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*Supplement of*

**Sources of humic-like substances in the Pearl River Delta, China:  
positive matrix factorization analysis of PM<sub>2.5</sub> major  
components and source markers**

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**Fig. S1.** Relationship between levoglucosan and mannosan, galactosan

**Fig. S2.** IM (maximum Individual column Mean) values of different factor numbers

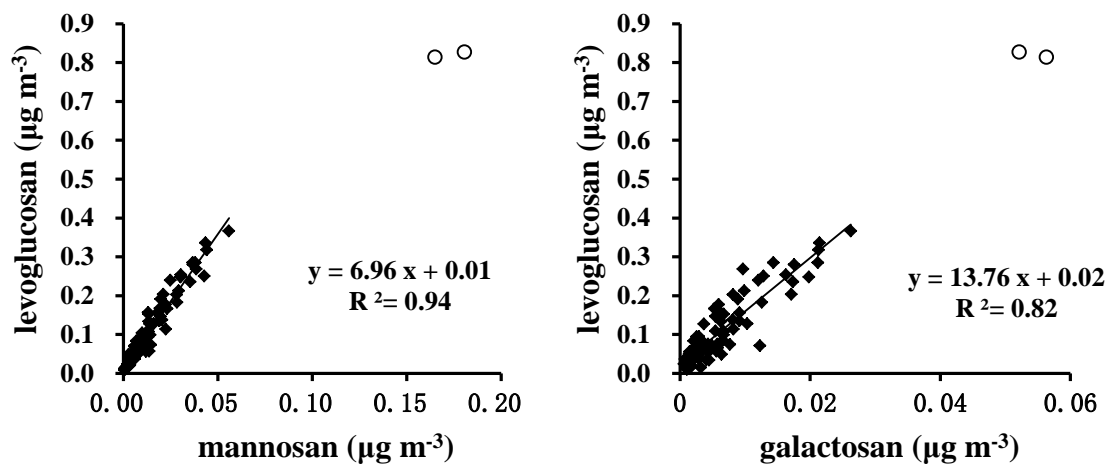
**Fig. S3.** Back trajectories of all sampling days in 2009. The type of air mass origins for individual sampling dates are given in Table S1.

**Fig. S4** Correlation of water-insoluble OC (WISOC) with EC for the GZ and NS samples

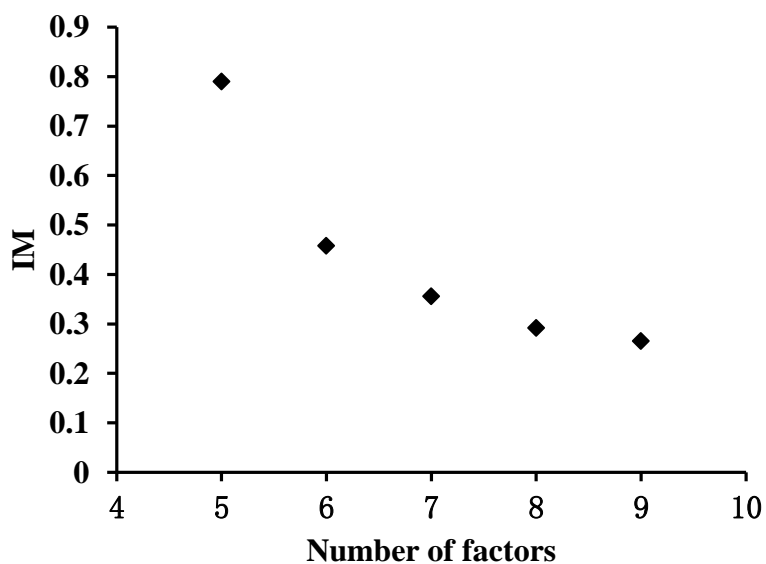
**Table S1.** Concentrations of PM<sub>2.5</sub>, WSOC and HULIS concentrations and influencing air mass origin on individual sampling days

**Table S2.** Coefficient of correlation ( $R^2$ ) between HULIS, WSOC\_h and all the species

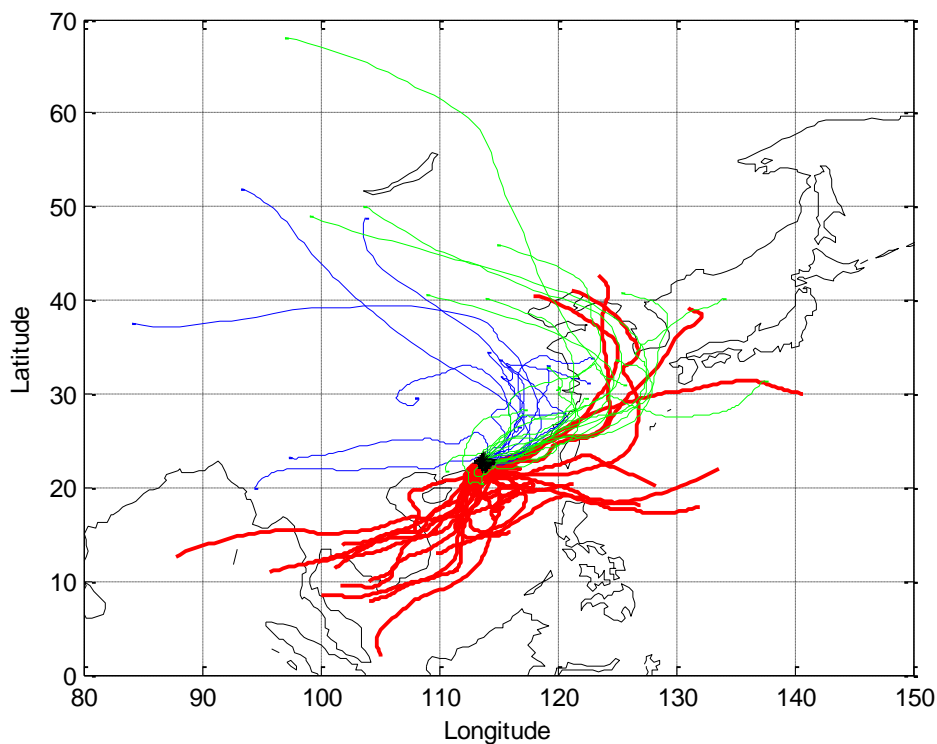
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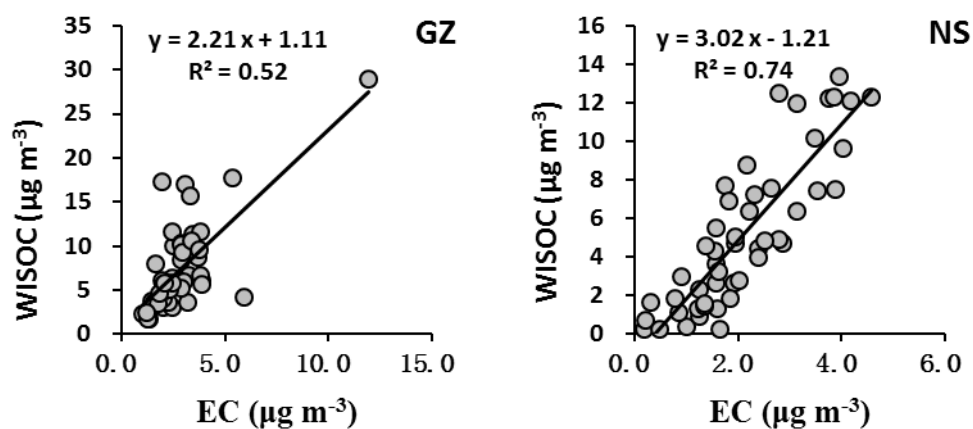
**Fig. S1** Relationship between levoglucosan and mannosan, galactosan.  
 The open circles represent the points which were not input into PMF (GZ Jan 26, NS Jan 26, because of extremely high levoglucosan)



**Fig. S2** IM (maximum Individual column Mean) values of different factor numbers



**Fig. S3** Back trajectories of all sampling days in 2009, with lines in red, green, and blue representing air mass back trajectories of marine, transitional, and continental origins, respectively.



**Fig. S4** Correlation of water-insoluble OC (WISOC) with EC for the GZ and NS samples

**Table S1.** Concentrations of PM<sub>2.5</sub>, WSOC and HULIS concentrations and influencing air mass origin on individual sampling days

	BT <sup>1</sup>	Guangzhou			Nansha		
		PM <sub>2.5</sub> µg/m <sup>3</sup>	WSOC µgC/m <sup>3</sup>	HULIS µg/m <sup>3</sup>	PM <sub>2.5</sub> µg/m <sup>3</sup>	WSOC µgC/m <sup>3</sup>	HULIS µg/m <sup>3</sup>
2-Jan-09	C	52.3	6.16	7.47	70.0	6.53	12.21
20-Jan-09	T	103.7	10.21	13.61	94.1	8.95	11.16
26-Jan-09		46.6	5.93	4.78	67.5	6.85	9.97
1-Feb-09	T	72.5	6.97	8.52	50.0	4.49	5.64
7-Feb-09	C	126.3	9.92	10.28	81.4	7.40	9.46
13-Feb-09	M				15.9	0.99	0.62
19-Feb-09	M	66.6	3.52	2.15	30.3	2.40	2.77
25-Feb-09	M	33.3	1.73	1.61	24.0	1.39	0.78
3-Mar-09	T	32.3	3.30	2.94	57.4	4.66	4.55
9-Mar-09	C	37.7	2.93	3.15	39.8	3.11	3.76
15-Mar-09	C	70.6	5.99	5.41	53.5	5.91	6.35
27-Mar-09	T	90.8	4.28	4.40	103.0	3.78	4.93
2-Apr-09	T	92.4	5.73	6.55	69.3	4.41	6.14
15-Apr-09	M	79.3	3.41	2.39	42.7	2.72	3.16
26-Apr-09	C	110.3	4.77	3.98	66.0	3.03	3.67
8-May-09	M	40.9	3.37	2.53	35.4	2.81	3.24
20-May-09	M	19.2	1.51	0.70	3.8	1.20	1.11
26-May-09	M	45.9	3.21	2.04	23.6	4.78	2.11
1-Jun-09	T	74.6	8.84	8.40	52.9	6.06	8.20
7-Jun-09	T	48.9	2.90	1.63	35.5	2.22	1.97
13-Jun-09	M	57.8	3.94	3.30	15.2	1.78	1.55
19-Jun-09	M	46.4	4.30	4.05	27.7	1.79	1.74
25-Jun-09	M	29.5	1.95	1.47	11.1	1.20	0.60
1-Jul-09	M	18.7	2.46	1.88	9.6	1.17	0.59
7-Jul-09	M	26.9	3.57	3.85	18.7	2.08	2.21
13-Jul-09	M	52.4	5.60	4.60	18.8	2.04	1.94
19-Jul-09	M	13.6	1.80	1.03	10.7	1.17	0.97
25-Jul-09	M	22.8	2.61	2.62			
31-Jul-09	M	20.8	2.58	2.61	11.1	1.20	0.64
6-Aug-09	M	23.5	1.97	0.97	26.5	1.51	1.42
12-Aug-09	M	35.0	2.35	2.42	13.9	1.26	0.82
14-Aug-09	M				10.3	1.18	0.71
18-Aug-09	M	32.4	3.33	3.37	20.7	1.59	1.62
24-Aug-09	C	47.1	5.60	4.47	64.1	7.12	8.68
30-Aug-09	M	85.3	5.78	5.67	68.6	5.83	7.58
5-Sep-09	M	38.3	5.48	6.96	22.1	2.78	3.35
11-Sep-09	M	37.1	3.27	3.49	36.6	2.44	2.89
17-Sep-09	M	44.2	4.14	3.14	23.9	2.26	2.03
23-Sep-09	C	37.5	3.70	3.45	48.6	4.55	6.04
29-Sep-09	T	46.6	4.64	3.43	39.3	3.78	4.42
5-Oct-09	T	44.6	5.20	4.37	59.8	6.43	8.32
11-Oct-09	T	46.1	6.48	5.05	61.3	7.10	9.27
17-Oct-09	C	77.3	8.40	7.59	69.9	8.14	11.19
23-Oct-09	T	76.8	8.92	8.15	95.3	10.43	14.47
29-Oct-09	T	104.2	9.23	10.95			
4-Nov-09	T	60.7	7.27	7.23	69.2	7.33	9.93
10-Nov-09	M	45.7	4.17	2.84			
16-Nov-09	T	8.5	0.96	0.12			
28-Nov-09	T	131.9	10.71	14.38	47.6	4.62	6.32
4-Dec-09	C	73.8	7.58	10.80	87.9	8.69	10.19
10-Dec-09	C	75.7	5.92	7.69	71.3	4.16	4.63
16-Dec-09	T	21.4	2.38	1.50	26.4	2.38	2.49
22-Dec-09	C	102.8	9.02	11.19	81.9	6.41	6.89
28-Dec-09	C	48.2	3.60	3.99	52.4	3.75	5.28

<sup>1</sup> M=marine; T=transitional; C=continental

**Table S2.** Coefficient of correlation ( $R^2$ ) between HULIS, WSOC\_h and all the species

	GZ, HULIS N=51	NS, HULIS N=49	GZ, WSOC_h N=51	NS, WSOC_h N=49
WSOC_h	0.41	0.39	1.00	1.00
WISOC	<b>0.64</b>	<b>0.59</b>	0.20	0.25
EC	0.39	0.51	0.12	0.31
levoglucosan	<b>0.53</b>	<b>0.53</b>	0.23	0.24
mannosan	<b>0.47</b>	<b>0.42</b>	0.16	0.14
galactosan	<b>0.48</b>	<b>0.42</b>	0.18	0.22
norhopane	0.38	0.19	0.08	0.11
hopane	0.31	0.20	0.05	0.09
NH4+	<b>0.55</b>	<b>0.60</b>	<b>0.44</b>	<b>0.40</b>
NO3-	<b>0.47</b>	<b>0.42</b>	0.26	0.25
SO4=	<b>0.49</b>	<b>0.63</b>	<b>0.56</b>	0.35
C2O4=	<b>0.53</b>	<b>0.33</b>	<b>0.43</b>	<b>0.40</b>
Na+	0.11	0.20	0.07	0.19
Mg2+	0.01	0.07	0.05	0.06
Cl-	0.23	0.12	0.03	0.10
Al	0.02	0.22	0.05	0.10
Si	0.01	0.14	0.03	0.07
K	0.52	0.70	0.40	0.34
Ca	0.02	0.28	0.05	0.16
Ti	0.01	0.19	0.03	0.10
V	0.04	0.01	0.07	0.06
Mn	0.18	0.37	0.12	0.18
Fe	0.04	0.26	0.06	0.11
Ni	0.07	0.11	0.06	0.11
Zn	<b>0.40</b>	<b>0.52</b>	0.23	0.22
Pb	<b>0.43</b>	<b>0.58</b>	0.28	0.25

**Table S3.** Average factor contributions to major PM<sub>2.5</sub> components for the 6-factor solution ( $\mu\text{g m}^{-3}$ )

Factors	GZ site						NS site					
	WSOC_h	EC	OC	sulfate	nitrate	NH <sub>4</sub> <sup>+</sup>	WSOC_h	EC	OC	sulfate	nitrate	NH <sub>4</sub> <sup>+</sup>
F1: Dust	0.08	0.09	0.15	0.78	0	0.10	0.06	0.07	0.11	0.59	0	0.08
F2: Cl <sup>-</sup> and NO <sub>3</sub> <sup>-</sup> dominated factor	0	0.05	2.34	1.48	<b>5.32</b>	<b>2.66</b>	0	0.03	1.57	0.99	<b>3.58</b>	<b>1.79</b>
F3: ship emissions and sea salt aerosols	0.32	<b>0.53</b>	1.29	2.30	0.31	0.79	<b>0.54</b>	<b>0.91</b>	2.23	3.97	0.54	1.36
F4: Secondary process	<b>0.54</b>	0.28	3.17	<b>7.67</b>	0.64	<b>2.90</b>	<b>0.44</b>	0.22	2.57	<b>6.21</b>	0.52	<b>2.35</b>
F5: Biomass burning	<b>0.43</b>	<b>0.64</b>	2.71	0	0.04	0	<b>0.33</b>	<b>0.49</b>	2.06	0	0.03	0
F6: Vehicular emissions	<b>0.82</b>	<b>1.29</b>	2.39	0.36	0.06	0	0.19	<b>0.30</b>	0.56	0.09	0.01	0
Subtotal	2.19	2.88	12.05	12.60	6.37	6.46	1.56	2.03	9.10	11.85	4.68	5.58
Observed conc.	2.31	2.89	12.22	13.39	6.71	6.81	1.46	2.12	9.13	12.15	4.85	5.55