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Direct radiative effect of carbonaceous aerosols from crop residue burning during the summer harvest season in East China

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Table Captions

Table S1. Descriptions of the sensitivity test simulations

Table S2. The OA DRE due to absorption at the top of atmosphere (TOA) for the sensitivity test simulations.

Table S1. Descriptions of the sensitivity test simulations.

Simulation	Emission inventory	BC-to-OC ratio	OA absorptivity	Mixing state
K1.5_BASE	Comprehensive	0.27	$k_{OA}^* \times 1.5$	Core-shell
K1.5_nOACB	No OA emissions from crop residue burning	0.27	$k_{OA}^* \times 1.5$	Core-shell
R0.18_BASE	Comprehensive	0.18	Saleh et al. (2014)	Core-shell
R0.18_nOACB	No OA emissions from crop residue burning	0.18	Saleh et al. (2014)	Core-shell
R0.18_nOAABS	Comprehensive	0.18	None	Core-shell
R0.18_nOACB_nOAABS	No OA emissions from crop residue burning	0.18	None	Core-shell
R0.42_BASE	Comprehensive	0.42	Saleh et al. (2014)	Core-shell
R0.42_nOACB	No OA emissions from crop residue burning	0.42	Saleh et al. (2014)	Core-shell
R0.42_nOAABS	Comprehensive	0.42	None	Core-shell
R0.42_nOACB_nOAABS	No OA emissions from crop residue burning	0.42	None	Core-shell
VM_BASE	Comprehensive	0.27	Saleh et al. (2014)	Volume mixing
VM_nCB	No crop residue burning emissions	0.27	Saleh et al. (2014)	Volume mixing

k_{OA}^* : the imaginary part of OA's refractive index, see Eq. (2), (3) and (4) (Saleh et al. 2014).

Table S2. The OA DRE due to absorption at the top of atmosphere (TOA) for the sensitivity test simulations.

Testing item	Value	Calculating procedure	DRE of OA absorption (W m ⁻²)
OA absorptivity	$k_{OA}^* \times 1.5$	$(ADRE_{K1.5_BASE}^a - ADRE_{nOAABS}) - (ADRE_{K1.5_nOACB} - ADRE_{nOACB_nOAABS})$	+0.27
BC-to-OC ratio	0.18	$(ADRE_{R0.18_BASE} - ADRE_{R0.18_nOAABS}) - (ADRE_{R0.18_nOACB} - ADRE_{R0.18_nOACB_nOAABS})$	+0.33
	0.42	$(ADRE_{R0.42_BASE} - ADRE_{R0.42_nOAABS}) - (ADRE_{R0.42_nOACB} - ADRE_{R0.42_nOACB_nOAABS})$	+0.13
Mixing State	Volume mixing	$ADRE_{VM_BASE} - ADRE_{VM_nCB}$	+0.23

^aThe DRE of all the aerosol species (ADRE) at TOA, see Eq. (1)

Figure Captions

Figure S1. The diurnal profile of crop-burning emissions in East China.

Figure S2. Time series of the (a) temperature and (b) relative humidity at 2 m above ground surface (T2 and RH2, respectively) and the (c) wind speed at 10 m above ground (WS10) observations (black dot) versus the corresponding WRF-Chem simulations (blue line) at three typical sites (Mengcheng, Suxian, and Xuzhou) in Eastern China in June 2013.

Figure S3. Time series of the observed (dots) and simulated (line) (a) PM_{2.5}, (b) sulfate, (c) ammonium and (d) nitrate mass concentrations ($\mu\text{g}/\text{m}^3$) at the Suixi site.

Figure S4. Scatterplots of simulated hourly AOD and corresponding MODIS AOD at 23 sites in June 2013. Normalized mean bias (NMB) and the correlation coefficient (R) are given in the scatterplot.

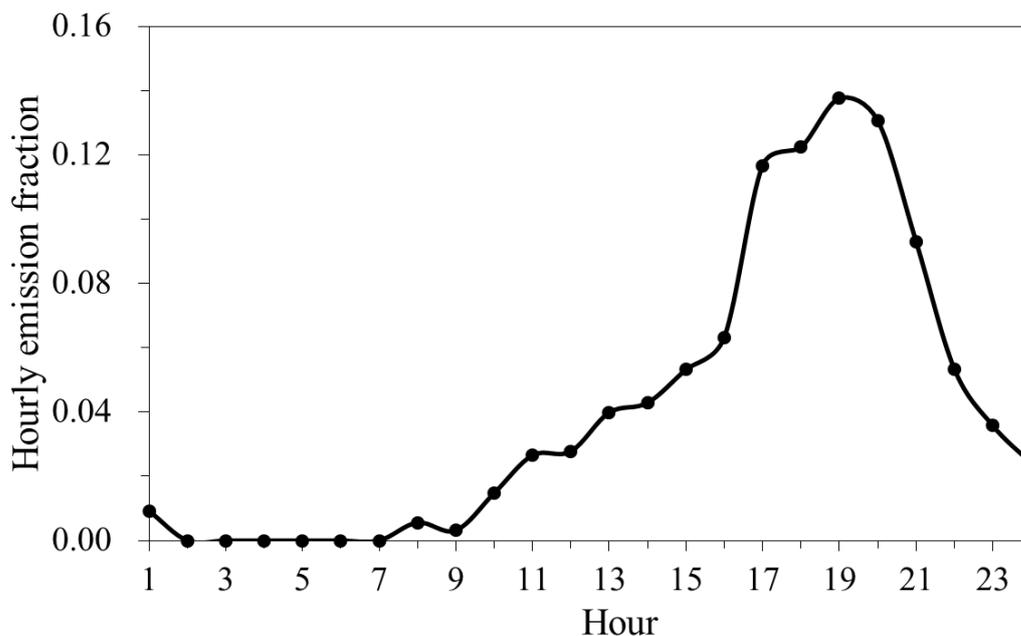


Figure S1. The diurnal profile of crop-burning emissions in East China. The diurnal profile was derived from the results of household surveys in the countryside of East China in the summer of 2013. Face-to-face surveys were made in five counties (Dongping, Lixin, Shangqiu, Xiantao and Dongping) in four Provinces (Shandong, Anhui, Hubei and Henan), where crop residue burning was intensive. Through interviews with about 1500 farmer families, information on farming method including in-field crop burning was collected. The frequencies of firing time and fire durations were calculated for the diurnal profile of crop-burning emissions. The crop fires were also recorded during the observations at Suixi.

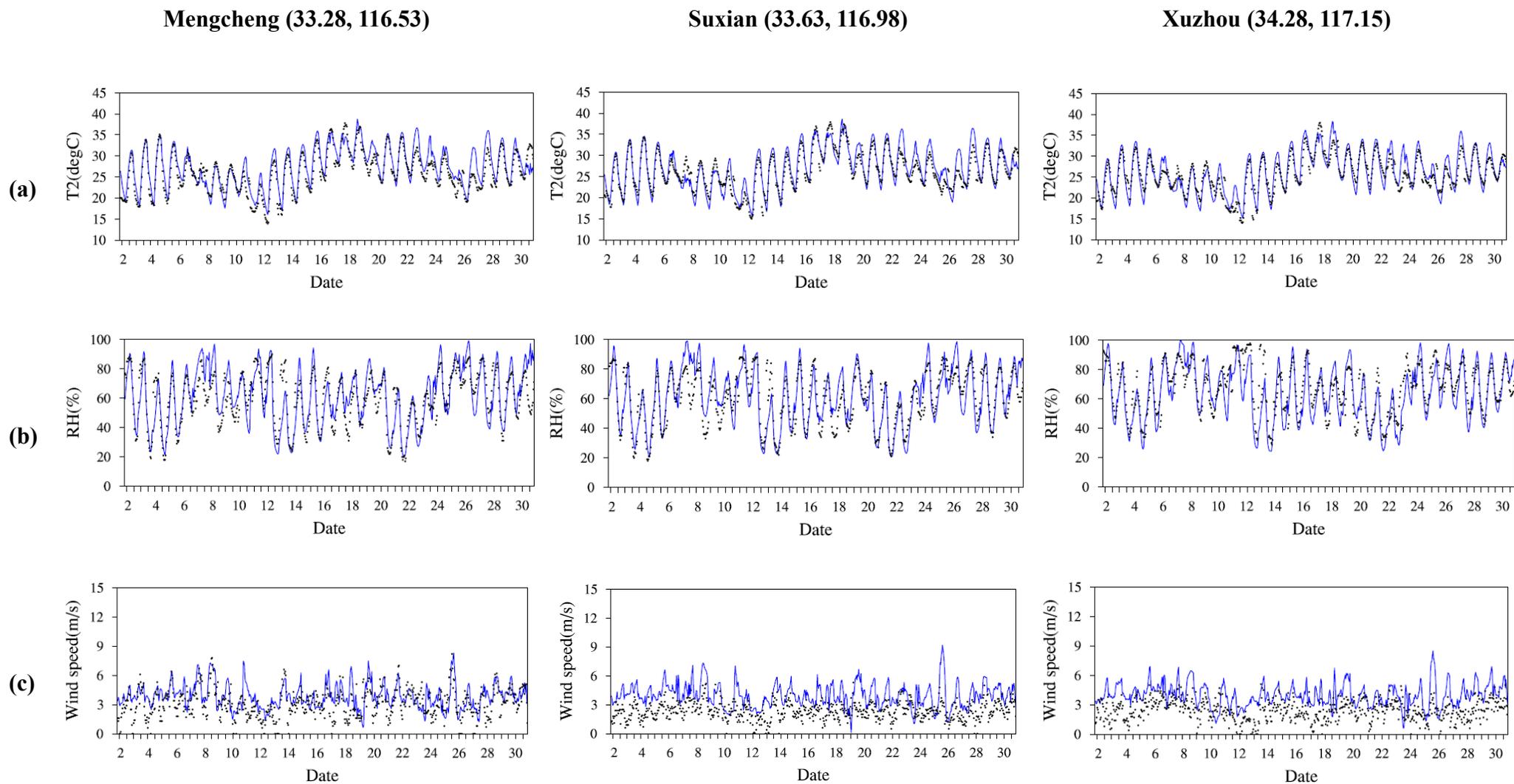


Figure S2. Time series of the (a) temperature and (b) relative humidity at 2 m above ground surface (T2 and RH2, respectively) and the (c) wind speed at 10 m above ground (WS10) observations (black dot) versus the corresponding WRF-Chem simulations (blue line) at three typical sites (Mengcheng, Suxian, and Xuzhou) in Eastern China in June 2013.

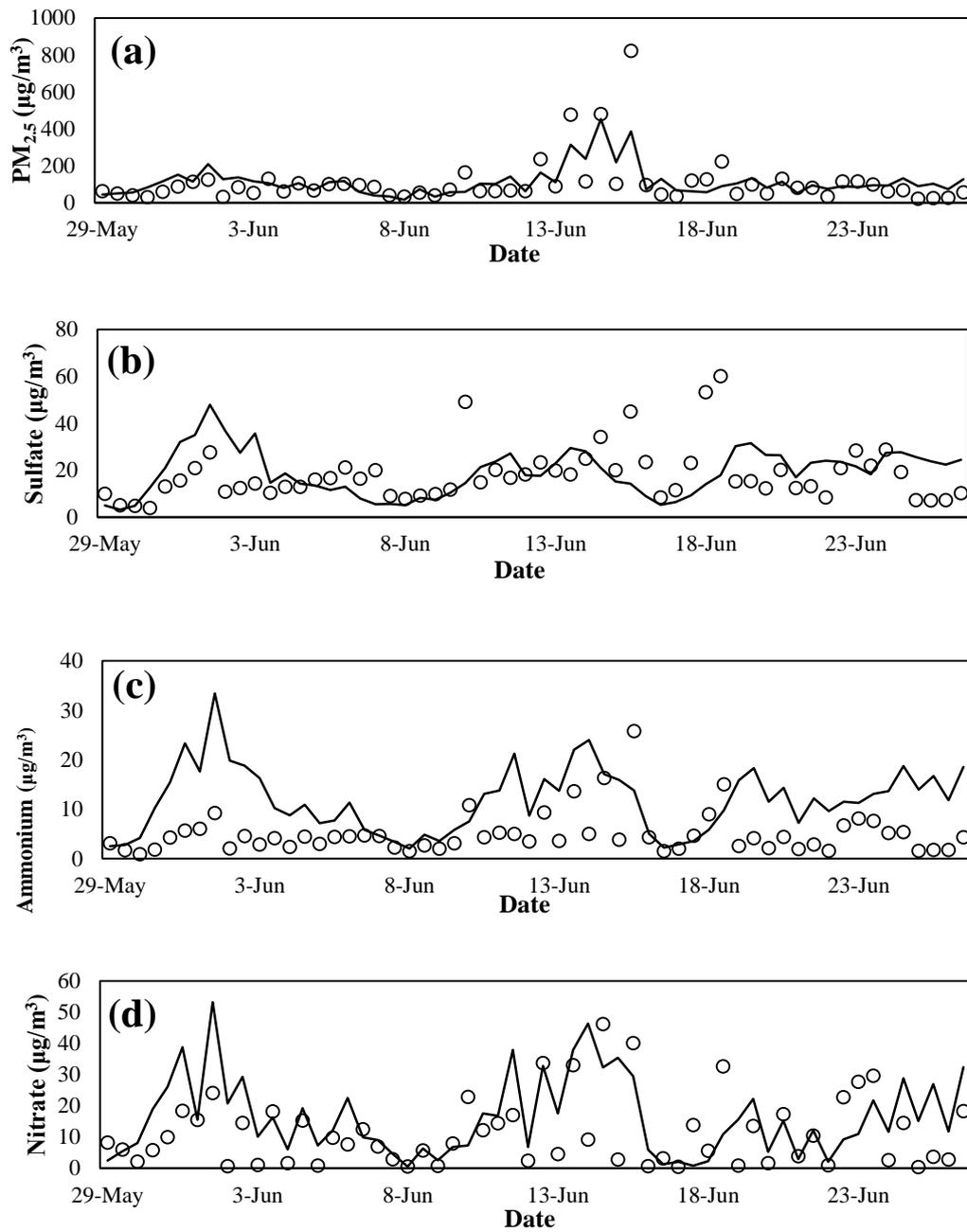


Figure S3. Time series of the observed (dots) and simulated (line) (a) PM_{2.5}, (b) sulfate, (c) ammonium and (d) nitrate mass concentrations (µg/m³) at the Suixi site.

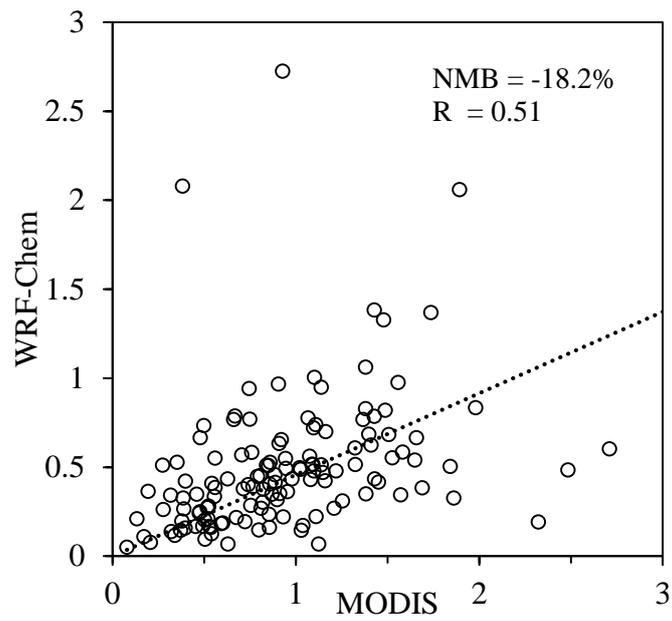


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