

Supplementary Material

Characteristics, potential sources and interaction of carbonaceous components in PM_{2.5} in two adjacent areas in Shanxi, China

Xiaofeng Liu^{A,}, Xin Tan^A, Xinyang Li^A, Xuan Li^A, Yuhuan Cheng^A and Kun Wang^A*

^ACollege of Environmental Science and Engineering, Taiyuan University of Technology, Taiyuan, 030024, PR China

*Correspondence to: Email: liuxiaofeng01@tyut.edu.cn

The data from Taiyuan and Yuci college town used in this study are listed in this supplementary material.

Chemical analysis of VOCs and Quality assurance and control (Liu *et al.* 2022)

Chemical analysis

The samples were pretreated using a preconcentrator (Entech 7100, USA) and analysed using a gas chromatography–mass selective detector/flame ionisation detector (GC-MSD/FID, Agilent 7890A/5975C, USA). The target compounds were 48 VOCs, which comprised 26 alkanes, 12 alkenes, 9 aromatics and 1 alkyne.

Quality assurance and control

The target VOCs were quantified using external standardised methods. The equipment used was calibrated by applying the five-point method (0.5, 1, 5, 15, and 30 ppbv) every 2 weeks using standard gases (Photochemical Assessment Monitoring Station and Toxic Organics-15), and the correlation coefficients (R^2) of the obtained calibration curves had to be greater than 0.99. Routine calibration was performed every 24 h using a calibration gas (10 ppbv), and the response deviation of each compound from the initial calibration values was required to be less than 10%. Otherwise, the relevant calibration curve was replotted. In the analytical system, the method detection limits (MDLs) ranged from 0.01 to 0.28 ppbv for alkanes, alkenes, and alkynes and from 0.01 to 0.04 ppbv for aromatic hydrocarbons.

Table S1. The data from Taiyuan used in this study ($\mu\text{g m}^{-3}$).

Date	OC1	OC2	OC3	OC4	OPC	EC1	EC2	EC3	Cl ⁻	SO ₄ ²⁻	NO ₃ ⁻	K ⁺	Mg ²⁺	Ca ²⁺	NH ₄ ⁺
29-Nov-17	0.54	2.80	3.47	2.05	3.21	6.80	6.44	0.19	3.86	6.55	5.88	0.80	0.27	4.92	2.80
30-Nov-17	1.10	3.24	3.03	1.57	8.73	8.77	8.93	0.26	4.96	8.14	7.83	1.00	0.35	6.63	3.90
1-Dec-17	0.94	4.01	4.00	2.02	4.95	7.95	7.11	0.19	4.46	7.12	7.02	0.61	0.24	4.40	4.54
2-Dec-17	1.75	5.75	5.25	2.33	11.62	12.38	13.11	0.27	7.84	14.31	12.69	1.20	0.45	9.25	7.62
3-Dec-17	0.88	4.81	4.95	2.72	4.73	10.67	6.67	0.22	6.19	7.48	7.00	0.69	0.25	5.75	4.35
4-Dec-17	0.15	1.36	1.62	1.30	2.45	3.65	4.13	0.18	1.55	3.87	3.55	0.22	0.11	2.37	1.37
5-Dec-17	0.68	2.06	1.53	0.92	3.91	3.85	6.07	0.17	2.54	5.13	3.34	0.38	0.10	3.12	2.30
21-Dec-17	1.47	4.36	3.81	1.87	10.22	9.68	10.43	0.24	7.61	9.34	8.38	0.38	0.09	3.07	2.30
22-Dec-17	1.25	5.47	5.91	2.62	5.60	13.90	6.58	0.19	40.19	9.90	11.22	1.13	0.47	6.50	6.93
23-Dec-17	1.37	4.78	4.16	2.08	11.47	11.37	11.92	0.19	8.96	13.13	11.88	0.95	0.41	5.74	6.24
24-Dec-17	0.12	0.96	1.03	0.63	3.41	2.01	3.48	0.15	0.67	5.63	2.05	0.14	0.11	2.40	1.90
25-Dec-17	1.47	4.22	3.55	1.80	11.50	10.15	9.70	0.17	6.09	11.71	8.16	0.90	0.37	5.26	5.93
26-Dec-17	1.36	6.03	5.86	2.77	9.51	15.23	8.88	0.18	9.16	15.23	11.92	1.18	0.51	6.90	8.30
27-Dec-17	1.56	5.15	4.30	3.06	9.00	12.85	10.46	0.18	9.26	14.98	15.64	1.27	0.40	7.26	8.71
28-Dec-17	1.59	6.65	5.76	2.96	12.25	19.94	9.06	0.19	12.24	22.23	26.55	1.59	0.30	5.00	14.38
18-Jan-18	1.71	5.06	4.07	1.88	10.33	10.39	11.88	0.22	6.36	16.59	6.34	0.96	0.36	6.74	6.28
19-Jan-18	1.98	7.99	7.41	2.76	14.96	18.75	12.50	0.37	7.20	15.71	5.28	1.59	0.33	6.28	7.16
20-Jan-18	0.98	2.93	2.33	1.31	7.37	6.03	9.04	0.17	4.56	8.58	7.09	0.53	0.25	5.08	4.92
21-Jan-18	2.17	6.91	4.85	2.21	15.95	17.28	16.19	0.28	9.06	25.20	12.90	1.95	0.29	5.06	12.20
22-Jan-18	0.24	1.03	0.75	0.60	3.53	1.64	4.15	0.12	0.70	6.39	2.30	0.16	0.13	3.05	2.15
23-Jan-18	0.60	2.12	2.10	1.40	2.65	5.29	4.18	0.22	3.53	4.60	3.55	0.60	0.14	2.73	3.16
24-Jan-18	0.32	1.58	1.64	1.24	2.47	3.48	4.08	0.24	3.50	4.72	4.20	0.67	0.15	3.07	3.07
5-Sep-18	0.04	1.47	1.38	0.79	3.49	2.76	4.53	0.14	0.21	5.61	3.38	0.27	0.09	1.39	3.17
6-Sep-18	0.03	1.35	2.42	1.01	4.66	2.48	5.73	0.15	0.18	7.28	2.65	0.29	0.24	1.19	3.72
7-Sep-18	0.03	0.69	0.54	0.32	1.34	0.64	1.39	0.10	0.08	1.92	0.34	0.05	0.03	0.33	0.68
8-Sep-18	0.06	1.28	1.05	0.65	2.74	1.96	3.31	0.12	0.12	5.27	1.02	0.19	0.04	1.26	2.64
9-Sep-18	0.05	1.08	2.01	1.15	2.84	2.41	4.25	0.14	0.27	6.55	5.31	0.71	0.12	1.85	3.64
10-Sep-18	0.08	2.07	1.17	0.72	3.85	2.81	3.80	0.10	0.22	10.03	9.31	0.62	0.12	1.03	7.10

Table S2. The data from Yuci college town used in this study ($\mu\text{g m}^{-3}$).

Date	OC1	OC2	OC3	OC4	OPC	EC1	EC2	EC3	Cl ⁻	SO ₄ ²⁻	NO ₃ ⁻	K ⁺	Mg ²⁺	Ca ²⁺	NH ₄ ⁺
29-Nov-17	1.03	3.23	2.98	1.51	8.15	7.33	10.32	0.18	4.20	7.00	9.44	0.89	0.23	6.07	5.24
30-Nov-17	1.05	4.54	4.41	2.27	5.47	9.32	8.33	0.20	5.31	8.34	6.75	0.81	0.08	3.85	6.27
1-Dec-17	0.93	3.68	3.38	1.83	5.38	7.38	8.27	0.20	4.78	7.96	0.89	0.71	0.10	3.97	5.24
2-Dec-17	1.30	5.45	4.53	2.46	8.27	13.72	9.40	0.21	7.85	16.02	16.40	1.49	0.14	3.77	11.11
3-Dec-17	1.19	3.91	2.75	0.90	8.71	8.83	9.94	0.21	4.59	9.55	9.83	0.81	0.11	4.01	6.80
4-Dec-17	0.34	2.06	1.93	1.23	3.21	3.98	6.62	0.17	2.06	4.58	2.98	0.29	0.07	3.02	2.01
5-Dec-17	1.09	4.55	3.12	1.55	3.99	6.86	6.91	0.21	3.29	6.49	3.40	0.49	0.10	2.76	3.67
21-Dec-17	1.48	5.25	3.97	2.04	6.81	11.90	9.70	0.22	7.13	10.40	7.35	0.82	0.10	2.77	7.66
22-Dec-17	1.64	6.38	5.98	3.31	15.14	19.48	15.60	0.34	11.80	22.48	18.55	1.47	0.27	8.69	10.54
23-Dec-17	1.39	5.52	4.40	2.60	12.87	16.12	9.46	0.21	8.16	19.70	15.05	1.33	0.15	3.03	11.11
24-Dec-17	0.16	1.12	0.85	0.63	2.80	2.07	3.57	0.14	0.99	5.88	2.15	0.19	0.05	1.75	1.57
25-Dec-17	1.32	4.94	3.50	2.24	5.27	10.30	7.65	0.19	6.22	15.68	7.95	0.76	0.14	3.08	6.73
26-Dec-17	1.49	4.77	2.89	1.52	11.79	11.16	11.30	0.16	7.79	16.08	11.39	1.06	0.13	2.39	9.72
27-Dec-17	1.25	4.97	3.89	2.54	10.51	14.57	7.17	0.16	7.28	15.93	18.89	1.18	0.10	2.76	10.93
28-Dec-17	1.42	6.04	4.60	3.00	11.95	18.57	9.98	0.19	8.81	20.93	25.23	1.80	0.18	2.96	17.85
18-Jan-18	1.77	5.02	4.04	2.01	5.89	10.07	8.72	0.26	5.95	11.44	5.99	0.74	0.18	3.35	6.00
19-Jan-18	2.20	6.86	5.47	2.47	8.49	14.28	9.80	0.22	6.43	13.19	6.46	1.04	0.18	3.79	7.27
20-Jan-18	1.35	3.70	2.49	1.29	7.56	7.74	10.06	0.17	5.51	9.75	7.13	0.77	0.10	3.03	6.19
21-Jan-18	1.99	7.03	4.75	2.82	12.96	18.23	12.45	0.24	9.03	24.30	15.05	1.80	0.19	3.79	14.14
22-Jan-18	0.15	0.94	0.68	0.36	2.20	1.69	2.75	0.14	1.03	6.75	2.92	0.17	0.06	1.31	2.58
23-Jan-18	0.66	1.58	0.89	0.54	4.44	2.94	4.78	0.13	20.95	5.56	4.25	0.27	0.02	1.52	3.66
24-Jan-18	0.73	1.90	1.45	0.87	4.88	3.86	6.95	0.14	3.50	4.80	3.57	0.27	0.04	2.61	3.10
5-Sep-18	0.04	1.38	1.11	0.66	3.18	2.37	4.07	0.12	0.21	7.01	2.52	0.20	0.11	1.88	2.84
6-Sep-18	0.05	1.21	0.83	0.46	3.32	1.89	3.29	0.11	0.20	8.15	2.85	0.27	0.18	3.20	1.97
7-Sep-18	0.01	0.64	0.90	0.43	1.44	0.72	2.32	0.10	0.37	2.70	0.57	0.11	0.04	1.20	0.49
8-Sep-18	0.02	0.77	0.98	0.45	2.02	1.01	3.46	0.11	0.21	4.24	1.97	0.21	0.01	1.83	1.52
9-Sep-18	0.05	1.30	0.93	0.55	3.19	2.19	3.64	0.11	0.19	7.97	3.64	0.30	0.11	1.60	4.68
10-Sep-18	0.04	1.04	1.32	0.50	3.08	1.76	4.20	0.09	0.18	10.47	9.39	0.47	0.06	0.95	8.37

Table S3. The temperature meteorological data pertaining to the sampling periods obtained from [Zhenqi.com](http://www.zhenqi.com) (<http://www.zq12369.com>) (°C).

Sampling date	Temperature in Taiyuan	Temperature in Yuci
29-Nov-17	0.30	-1.14
30-Nov-17	0.38	-0.60
1-Dec-17	-3.79	-3.75
2-Dec-17	-2.38	-1.83
3-Dec-17	0.21	0.50
4-Dec-17	-2.13	-2.04
5-Dec-17	-3.42	-2.29
21-Dec-17	-2.70	-1.90
22-Dec-17	-2.75	-2.29
23-Dec-17	-2.13	-1.83
24-Dec-17	-0.83	-1.04
25-Dec-17	-5.63	-4.92
26-Dec-17	-3.54	-2.71
27-Dec-17	-3.29	-2.00
28-Dec-17	0.38	-0.25
18-Jan-18	-3.00	-3.08
19-Jan-18	-1.96	-0.21
20-Jan-18	-2.04	-1.13
21-Jan-18	-1.42	-0.75
22-Jan-18	-1.04	0.09
23-Jan-18	-6.58	-7.75
24-Jan-18	-6.57	-8.63
5-Sep-18	20.96	20.21
6-Sep-18	19.75	18.29
7-Sep-18	17.38	15.38
8-Sep-18	15.67	15.08
9-Sep-18	16.38	16.58
10-Sep-18	18.00	18.25

Reference

Liu X, Li X, Tan X, Bai H, Li Y, Zhang S (2022) Distribution characteristics, source apportionment, and chemical reactivity of volatile organic compounds in two adjacent areas in Shanxi, North China. *Atmos. Environ.* **290**, 119374.