Supporting Information:

Fig. S1 Traditional prescribed and Spring Festival hourly profiles of the power plant and on-road vehicle sources

Fig. S2 Monthly precipitation (a) and emission changes (b) of dust PM_{10} in July 2013.

Fig. S3 Time series of simulated and observed $PM_{2.5}$ at GZLH, ZSZM, SZLY, and DGNC from July 25 to 27, 2013.

Table S1. Configurations in WRF and CAMx.

Table S2. Evaluation of WRF performance.

Table S3. The overall model performance of CAMx in B-Case1 and D-Case1 (July 25-27, 2013)

Table S4. The absolute differences of NMB and NME in B-Case2 and H-Case2.

Table S5. The overall model performance of CAMx in B-Case2 and H-Case2 (January 14-31, 2012)

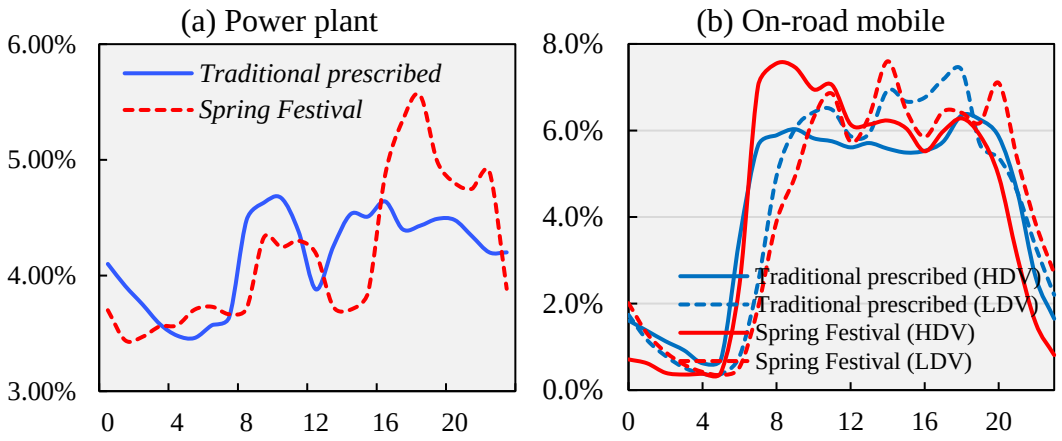

Fig. S1 Traditional prescribed and Spring Festival hourly profiles of power plant and on-road mobile.

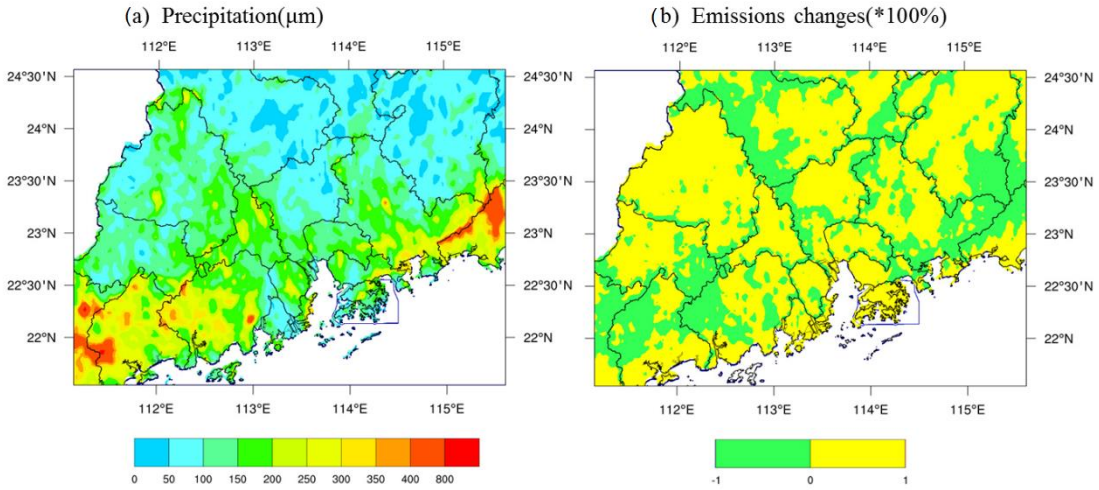

Fig. S2. Monthly precipitation (a) and emission changes (b) of dust PM_{10} in July 2013.

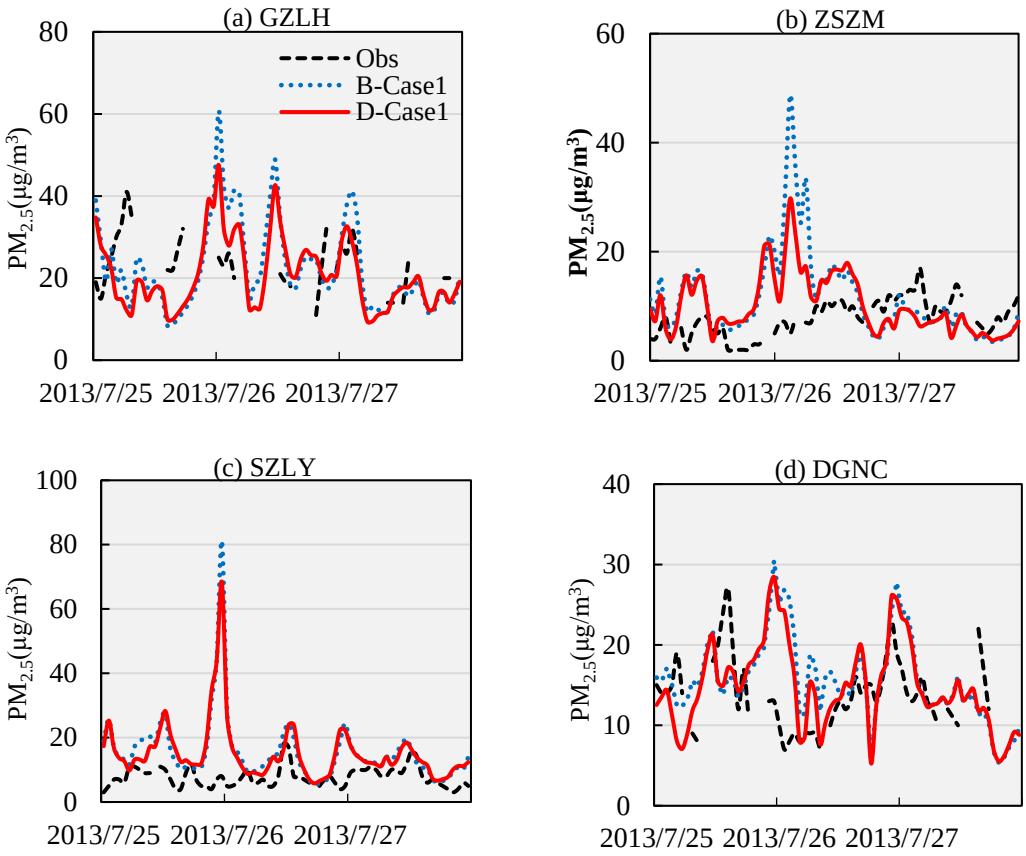

Fig. S3 Time series of simulated and observed $PM_{2.5}$ at GZLH, ZSZM, SZLY and DGNC in July 25 to 27, 2013.

Table S1 Model configurations in WRF and CAMx

WRF v3.3	
Horizontal resolution	27km/9km/3km (one-way nested)
Number of sigma level	26
Longwave Radiation	Rapid Radioactive Transfer Model (RRTM)
Shortwave Radiation	Dudhia scheme
Microphysics	WRF Single-Moment 6-class (WSM6)
Land-surface	Noah
Advection	Global mass-conserving scheme
Planetary boundary layer (PBL) scheme	MRF
Cumulus option	Kain-Fritsch
CAMx v5.4	
Horizontal resolution	27km/9km/3km (one-way nested)
Vertical layer Number	18
Gas-phase chemistry	Carbon Bond 05 (CB05)
Aerosol module	Inorganic aerosol thermodynamics/partitioning (ISORROPIA) Secondary organic aerosol formation/partitioning ((SOAP))
Horizontal/Vertical advection module	Eulerian continuity equation
Horizontal/Vertical diffusion	K-theory 1st order closure

Table S2 Performance statistics for surface temperature, wind speed, wind direction and relative humidity.

Statistic	Temperature (unit ℃)		Wind speed (unit m/s)		Wind direction		Relative humidity	
	GD	PRD	GD	PRD	GD	PRD	GD	PRD
Obs	28.00	27.96	2.27	2.18	152.56	141.28	94.15	96.30
Mod	28.38	28.76	2.45	2.44	158.09	147.83	92.95	93.30
MB	0.37	0.79	0.17	0.26	5.52	6.56	-0.00	-0.00
ME	1.71	1.89	1.09	1.15	59.04	60.53	0.00	0.00
NMB	1.33	2.84	7.66	12.11	-	-	-1.28	-3.12
NME	6.10	6.75	47.98	52.70	-	-	6.14	6.43
RMSE	2.29	2.57	1.41	1.46	-	-	0.00	0.00

Table S3. The overall model performance of CAMx in B-Case1 and D-Case1 (July 25-27, 2013)

	B-Case1		D-Case1	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
NMB (%)	-7.13	16.93	-17.61	11.40
NME (%)	53.33	64.74	55.08	61.47
RMSE ($\mu g/m^3$)	15.66	9.77	14.26	9.12
R	0.22	0.28	0.22	0.29

Table S4. The absolute differences of NMB and NME in B-Case2 and H-Case2 (22-28 January 2012)

Stations	H-Case2 - B-case2					
	NO_2		SO_2		PM_{10}	
	Δ|NMB|	**ΔNME**	**Δ|NMB|**	**ΔNME**	**Δ|NMB|**	**ΔNME**
CHTH	-7.88	2.69	0.00	0.00	-0.99	-0.83
DGNC	-65.06	-51.67	-43.49	-34.97	-20.19	-17.96
FSHJ	-41.67	-29.99	-7.08	1.77	5.91	6.53
GZLH	-76.11	-72.23	-24.50	-22.99	-8.46	-6.92
HZJG	-16.18	-1.18	-2.46	0.74	1.39	0.58
HZXP	-30.39	-4.90	0.00	0.00	0.01	1.06
SDDX	-43.37	-31.51	-9.32	-0.30	-4.69	-2.41
SZLY	-61.01	-46.90	-107.43	-80.33	-41.42	-25.43
ZHTJ	-38.71	-29.67	-16.08	-13.44	-3.32	0.17
ZQCZ	-28.53	0.08	-8.02	2.80	-3.33	-3.03
ZSZM	-25.42	-23.94	0.00	0.00	2.19	1.03

Table S5 The overall model performance of CAMx in B-Case2 and H-Case2 (January 14-31, 2012)

	B-Case2			H-Case2		
	NO_2	SO_2	PM_{10}[a]	NO_2	SO_2	PM_{10}[a]
NMB (%)	48.54	37.79	31.18	35.37	32.90	28.53
NME (%)	75.19	92.30	67.23	66.88	88.47	65.57
RMSE (ppb)	15.67	6.48	40.25	14.14	6.08	39.26

a: $\mu g \cdot m^{-3}$