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RADIOACTIVITY SURVEY DATA in Japan

NUMBER 38
Nov. 1973

National Institute of Radiological Sciences
Chiba, Japan

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THE SURVEY RESULTS OF THE 15TH NUCLEAR EXPLOSION TEST CARRIED OUT BY THE PEOPLE'S REPUBLIC OF CHINA

Science and Technology Agency
National Institute of Radiological Sciences

THE SURVEY RESULTS OF THE 15TH NUCLEAR EXPLOSION TEST CARRIED OUT BY THE PEOPLE'S REPUBLIC OF CHINA

Preface

This edition is provided for the radioactivity survey results of fallout by the 15th Chinese nuclear explosion test.

The 27th of June in 1973, The People's Republic of China carried out the 15th nuclear explosion test. Concerning this test, atmospheric disturbance was observed at the nation-wide meteorological observatories. The scale of this explosion was equivalent to TNT 2 megatones.

Fallout radioactivity measurement of this tests was carried out at the nation-wide radioactivity survey stations from the 28th of June to the 17th of July.

Meantime, comparatively high radioactivity was measured, i.e., 313pCi/m^3 of beta radioactivity in upper air at Northern Area and 220pCi/l of radioactivity iodine in milk at Miyagi prefecture.

The radioactivity survey results of this test were considerably lower than the values in the provisional guide of radioactivity countermeasures established by Radioactivity Countermeasures Headquarters.

Gross Beta-Radioactivity in the Rain and the Airborne Dust

(Japan Meteorological Agency)

The 15th nuclear test of the People's Republic of China was carried out on 27 June 1973. It is believed that the test area was somewhere in the neighbourhood of Lake Lop Nor (40°N, 90°E), about 4,000 km west-northwest of Tokyo.

Slight abnormal microbarographic disturbance which was caused by the nuclear test was observed at several stations in Japan as shown in Table 1 and Figure 1.

It is estimated from the air mass trajectory shown in Figure 2 that the radioactive debris released in the troposphere first passed in an altitude of about 10 km (300 mb level) over the central Japan two days after the explosion.

The data of gross beta-radioactivity obtained from the rains during the 1–10 July period and from the airborne dust during the 28 June–11 July period are shown in Tables 2 and 3.

As seen in Table 3 the radioactive dust flew in Japan from west to east, a relatively high gross beta-radioactivity value detected 2.4pCi/m^3 in Fukuoka on 1 July, and 6.0 pCi/m^3 in Sendai on 4 July. Later in areas north of Kanto values returned to almost normal. However, western Japan had high values again on the 6–8 July period.

A nation-wide distribution of the radioactive rain could not be obtained under the enforced observation network because of few rainfalls which reached measurable amounts of 1mm/day. However, as seen in Table 2, a relatively high value, 7.0 pCi/cc, was observed in Wajima in the rains during the 30 June -- 1 July period, the maximum value, 12.0 pCi/cc, in Yonago during the 1–2 July period, and values ranging from 1.0 pCi/cc to 5.0 pCi/cc in various places by 8 July.

By 9 July the values of radioactive rain and dust returned to almost normal, which took a whole period of 8 or 9 days, characteristically a long period.

This long period of the radioactive abatement is explained with the 300 mb and 500 mb charts as follows.

From 27 June to 2 July westerlies were prevailing over Japan in which the fallout seems to have arrived over Japan in an altitude of 300 mb from just after the noon to the evening of 29 June (See Figure 2).

From around 3 July, however, a high pressure zone covered Korea through the Japan Sea as seen in Figure 3, and the situation continued up to around 7 July. This caused in the neighbourhood of Japan prevailing easterly winds, which brought back to western Japan the fallout once passed through to the Pacific.

Survey of gross beta-activity in rain and dry fallout has been conducted using the data from 13 stations of Japan Meteorological Agency shown in Figure 4 and Table 4.

The procedures of sampling and counting are same as those discribed on page 2 of the report No.5 of this publication series.

Table 1. The Microbarographic Disturbances due to the 15th Nuclear Test of the people's Republic of China, 27th June, 1973
Compiled by T. Nagai, T. Honda and K. Mori
(Japan Meteorological Agency)

Station		Time (G.M.T.)	Amplitude (mb)	Period (min)	Duration (min)
Wakkanai	(N45°25′ E141°41′)	07:52	0.0	3	30
Kushiro	(N42°59′ E144°24′)	08:07	0.0	3	20
Akita	(N39°43′ E140°06′)	07:55	0.0	3	39
Wajima	(N37°23′ E136°54′)	07:44	0.0	2	34
Tokyo	(N35°41′ E139°46′)	08:00	0.1	5	27
Yonago	(N35°26′ E133°21′)	07:32	0.1	3	25
Murotomisaki	(N33°15′ E134°11′)	07:48	0.0	3	29
Kagoshima	(N31°34′ E130°33′)	?	?	?	?

? : obscure

Table 2. Gross Beta-Radioactivity in Rain, 1st–10th July, 1973

Compiled by T. Nagai, T. Honda and K. Mori

(Japan Meteorological Agency)

Upper row: Concentration (pCi/cc)
Lower row: Deposition (mCi/Km^2)

Station \ Date	July 1973 1	2	3	4	5	6	7	8	9	10
Wakkanai	–	–	–	–	–	2.3 3.5	0.4 2.0	0.1 0.2	–	–
Sapporo	–	–	–	–	–	–	–	0.9 0.9	–	–
Kushiro	–	–	0.1 0.2	–	–	–	0.1 0.2	0.0 0.0	0.0 0.0	0.0 0.0
Sendai	–	–	–	–	–	–	–	–	–	0.5 0.5
Akita	–	–	–	–	–	–	–	3.1 12.0	–	–
Tokyo	–	0.8 10.0	5.0 50.0	–	–	–	–	–	–	–
Wajima	7.0 20.0	–	–	–	–	–	–	–	–	–
Hachijojima	–	0.2 0.9	–	–	–	–	–	–	–	–
Osaka	–	3.1 40.0	1.7 23.0	0.7 3.0	–	–	–	–	–	–
Yonago	–	12.0 60.0	–	–	–	–	–	–	–	–
Murotomisaki	–	–	–	–	–	–	–	–	–	–
Fukuoka	–	–	–	–	–	3.2 3.2	–	–	–	–
Kagoshima	–	3.5 14.0	1.1 96.0	1.7 23.0	–	–	–	–	–	–

– : Observation is not carried out because the daily rainfall amount is less than 1 mm.

Table 3. Gross Beta-Radioactivity in Dust, 28th June – 11th July, 1973

Compiled by T. Nagai, T. Honda and K. Mori

(Japan Meteorological Agency)

(pCi/m^3)

Station \ Date	June 1973 28	29	30	July 1973 1	2	3	4	5	6	7	8	9	10	11
Sapporo	0.1	0.2	0.0	0.3	0.2	0.3	0.9	0.2	0.3	0.1	0.1	0.1	0.1	0.5
Sendai	0.1	0.1	0.1	0.1	0.5	0.5	6.0	0.5	0.3	0.3	0.2	0.2	0.2	0.3
Tokyo	0.1	0.2	0.2	0.2	0.5	0.5	0.6	0.2	0.6	0.6	1.1	0.7	0.6	0.5
Osaka	0.3	1.1	0.3	0.3	1.6	2.3	1.3	0.7	1.3	1.0	4.0	0.7	0.7	0.7
Fukuoka	0.2	0.3	0.1	2.4	4.4	1.2	1.5	1.0	1.5	1.6	0.5	0.5	0.8	0.8

Table 4. Station Sites and Observational Items

Station No.	Name of Station	Lat (N)	Long (E)	Elevation	Observational items a	b	c	d	e	f
401	Wakkanai	45°25′	141°41′	2.8m	0					0
412	Sapporo	43°03′	141°20′	16.9m	0	0			0	
418	Kushiro	42°59′	144°24′	31.8m	0					0
590	Sendai	38°16′	140°54′	38.4m	0	0			0	
582	Akita	39°43′	140°06′	9.4m	0				0	0
662	Tokyo District Met. Obs.	35°41′	139°46′	6.5m	0	0			0	0
678	Hachijojima	33°06′	139°47′	79.7m	0					
600	Wajima	37°23′	136°54′	5.3m	0					0
772	Osaka	34°41′	135°31′	23.1m	0	0			0	
744	Yonago	35°26′	133°21′	6.5m	0					0
899	Murotomisaki	33°15′	134°11′	184.7m	0					0
807	Fukuoka	33°35′	130°23′	2.5m	0	0			0	
827	Kagoshima	31°34′	130°33′	4.3m	0					0

Elevation: The numerics give the elevation above mean sea level of observation field.

Observational items

a: precipitation
b: airborne dust
c: sea water
d: vertical distribution
e: precipitation and settled dust for chemical analysis
f: microbarograph

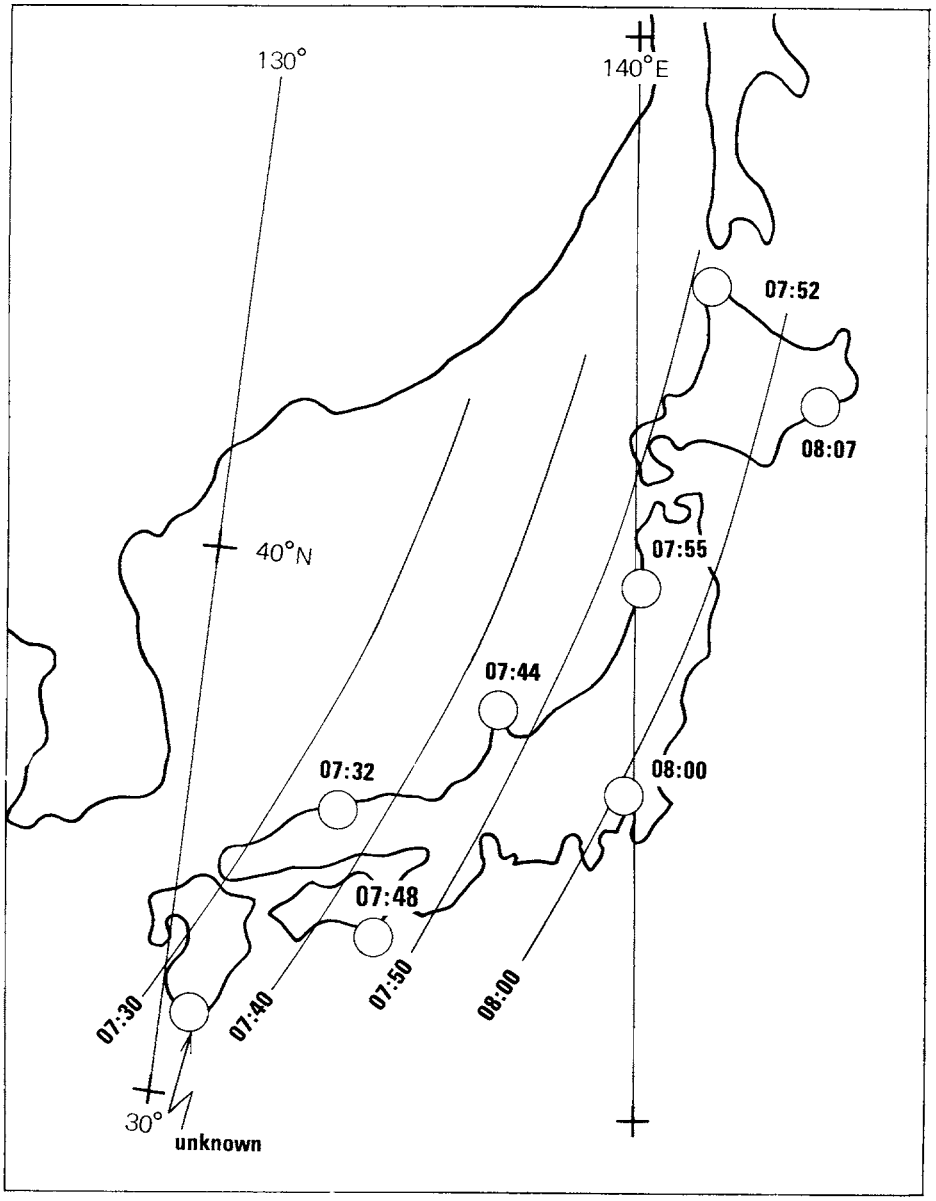


Figure 1 Isochrones of the First Schock Wave
Test Site: the neighbourhood of
Lake Lop Nor (40°N 90°E)
Time of Explosion: about 04:00 (G.M.T.)
June 27th, 1973

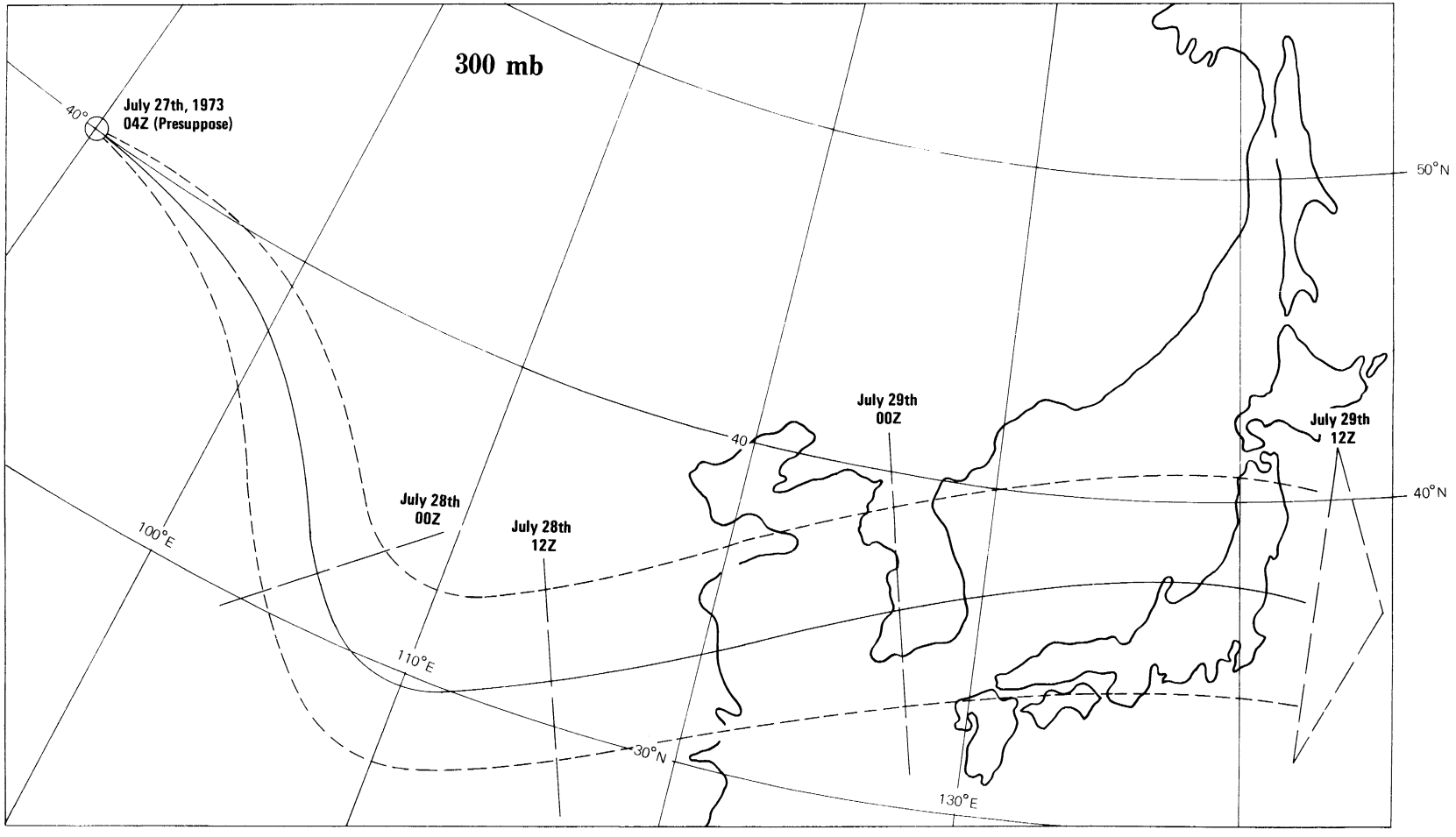


Figure 2 The Meteorological Trajectory at the time when the 15th Nuclear Test was carried out by the People's Republic of China

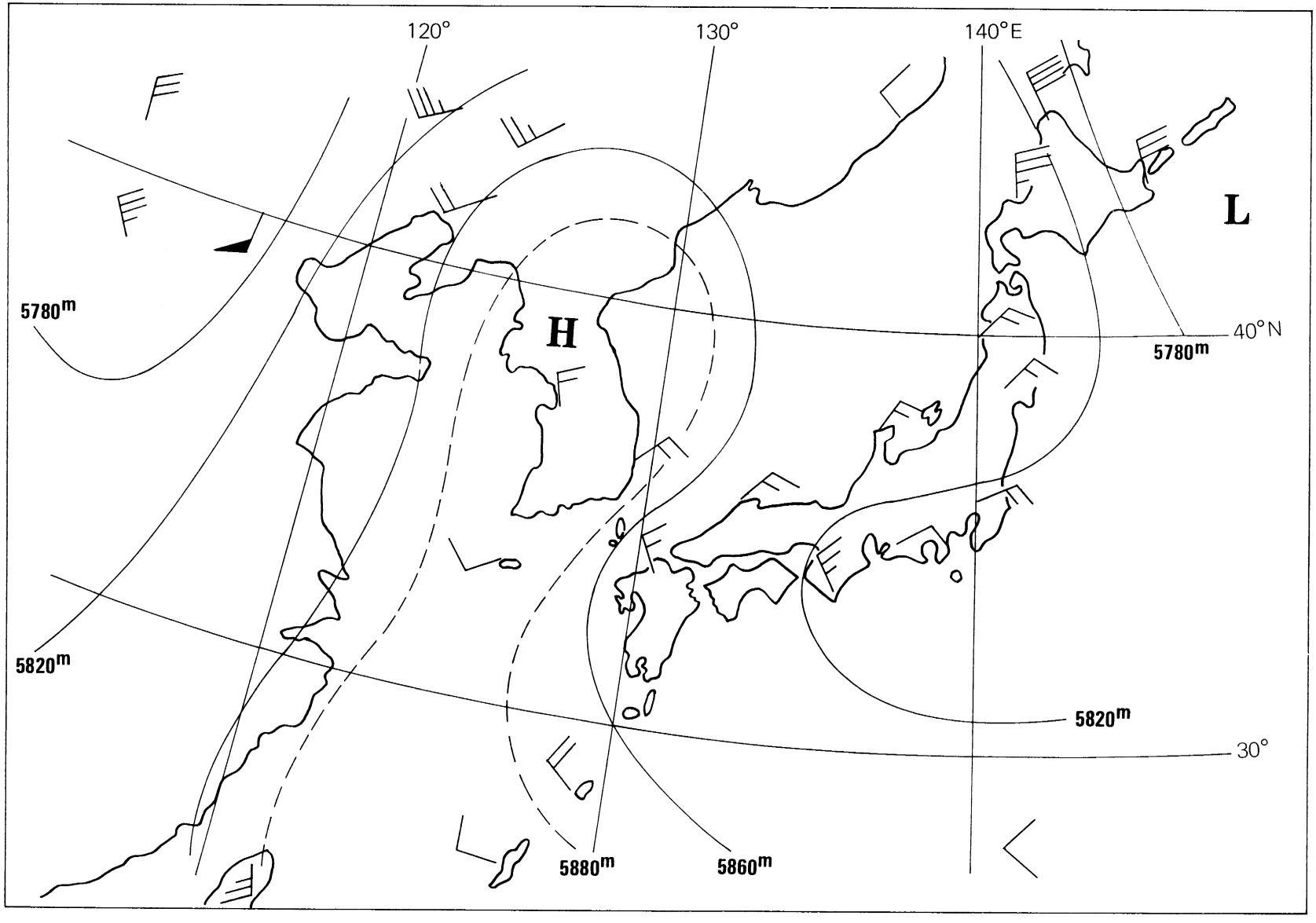
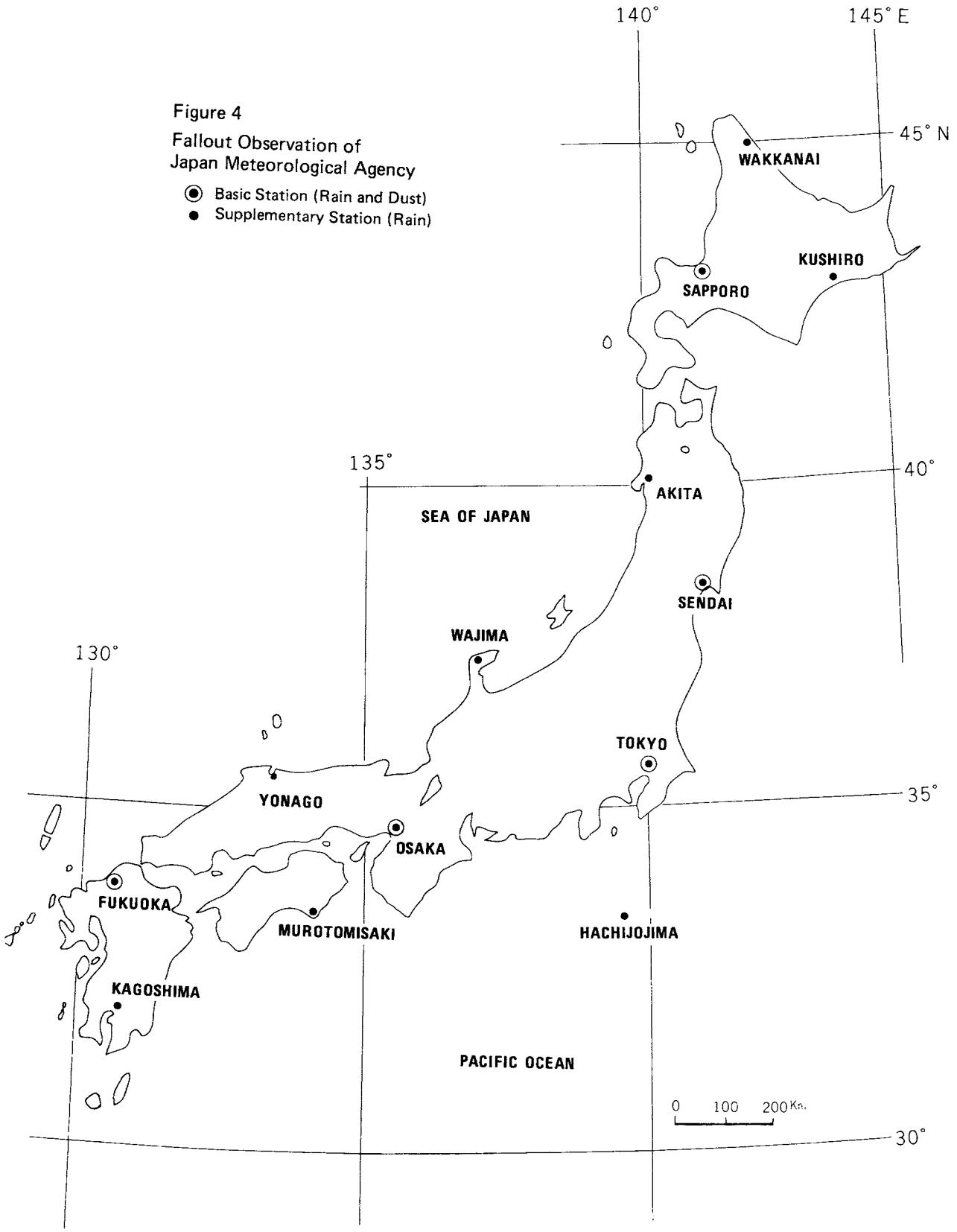


Figure 3 500 mb Chart for 00:00 (G.M.T.) July 3rd, 1973

Figure 4

Fallout Observation of
Japan Meteorological Agency

◉ Basic Station (Rain and Dust)
● Supplementary Station (Rain)



Gross Beta-Radioactivity in Upper Air

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

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

The samples were taken over three areas of Japan using dust samples attached under the aircraft wings.

The sampling flights were made using two aircrafts at the same time, one of which made a normal sampling flight and the other only upward and downward flight. The differences between the amounts of radioactivity of samples collected by the two aircrafts are taken as the value at the flight altitude.

Figure 5 shows three sampling areas of Japan.

Results obtained is shown in Table 5.

Table 5. Gross Beta-Radioactivity in Upper Air
– June 28th to July 9th, 1973 –
by K. Kenmochi, S. Igarashi, K. Kitazawa, M. Onuma and Y. Yamada
(Research and Development H. Q., Japan Defense Agency)

	Take-off date	Take-off time	Altitude (km)	Flight course	Activity (pCi/m^3)	Contamination
Western Area	Jun. 28th	15:55	about 12.5	Tsuiki-MG-Tsushima-Tsuiki	0.17	no
	" 29th	10:30	6.9 ~ 7.2	Tsuiki-MG-MD-MG-MD-Tsuiki	0.00	**800 cpm
	" "	16:26	6.6 ~ 8.5	Tsuiki-MG-MD-MG-MD-Tsuiki	0.02	no
	" 30th	0.7:33	9.8 ~11.5	"	0.04	"
	Jul. 2nd	10:42	6.2	Tsuiki-Iwakuni-Okayama-Nagoya-Iruma	7.1	"
	" 3rd	9:34	8.5	Iruma-Nagoya-Iwakuni-Tsuiki	10.1	"
	" 6th	8:20	6.6	Tsuiki-MG-Tsushima-Tsuiki	23.5	"
Northern Area	Jun. 29th	10:38	10.5	Misawa-GK-FK-Niigata-Misawa	0.12	no
	" "	14:41	8.4	Misawa-Morioka-GK-FJ-Misawa	0.15	"
	" 30th	14:12	10.2	Misawa-HL-Misawa-Iruma	*312.7	"
	" "	14:19	6.6	Misawa-Miyako-Matsushima-Taishi-Nikko-Iruma	28.7	"
	" "	17:09	6.9	Iruma-Niigata-Misawa	57.0	"
	" "	17:23	7.5	"	125.0	"
	Jul. 1st	11:48	10.2	Misawa-Miyako-Matsushima-Taishi-Nikko-Iruma	95.0	
	" "	14:48	6.9	Iruma-Yokote-Misawa	43.9	"
	" 4th	11:08	7.2	Misawa-Miyako-Matsushima-Taishi-Nikko-Iruma	41.5	"
	" 6th	10:36	6.9	Misawa-Matsushima-Akita-Misawa	17.0	"
Central Area	Jun. 30th	11:00	12.1	Iruma-Sado-Toyama-Iruma	69.7	no
	" "	12:20	9.8	Iruma-Niigata-Wajima-Takasaki-Iruma	232.3	"
	Jul. 3rd	10:20	8.2	Iruma-Matsushima-Iruma	16.4	"
	" 4th	12:35	7.2	Iruma-Nagoya-Otsu-Okayama-Iwakuni-Tsuiki	41.9	"
	" "	15:20	8.2	Tsuiki-Iwakuni-Itami-Nagoya-Iruma	18.3	"
	" 5th	10:20	6.6	Iruma-Utsunomiya-Sado-Wajima-Iruma	24.1	"
	" 7th	10:35	6.6	Iruma-Sado-Wajima-Iruma	6.1	"
	" 9th	9:50	6.6	Iruma-Suwa-Nagaoka-Komoro-Iruma	1.1	"

MG : Over Northern Sea from Mito Island (36°N 131°E)
HL : Over East Sea from Hachinohe
FK : Northeast from Sakata City (39°N 140°E)
GK : Near Hiraizumi (39°N 141°E)
MD : Over East Sea from Tsuiki
FJ : Southwest from Matsushima

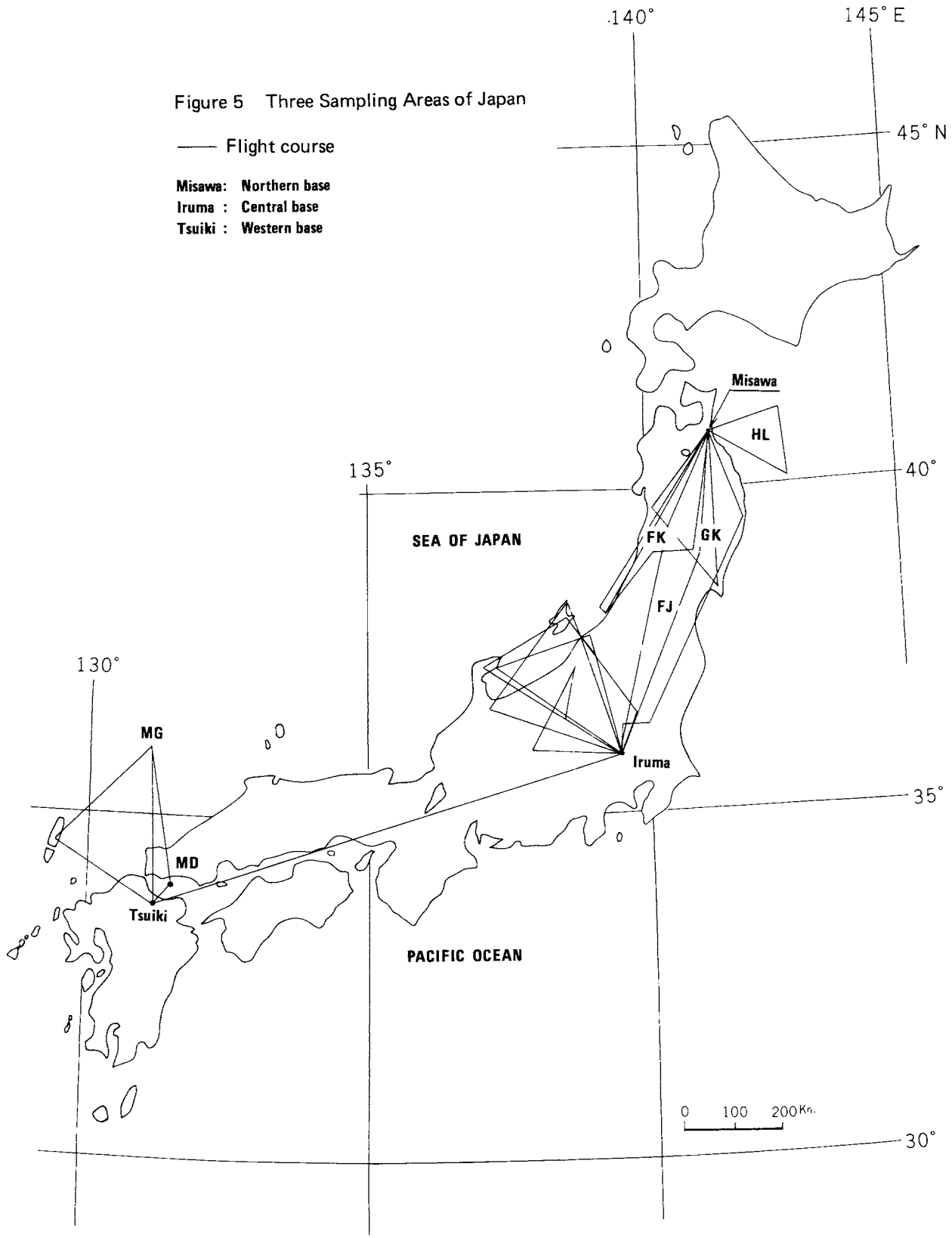
* The highest radioactivity getting from the sample of June 30th, 1972.

** Detected the pilot's clothes

Figure 5 Three Sampling Areas of Japan

—— Flight course

Misawa: Northern base
Iruma : Central base
Tsuiki : Western base



Gross Beta-Activity in Rain and Dry Fallout

(National Institute of Radiological Sciences)

Daily rain and dry fallout samples were continuously (from 9 A.M. to the next 9 A.M.) collected in a tray on the roof of the building of the National Institute of Radiological Sciences in Chiba City, to determine the gross beta-activity.

Gross beta-activity was measured using the uranium oxide (U_3O_8) standard with a Geiger-Müller counter. Highly radioactive particle was not detected.

The radioactivities of the samples were measured 6 hours after the time of collection of the samples.

The results obtained during the period from 28, June to 8, July 1973 are shown in Table 6.

Table 6. Gross Beta-Activity in Rain and Dry Fallout Collected at Chiba City
– June 28th to July 8th, 1973 –
Division of Environmental Contamination
(National Institute of Radiological Sciences)

Date of Sampling							Gross β-Activity (mCi/Km²)	Highly radioactivity
June	28th	09:00	~	June	29th	09:00	0.03	no detected
〃	29th	〃	~	〃	30th	〃	0.06	〃
〃	30th	〃	~	July	1st	〃	0.04	〃
July	1st	〃	~	〃	2nd	〃	7.90	〃
〃	2nd	〃	~	〃	3rd	〃	20.80	〃
〃	3rd	〃	~	〃	4th	〃	11.57	〃
〃	4th	〃	~	〃	5th	〃	2.25	〃
〃	5th	〃	~	〃	6th	〃	3.57	〃
〃	6th	〃	~	〃	7th	〃	2.33	〃
〃	7th	〃	~	〃	8th	〃	1.10	〃
〃	8th	〃	~	〃	9th	〃	0.55	〃

Gross Beta-activity in Airbone Dusts

(National Institute of Radiological Sciences)

Daily measurements of airbone dusts in surface air have been held since 28th June till 10th July.

Table 7 suggests that the counting values are slightly larger than a normal level.

Table 7 Gross Beta-Activity in Airborne Dusts
– June 28th to July 10th, 1973 –

(Unit : pCi/m^3 air)

Date of Sampling	Sampling Hours	Values Obtained at Given Times after Sampling Stop			
		80min.	24hr	48hr	72hr
June 28th 13:45 ~ June 29th 13:00	23	2.5	0.2	0.13	0.03
,, 29th 10:00 ~ ,, 30th 10:00	21	1.8	1.3	0.14	~0
,, 30th 10:00 ~ July 1st 10:00	24	2.6	0.4	0.02	0.04
July 1st 10:00 ~ ,, 2nd 10:00	24	3.8	0.5	0.13	0.12
,, 2nd 10:00 ~ ,, 3rd 10:00	24	2.6	0.86	0.64	0.64
,, 3rd 10:00 ~ ,, 4th 10:00	24	1.3	0.25	0.27	0.13
,, 4th 10:00 ~ ,, 5th 10:00	24	2.4	0.58	0.16	0.17
,, 5th 10:00 ~ ,, 6th 10:00	24	2.9	0.76	0.38	0.28
,, 6th 10:00 ~ ,, 7th 10:00	24	1.8	0.5	0.18	0.36
,, 7th 10:00 ~ ,, 8th 10:00	24	2.8	0.57	0.24	0.20
,, 8th 10:00 ~ ,, 9th 10:00	24	4.1	1.32	0.58	0.67
,, 9th 10:00 ~ ,, 10th 10:00	24	3.3	0.46	0.24	0.37
Normal Range	24	1 ~10	0.1 ~ 3	0.1 ~ 1	0.01 ~ 0.1

(National Institute of Radiological Sciences)

Exposure at 1m above the ground at the station in shown in Table 8.

Table 8 Exposure Rate
– June 23rd to July 9th, 1973 –

Date of Measurement			Measurement Value (μR/h)
June	23rd	(09:30)	3.3
"	29th	(12:00)	3.4
"	"	(17:00)	3.5
"	30th	(09:30)	3.4
"	"	(12:00)	3.4
July	1st	(10:20)	3.4
"	2nd	(09:30)	3.3
"	4th	(17:00)	3.6
"	5th	(09:30)	3.2
"	6th	(09:30)	3.8
July	7th	(10:00)	3.5
"	8th	(09:30)	3.4
"	9th	(09:30)	3.5

* Normal Value except cosmic ray at this station is 3.3 μR/h.

Iodine-131 in Milk

(National Institute of Radiological Sciences)

Concentrations of iodine-131 in milk were determined by the National Institute of Radiological Sciences during the period 28th June to 17th July, 1973.

Milk samples were raw milk, which were taken from a farm in the National Institute of Animal Industry located in the southern part of Chiba city.

Iodine-131 was determined by "Milk matrix" using 3ϕ x 3" NaI(TL) detector, 2ℓ of Marinelli breaker and multi channel pulse height analyzer. According to the method, detectable limit was 50pCi/ℓ.

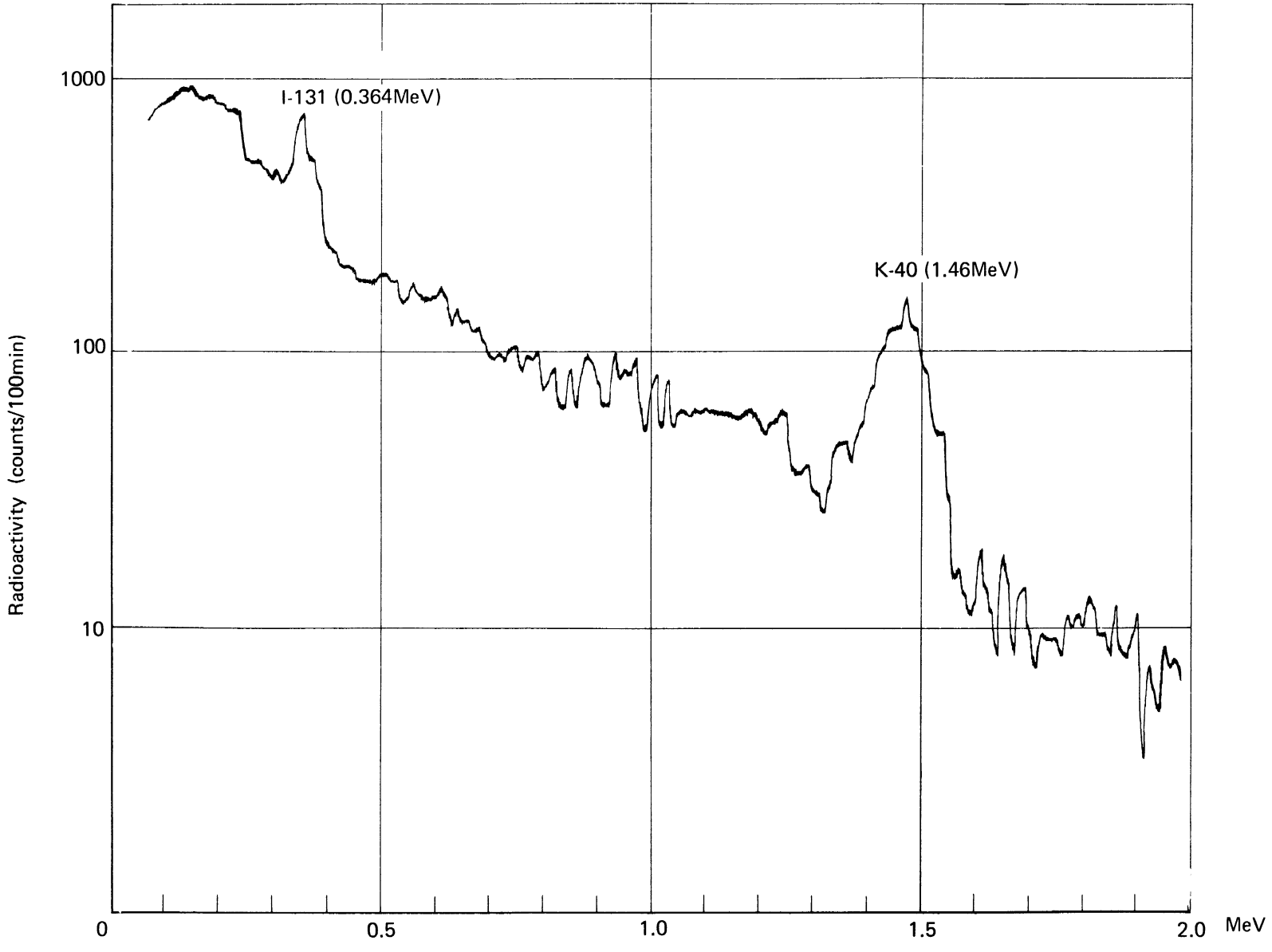
An example of γ-ray spectrum was shown in Fig. 6, and obtained results are shown in Table 9.

Table 9. Iodin-131 in Milk
– 28 Jun. to 17 Jul., 1973 –
by H. Kamada
(National Institute of Radiological Sciences)

Date of Sampling				Ioding-131 (pCi/l)
28	Jun.	1973	18:00	LTD
29	"	"	"	LTD
30	"	"	"	LTD
1	Jul.	"	"	LTD
2	"	"	"	LTD
3	"	"	"	LTD
4	"	"	"	70
5	"	"	"	135
6	"	"	"	93
7	"	"	"	51
8	"	"	"	61
9	"	"	"	LTD
10	"	"	"	51
11	"	"	"	91
12	"	"	"	81
13	"	"	"	80
14	"	"	"	56
15	"	"	"	53
16	"	"	"	LTD
17	"	"	"	LTD

LTD : Less Than Detectable Limit.

By H. Kamada
(National Institute of Radiological Sciences)



Monitoring Post

(Meteorological Agency)
(Prefectural Institutes and Laboratories)

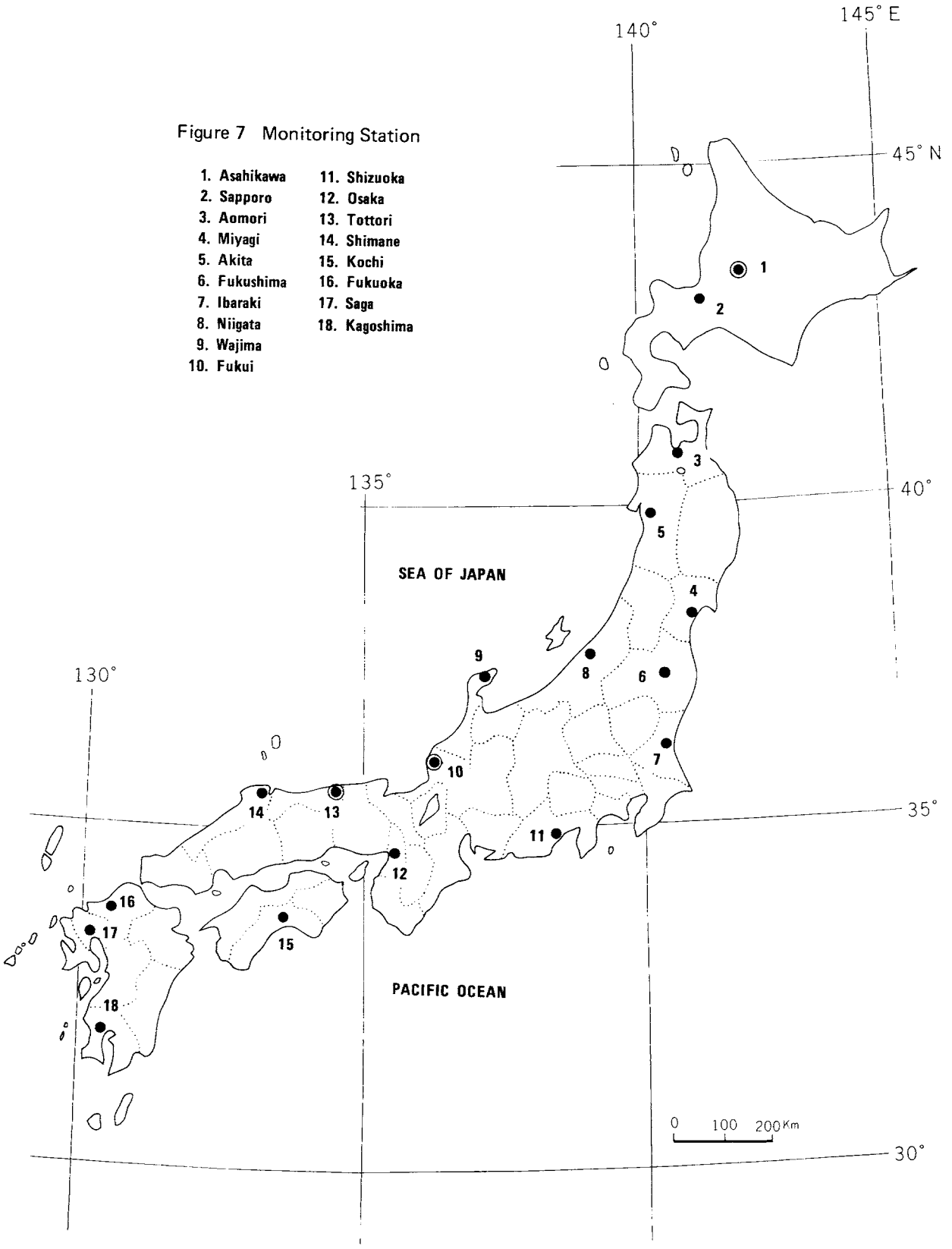
Most of the monitoring posts in Meteorological Agency (Asahikawa, Wajima) and in 16 prefectures showed the same as normal value, except three sites (Asahikawa, Fukui, Tottori) which did a little high as follows.

Table 10 Monitoring Post
– July 1st to 2nd, 1973 –

Station	Normal Value	Highest Value
Asahikawa	15 CPS	19.8 CPS
Fukui	16 CPS	25 CPS
Tottori	20 CPS	25 CPS

Figure 7 Monitoring Station

1. Asahikawa
2. Sapporo
3. Aomori
4. Miyagi
5. Akita
6. Fukushima
7. Ibaraki
8. Niigata
9. Wajima
10. Fukui
11. Shizuoka
12. Osaka
13. Tottori
14. Shimane
15. Kochi
16. Fukuoka
17. Saga
18. Kagoshima



Detection of Giant Particles and the Values in Milk, Rain and Fallout

(Prefectural Institutes and Laboratories)

Table 11. Highly Radioactive

Station	Date	Number	Intensity of Radioactivity
Fukui Prefectural Institute of Public Health	Jul. 1st – 2nd	2	4410, 720pCi
Environmental Pollution Research Center of Ibaragi	Jul. 1st – 2nd	1	2560pCi
Shimane Prefectural Public Health Laboratory	Jul. 1st	9	6800cpm (≒ 18000pCi), 2600, 2300, 2000, 1500, 1100, 1000cpm
Niigata University	Jul. 2nd	3	13500cpm (≒40500pCi), 11000, 7000cpm
Kanagawa Prefectural Public Health Laboratory	Jul. 3rd	3	10158, 3267, 1007pCi

Table 12. Iodine-131 in Milk

(Unit : pCi/ℓ)

Date of Sampling / Determination Agency	July 4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th	16th	17th
National Institute of Animal Industry (CHIBA)	70	135	93	51	61	–	51	91	81	80	56	53	–	–
Hokkaido National Agricultural Experiment Station (SAPPORO)	No					53	*	90	94	90	–	–	–	–
Kyushu Agricultural Experiment Station, Ministry of Agriculture and Forestry (KUMAMOTO)	No.		98	No		75	*	–	–	–	–	–	–	–
National Institute of Ragiological Sciences (CHIBA)	70	135	93	51	61	–	51	91	81	80	56	53	*	–
Miyagi Prefectural Institute of Public Health	184.9	220.3	207.3	139.1	120.6	103.8	84.7	82.2	57.6	*	–	–	–	–
Fukushima Institute of Health	No	148.9 154.4	187.3	144.3	114.9	92.8	*	–	–	–	–	–	–	–

No : No Detect
* : Under Limit Detect

Table 13. Gross Beta-Activity in Rain and Dry Fallout

(Prefectural Institutes and Laboratories)

Upper row : Concentration (pCi/cc)
Lower row : Deposition (mCi/km^2)

Station \ Date	July 1973 1	2	3	4	5	6	7	8	9
Kagoshima	–	7.8 33.5	1.37 121.8	3.07 47.6	–	–	–	–	–
Nagasaki	–	–	1.0 42.9	–	–	–	–	–	–
Yamaguchi	–	6.6 62.8	–	0.99 3.25	–	–	–	–	–
Hiroshima	–	3.9 26.1	–	4.99 223	–	–	–	–	–
Tottori	–	15.4 117	23.1 17.8	–	—	–	–	–	–
Okayama	–	5.7 51	5.1 51.4	–	–	–	–	–	–
Hyogo	–	36.6 78	–	–	–	–	–	–	–
Osaka	–	4.95 62	2.8 40.8	1.03 4.4	–	–	–	–	–
Wakayama	–	6.8 160.7		10.0 65.3	–	–	–	–	–
Fukui	–	8.88 191	–	–	–	–	–	–	–
Ishikawa	8.3 37.4	26.7 226.8	15.8 94.8	–	–	–	–	–	–
Aichi	–	2.92 22.2	–	–	–	–	–	–	–
Shizuoka	–	0.37 1.11	–	–	–	–	–	–	–
Niigata	1.88 0.47	–	–	–	–	–	–	–	–
Kanagawa	–	0.7 5.2	7.25 60.6	–	–	–	–	–	–
Tokyo	–	1.15 20.7	7.8 89.2	–	–	–	–	–	–
Saitama	–	0.34 4.21	–	–	–	–	–	–	–
Ibaraki	–	4.3 32	23	–	–	–	–	–	–
Fukushima	–	3.1 32.5	–	–	–	–	–	–	–
Kochi	–	7.2 7.2	–	–	–	–	–	–	–
Saga	–	–	2.37 87.0	1.1 24.7	–	–	–	–	–
Okinawa	–	–	–	–	0.6 5.4	–	–	–	–

: No rain July 6th to 9th.

Figure 8 Rain and Dry Fallout Sampling Location

1. Fukushima
2. Ibaraki
3. Saitama
4. Tokyo
5. Kanagawa
6. Niigata
7. Ishikawa
8. Fukui
9. Shizuoka
10. Aichi
11. Osaka
12. Hyogo
13. Wakayama
14. Tottori
15. Okayama
16. Hiroshima
17. Yamaguchi
18. Kochi
19. Saga
20. Nagasaki
21. Kagoshima
22. Okinawa