## Supplement for "Vertical profiles of NO<sub>2</sub>, SO<sub>2</sub>, HONO, HCHO, CHOCHO, and aerosols derived from MAX-DOAS measurements at a rural site in the central-western North China Plain and their relation to emission sources and effects of regional transport"

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**Figure S1:** Wind roses (a) and averaged diumal variations of local winds (b) derived from a local weather station during the measurement period of MAX-DOAS. The arrows point to the direction to which wind blows; the length of the arrows represent the wind speed.





**Figure S2:** Scatter plots of measured dSCDs against modelled dSCDs (simulated by the RTM SCIATRAN for the retrieved profiles) during the whole measurement period for retrievals of aerosols, NO<sub>2</sub>, SO<sub>2</sub>, HONO, and HCHO. The squares of the correlation coefficients ( $R^2$ ) and the slopes derived from the linear regressions (red lines) are given in each subplot. For HONO, R<sup>2</sup> and the slopes are also given for the measured dSCD larger than  $1 \times 10^{15}$  molecules cm<sup>2</sup> in order to minimise the effect of measurements close or below the detection limit.











Figure S3: Results from MAX-DOAS measurements, trajectories, meteorology data, and independent measurements of pollutants during the whole measurement period. See Fig. 10 in the main manuscript.

**(a)** 



**(b)** 



(c)



(**d**)



**Figure S4:** Average reproduced maps of VMRs of  $NO_2$  (a),  $SO_2$  (b), HCHO (c), and aerosol extinctions (d) based on MAX-DOAS results and backward trajectories at different altitudes (different columns of subfigures) with different backward times (different rows of subfigures).



**Figure S5:** Nighttime (0-6h) and daytime (7-18h) contributions (colorbar) of air mass from different locations into the measurement area along the 6h backward trajectories in the three groups of days during the whole measurement period. The days are sorted into the three groups based on the dominant directions (southerly, north-westerly, and easterly) of trajectories. The white areas represent no trajectories passing the areas.