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FALLOUT PROGRAM
QUARTERLY SUMMARY REPORT

(September 1, 1963 through December 1, 1963)

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Preceding reports in this series:

HASL-42, -51, -65, -69, -77, -84,
-88, -95, -105, -111, -113,
-115, -117, -122, -127, -131,
-132, -135, -138, and 140.

January 1, 1964

UNITED STATES ATOMIC ENERGY COMMISSION

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FALLOUT PROGRAM
QUARTERLY SUMMARY REPORT

January 1, 1964

ABSTRACT

This report presents current data from the HASL Fallout Program, the New Zealand Department of Scientific and Industrial Research, and the Dominion X-Ray and Radium Laboratory in New Zealand. Radionuclide levels in fallout, milk, tap water, diet, and upper air samples are given in tabular form. Also included are interpretive reports and notes dealing with fission product concentrations in the upper atmosphere, cumulative strontium-90 deposition levels from analyses of soils collected in 1962, and measurements of cesium-137 in the 1962 wheat crop. The production of and decay schemes for cadmium isotopes generated in a high altitude 1962 U. S. nuclear test are covered in a series of three reports. A listing of announced nuclear detonations and tables excerpted from published sources on the fission and total yields of nuclear tests precede a report on inventories of selected radioisotopes from nuclear testing. Finally, a bibliography of recent literature pertinent to fallout studies is given at the end of the report.

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Introduction

Every three months, the Health and Safety Laboratory issues a report summarizing current information obtained at HASL pertaining to fallout. This report, the latest in the series, contains information that became available during the period from September 1, 1963 to December 1, 1963. The next report is scheduled for publication on April 1, 1964. Preceding reports in the series, starting with HASL-42, "Environmental Contamination from Weapons Tests", and continuing through HASL-51, -65, -69, -77, -84, -88, -95, -105, -111, -113, -115, -117, -122, -127, -131, -132, -135, -138, -140, and 142 (this report); may be purchased from the Office of Technical Service, U. S. Department of Commerce, Washington 25, D. C.

To give a more complete picture of the current fallout situation and to provide a medium for rapid publication of fallout data, these quarterly reports often contain information from other laboratories and programs, some of which are not part of the general AEC program. To assist in developing, as rapidly as possible, provisional interpretations of the data, special interpretive reports and notes prepared by scientists working in the field of fallout are also included from time to time. Many of these scientists are associated in some way with the general AEC program. Information developed outside of HASL is identified as such and is gratefully acknowledged by the Laboratory. In this report, data from the New Zealand Department of Scientific and Industrial Research and the Dominion X-Ray and Radium Laboratory in New Zealand are included.

A portion of the radiochemical analyses are carried out by commercial laboratories under contract to the HASL Environmental Studies and Radiochemistry Divisions. The results of these analyses are reported as part of HASL's regular fallout program. The contractor analytical laboratories are Nuclear Science and Engineering Corporation, Pittsburgh, Pennsylvania; Isotopes, Incorporated, Westwood, New Jersey; Radiochemistry, Incorporated, Louisville, Kentucky; Tracerlab, Incorporated, Richmond, California; Controls for Radiation, Incorporated, Cambridge, Massachusetts; Hazleton-Nuclear Science Corporation, Palo Alto, California and Food, Chemical & Research Laboratories, Incorporated, Seattle, Washington.

This report is divided into four main parts:

1. HASL Fallout Program Data,
2. Data from Sources Other Than HASL,
3. Interpretive Reports and Notes, and
4. Recent Publications Related to Fallout.

FALLOUT PROGRAM

Quarterly Summary Report

January 1, 1964

Part I - HASL Fallout Program Data

1. Fallout Deposition Collections

1.1 Monthly Precipitation

1.11 Sr^{89} and Sr^{90} at 152 World-Wide Sites

At present, there are 48 monthly monitoring sites in the United States and 104 in foreign countries. A map showing the sites is presented as Figure 1, page 4. These collections are made using either stainless steel pots with exposed areas of 0.82 square feet, or funnels with exposed areas of 0.77 square feet to which are attached ion-exchange columns.

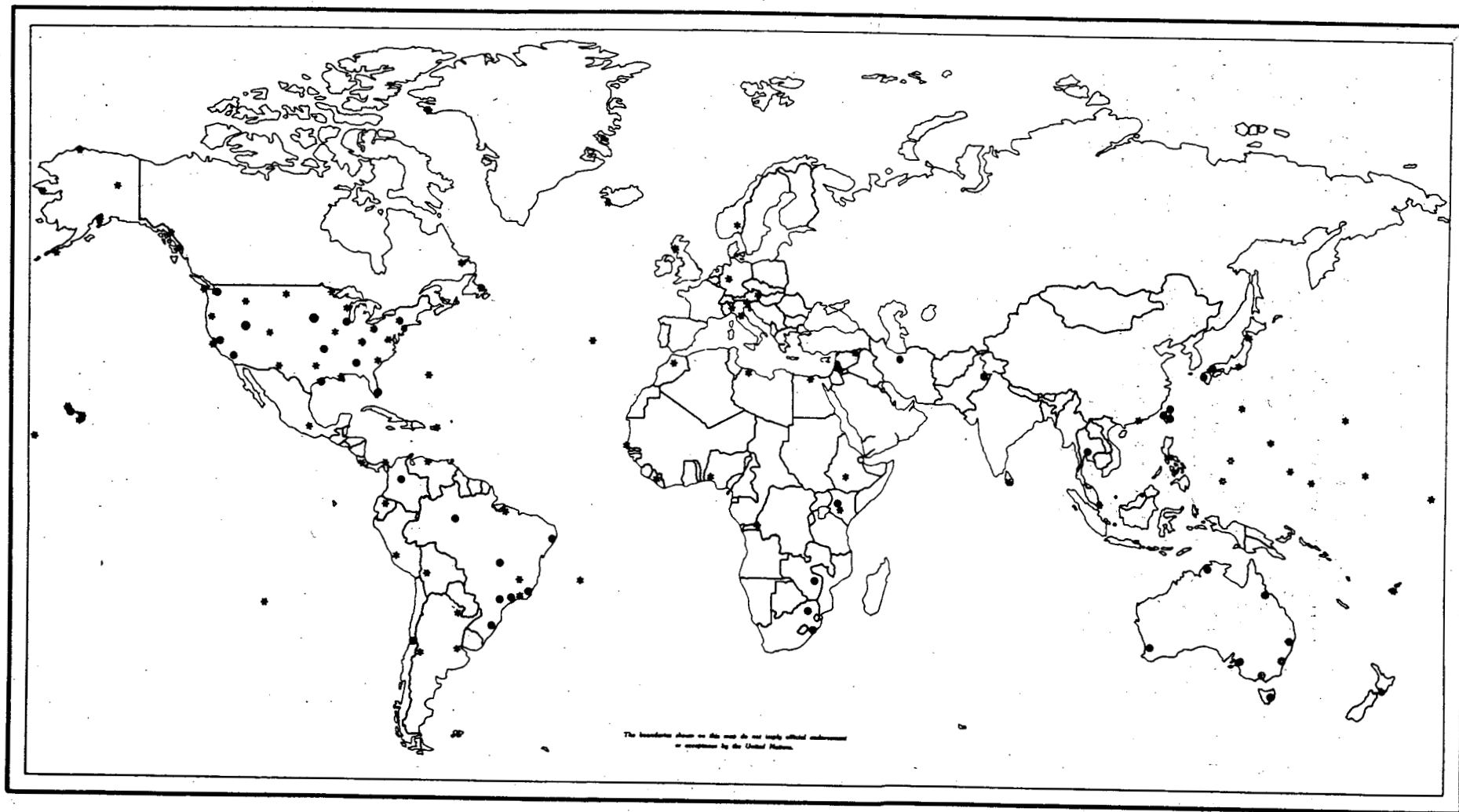
In late 1958 and 1959, the monthly samples were analyzed for strontium-89 and strontium-90. The strontium-89 measurements were discontinued in 1960 at most sites and resumed starting with the September 1961 collections. Starting with the 1960 May and June collections, the monthly samples were combined on a two-month basis since strontium-90 levels had dropped considerably. The September 1961 and later collections are being analyzed as individual monthly samples.

The data are presented in Tables 1a and 1b, pages 5 through 161. Where strontium-89 to strontium-90 ratios are reported, the strontium-89 results have been extrapolated to the midpoint of the sampling month. An asterisk (*) indicates that strontium-89 was assayed but not detected, while a dash (--) means that no strontium-89 analysis was made. Monthly strontium-90 levels for New York City since 1954 are shown in graph form in Figure 2, p 38.

1.12 Fission Product Radionuclides at 4 United States Sites Through June 1963

Duplicate monthly collections at Westwood, New Jersey, Pittsburgh, Pennsylvania, Richmond, California, and Houston, Texas have been analyzed for other fission product radionuclides in addition to strontium-89 and strontium-90. Depending upon the activity levels and laboratory facilities, these have included zirconium-95, ruthenium-

103, ruthenium-106, cesium-137, barium-140, cerium-141, cerium-144, and plutonium-239. Duplicate monthly collections at Louisville, Kentucky were analyzed for cerium-144 and plutonium-239 but these analyses were discontinued in June of 1961. The data for Westwood, Pittsburgh, Richmond and Houston are presented on pages 34, 42, 15, and 51, respectively. Collections and analyses at Pittsburgh, Richmond, and Houston were discontinued in June 1963. From July 1963 through June 1964, single monthly collections at Westwood, New Jersey; Appleton, Wisconsin; Chattanooga, Tennessee; Palo Alto, California; Midwest City, Oklahoma; and Seattle, Washington, will be analyzed for manganese-54, iron-55, strontium-89, strontium-90, zirconium-95, antimony-124, cesium-137, and cerium-144.



Sr^{90} MONTHLY SAMPLING NETWORK

Figure 1

- POT
- * FUNNEL



Monthly Fallout Deposition Collections: United States Sites

Site: ALABAMA, BIRMINGHAM (Pot) 33°30'N, 86°55'W, alt. 600 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1957	Precip. (in.)				5.41	2.96	7.70	2.62	4.19	9.59	1.81	5.67	4.01
	Sr-90 (mc/mi ²)				0.83	0.39	0.95	0.80	1.10	0.42	0.34	0.22	0.40
	Sr-89/Sr-90				--	9.4	31	--	8.4	67	75	20	18
1958	Precip. (in.)	3.42	5.14	3.03	3.51	2.33	3.10	6.79	1.98	5.74	2.31	3.38	1.29
	Sr-90 (mc/mi ²)	0.66	0.24	0.38	1.67	1.17	0.65	2.11	1.06	0.49	0.26	0.60	1.09
	Sr-89/Sr-90	17	12	16	14	15	38	42	44	39	26	48	50
1959	Precip. (in.)	4.16	3.52	5.13	2.81	8.27	2.09	3.61	3.64	5.95	6.21	3.84	2.46
	Sr-90 (mc/mi ²)	1.27	1.50	6.17	lost	3.05	1.57	1.68	lost	0.44	0.20	0.28	0.28
	Sr-89/Sr-90	38	48	5.5	"	11.6	4.5	2.7	"	3.9	*	0.66	*
1960	Precip. (in.)	5.05	3.36	6.31	2.28	2.28	2.74	2.06	4.09	2.73	3.45	3.24	3.21
	Sr-90 (mc/mi ²)	0.31	0.29	0.82	0.51	1.41		0.48		0.28		0.14	
	Sr-89/Sr-90	*	--	--	--	--		--		--		--	
1961	Precip. (in.)	1.49	17.67	9.22	4.33	2.45	4.85	10.17	3.56	2.42	2.05	4.29	13.98
	Sr-90 (mc/mi ²)	0.60			1.34		1.61		0.62	0.21	0.10	0.97	1.92
	Sr-89/Sr-90	--			--		--		--	28	62	72	59
1962	Precip. (in.)	8.64	4.39	5.21	2.99	1.26	3.59	3.89	3.49	3.69	2.03	6.41	2.55
	Sr-90 (mc/mi ²)	4.52	2.88	3.72	8.29	1.72	1.80	1.35	1.46	0.79	lost	2.94	1.19
	Sr-89/Sr-90	46	25	22	14	11	9	21	15	15	--	53	50
1963	Precip. (in.)	7.32	3.25	6.31	6.70	3.72	8.44						
	Sr-90 (mc/mi ²)	3.82	1.49	4.93									
	Sr-89/Sr-90	26	39	18									

Monthly Fallout Deposition Collections: United States Sites (cont'd.)

Site: ALASKA, ANCHORAGE (Column) 61°10'N, 149°59'W, ~alt. 90 ft.

[illegible]

Monthly Fallout Deposition Collections: United States Sites (cont'd.)

Site: ALASKA, BARROW (Column) 71°16'N, 156°50'W

[illegible]

Monthly Fallout Deposition Collections: United States Sites (cont'd.)

Site: ALASKA, COLD BAY (Column) 55° 12' N, 162° 43' W,

[illegible]

Monthly Fallout Deposition Collections: United States Sites (cont'd.)

Site: ALASKA, FAIRBANKS (Column) 64°49'N, 147°52'W, alt. 468 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1960	Precip. (in.)			0.20	0.39	0.24	0.79	1.38	1.57	3.05	0.92	0.41	0.23
	Sr-90 (mc/mi ²)			0.18	0.22		0.29		0.35		0.07		0.00
	Sr-89/Sr-90			--	--		--		--		--		--
1961	Precip. (in.)	0.27	0.17	0.47	0.37	0.24	0.89	2.38	2.85	1.91	1.17	0.47	0.59
	Sr-90 (mc/mi ²)		0.00		0.20		0.48		0.16	0.38	0.04	0.07	0.14
	Sr-89/Sr-90	--	--	--	--	--	--	--	--	32	70	58	51
1962	Precip. (in.)	0.69	1.26	0.76	0.27	0.62	2.22	4.35	5.00	0.43	0.28	0.17	0.56
	Sr-90 (mc/mi ²)	0.22	0.58	0.47	0.21	0.57	2.56	1.96	1.70	0.34	0.17	0.64	0.10
	Sr-89/Sr-90	58	27	19	10	9	7	6	33	51	28	43	50
1963	Precip. (in.)	1.78	0.27	2.10	0.49	0.11	2.01						
	Sr-90 (mc/mi ²)	0.39	0.90	1.56									
	Sr-89/Sr-90	36	25	18									

Monthly Fallout Deposition Collections: United States Sites (cont'd.)

Site: ALASKA, JUNEAU (Column) 58°22'N, 134°35'W, alt. 16.5 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)					3.79	1.36	7.39	5.75	5.84	6.04	6.82	5.88
	Sr-90 (mc/mi ²)					5.63	1.43	1.78	0.94	0.47	0.24	0.54	0.34
	Sr-89/Sr-90					7.5	5.0	3.2	1.8	0.90	0.86	0.4	0.8
1960	Precip. (in.)	3.86	2.05	5.26	1.57	1.57	3.54	4.33	4.77	8.66	8.95	5.12	0.39
	Sr-90 (mc/mi ²)	0.44	0.25	0.40	0.28	0.88		1.20		not recd.	0.56	0.16	not recd.
	Sr-89/Sr-90	--	--	--	--	--		--			--	--	
1961	Precip. (in.)	3.76	4.07	2.67	3.92	4.75	3.22	6.04	12.31	7.01	10.20	6.10	4.04
	Sr-90 (mc/mi ²)		0.46		1.21	0.98		1.00		not recd.	1.46	0.89	0.73
	Sr-89/Sr-90		--		--	--		--			94	82	62
1962	Precip. (in.)	6.99	0.76	5.00	1.99	2.85	4.75	4.75	5.21	9.75	7.39	4.03	8.16
	Sr-90 (mc/mi ²)	1.03	0.16	1.33	0.13	1.35	3.60	2.54	0.92	3.68	2.43	1.86	1.84
	Sr-89/Sr-90	46	*	30	15	9	10	8	8	23	32	47	42
1963	Precip. (in.)	6.55		3.75									
	Sr-90 (mc/mi ²)	2.26	not recd.	6.57									
	Sr-89/Sr-90	49		19									

Monthly Fallout Deposition Collections: United States Sites (cont'd.)

Site: ALASKA, NOME (Column) 64°30'N, 165°30'W

[illegible]

Monthly Fallout Deposition Collections: United States Sites (cont'd.)

Site: CALIFORNIA, W. LOS ANGELES (Pot) 34°04'N, 118°27'W, alt. 410 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1956	Precip. (in.)												0.49
	Sr-90 (mc/mi ²)												0.15
	Sr-89/Sr-90												44
1957	Precip. (in.)	3.88	1.94	0.95	1.33	0.27	0.06	0.03	0	0	1.51	0.51	2.10
	Sr-90 (mc/mi ²)	0.99	0.76	0.09	0.84	0.24	0.12	0.92	0.05	0.04	0.26	0.27	0.20
	Sr-89/Sr-90	15	--	--	--	15	13	0.9	4.0	6.9	17	18	20
1958	Precip. (in.)	1.49	6.26	5.25	2.04	0.01	trace	trace	0.02	0.03	0.32	trace	0.01
	Sr-90 (mc/mi ²)	0.44	0.90	1.30	1.50	0.05	0.10	0.16	0.08	0.08	0.15	0.11	0.07
	Sr-89/Sr-90	14	11	24	9	48	4	2	36	29	39	35	21
1959	Precip. (in.)	1.11	3.72	0	0.39	trace	trace	trace	trace	0.04	0.01	0.06	1.11
	Sr-90 (mc/mi ²)	1.82	3.31	0.10	0.63	0.22	0.09	0.09	0.05	0.03	0.12	0.03	0.39
	Sr-89/Sr-90	41	28	15	12	8.5	3.4	*	7.0	*	0.67	*	*
1960	Precip. (in.)	2.83	2.90	0.21	2.00	trace	trace	trace	0.00	trace	trace	2.67	0.06
	Sr-90 (mc/mi ²)	0.25	0.18	lost	0.13		0.12		0.08		0.10		0.15
	Sr-89/Sr-90	--	2.8	--	--		--		--		--		--
1961	Precip. (in.)	1.28	trace	0.46	0.29	trace	trace	0.01	0.30	0.04	trace	2.02	1.44
	Sr-90 (mc/mi ²)		0.17		0.20		0.05		0.60	0.15	0.09	1.66	0.91
	Sr-89/Sr-90	--	--	--	--	--	--	--	--	5.8	43	74	51
1962	Precip. (in.)	2.68											0.2
	Sr-90 (mc/mi ²)	1.81	8.51	1.38	0.18	0.19	0.14	0.11	0.16	0.05	0.26	0.11	0.20
	Sr-89/Sr-90	40	34	20	10	5	4	6	11	18	40	24	35
1963	Precip. (in.)												
	Sr-90 (mc/mi ²)	0.50	2.59	8.38									
	Sr-89/Sr-90	27	35	9.2									

DOCUMENTS AND INFORMATION RELATIVE TO THE LIFE OF JOHN F. KENNEDY, 1917-1963

IV. БУТО УЧЕО (СОПРИМ)

monthly collections from July 1963 are reported on page 167 and include, in addition to Sr^{90} and Sr^{89} , other fission product and tracer radionuclides.

Monthly Fallout Deposition Collections: United States Sites (cont'd)

Site: CALIFORNIA, PALO ALTO (COLUMN)

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1962	Precip. (in.)												2.38
	Sr-90 (mc/mi ²)												0.58
													0.58
	Sr-89/Sr-90												47
													46
1963	Precip. (in.)	3.34	1.89	4.47	4.02	5.84	0.01	0	trace	0.18			
	Sr-90 (mc/mi ²)	1.88	1.30	3.04	4.52	1.98	0.51	0.10	0.21	0.32			
		1.86	1.28	3.09	3.38	1.59	0.32						
	Sr-89/Sr-90	34	23	15.5	9.9	6.0	4.0						
		36	24	15.2	10.2	6.3	4.21	2.8	2.9	1.8			
1964	Precip. (in.)												
	Sr-90 (mc/mi ²)												
	Sr-89/Sr-90												

Monthly Fallout Deposition Collections: United States Sites (cont'd.)

Site: CALIFORNIA, RICHMOND (Pot)⁽¹⁾ 37°56'N, 108°38'W, ~Alt. 65 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1958	Precip. (inches)			6.64 (2)	wet	dry	wet	dry	dry	0.05	0.21	trace	1.77
	Sr-90 (mc/mi ²)			4.47 3.00	0.59 0.56	0.52 0.65	0.33 0.19	0.072 0.097	0.031 0.035	0.086 0.058	0.072 0.080	0.012 0.011	0.39 0.39
	Sr-89 (mc/mi ²)			88.5 75.0	9.51 4.06	10.5 10.7	2.01 2.30	1.38 1.44	0.84 0.85	1.22 1.41	2.19 2.44	0.20 0.18	13.6 14.6
	Sr-89/Sr-90			18 25	16 7.2	20 16	6.1 12	19 15	27 24	14 24	30 30	17 16	34 37
	Ba-140 (mc/mi ²)			388 308	21.5 17.7	12.8 13.2	0.92 0.94	5.09 4.81	1.30 1.35			0.49 0.47	
	W-185 (mc/mi ²)						0.28 0.25	2.48 2.48	2.60 2.21	4.04 4.04	2.04 2.04	1.10 0.99	2.90 3.20
	Total β (mc/mi ²)			628 630	501 257	48.9 39.2	21.8 23.0	15.4 17.6	7.2 7.8	9.4 9.6	20.2 22.3	5.8 6.3	65.8 73.6
1959	Precip. (inches)	4.42	6.12	0.81	0.44	trace	none	none	none	2.91	none	none	1.62
	Sr-90 (mc/mi ²)	1.99 1.76	2.26 3.06	0.81 0.73	0.46 0.51	0.22	0.019 0.019	≤ 0.008 ≤ 0.008	0.014 0.015	0.064 0.092	0.017 0.019	0.004 0.005	0.116 0.124
	Sr-89 (mc/mi ²)	59.7 53.0	69.7 75.5	10.7 11.5	4.8 5.1	1.40 1.49	0.119 0.124	0.24 0.31	0.036 0.041	0.099 0.107	0.017 0.015	0.011 0.011	0.086 0.044
	Sr-89/Sr-90	30 30	31 25	13 16	10 10	6.4 6.8	6.3 6.5	≤ 30 ≤ 39	2.6 2.7	1.5 1.2	1.0 0.8	2.8 2.2	0.7 0.4
	W-185 (mc/mi ²)	15.5 17.6	9.3 8.7	3.40 3.50	1.58 1.49	1.27 lost	0.47 0.55	0.20 0.25	0.061 0.053	0.072 0.074	0.058 0.047	0.049 0.055	0.066 0.063
	Total β (mc/mi ²)	417 497	425 400	100 79	54 65	22.7 24.1	4.8 6.3	1.55 1.63	1.19 1.31	5.37 4.92	1.09 1.11	0.68 0.73	3.54 3.17
1960	Precip. (inches)	5.50	4.63	2.45	1.05	0.33	none	trace	0	0	0.28	5.06	0.77
	Sr-90 (mc/mi ²)	0.360 0.356	0.378 0.340	0.400 0.456	0.081 0.086	0.067 0.069	0.011 0.009	0.025 0.020	0.022 0.020	0.011 0.013	0.020 0.020	0.111 0.125	0.098 0.088
	Sr-89 (mc/mi ²)	0.32 0.36	0.31 0.36	2.29 2.59	0.047 0.052	0.022 0.016	≤ 0.003 0.010						
	Sr-89/Sr-90	0.9 1.0	0.8 1.0	5.7 5.7	0.6 0.6	0.3 0.2	≤ 0.3 1.1						
	W-185 (mc/mi ²)	0.18 0.23	0.086 0.092	0.069 0.069	0.019 0.025	0.020 0.016	≤ 0.012 ≤ 0.014						
	Ce-144 (mc/mi ²)	3.42 8.90	2.99 2.91	3.38 3.62	0.61 0.62	0.48 0.48	0.12 0.12	0.154 0.146	0.218 0.110	0.072 0.122	0.40 0.34	0.53 0.52	0.28 0.32
	Pu-239 (mc/mi ²)	≤ 0.0012 0.007	≤ 0.006 0.006	0.007 0.009	0.0014 0.0018	0.0020 0.0022	0.0038 0.0039	0.0025 0.0020	0.0049 0.0033	0.0006 0.0016	0.0011 0.0011	0.0067 0.0067	0.0020 0.0019
	Total β (mc/mi ²)	11.6 22.4	10.7 12.7	16.8 17.9	2.37 2.27	1.41 1.49	0.82 0.89						

CALIFORNIA, RICHMOND (Pot) continued from the previous page.

1961	Precip. (inches)	2.98	1.18	2.79	0.99	0.39	trace	0	0.08	0.30	0.09	4.98	1.20
	Sr-90 (mc/mi ²)	0.131	0.059	0.181	0.153	0.285	0.016	0.029	lost	lost	0.062,	1.33	0.66
		0.111	0.058	0.202	0.133	0.255	0.016	0.025	0.041	0.029	0.071	1.29	0.64
	Sr-89 (mc/mi ²)									0.19	6.01	98.2	28.8
										0.55	5.93	97.0	28.4
	Sr-89/Sr-90									--	97	74	44
										19.0	84	75	44
	Zr-95 (mc/mi ²)									34.6	7.6	75.7	lost
										36.3	5.9	lost	lost
	Rh-102 (mc/mi ²)						≤0.042	≤0.025	≤0.065	≤0.02	≤0.05	≤0.12	
							lost	≤0.025	lost	lost	≤0.05	≤0.03	
	Ru-103 (mc/mi ²)							lost	2.33	18.2	69.0	26.3	
								≤0.26	3.79	17.1	55.6	28.7	
	Ru-106 (mc/mi ²)							lost	0.072	1.05	10.0	6.65	
								≤0.005	0.099	0.85	8.6	5.81	
	Cs-136 (mc/mi ²)								not detected	not detected	not detected	not detected	
	Cs-137 (mc/mi ²)						0.054	0.061	0.058	0.113	1.88	0.75	
							0.069	0.061	0.059	0.091	1.77	0.72	
	Ba-140 (mc/mi ²)									19.6	≤200	≤20	
										≤23	≤205	≤23	
	Ce-144 (mc/mi ²)	0.66	0.23	0.79	0.47	1.15	0.21	lost	lost	3.02	3.4	51	26.4
		0.40	0.26	0.78	0.46	1.35	0.21	0.44	0.11	3.11	3.2	57	29.9
	Pu-147 (mc/mi ²)							≤0.38	≤0.2	--	--	--	--
								≤0.2	≤0.2	--	--	--	--
	Pu-238 (mc/mi ²)							≤0.0004	≤0.0014	0.0013	0.0012	0.0016	0.0013
								≤0.0005	0.0008	0.0010	0.0012	0.0024	0.0016
	Pu-239 (mc/mi ²)	0.0049	0.0012	0.0025	0.0043	0.0111	≤0.0007	0.0062	0.0113	0.0084	0.0031	0.022	0.0112
		0.0032	0.0024	0.0027	0.0042	0.0110	≤0.0003	0.0053	0.0074	0.0086	0.0036	0.021	0.0113
	Ce-141 (mc/mi ²)									--	33.7	67	99
									3.84	35.9	57	127	33.7
													35.9
1962	Precip. (inches)	1.19	8.88	0.85	0.31	dry	dry	dry	0.10	0.10	6.53	0.90	3.30
	Sr-90 (mc/mi ²)	0.83	4.37	0.66	0.72	0.044	0.114	0.074	0.063	0.087	1.12	0.337	1.00
		0.81	4.13	0.71	0.81	0.035	0.107	0.078	0.062	0.101	1.01	0.312	1.02
	Sr-89 (mc/mi ²)	31.1	116	14.5	8.2	0.29	0.52	0.28	0.24	1.31	17.2	16.4	37.4
		31.3	107	14.4	8.5	0.30	0.50	0.26	0.21	1.20	18.5	15.0	37.3
	Sr-89/Sr-90	38	26	22	11	6.6	4.6	3.8	3.8	15	15	49	37
		39	26	20	10	8.6	4.7	3.3	3.4	12	18	48	36
	Zr-95 (mc/mi ²)	lost	52.5	25.7	lost	0.050	lost	1.57	0.62	lost	lost	39.8	75.3
		lost	lost	30.2	lost	0.025	2.40	1.15	1.47	3.17	33.7	40.9	70.5
	Rh-102 (mc/mi ²)	1.2	lost	lost	lost	lost	lost	0.21					
		1.2	≤0.6	lost	lost	lost	lost	0.14					
	Ru-103 (mc/mi ²)	31	≤170	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	2.7	26.9	23.8	58.5
		17	≤230	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	1.9	32.1	28.2	34.3
	Rh-106 (mc/mi ²)	11	40	2.48	10.1	0.92	1.81	0.95	0.41	1.18	9.9	3.67	14.9
		13	50	15.1	13.4	0.39	1.50	1.18	0.38	0.88	8.9	3.88	8.93
	Cs-136 (mc/mi ²)	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.						
	Cs-137 (mc/mi ²)	1.18	2.9	1.19	1.14	0.112	0.218	0.181	0.143	0.211	1.59	0.569	1.87
		1.21	8.6	1.39	1.45	0.107	0.233	0.196	0.135	0.209	1.61	0.553	1.77
	Ba-140 (mc/mi ²)	7.81	N.D.										
		6.85	N.D.										
	Ce-141 (mc/mi ²)	N.D.	≤95	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	≤0.3	≤21.7	47.3	63.7
		N.D.	lost	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	≤0.3	≤21.1	44.9	78.1
	Ce-144 (mc/mi ²)	25	36.4	25.7	17.7	2.26	2.05	2.19	8.65	2.82	27.6	14.1	41.3
		24	lost	26.3	20.4	1.23	2.46	1.24	9.66	3.06	23.5	14.1	37.9
	Pu-238 (mc/mi ²)	0.0007	0.0031					≤0.001	N.D.	0.002	N.D.	0.0029	0.0026
		0.0006	0.0060					≤0.001	N.D.	0.001	N.D.	0.0040	0.0046
	-239 (mc/mi ²)	0.016	0.023					0.0021	0.0025	0.0038	0.019	0.010	0.019
		0.012	0.087					≤0.0048	0.0018	0.0028	0.015	0.009	0.020

CALIFORNIA, RICHMOND (Pot) continued

1963	Precip. (inches)	4.45	2.12	3.97	4.30	0.45	dry
	Sr-90 (mc/mi ²)	2.50	2.69	5.77	5.53	1.08	0.296
		2.58	2.35	5.57	7.97	1.03	0.203
	Sr-89 (mc/mi ²)	71.7	51.7	97.8	58.1	6.73	0.457
		73.7	59.7	84.1	63.3	6.45	0.581
	Sr-89/Sr-90	29	19	17	10	6.2	1.5
		28	25	15	7.9	6.3	2.9
	Zr-95 (mc/mi ²)	104	73.7	130	139	31.0	4.09
		113	67.7	139	134	23.4	lost
	Rh-102 (mc/mi ²)						
	Ru-103 (mc/mi ²)	153	96	99.4	N.D.	N.D.	lost
		166	88	81.7	N.D.	N.D.	< 7.17
	Rh-106 (mc/mi ²)	34.7	27.9	77.3	92.1	53.3	lost
		36.5	26.5	80.1	84.1	54.9	9.50
	Cs-136 (mc/mi ²)						
	Cs-137 (mc/mi ²)	4.09	4.17	9.13	11.8	1.56	0.392
		4.29	4.13	11.9	10.1	1.65	0.469
195	Ba-140 (mc/mi ²)						
	Ce-141 (mc/mi ²)	90	40	< 32	N.D.	< 6.65	N.D.
		87	44	< 89	N.D.	N.D.	< 6.65
	Ce-144 (mc/mi ²)	89.7	73.3	152	189	34.7	7.25
		86.9	69.3	161	193	29.8	7.21
	Pu-238 (mc/mi ²)	0.0026	0.0043	lost	lost	0.019	0.0004
		0.0029	0.0065	lost	lost	< 0.004	< 0.003
	Pu-239 (mc/mi ²)	0.047	0.035	lost	lost	0.031	0.0057
		0.045	0.037	lost	lost	0.014	0.013

Beginning in July 1963, collections and analyses at this site were terminated.

Monthly Fallout Deposition Collections: United States Sites (cont'd)

Site: CALIFORNIA, RICHMOND (Column) 37°56'N, 108°38'W, ~Alt. 65 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1961	Precip. (in.)							0	0.08	0.30	0.09	5.80	0.38
	Sr-90 (mc/mi ²)							0.012	0.038	≤0.02	0.064	lost	0.239
								≤0.014	0.044	0.036	0.064	0.86	0.258
	Sr-89/Sr-90							---		≥16	8.7	--	48
								---		7.2	9.6	93	49
1962	Precip. (in.)	1.19	6.26	3.17	0.31	0	0	dry	0.10	0.10	6.50	0.90	3.30
	Sr-90 (mc/mi ²)	0.69	3.13	2.43	0.72	0.049	0.157	0.101	0.129	0.148	1.00	0.938	1.05
		0.74	3.29	2.04	0.66	0.052	0.116	0.115	0.139	0.190	0.98	0.310	0.958
	Sr-89/Sr-90	40	29	14	11	8.4	5.2	3.3	7.8	8.5	16	15	36
		36	29	17	12	7.3	4.6	2.5	7.4	7.6	16	44	37
1963	Precip. (in.)	4.45	2.12	3.97	4.30	0.45	dry						
	Sr-90 (mc/mi ²)	2.62	2.25	4.01	6.21	1.67	0.306						
		2.58	1.85	3.89	6.45	2.18	0.315						
	Sr-89/Sr-90	34	20	19	10	3.1	3.4						
		37	23	20	9.9	2.4	4.1						

Beginning in July 1963, collections and analyses at this site were terminated.

Monthly Fallout Deposition Collections: United States Sites (cont'd.)

Site: CALIFORNIA, SAN FRANCISCO (Column) 37°37'N, 122°23'W, alt. 97 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
-19-	1959	Precip. (in.)	4.66	0.30	0.37	0.04	trace	trace	trace	2.30	trace	trace	1.97
		Sr-90 (mc/mi ²)	0.50	not	0.39	0.36	lost	0.05	0.09	0.10	0.01	0.18	lost
		Sr-89/Sr-90	26	recd.	14	8.1	--	1.0	*	*	*	*	--
	1960	Precip. (in.)	4.49	3.48	1.17	0.73	0.54	trace	trace	trace	0.28	4.33	5.21
		Sr-90 (mc/mi ²)	0.48	0.23	0.24	0.22	0.13	trace	0.00	0.05		0.07	
		Sr-89/Sr-90	--	--	--	--	--	--	--	--	--	--	--
-19-	1961	Precip. (in.)	2.64	1.18	3.39	1.25	0.60	0.10	trace	0.04	0.41	0.03	1.82
		Sr-90 (mc/mi ²)	lost	0.33	0.50		0.32		0.02	0.02	0.06	0.87	0.29
		Sr-89/Sr-90	--	--	--	--	--	--	--	7.8	60	74	60
	1962	Precip. (in.)	1.70	8.48	2.98	0.34	trace	trace	trace	0.03	0.09	7.30	0.36
		Sr-90 (mc/mi ²)	0.74	3.42	1.12	0.54	0.14	0.08	5.26	0.04	0.61	0.52	0.18
		Sr-89/Sr-90	41	27	19	11	7	10	6	6	20	31	35
-19-	1963	Precip. (in.)	4.47	2.03	3.94	3.70	0.50	trace					
		Sr-90 (mc/mi ²)	1.87	1.66	3.10								
		Sr-89/Sr-90	25	31	21								

Monthly Fallout Deposition Collections: United States Sites (cont'd.)

Site: COLORADO, DENVER (Column) 39°46'N, 104°53'W, alt. 5283 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)	1.24	1.31	2.85	1.35	3.33	0.44	0.83	0.25	1.82	2.46	0.40	0.26
	Sr-90 (mc/mi ²)		0.63	lost	lost	8.03	1.13	0.70	0.30	0.10	0.22	lost	0.04
	Sr-89/Sr-90		5.2	--	--	7.3	4.4	2.8	1.5	1.1	*	--	*
1960	Precip. (in.)	1.04	1.66	0.89	2.56	2.27	0.63	1.31	0.79	0.39	2.46	0.39	1.57
	Sr-90 (mc/mi ²)	0.18	0.21	0.17	lost	0.99		0.00		0.20		0.04	
	Sr-89/Sr-90	--	--	--	--	--		--		--		--	
1961	Precip. (in.)	0.07	0.66	2.51	1.06	4.12	1.11	1.60	1.21	4.67	0.77	0.98	0.30
	Sr-90 (mc/mi ²)	0.63		0.57		1.15		0.36		0.27	0.14	0.29	0.01
	Sr-89/Sr-90	--		--		--		--		38	63	58	56
1962	Precip. (in.)	1.33	1.06	0.52	1.10	0.84	1.52	0.54	0.58	0.07	0.05	0.68	0.17
	Sr-90 (mc/mi ²)	0.16	lost	0.37	2.54	2.02	3.54	0.87	0.80	0.28	0.39	0.25	0.10
	Sr-89/Sr-90	38	--	18	14	9	10	7	12	10	39	31	34
1963	Precip. (in.)	0.71	0.21	1.42	0.03	0.68	3.59						
	Sr-90 (mc/mi ²)	0.21	lost	0.58									
	Sr-89/Sr-90	40	--	21									

Monthly Fallout Deposition Collections: United States Sites (cont'd.)

Site: FLORIDA, CORAL GABLES (Pot) 25°44'N, 80°17'W, alt. 10 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1957	Precip. (in.)				5.04	10.11	5.82	8.54	13.62	6.27	3.98	2.54	2.84
	Sr-90 (mc/mi ²)				0.53	0.50	0.56	1.51	0.75	0.52	0.41	0.29	0.63
	Sr-89/Sr-90				--	19	36	--	58	40	48	16	15
1958	Precip. (in.)	2.63	1.76	5.08	1.70	16.47	9.31	4.30	9.82	3.76	3.27	4.25	5.91
	Sr-90 (mc/mi ²)	0.29	0.22	0.60	0.49	1.70	1.39	0.77	6.20	0.60	0.74	0.63	1.86
	Sr-89/Sr-90	17	12	9	21	28	16	54	9	44	36	46	29
1959	Precip. (in.)	2.45	2.35	4.51	1.97	11.86	15.19	9.80	10.12	9.18	7.90	12.56	1.13
	Sr-90 (mc/mi ²)	1.16	0.90	6.0	1.54	3.52	lost	1.72	0.50	0.46	0.17	0.20	0.02
	Sr-89/Sr-90	36	24	17	11	7.3	--	2.6	2.8	0.97	*	*	*
1960	Precip. (in.)	0.70	1.71	0.87	10.89	3.54	6.30	5.12	4.33	24.41	10.63	2.36	0.39
	Sr-90 (mc/mi ²)	0.07	0.11	0.07	1.33		lost	0.13	0.44	0.26		0.17	
	Sr-89/Sr-90	--	--	--	--		--	--	--	--	--	--	--
1961	Precip. (in.)	5.00	0.63	1.94	0.55	6.81	10.48	1.91	4.68	3.40	3.92	2.15	0.13
	Sr-90 (mc/mi ²)		0.19	0.13	0.24		lost		0.18	0.08	0.29	0.36	0.26
	Sr-89/Sr-90		--	--	--		--		--	45	84	89	65
1962	Precip. (in.)	1.46	0.12	2.80	1.18	0.91	10.36						
	Sr-90 (mc/mi ²)	0.61	0.62	1.60	3.50	0.96	2.08	1.29	0.95	1.22	1.32	0.40	0.38
	Sr-89/Sr-90	41	35	15	11	17	13	17	8	13	41	47	33
1963	Precip. (in.)												
	Sr-90 (mc/mi ²)	1.16	1.40	3.86									
	Sr-89/Sr-90	41	32	13									

Monthly Fallout Deposition Collections: United States Sites (cont'd)

Site: FLORIDA, MIAMI (Column) - 80th Meridian Station

	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1963												
Precip. (in.)		3.45	0.97									
Sr-90 (mc/mi ²)		1.94	2.72									
Sr-89/Sr-90		28	19									

Monthly Fallout Deposition Collections: United States Sites (cont'd.)

Site: HAWAII, HILO (Column) 19°43'N, 155°04'W, alt. 36 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)		13.13	7.59	7.92	7.01	2.93	5.78	7.40	1.32	5.88	30.05	14.37
	Sr-90 (mc/mi ²)		6.02	lost	1.74	2.56	0.49	1.02	0.91	0.02	0.03	0.25	0.31
	Sr-89/Sr-90		8	"	11	9	5.5	3.5	1.7	*	*	*	*
1960	Precip. (in.)	25.95	15.97	7.13	15.04	11.70	6.73	9.68	12.88	12.00	10.63	14.93	4.13
	Sr-90 (mc/mi ²)	0.56	0.82	0.55	1.44	1.57	not	0.96		0.15		0.81	
	Sr-89/Sr-90	--	--	--	--	--	recd.	--		--		--	
1961	Precip. (in.)	2.34	20.50	5.75	5.52	8.12	5.78	5.47	7.78	6.76	22.95	12.84	16.04
	Sr-90 (mc/mi ²)	3.07		0.93		1.51		0.49		0.08	0.72	not	1.43
	Sr-89/Sr-90	--		--		--		--		55	91	recd.	58
1962	Precip. (in.)	2.51	5.31	10.88	2.93	13.58	3.39	8.01	4.15	9.49	2.40	6.63	2.31
	Sr-90 (mc/mi ²)	0.80	3.70	5.70	0.82	8.75	2.18	2.74	1.25	2.61	not	2.77	0.84
	Sr-89/Sr-90	42	31	22	13	9	10	12	8	26	recd.	49	47
1963	Precip. (in.)	1.14	1.70	15.85	30.75	12.60	10.91						
	Sr-90 (mc/mi ²)	1.06	2.23	11.80									
	Sr-89/Sr-90	35	23	15									

Monthly Fallout Deposition Collections: United States Sites (cont'd)

Site: HAWAII, LIHUE (Column) 21°59'N, 159°21'W; ~alt. 115 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1960	Precip. (in.)	0.97	4.14	9.72	1.16	2.70	1.46	1.19	1.82	7.36	2.48	6.98	2.75
	Sr-90 (mc/mi ²)					0.89		0.21		0.22		0.20	
	Sr-89/Sr-90					--		--		--		--	
1961	Precip. (in.)	1.25	2.19	3.42	4.99	1.02	0.07	2.70	1.82	1.65	4.71	3.09	6.19
	Sr-90 (mc/mi ²)	0.36		0.41		0.41		0.00		0.17	0.33	1.02	0.66
	Sr-89/Sr-90	--		--		--		--		123	111	103	65
1962			(1/12 - 3/21)		(3/21-4/23)	(4/23-5/24)	(5/24-6/25)	(6/25-7/28)					
	Precip. (in.)	14.24	23.40	13.08	2.37	10.88	6.87	1.65	7.05	1.31	5.38		1.14
	Sr-90 (mc/mi ²)		7.46		2.23	4.43	1.07	0.78	lost	1.60	1.60		1.35
	Sr-89/Sr-90		51		18	8	17	15	lost	17	42		44
1963			(2/9 - 3/2)										
	Precip. (in.)	12.31	1.68	6.31	8.84	1.57	1.95						
	Sr-90 (mc/mi ²)	2.31	1.76	5.54									
	Sr-89/Sr-90	65	29	10									

Monthly Fallout Deposition Collections: United States Sites (cont'd)

Site: HAWAII, MAUNA LOA (Column) 19°32'21"N, 155°34'42"W, ~alt. 11,150 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)		3.51	0.11	0.88	trace	0	5.76	5.76	2.82	2.18	2.82	0.28
	Sr-90 (mc/mi ²)		1.26	lost	0.02	0.05	0.01	0.09	lost	lost	0.02	0	-0.10
	Sr-89/Sr-90		26	--	120	6.7	*	*	--	--	*	*	*
1960	Precip. (in.)	0.30	2.11	2.15	1.03	1.12	2.31	0.04	0.71	0.33	1.20	0.69	1.63
	Sr-90 (mc/mi ²)	0.15	0.18	0.19	0.14		0.50		0.00		0.01		0.00
	Sr-89/Sr-90	--	--	--	--		--		--	--	--		--
1961	Precip. (in.)	0.17	1.26	0.63	0.77	1.02	0.07	trace	1.00	0.67	3.32	2.91	2.87
	Sr-90 (mc/mi ²)		0.15		0.28		lost		0.02	0.01	0.06	0.04	0.09
	Sr-89/Sr-90	--	--	--	--		--		--	*	66	88	86
1962	Precip. (in.)	1.24	0.13	2.14	1.78	2.15	0.49	0.03	0.64	1.36	0.05	0.04	0.02
	Sr-90 (mc/mi ²)	0.42	0.05	1.05	1.07	1.48	0.19	0.01	0.04	0.14	0.01	5.98	0.06
	Sr-89/Sr-90	40	62	18	13	19	13	1	*	14	*	36	17
1963	Precip. (in.)	3.5	0.59	4.36									
	Sr-90 (mc/mi ²)	0.82	0.39	2.17									
	Sr-89/Sr-90	15	31	15									

Monthly Fallout Deposition Collections: United States Sites (cont'd)

Site: HAWAII, OAHU (UNIV. OF HAWAII) (Pot) 21°19'N, 157°50'W, alt. 78 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1957	Precip. (in.)						0.83	1.62	3.09	0.62	0.28	4.87	4.02
	Sr-90 (mc/mi ²)						0.58	0.42	0.31	0.16	0.13	0.64	0.57
	Sr-89/Sr-90						--	--	--	--	--	--	--
1958	Precip. (in.)	3.30	2.62	17.75	1.39	2.37	1.76	3.42	7.69	1.48	4.57	0.77	3.30
	Sr-90 (mc/mi ²)	0.71	0.36	1.33	0.84	1.15	1.21	0.07	0.70	0.73	1.56	0.49	1.12
	Sr-89/Sr-90	15	11	21	15	9	2	57	54	26	2	46	51
1959	Precip. (in.)	4.15	5.48	1.28	3.13	3.37	0.30	1.24	5.12		0.91	1.57	2.44
	Sr-90 (mc/mi ²)	2.21	3.91	4.86	2.11	1.61	1.07	lost	0.82		0.16	0.21	0.38
	Sr-89/Sr-90	33	31	18	12	8	4.0	--	0.9		*	*	*
1960	Precip. (in.)	2.19	2.41	2.40	2.18	3.86	1.44	1.18	2.23	1.48	2.24	2.37	5.20
	Sr-90 (mc/mi ²)	0.19	0.33	0.14	0.55	0.55	0.06		0.43		0.38		0.78
	Sr-89/Sr-90	--	0.8	--	--	*	--		--		--		--
1961	Precip. (in.)	5.57	4.52	1.19	1.48	1.59	2.60	2.30	3.42	3.15	7.65	2.55	1.32
	Sr-90 (mc/mi ²)		0.84		0.59		0.83	not	0.38	0.34	0.72	0.63	0.91
	Sr-89/Sr-90		--		--		--	recd.	--	*	20	81	54
1962	Precip. (in.)	2.75	2.63	2.09	1.06	0.31	0.12	3.23	1.96	1.87	1.67	0.30	1.79
	Sr-90 (mc/mi ²)	0.93	2.77	3.56	0.56	2.54	1.45	0.59	lost	0.91	0.46	0.23	1.30
	Sr-89/Sr-90	46	23	20	14	8	7	6	lost	7	19	14	4
1963	Precip. (in.)	9.87	0.55	11.84									
	Sr-90 (mc/mi ²)	4.18	4.76	8.22									
	Sr-89/Sr-90	31	29	11									

Monthly Fallout Deposition Collections: United States Sites (cont'd)

Site: ILLINOIS, ARGONNE (Pot) 41°42'N, 87°59'W, alt. 746 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1956	Precip. (in.)												1.26
	Sr-90 (mc/mi ²)												0.14
	Sr-89/Sr-90												18
1957	Precip. (in.)	2.06	1.77	1.98	6.09	3.21	5.94	8.98	5.36	1.08	3.15	2.72	1.95
	Sr-90 (mc/mi ²)	0.30	0.27	0.47	1.15	0.27	0.48	1.57	0.75	0.12	0.22	0.20	not
	Sr-89/Sr-90	15	--	--	--	8.3	17	--	--	62	28	14	recd.
1958	Precip. (in.)		1.45	0.33	1.64	3.21	6.43	4.74	2.51	1.86	2.12	1.58	0.57
	Sr-90 (mc/mi ²)		0.30	lost	0.57	0.79	4.87	0.09	3.67	0.33	0.76	1.04	0.42
	Sr-89/Sr-90	10		--	24	20	13	13	6	41	37	54	59
1959	Precip. (in.)	2.12	2.39	3.91	4.00	3.87	5.94	4.77	1.63	2.17	2.86	3.01	2.00
	Sr-90 (mc/mi ²)	1.00	lost	lost	4.41	4.19	0.58	0.33	lost	0.90	not	not	not
	Sr-89/Sr-90	37	--	--	10	7.6	4.5	*	--	--	recd.	recd.	recd.
1960	Precip. (in.)	3.54	3.16	1.18	3.15	2.76	3.94	3.54	1.18	1.57	1.57	1.18	1.18
	Sr-90 (mc/mi ²)	not	0.21	1.09	0.64	not	0.00						
	Sr-89/Sr-90	recd.	--	--	--	recd.	--	0.52		0.24			0.09
1961	Precip. (in.)	0.28	0.91	2.95	3.27	1.53	3.74	2.99	6.07	14.17	3.49	1.66	1.89
	Sr-90 (mc/mi ²)		0.14		1.25		1.58	0.22	0.28	0.15	0.44	0.90	0.70
	Sr-89/Sr-90	--	--	--	--	--	--	--	*	63	83	83	64
1962	Precip. (in.)	2.52	1.81	1.81	1.58	2.91	2.56	4.15	2.06	1.72	1.34	0.86	0.33
	Sr-90 (mc/mi ²)	1.55	1.47	0.06	1.62	6.96	1.67	1.87	0.24	0.82	1.04	0.31	0.24
	Sr-89/Sr-90	35	31	25	11	10	8	17	20	33	28	56	49
1963	Precip. (in.)	0.98	0.75	1.84									
	Sr-90 (mc/mi ²)	0.63	0.29	6.35									
	Sr-89/Sr-90	24	35	18									

Monthly Fallout Deposition Collections: United States Sites (cont'd)

Site: KENTUCKY, LOUISVILLE (Pot) 38°13'N, 85°48'W, ~Alt. 450 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1958	Precip. (in.)									2.83	1.65	2.77	1.19
	Sr-89 (mc/mi ²)									3.95	10.56	11.48	23.82
										3.68	10.82	--	24.10
	Sr-90 (mc/mi ²)									0.24	0.52	0.61	0.58
										0.26	0.41	0.71	0.60
	Sr-89/Sr-90									16	20	19	41
										14	26	--	40
1959	Precip. (in.)	5.51	2.76	2.13	1.68	4.42	1.11	2.61	5.20	0.48	3.26	4.15	3.77
	Sr-89 (mc/mi ²)	95.65	47.86	70.55	46.55	36.6	6.54	2.81	0.32	0.11	0.43	0.39	1.47
		97.83	52.79	72.21	40.32	35.1	5.50	2.44	0.10	0.21	0.35	0.21	0.62
	Sr-90 (mc/mi ²)	2.10	1.63	3.19	3.14	2.97	0.94	0.76	0.29	0.06	0.35	0.20	0.46
		2.28	1.54	3.13	3.56	2.98	0.92	0.58	0.29	0.10	0.35	0.26	0.42
	Sr-89/Sr-90	46	29	22	15	12	7	3.7	1.1	1.8	1.2	2.0	3.2
		43	34	23	11	12	6	4.2	0.3	2.1	1.0	0.8	1.5
1960	Precip. (in.)	2.55	4.31	2.42	1.17	3.52	10.11	1.99	1.79	3.00	1.58	3.35	2.04
	Sr-89 (mc/mi ²)	1.00	1.45	1.73	0.22	0.16	0.12	0.08					
	lost		1.86	1.35	0.20	0.25	0.25	0.12					
	Sr-90 (mc/mi ²)	0.41	1.32	0.34	0.56	1.07	1.32	0.18	0.16	0.11	0.18	0.12	0.07
		1.41	1.12	0.41	0.60	1.31	1.27	0.20	0.13	0.08	0.17	0.14	0.07
	Sr-89/Sr-90	2.4	1.1	5.1	0.4	0.1	0.1	0.4					
		--	1.7	3.0	0.3	0.2	0.2	0.6					
	Pu-239 (mc/mi ²)	no	0.02	0.01	0.04	0.016	0.011	0.003	0.001	0.001	0.004	0.002	0.002
		analysis	0.01	0.01	0.04	0.025	0.012	0.001	0.002	0.001	0.002	0.006	0.002
	Ce-144 (mc/mi ²)	made	0.16	0.49	1.97	0.24	0.56	2.895	2.77	0.602	0.524	0.862	0.34
			0.30	0.85	2.36	0.24	0.60	2.784	0.785	0.714	0.571	0.585	0.32
1961	Precip. (in.)	2.41	5.24	7.63	4.83	9.00	3.59	5.80	0.92	1.48	2.00	4.23	3.76
	Sr-89 (mc/mi ²)									2.66	17.60	63.70	53.00
										3.28	18.95	61.23	58.19
	Sr-90 (mc/mi ²)	0.130	0.302	0.51	1.14	1.32	0.48	0.34	0.18	0.131	0.243	0.734	0.856
		0.156	0.380	0.53	0.97	1.13	0.39	0.52	0.16	0.076	0.276	0.788	0.909
	Sr-89/Sr-90									20	72	87	62
										43	67	78	64
	Pu-239 (mc/mi ²)	0.009	0.007	0.007	0.027	0.033	0.009						
		0.017	0.008	0.016	0.045	0.025	0.004						
	Ce-144	0.661	1.07	1.68	3.70	3.92	1.41						
		0.577	1.04	1.85	3.61	4.00	1.42						
1962	Precip. (in.)	4.03	6.58	3.58	1.44	2.90	5.94	0.65	2.08	3.68	4.70	1.60	2.72
	Sr-90 (mc/mi ²)	2.04	2.18	2.88	1.44	3.83	4.14	1.09	0.93	0.37	1.85	2.31	1.08
		2.07	2.59	3.14	1.22	4.03	3.88	0.98	0.78	0.71	1.59	3.23	1.29
	Sr-89 (mc/mi ²)	95.26	50.51	72.24	21.87	63.78	39.45	14.00	12.65	9.76	31.61	62.11	30.81
		93.38	80.35	76.05	16.97	63.65	37.54	14.14	12.59	27.57	27.74	61.42	33.91
	Sr-89/Sr-90	47	23	25	15	17	10	13		26	17	28	
		45	31	24	14	16	10	14	16	39	17	19	26
1963	Precip. (in.)	1.18	1.27	9.04	1.87	4.56	4.18						
	Sr-90 (mc/mi ²)	1.86	2.41	7.74	3.11	14.78	9.05						
		1.54	1.97	6.25	4.82	15.28	11.80						
	Sr-89 (mc/mi ²)	43.48	46.45	101.47	52.94	110.31	45.80						
		43.54	41.65	79.15	59.36	100.98	67.11						
	Sr-89/Sr-90	23	19	13	17	7	5						
		28	21	12	12	7	6						

Collections at this site were terminated in June 1963.

Monthly Fallout Deposition Collections: United States Sites (cont'd)

Site: KENTUCKY, LOUISVILLE (Column) 38°13'N, 85°48'W, ~Alt. 450 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1958	Precip. (in.)									2.83	1.65	2.77	1.19
	Sr-89 (mc/mi ²)									4.5	16.0	5.0	21.4
										4.6	10.6	9.0	21.3
	Sr-90 (mc/mi ²)									0.23	0.56	0.80	0.58
										0.22	0.30	1.20	0.50
	Sr-89/Sr-90									20	29	6	37
										21	35	8	43
1959	Precip. (in.)	5.51	2.76	2.13	1.68	4.42	1.11	2.61	5.20	0.48	3.26	4.15	3.77
	Sr-89 (mc/mi ²)	63.41	23.64	57.79	4.48	23.3	1.06	0.75	0.00	0.11	0.81	0.24	0.31
		31.61	27.54	60.30	0.00	27.8	5.37	0.07	0.25	0.14	0.16	0.10	0.45
	Sr-90 (mc/mi ²)	1.63	1.55	2.71	0.14	2.07	0.22	0.50	0.17	0.08	0.22	0.18	0.52
		0.82	1.26	2.84	0.29	2.90	0.84	0.43	0.25	0.09	0.27	0.30	0.42
	Sr-89/Sr-90	39	15	21	32	11	5	1.5	0	1.4	3.7	1.3	0.60
		39	22	21	--	10	6	0.2	1	1.6	0.6	0.33	1.07
1960	Precip. (in.)	2.55	4.31	2.42	1.17	3.52	10.11	1.99	1.79	3.00	1.58	3.35	2.04
	Sr-89 (mc/mi ²)	2.18	1.93	1.28	0.37	0.19	0	0.15					
		0.78	0.76	0.30	0.35	0.28	0	0.17					
	Sr-90 (mc/mi ²)	0.28	0.78	0.59	0.56	1.66	1.42		0.12	0.00	0.12	0.06	0.08
		1.05	0.99	0.41	0.44	1.23	1.11	0.07					
	Sr-89/Sr-90	7.8	2.5	2.2	0.7	0.1	~0	0.5					
		0.7	0.8	0.7	0.8	0.2	~0	0.5					
	Pu-239 (mc/mi ²)	no	0.01	0.01	0.04	0.016	0.009	0.001	0.001	0.003	0.009	0.002	0.003
		analysis	0.001	0.001	0.004	0.017	0.011	0.001	0.001	0.002	0.005	0.008	0.010
	Ce-144 (mc/mi ²)	made	0.25	0.62	0.89	0.24	0.59	0.938	0.700	0.460	0.626	1.204	0.45
			0.23	0.36	0.59	0.18	0.58	0.268	0.160	0.964	0.455	0.782	1.15
1961	Precip. (in.)	2.41	5.24	7.63	4.83	9.00	3.59						
	Sr-89 (mc/mi ²)												
	Sr-90 (mc/mi ²)	0.14	0.28	1.45		0.97	0.45						
		--	--	--		1.32	0.44						
	Sr-89/Sr-90												
	Pu-239 (mc/mi ²)	0.004	0.004	0.031		0.017	0.007						
		0.011	0.002	0.064		0.029	0.009						
	Ce-144 (mc/mi ²)	0.641	1.02	4.82		3.13	1.48						
		0.567	0.93	4.52		3.37	1.43						

These monthly collections have been discontinued.

Monthly Fallout Deposition Collections: United States Sites (cont'd)

Site: LOUISIANA, NEW ORLEANS (Column) 30°00'N, 90°03'W, ~alt. 3 feet

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1960	Precip. (in.)					3.15	1.57	4.33	6.51	4.00	4.33	0.60	4.17
	Sr-90 (mc/mi ²)					0.27		0.00		0.00			0.38
	Sr-89/Sr-90					--		--		--			--
1961	Precip. (in.)	6.94	9.00	8.53	2.88	7.27	8.01	10.38	7.26	8.90	0.51	8.66	5.99
	Sr-90 (mc/mi ²)	0.34			1.21	1.42		0.57		0.10	0.06	0.41	0.42
	Sr-89/Sr-90	--			--	--		--		36	60	81	66
1962	Precip. (in.)	4.19	1.17	1.60	2.66	1.31	8.87	4.70		2.52	3.29	1.96	4.47
	Sr-90 (mc/mi ²)	1.66	0.61	1.49	2.87	1.22	2.36	1.14	0.56	0.56	0.32	0.17	1.13
	Sr-89/Sr-90	41	29	18	14	17	15	24	17	6	26	40	41
1963	Precip. (in.)	5.21	5.90	1.00	1.84	3.17	4.16						
	Sr-90 (mc/mi ²)	1.56	1.60	0.66									
	Sr-89/Sr-90	30	26	18									

Monthly Fallout Deposition Collections: United States Sites (cont'd)

Site: MINNESOTA, INTERNATIONAL FALLS (Column) 48°34'N, 93°26', alt. 1180.

[illegible]

Monthly Fallout Deposition Collections: United States Sites (cont'd)

Site: MISSOURI, COLUMBIA (Column) 38°58'N, 92°20'W, Alt. 778. ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)		2.14	3.39	2.42	4.35	0.12	3.97	1.10	5.41	4.19	0.56	1.91
	Sr-90 (mc/mi ²)		3.65	3.95	2.92	3.90	0.38	0.56	0.11	0.24	0.26	0.17	0.29
	Sr-89/Sr-90		2.4	27	11	7.6	4.2	2.5	*	1.5	0.68	*	0.9
1960	Precip. (in.)	1.55	1.85	2.19	5.12	4.19	3.35	2.65	0.27	2.65	4.33	0.84	1.69
	Sr-90 (mc/mi ²)	0.16	0.37	0.30	lost	1.28		0.00		0.27		0.00	
	Sr-89/Sr-90	--	--	--	--	--		--		--		--	
1961	Precip. (in.)	0.69	2.04	4.68	4.70	6.33	5.26	5.66	1.97	8.20	2.86	3.36	1.63
	Sr-90 (mc/mi ²)	0.00		1.38		1.81		0.65		0.29	0.40	0.58	0.48
	Sr-89/Sr-90	--		--		--		--		15	100	81	72
1962	Precip. (in.)	1.66	2.00	3.40	1.33	2.59	1.41	3.58	4.14	6.73	2.48	0.74	0.77
	Sr-90 (mc/mi ²)	0.68	2.28	2.85	2.77	5.82	1.79	2.41	0.83	0.10	0.13	0.72	0.78
	Sr-89/Sr-90	43	40	20	14	16	11	14	21	9	29	38	36
1963	Precip. (in.)	0.40	0.18	3.43									
	Sr-90 (mc/mi ²)	0.39	0.46	1.97									
	Sr-89/Sr-90	22	24	25									

Monthly Fallout Deposition Collections: United States Sites (cont'd)

Site: MONTANA, HELENA (Column) 46°36'N, 112°00'W, alt. 3893 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)			0.02	0.72	1.56	1.90	0.11	0.36	0.46	0.95	1.45	0.14
	Sr-90 (mc/mi ²)			0.58	2.02	1.54	2.32	0.40	0.09	0.17	lost	0.03	0.17
	Sr-89/Sr-90			25	*	8.7	5.3	2.8	2.5	*	--	*	1.2
1960	Precip. (in.)	0.24	0.25	0.21	1.56	0.94	0.23	1.02	2.10	0.13	0.26	0.19	0.34
	Sr-90 (mc/mi ²)	0.06	0.11	0.11	0.52	0.11		0.52		0.11		0.00	
	Sr-89/Sr-90	*	0.8	--	--	--		--		--		--	
1961	Precip. (in.)	0.09	0.06	1.03	0.87	1.39	0.78	1.05	0.65	1.16	0.16	0.37	0.55
	Sr-90 (mc/mi ²)	0.13		0.47		0.30		0.39		0.10	0.11	0.27	0.11
	Sr-89/Sr-90	--		--		--		--		50	47	22	68
1962	Precip. (in.)	0.67	0.66	0.54	0.90	3.82	2.09	1.61	1.80	0.31	0.95	0.57	0.14
	Sr-90 (mc/mi ²)	0.10	0.35	0.42	0.15	4.29	3.45	3.46	2.70	0.52	0.56	0.29	0.20
	Sr-89/Sr-90	54	30	19	18	8	10	25	10	13	20	40	19
1963	Precip. (in.)	0.44	0.25	0.23									
	Sr-90 (mc/mi ²)	0.32	0.37	0.37									
	Sr-89/Sr-90	24	22	10									

Monthly Fallout Deposition Collections: United States Sites (cont'd)

Site: NEW JERSEY, WESTWOOD (Pot) 41°00'N, 74°02'W

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1957	Precip. (in.)												
	Sr-90 (mc/mi ²)								1.310 0.900	1.067 1.288	0.948 0.663	0.597 0.506	0.965 1.315
	Sr-89/Sr-90								--	--	--	--	--
1958	Precip. (in.)	6.42		4.92	6.38	3.98	1.90	2.78	4.31	2.66	4.72	3.46	1.08
	Sr-90 (mc/mi ²)	1.15 1.91	0.46 1.00	0.99 1.02	1.61 1.85	2.66 2.95	1.06 1.03	1.10 1.11	1.21 1.01	0.67 0.73	1.67 1.61	1.38 1.38	0.76 0.82
	Sr-89 (mc/mi ²)				45.6 32.1	30.1 34.2	10.5 15.3	42.4 45.8	26.3 24.2	19.42 18.40	73.77 83.38	53.50 53.11	25.74 24.65
	Sr-89/Sr-90				28 17	11 12	10 15	38 41	21 24	29 25	44 52	39 38	34 30
1959	Precip. (in.)	2.66	2.19	3.76	3.23	1.08	5.46	6.21	5.80	2.42	6.36	4.25	4.63
	Sr-90 (mc/mi ²)	1.387 1.385	1.376 1.508	4.49 4.89	6.20 6.51	2.72 2.54	3.56 4.00	1.80 1.72	0.998 1.01	0.088 0.074	0.415 0.422	0.282 0.267	0.329 0.331
	Sr-89 (mc/mi ²)	37.87 43.22	36.75 35.40	61.6 61.2	65.1 61.2	18.1 13.4	14.8 15.8	1.60 2.65	0.800 0.04	≤0.067 ≤0.076	0.388 0.396	0.302 0.300	0.583 0.608
	Sr-89/Sr-90	27 31	27 23	14 13	11 9	7 5	4 4	0.9 1.5	0.80 ~0	~0 ~0	0.94 0.94	1.07 1.12	1.77 1.84
1960	Precip. (in.)	3.13	4.89	2.14	3.99	2.70	1.50	8.33	6.73	6.95	2.59	2.96	2.06
	Sr-90 (mc/mi ²)	0.253 0.254	0.860 0.476	0.427 0.311	1.06 0.513	0.789 0.809	0.476 0.489	0.586 0.578	0.334 0.328	0.283 0.277	0.121 0.128	0.118 0.143	0.082 0.086
	Sr-89 (mc/mi ²)	≤0.030 ≤0.048	1.24 1.11	0.254 0.273	≤0.010 ≤0.003	≤0.036 ≤0.036	≤0.034 ≤0.034	-- --	-- --	-- --	-- --	-- --	-- --
	Sr-89/Sr-90	* *	1.44 2.33	0.6 0.1	* *	* *	* *	-- --	-- --	-- --	-- --	-- --	-- --
	Pu-239 (mc/mi ²)	lost "	≤0.0021 lost	0.0033 ≤0.0025	0.0110 0.0084	0.0097 0.0074	0.0036 0.0033	0.0051 0.0028	≤0.00346 ≤0.00149	≤0.00420 lost	≤0.00149 ≤0.00149	≤0.00149 ≤0.00198	-- --
	Ce-144 (mc/mi ²)	2.00 2.16	1.43 1.22	1.12 1.11	4.07 1.75	3.58 3.51	2.00 1.92	lost "	1.26 1.31	1.03 1.27	0.545 0.498	0.326 0.408	0.341 0.394
	Rh-102 (mc/mi ²)							0.00052	0.00042	0.00032	0.00233	0.00331	0.00087
1961	Precip. (in.)	1.46 & 15" snow	1.73 & 18" snow	4.86	6.17	2.79	1.95	6.83	5.47	3.68	2.06	2.95	3.46
	Sr-90 (mc/mi ²)	0.193 0.189	0.235 0.265	0.943 0.673	1.75 1.40	0.762 0.583	0.469 0.468	0.404 0.377	0.203 0.206	0.115 0.210	0.292 0.305	1.12 1.22	1.21 1.67
	Sr-89 (mc/mi ²)									4.47 4.42	20.4 22.3	92.1 104	49.0 95.4
	Sr-89/Sr-90									39 21	70 73	82 85	40 57
	Pu-239 (mc/mi ²)	0.0103 lost	0.0086 0.0057	0.0222 0.0181	0.0324 0.0370	0.0215 0.0242	0.0256 0.0136	0.0135 0.0517	-- 0.0183	≤0.0021 ≤0.0011	0.00469 0.00580	0.0115 lost	0.0176 0.0210
	Ce-144 (mc/mi ²)	0.571 0.697	0.714 0.709	2.96 2.58	2.87 3.38	2.43 1.87	1.60 1.92	2.77 1.67	1.73 1.45	1.23 5.28	7.46 9.21	41.4 40.4	49.3 58.4
	Rh-102 (mc/mi ²)	0.00208	0.00047	0.0139	0.0136	0.0245	0.0132	0.00475	0.00259	0.00206	0.00097	0.00135	0.00143
	Ba-140 (mc/mi ²)									66 ≤220	64 87	196 164	68.8 62.7
	Zr-95 (mc/mi ²)									23.3 82.7	44.4 66.4	168 151	133 138
	Bu-106 (mc/mi ²)							2.36 3.25	0.906 0.750	0.696 1.08	2.44 2.32	6.87 9.15	12.9 14.8
	Cs-137 (mc/mi ²)							0.621 0.611	0.615 0.410	0.376 0.471	0.605 0.712	1.85 2.07	2.34 2.73
	Ce-141 (mc/mi ²)									lost 51.0	32.1 30.8	144 167	42.2 67.0
	Pm-147 (mc/mi ²)							4.69 2.95	2.55 2.13				

1962	Precip. (in.)	2.95	4.44	4.57	3.37	1.26	6.29	1.29	7.47	3.45	4.70	4.61	2.85
	Sr-90 (mc/mi ²)	1.59	3.05	2.06	5.04	2.62	4.80	2.49	3.37	1.22	3.19	2.28	2.77
		1.37	3.05	2.15	6.00	2.65	4.77	2.73	3.53	1.25	3.01	2.70	3.14
	Sr-89 (mc/mi ²)	68.7	91.5	39.3	66.0	24.4	21.9	16.7	15.9	18.2	82.7	81.1	82.8
		66.9	93.6	38.9	59.8	27.4	29.6	17.0	19.5	18.5	75.5	84.9	86.3
	Sr-89/Sr-90	43	30	19	13	9.3	4.6	6.7	4.7	15	26	36	30
		49	31	18	10	10	6.2	6.2	5.5	15	25	31	27
	Pu-239 (mc/mi ²)	0.0100	0.0173	lost	0.0533	0.0343	0.0643	0.0620	0.0280	≤0.007	lost	0.030	0.0675
		0.0136	lost	0.0141	lost	0.0330	0.0924	0.0400	0.0340	≤0.007	0.030	0.041	0.0623
	Ce-144 (mc/mi ²)	56.2	87.2	50.5	114	52.2	123	50.4	63.3	20.3	74.8	41.7	81.4
		43.2	76.0	46.0	104	46.9	123	48.7	68.7	25.5	70.0	45.2	66.6
	Ba-140 (mc/mi ²)	10.7	6.39										
		9.51	6.00										
	Zr-95 (mc/mi ²)	118	137	47.0	92.2	45.0	56.8	32.3	60.6	25.9	120	94.0	222
		97.1	126	50.5	74.9	35.9	58.3	41.9	72.1	32.8	116	97.9	189
	Ru-106 (mc/mi ²)	15.6	39.6	6.18	55.4	17.9	51.2						
		11.6	38.9	9.10	43.8	17.1	54.5						
	Cs-137 (mc/mi ²)	2.89	4.98	3.02	8.87	3.86	8.21	3.13	4.68	1.76	5.20	2.80	lost
		2.55	4.46	3.16	7.49	3.70	8.61	3.08	5.07	1.77	4.31	3.07	lost
	Ce-141 (mc/mi ²)	34.3	60.2	17.6	3.52	3.20	≤10.6	≤7.36	≤13.9	28.9	97.2	103	78.0
		43.5	62.4	15.8	3.38	3.80	≤11.4	≤7.97	≤10.6	21.6	95.8	84.9	57.4
	Rh-102 (mc/mi ²)	0.00226	0.00467	lost	0.00332	0.00109	0.00412	0.00245	0.00248	0.000831	0.00418		
1963	Precip. (in.)	2.09	1.20	4.02	0.95	2.51	3.55						
	Sr-90 (mc/mi ²)	2.92	2.83	6.23	7.60	9.46	6.48						
		2.29	2.56	6.35	7.95	10.2	6.13						
	Sr-89 (mc/mi ²)	73.5	53.2	71.6	5.78	53.2	22.2						
		72.0	48.0	73.5	60.4	50.5	23.4						
	Sr-89/Sr-90	26	19	11	7.6	5.6	3.4						
		31	19	12	7.6	5.0	3.8						
	Pu-239 (mc/mi ²)	0.0145	0.0265	0.0727	0.0505	lost	≤0.0100						
		0.0319	0.0167	0.0344	lost	0.0532	≤0.0119						
	Ce-144 (mc/mi ²)	62.3	72.6	153	222	192	122						
		58.0	72.0	143	165	216	110						
	Ba-140 (mc/mi ²)												
	Zr-95 (mc/mi ²)	130	69.3	123	97.2	125	62.4						
		121	75.5	126	103	133	56.3						
	Ru-106 (mc/mi ²)												
	Cs-137 (mc/mi ²)	4.11	3.74	9.10	10.7	15.0	9.42						
		3.58	3.14	9.22	11.1	14.4	8.95						
	Ce-141 (mc/mi ²)	≤15.5	≤10.5	45.5	≤15	≤37.6	≤10.3						
		≤13.2	≤10.8	42.2	≤19	≤55.2	≤12.5						
	Rh-102 (mc/mi ²)												

Monthly collections from July 1963 are reported on page 167.

Monthly Fallout Deposition Collections: United States Sites (cont'd)

Site: NEW JERSEY, WESTWOOD (Column) 41°00'N, 74°02'W

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)				3.23	1.08	5.46	6.21	5.80	2.42	6.36	4.25	4.63
	Sr-90 (mc/mi ²)				4.62	1.48	4.35	1.13	0.63	0.123	0.35	0.23	0.27
					--	--	--	--	--	--	--	--	0.23
	Sr-89 (mc/mi ²)				40.4	8.3	14.8	2.14	0.78	≤0.052	0.26	0.40	0.40
					--	--	--	--	--	--	--	--	0.47
	Sr-89/Sr-90				8.8	5.6	3.4	1.9	1.2	~0	0.9	1.7	1.5
					--	--	--	--	--	--	--	--	1.4
1960	Precip. (in.)	3.13	4.89	2.14	3.99	2.70	1.50	8.33	6.73	6.95	2.59	2.96	2.06
	Sr-90 (mc/mi ²)	0.333	0.270	0.374	0.688	0.755	0.545	0.41	0.18	0.22	0.18	0.10	0.00
		0.334	0.711	0.389	0.692	0.768	0.634						
	Sr-89 (mc/mi ²)	0.131	0.473	0.08	≤0.408	≤0.034	≤0.037						
		0.082	0.900	≤0.06	≤0.038	≤0.034	≤0.039						
	Sr-89/Sr-90	0.4	1.8	0.2	*	*	*						
		0.2	1.3	*	*	*	*						
	Pu-239 (mc/mi ²)	0.0030	≤0.0022	≤0.0042	0.0039	0.0058	≤0.0031	0.0033	≤0.0016	≤0.0044	≤0.0020	≤0.0016	
		0.0053	≤0.0019	0.0054	≤0.0042	0.0072	0.0057	0.0033	≤0.0016	≤0.0044	≤0.0024	≤0.0016	
	Ce-144 (mc/mi ²)	2.02	0.790	0.352	2.41	3.46	2.79	1.98	1.36	0.966	lost	0.312	0.251
		3.26	lost	1.08	2.09	3.12	3.19	1.35	1.23	lost	0.680	0.512	lost
	Rh-102 (mc/mi ²)												
1961	Precip. (in.)	1.46 & 15" snow	1.73 & 18" snow	4.86	6.17	2.79	1.95	6.83	5.47	3.68	2.06	2.95	3.46
	Sr-90 (mc/mi ²)	0.544	0.456	1.03	1.29	0.544	0.394	0.446	0.477	0.135	0.26	1.11	1.36
		0.515	0.453	1.05	0.84	0.634	0.478	0.420	0.458	0.186	0.24	1.04	1.24
	Sr-89 (mc/mi ²)									2.48	18	81.1	74.9
										2.60	16	72.5	73.0
	Sr-89/Sr-90									18	75	73	55
										14	62	70	59
	Pu-239 (mc/mi ²)	0.0064	0.0228										
		0.0059	0.0095										
	Ce-144 (mc/mi ²)	1.30	0.597	1.78	2.80	2.37	1.33						
		--	0.803	1.86	1.74	4.43	lost						
1962	Precip. (in.)	2.95	4.44	4.57	3.37	1.26	6.29	1.29	7.47	3.45	4.70	4.61	2.85
	Sr-90 (mc/mi ²)	1.43	3.01	1.90	4.62	2.89	5.50	2.22	2.87	1.25	2.98	1.33	3.78
		1.29	2.74	1.84	5.15	3.06	5.33	2.51	2.84	1.44	2.96	1.17	3.97
	Sr-89 (mc/mi ²)	56.1	87.9	34.7	67.3	31.8	26.7	14.8	15.1	16.9	74.2	46.0	lost
		53.2	85.6	33.6	66.0	22.2	25.3	13.8	19.4	18.9	74.2	46.2	76.0
	Sr-89/Sr-90	39	29	18	15	11	4.8	6.7	5.3	14	25	35	
		41	31	18	13	7.2	4.7	5.5	6.8	13	25	40	19
1963	Precip. (in.)	2.09	1.20	4.02	0.95	2.91	3.55	4.76	1.80	4.69			
	Sr-90 (mc/mi ²)	2.73	2.37	3.53	7.48	9.90	3.98	12.0	7.11	4.63			
		2.42	2.28	4.11	7.38	9.31	5.46						
	Sr-89 (mc/mi ²)	64.5	43.7	40.2	46.6	45.7	16.4	33.0		5.55			
		70.5	39.7	60.2	41.1	52.4	22.2						
	Sr-89/Sr-90	24	18	11	6.2	4.6	4.1	2.8		1.2			
		29	17	15	5.6	5.6	4.1						

Monthly Fallout Deposition Collections: United States Sites (cont'd.)

Site: NEW YORK, NEW YORK CITY 40°40'N, 73°50'W, alt. 55 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1954	Precip. (in.)		1.81	3.22	2.55	3.28	1.57	0.71	4.38	6.52	1.93	4.93	3.34
	Sr-90 (mc/mi ²)		2.37	0.52	0.34	0.48	0.46	0.14	0.19	1.47	0.20	0.65	0.33
	Sr-89/Sr-90		--	--	--	--	--	--	--	--	--	--	--
1955	Precip. (in.)	0.46	3.01	3.71	1.97	2.02	3.34	0.31	10.75	2.78	6.87	4.18	0.19
	Sr-90 (mc/mi ²)	0.23	0.87	2.43	1.24	0.89	0.87	0.25	0.68	0.43	0.35	0.42	0.55
	Sr-89/Sr-90	--	--	--	--	--	--	--	--	--	--	--	--
1956	Precip. (in.)	1.02	4.84	4.89	2.66	2.20	3.11	3.13	2.80	2.08	1.20	5.03	3.29
	Sr-90 (mc/mi ²)	2.71	1.26	1.61	0.77	1.04	0.80	0.46	0.74	0.32	0.31	0.89	0.55
	Sr-89/Sr-90	--	--	--	--	--	--	--	--	--	--	--	--
1957	Precip. (in.)	1.57	2.50	2.05	4.51	3.67	1.66	1.66	2.87	3.01	3.27	4.46	5.26
	Sr-90 (mc/mi ²)	0.26	0.53	1.03	4.80	0.94	0.82	0.84	0.50	0.41	0.38	0.42	0.60
	Sr-89/Sr-90	24	21	--	--	12	28	18	59	47	61	21	20
1958	Precip. (in.)	3.79	2.98	3.19	6.14	3.25	2.55	3.68	2.36	4.44	5.46	1.85	1.25
	Sr-90 (mc/mi ²)	1.29	1.23	0.89	1.52	2.63	1.76	1.58	0.60	0.65	1.06	0.98	1.77
	Sr-89/Sr-90	21	16	17	12	11	12	11	20	28	53	29	46
1959	Precip. (in.)	2.34	1.69	3.77	1.91	1.33	4.20	4.28	4.80	0.71	4.88	4.95	4.96
	Sr-90 (mc/mi ²)	1.19	1.73	5.09	6.28	1.30	4.44	0.49	0.68	0.12	0.36	0.31	0.51
	Sr-89/Sr-90	32	23	13	12	5.2	5.04	3.33	1.0	1.05	0.33	0.32	*
1960	Precip. (in.)	3.16	5.41	2.94	3.18	3.75	1.00	9.97	6.04	7.48	2.36	2.76	3.15
	Sr-90 (mc/mi ²)	0.45	0.81	0.32	0.42	0.73	0.43	0.27	0.22	0.15	0.11	0.12	0.11
	Sr-89/Sr-90	0.3	1.5	1.0	0.9	0.2	0.4	--	--	--	--	--	--
1961	Precip. (in.)	3.19	4.09	5.12	7.36	3.98	2.76	5.47	3.13	1.70	2.21	2.71	3.04
	Sr-90 (mc/mi ²)	0.11	0.17	0.68	0.97	0.83	0.43	0.20	0.12	0.06	0.30	0.96	1.44
	Sr-89/Sr-90	--	--	--	--	--	--	--	--	72	87	83	47
1962	Precip. (in.)	2.62	3.74	2.97	3.00	1.26	3.73	1.67	5.71	3.10	3.15	3.94	2.26
	Sr-90 (mc/mi ²)	0.93	3.16	1.46	2.20	2.28	3.86	2.09	2.05	0.96	1.01	0.88	1.16
	Sr-89/Sr-90	50	30	15	11	10	7	5	7	18	30	27	33
1963	Precip. (in.)	1.93	2.55	3.61	1.27	2.16	2.72	2.19	3.21	3.95	0.14		
	Sr-90 (mc/mi ²)	2.39	1.14	4.26	3.70	4.52	4.72	6.84	4.78	2.92	0.31		
	Sr-89/Sr-90	30	19	21	--	5.2	5.2	3.4	1.5	1.3	0.9		

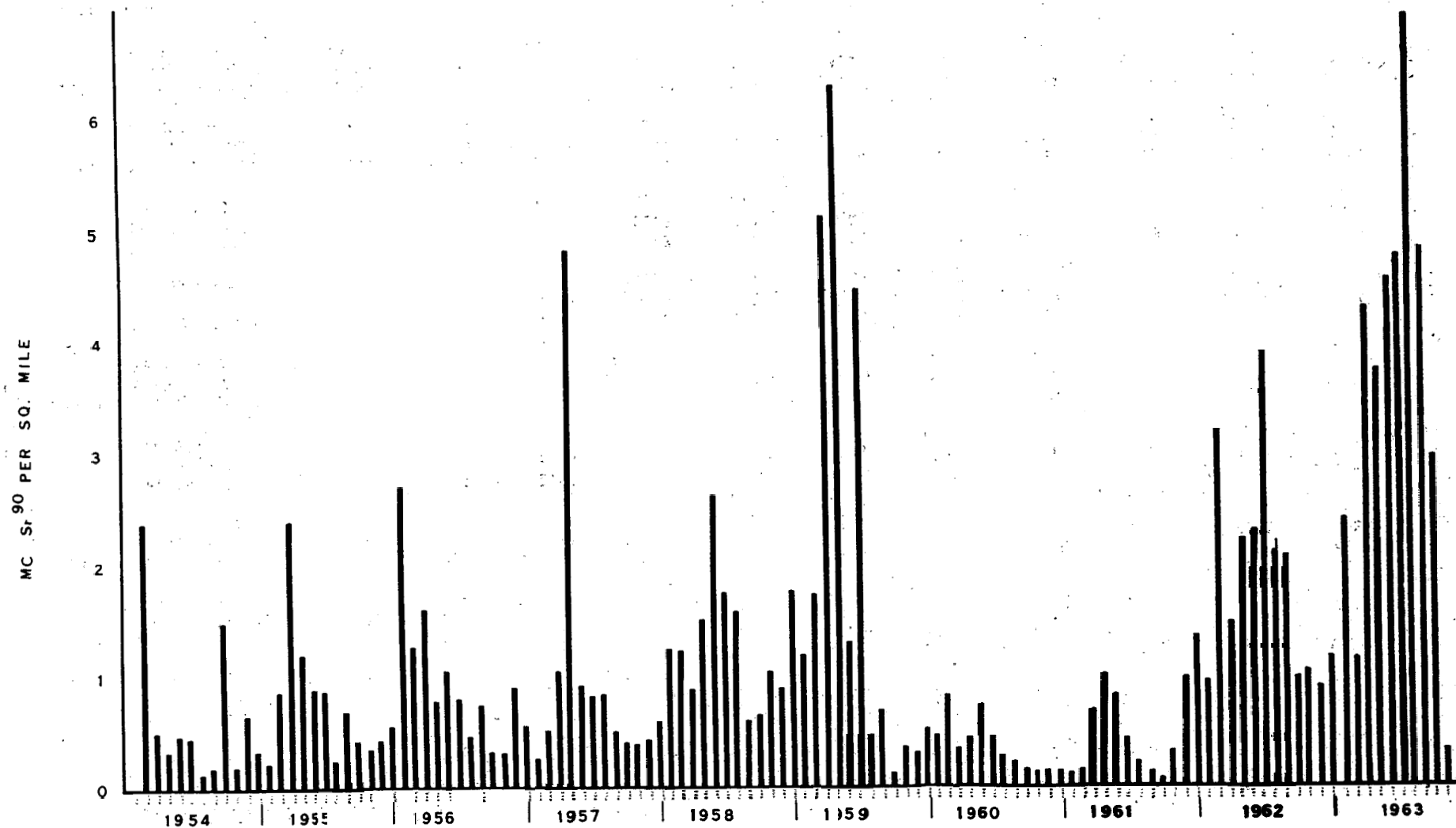


FIGURE 2

MONTHLY Sr^{90} NEW YORK CITY

Monthly Fallout Deposition Collections: United States Sites (cont'd)

Site: NORTH DAKOTA, WILLISTON (Column) 48°10'N, 103°38'W, ~alt. 16 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)	0.23	0.51	0.17	0.30	0.78	4.93	0.17	1.08	3.74	1.38	1.71	0.54
	Sr-90 (mc/mi ²)		0.22	lost	0.69	1.01	2.30	0.76	0.18	0.31	0.07	0.05	0.13
	Sr-89/Sr-90		23	--	12	7.5	6.8	2.9	0	0.59	*	1.8	1.3
1960	Precip. (in.)	0.61	0.39	0.28	1.11	1.73	5.22	0.89	2.98	0.05	0.02	0.64	0.45
	Sr-90 (mc/mi ²)	lost	0.14	0.26	0.58	0.54		0.32		0.12		0.06	
	Sr-89/Sr-90	--	0.7	--	--	--		--		--		--	--
1961	Precip. (in.)	0.09	1.25	0.12	2.39	0.58	0.43	1.80	0.14	2.49	0.07	0.09	0.05
	Sr-90 (mc/mi ²)	0.90		0.59		0.35		0.34		0.24	0.08	0.07	0.12
	Sr-89/Sr-90	--		--		--		--		24	27	51	52
1962	Precip. (in.)	0.47	0.95	0.60	0.38	3.50	3.14	4.10	1.97	0.43	2.08	0.38	0.27
	Sr-90 (mc/mi ²)	0.09	0.23	0.47	0.72	4.90	2.88	3.70	0.44	0.33	0.74	0.70	0.18
	Sr-89/Sr-90	56	28	21	14	8	9	11	10	10	25	35	24
1963	Precip. (in.)	0.35	0.53	0.70	2.33	2.05	3.00						
	Sr-90 (mc/mi ²)	0.14	0.62	0.42									
	Sr-89/Sr-90	23	22	12									

Monthly Fallout Deposition Collections: United States Sites (cont'd)

Site: OKLAHOMA, TULSA (Pot) 36°07'N, 95°58'W, alt. 804 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1958	Precip. (in.)	1.78	0.86	6.14	4.64	3.44	3.08	3.33	3.58	3.61	0.21	1.39	0.82
	Sr-90 (mc/mi ²)	0.35	0.40	2.29	2.84	2.22	1.47	1.92	1.05	0.90	0.20	0.47	0.57
	Sr-89/Sr-90	15	8	10	12	9	15	88	53	36	23	8	46
1959	Precip. (in.)	2.46		3.02	1.46	6.66	3.30	9.85	2.13	7.42	6.08	1.48	2.53
	Sr-90 (mc/mi ²)	3.94		6.45	3.19	5.95	1.61	1.45	0.26	0.56	0.08	0.06	0.55
	Sr-89/Sr-90	17		13	8.6	8.3	4.2	2.3	1.7	0.38	*	*	*
1960	Precip. (in.)	1.22	2.65	1.06	3.63	8.91	1.65	9.01	1.87	0.89	3.53	0.63	3.01
	Sr-90 (mc/mi ²)	0.17	lost	0.38	0.96	1.99		1.22		0.29	lost	0.15	
	Sr-89/Sr-90	--	--	--	--	--		--		--	--	--	
1961	Precip. (in.)	0.66	2.86	3.30	1.49	9.09		10.88	3.16	7.37	0.86	3.18	(see '62 data
	Sr-90 (mc/mi ²)	0.57		1.42		2.57		0.89		0.27	0.36	0.49	2.18
	Sr-89/Sr-90	--		--		--		--		84	113	99	(12/6-2/12)
1962	Precip. (in.)	(12/6-2/12) 1.33	(2/12-2/28) 1.44	3.24	3.40	1.69	5.52	4.83	3.10	10.50	3.92		2.46
	Sr-90 (mc/mi ²)	3.50	2.02	not	2.28	5.61	2.88	not	not	1.95	1.04		2.34
	Sr-89/Sr-90	46	25	recd.	19	20	15	recd.	recd.	12	32		76
1963	Precip. (in.)		1.76	1.45									
	Sr-90 (mc/mi ²)	0.27	1.56	2.05									
	Sr-89/Sr-90	22	27	25									

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Monthly Fallout Deposition Collections: United States Sites (cont'd)

Site: OREGON, MEDFORD (Column) 42°22'N, 122°52'W, Alt. 1312 ft.

[illegible]

Monthly Fallout Deposition Collections: United States Sites (cont'd.)

PENNSYLVANIA, PITTSBURGH (Pot) 40°26'N, 80°00'W, ~Alt. 745 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1957	Precip. (in.)							4.51	0.49	4.62	1.94	2.17	4.93
	Sr-90 (mc/mi ²)							0.87	0.160	0.126	0.281	0.44	0.66
								0.85	0.152	0.182	0.331	0.13	0.59
	Sr-89/Sr-90									50 28	26 27	5.9 22	12 14
1958	Precip. (in.)	3.40	1.00	3.36	3.87	3.87	3.00	8.47	5.33	4.34	0.84	3.13	1.18
	Sr-90 (mc/mi ²)	0.66	0.33	0.47	1.38	0.87	2.62	2.15	1.66	0.68	0.55	0.76	0.76
		0.66	0.38	0.48	0.62	0.84	2.47	2.48	1.69	0.68	0.56	0.71	0.77
	Sr-89 (mc/mi ²)	4.4	3.5	5.3	19.6	8.4	34	96	43	18.3	16.7	24.8	19.5
		4.3	4.2	5.1	7.7	9.7	36	90	40	15.9	14.2	24.7	19.0
	Sr-89/Sr-90	7	11	11	14	10	13	45	26	27	30	33	26
		6	11	11	12	12	14	36	24	23	25	35	25
1959	Precip. (in.)	2.80	4.01	2.50	3.65	2.92	3.60	3.32	3.52	1.41	4.59	3.10	2.87
	Sr-90 (mc/mi ²)	1.59	2.01	3.63	5.42	2.96	2.14	0.644	0.367	0.061	0.343	0.347	0.406
		1.29	1.99	3.27	5.36	2.85	1.97	0.704	0.504	0.068	0.355	0.361	0.285
	Sr-89 (mc/mi ²)	34.5	39.8	60.8	52.5	18.2	9.2	2.04	0.82	0.03	0.08	0.17	0.10
		34.0	41.4	61.8	50.1	19.5	9.5	2.14	0.72	0	0.08	0.18	0.14
	Sr-89/Sr-90	22	20	17	10	6	4	3	2.2	0.5	0.2	0.5	0.2
		26	21	19	9	7	5	3	1.4	0	0.2	0.5	0.5
1960	Precip. (in.)	2.89	2.07	1.61	1.59	4.71	3.51	2.89	2.50	3.08	1.93	1.38	2.76
	Sr-90 (mc/mi ²)	0.201	0.420	0.321	0.587	0.784	0.803	0.478	0.250	0.182	0.15	0.10	0.19
		0.300	0.343	0.336	0.431	0.843	0.803	0.459	0.226	0.165	0.14	0.14	0.20
	Sr-89 (mc/mi ²)	0.11	0.44	0.66	0.21	0	0.06						
		0.01	0.55	0.52	0.23	0.22	0.17						
	Sr-89/Sr-90	0.5	1.0	2.0	0.36	•	0.07						
		0.03	1.6	1.6	0.53	0.26	0.21						
	Pu-239 (mc/mi ²)	--	0.003	0.020	0.003	0	0.010	0.022	0.020	0.019	0.005	0.014	0.014
		--	lost	0.012	0.008	0.009	0.003	0.014	0.034	0.012	0.007	0.009	0.025
	Ce-144 (mc/mi ²)	--	2.71	2.20	3.24	3.75	3.48	1.41	1.04	0.66	0.54	0.40	0.58
		--	lost	2.28	2.39	3.63	3.80	1.81	1.02	0.79	0.59	0.46	0.61
	Ru-106							1.63	9.01	0.63	2.89	0.51	0.40
								2.25	3.96	0.97	--	0.80	1.06

1961	Precip. (in.)	0.90	3.01	3.68	3.44	3.39	4.23	4.08	3.28	1.68	3.09	3.22	2.04
	Sr-90 (mc/mi ²)	0.11	0.54	0.74	1.16	0.92	0.83	0.409	0.198	0.073	0.44	0.70	1.01
		0.14	0.63	0.80	1.08	0.97	0.86	0.442	0.192	0.073	0.37	0.68	0.94
	Sr-89 (mc/mi ²)									1.33	27.4	53.4	61.0
										1.37	27.6	53.9	62.2
	Sr-89/Sr-90									18	62	76	60
										19	74	79	66
	Pu-239 (mc/mi ²)	0.044	0.039	0.119	0	0	0	0.015	0.008	≤0.006	≤0.008	≤0.01	≤0.01
		0.043	0.062	0.028	0.009	0	0	0.002	0.008	0.010	0.014	≤0.01	≤0.01
	Ce-144 (mc/mi ²)	0.31	1.53	2.42	3.32	2.19	2.18	0.91	0.59	0.43	7.86	19.0	27.9
		0.40	1.77	2.36	3.52	2.21	1.97	0.99	0.60	0.55	8.78	23.2	28.0
	Ru-106 (mc/mi ²)	0.31	1.12	1.61	2.32	2.26	1.76	0.94	0.56	0.53	5.75	9.3	11.3
		0.26	0.87	1.40	0.34	1.92	1.79	0.94	0.65	0.39	5.44	7.5	14.6
	Rh-102 (mc/mi ²)							0.01	0.01	≤0.03	0.08	0.02	≤0.01
								0.01	0.01	≤0.01	0.06	0.02	≤0.09
	Cs-137 (mc/mi ²)							0.68	0.41	0.17	0.69	1.20	1.68
								0.74	0.39	0.13	0.69	1.16	1.71
	Gross β							8.0	14.8				
								7.2	18.1				
	Ba-140 (mc/mi ²)									6.35	56.7	55.6	23.1
										6.83	64.5	62.8	24.8
	Zr-95 (mc/mi ²)									1.09	37.4	71.6	97.4
										1.62	67.5	80.9	78.5
	Ce-141 (mc/mi ²)									3.9	54	72	125
										3.4	54	114	82
	Pm-147 (mc/mi ²)							0	0				
								0	0				
1962	Precip. (in.)	2.03	3.56	3.02	4.56	2.60	1.61	3.17	2.58	6.86	2.15	1.39	2.34
	Sr-90 (mc/mi ²)	1.36	2.06	2.24	3.69	3.41	1.59	3.75	3.09	1.53	1.43	1.66	1.86
		1.26	2.07	2.29	4.03	3.61	1.51	3.82	3.34	1.51	1.33	1.53	1.92
	Sr-89 (mc/mi ²)	63.3	57.5	44.0	59.9	32.8	9.54	23.4	15.7	29.9	33.2	72.4	58.9
		64.4	59.5	47.6	54.2	34.2	10.2	22.2	16.4	27.1	33.8	64.7	59.2
	Sr-89/Sr-90	46	28	20	16	9.6	6.0	6.2	5.1	19	23	44	32
		51	29	21	13	9.5	6.8	5.8	4.9	18	25	42	31
	Ba-140 (mc/mi ²)	9.32	3.20										
		10.3	3.88										
	Ce-144 (mc/mi ²)	48.8	62.1	73.9	124	96.5	28.3	79.4	60.8	34.6	30.8	72.6	53.3
		48.0	65.5	81.0	133	94.4	26.2	81.6	55.2	35.8	36.4	48.2	56.7
	Pu-239 (mc/mi ²)	≤0.003	≤0.005	0.007	≤0.006	≤0.004	≤0.002	0.38	0.07	0.003	0.008	0.024	0.035
		≤0.003	≤0.007	0.003	≤0.010	≤0.002	≤0.002	0.11	1.26	0.006	0.01	0.027	0.034
	Ru-106 (mc/mi ²)	20.7	lost	32.7	72.3	43.5	11.5						
		18.4	32.5	31.2	66.4	42.8	13.1						
	Cs-137 (mc/mi ²)	lost	lost	4.79	10.2	7.09	2.76	5.94	low	2.42	2.14	2.46	2.85
		lost	lost	4.95	9.25	6.8	2.79	6.05	yield	2.56	2.17	2.46	2.88
	Rh-102 (mc/mi ²)	≤0.03	≤0.01	≤0.05	0.13	≤0.4	0.05						
		≤0.03	≤0.01	≤0.02	0.16	≤0.03	0.08						
	Zr-95 (mc/mi ²)	55.5	47.2	63.3	86.5	81.0	10.0	26.7	61.6	71.2	88.7	115	67.7
		59.9	57.7	52.6	80.0	58.4	9.72	60.7	51.6	42.4	92.4	66.6	91.7
	Ce-141 (mc/mi ²)	58	79	0	97	64	9.0	<44	71	87.9	112	259	105
		70	84	93	27	41	7.4	<80	77	71.6	105	169	123

Monthly Fallout Deposition Collections: United States Sites (cont'd)

PENNSYLVANIA, PITTSBURGH (Pot) - continued from the previous page

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1963	Precip. (in.)	1.97	2.55	6.85	3.04	1.66							
	Sr-90 (mc/mi ²)	2.05 2.05	2.28 2.40	7.35 7.33	7.89 7.90	5.75 5.67							
	Sr-89 (mc/mi ²)	56.7 59.6	53.9 53.3	99.7 105	71.3 69.5	39.4 39.0							
	Sr-89/Sr-90	28 29	24 22	14 14	9 9	7 7							
	Ba-140 (mc/mi ²)												
	Ce-144 (mc/mi ²)	57.6 59.6	65.6 62.4	198 200	186 161	126 126							
	Pu-239 (mc/mi ²)	0.033 0.055	0.030 0.019	0.017 0.043	0.057 0.050	0.080 0.079							
	Ru-106 (mc/mi ²)												
	Cs-137 (mc/mi ²)	3.10 3.26	4.18 3.63	12.3 13.7	14.8 13.6	10.5 9.47							
	Rh-102 (mc/mi ²)												
	Zr-95 (mc/mi ²)	66.2 76.5	58.2 58.0	104 121	106 86.1	48.5 57.3							
	Ce-141 (mc/mi ²)	75.0 62.0	33.4 37.8	0 0	0 0	0 0							

Collections and analyses at this site have been terminated.

Monthly Fallout Deposition Collections: United States Sites (cont'd)

Site: PENNSYLVANIA, PITTSBURGH (Column) 40°26'N, 80°00'W, ~Alt. 745 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1960	Precip. (in.)		2.06	1.61	1.59	4.71	3.87	2.89	2.50	3.08	1.93	1.38	2.76
	Sr-90 (mc/mi ²)		0.144 0.220	0.179 0.191	0.257 0.422	lost "	0.489 0.459	0.006 0.020	0.51 0.68	0.26 0.27	0.35 0.57	0.32 0.37	0.36 0.35
	Sr-89 (mc/mi ²)	2 5	0.7 0.5	0.6 0.6	0.3 lost	0 0.5							
	Sr-89/Sr-90	13.9 22.7	3.9 2.6	2.3 1.4	1 --	0.0 1.1							
	Pu-239 (mc/mi ²)			0 0.006	0 0.004	0.018 0.006	0.008 0	0.028 0.030	0.037 0.027	0.024 0.051	0.001 0.004	0.005 0.014	0.003 0.025
	Ce-144 (mc/mi ²)			1.19 1.08	1.94 2.03	3.01 2.13	2.33 1.52	1.32 1.57	0.91 0.98	0.28 0.28	0.28 0.80	0.14 0.10	0.10 0.28
1961	Precip. (in.)	0.90	3.01	3.68	3.44	3.86	3.76	4.08	3.28	1.68	3.09	3.22	2.04
	Sr-90 (mc/mi ²)	0.24 0.26	0.57 0.53	0.50 0.38	0.32 0.42	0.19 0.60	0.15 0.26	0.35 0.28	0.03 0.07	0.018 0.039	0.187 0.129	0.56 0.63	0.78 0.71
	Sr-89 (mc/mi ²)									0.39 0.74	9.37 6.73	37.4 57.0	45.3 43.8
	Sr-89/Sr-90									22 19	50 53	67 90	58 62
	Pu-239 (mc/mi ²)	0.014 0.012	0.013 0.015	0.006 0.005	lost 0	0 0	0 0						
	Ce-144 (mc/mi ²)	0.19 0.13	0.32 0.21	0.16 0.07	0.69 lost	0.36 0.28	0.27 0.50						
1962	Precip. (in.)	2.03	3.56	3.02	4.56	2.60	1.61	3.17	2.58	6.86	2.15	1.39	2.34
	Sr-90 (mc/mi ²)	1.36 1.54	2.09 2.06	2.20 2.58	4.23 4.31	4.14 3.86	1.76 1.73	3.30 3.05	2.76 1.08	1.35 1.43	1.16 1.13	1.20 1.35	1.44 1.67
	Sr-89 (mc/mi ²)	59.5 69.9	61.8 60.6	46.9 50.8	61.4 58.6	43.9 39.4	11.0 10.6	23.2 20.6	14.6 6.5	23.7 24.6	27.9 22.1	57.1 55.8	54.0 54.0
	Sr-89/Sr-90	44 45	30 29	21 20	14 14	11 10	6.2 6.1	7.0 6.8	5.3 6.0	18 17	24 20	48 41	38 32
1963	Precip. (in.)	1.97	2.55	6.85	3.04	1.66							
	Sr-90 (mc/mi ²)	1.89 1.74	2.28 2.20	6.91 6.65	7.20 6.88	6.04 5.24							
	Sr-89 (mc/mi ²)	53.9 50.8	49.7 45.1	88.2 87.5	68.6 65.7	36.7 31.4							
	Sr-89/Sr-90	28 29	22 20	13 13	10 10	6 6							

Collections and analyses at this site have been terminated.

Monthly Fallout Deposition Collections: United States Sites (cont'd)

Site: SOUTH CAROLINA, COLUMBIA (Column) 33°57'N, 81°07'W, alt. 217 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)				2.64	5.79	2.67	13.87	4.52	7.12	12.09	0.67	2.42
	Sr-90 (mc/mi ²)				2.52	1.31	0.49	lost	0.31	0.13	0.52	0.21	0.13
	Sr-89/Sr-90				12.2	7.4	4.9	--	1.6	0.91	0.65	*	14
1960	Precip. (in.)	7.15	5.53	6.17	3.91	1.47	2.37	4.79	0.27	3.94	1.71	0.68	2.37
	Sr-90 (mc/mi ²)	0.72	1.01	0.65	0.50	0.83		0.30		0.26		0.31	
	Sr-89/Sr-90	--	--	--	--	--		--		--		--	--
1961	Precip. (in.)	2.93	8.95	0.29	0.01	2.98	1.95	5.70	14.94	1.46	0.82	1.01	4.74
	Sr-90 (mc/mi ²)		1.54		0.51		0.34		0.54	0.07	0.03	0.10	1.04
	Sr-89/Sr-90	--	--	--	--	--	--	--	--	13	142	174	60
1962	Precip. (in.)	6.49	5.24	5.30	3.21	4.11	2.99	2.67	4.14	2.85	0.84	4.53	2.27
	Sr-90 (mc/mi ²)	1.86	2.15	4.08	0.23	3.91	2.25	1.86	0.83	1.26	0.05	0.18	0.82
	Sr-89/Sr-90	38	30	19	12	9	8	13	21	73	23	32	47
1963	Precip. (in.)	(1/1 - 2/15)											
	Sr-90 (mc/mi ²)	7.47	3.94	3.28	4.18	2.87	4.84						
	Sr-89/Sr-90	lost	1.73	2.72									

Monthly Fallout Deposition Collections: United States Sites (cont'd)

Site: SOUTH DAKOTA, VERMILLION (Pot) 42°47'10"N, 96°55'37"W, alt. 1220 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1957	Precip. (in.)				1.35	4.17	2.37	4.29	1.62	3.14	1.67	1.49	0
	Sr-90 (mc/mi ²)				0.51	1.74	1.01	2.80	1.11	0.87	0.93	0.14	0.06
	Sr-89/Sr-90					11	25	68	--	33	51	15	16
1958	Precip. (in.)	0.22	2.13	0.52	3.15	1.85	1.09	4.47	0.19	0.88	0	0.94	0.07
	Sr-90 (mc/mi ²)	0.08	0.38	0.20	2.54	2.28	0.16	2.42	0.50	0.29	0.06	0.74	0.21
	Sr-89/Sr-90	17	13	13	12	16	5	31	49	43	23	47	37
1959	Precip. (in.)	0.27	0.84	1.02	1.33	7.87	2.73	1.32	3.15	2.60	2.60	2.02	1.44
	Sr-90 (mc/mi ²)	0.09	0.90	2.14	3.27	lost	1.52	lost	lost	0.42	0.37	0.24	0.15
	Sr-89/Sr-90	25	24	18	12	--	5.1	--	--	0.37	0.31	*	1.3
1960	Precip. (in.)	0.29	0.10	1.09	3.54	7.38	1.84	1.36	5.77	2.79	0.73	1.04	0.42
	Sr-90 (mc/mi ²)	0.03	0.06	0.70	0.86	3.09		0.90		0.30		0.16	
	Sr-89/Sr-90	--	--	--	--	--		--		--		--	
1961	Precip. (in.)	0.17	0.88	0.88	0.87	3.93	3.04	1.17	3.85	2.05	1.43	0.90	0.94
	Sr-90 (mc/mi ²)		0.07		0.56	1.85		0.52		0.74	0.17	0.90	0.25
	Sr-89/Sr-90		--		--	--		--		141	65	62	53
1962	Precip. (in.)	0.14	1.09	3.01	1.90	5.77	5.51	4.45	2.93	2.95	0.66	0.12	0.13
	Sr-90 (mc/mi ²)	0.15	1.24	3.30	5.05	15.5	4.03	2.57	3.33	2.93	0.93	0.08	lost
	Sr-89/Sr-90	38	60	19	10	9	4	26	11	13	27	29	--
1963	Precip. (in.)	0.88	0.25	0.78	1.65	1.96	4.49						
	Sr-90 (mc/mi ²)	0.27	0.45	4.56									
	Sr-89/Sr-90	30	28	20									

Monthly Fallout Deposition Collections: United States Sites (cont'd)

Site: TEXAS, DALLAS (Column) 32°51'N, 96°51'W, ~alt. 524 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)		2.47	1.26	0.72	3.18	3.16	3.25	1.77	3.51	11.38	1.93	5.85
	Sr-90 (mc/mi ²)		2.13	not	2.84	5.4	0.88	0.29	0.09	0.20	0.01	0.14	0.32
	Sr-89/Sr-90		33	recd.	11	7.4	5.2	2.1	*	1.3	*	*	*
1960	Precip. (in.)	3.21	2.83	0.95	2.98	2.23	3.22	7.34	3.31	2.61	3.74	0.82	8.50
	Sr-90 (mc/mi ²)	0.55	0.06	0.32	0.50	0.49		0.00		0.11		0.12	
	Sr-89/Sr-90	--	--	--	--	--		--		--		--	
1961	Precip. (in.)	3.39	3.21	4.90	1.66	1.31	7.85	1.30	0.19	5.54	3.41	4.04	3.19
	Sr-90 (mc/mi ²)	0.56		0.98		0.72		0.00		0.08	0.07	0.11	0.68
	Sr-89/Sr-90	--		--		--		--		87	101	290 ?	63
1962	Precip. (in.)	1.32	3.02	2.35	8.95	2.00	4.63	8.52	3.38	6.27	7.29	5.72	1.29
	Sr-90 (mc/mi ²)	0.82	1.03	2.54	7.42	0.93	3.57	0.75	0.34	0.07	lost	1.63	1.79
	Sr-89/Sr-90	38	89 lost	18	12	19	8	18	20	14	--	23	38
1963	Precip. (in.)	0.49	0.30	0.66	6.36	1.94	1.48						
	Sr-90 (mc/mi ²)	0.39	0.77	1.01									
	Sr-89/Sr-90	45	31	15									

Monthly Fallout Deposition Collections: United States Sites (cont'd)

Site: TEXAS, EL PASO (Column) 31°48'N, 106°24'W, alt. 3948 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)		trace	0.07	0.15	0.30	0.46	0.40	2.39	trace	0.58	0.14	0.29
	Sr-90 (mc/mi ²)		0.15	not	0.75	1.00	0.46	0.48	0.32	0.05	0.04	0.03	0.12
	Sr-89/Sr-90		23	recd.	9.4	7.7	4.2	3.2	2.5	*	*	*	3.1
1960	Precip. (in.)	0.72	0.37	0.21	0.02	0.04	0.76	3.61	0.77	0.01	0.77	0.11	1.73
	Sr-90 (mc/mi ²)	0.24	0.20	0.34	0.14	0.47		0.02		0.06		0.21	
	Sr-89/Sr-90	--	--	--	--	--		--		--		--	
1961	Precip. (in.)	0.41	trace	0.29	0.01	trace	0.27	2.18	1.40	0.69	0.18	1.63	0.63
	Sr-90 (mc/mi ²)	0.84		0.39		0.10		0.19		not	0.06	0.43	0.61
	Sr-89/Sr-90	--		--		--		--		recd.	57	106	58
1962	Precip. (in.)	0.94	0.58	0.24	0.10	0	trace	1.82	trace	3.54	0.55	0.21	0.30
	Sr-90 (mc/mi ²)	1.00	0.39	0.29	0.70	0.09	lost	0.70	0.13	0.66	0.07	0.44	0.32
	Sr-89/Sr-90	44	25	22	13	12	--	11	22	11	25	50	38
1963	Precip. (in.)	0.13	0.53	trace	trace	0.71	0.05						
	Sr-90 (mc/mi ²)	0.33	0.60	0.08									
	Sr-89/Sr-90	40	19	6.6									

Monthly Fallout Deposition Collections: United States Sites (cont'd)

Site: TEXAS, HOUSTON (Column) 29°39'N, 95°17'W, alt. 72 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)		11.33	1.58	7.76	6.20	2.78	9.67	8.45	4.76	5.76	1.90	4.16
	Sr-90 (mc/mi ²)		0.20	not	5.54	6.63	0.44	lost	0.26	0.21	0.09	0.10	0.31
	Sr-89/Sr-90		7.8	recd.	11	6.2	5.0	--	0.68	0.90	*	0.59	*
1960	Precip. (in.)	3.23	3.93	0.38	1.84	0.90	14.66	2.34	7.42	0.61	7.32	3.69	8.97
	Sr-90 (mc/mi ²)	0.35	0.82	0.38	0.60	0.25		0.44		0.23		0.21	
	Sr-89/Sr-90	--	--	--	--	--		--		--		--	
1961	Precip. (in.)	4.44	3.88	1.84	2.42	3.59	11.11	10.07	4.17	7.89	0.05	10.20	3.31
	Sr-90 (mc/mi ²)	1.74		0.66		0.52		0.53		0.06	0.03	0.34	0.33
	Sr-89/Sr-90	--		--		--		--		4.9	40	67	64
1962	Precip. (in.)	1.73	0.71	0.94	4.81	1.15	7.40	0.07	2.77	3.97	3.12	5.68	4.78
	Sr-90 (mc/mi ²)	0.96	0.48	0.86	0.06	0.42	2.12	0.16	0.58	0.38	3.23	1.25	1.04
	Sr-89/Sr-90	40	26	18	16	16	16	24	12	14	36	76	46
1963	Precip. (in.)	3.09	2.60	0.55	0.92	0.62	7.79						
	Sr-90 (mc/mi ²)	0.76	1.65	0.80									
	Sr-89/Sr-90	8	30	16									

Monthly Fallout Deposition Collections: United States Sites (cont'd)

Site: TEXAS, HOUSTON (Pot) 29°45'N, 95°25'W, ~Alt. 40 ft.

	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1958 Precip. (in.)					1.55	2.10	1.94	6.44	8.90	5.90	1.65	0.54
Sr-90 (mc/mi ²)					0.37 0.38	0.67 0.74	0.62 0.48	0.61 0.61	0.61 0.40	0.64 0.64	0.25 0.24	0.46 0.49
Sr-89 (mc/mi ²)					3.6 3.4	15.6 18.7	41.0 31.5	32 37	14.4 13.8	21.2 21.8	8.1 7.6	19.4 19.2
Sr-89/Sr-90					10 9	23 23	66 66	53 61	24 35	33 34	32 32	42 39
1959 Precip. (in.)	5.58	6.11	0.84	6.92	7.5	6.52	8.17	6.99	4.24	4.89	1.45	5.69
Sr-90 (mc/mi ²)	1.14 1.28	1.94 1.75	1.57 1.28	4.12 4.05	6.01 lost	1.00 0.92	0.845 0.896	0.351 0.321	0.537 0.262	0.065 0.055	≤0.045 0.043	0.204 0.212
Sr-89 (mc/mi ²)	40.0 42.2	43.4 38.0	25.1 22.2	43.5 41.3	34.2 lost	4.83 5.11	2.36 3.63	0.72 0.48	0.440 0.363	0.044 0.059	0.348 0.146	0.267 0.088
Sr-89/Sr-90	35 33	22 22	16 17	11 10	5.7 --	4.8 5.6	2.8 4.1	2.1 1.5	0.8 1.4	0.68 1.1	-- 3	1.3 0.4
1960 Precip. (in.)	1.95	3.99	--	0.85	0.88	14.38	5.48	7.42	1.86	10.85	4.73	6.72
Sr-90 (mc/mi ²)	0.158 0.140	0.620 lost	lost lost	0.221 0.278	0.090 0.077	0.601 0.564	0.104 0.103	0.327 0.322	0.079 0.072	0.241 0.229	0.110 0.106	0.181 0.160
Sr-89 (mc/mi ²)	0.083 0.058	2.13 lost	lost lost	0.540 0.597	0.018 0.022	≤0.049 ≤0.011						
Sr-89/Sr-90	0.5 0.4	3.44 --	-- --	2.4 2.1	0.2 0.3	0.1 0.02						
Pu-239 (mc/mi ²)	≤0.000 ≤0.000	lost lost	lost lost	0.0056 0.0051	0.0060 0.0093	0.0115 0.0119	0.0049 0.0098	0.020 0.016	0.0059 lost	0.0051 0.0078	0.0043 0.0029	0.0042 0.0053
Ce-144 (mc/mi ²)	2.71 2.32	5.48 lost	lost lost	2.59 3.11	1.34 1.15	3.62 2.64	1.50 1.37	2.65 2.68	0.81 0.97	0.336 0.334	0.55 0.65	0.55 0.58
1961 Precip. (in.)	4.44	6.46	1.84	2.42	3.59	8.57	8.61	3.23	7.89	0.21	5.70	0.88
Sr-90 (mc/mi ²)	0.253 0.247	0.482 0.452	0.227 0.248	0.69 0.65	0.150 0.158	0.431 0.390	0.275 0.256	0.206 0.207	0.094 0.058	0.028 0.029	0.461 0.319	0.38 0.32
Sr-89 (mc/mi ²)									0.986 0.262	1.59 1.72	27.0 19.3	16.5 16.6
Sr-89/Sr-90									10 4.5	57 59	58 50	43 52
Pu-239 (mc/mi ²)	0.0050 0.0040	≤0.009 0.010	≤0.0014 ≤0.0027	0.017 0.019	≤0.0029 lost	0.0065 0.0061	0.0106 0.0089	lost "	0.0129 0.0054	0.004 lost	0.0105 0.0108	0.0065 0.0076
Ce-144 (mc/mi ²)	0.88 0.70	1.26 1.13	0.90 0.91	1.87 1.87	0.46 1.24	1.66 1.78	0.78 0.67	1.24 0.77	1.50 1.34	1.86 1.77	20.4 20.2	lost lost
Pu-238 (mc/mi ²)							≤0.0033 ≤0.0029	lost "	0.0012 0.0007	≤0.001 lost	0.0021 0.0019	0.0006 0.0007
Ce-141 (mc/mi ²)									4.7 5.6	N.D. N.D.	N.D. N.D.	lost lost
Zr-95 (mc/mi ²)									lost 3.76	7.7 10.4	63 61	lost lost
Ba-140 (mc/mi ²)									21.6 27.0	≤700 ≤760	1010 ≤1010	lost 58

TEXAS, HOUSTON (Pot) continued from the previous page.

1962	Precip. (in.)	1.25	0.60	0.60	4.81	1.15	7.40	2.77	3.97	3.12	5.68	4.73
	Sr-90 (mc/mi ²)	0.77 0.84	0.89 0.44	1.25 0.79	4.70 4.93	0.43 0.46	3.65 4.61	1.39 1.35	0.56 0.50	1.17 lost	2.04 2.90	1.86 lost
	Sr-89 (mc/mi ²)	46.1 48.1	24.1 11.4	20.7 16.1	60.0 64.8	8.61 8.81	31.2 40.5	14.6 13.3	4.21 4.25	26.0 lost	178 202	56.9 lost
	Sr-89/Sr-90	60 57	27 26	16 20	13 13	20 19	8.5 8.8	10 9.8	7.5 8.5	22 --	87 70	30 --
	Ce-144 (mc/mi ²)	lost lost	25.2 21.5	73.7 80.9	165 198	21.1 20.0	127 147	23.2 20.8	40.9 42.9	40.1 lost	92.9 102	65.3 lost
	Pu-239 (mc/mi ²)	0.022 0.025	0.018 0.017	0.049 0.051	0.109 0.114	0.022 0.016	0.090 0.105	0.025 0.025	0.033 0.029	0.092 lost	lost 0.060	0.044 0.045
	Ce-141 (mc/mi ²)	lost lost	≤2.0 N.D.*	N.D. N.D.	N.D. N.D.	N.D. N.D.	N.D. N.D.	≤10 ≤2	≤13 ≤7	68 lost	347 398	128 lost
	Pu-238 (mc/mi ²)	0.0018 0.0018	0.0008 0.0007	0.0016 0.0018	0.005 0.005	0.0011 0.0015	0.0048 0.0074	0.0007 ≤0.0017	0.0015 ≤0.0026	0.010 lost	lost 0.014	0.0046 0.0054
	Ba-140 (mc/mi ²)	21.2 lost	N.D. 2.9	N.D. 2.9				33.3 30.3	4.29 4.21	88.9 lost	653 773	
	Zr-95 (mc/mi ²)	21 lost	17 lost	81 87	132 133	24.5 31.2	192 213	20.3 19.2	58.5 56.9	75.7 lost	107 111	131 138
	Cs-137 (mc/mi ²)										4.49 4.45	3.03 3.53
1963	Precip. (in.)	3.09	1.75	0.55	0.92	0.62	-					
	Sr-90 (mc/mi ²)	2.40 2.51	2.94 2.81	1.02 0.93	1.69 2.63	2.32 2.68	lost 5.61					
	Sr-89 (mc/mi ²)	78 72	61 60	8.45 8.89	11.6 12.1	15.2 17.4	- 1.23					
	Sr-89/Sr-90	33 29	21 22	8.2 9.6	6.9 4.6	6.6 6.5	- 0.2					
	Ce-144 (mc/mi ²)	72.9 71.7	lost 92.1	39 37	65 77	68.5 68.9	20.0 146					
	Pu-239 (mc/mi ²)	0.035 0.039	0.037 0.045	lost lost	lost lost	0.047 0.049	0.049 0.067					
	Ce-141 (mc/mi ²)	76.1 76.5	lost 67.3	≤24 ≤36	≤37 ≤8	N.D. N.D.	N.D. ≤31					
	Pu-238 (mc/mi ²)	0.0077 0.012	0.0079 0.0053	lost lost	lost lost	0.0034 0.0030	0.0017 0.0015					
	Ba-140 (mc/mi ²)											
	Zr-95 (mc/mi ²)	72.5 75.3	79.7 86.5	23 27	50 lost	38.7 41.3	lost 44.5					
	Cs-137 (mc/mi ²)	lost lost	5.41 5.37	2.16 1.84	21.0 20.0	28.1 71.7	3.19 23.6					

Beginning in July 1963, collections and analyses at this site were terminated.

Monthly Fallout Deposition Collections: United States Sites (cont'd)

Site: TEXAS, HOUSTON (Tracerlab Site) (Column) 29°45'N, 95°25'W, ~Alt. 40 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1961	Precip. (in.)							8.61	3.23	7.89	0.21	5.70	0.88
	Sr-90 (mc/mi ²)							lost	0.179	lost	0.026	0.259	0.308
								0.092	0.162	0.020	0.033	0.343	0.312
	Sr-89/Sr-90							--	--	--	64 61	74 75	68 83
										12			
1962	Precip. (in.)	1.25	0.60	0.60	4.81	1.15	7.40	0.07	2.70	3.97	3.12	5.68	4.73
	Sr-90 (mc/mi ²)	1.15	1.07	1.83	4.81	0.453	3.43	0.44	0.87	0.283	1.25	1.64	2.21
		1.18	0.94	1.81	5.01	0.469	1.94	0.40	--	0.251	--	--	1.11
	Sr-89/Sr-90	40	28	20	14	17	8.7	12	9.2	8.6	23	0.66	42
		39	28	17	13	16	8.2	13		9.4			38
1963	Precip. (in.)	3.09	1.75	0.55	0.92	0.62	N.D.						
	Sr-90 (mc/mi ²)	2.10	0.04	0.629	0.693	2.89	3.23						
		0.43	2.32	--	0.946	1.90	6.69						
	Sr-89/Sr-90	30	27	21	13	3.7	--						
		30	25	--	11	13	0.7						

Beginning in July 1963, collections and analyses at this site were terminated.

Monthly Fallout Deposition Collections: United States Sites (cont'd)

Site: UTAH, SALT LAKE CITY (Pot) 40°46'N, 110°49'30"W, Alt. 4970 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1956	Precip. (in.)												1.67
	Sr-90 (mc/mi ²)												0.31
	Sr-89/Sr-90												--
1957	Precip. (in.)	1.37	0.72	2.18	3.24	3.37	1.47	0.31	1.69	0.33	0.78	1.37	1.61
	Sr-90 (mc/mi ²)	0.8	0.83	2.39	2.30	0.81	1.61	0.94	1.28	0.15	0.59	0.41	0.64
	Sr-89/Sr-90	16	14	9.3	--	1.3	24	--	--	40	49	15	12
1958	Precip. (in.)	0.87	2.20	2.19	2.92	0.30	0.04	0.05	0.23	0.25	trace	1.13	0.54
	Sr-90 (mc/mi ²)	0.70	1.10	1.47	2.10	1.30	0.28	0.06	0.71	lost	0.10	0.25	3.07
	Sr-89/Sr-90	15	13	32	13	12	12	107	44	--	47	16	43
1959	Precip. (in.)	1.60	1.41	0.79	1.61	2.05	1.38	0.19	1.76	1.66	0.22	0.10	1.05
	Sr-90 (mc/mi ²)	2.46	2.56	4.56	5.84	5.95	2.40	0.53	lost	0.69	0.25	0.93	0.26
	Sr-89/Sr-90	--	27	18	10	10	5.8	3.0	--	1.30	0.40	0.11	0
1960	Precip. (in.)	0.96	1.58	2.45	1.11	0.79	0.39	trace	1.18	0.39	1.18	1.57	0.39
	Sr-90 (mc/mi ²)	0.17	0.40	1.08	0.93	0.06		0.16		0.04		0.30	not
	Sr-89/Sr-90	--	--	--	--	--		--		--		--	recd.
1961	Precip. (in.)	0.07	2.05	1.85	0.94	0.24	0.07	0.55	1.18	1.10	1.60	1.15	0.88
	Sr-90 (mc/mi ²)		0.88		1.13		0.07		0.24	0.20	1.13	0.65	2.31
	Sr-89/Sr-90		--		--		--		--	12	82	71	56
1962	Precip. (in.)	0.84	1.42	2.32	2.99	2.12	0.48	2.52		1	0.93	0.56	0.16
	Sr-90 (mc/mi ²)	1.16	4.50	5.53	6.77	10.66	0.33	1.77	0.51	0.50	1.48	0.90	0.22
	Sr-89/Sr-90	40	25	18	13	8	20	25	14	17	3	41	55
1963	Precip. (in.)			2.11									
	Sr-90 (mc/mi ²)		2.15	3.50									
	Sr-89/Sr-90		34	18									

Monthly Fallout Deposition Collections: United States Sites (cont'd)

Site: U.S. WEATHER BUREAU STATION (Column) - Silver Hill, Md., and Sterling, Va.* 38°59'N, 77°28'W, alt. 270 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
	<u>collector**</u>												
1959	Precip. (in.)		2.08	2.85	4.78	2.69	4.89	5.18	2.22	2.07	3.49	2.50	3.90
	Sr ⁹⁰ (mc/mi ²)	#1	1.81	lost	5.77	1.68	1.73	0.60	0.10	0.14	0.27	0.17	0.48
		#2			5.97	2.16	2.34	0.35	0.41	0.05	0.24	0.24	0.31
	Sr-89/Sr-90	#1	2.7		11	7.7	5.4	2.7	1.0	*	0.7	0.4	*
		#2			4.6	9.0	5.9	2.8	1.4	*	0.4	*	*
1960	Precip. (in.)		3.94	1.76	3.45	4.93	1.18	4.65	7.36	3.47	1.45	1.91	1.78
	Sr ⁹⁰ (mc/mi ²)	#1	lost	0.07	0.11	lost	0.38	1.03		0.65		0.64	
		#2	lost	0.66	0.22	lost	1.60	0.91		0.36		0.67	
1961	Precip. (in.)		3.20	4.13	4.05	3.22	3.50	3.46	3.19	3.56	3.73	3.25	2.90
	Sr ⁹⁰ (mc/mi ²)	#1	0.39		1.53		1.02		0.28		0.09	0.31	0.50
		#2	0.23		1.21		1.32		0.69		0.11	0.31	0.96
	Sr-89/Sr-90	#1	--		--		--		--	22	102	76	59
		#2	--		--		--		--	18	78	38	36
1962	Precip. (in.)		1.91	3.90	5.91	2.42	4.04	4.12	1.37	0.17	2.27	1.35	5.02
	Sr ⁹⁰ (mc/mi ²)	#1	0.86	2.70	1.60	2.67	0.48	2.20	1.24	0.22	1.03	0.66	1.72
		#2	0.85	0.10	1.61	2.80	4.34	2.74	1.19	0.23	1.09	0.71	1.40
	Sr-89/Sr-90	#1	43	28	21	14	95	10	6	9	14	26	42
		#2	42	25	16	12	9	9	7	11	17	30	51
1963	Precip. (in.)		1.42	1.63	4.89								
	Sr ⁹⁰ (mc/mi ²)	#1	1.15	2.97	3.85								
		#2	1.40	1.84	4.86								
	Sr-89/Sr-90	#1	31	17	18								
		#2	28	23	15								

* collections were made at the Silver Hill site from February 1959 through September 1960.
collections were started at Sterling, Va. in October 1960 and will be continued at this site indefinitely.

** collectors #1 and #2 are located in the open, approximately 6 feet apart.

Monthly Fallout Deposition Collections: United States Sites (cont'd)

Site: WASHINGTON, SEATTLE (Pot) 47°35'N, 122°20'W, ~Alt. 10 ft. (Univ. of Washington, Laboratory of Radiation Biology)

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1958	Precip. (in.)				1.34	0.92	0.72	trace	0.32	1.47	3.12	6.53	5.51
	Sr-90 (mc/mi ²)				0.51	2.12	0.57	0.04	0.16	0.50	0.64	lost	1.62
	Sr-89/Sr-90				15	6	26	4	8	49	48	--	125
1959	Precip. (in.)	7.98	3.64	4.12	3.59	1.60	1.82	0.93	0.60	4.60	2.67	8.14	1.15
	Sr-90 (mc/mi ²)	lost	1.98	3.47	3.64	5.08	1.31	1.29	lost	0.44	0.29	0.41	0.06
	Sr-89/Sr-90	--	28	17	6.1	8.5	4.3	2.9	--	*	*	*	*
1960	Precip. (in.)	5.48	4.01	4.08	2.88	2.68	0.39	trace	1.57	0.97	3.96	2.69	0.64
	Sr-90 (mc/mi ²)	0.50	lost	0.35	0.47		0.91		0.24		0.41		0.64
	Sr-89/Sr-90	--	--	--	--	--	--	--	--	--	--	--	--
1961	Precip. (in.)	7.71	9.11	4.45	2.35	3.07	0.43	0.75	0.82	0.46	2.83	4.39	3.58
	Sr-90 (mc/mi ²)		0.82		1.02		lost		0.13	0.06	0.60	1.20	2.53
	Sr-89/Sr-90		--		--		--		--	115	78	70	45
1962	Precip. (in.)	2.43						1.11	1.96	2.02	3.41		3.83
	Sr-90 (mc/mi ²)	1.53	1.56	4.20	2.37	2.64	0.89	0.56	1.21	1.86	0.75	2.22	1.91
	Sr-89/Sr-90	39	48	17	11	6	8	5	9	25	45	44	60
1963	Precip. (in.)	1.91	3.97	2.98									
	Sr-90 (mc/mi ²)	1.92	3.02	3.94									
	Sr-89/Sr-90	46	41	18									

Monthly Fallout Deposition Collections: United States Sites (cont'd)

Site: WASHINGTON, TATOOSH ISLAND (Column) 48°22'N, 124°36'W

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)	12.08	7.61	10.50	8.16	2.36	2.78	1.40	1.61	5.21	6.20	10.28	9.38
	Sr-90 (mc/mi ²)	0.24	0.12	3.30									
	Sr-89/Sr-90	1.03	0.20	3.28									0.09*
1960	Precip. (in.)	9.70	6.99	9.35	8.27	6.10	1.78	0.3	4.92	2.84	9.95	10.48	7.81
	Sr-90 (mc/mi ²)	0.09	0.71	1.16	0.34	0.22	0.13	0.18	0.28	0.31	0.07	0.47	0.03
	Sr-89/Sr-90	1.31	1.05	1.14	1.22	3.80	4.32	3.30	3.99	3.21	1.07	0.80	1.03
1961	Precip. (in.)	14.99	21.16	8.70	5.36	3.45	1.76	0.81	2.39	2.50	9.44	9.27	11.89
	Sr-90 (mc/mi ²)	1.80	1.80	lost	1.68	1.08	1.08	0.15	0.28	0.46	1.23	1.21	2.40
	Sr-89/Sr-90	0.31	0.33	1.15	1.21	1.43	4.01	4.81	3.48	32.05	106	90	62
1962	Precip. (in.)	7.11	3.67	6.26	10.20	2.12	1.77	0.89	4.78	3.66	6.48	16.30	12.92
	Sr-90 (mc/mi ²)	2.12	1.74	3.50	4.42	1.96	0.87	1.07	1.45	lost	lost	6.39	10.06
	Sr-89/Sr-90	44	33	19	14	9	9	7.81	9.25	5.08	3.33	500.00	150.10
1963	Precip. (in.)	2.86	8.97	6.40	5.76	3.33	1.90	5.0	1.0	1.3	0.0	0.0	0.0
	Sr-90 (mc/mi ²)	0.89	5.41	lost	2.24	3.70	1.43	0.87	0.02	0.31	0.38	0.13	0.32
	Sr-89/Sr-90	48	20	1.81	3.80	3.92	1.30	4.31	3.31	2.11	3.31	1.21	3.82
	Precip. (in.)												

Site: ALBUQUERQUE, CERRO PVA (Column) 35°33'N, 106°08'W

Monthly Fallout Deposition Collections: United States Sites (cont'd)

Monthly Fallout Deposition Collections: United States Sites (cont'd)

Site: WISCONSIN, GREEN BAY (Column) -44°29'N, 88°08'W, ~alt. 689 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)		1.98	1.87	2.84	3.86	1.26	4.21	2.71	5.17	3.27	1.61	2.85
	Sr-90 (mc/mi ²)		0.63	lost	5.34	2.10	1.42	0.94	0.65	0.21	0.26	0.12	0.25
	Sr-89/Sr-90		13	"	15	*	4.7	2.4	1.4	1.3	0.6	*	0.6
1960	Precip. (in.)	1.04	0.48	1.21	3.13	7.75	3.07	1.87	3.52	3.09	2.32	0.69	0.10
	Sr-90 (mc/mi ²)	0.22	0.01	0.94	lost	0.39		0.07		0.68		0.17	
	Sr-89/Sr-90	--	*	--	--	--		--		--		--	
1961	Precip. (in.)	0.31	0.93	2.12	1.67	1.42	4.31	4.91	2.48	5.02	3.34	2.60	1.27
	Sr-90 (mc/mi ²)	0.20		0.92		2.09		not	0.58	0.17	0.37	0.41	0.23
	Sr-89/Sr-90	--		--		--		recd.	--	50	96	76	64
1962	Precip. (in.)	1.27	2.02	1.14	2.55	2.86	4.35	2.70	2.86	3.87	1.94	0.84	1.03
	Sr-90 (mc/mi ²)	0.26	1.70	1.87	2.62	0.55	4.73	2.10	2.58	0.09	1.29	0.59	0.24
	Sr-89/Sr-90	39	28	18	13	112	8	10	15	21	23	39	30
1963	Precip. (in.)	1.02	0.59	2.58									
	Sr-90 (mc/mi ²)	0.54	0.15	3.29									
	Sr-89/Sr-90	28	33	19									

Monthly Fallout Deposition Collections: Outside United States Sites

Site: ARGENTINA, BUENOS AIRES (Column) 34° 37'S, 58°26'W, Alt. 66 ft.

[illegible]

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: ARGENTINA, FORMOSA (Column) 26°11'S, 58°10'W, Alt. 190 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1961	Precip. (in.)						3.46	4.06		5.82	6.09	5.85	3.00
	Sr-90 (mc/mi ²)						0.05	0.46	not	not	0.17	0.14	0.20
	Sr-89/Sr-90						--	*	recd.	recd.	*	*	*
1962	Precip. (in.)								1.23	2.34	5.57	3.41	
	Sr-90 (mc/mi ²)	0.20	0.16	0.12	0.11	0.16	0.09	0.10	0.20	0.24	3.33	0.28	0.26
	Sr-89/Sr-90	*	4	4	17	49	*	*	30	27	16	8	8
1963	Precip. (in.)												
	Sr-90 (mc/mi ²)												
	Sr-89/Sr-90												

100

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: ARGENTINA, MALARQUE (Column) 35°29'S, 69°35'W, Alt. 4723 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)												
	Sr-90 (mc/mi ²)											0.21	0.16
	Sr-89/Sr-90											*	*
1960	Precip. (in.)												
	Sr-90 (mc/mi ²)	0.24	0.21	0.05	0.03	0.16		0.00		0.14		0.01	
	Sr-89/Sr-90	0.02	*	--	--	--		--		--		--	--
1961	Precip. (in.)	0.09	0.72	0.14	0.85	0.48		0.20		1.13	0.53	0.11	0.31
	Sr-90 (mc/mi ²)		0.60		0.15		0.33		0.54	0.36	0.04	0.07	0.12
	Sr-89/Sr-90	--	--	--	--	--	--	*	*	*	*	*	*
1962	Precip. (in.)	0.85	0.84										
	Sr-90 (mc/mi ²)	0.20	0.52	0.10	≤0.01	0.05	0.17	lost	0.24	0.04	0.68		
	Sr-89/Sr-90	*	*	2	#	22	17	--	0.06	0.06	0.17		
									32	*	14		
1963	Precip. (in.)												
	Sr-90 (mc/mi ²)												
	Sr-89/Sr-90												

3.4 mc Sr⁸⁹/mi².

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: AUSTRALIA, ADELAIDE (Pot) 34°56'S, 138°35'E, Alt.140 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1958	Precip. (in.)						0.23	3.18	2.35	3.00	2.45	0.33	0.25
	Sr-90 (mc/mi ²)						0.04	0.16	0.33	0.50	0.71	0.21	0.10
	Sr-89/Sr-90						16	14	45	18	18	14	14
1959	Precip. (in.)	0.29	0.83	0.93	0.34	0.15	0.36	1.48	1.85	1.27	0.89	0.93	2.00
	Sr-90 (mc/mi ²)	0.08	0.21	0.06	0.05	0.05	0.04	0.11	0.20	0.22	0.29	0.18	0.13
	Sr-89/Sr-90	--	5.7	8.3	--	*	*	5.4	6.0	*	--	1.1	2.3
1960	Precip. (in.)	0.38	1.88	0.84	2.19	4.77	1.60	1.42	1.58	3.64	0.86	3.80	0.11
	Sr-90 (mc/mi ²)	0.08	0.03	0.11	0.14	0.15		0.24		0.58		0.57	
	Sr-89/Sr-90	--	--	--	--	--		--		--		--	
1961	Precip. (in.)	0.19	0.32	0.28	4.80	1.28	2.56	2.05	1.51	0.94	0.44	0.32	0.22
	Sr-90 (mc/mi ²)	0.17		0.18		0.33		0.38		0.12	0.41	0.32	0.12
	Sr-89/Sr-90	--		--		--		--		*	*	*	*
1962	Precip. (in.)	0.56	0.88	0.92	0.08	3.65	2.13	1.33	2.31	0.58	2.58	0.53	1.69
	Sr-90 (mc/mi ²)	0.16	0.33	0.15	0.06	0.23	0.26	0.24	0.14	0.10	0.36	0.32	0.29
	Sr-89/Sr-90	*	*	*	5	5	36	24	18	21	15	8	7
1963	Precip. (in.)	3.15	0.09										
	Sr-90 (mc/mi ²)	0.77	0.19										
	Sr-89/Sr-90	18	4.8										

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: AUSTRALIA, BRISBANE (Pot) 27°28'S, 153°02'E, Alt.137 ft.

[illegible]

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: AUSTRALIA, DARWIN (Pot) 12°28'S, 130°51'E, Alt. 97 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1958	Precip. (in.)							0.13	0.01	0.00	1.49	5.98	7.16
	Sr-90 (mc/mi ²)							0.43	0.04	0.62	0.26	0.27	0.63
	Sr-89/Sr-90							13	22	43	24	78	12
1959	Precip. (in.)	17.41	4.07	5.54	13.04	0.48	0	0	0	1.38	0.73	5.45	12.93
	Sr-90 (mc/mi ²)	0.48	0.33	0.47	0.04	0.05	0.02	0.01	0.00	0.06	0.06	0.32	0.13
	Sr-89/Sr-90	8.8	5.8	2.8	*	*	*	7.0	*	*	*	*	*
1960	Precip. (in.)	22.36	16.30	17.56	3.20	0.52	0	0	0	0.08	0.76	3.02	4.11
	Sr-90 (mc/mi ²)	0.06	0.20	0.24	0.07	0.07		0.03		0.17		0.27	
	Sr-89/Sr-90	10	--	--	--	--		--		--		--	
1961	Precip. (in.)	10.36	14.50	3.71	3.83	0.01	0	0	0	0.02	2.41	2.11	2.16
	Sr-90 (mc/mi ²)		0.10		0.21		0.09		0.06	0.01	0.38	0.24	0.12
	Sr-89/Sr-90		--		--		--		--	*	*	*	*
1962	Precip. (in.)	22.47	18.30	6.90	1.04	0	0.01	0.01	0	0	2.30	5.60	6.51
	Sr-90 (mc/mi ²)	0.06	0.16	0.19	0.05	0.08	0.03	0.04	0.04	0.01	0.10	0.14	0.28
	Sr-89/Sr-90	*	*	*	10	*	*	18	7	*	22	14	8
1963	Precip. (in.)	12.22	13.00										
	Sr-90 (mc/mi ²)	0.03	0.18										
	Sr-89/Sr-90	*	5.3										

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: AUSTRALIA, HOBART (Pot) 42°53'S, 147°20'E, Alt. 177 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1958	Precip. (in.)						1.34	2.16	5.44	0.87	4.82	1.28	5.14
	Sr-90 (mc/mi ²)						0.08	0.06	0.20	0.08	0.34	0.29	0.48
	Sr-89/Sr-90						2.1	--	32	25	14	15	--
1959	Precip. (in.)	1.36	1.67	0.44	2.06	0.71	1.38	2.15	0.63	3.08	1.00	0.83	3.94
	Sr-90 (mc/mi ²)	0.31	0.29	0.10	0.08	0.10	0.09	0.07	0.19	0.16	0.25	0.12	0.17
	Sr-89/Sr-90	9.3	7.2	4.0	*	5.0	4.4	4.3	1.0	*	1.7	*	*
1960	Precip. (in.)	2.46	0.49	0.59	9.75	3.81	1.99	2.13	1.03	3.29	2.57	1.16	0.39
	Sr-90 (mc/mi ²)	0.21	0.07	0.06	0.32	0.11	0.06	0.12		0.22		0.22	
	Sr-89/Sr-90	--	--	--	--	--	--	--		--		--	
1961	Precip. (in.)	1.14	1.20	0.78	1.97	1.23	4.72		2.84	1.31	1.16	0.53	1.63
	Sr-90 (mc/mi ²)		0.30	0.15	not	0.16	0.61			0.21	0.35	0.06	0.22
	Sr-89/Sr-90	--	--	--	recd.	--	--			*	*	*	*
1962	Precip. (in.)	1.36	0.54	1.39	1.65	2.59	2.43	2.57	3.63	3.84	2.95	0.91	1.73
	Sr-90 (mc/mi ²)	0.21	0.12	0.12	0.07	0.08	0.16	0.16	0.11	0.19	0.19	0.18	0.21
	Sr-89/Sr-90	*	*	*	*	*	20	5	20	19	--	10	7
1963	Precip. (in.)	0.88											
	Sr-90 (mc/mi ²)	0.19											
	Sr-89/Sr-90	5.8											

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: AUSTRALIA, MELBOURNE (Pot) 37°49'S, 144°58'E, Alt. 155 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1958	Precip. (in.)						0.72	1.98	3.19	3.03	4.04	2.77	1.25
	Sr-90 (mc/mi ²)						0.08	0.05	0.18	0.24	0.45	0.28	0.24
	Sr-89/Sr-90						2.5	22	12	28	20	--	11
1959	Precip. (in.)	0.54	1.28	4.10	0.62	1.47	2.42	2.57	1.85	4.10	3.26	0.92	2.74
	Sr-90 (mc/mi ²)	0.18	0.32	0.24	0.10	0.11	0.20	0.12	0.15	0.27	lost	0.24	0.24
	Sr-89/Sr-90	*	4.4	4.6	*	3.6	*	*	--	*	--	*	*
1960	Precip. (in.)	1.80	2.41	0.38	7.67	3.75	0.78	2.04	2.79	3.64	1.53	5.43	2.52
	Sr-90 (mc/mi ²)	0.19	0.12	0.16	0.25	0.10		0.29		0.55		0.88	
	Sr-89/Sr-90	--	--	--	--	--		--		--		--	
1961	Precip. (in.)	1.32	1.48	2.36	2.98	3.07	2.02	2.11	2.20	1.01	1.41	1.03	1.86
	Sr-90 (mc/mi ²)		0.28		0.45		0.38		0.30	0.12	0.29	0.38	0.28
	Sr-89/Sr-90		--		--		--		--	*	*	*	*
1962	Precip. (in.)	2.37	1.21	0.38	1.06	4.58	1.65	1.70	2.10	1.22	4.37	1.05	1.39
	Sr-90 (mc/mi ²)	0.45	0.39	0.13	0.16	0.15	0.02	0.21	0.15	0.25	0.28	0.26	0.43
	Sr-89/Sr-90	*	*	*	5	3	*	16	9	9	19	8	7
1963	Precip. (in.)	6.92	1.92										
	Sr-90 (mc/mi ²)	lost	lost										
	Sr-89/Sr-90	--	--										

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Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: AUSTRALIA, PERTH (Pot) 31°57'S, 115°51'E, Alt.210 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1958	Precip. (in.)						2.76	16.73	2.66	1.33	2.56	0.46	0.49
	Sr-90 (mc/mi ²)						0.09	0.16	0.18	0.33	0.11	0.11	0.15
	Sr-89/Sr-90						8.9	15	40	31	20	17	14
1959	Precip. (in.)	0.23	0.34	0.20	1.23	2.96	6.36	3.06	4.54	1.20	2.10	1.41	0.52
	Sr-90 (mc/mi ²)	0.06	0.08	0.12	0.10	0.25	0.28	0.19	0.23	0.21	0.18	0.06	0.02
	Sr-89/Sr-90	13.	7.0	5.0	4.0	3.2	*	4.7	*	*	*	*	*
1960	Precip. (in.)	1.06	0.22	2.27	0.72	5.33	4.44	7.38	2.54	2.55	1.06	0.30	0.34
	Sr-90 (mc/mi ²)	0.05	0.07	0.08	0.05	0.23		0.45		0.25		0.13	
	Sr-89/Sr-90	--	--	--	--	--		--		--		--	
1961	Precip. (in.)	0.44	0.32	1.64	3.86	3.41	6.40	6.45	6.03	1.80	0.96	0.16	0.90
	Sr-90 (mc/mi ²)		0.21		0.31	0.23		0.56		0.18	0.16	0.06	0.22
	Sr-89/Sr-90	--	--	--	--	--		--		*	*	*	*
1962	Precip. (in.)	0.07	0.33	1.64	0.34		5.68	6.07	3.39	2.83	0.93	1.51	0.53
	Sr-90 (mc/mi ²)	0.08	0.09	0.03	0.05	lost	0.35	0.31	0.17	0.18	0.08	0.14	0.17
	Sr-89/Sr-90	*	*	*	*	--	29	19	19	14	5	4	8
1963	Precip. (in.)		0.75										
	Sr-90 (mc/mi ²)	not	0.07										
	Sr-89/Sr-90	recd.	6.2										

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: AUSTRALIA, SYDNEY (Pot) 33°52'S, 151°12'E, Alt.138 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1958	Precip. (in.)						8.71	1.13	3.71	1.19	2.19	0.67	5.84
	Sr-90 (mc/mi ²)						0.34	0.26	0.44	0.25	0.24	0.21	0.57
	Sr-89/Sr-90						0.9	23	43	*	25	15	8.2
1959	Precip. (in.)	6.44	7.96	5.63	1.61	2.28	4.32	7.72	3.36	3.40	11.13	3.89	1.93
	Sr-90 (mc/mi ²)	0.64	0.45	0.21	0.05	0.21	0.36	0.26	0.13	0.30	0.68	0.33	0.21
	Sr-89/Sr-90	9.4	5.6	--	--	2.4	*	2.3	*	*	*	*	*
1960	Precip. (in.)	2.27	3.68	2.08	1.16	4.28	3.56	5.58	1.77	2.68	11.03	2.81	9.65
	Sr-90 (mc/mi ²)	0.14	0.21	0.12	0.17		0.23		0.14		0.65		0.90
	Sr-89/Sr-90	--	--	--	--		--		--	--	--	--	--
1961	Precip. (in.)	2.46	3.37	1.19	3.52	1.23	2.22	1.55	9.43	2.06	2.92	21.44	5.98
	Sr-90 (mc/mi ²)		0.54		0.30		0.41		0.44	0.15	0.48	1.18	0.47
	Sr-89/Sr-90		--		--		--		--	*	*	*	*
1962	Precip. (in.)	5.22	5.97	2.50	3.95	10.63	0.16	2.74	4.32	3.46	0.86	0.41	6.78
	Sr-90 (mc/mi ²)	0.60	0.23	0.29	0.14	0.15	0.01	0.15	0.10	0.14	0.23	0.34	0.32
	Sr-89/Sr-90	*	*	*	*	6	*	28	19	7	14	11	50
1963	Precip. (in.)	5.55	1.89										
	Sr-90 (mc/mi ²)	0.60	0.16										
	Sr-89/Sr-90	5.0	5.1										

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Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: AUSTRIA, KLAGENFURT (Column) ** 46°39'N, 14°20'E, Alt. 1470 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1957	Precip. (in.)								3.51	3.90	1.17	0.78	0.78
	Sr-90 (mc/mi ²)								1.17	0.47	0.08	0.08	0.09
	Sr-89/Sr-90								--	--	--	--	27
1958	Precip. (in.)	2.73	2.34	1.56	3.94	1.56	8.19	5.07	6.63	2.73	3.12	3.90	3.51
	Sr-90 (mc/mi ²)	0.13	0.17	1.15	1.26	0.49	not	3.51	2.28	0.80	0.66	0.46	1.03
	Sr-89/Sr-90	25	10	29	18	18	recd.	6	27	26	22	52	45
1959	Precip. (in.)	0.39	0	2.40	5.91	2.36	6.31	2.98	4.94	0.98	2.22	3.10	3.78
	Sr-90 (mc/mi ²)	0.32	lost	0.75	3.78	1.16	3.60	1.18	1.10	0.14	0.19	0.04	0.19
	Sr-89/Sr-90	28	--	18	9.8	7.9	5.1	2.7	2.1	0.98	1.8	*	7.8
1960	Precip. (in.)	0.86	1.76	3.05	1.80	1.28	4.18	6.18	4.06	5.22	4.30	3.94	4.44
	Sr-90 (mc/mi ²)	0.39	0.16	0.29	0.30	0.62	0.52						
	Sr-89/Sr-90	--	--	--	--	--	--	0.61		0.28		0.39	--
1961	Precip. (in.)	2.04	0.43	1.20	1.05	2.96	2.60	5.06	1.11	1.70	4.10	4.48	3.00
	Sr-90 (mc/mi ²)		0.20		0.44		1.30		0.74	0.09	0.38	0.68	0.50
	Sr-89/Sr-90		--		--		--		--	3.9	56	93	62
1962	Precip. (in.)	2.03	0.75	2.14	2.09	8.45	4.48	5.27	0.92	4.19	4.13	4.32	1.35
	Sr-90 (mc/mi ²)	0.48	0.32	0.75	1.47	5.70	4.76	5.82	0.94	1.70	0.46	0.98	0.48
	Sr-89/Sr-90	41	26	19	3	9	11	6	13	18	41	36	33
1963	Precip. (in.)	1.78	2.02	2.58									
	Sr-90 (mc/mi ²)	0.59	0.66	1.78									
	Sr-89/Sr-90	43	25	17									

** Operated as a Pot station from 8/57 - 5/59.

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: AUSTRIA, VIENNA (Column) *** 48°15'N, 16°22'E, Alt. 664 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1957	Precip. (in.)						0.78	5.07	2.73	2.34	0	1.95	1.56
	Sr-90 (mc/mi ²)						0.45	1.58	0.79	0.59	0.03	0.22	0.11
	Sr-89/Sr-90						--	--	--	--	--	--	27
1958	Precip. (in.)	1.17	2.34	2.73	0.78	0.78	5.85	1.95	3.90	0.78	2.73	1.17	2.73
	Sr-90 (mc/mi ²)	0.16	0.27	0.35	0.71	0.69	3.13	1.07	1.84	0.02	0.76	0.48	1.23
	Sr-89/Sr-90	25	14	15	18	17	1	12	20	**	34	42	46
1959	Precip. (in.)	1.0	0.79	1.39	3.55	1.97	5.91	5.94	4.48	0.02	--	2.33	
	Sr-90 (mc/mi ²)	0.43	lost	1.15	3.87	2.59	4.15	2.32	0.94	0.51	lost	0.08	lost
	Sr-89/Sr-90	33	--	15.5	11.7	8.0	5.0	2.9	1.4	*	--	*	--
1960	Precip. (in.)	1.85	0.33	1.60	0.97	2.13	3.11	3.43	2.79	1.97	2.51	0.71	1.07
	Sr-90 (mc/mi ²)	0.02	0.12	0.37	0.22	lost	not	0.18		0.23		lost	
	Sr-89/Sr-90	--	--	--	--	--	recd.	--		--		--	
1961	Precip. (in.)	0.35	2.68	1.40	2.55	3.31	1.89	3.26	1.11	0.88	2.31		2.05
	Sr-90 (mc/mi ²)		0.42		0.00		0.50		0.18	0.07	0.47	not	0.18
	Sr-89/Sr-90	--	--	--	--	--	--	--	--	37	62	recd.	3
1962	Precip. (in.)		1.57	2.11	2.53	2.04	0.98	2.04	1.00	0.99	1.94	3.94	1.68
	Sr-90 (mc/mi ²)	not	lost	1.15	1.78	4.45	1.19	2.62	1.18	0.62	0.90	1.21	0.71
	Sr-89/Sr-90	recd.	--	18	12	8	1½	8	5	19	32	42	46
1963	Precip. (in.)	1.56	0.87	1.87									
	Sr-90 (mc/mi ²)	8.44	0.27	2.09									
	Sr-89/Sr-90	34	24	16									

** Strontium-90 value suspect.

*** Operated as a Pot station from 6/57 - 4/59.

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: AZORES, LAJES FIELD (Column) 38°44'N, 27°04'W, ~alt. 366 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.) Sr-90 (mc/mi ²) Sr-89/Sr-90										4.85 0.10 *	4.36 0.06 *	2.54 0.14 *
1960	Precip. (in.) Sr-90 (mc/mi ²) Sr-89/Sr-90	8.42 0.62 --	10.75 0.27 --	3.23 0.51 --	lost --	0.42 --	1.48	0.42 0.00 --	3.03	1.79 0.21 --	2.30	7.15 0.17 --	1.78
-72- 1961	Precip. (in.) Sr-90 (mc/mi ²) Sr-89/Sr-90	4.78 0.56 --	5.86	6.16 0.92 --	3.62	1.41 0.46 --	1.79	0.06 0.16 --	2.25	2.54 0.09 32	4.00 0.32 70	5.14 1.19 78	13.60 2.20 64
1962	Precip. (in.) Sr-90 (mc/mi ²) Sr-89/Sr-90	2.66 0.78 41	0.92 0.84 27	10.45 3.24 19	2.99 3.03 13	4.74 1.60 9	1.53 0.06 11	1.90 0.87 7	1.79 0.54 9	2.76 0.24 10	5.74 1.26 33	1.58 1.33 44	5.34 1.61 60
1963	Precip. (in.) Sr-90 (mc/mi ²) Sr-89/Sr-90	7.26 4.51 33	3.39 1.84 24	5.24 5.08 22	5.59	0.41	3.87						

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: BERMUDA, KINDLEY AFB (Column) 32°22'N, 64°31'W, Alt. 25 ft.

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Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: BOLIVIA, LA PAZ (Column) 16°18'S, 66°15'W, Alt. 11,218 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
			(2/8-3/18)										
1960	Precip. (in.)		0.39		1.31	0.32	0	0	0.39	0.29	1.12	4.33	2.36
	Sr-90 (mc/mi ²)		0.23		0.17	0.12	0.00	0.00	0.00	0.00		0.15	
	Sr-89/Sr-90		--		--	--	--	--	--	--		--	
1961	Precip. (in.)	3.54		1.57	1.18	0.79	0	0	0.39	1.18	0.39		
	Sr-90 (mc/mi ²)	0.00			0.11		0.11		0.00	0.01	0.08	0.08	0.04
	Sr-89/Sr-90	--		--	--	--	--	--	--	*	6	6.0	*
1962	Precip. (in.)	3.54	2.76	3.94	0.79					0.79	1.18	1.18	
	Sr-90 (mc/mi ²)	0.87	0.04	0.03	0.06	0.16	not	not	not	0.56	0.13	0.09	0.19
	Sr-89/Sr-90	*	7	14	*	45	recd.	recd.	recd.	--	21	20	19
1963	Precip. (in.)												
	Sr-90 (mc/mi ²)	0.22	0.02	0.07									
	Sr-89/Sr-90	9.0	*	9.0									

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: BOLIVIA, CHACALTAYA (Column) 80th Meridian Station

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1963	Precip. (in.)												
	Sr-90 (mc/mi ²)												
	Sr-89/Sr-90												
1964	Precip. (in.)												
	Sr-90 (mc/mi ²)												
	Sr-89/Sr-90												

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: BRAZIL, BELÉM (Column) 1°27'S, 48°29'W, ~Alt. 25 ft.

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Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: BRAZIL, BRASILIA (Pot) 16°13'S, 44°29'W

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)									1.18	3.55	4.73	1.58
	Sr-90 (mc/mi ²)									0.00	0.08	0.01	0.02
	Sr-89/Sr-90									*	*	*	**
1960	Precip. (in.)												
	Sr-90 (mc/mi ²)	0.01	0.03	0.02	lost	lost	lost	not	not		0.08		0.06
	Sr-89/Sr-90	--	--	--	--	--	--	recd.	recd.	--	--	--	--
1961	Precip. (in.)												
	Sr-90 (mc/mi ²)		0.02	0.03**		≤0.02			≤0.04			0.07	0.10
	Sr-89/Sr-90		--	--		--			*			*	*
1962	Precip. (in.)												
	Sr-90 (mc/mi ²)	0.03	0.06	0.05			0.07		0.05	0.09	0.10	0.04	0.04
	Sr-89/Sr-90	*	*	*			20		34	10	9	15	11
1963	Precip. (in.)												
	Sr-90 (mc/mi ²)	0.08											
	Sr-89/Sr-90	11											

** Former value reported was incorrect.

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: BRAZIL, ITAICI, SÃO PAULO (Pot) 23°06'S, 47°11'W

[illegible]

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: BRAZIL, MANAUS (Pot) 3°06'S, 60°00'W, ~Alt. 95 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)		6.32	8.65	13.95	2.43	4.33	1.18	2.36	1.58	0.39	8.27	
	Sr-90 (mc/mi ²)	0.81	0.68	0.61	0.06	0.13	0.03	0.08	0.04	0	0.08	not	not
	Sr-89/Sr-90	1.7	41	16	20	9.6	*	*	*	*	*	recd.	recd.
1960	Precip. (in.)			9.06	0.55	0.24	5.91	2.76	3.15	3.15	9.06	9.45	11.81
	Sr-90 (mc/mi ²)	not	not	not	0.51	lost	not	0.02	not	not	not	0.09	
	Sr-89/Sr-90	recd.	recd.	recd.	--	--	--	--	recd.	recd.	recd.	--	--
1961	Precip. (in.)												
	Sr-90 (mc/mi ²)	0.16		0.22	0.16	not	≤0.04	lost		0.11		1.31	0.33
	Sr-89/Sr-90	--	--	--	--	recd.	--			*		49	50
1962	Precip. (in.)						(6/14 - 7/14	-	8/62)	(8/17 - 10/17)	(10/17 - 11/17)	(11/17-12/17)	
	Sr-90 (mc/mi ²)	not	not	not	not	not	0.08	0.21		0.05	0.08	0.19	
	Sr-89/Sr-90	recd.	recd.	recd.	recd.	recd.	49	38		20	30	20	
1963	Precip. (in.)	(12/14/62-1/14/63)											
	Sr-90 (mc/mi ²)	0.64											
	Sr-89/Sr-90	40											

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: BRAZIL, NOVA FRIBURGO (Pot) 22°16'S, 42°32'W

	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1958 Precip. (in.)												
Sr-90 (mc/mi ²)								0.14	0.48	0.83	not	0.37
Sr-89/Sr-90								21	65	16	recd.	18
1959 Precip. (in.)								3.6	0			
Sr-90 (mc/mi ²)	0.20	0.21	0.17	0.01	not	0.04	0.03	0.15	0	0.11	0.29	not
Sr-89/Sr-90	13	9.8	3.8	*	recd.	1.7	*	2.1	*	*	*	recd.
1960 Precip. (in.)			13.65	7.65	0.47	5.91		2.24				
Sr-90 (mc/mi ²)	0.03		0.13	0.00	0.04		0.26		0.24		0.37	not
Sr-89/Sr-90	--		--	--	--		--		--		--	recd.
1961 Precip. (in.)	15.46	9.61	8.59	3.12	2.57	1.60	0.32	0.04	0.27	1.37	7.41	5.10
Sr-90 (mc/mi ²)	0.28		0.16		0.09**		0.13		≤0.04	≤0.05	0.43	0.28
Sr-89/Sr-90	--		--		--		--		*	*	*	*
1962 Precip. (in.)	10.7	8.9			1.9	0.1	1.1	0.51	2.03	7.0	9.47	8.26
Sr-90 (mc/mi ²)	0.26	0.18	0.11	0.10	0.20	0.04	0.16	0.12	0.20	0.23	0.03	0.03
Sr-89/Sr-90	*	3	12	*	79	57	41	17	23	18	14	*
1963 Precip. (in.)												
Sr-90 (mc/mi ²)												
Sr-89/Sr-90												

** Former value reported was incorrect.

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: BRAZIL, RECIFE (Pot) 8°06'S, 34°53'W, ~Alt. 10 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.) Sr-90 (mc/mi ²) Sr-89/Sr-90									0.13 --	0.04 --	0.07 --	0.03 --
1960	Precip. (in.) Sr-90 (mc/mi ²) Sr-89/Sr-90	0.06 --	0.04 --	0.55 --	0.12 --	0.79 0.56 --	not recd.	0.22 --	not recd.	not recd.	not recd.	not recd.	not recd.
1961	Precip. (in.) Sr-90 (mc/mi ²) Sr-89/Sr-90	not recd.	not recd.	not recd.	not recd.	not recd.	not recd.	not recd.	not recd.	not recd.	not recd.	not recd.	not recd.
1962	Precip. (in.) Sr-90 (mc/mi ²) Sr-89/Sr-90	not recd.	not recd.	not recd.	not recd.	not recd.	20.17 0.49# 40	6.77 0.33 31	2.53 0.27 38	4.15 0.21 18	0.82 0.11 23	0.19 0.05 46	1.17 0.18 22
1963	Precip. (in.) Sr-90 (mc/mi ²) Sr-89/Sr-90	22.8 0.16# 11	6.81 0.13 8	12.32 0.31 10									

Column sample.

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: BRAZIL, RIO DE JANEIRO (Column) 22°59'S, 43°14'W, ~Alt. 30 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1960	Precip. (in.)				9.84	7.83	1.57	1.18	1.97	3.35	1.05	5.06	6.76
	Sr-90 (mc/mi ²)				0.01		0.18		0.03		0.04		lost
	Sr-89/Sr-90				--		--		--		--		--
1961	Precip. (in.)	6.88	3.70	5.01	6.80	5.73	8.01	3.15	0.39	1.32	0.22	4.61	6.81
	Sr-90 (mc/mi ²)		0.24		0.52		0.17		0.30	0.16	0.06	0.16	0.36
	Sr-89/Sr-90		--		--		--		--	3.3	21	*	*
1962	Precip. (in.)	18.50	12.78	0.72	1.52	5.68	3.42	3.70	2.40	6.26	4.33	7.25	4.92
	Sr-90 (mc/mi ²)	0.48	0.28	0.05	0.11	0.50	0.24	0.50	0.22	0.58	1.10	0.88	0.74
	Sr-89/Sr-90	1.04	4.0	7	*	42	30	21	18	13	11	10	5.8
1963	Precip. (in.)	0.61											
	Sr-90 (mc/mi ²)	0.24											
	Sr-89/Sr-90	10											

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: BRAZIL, SÃO JOSÉ DOS CAMPOS (Pot) 23°13'S, 45°51'W, alt. 2109 ft.

[illegible]

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: BRAZIL, SÃO LEOPOLDO (Pot) 29°45'S, 51°11'W

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)												
	Sr-90 (mc/mi ²)								0.25	0.30	0.08	0.05	0.20
	Sr-89/Sr-90								*	*	2.4	*	2.2
1960	Precip. (in.)				0.87								
	Sr-90 (mc/mi ²)	0.12	0.12	0.24	0.15	0.79		0.77		0.40			0.42
	Sr-89/Sr-90	--	--	--	--	--		--		--			--
1961	Precip. (in.)												
	Sr-90 (mc/mi ²)	0.27		0.22		0.30		not	0.12	0.03	0.54	0.50	0.29
	Sr-89/Sr-90	--		--		--		recd.		*	*	*	*
1962	Precip. (in.)												
	Sr-90 (mc/mi ²)	0.21	0.16	0.14	0.05	0.15	0.20	0.13	0.41	0.45	0.23	0.33	0.18
	Sr-89/Sr-90	*	*	*	*	106	38	50	19	16	11	105	14
1963	Precip. (in.)												
	Sr-90 (mc/mi ²)	0.18											
	Sr-89/Sr-90	6.0											

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: CANADA, ONTARIO, MOOSONEE (Column) 80th Meridian Station

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1963	Precip. (in.)			0.93									
	Sr-90 (mc/mi ²)			0.75									
	Sr-89/Sr-90			19									
1964	Precip. (in.)												
	Sr-90 (mc/mi ²)												
	Sr-89/Sr-90												

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: CANADA
NEWFOUNDLAND, ERNEST HARMAN AB (Column) 48°32'N, 58°34'W, ~alt. 86 ft.

[illegible]

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: CANADA													
NEWFOUNDLAND, GOOSE AB (Column)		53°19'N, 60°25'W, ~alt. 176.73 ft.											
		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)	2.29	1.46	3.11	1.23	2.47	2.26	2.90	2.41	2.11	2.76	3.55	2.36
	Sr-90 (mc/mi ²)										lost	lost	0.13
	Sr-89/Sr-90										--	--	
1960	Precip. (in.)	4.33	1.40	2.00	4.83	1.71	3.55	5.27	3.26	4.35	2.82	2.19	1.90
	Sr-90 (mc/mi ²)	0.03	0.17	0.29	0.19		0.38		0.00		0.16		0.07
	Sr-89/Sr-90	--	--	--	--		--		--		--		--
1961	Precip. (in.)	2.88	0.51	1.47	0.79	5.12	3.15	6.37	2.68	3.15	4.98	2.09	1.89
	Sr-90 (mc/mi ²)		0.08	0.07	not	lost	lost		0.75	0.50	0.25	not	not
	Sr-89/Sr-90	--	--	--	recd.	--	--	--	--	--	70	recd.	recd.
1962	Precip. (in.)	1.94	1.98	2.91	2.43	2.51	2.67	3.66	2.09	2.60	2.97	4.55	(12/62-1/63) 5.63
	Sr-90 (mc/mi ²)	0.13	0.36	0.76	0.05	2.49	2.82	2.79	1.40	not	not	0.54	0.95
	Sr-89/Sr-90	40	27	21	16	9	11	6	12	recd.	recd.	37	43
1963	Precip. (in.)	5.63	3.16	2.73	1.22	1.95	6.37	8.12					
	Sr-90 (mc/mi ²)	0.95	0.31	0.70									
	Sr-89/Sr-90	43	22	14									

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: CANTON ISLAND (Column) 2°46'S, 171°43'W, alt. 8 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)	10.08	8.01	3.00	3.45	1.15	0.43	1.01	0.89	0.68	0.20	0.86	0.13
	Sr-90 (mc/mi ²)		0.41	lost	0.05	0.00	0.02	0.02	0.01	≤0.00	lost	0.01	0.10
	Sr-89/Sr-90		11	--	4.2	*	*	*	*	*	--	*	*
1960	Precip. (in.)	0.42	4.47	0.74		3.74	3.49	2.22	1.36	0.53	0.61	1.12	0.66
	Sr-90 (mc/mi ²)	0.18	0.14	0.16		0.10	0.27		0.00	0.03		0.03	
	Sr-89/Sr-90	--	--	--	--	--	--	--	--	--	--	--	--
1961	Precip. (in.)	1.34	0.30	0.69	0.92	2.80	5.41	3.80	1.55	1.77	0.97	0.08	0.37
	Sr-90 (mc/mi ²)		0.18		0.26		0.00			≤0.03	0.05	≤0.01	≤0.01
	Sr-89/Sr-90	--	--	--	--	--	--	--	--	*	2	≥21	≥40
1962	Precip. (in.)	0.11	0.16	0.79	5.62	2.44	0.50	2.72	0.46	2.51	0.24	0.15	0.11
	Sr-90 (mc/mi ²)	0.03	0.04	≤0.02	0.04	0.31	0.07	0.22	1.13	0.11	0.03	0.02	0.01
	Sr-89/Sr-90	*	16	≥16	27	46	79	57	8	17	17	*	*
1963	Precip. (in.)	0.22	0.41	0.88	1.71	0.98	1.74						
	Sr-90 (mc/mi ²)	0.04	0.04	0.02									
	Sr-89/Sr-90	7	*	9.0									

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: CEYLON, COLOMBO (Column) 6°55'N, 79°52'E, ~Alt. 50 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.) Sr-90 (mc/mi ²) Sr-89/Sr-90	1.75	2.68	0.51	18.37	12.05	12.31	7.34	7.08	9.12 0.14 *	9.88 not recd.	10.58 0.02 *	6.61 0.05 *
1960	Precip. (in.) Sr-90 (mc/mi ²) Sr-89/Sr-90	1.84 0.39 --	6.82 0.01 --	2.73 0.16 --	7.81 0.14 --	14.05 0.03 --	4.96	18.38 0.00 --	1.65	4.55 0.08 --	13.89	16.75 0.00 --	2.10
1961	Precip. (in.) Sr-90 (mc/mi ²) Sr-89/Sr-90	1.19 0.00 --	1.92	10.58 0.21 --	18.42	20.10 0.21 --	8.77	8.84 not recd.	9.06 0.30 --	16.79 0.06 12	19.07 0.08 39	19.84 0.08 67	10.25 0.05 68
1962	Precip. (in.) Sr-90 (mc/mi ²) Sr-89/Sr-90	3.11 0.01 *	1.52 ≤0.01 ≥28	3.86 0.63 18	11.00 0.11 9	19.44 0.33 11	5.15 0.62 17	4.31 0.70 8	17.13 0.45 9	7.87 0.21 9	16.41 0.79 23	8.67 0.17 33	3.34 0.08 32
1963	Precip. (in.) Sr-90 (mc/mi ²) Sr-89/Sr-90	2.95 not recd.	8.73 0.67 22	4.75 0.28 14	12.94	21.52	7.23						

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: CHILE, ANTOFAGASTA (Column) 80th Meridian Station

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1963	Precip. (in.)												
	Sr-90 (mc/mi ²)			0.01									
	Sr-89/Sr-90			10									
1964	Precip. (in.)												
	Sr-90 (mc/mi ²)												
	Sr-89/Sr-90												

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: CHILE, PUERTO MONTT (Column) 80th Meridian Station

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1963	Precip. (in.)												
	Sr-90 (mc/mi ²)												
	Sr-89/Sr-90												
1964	Precip. (in.)												
	Sr-90 (mc/mi ²)												
	Sr-89/Sr-90												

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: CHILE, PUNTA ARENAS (Column) 80th Meridian Station

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
			(2/15-2/28)										
1963	Precip. (in.)			0.18									
	Sr-90 (mc/mi ²)		0.19	0.14									
	Sr-89/Sr-90		5	3.4									
1964	Precip. (in.)												
	Sr-90 (mc/mi ²)												
	Sr-89/Sr-90												

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: CHILE, SANTIAGO (Column) 80th Meridian Station

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1963	Precip. (in.) Sr-90 (mc/mi ²) Sr-89/Sr-90												
1964	Precip. (in.) Sr-90 (mc/mi ²) Sr-89/Sr-90												

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: CHILE, SANTIAGO (Pot) 33°29'S, 70°40'W, Alt. 1710 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1958	Precip. (in.) Sr-90 (mc/mi ²) Sr-89/Sr-90						4.33 not recd.	0.79 0.13 53	3.54 0.58 62	0.39 0.09 34	0 0.27 33	0.39 0.18 20	0 0.05 45
1959	Precip. (in.) Sr-90 (mc/mi ²) Sr-89/Sr-90	0 0.02 20	0 0.03 *	0.79 0.10 *	2.36 0.21 2.7	2.36 0.15 *	3.15 0.29 *	1.97 0.19 *	1.58 0.23 1.6	0.39 0.06 *	0.39 0.06 *	0 0.02 *	0 0.02 *
1960	Precip. (in.) Sr-90 (mc/mi ²) Sr-89/Sr-90	0 0.01 *	0 0.01 --	2.36 0.02 --	0 0.03 --	0.79 0.09 --	0.35 --	1.97 0.12 --	0.79 --	0.39 0.10 --	0 --	0 0.02 --	0 --
1961	Precip. (in.) Sr-90 (mc/mi ²) Sr-89/Sr-90	0 0.03 --	0 --	0.39 0.08 --	0 --	0.79 0.45 --	3.15 --	0.79 0.27 --	2.76 --	<1.18 0.04 *	1.18 0.23 *	0 ≤0.03 ≤12	0.28 0.03 *
1962	Precip. (in.) Sr-90 (mc/mi ²) Sr-89/Sr-90	0 0.05 *	0 0.01 *	0 0.03 *	0.02 0.01 *	0 0.06 *	5.90 0.22 29	0.56 0.10 46	1.26 0.34 28	0.24 0.05 8	0.44 0.01 *		0 0.14 31
1963	Precip. (in.) Sr-90 (mc/mi ²) Sr-89/Sr-90	0.01 0.013 7	0 0.04 *		0.02	0.17							

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: COLOMBIA, BOGOTA (Pot) 4°38' N, 74°05' W, ~Alt. 8630 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1957	Precip. (in.)	0.96	0.44	1.22	4.24	4.39	1.39	1.11	1.02	1.58	4.76	1.75	0.43
	Sr-90 (mc/mi ²)								0.02	0.02	0.01	not	-0.00
	Sr-89/Sr-90								--	--	--	recd.	--
1958	Precip. (in.)	0.35	0.96	1.64	2.71	0.98	0.53	0.22	2.23	0.74	2.77	4.03	1.84
	Sr-90 (mc/mi ²)	0.04	0.04	0.12	0.02	0.12	0.02	0.10	0.20	0.06	0.09	0.10	0.12
	Sr-89/Sr-90	12	15	4	33	13	133	43	92	72	42	44	45
1959	Precip. (in.)	0.26	0.41	2.37	2.94	2.25	4.72	2.69	1.61	0.94	3.64	1.78	0.73
	Sr-90 (mc/mi ²)	lost	0.06	0.07	0.25	0.02	lost	not	0.04	0.02	not	0.33	lost
	Sr-89/Sr-90	--	25	19	12	10	--	recd.	*	*	recd.	*	--
1960	Precip. (in.)	0.79	2.00	1.12	2.24	2.55	0.80	2.95	1.58	2.59	4.48	1.20	3.18
	Sr-90 (mc/mi ²)	not	not	0.29	0.04	0.04		0.01		not	not	not	not
	Sr-89/Sr-90	recd.	recd.	--	--	--		--		recd.	recd.	recd.	recd.
1961	Precip. (in.)	0.91	0.25	2.22	3.97	1.31	2.58	1.72	0.98	0.69	5.76	4.72	1.21
	Sr-90 (mc/mi ²)	lost	not	not	not	not	not	not	not	0.10	0.02	0.26	not
	Sr-89/Sr-90		recd.	recd.	recd.	recd.	recd.	recd.	recd.	--	*	65	recd.
1962	Precip. (in.)												
	Sr-90 (mc/mi ²)	not	not	not	0.10	<0.02	0.10	not	not	0.16	0.06	0.66	0.29
	Sr-89/Sr-90	recd.	recd.	recd.	19	*	57	recd.	recd.	26	23	22	9
1963	Precip. (in.)												
	Sr-90 (mc/mi ²)	0.21	0.42										
	Sr-89/Sr-90	41	24										

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: CONGO, LEOPOLDVILLE - SITE# 1 (Column) 4°18'S, 15°18'E, ~Alt. 1045 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)									2.36	6.70	3.15	
	Sr-90 (mc/mi ²)									0.13	0.05	0.06	0.04
	Sr-89/Sr-90									0.8	*	*	*
1960	Precip. (in.)	3.94	4.73	5.91	11.03	0.24	8.62	0.02	trace	2.55	4.43	6.90	3.77
	Sr-90 (mc/mi ²)	0.01	0.22	0.13	0.00	0.21		lost		0.35		0.26	
	Sr-89/Sr-90	--	--	--	--	--		--		--		--	
1961	Precip. (in.)	4.56	6.92	3.82	13.97	7.08	0.00	0.09	0.004	2.66			
	Sr-90 (mc/mi ²)		0.00		lost	0.34		≤0.00		0.05	≤0.01	0.08	0.37
	Sr-89/Sr-90	--	--	--	--	--		--		2.4	*	80	50
							(6/14 to 7/31)						
1962	Precip. (in.)	5.23	6.33										
	Sr-90 (mc/mi ²)	0.53	0.59	0.25	0.18	0.32		0.07	0.01	0.20	0.15	0.06	
	Sr-89/Sr-90	46	27	19	10	74		42	*	16	18	17	
1963	Precip. (in.)												
	Sr-90 (mc/mi ²)	0.18	0.51	1.34									
	Sr-89/Sr-90	27	29	17									

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: CONGO, LEOPOLDVILLE - SITE# 2 (Column) 4°22'S, 15°15'E, Alt. 1460 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1960	Precip. (in.)					0.24	8.62	0.02	trace	2.55	4.43	6.90	3.77
	Sr-90 (mc/mi ²)					0.16		0.40		0.55		0.57	
	Sr-89/Sr-90					--		--		--		--	
1961	Precip. (in.)	5.12	6.92	3.82	13.97	7.08	0	0.09	0.004	2.66		0.11	0.27
	Sr-90 (mc/mi ²)			0.16		0.00		0.09		0.07	≤0.01		
	Sr-89/Sr-90			--		--		--		*	*	64	36
1962	Precip. (in.)	5.23	6.33	9.70	2.33	6.62				1.94	3.79	12.30	9.25
	Sr-90 (mc/mi ²)	0.51	0.48	0.32	0.19	0.42	not	0.19	0.03	0.12	0.14	0.13	0.48
	Sr-89/Sr-90	45	30	18	12	135	recd.	3	*	23	18	14	29
1963	Precip. (in.)	4.39	11.44	8.91	8.11								
	Sr-90 (mc/mi ²)	0.49	1.15	1.44									
	Sr-89/Sr-90	27	22	18									

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: COSTA RICA, TURRIALBA (Column) 9°53'30"N, 83°39'30" W, Alt. 1988 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)									6.46	6.05		8.72
	Sr-90 (mc/mi ²)								0.16	0.02	lost	lost	0.18
	Sr-89/Sr-90								1.2	*	--	--	--
1960	Precip. (in.)	6.92	3.70	4.49	1.95	5.88	10.04	8.55	8.98	4.50	10.46	8.31	11.37
	Sr-90 (mc/mi ²)	0.29	0.09	0.32	0.36		0.14		0.00		0.06		0.00
	Sr-89/Sr-90	--	7.0	--	--		--		--		--		--
1961	Precip. (in.)	3.35	0.20	1.67	2.24		14.23	11.57		10.32	10.12	15.17	9.75
	Sr-90 (mc/mi ²)		0.02		0.04		0.04	0.00	not	<0.04	0.08	0.49	0.30
	Sr-89/Sr-90	--	--	--	--	--	--	--	recd.	*	13	93	64
1962	Precip. (in.)	4.70	1.2	1.5	4.94	7.56	8.54	12.68	12.81	9.73	11.57	21.00	12.91
	Sr-90 (mc/mi ²)	0.83		0.80	1.21	1.14	0.37	0.13	0.61		0.25	0.26	0.45
	Sr-89/Sr-90	48	38		12	54	71	14	34	18		25	45
1963	Precip. (in.)	4.35	3.71	4.6									
	Sr-90 (mc/mi ²)	0.01	0.61	1.43									
	Sr-89/Sr-90	*	26	17									

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: EASTER ISLAND (Column) 27°05'S, 109°20'W

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1962	Precip. (in.) Sr-90 (mc/mi ²) Sr-89/Sr-90												
1963	Precip. (in.) Sr-90 (mc/mi ²) Sr-89/Sr-90												

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: ECUADOR, QUITO (Column) 0°14'S, 78°30'W, ~Alt. 9300 ft.

	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959 Precip. (in.)							0.01	lost	lost	0.01	0.03	0.04
Sr-90 (mc/mi ²)							*	--	--	*	*	*
Sr-89/Sr-90												
1960 Precip. (in.)												
Sr-90 (mc/mi ²)	0.14	0.13	0.12	0.12	0.11	not	0.20	0.06	not	not	not	not
Sr-89/Sr-90	--	--	--	--	--	recd.	--	--	recd.	recd.	recd.	recd.
1961 Precip. (in.)					0.08	2.36	0.79	0.24	(9/5-10/10)	(10/12-11/30)		
Sr-90 (mc/mi ²)	not	not	not	0.08	0.08	0.18	0.00			8.42	4.83	
Sr-89/Sr-90	recd.	recd.	recd.	--	--	--	--			0.02	0.03	
										23	84	
1962 Precip. (in.)	9.40		6.85	7.16	4.20	2.04	0.02	0.09	1.48	3.42	5.88	2.60
Sr-90 (mc/mi ²)	0.10		0.05	0.09	0.25	0.06	0.01	0.02	0.10	0.16	0.06	0.05
Sr-89/Sr-90	31		25	38	11	58	*	14	21	17	34	46
1963 Precip. (in.)	5.87	4.73	8.66									
Sr-90 (mc/mi ²)	0.12	0.15	0.15									
Sr-89/Sr-90	37	11	15									

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Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: ECUADOR, GUAYAQUIL (Column) 80th Meridian Station

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1963	Precip. (in.)												
	Sr-90 (mc/mi ²)												
	Sr-89/Sr-90												
1964	Precip. (in.)												
	Sr-90 (mc/mi ²)												
	Sr-89/Sr-90												

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: ENIWETOK ATOLL (Column) 11°21'N, 162°21'E, ~alt. 13 ft.

[illegible]

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: ETHIOPIA, ADDIS ABABA (Column) 9°03'N, 38°42'E, ~Alt. 9850 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1960	Precip. (in.)												
	Sr-90 (mc/mi ²)	0.01	0.23	0.17	lost	lost	lost	0.00		0.03		0.05	0.10
	Sr-89/Sr-90	--	--	--	--	--	--	--		--		--	--
1961	Precip. (in.)												
	Sr-90 (mc/mi ²)	0.21		0.23		0.67		0.50		0.20			1.12
	Sr-89/Sr-90	--		--		--		--		*			54
1962	Precip. (in.)												
	Sr-90 (mc/mi ²)	≤0.02	not	not	0.33	1.73	not	2.56	1.73	0.49	0.02	0.28	0.62
	Sr-89/Sr-90	*	recd.	recd.	19	13	recd.	10	12	16	*	32	0.65 28
1963	Precip. (in.)												
	Sr-90 (mc/mi ²)	0.04	2.13	1.50	6.38	3.82	4.85	8.76					
	Sr-89/Sr-90	0.89 36	not recd.	2.38 15									

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: FLJI ISLANDS, SUVA (Column) 18°09'S, 178°25'E, ~ alt. 37 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)	13.33	8.30	17.43	17.48	9.37	11.32	1.32	19.19	1.53	9.03	13.03	
	Sr-90 (mc/mi ²)								0.30	0.01	lost	0.02	
	Sr-89/Sr-90								0.38	*	--	*	
1960	Precip. (in.)	15.46	9.49	10.60	4.87	6.45	10.79	11.42	4.37	4.72	5.32	17.94	9.34
	Sr-90 (mc/mi ²)	0.23	0.20		0.17		0.36		0.36		0.18		0.42
	Sr-89/Sr-90	--	*		--		--		--	--	--	--	--
1961	Precip. (in.)	12.82	10.54	4.20	13.6	7.09	6.97	6.18	5.09	14.03	4.20	24.99	19.25
	Sr-90 (mc/mi ²)		0.11		0.39		0.04		0.30	0.20	0.68	0.82	0.03
	Sr-89/Sr-90	--	--	--	--	--	--	--	--	3.0	95	0.5	32
1962	Precip. (in.)	20.91	21.64	28.29	5.94	6.67	12.84	4.96	3.22	4.98	4.72	10.67	9.39
	Sr-90 (mc/mi ²)	0.19	0.30	0.08	0.04	0.08	0.72	0.44	not	0.30	0.41	0.65	0.56
	Sr-89/Sr-90	2.2	3	4	4	24	83	55	recd.	12	*	8	9
1963	Precip. (in.)	15.51	6.64	11.87	22.43	13.67	4.46						
	Sr-90 (mc/mi ²)	0.39	0.36	0.18									
	Sr-89/Sr-90	8	7	4.0									

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: GERMANY, RHEIN MAIN AFB (Column) 50°02'N, 08°34'E, ~alt. 368 ft.

	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959 Precip. (in.)										1.34	1.34	2.09
Sr-90 (mc/mi ²)										0.10	0.15	0.21
Sr-89/Sr-90										0.72	0.77	*
1960 Precip. (in.)	1.97	1.64	0.91	1.06	2.76	0.75	3.74	4.94	1.34	5.12	0.30	2.71
Sr-90 (mc/mi ²)	0.31	0.40	lost	0.27	0.24		0.23		0.12		0.13	
Sr-89/Sr-90	--	11	--	--	--	--	--	--	--	--	--	--
1961 Precip. (in.)	2.44	1.27	0.06	2.40	2.48	7.14	4.84	2.14	1.54	2.64	3.35	1.89
Sr-90 (mc/mi ²)		0.21	0.70	0.33	1.09		0.74		0.07	0.23	0.39	0.25
Sr-89/Sr-90		--	--	--	--	--	--	--	15	55	81	60
1962 Precip. (in.)	1.93	2.29	2.52	2.01	2.48	0.36	1.14	2.21	1.38	0.59	1.62	2.84
Sr-90 (mc/mi ²)	0.56	0.64	1.58	2.02	not	3.21	0.06	1.13	lost	lost	0.69	0.86
Sr-89/Sr-90	53	30	18	13	recd.	9	7	7	--	--	40	45
1963 Precip. (in.)	0.71	0.91	3.15	1.18	1.62	1.77						
Sr-90 (mc/mi ²)	0.06	0.71	3.52									
Sr-89/Sr-90	22	22	20									

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: GREENLAND, THULE (Column) 76°35'N, 68°38'W, ~alt. 950 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)										1.08	0.22	0.25
	Sr-90 (mc/mi ²)										0.04	0.04	0.02
	Sr-89/Sr-90										*	*	*
1960	Precip. (in.)	0.23	0.24	0.57	0.07	0.23	0.15	0.67	0.12	0.68	0.37	0.92	0.15
	Sr-90 (mc/mi ²)	0.18	0.05	0.15	0.22		0.24		0.25		0.05		0.14
	Sr-89/Sr-90	--	--	--	--		--		--		--		--
1961	Precip. (in.)	0.16	trace	0.08	0.16	0.39	0.60		0.79	0.33	0.22	0.16	0.23
	Sr-90 (mc/mi ²)		0.02		0.00		0.19		0.14	0.03	0.06	1.06	0.04
	Sr-89/Sr-90	--	--	--	--	--	--	--	--	22	40	89	47
1962	Precip. (in.)	0.20	trace	0.41	0.66	0.52	trace		1.03	0.54	0.48	0.33	0.21
	Sr-90 (mc/mi ²)	≤0.01	≤0.01	≤0.01	0.11	0.14	≤0.01	0.31	0.64	0.07	0.23	0.09	0.06
	Sr-89/Sr-90	≥68	*	≥33	9	6	*	11	7	21	18	26	49
1963	Precip. (in.)	1.07	0.75	0.11	0.15	0.32	0.10						
	Sr-90 (mc/mi ²)	0.09	0.15	0.01									
	Sr-89/Sr-90	22	27	10									

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: GUAM (Column) 13°35'N, 144°55'E, ~alt. 605 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)									15.00	10.76	6.78	6.30
	Sr-90 (mc/mi ²)									0.06	0.04	0.10	0.11
	Sr-89/Sr-90									*	*	*	2.4
1960	Precip. (in.)	3.23	0.66	1.59	0.38	5.98	5.92	8.61	16.51	8.94	11.77	11.30	6.22
	Sr-90 (mc/mi ²)	0.25	0.14	0.20	0.27		0.20		0.14		0.27	0.06	0.27
	Sr-89/Sr-90	--	--	--	--		--		--		--	--	--
1961	Precip. (in.)	4.79	3.74	5.03	3.20	4.31	4.09	6.46	14.97	14.51	17.88	5.96	0.23
	Sr-90 (mc/mi ²)		0.12		0.02		0.17		0.12	0.05	0.14	0.35	0.35
	Sr-89/Sr-90		--		--		--		--	71	50	90	17
1962	Precip. (in.)	1.70	8.80	1.42	8.44	5.39	8.14	12.82	11.55	13.92	20.64	11.27	13.28
	Sr-90 (mc/mi ²)	1.48	0.87	0.61	1.97	1.24	1.50	0.79	lost	0.26	0.54		0.64
	Sr-89/Sr-90	47	30	23	12	12	16	17	"	22	25		35
1963	Precip. (in.)	10.92	11.06	3.36	24.00	13.97	6.93						
	Sr-90 (mc/mi ²)	1.69	2.38	1.03									
	Sr-89/Sr-90	32	37	16									

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: HONG KONG (Column) 22°18'N, 144°12'E, ~Alt. 25 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1960	Precip. (in.)	0.39	trace	9.84	1.57	9.84	27.56	6.30	21.26	12.24	10.23	5.43	0.05
	Sr-90 (mc/mi ²)	0.12	lost	0.17	lost	0.24	not	not	not	not	not	not	not
	Sr-89/Sr-90	--	--	--	--	--	recd.	recd.	recd.	recd.	recd.	recd.	recd.
1961	Precip. (in.)	~1.00		5.0	6.78	5.00	8.3	19.38	8.00	21.08	1.22	3.59	
	Sr-90 (mc/mi ²)	0.15			0.48		0.19	not	0.14	0.15	not	not	not
	Sr-89/Sr-90	--			--		--	recd.	--	*	recd.	recd.	recd.
1962	Precip. (in.)		3.27	0.64									
	Sr-90 (mc/mi ²)	not	not	1.40	0.69	0.99	1.04	0.40	0.09	not	0.98		0.24
	Sr-89/Sr-90	recd.	recd.	18	13	--	21	10	12	recd.	--	31	
1963	Precip. (in.)	(2/10-3/15) (3/15-4/10)											
	Sr-90 (mc/mi ²)	0.28	0.29	1.64									
	Sr-89/Sr-90	40	15	18									

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: ICELAND, KEFLAVIK (Column) 63°58'N, 22°36'W, ~ alt. 184 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)	2.46	10.94	9.54	2.85	2.44	3.07	2.31	5.54	8.95	7.61	2.15	3.94
	Sr-90 (mc/mi ²)												0.11
	Sr-89/Sr-90												*
1960	Precip. (in.)	3.45	1.58	4.72	2.78	2.36	5.51	5.09	0.69	5.20	2.32	0.23	4.08
	Sr-90 (mc/mi ²)	0.28	0.24	0.35	0.35	lost	lost	0.00		0.14		0.24	
	Sr-89/Sr-90	--	--	--	--	--	--	--	--	--	--	--	--
1961	Precip. (in.)	4.13	5.44	7.07	3.29	2.53	1.74	2.22	4.06	6.31	5.10	4.88	2.28
	Sr-90 (mc/mi ²)	0.28		0.62		0.73		0.36		0.34	0.53	0.60	0.70
	Sr-89/Sr-90	--	--	--	--	--	--	--	--	67	38	76	61
1962	Precip. (in.)	4.67	7.52	0.40	0.61	1.33	4.62	2.37	1.67	4.74	6.00	5.69	6.27
	Sr-90 (mc/mi ²)	1.55	0.53	0.69	2.35	1.42	1.74	0.58	lost	1.01	1.52	1.40	1.86
	Sr-89/Sr-90	43	32	114	12	9	9	9	"	26	29	53	48
1963	Precip. (in.)	3.45	3.54	4.33	6.00	4.06	1.41						
	Sr-90 (mc/mi ²)	1.89	2.07	2.98									
	Sr-89/Sr-90	26	20	12									

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: IRAN, TEHRAN (Pot) 35°44'N, 51°23'E, Alt. 4464 ft. /Tehran University Nuclear Center/

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1962	Precip. (in.)						0.15	trace		0.09	0.61	0.21	0.51
	Sr-90 (mc/mi ²)						0.66	0.08	0.19	0.20	1.10	0.41	0.76
	Sr-89/Sr-90						8	13	13	16	11	29	47
1963	Precip. (in.)	0.43	4.8										
	Sr-90 (mc/mi ²)	1.64	1.77										
	Sr-89/Sr-90	47	24										

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: ITALY, FLORENCE (Column) 43°47'N, 11°15'E, ~Alt. 165 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)										0.99		4.91
	Sr-90 (mc/mi ²)										0.12	0.33	0.43
	Sr-89/Sr-90										1.5	*	0.8
1960	Precip. (in.)	6.61	2.64	4.87	1.93	0.07	1.76	4.31	0.34	4.41	8.85	4.57	6.81
	Sr-90 (mc/mi ²)	0.27	0.64	0.63	0.36	0.84		1.13		0.48		0.57	
	Sr-89/Sr-90	--	0.3	--	--	--		--		--		--	
1961	Precip. (in.)	4.51	1.09	0	4.16	1.40	3.33	0.30	0.40		4.20	4.34	3.31
	Sr-90 (mc/mi ²)	0.39			0.97	0.58		0.19		0.26	0.68	0.64	1.92
	Sr-89/Sr-90	--			--	--		--		1.8	95	101	70
1962	Precip. (in.)	5.55	3.07	3.40	1.99	2.09	2.03	0.03		1.21	3.33	6.30	2.30
	Sr-90 (mc/mi ²)	1.35	1.35	3.02	4.34	3.03	3.37	0.12	0.70	0.50	1.09	2.54	1.81
	Sr-89/Sr-90	48	29	22	12	7	8	8	28	28	52	43	44
1963	Precip. (in.)	1.80	0.48	2.80									
	Sr-90 (mc/mi ²)	3.11	1.84	0.72									
	Sr-89/Sr-90	36	25	12									

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Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: ITALY, MILAN (Column) 45°28'N, 9°12'E, Alt. 400 ft.

[illegible]

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: IWO JIMA (Column) 24°47'N, 141°19'E, alt. 370 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)	2.83	0.93	1.14	5.69	5.33	1.60	2.10	5.28	5.48	6.75	2.88	3.47
	Sr-90 (mc/mi ²)								0.11	0.13	0.07	0.06	not
	Sr-89/Sr-90								2.1	*	*	*	recd.
1960	Precip. (in.)	7.01	7.09	1.50	11.70	1.31	2.63	5.16	11.77	0.00	11.81	0.00	2.99
	Sr-90 (mc/mi ²)	0.48	0.24	0.34	0.36	0.35		0.26		0.06		0.11	
	Sr-89/Sr-90	--	--	--	--	--		--		--		--	
1961	Precip. (in.)	2.71	3.65	6.88	2.85	2.87	3.12	13.53	6.47	8.06	7.66	5.60	2.72
	Sr-90 (mc/mi ²)	0.43		0.93		0.43		0.07		0.15	0.10	0.30	1.97
	Sr-89/Sr-90	--		--		--		--		14	90	72	69
1962	Precip. (in.)	7.38	0.33	2.03	2.70	7.65	8.76	1.80	11.20	2.17	13.27	3.32	5.67
	Sr-90 (mc/mi ²)	1.66	0.66	0.84	1.09	0.45	1.41	0.38	0.77	0.29	0.80	0.33	2.26
	Sr-89/Sr-90	47	29	22	14	8	7	9	12	16	30	49	50
1963	Precip. (in.)	1.44	0.31	0.58	1.21	4.41	2.03						
	Sr-90 (mc/mi ²)	1.44	0.73	0.06									
	Sr-89/Sr-90	45	35	20									

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: JAPAN, HIROSHIMA (Pot) 34°23'N, 132°27'E, ~Alt. 75 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1956	Precip. (in.)								11.93	9.83	3.51	1.64	0.23
	Sr-90 (mc/mi ²)								0.50	lost	0.27	0.11	0.06
	Sr-89/Sr-90								--	--	--	--	--
1957	Precip. (in.)	2.15	2.26	1.29	11.00	6.44	10.22	21.10	4.48	10.92	2.07	2.46	1.91
	Sr-90 (mc/mi ²)	0.29	0.53	0.23	1.12	0.57	0.49	0.82	0.05	0.28	lost	0.14	0.36
	Sr-89/Sr-90	--	--	--	--	--	--	--	--	--	--	--	--
1958	Precip. (in.)	2.65	2.93	4.88	10.49	3.74	3.98	6.90	9.87	3.59	4.88	2.38	1.95
	Sr-90 (mc/mi ²)	0.24	0.25	0.92	3.37	1.06	0.64	0.43	2.66	0.42	0.79	0.71	0.57
	Sr-89/Sr-90	13	12	11	10	14	11	3.2	17	52	48	8	62
1959	Precip. (in.)	2.64	5.24	2.37	8.12	6.03	2.60	13.08	4.77	4.93	4.33	2.24	3.70
	Sr-90 (mc/mi ²)	1.81	2.45	5.55	6.52	0.40	1.09	1.37	lost	0.04	0.27	0.13	0.16
	Sr-89/Sr-90	31	28	10	7	--	5.6	3.2	--	*	0.5	*	*
1960	Precip. (in.)	1.58	0.39	2.10	5.12	8.59	9.49	7.12	4.09	10.83	2.80	2.95	0.79
	Sr-90 (mc/mi ²)	0.24	0.09	0.84	0.56		1.31		0.48		0.27		0.08
	Sr-89/Sr-90	--	--	--	--		--		--		--		--
1961	Precip. (in.)	2.16	1.57	3.31	6.69	5.35	5.00	6.81	4.61	3.11	7.12	4.61	1.85
	Sr-90 (mc/mi ²)		0.24		1.06		0.77		0.11	not	0.28	0.58	not
	Sr-89/Sr-90		--		--		--		--	recd.	6.7	74	recd.
1962	Precip. (in.)	1.58	1.18	0.94	5.98	7.32	9.61	18.58	4.53	4.80	8.70	3.70	2.24
	Sr-90 (mc/mi ²)	1.11	1.66	3.50	3.44	3.56	1.72	0.13	0.28	1.16	0.97	0.93	1.69
	Sr-89/Sr-90	38	23	17	14	8	7	10	22	16	25	37	36
1963	Precip. (in.)	1.38	1.10	2.44	5.87	15.74	10.00	6.34	11.81				
	Sr-90 (mc/mi ²)	1.15	1.31	3.56									
	Sr-89/Sr-90	32	30	16									

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: JAPAN, MISAWA (Column) 40°42'N, 141°22'E, alt. 119 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)	3.78	1.92	4.43	1.92	2.83	5.34	4.48	4.13	7.34	3.44	2.92	2.11
	Sr-90 (mc/mi ²)									0.41	0.24	0.16	0.26
	Sr-89/Sr-90									0.46	1.0	*	*
1960	Precip. (in.)	9.25	3.91	2.66	3.95	4.11	1.84	2.11	4.73	3.29	6.56	3.80	4.58
	Sr-90 (mc/mi ²)	0.14	0.52	lost	0.29	0.00		0.00		0.21		0.03	
	Sr-89/Sr-90	--	--	--	--	--		--		--		--	
1961	Precip. (in.)	2.38	3.34	0.79	2.75	0.91	3.72	4.55	3.22	5.78	4.89	1.91	3.06
	Sr-90 (mc/mi ²)	0.40		0.88		0.54		0.20		<0.01	0.51	0.49	1.08
	Sr-89/Sr-90	--		--		--		--		>138	52	94	62
1962	Precip. (in.)	3.34	2.93	4.42		2.23	2.30	1.45	5.01	7.74	4.04	2.36	1.20
	Sr-90 (mc/mi ²)	0.86	≤0.03	3.59		3.10	1.86	0.05	0.87	2.84	3.16	1.01	0.74
	Sr-89/Sr-90	19	*	12		12	10	12	33	17	43	51	39
1963	Precip. (in.)	6.10	2.11	2.76									
	Sr-90 (mc/mi ²)	1.00	2.62	2.10									
	Sr-89/Sr-90	55	26	30									

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: JAPAN, NAGASAKI (Pot) 32°45'N, 129°52'E, ~Alt. 200 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1956	Precip. (in.)								17.43	16.07	3.59	1.44	1.37
	Sr-90 (mc/mi ²)								0.34	0.17	0.20	0.08	0.22
	Sr-89/Sr-90								--	--	--	--	--
1957	Precip. (in.)	3.94	3.28	1.40	11.27	6.44	10.18	28.67	11.35	14.74	2.11	2.42	5.38
	Sr-90 (mc/mi ²)	1.01	0.17	0.38	1.98	0.72	0.27	1.07	0.46	0.26	0.21	0.19	0.17
	Sr-89/Sr-90	--	--	--	--	--	--	--	--	--	--	--	--
1958	Precip. (in.)	2.50	2.77	5.38	14.94	7.29	5.93	1.33	14.27	2.77	6.67	2.11	3.86
	Sr-90 (mc/mi ²)	0.60	0.55	1.13	2.52	1.75	0.88	2.10	0.50	0.26	0.55	0.61	2.16
	Sr-89/Sr-90	16	11	14	15	4	35	86	60	52	44	48	37
1959	Precip. (in.)	3.35	5.83	3.55	8.59	7.84	4.18	11.11	3.15	8.67	0.56	3.90	4.77
	Sr-90 (mc/mi ²)	3.00	2.14	3.74	7.60	3.02	0.74	1.73	0.19	0.13	0.06	0.09	0.36
	Sr-89/Sr-90	31	26	15	9.3	7.3	3.9	2.3	*	*	*	*	*
1960	Precip. (in.)	2.36	0.79	4.33	5.63	9.84	12.16	1.50	3.15	16.14	3.66	3.23	1.69
	Sr-90 (mc/mi ²)	0.13	0.20	0.85	0.58		0.11				0.14		0.27
	Sr-89/Sr-90	--	--	--	--		--	not recd.	not recd.	--	--	--	--
1961	Precip. (in.)	3.46	1.85	4.17	4.21	8.78	4.28	5.35	7.16	4.16	6.14	4.92	2.56
	Sr-90 (mc/mi ²)		0.43		0.05		0.71		0.14	0.02	0.13	1.07	2.03
	Sr-89/Sr-90	--	--	--	--	--	--	--	--	*	44	86	60
1962	Precip. (in.)	5.51	2.24	2.44	7.95	7.56	12.36	19.22	12.87	7.48	4.72	4.92	3.11
	Sr-90 (mc/mi ²)	3.13	3.32	4.23	2.14	1.53	0.65	0.44	0.26	0.49	0.27	0.89	2.54
	Sr-89/Sr-90	40	29	23	14	7	9	14	15	15	16	36	54
1963	Precip. (in.)	4.33	1.22	4.29	7.95	13.58	8.82	15.91	17.21				
	Sr-90 (mc/mi ²)	3.44	2.02	6.29									
	Sr-89/Sr-90	29	35	15									

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: JAPAN, TACHIKAWA (Column) 35°42'N, 139°24'E, ~alt. 320 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)											2.77	3.75
	Sr-90 (mc/mi ²)										0.33	lost	0.14
	Sr-89/Sr-90										*	--	*
1960	Precip. (in.)	1.80	0.11	2.10	6.42	5.23	3.35	1.43	16.02	6.46	5.07	2.74	2.79
	Sr-90 (mc/mi ²)	0.22	0.13	0.38	0.96		1.21		0.00		0.22		0.56
	Sr-89/Sr-90	--	--	--	--		--		--		--		--
1961	Precip. (in.)	0.68	1.34	3.46	5.91	1.91	13.23	1.25	3.89	2.87	11.66	1.90	1.45
	Sr-90 (mc/mi ²)		0.89		0.93		0.83		0.21	<0.01	0.09	0.19	0.46
	Sr-89/Sr-90	--	--	--	--		--		--	>29	80	78	66
1962	Precip. (in.)	0.85	0.77	2.04	3.87	5.60	7.57	10.73	8.77	0.69	4.09	5.46	2.49
	Sr-90 (mc/mi ²)	0.36	0.49	≤0.03	1.76	1.99	4.23	2.26	0.38	0.16	1.18	1.49	0.50
	Sr-89/Sr-90	44	27	≥101	12	10	7	7	13	15	37	46	51
1963	Precip. (in.)	0.05	0.33	2.41	2.59	3.73	8.29						
	Sr-90 (mc/mi ²)	0.26	0.36	3.08									
	Sr-89/Sr-90	17	28	12									

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: JOHNSTON ISLAND (Column) 16°45'N, 169°32'W

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1960	Precip. (in.)		0.39	5.28	0.87	1.03	0.79	0.83	1.65	3.82	6.97	3.12	3.12
	Sr-90 (mc/mi ²)		0.32	0.14	0.17	0.48		0.01		0.09		0.09	
	Sr-89/Sr-90		--	--	--	--		--		--		--	
1961	Precip. (in.)	0.64	1.10	0.78	3.17	0.39	0.83	1.70	3.78	1.13	12.72	3.03	1.74
	Sr-90 (mc/mi ²)	0.12		not	0.22	0.02		0.07		0.06	0.07	0.71	0.29
	Sr-89/Sr-90	--		recd.	--	--		--		19	111	86	58
1962	Precip. (in.)	1.95	3.91		3.83	1.81	1.51	0.51	14.8	2.08	0.86	1.76	0.62
	Sr-90 (mc/mi ²)	0.47	1.20	2.79	0.08	0.13	0.71	1.32	0.04	0.36	0.06	0.06	0.03
	Sr-89/Sr-90	38	28	19	17	12	8	3	8	11	16	31	50
1963	Precip. (in.)	0.29	0.41	2.32									
	Sr-90 (mc/mi ²)	0.06	0.08	0.24									
	Sr-89/Sr-90	26	25	13									

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: KENYA, KIKUYU (Pot) 1°13'S, 36°38'E, Alt. 6800 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1957	Precip. (in.)	5.11	2.00	0.69	10.28	11.39	5.69	0.77	0.09	1.26	2.33	4.88	3.28
	Sr-90 (mc/mi ²)	0.14	0.26	0.03	0.03	0.14	0.19	0.15	0.02	0.04	0.09	0.06	0.16
	Sr-89/Sr-90	---	--	--	--	--	--	--	--	--	--	--	--
1958	Precip. (in.)	0.90	5.46	3.41	4.79	11.82	2.89	2.41	0.28	0.08	2.33	2.39	2.54
	Sr-90 (mc/mi ²)	0.03	0.14	0.22	0.13	0.90	0.22	0.26	0.13	0.07	0.25	0.15	0.12
	Sr-89/Sr-90	24	12	5	6	5	30	48	24	50	26	37	62
1959	Precip. (in.)	0.65	1.71	2.46	4.05	6.23	0.06	0.52	1.25	0.82	0.80	9.83	2.20
	Sr-90 (mc/mi ²)	0.24	0.22	0.27	0.35	0.22	0.03	0.01	0.04	0.09	0.03	0.11	0.04
	Sr-89/Sr-90	32	28	19	12	6.6	7.0	*	*	1.7	*	*	*
1960	Precip. (in.)	1.81	0.27	5.88	5.37	3.24	1.29	0.17	0.60	0.80	2.30	2.63	0.89
	Sr-90 (mc/mi ²)	0.10	0.01	0.13	0.07	0.22	not	0.04		0.17		0.09	
	Sr-89/Sr-90	--	--	--	--	--	recd.	--	--	--	--	--	--
1961	Precip. (in.)	0.26	0.28	2.74	6.62	3.85	0.62	1.05	1.00	1.29	6.46	21.93	13.57
	Sr-90 (mc/mi ²)		0.03		0.10		0.84		0.11		0.39	0.02	0.46
	Sr-89/Sr-90	--	--	--	--	--	--	--	--	28	*	*	65
1962	Precip. (in.)	6.35	0.68	1.29	5.67	14.80	1.30	0.05	1.29	0.32	2.76	4.44	3.53
	Sr-90 (mc/mi ²)	0.55	0.14	0.13	1.67	0.77	5.19	0.04	0.11	0.02	0.18	0.15	0.29
	Sr-89/Sr-90	40	33	20	9	4	7	34	31	7	16	26	54
1963	Precip. (in.)	3.47	2.12	1.83									
	Sr-90 (mc/mi ²)	0.38	0.45										
	Sr-89/Sr-90	37	34										

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: KENYA, NAIROBI (Column) 1°17'S, 36°49'E, alt. 5453 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)	0.43	3.54	7.45	4.03	3.34	0.08	0.05	1.23	2.44	1.20	9.11	1.37
	Sr-90 (mc/mi ²)									0.16	0.08	0.14	lost
	Sr-89/Sr-90									*	*	*	--
1960	Precip. (in.)	1.72	0.47	11.50	6.15	5.18	1.47	0.25	0.21	0.95	2.78	2.90	2.09
	Sr-90 (mc/mi ²)	0.12	0.17	0.25	0.20	0.05		0.00		0.08		0.01	
	Sr-89/Sr-90	--	--	--	--	--		--		--		--	
1961	Precip. (in.)	0.33	0.62	2.98	6.18	4.53	0.98	0.27	1.06	1.40	6.46	29.51	14.94
	Sr-90 (mc/mi ²)	0.00		0.37		0.23		0.07		0.02	0.04	0.20	0.64
	Sr-89/Sr-90	--		--		--		--		37	6.7	49	69
1962	Precip. (in.)	7.84	1.75	0.92	5.75	10.07		0.07	1.67	0.62	3.28	4.11	3.75
	Sr-90 (mc/mi ²)	1.26	0.29	0.20	0.24	0.80	0.67	0.19	0.12	0.30	0.40	0.27	0.30
	Sr-89/Sr-90	38	28	17	17	2	25	20	18	11	8	28	47
1963	Precip. (in.)	7.60	2.30	4.49	4.86	9.99	1.41	0.25	2.02				
	Sr-90 (mc/mi ²)	1.52	0.66	0.63									
	Sr-89/Sr-90	39	21	15									

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: KOROR ISLAND (Column) 7°21'N, 134°31'E, ~alt. 102 ft.

[illegible]

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: LEBANON, BEIRUT (Column) 33°54'N, 35°28'E, ~Alt. 125 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)										5.52	4.55	2.36
	Sr-90 (mc/mi ²)										0.28	lost	0.63
	Sr-89/Sr-90										*	--	*
1960	Precip. (in.)	5.62		4.72	1.17	0.02	0.00			0.71	0.47	0.39	1.18
	Sr-90 (mc/mi ²)	0.09	0.30	not	not	not	not	0.00		0.09		0.57	
	Sr-89/Sr-90	--	--	recd.	recd.	recd.	recd.	--		--		--	
1961	Precip. (in.)	6.43	10.56	3.66	0.11	6.16	0.00	0	0	13.20	5.83	3.02	5.51
	Sr-90 (mc/mi ²)		1.39		0.55		0.20	0.09		0.19	0.12	0.76	4.87
	Sr-89/Sr-90	--	--		--		--	--		--	62	51	53
1962	Precip. (in.)	7.00	7.56	0.53	2.28	0.29	0			12.24	5.43	0.18	11.25
	Sr-90 (mc/mi ²)	5.02	8.49	1.36	2.66	1.09	0.02	0.05	0.09	0.02	0.16	0.34	3.70
	Sr-89/Sr-90	43	31	30	17	8	*	8	7	17	19	14	43
1963	Precip. (in.)	10.1	6.20	2.80	3.70	3.02	trace						
	Sr-90 (mc/mi ²)	10.48	2.49										
	Sr-89/Sr-90	50	37										

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: LIBERIA, MONROVIA (Column) 6°20'N, 10°46'W

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)							3-5		5.01	1.01		
	Sr-90 (mc/mi ²)							0.32	lost	0.16	0.04	0.10	0.01
	Sr-89/Sr-90							*	--	*	--	*	--
1960	Precip. (in.)	1.18	1.01	5.01	1.45	11.07	57.18	19.30	23.41	25.75			
	Sr-90 (mc/mi ²)	0.01	lost	lost	0.17	0.14	0.21		0.07		0.14		0.14
	Sr-89/Sr-90	--	--	--	--	--	--		--	--	--		--
1961	Precip. (in.)		0.90	4.90	3.73								
	Sr-90 (mc/mi ²)	0.03	0.36		0.78	not	not	not	not	not	not	not	not
	Sr-89/Sr-90	--	--		--	recd.	recd.	recd.	recd.	recd.	recd.	recd.	recd.
1962	Precip. (in.)												
	Sr-90 (mc/mi ²)												
	Sr-89/Sr-90												
1963	Precip. (in.)		(2/8	-	4/10/63)								
	Sr-90 (mc/mi ²)	not			1.66								
	Sr-89/Sr-90	recd.			16								

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: LIBYA (Columns) 32°53'N, 13°12'E, ~alt. 30 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
<u>Sharah Shahat</u>													
1963	Precip. (in.)	4.49	2.73										
	Sr-90 (mc/mi ²)	0.19	1.18										
	Sr-89/Sr-90	25	32										

Ben Gashir

		(1/15-2/15) (2/15-3/15) (3/15-4/15)		
1963	Precip. (in.)	0.31	1.29	0.64
	Sr-90 (mc/mi ²)	0.26	0.12	0.30
	Sr-89/Sr-90	24	20	11

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: LIBYA, TRIPOLI (Column) 32°52'N, 13°11'E, ~Alt. 30 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1960	Precip. (in.)	1.05	0.24	0.20	2.19	0.04	0	0	0	2.11	0.12	1.61	8.20
	Sr-90 (mc/mi ²)										0.10	0.01	
	Sr-89/Sr-90										--	--	
1961	Precip. (in.)	1.81	1.12	1.45	1.86	0.37	0	0	0	0.04	0.89	0	1.41
	Sr-90 (mc/mi ²)	0.17		0.91		0.26		0.03		0.05	0.24	0.26	1.20
	Sr-89/Sr-90	--		--		--		--		*	26	19	47
1962	Precip. (in.)	4.46	3.26	0.73	0.12	0.20	0	0	0	0	1.69	0.70	3.49
	Sr-90 (mc/mi ²)	0.66	2.00	1.19	0.91	0.79	0.26	0.10	0.10	0.14	0.33	1.48	0.29
	Sr-89/Sr-90	44	26	17	12	8	7	5	4	10	44	60	35
1963	Precip. (in.)	(1/1-1/15)											
	Sr-90 (mc/mi ²)	1.99											
	Sr-89/Sr-90	0.19											
		25											

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: MAJURO ISLAND (Column) 7°05'N, 171°23'E, alt. 10 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1960	Precip. (in.)	9.17	3.60	11.17	23.41	14.27	13.22	14.10	14.59	16.93	9.71	16.32	6.54
	Sr-90 (mc/mi ²)		0.17	0.20	0.43	0.36		0.25		0.09			0.23
	Sr-89/Sr-90		--	--	--	--		--		--			--
1961	Precip. (in.)	21.97	6.50	4.24	8.50	8.34	13.90	5.34	11.31	11.14	11.50	12.04	16.92
	Sr-90 (mc/mi ²)	0.24		0.30		0.00		0.00		<0.03	0.06	0.09	0.52
	Sr-89/Sr-90	--		--		--		--		>20	12	72	70
1962	Precip. (in.)	17.55	5.15	11.48	5.95	12.01	7.54	11.02	8.91	21.03	16.36	22.69	11.71
	Sr-90 (mc/mi ²)	0.55	0.36	2.18	0.85	0.37	0.65	0.37	0.30	0.12	0.22	0.30	0.31
	Sr-89/Sr-90	40	34	20	13	36	54	30	22	19	30	138	55
1963	Precip. (in.)	17.46	9.57	12.43									
	Sr-90 (mc/mi ²)	0.35	0.99	1.38									
	Sr-89/Sr-90	29	24	18									

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: SINGAPORE, Malaya (Column) 1°20'N, 103°50'E, ~Alt. 25 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)										5.37	8.74	20.35
	Sr-90 (mc/mi ²)									0.05	0.00	0.02	0.00
	Sr-89/Sr-90									*	--	*	*
1960	Precip. (in.)	5.24	8.35	4.73	4.33	5.52	7.09	4.31	1.97	5.80	2.48	4.13	7.04
	Sr-90 (mc/mi ²)	≤0.00	lost	0.10	0.02	0.95	lost	0.96		0.09		0.10	
	Sr-89/Sr-90	--	--	--	--	--	--	--	--	--	--	--	--
1961	Precip. (in.)	6.05	5.25	12	5.44	5.39	4.71	4.72	2.60	5.71	2.07	8.65	11.23
	Sr-90 (mc/mi ²)	0.00		0.24	0.03	1.29		0.11		0.09	0.06	0.09	0.11
	Sr-89/Sr-90	--	--	--	--	--	--	--	--	3.1	16	55	53
1962	Precip. (in.)	15.37	3.94	9.45	5.12	4.33	3.54	4.28	6.89	7.09	6.10	8.04	15.70
	Sr-90 (mc/mi ²)	0.13	0.19	0.14	0.27	0.05	0.22	0.13	0.50	0.23	0.04	0.13	0.22
	Sr-89/Sr-90	43	22	18	14	12	56	32	12	10	28	25	41
1963	Precip. (in.)	8.91	5.96	1.79	1.88	6.25	6.7						
	Sr-90 (mc/mi ²)	0.26	0.31	0.31									
	Sr-89/Sr-90	46	28	18									

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: MEXICO, MEXICO CITY (Column) 19°26'N, 99°03' W, ~alt. 7340 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)								6.50	~5	5.91	0.08	0.04
	Sr-90 (mc/mi ²)								0.22	0.04	0.08	lost	0.15
	Sr-89/Sr-90								2.1	*	1.5	--	*
1960	Precip. (in.)	0.20	0	0.50	0.08	1.75	2.76	7.09	5.91	4.96	1.78	0.83	0.69
	Sr-90 (mc/mi ²)	0.13	0.12	0.02	0.25	0.25		lost	lost	0.06		0.03	
	Sr-89/Sr-90	--	--	--	--	--		--	--	--		--	--
1961	Precip. (in.)	0.29	trace	3.0	6.2	0.56	8.76	4.59	5.87	5.03	1.06	0.14	0.13
	Sr-90 (mc/mi ²)	0.15		0.41		0.49		0.23		0.04	0.01	0.02	0.04
	Sr-89/Sr-90	--		--		--		--		*	108	8.6	56
1962	Precip. (in.)			0.16	3.92	1.46	5.54		5.08	4.94	3.56	5.2	0.12
	Sr-90 (mc/mi ²)	≤0.01	0.03	≤0.01	2.72	0.60	0.81	not	0.87	0.16	0.20	0.09	0.09
	Sr-89/Sr-90	≥38	17	≥73	13	19	13	recd.	17	15	13	31	19
1963	Precip. (in.)			0.59									
	Sr-90 (mc/mi ²)	0.03	0.04	0.07									
	Sr-89/Sr-90	*	6	13									

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: MOROCCO, SIDI SLIMANE AFB (Column) 32°51'N, 8°32'W

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)												
	Sr-90 (mc/mi ²)									0.10	0.22	2.44	2.80
	Sr-89/Sr-90									*	*	0.31	0.28
												0.82	1.2
1960	Precip. (in.)			4.08		0.67	1.02	trace	trace				3.39
	Sr-90 (mc/mi ²)	0.31	0.37	1.24	lost	0.25		0.00		0.00		0.22	
	Sr-89/Sr-90	--	--	--	--	--		--		--		--	
1961	Precip. (in.)	2.23	0.06			0.42	0.37	trace	trace	0.12			1.19
	Sr-90 (mc/mi ²)	0.25		not	0.35	0.18		0.08		0.20	0.10	1.16	0.73
	Sr-89/Sr-90	--		recd.	--	--		--		5.1	56	77	68
1962	Precip. (in.)	0.42			0.43	0.22	0.37	trace	trace	0.14	1.36	8.27	3.09
	Sr-90 (mc/mi ²)	1.19	1.26	4.76	0.61	1.44	0.98	0.20	0.12	0.32	0.43	4.20	2.22
	Sr-89/Sr-90	44	27	23	13	10	8	5	9	10	33	43	49
1963	Precip. (in.)	5.16	7.55	0.35									
	Sr-90 (mc/mi ²)	3.18	1.65	0.34									
	Sr-89/Sr-90	31	29	23									

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd).

Site: NEW ZEALAND, WELLINGTON (Column) 41°17'S, 174°46'E, ~alt. 112 ft.

[illegible]

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: NIGERIA, LAGOS (Column) 6°26'N, 3°24'E, ~Alt. 2 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)								3.15	4.33	0.79	5.52	1.18
	Sr-90 (mc/mi ²)								lost	0.09	0.09	≤0.00	0.00
	Sr-89/Sr-90								--	*	1.2	*	*
1960	Precip. (in.)	0.79	2.36	1.58	8.66	9.06	13.38	3.94	4.33	9.06	6.30	2.76	3.94
	Sr-90 (mc/mi ²)	0.12	0.15	0.22	lost		0.16		0.23		0.05		0.13
	Sr-89/Sr-90	--	--	--	--		--		--	--	--		--
1961	Precip. (in.)	1.18	0.12	5.90	11.42		19.29	12.60	0.12	3.94	10.24	3.94	0.39
	Sr-90 (mc/mi ²)		0.11		0.64		0.46		0.16	≤0.03	0.08	0.03	0.14
	Sr-89/Sr-90	--	--	--	--		--		--	23	67	60	58
1962	Precip. (in.)	0.12	3.00	0			1.50				(10/5-11/15)(11/15-12/15)(12/15-1/28)		
	Sr-90 (mc/mi ²)	0.14		8.04	0.47	0.66	1.78	0.68	0.25	0.22	0.32	0.17	0.14
	Sr-89/Sr-90	46	3		12	22	30	30	16	13	27	25	20
1963	Precip. (in.)	(1/28-2/20)(2/20-3/9)											
	Sr-90 (mc/mi ²)	0.07	0.71	1.83	4.63	11.86	11.96	11.96	19.41	14.58			
	Sr-89/Sr-90	18	26										

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: NORWAY, OSLO (Column) 59°56'N, 10°45'E, Alt. 40 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)							2.60	1.73		5.16	5.24	5.67
	Sr-90 (mc/mi ²)							1.76	0.49	lost	0.34	0.39	0.40
	Sr-89/Sr-90							3.1	2	--	*	0.3	*
1960	Precip. (in.)	2.60	1.18	1.17	0.87	0.70	4.21	7.12	5.31	1.74	3.07	5.24	2.55
	Sr-90 (mc/mi ²)	0.31	0.17	2.40	0.15	0.80		0.60	not	0.13		0.18	
	Sr-89/Sr-90	--	--	--	--	--		--	recd.	--		--	
1961	Precip. (in.)	2.01	1.73	1.34	7.01	1.57	2.59	2.50	2.64	4.57	6.42	3.56	1.42
	Sr-90 (mc/mi ²)	0.43		0.44		0.18		0.35		0.24	0.55	0.42	0.34
	Sr-89/Sr-90	--		--		--		--		47	87	67	49
1962	Precip. (in.)	2.76	1.93	0.90	1.70	3.46	1.69	3.70	5.83	2.91	1.62	2.52	2.24
	Sr-90 (mc/mi ²)	0.99	0.42	0.24	1.12	2.80	1.26	2.09	1.91	1.24	0.49	1.11	0.84
	Sr-89/Sr-90	38	42	26	9	6	9	8	9	21	36	41	32
1963	Precip. (in.)	0.16	0.20	0.83	2.99	4.59	1.89						
	Sr-90 (mc/mi ²)	0.11	0.18										
	Sr-89/Sr-90	22	50										

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: PAKISTAN, KARACHI (Column)

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1963	Precip. (in.)	trace		trace									
	Sr-90 (mc/mi ²)	0.11		0.16									
	Sr-89/Sr-90	18		11									
1964	Precip. (in.)												
	Sr-90 (mc/mi ²)												
	Sr-89/Sr-90												

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: PAKISTAN, KARACHI (Pot) 24°51'N, 67°02'E, ~Alt. 50 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1958	Precip. (in.)		0.39	0	0	0	0	3.15				0	0.04
	Sr-90 (mc/mi ²)		0.02	0.07	0.13	0.39	0.07	0.29	0.15	0.56	0.06	0.04	0.65
	Sr-89/Sr-90		45	40	4	3	13	53	31	61	16	9	49
1959	Precip. (in.)	0	0	0	0	0	0	6.30	0.08	9.85	0	1.58	0
	Sr-90 (mc/mi ²)	0.29	lost	0.15	0.47	not	not	0.47	0.06	0.11	lost	0.12	lost
	Sr-89/Sr-90	37	--	18	5.3	recd.	recd.	2.4	--	4.5	--	*	--
1960	Precip. (in.)	0.16	0	1.18	0	0	trace	1.18	0.20	0	0	0	0
	Sr-90 (mc/mi ²)	0.38	0.02	0.13	0.02	lost		0.02		0.08		0.08	
	Sr-89/Sr-90	--	--	--	--	--		--		--		--	
1961	Precip. (in.)	0.04	0	0	0.24	0	0.20	3.55	1.97	3.94	0.96	(10/15 - 12/14) 0.02	0.26
	Sr-90 (mc/mi ²)		0.11	0.10	0.05	≤0.03	not	not	not	not		0.45+	
	Sr-89/Sr-90	--	--	--	--	--	recd.	recd.	recd.	recd.		75	
1962	Precip. (in.)	1.26	1.59	1.72	trace	0.59	trace	6.46	4.60	5.64	0.00	0.54	0.29
	Sr-90 (mc/mi ²)	2.22+	2.15+	5.33+	2.48+	1.67+	1.69+	not	lost	1.05+	0.31+		
	Sr-89/Sr-90	47	27	10	13	13	8	recd.	"	19	62		
1963	Precip. (in.)	0.00	0.30	0.50	0.89								
	Sr-90 (mc/mi ²)												
	Sr-89/Sr-90												

+ Samples for these months were designated as coming from Lahore (31°39'N, 74°22'E, Alt. 700 ft.)

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: <u>PANAMA CANAL ZONE</u> (Column)		8°55'N, 79°36'W, Alt. 33 ft.											
		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)									4.35	18.90	9.25	8.17
	Sr-90 (mc/mi ²)									0.09	0.05	0.08	0.18
	Sr-89/Sr-90									*	*	0.9	1.2
1960	Precip. (in.)	3.33	1.14	0.79	8.27	8.91	7.01	6.43	6.85	7.27	7.51	15.19	10.20
	Sr-90 (mc/mi ²)	0.13	0.22	0.18	0.49	0.18		0.03		0.13		0.06	
	Sr-89/Sr-90	--	--	--	--	--		--		--		--	--
1961	Precip. (in.)	0.19	0.86	0	1.79	4.19	10.31	9.93	5.91	7.13	10.93	11.92	4.16
	Sr-90 (mc/mi ²)		0.09	not	0.16	0.27		0.03		0.01	0.01	0.25	0.29
	Sr-89/Sr-90	--	--	recd.	--	--		--		14	46	102	56
1962	Precip. (in.)	1.03	0	0.03	3.51	7.89	8.87	7.91	8.09	7.05	15.23	9.18	6.8
	Sr-90 (mc/mi ²)	0.41	≤0.02	0.11	not	not	1.89	not	1.54	0.30	0.28	0.47	0.58
	Sr-89/Sr-90	41	≥25	22	recd.	recd.	34	recd.	29	22	18	46	39
1963	Precip. (in.)	2.31	2.47	trace									
	Sr-90 (mc/mi ²)	0.35	0.35	0.08									
	Sr-89/Sr-90	50	20	15									

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: PERU, LIMA (Column) 12°06'S, 77°03'W, ~Alt. 501 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)							0.39		0.16	0.79	0.06	0.08
	Sr-90 (mc/mi ²)							0.11		lost	0.03	lost	0.14
	Sr-89/Sr-90							--		--	*	--	*
1960	Precip. (in.)	trace	trace	trace	trace	0.1	0.20	0.20	0.39	2.36	0.24	0.08	trace
	Sr-90 (mc/mi ²)	0.03	not	not	0.08	0.25		lost	lost	0.12	not	0.07	
	Sr-89/Sr-90	--	recd.	recd.	--	--		--	--	--	recd.	--	
1961	Precip. (in.)	trace	0	0	0	trace	trace	0.39	0.39	0.39	0.12	trace	trace
	Sr-90 (mc/mi ²)	0.06			0.19	0.13		0.00		<0.02	0.06	0.06	<0.01
	Sr-89/Sr-90	--			--	--		--		*	*	*	*
1962	Precip. (in.)	trace	0	0	trace	trace	trace	0.2	0.02	0.1			0.1
	Sr-90 (mc/mi ²)	≤0.02	≤0.02	≤0.01	≤0.02	0.03	0.07	0.09	0.25	0.37	0.10	0.08	0.04
	Sr-89/Sr-90	*	*	≥1.7	*	40	45	9	10	27	9	14	2
1963	Precip. (in.)												
	Sr-90 (mc/mi ²)	1.76	0.02	0.01									
	Sr-89/Sr-90	35	*	18									

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: PERU, LIMA (Column) 80th Meridian Station

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1963	Precip. (in.)												
	Sr-90 (mc/mi ²)												
	Sr-89/Sr-90												
1964	Precip. (in.)												
	Sr-90 (mc/mi ²)												
	Sr-89/Sr-90												

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: PHILIPPINE ISLANDS, CEBU CITY (Column) 10°20'N, 123°54'E, Alt. 111 ft.

	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1961												
Precip. (in.)				2.76	5.03	6.47	9.98	2.96		10.28	4.46	4.03
Sr-90 (mc/mi ²)				0.36		0.00	≤0.00		not	0.02	≤0.01	0.15
Sr-89/Sr-90				--	--		--		recd.	38	>166	58
1962												
Precip. (in.)	2.08	7.12	3.26	1.26	3.27	6.96	8.30	13.03	5.50	4.41	5.46	2.64
Sr-90 (mc/mi ²)	≤0.02	1.51	0.07	0.15	0.28	0.29	0.47	lost	0.01	0.09	0.13	0.17
Sr-89/Sr-90	≥64	30	25	15	4	15	37	"	*	22	46	40
1963												
Precip. (in.)	2.72	1.02	3.09									
Sr-90 (mc/mi ²)	0.10	0.26	0.29									
Sr-89/Sr-90	22	15	15									

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: PHILIPPINE ISLANDS, CLARK AB (Column) 15°11'N, 120°33'E, alt. 33 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.) Sr-90 (mc/mi ²) Sr-89/Sr-90	0.91	0.14	1.35	0.10	3.06	2.80	16.17	16.83	8.74	2.00	9.46 0.11 *	3.15 0.11 2.4
1960	Precip. (in.) Sr-90 (mc/mi ²) Sr-89/Sr-90	0.79 lost --	1.18 0.24 --	0.14 0.08 --	4.69 0.18 --	4.42 0.02 --	14.78	6.56 0.09 --	31.50	11.28 0.12 --	0.44	3.54 0.00 --	0.39
1961	Precip. (in.) Sr-90 (mc/mi ²) Sr-89/Sr-90	0.01 0.13 --	0.13	0.39 0.08 --	1.44	5.22 0.25 --	26.48	16.46 0.22 --	13.20	10.20 0.15 *	6.32 0.10 61	1.04 0.02 293	0.01 0.02 23
1962	Precip. (in.) Sr-90 (mc/mi ²) Sr-89/Sr-90	2.87 0.01 247	0.21 0.09 13	0.07 0.10 11	3.87 not recd.	2.48 0.31 21	6.91 0.42 8	24.46 0.55 6	12.80 not recd.	19.06 0.28 10	1.57 0.26 32	3.34 0.13 11	Trace
1963	Precip. (in.) Sr-90 (mc/mi ²) Sr-89/Sr-90	0.05 lost --	0.04 not recd.	1.67 0.24 18	1.80	5.11	22.22						

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: PHILIPPINE ISLANDS, QUEZON CITY (Column) 14°40'N, 121°05'E, Alt. 231 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1961	Precip. (in.)			2.50	1.53	4.92	22.86	16.47	23.37		10.83	4.31	0.46
	Sr-90 (mc/mi ²)			0.73		0.20		0.00	0.01	0.00	0.07	0.04	0.02
	Sr-89/Sr-90			--		--		--	--	--	79	43	27
1962	Precip. (in.)	1.25	0.02	0.27	3.28		7.36	37.84	13.04	14.04	1.98	3.63	0.41
	Sr-90 (mc/mi ²)	≤0.02	≤0.01	≤0.01	0.25	not	0.61	0.99	0.28	0.20	0.13	0.08	0.05
	Sr-89/Sr-90	≥77	≥45	≥34	16	recd.	--	16	*	14	13	35	19
1963	Precip. (in.)	0.12	trace	0.26									
	Sr-90 (mc/mi ²)	0.04	0.05	0.12									
	Sr-89/Sr-90	29	15	11									

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: PONAPE ISLAND (Column) 6°58'N, 158°13'E, alt. 126 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1960	Precip. (in.)		12.45	15.81	25.72	20.08	18.36	12.01	16.02	13.11	16.18	18.9	20.8
	Sr-90 (mc/mi ²)		0.32	0.28	0.29	0.14	0.36	0.14		0.27			0.20
	Sr-89/Sr-90		3.3	--	--	--	--	--		--			--
1961	Precip. (in.)	17	18	17	12	22	18	15.51	17.52	20.71	14.07	18.29	16.47
	Sr-90 (mc/mi ²)		0.48		0.39		0.38		0.03	0.01	lost	0.37	0.23
	Sr-89/Sr-90		--		--		--		--	*	**	105	58
-142- 1962	Precip. (in.)	26.67	16.04	11.04	11.94	22.41	12.27	13.60	18.54	22.91	18.57	5.90	17.44
	Sr-90 (mc/mi ²)	0.32	1.01	1.44	1.31	1.26	0.51	0.42	0.22	0.21	0.19	0.88	0.51
	Sr-89/Sr-90	56	29	23	13	20	50	35	29	15	22	30	55
1963	Precip. (in.)	20.99	16.37	17.06									
	Sr-90 (mc/mi ²)	0.49	0.53	0.97									
	Sr-89/Sr-90	34	16	21									

** 0.50 mc Sr⁸⁹/mi².

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: PUERTO RICO, SAN JUAN (Column) 18°29'N, 66°08'W, ~Alt. 20 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1960	Precip. (in.)		3.13	2.40	5.76	22.09	18.35	5.08	8.49	12.97	16.18	18.90	20.87
	Sr-90 (mc/mi ²)		0.18	0.31	0.55	not	not	0.60		0.27	not	not	see
	Sr-89/Sr-90		--	--	--	recd.	recd.	--		--	recd.	recd.	Jan.'61
1961	Precip. (in.)	3.51	2.95		2.82	1.77	5.28	9.33	5.20	2.62	8.47	9.26	10.00
	Sr-90 (mc/mi ²)	0.27*		0.60		0.28		0.53	lost	0.30	0.47		0.86
	Sr-89/Sr-90	--		--		--		--	--	0.8	63		64
1962	Precip. (in.)	4.24	2.67		3.70	7.53	7.31	12.23		4.85	5.49	3.84	4.11
	Sr-90 (mc/mi ²)	1.53	1.01	not	3.46	2.62	1.57	2.00		0.54	0.31	0.37	0.94
	Sr-89/Sr-90	42	34	recd.	12	20	11	13		9	63	62	46
1963	Precip. (in.)	3.13	1.39	4.68									
	Sr-90 (mc/mi ²)	0.88	0.63	4.64									
	Sr-89/Sr-90	37	33	13									

* December 1960 and January 1961 combined.

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: SAUDI ARABIA, DHAHRAN (Column) 26°18'N, 50°05'E

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)												
	Sr-90 (mc/mi ²)												0.03
	Sr-89/Sr-90												*
1960	Precip. (in.)				0.05	0.00		0.00	0.00	0.00	0.00		0.04
	Sr-90 (mc/mi ²)	0.13	0.04	0.47	0.23	0.26	lost	0.21		0.55		0.08	
	Sr-89/Sr-90	--	--	--	--	--	--	--		--		--	
1961	Precip. (in.)	0.50	0.65	0.50	0.78	trace	0	0	0	0	0	1.02	0.19
	Sr-90 (mc/mi ²)		0.31		0.44		0.00	0.00		<0.02	0.03	0.12	0.46
	Sr-89/Sr-90	--	--	--	--	--	--	--		>11	22	11	60
1962	Precip. (in.)	trace	trace	trace									
	Sr-90 (mc/mi ²)	0.11	0.13	0.39									
	Sr-89/Sr-90	50	24	19									
1963	Precip. (in.)												
	Sr-90 (mc/mi ²)												
	Sr-89/Sr-90												

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Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: SCOTLAND, PRESTWICK (Column) 55°30'N, 4°37'W, ~alt. 30 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)									1.43	5.61	3.93	4.25
	Sr-90 (mc/mi ²)									0.13	not	0.25	0.25
	Sr-89/Sr-90									4.3	recd.	0.7	*
1960	Precip. (in.)	4.16	2.84	2.84	2.20	1.34	2.58	2.15	3.47	2.82	1.80	4.06	3.60
	Sr-90 (mc/mi ²)	0.03	0.27	0.44	0.60	0.51	0.67	lost	lost	0.51		0.39	
	Sr-89/Sr-90	--	--	--	--	--	--	--	--	--		--	--
1961	Precip. (in.)	1.73	2.9	2.02	2.98	0.90	1.57	2.81	0.20	5.68	5.28	2.23	3.11
	Sr-90 (mc/mi ²)		0.52		0.17		0.62		0.47	0.48	0.40	not	1.82
	Sr-89/Sr-90		--		--		--		--	53	84	recd.	62
1962	Precip. (in.)	5.03	2.19	1.07	1.89	1.88	1.72	2.26	5.49	6.50	1.86	1.85	3.85
	Sr-90 (mc/mi ²)	1.76	2.15	1.38	not	2.84	1.81	1.60	2.88	1.60	0.78	1.26	1.55
	Sr-89/Sr-90	46	30	20	recd.	8	10	7	8	17	29	9	45
1963	Precip. (in.)	0.45	0.27	3.42	1.66	3.20	2.06						
	Sr-90 (mc/mi ²)	0.37	2.59	2.51									
	Sr-89/Sr-90	28	21	23									

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: SOUTHERN RHODESIA, SALISBURY (Pot) 17°48.5'S, 31°03'E, Alt. 4900 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1956	Precip. (in.)											7.41	7.80
	Sr-90 (mc/mi ²)											0.18	0.12
	Sr-89/Sr-90											--	--
1957	Precip. (in.)	5.85	8.97	5.46	1.17	0.78	0.02	0	0.39	0.39	0.78	1.32	9.21
	Sr-90 (mc/mi ²)	0.11	0.08	0.05	0.04	not	not	not	not	not	not	0.11	0.10
	Sr-89/Sr-90	--	--	--	--	recd.	recd.	recd.	recd.	recd.	recd.	--	--
1958	Precip. (in.)	5.87	8.98	0.57	1.87	trace	0	0.08	0	0.79	1.97	1.97	4.67
	Sr-90 (mc/mi ²)	0.10	0.04	0.02	0.16	0.55	0.02	0.02	0.05	0.17	0.43	0.35	0.41
	Sr-89/Sr-90	4	5	7	18	--	9	14	*	71	32	12	9
1959	Precip. (in.)	8.91	2.51	1.59	0	0.58	0.65	0.12	0	0.20		3.23	6.67
	Sr-90 (mc/mi ²)	0.13	0.20	0.13	≤0.01	0.02	0.05	0.09	0.02	lost		0.08	0.12
	Sr-89/Sr-90	4.3	13	4.4	*	3.0	5.8	*	*	--		13	--
1960	Precip. (in.)	2.61	4.21	0.24	3.53	1.19	0.39	0.00	0.00	0.12	0.94	2.52	8.31
	Sr-90 (mc/mi ²)	0.07	0.08	0.07	0.04		0.06		0.26		0.32		0.37
	Sr-89/Sr-90	--	--	--	--		--		--		--		--
1961	Precip. (in.)	6.25	5.66	4.04	4.56	0.34	0.60	0	0.23	1.06	1.81	8.58	1.61
	Sr-90 (mc/mi ²)		0.46		0.07		0.05		0.22	0.04	0.16	0.21	0.17
	Sr-89/Sr-90		--		--		--		--	*	*	*	*
1962	Precip. (in.)	8.22	4.83	3.60	0.89	0.07	0	0	0.01	0.11	0.01	4.54	16.22
	Sr-90 (mc/mi ²)	0.10	0.15	0.08	0.05	0.02	0.01	0.02	0.02	0.14	0.03	0.42	0.46
	Sr-89/Sr-90	7.4	7	*	*	*	12	9	*	6	*	18	22
1963	Precip. (in.)	4.52	11.24	1.45									
	Sr-90 (mc/mi ²)	0.20	0.27	0.07									
	Sr-89/Sr-90	8	9	4.5									

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: SYRIA, DAMASCUS (Column) 33°30'N, 36°19'E, Alt. 2250 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1960	Precip. (in.)		trace	5.19	0.39	trace	0	0	0	0	0	2.36	1.18
	Sr-90 (mc/mi ²)	not	0.15		0.52	not	not	not	not	not	not		0.07
	Sr-89/Sr-90	recd.	--	--	--	recd.	recd.	recd.	recd.	recd.	recd.		--
1961	Precip. (in.)												
	Sr-90 (mc/mi ²)	0.50	0.02	not	0.04	not	not	not	not	not	not	not	not
	Sr-89/Sr-90	--	--	recd.	--	recd.	recd.	recd.	recd.	recd.	recd.	recd.	recd.
1962	Precip. (in.)												
	Sr-90 (mc/mi ²)												
	Sr-89/Sr-90												
1963	Precip. (in.)												
	Sr-90 (mc/mi ²)												
	Sr-89/Sr-90												

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: SYRIA, EL QUAMISHLYIE (Column) 37°03'N, 41°15'E

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1960	Precip. (in.)		trace	2.76	2.36			0		0.22	2.45		trace
	Sr-90 (mc/mi ²)		0.71	not	not	not	not	not	not	0.01		not	not
	Sr-89/Sr-90		--	recd.	recd.	recd.	recd.	recd.	recd.	--		recd.	recd.
1961	Precip. (in.)	1.18	0.94	3.15	2.36								
	Sr-90 (mc/mi ²)	not	0.25	not	0.63	not	not	not	not	not	not	not	not
	Sr-89/Sr-90	recd.	--	recd.	--	recd.	recd.	recd.	recd.	recd.	recd.	recd.	recd.
1962	Precip. (in.)												
	Sr-90 (mc/mi ²)												
	Sr-89/Sr-90												
1963	Precip. (in.)												
	Sr-90 (mc/mi ²)												
	Sr-89/Sr-90												

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: TAIWAN, TAINAN (Pot) 23°01'N, 120°14'E

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1958	Precip. (in.)	0.86	0.77	3.49	0.15	4.92	3.74	28.21					
	Sr-90 (mc/mi ²)	0.03	0.07	0.19	0.05	0.41	0.22	1.01	0.30	0.37	0.01	0.01	0.28
	Sr-89/Sr-90	25	12	10	12	58	47	65	10	50	158	110	47
1959	Precip. (in.)												
	Sr-90 (mc/mi ²)	0.22	0.77	0.14	1.23	0.22	0.68	0.27	0.17	≤0.00	0.02	0.05	0.04
	Sr-89/Sr-90	35	29	9.6	15	8.3	1.2	3.7	0.9	--	3.6	*	*
1960	Precip. (in.)		0.79	5.52	9.06								
	Sr-90 (mc/mi ²)	0.03	0.04	0.17	0.14	0.29		0.29		0.03			0.03
	Sr-89/Sr-90	--	--	--	--	--		--		--			--
1961	Precip. (in.)												
	Sr-90 (mc/mi ²)		0.07		0.04	1.51		0.13	≤0.03	0.02	0.06	0.14	
	Sr-89/Sr-90		--		--	--		--	*	*	79	69	
1962	Precip. (in.)												
	Sr-90 (mc/mi ²)	0.26	0.28	0.56	0.52	0.09	0.06	0.46	0.17	0.30	0.08	0.06	0.05
	Sr-89/Sr-90	38	34	22	11	8	40	35	21	25	12	20	51
1963	Precip. (in.)			10.5									
	Sr-90 (mc/mi ²)	0.32	in	0.76									
	Sr-89/Sr-90	10	process	46									

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd.)

Site: TAIWAN, TAIPEI (Pot) 25°05'N, 121°32'E

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1958	Precip. (in.)		9.57	5.40	2.24	4.13	8.49	20.43	4.68	7.02	3.51	1.95	5.85
	Sr-90 (mc/mi ²)		0.15	0.10	0.57	0.31	1.01	0.07	0.57	0.23	0.80	1.13	2.01
	Sr-89/Sr-90		9	14	11	37	34	327**	51	47	54	44	32
1959	Precip. (in.)	3.15	2.44	3.94	12.61	7.49	13.00	16.55	9.06	8.67	4.73	5.12	14.97
	Sr-90 (mc/mi ²)	1.86	lost	2.84	3.97	1.16	0.14	0.27	0.20	0.08	0.42	0.21	0.11
	Sr-89/Sr-90	38	"	17	12	7.6	3.9	1.9	1.7	*	*	1.2	*
1960	Precip. (in.)	4.33	0.79	5.52	9.06	7.88	9.46	9.46	55.16	7.49	2.76	2.76	2.76
	Sr-90 (mc/mi ²)	not	0.32	0.48	0.70	0.40	0.69	0.29		0.31		0.26	
	Sr-89/Sr-90	recd.	--	--	--	--	--	--		--		--	
1961	Precip. (in.)	1.97	6.30	9.85	4.33	7.49	2.76	15.76	3.94	14.18	3.15	1.97	4.73
	Sr-90 (mc/mi ²)		0.49		0.06		0.14		0.12	0.14	0.51	0.31	1.00
	Sr-89/Sr-90		--		--		--		--	121	79	85	59
1962	Precip. (in.)	4.33	3.15	11.42	4.72	7.09							
	Sr-90 (mc/mi ²)	2.28	1.89	5.25	2.46	1.92	0.40	0.35	0.24	0.65	0.10	0.60	0.80
	Sr-89/Sr-90	44	24	17	12	10	9	16	28	22	17	42	47
1963	Precip. (in.)												
	Sr-90 (mc/mi ²)	0.44	in	3.29									
	Sr-89/Sr-90	8	process	21									

** Sr⁹⁰ value suspect.

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: TAIWAN, TAITUNG (Pot) 22°45'N, 121°10'E

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1958	Precip. (in.)				1.17	6.86	4.30	15.73					
	Sr-90 (mc/mi ²)				0.22	0.18	0.57	0.45	0.07	0.02	lost	0.08	0.50
	Sr-89/Sr-90				10	25	56	51	1	40	--	50	41
1959	Precip. (in.)												
	Sr-90 (mc/mi ²)	0.37	0.52	lost	0.92	0.37	0.21	0.08	0.04	lost	0.03	0.05	0.08
	Sr-89/Sr-90	41	22	--	9.4	8.9	*	*	*	--	*	*	4.7
1960	Precip. (in.)												
	Sr-90 (mc/mi ²)	0.04	0.11	0.04	0.25		0.23		0.08		0.05		0.03
	Sr-89/Sr-90	--	--	--	--		--		--		--		--
1961	Precip. (in.)												
	Sr-90 (mc/mi ²)		0.19		0.49		0.09		0.04	0.02	<0.03	0.17	0.35
	Sr-89/Sr-90		--		--		--		--	*	*	31	49
1962	Precip. (in.)												
	Sr-90 (mc/mi ²)	0.45	2.31	1.66	3.11	0.84	0.03	0.12	lost	0.15	2.08	0.20	0.32
	Sr-89/Sr-90	35	33	17	14		*	16	"	24	22	33	48
1963	Precip. (in.)												
	Sr-90 (mc/mi ²)	1.41	in	1.17									
	Sr-89/Sr-90	26	process	2.31									
				17									

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: THAILAND, BANGKOK (Pot) 13°44'N, 100°30'E, Alt. 75 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1957	Precip. (in.)			1.95	5.85	1.56	9.36	6.63	11.70	17.55	16.38	2.73	0
	Sr-90 (mc/mi ²)			0.05	0.13	0.04	0.02	0.02	0.04	0.07	0.02	0.01	not
	Sr-89/Sr-90			--	--	--	--	--	--	--	--	--	recd.
1958	Precip. (in.)	1.56	1.56	0.12	0.12	1.56	7.03	6.63	12.48	12.48	8.97	0.48	0
	Sr-90 (mc/mi ²)	0.12	lost	0.04	0.04	0.05	0.17	0.40	0.23	0.04	0.12	0.02	0.03
	Sr-89/Sr-90	8	--	5	44	17	79	96	44	46	48	57	21
1959	Precip. (in.)	0	1.51	0.69	2.36	8.57	5.30	9.46	3.94	8.27	9.06	0.83	0
	Sr-90 (mc/mi ²)	≤0.02	0.05	0.54	0.04	0.14	0.25	0.48	0.11	0.06	0.03	≤0.00	0.16
	Sr-89/Sr-90	--	12	18	2.1	2.9	7.9	3.4	*	*	*	*	*
1960	Precip. (in.)	0	0	1.35	4.24	4.11	3.12	5.02	9.60	2.33	17.5	0.27	0.40
	Sr-90 (mc/mi ²)	0.29	0.00	0.08	0.04		0.18		0.07		0.14		0.02
	Sr-89/Sr-90	--	--	--	--	--	--	--	--	--	--	--	--
1961	Precip. (in.)	0	3.47	2.36	3.54	7.48	8.32	4.69	7.09	8.64	8.99	1.24	0.06
	Sr-90 (mc/mi ²)		0.11		0.13		0.16		0.17	0.02	0.20	0.03	not
	Sr-89/Sr-90		--		--		--		--	*	59	*	recd.
1962	Precip. (in.)	0	0.79	1.71	1.47	7.06	4.64	4.94		18.25	6.48	0.06	
	Sr-90 (mc/mi ²)	≤0.01	0.14	0.60	0.20	0.03	0.02	0.30	0.15	0.26	0.09	0.02	0.03
	Sr-89/Sr-90	*	6	17	16	*	64	13	35	30	*	*	*
1963	Precip. (in.)	0	0.39	1.59	2.18	3.30	4.81	5.22	12.11	13.12			
	Sr-90 (mc/mi ²)												
	Sr-89/Sr-90												

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: TRINDADE ISLAND (column) 20°30'S, 29°18'W

	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>5/28</u> <u>to 6/1</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1962	Precip. (in.)												
	Sr-90 (mc/mi ²)				0.23	0.02	0.05	0.14	0.26	0.28, 0.03	0.27	0.18	0.25
	Sr-89/Sr-90				3	*	112	15	11	13 *	6	10	7
1963	Precip. (in.)												
	Sr-90 (mc/mi ²)	0.14	0.26										
	Sr-89/Sr-90	5	6.3										

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: TRUK ISLAND (Column) 7°28'N, 151°51'E, ~alt. 5 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.) Sr-90 (mc/mi ²) Sr-89/Sr-90	0.96	8.23	9.11	16.12	20.08	7.97	13.48	11.47	14.49	11.36	11.30	34.89 0.00 *
1960	Precip. (in.) Sr-90 (mc/mi ²) Sr-89/Sr-90	12.61 not recd.	6.30 0.24 --	7.43 0.09 --	10.86 0.18 --	14.23 0.22 --	11.09	9.45 0.05 --	13.19	6.49 0.06 --	11.14	16 0.02 --	18
1961	Precip. (in.) Sr-90 (mc/mi ²) Sr-89/Sr-90	9.12 0.28 --	7.62	6.13 1.07 --	11.3	22.36 0.40 --	12.71	19.24 0.09 --	17.86	17.12 0.06 *	17.88 0.07 11	7.87 0.33 94	15.24 0.45 74
1962	Precip. (in.) Sr-90 (mc/mi ²) Sr-89/Sr-90	7.97 0.21 51	7.75 0.52 26	12.77 0.06 *	6.98 0.63 9	18.33 0.63 17	12.27 0.48 44	32.99 0.52 40	16.51 lost "	14.64 0.09 24	9.77 0.09 21	26.26 0.10 17	11.04 0.28 46
1963	Precip. (in.) Sr-90 (mc/mi ²) Sr-89/Sr-90	11.27 0.49 24	7.35 0.36 23	5.44 0.59 22	7.41	8.54	7.64						

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: UAR, ALEXANDRIA (Column) 31°13'N, 29°55'E, alt. 25 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)												
	Sr-90 (mc/mi ²)												0.25
	Sr-89/Sr-90												*
1960	Precip. (in.)	2.76	0.39	1.18	0.00	0.00	0.00	0.00	0.00	trace	trace	2.36	1.97
	Sr-90 (mc/mi ²)	0.03	0.18	0.18	0.26	0.00	not	not	not	not	not	not	not
	Sr-89/Sr-90	--	--	--	--	--	recd.	recd.	recd.	recd.	recd.	recd.	recd.
1961	Precip. (in.)												
	Sr-90 (mc/mi ²)	not	not	not	not	not	not	not	not	not	not	not	not
	Sr-89/Sr-90	recd.	recd.	recd.	recd.	recd.	recd.	recd.	recd.	recd.	recd.	recd.	recd.
1962	Precip. (in.)												
	Sr-90 (mc/mi ²)												
	Sr-89/Sr-90												
1963	Precip. (in.)												
	Sr-90 (mc/mi ²)												
	Sr-89/Sr-90												

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: UNION OF SOUTH AFRICA, DURBAN (Pot) 29°52'S, 30°59'E, Alt. 511 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1957	Precip. (in.)						0.39	0.39	0.78	4.64	3.51	3.12	5.85
	Sr-90 (mc/mi ²)						0.08	0.01	0.10	0.23	0.24	0.32	0.22
	Sr-89/Sr-90						--	--	--	--	--	--	--
1958	Precip. (in.)	9.75	10.53	4.68	11.70	0.39	0.78	0.78	0.25	3.12	1.17	4.29	3.55
	Sr-90 (mc/mi ²)	0.02	0.18	0.09	0.46	0.91	0.04	0.44	0.02	0.40	0.38	0.60	0.60
	Sr-89/Sr-90	<5	16	2	<2	--	34	4	15	32	16	14	11
1959	Precip. (in.)	5.12	2.76	0.79	1.18	5.91	0	4.33	3.15	1.58	3.15	2.76	2.76
	Sr-90 (mc/mi ²)	0.56	0.14	lost	0.17	0.24	0.05	0.08	0.17	lost	0.24	0.43	0.27
	Sr-89/Sr-90	3	5	--	3.0	2.3	*	4.7	*	--	*	*	2.9
1960	Precip. (in.)	2.76	3.55	2.36	3.15	0.39	0.08	0.39	0.04	1.97	3.54	6.30	6.69
	Sr-90 (mc/mi ²)	0.29	0.20	0.07	lost		0.03		0.68		0.39	not	not
	Sr-89/Sr-90	--	--	--	--	--	--	--	--	--	--	recd.	recd.
1961	Precip. (in.)	4.72	2.76	5.12	10.63	2.76	5.51	1.97	1.58	2.76	3.54	3.14	3.14
	Sr-90 (mc/mi ²)		0.60		0.61		0.25		0.38	0.28	0.55	0.64	0.54
	Sr-89/Sr-90		--		--		--		--	*	*	*	*
1962	Precip. (in.)	3.55	3.54	4.72	1.57	1.97	0.04						
	Sr-90 (mc/mi ²)	0.50	0.54	0.38	0.13	<0.02	0.18	<0.01	0.24	0.26	0.47	0.75	0.45
	Sr-89/Sr-90	*	*	*	*	*	7	*	25	17	12	11	8
1963	Precip. (in.)												
	Sr-90 (mc/mi ²)												
	Sr-89/Sr-90	in process	0.52 3	0.68 24									

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: UNION OF SOUTH AFRICA, PRETORIA (Pot) 25°45'S, 28°14'E, Alt. 4490 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1957	Precip. (in.)							4.29	1.56	4.68	3.12		0.63
	Sr-90 (mc/mi ²)							0.06	0.07	0.45	0.19	0.10	0.12
	Sr-89/Sr-90							--	--	--	--	--	--
1958	Precip. (in.)	4.91	1.13	3.32	3.39	0.92	0.04	0	0	1.56	2.34	4.29	7.49
	Sr-90 (mc/mi ²)	0.10	0.06	0.11	0.17	0.49	0.02	0.05	0.01	0.59	0.86	0.36	0.76
	Sr-89/Sr-90	29	3	3	3	--	38	39	194**	60	33	17	19
1959	Precip. (in.)	7.49	4.02	0.18	1.58	0.79	0	0.39	0	0.39	0.79	3.94	5.91
	Sr-90 (mc/mi ²)	0.48	0.52	0.13	0.16	0.08	0.03	0.05	≤0.00	0.12	0.07	0.17	0.24
	Sr-89/Sr-90	7	3	4.8	0.58	*	*	*	--	*	97	*	*
1960	Precip. (in.)	3.00	2.36	2.76	2.76	2.76	0.08	0.04	0.39	0.78	2.36	6.30	4.33
	Sr-90 (mc/mi ²)	0.06	0.09	0.09	0.09	0.23			0.01		0.25		0.42
	Sr-89/Sr-90	--	--	--	--	--			--		--		--
1961	Precip. (in.)	4.33	1.97	3.15	4.33	1.37	0.39	trace	trace	1.57	3.94	4.33	2.93
	Sr-90 (mc/mi ²)		0.37		0.22		0.14		≤0.05	0.46	0.26	6.48	0.53
	Sr-89/Sr-90	--	--	--	--	--	--	--	--	*	*	*	*
1962	Precip. (in.)	3.94	4.97	2.60	1.34	0	0	0	0.05	0.01	1.17	6.93	3.94
	Sr-90 (mc/mi ²)	0.23	0.23	0.33	0.10	0.02	0.03	not	0.12	0.06	0.67	0.48	
	Sr-89/Sr-90	*	*	*	*	*	85	recd.	19	14	25	12	
1963	Precip. (in.)	5.13	0.51										
	Sr-90 (mc/mi ²)	0.57	0.09										
	Sr-89/Sr-90	8	6.5										

** Sr⁹⁰ value suspect.

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: <u>Site #1</u> <u>VENEZUELA, CARACAS</u> (Column) 10°24'N, 66°59'W, Alt. 5740 ft. (I.V.I.C.)		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1960	Precip. (in.)	0.79	1.46	0.05	3.18	3.14	6.45	6.02	4.87	3.42	1.90	1.63	3.49
	Sr-90 (mc/mi ²)	0.11	0.07	0.02	0.24	0.76		0.27		0.13		0.24	
	Sr-89/Sr-90	--	--	--	--	--		--		--		--	
1961	Precip. (in.)	0.37	0.17	0.13	4.17	0.12	3.33	8.20	4.20	5.04	3.72	3.64	1.48
	Sr-90 (mc/mi ²)		0.17		0.00		0.31	0.08		0.06		0.18	0.11
	Sr-89/Sr-90	--	--	--	--	--	--	--	--	*	71		63
1962	Precip. (in.)	0.70	1.00		2.10	4.58	(a) 8.42	(b)	3.82	3.41	4.40	4.39	1.96
	Sr-90 (mc/mi ²)	0.55	0.28		0.46	0.56	1.00	0.92	0.33	0.61	0.18	0.26	0.25
	Sr-89/Sr-90	46	27		8	28	14	--	23	19	26	58	37
1963	Precip. (in.)	0.87	0.65	1.51	1.28	13.86	8.95	3.14	2.45	5.80			
	Sr-90 (mc/mi ²)	0.30	0.24	1.10									
	Sr-89/Sr-90	22	23	16									

(a) Sampling period - 6/1 - 7/11.

(b) Sampling period - 7/11 - 8/1.

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site #2

VENEZUELA, CARACAS (Column) 10°3'N, 66°48'W, ~alt. 3035 ft.

	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1962 Precip. (in.)												
Sr-90 (mc/mi ²)										0.17	0.44	
Sr-89/Sr-90										23	30	

Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: WAKE ISLAND (Column) 19°17'N, 166°39'E, ~alt. 11.45 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1959	Precip. (in.)	1.02	0.57	0.55	2.22	2.04	2.13	2.36	3.15	3.26	2.43	2.14	3.10
	Sr-90 (mc/mi ²)				1.95	1.04	0.07	0.24	0.18	0.10	0.04	0.27	0.21
	Sr-89/Sr-90				12	8.4	5.7	2.6	1.2	*	*	*	2.9
1960	Precip. (in.)	0.39	0.73	0.52	2.00	0.95	5.47	3.15	3.19	4.87	6.41	4.46	0.65
	Sr-90 (mc/mi ²)	0.15	≤0.00	0.24	0.24	0.22	0.15	0.18		0.25		0.11	
	Sr-89/Sr-90	--	--	--	--	--	--	--		--		--	
1961	Precip. (in.)	0.83	0.56	3.47	1.09	0.50	1.09	4.29	8.03	10.81	5.31	3.32	0.76
	Sr-90 (mc/mi ²)		0.48		0.62		0.23		0.46	0.29	0.14	≤0.05	0.18
	Sr-89/Sr-90	--	--	--	--	--	--	--	--	3.8	53	≥85	54
1962	Precip. (in.)	0.49	0.63	1.00	0.58	1.00	5.16	8.26	8.48	6.27	11.70	1.03	2.44
	Sr-90 (mc/mi ²)	0.16	0.42	0.10	0.62	0.50	1.76	1.39	1.14	0.22	0.16	0.18	0.58
	Sr-89/Sr-90	51	32	34	12	13	11	13	10	23	22	48	47
1963	Precip. (in.)	0.55	0.32	1.09	2.86	3.66	3.37	1.38	4.37				
	Sr-90 (mc/mi ²)	1.60	0.58	0.40									
	Sr-89/Sr-90	28	22	23									

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Monthly Fallout Deposition Collections: Outside United States Sites (cont'd)

Site: YAP ISLAND (Column) 9°31'N, 138°08'E, alt. 58 ft.

		<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1960	Precip. (in.)	1.72	6.23	4.22	6.30	13.52	9.56	11.46	11.97	10.67	18.07	20.75	8.15
	Sr-90 (mc/mi ²)	0.44	0.13	0.24	0.24	0.42		0.08		0.20		lost	0.02
	Sr-89/Sr-90	--	--	--	--	--		--		--		--	--
1961	Precip. (in.)	11.65	5.67	11.14	4.76	18.07	12.32	12.72	17.24	10.81	21.00	4.93	11.38
	Sr-90 (mc/mi ²)	0.31		0.28	not	lost		0.00		≤0.01	0.13	lost	0.36
	Sr-89/Sr-90	--			recd.	--		--		121	31	#	62
-1961- 1962	Precip. (in.)	8.53	13.36	7.50	15.95	14.43	7.77	19.44	17.52	12.23	9.38	7.41	15.01
	Sr-90 (mc/mi ²)	0.25	0.84	0.84	0.85	0.82	0.40	0.77	lost	0.24	0.15	0.25	0.65
	Sr-89/Sr-90	54	29	22	13	9	18	20	"	15	17	32	39
1963	Precip. (in.)	11.26	12.20	11.13	4.20	7.14	8.77						
	Sr-90 (mc/mi ²)	0.36	0.63	0.93									
	Sr-89/Sr-90	44	29	17									

12.4 mc Sr⁸⁹/mi².

1.1 Monthly Precipitation - cont'd.

1.13 "Tracer" Radionuclides at 3 U. S. Sites
Through June 1963

A number of activation products were produced in relatively high abundance in the high yield detonations carried out by the USSR at Novaya Zemlya in the Fall of 1961. Specifically, Mn-54, Fe-55 and Sb-124 were produced in large quantities while Tl-204 was generated in smaller amounts. The half-lives and dominant radiations of these "tracer" radionuclides are given below.

Nuclide	Half Life (days)	Energy (Mev)		
		β	γ	x-ray
Mn ⁵⁴	310	(EC)	0.84	
Fe ⁵⁵	986	(EC)		5.9 kev
Sb ¹²⁴	60	0.61, 2.31	0.60	
Tl ²⁰⁴	1424	0.77		

In an attempt to trace the arrival and behavior of debris from the higher yield shots, three laboratories were contracted to analyze for several of these radionuclides in monthly fallout collections. Data for Richmond, California, Pittsburgh, Pennsylvania, and Westwood, New Jersey through June 1963 are given in tables 1c, 1d, & 1e, pages 163, 164, and 165, respectively.

The collections at Westwood, New Jersey were also analyzed for strontium-90 and these data may be compared with the monthly data reported on pages 34 and 35 of this quarterly report. Strontium-90 and other radionuclide data for monthly collections at Pittsburgh, Pennsylvania and Richmond, California, are reported on pages 42 through 44 and 15 through 17, respectively.

Rhodium-102 which is a tracer for the high altitude U. S. Orange shot of the Hardtack series on August 11, 1958 has been measured in fallout debris collected at Westwood, New Jersey. These data are reported on page 35.

"Tracer" Radionuclides in Monthly and Weekly Fallout Collections

Site: Richmond, California

<u>Year</u>	<u>Collection Period</u>	<u>Precip. (inches)</u>	<u>mc/mi²(1)</u>		
			<u>Mn-54</u>	<u>Sb-124</u>	<u>Fe-55</u>
1962	April 2 to May 5	0.31	0.308	1.01	<1.28
	August 6 - 9	0.10	0.075		
	October 5 - 15	6.5	0.153	0.538	
	October 15 - 22	0.02	0.097	0.015	
	October 22 - 29	0.01	0.096		
	November 5 - 12	0.08	0.092	0.055	
	November 12 - 17	0.10	0.132	<0.026	
	November 17 - 27	0.72	0.187	<0.752	
	December 10 - 14	0.29	0.094		
	December 14 - 18	2.81	1.88		
1963	January 22 to February 1	4.45		3.69	
	February 1 - 11	1.11		2.15	
	February 11 - 14	0.95	0.952		
	February 14 - 19	0.06		0.124	
	March 13 - 15	0.11	0.345	0.178	101
	March 15 - 18	1.12	0.915	0.602	44.8
	March 18 - 25	0.80	2.58	1.38	81.5
	April 1 - 11	1.55	4.52	2.12	<18.8

(1) Data are corrected for decay to the midpoint of the collection period.

Table 1d

"Tracer" Radionuclides in Monthly Fallout Collections Through June 1963

Site: Westwood, New Jersey

Site: Westwood, New Jersey

Year	Collection Month	Precip. (inches)	mc/mi ² ⁽¹⁾				
			Sr-90	Mn-54	Fe-55	Sb-124	Tl-204
1962	July	1.29	2.42 ± 0.03	1.68 ± 0.18	≤ 5.96	0.44 ± 0.13	≤ 0.006
	August	7.47	2.24 ± 0.03	4.40 ± 0.12	12.9 ± 0.6	24.2 ± 10.6 ⁽²⁾	≤ 0.052
			2.32 ± 0.03	4.02 ± 0.05	8.12 ± 0.29	0.27 ± 0.06	0.098 ± 0.002
	September	3.45	1.07 ± 0.01	≤ 0.73	5.38 ± 0.29	0.35 ± 0.07	≤ 0.046
			0.76 ± 0.01	0.81 ± 0.03	3.54 ± 0.10	lost	0.035 ± 0.006
	October	4.70	2.70 ± 0.03	5.27 ± 0.18	38.3 ± 1.8	≤ 0.73	lost
			2.53 ± 0.03	3.45 ± 0.06	10.4 ± 0.2	0.16 ± 0.06	lost
	November	4.61	1.38 ± 0.02	2.28 ± 0.14	10.6 ± 0.6	20.1 ± 1.1 ⁽²⁾	≤ 0.043
			0.96 ± 0.01	2.01 ± 0.05	4.19 ± 0.14	0.09 ± 0.01	lost
	December	2.85	3.48 ± 0.04	2.70 ± 0.13	6.24 ± 0.25	≤ 1.05	0.129 ± 0.024
			lost	2.02 ± 0.05	4.48 ± 0.04	0.11 ± 0.03	0.337 ± 0.008
	1963	January	2.09	2.73 ± 0.03	4.43 ± 0.08	10.2 ± 0.1	≤ 0.40
3.24 ± 0.10				6.07 ± 0.16	14.5 ± 0.4	≤ 0.30	0.008 ± 0.001
February		1.20	2.69 ± 0.03	5.47 ± 0.12	14.2 ± 0.4	0.44 ± 0.05	0.101 ± 0.089
			1.32 ± 0.02	4.34 ± 0.13	12.0 ± 0.3	≤ 0.27	lost
March		4.02	4.82 ± 0.08	5.89 ± 0.18	47.6 ± 1.4	0.18 ± 0.08	0.056 ± 0.002
			4.36 ± 0.05	6.40 ± 0.13	46.9 ± 1.1	0.13 ± 0.05	0.148 ± 0.001
April		0.95	6.00 ± 0.07	5.67 ± 0.24	38.0 ± 1.1	0.15 ± 0.11	0.102 ± 0.002
			9.58 ± 0.13	6.90 ± 0.43	37.8 ± 0.6	≤ 0.11	0.112 ± 0.004
May		2.91	7.18 ± 0.08	6.78 ± 0.22	67.9 ± 1.2	≤ 0.09	0.141 ± 0.004
			7.66 ± 0.09	8.31 ± 0.12	84.3 ± 1.2	≤ 0.06	0.120 ± 0.002
June		3.55	6.05 ± 0.07	7.88 ± 0.13	lost	lost	0.095 ± 0.003
			5.92 ± 0.09	6.34 ± 0.10	88.6 ± 2.4	0.05 ± 0.03	0.081 ± 0.003

(1) Data are corrected for decay to the midpoint of the collection period.

(2) Suspect data.

Table 1e

"Tracer" Radionuclides in Monthly Fallout Collections Through May 1963

Site: Pittsburgh, Pennsylvania

Year	Collection Month	Precip. (inches)	mc/mi ² (1)	
			Mn-54	Sb-124
1962	April	4.56	5.93 ± 0.28	1.4 ± 2.8
	May	2.60	7.62 ± 0.31	1.2 ± 1.8
	June	1.61	4.30 ± 0.24	lost
	July	3.17	7.9 ± 0.3	0.32 ± 0.64
			8.4 ± 0.6	0.82 ± 0.50
	August	2.58	0.76 ± 0.36	0 ± 0.3
			1.47 ± 0.34	0 ± 0.1
	September	6.86	2.30 ± 0.36	0.05 ± 0.17
			2.36 ± 0.36	0.11 ± 0.15
	October	2.15	1.92 ± 0.34	0.23 ± 0.12
			1.77 ± 0.36	0.01 ± 0.09
	November	1.39	2.20 ± 0.33	0.08 ± 0.10
			2.78 ± 0.33	0.23 ± 0.09
1963	December	2.34	3.22 ± 0.34	0.15 ± 0.07
			3.01 ± 0.39	0.05 ± 0.09
	January	1.97	3.15 ± 0.21	0.34 ± 0.13
			2.96 ± 0.20	0.26 ± 0.14
	February	2.55	5.08 ± 0.19	0.3 ± 0.3
			5.02 ± 0.15	0.1 ± 0.3
	March	6.85	18.3 ± 0.4	1.05 ± 0.12
			17.3 ± 0.4	0.50 ± 0.11
	April	3.04	21.7 ± 0.4	0.35 ± 0.06
			21.6 ± 0.4	0.25 ± 0.06
	May	1.66	17.4 ± 0.3	0.13 ± 0.03
			17.3 ± 0.3	0.12 ± 0.03

(1) Data are corrected for decay to the midpoint of the collection period.

1.1 Monthly Precipitation - cont'd.

1.14 Fission Product and "Tracer" Radionuclides
at 6 U. S. Sites From July 1963

It was considered desirable to obtain data on short and long-lived fission products and unique tracers in precipitation at sites representing the major regions of the United States. Beginning in July 1963, monthly precipitation collections at six sites are being analyzed for the fission product radionuclides; Sr-89, Sr-90, Zr-95, Cs-137, and Ce-144, and the "tracer" radionuclides; Mn-54, Fe-55, and Sb-124. The sites are at Westwood, New Jersey; Appleton, Wisconsin; Chattanooga, Tennessee; Midwest City, Oklahoma; Palo Alto, California; and Seattle, Washington. Available results are reported in the following table 1f, page 167.

Table 1f

FISSION PRODUCT AND "TRACER" RADIONUCLIDES IN MONTHLY COLLECTIONS AT 6 U. S. SITES FROM JULY 1963

Period	<u>mc Sr⁹⁰/mi²</u>						<u>mc Sr⁸⁹/mi²</u>						<u>mc Ce¹⁴⁴/mi²</u>					
	Westwood	Appleton	Chattanooga	Midwest City	Palo Alto	Seattle	Westwood	Appleton	Chattanooga	Midwest City	Palo Alto	Seattle	Westwood	Appleton	Chattanooga	Midwest City	Palo Alto	Seattle
July 1963	13.4					1.27 ⁽¹⁾	32.2					3.55 ⁽¹⁾	186					14.0 ⁽¹⁾
August		3.88	1.50			1.79		7.27	2.60			3.87	124	74.5	29.5			30.5
September		3.98	0.96											70.4	18.3			
October																		
November																		
December																		
January 1964																		
February																		
March																		
April																		
May																		
June																		
Period	<u>mc Cs¹³⁷/mi²</u>						<u>mc Zr⁹⁵/mi²</u>						<u>mc Mn⁵⁴/mi²</u>					
	Westwood	Appleton	Chattanooga	Midwest City	Palo Alto	Seattle	Westwood	Appleton	Chattanooga	Midwest City	Palo Alto	Seattle	Westwood	Appleton	Chattanooga	Midwest City	Palo Alto	Seattle
July 1963	17.3					1.35 ⁽¹⁾	86.0					6.25 ⁽¹⁾	24.0					
August	12.2	5.60	2.63			2.31		lost	11.8			12.35		5.04	1.64			
September		6.44	1.66															
October																		
November																		
December																		
January 1964																		
February																		
March																		
April																		
May																		
June																		
Period	<u>mc Fe⁵⁵/mi²</u>						<u>mc Sb¹²⁴/mi²</u>						<u>Precipitation in inches</u>					
	Westwood	Appleton	Chattanooga	Midwest City	Palo Alto	Seattle	Westwood	Appleton	Chattanooga	Midwest City	Palo Alto	Seattle	Westwood	Appleton	Chattanooga	Midwest City	Palo Alto	Seattle
July 1963	72.0						0.83						4.76					1.81 ⁽¹⁾
August		37.6	14.3					0.28	0.21				1.80	1.98	0.83			1.57
September													4.69	3.82	0.94			
October																		
November																		
December																		
January 1964																		
February																		
March																		
April																		
May																		
June																		

(1) Collections began on the 15th.

Note: Radionuclide data extrapolated to midpoint of collection month.

1.2 Weekly and Individual Precipitation

1.21 Fission Product Radionuclides at 3 United States Sites Through June 1963

Individual or weekly precipitation collections have been carried out at Westwood, New Jersey since February 1958, Pittsburgh, Pennsylvania since February 1955, and Richmond, California since March 1958. These samples have been analyzed continuously for strontium-90 and for strontium-89, zirconium-95, cesium-137, barium-140, cerium-141, and cerium-144 during appropriate periods. These collections commenced immediately after a rainfall and terminated either after the next rainfall or after a week of dry weather. The collection vessels ranged in area from 3 to 80 square feet. The data heretofore unreported for Richmond and Westwood are given in tables 1g and 1h, pages 169 and 170, respectively. Results for the Pittsburgh collections were reported through May 1963 in HASL-140. Collections at Richmond and Pittsburgh have been discontinued. Weekly precipitation collections at Westwood beginning in July 1963, are reported on page 172 of this quarterly report.

Table 1g

Radionuclides in Individual Precipitation Collections: California, Richmond

(Large Collector - 25 ft²)

Sampling Period (1)		Precip. (inches)	millicuries per square mile at midpoint of sampling period					
from	to		Sr-89	Sr-90	Zr-95	Ce-141	Ce-144	Ba-140
1962								
12/10, 1500	12/14, 1500	0.29	3.09 ± 0.04	0.085 ± 0.002	2.30 ± 0.32	3.60 ± 0.46	2.29 ± 0.04	6.24 ± 0.25
12/14, 1500	12/18, 1500	2.81	26.1 ± 0.3	0.644 ± 0.005	23.0 ± 0.2	30.7 ± 4.3	13.7 ± 0.4	12.5 ± 0.8
12/18, 1500	12/24, 1300	0.03	1.04 ± 0.02	0.033 ± 0.001	2.42 ± 0.03	10.7 ± 1.4	6.54 ± 0.10	1.43 ± 0.08
12/24, 1300	12/31, 1430	dry	0.241 ± 0.010	0.021 ± 0.002	1.49 ± 0.01	2.22 ± 0.22	1.21 ± 0.04	0.790 ± 0.025
1963								
12/31, 1430	1/7, 1500	dry	0.354 ± 0.006	0.0145 ± 0.0005	0.755 ± 0.015	2.24 ± 0.34	1.64 ± 0.03	0.752 ± 0.035
1/7, 1500	1/14, 1600	dry	0.054 ± 0.002	0.0012 ± 0.0001	0.074 ± 0.003	0.296 ± 0.031	0.199 ± 0.008	0.159 ± 0.004
1/14, 1600	1/22, 1600	dry	0.387 ± 0.009	0.0150 ± 0.0004	1.47 ± 0.02	0.689 ± 0.086	0.865 ± 0.005	0.805 ± 0.020
1/22, 1600	2/1, 1500	4.45	65.4 ± 0.5	1.69 ± 0.02	60.9 ± 0.5	47.0 ± 4.0	46.4 ± 0.7	22.1 ± 0.2
2/1, 1500	2/11, 1530	1.11	34.7 ± 0.2	1.35 ± 0.01	42.4 ± 0.3	47.0 ± 8.0	48.6 ± 0.1	9.46 ± 0.10
2/11, 1530	2/14, 1600	0.95	17.1 ± 0.2	0.750 ± 0.006	17.6 ± 0.1	16.2 ± 1.8	19.2 ± 0.3	4.77 ± 0.06
2/14, 1600	2/19, 1600	0.06	1.61 ± 0.02	0.087 ± 0.001	3.30 ± 0.04	11.0 ± 1.3	11.7 ± 0.3	0.558 ± 0.020
2/19, 1550	2/26, 1550	trace	0.457 ± 0.020	0.023 ± 0.006	2.05 ± 0.02	4.7 ± 0.7	7.55 ± 0.15	0.235 ± 0.003
2/26, 1550	3/6, 1600	0.146	2.41 ± 0.04	0.153 ± 0.004	4.88 ± 0.06	2.9 ± 0.7	5.18 ± 0.15	0.307 ± 0.006
3/6, 1600	3/13, 1600	0.03	1.99 ± 0.03	0.083 ± 0.003	2.77 ± 0.02	1.4 ± 0.3	3.34 ± 0.08	0.133 ± 0.004
3/13, 1600	3/15, 1600	0.11	2.45 ± 0.04	0.184 ± 0.001	3.55 ± 0.03	< 1.58	4.08 ± 0.09	N.D.
3/15, 1600	3/18, 1600	1.12	5.99 ± 0.05	0.476 ± 0.003	7.35 ± 0.05	< 5.03	8.40 ± 0.15	N.D.
3/18, 1600	3/25, 1500	0.80	18.0 ± 0.2	1.44 ± 0.01	21.1 ± 0.2	< 4.71	32.2 ± 0.3	N.D.
3/25, 1500	4/1, 1630	1.76	28.7 ± 0.3	2.68 ± 0.03	30.2 ± 0.2	< 15.0	37.4 ± 1.1	N.D.
4/1, 1630	4/11, 1530	1.55	19.7 ± 0.2	1.80 ± 0.02	28.1 ± 0.2	< 18.2	56.9 ± 1.5	N.D.
4/11, 1530	4/24, 1545	2.24	12.5 ± 0.2	1.68 ± 0.02	33.5 ± 0.3	< 9.71	75.5 ± 1.0	N.D.
4/24, 1545	5/2, 1530	0.51	12.0 ± 0.2	1.56 ± 0.01	16.3 ± 0.3	< 9.71	32.8 ± 0.9	N.D.
5/2, 1530	5/15, 1600	0.45	4.54 ± 0.06	0.659 ± 0.005	7.14 ± 0.05	N.D.	34.5 ± 0.3	N.D.
5/15, 1600	5/23, 1500	trace	0.860 ± 0.010	0.139 ± 0.002	5.23 ± 0.05	< 0.634	10.0 ± 0.2	N.D.
5/23, 1500	6/4, 1630	dry	0.674 ± 0.025	0.137 ± 0.002	3.88 ± 0.04	N.D.	6.69 ± 0.05	-
6/4, 1630	6/13, 1630	dry	< 0.007	0.113 ± 0.003	2.66 ± 0.03	N.D.	6.14 ± 0.10	-
6/13, 1630	6/24, 1630	dry	0.351 ± 0.006	0.084 ± 0.001	2.06 ± 0.03	N.D.	4.25 ± 0.10	-
6/24, 1630	7/1, 1630	dry	0.136 ± 0.004	0.004 ± 0.001	0.83 ± 0.01	N.D.	1.34 ± 0.04	-

(1) Sampling began March 20, 1958.

Table 1h

Radionuclides in Weekly Precipitation Collections Through June 1963

Westwood, New Jersey
(collector area: 1.97 ft²)

Sampling Period*		Precip. (inches)	millicuries per square mile at midpoint of sampling period							
from	to		Sr-89	Sr-90	Zr-95	Cs-137	Ba-140	Ce-141	Ce-144	
1963										
3/18, 1400	3/25, 1330	0.89	11.3 ± 0.2	0.874 ± 0.009	18.5 ± 0.4	1.63 ± 0.02	0.91 ± 0.11	≤ 2.80	19.7 ± 0.4	
3/25, 1330	4/1, 1000	0.25	9.44 ± 0.19	0.740 ± 0.013	5.01 ± 0.15	1.04 ± 0.01	1.04 ± 0.11	≤ 2.00	20.6 ± 0.1	
4/1, 1000	4/8, 1430	dry	5.64 ± 0.26	0.635 ± 0.010	13.7 ± 0.2	0.88 ± 0.01	0.26 ± 0.03	≤ 1.50	16.2 ± 0.1	
4/8, 1430	4/15, 1600	dry	1.40 ± 0.22	0.293 ± 0.004	4.39 ± 0.08	0.41 ± 0.01	0.05	≤ 1.36	5.44 ± 0.06	
4/18, 1600	4/22, 1400	dry	15.8 ± 0.4	1.98 ± 0.02	20.6 ± 0.3	2.78 ± 0.03	0.38 ± 0.03	≤ 6.56	50.0 ± 1.2	
4/22, 1400	5/1, 1000	0.95	32.9 ± 0.6	5.30 ± 0.05	64.3 ± 0.6	7.33 ± 0.06	1.69	1.52 ± 0.64	11.6 ± 0.1	
5/1, 1000	5/6, 1336	0.46	16.4 ± 0.5	3.21 ± 0.03	37.9 ± 0.3	4.43 ± 0.03	0.24 ± 0.01	≤ 3.54	71.3 ± 1.3	
5/6, 1336	5/13, 1400	0.34	5.90 ± 0.25	1.24 ± 0.01	17.5 ± 0.4	1.78 ± 0.02	0.020	≤ 2.06	28.9 ± 0.6	
5/13, 1900	5/20, 1930	1.74	25.4 ± 0.4	4.76 ± 0.05	51.8 ± 0.5	7.26 ± 0.07	≤ 0.37	≤ 4.20	93.7 ± 1.3	
5/20, 1930	5/27, 2000	0.19	4.58 ± 0.24	1.25 ± 0.02	19.0 ± 0.4	1.76 ± 0.02	≤ 0.73	≤ 5.40	32.2 ± 0.6	
5/27, 2000	6/1, 1130	0.18	2.95 ± 0.16	0.656 ± 0.013	15.7 ± 0.3	0.90 ± 0.02	≤ 0.51	≤ 4.27	28.4 ± 0.5	
6/1, 1130	6/10, 2000	0.83	5.51 ± 0.24	1.58 ± 0.02	15.4 ± 0.4	2.24 ± 0.02	≤ 0.71	≤ 4.70	30.3 ± 0.7	
6/10, 2000	6/17, 1900	0.85	3.60 ± 0.24	1.25 ± 0.01	13.6 ± 0.5	1.88 ± 0.02	≤ 0.15	≤ 2.95	22.2 ± 0.5	
6/17, 1900	6/24, 1030	0.89	7.77 ± 0.38	3.51 ± 0.02	18.4 ± 0.3	4.46 ± 0.02	≤ 0.24	≤ 2.64	52.2 ± 0.2	
6/24, 1030	7/1, 0900	0.98	1.67 ± 0.18	1.28 ± 0.02	8.54 ± 0.25	1.59 ± 0.02	≤ 0.18	≤ 3.78	17.8 ± 0.8	

* Sampling began February 4, 1958

1.2 Weekly and Individual Precipitations - cont'd.

1.22 Sr⁸⁹ and Sr⁹⁰ at 6 U. S. Sites From July 1963

In July 1963 weekly precipitation collections were initiated at six sites in the United States: Westwood, New Jersey; Appleton, Wisconsin; Chattanooga, Tennessee; Midwest City, Oklahoma; Palo Alto, California; and Seattle, Washington. These collections are being analyzed for strontium-89 and strontium-90 only and the available results are reported in the following table 1i, page 172.

Table 11

WEEKLY PRECIPITATION COLLECTIONS For Sr^{90} and Sr^{89} at 6 U. S. Sites from July 1963

Period	Precipitation in Inches						$\text{mc Sr}^{90}/\text{mi}^2$						$\text{mc Sr}^{89}/\text{mi}^2(1)$						$\text{Sr}^{89}/\text{Sr}^{90}$					
	Westwood	Appleton	Chattanooga	Midwest City	Palo Alto	Seattle	Westwood	Appleton	Chattanooga	Midwest City	Palo Alto	Seattle	Westwood	Appleton	Chattanooga	Midwest City	Palo Alto	Seattle	Westwood	Appleton	Chattanooga	Midwest City	Palo Alto	Seattle
7/1-8/63	0.91			0.02	dry		2.77			0.27	0.027		7.07			0.98	0.087		2.6			3.6	3.2	
7/8-15/63	0.34			2.81	dry		2.98			1.64	0.014		7.43			5.89	0.046		2.5			3.6	3.2	
7/15-22/63	1.98			dry	dry	1.79	5.60			0.02	0.012	0.67	6.35			0.05	0.033	1.73	1.1			2.6	2.8	2.6
7/22-31/63	1.53	0.34	3.05 ⁽²⁾	3.11	dry	0.02	2.77	1.86	4.54	2.00	0.016	0.62	5.67	4.09	7.87	6.28	0.032	1.60	2.0	2.2	1.7	3.1	2.0	2.6
8/1-8/63	0.05	0.59	0.03	trace	dry	dry	0.54	0.86	0.10	0.09	0.048	0.08	1.35	1.82	0.12	0.30	0.158	0.15	2.5	2.1	1.3	3.2	3.3	1.8
8/8-15/63	0.98	0.31	0.07	1.89	trace	0.08	0.66	1.29	1.28	1.45	0.153	0.93	1.17	3.01	3.23	4.50	0.428	1.51	1.8	2.3	2.5	3.1	2.8	1.6
8/15-22/63	0.77	0.33	0.61	0.06	dry	0.40	1.84	1.14	1.50	0.06	0.021	0.26	3.62	1.50	2.40	0.19	0.046	0.42	2.0	1.3	1.6	3.4	2.2	1.6
8/22-31/63	dry	0.75	0.12	0.50	dry	1.09	0.23	0.52	0.19	0.49	0.022	0.73	0.34		0.24	1.13	0.057	0.95	1.5		1.2	2.3	2.6	1.3
9/1-8/63	0.44	1.21	0.19	0.97	dry	0.45	0.49	2.00	0.15	0.58	0.045	0.60	0.71	2.42	0.16	1.22	0.086	0.73	1.4	1.2	1.1	2.1	1.9	1.2
9/8-15/63	0.58	1.39	0.09	0.21	0.18	0.20	0.64	0.86	0.26	0.19	0.21	0.97	0.87	1.13	0.19	0.40	0.378	0.89	1.4	1.3	1.4	2.1	1.8	0.9
9/15-22/63	0.47	0.51	dry	0.43	trace	0.19	0.72	0.65	0.04	0.19	0.12	0.36	0.92	0.71	<0.04	0.32	0.24	0.31	1.3	1.1		1.7	2.0	0.8
9/22-30/63	3.20	0.70	0.66	0.20	dry	0.10	3.66	1.02	0.64	0.33	0.010	0.41				0.50	0.023	0.49				1.5	2.3	1.2
10/1-8/63	dry	0.01	dry			0.32	0.14	0.29	0.03			0.88						0.87						1.0
10/8-15/63																								
10/15-22/63																								
10/22-30/63																								

(1) Sr^{89} result as of midpoint of collection period.

(2) Rain gauge blew over during severe thunderstorm.

2. Radiostrontium in Milk and Tap Water

In 1954 the Health and Safety Laboratory began monitoring liquid whole milk in New York City for strontium-90 in order to estimate the dietary contribution from the ingestion of this radionuclide in milk. During the same year, tap water sampling was begun on a routine basis at the laboratory which receives its supply from one of the main reservoirs servicing New York City. Tap water sampling at Richmond, California was started in 1958.

Powdered milk monitoring was initiated at a main processing plant in Perry, New York in 1954 and in 1955, sampling of powdered buttermilk from the Mandan, North Dakota area was begun. The powdered buttermilk is used as cattle feed and it was of interest to have a continuous record of the strontium-90 levels in this animal dietary supplement. Liquid milk from two large dairies serving Honolulu has been monitored since the summer of 1959. On the island of Oahu the dairy cows are on pasture throughout the year and it is of interest to know how well the strontium levels in milk in this area reflect changes in deposition rates.

Although a more complete study of the strontium-90 content of the diets in three major U.S. cities has been in process since March 1960, milk and tap water analyses at the above-mentioned sites have been continued in order to provide a detailed and continuous history of the contamination levels of these staples.

2.1 Milk

The New York City sample is a monthly composite of pasteurized milk purchased daily at retail stores. Five main dairies are represented in the sample. The Mandan and Perry samples are monthly composites of powdered milk collected in weekly five-pound lots. The Honolulu samples are monthly composites of quart samples collected weekly. During appropriate periods strontium-89, as well as strontium-90, has been analyzed in these milk samples. These data have been given in the quarterly reports but the monthly results for 1963 only are presented on pages 174 and 175 of this report. The strontium-90 data since the inception of the sampling programs are graphed in Figures 3, 4, 5, and 6 on pages 177 through 180.

A marked increase in the strontium-90 content of milk from the continental U.S. stations was observed beginning in May 1963, due to the heavy spring fallout deposition. The Honolulu samples indicate a higher strontium concentration in May also, but the increase is not as abrupt.

2.2 Tap Water

Samples of tap water are taken daily at laboratories in New York City and Richmond, California so that by the end of the month, approximately 100 liters have been collected at each site. Strontium-89 and strontium-90 data for monthly samples collected in 1963 are shown on page 176. Sampling at Richmond, California was terminated in June 1963. A graphical presentation of all available strontium-90 data is shown in Figure 7, page 181.

Table 2a

Strontium-90 and Calcium in Milk

<u>Year</u>	<u>Sampling Month</u>	<u>g Ca</u> <u>liter</u>	<u>pc Sr⁹⁰</u> <u>liter</u>	<u>per</u> <u>g Ca</u>
<u>New York City - liquid</u>				
1959	Average			11
1960	Average			8.0
1961	Average			6.7
1962	Average			12
1963	January	0.97	8.1	8.3
	February	1.01	11.3	11.2
	March	1.03	13.8	13.4
	April	0.96	11.6	12.1
	May	1.00	40.8	40.6
	June	1.00	42.4	42.4
	July	1.04	37.3	35.8
	August	1.03	41.8	40.5
	September	1.04	28.2	27.1

<u>Year</u>	<u>Sampling Month</u>	<u>g Ca/liter dairy</u>		<u>pc Sr⁹⁰/liter dairy</u>		<u>pc Sr⁹⁰/g Ca dairy</u>	
		<u>#1</u>	<u>#2</u>	<u>#1</u>	<u>#2</u>	<u>#1</u>	<u>#2</u>
<u>Honolulu, Hawaii - liquid</u>							
8/59-12/59	Average					5.0	
1960	Average					3.2	
1961	Average					2.4	
1962	Average					3.5	5.0
1963	January	1.04	1.09	4.9	5.3	4.8	4.8
	February	1.05	1.10	4.5	7.7	4.3	7.0
	March	1.09	1.10	6.5	10.2	6.0	9.3
	April	1.10	1.17	7.0	11.1	6.4	9.5
	May	1.04	1.07	7.6	12.7	7.3	11.9
	June	1.05	1.09	10.6	9.5	10.1	8.8
	July	1.08	1.11	9.6	10.0	8.9	9.0
	August	1.06	1.10	6.9	9.6	6.5	8.6
	September	1.10	1.14	8.2	8.3	7.4	7.3

Table 2a - cont'd.

Strontium-90 and Calcium in Milk

<u>Year</u>	<u>Sampling Month</u>	<u>g Ca</u>	<u>pc Sr⁹⁰ per</u>	
		<u>kg powder</u>	<u>kg powder</u>	<u>g Ca</u>
<u>Perry, New York - powdered</u>				
1959	Average			8.0
1960	Average			6.5
1961	Average			6.2
1962	Average			11.1
1963	January	8.8	109	12.5
	February	8.6	98	11.4
	March	8.8	105	11.9
	April	7.8	92	11.8
	May	8.7	158	18.3
	June	5.6	171	30.5
	July	9.1	274	30.1
	August	8.8	238	27.1
	September	8.9	274	30.6
<u>Mandan, North Dakota - powdered buttermilk</u>				
1959	Average			26
1960	Average			15
1961	Average			9.4
1962	Average			25
1963	January	11.6	306	26.6
	February	11.6	363	31.3
	March	12.0	360	30.0
	April	12.6	532	42.4
	May	11.6	1214	105
	June	16.8	952	56.5
	July	15.1	805	53.2
	August	13.9	822	59.2
	September	12.5	762	61.0

Table 2b

Radiostrontium in Tap Water

<u>Year</u>	<u>Sampling Month</u>	<u>New York, N.Y. (1)</u>		<u>Richmond, Calif. (2)</u>	
		<u>pc Sr⁹⁰/liter</u>	<u>Sr⁸⁹/Sr⁹⁰(3)</u>	<u>pc Sr⁹⁰/liter</u>	<u>Sr⁸⁹/Sr⁹⁰(3)</u>
1959	Average	0.40		0.29	
1960	Average	0.47		0.26	
1961	Average	0.32		0.25	
1962	Average	0.72		0.23	
1963	January	0.94	6.2	0.24	7.4
	February	0.52	5.4	0.28	8.5
	March	1.03	4.3	0.36	7.8
	April	1.07	4.7	lost	lost
	May	1.23	3.9	0.50	3.8
	June	1.23	3.3	0.82	1.9
	July	2.14	2.2		
	August	1.76			
	September	1.88			
	October	1.40			

(1) From 100-200 liters per sample - sampling began August 1954.

(2) Approximately 100 liters per sample - sampling began April 1958.

(3) Sr-89 extrapolated to midpoint of sampling period.

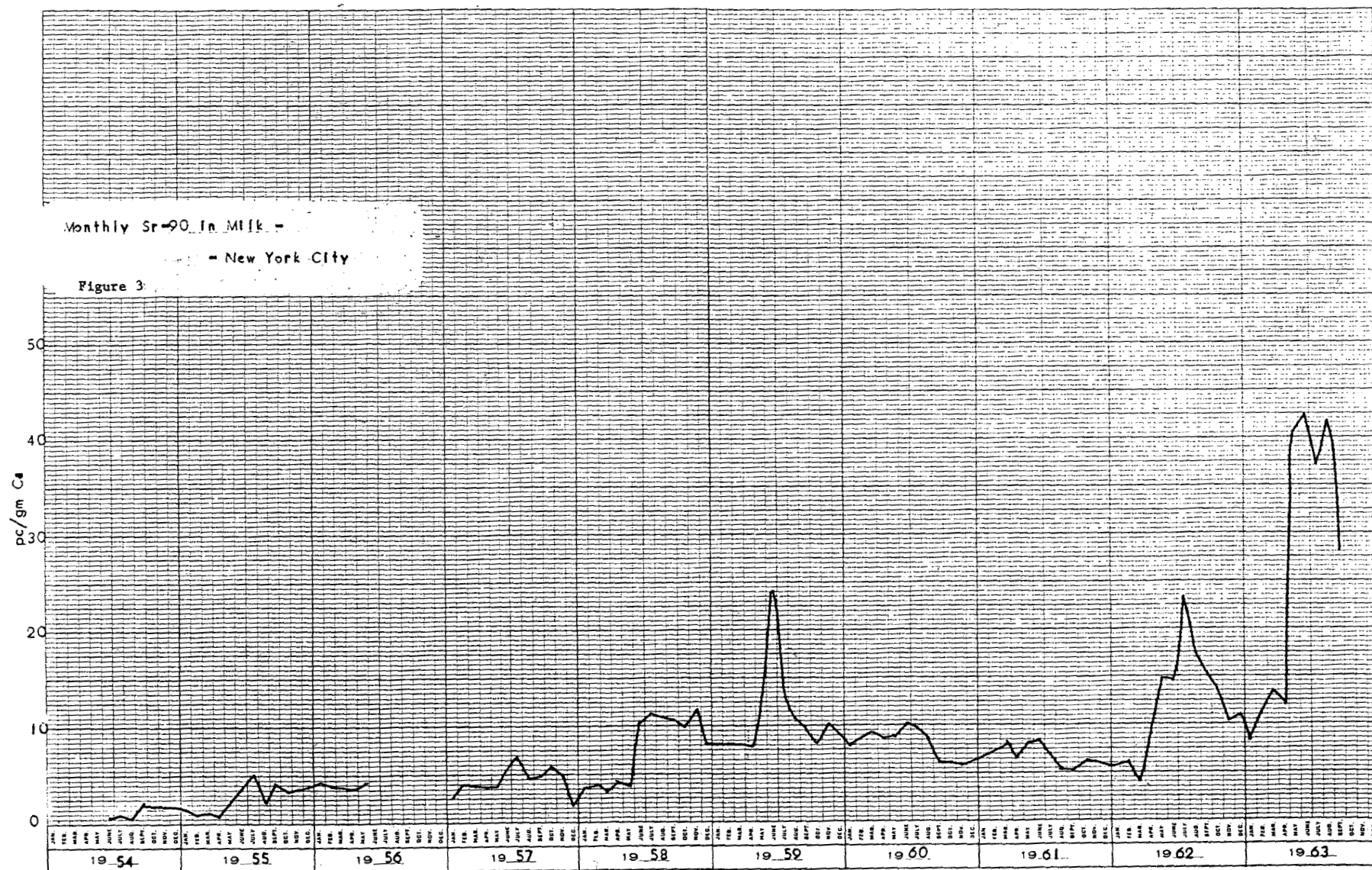


Figure 4

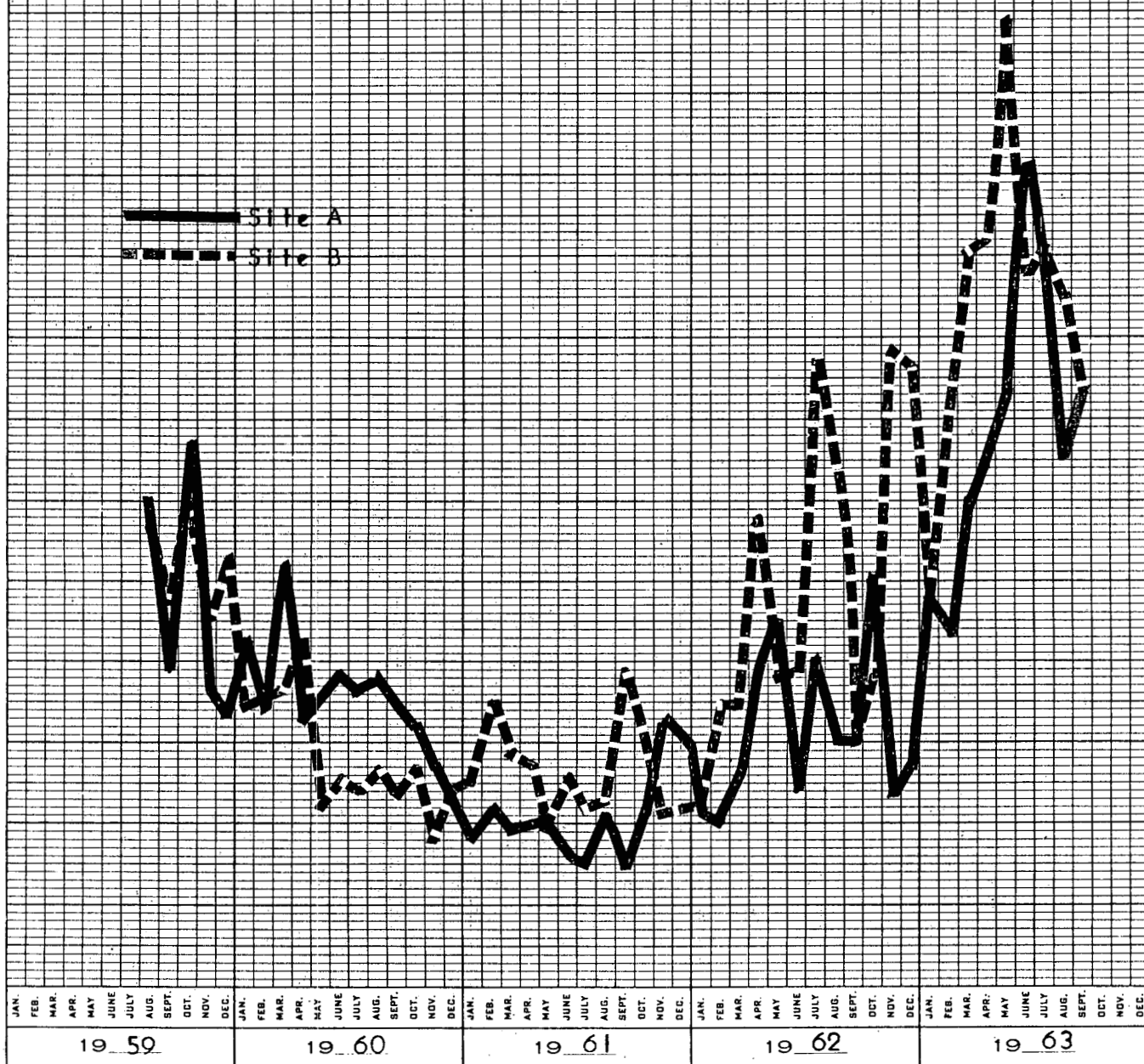


Figure 5

Monthly Sr-90 in Milk -

Honolulu, Hawaii

UUC Sr-90/gm Ca

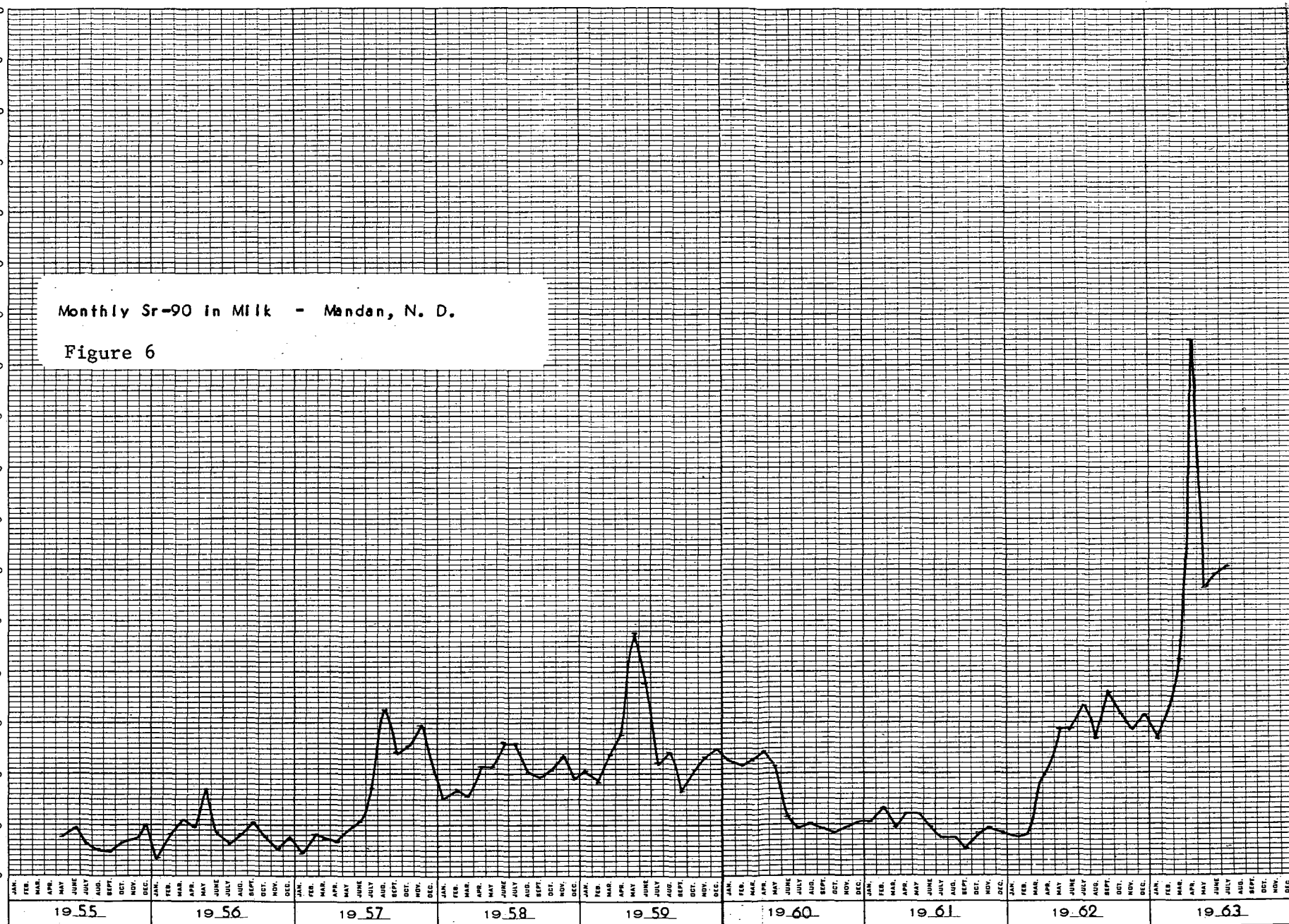


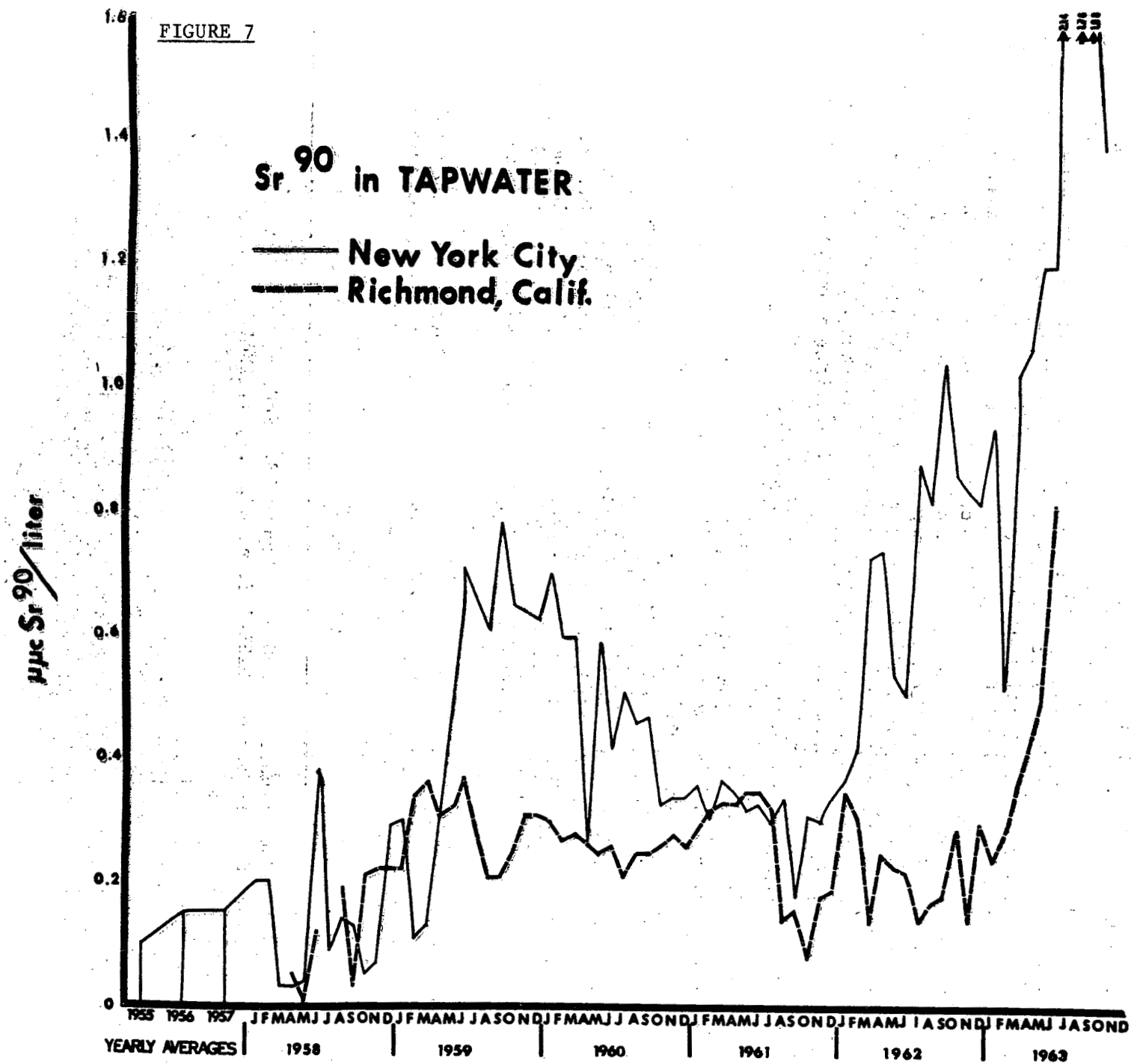
- 180 -

uuc Sr-90/gm Ca

Monthly Sr-90 in Milk - Mandan, N. D.

Figure 6





3. Tri-City Diet Studies - Thirteenth Sampling

The annual dietary intake of strontium-90 in New York City, Chicago, and San Francisco has been estimated from measurements of the strontium-90 content of foods purchased at these cities every three months since March 1960. Details of the sampling system and assumptions as to the amounts of specific foods consumed during the year have been given in HASL-90(1). After two samplings at each city, it was found that the calcium content of most food categories did not vary among cities nor did it vary significantly with time. Calcium analyses were, therefore, discontinued and average calcium contents of foods were computed and used to estimate the average annual intake of this mineral. The specific numbers used to calculate calcium intake are given in HASL-113(2). Additional Ca analyses of foods obtained at the three cities are now being performed to further validate these estimates.

Results of the most recent analyses of foods and estimates of the Sr-90/Ca ratio in the diet at the three cities are presented in Table 3. The average daily intake of strontium-90 at the three cities since the tri-city diet surveys began are plotted in Figure 8.

The sharp increases in the daily intake of Sr-90 at each of the cities, evident in Figure 8, is due principally to increases in the Sr-90 content of milk. These increases came about when dairy cows in the milksheds of the three cities were put out to pasture and presumably consumed grass heavily contaminated with Sr-90 deposited during the spring and early summer.

It is expected that the relatively high levels of Sr-90 intake noted, persisted throughout the summer of 1963 but that somewhat lower levels existed during the late fall and winter.

(1) USAEC Report No. HASL-90, August 18, 1960.

(2) USAEC Report No. HASL-113, p. 87, July 1, 1961.

Table 3 Tri-City Diet Studies
(Thirteenth Sampling)

<u>Food Category</u>	<u>kg/yr</u>	<u>g Ca/yr</u>	<u>N. Y. C. 5/63</u>		<u>Chicago 7/63</u>		<u>S. F. 6/63</u>	
			<u>μuc/kg</u>	<u>μuc/yr</u>	<u>μuc/kg</u>	<u>μuc/yr</u>	<u>μuc/kg</u>	<u>μuc/yr</u>
Bakery Products	37	37.0	15.0 ± 2.8	555	18.4 ± 1.0	679	12.0 ± 1.1	445
Whole Grain Products	11	10.0	51.1 ± 1.8	562	47.2 ± 2.0	519	18.6 ± 1.6	204
Eggs	16	9.1	3.4 ± 0.1	54	9.4 ± 0.2	150	5.9 ± 0.2	95
Fresh Vegetables	43	15.0	20.3 ± 0.6	873	6.4 ± 0.6	276	16.3 ± 0.6	703
Root Vegetables	17	6.1	7.6 ± 0.5	129	4.1 ± 0.4	70	4.0 ± 0.5	67
Milk	221	234.3	40.8 ± 1.0	9017	17.1 ± 0.7	3777	19.3 ± 0.7	4263
Poultry	17	9.2	0.7 ± 0.1	12	2.9 ± 0.2	50	3.5 ± 0.2	60
Fresh Fish	8	10.8	0.8 ± 0.1	6	1.3 ± 0.1	10	0.8 ± 0.1	6
Flour	43	8.6	23.5 ± 0.6	1011	28.3 ± 0.7	1215	7.0 ± 0.3	301
Macaroni	3	0.7	14.0 ± 0.6	42	16.8 ± 0.6	50	12.3 ± 0.7	37
Rice	3	1.1	1.8 ± 0.3	5	4.1 ± 0.4	12	2.8 ± 0.3	8
Meat	73	10.9	0.7 ± 0.2	51	2.3 ± 0.1	171	2.4 ± 0.2	176
Shell Fish	1	0.8	2.8 ± 0.5	3	1.2 ± 0.1	1	1.5 ± 0.3	2
Dried Beans	3	2.9	14.0 ± 1.8	42	lost	(90)*	6.5 ± 1.9	20
Fresh Fruit	68	13.6	11.1 ± 3.8	755	2.8 ± 0.3	190	3.0 ± 0.3	203
Potatoes	45	5.8	5.8 ± 0.6	216	2.3 ± 0.2	104	1.1 ± 0.4	49
Canned Fruit	26	1.3	1.4 ± 0.2	36	1.6 ± 0.2	42	1.2 ± 0.1	30
Fruit Juices	19	1.7	2.3 ± 0.3	44	3.3 ± 0.3	62	3.8 ± 0.3	72
Canned Vegetables	20	4.2	6.5 ± 0.5	130	8.1 ± 0.6	162	1.9 ± 0.4	37
Annual Intake		383		6726		5346		3309
Strontium-90 to Calcium ratio in total diet				35.3		20.0		17.7

* Estimated from April 1963 sampling.

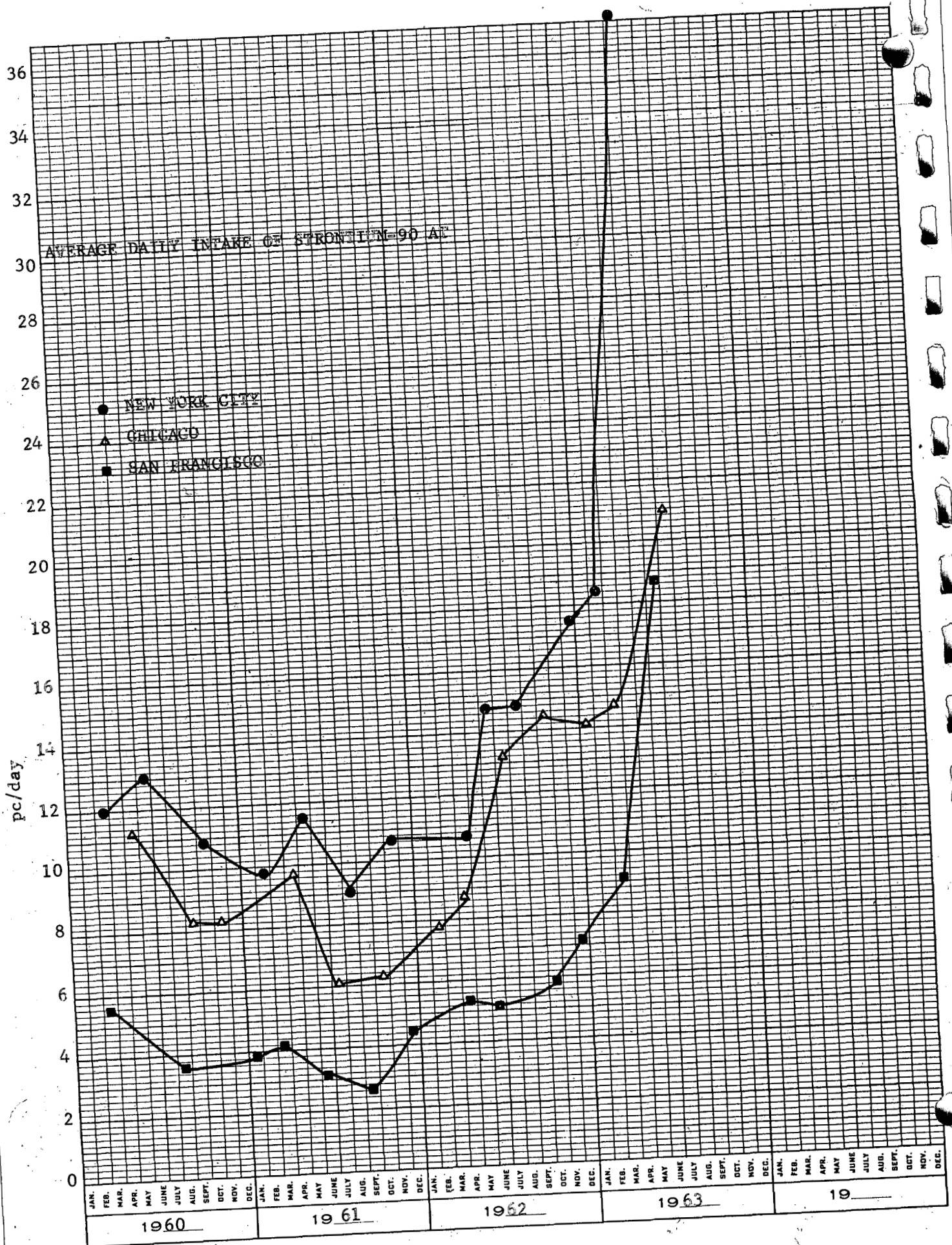


FIGURE 8

4. High Altitude Balloon Sampling Program

by L. P. Salter (HASL)

The U. S. Atomic Energy Commission's program for measuring stratospheric nuclear debris collected by balloon-borne filtering devices has been in continuous operation since 1956. During 1963 monthly collections have been made from several altitudes at two sites:

<u>Location</u>	<u>Latitude</u>	<u>Flight Organization</u>
San Angelo, Texas	31°N	59th Weather Reconnaissance Squadron, Goodfellow Air Force Base
Mildura, Australia	34°S	Department of Supply, Commonwealth of Australia

Additional samples have been collected on special flights from South Dakota and Minnesota at 45°N, and Eilson Air Force Base, Alaska, at 65°N by the 59th Weather Reconnaissance Squadron and General Mills, Inc.

Filters are shipped to HASL where gross gamma determinations and gamma scans have been obtained for all samples collected since February 1962. Selected filters are then analyzed for fission products and other pertinent radionuclides at HASL and contractor laboratories.

The results for collections through May 1963 have been given previously in HASL-115, p.70 (October 1961), HASL-127, p.151 (July 1962), and HASL-140, p.166 (October 1963). Gross gamma activity results for samples collected from June-November 1963 are given in Tables 4a, 4b, and 4c herein. Gross gamma concentration data for 1962 and 1963 samples at 31°N and 34°S are summarized in Figures 9a, 9b, 9c, and 9d.

Sample Collection Data

HASL Number

A number is assigned by the Health and Safety Laboratory to each individual sample.

Altitude

All altitude data are obtained from barometric readings and refer to pressure-altitude in the ICAO Standard Atmosphere. The predominant

sampling altitude is given in kilofeet (KFT). The entire sample was collected within a range of ± 2 kilofeet of the predominant altitude except as indicated otherwise in NOTES on the bottom of the page.

Flight Date and Number

The date of flight and number assigned to the flight by balloon operations organizations are given. Two samples usually are collected from each flight.

Unit

Collections since June 1963 have been made with the "Direct Flow Sampler" which utilizes one square foot of I.P.C. No. 1478 filter paper. This system when routinely used with a Westinghouse motor and Torrington 704 blower is referred to as "D7". A discussion of this unit was presented by Rex Wood in HASL-115, p.155 (October 1961).

When two samples are obtained on the same flight from similar units they are designated as -1 and -2.

Volume

The volume of air sampled is reported in thousands of standard cubic feet (KSCF) of air, computed at 1013 mb and 59°F (1 KSCF = 34.6 Kg of air). The method of determining the volume is indicated according to the following code listed under the reported volume:

F: Flowmeter

T: Radiotelemeter

E: Estimated

The method currently preferred is that based on flowmeter measurements. In the absence of these data or when such data are suspect, a volume was calculated on the basis of radiotelemetry of the instantaneous blower speed. Whenever the volume listed is estimated or doubtful, appropriate NOTES are given on the bottom of the page and the data are given in parentheses.

Gross Gamma Measurements

The net gamma counts per minute observed per 10^3 SCF (CPM/KSCF) are reported as of the counting date. The standard deviation due to counting is less than 5% unless otherwise noted.

Counting Procedure

The filter samples are received in plastic bags from the collection sites and counted without prior treatment about one to two weeks after collection date.

The bags containing the one square foot filters are folded into a plastic box 80 mm x 65 mm x 31 mm deep which is placed in the center of a heavily shielded 8" diameter x 4" NaI (Tl) crystal. The pulses from three phototubes, matched for pulse height response, are summed, amplified, and fed to a multichannel analyzer to obtain a gamma scan. The gross gamma activities are obtained by summing the data between 100 and 3000 keV and correcting for background.

Standardization

Because of the great complexity involved in estimating the disintegration rate from the observed gamma counts per minute in a mixture of nuclides such as those present in composited weapons debris, such a conversion has not been attempted. The CPM results reported herein, therefore, are of significance on a relative basis only. The efficiency of the counting system has been compared, however, to a standard Cs-137 source counted under the same geometry. This source yields about 0.35 counts per emitted photon which is equivalent to about 0.30 counts per disintegration of Cs-137.

Precision

The degree of reproducibility for these gross gamma measurements has been evaluated and a value of about 0.013 found for the coefficient of variation (ratio of standard deviation to mean, or per cent standard deviation $\times$ 100). This precision value includes the error from all sources of variation, exclusive of counting statistics, such as day to day fluctuations in response due to counting and factors relating to sample handling processes. The precision data are discussed in more detail in HASL-131, p.153 (October 1962).

Gross Gamma Activity Concentration Figures

The gross gamma activity concentration data are shown on a log scale as a function of time (in months) and altitude (in kilofeet) in Figures 9a, 9b, 9c, and 9d. The bars represent the average CPM/KSCF for duplicate "Direct Flow" samples. Bars based on a single sample are marked with an asterisk (*) if comparable paired values are not available or doubtful values differing by more than 50% from its duplicate are excluded in averaging.

The midpoints of the bars are the predominant altitudes and their widths are unrelated to the data. Different patterns have been used to conveniently illustrate predominant altitudes falling within defined ranges.

Concentrations, based on measurements obtained more than 20 days after collection date, are shown with extended dashes.

Table 4a

SAN ANGELO, TEXAS (31°N) JUN 1963

HASL A-ALT(KFT)	788 62	789 62	786 80	787 80	790 91	791 91	801 106	802 106
FLT DAY	6	6	4	4	11	11	27	27
FLT NO	T791	T791	T790	T790	T792	T792	T796	T796
UNIT	D7-1	D7-2	D7-1	D7-2	D7-1	D7-2	D7-1	D7-2
VOLUME (KSCF)	1.15 F	1.42 F	1.53 F	1.52 F	1.59 F	1.72 F	0.67 F	0.68 F
GR GAMMA CPM/KSCF	JUN14 26800	JUN14 27800	JUN 7 10800	JUN 7 10500	JUN19 2670	JUN20 2540	JUL 2 1970	JUL 2 2260

SAN ANGELO, TEXAS (31°N) JUL 1963

HASL A-ALT(KFT)	813 65	814 65	809 80	810 80	811 91	812 91	828 104	829 104
FLT DAY	8	8	1	1	2	2	20	20
FLT NO	T800	T800	T797	T797	T798	T798	T805	T805
UNIT	D7-1	D7-2	D7-1	D7-2	D7-1	D7-2	D7-1	D7-2
VOLUME (KSCF)	1.65 F	2.05 F	1.79 F	1.64 F	1.29 F	1.34 F	0.87 F	1.16 F
GR GAMMA CPM/KSCF	JUL12 28500	JUL12 27000	JUL 8 14000	JUL 9 14000	JUL 8 3360	JUL 8 3220	AUG 6 1640	AUG 7 1590

SAN ANGELO, TEXAS (31°N) AUG 1963

HASL A-ALT(KFT)	839 66	840 66	837 80	838 80	835 90	836 90	857 103	858 103
FLT DAY	7	7	6	6	1	1	21	21
FLT NO	T811	T811	T810	T810	T809	T809	T817	T817
UNIT	D7-1	D7-2	D7-1	D7-2	D7-1	D7-2	D7-1	D7-2
VOLUME (KSCF)	2.16 T	2.13 F	1.67 F	1.77 F	1.72 F	1.53 F	0.91 F	0.93 F
GR GAMMA CPM/KSCF	AUG19 20900	AUG20 20700	AUG19 11000	AUG20 10500	AUG19 2120	AUG20 2450	SEP10 1340	SEP10 1360

Table 4a (Contd.)

SAN ANGELO, TEXAS (31°N) SEP 1963

HASL A-ALT(KFT)	866 66	867 66	863 82	864 82	860 91	861 91	868 105 ^a	869 105 ^a
FLT DAY	9	9	5	5	4	4	11	11
FLT NO	T823	T823	T822	T822	T821	T821	T825	T825
UNIT	D7-1	D7-2	D7-1	D7-2	D7-1	D7-2	D7-1	D7-2
VOLUME (KSCF)	1.88 T	1.87 T	1.50 F	1.41 T	1.49 F	1.47 F	0.81 F	0.78 F
GR GAMMA CPM/KSCF	SEP14 22800	SEP14 24600	SEP10 14500	SEP11 15800	SEP10 3840	SEP11 3740	SEP24 1720	SEP25 1590

SAN ANGELO, TEXAS (31°N) OCT 1963

HASL A-ALT(KFT)	905 67	906 67	882 81	883 81	902 91	903 91	890 103	891 103
FLT DAY	15	15	1	1	14	14	8	8
FLT NO	T834	T834	T828	T828	T833	T833	T829	T829
UNIT	D7-1	D7-2	D7-1	D7-2	D7-1	D7-2	D7-1	D7-2
VOLUME (KSCF)	1.91 F	1.99 F	1.77 F	1.83 F	1.48 F	1.49 F	0.90 F	0.82 F
GR GAMMA CPM/KSCF	OCT24 14100	OCT25 14400	OCT 9 9860	OCT10 9910	OCT24 2100	OCT25 2120	OCT16 881	OCT17 862

SAN ANGELO, TEXAS (31°N) NOV 1963

HASL A-ALT(KFT)	965 65	966 65	956 83	957 83	958 90	959 90	969 101 ^b	970 101 ^b
FLT DAY	12	12	5	5	6	6	20	20
FLT NO	T843	T843	T838	T838	T839	T839	T845	T845
UNIT	D7-1	D7-2	D7-1	D7-2	D7-1	D7-2	D7-1	D7-2
VOLUME (KSCF)	2.51 F	2.69 F	1.38 F	1.44 F	1.82 F	1.69 F	1.31 F	1.09 F
GR GAMMA CPM/KSCF	NOV19 9440	NOV20 8940	NOV13 3750	NOV14 3710	NOV13 1270	NOV14 1290	NOV27 744	NOV27 838

^a Altitude ranged from 102 to 105 kilofeet.^b Altitude ranged from 95 to 105 kilofeet.

Table 4b

MILDURA, AUSTRALIA (34°S) JUN 1963

HASL A-ALT(KFT)	799 67	800 67	797 77	798 77	807 86	808 86
FLT DAY	27	27	24	24	26	26
FLT NO	A146	A146	A143	A143	A145	A145
UNIT	D7-1	D7-2	D7-1	D7-2	D7-1	D7-2
VOLUME (KSCF)	2.40 F	2.30 F	2.17 F	2.18 F	1.64 F	1.89 T
GR GAMMA CPM/KSCF	JUL 1 450	JUL 1 452	JUN27 2880	JUN28 2850	JUL 2 2880	JUL 3 2420

MILDURA, AUSTRALIA (34°S) JUL 1963

HASL A-ALT(KFT)	826 85	827 85	822 103	823 103
FLT DAY	26	26	24	24
FLT NO	A149	A149	A148	A148
UNIT	D7-1	D7-2	D7-1	D7-2
VOLUME (KSCF)	1.18 F	1.16 F	0.83 F	0.89 F
GR GAMMA CPM/KSCF	AUG 6 1450	AUG 7 1530	AUG 7 329	AUG 7 313

MILDURA, AUSTRALIA (34°S) AUG 1963

HASL A-ALT(KFT)	843 62	844 62	841 78	842 78
FLT DAY	9	9	8	8
FLT NO	A151	A151	A150	A150
UNIT	D7-1	D7-2	D7-1	D7-2
VOLUME (KSCF)	2.83 F	2.84 F	2.12 F	1.96 F
GR GAMMA CPM/KSCF	AUG20 577	AUG21 560	AUG20 1720	AUG21 1750

Table 4b (Contd.)

MILDURA, AUSTRALIA (34°S) SEP 1963

HASL A-ALT(KFT)	877 68	878 68	871 79	872 79	874 90	875 90	879 105	880 105
FLT DAY	20	20	18	18	19	19	27	27
FLT NO	A155	A155	A153	A153	A154	A154	A156	A156
UNIT	D7-1	D7-2	D7-1	D7-2	D7-1	D7-2	D7-1	D7-2
VOLUME (KSCF)	2.14 F	2.03 F	2.00 F	2.27 F	1.36 F	1.27 F	0.81 F	(0.22) ^a E
GR GAMMA CPM/KSCF	OCT 1 1330	OCT 2 1470	SEP24 1090	SEP25 1032	SEP24 372	SEP25 365	OCT 3 233	OCT 3 (309±12%)

MILDURA, AUSTRALIA (34°S) OCT 1963

HASL A-ALT(KFT)	900 68	901 68	907 80	908 80	897 90	898 90	910 106	911 106
FLT DAY	15	15	17	17	10	10	24	24
FLT NO	A159	A159	A160	A160	A158	A158	A161	A161
UNIT	D7-1	D7-2	D7-1	D7-2	D7-1	D7-2	D7-1	D7-2
VOLUME (KSCF)	2.11 F	2.38 T	1.72 F	1.84 F	1.27 F	1.32 F	0.65 F	0.63 F
GR GAMMA CPM/KSCF	OCT24 1040	OCT25 1030	OCT24 1080	OCT24 1060	OCT16 420	OCT17 425	OCT30 232	OCT30 222

MILDURA, AUSTRALIA (34°S) NOV 1963

HASL A-ALT(KFT)	963 68	964 68	954 78	955 78	961 87	962 87	967 107	968 107
FLT DAY	12	12	8	8	14	14	20	20
FLT NO	A163	A163	A162	A162	A164	A164	A165	A165
UNIT	D7-1	D7-2	D7-1	D7-2	D7-1	D7-2	D7-1	D7-2
VOLUME (KSCF)	2.20 F	2.20 F	2.10 F	1.97 F	1.38 F	1.29 F	0.68 F	(0.63) ^b E
GR GAMMA CPM/KSCF	NOV19 964	NOV20 950	NOV13 916	NOV14 904	NOV19 380	NOV20 363	NOV26 446	NOV27 (422)

^a Motor burned out during collection; volume estimated from telemetry data.^b Faulty flowmeter equipment; volume estimated from ratio of blower speeds of D7-2 unit to D7-1 unit.

Table 4c

ALASKA (65°N) JUL 1963

HASL A-	832	833	830	831	824	825
ALT(KFT)	80	80	89	89	106 ^a	106 ^a
FLT DAY	29	29	28	28	25	25
FLT NO	AL-3	AL-3	AL-2	AL-2	AL-1	AL-1
UNIT	D7-1	D7-2	D7-1	D7-2	D7-1	D7-2
VOLUME	1.75	1.71	1.84	1.76	0.74	0.80
(KSCF)	F	F	F	F	F	F
GR GAMMA	AUG 2	AUG 6	AUG 6	AUG 7	AUG 6	AUG 7
CPM/KSCF	3100	2920	2600	2550	6700	6190

a Altitude ranged from 99 to 106 kilofeet.

Gross γ activity concentration (CPM/KSCF)

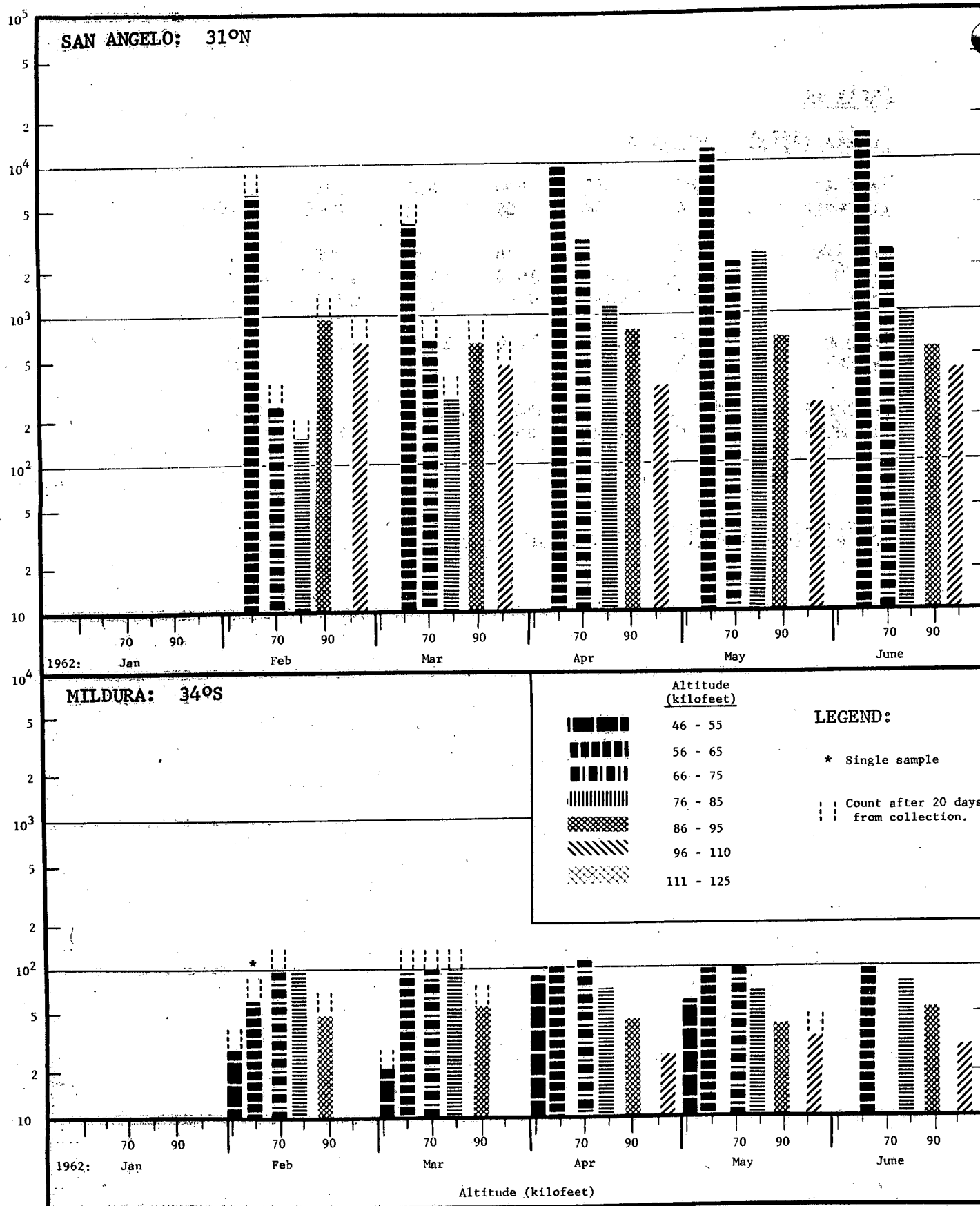


Figure 9a

GROSS GAMMA ACTIVITY CONCENTRATIONS
IN HIGH ALTITUDE BALLOON SAMPLES

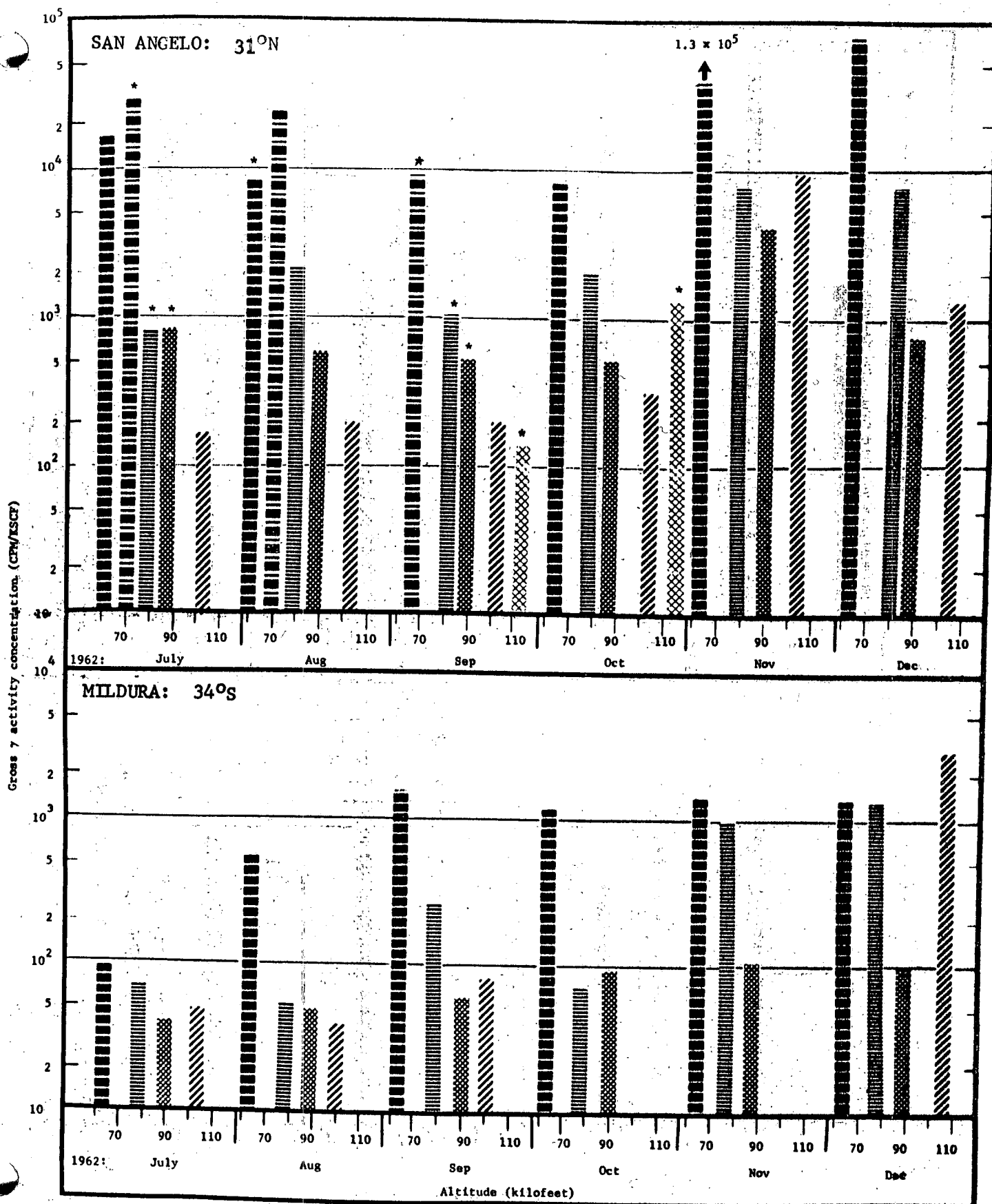


Figure 9b

GROSS GAMMA ACTIVITY CONCENTRATIONS
IN HIGH ALTITUDE BALLOON SAMPLES

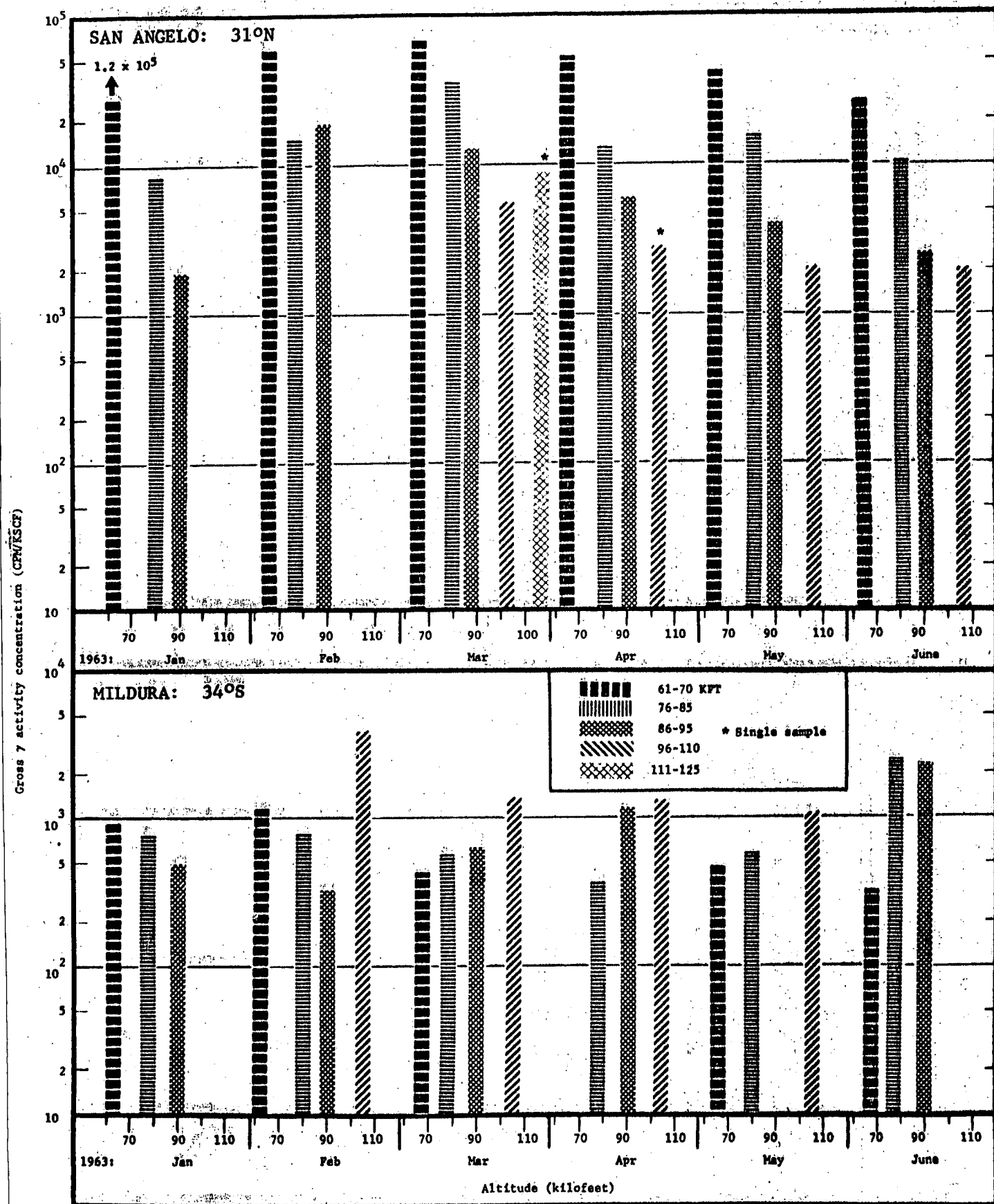


Figure 9c

GROSS GAMMA ACTIVITY CONCENTRATIONS
IN HIGH ALTITUDE BALLOON SAMPLES

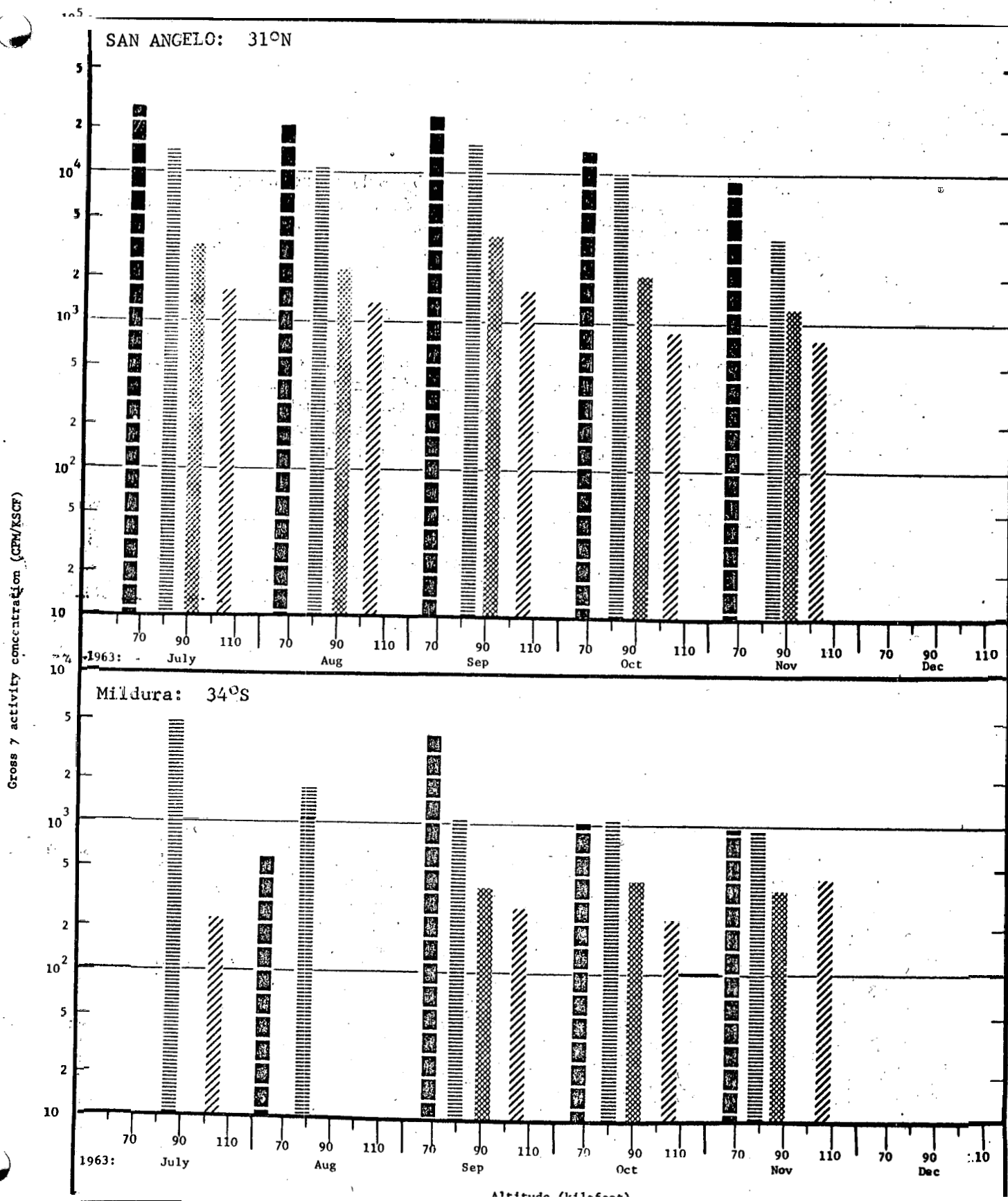


Figure 9d

GROSS GAMMA ACTIVITY CONCENTRATIONS
IN HIGH ALTITUDE BALLOON SAMPLES

Part II - Data From Sources Other Than HASL

Numerous fallout studies are conducted by other organizations in the United States and abroad. Some of these data are sent to the editors for dissemination in these HASL quarterly reports. Submitted data are reproduced essentially as received and no interpretation by HASL is attempted.

1. The New Zealand Department of Scientific and Industrial Research

Since November 1958, precipitation collections at Lower Hutt have been analyzed for strontium-90, barium-140, and cesium-137. Beginning in September 1961, cerium-144 was also determined. Results for June and July 1963 are reported on pages 199 and 200. The May 1963 data were not received but it is expected that they will be published in the April 1, 1964 quarterly report.

2. Dominion X-Ray and Radium Laboratory, Christchurch, New Zealand

Reprinted in this quarterly on pages 201 through 216 is the Quarterly Report, Fallout in New Zealand, for April-June 1963, No. DXRL-F9.

Report No. 50

Period: 31 May - 1 July 1963.

1. RADIOISOTOPES IN RAINWATER

STATION: Gracefield, Lower Hutt, New Zealand. S.41°14' E.174°55'

POLYTHENE COLLECTOR 10.1 sq.ft.

Sampling Period		Activity: Microcuries/sq.mile				Ba ¹⁴⁰ /Sr ⁹⁰	Cs ¹³⁷ /Sr ⁹⁰	Cumulative Sr ⁹⁰ Millicuries/Sq.Mile	Rain Inches	Remarks
Start	Finish	Sr ⁹⁰	Ce ¹⁴⁴	Ba ¹⁴⁰	Cs ¹³⁷					
5 - 31	7 - 1	760 ± 7	5530 ± 35	less than 3		less than 0.004		2.767	6.72	
5 - 31	7 - 1	560 ± 9	4060 ± 50	less than 40	1270 ± 50	less than 0.07	2.27	2.434	6.72	Monthly Pot Sample
Accumulated Total or Average for 1963.		2395			5113		2.13		23.11	

Report No. 51

Period: 1 July - 1 August 1963

RADIOISOTOPES IN RAINWATER

STATION: Gracefield, Lower Hutt, New Zealand. S.41°14' E.174°55'

POLYTHENE COLLECTOR 10.1 sq.ft.

Sampling Period		Activity: Microcuries/sq.mile				Ba ¹⁴⁰ /Sr ⁹⁰	Cs ¹³⁷ /Sr ⁹⁰	Cumulative Sr ⁹⁰ Millicuries/Sq.Mile	Rain Inches	Remarks
Start	Finish	Sr ⁹⁰	Ce ¹⁴⁴	Ba ¹⁴⁰	Cs ¹³⁷					
7 - 1	8 - 1	320 ± 2	2550 ± 14	less than 3	1300 ± 100	less than 0.01	4.06	3.087	4.82	Monthly Pot Sample
7 - 1	8 - 1	390 ± 7	1750 ± 50	less than 70	1060 ± 60	less than 0.2	2.72	2.824	4.82	
Accumulated Total or Average for 1963.		2785			6173		2.22		27.93	



QUARTERLY REPORT

FALLOUT IN NEW ZEALAND

APRIL - JUNE 1963

DOMINION X-RAY AND RADIUM LABORATORY,
DEPARTMENT OF HEALTH,
P.O. BOX 1456, CHRISTCHURCH, NEW ZEALAND

FALLOUT IN NEW ZEALAND
 QUARTERLY REPORT APRIL - JUNE 1963
 REPORT No. DXRL-F9
 OF 30 AUGUST 1963

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SUMMARY

The results of total beta and total gamma activity measurements on air filter and rainwater samples indicate that the radiation levels for the second quarter 1963 are generally lower than those for the previous quarter.

The New Zealand station average for Sr^{90} in rain is also lower. An average of 0.32 mc./km.^2 was deposited during the second quarter 1963. The average depositions for the first quarter 1963 and for the last quarter 1962 were 0.54 mc./km.^2 and 0.62 mc./km.^2 respectively.

As was to be expected, following the cessation of nuclear

SUMMARY - CONTINUED

tests in the atmosphere, the Sr^{89} levels have been steadily falling over the last few months to an average value of approximately 0.1 mc./km.^2 for June 1963. In view of this very low level, Sr^{89} measurements will now be discontinued.

There has been a slight overall increase in the Sr^{90} level in milk, with the average level for all New Zealand stations at 7.4 Strontium Units for May-June 1963. The average of all stations for the previous sampling periods - March-April 1963 and January-February 1963, were 6.8 Strontium Units and 5.9 Strontium Units respectively. The average for all stations for the entire year 1962 was 6.1 Strontium Units.

A measure of the significance of the level of Sr^{90} in New Zealand milk can be derived from a comparison of these levels with the recommendations made by the British Medical Research Council on the permissible levels for the exposure of the population to radiation. A "cautionary level" was set at one half of the permissible level and the Council stated that this "cautionary level" would not be exceeded if the following levels were maintained indefinitely in the diet: 400 Strontium Units for individuals in the general population, or 130 Strontium Units as average for the population as a whole.

INTRODUCTION

The present report continues the series of quarterly reports on "Fallout in New Zealand" issued by the Department of Health.

The results of routine monitoring for total beta or gamma activity of air filters and of rain samples for the quarter ending June 30, 1963 are given. The results of strontium-90 and strontium-89 measurements in rain and of strontium-90 measurements in milk are also given for the same period.

NOTE ON CHANGE OF UNITS

In line with current overseas practice, we are now reporting our results in the metric system. The activity in rain is given in millicuries per square kilometre instead of millicuries per square mile and rainfall is given in centimetres instead of inches. In addition, picocurie is used in place of micromicrocurie.

UNITS AND ABBREVIATIONS

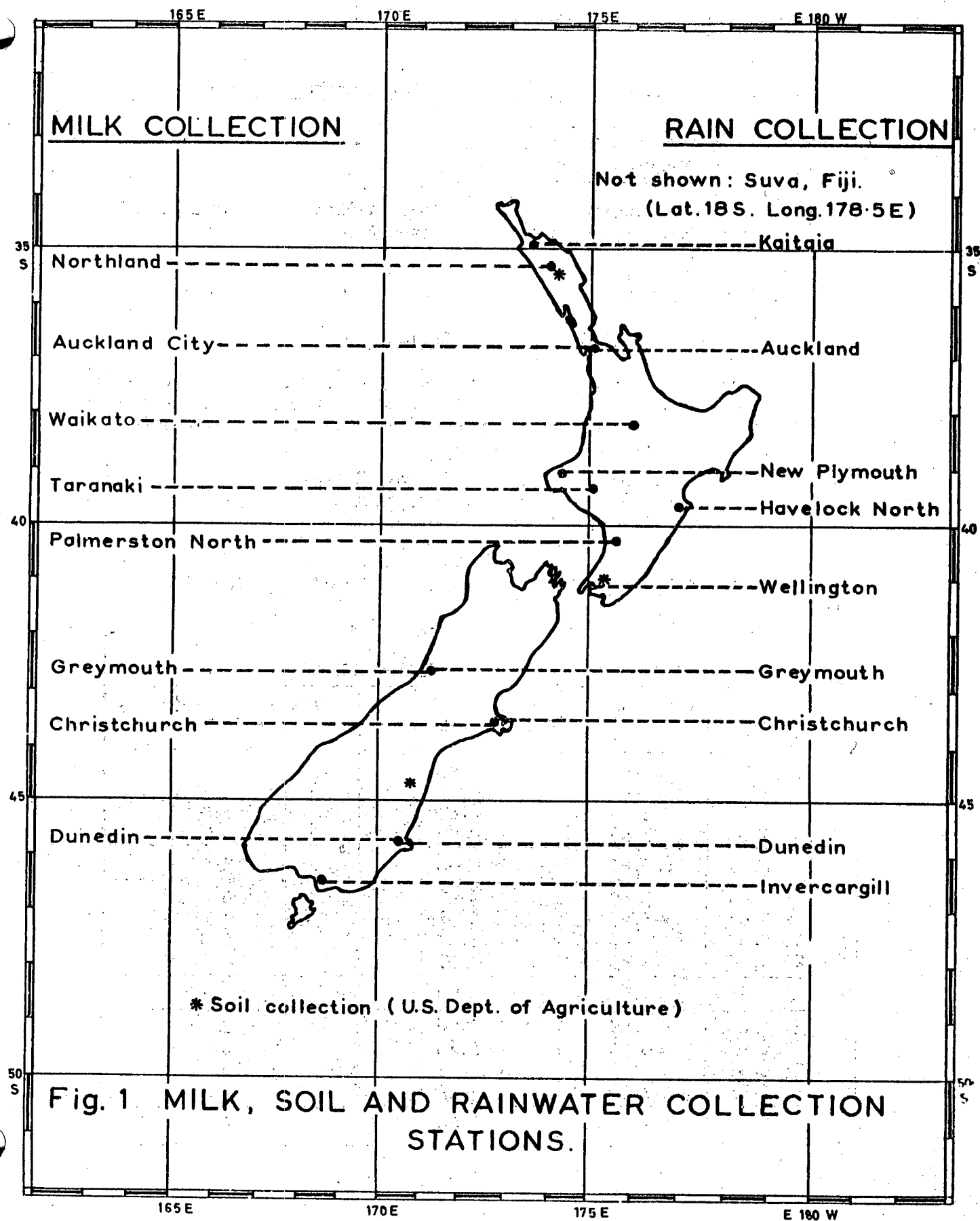
Centimetre	cm.		
Square kilometre	km ²		
Cubic metre	m ³		
Litre	l.		
Gram	g.		
Millicurie	mc.	=	10 ⁻³ curies
Picocurie	pc.	=	10 ⁻¹² curies
Strontium Unit	S.U.	=	1pc/g. of calcium

CONVERSION FACTORS

Multiply inches	by	2.54	to obtain	cm.
Multiply cm.	by	0.394	to obtain	inches
Multiply mc/sq. mile	by	0.386	to obtain	mc/km ²
Multiply mc/km ²	by	2.59	to obtain	mc/sq. mile

NOTE:

1. 1 curie = 3.7×10^{10} disintegrations per second
1 picocurie = 2.22 disintegrations per minute
2. Specific activity (pc/l.) = $\frac{\text{deposition (mc/km}^2\text{)}}{\text{rainfall (cm)}} \times 100$
3. 1 litre of whole milk contains approx. 1.2 g. of calcium



SECTION A

MEASUREMENT OF TOTAL BETA AND TOTAL GAMMA ACTIVITY

**1. TOTAL GAMMA ACTIVITY OF AIR FILTER
SAMPLES COLLECTED NEAR GROUND LEVEL**

The total gamma activities of air filter samples from Auckland and Christchurch are listed in Table 1, page 6.

**2. TOTAL BETA ACTIVITY OF FALLOUT
DEPOSITED ON THE GROUND**

Christchurch - Stainless Steel Pot Collection

The results for the individual weekly collections together with the monthly totals are given in Table 2 below in millicuries per square kilometre. The average monthly specific activities as calculated from the formula on page 3 are as follows:

April 1963	48	picocuries per litre
May 1963	30	picocuries per litre
June 1963	41	picocuries per litre

<u>TABLE 2: TOTAL BETA ACTIVITY OF FALLOUT DEPOSITED ON THE GROUND</u>			
In Millicuries per Square Kilometre			
COLLECTING STATION: CHRISTCHURCH			
Date of Collection		Rainfall Centimetres	Total Beta Activity mc./km. ²
From	To		
1.4.63	8.4.63	0.99	0.8
8.4.63	16.4.63	1.88	1.1
16.4.63	23.4.63	2.49	0.6
23.4.63	1.5.63	0.00	0.1
1.4.63	1.5.63	5.36	2.6
1.5.63	8.5.63	0.41	0.1
8.5.63	15.5.63	0.51	0.1
15.5.63	23.5.63	0.02	0.2
23.5.63	31.5.63	1.09	0.2
1.5.63	31.5.63	2.03	0.6
31.5.63	7.6.63	3.76	0.7
7.6.63	14.6.63	0.23	0.2
14.6.63	21.6.63	1.25	0.1
21.6.63	1.7.63	0.64	1.4
31.5.63	1.7.63	5.88	2.4

TABLE 1: TOTAL GAMMA ACTIVITY OF AIR SAMPLES

In Picocuries per Cubic Metre Eight Days After Collection

AUCKLAND			CHRISTCHURCH		
Date of Collection		Total Gamma Activity pc./m. ³	Date of Collection		Total Gamma Activity pc./m. ³
From	To		From	To	
1.4.63	3.4.63	0.2	1.4.63	3.4.63	0.2
3.4.63	5.4.63	0.2	3.4.63	5.4.63	0.1
5.4.63	8.4.63	0.1	5.4.63	8.4.63	<0.1
8.4.63	10.4.63	<0.1	8.4.63	11.4.63	0.1
10.4.63	13.4.63	0.3	11.4.63	16.4.63	<0.1
13.4.63	16.4.63	0.4	16.4.63	19.4.63	<0.1
16.4.63	19.4.63	0.2	19.4.63	22.4.63	<0.1
19.4.63	22.4.63	0.3	22.4.63	24.4.63	0.1
22.4.63	24.4.63	<0.1	24.4.63	26.4.63	0.1
24.4.63	26.4.63	0.2	26.4.63	29.4.63	<0.1
26.4.63	29.4.63	0.1	29.4.63	1.5.63	<0.1
29.4.63	1.5.63	<0.1			
1.4.63	1.5.63	Average 0.2 pc./m. ³	1.4.63	1.5.63	Average <0.1 pc./m. ³
1.5.63	3.5.63	0.1	1.5.63	3.5.63	0.1
3.5.63	6.5.63	<0.1	3.5.63	6.5.63	<0.1
6.5.63	8.5.63	<0.1	6.5.63	8.5.63	<0.1
8.5.63	10.5.63	0.2	8.5.63	10.5.63	<0.1
10.5.63	13.5.63	<0.1	10.5.63	13.5.63	<0.1
13.5.63	15.5.63	<0.1	13.5.63	15.5.63	<0.1
15.5.63	17.5.63	0.1	15.5.63	17.5.63	<0.1
17.5.63	20.5.63	<0.1	17.5.63	20.5.63	<0.1
20.5.63	22.5.63	<0.1	20.5.63	22.5.63	<0.1
22.5.63	24.5.63	0.1	22.5.63	24.5.63	<0.1
24.5.63	27.5.63	<0.1	24.5.63	27.5.63	<0.1
27.5.63	29.5.63	<0.1	27.5.63	29.5.63	0.1
29.5.63	31.5.63	<0.1	29.5.63	31.5.63	0.1
1.5.63	31.5.63	Average <0.1 pc./m. ³	1.5.63	31.5.63	Average <0.1 pc./m. ³
31.5.63	3.6.63	0.1	31.5.63	4.6.63	<0.1
3.6.63	5.6.63	0.1	4.6.63	7.6.63	<0.1
5.6.63	7.6.63	0.2	7.6.63	10.6.63	<0.1
7.6.63	10.6.63	<0.1	10.6.63	12.6.63	<0.1
10.6.63	12.6.63	<0.1	12.6.63	14.6.63	0.1
12.6.63	14.6.63	0.1	14.6.63	17.6.63	<0.1
14.6.63	17.6.63	<0.1	17.6.63	19.6.63	<0.1
17.6.63	19.6.63	<0.1	19.6.63	21.6.63	<0.1
19.6.63	21.6.63	<0.1	21.6.63	24.6.63	<0.1
21.6.63	24.6.63	0.1	24.6.63	26.6.63	<0.1
24.6.63	26.6.63	<0.1	26.6.63	28.6.63	<0.1
26.6.63	28.6.63	<0.1	28.6.63	1.7.63	<0.1
28.6.63	1.7.63	<0.1			
31.5.63	1.7.63	Average 0.1 pc./m. ³	31.5.63	1.7.63	Average <0.1 pc./m. ³

SECTION B

MEASUREMENT OF SPECIFIC RADIOISOTOPES

1. STRONTIUM-90 AND STRONTIUM-89 IN RAIN

Table 3, page 8 gives the recent results of strontium-90 and strontium-89 measurements in rain from the nine New Zealand collecting stations and from Fiji. The results of measurements made by the Institute of Nuclear Sciences on rain collected at Gracefield, and the United Kingdom Atomic Energy Authority's measurements on rain collected at Ohakea are also included. Past and present results for strontium-90 and rainfall are given in graphical form in Fig. 2 a, b, c, d, e, pages 9-13.

2. STRONTIUM-90 IN MILK

Table 4, gives the recent results of strontium-90 measurements in milk from the eight New Zealand collecting stations. Past and present results are given in graphical form in Fig. 3 a, b, pages 14-15.

<u>TABLE 4: STRONTIUM-90 IN MILK 1963</u>		
Strontium Units (pc. Sr^{90} /g. Milk Calcium)		
Station	March-April	May-June
Northland	6.8	*
Auckland	5.7	5.1
Waikato	4.6	5.1
Taranaki	6.8	9.7
Palmerston North	4.8	4.5
Greymouth	18.9	21.4
Christchurch	3.4	2.7
Dunedin	3.3	3.4
Average of all Stations	6.8	7.4

* No sample available

TABLE 3: STRONTIUM-90 AND STRONTIUM-89 IN RAIN 1963

In Millicuries per Square Kilometre at Mid Collection Date

To Obtain Millicuries per Square Mile Multiply by 2.59

STATION		April	May	June
KAITAIA	Rainfall cm. Sr ⁹⁰ mc./km. ² Sr ⁸⁹ mc./km. ²	3.1 0.06 0.1	7.6 0.08 0.1	16.2 0.15 0.2
AUCKLAND	Rainfall cm. Sr ⁹⁰ mc./km. ² Sr ⁸⁹ mc./km. ²	9.8 0.16 0.1	7.5 0.05 <0.1	16.2 0.10 0.2
NEW PLYMOUTH	Rainfall cm. Sr ⁹⁰ mc./km. ² Sr ⁸⁹ mc./km. ²	2.8 0.05 0.1	18.3 0.19 0.2	12.7 0.12 0.2
HAVELOCK NORTH	Rainfall cm. Sr ⁹⁰ mc./km. ² Sr ⁸⁹ mc./km. ²	2.3 0.04 <0.1	1.1 0.03 <0.1	20.6 0.09 0.1
WELLINGTON	Rainfall cm. Sr ⁹⁰ mc./km. ² Sr ⁸⁹ mc./km. ²	5.1 0.16 0.1	11.9 0.13 0.1	12.7 0.12 <0.1
GRACEFIELD measured by Inst. Nuc. Sc.	Rainfall cm. Sr ⁹⁰ mc./km. ²	6.8 0.12		
GREYMOUTH	Rainfall cm. Sr ⁹⁰ mc./km. ² Sr ⁸⁹ mc./km. ²	8.0 0.16 0.2	39.3 0.26 0.4	26.8 0.25 0.2
CHRISTCHURCH	Rainfall cm. Sr ⁹⁰ mc./km. ² Sr ⁸⁹ mc./km. ²	5.4 0.10 0.2	2.0 0.03 <0.1	5.9 0.08 0.1
DUNEDIN	Rainfall cm. Sr ⁹⁰ mc./km. ² Sr ⁸⁹ mc./km. ²	3.8 0.08 0.3	2.9 0.03 <0.1	5.9 0.04 <0.1
INVERCARGILL	Rainfall cm. Sr ⁹⁰ mc./km. ² Sr ⁸⁹ mc./km. ²	5.5 0.11 0.4	12.9 0.14 0.2	11.3 0.10 <0.1
FIJI	Rainfall cm. Sr ⁹⁰ mc./km. ² Sr ⁸⁹ mc./km. ²	68.2 0.24 0.5	25.0 0.08 0.2	10.2 0.11 0.2

		Oct., Nov., Dec. 1962
OHAKA measured by U.K. Atomic Energy Authority	Rainfall cm. Sr ⁹⁰ mc./km. ²	24.5 0.47

FIG.2a

STRONTIUM 90 IN RAIN

Millicuries Sr^{90} /sq. kilometre per month.

Shaded portions indicate centimetres of rain as shown by scale on right.

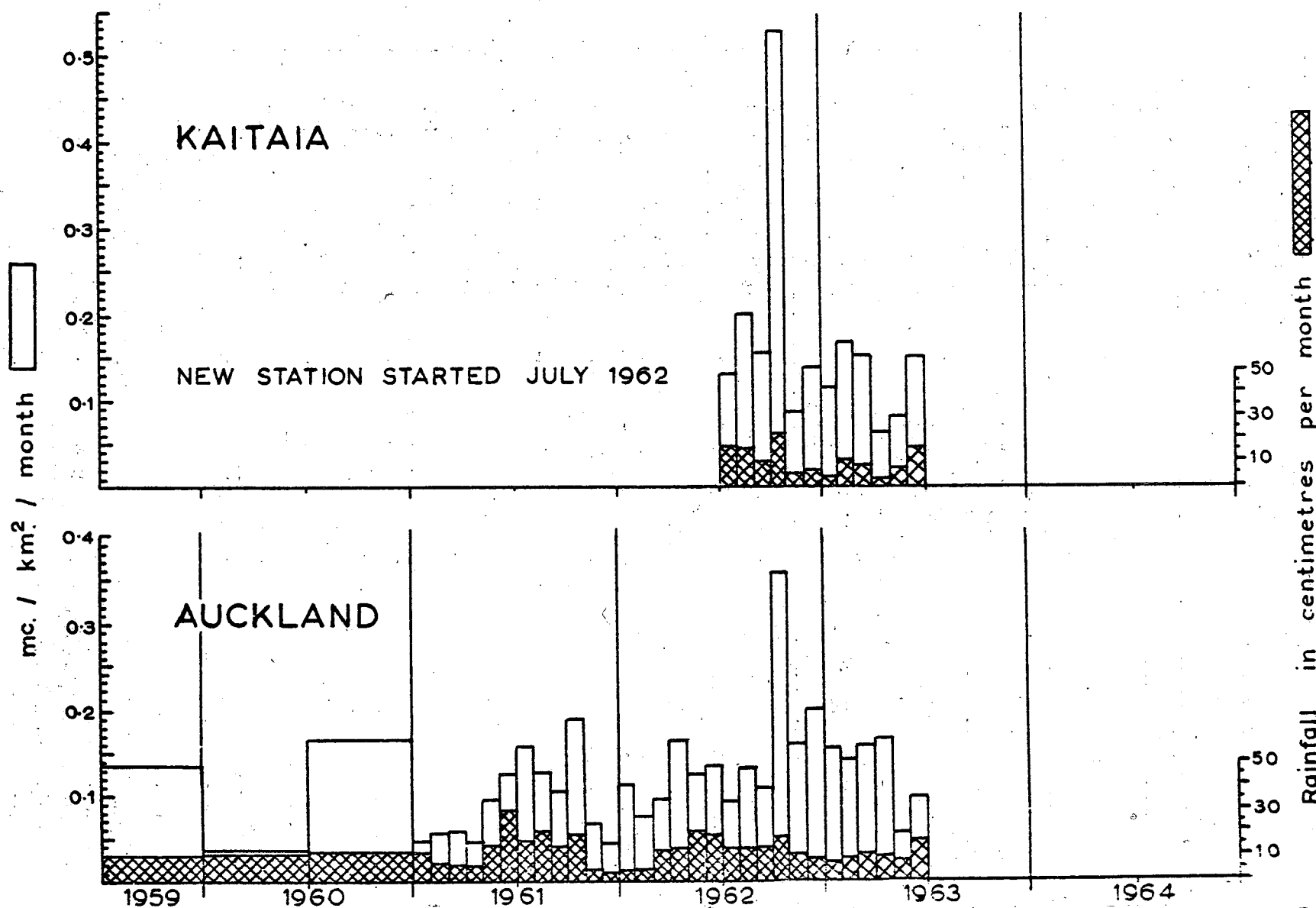


FIG. 2b

STRONTIUM 90 IN RAIN

Millicuries Sr^{90} /sq. kilometre per month.

Shaded portions indicate centimetres of rain as shown by scale on right.

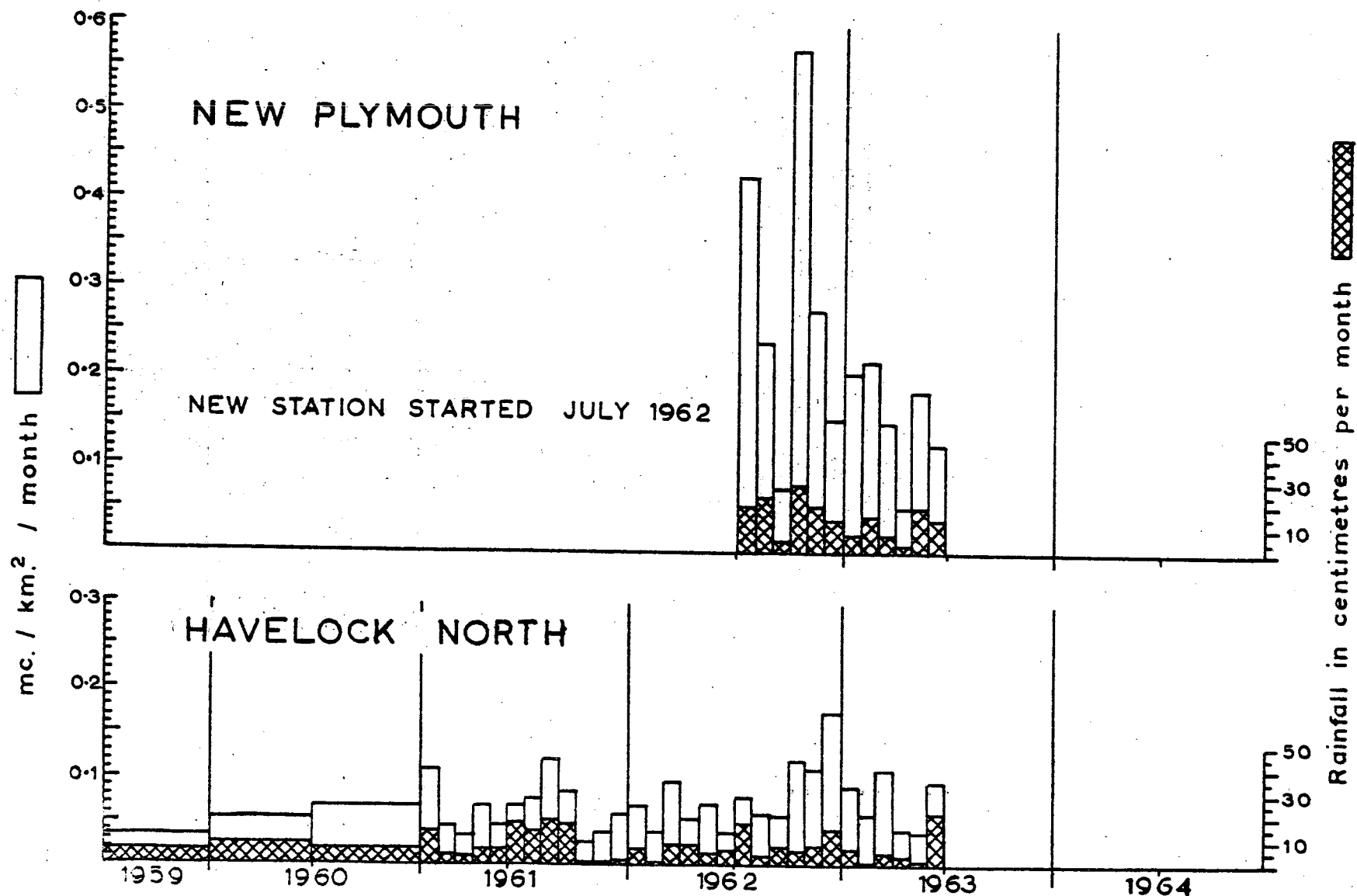


FIG. 2c STRONTIUM 90 IN RAIN Millicuries Sr^{90} /sq. kilometre per month.
 Shaded portions indicate centimetres of rain as shown by scale on right.

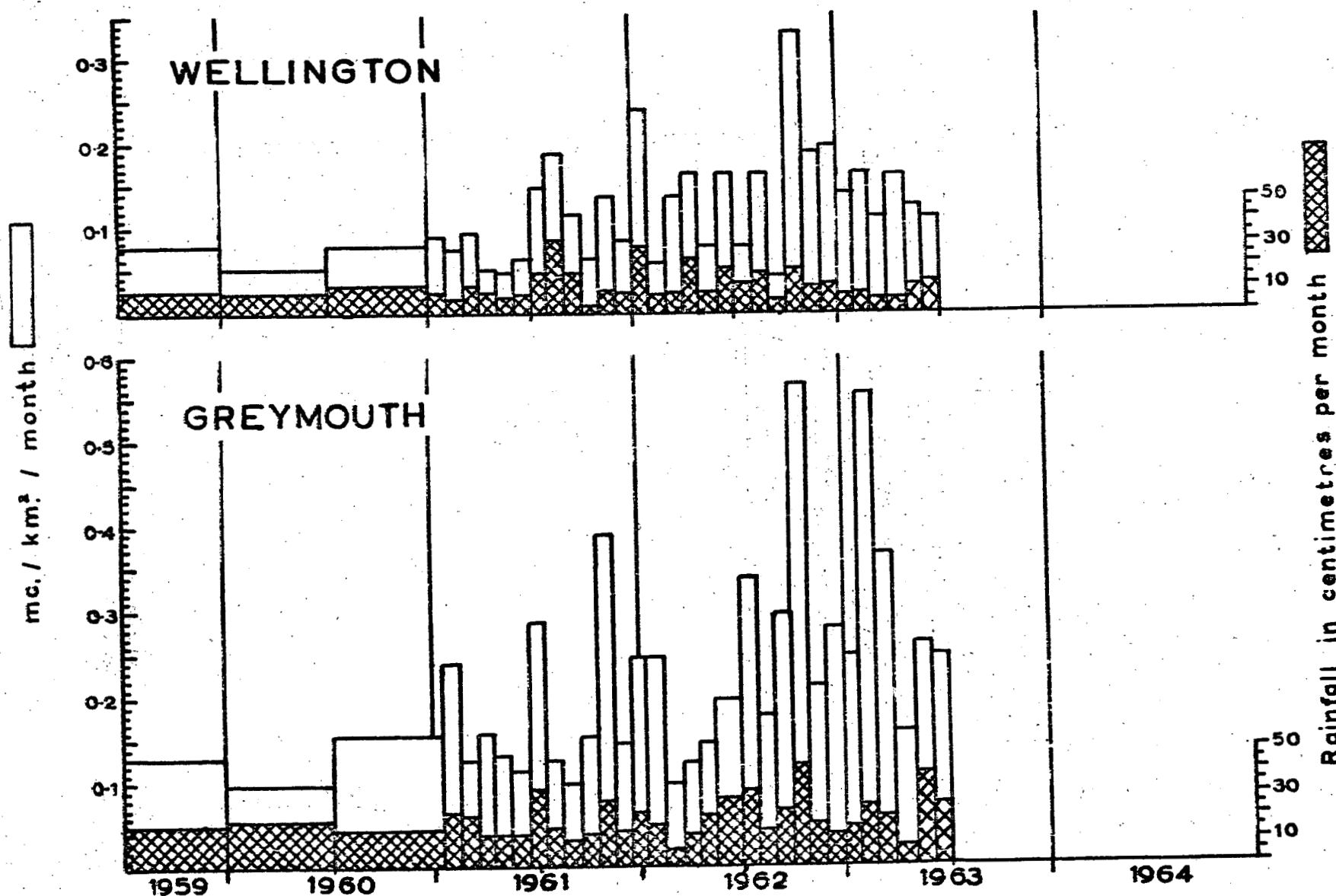


FIG.2d STRONTIUM 90 IN RAIN Millicuries Sr^{90} /sq. kilometre per month.

Shaded portions indicate centimetres of rain as shown by scale on right.

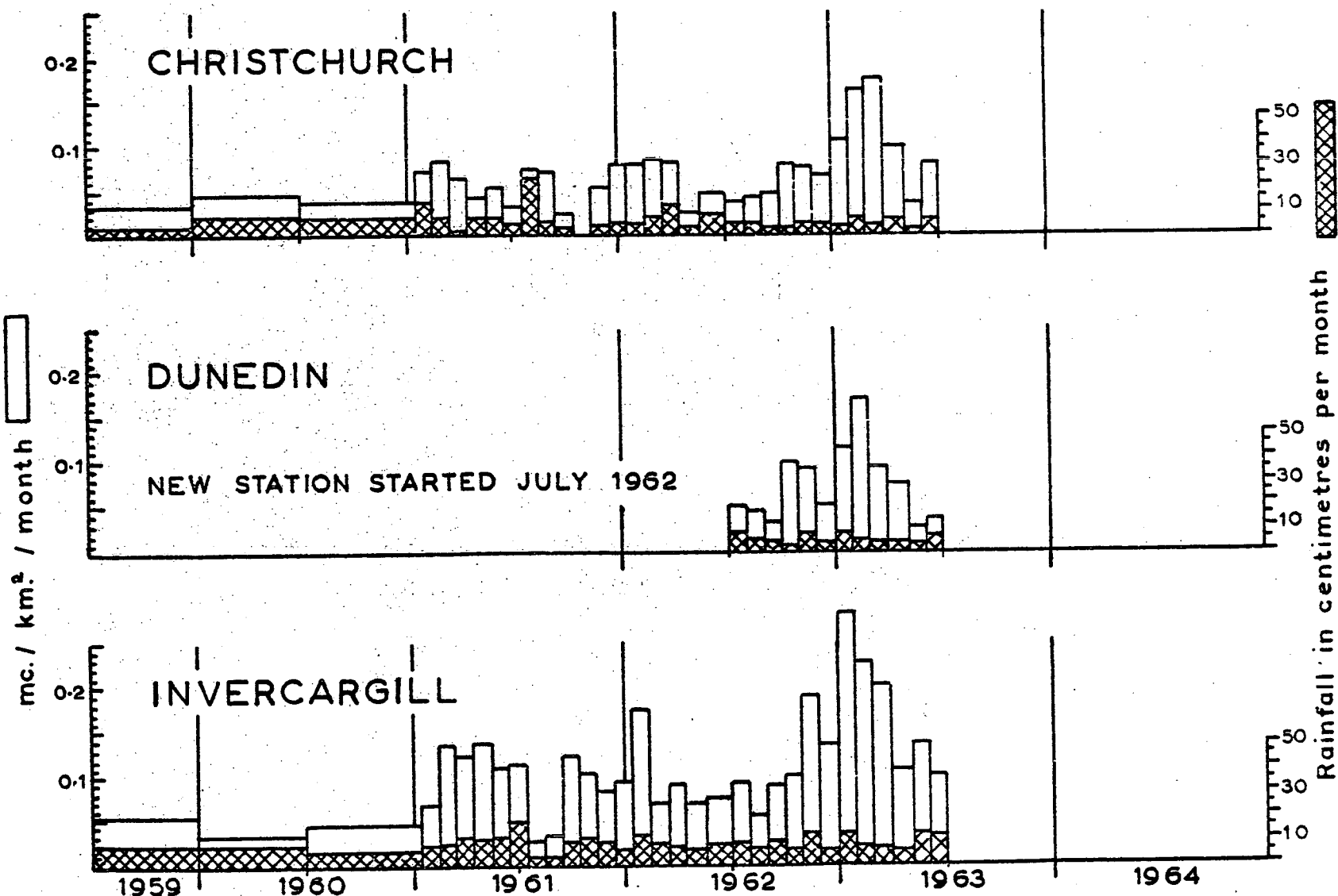
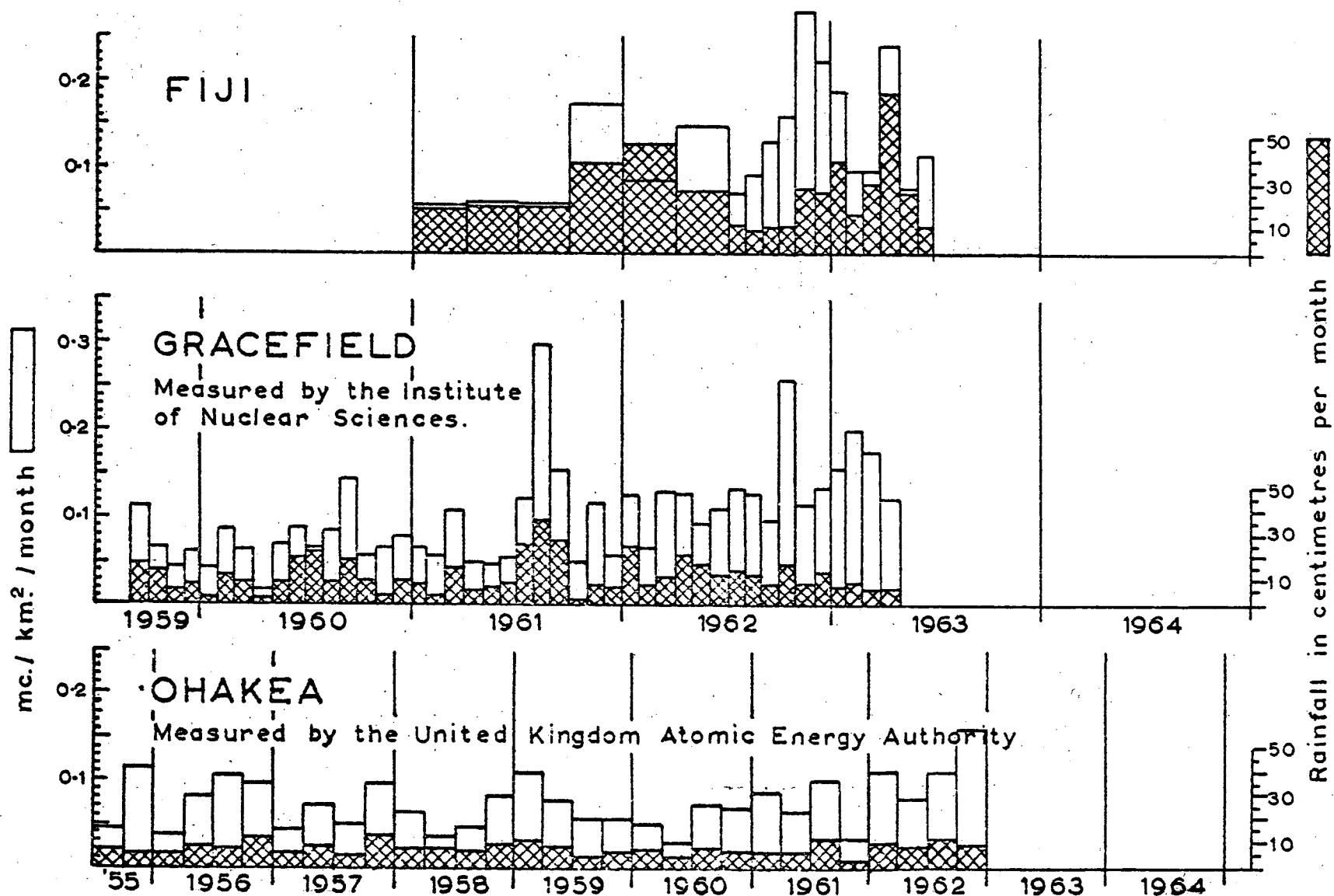


FIG.2e STRONTIUM 90 IN RAIN Millicuries Sr^{90} /sq.kilometre per month.
Shaded portions indicate centimetres of rain as shown by scale on right.



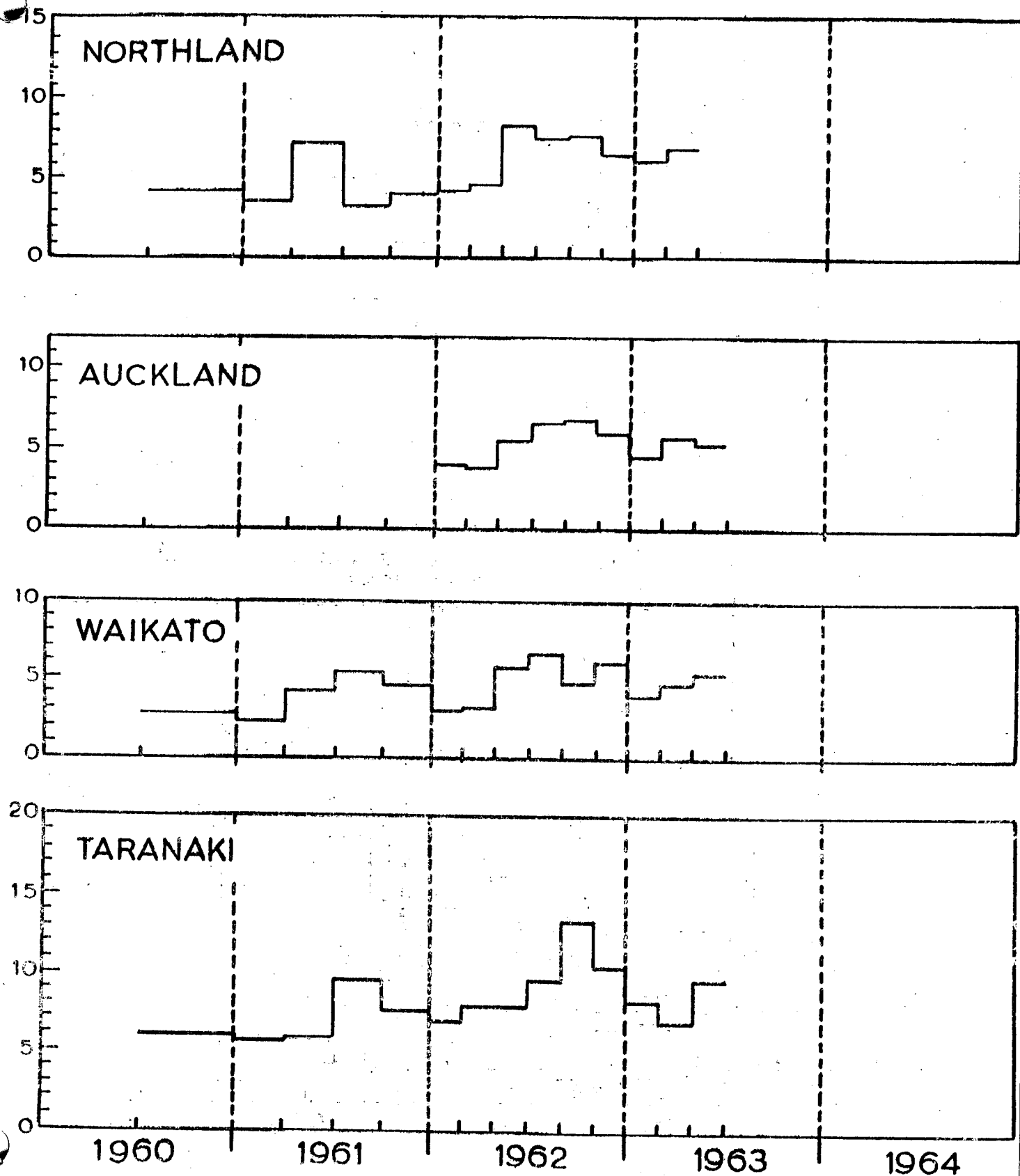
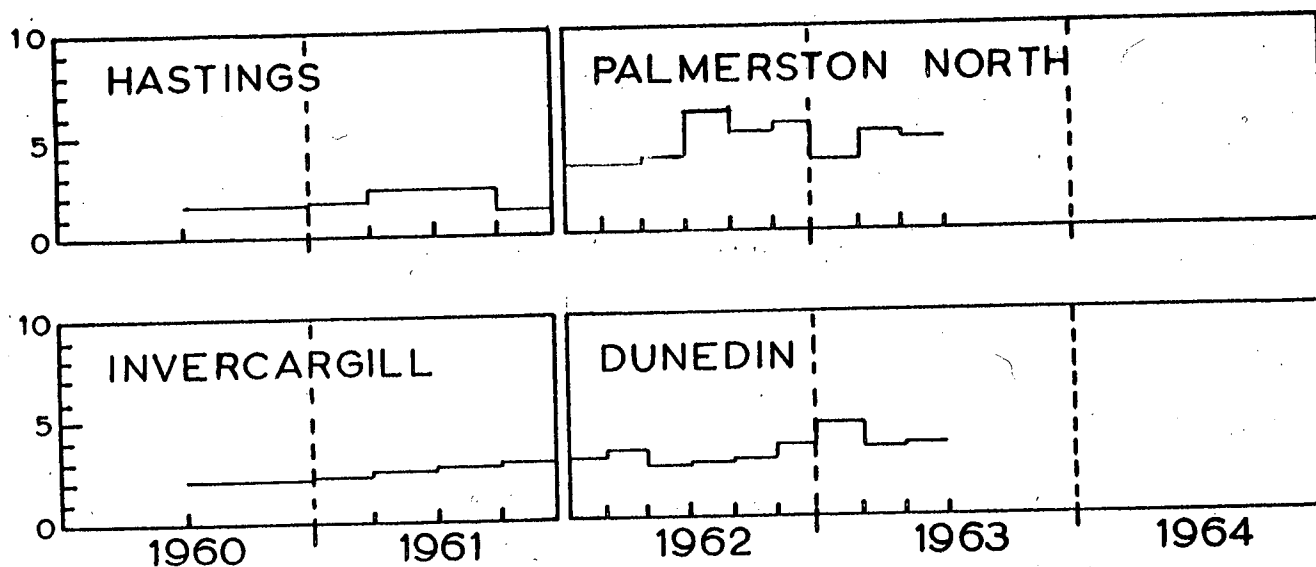


FIG. 3a Sr^{90} IN MILK (Strontium Units - pc. Sr^{90} /g. calcium)



STATIONS WITH HIGHEST AND LOWEST VALUES AND AVERAGE OF ALL NEW ZEALAND STATIONS

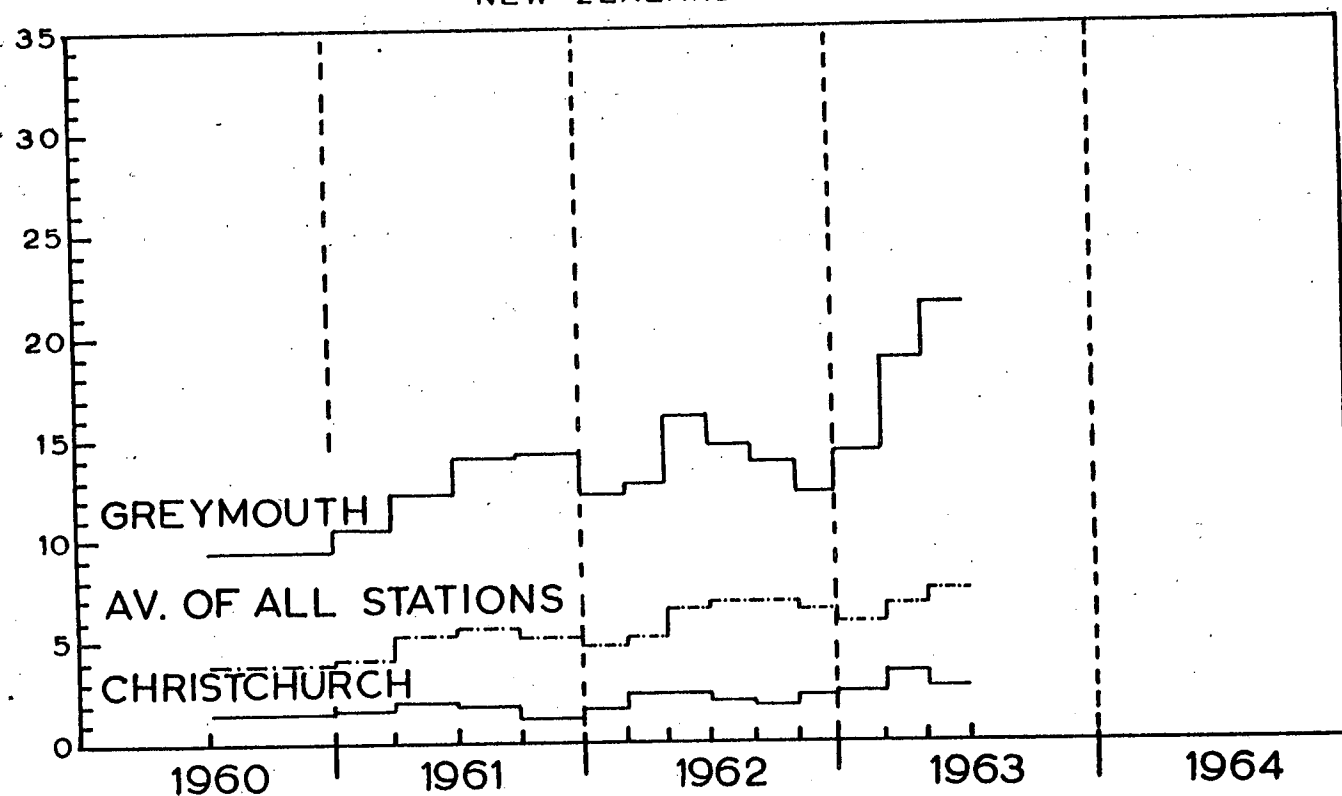


FIG. 3b Sr^{90} IN MILK (Strontium Units - $\text{pc. Sr}^{90}/\text{g. calcium}$)

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"Approximate Fission and Total Yields of Nuclear Tests Conducted through 1962", excerpted from Report no. 4, Federal Radiation Council, May 1963.	241
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"B-57 Air Sampling in Southwestern United States - February and March 1961" by K. R. Peterson, U. S. Weather Bureau.	277
"Strontium-90 in Soils Collected in 1962" by L. T. Alexander, M. Meyer, J. S. Allen, U. S. Soil Conservation Service, and E. P. Hardy, Health and Safety Laboratory, USAEC.	293
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"Emitted Radiations from Cd-109 and Cd-113m" by N. Hallden and L. P. Salter, Health and Safety Laboratory, USAEC.	299
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"The Distribution of Accumulated Fallout Strontium-90 with Slope" by L. T. Alexander, M. Meyer, J. S. Allen, U. S. Soil Conservation Service, and E. P. Hardy, Health and Safety Laboratory, USAEC.	323
"1962 Soil Sampling in Clallam County, Washington" by L. T. Alexander, M. Meyer, J. S. Allen, U. S. Soil Conservation Service, and E. P. Hardy, Health and Safety Laboratory, USAEC.	325

**ANNOUNCED NUCLEAR DETONATIONS
1945 - 1962**

**United States
United Kingdom
Republic of France
Union of Soviet Socialist Republics**

**Compiled by the
Atmospheric Radioactivity Research Project
Meteorological Research Projects
U. S. Weather Bureau
Washington, D.C.**

November 1963

ANNOUNCED NUCLEAR DETONATIONS

1945 - 1962

United States

United Kingdom

Republic of France

Union of Soviet Socialist Republics

The following list of nuclear detonations has been compiled principally from press releases of the United States Atomic Energy Commission Public Information Service. However, reports in government publications and by government officials as to the size, type, cloud height, etc., of various explosions have been included when available. Press or unofficial estimates have not been included. A list of the references used is appended.

The AEC has pointed out that this country does not disclose all of the USSR shots of which it has knowledge but limits itself to statements about explosions of special interest. The actual number of Soviet detonations is, therefore, higher than those announced. Similarly, not all of the detonations by this country have been announced.

Explanation of Table

1. No.-----the number of the announced detonation for a given series.
2. Time (GCT)-----Greenwich Civil Time.
3. Name-----the unclassified code name given to an individual detonation.
4. Height of Burst---height (feet) of the detonation above the surface.
5. Type-----the type of delivery or placement of the device.
6. Yield-----the total effective energy released in a nuclear explosion or to the type of nuclear weapon which was detonated. The following nomenclature is used:
 - a. Fission-----nuclear weapon utilizing fission energy only.
 - b. Hydrogen-----a device in which part of the explosive energy results from the thermonuclear fusion reaction. The high temperatures required are obtained by means of a fission reaction.
 - c. Kiloton (KT)---the energy of a nuclear explosion which is equivalent to that produced by the explosion of one kiloton (i.e., 1,000 tons) of TNT.
 - d. Megaton (MT)-- the energy of a nuclear explosion which is equivalent to 1,000,000 tons (or 1,000 kilotons) of TNT.

e. Nominal-----an atomic weapon with an energy release equivalent to 20 kilotons (i.e., 20,000 tons) of TNT.

f. Since 1961, the United States Atomic Energy Commission has announced the yields of the US, USSR and UK tests as:

Low yield-----20 KT or less

Intermediate yield----between 20 KT and 1 MT

7. Cloud Top-----height of the nuclear cloud top above mean sea level (MSL), in feet.
8. Cloud Base-----height of the top of the stem (or base of the mushroom head) above mean sea level, in feet. The Nevada Test Site is approximately 4,000 feet above sea level.
9. Tropopause-----the boundary between the troposphere and stratosphere, usually characterized by an abrupt change of the vertical temperature gradient. The change is in the direction of increased atmosphere stability from regions below to regions above the tropopause.
10. Method of Observation-----type of measurement used for cloud height documentation.

A - Aircraft
P - Photography
S - Searchlight
T - Theodolite
U - Unknown

It should be noted that while there has been no attempt made in the tables to indicate the reliability of the cloud data for individual cases, the quality varies considerably. In general, the cloud height reported by photography is considered to be more reliable than the theodolite and/or aircraft measurements. For theodolite and aircraft measurements, it must be assumed that greater uncertainty exists as to the exact height particularly for the higher clouds.

11. Remarks-----Other pertinent information. In several cases, the AEC press release for Soviet detonations was in the form of a statement on a particular date by a U. S. official and does not necessarily mean that the detonation occurred on that date.

Since 1955, the U. S. Atomic Energy Commission has conducted a number of safety experiments at the Nevada Test Site to determine the safety of nuclear weapons in case of accident. A safety experiment

which resulted in a very low, but measurable nuclear yield, has been included as a nuclear detonation. To date, 19 such experiments have been reported.

Since the resumption of U. S. nuclear tests on September 15, 1961, the AEC has announced the detonation of 61 U. S. nuclear devices in the continental limits of the United States through December 31, 1962. Many of these detonations occurred underground to decrease the amount of radioactive material released into the atmosphere. The Remarks for this period contains notes concerning the release of radioactivity into the atmosphere. Several nuclear detonations occurred during this period as part of the AEC Plowshare Program to develop peaceful uses for nuclear explosives. These are also indicated in the Remarks column.

Listed below are the approximate latitudes and longitudes of the various test sites:

U. S.

Nevada Test Site (NTS), U. S. A.-----37° 116°W
Pacific Proving Ground-----
Eniwetok-----11°N 162°E
Bikini-----11°N 165°E
Johnston Island-----17°N 169°W
Christmas Island----- 2°N 157°W

U. K.

Monte Bello Island, Australia-----20°S 115°E
Woomera, Australia-----31°S 137°E
Maralinga Proving Ground, Australia-----30°S 131°E
Christmas Island, Pacific----- 2°N 157°W
Nevada Test Site, U.S.A.-----37°N 116°W

U. S. S. R.

Arctic Test Site (Novaya Zemlya)-----75°N 55°E
Siberian Test Site (Semipalatinsk)-----52°N 78°E
U.S.S.R.-----denotes the explosion was in
Soviet territory, the test site
was not given.

Republic of France

Reggan, Algeria-----27°N 0°
In Ekker, Algeria-----24°N 5°E

SUMMARY OF U. S. NUCLEAR DETONATIONS

			<u>Number</u>	<u>Cumulative</u>
1945	July	<u>Trinity</u> , New Mexico	1	1
	August	Japan	2	3
1946	July	<u>Crossroads</u> , Bikini Atoll	2	5
1948	April	<u>Sandstone</u> , Eniwetok Atoll	3	8
1951	Jan-Feb	<u>Ranger</u> , Nevada Test Site	5	13
	Apr-May	<u>Greenhouse</u> , Eniwetok Atoll	4	17
	Oct-Nov	<u>Buster-Jangle</u> , Nevada T. S.	7	24
1952	Apr-June	<u>Tumbler-Snapper</u> , Nevada T. S.	8	32
	November	<u>Ivy</u> , Eniwetok Atoll	2	34
1953	Mar-June	<u>Upshot-Knothole</u> , Nevada T. S.	11	45
1954	Mar-May	<u>Castle</u> , Bikini & Eniwetok Atoll	6	51
1955	Feb-May	<u>Teapot</u> , Nevada T. S.	14	65
	May	<u>Wigwam</u> , Pacific Ocean	1	66
1956	January	Safety, Nevada T. S.	1*	67
	May-July	<u>Redwing</u> , Eniwetok & Bikini Atoll	13	80
1957	May-Oct	<u>Plumbbob</u> , Nevada T. S.	26*	106
	December	Safety, Nevada T. S.	2*	108
1958	Apr-Aug	<u>Hardtack</u> , Eniwetok & Bikini Atoll, Johnston Island	31	139
	Sept-Oct	<u>Hardtack Phase II</u> , Nevada T. S.	32*	171
	Aug-Sept	<u>Argus</u> , South Atlantic	3	174
1961	Sept-Dec	Nevada T. S.	8	182
	December	Carlsbad, New Mexico	1	183
1962	Jan-Dec	Nevada T. S.	52	235
	Apr-July	<u>Dominic</u> , Christmas & Johnston Islands	27	262
	Oct-Nov	<u>Dominic</u> , Johnston Island	9	271

* Nineteen safety experiments at the Nevada Test Site which resulted in a measurable nuclear yield are included.

SUMMARY OF U. K. NUCLEAR DETONATIONS

			<u>Number</u>	<u>Cumulative</u>
1952	October	<u>Hurricane</u> , Monte Bello Islands, Aus.	1	1
1953	October	<u>Totem</u> , Woomera, Australia	2	3
1956	May-June	<u>Mosaic</u> , Monte Bello Islands	2	5
	Sept-Oct	<u>Buffalo</u> , Maralinga Proving Grounds, South Australia	4	9
1957	May-June	<u>Grapple</u> , Christmas Island, Pacific	3	12
	Sept-Oct	<u>Antler</u> , Maralinga, P.G., S. Australia	3	15
	November	<u>Grapple</u> , Christmas Island, Pacific	1	16
1958	Apr-Sept	<u>Grapple</u> , Christmas Island, Pacific	5	21
1962	Mar & Dec	Nevada T. S.	2	23

SUMMARY OF REPUBLIC OF FRANCE NUCLEAR DETONATIONS

1960	Feb-Apr	2	2
	December	1	3
1961	April	1	4
1962	May	1	5

SUMMARY OF USSR NUCLEAR DETONATIONS

1949	September	1	1
1951	October	2	3
1953	August	2*	5
1954	October	1*	6
1955	Aug-Nov	4*	10
1956	Mar-Apr	2*	12
	Aug-Nov	5*	17
1957	Jan-Apr	7*	24
	Aug-Dec	6	30
1958	Feb-Mar	9	39
	Sept-Nov	16	55
1961	Sept-Nov	31**	86
1962	February	1	87
	Aug-Dec	37*	124

* Announced by U. S. as being part of a series.

** Announced by U. S. as being part of a series of approximately 50 atmospheric tests.

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U.S. NUCLEAR DETONATIONS

No.	Date	Time (GCT)	Name	Height of Burst(ft.)	Type of Burst	Yield	- MSL: Feet -		Trop.	Method of Observation	Remarks:
							Cloud Top	Cloud Base			
<u>1945: OPERATION TRINITY</u>											
1	16 July	1230	Trinity	100	Tower	19 KT	35,000			S	Alamogordo, N. M.
<u>1945: World War II</u>											
1	5 Aug	2315		~1850	Air	Nominal					Hiroshima, Japan
2	9 Aug	0158		~1850	Air	Nominal					Nagasaki, Japan
<u>1946: OPERATION CROSSROADS (Bikini Atoll)</u>											
1	30 June	2201	Able	520	Air	Nominal	35,000			U	
2	24 July	2135	Baker	-90	Underwater	Nominal	8,000			U	
<u>1948: OPERATION SANDSTONE (Eniwetok Atoll)</u>											
1	14 Apr	1817	X-ray	200	Tower	37 KT	56,000	25,000	56,000	T	
2	30 Apr	1809	Yoke	200	Tower	49 KT	55,000	35,000	54,000	T	
3	14 May	1804	Zebra	200	Tower	18 KT	28,000	20,000	54,000	T	
<u>1951: OPERATION RANGER (Nevada Test Site)</u>											
1	27 Jan	1345	Able	1060	Air	1 KT	17,000		33,000	T,A	
2	28 Jan	1352	Baker	1080	Air	8 KT	35,000		32,000	T,A	
3	1 Feb	1347	Easy	1080	Air	1 KT	12,000		35,000	T	
4	2 Feb	1349	Baker-2	1100	Air	8 KT	36,000		38,000	T	
5	6 Feb	1347	Fox	1435	Air	22 KT	42,000		40,000	T,A	
<u>1951: OPERATION GREENHOUSE (Eniwetok Atoll)</u>											
1	7 Apr	1834	Dog	300	Tower				55,000		
2	20 Apr	1827	Easy	300	Tower	47 KT	40,000	30,000	54,000	P,T	
3	8 May	2130	George	200	Tower				55,000		
4	24 May	1817	Item	200	Tower				55,000		
<u>1951: OPERATION BUSTER-JANGLE (Nevada Test Site)</u>											
1	22 Oct	1400	Able	100	Tower	<0.1 KT	8,000	6,700		T,A	
2	28 Oct	1520	Baker	1118	Air	3.5 KT	29,000	23,000	39,000	P,T,A	
3	30 Oct	1500	Charlie	1132	Air	14 KT	40,000	32,000	38,000	P,T,A	
4	1 Nov	1530	Dog	1417	Air	21 KT	40,000	27,000	38,000	P,T,A	
5	5 Nov	1630	Easy	1314	Air	31 KT	45,000	31,000	35,000	P,T,A,	
6	19 Nov	1700	Sugar	4	Surface	1.2 KT	16,000	11,000		P,T,A	
7	29 Nov	2000	Uncle	-17	Underground	1.2 KT	11,000			P,T	
<u>1952: OPERATION TUMBLER-SNAPPER (Nevada Test Site)</u>											
1	1 Apr	1700	Able	793	Air	1 KT	16,000		42,000	T,A	
2	15 Apr	1730	Baker	1050	Air	1 KT	16,000	10,000	38,000	P,T,A	
3	22 Apr	1730	Charlie	3447	Air	31 KT	42,000	31,000	38,000	P,T,A	
4	1 May	1630	Dog	1040	Air	19 KT	42,000	28,000	38,000	P,T,A	
5	7 May	1215	Easy	300	Tower	12 KT	34,000		41,000	T,A	
6	25 May	1200	Fox	300	Tower	11 KT	41,000		37,000	T,A	
7	1 June	1155	George	300	Tower	15 KT	37,000		37,000	T,A	
8	5 June	1155	How	300	Tower	14 KT	41,000		40,000	T,A	

U.S. NUCLEAR DETONATIONS

No.	Date	Time (GCT)	Name	Height of Burst (ft.)	Type of Burst	Yield	- MSL: Feet - Cloud Top	Cloud Base	Trop	Method of Observation	Remarks
1952: OPERATION IVY (Eniwetok)											
1	31 Oct	1915	Mike		Surface		~100,000		56,000	P,A	Experimental thermo- nuclear device
2	15 Nov	2330	King	1480	Air	High Yield	~ 70,000		55,000	P	
1953: OPERATION UPSHOT-KNOTHOLE (Nevada Test Site)											
1	17 Mar	1320	Annie	300	Tower	16 KT	41,000	28,000	36,000	T,A	
2	24 Mar	1310	Nancy	300	Tower	24 KT	42,000	26,000	40,000	T,A	
3	31 Mar	1300	Ruth	300	Tower	0.2 KT	14,000	11,000	36,000	T,A	
4	6 Apr	1530	Dixie	6020	Air	11 KT	43,000	33,000	36,000	P,T,A	
5	11 Apr	1245	Ray	100	Tower	0.2 KT	13,000	8,000	38,000	P,T,A	
6	18 Apr	1235	Badger	300	Tower	23 KT	35,000	23,000	39,000	P,T,A	
7	25 Apr	1230	Simon	300	Tower	43 KT	45,000	31,000	38,000	P,T,A	
8	8 May	1530	Encore	2425	Air	27 KT	41,000	29,000	39,000	P,T,A	
9	19 May	1205	Harry	300	Tower	32 KT	43,000	27,000	42,000	P,T,A	
10	25 May	1530	Grable	524	Gun	15 KT	38,000	23,000	38,000	P,T,A	
11	4 June	1115	Climax	1334	Air	61 KT	43,000	35,000	39,000	T,A	
1954: OPERATION CASTLE (Pacific Proving Ground)											
1	28 Feb	1845	Bravo		Surface	15 MT	114,000	55,000	55,000	P	Bikini
2	26 Mar	1830	Romeo		Barge				55,000		Bikini
3	6 Apr	1820	Koon		Surface	~100 KT			53,000		Bikini
4	25 Apr	1810	Union		Barge				57,000		Bikini
5	4 May	1810	Yankee		Barge				55,000		Bikini
6	13 May	1820	Nectar		Barge				56,000		Eniwetok
1955: OPERATION TEAPOT (Nevada Test Site)											
1	18 Feb	2000	Wasp	762	Air	1 KT	22,000	15,000		P,T,A	
2	22 Feb	1345	Moth	300	Tower	2 KT	25,000	16,000		P,T,A	
3	1 Mar	1330	Tesla	300	Tower	7 KT	30,000	18,000	38,000	P,T,A	
4	7 Mar	1320	Turk	500	Tower	43 KT	44,000	36,000	40,000	P,T,A	
5	12 Mar	1320	Hornet	300	Tower	4 KT	35,000	27,000	38,000	P,T,A	
6	22 Mar	1305	Bee	500	Tower	8 KT	40,000	29,000	37,000	P,T,A	
7	23 Mar	2030	Ess	-67	Underground	1 KT	12,000		39,000	T,A	
8	29 Mar	1255	Apple 1	500	Tower	14 KT	32,000	22,000	39,000	P,T,A	
9	29 Mar	1800	Wasp Prime	740	Air	3 KT	32,000		40,000	T,A	
10	6 Apr	1800	HA	36,620 MSL	Air	3 KT	55,000		31,000	P,T,A	
11	9 Apr	1230	Post	300	Tower	2 KT	16,000	13,000		P,T,A	
12	15 Apr	1915	Met	400	Tower	22 KT	40,000	31,000	37,000	P,T,A	
13	5 May	1210	Apple 2	500	Tower	29 KT	43,000	34,000	41,000	P,T,A	
14	15 May	1200	Zucchini	500	Tower	28 KT	35,000	25,000	44,000	P,T,A	
1955: OPERATION WIGWAM											
1	14 May	2000	Wigwam	-2000	Underwater	30 KT					29°N 126°W
1956: (Nevada Test Site)											
1	18 Jan	2130			Surface						Safety experi

U.S. NUCLEAR DETONATIONS

No.	Date	Time (GCT)	Name	Height of Burst(ft.)	Type of Burst	Yield	- MSL: Feet - Cloud Top Cloud Base	Trop.	Method of Observation	Remarks
<u>1956: OPERATION REDWING (Pacific Proving Ground)</u>										
1	4 May	1825	Lacrosse		Surface	Kiloton		53,000		Eniwetok
2	20 May	1751	Cherokee	4320	Air	Range Several Megatons		53,000		Bikini
3	27 May	1756	Zuni		Surface			51,000		Bikini
4	30 May	1815	Erie	300	Tower			54,000		Eniwetok
5	6 June	0055	Seminole		Surface			52,000		Eniwetok
6	11 June	1826	Flathead		Barge			50,000		Bikini
7	11 June	1826	Blackfoot	200	Tower			52,000		Eniwetok
8	16 June	0114	Osage	680	Air			52,000		Eniwetok
9	25 June	1806	Dakota		Barge			54,000		Bikini
10	8 July	1806	Apache		Barge			52,000		Eniwetok
11	10 July	1756	Navajo		Barge			50,000		Bikini
12	20 July	1748	Tewa		Barge			52,000		Bikini
13	21 July	1816	Huron		Barge			51,000		Eniwetok
<u>1957: OPERATION PLUMBBOB (Nevada Test Site)</u>										
1	28 May	1155	Boltzmann	500	Tower	12 KT	33,000 23,000	41,000	A	
2	2 June	1155	Franklin	300	Tower	140 Tons	17,000 14,000		A	
3	5 June	1145	Lassen	500	Balloon	0.5 Tons	7,000	43,000	A	
4	18 June	1145	Wilson	500	Balloon	10 KT	35,000 25,000	40,000	A	
5	24 June	1330	Priscilla	700	Balloon	37 KT	43,000 24,000	49,000	A	
6	5 July	1140	Hood	1500	Balloon	74 KT	48,000 35,000	53,000	A	
7	15 July	1130	Diablo	500	Tower	17 KT	32,000 20,000	43,000	A	
8	19 July	1400	John	20,000 MSL	Rocket	~2 KT	44,000	48,000	A	
9	24 July	1150	Kepler	500	Tower	10 KT	28,000 20,000	34,000	A	
10	25 July 1330	1330	Owens	500	Balloon	9.7 KT	35,000 20,000	49,000	A	
11	26 July	0800	Pascal A		Underground	Slight	6,000		A	Safety experiment
12	7 Aug	1225	Stokes	1500	Balloon	19 KT	37,000 27,000	47,000	A	
13	18 Aug	1200	Shasta	500	Tower	17 KT	32,000 16,000	50,000	A	
14	23 Aug	1230	Doppler	1500	Balloon	11 KT	38,000 23,000	43,000	A	
15	30 Aug	1240	Franklin Prime	750	Balloon	4.7 KT	32,000 21,000	32,000	A	
16	31 Aug	1230	Smoky	700	Tower	44 KT	38,000	35,000	A	
17	2 Sept	1240	Galileo	500	Tower	11 KT	37,000 17,000	39,000	A	
18	6 Sept	1245	Wheeler	500	Balloon	197 Tons	17,000 14,000	50,000	A	
19	6 Sept	2005	Coulomb B		Surface	0.3 KT	18,000	50,000	A	Safety experiment
20	8 Sept	1300	Laplace	750	Balloon	1 KT	20,000 14,000	44,000	A	
21	14 Sept	1645	Fizeau	500	Tower	11 KT	40,000 27,000	43,000	A	
22	16 Sept	1250	Newton	1500	Balloon	12 KT	32,000 19,000	52,000	A	
23	19 Sept	1700	Rainier	-790	Underground	1.7 KT				No tunnel venting
24	23 Sept	1230	Whitney	500	Tower	19 KT	30,000 18,000	53,000	A	
25	28 Sept	1300	Charleston	1500	Balloon	12 KT	32,000 20,000	45,000	A	
26	7 Oct	1300	Morgan	500	Balloon	8 KT	40,000 26,000	37,000	A	
<u>1957: (Nevada Test Site)</u>										
1	6 Dec	2015	Pascal C		Vertical Shaft	Slight				Safety experiment
2	9 Dec	2000	Coulomb C		Surface	0.5 KT				Safety experiment

U.S. NUCLEAR DETONATIONS

No.	Date	Time (GCT)	Name	Height of Burst (ft.)	Type of Burst	Yield	- MSL: Feet -		Trop	Method of Observation	Remarks
							Cloud Top	Cloud Base			
1958: OPERATION HARDTACK - PHASE I (Pacific Proving Ground)											
1	28 Apr	0240	Yucca	86,000	Balloon				53,000		12°37'N 163°01'E
2	5 May	1815	Cactus		Surface				51,000		Eniwetok
3	11 May	1750	Fir		Barge				54,000		Bikini
4	11 May	1815	Butternut		Barge				53,000		Eniwetok
5	12 May	1830	Koa		Surface				57,000		Eniwetok
6	16 May	0130	Wahoo	-500	Underwater				59,000		Eniwetok
7	20 May	1830	Holly		Barge				52,000		Eniwetok
8	21 May	2120	Nutmeg		Barge				54,000		Bikini
9	26 May	0200	Yellowwood		Barge				55,000		Eniwetok
10	26 May	1800	Magnolia		Barge				54,000		Eniwetok
11	30 May	0215	Tobacco		Barge				55,000		Eniwetok
12	31 May	0300	Sycamore		Barge				55,000		Bikini
13	2 June	1845	Rose		Barge				57,000		Eniwetok
14	8 June	2315	Umbrella	-150	Underwater				54,000		Eniwetok
15	10 June	1730	Maple		Barge				53,000		Bikini
16	14 June	1730	Aspen		Barge				52,000		Bikini
17	14 June	1830	Walnut		Barge				54,000		Eniwetok
18	18 June	0300	Linden		Barge				54,000		Eniwetok
19	27 June	1730	Redwood		Barge				52,000		Bikini
20	27 June	1830	Elder		Barge				52,000		Eniwetok
21	28 June	1930	Oak		Barge				50,000		Eniwetok
22	29 June	0000	Hickory		Barge				51,000		Bikini
23	1 July	1830	Sequoia		Barge				52,000		Eniwetok
24	2 July	1730	Cedar		Barge				51,000		Bikini
25	5 July	1830	Dogwood		Barge				52,000		Eniwetok
26	12 July	0330	Poplar		Barge				55,000		Bikini
27	22 July	0420	Juniper		Barge				51,000		Bikini
28	22 July	2030	Oliver		Barge				48,000		Eniwetok
29	26 July	2030	Pine		Barge				52,000		Eniwetok
30	1 Aug	1050	Teak	252,000	Rocket	Megaton range					Johnston Is.
31	12 Aug	1030	Orange	141,000	Rocket	Megaton range					Johnston Is.
1958: OPERATION HARDTACK - PHASE II (Nevada Test Site)											
1	12 Sept	2000	Otero	-480	Underground	38 Tons	9,000			A	Safety Experiment
2	17 Sept	1930	Bernalillo	-456	Underground	15 Tons	7,500	5,500		A	Safety Experiment
3	19 Sept	1400	Eddy	500	Balloon	83 Tons	11,000	7,500	48,000	A	
4	21 Sept	1900	Luna	-484	Underground	1.5 Tons	Low diffuse cloud			A	Safety Experiment
5	26 Sept	2000	Valencia	-484	Underground	2 Tons	5,500			A	Safety Experiment
6	28 Sept	0000	Mars		Underground	13 Tons	Low diffuse cloud			A	Safety Experiment
7	29 Sept	1405	Mora	1,500	Balloon	2 KT	18,500	10,000	40,000	A	
8	5 Oct	1410	Hidalgo	377	Balloon	77 Tons	12,000	8,000		A	Safety Experiment
9	5 Oct	1615	Colfax	-350	Underground	5.5 Tons	5,500	4,500		A	Safety Experiment
10	8 Oct	2200	Tamapais	-330	Underground	72 Tons	Low diffuse cloud				
11	10 Oct	1430	Quay	100	Tower	79 Tons	10,000	7,500		A	
12	13 Oct	1320	Lea	1,500	Balloon	1.4 KT	17,000	12,000		A	
13	14 Oct	1800	Neptune	-98.5	Underground	115 Tons	11,000			A	Safety Experiment
14	15 Oct	1600	Hamilton	50	Tower	1.2 Tons	6,000	4,500		A	

U.S. NUCLEAR DETONATIONS

No.	Date	Time	Name	Height of	Type of	Yield	- MSL: Feet -		Trop.	Method of	Remarks
		(GCT)		Burst(ft.)	Burst		Cloud Top	Cloud Base		Observation	
1958: OPERATION HARDTACK - PHASE II (Con't)											
15	16 Oct	0600	Logan	-830	Underground	5 KT				A	No venting
16	16 Oct	1420	Dona Ana	450	Balloon	37 Tons	11,000	6,500	49,000	A	
17	17 Oct	2300	Vesta		Surface	24 Tons	10,000			A	Safety experiment
18	18 Oct	1425	Rio Arriba	72.5	Tower	90 Tons	13,500	11,000		A	
19	22 Oct	1330	Socorro	1450	Balloon	6 KT	26,000	20,000		A	
20	22 Oct	1650	Wrangell	1500	Balloon	115 Tons	10,000	7,000		A	
21	22 Oct	2340	Rushmore	500	Balloon	188 Tons	11,500		42,000	A	
22	24 Oct	1500	Catron	72.5	Tower	21 Tons	8,500	5,000		A	Safety experiment
23	24 Oct	1601	Juno		Surface	1.7 Tons	5,500			A	Safety experiment
24	26 Oct	0400	Ceres	25	Tower	0.7 Tons	6,000			A	Safety experiment
25	26 Oct	1020	Sanford	1500	Balloon	4.9 KT	26,000	12,500		A	
26	26 Oct	1600	De Baca	1500	Balloon	2.2 KT	17,500	10,000		A	
27	27 Oct	1430	Chavez	52.5	Tower	0.6 Tons	6,500			A	Safety experiment
28	29 Oct	0000	Evans	-848	Underground	55 Tons				A	Venting
29	29 Oct	1445	Humboldt	25	Tower	7.8 Tons	7,500	6,000		A	
30	30 Oct	0300	Santa Fe	1500	Balloon	1.3 KT	18,000	13,000	39,000	A	
31	30 Oct	1500	Blanca	-835	Underground	19 KT	7,700			A	
32	30 Oct	2034	Titania	25	Tower	0.2 Tons	6,000			A	Safety experiment
1958: OPERATION ARGUS											
1	27 Aug		Argus-1	~300 miles	Rocket	1-2 KT					38°S 12°W
2	30 Aug		Argus-2	~300 miles	Rocket	1-2 KT					50°S 8°W
3	6 Sept		Argus-3	~300 miles	Rocket	1-2 KT					50°S 10°W

U.S. NUCLEAR DETONATIONS

<u>No.</u>	<u>Date</u>	<u>Time</u> <u>(GCT)</u>	<u>Name</u>	<u>Height of</u> <u>Burst (ft.)</u>	<u>Type of</u> <u>Burst</u>	<u>Yield</u>	<u>Remarks:*</u>
<u>1961: CONTINENTAL TEST (All tests conducted at the Nevada Test Site unless otherwise noted)</u>							
1	15 Sept	1700	Antler	-1319	Underground	2.4 KT	4, 5, 7
2	16 Sept		Shrew		Underground	Low	3, 5, 7
3	10 Oct		Chena		Underground	Low	3, 7
4	29 Oct		Mink		Underground	Low	3, 5, 8
5	3 Dec	2305	Fisher	-1193	Underground	13.5 KT	3, 5, 8
6	10 Dec	1900	Gnome	-1184	Underground	3±1 KT	4. Plowshare experiment, detonation occurred 25 miles S.E. of Carlsbad, New Mexico.
7	13 Dec	1800	Mad	-594	Underground	430 Tons	3, 5, 7
8	17 Dec		Ringtail		Underground	Low	3, 5, 7
9	22 Dec		Feather		Underground	Low	4, 7
<u>1962: CONTINENTAL TEST (All tests conducted at the Nevada Test Site unless otherwise noted)</u>							
1	9 Jan		Stoat		Underground	4.5 KT	3, 8
2	18 Jan	1800	Agouti	-856	Underground	5.9 KT	1, 7
3	30 Jan		Dormouse		Underground	Low	3, 5, 8
4	8 Feb	1800	Stillwater	-625	Underground	2.8 KT	1, 8
5	9 Feb	1630	Armadillo	-786	Underground	6.6 KT	3, 8
6	15 Feb	1800	Hardhat	-950	Underground	5.9 KT	3, 8
7	19 Feb	1630	Chinchilla	-504	Underground	1.8 KT	3, 5, 8
8	19 Feb		Codsaw		Underground	Low	2, 7
9	23 Feb	1800	Cimarron	-1000	Underground	11.2 KT	1, 8
10	24 Feb		Platypus		Underground	Low	3, 7
11	5 Mar		Danny Boy	-110	Underground	430 Tons	4, 6. Cratering experiment.
12	6 Mar		Ermine		Underground	Low	1, 8
13	8 Mar		Brazos		Underground	7.8 KT	3, 5, 8
14	15 Mar		Hognose		Underground	Low	1, 8
15	28 Mar		Hoosic		Underground	3.1 KT	1, 8

* Categories of Release of Radioactivity

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2. Radiation levels detected near surface zero above normal background from radioactivity released by this detonation. No other radiation levels detected on or off the Nevada Test Site from radioactivity released by this detonation.
3. Radiation detected on-site from radioactivity released by this detonation. No radiation levels above background detected off the Nevada Test Site in populated areas from radioactivity released by this detonation. ("On-site" as used above includes the Las Vegas Bombing and Gunnery Range.)
4. Some radioactivity detected in off-site areas. For details see subsequent tabulations.
5. Event released small visible quantities of radioactive steam and/or gases.
6. A persistent cloud was produced containing appreciable quantities of radioactivity associated with particulates.
7. No radiation detected at the work site or any other location from releases of gaseous radioactivity during post-shot drilling or tunnel re-entry operations.
8. Some radiation detected in the area surrounding surface zero from gaseous radioactivity released during post-shot drilling or tunnel re-entry operations. No radioactivity detected off the Nevada Test Site from post-shot operations.
9. Although a cloud was formed, the U. S. Public Health Service off-site monitoring network did not identify any radioactivity in the off-site area, as defined in category 3, which could be attributed to this event.

U. S. NUCLEAR DETONATIONS (Continued)

<u>No.</u>	<u>Date</u>	<u>Time (GCT)</u>	<u>Name</u>	<u>Height of Burst (ft.)</u>	<u>Type of Burst (ft.)</u>	<u>Yield</u>	<u>Remarks*</u>
<u>1962: CONTINENTAL TEST (Continued)</u>							
16	31 Mar		Chinchilla II		Underground	Low	2, 8
17	5 Apr		Dormouse Prime		Underground	9.7 KT	1, 8
18	6 Apr		Passaic		Underground	Low	1, 8
19	12 Apr		Hudson		Underground	Low	1, 8
20	14 Apr		Platte		Underground	1.7 KT	4, 6, 7
21	21 Apr		Dead		Underground	Low	1, 8
22	27 Apr		Black		Underground	Low	1, 8
23	7 May		Paca		Underground	Low	1, 8
24	12 May	1900	Aardvark	-1444	Underground	37 KT	2, 8
25	19 May		Eel		Underground	Low	4, 5, 7
26	25 May		White		Underground	Low	1, 8
27	1 June		Raccoon		Underground	Low	1, 7
28	6 June		Packrat		Underground	Low	2, 8
29	13 June		Des Moines		Underground	Low	4, 6, 7
30	21 June		Daman I		Underground	Low	2, 8
31	27 June	1800	Haymaker	-1346	Underground	56 KT	3, 5, 8
32	28 June		Marshmallow		Underground	Low	3, 7
33	30 June		Sacramento		Underground	Low	1, 7
34	6 July	1700	Sedan	-635	Underground	About 100 KT	Less than 30 KT fission yield. 4, 6, 7. Cloud height of about 12,000 feet above the ground. Flowshare cratering experiment.
35	7 July	1900	Little Feller II	Slightly above ground	Surface	Low	3, 6, 9. Cloud height of about 8,000 feet above ground.
36	11 July	1645	Johnie Boy	Shallow depth	Underground	500 Tons	4, 6. Cloud height of about 11,000 feet above ground.
37	13 July		Merrimac		Underground	Low	3, 5, 8
38	14 July	1830	Small Boy	Slightly above ground	Surface	Low	4, 6. Cloud height of about 15,000 feet above ground.
39	17 July	1750	Little Feller I	Slight above ground	Surface	Low	3, 6, 9. Cloud height of about 10,000 feet above ground.
40	27 July		Wichita		Underground	Low	3, 5, 7

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8. Some radiation detected in the area surrounding surface zero from gaseous radioactivity released during post-shot drilling or tunnel re-entry operations. No radioactivity detected off the Nevada Test Site from post-shot operations.
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U. S. NUCLEAR DETONATIONS (Continued)

<u>No.</u>	<u>Date</u>	<u>Time (GCT)</u>	<u>Name</u>	<u>Height of Burst (ft.)</u>	<u>Type of Burst</u>	<u>Yield</u>	<u>Remarks:*</u>
<u>1962: CONTINENTAL TESTS (Continued)</u>							
41	24 Aug		Bobac		Underground	Low	1, 8
42	24 Aug		York		Underground	Low	1, 8
43	14 Sept		Hyrax		Underground	Low	2, 8
44	20 Sept		Peba		Underground	Low	1, 8
45	29 Sept		Allegheny		Underground	Low	3, 5, 7
46	5 Oct		Mississippi		Underground	Intermediate	1, 8
47	12 Oct		Roanoke		Underground	Low	2, 5, 8
48	19 Oct		Bandicoot		Underground	Low	4, 6, 8
49	27 Oct		Santee		Underground	Low	1, 8
50	27 Nov		Anacostia	-750	Underground	Low	2, 5, 8. Plowshare experiment.
51	12 Dec		Madison		Underground	Low	2, 8
52	12 Dec		Numbat		Underground	Low	2, 8

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8. Some radiation detected in the area surrounding surface zero from gaseous radioactivity released during post-shot drilling or tunnel re-entry operations. No radioactivity detected off the Nevada Test Site from post-shot operations.
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U. S. NUCLEAR DETONATIONS

<u>No.</u>	<u>Date</u>	<u>Time (GCT)</u>	<u>Name</u>	<u>Type of Burst</u>	<u>Yield</u>	<u>Location</u>	<u>Remarks</u>
<u>1962: OPERATION DOMINIC</u>							
1	25 Apr	1545	Adobe	Air	Intermediate	Christmas Is. Area	
2	27 Apr	1602	Aztec	Air	Intermediate	Christmas Is. Area	
3	2 May	1802	Arkansas	Air	Low Megaton	Christmas Is. Area	
4	4 May	1904	Questa	Air	Intermediate	Christmas Is. Area	
5	6 May	2330	Frigate Bird	Missile		Christmas Is. Area	Nuclear warhead in a missile launched from a Polaris submarine.
6	8 May	1801	Yukon	Air	Intermediate	Christmas Is. Area	
7	9 May	1701	Mesilla	Air	Intermediate	Christmas Is. Area	
8	11 May	1537	Muskegon	Air	Intermediate	Christmas Is. Area	
9	11 May	2000	Swordfish	Underwater	Low	Eastern Pacific Ocean	Several hundred miles from the closest land area
10	12 May	1703	Encino	Air	Intermediate	Christmas Is. Area	
11	14 May	1522	Swanee	Air	Intermediate	Christmas Is. Area	
12	19 May	1537	Chetco	Air	Intermediate	Christmas Is. Area	
13	25 May	1609	Tanana	Air	Low	Christmas Is. Area	
14	27 May	1703	Nambe	Air	Intermediate	Christmas Is. Area	
15	8 June	1703	Alma	Air	Intermediate	Christmas Is. Area	
16	9 June	1537	Truckee	Air	Intermediate	Christmas Is. Area	
17	10 June	1601	Yaso	Air	Low Megaton	Christmas Is. Area	
18	12 June	1537	Harlem	Air	Intermediate	Christmas Is. Area	
19	15 June	1601	Rinconada	Air	Intermediate	Christmas Is. Area	
20	17 June	1601	Dulce	Air	Intermediate	Christmas Is. Area	
21	19 June	1501	Petit	Air	Low	Christmas Is. Area	
22	22 June	1601	Otowi	Air	Intermediate	Christmas Is. Area	
23	27 June	1519	Bighorn	Air	Megaton	Christmas Is. Area	
24	30 June	1521	Bluestone	Air	Low Megaton	Christmas Is. Area	
25	9 July	0900	Starfish Prime	High Altitude	1.4 MT	Johnston Is. Area	Detonated at an altitude of 400 kilometers
26	10 June	1633	Sunset	Air	Intermediate	Christmas Is. Area	
27	11 July	1537	Pamlico	Air	Low Megaton	Christmas Is. Area	
28	2 Oct	1617	Androskoggin	Air	Intermediate	Johnston Is. Area	
29	6 Oct	1602	Bumping	Air	Low	Johnston Is. Area	
30	18 Oct	1601	Chama	Air	Low Megaton	Johnston Is. Area	
31	21 Oct	0830	Checkmate	Rocket	Low	Johnston Is. Area	Detonated at an altitude of tens of kilometers
32	27 Oct	1000	Bluegill Triple Prime	Rocket	Sub-megaton	Johnston Is. Area	Detonated at an altitude of tens of kilometers
33	27 Oct	1546	Calamity	Air	Intermediate	Johnston Is. Area	
34	30 Oct	1602	Housatonic	Air	Megaton	Johnston Is. Area	
35	1 Nov	1210	Kingfish	Rocket	Sub-megaton	Johnston Is. Area	Detonated at an altitude of tens of kilometers
36	4 Nov	0730	Tightrope	Rocket	Low	Johnston Is. Area	Detonated at an altitude of tens of kilometers

U.K. NUCLEAR DETONATIONS

No.	Date	Time (GCT)	Name	Type of Burst	Yield	- MSL: Feet - Cloud Top Cloud Base	Method of Observation	Location
<u>1952 HURRICANE</u>								
1	3 Oct			Ship	Kiloton Range			Monte Bello Islands
<u>1953 TOTEM</u>								
1	14 Oct	2230		Tower	Kiloton Range			Tests held at Emu Field, 300 miles NW of Woomera.
2	26 Oct	2230		Tower	Kiloton Range			
<u>1956 MOSAIC</u>								
1	16 May			Tower	Kiloton Range			Monte Bello Islands
2	19 June			Tower	Kiloton Range			Monte Bello Islands
<u>1956 BUFFALO</u>								
1	27 Sept			Tower	Kiloton Range			Maralinga
2	4 Oct			Surface	Low Yield			Maralinga
3	11 Oct			Air Drop	Low Yield			Maralinga
4	22 Oct			Tower	Kiloton Range			Maralinga
<u>1957 GRAPPLE</u>								
1	15 May			Air Drop	Megaton Range			Christmas Island Area
2	31 May			Air Drop	Megaton Range			Christmas Island Area
3	19 June			Air Drop	Megaton Range			Christmas Island Area
<u>1957 ANTLER</u>								
1	14 Sept	0530		Tower	Low Yield			Maralinga
2	25 Sept	0030		Tower	Kiloton Range			Maralinga
3	9 Oct	0730		Balloon	Kiloton Range			Maralinga
<u>1957 GRAPPLE</u>								
1	8 Nov			Air Drop	Megaton Range			Christmas Island Area
<u>1958 GRAPPLE</u>								
1	28 Apr			Air Drop	Megaton Range			Christmas Island Area
2	22 Aug			Balloon	Kiloton Range			Christmas Island Area
3	2 Sept			Air Drop	Megaton Range			Christmas Island Area
4	11 Sept			Air Drop	Megaton Range			Christmas Island Area
5	23 Sept			Balloon	Kiloton Range			Christmas Island Area
<u>1962</u>								
1	1 Mar		Pampas*	Underground	Low			Nevada
2	7 Dec		Tendrac**	Underground	Low			Nevada
<u>REPUBLIC OF FRANCE DETONATIONS</u>								
<u>1960</u>								
1	13 Feb	0704	Gerboise bleue	350 ft. Tower	60-70 KT	42,300	26,700	T, P Reggan
2	1 Apr.	0617	Gerboise blanche	Surface	Small			
3	27 Dec	0730	Gerboise rouge	Tower	Small			
<u>1961</u>								
1	25 Apr	0600	Gerboise verte	Tower	Small			Reggan
<u>1962</u>								
1	1 May	1000		Underground	Medium			In Ekker

• Some radioactivity detected in off-site areas. For details, see subsequent.

Some radiation detected in the area surrounding surface zero from gaseous radioactivity released during post-shot drilling or tunnel re-entry operations. No radioactivity detected off the Nevada Test Site from post-shot operations.

** No radiation levels detected above background on or off the Nevada Test Site from radioactivity released by this detonation.

Some radiation detected in the area surrounding surface zero from gaseous radioactivity released during post-shot drilling or tunnel re-entry operations. No radioactivity detected off the Nevada Test Site from post-shot operations.

U.S.S.R. NUCLEAR DETONATIONS

<u>No.</u>	<u>Date</u>	<u>Type</u>	<u>Yield</u>	<u>Location</u>	<u>Remarks</u>
1	<u>1949</u> 29 Aug			USSR	First Russian nuclear detonation.
1	<u>1951</u> 3 Oct*			USSR	Statement by Press Secretary Short, detonated recently.
2	22 Oct*			USSR	Statement by White House.
1	<u>1953</u> 12 Aug		Thermonuclear	USSR	Part of a series.
2	23 Aug		Fission	USSR	Part of a series, energy release equivalent to type detonated at Nevada Test Site.
1	<u>1954</u> 26 Oct*			USSR	Part of a series, statement by Mr. Strauss, series began in mid-Sept. and continued at intervals to the present.
1	<u>1955</u> 4 Aug*			USSR	Part of a series, statement by Dr. Libby - detonated in the past few days.
2	24 Sept*			USSR	Part of a series, statement by Mr. Strauss - detonated recently.
3	10 Nov*			USSR	Part of a series, statement by Mr. Strauss - detonated recently.
4	23 Nov*	Air	Megaton Range	USSR	Part of a series, statement by Mr. Strauss.
1	<u>1956</u> 21 Mar*			USSR	Part of a series, statement by Mr. Strauss - detonated in the past few days.
2	2 Apr*			USSR	Part of a series, statement by Mr. Strauss - detonated recently.
1	<u>1956</u> 24 Aug		Less than a Megaton	Siberia	Part of a series.
2	30 Aug		Large	Siberia	Part of a series.
3	2 Sept			USSR	Part of a series.
4	10 Sept			USSR	Part of a series, announced by Soviet Union.
5	17 Nov		Large	USSR	Part of a series.
1	<u>1957</u> 19 Jan			USSR	Part of a series.
2	8 Mar			USSR	Part of a series.
3	3 Apr			USSR	Part of a series.
4	6 Apr			USSR	Part of a series.
5	10 Apr		Large	USSR	Part of a series.
6	12 Apr			USSR	Part of a series.
7	16 Apr		Large	Siberia	Part of a series-largest tested so far for this series.
1	<u>1957</u> 22 Aug		Substantial Size	Siberia	
2	9 Sept*		Moderate Intensity	Siberia	Statement by Mr. Strauss, detonated within the past two days.
3	24 Sept		Megaton Range	Arctic	
4	6 Oct		Thermonuclear	USSR	Announced by Soviet Union as a hydrogen device, AEC said it was of substantial size.
5	10 Oct		Small Explosion	Arctic	
6	28 Dec			Siberia	

* Date of announcement, not necessarily shot date.

U.S.S.R. NUCLEAR DETONATIONS

<u>No.</u>	<u>Date</u>	<u>Type</u>	<u>Yield</u>	<u>Location</u>	<u>Remarks</u>
<u>1958</u>					
1	23 Feb		Megaton Range	Arctic	
2	27 Feb		Megaton Range	Arctic	
3	27 Feb		Large	Arctic	
4	14 Mar		Below Megaton Range	Arctic	
5	14 Mar		Below Megaton Range	Siberia	
6	15 Mar		Below Megaton Range	Siberia	
7	20 Mar		Small Range	Siberia	
8	21 Mar			Arctic	This detonation was in a larger range than the test the day before.
9	22 Mar		Medium Range	Arctic	
<u>1958</u>					
1	30 Sept		Moderate to High	Arctic	
2	30 Sept		Moderate to High	Arctic	
3	2 Oct		Moderate	Arctic	
4	2 Oct		Moderate	Arctic	
5	5 Oct			Arctic	Lesser yield than the detonations (4) which occurred on 30 Sept. and 2 Oct.
6	10 Oct		Relatively Large**	Arctic	
7	12 Oct		Large**	Arctic	
8	15 Oct		Large**	Arctic	
9	18 Oct		Large**	Arctic	
10	19 Oct		Small	Arctic	
11	20 Oct		Large**	Arctic	
12	22 Oct		Large**	Arctic	
13	24 Oct		Large**	Arctic	
14	25 Oct		Relatively Large	Arctic	
15	1 Nov		Relatively Low	Siberia	
16	3 Nov		Relatively Low	Siberia	

** Mr. McCone on Oct. 24, 1958, announced that these seven tests had a high yield, meaning that each had an explosive power equal to millions of tons of TNT.

U.S.S.R. NUCLEAR DETONATIONS

<u>No.</u>	<u>Date</u>	<u>Type</u>	<u>Yield</u>	<u>Location</u>	<u>Remarks</u>
<u>1961</u>					
1	1 Sept	Atmospheric	Intermediate	Semipalatinsk	
2	4 Sept	Atmospheric	Low	Semipalatinsk	
3	5 Sept	Atmospheric	Low-Intermediate	Semipalatinsk	
4	6 Sept	Atmospheric	Low-Intermediate	East of Stalingrad	
5	10 Sept	Atmospheric	Several Megatons	Novaya Zemlya	
6	10 Sept	Atmospheric	Low-Intermediate	Novaya Zemlya	
7	12 Sept	Atmospheric	Several Megatons	Novaya Zemlya	
8	13 Sept	Atmospheric	Low-Intermediate	Semipalatinsk	
9	13 Sept	Atmospheric	Low-Intermediate	Novaya Zemlya	
10	14 Sept	Atmospheric	Several Megatons	Novaya Zemlya	
11	16 Sept	Atmospheric	Order of a Megaton	Novaya Zemlya	
12	17 Sept	Atmospheric	Intermediate	Semipalatinsk	
13	18 Sept	Atmospheric	Order of a Megaton	Novaya Zemlya	
14	20 Sept	Atmospheric	Order of a Megaton	Novaya Zemlya	
15	22 Sept	Atmospheric	Order of a Megaton	Novaya Zemlya	
16	2 Oct	Atmospheric	Order of a Megaton	Novaya Zemlya	
17	4 Oct	Atmospheric	Several Megatons	Novaya Zemlya	
18	6 Oct	Atmospheric	Several Megatons	Novaya Zemlya	
19	8 Oct	Atmospheric	Low	Novaya Zemlya	
20	12 Oct	Atmospheric	Low-Intermediate	Semipalatinsk	
21	20 Oct	Atmospheric	Several Megatons	Novaya Zemlya	
22	23 Oct	Atmospheric	About 25 MT	Novaya Zemlya	Detonated at about 12,000 feet.
23	23 Oct	Underwater	Low	South of Novaya Zemlya	
24	25 Oct	Atmospheric	Intermediate-High	Novaya Zemlya	Yield probably less than a megaton.
25	27 Oct	Atmospheric	Low-Intermediate	Novaya Zemlya	
26	30 Oct	Atmospheric	55-60 MT***	Novaya Zemlya	Detonated at about 12,000 feet.
27	31 Oct	Atmospheric	Several Megatons	Novaya Zemlya	
28	31 Oct	Atmospheric	Intermediate-High	Novaya Zemlya	Yield probably less than a megaton.
29	2 Nov	Atmospheric	Low-Intermediate	Novaya Zemlya	
30	2 Nov	Atmospheric	Low-Intermediate	Novaya Zemlya	
31	4 Nov	Atmospheric	Several Megatons	Novaya Zemlya	

*** The AEC on December 9, 1961 issued the following statement: "Of especial interest is the small fission yield of the 55-60 megaton test conducted on October 30. The total fission yield for the series is estimated to be about 25 megatons, out of the total yield of about 120 megatons for the approximately 50 atmospheric tests." There were approximately 19 other USSR tests that were not announced.

U.S.S.R. NUCLEAR DETONATIONS

<u>No.</u>	<u>Date</u>	<u>Type</u>	<u>Yield</u>	<u>Location</u>	<u>Remarks</u>
1	<u>1962:</u> 2 Feb	Underground		Semipalatinsk	The AEC on February 2, 1962 issued the following statement. "..... the Soviet Union apparently conducted a nuclear detonation underground today.....Its yield was well above the threshold of underground detectability....."
1	<u>1962</u> 5 Aug	Atmospheric	30 Megatons****	Novaya Zemlya	
2	7 Aug	Atmospheric	Low	Central Siberia	
3	10 Aug	Atmospheric	Less than one Megaton	Novaya Zemlya	
4	20 Aug	Atmospheric	Order of Several Megatons	Novaya Zemlya	
5	22 Aug	Atmospheric	Low Megaton	Novaya Zemlya	
6	25 Aug	Atmospheric	Order of Several Megatons	Novaya Zemlya	
7	25 Aug	Atmospheric	Low	Semipalatinsk	
8	27 Aug	Atmospheric	Several Megatons	Novaya Zemlya	
9	2 Sept	Atmospheric	Intermediate	Novaya Zemlya	
10	8 Sept	Atmospheric	Megaton	Novaya Zemlya	
11	15 Sept	Atmospheric	Several Megatons	Novaya Zemlya	
12	16 Sept	Atmospheric	Several Megatons	Novaya Zemlya	
13	18 Sept	Atmospheric	Few Megatons	Novaya Zemlya	
14	19 Sept	Atmospheric	Multi-Megatons	Novaya Zemlya	This detonation was the fourth multi-megaton test in the past 5 days.
15	21 Sept	Atmospheric	Few Megatons	Novaya Zemlya	
16	25 Sept	Atmospheric	Multi-Megaton	Novaya Zemlya	Second largest test in the current series. Slightly higher in yield than the test conducted on September 19.
17	27 Sept	Atmospheric	Less than 30 Megatons	Novaya Zemlya	
18	7 Oct	Atmospheric	Intermediate	Novaya Zemlya	
19	14 Oct	Atmospheric	Low	Semipalatinsk	
20	22 Oct	High Altitude	Few Hundred Kilotons	Central Asia	
21	22 Oct	Atmospheric	Several Megatons	Novaya Zemlya	
22	27 Oct	Atmospheric	Intermediate	Novaya Zemlya	
23	28 Oct	High Altitude	Intermediate	Central Asia	
24	28 Oct	Atmospheric	Low	Semipalatinsk	
25	29 Oct	Atmospheric	Intermediate	Novaya Zemlya	
26	30 Oct	Atmospheric	Intermediate	Novaya Zemlya	
27	1 Nov	High Altitude	Intermediate	Central Asia	
28	1 Nov	Atmospheric	Intermediate	Novaya Zemlya	
29	3 Nov	Atmospheric	Intermediate	Novaya Zemlya	
30	3 Nov	Atmospheric	Intermediate	Novaya Zemlya	

**** AEC news release: ".....There are indications that the Soviet Union had resumed atmospheric nuclear testing a few days prior to the nuclear detonation announced as having occurred at Novaya Zemlya on August 5. The indications are that tests were conducted in the low kiloton yield range at the Soviet test site in Central Siberia."

U.S.S.R. NUCLEAR DETONATIONS

<u>No.</u>	<u>Date</u>	<u>Type</u>	<u>Yield</u>	<u>Location</u>	<u>Remarks</u>
<u>1962 (Continued)</u>					
31	4 Nov	Atmospheric	Intermediate	Semipalatinsk	
32	17 Nov	Atmospheric	Low	Semipalatinsk	
33	18 Dec	Atmospheric	Intermediate	Novaya Zemlya	
34	18 Dec	Atmospheric	Intermediate	Novaya Zemlya	
35	20 Dec	Atmospheric	Low	Novaya Zemlya	
36	22 Dec	Atmospheric	Intermediate	Novaya Zemlya	
37	24 Dec	Atmospheric	About 20 Megatons*****	Novaya Zemlya	

***** AEC news release: "The Soviet Union conducted a number of atmospheric nuclear tests in the vicinity of Novaya Zemlya during the period December 23 through 25. The largest detonation occurred on December 24 with a yield of about twenty megatons. The magnitudes of the other tests varied from the low yield range up to a few megatons."

Fission and Total Yields from Nuclear Tests Made by
The United States, The United Kingdom, and The U.S.S.R.

(1945-1958)

The following written material and table were excerpted from "The Effects of Nuclear Weapons", S. Glasstone-Editor, U.S. Atomic Energy Commission, Washington 25, D.C., April 1962, Section 9.161.

"9.161 During the course of major nuclear weapons testing, from 1945 through 1958, approximately 92 megatons of fission yield were introduced into the atmosphere, to constitute both early and delayed fallout. The distribution according to nations and types of burst is given in Table 9.161. This table does not include data for tests carried out since 1958. In estimating fission yields a value of 50 percent has been chosen for the fission fraction of all thermonuclear devices, including those of the U.S.S.R., since this is about the average for the U.S. and U.K. tests."

TABLE 9.161
FISSION AND TOTAL YIELDS FROM NUCLEAR TESTS MADE BY
THE UNITED STATES, THE UNITED KINGDOM, AND THE U.S.S.R.
(1945-1958)

United States and United Kingdom Nuclear Tests					
Years	Fission yield (kilotons)	Fission yield from events with total yields of 1 MT or greater (kilotons)			
1945-----	60	-----			
1946-----	40	-----			
1948-----	100	-----			
1951-----	500	-----			
1952-1954-----	37, 000	36, 000			
1955-----	200	-----			
1956-----	9, 000	8, 000			
1957-1958-----	19, 000	14, 000			
U.S.S.R. Nuclear Tests					
Years (inclusive)	Fission yield (kilotons)				
1945-1951-----	60				
1952-1954-----	500				
1955-1956-----	4, 000				
1957-1958-----	21, 000				
All Nuclear Tests					
Inclusive years	Fission yield (kilotons)			Total yield (kilotons)	
	Air burst	Ground surface burst	Water surface burst	Air burst	Surface burst
1945-1951-----	190	550	20	190	570
1952-1954-----	1, 000	15, 000	22, 000	1, 000	59, 000
1955-1956-----	5, 600	1, 500	6, 000	11, 000	17, 000
1957-1958-----	31, 000	4, 400	4, 600	57, 000	28, 000

Approximate Fission and Total Yields of Nuclear Tests
Conducted Through 1962

The following written material and tables were excerpted from Report No. 4 of the Federal Radiation Council, May 1963, entitled "Estimates and Evaluation of Fallout in the United States From Nuclear Weapons Testing Conducted Through 1962."

"Table 1 summarizes the fission and total yields of atmospheric testing conducted by all nations through December 1962. As of January 1959, the strontium-90 inventory was estimated to be 9.2 megacuries produced by the detonation of 92 megatons of fission yield, 40 megatons of which had been detonated in 1957 and 1958.⁽¹⁾ Of this inventory, it was estimated that 3 megacuries had deposited as "close in" fallout near the test sites. Of the 6 megacuries then available for worldwide deposition, 3 megacuries had been deposited as worldwide deposition, and 3 megacuries were still in the atmosphere. The available inventory as of May 1961, taking into account the decrease of 2.5 percent per year for the radioactive decay of strontium-90, was estimated as 5.2 to 5.3 megacuries strontium-90. Of that quantity, 4.2 megacuries had deposited on the ground and 1 megacurie was still in the atmosphere. Less than one-quarter of this atmospheric burden was in the lower stratosphere in the northern hemisphere.

The USSR detonated an estimated 120 megatons of total yield in 1961 of which about 25 megatons were due to fission yield. The estimated radiation doses from this series were presented in FRC Report No. 3, "Health Implications of Fallout from Nuclear Weapons Testing through 1961."

The United States and the Soviet Union conducted tests in 1962 at levels shown in Table 2. U.S. and Soviet tests do not contribute equally to fallout exposures in the U.S. not only because of the differences in fission yields, but also because the distribution and rate of deposition vary with the geographic location of the tests and the altitude to which the weapon debris is carried. The amounts of fission yield injected into the stratosphere by the U.S. and the USSR in 1961 and 1962 are shown in Table 3. The total of 57 megatons fission yield injected into the lower stratosphere in 1961 and 1962 dominates the inventory available for worldwide deposition in 1962, and in the next few years."

(1) 10 megatons of fission yield produce approximately 1 megacurie of strontium-90.

TABLE 1

**Approximate Fission and Total Yields of Nuclear Weapons Tests
Conducted in the Atmosphere by All Nations**

(Yield in Megatons)

Inclusive Years	Fission Yield		Total Yield	
	Air	Surface	Air	Surface
1945 - 1951	.19	.57	.19	.57
1952 - 1954	1	37	1	59
1955 - 1956	5.6	7.5	11	17
1957 - 1958	31	9	57	28
Subtotal	37.8	54	69.2	104.6
1959 - 1960	TEST		MORATORIUM	
1961	25 ^{1/}		120	
Subtotal	63	54	189	105
1962	76 ^{1/}		217	
TOTAL	139	54	406	105

^{1/} The small yield tests conducted in Nevada do not contribute significantly to the worldwide distribution of strontium-90 to which this summary is related

TABLE 2

**Approximate Fission and Total Yields of Atmospheric
Tests Conducted in 1962**

(Yield in Megatons)

	Fission Yield	Total Yield
U.S.	16	37
USSR	60	180
TOTAL	76	217

TABLE 3

**Approximate Fission Yields Injected into the
Stratosphere in 1961 and 1962**

(Yield in Megatons)

	Lower Stratosphere ^{1/} (MT)	Upper Stratosphere ^{1/} (MT)	Total (MT)
USSR (1961)	17	8	25
USSR (1962)	30	30	60
U.S. (1962)	10	1	11

^{1/} The lower stratosphere occupies the first few tens of thousands of feet above the tropopause and the upper stratosphere continues to about 150,000 feet. The tropopause, on the average, is located at 30 - 40,000 feet in the temperate and polar zones and 50 - 55,000 feet in the tropical and the equatorial zones. Debris injected above 150,000 feet is omitted from this table.

**Inventories of selected long-lived radioisotopes produced
during nuclear testing**

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Meteorological Research Projects

U. S. Weather Bureau

Washington, D. C.

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Inventories of selected long-lived radioisotopes produced during nuclear testing

L. Machta, R. J. List and K. Telegadas

I. Introduction

This paper has as its objective a documentation of the inventories of certain man-made radionuclides injected into the atmosphere. A secondary purpose is the assignment of uncertainty associated with the best estimates of the amounts of the radioisotopes. The data for this study derives from the extensive aircraft sampling by the U. S. Department of Defense under Projects HASP, Star Dust and others, from the cooperative rainfall network of the U. S. Atomic Energy Commission and many countries, the collaborative efforts of the U. S. Department of Agriculture and Atomic Energy Commission in a series of soil surveys and the U. S. Atomic Energy Commission's high altitude balloon sampling program.

The present inventory study limits itself to long-lived radio isotopes; existing world-wide monitoring networks are not designed to provide information on the amounts of radionuclides with short half-lives. Further, radioisotopes measured globally reflect, in part, the interest of the health physics community and economy of sampling. Inventory calculations are given for the following radioisotopes: strontium-90, tungsten-185, rhodium-102 and carbon-14. In addition, the amount of Sr-90 attributable to the USSR test series in the fall of 1958, 1961 and 1962 are estimated from the strontium-89 to strontium-90 ratio. Finally, one may convert strontium-90 to cesium-137 and carbon-14 to tritium inventories using fixed ratios but with some greater uncertainties in the resulting numbers.

II. Data analysis and uncertainties

Airborne radionuclides

The atmosphere is a huge reservoir for radionuclides. Several large-scale

programs exist to sample various portions of this reservoir for the concentration of radionuclides. Up to 70,000 feet, about 95% of the mass of the atmosphere, aircraft were used (Friend, 1961, Friend; 1962). From 70,000 to 100,000 feet, about 4% of the mass of the atmosphere, it has been necessary to rely on a much smaller number of samples collected from high-altitude balloon platforms (U. S. Atomic Energy Commission, 1963) at 31°N and 34°S. For the 1% of the atmosphere above 100,000 feet virtually no data are available.

To use these data in estimating the inventory of the radionuclide in the atmosphere, certain assumptions must be made. Since the mean airflow in all layers of the atmosphere is observed to be quasi-zonal, i.e., along latitude circles, the concentration is assumed to be a function of latitude and altitude only at any one time. It is also assumed that individual samples, or the means of samples collected in limited regions, are representative of much larger unsampled regions and that variations in concentrations with time at a single point can be used to indicate the magnitude of gradients of concentration in space.

Briefly, all available data for a specific radionuclide for a limited period of time, approximately a month, were plotted as a function of latitude and altitude. Isolines of concentration were subjectively drawn and an integration was performed to ascertain the lower stratospheric content. Above this, in the balloon layer, the limited data permitted only the crudest numerical integration. Tropospheric concentrations were ordinarily several orders of magnitude lower than those in the stratosphere because of the removal processes in the lower layers of the atmosphere. In most instances no tropospheric isolines were drawn. Instead, a numerical integration based on average concentrations was used to ascertain the small fractions of the total inventory residing in the troposphere.

Figure 1 illustrates the data availability and the isoline analysis for a Sr-90 inventory in May-July 1961. This was a relatively quiescent period; there had been no stratospheric injection during the preceeding two-and half years. Both time trends and space distribution reveal no marked gradients in Sr-90 concentration except those still expected in the vicinity of the

tropopause. The lesser amounts of data in the Southern Hemisphere makes that portion of the inventory more uncertain, although in mid 1961, the data suggested similar stratospheric distributions in the two hemispheres.

Large-scale atmospheric testing resumed in late 1961. Figure 2 shows an analysis of the Sr-90 concentration in April 1962, about 5 months after the last stratospheric injection with almost the same number of datum points as in Figure 1. Large horizontal and vertical gradients are evident in the polar stratosphere of the Northern Hemisphere. Fortunately, during this period an augmented Northern Hemisphere aircraft program provided many additional samples. The complete data for the same fiducial date are shown in Figure 3. A 30% larger inventory of Sr-90 in the lower stratosphere of the Northern Hemisphere is indicated by the isolines of Figure 2 when compared to the inventory computed from Figure 3. Large spatial variability is evident in Figure 3. The time variability can be estimated from the several values given for some of the datum point. Each number represents a sample made at a different time within the two-month period. It is evident that the uncertainties involved in integrating the lower stratosphere is a function both of the amount of data and of the gradients of concentration.

The 4% of the atmosphere represented by the balloon data presents similar problems. Data at one temperate latitude station in each hemisphere is obviously inadequate to describe the whole atmosphere between 70 and 100,000 feet; polar and equatorial data are sorely needed. Again, time changes at a single point may be used to estimate space variability. For example, the Sr-90 concentration at any one altitude and latitude did not vary more than 25% for the annual average in 1961, indicating a stable distribution with minimal gradients. San Angelo, Texas at 31°N was assumed to represent the Northern Hemisphere average concentration and Mildura, Australia at 34°S that of the Southern Hemisphere. A very different picture emerged in 1963. In January of that year, the 80 and 90 thousand-foot levels had concentration of about 200 and 100 dpm/1000 SCF respectively. In February, the 80,000-foot concentration increased threefold and the 90,000 foot value increased by an

order of magnitude. The concentrations remained high for several months thereafter. Short-lived isotopes and, in particular, Mn-54, a tracer for 1961 USSR debris (U. S. Atomic Energy Commission, 1963), indicated that the increased Sr-90 in all probability originated in the 1961 U.S.S.R. series. This information was used in estimating the Sr-90 content of the stratosphere from 70 to 100 thousand feet; in January 1963 it was assumed that a reservoir of higher Sr-90 concentrations existed poleward of 31°N.

To examine the question of zonal uniformity, cesium-137 concentrations from the lower stratosphere over England (Crooks, 1961) were compared with Sr-90 concentrations over the central United States and Canada at similar latitudes and altitudes. (The Cs-137 values were converted ^{to} Sr-90 concentrations using the formation ratio, 1.7.) No systematic differences were noted, but the comparison was too limited to be conclusive.

There are several other possible sources of error in atmospheric inventory computations in addition to the inadequate quantity of data: the volume of air sampled, the efficiency of collection of the radionuclides, the radiochemical analysis, etc. These errors, individually and cumulatively, are thought to be small in comparison with the uncertainties in utilizing the limited data available to determine the content of the atmosphere. It is believed that the true atmospheric inventory, nine chances out of ten, lies within 50% of the values shown in the tables.

Deposited radionuclides

The basic source of information on the cumulative world-wide Sr-90 deposition is the soil sampling program of the U. S. Atomic Energy Commission and the U. S. Department of Agriculture (Alexander et al, 1961; Hardy et al, 1962). The techniques for utilizing these data to estimate the total global deposition and the uncertainties involved have been discussed by Alexander et al (1961). Briefly, the uncertainties fall into two categories; first, the accuracy with which the soil samples measure the amount of deposited Sr-90; and second, the reliability of reconstructing a world-wide fallout picture from a limited number of points. Uncertainties in the first category can be partially examined by means of replicate sampling and analysis and by comparisons with measurements made by other techniques and is estimated to

be of the order of 10%. Reliable soil sampling can be obtained only from carefully chosen level, open terrain. It is not known to what extent impact on quasi-vertical obstructions can add to the removal of radioactive particulates from the air. While the significance of this removal mechanism remains unclear, it represents a systematic rather than a random error, causing the deposited Sr-90 inventory to be low by an unknown amount.

Much more important in estimating global deposition are the uncertainties arising from the limited number of soil samples, about 100, and the lack of reliable measurements of oceanic fallout. Mean precipitation patterns have been used to interpolate between soil sampling points and it has been assumed that fallout over the oceans is similar, to that over adjacent land areas. There is some evidence (Bowen and Sugihara, 1960) that fallout over the oceans may be higher than that over adjacent land areas, but the issue is by no means resolved. It must be noted that there is even a large uncertainty in oceanic precipitation amounts. Since 70% of the earth is covered by oceans, a systematic underestimate of oceanic fallout can cause a significant underestimate of total deposition, i.e., of the order of a megacurie of Sr-90 or more.

It is estimated that the overall random uncertainty in computing global deposition on the basis of the current number of soil sampling points is about 40% (9 chances out of 10 the true value will be within 40% of the quoted number); the systematic bias cannot be quantitatively estimated but is likely to cause the quoted numbers to be too low.

World-wide soil sampling programs were conducted in mid-1959 and again in mid-1960. To arrive at estimates of global deposition on the other dates shown in Table 1, it was necessary to add the incremental fallout from the monthly precipitation collection network of the AEC Health and Safety Laboratory (U. S. Atomic Energy Commission, 1963). This network consists of 40 pot or ion-exchange collectors in the United States and 93 in other countries. Both the random and systematic uncertainties of the incremental global fallout integrals may be proportionally larger than the soil inventories, but the absolute amounts of the additions are small. Hence this source of error does not play a dominant role in accumulated inventory uncertainties.

To obtain a complete inventory of a radionuclide introduced into the atmosphere, it is also necessary to know the amount deposited locally in the vicinity of the test sites within a day or so of a nuclear detonation. The only significant source of local fallout is the detonation of high-yield devices at or near the surface of the earth. Kiloton-yield devices contribute a negligible fraction of the total local fallout and devices detonated more than a fireball-radius above the surface of the earth create virtually no local fallout. As far as is known, only the United States nuclear tests in the Pacific during the years 1952, 1954, 1956 and 1958 produced a significant amount of local fallout. Direct measurements of this fallout are unavailable as most of it was deposited over the open ocean. Indirect techniques have been used to estimate the fraction of local fallout as a function of the altitude and type of burst, i.e., air, water, barge, land surface, etc. It has been calculated (Glasstone, 1962) that a total of about 3 megacuries of Sr-90 was deposited as local fallout. It is difficult to assess the uncertainty in this calculation, but it is certainly large and if anything, 3 megacuries probably represents an overestimate for the amount of local fallout.

Carbon-14

The C-14 atmospheric concentrations are derived from the analysis of whole air samples collected from aircraft to 70,000 feet and balloons to 100,000 feet (Hagemann et al, 1959). A background or natural C-14 concentration of 71×10^5 atoms/gr. of air has been subtracted to derive the bomb C-14 inventories. The C-14 concentrations must be viewed as preliminary and subject to change. Publication of the full set of data by Hagemann is delayed pending resolution, if possible, of the nature and magnitude of certain corrections. The problem lies in contamination, fractionation and absorption of the $C^{14}O_2$ during collection and transfer in the field and discussion of this aspect is beyond the scope of this paper. Despite this, it can be stated that individual concentrations, particularly those from stratospheric aircraft samples, are probably in error by less than about 5% so that, once again, it is the integration of a global content from limited data which controls the final error. The C-14 atmospheric inventories, nine chances out of ten, also lies

within 50% of the values given in the table.

III. Production of radionuclides

The inventory of radionuclides will be compared with the estimated production of the particular isotope. As with the other phases of the inventory calculation, uncertainties also exist in production estimates.

Strontium-90

The production of Sr-90 is related to the fission-yield, design and fuel employed in the particular device. In the past, it has been customary to use the arithmetic convenience of assuming the creation of 0.1 megacurie of Sr-90 for each megaton of fission yield. The precise derivation of this figure is undocumented. Hallden et al (1961) have concluded that the best overall estimate for the production of Sr-90 from high-yield tests, based on measured fission product yields obtained by analysis of debris from tests in the megaton yield range, is 0.109 megacurie per megaton of fission. This value varies for different devices, but is the best available overall yield determination and had been used here. It results in a 9% increase in the amount of Sr-90 over that previously reported. It is not considered likely that errors resulting from the conversion of fission energy to Sr-90 activity are significant in the context of this paper.

A more important uncertainty arises in the estimation of the fission yield and the total yield introduced into the atmosphere. The only available estimates are those provided by ^{the}U. S. Government (Federal Radiation Council, 1963). While it may be assumed that information on United States testing is reliably known, much of the Sr-90 in the atmosphere originated from other than United States testing.

Another radioisotope of strontium, Sr-89 with a 50.5-day half-life, has been used to date debris by means of the Sr-89 and Sr-90 ratio. Again using the results of Hallden et al, it has been assumed that for large devices the activity ratio of Sr-89 to Sr-90 is 146 at time of formation.

Tungsten-185

Two tungsten isotopes, W-185 and W-181 were produced in relatively large

quantities during the 1958 U. S. Pacific test series, although small quantities may have been produced in other test series. The total production of W-185 was 225 megacuries (Martell and Drevinsky, 1960) corrected to August 15, 1958. The amount available for world-wide distribution is estimated to be 53 megacuries (Stebbins, 1961). Because of uncertainties concerning total production and, more important, the amount in the local fallout (these were surface bursts), this must be viewed as a rough "best guess" of the amount available for global distribution.

Rhodium-102

Rhodium-102 was introduced into the high atmosphere by a rocket-borne megaton range device detonated at about 40 km on August 12, 1958. The nature of the burst precluded precise measurements of the amount of Rh-102 produced. It is estimated that about 3 megacuries resulted from this event (Kalkstein, 1962). Lesser amounts, about 0.3 megacuries in all, resulted from other low altitude tests in the 1958 Pacific test series and a significant fraction of this was contained in the local fallout.

Carbon-14

Carbon-14 is produced by the interaction of bomb-produced neutrons and atmospheric nitrogen. Machta (1959) has stated that each megaton of total nuclear energy (fission plus fusion) produce $2 \pm 1 \times 10^{26}$ C-14 atoms if detonated in the free atmosphere. Surface bursts produce half this number of C-14 atoms per megaton because of the absorption of neutrons by the ground or water.

IV. Results

Total Strontium-90

Global inventories of Sr-90 for several times between 1960 and 1963 appear in Table 1, together with estimates of the total amount of this radionuclide injected into the atmosphere. Atmospheric content, world-wide deposition and an estimate of the Sr-90 deposited locally in the vicinity of test-sites has been included in the inventory. All data have been corrected for radioactive decay to the indicated dates.

The atmospheric content is shown separately for the troposphere and the stratosphere and the latter is further sub-divided into Northern and Southern Hemisphere values for the altitude range from the tropopause to 70,000 feet, and 70-100,000 feet, the region of operational balloon sampling.

The last significant injection of Sr-90 into the atmosphere prior to the period covered by Table 1 occurred in late 1958 and large-scale atmospheric testing was not resumed until September 1961. The first two dates shown, May 1960 and May 1961, are therefore representative of a quiescent period and the gradients of Sr-90 in the several regions of atmosphere would be expected to be less marked than during periods immediately following new injections. As can be seen, the content of each hemisphere does not differ significantly from the other during the 1960-61 period nor does the amount in the lower stratosphere, the layer below 70,000 ft, change with time. The layer between 70,000 and 100,000 feet decreases to almost half of the May 1960 value in May 1961.

The April 1962 inventory reflects the additions resulting from the fall 1961 Soviet test series. It is estimated that this series injected 2.7 megacuries of Sr-90 into the stratosphere. By April 1962 the tropospheric content increased fivefold, as did that of the lower stratosphere of the Northern Hemisphere. The decrease in the 70,000 - 100,000 foot layer of the Northern Hemisphere observed from May 1960 to May 1961 ceased. An examination of the shorter-lived isotopes in this region in April 1962 indicates the presence of fresh debris. The stratospheric content of the Southern Hemisphere continued to decrease from May 1961 to April 1962. That virtually no Soviet 1961 Sr-90 entered this region by April 1962, is also verified by measurements of short-lived isotopes.

Between April 1962 and January 1963, it is estimated that the United States injected 1.2 megacuries of Sr-90 into the tropical stratosphere and the U.S.S.R. injected 6.5 megacuries into the polar stratosphere of the Northern Hemisphere. These injections are reflected by increases in concentration in all parts of the atmosphere. The January 1963 troposphere and Southern Hemisphere stratosphere contained twice as much Sr-90 as in April 1962. The Southern Hemisphere increase is primarily the result of U. S. testing. The Northern Hemisphere stratosphere increased by a factor of almost five, mainly due to U.S.S.R. testing.

In January 1963, 90% of the observable atmospheric Sr-90 was contained in the Northern Hemisphere stratosphere and this reservoir constituted one-third of all the existing Sr-90.

The world-wide deposition shown in Table 1 indicates that for the period from May 1960 to May 1961 the radioactive decay of the deposited Sr-90 more than balanced the deposition rate. Significant additional Sr-90 fell out from May 1961 to April 1962 and from April 1962 to January 1963. A breakdown by hemispheres reveals that three-quarters of the first increase and five-sixths of the April 1962 to January 1963 deposition occurred in the Northern Hemisphere, a direct result of the preponderance of testing in the polar latitudes of that hemisphere.

The sum of the megacuries of Sr-90 in the atmosphere below 100,000 feet, the world-wide deposition and the estimated local fallout may be compared with the Sr-90 assumed to result from all nuclear testing in the last two lines of Table 1. Considering all the uncertainties in each number the agreement appears to be quite good in May 1960 and May 1961. The somewhat poorer agreement in 1962 and 1963 may result from the unmeasured storage of Sr-90 above 100,000 feet.

USSR Strontium-90

The USSR conducted high yield atmospheric nuclear tests during the fall of 1958, 1961 and 1962. In so far as can be determined the tests resulted in no significant local fallout. It is of considerable interest to inventory these injections. The basis for assigning a fraction of the total Sr-90 to a given test series lies in the dating of debris from the ratio of Sr-89 to Sr-90. This technique involves several assumptions, permitting calculation of both "maximum" and "minimum" USSR contributions to the total amount of Sr-90. For the maximum contribution, it was assumed that Sr-89 activity derives only from the USSR sources. For the minimum contribution it was assumed that the Sr-89 activity for the USSR fall 1958 inventory computation was a mixture of U. S. Pacific debris with a mean formation date of June 15, 1958 and USSR debris with a mean date of October 15, 1958. Similarly, the Sr-89 activity for the USSR fall 1962 inventory was assumed a mixture of U. S. Pacific debris with a mean date of June 15, 1962 and USSR debris with

mean date of October 15, 1962. In the case of the 1961 series, a single USSR source of Sr-89 having a mean formation date of October 20, 1962 was used.

Sr-89 to Sr-90 ratios in aircraft, balloon and deposition samples suggest that no significant amount of USSR debris entered the Southern Hemisphere up to a year following any of the three series.

The USSR inventories given in Table II are the average contributions defined as the arithmetic mean of the maximum and minimum calculations. It had been suggested that the 1958 fall USSR nuclear clouds probably did not rise to over 70,000 feet (Friend and Feely, 1961). However, in 1961 and 1962, there were several unusually large detonations whose nuclear clouds in all probability rose to well over 70,000 feet.

It is difficult to account for the poor agreement between the total observed Sr-90 that can be attributed to USSR sources and the amounts assumed to have been produced on the basis of U. S. Government announcements. The average values for 1958 and 1962 are within 15% of the calculated maximum or minimum values. In the case of the 1961 and 1962 series part of the discrepancy is undoubtedly due to the presence of debris above 70,000 feet.

Tungsten-185

Tracers, both natural or man-made, which can be followed for months or years, represent a valuable tool in our quest for a better understanding of the atmosphere. Prior to the test moratorium of 1959, two unique radioactive tracers, radiotungsten and rhodium-102, were injected into the atmosphere by nuclear testing. The only significant source of radiotungsten in the atmosphere from 1958-1960 derived from several nuclear tests of the 1958 U. S. Pacific series. These tests produced clouds whose tops rose to between 60-80,000 feet, thus providing a source of tracer material in the lower equatorial stratosphere.

Table III lists the W-185 global inventory as of May 1959. The lower stratosphere (tropopause to 70,000 feet) contained about 22 megacuries of which two-thirds was in the Northern Hemisphere even though the injection occurred near the equator (11°N). The amount of W-185 deposited on the ground for the period August 1958 through May 1959 exhibits a similar 2 to 1 partitioning between hemispheres. The total observed W-185 inventory to 70,000

feet is estimated as 58 megacuries. If one assumes a linear decrease of W-185 concentration with pressure above 70,000 feet, the stratospheric inventory as of May 1959 would be increased by only about 20%, about four megacuries. Since a substantial portion of the estimated 225 megacuries of W-185 produced was contained in the local fallout, a comparison between the global inventory and the theoretical production cannot be undertaken.

The time sequence for the W-185 content of the lower stratosphere appears in Figure 4. It provides some insight concerning the removal rates of W-185 from the stratosphere of each hemisphere. The exponential decrease of the Northern Hemisphere W-185 content corresponds to a half-time of about 5 months while that for the Southern Hemisphere, about 14 months during the interval May 1959 to May 1960. On May 1959 the Northern Hemisphere stratospheric W-185 concentrations exceeded those in the Southern Hemisphere by about a factor of two. It is therefore reasonable to expect an exchange through the equatorial stratosphere toward the Southern Hemisphere. This additional loss from the Northern Hemisphere decreases the residence time of that hemisphere. Similarly, the apparent residence time in the Southern Hemisphere stratosphere would be increased. This average residence time of 7 months agrees well with that found from May 1960 to November 1960 in both hemispheres. However, the W-185 data becomes increasingly more doubtful with time due to the low levels of activity present so that the 1960 points become very uncertain.

Rhodium-102

The only significant source of Rh-102 in the atmosphere resulted from the rocket detonation on August 12, 1958 at Johnston Island (17°N) into the high sub-tropical stratosphere.

The global inventory for this nuclide, as of May 1961 appears in Table 4. The global stratospheric inventory (to 70,000 feet), and tropospheric content are based mainly on the data reported by Kalkstein (1962). Balloon samples at approximately 30 and 45°N indicated that the stratospheric layer from 70,000 to 100,000 feet had an average Rh-102 concentration of approximately 200 d/m/1000 SCF during May and November 1960. It was therefore assumed that this concentration

prevailed in May 1961 for the entire atmosphere between 70-100,000 feet. The deposition is based on the work of Walton (1962), who assumed that Rh-102 deposition was comparable in its geographical distribution to the Sr-90 deposition. The measurement of Rh-102 in Westwood, N. J. precipitation fixes the world-wide deposition.

The total observed budget of Rh-102 is 3-fold smaller than what has been estimated to have been injected into the atmosphere. The uncertainties in the production together with the amount residing above 100,000 feet as of May 1961 can easily account for this discrepancy.

A time sequence of the Rh-102 content of the lower stratosphere of each hemisphere appears in Figure 5. It is evident that the Johnston Island rocket injection^{of} Rh-102 partitioned more or less equally between hemispheres during 1960-1961. It was apparent from extensive aircraft sampling that the first major increase in Rh-102 concentrations at approximately 70,000 feet began in late 1959, over a year following the injection. The concentration reached a maximum in the early part of 1960, and then remained about constant through 1961. The highest Rh-102 concentrations were found in the polar regions at the highest observed altitudes. Although the findings of the Rh-102 experiment were helpful in deducing possible behaviors of the atmosphere, there is not as yet universal agreement on how this tracer moved from its great height at 17°N to appear in maximum concentrations over the polar regions below 70,000 feet and to have been partitioned equally between hemispheres.

Carbon-14

The C-14 produced by nuclear testing either remains air borne or exchanges with the carbon reservoir of the oceans, humus and biosphere. Of the latter, oceanic uptake represents the prime removal from the atmosphere. Bomb C-14 is assumed to be present only as $C^{14}O_2$ in the atmosphere; the molecular state in which it is sought.

Table 5 lists inventories of bomb excess C-14 as measured in the atmosphere to 100,000 feet. The oceanic content is computed on the assumption of an uptake of about 20% per year of the tropospheric C-14 content accumulated to the fiducial date. The slight increase in the atmosphere from November 1960

to early 1961 reflects measurement uncertainties and possible intrusion of C-14 from high altitude tests from above. On the other hand, the increment from 1961 to 1963 stems from the large scale testing in that period. It is noted that the November 1960 and May-June 1961 observed and produced C-14 agree well but the observed increased to 1963 falls short of that computed from the energy yields. In part, the discrepancy in 1963 must be attributed, as was the case for the Sr-90, to inadequate sampling at high altitudes in the Northern Hemisphere.

Cesium-137

It is possible to estimate the inventories of Cs-137 by multiplying the Sr-90 inventories by 1.7, the assumed ratio of activity of Cs-137 to Sr-90 at formation time. Since the half-lives are roughly the same, the ratio will remain virtually constant with time.

Tritium

Hagemann et al (1959) have shown that the atom ratio of tritium to C-14 in the stratosphere in 1957-1958 was 0.4. Statistically, this number is on weak grounds and its extrapolation to other time period must be viewed with even greater suspicion. Thus, an approach to finding a tritium inventory from nuclear tests might be through applying this factor to the C-14 content. The result may not be correct to within an order of magnitude. The distribution of the tritium will be different than the C-14. The bulk of the latter resides in the troposphere, while almost all of the tritium which passed into the troposphere has been washed out.

V. Conclusions

Although our knowledge of the amounts of a particular radionuclide observed or produced is very imperfect, it is these numbers that must serve as a basis for prediction. If fewer data are available in the Southern Hemisphere than in the Northern, it follows that predictions of the deposition will be more uncertain there, other things being equal. The absence of data above 100,000 feet makes assessment of the atmospheric burden in this region difficult, but it has been observed that nuclides injected at these altitudes

do eventually enter man's environment. The Rh-102 experiment has yielded invaluable data for ascertaining the mode and rate at which the exchange between the high and lower atmosphere takes place. Further evidence will come from the cadmium-109 high-altitude injection made from Johnston Island in 1962 and from the manganese-54, iron-55 and other tracers supposedly associated with the 1961 USSR debris.

Acknowledgement

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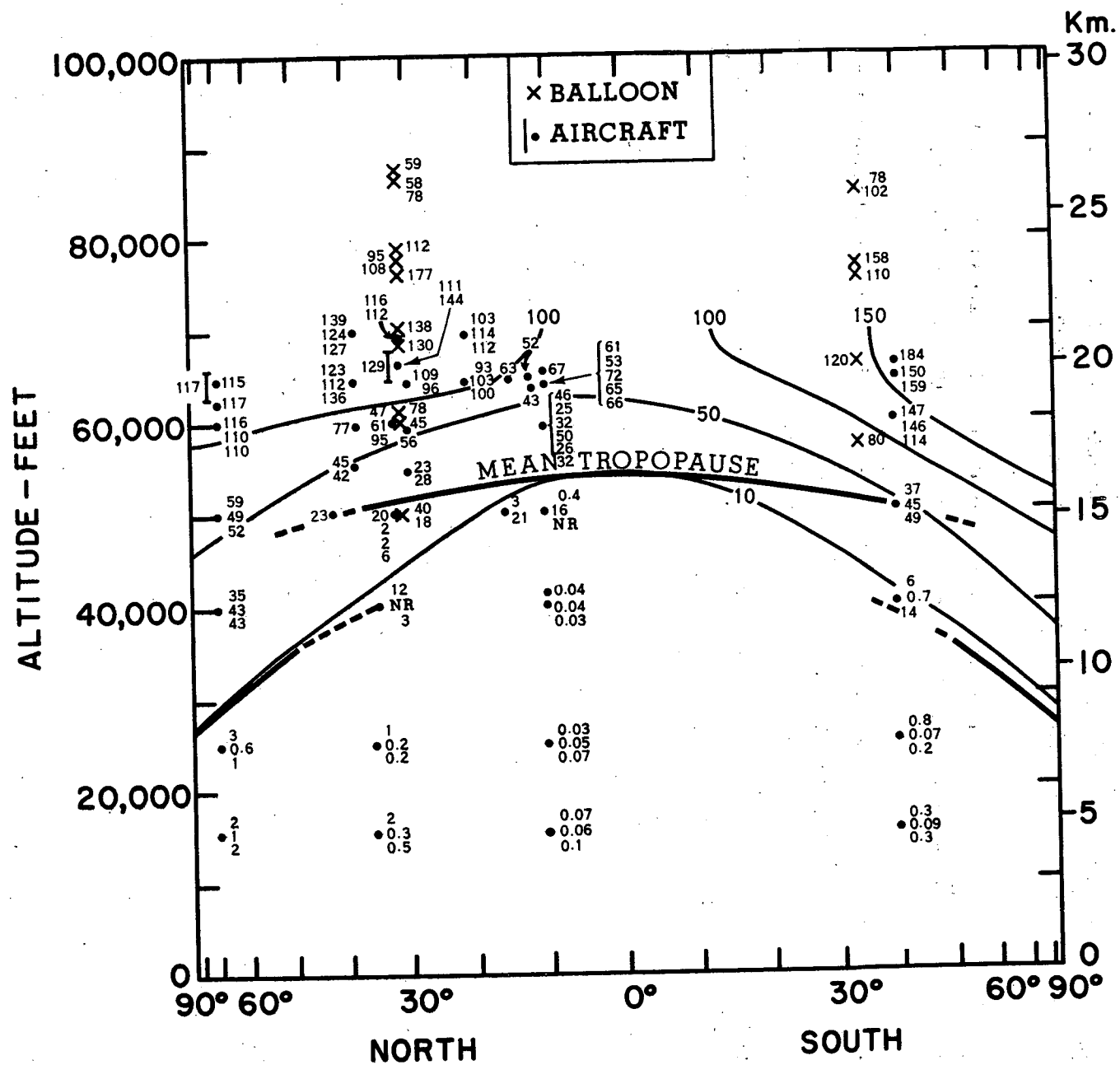
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FIGURES

- Fig. 1 Strontium-90 concentration as a function of latitude and altitude, May-July 1961 (dpm per 1000 standard cubic feet of air).
- Fig. 2 Strontium-90 concentration as a function of latitude and altitude based on limited data, April 1962 (dpm per 1000 scf).
- Fig. 3 Strontium-90 concentration as a function of latitude and altitude based on all available data, March-April 1962 (dpm/1000 scf).
- Fig. 4 Time history of the tungsten-185 content of the lower stratosphere (to 70,000 feet).
- Fig. 5 Time history of the rhodium-102 content of the lower stratosphere (to 70,000 feet).



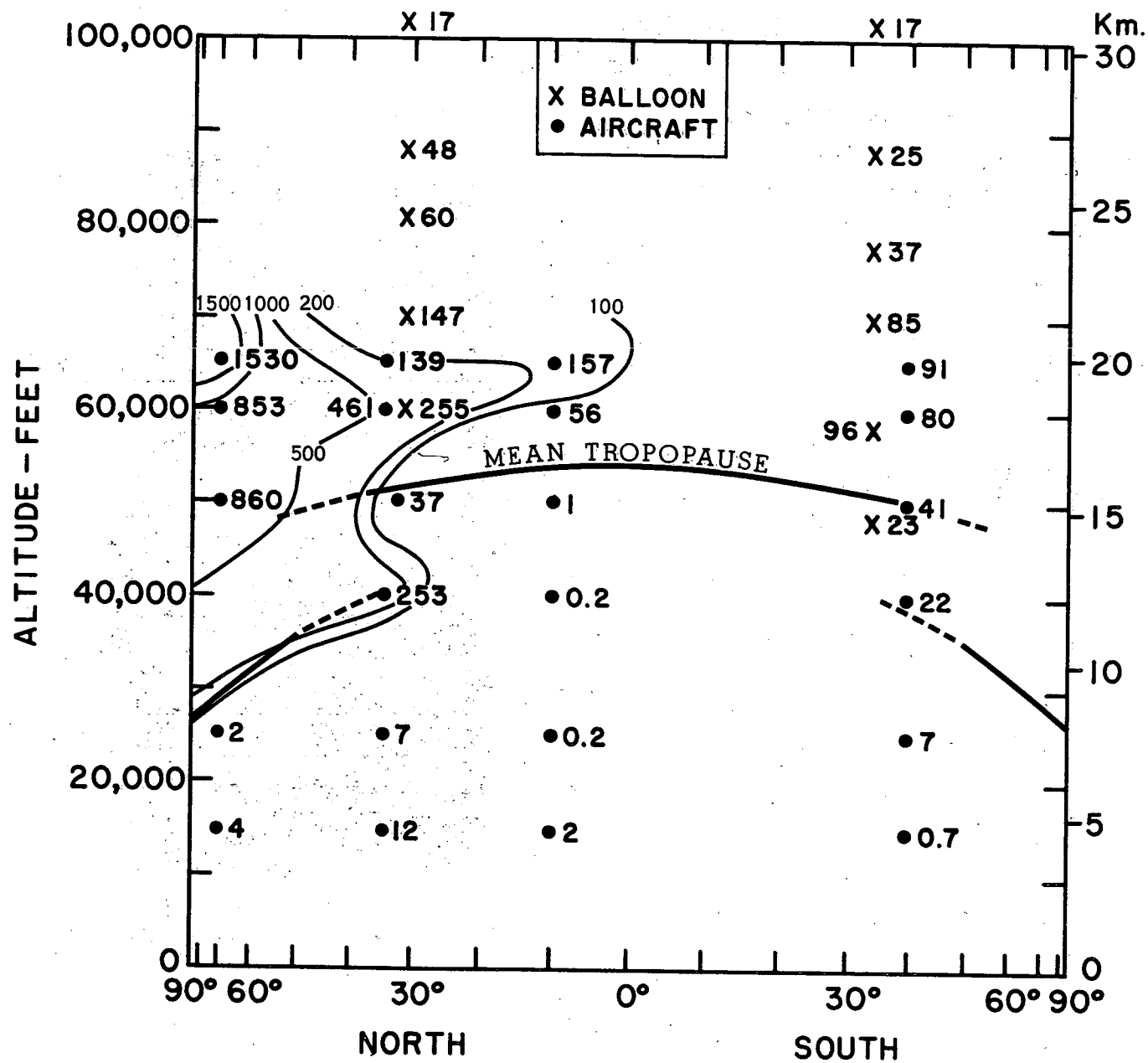


Figure 2

SR-90 d/m/1000 scf
APRIL 1962

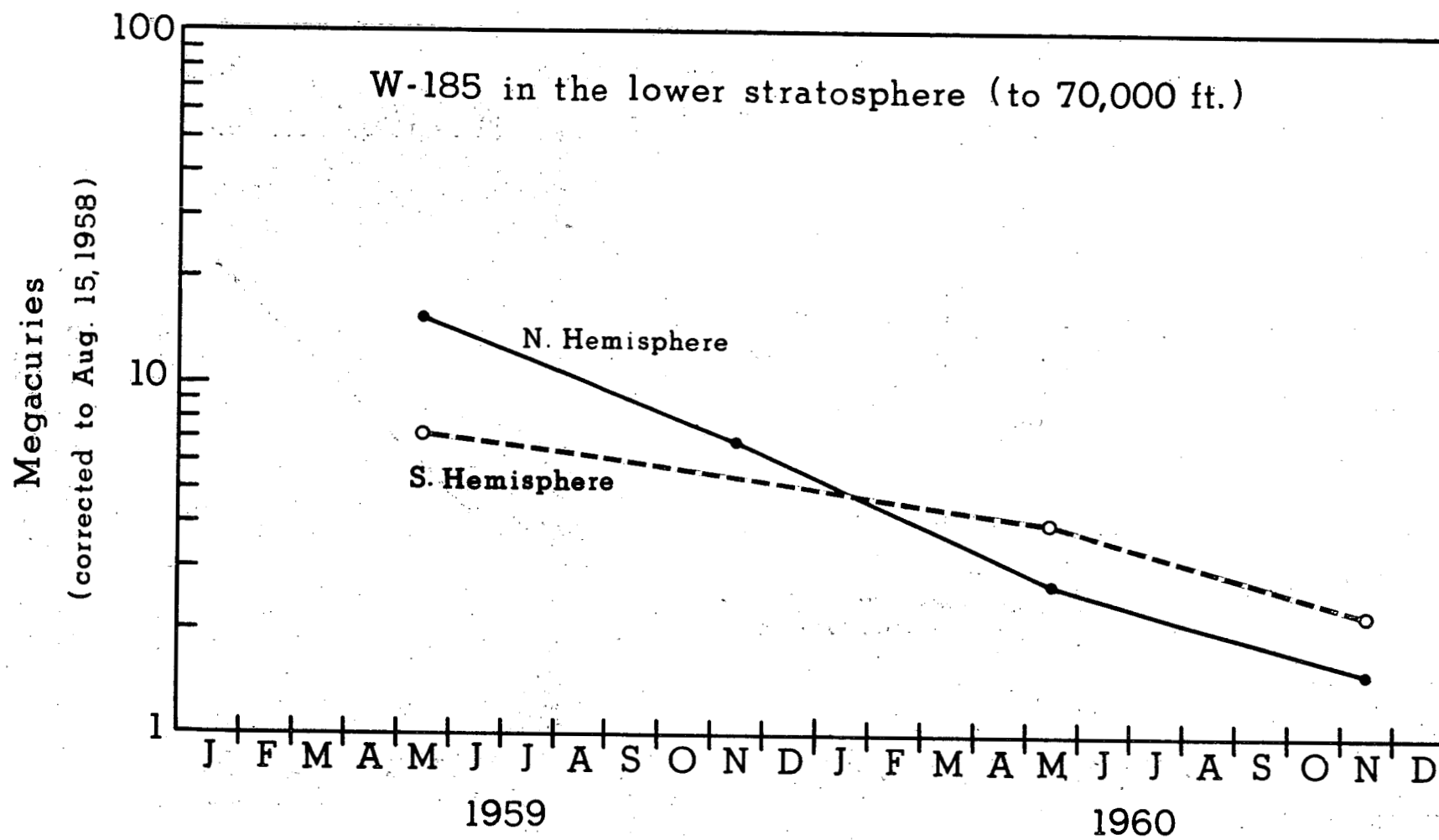


Figure 4

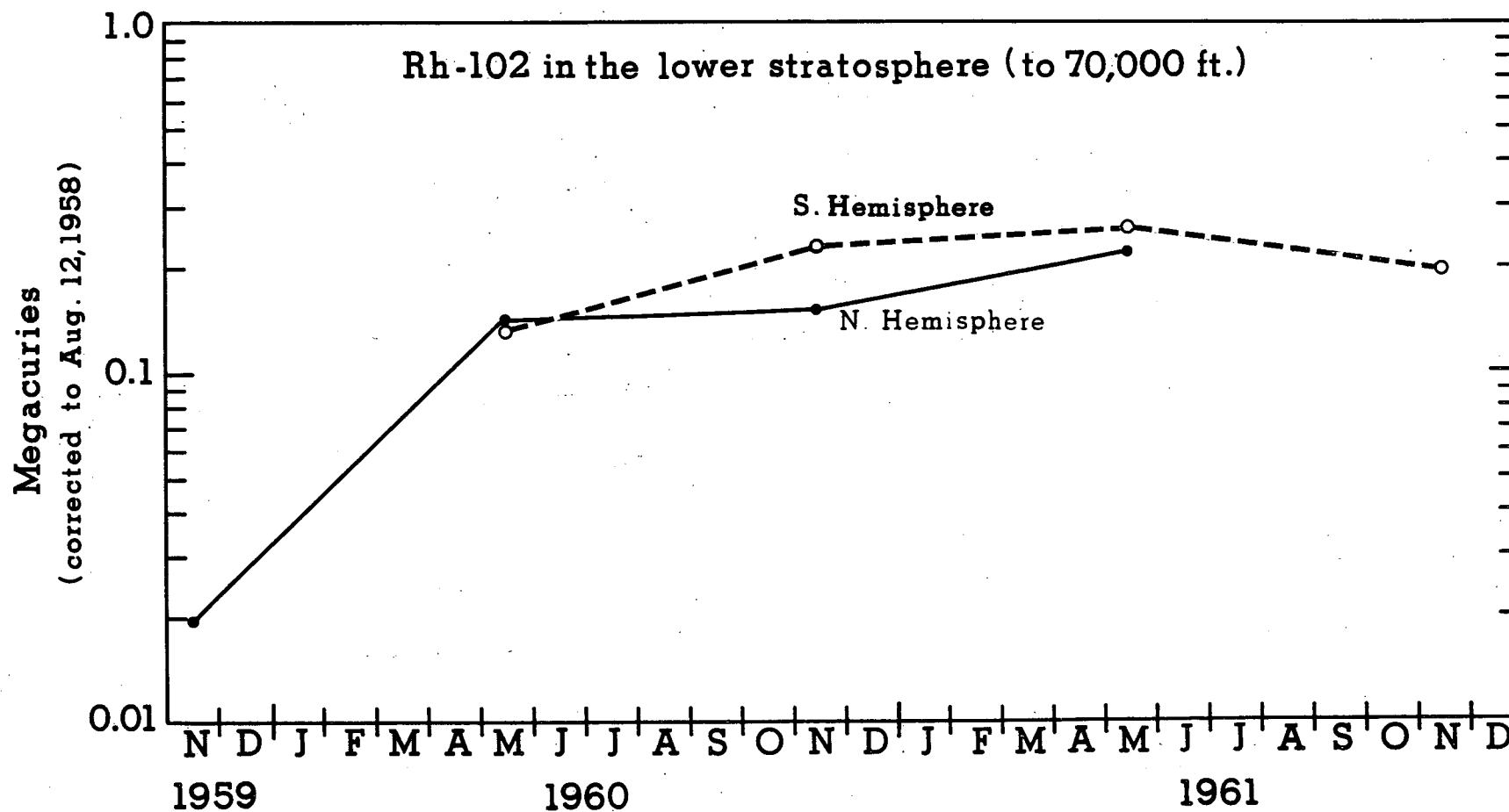


Figure 5

GLOBAL SR-90 INVENTORY (megacuries)

	MAY 1960	MAY 1961	APRIL 1962	JAN. 1963
STRATOSPHERE				
N. Hemisphere to 70,000 ft.	0.25	0.22	1.11	4.51
70-100,000 ft.	0.25	0.12	0.13	1.21
S. Hemisphere to 70,000 ft.	0.25	0.26	0.21	0.42
70-100,000 ft.	0.19	0.12	0.05	0.10
TROPOSPHERE	0.03	0.03	0.16	0.32
Total in atmosphere to 100,000 ft.	1.0	0.8	1.7	6.6
World-wide deposition	4.3	4.2	4.9	5.8
Estimated local fallout	2.6	2.5	2.5	2.4
TOTAL	7.9	7.5	9.1	14.8
CUMULATIVE PRODUCTION	8.8	8.5	11.1	19.1

Table I

ESTIMATES OF N. HEMISPHERE SR-90 INVENTORY

From USSR fall 1958, 1961, 1962 test series

(megacuries)

SERIES	1958	1961	1962
FIDUCIAL DATE	DEC. 1959	APRIL 1962	JAN. 1963
STRATOSPHERE TO 70,000 FT.	0.1	1.0	3.2
TROPOSPHERE	~0	0.1	0.2
DEPOSITION ON GROUND	0.7	0.6	0.2
<i>TOTAL</i>	<i>0.8</i>	<i>1.7</i>	<i>3.6</i>
<i>INJECTED INTO ATMOSPHERE</i>	<i>1.4-1.6</i>	<i>2.7</i>	<i>6.5</i>

Table 2

GLOBAL W-185 INVENTORY MAY 1959
(megacuries—corrected for decay to Aug. 15, 1958)

	N. Hemisphere	S. Hemisphere	<i>Total</i>
STRATOSPHERE TO 70,000 FT.	15	7	<i>22</i>
DEPOSITION	23	12	<i>36</i>
<i>TOTAL OBSERVED</i>			<i>58</i>
<i>TOTAL PRODUCED</i>			<i>225</i>

Table 3

GLOBAL Rh-102 INVENTORY MAY 1961
(megacuries-corrected for decay to Aug. 12, 1958)

ATMOSPHERE

STRATOSPHERE

TO 70,000 FT. 0.48

70-100,000 FT. ~ 0.5

(estimated)

TROPOSPHERE 0.05

TOTAL IN ATMOSPHERE ~1
TO 100,000 FT.

ESTIMATED DEPOSITION ~0.02

***TOTAL* ~1**

INJECTED INTO STRATOSPHERE ~3
(ABOVE 100,000 FT.)

GLOBAL EXCESS C-14 INVENTORY

(10^{27} Atoms)

PRELIMINARY

STRATOSPHERE

N. Hemisphere

to 70,000 ft.

2.3

2.7

15.7

70-100,000 ft.

1.2

1.7

6.0

S. Hemisphere

to 70,000 ft.

2.0

2.2

2.8

70-100,000 ft.

0.9

1.5

1.3

TROPOSPHERE

10.5

11.8

24.5

Total in atmosphere

to 100,000 ft.

16.9

19.9

50.3

Oceanic up-take

5.1

6.2

12.1

Total

22.0

26.1

62.4

Cumulative
production

24.3

24.3

91.7

Table 5

GLOBAL ATMOSPHERIC RADIOACTIVITY

NOVEMBER 1961 and APRIL 1962

Introduction

In November 1961 and again in April 1962, USAF aircraft were deployed to make a series of vertical profiles of particulate radioactivity in the atmosphere. In November 1961 these were made in the vicinity of latitude 40°S (Table I). In April 1962 the aircraft sampling was conducted in the vicinity of four latitudes: 70°N, 35°N, 10°N and 40°S (Table II). Altitudes sampled were 15,000 feet, 25,000 feet, 40,000 feet, 50,000 feet, 60,000 feet, and a layer near 65,000 feet. B-57 aircraft were used for the lower altitudes, U-2 aircraft for the upper. Radiochemical analysis was by a government laboratory.

These data were collected as part of a cooperative effort by the U. S. Department of Defense, Atomic Energy Commission and Weather Bureau, and are a continuation of similar sampling programs conducted in the past by the Department of Defense. (1,2)

Data

A summary of the data collected is given in the tables.

Date	Day (GCT) on which the filter was extracted from the aircraft, immediately after landing.
Latitude Longitude	Region of flight to nearest whole degree.
Aircraft Type	B-57 aircraft were equipped with wing-tip filter tanks having an exposed filter area of 1.75 square feet. U-2 aircraft used hatch samplers with a filter area of 1.38 square feet.

Altitude Pressure altitude at which sampling was performed.

Exposure Time period (minutes) over which the sample was collected.

Volume Reported in units of 1000 standard cubic feet (SCF) of air, computed at 1,013 mb, and 59°F. 1000 SCF = 34.6 kg of air.

Tropopause Height Height of tropopause as reported by a nearby radiosonde station.

Isotopic Data All data are reported in units of disintegrations per minute per 1000 SCF. All radioactivity data were corrected to day of extraction of the filter with the exception of Rh-102 which was corrected to August 12, 1958. The following constants were used:

<u>Isotope</u>	<u>Half-Life Days</u>	<u>Decay Constant Days⁻¹</u>
Be-7	53.0	0.0131
Mn-54	309	0.00224
Fe-55	1073	0.000646
Sr-89	53.0	0.0131
Sr-90	10104	0.0000686
Zr-95	63.6	0.0109
Rh-102	210	0.00330
Sb-124	60.8	0.0114
Cs-137	9708	0.0000714
Ba-140	12.8	0.0542
Ce-141	32.5	0.0213
Ce-144	282	0.00246

Unless otherwise indicated, the precision of the radiochemical analysis is within 3%. Standard errors in the analysis greater than 3% are indicated by a lower case letter following the value in accordance with the following code:

- a 3-10%
- b 11-20%
- c 21-40%
- d 41-100%
- e > 100%

LIA

indicates the isotope was lost in the radio-chemical analysis.

N.R.

indicates the isotope was not detected in resolvable amounts.

ACKNOWLEDGMENTS

This program would not have been possible without the cooperation of the Government of Australia.

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TABLE I

ATMOSPHERIC RADIOACTIVITY DATA, NOVEMBER 1961

(40°S - 147°E)

Date 1961	Nov. 7	Nov. 16	Nov. 22	Nov. 7	Nov. 16	Nov. 22
Altitude (Ft.)	15,000	15,000	15,000	25,000	25,000	25,000
Aircraft Type	B-57	B-57	B-57	B-57	B-57	B-57
Exposure (Minutes)	125	124	120	130	120	130
Volume (1000 SCF)	448	449	431	392	363	398
Tropopause (Ht., Ft.)	38,000	32,000	35,000	38,000	32,000	35,000
Isotope						
Be-7	NR	22.6	< 3	39.5	26.8	14.4
Sr-89	NR	NR	NR	NR	NR	NR
Sr-90	0.708a	0.604	0.107a	1.40	0.705a	0.325a
Zr-95	NR	0.075a	0.090c	NR	0.187a	0.298
Rh-102	NR	5.77	NR	NR	1.21c	4.19a
Cs-137	0.975	0.831	0.135	2.21	0.925	0.437
Ba-140	NR	NR	0.328a	NR	NR	NR
Ce-141	NR	NR	< 0.9	NR	NR	0.130e
Ce-144	1.01b	0.951	0.156c	3.32a	1.22	0.636
Date 1961	Nov. 7	Nov. 16	Nov. 22	Nov. 7	Nov. 16	Nov. 22
Altitude (Ft.)	40,000	40,000	40,000	50,000	50,000	50,000
Aircraft Type	B-57	B-57	B-57	U-2	U-2	U-2
Exposure (Minutes)	130	120	123	108	210	235
Volume (1000 SCF)	250	229	232	89	174	195
Tropopause (Ht., Ft.)	38,000	32,000	35,000	38,000	32,000	35,000
Isotope						
Be-7	382b	104	313	492	317	203a
Sr-89	NR	0.846	NR	NR	0.582e	17.7a
Sr-90	33.4	2.64	14.3	34.5	19.3	11.0a
Zr-95	NR	3.92	3.32	NR	7.51	29.3
Rh-102	106b	7.42a	40.8a	93.0b	23.6a	21.8
Cs-137	45.0	4.04	23.6	LIA	29.7	17.9
Ba-140	NR	0.602d	NR	NR	NR	85.4a
Ce-141	NR	0.207d	NR	NR	77.3b	26.5
Ce-144	59.4a	5.72a	25.5	68.4a	32.4	28.9
Date 1961	Nov. 7	Nov. 16	Nov. 22	Nov. 7	Nov. 16	Nov. 22
Altitude (Ft.)	60,000	20,000	20,000	63,000	65,000	64,000
Aircraft Type	U-2	U-2	U-2	U-2	U-2	U-2
Exposure (Minutes)	136	272	258	177	338	324
Volume (1000 SCF)	63	126	119	60	112	107
Tropopause (Ht., Ft.)	38,000	32,000	35,000	38,000	32,000	35,000
Isotope						
Be-7	718a	615	630a	NR	586	711
Sr-89	NR	NR	NR	NR	NR	NR
Sr-90	110	89.8	88.4	134	94.7	110
Zr-95	NR	NR	0.706a	NR	NR	0.609a
Rh-102	254a	194	155	27.0a	197	193
Cs-137	177a	154	144	186a	161a	188
Ba-140	NR	NR	NR	NR	NR	NR
Ce-141	NR	NR	NR	NR	NR	NR
Ce-144	190a	152	193a	216b	190a	198

TABLE II

ATMOSPHERIC RADIOACTIVITY DATA - APRIL 1962

	70°N - 144°W (April 5)						34°N - 105°W (April 5)			32°N - 105°W (April 5)		
Altitude	15,000	25,000	40,000	50,000	60,000	66,000	15,000	25,000	40,000	50,000	60,000	66,000
Aircraft Type	B-57	B-57	B-57	U-2	U-2	U-2	B-57	B-57	B-57	U-2	U-2	U-2
Exposure (Minutes)	120	120	120	193	152	158	120	121	132	188	126	172
Volume (1000 SCF)	263	203	189	157	76	51	434	360	252	153	58	51
Trop. (Ht., Ft.)	32,000	32,000	32,000	32,000	32,000	32,000	37,000	37,000	37,000	33,000	33,000	33,000
Isotope												
Be-7	30.9	17.3a	LIA	1,036	1,518	3,227	33.5	26.7	544	183	804	927
Mn-54	LIA	LIA	LIA	LIA	LIA	LIA	LIA	LIA	LIA	62.6b	2,011a	1,921a
Fe-55	LIA	513e	LIA	5,986	49,610	196,390	22.3a	9.59	582	128	7,339	9,635a
Sr-89	62.4	33.8	LIA	12,106	14,936	25,029	109	73.0	2,786	454	3,649	1,122
Sr-90	4.23b	2.04	LIA	880a	873a	1,566	12.1a	6.82a	259a	37.8a	472	143a
Zr-95	161	79.0	LIA	26,852	30,069	50,720	291	171	7,430	790	8,307	2,211
Rh-102	42.8	4.97d	LIA	149	433a	371	43.1a	24.7	236	185	6,206a	2,473
Sb-124	1.57a	0.820a	LIA	1,572	18,602	74,670	2.66	1.61	128	30.3b	12,314	1,847
Cs-137	8.15	4.06	LIA	1,298	1,534	2,103	14.5	7.90	345	44.7	447	237a
Ce-141	45.1c	51.9c	LIA	7,898b	9,900	15,862b	NR	53.0b	1,947a	227a	2,171a	372
Ce-144	135	67.6	LIA	21,578	24,154	37,859	275	143	6,464	676	6,901	1,944

	10°N - 145°E (April 6)						8°N - 80°W (April 6)			40°S - 148°E (April 4)		
Altitude	15,000	25,000	40,000	50,000	60,000	65,000	15,000	25,000	40,000	50,000	60,000	66,000
Aircraft Type	B-57	B-57	B-57	U-2	U-2	U-2	B-57	B-57	B-57	U-2	U-2	U-2
Exposure (Minutes)	120	120	120	144	122	150	120	120	120	131	145	150
Volume (1000 SCF)	485	315	197	115	56	48	431	336	229	98.0	66	43
Trop. (Ht., Ft.)	58,000	58,000	58,000	54,000	54,000	54,000	25,000	25,000	25,000	25,000	25,000	25,000
Isotope												
Be-7	15.4	5.68b	NR	60.3b	246	297b	19.7a	188	524	701	927	1,000
Mn-54	LIA	LIA	LIA	NR	LIA	108	LIA	LIA	LIA	LIA	LIA	NR
Fe-55	6.72a	NR	NR	NR	157	328a	1.63b	NR	NR	27.7b	47.6	NR
Sr-89	33.3	1.50a	199a	14.2b	375	866	0.0711e	0.972c	9.55b	14.3b	4.23e	NR
Sr-90	2.21a	0.163b	0.179b	1.31d	56.9a	160a	0.698a	6.73	22.3	41.9	81.8	93.1a
Zr-95	72.5	7.31	7.90	54.4	878	1,960	0.240a	2.94	27.3	39.0	0.983b	3.26a
Rh-102	30.7	14.7a	14.9c	34.1b	84.0a	115a	4.47a	33.9	47.2	155a	221	314
Sb-124	0.669	0.069b	0.107b	0.616a	30.7	11.4	0.078c	0.388a	1.32a	2.37a	4.39a	5.97a
Cs-137	3.86	0.185a	0.297a	1.80	75.7	179	1.21	10.7	36.6	62.7	139	175
Ce-141	25.1c	NR	NR	4.88a	275b	NR	NR	NR	NR	NR	NR	NR
Ce-144	61.2	5.73	5.39	25.3	846	1,905	1.06a	10.9	52.5	73.4	110	139

B-57 Air Sampling in Southwestern United States-
February and March 1961*

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United States Weather Bureau
Washington, D. C.
December 1963

Introduction

The United States Weather Bureau directed an air sampling program during February and March of 1961 to investigate exchange processes through the tropopause using radioactive isotopes as tracers. The operation was carried out at Kirtland Air Force Base, Albuquerque, New Mexico, with the support of personnel of the 4950th Test Group (Nuclear) and the 4926th Test Squadron (Sampling). B-57 jet aircraft were used to expose 145 filters in wing-tip and bomb-bay sampling tanks at altitudes of 12-48,000 feet over the area shown by the heavy line in figure 1. The number of samples obtained within each state are also indicated.

The 1961 sampling program was a continuation of the program which was undertaken at Albuquerque in the spring of 1960 and was reported by Telegadas and List (1). The 1960 data have been investigated extensively by Danielsen, et. al. (2) and Giles (3). The purpose of this report is to present the collected data for 1961 to all interested persons without waiting for a meteorological interpretation which is planned for some future date.

* The work reported in this paper was supported under contract to the Division of Biology and Medicine, United States Atomic Energy Commission.

Location of samples

Nearly three-fourths of the observations were taken within 150 nautical miles of Albuquerque, New Mexico. Other observations were taken over the area shown in figure 1. Most observations were taken in the vicinity of the tropopause. A break-down of the data by altitudes is given in table 1.

Table 1. Altitudes of Samples taken during 1961 program.

<u>Height</u> <u>(Thsds. of ft.)</u>	<u>Number of</u> <u>samples</u>
12-15	3
16-20	3
21-25	10
26-30	20
31-35	28
36-40	44
41-45	29
46-48	8
Total	145

Sampling Systems

Two sampling devices were used with IPC 1478 filter paper. The characteristics of this paper have been reported in reference (4). Wing-tip type samplers were loaned by the Los Alamos Scientific Laboratory (LASL). Two samplers are carried by each aircraft and can be opened and closed independently in flight. The characteristics of this sampler are discussed in (1). Almost three-fourths of the observations were taken with this device.

The other sampling system employed a bomb-bay exposure device developed by the Bendix Corporation. The filters used in this sampler have an exposed filter area of 1.38 square feet, or about one-third the exposed area of the LASL filters. With an exposure time of thirty minutes per filter, as many as 6 filters were exposed sequentially in flight.

Sampling Procedure

All B-57's were vectored from Kirtland AFB to their predetermined sampling altitudes. The aircraft were usually flown parallel to the wind for 15 minutes,

turned and flown back on a reciprocal course for a total exposure time of 30 minutes. The exposed filters were placed into polyethylene bags and sent to a government laboratory for radiochemical analysis.

Intercomparison of LASL and Bendix Samplers

A discussion of the flow rate through the LASL samplers is contained in reference (1).

In-flight comparisons have shown that the indicated radionuclide concentration of the Bendix system is approximately 15 percent less than the LASL sampler. A least squares analysis of simultaneous Sr-90 observations made by LASL and Bendix sampler-equipped aircraft indicates that the Bendix flow rates should be reduced by 0.85 to make the Bendix observations comparable with the LASL observations. Table 2 shows a comparison of the simultaneous observations with the correction applied to the Bendix sampler observations. A description of the table notations is given in the legend preceding table 6. It is apparent from inspection of the isotopic observations that the two sampling systems are compatible.

Table 2. Intercomparison of LASL and Bendix Samplers (values obtained by Bendix Sampler adjusted by 15 percent). Aircraft flown side-by-side. See explanation of table 6 for tabular notations.

Filter No.	Altitude (10 ³ ft)	Sampler	Isotopes (dpm/1000 SCF)				
			Sr-90	Cs-137	Ce-144	Be-7	Pb-210
213	25.0	LASL	0.67a	1.3	2.5	16.0a	0.15a
419		Bendix	0.66b	0.98	2.4a	9.4d	0.13
214	35.0	LASL	2.5	4.6	8.4	45.5	0.21
420		Bendix	2.4a	4.2	7.7	46.9c	0.27a
215	40.0	LASL	18.0	31.4	65.3	254	0.38
421		Bendix	18.9	32.8	68.6	262	0.41a
236	38.0	LASL	45.8	78.9	163	508a	0.47
438		Bendix	42.2	73.2	156	458	0.43a
240	38.0	LASL	29.6	52.6	109	358	0.46
441		Bendix	30.5	55.9	NR	376a	0.44a
237	42.0	LASL	27.2	46.2	97.5	348	0.42a
439		Bendix	(18.2)	44.4	98.9	378	LIA

Background Contamination

One potential error source in isotope measurements is contamination of the filter paper before it is placed in the aircraft. Five rolls of paper were used during the sampling program and a sheet of unexposed paper from each roll was analyzed for Sr-90 content. The results of the analyses are shown in table 3 as disintegrations per minute over the total paper. An NR indicates that the level of activity was below the resolving capability of the radiochemical analysis technique. It is evident that the background contamination was negligible.

Table 3. Analysis of Blank Filters for Background Contamination
(disintegrations per minute per total paper).

<u>Filter Roll No.</u>	<u>Sr-90</u>
1	6.5
2	2.4
3	NR
4	NR
5	5.3

Leakage Tests

A second potential error source in the measurement of isotope concentrations is leakage of air through the LASL and Bendix filter gates when the filters are unexposed. Tests performed on the LASL samplers in 1960 indicated that leakage was negligible (1). The results of leakage tests performed during the 1961 sampling program are shown in Table 4. Analyses of Sr-90 content indicate that a negligible amount of leakage occurred in both the LASL and Bendix samplers.

Table 4. Leakage Tests of LASL and Bendix Samplers. LASL filter pairs were exposed simultaneously by same aircraft.

<u>Sampler</u>	<u>Filter No.</u>	<u>Gate Position</u>	<u>Altitude (Thsds of ft.)</u>	<u>Sr-90 (dpm/total paper)</u>
Bendix	417	Open	15.0	52
	418	Closed		NR
LASL	215	Open	40.0	2610
	216	Closed		32
LASL	217	Closed	41.0	27
	218	Closed		28
LASL	219	Open	41.0	1770
	220	Closed		36
LASL	298	Closed	42.0	10
	299	Open		162
LASL	300	Closed	40.0	12
	301	Open		208

Isotopic Data

Four nuclear bomb-produced isotopes were analyzed, viz., Sr-90, Cs-137, Ce-144 and Rh-102. All have relatively long half-lives and the last was a unique tracer in the high-altitude Orange detonation of August 12, 1958. All observations of these isotopes were corrected for decay to February 1, 1961.

Three naturally produced isotopes were measured; these were Be-7, Pb-210 and Bi-210. Be-7, a spallation product of cosmic ray bombardment, is produced in the atmosphere at an approximately known rate, dependent upon altitude and geomagnetic latitude (5). All observations of this isotope were corrected to the date the filter paper was exposed.

Pb-210 and Bi-210 are produced as daughter products of radon, a radioactive gas which escapes from the earth's surface. These two isotopes eventually attain equilibrium with each other. The observations were corrected to the chemical separation time of the sample.

The half-lives and decay constants for the isotopes measured are given in Table 5.

Table 5. Half-lives and Decay Constants of Isotopes Measured.

Isotope	Half-life (Days)	Decay Constant (Days ⁻¹)
Sr-90	10104	0.0000686
Cs-137	9708	0.0000714
Ce-144	282	0.00246
Rh-102	210	0.00330
Be-7	53.0	0.0131
Pb-210	8030	0.0000863
Bi-210	5.0	0.139

Accuracy of Radiochemical Analyses

The radiochemical analyses are accurate within 5 percent of their values unless otherwise indicated. The mean Cs-137 to Sr-90 ratio has been computed for the data in Table 6 and is 1.76 ± 0.23 . Figure 2 is a histogram of the results which are in excellent agreement with previous observations reported by Friend (6) and List and Telegadas (7).

Isotope Data

All samples are listed in Table 6, along with pertinent flight data. The following is an explanation of the table:

Filter No.	The LASL filters were numbered serially from 200-399. The Bendix filters were numbered beginning at 400.
Sampler	L indicates a LASL sampler was used. B indicates a Bendix sampler was used.

Date Month and day (GCT) at beginning of sampling period.

Altitude Average altitude of aircraft, thousands of feet. For all sorties the aircraft altimeter was set at 29.2 inches of mercury, thereby recording pressure altitude. The average altitude is considered to be accurate within a few hundred feet.

Latitude The normal sampling course was to fly parallel to
Longitude the wind for approximately 15 minutes, turn and
Time fly the reciprocal course. Given are the latitude, longitude and time (GCT) of the sampling course.

Volume 1000 standard cubic feet (1000 SCF) of air computed at 29.92 inches of mercury pressure and 59°F temperature. (Equivalent to 34.6 kilograms of air).

Gross Count Total gross beta count per minute, about 1-2 weeks after sampling.

Isotopes Units are disintegrations per minute per 1000 standard cubic feet of air.

Sampling Error (appearing after data value):

no letter	0-4%
a	5-10
b	11-20
c	21-40
d	41-100
e	> 100

Other Symbols:

* Sampler gate malfunction suspected.

φ All data except Pb-210 and Bi-210
appear too low.

() Data questionable due to low count
and/or low chemical yield.

LIA Filter sample lost in analysis.

NR Isotope not resolvable - below
limits of radiochemical analysis.

- Radiochemical analysis not made.

ACKNOWLEDGMENTS

The sampling program was carried out under the supervision of the following Weather Bureau personnel: Messrs. R. J. List, G. J. Ferber and K. C. Giles. Prof. E. F. Danielsen of Pennsylvania State University and Prof. D. O. Staley of the University of Arizona assisted in a substantial part of the flight planning. Without the dedicated support of the 4950th Test Group (Nuclear) and 4926th Test Squadron (Sampling) of Kirtland AFB, Albuquerque, New Mexico, this sampling program would not have been possible.

The Weather Bureau is indebted to P. R. Guthals of Los Alamos Scientific Laboratory for providing the LASL air samplers.

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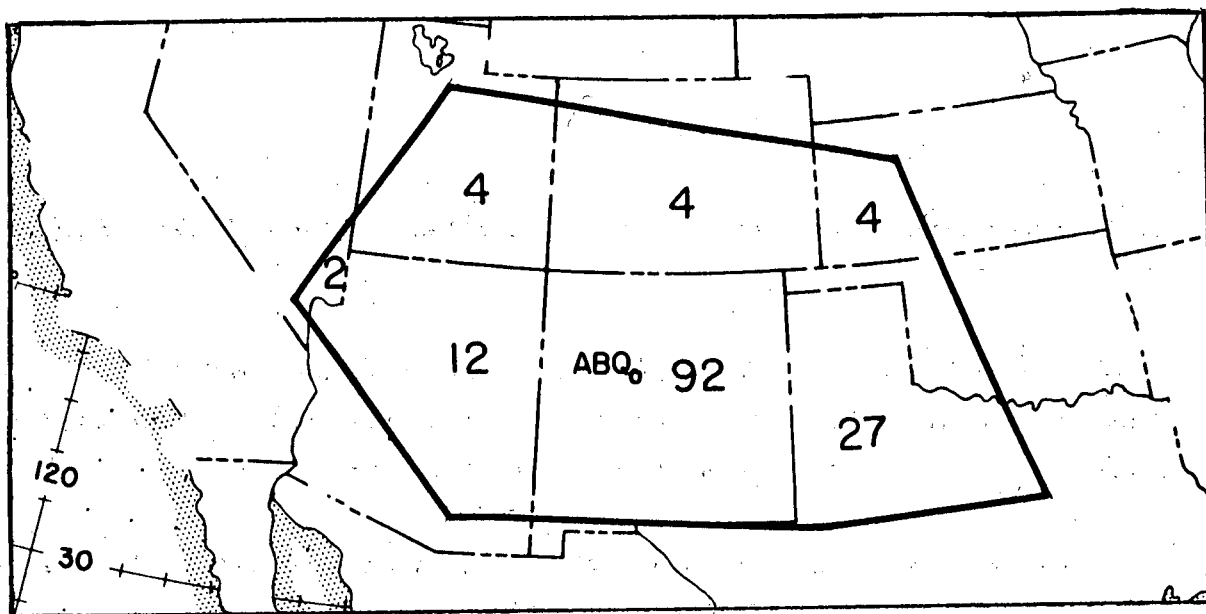


Fig. 1. Coverage of air sampling program during February and March 1961, showing number of samples taken within each state between 12,000 and 48,000 feet.

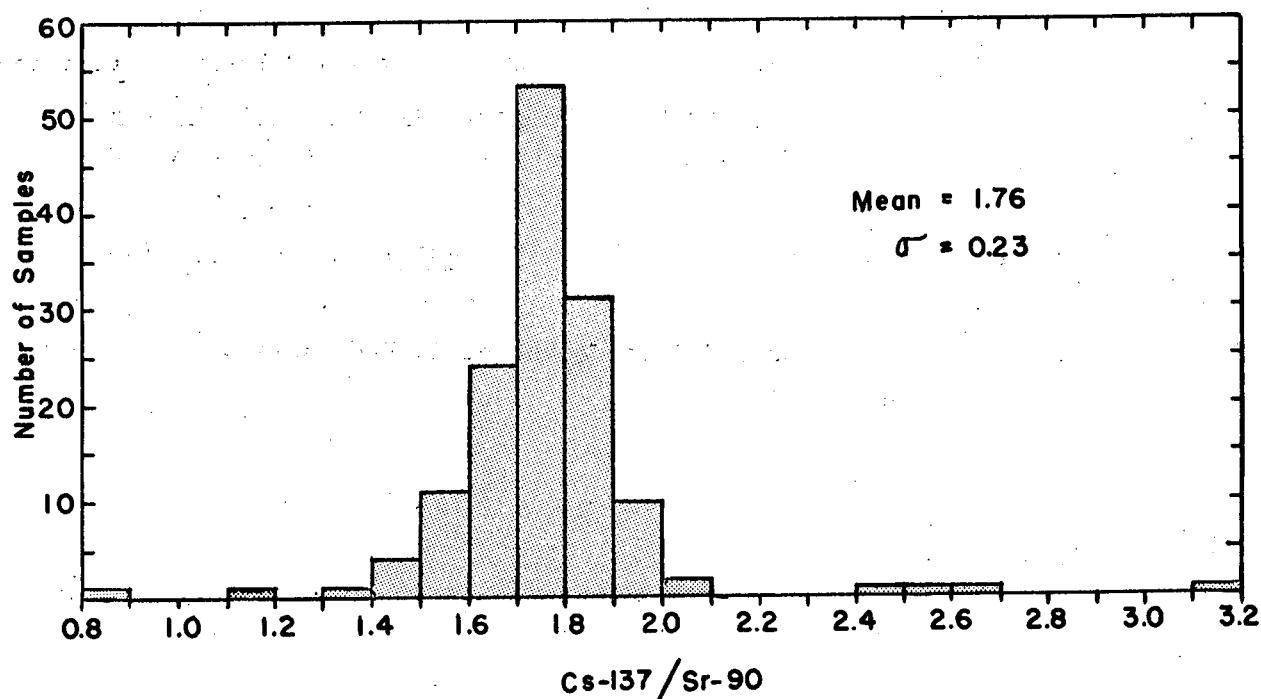


Fig. 2. Frequency of cesium-137 to strontium-90 ratios for samples taken during B-57 air sampling program, February-March 1961.

TABLE 6. AIRBORNE RADIOACTIVITY OVER SOUTHWESTERN UNITED STATES DURING FEBRUARY AND MARCH, 1961

Filter No. Sampler	203* L	204 L	201 L	202 L	401 B	402 B	403 B	404 B	405 B	406* B	205 L	206 L	207 L	
Date	2-6	2-6	2-6	2-6	2-6	2-6	2-6	2-6	2-6	2-6	2-7	2-7	2-7	
Altitude	30.0	36.0	38.0	43.0	28.0	30.0	32.0	34.0	39.0	44.0	24.5	29.0	34.0	
Open: Lat.	36°47'	36°51'	35°45'	36°15'	35°03'	35°03'	35°03'	35°03'	35°03'	35°03'	31°51'	31°55'	31°44'	
Long.	108°56'	109°32'	115°10'	115°02'	106°35'	106°35'	106°35'	106°35'	106°35'	106°35'	98°57'	98°50'	98°57'	
Time	2136	2213	1922	1958	1745	1816	1847	1918	1951	2025	1936	2010	1925	
Turn: Lat.	38°28'	38°28'	37°02'	35°26'	33°35'	33°57'	33°45'	33°53'	33°53'	33°40'	32°25'	32°35'	32°24'	
Long.	108°38'	108°45'	114°41'	115°15'	107°45'	107°31'	107°40'	107°35'	107°35'	107°42'	97°30'	97°35'	96°50'	
Time	2151	2228	1935	2006	1758	1828	1858	1930	2003	2037	1948	2022	1940	
Close: Lat.	36°41'	36°40'	35°45'	35°40'	35°03'	35°03'	35°03'	35°03'	35°03'	35°03'	32°03'	31°51'	32°13'	
Long.	109°32'	109°32'	115°10'	115°11'	106°35'	106°35'	106°35'	106°35'	106°35'	106°35'	98°38'	98°57'	98°13'	
Time	2206	2243	1952	2028	1815	1846	1917	1948	2021	2055	2006	2040	1955	
Volume	202	158	150	117	58.7	48.3	44.9	41.5	33.1	26.0	182	150	144	
Gross Count	2142	10129	678	3029	515	363	1225	2425	1847	900	732	729	6523	
Isotopes														
Sr-90	4.8	26.4	1.9	10.0	4.8b	3.7a	12.2	25.6	26.2a	13.9	1.8	1.0a	19.0	
Cs-137	8.5	46.4	3.5	18.5	8.0	5.7	22.1	44.3	43.4	23.1	3.0	1.6	34.5	
Ce-144	14.7	88.0	6.4	38.6	14.7	10.8	42.2	86.1	86.8	48.9	5.2	2.8a	67.9	
Rh-102	0.18	1.2b	(0.02)c	0.54	0.35b	0.16b	1.1a	1.2a	1.4a	1.4a	0.02a	(0.10)b	1.1c	
Be-7	86.0	329	43.6a	168	91.9b	55.9	196	353a	331a	201c	28.4a	23.2	265	
Pb-210	0.13a	0.50a	0.46	0.33a	0.39	0.28	0.41	0.48	0.46b	0.32	0.29	0.38	0.48	
Bi-210	-	0.42	-	-	-	-	-	-	-	-	-	0.31a	0.43	
Filter No. Sampler	208 L	407 B	408 B	409 B	410 B	411 B	412* B		209 L	210 L	212 L	211 L	416 B	415 B
Date	2-7	2-7	2-7	2-7	2-7	2-7	2-7		2-8	2-8	2-8	2-8	2-8	2-8
Altitude	39.0	28.0	30.0	32.0	34.0	39.0	44.0		22.0	25.0	28.0	31.0	12.0	14.0
Open: Lat.	31°44'	34°35'	34°36'	34°34'	34°46'	34°34'	34°34'		37°43'	37°43'	37°43'	37°43'	35°57'	35°57'
Long.	98°57'	105°25'	105°30'	105°25'	105°20'	105°24'	105°25'		100°01'	100°01'	100°01'	100°01'	105°10'	105°10'
Time	2009	1811	1846	1920	1956	2033	2110		2305	2340	2339	2305	2319	2246
Turn: Lat.	32°44'	33°55'	34°09'	34°13'	34°06'	34°08'	34°06'		38°36'	38°40'	39°02'	39°02'	35°13'	35°13'
Long.	97°03'	104°05'	103°55'	105°50'	103°50'	103°50'	103°50'		99°22'	100°00'	100°04'	100°07'	104°12'	104°12'
Time	2024	1824	1854	1934	2008	2045	2122		2320	2355	2354	2320	2332	2300
Close: Lat.	32°13'	34°44'	34°50'	34°47'	34°50'	34°47'	34°50'		37°43'	37°43'	37°43'	37°43'	35°57'	35°57'
Long.	98°13'	105°08'	105°23'	105°00'	105°23'	105°25'	105°40'		100°01'	100°01'	100°01'	100°01'	105°10'	105°10'
Time	2039	1841	1916	1950	2026	2103	2140		2335	0005	0009	2335	2349	2316
Volume	112	48.4	47.4	45.6	43.8	36.4	31.3		239	179	439	193	60.1	53.4
Gross Count	3913	631	1332	2095	2983	2512	403		806	690	1788	5982	72	57
Isotopes														
Sr-90	14.1	6.7	12.8	20.8	35.6	25.5	6.4		1.4a	1.7	1.6	13.4	0.46a	0.74
Cs-137	23.2	11.0	22.8	36.4	56.1	48.4	10.3		2.5	(1.5)	3.1	23.7	0.67	1.3
Ce-144	50.8	21.1	43.0	68.6	109	105	20.5		4.6	5.4	5.3	45.5	(1.3)	2.5
Rh-102	(0.87)	0.23b	0.49c	1.1	1.3a	1.6a	0.65b		0.58	0.07b	0.07	0.68	-	-
Be-7	218	110a	200	289	442	364	145b		32.3a	37.8b	35.0	208	-	-
Pb-210	0.39	0.38	0.47	0.45	-	-	0.32		0.43	0.39	(0.19)a	0.46	0.66	0.58
Bi-210	-	-	-	-	-	-	-		-	-	-	0.46b	-	-

TABLE 6. AIRBORNE RADIOACTIVITY OVER SOUTHWESTERN UNITED STATES DURING FEBRUARY AND MARCH, 1961 (CONTINUED)

Filter No. Sampler	417 B	414 B	413 B	213 L	214 L	215 L	419 B	420 B	421 B	219 L	221 L	
Date	2-8	2-8	2-8	2-9	2-9	2-9	2-9	2-9	2-9	2-13	2-14	
Altitude	15.0	16.0	18.0	25.0	35.0	40.0	25.0	35.0	40.0	41.0	35.0	
Open: Lat.	35°57'	35°57'	35°57'	34°45'	36°13'	35°35'	35°03'	35°03'	35°03'	35°24'	35°17'	
Long.	105°10'	105°10'	105°10'	105°25'	107°30'	107°10'	106°35'	106°35'	106°35'	105°30'	101°38'	
Time	2351	2213	2141	2100	2140	2215	2100	2140	2215	2230	2310	
Turn: Lat.	35°13'	35°13'	35°13'	34°20'	34°17'	36°30'	35°03'	35°03'	35°03'	-	35°52'	
Long.	104°12'	104°12'	104°12'	106°20'	106°20'	107°40'	106°35'	106°35'	106°35'	-	99°20'	
Time	0005	2226	2154	2107	2155	2225	2107	2155	2225	-	2325	
Close: Lat.	35°57'	35°57'	35°57'	35°42'	35°05'	34°30'	35°03'	35°03'	35°03'	35°12'	35°37'	
Long.	105°10'	105°10'	105°10'	107°15'	106°50'	106°30'	106°35'	106°35'	106°35'	106°20'	100°23'	
Time	0021	2243	2211	2130	2210	2245	2130	2210	2245	2315	2340	
Volume	56.6	52.0	51.6	264	180	141	78.5	53.4	41.7	167	167	
Gross Count	94	103	71	416	1119	6398	114	265	1961	4701	161	
Isotopes:												
Sr-90	0.91a	0.78a	0.71a	0.67a	2.5	18.0	0.66b	2.4a	18.9	10.6	0.45a	
Cs-137	1.4	1.5	1.2	1.3	4.6	31.4	0.98	4.2	32.8	19.3	0.79	
Ce-144	2.8	2.6	2.4	2.5	8.4	65.3	2.4a	7.7	68.6	40.0	1.5b	
Rh-102	-	(0.11)b	-	0.35b	0.12a	0.65b	NR	(0.42)	0.98	0.55a	(0.06)a	
Be-7	-	21.2a	-	16.0a	45.5	254	9.4d	46.9c	262	212	18.5a	
Pb-210	0.55	0.45	0.48	0.15a	0.21	0.38	0.13	0.27a	0.41a	0.32	0.22	
Bi-210	-	-	-	0.14	0.16	0.41c	-	0.31	0.42	0.33	0.14	
Filter No. Sampler	223 L	224 L	222 L	227 L	228 L	226 L	225φ L	422 B	423 B	424 B	425 B	426 B
Date	2-14	2-14	2-15	2-15	2-15	2-15	2-15	2-15	2-15	2-15	2-16	2-16
Altitude	37.0	39.0	41.0	28.0	30.0	32.0	34.0	36.0	38.0	40.0	42.0	44.0
Open: Lat.	35°14'	35°14'	35°27'	32°50'	32°50'	33°09'	33°09'	32°59'	33°17'	32°45'	32°55'	32°55'
Long.	101°45'	101°45'	100°54'	104°25'	104°25'	103°33'	103°33'	103°23'	103°13'	103°25'	103°38'	103°25'
Time	2203	2241	2345	2231	2305	2310	2235	2212	2247	2325	0000	0035
Turn: Lat.	34°47'	34°47'	35°02'	32°16'	32°16'	31°58'	31°56'	32°04'	31°58'	32°02'	32°24'	32°23'
Long.	103°23'	103°23'	102°27'	102°13'	102°13'	102°19'	102°16'	102°29'	102°01'	101°58'	101°53'	101°47'
Time	2218	2256	0000	2245	2319	2324	2250	2225	2303	2338	0014	0048
Close: Lat.	35°14'	35°14'	35°28'	32°50'	32°50'	33°08'	33°08'	33°17'	33°03'	32°58'	32°49'	32°45'
Long.	101°45'	101°45'	100°53'	104°25'	104°25'	103°28'	103°28'	103°30'	102°53'	103°30'	103°36'	103°36'
Time	2233	2312	0015	2301	2335	2340	2305	2242	2317	2355	0030	0105
Volume	125	132	125	219	138	176	173	37.1	35.4	33.2	31.3	27.9
Gross Count	3298	6340	7872	513	324	567	313	73	212	253	220	211
Isotopes:												
Sr-90	11.0	21.6	24.0	1.1a	0.98	1.3a	0.83a	1.2	2.7a	3.5	3.1	3.7a
Cs-137	17.0	35.8	41.8	1.6	(1.3)	2.2	1.3	1.8	4.4	5.4	4.9	5.6
Ce-144	40.2	74.9	89.5	3.3	3.1	4.5	2.5	3.6	9.4	11.9	10.4	11.6
Rh-102	0.52	1.2b	1.0	0.07a	(0.02)b	(0.10)b	0.3c	-	(0.41)a	(0.75)c	(0.41)e	(0.48)b
Be-7	158	288	316a	32.6	LIA	58.8a	44.6a	-	109	114a	102a	113b
Pb-210	0.37	0.47b	0.38	0.27a	0.26a	0.38	0.38	0.34	0.39a	0.39a	0.39a	0.50a
Bi-210	0.39	0.30c	0.38	0.27	0.26	0.30	0.34	-	0.38	0.39	0.38	0.28

TABLE 6. AIRBORNE RADIOACTIVITY OVER SOUTHWESTERN UNITED STATES DURING FEBRUARY AND MARCH, 1961 (CONTINUED)

Filter No. Sampler	231 L	232 L	229 L	230 L	429 B	427 B	428 B	430 B	235-A L	235-B L	234* L	235 L	431* B	
Date	2-16	2-16	2-16	2-16	2-16	2-16	2-16	2-16	2-17	2-17	2-17	2-17	2-17	
Altitude	32.0	34.0	36.0	38.0	38.0	40.0	42.0	44.0	20.0	23.0	27.0	30.0	31.0	
Open: Lat.	40°35'	40°35'	40°35'	40°35'	35°56'	35°50'	35°54'	35°54'	33°10'	33°10'	33°14'	33°14'	33°14'	
Long.	109°47'	109°47'	109°47'	109°47'	105°04'	105°15'	105°05'	105°05'	107°00'	107°00'	107°00'	107°00'	106°59'	
Time	2240	2315	2240	2312	2320	2206	2238	2359	2003	2037	1945	2017	1946	
Turn: Lat.	39°50'	39°50'	39°50'	39°50'	35°20'	35°10'	35°30'	35°04'	33°00'	33°00'	33°04'	33°06'	33°32'	
Long.	111°35'	111°35'	111°35'	111°35'	106°20'	106°36'	106°00'	106°40'	108°50'	108°50'	108°25'	108°45'	108°24'	
Time	2255	2330	2255	2327	2335	2221	2253	0014	2020	2054	1959	2035	2003	
Close: Lat.	40°35'	40°35'	40°35'	40°35'	36°18'	36°06'	36°29'	36°18'	33°10'	33°10'	33°14'	33°14'	33°12'	
Long.	109°47'	109°47'	109°47'	109°47'	104°25'	104°40'	104°05'	104°20'	107°00'	107°00'	107°00'	107°00'	107°07'	
Time	2310	2345	2310	2342	2350	2236	2308	0029	2034	2108	2015	2047	2016	
Volume	187	173	160	138	42.8	38.5	35.0	31.3	257	223	190	167	46.0	
Gross Count	7026	4744	6605	9248	103	1360	1753	3741	538	1270	4928	5429	24	
Isotopes:														
Sr-90	16.3	12.1	15.1	18.0	0.89a	13.6	21.7	56.3a	0.81	2.4	11.6	13.4	(0.03)d	
Cs-137	28.5	21.9	27.2	(20.8)	1.5	22.8	37.6	95.2	1.6	4.5	19.8	25.3	(0.08)	
Ce-144	56.3	41.4	55.9	64.6	3.3	50.6	79.0	212	3.1	8.8	37.0	43.9	LIA	
Rh-102	1.6	0.60	0.78	1.0a	0.33c	1.5a	1.5a	4.0	0.07a	-	0.53	0.62a	-	
Be-7	190	167	195	185	29.8c	232	266	527a	14.8b	45.9b	149	176	-	
Pb-210	0.36	0.45	0.30	0.17a	0.26a	0.39	0.37	0.43a	0.73	0.69	0.76	0.63	(0.03)c	
Bi-210	0.29	0.43	0.25b	0.19	0.18	-	0.32b	0.35	0.71	0.70	0.69	0.59	-	
Filter No. Sampler	432 B	433 B	434 B	435 B	436 B		238 L	236 L	240 L	237 L	239 L	241 L	437 B	438 B
Date	2-17	2-17	2-17	2-17	2-17		2-20	2-20	2-20	2-20	2-20	2-20	2-20	2-20
Altitude	32.0	33.0	34.0	36.0	42.0		36.0	38.0	38.0	42.0	44.0	48.0	35.0	38.0
Open: Lat.	33°13'	33°26'	33°35'	33°30'	33°28'		35°03'	32°07'	35°03'	32°07'	35°24'	35°03'	32°07'	32°07'
Long.	107°10'	107°20'	107°22'	107°20'	107°21'		106°37'	110°50'	106°37'	110°50'	106°45'	106°49'	110°50'	110°50'
Time	2017	2050	2122	2155	2233		2100	2040	2302	2117	2144	2348	2005	2040
Turn: Lat.	33°26'	33°26'	33°26'	33°31'	33°40'		35°50'	33°22'	36°33'	33°30'	36°47'	36°14'	33°20'	33°22'
Long.	108°39'	108°42'	108°48'	108°54'	108°36'		107°16'	111°24'	107°10'	111°28'	107°17'	107°05'	111°24'	111°24'
Time	2035	2108	2140	2214	2250		2116	2055	2316	2132	2158	2358	2020	2055
Close: Lat.	33°15'	33°18'	33°15'	33°20'	33°25'		35°33'	32°07'	35°15'	32°29'	35°18'	34°31'	32°07'	32°07'
Long.	107°16'	107°22'	107°16'	107°41'	107°23'		106°49'	110°50'	106°41'	111°00'	106°43'	106°25'	110°50'	110°50'
Time	2047	2120	2152	2225	2303		2130	2110	2332	2147	2213	0017	2035	2110
Volume	44.9	44.5	44.5	34.3	27.6		154	121	124	98.3	94.4	77.1	38.9	35.0
Gross Count	1605	1852	2229	3442	2018		10222	6012	8824	12672	7391	10868	2894	3360
Isotopes:														
Sr-90	17.2	19.2	25.8a	48.1	33.2		25.8	45.8	29.6	27.2	31.0	58.2	33.5	42.2
Cs-137	29.6	34.4	41.1	77.0	55.0		45.9	78.9	52.6	46.2	55.3	103	58.8	73.2
Ce-144	59.5	68.5	82.0	168	118		94.3	163	109	97.5	118	229	119	156
Rh-102	0.83b	1.1	1.1	LIA	2.1b		1.3	2.4	1.0	1.8	2.0	3.1	1.7a	LIA
Be-7	184	234	274	524	317		302	508a	358	348	376	505	396	458
Pb-210	0.51	0.55	0.51	0.53a	0.39b		0.40a	0.47	0.46	0.42a	0.40	0.43	0.48a	0.43a
Bi-210	0.46a	0.49	0.41a	-	0.33b		0.38b	0.45	0.40	0.40	0.39b	0.37a	0.44a	0.40a

TABLE 6. AIRBORNE RADIOACTIVITY OVER SOUTHWESTERN UNITED STATES DURING FEBRUARY AND MARCH, 1961 (CONTINUED)

Filter No. Sampler	441 B	439 B	440 B		246 L	247 L	242 L	243 L	248 L	244 L	245 L	249 L		251 L
Date	2-20	2-20	2-20		2-21	2-21	2-21	2-21	2-21	2-21	2-22	2-22		2-23
Altitude	38.0	42.0	44.0		35.0	36.0	37.0	39.0	41.0	43.0	45.0	48.0		21.0
Open: Lat.	35°05'	32°07'	32°07'		35°02'	35°02'	32°02'	32°02'	32°02'	35°03'	35°03'	35°02'		34°22'
Long.	106°48'	110°50'	110°50'		106°37'	106°37'	106°37'	106°37'	106°37'	106°37'	106°37'	106°37'		111°15'
Time	2302	2117	2155		2120	2154	2120	2154	2315	2315	0001	0001		2240
Turn: Lat.	36°34'	33°30'	33°20'		36°26'	36°30'	36°39'	36°40'	36°14'	36°07'	35°07'	35°20'		35°10'
Long.	107°30'	111°28'	111°24'		105°55'	105°46'	106°47'	106°47'	107°55'	107°53'	108°15'	108°30'		111°56'
Time	2316	2132	2210		2135	2209	2135	2210	2330	2329	0015	0016		2255
Close: Lat.	33°14'	32°29'	32°16'		35°02'	35°02'	35°02'	35°02'	35°02'	35°03'	35°03'	35°02'		33°52'
Long.	106°50'	111°00'	110°55'		106°37'	106°35'	106°37'	106°37'	106°37'	106°37'	106°37'	106°37'		111°22'
Time	2332	2147	2225		2150	2224	2150	2224	2345	2345	0031	0031		2310
Volume	35.0	28.5	25.8		167	160	151	135	124	112	100	82.2		198
Gross Count	2316	1648	1490		442	3309	5725	9997	7087	6461	4271	5998		2757
Isotopes:														
Sr-90	30.5	(18.2)	23.6		1.3	9.6	12.4	35.0	20.9	24.8	19.8	26.6		6.0
Cs-137	55.9	44.4	41.4		2.1	17.7	23.3	63.7	34.8	43.4	35.0	47.9		LIA
Ce-144	NR	98.9	88.7		4.7	36.2	47.0	127	81.5	95.7	74.7	108		22.1
Rh-102	1.7a	2.6	1.5a		0.10a	0.51a	1.1	2.3c	1.5	1.6	1.6	1.5		0.29a
Be-7	376a	378	330		32.7	134	138	349	273	271	294	335		116
Pb-210	0.44a	LIA	0.40		0.33	0.35	0.34b	0.43	0.31	0.35	0.33	0.30		LIA
Bi-210	-	0.18b	0.38		0.33a	0.30a	0.25	0.37a	0.27a	0.35b	0.39	-		-
Filter No. Sampler	252 L	257 L	256 L	255 L	258 L	253 L	254 L		260 L	259 L	263 L	261 L	264 L	262 L
Date	2-23	2-24	2-23	2-23	2-24	2-23	2-23		2-24	2-24	2-24	2-24	2-25	2-25
Altitude	22.0	27.0	28.0	32.0	32.0	36.0	40.0		32.0	34.0	37.0	39.0	40.0	42.0
Open: Lat.	33°53'	34°55'	39°06'	39°06'	35°35'	35°38'	35°31'		35°17'	35°17'	35°02'	35°16'	35°03'	35°03'
Long.	111°20'	110°22'	108°34'	108°34'	110°24'	110°10'	110°10'		101°38'	101°38'	106°37'	106°36'	106°49'	106°37'
Time	2312	0140	2300	2221	0105	2122	2159		1930	1858	2333	2326	0011	0007
Turn: Lat.	34°42'	35°48'	40°18'	40°24'	36°24'	36°52'	36°56'		36°30'	36°30'	36°20'	36°49'	36°16'	36°26'
Long.	111°24'	111°04'	109°12'	109°15'	111°13'	110°38'	111°11'		101°35'	101°55'	106°37'	107°07'	107°40'	107°39'
Time	2327	0157	2316	2238	0121	2135	2216		1945	1913	2348	0026	0024	0024
Close: Lat.	33°24'	34°31'	39°06'	39°06'	34°58'	35°08'	35°42'		35°17'	35°17'	34°36'	35°24'	34°46'	35°05'
Long.	111°10'	110°31'	108°34'	108°34'	110°23'	109°46'	110°21'		101°38'	101°38'	106°50'	106°24'	106°36'	106°50'
Time	2342	0210	2330	2252	0135	2152	2229		2000	1928	0003	2356	0041	0037
Volume	184	146	179	158	142	127	112		167	152	151	142	130	115
Gross Count	3293	3736	5881	11877	7437	12431	17145		4969	9623	2850	2544	4930	7487
Isotopes:														
Sr-90	9.5	11.5	17.8	40.2	26.1a	48.1	73.0		13.3	32.7	7.5a	7.1	15.7	25.7
Cs-137	16.9	22.3	30.3	70.7	47.3	88.7	130		24.1	60.8	13.5	13.6	29.5	50.0
Ce-144	30.8	43.3	56.2	138	95.3	185	302		48.3	122	25.6	27.9	61.3	105
Rh-102	0.38	0.69b	0.80a	2.0	1.2	4.1a	5.1		(1.4)	1.6	(0.08)b	0.42	1.1	1.6
Be-7	151	183	260	486	326	547	586		90.5d	327	22.4d	83.6	218	348
Pb-210	0.55	0.53	0.51	0.48	0.43	0.44	0.37		0.30a	0.40	0.29	0.39	0.42	0.35
Bi-210	-	0.49b	LIA	-	-	-	-		-	-	-	-	-	-

TABLE 6. AIRBORNE RADIOACTIVITY OVER SOUTHWESTERN UNITED STATES DURING FEBRUARY AND MARCH, 1961 (CONTINUED)

Filter No. Sampler	265 L	266 L	267 L	268 L	271 L	269 L	270 L	272 L	275 L	276 L	273 L
Date	2-28	3-1	3-1	3-1	3-3	3-2	3-2	3-3	3-3	3-3	3-3
Altitude	29.0	32.2	39.0	41.0	40.0	42.0	43.0	46.0	35.0	38.0	42.0
Open: Lat.	35°04'	35°04'	35°02'	35°02'	35°05'	35°05'	35°05'	35°05'	35°03'	35°03'	35°12'
Long.	106°48'	106°48'	106°37'	106°37'	106°40'	106°40'	106°40'	106°40'	106°49'	106°49'	106°30'
Time	2311	0022	2232	2305	0040	2248	2325	0117	1808	1845	1800
Turn: Lat.	36°17'	36°14'	36°25'	36°15'	34°30'	34°30'	34°32'	34°32'	34°15'	34°10'	33°51'
Long.	107°24'	107°20'	107°15'	107°55'	108°20'	108°20'	108°13'	108°13'	108°20'	108°29'	107°20'
Time	2326	0037	2247	2320	0053	2305	2339	0131	1825	1903	1817
Close: Lat.	35°09'	35°04'	35°06'	35°04'	35°05'	35°05'	35°05'	35°05'	35°12'	35°03'	35°13'
Long.	106°50'	106°48'	106°38'	106°38'	106°40'	106°40'	106°40'	106°40'	106°30'	106°49'	106°32'
Time	2341	0052	2302	2335	0110	2318	2355	0147	1838	1915	1830
Volume	175	157	131	124	130	127	122	90.5	173	149	110
Gross Count	8647	9751	1346	3400	4223	1592	1187	2387	2109	4421	2174
Isotopes:											
Sr-90	22.6	28.6	5.2	10.8	13.8	5.4	4.8	11.1	5.6	12.6	12.8
Cs-137	41.6	53.3	9.0	(21.8)	26.1	9.5	8.4	20.8	10.2	22.9	22.4
Ce-144	79.2	99.5	19.0	44.3	53.2	19.3	17.0	38.7	20.7	47.8	46.8
Rh-102	1.4	1.6	0.36a	0.73	0.85	0.33	LIA	0.74	0.32a	0.74	0.90a
Be-7	316	367a	92.7	212	480	196	183	221	96.4	192	273
Pb-210	0.55	0.46	0.33	0.27	0.50	0.35	0.35	0.31	0.35a	0.37a	0.36
Bi-210	-	-	-	-	-	-	-	-	-	-	-

Filter No. Sampler	274 L	279 L	280 L	282 L	283 L	284 L	277 L	278 L	285 L	288 L	286 L	289 L	287 L
Date	3-3	3-6	3-6	3-6	3-6	3-6	3-6	3-6	3-6	3-7	3-7	3-7	3-7
Altitude	46.0	26.0	28.0	30.0	32.0	34.0	36.0	38.0	40.0	42.0	44.0	46.0	48.0
Open: Lat.	35°36'	34°59'	34°59'	35°03'	35°03'	34°59'	34°59'	34°59'	34°59'	35°02'	35°02'	35°02'	35°02'
Long.	106°10'	106°37'	106°37'	106°49'	106°49'	106°37'	106°37'	106°37'	106°37'	106°36'	106°36'	106°36'	106°36'
Time	1849	1931	2009	2122	2201	2247	1940	2018	2325	0046	0026	0121	0107
Turn: Lat.	34°05'	35°19'	35°04'	35°20'	35°16'	34°34'	35°18'	34°55'	35°01'	35°18'	35°18'	35°10'	35°10'
Long.	107°50'	104°16'	104°23'	104°30'	104°35'	108°10'	104°07'	104°03'	108°07'	108°25'	108°25'	108°00'	108°00'
Time	1909	1945	2023	2137	2216	2303	1955	2033	2341	0102	0043	0135	0124
Close: Lat.	34°44'	35°02'	35°08'	35°15'	35°12'	34°58'	35°13'	34°57'	35°00'	35°02'	35°02'	35°02'	35°02'
Long.	107°10'	105°49'	106°17'	106°00'	106°10'	106°44'	105°49'	105°41'	106°41'	106°36'	106°36'	106°36'	106°36'
Time	1919	1959	2039	2152	2231	2317	2010	2048	2355	0116	0056	0151	0137
Volume	84.6	232	227	185	169	160	158	141	99.3	120	101	82.2	74.5
Gross Count	5044	2092	2310	2300	7139	6004	11587	12742	8678	8922	8920	7813	6778
Isotopes:													
Sr-90	27.0	3.9b	4.5	5.7	18.1	16.7	32.9	LIA	38.4	30.6	37.5	41.4	37.8
Cs-137	44.6	7.5	8.1	9.4	31.7	32.6	57.4	69.2	69.8	54.8	63.9	74.1	67.6
Ce-144	100	14.9	16.2	20.8	65.1	63.3	120	152	143	122	141	156	148
Rh-102	1.4	0.24	0.25b	0.27a	0.91	0.85	2.0a	2.5	2.9	2.4	3.3a	2.9	2.8
Be-7	292	62.1	67.3	78.9	225	212	374	623	418	356	484	454	406
Pb-210	0.35	1.5	1.4	1.3	0.78	0.39	0.44	LIA	0.38	0.35	0.41	0.38	0.37
Bi-210	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE 6. AIRBORNE RADIOACTIVITY OVER SOUTHWESTERN UNITED STATES DURING FEBRUARY AND MARCH, 1961 (CONTINUED)

Filter No. Sampler	292 L	290 L	291 L	294 L	295 L	293 L	296 L	297 L	302 L	303 L	301 L	299 L
Date	3-8	3-7	3-7	3-7	3-7	3-8	3-8	3-8	3-9	3-9	3-9	3-9
Altitude	23.0	24.0	26.0	28.0	30.0	32.0	40.0	42.0	37.0	38.0	40.0	42.0
Open: Lat	35°17'	35°17'	35°17'	35°17'	35°17'	35°17'	35°17'	35°17'	35°03'	35°03'	34°54'	36°57'
Long.	101°38'	101°38'	101°38'	101°38'	101°38'	101°38'	101°38'	101°38'	106°49'	106°49'	106°15'	106°02'
Time	0223	2123	2157	2131	2204	0301	0315	0353	2122	2200	1929	1730
Turn: Lat.	34°48'	34°50'	34°50'	34°44'	34°41'	34°50'	34°41'	34°43'	34°52'	34°51'	36°06'	34°05'
Long.	103°20'	103°10'	103°10'	103°22'	103°32'	103°04'	103°32'	103°27'	108°24'	108°40'	106°43'	106°52'
Close: Lat.	35°17'	35°17'	35°17'	35°17'	35°17'	35°17'	35°17'	35°17'	35°05'	35°03'	34°59'	32°56'
Long.	101°38'	101°38'	101°38'	101°38'	101°38'	101°38'	101°38'	101°38'	106°32'	106°49'	106°27'	106°01'
Time	0253	2153	2227	2201	2234	0331	0345	0423	2152	2230	1959	1800
Volume	231	223	205	236	217	163	125	109	151	143	127	130
Gross Count	6630	7358	10959	11695	10530	1080	179	80	249	713	423	297
Isotopes:												
Sr-90	13.2	10.5	24.9	22.3	21.9	3.0	0.60a	0.45a	(0.50)a	2.3	1.6	1.3a
Cs-137	23.2	26.6	41.5	LIA	38.2	5.4	0.97	0.75	1.6	3.9	2.8	2.1
Ce-144	45.1	51.9	82.3	81.1	81.2	11.0	2.3	1.4	2.9	8.3	6.0	4.6
Rh-102	0.61	0.71a	1.5	1.4	0.89	0.23	0.90a	-	0.08	0.18a	0.39a	0.03c
Be-7	197	217	297	206	259	114	59a	-	28.0b	110b	101	101
Pb-210	0.48	0.49	(0.50)	0.53	0.42	0.29	0.22	0.19	0.15	0.34	0.31	0.28
Filter No. Sampler	304 L	305 L	306 L	307 L		311 L	308 L	309 L	313 L	314 L		
Date	3-10	3-10	3-10	3-10		3-13	3-13	3-13	3-13	3-13		
Altitude	38.0	40.0	43.0	47.5		39.0	40.0	41.0	43.0	46.0		
Open: Lat.	35°03'	35°03'	35°01'	35°04'		35°00'	35°03'	35°03'	35°10'	35°04'		
Long.	106°49'	106°49'	106°55'	106°39'		106°37'	106°49'	106°49'	107°04'	106°50'		
Time	1808	1846	1846	1935		2207	2145	2219	2100	2147		
Turn: Lat.	34°27'	34°27'	34°36'	34°50'		35°28'	35°34'	35°34'	35°50'	36°02'		
Long.	108°48'	108°47'	108°24'	108°23'		108°21'	108°32'	108°32'	108°31'	108°13'		
Time	1826	1904	1901	1952		2222	2201	2235	2115	2202		
Close: Lat.	35°03'	35°03'	35°03'	34°58'		35°03'	35°03'	35°03'	35°20'	35°13'		
Long.	106°49'	106°49'	106°49'	107°06'		106°49'	106°49'	106°49'	107°26'	107°04'		
Time	1838	1916	1916	2005		2237	2215	2249	2130	2217		
Volume	156	141	104	70.3		126	121	114	92.8	77.5		
Gross Count	2069	3951	5947	4850		3783	6045	6193	11783	12796		
Isotopes:												
Sr-90	16.9	12.3	24.0	26.3		16.4a	20.1	23.4	52.7	68.6		
Cs-137	29.8	21.3	42.7	(53.2)		24.3	37.4	40.9	92.2	123		
Ce-144	65.2	51.7	103	114		48.1	82.5	89.7	204	284		
Rh-102	1.1	0.73	1.6	2.5		1.1a	1.6	2.1	3.7	5.5		
Be-7	251a	259	333	336		211a	306	288	494a	641		
Pb-210	0.42	0.35	(1.2)a	0.40		0.34	0.37	0.35	0.36	0.43		
Bi-210	-	-	-	-		-	-	-	-	-		

Strontium-90 in Soils Collected in 1962

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To estimate the cumulative deposition of strontium-90 on the earth's surface, soil samples have been collected and analyzed for this fission product since 1955. Results for collections made between 1955 and 1959(1) and during 1960 and 1961(2) have been reported. With the resumption of weapons testing in September 1961, it was considered desirable to limit the soil collections in 1962 to selected sites in the United States and Bermuda. A major world-wide sampling began during the summer of 1963 after the cessation of atmospheric detonations.

Results for twelve regular U. S. sites, two special study sites, and Bermuda are given in Table 1 and mapped in Figure 1. Strontium-90 was extracted from the soil with 6N hydrochloric acid.(3) The analyses were performed at HASL except for the Corvallis sample which was analyzed at the Department of Agriculture Strontium-90 Laboratory in Beltsville, Md.

Table 1
Sr⁹⁰ in Soil Collected in 1962

<u>Location</u>	<u>Precip.(1) in inches</u>	<u>sampling date</u>	<u>depth in inches</u>	<u>kg soil per 1.34 ft.²</u>	<u>d/m Sr⁹⁰(2) per kg</u>	<u>mc Sr⁹⁰(2) per mi²</u>
Regular U.S. Sites						
Puyallup, Wash.	413	9/29/62	10	28.85	220	59.5
Bozeman, Mont.	160	9/26/62	8	30.95	360	104
St. Paul, Minn.	257	10/8/62	10	38.85	269	98.0
Orono, Me.	357	9/15/62	8	28.70	233	62.7
Corvallis, Ore.	406	10/4/62	10	33.00	212	65.6(3)
Rapid City, S.D.	172	9/23/62	8	35.15	350	115
Logan, Utah	144	10/7/62	10	36.70	182	62.6
Salt Lake City, Utah	156	10/10/62	10	37.60	362	128
Columbus, Ohio	317	9/19/62	10	38.15	244	87.3
Derby, Colo.	150	10/13/62	8	40.00	304	114
Manhattan, Kan.	302	10/14/62	8	29.00	399	108
Little Rock, Ark.	488	10/18/62	10	41.90	251	98.6
Special Study Sites						
Brigham City, Utah	170	10/7/62	10	35.35	371	123
Heber City, Utah	137	10/10/62	10	32.85	224	69.0
Bermuda						
Paget East	659	12/13/62	10	28.40	432	115

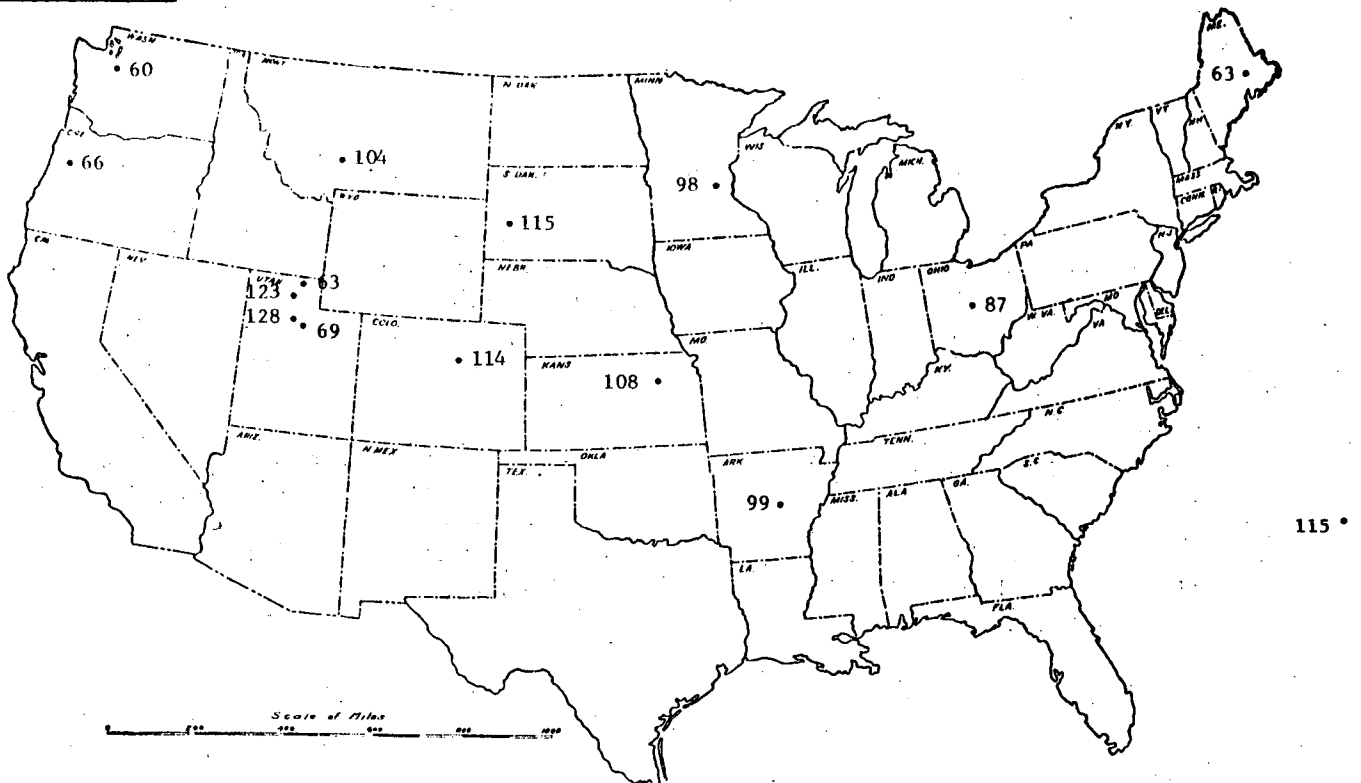
(1) from 1-1-53 to sampling date.

(2) results *calculated* to sampling date.

(3) result obtained at Beltsville. HASL result of 45.5 considered in error.

Figure 1

Sr⁹⁰ in 1962 Soils
values in mc/mi²

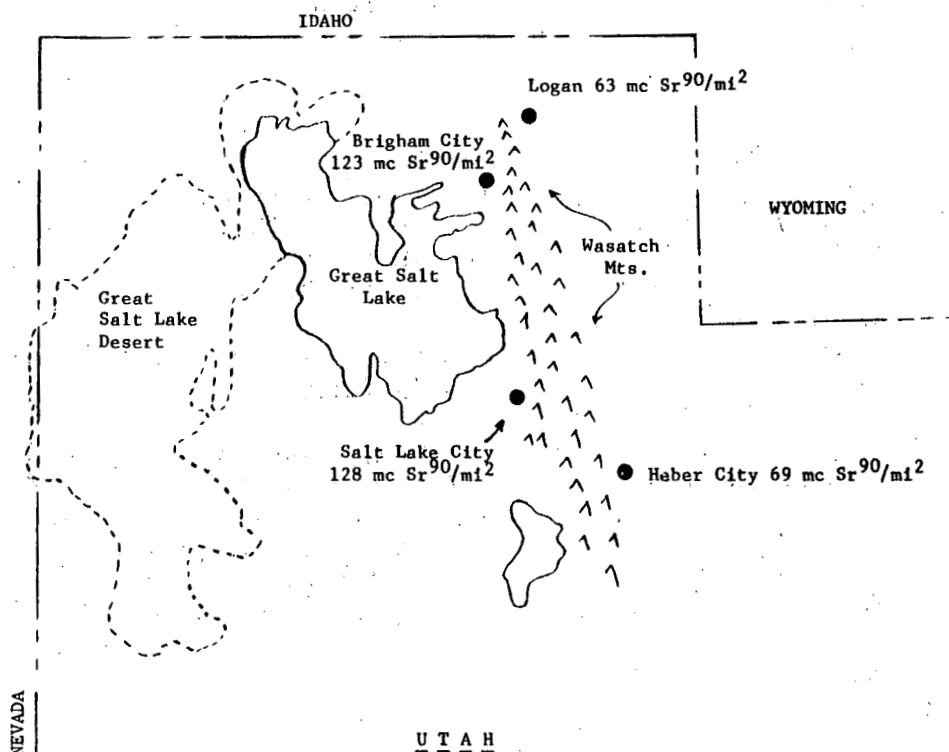


The twelve U. S. sites were also sampled in 1960: ten were taken during the fall months and two during the last week of July. Neglecting the fallout during the summer of 1960, the average strontium-90 depositions during the fall of 1960 and 1962 were 65.9 and 91.9 millicuries per square mile, respectively. The incremental strontium-90 fallout between the fall of 1960 and the fall of 1962 is 26.0 millicuries per square mile. It is interesting to compare this soil increment with that measured by the monthly pot and column collection network(4)(5)(6). Based on the 46 collection stations located between 50° N latitude and 30° N latitude (the approximate latitudinal area of the United States) the average strontium-90 deposition between the fall of 1960 and 1962 totalled 21.7 millicuries per square mile. Considering the relatively small number of soil sampling sites, these two measurements are in reasonable agreement.

The selection of the two new sites, Brigham City and Heber City, Utah was made to determine the validity of higher strontium-90 values for Salt Lake City relative to Logan that have been noted for several years. Brigham City was selected as being a site comparable to Salt Lake City and Heber City as being comparable to Logan. Both Salt Lake City and Brigham City are at the same level on the west side of the Wasatch Mountains and near the Great Salt Lake and the salt flats. Logan and Heber City are on the east side of the

mountains as can be seen from the sketch map in Figure 2.

FIGURE 2 Location of Northern Utah Sampling Sites



The 1962 data for these four sites is shown again in the following table:

Table 2

1962 Sr-90 Data for Northern Utah Sites

<u>Site</u>	<u>1962 Sr⁹⁰ mc/mi²</u>	<u>Precip. in inches (1)</u>	<u>Geographic Position Relative to Great Salt Lake</u>
Brigham City	123	170	adjacent to Lake
Heber City	69	137	about 45 miles SE of Lake over high mountains
Logan	63	145	about 20 miles NE of Lake over mountains
Salt Lake City	128	156	adjacent to Lake

(1) from 1-1-53 to sampling date.

The above data confirm the reality of the difference between Salt Lake City and Logan. The exact reasons for these differences are not known but are believed to be related to the proximity to the Great Salt Lake and the salt flats. Some additional work is planned in this area.

References

- (1) Alexander, L. T., Jordan, R. H., Dever, R. F., Hardy, E. P., Hamada, G. H., Machta, L., and List, R. J., Strontium-90 on the Earth's Surface, TID-6567, USAEC Office of Technical Information, February 1961.
- (2) Hardy, E. P., List, R. J., Machta, L., Alexander, L. T., Allen, J. S., Meyer, M. W., Strontium-90 on the Earth's Surface II, TID-17090, USAEC Office of Technical Information, November, 1962.
- (3) Hamada, G. H., Hardy, E. P., and Alexander, L. T., A Procedure for the Acid Extraction and Analysis of Strontium-90 in Soil, USAEC Report HASL-33 (Rev.) New York Operations Office.
- (4) Frankel, R., Hardy, E. P., Strontium-90 Deposition on the Earth's Surface During 1958, 1959, and 1960, USAEC Report No. HASL-113, p. 107, July 1, 1963.
- (5) Hardy, E. P., Collins, W. R., Strontium-90 Deposition on the Earth's Surface From 1958 through 1961, USAEC Report No. 131, p. 221, October 1, 1962.
- (6) Collins, W. R., Strontium-90 Deposition on the Earth's Surface from 1958 through 1962, USAEC Report No. HASL-140, p. 240, October 1, 1963.

Cs-137 in the 1962 U.S. Wheat Crop

by J. Rivera (HASL)

The Sr-90 content of wheat grown in the United States has been studied in this laboratory for a number of years.⁽¹⁾ In addition to analyzing the samples obtained from the 1962 crop for Sr-90 and Ca, Cs-137 analyses were also performed on some of the samples.⁽²⁾ The results of the analyses are listed in Table 1.

There is no apparent correlation between Sr-90 and Cs-137 concentrations in the samples analyzed but in general the Cs-137 levels are higher than the Sr-90 levels. If the contamination of wheat were due solely to direct deposition one would expect the Cs-137/Sr-90 ratio in the berry to be the same as that in rainwater i.e. about 1.7.⁽³⁾ Since this was not observed, other processes acting differently on Cs-137 and Sr-90 must have been operative. These processes probably include root uptake, translocation, and wash-off.

An experiment was performed on six samples to see if Cs-137 could be removed from the wheat by washing in distilled water under gentle agitation for 20 minutes.

The samples were analyzed for Cs-137 by γ -ray spectroscopy before and after washing. A significant reduction ($>20\%$) in Cs-137 content was detected in only two of the samples tested. The samples are now being analyzed for Cs-137 and Sr-90 radiochemically to establish more accurately the effects of washing on the concentrations of these radionuclides in wheat.

The distribution of Cs-137 within the wheat berry may be roughly estimated by observing its concentration in milling fractions. The results of the analysis of milling fractions from the Kansas wheat sample, together with a crude material balance for Cs-137 and Sr-90 are presented in Table 2.

Although the material balances for Cs-137 and Sr-90 are poor, it is apparent that the concentrations of these nuclides were very much greater in the outer (bran) layers of the berry than in the inner endosperm from which flour is made. From the Cs-137/Sr-90 ratios, however, it would seem that flour may have a higher concentration of Cs-137 relative to Sr-90 than is found in rainwater. Further studies will have to be done to verify this finding.

Reference

- (1) USAEC Report No. HASL-140, p. 276, October 1, 1963.
- (2) Health and Safety Laboratory, Manual of Standard Procedures, NYO-4700, p. E55-02-01.
- (3) USAEC Report No. HASL-132, p. 247, January 1, 1963.

Table 1

Cs-137 and Sr-90 in U.S. 1962 Wheat Crop

<u>Location</u>	<u>Cs-137 pc/kg</u>	<u>Sr-90 pc/kg</u>	<u>Cs137/Sr90</u>
California	40	14	2.9
Colorado	28	61	0.5
Idaho-a	14	17	0.8
Idaho-b	24	24	1.0
Iowa	536	138	3.9
Kansas	273	91	3.0
Missouri	332	128	2.6
Montana	65	64	1.0
Nebraska-a	112	112	1.0
Nebraska-b	217	87	2.5
New York	262	100	2.6
North Dakota	153	100	1.5
Oklahoma	104	101	1.0
Texas	186	51	3.6
Utah	262	23	11.4
Washington	15	14	1.1

Table 2

Cs-137 and Sr-90 in Kansas Wheat and Milling Products

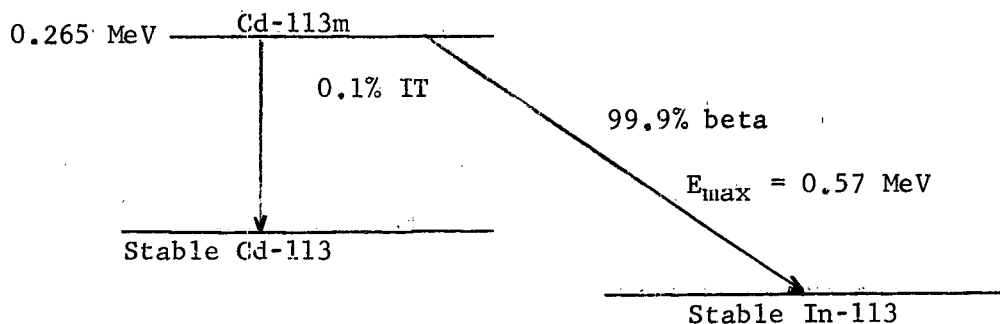
		<u>Relative</u>	<u>pc/kg</u>		<u>pc in fractions</u>		<u>Cs137/Sr90</u>
		<u>Weights</u>	<u>Cs-137</u>	<u>Sr-90</u>	<u>Cs-137</u>	<u>Sr-90</u>	
INPUT	Wheat	1.00	273	90	273	90	3.0
	Patent Flour	0.58	57	17	33	10	3.4
	1st & 2nd	0.14	74	57	10	8	1.3
OUTPUT	Clear						
	Germ & Shorts	0.17	486	370	83	63	1.3
	Bran	0.11	656	486	72	53	1.3
TOTAL					198	134	1.5

Emitted Radiations from Cadmium-109 and Cadmium-113m

by N. A. Hallden and L. P. Salter (HASL)

Cadmium-109 ($t_{1/2} = 470$ days) was produced during the high altitude nuclear detonation, Starfish, on July 9, 1962. The introduction of this material at about 400 km represents an attempt to investigate atmospheric distribution and fallout for debris injected at the outer edge of the ionosphere. The production of Cd-113m ($t_{1/2} \sim 5$ or 14 years), Cd-115m ($t_{1/2} = 43$ days), and Cd-115 ($t_{1/2} = 2.3$ days) accompanied that of Cd-109. The Cd-115 isomers are too short-lived to be useful as long term tracers. Several laboratories may be engaged in studies of the longer-lived cadmium nuclides, however, and it is necessary to evaluate their decay schemes, if only to establish a consistent basis for reporting data.

According to NAS-NRC Nuclear Data Sheets Cd-113m undergoes beta decay and isomeric transition as follows:



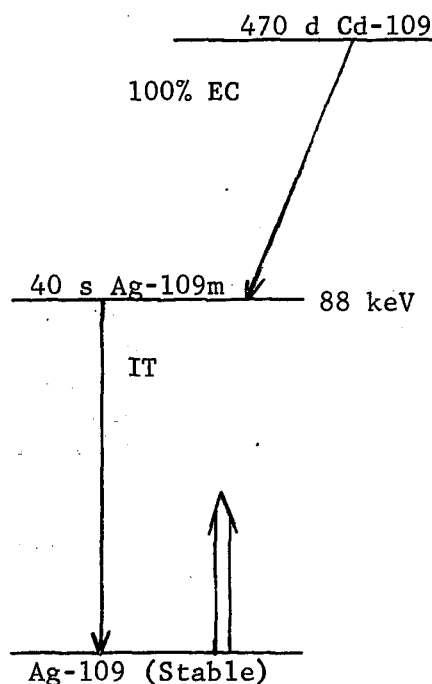
A half-life of 5.1 years and 14 years is given.

Cd-109 decays solely by electron capture to Ag-109m ($t_{1/2} = 40$ sec). Electron capture is not detectable directly, since there is no observable radiation. After electron capture the shell structure of the atom rearranges with subsequent X-ray and Auger electron emission. The Ag-109m daughter undergoes an isomeric transition emitting gamma rays which are highly converted, resulting in conversion electrons and additional X-ray and Auger electrons.

Following is the decay scheme with values for physical parameters. These values have been obtained from NAS-NRC Nuclear Data Sheets weighted as follows:

50% for first of listed values

50% for average of remaining values



$$\epsilon_{LMN} / \epsilon_K = 0.28$$

$$\epsilon_{MN} / \epsilon_L = 0.18$$

$$\alpha_K = C_K / \gamma = 10.2$$

$$C_K / C_{LM} = 0.83$$

$$(\text{Single Value: } C_K / C_{LMN} = 101/116.5)$$

$$C_{MN} / C_L = 0.165$$

Where $\epsilon_K, \epsilon_L \equiv$ electron capture from K, L shell

$\alpha_K \equiv$ γ ray conversion coefficient for electrons ejected from K shell

$C_K, C_L \equiv$ conversion electrons ejected from K, L shell

and $\gamma \equiv$ 88 keV photons emitted

While measurement of Cd-109 based on the detection of the 22 keV X-rays appears to be the preferred method, systems based on the detection of the 62-88 keV conversion electrons, the 88 keV photon or even coincidence techniques may be used. The numerical relationship of each of these events to the Cd-109 disintegrations, therefore, must be developed for intercalibration purposes.

Table 1 summarizes the emissions from Cd-109 and Ag-109m per 1000 disintegrations of Cd-109. The data used in this compilation are, to our knowledge, the most accurate available. All radiations greater than 1 keV are listed. The table is divided into three parts. The first part lists the number of events from the electron capture of Cd-109, the isomeric transition of Ag-109m and the totals. The second part, under anti-coincidence, lists discrete events, that is, those that are not in coincidence with conversion electrons or K Auger electrons. These must be considered rather than total events in 4π counting since, for example, a $2\frac{1}{2}$ keV L Auger electron will yield an additional count only if a more energetic electron has not been

emitted in coincidence. The third part of the table lists coincidences between photons and electrons or photons and photons since these must be known to evaluate coincidence counting data. Coincidences which do not occur simultaneously with conversion electrons or K Auger electrons also appear in this section.

Values for physical parameters used to calculate intensities of X-rays and Auger electrons resulting from atomic de-excitation ($Z = 47$) were taken from A. H. Wapstra et al., "Nuclear Spectroscopy Tables" (North-Holland Publishing Company, Amsterdam, 1959) and are given below:

$$K_{\beta}/K_{\alpha} = 0.202 \quad (\text{p.81})$$

$$W_K = 0.805 \quad (\text{p.81})$$

$$(KLY)/(KLL) = 0.41 \quad (\text{p.84})$$

$$(KYY)/(KLL) = 0.065 \quad (\text{p.84})$$

$$W_L = 0.10 \quad (\text{p.86})$$

where K_{α} , K_{β} $\equiv$ electron transitions from L, MN shell to K shell

W_K , W_L $\equiv$ K, L fluorescence yield

and KLY etc. $\equiv$ Auger electron ejected from MN shell after transition of an L shell electron into a K shell vacancy.

Table 1
SUMMARY OF EMITTED RADIATIONS > 1 keV

(per 1000 Cd^{109} disintegrations)

keV		Electrons			Photons		
		Conversion	Auger		Gamma's	X-Ray	
		C	A_K	A_L	γ	X_K	X_L
		62-88	18-25	2½	88	22-25	3
Electron Capture	Cd^{109}	0	153	851	0	628	95
Isomeric Transitions	Ag^{109m}	957	84	783	43	350	88
Total		957	237	1634	43	978	183
Anti-Coincident with	C	-	153	851	43	628	95
Anti-Coincident with	C or A_K	-	-	638	43	628	71
Coincident with γ :	Total	0	0	0	0	0	0
Coincident with X_K :	Total	350	0	733	0	0	81
anti	C	-	0	471	0	0	52
anti	C or A_K	-	-	471	0	0	52
Coincident with X_L :	Total	88	38	25	0	81	2
anti	C	-	24	16	0	52	1
anti	C or A_K	-	-	0	0	52	0

Note on the Detectability of Cadmium Isotopes from
Starfish in 1964 Ground Level Samples

by L. P. Salter (HASL)

On July 9, 1962, the United States detonated a nuclear device at about 400 kilometers over Johnston Island. In this event, known as Starfish, Cd-109 ($t_{1/2} = 470$ days) and Cd-113m ($t_{1/2} \sim 5$ or 14 years) were produced. Long-lived radioactive material, therefore, was made available to trace the distribution of debris formed at the top of the ionosphere.

Cd-109 decays by electron capture to Ag-109m ($t_{1/2} = 40$ s) which undergoes a highly converted 88 keV isomeric transition to the ground state. Detection of the 22 keV K X-ray peak appears to be the most sensitive method for radioactivity assay of Cd-109. Measurement of the 62-88 keV conversion electrons, the low intensity 88 keV photons, or coincidences between the K X-ray and 62 keV conversion electrons are also possible. The following table summarizes the relative intensities of these events(1):

	<u>Energy (keV)</u>	<u>Number per Cd-109 disintegration</u>
K X-ray	22-25	0.978
Conversion electrons	62-88	0.957
Photons	88	0.043
K X-ray and conversion electron coincidences	-	0.350

Cd-113m undergoes beta decay (99.9%) and is detectable by its 0.57 Mev $E_{\max}$ particles. A very weak 0.265 Mev photon ($\sim 0.1\%$) is also emitted. In beta measurements of Cd-113m, the Cd-109 conversion electrons may be filtered out by counting through an aluminum absorber 17 mg/cm² which is about one-half thickness for the 0.57 Mev beta.

Recent data(2,3) indicate that about 0.25 ± 0.15 MC of Cd-109 was produced in Starfish and 25-30% as much Cd-113m activity. Shorter-lived Cd-115 ($t_{1/2} = 2.3$ days) and Cd-115m ($t_{1/2} = 43$ days) were also formed in Starfish as well as other nuclear detonations but these should have decayed to insignificant levels relative to Cd-109 and Cd-113m by January 1, 1964. Because these are fission products, however, the hard beta from the latter, especially, could interfere with Cd-113m measurements in material mixed with fresh weapons debris.

Results from the AEC's High Altitude Balloon Sampling Program indicate that Starfish Cd-109 and Cd-113m were detectable as early as December 1962 at 35 kilometers in the Southern Hemisphere and several months later in the Northern Hemisphere(4).

Concentrations of Starfish Cd-109 at ground level may be predicted by comparison with results obtained on Rh-102 produced in Orange, the U. S. high altitude detonation of August 1958. An estimated 3 MC of Rh-102 (about 10 times that of Starfish Cd-109) was formed and rose to above 100 kilometers in this test⁽⁵⁾. Measurements of Rh-102 concentrations in surface air^(6,7) and precipitation⁽⁸⁾ in 1960, the second year after the Orange detonation, have been used to calculate the 1964 levels of Cd-109 in moderate rainfall regions of the mid-latitude bands of the Northern and Southern Hemispheres. These are given in Table 1. The sample sizes required to detect the Cd-109 at the lower end of the range are given in the last column of the table and have been estimated by setting the minimum detectable quantity conservatively at 5 dpm as of the sampling date.

These predicted activity levels are slightly lower than those calculated by Collins⁽⁹⁾ from a theoretical distribution of 0.25 MC of Cd-109:

Surface Air: 5 dpm/10⁶ SCF

Deposition: 0.5 dpm/ft²/mo

The required sample sizes listed may be pessimistically high since conservative figures were used in their calculation. They may be as much as an order of magnitude larger than the minimal amount needed to detect the Cd-109 in the Southern Hemisphere toward the end of the year and in the Northern Hemisphere in the spring of 1965, when the fallout rate of Starfish cadmium isotopes should be at its peak.

Cd-113m activity concentrations approximately equal to those of Cd-109 may be expected in 1964 since Cd-109 will have decayed to 45-25% of its initial value.

Table 1

Cd-109 at Ground Level in 1964

	<u>Cd-109 Activity</u> <u>(As of sampling date)</u>	<u>Sample Size Required</u> <u>for Lower End of Range</u>
Surface Air	0.5 ~ 3 dpm/10 ⁶ SCF	10 x 10 ⁶ SCF
	0.002-0.01 dpm/10 ² SCM	300 x 10 ³ SCM
Precipitation	0.01 ~ 0.05 dpm/liter	500 liters
Monthly Deposition	0.05 ~ 0.3 dpm/ft ² /mo	100 ft ²

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THE PRODUCTION OF Cd^{109} AND Cd^{113m} IN A SPACE NUCLEAR EXPLOSION

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Introduction

In one of the high altitude nuclear tests conducted by the United States during Operation HARDTACK in August, 1958, a few megacuries of Rh^{102} were produced to serve as a long-term, world-wide tracer for atmospheric transport from altitudes in excess of 100,000 feet. Unfortunately, all attempts to sample the radioactive debris from the ORANGE test failed, with the result that the source term has forever remained in doubt. Another serious limitation of this experiment lay in the fact that a significant amount of Rh^{102} was manufactured as a bomb diagnostic tracer in devices that placed their radioactivity between the surface and about 100,000 feet. Consequently, a period of about 18 months elapsed before it was possible to identify with some degree of confidence Rh^{102} of ORANGE origin. This experience emphasized the importance of establishing directly the quantity of tracer isotope produced, something concerning its spacial distribution after the explosion, and the choice of a substance that could be unambiguously assigned to the high altitude explosion. Additional desirable features would be high intensity, and ease of chemical and radiometric procedures. At the suggestion of M. Kalkstein, Cd^{109} was chosen. This isotope is produced by neutron capture on Cd^{108} (.88% abundant) and by $n,2n$ on Cd^{110} (12.4% abundant). The production of Cd^{109} as a fission product (it is a β^- shielded, neutron deficient isotope) is negligible, amounting to at most 1 curie per megaton of fission. Its production from small quantities of cadmium impurities in a typical thermonuclear device can similarly be dismissed unless an explicit attempt is made to manufacture it by exposing large masses of cadmium to the neutron flux. Cd^{109} decays by K and L capture with a half life of 1.3 years to Ag^{109m} . The L/K ratio is reported as .28 and the energy of the Ag^{109m} transition as 87.5 kilovolts.

The Starfish event took place on 9 July 1962 at four hundred kilometers in the vicinity of Johnston Island. The yield was reported to be 1.4 MT, producing a few tenths of a megacurie of Cd^{109} . Debris samples were obtained by three samplers placed in the vicinity of the burst and subsequently recovered.

Fission Product Analyses

The results of fission product analyses, expressed as Mo^{99} R values* are given in Table 1. Chains having an appreciable fraction of the chain yield as halogen, rare gas or volatile alkaline elements are found in about the same proportion as chains having much more refractory ancestors. The explanation probably lies in the fact that a sensible fraction of the fission products were interstitially trapped in the collecting matrix.

Assay of the Cadmium Isotopes and Estimates of Production

The magnitudes of the Cd^{115} and $\text{Cd}^{115\text{m}}$ R values reflect mainly n, γ and n,2n origin from Cd^{114} (28.8%) and Cd^{116} (7.6%). If the trough of the fission yield curve is assigned an R value of 25, then approximately 90% of Cd^{115} and 97% of $\text{Cd}^{115\text{m}}$ are to be attributed to neutron production processes. The observed "net" $\text{Cd}^{115}/\text{Cd}^{115\text{m}}$ atom ratio is 3.89. This is to be contrasted with the ratio of 16 found in fission when the two isomers arise only from decay of Ag^{115} .

Assay of Cd^{109} by scintillation gamma spectrometry had to await the decay of 2.3 day Cd^{115} . Figure 2 depicts a spectrum taken about eight days after t_0 . The corresponding spectrum of Cd^{109} in the sample based upon later measurements is included.

Figure 3 illustrates that a small peak in the region of 22 kev may arise from $\text{Cd}^{115\text{m}}$. The sample chosen for illustration was produced by fission spectrum neutrons. Absence of any significant quantities of activated cadmium was indicated by the agreement of the $\text{Cd}^{115}/\text{Cd}^{115\text{m}}$ ratio with that expected only from decay of Ag^{115} . A possible indication of a small $\text{Cd}^{115\text{m}}$ contribution to the 22 kev region in the Starfish samples is to be found in the 22 kev gamma decay curve of Cd^{109} (Figure 4). The Starfish cadmium gamma spectrum is shown with the Cd^{109} standard in Figure 5, 135 days after t_0 . Two other Starfish cadmium samples gave identical spectra.

The data for Cd^{109} are reported as kilocuries of 22.5 kev X-rays, and are based upon an intercalibration with Stevenson and West of the Lawrence Radiation Laboratory. The figure given is not the disintegration rate of the source, i.e., no corrections have been made for K/L,M conversion factors, fluorescent yield or for conversion of the 87.5 kev $\text{Ag}^{109\text{m}}$ gamma. Wapstra reports the ratio of 22.5 kev X-ray to 87.5 kev gamma in Cd^{109} to be 23.8 and the same ratio for $\text{Ag}^{109\text{m}}$ as 8.36. A K fluorescent yield of .81 and the fraction of electron captures proceeding via X-ray emission of .81 have also been reported.

*The R value is the activity ratio of the nuclide to Mo^{99} in the sample divided by the activity ratio of the nuclide to Mo^{99} in thermal fission.

A standard solution of Cd^{109} obtained from Dr. R. Koch of Nuclear Science & Engineering Corporation resulted in a production figure about 20% higher than that given by Stevenson's and West's calibration. Since it was not clear whether Koch's titer was based on the disintegration rate or on the K X-ray output of the sample, the Stevenson and West calibration has been temporarily adopted.

Reference of Cadmium Isotopes to Fission

After a small correction for fission product cadmium was made, based on Figure 1, the average value of the $\text{Cd}^{115\text{m}}$ (or Cd^{115}) excess to fissions was calculated, and the $\text{Cd}^{109}/\text{Cd}^{115\text{m}}$ ratios in the best samples used, in conjunction with the known total number of fissions, to calculate the total Cd^{109} produced. A similar procedure was followed to obtain a value for $\text{Cd}^{113\text{m}}$. On this basis we obtained:

		+152	
Cd^{109}	424		kilocuries
		-113	
		+22	
$\text{Cd}^{113\text{m}}$	126		kilocuries
		-16	

The errors quoted represent the highest and the lowest values found and reflect the magnitude of cadmium fractionation with respect to Mo^{99} in the three samples. The Cd^{109} /fission ratio has a standard deviation of the average of 12%. There is at least a 10% uncertainty in specifying absolute disintegration rates from counting rates.

Assay for Cadmium $^{113\text{m}}$

Figure 6 depicts absorption curves for $\text{Cd}^{115\text{m}}$, Cd^{109} and a Starfish cadmium sample. The presence of a third component is clearly indicated. Since the $\text{Cd}^{115\text{m}}$ and Cd^{109} components of the sample as measured on a beta gamma counter had been established, the absorption curve of the third component was determined by difference. Figure 7 shows the beta absorption curve of this component referred to an absorption curve of I^{131} for comparison. The most reasonable attribution of the third component is $\text{Cd}^{113\text{m}}$, which emits a .58 Mev beta. To provide a sound basis for inter-comparison of three component samples and of standards at various precipitate techniques, empirical precipitate curves were prepared for $\text{Cd}^{115\text{m}}$, Cd^{109} and I^{131} . The latter was used as a surrogate for $\text{Cd}^{113\text{m}}$. The empirical precipitate curves are shown in Figure 8. The Starfish cadmium samples were now re-purified by the procedure outlined in Appendix B. The absorption curves of the third component pre- and post-purification are given in Figure 9. Figure 10 compares the gamma spectra of a sample taken pre- and post-purification. The post-purification spectrum is uncorrected for yield and decay. The specific activity of Cd^{109} and of

the component we shall now refer to as $\text{Cd}^{113\text{m}}$ was unchanged by the purification process. A suggestion has been made that the beta-emitting component might be $\text{Ag}^{110\text{m}}$ contamination. Apart from the evidence mentioned above, this hypothesis is not borne out by the beta activity of silver samples isolated from Starfish debris. For example, a silver sample corresponding to a comparable number of total fissions gave less than five per cent of the $\text{Cd}^{113\text{m}}$ beta activity.

The finding of $\text{Cd}^{113\text{m}}$ in the Starfish debris adds a new dimension to the usefulness of cadmium as a world-wide atmospheric tracer during cessation of testing. Because it is a beta emitter, $\text{Cd}^{113\text{m}}$ can be quickly and conveniently assayed without the benefit of expensive gamma spectrometric equipment. The long life of $\text{Cd}^{113\text{m}}$ (14 years) is of a magnitude appropriate to studying processes having mean times of many years with little reduced sensitivity.

Debris Containment

It is probable that the majority of fission fragments was trapped in the magnetosphere. Evidence is less compelling for the trapping of the non-fission fragment components of the debris. Whereas fission fragments unquestionably become or remain charged when they decay in a vacuum, the self-ionization by decay of Cd^{109} and $\text{Cd}^{113\text{m}}$ is inconsequential. Until further information becomes available on the state of ionization of the non-fission fragment debris components, it will not be possible to estimate the fraction of upward moving cadmium trapped within the magnetosphere.

Table 1

R Values Based on Mo-99

<u>Isotope</u>	<u>"A"</u>	<u>"B"</u>	<u>"C"</u>
Sr-89		0.81	
Sr-91		0.91	
Y-91	0.64	0.82	0.71
Zr-95	1.11	0.90	1.00
Zr-97	0.91	0.95	0.94
Mo-99	1.00	1.00	1.00
Rh-105	2.70	3.36	2.58
Ag-111	19.0	24.2	9.47
Pd-112	19.3	29.2	
Cd-115	157	328	231
Cd-115m	697	1,300	883
Sn-125	18.4	23.4	13.2
Sb-127	7.40	7.00	5.77
Te-129m		2.68	
Te-132	1.04	1.61	0.64
Ba-140	0.75	1.26	0.76
Ce-141	1.28	1.14	0.82
Pr-143		0.89	
Nd-147		1.18	

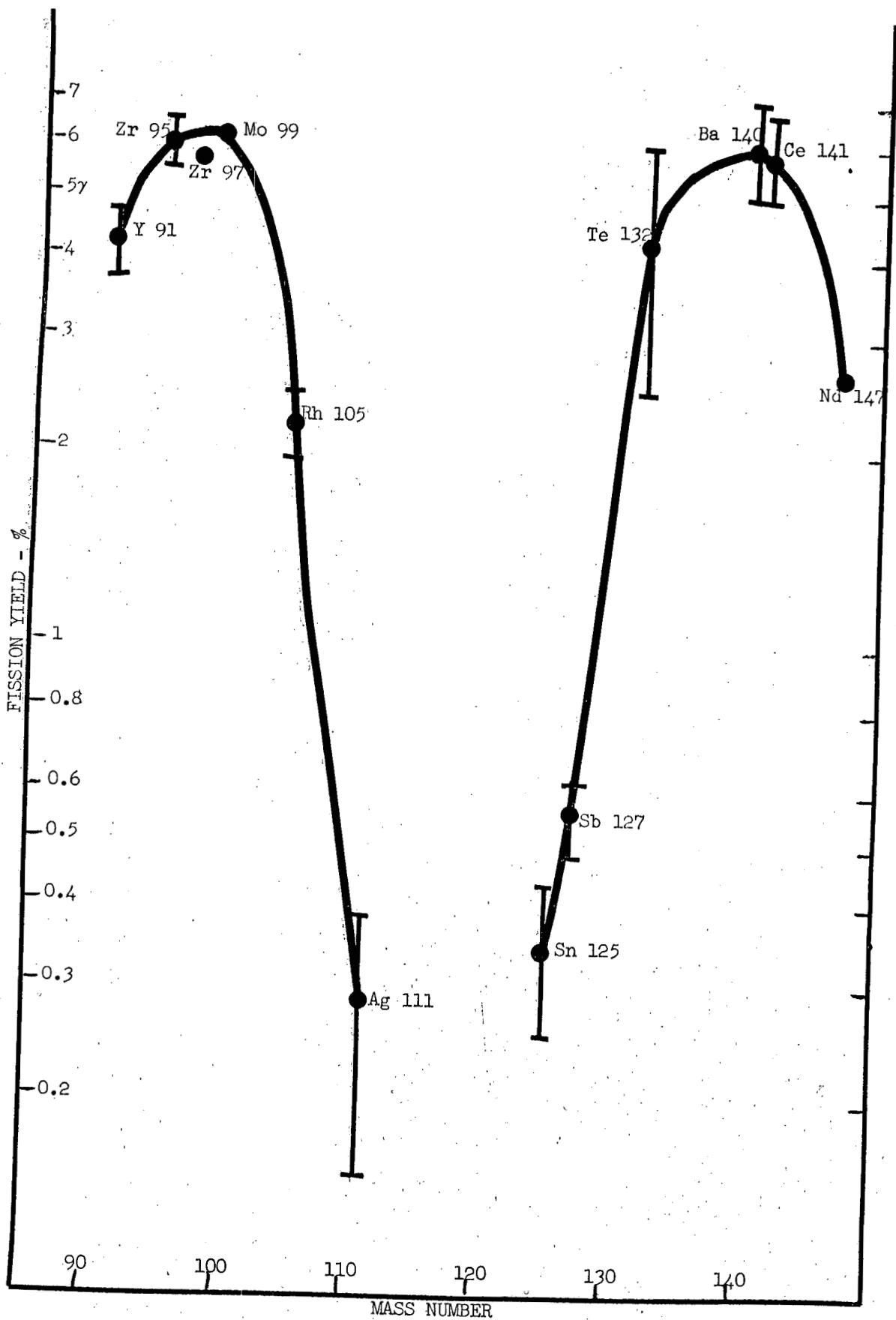


FIGURE 1 - AVERAGE FISSION YIELD DISTRIBUTION STARFISH

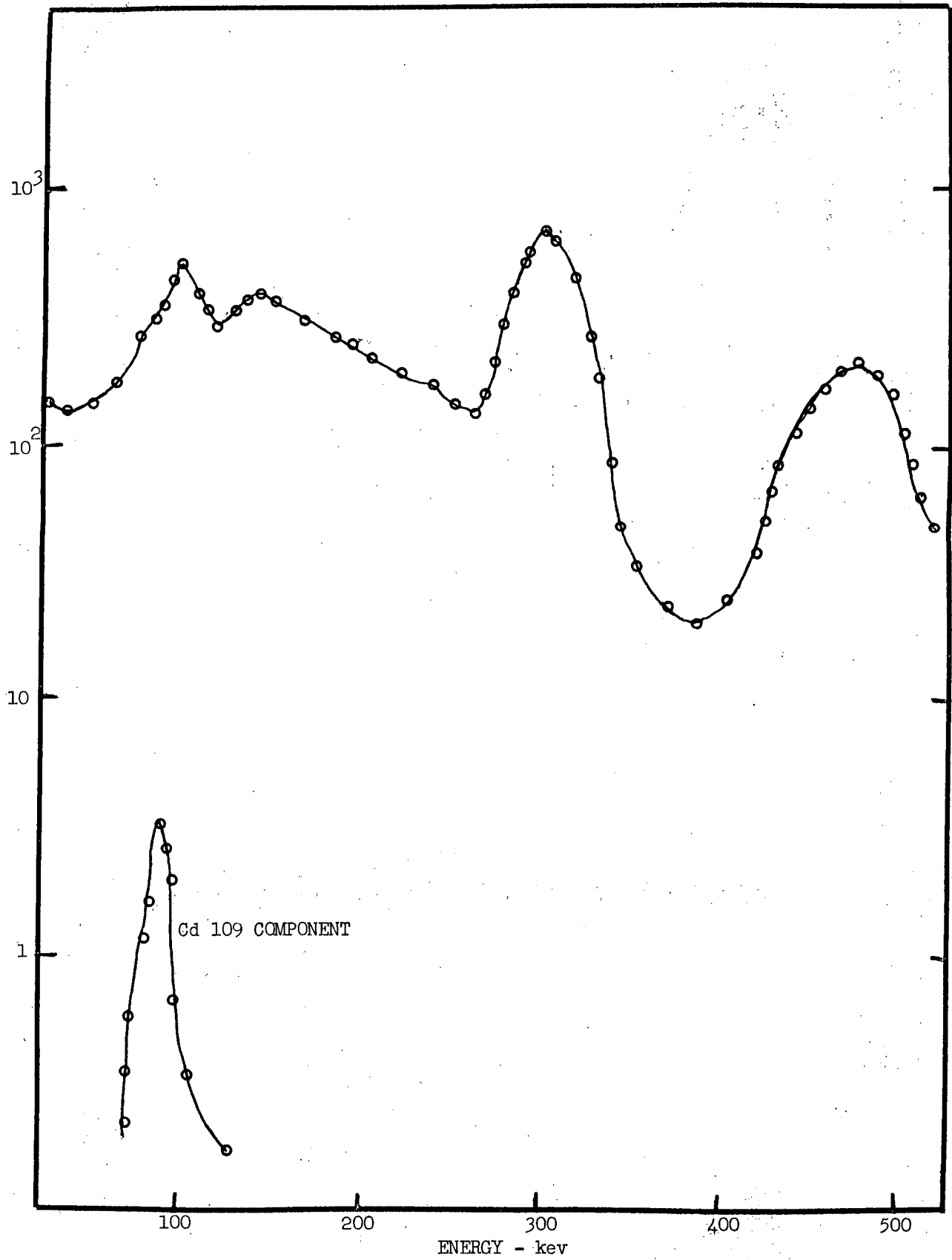


FIGURE 2 - CADMIUM GAMMA SPECTRA SAMPLE 67-62, NINE DAYS AFTER BURST

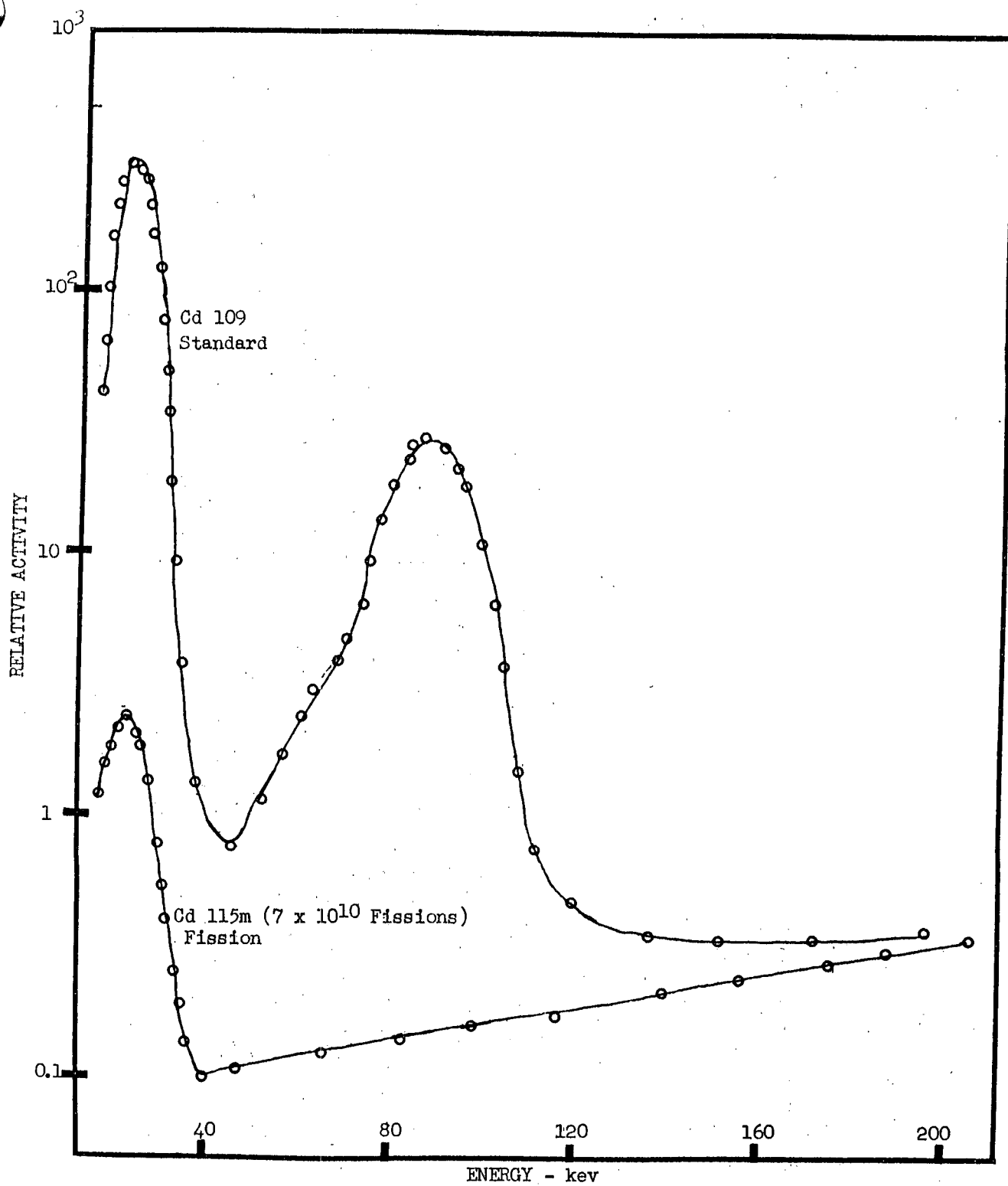


FIGURE 3 - GAMMA SPECTRA

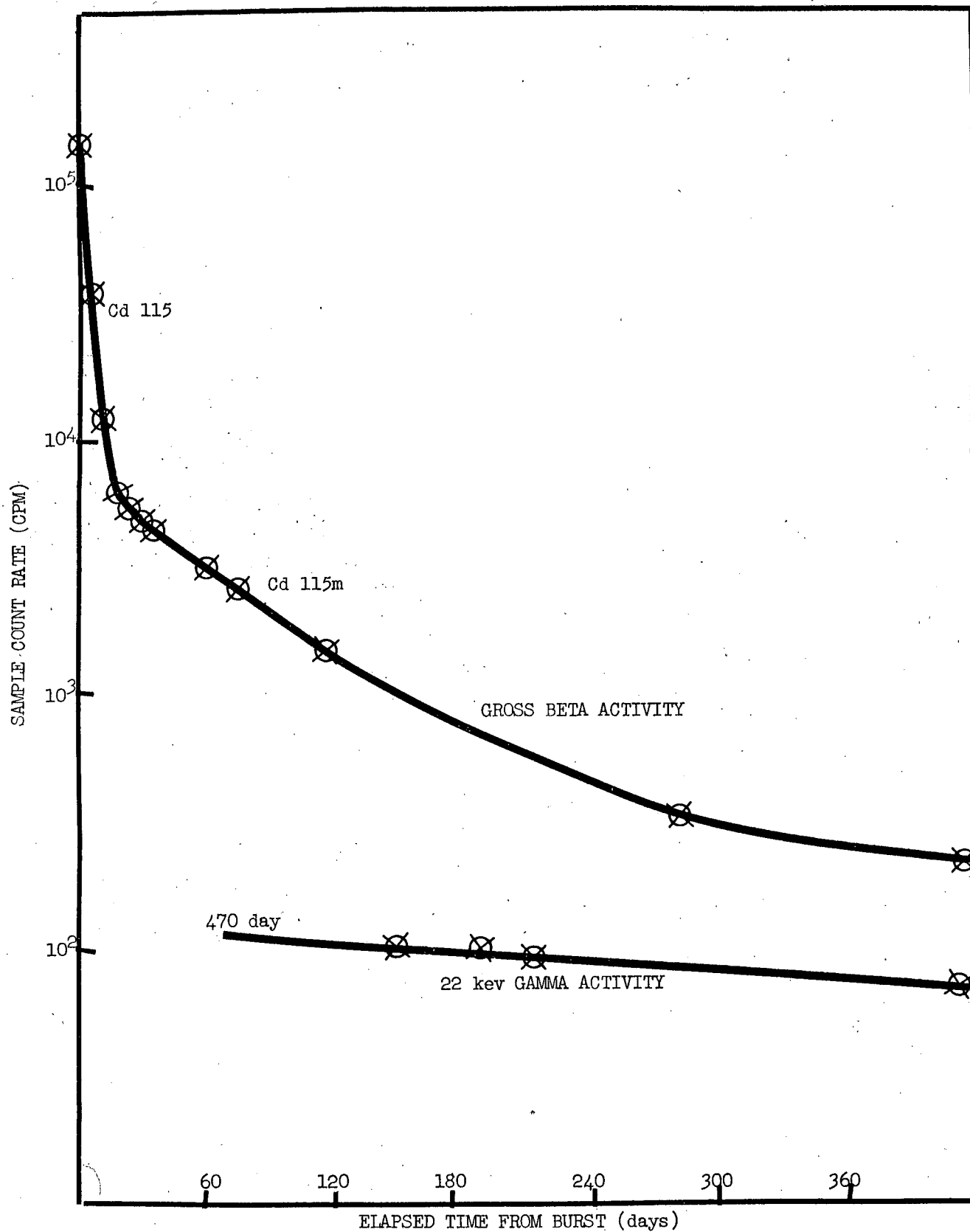


FIGURE 4 - DECAY MEASUREMENT SAMPLE 68-62

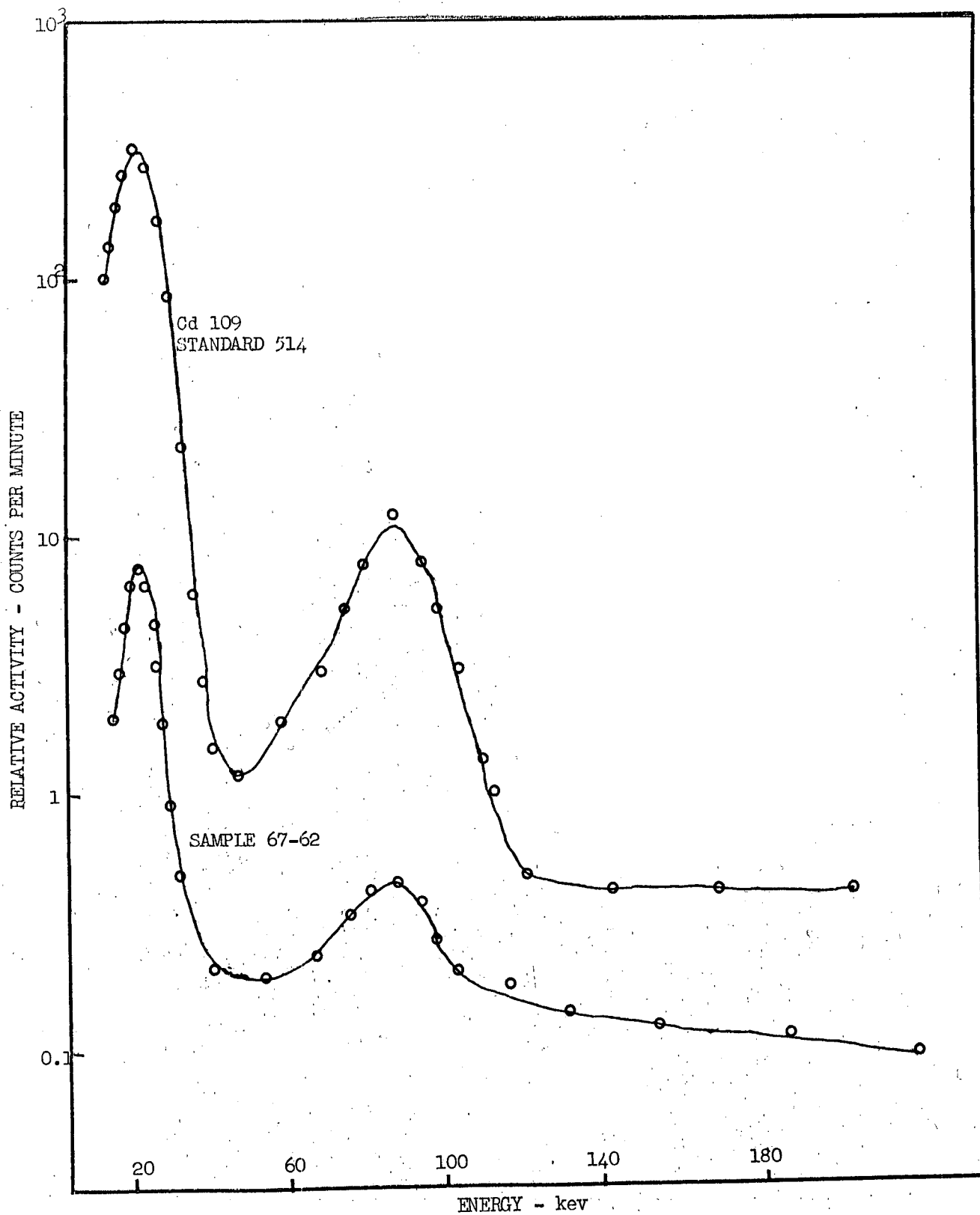


FIGURE 5 - GAMMA SPECTRA 135 DAYS FROM BURST

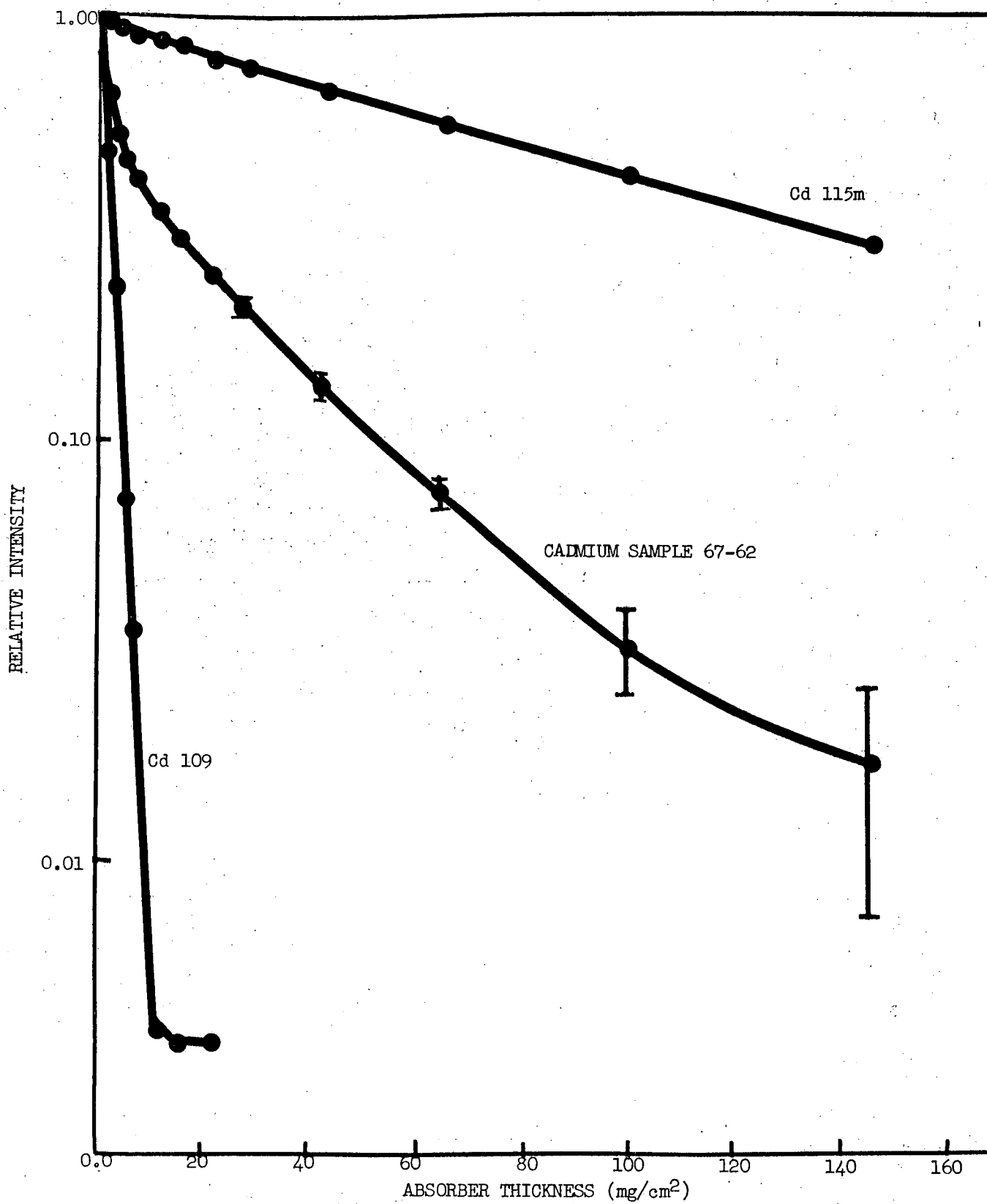


FIGURE 6 - GROSS BETA ABSORPTION CURVE

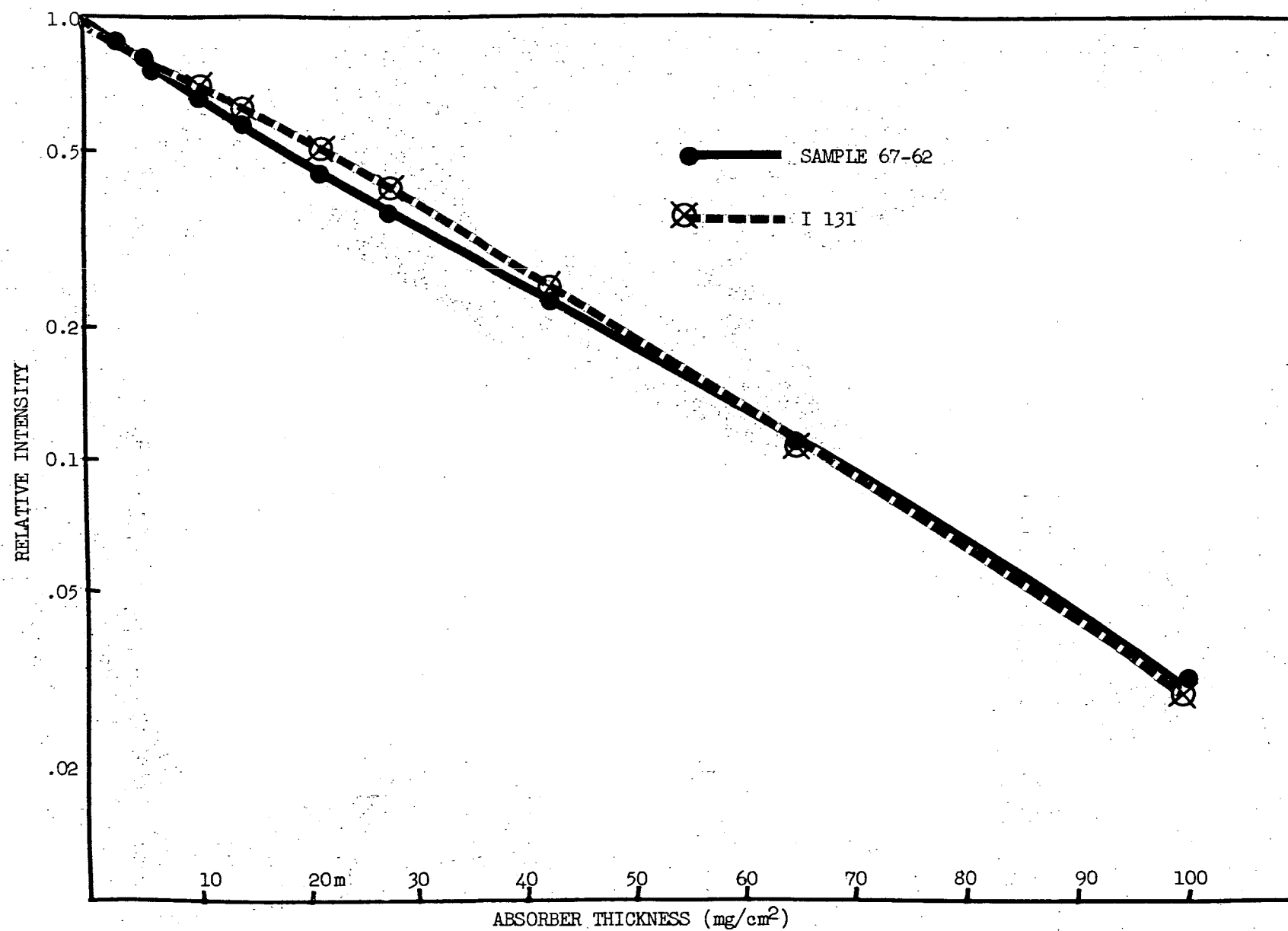


FIGURE 7 - BETA ABSORPTION CURVE SAMPLE 67-62
Cd 109, Cd 115m CONTRIBUTIONS ELIMINATED

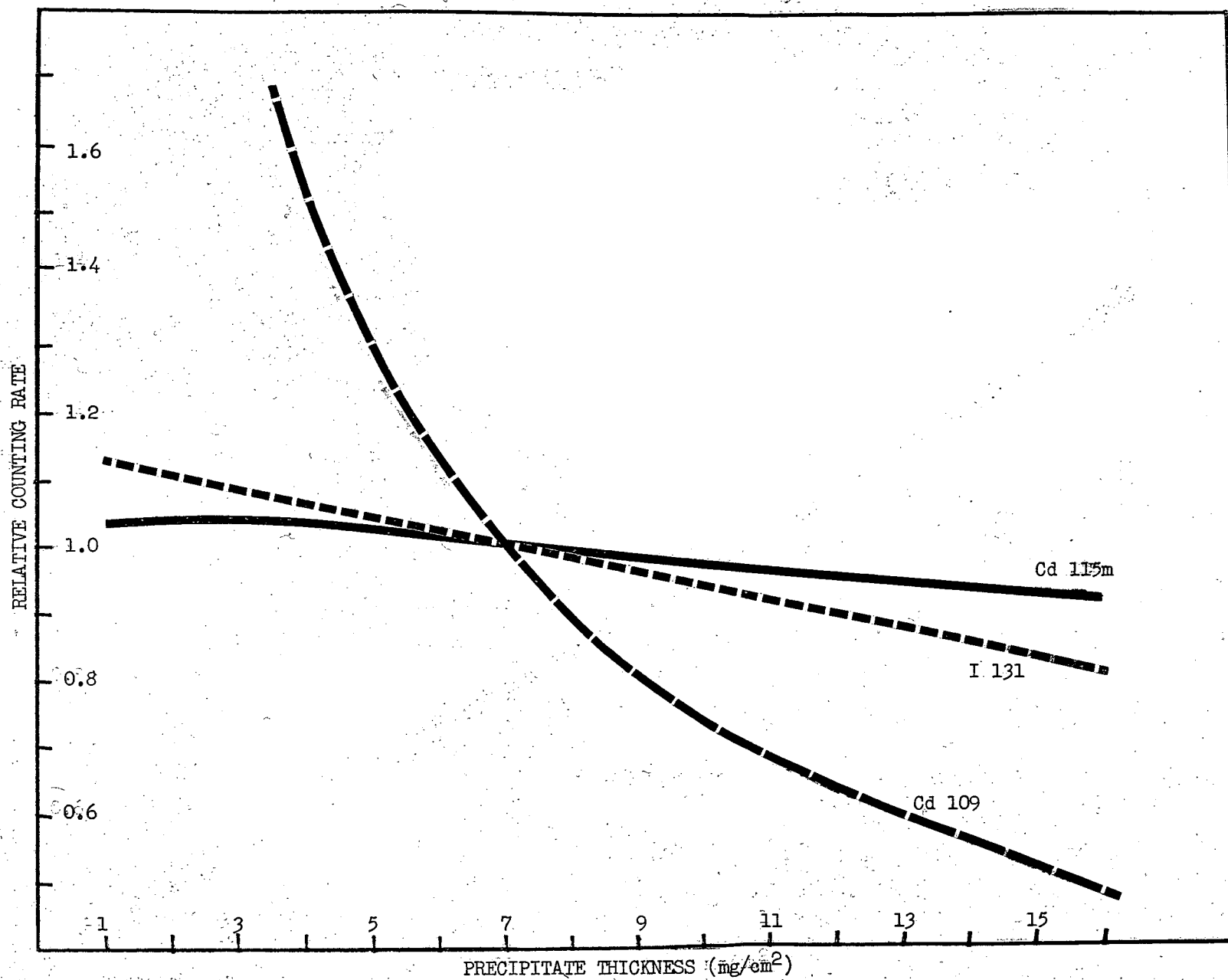


FIGURE 8 - EMPIRICAL PRECIPITATE THICKNESS CURVES

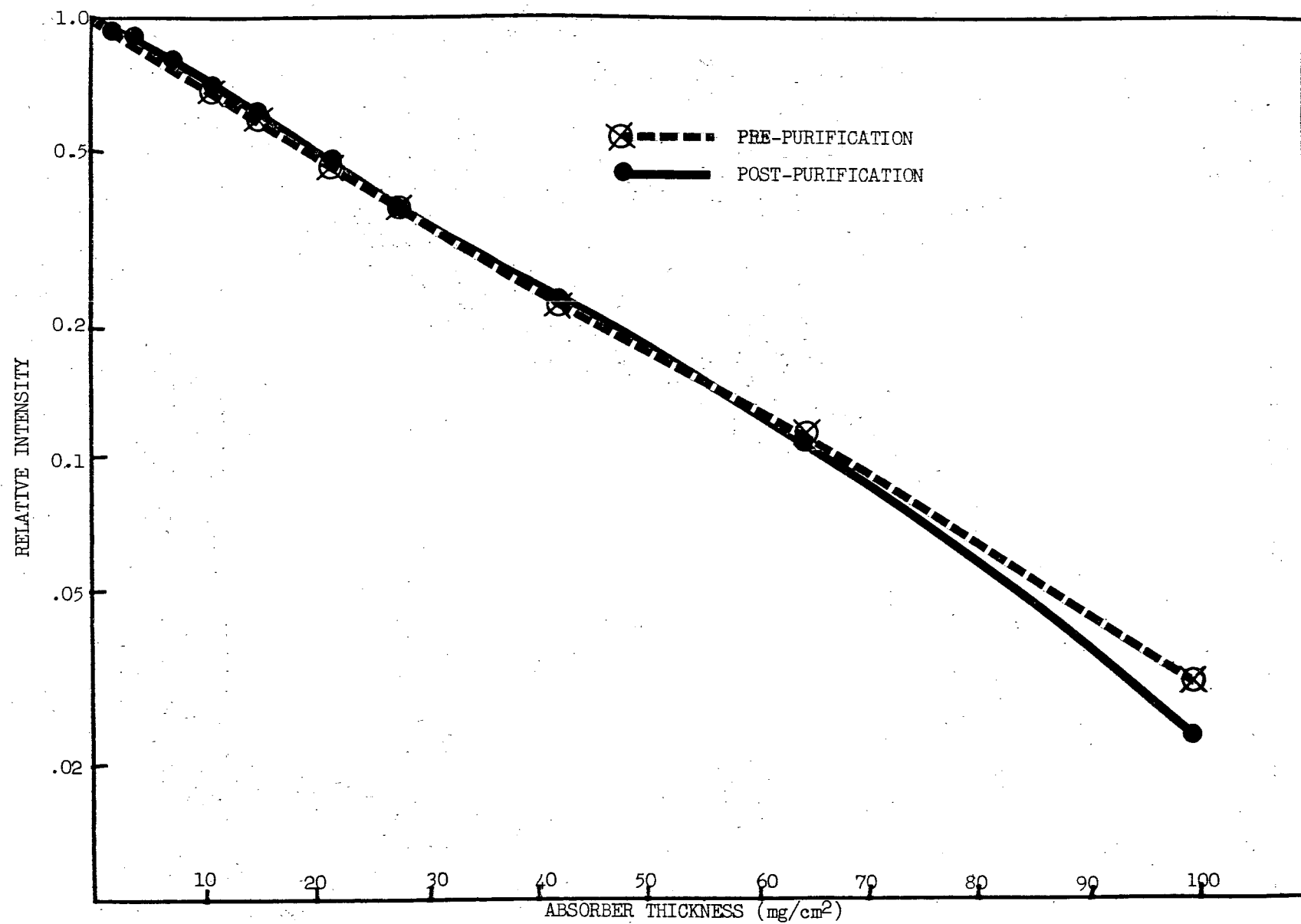


FIGURE 9 - BETA ABSORPTION CURVE SAMPLE 67-62
Cd 109, Cd 115m CONTRIBUTIONS ELIMINATED

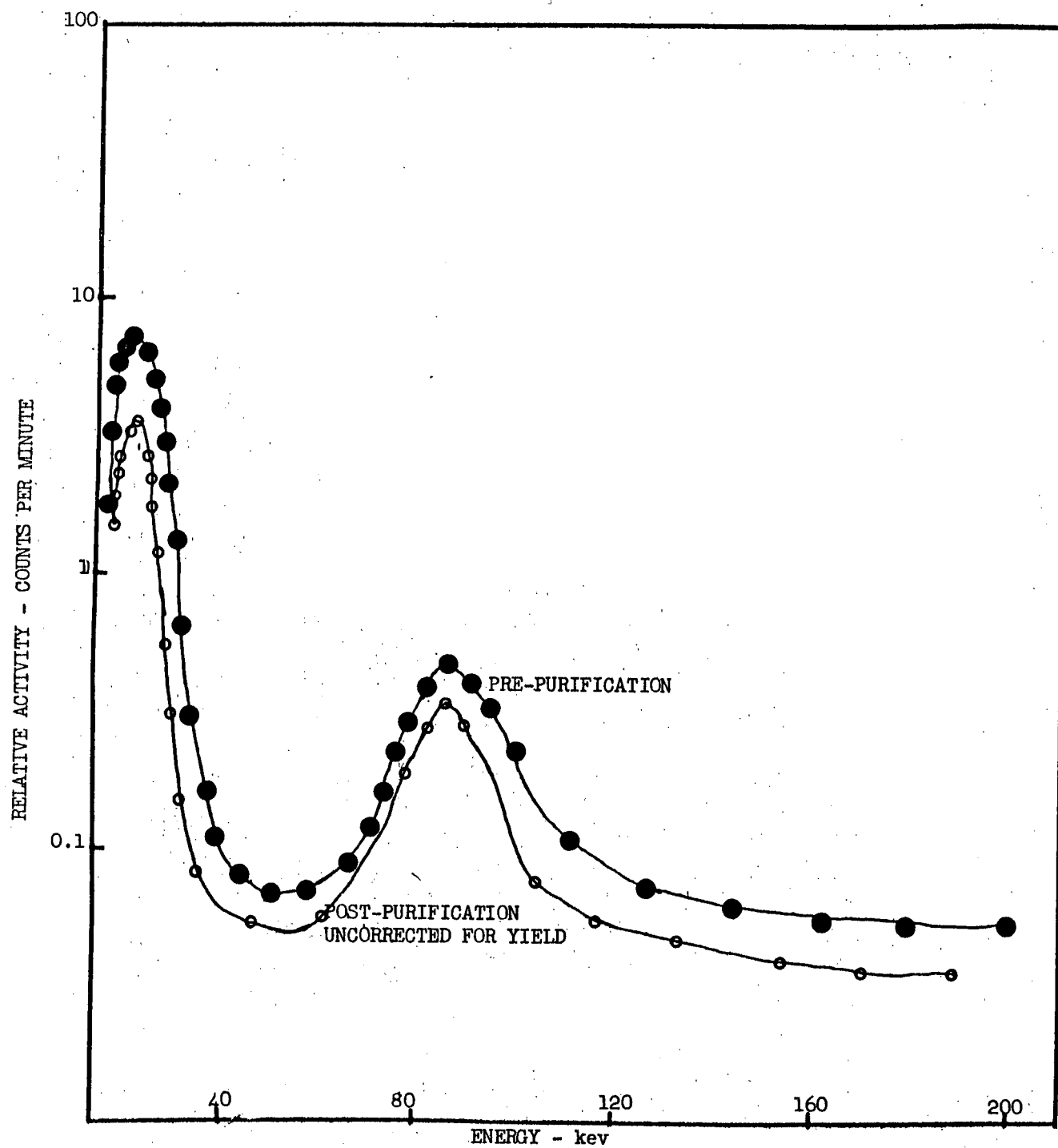


FIGURE 10 - GAMMA SPECTRA SAMPLE 67-62

APPENDIX A

CONSTANTS USED FOR
REDUCTION OF RADIOCHEMICAL DATA

<u>Isotope</u>	<u>Half Life</u>	<u>Decay Constant</u> days ⁻¹	<u>Thermal Yield</u> %	<u>Activity</u> <u>Ratio/Mo⁹⁹</u>
Sr-89	50.4d	.01375	4.54	.0403
Sr-90	27.7y	6.9 x 10 ⁻⁵	5.9	.000262
Sr-91	9.67h	1.720	5.84	6.52
Y-91	57.5d	.01205	5.84	.0459
Y-93	10.1h	1.648	6.45	6.89
Zr-95	63d	.0110	6.27	.0445
Zr-97	16.83h	.988	6.09	3.89
Mo-99	66.1h	.2518	6.14	1.00
Rh-105	36h	.461	.85	.250
Ag-111	7.4d	.0936	.0161	.000975
Pd-112	20.8h	.799	.0107	.00554
Cd-115m	43.3d	.0161	.00071	7.09 x 10 ⁻⁶
Cd-115	53h	.3136	.0098	.00199
Sb-127	93h	.179	.103	.00119
Te-129m	33.5d	.0207	.19	.0025
I-131	8.05d	.0861	2.86	.159
Te-132	77.7h	.214	4.29	.594
I-133	20.9h	.795	6.48	3.34
I-135	6.75h	2.46	6.00	9.56
Cs-136	12.9d	.0538	.0095	.000331
Cs-137	26.6y	.0000713	5.94	.000274
Ba-140	12.8d	.0541	6.56	.230
Ce-141	33.1d	.0209	6.00	.0826
Ce-143	33.1d	.504	6.16	2.01
Pr-143	13.7d	.0506	6.16	.224
Ce-144	282d	.00245	6.22	.00985
Nd-147	11.05d	.0628	2.6	.106
Sm-153	47h	.354	.13	.0298

APPENDIX B

REPURIFICATION OF STARFISH CADMIUM SAMPLES (November 1963)

The procedure for the Starfish Cadmium samples (64-62, 67-62, 68-62) was as follows:

1. Sample dismounted and dissolved in $\text{HNO}_3\text{-HClO}_4$.¹
2. Pd and Zn scavengers added, solution converted to chloride, and diluted to 3N HCl.
3. Solution saturated with H_2S and PdS filtered off.
4. Supernate boiled down with a few ml of H_2SO_4 and then adjusted to 2N H_2SO_4 .²
5. Solution saturated with H_2S and CdS ppt centrifuged and dissolved in 6N HCl.
6. Steps four and five repeated without Zn scavenge.
7. HCl solution of cadmium boiled to near dryness and diluted to 10 ml with H_2O .
8. Fe scavenge performed with NH_4OH , and solution centrifuged.
9. Supernate adjusted to pH 7 and 2 ml 1.5 M $(\text{NH}_4)_2 \text{HPO}_4$ added.
10. CdNH_4PO_4 ppt digested until crystalline, washed, and mounted.

¹Samples were in rather poor condition due to rough handling so that the ppt could not be effectively peeled off.

²Cd-Zn separation suggested by Hillebrand & Lundell pp 204-205.

The Distribution of Accumulated Fallout Strontium-90 with Slope

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In April 1962, 23 soil samples were collected along a 1300 ft. straight line traverse in a well managed tame-grass pasture in Loudoun County, Virginia. This site was chosen for its sloping terrain so that the effect of slope on the cumulative deposition of strontium-90 could be studied. The difference in elevation from the highest to the lowest point along the traverse was 90 feet. Each sample consisted of twenty, $3\frac{1}{2}$ " diameter cores, cut to a depth of eight inches. The total area represented by each sample was, therefore, 1.34 square feet.

Each sample was dried, seived, and blended and duplicate one kilogram aliquots were then taken for strontium-90 analysis. One set of aliquots were analyzed at HASL using the hydrochloric acid extraction method while the other set was analyzed at the Beltsville Strontium-90 Laboratory using an HCL - HNO₃ extraction technique.

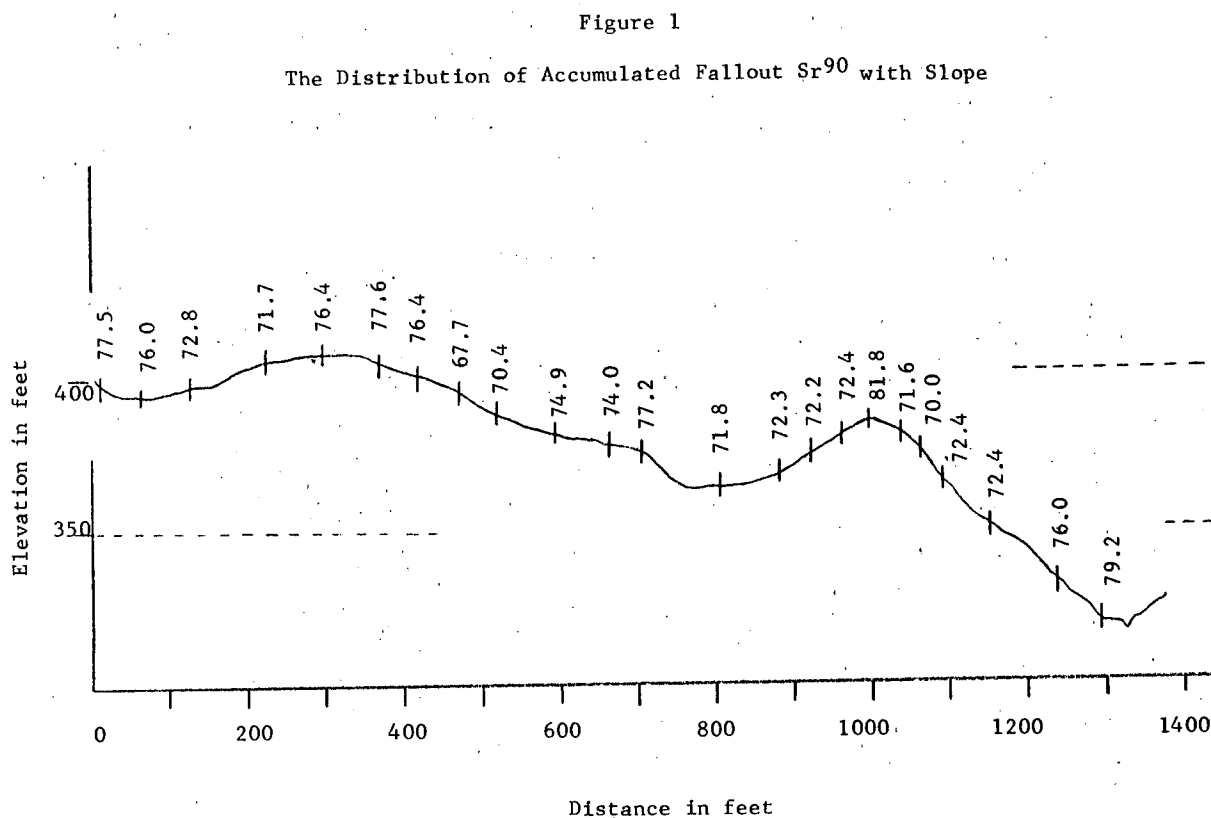
Data obtained from the two laboratories are given in table 1.

Table 1

Sr⁹⁰ in Soils Collected on April 5, 1962, Along a Straight-Line Traverse
in Loudoun County, Virginia

Sample	Distance from starting point (ft.)	kg soil $\frac{\text{ft.}}{\text{ft.}^2}$	mc Sr ⁹⁰ /mi ²		Avg. mc Sr ⁹⁰ /mi ²
			HASL	BSL	
1	12	23.51	79.7	75.3	77.5
2	64	24.89	75.7	76.3	76.0
3	128	26.60	72.8	72.8	72.8
4	228	24.55	73.1	70.3	71.7
5	300	24.85	75.9	76.8	76.4
6	372	22.42	78.3	76.9	77.6
7	421	23.13	76.4	76.4	76.4
8	477	25.37	65.6	69.8	67.7
9	523	24.92	69.5	71.4	70.4
10	600	22.24	73.5	76.3	74.9
11	669	24.59	73.8	74.1	74.0
12	710	24.36	77.1	77.4	77.2
13	808	24.55	66.9	76.8	71.8
14	888	23.43	69.8	74.8	72.3
15	925	23.32	69.7	74.7	72.2
16	964	23.54	71.6	73.3	72.4
17	1000	23.47	83.7	79.9	81.8
18	1042	23.58	68.7	74.4	71.6
19	1063	24.22	68.5	71.5	70.0
20	1092	24.51	72.0	72.7	72.4
21	1150	24.66	72.5	72.2	72.4
22	1239	25.71	74.3	77.8	76.0
23	1291	25.07	76.5	81.9	79.2

An F test was used to examine the paired data from HASL and Beltsville to determine whether or not there was a significant difference in results obtained by the two laboratories. The result of this test was that there was no difference between laboratories at the 99 percent confidence level. A diagram showing the average strontium-90 results for each sampling point and its relative position along the traverse is shown in Figure 1.



The most striking observation is the uniformity in cumulative deposition even on the steepest slope where one might have expected to observe marked differences in deposition due to run-off. The uniformity is likely due to the good grass cover. An F test was also used to determine whether or not there was a significant difference among sites when a combined sampling and analytical error of plus or minus 4 mc Sr^{90} per mi^2 was assigned to each result. Under these conditions at the $F_{0.99}$ level, there was no difference among sites.

Further sampling including a transect of cultivated area is planned to continue this study of redistribution of strontium-90 in relation to slope.

1962 Soil Sampling in Clallam County, Washington

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Five soil sampling sites were selected in Clallam County, Washington to study the effect of varying amounts of precipitation on the cumulative deposition of strontium-90 within a limited geographical area. Only four of the sites were sampled in the fall of 1957. Subsequent samplings of all five locations were carried out in 1959 and 1960. The soils were analyzed for strontium-90 and the data expressed as activity per unit area (millicuries of strontium-90 per square mile). The results were compared with the cumulative precipitation at each site and a linear relationship was observed between these two variables for each of the three sampling periods.(1),(2)

The five sites were re-sampled in 1962 and the new data along with the results obtained from the previous samplings are reported in Table 1. Most of the soils were extracted with hydrochloric acid to remove strontium-90 but in some cases an HCl-HNO_3 extraction or basic carbonate fusion was used. Some of the samples were analyzed at the Soil Conservation Service's Soil Survey Laboratory in Beltsville, Md. (BSL), while the bulk of the analyses were performed at the Health and Safety Laboratory (HASL).

The precipitation data and strontium-90 values in millicuries per square mile are given in Table 2. The strontium-90 results are averages of the data obtained by hydrochloric acid extraction only. The fusion and HCl-HNO_3 extraction methods were carried out to test the efficiency of the hydrochloric acid leach. Similar tests were done on other soils not connected with the Clallam County study and these data will be reported and evaluated at another time. For comparisons among the Clallam County sites, the hydrochloric acid extraction data was considered adequate. It will be noted that the strontium-90 data for 1957, 1959, and 1960 given in Table 2, are slightly different from results reported previously.(1),(2) Whereas all available results were formerly used in averaging, only the hydrochloric acid leach values were employed in calculating the means listed in Table 2. Furthermore, the data in Table 1 have been calculated to the sampling date while previous data were reported as of the counting date. The observations and conclusions already presented(1),(2) are not at all affected by these minor changes.

Cumulative strontium-90 deposition is plotted against precipitation in Figure 1 for each of the four sampling periods. A linear regression line has been drawn through each set of points. The correlation coefficients for the 1957, 1959, 1960 and 1962 data are 0.93, 0.98, 0.99 and 0.97, respectively which indicate correlation between deposition and precipitation at the 99 per cent confidence level for the 1959, 1960 and 1962 data, and at the 95 per

cent confidence level for the 1957 data.⁽³⁾ Thus, the linearity between cumulative strontium-90 deposition and precipitation which was observed from the 1957, 1959, and 1960 studies, also held for the 1962 sampling.

The dashed portion of the line is an extrapolation to zero rainfall on the assumption that linearity persists in this region. The values of the y-intercept, which are taken to represent the cumulative dry deposition, are 12, 16, 14, and 29 millicuries of strontium-90 per square mile for 1957, 1959, 1960, and 1962, respectively. The change in slope from one year to the next is a reflection of the change in annual fallout deposition per unit amount of precipitation. The slopes are 0.04 mc Sr-90/mi²/in. precipitation in 1957, 0.10 in 1959, 0.14 in 1960, and 0.11 in 1962. The decrease in slope in 1962 is accompanied by an increase in the cumulative dry deposition by almost a factor of 2, as measured by the y-intercept. It is possible that the major part of the fallout occurring in Clallam County between the fall of 1960 and the fall of 1962 was of tropospheric rather than stratospheric origin and deposited by mechanisms other than scavenging by precipitation.

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Table 1

Clallam County Soils

Site	Sampling Date	depth in inches	kg soil / ft. ²	d/m Sr ⁹⁰ (1) kg	method	laboratory
Sequim	6/23/57	0-5	8.97	110	HCl	HASL
				90	HCl	HASL
	9/24/59	0-6	15.23	156	HCl	HASL
	9/27/60	0-7½	18.62	154	HCl	HASL
				137(2)	HCl	HASL
				140	HCl	HASL
				167	Fusion	HASL
				149(2)	Fusion	HASL
				148	HCl-HNO ₃	HASL
	10/1/62	0-7	18.17	173	HCl	HASL
				194(2)	HCl	HASL
Port Angeles	6/23/57	0-5	14.35	114	HCl	HASL
	9/24/59	0-7	21.49	141	HCl	HASL
	9/27/60	0-8	31.34	118	HCl	HASL
				101(2)	HCl	HASL
				115	HCl	HASL
				140	Fusion	HASL
				119(2)	Fusion	HASL
				126	HCl-HNO ₃	HASL
	10/1/62	0-9	24.07	206	HCl	HASL
				227(2)	HCl	HASL
Joyce	6/23/57	0-6	10.66	161	HCl	HASL
	9/24/59	0-8	17.77	160	HCl	HASL
				220	HCl	HASL
				211(2)	HCl	HASL
	9/27/60	0-8	20.92	214	HCl	BSL
				299	HCl	HASL
				332	HCl	HASL
				282	HCl	HASL
				263	HCl	BSL
				301	Fusion	HASL
				283(2)	Fusion	HASL
	10/1/62	0-10	19.63	306	HCl-HNO ₃	HASL
				342	HCl	HASL
Clallam Bay	9/24/59	0-9	24.54	340(2)	HCl	HASL
	9/27/60	0-8	24.75	233	HCl	HASL
				336	HCl	HASL
				277(2)	HCl	HASL
				350	HCl	HASL
				391	Fusion	HASL
				374(2)	Fusion	HASL
	10/2/62	0-10	27.50	384	HCl	HASL
				386(2)	HCl	HASL
Forks	6/24/57	0-6	14.28	180	HCl	HASL
	9/25/59	0-9	19.30	415	HCl	HASL
	9/28/60	0-9	22.51	515	HCl	HASL
				464(2)	HCl	HASL
				513	HCl	HASL
				476(2)	HCl	BSL
				534	HCl	BSL
				542	HCl	BSL
				561	Fusion	HASL
				516	Fusion	HASL
				525	HCl-HNO ₃	HASL
	10/2/62	0-12	26.01	465	HCl	HASL
				473(2)	HCl	HASL

(1) calculated to sampling date.

(2) blind duplicate.

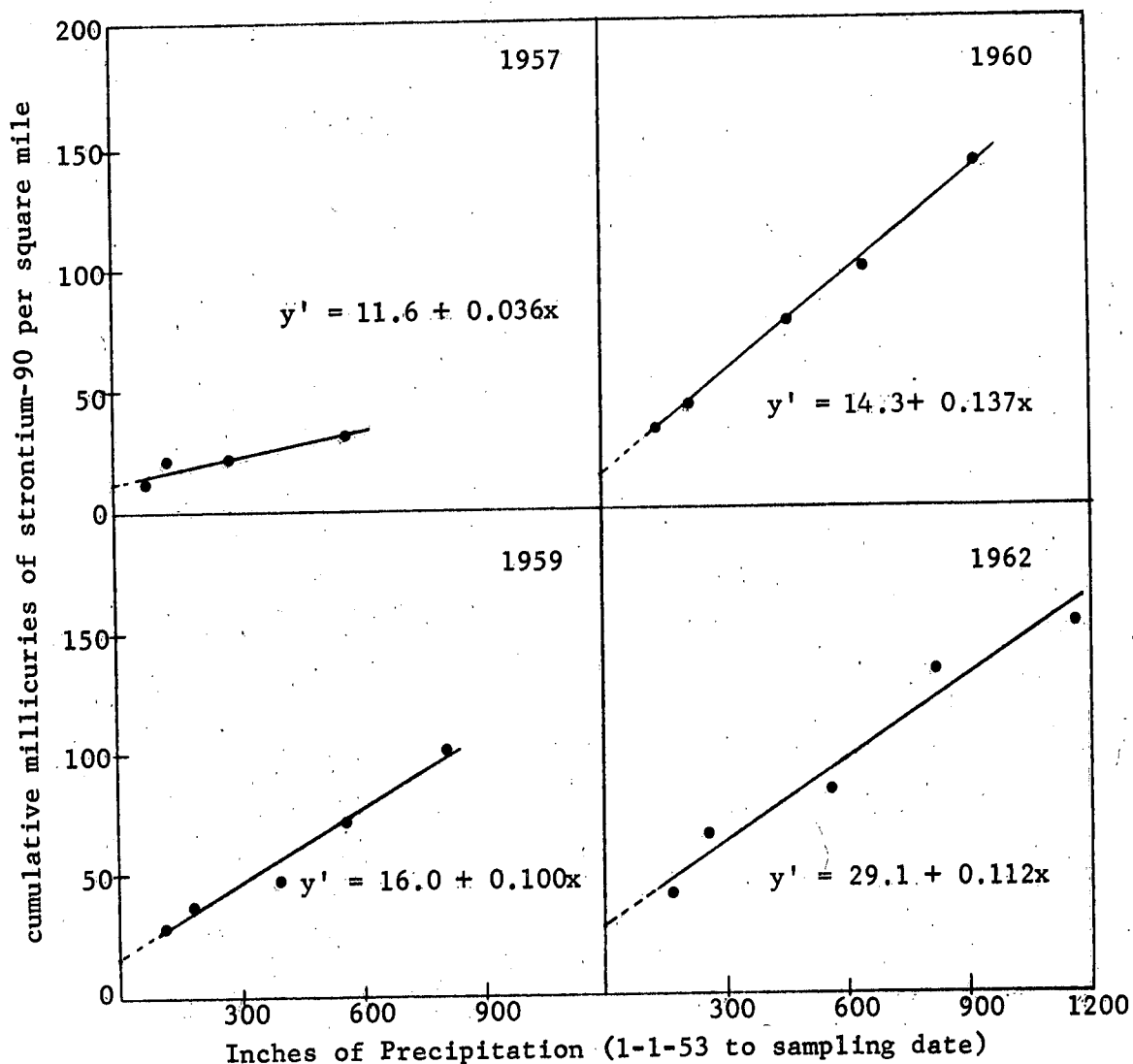
Table 2

Rainfall and Sr-90 Data for Clallam County Soil Sites

<u>Site</u>	<u>in. of precipitation from 1-1-53 thru collection date</u>				<u>mc Sr⁹⁰/mi.²</u>			
	<u>1957</u>	<u>1959</u>	<u>1960</u>	<u>1962</u>	<u>1957</u>	<u>1959</u>	<u>1960</u>	<u>1962</u>
Sequim	87	119	135	163	11.3	29.8	33.7	42.0
Port Angeles	134	187	215	263	20.6	38.1	43.7	65.3
Joyce	288	404	459	568	21.4	48.0	77.3	84.1
Clallam Bay	-	566	648	811	-	71.8	99.8	133
Forks	576	812	922	1160	32.3	101	143	153

Figure 1

Strontium-90 Deposition as a Function of
Amount of Precipitation
1957, 1959, 1960, and 1962



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The following abbreviation listing and conversion table involve units of measurement used in the HASL fallout and air sampling programs.

ABBREVIATIONS:

in. - inches	mm - millimeters	mc - millicuries
ft. - feet	cm - centimeters	d/m - disintegrations per minute
mi. - miles	m - meters	μc - micro-curies
lb. - pounds	km - kilometers	μμc - micro-microcuries
liq.qt. - liquid quarts	kg - kilograms	pc - picocuries
	l - liters	nc - nanocuries

SCF - standard cubic feet at 1 atmosphere (1013 mb) and 15°C (59°F).
 SCM - standard cubic meters at 1 atmosphere (1013 mb) and 15°C (59°F).
 kg air - kilograms of air at 1 atmosphere (1013 mb) and 15°C (59°F).

CONVERSION TABLE

Multiply	by	to obtain	Multiply	by	to obtain
in.	25.4	mm	mm	0.0394	in.
in.	2.54	cm	cm	0.394	in.
ft.	0.305	m	m	3.28	ft.
mi.	1.61	km	km	0.621	mi.
lb.	0.4536	kg	kg	2.205	lb.
liq.qt.-U.S.	0.946	l	l	1.057	liq.qt.-U.S.
mi ²	2.59	km ²	km ²	0.386	mi ²
mc/mi ²	0.386	mc/km ² (μμc/m ²)	mc/km ² (μμc/m ²)	2.59	mc/mi ²
mc/mi ² /in.	15.2	μμc/l	μμc/l	0.0657	mc/mi ² /in.
μμc/l	0.01	mc/km ² /cm	mc/km ² /cm	100	μμc/l
d/m	0.450	μμc (pc)	μμc (pc)	2.22	d/m
nc (μμc)	1 x 10 ³	μμc	μμc	1 x 10 ⁻³	nc
d/m/l	0.45 x 10 ⁻⁹	μc/cc	μc/cc	2.22 x 10 ⁹	d/m/liter
d/m/ft. ²	0.01256	mc/mi ²	mc/mi ²	79.6	d/m/ft. ²
10 ³ SCF	28.3	SCM	SCM	0.0353	10 ³ SCF
10 ³ SCF	34.7	kg air	kg air	0.0288	10 ³ SCF
SCM	1.226	kg air	kg air	0.816	SCM

AREA OF THE EARTH

	Area	
	mi ²	km ²
land	57.470 x 10 ⁶	148.847 x 10 ⁶
ocean	139.480 x 10 ⁶	361.254 x 10 ⁶
total	196.950 x 10 ⁶	510.101 x 10 ⁶

The following table is a limited listing of fission product radionuclides of interest in the HASL fallout program. The half-life values are those currently in use at HASL and are subject to change as new measurements are made. The energy values for each isotope are listed from left to right in order of decreasing abundance and by no means include all emissions involved in the decay scheme. Photon energies contributing less than ten percent are not listed.

FISSION PRODUCTS

Nuclide	Daughter	t _{1/2}	Energy - Mev	
			γ	β
38Sr ⁸⁹		50.5 d		1.46
38Sr ⁹⁰	39Y ⁹⁰	27.7 y 64.2 h		0.54 2.27
39Y ⁹¹		57.5 d		1.55
40Zr ⁹⁵	41Nb ⁹⁵	65.0 d 35 d	0.72, 0.76 0.77	0.40, 0.36 0.167
44Ru ¹⁰³		39.8 d	0.50	0.21, 0.12
44Ru ¹⁰⁶	45Rh ¹⁰⁶	1.0 y 30 s	0.51, 0.62	0.04 3.55, 2.4, 3.05
51Sb ¹²⁵	52Te ^{125m}	2.0 y 58 d	0.43, 0.60, 0.46, 0.64, 0.18	0.30, 0.12, 0.61, 0.44
53I ¹³¹		8.08 d	0.36	0.61, 0.33
55Cs ¹³⁶		12.9 d	0.83, 1.07, 0.34, 1.25, 0.15, 0.17, 0.27	0.34, 0.66
55Cs ¹³⁷	56Ba ^{137m}	30.5 y 2.6 m	0.66	0.51, 1.16
56Ba ¹⁴⁰	57La ¹⁴⁰	12.8 d 40.2 h	0.54 1.60, 0.49, 0.82, 0.33	1.01, 0.48, 0.11, 0.9 1.38, 1.10, 0.83
58Ce ¹⁴¹		33.1 d	0.14	0.44, 0.58
58Ce ¹⁴⁴	59Pr ¹⁴⁴	285 d 17.3 m	0.03	0.32, 0.19, 0.24 2.98, 2.29, 0.80
61Pm ¹⁴⁷		2.64 y		0.23

latitude band	Area	
	mi ²	km ²
0-10	17.142 x 10 ⁶	44.398 x 10 ⁶
10-20	16.621 x 10 ⁶	43.048 x 10 ⁶
20-30	15.595 x 10 ⁶	40.392 x 10 ⁶
30-40	14.096 x 10 ⁶	36.508 x 10 ⁶
40-50	12.167 x 10 ⁶	31.512 x 10 ⁶
50-60	9.870 x 10 ⁶	25.565 x 10 ⁶
60-70	7.271 x 10 ⁶	18.833 x 10 ⁶
70-80	4.454 x 10 ⁶	11.536 x 10 ⁶
80-90	1.258 x 10 ⁶	3.257 x 10 ⁶