

Figure S1. Terrain height and locations of the selected monitoring sites and metrological sites in China

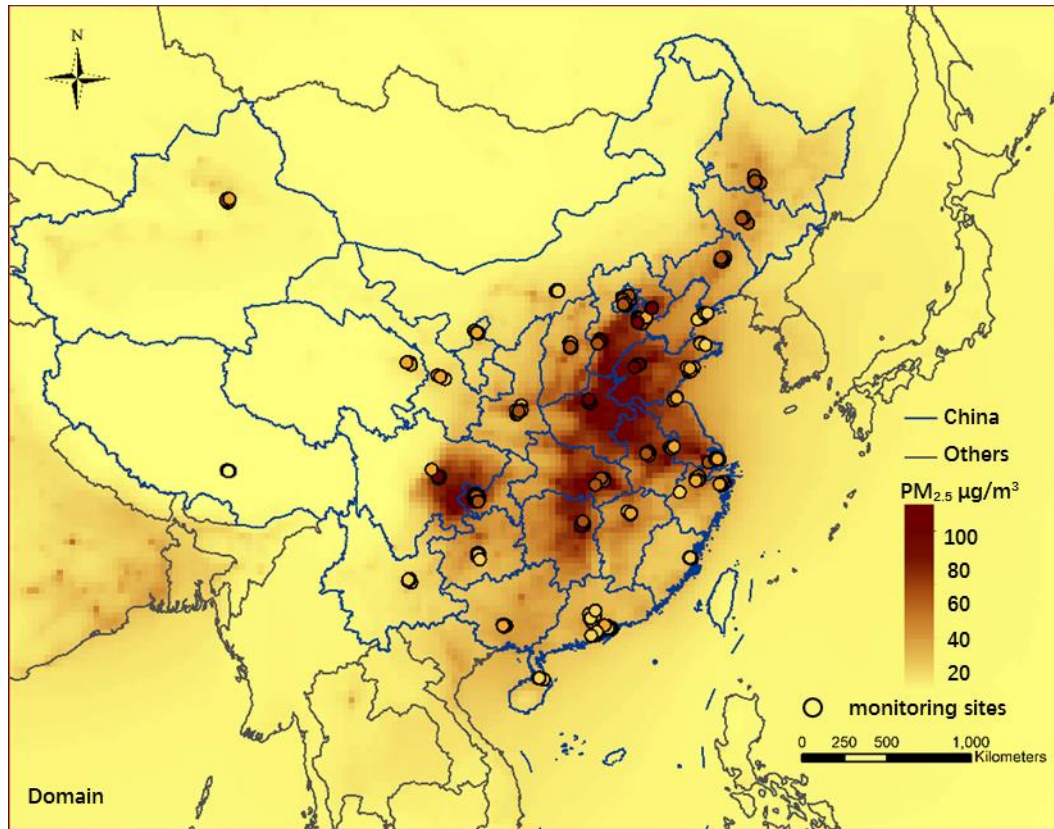


Figure S2. Spatial validation of the predicted PM_{2.5} annual mean concentrations. The gridded background color represented the predicted concentrations. The color of points showed the observed concentrations.

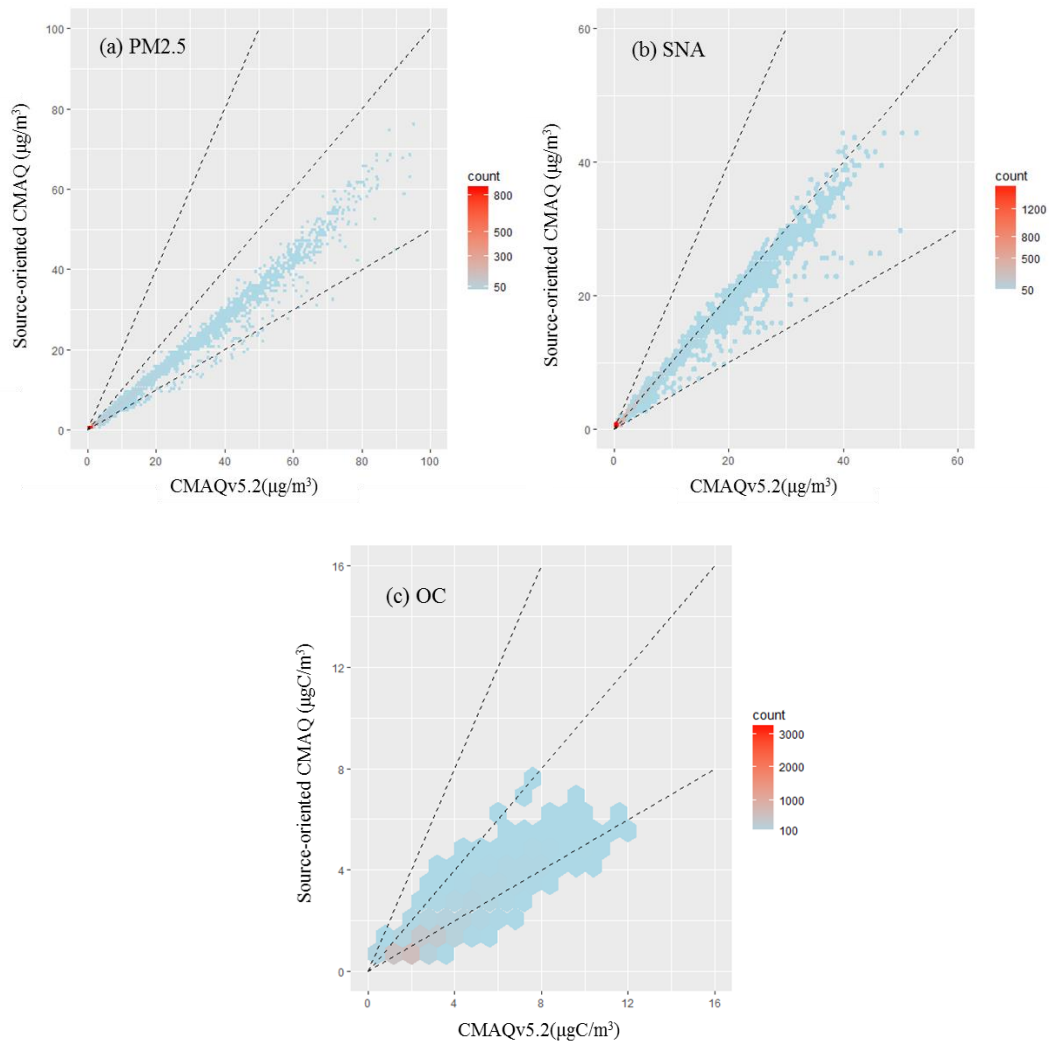


Figure S3. Comparison of the monthly mean concentrations in summer predicted by CMAQ version 5.2 and the source-oriented CMAQ at all grids within China, including: (a) PM_{2.5} (b) SNA (c) OC.

Table S1. Convert factors from total HC (THC) emissions of shipping to lumped species in CB05 mechanism

Lumped Species	Convert factor (moles/kg THC)
PAR	43.92
OLE	0.70
TOL	0.65
XYL	0.79
FORM	0.01
ALD2	0.00
ETH	0.01
ISOP	0.00
MEOH	0.00
ETOH	0.01
ETHA	0.00
IOLE	0.26
ALDX	0.11
TERP	0.00
UNR	4.66

Table S2. Convert factors from total HC (THC) emissions of shipping to lumped species in SAPRC-07 mechanism

Lumped Species	Convert factor (moles/kg THC)
ACET	1.02
ALK1	0.80
ALK2	0.08
ALK3	0.31
ALK4	1.25
ALK5	3.49
ARO1	0.69
ARO2	0.79
BACL	0.00
BALD	0.00
CCHO	0.00
CRES	0.00
ETHE	0.00
GLY	0.00
HCHO	0.00
IPRD	0.00
ISOP	0.00
MACR	0.11
MEK	0.00
MEOH	0.00
MGLY	0.00
MVK	0.00
OLE1	0.63
OLE2	0.28
PHEN	0.00
PRD2	0.08
RCHO	0.00
TERP	0.00

Table S3. Statistics for meteorological predictions

Statistics	Jan	Apr	Jul	Oct	Annual
T2 (°C)					
MB	-1.0	-0.7	-0.3	-0.9	-0.7
NMB (%)	-15	-4	-1	-4	-6
NME (%)	16	12	6	8	10
R	0.9	0.9	0.9	0.9	0.9
WS10 (m/s)					
MB	-0.4	-0.9	-1.1	-0.8	-0.8
NMB (%)	-9	-21	-28	-23	-20
NME (%)	32	35	38	38	36
R	0.7	0.6	0.7	0.7	0.7
WD10(degree)					
MB	4.5	2.8	0.4	4.0	3.0
NMB (%)	2	1	0	2	1
NME (%)	18	16	18	21	18
R	0.4	0.5	0.5	0.5	0.5
RH(%)					
MB	2.6	4.8	0.9	3.0	2.8
NMB (%)	4	8	1	4	4
NME (%)	17	19	11	14	15
R	0.8	0.8	0.8	0.8	0.8

MB, mean biases; NMB, normalized mean biases; NME, normalized mean errors; R, correlation coefficients.

Table S4. Statistics for PM_{2.5} concentration

Statistics	Jan	Apr	Jul	Oct	Annual
Hourly PM_{2.5} (µg/m³)					
Mean OBS	90.4	50.7	38.1	53.0	58.3
Mean SIM	118.8	60.3	52.4	72.3	76.2
MB	29.5	10.0	14.1	19.4	18.3
NMB (%)	30	20	42	37	32
NME (%)	67	69	87	77	75
MFB (%)	14	-1	14	17	11
MFE (%)	52	57	61	60	57
R	0.5	0.4	0.3	0.5	0.4

Mean OBS, monthly average of observations; Mean SIM, monthly average of simulations; MB, mean biases; NMB, normalized mean biases; NME, normalized mean errors; MFB, mean fractional bias; MFE, mean fractional error; R, correlation coefficients.