of VOCs and their impact on air qulity and health in the megacity of Seoul

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The source apportionment of volatile organic compounds (VOCs) was examined using receptor models (positive matrix factorization and chemical mass balance) and a chemical transport model (CTM). The receptor model-based analysis was performed using the datasets collected from four different sites from the megacity of Seoul during the years 2013–2015. The contributions of VOC emission sources to ozone (O3) and PM2.5 concentrations and the subsequent health effects in the study area were also assessed during a photochemically active period (June 2015) using a three-dimensional CTM, Community Multi-scale Air Quality (CMAQ), and the Environmental Benefits Mapping and Analysis Program (BenMAP). The solvent use and the on-road mobile emission sources were found to exert dominant controls on the VOC levels observed in the target city. VOCs transported from regions outside of Seoul accounted for a significant proportion (up to approximately 35%) of ambient VOC levels during the study period. The solvent use accounted for 3.4% of the ambient O3 concentrations during the day (daily mean of 2.6%) and made insignificant contributions to PM2.5 (<1%) during the simulation period. Biogenic VOC made insignificant contributions to O3 (<1%) and a small contribution to PM2.5 during the day (5.6% with a daily mean of 2.4%). The number of premature deaths attributed indirectly (O3 and PM2.5 formations via the oxidation of VOCs) to solvent use is expected to be significant.