

Supplementary material

S1. Past studies

Table S1. Past Capture Vaporizer-AMS or -ACSM studies that detected BBOA

Author (Year)	Study Location	DOI
Hu et al. (2018)	Centerville, AL, USA	https://doi.org/10.1080/02786826.2018.1454584
Xu et al. (2020)	Laboratory standards	https://doi.org/10.5194/amt-13-3205-2020
Joo et al. (2021)	Atlanta, GA, USA	https://doi.org/10.1021/acsearthspacechem.1c00173
Sun et al. (2022)	Fresno, CA, USA	https://doi.org/10.1016/j.envpol.2021.118254
Zheng et al. (2020)	Beijing, China	https://doi.org/10.5194/amt-13-2457-2020
Sun et al. (2020)	Gucheng, China	https://doi.org/10.1029/2019GL086288
Xu et al. (2021)	Gucheng, China	https://doi.org/10.1039/D1EA00025J
Sofowote et al. (2017)	Toronto, Canada	https://doi.org/10.1016/j.atmosenv.2017.10.063
Day et al. (2022)	Flight, inland southeast USA	https://doi.org/10.5194/amt-15-459-2022
Lei et al. (2021)	Beijing, China	https://doi.org/10.1021/acs.est.1c00479
Li et al. (2022)	Nanjing, China	https://doi.org/10.1016/j.envres.2022.113557
Lalchandani et al. (2021)	Delhi, India	https://doi.org/10.1029/2021JD035232
Zheng et al. (2021)	Beijing, China	https://doi.org/10.1021/acs.est.1c04255
Shukla et al. (2021)	Delhi, India	https://doi.org/10.1016/j.atmosenv.2021.118598
Tobler (2020)	Delhi, India; Krakow, Poland	https://doi.org/10.3929/ethz-b-000477359
Kuang et al. (2020)	Gucheng, China	https://doi.org/10.1021/acs.est.9b06836
Sun et al. (2018)	Beijing, China	https://doi.org/10.5194/acp-18-8469-2018
Nursanto et al. (2023)	Cabauw, Netherlands	https://doi.org/10.5194/egusphere-2023-554
Katz et al. (2021)	Beijing, China	https://doi.org/10.1080/02786826.2021.1931013
Sofowote et al. (2020)	Toronto, Canada	https://doi.org/10.1016/j.scitotenv.2020.143225
Li et al. (2022)	Yuncheng, China	https://doi.org/10.1016/j.atmosres.2022.106018

S2. Sampling periods of filter levoglucosan samples

Table S2. Sampling periods of PM_{0.95} filter levoglucosan samples collected in the COALA-2020 campaign.

Sample ID	Start time (UTC)	Stop time (UTC)
AUS20QFF010	2020-01-23 23:00:00	2020-01-24 22:33:00
AUS20QFF011	2020-01-24 22:46:00	2020-01-25 23:36:00
AUS20QFF012	2020-01-25 23:52:00	2020-01-26 22:29:00
AUS20QFF013	2020-01-26 22:45:00	2020-01-27 22:38:00
AUS20QFF015	2020-01-27 23:08:00	2020-01-28 22:35:00
AUS20QFF017	2020-01-29 00:40:00	2020-01-29 22:26:00
AUS20QFF018	2020-01-29 22:42:00	2020-01-30 22:22:00
AUS20QFF050	2020-01-30 22:43:00	2020-01-31 22:29:00
AUS20QFF020	2020-01-31 22:44:00	2020-02-01 22:19:00
AUS20QFF021	2020-02-01 22:38:00	2020-02-02 22:21:00
AUS20QFF023	2020-02-02 22:53:00	2020-02-03 22:17:00
AUS20QFF025	2020-02-03 23:44:00	2020-02-05 22:42:00
AUS20QFF026	2020-02-05 23:07:00	2020-02-08 01:29:00
AUS20QFF027	2020-02-08 01:50:00	2020-02-09 22:49:00
AUS20QFF028	2020-02-09 23:15:00	2020-02-12 01:03:00
AUS20QFF051	2020-02-12 01:56:00	2020-02-14 01:00:00
AUS20QFF030	2020-02-14 01:41:00	2020-02-16 01:29:00
AUS20QFF032	2020-02-16 02:44:00	2020-02-17 22:26:00
AUS20QFF034	2020-02-18 01:22:00	2020-02-20 01:50:00
AUS20QFF035	2020-02-20 02:36:00	2020-02-22 00:22:00
AUS20QFF036	2020-02-22 01:05:00	2020-02-24 00:18:00
AUS20QFF037	2020-02-24 00:55:00	2020-02-25 22:29:00
AUS20QFF038	2020-02-25 23:04:00	2020-02-27 22:44:00
AUS20QFF040	2020-02-28 00:24:00	2020-02-29 23:28:00
AUS20QFF042	2020-03-01 01:42:00	2020-03-03 00:45:00
AUS20QFF043	2020-03-03 01:21:00	2020-03-04 23:48:00
AUS20QFF044	2020-03-05 00:58:00	2020-03-07 00:55:00
AUS20QFF045	2020-03-07 01:37:00	2020-03-08 23:14:00
AUS20QFF046	2020-03-08 23:40:00	2020-03-10 22:26:00

S3. Mass spectra of levoglucosan standard

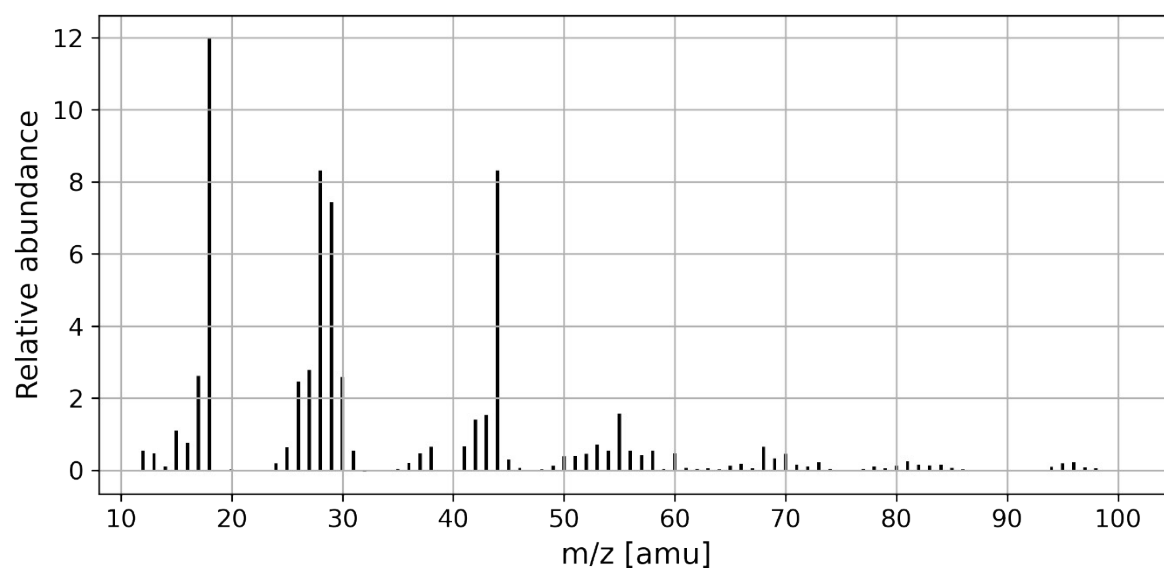


Figure S1. Mass spectra of a levoglucosan standard run through a capture vaporizer-ToF-ACSM.

S4. Comparison of earlier (smoky) and later (clear) periods of the COALA-2020 campaign

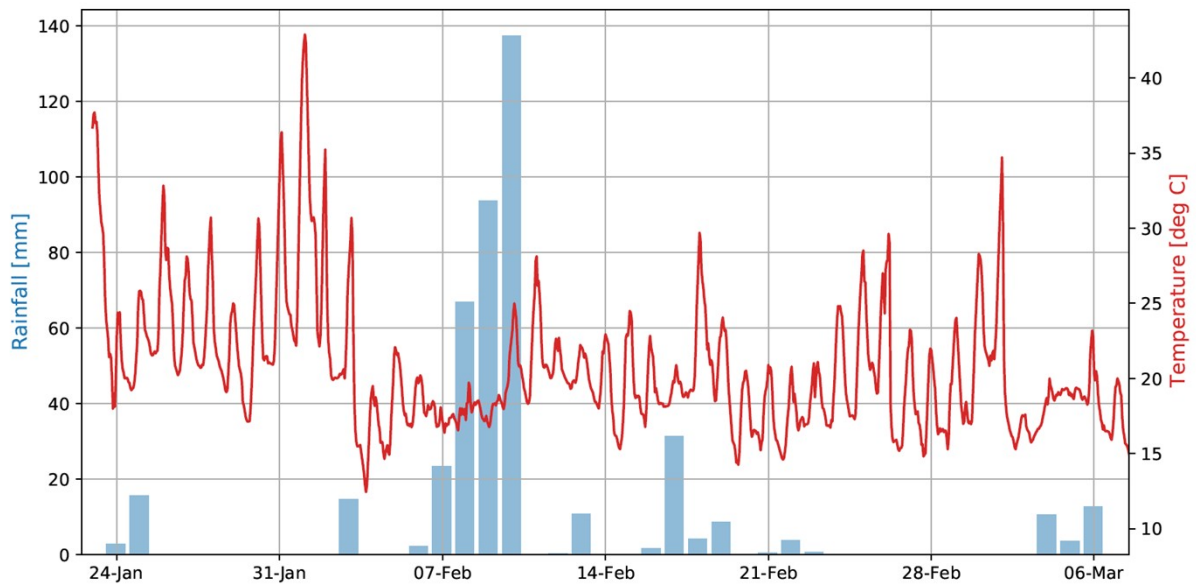


Figure S2. Temperature and rainfall observed at the observation site of the COALA-2020 campaign.

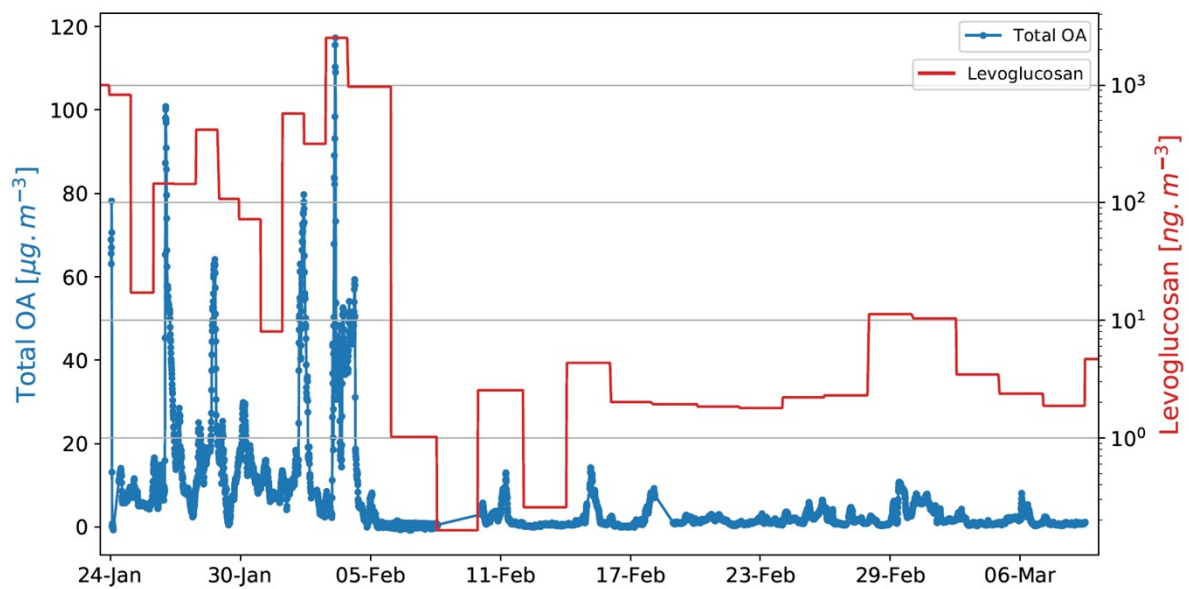


Figure S3. Concentrations of total OA and levoglucosan measured during the COALA-2020 campaign.

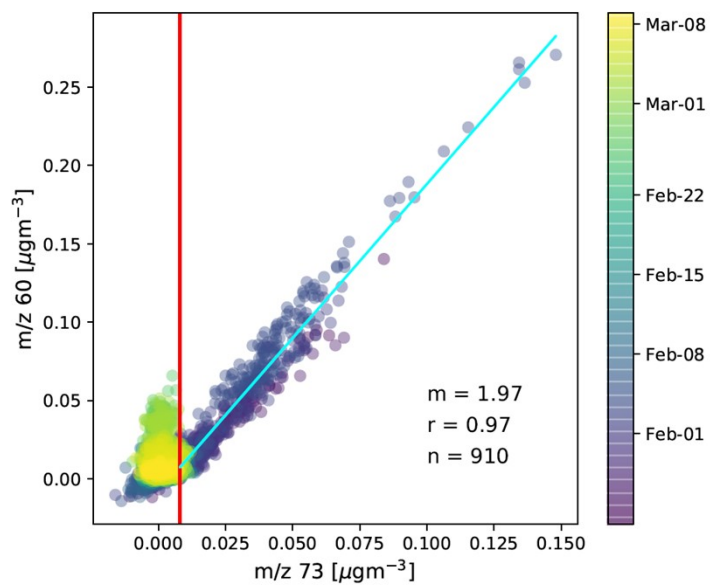


Figure S4. Correlation plot of m/z 60 and m/z 73 concentrations at the COALA-2020 campaign, showing the threshold m/z 73 concentration and parameters of their correlation. Points are shaded by date.

S5. Mass spectra of PMF factors from COALA and KCG (May 2021)

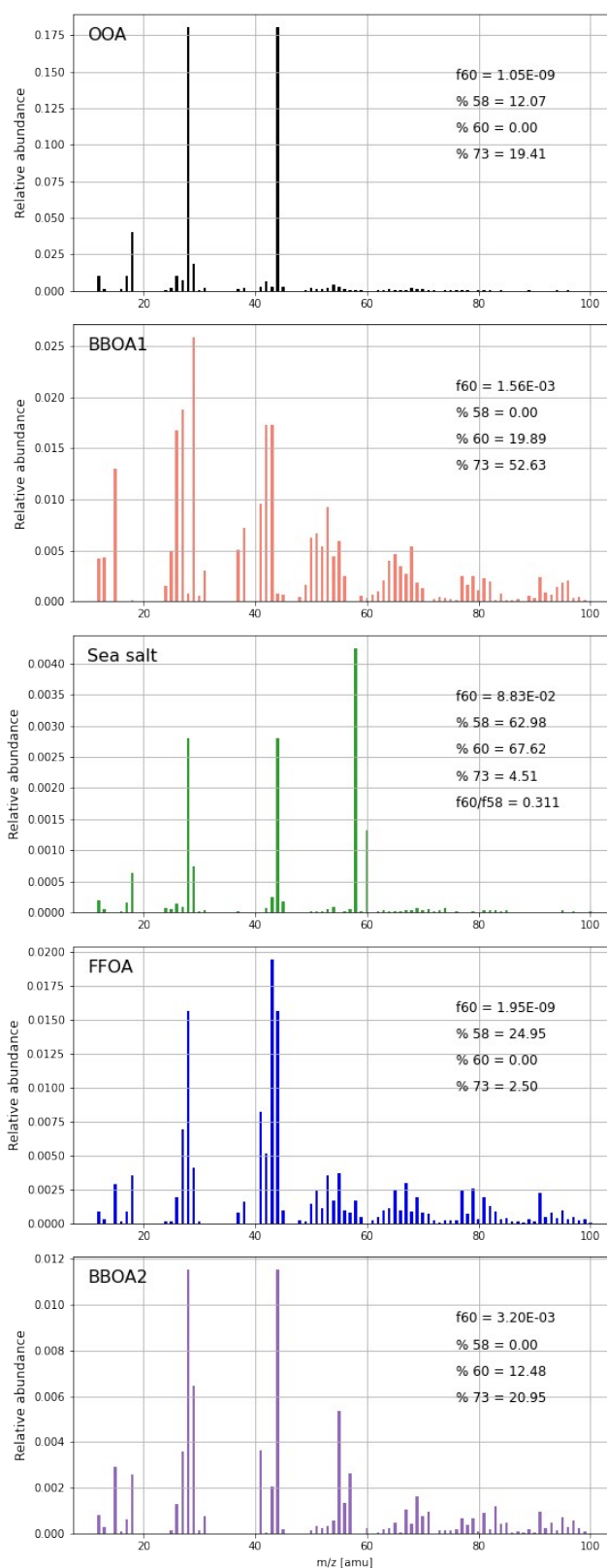


Figure S5. Mass spectra of the 5-factor PMF solution from the COALA campaign. The particle sources from top to bottom are Oxygenated OA, Biomass Burning OA 1, Sea Salt aerosols, likely Fossil Fuels

OA, and Biomass Burning OA 2. The percentage of m/z 58, m/z 60, and m/z 73 in each factor are also listed for each factor.

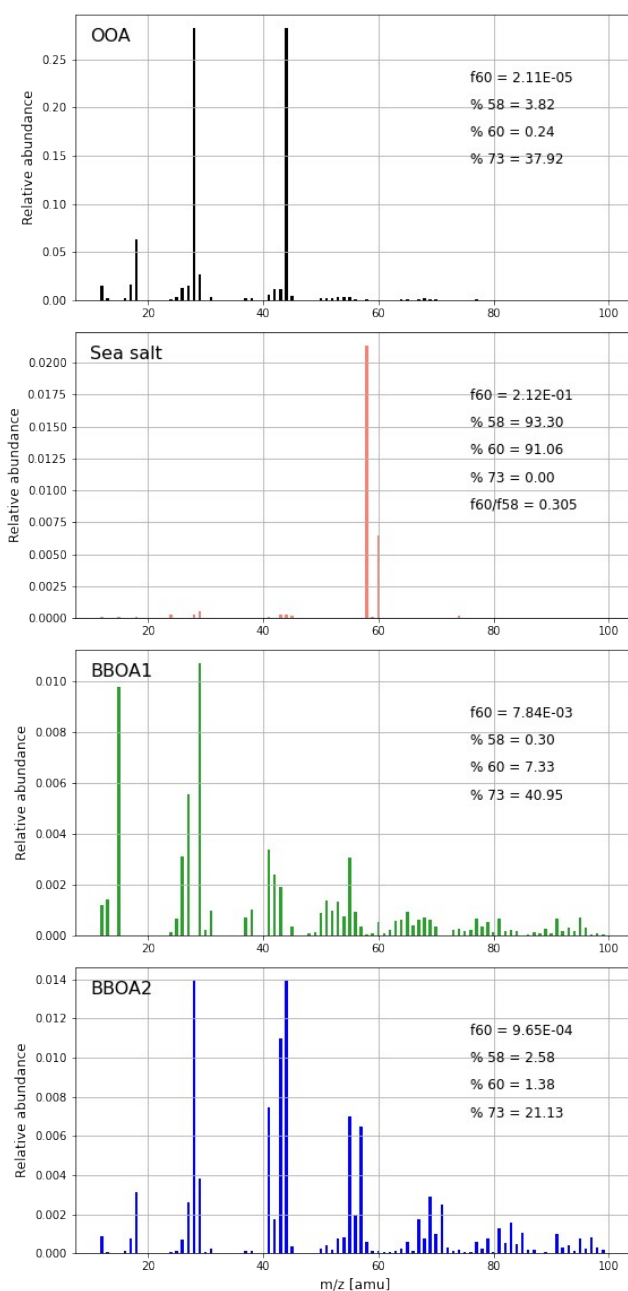


Figure S6. Mass spectra of the 5-factor PMF solution from measurements at KCG in May 2021. The particle sources from top to bottom are Oxygenated OA, Sea Salt aerosols, Biomass Burning OA 1, and Biomass Burning OA 2. The percentage of m/z 58, m/z 60, and m/z 73 in each factor are also listed for each factor.