Supplement information

Volatile organic compounds at a rural site in Beijing: Influence of temporary emission control and wintertime heating

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1. Calculation of ozone formation potentials (OFPs) and secondary organic aerosol formation potentials (SOAFPs)

The OFP of individual VOC species *i*, OFP (*i*), is calculated by the following equation:

$$OFP\ (i)=conc(i)\times MIR(i)$$

where conc (*i*) is the concentration of VOC species *i*, and MIR (*i*) is the maximum incremental reactivity coefficient of VOC species *i*, which is defined by Carter (2009).

SOAFPs is estimated using the following formula:

$$SOAFPs=\sum_{i} X_i \times Y_i$$

where X_i is the mass concentration of precursor *i* (μg m^{-3}), and Y_i (%) is the SOA yield of precursor *i*. In this study, the SOA yields are taken from Ng et al (2007), Lim and Ziemann (2009) and Loza et al (2014).

Table S1. Ozone formation potentials (OFPs) of VOCs in the air masses from the south and the north during period I, II and III.

		Ozone formation potentials, ppbv				
		Alkanes	Alkenes	Aromatics	Ethyne	Sum
Period I		10.02	25.90	21.81	2.91	60.64
Period II		4.51	17.42	5.07	1.51	28.51
Period III		8.78	36.73	13.17	2.80	61.47
Period I	South [a]	12.04	30.03	23.57	3.58	69.21
	North [b]	3.97	13.53	16.53	0.90	34.92
Period II	South [a]	6.07	20.46	7.29	2.08	35.89
	North [b]	2.27	13.04	1.85	0.69	17.86
Period III	South [a]	14.15	67.64	25.40	5.51	112.70
	North [b]	5.93	20.38	6.70	1.36	34.39

[a] For the datasets in the southerly air masses; [b] For the datasets in the northerly air masses.

Table S2. Secondary organic aerosol formation potentials (SOAFPs) of VOCs in the southerly and northerly air masses during period I, II and III.

		Secondary organic aerosol formation potentials, μg m^{-3}					
		Low-NOx			High-NOx		
		Alkanes	Aromatics	Sum	Alkanes	Aromatics	Sum
Period I		1.47	7.30	8.77	1.63	2.39	4.02
Period II		0.61	1.93	2.54	0.68	0.75	1.43
Period III		0.68	4.62	5.30	0.75	1.68	2.43
Period I	South [a]	1.66	8.08	9.74	1.83	2.71	4.54
	North [b]	0.91	4.96	5.86	1.01	1.44	2.45
Period II	South [a]	0.75	2.80	3.55	0.84	1.09	1.92
	North [b]	0.40	0.68	1.09	0.45	0.27	0.72
Period III	South [a]	1.08	9.11	10.19	1.17	3.37	4.54
	North [b]	0.47	2.25	2.72	0.52	0.79	1.31

[a] For the datasets in the southerly air masses; [b] For the datasets in the northerly air masses.

Table S3. Average reductions (ppbv) of VOCs contributed by different sources as derived from the PMF source apportioning results

Sources	Average sources reduction contribution, ppbv		
	All [a]	South [b]	North [c]
Gasoline exhaust	3.18	4.00	0.57
Industrial emission	1.35	1.77	0.27
Solvent use	4.29	4.90	2.22
Diesel exhaust	2.28	2.03	1.71
Coal/biomass burning	0.31	0.16	0
Total	11.41	12.86	4.77

[a] For all the data; [b] For the datasets in the southerly air masses; [c] For the datasets in the northerly air masses.

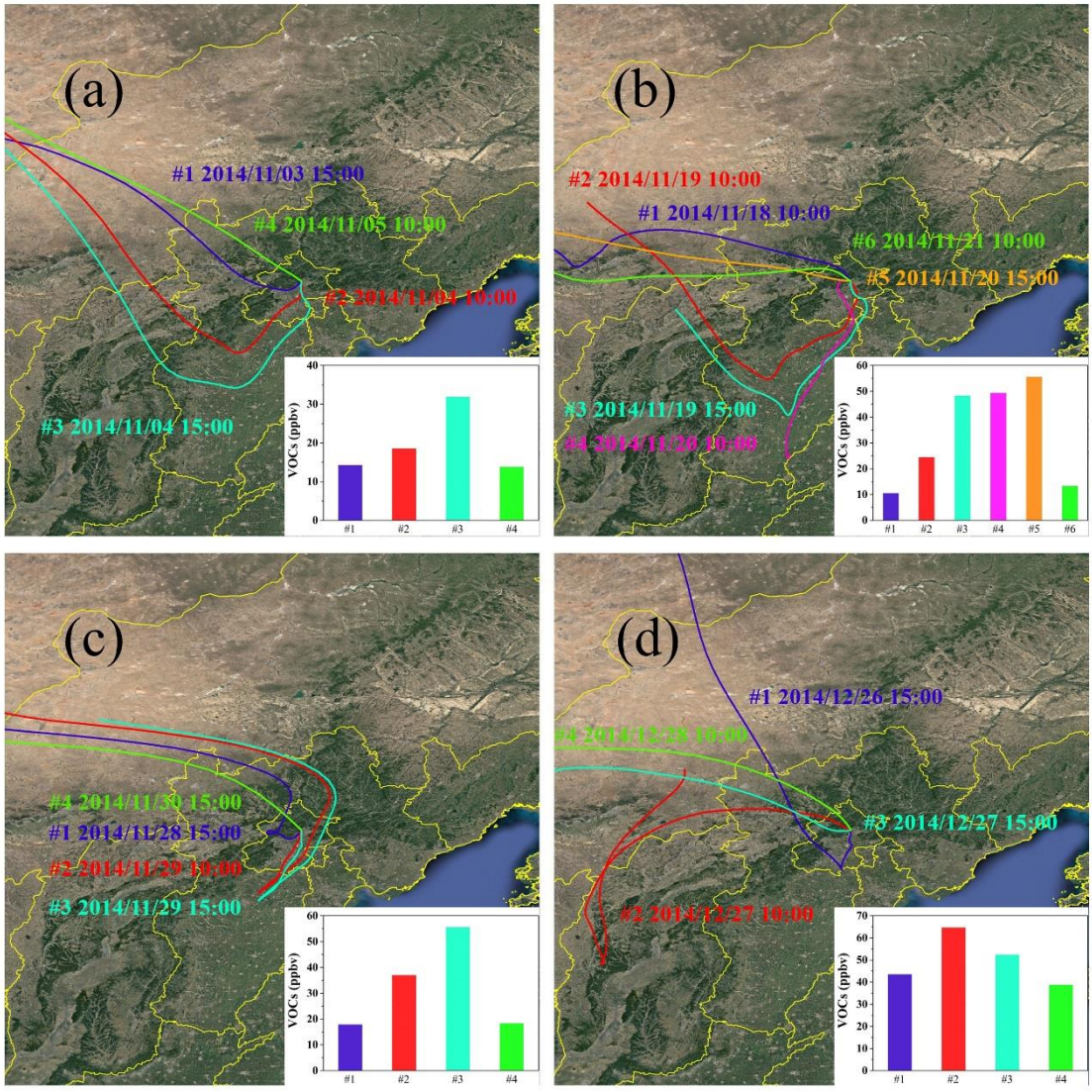

Figure S1. Mixing ratios of VOCs and corresponding back trajectories of air masses arriving at 100 m above the ground level during (a) 3-5 November, (b) 18-21 November, (c) 28-30 November, and (d) 26-28 December, respectively.

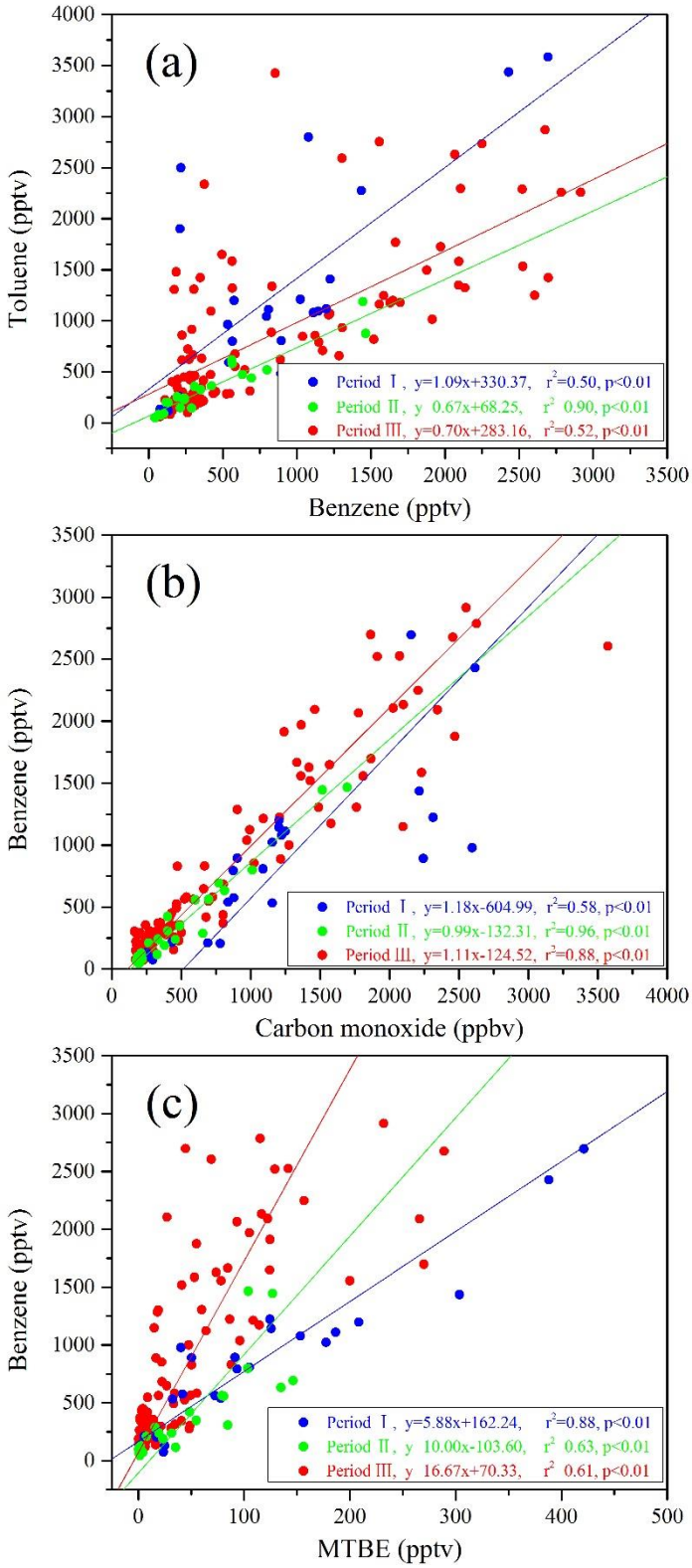

Figure S2. Scatter plots of (a) toluene versus benzene, (b) benzene versus carbon monoxide, and (c) benzene versus methyl tert-butyl ether (MTBE), during period I (in blue), II (in green) and III (in red).

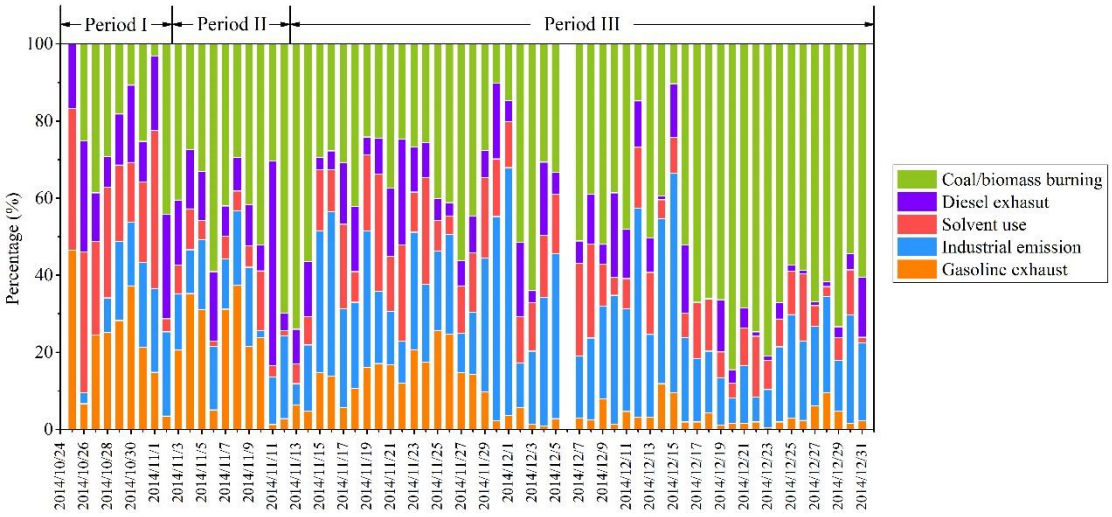

Figure S3. Time series of source contributions based on PMF results (No data on 2014/12/6 due to unexpected power failure).

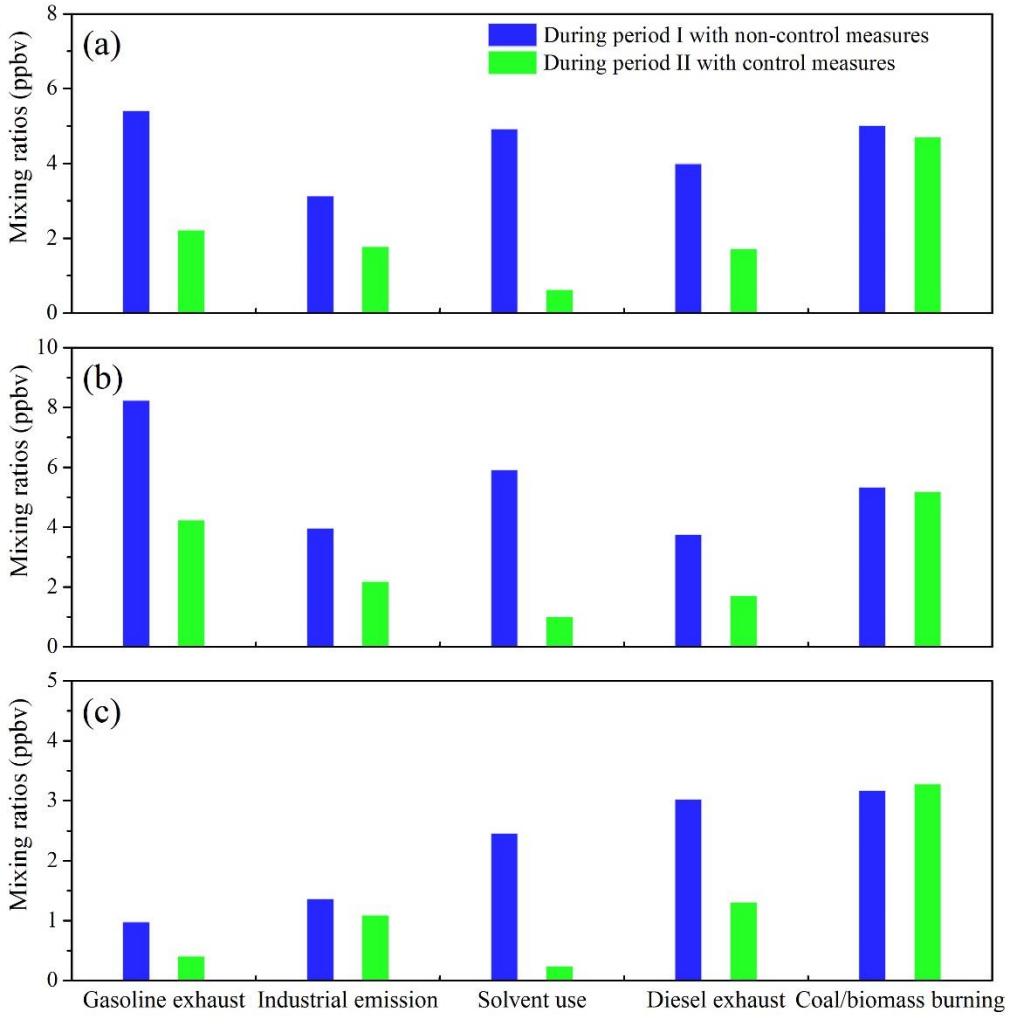

Figure S4. Sources contributions (a) in all samples, (b) in the air masses from the south, and (c) in the air masses from north during period I and II, as resolved from PMF model.

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