Supplement of

Nighttime ozone in the lower boundary layer and its influences on surface ozone: insights from 3-year tower-based measurements in South China and regional air quality modeling

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Table S1. Statistical metrics of comparison between observed and simulated ozone and meteorological parameters

Parameters	$\overline{Obs}$	$\overline{Sim}$	r	NMB (%)[a]	MB[b]	RMSE[c]	IOA[d]
Ozone (ppbv)	24	22	0.70	-7.66	-1.81	13.55	0.83
T (°C)	28	27	0.95	0.93	0.11	1.05	0.96
RH (%)	54	53	0.69	-8.99	-2.11	7.79	0.79

[a]Normalized mean bias (NMB). Defined as $NMB = \dfrac{\sum_{i=1}^{n}(Sim_i - Obs_i)}{\sum_{i=1}^{n} Obs_i}$

[b]Mean bias (MB). Defined as $MB = \overline{Obs} - \overline{Sim}$

[c]Root mean square error (RMSE). Defined as $RMSE = \dfrac{\sum_{i=1}^{n}(Sim_i - \overline{Sim_i})(Obs_i - \overline{Obs_i})}{\sqrt{\sum_{i=1}^{n}(Sim_i - \overline{Sim_i})^2}\sqrt{\sum_{i=1}^{n}(Obs_i - \overline{Obs_i})^2}}$

[d]Index of agreement (IOA). Defined as $IOA = 1 - \dfrac{\sum_{i=1}^{n}(Sim_i - Obs_i)^2}{\sum_{i=1}^{n}(|Sim_i - \overline{Obs}| + |Obs_i - \overline{Obs}|)^2}$
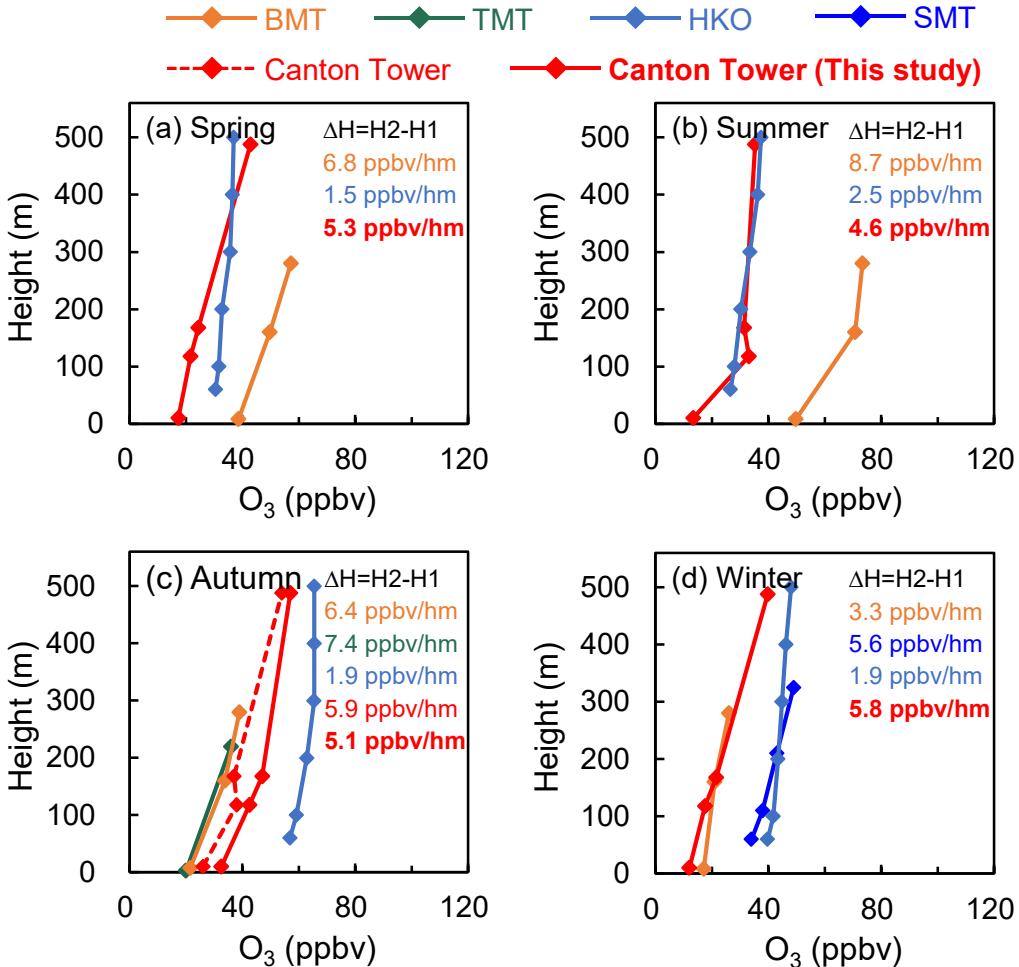
Figure S1. Comparison of the lower boundary layer ozone between the Canton Tower and nearby ozonesonde observations and other reported tower-based observations. H1, H2 represent the lowest and highest measuring point in each station, respectively. Measurements in the Beijing Meteorology Tower (BMT) is from Liu et al. (2022) (2019 to 2020), in the Tianjin Meteorological Tower (TMT) is from Han et al. (2020) (October 2018), in the Shenzhen Meteorology Tower (SMT) is from Li et al. (2019) (December 2017), in the Canton Tower is from Li et al. (2022) (August 18 to November 5, 2020), and in Hong Kong Observatory (January, April, July and October 2017 to 2019), respectively.
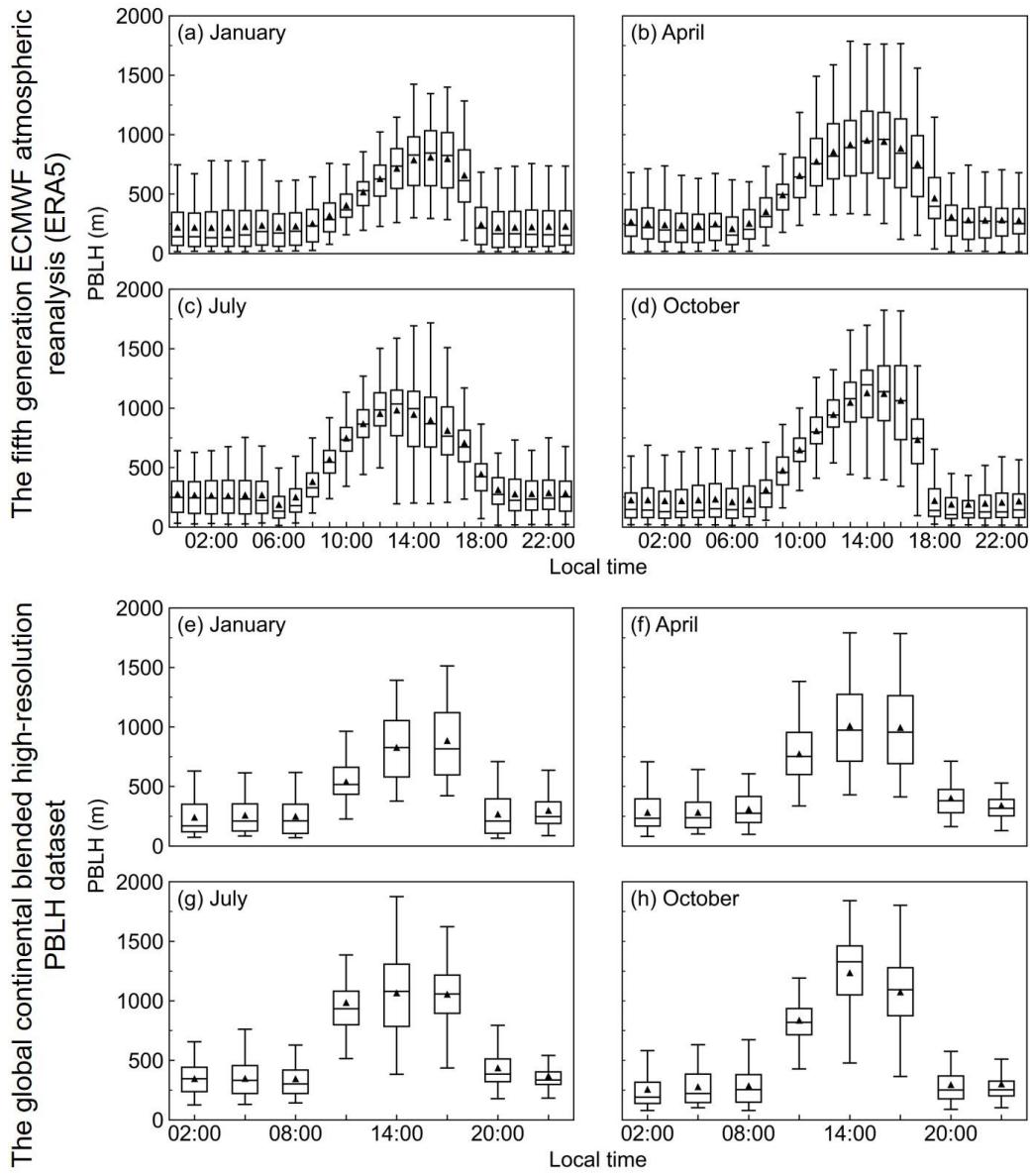
Figure S2. Time series of the planet boundary layer height (PBLH) at the Canton Tower. Panels (a) to (d) show the PBLH obtained from the ERA5 re-analysis dataset with 1-hour temporal resolution. Panels (e) to (h) show the PBLH obtained from the global continental blended high-resolution PBLH dataset (Guo. et al., 2022) with 3-hour temporal resolution.
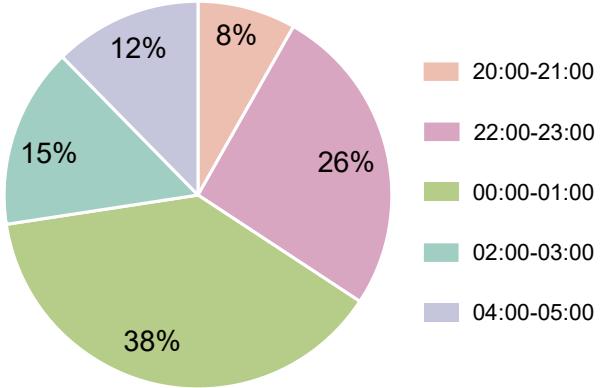
Figure S3. Occurrence time of nocturnal ozone enhancement (NOE) events among all the days in 2017-2019 with available observations. The occurrence time is defined as the time of maximum ($\Delta O_3/\Delta t$) during each NOE event.

References for Supporting Information:

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