Supporting Information for

The heavy particulate matter pollution during the COVID-19 lockdown period in the Guanzhong Basin, China

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Contents of this file:

Figure S1 to S10
Table S1 to S3
Introduction
The supporting information includes 10 supplementary figures and 3 supplementary tables.
Figure S1. Comparisons of observed (black dots) and simulated (red lines) near-surface (a) temperature, (b) relative humidity, (c) wind speed, and (d) wind direction at the Jinghe meteorological station in Xi’an from January 20 to February 14, 2020.
Figure S2. Pattern comparisons of simulated (color counters) vs. observed (colored circles) near-surface mass concentrations of (a) PM$_{2.5}$, (b) O$_3$, (c) NO$_2$, and (d) SO$_2$ averaged from January 20 to February 14, 2020. The black arrows indicate simulated surface winds.
Figure S3. Comparisons of observed (black dots) and simulated (red lines) diurnal profiles of near-surface mass concentrations of (a) PM$_{2.5}$, (b) O$_3$, (c) NO$_2$, (d) SO$_2$, and (e) CO averaged over all ambient monitoring sites in the GZB from January 20 to February 14, 2020.
Figure S4. Temporal variations of near-surface (a) PM$_{2.5}$, (b) O$_3$, (c) NO$_2$, (d) SO$_2$, and (e) CO mass concentrations averaged over the GZB in $F_{Base}$ (red solid line) and $F_{Sens}$ (blue solid line) from January 20 to February 14, 2020.
Figure S5. Contributions of emission reduction due to the CLD to the near-surface (a) PM$_{2.5}$, (b) O$_3$, (c) NO$_2$, and (d) SO$_2$ mass concentrations in the GZB averaged from January 23 to February 13, 2020.
Figure S6. Temporal variations of (a) organic aerosols (OA), (b) secondary organic aerosols (SOA), (c) sulfate, (d) nitrate, and (e) ammonium mass concentrations averaged over the GZB in $F_{\text{Base}}$ (red solid line) and $F_{\text{Sens}}$ (blue solid line) from January 20 to February 14, 2020.
Figure S7. Contributions of emission reduction due to the CLD to the (a) SOA, (b) sulfate, (c) nitrate, and (d) ammonium concentrations in the GZB averaged from January 23 to February 13, 2020.
Figure S8. Chemical composition of PM$_{2.5}$ in the GZB in $F_{Base}$ (a) and $F_{Sens}$ (b).
Figure S9. Variations of the observed near-surface O$_3$ and NO$_2$ mass concentrations as a function of the PM$_{2.5}$ concentrations from 10:00 to 17:00 (BJT) over all the monitoring sites in the GZB during (a) the wintertime from 2013 to 2018 and (b) the CLD period. The yellow lines show the PM$_{2.5}$ mass concentration of 75 µg m$^{-3}$. 
Figure S10. Isopleth diagrams for the mass concentrations of (a) SOA, (b) sulfate, (c) nitrate, and (d) ammonium in the GZB during the CLD period with NO\textsubscript{X} and VOCs emissions varying from 0 to 100%. The yellow dash lines show the emission reduction of 45% and 34% for NO\textsubscript{X} and VOCs during the CLD period in the GZB, respectively.
### Table S1. WRF-Chem model configurations.

| Items                          | Configurations                                                                 |
|-------------------------------|-------------------------------------------------------------------------------|
| Region                        | Guanzhong Basin (GZB)                                                         |
| Simulation period             | January 20 to February 14, 2020                                              |
| Domain size                   | 150 × 150                                                                     |
| Domain center                 | 34.25°N, 109°E                                                               |
| Horizontal resolution         | 6 km × 6 km                                                                   |
| Vertical resolution           | 35 vertical levels with a stretched vertical grid with spacing ranging from 30 m near the surface to 500 m at 2.5 km and 1 km above 14 km |
| Microphysics scheme          | WRF Single-Moment 6-class graupel scheme (Hong & Lim, 2006)                  |
| Boundary layer scheme         | Mellor-Yamada-Janjić (MYJ) turbulent kinetic energy (TKE)                     |
|                              | planetary boundary layer scheme (Janjić, 2002)                                |
| Surface layer scheme          | MYJ surface scheme (Janjić, 2002)                                            |
| Land-surface scheme           | Unified Noah Land-surface model (Chen and Dudhia, 2001)                       |
| Longwave radiation scheme     | Goddard longwave scheme (Chou et al., 2001)                                  |
| Shortwave radiation scheme    | Goddard shortwave scheme (Chou & Suarez, 1999)                               |
| Meteorological boundary       | NCEP 1° × 1° reanalysis data                                                  |
| and initial conditions        |                                                                               |
| Chemical initial and boundary | WACCM 6-h output (Neale et al., 2013; Marsh et al., 2013)                     |
| conditions                    |                                                                                |
| Anthropogenic emission inventory | Developed by Zhang et al. (2009) and Li et al. (2017)                      |
| Biogenic emission inventory   | MEGAN model (Guenther et al., 2006)                                          |
**Table S2.** Average mass concentrations of PM$_{2.5}$, O$_3$, NO$_2$, SO$_2$ and CO in the GZB during the COVID-19 lockdown period from January 23 to February 13, 2020 (CLD), the three-weeks average before CLD from January 1 to 22, 2020 (PRE-CLD), the five-years average from 2015 to 2019 during the same time period with CLD in the Gregorian calendar (STP-CLD), and the five-years average from 2015 to 2019 during the same time period with CLD in the Chinese lunar calendar that covers the Lunar New Year (STP-LNY).

| Time period | PM$_{2.5}$ (µg m$^{-3}$) | O$_3$ (µg m$^{-3}$) | NO$_2$ (µg m$^{-3}$) | SO$_2$ (µg m$^{-3}$) | CO (mg m$^{-3}$) |
|-------------|--------------------------|---------------------|----------------------|----------------------|------------------|
| STP-LNY     | 89.9 ± 51.6              | 55.0 ± 17.6         | 38.8 ± 15.1          | 24.3 ± 11.6          | 1.5 ± 0.43       |
| STP-CLD     | 94.9 ± 54.9              | 43.6 ± 19.8         | 45.6 ± 16.1          | 29.4 ± 14.5          | 1.7 ± 0.56       |
| PRE-CLD     | 120.1 ± 38.9             | 32.3 ± 19.4         | 50.1 ± 8.2           | 13.6 ± 4.1           | 1.5 ± 0.32       |
| CLD         | 105.9 ± 48.1             | 66.7 ± 25.4         | 23.9 ± 7.4           | 11.9 ± 3.2           | 1.2 ± 0.29       |
| NOx reduction | VOCs reduction | PM$_{2.5}$ | SA | SOA | Sulfate | Nitrate | Ammonium | 8-h O$_3$ | O$_3$ | NO$_2$ | SO$_2$ | NH$_3$ |
|---------------|---------------|------------|----|-----|---------|---------|----------|----------|------|-------|-------|-------|
| 0             | 0             | 0          | 0  | 0   | 0       | 0       | 0        | 0        | 0    | 0     | 0     | 0     |
| 0             | 20            | -2.3       | -3.6| -10.2| -3.8   | 1.5     | -0.6     | -8.5     | -6.7 | 3.4   | 2.7   | 2.5   |
| 0             | 40            | -4.8       | -7.6| -20.3| -7.5   | 1.7     | -1.5     | -20.1    | -14.9| 6.9   | 5.5   | 5.9   |
| 0             | 60            | -7.3       | -12.0| -30.3| -10.7 | 0.5     | -2.9     | -36.2    | -24.3| 10.6  | 8.6   | 10.1  |
| 0             | 80            | -10.6      | -17.3| -41.0| -13.9 | -2.4    | -5.1     | -59.3    | -34.7| 12.8  | 10.7  | 17.0  |
| 0             | 100           | -13.8      | -22.8| -51.5| -16.5 | -6.5    | -7.5     | -90.3    | -44.8| 12.5  | 13.2  | 24.6  |
| 20            | 0             | -2.2       | -3.4| -0.6 | 2.6    | -10.3   | -3.3     | 2.8      | 5.5   | -22.2 | -2.5  | 8.4   |
| 20            | 20            | -3.9       | -6.4| -9.8 | -1.0   | -8.0    | -3.4     | -3.7     | 0.2   | -19.0 | 0.8   | 10.0  |
| 20            | 40            | -6.0       | -9.9| -19.5| -5.0   | -6.6    | -4.0     | -13.1    | -6.8  | -15.5 | 4.0   | 12.5  |
| 20            | 60            | -8.5       | -13.9| -29.7| -9.1   | -6.0    | -5.0     | -26.7    | -15.7 | -11.8 | 6.9   | 16.1  |
| 20            | 80            | -11.4      | -18.6| -40.1| -12.6 | -7.4    | -6.7     | -46.3    | -26.0| -8.4  | 9.6   | 21.1  |
| 20            | 100           | -14.7      | -24.1| -51.0| -15.9 | -10.5   | -9.1     | -73.6    | -36.8| -6.7  | 12.2  | 28.0  |
| 40            | 0             | -4.5       | -7.6| -1.4 | 6.1    | -22.9   | -7.1     | 3.7      | 8.8   | -43.1 | -4.7  | 19.7  |
| 40            | 20            | -6.0       | -10.2| -10.1| 2.0    | -20.1   | -7.1     | -0.8     | 5.7   | -40.9 | -1.4  | 20.6  |
| 40            | 40            | -7.9       | -13.3| -19.2| -2.4   | -17.5   | -7.4     | -7.7     | 0.6   | -38.1 | 2.1   | 21.9  |
| 40            | 60            | -10.1      | -16.7| -29.0| -6.7   | -15.5   | -8.0     | -18.3    | -6.7  | -34.8 | 5.4   | 24.1  |
| 40            | 80            | -12.4      | -20.6| -39.2| -10.9 | -14.7   | -8.9     | -34.4    | -16.4| -31.0 | 8.7   | 27.4  |
| 40            | 100           | -15.6      | -25.7| -50.2| -14.9 | -16.1   | -10.9    | -58.2    | -27.6| -27.9 | 11.7  | 33.4  |
| 60            | 0             | -7.9       | -13.3| -4.3 | 9.0    | -37.5   | -12.2    | 1.1      | 8.8   | -63.3 | -7.4  | 33.1  |
| 60            | 20            | -9.5       | -15.8| -12.3| 4.8    | -34.7   | -12.4    | -1.3     | 8.0   | -61.7 | -3.7  | 34.4  |
| 60            | 40            | -11.1      | -18.5| -20.6| 0.4    | -31.8   | -12.5    | -5.4     | 5.7   | -59.8 | -0.1  | 35.7  |
| 60            | 60            | -12.7      | -21.1| -29.2| -4.1   | -28.6   | -12.5    | -12.4    | 1.1   | -57.5 | 3.5   | 36.8  |
| 60            | 80            | -14.7      | -24.3| -38.8| -8.9   | -26.0   | -13.0    | -24.4    | -6.5  | -54.4 | 7.1   | 38.4  |
| 60            | 100           | -17.3      | -28.5| -49.7| -13.8 | -24.6   | -14.0    | -43.8    | -17.0| -51.1 | 10.8  | 41.5  |
| 80            | 0             | -11.8      | -19.8| -9.5 | 11.9   | -51.9   | -17.4    | -9.3     | 2.9   | -81.5 | -9.6  | 47.3  |
| 80            | 20            | -13.0      | -22.2| -16.4| 7.9    | -50.0   | -17.6    | -8.7     | 4.5   | -80.7 | -5.8  | 49.7  |
| 80            | 40            | -14.8      | -24.9| -24.0| 3.2    | -47.7   | -18.3    | -9.3     | 5.4   | -79.7 | -2.2  | 52.1  |
| 80            | 60            | -16.5      | -27.5| -31.6| -1.8   | -44.9   | -18.7    | -11.7    | 4.9   | -78.4 | 1.8   | 53.5  |
| 80            | 80            | -17.9      | -30.0| -39.5| -7.0   | -41.4   | -18.8    | -17.9    | 1.6   | -76.6 | 6.1   | 54.2  |
| 100           | 0             | -15.3      | -26.2| -18.3| 13.5   | -62.4   | -21.2    | -43.7    | -13.5| -97.1 | -10.8 | 58.2  |
| 100           | 20            | -17.4      | -29.3| -25.7| 9.1    | -61.5   | -22.3    | -39.5    | -10.5| -96.9 | -7.3  | 61.6  |
| 100           | 40            | -19.3      | -32.3| -32.8| 4.4    | -60.6   | -23.4    | -35.6    | -7.5  | -96.8 | -3.4  | 65.7  |
| 100           | 60            | -20.9      | -35.3| -39.5| -6.6   | -59.6   | -24.5    | -31.9    | -4.4  | -96.5 | 1.1   | 69.9  |
| 100           | 80            | -22.8      | -38.3| -46.1| -6.0   | -58.3   | -25.8    | -26.7    | -1.4  | -96.2 | 5.4   | 73.8  |
| 100           | 100           | -24.4      | -40.6| -52.3| -11.4  | -55.7   | -26.5    | -27.7    | 0.2   | -95.6 | 9.7   | 76.3  |