

Changes in China's anthropogenic emissions during the COVID-19 pandemic

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Table S1. China's monthly statistical data used in this study.

#	Data type	Sector	Data name	Spatial resolution	Temporal resolution	Data source
1	Fuel consumption	All	Natural gas	Country	Month	1
2	Fuel consumption	Power	Coal consumption from six major power companies	Country	Day	2
3	Industrial product	Power	Thermal power generation	Province	Month	3
4	Industrial product	Industry	Industrial value-added	Province	Month	3
5	Industrial product	Industry	Manufacturing purchasing manager's index	Country	Month	3
6	Industrial product	Industry	Iron	Province	Month	3
7	Industrial product	Industry	Crude steel	Province	Month	3
8	Industrial product	Industry	Cement	Province	Month	3
9	Industrial product	Industry	Plain glass	Province	Month	3
10	Industrial product	Industry	Aluminum	Country	Month	3
11	Industrial product	Industry	Aluminum oxide	Province	Month	3
12	Industrial product	Industry	Nonferrous Metals	Province	Month	3
13	Industrial product	Industry	Coke	Province	Month	3
14	Industrial product	Industry	Crude oil	Province	Month	3
15	Industrial product	Industry	Processing Volume of Crude oil	Province	Month	3
16	Industrial product	Industry	Natural gas	Province	Month	3
17	Industrial product	Industry	Chemical fertilizers	Province	Month	3
18	Industrial product	Industry	Sulfuric acid	Province	Month	3
19	Industrial product	Industry	Machine-made Paper and Paperboards	Province	Month	3
20	Industrial product	Industry	Synthetic rubber	Country	Month	3
21	Industrial product	Industry	Tire	Country	Month	3
22	Industrial product	Industry	Ethylene	Province	Month	3
23	Industrial product	Industry	Primary plastic	Province	Month	3
24	Industrial product	Industry	Refined sugar	Province	Month	3
25	Industrial product	Industry	Beer	Country	Month	3
26	Industrial product	Industry	Wine	Country	Month	3
27	Industrial product	Industry	Liquor	Country	Month	3
28	Industrial product	Industry	Synthetic fiber	Country	Month	3
29	Industrial product	Industry	Silk and woven fabric	Country	Month	3
30	Industrial product	Industry	Cloth	Province	Month	3
31	Industrial product	Industry	Chemical medicine	Country	Month	3
32	Traffic volume	Transportation	Onroad freight ton-kilometers	Province	Month	4
33	Traffic volume	Transportation	Onroad passenger-kilometers	Province	Month	4
34	Traffic volume	Transportation	Railway freight ton-kilometers	Country	Month	3
35	Traffic volume	Transportation	Waterway freight ton-kilometers	Country	Month	3
36	Traffic index	Transportation	TOMTOM traffic index	City	Day	5
37	Real estate	Transportation	Floor space of real estate started	Country	Month	3
38	Residential activity	Residential	Index of service production	Country	Month	3
39	Residential activity	Residential	Population-weighted heating degree day	Province	Day	6

Data source note:

1: <https://www.ndrc.gov.cn/fgsj/tjsj/jjyx/mdyqy/>

2: <https://www.wind.com.cn/>

3: <https://data.stats.gov.cn/>

4: <http://www.mot.gov.cn/shuju/>

5: https://www.tomtom.com/en_gb/traffic-index/

6: Daily average temperature is derived from <https://cds.climate.copernicus.eu/>. Gridded population dataset is derived from the UN WPP-Adjusted Population Count, v4.11 (<https://doi.org/10.7927/H4PN93PB>).

Table S2. Monthly growth rates (%) in 2020 compared to the same month of 2019 in China.

#	Data name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
1	Natural gas	3.4	-1.9	2.8	8.8	7.4	3.5	-0.9	3.9
2	Coal consumption from six major power companies	-12.6	-16.9	-20.0	-13.1	7.1	-18.4	/	/
3	Thermal power generation		-8.9*	-7.5	1.2	9.0	5.4	-0.7	6.2
4	Industrial value-added		-13.5*	-1.1	3.9	4.4	4.8	4.8	5.6
5	Manufacturing purchasing manager's index	0.8	-43.8	2.7	3.1	2.9	5.1	3.6	3.1
6	Iron		3.1*	1.1	-1.2	2.4	4.1	8.8	5
7	Crude steel		3.1*	-1.7	0.2	4.2	4.5	9.1	8.4
8	Cement		-29.5*	-18.3	3.8	8.6	8.4	3.6	6.6
9	Plain glass		2.3*	0.5	-6.8	-0.6	-3.9	0.6	3.1
10	Aluminum		2.4*	2.3	1.5	-0.1	0.8	3.1	5.5
11	Aluminum oxide		-13*	-3.6	-3.2	-4.6	-1.8	-1.6	6.6
12	Nonferrous Metals		2.2*	1.6	3.8	4.1	3.1	3.3	6.9
13	Coke		-5.5*	-2.4	-1.3	-3.2	-4.2	0.3	2.9
14	Crude oil		3.7*	-0.1	0.9	1.3	0.7	0.6	2.3
15	Processing Volume of Crude oil		-3.8*	-6.6	0.8	8.2	9	12.4	9.2
16	Natural gas		8.0*	11.2	14.3	12.7	11.3	4.8	3.7
17	Chemical fertilizers		-4.1*	5.1	-1.4	-2	-1.9	-6.7	-5.3
18	Sulfuric acid		-10.4*	-8.7	8.6	0.7	0.8	-0.5	2.4
19	Machine-made Paper and Paperboards		-17.8*	-2.1	2.8	-0.5	4.1	4.9	5.3
20	Synthetic rubber		-14.8*	1.1	2.3	7.1	5	7.1	9.2
21	Tire		-27.2*	-7.8	-12.2	-4.6	0.5	5.5	13.4
22	Ethylene		5.6*	-1.4	-1.4	-2.7	-4.3	3	8.6
23	Primary plastic		-3.8*	1.2	3.7	7.9	7.7	5.1	13.1
24	Refined sugar		-1.5*	-43.2	-28	82.4	81.4	67.8	27.3
25	Beer		-40.0*	-21.5	7.5	14.6	7.6	0.7	-3.8
26	Wine		-67.6*	-31.3	26.9	-19.2	-21.2	-23.1	-22.2
27	Liquor		-16.9*	-6.5	-2.4	4.3	-2.3	-8.9	-15.3
28	Synthetic fiber		-13.3*	-4.3	3.3	6.7	8.2	2.3	2.3
29	Silk and woven fabric		-17.3*	-16.3	-30.2	-22.4	-9.4	-13.1	-22.1
30	Cloth		-36.0*	-24.9	-21.8	-19.6	-18.9	-18.8	-15.6
31	Chemical medicine		-22.2*	-2.4	1.2	0.9	0.8	1.0	-1.0
32	Onroad freight ton-kilometers	-20.6	-41.5	-14.5	1.6	1.6	6.6	4.6	6
33	Onroad passenger-kilometers	-11.2	-87.7	-71.6	-58.4	-51.1	-44.6	-43.4	-40.8
34	Railway freight ton-kilometers	-3.4	3.8	-5.2	-10.2	-2.3	5.6	6.5	4.8
35	Waterway freight ton-kilometers	-13.8	-17.5	-7	-5.7	-4.3	1.9	-3.8	1.9
37	Floor space of real estate started		-44.9*	-10.5	-1.3	2.5	8.9	11.3	2.4
38	Index of service industrial production		-13.0*	-9.1	-4.5	1.0	2.3	3.5	4.0
39	Population-weighted heating degree day	-3.6	-9.1	-3.4	/	/	/	/	/

* represents the growth rates of the sum of data in January and February.

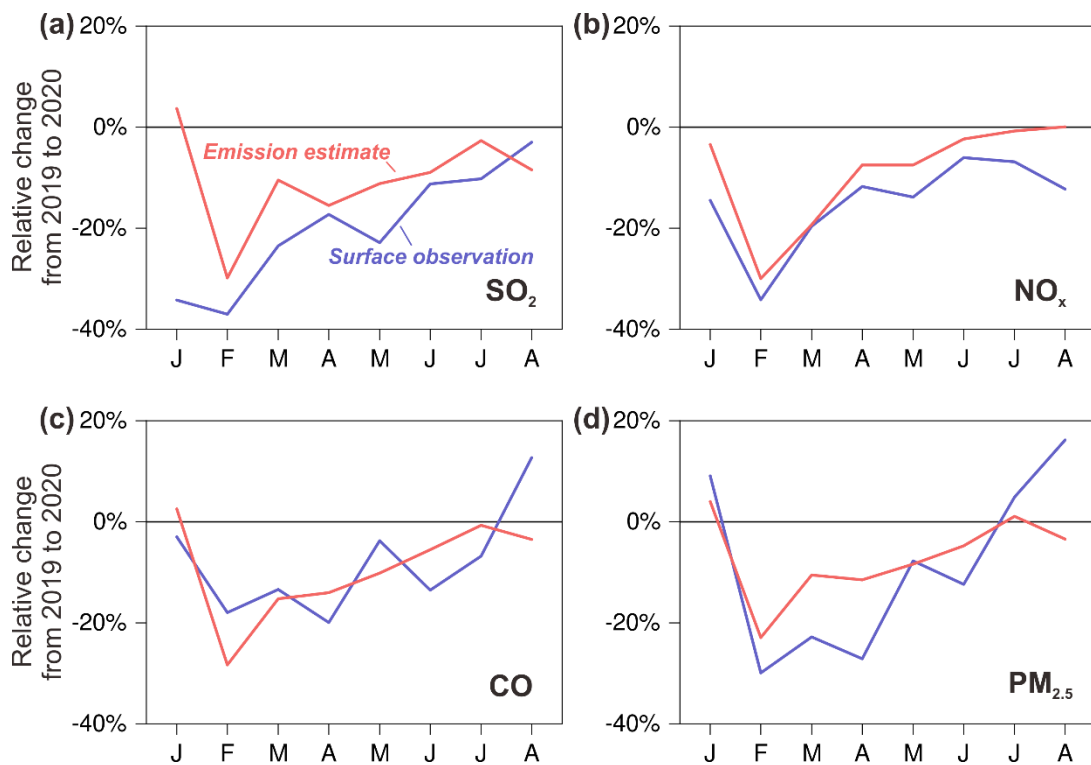


Figure S1: Comparison between observations and emissions in the North China Plain regarding the monthly relative changes from 2019 to 2020. Here the North China Plain includes the provinces of Beijing, Tianjin, and Hebei. Four pollutants are presented including SO₂ (a), NO_x (b), CO (c), and PM_{2.5} (d). The red solid curves represent the emission results of this study and the purple curves represent the surface observations (<http://106.37.208.233:20035/>, accessed on 10 November 2020).

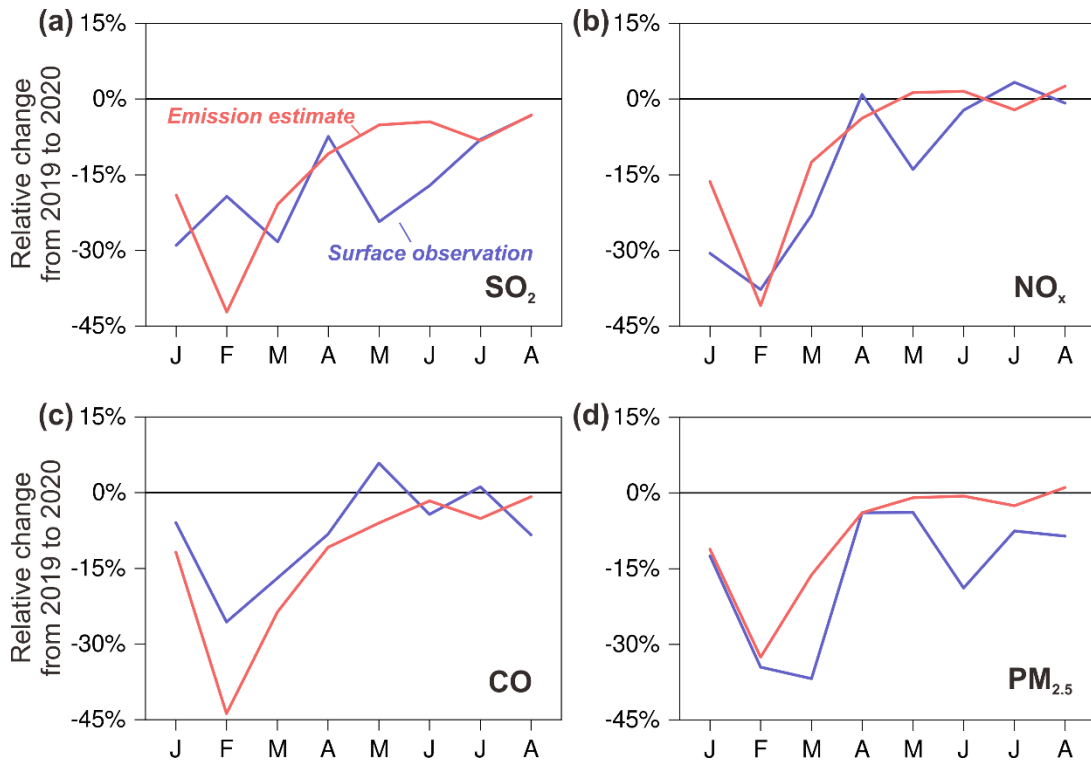


Figure S2: Comparison between observations and emissions in the Yangtze River Delta regarding the monthly relative changes from 2019 to 2020. Here the Yangtze River Delta includes the provinces of Shanghai, Jiangsu, and Zhejiang. Four pollutants are presented including SO₂ (a), NO_x (b), CO (c), and PM_{2.5} (d). The red solid curves represent the emission results of this study and the purple curves represent the surface observations (<http://106.37.208.233:20035/>, accessed on 10 November 2020).

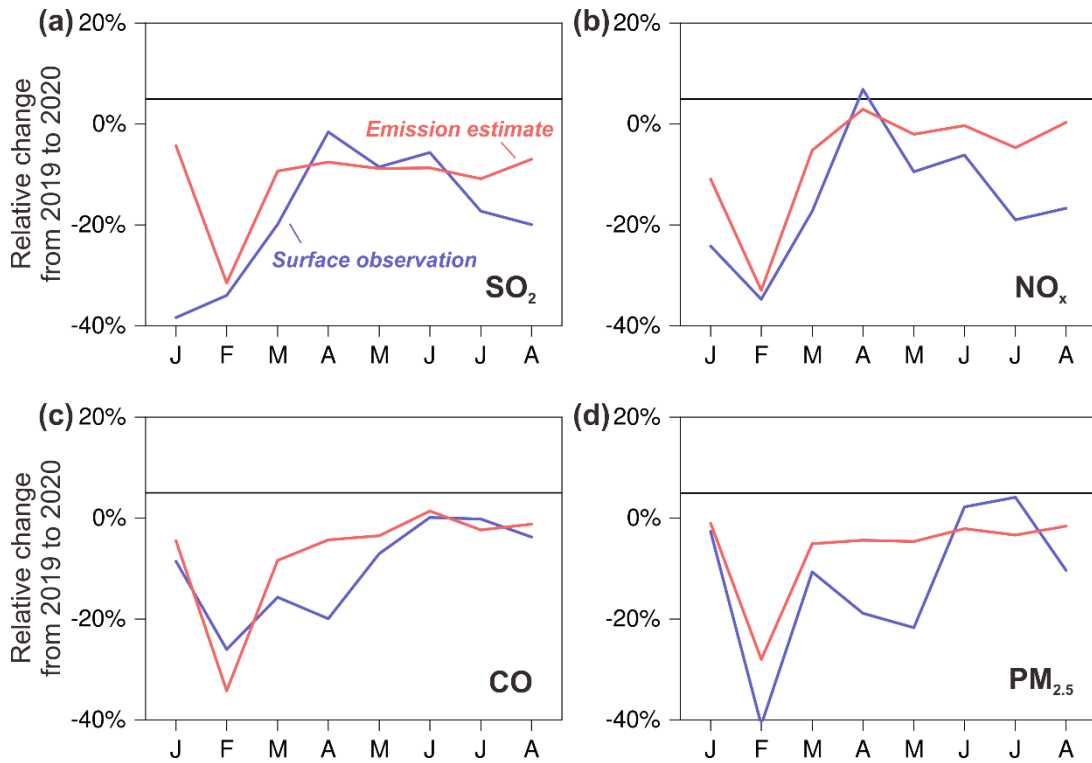


Figure S3: Comparison between observations and emissions in the Fenwei plain regarding the monthly relative changes from 2019 to 2020. Here the Fenwei plain includes the provinces of Shanxi, Shaanxi, and Henan. Four pollutants are presented including SO₂ (a), NO_x (b), CO (c), and PM_{2.5} (d). The red solid curves represent the emission results of this study and the purple curves represent the surface observations (<http://106.37.208.233:20035/>, accessed on 10 November 2020).