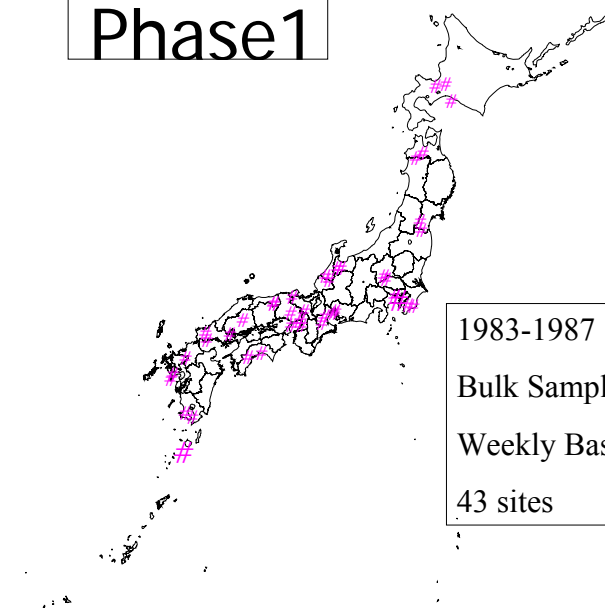


Acid Deposition Monitoring over Japan

Acid Deposition and Oxidant Research
Center

Phase1

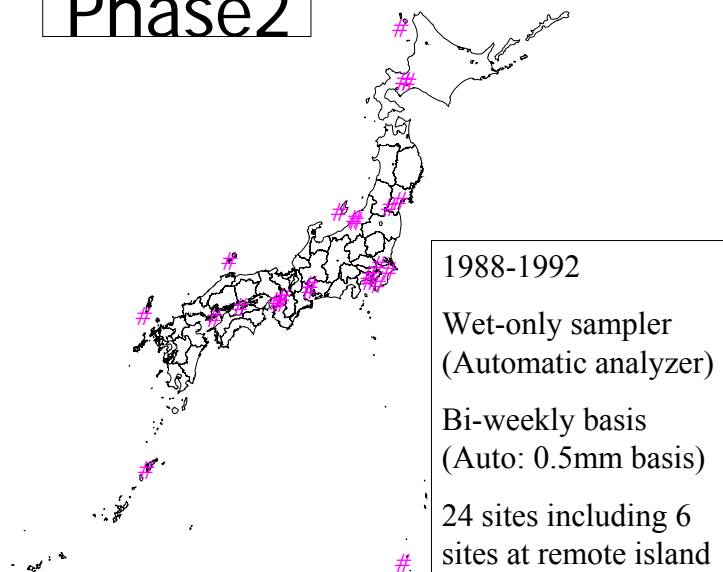


1983-1987
Bulk Sampler
Weekly Basis
43 sites

Phase1: Major results on atmospheric monitoring

1. Mean pH: 4.4 (Musashino, 1984) - 5.5 (Koto, 1987).
Precipitation pH in western region was lower than that in eastern region.
2. There was no significant regional differences in SO_4^{2-} , NO_3^- , and nss- SO_4^{2-} concentration. pH was depend on the relation among H_2SO_4 , HNO_3 , CaCO_3 , and NH_3 .
 $\text{NO}_3^-/\text{nss-SO}_4$ ratios was high in urban area.
3. SO_4^{2-} deposition in Japan was larger than that in US. NO_3^- deposition in Japan was almost equal to that in US. On the other hand, H^+ deposition was smaller than US.

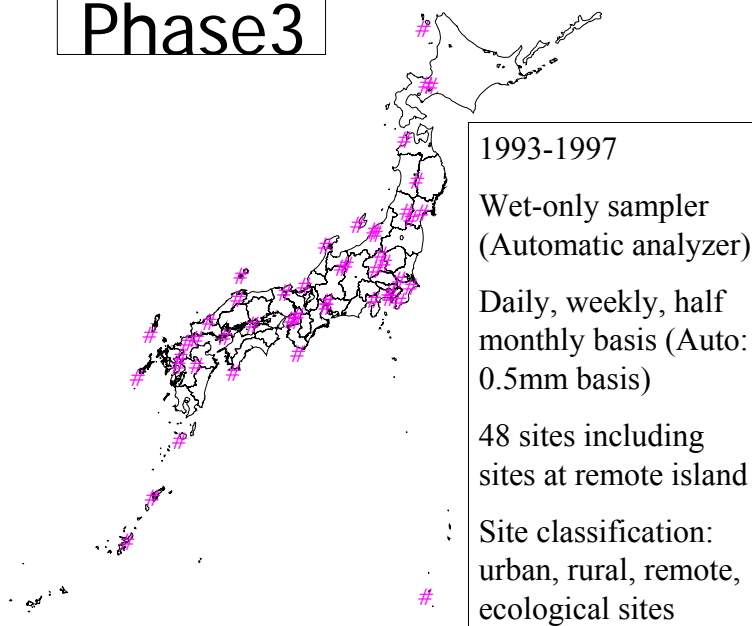
Phase2



Phase2.Major results on atmospheric monitoring

1. Mean pH, 4.5-5.8 (overall average: pH4.8), was same level as Phase 1 and US and Europe.
2. Maximum annual deposition of nss-SO_4^{2-} and NO_3^- was larger than that in US. There was no variation with time in average deposition in last 10 years.
3. **Nss-SO₄²⁻ concentration in remote island in the Sea of Japan varied with season, high in autumn and winter. One of the possible causes in the variation was long range transportation of air pollutant from Asian continent to Japan.**

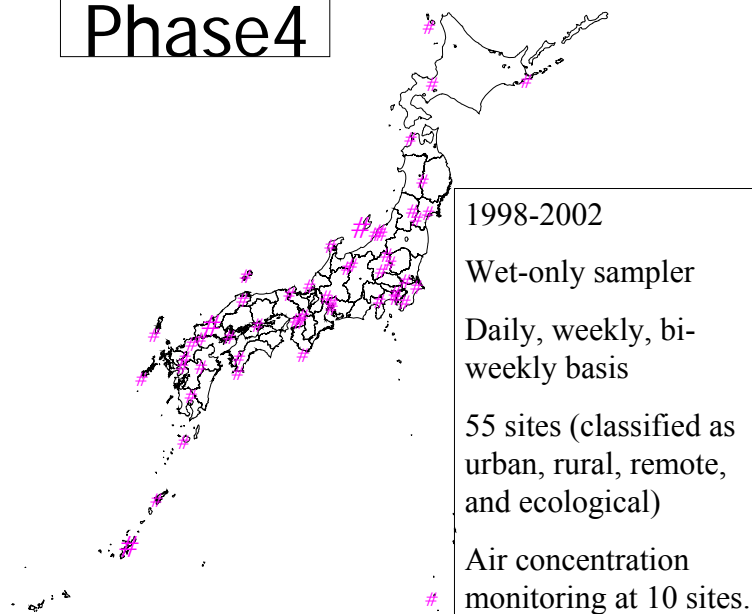
Phase3



Phase3.Major results on atmospheric monitoring

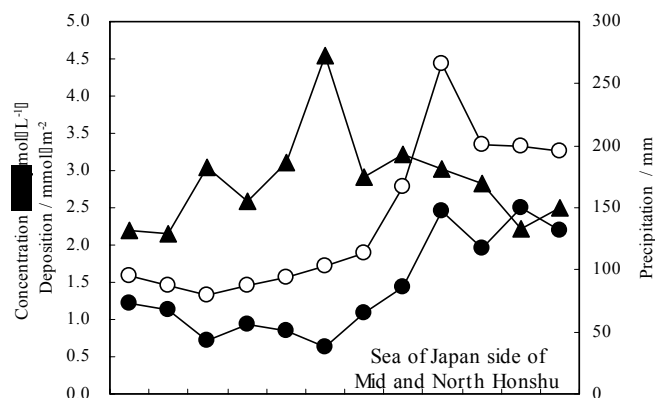
1. Annual mean pH 4.7 - 4.9 was same level as Phase2. nss-SO₄²⁻ concentration and deposition decreased comparing with Phase2 survey. NO₃⁻ concentration and deposition increased. Contribution of HNO₃ to acidification of precipitation increased.
2. **Nss-SO₄²⁻ and NO₃⁻ deposition in remote island in the Sea of Japan varied with season, high in autumn and winter.**
3. Long range transportation model of air pollutant in East Asia was developed.

Phase4



Phase4.Major results on atmospheric monitoring

1. Annual mean pH 4.47 - 6.15 (overall average 4.82) was same level as Phase3. However, precipitation acidity and nss-SO₄²⁻ concentration in 2000 was higher than that in other years due to influence of volcanic eruption.
2. Nss-SO₄²⁻ deposition decreased and NO₃⁻ deposition increased year by year.
3. **nss-SO₄²⁻ and NO₃⁻ deposition increased in winter in the area along the sea of Japan. nss-Ca²⁺ deposition increased in spring in all region.**
4. SO₂ median was less than 1ppb in all sites. High concentration observed in Kanto district in 2000 due to the influence of volcanic eruption. O₃ annual average was more than 40 ppb in many sites. High in spring. PM: Peak in March and April.



Seasonal variation of nss-SO₄²⁻ concentration and deposition

●.nss-SO₄²⁻ concentration.▲.precipitation.○.nss-SO₄²⁻ deposition

Wet deposition monitoring stations and screening of annual data

No.	Name of Station	Regional category	Environmental Category	Screening results of annual values												
				Phase 2					Phase 3					Phase 4		
				1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	Rishiri	Jh	R				o	o	o	o	o	o	o	o	o	o
2	Sapporo	Jh	U	o	o	o	o	o	o	o	o	o	o	o	o	o
3	Nopporo	Jh	r	o	o	o	o	o	o	o	o	o	o	o	o	o
4	Tappi	Jn	R							o	o	o	o	o	o	o
5	Obanazawa	Jn	E							o	o	o	o	o	o	o
6	Sado	Jn	R				o	o	o	o	o	o	o	o	o	o
7	Sado-Seki	Jn	R													o
8	Niigata	Jn	U	o	o	o	o	o	o	o	o	o	o	o	o	o
9	Niitsu	Jn	r	o	o	o	o	o	o	o	o	o	o	o	o	o
10	Niigata-Maki	Jn	r													o
11	Tateyama	Jn	E							o	o	o	o	o	o	o
12	Wajima	Jn	R							o	o	o	o	o	o	o
13	Echizen-misaki	Jn	R							o	o	o	o	o	o	o
14	Happo	Jn	R							o	o	o	o	o	o	o
15	Kyoto-Yasaka	Jn	E								o	o	o	o	o	o

1) Regional categories: Jh; the Sea of Japan side of Hokkaido, Jn; the Sea of Japan side of Mid and North Honshu, Js; San-in, P; the Pacific Ocean side, I; the Seto Inland Sea side, E; the East China Sea coast, S; Southwest islands
 2) Environmental Categories: u ; urban, r; rural, r ; remote, e ; ecological survey site
 3) Screening results: □ ; not accept for insufficient monitoring period, □ ; not accept for technical trouble, o ; acceptance