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Observations of aerosol and NO₂ vertical profiles derived from MAX-DOAS in four metropolises of China during 2019

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Air pollution has become one of the major environmental problems around the world. It is particularly serious in China due to the rapid development of the economy and industrialization. Four ground-based multi-axis differential optical absorption spectroscopy (MAX-DOAS) were performed in four metropolises of China during 2019. Beijing, Nanjing, Guangzhou and Chongqing are central cities of Beijing-Tianjin-Hebei region, Yangtze River Delta, Pearl River Delta and Sichuan basin, four major polluted areas of China, respectively. In this study, vertical profiles of aerosol extinction coefficient, nitrogen dioxide (NO₂) in these four cities were retrieved from MAX-DOAS. In order to understand the pollution characteristics in four major polluted areas during 2019, the averaged diurnal variation and seasonal variation of aerosol and NO₂ in above four cities were performed. On the other hand, the differences of vertical structure of aerosol and NO₂ in four cities were analyzed. In addition, the variation of PM_{2.5}, PM₁₀ and PM_{2.5}/PM₁₀ in above four cities during 2019 were analyzed, and it is helpful to understand the formation and source of haze occurred in the four major polluted areas. PM_{2.5}/PM₁₀ increasing when PM_{2.5} pollution became worse indicates that regional transport is the major pathway for haze. PM_{2.5}/PM₁₀ decreasing when PM_{2.5} pollution became worse indicates that primary emission and secondary chemistry are the major pathways for haze.