Supplement of Atmos. Chem. Phys., 16, 8309–8329, 2016
http://www.atmos-chem-phys.net/16/8309/2016/
doi:10.5194/acp-16-8309-2016-supplement

Atmospheric Chemistry and Physics
Open Access

Supplement of

Primary and secondary aerosols in Beijing in winter: sources, variations and processes

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Table S1. A summary of non-refractory submicron aerosol composition and OA factors from AMS measurements in Beijing China.

Site	**[1]CAMS**	**[2]PEK**	**[3]PEK**	**[4]PEK**	**[5]IAP**	**[6]IAP**	**[6]IAP**	**[7]IAP**	**[8]IAP**	**[9]IAP**	**[10]IAP**
AMS	Q-AMS	HR-AMS	HR-AMS	ACSM	ACSM	HR-AMS	HR-AMS	HR-AMS	HR-AMS	HR-AMS	HR-AMS
Season	Summer	Summer/Autumn	Winter	Summer	Winter	Summer	Fall	Winter	Winter	Winter	Fall
Date	9 - 21 Jul, 2006	24 Jul - 20 Sep, 2008	22 Nov - 22 Dec, 2010	26 Jun - 28 Aug, 2011	21 Nov - 20 Jan, 2012	1 - 31 Aug, 2012	1- 31 Oct, 2012	1 - 31 Jan, 2013	16 Dec, 2013- 17 Jan, 2014	1 Jan - 3 Feb, 2014	14 Oct - 12 Nov, 2014
Index	S, 2006	S-F, 2008	W, 2010	S, 2011	W, 2011-2012	S, 2012	F, 2012	W, 2013	W, 2013-2014	W, 2014	F, 2014
Organics	28.1	23.9	34.5	20.0	34.4			49.1	38.1	27.3	29.4
Sulfate	20.3	16.8	8.7	9.0	9.3			19.6	9.4	8.6	9.1
Nitrate	17.3	10.0	6.8	12.4	10.9			12.5	7.2	8.1	17.8
Ammonium	13.1	10.0	7.7	8.0	8.6			8.9	5.4	4.5	7.8
Chloride	1.1	0.6	5.8	0.5	3.5			3.6	4.0	2.0	2.9
NR-PM_1	80	61	64	50	67			94	64	51	67
HOA	11.5	4.3	4.7	7.1	5.8	2.9	3.0	5.4	3.9	4.4	3.4
COA		5.8	6.7		6.6	3.0	7.8	9.8	6.7	3.8	7.5
CCOA			8.2		11.3			9.3	7.6	4.6	
BBOA			4.1						3.3		4.1
OOA				12.7	10.7	7.2					
SV-OOA	4.3	5.7	4.3				6.3	12.8	12.1	9.8	7.0
LV-OOA	12.3	8.1	6.2				10.2	13.8	4.4	4.1	7.9
OA	28	24	35	20	34	13	27	51	38	27	30

Sampling sites: Chinese Academy of Meteorological Sciences (CAMS); Peking University (PEK); Institute of Atmospheric Physics (IAP).

References: [1](Sun et al., 2010); [2](Huang et al., 2010); [3](Hu et al., 2016); [4](Sun et al., 2012); [5](Sun et al., 2013); [6](Zhang et al., 2015a); [7](Zhang et al., 2014); [8]This study; [9](Zhang et al., 2015b); [10](Xu et al., 2015).

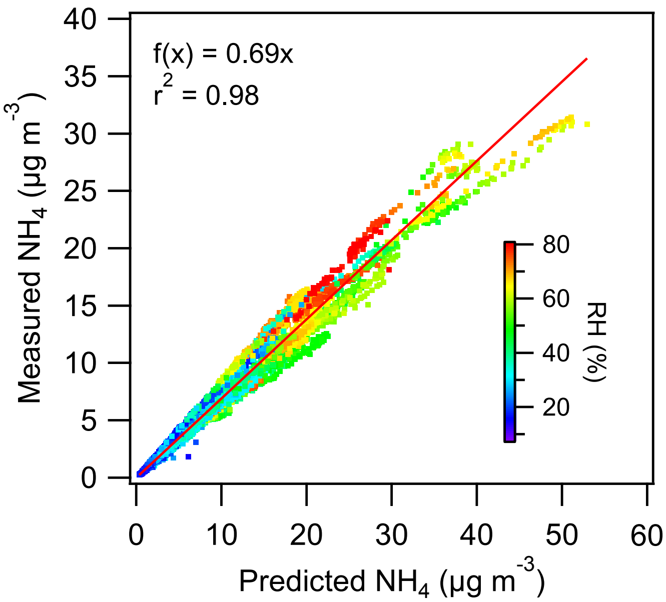

Figure S1. Correlation between measured NH_4^+ and predicted NH_4^+ (=18× (2×SO_4^{2-}/96 + NO_3^-/62 + Chl/35.5)).

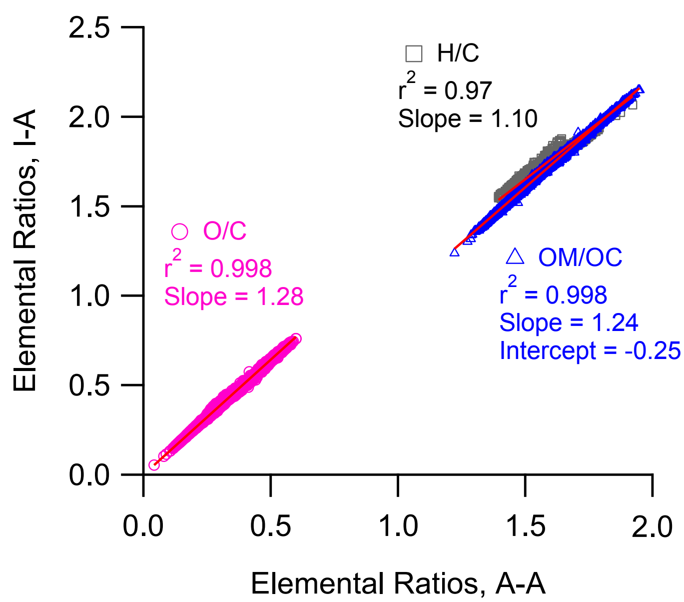

Figure S2. Comparison of the elemental ratios calculated from the A-A method (Aiken et al., 2008) with those from the recently updated I-A method (Canagaratna et al., 2015).

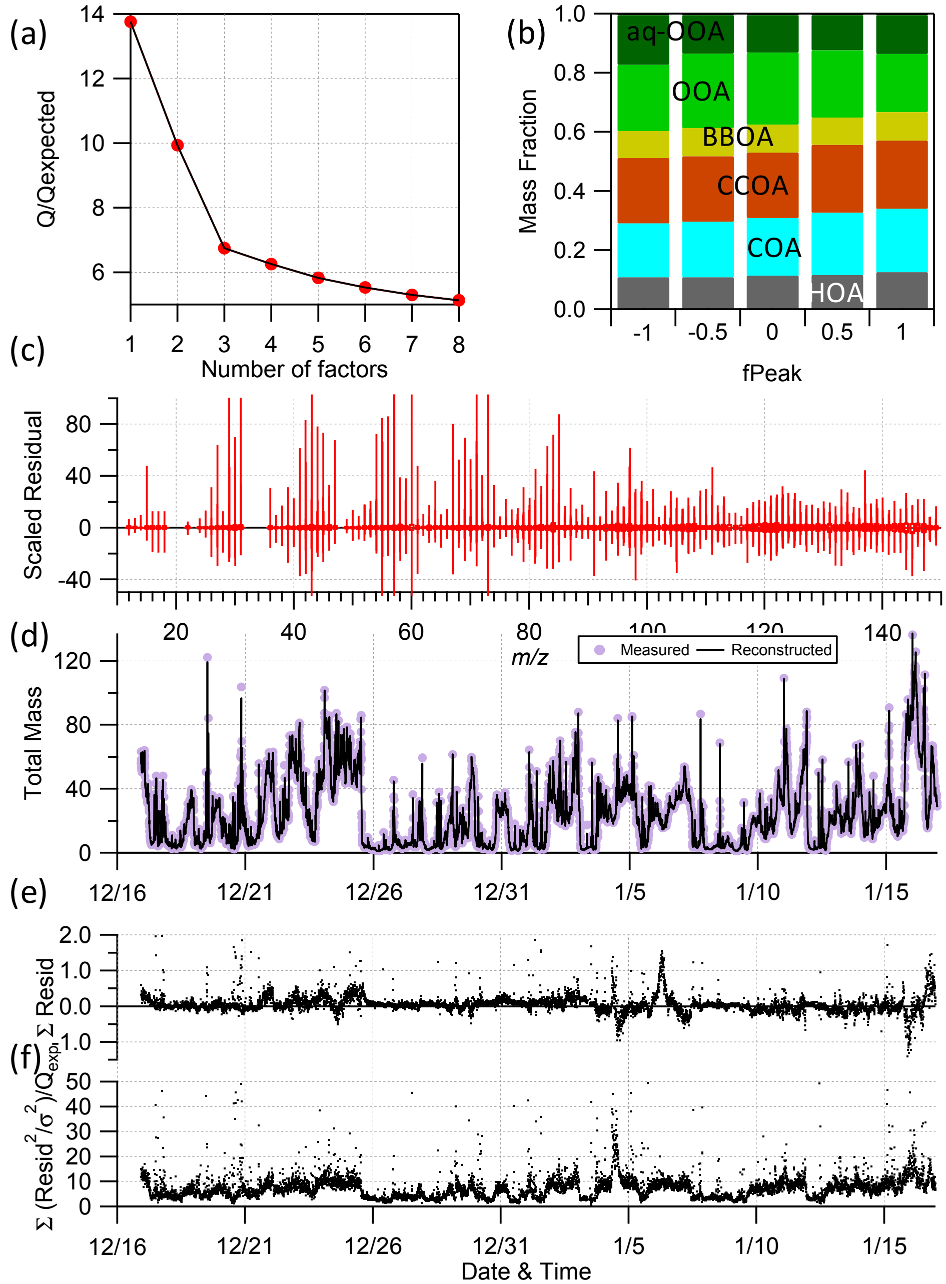

Figure S3. A summary of PMF diagnostic plot: (a) Q/Q_{exp} as a function of number of factors, (b) mass fractions of OA factors as a function of fpeak, (c) scaled residual for each fragment ion, (d) a comparison of measured and PMF reconstructed mass, (e) time series of residual, and (f) time series of Q/Q_{exp}.

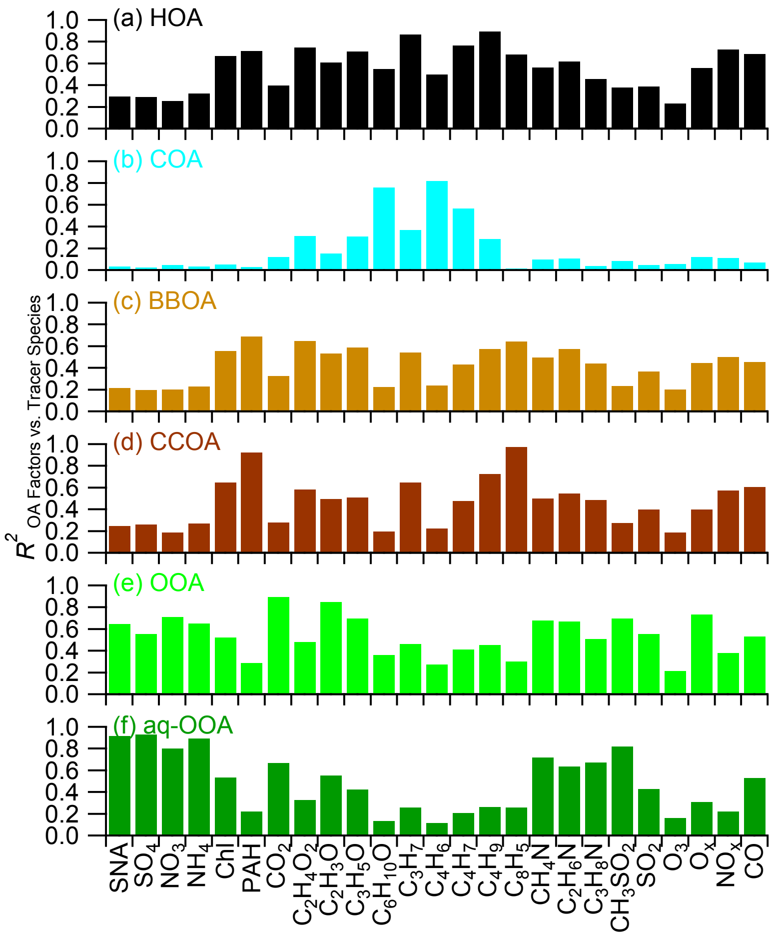

Figure S4. Correlations of six OA factors with other tracers.

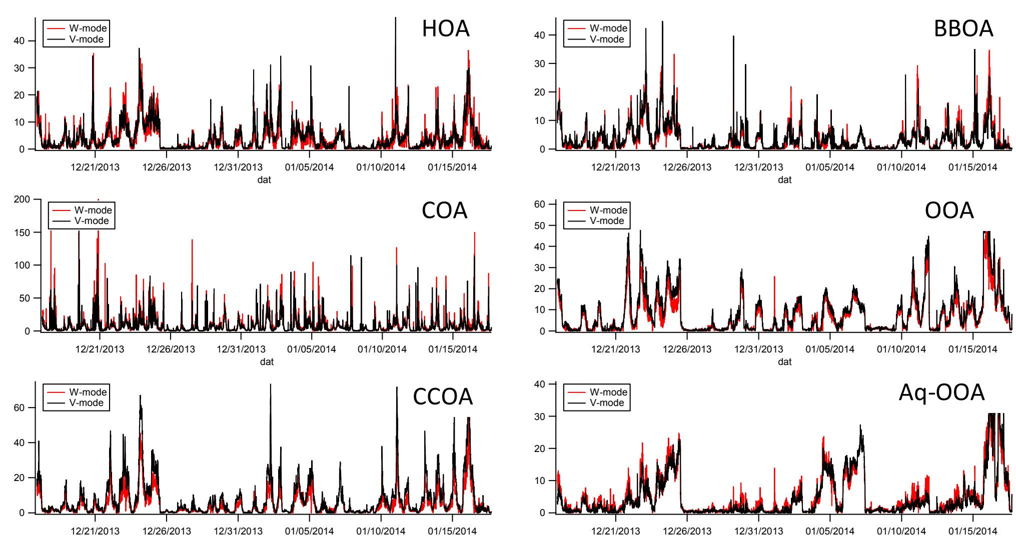

Figure S5. Comparisons of time series of six OA factors from PMF analysis of V-mode and W-mode.

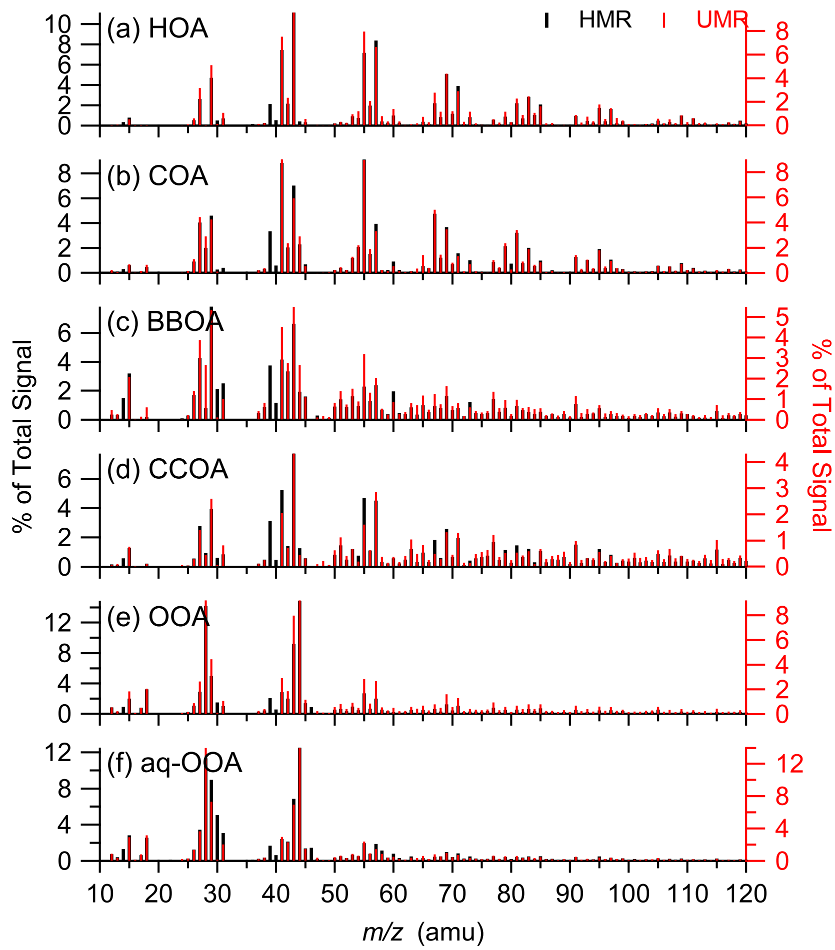

Figure 6. Mass spectra comparisons between UMR-PMF and HMR-PMF.

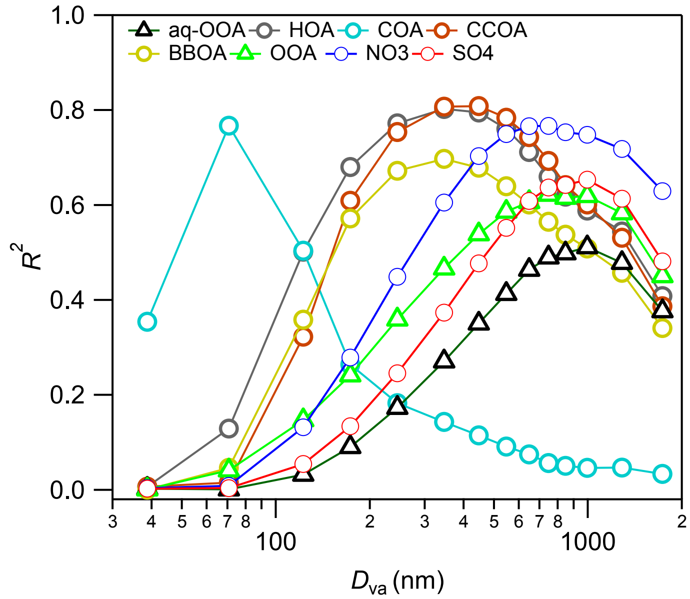

Figure S7. Correlations of organics at different sizes with six OA factors, sulfate and nitrate.

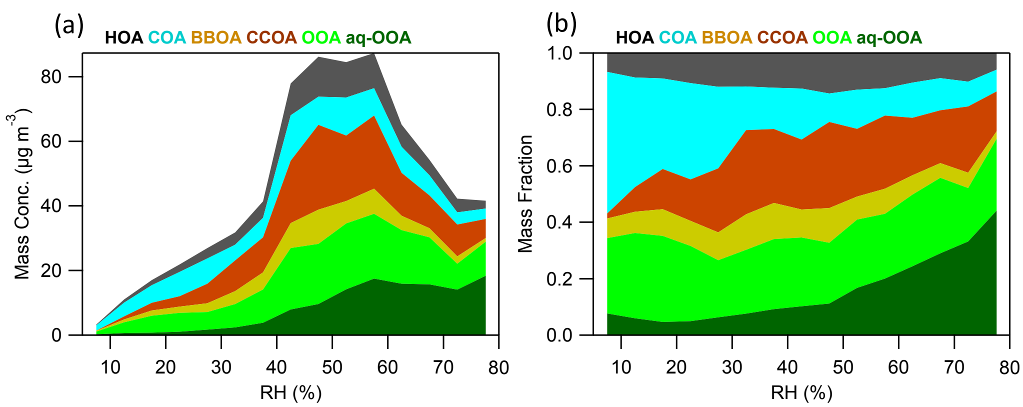

Figure S8. Variations of (a) mass concentrations and (b) mass fractions of OA factors as a function of RH.

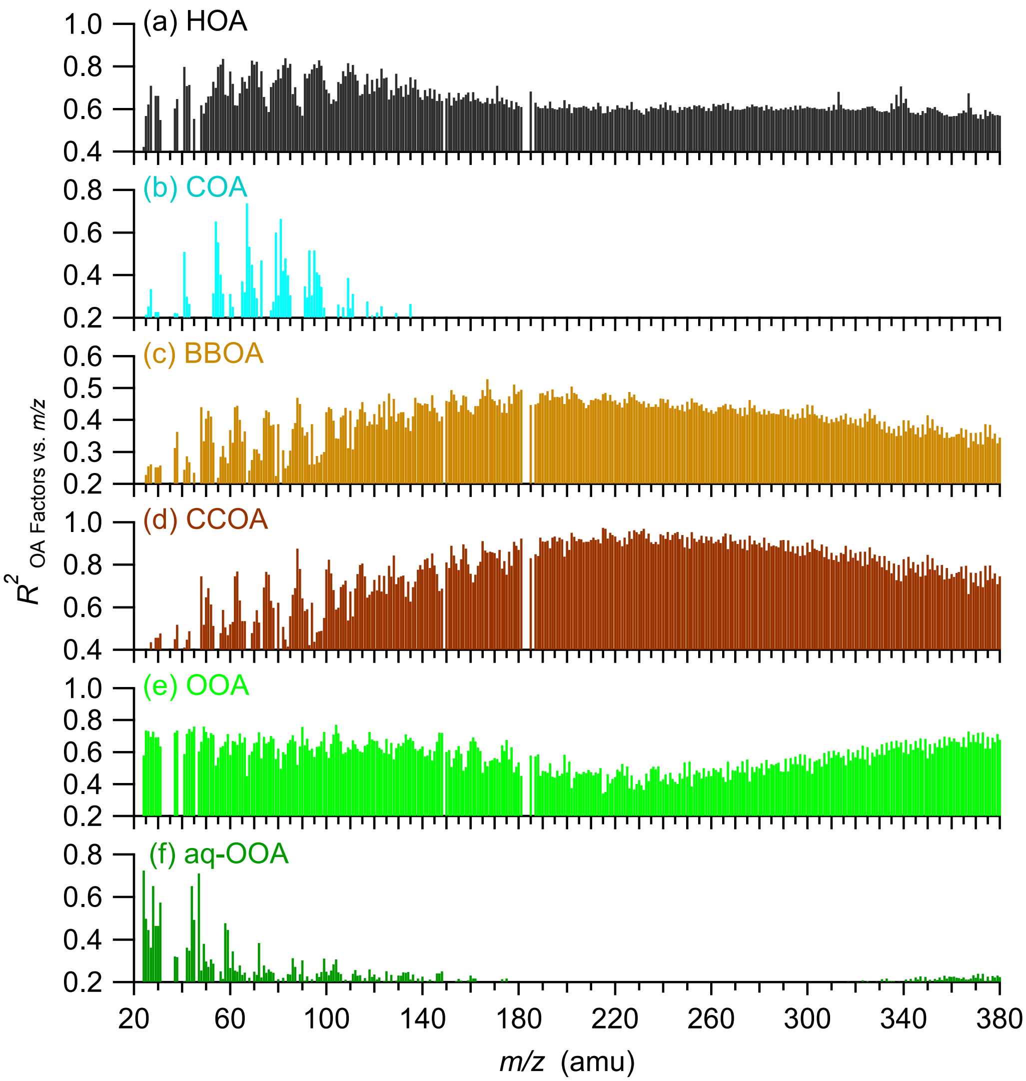

Figure S9. Correlations of six OA factors with each unit *m/z*.

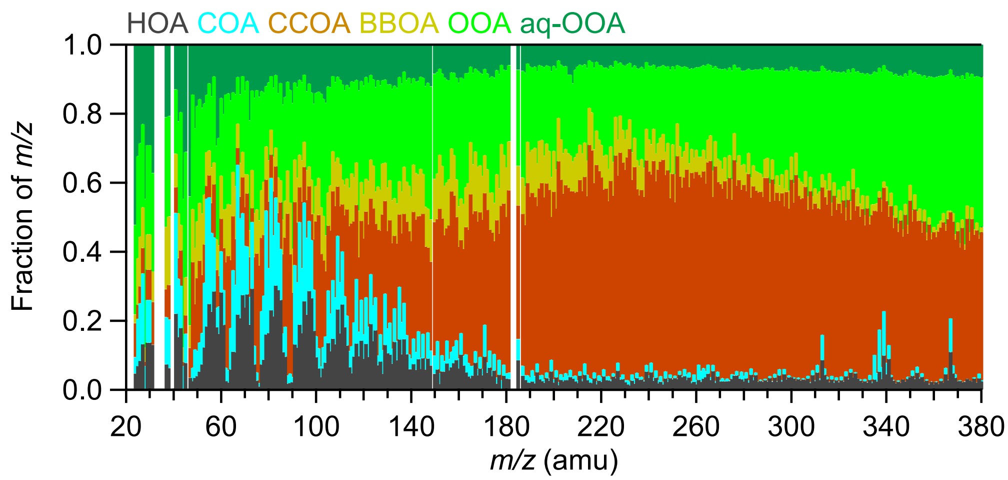

Figure S10. Contributions of six OA factors to each *m/z*.

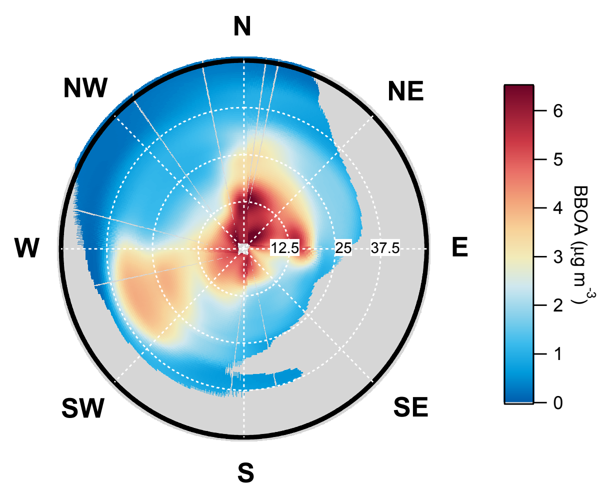

Figure S11. Bivariate polar plot of BBOA.

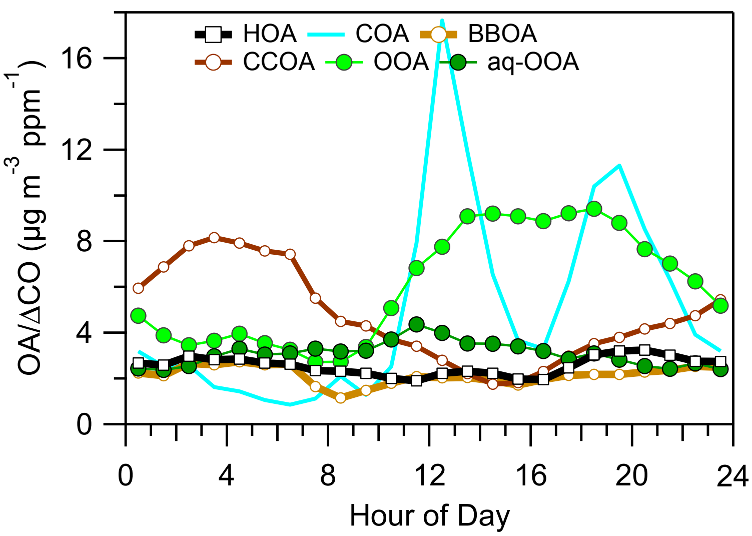

Figure S12. Average diurnal cycles of OA/CO for six OA factors.

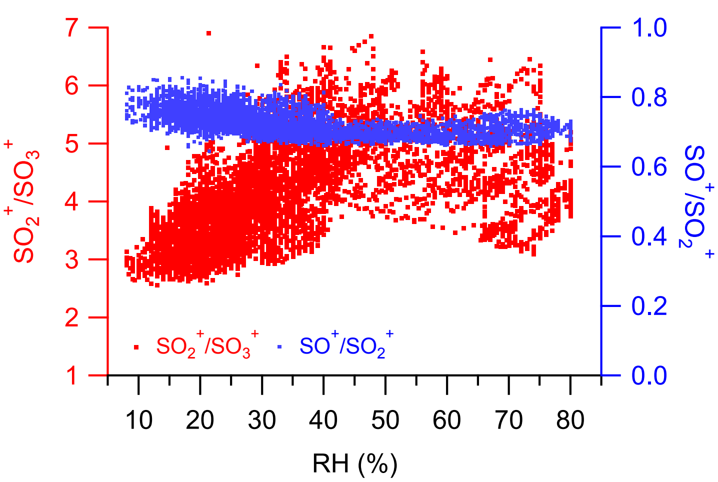

Figure S13. Variations of SO_2^+/SO_3^+ and SO^+/SO_2^+ ratios as a function of RH.

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