Supplement of:

Measurement Report: Size-resolved secondary organic aerosol formation modulated by aerosol water uptake in wintertime haze

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Table S1 A summary of size ranges of 10 bins in the range of 80 – 2500 nm.

Bin number	Size (nm)
Bin1	80-112
Bin2	112-159
Bin3	159-225
Bin4	225-317
Bin5	317-447
Bin6	447-631
Bin7	631-890
Bin8	890-1256
Bin9	1256-1772
Bin10	1772-2500

Table S2 Evaluation of random forest regression model.

campaign	Size (nm)	RMSE[a]	R^{2b}
winter 2013-2014	112-159	0.126	0.01
	159-225	0.034	0.63
	225-317	0.036	0.60
	317-447	0.049	0.73
	447-631	0.043	0.74
	631-890	0.068	0.69
	890-1256	0.052	0.67
	1256-1772	0.076	0.36
winter 2018-2019	112-159	0.196	0.09
	159-225	0.108	0.30
	225-317	0.075	0.54
	317-447	0.075	0.53
	447-631	0.066	0.61
	631-890	0.057	0.71
	890-1256	0.053	0.80
	1256-1772	0.074	0.75

[a] RMSE (Root mean square error) is the square root of the expected squared difference between the predicted and observed values.

[b] R^2 is the correlation between the observed and random forest predicted SOA%.

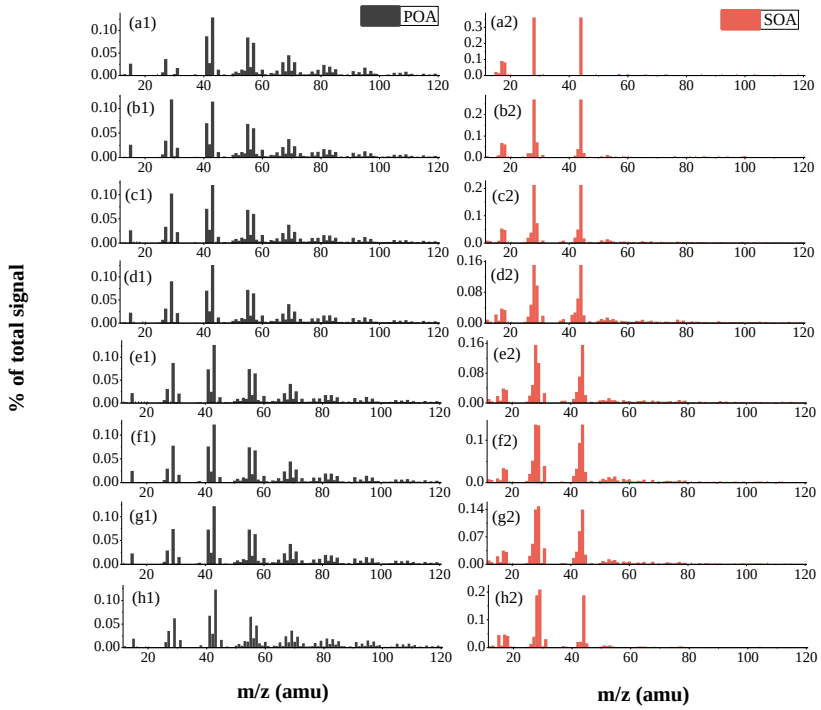

Figure S1. Mass spectra of (a1-h1) POA, (a2-h2) SOA under different size ranges of 112-159 nm, 159-225 nm, 225-317 nm, 317-447 nm, 447-631 nm, 631-890 nm, 890-1256 nm, and 1256-1772 nm, respectively, in winter 2013-2014 in Xi'an.

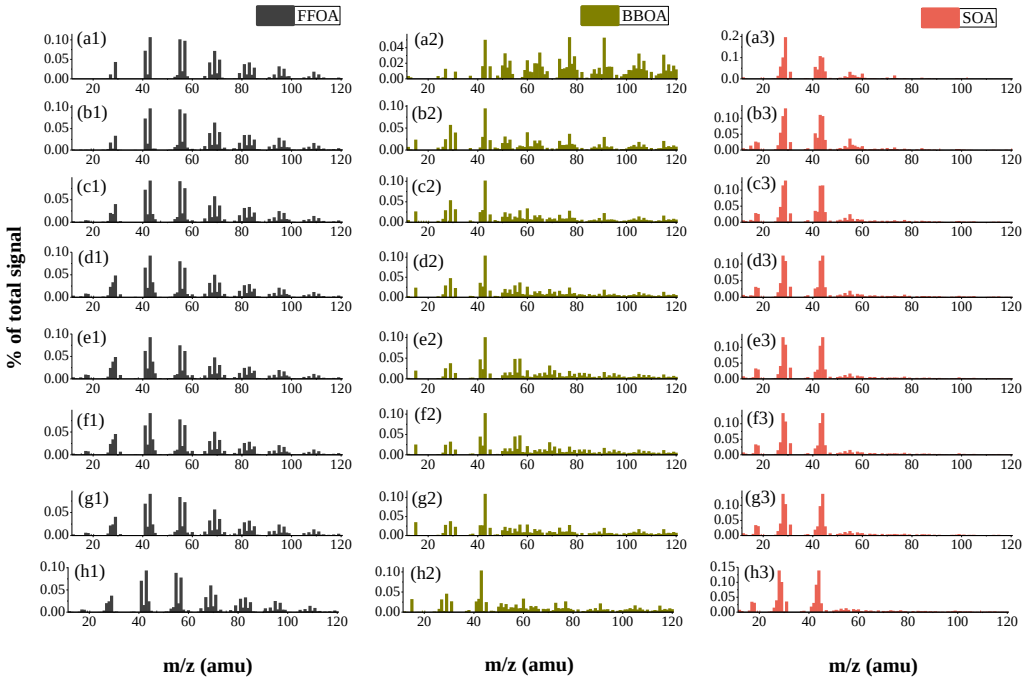

Figure S2. Mass spectra of (a1-h1) FFOA, (a2-h2) BBOA, and (a3-h3) SOA under different size ranges of 112-159 nm, 159-225 nm, 225-317 nm, 317-447 nm, 447-631 nm, 631-890 nm, 890-1256 nm, and 1256-1772 nm, respectively, in winter 2018-2019 in Xi'an.

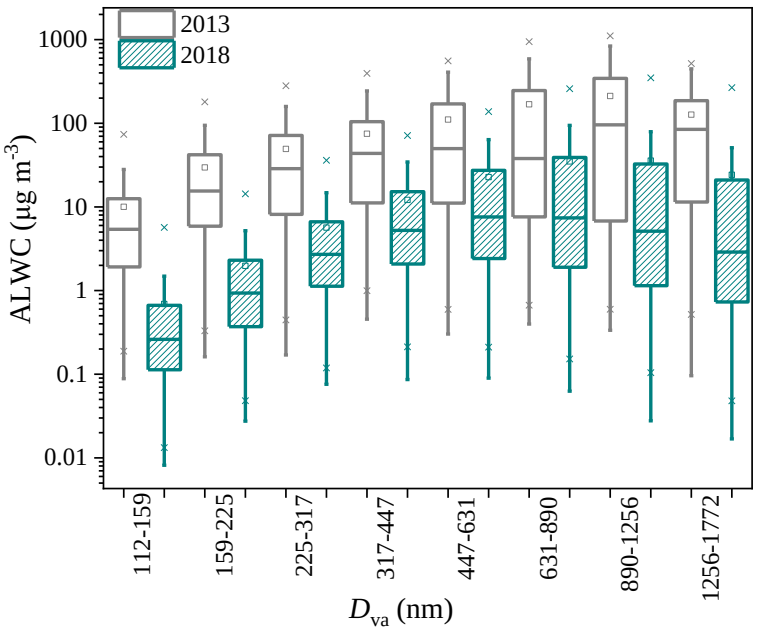

Figure S3. Size distribution of ALWC between winter 2013-2014 and winter 2018-2019 in Xi'an.

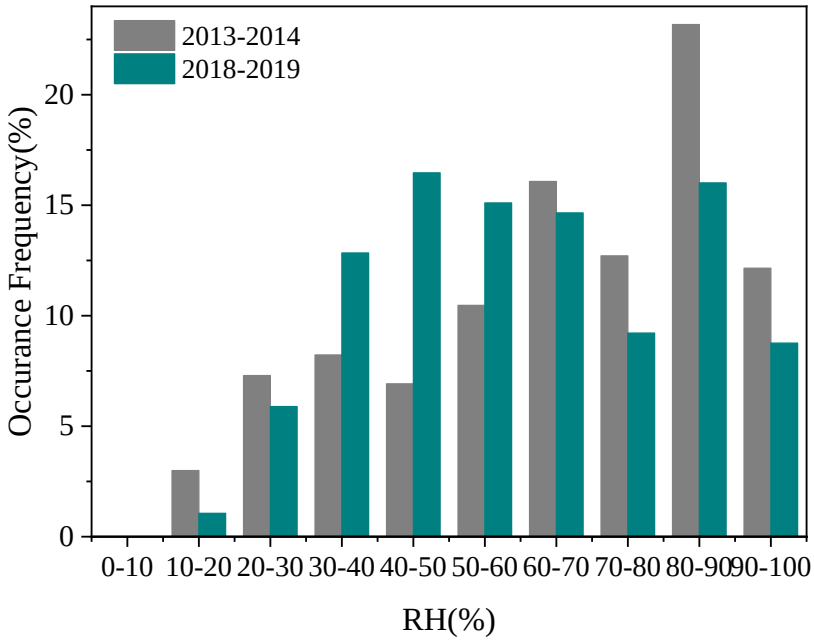

Figure S4. Distribution frequency of RH between winter 2013-2014 and winter 2018-2019 in Xi'an.

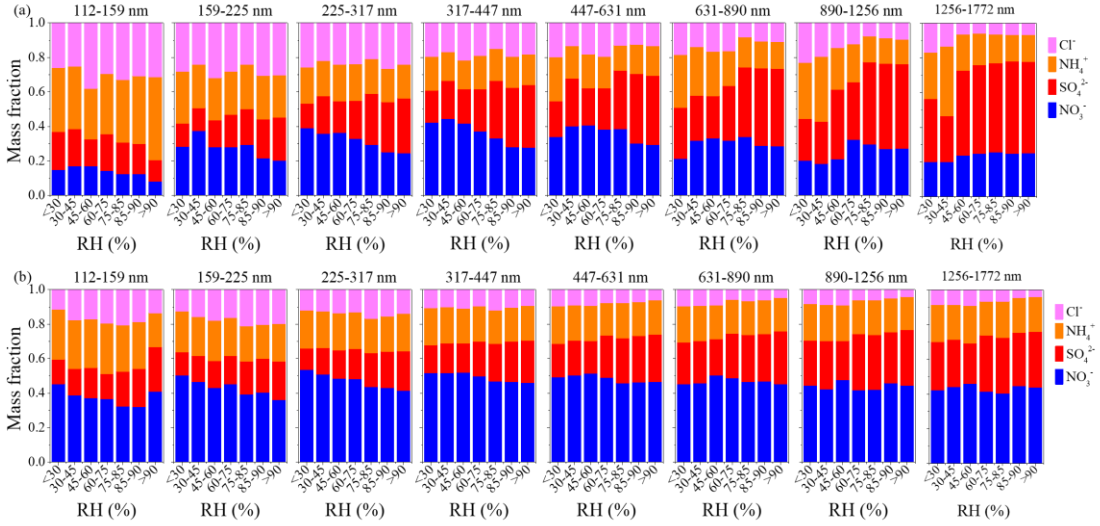

Figure S5. Mass composition of inorganic species under different size ranges and RH ranges between winter 2013-2014 (a) and winter 2018-2019 (b).

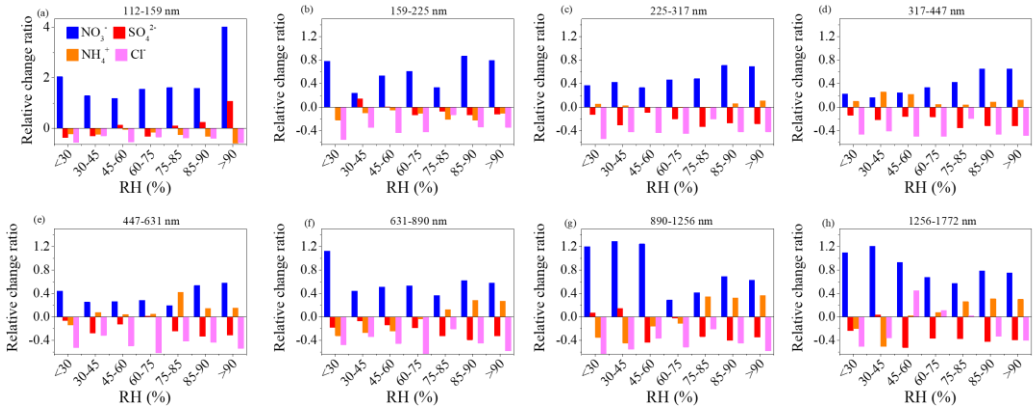

Figure S6. Relative changes of mass fraction of NO_3^-, SO_4^{2-}, NH_4^+, and Cl^- in total inorganic aerosol in winter 2018-2019, compared to winter 2013-2014 under different size ranges.