Supporting Information for

Comparisons of GC-Measured Carboxylic Acids and AMS m/z 44 Signals: Contributions of Organic Acids to m/z 44 Signals in Remote Aerosols from Okinawa Island

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Figure S1 shows real time variations of m/z 44 and organics measured by AMS in aerosols from Cape Hedo Okinawa.

Figure S2 shows f44 vs. f43 for all the OA component from Okinawa. Except for the red filled circle, all data are adopted from Ng et al. (2010).

Table S1 shows concentrations of organic and inorganic species measured by different methods during the same study period.

Text S1 introduces the calculation of specific diacid to m/z 44

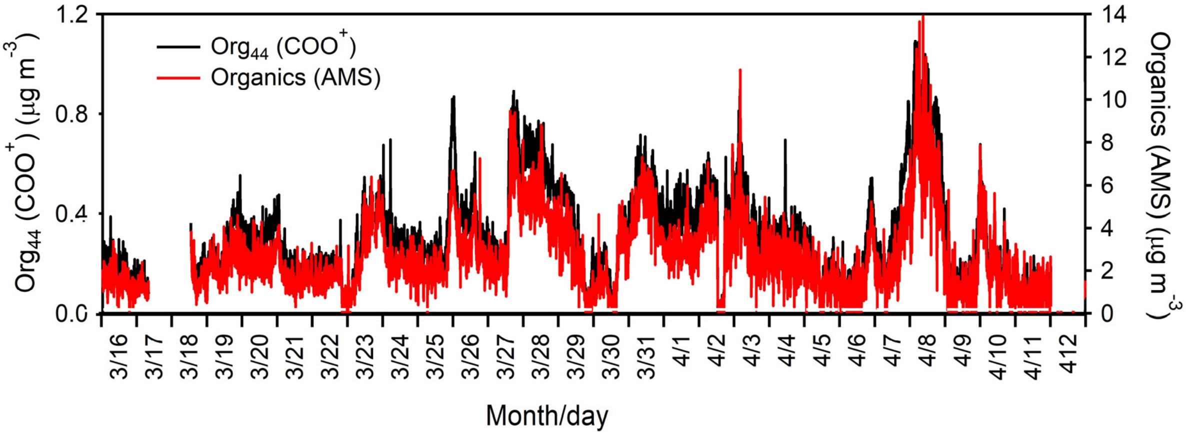

Figure S1. Real time variations of m/z 44 and organics measured by AMS in aerosols from Cape Hedo, Okinawa, Japan.

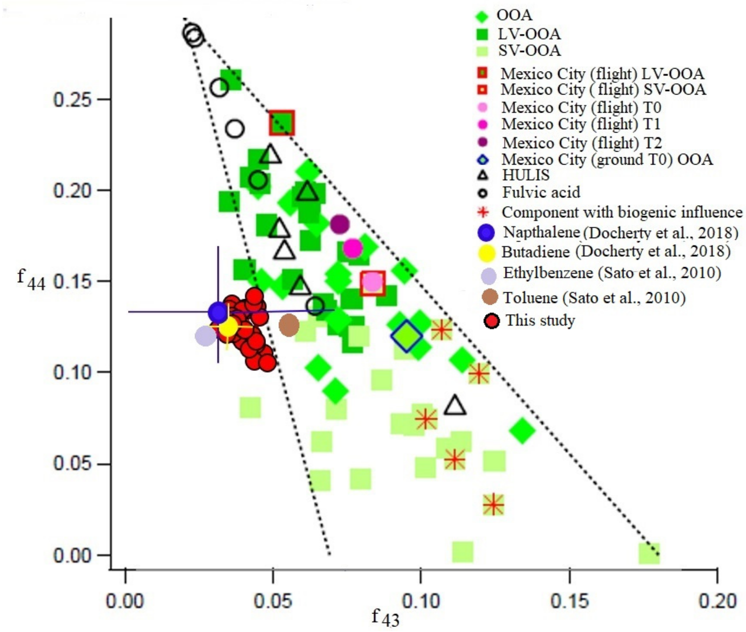

Figure S2. f_{44} (m/z44/OA) vs. f_{43} (m/z43/Org) Okinawa together with several studies from previous literatures. Except for the red filled circle, yellow, blue and light blue, all data are adopted from Ng et al. (2010).

Table S1. Concentrations of organic measured by different methods during the same study period.

Species	Av±SD	Range (Min-Max)				
Organics (μg m^{-3}, by AMS)						
Total organics	5.0±2.4	2.0-12				
m/z 44	0.58±0.28	0.24-1.4				
OC_{Sunset}	1.2±0.59	0.41-2.5				
EC_{Sunset}	0.36±0.23	0.41-2.5				
Dicarboxylic acids (ng m^{-3}, by GC)			Contribution to OM_{AMS} (%)		Contribution to OC_{Sunset} (%)	
Species	Av±SD	Range (Min-Max)	Av±SD	Range (Min-Max)	Av±SD	Range (Min-Max)
Oxalic, C_2	189±73	78-329	7.0±1.7	4.5-10	14±4.4	7.1-22
Malonic, C_3	26±13	7.5-58	1.0±0.22	0.52-1.6	2.1±0.63	0.8-3.7
Succinic, C_4	20±11	5.2-53	0.8±0.24	0.38-1.7	1.7±0.62	0.58-3.7
Glutaric, C_5	4.5±2.5	1.0-9.9	0.18±0.06	0.06-0.28	0.36±0.12	0.1-0.73
Adipic, C_6	2.9±2.0	0.31-9.3	0.11±0.07	0.02-0.38	0.22±0.13	0.03-0.65
Pimeric, C_7	0.60±0.71	BDL-3.1	0.02±0.02	0-0.13	0.04±0.04	0-0.22
Suberic, C_8	0.93±2.2	BDL-11	0.03±0.08	0-0.45	0.07±0.15	0-0.78
Azelaic, C_9	3.3±0.75	0.37-4.5	0.16±0.07	0.02-0.33	0.33±0.16	0.04-0.7
Sebacic, C_{10}	0.39±0.37	BDL-1.2	0.01±0.01	0-0.06	0.03±0.03	0-0.12
Dodecanedioic, C_{12}	0.91±0.43	0.32-1.9	0.04±0.01	0.02-0.06	0.08±0.03	0.02-0.18
Methylmalonic, iC_4	4.3±2.5	1.3-9.8	0.17±0.07	0.06-0.37	0.36±0.16	0.14-0.95
Methylsuccinic, iC_5	1.2±0.91	0.17-3.1	0.04±0.02	0.01-0.09	0.09±0.04	0.02-0.22
Methylglutaric, iC_6	0.36±0.26	BDL-0.95	0.02±0.02	0-0.08	0.03±0.02	0-0.13
Maleic, M	1.6±1.0	0.33-4.9	0.06±0.04	0.02-0.2	0.13±0.09	0.04-0.4
Fumaric, F	0.68±0.47	0.20-2.2	0.03±0.01	0.01-0.06	0.05±0.02	0.02-0.11
Methylmaleic, mM	2.0±3.9	BDL-11	0.1±0.2	0.12-0.54	0.19±0.42	0.29-1.42
Phthalic, Ph	12±8.4	2.39-35	0.49±0.31	0.2-1.63	1.03±0.69	0.44-3.59

Isophthalic, iPh	0.74±0.63	0.04-2.2	0.03±0.02	0-0.06	0.05±0.03	0.01-0.11
Terephthalic, tPh	0.22±2.2	BDL-7.2	0.03±0.04	0-0.2	0.05±0.07	0-0.29
Hydroxysuccinic, hC_4	0.21±0.15	0.07-0.87	0.01±0.0	0-0.02	0.02±0.01	0-0.03
Ketomalonic, kC_3	15±14	0.45-69	0.5±0.33	0.04-1.2	1.1±0.88	0.11-3.3
Ketopimelic, kC_7	3.4±2.0	0.61-7.8	0.13±0.04	0.04-0.2	0.27±0.1	0.06-0.47
Total diacids	290±121	114-537	11±1.9	6.8-16	23±5.7	10-35
Oxocarboxylic acids (ng m^{-3}, by GC)						
Pyruvic acid, Pyr	4.9±2.5	1.7-10	0.19±0.05	0.11-0.29	0.4±0.15	0.19-0.91
Glyoxylic, ωC_2	22±12	4.7-44	0.84±0.23	0.44-1.23	1.7±0.53	0.68-3.3
3-Oxopropanoic, ωC_3	0.02±0.04	BDL-0.14	0±0	0-0.01	0±0	0-0.01
4-Oxobutanoic ωC_4	2.9±2.0	0.15-7.3	0.11±0.05	0.01-0.2	0.21±0.1	0.03-0.4
9-Oxononoic, ωC_9	2.2±1.3	0.46-6.2	0.08±0.02	0.04-0.13	0.18±0.08	0.06-0.37
Total oxoacids	32±17	7.2-63	1.2±0.3	0.64-1.7	0.4±0.15	0.19-0.91
Aromatic monoacid (ng m^{-3}, by GC)						
Benzoic acid (Bez)	17±9.2	4.2-36	0.71±0.36	0.22-1.9	1.4±0.62	0.51-3.1
Fatty acids (ng m^{-3}, by GC)						
Total fatty acids (C_7-C_{20})	69±31	BDL-51	3.0±1.38	1.4-7.9	6.3±2.5	3.1-13

Note: BDL means below detection limit (<0.001 ng m^{-3}). The data of diacids, oxoacids, pyruvic acid, aromatic monoacid and fatty acids are adopted from Kunwar et al. (2016). Although tri-acids such as citric acid are detectable by the GC method, citric acid was not detected in Okinawa samples. We calculated COO from the above-mentioned monoacids and diacids. Av and SD in Table 1 mean the campaign average value and standard deviation during study period. We collected filter samples and AMS data during same time period.

Text S1

Average concentration of oxalic acid obtained from GC-FID= 189 ng m^{-3}

Average concentration of 2COO from oxalic acid = 189*44*2/90 = 184.8 ng m^{-3}

Average concentration of m/z 44 (COO^+) = 290 ng m^{-3}

Therefore, average contribution of 2COO of oxalic acid to m/z 44 (COO^+) signal = (184.8/580)*(1/2)*100 = 16%.

References

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