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Supplement of

Seasonal characterization of submicron aerosol chemical composition and organic aerosol sources in the southeastern United States: Atlanta, Georgia and Look Rock, Tennessee

S. H. Budisulistiorini et al.

Correspondence to: J. D. Surratt (surratt@unc.edu)

Table S1. Correlation of PMF factor temporal variations and mass spectra resolved from OA measurements at JST site with external gas- and particle-phase measurements and reference mass spectra.

	HOA				**BBOA**				**LVOOA**				**SVOOA**				**91Fac**				**IEPOXOA**			
	Wtr	**Spr**	**Smr**	**Fall**	**Wtr**	**Spr**	**Smr**	**Fall**	**Wtr**	**Spr**	**Smr**	**Fall**	**Wtr**	**Spr**	**Smr**	**Fall**	**Wtr**	**Spr**	**Smr**	**Fall**	**Wtr**	**Spr**	**Smr**	**Fall**
$\boldsymbol{R^2_{TS}}$																								
BC	0.70	0.59	0.65	0.75	0.49	*n.a.*	*n.a.*	0.40	0.13	0.04	0.01	0.01	0.25	*n.a.*	*n.a.*	0.41	*n.a.*	0.15	0.12	*n.a.*	*n.a.*	0.17	0.11	*n.a.*
CO	0.74	0.63	0.61	0.81	0.42	*n.a.*	*n.a.*	0.39	0.07	0.02	0.01	0.00	0.24	*n.a.*	*n.a.*	0.34	*n.a.*	0.20	0.15	*n.a.*	*n.a.*	0.15	0.13	*n.a.*
NO_x (=$NO+NO_2$)	0.81	0.73	0.58	0.81	0.28	*n.a.*	*n.a.*	0.37	0.02	0.00	0.02	0.00	0.23	*n.a.*	*n.a.*	0.30	*n.a.*	0.19	0.08	*n.a.*	*n.a.*	0.04	0.00	*n.a.*
NO_y	0.80	0.73	0.60	0.80	0.27	*n.a.*	*n.a.*	0.36	0.01	0.00	0.01	0.00	0.22	*n.a.*	*n.a.*	0.30	*n.a.*	0.18	0.08	*n.a.*	*n.a.*	0.05	0.01	*n.a.*
NO_z	0.32	0.19	0.10	0.32	0.06	*n.a.*	*n.a.*	0.10	0.00	0.08	0.20	0.02	0.01	*n.a.*	*n.a.*	0.17	*n.a.*	0.04	0.06	*n.a.*	*n.a.*	0.09	0.25	*n.a.*
O_3	0.30	0.23	0.11	0.25	0.15	*n.a.*	*n.a.*	0.28	0.02	0.04	0.16	0.01	0.22	*n.a.*	*n.a.*	0.12	*n.a.*	0.03	0.00	*n.a.*	*n.a.*	0.00	0.06	*n.a.*
O_x (=NO_2+O_3)	0.00	0.04	0.01	0.02	0.02	*n.a.*	*n.a.*	0.01	0.02	0.11	0.20	0.10	0.00	*n.a.*	*n.a.*	0.00	*n.a.*	0.00	0.02	*n.a.*	*n.a.*	0.01	0.13	*n.a.*
SO2	0.27	0.21	0.01	0.33	0.05	*n.a.*	*n.a.*	0.16	0.00	0.00	0.01	0.00	0.06	*n.a.*	*n.a.*	0.15	*n.a.*	0.07	0.00	*n.a.*	*n.a.*	0.01	0.02	*n.a.*
SO4	0.03	0.04	0.01	0.10	0.02	*n.a.*	*n.a.*	0.03	0.04	0.17	0.18	0.20	0.00	*n.a.*	*n.a.*	0.18	*n.a.*	0.02	0.01	*n.a.*	*n.a.*	0.17	0.20	*n.a.*
ACSM SO_4	0.00	0.01	0.01	0.00	0.00	*n.a.*	*n.a.*	0.00	0.05	0.12	0.18	0.21	0.02	*n.a.*	*n.a.*	0.08	*n.a.*	0.01	0.01	*n.a.*	*n.a.*	0.15	0.27	*n.a.*
ACSM NO_3	0.15	0.30	0.36	0.07	0.25	*n.a.*	*n.a.*	0.19	0.17	0.05	0.15	0.10	0.38	*n.a.*	*n.a.*	0.16	*n.a.*	0.11	0.11	*n.a.*	*n.a.*	0.28	0.42	*n.a.*
ACSM NH_4	0.02	0.05	0.05	0.18	0.04	*n.a.*	*n.a.*	0.20	0.12	0.16	0.22	0.20	0.08	*n.a.*	*n.a.*	0.29	*n.a.*	0.03	0.03	*n.a.*	*n.a.*	0.19	0.29	*n.a.*
LWC	0.02	0.04	0.02	0.10	0.03	*n.a.*	*n.a.*	0.05	0.02	0.00	0.13	0.00	0.03	*n.a.*	*n.a.*	0.10	*n.a.*	0.00	0.00	*n.a.*	*n.a.*	0.02	0.07	*n.a.*
pH	0.14	0.07	0.13	0.15	0.06	*n.a.*	*n.a.*	0.23	0.00	0.04	0.06	0.03	0.20	*n.a.*	*n.a.*	0.02	*n.a.*	0.00	0.03	*n.a.*	*n.a.*	0.00	0.01	*n.a.*
$\boldsymbol{R^2_{MS}}$																								
HOA	0.96	0.87	0.86	0.91	0.41	*n.a.*	*n.a.*	0.12	0.04	0.04	0.03	0.03	0.10	*n.a.*	*n.a.*	0.32	*n.a.*	0.07	0.04	*n.a.*	*n.a.*	0.19	0.15	*n.a.*
LV-OOA	0.04	0.08	0.25	0.21	0.45	*n.a.*	*n.a.*	0.85	0.95	0.94	0.90	0.93	0.85	*n.a.*	*n.a.*	0.73	*n.a.*	0.87	0.94	*n.a.*	*n.a.*	0.87	0.92	*n.a.*
SV-OOA	0.41	0.62	0.77	0.60	0.88	*n.a.*	*n.a.*	0.52	0.35	0.37	0.32	0.34	0.48	*n.a.*	*n.a.*	0.87	*n.a.*	0.37	0.37	*n.a.*	*n.a.*	0.73	0.66	*n.a.*
BBOA	0.46	0.61	0.75	0.66	0.77	*n.a.*	*n.a.*	0.45	0.27	0.29	0.28	0.27	0.43	*n.a.*	*n.a.*	0.68	*n.a.*	0.35	0.28	*n.a.*	*n.a.*	0.57	0.52	*n.a.*
82Fac	0.17	0.32	0.49	0.39	0.62	*n.a.*	*n.a.*	0.72	0.70	0.72	0.68	0.69	0.73	*n.a.*	*n.a.*	0.74	*n.a.*	0.64	0.70	*n.a.*	*n.a.*	0.79	0.83	*n.a.*
91Fac	0.60	0.70	0.88	0.83	0.68	*n.a.*	*n.a.*	0.49	0.39	0.38	0.33	0.33	0.43	*n.a.*	*n.a.*	0.68	*n.a.*	0.44	0.36	*n.a.*	*n.a.*	0.58	0.56	*n.a.*
IEPOX-OA	0.13	0.30	0.50	0.37	0.79	*n.a.*	*n.a.*	0.72	0.61	0.61	0.56	0.58	0.74	*n.a.*	*n.a.*	0.92	*n.a.*	0.61	0.62	*n.a.*	*n.a.*	0.92	0.91	*n.a.*
Lab IEPOX SOA	0.20	0.36	0.51	0.42	0.62	*n.a.*	*n.a.*	0.47	0.34	0.37	0.37	0.35	0.48	*n.a.*	*n.a.*	0.60	*n.a.*	0.38	0.35	*n.a.*	*n.a.*	0.56	0.57	*n.a.*

Table S2. Correlation of PMF factor temporal variations and mass spectra resolved from OA measurements at LRK with external gas- and particle-phase measurements and reference mass spectra.

	BBOA				LVOOA				91Fac				IEPOXOA			
	Wtr	**Spr**	**Smr**	**Fall**	**Wtr**	**Spr**	**Smr**	**Fall**	**Wtr**	**Spr**	**Smr**	**Fall**	**Wtr**	**Spr**	**Smr**	**Fall**
R^2_{TS}																
BC	0.21	*n.a.*	*n.a.*	*n.a.*	0.72	0.33	0.33	0.68	*n.a.*	0.30	0.37	0.17	*n.a.*	0.28	0.33	0.37
CO	0.00	*n.a.*	*n.a.*	*n.a.*	0.01	0.04	0.36	0.03	*n.a.*	0.11	0.24	0.18	*n.a.*	0.06	0.31	0.04
NO_x (=$NO+NO_2$)	0.00	*n.a.*	*n.a.*	*n.a.*	0.00	0.10	0.00	0.07	*n.a.*	0.00	0.01	0.03	*n.a.*	0.14	0.01	0.05
NO_y	0.00	*n.a.*	*n.a.*	*n.a.*	0.01	0.01	0.04	0.07	*n.a.*	0.04	0.09	0.09	*n.a.*	0.02	0.07	0.05
NO_z	0.01	*n.a.*	*n.a.*	*n.a.*	0.04	0.04	0.10	0.03	*n.a.*	0.04	0.07	0.11	*n.a.*	0.00	0.14	0.02
O_3	0.09	*n.a.*	*n.a.*	*n.a.*	0.30	0.11	0.26	0.24	*n.a.*	0.09	0.09	0.00	*n.a.*	0.01	0.16	0.07
O_x (=NO_2+O_3)	0.10	*n.a.*	*n.a.*	*n.a.*	0.32	0.10	0.21	0.22	*n.a.*	0.10	0.04	0.01	*n.a.*	0.01	0.15	0.06
SO2	0.02	*n.a.*	*n.a.*	*n.a.*	0.04	0.01	0.03	0.01	*n.a.*	0.01	0.03	0.08	*n.a.*	0.00	0.15	0.00
SO4	0.01	*n.a.*	*n.a.*	*n.a.*	0.09	0.10	0.22	0.32	*n.a.*	0.00	0.10	0.00	*n.a.*	0.00	0.56	0.03
ACSM SO_4	0.01	*n.a.*	*n.a.*	*n.a.*	0.11	0.44	0.36	0.47	*n.a.*	0.04	0.13	0.03	*n.a.*	0.27	0.66	0.11
ACSM NO_3	0.04	*n.a.*	*n.a.*	*n.a.*	0.06	0.13	0.50	0.03	*n.a.*	0.12	0.49	0.18	*n.a.*	0.01	0.55	0.00
ACSM NH_4	0.04	*n.a.*	*n.a.*	*n.a.*	0.20	0.46	0.42	0.37	*n.a.*	0.08	0.19	0.11	*n.a.*	0.20	0.62	0.09
LWC	0.01	*n.a.*	*n.a.*	*n.a.*	0.01	0.01	0.04	0.01	*n.a.*	0.00	0.00	0.00	*n.a.*	0.00	0.00	0.01
pH	0.01	*n.a.*	*n.a.*	*n.a.*	0.10	0.05	0.08	0.02	*n.a.*	0.01	0.00	0.00	*n.a.*	0.13	0.09	0.01
R^2_{MS}																
HOA	0.42	*n.a.*	*n.a.*	*n.a.*	0.03	0.02	0.05	0.06	*n.a.*	0.14	0.16	0.19	*n.a.*	0.14	0.09	0.16
LV-OOA	0.76	*n.a.*	*n.a.*	*n.a.*	0.94	0.92	0.97	0.98	*n.a.*	0.97	0.98	0.84	*n.a.*	0.99	0.97	0.97
SV-OOA	0.83	*n.a.*	*n.a.*	*n.a.*	0.33	0.30	0.41	0.42	*n.a.*	0.55	0.60	0.45	*n.a.*	0.61	0.51	0.65
BBOA	0.83	*n.a.*	*n.a.*	*n.a.*	0.21	0.18	0.28	0.30	*n.a.*	0.46	0.45	0.44	*n.a.*	0.45	0.43	0.47
82Fac	0.84	*n.a.*	*n.a.*	*n.a.*	0.64	0.59	0.69	0.73	*n.a.*	0.84	0.81	0.68	*n.a.*	0.85	0.88	0.83
91Fac	0.85	*n.a.*	*n.a.*	*n.a.*	0.35	0.32	0.41	0.45	*n.a.*	0.61	0.66	0.62	*n.a.*	0.60	0.52	0.63
IEPOX-OA	0.85	*n.a.*	*n.a.*	*n.a.*	0.58	0.54	0.65	0.67	*n.a.*	0.76	0.76	0.60	*n.a.*	0.81	0.79	0.81
Lab IEPOX SOA	0.72	*n.a.*	*n.a.*	*n.a.*	0.26	0.23	0.30	0.33	*n.a.*	0.48	0.42	0.44	*n.a.*	0.47	0.53	0.46

Table S3. Estimated dry density of PM_1 and meteorological conditions at JST and LRK sites.

	Winter		Spring		Summer		Fall	
	JST	LRK	JST	LRK	JST	LRK	JST	LRK
Dry density (g cm^{-3})	1.40	1.49	1.48	1.35	1.40	1.42	1.42	1.43
Meteorological conditions								
Precipitation (mm)	83.98	*n.a.*	216.94	*n.a.*	80.84	*n.a.*	76.46	*n.a.*
Solar radiation (W m^{-2})	184.64	*n.a.*	329.91	*n.a.*	294.04	*n.a.*	216.40	*n.a.*
Temperature (°C)	12.29	4.15	21.26	12.83	26.02	20.97	14.49	11.10
RH (%)	66.01	71.48	65.15	67.26	69.05	80.15	67.56	75.18

Table S4. Meteorological conditions at JST site in summer 2011 (Budisulistiorini et al., 2013).

Meteorological parameter	
Precipitation (mm)	174.14 ± 169.88
Solar radiation (W m^{-2})	239.03 ± 316.77
Temperature (°C)	25.89 ± 4.52
RH (%)	68.45 ± 17.87

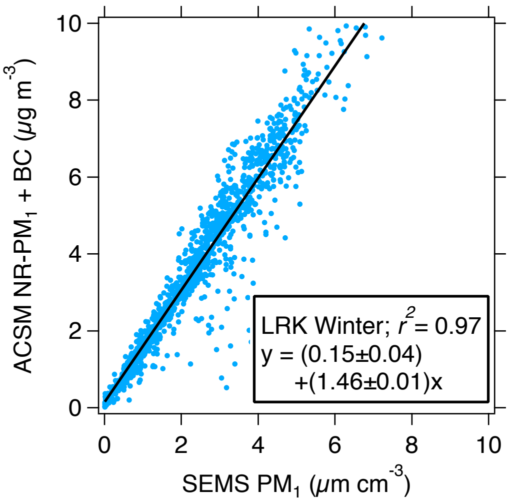

Figure S1. Correlation of total aerosol mass measured by ACSM (NR-PM_1) and black carbon (BC) measured at LRK during winter 2013 against PM_1 measured by SEMS DMA/MCPC.

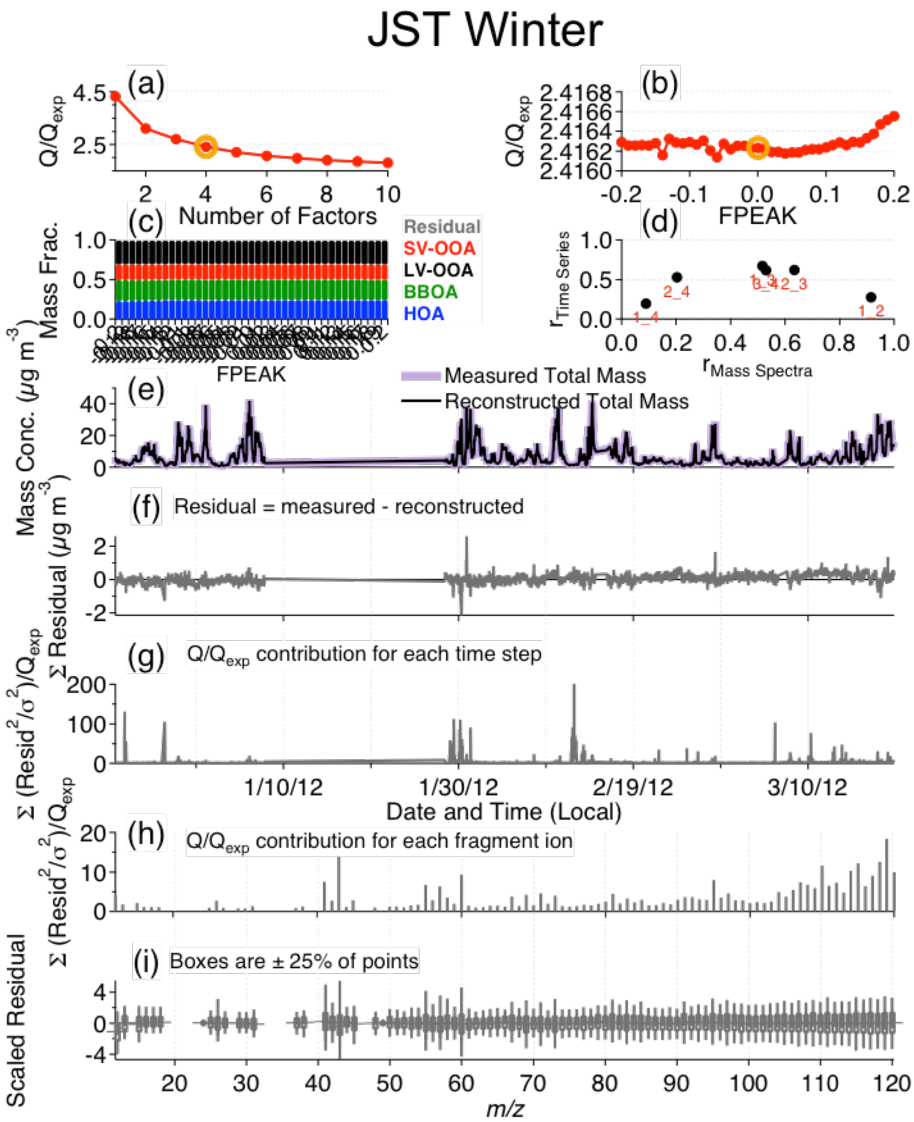

Figure S2. Diagnostic plots for PMF analysis of JST winter datasets: (a) Q/Qexp as a function of number of factors (p), (b) Q/Qexp as a function of FPEAK selected for the chosen number of factors, (c) fractional contribution of OA factors for each FPEAK, (d) correlation among PMF factors based on factor TS and MS, (e) TS of the measured OA mass and the reconstructed OA mass, (f) variation of the residual of the fit, Q/Qexp for each point in time (g) and for each *m/z* (h), and the box and whisker plot of the scaled residuals for each *m/z*.

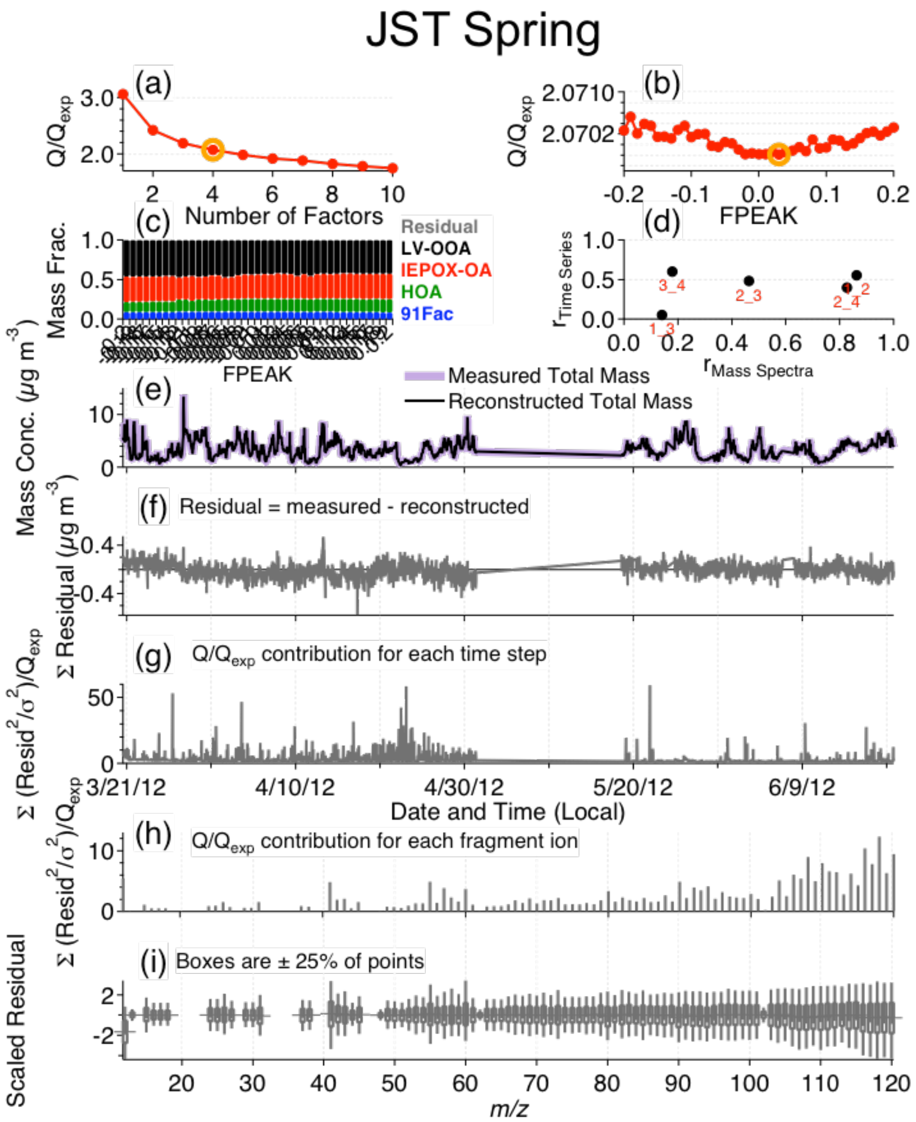

Figure S3. Diagnostic plots for PMF analysis of JST spring datasets: (a) Q/Qexp as a function of number of factors (p), (b) Q/Qexp as a function of FPEAK selected for the chosen number of factors, (c) fractional contribution of OA factors for each FPEAK, (d) correlation among PMF factors based on factor TS and MS, (e) TS of the measured OA mass and the reconstructed OA mass, (f) variation of the residual of the fit, Q/Qexp for each point in time (g) and for each *m/z* (h), and the box and whisker plot of the scaled residuals for each *m/z*.

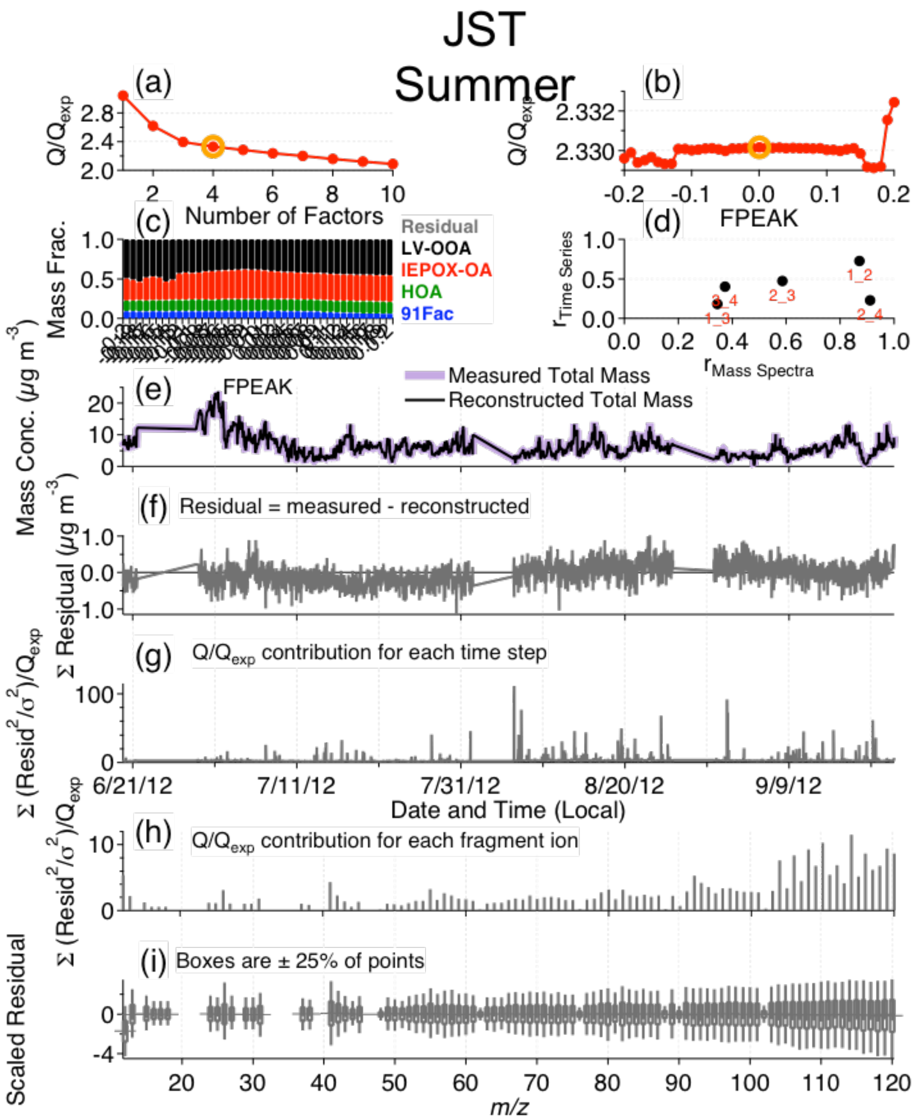

Figure S4. Diagnostic plots for PMF analysis of JST summer datasets: (a) Q/Qexp as a function of number of factors (p), (b) Q/Qexp as a function of FPEAK selected for the chosen number of factors, (c) fractional contribution of OA factors for each FPEAK, (d) correlation among PMF factors based on factor TS and MS, (e) TS of the measured OA mass and the reconstructed OA mass, (f) variation of the residual of the fit, Q/Qexp for each point in time (g) and for each *m/z* (h), and the box and whisker plot of the scaled residuals for each *m/z*.

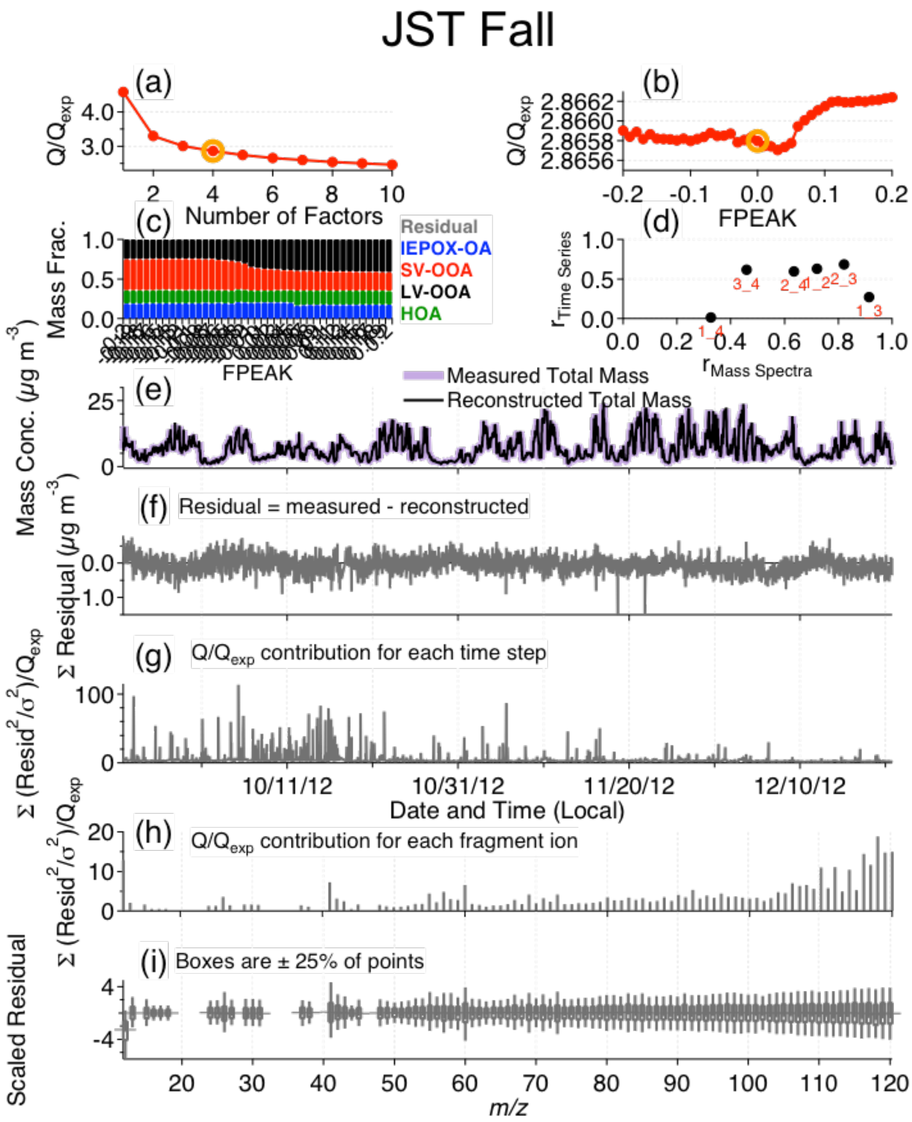

Figure S5. Diagnostic plots for PMF analysis of JST fall datasets: (a) Q/Qexp as a function of number of factors (p), (b) Q/Qexp as a function of FPEAK selected for the chosen number of factors, (c) fractional contribution of OA factors for each FPEAK, (d) correlation among PMF factors based on factor TS and MS, (e) TS of the measured OA mass and the reconstructed OA mass, (f) variation of the residual of the fit, Q/Qexp for each point in time (g) and for each *m/z* (h), and the box and whisker plot of the scaled residuals for each *m/z*.

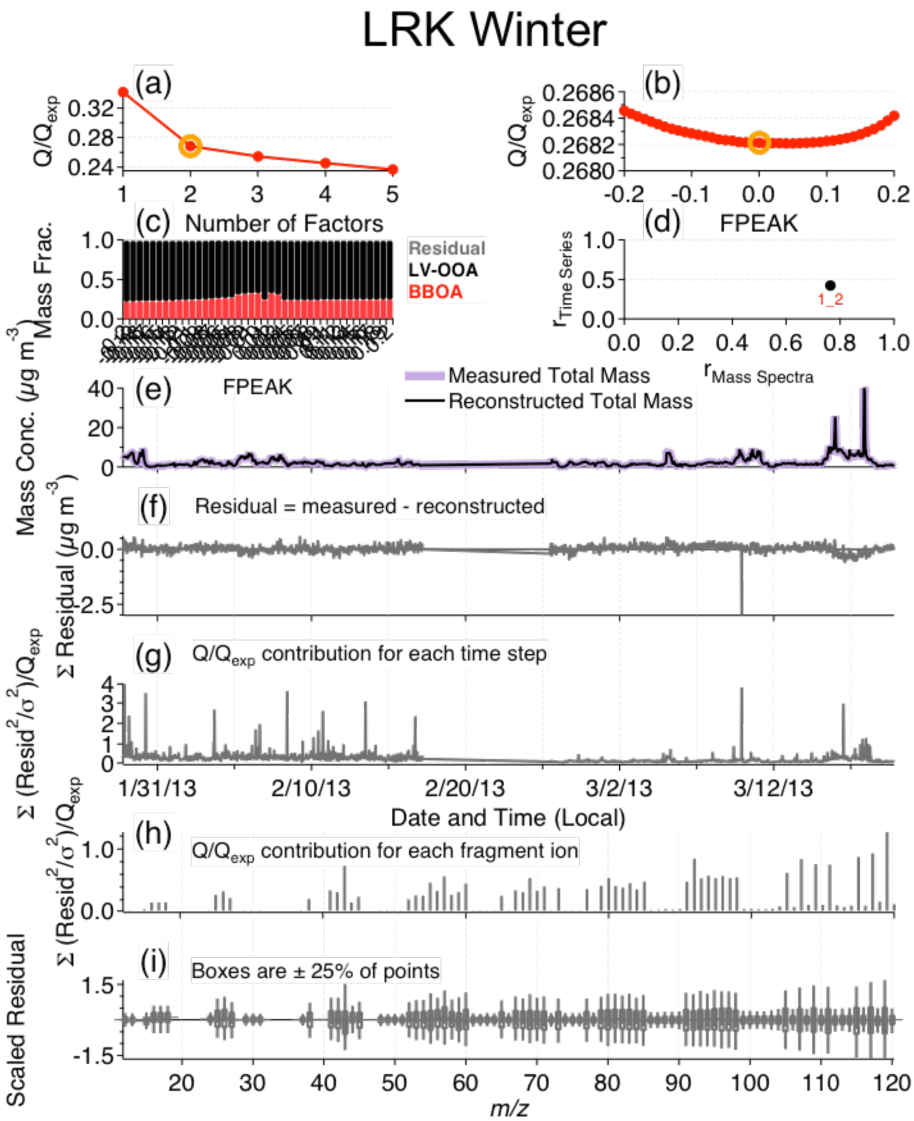

Figure S6. Diagnostic plots for PMF analysis of LRK winter datasets: (a) Q/Qexp as a function of number of factors (p), (b) Q/Qexp as a function of FPEAK selected for the chosen number of factors, (c) fractional contribution of OA factors for each FPEAK, (d) correlation among PMF factors based on factor TS and MS, (e) TS of the measured OA mass and the reconstructed OA mass, (f) variation of the residual of the fit, Q/Qexp for each point in time (g) and for each *m/z* (h), and the box and whisker plot of the scaled residuals for each *m/z*.

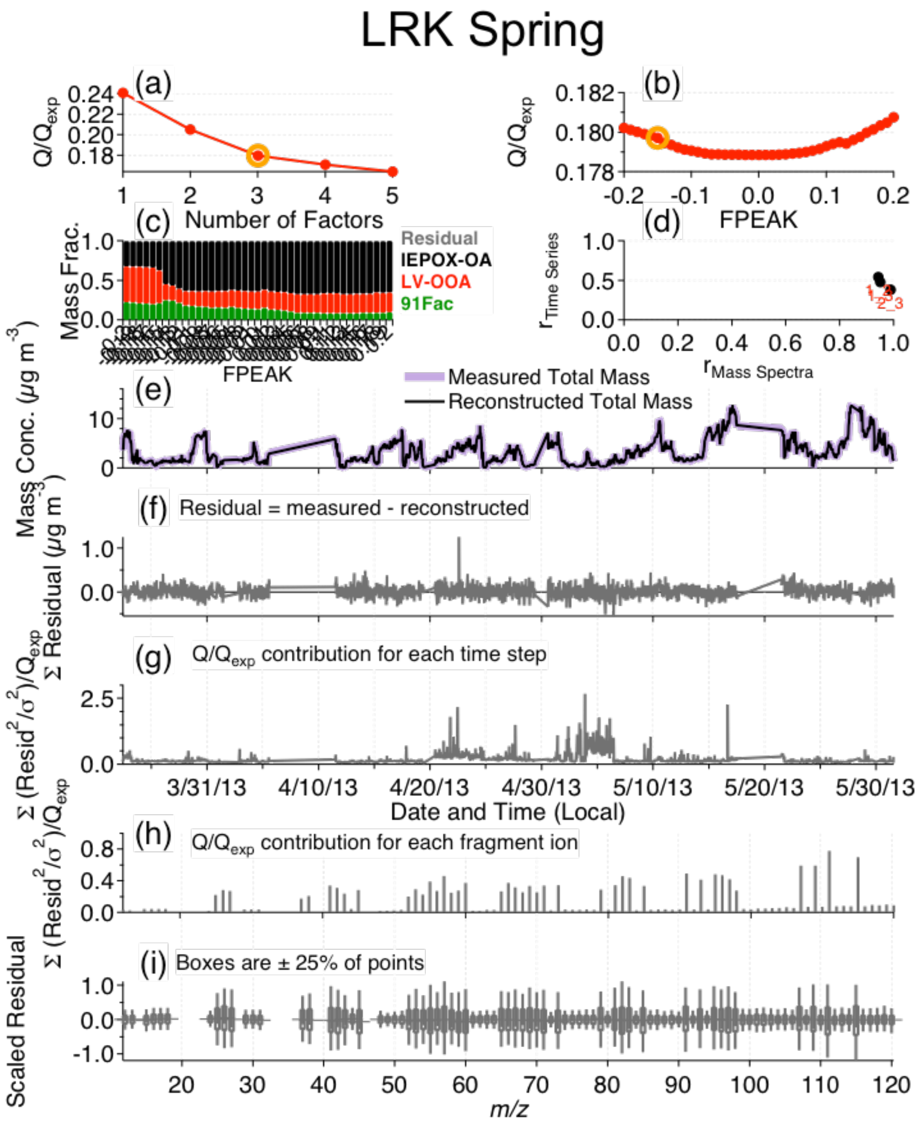

Figure S7. Diagnostic plots for PMF analysis of LRK spring datasets: (a) Q/Qexp as a function of number of factors (p), (b) Q/Qexp as a function of FPEAK selected for the chosen number of factors, (c) fractional contribution of OA factors for each FPEAK, (d) correlation among PMF factors based on factor TS and MS, (e) TS of the measured OA mass and the reconstructed OA mass, (f) variation of the residual of the fit, Q/Qexp for each point in time (g) and for each *m/z* (h), and the box and whisker plot of the scaled residuals for each *m/z*.

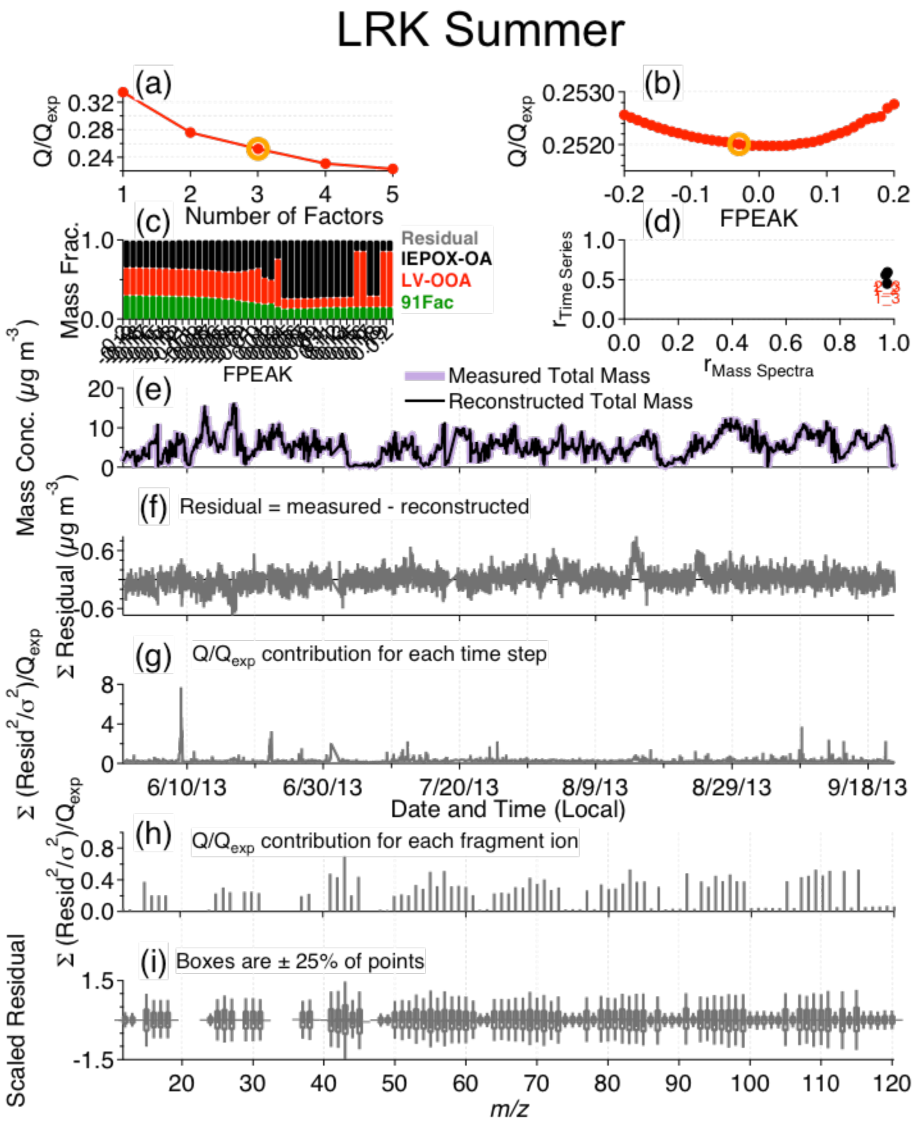

Figure S8. Diagnostic plots for PMF analysis of LRK summer datasets: (a) Q/Qexp as a function of number of factors (p), (b) Q/Qexp as a function of FPEAK selected for the chosen number of factors, (c) fractional contribution of OA factors for each FPEAK, (d) correlation among PMF factors based on factor TS and MS, (e) TS of the measured OA mass and the reconstructed OA mass, (f) variation of the residual of the fit, Q/Qexp for each point in time (g) and for each *m/z* (h), and the box and whisker plot of the scaled residuals for each *m/z*.

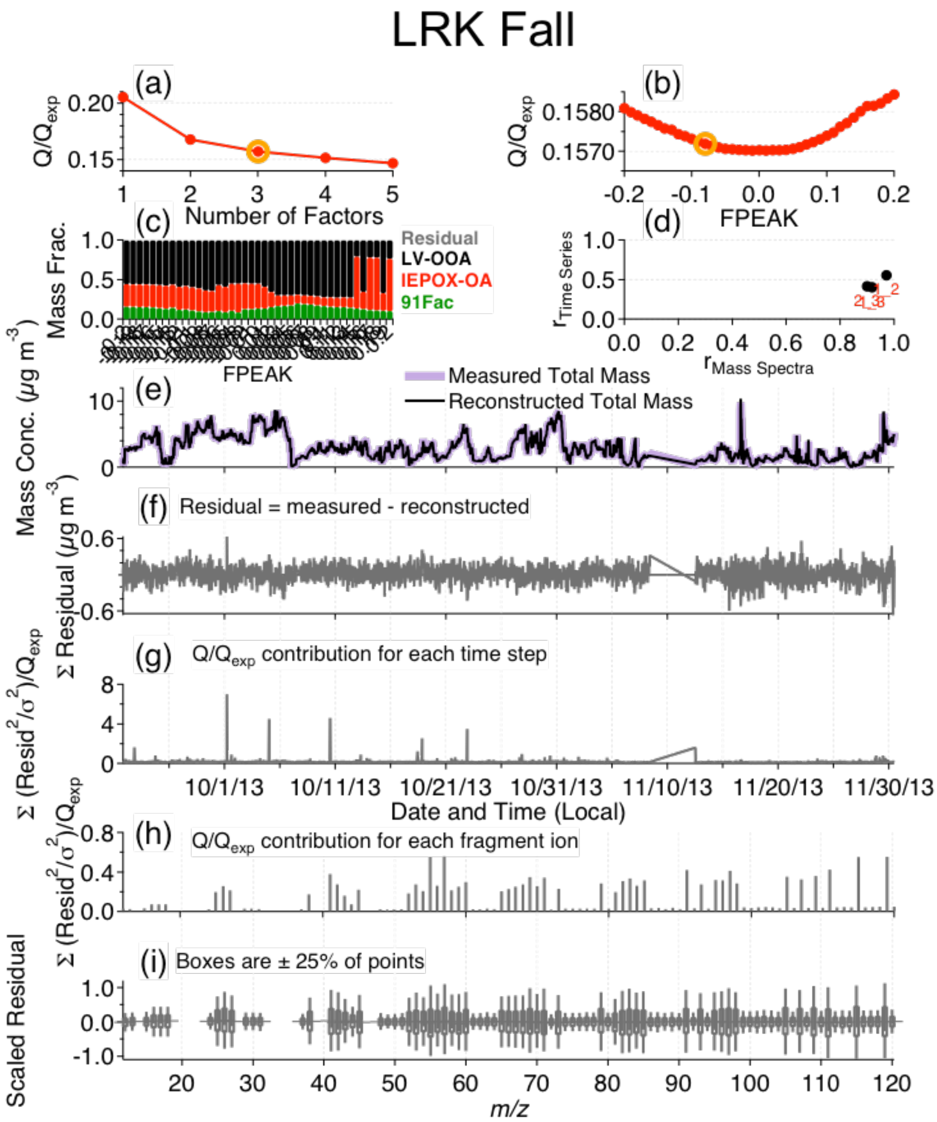

Figure S9. Diagnostic plots for PMF analysis of LRK fall datasets: (a) Q/Qexp as a function of number of factors (p), (b) Q/Qexp as a function of FPEAK selected for the chosen number of factors, (c) fractional contribution of OA factors for each FPEAK, (d) correlation among PMF factors based on factor TS and MS, (e) TS of the measured OA mass and the reconstructed OA mass, (f) variation of the residual of the fit, Q/Qexp for each point in time (g) and for each *m/z* (h), and the box and whisker plot of the scaled residuals for each *m/z*.

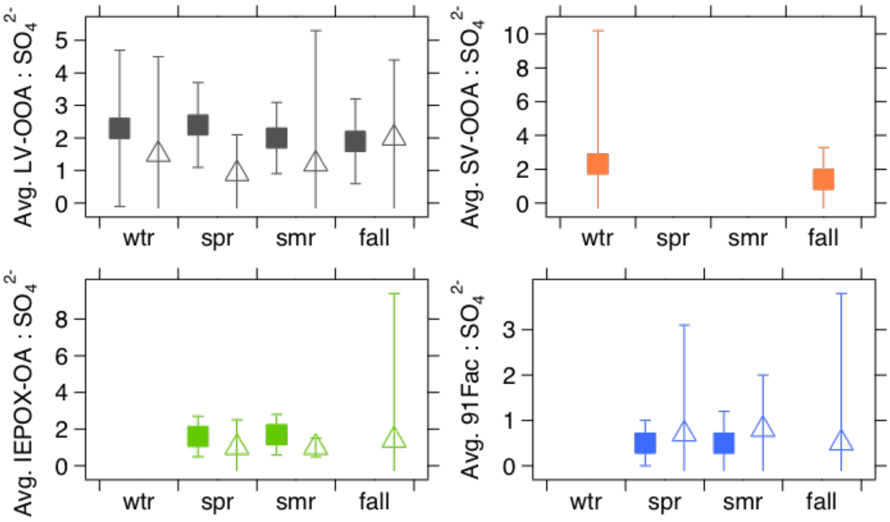

Figure S10. Seasonal average ratio of LV-OOA:SO_4 at JST (solid squares) and LRK (open triangles).

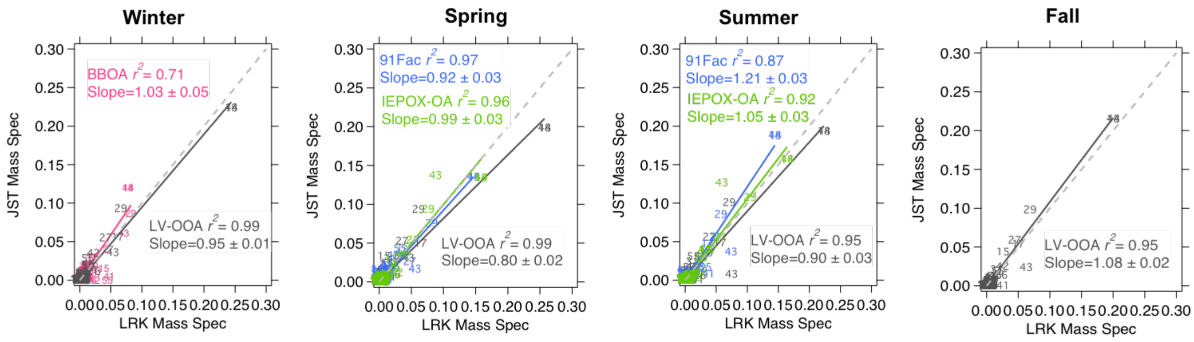

Figure S11. Mass spectral comparisons of similar PMF factors resolved from JST and LRK data during each season.