

**Table S1. The straw-grain ratios of different crops in typical regions of China.**

Regions	Rice	Wheat	Corn	Legume	Tuber crop	Oil Plant	Cotton	Sugarcane	Fiber crop	Others
Northeast China <sup>a</sup>	0.97	0.93	1.86	1.70	0.71	2.00	3.66	0.10	1.70	0.97
North China <sup>b</sup>	0.93	1.34	1.73	1.57	1.00	2.00	3.99	0.10	1.70	0.85
Northwest China <sup>c</sup>	1.05	1.23	1.52	1.07	1.22	2.00	3.67	0.10	1.70	1.23
the middle and lower reaches of Yangtze River <sup>d</sup>	1.28	1.38	2.05	1.68	1.16	2.05	3.32	0.10	1.70	1.06
Southwest China <sup>e</sup>	1.00	1.31	1.29	1.05	0.60	2.00	3.66	0.10	1.70	1.31
South China <sup>f</sup>	1.06	1.38	1.32	1.08	1.41	2.00	3.66	0.10	1.70	1.38

(a) Including provinces: Liaoning, Jilin, Heilongjiang.

(b) Including provinces: Beijing, Tianjin, Hebei, Shanxi, Neimenggu, Shandong, Henan.

(c) Including provinces: Shanxi, Gansu, Qinghai, Ningxia, Xinjiang.

5 (d) Including provinces: Shanghai, Jiangsu, Zhejiang, Anhui, Jiangxi, Hubei, Hunan.

(e) Including provinces: Chongqing, Sichuan, Guizhou, Yunnan, Xizang.

(f) Including provinces: Fujian, Guangdong, Guangxi, Hainan.

**Table S2. The proportion of crop residue to be burned in each province of China.**

Province	proportion (%)	Province	proportion (%)	Province	proportion (%)
Beijing	13	Shanghai	12	Hubei	30
Tianjin	30	Jiangsu	19	Hunan	35
Hebei	19	Zhejiang	22	Guangdong	18
Shanxi	22	Anhui	42	Guangxi	35
Inner Mongolia	27	Fujian	17	Hainan	56
Liaoning	34	Jiangxi	25	Chongqing	45
Jilin	25	Shandong	21	Sichuan	30
Heilongjiang	25	Henan	22	Guizhou	43
Yunnan	31	Xizang	28	Shaanxi	28
Gansu	33	Qinghai	28	Ningxia	16
Xinjiang	30				

**Table S3. Emission factors (EFs) of air pollutants from crop residue burning. (Unit of EFs: g kg<sup>-1</sup>)**

Pollutants	Crops	EFs reported in previous studies	EFs used in this study	Related references <sup>(a)</sup>
BC	Rice	0.52, 0.85, 0.5, 0.58, 0.47	0.58	3, 8, 12, 14, 24
	Wheat	0.52, 0.8, 0.9, 0.5	0.68	11, 12, 14, 24
	Corn	0.78, 0.96, 0.75, 0.72, 0.52	0.75	3, 8, 12, 14, 24
	Cotton	0.82	0.82	24
	Sugarcane	0.77, 0.69	0.73	8, 11
	Others	0.75, 0.69, 0.66, 0.59, 0.8, 0.43, 0.47	0.63	1, 2, 3, 5, 6, 7, 12
NO <sub>x</sub>	Rice	3.52, 3.1, 1.42, 2.93, 3.83	2.96	4, 10, 16, 21, 25
	Wheat	2.59, 3.3, 1.19, 3.18, 1.14	2.28	4, 10, 16, 21, 23
	Corn	3.36, 4.3, 4.51, 1.27	3.36	4, 10, 21, 23
	Legume	1.12, 1.08, 2.47	1.56	10, 16, 25
	Cotton	2.68, 3.37	3.03	4, 10
	Others	3.11, 5.3, 3.8, 3.83, 2.55, 3.37, 2.5	3.49	1, 6, 9, 15, 17, 18, 27
CO	Rice	72.4, 34.7, 82, 64.2, 53.2, 48.7	59.20	4, 10, 16, 22, 25, 28
	Wheat	65.5, 60, 61.1	62.20	4, 10, 23
	Corn	70.2, 53, 40.3	54.50	4, 10, 23
	Legume	33.5, 32.3	32.90	10, 16
	Cotton	111.8, 68.3	90.05	4, 10
	Sugarcane	40.8	40.08	25
Others	102, 102.2, 56.5, 92, 80.99, 68.33, 86.3, 56.4	80.59	1, 6, 9, 15, 17, 18, 23, 27	
CO <sub>2</sub>	Rice	1757.6, 1460, 1105.2, 1101	1355.95	4, 10, 25, 28
	Wheat	1483.6, 1460, 1557.9, 1320	1455.38	4, 10, 22, 23
	Corn	1350, 1261.5, 1160	1257.17	10, 22, 23
	Legume	1445	1445.00	10
	Cotton	1453.4, 1445	1449.20	4, 10
	Sugarcane	1152.5	1152.50	25
Others	1585, 1584.9, 1410, 1515, 1445.76, 1445, 1130	1445.09	1, 6, 9, 15, 17, 18, 23	
PM <sub>2.5</sub>	Rice	12.95, 13.1, 12.1	12.72	10, 21, 25
	Wheat	7.6, 6.2	6.90	10, 21
	Corn	11.7, 10.5	11.10	10, 21
	Legume	3.32, 3.28	3.30	10, 21
	Sugarcane	4.12	4.12	25
	Others	6.26, 6.3, 9.65, 3.88, 5.4, 3.9	5.90	1, 6, 9, 12, 13, 27
PM <sub>10</sub>	Rice	14	14.00	25
	Wheat	7.73	7.73	26
	Corn	11.95	11.95	26
	Sugarcane	5.65, 6.93	6.29	25, 26
	Others	11.7, 10	10.85	9, 27

SO <sub>2</sub>	Rice	0.147, 0.9, 0.75	0.60	4, 10, 21
	Wheat	0.049, 0.85, 0.63, 0.03	0.39	4, 10, 21, 23
	Corn	0.026, 0.44, 0.46, 0.015	0.24	4, 10, 21, 23
	Legume	0.25	0.25	10
	Cotton	0.002, 0.56	0.28	4, 10
	Others	0.4, 0.54, 0.48, 0.37, 0.56, 0.216	0.43	6, 9, 12, 17, 18, 23
OC	Rice	1.96, 3.3, 7.68, 1.07	3.50	4, 10, 21, 25
	Wheat	3.83, 2.7, 2.93	3.15	4, 10, 21
	Corn	2.21, 3.9, 5.93, 2.79	3.71	4, 10, 21, 25
	Legume	1.1, 1.17	1.14	10, 25
	Cotton	1.83, 4.5	3.17	4, 10
	Sugarcane	1.25	1.25	25
	Others	2.3, 1.7, 3.3, 4.49, 2.6	4.80	1, 13, 15, 18, 20
NH <sub>3</sub>	Rice	0.78, 0.39	0.59	10, 21
	Wheat	0.37, 0.29	0.33	10, 21
	Corn	0.68, 0.41	0.55	10, 21
	Legume	0.53	0.53	10
	Cotton	0.78	0.78	10
	Others	2.17, 2.2, 0.52, 1.3, 0.78	1.39	1, 6, 9, 15, 18
CH <sub>4</sub>	Rice	3.2, 5.39	4.30	10, 28
	Wheat	3.4, 2.62	3.01	10, 23
	Corn	4.4, 1.6	3.00	10, 23
	Legume	3.9	3.90	10
	Cotton	3.5	3.50	10
	Others	5.82, 5.8, 3.5, 3.9, 3.89, 2.7, 4.56	4.31	1, 6, 9, 15, 17, 18, 23
NMVOC	Rice	6.05, 8.4, 9.39	7.95	10, 25, 28
	Wheat	7.5, 9.37, 3.5	6.79	10, 18, 28
	Corn	10, 7.34, 4.49, 2.93	6.19	10, 18, 25, 28
	Legume	8.64	8.64	10
	Cotton	8.17	8.17	10
	Others	10.56, 15.7, 8.17, 7.97	10.60	9, 15, 18, 19

(a) Listed in Supplementary References.

**Table S4. Typical harvest months in different regions of China.**

Region	Rice	Wheat	Corn	Legume	Tuber crop	Oil Plant	Cotton
Northeast China	9-10	7-8	9-10	9-10	6-8	7-8	9-11
North China	9-10	6-7	9-10	9-11	6-7,10-11	6-7	10-11
Northwest China	8-10	6-8	9-11	9-10	6-7,10-11	6-7	9-10
the middle and lower reaches of Yangtze River	6-7,10	5-6	8-10	10-11	5-6,10-11	5-6	10-11
Southwest China	6-7,9-10	5	7-9	10-11	5-6,10-11	5-6	10-11
South China	5-7,10-11	4-5	6-7,9-10	6,11	5-6,10-11	5-6	10-12

**Table S5. Pollutant emissions at prefectural city level in 2014. (Unit for emission estimate: Gg)**

Cities	BC	OC	PM <sub>2.5</sub>	PM <sub>10</sub>	SO <sub>2</sub>	NO <sub>X</sub>	NH <sub>3</sub>	CH <sub>4</sub>	NMVOC	CO	CO <sub>2</sub>
Beijing	0.09	0.45	1.28	1.40	0.03	0.39	0.07	0.38	0.79	6.95	160.44
Tianjin	0.53	2.57	7.22	7.78	0.21	2.21	0.37	2.22	4.74	42.94	967.81
Shijiazhuang	0.99	4.88	12.44	13.99	0.44	4.01	0.71	4.30	9.37	82.55	1881.48
Chengde	0.23	1.20	3.33	3.80	0.09	1.05	0.21	1.04	2.19	18.37	412.34
Zhangjiakou	0.26	1.43	3.51	4.25	0.11	1.21	0.27	1.24	2.71	22.28	484.42
Qinhuangdao	0.17	0.93	2.42	2.85	0.07	0.80	0.17	0.81	1.75	14.40	317.60
Tangshan	0.64	3.36	8.90	10.26	0.30	2.85	0.58	3.02	6.47	54.57	1209.25
Langfang	0.37	1.81	5.06	5.58	0.14	1.57	0.28	1.56	3.33	29.38	663.92
Baoding	1.15	5.74	14.65	16.58	0.50	4.76	0.87	5.03	10.94	95.80	2165.59
Cangzhou	0.94	4.52	12.15	13.39	0.40	3.80	0.66	4.01	8.68	77.74	1746.81
Hengshui	0.78	3.77	10.01	10.99	0.34	3.14	0.56	3.37	7.37	66.70	1473.38
Xingtai	0.95	4.58	12.18	13.39	0.41	3.83	0.70	4.13	9.04	82.01	1797.52
Handan	1.11	5.38	14.30	15.74	0.48	4.49	0.78	4.76	10.35	93.02	2085.84
Datong	0.23	1.16	3.27	3.70	0.08	1.03	0.19	0.98	2.06	17.36	398.65
Shuozhou	0.30	1.52	4.26	4.83	0.11	1.35	0.25	1.29	2.71	22.89	521.80
Xinzhou	0.08	0.46	1.04	1.48	0.04	0.39	0.11	0.48	1.07	7.74	174.30
Taiyuan	0.08	0.41	1.19	1.32	0.03	0.37	0.06	0.34	0.71	6.10	140.74
Yangquan	0.07	0.36	1.08	1.17	0.02	0.33	0.06	0.30	0.62	5.36	123.42
Jinzhong	0.41	2.04	6.00	6.59	0.14	1.83	0.31	1.71	3.56	30.76	714.05
Lvliang	0.23	1.15	3.24	3.61	0.09	1.01	0.17	0.99	2.10	18.10	418.22
Changzhi	0.39	1.95	5.80	6.31	0.13	1.76	0.30	1.61	3.32	28.88	665.78
Linfen	0.62	2.99	8.13	8.98	0.25	2.54	0.42	2.60	5.55	48.86	1132.51
Jincheng	0.17	0.85	2.38	2.65	0.07	0.74	0.13	0.73	1.54	13.28	306.68
Yuncheng	0.71	3.40	9.09	10.05	0.30	2.85	0.47	3.00	6.46	57.34	1320.99
Chifeng	1.42	7.21	20.29	22.71	0.49	6.41	1.17	6.00	12.65	108.31	2461.88
Ulanqab	0.26	1.57	3.05	4.18	0.13	1.25	0.36	1.38	3.19	25.44	516.55
Ordos	0.48	2.50	6.80	7.71	0.17	2.20	0.42	2.07	4.42	37.78	842.53
Bayan Nur	0.85	4.76	11.17	13.55	0.37	3.97	0.92	4.04	8.96	74.87	1592.73
Wuhai	0.01	0.06	0.18	0.20	0.00	0.06	0.01	0.05	0.11	0.98	22.25
Hohehot	0.40	2.09	5.46	6.32	0.15	1.81	0.37	1.76	3.79	32.05	709.61
Baotou	0.33	1.75	4.67	5.31	0.12	1.52	0.30	1.45	3.12	26.72	591.35
Tongliao	1.97	9.81	28.82	31.52	0.65	8.84	1.50	8.05	16.73	145.23	3346.40
Hulun Buir	1.63	7.51	19.48	25.48	0.66	6.63	1.40	7.68	16.72	125.35	3106.89
Shenyang	1.31	6.78	20.16	22.30	0.56	6.01	1.09	5.99	12.25	103.00	2344.40
Dalian	0.41	2.03	6.02	6.77	0.16	1.82	0.33	1.80	3.72	30.89	720.19
Anshan	0.44	2.23	6.77	7.40	0.18	2.00	0.35	1.94	3.95	33.62	773.65
Fushun	0.19	0.95	2.87	3.15	0.08	0.85	0.15	0.83	1.70	14.33	330.20
Benxi	0.09	0.43	1.31	1.44	0.03	0.39	0.07	0.38	0.78	6.55	151.30

Dandong	0.33	1.72	5.30	5.83	0.16	1.53	0.27	1.58	3.17	26.35	605.84
Jinzhou	0.76	3.89	11.41	12.56	0.29	3.47	0.62	3.30	6.82	58.30	1328.88
Yingkou	0.18	0.95	3.10	3.40	0.11	0.83	0.15	0.96	1.86	14.94	344.13
Fuxin	0.86	4.52	12.28	14.01	0.32	3.97	0.78	3.80	8.08	68.38	1521.97
Liaoyang	0.29	1.51	4.74	5.17	0.14	1.35	0.24	1.40	2.79	23.19	533.02
Panjin	0.23	1.31	4.57	5.06	0.19	1.13	0.22	1.51	2.85	21.62	501.67
Tieling	1.34	6.80	19.97	22.05	0.50	6.07	1.08	5.79	11.98	102.06	2335.22
Chaoyang	0.71	3.53	10.56	11.46	0.25	3.18	0.54	2.95	6.07	52.53	1208.17
Huludao	0.17	0.87	2.45	2.76	0.06	0.77	0.15	0.74	1.56	13.16	296.94
Changchun	2.83	14.37	42.49	46.58	1.05	12.86	2.25	12.15	25.05	214.97	4914.09
Jilin	1.00	4.99	15.26	16.93	0.41	4.49	0.78	4.50	9.15	75.86	1777.77
Siping	2.38	11.85	35.56	38.50	0.82	10.70	1.78	9.81	20.17	175.48	4046.52
Liaoyuan	3.79	19.26	57.33	63.31	1.49	17.21	3.05	16.72	34.34	290.44	6674.57
Tonghua	0.13	0.65	2.03	2.22	0.06	0.58	0.10	0.60	1.20	9.91	229.64
Baishan	0.61	3.10	9.24	10.20	0.24	2.77	0.49	2.69	5.53	46.79	1075.32
Baicheng	0.78	3.96	11.78	13.01	0.31	3.54	0.63	3.44	7.06	59.70	1371.94
Songyuan	1.79	9.09	27.07	29.89	0.70	8.13	1.44	7.90	16.22	137.15	3151.81
Harbin	3.63	18.35	56.73	62.39	1.56	16.46	2.85	16.59	33.50	279.18	6499.41
Qiqihar	3.17	15.11	45.39	52.42	1.19	13.79	2.46	14.03	29.01	232.26	5627.97
Mudanjiang	0.79	3.76	11.06	13.07	0.29	3.43	0.63	3.55	7.40	58.23	1419.48
Jiamusi	1.50	7.69	24.48	27.65	0.80	6.86	1.26	7.72	15.36	121.17	2868.18
Daqing	1.53	7.68	23.22	25.26	0.56	6.92	1.17	6.52	13.33	114.58	2648.69
Jixi	0.74	3.70	11.61	12.97	0.34	3.33	0.59	3.52	7.06	57.22	1351.39
Shuangyashan	0.78	3.85	11.74	12.93	0.30	3.48	0.59	3.37	6.89	58.01	1358.35
Yichun	0.17	0.71	2.26	3.08	0.08	0.68	0.14	0.92	1.90	12.34	343.11
Qitaihe	0.26	1.29	3.88	4.31	0.09	1.17	0.20	1.12	2.30	19.37	456.15
Hegang	0.19	1.00	3.30	3.70	0.12	0.88	0.16	1.06	2.06	16.01	377.32
Heihe	0.82	3.00	8.67	13.42	0.32	2.94	0.64	4.16	8.95	54.83	1638.93
Suihua	3.75	18.49	56.10	62.03	1.40	16.73	2.86	16.19	33.14	278.42	6537.48
Shanghai	0.09	0.56	2.01	2.22	0.09	0.47	0.10	0.68	1.27	9.51	216.33
Nanjing	0.19	1.10	3.17	3.71	0.15	0.89	0.20	1.21	2.45	19.09	421.89
Wuxi	0.11	0.59	1.81	2.04	0.09	0.48	0.09	0.67	1.34	10.64	246.03
Xuzhou	0.80	4.09	11.56	13.01	0.49	3.35	0.61	4.13	8.58	71.74	1646.50
Changzhou	0.22	1.20	3.53	4.01	0.17	0.97	0.19	1.30	2.63	21.14	484.88
Suzhou	0.32	1.70	5.12	5.76	0.24	1.38	0.26	1.86	3.74	30.08	695.10
Nantong	0.60	3.25	8.78	10.50	0.42	2.63	0.59	3.48	7.27	57.70	1288.12
Lianyungang	0.56	3.03	8.73	9.89	0.42	2.44	0.47	3.24	6.59	53.61	1222.58
Huaian	0.70	3.77	11.12	12.57	0.54	3.03	0.58	4.14	8.35	67.22	1544.96
Yancheng	1.15	6.16	17.77	20.15	0.82	4.99	0.98	6.54	13.37	109.14	2467.77
Yangzhou	0.46	2.48	7.45	8.48	0.37	1.99	0.39	2.81	5.63	44.62	1029.08
Zhenjiang	0.19	1.06	3.17	3.62	0.16	0.86	0.18	1.19	2.38	18.78	425.86

Taizhou	0.50	2.71	7.90	9.04	0.39	2.17	0.43	3.01	6.08	48.59	1108.16
Suqian	0.39	2.09	6.23	7.04	0.29	1.70	0.32	2.28	4.60	36.95	850.54
Hangzhou	0.11	0.66	1.94	2.45	0.10	0.55	0.14	0.80	1.61	11.43	261.17
Ningbo	0.13	0.69	2.32	2.76	0.11	0.59	0.13	0.88	1.71	12.28	290.64
Jiaxing	0.20	1.18	3.99	4.50	0.19	0.98	0.21	1.41	2.69	20.13	456.85
Huzhou	0.11	0.68	2.34	2.63	0.11	0.57	0.12	0.82	1.54	11.50	258.83
Shaoxing	0.18	1.03	3.34	3.89	0.16	0.87	0.19	1.22	2.38	17.64	404.13
Zhoushan	0.01	0.04	0.10	0.13	0.00	0.03	0.01	0.04	0.08	0.63	14.16
Wenzhou	0.12	0.70	2.33	2.65	0.11	0.59	0.13	0.83	1.59	11.84	266.29
Jinhua	0.13	0.72	2.23	2.65	0.10	0.62	0.15	0.85	1.69	12.50	281.38
Quzhou	0.14	0.82	2.48	2.96	0.12	0.68	0.16	0.94	1.87	13.88	309.40
Taizhou	0.11	0.62	1.98	2.33	0.10	0.53	0.12	0.74	1.46	10.63	243.12
Lishui	0.08	0.48	1.43	1.79	0.07	0.40	0.10	0.58	1.17	8.31	189.20
Hefei	1.13	6.66	19.83	23.06	0.97	5.43	1.24	7.48	14.97	115.96	2545.46
Huaibei	0.50	2.27	5.54	6.56	0.25	1.81	0.30	2.24	4.95	42.11	1018.47
Bozhou	1.89	8.75	21.37	25.18	0.92	7.01	1.20	8.45	18.66	159.61	3790.92
Suzhou	1.81	8.84	21.33	25.38	0.87	7.15	1.37	8.31	18.38	156.09	3595.18
Bengbu	1.23	6.60	15.84	19.06	0.76	5.18	1.13	6.49	14.12	117.09	2590.38
Fuyang	2.27	10.82	27.50	31.87	1.15	8.75	1.52	10.43	22.66	193.28	4553.06
Huainan	0.45	2.39	6.95	7.85	0.35	1.89	0.35	2.64	5.37	43.54	1009.24
Chuzhou	1.49	8.20	23.58	27.06	1.15	6.58	1.34	8.94	18.17	145.47	3294.62
Luan	1.55	8.70	26.38	30.03	1.28	7.05	1.45	9.76	19.45	153.26	3467.41
Maanshan	0.38	2.20	6.50	7.53	0.32	1.78	0.40	2.46	4.94	38.60	852.21
Wuhu	0.53	3.07	9.37	10.82	0.44	2.54	0.59	3.49	6.99	54.58	1174.71
Xuancheng	0.47	2.76	8.13	9.50	0.40	2.25	0.51	3.09	6.20	47.97	1059.59
Tongling	0.06	0.37	1.07	1.25	0.05	0.30	0.07	0.40	0.82	6.41	139.27
Chizhou	0.28	1.68	5.08	5.89	0.24	1.39	0.34	1.89	3.81	29.84	629.63
Anqing	1.00	5.92	18.19	21.05	0.86	4.91	1.17	6.77	13.54	105.26	2249.53
Huangshan	0.13	0.77	2.21	2.70	0.11	0.64	0.16	0.87	1.75	13.03	286.55
Ningde	0.07	0.45	1.23	1.52	0.06	0.36	0.10	0.50	1.02	7.56	161.47
Putian	0.04	0.23	0.67	0.82	0.03	0.19	0.05	0.27	0.54	3.98	85.98
Fuzhou	0.14	0.89	2.54	3.10	0.13	0.72	0.19	1.01	2.03	15.05	325.51
Xiamen	0.01	0.04	0.08	0.12	0.00	0.03	0.01	0.04	0.10	0.72	13.95
Nanping	0.07	0.46	1.33	1.62	0.07	0.38	0.10	0.53	1.06	7.88	170.32
Zhangzhou	0.08	0.52	1.33	1.69	0.07	0.42	0.12	0.57	1.20	8.82	186.39
Sanming	0.08	0.52	1.50	1.82	0.08	0.42	0.11	0.60	1.20	8.86	191.64
Longyan	0.07	0.42	1.19	1.45	0.06	0.34	0.09	0.47	0.95	7.07	152.82
Quanzhou	0.06	0.37	1.05	1.28	0.05	0.30	0.08	0.42	0.84	6.24	134.90
Nanchang	0.48	2.95	9.58	11.02	0.47	2.45	0.56	3.49	6.73	50.09	1110.63
Jingdezhen	0.01	0.09	0.12	0.20	0.01	0.06	0.02	0.08	0.19	1.50	26.70
Yingtian	0.01	0.05	0.07	0.12	0.00	0.04	0.02	0.05	0.12	0.90	16.08



Xinyu	0.05	0.32	1.03	1.19	0.05	0.27	0.06	0.38	0.74	5.67	122.62
Ganzhou	0.51	3.10	10.48	11.93	0.50	2.59	0.57	3.73	7.10	52.55	1187.76
Jiujiang	0.41	2.44	7.19	8.45	0.34	2.02	0.51	2.74	5.59	43.85	911.74
Fuzhou	0.51	3.09	10.55	11.97	0.51	2.60	0.56	3.75	7.12	52.57	1191.71
Shangrao	0.65	3.96	13.11	15.01	0.64	3.31	0.74	4.74	9.08	67.42	1508.22
Pingxiang	0.11	0.68	2.17	2.53	0.11	0.57	0.13	0.80	1.56	11.58	258.21
Ji'an	0.75	4.55	15.15	17.34	0.73	3.80	0.85	5.45	10.43	77.24	1735.41
Yichun	0.07	0.51	0.73	1.20	0.05	0.38	0.15	0.46	1.14	9.02	159.50
Jinan	0.58	2.84	7.49	8.31	0.25	2.37	0.40	2.49	5.38	47.76	1092.38
Qingdao	0.77	3.99	9.67	11.25	0.35	3.27	0.65	3.49	7.69	66.51	1479.70
Zibo	0.33	1.60	4.25	4.68	0.14	1.34	0.22	1.39	2.99	26.61	612.07
Zaozhuang	0.37	1.85	4.60	5.28	0.17	1.51	0.28	1.65	3.61	31.41	712.14
Dongying	0.26	1.21	3.55	3.73	0.11	1.05	0.19	1.13	2.46	23.31	485.36
Yantai	0.54	2.92	6.66	8.13	0.25	2.38	0.54	2.56	5.72	48.10	1040.79
Weifang	1.05	5.17	13.41	14.97	0.45	4.30	0.76	4.51	9.81	86.85	1964.81
Jining	1.01	4.95	13.02	14.53	0.46	4.10	0.75	4.49	9.76	86.51	1930.85
Taian	0.65	3.28	8.17	9.37	0.29	2.70	0.51	2.87	6.30	54.85	1232.35
Weihai	0.24	1.34	2.92	3.66	0.12	1.08	0.26	1.18	2.66	22.10	472.58
Rizhao	0.25	1.41	3.05	3.81	0.13	1.12	0.27	1.26	2.83	23.68	505.75
Laiwu	0.06	0.31	0.81	0.93	0.02	0.27	0.05	0.26	0.57	4.92	108.23
Linyi	1.02	5.59	12.50	15.43	0.52	4.47	1.03	5.07	11.33	94.79	2047.66
Dezhou	1.41	6.73	18.08	19.66	0.60	5.62	0.91	5.91	12.76	115.34	2635.59
Liaocheng	1.11	5.38	14.20	15.64	0.48	4.48	0.75	4.72	10.21	91.36	2086.69
Binzhou	0.71	3.38	9.33	10.05	0.30	2.86	0.48	3.00	6.49	59.36	1322.43
Heze	1.40	6.75	17.33	19.29	0.63	5.53	0.99	6.11	13.45	120.89	2691.99
Zhengzhou	0.38	1.97	4.69	5.51	0.18	1.60	0.32	1.75	3.88	33.39	744.65
Kaifeng	0.86	4.41	10.42	12.26	0.44	3.50	0.70	4.05	8.94	76.86	1717.98
Luoyang	0.49	2.48	6.06	7.13	0.23	2.03	0.40	2.24	4.91	41.89	946.12
Pingdingshan	0.46	2.35	5.60	6.59	0.22	1.90	0.38	2.10	4.65	39.91	896.96
Anyang	0.64	3.28	7.76	9.12	0.33	2.61	0.52	3.01	6.65	57.22	1278.89
Hebi	0.20	1.01	2.40	2.82	0.10	0.81	0.16	0.93	2.06	17.70	395.56
Xinxiang	0.69	3.57	8.44	9.93	0.36	2.84	0.57	3.28	7.24	62.25	1391.43
Jiaozuo	0.43	2.19	5.18	6.09	0.22	1.74	0.35	2.01	4.44	38.17	853.19
Puyang	0.48	2.49	5.89	6.92	0.25	1.98	0.39	2.29	5.05	43.40	970.11
Xuchang	0.57	2.95	6.98	8.21	0.30	2.35	0.47	2.71	5.99	51.49	1150.90
Luohe	0.37	1.78	4.47	5.04	0.17	1.44	0.25	1.60	3.51	31.05	708.81
Sanmenxia	0.13	0.64	1.55	1.88	0.06	0.53	0.10	0.60	1.33	11.02	256.06
Nanyang	1.52	8.16	17.53	21.87	0.81	6.38	1.48	7.52	17.01	143.47	3104.69
Shangqiu	1.45	7.13	17.09	19.87	0.69	5.71	1.06	6.50	14.41	125.45	2856.67
Xinyang	0.94	5.53	14.85	17.67	0.76	4.38	1.02	5.93	12.26	96.63	2112.64
Zhoukou	1.39	7.15	16.91	19.88	0.72	5.68	1.13	6.57	14.50	124.67	2786.72

Zhumadian	1.23	6.35	15.02	17.67	0.64	5.05	1.01	5.84	12.88	110.77	2475.88
Wuhan	0.36	2.16	6.24	7.42	0.29	1.78	0.43	2.39	4.84	37.10	802.70
Huangshi	0.18	1.11	3.07	3.70	0.15	0.90	0.23	1.20	2.46	18.85	403.46
Shiyan	0.38	2.10	5.05	6.28	0.21	1.72	0.41	2.00	4.35	34.76	759.24
Jingzhou	1.14	6.80	19.66	23.20	0.96	5.54	1.35	7.57	15.37	119.21	2552.65
Yichang	0.55	3.19	8.19	9.91	0.34	2.63	0.64	3.11	6.61	52.85	1125.87
Xiangyang	1.40	7.44	20.08	22.94	0.90	5.98	1.18	7.47	15.64	130.37	2925.44
Ezhou	0.10	0.62	1.72	2.09	0.09	0.50	0.13	0.69	1.40	10.63	226.00
Jingmen	0.78	4.57	12.68	15.10	0.61	3.70	0.88	4.94	10.15	79.24	1722.72
Xiaogan	0.58	3.47	10.24	11.97	0.50	2.82	0.66	3.91	7.85	60.80	1322.68
Huanggang	0.91	5.66	15.60	18.88	0.78	4.56	1.18	6.22	12.75	97.63	2060.72
Xianning	0.28	1.68	4.95	5.85	0.23	1.39	0.33	1.86	3.73	28.30	617.42
Suizhou	0.39	2.20	6.41	7.37	0.31	1.78	0.38	2.41	4.87	38.73	862.15
Enshi	0.51	2.94	7.25	8.96	0.27	2.46	0.60	2.72	5.88	46.76	1002.61
Changsha	0.64	3.86	13.09	14.75	0.61	3.25	0.70	4.58	8.73	65.50	1472.10
Zhuzhou	0.46	2.76	9.52	10.68	0.45	2.32	0.49	3.31	6.27	46.85	1057.13
Xiangtan	0.37	2.22	7.87	8.72	0.37	1.88	0.39	2.69	5.04	37.74	855.14
Hengyang	0.93	5.71	18.02	20.88	0.87	4.73	1.10	6.62	12.91	96.88	2130.83
Shaoyang	1.14	7.07	19.43	23.57	0.92	5.78	1.47	7.56	15.49	118.05	2518.86
Yueyang	0.87	5.24	17.12	19.48	0.80	4.38	0.96	6.07	11.71	88.41	1967.37
Changde	1.18	7.29	21.74	25.60	1.04	5.99	1.44	8.17	16.25	122.91	2666.98
Zhangjiajie	0.21	1.25	3.37	4.06	0.14	1.04	0.25	1.26	2.61	20.35	439.04
Yiyang	0.70	4.28	13.52	15.58	0.65	3.54	0.82	4.92	9.59	72.29	1587.91
Chenzhou	0.53	3.12	9.93	11.40	0.45	2.63	0.58	3.52	6.89	52.20	1163.96
Yongzhou	0.85	5.03	16.50	18.87	0.75	4.25	0.92	5.84	11.28	84.71	1909.31
Huaihua	0.56	3.33	10.14	11.71	0.44	2.79	0.63	3.61	7.16	55.11	1210.78
Loudi	0.45	2.57	8.68	9.69	0.37	2.20	0.44	2.92	5.60	42.79	972.34
Guangzhou	0.04	0.23	0.76	0.89	0.04	0.22	0.06	0.31	0.63	4.17	96.45
Shenzhen	0.00	0.02	0.05	0.07	0.00	0.02	0.00	0.02	0.05	0.33	7.18
Zhuhai	0.03	0.15	0.43	0.52	0.02	0.13	0.04	0.18	0.36	2.60	56.55
Dongguan	0.00	0.01	0.02	0.03	0.00	0.01	0.00	0.01	0.02	0.15	2.94
Foshan	0.08	0.46	1.30	1.59	0.07	0.40	0.11	0.54	1.10	7.90	172.13
Zhongshan	0.04	0.23	0.65	0.79	0.03	0.20	0.05	0.27	0.55	3.96	86.21
Huizhou	0.06	0.41	1.11	1.38	0.06	0.33	0.09	0.46	0.94	6.94	147.20
Shantou	0.05	0.34	0.89	1.10	0.05	0.27	0.07	0.37	0.75	5.65	118.09
Jiangmen	0.11	0.65	2.16	2.48	0.11	0.56	0.13	0.79	1.53	11.18	250.58
Maoming	0.21	1.25	3.54	4.32	0.18	1.08	0.29	1.46	3.01	21.51	468.70
Zhaoqing	0.16	0.93	2.62	3.20	0.13	0.80	0.22	1.08	2.23	15.96	347.73
Zhanjiang	0.33	1.52	4.18	5.36	0.25	1.65	0.52	2.16	4.74	28.77	658.73
Meizhou	0.10	0.60	1.70	2.07	0.09	0.52	0.14	0.70	1.44	10.32	224.85
Shanwei	0.06	0.38	1.07	1.30	0.05	0.33	0.09	0.44	0.91	6.49	141.39

Heyuan	0.05	0.30	0.85	1.04	0.04	0.26	0.07	0.35	0.72	5.17	112.71
Qingyuan	0.10	0.60	1.70	2.08	0.09	0.52	0.14	0.70	1.45	10.37	225.96
Shaoguan	0.08	0.48	1.36	1.67	0.07	0.42	0.11	0.56	1.16	8.30	180.87
Jieyang	0.09	0.54	1.53	1.86	0.08	0.47	0.13	0.63	1.30	9.28	202.20
Yangjiang	0.11	0.66	1.87	2.29	0.10	0.57	0.15	0.77	1.59	11.40	248.37
Chaozhou	0.04	0.21	0.59	0.72	0.03	0.18	0.05	0.24	0.50	3.59	78.23
Yunfu	0.08	0.48	1.36	1.66	0.07	0.42	0.11	0.56	1.16	8.28	180.52
Nanning	0.84	3.73	11.56	13.93	0.59	4.10	1.14	5.17	11.04	68.74	1632.99
Guilin	0.47	2.77	8.77	10.23	0.41	2.36	0.54	3.23	6.35	46.83	1053.52
Liuzhou	0.35	1.38	4.56	5.53	0.26	1.73	0.52	2.25	4.87	27.45	676.80
Wuzhou	0.26	1.16	3.66	4.38	0.19	1.27	0.35	1.63	3.46	21.51	509.20
Qinzhou	0.43	1.93	6.05	7.26	0.32	2.10	0.59	2.70	5.72	35.61	842.76
Beihai	0.33	1.48	4.66	5.59	0.24	1.62	0.45	2.08	4.41	27.45	649.55
Yulin	0.55	2.47	7.76	9.31	0.41	2.69	0.75	3.46	7.34	45.68	1081.06
Guigang	0.43	2.38	7.31	8.62	0.36	2.16	0.54	2.88	5.84	41.08	925.00
Fangchenggang	0.16	0.70	2.20	2.64	0.12	0.76	0.21	0.98	2.08	12.95	306.61
Baise	0.35	1.58	4.95	5.94	0.26	1.72	0.48	2.21	4.68	29.14	689.62
Chongzuo	0.32	1.46	4.59	5.51	0.24	1.59	0.44	2.05	4.34	27.04	639.96
Laibin	0.48	1.60	5.08	6.47	0.32	2.32	0.76	2.94	6.63	34.24	865.80
Hezhou	0.22	0.98	3.08	3.69	0.16	1.07	0.30	1.37	2.91	18.10	428.42
Hechi	0.30	1.36	4.28	5.13	0.22	1.49	0.41	1.91	4.05	25.20	596.37
Haikou	0.06	0.39	1.11	1.35	0.06	0.33	0.09	0.45	0.92	6.72	143.69
Sanya	0.02	0.12	0.38	0.45	0.02	0.10	0.02	0.14	0.28	2.10	45.64
Chongqing	3.19	18.70	50.13	61.50	2.20	15.51	3.79	19.38	40.31	308.67	6743.70
Chengdu	0.51	3.01	8.08	9.81	0.39	2.43	0.59	3.21	6.65	51.33	1118.08
Zigong	2.79	16.11	42.20	51.22	1.89	13.16	3.12	16.43	34.48	270.38	5906.66
Panzhihua	0.07	0.38	1.01	1.22	0.05	0.31	0.07	0.39	0.82	6.45	140.83
Luzhou	0.37	2.11	5.54	6.72	0.25	1.73	0.41	2.16	4.53	35.49	775.38
Deyang	0.44	2.48	6.53	7.80	0.31	1.98	0.45	2.57	5.38	42.78	944.20
Mianyang	0.56	3.18	7.89	9.67	0.37	2.55	0.61	3.18	6.80	54.25	1178.83
Guangyuan	0.22	1.27	3.32	4.03	0.15	1.04	0.25	1.29	2.71	21.28	464.87
Suining	0.31	1.80	4.72	5.73	0.21	1.47	0.35	1.84	3.85	30.23	660.40
Neijiang	0.42	2.42	6.33	7.68	0.28	1.97	0.47	2.46	5.17	40.55	885.76
Leshan	0.31	1.79	4.68	5.68	0.21	1.46	0.35	1.82	3.83	30.00	655.44
Nanchong	0.71	4.10	10.75	13.05	0.48	3.35	0.80	4.19	8.78	68.87	1504.47
Yibin	0.47	2.74	7.17	8.70	0.32	2.24	0.53	2.79	5.86	45.94	1003.53
Guangan	0.35	2.03	5.31	6.45	0.24	1.66	0.39	2.07	4.34	34.03	743.52
Dazhou	0.64	3.67	9.62	11.67	0.43	3.00	0.71	3.74	7.86	61.61	1345.91
Meishan	0.34	1.98	5.18	6.28	0.23	1.61	0.38	2.02	4.23	33.16	724.43
Yaan	0.10	0.57	1.55	1.87	0.06	0.48	0.11	0.58	1.21	9.44	210.11
Bazhong	0.19	1.07	2.80	3.39	0.13	0.87	0.21	1.09	2.28	17.91	391.22

Ziyang	0.56	3.20	8.38	10.18	0.38	2.61	0.62	3.26	6.85	53.71	1173.37
Guiyang	0.21	1.21	2.73	3.48	0.11	1.00	0.26	1.11	2.48	19.69	414.75
Liupanshui	0.11	0.64	1.81	2.12	0.08	0.54	0.12	0.66	1.35	10.56	232.16
Zunyi	0.54	3.27	7.85	9.89	0.36	2.66	0.70	3.22	6.94	53.98	1132.00
Anshun	0.13	0.82	1.72	2.29	0.08	0.66	0.19	0.76	1.71	13.40	274.43
Bijie	0.43	2.53	6.50	7.94	0.28	2.09	0.52	2.53	5.34	41.67	892.30
Tongren	0.30	1.78	4.24	5.32	0.18	1.46	0.38	1.71	3.72	29.17	615.58
Kunming	0.26	1.32	3.66	4.32	0.12	1.14	0.23	1.25	2.62	21.00	484.79
Qujing	0.67	3.71	9.03	11.35	0.33	3.12	0.75	3.45	7.52	59.41	1295.23
Yuxi	0.17	0.83	2.34	2.74	0.08	0.77	0.17	0.85	1.81	13.56	313.37
Baoshan	0.33	1.65	4.80	5.69	0.19	1.53	0.35	1.79	3.75	27.45	635.87
Zhaotong	0.39	1.99	5.66	6.49	0.16	1.75	0.33	1.79	3.75	30.86	714.32
Lijiang	0.10	0.52	1.41	1.76	0.06	0.45	0.10	0.54	1.15	8.72	204.85
Pu'er	0.30	1.44	4.36	5.03	0.16	1.40	0.31	1.58	3.32	24.02	567.66
Lincang	0.37	1.44	4.22	5.15	0.19	1.69	0.46	1.93	4.30	26.49	651.98
Lhasa	0.02	0.10	0.20	0.25	0.01	0.07	0.02	0.10	0.22	1.91	42.33
Qamdo	0.01	0.04	0.09	0.11	0.00	0.03	0.01	0.04	0.09	0.76	17.08
Shannan	0.02	0.11	0.21	0.27	0.01	0.08	0.02	0.11	0.24	2.05	45.86
Xigaze	0.02	0.14	0.24	0.35	0.01	0.10	0.03	0.13	0.31	2.45	52.58
Nyingchi	0.01	0.05	0.12	0.14	0.01	0.04	0.01	0.05	0.12	1.01	22.80
Weinan	0.57	2.78	7.39	8.15	0.24	2.33	0.41	2.46	5.36	48.16	1076.19
Yan'an	0.16	0.78	2.23	2.54	0.05	0.70	0.13	0.67	1.42	11.86	276.58
Hanzhong	0.23	1.37	3.51	4.28	0.16	1.11	0.27	1.38	2.90	22.77	489.30
Yulin	0.26	1.30	3.56	4.19	0.09	1.16	0.23	1.14	2.44	19.99	460.28
Ankang	0.18	1.03	2.49	3.08	0.10	0.84	0.20	0.98	2.12	16.95	365.09
Shangluo	0.13	0.66	1.75	2.01	0.05	0.56	0.10	0.58	1.26	10.62	247.28
Baoji	0.36	1.72	4.50	4.99	0.16	1.42	0.23	1.51	3.27	29.04	673.76
Xianyang	0.48	2.34	6.13	6.80	0.21	1.95	0.32	2.04	4.40	39.04	899.32
Tongchuan	0.06	0.32	0.87	0.96	0.02	0.27	0.05	0.27	0.58	5.05	115.97
Xi'an	0.44	2.15	5.75	6.29	0.19	1.80	0.29	1.86	4.00	35.82	828.43
Lanchow	0.14	0.73	1.62	2.05	0.07	0.59	0.14	0.66	1.49	12.25	267.60
Jiayuguan	0.00	0.02	0.06	0.07	0.00	0.02	0.00	0.02	0.04	0.33	7.96
Jinchang	0.09	0.49	1.14	1.37	0.04	0.40	0.08	0.44	0.98	8.35	185.54
Baiyin	0.25	1.33	3.25	3.89	0.11	1.12	0.24	1.16	2.54	21.23	467.08
Tianshui	0.38	2.06	4.67	5.79	0.18	1.68	0.39	1.83	4.09	33.94	737.11
Wuwei	0.38	2.03	4.89	5.94	0.16	1.71	0.39	1.77	3.92	32.64	701.25
Zhangye	0.39	2.05	4.85	5.87	0.17	1.69	0.37	1.81	4.01	33.63	736.30
Pingliang	0.34	1.83	4.18	5.12	0.16	1.48	0.33	1.63	3.64	30.45	669.34
Qiuquan	0.15	0.69	1.98	2.18	0.06	0.60	0.12	0.65	1.43	12.95	274.89
Qingyang	0.52	2.73	6.73	7.95	0.22	2.29	0.48	2.37	5.20	44.00	973.34
Dingxi	0.46	2.65	5.77	7.38	0.21	2.17	0.55	2.30	5.19	42.32	886.14

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Longnan	0.29	1.60	3.46	4.37	0.14	1.28	0.30	1.44	3.25	27.01	582.91
Xining	0.07	0.45	0.65	1.04	0.04	0.33	0.11	0.41	0.99	7.86	151.89
Haidong	0.11	0.74	1.01	1.69	0.07	0.54	0.19	0.67	1.62	12.71	239.80
Yinchuan	0.10	0.54	1.69	1.85	0.06	0.47	0.08	0.52	1.04	8.63	198.38
Shizuishan	0.07	0.38	1.07	1.20	0.03	0.33	0.06	0.33	0.69	5.85	131.65
Wuzhong	0.17	0.92	2.32	2.74	0.08	0.77	0.17	0.80	1.73	14.43	312.22
Guyuan	0.26	1.73	2.74	4.23	0.15	1.31	0.44	1.54	3.66	28.64	547.41
Zhongwei	0.14	0.82	1.78	2.28	0.07	0.67	0.17	0.71	1.60	12.97	267.63
Urumqi	0.06	0.35	0.69	0.96	0.04	0.27	0.08	0.34	0.76	6.00	119.45
Karamay	0.02	0.09	0.27	0.28	0.01	0.08	0.02	0.09	0.20	1.99	35.45
Turpan	0.04	0.15	0.51	0.49	0.01	0.14	0.03	0.15	0.35	3.75	62.86
Hami	0.08	0.37	1.02	1.08	0.04	0.31	0.08	0.37	0.86	8.42	156.57

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**Table S6. Monthly coefficients of pollutant emissions in different regions.**

Regions	Crops	Month											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Northeast China	Rice	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.292	0.292	0.042	0.042
	Wheat	0.042	0.042	0.042	0.042	0.042	0.042	0.292	0.292	0.042	0.042	0.042	0.042
	Corn	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.292	0.292	0.042	0.042
	Legume	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.292	0.292	0.042	0.042
	Tuber crop	0.042	0.042	0.042	0.042	0.042	0.208	0.208	0.208	0.042	0.042	0.042	0.042
	Oil plant	0.042	0.042	0.042	0.042	0.042	0.042	0.292	0.292	0.042	0.042	0.042	0.042
	Cotton	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.208	0.208	0.208	0.042
	Sugarcane	0.142	0.142	0.142	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.142	0.142
	Fiber crop	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.292	0.292	0.042	0.042
North China	Rice	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.292	0.292	0.042	0.042
	Wheat	0.042	0.042	0.042	0.042	0.042	0.292	0.292	0.042	0.042	0.042	0.042	0.042
	Corn	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.292	0.292	0.042
	Legume	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.208	0.208	0.208	0.042
	Tuber crop	0.042	0.042	0.042	0.042	0.042	0.167	0.167	0.042	0.042	0.167	0.167	0.042
	Oil plant	0.042	0.042	0.042	0.042	0.042	0.292	0.292	0.042	0.042	0.042	0.042	0.042
	Cotton	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.292	0.292	0.042
	Sugarcane	0.142	0.142	0.142	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.142	0.142
	Fiber crop	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.292	0.292	0.042	0.042
Northwest China	Rice	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.208	0.208	0.208	0.042	0.042
	Wheat	0.042	0.042	0.042	0.042	0.042	0.208	0.208	0.208	0.042	0.042	0.042	0.042
	Corn	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.208	0.208	0.208	0.042
	Legume	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.292	0.292	0.042	0.042
	Tuber crop	0.042	0.042	0.042	0.042	0.042	0.167	0.167	0.042	0.042	0.167	0.167	0.042
	Oil plant	0.042	0.042	0.042	0.042	0.042	0.292	0.292	0.042	0.042	0.042	0.042	0.042
	Cotton	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.292	0.292	0.042	0.042
	Sugarcane	0.142	0.142	0.142	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.142	0.142
	Fiber crop	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.292	0.292	0.042	0.042
the middle and lower reaches of Yangtze River	Rice	0.042	0.042	0.042	0.042	0.042	0.208	0.208	0.042	0.042	0.208	0.042	0.042
	Wheat	0.042	0.042	0.042	0.042	0.292	0.292	0.042	0.042	0.042	0.042	0.042	0.042
	Corn	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.208	0.208	0.208	0.042	0.042
	Legume	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.292	0.292	0.042
	Tuber crop	0.042	0.042	0.042	0.042	0.167	0.167	0.042	0.042	0.042	0.167	0.167	0.042
	Oil plant	0.042	0.042	0.042	0.042	0.292	0.292	0.042	0.042	0.042	0.042	0.042	0.042
	Cotton	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.292	0.292	0.042
	Sugarcane	0.167	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.167	0.167	0.167
	Fiber crop	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.292	0.292	0.042	0.042
Southwest	Rice	0.042	0.042	0.042	0.042	0.042	0.167	0.167	0.042	0.167	0.167	0.042	0.042

China	Wheat	0.042	0.042	0.042	0.042	0.542	0.042	0.042	0.042	0.042	0.042	0.042	0.042
	Corn	0.042	0.042	0.042	0.042	0.042	0.042	0.208	0.208	0.208	0.042	0.042	0.042
	Legume	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.292	0.292	0.042
	Tuber crop	0.042	0.042	0.042	0.042	0.167	0.167	0.042	0.042	0.042	0.167	0.167	0.042
	Oil plant	0.042	0.042	0.042	0.042	0.292	0.292	0.042	0.042	0.042	0.042	0.042	0.042
	Cotton	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.292	0.292	0.042
	Sugarcane	0.125	0.125	0.125	0.125	0.042	0.042	0.042	0.042	0.042	0.042	0.125	0.125
	Fiber crop	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.292	0.292	0.042	0.042
South China	Rice	0.042	0.042	0.042	0.042	0.142	0.142	0.142	0.042	0.042	0.042	0.142	0.142
	Wheat	0.042	0.042	0.042	0.292	0.292	0.042	0.042	0.042	0.042	0.042	0.042	0.042
	Corn	0.042	0.042	0.042	0.042	0.042	0.167	0.167	0.042	0.167	0.167	0.042	0.042
	Legume	0.042	0.042	0.042	0.042	0.042	0.292	0.042	0.042	0.042	0.042	0.292	0.042
	Tuber crop	0.042	0.042	0.042	0.042	0.167	0.167	0.042	0.042	0.042	0.167	0.167	0.042
	Oil plant	0.042	0.042	0.042	0.042	0.292	0.292	0.042	0.042	0.042	0.042	0.042	0.042
	Cotton	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.208	0.208	0.208
	Sugarcane	0.142	0.142	0.142	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.142	0.142
Fiber crop	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.208	0.208	0.208	0.042	

**Table S7. Parameters for uncertainty analysis on EFs.**

Pollutants	Crops	Samples	Mean (g kg <sup>-1</sup> )	Standard Deviation (SD)	Coefficients of variation (CV, %)
BC	Rice	5	0.58	0.14	24
	Wheat	4	0.68	0.17	26
	Corn	5	0.75	0.14	19
	Others	7	0.63	0.13	20
CO	Rice	6	59.20	15.63	26
	Wheat	3	62.20	2.38	4
	Corn	3	54.50	12.25	22
	Others	9	80.59	16.34	20
CO <sub>2</sub>	Rice	4	1355.95	273.87	20
	Wheat	4	1455.38	86.10	6
	Corn	3	1257.17	77.63	6
	Others	7	1445.09	143.69	10
OC	Rice	4	3.50	2.54	73
	Wheat	3	3.15	0.49	15
	Corn	4	3.71	1.42	38
	Others	5	4.80	0.96	20
NMVOC	Rice	3	7.95	1.40	18
	Wheat	3	6.79	2.45	36
	Corn	4	6.19	2.71	44
	Others	4	10.60	3.12	29



## Supplementary References

- [1] Akagi, S. K., Yokelson, R. J., Wiedinmyer, C., Alvarado, M. J., Reid, J. S., Karl, T., Crounse, J. D., and Wennberg, P. O.: Emission factors for open and domestic biomass burning for use in atmospheric models, *Atmos. Chem. Phys.*, 11, 4039–4072, doi: 10.5194/acp-11-4039-2011, 2011.
- 5 [2] Bond, T. C., Streets, D. G., and Yarber, K. F.: A technology-based global inventory of black and organic carbon emissions from combustion, *J. Geophys. Res.*, 109, doi: 10.1029/2003jd003697, 2004.
- [3] Cao, G., Zhang, X., and Wang, Y.: Inventory on Black Carbon Emission from China, *Adv. Clim. Chang. Res.*, 2, 259–264, 2006 (in Chinese).
- [4] Cao, G., Zhang, X., Wang, Y., and Zheng, F.: Estimation of emissions from field burning of crop straw in China, *Sci. Bull.*, 53, 784–
- 10 790, doi: 10.1007/s11434-008-0145-4, 2008.
- [5] Habib, G., Venkataraman, C., Shrivastava, M., Banerjee, R., Stehr, J. W., and Dickerson, R. R.: New methodology for estimating biofuel consumption for cooking: Atmospheric emissions of black carbon and sulfur dioxide from India, *Global Biogeochem. Cy.*, 18, GB3007, doi: 10.1029/2003gb002157, 2004.
- [6] Huang, X., Li, M., Li, J., and Song, Y.: A high-resolution emission inventory of crop burning in fields in China based on MODIS
- 15 Thermal Anomalies/Fire products, *Atmos. Environ.*, 50, 9–15, doi: 10.1016/j.atmosenv.2012.01.017, 2012.
- [7] Li, X., Wang, S., and Duan, L.: Carbonaceous Aerosol Emissions from Household Biofuel Combustion in China, *Environ. Sci. Technol.*, 43, 6076–6081, 2009.
- [8] Liousse, C., Penner, J. E., Chuang, C., Walton, J. J., Eddleman, H., and Cachier, H.: A global three-dimensional model study of carbonaceous aerosols, *J. Geophys. Res.*, doi: 10.1029/95jd03426, 1996.
- 20 [9] Lu, B., Kong, S., and Han, B.: Inventory of atmospheric pollutants discharged from biomass burning in China continent in 2007, *China Environmental Science*, 31, 186–194, 2011 (in Chinese).
- [10] Peng, L., Zhang, Q., and HE, K.: Emissions inventory of atmospheric pollutants from open burning of crop residues in China based on a National Questionnaire, *Res. Environ. Sci.*, 29, doi: 1109–1118, 2016 (in Chinese).
- [11] Qin, Y., and Xie, S. D.: Spatial and temporal variation of anthropogenic black carbon emissions in China for the period 1980–2009,
- 25 *Atmos. Chem. Phys.*, 12, 4825–4841, doi: 10.5194/acp-12-4825-2012, 2012.
- [12] Reddy, S. M. and Venkataraman, C.: Inventory of aerosol and sulphur dioxide emissions from India: Part II – biomass combustion, *Atmos. Environ.*, 36, 699–712, 2002.
- [13] Shen, G., Xue, M., Chen, Y., Yang, C., Li, W., Shen, H., Huang, Y., Zhang, Y., Chen, H., Zhu, Y., Wu, H., Ding, A., and Tao, S.: Comparison of carbonaceous particulate matter emission factors among different solid fuels burned in residential stoves, *Atmos. Environ.*,
- 30 89, 337–345, doi: 10.1016/j.atmosenv.2014.01.033, 2014.
- [14] Streets, D. G., Gupta, S., and Waldhoff, S. T.: Black carbon emissions in China, *Atmos. Environ. Res.*, 35, 4281–4296, 2001.
- [15] Streets, D. G., Yarber, K. F., Woo, J.-H., and Carmichael, G. R.: Biomass burning in Asia: Annual and seasonal estimates and atmospheric emissions, *Global Biogeochem. Cy.*, 17, 1099, doi:10.1029/2003GB002040, 2003.
- [16] Tang, X., Huang, C., and Lou, S.: Emission factor and PM chemical composition study of biomass burning in the Yangtze River
- 35 Delta Reigon, *Environmental Science*, 35, 1623–1632, 2014 (in Chinese).

- [17] Tian, H., Zhao, D., and Wang, Y.: Emission inventories of atmospheric pollutants discharged from biomass burning in China, *Acta. Sci. Circum.*, 31, 349–357, 2011 (in Chinese).
- [18] Wang, S., and Zhang, C.: Spatial and temporal distribution of air pollutant emissions from open burning of crop residues in China, *Sciencepaper Online*, 3, 329–333, 2008 (in Chinese).
- 5 [19] Wei, M., Wang, X., and Xie, G.: Maturity date of main field crop residues in different regions of China, *Journal of China Agricultural University*, 17, 20–31, 2012 (in Chinese).
- [20] Wei, W., Wang, S., Chatani, S., Klimont, Z., Cofala, J., and Hao, J.: Emission and speciation of non-methane volatile organic compounds from anthropogenic sources in China, *Atmos. Environ.*, 42, 4976–4988, 2008.
- [21] Zhang, H., Hu, J., Qi, Y., Li, C., Chen, J., Wang, X., He, J., Wang, S., Hao, J., Zhang, L., Zhang, L., Zhang, Y., Li, R., Wang, S., and  
10 Chai, F.: Emission characterization, environmental impact, and control measure of PM<sub>2.5</sub> emitted from agricultural crop residue burning in China, *Journal of Cleaner Production. Res.*, 149, 629–635, doi: 10.1016/j.jclepro.2017.02.092, 2017.
- [22] Zhang, H., Ye, X., Cheng, T., Chen, J., Yang, X., Wang, L., and Zhang, R.: A laboratory study of agricultural crop residue combustion in China: Emission factors and emission inventory, *Atmos. Environ.*, 42, 8432–8441, doi: 10.1016/j.atmosenv.2008.08.015, 2008.
- 15 [23] Zhang, J., Smith, K. R., Ma, Y., Ye, S., Jiang, F., Qi, W., Liu, P., Khalil, M. A. K., Rasmussen, R. A., and Thorneloe, S. A.: Greenhouse gases and other airborne pollutants from household stoves in China: a database for emission factors, *Atmos. Environ.*, 34, 4537–4549, 2000.
- [24] Zhang, N., Qin, Y., and Xie, S.: Spatial distribution of black carbon emissions in China, *Chinese Science Bulletin*, 58, 1855–1864, doi:10.1007/s11434-013-5820-4, 2013a (in Chinese).
- 20 [25] Zhang, Y., Shao, M., Lin, Y., Luan, S., Mao, N., Chen, W., and Wang, M.: Emission inventory of carbonaceous pollutants from biomass burning in the Pearl River Delta Region, China, *Atmos. Environ.*, 76, 189–199, doi: 10.1016/j.atmosenv.2012.05.055, 2013b.
- [26] Zhou, J., Wu, H., and Ding, S.: Analysis of seasonal variation in crop residue harvest and sustainability of its energy supply, *Resour. Sci.*, 33, 1537–1545, 2011 (in Chinese).
- [27] Zhu, J., Wang, T., Deng, J., Jiang, A., and Liu, D.: An emission inventory of air pollutants from crop residue burning in Yangtze  
25 River Delta Region and its application in simulation of a heavy haze weather process, *Acta Scientiae Circumstantiae*, 32, 3045–3055, 2012 (in Chinese).
- [28] Zhu, S. L.: Study on emission factors of GHG and pollutants from rural stoves in developing countries, *Renewable Energy*, 114, 16–19, 2004 (in Chinese).