



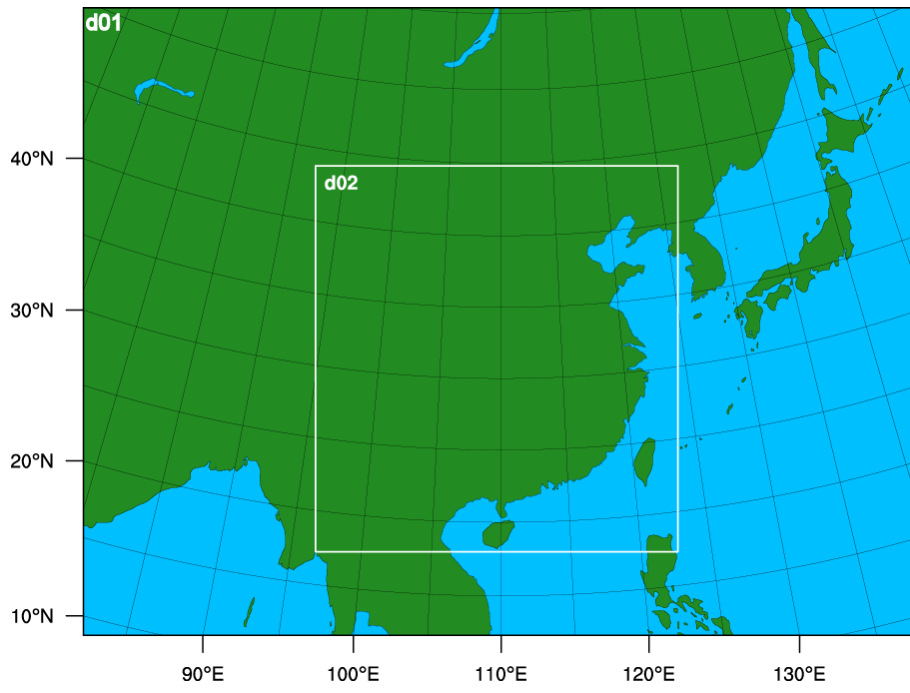
Supplement of

Development of a high-resolution integrated emission inventory of air pollutants for China

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22 **Figure S1: Two nested domains in this study.** The first domain (D01) covers the entire Chinese mainland and parts of neighboring
23 countries, and the second domain (D02) covers the Eastern China.

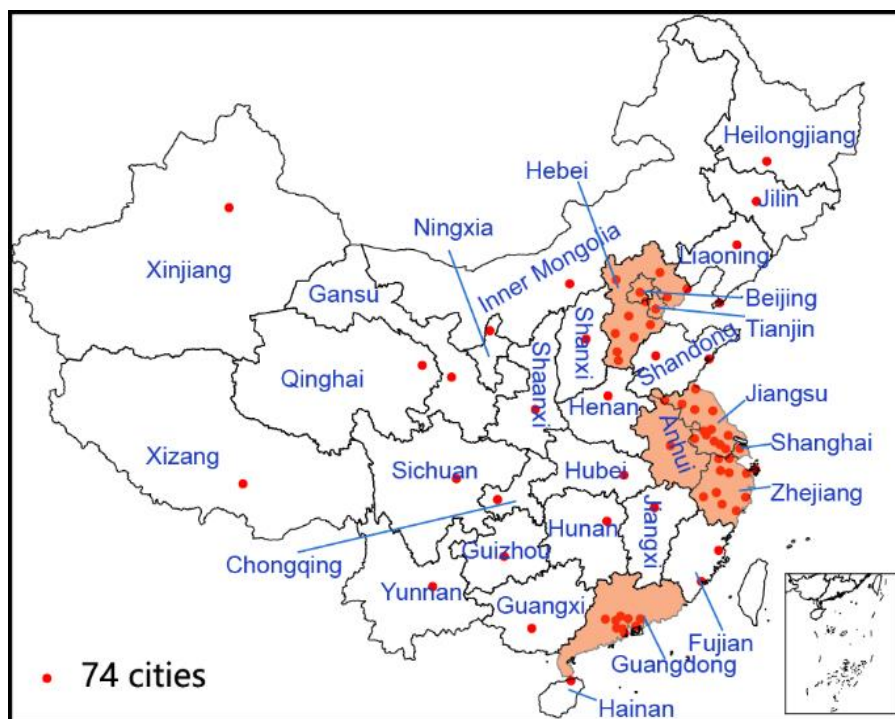
1 st level source	2 nd level source
Stationary Combustion	Mining and Washing of Coal
	Extraction of Petroleum and Natural Gas
	Mining and Processing of Ferrous Metal Ores
	Mining and Processing of Non-Ferrous Metal Ores
	Mining and Processing of Nonmetal Ores
	Support Activities for Mining
	Mining of Other Ores
	Processing of Food from Agricultural Products
	Manufacture of Foods
	Manufacture of Liquor, Beverages and Refined Tea
	Manufacture of Tobacco
	Manufacture of Textile
	Manufacture of Textile, Wearing Apparel and Accessories
	Manufacture of Leather, Fur, Feather and Related Products and Footwear
	Processing of Timber, Manufacture of Wood, Bamboo, Rattan, Palm, and Straw Products
	Manufacture of Furniture
	Manufacture of Paper and Paper Products
	Printing and Reproduction of Recording Media
	Manufacture of Articles for Culture, Education, Arts and Crafts, Sport and Entertainment Activities
	Petroleum Processing, Coking and Nuclear Fuel Processing
	Manufacture of Raw Chemical Materials and Chemical Products
	Manufacture of Medicines
	Manufacture of Chemical Fibers
	Manufacture of Rubber and Plastics Products
	Manufacture of Non-metallic Mineral Products
	Smelting and Pressing of Ferrous Metals
	Smelting and Pressing of Non-ferrous Metals
	Manufacture of Metal Products
	Manufacture of General Purpose Machinery
	Manufacture of Special Purpose Machinery
	Manufacture of Automobiles
	Manufacture of Railway, Ship, Aerospace and Other Transport Equipment
	Manufacture of Electrical Machinery and Apparatus
	Manufacture of Computers, Communication and Other Electronic Equipment
	Manufacture of Measuring Instruments and Machinery
	Other Manufacture
	Utilization of Waste Resources
	Repair Service of Metal Products, Machinery and Equipment
	Production of Electric Power
	Supply of Electric Power
	Production of Industrial Heat Power
	Production of Residential Heat Power
Production and Supply of Gas	
Urban Residential	
Rural Residential	
Industrial Process	Processing of Food from Agricultural Products
	Manufacture of Foods

	Manufacture of Liquor, Beverages and Refined Tea
	Manufacture of Textile
	Manufacture of Paper and Paper Products
	Petroleum Processing, Coking and Nuclear Fuel Processing
	Manufacture of Raw Chemical Materials and Chemical Products
	Manufacture of Chemical Fibers
	Manufacture of Rubber and Plastics Products
	Manufacture of Non-metallic Mineral Products
	Smelting and Pressing of Ferrous Metals
	Smelting and Pressing of Non-ferrous Metals
Mobile Source	Passenger Vehicle
	Freight Truck
	Motorcycle
	Construction Machinery
	Agricultural Machinery
	Small Equipment and Tools
	Diesel Generator Sets
	Ship
	Locomotive
	Domestic Aviation
Solvent Use	Printing ink
	Coating
	Pesticide Use
	Other Solvent Use
Agriculture	Fertilizer
	Livestock
	Agricultural Soil
	Nitrogen-fixing Crop
	Composting of Crop Residue
	Human Feces
Dust	Soil Dust
	Road Dust
	Construction Dust
	Dust from Stockpiles
Biomass Burning	Biomass Fuel
	Open Biomass Burning
Storage and Transportation	Storage and Transportation of Oil and Natural Gas
Waste Treatment	Disposal of Wastewater
	Disposal of Solid Waste
	Flue Gas Denitrification
Other Sources	Catering

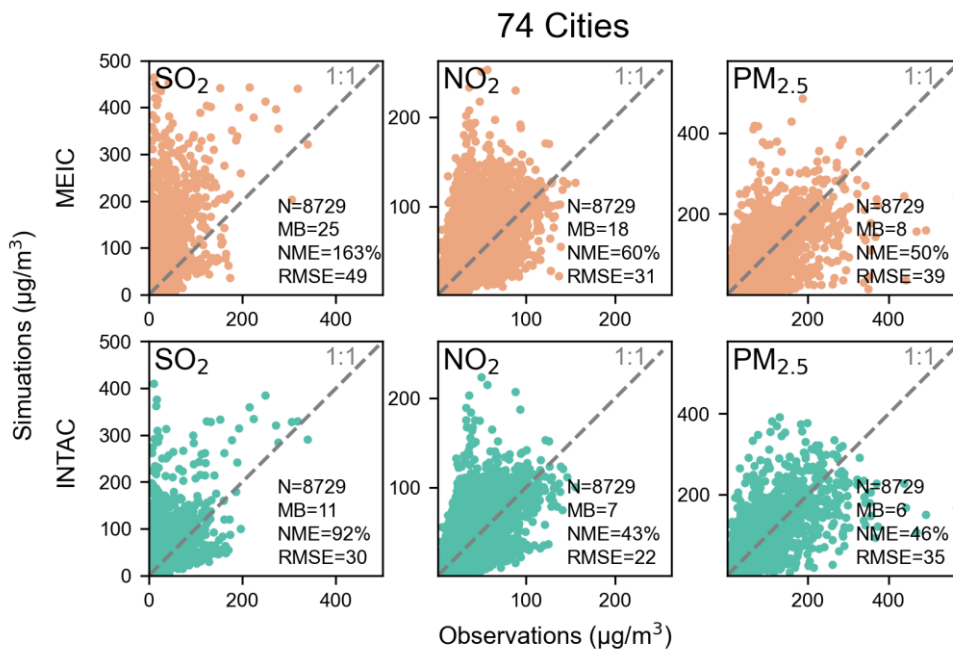
Table S2: Evaluation of simulated temperature, relative humidity, wind speed, and wind direction for D01 in 2017.

Variable	Month	Sample	Mean_obs	Mean_sim	Corr	MB	RMSE	NMB(%)	NME(%)
Temperature (°C)	1	425737	277.1	276.5	0.98	-0.6	2.3	3.2	-0.2
	2	398617	279	278.2	0.97	-0.8	2.3	3.2	-0.3
	3	444709	282.9	281.9	0.96	-0.9	2.3	3.3	-0.3
	4	430935	289.1	288.1	0.95	-1	2.2	3.1	-0.3
	5	443495	293.4	292.6	0.93	-0.8	2.1	3	-0.3
	6	423895	295.6	295	0.92	-0.6	1.9	2.8	-0.2
	7	432868	298.8	298.1	0.89	-0.7	1.9	2.6	-0.2
	8	437872	298	297.4	0.92	-0.6	1.7	2.5	-0.2
	9	430728	294.8	294.2	0.94	-0.6	1.8	2.5	-0.2
	10	448579	289.5	289.1	0.97	-0.4	1.8	2.5	-0.1
	11	431392	283.4	283	0.98	-0.4	1.9	2.7	-0.1
	12	445121	278	277.5	0.98	-0.5	2.1	2.9	-0.2
Relative Humidity (%)	1	425354	68	72.1	0.77	4.1	10	13.2	6
	2	398268	64.1	69.3	0.78	5.1	10.6	13.9	8
	3	444073	64.4	70	0.8	5.6	10.8	14.3	8.6
	4	429336	63.4	68.7	0.84	5.3	10.3	13.9	8.4
	5	443006	65	68.8	0.86	3.8	9.5	12.7	5.9
	6	423251	71	73.4	0.85	2.4	8.7	11.6	3.4
	7	432151	75.9	78.4	0.84	2.5	8.1	10.7	3.3
	8	437176	76.7	79	0.82	2.3	7.9	10.4	3
	9	429720	73.9	76	0.85	2.1	8.1	10.8	2.9
	10	447503	73.5	75.4	0.85	1.9	8.0	10.7	2.5
	11	430711	68.9	72	0.82	3.1	8.9	11.9	4.5
	12	444518	66.5	70.7	0.81	4.2	9.5	12.5	6.3
Wind Speed (m/s)	1	404082	2.8	3.2	0.6	0.4	1.6	2.2	14.9
	2	381158	2.9	3.3	0.62	0.3	1.6	2.1	11.7
	3	428428	2.7	2.9	0.59	0.2	1.4	1.9	6
	4	418972	3	3.1	0.63	0.1	1.5	1.9	2.3
	5	431251	2.7	2.7	0.62	0	1.3	1.8	-1
	6	410320	2.6	2.6	0.56	0	1.3	1.7	-1
	7	417858	2.4	2.4	0.53	0	1.3	1.7	-1.9
	8	424714	2.5	2.5	0.58	0	1.3	1.7	-1
	9	417017	2.5	2.5	0.63	0.1	1.3	1.7	2.8
	10	429166	2.7	2.8	0.67	0.2	1.4	1.9	5.8
	11	416456	2.7	2.9	0.64	0.2	1.4	1.9	7.7
	12	428713	2.8	3.1	0.66	0.3	1.5	2	10.5

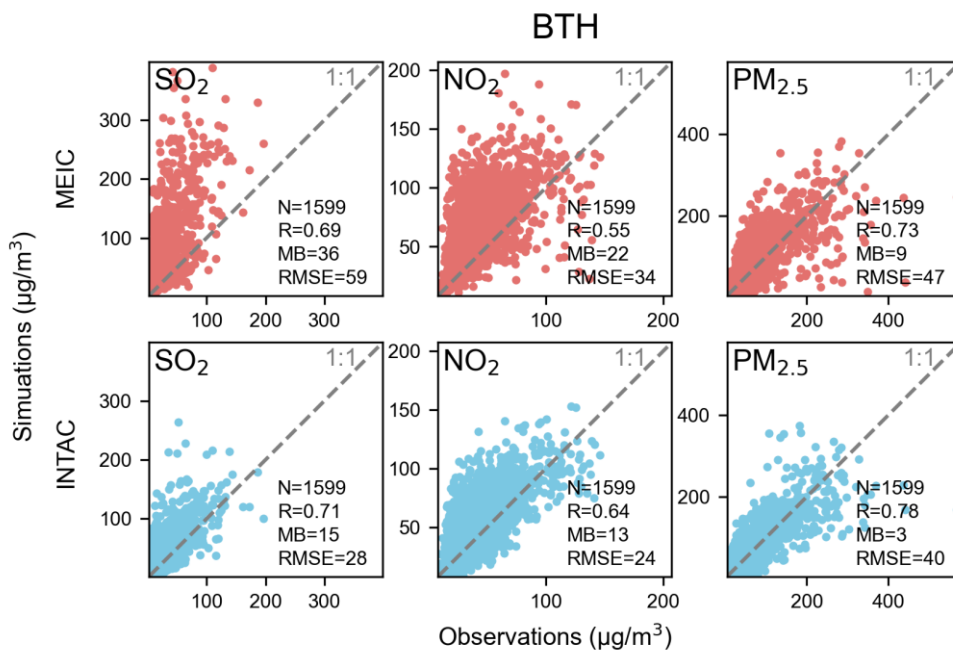
Variable	Month	Sample	Mean_obs	Mean_sim	Corr	MB	RMSE	NMB(%)	NME(%)
Wind Direction (°)	1	344078	207.3	202.5	0.4	-4.8	79.4	125.8	-2.3
	2	325981	210.2	209.2	0.43	-0.9	72.9	117.1	-0.4
	3	368216	202.3	196.1	0.41	-6.3	76.9	121.3	-3.1
	4	363361	198.5	194.1	0.42	-4.4	66.3	106.5	-2.2
	5	368370	192.7	185.7	0.38	-7	70.6	109.8	-3.6
	6	351094	189.9	180.7	0.35	-9.2	71.6	111.2	-4.8
	7	356046	192.7	184.5	0.34	-8.1	67.1	103.5	-4.2
	8	362346	188	171.4	0.38	-16.6	71	111.6	-8.8
	9	349721	194.6	180.1	0.38	-14.5	73.9	115.5	-7.5
	10	357403	183.5	159.8	0.4	-23.6	81.6	129.8	-12.9
	11	351239	203.7	192.2	0.42	-11.5	76.7	122.4	-5.7
	12	365757	211.2	200.4	0.42	-10.8	76.9	123.1	-5.1



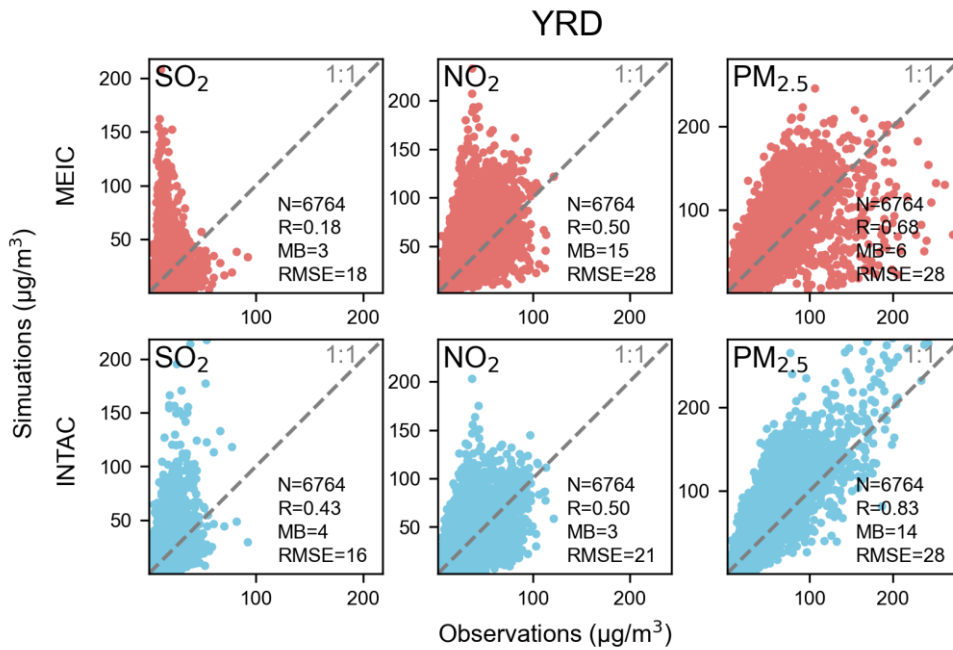
28 **Figure S2: The location of key regions, provinces, and 74 cities in China.** The shaded areas in orange from north to south represent the
 29 BTH, YRD, and PRD regions. Hong Kong, Macao, and Taiwan are excluded provinces due to unavailability of emission data. The red
 30 dots denote the locations of the 74 major cities.



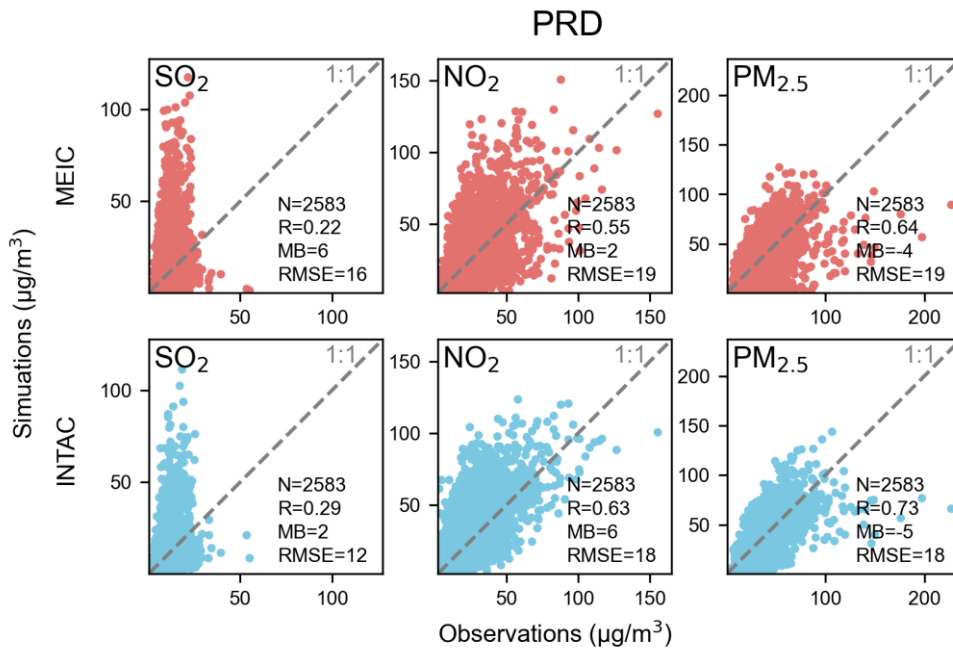
31 **Figure S3: Scatter plots comparing modeling performance over 74 cities using MEIC and INTAC as emission inputs, respectively.**
 32 Each point represents the city-average daily concentrations for key air pollutants. The statistical metrics, including R, MB (µg/m³), and
 33 RMSE (µg/m³), are labeled in the figure.



34 **Figure S4: Scatter plots comparing modeling performance across the BTH using MEIC and INTAC as emission inputs,**
 35 **respectively.** Each point represents the city-average daily concentrations for key air pollutants. The statistical metrics, including R, MB
 36 (µg/m³), and RMSE (µg/m³), are labeled in the figure.



37 **Figure S5: Scatter plots comparing modeling performance across the YRD using MEIC and INTAC as emission inputs,**
 38 **respectively.** Each point represents the city-average daily concentrations for key air pollutants. The statistical metrics, including R, MB
 39 ($\mu\text{g}/\text{m}^3$), and RMSE ($\mu\text{g}/\text{m}^3$), are labeled in the figure.



40 **Figure S6: Scatter plots comparing modeling performance across the PRD using MEIC and INTAC as emission inputs,**
 41 **respectively.** Each point represents the city-average daily concentrations for key air pollutants. The statistical metrics, including R, MB
 42 ($\mu\text{g}/\text{m}^3$), and RMSE ($\mu\text{g}/\text{m}^3$), are labeled in the figure.

Table S3: The discrepancies between simulated NH₄⁺ concentrations and observed values, using MEIC and INTAC as emission inputs. The observed concentrations are collected from previous studies (Zhang et al., 2019).

Month	MEIC					INTAC				
	Obs ($\mu\text{g}/\text{m}^3$)	Sim ($\mu\text{g}/\text{m}^3$)	MB ($\mu\text{g}/\text{m}^3$)	NMB (%)	NME (%)	Obs ($\mu\text{g}/\text{m}^3$)	Sim ($\mu\text{g}/\text{m}^3$)	MB ($\mu\text{g}/\text{m}^3$)	NMB (%)	NME (%)
Jan.	12.9	5.9	-7.0	-53	53	12.9	6.4	-6.5	-50	50
Apr.	5.5	4.7	-0.8	-16	25	5.5	3.8	-1.7	-32	32
Jul.	3.4	2.5	-0.9	-26	26	3.4	2.9	0.5	-15	15
Oct.	5.9	5.2	-0.7	-12	33	5.9	5.9	0.0	1	38

45 **References**

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