atmosphere

Supplementary Materials: Temporal Variation of NO_2 and HCHO Vertical Profiles Derived from MAX-DOAS Observation in Summer at a Rural Site of the North China Plain and Ozone Production in Relation to HCHO/NO_2 Ratio

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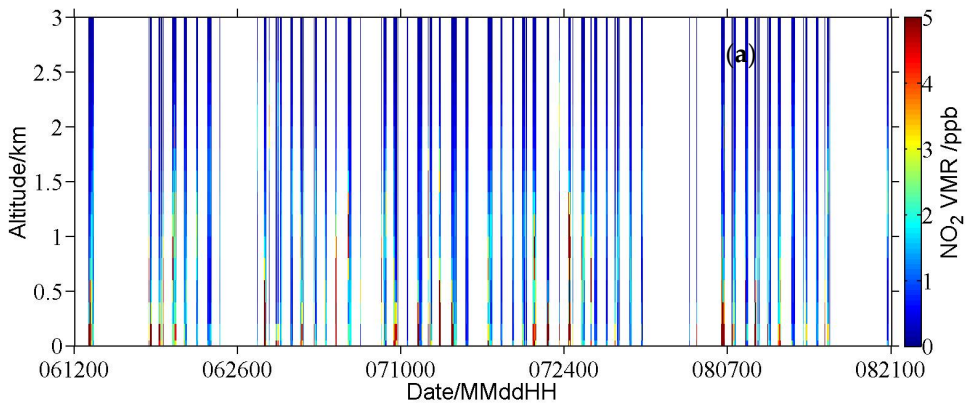
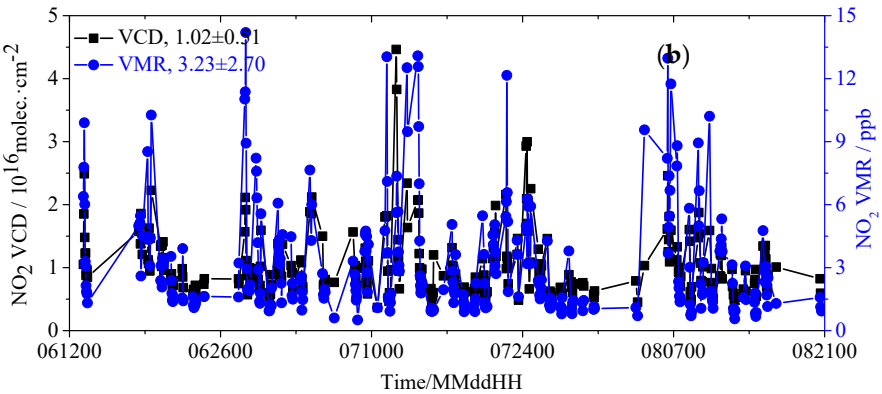
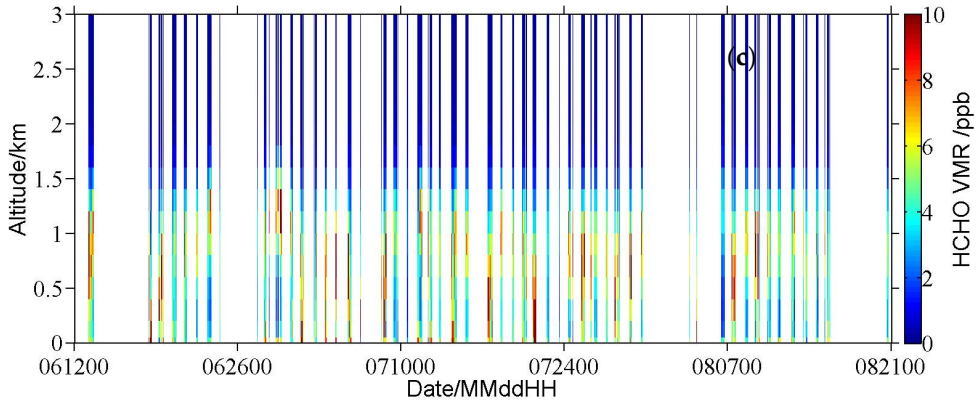
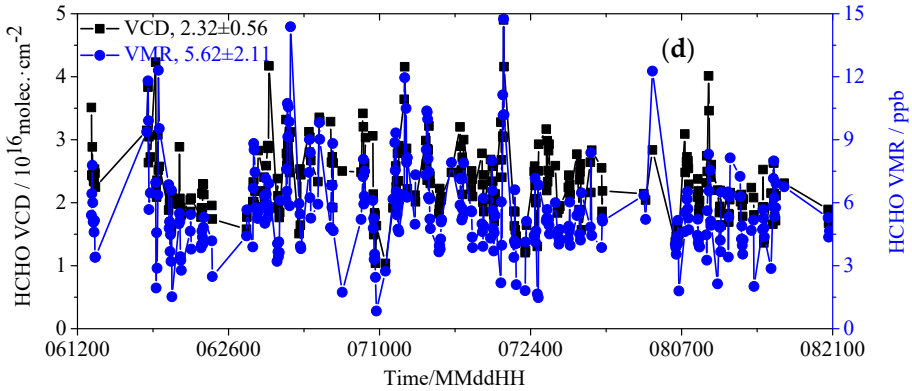
Table S1. Fit settings for the NO_2 and HCHO spectral analyses.

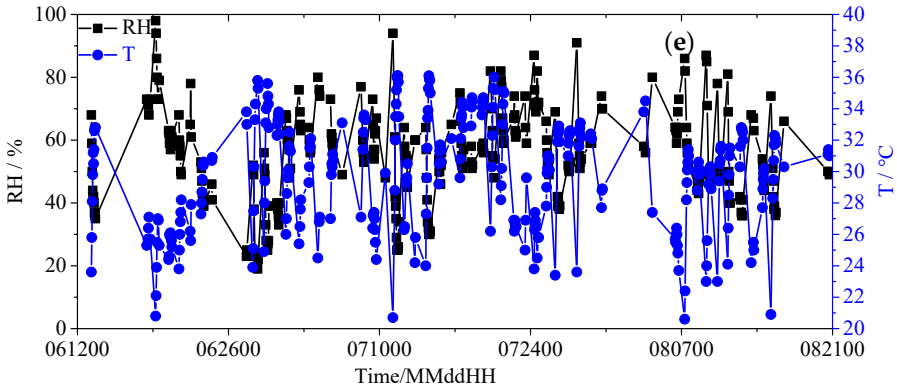
Parameters	Setting
fitting interval	338-370 nm for NO_2; 324-359 nm for HCHO
DOAS polynomial	degree: 5
intensity offset	degree: 2
shift and stretch	spectrum
ring effect	original and wavelength-dependent ring spectra
NO_2 cross section	Vandaele et al. (1998), 220K, 294K, I_o correction (10^{17} molec•cm^{-2})
H_2O cross section	Polyansky et al. (2018), 293K
O_3 cross section	Serdyuchenko et al. (2014), 223K, 243K, I_o correction (10^{20} molec•cm^{-2})
O_4 cross section	Thalman and Volkamer (2013), 293K
HCHO cross section	Meller and Moortgat (2000), 298K
BrO cross section	Wilmouth et al. (1999), 228K
HONO cross section	Stutz et al. (2000), 296K




VCD, 1.02±0.51
VMR, 3.23±2.70
(b)
NO2 VCD / 10^16 molec.·cm^-2
NO2 VMR / ppb
Time/MMddHH
061200
062600
071000
072400
080700
082100


(c)
Altitude/km
HCHO VMR /ppb
Date/MMddHH
061200
062600
071000
072400
080700
082100


VCD, 2.32±0.56
VMR, 5.62±2.11
(d)
HCHO VCD / 10^16 molec.·cm^-2
HCHO VMR / ppb
Time/MMddHH
061200
062600
071000
072400
080700
082100


RH
T
(e)
RH / %
T / °C
Time/MMddHH
061200
062600
071000
072400
080700
082100

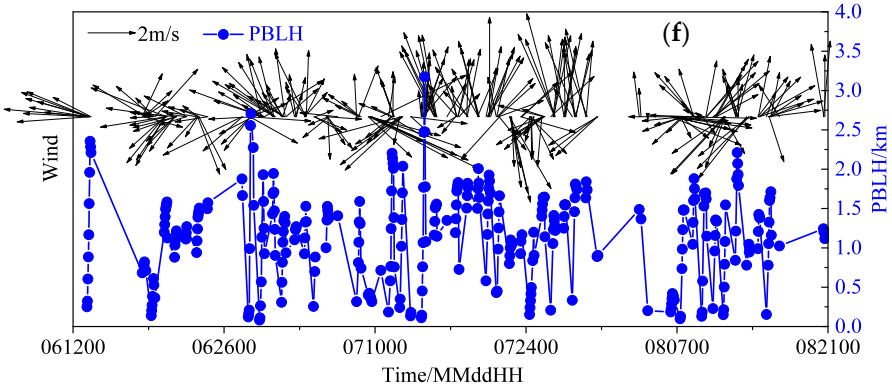


Figure S1. Time series of the qualified hourly NO_2 and HCHO as well as coincident meteorological conditions. (**a**) Vertical profiles of NO_2 volume mixing ratio (VMR) derived from MAX-DOAS; (**b**) NO_2 vertical column density (VCD, black curve with squares) and VMR (blue curve with dots) in the lowest layer; (**e**) In-situ surface relative humidity (RH) and temperature (T); (**f**) In-situ surface wind showed by vector arrow with a scale of 2m/s and the height of planetary boundary layer (PBLH) from linearly interpolated reanalysis data (https://www.ecmwf.int/en/forecasts/datasets/re-analysis-datasets/era5). The expressions in the figure (**b**) denote the 'mean ±standard deviation' for NO_2 VCDs (unit: 10^{16}molec.·cm^{-2}) and VMRs (unit: ppb). (**c**, **d**) are same as to (**a**, **b**) but for HCHO, respectively.

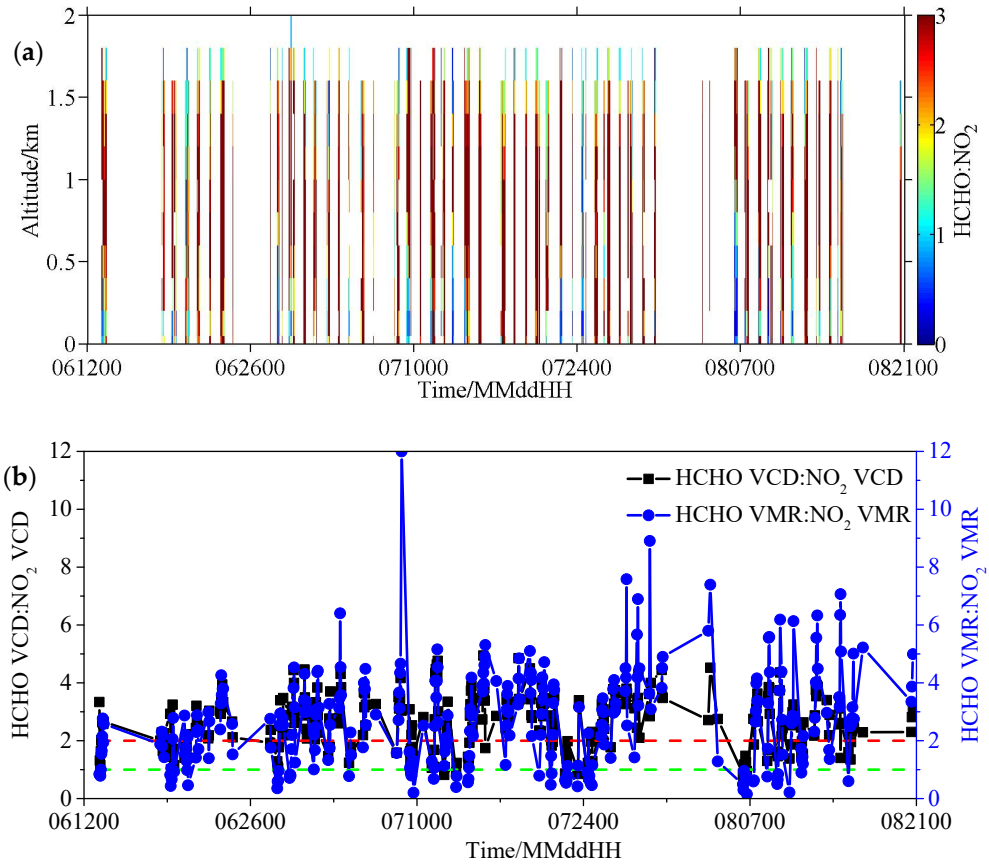


Figure S2. Time series for (**a**) vertical profiles of VMR ratios of HCHO to NO_2 as well as (**b**) HCHO/NO_2 ratios of VCD and near-surface VMR. Note that the color blocks are not shown in (**a**), once the HCHO VMRs less than 1ppb or larger than 10ppb. The 1:1 and 2:1 ratios of HCHO/NO_2 are also shown by the color dash lines in (**b**).