

LI, L., LI, Q., HUANG, L., WANG, Q., ZHU, A., XU, J., LIU, Z., LI, H., SHI, L., LI, R., AZARI, M., WANG, Y., ZHANG, X., LIU, Z., ZHU, Y., ZHANG, K., XUE, S., OOI, M.C.G., ZHANG, D. and CHAN, A. 2020. Air quality changes during the COVID-19 lockdown over the Yangtze River Delta region: an insight into the impact of human activity pattern changes on air pollution variation. [Dataset]. *Science of the total environment* [online], 732, article 139282. Available from: <https://doi.org/10.1016/j.scitotenv.2020.139282>

Air quality changes during the COVID-19 lockdown over the Yangtze River Delta region: an insight into the impact of human activity pattern changes on air pollution variation. [Dataset]

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Supplement of

Air quality changes during the COVID-19 lockdown over the Yangtze River Delta Region: an insight into the impact of human activity pattern changes on air pollution variation

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Fig. S1(a) Comparisons between the WRF model predicted and observed surface temperature in typical cities of the YRD region.

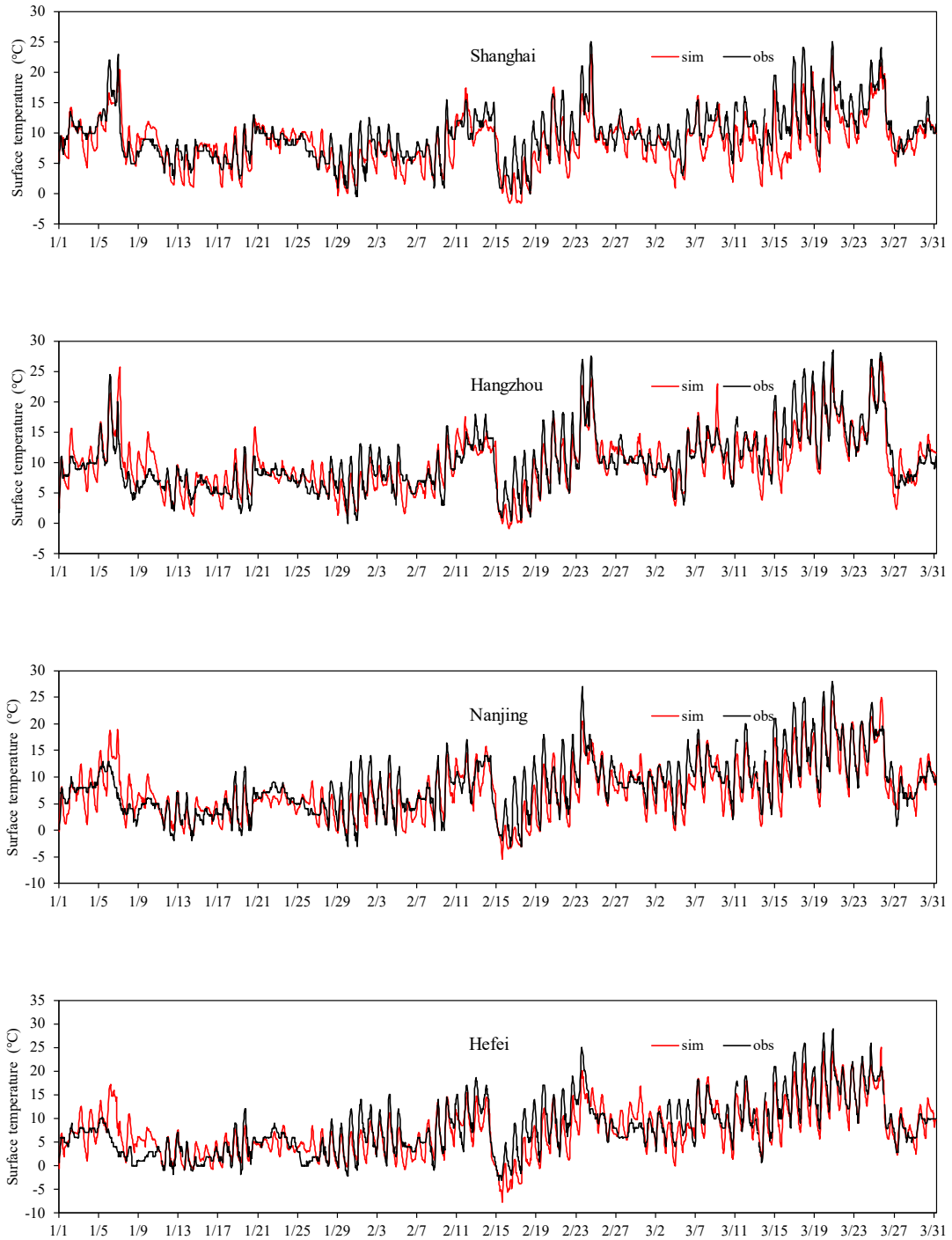


Fig. S1(b) Comparisons between the WRF model predicted and observed wind speed in typical cities of the YRD region.

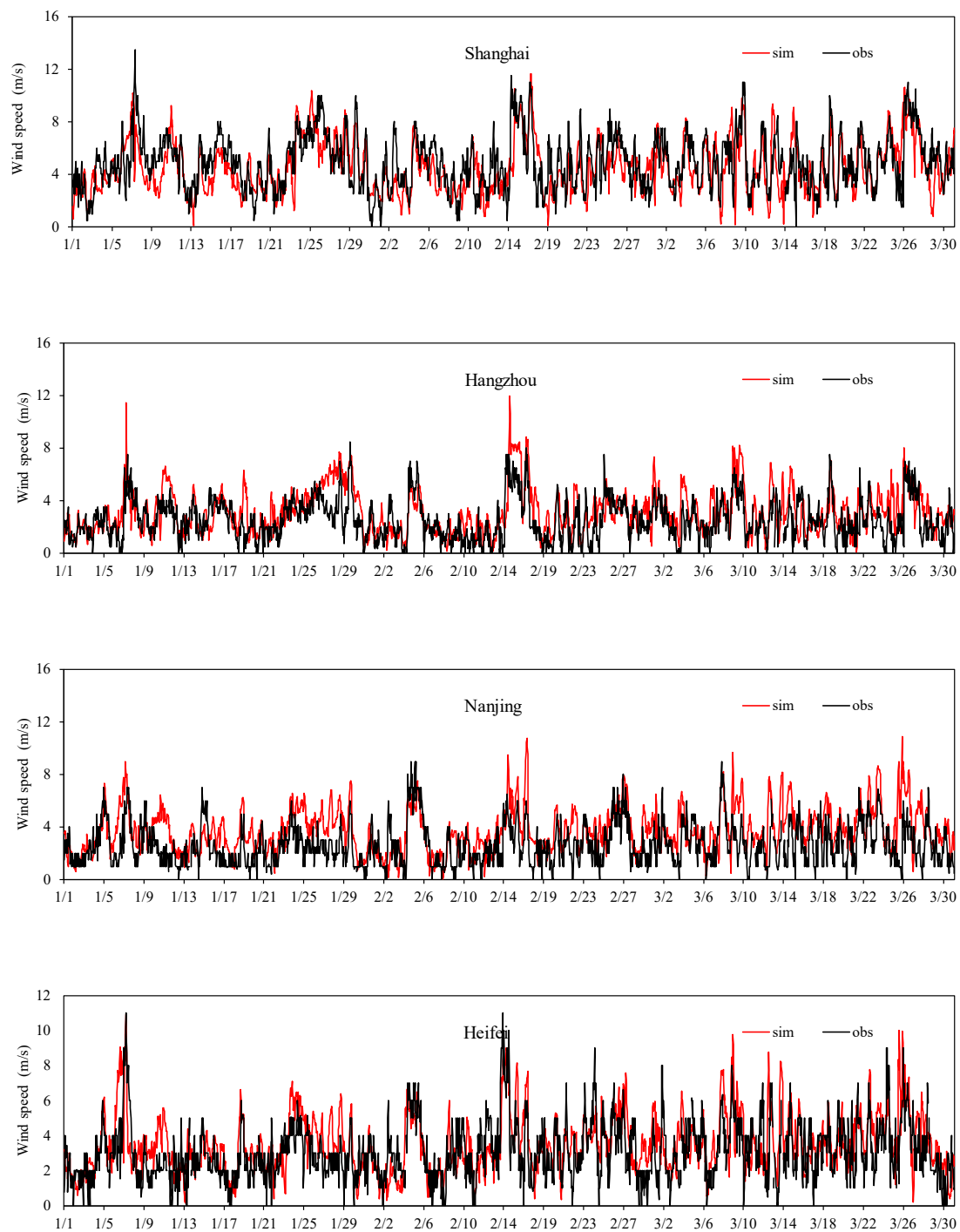


Fig. S1(c) Comparisons between the WRF model predicted and observed humidity in typical cities of the YRD region.

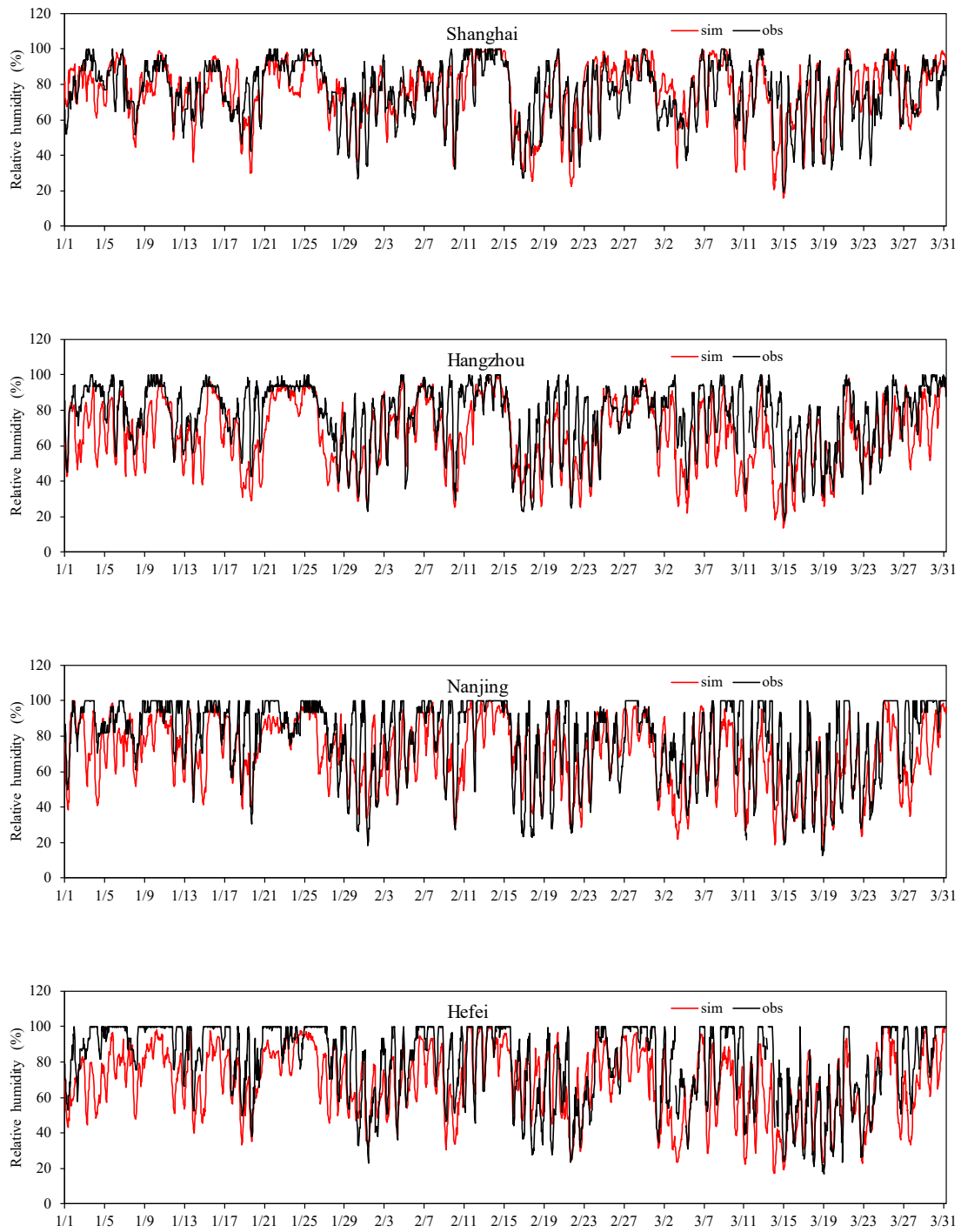


Fig. S1(d) Comparisons between the WRF model predicted and observed air pressure in typical cities of the YRD region.

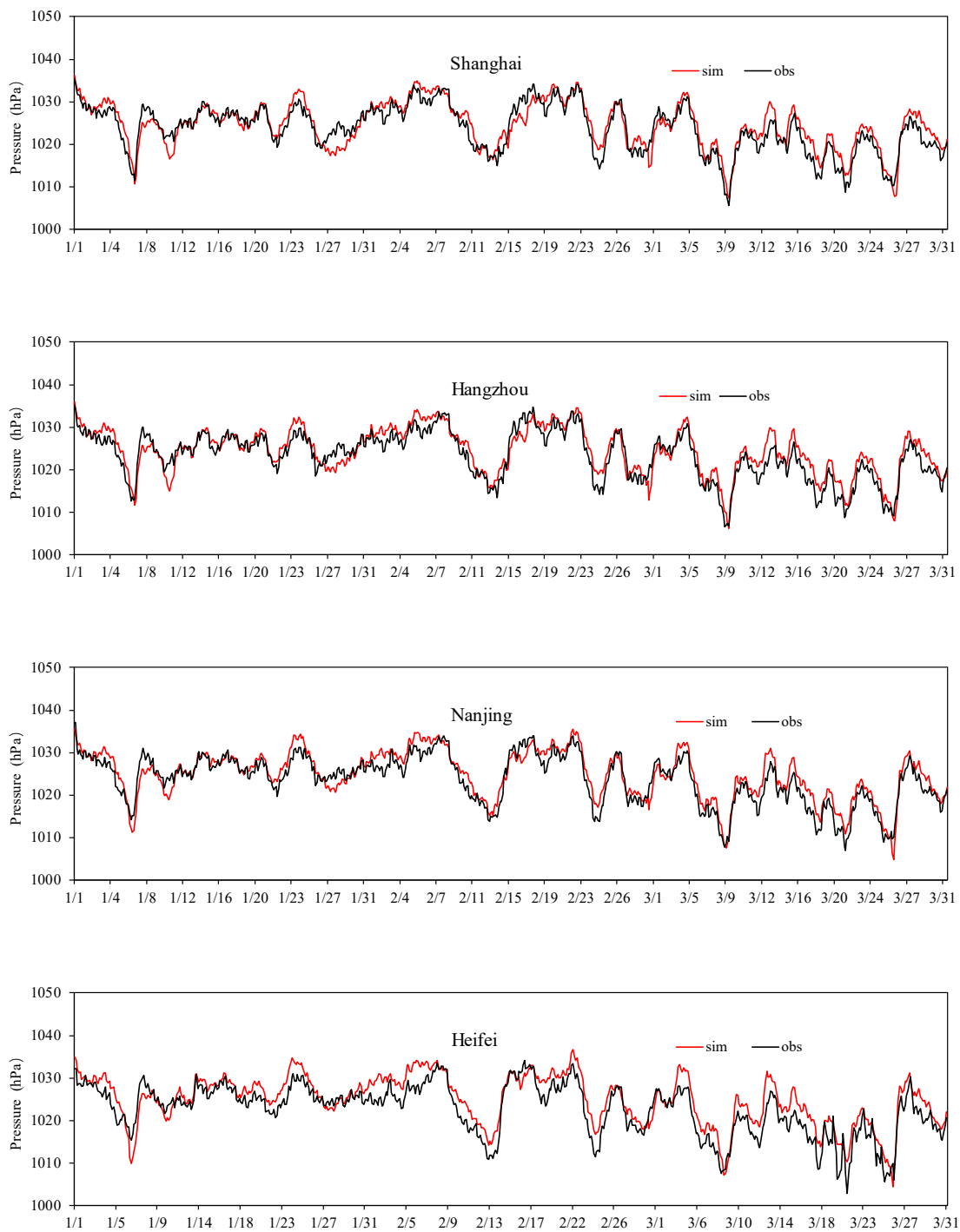


Fig. S2(a) Comparisons of surface temperature during 1st January - 31st March, 2020 with 2017-2019 in cities over YRD.

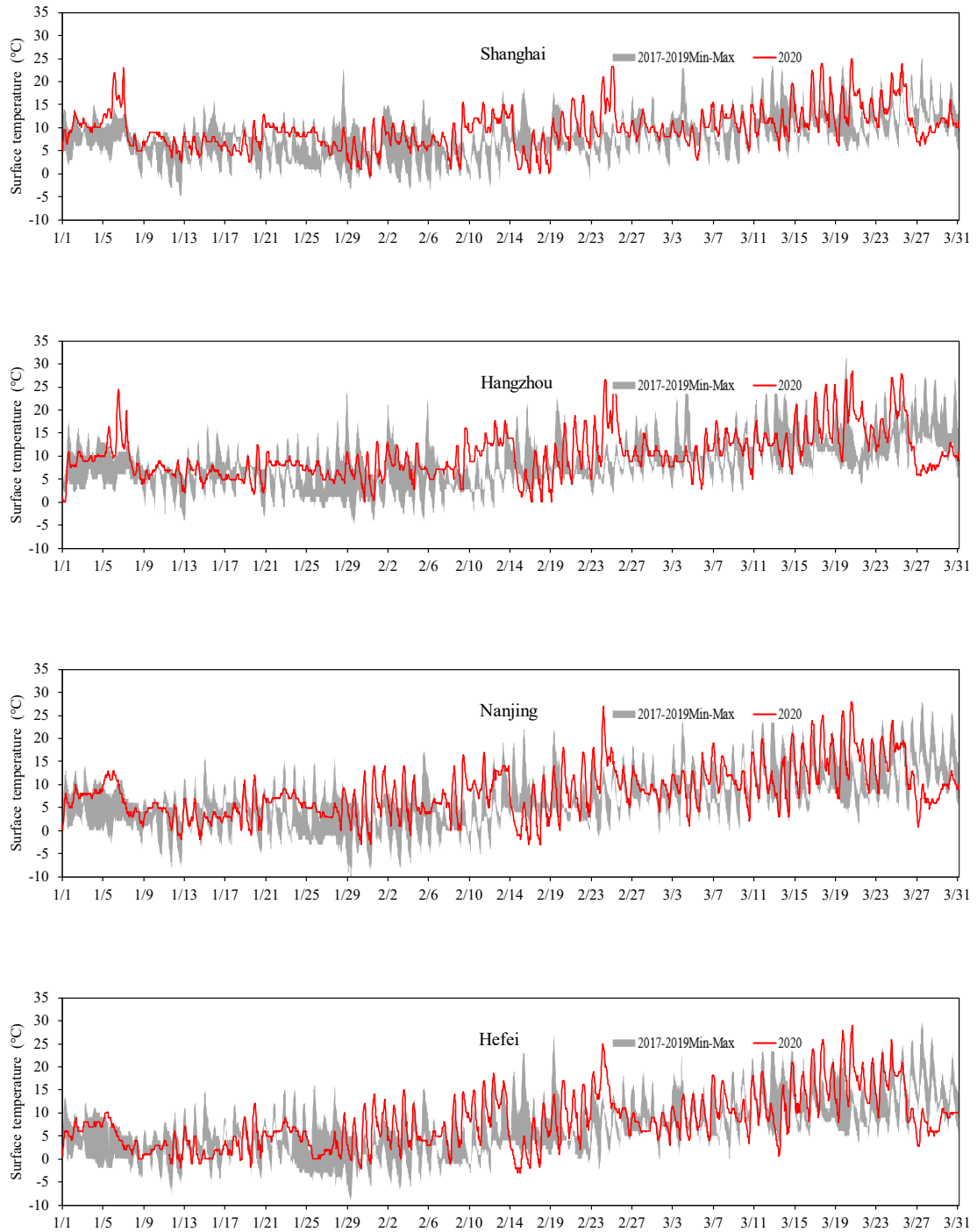


Fig. S2(b) Comparisons of air pressure during 1st January - 31st March, 2020 with 2017-2019 in cities over YRD.

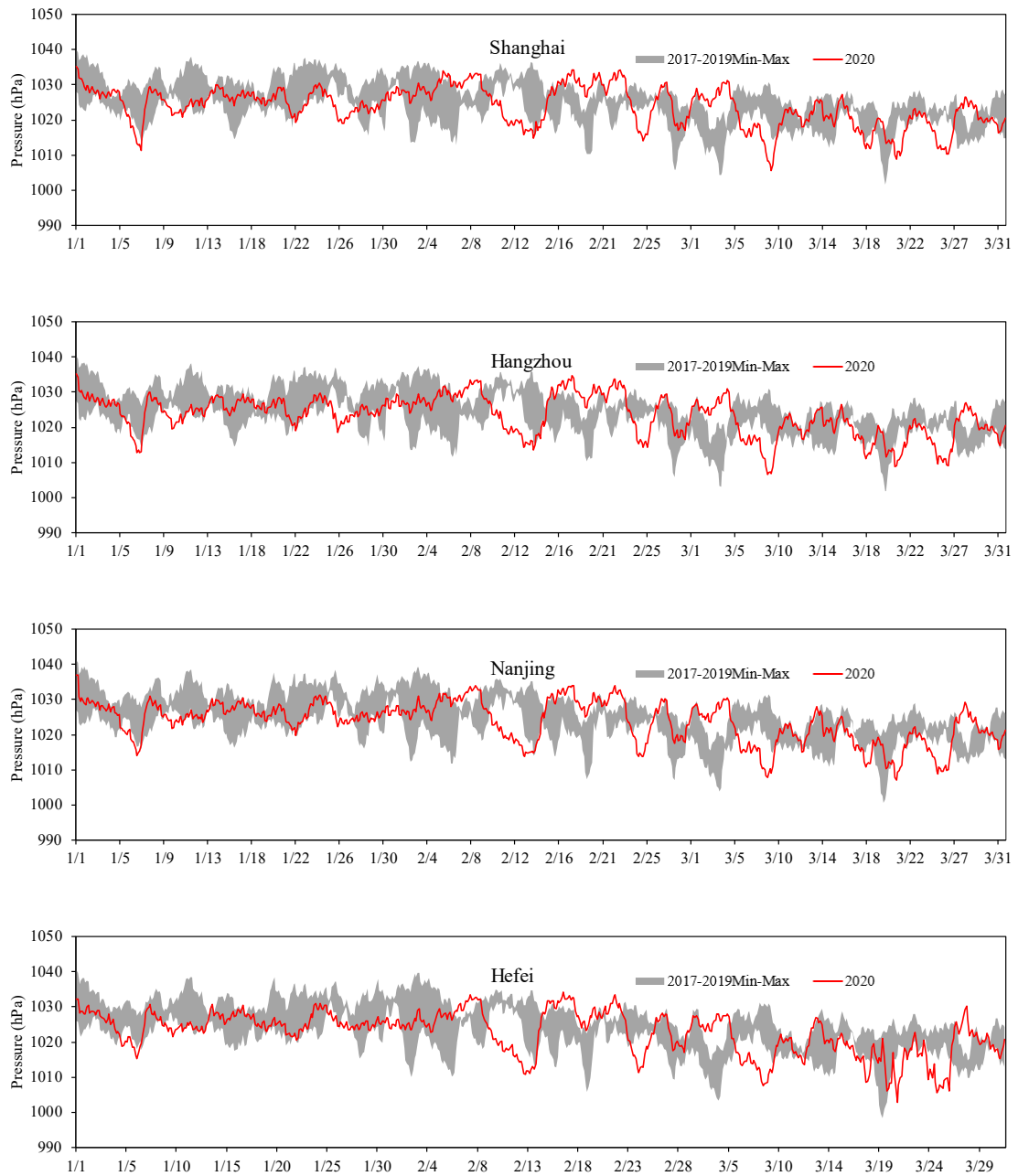


Fig. S2(c) Comparisons of relative humidity during 1st January - 31st March, 2020 with 2017-2019 in cities over YRD.

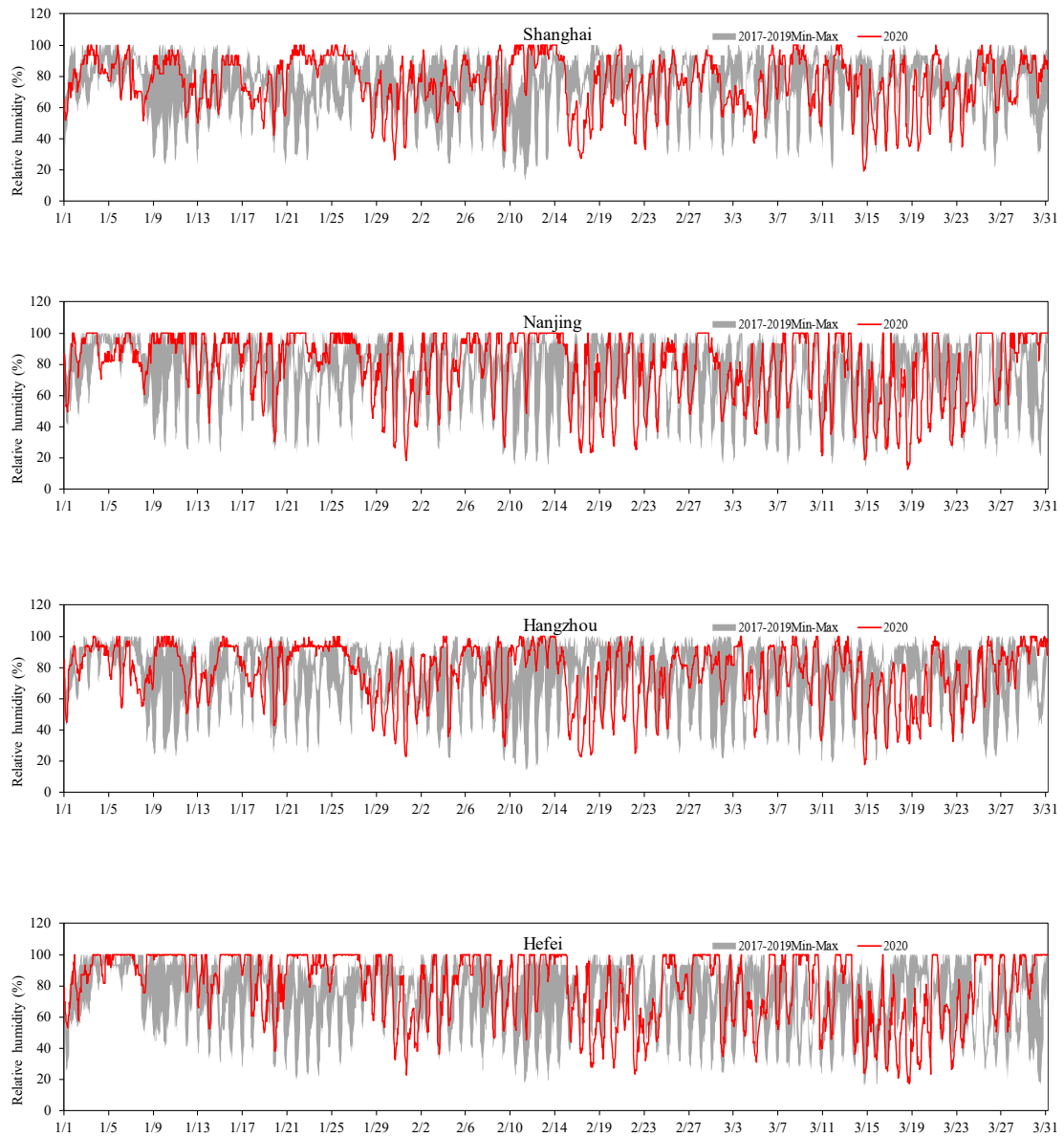


Fig. S2(d) Comparisons of wind speed during 1st January - 31st March, 2020 with 2017-2019 in cities over YRD.

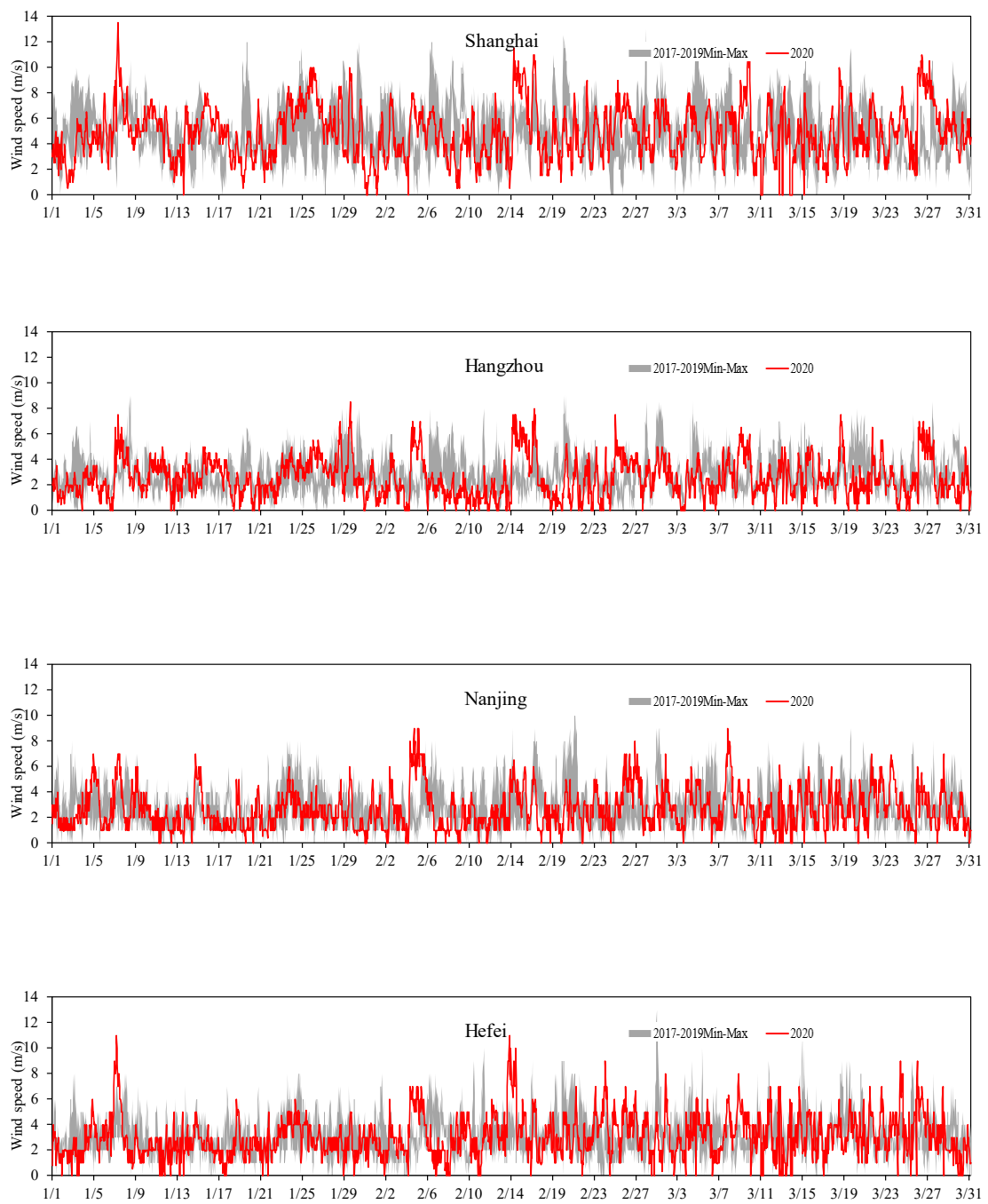


Fig. S3 Comparisons of wind rose from Jan 1st to Mar. 31st in 2017-2020 in typical cities over the YRD region.

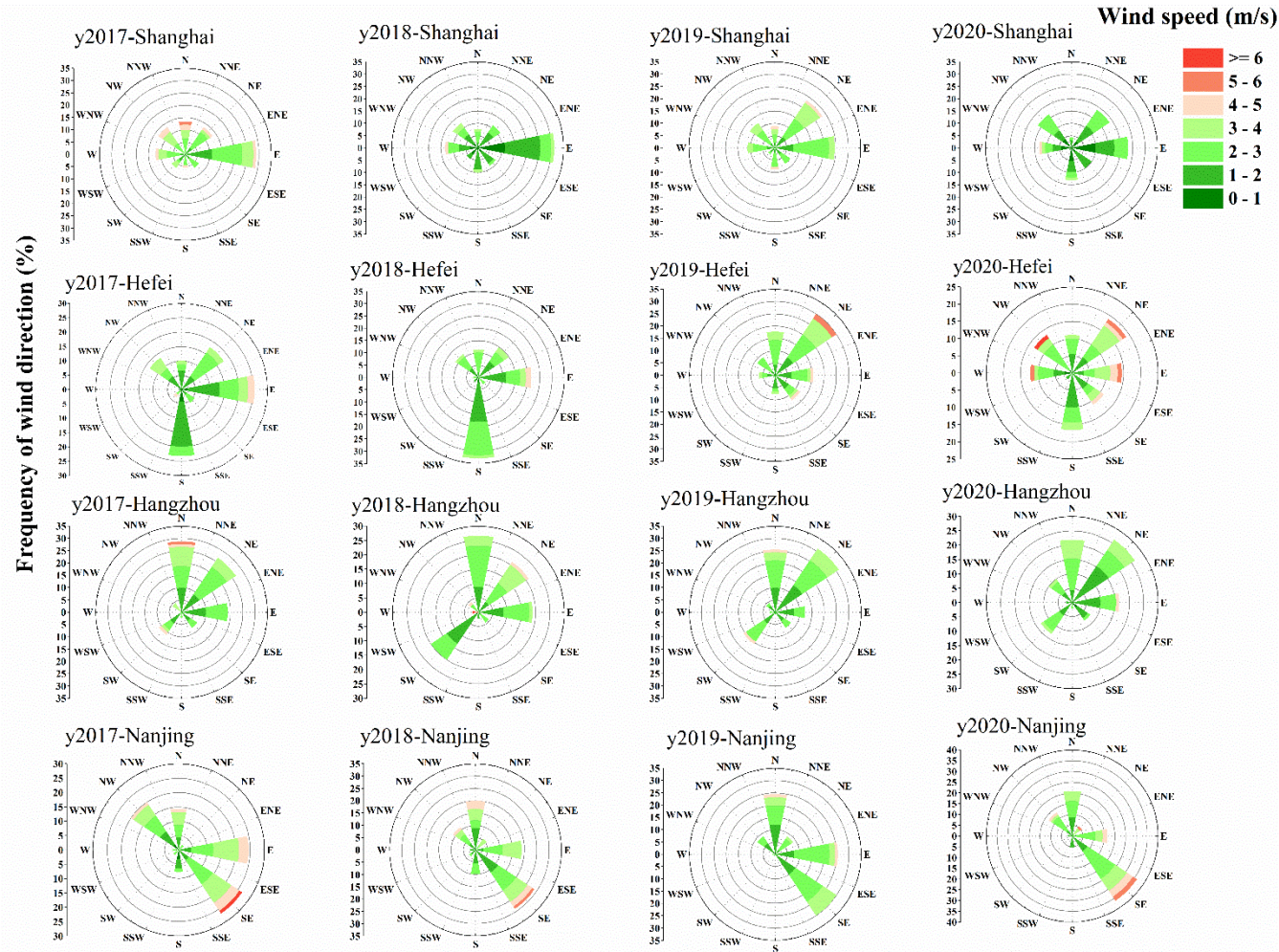


Fig. S4 Changes of SO₂, NO₂, O₃ before lockdown, during Level I and Level II response in YRD

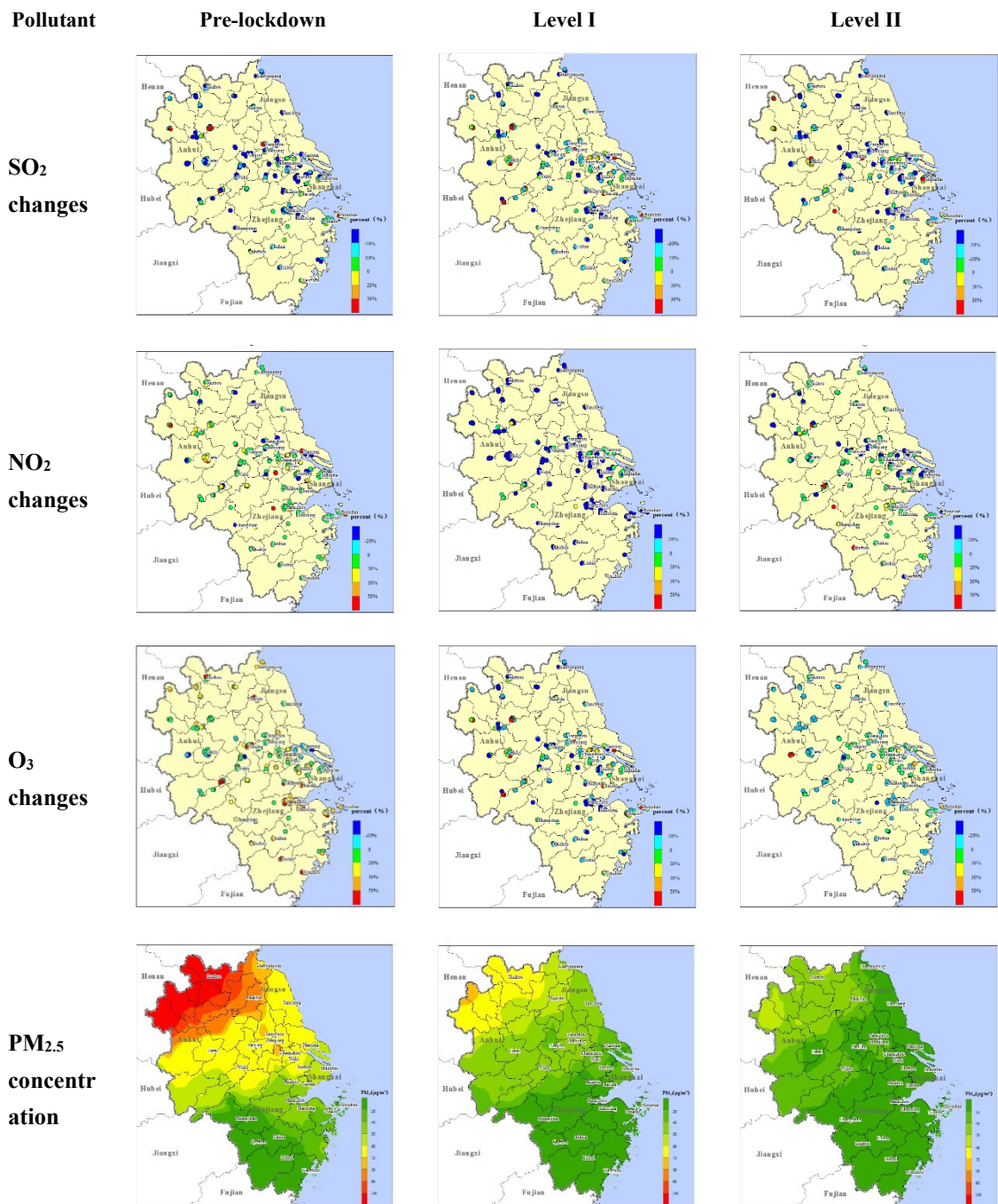
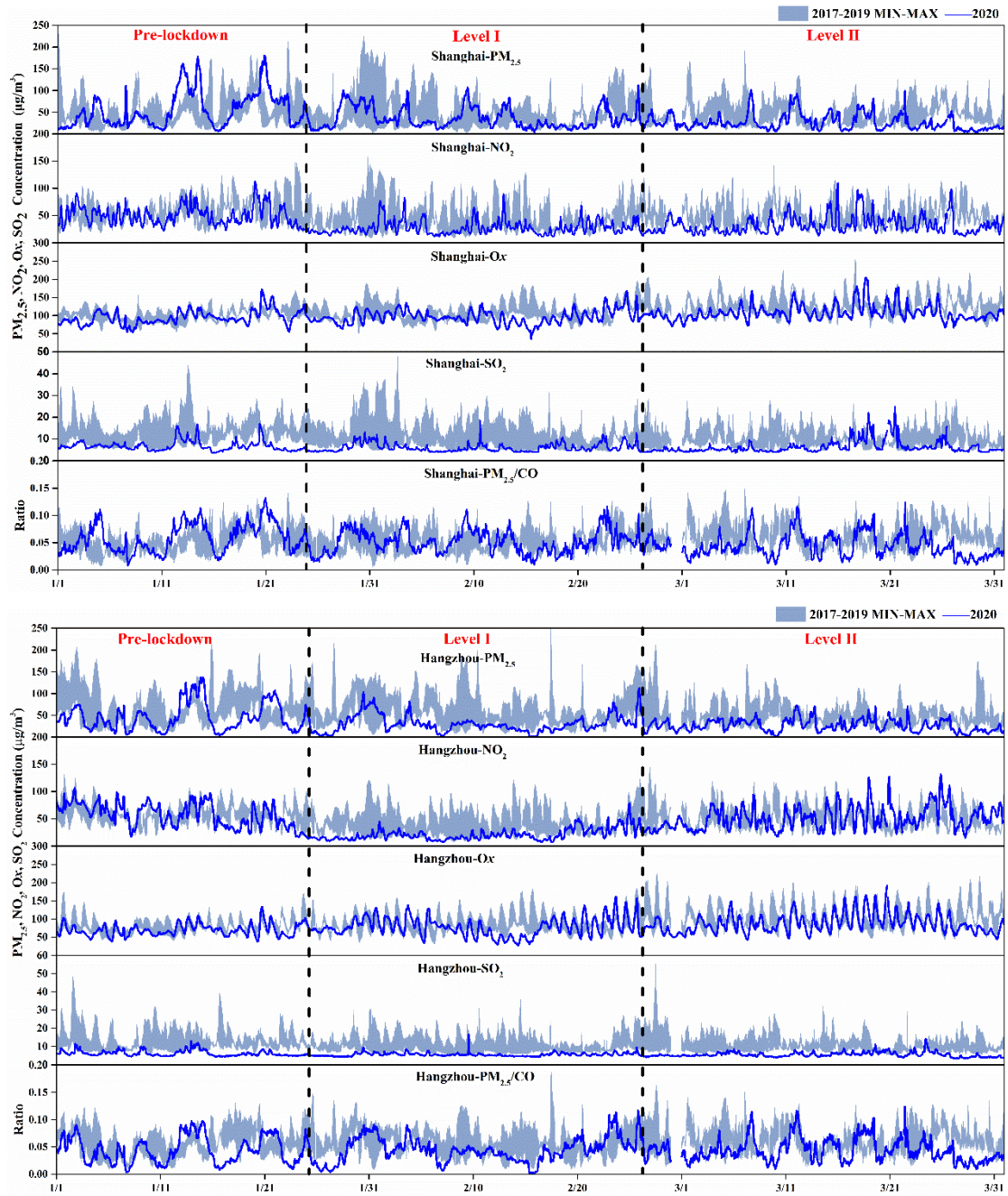


Fig. S5 Time series of concentrations of main air pollutants from Jan 1st to Mar.

31st, 2020 in typical cities over the YRD.



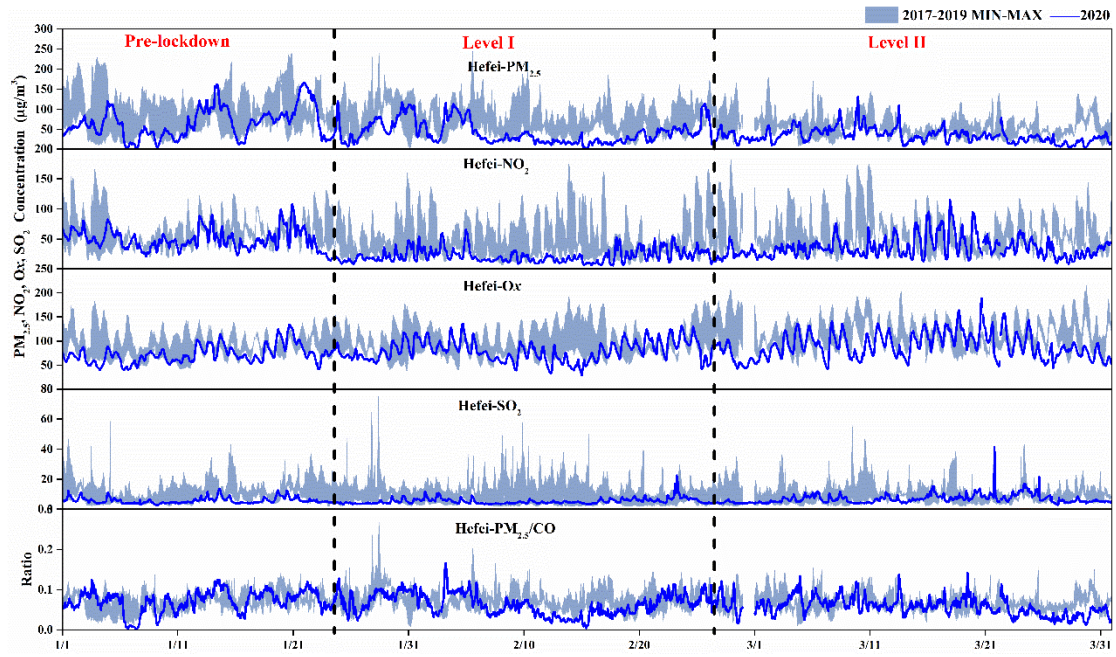
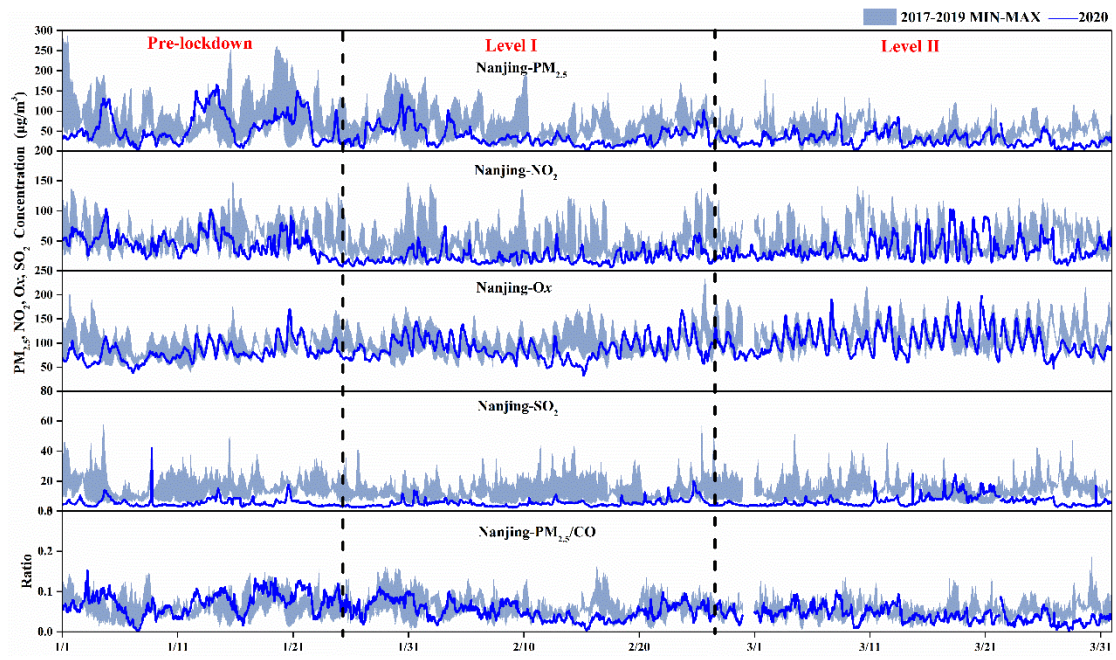


Fig.S6 Year-on-year changes of clustering analysis in Shanghai.

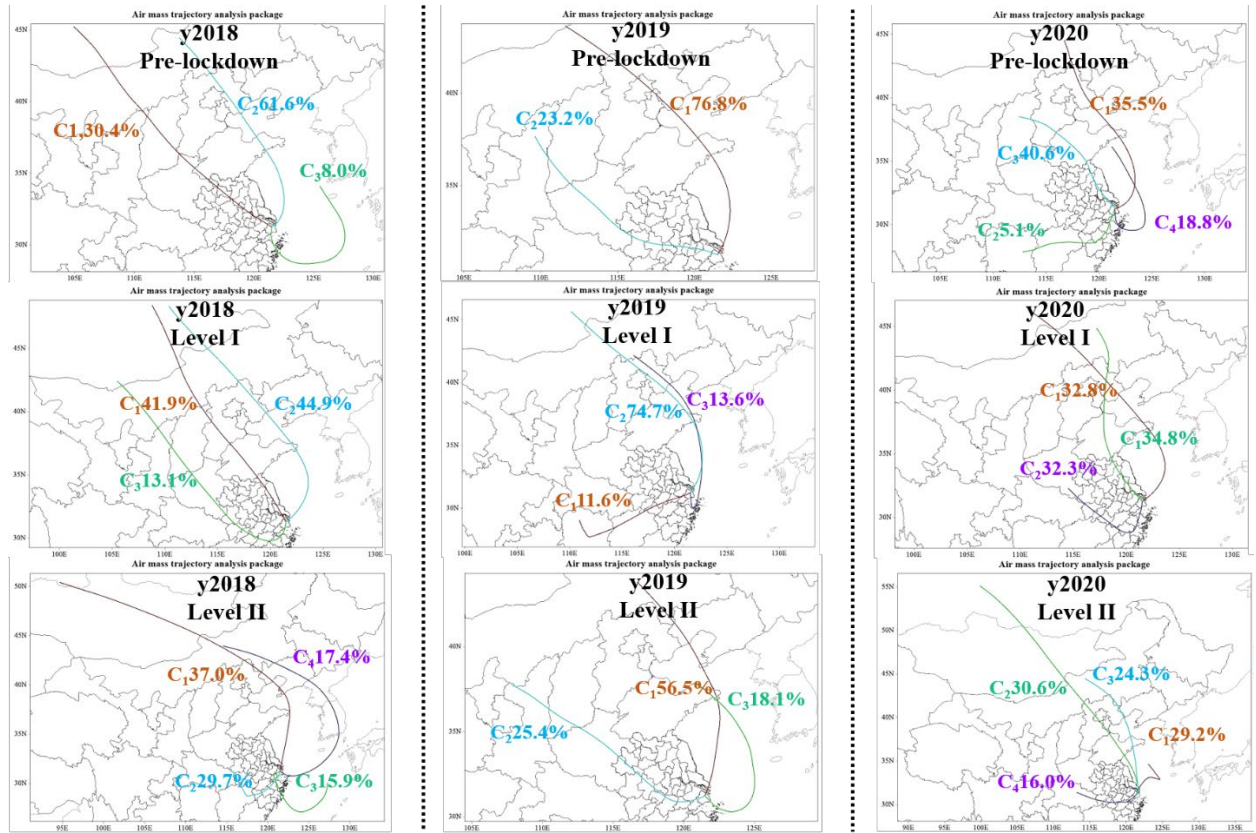


Table S1 Statistical summary of hourly PM_{2.5} concentrations at 41 monitoring sites over the YRD region during January 1st to March 31st 2020 (MB: mean bias; NMB: normalized mean bias; FB: fractional bias; FE: fractional error)

| Province | City | Latitude | Longitude | Observed ($\mu\text{g}/\text{m}^3$) | Predicted ($\mu\text{g}/\text{m}^3$) | MB ($\mu\text{g}/\text{m}^3$) | NMB | FB | FE |
|-----------|-------------|----------|-----------|---------------------------------------|--|---------------------------------|-------|-------|--------------|
| Shanghai | | 31.17 | 121.41 | 43.3 | 31.8 | -11.2 | -0.26 | -0.36 | 0.62 |
| Anhui | Anqing | 30.51 | 117.06 | 47.2 | 46.8 | -0.6 | -0.01 | -0.06 | 0.59 |
| | Bengbu | 32.94 | 117.40 | 60.5 | 46.6 | -13.7 | -0.23 | -0.29 | 0.61 |
| | Bozhou | 33.84 | 115.81 | 78.1 | 43.9 | -34.0 | -0.44 | -0.54 | 0.65 |
| | Chizhou | 30.66 | 117.47 | 39.7 | 46.3 | 6.6 | 0.17 | 0.07 | 0.64 |
| | Chuzhou | 32.32 | 118.31 | 50.5 | 39.7 | -10.8 | -0.21 | -0.34 | 0.70 |
| | Fuyang | 32.89 | 115.83 | 75.2 | 48.8 | -26.4 | -0.35 | -0.41 | 0.59 |
| | Hefei | 31.79 | 117.20 | 43.3 | 47.9 | 4.7 | 0.11 | 0.04 | 0.62 |
| | Huaibei | 33.95 | 116.78 | 73.9 | 44.5 | -29.5 | -0.40 | -0.48 | 0.62 |
| | Huainan | 32.76 | 116.80 | 77.7 | 44.0 | -33.7 | -0.43 | -0.57 | 0.71 |
| | Huangshan | 30.28 | 118.14 | 23.2 | 22.0 | -1.3 | -0.06 | -0.09 | 0.72 |
| | Liu'an | 31.74 | 116.51 | 48.7 | 40.2 | -8.5 | -0.17 | -0.20 | 0.60 |
| | Maanshan | 31.69 | 118.48 | 50.8 | 65.4 | 14.3 | 0.28 | 0.19 | 0.63 |
| | Tongling | 30.94 | 117.82 | 44.3 | 67.3 | 22.7 | 0.51 | 0.29 | 0.61 |
| | Wuhu | 31.35 | 118.35 | 45.4 | 46.3 | 0.5 | 0.01 | 0.00 | 0.60 |
| | Suzhou | 33.63 | 116.99 | 68.1 | 41.5 | -26.7 | -0.39 | -0.39 | 0.67 |
| Xuancheng | 30.95 | 118.76 | 47.2 | 38.9 | -8.5 | -0.18 | -0.21 | 0.62 | |
| Jiangsu | Changzhou | 31.76 | 120.00 | 46.7 | 75.7 | 29.2 | 0.63 | 0.28 | 0.71 |
| | Huaian | 33.61 | 118.99 | 54.4 | 33.9 | -20.3 | -0.37 | -0.38 | 0.65 |
| | Lianyungang | 34.59 | 119.18 | 53.2 | 26.5 | -26.8 | -0.50 | -0.59 | 0.77* |
| | Nanjing | 32.11 | 118.80 | 39.5 | 64.2 | 25.2 | 0.64 | 0.38 | 0.72 |

| | | | | | | | | | |
|----------|-----------|--------|--------|------|------|-------|-------|--------------|--------------|
| | Nantong | 32.02 | 120.87 | 39.9 | 30.2 | -9.8 | -0.25 | -0.27 | 0.68 |
| | Suzhou | 31.29 | 120.63 | 41.4 | 48.1 | 6.3 | 0.15 | 0.07 | 0.63 |
| | Taizhou | 32.46 | 119.89 | 46.3 | 36.0 | -10.3 | -0.22 | -0.26 | 0.65 |
| | Wuxi | 31.68 | 120.29 | 37.0 | 44.8 | 7.6 | 0.21 | 0.14 | 0.65 |
| | Xuzhou | 34.28 | 117.29 | 71.9 | 51.4 | -20.4 | -0.28 | -0.32 | 0.55 |
| | Yangzhou | 32.41 | 119.40 | 48.7 | 39.7 | -9.0 | -0.19 | -0.15 | 0.66 |
| | Zhenjiang | 32.13 | 119.43 | 48.3 | 42.3 | -6.3 | -0.13 | -0.17 | 0.60 |
| Zhejiang | Hangzhou | 30.31 | 120.35 | 32.6 | 40.7 | 7.9 | 0.24 | 0.10 | 0.64 |
| | Huzhou | 30.90 | 120.09 | 30.4 | 38.6 | 8.2 | 0.27 | 0.15 | 0.66 |
| | Jiaxing | 30.80 | 120.74 | 31.8 | 44.7 | 12.8 | 0.40 | 0.26 | 0.66 |
| | Jinhua | 29.10 | 119.69 | 29.0 | 35.7 | 6.8 | 0.23 | 0.17 | 0.67 |
| | Lishui | 28.45 | 119.91 | 23.6 | 19.6 | -3.7 | -0.16 | -0.18 | 0.72 |
| | Ningbo | 29.85 | 121.52 | 24.2 | 31.0 | 7.0 | 0.29 | 0.15 | 0.67 |
| | Quzhou | 28.94 | 118.87 | 29.5 | 63.8 | 34.6 | 1.17 | 0.68* | 0.78* |
| | Shaoxing | 30.09 | 120.60 | 29.4 | 44.7 | 15.3 | 0.52 | 0.27 | 0.63 |
| | Taizhou | 28.65 | 121.42 | 33.1 | 23.2 | -9.7 | -0.29 | -0.27 | 0.66 |
| | Wenzhou | 28.01 | 120.63 | 27.1 | 25.9 | -1.2 | -0.04 | 0.01 | 0.61 |
| Zhoushan | 30.02 | 122.12 | 23.1 | 18.3 | -4.6 | -0.20 | -0.19 | 0.71 | |

*Shaded values exceed standards recommended by EPA (2007).

Table S2 Definition of CAMx PSAT groups.

| No. | Source Category | Abbreviation | Emission source sector |
|-----|-----------------------|--------------|---|
| 1 | Agriculture | AGR | Agriculture |
| 2 | Residential | RES | Cooking Residential combustion |
| 3 | Dust | DST | Construction dust Road dust Power plants |
| 4 | Industry | IND | Industrial boilers Industrial kilns Industrial processes |
| 5 | Biomass burning | BB | Biomass burning Onroad vehicle exhaust |
| 6 | Mobile | MOB | Non-road Aircraft Architectural coating |
| 7 | Solvent use + storage | OTHER | Household solvent usage Hospital solvent usage Gas station Oil storage |
| 8 | Natural | NAT | Biogenic emissions Sea-salt emissions |

Table S3. Year-on-year variability of various pollutants in 2020.

| Pollutants | Pre-lockdown | | | Level I Response Period | | | Level II Response Period | | |
|-------------------------|--------------|-------|---------------|-------------------------|-------|---------------|--------------------------|-------|---------------|
| | y2019 | y2020 | Changing rate | y2019 | y2020 | Changing rate | y2019 | y2020 | Changing rate |
| PM_{2.5} | 75 | 66 | -12.3% | 62 | 42 | -31.8% | 51 | 34 | -33.2% |
| PM₁₀ | 101 | 81 | -19.6% | 81 | 54 | -33.7% | 81 | 57 | -29.0% |
| CO | 1.0 | 1.0 | -7.8% | 0.9 | 0.7 | -20.9% | 0.7 | 0.6 | -14.7% |
| NO₂ | 48 | 39 | -18.5% | 31 | 17 | -45.1% | 38 | 28 | -25.9% |
| SO₂ | 11 | 7 | -29.3% | 8 | 7 | -20.4% | 10 | 7 | -27.2% |
| O_{3_8h} | 49 | 54 | 10.4% | 70 | 84 | 20.5% | 96 | 89 | -7.6% |

Table S4. Ratio of various pollutants in provinces (cities) in the Yangtze River Delta in 2020 compared with the same period in 2019.

| Pollutants | Pre-lockdown | | | | Level I Response | | | | Level II Response | | | |
|-------------------------|--------------|---------|----------|----------|------------------|---------|----------|----------|-------------------|---------|----------|----------|
| | Anhui | Jiangsu | Shanghai | Zhejiang | Anhui | Jiangsu | Shanghai | Zhejiang | Anhui | Jiangsu | Shanghai | Zhejiang |
| PM_{2.5} | -13.9% | -6.3% | 5.2% | -21.4% | -34.3% | -29.5% | -9.8% | -31.5% | -29.1% | -36.3% | -45.0% | -35.5% |
| PM₁₀ | -19.1% | -19.5% | -17.8% | -21.0% | -32.9% | -36.0% | -22.3% | -32.3% | -24.9% | -34.5% | -36.1% | -27.2% |
| CO | -8.8% | -7.0% | 6.3% | -8.4% | -21.5% | -19.4% | -7.3% | -23.0% | -11.0% | -19.1% | -21.0% | -14.0% |
| NO₂ | -17.3% | -21.2% | -13.5% | -17.3% | -42.8% | -44.7% | -29.5% | -51.7% | -26.4% | -29.5% | -36.9% | -18.8% |
| SO₂ | -29.5% | -35.1% | -24.7% | -18.9% | -20.2% | -24.0% | -9.8% | -16.2% | -24.1% | -33.6% | -12.3% | -24.3% |
| O_{3_8h} | 3.5% | 11.8% | 7.3% | 20.4% | 22.7% | 12.4% | 16.2% | 28.7% | -8.1% | -5.6% | -2.6% | -9.9% |

Table S5 Year-on-year changes of various pollutants in different gas groups in Shanghai.

| Stages | Clusters | Rate | | | Concentration ($\mu\text{g}/\text{m}^3$; CO, mg/m^3) | | | | | | | | | | | | | | | | | | | | |
|--------------------|----------|-------|-------|-------|---|-----------|-----------|------------|------------|------------|-----------------|----------|----------|-----------------|-----------|-----------|--------------------|-----------|-----------|------------|------------|------------|--------------------|-----------|-----------|
| | | | | | PM _{2.5} | | | CO | | | SO ₂ | | | NO ₂ | | | O ₃ _1h | | | Ox | | | O ₃ _8h | | |
| | | y2018 | y2019 | y2020 | y2018 | y2019 | y2020 | y2018 | y2019 | y2020 | y2018 | y2019 | y2020 | y2018 | y2019 | y2020 | y2018 | y2019 | y2020 | y2018 | y2019 | y2020 | y2018 | y2019 | y2020 |
| EP1 | C1 | 30.4% | 76.8% | 35.5% | 70 | 45 | 32 | 1.1 | 0.7 | 0.6 | 16 | 8 | 6 | 63 | 51 | 44 | 39 | 43 | 49 | 101 | 93 | 93 | 36 | 43 | 48 |
| | C2 | 61.6% | 23.2% | 5.1% | 47 | 81 | 54 | 0.9 | 1.1 | 0.9 | 12 | 13 | 6 | 55 | 83 | 62 | 47 | 27 | 22 | 102 | 110 | 84 | 46 | 27 | 26 |
| | C3 | 8.0% | | 40.6% | 55 | | 85 | 1.0 | | 1.1 | 15 | | 8 | 78 | | 55 | 22 | | 42 | 100 | | 97 | 22 | | 41 |
| | C4 | | | 18.8% | | | 39 | | | 0.7 | | | 6 | | | 49 | | | 41 | | | 90 | | | 43 |
| EP1_Average | | | | | 55 | 53 | 56 | 1.0 | 0.8 | 0.9 | 13 | 9 | 7 | 59 | 58 | 50 | 42 | 39 | 43 | 102 | 97 | 94 | 41 | 39 | 43 |
| EP2 | C1 | 41.9% | 11.6% | 32.8% | 69 | 47 | 25 | 1.1 | 0.9 | 0.6 | 18 | 7 | 5 | 57 | 41 | 24 | 56 | 44 | 74 | 114 | 85 | 98 | 54 | 44 | 72 |
| | C2 | 44.9% | 74.7% | 32.3% | 35 | 41 | 34 | 0.7 | 0.7 | 0.6 | 11 | 7 | 6 | 38 | 36 | 31 | 71 | 65 | 66 | 109 | 101 | 98 | 71 | 63 | 69 |
| | C3 | 13.1% | 13.6% | 34.8% | 49 | 34 | 49 | 0.8 | 0.6 | 0.8 | 13 | 7 | 7 | 56 | 49 | 26 | 69 | 45 | 67 | 125 | 93 | 93 | 71 | 47 | 66 |
| EP2_Average | | | | | 51 | 41 | 36 | 0.9 | 0.7 | 0.7 | 14 | 7 | 6 | 48 | 38 | 27 | 64 | 59 | 69 | 113 | 98 | 96 | 64 | 59 | 69 |
| EP3 | C1 | 37.0% | 56.5% | 29.2% | 35 | 54 | 27 | 0.6 | 0.7 | 0.6 | 10 | 7 | 5 | 34 | 50 | 31 | 80 | 68 | 72 | 114 | 118 | 103 | 78 | 69 | 71 |
| | C2 | 29.7% | 25.4% | 30.6% | 44 | 55 | 24 | 0.7 | 0.8 | 0.6 | 13 | 9 | 6 | 52 | 55 | 28 | 75 | 82 | 80 | 127 | 137 | 108 | 74 | 78 | 78 |
| | C3 | 15.9% | 18.1% | 24.3% | 28 | 43 | 36 | 0.6 | 0.7 | 0.7 | 12 | 6 | 6 | 43 | 52 | 31 | 59 | 73 | 78 | 102 | 125 | 109 | 65 | 74 | 78 |
| | C4 | 17.4% | | 16.0% | 22 | | 39 | 0.5 | | 0.6 | 9 | | 9 | 30 | | 43 | 87 | | 81 | 118 | | 124 | 88 | | 82 |
| EP3_Average | | | | | 34 | 52 | 30 | 0.6 | 0.7 | 0.6 | 11 | 7 | 6 | 40 | 51 | 32 | 76 | 73 | 77 | 117 | 124 | 109 | 76 | 72 | 77 |
| Average | | | | | 47 | 47 | 40 | 0.8 | 0.8 | 0.7 | 13 | 8 | 6 | 50 | 48 | 35 | 61 | 57 | 64 | 111 | 105 | 99 | 61 | 57 | 64 |

Note: EP1 for Pre-lockdown; EP2 for Level I Response; EP2 for Level II Response.

Table S6 Changes in averaged PM_{2.5} concentrations (µg/m³) due to lockdown during Level I and Level II periods.

| Province | City | Level I | | | Level II | | |
|-----------|-------------|-------------------------------|----------------------------------|--|-------------------------------|----------------------------------|--|
| | | Observed (µg/m ³) | Relative improvement factor (RF) | Changes due to lockdown (µg/m ³) | Observed (µg/m ³) | Relative improvement factor (RF) | Changes due to lockdown (µg/m ³) |
| Shanghai | | 36.5 | -40.9% | -14.9 | 26.9 | -34.9% | -9.4 |
| Anhui | Anqing | 42.2 | -32.2% | -13.6 | 39.2 | -19.5% | -7.6 |
| | Bengbu | 55.1 | -38.3% | -21.1 | 42.0 | -21.4% | -9.0 |
| | Bozhou | 78.9 | -33.6% | -26.5 | 50.2 | -21.1% | -10.6 |
| | Chizhou | 36.4 | -28.5% | -10.4 | 32.5 | -17.2% | -5.6 |
| | Chuzhou | 48.8 | -39.1% | -19.0 | 38.8 | -26.9% | -10.5 |
| | Fuyang | 72.2 | -37.8% | -27.3 | 51.3 | -24.0% | -12.3 |
| | Hefei | 41.8 | -44.8% | -18.7 | 34.7 | -23.3% | -8.1 |
| | Huaibei | 65.9 | -37.4% | -24.7 | 51.1 | -22.2% | -11.4 |
| | Huainan | 61.1 | -39.8% | -24.3 | 48.7 | -22.8% | -11.1 |
| | Huangshan | 20.9 | -25.4% | -5.3 | 25.1 | -21.0% | -5.3 |
| | Liuan | 45.3 | -35.0% | -15.9 | 39.5 | -24.2% | -9.5 |
| | Maanshan | 45.3 | -33.9% | -15.4 | 36.9 | -15.3% | -5.6 |
| | Tongling | 43.0 | -32.5% | -14.0 | 37.7 | -16.8% | -6.3 |
| | Wuhu | 44.1 | -38.2% | -16.8 | 36.1 | -21.5% | -7.8 |
| | Suzhou | 62.9 | -36.2% | -22.8 | 44.5 | -23.5% | -10.5 |
| Xuancheng | 38.5 | -35.9% | -13.8 | 34.9 | -24.5% | -8.5 | |
| Jiangsu | Changzhou | 43.8 | -38.0% | -16.7 | 37.9 | -17.5% | -6.7 |
| | Huaian | 54.8 | -44.9% | -24.6 | 40.3 | -30.6% | -12.4 |
| | Lianyungang | 50.6 | -43.4% | -22.0 | 32.7 | -29.4% | -9.6 |

| | | | | | | | |
|----------|-----------|------|--------|-------|------|--------|-------|
| | Nanjing | 37.8 | -35.9% | -13.6 | 29.6 | -19.6% | -5.8 |
| | Nantong | 39.5 | -44.3% | -17.5 | 30.1 | -27.8% | -8.4 |
| | Suzhou | 37.1 | -37.4% | -13.9 | 32.0 | -21.6% | -6.9 |
| | Taizhou | 44.3 | -48.1% | -21.3 | 33.2 | -29.6% | -9.8 |
| | Wuxi | 34.5 | -38.3% | -13.2 | 29.3 | -22.7% | -6.7 |
| | Suqian | 62.8 | -38.9% | -24.4 | 44.8 | -26.9% | -12.1 |
| | Xuzhou | 65.9 | -39.0% | -25.7 | 48.1 | -22.8% | -11.0 |
| | Yancheng | 42.4 | -42.3% | -17.9 | 31.6 | -28.8% | -9.1 |
| | Yangzhou | 40.9 | -38.0% | -15.5 | 30.9 | -17.5% | -5.4 |
| | Zhenjiang | 45.6 | -36.2% | -16.5 | 37.0 | -23.8% | -8.8 |
| Zhejiang | Hangzhou | 30.3 | -38.5% | -11.7 | 26.9 | -24.9% | -6.7 |
| | Huzhou | 28.5 | -32.8% | -9.4 | 22.5 | -23.8% | -5.3 |
| | Jiaxing | 31.9 | -35.3% | -11.2 | 24.1 | -21.5% | -5.2 |
| | Jinhua | 26.6 | -39.1% | -10.4 | 25.5 | -26.9% | -6.9 |
| | Lishui | 19.6 | -37.8% | -7.4 | 21.5 | -33.8% | -7.3 |
| | Ningbo | 26.7 | -47.0% | -12.6 | 20.3 | -33.5% | -6.8 |
| | Quzhou | 23.9 | -31.7% | -7.6 | 27.2 | -18.0% | -4.9 |
| | Shaoxing | 28.9 | -40.4% | -11.7 | 25.1 | -27.0% | -6.8 |
| | Taizhou | 26.6 | -38.7% | -10.3 | 25.7 | -32.2% | -8.3 |
| | Wenzhou | 21.5 | -45.8% | -9.9 | 24.5 | -36.0% | -8.8 |
| | Zhoushan | 21.9 | -31.1% | -6.8 | 15.3 | -26.3% | -4.0 |

Table S7 Changes in averaged SO₂ concentrations (µg/m³) due to lockdown during Level I and Level II periods.

| Province | City | Level I | | | Level II | | |
|----------|-------------|-------------------------------|----------------------------------|--|-------------------------------|----------------------------------|--|
| | | Observed (µg/m ³) | Relative improvement factor (RF) | Changes due to lockdown (µg/m ³) | Observed (µg/m ³) | Relative improvement factor (RF) | Changes due to lockdown (µg/m ³) |
| Shanghai | | 6.1 | -24.6% | -1.5 | 6.3 | -17.6% | -1.1 |
| Anhui | Anqing | 8.9 | -30.4% | -2.7 | 7.3 | -13.9% | -1.0 |
| | Bengbu | 9.5 | -25.3% | -2.4 | 14.7 | -21.2% | -3.1 |
| | Bozhou | 6.1 | -25.4% | -1.6 | 6.4 | -21.8% | -1.4 |
| | Chizhou | 8.1 | -31.7% | -2.6 | 8.9 | -12.7% | -1.1 |
| | Chuzhou | 7.2 | -32.8% | -2.4 | 6.8 | -17.4% | -1.2 |
| | Fuyang | 5.9 | -17.9% | -1.1 | 5.9 | -21.4% | -1.3 |
| | Hefei | 5.5 | -27.1% | -1.5 | 6.9 | -18.9% | -1.3 |
| | Huaibei | 7.8 | -25.7% | -2.0 | 8.2 | -20.1% | -1.6 |
| | Huainan | 8.5 | -27.2% | -2.3 | 9.7 | -21.1% | -2.0 |
| | Huangshan | 5.5 | -30.6% | -1.7 | 5.9 | -20.5% | -1.2 |
| | Liuan | 4.5 | -23.3% | -1.0 | 5.2 | -20.7% | -1.1 |
| | Maanshan | 9.5 | -31.8% | -3.0 | 9.9 | -12.9% | -1.3 |
| | Tongling | 14.1 | -31.8% | -4.5 | 12.4 | -12.0% | -1.5 |
| | Wuhu | 6.9 | -27.6% | -1.9 | 7.3 | -13.6% | -1.0 |
| | Suzhou | 6.6 | -19.6% | -1.3 | 6.4 | -21.5% | -1.4 |
| | Xuancheng | 6.7 | -28.5% | -1.9 | 6.7 | -17.7% | -1.2 |
| Jiangsu | Changzhou | 8.8 | -30.9% | -2.7 | 8.6 | -13.2% | -1.1 |
| | Huaian | 5.1 | -28.1% | -1.4 | 6.6 | -17.7% | -1.2 |
| | Lianyungang | 10.9 | -26.3% | -2.9 | 8.8 | -22.6% | -2.0 |

| | | | | | | | |
|----------|-----------|-----|--------|------|------|--------|------|
| | Nanjing | 5.4 | -27.5% | -1.5 | 6.8 | -15.1% | -1.0 |
| | Nantong | 5.0 | -28.4% | -1.4 | 6.5 | -14.5% | -0.9 |
| | Suzhou | 4.1 | -27.3% | -1.1 | 4.9 | -15.7% | -0.8 |
| | Taizhou | 5.9 | -29.7% | -1.8 | 6.6 | -15.8% | -1.0 |
| | Wuxi | 6.2 | -31.7% | -2.0 | 6.1 | -15.3% | -0.9 |
| | Suqian | 4.7 | -27.0% | -1.3 | 5.1 | -21.2% | -1.1 |
| | Xuzhou | 8.9 | -29.2% | -2.6 | 10.8 | -18.2% | -2.0 |
| | Yancheng | 3.6 | -26.0% | -0.9 | 4.2 | -20.3% | -0.8 |
| | Yangzhou | 7.0 | -30.9% | -2.2 | 8.9 | -13.2% | -1.2 |
| | Zhenjiang | 7.9 | -31.3% | -2.5 | 7.9 | -14.0% | -1.1 |
| Zhejiang | Hangzhou | 5.5 | -32.9% | -1.8 | 5.4 | -15.1% | -0.8 |
| | Huzhou | 4.7 | -32.5% | -1.5 | 6.0 | -17.7% | -1.1 |
| | Jiaxing | 7.2 | -32.2% | -2.3 | 7.3 | -13.7% | -1.0 |
| | Jinhua | 4.8 | -32.8% | -1.6 | 5.9 | -17.4% | -1.0 |
| | Lishui | 4.5 | -29.4% | -1.3 | 5.1 | -23.9% | -1.2 |
| | Ningbo | 6.6 | -30.9% | -2.0 | 7.6 | -17.8% | -1.4 |
| | Quzhou | 3.7 | -33.6% | -1.2 | 6.7 | -13.8% | -0.9 |
| | Shaoxing | 3.8 | -32.0% | -1.2 | 4.4 | -16.3% | -0.7 |
| | Taizhou | 3.2 | -29.3% | -0.9 | 4.1 | -20.5% | -0.8 |
| | Wenzhou | 5.9 | -25.2% | -1.5 | 6.6 | -23.2% | -1.5 |
| | Zhoushan | 6.5 | -41.3% | -2.7 | 5.6 | -27.0% | -1.5 |

Table S8 Changes in averaged NO₂ concentrations (µg/m³) due to lockdown during Level I and Level II periods

| Province | City | Level I | | | Level II | | |
|-----------|-------------|-------------------------------|----------------------------------|--|-------------------------------|----------------------------------|--|
| | | Observed (µg/m ³) | Relative improvement factor (RF) | Changes due to lockdown (µg/m ³) | Observed (µg/m ³) | Relative improvement factor (RF) | Changes due to lockdown (µg/m ³) |
| Shanghai | | 27.2 | -59.1% | -16.1 | 32.2 | -52.8% | -17.0 |
| Anhui | Anqing | 19.2 | -44.6% | -8.6 | 27.3 | -18.9% | -5.1 |
| | Bengbu | 17.7 | -66.0% | -11.6 | 28.5 | -26.9% | -7.7 |
| | Bozhou | 13.7 | -61.1% | -8.4 | 21.3 | -29.5% | -6.3 |
| | Chizhou | 16.6 | -37.2% | -6.2 | 25.3 | -13.1% | -3.3 |
| | Chuzhou | 23.3 | -53.5% | -12.5 | 30.0 | -30.6% | -9.2 |
| | Fuyang | 16.7 | -67.1% | -11.2 | 21.4 | -26.2% | -5.6 |
| | Hefei | 22.4 | -65.2% | -14.6 | 35.8 | -24.0% | -8.6 |
| | Huaibei | 16.6 | -63.9% | -10.6 | 26.4 | -26.4% | -6.9 |
| | Huainan | 17.4 | -70.3% | -12.2 | 26.5 | -26.6% | -7.1 |
| | Huangshan | 11.3 | -53.4% | -6.0 | 15.7 | -25.1% | -3.9 |
| | Liuan | 14.2 | -65.9% | -9.4 | 26.4 | -27.5% | -7.3 |
| | Maanshan | 23.1 | -40.2% | -9.3 | 32.6 | -15.6% | -5.1 |
| | Tongling | 25.9 | -36.4% | -9.4 | 35.9 | -13.7% | -4.9 |
| | Wuhu | 24.0 | -54.1% | -13.0 | 36.8 | -19.7% | -7.3 |
| | Suzhou | 14.6 | -57.5% | -8.4 | 24.4 | -25.2% | -6.1 |
| Xuancheng | 17.5 | -53.0% | -9.3 | 26.7 | -24.6% | -6.6 | |
| Jiangsu | Changzhou | 22.5 | -40.3% | -9.1 | 36.2 | -13.3% | -4.8 |
| | Huaian | 14.6 | -44.2% | -6.5 | 20.8 | -22.7% | -4.7 |
| | Lianyungang | 17.8 | -65.8% | -11.7 | 25.0 | -35.4% | -8.9 |

| | | | | | | | |
|----------|-----------|------|--------|-------|------|--------|-------|
| | Nanjing | 23.4 | -42.7% | -10.0 | 36.5 | -19.1% | -7.0 |
| | Nantong | 16.7 | -58.9% | -9.8 | 24.5 | -30.9% | -7.6 |
| | Suzhou | 17.0 | -56.4% | -9.6 | 29.8 | -30.9% | -9.2 |
| | Taizhou | 16.7 | -59.8% | -10.0 | 25.4 | -29.1% | -7.4 |
| | Wuxi | 20.7 | -46.8% | -9.7 | 33.5 | -24.4% | -8.2 |
| | Suqian | 15.8 | -64.4% | -10.2 | 25.1 | -34.5% | -8.7 |
| | Xuzhou | 18.8 | -40.3% | -7.6 | 34.3 | -20.6% | -7.1 |
| | Yancheng | 14.0 | -61.1% | -8.6 | 19.8 | -30.9% | -6.1 |
| | Yangzhou | 18.1 | -40.3% | -7.3 | 31.0 | -13.3% | -4.1 |
| | Zhenjiang | 18.5 | -47.7% | -8.9 | 28.9 | -24.1% | -7.0 |
| Zhejiang | Hangzhou | 15.6 | -56.8% | -8.8 | 38.1 | -27.6% | -10.5 |
| | Huzhou | 16.8 | -50.5% | -8.5 | 33.0 | -27.1% | -8.9 |
| | Jiaxing | 16.2 | -40.4% | -6.5 | 31.1 | -18.1% | -5.6 |
| | Jinhua | 15.7 | -53.5% | -8.4 | 33.8 | -30.6% | -10.4 |
| | Lishui | 7.7 | -58.8% | -4.5 | 18.7 | -34.5% | -6.5 |
| | Ningbo | 15.9 | -59.8% | -9.5 | 32.5 | -36.9% | -12.0 |
| | Quzhou | 14.8 | -32.5% | -4.8 | 34.0 | -13.4% | -4.6 |
| | Shaoxing | 13.5 | -42.8% | -5.8 | 27.9 | -22.0% | -6.1 |
| | Taizhou | 7.9 | -49.5% | -3.9 | 22.3 | -26.2% | -5.8 |
| | Wenzhou | 8.1 | -52.1% | -4.2 | 31.2 | -32.0% | -10.0 |
| | Zhoushan | 11.4 | -66.9% | -7.7 | 17.0 | -42.2% | -7.2 |

Table S9 Changes in averaged O₃ concentrations (µg/m³) due to lockdown during Level I and Level II periods

| Province | City | Level I | | | Level II | | |
|-----------|-------------|-------------------------------|----------------------------------|--|-------------------------------|----------------------------------|--|
| | | Observed (µg/m ³) | Relative improvement factor (RF) | Changes due to lockdown (µg/m ³) | Observed (µg/m ³) | Relative improvement factor (RF) | Changes due to lockdown (µg/m ³) |
| Shanghai | | 69.1 | 24.2% | 16.7 | 75.6 | 16.8% | 12.7 |
| Anhui | Anqing | 73.2 | 7.1% | 5.2 | 67.5 | -0.3% | -0.2 |
| | Bengbu | 63.3 | 14.6% | 9.2 | 61.4 | 2.0% | 1.2 |
| | Bozhou | 66.0 | 11.5% | 7.6 | 66.7 | 2.8% | 1.9 |
| | Chizhou | 50.2 | 0.4% | 0.2 | 52.3 | -2.2% | -1.2 |
| | Chuzhou | 62.4 | 1.3% | 0.8 | 65.5 | -0.5% | -0.3 |
| | Fuyang | 64.1 | 25.9% | 16.6 | 61.6 | 6.0% | 3.7 |
| | Hefei | 57.5 | 17.5% | 10.1 | 54.0 | 2.8% | 1.5 |
| | Huaibei | 66.1 | 19.6% | 13.0 | 64.0 | 4.8% | 3.1 |
| | Huainan | 63.7 | 16.1% | 10.2 | 65.2 | 3.3% | 2.1 |
| | Huangshan | 60.4 | -2.7% | -1.7 | 62.9 | -3.7% | -2.3 |
| | Liuan | 67.5 | 5.5% | 3.7 | 66.1 | 0.4% | 0.3 |
| | Maanshan | 50.9 | 2.5% | 1.3 | 54.2 | -0.7% | -0.4 |
| | Tongling | 53.9 | -2.4% | -1.3 | 52.6 | -2.3% | -1.2 |
| | Wuhu | 56.3 | 13.2% | 7.4 | 55.2 | 1.8% | 1.0 |
| | Suzhou | 65.2 | 12.3% | 8.0 | 62.9 | 2.8% | 1.8 |
| Xuancheng | 77.2 | 4.8% | 3.7 | 77.5 | -0.4% | -0.3 | |
| Jiangsu | Changzhou | 67.5 | 0.3% | 0.2 | 66.5 | 1.7% | 1.1 |
| | Huaian | 60.7 | 14.2% | 8.6 | 67.7 | 3.8% | 2.6 |
| | Lianyungang | 63.6 | 11.4% | 7.2 | 75.6 | 3.9% | 2.9 |

| | | | | | | | |
|----------|-----------|------|-------|------|------|-------|------|
| | Nanjing | 65.5 | 4.6% | 3.0 | 67.2 | 1.6% | 1.1 |
| | Nantong | 65.6 | 11.5% | 7.5 | 71.6 | 5.8% | 4.2 |
| | Suzhou | 68.7 | 12.2% | 8.4 | 66.5 | 5.2% | 3.5 |
| | Taizhou | 62.2 | 6.4% | 4.0 | 72.4 | 2.8% | 2.0 |
| | Wuxi | 65.4 | 4.8% | 3.1 | 65.4 | 3.2% | 2.1 |
| | Suqian | 64.2 | 8.4% | 5.4 | 68.1 | 3.1% | 2.1 |
| | Xuzhou | 63.6 | 19.6% | 12.5 | 58.2 | 6.2% | 3.6 |
| | Yancheng | 70.3 | 4.8% | 3.4 | 77.0 | 1.1% | 0.8 |
| | Yangzhou | 60.2 | 0.3% | 0.2 | 64.5 | 1.7% | 1.1 |
| | Zhenjiang | 60.1 | 5.1% | 3.1 | 65.2 | 1.4% | 0.9 |
| Zhejiang | Hangzhou | 62.9 | 8.2% | 5.1 | 48.9 | 3.4% | 1.7 |
| | Huzhou | 65.9 | 2.9% | 1.9 | 59.4 | 1.0% | 0.6 |
| | Jiaxing | 70.6 | -0.1% | -0.1 | 66.1 | 0.8% | 0.5 |
| | Jinhua | 52.5 | 1.3% | 0.7 | 48.2 | -0.5% | -0.2 |
| | Lishui | 53.9 | -2.6% | -1.4 | 53.7 | -3.6% | -1.9 |
| | Ningbo | 73.8 | 15.9% | 11.7 | 67.3 | 6.1% | 4.1 |
| | Quzhou | 58.1 | -7.1% | -4.1 | 48.0 | -3.3% | -1.6 |
| | Shaoxing | 66.1 | 0.0% | 0.0 | 59.6 | 0.1% | 0.0 |
| | Taizhou | 71.6 | 1.7% | 1.2 | 68.0 | -0.1% | -0.1 |
| | Wenzhou | 70.3 | 3.1% | 2.2 | 55.4 | 2.4% | 1.3 |
| | Zhoushan | 75.6 | 8.5% | 6.4 | 77.4 | 2.7% | 2.1 |