

Supplementary Materials: Spatiotemporal Patterns and Regional Transport of Ground-Level Ozone in Major Urban Agglomerations in China

Xiaoyong Liu ^{1,2}, Chengmei Zhao ^{1,2}, Jiqiang Niu ^{1,2,*}, Fangcheng Su ³, Dan Yao ⁴, Feng Xu ^{1,2}, Junhui Yan ^{1,2}, Xinzhi Shen ⁵ and Tao Jin ⁵

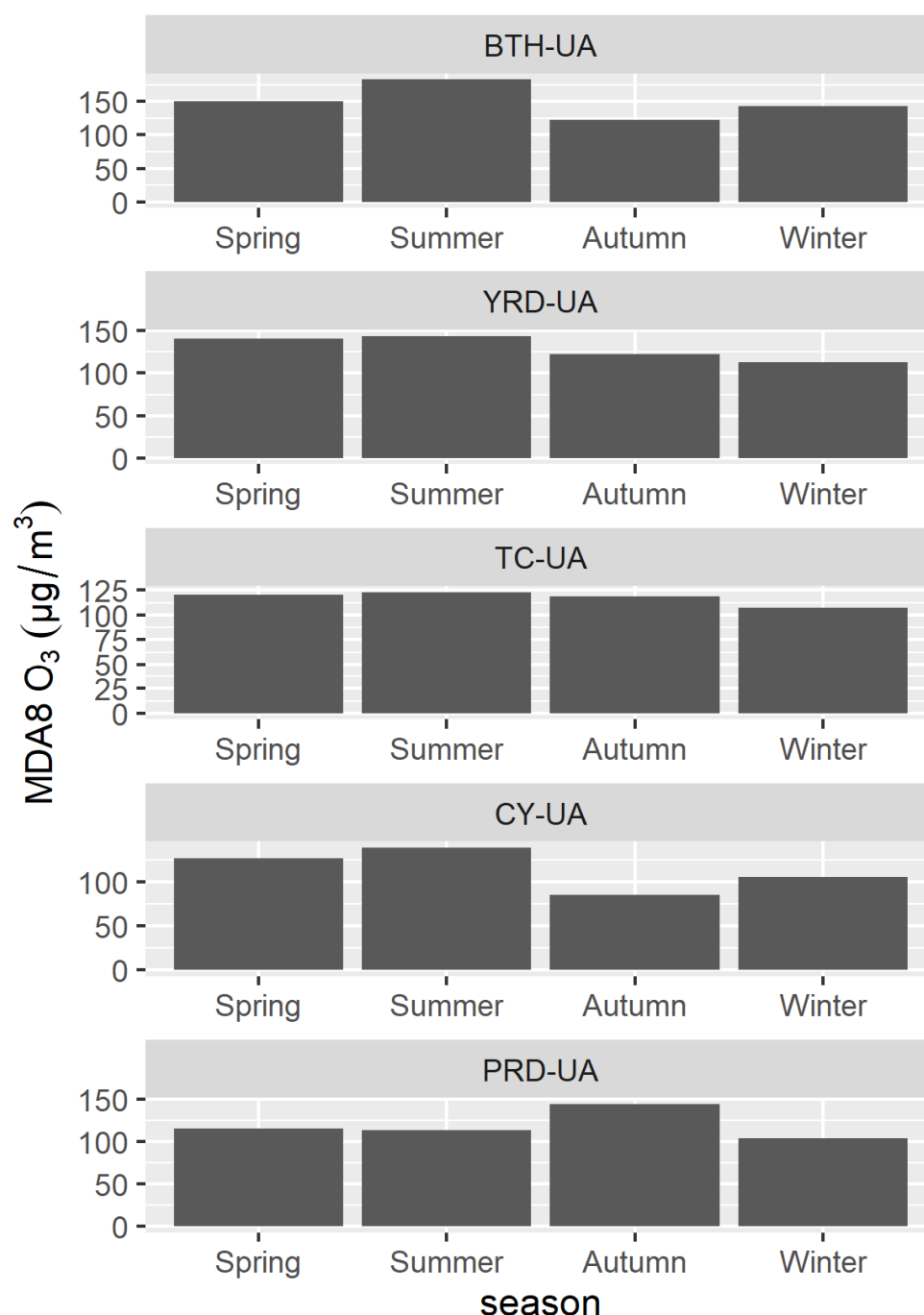


Figure S1. Seasonal average values of MDA8 O₃ concentrations in five urban agglomerations in 2017-2020.

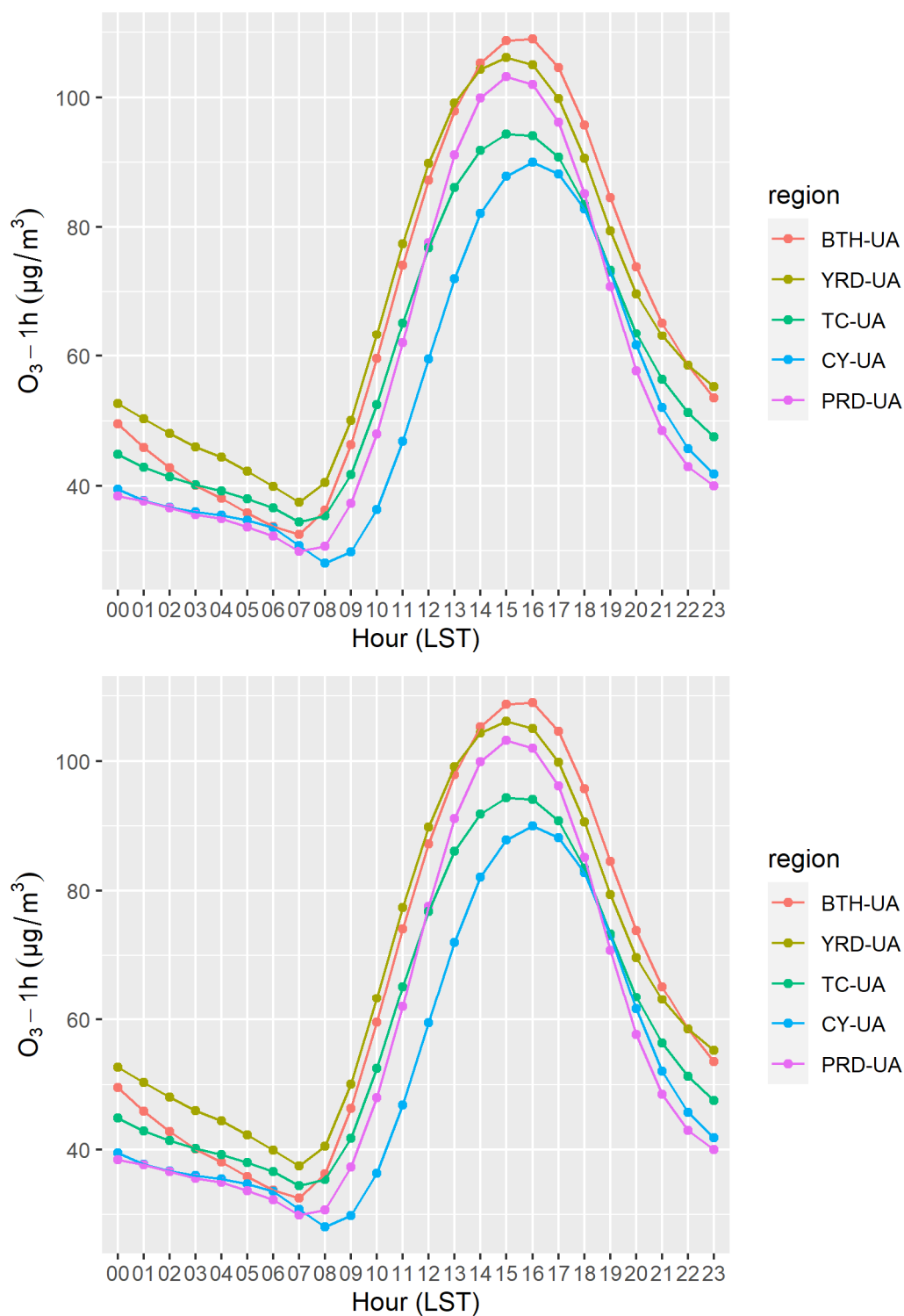


Figure S2. Diurnal variations of O_3 in five regions during 2017–2020.

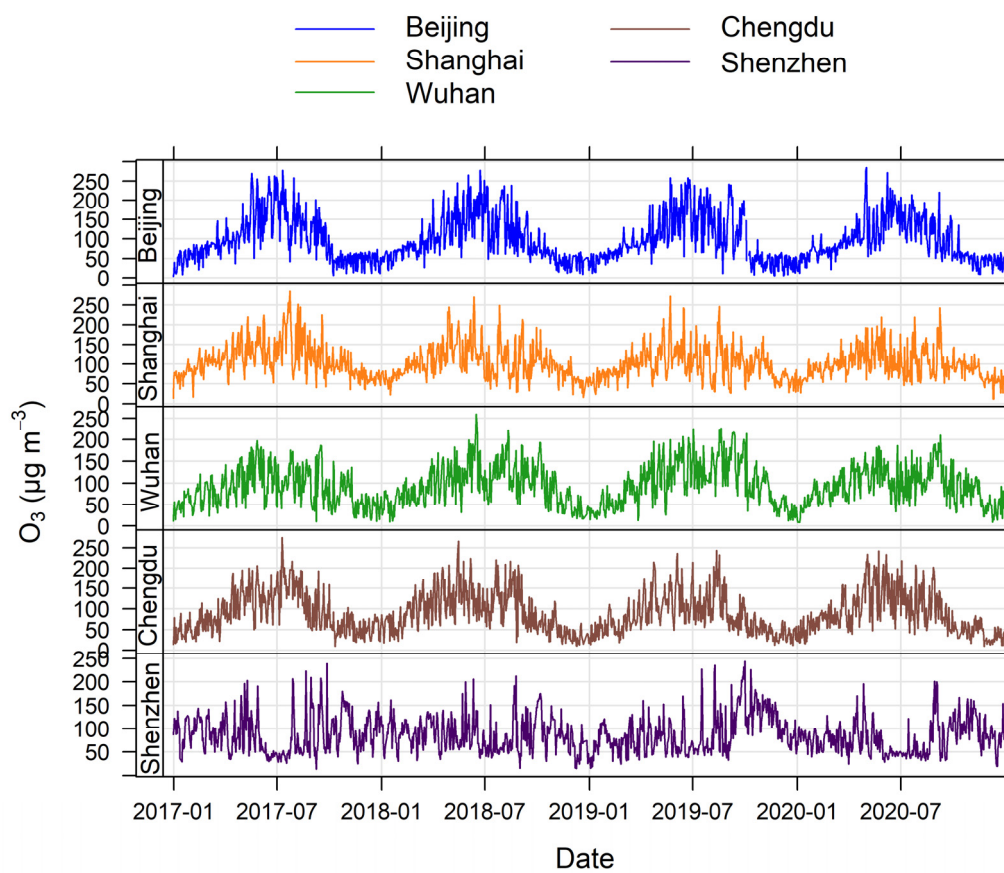


Figure S3. The original time series of MDA8 O₃ in five cities.

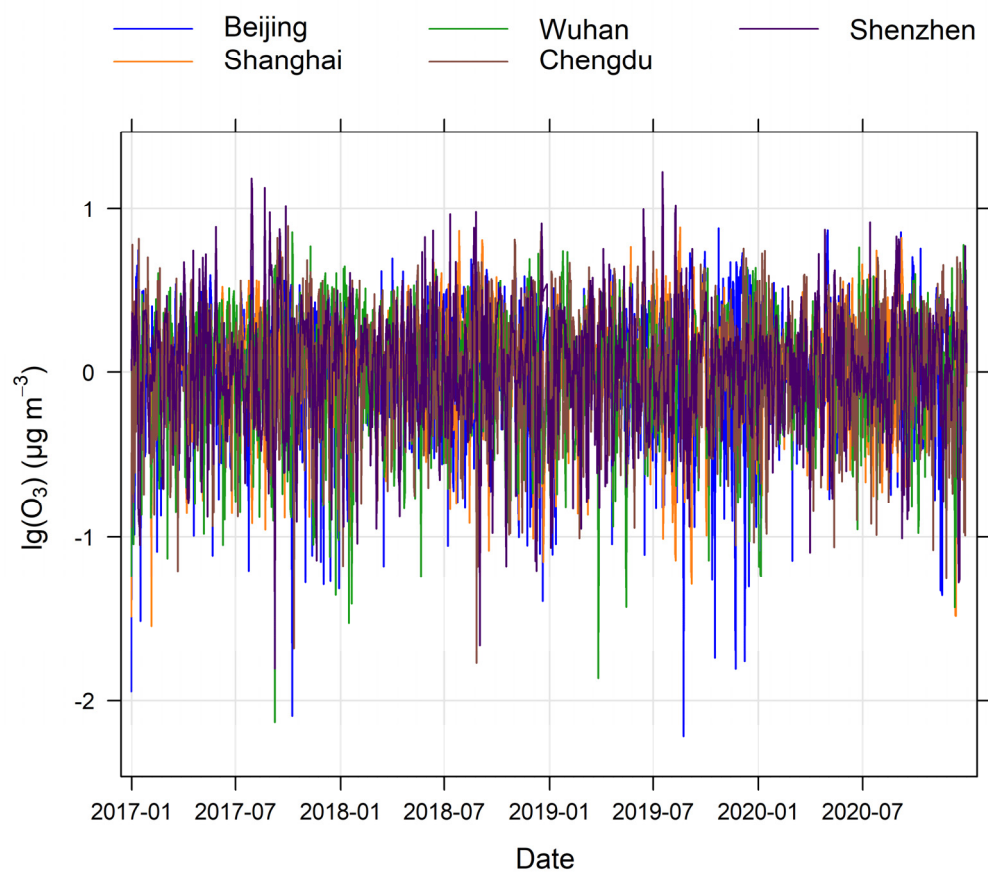


Figure S4. The short-term components of MDA8 O₃ decomposed by KZ filter in five cities.

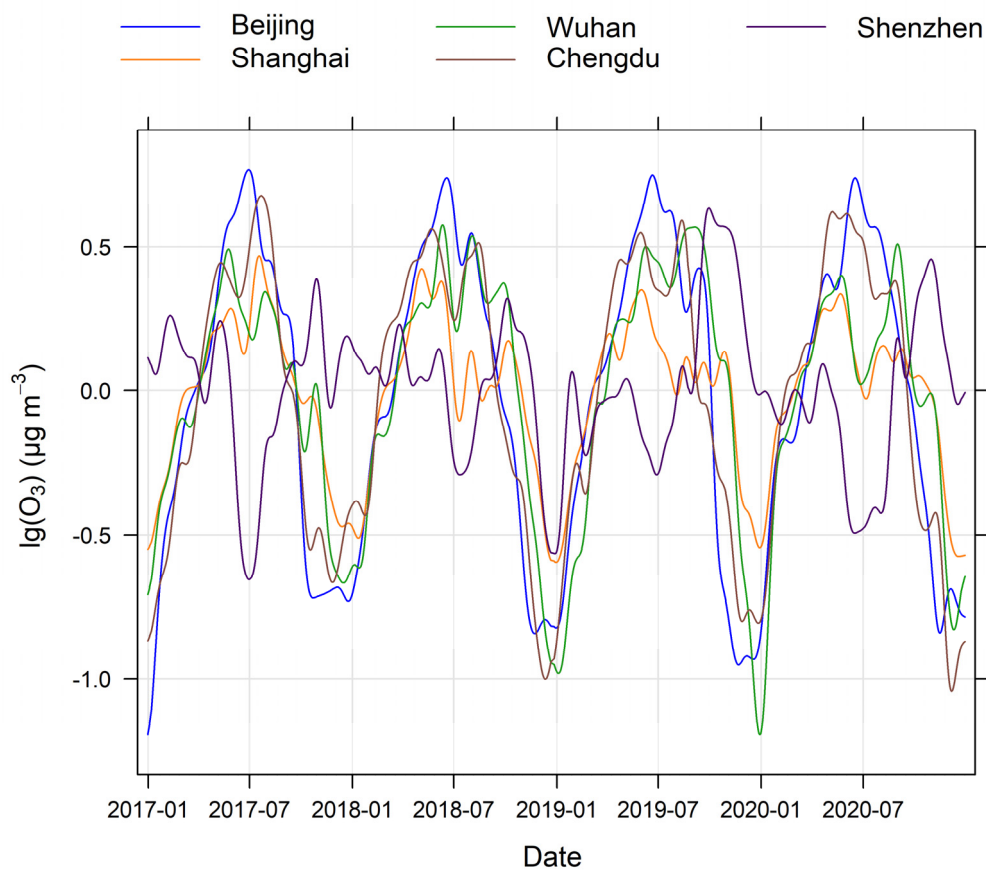


Figure S5. The seasonal components of MDA8 O₃ decomposed by KZ filter in five cities.

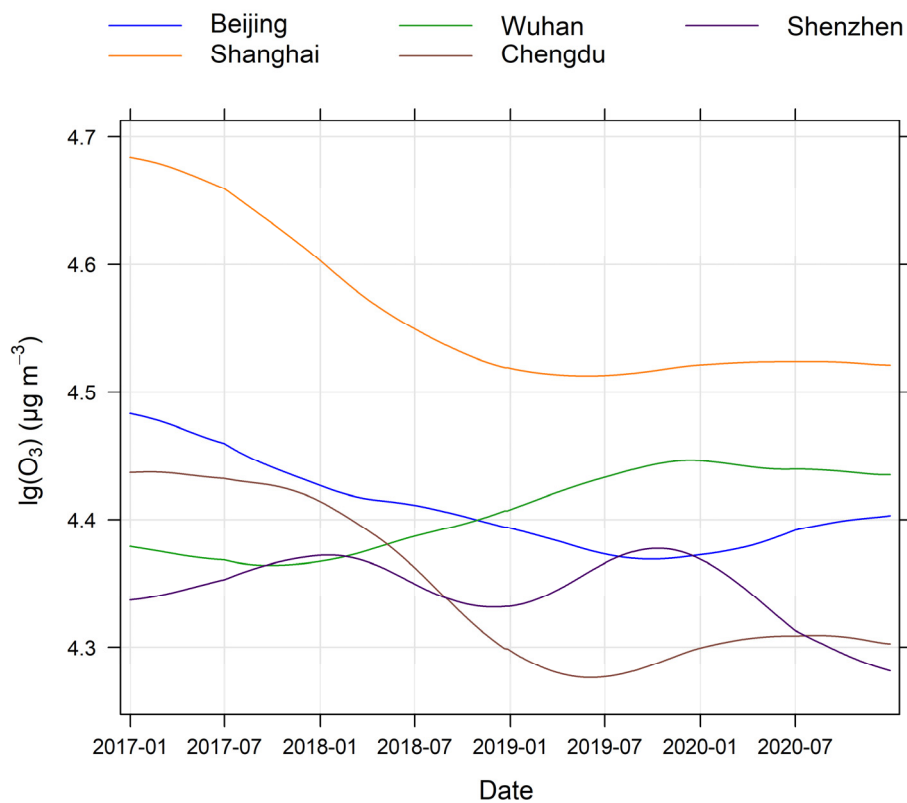


Figure S6. The long-term components of MDA8 O₃ decomposed by KZ filter in five cities.

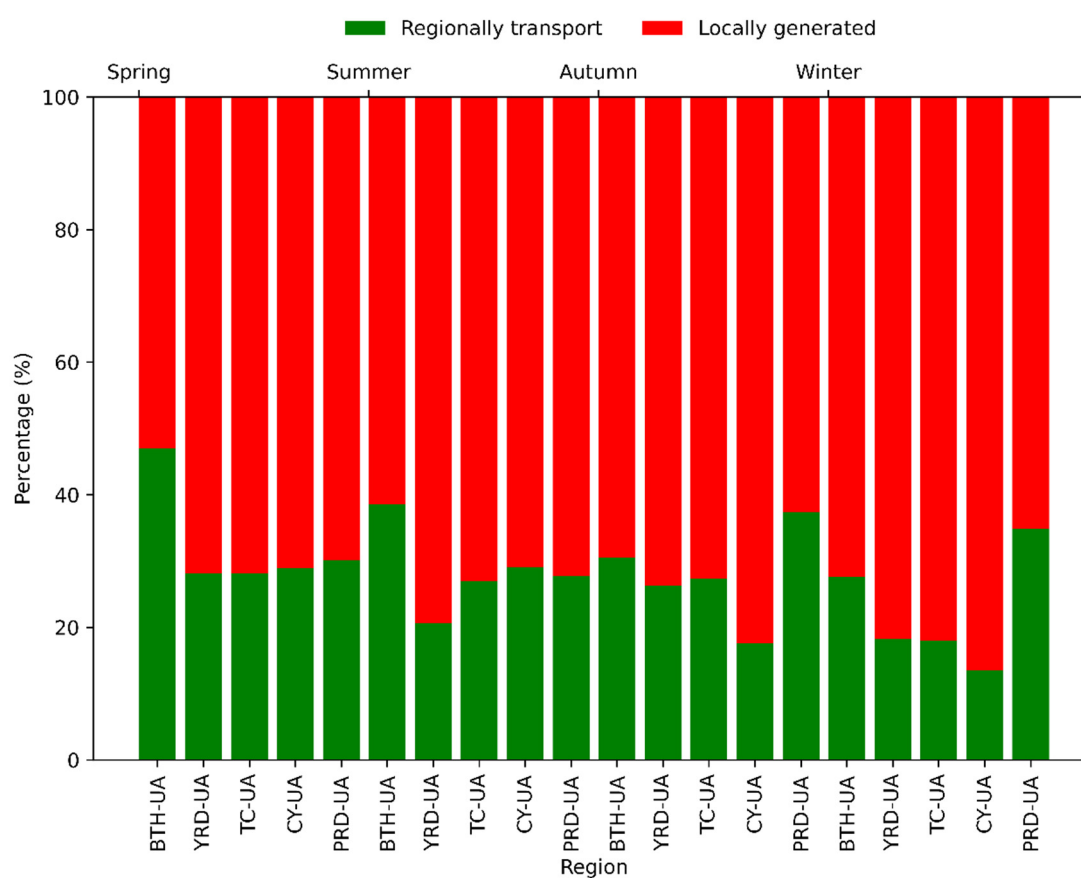


Figure S7. The estimated regional contributions of O₃ in different seasons in five urban agglomerations during 2017–2020 by the TCEQ method.

Table S1. Parameters of standard deviation ellipse in five urban agglomerations during 2017–2020.

| Region | Parameters | Year | | | |
|--------|----------------------|----------------------|----------------------|----------------------|----------------------|
| | | 2017 | 2018 | 2019 | 2020 |
| BTH-UA | azimuth/degree | 56.37 | 56.17 | 56.64 | 57.32 |
| | mean center | 116.36°E, 39.06°N | 116.40°E, 39.09°N | 116.41°E, 39.06°N | 116.48°E, 39.09°N |
| | major axes/km | 448.3 | 448.8 | 453.6 | 450.1 |
| | minor axes/km | 232.6 | 233.4 | 228.5 | 228.3 |
| | area/km ² | 81868 | 82251 | 81379 | 80681 |
| YRD-UA | azimuth/degree | 130.15 | 130.23 | 130.24 | 130.74 |
| | mean center | 119.12°E, 31.67°N | 119.10°E, 31.69°N | 119.09°E, 31.65°N | 119.11°E, 31.68°N |
| | major axes/km | 556.1 | 549.3 | 547.7 | 560.0 |
| | minor axes/km | 311.5 | 313.0 | 315.8 | 314.3 |
| | area/km ² | 136048 | 135032 | 135823 | 138210 |
| TC-UA | azimuth/degree | 99.42 | 99.97 | 100.41 | 99.54 |
| | mean center | 114.01°E, 28.99°N | 114.06°E, 29.03°N | 114.03°E, 29.0°N | 114.11°E, 28.98°N |
| | major axes/km | 481.3 | 471.4 | 472.9 | 480.7 |
| | minor axes/km | 393.3 | 396.9 | 395.9 | 393.6 |
| | area/km ² | 148657 | 146944 | 147009 | 148601 |
| CY-UA | azimuth/degree | 87.48 | 86.86 | 86.67 | 88.65 |
| | mean center | 105.22°E, 30.05°N | 105.24°E, 30.07°N | 105.27°E, 30.07°N | 105.20°E, 30.06°N |

| | | | | | |
|--------|----------------------|----------------------|----------------------|----------------------|----------------------|
| | major axes/km | 322.8 | 325.5 | 328.3 | 326.1 |
| | minor axes/km | 236.9 | 239.2 | 239.9 | 240.4 |
| | area/km ² | 60075 | 61147 | 61852 | 61560 |
| | azimuth/degree | 101.81 | 101.34 | 102.06 | 101.47 |
| PRD-UA | mean center | 113.49°E, 22.84°N | 113.49°E, 22.85°N | 113.50°E, 22.84°N | 113.50°E, 22.85°N |
| | major axes/km | 156.6 | 155.9 | 156.0 | 154.9 |
| | minor axes/km | 87.6 | 88.1 | 87.1 | 88.4 |
| | area/km ² | 10781 | 10784 | 10671 | 10753 |
| | | | | | |

Table S2. Variances of different MDA8 O₃ components decomposed by KZ filter in five cities.

| City | D(O) | D(W) | D(S) | D(e) |
|----------|-------|-------|-------|-------|
| Beijing | 0.462 | 0.162 | 0.279 | 0.001 |
| Shanghai | 0.186 | 0.104 | 0.067 | 0.003 |
| Wuhan | 0.351 | 0.153 | 0.175 | 0.001 |
| Chengdu | 0.393 | 0.146 | 0.224 | 0.004 |
| Shenzhen | 0.224 | 0.140 | 0.063 | 0.001 |