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DEPARTMENT OF PHYSICS & ASTRONOMY

LAKE MARIE IN THE SNOWY RANGE—A SHORT DRIVE FROM CAMPUS

UNIVERSITY OF WYOMING

FINAL REPORT
SAM II BALLOON TEST
(STRATOSPHERIC AEROSOL MEASUREMENT)

NASA CONTRACT
NSG-1006

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APP-4

INTRODUCTION

As a parallel effort to the LACATE balloon experiment a small optical system was constructed to enable a balloon test of a diode filter system similar to the type planned for the Nimbus-G SAM II experiment. The system was called the SAM II Balloon Test. Prior to the sunrise on the night of the LACATE Experiment, a 100,000 ft^3 balloon was launched with the SAM II test instrument. When the balloon was at an altitude of 80,000 feet it broke on ascent and the SAM II test was terminated without collecting any data. About a month later, the package was found by a hiker and the SAM II Balloon instrument was returned to the University of Wyoming.

After the first flight and the instrument's return, the gondola was refurbished and flown again from the balloon station at Laramie. This flight was successful, and the data was described in a paper at the Spring 1975 meeting of the A.G.U. by the principal investigator. The results are summarized here.

BALLOON FLIGHT RESULTS

Balloon Flight: W-105

Date: June 7, 1975

Launch Time: 0241 CDT

Launch Location: Laramie, Wyoming

Detector: PIN 40 diode United Detector

Filter: λ=1.0μm, $\Delta\lambda$=.03μm

Data Recorded: Intensity vs. time
Balloon Alt vs. time
Detector temp vs. time
Balloon Position vs. time

The recorded data has been reduced and Table-I lists the observed parameters. In this table the following parameters are listed:

Time: CDT time in decimal hours

EL ANG: Elevation angle from local horizontal to solar center

I-INIT: Intensity recorded during balloon flight

I-CRCT: Intensity corrected for vignetting (< 1%) and for temp sensitivity of diode (1-10%)

TAN HT: Computer tangent height of ray from balloon to center of solar disk

Airmass: Computed airmass along ray.

The corrected intensities as a function of tangent height have been used to compute the total extinction coefficient by using an "onion skin" model of the atmosphere and inverting the signal. The aerosol extinciton coefficient, β_Λ, was then determined by subtracting the molecular extinction for a standard atmosphere. The results are shown in Figure 1. Figure 2 shows the extinction ratio, ratio of total extinction to molecular extinction, as a function of altitude for these results. The large ratios shown in Figure 2 are caused by the aerosol from the Fuego Volcano that erupted in October of 1974; they demonstrate the ability that the solar extinction method at λ=1μm has in measuring the stratospheric aerosols. Backscatter ratios from LIDAR returns at this time were less than 4.0.

TABLE-I

LARAMIE FLIGHT - W-105 - 6/7/75

STATION LATITUDE: 41.3136
STATION LONGITUDE: -105.6731

TIME	EL ANG	I-INIT	I-CRCT	TAN HT	AIRMASS
6.419	8.384	98.000	106.828	.000	.048
6.410	8.299	97.800	106.629	.000	.049
6.402	8.218	97.500	106.320	.000	.049
6.394	8.137	97.400	106.229	.000	.049
6.386	8.054	96.800	105.619	.000	.050
6.370	7.889	97.400	106.362	.000	.051
6.362	7.806	97.100	106.078	.000	.051
6.353	7.722	97.100	106.123	.000	.051
6.345	7.636	97.000	106.060	.000	.052
6.287	7.050	96.000	105.277	.000	.055
6.100	5.183	95.600	106.143	.000	.074
6.075	4.940	96.000	106.838	.000	.077
6.067	4.859	95.900	106.813	.000	.078
6.059	4.777	96.200	107.237	.000	.079
6.051	4.698	96.600	107.769	.000	.080
6.043	4.617	96.500	107.745	.000	.081
6.034	4.537	96.600	107.945	.000	.082
6.026	4.456	96.500	107.922	.000	.083
6.018	4.376	96.600	108.123	.000	.084
6.010	4.292	96.500	108.103	.000	.086
6.001	4.212	96.700	108.417	.000	.087
5.993	4.128	96.800	108.626	.000	.088
5.985	4.048	96.800	108.720	.000	.090
5.977	3.968	97.600	109.714	.000	.091
5.968	3.886	96.800	108.911	.000	.093
5.960	3.804	96.800	109.008	.000	.094
5.952	3.724	96.900	109.216	.000	.096
5.943	3.643	96.700	109.087	.000	.097
5.935	3.561	96.600	109.072	.000	.099
5.927	3.483	96.400	108.939	.000	.101
5.919	3.402	96.500	109.150	.000	.102
5.910	3.320	96.300	109.022	.000	.104
5.902	3.241	96.400	109.231	.000	.106
5.894	3.159	96.300	109.216	.000	.108
5.886	3.078	96.300	109.328	.000	.110
5.877	2.995	96.200	109.333	.000	.112
5.869	2.916	95.900	109.106	.000	.114
5.861	2.838	95.700	108.990	.000	.116
5.852	2.756	95.400	108.766	.000	.118
5.844	2.676	95.500	108.995	.000	.121
5.836	2.594	95.100	108.657	.000	.123
5.828	2.518	95.000	108.660	.000	.126
5.572	.061	92.900	110.144	.000	.283

TALLE-I Continued

TIME	EL ANG	I-INIT	I-CRCT	TAN HT	AIRMASS
5.563	-.018	92.900	110.282	32.309	.293
5.555	-.098	92.900	110.421	32.301	.304
5.547	-.178	92.700	110.324	32.280	.315
5.522	-.414	92.600	110.619	32.147	.354
5.513	-.493	92.500	110.638	32.079	.368
5.505	-.571	92.400	110.658	31.998	.383
5.497	-.648	92.300	110.668	31.908	.399
5.489	-.726	92.100	110.546	31.805	.416
5.480	-.804	92.000	110.545	31.690	.434
5.472	-.882	91.800	110.425	31.563	.453
5.465	-.949	91.600	110.294	31.445	.471
5.455	-1.036	91.300	110.075	31.279	.495
5.447	-1.111	91.200	110.076	31.125	.517
5.439	-1.188	91.100	110.082	30.953	.542
5.431	-1.264	91.000	110.086	30.773	.568
5.423	-1.339	90.700	109.845	30.587	.595
5.415	-1.413	90.600	109.848	30.390	.624
5.407	-1.489	90.300	109.635	30.178	.656
5.383	-1.707	89.000	108.484	29.509	.760
5.367	-1.859	88.700	108.419	28.987	.847
5.317	-2.320	87.600	107.721	27.148	1.211
5.308	-2.401	87.200	107.265	26.785	1.294
5.299	-2.479	86.500	106.438	26.423	1.383
5.290	-2.561	86.000	105.859	26.029	1.485
5.282	-2.638	85.300	105.030	25.655	1.586
5.274	-2.715	84.700	104.325	25.262	1.700
5.265	-2.794	83.500	102.881	24.852	1.826
5.257	-2.870	82.600	101.807	24.447	1.958
5.248	-2.946	80.700	99.519	24.034	2.101
5.240	-3.019	80.100	98.831	23.630	2.252
5.232	-3.094	79.000	97.525	23.208	2.421
5.224	-3.166	77.400	95.600	22.788	2.598
5.216	-3.239	76.200	94.166	22.359	2.791
5.208	-3.315	74.200	91.744	21.906	3.013
5.199	-3.390	71.500	88.454	21.445	3.251
5.191	-3.467	68.000	84.170	20.968	3.521
5.183	-3.542	64.600	80.005	20.494	3.811
5.174	-3.622	59.800	74.102	19.984	4.143
5.147	-3.863	47.300	58.681	18.410	5.366
5.138	-3.945	44.500	55.248	17.857	5.875
5.113	-4.171	41.500	51.627	16.324	7.528
5.098	-4.301	39.200	48.822	15.439	8.688
5.091	-4.367	38.300	47.729	14.991	9.325
5.067	-4.582	37.800	47.196	13.523	11.820
5.058	-4.658	38.000	47.478	13.012	12.806
5.050	-4.732	37.200	46.509	12.518	13.888
5.042	-4.805	36.000	45.038	12.039	14.977
5.034	-4.876	34.300	42.949	11.576	16.136

TABLE-I Continued

TIME	EL ANG	I-INIT	I-CRCT	TAN HT	AIRMASS
5.025	-4.949	32.100	40.273	11.101	17.423
5.018	-5.109	30.500	38.336	10.660	18.689
5.010	-5.090	28.700	36.141	10.228	20.039
5.002	-5.159	26.300	33.180	9.772	21.509
4.994	-5.230	24.000	30.330	9.287	23.170
4.986	-5.299	21.500	27.215	8.793	24.945
4.978	-5.368	18.400	23.329	8.269	26.865
4.963	-5.500	12.200	15.516	7.320	30.521
4.955	-5.571	8.760	11.160	6.836	32.622
4.945	-5.659	5.500	7.021	6.286	35.142

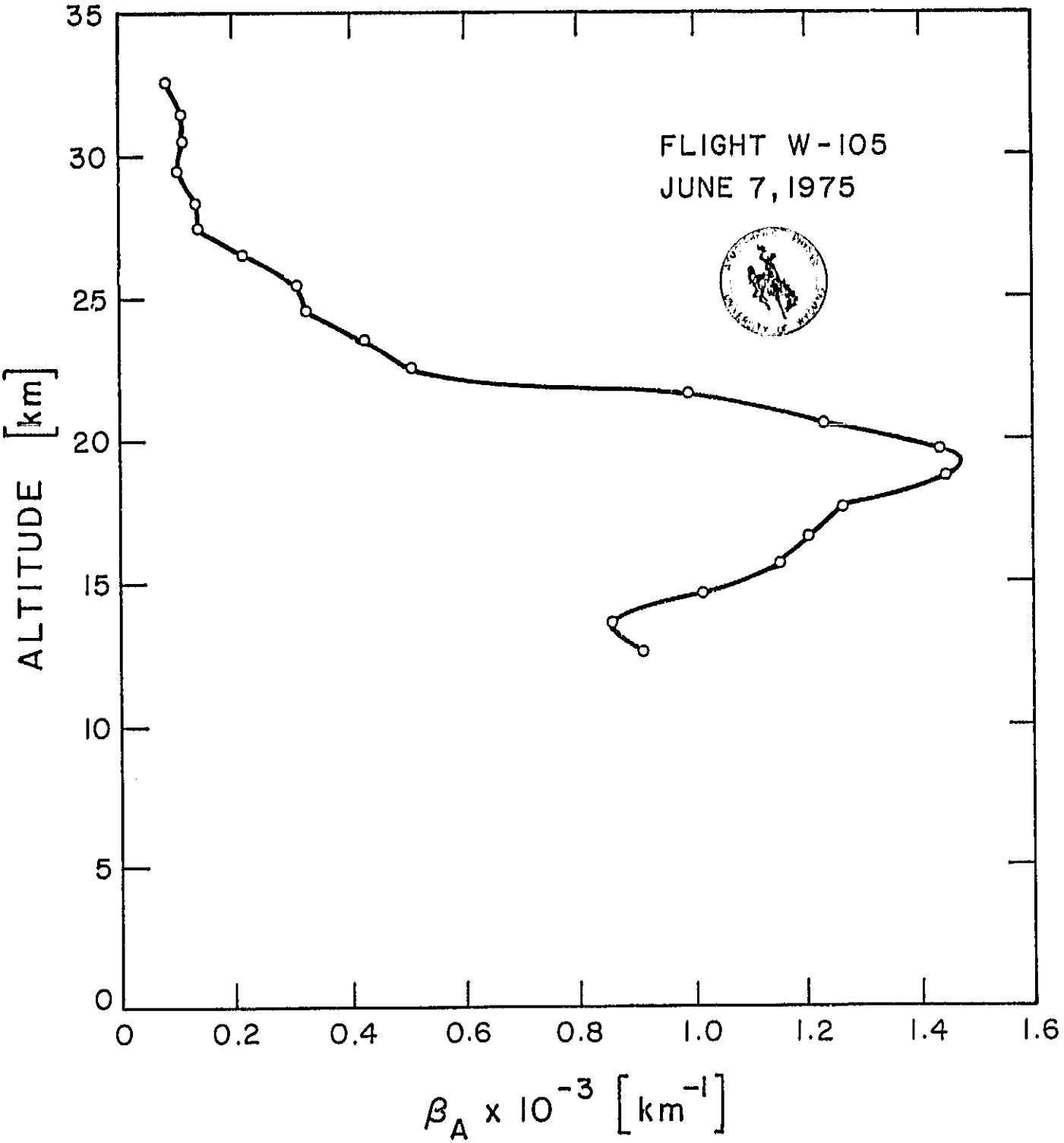
FLIGHT W-105
JUNE 7, 1975
ALTITUDE [km]
35
30
25
20
15
10
5
0
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
$\beta_A \times 10^{-3}$ [km^{-1}]

FIGURE 1

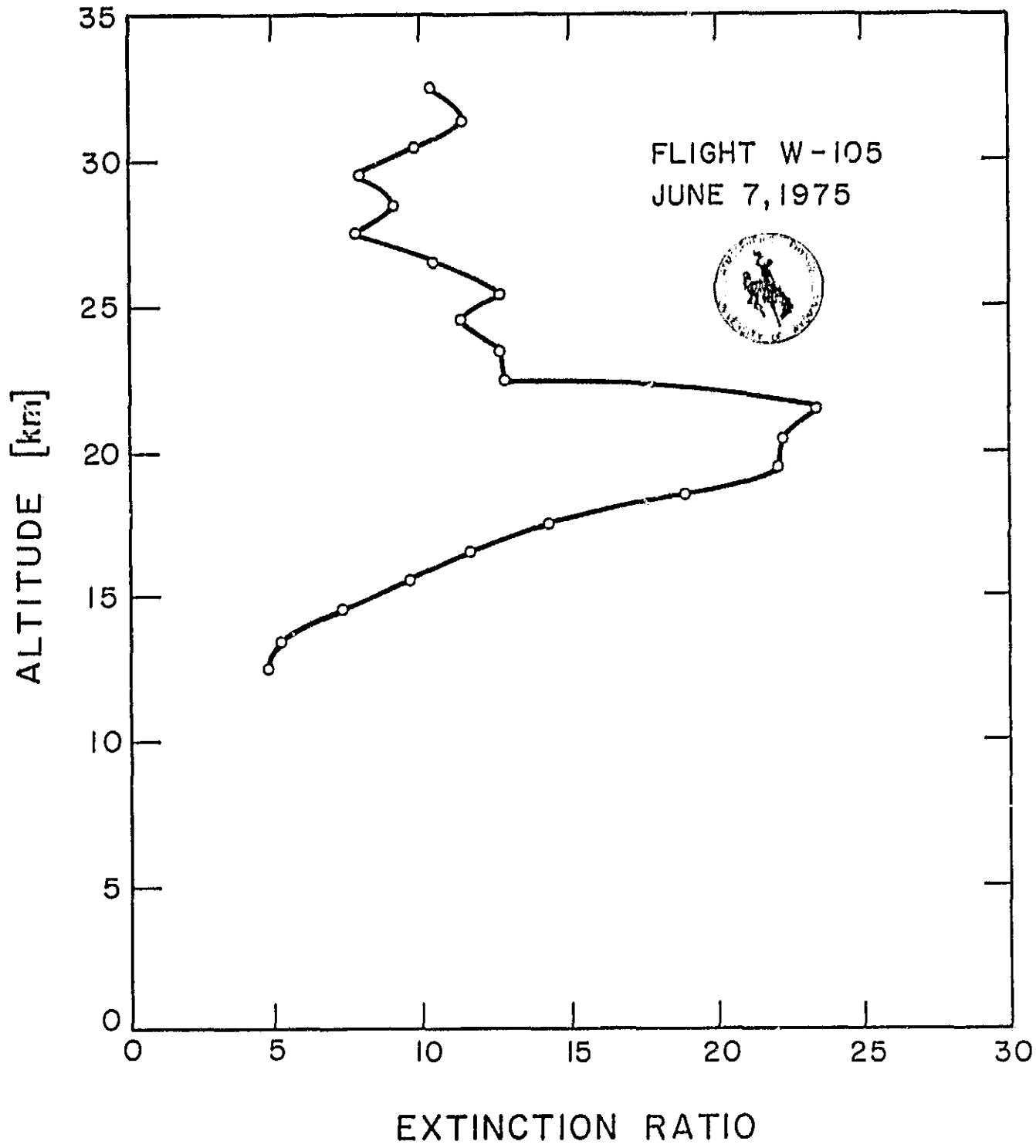
FLIGHT W-105
JUNE 7, 1975
ALTITUDE [km]
EXTINCTION RATIO
0
5
10
15
20
25
30
35

FIGURE II