Unheralded contributions of biogenic volatile organic compounds from urban greening to ozone pollution: a high-resolution modeling study

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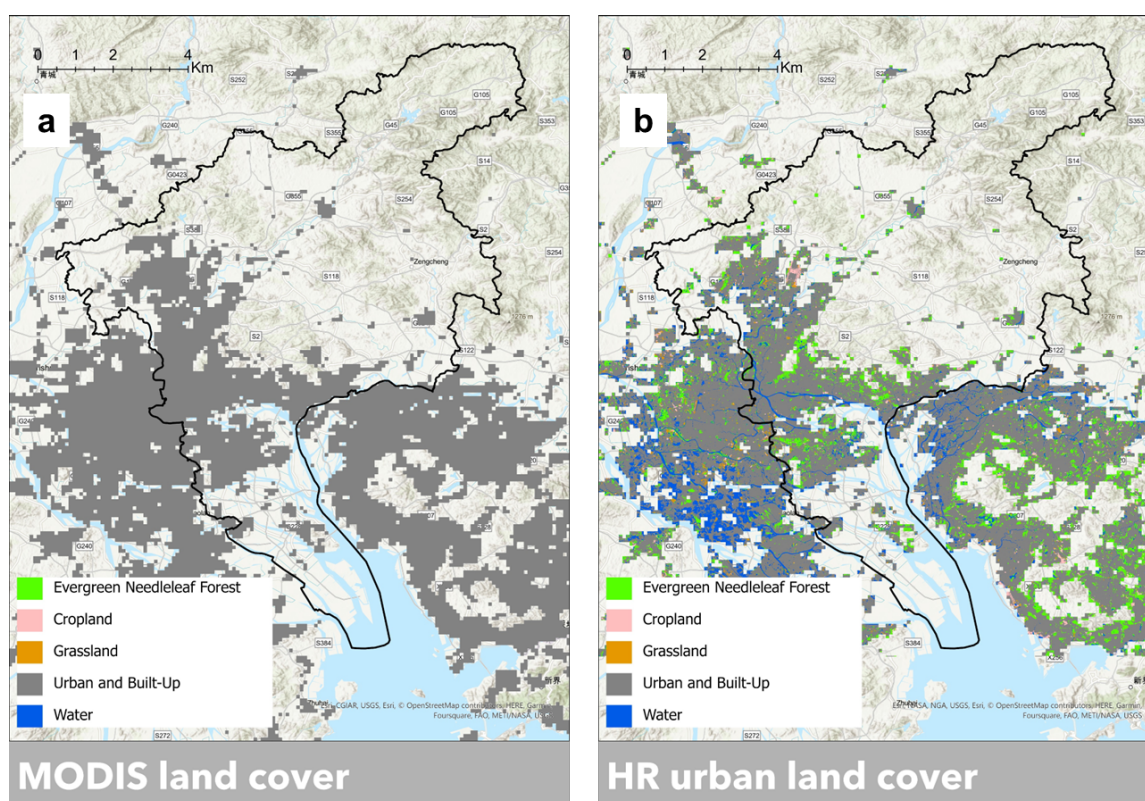*Correspondence to*: Yiming Liu (liuym88@mail.sysu.edu.cn), Qi Fan (eesfq@mail.sysu.edu.cn)

Figure S1 the processed land cover dataset. (a) is the MODIS land cover without UGS and (b) has characterized the UGS base on MODIS land cover.
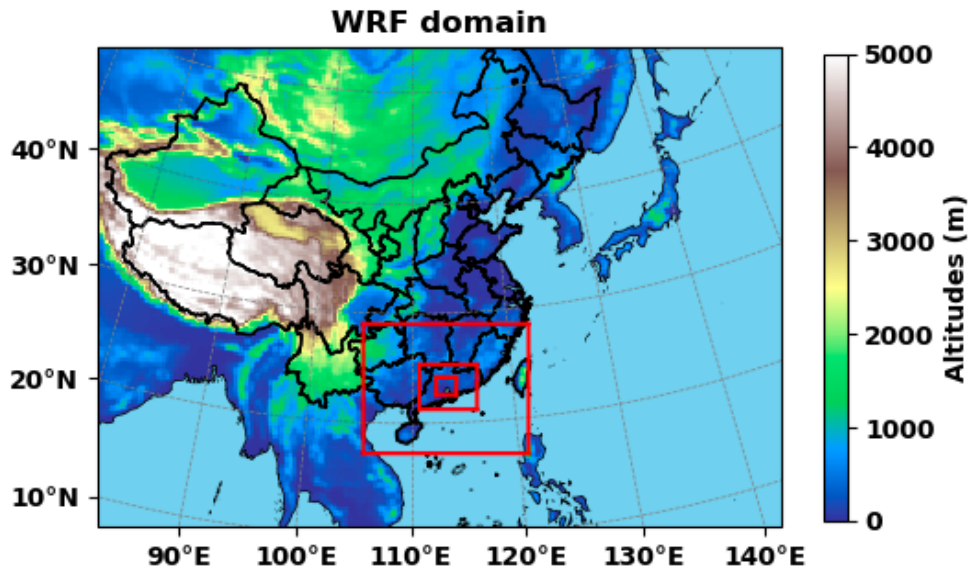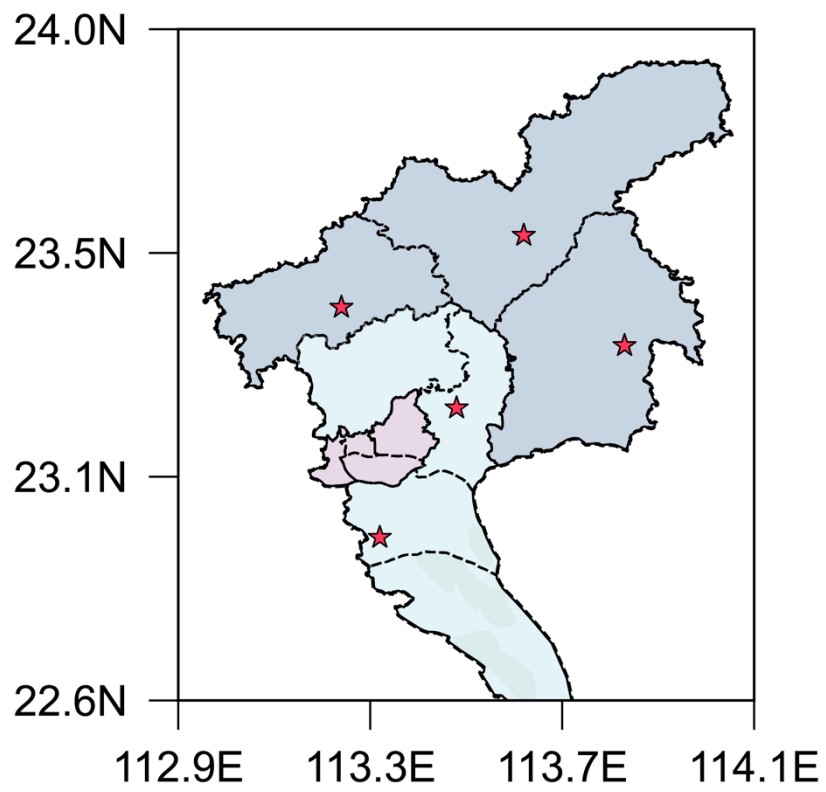
Figure S2 WRF domain nested map with topography.

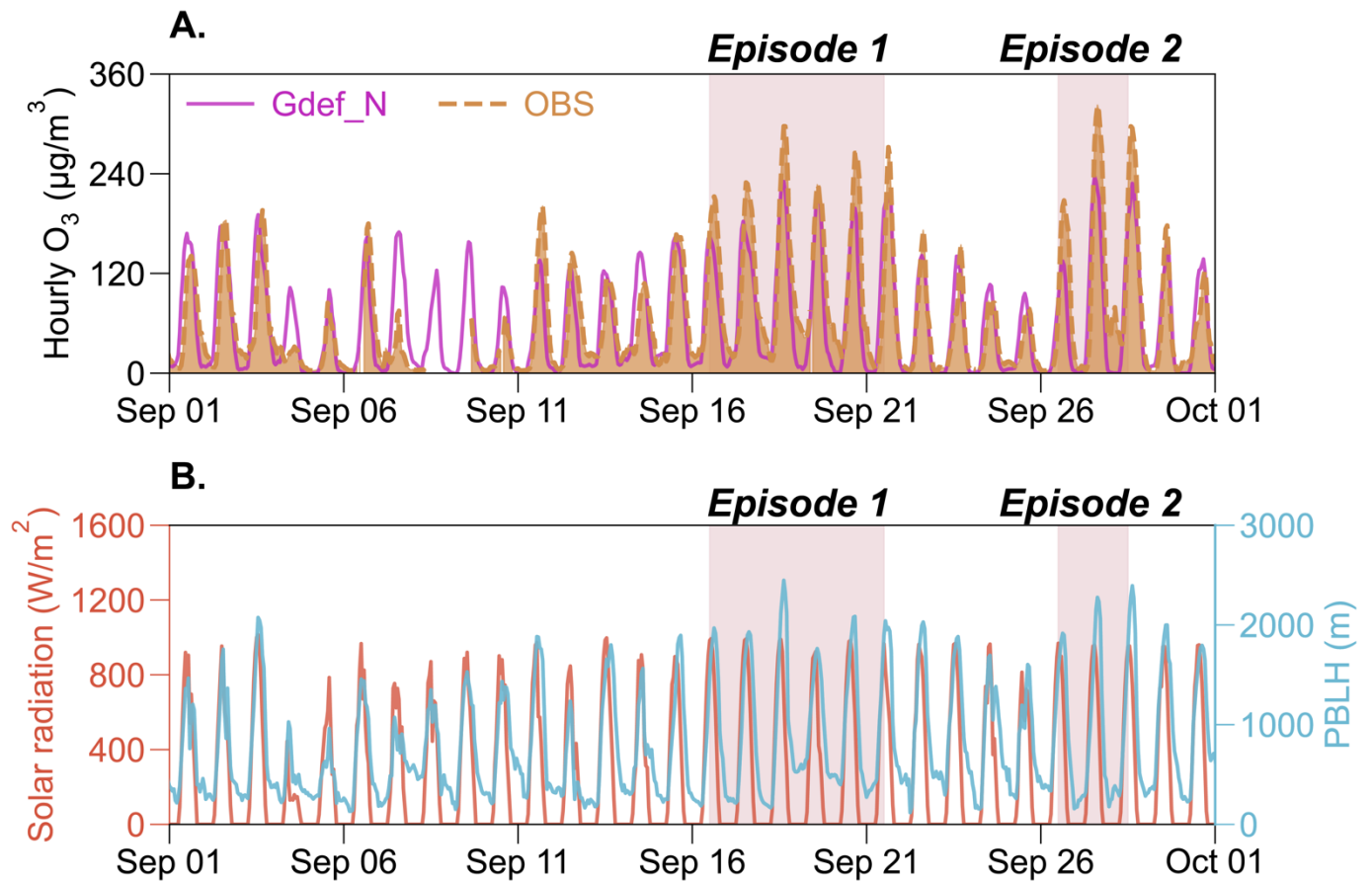**Figure S3 the meteorological station map and various areas.**

Figure S4 The comparison between the average hourly O3 values from simulation and observation (A). And the relative grid average values of solar radiation and PBLH (B).

Table S1 the physical parameterizations employed within the WRF.

Model attribution	Configuration
Microphysics	Purdue Lin (Chen and Sun, 2002)
PBL physics scheme	MYJ (Janjić, 1994)
Shortwave radiation	Goddard (Chou et al., 2001)
Longwave radiation	Rapid Radiative Transfer Model (RRTM) (Mlawer et al., 1997)
Land surface model	Noah land surface model (LSM) (Ek et al., 2003)
Urban scheme	Single-layer urban canopy model (UCM) (Kusaka and Kimura, 2004)

Table S2 The metrics of meteorological parameters.

	Default land use cover datasets				High-resolution land use cover datasets			
	NME	NMB	MB	R	NME	NMB	MB	R
Temperature (K)	3.15%	2.89%	0.76	0.82	3.15%	2.88%	0.75	0.83
Relative humid (%)	13.01%	-12.88%	-10.36	0.74	13.01%	-12.76%	-10.31	0.77
Wind speed (m/s)	21.43%	9.30%	0.21	0.63	20.39%	9.22%	0.19	0.65

Table S3: The formulas for metrics.

R	$$\frac{\sum_{i=1}^{n}(M_i - \bar{M}_i)(o_i - \bar{O}_i)}{\sqrt{\sum_{i=1}^{n}(M_i - \bar{M}_i)^2}\sqrt{\sum_{i=1}^{n}(O_i - \bar{O}_i)^2}}$$
NMB	$$\frac{\sum_{i=1}^{n}(M_i - O_i)}{\sum_{i=1}^{n}O_i}$$
NME	$$\frac{\sum_{i=1}^{n}|M_i - O_i|}{\sum_{i=1}^{n}O_i}$$
MB	$$\frac{\sum_{i=1}^{n}(M_i - O_i)}{n}$$

Where M_i and O_i are the simulated and observed data, respectively. $\bar{M}_i$ and $\bar{O}$ are the average of the simulated and observed data, respectively. n is the number of samples.

Table S4 The estimate of the UGS-BVOC emission in Guangzhou city based on high-resolution land use cover (units: Gg)

Species	Abbreviations	Urban (Gg)	Suburban (Gg)	Rural (Gg)	Total (Gg)
Acetic acid	AACD	0.88	2.43	1.18	4.49
Acetaldehyde	ALD2	3.48	11.57	5.86	20.91
Formaldehyde	FORM	0.94	3.90	2.18	7.02
Methanol	MEOH	12.54	41.36	20.46	74.36
Formic acid	FACD	2.81	7.83	3.80	14.44
Ethane	ETHA	2.14	8.40	4.65	15.19
Ethanol	ETOH	3.64	12.13	6.13	21.90
Acetone	ACET	6.22	21.47	11.66	39.35
Propane	PRPA	2.08	8.19	4.55	14.82
Ethene	ETH	3.95	15.60	8.67	28.22
Isoprene	ISOP	47.57	117.00	48.10	212.67
Monoterpenes	TERP	24.11	74.48	37.59	136.18
Alpha pinene	APIN	11.30	29.97	13.18	54.45
Methane	ECH4	0.04	0.14	0.08	0.26
Sesquiterpenes	SESQ	4.31	11.88	5.95	22.14
Total	Total	126.01	366.35	174.04	666.40