Supplement of Atmos. Chem. Phys., 26, 9453–9470, 2026
https://doi.org/10.5194/acp-26-9453-2026-supplement

Atmospheric Chemistry and Physics
Open Access
EGU

Supplement of

Elevated foehn exacerbates surface ozone pollution in summer Beijing

Zhiheng Liao et al.

Correspondence to: Zhiheng Liao (zhliao@ium.cn) and Zhiqiang Ma (zqma@ium.cn)

Table S1. Statistics of $MDA8O_3$ and $PM_{2.5}$ pollution for summertime elevated foehn events identify in this study, and their comparison with shallow foehn events identified in Li et al (2025).

	Average concentration on post-foehn days ($\mu g\ m^{-3}$)	Average increasing rate relative to pre-foehn days (%)	Pollution-worsened rate in all cases (%)
Statistics for summertime elevated foehn events (54 cases)			
$MDA8O_3$	168.3	32.4	86.7 (46 in 53 cases)
$PM_{2.5}$	32.2	31.5	69.8 (37 in 53 cases)
Statistics for summertime shallow foehn events (90 cases)			
$MDA8O_3$	142.9	7.6	55.2 (48 in 87 cases)
$PM_{2.5}$	27.7	-2.5	55.2 (48 in 87 cases)

Note: Pollution data were missing for one day in the elevated foehn events and for three days in the shallow foehn events. The summertime shallow foehn events were identified over the period 2015–2020, which differs from the elevated foehn events identified over 2015–2024.

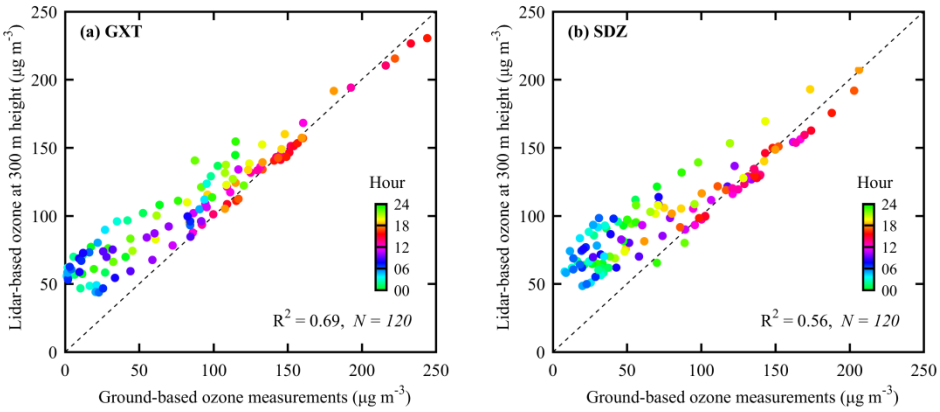

Figure S1. Validation of O_3 lidar observations against ground-based measurements during the ozone pollution event (27–31 August 2024).

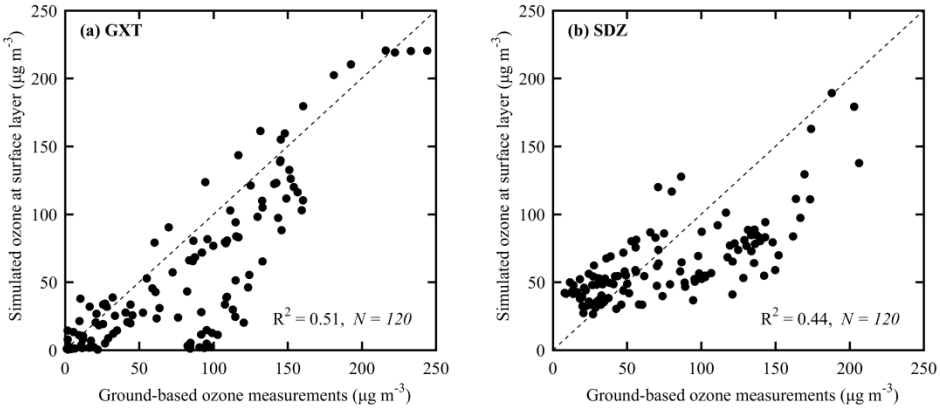

Figure S2. Validation of simulated surface ozone concentrations against ground-based measurements during the ozone pollution event (27–31 August 2024).

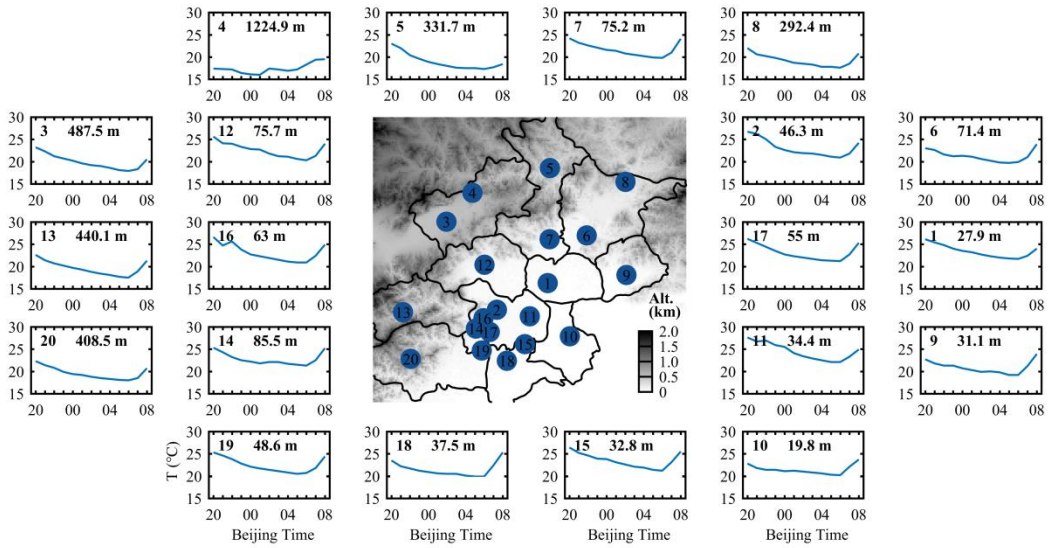

Figure S3. Hourly temperature variations from 20:00 BJT on 29 August to 08:00 BJT on 30 August at 20 surface meteorological stations in Beijing. The locations of individual stations can be found in middle plot, and their altitudes are indicated by the numbers within each subplot. The site name corresponding to the numbers are as follows: 1-Shunyi, 2-Haidian, 3-Yanqing, 4-Foyeding, 5-Tanghekou, 6-Miyun, 7-Huairou, 8-Shangdianzi, 9-Pinggu, 10-Tongzhou, 11-Chaoyang, 12-Changping, 13-Zhaitang, 14-Mentougou, 15-Guangxiangtai, 16-Shijingshan, 17-Fengtai, 18-Daxing, 19-Fangshan, 20-Xiayunling.

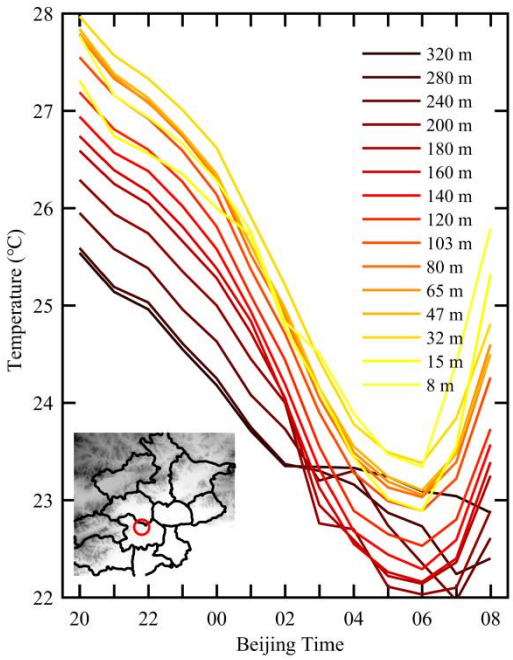

Figure S4. Hourly temperature variations from 20:00 BJT on 29 August to 08:00 BJT on 30 August at 15 levels on a 325 m high meteorological tower in the Institute of Atmospheric Physics (red dot in subplot).

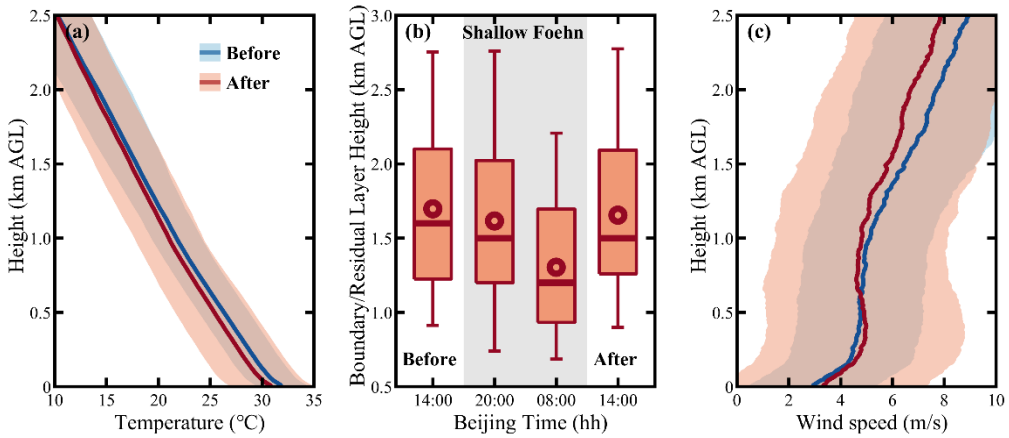

Figure S5. Composite of (a) afternoon boundary layer temperature profiles, (b) boundary/residual layer height, and (c) afternoon boundary layer wind speed profiles before, during, and after 90 shallow foehn events in Beijing, as identified by Li et al (2025). In (a) and (c), solid lines represent the mean profiles and shaded areas indicate the standard deviation. In (b), box-and-whisker plots display the 5th, 25th, 50th, 75th, and 95th percentiles; dots denote the means.

References

Li, J., Zhang, J., Bai, M., Su, J., Li, Q., Jia, X.: Identification and characterization of foehn events in Beijing and their impact on air pollution episodes, Atmos. Chem. Phys., 25, 8683-8700, https://doi.org/10.5194/acp-25-8683-2025, 2025.