



*Supplement of*

## **Patterns in atmospheric carbonaceous aerosols in China: emission estimates and observed concentrations**

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**Table S1. Annual average OC and EC levels in PM<sub>2.5</sub> (µg m<sup>-3</sup>) and OC/EC ratios by category of measurement site.**

Location <sup>a</sup>	Period	OC	EC	OC/EC	Analytic methods (instrument)	Reference
<b>Urban</b>						
Xian	Jan 2003, Jun-Jul 2003	64.8	14.3	4.4	IMPROVE_TOR <sup>b</sup> (DRI 2001)	Cao et al. (2007)
	Dec 2007, Jun 2008	32.6	13.0	2.6	IMPROVE_TOR (DRI 2001)	Zhu et al. (2014)
Shijiazhuang	Apr 2009-Feb 2010	26.4	9.7	2.7	IMPROVE_TOR (DRI 2001)	P. Zhao et al. (2013)
Changchun	Jan 2003, Jun-Jul 2003	25.9	8.2	3.2	IMPROVE_TOR (DRI 2001)	Cao et al. (2007)
Jinan	Mar 2006-Feb 2007	22.2	4.1	5.4	NIOSH_TOT <sup>c</sup>	Yang et al. (2012)
Beijing	Jun-Jul 2002, Dec 2002	23.7	10.5	2.9	(C/H/N elemental analyzer)	Dan et al. (2004)
	Jun, Dec 2002	21.4	5.7	3.8	NIOSH_TOT (Sunset)	Feng et al. (2006b)
	Jan-Dec 2005	20.1	7.1	2.8	Not specified	Wang et al. (2011)
	Nov 2005-Oct 2006	15	5.8	2.6	NIOSH_TOT (Sunset)	Lin et al. (2009)
	2005-2008	22.1	9	2.4	EnCan Total 900c (Sunset)	Yang et al. (2011)
	Apr 2009-Feb 2010	10.7	3.9	2.8	IMPROVE_TOR (DRI 2001)	P. Zhao et al. (2013)
Chengde	Apr 2009-Feb 2010	19.0	7.3	2.6	IMPROVE_TOR (DRI 2001)	P. Zhao et al. (2013)
Tianjin	Jan 2003, Jun-Jul 2003	27.7	6.1	4.7	IMPROVE_TOR (DRI 2001)	Cao et al. (2007)
	Aug-Dec 2006	23.9	5.5	4.2	IMPROVE_TOR (DRI 2001)	Dong et al. (2013)
	Jan, Apr, Jul 2007	23.2	5.2	4.5	IMPROVE_TOR (DRI 2001)	Li et al. (2009)
	Jan, Apr, Jul, Oct 2008	16.9	5.7	2.9	IMPROVE_TOR (DRI 2001)	Gu et al. (2010)
	Apr 2009-Feb 2010	18.8	6.9	2.7	IMPROVE_TOR (DRI 2001)	P. Zhao et al. (2013)
Qingdao	Jan 2003, Jun-Jul 2003	15.8	3.9	3.9	IMPROVE_TOR (DRI 2001)	Cao et al. (2007)
	Average for northern cities	24.8	7.5	3.5		
Chongqing	Jan 2003, Jun-Jul 2003	50.9	12.3	4.0	IMPROVE_TOR (DRI 2001)	Cao et al. (2007)
	May 2012-Apr 2013	15.2	4.0	3.8	NIOSH_TOT (Sunset)	Chen et al. (2014)
Wuhan	Jan 2003, Jun-Jul 2003	26.2	5.7	4.7	IMPROVE_TOR (DRI 2001)	Cao et al. (2007)
	Jul 2011-Feb 2012	19.4	2.9	6.7	NIOSH_TOT (Sunset)	Cheng et al. (2012)
Chengdu	May 2012-Apr 2013	19	4.6	4.3	NIOSH_TOT (Sunset)	Chen et al. (2014)
Hangzhou	Jan 2003, Jun-Jul 2003	23.9	6.5	3.7	IMPROVE_TOR (DRI 2001)	Cao et al. (2007)
Nanjing	Jun 2007-May 2008	15.7	10.4	2.4	IMPROVE_TOR (DRI 2001)	Chen et al. (2010)
Guangzhou	Jan-Feb 2002, Jun-Jul 2002	15.5	5.3	2.9	IMPROVE_TOR (DRI 2001)	Cao et al. (2003)
	Dec 2002, Jul 2003	18.4	6.4	2.9	NIOSH_TOT (Sunset)	Feng et al. (2006b)
	Oct-Dec 2002, Mar-Jun 2003	17.6	4.4	4.1	IMPROVE_TOR (DRI 2001)	Zheng et al. (2011)
	Jan 2003, Jun-Jul 2003	25.9	8.9	3.2	IMPROVE_TOR (DRI 2001)	Cao et al. (2007)
	Aug-Sep 2004, Feb-Mar 2005	20.7	4.8	4.3	NIOSH_TOT (Sunset)	Duan et al. (2007)
	Aug 2006-Aug 2007	7.1	4.0	2.0	IMPROVE_TOR (DRI 2001)	Huang et al. (2011)
Xiamen	Jan 2003, Jun-Jul 2003	10.7	3.2	3.4	IMPROVE_TOR (DRI 2001)	Cao et al. (2007)
	Apr 2009-Jan 2010	19.3	3.3	5.8	NIOSH_TOT (Sunset)	Zhang et al. (2011)
Shanghai	Nov 2002, Aug 2003	9.9	2.9	3.1	NIOSH_TOT (Sunset)	Feng et al. (2006a)
	Oct 2005, Jan, Apr, Jul 2006	14.7	2.8	5.0	NIOSH_TOT (Sunset)	Feng et al. (2009)
	Apr 2006-Jan 2007	7.4	2.8	2.8	IMPROVE_TOR (DRI 2001)	Hou et al. (2011)
	Dec 2007-Dec 2008	8.4	4.0	2.1	IMPROVE_TOR (DRI 2001)	Wang et al. (2010)
	Jan 2010-Jan 2011	10.5	2.6	4.0	IMPROVE_TOR (DRI 2001)	Feng et al. (2013)
Shenzhen	Jan-Feb 2001, Jun-Jul 2002	10.4	5.2	2.0	IMPROVE_TOR (DRI 2001)	Cao et al. (2003)
	Oct-Dec 2002, Mar-Jun 2003	10.7	3.9	2.8	IMPROVE_TOR (DRI 2001)	Zheng et al. (2011)

**Table S1. Annual average OC and EC levels in PM<sub>2.5</sub> (µg m<sup>-3</sup>) and OC/EC ratios by category of measurement site (continued).**

Location <sup>a</sup>	Period	OC	EC	OC/EC	Analytic methods (instrument)	Reference
Zhuhai	Jan-Feb 2001, Jun-Jul 2002	8.8	3.5	2.6	IMPROVE_TOR (DRI 2001)	Cao et al. (2003)
Fuzhou	Apr 2007-Jan 2008	8.5	2.2	3.9	IMPROVE_TOR (DRI 2001)	Xu et al. (2012)
Average for southern cities		16.8	5.1	3.6		
<b>Suburban</b>						
Beijing	Jun, Dec 2002	25.6	5.6	4.6	NIOSH_TOT (Sunset)	Feng et al. (2006b)
	Jan 2003, Jun-Jul 2003	22.2	5.9	4.1	IMPROVE_TOR (DRI 2001)	Cao et al. (2007)
	Mar-Dec 2006	29	6.4	4.5	IMPROVE_TOR (DRI 2001)	Li et al. (2013)
Guangzhou	Dec 2002, Jul 2003	22.6	6.5	3.5	NIOSH_TOT (Sunset)	Feng et al. (2006b)
	Aug 2006-Aug 2007	8.2	3.8	2.2	IMPROVE_TOR (DRI 2001)	Huang et al. (2011)
Shanghai	Nov 2002, Aug 2003	10.7	2.8	3.5	NIOSH_TOT (Sunset)	Feng et al. (2006a)
	Oct 2005, Jan, Apr, Jul 2006	17.5	3.0	5.6	NIOSH_TOT (Sunset)	Feng et al. (2009)
	Jan 2010-Jan 2011	11.4	2.8	4.1	IMPROVE_TOR (DRI 2001)	Feng et al. (2013)
Xiamen	Apr 2009-Jan 2010	15.8	2.7	5.8	NIOSH_TOT (Sunset)	Zhang et al. (2011)
	Jun 2009-May 2010	15.2	2.9	5.2	NIOSH_TOT (Sunset)	Zhang et al. (2012)
<b>Rural</b>						
Jinan	Mar 2006-Feb 2007	20.2	4.3	4.7	NIOSH_TOT	Yang et al. (2012)
Jinchang <sup>d</sup>	Jan 2003, Jun-Jul 2003	15.5	3.3	4.7	IMPROVE_TOR (DRI 2001)	Cao et al. (2007)
Beijing	Jan-Dec 2005	14.9	3.2	4.6	Not specified	Wang et al. (2011)
	2005-2008	12.3	4.0	3.1	EnCan Total 900c (Sunset)	Yang et al. (2011)
Daihai	Aug 2005-May 2007	11.8	1.9	6.6	IMPROVE_TOR (DRI 2001)	Han et al. (2008)
Changdao	March 2003-January 2004	8.4	1.8	4.8	NIOSH_TOT (Sunset)	Feng et al. (2007)
Guangzhou	Oct, Dec 2002, Mar, Jun 2003	9.2	1.4	6.5	IMPROVE_TOR (DRI 2001)	Zheng et al. (2011)
Hong Kong	Oct, Dec 2002, Mar, Jun 2003	4.9	0.82	6.1	IMPROVE_TOR (DRI 2001)	Zheng et al. (2011)
<b>Remote</b>						
Jinsha	Mar 2012-Mar 2013	7.5	0.7	11.5	NIOSH_TOT (Sunset)	Zhang et al. (2014)
Akdala	Jul 2004-Mar 2005	2.8 <sup>e</sup>	0.36 <sup>e</sup>	12.2	IMPROVE_TOR (DRI 2001)	Qu et al. (2009)
Zhuzhang	Jul 2004-Mar 2005	3.1 <sup>e</sup>	0.34 <sup>e</sup>	11.9	IMPROVE_TOR (DRI 2001)	Qu et al. (2009)
Muztagh Ata	Dec 2003-Feb 2006	0.5 <sup>f</sup>	0.06 <sup>f</sup>	10.0	IMPROVE_TOR (DRI 2001)	Cao et al. (2009)

<sup>a</sup> Geographical locations of these observation sites are shown in Figure S1.

<sup>b</sup> IMPROVE (Interagency Monitoring of Protected Visual Environments) thermal/optical reflectance (TOR) protocol.

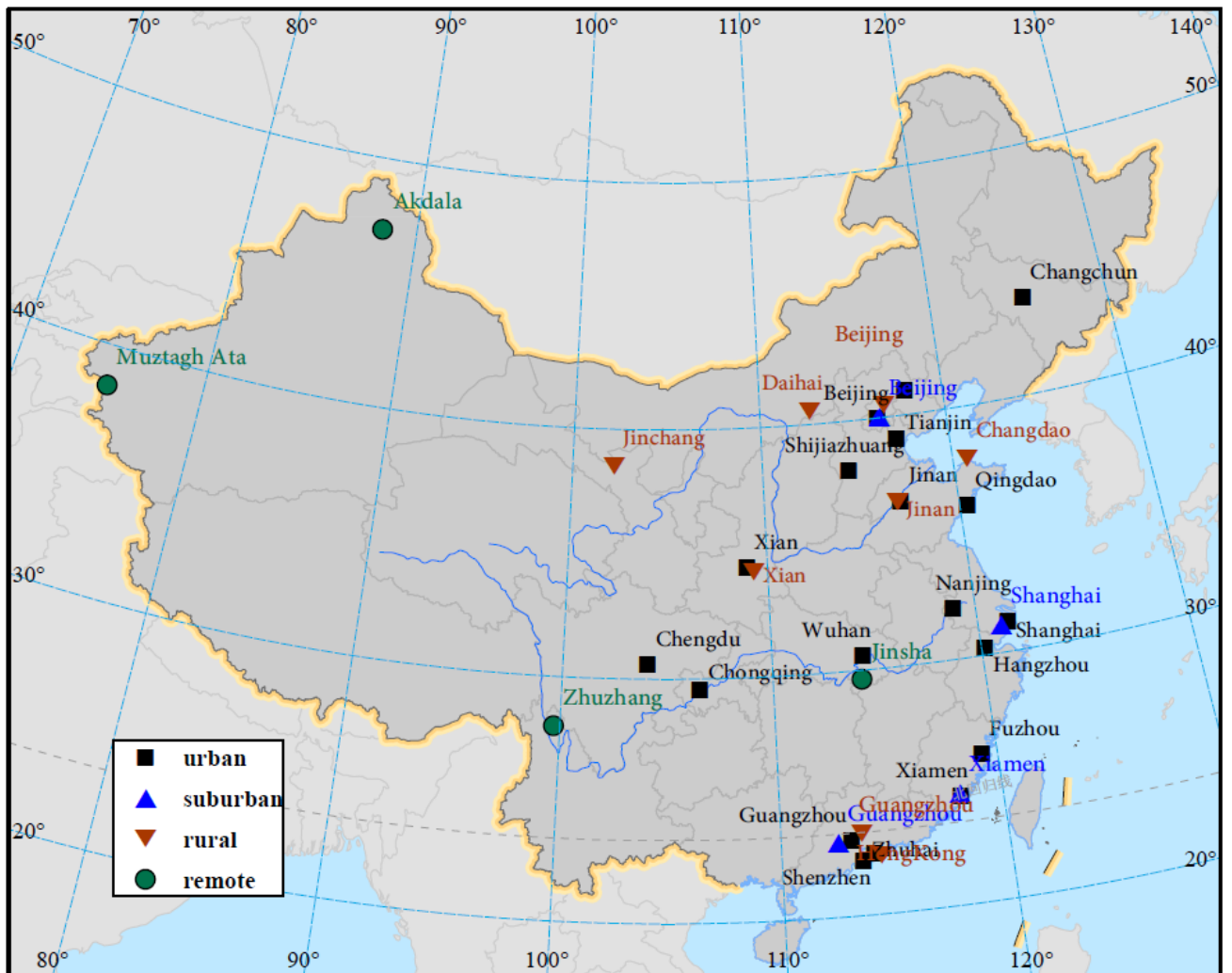
<sup>c</sup> NIOSH (National Institute of Occupational Safety and Health) thermal/optical transmission (TOT) protocol.

<sup>d</sup> Jinchang site is in a desert region with little local industry and has little population according to Cao et al. (2007). We categorize it as a rural site for this study.

<sup>e</sup> Refer to that measured in PM<sub>10</sub>.

<sup>f</sup> Refer to that measured in TSP.

Figure S1.



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