

Table 1 Performance statistics of near surface meteorological parameters.

	IOA	R	STD _O	STD _F	RMSE	MB	ME
T ₂ ^a	0.83	0.88	3.7 K	4.8	3.6	-2.8	3.0
Q ₂ ^a	0.52	0.73	0.5 g kg ⁻¹	0.6	1.0	1.0	1.0
WD ₁₀ ^a	0.66	0.41	111.6	88.8	119.8	47.1	74.8
WS ₁₀ ^a	0.74	0.62	1.6 m s ⁻¹	1.4	1.5	0.7	1.2
T ₂ ^b	0.82	0.84	3.2 K	4.5	3.4	-2.3	2.8
Q ₂ ^b	0.76	0.79	0.7 g kg ⁻¹	0.7	0.7	0.6	0.6
WD ₁₀ ^b	0.61	0.29	118.7	109.1	139.7	32.1	93.7
WS ₁₀ ^b	0.81	0.68	1.5 m s ⁻¹	1.4	1.2	0.3	0.9

^a and ^b represent December 2014 and 2015 respectively.

Table 2 Performance statistics of hourly NO₂ and PM_{2.5} concentrations in December 2014 and 2015.

	IOA	R	STD _O	STD _F	RMSE	MB	ME
PM _{2.5} ^a	0.66	0.52	91.9 µg m ⁻³	76.3 µg m ⁻³	87.3 µg m ⁻³	-18.8 µg m ⁻³	59.3 µg m ⁻³
PM _{2.5} ^b	0.66	0.48	113.0 µg m ⁻³	108.7 µg m ⁻³	112.2 µg m ⁻³	-16.5 µg m ⁻³	83.2 µg m ⁻³

^a and ^b represent December 2014 and 2015 respectively.

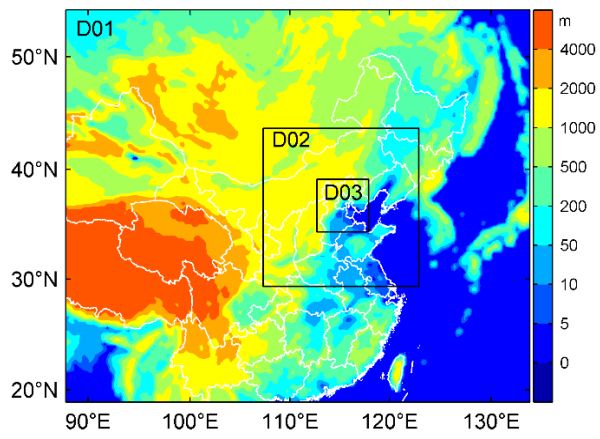


Figure S1 The three nested domains for simulation with horizontal resolutions of 27 km, 9 km and 3 km. The colour bar represents altitude, the white line represents the administrative boundaries of province.

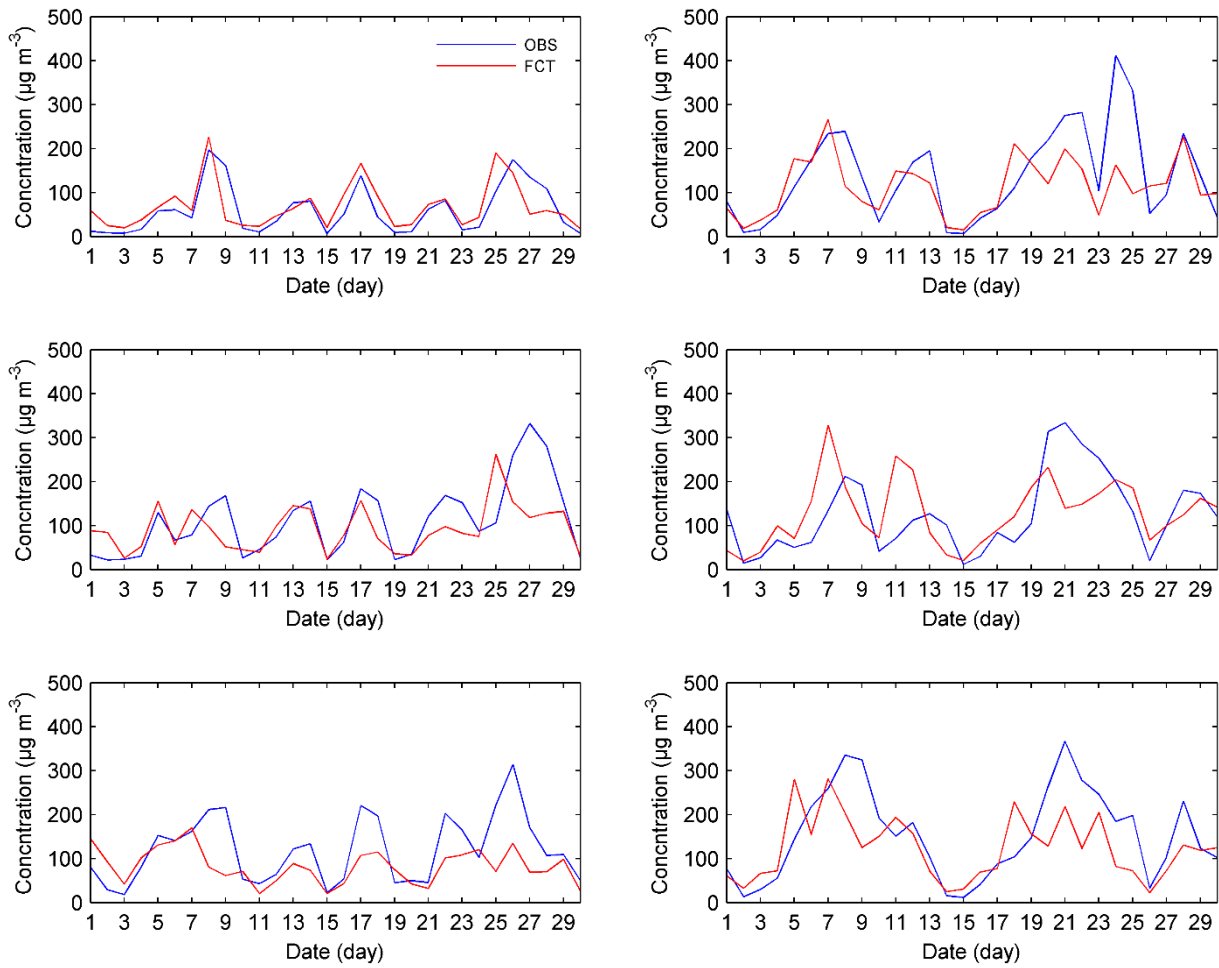


Figure S2. Comparison between observed (OBS) and simulated (FCT) daily average PM_{2.5} concentration in Beijing (a-b), Tianjin (c-d), and Shijiazhuang (e-f) for December 2014 and 2015 respectively.

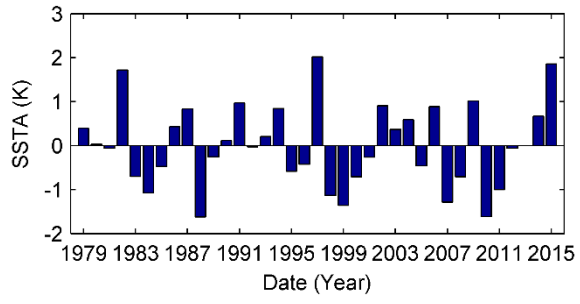


Figure S3 Time series of monthly averaged SSTA over the Niño3 region in December 1979-2015.

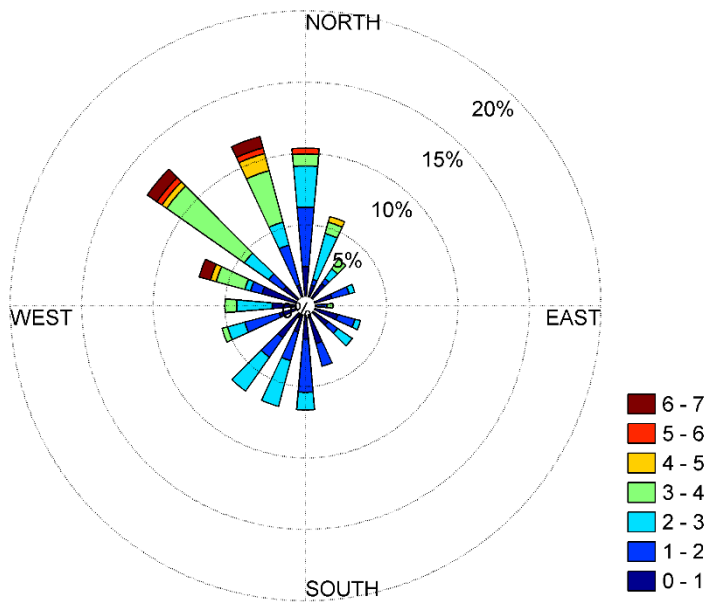


Figure S4 The observed and simulated wind frequency and directions averaged in December 2015.