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RADIOACTIVITY SURVEY DATA in Japan

Part 1
= Environmental Materials =

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National Institute of Radiological Sciences
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Contents

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Environmental and Dietary Materials*

(Japan Chemical Analysis Center)

1. Collection and pretreatment of samples

(1) Rain and dry fallout

Rain and dry fallout was collected monthly on a sampling tray, approximately 5000 cm^2 in area, which was filled with water to a depth of 1 cm at the beginning of every month.

Strontium and cesium carrier solutions were added after the sample was filtered. The tray was washed with 5 ℓ of distilled water and the washing was combined to the filtrate.

The sample was passed through a cation exchange column (500 mℓ of Dowex 50W X8, 50 ~ 100 mesh, Na form) at a rate flow of 80 mℓ/min.

(2) Airborne dust

Airborne dust was collected by an electrostatic precipitator or a filter air sampler for every three months at a rate of more than 3000 m^3 per month. The sampling was done 1 to 1.5 meters above the ground.

(3) Service water and freshwater

Service water, 100 ℓ each, was collected at the intake of the water-treatment plant and at the tap after water was left running for five minutes. Strontium and cesium carriers were added to the filtered water sample. The subsequent process was the same as that described in the section (1). Freshwater was treated in the same way as the service water.

(4) Soil

Soil was collected from the location in the spacious and flat area without past surface disturbance caused by duststorms, inflow and outflow due to precipitation, etc.. Any places located under trees in a forest, in a stony area or inside of river banks were avoided. Soil was taken from two layers of different depths, 0-5cm and 5-20cm. The soil lumps were crushed by hands and dried in a drying oven regulated 105 ℃ . The soil was then passed through a 2 mm sieve to remove plant roots and pebbles.

(5) Sea water

Sea water was collected at the fixed stations where the effect of terrestrial fresh water from rivers was expected to be negligibly small. A special consideration was also given to weather conditions. The sampling was carried out when there was no rainfall for the last few days. To prevent contamination, water samples were collected at the bow of a sampling boat just before she stood still by scooping surface water using a polyethylene bucket. Immediately after the collection, the samples were acidified to a pH lower than 3 by adding concentrated hydrochloric acid in a ratio of 1 mℓ to 1 ℓ of sea water, and then stored in 20 ℓ polyethylene containers. The sampling equipments as well as containers were thoroughly rinsed with dilute hydrochloric acid and then with distilled water before use. Two hundred milliliters of sea water was also collected at the same stations for the determination of chlorinity.

(6) Sea sediments

Sediment was collected in the same area as that for the sea water sample, taking the following criteria into account:

a. The depth of water exceeds 1 m at low tide.
b. No significant sedimental movement is observed in the vicinity of concern.
c. Mud, silt and fine sand are preferable.

A conventional sediment sampling device was used for collecting the top few centimeters of surface sediment. Approximately 4kg of the sample in wet weight was spread on a stenless steel dish after removed of the pebbles, shells and other foreign materials, and dried in a drying oven regulated at 105℃ .

(7) Total diet

A full one day ordinary diet including three meals, water, tea and other in-between snacks for five persons was collected as a sample of "total diet". The sample in a large stainless steel pan was carbonized carefully by direct application of gas flame, and was transfered to a porcelain dish and then ashed at 450 ℃ in an electric muffle furnace.

(8) Rice

Polished rice was collected in producing districts at the harvest and in consuming areas when new crops were first put on sale. The sample was carbonized and ashed in a porcelain dish.

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* Samples were sent to the Center from 32 contracted prefectures.

(9) Milk

Raw milk was collected in producing districts and commercial milk was purchased in consuming districts. Milk in a stainless steel pan or a porcelain dish was evaporated to dryness followed by carbonization and ashing.

(10) Vegetables

Spinach and Japanese radish were selected as the representatives for leaf vegetables and for non-starch roots, respectively. After removing soil, the edible part of vegetable sample was dried and carbonized in a stainless steel pan or a porcelain dish.

(11) Tea

Five hundred grams of manufactured green tea was collected, carbonized and ashed in a stainless steel pan or a porcelain dish.

(12) Fish, shellfish and seaweeds

a. Sea fish and freshwater fish

Fish was rinsed with water and blotted with a filter paper. Only the edible part was used in case of larger sized fish, and the whole part was used in case of smaller ones. Each sample was weighed and placed in a stainless steel pan or a porcelain dish. After carbonized, the sample was ashed in an electric muffle furnace.

b. Shellfish

Approximately 4 kg of shellfish including the shells was collected or purchased. After removing the shells, it was treated in the same way as that for the sea fish.

c. Seaweeds

Edible seaweeds were collected and rinsed with water to remove sand and other adhering matters on the surface. These were removed of excess water, weighed dried and ashed.

Table 1 shows detailes of sample collection.

Table 1 Details of sample collection

Sample	Frequency of sampling	Quantity of sample
=Environmental materials=		
(1) Rain and dry fallout		
1. For domestic program	monthly	
2. For WHO program	monthly	
(2) Airborne dust	quarterly	>3000 m^3/month
(3) Service water and freshwater		
1. Service water (source water)	semiyearly	100 ℓ
2. Service water (tap water)	semiyearly	100 ℓ
3. Freshwater	yearly (fishing season)	100 ℓ
(4) Soil		
1. 0 ~ 5 cm	yearly	4 kg
2. 5 ~ 20cm	yearly	4 kg
(5) Sea water	yearly	40 ℓ
(6) Sea sediments	yearly	4 kg
=Dietary materials=		
(7) Total diet	semiyearly	daily amount for 5 persons
(8) Rice		
1. Producing districts	yearly (harvesting season)	5 kg (polished rice)
2. Consuming districts	yearly (harvesting season)	5 kg (polished rice)
(9) Milk		
1. Producing districts for WHO program	quarterly (February, May, August and November)	3 ℓ
2. Producing districts for domestic program	semiyearly (February and August)	3 ℓ

Sample	Frequency of sampling	Quantity of sample
3. Consuming districts	semiyearly (February and August)	3 ℓ
4. Powdered milk	semiyearly (April and October)	2～3 kg
(10) Vegetables		
1. Producing districts	yearly (harvesting season)	4 kg
2. Consuming districts	yearly (harvesting season)	4 kg
(11) Tea	yearly (the first harvesting season)	500g (manufactured tea)
(12) Fish, shellfish and seaweeds		
1. Sea fish	yearly (fishing season)	4 kg
2. Freshwater fish	yearly (fishing season)	4 kg
3. Shellfish	yearly (fishing season)	4 kg
4. Seaweeds	yearly (fishing season)	2～3 kg

2. Preparation of samples for analysis

(1) Rain, service water and freshwater

Strontium and cesium were eluted with hydrochloric acid from the cation exchange column. The residue of rain sample on the filter paper was ashed in an electric muffle furnace and the ash was dissolved in hydrochloric acid. The insoluble part was filtered and washed. The filtrate and the washings were combined to the previous eluate and used for radiochemical analysis.

(2) Soil and Sea sediment

Dried soil was crushed to smaller ones than 0.25 mm in size by a crusher. The sieved sample was ashed in an electric muffle furnace regulated at 450℃. The sample was then heated with hydrochloric acid, strontium and cesium carrier solutions and the mixture was heated. The insoluble constituent was filtered off and washed with water.

The dried sample was crushed to smaller ones than 0.25 mm by a crushing machine. The further preparation of the sample was the same as that described in the section 2-(2).

(3) Rice

The ashed sample was pulverized with a porcelain mortar and passed through a 0.35 mm sieve. The sieved sample to which both strontium and cesium carriers were added, was digested with nitric acid by heating. After the sample was heated again with nitric acid to dryness, strontium and cesium were extracted with hydrochloric acid and water. The insoluble constituent was filtered and washed. The filtrate and washings were combined for subsequent radiochemical analysis.

(4) Airborne dust, diet, milk, vegetables, fish and shellfish, seaweeds, tea and others

These ashed samples were treated with the same procedure as that described in the section 2-(4).

3. Separation of strontium-90 and cesium-137

(1) Strontium-90

Sample solutions, prepared as in the foregoing sections 2-(1) through 2-(4), were neutralized with sodium hydroxide. After sodium carbonate was added, the precipitate of strontium and calcium carbonates was separated. The supernatant solution was retained for cesium-137 determination. The carbonates were dissolved in hydrochloric acid and strontium and calcium were precipitated as oxalates. The precipitate was dissolved in nitric acid and strontium was separated from calcium by successive fuming nitric acid separation. Iron scavenge was made after addition of ferric iron carrier followed by barium chromate separation after addition of barium carrier to remove radium, its daughters and lead. Strontium was recovered as carbonate, and the precipitate was dried and weighed to determine strontium recovery. The strontium carbonate was dissolved in hydrochloric acid and iron carrier was added. The solution was allowed to stand for two weeks for strontium-90 and yttrium-90 to attain equilibrium. Yttrium-90 was coprecipitated with ferric hydroxide and the precipitate was filtered off, washed and counted.

(2) Cesium-137

The supernatant separated from the strontium fraction was acidified with hydrochloric acid. While stirring, cesium was adsorbed on the ammonium molyb-

dophosphate added.

After filtered off and washed with hydrochlotric acid the precipitate was dissolved in 2.5N sodium hydroxide solution. The solution was adjusted to pH 8.2 with hydrochloric acid and allowed to cool. Resultant molybdenum hydroxide which separated out in the solution, was filtered off and washed with water. EDTA was added to the filtrate and washings. Cesium and rubidium were adsorbed on a cation exchange column and cesium was separated from rubidium by eluting with hydrochloric acid.

The eluate was evaporated to dryness and was dissolved. The solution was filtered. Chloroplatinic acid was added to precipitate cesium. The precipitate was filtered onto a tared paper using a demountable filter and washed with water and then ethanol. After drying, the chemical yield of cesium was determined by weighing the precipitate. Cesium-137 radioactivity was measured for this precipitate.

4. Determination of stable strontium, calcium and potassium

A weighed amount of soil or sea sediment was heated in a electric muffle furnace at 450 ℃ and then treated with hydrochloric acid for extraction. A weighed aliquot of ashed samples of total diet, vegetables, milk, fish, shellfish or seaweeds was digested with hydrofluoric acid and nitric acid.
The extract was made up to an appropriate volume with dilute hydrochloric acid. The sample solution was analyzed for calcium by titration with standard potassium permanganate solution after separating calcium as oxalate. Atomic absorption spectroscopy was applied when appropriate. Stable strontium and potassium were determined by atomic absorption and flame emission spectrometry, respectively.

5. Counting

After the radiochemical separation the mounted precipitates were counted for activity using low background beta counters normally for 60 to 90 min. Net sample counting rates were corrected for counter efficiency, recovery, self-absorption and decay to obtain the content of strontium-90 and cesium-137 per sample aliquot. From the results, concentrations of these nuclides in the original samples were calculated.

6. Results

(1)-1 Strontium-90 and Cesium-137 in Rain and Dry Fallout(for domestic program)
(from Mar. 1988 to Dec. 1988)

-continued from NO. 84 of this publication-

Table (1)-1: Strontium-90 and Cesium-137 in Rain and Dry Fallout

Location	Duration (days)	Precipitation (mm)	^{90}Sr (MBq/Km^2)	^{137}Cs (MBq/Km^2)
March, 1988				
KKosugi-machi, TOYAMA	32	167.0	0.03 ± 0.018	0.30 ± 0.031
Koufu, YAMANASHI	32	126.5	0.005 ± 0.016	0.11 ± 0.024
Ooita, OOITA	32	199.0	0.01 ± 0.019	0.06 ± 0.020
April, 1988				
Morioka, IWATE	32	112.0	0.05 ± 0.019	0.28 ± 0.029
KKosugi-machi, TOYAMA	32	117.0	0.09 ± 0.020	0.44 ± 0.036
Koufu, YAMANASHI	31	78.0	0.00 ± 0.083	0.49 ± 0.100
Kyoto, KYOTO	32	70.0	0.03 ± 0.018	0.13 ± 0.025
Wakayama, WAKAYAMA	36	103.3	0.04 ± 0.026	0.11 ± 0.028
Matsue, SHIMANE	33	80.6	0.05 ± 0.013	0.36 ± 0.025
Saga, SAGA	33	153.0	0.02 ± 0.019	0.12 ± 0.023
Ooita, OOITA	31	110.0	0.05 ± 0.022	0.21 ± 0.029
May, 1988				
Morioka, IWATE	31	86.1	0.05 ± 0.019	0.10 ± 0.022
KKosugi-machi, TOYAMA	31	167.5	0.03 ± 0.018	0.15 ± 0.027
Koufu, YAMANASHI	32	72.0	0.00 ± 0.016	0.11 ± 0.025
Nagoya, AICHI	32	165.6	0.02 ± 0.019	0.12 ± 0.026
Kyoto, KYOTO	31	165.6	0.02 ± 0.022	0.09 ± 0.023
Wakayama, WAKAYAMA	28	96.8	0.02 ± 0.022	0.08 ± 0.022
Matsue, SHIMANE	31	107.7	0.02 ± 0.012	0.11 ± 0.016
Saga, SAGA	31	209.2	0.01 ± 0.020	0.05 ± 0.019
Ooita, OOITA	32	228.0	0.05 ± 0.020	0.07 ± 0.021
June, 1988				
Aomori, AOMORI	31	87.4	0.12 ± 0.023	0.07 ± 0.020
Morioka, IWATE	31	74.2	0.01 ± 0.017	0.01 ± 0.017
Ookuma-machi, FUKUSHIMA	30	162.4	0.00 ± 0.018	0.15 ± 0.025
Mito, IBARAGI	31	121.0	0.01 ± 0.018	0.04 ± 0.019
Utsunomiya, TOCHIGI	31	269.8	0.001 ± 0.016	0.03 ± 0.022
KKosugi-machi, TOYAMA	31	187.5	0.00 ± 0.016	0.07 ± 0.023
Koufu, YAMANASHI	31	164.5	0.002 ± 0.016	0.08 ± 0.024
Shizuoka, SHIZUOKA	31	450.5	0.02 ± 0.019	0.10 ± 0.024

Location	Duration (days)	Precipitation (mm)	^{90}Sr (MBq/Km^2)	^{137}Cs (MBq/Km^2)
Nagoya, AICHI	30	354.1	0.03 ± 0.019	0.08 ± 0.025
Kyoto, KYOTO	31	224.5	0.09 ± 0.032	0.07 ± 0.022
Matsue, SHIMANE	31	193.8	0.00 ± 0.024	0.07 ± 0.014
Dazaifu, FUKUOKA	31	333.9	0.06 ± 0.020	0.02 ± 0.018
Saga, SAGA	31	354.5	0.00 ± 0.018	0.08 ± 0.020
Ooita, OOITA	31	801.0	0.04 ± 0.019	0.04 ± 0.018
July, 1988				
Sapporo, HOKKAIDO	32	23.5	0.04 ± 0.020	0.07 ± 0.022
Aomori, AOMORI	32	48.5	0.07 ± 0.021	0.04 ± 0.017
Onagawa-machi, MIYAGI	32	279.3	0.06 ± 0.019	0.00 ± 0.014
Morioka, IWATE	32	104.3	0.02 ± 0.018	0.05 ± 0.019
Yamagata, YAMAGATA	32	156.9	0.03 ± 0.017	0.05 ± 0.019
Ookuma-machi, FUKUSHIMA	33	354.5	0.04 ± 0.021	0.04 ± 0.023
Mito, IBARAGI	32	204.0	0.00 ± 0.018	0.01 ± 0.017
Shinjuku, TOKYO	32	170.9	0.04 ± 0.019	0.04 ± 0.018
Yokohama, KANAGAWA	31	226.7	0.03 ± 0.018	0.09 ± 0.021
Utsunomiya, TOCHIGI	32	142.2	0.04 ± 0.022	0.03 ± 0.017
KKosugi-machi, TOYAMA	32	208.0	0.00 ± 0.016	0.01 ± 0.023
Fukui, FUKUI	32	217.0	0.11 ± 0.095	0.00 ± 0.077
Koufu, YAMANASHI	32	135.5	0.004 ± 0.017	0.05 ± 0.020
Shizuoka, SHIZUOKA	32	214.0	0.01 ± 0.018	0.01 ± 0.019
Nagoya, AICHI	32	205.9	0.01 ± 0.019	0.03 ± 0.019
Kyoto, KYOTO	32	224.5	0.04 ± 0.021	0.03 ± 0.021
Kobe, HYOGO	30	86.9	0.002 ± 0.018	0.05 ± 0.019
Tottori, TOTTORI	32	279.2	0.15 ± 0.025	0.01 ± 0.018
Matsue, SHIMANE	32	279.8	0.01 ± 0.013	0.08 ± 0.014
Hiroshima, HIROSHIMA	32	154.1	0.13 ± 0.023	0.08 ± 0.021
Matsuyama, EHIME	32	85.0	0.00 ± 0.018	0.01 ± 0.017
Takamatsu, KAGAWA	32	182.0	0.00 ± 0.018	0.02 ± 0.016
Dazaifu, FUKUOKA	32	377.2	0.04 ± 0.021	0.04 ± 0.018
Saga, SAGA	32	211.5	0.01 ± 0.019	0.01 ± 0.016
Nagasaki, NAGASAKI	32	117.0	0.04 ± 0.021	0.01 ± 0.017
Ooita, OOITA	32	138.9	0.001 ± 0.018	0.08 ± 0.021
Miyazaki, MIYAZAKI	32	431.9	0.05 ± 0.020	0.23 ± 0.028
August, 1988				
Sapporo, HOKKAIDO	32	188.0	0.09 ± 0.022	0.07 ± 0.021
Aomori, AOMORI	32	38.5	0.03 ± 0.021	0.10 ± 0.022
Onagawa-machi, MIYAGI	31	212.7	0.03 ± 0.019	0.03 ± 0.021

Location	Duration (days)	Precipitation (mm)	^{90}Sr (MBq/Km^2)	^{137}Cs (MBq/Km^2)
Yamagata, YAMAGATA	32	292.8	0.04 ± 0.020	0.05 ± 0.017
Ookuma-machi, FUKUSHIMA	32	444.5	0.00 ± 0.022	0.05 ± 0.018
Mito, IBARAGI	32	253.0	0.004 ± 0.016	0.02 ± 0.018
Shinjuku, TOKYO	32	357.0	0.05 ± 0.019	0.03 ± 0.019
Yokohama, KANAGAWA	33	333.2	0.05 ± 0.020	0.12 ± 0.024
Utsunomiya, TOCHIGI	32	357.4	0.00 ± 0.017	0.01 ± 0.019
KKosugi-machi, TOYAMA	32	114.5	0.00 ± 0.017	0.00 ± 0.021
Fukui, FUKUI	32	104.3	0.02 ± 0.082	0.00 ± 0.100
Koufu, YAMANASHI	32	187.0	0.01 ± 0.018	0.02 ± 0.017
Shizuoka, SHIZUOKA	33	292.0	0.02 ± 0.019	0.08 ± 0.020
Nagoya, AICHI	32	129.2	0.00 ± 0.036	0.03 ± 0.018
Kyoto, KYOTO	31	115.5	0.04 ± 0.018	0.07 ± 0.022
Kobe, HYOGO	34	190.2	0.03 ± 0.019	0.09 ± 0.019
Tottori, TOTTORI	32	243.2	0.29 ± 0.031	0.00 ± 0.021
Matsue, SHIMANE	32	41.9	0.01 ± 0.013	0.06 ± 0.013
Hiroshima, HIROSHIMA	32	19.5	0.34 ± 0.032	0.08 ± 0.022
Matsuyama, EHIME	32	63.0	0.01 ± 0.022	0.02 ± 0.014
Takamatsu, KAGAWA	32	96.5	0.00 ± 0.018	0.02 ± 0.016
Dazaifu, FUKUOKA	31	141.4	0.04 ± 0.023	0.03 ± 0.019
Saga, SAGA	32	119.2	0.01 ± 0.021	0.02 ± 0.016
Nagasaki, NAGASAKI	32	141.5	0.07 ± 0.022	0.02 ± 0.018
Ooita, OOITA	32	169.5	0.00 ± 0.018	0.05 ± 0.022
Miyazaki, MIYAZAKI	32	157.5	0.005 ± 0.019	0.10 ± 0.023
Yonagusuku-mura, OKINAWA	31	274.0	0.00 ± 0.018	0.04 ± 0.019
September, 1988				
Sapporo, HOKKAIDO	31	91.0	0.04 ± 0.020	0.03 ± 0.020
Aomori, AOMORI	31	52.5	0.07 ± 0.023	0.04 ± 0.018
Onagawa-machi, MIYAGI	31	250.0	0.04 ± 0.020	0.02 ± 0.017
Yamagata, YAMAGATA	31	110.0	0.01 ± 0.019	0.23 ± 0.029
Ookuma-machi, FUKUSHIMA	31	479.1	0.03 ± 0.016	0.02 ± 0.019
Mito, IBARAGI	31	255.5	0.002 ± 0.016	0.05 ± 0.021
Shinjuku, TOKYO	31	267.6	0.00 ± 0.017	0.00 ± 0.016
Yokohama, KANAGAWA	31	303.1	0.04 ± 0.020	0.08 ± 0.021
Utsunomiya, TOCHIGI	33	418.6	0.00 ± 0.016	0.01 ± 0.016
KKosugi-machi, TOYAMA	31	362.5	0.00 ± 0.017	0.09 ± 0.021
Fukui, FUKUI	30	193.2	0.01 ± 0.100	0.02 ± 0.090
Koufu, YAMANASHI	31	191.0	0.01 ± 0.018	0.02 ± 0.019
Shizuoka, SHIZUOKA	32	471.0	0.03 ± 0.023	0.04 ± 0.018
Nagoya, AICHI	31	367.5	0.10 ± 0.037	0.10 ± 0.029

Location	Duration (days)	Precipitation (mm)	^{90}Sr (MBq/Km^2)	^{137}Cs (MBq/Km^2)
Kyoto, KYOTO	31	119.8	0.03 ± 0.019	0.01 ± 0.018
Kobe, HYOGO	31	93.2	0.01 ± 0.019	0.02 ± 0.018
Tottori, TOTTORI	33	203.5	0.13 ± 0.026	0.02 ± 0.016
Matsue, SHIMANE	31	238.5	0.00 ± 0.011	0.03 ± 0.013
Hiroshima, HIROSHIMA	33	165.8	0.11 ± 0.025	0.02 ± 0.019
Matsuyama, EHIME	31	167.0	0.01 ± 0.021	0.00 ± 0.013
Takamatsu, KAGAWA	31	121.5	0.02 ± 0.019	0.05 ± 0.018
Dazaifu, FUKUOKA	31	146.7	0.01 ± 0.019	0.02 ± 0.016
Saga, SAGA	31	136.6	0.00 ± 0.018	0.002 ± 0.015
Nagasaki, NAGASAKI	31	194.0	0.02 ± 0.020	0.04 ± 0.017
Ooita, OOITA	31	180.5	0.00 ± 0.017	0.00 ± 0.019
Miyazaki, MIYAZAKI	31	243.6	0.003 ± 0.019	0.04 ± 0.016
Yonagusuku-mura, OKINAWA	31	144.5	0.00 ± 0.020	0.00 ± 0.013
October, 1988				
Sapporo, HOKKAIDO	32	92.0	0.01 ± 0.017	0.08 ± 0.020
Aomori, AOMORI	32	67.5	0.14 ± 0.025	0.08 ± 0.023
Onagawa-machi, MIYAGI	33	60.7	0.07 ± 0.020	0.04 ± 0.020
Yamagata, YAMAGATA	32	127.0	0.06 ± 0.022	0.03 ± 0.020
Ookuma-machi, FUKUSHIMA	31	67.6	0.05 ± 0.019	0.13 ± 0.024
Mito, IBARAGI	32	60.5	0.02 ± 0.007	0.06 ± 0.019
Shinjuku, TOKYO	32	58.1	0.06 ± 0.021	0.06 ± 0.022
Yokohama, KANAGAWA	32	65.1	0.04 ± 0.018	0.05 ± 0.020
Utsunomiya, TOCHIGI	30	59.4	0.08 ± 0.019	0.02 ± 0.015
KKosugi-machi, TOYAMA	32	160.0	0.05 ± 0.020	0.07 ± 0.021
Fukui, FUKUI	31	110.9	0.15 ± 0.083	0.00 ± 0.084
Koufu, YAMANASHI	32	55.5	0.02 ± 0.008	0.03 ± 0.018
Shizuoka, SHIZUOKA	30	66.0	0.00 ± 0.019	0.13 ± 0.023
Nagoya, AICHI	32	59.9	0.004 ± 0.017	0.05 ± 0.018
Kobe, HYOGO	32	43.3	0.03 ± 0.016	0.10 ± 0.022
Tottori, TOTTORI	30	143.5	0.10 ± 0.022	0.02 ± 0.019
Matsue, SHIMANE	32	107.5	0.02 ± 0.014	0.06 ± 0.016
Hiroshima, HIROSHIMA	30	61.6	0.08 ± 0.023	0.03 ± 0.017
Matsuyama, EHIME	32	56.5	0.03 ± 0.018	0.00 ± 0.015
Takamatsu, KAGAWA	32	36.5	0.01 ± 0.019	0.05 ± 0.020
Dazaifu, FUKUOKA	33	65.3	0.06 ± 0.029	0.003 ± 0.029
Saga, SAGA	32	43.9	0.02 ± 0.008	0.02 ± 0.018
Nagasaki, NAGASAKI	32	29.0	0.00 ± 0.020	0.03 ± 0.021
Ooita, OOITA	32	24.0	0.004 ± 0.021	0.02 ± 0.022
Miyazaki, MIYAZAKI	32	24.3	0.01 ± 0.018	0.09 ± 0.020

Location	Duration (days)	Precipitation (mm)	^{90}Sr (MBq/Km^2)	^{137}Cs (MBq/Km^2)
Yonagusuku-mura, OKINAWA	32	247.0	0.00 ±0.090	0.08 ±0.10
November, 1988				
Sapporo, HOKKAIDO	31	101.5	0.06 ±0.020	0.07 ±0.022
Aomori, AOMORI	31	72.5	0.03 ±0.020	0.08 ±0.022
Onagawa-machi, MIYAGI	31	70.5	0.06 ±0.022	0.06 ±0.021
Yamagata, YAMAGATA	31	67.7	0.05 ±0.020	0.09 ±0.022
Ookuma-machi, FUKUSHIMA	32	43.6	0.00 ±0.018	0.06 ±0.020
Mito, IBARAGI	31	27.0	0.01 ±0.007	0.02 ±0.016
Shinjuku, TOKYO	31	28.9	0.03 ±0.022	0.03 ±0.019
Yokohama, KANAGAWA	31	27.0	0.02 ±0.019	0.10 ±0.022
Utsunomiya, TOCHIGI	31	27.6	0.002±0.019	0.06 ±0.018
KKosugi-machi, TOYAMA	31	348.5	0.04 ±0.019	0.19 ±0.028
Fukui, FUKUI	37	383.1	0.06 ±0.100	0.18 ±0.096
Koufu, YAMANASHI	31	25.0	0.01 ±0.008	0.02 ±0.018
Shizuoka, SHIZUOKA	31	87.5	0.003±0.021	0.39 ±0.033
Nagoya, AICHI	33	40.9	0.00 ±0.020	0.18 ±0.026
Kobe, HYOGO	31	66.4	0.001±0.022	0.09 ±0.021
Tottori, TOTTORI	31	182.3	0.17 ±0.028	0.17 ±0.027
Hiroshima, HIROSHIMA	31	10.9	0.16 ±0.024	0.02 ±0.016
Matsuyama, EHIME	31	52.0	0.03 ±0.018	0.06 ±0.019
Takamatsu, KAGAWA	31	15.5	0.01 ±0.008	0.06 ±0.021
Dazaifu, FUKUOKA	31	73.9	0.04 ±0.020	0.04 ±0.021
Saga, SAGA	31	40.0	0.002±0.007	0.04 ±0.022
Nagasaki, NAGASAKI	31	36.0	0.05 ±0.020	0.08 ±0.021
Ooita, OOITA	31	2.5	0.01 ±0.008	0.003±0.016
Miyazaki, MIYAZAKI	31	19.1	0.04 ±0.021	0.29 ±0.030
Yonagusuku-mura, OKINAWA	31	48.5	0.004±0.023	0.02 ±0.018
December, 1988				
Aomori, AOMORI	35	94.5	0.05 ±0.010	0.13 ±0.022
Onagawa-machi, MIYAGI	36	10.1	0.04 ±0.022	0.06 ±0.019
Yamagata, YAMAGATA	35	62.0	0.04 ±0.020	0.06 ±0.022
Shinjuku, TOKYO	35	0.0	0.00 ±0.018	0.02 ±0.014
Yokohama, KANAGAWA	29	0.5	0.04 ±0.022	0.04 ±0.016
Fukui, FUKUI	31	214.3	0.00 ±0.10	0.27 ±0.100
Koufu, YAMANASHI	35	0.0	0.01 ±0.007	0.005±0.015
Shizuoka, SHIZUOKA	36	1.0	0.02 ±0.020	0.28 ±0.030
Nagoya, AICHI	34	20.6	0.02 ±0.008	0.16 ±0.023
Kobe, HYOGO	29	2.9	0.03 ±0.019	0.07 ±0.022
Tottori, TOTTORI	35	138.9	0.06 ±0.024	0.08 ±0.019

Location	Duration (days)	Precipitation (mm)	^{90}Sr (MBq/Km^2)	^{137}Cs (MBq/Km^2)
Hiroshima, HIROSHIMA	36	15.2	0.14 ± 0.026	0.04 ± 0.015
Matsuyama, EHIME	35	29.5	0.02 ± 0.008	0.05 ± 0.021
Takamatsu, KAGAWA	31	3.0	0.004 ± 0.007	0.01 ± 0.018
Dazaifu, FUKUOKA	35	13.3	0.03 ± 0.010	0.07 ± 0.019
Nagasaki, NAGASAKI	35	30.5	0.05 ± 0.024	0.01 ± 0.013
Ooita, OOITA	35	0.0	0.00 ± 0.007	0.05 ± 0.018
Miyazaki, MIYAZAKI	35	12.6	0.01 ± 0.019	0.65 ± 0.043
Yonagusuku-mura, OKINAWA	37	13.5	0.00 ± 0.008	0.03 ± 0.018

(1)-2 Strontium-90 and Cesium-137 in Rain and Dry Fallout(for WHO program)
(from Jun. 1988 to Jan. 1989)

-continued from NO. 84 of this publication-

Table (1)-2: Strontium-90 and Cesium-137 in Rain and Dry Fallout

Location	Duration (days)	Precipitation (mm)	^{90}Sr (MBq/Km^2)	^{137}Cs (MBq/Km^2)
June, 1988				
Chiba, CHIBA	31	199.7	0.04 ± 0.020	0.09 ± 0.017
Niigata, NIIGATA	31	76.1	0.00 ± 0.016	0.12 ± 0.024
Nagano, NAGANO	31	120.8	0.00 ± 0.016	0.04 ± 0.023
Kagoshima, KAGOSHIMA	33	305.5	0.07 ± 0.039	0.07 ± 0.026
July, 1988				
Akita, AKITA	32	66.7	0.07 ± 0.021	0.04 ± 0.019
Chiba, CHIBA	32	208.2	0.00 ± 0.017	0.02 ± 0.017
Niigata, NIIGATA	32	118.1	0.01 ± 0.019	0.04 ± 0.017
Kanazawa, ISHIKAWA	30	238.5	0.01 ± 0.018	0.05 ± 0.018
Nagano, NAGANO	32	155.8	0.00 ± 0.030	0.04 ± 0.020
Osaka, OSAKA	33	181.7	0.03 ± 0.018	0.03 ± 0.017
Okayama, OKAYAMA	32	178.0	0.05 ± 0.019	0.02 ± 0.018
Yamaguchi, YAMAGUCHI	32	155.5	0.04 ± 0.020	0.00 ± 0.016
Kochi, KOCHI	32	121.9	0.08 ± 0.021	0.04 ± 0.019
Kagoshima, KAGOSHIMA	32	190.5	0.04 ± 0.019	0.03 ± 0.021
August, 1988				
Akita, AKITA	32	165.7	0.07 ± 0.024	0.05 ± 0.018
Chiba, CHIBA	32	289.1	0.01 ± 0.019	0.04 ± 0.017
Niigata, NIIGATA	32	52.2	0.00 ± 0.017	0.06 ± 0.021
Kanazawa, ISHIKAWA	34	153.5	0.00 ± 0.020	0.01 ± 0.017
Nagano, NAGANO	32	63.3	0.01 ± 0.022	0.01 ± 0.018
Osaka, OSAKA	32	119.9	0.04 ± 0.019	0.04 ± 0.019
Okayama, OKAYAMA	32	75.6	0.07 ± 0.022	0.02 ± 0.020
Yamaguchi, YAMAGUCHI	32	45.5	0.04 ± 0.026	0.03 ± 0.025
Kochi, KOCHI	32	383.1	0.06 ± 0.022	0.00 ± 0.018
Kagoshima, KAGOSHIMA	32	389.0	0.05 ± 0.024	0.06 ± 0.023
September, 1988				
Akita, AKITA	31	138.0	0.00 ± 0.018	0.08 ± 0.023
Chiba, CHIBA	33	266.7	0.00 ± 0.020	0.00 ± 0.014
Niigata, NIIGATA	31	118.5	0.02 ± 0.021	0.03 ± 0.015
Kanazawa, ISHIKAWA	31	130.5	0.03 ± 0.019	0.02 ± 0.021
Nagano, NAGANO	31	184.6	0.00 ± 0.019	0.004 ± 0.015

Location	Duration (days)	Precipitation (mm)	^{90}Sr (MBq/Km^2)	^{137}Cs (MBq/Km^2)
Osaka, OSAKA	30	174.2	0.08 ± 0.021	0.05 ± 0.018
Okayama, OKAYAMA	31	177.8	0.03 ± 0.019	0.04 ± 0.021
Yamaguchi, YAMAGUCHI	31	146.0	0.02 ± 0.019	0.03 ± 0.017
Kochi, KOCHI	33	235.6	0.08 ± 0.022	0.06 ± 0.020
Kagoshima, KAGOSHIMA	30	288.0	0.02 ± 0.020	0.03 ± 0.018
October, 1988				
Akita, AKITA	32	160.4	0.08 ± 0.021	0.10 ± 0.023
Chiba, CHIBA	30	82.3	0.02 ± 0.016	0.01 ± 0.015
Niigata, NIIGATA	32	106.8	0.00 ± 0.019	0.04 ± 0.018
Kanazawa, ISHIKAWA	32	236.5	0.03 ± 0.020	0.08 ± 0.021
Nagano, NAGANO	32	67.0	0.002 ± 0.018	0.00 ± 0.018
Osaka, OSAKA	32	52.9	0.01 ± 0.015	0.01 ± 0.017
Okayama, OKAYAMA	32	43.7	0.03 ± 0.018	0.02 ± 0.018
Yamaguchi, YAMAGUCHI	32	53.5	0.00 ± 0.018	0.01 ± 0.019
Kochi, KOCHI	30	23.4	0.13 ± 0.024	0.04 ± 0.019
November, 1988				
Akita, AKITA	31	172.9	0.06 ± 0.020	0.08 ± 0.021
Chiba, CHIBA	31	28.0	0.05 ± 0.021	0.04 ± 0.017
Kanazawa, ISHIKAWA	33	461.5	0.02 ± 0.021	0.11 ± 0.023
Nagano, NAGANO	31	35.9	0.00 ± 0.019	0.02 ± 0.019
Osaka, OSAKA	31	55.0	0.02 ± 0.019	0.11 ± 0.020
Okayama, OKAYAMA	31	10.5	0.04 ± 0.023	0.07 ± 0.022
Yamaguchi, YAMAGUCHI	32	83.0	0.03 ± 0.009	0.05 ± 0.021
Kochi, KOCHI	31	29.1	0.14 ± 0.026	0.08 ± 0.021
Kagoshima, KAGOSHIMA	31	74.5	0.01 ± 0.021	0.04 ± 0.019
December, 1988				
Akita, AKITA	31	162.9	0.09 ± 0.023	0.06 ± 0.017
Chiba, CHIBA	36	2.6	0.01 ± 0.019	0.12 ± 0.023
Kanazawa, ISHIKAWA	27	209.5	0.03 ± 0.020	0.06 ± 0.017
Osaka, OSAKA	37	12.4	0.01 ± 0.018	0.13 ± 0.024
Okayama, OKAYAMA	36	6.7	0.03 ± 0.024	0.03 ± 0.016
Kochi, KOCHI	36	1.2	0.09 ± 0.025	0.04 ± 0.015
Kagoshima, KAGOSHIMA	28	20.0	0.09 ± 0.013	0.05 ± 0.023
January, 1989				
Chiba, CHIBA	28	110.5	0.00 ± 0.018	0.01 ± 0.018
Osaka, OSAKA	27	131.9	0.01 ± 0.020	0.05 ± 0.018

(2) Strontium-90 and Cesium-137 in Airborne Dust
(from Apr. 1988 to Dec. 1988)

-continued from NO. 84 of this publication-

Table (2): Strontium-90 and Cesium-137 in Airborne Dust

Location	Sampling period	Absorption volume (m^3)	^{90}Sr (mBq/m^3)	^{137}Cs (mBq/m^3)
April～June, 1988				
Morioka, IWATE	4～6	12,620	0.001 ± 0.0007	0.001 ± 0.0006
Mito, IBARAGI	4～6	10,784	0.000 ± 0.0008	0.001 ± 0.0006
Utsunomiya, TOCHIGI	4～6	14,700	0.000 ± 0.0006	0.000 ± 0.0004
KKosugi-machi, TOYAMA	4～6	12,499	0.001 ± 0.0007	0.003 ± 0.0006
Koufu, YAMANASHI	4～6	11,658	0.001 ± 0.0007	0.002 ± 0.0006
Nagoya, AICHI	4～6	13,453	0.001 ± 0.0007	0.001 ± 0.0005
Kyoto, KYOTO	4～6	3,898	0.000 ± 0.0023	0.002 ± 0.0020
Wakayama, WAKAYAMA	4～6	10,267	0.000 ± 0.0009	0.000 ± 0.0006
Ooita, OOITA	4～6	10,506	0.001 ± 0.0009	0.003 ± 0.0007
June～July, 1988				
Saga, SAGA	6～7	10,066	0.002 ± 0.0009	0.000 ± 0.0005
July～October, 1988				
Ookuma-machi, FUKUSHIMA	7～10	9,321	0.001 ± 0.0010	0.001 ± 0.0006
Mito, IBARAGI	7～10	10,416	0.000 ± 0.0008	0.002 ± 0.0008
Utsunomiya, TOCHIGI	7～10	14,780	0.001 ± 0.0007	0.000 ± 0.0004
Niigata, NIIGATA	7～10	13,266	0.000 ± 0.0006	0.000 ± 0.0004
KKosugi-machi, TOYAMA	7～10	17,719	0.0003 ± 0.0005	0.0002 ± 0.0004
Fukui, FUKUI	7～10	10,984	0.001 ± 0.0010	0.000 ± 0.0006
Koufu, YAMANASHI	7～10	10,817	0.000 ± 0.0008	0.000 ± 0.0006
Hamaoka-machi, SHIZUOKA	7～10	10,213	0.0003 ± 0.0009	0.001 ± 0.0006
Nagoya, AICHI	7～10	14,023	0.0001 ± 0.0006	0.001 ± 0.0005
Kyoto, KYOTO	7～10	4,219	0.004 ± 0.0023	0.004 ± 0.0018
Osaka, OSAKA	7～10	14,594	0.0003 ± 0.0007	0.0002 ± 0.0005
Kobe, HYOGO	7～10	10,893	0.001 ± 0.0009	0.001 ± 0.0007
Wakayama, WAKAYAMA	7～10	11,252	0.001 ± 0.0008	0.0002 ± 0.0005
Tottori, TOTTORI	7～10	13,672	0.000 ± 0.0006	0.001 ± 0.0005
Hiroshima, HIROSHIMA	7～10	11,572	0.001 ± 0.0009	0.001 ± 0.0006
Takamatsu, KAGAWA	7～10	17,490	0.001 ± 0.0005	0.0004 ± 0.0003
Saga, SAGA	7～10	11,944	0.001 ± 0.0008	0.001 ± 0.0005
Nagasaki, NAGASAKI	7～10	10,736	0.001 ± 0.0008	0.000 ± 0.0005
Ooita, OOITA	7～10	10,225	0.0003 ± 0.0009	0.001 ± 0.0005
Miyazaki, MIYAZAKI	7～10	11,763	0.001 ± 0.0008	0.0005 ± 0.0005
October, 1989 ～January, 1989				
Mito, IBARAGI	10～1	10,211	0.000 ± 0.0004	0.001 ± 0.0007

Location	Sampling period	Absorption volume (m^3)	^{90}Sr (mBq/m^3)	^{137}Cs (mBq/m^3)
KKosugi-machi, TOYAMA	10～1	17,521	0.0002 ± 0.0002	0.001 ± 0.0005
Fukui, FUKUI	10～1	11,932	0.001 ± 0.0008	0.000 ± 0.0004
Koufu, YAMANASHI	10～1	12,683	0.0002 ± 0.0004	0.0005 ± 0.0006
Hamaoka-machi, SHIZUOKA	10～1	10,497	0.001 ± 0.0004	0.003 ± 0.0006
Nagoya, AICHI	10～1	11,629	0.002 ± 0.0011	0.003 ± 0.0007
Osaka, OSAKA	10～1	8,916	0.001 ± 0.0005	0.001 ± 0.0008
Kobe, HYOGO	10～1	9,479	0.001 ± 0.0012	0.002 ± 0.0007
Tottori, TOTTORI	10～1	11,798	0.0005 ± 0.0003	0.0003 ± 0.0006
Hiroshima, HIROSHIMA	10～1	11,389	0.001 ± 0.0010	0.001 ± 0.0006
Takamatsu, KAGAWA	10～1	14,538	0.001 ± 0.0003	0.0002 ± 0.0005
Saga, SAGA	10～1	14,686	0.0001 ± 0.0003	0.0001 ± 0.0005
Nagasaki, NAGASAKI	10～1	8,574	0.000 ± 0.0011	0.0004 ± 0.0007
Ooita, OOITA	10～1	9,867	0.000 ± 0.0005	0.002 ± 0.0008
Miyazaki, MIYAZAKI	10～1	15,861	0.0004 ± 0.0003	0.0005 ± 0.0003

(3) Strontium-90 and Cesium-137 in Service Water
(from Jun. 1988 to Dec. 1988)

-continued from NO. 84 of this publication-

Table (3): Strontium-90 and Cesium-137 in Service Water

Location	pH	^{90}Sr (mBq/ℓ)	^{137}Cs (mBq/ℓ)
(Source Water)			
June, 1988			
Nagano, NAGANO	6.9	1.6 ±0.17	0.5 ±0.12
Inuyama, AICHI	7.1	2.8 ±0.18	0.4 ±0.12
Fukuoka, FUKUOKA	6.7	2.6 ±0.18	0.2 ±0.08
August, 1988			
Kyoto, KYOTO	7.7	4.6 ±0.23	0.5 ±0.11
December, 1988			
Katsushika, TOKYO	7.3	1.8 ±0.16	0.5 ±0.10
Tsukui-machi, KANAGAWA	7.0	0.3 ±0.11	0.04 ±0.08
Moriguchi, OSAKA	7.2	5.0 ±0.28	0.3 ±0.10
Fukuoka, FUKUOKA	6.8	2.2 ±0.19	0.0 ±0.09
(Tap Water)			
June, 1988			
Morioka, IWATE	6.9	1.2 ±0.14	0.1 ±0.09
Fukushima, FUKUSHIMA	7.1	4.1 ±0.21	0.01 ±0.09
Utsunomiya, TOCHIGI	7.2	1.1 ±0.14	0.05 ±0.11
Niigata, NIIGATA	6.8	3.4 ±0.19	0.3 ±0.09
KKosugi-machi, TOYAMA	6.9	1.9 ±0.16	0.2 ±0.12
Nagano, NAGANO	7.1	1.2 ±0.15	0.3 ±0.11
Koufu, YAMANASHI	7.5	1.3 ±0.15	0.03 ±0.10
Nagoya, AICHI	6.8	2.1 ±0.17	0.04 ±0.11
Matsue, SHIMANE	-	3.9 ±0.22	0.8 ±0.12
Fukuoka, FUKUOKA	6.7	3.1 ±0.19	0.4 ±0.10
Ooita, OOITA	6.2	1.1 ±0.14	0.1 ±0.09
July, 1988			
Sendai, MIYAGI	5.8	2.0 ±0.20	0.2 ±0.09
Sshinguu, WAKAYAMA	7.1	1.4 ±0.16	0.2 ±0.09
Saga, SAGA	7.0	2.2 ±0.17	0.2 ±0.10
August, 1988			
Kyoto, KYOTO	7.3	5.0 ±0.25	0.3 ±0.10
Takamatsu, KAGAWA	7.1	3.0 ±0.23	0.1 ±0.09

Location	pH	^{90}Sr (mBq/ℓ)	^{137}Cs (mBq/ℓ)
Miyazaki, MIYAZAKI	7.2	1.9 ±0.16	0.0 ±0.10
November, 1988			
KKosugi-machi, TOYAMA	6.9	2.0 ±0.18	0.0 ±0.07
Fukui, FUKUI	7.6	0.9 ±0.14	0.0 ±0.07
December, 1988			
Wakkanai, HOKKAIDO	6.6	1.9 ±0.17	0.1 ±0.08
Aomori, AOMORI	7.4	1.3 ±0.16	0.5 ±0.11
Akita, AKITA	6.2	3.2 ±0.22	0.3 ±0.09
Yamagata, YAMAGATA	7.1	2.3 ±0.19	0.1 ±0.08
Mito, IBARAGI	7.6	1.8 ±0.19	0.02 ±0.08
Katsushika, TOKYO	7.1	1.6 ±0.16	0.2 ±0.09
Yokohama, KANAGAWA	7.0	0.6 ±0.12	0.0 ±0.07
Kanazawa, ISHIKAWA	7.3	3.8 ±0.23	0.3 ±0.09
Osaka, OSAKA	6.8	5.0 ±0.28	0.1 ±0.08
Kobe, HYOGO	7.8	4.1 ±0.22	0.1 ±0.08
Tottori, TOTTORI	7.5	2.3 ±0.18	0.05 ±0.08
Okayama, OKAYAMA	6.9	2.0 ±0.17	0.0 ±0.07
Hiroshima, HIROSHIMA	6.8	3.1 ±0.23	0.1 ±0.08
Ube, YAMAGUCHI	6.7	2.3 ±0.19	0.1 ±0.08
Matsuyama, EHIME	7.8	1.9 ±0.18	0.1 ±0.08
Kochi, KOCHI	7.4	2.1 ±0.16	0.1 ±0.08
Takamatsu, KAGAWA	7.3	3.4 ±0.27	0.01 ±0.08
Fukuoka, FUKUOKA	6.9	3.1 ±0.23	0.0 ±0.08
Saga, SAGA	7.5	1.6 ±0.19	0.03 ±0.07
Nagasaki, NAGASAKI	7.0	1.9 ±0.18	0.2 ±0.09
Ooita, OOITA	-	0.9 ±0.16	0.2 ±0.10
Miyazaki, MIYAZAKI	7.2	1.3 ±0.17	0.1 ±0.10
Kagoshima, KAGOSHIMA	7.0	0.4 ±0.14	0.03 ±0.08
Naha, OKINAWA	7.2	4.3 ±0.26	0.3 ±0.11

(4) Strontium-90 and Cesium-137 in Freshwater
(from Jul. 1988 to Dec. 1988)

-continued from NO. 84 of this publication-

Table (4): Strontium-90 and Cesium-137 in Freshwater

Location	pH	^{90}Sr (mBq/ℓ)	^{137}Cs (mBq/ℓ)
(Freshwater)			
July, 1988			
Akita, AKITA	6.8	5.4 ±0.24	0.6 ±0.11
August, 1988			
Turuga, FUKUI	6.7	5.9 ±0.28	3.7 ±0.22
September, 1988			
Fukushima, FUKUSHIMA	6.7	1.8 ±0.17	0.7 ±0.11
October, 1988			
Shobara, HIROSHIMA	7.1	1.9 ±0.19	0.2 ±0.12
December, 1988			
Suwa-lake, NAGANO	8.4	0.9 ±0.15	0.4 ±0.11

(5) Strontium-90 and Cesium-137 in Soil
(from Jun. 1988 to Sep. 1988)

-continued from NO. 84 of this publication-

Table (5): Strontium-90 and Cesium-137 in Soil

Location	Sampling Depth (cm)	^{90}Sr (Bq/Kg) (dried Soil)	^{90}Sr (MBq/Km^2)	^{137}Cs (Bq/Kg) (dried Soil)	^{137}Cs (MBq/Km^2)
June, 1988					
Fukushima, FUKUSHIMA	0～5	12 ± 0.3	200 ± 6	26 ± 0.6	450 ± 10
〃	5～20	7.0 ± 0.27	520 ± 20	15 ± 0.4	1100 ± 30
Katsushika, TOKYO	0～5	0.6 ± 0.10	39 ± 6.6	4.3 ± 0.24	280 ± 16
〃	5～20	0.5 ± 0.10	97 ± 19	1.3 ± 0.16	240 ± 31
July, 1988					
Aomori, AOMORI	0～5	2.3 ± 0.17	82 ± 6.2	5.2 ± 0.26	180 ± 9
〃	5～20	0.6 ± 0.12	46 ± 8.6	0.5 ± 0.12	40 ± 8.6
Kawabe-machi, AKITA	0～5	50 ± 0.8	1800 ± 30	130 ± 1	4900 ± 40
〃	5～20	19 ± 0.5	2000 ± 50	97 ± 1.0	9900 ± 110
Yamagata, YAMAGATA	0～5	4.9 ± 0.27	170 ± 10	34 ± 0.7	1200 ± 20
〃	5～20	1.7 ± 0.15	210 ± 19	3.2 ± 0.21	410 ± 27
Imaichi, TOCHIGI	0～5	7.7 ± 0.30	180 ± 7	26 ± 0.5	590 ± 13
〃	5～20	4.6 ± 0.24	99 ± 5.1	7.8 ± 0.31	170 ± 7
Kashiwazaki, NIIGATA	0～5	0.7 ± 0.12	45 ± 7.8	15 ± 0.4	960 ± 27
〃	5～20	1.2 ± 0.14	240 ± 29	5.2 ± 0.26	1100 ± 50
Kanazawa, ISHIKAWA	0～5	10 ± 0.3	460 ± 15	36 ± 0.7	1600 ± 30
〃	5～20	10 ± 0.3	1600 ± 50	32 ± 0.6	5100 ± 100
Fukui, FUKUI	0～5	0.7 ± 0.13	34 ± 6.4	9.4 ± 0.34	470 ± 17
〃	5～20	0.8 ± 0.12	53 ± 8.2	2.4 ± 0.19	170 ± 13
Nagano, NAGANO	0～5	4.2 ± 0.23	65 ± 3.4	44 ± 0.7	670 ± 11
〃	5～20	3.1 ± 0.20	130 ± 8	4.3 ± 0.24	180 ± 10
Takane-machi, YAMANASHI	0～5	11 ± 0.4	550 ± 19	51 ± 0.8	2600 ± 40
〃	5～20	9.3 ± 0.33	1300 ± 50	17 ± 0.5	2400 ± 70
Gotenba, SHIZUOKA	0～5	1.3 ± 0.16	49 ± 5.9	14 ± 0.4	530 ± 15
〃	5～20	2.4 ± 0.19	320 ± 25	6.7 ± 0.29	880 ± 39
Miyazu, KYOTO	0～5	3.4 ± 0.21	110 ± 7	63 ± 0.9	2000 ± 30
〃	5～20	2.6 ± 0.19	670 ± 49	5.2 ± 0.26	1300 ± 70

Location	Sampling Depth (cm)	^{90}Sr (Bq/Kg) (dried Soil)	^{90}Sr (MBq/Km^2)	^{137}Cs (Bq/Kg) (dried Soil)	^{137}Cs (MBq/Km^2)
Kumatori-machi, OSAKA	0～5	2.6 ± 0.18	160 ± 11	4.4 ± 0.24	270 ± 15
〃	5～20	1.3 ± 0.15	230 ± 26	2.1 ± 0.18	380 ± 32
Kasai, HYOGO	0～5	5.1 ± 0.26	200 ± 10	66 ± 0.8	2600 ± 30
〃	5～20	1.1 ± 0.14	150 ± 20	9.5 ± 0.34	1300 ± 50
Sshinguu, WAKAYAMA	0～5	0.3 ± 0.11	19 ± 7.8	3.4 ± 0.20	240 ± 14
〃	5～20	0.1 ± 0.10	8 ± 7.3	0.8 ± 0.11	65 ± 8.5
Oota, SHIMANE	0～5	15 ± 0.5	410 ± 13	31 ± 0.6	840 ± 15
〃	5～20	4.7 ± 0.26	490 ± 27	11 ± 0.3	1100 ± 30
Tsuyama, OKAYAMA	0～5	0.3 ± 0.12	9 ± 3.8	2.7 ± 0.20	89 ± 6.5
〃	5～20	0.4 ± 0.15	45 ± 15	1.5 ± 0.16	160 ± 17
Hiroshima, HIROSHIMA	0～5	0.8 ± 0.12	56 ± 8.4	2.7 ± 0.20	190 ± 14
〃	5～20	2.6 ± 0.19	600 ± 43	11 ± 0.4	2600 ± 80
Hagi, YAMAGUCHI	0～5	2.1 ± 0.17	130 ± 10	8.4 ± 0.33	510 ± 20
〃	5～20	2.2 ± 0.18	560 ± 46	5.3 ± 0.27	1400 ± 70
Matsuyama, EHIME	0～5	1.3 ± 0.14	58 ± 6.3	20 ± 0.5	880 ± 22
〃	5～20	1.5 ± 0.15	180 ± 18	14 ± 0.4	1700 ± 50
Fukuoka, FUKUOKA	0～5	9.7 ± 0.35	380 ± 14	17 ± 0.5	680 ± 18
〃	5～20	7.2 ± 0.31	670 ± 29	6.0 ± 0.28	560 ± 26
Obama-machi, NAGASAKI	0～5	7.5 ± 0.29	120 ± 5	67 ± 0.9	1100 ± 10
〃	5～20	8.5 ± 0.31	630 ± 23	41 ± 0.7	3000 ± 50
Sadowara-machi, MIYAZAKI	0～5	1.8 ± 0.16	130 ± 11	12 ± 0.4	910 ± 29
〃	5～20	2.1 ± 0.17	390 ± 32	14 ± 0.4	2600 ± 80
Kaimon-machi, KAGOSHIMA	0～5	0.2 ± 0.09	5.0 ± 2.9	0.30 ± 0.10	9 ± 3.2
〃	5～20	0.2 ± 0.09	21 ± 13.0	0.0 ± 0.08	0.0 ± 11
Naha, OKINAWA	0～5	1.8 ± 0.19	110 ± 11	6.8 ± 0.29	410 ± 17
〃	5～20	2.0 ± 0.18	380 ± 34	5.4 ± 0.28	1000 ± 50
August, 1988					
Sapporo, HOKKAIDO	0～5	12 ± 0.4	500 ± 16	36 ± 0.6	1500 ± 30
〃	5～20	8.4 ± 0.32	1300 ± 50	9.3 ± 0.31	1400 ± 50
Iwadeyama-machi, MIYAGI	0～5	2.7 ± 0.18	100 ± 7	6.7 ± 0.30	260 ± 11
〃	5～20	1.8 ± 0.16	300 ± 26	3.3 ± 0.22	550 ± 36

Location	Sampling Depth (cm)	^{90}Sr (Bq/Kg) (dried Soil)	^{90}Sr (MBq/Km^2)	^{137}Cs (Bq/Kg) (dried Soil)	^{137}Cs (MBq/Km^2)
Takisawa-mura, IWATE	0～5	21 ± 0.5	580 ± 13	100 ± 1	2900 ± 30
〃	5～20	15 ± 0.4	1400 ± 40	12 ± 0.4	1200 ± 40
Yokohama, KANAGAWA	0～5	14 ± 0.4	360 ± 10	58 ± 0.8	1500 ± 20
〃	5～20	13 ± 0.4	1100 ± 40	19 ± 0.5	1700 ± 40
KKosugi-machi, TOYAMA	0～5	6.2 ± 0.28	370 ± 17	17 ± 0.4	1000 ± 30
〃	5～20	7.8 ± 0.32	1300 ± 50	2.4 ± 0.20	420 ± 34
Kokufu-machi, TOTTORI	0～5	0.4 ± 0.10	33 ± 9.7	2.0 ± 0.18	190 ± 17
〃	5～20	1.1 ± 0.14	210 ± 26	2.6 ± 0.19	480 ± 36
Kochi, KOCHI	0～5	7.7 ± 0.30	380 ± 15	29 ± 0.6	1400 ± 30
〃	5～20	8.3 ± 0.33	970 ± 38	18 ± 0.5	2100 ± 60
Sakaide, KAGAWA	0～5	3.1 ± 0.20	160 ± 10	11 ± 0.4	580 ± 19
〃	5～20	2.5 ± 0.18	360 ± 26	1.3 ± 0.15	180 ± 21
September, 1988					
Saga, SAGA	0～5	0.02 ± 0.10	1 ± 5.2	0.3 ± 0.10	15 ± 5.5
〃	5～20	1.3 ± 0.15	190 ± 23	5.1 ± 0.25	750 ± 37
JKujuu-machi, OOITA	0～5	7.5 ± 0.31	180 ± 7	110 ± 1	2700 ± 30
〃	5～20	5.6 ± 0.28	500 ± 25	22 ± 0.5	1900 ± 40

(6) Strontium-90 and Cesium-137 in Sea Water
(from Jul. 1988 to Sep. 1988)

-continued from NO. 84 of this publication-

Table (6): Strontium-90 and Cesium-137 in Sea Water

Location	Sample volume analyzed (ℓ)	Cl (‰)	^{90}Sr (mBq/ℓ)	^{137}Cs (mBq/ℓ)
July, 1988				
Yoichi-bay, HOKKAIDO	40	18.83	2.5 ± 0.31	4.9 ± 0.44
Niigata-Port, NIIGATA	43.7	18.60	3.2 ± 0.34	4.1 ± 0.40
Moji-Port, FUKUOKA	40	18.75	1.7 ± 0.33	3.8 ± 0.34
Kaseda, KAGOSHIMA	40	18.20	2.9 ± 0.33	3.9 ± 0.41
August, 1988				
Mutsu-bay, AOMORI	40	17.9	2.4 ± 0.34	4.9 ± 0.38
Matsukawaura, FUKUSHIMA	40	17.4	2.9 ± 0.37	4.0 ± 0.36
Odawa-bay, KANAGAWA	40	17.8	3.0 ± 0.36	4.4 ± 0.42
Ise-bay, AICHI	40	10.1	2.6 ± 0.35	2.6 ± 0.35
Osaka-Port, OSAKA	40	12.0	4.1 ± 0.39	2.5 ± 0.36
Yamaguchi-bay, YAMAGUCHI	40	17.0	2.3 ± 0.35	4.2 ± 0.36
September, 1988				
Kinnakagusuku-bay, OKINAWA	40	19.03	2.4 ± 0.34	4.8 ± 0.43

(7) Strontium-90 and Cesium-137 in Sea Sediments
(from May 1988 to Sep. 1988)

-continued from NO. 84 of this publication-

Table (7): Strontium-90 and Cesium-137 in Sea Sediments

Location	Depth (m)	^{90}Sr (Bq/Kg·dried Soil)	^{137}Cs (Bq/Kg·dried Soil)
May, 1988			
Sekine-machi, AOMORI	13	0.11 ±0.10	0.30 ±0.12
July, 1988			
Yoichi-bay, HOKKAIDO	13	0.08 ±0.11	0.62 ±0.12
Tokai, IBARAGI	7	0.02 ±0.08	0.57 ±0.12
Niigata-Port, NIIGATA	24	0.05 ±0.09	1.8 ±0.17
Moji-Port, FUKUOKA	9	0.06 ±0.08	2.3 ±0.18
Kaseda, KAGOSHIMA	21	0.01 ±0.08	0.19 ±0.09
August, 1988			
Mutsu-bay, AOMORI	11	0.51 ±0.11	8.3 ±0.32
Matsukawaura, FUKUSHIMA	5	0.04 ±0.08	1.2 ±0.14
Odawa-bay, KANAGAWA	8.5	0.10 ±0.09	3.9 ±0.22
Ise-bay, AICHI	22	0.12 ±0.09	3.1 ±0.22
Osaka-Port, OSAKA	12	0.00 ±0.08	5.8 ±0.28
Yamaguchi-bay, YAMAGUCHI	10	0.07 ±0.09	4.5 ±0.24
September, 1988			
Kinnakagusuku-bay, OKINAWA	14	0.01 ±0.11	0.54 ±0.14

* * * Rain and Dry Fallout (for domestic program) * * *

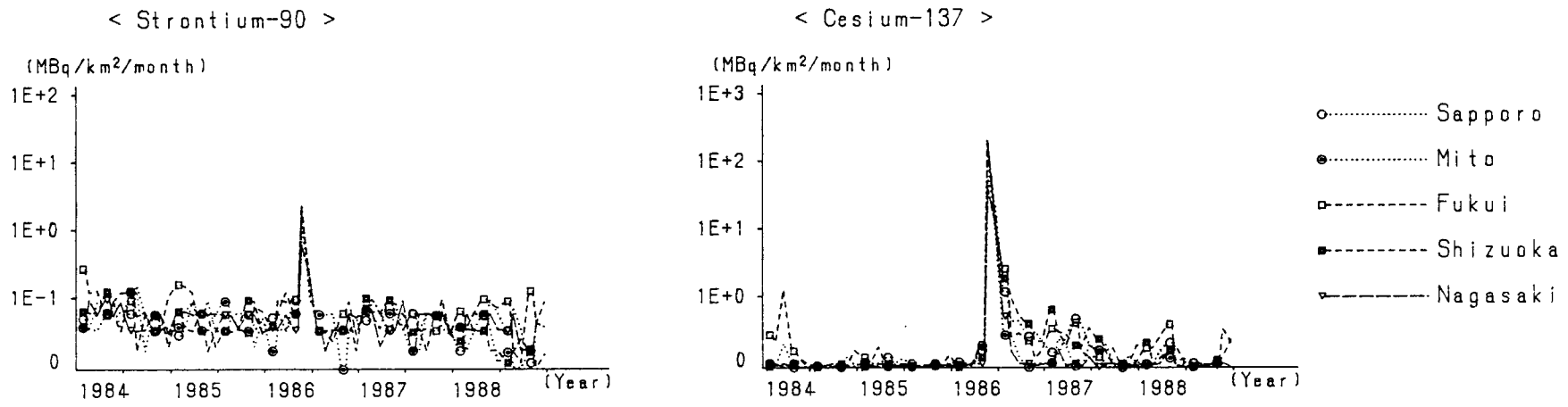

Fig. 1-1

* * * Rain and Dry Fallout (for WHO program) * * *

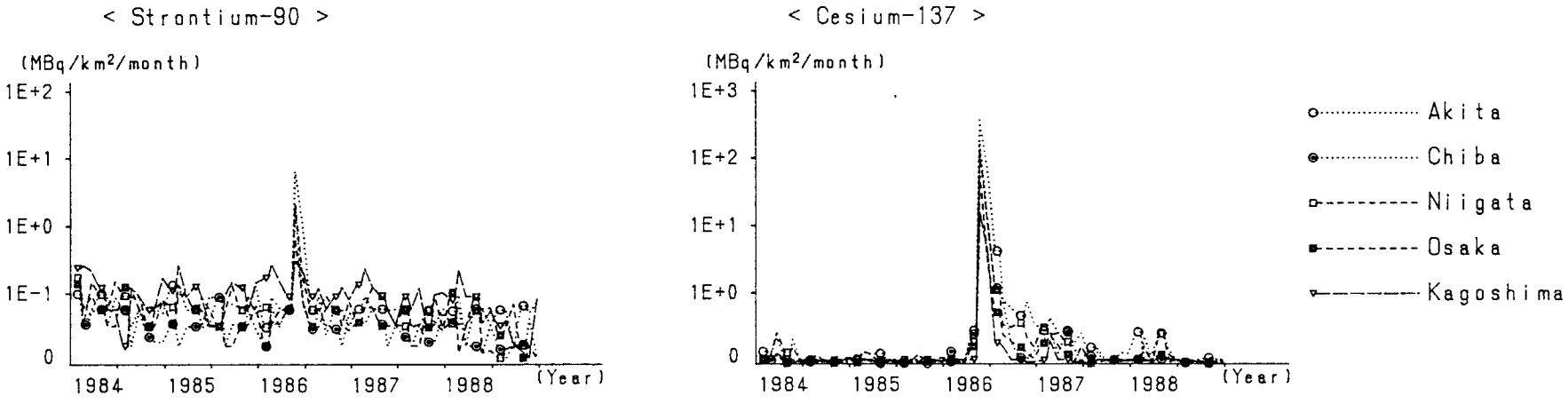

Fig. 1-2

* * * Airborne Dust * * *

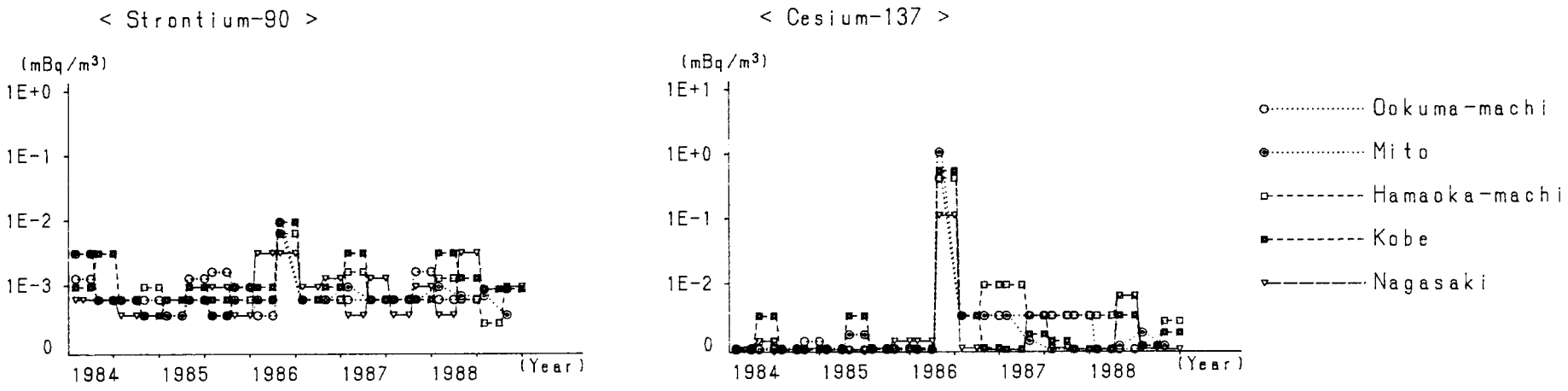

Fig. 2

＊＊＊　Tap water　＊＊＊

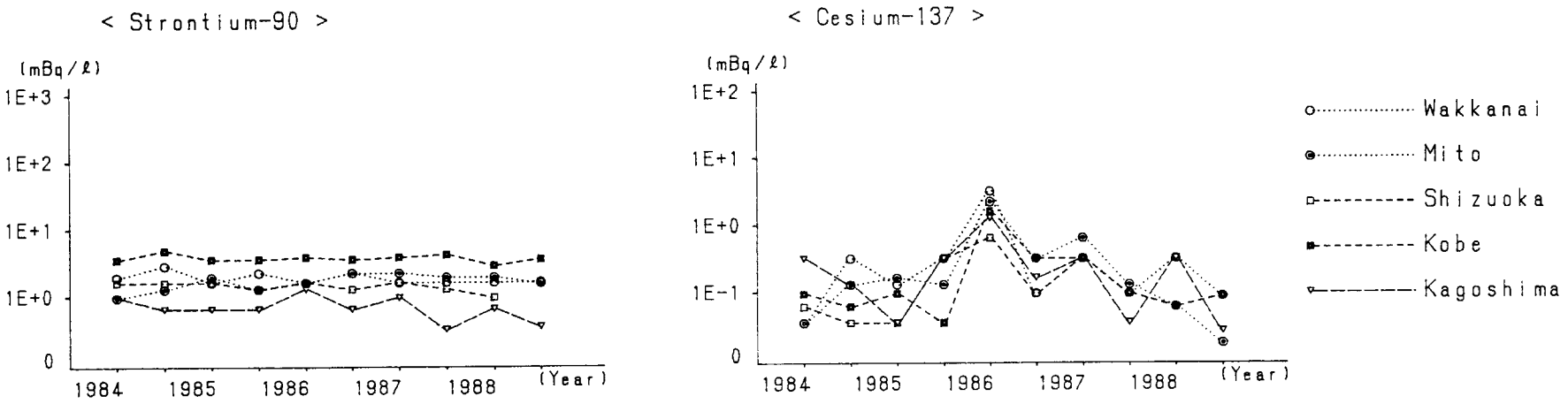

Fig.3

* * * Freshwater * * *

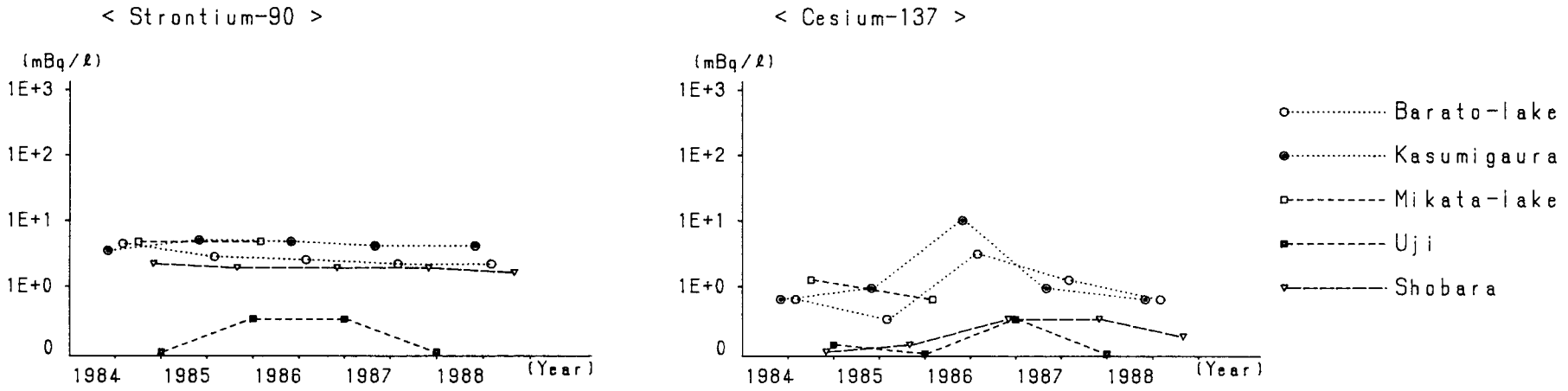

Fig. 4

＊＊＊　Soil　＊＊＊

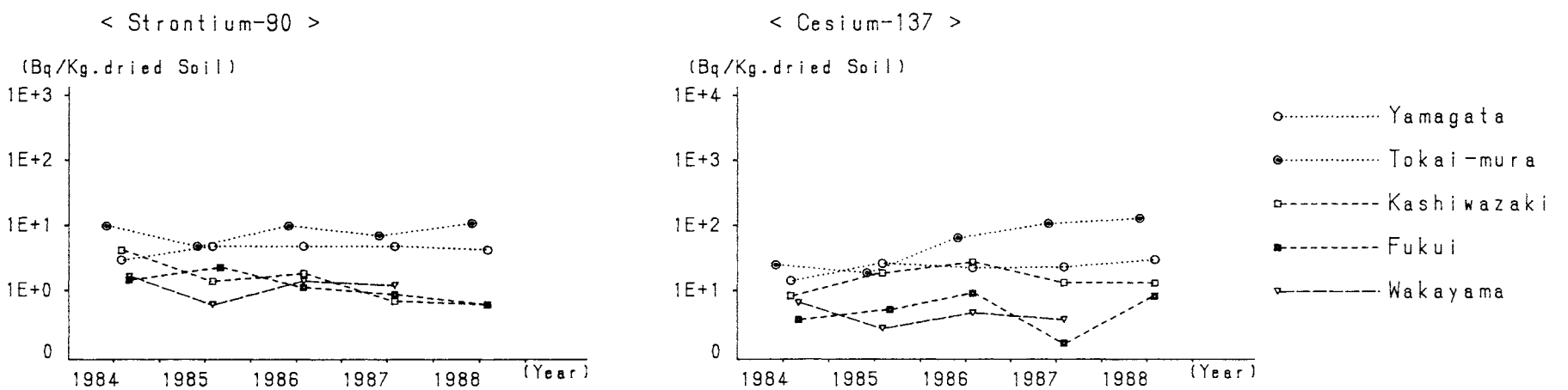
< Strontium-90 >
(Bq/Kg.dried Soil)
1E+3
1E+2
1E+1
1E+0
0
1984
1985
1986
1987
1988
(Year)
< Cesium-137 >
(Bq/Kg.dried Soil)
1E+4
1E+3
1E+2
1E+1
0
1984
1985
1986
1987
1988
(Year)
Yamagata
Tokai-mura
Kashiwazaki
Fukui
Wakayama

Fig.5

* * * Sea Water * * *

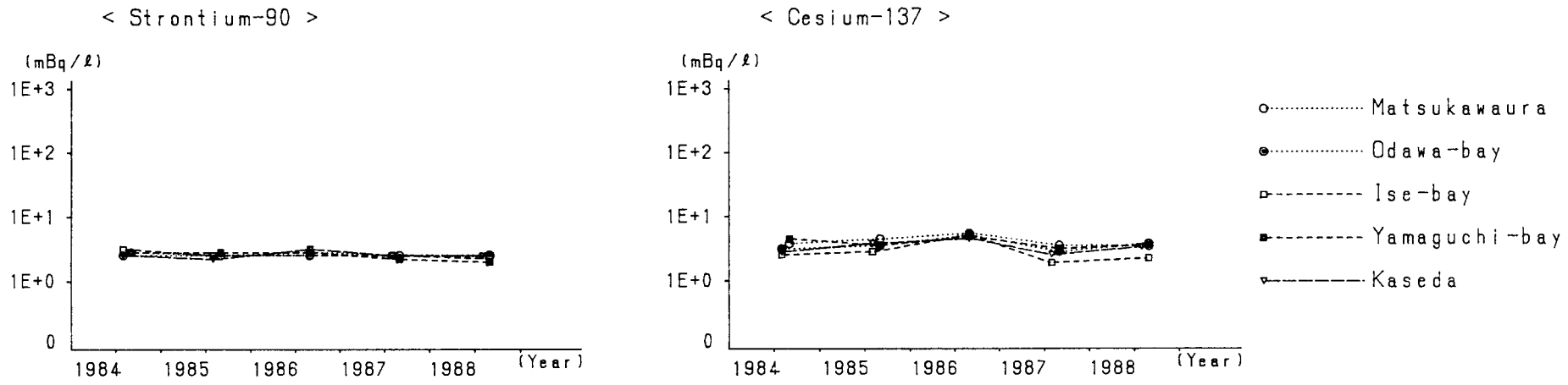

Fig.6

* * * Sea Sediments * * *

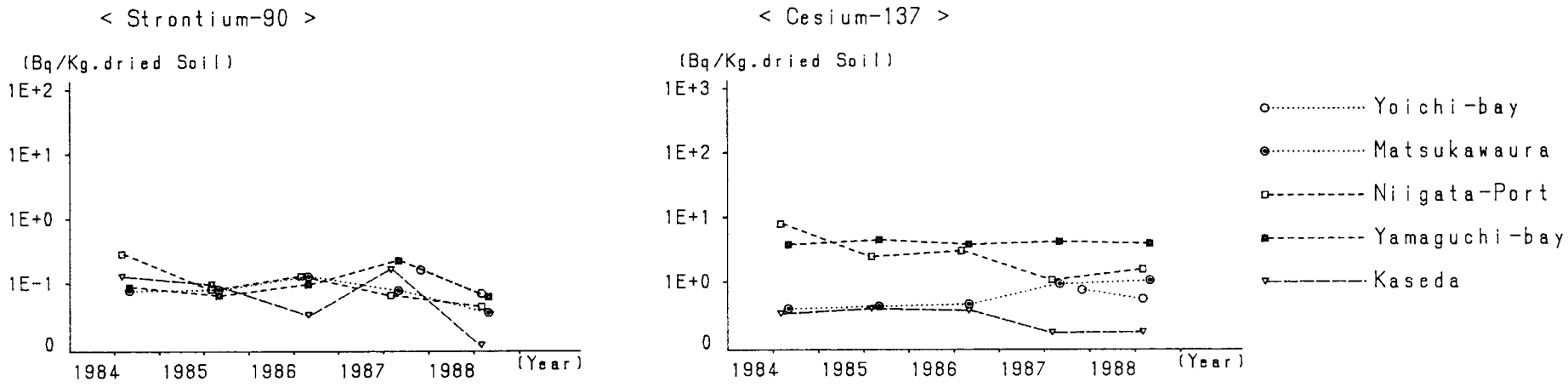

Fig.7

** Sampling Locations in Japan **

1 : Sapporo
2 : Aomori
3 : Morioka
4 : Akita
5 : Sendai
6 : Yamagata
7 : Fukushima
8 : Niigata
9 : Mito
10 : Utsunomiya
11 : Chiba
12 : Shinjuku
13 : Nagano
14 : Yokohama
15 : Kouhu
16 : Toyama
17 : Kanazawa
18 : Shizuoka
19 : Fukui
20 : Nagoya
21 : Kyoto
22 : Osaka
23 : Tottori
24 : Kobe
25 : Wakayama
26 : Okayama
27 : Matsue
28 : Hiroshima
29 : Kochi
30 : Matsuyama
31 : Yamaguchi
32 : Ooita
33 : Fukuoka
34 : Saga
35 : Nagasaki
36 : Kagoshima
37 : Naha