First Formaldehyde Retrieval Using the Raw Data Obtained from Pandora in Seoul: Investigation of the Temporal Characteristics and Comparison with Ozone Monitoring Instrument Measurement

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Abstract : In this present study, for the first time, we retrieved the Formaldehyde (HCHO) Vertical Column Density (HCHOVCD) using Pandora instruments in Seoul, a megacity in northeast Asia, for the period between 2012 and 2014 and investigated the temporal characteristics of HCHOVCD. HCHO Slant Column Density (HCHOSCD) was obtained using the Differential Optical Absorption Spectroscopy (DOAS) method. HCHOSCD was converted to HCHOVCD using geometric Air Mass Factor (AMFG) as Pandora is the direct-sun measurement. The HCHOVCDs is low at 12:00 Local Time (LT) and is high in the morning (10:00 LT) and late afternoon (16:00 LT) except for winter. The maximum (minimum) values of Pandora HCHOVCD are 2.68×1016 (1.63×10^{16}), 3.19×10^{16} (2.23×10^{16}), 2.00×10^{16} (1.26×10^{16}), and 1.63×10^{16} (0.82×10^{16}) molecules cm^{-2} in spring, summer, autumn, and winter, respectively. In terms of seasonal variations, HCHOVCD was high in summer and low in winter which implies that photo-oxidation plays an important role in HCHO production in Seoul. In comparison with the Ozone Monitoring Instrument (OMI) measurements, the HCHOVCDs from the OMI are lower than those from Pandora. The correlation coefficient (R) between monthly HCHOVCDs values from Pandora and OMI is 0.61, with slop of 0.35. Furthermore, to understand HCHO mixing ratio within Planetary Boundary Layer (PBL) in Seoul, we converted Pandora HCHOVCDs to HCHO mixing ratio in the PBL using several meteorological input data from the Atmospheric InfraRed Sounder (AIRS). Seasonal HCHO mixing ratio in PBL converted from Pandora (OMI) HCHOVCDs are estimated to be 6.57 (5.17), 7.08 (6.68), 7.60 (4.70), and 5.00 (4.76) ppbv in spring, summer, autumn, and winter, respectively.

Keywords : formaldehyde, OMI, Pandora, remote sensing
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