Supplement of Atmos. Chem. Phys., 25, 2291–2309, 2025
https://doi.org/10.5194/acp-25-2291-2025-supplement

Atmospheric Chemistry and Physics
Open Access
EGU

Supplement of

Identifying missing sources and reducing NO_x emissions uncertainty over China using daily satellite data and a mass-conserving method

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Table S1: The 20th, 50th,80th percentile ranges of three coefficients from $INTAC_{0\%}$ and $INTAC_{30\%}$.

NO_x/NO_2	$INTAC_{0\%}$	$INTAC_{30\%}$
20%	2.76	2.68
50%	6.30	6.24
80%	14.6	14.9
Lifetime (days)	**$INTAC_{0\%}$**	**$INTAC_{30\%}$**
20%	0.29	0.27
50%	0.48	0.48
80%	0.68	0.73
Transport (km)	**$INTAC_{0\%}$**	**$INTAC_{30\%}$**
20%	-322.	-289.0
50%	18.1	16.3
80%	351.	314.

Table S2: The account of grids from different sources over which the median values of NO_x/NO_2 are from 1 to 5, from 5 to 10 and above 10.

Different sources (Number)	From 1 to 5	From 5 to 10	Above 10
Biomass Burning (30)	22%	48%	30%
Cement Factories (99)	29%	36%	35%
Heat Production and Supply (195)	34%	42%	24%
Steel and Iron Factories (85)	24%	24%	52%
Power Plants (104)	20%	40%	40%

Table S3: The 25th percentile, mean, and 75th percentile values of day-by-day and grid-by-grid emissions (T/day) for 30 cities.

Region 1	Cities	Mean	25th	75th
1	Beijing	3.35	1.65	4.27
2	Tianjin	4.70	2.64	5.70
3	Tangshan	5.01	2.63	6.02
4	Jinan	3.75	2.36	4.38
5	Zibo	3.81	2.26	4.55
6	Jining	3.29	2.28	3.90
7	Heze	2.90	2.04	3.51
8	Qingdao	2.79	1.74	3.44
9	Xuzhou	2.86	2.04	3.45
10	Shijiazhuang	3.76	2.28	4.64
11	Xingtai	3.55	2.39	4.26
12	Handan	3.76	2.39	4.38
13	Lianyungang	2.86	2.04	3.44
Region 2	**Cities**	**Mean**	**25th**	**75th**
14	Shanghai	4.62	2.13	5.81
15	Suzhou	3.28	1.82	4.07
16	Wuxi	2.67	1.66	3.25
17	Changzhou	3.08	1.97	3.55
18	Nanjing	3.08	1.65	3.27
19	Ma'anshan	2.56	1.66	2.88
20	Wuhan	2.66	1.31	2.62
21	Hangzhou	1.74	0.89	2.07
22	Ningbo	2.03	1.16	2.27
Region 3	**Cities**	**Mean**	**25th**	**75th**
23	Xiamen	2.73	1.50	3.40
24	Shantou	2.14	1.57	2.34
25	Dongguan	4.15	2.61	4.66
26	Foshan	4.11	1.98	4.74
27	Hongkong	4.38	2.17	5.07
28	Macao	2.98	1.78	4.14
29	Guangzhou	3.30	1.65	3.75
30	Beihai	1.46	1.07	1.58

Figure S1: The distributions of three key coefficients obtained from $INTAC_{0\%}$ and $INTAC_{30\%}$: a) NO_x/NO_2, b) Lifetime [hours], c) Transport [km]. The ratio of $(INTAC_{30\%}-INTAC_{0\%})/INTAC_{0\%}$ is also displayed on: d) NO_x/NO_2, e) Lifetime [hours], f) Transport [km].

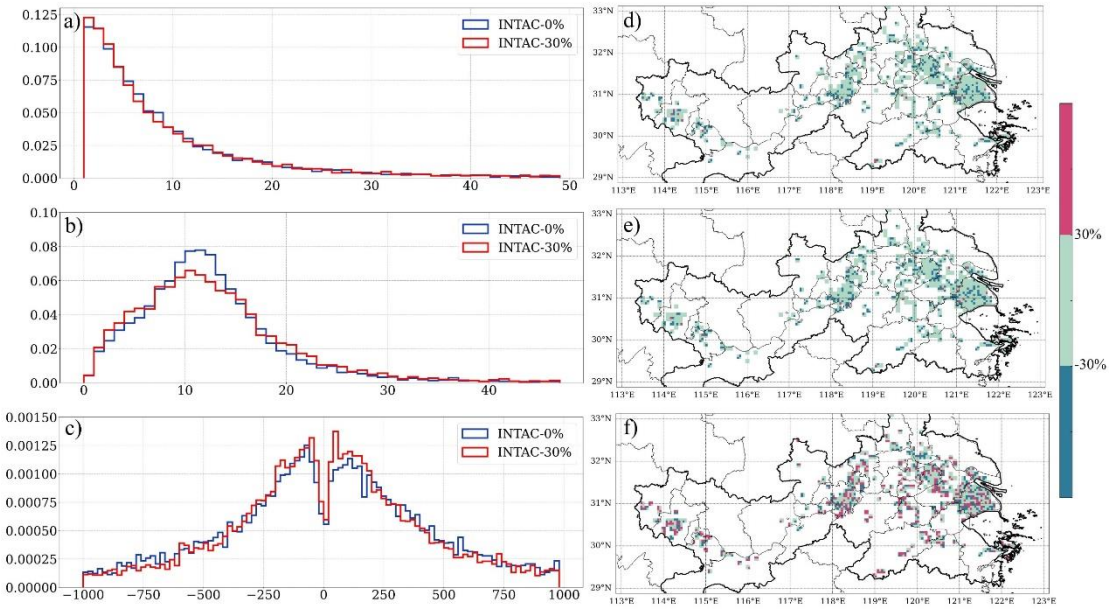

Figure S2: Map of median values in 12 months overlaid by the different types of sources: a) Biomass Burning, b) Cement Factories, c) Heat Production and Supply, d) Steel and Iron Factories, e) Power Plants.

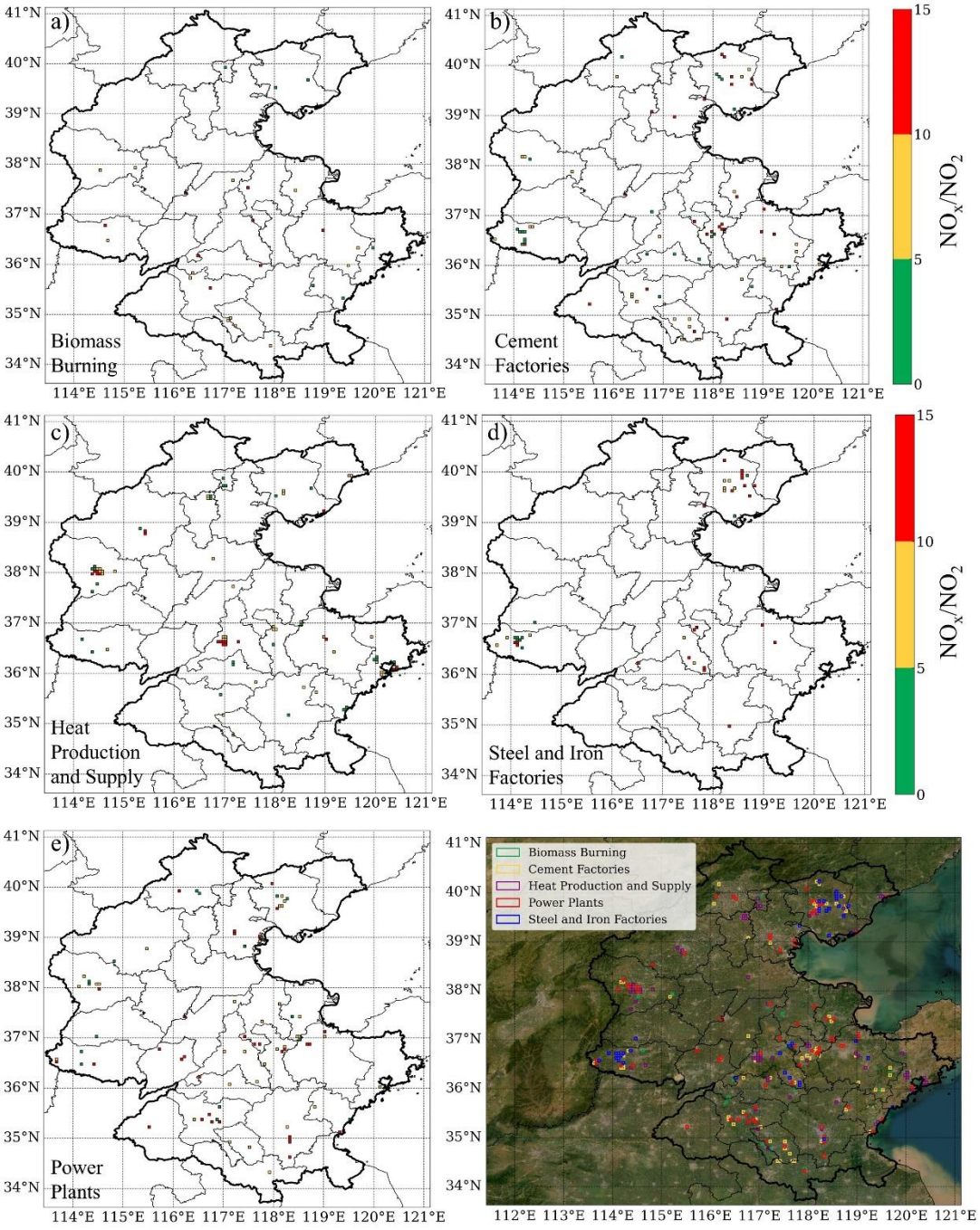

Figure S3: The TROPOMI NO_2 column data is perturbated by a random factor 40% herein called [$TO_{40\%}$] to represent its range of uncertainty. The results are displayed for annual mean of emissions of a) $TO_{0\%}$, b) $TO_{40\%}$, and annual mean of error of c) $TO_{0\%}$, d) $TO_{40\%}$, and the annual mean of e) ($TO_{0\%}$-$TO_{40\%}$)/$TO_{0\%}$.

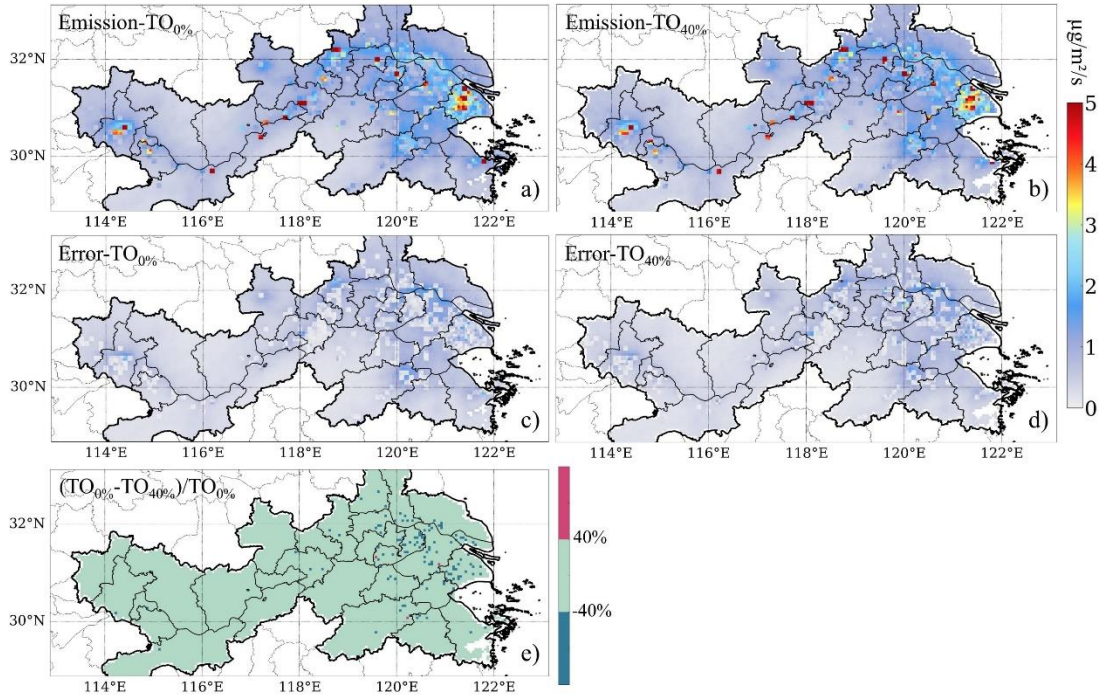

Figure S4: a) The PDF of NO_x emissions [μg/m²/s] over all individual days and grids of $TO_{0\%}$ and $TO_{40\%}$, b) The 20th, mean and 80th values across different months of $TO_{0\%}$ and $TO_{40\%}$, and c) The time series of the spatial median values of $TO_{0\%}$ and $TO_{40\%}$ for whole year.