

Supplementary Material: An integrated quantitative method based on ArcGIS evaluating the contribution of rural straw open burning to urban fine particulate pollution

Xin Wen¹, Weiwei Chen^{1*}, Pingyu Zhang¹, Jie Chen², Guoqing Song³

¹ Northeast Institute of Geography and Agroecology, Chinese Academy of Sciences, Changchun 130102, China

² National Satellite Meteorological Center, Beijing 100081, China

³ School of Biological and Agricultural Engineering, Jilin University, Changchun 130022, China

Here additional table and figures are presented that should help the reader to better understand the facts presented in the article in addition to the figures and tables already present in the article itself.

Supplement 1

Supplement Figure S1 shows the procedure for identifying potential SOB sources of PE III1.

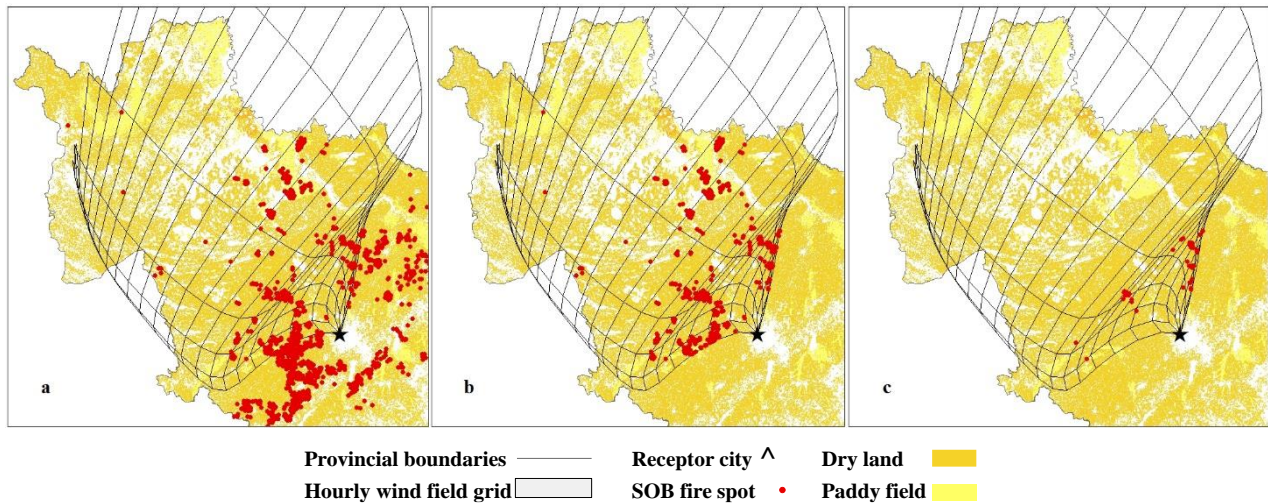


Figure S1. Schematic of identifying potential straw open burning sources.

Note: Fire spots in Figure 4a are SOB-caused fire occurred on April 6-7 in province-wide farmland, that is, the satellite wildfire data with acquisition time of April 6-7 extracted by the spatial distribution of farmland. Fire spots in Figure 4b are SOB-caused fire occurred on April 6-7 in PE III1's HWFGs, that is, SOB-caused fire with acquisition time of April 6-7 extracted by the spatial scope of HWFGs during PEIII1. Fire spots in Figure 4c are SOB-caused fire whose burning time are during the air mass passing through, that is, SOB-caused fire whose acquisition time are within three hours before the pathway time of their located grids.

Supplement 2

Supplement Table S1 shows the computation table of PM_{2.5-inflow} contribution to urban hourly average PM_{2.5} concentration.

Table S1. Computation table of PM_{2.5-inflow} contribution to urban hourly average PM_{2.5} concentration.

Periods	PM _{2.5-inflow} concentration	The urban hourly average concentration	Contribution to $\overline{C_{rc}}$ during 1 st hour of residence time	Contribution to $\overline{C_{rc}}$ during the 2 nd hour of residence time	Contribution to $\overline{C_{rc}}$ during the 3 rd hour of residence time	...	Contribution to $\overline{C_{rc}}$ during the m th period of residence time	...
---------	--	--	---	---	---	-----	---	-----

τ_1	$C_{n_{\tau 1}}$	$\overline{C_{rc}(\tau_1)}$	$\overline{C_{rc}(\tau_1)}_{C_{n_{\tau 1}}}$					
τ_2	$C_{n_{\tau 2}}$	$\overline{C_{rc}(\tau_2)}$	$\overline{C_{rc}(\tau_2)}_{C_{n_{\tau 2}}}$	$\overline{C_{rc}(\tau_2)}_{C_{n_{\tau 1}}}$				
τ_3	$C_{n_{\tau 3}}$	$\overline{C_{rc}(\tau_3)}$	$\overline{C_{rc}(\tau_3)}_{C_{n_{\tau 3}}}$	$\overline{C_{rc}(\tau_3)}_{C_{n_{\tau 2}}}$	$\overline{C_{rc}(\tau_3)}_{C_{n_{\tau 1}}}$			
\vdots	\vdots	\vdots	\vdots	\vdots	\vdots	\ddots		
τ_m	$C_{n_{\tau m}}$	$\overline{C_{rc}(\tau_m)}$	$\overline{C_{rc}(\tau_m)}_{C_{n_{\tau m}}}$	$\overline{C_{rc}(\tau_m)}_{C_{n_{\tau(m-1)}}}$	$\overline{C_{rc}(\tau_m)}_{C_{n_{\tau(m-2)}}}$...	$\overline{C_{rc}(\tau_m)}_{C_{n_{\tau 1}}}$	
\vdots	\vdots	\vdots	\vdots	\vdots	\vdots
τ_k	$C_{n_{\tau k}}$	$\overline{C_{rc}(\tau_k)}$	$\overline{C_{rc}(\tau_k)}_{C_{n_{\tau k}}}$	$\overline{C_{rc}(\tau_k)}_{C_{n_{\tau(k-1)}}}$	$\overline{C_{rc}(\tau_k)}_{C_{n_{\tau(k-2)}}}$

Supplement 3

Supplement Table S2 shows hourly and staged average contribution of straw open burning sources during PE II and PE III.

Table S2. Hourly and staged average contribution of straw open burning sources during PE II and PE III.

PE	Stage	Time (yyyy-mm-dd hh)	Hourly average			Staged average		
			Urban PM _{2.5} concentration	Contribution of straw open burning	Proportion of contribution of straw open burning	Urban PM _{2.5} concentration	Contribution of straw open burning	Proportion of contribution of straw open burning
PE II	Before	2021-04-07 17	44	0.0046	0.010%	55	0.15	0.27%
		2021-04-07 18	51	0.031	0.060%			
		2021-04-07 19	70	0.41	0.59%			
	During- 1st PS	2021-04-07 20	125	35	28%	233	116	50%
		2021-04-07 21	386	189	49%			
		2021-04-07 22	363	191	53%			
		2021-04-07 23	232	157	67%			
		2021-04-08 00	162	59	37%			
		2021-04-08 01	128	67	52%			
		2021-04-08 02	122	11	8.9%	356	35	9.8%
	During- 2nd PS	2021-04-08 03	318	57	18%			
		2021-04-08 04	598	82	14%			
		2021-04-08 05	488	25	5.2%			
	After	2021-04-08 06	252	0	0%	38	0	0%
		2021-04-08 07	54	0	0%			
		2021-04-08 08	21	0	0%			
PE III	Before	2021-04-08 14	29	0.090	0.31%	50	0.21	0.41%
		2021-04-08 15	48	0.11	0.23%			
		2021-04-08 16	55	0.14	0.26%			
		2021-04-08 17	58	0.33	0.58%			
		2021-04-08 18	61	0.36	0.58%			
	During- 1st PS	2021-04-08 19	88	0.38	0.43%	158	59	38%
		2021-04-08 20	115	2.4	2.1%			
		2021-04-08 21	136	6.1	4.5%			
		2021-04-08 22	129	19	15%			
		2021-04-08 23	124	24	20%			
		2021-04-09 00	128	33	26%			
		2021-04-09 01	132	62	47%			
		2021-04-09 02	150	67	45%			
		2021-04-09 03	161	75	47%			
		2021-04-09 04	175	111	64%			
		2021-04-09 05	189	122	65%			
		2021-04-09 06	213	136	64%			
		2021-04-09 07	244	145	59%			
	During- 2nd PS	2021-04-09 08	251	84	34%	117	9.4	8.0%
		2021-04-09 09	193	49	26%			
		2021-04-09 10	142	49	35%			
		2021-04-09 11	116	24	21%			
		2021-04-09 12	99	6.9	7.0%			
		2021-04-09 13	90	7.2	8.0%			
		2021-04-09 14	90	4.8	5.3%			
		2021-04-09 15	89	0.33	0.37%			
		2021-04-09 16	86	0.33	0.38%			

	2021-04-09	17	88	0.33	0.38%			
	2021-04-09	18	83	0	0%			
	2021-04-09	19	80	0	0%			
	2021-04-09	20	103	0	0%			
	2021-04-09	21	121	0	0%			
	2021-04-09	22	138	14	10%			
	2021-04-09	23	149	59	40%			
	2021-04-10	00	177	58	33%			
	2021-04-10	01	192	43	23%			
	2021-04-10	02	183	0.00	0%			
	2021-04-10	03	160	2.9	1.8%			
	2021-04-10	04	131	2.9	2.2%			
	2021-04-10	05	111	2.7	2.4%			
	2021-04-10	06	104	2.6	2.5%			
	2021-04-10	07	103	0.00	0%			
	2021-04-10	08	96	0.00	0%			
	2021-04-10	09	96	0.00	0%			
After	2021-04-10	10	75	0.00	0%	70	0	0%
	2021-04-10	11	64	0.00	0%			
