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RADIOACTIVITY SURVEY DATA in Japan

NUMBER 22
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National Institute of Radiological Sciences
Chiba, Japan

Radioactivity Survey Data in Japan

Number 22

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Contents

National Institute of Radiological Sciences

DATA OF ROUTINE SURVEY

Meteorological Data

Monthly and Cumulative Deposits of Strontium-90 and Cesium-137

(Meteorological Research Institute, Tokyo)

Since 1954, rain and fallout dust have been collected monthly, in a receiver (collection area, 1 m^2), at the Meteorological Research Institute, Tokyo, to determine the content of strontium-90 and cesium-137.

Other samples collected monthly (receiver collection area, 0.5 m^2) at six stations located throughout Japan, have also been analyzed.

Locations of the stations are shown in Figure 1.

The results of observation during the period from January 1967 to December, 1968 are shown in Table 1.

Total cumulative deposits of strontium-90 and cesium-137 in Tokyo reached the levels of 70 and 188 mCi/km^2 respectively, at the end of December, 1968.

The values from January to July, 1967 which appeared in Table 1, Issue No. 17 of this publication are printed here again.

Figure 1. Rain and Fallout Dust Sampling Stations

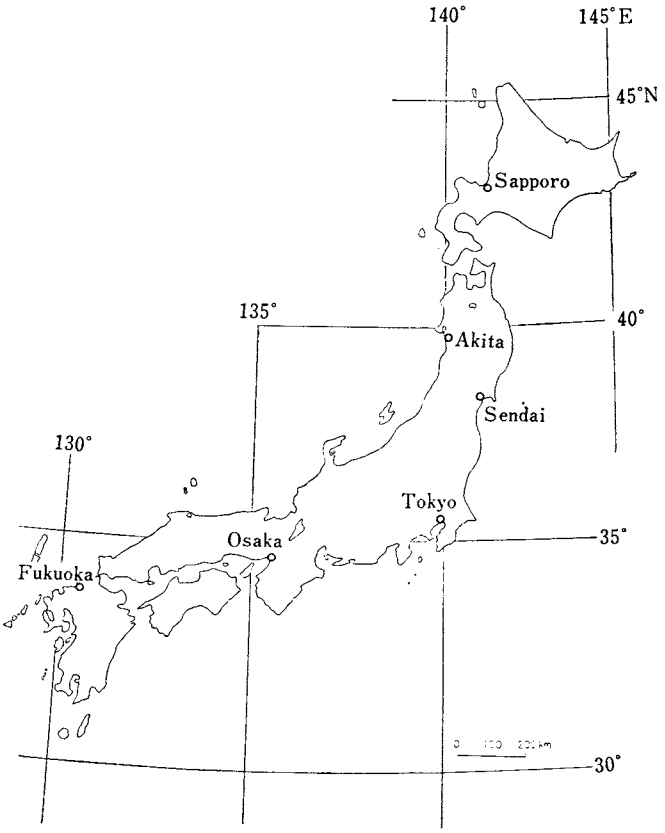


Table 1, Monthly Deposits of ^{90}Sr and ^{137}Cs — Jan. 1967 to Dec. 1968 —

By Y. Miyake, K. Saruhashi, Y. Katsuragi and T. Kanazawa
(Meteorological Research Institute, Tokyo)

(Continued from Table 1, Issue No. 17 of this Publication)

Sapporo (Sapporo District Central Meteorological Observatory)
Location: 43°03' N, 141°20' E (16.9 m)

	1967 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Sum.
^{90}Sr (mCi/km²)	0.04	0.10	0.09	0.24	0.13	0.11	0.07	0.06	0.04	0.07	0.02	0.04	1.01
Precipitation (mm)	96.4	36.9	89.3	63.1	49.2	123.2	100.4	92.1	174.0	102.3	75.9	101.5	1104.3

	1968 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Sum.
^{90}Sr (mCi/km²)	0.06	0.05	0.12	0.08	0.17	0.17	0.08	0.12	0.05	0.06	0.14	0.10	1.20
Precipitation (mm)	103.0	101.5	37.0	37.0	92.5	38.0	48.0	129.0	108.5	67.5	135.0	84.0	981.0

Akita (Akita District Meteorological Observatory)
Location: 39°43' N, 140°06' E (9.1 m)

	1967 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Sum.
^{90}Sr (mCi/km²)	0.40	0.28	0.17	0.35	0.30	0.02	0.06	0.05	0.03	0.05	0.03	0.01	1.75
Precipitation (mm)	103.9	60.9	146.4	164.8	78.3	62.6	133.6	225.8	188.5	183.4	163.9	202.3	1714.4

	1968 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Sum.
^{90}Sr (mCi/km²)	0.18	0.14	0.20	0.18	0.17	0.24	0.10	0.28	0.06	0.04	0.15	0.14	1.88
Precipitation (mm)	133.0	109.5	80.0	106.0	146.5	78.0	81.0	338.0	82.5	100.5	59.0	155.5	1469.5

Sendai (Sendai District Central Meteorological Observatory)
Location: 38°16' N, 140°54' E (38.4 m)

	1967 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Sum.
^{90}Sr (mCi/km²)	0.04	0.04	0.06	0.18	0.12	0.16	0.06	0.02	0.04	0.14	0.01	0.03	0.90
Precipitation (mm)	65.3	11.2	58.6	98.6	67.2	165.6	184.4	88.8	210.6	130.0	41.7	34.6	1156.6

	1968 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Sum.
^{90}Sr (mCi/km²)	0.02	0.03	0.07	0.09	0.41	0.27	0.13	0.13	0.18	0.03	0.03	0.07	1.46
Precipitation (mm)	6.5	25.5	42.5	78.5	171.5	125.0	97.5	242.0	86.5	145.5	12.5	167.5	1201.0

Tokyo (Meteorological Research Institute)
Location: 35° 42' N, 139° 39' E

	1967 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Sum.
^{90}Sr (mCi/km²)	0.07	0.12	0.11	0.15	0.10	0.12	0.03	0.02	0.03	0.04	0.01	0.01	0.81
^{137}Cs (mCi/km²)	0.29	0.25	0.39	0.28	0.22	0.33	0.10	0.08	0.08	0.09	0.03	0.03	2.17
$^{137}Cs/^{90}Sr$	4.1	2.1	3.5	1.9	2.2	2.8	3.3	4.0	2.7	2.3	3.0	3.0	2.68
Precipitation (mm)	33.1	55.1	69.1	111.3	59.2	147.1	130.1	140.1	211.5	158.3	64.2	28.9	1208.0

	1968 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Sum.
^{90}Sr (mCi/km)	0.04	0.02	0.10	0.17	0.14	0.26	0.22	0.07	0.12	0.07	0.03	0.05	1.28
^{137}Cs (mCi/km)	0.10	0.04	0.21	0.43	0.34	0.43	0.44	0.17	0.28	0.17	0.04	0.10	2.75
$^{137}Cs/^{90}Sr$	2.5	2.0	2.1	2.5	2.4	1.7	2.0	2.4	2.3	2.4	1.3	2.0	2.15
Precipitation (mm)	9.5	72.9	77.6	131.7	174.7	203.7	177.8	268.2	111.9	160.5	39.8	215.7	1644.0

Tokyo (Tokyo District Central Meteorological Observatory)
Location: 35° 41' N, 139° 46' E (4.1 m)

	1967 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Sum.
^{90}Sr (mCi/km^2)	0.01	0.09	0.18	0.18	0.10	0.04	0.03	0.03	0.01	0.04	0.01	0.02	0.74
Precipitation (mm)	32.2	43.8	69.7	104.7	49.3	109.3	89.2	67.3	148.8	214.7	61.4	32.9	1023.3
	1968 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Sum.
^{90}Sr (mCi/km^2)	0.04	0.02	0.11	0.16	0.15	0.29	0.14	0.10	0.06	0.06	0.06	0.06	1.25
Precipitation (mm)	9.5	48.0	94.0	117.5	185.5	175.0	136.0	256.0	109.5	152.5	19.5	188.0	1491.0

Osaka (Osaka District Central Meteorological Observatory)
Location: 34° 39' N, 135° 32' E (6.7 m)

	1967 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Sum.
^{90}Sr (mCi/km^2)	0.08	0.06	0.10	0.17	0.11	0.09	0.05	0.05	0.02	0.03	0.01	0.02	0.79
Precipitation (mm)	66.9	41.2	170.3	259.4	59.0	109.9	297.7	64.1	130.2	128.7	83.0	25.4	1435.8
	1968 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Sum.
^{90}Sr (mCi/km^2)	0.15	0.03	0.12	0.15	0.10	0.21	0.15	0.04	0.11	0.05	0.07	0.06	1.24
Precipitation (mm)	42.0	55.5	96.0	104.1	94.5	112.5	302.0	95.5	223.5	114.0	33.0	78.5	1351.1

Fukuoka (Fukuoka District Central Meteorological Observatory)
Location: 35° 35' N, 130° 23' E (2.1 m)

	1967 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Sum.
^{90}Sr (mCi/km^2)	0.09	0.10	0.14	0.23	0.07	0.09	0.04	0.04	0.02	0.04	0.01	0.10	0.97
Precipitation (mm)	111.1	50.7	117.7	215.0	59.3	67.6	366.6	69.8	23.6	100.7	93.4	69.9	1345.4
	1968 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Sum.
^{90}Sr (mCi/km^2)	0.21	0.08	0.11	0.18	0.08	0.15	0.08	0.02	0.09	0.06	0.06	0.08	1.20
Precipitation (mm)	60.0	126.5	56.5	64.5	46.5	162.5	303.5	95.5	243.0	72.0	51.0	131.5	1413.0

The Concentration of Radionuclides in Air Borne Dust

(National Institute of Radiological Sciences)

The air borne dust samples were collected from 1~1.5 m above the ground in the campus of National Institute of Radiological Sciences in Chiba City, using a improved dust collector that composed of a prefilter, a cottrell type dust collector and a spongy polyurethane filter.

Sampling station is shown in Figure 2.

The design of the improved dust collector is the same one mentioned in page 4, Issue No. 17 of this publication.

The samples were ignited in a muffle furnace at 450°C to destroy organic matters. Radioactivities of nuclides in ashed samples were measured by gamma-ray spectrometry using a NaI(Tl) detector coupled with multi-channel pulse height analyzer, while concentration of strontium-90 and cesium-137 in ashed samples were determined by the radiochemical separation method after Na_2CO_3 fusion.

The results obtained during the period from September, 1967 to March, 1969 are shown in Table 2.

Figure 2. Air Borne Dust Sampling Location

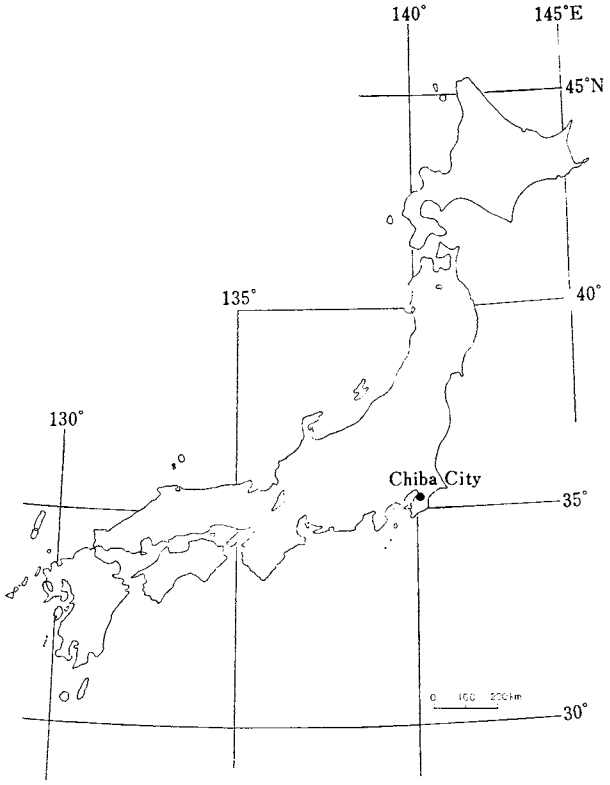


Table 2. The Concentration of Radionuclides in Air Borne Dust in Chiba City (10^{-3}pCi/m^3)
—Sept. 1967 to Mar. 1969—

By M. Saiki, H. Kamada, K. Kimura and E. Nakano
(*National Institute of Radiological Sciences*)

(Continued from Table 2. Issue No. 17 of this Publication)

Month collected	Duration (days)	Air inhaled (m^3)	Ash Weight	^{89}Sr	^{90}Sr	^{95}Zr +^{95}Nb	^{103}Ru	^{106}Ru	^{137}Cs	^{140}Ba +^{140}La	^{141}Ce	^{144}Ce
1967												
Sept. 1～Sept. 15	15	216,000	4.5	—	0.1	0.2	2.1	—	0.5	—	—	0.04
〃 16～ 〃 30	15	216,000	7.5	—	0.1	17.5	1.7	—	0.3	—	—	1.1
Oct. 1～Oct. 15	15	216,000	10.0	—	0.4	59.1	16.0	—	1.6	—	—	8.0
〃 16～ 〃 31	16	230,400	12.0	—	0.1	85.5	6.2	—	0.6	—	—	9.7
Nov. 1～Nov. 15	15	216,000	9.5	—	0.3	7.2	16.0	—	1.0	—	—	6.0
〃 16～ 〃 30	15	216,000	4.5	—	0.1	31.3	1.0	—	0.3	—	—	4.1
Dec. 1～Dec. 15	15	216,000	14.0	—	0.1	47.5	8.4	—	0.4	—	—	10.8
〃 16～1968 Jan. 5	21	302,400	24.0	—	0.1	97.9	17.5	—	0.5	—	—	19.7
1968												
Jan. 6～Jan. 15	10	144,000	12.1	3.88	0.28	43.18	16.45	0.40	0.70	—	20.49	8.12
〃 16～ 〃 31	16	230,400	19.0	2.74	0.23	54.79	10.45	0.35	0.51	—	26.63	7.04
Feb. 1～Feb. 15	15	216,000	17.0	2.73	0.21	33.39	9.63	0.32	0.64	—	11.80	6.29
〃 16～ 〃 29	14	201,600	11.0	2.02	0.20	20.05	4.88	0.04	0.58	—	10.47	2.69
Mar. 1～Mar. 16	16	230,400	19.0	4.83	0.67	84.49	29.18	1.22	2.01	—	24.49	16.58
〃 17～ 〃 1	16	230,400	17.8	3.46	0.75	62.44	15.52	2.24	2.33	—	15.18	13.60
Apr. 2～Apr. 15	14	201,600	16.5	2.09	0.82	40.38	1.86	3.25	2.64	—	5.88	10.61
〃 16～ 〃 30	15	216,000	7.7	1.81	0.88	30.26	2.51	3.40	2.97	—	5.67	12.77
May. 1～May. 15	15	216,000	8.8	1.52	0.94	20.14	3.16	3.55	3.29	—	5.45	14.93
〃 16～ 〃 31	16	230,400	10.4	1.21	1.09	11.46	4.74	4.24	3.44	—	4.50	13.64
Jun. 1～Jun. 16	16	230,400	12.0	0.90	1.24	2.77	6.32	4.93	3.59	—	3.54	20.35
〃 17～ 〃 30	14	201,600	8.8	1.05	0.94	2.71	3.76	3.46	2.57	—	1.84	13.80
Jul. 1～Jul. 15	15	216,000	5.5	1.20	0.64	2.64	1.19	1.99	1.54	—	0.13	7.24
〃 16～ 〃 31	16	230,400	7.5	0.67	0.55	2.52	1.49	1.41	1.42	—	0.43	6.08
Aug. 1～Aug. 15	15	216,000	9.5	0.14	0.45	2.39	1.78	0.82	1.29	—	0.72	4.91

Month collected		Duration (days)	Air inhaled (m^3)	Ash Weight	^{89}Sr	^{90}Sr	^{95}Zr $+^{95}Nb$	^{103}Ru	^{106}Ru	^{137}Cs	^{140}Ba $+^{140}La$	^{141}Ce	^{144}Ce
〃 16～ 〃	31	16	230,000	9.5	0.89	0.09	1.66	0.90	0.45	0.37	2.78	1.00	1.36
Sept. 1～Sept.	15	15	216,000	7.0	0.46	0.41	1.56	0.99	1.54	1.28	—	0.19	4.06
〃 16～ 〃	30	15	216,000	7.0	0.12	0.24	7.70	1.43	1.02	0.76	—	0.48	2.65
Oct. 1～Oct.	15	15	216,000	7.5	0.12	0.35	5.30	0.41	1.71	1.10	—	0.99	3.90
〃 16～ 〃	31	16	230,400	6.5	0.06	0.27	2.40	0.75	0.58	0.52	—	0.47	1.87
Nov. 1～Nov.	15	15	216,000	7.0	0.56	0.44	4.00	0.12	0.58	1.13	—	0.03	3.95
〃 16～ 〃	30	15	216,000	18.0	0.72	0.33	1.40	0.99	0.25	0.72	—	0.04	2.03
Dec. 1～Dec.	15	15	216,000	2.0	0.15	0.12	0.77	0.15	0.60	0.21	—	0.31	0.60
〃 16～ 〃	31	16	230,400	8.5	0.01	0.09	1.30	0.64	0.11	0.40	—	0.38	0.51
1969													
Jan. 1～Jan.	16	16	230,400	5.5	0.05	0.01	0.43	1.08	0.22	0.08	—	16.61	0.34
〃 17～ 〃	31	15	216,000	6.0	0.45	0.05	1.15	3.02	0.50	0.17	2.57	35.62	1.08
Feb. 1～Feb.	15	15	216,000	6.0	0.23	0.03	0.96	1.19	0.26	0.14	0.98	13.59	0.66
〃 16～ 〃	28	13	187,200	4.0	—	—	0.84	—	—	—	—	—	—
Mar. 1～Mar.	16	16	230,400	5.0	—	—	1.56	—	—	—	—	—	—
〃 17～ 〃	31	15	216,000	3.4	—	—	1.01	—	—	—	—	—	—

Geographical Data

Strontium-90, Ruthenium-106, Cesium-137 and Cerium-144 in Soil

(National Institute of Radiological Sciences)

The concentrations of radionuclides in soil in Japan since 1963 have been determined in co-operation with 7 prefectural Public Health Laboratories on sampling.

Sampling locations were Tokyo, Niigata and Osaka prefecturs from 1964, and since 1965 Fukushima was added. Sampling sites are shown in Figure 3.

The purpose of this survey is to investigate the amount of ground deposit and leaching rates of radionuclides from soil to river.

Undisturbed and uncultivated soil up to the depth of 5 cm has been collected, and in addition since 1968 in Fukushima and Tokyo, the soil samples up to the depth of 20 cm were collected at the same sites to get information on the vertical distribution of radionuclides.

Strontium-90 contents in the samples were determined radiochemically by HASL NYO-4700 E-Sr-01-17-19 Soil (NaOH-HCl Method), and ruthenium-106, cesium-137 and cerium-144 were determined by Gamma-ray spectrometry.

The amounts of radionuclides deposited on ground are shown in Table 3.

Figure 3. Soil Sampling Locations

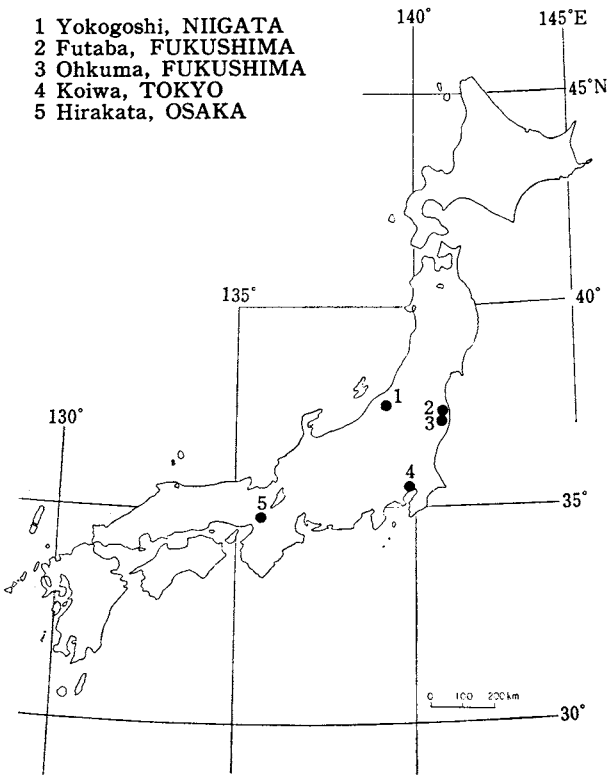


Table 3. ^{90}Sr, ^{106}Ru, ^{137}Cs and ^{144}Ce in Soil

By M. Saiki, H. Kamada and E. Nakano —Dec. 1967 to Sept. 1968—

(National Institute of Radiological Sciences)

Location	Sampling Date	Depth (cm)	^{90}Sr		^{106}Ru		^{137}Cs		^{144}Ce	
			pCi/kg	mCi/km²	pCi/kg	mCi/km²	pCi/kg	mCi/km²	pCi/kg	mCi/km²
Futaba, FUKUSHIMA	Jul. 1968	0~5	370.8	22.6	11	1	205	13	302	19
〃 〃	〃	0~20	119.6	33.9	11	1	75	20	93	26
Ohkuma, FUKUSHIMA	〃	0~5	548.9	28.5	566	29	686	37	560	29
〃 〃	〃	0~20	240.3	58.3	566	29	193	48	256	62
Ohkuma, FUKUSHIMA	〃	0~5	323.0	18.7	0	0	183	11	674	39
〃 〃	〃	0~20	225.4	48.2	0	0	71	15	302	80
Mean values of Futaba, FUKUSHIMA (1 location) Ohkuma, FUKUSHIMA (2 locations)	Dec. 1967	0~5	599.3	32.3	1621	90	714	37	18	1
	Jul. 1968	0~5	414.3	23.3	192	10	358	20	512	29
	〃	0~20	195.1	46.8	192	10	113	28	217	56
Yokogoshi, NIIGATA	Dec. 1967	0~5	288.5	20.5	97	7	328	23	0	0
Koiwa, TOKYO	Dec. 1967	0~5	89.5	5.0	46	3	275	15	14	1
〃 〃	Aug. 1968	0~5	81.6	5.0	270	16	274	16	441	26
〃 〃	Sept. 1968	0~20	26.7	7.9	79	23	75	22	105	31
Hirakata, OSAKA	Dec. 1967	0~5	183.4	9.6	0	0	430	23	0	0

Strontium-90, Ruthenium-106, Cesium-137 and Cerium-144 in River Sediments

(National Institute of Radiological Sciences)

The quantity of radionuclides precipitated or deposited in river sediments since 1964, was determined.

The concentrations of radionuclides in the sediments of 3 river in Japan have been determined in co-operation with the prefectural Public Health Laboratories of Tokyo, Niigata and Osaka on Sampling.

Sampling locations are shown in Figure 4. Strontium-90 contents in the samples were determined radiochemically by HASL NYO-4700 E-Sr-01-17-19 soil (NaOH-HCL Method), ruthenium-106, cesium-137 and cerium-144 were made by Gamma-ray spectrometry.

The concentrations of strontium-90, ruthenium-106, cesium-137 and cerium-144 are shown in Table 4.

Figure 4. River Sediments Sampling Locations

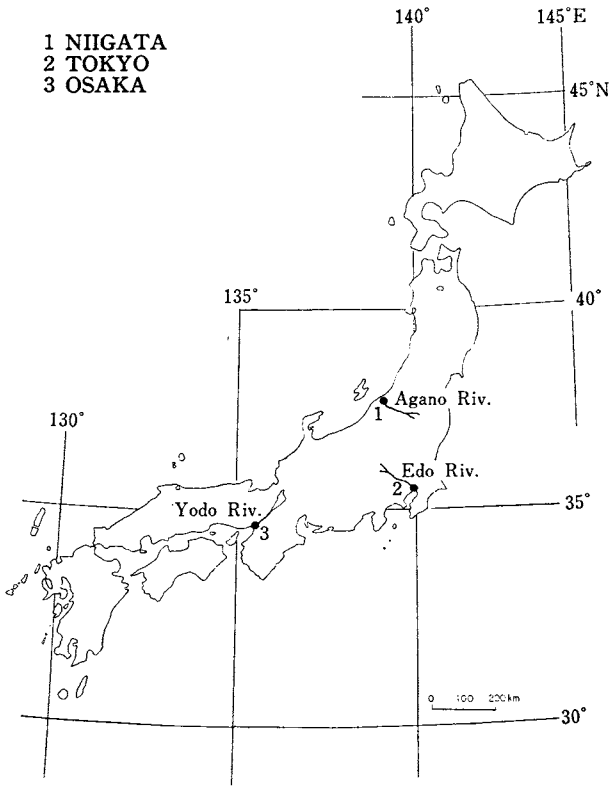


Table 4. ^{90}Sr, ^{106}Ru, ^{137}Cs, and ^{144}Ce in River Sediments —Dec. 1967 to Dec. 1968—

By M. Saiki, H. Kamada, S. Hirano, K. Kinjo and E. Nakano

(National Institute of Radiological Sciences)

Sampling Location	Sampling Date	^{90}Sr (mμCi/kg)	^{106}Ru (mμCi/kg)	^{137}Cs (mμCi/kg)	^{144}Ce (mμCi/kg)
Agano River (NIIGATA)	Dec. 1967	0.111	0.51	0.80	0.11
〃 〃 〃	Jul. 1968	0.049	0.15	0.35	0.41
〃 〃 〃	Dec. 1968	0.053	0.32	0.68	0.67
Edo River (TOKYO)	Dec. 1967	0.025	0.00	0.00	0.00
〃 〃 〃	Jul. 1968	0.090	0.20	0.29	0.33
〃 〃 〃	Dec. 1968	0.056	0.03	0.12	0.22
Yodo River (OSAKA)	Dec. 1967	0.079	0.26	0.59	0.03
〃 〃 〃	Jul. 1968	0.043	0.30	0.15	0.72
〃 〃 〃	Dec. 1968	0.013	0.27	0.27	0.43

Note: The above values, respectively indicate the mean values of the left side, center and right side in the sampling river.

Water Data

Strontium-90, Ruthenium-106, Cesium-137 and Cerium-144 in Source Water and Treated Water

(National Institute of Radiological Sciences)

Since December 1961, the concentrations of strontium-90 and cesium-137 in city water in Japan have been determined in co-operation with 24 prefectural Public Health Laboratries.

From April 1963, sampling points have been selected in Tokyo, Niigata and Osaka prefectures. Sampling locations are shown in Figure 4.

The samples have been analyzed for strontium-90, ruthenium-106, cesium-137 and cerium-144. The analytical method is the same one mentioned in page 9, Issue No. 18 of this publication.

The results obtained from August, 1967 to December, 1968 are shown in Table 5.

Table 5. ^{90}Sr, ^{106}Ru, ^{137}Cs and ^{144}Ce in Source Water and Treated Water —Aug. 1967 to Dec. 1968—

By M. Saiki, H. Kamada, E. Nakano and K. Kinjo

(National Institute of Radiological Sciences)

(Continued from Table 5, Issue No. 18 of this publication)

Location	Source	Type	Date	^{90}Sr	^{106}Ru	^{137}Cs	^{144}Ce
				pCi/l			
Niitsu, NIIGATA	Agano River	SW	Aug. 1967	0.55	0.11	0.21	0.23
〃	〃	TW	〃	0.44	0.09	0.17	0.19
〃	〃	SW	Oct. 1967	0.54	0.15	0.17	0.27
〃	〃	TW	〃	0.54	0.08	0.15	0.26
〃	〃	SW	Dec. 1967	0.68	0.06	0.15	0.22
〃	〃	TW	〃	0.62	0.04	0.13	0.20
〃	〃	SW	Feb. 1968	0.63	0.12	0.16	0.42
〃	〃	TW	〃	0.59	0.09	0.12	0.22
〃	〃	SW	Apr. 1968	0.71	0.09	0.20	0.49
〃	〃	TW	〃	0.52	0.07	0.10	0.18

Location	Source	Type	Date	^{90}Sr	^{106}Ru	^{137}Cs	^{144}Ce
				pCi/l			
〃	〃	SW	June. 1968	0.57	0.09	0.20	0.64
〃	〃	TW	〃	0.55	0.07	0.07	0.10
〃	〃	SW	Aug. 1968	0·64	0.04	0.10	0.33
〃	〃	TW	〃	0.61	0·02	0.07	0.09
〃	〃	SW	Oct. 1968	0.55	0.07	0.07	0.11
〃	〃	TW	〃	0.54	0.07	0.05	0.03
〃	〃	SW	Dec. 1968	0.49	0.03	0.07	0.08
〃	〃	TW	〃	0.47	0.02	0.04	0.03
Kanamachi, TOKYO	Edo River	SW	Aug. 1967	0.50	0.12	0.17	0.15
〃	〃	TW	〃	0.46	0.10	0.14	0.10
〃	〃	SW	Oct. 1967	0.43	0.17	0.14	0.12
〃	〃	TW	〃	0.41	0.05	0.13	0.10
〃	〃	SW	Dec. 1967	0.46	0.33	0.12	0.13
〃	〃	TW	〃	0.46	0.10	0.12	0.11
〃	〃	SW	Feb. 1968	0.59	0.05	0.12	0.10
〃	〃	TW	〃	0.48	0.03	0.10	0.07
〃	〃	SW	Apr. 1968	0.48	0.05	0.10	0.10
〃	〃	TW	〃	0.21	0.04	0.08	0.00
〃	〃	SW	Jun. 1968	0.45	0.10	0.12	0.12
〃	〃	TW	〃	0.43	0.06	0.10	0.03
〃	〃	SW	Aug. 1968	0.45	0.07	0.08	0.49
〃	〃	TW	〃	0.42	0.04	0.07	0.00
〃	〃	SW	Oct. 1968	0.41	0.05	0.06	0.07
〃	〃	TW	〃	0.39	0.05	0.06	0.06
〃	〃	SW	Dec. 1968	0.33	0.03	0.05	0.00
〃	〃	TW	〃	0.33	0.03	0.04	0.00
Moriguchi, OSAKA	Yodo River	SW	Aug. 1967	0.64	0.05	0.15	0.29
〃	〃	TW	〃	0.63	0.04	0.15	0.14
〃	〃	SW	Oct. 1967	0.64	0.07	0.19	0.14
〃	〃	TW	〃	0.61	0.03	0.16	0.10
〃	〃	SW	Dec. 1967	0.64	0.06	0.14	0.13
〃	〃	TW	〃	0.61	0.02	0.13	0.08
〃	〃	SW	Feb. 1968	0.68	0.04	0.11	0.24
〃	〃	TW	〃	0.58	0.03	0.09	0.14
〃	〃	SW	Apr. 1968	0.70	0.08	0.17	0.31
〃	〃	TW	〃	0.53	0.06	0.08	0.03
〃	〃	SW	Jun. 1968	0.74	0.22	0.20	0.84
〃	〃	TW	〃	0.66	0.11	0.13	0.11
〃	〃	SW	Aug. 1968	0.59	0.08	0.22	0.24
〃	〃	TW	〃	0.47	0.04	0.05	0.23
〃	〃	SW	Oct. 1968	0.64	0.23	0.04	0.07
〃	〃	TW	Oct. 1968	0.57	0.00	0.04	0.00
〃	〃	SW	Dec. 1968	0.50	0.07	0.06	0.12
〃	〃	TW	〃	0.44	0.04	0.03	0.01

Dietary Data

Strontium-90 and Cesium-137 in Rice

(National Institute of Agricultural Sciences, Institute of Public Health)

Strontium-90 content in rice has been determined at the National Institute of Agricultural Sciences since 1957, and cesium-137 content in rice since 1961 in co-operation with the Institute of Public Health.

All rice samples are collected at, and sent from national and prefectural agricultural experimental stations, covering all important agricultural areas throughout Japan. Sampling locations are shown in figure 5.

The samples are chosen as representative of agricultural conditions, including soil type, crop variety, fertilizer application and harvest time.

The analytical procedure applied is the same as described on page 14, Issue No. 3, of this publication.

The results obtained in 1967 are shown in Tables 6 and 7. The annual average of strontium-90 and cesium-137 contents during the period 1957 to 1967 is shown in Figure 6.

Figure 5. Rice Sampling Locations

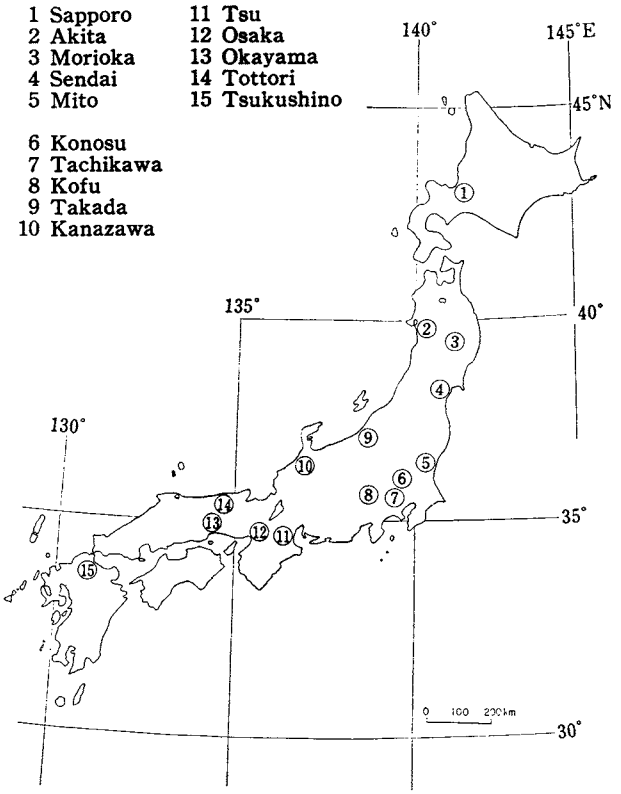


Table 6. ^{90}Sr in Rice —1967—

By H. Kobayashi and M. Ishikawa
(National Institute of Agricultural Sciences)

(Continued from Table 1, Issue No. 18, of this publication)

Location	Month harvested	Brown Rice			Polished Rice		
		g Ca/kg	pCi/kg	S. U.	g Ca/kg	pCi/kg	S. U.
1967							
Sapporo, HOKKAIDO	Oct	0.131	9.1	69	0.046	1.1	24
Akita, AKITA	Oct	0.131	13.0	99	0.040	5.1	128
Morioka, IWATE	Sept	0.181	7.9	44	0.055	1.2	21
Sendai, MIYAGI	Sept	0.135	9.1	67	0.023	0.6	26
Mito, IBARAKI	〃	0.100	7.0	70	0.082	1.2	15
Konosu, SAITAMA	Oct	0.090	8.2	91	0.048	1.4	29
Tachikawa, TOKYO	〃	0.161	5.1	32	0.030	0.7	24
Kofu, YAMANASHI	〃	0.181	5.7	31	0.072	0.4	5
Takada, NIIGATA	Sept	0.131	12.4	95	0.046	3.5	76
Kanazawa, ISHIKAWA	〃	0.117	11.5	98	0.031	2.4	77
Tsu, MIE	〃	0.111	2.1	19	0.046	1.4	30
Osaka, OSAKA	Nov	0.131	7.9	60	0.068	0.8	12
Okayama, OKAYAMA	〃	0.181	5.1	28	0.080	1.9	24
Tottori, TOTTORI	Oct	0.101	9.9	98	0.053	1.4	27
Tsukushino, FUKUOKA	Nov	0.161	9.4	60	0.055	1.1	21
Average for year		0.136	8.2	64	0.052	1.6	36

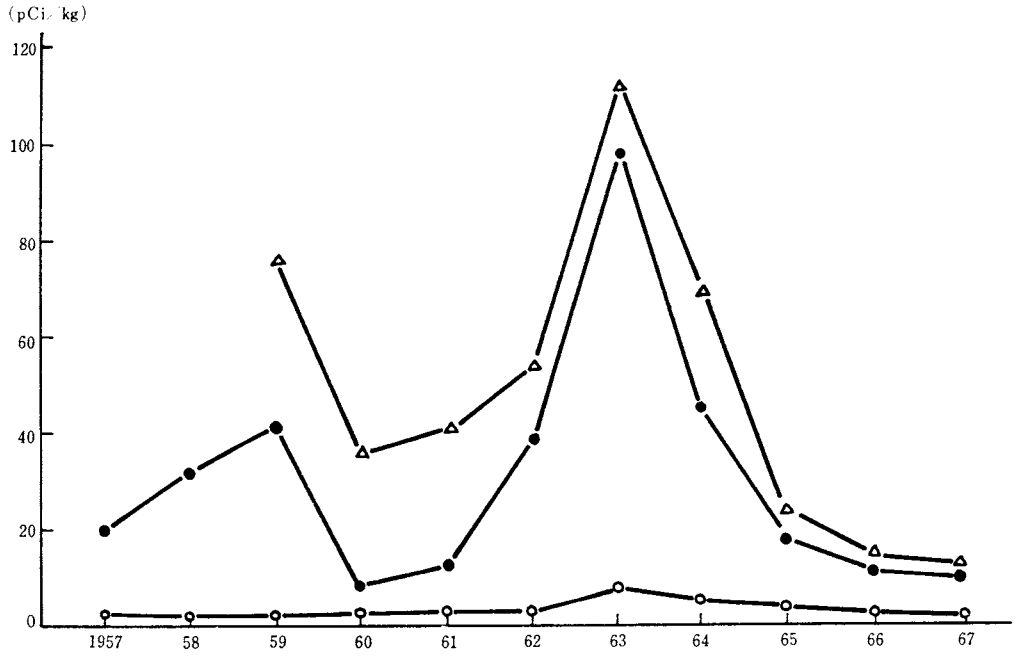
Table 7. ^{137}Cs in Rice —1967—

By H.Kobayashi and A. Tsumura
(National Institute of Agricultural (Sciences
By N. Yamagata
(Institute of Public Health)

(Continued from Table 2. Issue No. 18, of this publication)

Location	Month harvested	Polished Rice		
		g K/kg	pCi/kg	C.U.
1967				
Sapporo, HOKKAIDO	Oct	0.91	20.0	22
Akita, AKITA	Oct	0.82	17.1	21
Morioka, IWATA	Sept	1.01	18.3	18
Sendai, MIYAGI	Sept	0.56	11.4	20
Mito, IBARAKI	〃	1.01	9.3	9
Tachikawa, TOKYO	Oct	0.73	7.7	11
Kofu, YAMANASHI	〃	1.05	12.8	12
Takada, NIIGATA	Sept	0.93	17.9	19
Kanazawa, ISHIKAWA	〃	0.84	18.8	22
Tsu, MIE	〃	0.71	7.7	11
Osaka, OSAKA	Nov	1.04	7.6	7
Okayama, OKAYAMA	〃	1.31	6.7	5
Tsukushino, FUKUOKA	〃	0.83	7.5	9
Arerage for year		0.90	12.5	14

Figure 6. Temporal Variation of ^{90}Sr and ^{137}Cs in Rice —1957 to 1967—
—All Japan Mean Values—
△ ^{137}Cs in Polished Rice
● ^{90}Sr in Brown Rice
○ ^{90}Sr in Polished Rice



Strontium-90 in Wheat

(National Institute of Agricultural Sciences)

Strontium-90 content in wheat has been determined at the National Institute of Agricultural Sciences since 1957. All wheat samples are collected at, and sent from national and prefectural experimental stations, covering all important areas of agriculture throughout Japan.

Sampling locations are shown in Figure 7. The samples are chosen as representative of agricultural conditions, including soil type, crop variety, fertilizer application and harvest time.

The analytical method applied is the same one with that shown on page 15, Issue No. 6 of this publication.

The analytical results in 1968 are shown in Table 8. The yearly average of strontium-90 content during the period from 1957 to 1968 is shown in figure 8.

Figure 7. Wheat Sampling Locations

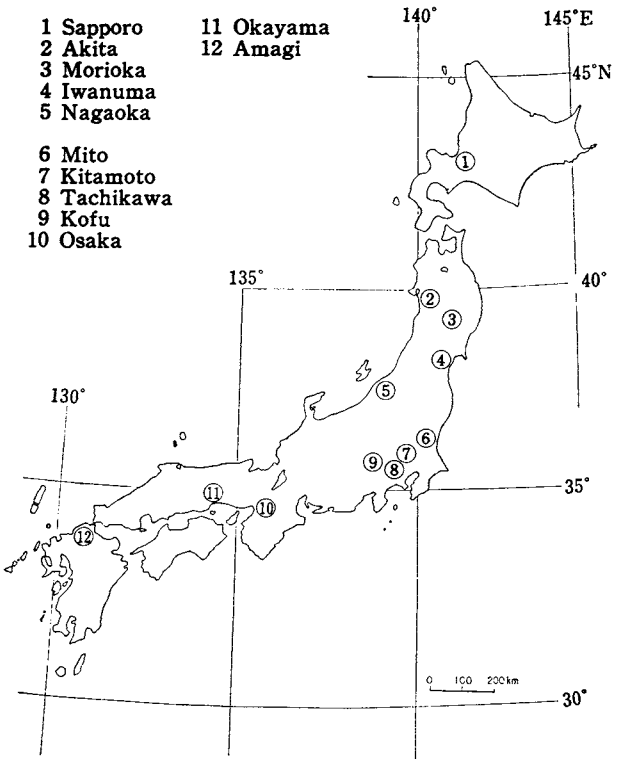


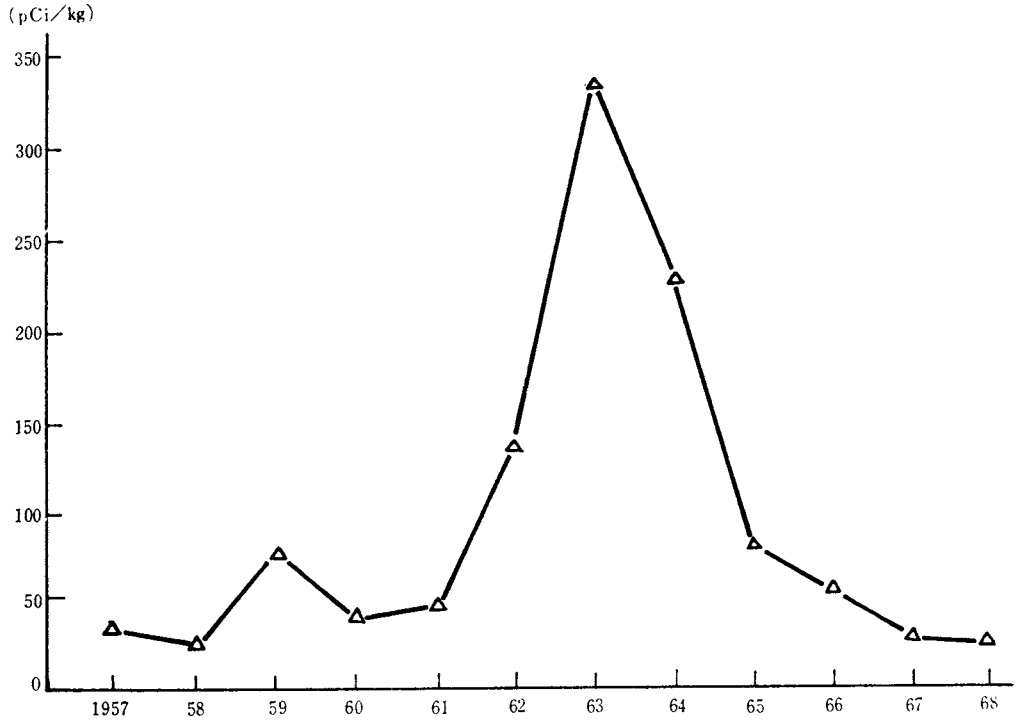
Table 8. ^{90}Sr in Wheat —1968—

By H. Kobayshi and M. Ishikawa
(National Institute of Agricultural Sciences)

(Continued from Table 3, Issue No. 18, of this publication)

Location	Month harvested	g Ca/kg	pCi/kg	S.U.
1968				
Sapporo, HOKKAIDO	Aug	0.382	5.6	15
Akita, AKITA	July	0.422	84.2	200
Morioka, IWATE	〃	0.552	24.3	44
Iwanuma, MIYAGI	June	0.217	17.7	82
Nagaoka, NIIGATA	July	0.241	19.7	82
Mito, IBARAKI	〃	0.307	13.2	43
Kitamoto, SAITAMA	June	0.325	28.6	75
Tachikawa, TOKYO	〃	0.422	26.5	63
Kofu, YAMANASHI	〃	0.362	9.6	27
Osaka, OSAKA	〃	0.225	8.2	36
Okayama, OKAYAMA	〃	0.297	17.9	60
Amagi, FUKUOKA	〃	0.211	33.6	159
Average for year		0.330	24.1	74

Figure 8. Temporal Variation of ^{90}Sr in Wheat —1957 to 1968—
—All Japan Mean Values—



DATA OF THE EIGHTH NUCLEAR TEST OF THE PEOPLE'S REPUBLIC OF CHINA

Meteorological Data

Gross Beta-radioactivity in Rain and Dry Fallout

(Meteorological Agency)

Since 1955, the Meteorological Agency has measured gross beta-activity in rain and dry fallout at local weather station. The network of 13 stations are shown in Figure 9. The rain samples were collected by the same method mentioned in the explanation on Page 2, Issue No. 5 of this publication series.

The eighth nuclear detonation of the People's Republic of China was carried out on the 27th December, 1968 according to the news reporting. Results obtained during the period from the 23rd December, 1968 to the 13th January, 1969 are shown in Tables 9 and 10. The radioactivity of the rain water samples were measured 6 hours after sampling and that of the dust samples 20 hours after sampling.

The eighth test area is believed to be in the neighborhood of Lake Lop Nor, (40°N, 90°E), about 4,000 km west-northwest of Japan.

Now in Japan, abnormal micro-barographic record was distinctly observed. These records are shown in Table 11 and Figure 10.

The meteorological trajectory shown in Figure 11, estimates that the radioactive debris emitted into the troposphere first passed about 10 km of altitued (300 mb level) in the northern part of Japan one day after the explosion date. Both radioactivity in rain and suspended dust near the ground in this test were generally normal in these period.

Figure 9. Fallout Observation Network of Meteorological Agency

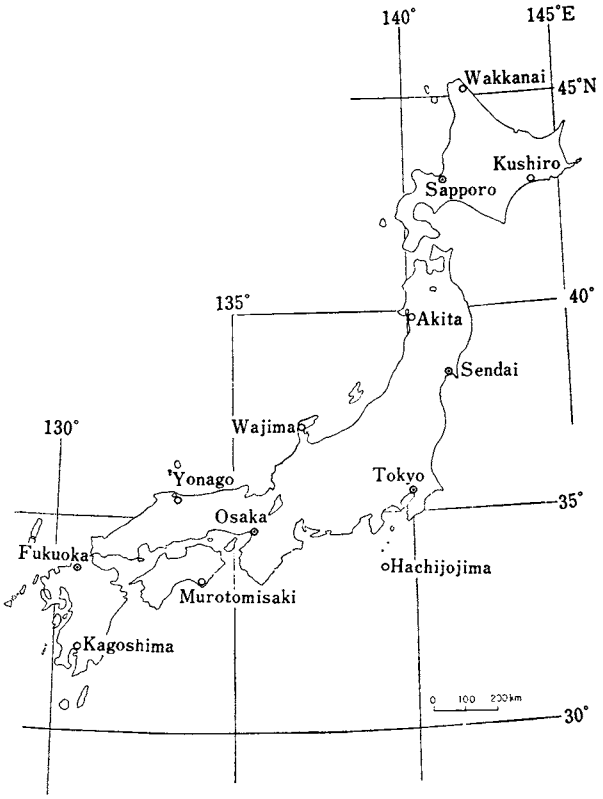


Table 9. Gross β-activity in Rain —Dec. 23rd, 1968 to Jan. 13th 1969—

Compiled by T. Nagai, H. Fujimoto, M. Kamiyama, H. Ueno and S. Arai
(Meteorological Agency)

Upper Row: Concentration (pCi/cc)
Lower Row: Deposition (mCi/km²)

Station \ Date	Dec. 1968 23	24	25	26	27	28	29	30	31	Jan. 1969 1	2
Wakkanai	0.5	0.1		0.2	0.1	0.0	0.0	0.0	0.1		
//	0.8	0.3		2.2	0.4	0.0	0.0	0.0	0.3		
Sapporo	0.1	0.0	0.1	0.0				0.0			
//	0.5	0.0	0.3	0.0				0.0			
Kushiro	0.0			0.0							
//	0.0			0.0							
Sendai	0.0		0.0					0.0			
//	0.0		0.0					0.0			
Akita	0.0	0.1		0.1		0.0	0.0	0.1	0.2		
//	0.0	0.6		0.8		0.0	0.0	0.3	0.4		
Tokyo	0.0										
//	0.0										
Wajima	0.0	0.1	0.3	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.0
//	0.0	2.9	0.6	0.6	1	0.0	0.2	0.2	0.7	1	0.0
Hachijojima					0.0	0.0					
//					0.0	0.0					
Osaka											
//											
Yonago	0.1	0.2	0.1	0.3	0.1	0.1				0.1	
//	1.1	0.4	0.2	0.4	1.2	0.4				0.9	
Murotomisaki											
//											
Fukuoka	0.1	0.2	0.3	0.1	0.0						
//	0.3	0.7	0.3	0.4	0.0						
Kagoshima								0.0			0.0
//								0.0			0.0

Station \ Date	Jan. 1969 3	4	5	6	7	8	9	10	11	12	13
Wakkanai				0.0	0.7	0.0	0.0	0.0			0.0
//				0.0	2	0.0	0.0	0.0			0.0
Sapporo								0.0			0.0
//								0.0			0.0
Kushiro		0.0									
//		0.0									
Sendai			0.0	0.1							
//			0.0	0.4							
Akita		0.0	0.0				0.0		0.0		0.0
//		0.0	0.0				0.0		0.0		0.0
Tokyo											0.0
//											0.0
Wajima	0.0	0.1	0.0	0.2	0.1	0.1	0.0		0.1		
//	0.0	0.3	0.0	0.5	0.9	0.7	0.0		0.8		
Hachijojima		0.0		0.0	0.0					0.0	0.0
//		0.0		0.0	0.0					0.0	0.0
Osaka											
//											
Yonago	0.1	0.1		0.2	0.1					0.0	0.0
//	0.7	0.9		1.5	0.8					0.0	0.0
Murotomisaki									0.0		0.0
//									0.0		0.0
Fukuoka			0.1	0.1					0.1	0.0	0.0
//			0.3	0.3					1.5	0.0	0.0
Kagoshima	0.0				0.1	0.0				0.1	
//	0.0				0.2	0.0				1	

Table 10. Gross β-activity in Dust —Dec. 23rd, 1968 to Jan. 13th, 1969—

Compiled by T. Nagai, H. Fujimoto, M. Kamiyama, H. Ueno and S. Arai
(Meteorological Agency)

(pCi/m³)

Station	Dec. 1968									Jan. 1969	
	23	24	25	26	27	28	29	30	31	1	2
Sapporo	0.0		0.0		0.0	0.0	0.2	0.0	0.0		
Sendai	0.2		0.5		0.2	0.2	0.2	0.0	0.2		
Tokyo	0.4		0.7		0.2	0.6	0.4	0.3			
Osaka	0.5		1.2		0.5	0.5	0.2	0.0	1.7		
Fukuoka	0.2		0.5		0.2	0.5	0.2	1.0	0.2	0.0	

Station	Jan. 1969										
	3	4	5	6	7	8	9	10	11	12	13
Sapporo				0.0		0.0		0.2			0.0
Sendai	0.2			0.2		0.2		0.2			0.2
Tokyo	0.2			0.6		0.3		0.4			0.3
Osaka				1.2		0.2		1.0			0.5
Fukuoka	0.2			0.2		0.7		1.0			0.2

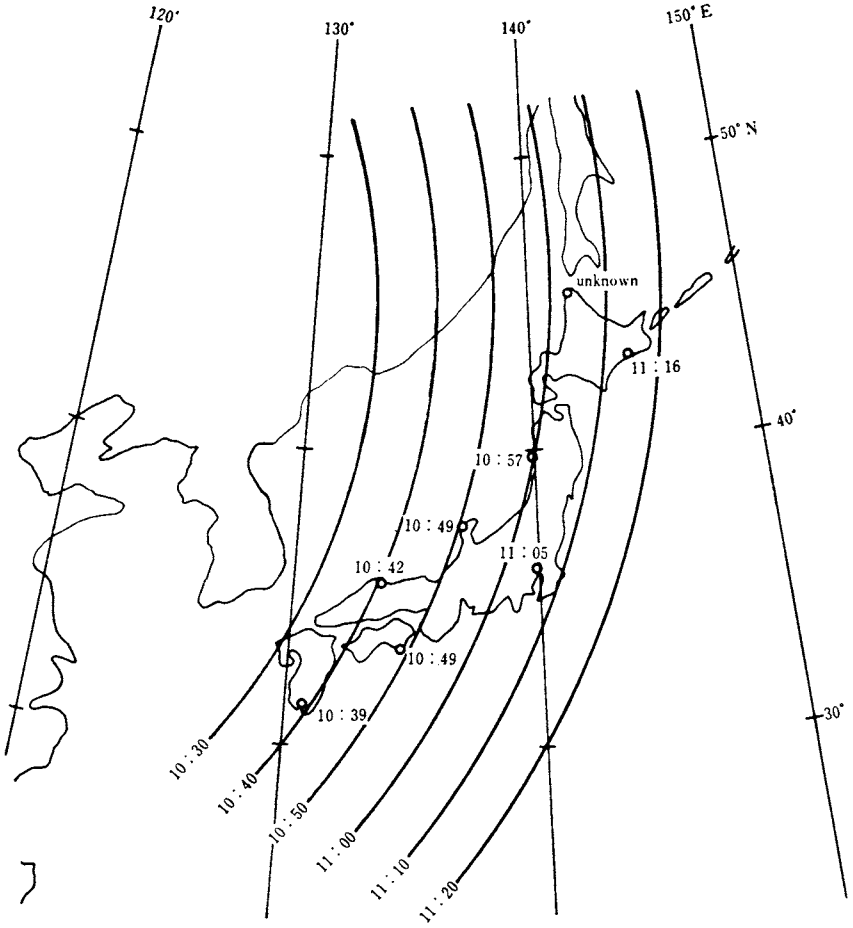
Table 11. The Microbarographic Records Produced by the 8th Nuclear Test of The People's Republic of China —Dec. 27th, 1968—

Compiled by T. Nagai, H. Fujimoto, M. Kamiyama, H. Ueno and S. Arai
(Meteorological Agency)

Station	LAT.	LONG.	T (G. M. T.)	A (mb)	P (min)	D (min)	V (m/s)
Wakkanai	45°25′N	144°24′E	—	—	—	—	—
Kushiro	42°59′N	144°24′E	11 : 16	0.3	3	50	333
Akita	39°43′N	140°06′E	10 : 59	0.2	3	76	340
Wajima	37°23′N	136°54′E	10 : 49	0.2	4	46	344
Tokyo	35°41′N	139°46′E	11 : 05	0.1	2	31	340
Yonago	35°26′N	133°21′E	10 : 42	0.2	1	46	346
Murotomisaki	33°15′N	134°11′E	10 : 49	0.2	4	30	339
Kagoshima	31°34′N	130°33′E	10 : 39	0.6	1	45	337

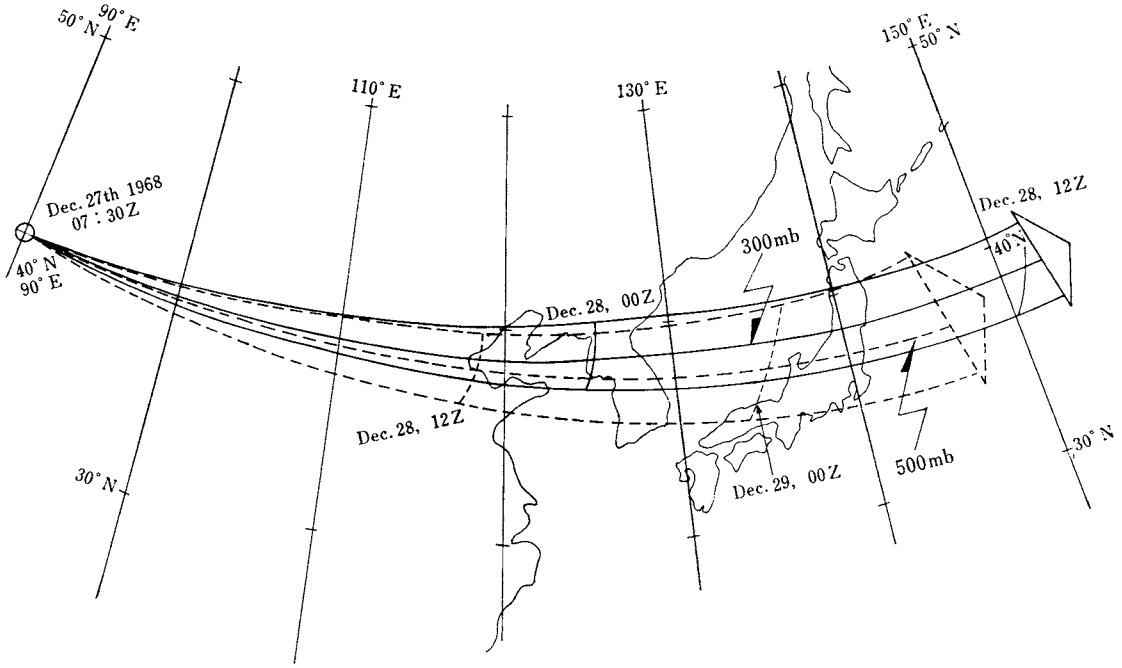
Note. T means Time, A : Amplitude, P : Periodic, D : Duration, V : Velocity, respectively.

Figure 10. Isochrones of the First Shock Wave
Test Site: the Neighborhood of Lake Lop Nor (40°N. 90°E)
Time of Explosion: about 07:30, Dec. 27th, 1968 (G.M.T.)



* (Numeral indicates the arrival time of the first shock. G.M.T.)

Figure 11. The Meteorological Trajectory at the Time when the 8th Nuclear Test was carried out by the People's Republic of China



Gross Beta-Radioactivity in Upper Air

(Research and Development H.Q., Japan Defense Agency)

Since 1960, Research and Development H.Q., Japan Defense Agency has measured the beta-activity of dust in the lower layer of the stratosphere and tropopause using aircraft as collectors.

The samples were taken over three areas of Japan using both dust samplers attached under the aircraft wings and gummed papers attached in front of them.

The sampling flight with gummed papers was made using two aircraft at the same time, one of which made a normal sampling flight and the other only upward and downward flight. The difference between the amounts of radioactivity of the samples collected by the two aircraft is taken as the value at the flight altitude.

Figure 12 shows three sampling areas of Japan.

As to the eighth nuclear test, aircraft detected little amount of radioactivity over three sampling areas of Japan, except the North area of Hokkaido, Tohoku on the day following the nuclear test. So it is assumed that the radioactive cloud passed fast over the North of Japan.

Results obtained in shown in Table 12.
Figure 13 shows the temporal variation of gross beta-activity in upper air at altitudes of 9 km and 6 km.

Figure 12. Three Sampling Area of Japan

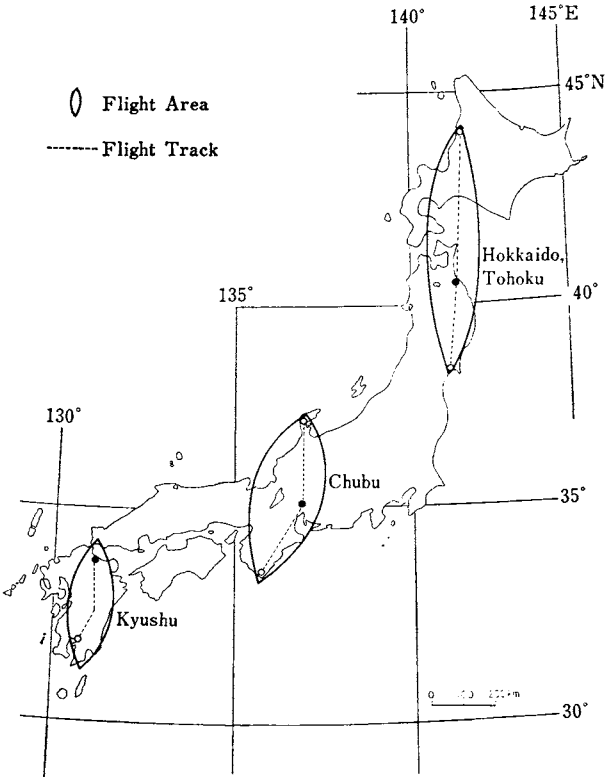


Table 12. Gross β-activity in Upper Air —Dec. 28th, 1968 to Jan. 6th, 1969—

By S. Igarashi

(Research and Development H. Q., Japan Defense Agency)

(pCi/m^3)

Date \ Sky Area	Hokkaido, Tohoku 9,000 m	Hokkaido, Tohoku 6,000 m	Chubu 9,000 m	Chubu 6,000 m	Kyushu 9,000 m	Kyushu 6,000 m
Dec. 28, 1968						
7.30 a.m.					17.4	
8.00 a.m.			1.6			
8.30 a.m.	16.5					
10.00 a.m.			8.5			
11.00 a.m.	38.3				31.8	
12.00 p.m.			2.3			
1.00 p.m.					33.7	
1.00 p.m.	755.6					
2.00 p.m.			11.1			
3.00 p.m.	467.6				34.1	
8.00 p.m.				29.3		31.7
12.00 a.m.				3.4		14.4
Dec. 29, 1968						
8.00 a.m.				2.0		8.0
11.00 a.m.		24.0		1.0		
1.00 p.m.		35.0				
2.00 p.m.				1.3		
Dec. 30, 1668						
8.00 a.m.				0.82		
8.45 a.m.		2.6				
Jan. 6, 1969						
1.15 p.m.				0.4		

Figure 13. Temporal Variation of Gross β-activity in Upper Air