



Supplement of

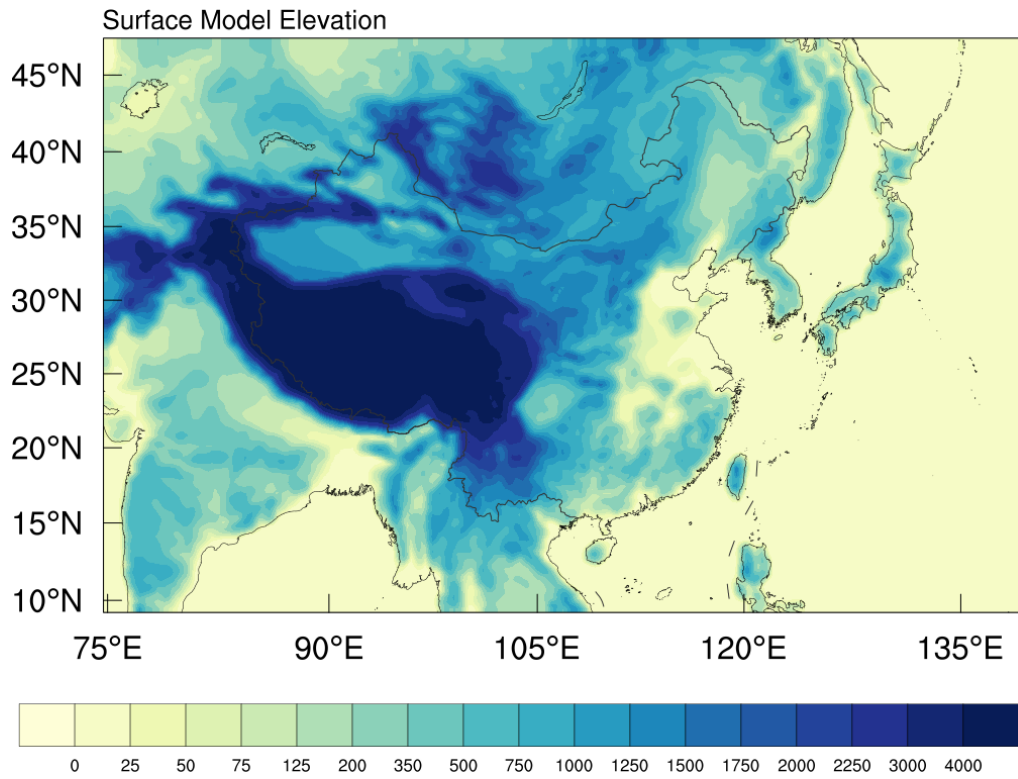
Dissimilar roles of aerosols, nitrogen deposition and ozone on the terrestrial carbon sink in China during 2010–2020

Nanhong Xie et al.

Correspondence to: Tijian Wang (tjwang@nju.edu.cn)

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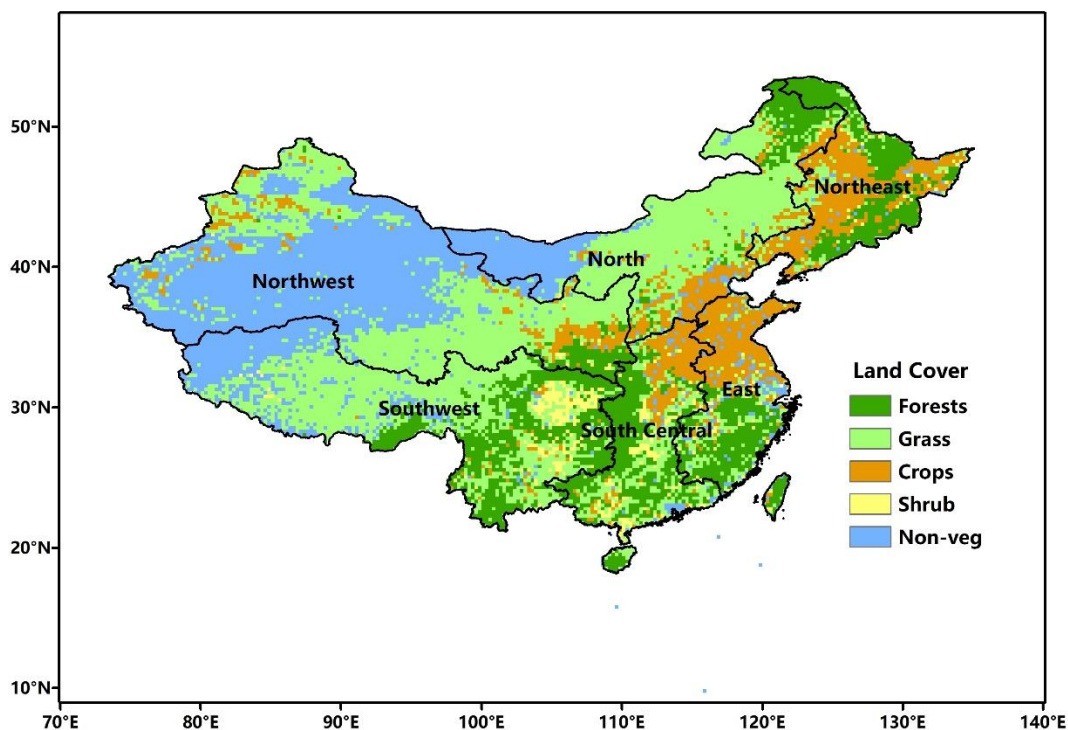


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53 **Figure S1.** The modeling domain applied and Topographic Elevation (Units: m) in this study.

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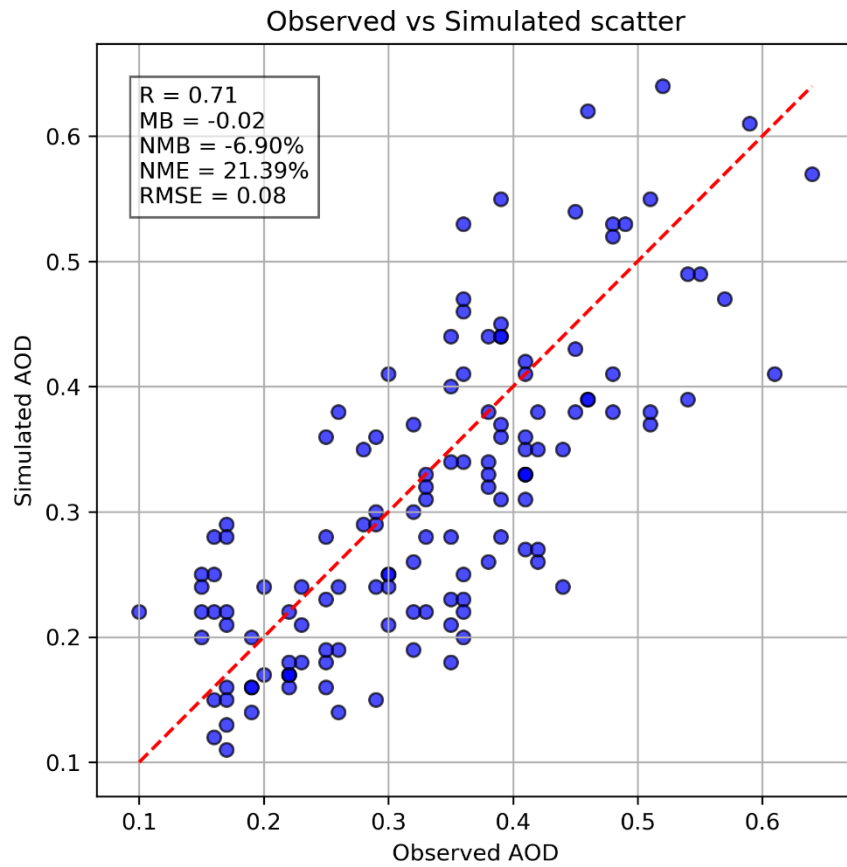


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78 **Figure S2.** Regional division of China used in this study, including six subregions: Northeast
79 (Heilongjiang, Jilin, and Liaoning), North (Beijing, Tianjin, Hebei, Shanxi, and Inner Mongolia),
80 Northwest (Xinjiang, Gansu, Ningxia, Qinghai, and Shaanxi), East (Shandong, Jiangsu, Anhui,
81 Shanghai, Zhejiang, Fujian, and Jiangxi), South Central (Henan, Hubei, Hunan, Guangxi,
82 Guangdong, and Hainan), and Southwest (Xizang, Sichuan, Yunnan, Chongqing, and Guizhou).
83 The background map shows ecosystem types further categorized based on 2017 MODIS land use
84 types.

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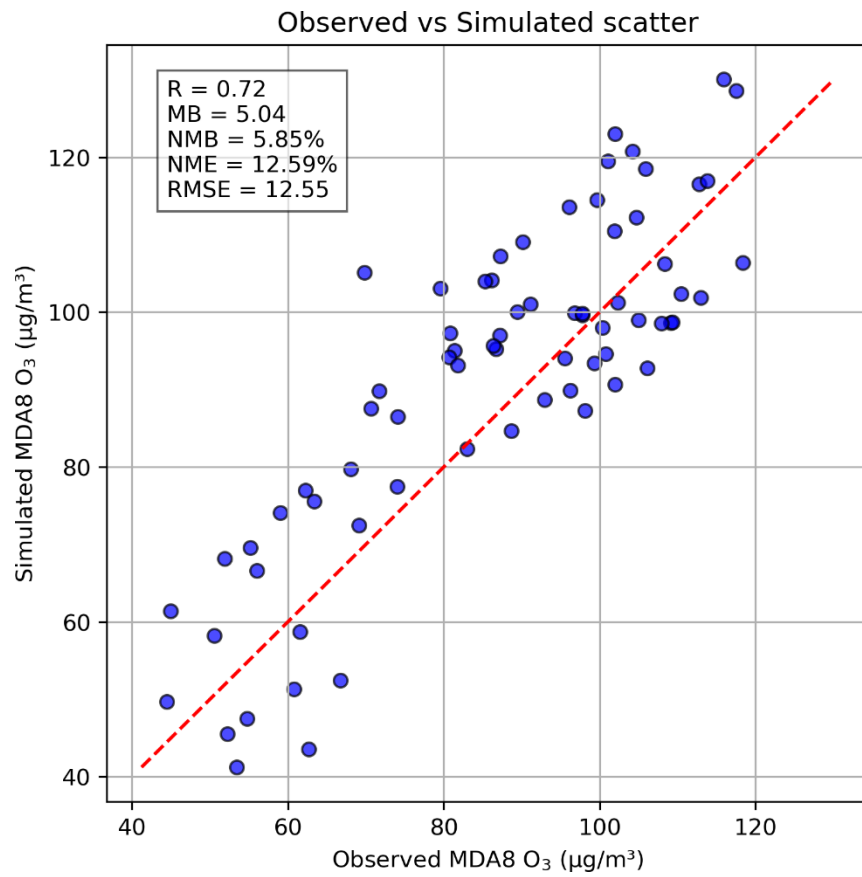


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113 **Figure S3.** Monthly mean aerosol scatter plot between simulations and MODIS from 2010 to
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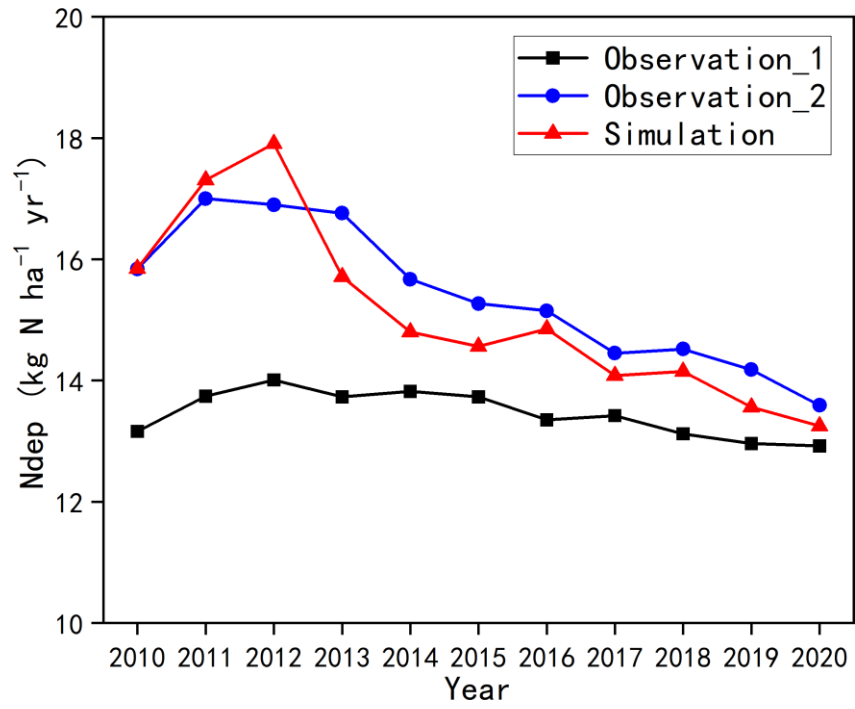


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141 **Figure S4.** Scatter plot of MDA8 O₃ from simulations and observations from 2015 to 2020.

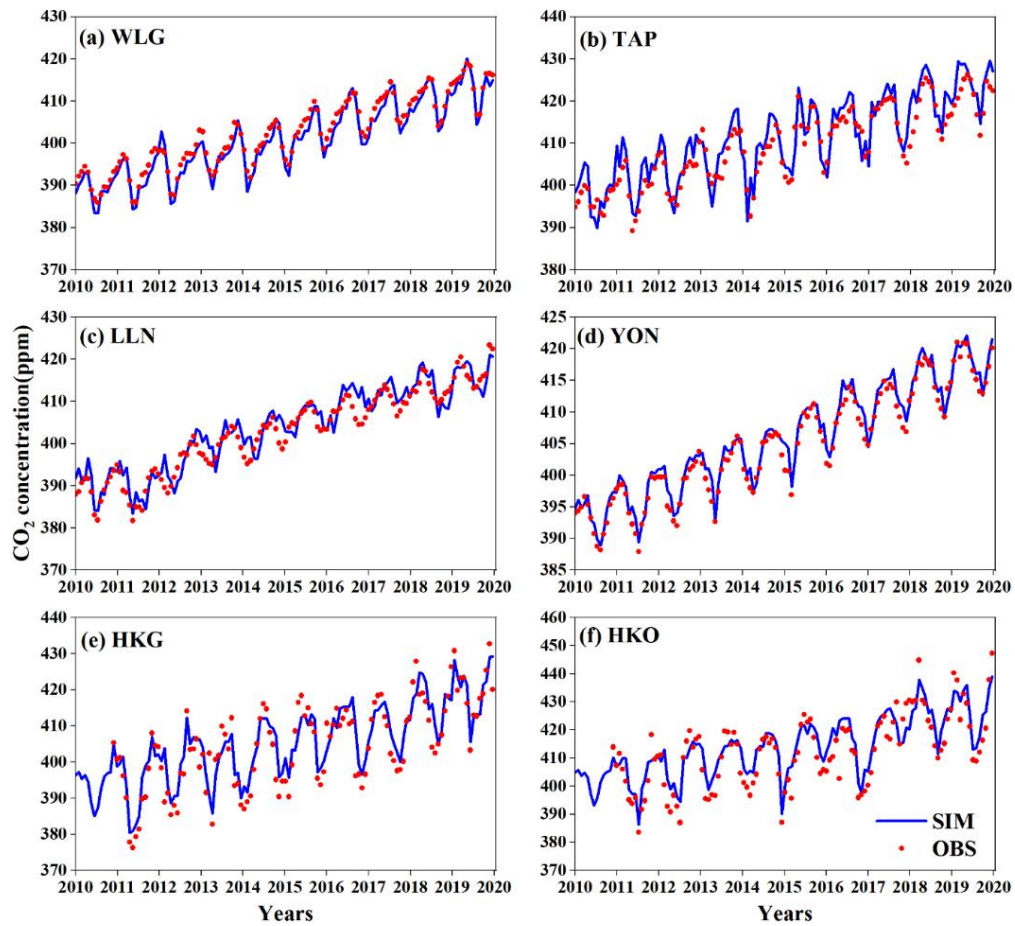
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Figure S5. Comparison of annual mean atmospheric nitrogen deposition from simulations and literature reports during 2010–2020.

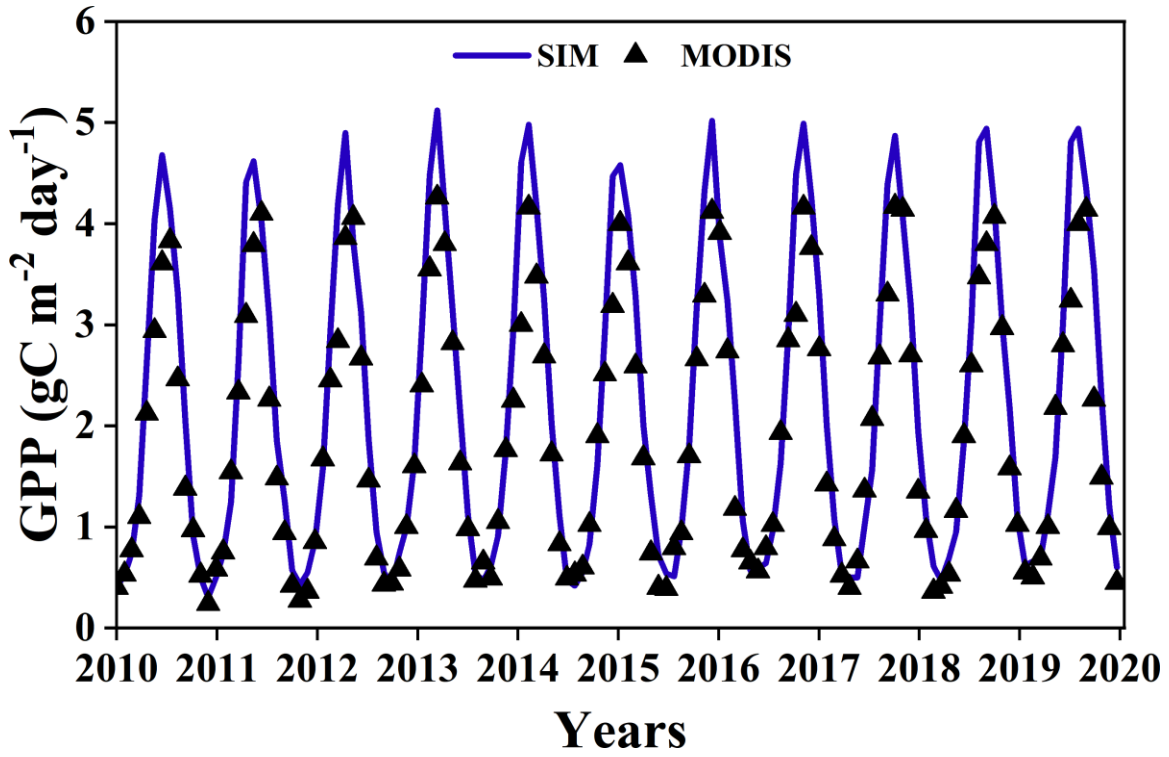


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178 **Figure S6.** Monthly mean CO₂ concentration data at six monitoring sites in East Asia, with
 179 simulated values (blue line) and observed values (red dots). Units: ppm.

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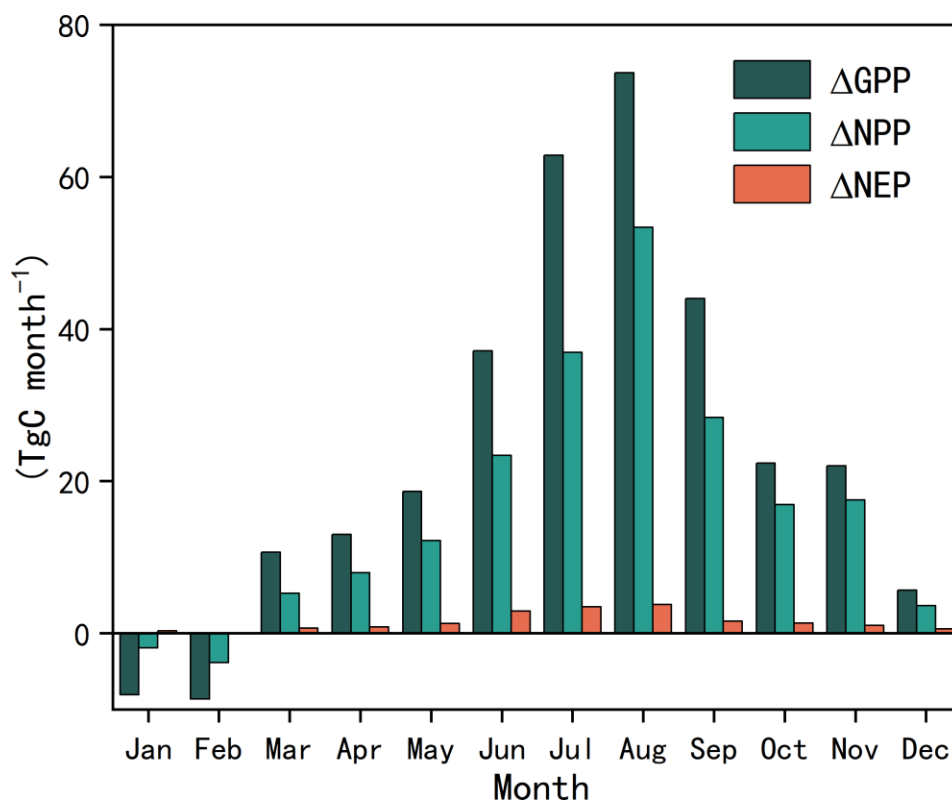


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203 **Figure S7.** Comparison of the monthly mean GPP values simulated for the period 2010–2020
204 (blue line) with MODIS data (black triangles). Units: gC m⁻² day⁻¹

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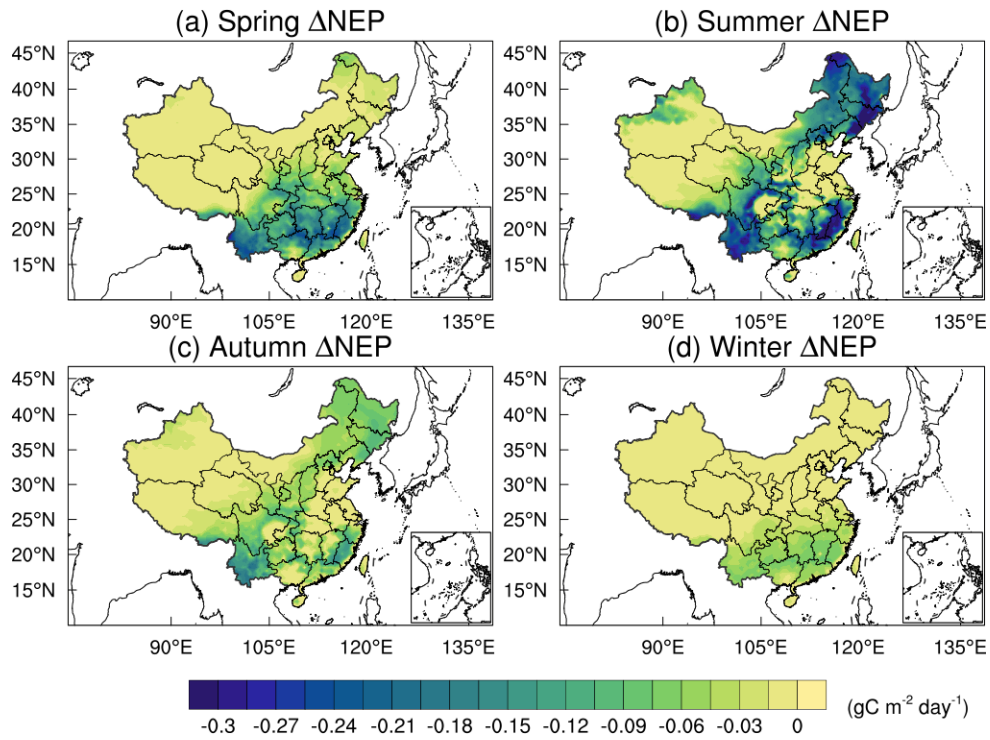
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233 **Figure S8.** Monthly variations in GPP, NPP, and NEP induced by aerosol direct radiative effects
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247 **Figure S9.** O₃-induced seasonal variation in NEP.

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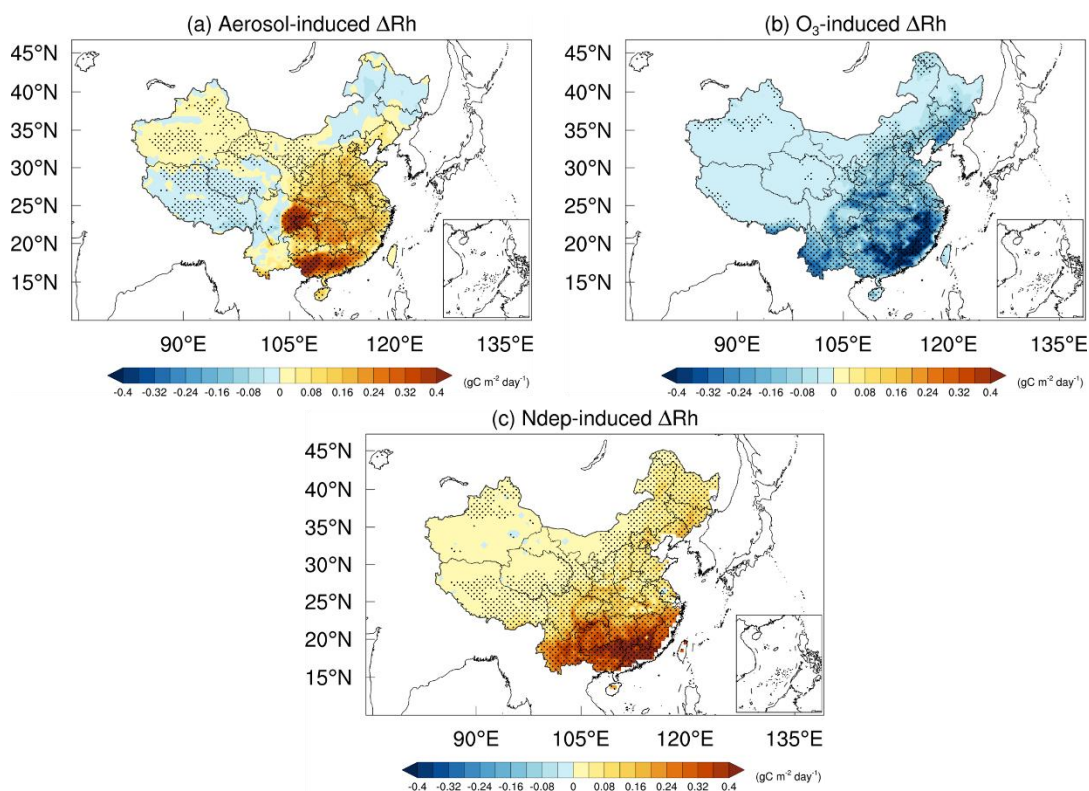
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278 **Figure S10.** Spatial responses of heterotrophic respiration (Rh) to (a) aerosols, (b) O₃ pollution,
279 and (c) atmospheric nitrogen deposition over China during 2010–2020. Black dots denote
280 significant changes ($p < 0.01$).

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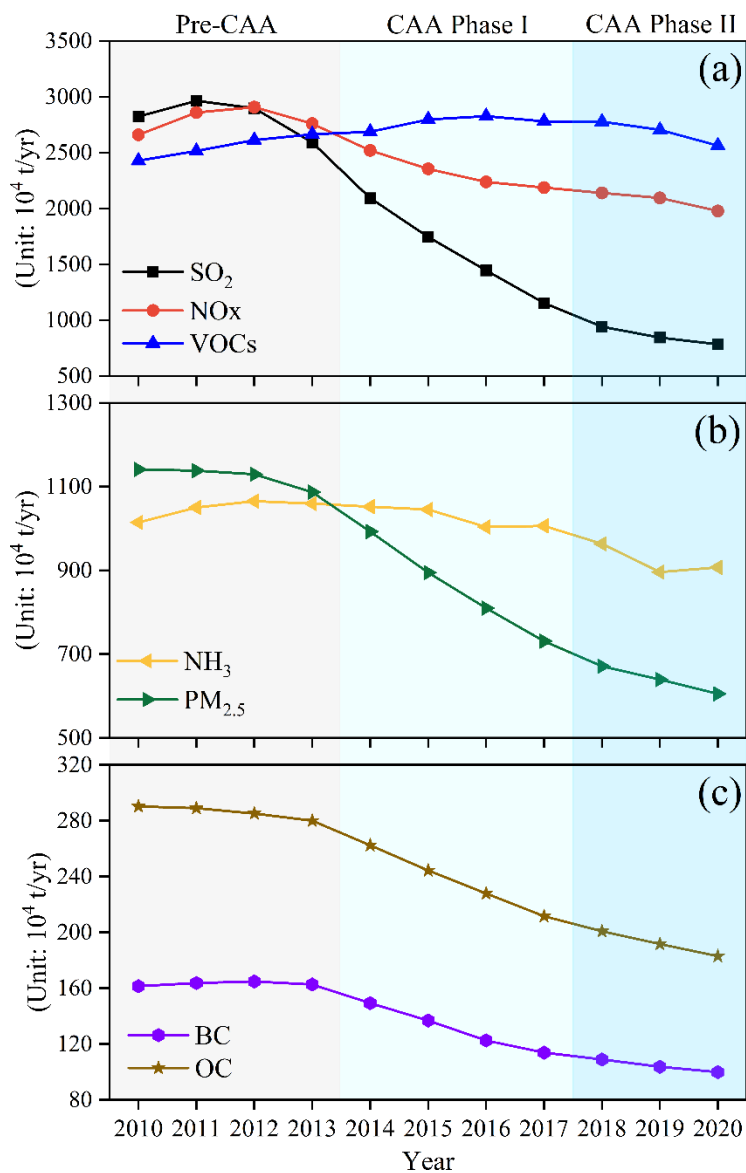
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299 **Figure S11.** Temporal evolution of major anthropogenic emissions in China during 2010–2020.
300 Panels show grouped annual emissions of (a) SO₂, NO_x, and VOCs, (b) NH₃ and PM_{2.5}, and (c)
301 BC and OC. Shaded backgrounds indicate Pre-CAA (2010–2013), CAA Phase I (2014–2017),
302 and CAA Phase II (2018–2020).
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311 **Table S1.** Information about the CO2 observation site and comparison between simulation and
 312 observation.

Sites	Time	(Latitude, Longitude)	Elevation (m)	Obs (ppm)	Sim (ppm)	MB (ppm)	RMSE (ppm)	R
WLG	2010- 2020	(36.29, 100.90)	3810	403.3	401.5	-1.8	2.98	0.92
TAP	2010- 2020	(36.73, 126.13)	20	410.3	412.9	2.6	4.6	0.89
LLN	2010- 2020	(23.46, 120.87)	2867	403.5	406.3	2.8	4.01	0.88
YON	2010- 2020	(24.47, 123.01)	30	405.9	404.8	-1.1	1.75	0.96
HKG	2011- 2020	(22.21, 114.25)	60	404.7	407.8	3.1	6.02	0.84
HKO	2011- 2020	(22.31, 114.17)	65	412.3	415.6	3.3	6.17	0.83

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