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*Supplement of*

## **Modeling study of the 2010 regional haze event in the North China Plain**

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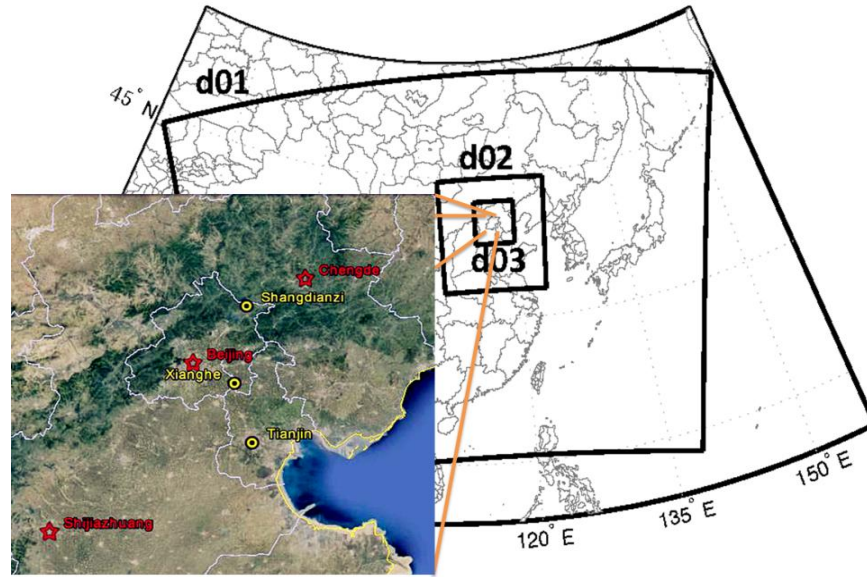


Figure S1. WRF-Chem modeling domain settings and locations of observations.

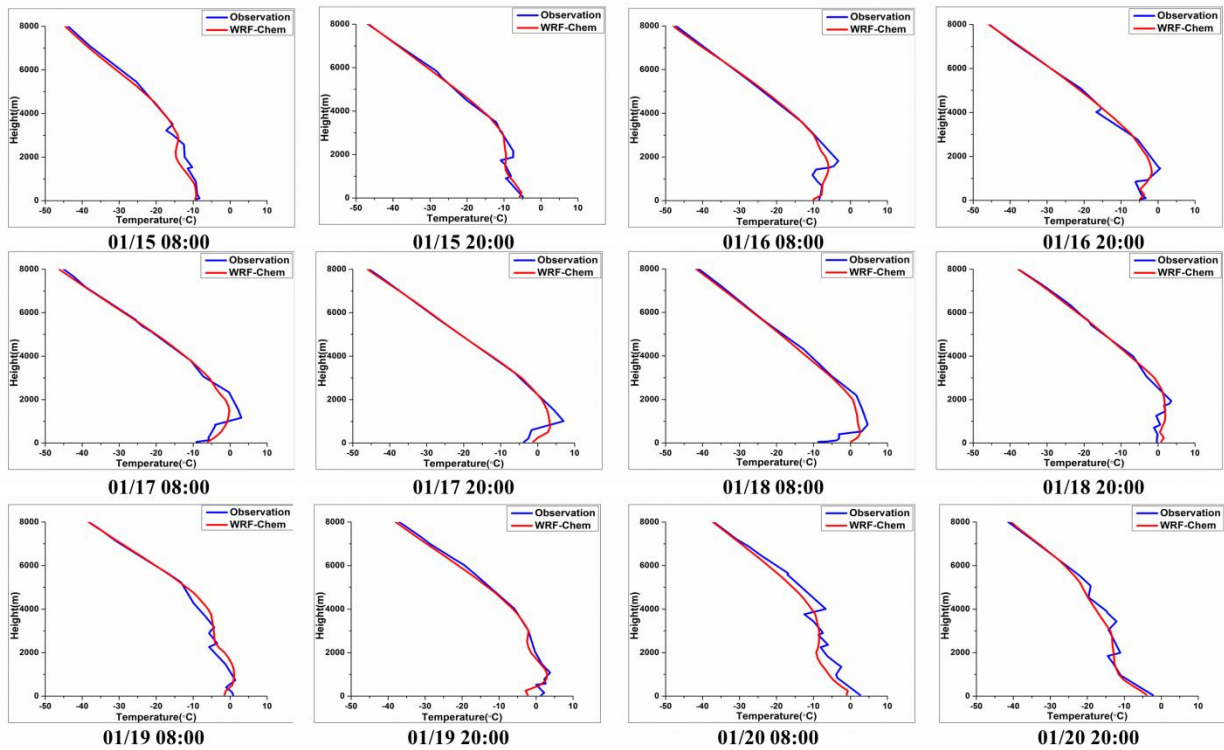


Figure S2. Simulated and observed vertical temperature profiles at 0800 and 2000 (China Standard Time, CST) from 15 January to 20 January.

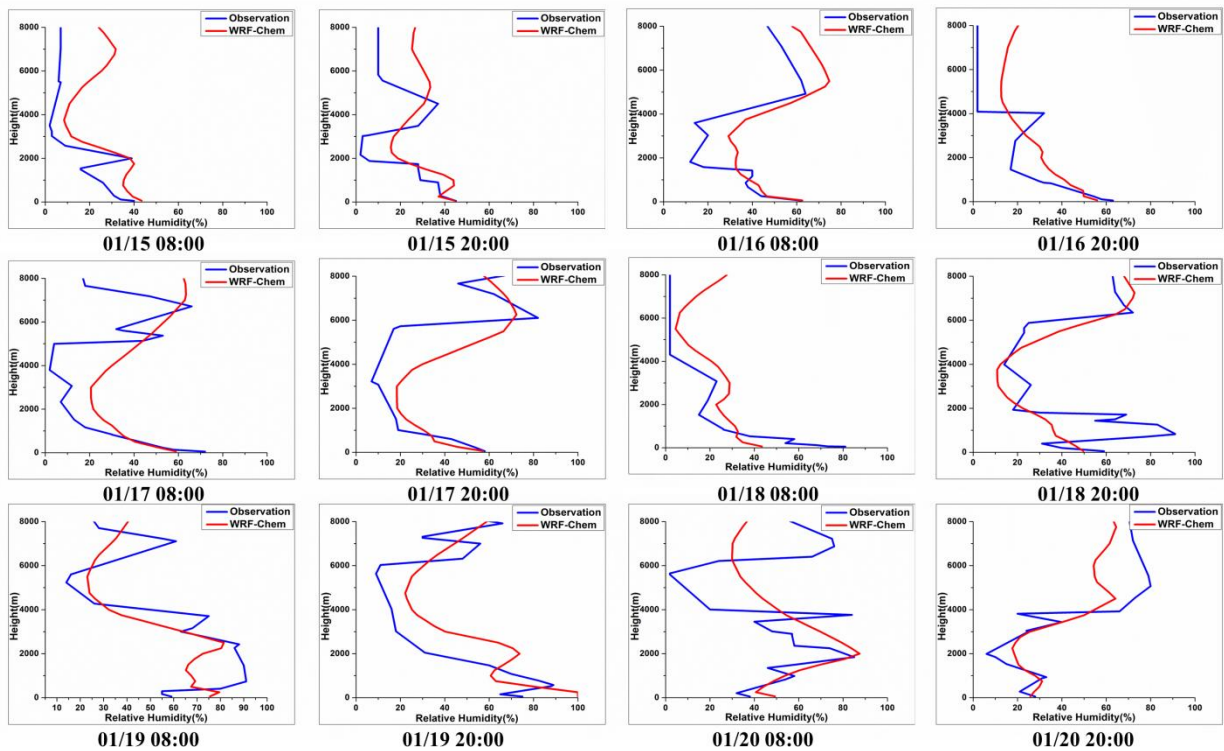


Figure S3. Simulated and observed vertical RH profiles at 0800 and 2000 (CST) from 15 January to 20 January.

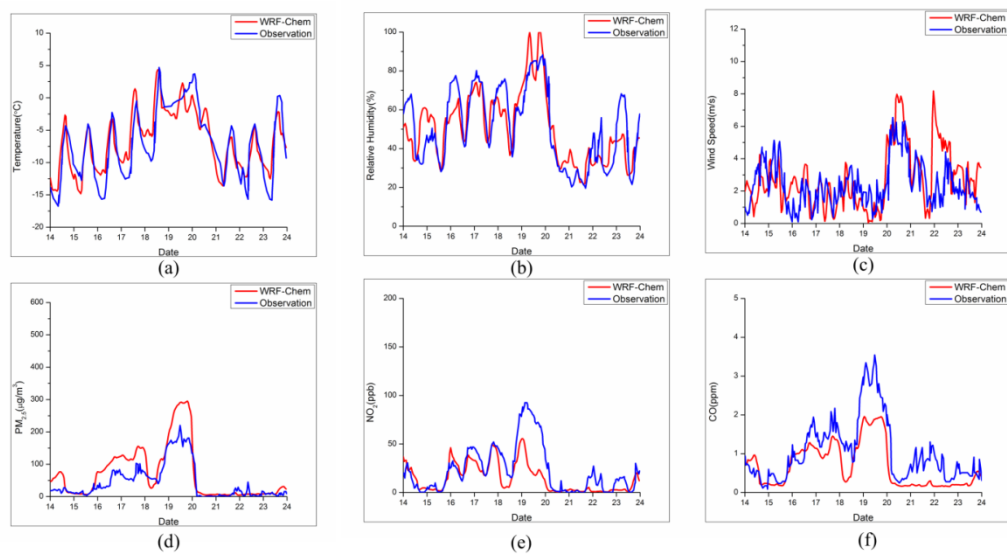


Figure S4. Simulated and observed hourly temperature, RH, wind speed,  $PM_{2.5}$ ,  $NO_2$  and CO in the Shangdianzi (SDZ) station.

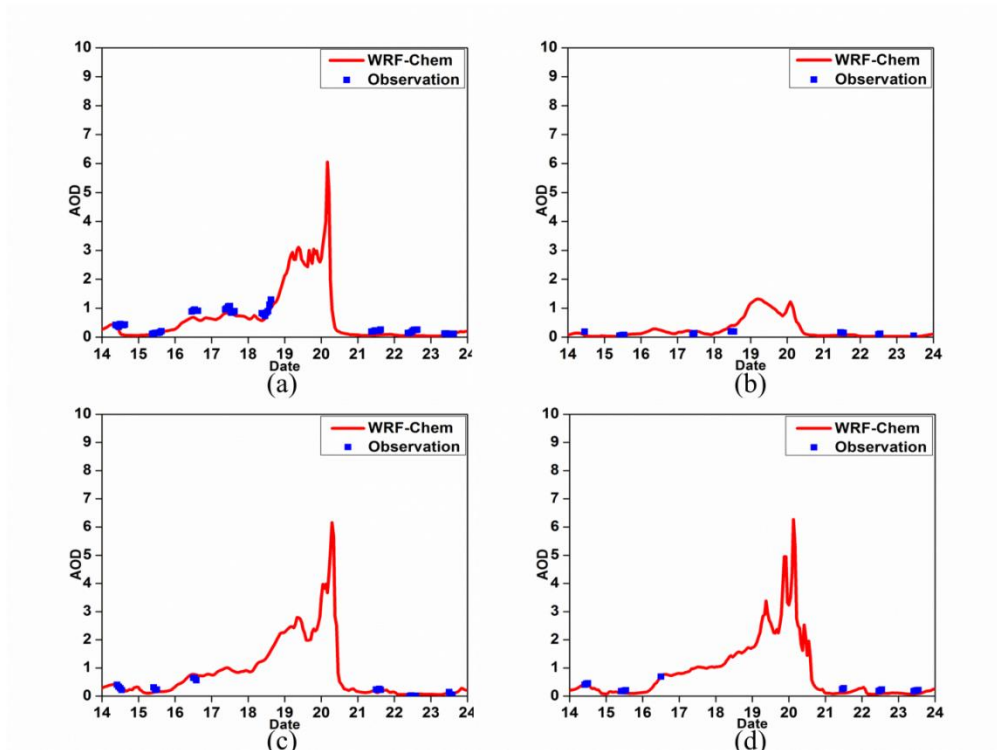


Figure S5. Simulated and measured AOD at 500nm at Beijing city (a), Beijing forest (b), Baoding city (c) and Cangzhou city.

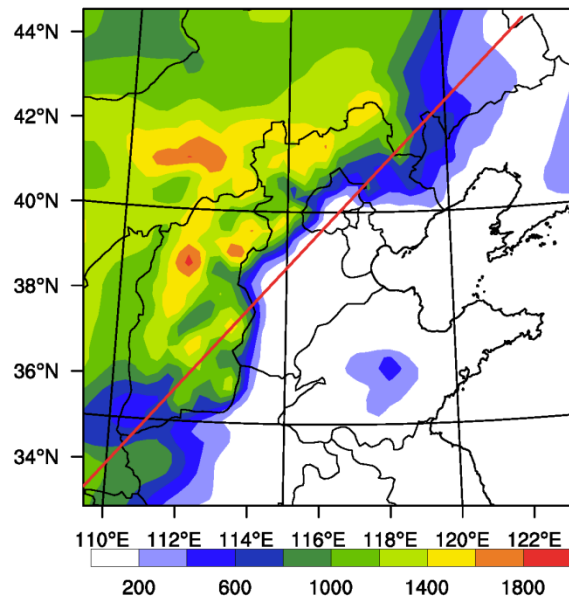


Figure S6. Terrain heights and direction of cross section plots.

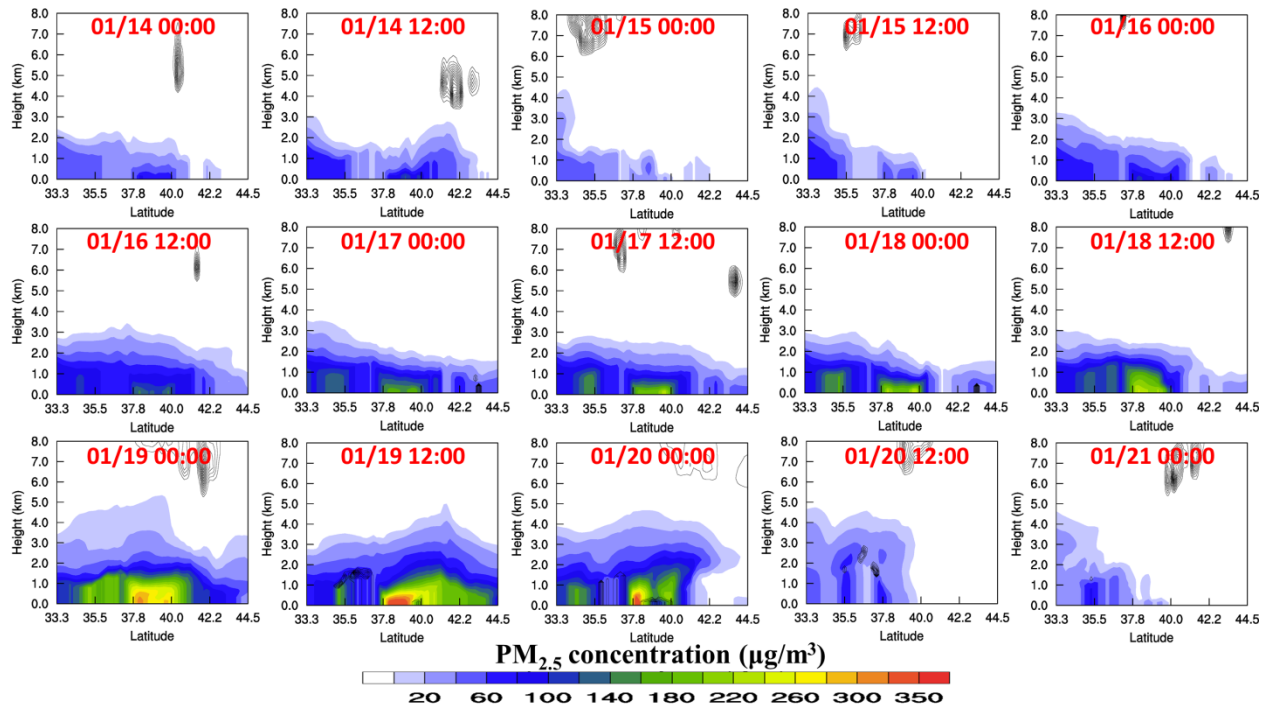


Figure S7. Cross section plots of PM<sub>2.5</sub> concentration and clouds from 14 January 00:00 to 21 00:00 January every 12 hours.

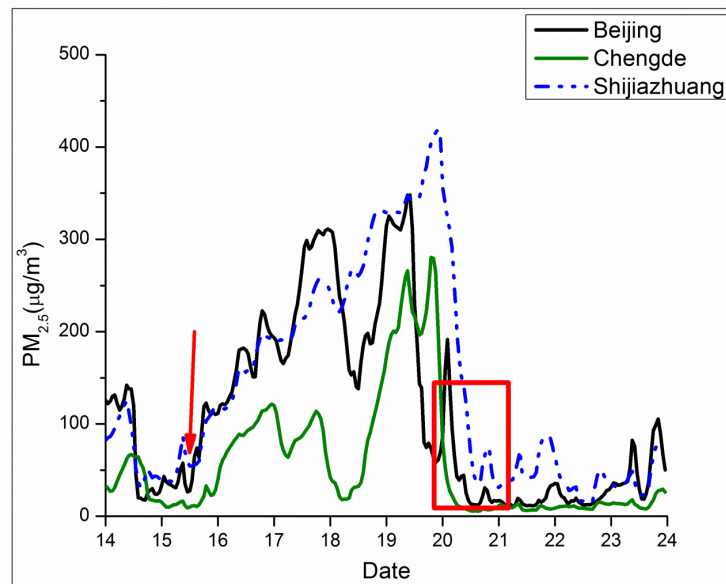


Figure S8. Temporal variations of simulated PM<sub>2.5</sub> at Shijiazhuang, Beijing and Chengde.

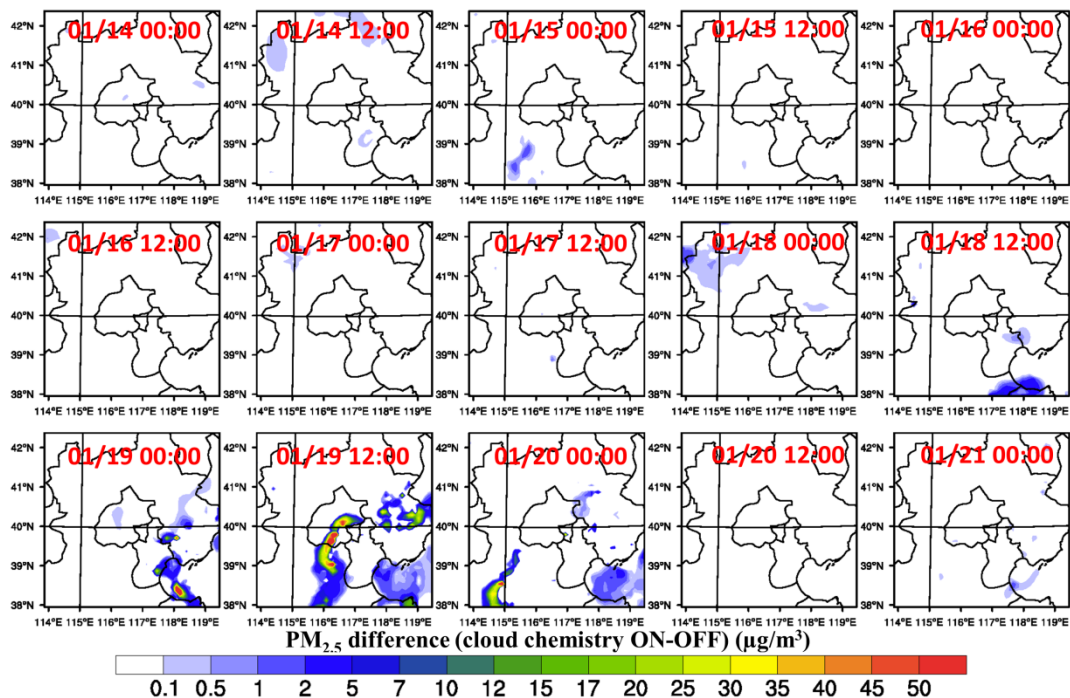


Figure S9. PM<sub>2.5</sub> concentration difference due to cloud chemistry from 14 January 0000 to 21 January 0000, plotted every 12 hours.

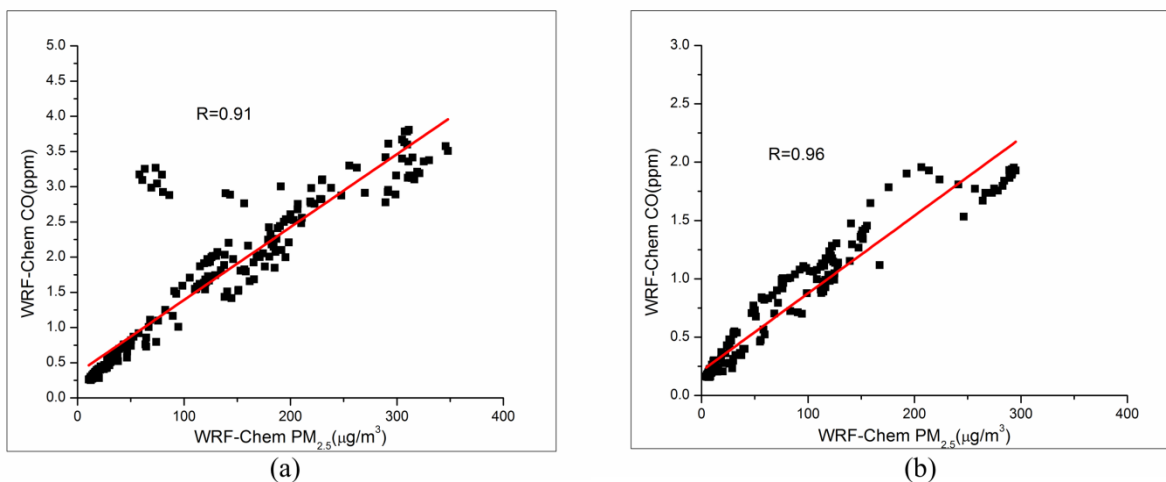


Figure S10. Correlation between CO and PM<sub>2.5</sub> at Beijing (a) Shangdianzi (b).

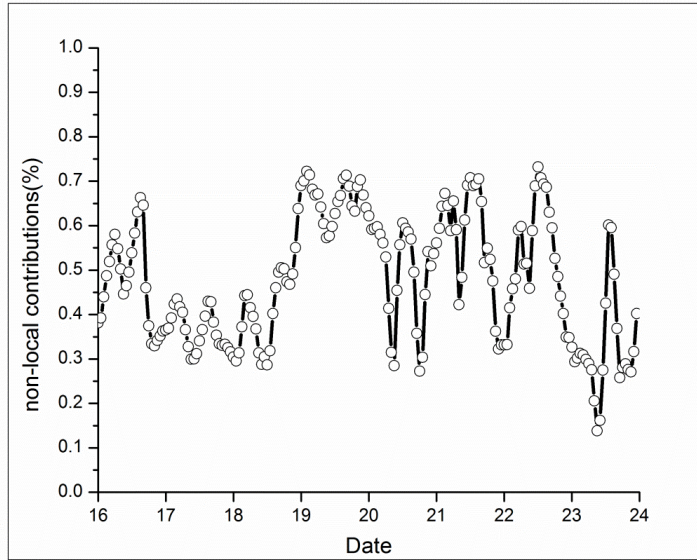


Figure S11. Non-local contributions to CO in Beijing.

Table S1. **Observation Data and Variables Used in This Study.**

Data sets <sup>a</sup>	Variables <sup>b</sup>	Data frequency	Number of sites used	Data sources
CMDSSS	T2, RH2, WS10	Daily	4	<a href="http://cdc.cma.gov.cn/home.do">http://cdc.cma.gov.cn/home.do</a>
Atmospheric Sounding	T, RH	12 hours	1	<a href="http://weather.uwyo.edu/uppe_rair/sounding.html">http://weather.uwyo.edu/uppe_rair/sounding.html</a>
CARE-China	PM <sub>2.5</sub> , NO <sub>2</sub> , SO <sub>2</sub>	Hourly	3	
CSHNET	AOD	Hourly	4	
SDZ	T1.5, RH1.5, WS10, PM <sub>2.5</sub> , NO <sub>2</sub> , CO	Hourly	1	Zhao et al. (2013)
CALIPSO	AOD	N/A	N/A	<a href="http://www-calipso.larc.nasa.gov/">http://www-calipso.larc.nasa.gov/</a>
MODIS	AOD	Daily	N/A	<a href="http://ladsweb.nascom.nasa.gov/data/search.html">http://ladsweb.nascom.nasa.gov/data/search.html</a>

<sup>a</sup>CMDSSS—China Meteorological Data Sharing Service System; CARE-China—Campaign on the atmospheric Aerosol Research network of China; CSHNET—Chinese Sun Hazemeter Network; SDZ—Observation data at Shangdianzi site are extracted from paper Zhao et al. (2013); CALIPSO—The Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation; MODIS—the Moderate Resolution Imaging Spectroradiometer. <sup>b</sup>T2— temperature at 2m; RH2—relative humidity at 2m; WS10—wind speed at 10m; T1.5—temperature at 1.5m; RH1.5—relative humidity at 1.5m; AOD—Aerosol Optical Depth.



Table S2. **Performance Statistics for Meteorological Variables.**

Variables	Beijing					Tianjin					Baoding					Chengde				
	Obs.	Mod.	MB	ME	RMSE	Obs.	Mod.	MB	ME	RMSE	Obs.	Mod.	MB	ME	RMSE	Obs.	Mod.	MB	ME	RMSE
T2(K)	269.5	267.6	-1.9	2.0	2.5	269.3	268.1	-1.1	1.2	1.5	270.4	268.5	-2.0	2.0	2.3	262.5	264.5	2.0	2.4	3.2
RH2 (%)	46.9	53.4	6.6	7.2	11.1	61.5	58.4	-3.1	5.9	6.4	44.4	52.5	8.1	8.1	10.4	59.4	55.0	-4.4	8.0	8.8
WS10(m/s)	2.1	3.4	1.3	1.3	1.6	2.8	3.2	0.4	1.0	1.1	1.4	2.8	1.4	1.4	2.1	1.4	2.9	1.5	1.5	1.8