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in Japan

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(Japan Chemical Analysis Center)

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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 asampling 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 threemonths 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 andcesium carriers were added to the filtered water sample. The subsequent process was the same as that describedin the section (1). Freshwater was treated inthe 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 out flow due to precipitation, etc.. Any places located under trees in a forest, in astony 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 driedin 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 1mℓ to 1ℓ 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 stainless 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 otherin-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 46 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 left 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 p
ersons		
(8) Rice		
1. Producing districts	yearly (harvesting season)	5 kg (polished rice)
2. Consuming districts	yaerly (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 washeated. 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 sievedsample 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 retainedfor cesium-137 determination. The carbonates weredissolved 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 molybdophosphate added.

After filtered off and washed with hydrochlotric acid the precipitate was dissolved in 2.5 N 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 cesiumwas 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 andpotassium were determined by atomic absorption andflame 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 Apr. 1992 to Sep. 1992)

-continued from NO. 100 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)
April, 1992				
Sapporo, HOKKAIDO	31	23.0	0.019 ± 0.019	0.068 ± 0.038
Aomori, AOMORI	31	38.5	0.043 ± 0.0094	0.099 ± 0.024
Morioka, IWATE	31	108.7	0.031 ± 0.0098	0.12 ± 0.027
Onagawa-machi, MIYAGI	31	168.5	0.048 ± 0.020	0.075 ± 0.024
Yamagata, YAMAGATA	31	118.9	0.026 ± 0.0088	0.056 ± 0.026
Ookuma-machi, FUKUSHIMA	31	103.1	0.021 ± 0.020	0.089 ± 0.026
Mito, IBARAKI	31	168.5	0.018 ± 0.019	0.090 ± 0.031
Utsunomiya, TOCHIGI	31	193.5	0.14 ± 0.013	0.26 ± 0.040
Maebashi, GUNMA	31	108.5	0.040 ± 0.0094	0.13 ± 0.027
Urawa, SAITAMA	31	153.8	0.012 ± 0.0072	0.084 ± 0.015
Chiba, CHIBA	30	109.8	0.032 ± 0.0091	0.072 ± 0.019
Shinjuku, TOKYO	31	185.5	0.029 ± 0.010	0.074 ± 0.019
Yokohama, KANAGAWA	32	161.2	0.076 ± 0.020	0.20 ± 0.032
Kosugi-machi, TOYAMA	31	142.5	0.036 ± 0.0093	0.067 ± 0.018
Fukui, FUKUI	30	189.6	0.090 ± 0.041	0.21 ± 0.13
Koufu, YAMANASHI	31	117.5	0.000 ± 0.017	0.000 ± 0.019
Gifu, GIFU	31	195.0	0.035 ± 0.018	0.054 ± 0.024
Shizuoka, SHIZUOKA	31	271.5	0.074 ± 0.032	0.048 ± 0.022
Nagoya, AICHI	31	143.1	0.0090 ± 0.0080	0.049 ± 0.020
Tsu, MIE	31	153.5	0.024 ± 0.0081	0.10 ± 0.026
Ootsu, SHIGA	31	177.4	0.048 ± 0.020	0.072 ± 0.025
Kyoto, KYOTO	30	167.5	0.015 ± 0.016	0.024 ± 0.012
Kobe, HYOGO	31	101.4	0.027 ± 0.0088	0.039 ± 0.026
Nara, NARA	33	164.3	0.035 ± 0.010	0.084 ± 0.020
Wakayama, WAKAYAMA	38	111.5	0.017 ± 0.0076	0.024 ± 0.020
Tottori, TOTTORI	31	118.8	0.039 ± 0.010	0.10 ± 0.023
Matsue, SHIMANE	31	119.3	0.042 ± 0.0072	0.16 ± 0.018
Hiroshima, HIROSHIMA	31	104.6	0.031 ± 0.0089	0.084 ± 0.027
Ishii-machi, TOKUSHIMA	32	100.0	0.028 ± 0.0097	0.035 ± 0.017
Takamatsu, KAGAWA	31	46.0	0.030 ± 0.0085	0.046 ± 0.016
Matsuyama, EHIME	31	103.5	0.048 ± 0.028	0.092 ± 0.024
Dazaifu, FUKUOKA	31	116.7	0.032 ± 0.0088	0.052 ± 0.026

Location	Duration (days)	Precipitation (mm)	^{90}Sr (MBq/km^2)	^{137}Cs (MBq/km^2)
Saga, SAGA	31	177.4	0.038 ± 0.0088	0.077 ± 0.027
Nagasaki, NAGASAKI	31	148.5	0.034 ± 0.0089	0.023 ± 0.016
Kumamoto, KUMAMOTO	31	110.2	0.023 ± 0.0091	0.021 ± 0.015
Ooita, OOITA	31	58.5	0.0059 ± 0.0086	0.044 ± 0.016
Miyazaki, MIYAZAKI	31	172.4	0.026 ± 0.018	0.039 ± 0.020
Yonagusuku-mura, OKINAWA	31	250.5	0.056 ± 0.021	0.026 ± 0.030
May, 1992				
Sapporo, HOKKAIDO	32	64.0	0.066 ± 0.020	0.034 ± 0.022
Aomori, AOMORI	32	86.5	0.040 ± 0.0096	0.022 ± 0.019
Morioka, IWATE	32	158.0	0.008 ± 0.017	0.018 ± 0.014
Onagawa-machi, MIYAGI	32	120.5	0.014 ± 0.016	0.038 ± 0.020
Yamagata, YAMAGATA	32	111.4	0.013 ± 0.019	0.066 ± 0.030
Ookuma-machi, FUKUSHIMA	32	194.5	0.022 ± 0.0094	0.049 ± 0.023
Mito, IBARAKI	32	130.5	0.024 ± 0.0092	0.044 ± 0.029
Utsunomiya, TOCHIGI	32	211.2	0.040 ± 0.0092	0.15 ± 0.025
Maebashi, GUNMA	32	110.5	0.027 ± 0.0087	0.098 ± 0.026
Urawa, SAITAMA	33	157.7	0.015 ± 0.0065	0.077 ± 0.014
Chiba, CHIBA	33	190.8	0.033 ± 0.0092	0.054 ± 0.017
Shinjuku, TOKYO	32	134.1	0.0065 ± 0.0084	0.033 ± 0.015
Yokohama, KANAGAWA	32	150.0	0.053 ± 0.020	0.10 ± 0.027
Kosugi-machi, TOYAMA	32	110.2	0.011 ± 0.0077	0.040 ± 0.018
Fukui, FUKUI	32	126.9	0.062 ± 0.095	0.09 ± 0.12
Koufu, YAMANASHI	32	67.5	0.008 ± 0.018	0.000 ± 0.019
Gifu, GIFU	32	189.5	0.10 ± 0.029	0.013 ± 0.023
Shizuoka, SHIZUOKA	32	279.0	0.000 ± 0.023	0.018 ± 0.019
Nagoya, AICHI	32	165.2	0.0044 ± 0.0074	0.002 ± 0.017
Tsu, MIE	32	164.0	0.028 ± 0.0078	0.080 ± 0.026
Ootsu, SHIGA	32	164.8	0.0095 ± 0.0074	0.000 ± 0.022
Kyoto, KYOTO	31	187.5	0.045 ± 0.021	0.043 ± 0.018
Kobe, HYOGO	31	119.5	0.035 ± 0.019	0.000 ± 0.033
Nara, NARA	32	268.1	0.011 ± 0.0083	0.031 ± 0.017
Wakayama, WAKAYAMA	32	240.5	0.029 ± 0.013	0.000 ± 0.026
Tottori, TOTTORI	32	90.3	0.055 ± 0.011	0.041 ± 0.018
Matsue, SHIMANE	32	83.6	0.023 ± 0.012	0.038 ± 0.0097
Hiroshima, HIROSHIMA	31	84.7	0.027 ± 0.017	0.034 ± 0.031
Ishii-machi, TOKUSHIMA	31	135.0	0.030 ± 0.012	0.019 ± 0.014
Takamatsu, KAGAWA	32	117.5	0.014 ± 0.0082	0.020 ± 0.013
Matsuyama, EHIME	32	170.0	0.022 ± 0.028	0.023 ± 0.018
Dazaifu, FUKUOKA	32	172.4	0.027 ± 0.0079	0.000 ± 0.024

Location	Duration (days)	Precipitation (mm)	^{90}Sr (MBq/km^2)	^{137}Cs (MBq/km^2)
Saga, SAGA	32	182.9	0.021 ± 0.017	0.053 ± 0.034
Nagasaki, NAGASAKI	32	119.0	0.048 ± 0.010	0.034 ± 0.016
Kumamoto, KUMAMOTO	32	99.7	0.0000 ± 0.0083	0.033 ± 0.015
Ooita, OOITA	32	97.4	0.013 ± 0.0087	0.017 ± 0.013
Miyazaki, MIYAZAKI	31	262.0	0.055 ± 0.031	0.030 ± 0.023
Yonagusuku-mura, OKINAWA	33	105.5	0.025 ± 0.021	0.009 ± 0.033
June, 1992				
Sapporo, HOKKAIDO	31	33.5	0.009 ± 0.017	0.026 ± 0.022
Aomori, AOMORI	31	40.0	0.045 ± 0.020	0.009 ± 0.016
Morioka, IWATE	31	114.0	0.000 ± 0.016	0.000 ± 0.012
Onagawa-machi, MIYAGI	31	229.5	0.14 ± 0.026	0.079 ± 0.019
Yamagata, YAMAGATA	31	158.6	0.0012 ± 0.0087	0.023 ± 0.013
Ookuma-machi, FUKUSHIMA	31	384.3	0.0093 ± 0.0082	0.031 ± 0.022
Mito, IBARAKI	31	173.0	0.0000 ± 0.0080	0.018 ± 0.013
Utsunomiya, TOCHIGI	31	184.8	0.0093 ± 0.0075	0.035 ± 0.019
Maebashi, GUNMA	31	169.5	0.016 ± 0.0082	0.000 ± 0.021
Urawa, SAITAMA	30	224.4	0.031 ± 0.016	0.016 ± 0.014
Chiba, CHIBA	31	236.1	0.0086 ± 0.0079	0.006 ± 0.013
Shinjuku, TOKYO	31	251.3	0.000 ± 0.020	0.045 ± 0.020
Yokohama, KANAGAWA	30	270.9	0.024 ± 0.0078	0.046 ± 0.022
Kosugi-machi, TOYAMA	31	102.3	0.015 ± 0.0085	0.001 ± 0.014
Fukui, FUKUI	32	104.0	0.000 ± 0.040	0.000 ± 0.073
Koufu, YAMANASHI	31	179.0	0.009 ± 0.017	0.023 ± 0.018
Gifu, GIFU	31	207.0	0.051 ± 0.023	0.014 ± 0.016
Shizuoka, SHIZUOKA	31	273.0	0.000 ± 0.026	0.000 ± 0.019
Nagoya, AICHI	31	191.6	0.018 ± 0.0074	0.002 ± 0.022
Tsu, MIE	31	221.0	0.020 ± 0.0077	0.098 ± 0.020
Ootsu, SHIGA	31	157.5	0.000 ± 0.029	0.034 ± 0.016
Kyoto, KYOTO	32	142.5	0.056 ± 0.037	0.000 ± 0.015
Kobe, HYOGO	32	113.7	0.0036 ± 0.0080	0.000 ± 0.012
Nara, NARA	31	200.3	0.0000 ± 0.0081	0.028 ± 0.017
Wakayama, WAKAYAMA	30	185.5	0.037 ± 0.013	0.000 ± 0.026
Tottori, TOTTORI	31	85.7	0.12 ± 0.014	0.000 ± 0.016
Matsue, SHIMANE	31	55.5	0.018 ± 0.013	0.012 ± 0.0087
Hiroshima, HIROSHIMA	33	113.4	0.000 ± 0.016	0.000 ± 0.012
Ishii-machi, TOKUSHIMA	31	180.0	0.022 ± 0.0086	0.016 ± 0.014
Takamatsu, KAGAWA	31	53.0	0.0079 ± 0.0078	0.0000 ± 0.0098
Matsuyama, EHIME	31	136.0	0.014 ± 0.0072	0.038 ± 0.025
Dazaifu, FUKUOKA	31	166.0	0.011 ± 0.0084	0.000 ± 0.011

Location	Duration (days)	Precipitation (mm)	^{90}Sr (MBq/km^2)	^{137}Cs (MBq/km^2)
Saga, SAGA	29	147.3	0.037 ± 0.0082	0.001 ± 0.014
Nagasaki, NAGASAKI	31	271.0	0.0090 ± 0.0082	0.045 ± 0.016
Kumamoto, KUMAMOTO	31	231.9	0.0000 ± 0.0077	0.000 ± 0.011
Ooita, OOITA	31	227.8	0.000 ± 0.017	0.006 ± 0.017
Miyazaki, MIYAZAKI	31	591.7	0.020 ± 0.035	0.000 ± 0.021
Yonagusuku-mura, OKINAWA	30	261.5	0.030 ± 0.033	0.000 ± 0.021
July, 1992				
Sapporo, HOKKAIDO	32	61.0	0.019 ± 0.0080	0.020 ± 0.017
Aomori, AOMORI	32	86.5	0.0020 ± 0.0087	0.007 ± 0.015
Yamagata, YAMAGATA	34	73.1	0.014 ± 0.019	0.022 ± 0.020
Ookuma-machi, FUKUSHIMA	34	132.3	0.022 ± 0.010	0.12 ± 0.034
Mito, IBARAKI	34	33.5	0.016 ± 0.0078	0.019 ± 0.018
Utsunomiya, TOCHIGI	34	151.1	0.003 ± 0.018	0.041 ± 0.021
Maebashi, GUNMA	34	255.5	0.048 ± 0.029	0.000 ± 0.022
Urawa, SAITAMA	32	60.9	0.027 ± 0.013	0.000 ± 0.015
Chiba, CHIBA	31	74.3	0.039 ± 0.021	0.015 ± 0.017
Shinjuku, TOKYO	34	130.4	0.000 ± 0.018	0.035 ± 0.018
Yokohama, KANAGAWA	32	123.1	0.000 ± 0.016	0.017 ± 0.018
Kosugi-machi, TOYAMA	34	131.1	0.0000 ± 0.0070	0.000 ± 0.023
Fukui, FUKUI	33	171.9	0.063 ± 0.042	0.000 ± 0.091
Koufu, YAMANASHI	34	90.0	0.000 ± 0.016	0.030 ± 0.019
Shizuoka, SHIZUOKA	34	152.5	0.002 ± 0.013	0.000 ± 0.012
Nagoya, AICHI	34	143.3	0.011 ± 0.0072	0.000 ± 0.018
Tsu, MIE	31	101.5	0.0051 ± 0.0093	0.19 ± 0.026
Ootsu, SHIGA	34	164.4	0.019 ± 0.0098	0.018 ± 0.018
Kyoto, KYOTO	32	149.0	0.021 ± 0.023	0.000 ± 0.014
Kobe, HYOGO	32	97.5	0.000 ± 0.027	0.011 ± 0.017
Nara, NARA	32	181.9	0.017 ± 0.0083	0.021 ± 0.018
Wakayama, WAKAYAMA	32	61.5	0.024 ± 0.011	0.000 ± 0.020
Tottori, TOTTORI	34	105.3	0.10 ± 0.014	0.015 ± 0.029
Matsue, SHIMANE	35	81.7	0.006 ± 0.014	0.000 ± 0.017
Hiroshima, HIROSHIMA	29	115.2	0.011 ± 0.0072	0.000 ± 0.012
Ishii-machi, TOKUSHIMA	34	73.0	0.014 ± 0.0070	0.030 ± 0.026
Takamatsu, KAGAWA	32	94.0	0.029 ± 0.0087	0.008 ± 0.015
Matsuyama, EHIME	34	148.0	0.022 ± 0.0085	0.005 ± 0.026
Dazaifu, FUKUOKA	32	164.7	0.015 ± 0.0083	0.000 ± 0.013
Saga, SAGA	34	194.3	0.010 ± 0.0073	0.000 ± 0.010
Nagasaki, NAGASAKI	32	203.0	0.0000 ± 0.0078	0.034 ± 0.015
Kumamoto, KUMAMOTO	34	152.9	0.016 ± 0.025	0.020 ± 0.016

Location	Duration (days)	Precipitation (mm)	^{90}Sr (MBq/km^2)	^{137}Cs (MBq/km^2)
Ooita, OOITA	32	90.0	0.0099±0.0091	0.066 ±0.028
Miyazaki, MIYAZAKI	32	178.6	0.000 ±0.022	0.000 ±0.019
Yonagusuku-mura, OKINAWA	32	50.0	0.0000±0.0090	0.053 ±0.022
August, 1992				
Sapporo, HOKKAIDO	32	226.0	0.0064±0.0068	0.15 ±0.033
Aomori, AOMORI	30	85.5	0.025 ±0.0098	0.000 ±0.014
Morioka, IWATE	30	103.5	0.003 ±0.017	0.007 ±0.011
Onagawa-machi, MIYAGI	30	62.0	0.029 ±0.021	0.027 ±0.018
Yamagata, YAMAGATA	30	47.8	0.0024±0.0081	0.015 ±0.014
Ookuma-machi, FUKUSHIMA	30	21.5	0.0011±0.0060	0.010 ±0.016
Mito, IBARAKI	30	41.0	0.015 ±0.0078	0.021 ±0.020
Utsunomiya, TOCHIGI	30	42.8	0.016 ±0.0075	0.014 ±0.019
Maebashi, GUNMA	30	119.5	0.017 ±0.0073	0.009 ±0.013
Urawa, SAITAMA	32	70.2	0.024 ±0.012	0.012 ±0.015
Chiba, CHIBA	33	34.2	0.000 ±0.017	0.038 ±0.017
Shinjuku, TOKYO	30	6.5	0.0000±0.0086	0.000 ±0.012
Yokohama, KANAGAWA	32	20.6	0.060 ±0.012	0.083 ±0.020
Kosugi-machi, TOYAMA	30	135.4	0.0005±0.0071	0.007 ±0.032
Fukui, FUKUI	30	98.8	0.16 ±0.096	0.14 ±0.093
Koufu, YAMANASHI	30	64.0	0.0068±0.0065	0.000 ±0.021
Gifu, GIFU	30	217.5	0.000 ±0.022	0.003 ±0.017
Shizuoka, SHIZUOKA	31	145.5	0.015 ±0.012	0.006 ±0.010
Nagoya, AICHI	30	128.1	0.000 ±0.037	0.002 ±0.019
Ootsu, SHIGA	30	200.9	0.044 ±0.024	0.053 ±0.020
Kyoto, KYOTO	32	104.0	0.000 ±0.020	0.035 ±0.018
Kobe, HYOGO	32	208.3	0.0000±0.0082	0.046 ±0.027
Nara, NARA	30	218.7	0.052 ±0.021	0.010 ±0.012
Wakayama, WAKAYAMA	33	148.5	0.017 ±0.011	0.066 ±0.020
Tottori, TOTTORI	30	105.0	0.10 ±0.013	0.019 ±0.023
Matsue, SHIMANE	29	190.5	0.031 ±0.013	0.043 ±0.013
Hiroshima, HIROSHIMA	34	260.0	0.032 ±0.0099	0.046 ±0.023
Ishii-machi, TOKUSHIMA	30	414.0	0.026 ±0.0085	0.015 ±0.024
Takamatsu, KAGAWA	32	155.5	0.027 ±0.0082	0.039 ±0.025
Matsuyama, EHIME	30	154.5	0.0092±0.0075	0.029 ±0.024
Dazaifu, FUKUOKA	32	210.5	0.024 ±0.0092	0.029 ±0.024
Saga, SAGA	32	237.1	0.013 ±0.0081	0.004 ±0.011
Nagasaki, NAGASAKI	32	325.0	0.019 ±0.026	0.000 ±0.012
Kumamoto, KUMAMOTO	30	348.0	0.012 ±0.018	0.012 ±0.016
Ooita, OOITA	32	414.6	0.041 ±0.023	0.027 ±0.023
Miyazaki, MIYAZAKI	32	419.9	0.0095±0.0086	0.000 ±0.023

Location	Duration (days)	Precipitation (mm)	^{90}Sr (MBq/km^2)	^{137}Cs (MBq/km^2)
Yonagusuku-mura, OKINAWA	32	417.0	0.001 ± 0.021	0.000 ± 0.025
September, 1992				
Sapporo, HOKKAIDO	31	233.0	0.007 ± 0.022	0.006 ± 0.016
Aomori, AOMORI	31	101.5	0.029 ± 0.011	0.026 ± 0.016
Morioka, IWATE	32	142.8	0.015 ± 0.019	0.025 ± 0.013
Onagawa-machi, MIYAGI	32	45.0	0.027 ± 0.011	0.038 ± 0.019
Yamagata, YAMAGATA	31	29.1	0.028 ± 0.020	0.036 ± 0.021
Ookuma-machi, FUKUSHIMA	31	97.7	0.012 ± 0.0072	0.007 ± 0.016
Mito, IBARAKI	31	126.5	0.043 ± 0.020	0.13 ± 0.027
Utsunomiya, TOCHIGI	31	110.4	0.049 ± 0.019	0.017 ± 0.023
Maebashi, GUNMA	31	37.5	0.011 ± 0.0071	0.025 ± 0.014
Urawa, SAITAMA	31	71.4	0.035 ± 0.017	0.063 ± 0.018
Chiba, CHIBA	31	92.4	0.000 ± 0.018	0.079 ± 0.018
Shinjuku, TOKYO	31	104.6	0.000 ± 0.017	0.13 ± 0.032
Yokohama, KANAGAWA	31	121.4	0.061 ± 0.011	0.076 ± 0.022
Kosugi-machi, TOYAMA	31	64.9	0.0071 ± 0.0080	0.048 ± 0.029
Fukui, FUKUI	31	80.1	0.01 ± 0.23	0.00 ± 0.15
Koufu, YAMANASHI	31	39.5	0.000 ± 0.016	0.008 ± 0.016
Gifu, GIFU	31	102.0	0.043 ± 0.023	0.000 ± 0.017
Shizuoka, SHIZUOKA	30	206.5	0.000 ± 0.013	0.0000 ± 0.0083
Nagoya, AICHI	31	120.7	0.042 ± 0.020	0.000 ± 0.012
Tsu, MIE	31	185.5	0.025 ± 0.010	0.002 ± 0.017
Ootsu, SHIGA	31	84.8	0.000 ± 0.010	0.029 ± 0.026
Kyoto, KYOTO	32	45.5	0.000 ± 0.021	0.000 ± 0.017
Kobe, HYOGO	31	103.8	0.0030 ± 0.0086	0.025 ± 0.022
Nara, NARA	31	92.1	0.039 ± 0.020	0.002 ± 0.010
Wakayama, WAKAYAMA	25	87.5	0.009 ± 0.010	0.025 ± 0.025
Tottori, TOTTORI	31	69.7	0.16 ± 0.017	0.000 ± 0.020
Matsue, SHIMANE	31	122.1	0.020 ± 0.014	0.017 ± 0.011
Hiroshima, HIROSHIMA	31	77.0	0.016 ± 0.0087	0.000 ± 0.021
Ishii-machi, TOKUSHIMA	31	141.5	0.040 ± 0.0096	0.028 ± 0.024
Takamatsu, KAGAWA	31	41.0	0.011 ± 0.019	0.034 ± 0.017
Matsuyama, EHIME	31	50.5	0.0000 ± 0.0074	0.016 ± 0.028
Dazaifu, FUKUOKA	31	119.2	0.000 ± 0.011	0.032 ± 0.030
Saga, SAGA	31	88.2	0.018 ± 0.013	0.000 ± 0.030
Nagasaki, NAGASAKI	31	178.5	0.019 ± 0.026	0.000 ± 0.012
Kumamoto, KUMAMOTO	31	56.0	0.000 ± 0.018	0.003 ± 0.015
Ooita, OOITA	31	69.7	0.017 ± 0.0090	0.001 ± 0.016
Miyazaki, MIYAZAKI	31	189.3	0.0000 ± 0.0072	0.000 ± 0.018

Location	Duration (days)	Precipitation (mm)	^{90}Sr (MBq/km^2)	^{137}Cs (MBq/km^2)
Yonagusuku-mura, OKINAWA	31	160.5	0.013 ± 0.011	0.000 ± 0.019

(1)-2 Strontium-90 and Cesium-137 in Rain and Dry Fallout(for WHO program)
(from Apr. 1992 to Sep. 1992)

-continued from NO.100 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)
April, 1992				
Akita, AKITA	31	121.5	0.053 ± 0.010	0.044 ± 0.027
Ichihara, CHIBA	31	161.3	0.027 ± 0.0088	0.080 ± 0.026
Niigata, NIIGATA	31	130.5	0.25 ± 0.027	0.13 ± 0.027
Kanazawa, ISHIKAWA	34	217.5	0.008 ± 0.017	0.018 ± 0.024
Nagano, NAGANO	30	58.6	0.014 ± 0.0081	0.029 ± 0.024
Osaka, OSAKA	31	179.9	0.023 ± 0.0074	0.099 ± 0.025
Okayama, OKAYAMA	31	88.6	0.014 ± 0.0081	0.060 ± 0.016
Yamaguchi, YAMAGUCHI	31	144.0	0.047 ± 0.018	0.074 ± 0.025
Kochi, KOCHI	32	250.6	0.054 ± 0.017	0.047 ± 0.029
Kagoshima, KAGOSHIMA	31	208.5	0.063 ± 0.012	0.059 ± 0.025
May, 1992				
Akita, AKITA	32	208.9	0.026 ± 0.0076	0.060 ± 0.024
Ichihara, CHIBA	32	197.2	0.025 ± 0.0098	0.052 ± 0.022
Niigata, NIIGATA	32	91.5	0.26 ± 0.018	0.067 ± 0.024
Kanazawa, ISHIKAWA	35	145.0	0.026 ± 0.0069	0.000 ± 0.022
Nagano, NAGANO	33	67.9	0.000 ± 0.021	0.051 ± 0.016
Osaka, OSAKA	33	196.2	0.046 ± 0.017	0.091 ± 0.024
Okayama, OKAYAMA	32	94.9	0.0092 ± 0.0074	0.039 ± 0.014
Yamaguchi, YAMAGUCHI	32	104.5	0.016 ± 0.0070	0.016 ± 0.020
Kohchi, KOHCHI	32	223.0	0.080 ± 0.011	0.11 ± 0.022
Kagoshima, KAGOSHIMA	30	78.0	0.065 ± 0.012	0.025 ± 0.019
June, 1992				
Akita, AKITA	31	50.0	0.015 ± 0.0072	0.030 ± 0.016
Ichihara, CHIBA	31	261.2	0.029 ± 0.010	0.025 ± 0.020
Niigata, NIIGATA	31	113.4	0.36 ± 0.031	0.098 ± 0.027
Kanazawa, ISHIKAWA	31	112.0	0.017 ± 0.0073	0.000 ± 0.013
Nagano, NAGANO	31	100.7	0.000 ± 0.031	0.027 ± 0.017
Osaka, OSAKA	31	203.3	0.0000 ± 0.0065	0.000 ± 0.014
Okayama, OKAYAMA	31	149.9	0.0039 ± 0.0080	0.023 ± 0.013
Yamaguchi, YAMAGUCHI	31	143.5	0.012 ± 0.0095	0.001 ± 0.011
Kochi, KOCHI	31	283.7	0.067 ± 0.012	0.16 ± 0.030
Kagoshima, KAGOSHIMA	32	617.5	0.0095 ± 0.0090	0.14 ± 0.029
July, 1992				
Akita, AKITA	32	96.7	0.000 ± 0.017	0.000 ± 0.016

Location	Duration (days)	Precipitation (mm)	^{90}Sr (MBq/km^2)	^{137}Cs (MBq/km^2)
Ichihara, CHIBA	34	126.7	0.022 ± 0.0094	0.005 ± 0.018
Niigata, NIIGATA	34	89.1	0.25 ± 0.028	0.003 ± 0.018
Kanazawa, ISHIKAWA	35	68.0	0.003 ± 0.021	0.012 ± 0.018
Nagano, NAGANO	31	180.3	0.022 ± 0.018	0.000 ± 0.015
Osaka, OSAKA	34	93.3	0.005 ± 0.027	0.022 ± 0.019
Okayama, OKAYAMA	34	51.3	0.000 ± 0.018	0.009 ± 0.013
Yamaguchi, YAMAGUCHI	34	96.5	0.028 ± 0.0086	0.000 ± 0.012
Kochi, KOCHI	34	180.5	0.072 ± 0.012	0.084 ± 0.019
Kagoshima, KAGOSHIMA	32	310.5	0.013 ± 0.0097	0.035 ± 0.019
August, 1992				
Akita, AKITA	32	238.5	0.030 ± 0.011	0.016 ± 0.015
Ichihara, CHIBA	30	21.6	0.0000 ± 0.0073	0.000 ± 0.017
Niigata, NIIGATA	30	93.4	0.23 ± 0.021	0.059 ± 0.021
Kanazawa, ISHIKAWA	28	61.5	0.033 ± 0.010	0.018 ± 0.018
Nagano, NAGANO	32	73.6	0.029 ± 0.019	0.000 ± 0.012
Osaka, OSAKA	29	115.1	0.002 ± 0.020	0.038 ± 0.016
Okayama, OKAYAMA	30	149.4	0.033 ± 0.0090	0.058 ± 0.020
Yamaguchi, YAMAGUCHI	30	321.0	0.032 ± 0.010	0.000 ± 0.023
Kochi, KOCHI	30	821.3	0.095 ± 0.028	0.086 ± 0.021
Kagoshima, KAGOSHIMA	32	228.5	0.080 ± 0.014	0.035 ± 0.023
September, 1992				
Akita, AKITA	31	131.4	0.035 ± 0.0095	0.066 ± 0.025
Ichihara, CHIBA	31	98.2	0.000 ± 0.033	0.030 ± 0.018
Niigata, NIIGATA	31	41.5	0.24 ± 0.021	0.032 ± 0.020
Kanazawa, ISHIKAWA	31	58.0	0.0061 ± 0.0080	0.017 ± 0.024
Nagano, NAGANO	32	19.3	0.0072 ± 0.0068	0.000 ± 0.015
Osaka, OSAKA	31	72.3	0.017 ± 0.0084	0.000 ± 0.019
Okayama, OKAYAMA	31	47.4	0.046 ± 0.011	0.042 ± 0.023
Yamaguchi, YAMAGUCHI	31	92.5	0.015 ± 0.017	0.021 ± 0.016
Kochi, KOCHI	31	276.3	0.063 ± 0.024	0.017 ± 0.017
Kagoshima, KAGOSHIMA	31	62.5	0.058 ± 0.012	0.029 ± 0.019

(2) Strontium-90 and Cesium-137 in Airborne Dust
(from Apr. 1992 to Sep. 1992)

-continued from NO.100 of this publication-

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

Location	Sampling period	Absorption volume (m3)	^{90}Sr (mBq/m^3)	^{137}Cs (mBq/m^3)
April～June, 1992				
Morioka, IWATE	4～6	10,930.0	0.00000± 0.00087	0.0012 ± 0.00062
Akita, AKITA	4～6	10,080.0	0.00085± 0.00042	0.0021 ± 0.00081
Yamagata, YAMAGATA	4～6	12,960.0	0.00007± 0.00028	0.00000± 0.00040
Ookuma-machi, FUKUSHIMA	4～6	8,313.0	0.00007± 0.00039	0.00000± 0.00068
Mito, IBARAKI	4～6	10,037.9	0.00040± 0.00037	0.00000± 0.00057
Utsunomiya, TOCHIGI	4～6	15,139.0	0.00080± 0.00066	0.00086± 0.00042
Maebashi, GUNMA	4～6	11,787.0	0.00074± 0.00083	0.00000± 0.00054
Ichihara, CHIBA	4～6	12,960.0	0.00029± 0.00073	0.00030± 0.00053
Yokohama, KANAGAWA	4～6	10,029.0	0.00066± 0.00044	0.0012 ± 0.00073
Niigata, NIIGATA	4～6	10,837.0	0.0015 ± 0.00095	0.00000± 0.00055
Kosugi-machi, TOYAMA	4～6	18,458.0	0.00000± 0.00019	0.00011± 0.00038
Fukui, FUKUI	4～6	12,275.0	0.00000± 0.00028	0.00079± 0.00049
Koufu, YAMANASHI	4～6	15,251.0	0.00061± 0.00055	0.00051± 0.00036
Nagano, NAGANO	4～6	13,615.0	0.00099± 0.00033	0.00000± 0.00048
Gifu, GIFU	4～6	11,661.0	0.00002± 0.00029	0.00046± 0.00048
Hamaoka-machi, SHIZUOKA	4～6	11,990.0	0.00000± 0.00072	0.00018± 0.00048
Nagoya, AICHI	4～6	10,563.0	0.00000± 0.00035	0.00000± 0.00050
Tsu, MIE	4～6	14,470.0	0.00034± 0.00027	0.00000± 0.00048
Ootsu, SHIGA	4～6	10,626.0	0.00063± 0.00038	0.00016± 0.00068
Kyoto, KYOTO	4～6	10,189.0	0.00054± 0.00061	0.0014 ± 0.00058
Osaka, OSAKA	4～6	16,560.0	0.00007± 0.00023	0.00029± 0.00029
Koube, HYOGO	4～6	9,711.0	0.00025± 0.00043	0.00000± 0.00039
Nara, NARA	4～6	11,625.0	0.00000± 0.00081	0.00086± 0.00054
Wakayama, WAKAYAMA	4～6	9,948.0	0.00000± 0.00096	0.00005± 0.00057
Tottori, TOTTORI	4～6	15,358.0	0.00000± 0.00054	0.00032± 0.00038
Okayama, OKAYAMA	4～6	11,010.0	0.00011± 0.00081	0.00047± 0.00055
Hiroshima, HIROSHIMA	4～6	10,590.0	0.00049± 0.00037	0.00000± 0.00057
Yamaguchi, YAMAGUCHI	4～6	19,954.0	0.00019± 0.00020	0.00000± 0.00051
Tokushima, TOKUSHIMA	4～6	11,760.0	0.00000± 0.00031	0.00049± 0.00053
Takamatsu, KAGAWA	4～6	15,638.0	0.00004± 0.00023	0.0012 ± 0.00053
Saga, SAGA	4～6	10,732.0	0.00000± 0.00032	0.00019± 0.00067
Nagasaki, NAGASAKI	4～6	10,411.0	0.00036± 0.00092	0.00004± 0.00063
Kumamoto, KUMAMOTO	4～6	11,645.0	0.00085± 0.00081	0.0026 ± 0.00070
Ooita, OOITA	4～6	10,299.0	0.00022± 0.00034	0.00000± 0.00053

Location	Sampling period	Absorption volume (m3)	^{90}Sr (mBq/m^3)	^{137}Cs (mBq/m^3)
Miyazaki, MIYAZAKI	4～6	13,485.0	0.00013± 0.00068	0.00000± 0.00039
July～Septmber, 1992				
Morioka, IWATE	7～9	10,845.0	0.00030± 0.00083	0.00013± 0.00047
Akita, AKITA	7～9	10,638.0	0.00065± 0.00033	0.00000± 0.00066
Yamagata, YAMAGATA	7～9	12,960.0	0.00000± 0.00077	0.00094± 0.00051
Ookuma-machi, FUKUSHIMA	7～9	10,271.0	0.00043± 0.00040	0.00000± 0.00035
Mito, IBARAKI	7～9	9,502.7	0.00069± 0.00097	0.00047± 0.00058
Utsunomiya, TOCHIGI	7～9	15,613.0	0.00093± 0.00027	0.00043± 0.00039
Maebashi, GUNMA	7～9	12,192.4	0.00061± 0.00034	0.00094± 0.00049
Ichihara, CHIBA	7～9	12,960.0	0.00000± 0.00069	0.00036± 0.00038
Yokohama, KANAGAWA	7～9	9,541.0	0.00095± 0.00086	0.00000± 0.00062
Niigata, NIIGATA	7～9	10,896.0	0.00000± 0.00083	0.00008± 0.00054
Kosugi-machi, TOYAMA	7～9	18,333.0	0.00028± 0.00020	0.00061± 0.00032
Fukui, FUKUI	7～9	11,830.0	0.00000± 0.00063	0.00012± 0.00049
Koufu, YAMANASHI	7～9	17,772.0	0.00000± 0.00042	0.00011± 0.00031
Nagano, NAGANO	7～9	14,580.0	0.00065± 0.00025	0.00003± 0.00040
Gifu, GIFU	7～9	10,530.0	0.00064± 0.00039	0.0012 ± 0.00058
Hamaoka-machi, SHIZUOKA	7～9	11,925.0	0.00009± 0.00049	0.00060± 0.00051
Nagoya, AICHI	7～9	10,574.0	0.00033± 0.00077	0.00035± 0.00056
Tsu, MIE	7～9	14,110.0	0.00070± 0.00063	0.00003± 0.00039
Ootsu, SHIGA	7～9	11,418.0	0.00038± 0.00031	0.00032± 0.00052
Kyoto, KYOTO	7～9	10,314.0	0.00011± 0.00057	0.00047± 0.00050
Osaka, OSAKA	7～9	17,280.0	0.00000± 0.00045	0.00027± 0.00033
Koube, HYOGO	7～9	9,743.0	0.00098± 0.00038	0.00000± 0.00061
Nara, NARA	7～9	11,213.0	0.00058± 0.00039	0.00000± 0.00045
Wakayama, WAKAYAMA	7～9	10,056.0	0.00000± 0.00057	0.00054± 0.00058
Tottori, TOTTORI	7～9	15,202.0	0.00072± 0.00044	0.00000± 0.00031
Okayama, OKAYAMA	7～9	13,112.0	0.00000± 0.00067	0.00000± 0.00043
Hiroshima, HIROSHIMA	7～9	11,401.0	0.00043± 0.00080	0.00020± 0.00049
Yamaguchi, YAMAGUCHI	7～9	20,231.0	0.00023± 0.00046	0.00018± 0.00026
Tokushima, TOKUSHIMA	7～9	11,880.0	0.00048± 0.00073	0.00000± 0.00051
Takamatsu, KAGAWA	7～9	15,654.0	0.00024± 0.00022	0.00023± 0.00039
Saga, SAGA	7～9	12,825.7	0.00057± 0.00074	0.00015± 0.00054
Nagasaki, NAGASAKI	7～9	10,274.0	0.00069± 0.00042	0.00008± 0.00057
Kumamoto, KUMAMOTO	7～9	10,577.0	0.00022± 0.00058	0.00069± 0.00058
Ooita, OOITA	7～9	10,542.0	0.00038± 0.00034	0.00011± 0.00035
Miyazaki, MIYAZAKI	7～9	13,177.0	0.00038± 0.00078	0.00052± 0.00045

(3) Strontium-90 and Cesium-137 in Service Water
(from Apr. 1992 to Sep. 1992)

-continued from NO.100 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, 1992			
Urawa, SAITAMA	7.6	0.00 ± 0.14	0.000 ± 0.092
Katsushika, TOKYO	7.1	1.5 ± 0.19	0.40 ± 0.11
Tsukui-machi, KANAGAWA	8.8	0.46 ± 0.10	0.27 ± 0.079
Nagano, NAGANO	7.3	0.98 ± 0.078	0.000 ± 0.076
Inuyama, AICHI	6.9	2.6 ± 0.13	0.22 ± 0.089
Moriguchi, OSAKA	7.1	3.9 ± 0.21	0.18 ± 0.087
Fukuoka, FUKUOKA	7.6	2.3 ± 0.12	0.12 ± 0.088
July, 1992			
Sapporo, HOKKIDO	7.1	1.4 ± 0.15	0.090 ± 0.075
Kisarazu, CHIBA	7.86	2.3 ± 0.18	0.006 ± 0.082
August, 1992			
Kyoto, KYOTO	8.10	3.9 ± 0.22	0.20 ± 0.10
(Tap Water)			
May, 1992			
Yamagata, YAMAGATA	7.2	2.0 ± 0.16	0.22 ± 0.083
Nagano, NAGANO	7.4	0.99 ± 0.13	0.061 ± 0.081
Hiroshima, HIROSHIMA	6.75	2.4 ± 0.18	0.18 ± 0.084
June, 1992			
Wakkanai, HOKKAIDO	6.8	1.2 ± 0.14	0.14 ± 0.089
Aomori, AOMORI	7.4	1.3 ± 0.16	0.32 ± 0.11
Morioka, IWATE	7.1	1.3 ± 0.10	0.006 ± 0.074
Fukushima, FUKUSHIMA	6.7	2.9 ± 0.20	0.000 ± 0.080
Mito, IBARAKI	7.7	1.4 ± 0.12	0.077 ± 0.081
Maebashi, GUNMA	7.0	1.5 ± 0.11	0.25 ± 0.090
Urawa, SAITAMA	7.2	1.9 ± 0.18	0.000 ± 0.075
Kisarazu, CHIBA	6.89	2.5 ± 0.12	0.052 ± 0.090
Katsushika, TOKYO	7.1	1.1 ± 0.18	0.19 ± 0.10
Tsukui-machi, KANAGAWA	6.7	0.31 ± 0.097	0.19 ± 0.068
Niigata, NIIGATA	7.42	2.9 ± 0.19	0.19 ± 0.091
Kosugi-machi, TOYAMA	7.1	2.0 ± 0.17	0.060 ± 0.086
Kanazawa, ISHIKAWA	7.36	2.2 ± 0.17	0.12 ± 0.10
Fukui, FUKUI	6.21	0.47 ± 0.12	0.000 ± 0.064

Location	pH	^{90}Sr (mBq/ℓ)	^{137}Cs (mBq/ℓ)
Koufu, YAMANASHI	6.5	1.1 ± 0.10	0.000 ± 0.089
Gifu, GIFU	6.83	1.5 ± 0.16	0.074 ± 0.079
Shizuoka, SHIZUOKA	7.53	0.80 ± 0.12	0.000 ± 0.082
Nagoya, AICHI	6.7	2.2 ± 0.12	0.18 ± 0.088
Tsu, MIE	6.8	2.6 ± 0.12	0.000 ± 0.078
Ootus, SHIGA	6.7	4.2 ± 0.18	0.20 ± 0.096
Osaka, OSAKA	7.0	3.7 ± 0.21	0.018 ± 0.063
Koube, HYOGO	6.79	3.2 ± 0.14	0.15 ± 0.089
Nara, NARA	7.3	2.9 ± 0.19	0.000 ± 0.076
Tottori, TOTTORI	7.3	2.1 ± 0.17	0.000 ± 0.056
Matsue, SHIMANE	-	3.0 ± 0.21	0.066 ± 0.085
Okayama, OKAYAMA	6.7	2.3 ± 0.18	0.12 ± 0.087
Ube, YAMAGUCHI	7.6	2.4 ± 0.29	0.083 ± 0.083
Tokushima, TOKUSHIMA	6.5	2.0 ± 0.12	0.19 ± 0.10
Takamatsu, KAGAWA	7.2	2.8 ± 0.18	0.10 ± 0.089
Matsuyama, EHIME	7.6	1.7 ± 0.17	0.000 ± 0.064
Kochi, KOCHI	7.3	1.7 ± 0.11	0.058 ± 0.077
Fukuoka, FUKUOKA	7.3	3.6 ± 0.15	0.000 ± 0.082
Saga, SAGA	7.5	2.3 ± 0.20	0.000 ± 0.064
Nagasaki, NAGASAKI	7.3	1.7 ± 0.16	0.006 ± 0.075
Kumamoto, KUMAMOTO	5.9	0.07 ± 0.10	0.000 ± 0.073
Ooita, OOITA	7.69	0.74 ± 0.12	0.22 ± 0.099
Miyazaki, MIYAZAKI	6.93	1.4 ± 0.15	0.012 ± 0.057
Kagoshima, KAGOSHIMA	7.2	0.53 ± 0.072	0.36 ± 0.10
July, 1992			
Sendai, MIYAGI	-	1.5 ± 0.22	0.013 ± 0.086
Akita, AKITA	7.10	4.2 ± 0.17	0.15 ± 0.095
Shinguu, WKAYAMA	7.0	1.8 ± 0.12	0.000 ± 0.094
August, 1992			
Kyoto, KYOTO	7.50	3.5 ± 0.20	0.14 ± 0.089

(4) Strontium-90 and Cesium-137 in Freshwater
(from Apr. 1992 to Sep. 1992)

-continued from NO.100 of this publication-

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

Location	pH	^{90}Sr (mBq/ℓ)	^{137}Cs (mBq/ℓ)
(Freshwater)			
May, 1992			
Kasumigaura, IBARAKI	8.6	2.9 ± 0.18	0.44 ± 0.10
July, 1992			
Ishikari-machi, HOKKAIDO	7.5	3.1 ± 0.21	0.55 ± 0.11
August, 1992			
Tsuruga, FUKUI	9.14	5.2 ± 0.20	3.2 ± 0.22
September, 1992			
Akita, AKITA	6.32	3.5 ± 0.18	0.57 ± 0.12
Fukushima, FUKUSHIMA	6.6	1.9 ± 0.12	0.13 ± 0.092

(5) Strontium-90 and Cesium-137 in Soil
(from May. 1992 to Sep. 1992)

-continued from NO.100 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)
May, 1992					
Tokai-mura, IBARAKI	0～5	1.2 ± 0.14	63 ± 7.3	9.2 ± 0.33	480 ± 17
〃	5～20	1.3 ± 0.14	170 ± 19	16 ± 0.4	2100 ± 60
Akabane-machi, AICHI	0～5	0.093± 0.042	5.5± 2.5	3.3 ± 0.21	190 ± 12
〃	5～20	0.16 ± 0.048	31 ± 9.2	1.5 ± 0.15	280 ± 28
June, 1992					
Fukushima, FUKUSHIMA	0～5	3.1 ± 0.14	71 ± 3.2	9.8 ± 0.34	220 ± 8
〃	5～20	0.61 ± 0.068	45 ± 5.1	0.52 ± 0.099	38 ± 7.3
Katsushika, TOKYO	0～5	0.61 ± 0.13	34 ± 7.1	3.0 ± 0.20	170 ± 11
〃	5～20	0.54 ± 0.065	89 ± 11	1.6 ± 0.15	260 ± 26
Naha, OKINAWA	0～5	1.7 ± 0.18	100 ± 11	5.9 ± 0.27	360 ± 17
〃	5～20	1.8 ± 0.16	350 ± 31	4.6 ± 0.24	920 ± 47
July, 1992					
Aomori, AOMORI	0～5	0.88 ± 0.14	31 ± 4.9	1.5 ± 0.15	51 ± 5.2
〃	5～20	0.14 ± 0.10	16 ± 12	0.077± 0.076	9.1± 9.0
Yamagata, YAMAGATA	0～5	4.0 ± 0.23	200 ± 11	18 ± 0.5	880 ± 24
〃	5～20	0.66 ± 0.13	65 ± 13	1.3 ± 0.16	130 ± 16
Imaichi, TOCHIGI	0～5	8.9 ± 0.33	210 ± 8	32 ± 0.6	750 ± 14
〃	5～20	5.2 ± 0.27	310 ± 16	6.5 ± 0.28	390 ± 16
Yokohama, KANAGAWA	0～5	8.9 ± 0.22	230 ± 6	26 ± 0.5	660 ± 14
〃	5～20	11 ± 0.3	930 ± 24	19 ± 0.5	1700 ± 40
Kashiwazaki, NIIGATA	0～5	0.74 ± 0.074	48 ± 4.8	11 ± 0.4	730 ± 24
〃	5～20	0.77 ± 0.076	190 ± 18	7.7 ± 0.31	1800 ± 70
Kosugi-machi, TOYAMA	0～5	4.9 ± 0.19	370 ± 14	16 ± 0.4	1200 ± 30
〃	5～20	8.0 ± 0.23	1500 ± 40	1.2 ± 0.13	210 ± 24
Kanazawa, ISHIKAWA	0～5	14 ± 0.4	500 ± 15	49 ± 0.8	1800 ± 30
〃	5～20	9.4 ± 0.37	1300 ± 50	25 ± 0.5	3400 ± 70

Location	Sampling Depth (cm)	^{90}Sr (Bq/kg) (dried Soil)	^{90}Sr (MBq/km²)	^{137}Cs (Bq/kg) (dried Soil)	^{137}Cs (MBq/km²)
Fukui, FUKUI	0～5	0.65 ± 0.083	29 ± 3.7	6.4 ± 0.28	290 ± 13
〃	5～20	0.69 ± 0.076	150 ± 16	2.6 ± 0.19	550 ± 39
Takane-machi, YAMANASHI	0～5	7.4 ± 0.21	180 ± 5	34 ± 0.6	800 ± 15
〃	5～20	7.9 ± 0.24	530 ± 16	18 ± 0.5	1200 ± 30
Nagano, NAGANO	0～5	6.2 ± 0.19	180 ± 6	130 ± 1	3700 ± 30
〃	5～20	5.9 ± 0.19	370 ± 12	23 ± 0.5	1500 ± 30
Gifu, GIFU	0～5	1.0 ± 0.08	41 ± 3.2	12 ± 0.4	460 ± 15
〃	5～20	1.4 ± 0.09	330 ± 22	7.9 ± 0.31	1800 ± 70
Gotenba, SHIZUOKA	0～5	1.7 ± 0.15	41 ± 3.7	10 ± 0.4	250 ± 9
〃	5～20	1.5 ± 0.14	230 ± 21	4.8 ± 0.26	730 ± 40
Akabane-machi, AICHI	0～5	0.093± 0.042	5.5± 2.5	3.3 ± 0.21	190 ± 12
〃	5～20	0.16 ± 0.048	31 ± 9.2	1.5 ± 0.15	280 ± 28
Tsu, MIE	0～5	0.26 ± 0.055	9.8± 2.1	0.24 ± 0.095	9.1± 3.6
〃	5～20	0.25 ± 0.054	39 ± 8.6	0.71 ± 0.12	110 ± 19
Yasu-machi, SHIGA	0～5	0.25 ± 0.051	16 ± 3.2	6.0 ± 0.27	380 ± 17
〃	5～20	0.84 ± 0.078	110 ± 10	9.0 ± 0.34	1200 ± 40
Miyazu, KYOTO	0～5	11 ± 0.4	330 ± 11	57 ± 0.9	1700 ± 30
〃	5～20	1.1 ± 0.14	250 ± 31	8.0 ± 0.33	1800 ± 70
Osaka, OSAKA	0～5	2.1 ± 0.11	59 ± 3.2	8.8 ± 0.33	250 ± 10
〃	5～20	1.2 ± 0.09	220 ± 16	2.7 ± 0.20	490 ± 36
Kasai, HYOGO	0～5	1.8 ± 0.17	80 ± 7.6	19 ± 0.5	840 ± 21
〃	5～20	1.6 ± 0.16	110 ± 12	17 ± 0.5	1200 ± 30
Kashihara, NARA	0～5	0.95 ± 0.14	44 ± 6.6	4.8 ± 0.26	220 ± 12
〃	5～20	1.4 ± 0.16	160 ± 19	5.1 ± 0.26	620 ± 32
Shinguu, WAKAYAMA	0～5	0.32 ± 0.12	15 ± 5.4	3.4 ± 0.22	160 ± 10
〃	5～20	0.15 ± 0.051	19 ± 6.4	1.2 ± 0.14	160 ± 18
Kokufu-machi, TOTTORI	0～5	0.20 ± 0.053	11 ± 2.8	0.87 ± 0.12	48 ± 6.3
〃	5～20	0.50 ± 0.069	34 ± 4.7	1.1 ± 0.14	75 ± 9.3
Oota, SHIMANE	0～5	26 ± 0.4	360 ± 6	33 ± 0.6	470 ± 9
〃	5～20	6.4 ± 0.20	610 ± 19	13 ± 0.4	1200 ± 40

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)
Asahi-machi, OKAYAMA	0～5	0.15 ± 0.055	7.8± 2.7	0.64 ± 0.11	32 ± 5.7
〃	5～20	0.21 ± 0.057	23 ± 6.3	0.24 ± 0.092	26 ± 10
Hiroshima, HIROSHIMA	0～5	0.48 ± 0.10	34 ± 7.3	1.4 ± 0.15	98 ± 10
〃	5～20	1.9 ± 0.16	380 ± 33	9.3 ± 0.35	1900 ± 70
Kamiita, TOKUSHIMA	0～5	0.92 ± 0.095	57 ± 5.9	3.2 ± 0.20	200 ± 12
〃	5～20	0.83 ± 0.081	170 ± 16	3.0 ± 0.19	590 ± 38
Sakaide, KAGAWA	0～5	2.7 ± 0.18	95 ± 6.5	19 ± 0.5	690 ± 18
〃	5～20	2.5 ± 0.18	280 ± 19	1.3 ± 0.15	140 ± 16
Matsuyama, EHIME	0～5	1.3 ± 0.16	50 ± 5.9	34 ± 0.6	1300 ± 20
〃	5～20	0.72 ± 0.14	54 ± 10	10 ± 0.4	790 ± 26
Kochi, KOCHI	0～5	4.6 ± 0.23	210 ± 10	13 ± 0.4	580 ± 19
〃	5～20	4.9 ± 0.25	680 ± 35	9.0 ± 0.35	1300 ± 50
Fukuoka, FUKUOKA	0～5	5.3 ± 0.25	340 ± 16	4.6 ± 0.25	290 ± 16
〃	5～20	3.2 ± 0.21	520 ± 33	0.92 ± 0.13	150 ± 21
Obama-machi, NAGASAKI	0～5	4.2 ± 0.23	130 ± 7	79 ± 1.0	2500 ± 30
〃	5～20	4.3 ± 0.24	470 ± 27	14 ± 0.4	1500 ± 50
Nishihara-mura, KUMAMOTO	0～5	7.7 ± 0.20	130 ± 3	96 ± 1.1	1600 ± 20
〃	5～20	8.9 ± 0.23	430 ± 11	22 ± 0.5	1100 ± 30
Sadohara-machi, MIYAZAKI	0～5	0.94 ± 0.084	59 ± 5.3	8.9 ± 0.35	560 ± 22
〃	5～20	1.1 ± 0.09	180 ± 15	8.8 ± 0.34	1500 ± 60
August, 1992					
Sapporo, HOKKAIDO	0～5	11 ± 0.3	380 ± 12	31 ± 0.6	1100 ± 20
〃	5～20	7.1 ± 0.29	960 ± 40	9.6 ± 0.36	1300 ± 50
Takizawa-mura, IWATE	0～5	16 ± 0.3	450 ± 8	83 ± 1.0	2300 ± 30
〃	5～20	11 ± 0.3	1100 ± 30	5.0 ± 0.26	510 ± 26
Maebashi, GUNMA	0～5	1.1 ± 0.14	68 ± 8.5	3.4 ± 0.20	210 ± 12
〃	5～20	1.1 ± 0.15	150 ± 20	2.2 ± 0.16	300 ± 22
Ichihara, CHIBA	0～5	0.097± 0.096	5.3± 5.2	2.0 ± 0.18	110 ± 10
〃	5～20	0.43 ± 0.11	98 ± 26	1.9 ± 0.18	430 ± 40
Hagi, YAMAGUCHI	0～5	1.2 ± 0.15	76 ± 9.4	8.1 ± 0.31	500 ± 19
〃	5～20	1.5 ± 0.10	290 ± 19	4.8 ± 0.25	960 ± 49

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)
Saga, SAGA	0～5	0.47 ± 0.065	12 ± 1.7	1.4 ± 0.14	37 ± 3.7
〃	5～20	0.64 ± 0.072	120 ± 13	2.2 ± 0.17	410 ± 31
Kujuu-machi, OOITA	0～5	5.6 ± 1.9	99 ± 3.3	85 ± 1.0	1500 ± 20
〃	5～20	3.8 ± 0.17	130 ± 6	17 ± 0.5	610 ± 17
Kaimon-machi, KAGOSHIMA	0～5	0.58 ± 0.063	29 ± 3.2	1.3 ± 0.13	64 ± 6.7
〃	5～20	0.64 ± 0.074	64 ± 7.5	1.3 ± 0.14	130 ± 14
September, 1992					
Iwadeyama-machi, MIYAGI	0～5	1.9 ± 0.11	74 ± 4.3	4.3 ± 0.25	170 ± 10
〃	5～20	1.6 ± 0.10	260 ± 17	2.2 ± 0.20	370 ± 33
Akita, AKITA	0～5	6.3 ± 0.28	270 ± 12	54 ± 0.8	2300 ± 30
〃	5～20	6.3 ± 0.28	610 ± 27	31 ± 0.6	3000 ± 60

(6) Strontium-90 and Cesium-137 in Sea Water
(from Jul. 1992 to Aug. 1992)

-continued from NO.98 of this publication-

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

Location	Sample volume analyzed (ℓ)	Cl (ℓ)	^{90}Sr (mBq/ℓ)	^{137}Cs (mBq/ℓ)
July, 1992				
Yoichi-bay, HOKKAIDO	40.0	—	3.0 ±0.35	2.9 ±0.38
Tokai-mura, IBARAKI	40.0	15.94	2.4 ±0.33	3.4 ±0.37
Niigata, NIIGATA	40.0	19.0	2.4 ±0.20	4.1 ±0.40
Tokoname, AICHI	40.0	11.5	2.4 ±0.31	2.1 ±0.31
Yamaguchi-bay, YAMAGUCHI	38.8	19.0	2.3 ±0.19	4.0 ±0.40
Monji, FUKUOKA	40.0	18.96	2.5 ±0.33	2.8 ±0.37
August, 1992				
Mutsu, AOMORI	40.0	16.5	2.4 ±0.33	3.6 ±0.40
Souma, FUKUSHIMA	37.4	17.5	2.3 ±0.36	2.7 ±0.38
Ichihara, CHIBA	40.0	17.02	2.3 ±0.19	3.8 ±0.38
Yokosuka, KANAGAWA	35.9	17.0	2.3 ±0.37	3.8 ±0.45
Osaka-bay, OSAKA	39.0	14.1	2.3 ±0.19	3.4 ±0.38
Katsuren-machi, OKINAWA	39.8	19.01	2.2 ±0.19	3.9 ±0.38

(7) Strontium-90 and Cesium-137 in Sea Sediments
(from May. 1992 to Aug. 1992)

-continued from NO. 100 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, 1992			
Mutsu, AOMORI	14	0.000± 0.092	0.044± 0.088
July, 1992			
Yochi-bay, HOKKAIDO	13	0.039± 0.031	0.40 ± 0.096
Tokai-mura, IBARAKI	7	0.10 ± 0.036	0.44 ± 0.089
Niigata, NIIGATA	25	0.22 ± 0.076	9.1 ± 0.33
Jyokatsu, AICHI	21.0	0.14 ± 0.042	4.1 ± 0.23
Yamaguchi-bay, YAMAGUCHI	10	0.32 ± 0.064	4.2 ± 0.24
Monji, FUKUOKA	10	0.097± 0.040	1.7 ± 0.16
August, 1992			
Mutsu, AOMORI	13	0.77 ± 0.14	7.0 ± 0.29
Souma, FUKUSHIMA	5	0.047± 0.050	0.74 ± 0.11
Ichihara, CHIBA	9.4	0.17 ± 0.049	3.9 ± 0.23
Yokosuka, KANAGAWA	7.0	0.16 ± 0.043	2.6 ± 0.19
Osaka-bay, OSAKA	17.8	0.17 ± 0.047	3.9 ± 0.23
Katuren-machi, OKINAWA	13.0	0.14 ± 0.047	0.38 ± 0.097

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

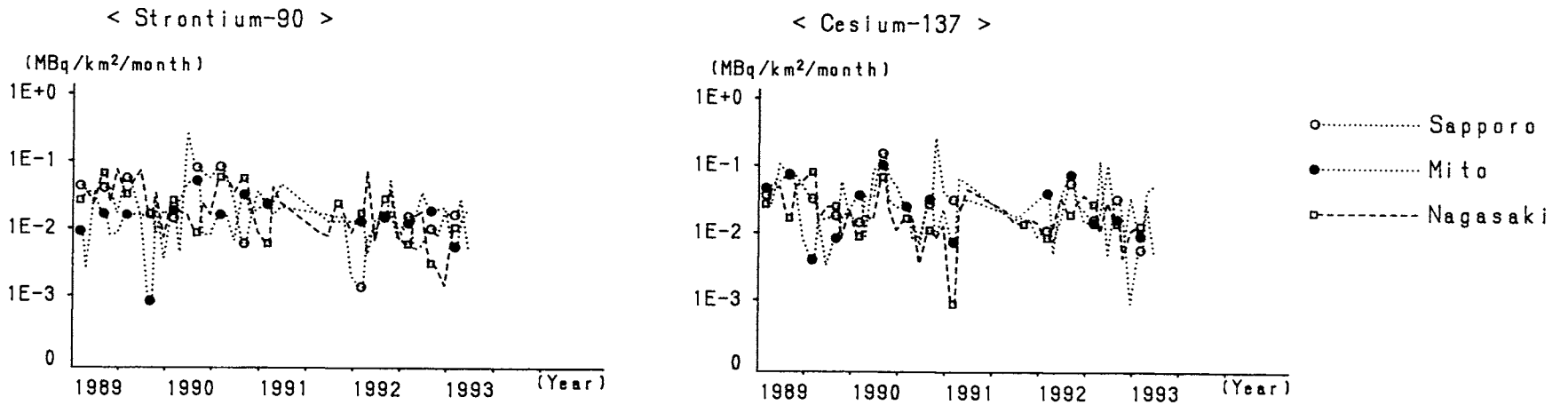

Fig. 1-1

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

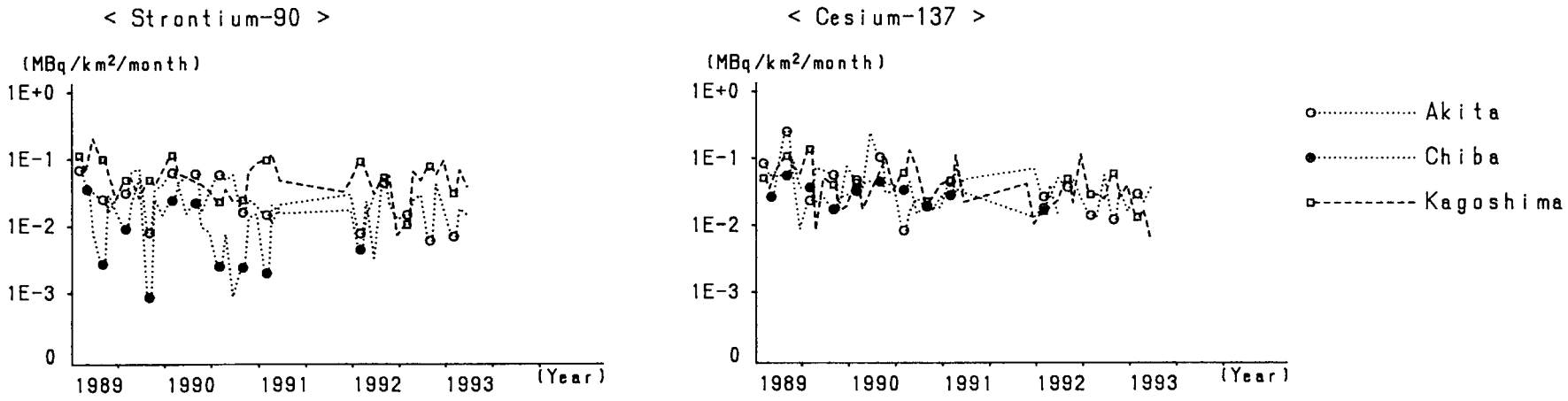

Fig.1-2

* * * Airborne Dust * * *

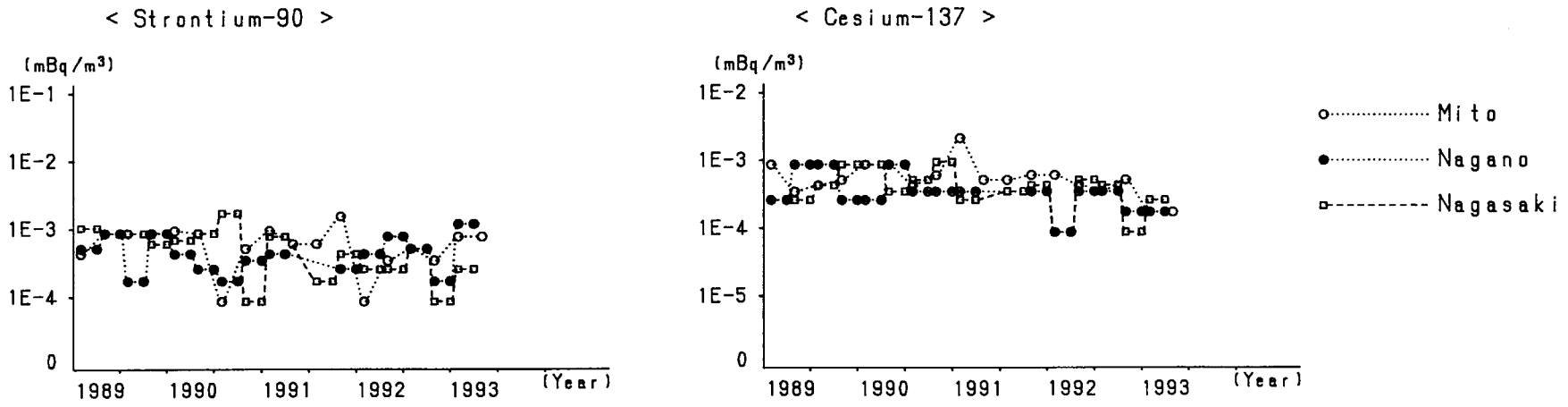

Fig. 2

* * * Source water * * *

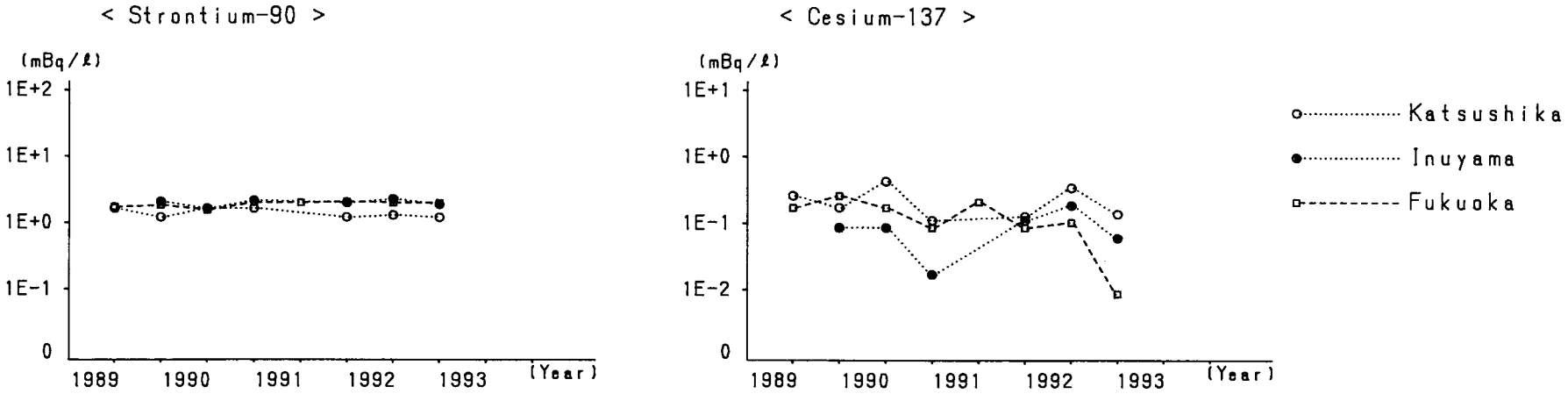

Fig.3-1

* * * Tap water * * *

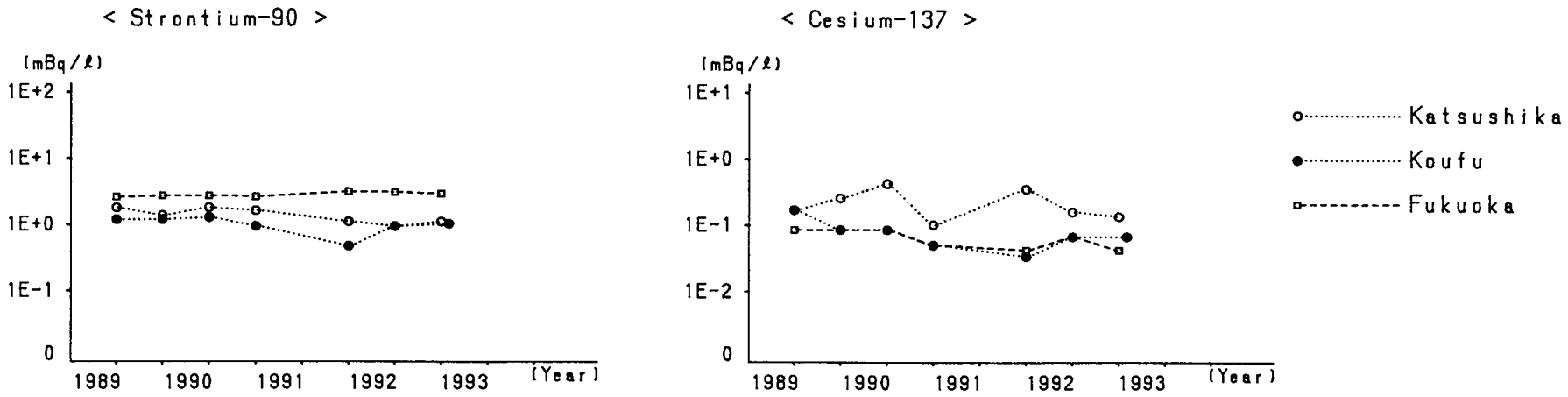

Fig.3-2

* * * Freshwater * * *

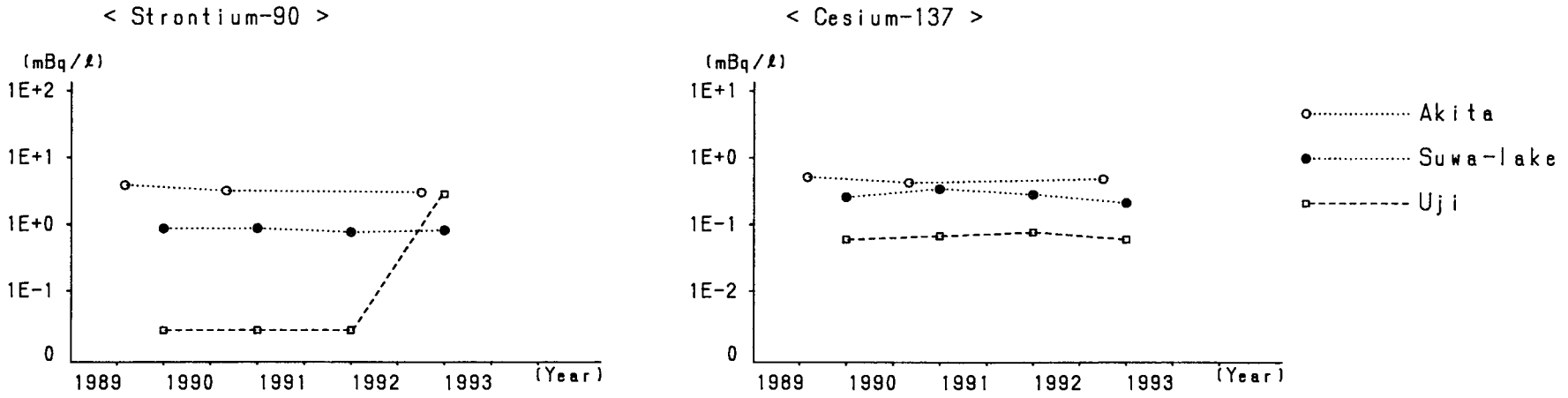

Fig. 4

* * * Soil * * *

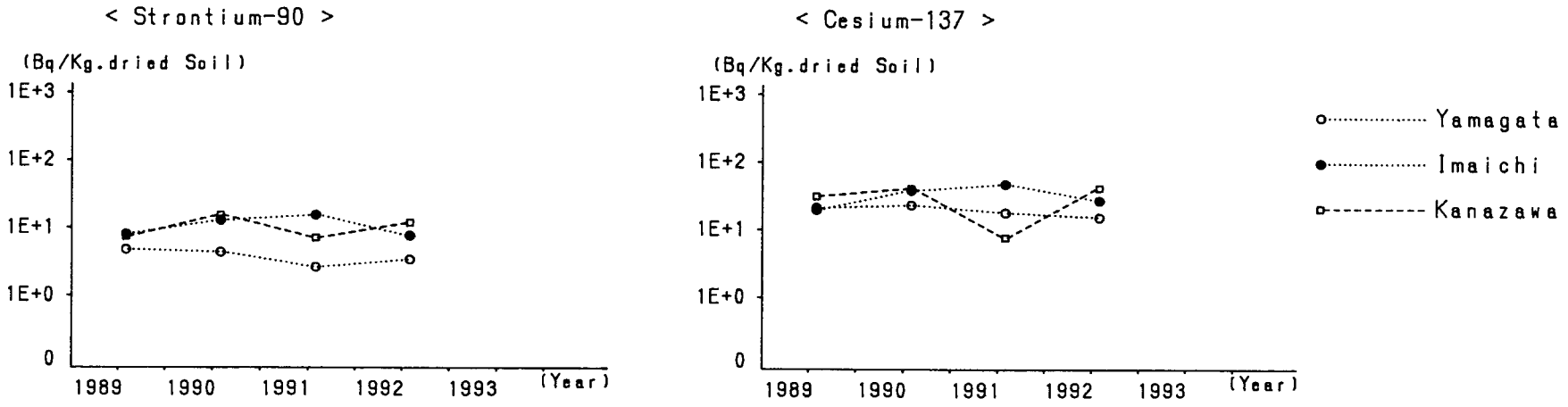
< Strontium-90 >
(Bq/Kg.dried Soil)
1E+3
1E+2
1E+1
1E+0
0
1989
1990
1991
1992
1993
(Year)
< Cesium-137 >
(Bq/Kg.dried Soil)
1E+3
1E+2
1E+1
1E+0
0
1989
1990
1991
1992
1993
(Year)
Yamagata
Imaichi
Kanazawa

Fig.5

* * * Sea Water * * *

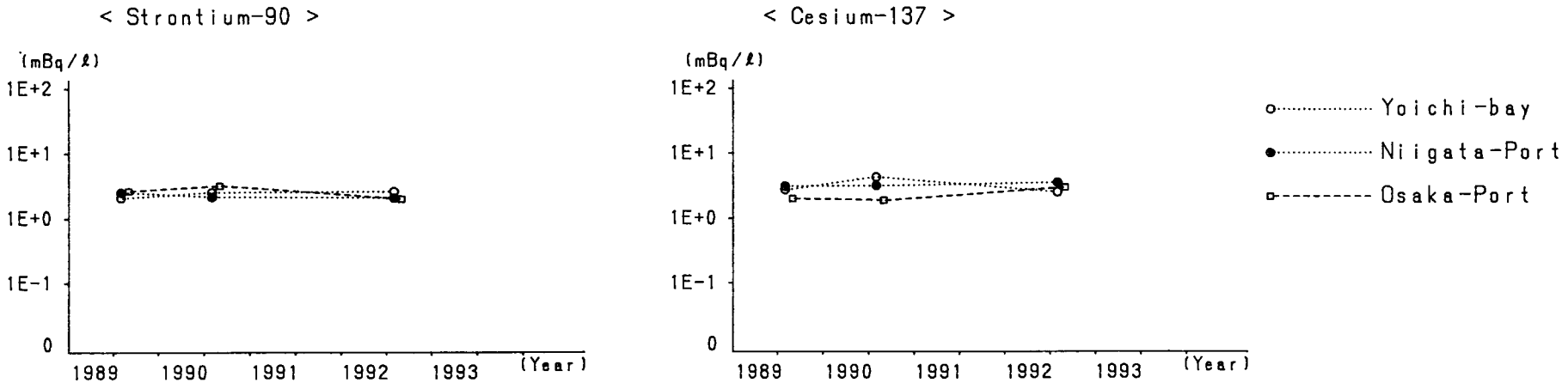

Fig.6

* * * Sea Sediments * * *

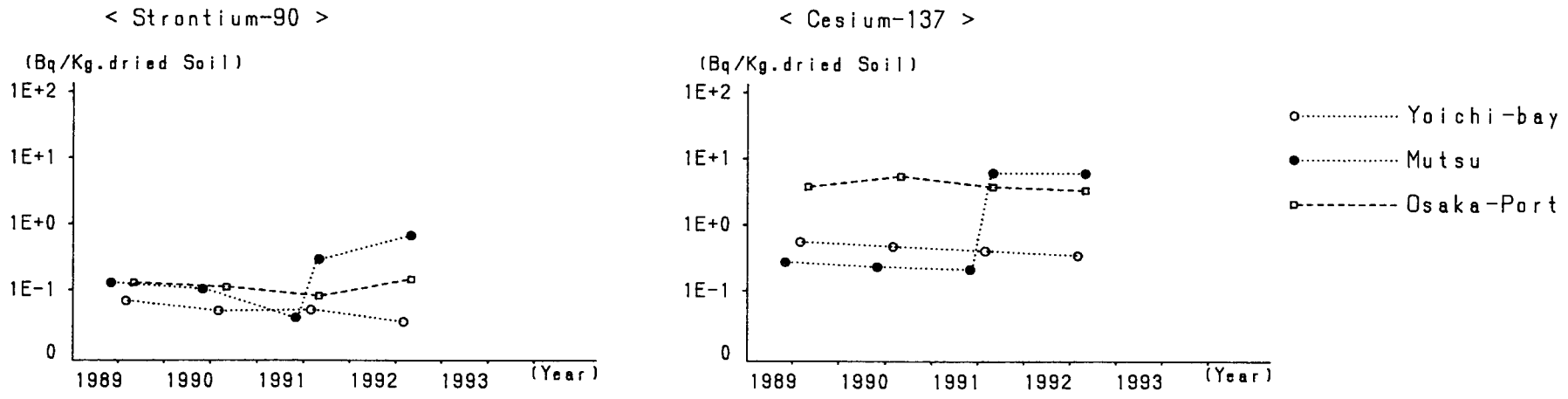

Fig.7

** 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 : Urawa
13 : Maebaahi
14 : Shinjuku
15 : Nagano
16 : Yokohama
17 : Koufu
18 : Toyama
19 : Kanazawa
20 : Shizuoka
21 : Gifu
22 : Fukui
23 : Nagoya
24 : Ootsu
25 : Tsu
26 : Kyoto
27 : Nara
28 : Osaka
29 : Tottori
30 : Kobe
31 : Wakayama
32 : Okayama
33 : Matsue
34 : Tokushima
35 : Takamatsu
36 : Hiroshima
37 : Kochi
38 : Matsuyama
39 : Yamaguchi
40 : Ooita
41 : Fukuoka
42 : Saga
43 : Kumamoto
44 : Miyazaki
45 : Nagasaki
46 : Kagoshima
47 : Naha