RADIOACTIVITY SURVEY DATA in Japan

NUMBER 18
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National Institute of Radiological Sciences
Chiba, Japan

Radioactivity Survey Data in Japan

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National Institute of Radiological Sciences

DATA OF ROUTINE SURVEY

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 1.

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 1966 are shown in Tables 1 and 2. The annual average of strontium-90 and cesium-137 contents during the period 1957 to 1966 is shown in Figure 2.

Figure 1. Rice Sampling Locations

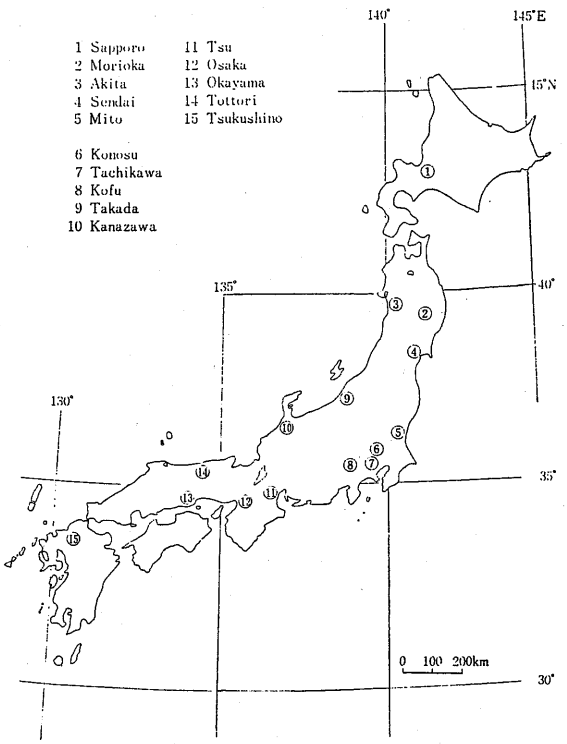


Table 1. ^{90}Sr in Rice —1966—

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

(Continued from Table 3, Issue No. 14, of this publication)

Location	Month Harvested	^{90}Sr (pCi/kg)	
		Brown Rice	Polished Rice
	1966		
Sapporo, HOKKAIDO	Oct	6	1.6
Morioka, IWATE	〃	7	0.9
Akita, AKITA	Sept	13	4.6
Sendai, MIYAGI	〃	9	1.2
Mito, IBARAGI	〃	8	1.1
Konosu, SAITAMA	Oct	14	1.5
Tachikawa, TOKYO	〃	11	1.7
Kofu, YAMANASHI	〃	4	0.6
Takada, NIIGATA	〃	22	
Kanazawa, ISHIKAWA	Sept	8	2.1
Tsu, MIE	Oct	12	2.8
Osaka, OSAKA	Nov	4	0.9
Okayama, OKAYAMA	〃	6	0.9
Tottori, TOTTORI	Oct	17	1.2
Tsukushino, FUKUOKA	Nov	7	1.7
Average for year		9.9	1.6

Table 2. ^{137}Cs in Rice —1966—

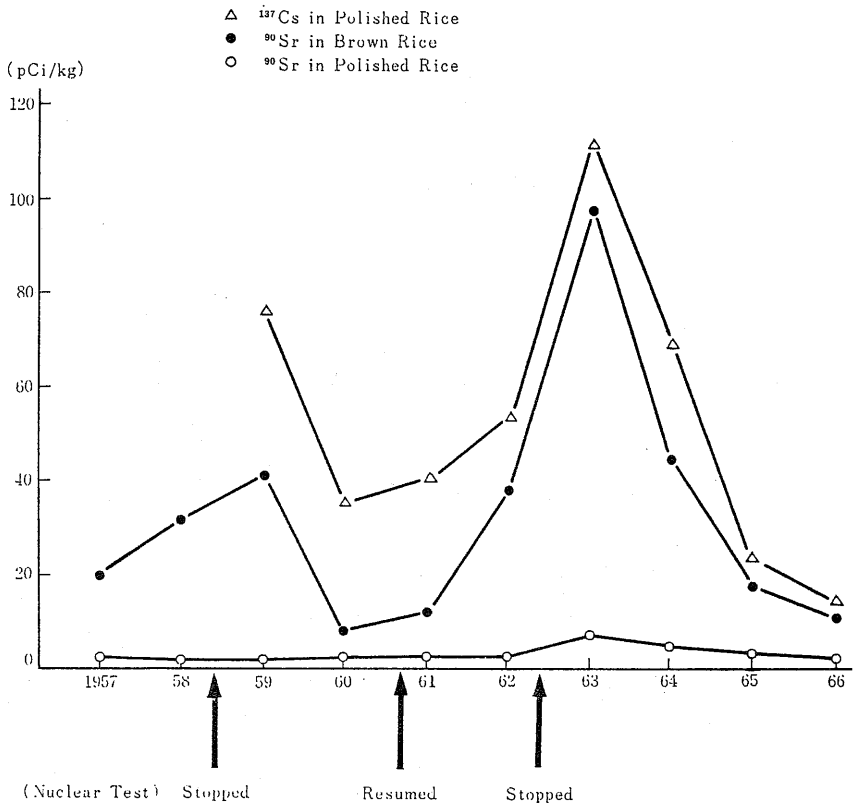
By H. Kobayashi and A. Tsumura
(National Institute of Agricultural Sciences)
N. Yamagata
(Institute of Public Health)

(Continued from Table 4, Issue No. 14, of this publication)

Location	Month Harvested	^{137}Cs (pCi/kg)*
		Polished Rice
	1966	
Sapporo, HOKKAIDO	Oct	20
Morioka, IWATE	〃	20
Akita, AKITA	Sept	27
Mito, IBARAGI	〃	8
Konosu, SAITAMA	Oct	8
Tachikawa, TOKYO	〃	11
Kofu, YAMANASHI	〃	4
Takada, NIIGATA	〃	14
Kanazawa, ISHIKAWA	Sept	9
Tsu, MIE	Oct	9
Osaka, OSAKA	Nov	4
Okayama, OKAYAMA	〃	5
Tottori, TOTTORI	Oct	8
Average for year		11

Note * The unit pCi/kg, shown in Table 4 (Page 6), Issue No. 14 of this publication, was error and should read pCi/3 kg.

Figure 2. Temporal Variation of ^{90}Sr and ^{137}Cs in Rice —1957 to 1966—
—All Japan Mean Values—



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 agricultural experimental stations, covering all important areas of agriculture throughout Japan.

Sampling locations are shown in Figure 3. 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 1967 are shown in Table 3. The yearly average of strontium-90 content during the period 1957 to 1967 is shown in Figure 4.

Figure 3. Wheat Sampling Locations

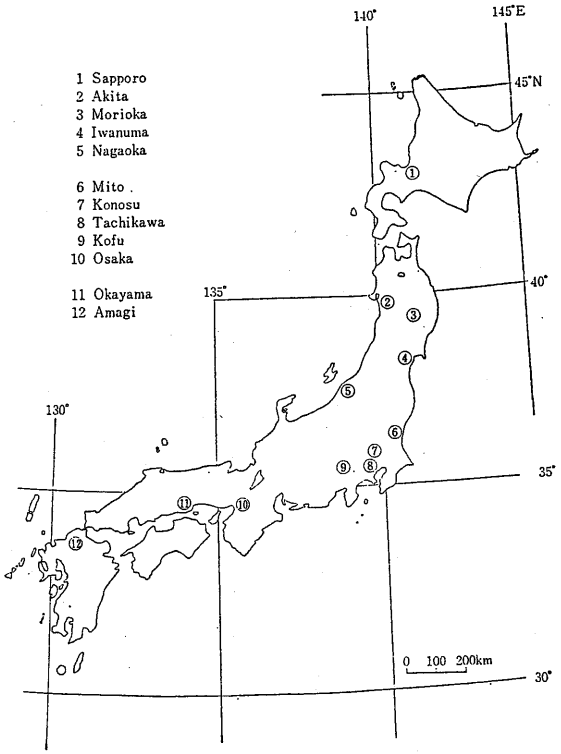


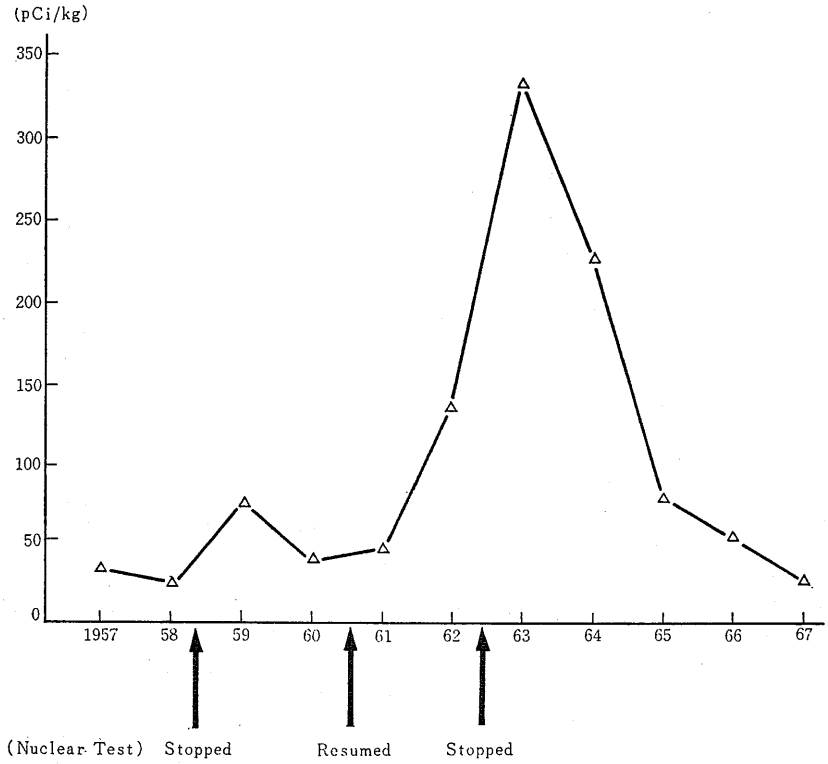
Table 3. ^{90}Sr in Wheat —1967—

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

(Continued from Table 5, Issue No. 14, of this publication)

Location	Month Harvested	^{90}Sr (pCi/kg) Wheat Grain
	1967	
Sapporo, HOKKAIDO	Jul	14
Akita, AKITA	〃	122
Morioka, IWATE	〃	22
Iwanuma, MIYAGI	Jun	16
Nagaoka, NIIGATA	〃	32
Mito, IBARAGI	〃	26
Konosu, SAITAMA	〃	16
Tachikawa, TOKYO	〃	14
Kofu, YAMANASHI	〃	7
Osaka, OSAKA	〃	14
Okayama, OKAYAMA	〃	15
Amagi, FUKUOKA	〃	26
Average for year		27

Figure 4. Temporal Variation of ^{90}Sr in Wheat —1957 to 1967—
—All Japan Mean Values—



Strontium-90 and Cesium-137 in Milk

(National Institute of Animal Industry)

The observation of the monthly variation in strontium-90 and cesium-137 content in milk was conducted at the National Institute of Animal Industry.

Samples were taken from the same cow, if possible, at the farm of the Institute and six other prefectural agricultural experimental stations, and analyzed by the method recommended by the Science and Technology Agency.

Sampling stations are indicated in Figure 5.

Results obtained during the period from February, 1967 to March, 1968 are shown in Table 4.

Figure 5. Milk Sampling Stations

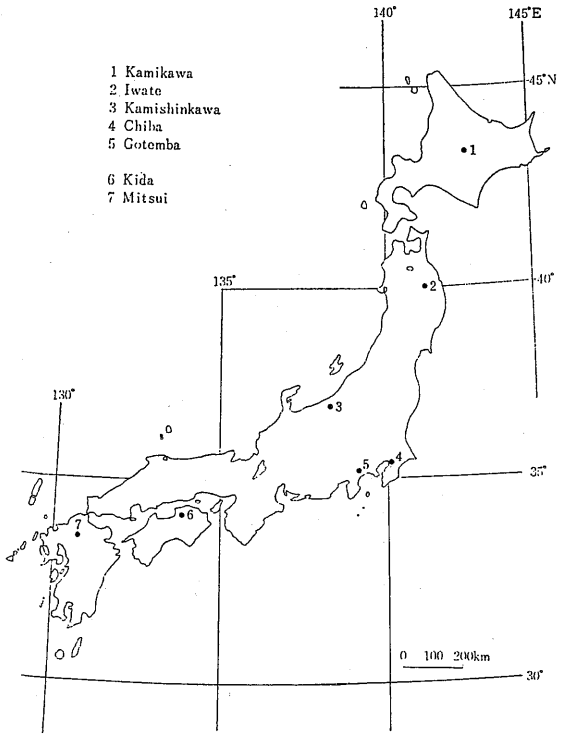


Table 4. ^{90}Sr and ^{137}Cs in Milk —Feb., 1967 to Mar., 1968—

By H. Danbara and T. Mitsuhashi
(National Institute of Animal Industry)

(Continued from Table 13, Issue No. 15 of this Publication)

Location	Component		^{90}Sr		^{137}Cs	
	Ca (g/*l*)	K (g/*l*)	(pCi/*l*)	(pCi/gCa)	(pCi/*l*)	(pCi/gK)
Feb. 1967						
Kamikawa, HOKKAIDO	1.0	1.6	42.8	42.8	273.2	170.7
Iwate, IWATE	1.0	1.4	11.7	11.7	89.5	63.9
Kamishinkawa, TOYAMA	1.0	1.5	9.1	9.1	44.9	29.9
Chiba, CHIBA	1.1	1.4	6.5	5.9	32.6	23.3
Gotemba, SHIZUOKA	1.1	1.7	8.6	7.8	114.7	67.5
Kida, KAGAWA	1.1	1.6	5.8	5.3	57.5	35.9
Mitsui, FUKUOKA	1.0	1.5	7.4	7.4	71.6	47.7
Mar. 67						
Kamikawa, HOKKAIDO	1.1	1.3	49.0	44.5	201.6	155.1
Iwate, IWATE	1.0	1.7	8.9	8.9	105.7	62.2
Kamishinkawa, TOYAMA	0.9	1.4	2.8	3.1	43.1	30.8
Chiba, CHIBA	1.0	1.5	3.0	3.0	28.1	18.8
Gotemba, SHIZUOKA	1.0	1.7	6.5	6.5	35.7	21.0
Kida, KAGAWA	1.0	1.4	4.1	4.1	75.1	53.6
Mitsui, FUKUOKA	1.0	1.6	5.5	5.5	43.5	27.2
Apr. 67						
Kamikawa, HOKKAIDO	1.0	1.5	29.1	29.1	101.7	67.8
Iwate, IWATE	1.1	1.6	13.5	12.3	41.3	25.8
Kamishinkawa, TOYAMA	1.2	1.3	11.6	9.7	63.6	48.9
Chiba, CHIBA	1.0	1.7	4.5	4.5	17.4	10.2
Gotemba, SHIZUOKA	1.1	1.7	10.3	9.4	39.7	23.4
Kida, KAGAWA	1.0	1.5	4.0	4.0	16.8	11.2
Mitsui, FUKUOKA	1.0	1.4	6.3	6.3	29.5	21.1

Location	Component		^{90}Sr		^{137}Cs	
	Ca (g/*l*)	K (g/*l*)	(pCi/*l*)	(pCi/gCa)	(pCi/*l*)	(pCi/gK)
May 67						
Kamikawa, HOKKAIDO	1.1	1.5	33.9	30.8	111.2	74.1
Iwate, IWATE	1.0	1.4	12.1	12.1	31.0	22.1
Kamishinkawa, TOYAMA	1.0	1.5	8.8	8.8	57.9	38.6
Chiba, CHIBA	1.0	1.7	5.0	5.0	18.3	10.8
Gotemba, SHIZUOKA	1.0	1.5	14.6	14.6	58.3	38.9
Kida, KAGAWA	1.0	1.5	3.7	3.7	15.4	10.2
Mitsui, FUKUOKA	1.0	1.5	7.2	7.2	37.1	24.7
Jun. 67						
Kamikawa, HOKKAIDO	1.1	1.5	22.3	20.3	70.2	46.8
Iwate, IWATE	1.3	1.2	9.6	7.4	23.0	19.2
Kamishinkawa, TOYAMA	1.0	1.6	10.3	10.3	31.6	19.8
Chiba, CHIBA	1.0	1.7	3.3	3.3	13.3	7.8
Gotemba, SHIZUOKA	1.0	1.7	6.8	6.8	8.0	4.7
Kida, KAGAWA	1.0	1.5	2.2	2.2	9.2	6.1
Mitsui, FUKUOKA	1.0	1.5	7.5	7.5	25.0	1.7
Jul. 67						
Kamikawa, HOKKAIDO	1.1	1.5	21.4	19.5	70.0	46.7
Iwate, IWATE	1.0	1.6	10.8	10.8	85.2	53.3
Kamishinkawa, TOYAMA	0.9	1.4	7.2	8.0	16.2	11.6
Chiba, CHIBA	1.0	1.7	5.0	5.0	18.1	10.6
Gotemba, SHIZUOKA	1.1	1.4	7.2	6.5	22.4	16.0
Kida, KAGAWA	1.1	1.4	3.0	2.7	20.7	14.7
Mitsui, FUKUOKA	1.0	1.5	5.1	5.1	8.6	5.7
Aug. 67						
Kamikawa, HOKKAIDO	1.1	1.7	13.9	12.6	149.2	87.8
Iwate, IWATE	1.0	1.6	10.2	10.2	48.2	30.1
Kamishinkawa, TOYAMA	1.0	1.5	8.1	8.1	14.2	9.5
Chiba, CHIBA	0.9	1.7	2.5	2.8	14.0	8.2
Gotemba, SHIZUOKA	1.0	1.5	2.6	2.6	20.3	13.5
Kida, KAGAWA	1.1	1.5	2.8	2.5	5.9	3.9
Mitsui, FUKUOKA	1.0	1.6	7.3	7.3	17.0	10.6
Sept. 67						
Kamikawa, HOKKAIDO	1.2	1.6	23.0	19.2	113.5	70.9
Iwate, IWATE						
Kamishinkawa, TOYAMA	1.0	1.4	10.1	10.1	31.6	22.6
Chiba, CHIBA	0.9	1.7	3.2	3.6	12.3	7.2
Gotemba, SHIZUOKA	1.1	1.4	6.4	5.8	19.5	13.9
Kida, KAGAWA	1.0	1.4	2.5	2.5	9.0	6.4
Mitsui, FUKUOKA	1.0	1.5	8.6	8.6	19.7	13.1
Oct. 67						
Kamikawa, HOKKAIDO	1.0	1.5	20.1	20.1	96.3	64.2
Iwate, IWATE	1.1	1.5	10.2	9.3	41.3	27.5
Kamishinkawa, TOYAMA	1.1	1.4	8.2	7.5	25.9	18.5
Chiba, CHIBA	1.0	1.6	4.6	4.6	23.8	14.9
Gotemba, SHIZUOKA	1.1	1.3	6.3	5.7	66.5	51.2
Kida, KAGAWA	1.2	1.3	4.2	3.5	17.9	13.8
Mitsui, FUKUOKA	1.0	1.5	2.3	2.3	15.8	10.5
Nov. 67						
Kamikawa, HOKKAIDO	1.2	1.5	18.6	15.5	89.3	59.5
Iwate, IWATE	1.0	1.5	10.0	10.0	49.9	33.3
Kamishinkawa, TOYAMA	1.5	1.3	6.3	4.2	42.9	33.0
Chiba, CHIBA	0.9	1.6	3.0	3.3	18.7	11.7
Gotemba, SHIZUOKA	1.1	1.4	4.8	4.4	47.0	33.5
Kida, KAGAWA	1.2	1.4	5.0	4.2	22.4	16.0
Mitsui, FUKUOKA						
Dec. 67						
Kamikawa, HOKKAIDO	1.1	1.4	19.1	17.4	45.8	32.7
Iwate, IWATE	1.0	1.6	7.4	7.4	79.8	49.9
Kamishinkawa, TOYAMA	1.2	1.5	8.9	7.4	31.4	20.9
Chiba, CHIBA	1.1	1.7	4.8	4.4	21.1	12.4
Gotemba, SHIZUOKA	1.1	1.3	7.7	7.0	30.4	23.4
Kida, KAGAWA	1.4	1.1	12.1	8.6	25.2	22.9
Mitsui, FUKUOKA	1.0	1.5	6.4	6.4	10.1	6.7

Location	Component		^{90}Sr		^{137}Cs	
	Ca (g/*l*)	K (g/*l*)	(pCi/*l*)	(pCi/gCa)	(pCi/*l*)	(pCi/gK)
Jan. 1968						
Kamikawa, HOKKAIDO	1.2	1.5	21.4	17.8	123.8	82.5
Iwate, IWATE	0.9	1.3	10.4	11.5	67.3	51.8
Kamikawa, TOYAMA	1.1	1.4	9.5	8.6	12.1	8.6
Chiba, CHIBA	1.1	1.5	4.4	4.0	10.1	6.7
Gotemba, SHIZUOKA	1.0	1.6	4.8	4.8	13.8	8.6
Kida, KAGAWA	1.0	1.5	3.6	3.6	9.0	6.0
Mitusi, FUKUOKA	1.2	1.6	5.9	4.9	16.0	10.0
Feb. 68						
Kamikawa, HOKKAIDO	1.2	1.3	16.1	13.4	71.4	54.9
Iwate, IWATE	1.0	1.6	9.3	9.3	50.3	31.4
Kamishinkawa, TOYAMA	1.1	1.5	11.3	10.3	12.9	8.6
Chiba, CHIBA	1.0	1.5	3.9	3.9	8.0	5.3
Gotemba, SHIZUOKA	1.1	1.6	6.8	6.2	18.3	11.4
Kida, KAGAWA	1.0	1.5	3.3	3.3	3.5	2.3
Mitsui, FUKUOKA	1.2	1.5	4.4	3.7	8.4	5.6
Mar. 68						
Kamikawa, HOKKAIDO	1.2	1.4	19.4	16.2	110.6	79.0
Iwate, IWATE	1.1	1.3	8.6	7.8	94.2	72.4
Kamishinkawa, TOYAMA	1.1	1.5	12.0	10.9	13.8	9.2
Chiba, CHIBA	1.0	1.5	3.8	3.8	8.2	5.5
Gotemba, SHIZUOKA	1.1	1.7	8.3	7.5	23.8	14.0
Kida, KAGAWA	1.1	1.4	4.2	3.8	4.9	3.5
Mitsui, FUKUOKA	1.1	1.5	7.4	6.7	11.3	7.5

Water Data

Strontium-89, 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 prfectures. The samples have been analyzed for strontium-90, ruthenium-106 cesium-137 and cerium-144. Sampling locations are shown in Figure 6.

An acryl resin column, 25 cm in length, 5.3 cm and 6 cm in inner and outer diameters, equipped with a saran filter and inserted gum packing, was provided with an acryl resin funnel. Cation exchange resin (Dowex 50 W-X 8. 50-100 mesh) was packed in the column and sent to each laboratory with the carrier solution in a polyethylene bottle.

Water samples were collected at each district. At each laboratory, 100 liter samples were passed through the column at a flow rate of 12 liter per hour after addition of the carrier solution.

The resin column, when returned to the National Institute of Radiological Sciences, was eluted with 2 liters 3N-HCl and the effluent was analyzed radiochemically. The radioactivity was determined using a low background beta-counter (0.5 cpm background), but strontium-89 and strontium-90 were measured by a low background beta-ray spectrometer.

The results obtained from October 1964, to June 1967. are shown in Table 5.

Figure 6. Source Water and Treated Water Sampling Locations

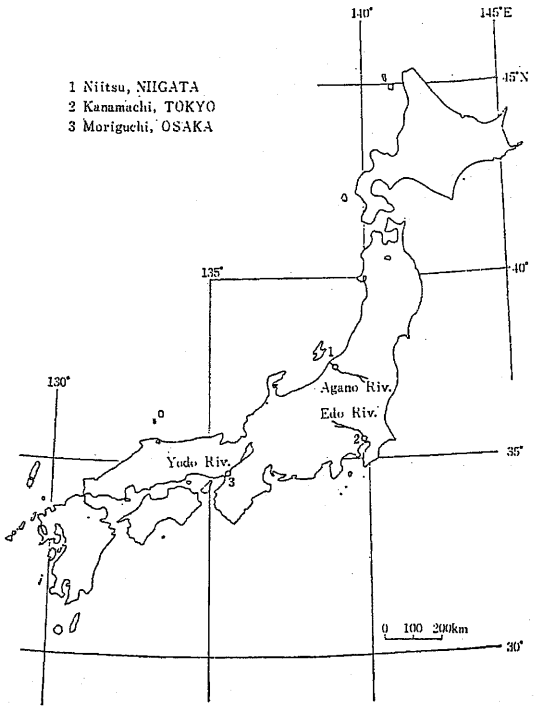


Table 5. ^{89}Sr, ^{90}Sr, ^{106}Ru, ^{137}Cs and ^{144}Ce in Source Water and Treated Water —Oct. 1964 to Jun. 1967—

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

(Contined from Table 6, Issue No. 6. of this Publication)

Location	Source	Type	Date	^{89}Sr	^{90}Sr	^{106}Ru	^{137}Cs	^{144}Ce
				pCi/*l*				
Niitsu, NIIGATA	Agano River	SW	Oct. 1964	5.35	0.62	0.11	0.24	0.05
〃	〃	TW	〃	5.06	0.59	0.08	0.09	0.05
〃	〃	SW	Dec. 1964	2.89	0.70	0.26	0.22	0.23
〃	〃	TW	〃	2.59	0.62	0.14	0.10	0.04
〃	〃	SW	Feb. 1965	1.75	0.97	0.11	0.51	0.08
〃	〃	TW	〃	1.73	0.95	0.01	0.35	0.07
〃	〃	SW	Apr. 1965	1.98	0.92	0.17	0.45	2.85
〃	〃	TW	〃	0.53	0.60	0.04	0.45	2.58
〃	〃	SW	Jun. 1965	1.00	0.74	0.20	0.45	2.09
〃	〃	TW	〃	0.63	0.68	0.04	0.28	1.34
〃	〃	SW	Aug. 1965	0.11	0.65	0.07	0.45	0.14
〃	〃	TW	〃	0.07	0.62	0.05	0.33	1.30
〃	〃	SW	Oct. 1965	0.17	0.65	0.10	0.24	1.72
〃	〃	TW	〃	0.17	0.65	0.08	0.20	1.08
〃	〃	SW	Dec. 1965	0.02	0.69	0.09	0.29	2.05
〃	〃	TW	〃	0.01	0.60	0.06	0.20	1.52
〃	〃	SW	Feb. 1966	—	0.96	0.18	1.03	2.39
〃	〃	TW	〃	—	0.85	0.13	0.45	1.19
〃	〃	SW	Apr. 1966	—	0.77	0.16	0.40	1.07
〃	〃	TW	〃	—	0.76	0.11	0.34	0.97
〃	〃	SW	Jun. 1966	0.27	0.59	0.08	0.35	0.87
〃	〃	TW	〃	0.27	0.58	0.04	0.28	0.69
〃	〃	SW	Aug. 1966	—	0.60	0.27	0.40	0.31
〃	〃	TW	〃	—	0.54	0.18	0.27	0.00
〃	〃	SW	Oct. 1966	—	0.62	5.60	0.96	1.25
〃	〃	TW	〃	—	0.36	0.52	0.19	0.08
〃	〃	SW	Dec. 1966	—	0.51	0.09	0.29	0.14
〃	〃	TW	〃	—	0.46	0.05	0.27	0.09
〃	〃	SW	Feb. 1967	*	0.70	0.62	0.42	0.00～0.23
〃	〃	TW	〃	*	0.66	0.10	0.37	0.00～0.09
〃	〃	SW	Apr. 1967	*	0.53	0.83	0.32	0.00～0.37
〃	〃	TW	〃	*	0.52	0.02	0.28	0.00～0.25
〃	〃	SW	Jun. 1967	*	0.65	0.35	0.38	0.00～0.69
〃	〃	TW	〃	*	0.60	0.20	0.32	0.00～0.39
Kanamachi, TOKYO	Edo River	SW	Oct. 1964	2.86	0.37	0.05	0.24	0.03
〃	〃	TW	〃	2.80	0.36	0.05	0.06	0.00
〃	〃	SW	Dec. 1964	1.76	0.39	0.04	0.18	0.05
〃	〃	TW	〃	1.20	0.27	0.03	0.06	0.02
〃	〃	SW	Feb. 1965	0.56	0.34	0.04	0.11	0.01
〃	〃	TW	〃	0.52	0.32	0.03	0.07	0.00
〃	〃	SW	Apr. 1965	2.69	0.38	0.12	0.31	0.80
〃	〃	TW	〃	1.29	0.36	0.10	0.23	0.72
〃	〃	SW	Jun. 1965	0.85	0.47	0.08	0.33	0.81
〃	〃	TW	〃	0.70	0.39	0.02	0.33	0.69
〃	〃	SW	Aug. 1965	0.50	0.45	0.06	0.44	0.72
〃	〃	TW	〃	0.27	0.40	0.05	0.38	0.71
〃	〃	SW	Oct. 1965	0.11	0.42	0.08	0.26	0.87
〃	〃	TW	〃	0.10	0.40	0.05	0.19	0.78
〃	〃	SW	Dec. 1965	0.01	0.39	0.05	0.24	0.76
〃	〃	TW	〃	0.01	0.39	0.04	0.21	0.70
〃	〃	SW	Feb. 1966	—	0.47	0.06	0.26	0.58
〃	〃	TW	〃	—	0.37	0.05	0.22	0.55
〃	〃	SW	Apr. 1966	—	0.54	0.04	0.24	0.45
〃	〃	TW	〃	—	0.46	0.04	0.16	0.40
〃	〃	SW	Jun. 1966	0.35	0.57	0.06	0.48	0.51
〃	〃	TW	〃	0.34	0.55	0.05	0.21	0.45
〃	〃	SW	Aug. 1966	—	0.37	0.30	0.42	0.00
〃	〃	TW	〃	—	0.31	0.02	0.32	0.00
〃	〃	SW	Oct. 1966	—	0.38	3.00	0.24	0.00
〃	〃	TW	〃	—	0.38	0.61	0.24	0.00
〃	〃	SW	Dec. 1966	—	0.35	0.05	0.65	0.00
〃	〃	TW	〃	—	0.34	0.02	0.30	0.00
〃	〃	SW	Feb. 1967	*	0.44	0.23	0.31	0.00～0.40
〃	〃	TW	〃	*	0.43	0.02	0.21	0.00

Location	Source	Type	Date	^{89}Sr	^{90}Sr	^{106}Ru	^{137}Cs	^{144}Ce
				pCi/l				
Kanamachi, TOKYO	Edo River	SW	Apr. 1967	*	0.41	0.15	0.23	0.00～0.25
〃	〃	TW	〃	*	0.39	0.02	0.16	0.00～0.18
〃	〃	SW	Jun. 1967	*	0.65	0.69	0.22	0.00～0.23
〃	〃	TW	〃	*	0.51	0.09	0.21	0.00～0.10
Moriguchi, OSAKA	Yodo River	SW	Oct. 1964	5.70	0.69	0.03	0.09	0.13
〃	〃	TW	〃	5.47	0.68	0.00	0.08	0.00
〃	〃	SW	Dec. 1964	2.96	0.84	0.10	0.12	0.03
〃	〃	TW	〃	2.81	0.81	0.03	0.07	0.01
〃	〃	SW	Feb. 1965	1.25	0.74	0.04	0.15	0.01
〃	〃	TW	〃	1.10	0.62	0.00	0.11	0.00
〃	〃	SW	Apr. 1965	2.98	0.68	0.08	0.42	1.02
〃	〃	TW	〃	1.59	0.47	0.07	0.26	0.83
〃	〃	SW	Jun. 1965	4.57	0.68	0.11	0.24	0.85
〃	〃	TW	〃	1.83	0.52	0.01	0.20	0.66
〃	〃	SW	Aug. 1965	0.43	0.70	0.05	0.24	0.83
〃	〃	TW	Sept. 1965	0.42	0.64	0.02	0.24	0.55
〃	〃	SW	Oct. 1965	0.16	0.63	0.05	0.25	2.13
〃	〃	TW	Nov. 1965	0.16	0.63	0.05	0.17	1.03
〃	〃	SW	Dec. 1965	0.02	0.67	0.04	0.14	0.87
〃	〃	TW	〃	0.01	0.64	0.04	0.14	0.78
〃	〃	SW	Feb. 1966	—	0.90	0.08	0.15	0.76
〃	〃	TW	Mar. 1966	—	0.74	0.04	0.12	0.70
〃	〃	SW	Apr. 1966	—	0.96	0.04	0.19	0.50
〃	〃	TW	〃	—	0.90	0.02	0.18	0.43
〃	〃	SW	Jun. 1966	0.32	0.72	0.06	0.21	0.51
〃	〃	TW	Jul. 1966	0.32	0.71	0.03	0.20	0.41
〃	〃	SW	Aug. 1966	—	0.56	0.23	0.27	1.28
〃	〃	TW	〃	—	0.47	0.07	0.22	0.00
〃	〃	SW	Oct. 1966	—	0.62	1.69	0.28	0.00
〃	〃	TW	Nov. 1966	—	0.58	0.28	0.19	0.00
〃	〃	SW	Dec. 1966	—	0.52	0.03	0.70	0.77
〃	〃	TW	〃	—	0.40	0.03	0.12	0.00
〃	〃	SW	Feb. 1967	*	0.79	0.09	0.30	0.00～0.52
〃	〃	TW	〃	*	0.68	0.05	0.20	0.00～0.43
〃	〃	SW	Apr. 1967	*	0.67	0.11	0.21	0.00～0.41
〃	〃	TW	〃	*	0.64	0.09	0.19	0.00～0.32
〃	〃	SW	Jun. 1967	*	0.72	0.25	0.25	0.00～0.27
〃	〃	TW	〃	*	0.71	0.17	0.24	0.00～0.18

Note: SW and TW indicate Source and Treated Water respectively
— not detected
* not determined

Strontium-90 and Cesium-137 in Potable Rain Water used by Lighthouses

(Japan Analytical Chemistry Research Institute)

Since April 1964, potable rain water used by residents of beacon lighthouses has been analyzed for strontium-90 and cesium-137 content by the Japan Analytical Chemistry Research Institute.

Samples of potable rain water were collected in polyethylene bottles at 8 lighthouses and also ten liter samples, with and without filtration through sand and charcoal, were sent from each lighthouse. Sampling locations are shown in Figure 7.

The analytical procedure applied was the method recommended by the Science and Technology Agency.

Results obtained during the period from March 1966 to February 1967, are shown in Table 6.

Figure 7. Potable Rain Water Sampling Locations

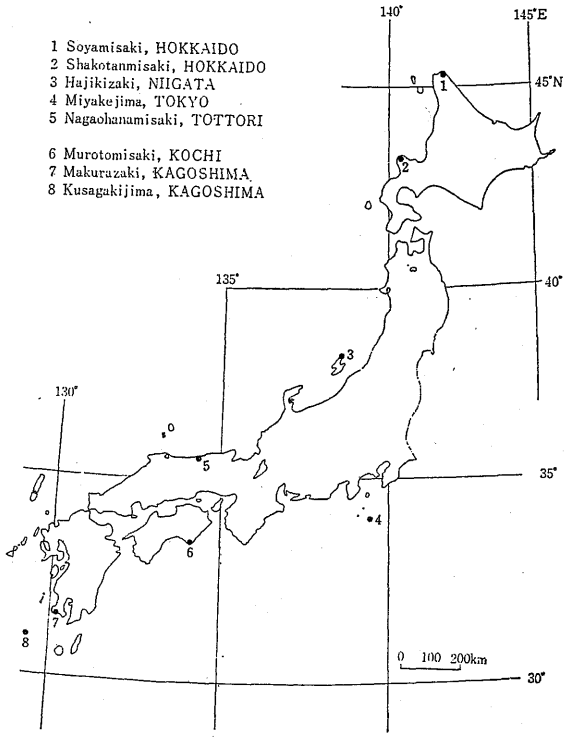


Table 6. ^{90}Sr and ^{137}Cs in Potable Rain Water used by Lighthouses —Mar. 1966 to Feb. 1967—

By T. Asari, M. Chiba and M. Kuroda
(Japan Analytical Chemistry Research Institute)

(Continued from Table 7. Issue No. 8 of this Publication)

Lighthouse Location	^{90}Sr(pCi/l)		^{137}Cs(pCi/l)	
	Original	Filtrate	Original	Filtrate
Mar. 1966				
Nagaohanamisaki, TOTTORI	7.70	5.43	0.10	2.29
May 1966				
Shakotanmisaki, HOKKAIDO	0.58	3.04	1.56	1.92
Hajikizaki, NIIGATA	6.36	4.02	0.18	1.33
Miyakejime, TOKYO	2.02	3.24	3.72	3.61
Nagaohanamisaki, TOTTORI	3.31	3.08	0.18	0.81
Murotomisaki, KOCHI	2.09	1.41	0.25	1.21
Makurazaki, KAGOSHIMA	3.46	1.43	1.30	1.26
Jun. 1966				
Soyamisaki, HOKKAIDO	2.93	0.05	9.81	0.24
Sept. 1966				
Soyamisaki, HOKKAIDO	0.72	1.34	0.18	1.61
Shakotanmisaki, HOKKAIDO	0.28	0.13	0.14	0.39
Hajikizaki, NIIGATA	3.21	2.02	0.20	1.71
Miyakejima, TOKYO	1.49	0.42	3.21	1.08
Nagaohanamisaki, TOTTORI	0.07	2.59	0.52	0.72
Murotomisaki, KOCHI	0.08	1.65	0.02	0.37
Makurazaki, KAGOSHIMA	0.65	0.70	0.22	0.54
Jan. 1967				
Soyamisaki, HOKKAIDO	0.59	1.95	0.18	2.20
Shakotanmisaki, HOKKAIDO	0.17	2.36	0.12	1.81
Hajikizaki, NIIGATA	4.53	4.42	1.54	1.58
Miyakejima, TOKYO	1.23	0.87	1.76	1.45
Nagaohanamisaki, TOTTORI	3.17	1.22	0.65	0.36
Murotomisaki, KOCHI	2.82	4.19	0.20	20.67
Feb. 1967				
Kusagakijima, KAGOSHIMA	3.19	1.63	0.26	1.12

Geographical Data

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 rivers 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 8.

Concentrations of strontium-90, ruthenium-106, cesium-137 and cerium-144 in 6N-HCl-extracts determined by radiochemical analysis are shown in Table 7 in comparison with land soils. The amount of precipitated or deposited radionuclides determined by gamma-ray spectrometry and their extraction rates with 6N-HCl are shown in Table 8.

Figure 8. River Sediments Sampling Locations

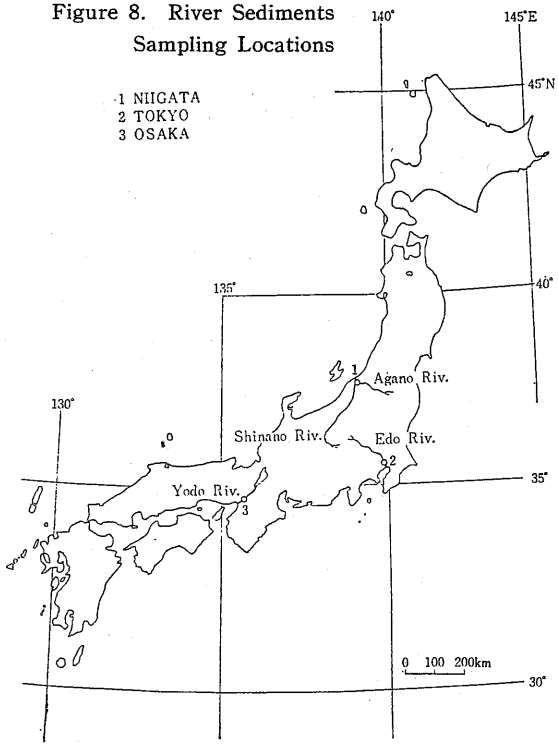


Table 7. ^{90}Sr, ^{106}Ru, ^{137}Cs and ^{144}Ce in River Sediments —Jul., 1964 to Dec., 1966—

By M. Saiki, H. Kamada, K. Kimura, E. Nakano and K. Kinjyo

(National Institute of Radiological Sciences)

Location	Sampling Date	^{90}Sr (mμCi/kg)				^{106}Ru (mμCi/kg)				^{137}Cs (mμCi/kg)				^{144}Ce (mμCi/kg)			
		L.S.	C.	R.S.	M.	L.S.	C.	R.S.	M.	L.S.	C.	R.S.	M.	L.S.	C.	R.S.	M.
Shinano River (NIIGATA)	Aug. 64	0.39	0.67	0.55	0.54	0.18	0.83	0.29	0.42	1.65	1.78	1.65	1.69	8.69	12.28	8.36	9.78
〃 〃 〃	Dec. 64	0.69	0.35	0.53	0.52	0.04	0.03	0.04	0.04	1.27	1.60	1.17	1.35	18.35	13.68	9.11	13.71
Agano River 〃	Jul. 65	0.43	0.30	0.42	0.38	0.07	0.02	0.06	0.05	5.12	1.69	2.97	3.26	14.08	1.84	9.16	8.36
〃 〃 〃	Dec. 65	0.43	0.66	0.20	0.43	0.00	0.49	0.80	0.43	3.22	3.82	2.80	3.28	1.61	1.69	2.32	1.88
〃 〃 〃	Aug. 66	0.11	0.11	0.06	0.09	0.36	0.11	0.20	0.22	1.23	0.54	0.91	0.89	0.27	0.03	0.97	0.42
〃 〃 〃	Dec. 66	0.04	0.05	0.17	0.09	0.30	0.32	0.74	0.45	1.19	0.78	1.66	1.21	0.52	0.28	0.71	0.50
Edo River (TOKYO)	Jul. 64	0.07	—	0.05	0.06	0.07	—	0.12	0.10	0.22	—	0.22	0.22	1.57	—	1.67	1.62
〃 〃 〃	Dec. 64	0.24	0.28	0.12	0.21	0.01	0.02	0.01	0.01	0.23	0.70	0.15	0.36	3.42	4.86	0.54	2.94
〃 〃 〃	Jul. 65	0.06	0.06	0.07	0.06	0.01	0.01	0.00	0.01	0.12	0.11	0.12	0.12	0.17	0.24	0.20	0.20
〃 〃 〃	Dec. 65	0.06	0.34	0.13	0.18	0.24	0.00	0.60	0.28	0.27	0.20	0.99	0.49	0.20	0.23	0.82	0.35
〃 〃 〃	Aug. 66	—	0.09	0.05	0.07	—	0.13	0.22	0.17	—	0.06	0.06	0.06	—	0.09	0.03	0.06
〃 〃 〃	Dec. 66	0.03	0.05	0.02	0.03	0.16	0.16	0.10	0.14	0.18	0.47	0.03	0.23	0.03	0.04	0.03	0.03
Yodo River (OSAKA)	Jul. 64	0.59	—	0.48	0.54	0.22	—	0.30	0.26	2.32	—	2.07	2.20	16.49	—	15.81	16.15
〃 〃 〃	Dec. 64	0.55	—	0.11	0.33	0.11	—	0.02	0.07	1.32	—	0.43	0.88	6.87	—	0.19	3.53
〃 〃 〃	Jul. 65	0.28	0.07	0.28	0.21	0.03	0.02	0.01	0.02	1.77	0.54	1.76	1.36	3.49	0.80	4.23	2.84
〃 〃 〃	Dec. 65	0.08	—	0.16	0.12	0.03	—	0.00	0.01	0.69	—	1.56	1.13	0.18	—	0.24	0.21
〃 〃 〃	Mar. 66	0.12	—	0.50	0.31	0.00	—	0.50	0.25	1.04	—	1.15	1.10	0.36	—	0.31	0.33
〃 〃 〃	Jul. 66	0.05	0.06	—	0.05	0.30	0.02	—	0.16	0.03	0.30	—	0.17	0.11	0.25	—	0.18
〃 〃 〃	Dec. 66	0.08	0.05	—	0.07	0.10	0.37	—	0.24	0.52	0.38	—	0.45	0.06	0.24	—	0.15

Note: L. S., C., R. S., and M. indicate the left side, center, right side and mean values, respectivily, in the sampling river.

Table 8. The Deposits of Radionuclides and Extraction Rates with HCl in River-Sediments
—Dec., 1965 to Jul., 1967—

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

Location	Sampling Date	^{106}Ru		^{137}Cs		^{144}Ce	
		mμCi/kg	Extract Rates with HCl*	mμCi/kg	Extract Rates with HCl*	mμCi/kg	Extract Rates with HCl*
Agano River (NIIGATA)	Dec. 65	2.07	23	5.96	55	2.27	83
〃 〃	Aug. 66	1.05	21	1.93	46	0.89	47
〃 〃	Dec. 66	1.22	37	3.10	39	0.86	58
〃 〃	Jul. 67	0.82	—	1.50	—	0.84	—
Edo River (TOKYO)	Dec. 65	1.09	30	0.92	53	0.78	45
〃 〃	Aug. 66	0.94	18	0.33	18	0.23	26
〃 〃	Dec. 66	0.70	20	0.53	43	0.28	11
〃 〃	Jul. 67	0.06	—	0.03	—	3.73	—
Yodo River (OSAKA)	Dec. 65	0.90	16	1.41	80	0.51	41
〃 〃	Mar. 66	1.05	25	1.34	82	0.50	66
〃 〃	Jul. 66	0.89	18	0.71	24	0.44	41
〃 〃	Dec. 66	0.91	26	0.74	61	0.44	34
〃 〃	Jul. 67	0.33	—	0.42	—	0.87	—

* $\frac{\text{Extract with HCl}}{\text{Total deposit}} \times 100$

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

Part 1 *(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. The amount of ground deposit was determined and an estimation was made of the leaching rates of radionuclides from soil to river.

Sampling locations are shown in Figure 9.

Sampling sites were selected in Tokyo, Niigata and Osaka prefectures from 1964, and since 1965 in Fukushima. Samples of grassless soil were analyzed radiochemically. Determination of strontium-90, ruthenium-106, cesium-137 and cerium-144 was made by gamma-ray spectrometry.

Concentrations of radionuclides probably leached from soil into river are shown in Table 9. The amounts of radionuclides deposited on ground and contents described above are compared in Table 10.

Figure 9. Soil Sampling Locations

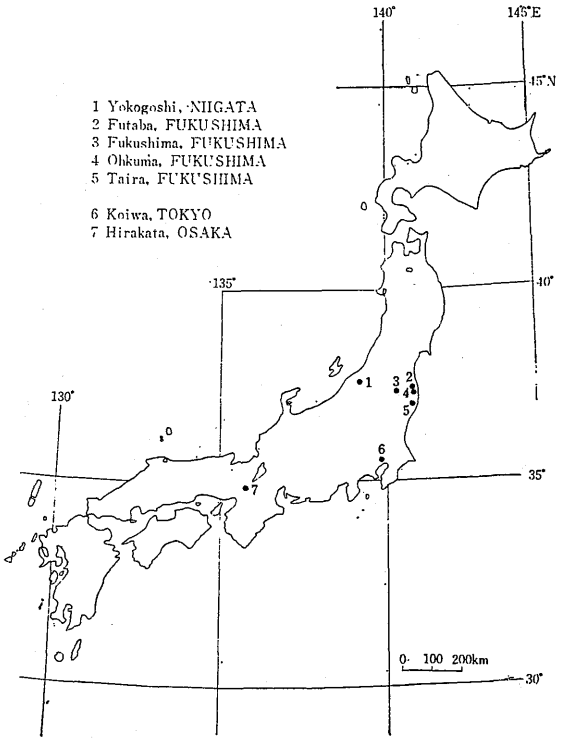


Table 9. ^{90}Sr, ^{106}Ru, ^{137}Cs and ^{144}Ce in Soil —Aug. 1964 to Mar. 1966—

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

Location	Sampling Date	^{90}Sr		^{106}Ru		^{137}Cs		^{144}Ce	
		pCi/kg	mCi/km²	pCi/kg	mCi/km²	pCi/kg	mCi/km²	pCi/kg	mCi/km²
Yokogoshi, NIIGATA	Aug. 64	335.2	24.5	120.8	9.0	224.2	17.0	1836.3	139.9
〃 〃	Dec. 64	134.0	8.9	34.7	2.3	95.9	6.3	1158.8	78.7
〃 〃	Aug. 65	818.8	34.4	33.3	1.4	1598.6	64.1	1765.3	74.1
〃 〃	Dec. 65	717.4	42.9	205.1	12.2	1990.0	119.0	224.5	13.4
Fukushima, FUKUSHIMA	Aug. 65	334.6	20.3	52.9	3.2	2611.4	158.0	5497.4	332.6
〃 〃	〃	318.8	18.3	13.9	0.8	1031.4	59.1	1193.1	68.4
〃 〃	Dec. 65	710.5	45.5	0.0	0.0	1290.0	82.7	373.5	23.9
〃 〃	〃	238.1	12.7	302.8	16.2	980.0	52.4	146.6	7.7
Taira, FUKUSHIMA	Aug. 65	91.5	4.0	25.0	1.1	420.9	18.2	753.7	32.6
〃 〃	Nov. 65	426.1	26.7	0.0	0.0	676.0	42.4	328.1	20.6
Koiwa, TOKYO	Aug. 64	506.1	30.5	442.1	26.7	1144.2	69.1	4337.4	262.1
〃 〃	Feb. 65	158.6	7.1	12.5	0.6	148.6	6.4	27109.3	1212.9
〃 〃	Aug. 65	320.2	15.1	12.3	0.6	1877.6	88.4	2711.2	127.7
〃 〃	Dec. 65	105.9	6.0	227.0	13.1	200.0	11.4	136.9	7.8
Hirakata, OSAKA	Aug. 64	251.5	18.2	286.1	20.7	399.2	28.9	1316.0	95.4
〃 〃	Nov. 64	68.6	5.0	111.1	8.1	301.1	22.0	1196.9	87.5
〃 〃	Aug. 65	311.5	22.2	15.9	1.1	812.5	57.9	1254.3	89.3
〃 〃	Dec. 65	255.1	14.0	70.0	3.8	875.5	48.1	236.6	13.0
〃 〃	Mar. 66	186.5	7.1	69.7	6.1	640.0	24.5	161.4	6.2

Table 10. The Deposits of Radionuclides and Extraction Rates with HCl in Soil —Nov., 1965 to Aug., 1967—

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

Location	Sampling Date	^{90}Sr	^{106}Ru		^{137}Cs		^{144}Ce	
		mCi/km² *	mCi/km² **	Extract Rates with HCl ***	mCi/km² **	Extract Rates with HCl ***	mCi/km² **	Extract Rates with HCl ***
Yokogoshi, NIIGATA	Dec. 65	42.90	26.0	46	153.0	78	23.0	57
〃 〃	Sept. 66	9.67	19.0	13	68.0	41	10.0	47
〃 〃	Dec. 66	13.85	64.9	25	291.3	52	37.4	48
〃 〃	Aug. 67	21.98	11.6	—	28.2	—	30.6	—
Koiwa, TOKYO	Dec. 65	6.00	45.6	34	21.0	53	15.0	53
〃 〃	Aug. 66	6.00	30.0	19	20.0	27	12.0	35
〃 〃	Dec. 66	1.48	33.1	17	28.5	67	14.6	48
〃 〃	Aug. 67	5.73	12.2	—	10.7	—	14.2	—
Hirakata, OSAKA	Dec. 65	14.00	9.0	44	65.0	74	30.0	44
〃 〃	Mar. 66	7.10	28.4	21	33.2	74	14.1	44
〃 〃	Aug. 66	11.74	52.0	17	72.0	62	29.0	65
〃 〃	Dec. 66	5.84	56.3	27	62.3	60	27.9	39
〃 〃	Aug. 67	33.49	16.7	—	24.9	—	24.3	—
Mean Values of Fukushima, FUKUSHIMA (2 locations) Taira, FUKUSHIMA (1 location)	Nov.–Dec. 65	28.30	40.0	23	71.7	82	32.6	52
Mean Values of Futaba, FUKUSHIMA (2 locations) Ohkuma, FUKUSHIMA (1 location)	Aug. 66	33.50	54.3	26	165.3	59	28.2	39
	Dec. 66	14.15	42.4	24	78.0	50	22.7	45
	Aug. 67	21.97	34.9	—	58.7	—	24.1	—

* Deposit of extract with 6N-HCl

** Total deposit

*** $\frac{\text{Extract with HCl}}{\text{Total deposit}} \times 100$

Part 2 *(Japan Analytical Chemistry Research Institute)*

The Japan Analytical Chemistry Research Institute has analyzed surface soil samples collected from 16 prefectures, to determine the total deposits of fallout. Sampling locations are indicated in Figure 10.

Sampling procedures and treatment method of the samples for strontium-90 and cesium-137 analyses are the same as those mentioned in the explanation of page 6~7, Issue No. 4 of this publication.

Results obtained during the period from July 1966 to December 1966, are shown in Table 11.

Figure 10. Soil Sampling Location

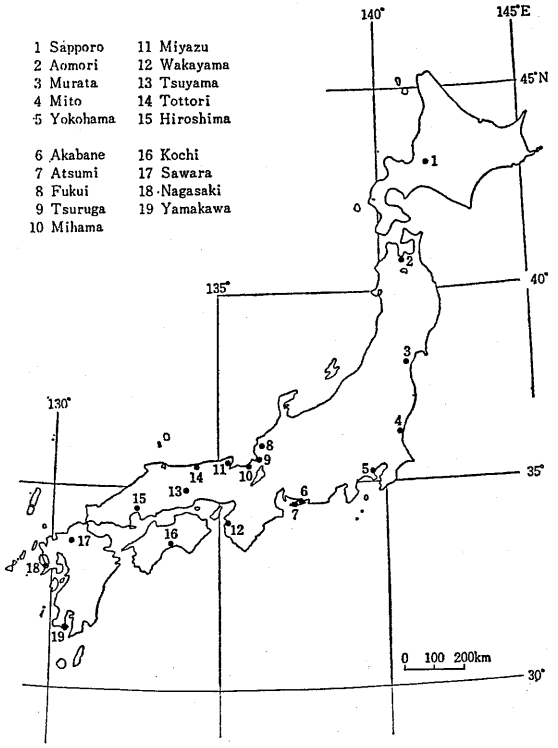


Table 11. ^{90}Sr, ^{137}Cs and ^{144}Ce in Soil —Jul. 1966 to Dec. 1966—

By T. Asari, M. Chiba and M. Kuroda
(Japan Analytical Chemistry Research Institute)

(Continued from Table 10, Issue No. 9~10 of this Publication)

Location	Type	Dry Soil Collected			^{90}Sr			^{137}Cs			^{144}Ce +^{144}Pr
		Weight (%)	Ca (%)	K (%)	pCi/kg	mCi/km²	mCi/gCa	pCi/kg	mCi/km²	mCi/gK	mCi/km²
Jul. 1966											
Sapporo, HOKKAIDO	Green	94.86	0.120	0.381	432	16.5	360	331	12.7	87	13.2
Aomori, AOMORI	Bare	90.02	0.252	0.311	1276	33.0	506	1175	30.4	378	2.5
Murata, MIYAGI	Green	93.11	0.394	0.326	720	22.6	183	592	18.6	182	34.5
Mito, IBARAGI	〃	89.73	0.768	0.273	518	18.3	68	1151	40.7	422	41.4
Yokohama, KANAGAWA	〃	83.35	0.918	0.301	135	3.7	15	1947	53.3	647	31.8
Atsumi, AICHI	〃	95.84	0.203	0.155	425	19.4	210	906	41.3	585	6.6
Miyazu, KYOTO	〃	97.70	0.090	0.251	575	18.2	639	622	19.7	248	12.7
Tsuyama, OKAYAMA	〃	91.22	0.137	0.285	500	15.3	365	881	27.0	309	10.5
Tottori, TOTTORI	〃	98.70	0.23	0.10	564	28.5	245	1326	67.0	1326	68.6
Kochi, KOCHI	〃	92.22	0.616	0.195	141	5.0	23	1709	60.6	877	43.4
Nagasaki, NAGASAKI	〃	95.28	1.089	0.283	1188	33.7	109	1372	38.9	485	57.7
Yamakawa, KAGOSHIMA	〃	93.37	1.804	0.229	568	17.7	32	1250	38.9	546	46.8
Aug. 66											
Tsuruga, FUKUI	〃	96.72	0.166	0.252	593	25.4	357	1425	61.1	566	68.4
Mihama, 〃	〃	99.25	0.335	0.142	599	32.7	179	2962	161.7	2086	31.2
Fukui, 〃	〃	92.02	1.026	0.289	1140	42.7	111	1723	64.6	596	57.7
Hiroshima, HIROSHIMA	〃	96.47	0.322	0.290	652	22.6	202	1754	60.9	605	74.0
Sawara, FUKUOKA	〃	93.96	0.22	0.083	432	20.1	196	1096	51.0	1320	33.4

Location	Type	Dry Soil Collected			^{90}Sr			^{137}Cs			$^{144}Ce + ^{144}Pr$
		Weight (%)	Ca (%)	K (%)	pCi/kg	mCi/km²	mCi/gCa	pCi/kg	mCi/km²	mCi/gK	mCi/km²
Sept. 66											
Wakayama, WAKAYAMA	Green	98.66	1.88	0.25	315	12.9	17	801	32.9	320	31.6
Nov. 66											
Sapporo, HOKKAIDO	Bare	97.10	0.96	0.20	122	6.7	13	217	12.0	109	10.0
Aomori, AOMORI	Green	88.78	0.14	0.20	333	14.8	238	165	7.3	83	38.1
Murata, MIYAGI	Bare	93.06	0.59	0.12	62	3.0	11	88	4.2	73	
Yokohama, KANAGAWA	〃	95.30	2.43	0.13	145	6.3	6	258	11.2	198	12.4
Akabane, AICHI	〃	97.57	0.51	0.45	187	11.0	37	337	19.8	75	13.5
Wakayama, WAKAYAMA	Green	98.50	0.34	0.22	109	5.6	32	265	13.6	120	12.9
Tsuyama, OKAYAMA	Bare	97.41	0.42	0.20	128	8.9	30	367	25.6	184	21.3
Kochi, KOCHI	〃	96.43	1.41	0.19	276	15.7	19	939	53.3	494	31.0
Sawara, FUKUOKA	〃	98.06	0.16	0.31	34	1.9	21	790	45.4	255	35.2
Dec. 66											
Mito, IBARAGI	〃	89.45	1.85	0.11	303	14.0	16	567	26.2	515	19.9
Mihama, FUKUI	〃	99.48	0.15	0.075	305	17.0	203	3820	213.2	5093	65.5
Tsuruga, 〃	〃	99.08	0.24	0.14	173	11.6	72	769	51.6	549	25.1
Fukui, 〃	〃	98.06	0.26	0.18	241	12.7	93	141	7.4	78	5.5
Miyazu, KYOTO	〃	98.93	0.32	0.30	207	11.2	65	319	17.3	106	15.3
Tottori, TOTTRI	〃	98.07	0.39	0.18	284	21.1	73	1119	83.2	622	67.3
Hiroshima, HIROSHIMA	〃	98.90	0.55	0.60	159	11.0	29	568	39.2	95	34.3
Nagasaki, NAGASAKI	〃	93.24	0.42	0.11	337	23.3	80	603	36.4	548	39.9
Yamakawa, KAGOSHIMA	〃	97.27	1.58	0.064	120	7.8	8	129	8.4	202	9.9

Human Data

Cesium-137 in Human Urine

(National Institute of Radiological Sciences)

Since 1963, the cesium-137 content in human urine has been determined to estimate the population's cesium-137 body burden.

Daily urine samples were collected monthly from the same male individuals selected from the staffs of the National Institute of Radiological Sciences and the Institute of Public Health. The samples were occasionally collected from students of the police school in Saitama prefecture.

Urine samples were acidified with nitric acid after addition of a cesium carrier. Cesium was coprecipitated with ammonium molybdophosphate and the precipitate was dissolved in a sodium hydroxide solution. The solution was passed through a column of Dowex 50 W-X 12 ion exchange resin (H^+ type) on which cesium was retained. Finally, cesium was precipitated in form of platinochlorate and its beta-activity was determined by use of a low-background counter. Determination of potassium was carried out by flame photospectrometry.

Results obtained from April 1964 to March 1967 are shown in Tables 12 and 13.

Figures 11 and 12 show the variations of the monthly average content of daily urine.

Table 12. ^{137}Cs in Human Urine —Apr. 1964 to Mar. 1967—

By M. Saiki and M. Uchiyama
(National Institute of Radiological Sciences)

(Continued from Table 13, Issue No. 6 of this publication)

Results obtained from the staffs of National Institute of Radiological Sciences and National Institute of Public Health

Subject	pCi	C. U.	Subject	pCi	C. U.	Subject	pCi	C. U.	Subject	pCi	C. U.
Apr. 1964			S	98	83	S	100	80	K	98	62
A	133	67	Y	110	140	U	126	58	I	64	44
K	60	52	Av.	131	91	I	87	59	Y	79	126
K	102	65				Y	135	66	S	66	71
I	73	112	**Jul. '64**			I	119	96	S	89	94
S	124	96	A	123	83	W	48	56	K	82	68
Y	119	99	K	40	140	Av.	100	100	I	75	62
S	58	94	K	98	63				I	90	59
Av.	95	83	I	86	72	**Sept. '64**			Y	101	87
May '64			S	174	76	A	76	63	Av.	78	67
A	145	50	Y	118	143	K	34	42			
K	120	55	S	114	120	K	70	99	**Nov. '64**		
K	189	91	S	140	130	I	63	48	A	66	46
I	104	57	I	97	116	S	103	82	K	87	59
S	138	75	U	138	111	S	80	81	K	45	62
S	82	128	Av.	113	105	K	35	33	S	23	40
Av.	130	76				I	78	62	Y	110	85
Jun. '64			**Aug. '64**			I	94	67	K	58	79
A	158	76	A	89	53	U	77	53	I	40	67
K	99	71	K	93	52	Y	83	67	S	84	78
K	147	100	K	87	63	W	100	66	I	68	45
I	84	57	I	111	406	Av.	74	63	I	69	63
S	221	112	S	108	93				Y	64	62
			Y	87	91	**Oct. '64**			W	53	53
			S	109	131	A	70	65	Av.	64	61

Subject	pCi	C. U.
Dec. '64		
A	37	41
K	119	42
K	43	35
Y	98	66
K	76	37
I	47	35
S	75	61
I	79	48
I	80	51
Y	99	76
W	74	61
U	118	54
Av.	79	51
Jan. 1965		
S	126	71
K	160	93
A	74	59
K	62	67
I	76	60
I	116	71
U	91	61
I	111	73
Y	102	54
W	79	59
Y	149	101
K	153	48
Av.	108	68
Feb. '65		
A	112	71
Y	143	138
I	60	63
K	118	70
M	120	48
I	103	52
U	129	72
W	80	46
I	99	91
Y	92	56
Av.	106	71
Mar. '65		
I	93	83
U	99	56
I	83	69
Y	83	61
W	97	71
K	160	52
I	82	65
Av.	100	65
Apr. '65		
I	82	79
U	93	42
K	86	72
K	119	87
M	82	100
O	104	69
O	93	46
N	68	49
I	79	73
U	87	57
Y	72	47
I	108	54
K	111	49
Y	106	81
W	76	57
K	103	52
K	137	67
Av.	94	64
May '65		
I	85	92
U	77	67
K	76	79
H	89	78
K	109	77
M	64	80
O	72	80
O	96	70
N	73	70
I	85	53
K	91	61
Y	93	79
U	96	85
Y	58	65
I	95	55
W	111	80
I	85	77
K	118	36
Av.	88	71
Jun. '65		
I	89	79
U	78	56
K	96	81
M	68	105
O	62	84
O	92	46
I	92	70
K	102	51
U	82	83
K	83	64
H	59	63
N	65	56
Y	69	63
I	72	62
W	72	35
Y	77	61
I	30	43
K	72	36
Av.	76	63
Jul. '65		
N	66	56
Y	81	70
O	61	54
K	76	79
O	85	65
U	73	45
I	74	18
W	80	41
I	62	41
M	57	55
U	79	54
K	73	43
Y	47	38
I	70	43
K	72	44
H	65	42
K	98	73
I	50	51
Av.	70	49
Aug. '65		
U	67	34
I	70	60
M	39	88
K	65	52
O	88	49
O	69	68
N	71	63
K	50	39
H	60	60
I	69	72
U	65	55
Y	78	67
I	70	46
W	92	46
Y	110	58
K	93	44
K	111	58
I	66	53
Av.	74	57
Sept. '65		
K	83	46
U	77	39
O	61	54
K	76	53
M	49	58
Y	101	75
I	75	55
K	64	38
I	81	50
U	65	55
I	84	54
Y	51	36
N	58	44
H	76	44
O	74	28
W	95	56
K	64	52
I	47	49
Av.	71	49
Oct. '65		
K	70	49
U	61	36
M	71	75
K	73	63
I	74	50
Y	50	37
H	63	45
O	68	27
U	97	159
Y	79	52
K	72	36
I	70	50
N	60	51
I	86	48
W	76	43
I	53	40
Av.	70	54
Nov. '65		
K	102	67
I	104	61
H	73	84
U	80	50
N	59	88
W	55	25
I	81	51
K	76	51
Y	70	64
O	83	43
Y	70	36
M	54	47
K	80	46
I	82	52
O	59	53
K	105	45
I	50	41
Av.	77	54
Dec. '65		
K	77	50
I	41	31
I	69	70
K	100	67
O	65	53
Y	63	68
M	51	67
K	71	63
U	69	34
O	70	37
K	66	55
H	67	57
W	42	35
N	46	61
I	69	45
U	62	72
Y	48	42
Av.	63	53
Jan. 1966		
K	65	37
I	71	42
I	56	51
N	49	56
K	68	44
K	63	44
Y	68	43
U	58	41
O	56	36
I	60	39
K	33	34
U	60	59
O	62	32
W	51	32
Y	71	48
Av.	58	41
Feb. '66		
I	78	46
N	51	49
Y	56	38
K	82	37
I	64	49
W	56	58
O	63	59
K	68	45
O	67	30
Y	73	45

Subject	pCi	C. U.	Subject	pCi	C. U.	Subject	pCi	C. U.	Subject	pCi	C. U.
H	60	47	**Jun. '66**			M	50	58	I	55	36
K	60	39	K	85	56	K	48	39	K	45	37
I	69	51	H	63	48	W	37	29	O	70	63
M	52	90	K	69	44	K	64	41	Y	44	31
U	61	56	I	80	93	I	68	39	U	46	48
I	37	30	M	65	92	O	67	25	Av.	57	39
K	73	44	S	83	42	K	49	59			
Av.	63	48	K	65	37	Y	56	67	**Mar. 1967**		
			W	40	30	O	64	81	K	59	27
Mar. '66			K	106	47	Av.	56	47	H	45	37
H	60	47	I	79	49				K	51	35
I	55	27	O	45	56				U	33	26
K	55	47	K	80	49				I	58	46
I	51	36	Y	74	32				M	43	68
M	31	39	U	49	59	**Dec. '66**			K	53	39
K	59	79	Av.	70	52	K	66	37	W	45	31
K	74	58				H	67	29	K	52	31
W	41	20				K	65	33	I	47	41
Y	48	33				U	54	36	O	51	68
I	59	44	**Sept. '66**			I	57	46	Y	38	34
O	49	27	K	74	29	M	47	58	U	55	46
Y	52	54	H	48	46	S	73	43	Av.	48	41
U	58	59	K	56	38	W	58	29			
Av.	53	44	U	45	36	K	42	30			
			I	55	66	O	60	30			

Table 13. ^{137}Cs in Human Urine —Jul. 1964 to Mar. 1965—

By M. Saiki and M. Uchiyama
(National Institute of Radiological Sciences)

Results obtained from the staffs of the police school in Saitama prefecture

Subject	pCi	C. U.	Subject	pCi	C. U.	Subject	pCi	C. U.
Jul. 1964			**Nov. '64**			**Mar. '65**		
I	161	132	I	58	43	1	74	59
I	96	73	I	54	45	2	89	87
H	171	122	I	71	69	3	74	50
N	104	87	S	61	44	4	96	67
O	88	121	H	106	79	5	64	49
S	81	92	T	52	78	6	72	74
Av.	117	105	Av.	68	60	Av.	78	64
Sept. '64			**Jan. 1965**					
I	71	95	1	76	65			
I	34	38	2	88	75			
H	74	88	3	107	80			
N	121	111	4	93	70			
O	69	38	5	102	90			
S	77	55	6	73	52			
Av.	74	71	Av.	90	72			

Figure 11. The Variation of ^{137}Cs in Human Urine
—Apr. 1964 to Mar. 1967—

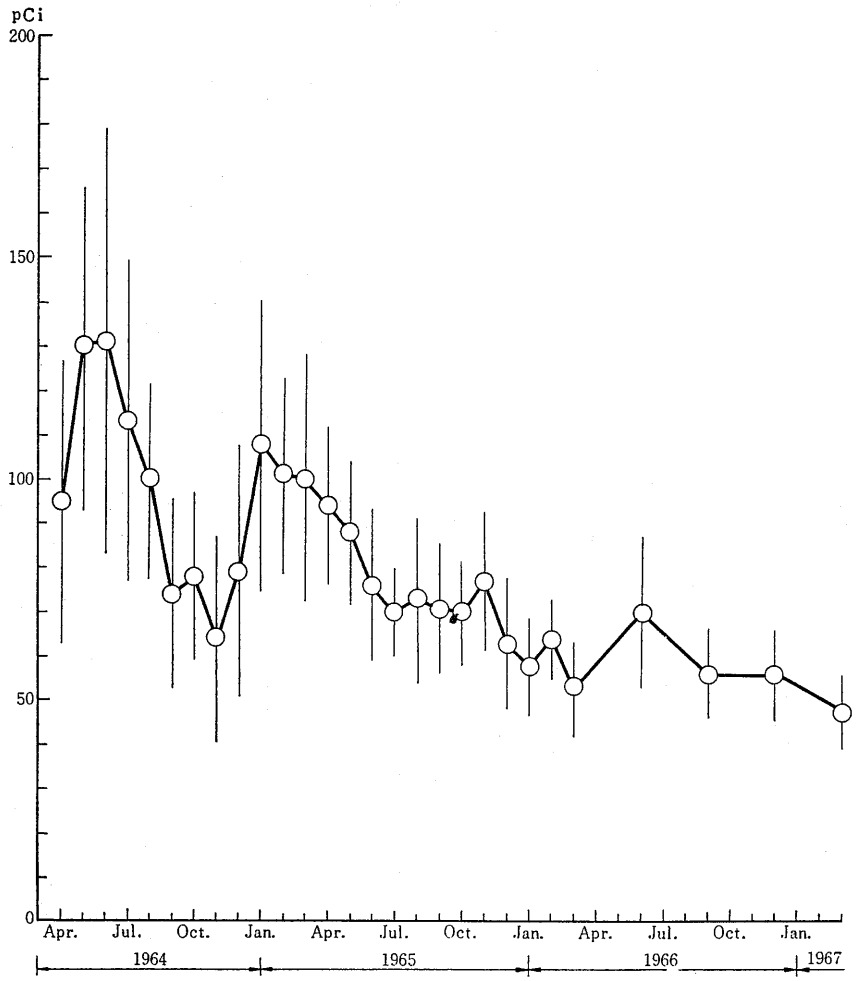
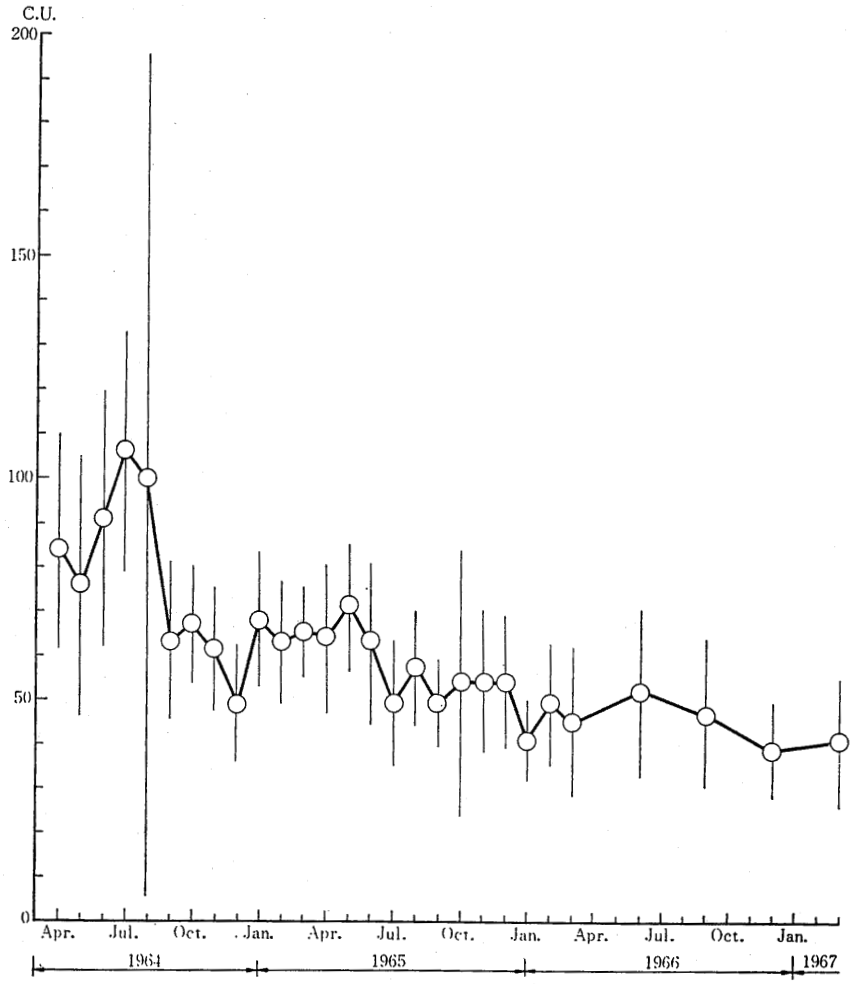


Figure 12. The Variation of Cesium Unit (pCi of ^{137}Cs/gK) in Human Urine
—Apr. 1964 to Mar. 1967—



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

Meteorological Data

Gross Beta-radioactivity in Rain and Dry Fallout

Part 1 *(Meteorological Agency)*

Survey of gross beta-activity in precipitation and airborne dusts has been conducted with the network of 13 stations shown in Figure 13. Processes of sampling and counting are the same ones with that in the explanation on page 2, Issue No. 5 of this publication series.

The seventh nuclear test of the People's Republic of China was carried out on the 24th of December, 1967 according to the news reportings. The results obtained during the period from the 23rd of December, 1967 to the 21st, January, 1968 are shown in Tables 14 and 15. Both airborne dust radioactivity concentrations and radioactive deposits in these period were comparably low with the exception of two or three peaks.

The first arrival of the fallout was on the 25th of December, 1967 but the radioactivity concentrations were very low. Transit of the radioactive cloud over Japan can be understood by Meteorological trajectories drawn in Figure 14 in which showed the starting time and location of air parcel assumed as $03^{h}00^{m}$ (GMT) on the 24th of December and 90°E, 40°N respectively.

Characteristics of the fallout in this case may be summarized as follows, i, e, (1) very early arrival or transit of the fallout cloud, (2) very low concentrations of the first fallout, (3) appearance of the second or third fallout after passed the course of arround the world in which radioactivity concentrations are higher than the first.

These situation can be understood as compared with the circumpolar trajectory chart of 300 mb level shown in Figure 15, and the time variation of gross beta-activity in precipitation and airborne dusts shows in Figure 16.

Figure 13. Fallout Observation Network of Meteorological Agency

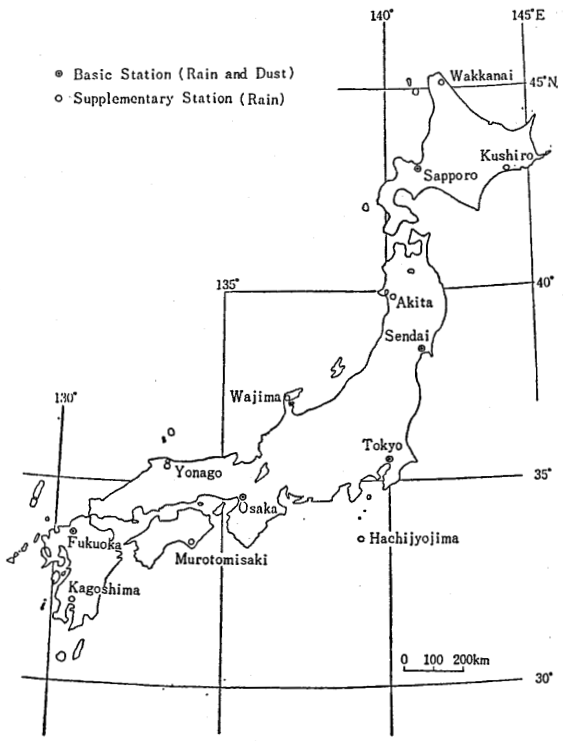


Table 14. Gross β-activity in Rain —Dec. 23, 1967 to Jan. 21, 1968—

Compiled by N. Murayama, H. Fujimoto, H. Ueno, H. Shimura and S. Maeshima
(Meteorological Agency)

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

Station \ Date	Dec. 1967 23	24	25	26	27	28	29	30	31	Jan. 1968 1	2	3	4	5	6
Wakkanai			0.0				0.0						0.0	0.0	
//			0.0				0.0						0.0	0.0	
Sapporo			0.0				0.0			0.0			0.0		
//			0.0				0.0			0.0			0.0		
Kushiro	0.0					0.1	0.0								
//	0.0					0.6	0.0								
Sendai						0.0									
//						0.0									
Akita	0.0		0.0	0.0	0.0	0.0							0.0	0.0	
//	0.0		0.0	0.0	0.0	0.0							0.0	0.0	
Tokyo															
//															
Wajima	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.0		0.0	0.0	0.1	0.1	0.0	0.1
//	0.0	0.0	2	0.0	0.6	2	0.0	0.0		0.0	0.0	3	0.8	0.0	3
Hachijojima															
//															
Osaka					0.0										
//					0.0										
Yonago	0.0	0.0	0.1			0.1	0.0	0.0		0.2	0.1				
//	0.0	0.0	0.4			1	0.0	0.0		1	0.1				
Murotomisaki					0.0										
//					0.0										
Fukuoka	0.0			0.3	0.0		0.1	0.1	0.1	0.0		0.0			
//	0.0			0.3	0.0		0.6	0.1	0.2	0.0		0.0			
Kagoshima					0.0	0.0	0.0		0.0	0.0					
//					0.0	0.0	0.0		0.0	0.0					

Station \ Date	Jan. 1968 7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Wakkanai		0.0	0.0		0.3					0.0	0.2		0.1	0.2	
//		0.0	0.0		0.4					0.0	0.7		0.3	1	
Sapporo		0.1	0.6	0.0	1.0	0.2		1.1		0.0			0.0		0.1
//		0.9	5	0.0	3	0.4		1.1		0.0			0.0		0.2
Kushiro								0.4							
//								2							
Sendai								0.1	0.0			0.1			
//								0.1	0.0			0.4			
Akita		0.3	0.0	0.1	0.2			0.1	0.2	0.3	0.3		0.1		
//		3	0.0	0.5	2			0.6	0.7	2	0.7		0.5		
Tokyo	0.2							0.4							
//	1							2							
Wajima	1.3	0.3	0.2	0.1	0.3			0.1	0.1	0.0	0.1	0.2	0.2		0.3
//	5.5	2	5	0.2	2			0.9	2	0.0	0.5	2	1		1
Hachijojima															
//															
Osaka	0.1						0.8	0.4	0.1						
//	2						1	3	0.4						
Yonago	0.4	0.2	1.0		0.5			1.5	0.1	0.1	0.1	1.0			
//	5	3	20		1			1.8	3	2	0.4	3			
Murotomisaki							0.0								
//							0.0								
Fukuoka	0.1				0.2		0.2		0.2						
//	2				1		2		3						
Kagoshima					0.1		0.1	0.0	0.1						
//					1		1	0.0	0.7						

Table 15. Gross β-activity in Dust —Dec., 23, 1967 to Jan., 21, 1968—

Compiled by H. Fujimoto, H. Ueno, H. Shimura and S. Maeshima
(Meteorological Agency)

(pCi/m³)

Station	Dec. 1967 23	24	25	26	27	28	29	30	31	Jan. 1968 1	2	3	4	5	6
Sapporo			0.0	0.0	0.2	0.2	0.2							0.0	
Sendai			0.2	0.5	0.2	0.2	0.0					0.5		0.7	
Tokyo			0.3	0.9	0.7	0.7	0.3			0.5		0.9		0.7	
Osaka			1.0	1.2	0.5	0.2	0.2							1.2	
Fukuoka			1.2	0.7	0.0	0.0	0.0			0.0			0.2	0.5	

Station	Jan. 1968 7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Sapporo		0.2		0.5		0.0					0.0		0.0		
Sendai		0.2		1.0		0.7					0.0		0.2		
Tokyo		0.4		0.7		1.0			0.3		0.7		0.6		
Osaka		0.5		0.5		1.4					0.7		0.7		
Fukuoka		0.5		0.7		1.2			0.0		0.5		0.7		

Figure 14. The Meteorological Trajectory at the Time when The 7th Nuclear Test was carried out by the People's Republic of China

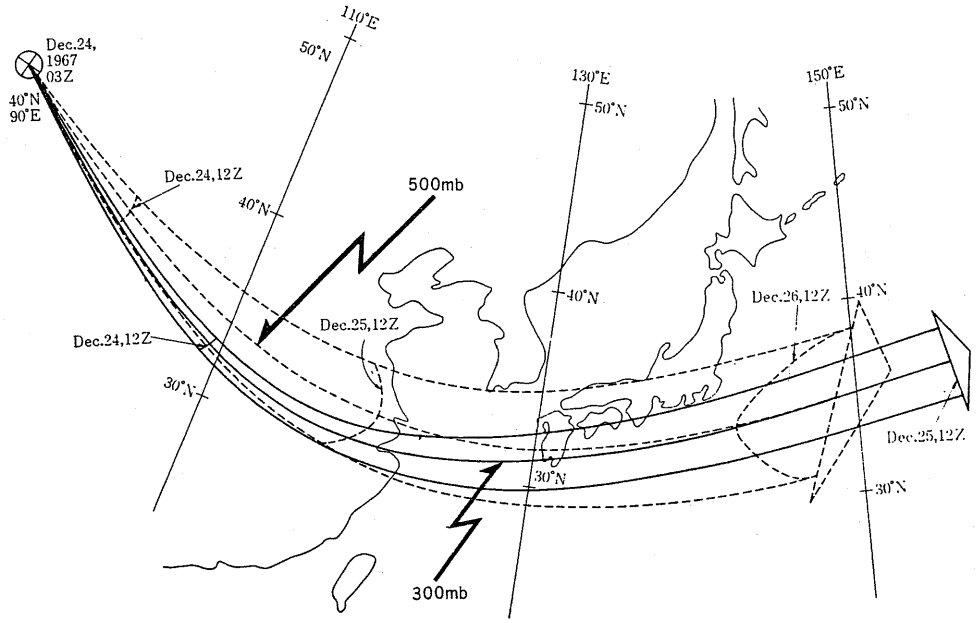


Figure 15. The Circumpolar trajectory of 300 mb Level in association with the December 24, 1967 explosion.

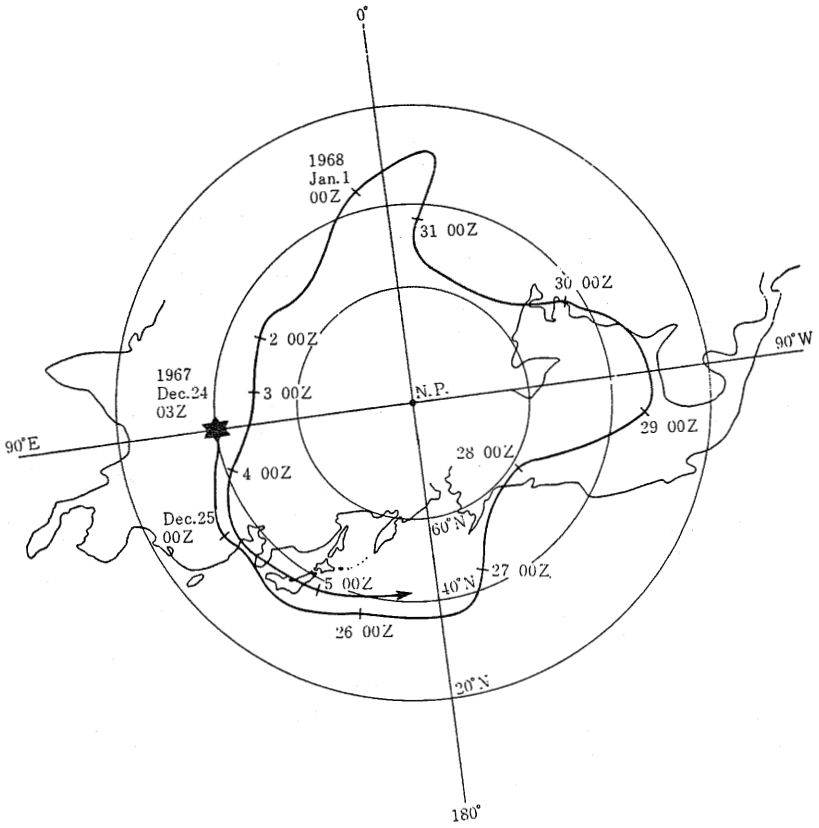
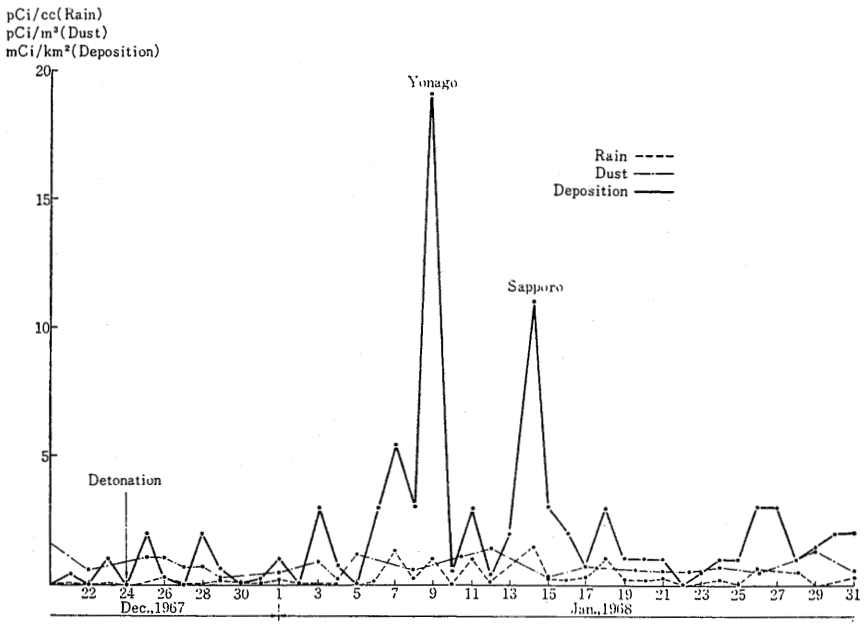


Figure 16. Temporal Variation of Gross β-activity in Rain and Dust near the Ground (Maximum Value: in Japan)



Part 2 *(Meteorological Research Institute, Tokyo)*

The Meteorological Research Institute, Tokyo, measured beta-radioactivity in rain and dry fallout collected in a tray at the institute.

Results of measurements obtained during the period from the 14th of December, 1967 to the 22nd of January, 1968 when the effect of the seventh nuclear test by the People's Republic of China was noticed, are shown in Table 16.

Table 16. Deposits of Radioactive Fallout —Dec. 14, 1967 to Jan. 22, 1968—
By Y. Miyake, K. Saruhashi, Y. Katsuragi and T. Kanazawa
(Meteorological Research Institute, Tokyo)

Date of Sampling		Duration of Collection (hr)	Total β-activity (mCi/km^2)	Remarks
Dec., 1967				
9.00 a.m.,	14th to 9.00 a.m., 15th	24	0.08	Rain (17.6 mm)
〃	15〃 〃 〃 16〃	〃	0.01	Dry fallout
〃	16〃 〃 〃 17〃	〃	0.01	〃
〃	17〃 〃 〃 18〃	〃	0.01	〃
〃	18〃 〃 〃 19〃	〃	0.01	〃
〃	19〃 〃 〃 20〃	〃	0.17	Rain (11.3 mm)
〃	21st 〃 〃 22nd	〃	0.01	Dry fallout
〃	22nd 〃 〃 23rd	〃	0.01	〃
〃	23rd 〃 〃 24th	〃	0.01	〃
〃	24th 〃 〃 25〃	〃	0.01	〃
〃	25〃 〃 〃 26〃	〃	0.02	〃
〃	26〃 〃 〃 27〃	〃	0.43	〃
〃	27〃 〃 〃 28〃	〃	0.27	〃
〃	28〃 〃 10.00 a.m., 29〃	25	0.06	〃
10.00 a.m.,	29〃 〃 1.00 p.m., 30〃	27	0.01	〃
1.00 p.m.,	30〃 〃 10.00 a.m., 31st	21	0.01	〃
10.00 a.m.,	31st 〃 2.00 p.m., 2nd Jan. 1968	52	0.01	〃
Jan., 1968				
2.00 p.m.,	2nd to 9.00 a.m., 4th	43	0.02	Dry fallout
9.00 a.m.,	4th 〃 〃 5〃	24	0.01	〃
〃	5〃 〃 〃 6〃	〃	0.02	〃
〃	6〃 〃 〃 7〃	〃	2.30	Rain (5.0 mm)
〃	8〃 〃 〃 9〃	〃	0.08	Dry fallout
〃	9〃 〃 〃 10〃	〃	0.12	〃
〃	10〃 〃 〃 11〃	〃	0.04	〃
〃	11〃 〃 〃 12〃	〃	0.12	〃
〃	12〃 〃 〃 13〃	〃	0.01	〃
〃	13〃 〃 〃 14〃	〃	0.39	Rain (4.3 mm)
〃	16〃 〃 〃 17〃	〃	0.01	Dry fallout
〃	17〃 〃 〃 18〃	〃	0.01	〃
〃	18〃 〃 〃 19〃	〃	0.03	〃
〃	19〃 〃 〃 20〃	〃	0.02	〃
〃	20〃 〃 〃 22nd	48	0.12	Rain (0.1 mm)

Chemical Composition of Dry Fallout

(Meteorological Research Institute, Tokyo)

The Meteorological Research Institute, Tokyo carried out radiochemical analysis of fallout particles collected from the 26th to the 27th of December, 1967 when the effect of the seventh nuclear test by the People's Republic of China was detected. Results obtained are indicated in Table 17.

Table 18 shows the contents and ratios of uranium-237 and neptunium-239 in fallout particles originated from the seven nuclear tests by the People's Republic of China.

Table 17. Radiochemical Analysis of Fallout Particles
Date of sampling: Dec. 26 to 27, 1967
(The value reduced on the 9th of January, 1968)
By Y. Miyake, K. Saruhashi, Y. Katsuragi, T. Kanazawa and Y. Sugimura
(Meteorological Research Institute, Tokyo)

Nuclides	(Percentage in Activity) Fission and induced product
^{237}U	0.5%
^{239}Np	1.5
^{99}Mo, ^{132}Te, ^{103}Ru, ^{106}Ru, ^{106}Rh	10.5
^{95}Zr, ^{95}Nb	22.8
^{89}Sr, ^{90}Sr, ^{140}Ba	2.4
Rare Earth Elements	62.2

Table 18. Contents and Ratios of ^{237}U and ^{239}Np in bomb debris
By Y. Miyake, K. Saruhashi, Y. Katsuragi, T. Kanazawa, and Y. Sugimura
(Meteorological Research Institute, Tokyo)
(7 days after test)

Date of test	^{237}U (%)	^{239}Np (%)	$^{237}U/^{239}Np$
Oct. 16, 1964 (The 1st Test)	3.5	57.3	0.06
May 14, 1965 (The 2nd Test)	1.0	31.2	0.03
May 9, 1966 (The 3rd Test)	0.8	2.5	0.32
Oct. 27, 1966 (The 4th Test)	0.9	21.4	0.04
Dec. 28, 1966 (The 5th Test)	4.8	26.8	0.18
Jun. 17, 1967 (The 6th Test)	16.4	56.5	0.29
Dec. 24, 1967 (The 7th Test)	0.4	7.3	0.05

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 17 shows three sampling areas of Japan and results obtained are shown in Table 19.

As to the seventh nuclear test, the considerable large amount of radioactivity was detected especially in Chubu sky area.

It is assumed that the phenomenon was caused by the low decay of radioactivity and the small spread of horizontal diffusion of radioactive cloud, because the radioactive cloud reached the Japan sky area one or two days faster than the past nuclear tests.

Figure 18 shows the temporal variation of gross beta-activity in upper air at altitudes from 6 km to 12 km.

Figure 17. Three Sampling Areas of Japan

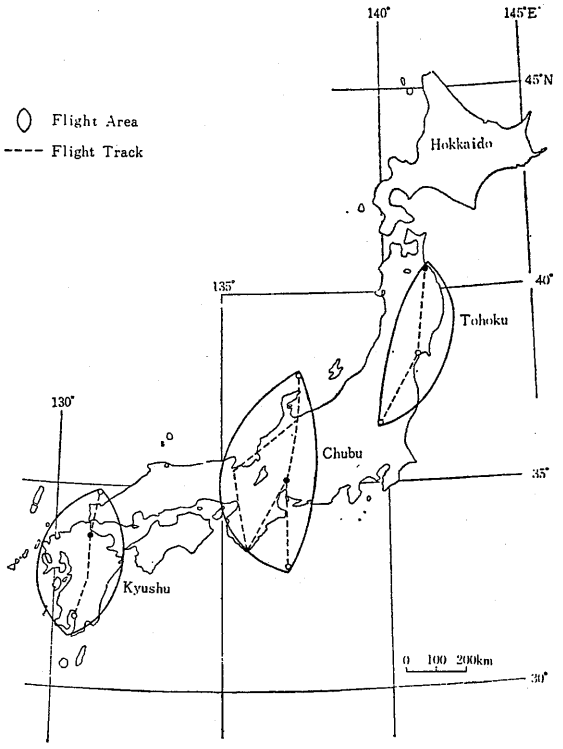


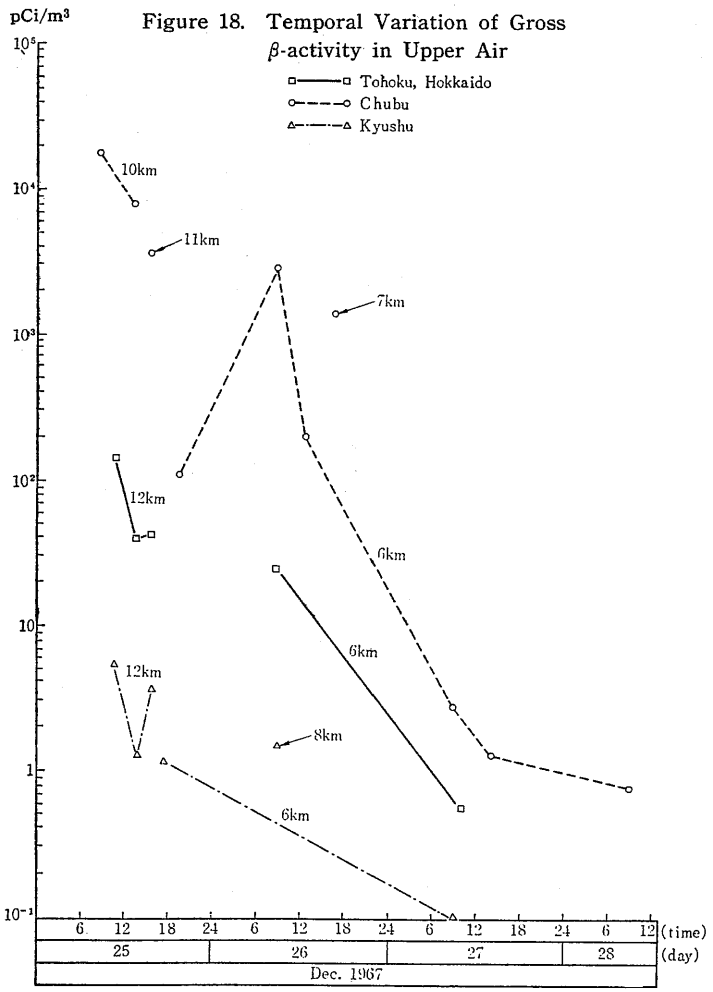
Table 19. Gross β-activity in Upper Air —Dec., 25 to Dec., 28, 1967—

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

(pCi/m³)

Sky Area / Date	Tohoku		Chuba				Kyushu		
	12,000 m	6,000 m	11,000 m	10,000 m	7,000 m	6,000 m	12,000 m	8,000 m	6,000 m
Dec., 25, 1967									
11.00 a.m.	105.0			17,960.0			5.4		
2.00 p.m.	39.6			8,800.0			1.4		
4.00 p.m.	41.2		3,677.5				3.7		
6.00 p.m.									1.2
8.00 p.m.						113.3			
Dec., 26, 1967									
9.00 a.m.		24.5				2,859.0		1.6	
1.00 p.m.						203.4			
5.00 p.m.					1,450.0				
Dec., 27, 1967									
9.00 a.m.						2.8			0.1
10.00 a.m.		0.6							
2.00 p.m.						1.4			
Dec., 28, 1967									
9.00 a.m.						0.8			

Figure 18. Temporal Variation of Gross β-activity in Upper Air



Highly Radioactive Fallout Particles

(National Institute of Radiological Sciences)

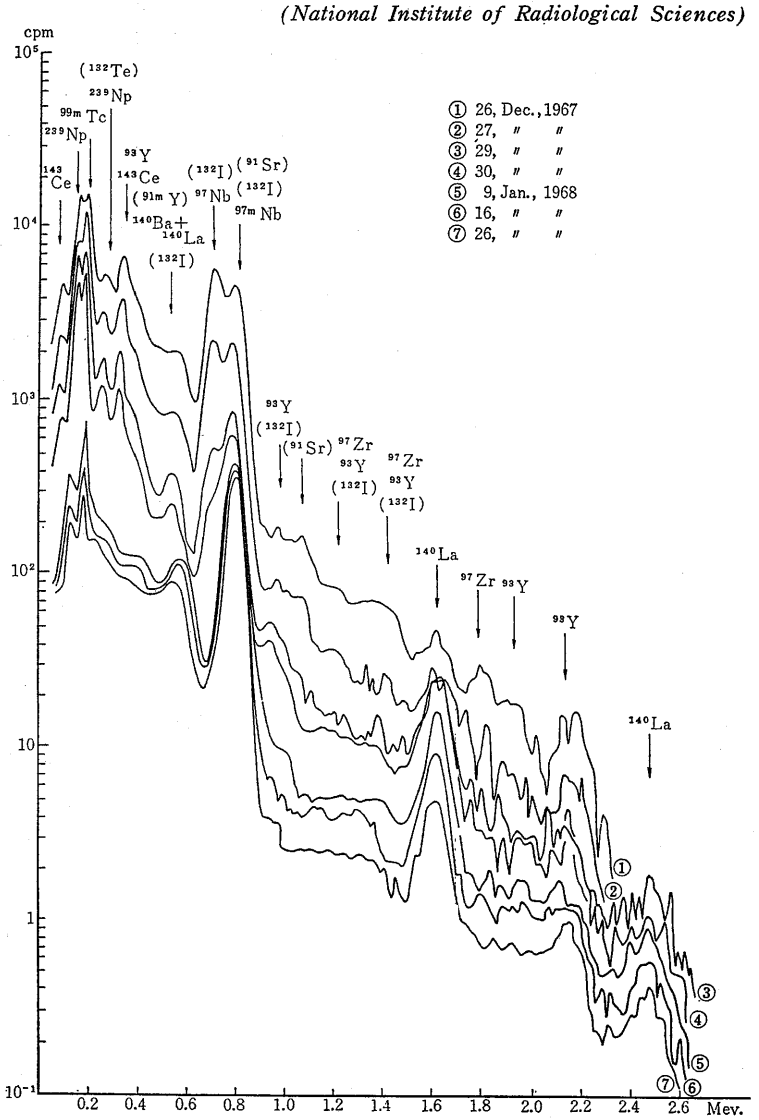
Daily rain and dry fallout samples were continously (from 9 a. m. to the next 9 a. m.) collected on the roof of the building of National Institute of Radiological Sciences in Chiba city, to determine the gross beta-activity and activity of radio-iodine. And also fall rate and gross beta-activity of highly radioactive fallout particles were determined every an hour using Geiger Müller survey meter.

In the samples collected every day in 1000 cm^2 during the period from 25 to 29 December, 1967, radioactiveties considered to be originated from the debris of the 7th nuclear test carried out on the 24th of December, 1967, were not detected.

During 2 p.m. to 3 p.m. of 26 December, 1967, 3 particles having highy radioactivity of up to 70 mμCi, were detected in 7 m^2. The particles were analyzed by a scintillation gamma-ray spectroscopic method.

The variation in gamma-ray spectroscopic method are shown in Figure 19. From results of estimation on gamma-ray energie and decay, those particles were presumed to contain Np-239, Mo-99+Tc-99 m, Ba-140+La -140, Ce-143, Zr-97+Nb-97 m+Nb-97, Te-132+I-132, Sr-91+(Y-91 m)+Y-91 and Sr-93+Y-93 etc, and the particles were considered to be originated from the debris of the 7th nuclear explosion test.

Figure 19. Gamma-ray Spectrum of Highly Radioactive Fallout Particles
By. M. Saiki and H. Kamada
(National Institute of Radiological Sciences)



Dietary Data

Radioactive Iodine in Milk

(National Institute of Radiological Sciences)

The concentration of radioactive iodine in raw milk was determined by National Institute of Radiological Sciences during the period from 27 to 30, December, 1967.

The raw milk samples were taken from a farm through a milk collecting center located in the northern part of Chiba Prefecture.

Iodine in the raw milk samples was chemically separated and measured for radioactivity by a low background beta counter using Iodine-131 standards.

Results obtained are shown in Table 20.

Any significant concentrations of radioiodine were not detected during the above period.

Table 20. Radioactive Iodine in Milk in the northern part of Chiba prefecture
—27 to 30, December, 1967—
By G. Tanaka and H. Kawamura
(National Institute of Radiological Sciences)

Date of Sampling	Date of Determination	Concentration of Radioactivie Iodine (pCi/*l*)
27, Dec., 1967	29, Dec., 1967	0.26 ± 0.77
30, 〃 〃	30, 〃 〃	0.24 ± 0.93