# Electronic Supplementary Material to: A New Index Developed for Fast Diagnosis of Meteorological Roles in Ground-Level Ozone Variations*

Weihua CHEN[1], Weiwen WANG[1], Shiguo JIA[2], Jingying MAO[1], Fenghua YAN[1], Lianming ZHENG[1], Yongkang WU[1], Xingteng ZHANG[1], Yutong DONG[1], Lingbin KONG[1], Buqing ZHONG[3], Ming CHANG[1], Min SHAO[1], and Xuemei WANG[1]

[1]*Guangdong-Hongkong-Macau Joint Laboratory of Collaborative Innovation for Environmental Quality, Institute for Environmental and Climate Research, Jinan University, Guangzhou* 510632, *China*

[2]*School of Atmospheric Sciences, Guangdong Province Key Laboratory for Climate Change and Natural Disaster Studies, Sun Yat-sen University, Guangzhou* 510275, *China*

[3]*Key Laboratory of Vegetation Restoration and Management of Degraded Ecosystems, South China Botanical Garden, Chinese Academy of Sciences, Guangzhou* 510650, *China*

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**Table S1**. Statistics for $T_2$ and WS during 2013–2019.

| | $T_2$ (°C) | | | | | | WS (m s$^{-1}$) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | OBS | SIM | MB | RMSE | *R* | IOA | OBS | SIM | MB | RMSE | *R* | IOA |
| BTH | 12.72 | 12.89 | 0.17 | 1.3 | 0.99 | 1.00 | 1.75 | 3.50 | 1.75 | 1.80 | 0.74 | 0.25 |
| FWP | 14.43 | 15.09 | 0.66 | 1.32 | 0.99 | 1.00 | 2.19 | 3.34 | 1.15 | 1.20 | 0.34 | 0.27 |
| YRD | 16.60 | 16.61 | 0.01 | 0.66 | 1.00 | 1.00 | 2.18 | 4.22 | 2.05 | 2.07 | 0.62 | 0.14 |
| SCB | 14.50 | 16.26 | 1.76 | 2.33 | 0.98 | 0.98 | 1.65 | 2.80 | 1.14 | 1.21 | 0.31 | 0.20 |
| PRD | 22.93 | 23.11 | 0.18 | 0.86 | 0.99 | 0.99 | 2.10 | 4.69 | 2.60 | 2.66 | 0.39 | 0.15 |

**Table S2**. Fitting parameters for historical 90th percentile MDA8-$O_3$ and MSI in the key regions with 95% confidence bounds.

| Region | Slope | Intercept | $R^2$ |
|---|---|---|---|
| BTH | 66.1 (58.8, 73.3) | 69.3 (61.0, 77.7) | 0.80** |
| FWP | 49.6 (44.2, 55.0) | 66.3 (59.2, 73.4) | 0.80** |
| YRD | 54.1 (47.2, 61.0) | 81.5 (74.3, 88.8) | 0.75** |
| SCB | 42.6 (37.0, 48.3) | 60.7 (52.6, 68.8) | 0.73** |
| PRD | 33.6 (23.7, 43.4) | 98.4 (86.6, 110.2) | 0.36** |

**Significant at the 0.01 level.

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**Table S3**. Summary of the meteorological contribution to $O_3$ concentration.

| Region | Period | Season | Method* | Contribution | Reference |
|---|---|---|---|---|---|
| Northern China | 2003–2015 | Annual | KZ | <0% | Ma et al., 2016 |
| Northern China | 2013–2017 | Summer | CMAQ | >100% | Ding et al., 2019 |
| Northern China | 2004–2012 | Winter | GEOS-Chem | >100% | Lou et al., 2015 |
| Northern China | 2004–2012 | Spring | GEOS-Chem | 80% | Lou et al., 2015 |
| Northern China | 2004–2012 | Summer | GEOS-Chem | 61% | Lou et al., 2015 |
| Northern China | 2004–2012 | Autumn | GEOS-Chem | 78% | Lou et al., 2015 |
| BTH | 2012–2017 | Summer | GEOS-Chem | 49% | Dang and Liao, 2019 |
| BTH | 2013–2019 | Summer | MLR | 42% | Li et al., 2020 |
| BTH | 2015–2019 | Annual | KZ | 32% | Mousavinezhad et al., 2021 |
| Eastern China | 2013–2018 | Summer | MLR | 43% | Han et al., 2020 |
| Eastern China | 2003–2015 | Summer | GEOS-Chem | 44% | Sun et al., 2019 |
| YRD | 2012–2017 | Summer | GEOS-Chem | 84% | Dang and Liao, 2019 |
| YRD | 2013–2019 | Summer | MLR | 43% | Li et al., 2020 |
| YRD | 2013–2017 | Annual | KZ | <10% | Yu et al., 2019 |
| YRD | 2013–2017 | Summer | CMAQ | >100% | Ding et al., 2019 |
| Southern China | 2013–2017 | Summer | CMAQ | >100% | Ding et al., 2019 |
| Southern China | 2004–2012 | Winter | GEOS-Chem | 82% | Lou et al., 2015 |
| Southern China | 2004–2012 | Spring | GEOS-Chem | 67% | Lou et al., 2015 |
| Southern China | 2004–2012 | Summer | GEOS-Chem | >100% | Lou et al., 2015 |
| Southern China | 2004–2012 | Autumn | GEOS-Chem | 92% | Lou et al., 2015 |
| PRD | 2013–2019 | Summer | MLR | 73% | Li et al., 2020 |
| PRD | 2007–2017 | Annual | KZ | 15% | Yang et al., 2019 |
| PRD | 2015–2019 | Annual | KZ | 83% | Mousavinezhad et al., 2021 |
| SCB | 2013–2019 | Summer | MLR | <0% | Li et al., 2020 |
| SCB | 2004–2012 | Winter | GEOS-Chem | 58% | Lou et al., 2015 |
| SCB | 2004–2012 | Spring | GEOS-Chem | 45% | Lou et al., 2015 |
| SCB | 2004–2012 | Summer | GEOS-Chem | 47% | Lou et al., 2015 |
| SCB | 2004–2012 | Autumn | GEOS-Chem | 44% | Lou et al., 2015 |

*The methods include statistical methods, i.e., the Kolmogorov–Zurbenko (KZ) filter method and multiple linear regression (MLR), and chemical transport models (CTMs), i.e., the Community Multiscale Air Quality (CMAQ) and the Goddard Earth Observing System Chemistry Global Chemical Transport Model (GEOS-Chem).

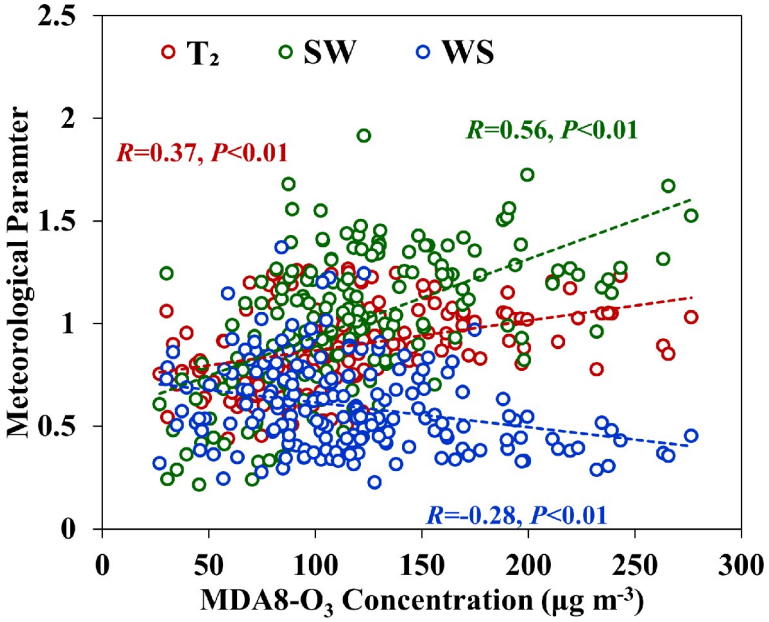


**Fig. S1**. Scatter plot of MDA8-$O_3$ concentration versus dimensionless meteorological parameters. The correlation coefficient is inserted.

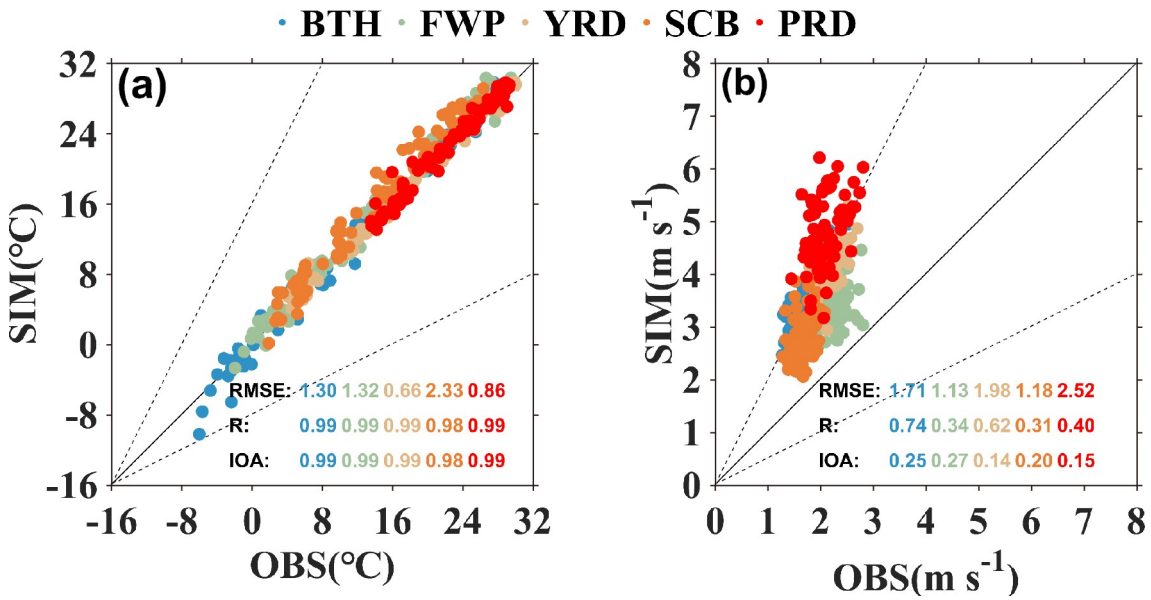


**Fig. S2**. Scatter plot of observed (OBS) versus simulated (SIM) (a) $T_2$ and (b) WS in the study regions over China from 2013 to 2019.

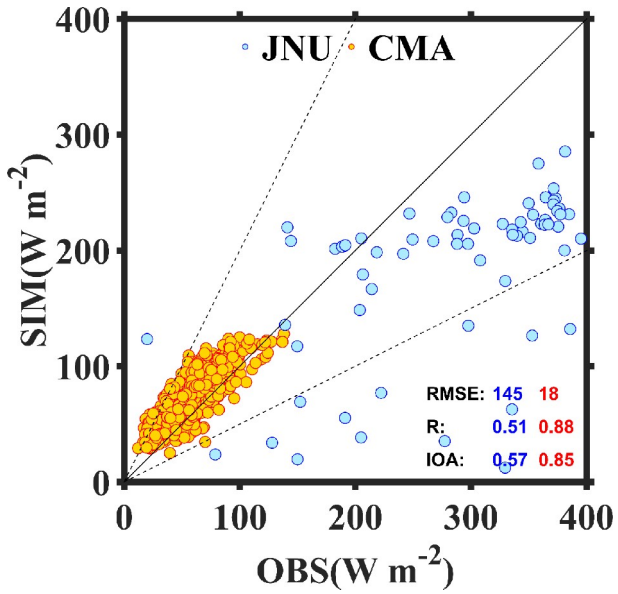


**Fig. S3**. Scatter plot of observed (OBS) versus simulated (SIM) SW. Blue dots represent daily solar radiation at JNU from 1 October 2019 to 31 December 2019; orange dots represent monthly solar radiation over China (CMA) from 2013 to 2019.

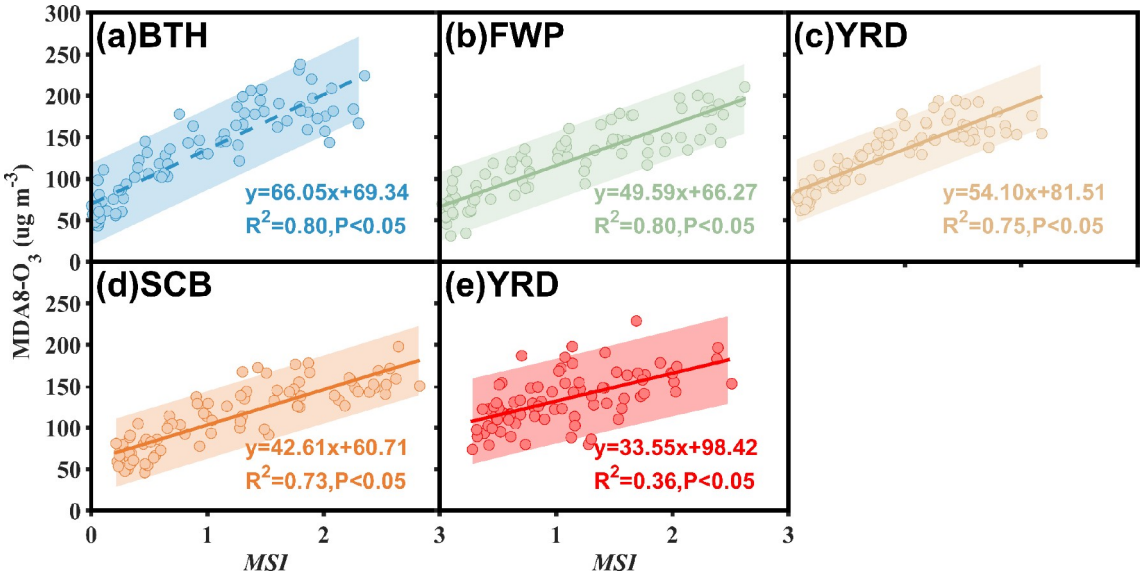


**Fig. S4**. Scatter plot of MSI versus observed MDA8-$O_3$ in the key regions over China during 2013–2019 (shaded areas are the 95% confidence interval).

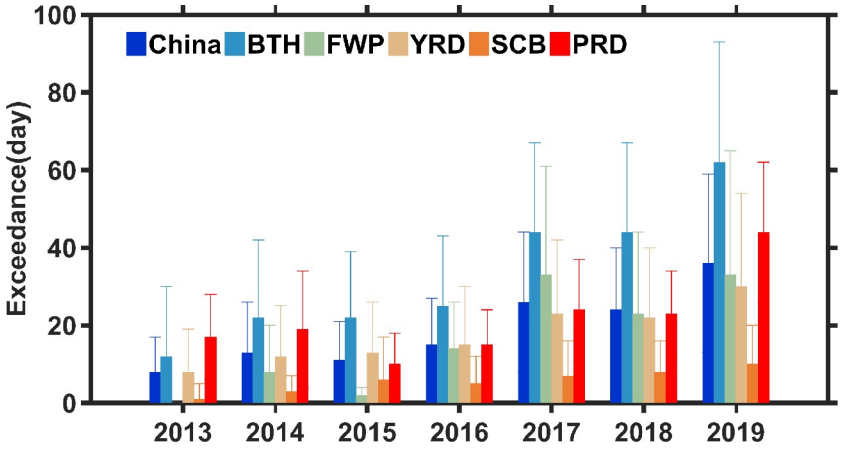


**Fig. S5**. Annual $O_3$ exceedance (days) in the study regions over China during 2013–2019.

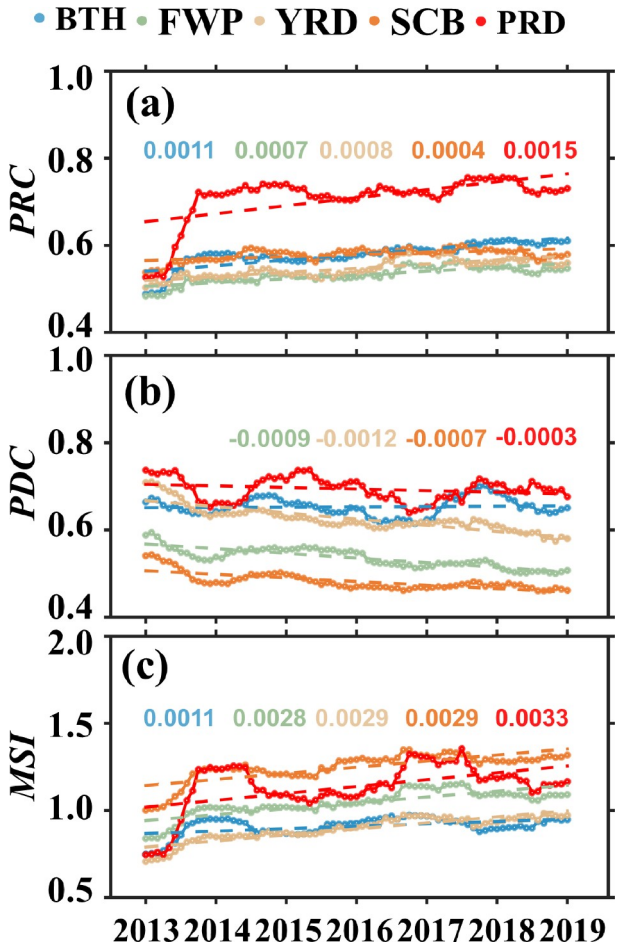


**Fig. S6**. Trends of the 12-month moving average (a) Photochemical Reaction Conditions (PRC), (b) Physical Dispersion Capacity (PDC), and (c) Meteorology Synthetic Index (MSI) in the study regions during 2013–2019. The slopes for the linear regression at the 95% confidence level are shown in each plot.

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