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Examining the implications of photochemical indicators for O_3–NO_x–VOC sensitivity and control strategies: a case study in the Yangtze River Delta (YRD), China

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Supplementary tables

Table S1 Evaluation of model performance on hourly O_3 in thirteen cities in Jiangsu Province. The red indicates the metric values exceed the criteria recommended by Emery et al. (2017).

	NMB	NME	r
Nanjing	13%	24%	0.93
Wuxi	7%	17%	0.81
Xuzhou	2%	23%	0.64
Changzhou	12%	21%	0.92
Suzhou	13%	22%	0.72
Nantong	17%	24%	0.83
Lianyungang	14%	22%	0.53
Huaian	8%	22%	0.70
Yancheng	14%	23%	0.57
Yangzhou	-2%	29%	0.70
Zhenjiang	9%	26%	0.77
Taizhou	12%	27%	0.66
Suqian	-1%	21%	0.73

Table S2 The fractions of VOC-limited, NO_x-limited, and transitional regimes identified by each indicator in the area in Jiangsu.

	VOC-limited regime	NO_x-limited regime	Transitional regime
P_{H2O2}/P_{HNO3}	12.7%	82.2%	5.1%
$HCHO/NO_2$	5.2%	81.8%	13.0%
$HCHO/NO_y$	4.0%	80.8%	15.2%
NO_y	2.4%	84.1%	13.5%

15

Supplementary figures

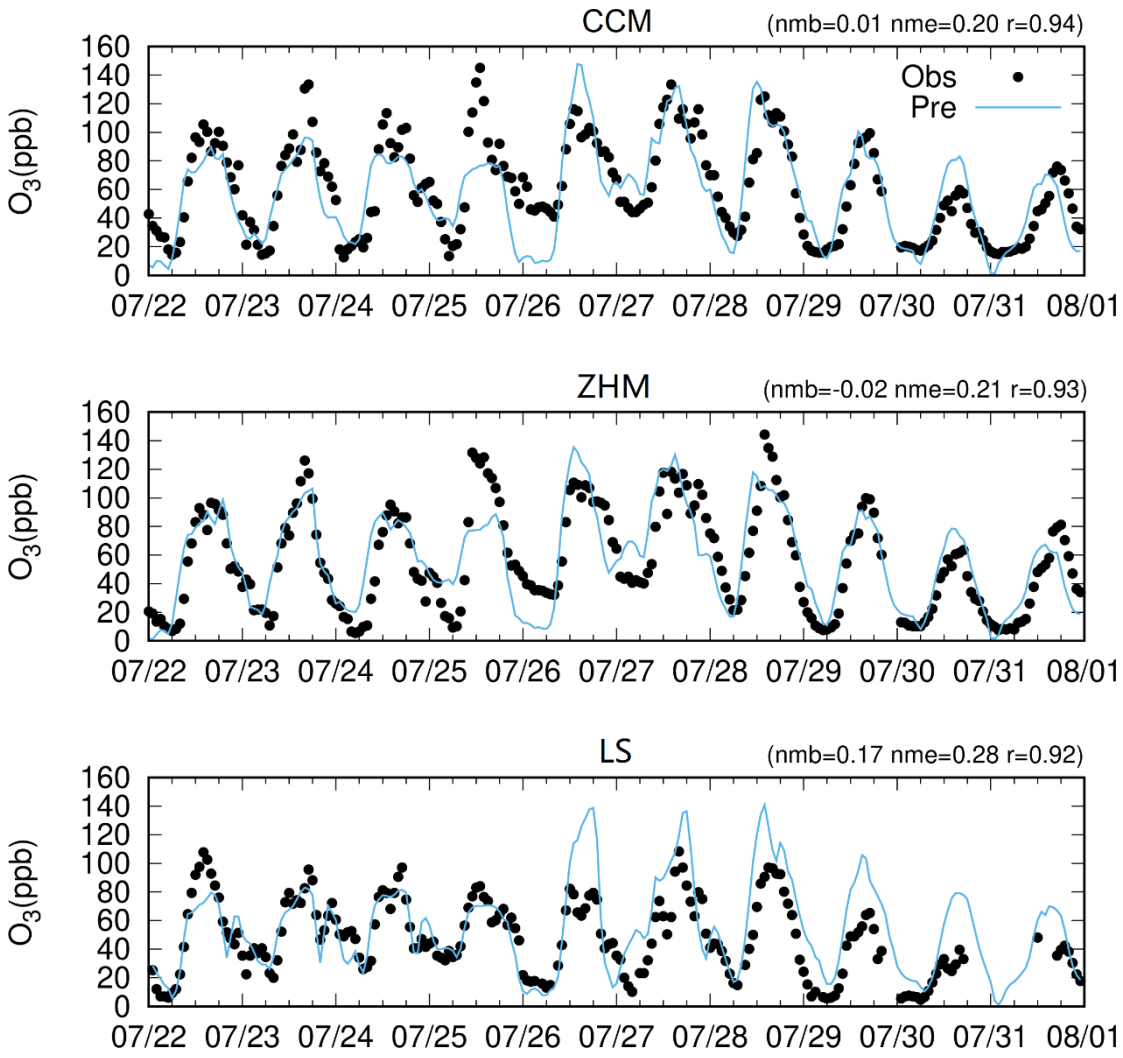

Figure S1 Comparison of the observed (black dots) and simulated (blue lines) O_3 at the three representative sites (CCM, ZHM, LS) during July 22−31 in 2017. The values of evaluation metrics (NMB, NME and r) are given at the upper right corner of each panel.

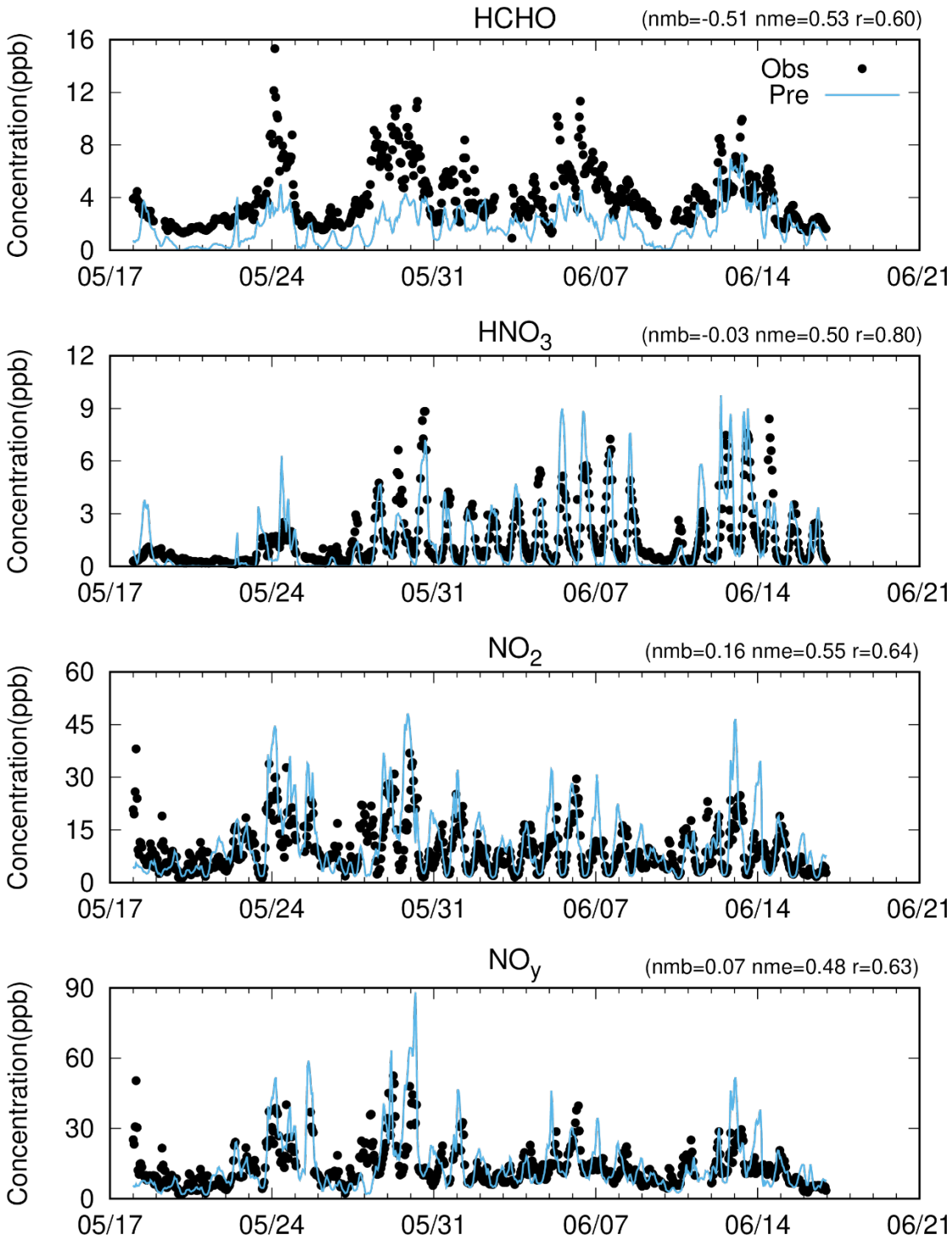

Figure S2 Comparison of the observed (black dots) and simulated (blue lines) HCHO, HNO_3, NO_2, and NO_y at the Taizhou site (32°35'N, 119°57'E) during the EXPLORE-YRD campaign (from May 17 to June 20 in 2018). The values of evaluation metrics (NMB, NME, and r) are given at the upper right corner of each panel.

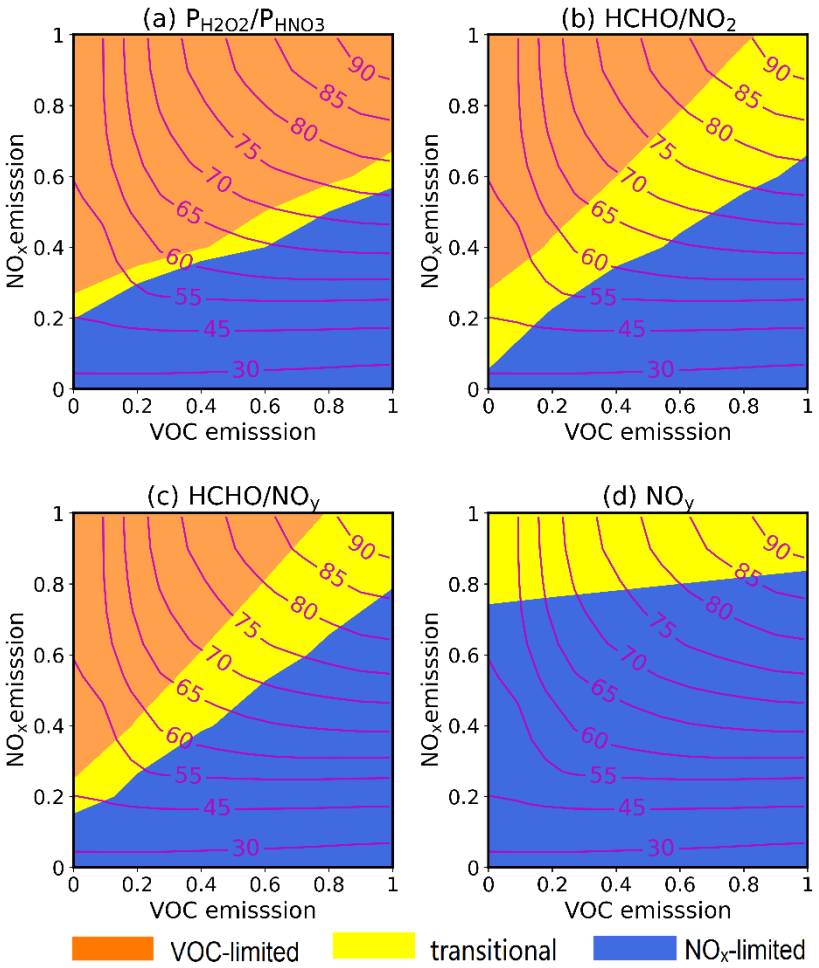

Figure S3 O_3 isopleths (red lines) overlap with the O_3 formation regimes (shading color) identified with P_{H2O2}/P_{HNO3} (a), $HCHO/NO_2$ (b), $HCHO/NO_y$ (c), and NO_y (d) at the ZHM site. The orange indicates a VOC-limited regime. The yellow indicates a transitional regime, and the blue indicates a NO_x-limited regime.

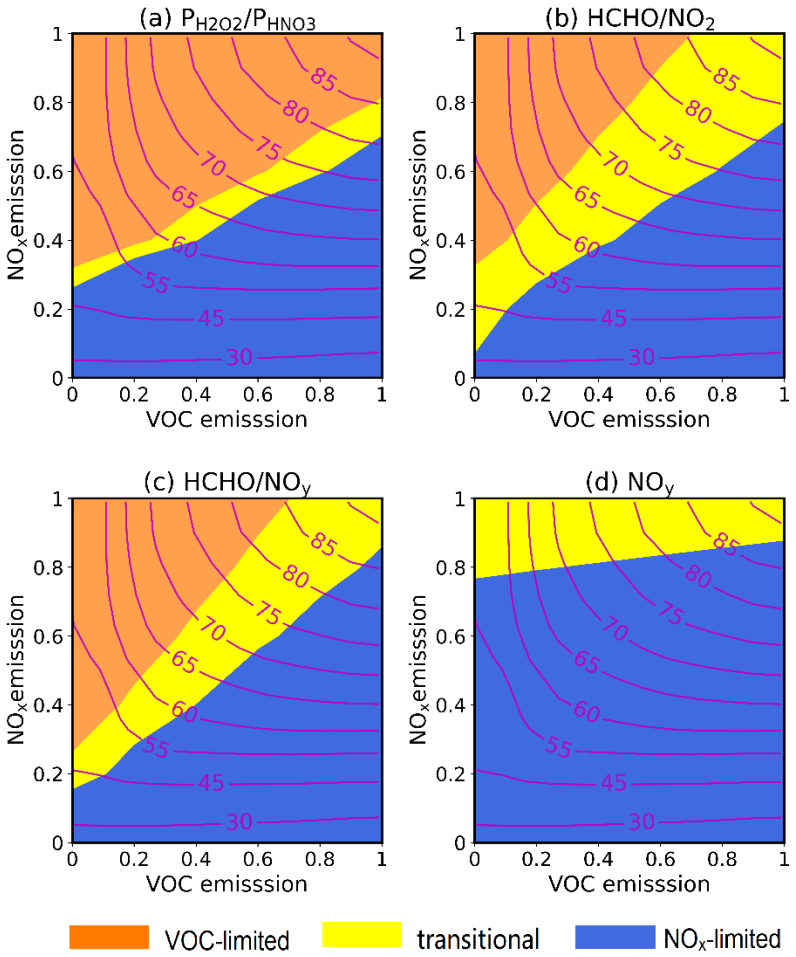

Figure S4 O_3 isopleths (red lines) overlap with the O_3 formation regimes (shading color) identified with P_{H2O2}/P_{HNO3} (a), HCHO/NO_2 (b), HCHO/NO_y (c), and NO_y (d) at the LS site. The orange indicates a VOC-limited regime. The yellow indicates a transitional regime, and the blue indicates a NO_x-limited regime.

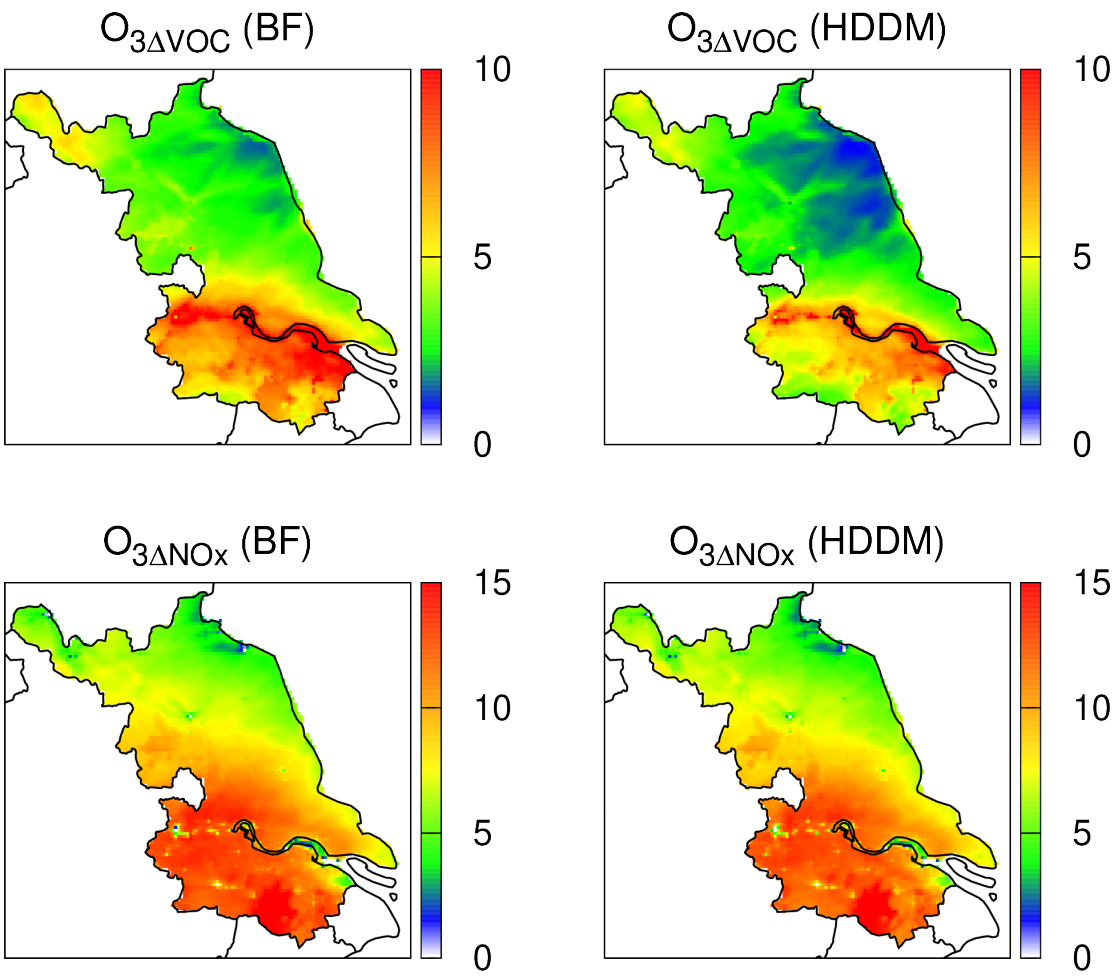

Figure S5 Spatial distributions of O_3 changes (in unit of ppb) resulting from a 35% reduction in VOC or NO_x emissions with perturbed simulations (left column) or Taylor expansions with first- and second-order sensitivity coefficients in the HDDM (right column).

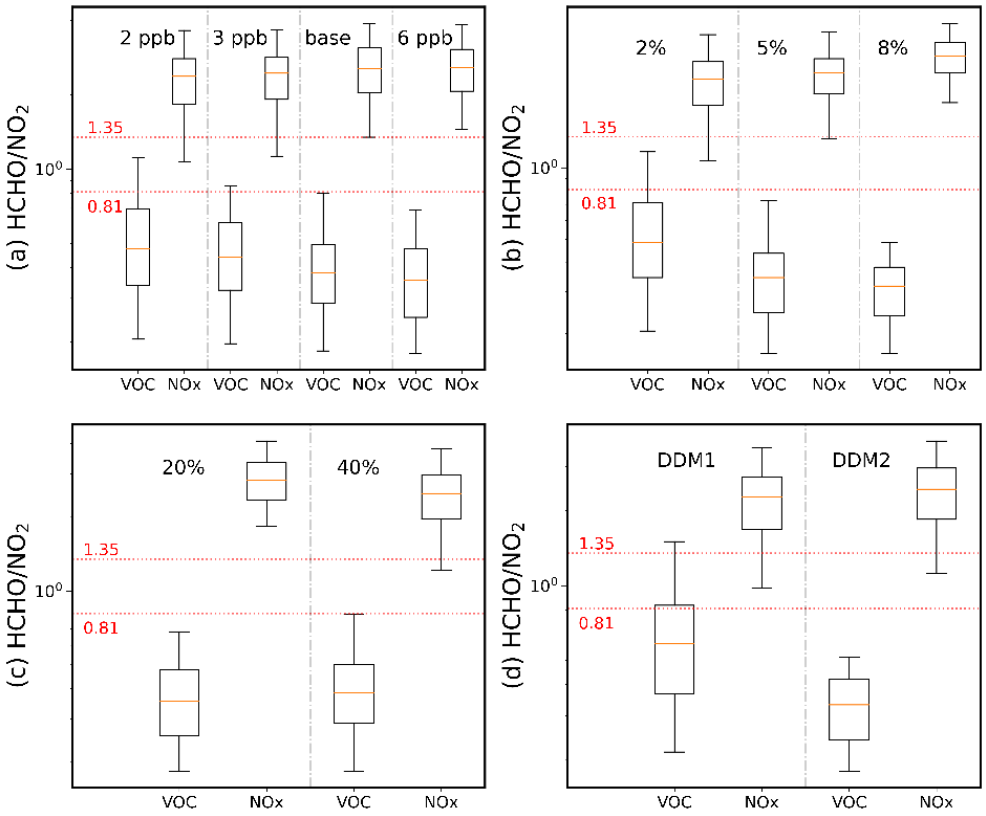

Figure S6 The percentile distributions of the $HCHO/NO_2$ values at the VOC- or NO_x-limited grid cells with different setups in methodology. The threshold intervals of $HCHO/NO_2$ in Table 3 are indicated with red dotted lines.

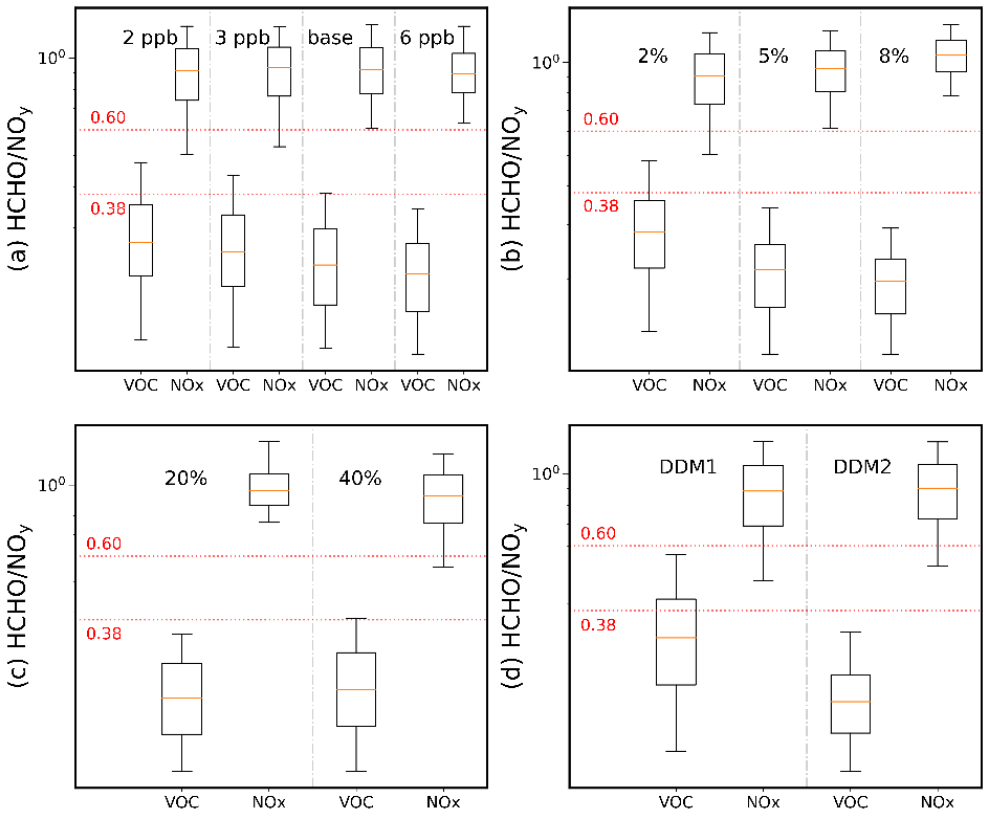

Figure S7 The percentile distributions of the $HCHO/NO_y$ values at the VOC- or NO_x-limited grid cells with different setups in methodology. The threshold intervals of $HCHO/NO_y$ in Table 3 are indicated with red dotted lines.

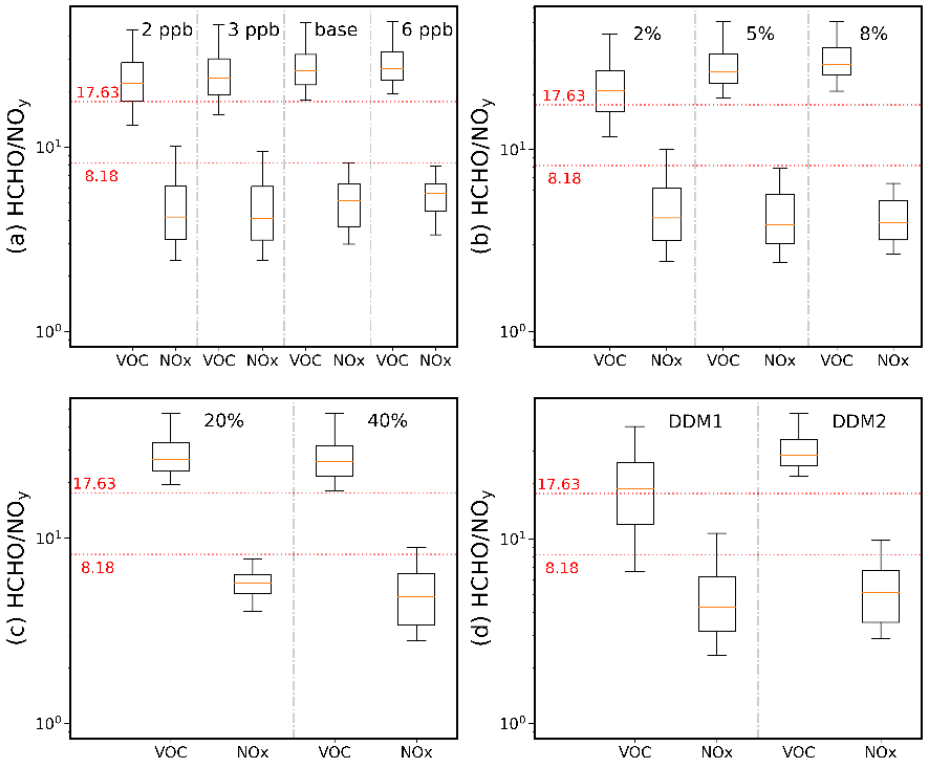

Figure S8 The percentile distributions of the NO_y values at the VOC- or NO_x-limited grid cells with different setups in methodology. The threshold intervals of NO_y in Table 3 are indicated with red dotted lines.