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No. [redacted] of [redacted] Series A

Dr. J. H. Harley and Mr. I. B. Whitney July 2, 1956

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Analytical Branch, Health and Safety Laboratory

GENERAL MILLS HIGH ALTITUDE BALLOON FILTER SAMPLES

SYMBOL: HSA:EPH:ST

Ten (10) filter samples forwarded to HASL by Dr. Worf have been analyzed for total beta activity, Sr-89, Sr-90 and Cs-137. Pertinent information available and analytical results are reported in the accompanying four (4) tables. General Mills samples numbered ET 4 and 5 were reported lost.

Each filter was ignited at 550°C for twelve (12) hours and the residue transferred to a glass planchet and beta counted. K-40 was used as a standard. The standard cubic foot values were obtained from Dr. L. Machta by phone. At that time it was explained that these figures were based on calculation of fan revolution rate which was not constant throughout the sampling period. The efficiency for collection of particles at these altitudes is considered to be 25% but the data presented in this memorandum has not been corrected for efficiency. No blank filters were received for control analysis.

In reference to the ensuing comments, possible variation of nuclide abundance or other parameter with time has been disregarded. There is no apparent correlation of ash weight with altitude. By plotting isotopic concentration in d/m per standard cubic foot with altitude (Figures I-IV), it appears as though total beta activity diminishes with increasing altitude. A range of 0.96 to 1.14 d/m/std ft^3 is indicated for the samples collected between 58 and 60 thousand feet and a range 0.16 to 0.38 for those collected between 76 and 92 thousand feet. Likewise, the concentration of Sr-90 and Sr-89 seems to decrease with increasing altitude, while this trend is not evident in the case of Cs-137. The concentration of Sr-90 falls within the limits 0.036 and 0.046 d/m/std ft^3 between 58 to 60 thousand feet and within 0.010 and 0.032 between 76 to 92 thousand feet. By plotting the relative nuclide abundance in per cent against altitude (Fugures V-VII), there is indication of an enrichment of Sr-90

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and Cs-137 at higher altitudes while no correlation is apparent in the case of Sr-89. In addition no trend is evidenced when the ratio of Sr-89 to Sr-90 is plotted against altitude (Figure VIII). Sr-89 was detectable in seven (7) samples where the ratio of 89 to 90 ranged from 3.4 to 15.

Ten (10) 50 ml solutions representing the insoluble carbonate fractions (minus strontium) may be sent to Dr. H. D. Rock of AFOAT-1 for radioactive Zr and Ce analysis.

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TABLE 1

HASL #	G. M. #	Sampling Date	Altitude (feet)	Weight of Ash (grams)	Standard ft^3*
3575	ET- 1	4-12-56	60,000	1.019	3050
3576	ET- 2	4-13-56	77,500	0.236	2000
3591	ET- 3	4-16-56	59,700	0.263	3850
3590	ET- 6	4-29-56	88,750	0.924	1210
3594	ET- 7	5- 2-56	59,000	0.343	4570
3596	ET- 8	5- 3-56	76,000	0.213	833
3595	ET- 9	5- 3-56	90,500	0.115	1310
3598	ET-10	5- 4-56	91,600	0.170	1842
3597	ET-11	5- 4-56	91,600	1.529	
3609	ET-12	5- 5-56	92,000	0.174	1220

* Private communication, Dr. L. Machta, 6/18/56.

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TABLE 2

G. M. #	Total Activity C-date	T. A. d/m/sample	Sr-90 d/m/sample	Sr-89* d/m/sample	Cs-137 d/m/sample
ET- 1	4-23-56	3470 ± 40	140 ± 7.1	574 ± 16	204 ± 10
ET- 2	4-23-56	456 ± 15	25 ± 6.8	27 ± 10	47 ± 8.1
ET- 3	5-16-56	3736 ± 27	138 ± 7.0	340 ± 22	not reported
ET- 6	5-16-56	454 ± 12	37 ± 5.6	≤ 10	lost
ET- 7	5-17-56	5240 ± 52	177 ± 7.9	270 ± 18	409 ± 12
ET- 8	5-18-56	290 ± 14	16 ± 5.1	30 ± 10	53 ± 7.0
ET- 9	5-17-56	226 ± 23	13 ± 5.5	36 ± 13	52 ± 9.4
ET-10	5-18-56	330 ± 14	33 ±12	≤ 34	65 ± 8.3
ET-11	5-18-56	225 ± 11	22 ± 6.1	15 ± 13	88 ± 10
ET-12	5-18-56	390 ± 14	22 ± 6.1	≤ 12	92 ± 11

* As of sampling date.

NOTE: All results accompanied by one standard deviation due to the error in counting.

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TABLE 3

G. M. No.	% Sr-90*	% Sr-89*	% Cs-137*	Sr-89/Sr-90**
ET- 1	4.0	14	5.8	15
ET- 2	5.5	5.3	10	4.1
ET- 3	3.7	6.2		9.6
ET- 6	8.1			
ET- 7	3.4	4.2	7.8	7.1
ET- 8	5.5	8.6	18	9.2
ET- 9	5.8	13	23	14
ET-10	10		20	
ET-11	9.8	5.8	39	3.4
ET-12	5.6		24	

* On total activity C-date.

** Sr-89 as of 1/1/56.

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TABLE 4

G. M. No.	Total Activity d/m/std. ft^3	Sr-90 d/m/std. ft^3	Sr-89* d/m/std. ft^3	Cs-137 d/m/std. ft^3
ET- 1	1.14 ± 0.010	0.0459 ± 0.0023	0.188 ± 0.0051	0.0669 ± 0.0033
ET- 2	0.226 ± 0.008	0.0125 ± 0.0034	0.0135 ± 0.0052	0.0235 ± 0.0041
ET- 3	0.970 ± 0.007	0.0358 ± 0.0018	0.0883 ± 0.0057	
ET- 6	0.375 ± 0.010	0.0306 ± 0.0046	≤ 0.0083	–
ET- 7	1.15 ± 0.011	0.0387 ± 0.0017	0.0591 ± 0.0039	0.0895 ± 0.0026
ET- 8	0.348 ± 0.017	0.0192 ± 0.0061	0.0360 ± 0.0120	0.0636 ± 0.0084
ET- 9	0.172 ± 0.018	0.0099 ± 0.0042	0.0275 ± 0.0099	0.0397 ± 0.0072
ET-10	0.179 ± 0.008	0.0179 ± 0.0065	≤ 0.0184	0.0353 ± 0.0045
ET-11				
ET-12	0.320 ± 0.011	0.0180 ± 0.0050	≤ 0.0098	0.0754 ± 0.0090

* As of sampling date.

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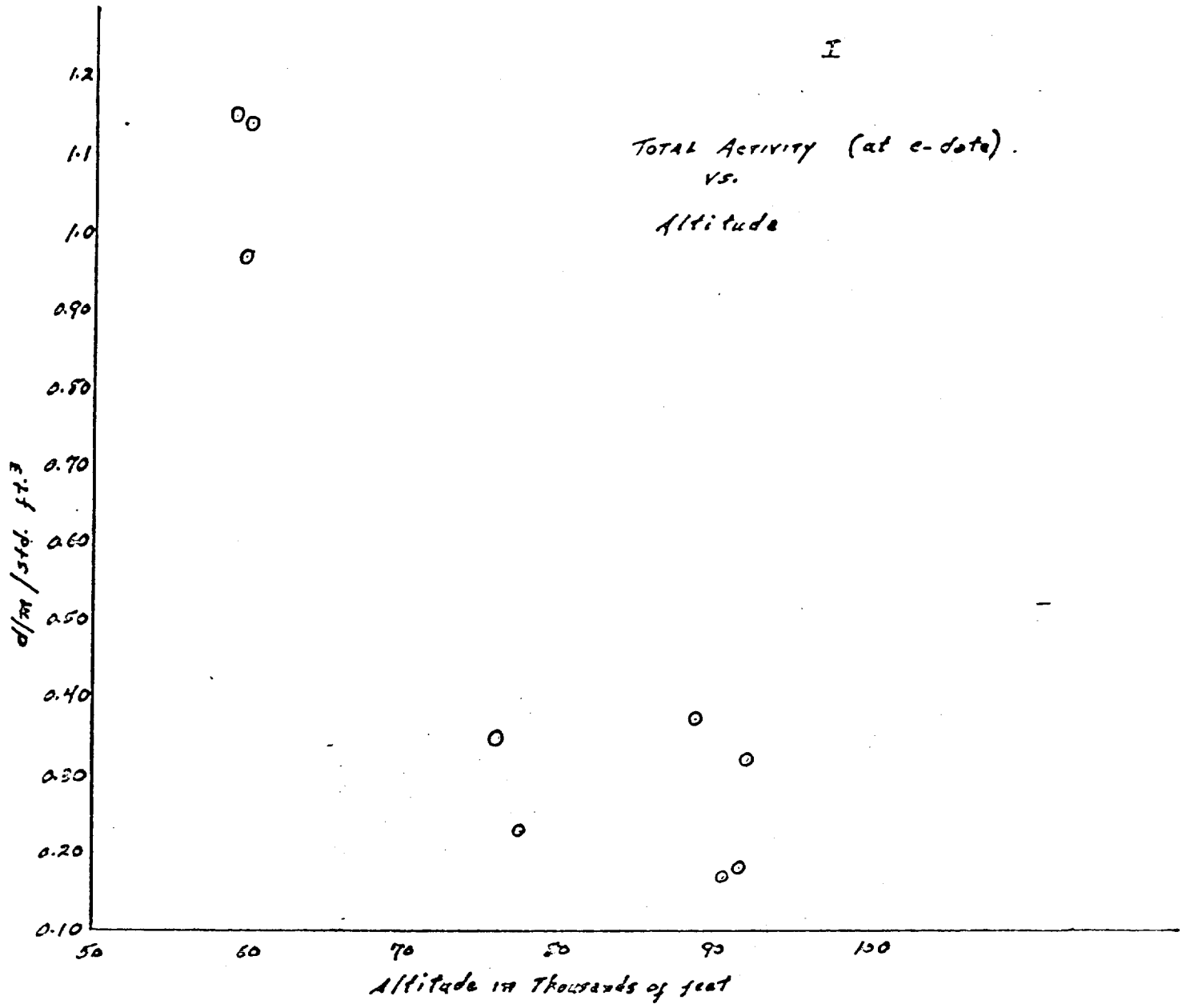

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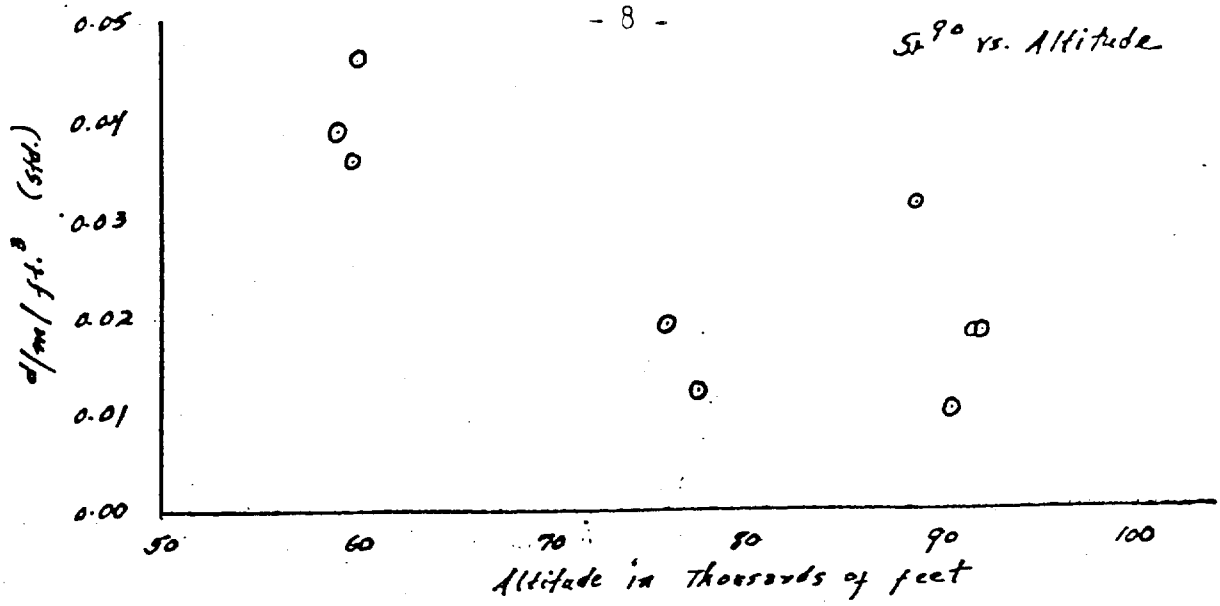

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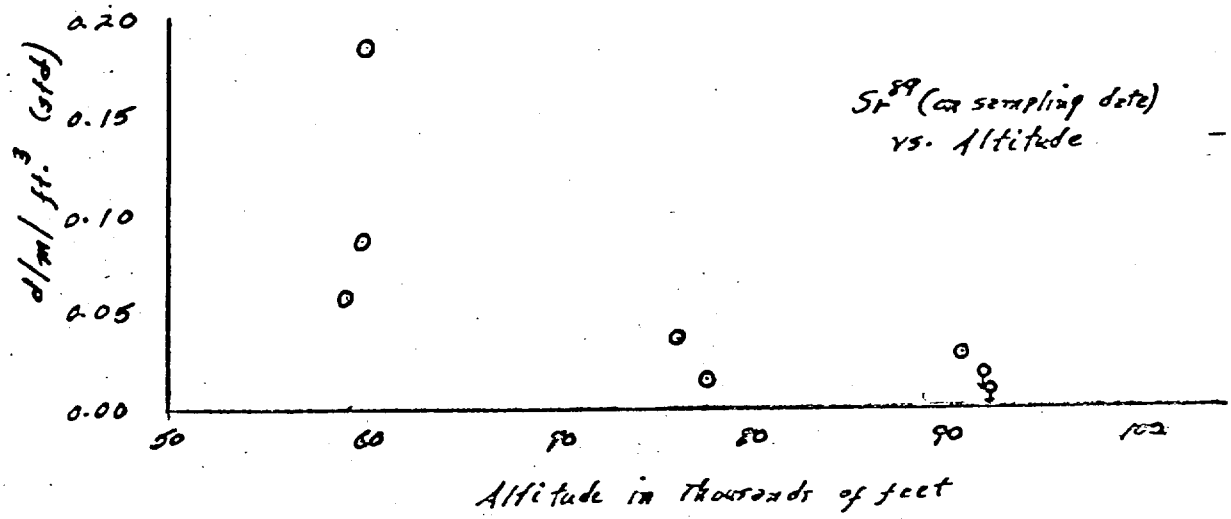

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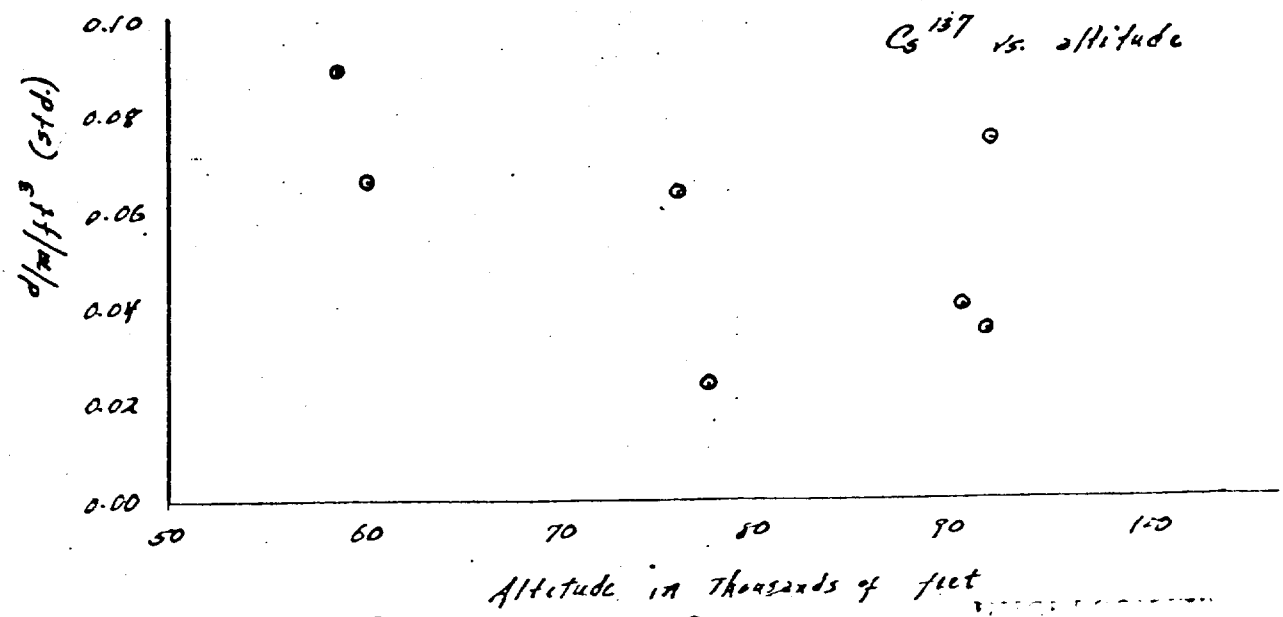

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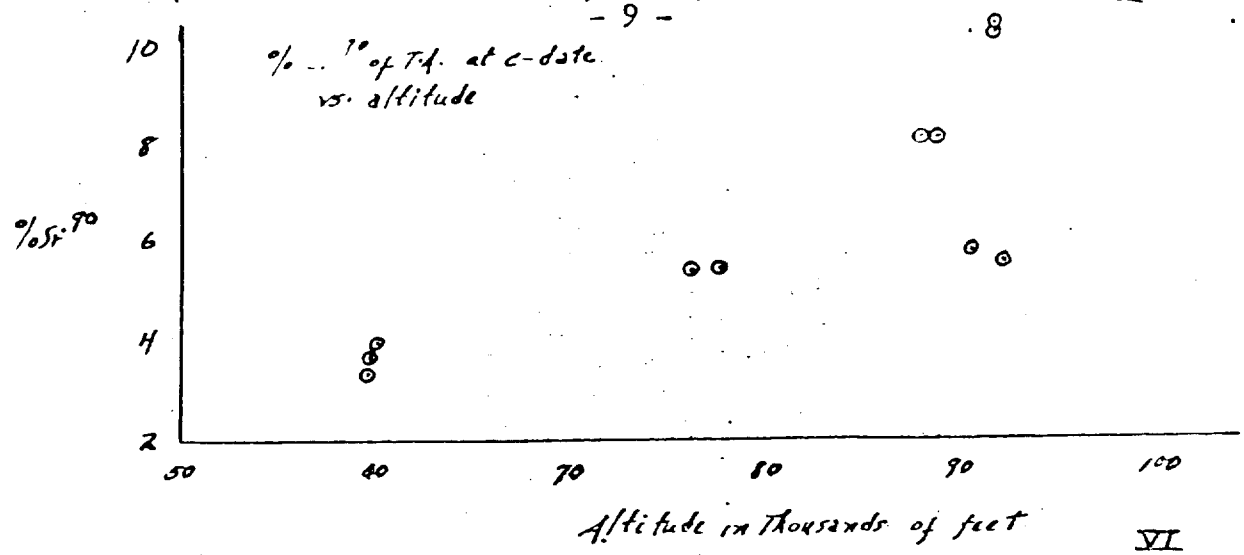

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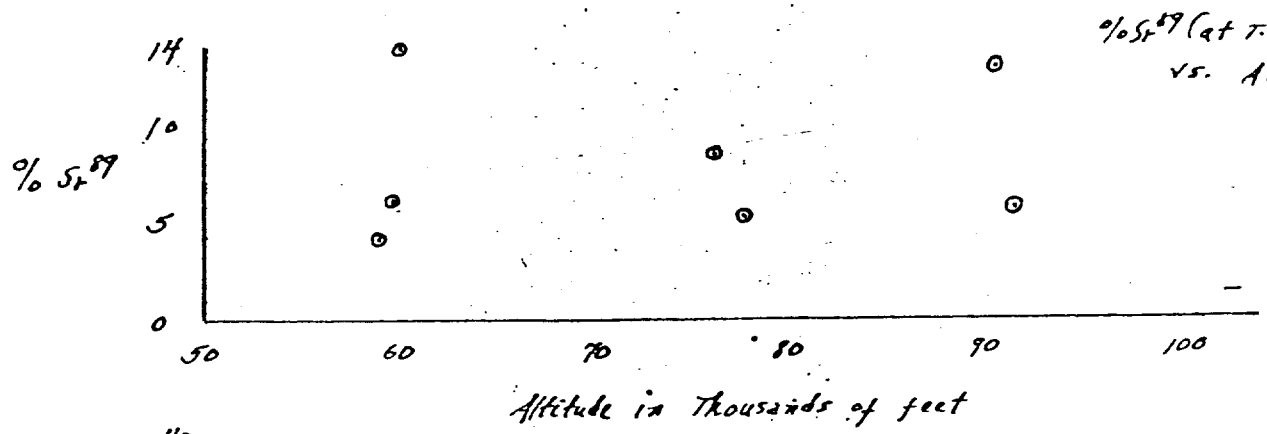

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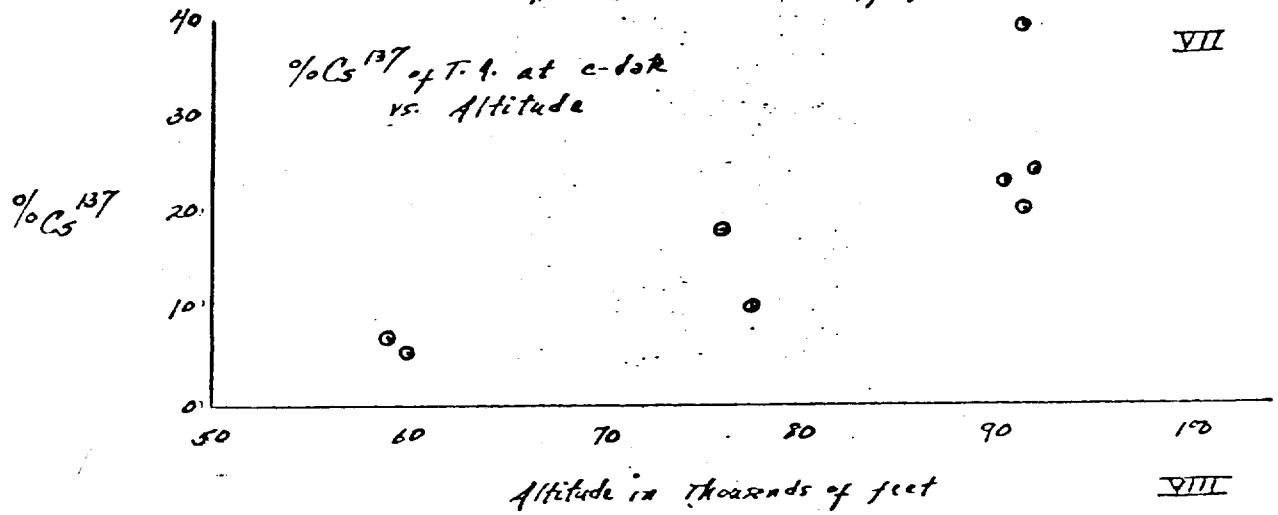

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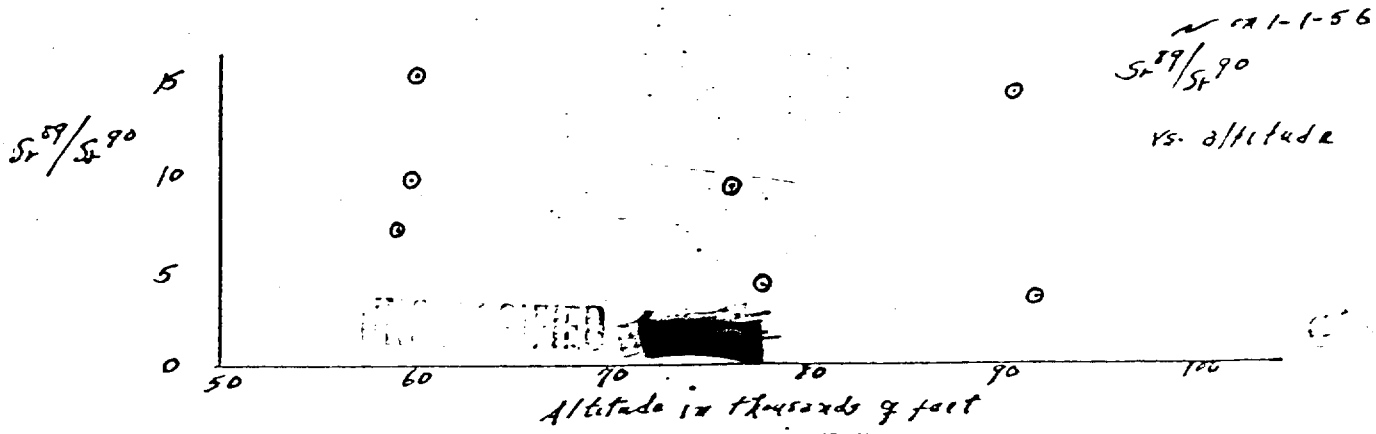

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