

**SCHMÜCKE HILL CAP CLOUD AND VALLEY STATIONS AEROSOL CHARACTERISATION  
DURING FEBUKO (I): PARTICLE SIZE DISTRIBUTION, MASS, AND MAIN COMPONENTS**

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**ELECTRONIC SUPPLEMENTAL MATERIAL (ESM)**

Table I

Trace gas mixing ratios during the FEBUKO events I, II, and III (data are calculated half hour mean values)

Table II

Concentration of components of particles at the upwind station Goldlauter in  $\mu\text{g m}^{-3}$  (\*: in  $\text{ng m}^{-3}$ , n.d.: not detectable)

Table III

Concentration of components of cloud water at the summit station Schmücke in  $\mu\text{g m}^{-3}$  (\*: in  $\text{ng m}^{-3}$ , n.d.: not detectable)

Table IV

Time series of pH value and liquid water content of events I, II, and III at summit site

Table V

Concentration of components of particles at the downwind station Gehlberg in  $\mu\text{g m}^{-3}$  (\*: in  $\text{ng m}^{-3}$ , n.d.: not detectable)

Table I  
Trace gas mixing ratios during the FEBUKO events I, II, and III  
(data are calculated half hour mean values)

Trace gas mixing ratios (ppbv) at upwind site		O <sub>3</sub>	SO <sub>2</sub>	CO	NO	NO <sub>2</sub>
		ppbv	ppbv	ppbv	ppbv	ppbv
Event I						
26.10.01	22:30	22.69	0.50	221.21	0.03	5.19
26.10.01	23:00	24.31	0.64	233.88	0.01	4.18
26.10.01	23:30	23.23	1.21	211.44	0.01	4.56
26.10.01	0:00	21.51	1.13	214.47	0.00	5.19
27.10.01	0:30	19.97	0.83	211.60	0.02	6.05
27.10.01	1:00	18.43	0.78	222.46	0.01	6.85
27.10.01	1:30	17.44	0.70	228.60	0.01	7.15
27.10.01	2:00	15.89	0.62	225.37	0.01	7.21
27.10.01	2:30	14.58	0.53	225.98	0.01	7.44
27.10.01	3:00	14.43	0.45	229.92	0.03	7.49
27.10.01	3:30	13.36	0.56	235.73	0.04	8.29
27.10.01	4:00	13.43	0.49	235.53	0.04	8.49
27.10.01	4:30	19.25	0.47	206.76	0.02	6.25
27.10.01	5:00	24.24	0.60	185.68	0.01	4.95
27.10.01	5:30	23.34	0.58	198.71	0.02	4.63
27.10.01	6:00	21.05	0.61	218.11	0.01	4.83
27.10.01	6:30	20.14	0.79	224.60	0.15	7.06
27.10.01	7:00	15.26	0.73	239.87	0.33	8.19
27.10.01	7:30	11.48	0.77	250.92	1.04	9.86
27.10.01	8:00	11.35	0.64	243.22	1.00	10.10
27.10.01	8:30	13.12	0.63	264.35	1.08	9.23
27.10.01	9:00	15.52	0.75	252.45	1.30	8.84
27.10.01	9:30	16.60	0.71	229.47	0.90	8.92
27.10.01	10:00	17.39	0.69	230.46	1.12	8.18
27.10.01	10:30	20.13	0.73	215.36	1.05	7.10
27.10.01	11:00	25.15	0.85	259.28	0.96	5.29
27.10.01	11:30	23.16	0.80	423.43	0.43	5.85
27.10.01	12:00	21.77	0.91	302.12	0.36	6.13
27.10.01	12:30	22.91	0.96	261.49	0.36	5.79
27.10.01	13:00	23.63	0.86	243.99	0.37	5.86

Table I  
(continued)

Event II		O <sub>3</sub> ppbv	SO <sub>2</sub> ppbv	CO ppbv	NO ppbv	NO <sub>2</sub> ppbv
6.10.01	11:01	22.00	0.75	279.46	1.50	6.25
6.10.01	11:31	23.02	0.89	276.33	1.66	6.09
6.10.01	12:01	24.44	0.74	282.16	1.29	6.16
6.10.01	12:31	24.72	0.68	300.06	0.98	5.70
6.10.01	13:01	25.98	0.76	299.31	1.08	5.24
6.10.01	13:31	25.45	0.65	291.85	0.49	5.67
6.10.01	14:01	29.04	0.63	282.59	0.57	
6.10.01	14:31	34.24	0.51	254.76	0.28	2.34
6.10.01	15:01	32.38	0.52	294.34	0.16	3.50
7.10.01	14:00	24.77	0.27	246.08	0.05	3.09
7.10.01	14:30	25.19	0.28	241.02	0.05	3.33
7.10.01	15:00	27.94	0.24	254.51	0.13	2.39
7.10.01	15:30	27.35	0.18	230.57	0.05	1.59
7.10.01	18:30	11.45	0.25	199.85	0.16	2.05
7.10.01	19:00	14.00	0.23	225.60	0.09	1.70
7.10.01	19:30	17.16	0.19	212.89	0.03	1.53
7.10.01	20:00	19.37	0.21	205.54	0.05	1.49
7.10.01	20:30	29.92	0.22	224.17	0.03	1.52
7.10.01	21:00	29.54	0.19	229.55	0.01	1.71
7.10.01	21:30	27.56	0.19	253.81	0.00	2.14
7.10.01	22:00	27.83	0.19	263.30	0.00	2.35
7.10.01	22:30	27.02	0.25	247.70	0.01	2.76
7.10.01	23:00	27.08	0.25	230.86	0.00	2.74
7.10.01	23:30	27.30	0.24	237.31	0.00	2.78
7.10.01	0:00	26.56	0.25	238.46	0.01	3.16
8.10.01	0:30	27.09	0.28	248.06	0.00	3.09
8.10.01	1:00	25.16	0.28	237.09	0.01	3.21
8.10.01	1:30	25.31	0.23	230.40	0.00	2.87
8.10.01	2:00	25.32	0.26	227.64	0.00	2.88
8.10.01	2:30	25.68	0.30	243.45	0.00	2.47
8.10.01	3:00	23.82	0.35	233.68	0.01	2.53
8.10.01	3:30	22.46	0.32	210.76	0.04	2.79
8.10.01	4:00	22.23	0.35	233.90	0.01	3.10
8.10.01	4:30	20.82	0.34	239.98	0.03	3.38
8.10.01	5:00	22.37	0.32	255.59	0.03	3.58
8.10.01	5:30	20.71	0.27	232.63	0.03	4.14

Table I  
(continued)

		O <sub>3</sub> ppbv	SO <sub>2</sub> ppbv	CO ppbv	NO ppbv	NO <sub>2</sub> ppbv
<b>Event II (continued)</b>						
8.10.01	6:00	19.98	0.30	259.75	0.09	4.75
8.10.01	6:30	21.04	0.32	222.91	0.21	4.68
8.10.01	7:00	18.98	0.33	227.92	0.40	5.29
8.10.01	7:30	19.70	0.31	219.26	0.54	5.08
8.10.01	8:00	21.20	0.31	212.46	0.51	5.21
8.10.01	8:30	20.81	0.28	212.92	0.59	5.29
8.10.01	9:00	22.40	0.30	213.65	0.76	4.87
8.10.01	9:30	23.78	0.25	207.64	0.82	4.56
8.10.01	10:00	25.01	0.31	205.37	0.68	4.73
8.10.01	10:30	25.31	0.33	202.77	0.58	4.83
8.10.01	11:00	25.55	0.29	205.08	0.40	4.68
8.10.01	11:30	28.53	0.34	200.35	0.57	4.50
<b>Event III</b>						
16.10.02	22:01	28.92	0.62	190.77	0.00	4.00
16.10.02	22:31	29.70	0.60	184.80	0.00	3.54
16.10.02	23:01	31.80	0.58	190.11	0.00	2.76
16.10.02	23:31	33.50	0.59	187.47	0.00	2.16
16.10.02	0:00	34.14	0.53	186.83	0.00	1.75
17.10.02	0:31	34.12	0.52	184.81	0.00	1.62
17.10.02	1:01	32.82	0.55	183.33	0.00	1.74
17.10.02	1:31	32.74	0.63	182.89	0.00	1.71
17.10.02	2:01	32.20	0.65	183.42	0.00	1.73
17.10.02	2:31	33.04	0.62	179.01	0.00	1.64
17.10.02	3:01	32.44	0.59	182.24	0.00	1.63
17.10.02	3:31	33.13	0.57	172.47	0.00	1.54
17.10.02	4:01	32.93	0.57	174.00	0.00	1.63
17.10.02	4:31	32.04	0.46	177.47	0.00	1.78
17.10.02	5:01	32.03	0.51	178.33	0.00	1.73
17.10.02	5:31	30.63	0.48	174.86	0.00	2.49
17.10.02	6:01	30.13	0.47	162.36	0.00	2.67

Table I  
(continued)

Trace gas mixing ratios (ppbv) at summit

Event I		O <sub>3</sub> ppbv	SO <sub>2</sub> ppbv	CO ppbv	NO ppbv	NO <sub>2</sub> ppbv
26.10.01	22:30					
26.10.01	23:00		0.68		0.00	5.22
26.10.01	23:30				0.02	1.17
26.10.01	0:00				0.03	0.98
27.10.01	0:30	17.48	0.79		0.00	7.07
27.10.01	1:00	15.98	0.68		0.00	7.56
27.10.01	1:30	15.05	0.58		0.00	7.85
27.10.01	2:00	13.64	0.51		0.00	8.05
27.10.01	2:30	13.04	0.47		0.00	8.15
27.10.01	3:00	13.36	0.44		0.00	8.00
27.10.01	3:30	13.27	0.44		0.00	7.95
27.10.01	4:00	12.57	0.44		0.00	8.29
27.10.01	4:30	19.30	0.40		0.00	6.24
27.10.01	5:00	20.98	0.40		0.00	5.71
27.10.01	5:30	21.21	0.44		0.00	5.46
27.10.01	6:00	23.32	0.47		0.00	5.02
27.10.01	6:30	20.84	0.54		0.00	5.95
27.10.01	7:00	17.34	0.75		0.07	6.88
27.10.01	7:30	14.16	0.96		0.30	8.29
27.10.01	8:00	14.35	0.65		0.45	8.59
27.10.01	8:30	15.37	0.51		0.52	8.15
27.10.01	9:00	16.07	0.65		0.82	8.44
27.10.01	9:30	17.52	0.68		0.82	8.29
27.10.01	10:00	17.94	0.58		0.97	8.00
27.10.01	10:30	18.04	0.58		0.97	7.80
27.10.01	11:00	21.92	0.61		0.67	6.83
27.10.01	11:30	24.77	0.72		0.30	6.24
27.10.01	12:00	24.21	0.79		0.22	6.24
27.10.01	12:30	24.07	0.72		0.22	6.29
27.10.01	13:00	25.51	0.75		0.15	6.24

Table I  
(continued)

Event II		O <sub>3</sub> ppbv	SO <sub>2</sub> ppbv	CO ppbv	NO ppbv	NO <sub>2</sub> ppbv
6.10.01	11:01	13.22	0.79		1.42	9.71
6.10.01	11:31	20.19	0.61		0.97	7.37
6.10.01	12:01	23.22	0.65		0.90	6.93
6.10.01	12:31	21.68	0.61		0.90	7.32
6.10.01	13:01	24.95	0.61		0.67	6.00
6.10.01	13:31	22.48	0.65		0.75	6.54
6.10.01	14:01	23.41	0.61		0.37	6.29
6.10.01	14:31	25.19	0.47		0.45	5.51
6.10.01	15:01	30.09	0.40		0.37	3.61
7.10.01	14:00	26.31	0.23		0.15	3.32
7.10.01	14:30	27.43	0.23		0.07	3.22
7.10.01	15:00	31.26	0.23		0.15	2.63
7.10.01	15:30	36.87	0.20		0.00	1.61
7.10.01	18:30	30.28	0.30		0.00	2.29
7.10.01	19:00	30.98	0.30		0.00	1.90
7.10.01	19:30	32.34	0.30		0.00	1.80
7.10.01	20:00	32.20	0.27		0.00	1.80
7.10.01	20:30	32.62	0.23		0.00	1.76
7.10.01	21:00	30.93	0.23		0.00	1.90
7.10.01	21:30	28.36	0.20		0.00	2.20
7.10.01	22:00	29.58	0.23		0.00	2.24
7.10.01	22:30	28.04	0.27		0.00	2.73
7.10.01	23:00	27.90	0.27		0.00	2.78
7.10.01	23:30	27.52	0.27		0.00	2.83
7.10.01	0:00	26.17	0.30		0.00	3.17
8.10.01	0:30	26.50	0.30		0.00	3.02
8.10.01	1:00	26.64	0.23		0.00	2.78
8.10.01	1:30	26.68	0.23		0.00	2.68
8.10.01	2:00	24.95	0.27		0.00	2.83
8.10.01	2:30	24.77	0.27		0.00	2.68
8.10.01	3:00	23.97	0.30		0.00	2.68
8.10.01	3:30	24.16	0.33		0.00	2.83
8.10.01	4:00	22.94	0.30		0.00	3.02
8.10.01	4:30					
8.10.01	5:00		0.33		0.00	3.27
8.10.01	5:30	21.12	0.33		0.00	3.66

Table I  
(continued)

		O <sub>3</sub> ppbv	SO <sub>2</sub> ppbv	CO ppbv	NO ppbv	NO <sub>2</sub> ppbv
<b>Event II (continued)</b>						
8.10.01	6:00	20.33	0.30		0.07	4.05
8.10.01	6:30	21.96	0.30		0.15	4.05
8.10.01	7:00	19.53	0.30		0.30	4.63
8.10.01	7:30	21.12	0.30		0.45	4.44
8.10.01	8:00	20.61	0.27		0.45	4.73
8.10.01	8:30	21.26	0.27		0.52	4.54
8.10.01	9:00	22.57	0.30		0.52	4.39
8.10.01	9:30	24.81	0.27		0.75	4.34
8.10.01	10:00	25.33	0.27		0.67	4.39
8.10.01	10:30	25.28	0.27		0.52	4.54
8.10.01	11:00	25.61	0.27		0.30	4.49
8.10.01	11:30	27.71	0.30		0.45	4.63
<b>Event III</b>						
16.10.02	22:01	22.15	0.15	1385	4.98	
16.10.02	22:31	22.06	0.18	1383	4.24	
16.10.02	23:01	21.87	0.18	1375	3.85	
16.10.02	23:31	20.93	0.24	1367	2.98	
16.10.02	0:00	20.65	0.24	1364	2.24	
17.10.02	0:31	20.70	0.25	1358	1.76	
17.10.02	1:01	33.64	0.18	1357	1.46	
17.10.02	1:31	33.41	0.17	1358	1.51	
17.10.02	2:01	33.55	0.21	1361	1.61	
17.10.02	2:31	32.66	0.18	1358	1.56	
17.10.02	3:01	32.94	0.18	1360	1.41	
17.10.02	3:31	33.08	0.22	1362	1.41	
17.10.02	4:01	32.80	0.17	1365	1.27	
17.10.02	4:31	32.76	0.18	1367	1.32	
17.10.02	5:01	31.92	0.15	1369	1.37	
17.10.02	5:31	31.96	0.16	1374		
17.10.02	6:01	32.76	0.11	1375	1.90	0.00

Table I  
(continued)

Trace gas mixing ratios (ppbv) at downwind site

		O <sub>3</sub> ppbv	SO <sub>2</sub> ppbv	CO ppbv	NO ppbv	NO <sub>2</sub> ppbv
<hr/>						
Event I						
26.10.01	22:30					
26.10.01	23:00					
26.10.01	23:30					
26.10.01	0:00					
27.10.01	0:30					
27.10.01	1:00					
27.10.01	1:30					
27.10.01	2:00					
27.10.01	2:30					
27.10.01	3:00					
27.10.01	3:30	No	data	available		
27.10.01	4:00					
27.10.01	4:30					
27.10.01	5:00					
27.10.01	5:30					
27.10.01	6:00					
27.10.01	6:30					
27.10.01	7:00					
27.10.01	7:30					
27.10.01	8:00					
27.10.01	8:30					
27.10.01	9:00					
27.10.01	9:30					
27.10.01	10:00					
27.10.01	10:30					
27.10.01	11:00					
27.10.01	11:30					
27.10.01	12:00					
27.10.01	12:30					
27.10.01	13:00					
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Table I  
(continued)

Event II		O <sub>3</sub> ppbv	SO <sub>2</sub> ppbv	CO ppbv	NO ppbv	NO <sub>2</sub> ppbv
6.10.01	11:01	25.75	0.52			
6.10.01	11:31	26.32	0.48			
6.10.01	12:01	26.62	0.46			
6.10.01	12:31	26.92	0.44			
6.10.01	13:01	27.08	0.42			
6.10.01	13:31	26.81	0.42			
6.10.01	14:01	26.73	0.42			
6.10.01	14:31	26.83	0.41			
6.10.01	15:01	26.84	0.40			
7.10.01	14:00	31.76	0.22			
7.10.01	14:30	31.83	0.22			
7.10.01	15:00	31.84	0.22			
7.10.01	15:30	31.74	0.21			
7.10.01	18:30	30.64	0.21			
7.10.01	19:00	30.76	0.21			
7.10.01	19:30	30.71	0.21			
7.10.01	20:00	30.54	0.21			
7.10.01	20:30	30.23	0.21			
7.10.01	21:00	29.80	0.21			
7.10.01	21:30	29.37	0.21			
7.10.01	22:00	29.43	0.21			
7.10.01	22:30	29.50	0.21			
7.10.01	23:00	29.35	0.22			
7.10.01	23:30	29.11	0.22			
7.10.01	0:00	28.71	0.22			
8.10.01	0:30	28.42	0.22			
8.10.01	1:00	28.23	0.21			
8.10.01	1:30	27.15	0.22			
8.10.01	2:00	26.18	0.22			
8.10.01	2:30	25.31	0.22			
8.10.01	3:00	24.68	0.22			
8.10.01	3:30	23.82	0.22			
8.10.01	4:00	23.34	0.23			
8.10.01	4:30	23.04	0.24			
8.10.01	5:00	22.99	0.26			
8.10.01	5:30	23.74	0.29			

Table I  
(continued)

		O <sub>3</sub> ppbv	SO <sub>2</sub> ppbv	CO ppbv	NO ppbv	NO <sub>2</sub> ppbv
<b>Event II (continued)</b>						
8.10.01	6:00	24.61	0.30			
8.10.01	6:30	25.57	0.31			
8.10.01	7:00	27.19	0.32			
8.10.01	7:30	28.62	0.32			
8.10.01	8:00	29.31	0.33			
8.10.01	8:30	30.57	0.33			
8.10.01	9:00	31.73	0.32			
8.10.01	9:30	32.89	0.31			
8.10.01	10:00	33.68	0.29			
8.10.01	10:30	34.28	0.27			
8.10.01	11:00	34.77	0.26			
8.10.01	11:30	35.15	0.25			
<b>Event III</b>						
16.10.02	22:01	33.99	0.08	191.98	0.18	2.28
16.10.02	22:31	34.26	0.08	187.28	0.15	2.09
16.10.02	23:01	34.61	0.09	182.44	0.16	1.93
16.10.02	23:31	35.29	0.09	180.33	0.21	1.74
16.10.02	0:00	35.84	0.08	177.23	0.23	1.54
17.10.02	0:31	36.35	0.08	174.45	0.17	1.27
17.10.02	1:01	37.65	0.08	165.63	0.11	0.99
17.10.02	1:31	36.01	0.09	169.68	0.09	0.88
17.10.02	2:01	35.53	0.10	163.68	0.12	0.89
17.10.02	2:31	35.75	0.09	163.40	0.09	0.89
17.10.02	3:01	36.18	0.09	166.05	0.08	0.78
17.10.02	3:31	36.16	0.07	170.82	0.13	0.77
17.10.02	4:01	36.42	0.06	181.39	0.16	0.78
17.10.02	4:31	36.38	0.06	190.75	0.14	0.89
17.10.02	5:01	36.43	0.06	194.53	0.17	1.03
17.10.02	5:31	36.25	0.06	195.66	0.16	1.23
17.10.02	6:01	36.53	0.07	196.19	0.16	1.38

Table II  
Concentration of components of particles at the upwind station Goldlauter in  $\mu\text{g m}^{-3}$

Event I Date	U site Component	BERNER impactor (BI)					BI <sub>sum</sub> PM <sub>10</sub> $\mu\text{g m}^{-3}$	HVAndersen PM <sub>10</sub> $\mu\text{g m}^{-3}$	Steam Jet total $\mu\text{g m}^{-3}$
		0.05-0.14 $\mu\text{m}$ $\mu\text{g m}^{-3}$	0.14-0.42 $\mu\text{m}$ $\mu\text{g m}^{-3}$	0.42-1.2 $\mu\text{m}$ $\mu\text{g m}^{-3}$	1.2-3.5 $\mu\text{m}$ $\mu\text{g m}^{-3}$	3.5-10 $\mu\text{m}$ $\mu\text{g m}^{-3}$			
26./27.10.2001	mass	0.9289	3.6000	9.5274	2.2074	0.5956	16.8593	21.5720	
	Cl <sup>-</sup>	n.d.	0.0013	0.0062	0.0011	n.d.	0.0085	0.0885	0.1292
	NO <sub>3</sub> <sup>-</sup>	0.0041	0.4582	2.1451	0.2623	0.0449	2.9146	5.3175	7.1809
	SO <sub>4</sub> <sup>2-</sup>	0.0466	0.4894	1.4757	0.0752	0.0134	2.1002	2.0514	2.8806
	Na <sup>+</sup>	n.d.	0.0012	0.0048	0.0666	0.0227	0.0953	0.0483	
	NH <sub>4</sub> <sup>+</sup>	0.0259	0.3264	0.8110	0.1178	0.0095	1.2905	2.4295	
	K <sup>+</sup>	0.0031	0.0196	0.0365	0.0102	0.0031	0.0725	0.0402	
	Mg <sup>2+</sup>	n.d.	n.d.	0.0012	0.0106	0.0057	0.0175	0.0241	
	Ca <sup>2+</sup>	n.d.	n.d.	0.0018	0.0270	0.0205	0.0493	0.0563	
	OC	0.0760	0.2490	0.5630	0.1280	0.0690	1.0850		
	EC	0.0750	0.3630	0.4340	0.1010	0.0260	0.9990		
	Fe							3.74*	
	Cu							2.99*	
	Mn							0.75*	
	Zn							8.23*	

\*: in  $\text{ng m}^{-3}$ , n.d.: not detectable

Table II  
(continued)

Event II Date	U site Component	BERNER impactor (BI)					BI <sub>sum</sub>	HVAndersen	Steam Jet
		0.05-0.14 $\mu\text{m}$ $\mu\text{g m}^{-3}$	0.14-0.42 $\mu\text{m}$ $\mu\text{g m}^{-3}$	0.42-1.2 $\mu\text{m}$ $\mu\text{g m}^{-3}$	1.2-3.5 $\mu\text{m}$ $\mu\text{g m}^{-3}$	3.5-10 $\mu\text{m}$ $\mu\text{g m}^{-3}$	PM <sub>10</sub> $\mu\text{g m}^{-3}$	PM <sub>10</sub> $\mu\text{g m}^{-3}$	total $\mu\text{g m}^{-3}$
06.-08.10.2001	mass	0.5024	2.5845	3.4841	0.7807	0.6966	8.0483	10.0680	
	Cl <sup>-</sup>	n.d.	n.d.	n.d.	n.d.	0.0006	0.0006	0.0296	0.0566
	NO <sub>3</sub> <sup>-</sup>	0.0006	0.1398	0.3948	0.0354	0.0133	0.5839	1.2795	1.7476
	SO <sub>4</sub> <sup>2-</sup>	0.0456	0.4905	0.7772	0.0428	0.0105	1.3667	1.3636	1.5221
	Na <sup>+</sup>	n.d.	0.0030	0.0058	0.0196	0.0054	0.0338	0.0572	
	NH <sub>4</sub> <sup>+</sup>	0.0207	0.2198	0.3360	0.0176	0.0046	0.5988	0.9275	
	K <sup>+</sup>	0.0024	0.0167	0.0226	0.0076	0.0039	0.0532	0.0370	
	Mg <sup>2+</sup>	n.d.	n.d.	0.0006	0.0034	0.0019	0.0058	n.d.	
	Ca <sup>2+</sup>	0.0006	0.0038	0.0037	0.0108	0.0080	0.0269	0.1688	
	OC	0.0627	0.3874	0.3738	0.1139	0.1270	1.0648		
	EC	0.0767	0.1368	0.1730	0.0258	0.0347	0.4469		
	Fe							5.36*	
	Cu							2.44*	
	Mn							0.98*	
	Zn							5.36*	

\*: in  $\text{ng m}^{-3}$ , n.d.: not detectable

Table II  
(continued)

Event III Date	U site Component	BERNER impactor (BI)					BI <sub>sum</sub>	HVAndersen	Steam Jet
		0.05-0.14 $\mu\text{m}$ $\mu\text{g m}^{-3}$	0.14-0.42 $\mu\text{m}$ $\mu\text{g m}^{-3}$	0.42-1.2 $\mu\text{m}$ $\mu\text{g m}^{-3}$	1.2-3.5 $\mu\text{m}$ $\mu\text{g m}^{-3}$	3.5-10 $\mu\text{m}$ $\mu\text{g m}^{-3}$	PM <sub>10</sub> $\mu\text{g m}^{-3}$	PM <sub>10</sub> $\mu\text{g m}^{-3}$	total $\mu\text{g m}^{-3}$
16./17.10.2002	mass	0.5271	2.8434	2.1891	1.5845	0.9643	8.1085	30.8263	
	Cl <sup>-</sup>	n.d.	0.0021	n.d.	0.0261	0.0168	0.0450	0.1852	0.0720
	NO <sub>3</sub> <sup>-</sup>	0.0021	0.1706	0.1440	0.2285	0.0404	0.5855	0.9934	1.0150
	SO <sub>4</sub> <sup>2-</sup>	0.0225	0.5006	0.4799	0.0503	0.0166	1.0699	1.3217	1.3990
	Na <sup>+</sup>	n.d.	n.d.	0.0162	0.1021	0.0286	0.1468	0.2357	
	NH <sub>4</sub> <sup>+</sup>	0.0096	0.2776	0.2515	0.0212	0.0019	0.5618	0.6567	
	K <sup>+</sup>	n.d.	0.0121	0.0115	0.0095	0.0053	0.0385	0.0505	
	Mg <sup>2+</sup>	n.d.	n.d.	n.d.	0.0073	n.d.	0.0073	n.d.	
	Ca <sup>2+</sup>	0.0072	0.0101	0.0127	0.0270	0.0129	0.0700	0.1347	
	OC	0.1311	0.2674	0.2620	0.2163	0.1874	1.0642		
	EC	0.0464	0.1915	0.1055	0.0279	0.0344	0.4057		
	Fe							3.17*	
	Cu							4.17*	
	Mn							1.34*	
	Zn							17.53*	

\*: in  $\text{ng m}^{-3}$ , n.d.: not detectable

Table III

Concentration of components of cloud water at the summit station Schmücke in  $\mu\text{g m}^{-3}$  (\*: in  $\text{ng m}^{-3}$ , n.d.: not detectable)

E I (26./27.10.2001)																	
Comp.	Sampler	date															Mean
		26.10. 22-23	26.10. 23-24	27.10. 0-1	27.10. 1-2	27.10. 2-3	27.10. 3-4	27.10. 4-5	27.10. 5-6	27.10. 6-7	27.10. 7-8	27.10. 8-9	27.10. 9-10	27.10. 10-11	27.10. 11-12	27.10. 12-13	
Cl <sup>-</sup>	Ift	0.155	0.155	0.091	0.091	0.129	0.129	0.187	0.187	0.233	0.233	0.169	0.169	0.248	0.248	0.264	0.184
	BTU	0.358	0.245	0.243	0.186	0.231	0.298	0.233	0.269	0.288	0.282	0.175	0.185	0.207	0.270	0.295	0.251
	CVI																n.d.
	INT																n.d.
NO <sub>3</sub> <sup>-</sup>	Ift	8.385	8.385	8.671	8.671	7.160	7.160	5.771	5.771	5.235	5.235	5.076	5.076	5.460	5.460	5.949	6.463
	BTU	10.355	10.585	9.750	10.565	10.075	8.841	6.350	6.999	6.885	7.015	6.341	5.786	5.451	6.077	6.517	7.839
	CVI																0.894
	INT																0.011
SO <sub>4</sub> <sup>2-</sup>	Ift	1.981	1.981	1.863	1.863	1.740	1.740	2.110	2.110	1.992	1.992	1.796	1.796	2.508	2.508	2.845	2.104
	BTU	2.698	2.485	2.271	2.345	2.530	2.471	2.330	2.774	2.666	2.306	2.097	2.289	2.458	2.984	3.108	2.521
	CVI																2.030
	INT																0.163
Na <sup>+</sup>	BTU	0.358	0.271	0.258	0.231	0.264	0.298	0.186	0.183	0.205	0.207	0.159	0.154	0.149	0.191	0.274	0.226
	CVI																0.209
	INT																0.007
NH <sub>4</sub> <sup>+</sup>	BTU	3.129	3.219	3.170	3.131	3.140	2.731	1.898	1.880	1.964	1.870	1.809	1.926	2.028	2.124	2.211	2.415
	CVI																0.768
	INT																0.074

Table III  
(continued)

E I (continued)																		
Comp.	Sampler	date	26.10.	26.10.	27.10.	27.10.	27.10.	27.10.	27.10.	27.10.	27.10.	27.10.	27.10.	27.10.	27.10.	27.10.	27.10.	Mean
		time(UTC)	22-23	23-24	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13	
Mg <sup>2+</sup>	BTU		0.061	0.040	0.038	0.038	0.053	0.051	0.038	0.029	0.034	0.031	0.025	0.023	0.024	0.028	0.044	0.037
	CVI																	0.008
	INT																	n.d.
Ca <sup>2+</sup>	BTU		0.218	0.165	0.152	0.209	0.269	0.247	0.161	0.108	0.134	0.154	0.155	0.151	0.156	0.207	0.264	0.183
	CVI																	0.109
	INT																	n.d.
DOC	IfT		2.287	2.287			2.453	2.453	1.642	1.642	1.970	1.970	2.459	2.459	3.096	3.096	3.108	2.431
POC	IfT		0.341	0.341			0.530	0.530	0.321	0.321	0.112	0.112	0.232	0.232	0.324	0.324	0.548	0.344
OC	CVI																	2.329
	INT																	0.459
EC	CVI																	0.746
	INT																	0.299
H <sub>2</sub> O <sub>2</sub>	ZUF		0.021	0.021	0.015	0.015	0.010	0.010	0.012	0.012	0.009	0.009	0.011	0.011	0.008	0.008	0.006	0.011
Fe*	IfT		12.32	12.32	11.42	11.42	13.72	13.72	16.69	16.69	16.69	16.69	16.88	16.88	21.98	21.98	25.74	16.93
Cu*	IfT		2.37	2.37	2.02	2.02	2.84	2.84	2.89	2.89	2.44	2.44	2.01	2.01	2.97	2.97	2.81	2.54
Mn*	IfT		2.37	2.37	2.69	2.69	2.37	2.37	1.61	1.61	2.04	2.04	2.01	2.01	2.67	2.67	3.28	2.38
Zn*	IfT		33.18	33.18	36.96	36.96	33.11	33.11	38.52	38.52	30.53	30.53	32.16	32.16	41.58	41.58	42.12	36.02

Table III  
(continued)

E II (06.-08.10.2001)																						
Comp.	Sampler	date	06.10.	06.10.	07.10.	07.10.	07.10.	07.10.	07.10.	07.10.	07.10.	07.10.	07.10.	07.10.	07.10.	07.10.	07.10.	07.10.	07.10.	07.10.	07.10.	Mean
		time (UTC)	11-13	13-14	13-14	18-19	19-20	20-21	21-22	22-23	23-24	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11
Cl <sup>-</sup>	I FT	0.027	0.067	0.081	0.197	0.197	0.067	0.067	0.048	0.048	0.016	0.016	0.045	0.045	0.061	0.061	0.110	0.110	0.147	0.147	0.107	0.081
	BTU	0.129		0.491	0.274	0.164	0.047	0.023	0.032	0.035	0.038	0.033	0.031	0.038	0.043	0.061	0.091	0.107	0.154	0.145	0.125	0.108
	CVI																					n.d.
	INT																					n.d.
NO <sub>3</sub> <sup>-</sup>	I FT	0.699	1.766	1.173	1.880	1.880	1.936	1.936	2.591	2.591	2.021	2.021	2.574	2.574	2.726	2.726	1.964	1.964	1.692	1.692	1.454	1.873
	BTU	4.565		1.766	2.224	2.313	1.995	2.110	2.706	2.795	2.659	2.764	2.733	2.956	2.932	3.012	2.311	1.920	1.910	2.028	1.759	2.498
	CVI																					0.232
	INT																					0.011
SO <sub>4</sub> <sup>2-</sup>	I FT	0.329	0.787	0.705	1.703	1.703	1.177	1.177	1.036	1.036	0.842	0.842	1.026	1.026	1.119	1.119	1.161	1.161	1.314	1.314	1.168	1.031
	BTU	2.299		1.261	2.140	1.927	1.427	1.174	1.231	1.059	0.993	1.021	1.139	1.299	1.243	1.298	1.334	1.345	1.584	1.692	1.476	1.418
	CVI																					0.872
	INT																					0.190
Na <sup>+</sup>	BTU	0.077		0.327	0.178	0.103	0.044	0.028	0.026	0.023	0.018	0.018	0.015	0.017	0.018	0.031	0.046	0.052	0.089	0.083	0.083	0.067
	CVI																					0.054
	INT																					n.d.
NH <sub>4</sub> <sup>+</sup>	BTU	1.709		0.797	0.817	0.705	0.555	0.619	0.784	0.821	0.854	0.973	0.946	1.113	1.146	1.220	1.118	1.061	1.129	1.135	0.969	0.972
	CVI																					0.318
	INT																					0.061

Table III  
(continued)

E II (continued)																						
Comp.	Sampler	06.10.	06.10.	07.10.	07.10.	07.10.	07.10.	07.10.	07.10.	07.10.	08.10.	08.10.	08.10.	08.10.	08.10.	08.10.	08.10.	08.10.	08.10.	08.10.	08.10.	Mean
	date	11-13	13-14	13-14	18-19	19-20	20-21	21-22	22-23	23-24	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	
	time (UTC)																					
Mg <sup>2+</sup>	BTU	0.021		0.008	0.022	0.017	0.008	0.008	0.003	0.003	0.002	0.003	0.003	0.002	0.005	0.003	0.004	0.004	0.007	0.011	0.011	0.008
	CVI																					0.004
	INT																					n.d.
Ca <sup>2+</sup>	BTU	0.172		0.073	0.051	0.044	0.029	0.044	0.029	0.023	0.018	0.018	0.027	0.024	0.020	0.020	0.017	0.024	0.037	0.042	0.055	0.040
	CVI																					0.007
	INT																					n.d.
DOC	IfT			1.324	1.338	1.338	1.233	1.233	1.358	1.358	1.270	1.270	1.301	1.301	1.457	1.457	1.446	1.446				1.341
POC	IfT			0.339	0.113	0.113	0.081	0.081	0.116	0.116	0.241	0.241	0.062	0.062	0.169	0.169	0.221	0.221				0.168
OC	CVI																					1.410
	INT																					0.527
EC	CVI																					0.587
	INT																					0.306
H <sub>2</sub> O <sub>2</sub>	ZUF		0.071	0.071	0.039	0.039	0.030	0.030	0.031	0.031	0.020	0.020	0.027	0.027	0.033	0.033	0.011	0.011				0.033
Fe*	IfT			13.70	14.35	14.35	10.36	10.36	16.73	16.73	5.93	5.93	41.54	41.54	6.00	6.00	45.39	45.39	8.77	8.77		18.09
Cu*	IfT			1.62	2.82	2.82	2.27	2.27	1.67	1.67	2.55	2.55	1.07	1.07	2.94	2.94	1.12	1.12	0.45	0.45		1.83
Mn*	IfT			0.87	0.82	0.82	0.58	0.58	0.58	0.58	0.24	0.24	0.54	0.54	0.30	0.30	0.36	0.36	0.82	0.82		0.57
Zn*	IfT			49.23	13.37	13.37	20.13	20.13	37.16	37.16	25.53	25.53	33.56	33.56	18.65	18.65	16.36	16.36	17.27	17.27		25.69

Table III  
(continued)

E III (16./17.10.2002)						
Comp.	Sampler	16.10.	16.10.	17.10.	17.10.	Mean
	date time (UTC)	21-23	23-1	1-3	3-4	
Cl <sup>-</sup>	IFT	0.109	0.228	0.356	0.469	0.290
	BTU	0.148	0.271	0.376	0.512	0.327
	CSU	0.045	0.212	0.345	0.444	0.262
	CVI					0.019
	INT					n.d.
NO <sub>3</sub> <sup>-</sup>	IFT	2.403	1.506	1.357	1.215	1.620
	BTU	2.274	1.548	1.504	1.013	1.585
	CSU	2.283	1.437	1.289	1.063	1.518
	CVI					0.210
	INT					0.140
SO <sub>4</sub> <sup>2-</sup>	IFT	1.178	1.087	0.991	0.898	1.039
	BTU	1.201	1.147	1.093	0.752	1.048
	CSU	1.079	0.946	0.923	0.749	0.924
	CVI					0.794
	INT					0.296
Na <sup>+</sup>	IFT	0.095	0.195	0.288	0.332	0.227
	BTU	0.093	0.191	0.243	0.342	0.217
	CSU	0.075	0.370	0.242	0.327	0.214
	CVI					n.d.
	INT					0.028

Table III  
(continued)

E III (continued)						
Comp.	Sampler date time (UTC)	16.10. 21-23	16.10. 23-1	17.10. 1-3	17.10. 3-4	Mean
NH <sub>4</sub> <sup>+</sup>	Ift	0.741	0.636	0.642	0.531	0.637
	BTU	0.774	0.642	0.631	0.412	0.615
	CSU	0.725	0.648	0.621	0.516	0.627
	CVI					0.309
	INT					0.137
K <sup>+</sup>	Ift	0.063	0.076	0.070	0.058	0.067
	BTU	0.041	0.040	0.042	0.036	0.040
	CSU	0.072	0.059	0.054	0.073	0.061
	CVI					0.212
	INT					n.d.
Mg <sup>2+</sup>	Ift	0.019	0.031	0.046	0.052	0.037
	BTU	0.014	0.021	0.030	0.034	0.025
	CSU	0.009	0.041	0.031	0.040	0.030
	CVI					n.d.
	INT					n.d.
Ca <sup>2+</sup>	Ift	0.056	0.057	0.060	0.057	0.058
	BTU	0.043	0.051	0.042	0.045	0.045
	CSU	0.053	0.218	0.100	0.081	0.078
	CVI					n.d.
	INT					n.d.

Table III  
(continued)

E III (continued)						
Comp.	Sampler	16.10.	16.10.	17.10.	17.10.	Mean
	date	21-23	23-1	1-3	3-4	
	time (UTC)					
DOC	IfT	1.242	0.947	0.962	0.906	1.014
	CSU		0.466		0.437	0.452
POC	IfT	0.169	0.054	0.047	0.406	0.169
	CSU		0.26		0.128	0.194
OC	CVI					2.158
	INT					0.261
EC	CVI					0.265
	INT					0.137
H <sub>2</sub> O <sub>2</sub>	ZUF	0.023	0.026	0.025	0.022	0.024
Fe*	IfT	19.46	8.28	8.42	5.10	10.32
Cu*	IfT	1.69	0.91	0.55	0.60	0.94
Mn*	IfT	1.84	1.55	1.47	1.49	1.59
Zn*	IfT	146.37	26.34	26.53	25.11	56.09

Table IV

Time series of pH value and liquid water content of events I, II, and III at summit site

start time (UTC)	sampling time min	LWC g m <sup>-3</sup>	pH value
Event I			
26.10.2001 22:00	120	0.237	4.3
27.10.2001 00:00	120	0.336	5.0
27.10.2001 02:00	120	0.437	4.6
27.10.2001 04:00	120	0.321	4.0
27.10.2001 06:00	120	0.407	4.0
27.10.2001 08:00	120	0.402	4.2
27.10.2001 10:00	120	0.297	4.2
27.10.2001 12:00	60	0.234	4.0
Event II			
07.10.2001 13:00	60	0.249	5.1
07.10.2001 18:00	120	0.205	4.3
07.10.2001 20:00	120	0.259	4.5
07.10.2001 22:00	120	0.291	4.6
08.10.2001 00:00	120	0.237	4.6
08.10.2001 02:00	120	0.268	4.8
08.10.2001 04:00	120	0.24	4.7
08.10.2001 06:00	120	0.204	5
08.10.2001 08:00	120	0.121	4.8
08.10.2001 10:00	60		4.5
Event III			
16.10.2002 21:00	120	0.172	4.1
16.10.2002 23:00	120	0.212	4.5
17.10.2002 01:00	120	0.211	4.6
17.10.2002 03:00	60	0.189	4.5

Table V  
Concentration of components of particles at the downwind station Gehlberg in  $\mu\text{g m}^{-3}$

Event I Date	D site Component	BERNER impactor (BI)					BI <sub>sum</sub>	HVAndersen
		0.05-0.14 $\mu\text{m}$ $\mu\text{g m}^{-3}$	0.14-0.42 $\mu\text{m}$ $\mu\text{g m}^{-3}$	0.42-1.2 $\mu\text{m}$ $\mu\text{g m}^{-3}$	1.2-3.5 $\mu\text{m}$ $\mu\text{g m}^{-3}$	3.5-10 $\mu\text{m}$ $\mu\text{g m}^{-3}$	PM <sub>10</sub> $\mu\text{g m}^{-3}$	PM <sub>10</sub> $\mu\text{g m}^{-3}$
26./27.10.2001	mass	0.2370	2.7659	7.0726	1.1022	0.2844	11.4621	18.5225
	Cl <sup>-</sup>	0.0002	n.d.	n.d.	n.d.	n.d.	0.0002	0.0885
	NO <sub>3</sub> <sup>-</sup>	0.0033	0.3606	1.1882	0.1294	0.0236	1.7051	4.7302
	SO <sub>4</sub> <sup>2-</sup>	0.0559	0.4585	1.0499	0.0575	0.0033	1.6252	1.9951
	Na <sup>+</sup>	0.0004	0.0015	0.0069	0.0472	0.0105	0.0666	0.0161
	NH <sub>4</sub> <sup>+</sup>	0.0303	0.3196	0.6207	0.0590	0.0047	1.0342	2.3410
	K <sup>+</sup>	0.0053	0.0170	0.0328	0.0075	0.0023	0.0649	0.0483
	Mg <sup>2+</sup>	n.d.	n.d.	0.0011	0.0058	0.0017	0.0086	0.0241
	Ca <sup>2+</sup>	0.0054	0.0050	0.0076	0.0155	0.0097	0.0431	0.0322
	OC	0.0580	0.2950	0.3390	0.0450	0.0130	0.7500	
	EC	0.0400	0.2230	0.4390	0.0530	0.0040	0.7590	
	Fe							3.74*
	Cu							4.49*
	Mn							0.75*
Zn							8.97*	

\*: in  $\text{ng m}^{-3}$ , n.d.: not detectable

Table V  
(continued)

Event II Date	D site Component	BERNER impactor (BI)					BI <sub>sum</sub>	HVAndersen
		0.05-0.14 $\mu\text{m}$ $\mu\text{g m}^{-3}$	0.14-0.42 $\mu\text{m}$ $\mu\text{g m}^{-3}$	0.42-1.2 $\mu\text{m}$ $\mu\text{g m}^{-3}$	1.2-3.5 $\mu\text{m}$ $\mu\text{g m}^{-3}$	3.5-10 $\mu\text{m}$ $\mu\text{g m}^{-3}$	PM <sub>10</sub> $\mu\text{g m}^{-3}$	PM <sub>10</sub> $\mu\text{g m}^{-3}$
06.-08.10.2001	mass	0.3430	1.8792	2.6551	0.5343	0.4416	5.8532	9.6978
	Cl <sup>-</sup>	n.d.	n.d.	n.d.	n.d.	0.0005	0.0005	0.0270
	NO <sub>3</sub> <sup>-</sup>	0.0007	0.0653	0.1108	0.0295	0.0165	0.2229	1.3273
	SO <sub>4</sub> <sup>2-</sup>	0.0386	0.2936	0.3828	0.0367	0.0142	0.7659	1.4790
	Na <sup>+</sup>	n.d.	0.0009	0.0040	0.0221	0.0088	0.0358	0.0347
	NH <sub>4</sub> <sup>+</sup>	0.0175	0.1430	0.1858	0.0096	0.0048	0.3607	1.0041
	K <sup>+</sup>	0.0013	0.0079	0.0099	0.0039	0.0025	0.0254	0.0302
	Mg <sup>2+</sup>	n.d.	n.d.	0.0002	0.0033	0.0022	0.0057	n.d.
	Ca <sup>2+</sup>	0.0018	n.d.	0.0004	0.0066	0.0077	0.0165	0.0492
	OC	0.0300	0.1500	0.1900	0.0400	0.0400	0.4500	
	EC	0.0300	0.0800	0.1500	0.0100	0.0100	0.2800	
	Fe							3.90*
	Cu							2.93*
Mn							0.49*	
Zn							5.36*	

\*: in  $\text{ng m}^{-3}$ , n.d.: not detectable

Table V  
(continued)

Event III Date	D site Component	BERNER impactor (BI)					BI <sub>sum</sub>	HVAndersen
		0.05-0.14 $\mu\text{m}$ $\mu\text{g m}^{-3}$	0.14-0.42 $\mu\text{m}$ $\mu\text{g m}^{-3}$	0.42-1.2 $\mu\text{m}$ $\mu\text{g m}^{-3}$	1.2-3.5 $\mu\text{m}$ $\mu\text{g m}^{-3}$	3.5-10 $\mu\text{m}$ $\mu\text{g m}^{-3}$	PM <sub>10</sub> $\mu\text{g m}^{-3}$	PM <sub>10</sub> $\mu\text{g m}^{-3}$
16./17.10.2002	mass	0.2065	1.5895	1.2157	0.8706	0.5098	4.3921	15.9366
	Cl <sup>-</sup>	0.0056	n.d.	0.0064	0.0216	0.0236	0.0573	0.1527
	NO <sub>3</sub> <sup>-</sup>	0.0054	0.0573	0.0386	0.1480	0.0296	0.2790	0.9559
	SO <sub>4</sub> <sup>2-</sup>	0.0385	0.3480	0.3173	0.0321	0.0149	0.7508	1.1030
	Na <sup>+</sup>	0.0005	0.0001	0.0166	0.0812	0.0296	0.1280	0.1414
	NH <sub>4</sub> <sup>+</sup>	0.0239	0.1967	0.1584	0.0050	0.0000	0.3841	0.6561
	K <sup>+</sup>	0.0003	0.0097	0.0127	0.0066	0.0056	0.0349	0.0396
	Mg <sup>2+</sup>	0.0003	n.d.	0.0032	0.0108	0.0049	0.0193	0.0113
	Ca <sup>2+</sup>	0.0029	0.0004	0.0020	0.0045	0.0071	0.0170	0.1131
	OC	0.0763	0.1328	0.1563	0.1380	0.1129	0.6162	
	EC	0.0323	0.1073	0.0545		0.0205	0.2147	
	Fe							n.d.*
	Cu							5.77*
Mn							0.56*	
Zn							23.93*	

\*: in  $\text{ng m}^{-3}$ , n.d.: not detectable