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Long distance mobile MAX-DOAS observation of NO₂ and SO₂ over the North China Plain, and identification of regional transport and emission of power plant

Wei Tan¹, Cheng Liu^{1,2,3}, Shanshan Wang^{4,5}, Haoran Liu², Yizhi Zhu¹, Wenjing Su⁶, Qihou Hu¹, and Jianguo Liu¹

¹Key Laboratory of Environmental Optics and Technology, Anhui Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, Hefei, 230031, China

²Department of Precision Machinery and Precision Instrumentation, University of Science and Technology of China, Hefei, 230026, China

³Center for Excellence in Regional Atmospheric Environment, Institute of Urban Environment, Chinese Academy of Sciences, Xiamen, 361021, China

⁴Shanghai Key Laboratory of Atmospheric Particle Pollution and Prevention (LAP3), Department of Environmental Science and Engineering, Fudan University, Shanghai, 200433, China

⁵Institute of Eco-Chongming (IEC), No.20 Cuinia Road, Shanghai 202162, China

⁶School of Earth and Space Sciences, University of Science and Technology of China, Hefei, 230026, China

In this study, the spatial-temporal distribution of the NO₂ and SO₂ Vertical Columns Densities (VCDs) in the North China Plain (NCP) region was achieved by the long-distance mobile measurements using the mobile Multi-Axis Differential Optical Absorption Spectroscopy (MAX-DOAS) instrument. The mobile observations were taken in both summer (July 2017) and winter (January and February 2018) and the total driving mileage exceeded 3000 km. The concentrations of NO₂ and SO₂ pollution in different seasons and places were significantly different. During winter observations, the serious NO₂ and SO₂ pollution were both observed in northern Anhui province, central Shandong province, and the Beijing-Tianjin-Hebei Region. The evolution and transportation process of the three typical heavy pollution cases were discussed in detail. Combined with the WRF-chem simulated wind field information, the NO₂ transportation flux from the northern Jiangsu province to the northern Anhui province was quantified to be 7.12 kg s⁻¹. Finally, we estimated the NO₂ and SO₂ emissions from the Dezhou and Hengshui power plants by the plume cross section scanning observation and encircled observation methods, respectively. The NO₂ and SO₂ emission fluxes of the Dezhou power plant are 0.79 and 1.11 kg s⁻¹, while the NO₂ and SO₂ emission fluxes of the Hengshui power plant are 0.12 and 0.36 kg s⁻¹. This study has quantitatively analyzed the transportations of atmospheric pollutants and emissions of power plants, which is helpful to understand the occurrence and evolution of pollution and also useful for the government to put forward some policies to protect and control the atmospheric environment.