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Supplement of

Measurement report: Volatile organic compound characteristics of the different land-use types in Shanghai: spatiotemporal variation, source apportionment and impact on secondary formations of ozone and aerosol

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Table S1. The sources and land-use type at the sampling sites.

Sites	Land-use type	Details	References
Jinshan Site (JS)	Industrial district	Surrounded by chemical factories	Zhang et al., (2018)
Pudong Site (PD)	Residential and commercial mixed districts	Surrounded by residences and administrative areas	Cai et al., (2010b)
Qingpu Site (QP)	Background district	Surrounded by farmlands and forests	Zhang et al., (2020)

Table S2. MIR and MDL of measured VOCs species at three sampling sites.

Species	MIR	MDL (ppb)
ethane	0.28	0.74
propane	0.49	0.11
iso-butane	1.23	0.10
n-butane	1.15	0.11
iso-pentane	1.45	0.03
n-pentane	1.31	0.05
n-hexane	1.24	0.18
2, 4-dimethylpentane	1.46	0.06
cyclohexane	1.25	0.06
2, 2, 4-trimethylpentane	1.26	0.17
2, 3, 4-trimethylpentane	1.60	0.05
n-heptane	1.07	0.55
2-methylheptane	1.07	0.14
3-methylheptane	1.24	0.15
octane	0.90	0.13
n-nonane	0.78	0.09
ethylene	7.40	0.60
propylene	11.66	0.24
trans-2-butene	15.16	0.14
cis-2-butene	14.24	0.04
1-amylene	7.21	0.07
trans-2-amylene	10.56	0.09
cis-2-2amylene	14.24	-
isoprene	10.61	0.09
1-hexene	5.35	0.11
1, 3-butadiene	12.61	0.17
benzene	0.72	0.11
toluene	4.00	0.14
ethylbenzene	3.04	0.04
m/p-xylene	7.40	0.09
o-xylene	7.64	0.08
styrene	1.73	0.06
isopropylbenzene	2.52	0.12
n-propylbenzene	2.03	0.07
m-ethyltoluene	7.39	0.15
p-ethyltoluene	4.44	0.15
o-ethyltoluene	5.59	0.10
1, 3, 5-trimethylbenzene	11.76	0.09
1, 2, 4-trimethylbenzene	8.87	0.12
1, 2, 3-trimethylbenzene	11.97	0.13
m-diethylbenzene	7.10	0.19
p-diethylbenzene	4.43	0.23
ethyne	0.95	0.27

Table S3. Comparison of TVOCs, OFP and SOAFP with other cities.

Sampling location	Site type	Sampling time	Quantifies species	TVOCs (ppb)	OFP (ppb)	SOAFP (μg m^{-3})	References
Shanghai	Industrial area	Nov. 2013-Jan. 2014	69	94.14	220.49	-	Zhang et al. (2018)
Shanghai	Dianshan Lake	Apr. 7-Sep. 25, 2018	55	15.41	-	-	Zhang et al. (2020a)
Jinan	Suburban area	2014	56	50.58	-	0.2-5.56	Zhang et al. (2017)
Wuhan	Urban area	Sep. 2016-Aug. 2017	58	34.65	7.81-634.27	-	Hui et al. (2018)
Taiwan	Industrial and urban area	Feb. 2017	109	36-327	66-831	0.12-5.55	Vo et al. (2018)
Nanjing	Industrial area	Mar. 2011-Feb. 2012	56	43.5	-	-	An et al. (2017)
Nanjing	Suburban area	Jul. 2018	89	35	86.62	0.36	Mozaffar et al. (2020)
Xi'an	20 sites	Jun.-Jul. 2019	106	29.1	53.9	-	Song et al. (2021)
India	Urban (two) and rural (one) area	2013-2014	12	43.71; 54.59; 22.4	177.05; 218.49; 68.22	-	Kumar et al. (2018)
Houston	Industrial area	Wintertime of 2018	48	33.92	-	-	Sadeghi et al. (2021)
Shanghai	Urban area	Jan.-Mar. 2019	43	22.64; 21.36; 11.93	50.89; 33.94; 24.26	1.00; 0.46; 0.41	this study

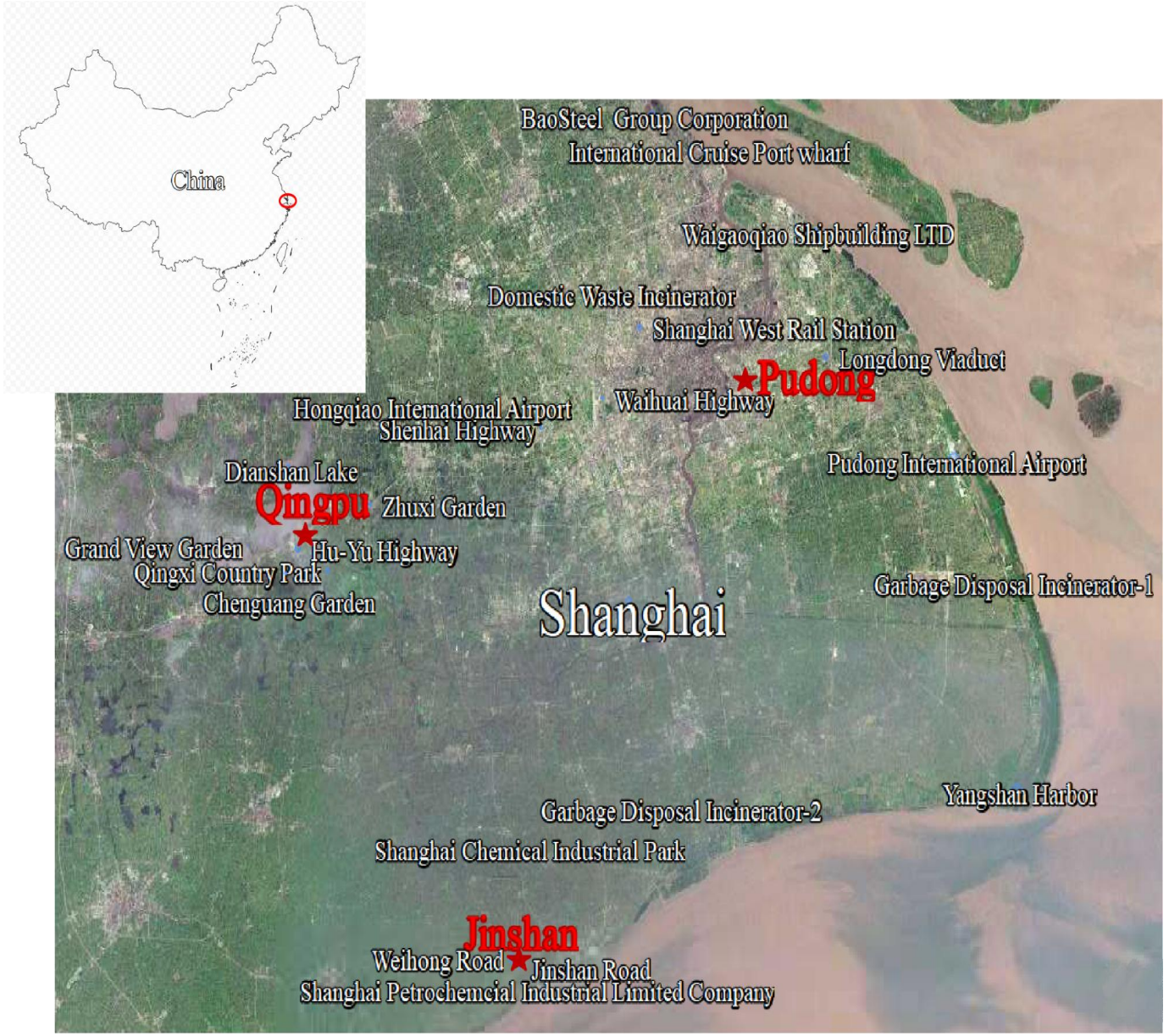


Figure S1. Locations of three sampling sites (© Google Earth).

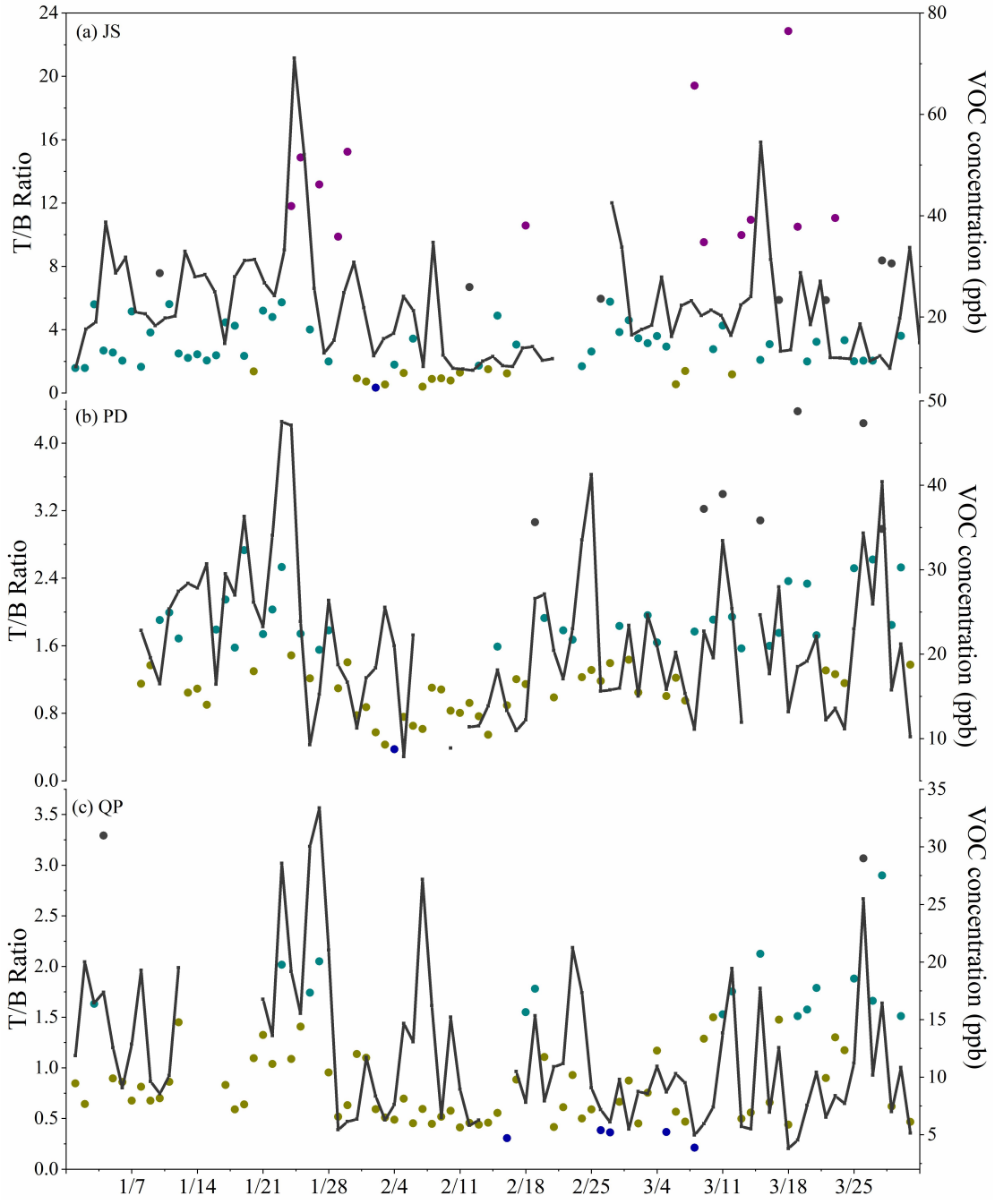


Figure S2. The spatio-temporal variations of T/B ratios at the JS (a), PD (b) and QP (c) sites.

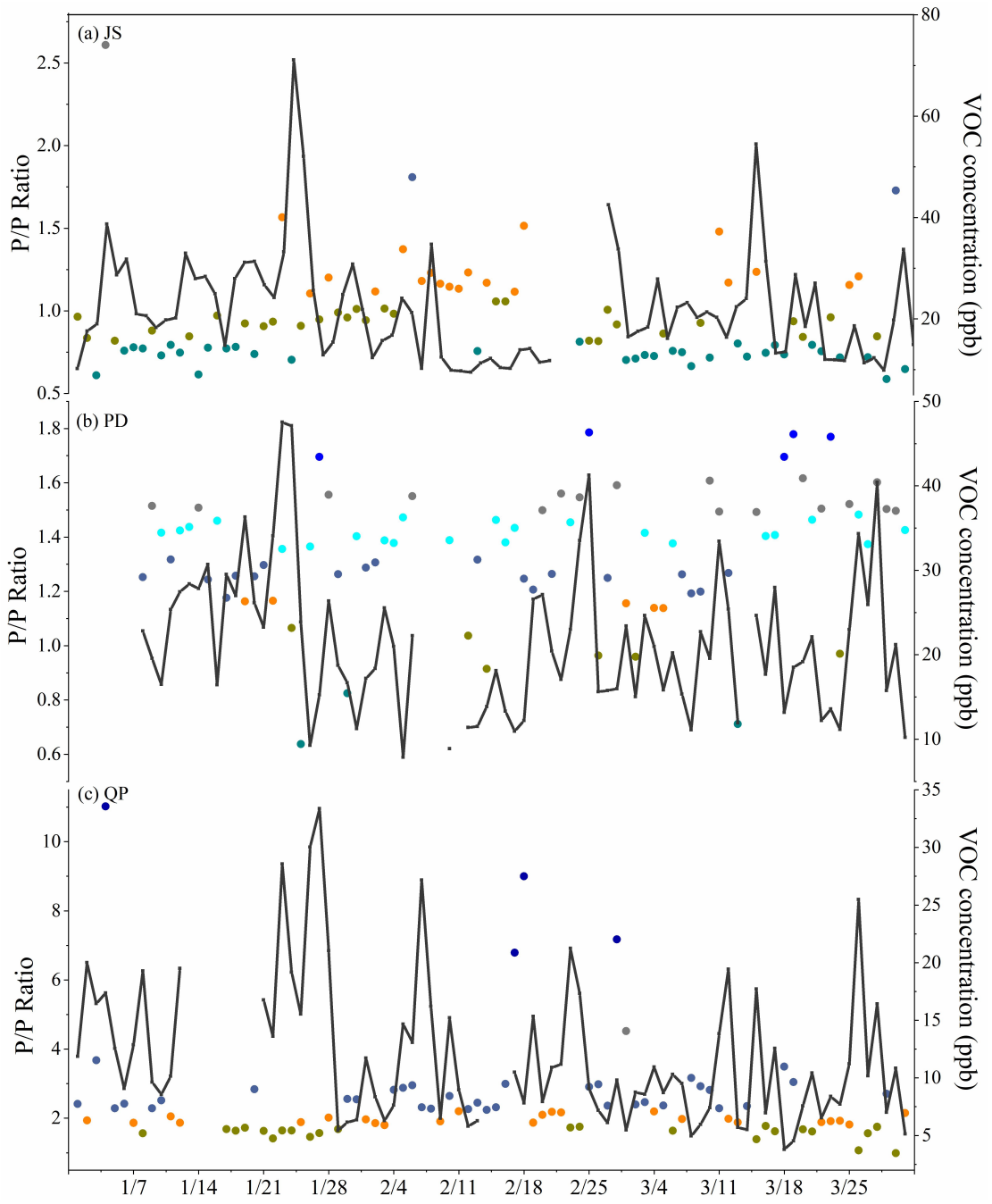


Figure S3. The spatio-temporal variations of P/P ratios at the JS (a), PD (b) and QP (c) sites.

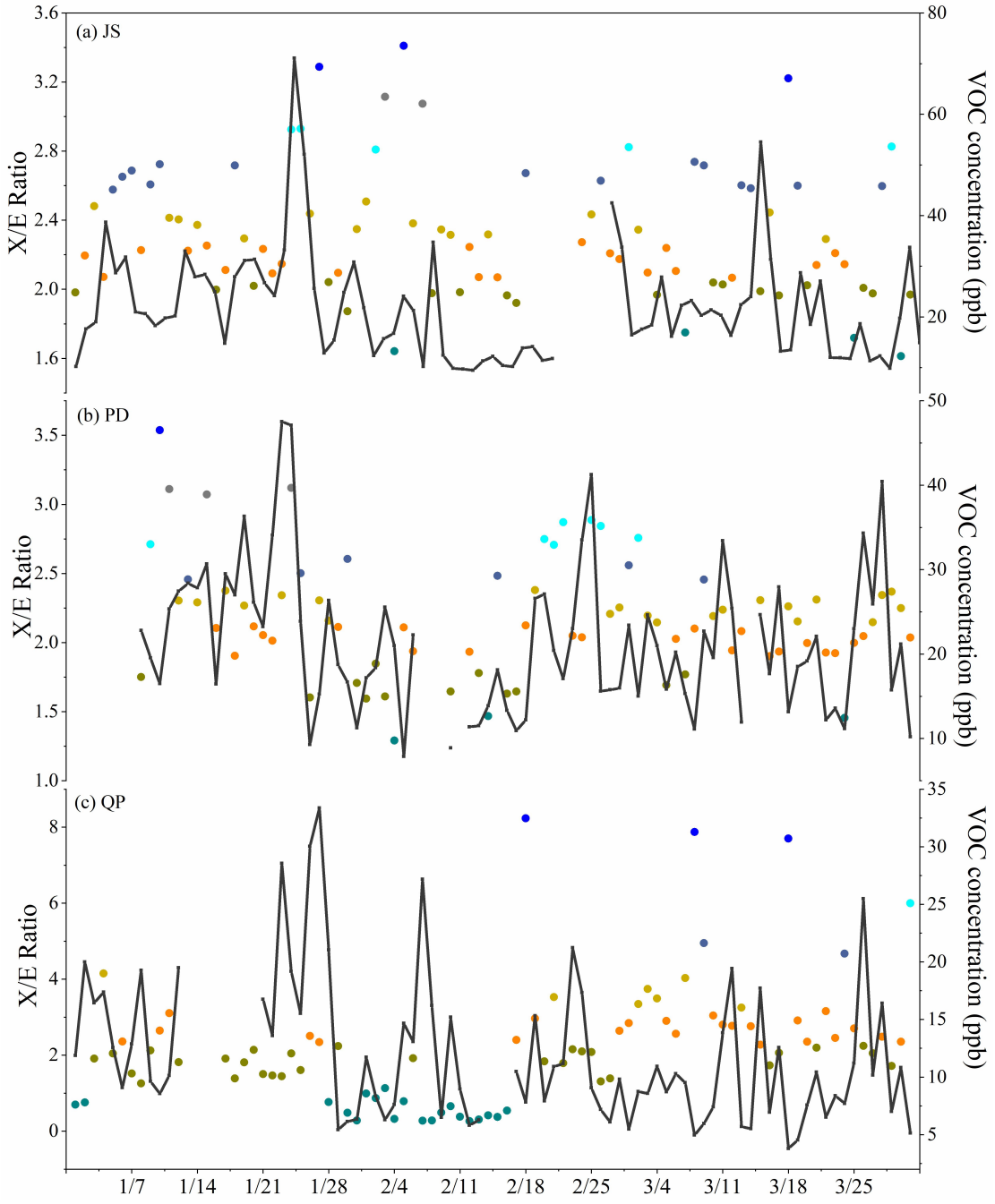
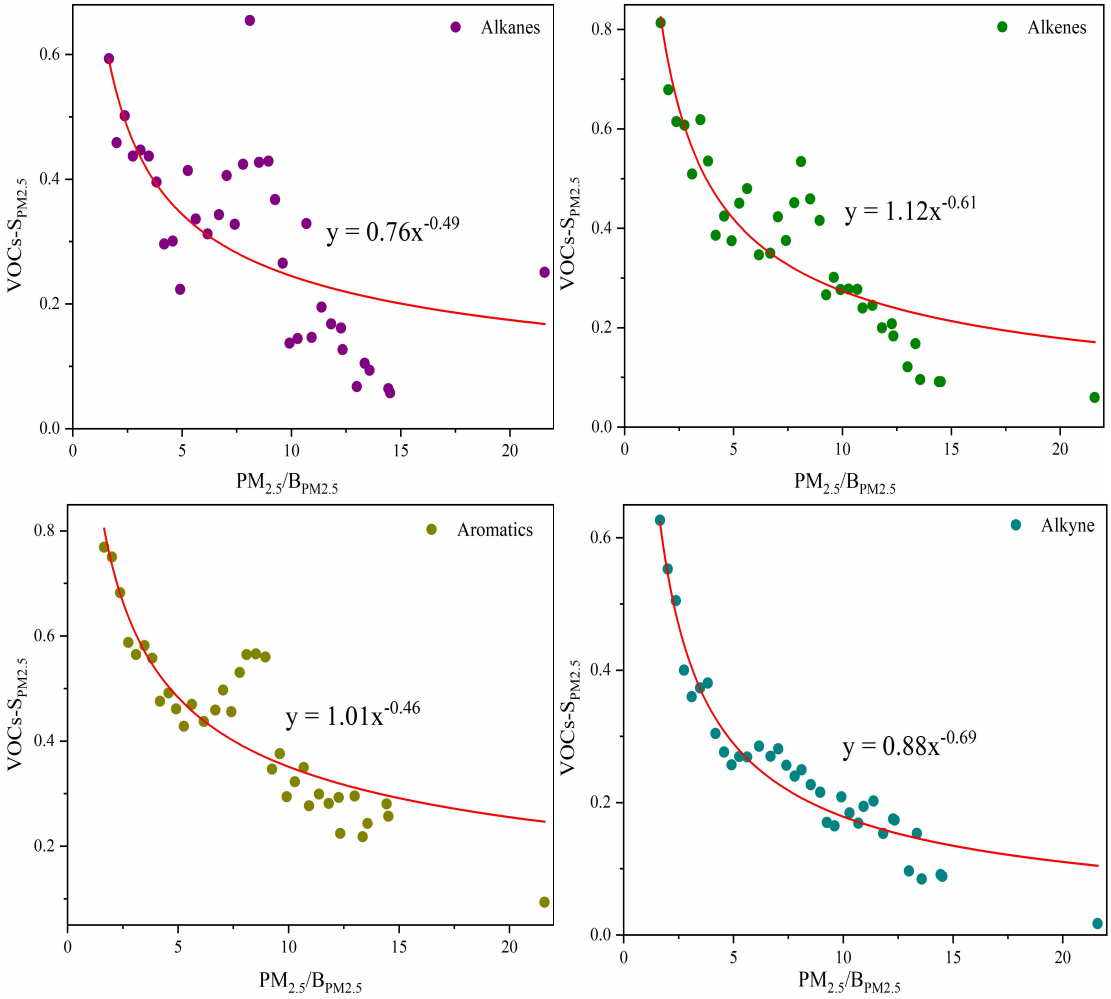
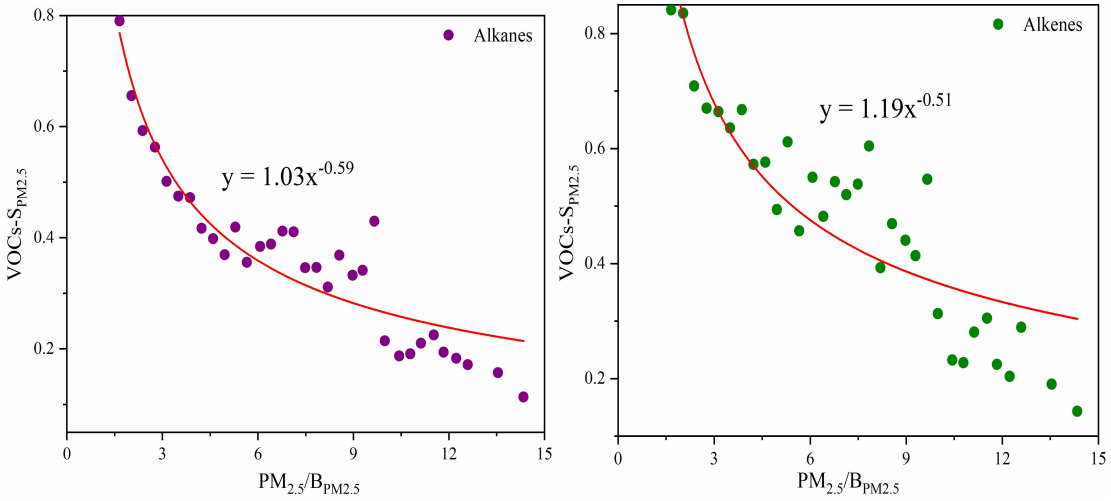


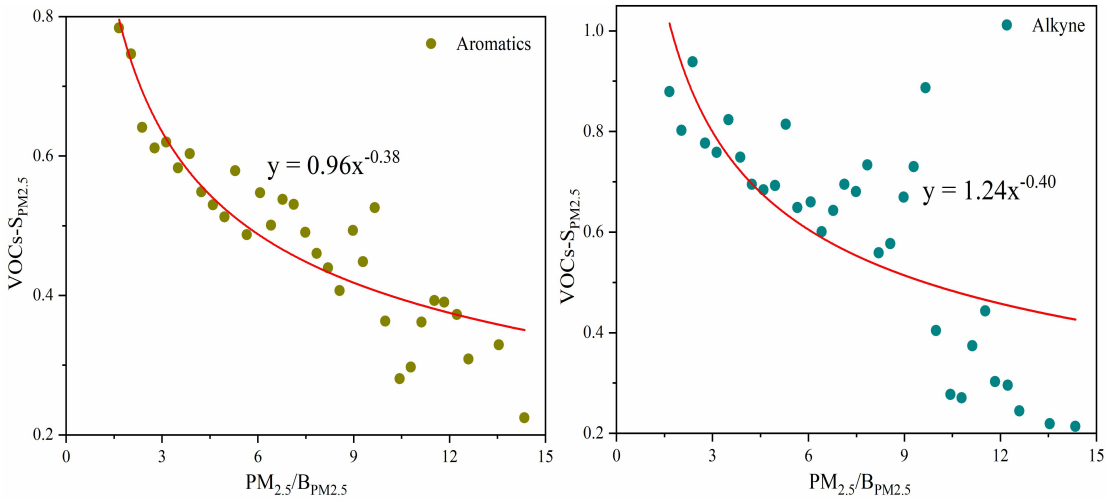
Figure S4. The spatio-temporal variations of X/E ratios at the JS (a), PD (b) and QP (c) sites.

(a) JS


Alkanes
y = 0.76x^-0.49
Alkenes
y = 1.12x^-0.61
Aromatics
y = 1.01x^-0.46
Alkyne
y = 0.88x^-0.69
VOCs-S_PM2.5
PM2.5/BPM2.5

(b) PD


Alkanes
y = 1.03x^-0.59
Alkenes
y = 1.19x^-0.51
VOCs-S_PM2.5
PM2.5/BPM2.5



(c) QP

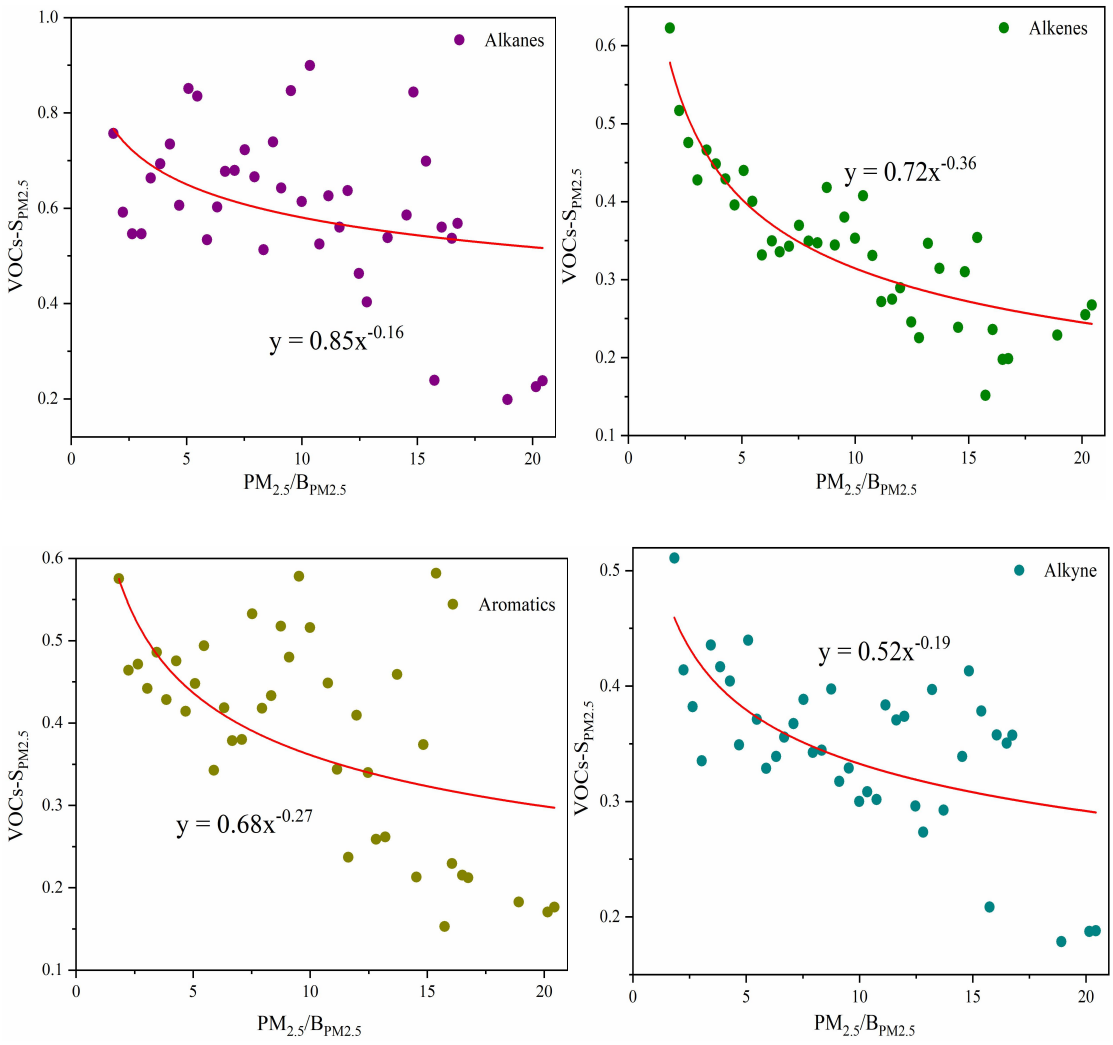


Figure S5. VOCs-$S_{PM2.5}$ values for alkanes (purple), alkenes (green), aromatics (yellow) and alkyne (blue) at the JS (a), PD (b) and QP (c) sites.

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