Prediction of potentially high PM$_{2.5}$ concentrations in Chengdu, China

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Table S1: Person correlation analysis of PM$_{2.5}$ concentration in the monitoring sites.

|       | USE | LJX  | JQLH | CTS  | SLD  | SHP  | SWY  | RMGY |
|-------|-----|------|------|------|------|------|------|------|
| USE   | 1   |      |      |      |      |      |      |      |
| LJX   |     | 1    |      |      |      |      |      |      |
| JQLH  |     |      | 1    |      |      |      |      |      |
| CTS   |     |      |      | 1    |      |      |      |      |
| SLD   |     |      |      |      | 1    |      |      |      |
| SHP   |     |      |      |      |      | 1    |      |      |
| SWY   |     |      |      |      |      |      | 1    |      |
| RMGY  |     |      |      |      |      |      |      | 1    |

Note: ** P<0.01. USE: US Embassy and Consulate station; LJX: Liangjiaxiang station; JQLH: JinquanLianghe station; CTS: Caotangsi station; SLD: Shilidian station; SHP: Shahepu station; SWY: Sanwayao station; RMGY: People's Park station.

Table S2: List of meteorological parameters used in this study.
| NO. | Data source | Variables | Description |
|-----|-------------|-----------|-------------|
| 1   | 1           | Year      | Year        |
| 2   | 1           | Mon       | Month       |
| 3   | 1           | TEM       | Average daily (24-hour) temperature (°C) |
| 4   | 1           | TMAX      | Daily maximum air temperature (°C) |
| 5   | 1           | TMIN      | Daily minimum air temperature (°C) |
| 6   | 1           | RH        | Average daily (24-hour) relative humidity (%) |
| 7   | 1           | RHMAX     | Daily maximum relative humidity (%) |
| 8   | 1           | RHMN      | Daily minimum relative humidity (%) |
| 9   | 1           | WD        | Average daily (24-hour) wind direction (degree) |
| 10  | 1           | WS        | Average daily (24-hour) wind speed (m/s) |
| 11  | 1           | PRC       | Daily total precipitation (mm) |
| 12  | 1           | SLP       | Sea level pressure (hPa) |
| 13  | 1           | SLP<sub>sd</sub> | Sea level pressure 5 days earlier (hPa) |
| 14  | 2           | WD<sub>8/20</sub> | Vector wind direction (degrees) in lowest 1000 meters height at 8 am and 8 pm local time |
| 15  | 2           | WS<sub>8/20</sub> | Wind speed in the lowest 1000 meters height at 8 am and 8 pm local time (m/s) |
| 16  | 2           | T<sub>1km8/20</sub> | Air temperature (°C) in the lowest 1000 meters at 8 am and 8 pm local time |
| 17  | 2           | RH<sub>1km8/20</sub> | Relative humidity in the lowest 1000 meters height at 8 am and 8 pm local time (%) |
| 18  | 2           | Mix<sub>1km8/20</sub> | Water vapor mixing ratio in the lowest 1000 meters height at 8am and 8pm local time (g/kg) |
| 19  | 2           | CAPE<sub>8/20</sub> | Convective available potential energy at 8am and 8pm local time |
| 20  | 2           | LCLP<sub>8/20</sub> | Lifting condensation level pressure in hPa at 8 am and 8 pm local time |
| 21  | 2           | MLTheta<sub>8/20</sub> | Mean mixed layer potential temperature in K at 8 am and 8 pm local time |
| 22  | 2           | MLMR<sub>8/20</sub> | Mean mixed layer mixing ratio in g/kg at 8am and 8pm local time |
| 23  | 2           | Thick     | 1000 mb to 500 mb thickness in meters at 8am and 8pm local time |
| 24  | 3           | TrajDist  | Endpoint distant (point to point) after 12 hours (a) / 24 (b) hours of transport for a back trajectory initialized at 10 am and 10 pm local time (Km) |
| 25  | 3           | TrajQ     | Endpoint quadrant after 12 hours (a) / 24 (b) hours of transport for a back trajectory initialized at 10 am and 10 pm local time |
| 26  | 3           | TrajDegs  | Endpoint degrees after 12 hours (a) / 24 (b) hours of transport for a back trajectory initialized at 10 am and 10 pm local time (degree) |
Data source:
1. China Meteorological Administration
2. Radiosonde (balloon) data (http://weather.uwyo.edu/upperair/sounding.html)
3. HYSPLIT model (v4.9)
The effect of each meteorological factor on the PM$_{2.5}$ concentration. All the selected meteorological factors have a non-linear relationship with PM$_{2.5}$ concentration.

Fig. S1 Partial response plots for daily PM$_{2.5}$. The dashed line represents the point-by-point standard deviation of the fitting function (i.e., the upper and lower limits of the confidence interval); the solid line represents the smooth fitting of the explanatory variable to PM$_{2.5}$ concentration. The x-axis is the observed value of the explanatory variable, the y-axis is the smooth fitting value of the explanatory variable to PM$_{2.5}$ concentration.
Mean ΔSLP did not show a significant difference on randomly selected days.

Fig. S2 Mean ΔSLP (±95% CI) on randomly selected days in each year (2013-2017).