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/fpsiyi/yjxx/mdyqyy/](https://www.ndrc.gov.cn/fpsiyi/yjxx/mdyqyy/)
2. [https://www.wind.com.cn/](https://www.wind.com.cn/)
3. [https://data.stats.gov.cn/](https://data.stats.gov.cn/)
4. [http://www.mot.gov.cn/shuju/](http://www.mot.gov.cn/shuju/)
5. [https://www.tomtom.com/en_gb/traffic-index/](https://www.tomtom.com/en_gb/traffic-index/)
6. Daily average temperature is derived from [https://cds.climate.copernicus.eu](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](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    | −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 |
| 36 | Floor space of real estate started       | −44.9*| −10.5| −1.3| 2.5 | 8.9 | 11.3| 2.4 |
| 37 | Index of service industrial production   | −13.0*| −9.1| −4.5| 1.0 | 2.3 | 3.5 | 4.0 |
| 38 | 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 SO$_2$ (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), NOₓ (b), CO (c), and PM₂.₅ (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 SO$_2$ (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).