

Monitoring of SO₂ concentration at the summit of Mt. Fuji

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This photo is from
[www.oecn.ne.jp/~ynika57...](http://www.oecn.ne.jp/~ynika57/)



Volcanic SO₂ sources over Japanese Islands

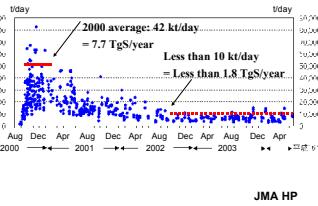
Annual SO₂ emission :
0.55 TgS during quiescent period

(Fujita et al., 1992)

MT. Oyama volcano
Miyake-jima Island

Photo taken in Apr. 2002
from JMA HP

SO₂ emission from Miyake-jima

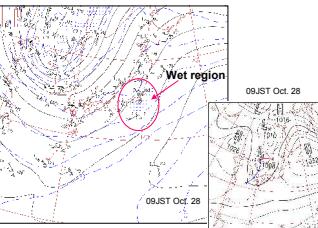


JMA HP

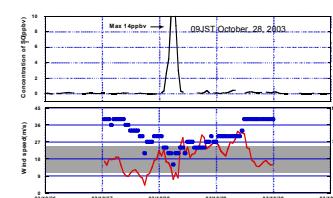
Summary and comparison of monthly median SO₂ concentrations with literature values

Authors	Location	Altitude	Month/Season	SO ₂ conc. (ppmv)	Remarks
Present study	Summit of Mt. Fuji	3776 m	October 2002	0.06±0.10	Median of 1-min data
			November 2002	0.12±0.26	
			December 2002	0.09±0.21	
			January 2003	0.01±0.16	
			February 2003	0.07±0.13	
			June 2003	0.07±0.22	
			July 2003	0.05±0.26	
			August 2003	0.04±0.26	
			September 2003	0.04±0.11	
			October 2003	0.07±0.19	
Sakano et al. (1997)	Summit of Mt. Fuji	3776 m	July-August 1993	0.04±0.02	Average of 4 h data
Fujita et al. (1996)	Jungfrufjellet, Norway	3550 m	July 1994	0.04±0.16	Median of 4 h data
Luria et al. (1996)	Morne Rose Volcano, St. Lucia	3400 m	December 1995 November 1995	about 0.2	Annual average level
Hatakeyama et al. (1995)	Northeast Pacific Rim	0.5-3 km	October 1991	0.16±0.32	Range of monthly median of 4 h data
Thompson et al. (1997)	Sequoia National Forest, California, 3-40 km	2.4 km	February-August 1993	0.13±0.762	Range of average

Weather chart for surface and 700 hPa level



The maximum peak found during end of October 2003

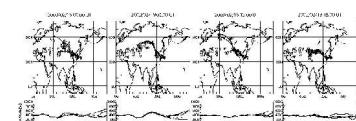


The maximum plume height from the Miyake-jima island

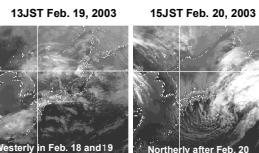


From JMA HP

Backward trajectories (isentropic)



Infrared satellite images



Inventory of sulfur in the atmosphere

SO₂ emission from Asia

TABLE I
Estimates of national SO₂ and NO_x emissions (Gg/yr) for 1990, 1995, and 1997.

D.G. Streets, N.Y. Tsai,
H. Akimoto and K. Oka,
Trends in emissions of acidifying species in Asia,
Water, Air and Soil Poll.,
130, 187-192, 2001.

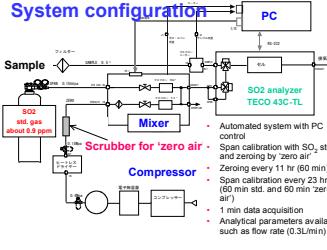
Table 5.5: Production parameters and burdens of SO₂ and aerosol sulphate as predicted by eleven different models.

Model	Sulphur precursor	Deposition	Gas phase	Aerosol	SO ₂ (%)	Sulphate dry deposition	Sulphate wet deposition	t(SO ₄ ²⁻) (%)	SO ₂ burden (%)	days	P
A	94.5	47	8	45	0.30	1.1	16	84	0.77	5.0	2.5
B	100.7	49	5	34	0.20	0.6	27	73	0.68	4.6	2.2
C	100.7	49	17	34	0.43	1.5	13	87	0.63	4.4	2.2
D	80.4	44	16	39	0.56	2.6	20	80	0.73	5.7	3.1
E	106.0	54	6	40	0.36	1.2	11	89	0.55	4.1	2.1
F	106.0	50	18	34	0.24	0.22	70	92	0.47	3.1	1.6
G	82.5	33	12	56	0.40	1.9	7	93	0.57	3.8	2.2
H	95.7	45	13	42	0.54	2.4	18	82	1.04	7.2	3.5
I	123.6	47	9	44	0.63	2.0	16	84	0.74	3.6	2.2
J	123.6	49	15	47	0.60	2.3	25	75	1.11	4.3	2.2
K	92.5	56	15	47	0.43	1.8	13	87	0.63	5.8	2.8
Average	98.2	42	12	45	0.46	1.8	17	83	0.77	4.9	2.5
Standard deviat.	14.7	12	5	11	0.14	0.6	6	0.19	1.0	0.3	

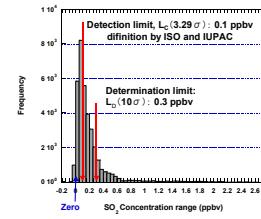
Model/Reference: A-MOGGINATA/Larson and Rodhe, 1991; B-IMAGIS/Pham et al., 1996; C-ECHAM4/Fiechter et al., 1996; D-Harvard-Koch et al., 1999; E-CM1-GRANTOUR/Chang et al., 1997; F-TECH4/Bard et al., 2000; G-CM3/Bath et al., 2000 and Rasch et al. 2000a; H-CCC/Lohmann et al., 1999a; I-Vriesen et al., 2000; J-Lelieveld et al., 1997; K-GOCART/Chin et al., 2000.

From IPCC2001

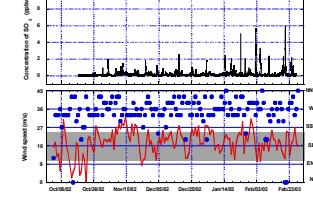
Total Asia 33670.9 38471.0 39179.5 18650.4 25627.8 28501.4



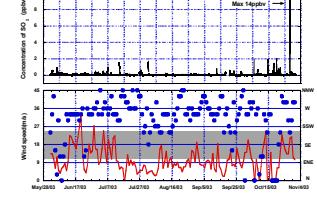
Frequency distribution of SO₂ concentration (1 min value) during Nov. 2002



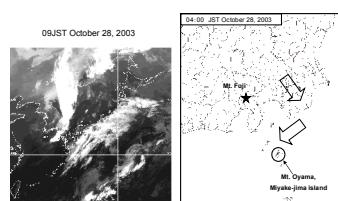
Temporal trend of SO₂ concn. during winter (October 2002 – February 2003)



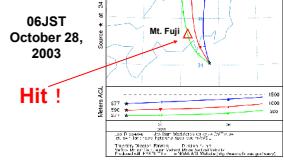
Temporal trend of SO₂ concn. during winter (June 2003 – October 2003)



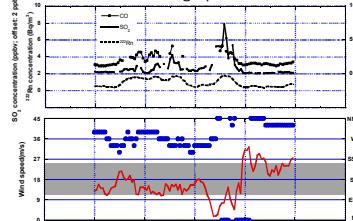
Infra-red satellite image and surface winds



Forward trajectories



Temporal change of SO₂, CO and ²²²Rn and win during Epd.1.



Surface weather chart



Summary and future tasks

- A continuous SO₂ monitor was installed at the summit of Mt. Fuji. BG concentrations were so low that could not be measured by the present system. Diurnal changes were generally small.
- Seasonal trends in SO₂ concentrations were characterized as low in summer and high in winter. This could be attributable to the seasonal change in source intensity, transport and oxidation rate.
- Miyake-jima volcanic plume was detected once during the observation. After the late 2002, the plume height has not been beyond 1.2km, the plume would rarely be transported to 3-4km level in the free troposphere except the case for turbulence.
- Asian outflow of the pollutants during winter was obviously observed.
- High SO₂ concentration events usually accompanied by high CO as well as ²²²Rn concentration, the polluted air mass originated from the same region in the Asian continent.
- SO₂ data during spring should be obtained.
- The SO₂/SO₄²⁻ ratio should be known.