Table S1. China's historical emissions for 2016 and future emission scenario SSP1-RCP2.6-BHE for 2030 and 2050 provided by Tong et al. (2020)

Unit: Tg	2016	2030	2050	2030/2016	2050/2016
BC	1.3	0.49	0.28	0.38	0.22
SO2	13	5.9	2.3	0.44	0.17
NOx	23	10	6.1	0.46	0.27
OC	2.3	1.2	0.66	0.50	0.29
VOC	28	20	13	0.70	0.45
PM2.5	8.1	3.9	2.0	0.48	0.24
NH3	10	8.5	6.1	0.85	0.61
CO	142	92	69	0.65	0.49

Table S2. Information of observation sites for sulfate, nitrate, and black carbon concentrations used for model evaluation

Site	Species	Year	Lon (°)	Lat (°)	References
Beijing	Sulfate, Nitrate	2006/2008/2010	116.33-116.37	39.95-39.99	Zhang et al. (2013), Hu et al. (2016), Sun et al. (2010), Huang et al. (2010)
Beijing	Sulfate, Nitrate	2016	116.32	39.95	Liu et al. (2018)
Beijing	BC	2008-2016	116.37	39.97	Xia et al. (2020)
Zhengzhou	Sulfate, Nitrate	2010	113.52	34.8	Geng et al. (2013)
Tianjin	Sulfate Nitrate	2008	117.17	39.01	Gu et al. (2013)
Nanjing	Sulfate	2015	118.71-118.75	32.01-32.21	Ge et al. (2017), Wang et al. (2016), Zhang et al. (2017)
Hangzhou	Sulfate	2016	120.21	30.21	Li et al. (2018)
Jiaxing	Sulfate	2010	120.8	30.8	Huang et al. (2013)
Shanghai	Sulfate, Nitrate	2011-2014	121.53	31.23	Tao et al. (2017)
Shanghai	BC	2008-2016	121.59	31.18	Wei et al. (2020)
Fukue Island	BC	2010-2016	128.68	32.75	Kanaya et al. (2019)

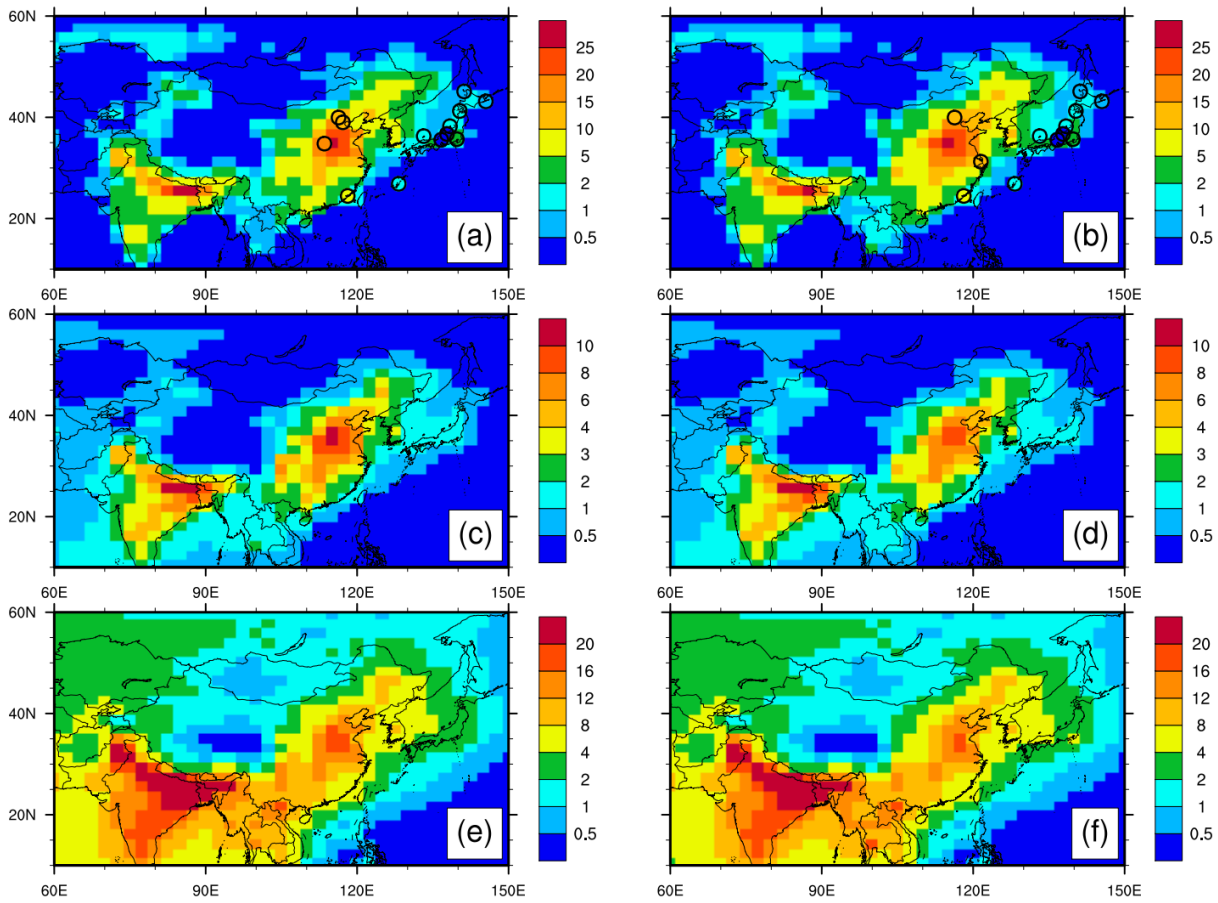

Fig. S1 Simulated annual mean surface concentrations (unit: μg m^{-3}) of $PM_{2.5}$ nitrate (a-b), ammonium (c-d), and organic aerosols (e-f) between 2008 (left) and 2016 (right). Measurements of nitrate concentrations are shown in colored dots for comparison.

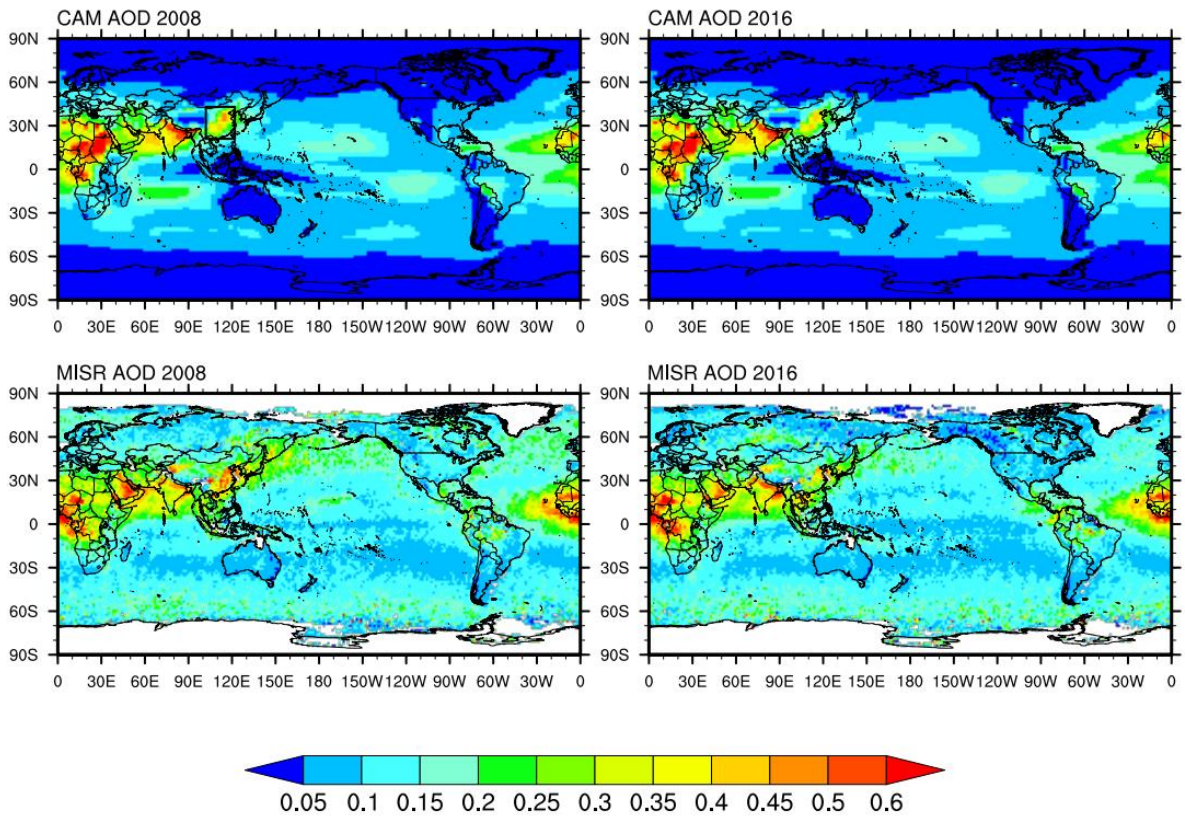

Fig. S2 Comparison of modeled AOD 550 nm with MISR observations in 2008 and 2016. Note that the CAM AOD in 2016 is derived from the simulation using the emission year of 2016 for China.

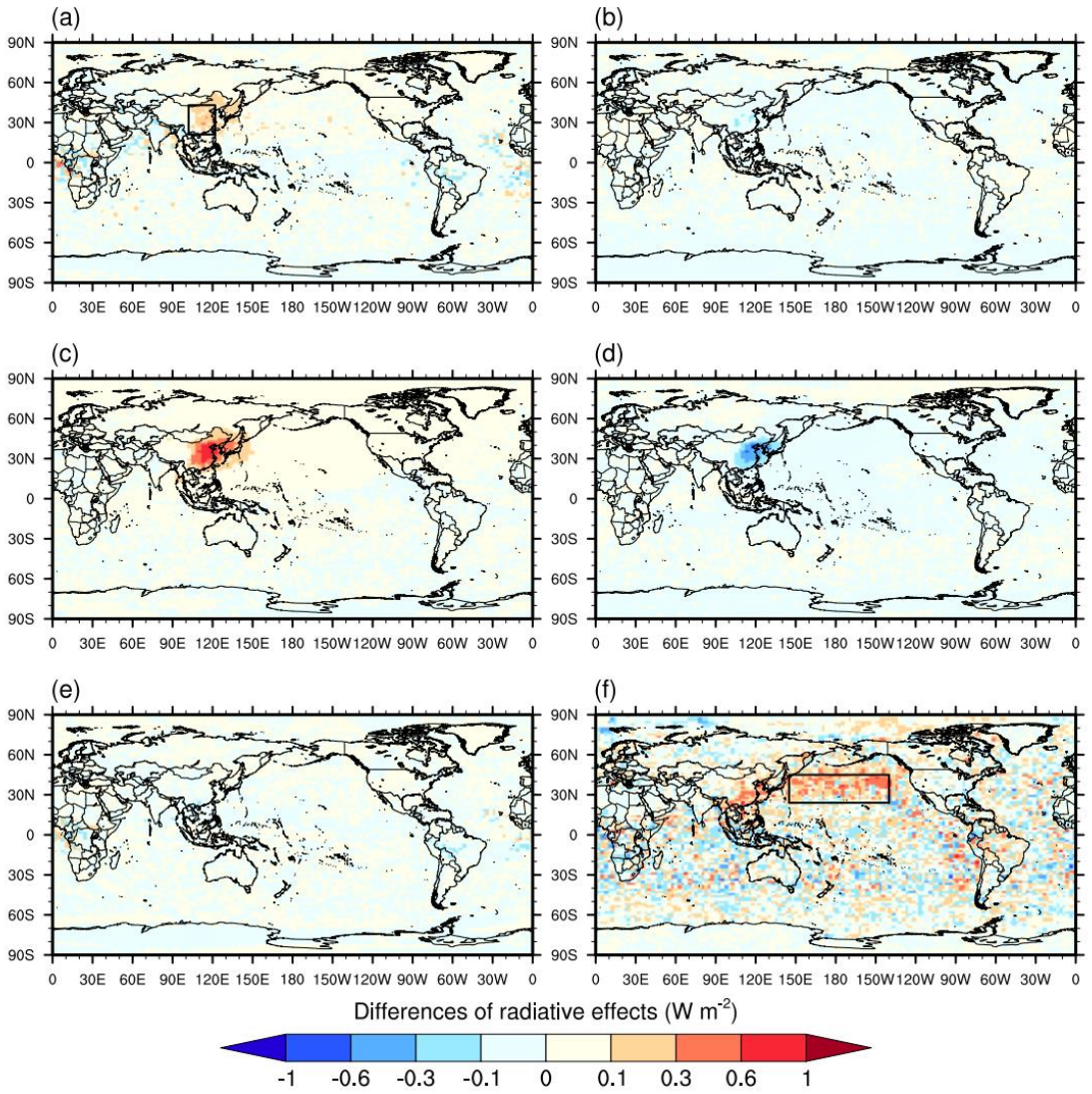

Fig. S3. DRF from total aerosols (a), BC (b), sulfate (c), nitrate + ammonium (d), and OA + dust (e), and aerosol-induced clouds effects (f), due to the reduction in SO_2 emissions in China.

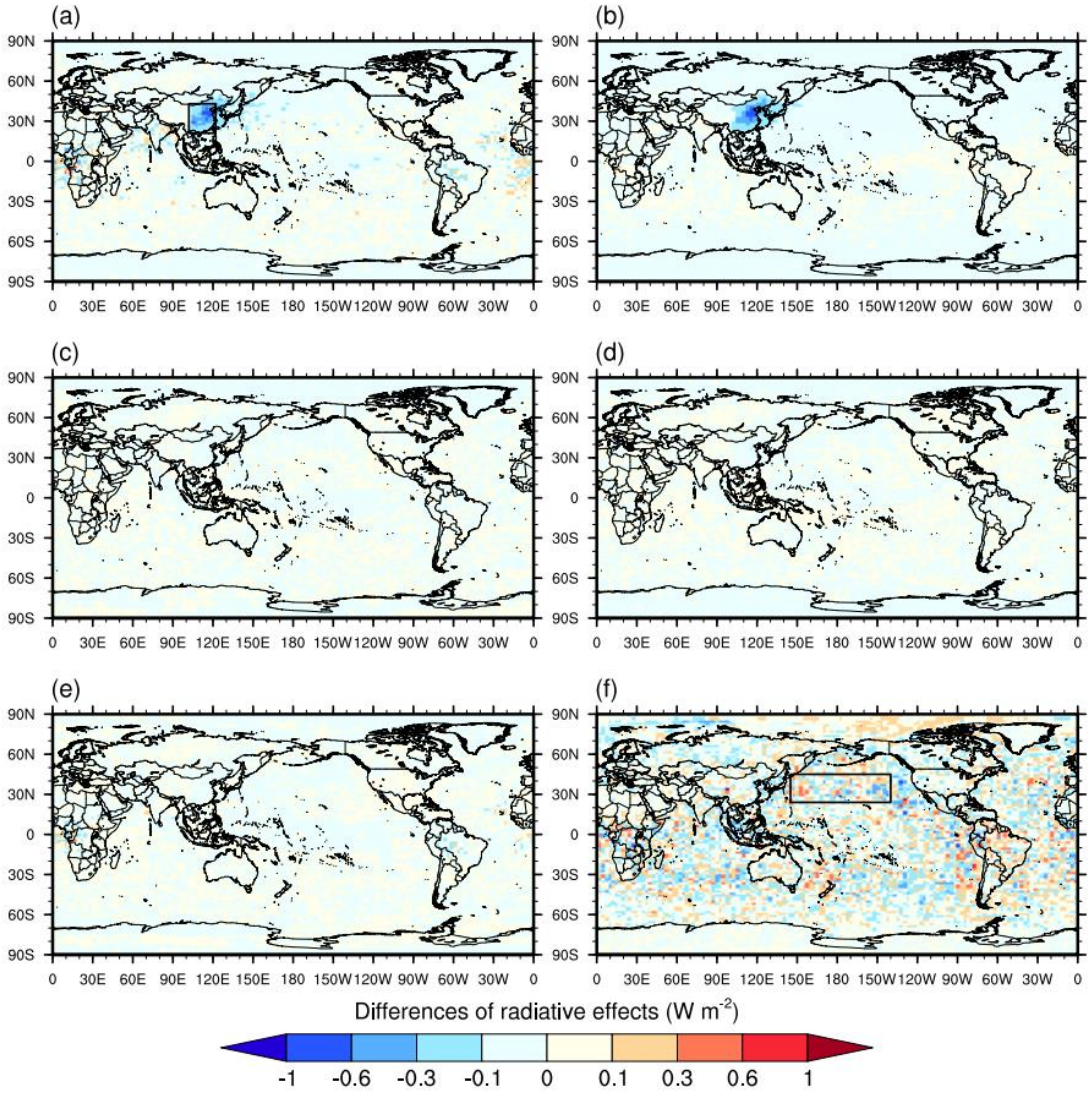

Fig. S4 The same with Fig. S3, but due to the reduction in BC emissions.

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