Supplementary Information for

Aqueous-phase processing of atmospheric aerosol influences dissolution kinetics of metal ions in an urban background site in the Po Valley

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Table S1. Concentrations (μg/m^3) of $PM_{2.5}$ and water-soluble ions determined using ion chromatography. Ac = acetate, Fo = formate, MSA = methanesulphonate, Suc = succinate, Mal = malonate, Ox = oxalate.

Date	$PM_{2.5}$	Na^+	NH_4^+	K^+	Mg^{2+}	Ca^{2+}	Ac^-	Fo^-	MSA^-	Cl^-	NO_2^-	NO_3^-	Suc^{2-}	Mal^{2-}	SO_4^{2-}	Ox^{2-}	PO_4^{3-}
01/02/2019	22	0.057	0.60	0.38	0.015	0.070	0.011	0.0033	0.012	0.061	<LOD	1.4	0.0020	0.035	0.51	0.048	0.0022
05/02/2019	32	0.13	0.80	0.56	0.027	0.14	0.023	0.017	0.021	0.11	0.0019	2.4	0.011	0.0048	0.60	0.046	0.0087
08/02/2019	58	0.20	2.1	1.4	0.050	0.29	0.054	0.088	0.037	0.23	0.012	5.9	0.035	0.029	2.0	0.17	0.018
12/02/2019	19	0.083	1.0	0.66	0.026	0.15	0.015	0.015	0.024	0.079	<LOD	3.5	0.0083	0.0051	0.68	0.047	0.0096
14/02/2019	54	0.14	3.8	1.2	0.041	0.21	0.062	0.082	0.058	0.16	0.010	11	0.021	0.035	1.8	0.19	0.018
18/02/2019	96	0.22	13	1.2	0.046	0.22	0.056	0.074	0.12	0.30	0.0067	33	0.046	0.17	3.8	0.43	0.018
20/02/2019	100	0.23	14	0.62	0.051	0.24	0.051	0.059	0.036	0.20	0.0013	35	0.035	0.11	4.6	0.40	0.0080
22/02/2019	84	0.30	13	0.94	0.044	0.20	0.051	0.041	0.10	0.25	0.0056	34	0.037	0.19	4.1	0.40	0.0094
26/02/2019	70	0.49	4.3	1.5	0.073	0.43	0.024	0.053	0.080	0.41	0.0043	14	0.027	0.0072	1.5	0.17	0.024
28/02/2019	51	0.12	4.8	0.57	0.037	0.20	0.027	0.015	0.070	0.43	0.0040	14	0.020	0.037	2.5	0.23	0.0063
04/03/2019	54	0.38	6.5	0.67	0.032	0.17	0.025	0.0061	0.051	0.35	0.0017	14	0.0030	0.078	5.0	0.31	<LOD
06/03/2019	40	0.70	6.4	0.86	0.045	0.25	0.040	0.045	0.10	0.28	0.0067	16	0.025	0.078	4.2	0.31	0.014
08/03/2019	21	0.74	0.80	0.69	0.051	0.23	0.00053	<LOD	0.039	0.43	0.0025	1.5	0.0028	0.0017	1.0	0.098	<LOD
12/03/2019	8.7	0.30	0.40	0.50	0.041	0.31	0.00060	<LOD	0.014	0.077	0.0018	0.81	<LOD	<LOD	0.11	0.014	0.0015
14/03/2019	41	0.23	3.8	0.45	0.035	0.22	0.028	0.020	0.042	0.094	0.0024	11	0.013	0.023	1.3	0.13	0.0050

Table S2. Total concentrations (ng/m^3) of elements in the $PM_{2.5}$ samples determined using inductively coupled plasma mass spectrometry.

Date	Al	As	B	Ba	Cd	Co	Cr	Cu	Fe	Ga	Mn	Ni	Pb	Rb	Sr	V	Zn
01/02/2019	390	9.3	60	1.6	0.54	0.093	2.9	11	1827	47	8.4	55	3.7	1.5	2.7	0.88	372
05/02/2019	13	0.44	7.3	6.0	0.25	0.11	2.1	7.3	213	71	8.5	37	4.9	2.3	0.36	0.23	87
08/02/2019	21	0.72	12	7.7	0.59	0.11	21	15	302	1.2	9.5	28	9.7	2.9	0.59	0.88	97
12/02/2019	4.3	0.33	3.8	3.1	0.62	0.070	1.4	5.8	130	0.45	6.0	4.9	4.4	1.7	0.34	1.6	43
14/02/2019	16	0.69	9.7	75	3.1	0.10	32	20	2035	1.8	20	215	23	2.8	1.5	1.8	639
18/02/2019	167	1.3	20	8.5	0.89	0.10	4.2	16	1262	1.3	23	98	23	4.0	0.98	7.6	459
20/02/2019	26	0.95	16	13	0.40	0.12	121	26	605	1.0	15	5.5	11	2.8	0.60	2.4	112
22/02/2019	26	1.0	18	6.9	2.0	0.12	92	21	4335	3.9	43	23	18	2.3	0.60	2.0	1273
26/02/2019	31	15	9.9	15	2.0	0.19	11	35	834	22	20	19	37	7.1	2.2	0.53	497
28/02/2019	23	0.68	80	4.4	3.3	0.19	1.7	28	330	0.69	8.2	5.1	11	1.4	0.52	5.5	56
04/03/2019	33	0.53	8.2	2.0	0.45	0.12	14	32	2247	0.39	26	9.3	7.8	1.2	0.22	4.1	43
06/03/2019	185	23	9.2	24	0.97	0.086	104	30	5009	52	19	23	36	2.3	1.9	5.7	1140
08/03/2019	36	1.4	4.6	3.1	0.28	0.036	6.3	4.3	144	0.47	2.7	2.0	3.2	0.64	3.7	1.4	23
12/03/2019	293	11	123	26	0.46	0.039	36	34	418	14	6.3	33	1.3	1.0	2.4	1.9	326
14/03/2019	3.6	0.35	164	8.4	0.50	0.036	14	11	100	96	5.1	1.7	8.1	0.83	0.27	1.3	34

Table S3. Kinetic constants k (min^{-1}) of the solubilisation obtained for each element and all 15 samples for which a marked kinetic behaviour was observed. The corresponding standard deviations, computed from the fitting, are given in brackets. Dates are in dd/mm/yyyy format. Days with recorded fog events are highlighted in light blue.

	Al	As	B	Ba	Cd	Co	Cr	Cu	Fe	Ga	Mn	Ni	Rb	Sr	V	Zn
01/02/2019		0.016 (0.018)	0.25 (0.14)	0.0078 (0.0065)				0.0074 (0.0044)	0.022 (0.014)	0.043 (0.015)	0.060 (0.013)		0.35 (0.15)	0.11 (0.13)		0.067 (0.010)
05/02/2019		0.0169 (0.0091)		0.0320 (0.0075)	1.2 (1.2)	0.053 (0.032)		0.0198 (0.0062)	0.046 (0.011)	0.0340 (0.0036)	0.0429 (0.0087)	0.038 (0.019)	0.054 (0.037)	0.044 (0.038)		0.056 (0.014)
08/02/2019	0.022 (0.026)	0.206 (0.091)		0.0050 (0.0015)	0.24 (0.10)			0.0053 (0.0046)	0.038 (0.012)	0.033 (0.017)	0.044 (0.014)			0.25 (0.12)	0.036 (0.018)	0.069 (0.022)
12/02/2019		0.057 (0.026)		0.015 (0.018)	0.073 (0.028)	0.097 (0.056)		0.0244 (0.0080)	0.0053 (0.0080)		0.026 (0.010)	0.0149 (0.0030)	0.148 (0.090)		0.022 (0.010)	0.154 (0.076)
14/02/2019	0.019 (0.014)	0.028 (0.024)		0.0133 (0.0033)	0.083 (0.040)			0.0116 (0.0070)	0.0029 (0.0024)	0.0105 (0.0072)	0.0177 (0.0061)	0.022 (0.010)	0.053 (0.028)	0.013 (0.010)	0.0228 (0.0051)	0.054 (0.016)
18/02/2019		0.018 (0.022)	0.0124 (0.0080)	0.0050 (0.0026)	0.131 (0.068)		0.016 (0.016)	0.0067 (0.0063)	0.058 (0.010)		0.071 (0.022)	0.030 (0.011)		0.041 (0.035)	0.0085 (0.0090)	0.137 (0.028)
20/02/2019				0.035 (0.018)			0.14 (0.10)	0.0304 (0.0057)	0.048 (0.010)		0.0121 (0.0037)	0.041 (0.017)			0.023 (0.011)	0.13 (0.15)
22/02/2019			0.103 (0.075)	0.0169 (0.0027)	0.132 (0.046)		0.061 (0.039)	0.047 (0.015)	0.049 (0.011)	0.036 (0.017)	0.063 (0.010)	0.051 (0.034)	0.034 (0.031)		0.17 (0.12)	0.0472 (0.0092)
26/02/2019		0.0242 (0.0076)	0.034 (0.019)	0.0098 (0.0015)	0.134 (0.064)			0.0117 (0.0057)	0.0148 (0.0032)	0.054 (0.015)	0.0389 (0.0091)	0.028 (0.020)		0.071 (0.038)		0.104 (0.016)
28/02/2019				0.0044 (0.0017)	0.044 (0.021)	0.25 (0.11)	0.055 (0.060)		0.009 (0.013)	0.0112 (0.0085)	0.206 (0.066)			0.021 (0.020)	0.038 (0.014)	0.222 (0.027)
04/03/2019				0.0212 (0.0085)			0.075 (0.039)	0.065 (0.040)		0.093 (0.049)	0.178 (0.067)	0.025 (0.023)				
06/03/2019	0.104 (0.062)			0.0201 (0.0034)					0.048 (0.030)	0.062 (0.027)	0.323 (0.046)					0.310 (0.046)
08/03/2019	0.009 (0.027)			0.0062 (0.0022)				0.114 (0.057)	0.068 (0.096)		0.069 (0.043)	0.038 (0.016)				0.159 (0.032)
12/03/2019	0.0138 (0.0046)			0.0258 (0.0040)				0.0230 (0.0048)	0.0112 (0.0021)	0.0229 (0.0078)	0.0053 (0.0080)	0.010 (0.011)				0.020 (0.016)
14/03/2019				0.01295 (0.00099)				0.026 (0.012)	0.0215 (0.0050)	0.021 (0.011)	0.145 (0.036)				0.009 (0.016)	0.258 (0.044)

Table S4. Half-time $t_{1/2}$ (min) of the solubilisation obtained for each element and all 15 samples for which a marked kinetic behaviour was observed. The corresponding standard deviations, computed from the fitting, are given in brackets. Dates are in dd/mm/yyyy format. Days with recorded fog events are highlighted in light blue.

	Al	As	B	Ba	Cd	Co	Cr	Cu	Fe	Ga	Mn	Ni	Rb	Sr	V	Zn
01/02/2019		44 (50)	2.7 (1.5)	89 (75)				94 (56)	31 (19)	16.0 (5.7)	11.6 (2.5)		2.00 (0.86)	6.1 (6.9)		10.4 (1.6)
05/02/2019		41 (22)		21.7 (5.1)	0.60 (0.65)	13.0 (7.8)		35 (11)	15.2 (3.8)	20.4 (2.2)	16.2 (3.3)	18.3 (9.3)	12.9 (8.9)	16 (13)		12.4 (3.2)
08/02/2019	31 (36)	3.4 (1.5)		140 (41)	2.9 (1.2)			131 (115)	18.3 (5.8)	21 (11)	15.6 (4.8)			2.8 (1.3)	19.1 (9.3)	10.1 (3.2)
12/02/2019		12.1 (5.5)		45 (52)	9.4 (3.6)	7.1 (4.1)		28.5 (9.4)	130 (195)		27 (11)	46.5 (9.2)	4.7 (2.8)		31 (14)	4.5 (2.2)
14/02/2019	37 (29)	24 (20)		52 (13)	8.4 (4.0)			60 (36)	242 (200)	66 (45)	39 (13)	31 (14)	13.1 (6.9)	55 (44)	30.5 (6.8)	12.7 (3.7)
18/02/2019		38 (44)	56 (36)	140 (72)	5.3 (2.7)		44 (46)	103 (96)	11.9 (2.1)		9.8 (3.0)	23.5 (8.5)		17 (14)	82 (86)	5.1 (1.0)
20/02/2019				20 (10)			4.8 (3.4)	22.8 (4.2)	14.5 (3.2)		57 (17)	17.0 (7.0)			30 (15)	5.3 (6.0)
22/02/2019			6.8 (4.9)	40.9 (6.6)	5.2 (1.8)		11.4 (7.3)	14.9 (4.7)	14.1 (3.0)	19.2 (8.9)	11.0 (1.8)	13.5 (9.0)	20 (18)		4.2 (3.1)	14.7 (2.9)
26/02/2019		28.6 (9.0)	21 (11)	71 (11)	5.2 (2.5)			59 (29)	47 (10)	12.8 (3.6)	17.8 (4.2)	24 (17)		9.7 (5.2)		6.7 (1.0)
28/02/2019				157 (61)	15.7 (7.6)	2.8 (1.2)	13 (14)		81 (125)	62 (47)	3.4 (1.1)			33 (31)	18.4 (6.7)	3.13 (0.39)
04/03/2019				33 (13)			9.3 (4.8)	10.6 (6.5)		7.5 (3.9)	3.9 (1.5)	28 (26)				
06/03/2019	6.7 (4.0)			34.5 (5.7)					14.4 (8.9)	11.1 (4.8)	2.14 (0.31)					2.24 (0.33)
08/03/2019	81 (258)			112 (39)				6.1 (3.1)	10 (14)		10.0 (6.2)	18.2 (7.6)				4.37 (0.87)
12/03/2019	50 (17)			26.8 (4.1)				30.1 (6.3)	62 (12)	30 (10)	132 (199)	67 (73)			81 (147)	34 (26)
14/03/2019				53.5 (4.1)				26 (12)	32.2 (7.4)	33 (17)	4.8 (1.2)					2.69 (0.46)

Table S5. Concentrations (ng/m^3) of water-soluble elements in the $PM_{2.5}$ samples at t = 2 min of the kinetics experiments determined using inductively coupled plasma mass spectrometry.

Date	Al	As	B	Ba	Cd	Co	Cr	Cu	Fe	Ga	Mn	Ni	Pb	Rb	Sr	V	Zn
01/02/2019	0.36	0.17	0.29	<LOD	0.029	<LOD	0.069	1.2	3.0	<LOD	1.3	0.0010	0.77	1.0	0.056	0.10	12
05/02/2019	5.1	0.31	2.2	1.2	0.029	<LOD	1.4	2.0	8.2	0.25	2.4	0	1.4	1.5	0.20	0.23	29
08/02/2019	7.7	0.39	6.9	0.64	0.029	0.012	4.0	3.5	23	0.21	3.4	0.24	2.5	2.6	0.29	0.34	40
12/02/2019	8.8	0.20	3.5	1.6	0.029	0.0038	0.52	2.5	7.0	0.34	2.6	1.2	2.4	1.7	0.28	0.37	32
14/02/2019	19	0.60	10	2.1	0.49	0.0338	1.0	4.8	16	0.47	6.7	0.56	4.1	2.9	0.39	1.0	76
18/02/2019	12	0.96	16	4.2	0.59	0.036	0.97	6.7	51	0.73	8.3	0.92	8.3	3.4	0.45	2.7	97
20/02/2019	14	0.86	18	4.8	0.41	0.057	0.98	8.9	68	0.92	8.4	1.3	6.4	2.4	0.50	2.3	78
22/02/2019	13	0.85	16	2.4	0.56	0.040	1.1	7.7	47	0.50	8.9	0.87	6.9	2.5	0.34	1.8	96
26/02/2019	15	0.52	6.3	2.3	0.65	0.039	0.85	5.5	18	0.43	7.8	0.42	4.3	3.2	1.0	0.26	102
28/02/2019	12	0.51	8.4	1.5	1.6	0.091	0.41	4.3	21	0.28	3.1	1.1	3.1	1.3	0.30	3.7	32
04/03/2019	1.9	<LOD	13	0.21	0.21	0.020	0.54	4.4	26	0.076	3.4	1.2	2.5	1.2	0.16	3.7	37
06/03/2019	1.5	<LOD	4.8	0.12	0.081	<LOD	0.27	3.6	15	0.067	1.9	0.85	3.2	0.85	0.20	2.6	18
08/03/2019	0.73	<LOD	<LOD	0.34	<LOD	<LOD	0.084	2.7	3.8	0.056	0.93	0.26	0.89	0.52	0.31	0.78	13
12/03/2019	1.1	<LOD	<LOD	0.092	<LOD	<LOD	0.025	2.3	1.4	0.047	1.5	0.14	0.49	0.34	0.17	0.0081	15
14/03/2019	1.3	<LOD	1.4	0.062	0.16	<LOD	0.15	3.0	7.9	0.053	1.8	0.34	3.3	0.66	0.17	0.75	17

Table S6. Concentrations (ng/m^3) of water-soluble elements in the $PM_{2.5}$ samples at t > 60 min of the kinetics experiments determined using inductively coupled plasma mass spectrometry.

Date	Al	As	B	Ba	Cd	Co	Cr	Cu	Fe	Ga	Mn	Ni	Pb	Rb	Sr	V	Zn
01/02/2019	2.6	0.22	2.6	2.7	0.029	<LOD	0.12	1.4	4.2	0.18	1.7	0.081	0.62	1.1	0.11	0.16	17
05/02/2019	7.1	0.37	4.3	4.3	0.029	0.013	1.3	3.0	12	0.45	2.8	0.10	1.9	1.6	0.31	0.24	35
08/02/2019	16	0.53	8.8	9.1	0.029	0.017	3.4	4.5	30	0.79	4.0	0.35	2.1	2.6	0.51	0.58	46
12/02/2019	9.2	0.31	4.4	2.3	0.029	0.007	0.49	4.0	16	0.46	3.0	1.7	3.3	1.8	0.31	0.87	39
14/02/2019	25	0.68	13	9.5	0.55	0.043	1.5	7.1	37	0.99	7.9	0.94	5.0	3.0	0.58	1.4	88
18/02/2019	13	0.97	20	9.5	0.67	0.040	1.0	7.7	57	0.81	9.3	1.2	6.2	3.4	0.50	2.9	115
20/02/2019	23	0.90	20	5.8	0.53	0.060	1.0	11	86	1.0	9.4	1.6	7.8	2.4	0.58	2.6	82
22/02/2019	17	0.93	19	8.7	0.69	0.042	1.2	8.3	52	0.75	10	1.0	4.9	2.6	0.47	1.9	105
26/02/2019	16	0.79	11	15	0.73	0.046	0.93	7.3	27	1.1	8.7	0.54	3.4	3.3	1.1	0.32	118
28/02/2019	14	0.52	11	8.2	1.7	0.11	0.45	4.9	24	0.62	3.7	1.5	2.4	1.3	0.43	4.0	45
04/03/2019	5.2	<LOD	13	2.6	0.37	0.0042	0.66	5.3	28	0.20	4.1	1.5	4.5	1.2	0.23	4.0	42
06/03/2019	6.0	<LOD	6.3	2.0	0.15	<LOD	0.56	4.3	19	0.16	3.1	1.5	3.8	0.89	0.22	2.9	36
08/03/2019	1.5	<LOD	0.39	3.5	0.016	<LOD	0.080	2.9	4.2	0.16	1.1	0.45	0.91	0.53	0.32	1.0	19
12/03/2019	3.7	<LOD	<LOD	1.0	0.0027	<LOD	0.026	3.3	5.5	0.13	1.8	0.20	0.67	0.34	0.20	0.020	17
14/03/2019	1.9	<LOD	2.3	1.9	0.25	<LOD	0.18	3.6	10	0.13	2.4	0.47	4.7	0.71	0.17	0.90	28

Table S7. Speciation of each metal in deliquescent aerosol, obtained with the model Visual MinteQ, as percent distribution of the different chemical species.

Component	Species name	01/02/ 2019	05/02/ 2019	08/02/ 2019	12/02/ 2019	14/02/ 2019	18/02/ 2019	20/02/ 2019	22/02/ 2019	26/02/ 2019	28/02/ 2019	04/03/ 2019	06/03/ 2019	08/03/ 2019	12/03/ 2019*	14/03/ 2019
Al(III)	Al^{3+}	10.79	0.02		0.02	0.01		0.03		0.02		0.08		0.46		
	$AlOH^{2+}$													0.05		
	$AlCl^{2+}$	0.01	0.06	0.04	0.11	0.04				0.14	0.07			0.34		0.01
	$AlSO_4^{+}$	23.70	43.63	40.48	63.09	42.32	2.73	13.80	2.63	50.66	44.56	21.76	28.31	15.08		28.19
	$Al(SO_4)_2^{-}$	5.13	8.36	13.85	10.59	9.83	0.57	3.11	0.57	7.44	13.80	12.31	13.85	0.03		6.14
	$AlHPO_4^{+}$	0.03					0.21	0.14	0.05	0.01			0.38			1.20
	$Al\text{-}(Malonate)_2^{-}$	0.15					22.79	2.07	22.25			0.76	6.04	0.43		5.46
	$Al\text{-}Malonate^{+}$	5.14	0.02			0.07	21.38	14.08	20.48	0.02	0.01	6.61	22.80	73.44		32.72
	$Al\text{-}Succinate^{+}$							0.02						0.06		
	$AlH\text{-}Oxalate^{2+}$	0.27	1.09	2.28	5.34	0.84				0.98	1.37	0.04				
	AlOH-Oxalate	0.04					0.07	0.21	0.09			0.03	0.02	0.07		0.04
	$Al\text{-}(Oxalate)_3^{3-}$	0.39										0.05				
	$Al\text{-}(Oxalate)_2^{-}$	14.77	7.13	10.19	1.18	8.39	32.55	27.08	34.23	4.46	8.28	27.84	8.31	0.01		4.21
	$Al\text{-}Oxalate^{+}$	39.57	39.68	33.16	19.66	38.49	19.69	39.45	19.68	36.26	31.90	30.53	20.27	10.00		22.01
Cr(III)	$Cr(OH)_2^{+}$													0.04		
	Cr^{3+}	45.05	0.09	0.05	0.11	0.07	0.09	0.62	0.08	0.13	0.06	1.19	0.04	7.58		0.09
	$CrOH^{2+}$	0.11					0.08	0.24	0.09			0.05	0.02	21.49		0.04
	$CrCl^{2+}$	0.02	0.11	0.09	0.21	0.07	0.06	0.02	0.03	0.35	0.19	0.04	0.03	2.36		0.04
	$CrSO_4^{+}$	37.84	95.20	98.40	98.42	95.59	99.35	98.87	99.55	96.11	98.74	98.62	99.76	65.76		99.37
	$CrOHSO_4$ (aq)						0.08	0.10	0.08			0.03	0.04	0.21		0.04
	$CrNH_3^{3+}$													0.17		
	$CrNO_3^{2+}$	0.02	0.14	0.12	0.43	0.24	0.31	0.15	0.16	0.70	0.32	0.07	0.08	2.38		0.37
	$CrH_2PO_4^{2+}$	0.01	0.02		0.01	0.01	0.04			0.06			0.04			0.05
	$Cr\text{-}Acetate^{2+}$	16.95	4.44	1.32	0.81	4.01				2.64	0.68					
	$Cr\text{-}(Acetate)_2^{+}$		0.02			0.02										

Cu(II)	**Cu^{2+}**	54.92	0.35	0.22	0.12	0.12	0.12	1.68	0.25	0.08	0.09	4.56	0.33	3.58	0.10
	$CuCl^{+}$	0.47	1.56	1.24	0.71	0.37	0.25	0.28	0.27	0.66	0.82	1.09	0.65	3.21	0.15
	$CuCl_2$ (aq)		0.05	0.05	0.04					0.05	0.07		0.01	0.03	
	$CuSO_4$ (aq)	17.08	1.60	1.77	0.48	0.66	0.59	3.93	1.31	0.27	0.63	14.39	3.86	0.15	0.52
	$CuHSO_4^{+}$	0.16	0.86	2.33	2.45	0.28				0.14	0.50	0.10	0.02		
	$CuNH_3^{2+}$							0.02						0.12	
	$CuNO_3^{+}$	12.37	57.62	47.72	40.71	42.08	40.85	67.61	50.08	35.67	36.53	56.91	54.64	84.43	39.34
	$Cu(NO_3)_2$ (aq)	0.14	35.02	39.43	52.45	55.46	52.84	20.52	37.20	62.69	59.75	9.33	34.52	7.87	59.03
	CuH-Malonate^{+}	5.06	0.07	0.05		0.07	1.50	0.86	2.58		0.02	5.03	3.23	0.12	0.39
	Cu-(Malonate)$_2^{2-}$								0.01			2.70			
	Cu-Malonate (aq)	2.10					2.76	2.33	5.92				1.95	0.46	0.36
	CuH-Succinate^{+}						0.03	0.12	0.06				0.01	0.01	
	Cu-(Oxalate)$_2^{2-}$	0.69					0.03	0.07	0.07			0.33			
	Cu-Oxalate (aq)	6.12	0.31	0.34	0.04	0.13	0.99	2.51	2.18	0.05	0.11	4.96	0.70	0.03	0.10
	CuH-Oxalate^{+}	0.86	2.55	6.85	3.00	0.83	0.03	0.06	0.06	0.40	1.47	0.57	0.07		
	Cu-Acetate^{+}	0.02													
Fe(III)	**Fe^{3+}**	0.29													
	$FeOH^{2+}$	0.06												0.90	
	$Fe(OH)_2^{+}$													1.13	
	$FeCl^{2+}$	0.01	0.13	0.08	0.64	0.07				0.42	0.17			0.18	
	$FeSO_4^{+}$	1.37	5.46	4.49	18.24	4.99	0.01	0.30	0.01	7.35	5.42	0.77	0.38	0.36	0.36
	$Fe(SO_4)_2^{-}$	0.15	0.51	0.71	1.33	0.57		0.03		0.45	0.71	0.19	0.08		0.04
	$FeH_2PO_4^{2+}$	0.08	0.19	0.04	0.20	0.12				0.34	0.02		0.01		0.02
	$FeHPO_4^{+}$	0.43	0.25	0.02	0.02	0.21	0.17	0.62	0.04	0.37	0.01		0.93		3.05
	Fe-(Malonate)$_3^{3-}$	0.03													
	Fe-(Malonate)$_2^{-}$	9.04					88.51	45.66	88.52			25.60	74.86	9.00	69.07
	Fe-Malonate^{+}	15.44	0.15	0.03	0.01	0.42	4.29	15.81	4.15	0.14	0.08	11.84	15.19	84.86	21.64
	Fe-Succinate^{+}							0.22						0.85	0.03

	Fe-(Oxalate)$_3^{3-}$	9.09						0.06				0.63			
	Fe-(Oxalate)$_2^{-}$	40.53	42.36	55.30	17.02	47.01	6.19	28.31	6.45	32.44	50.46	49.07	5.55	0.02	2.69
	Fe-Oxalate^{+}	23.49	50.96	39.32	62.54	46.60	0.82	8.96	0.81	58.50	43.15	11.88	3.00	2.69	3.09
Fe(II)	**Fe^{2+}**	73.57	10.47	7.63	12.30	10.10	9.63	26.53	12.54	10.10	7.76	21.97	5.45	72.43	9.40
	FeCl^{+}	0.25	19.22	17.36	28.02	13.14	8.18	1.80	5.37	32.23	28.18	2.04	4.03	24.27	5.65
	FeSO$_4$ (aq)	25.05	52.87	68.23	53.38	61.90	52.58	67.96	71.81	38.10	61.78	75.53	68.52	3.26	53.28
	FeH$_2$PO$_4^{+}$	0.97	17.26	6.57	6.23	14.65	27.54	2.91	7.47	19.45	2.09		21.71		31.41
	Fe-Malonate (aq)						0.65	0.11	0.88			0.04	0.09	0.03	0.10
	Fe-Oxalate (aq)	0.14	0.17	0.21	0.07	0.19	1.41	0.70	1.93	0.11	0.18	0.42	0.20		0.16
	Fe-Acetate^{+}		0.02			0.02									
Mn(II)	**Mn^{2+}**	72.68	0.09	0.05	0.02	0.02	0.02	0.67	0.06	0.01	0.01	3.27	0.09	2.84	0.02
	MnCl$_3^{-}$		0.03	0.03	0.01					0.02	0.03				
	MnCl$_2$ (aq)		0.16	0.14	0.06	0.02				0.06	0.09	0.05	0.03	0.17	
	MnCl^{+}	0.40	0.25	0.18	0.08	0.04	0.03	0.07	0.04	0.06	0.08	0.48	0.10	1.51	0.02
	MnSO$_4$ (aq)	17.55	0.31	0.31	0.07	0.08	0.08	1.22	0.25	0.03	0.08	8.01	0.77	0.09	0.06
	MnNO$_3^{+}$	7.24	6.41	4.89	3.26	3.09	3.20	12.02	5.38	2.43	2.61	18.50	6.44	30.92	2.79
	Mn(NO$_3$)$_2$ (aq)	2.01	92.75	94.40	96.50	96.75	96.66	86.00	94.25	97.38	97.10	69.63	92.57	64.47	97.11
	Mn-Oxalate (aq)	0.11						0.01				0.05			
Ni(II)	**Ni^{2+}**	66.82		0.60	0.40	0.39	0.39	3.11	0.66	0.30	0.32	7.47	0.76	5.40	0.35
	NiCl^{+}	0.13		0.76	0.52	0.28	0.19	0.12	0.16	0.54	0.65	0.39	0.32	1.02	0.12
	NiCl$_2$ (aq)			0.01						0.01	0.02				
	NiSO$_4$ (aq)	19.78		4.62	1.50	2.05	1.85	6.90	3.27	0.96	2.15	22.03	8.14	0.21	1.68
	Ni(SO$_4$)$_2^{2-}$	0.02										0.01			
	NiNO$_3^{+}$	10.55		93.74	97.54	97.14	95.96	88.34	93.29	98.13	96.75	66.98	89.48	93.32	97.58
	NiH$_2$PO$_4^{+}$	0.02					0.02						0.05		0.02
	NiH-Malonate^{+}	0.64		0.02		0.02	0.51	0.17	0.71			0.84	0.74	0.02	0.14
	Ni-Malonate (aq)	0.06					0.20	0.10	0.35			0.10	0.10	0.02	0.03

	NiH-Succinate^{+}						0.01	0.03	0.02						
	Ni-(Oxalate)$_2^{2-}$	0.01													
	Ni-Oxalate (aq)	1.98		0.25	0.03	0.11	0.87	1.24	1.53	0.05	0.11	2.17	0.42	0.01	0.09
Pb(II)	**Pb^{2+}**	29.46	0.01					0.09				0.45	0.01	0.35	0.06
	PbCl^{+}	4.48	0.93	0.69	0.31	0.15	0.11	0.27	0.16	0.25	0.32	1.94	0.42	5.72	0.01
	PbCl$_2$ (aq)	0.08	0.63	0.58	0.27	0.07	0.04	0.01	0.03	0.30	0.44	0.23	0.12	0.73	
	PbCl$_3^{-}$		0.32	0.37	0.17	0.03				0.26	0.44	0.03	0.02	0.07	
	PbCl$_4^{2-}$			0.01						0.01	0.02				
	PbSO$_4$ (aq)	25.55	0.15	0.15	0.03	0.04	0.04	0.57	0.12	0.02	0.04	3.75	0.36	0.04	0.03
	Pb(SO$_4$)$_2^{2-}$	3.77						0.01				0.33			
	PbNO$_3^{+}$	29.11	8.37	6.48	4.41	4.12	4.31	15.79	7.17	3.31	3.54	24.92	8.69	37.32	3.79
	Pb(NO$_3$)$_2$ (aq)	5.97	89.54	91.66	94.78	95.58	95.48	83.20	92.48	95.86	95.20	68.13	90.35	55.78	96.10
	PbH$_2$PO$_4^{+}$	0.03													
	PbH-Malonate^{+}	0.33							0.01			0.06	0.01		
	Pb-Malonate (aq)	0.01													
	PbH-Oxalate^{+}	0.13	0.02	0.06	0.02							0.02			
	Pb-Oxalate (aq)	1.04						0.04	0.02			0.15			
	Pb-Acetate^{+}	0.03													
Zn(II)	**Zn^{2+}**	61.55	0.36	0.23	0.12	0.11	0.12	1.93	0.28	0.07	0.08	5.58	0.36	4.14	0.09
	ZnCl^{+}	0.82	2.58	2.09	1.09	0.56	0.39	0.51	0.47	0.92	1.18	2.08	1.07	5.69	0.22
	ZnCl$_4^{2-}$			0.01						0.02	0.03				
	ZnCl$_3^{-}$		0.22	0.30	0.17	0.02				0.30	0.49		0.02	0.02	
	ZnCl$_2$ (aq)		0.35	0.38	0.22	0.05	0.03		0.02	0.27	0.39	0.06	0.07	0.19	0.01
	ZnSO$_4$ (aq)	19.73	1.73	1.95	0.48	0.64	0.60	4.64	1.49	0.25	0.59	17.88	4.19	0.17	0.49
	Zn(SO$_4$)$_2^{2-}$	5.08	0.02	0.04		0.01		0.17	0.02		0.01	2.66	0.12		
	ZnNO$_3^{+}$	11.18	48.59	41.42	32.44	32.25	32.62	62.57	44.94	26.15	27.28	56.01	47.13	78.31	29.61
	Zn(NO$_3$)$_2$ (aq)	0.20	46.10	53.51	65.45	66.33	65.95	29.66	52.14	72.01	69.93	14.38	46.65	11.45	69.52
	ZnH-Malonate^{+}	0.44					0.11	0.08	0.22			0.47	0.26	0.01	0.03

Zn-Malonate (aq)	0.03				0.03	0.03	0.07		0.04	0.02	
ZnH-Succinate^{+}						0.03	0.01				
Zn-Oxalate (aq)	0.96	0.05	0.05	0.02	0.14	0.40	0.34	0.02	0.85	0.11	0.01

*Sample from the 12/03/2019 was collected in conditions of low RH (<40%) so that an aerosol liquid water content could not be calculated

Table S8. Amount in percentage of the metal predicted to form solid precipitates* in deliquescent aerosol, obtained with the model Visual MinteQ.

Date	Ca	Pb	Mn	Fe	Al
01/02/2019	28.2	0.0	0.0	0.0	0.0
05/02/2019	85.8	0.0	0.0	0.0	0.0
08/02/2019	89.8	0.0	0.0	0.0	0.0
12/02/2019	85.1	0.0	0.0	0.0	0.0
14/02/2019	50.4	0.0	0.0	0.0	0.0
18/02/2019	79.8	3.4	0.0	0.0	0.0
20/02/2019	48.7	0.0	26.4	0.0	0.0
22/02/2019	77.6	0.0	27.9	0.0	0.0
26/02/2019	52.9	0.0	0.0	0.0	0.0
28/02/2019	40.1	0.0	0.0	0.0	0.0
04/03/2019	74.8	0.0	0.0	0.0	0.0
06/03/2019	67.8	0.0	33.2	0.0	0.0
08/03/2019	48.4	0.0	0.0	98.2	46.4
12/03/2019					
14/03/2019	53.2	0.0	19.0	0.0	0.0

*Solids predicted to form in deliquescent aerosol are: calcium oxalate ($CaC_2O_4 \cdot H_2O$), gypsum ($CaSO_4 \cdot 2H_2O$), chloropyromorphite ($Pb_5(PO_4)_3Cl$), manganese hydrogen phosphate ($MnHPO_4$), ferrihydrite ($Fe_2O_3 \cdot 0.5H_2O$), and aluminium hydroxide sulphate ($AlOHSO_4$).

Table S9. Speciation of each metal in simulated fog water, obtained with the model Visual MinteQ, as percent distribution of the different chemical species.

Component	Species name	01/02/ 2019	05/02/ 2019	08/02/ 2019	12/02/ 2019	14/02/ 2019	18/02/ 2019	20/02/ 2019	22/02/ 2019	26/02/ 2019	28/02/ 2019	04/03/ 2019	06/03/ 2019	08/03/ 2019	12/03/ 2019	14/03/ 2019
Al(III)	**Al^{3+}**	2.08	4.52	1.10	6.24	1.48	0.23	0.45	0.29	1.19	0.53	0.23	0.22	0.78	17.49	0.64
	$AlOH^{2+}$	0.25	0.53	0.12	0.73	0.16	0.02	0.05	0.03	0.13	0.06	0.02	0.02	0.09	2.07	0.07
	$Al(OH)_2^+$		0.02		0.02										0.06	
	$AlSO_4^+$	0.15	0.34	0.17	0.50	0.20	0.05	0.11	0.07	0.14	0.09	0.07	0.06	0.08	0.73	0.07
	$AlHPO_4^+$		0.06	0.03	0.09	0.04				0.04						
	Al-$(Malonate)_2^-$	0.01					0.03	0.02	0.04							
	Al-$Malonate^+$	2.20	0.62	0.87	0.87	1.31	0.94	1.08	1.26	0.22	0.51	0.45	0.43	0.04		0.40
	AlOH-Succinate (aq)		0.02	0.01	0.02											
	AlOH-$(Oxalate)_2^{2-}$	0.22	0.12	0.38	0.09	0.32	0.82	0.67	0.77	0.38	0.58	0.80	0.81	0.44	0.03	0.52
	$Al(OH)_2$-$Oxalate^-$	2.04	2.20	1.84	2.20	1.92	1.12	1.40	1.20	1.86	1.52	1.15	1.13	1.73	2.00	1.62
	AlOH-Oxalate	19.70	21.13	17.52	21.10	18.30	10.53	13.07	11.27	17.62	14.44	10.82	10.69	16.64	19.33	15.41
	Al-$(Oxalate)_3^{3-}$	0.03		0.10		0.07	0.80	0.42	0.66	0.10	0.28	0.73	0.75	0.14		0.21
	Al-$(Oxalate)_2^-$	15.74	8.52	26.12	6.23	21.93	53.76	43.31	50.48	25.98	39.10	53.48	53.98	31.24	1.81	35.46
	Al-$Oxalate^+$	57.55	61.87	51.71	61.86	54.21	31.68	39.40	33.92	52.32	42.87	32.26	31.89	48.81	56.48	45.58
	AlOH-$Acetate^+$	0.01	0.05	0.03	0.05	0.04				0.01						
Cr(III)	**$Cr(OH)_2^+$**	0.55	0.54	0.51	0.54	0.50	0.46	0.46	0.46	0.51	0.50	0.49	0.49	0.55	0.56	0.52
	Cr^{3+}	25.57	25.48	25.29	25.79	25.55	26.96	27.11	27.07	26.68	26.46	26.53	26.35	26.16	25.92	26.24
	$CrOH^{2+}$	72.15	71.10	67.93	71.50	67.33	65.72	65.63	65.83	69.45	68.86	67.69	67.14	72.23	73.04	69.61
	$Cr(OH)_3$ (aq)	0.01	0.01	0.01	0.01	0.01				0.01	0.01	0.01	0.01	0.01	0.01	0.01
	$CrSO_4^+$	0.65	0.69	1.44	0.74	1.24	2.04	2.41	2.21	1.12	1.68	2.92	2.45	0.95	0.39	1.02
	$CrOHSO_4$ (aq)	0.04	0.04	0.09	0.05	0.08	0.13	0.15	0.14	0.07	0.11	0.18	0.15	0.06	0.03	0.06
	Cr-$Acetate^{2+}$	1.02	2.13	4.73	1.37	5.30	4.68	4.24	4.28	2.16	2.38	2.18	3.42	0.05	0.06	2.54
Cu(II)	**Cu^{2+}**	75.31	86.68	63.86	89.75	68.85	33.48	44.98	36.47	65.54	49.64	34.07	33.62	58.60	96.49	53.78
	$CuOH^+$	0.04	0.05	0.03	0.05	0.04	0.02	0.02	0.02	0.03	0.03	0.02	0.02	0.03	0.05	0.03
	$CuSO_4$ (aq)	0.25	0.31	0.49	0.34	0.46	0.37	0.59	0.44	0.38	0.44	0.53	0.44	0.28	0.19	0.29

	$CuNO_3^+$	0.01	0.02	0.04	0.03	0.08	0.11	0.15	0.12	0.10	0.07	0.05	0.06			0.06
	CuH-Malonate$^+$	0.01				0.01	0.03	0.02	0.03			0.01	0.01			
	Cu-Malonate (aq)	2.16	0.32	1.42	0.34	1.74	4.09	3.28	4.90	0.35	1.39	2.00	1.95	0.08		0.95
	$Cu\text{-}(Oxalate)_2^{2-}$	0.51	0.15	1.46	0.08	1.01	8.66	4.88	7.25	1.45	3.71	8.41	8.65	2.16		2.92
	Cu-Oxalate (aq)	21.70	12.46	32.65	9.39	27.78	53.21	46.05	50.73	32.13	44.69	54.89	55.23	38.82	3.25	41.94
	CuH-Oxalate$^+$			0.01		0.01	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.02		0.02
Fe(III)	**Fe^{3+}**	0.03	0.05	0.02	0.05	0.03				0.02				0.01	0.06	0.01
	$FeOH^{2+}$	6.95	10.36	3.99	11.35	5.14	0.59	1.30	0.75	4.20	1.75	0.61	0.59	2.93	13.13	2.23
	$Fe(OH)_2^+$	43.25	64.10	24.10	69.93	30.72	3.35	7.40	4.25	24.91	10.35	3.58	3.44	18.03	81.74	13.38
	$FeHPO_4^+$	0.05	0.28	0.22	0.34	0.27	0.03	0.03	0.02	0.30	0.03		0.02			0.03
	$Fe\text{-}(Malonate)_2^-$	0.47	0.01	0.17	0.01	0.29	0.83	0.66	1.27	0.01	0.12	0.19	0.18			0.06
	Fe-Malonate$^+$	3.78	0.73	1.70	0.82	2.50	1.40	1.85	1.96	0.43	0.94	0.69	0.66	0.08		0.76
	Fe-Succinate$^+$		0.07	0.08	0.05	0.06	0.01	0.02	0.01	0.06	0.02					0.02
	$Fe\text{-}(Oxalate)_3^{3-}$	0.40	0.08	1.52	0.03	1.03	9.35	5.67	8.03	1.57	4.04	8.65	8.87	2.21		3.14
	$Fe\text{-}(Oxalate)_2^-$	25.11	9.43	47.69	5.51	39.01	74.85	69.34	73.04	47.64	66.81	76.28	76.42	57.28	0.65	62.82
	Fe-Oxalate$^+$	19.95	14.88	20.52	11.88	20.96	9.59	13.71	10.67	20.86	15.92	10.00	9.81	19.45	4.41	17.55
Fe(II)	**Fe^{2+}**	99.13	99.36	98.27	99.40	98.56	96.11	96.85	96.34	98.51	97.51	95.65	95.83	98.34	99.73	98.08
	$FeSO_4$ (aq)	0.36	0.38	0.82	0.41	0.72	1.16	1.38	1.26	0.62	0.94	1.62	1.37	0.51	0.21	0.57
	$FeH_2PO_4^+$			0.01						0.01						
	Fe-Malonate (aq)						0.04	0.02	0.04			0.02	0.02			
	Fe-Oxalate (aq)	0.50	0.25	0.88	0.18	0.70	2.69	1.74	2.36	0.85	1.54	2.71	2.77	1.15	0.06	1.34
Mn(II)	**Mn^{2+}**	99.32	99.51	98.66	99.54	98.86	96.81	97.43	97.01	98.80	98.01	96.55	96.68	98.70	99.80	98.45
	$MnSO_4$ (aq)	0.25	0.27	0.59	0.29	0.51	0.83	0.98	0.90	0.44	0.67	1.16	0.98	0.37	0.15	0.41
	$MnNO_3^+$		0.01	0.03	0.02	0.05	0.14	0.15	0.14	0.06	0.06	0.06	0.07			0.05
	Mn-Malonate (aq)						0.03	0.02	0.04			0.02	0.02			
	Mn-Oxalate (aq)	0.41	0.20	0.72	0.15	0.57	2.18	1.42	1.91	0.69	1.25	2.21	2.25	0.93	0.05	1.09
Ni(II)	**Ni^{2+}**	92.54	95.98	87.36	96.92	89.66	69.33	77.49	71.95	87.92	79.96	69.00	68.68	84.64	98.93	82.34

	$NiSO_4$ (aq)	0.29	0.32	0.64	0.35	0.57	0.72	0.95	0.81	0.48	0.66	1.01	0.85	0.38	0.18	0.41
	$NiNO_3^+$		0.02	0.04	0.03	0.08	0.16	0.19	0.17	0.09	0.08	0.07	0.08			0.06
	Ni-Malonate (aq)	0.06		0.04		0.05	0.19	0.13	0.22	0.01	0.05	0.09	0.09			0.03
	Ni-$(Oxalate)_2^{2-}$			0.03		0.02	0.28	0.13	0.22	0.03	0.09	0.26	0.27	0.05		0.07
	Ni-Oxalate (aq)	7.09	3.67	11.88	2.70	9.62	29.31	21.10	26.62	11.46	19.15	29.56	30.02	14.92	0.89	17.08
Pb(II)	**Pb^{2+}**	90.82	94.61	84.32	95.63	86.83	64.69	72.79	67.28	84.92	76.07	64.28	64.09	81.79	98.33	79.05
	$PbOH^+$	0.06	0.06	0.05	0.06	0.05	0.04	0.04	0.04	0.05	0.04	0.04	0.04	0.05	0.06	0.05
	$PbCl^+$		0.02	0.03	0.01	0.02	0.03	0.02	0.02	0.05	0.05	0.03	0.03	0.05	0.01	0.01
	$PbSO_4$ (aq)	0.82	0.92	1.78	0.99	1.59	1.96	2.60	2.21	1.35	1.84	2.74	2.31	1.07	0.53	1.15
	$PbNO_3^+$	0.06	0.11	0.23	0.16	0.45	0.92	1.09	0.97	0.54	0.49	0.41	0.46	0.06	0.04	0.38
	Pb-Malonate (aq)	0.03		0.02		0.03	0.09	0.06	0.10		0.02	0.04	0.04			0.02
	Pb-Succinate (aq)		0.01	0.03		0.02	0.03	0.03	0.03	0.03	0.02		0.02			0.01
	PbH-$Oxalate^+$						0.01		0.01			0.01	0.01			
	Pb-$(Oxalate)_2^{2-}$						0.01		0.01			0.01	0.01			
	Pb-Oxalate (aq)	8.19	4.26	13.50	3.13	10.97	32.19	23.33	29.31	13.04	21.45	32.42	32.98	16.97	1.04	19.31
	Pb-$Acetate^+$		0.01	0.03		0.03	0.02	0.02	0.02	0.01	0.01		0.01			0.01
Zn(II)	**Zn^{2+}**	95.78	97.66	92.58	98.15	93.94	80.77	86.19	82.56	92.96	87.99	80.42	80.28	91.10	99.33	89.64
	$ZnSO_4$ (aq)	0.32	0.36	0.73	0.38	0.64	0.92	1.15	1.01	0.55	0.79	1.28	1.08	0.45	0.20	0.49
	$ZnNO_3^+$	0.01	0.02	0.05	0.03	0.09	0.21	0.24	0.22	0.11	0.10	0.09	0.11	0.01		0.08
	Zn-Malonate (aq)	0.03		0.02		0.03	0.11	0.07	0.12		0.03	0.05	0.05			0.02
	Zn-$(Oxalate)_2^{2-}$						0.06	0.03	0.05		0.02	0.06	0.06			0.01
	Zn-Oxalate (aq)	3.85	1.96	6.61	1.43	5.29	17.92	12.32	16.03	6.36	11.06	18.09	18.42	8.43	0.47	9.76

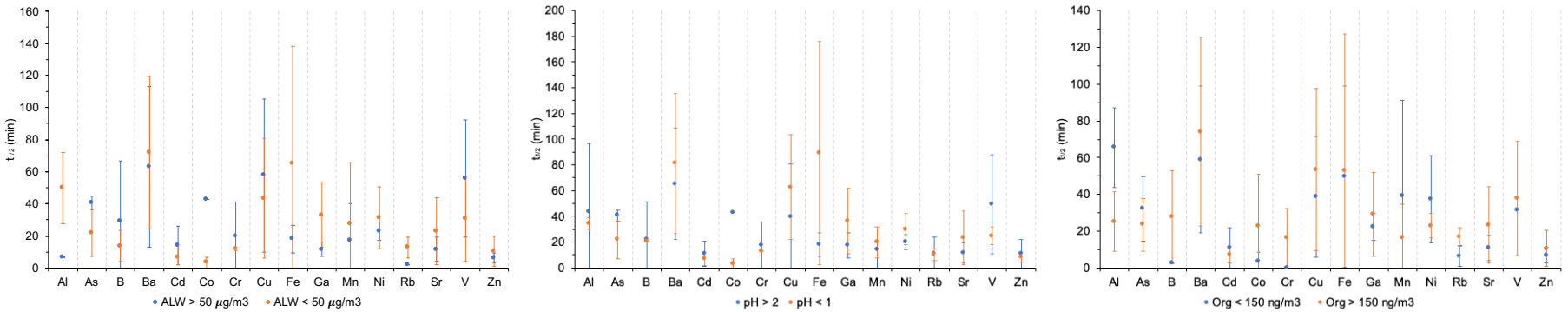

Figure S1. Difference in solubilisation kinetics (average $t_{1/2}$ and standard deviation across different samples) in samples with high and low ALW (left panel), less and more acidic conditions (central panel), high and low organic acid content (right panel).

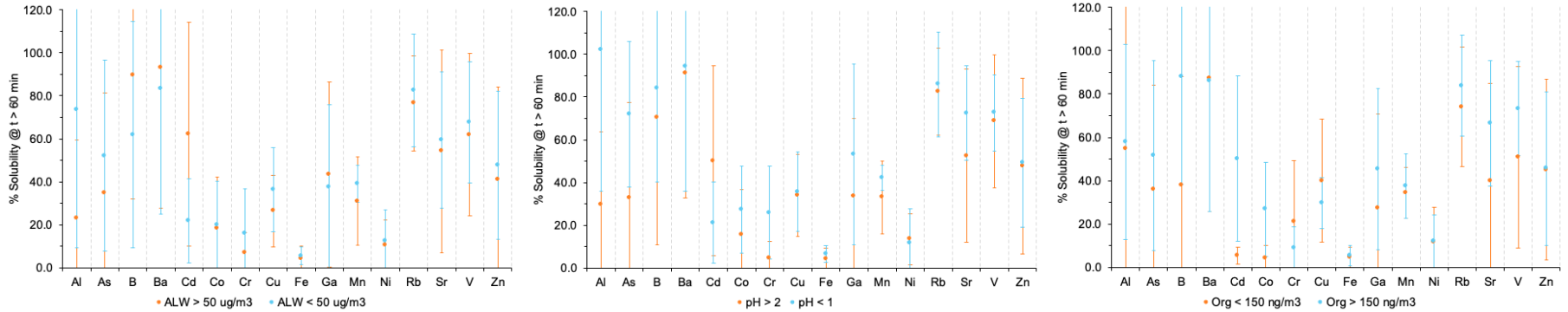

Figure S2. Difference in solubility (average S_∞ and standard deviation across different samples) in samples with high and low ALW (left panel), less and more acidic conditions (central panel), high and low organic acid content (right panel).

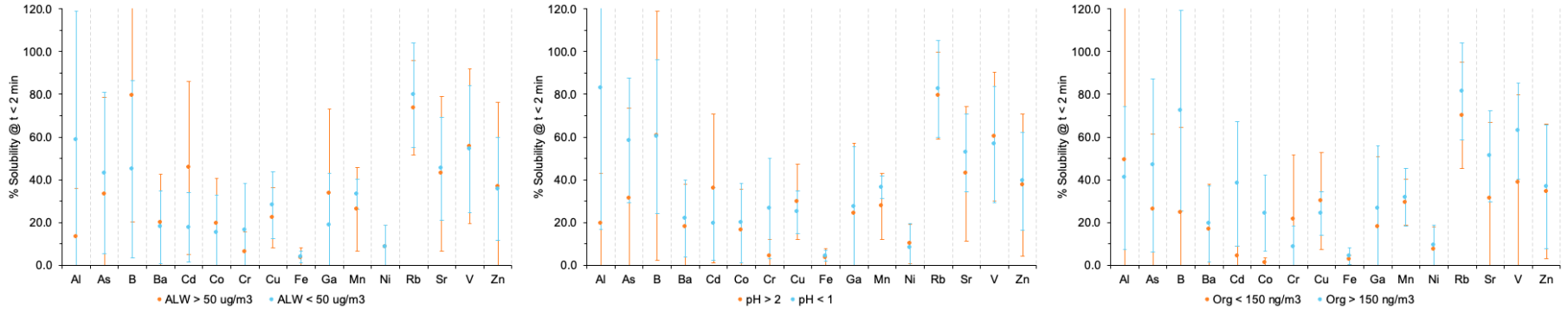

Figure S3. Difference in solubility at t = 2 min of the kinetics experiments (average S_0 and standard deviation across different samples) in samples with high and low ALW (left panel), less and more acidic conditions (central panel), high and low organic acid content (right panel).