

## Supporting Information for

# Process Contributions to Secondary Inorganic Aerosols during Typical Pollution Episodes over the Pearl River Delta Region, China

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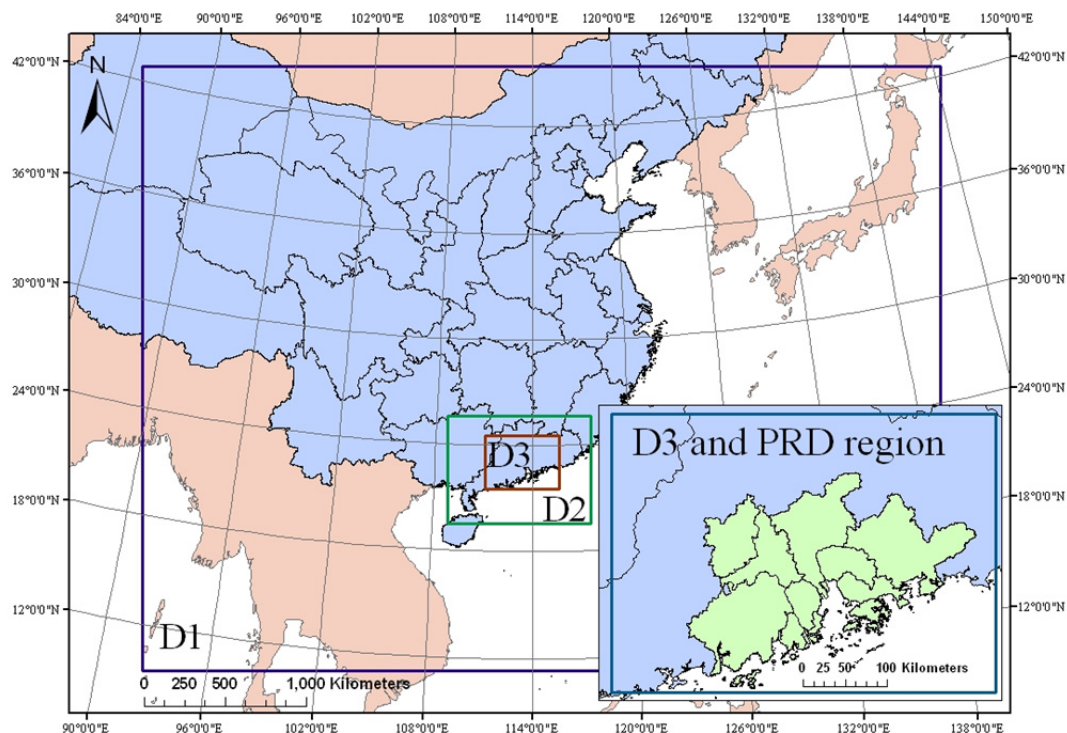
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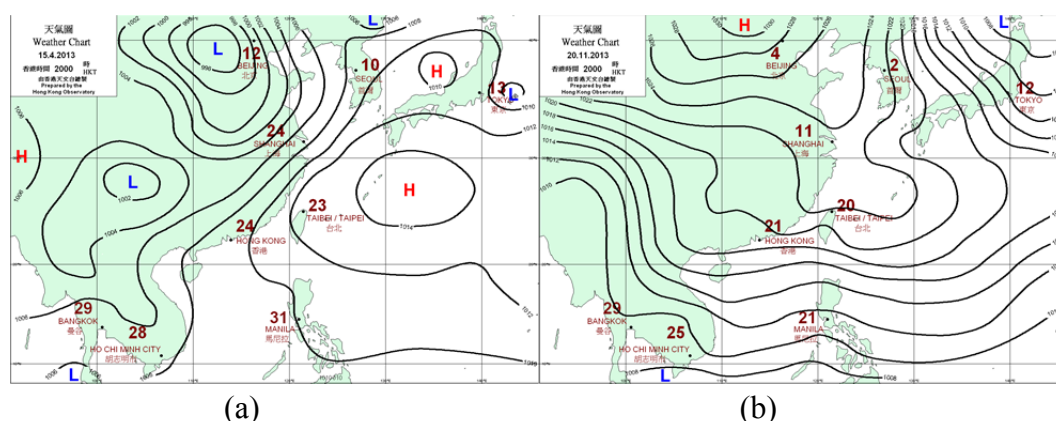
**Fig. S1.** Modeling Domains of CAMx

**Table S1.** Model configurations in WRF and CAMx

<b>WRF v3.2</b>	
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
<b>CAMx v5.4</b>	
Horizontal resolution	27km/9km/3km
Vertical resolution	18 sigma-pressure levels
Gas-phase chemistry	Carbon Bond 05 (CB05)
Vertical diffusion	K-theory
Aerosol chemistry schemes	CF/ISORROPIA
Dry deposition	Zhang scheme
Aqueous chemistry	RADM
Advection solver	PPM

**Table S2.** Environmental background and available data of observation station

Monitoring Stations	Area Type	Sampling Height(Above Ground)	Data type
Luhu Park (Guangzhou)	City	9m	Hourly Concentration (PM2.5, PM10, NO <sub>x</sub> , NO <sub>2</sub> , O <sub>3</sub> and SO <sub>2</sub> ) From PRDRAQM
Tianhu (Guangzhou)	Background : rural	13m	
Liyuan (Shenzhen)	City	12m	
Tangjia(Zhuhai)	commercial and residential	13m	
Jinjuzui(Foshan)	Tourist and cultural	17m	
Huijingcheng (Foshan)	Urban: mixed residential	14m	
Donghu (Jiangmen)	City	5m	
Chengzhong (Zhaoqing)	Urban: mixed residential	16m	
Xiapu (Huizhou)	Urban: commercial	20m	
Jinguowan (Huizhou)	Residential	8m	
Nancheng(Dongguan)	Mixed residential	18m	
Zimaling Park (Zhongshan)	Mixed residential/commercial	7m	
Panyu	Suburban site	10–20 m	
Nansha	Coastline site	About 15m	24-h concentrations (NH <sub>4</sub> <sup>+</sup> ,NO <sub>3</sub> <sup>-</sup> ,SO <sub>4</sub> <sup>2-</sup> ,PM <sub>2.5</sub> )
Nanhai	Urban site	About 15m	
Guangzhou	Urban site	About 65m	
Dongguan	Urban site	About 15m	



**Fig. S2.** Surface weather charts in East Asia at 20:00 on April 15, 2013 (a) and at 20:00 on November 20, 2013 (b)

**Table S3.** Concentrations contributed by processes at the four sites in April and November.

Stations-month	Species	Concentration of Process Contributions						
		EMIS	TDEP	HADV	HDIF	HADV	VDIF	AERO
Guangzhou-04	PM25	73.28±45.09	04.53±02.41	33.71±106.14	00.69±06.99	-42.37±105.08	-86.29±45.24	27.08±12.05
	PNH4	-	00.54±00.27	02.69±10.42	00.17±00.84	-04.38±10.32	-03.28±02.47	05.77±02.65
	PNO3	-	00.93±00.60	03.41±22.12	00.72±02.84	-08.74±21.87	-10.02±07.79	17.00±09.03
	PSO4	-	00.89±00.54	06.06±15.29	00.09±00.60	-06.29±15.02	-01.28±01.24	01.56±00.93
Heshan-04	PM25	10.16±04.75	03.61±02.54	02.36±58.94	00.30±02.77	-04.39±57.07	-07.67±08.15	00.02±08.78
	PNH4	-	00.44±00.33	01.28±07.06	00.13±00.42	-00.93±06.88	00.00±01.74	00.01±02.09
	PNO3	-	00.45±00.47	00.51±09.84	00.43±01.17	00.71±09.05	00.55±05.23	00.96±06.92
	PSO4	-	01.13±00.86	02.79±17.86	00.09±00.53	-02.85±17.57	00.76±01.28	00.49±00.66
Huizhou-04	PM25	13.96±06.90	01.91±01.06	09.27±19.50	01.09±01.90	-10.22±17.65	-14.91±10.53	03.22±13.19
	PNH4	-	00.26±00.13	01.49±02.57	00.13±00.26	-01.33±02.32	00.74±01.95	00.83±02.06
	PNO3	-	00.30±00.21	01.89±04.02	00.39±00.89	-01.42±03.25	00.95±11.19	00.53±12.21
	PSO4	-	00.54±00.38	02.88±05.28	00.02±00.16	-02.82±05.21	00.27±01.09	00.35±00.37
Panyu-04	PM25	16.45±07.47	04.33±02.46	51.98±96.24	01.55±04.43	-50.92±99.32	-17.70±14.11	02.64±10.28
	PNH4	-	00.56±00.32	06.39±11.66	00.24±00.65	-06.26±12.11	00.23±02.15	00.44±02.17
	PNO3	-	00.73±00.56	07.74±15.21	00.72±01.56	-07.24±16.50	00.71±06.99	00.09±07.79
	PSO4	-	01.18±00.75	13.63±26.46	00.11±00.65	-13.88±26.48	00.42±01.29	02.15±02.53
Guangzhou-11	PM25	89.62±55.53	03.89±02.02	44.66±58.06	01.55±03.79	-61.12±55.46	-88.92±52.69	18.15±07.46
	PNH4	-	00.37±00.16	04.87±05.24	00.01±00.24	-06.42±05.46	01.77±01.04	03.71±01.65
	PNO3	-	00.51±00.29	06.48±09.13	00.40±00.72	-10.41±09.29	05.29±03.66	09.96±05.53
	PSO4	-	00.62±00.33	08.41±08.61	00.28±00.32	-09.21±08.49	01.19±00.66	01.33±00.56
Heshan-11	PM25	13.92±06.92	02.71±02.70	26.38±60.84	01.22±03.22	-31.01±58.69	-19.87±08.30	05.88±07.47
	PNH4	-	00.32±00.32	03.59±07.04	00.04±00.34	-03.87±07.16	00.47±01.24	01.12±01.68
	PNO3	-	00.39±00.55	06.11±09.29	00.08±01.03	-06.98±09.10	01.56±03.59	02.90±05.99

Huizhou-11	PSO4	-	00.55±00.56	04.96±13.75	00.06±00.25	-04.89±13.68	00.11±00.99	00.53±00.40
	PM25	16.04±08.60	03.92±01.51	12.64±25.97	00.04±01.18	-05.60±28.04	-20.10±10.98	00.98±06.15
	PNH4	-	00.46±00.16	00.89±03.58	00.07±00.13	-00.71±03.54	00.19±01.28	00.04±01.39
	PNO3	-	00.60±00.39	01.46±06.17	00.21±00.39	-00.87±06.11	00.41±04.12	00.67±05.12
Panyu-11	PSO4	-	00.78±00.35	01.31±05.20	00.02±00.07	-01.25±05.14	00.14±00.27	00.52±00.35
	PM25	19.65±08.96	03.84±01.96	-13.10±36.71	00.34±01.01	15.58±36.31	-23.00±09.78	04.47±05.35
	PNH4	-	00.44±00.21	-01.81±04.39	00.00±00.10	01.92±04.41	00.49±01.18	00.82±01.20
	PNO3	-	00.33±00.32	-02.88±04.66	00.07±00.21	03.08±04.90	01.58±03.69	01.59±04.18
	PSO4	-	00.92±00.51	-02.41±08.87	00.05±00.19	02.75±08.88	00.14±00.65	01.68±01.27

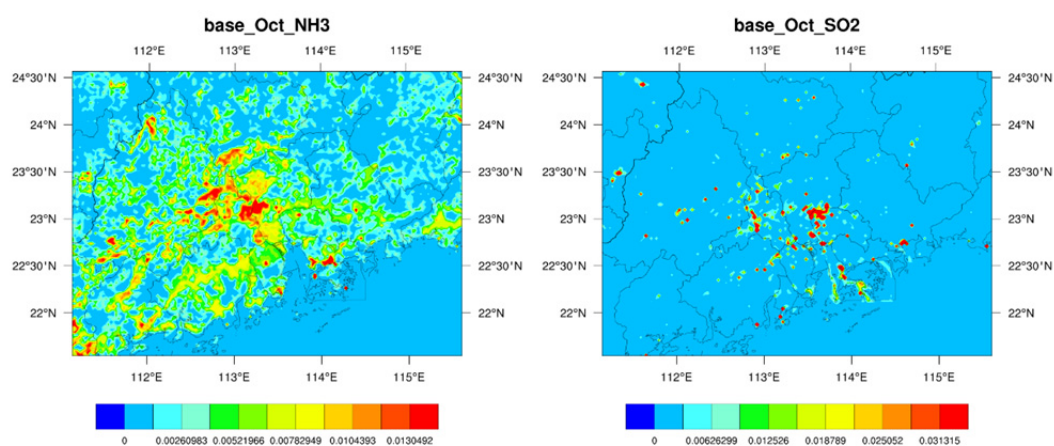
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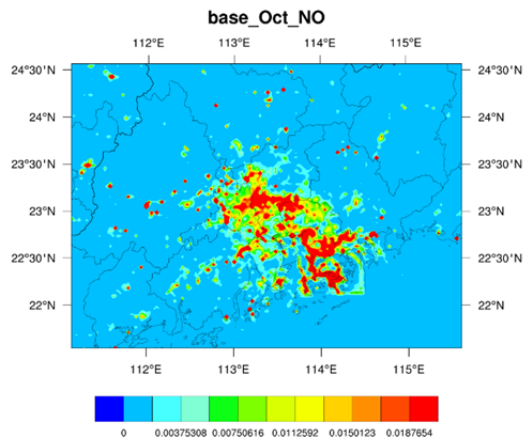
**Table S4.** Correlation coefficients between EMIS/HADV and other processes at different sites.

	Guangzhou		Heshan		Panyu		Huizhou	
	EMIS	HADV	EMIS	HADV	EMIS	HADV	EMIS	HADV
EMIS	<b>1.00</b>	<b>0.19</b>	<b>1.00</b>	-0.14	<b>1.00</b>	0.17	<b>1.00</b>	0.05
TDEP	<b>-0.78</b>	-0.13	<b>-0.41</b>	0.05	<b>-0.74</b>	<b>-0.24</b>	<b>-0.63</b>	0.00
HADV	<b>0.19</b>	<b>1.00</b>	-0.14	<b>1.00</b>	0.17	<b>1.00</b>	0.05	<b>1.00</b>
HDIF	-0.04	<b>-0.63</b>	-0.05	<b>-0.42</b>	<b>0.28</b>	-0.08	<b>0.30</b>	0.00
VADV	<b>-0.20</b>	<b>-0.98</b>	0.12	<b>-0.99</b>	-0.16	<b>-0.99</b>	0.08	<b>-0.95</b>
VDIF	<b>-0.95</b>	-0.11	<b>-0.69</b>	0.07	<b>-0.66</b>	0.01	<b>-0.43</b>	0.10
AERO	-0.10	-0.05	-0.17	<b>0.17</b>	-0.14	0.01	<b>-0.54</b>	0.00

**Table S5.** Correlation coefficients between processes and the net change of SIA concentrations

	Guangzhou		Heshan		Panyu		Huizhou	
	P	N	P	N	P	N	P	N
EMIS	0.08	-0.08	0.08	0.08	0.12	-0.17	-0.02	0.09
TDEP	<b>-0.23</b>	<b>0.39</b>	0.03	<b>0.29</b>	0.14	<b>0.34</b>	0.06	-0.1
TADV	<b>0.32</b>	<b>0.41</b>	<b>0.48</b>	0.18	<b>0.31</b>	<b>0.34</b>	<b>0.68</b>	<b>0.53</b>
HADV	0.05	<b>0.38</b>	-0.09	0.17	0.19	-0.03	<b>0.35</b>	0
VADV	-0.01	<b>-0.33</b>	0.15	-0.15	-0.17	0.05	<b>-0.24</b>	0.05
HDIF	0.06	-0.1	-0.1	-0.08	0.09	<b>-0.56</b>	0.11	0.19
VDIF	-0.19	<b>0.59</b>	-0.09	0.23	-0.15	<b>0.37</b>	-0.14	<b>0.3</b>
AERO	<b>0.44</b>	-0.32	<b>0.52</b>	<b>0.3</b>	<b>0.51</b>	-0.01	<b>0.3</b>	0.03





**Fig. S3.** Spatial distribution of emissions of NH<sub>3</sub>, SO<sub>2</sub> and NO<sub>x</sub> in the PRD region.