Measurement of Optical and Chemical Properties of Atmospheric Aerosols at Amami-Ohshima and Fukue Islands

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○Measurements of optical and chemical properties of atmospheric aerosols at Amami-Ohshima island on December 11-22, 2000 and April 2-29, 2001, and Fukue island on August 20-25, 2000 and March 19-26, 2001.

- Scattering coefficient (Integratig nepherometer)
- Absorption coefficient (Absorption photometer)
- Number size distribution (Particle counter)
- Chemical components (Aerosol sampler)
  → Chemical analysis

- Optical thickness and size distribution in the whole air column
  (Sky-radiometer, Sun-photometer)
  ← Prof.Takamura

○Chemical analysis of aerosols

(a) Aerosol samples on Teflon filters

· Extraction in distilled-deionized water

→ IC analysis

SO_4^{2-}, NO_3^-, Cl^-, NH_4^+, Na^+, K^+, Ca^{2+}, Mg^{2+}

· Extraction in mixed solution of HF and HNO_3

→ ICP-MS analysis

Al, Fe, Mn, Cu, Zn, V, Ni, Pb, As, Cd

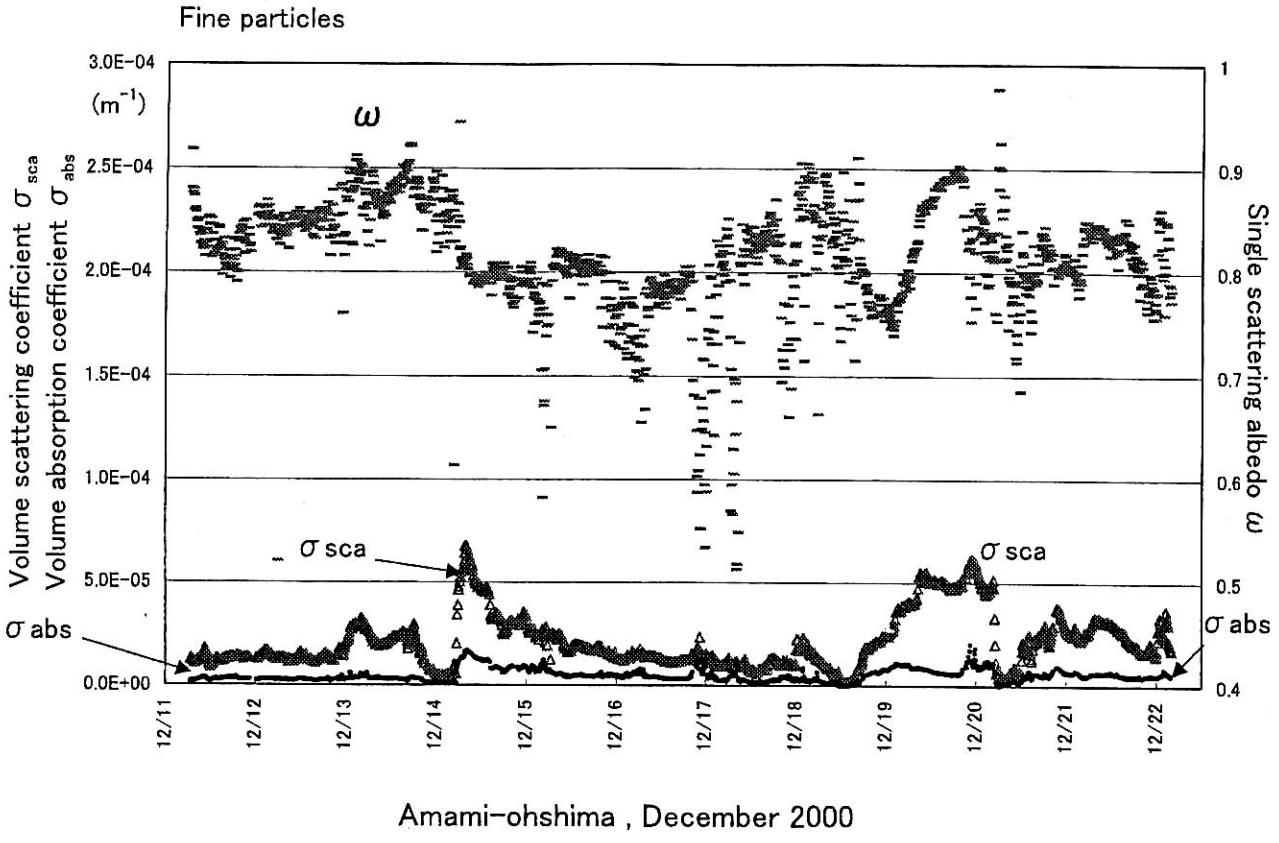
(b). Aerosol samples on quartz fiber filters

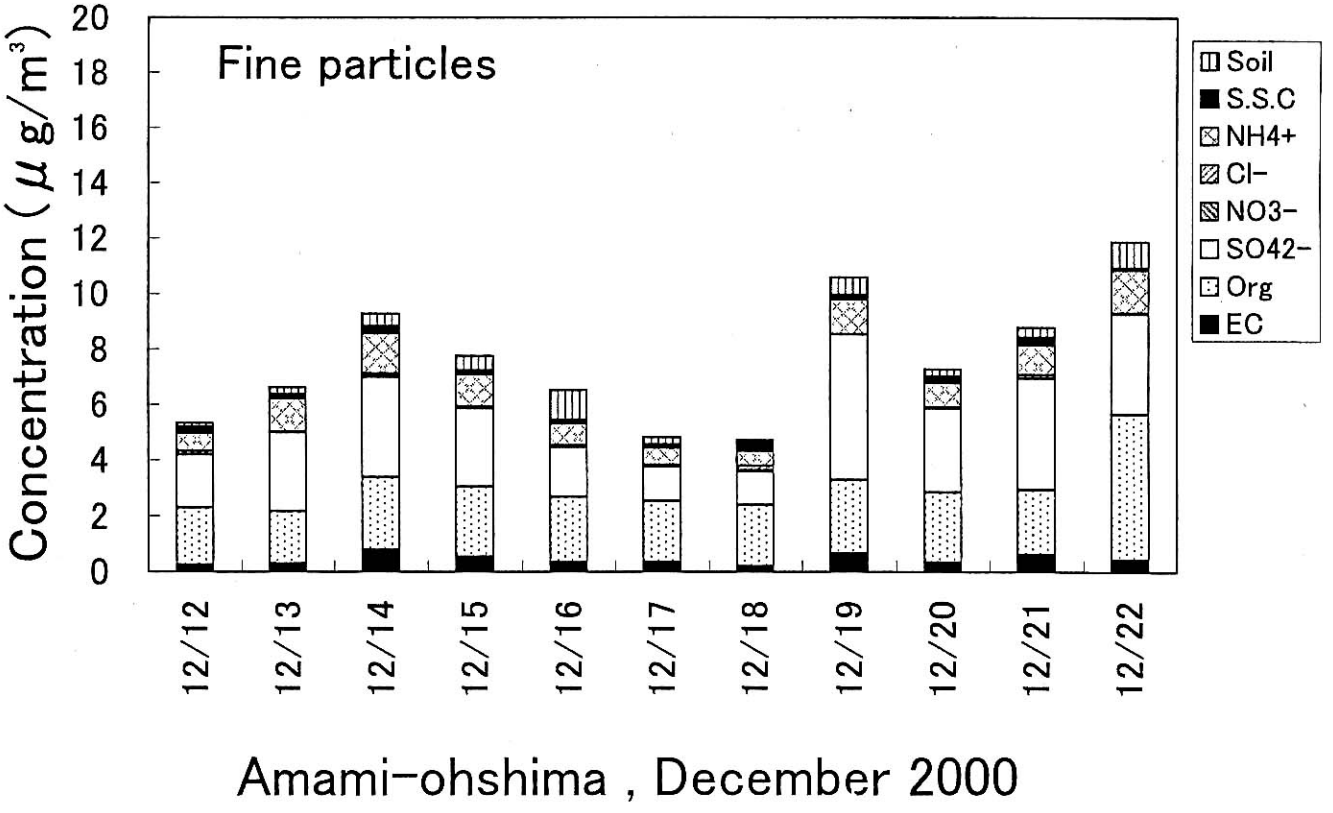
→ Carbon analyzer

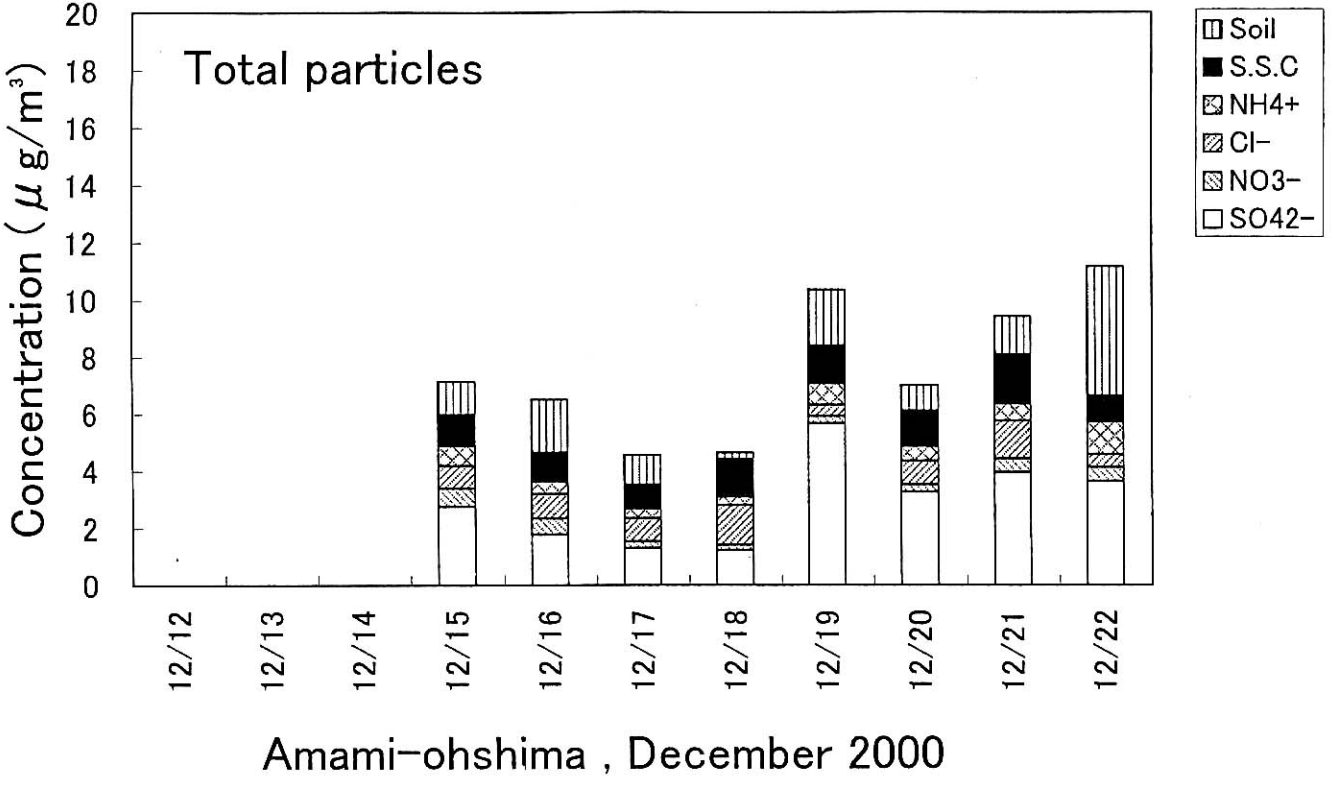
Elemental carbon (EC), Organic carbon

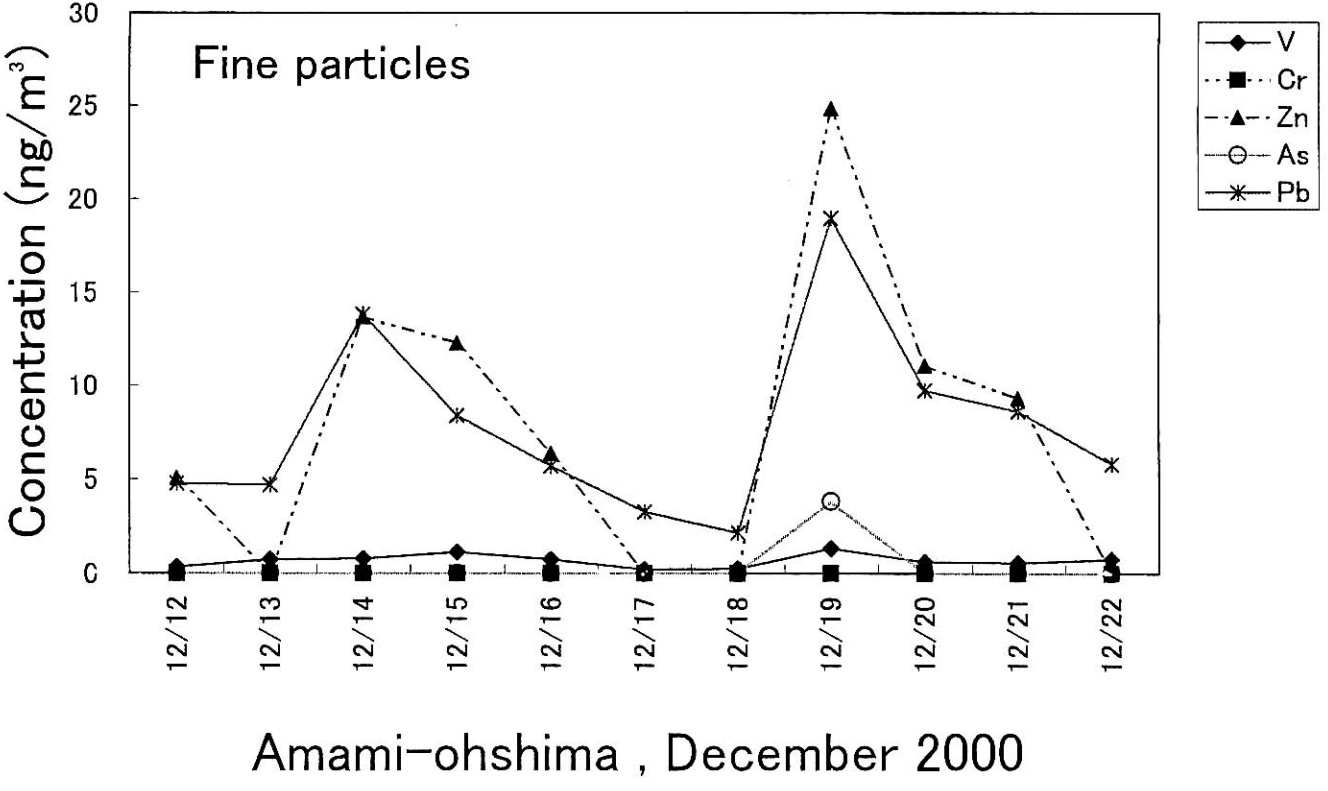
○Index element for emission source

- Soil : Al, Si, Fe
- Sea salt : Na, Cl
- Fuel oil combustion : V, Ni
- Coal combustion : As, I, Se, Te
- Refuse incineration : K, Zn
- Gasoline powerd automobile : Pb, Br
- Iron and steel ind. : Mn, Fe, Zn, Pb


Fine particles
3.0E-04
(m-1)
ω
2.5E-04
2.0E-04
1.5E-04
1.0E-04
5.0E-05
0.0E+00
Volume scattering coefficient σ sca
Volume absorption coefficient σ abs
σ sca
σ abs
σ sca
σ abs
1
0.9
0.8
0.7
0.6
0.5
0.4
Single scattering albedo ω
12/11
12/12
12/13
12/14
12/15
12/16
12/17
12/18
12/19
12/20
12/21
12/22
Amami-ohshima , December 2000


Fine particles
Concentration (μ g/m3)
20
18
16
14
12
10
8
6
4
2
0
12/12
12/13
12/14
12/15
12/16
12/17
12/18
12/19
12/20
12/21
12/22
Soil
S.S.C
NH4+
Cl−
NO3−
SO42−
Org
EC
Amami-ohshima , December 2000


Total particles
Concentration (μ g/m³)
20
18
16
14
12
10
8
6
4
2
0
12/12
12/13
12/14
12/15
12/16
12/17
12/18
12/19
12/20
12/21
12/22
Soil
S.S.C
NH4+
Cl−
NO3−
SO42−
Amami-ohshima , December 2000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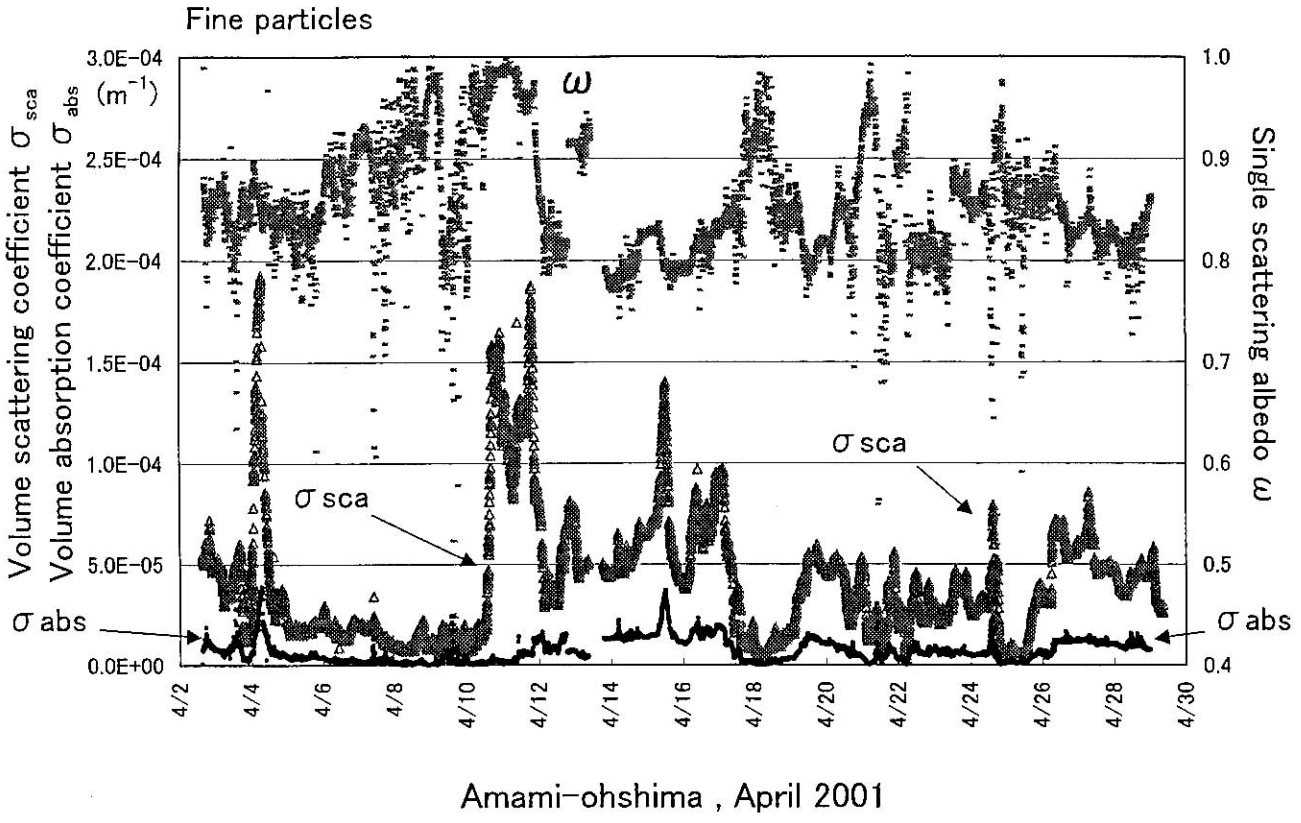
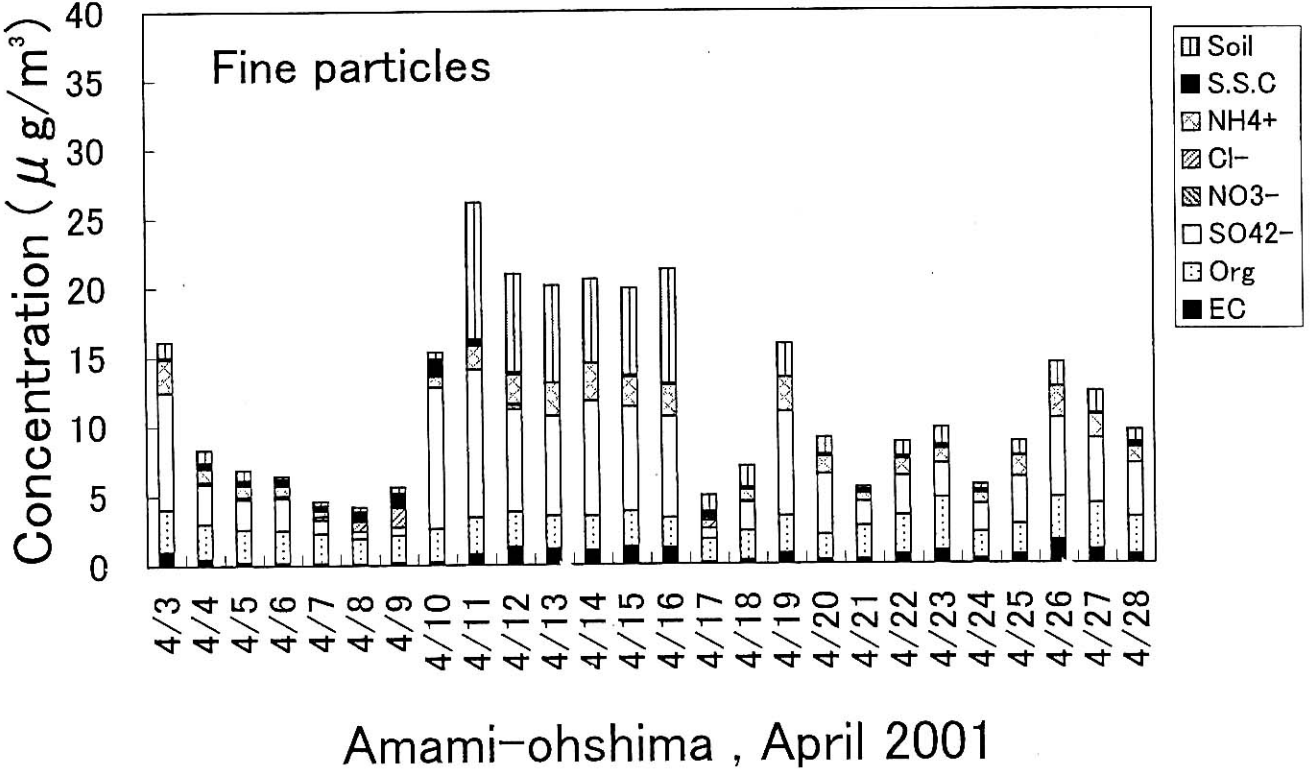
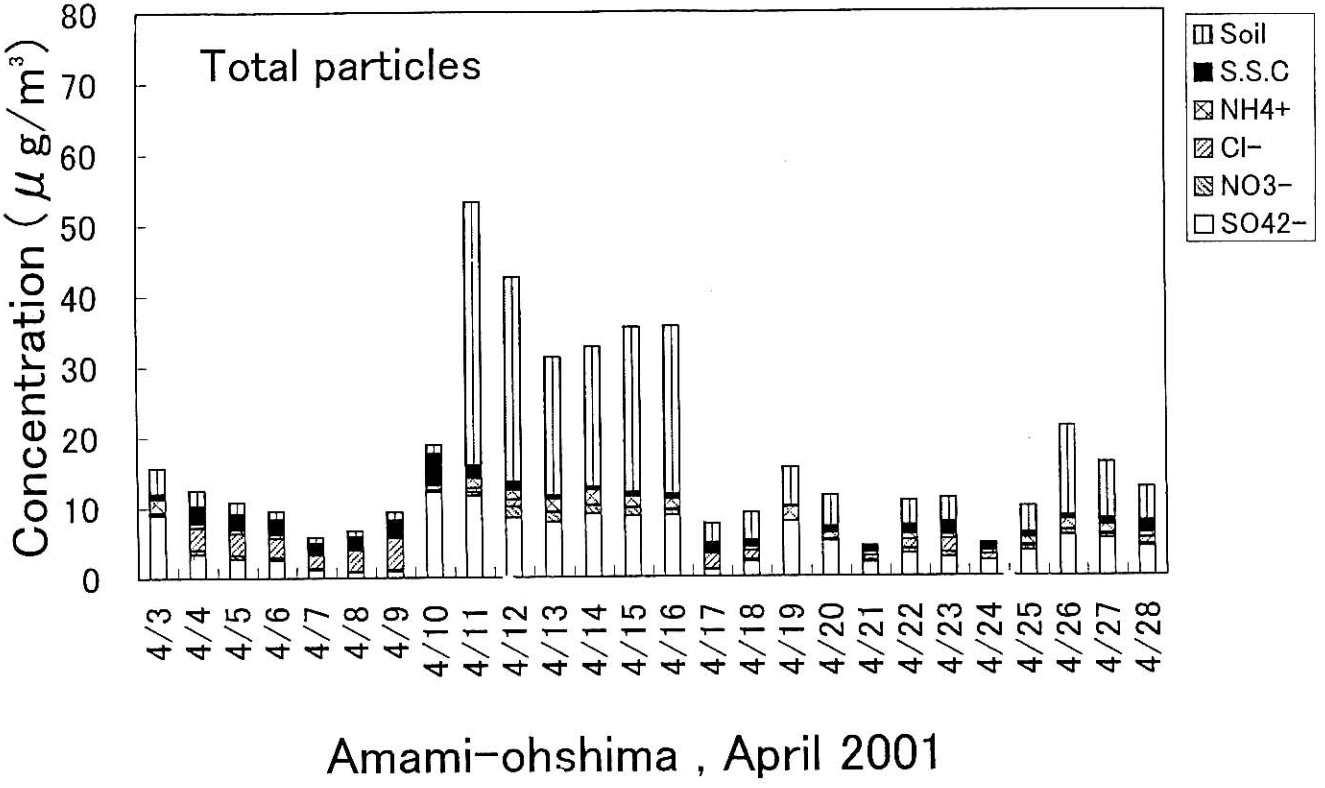
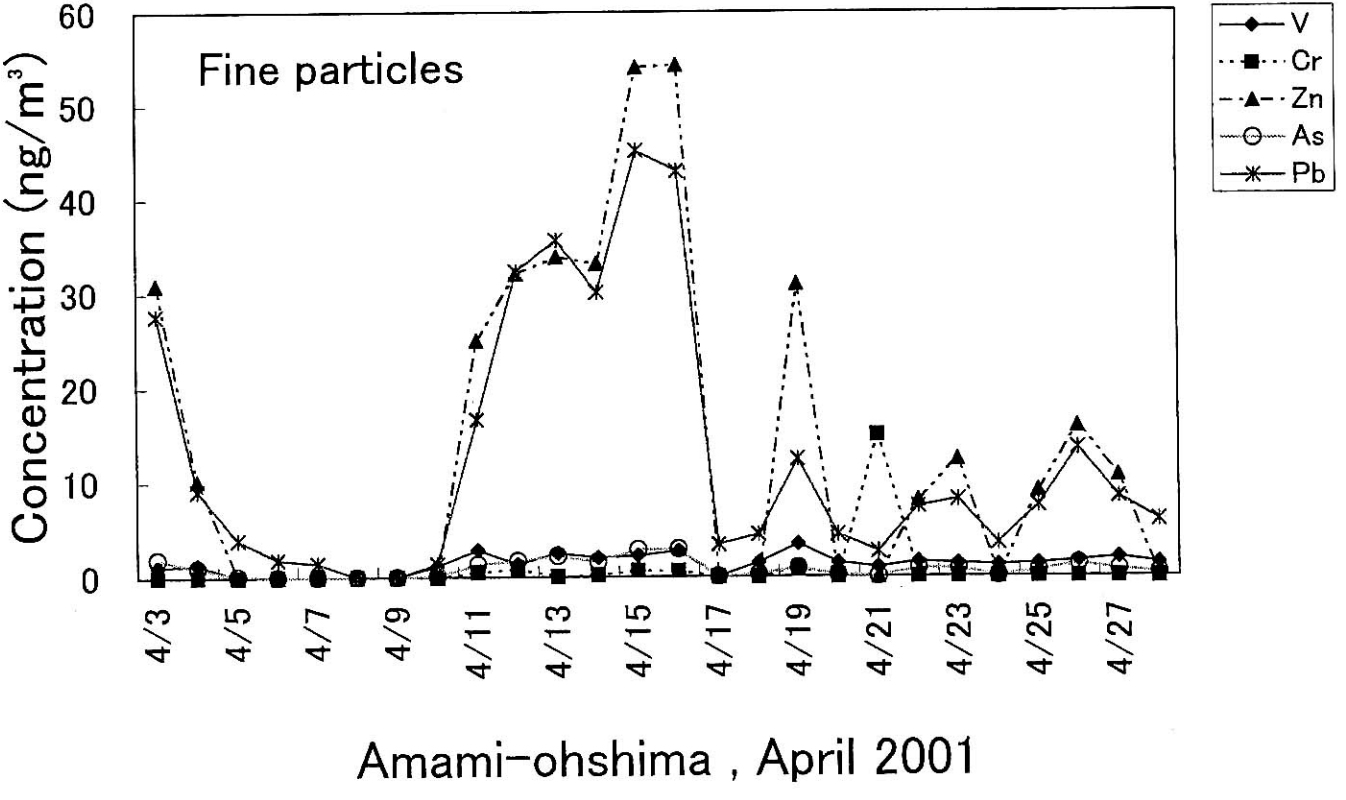
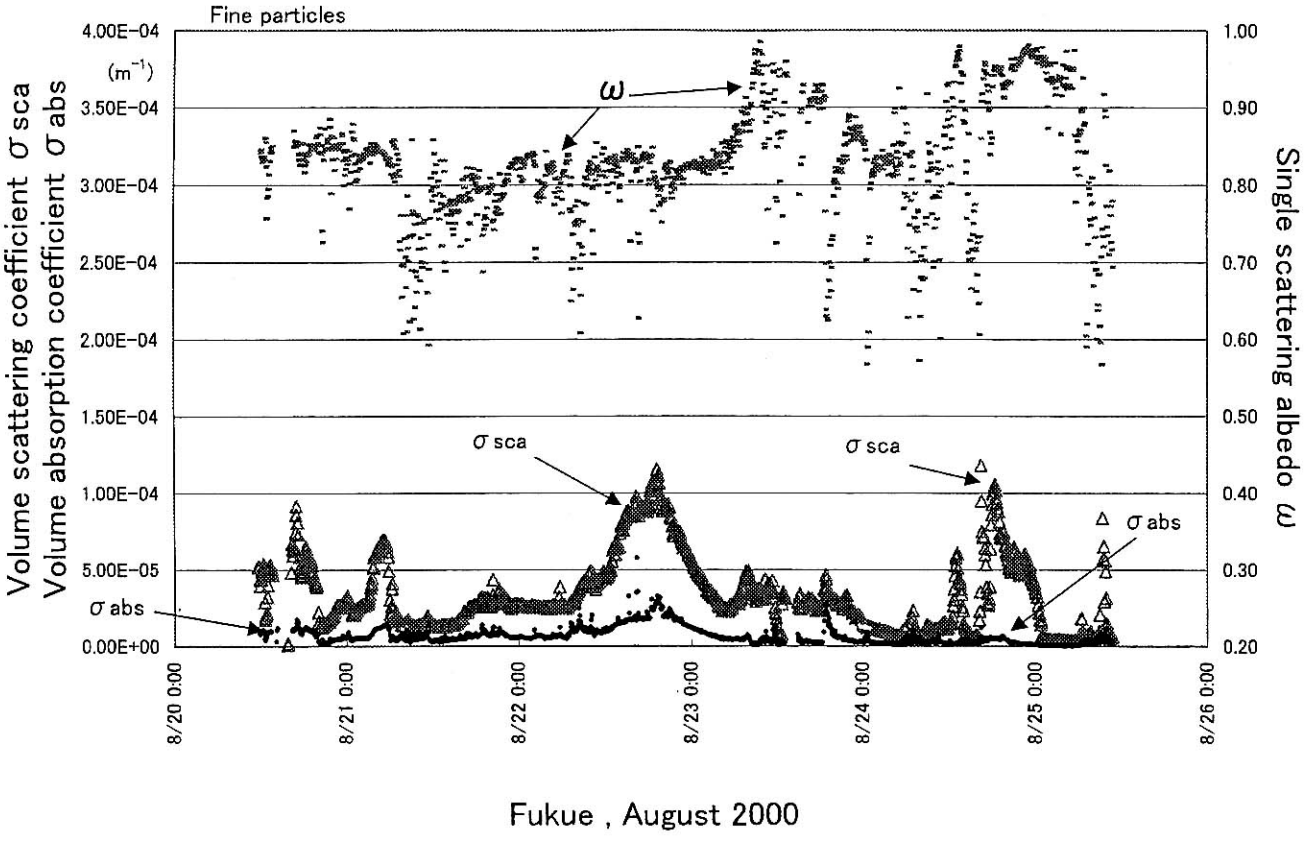
Concentration (ng/m3)
30
25
20
15
10
5
0
12/12
12/13
12/14
12/15
12/16
12/17
12/18
12/19
12/20
12/21
12/22
V
Cr
Zn
As
Pb
Amami-ohshima , December 2000

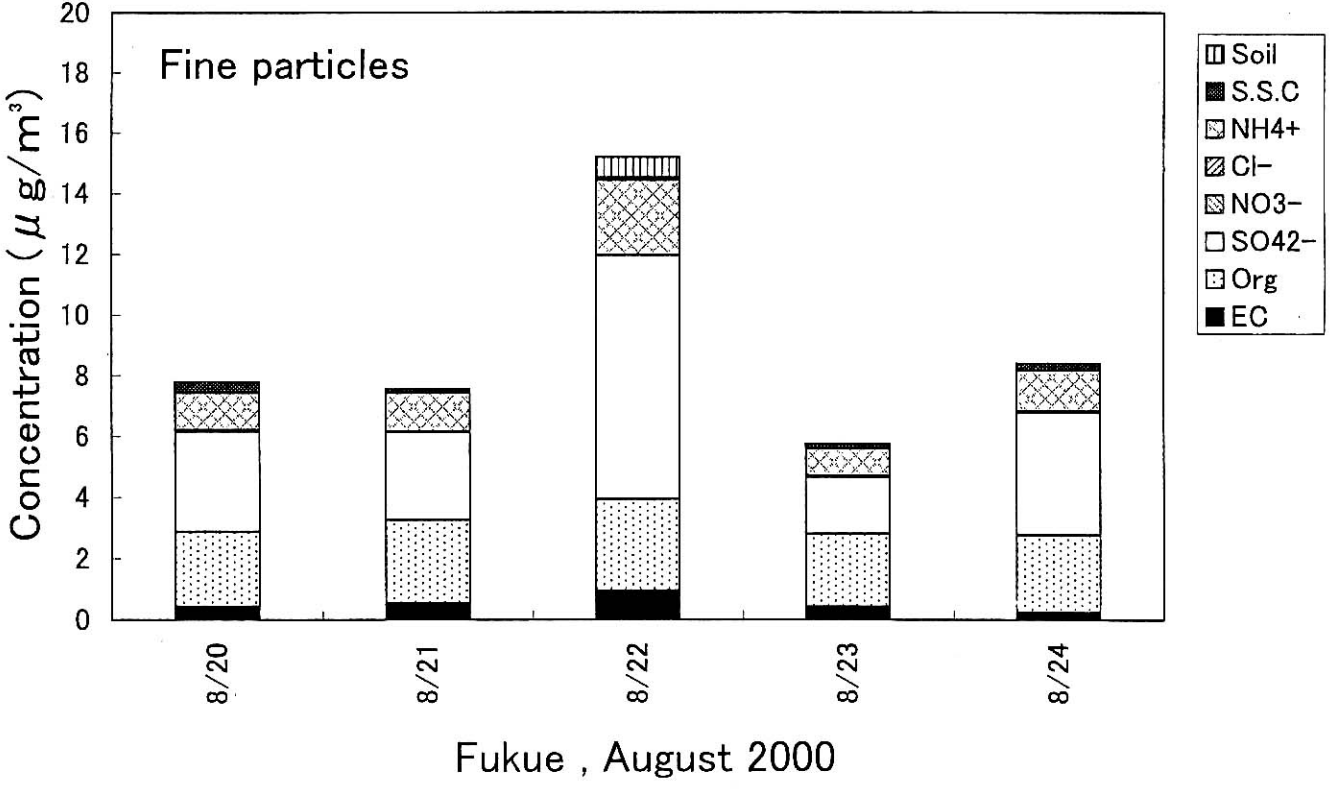

Fine particles
Volume scattering coefficient σ sca
Volume absorption coefficient σ abs
(m⁻¹)
3.0E-04
2.5E-04
2.0E-04
1.5E-04
1.0E-04
5.0E-05
0.0E+00
ω
σ sca
σ sca
σ abs
σ abs
Single scattering albedo ω
1.0
0.9
0.8
0.7
0.6
0.5
0.4
4/2
4/4
4/6
4/8
4/10
4/12
4/14
4/16
4/18
4/20
4/22
4/24
4/26
4/28
4/30
Amami-ohshima , April 2001

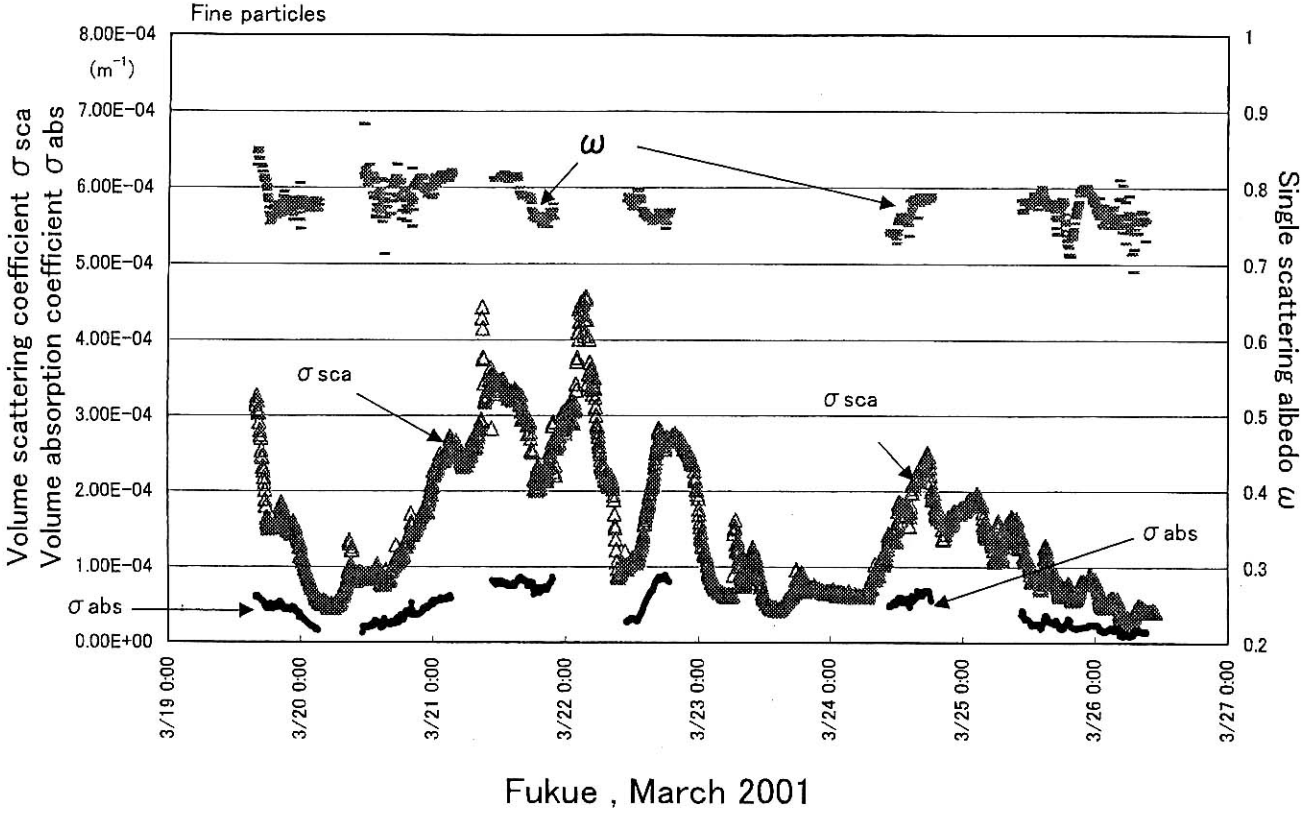

Fine particles
Concentration (μ g/m3)
40
35
30
25
20
15
10
5
0
Soil
S.S.C
NH4+
Cl−
NO3−
SO42−
Org
EC
4/3
4/4
4/5
4/6
4/7
4/8
4/9
4/10
4/11
4/12
4/13
4/14
4/15
4/16
4/17
4/18
4/19
4/20
4/21
4/22
4/23
4/24
4/25
4/26
4/27
4/28
Amami−ohshima , April 2001

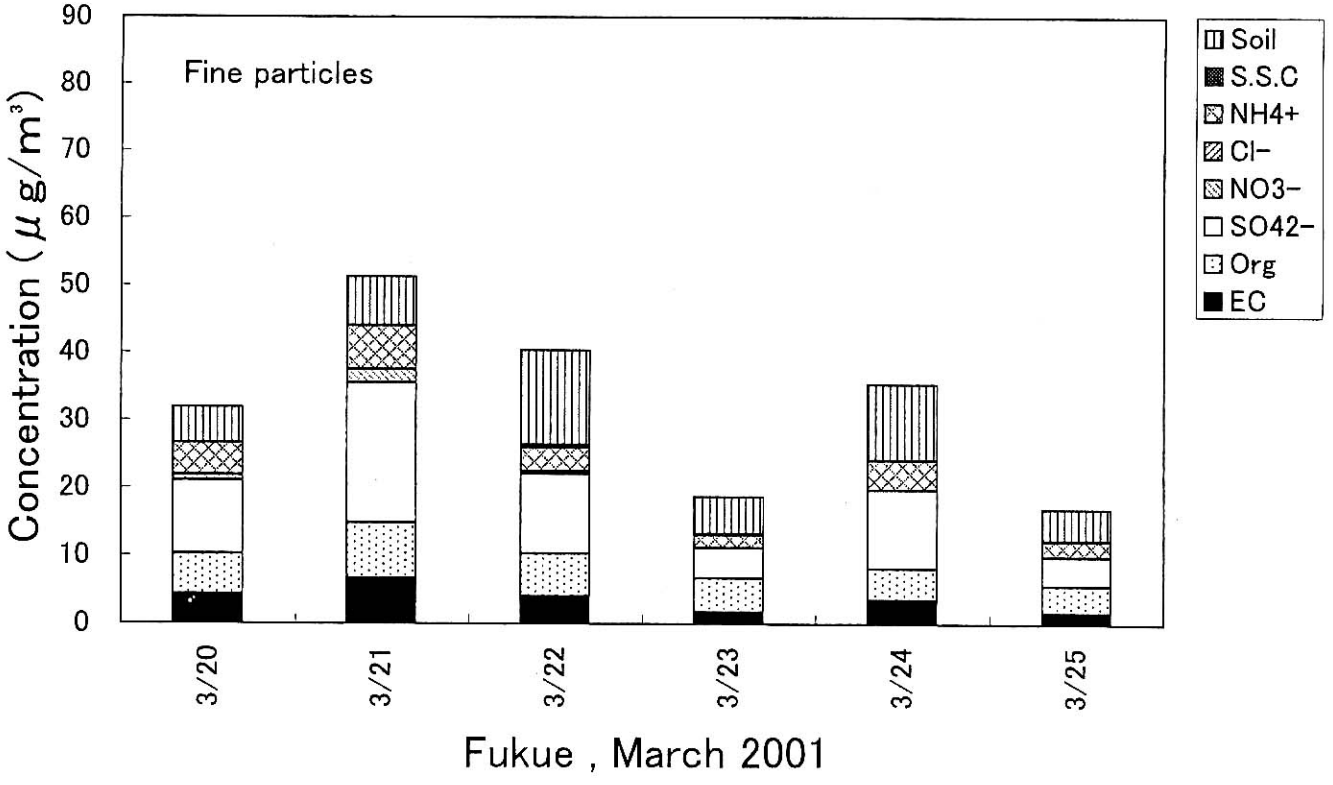

Total particles
Concentration (μ g/m3)
80
70
60
50
40
30
20
10
0
Soil
S.S.C
NH4+
Cl-
NO3-
SO42-
4/3
4/4
4/5
4/6
4/7
4/8
4/9
4/10
4/11
4/12
4/13
4/14
4/15
4/16
4/17
4/18
4/19
4/20
4/21
4/22
4/23
4/24
4/25
4/26
4/27
4/28
Amami-ohshima , April 2001

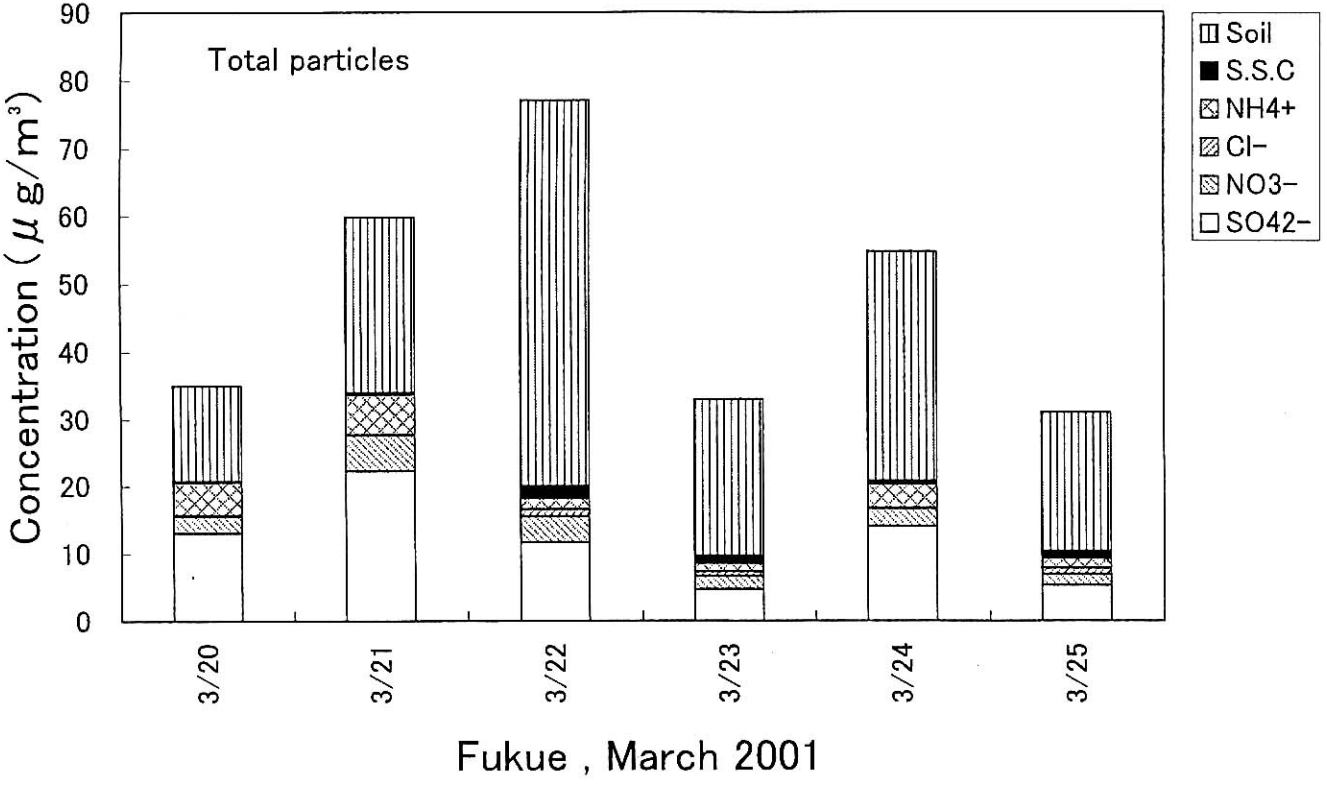

Fine particles
Concentration (ng/m³)
60
50
40
30
20
10
0
4/3
4/5
4/7
4/9
4/11
4/13
4/15
4/17
4/19
4/21
4/23
4/25
4/27
V
Cr
Zn
As
Pb
Amami-ohshima , April 2001

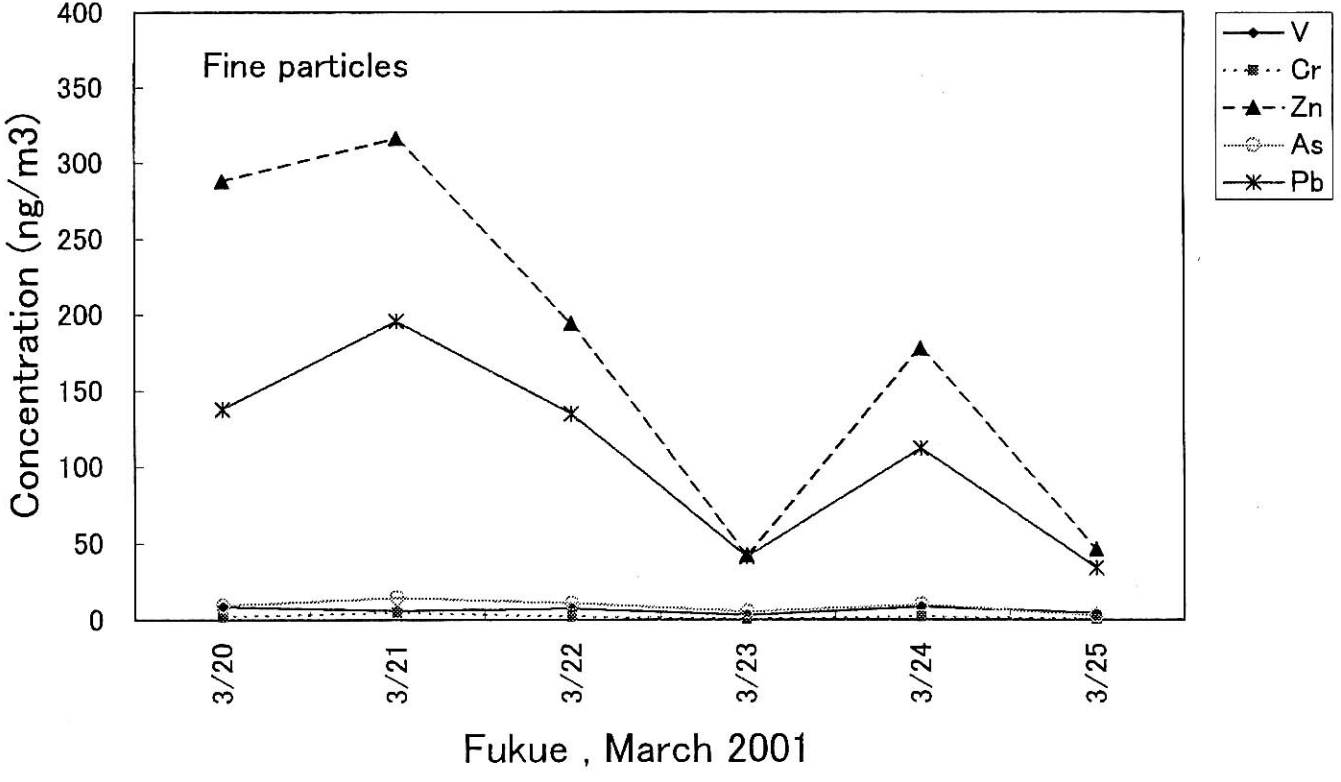

Fine particles
Volume scattering coefficient σ sca
Volume absorption coefficient σ abs
Single scattering albedo ω
(m⁻¹)
4.00E-04
3.50E-04
3.00E-04
2.50E-04
2.00E-04
1.50E-04
1.00E-04
5.00E-05
0.00E+00
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
ω
σ sca
σ sca
σ abs
σ abs
8/20 0:00
8/21 0:00
8/22 0:00
8/23 0:00
8/24 0:00
8/25 0:00
8/26 0:00
Fukue , August 2000


Fine particles
Concentration (μ g/m³)
20
18
16
14
12
10
8
6
4
2
0
8/20
8/21
8/22
8/23
8/24
Fukue , August 2000
Soil
S.S.C
NH4+
Cl−
NO3−
SO42−
Org
EC


Fine particles
8.00E-04
(m⁻¹)
7.00E-04
6.00E-04
5.00E-04
4.00E-04
3.00E-04
2.00E-04
1.00E-04
0.00E+00
Volume scattering coefficient σ sca
Volume absorption coefficient σ abs
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
Single scattering albedo ω
ω
σ sca
σ sca
σ abs
σ abs
3/19 0:00
3/20 0:00
3/21 0:00
3/22 0:00
3/23 0:00
3/24 0:00
3/25 0:00
3/26 0:00
3/27 0:00
Fukue , March 2001


Fine particles
Concentration (μ g/m³)
90
80
70
60
50
40
30
20
10
0
3/20
3/21
3/22
3/23
3/24
3/25
Fukue , March 2001
Soil
S.S.C
NH4+
Cl−
NO3−
SO42−
Org
EC


Total particles
Concentration (μ g/m³)
90
80
70
60
50
40
30
20
10
0
3/20
3/21
3/22
3/23
3/24
3/25
Fukue , March 2001
Soil
S.S.C
NH4+
Cl−
NO3−
SO42−


Fine particles
Concentration (ng/m3)
400
350
300
250
200
150
100
50
0
3/20
3/21
3/22
3/23
3/24
3/25
Fukue , March 2001
V
Cr
Zn
As
Pb

○Aerosol measurement at Amami-Ohshima in April 2001.

Period	Date	σ sca (10^{-6} m^{-1})	ω	SO_4^{2-} (μg/m³)	EC (μgC/m³)	Al (ng/m³)	Zn (ng/m³)
A	April 3	10-190	0.81-0.88	8.5	1.0	100	30
B	10	10-160	0.96-0.98	10.2	0.2	40	2
C	11-16	30-190	0.78-0.96	7.3-10.7	0.8-1.2	500-800	25-55
		(50-140)	(～0.80)	(～7.6)	(～1.1)	(～600)	33-55
D	19	40- 60	0.78-0.86	7.5	0.75	200	31
E	26-27	30- 75	0.80-0.86	4.8-5.8	1.0-1.6	140-150	11-16

○Aerosol measurement at Fukue Island in March 2001.

Date	σ sca (10^{-6} m^{-1})	ω	SO_4^{2-} (μg/m^3)	EC (μgC/m^3)	Al (ng/m^3)	Zn
March 21	200-460	0.75-0.82	22.3	6.6	2110	320
22	80-280	0.78-0.80	11.6	4.0	4640	200
24	100-250	0.73-0.78	14.0	3.5	2760	180