PHOTOGRAMMETRIC DETERMINATION OF SURFACE ALTITUDE, VELOCITY, AND CALVING RATE OF COLUMBIA GLACIER, ALASKA, 1983-91

U.S. GEOLOGICAL SURVEY

Open-File Report 92-104

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By Robert M. Krimmel

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CONVERSION FACTORS AND VERTICAL DATUM

Multiply	By	To obtain
micrometer	0.00003937	inch
meter (m)	3.281	foot
centimeter (cm)	0.3937	inch
kilometer (km)	0.6214	mile

Sea level:

In this report "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)--a geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called Sea Level Datum of 1929.

Photogrammetric Determination of Surface Altitude, Velocity, and Calving Rate of Columbia Glacier, Alaska, 1983-91

By Robert M. Krimmel

ABSTRACT

Columbia Glacier is a tidewater glacier near Valdez, Alaska. The condition of this glacier has been documented by vertical stereo photography more than 70 times since 1957. Photogrammetry is used to convert from analog film medium to numerical data that are easily subjected to analysis of terminus position, surface altitude, surface velocity, calving volume, and adjacent ice-dammed lake levels. Between 1983 and 1991, Columbia Glacier retreated 5 km, thinned 160 m, and calved as much as 3 km^3/year.

INTRODUCTION

Columbia Glacier, Alaska, is a tidewater glacier terminating near Valdez (Figure 1). It was undergoing a rapid retreat in 1984 (Meier and others, 1985a), and by 1985 had tripled its speed (Krimmel and Vaughn, 1987). It is the major source of icebergs in eastern Prince William Sound.

The instantaneous condition of the lower part of this glacier has been recorded by vertical stereo photography more than 70 times since 1957. Photogrammetry is used to measure the surface altitude, and by comparison of successive dates of photography, surface velocity is measured (Meier and others, 1985b). The purpose of this report is 1) to disseminate photogrammetric results obtained from this sequence of photography that were not included in two earlier data reports (Fountain, 1982; Krimmel, 1987), and 2) to summarize these data to quantify the changes in Columbia Glacier since early 1983.

THE PHOTOGRAPHY DATA SET AND PREVIOUS WORK

The flight line is designed to give stereo coverage of the lower reach of the glacier and of ground control along the glacier margins in one strip approximately along the glacier centerline (fig. 1). Image scale at sea level is nominally 1:46,000, which requires a flight altitude of 7015 m (23,000 ft) using a 15 cm (6 in) focal length lens on a 23 x 23 cm (9 x 9 in) film format. Various contractors have supplied the negatives using several different metric cameras. On a few of the flight dates the scale is significantly different from the nominal scale (table 1). Each flight date is assigned a number, beginning with 1 on July 20, 1957; this report covers flights through 75, on October 11, 1991.

The photogrammetry for Columbia prior to this report (flights 1-36 and 50-55) was done by the USGS National Mapping Division (NMD) in Menlo Park, Calif., and was reported in two data-oriented reports (Fountain, 1982; Krimmel, 1987). The procedures used to obtain those data were reported in an interpretive report (Meier and others, 1985b). Some of those data were further refined into systematic grids (Rasmussen and Meier, 1985; Rasmussen, 1989). A similar photogrammetric analysis has been done for other glaciers (Brecher, 1986), but no other glacier has as long or frequent coverage as does Columbia.

Several different coordinate systems have been used to define locations on and around Columbia Glacier. All of the systems have been based on the Universal Transverse Mercator (UTM) Zone 6, but with the subtraction of a constant to reduce the magnitude (Mayo, 1979; Fountain, 1982; Krimmel, 1987). Altitudes, in this, and all previous reports, are given in meters above sea level.

PHOTOGRAMMETRY OF FLIGHTS 37-49 AND 56-71

Photogrammetry for this report was done by the author and people working under his supervision. An analytical stereo plotter with 10-15 micrometer measurement repeatability, coupled with a personal computer, was used. The software used was based on established photogrammetry equations, and included programs for interior, relative, and absolute orientation of stereographic models. Simultaneous block adjustment software provided by the USGS NMD was used to link the five or six models on each flight date.

The accuracy to which objects can be located in a stereo model depends on many factors: the photograph quality, which includes the quality of the camera and the photographic reproduction process; the precision of the measurement instrument; the quality and quantity of the ground control; and the ability of the operator to identify features in the stereo model. The camera, film, and reproduction combination allow objects of high contrast, say icebergs, as small as perhaps 1.0 m in diameter to be seen. The ground control was carefully surveyed and marked (Meier and others, 1985b). The instrument allows an accuracy of its measurement repeatability times the photography scale, or about 0.5 m at the nominal 1:46,000 scale.

The most significant error comes from the operator. Photogrammetry depends on the ability of the operator to compare images of the same feature from two vantage points, and to superimpose those images. Stereoscopic viewing is a convenient method to do this. The operator superimposes the images by doing a mental "best fit" of the image surrounding the feature for which the position is desired. Thus the operator considers a surface, rather than a point. For the Columbia Glacier photography, the size of that area is estimated to be 10-20 m in diameter. Because of this surface averaging, topographic highs and lows are smoothed. Nearly all areas of the lower reach offer sufficient surface features to form a good stereo image.

To measure ice velocity, two dates of photographs, with enough time between dates to allow statistically significant displacement to have occurred, but not so much time that surface features have changed so much that they cannot be identified (or have calved away) on the succeeding photo date, must be available. At Columbia Glacier the optimum length of time between photo sets is 60-90 days. The same surface feature, usually a crevasse and serac pattern, is identified on both dates of photos by a similar image superposition process that is used to determine surface altitudes in a stereo model. The mental "best fit" must be applied three times: first to determine the same feature on both dates, then to locate the feature in a stereo model on each of two dates. Deformation due to ice flow, changes in sun angle, and ablation or accumulation all tend to change the appearance of the surface between flights, adding to the error in velocity measurements.

With consideration of the above items, an estimation of error is made in which the horizontal location of a well-defined point is 2 m, and the vertical error is 4 m. This is approximately the error given by Meier and others (1985b), where well-defined points are considered accurate to 2 m in both horizontal and vertical, and horizontal displacements determinations are accurate to 4 m. An independent check on the errors was done by a simple comparison of results obtained by NMD and results obtained by the author. For each of two of the photo dates (arbitrarily selected flights 36 and 55) the locations of 20 individual photo points (IPP's) that had been identified by NMD were remeasured. These 20 IPP's were the first 20 found while scanning the stereo model. Comparison of results from both systems indicates repeatability of less than 1 m in the horizontal and 5 m in the vertical (table 2). The accuracy of the velocity measurements, when reported in length/time, is somewhat self compensating: the shorter the time interval, the more the inaccuracy in the end points influences the speed results; yet the shorter the time interval, the more precisely the same surface feature can be identified on each photo date.

The measurement system reported values to the millimeter, but results are significant only to the meter; therefore values have be rounded to the meter. For some applications, the meter fraction is retained, as it has been in the original compilation.

The altitude and velocity measurements were isolated from each other in the procedure used in this report; this is different from the procedure used by NMD where IPP's served both as the ends of the velocity vector and the measurement of altitude. The procedure used in this report allowed a better distribution of altitude measurements, even when the velocity measurements were made in limited areas.

Altitude measurements

It was decided to obtain more detail in surface altitude across the glacier, perpendicular to the flow line, than in the longitudinal direction, for the following reasons. The lower Columbia Glacier flows approximately north to south, parallel to the UTM northing (Y) axis. The condition of a glacier is better described by an altitude profile along its centerline than by transverse profiles; however, it is desirable to have some representative altitude in the transverse direction. By taking numerous altitudes along the transverse profiles, averaging can be done to give a representative altitude at the centerline. Altitudes along transverse profiles were taken at multiples of 100 m. The profiles were spaced at multiples of 500 m along the longitudinal glacier axis in the lower half of the lower reach, and at 1,000 m in the upper half. Each of the 20 profiles was about 5,000 m long, resulting in about 1,000 altitude points for each flight date (table 1 and Appendix 1). The actual measurement point was usually slightly different from the pre-defined position; these deviations are shown in figure 2 for flight 41. The altitude variations along three of these profiles, each for two dates, are shown in figure 3.

For each of the approximately 1,000 grid points a time series (flights 37-49 and 56-71) of surface altitude was formed, and on each of these a linear regression was done that resulted in a value of annual surface level change. An example of the linear regression is shown in figure 4, and the result of all of the regressions is shown, in the form of a contour map, in figure 5.

The average altitude of each profile on a certain date was determined by taking a simple average of the 21 points included in a 2000-m-wide center portion of the profile (fig. 5). This width averaged altitude, as a function of time, for three profiles is shown in figure 6.

Velocity measurements

When the flight interval is optimum, it is a simple matter to identify matching ice surface features on both photo dates. There are zones of the lower reach, particularly in the northern part, where no features can be found to follow. Also, in the shear zones between ice moving relatively fast compared with the marginal ice, it is often difficult or impossible to follow features because of ice deformation. This problem becomes more serious as the flight interval increases, and for some of the flight intervals that were several months long, or where the photo quality was poor, only a few velocity measurements could be made. The velocity measurements were concentrated along the glacier centerline (fig. 7). For a few intervals the spatial density of measurements was increased so that the lateral velocity variations could be observed. Generally it was found that these lateral variations were predictable and did not change significantly over the several years of observations. Examples of the ice velocities across transverse profiles are shown in figures 7-9. The flight intervals and number of velocity measurements are given in table 3. Positions of the features used for the velocity measurements are given in Appendix 2.

Ice velocity along a centerline longitudinal profile increases as the ice approaches the terminus (figure 10). Ice velocity at a fixed location along the longitudinal profile increases with time as the glacier terminus calves toward the location (fig. 11). Maximum velocity near the terminus is about 15 m/day, and is achieved shortly before that portion of the glacier is lost to calving.

Terminus position

The location of the terminus is measured approximately every 100 m at the base of the ice cliff. Usually there is a very distinct ice cliff, but occasionally, the terminus ends with a gradual slope, with no clear delineation between the grounded glacier ice and the floating icebergs. That condition exists on fewer than five photo dates, and on those dates includes less that 20 percent of the terminus, along which an estimated terminus position was measured. The terminus position is width averaged by taking the mean UTM Y position of all the terminus points between UTM X=496500 and UTM X=499000 (fig. 12). The width-averaged terminus position, shown as glacier length, is shown in figure 13 and given in table 1. These glacier lengths differ slightly from those reported in an earlier report (Meier and others, 1985b), where the average glacier length was determined using a curvilinear system of lines parallel to flow. Positions of the terminus points are given in Appendix 3.

Calving

Calving rate is usually considered to be the difference between the width-averaged ice speed at the at the terminus and the time rate of change of the width-averaged terminus position (Brown and others, 1982). In this report, ice that is attached to the glacier on one date, but has been removed by calving on the following date, is identified by comparing photos from the two dates. This "ice that will be calved" is measured by locating points around the perimeter of this area about every 100 m. At the calving ice cliff, measurement is made at the top of the ice cliff.

The area of that ice is calculated, and converted to a calving volume by assuming that there is a constant 150 m of ice under water (taken as the average cross section water depth indicated by Brown and others, 1986), and by taking the average altitude of all the perimeter points as the thickness of ice above water. In this calculation, it was assumed that surface velocity equalled sliding velocity even though in a more careful analysis of previous data, sliding velocity was found to average 94 percent of surface velocity (Rasmussen, 1989). Calving rate and the average height above water of the calved ice are shown in table 3.

Terentiev and Kadin Lakes

Two major ice-dammed lakes are impounded along the west side of the lower reach of Columbia Glacier. The level of water in these lakes is measured with an estimated error of 4 m, and is shown on figure 14 and in table 1. Water level in Terentiev Lake was 12 m on October 11, 1991, which is the lowest possible level unless a water gap is eroded through the Terentiev lobe terminal moraine. The photo coverage commonly did not include Kadin Lake, resulting in fewer measurements for Kadin than Terentiev.

CONCLUSION

Stereo photographs, when properly produced and stored, are the most complete and objective documentation of the condition of a glacier at a given time. The film medium, while being a very high density information storage device, is not readily numerically accessible. The results given in this report are a conversion of the analog film product, to digital data that can be processed numerically, and are only a small fraction of those that could be obtained from this time series of photographs. These digital data, and the summaries of them given in this report, give a conclusion similar to that which can be readily obtained directly from the photography using simple graphical methods: Columbia Glacier is retreating rapidly, thinning rapidly, and flows at high speed; but the digital data give, as seen in this report, quantitative values of the retreat, thinning, speed, and other variables.

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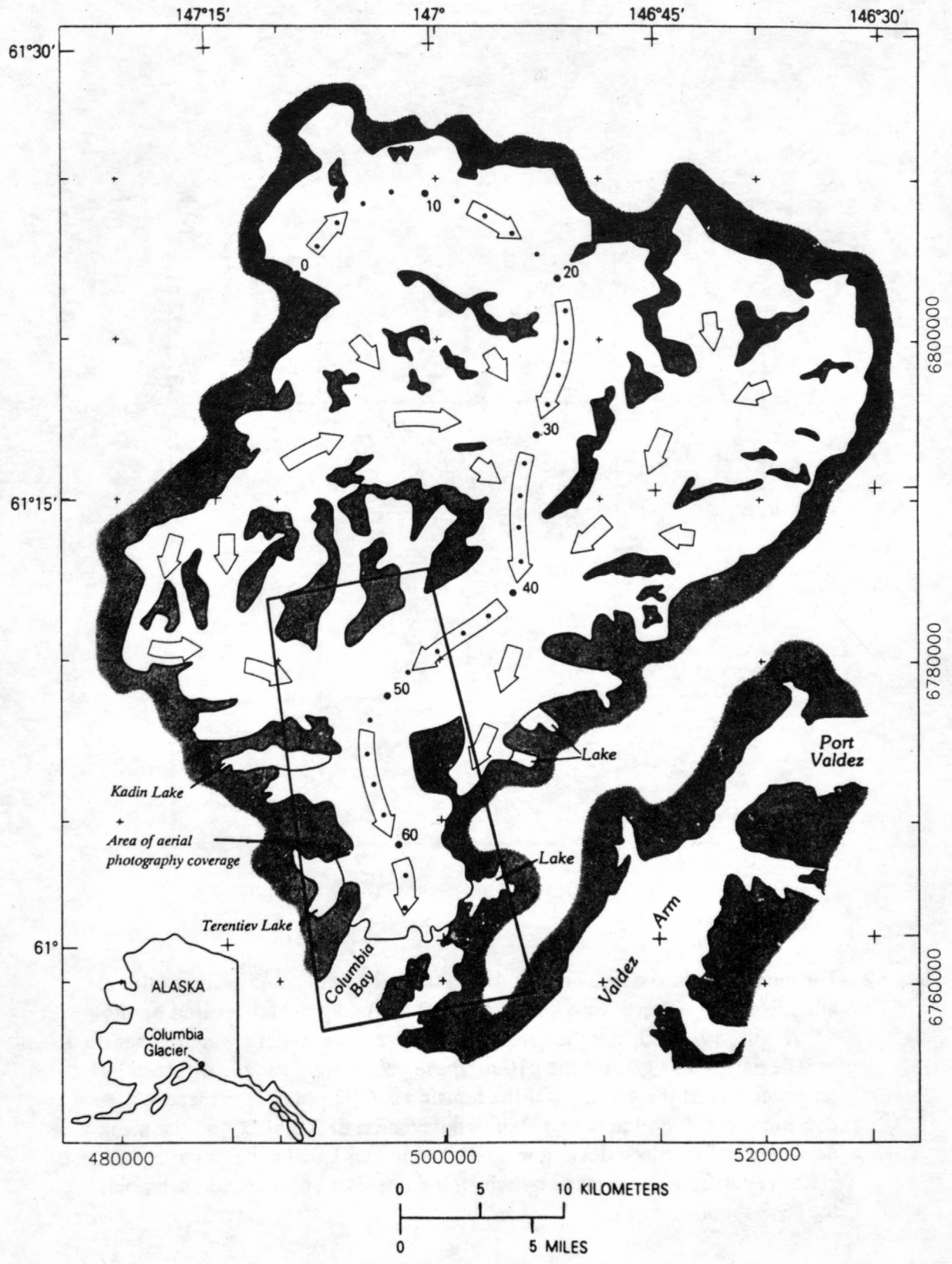


Figure 1.--Index map of Columbia Glacier, Alaska. The aerial photography coverage is trapezoidal because the aircraft altitude is held constant, but the terrain rises from south to north. Arrows show direction of flow, the main ice stream being indicated by the longer arrows and dots at 2-km intervals from the head of the glacier. The September 1, 1981, terminus position is shown.

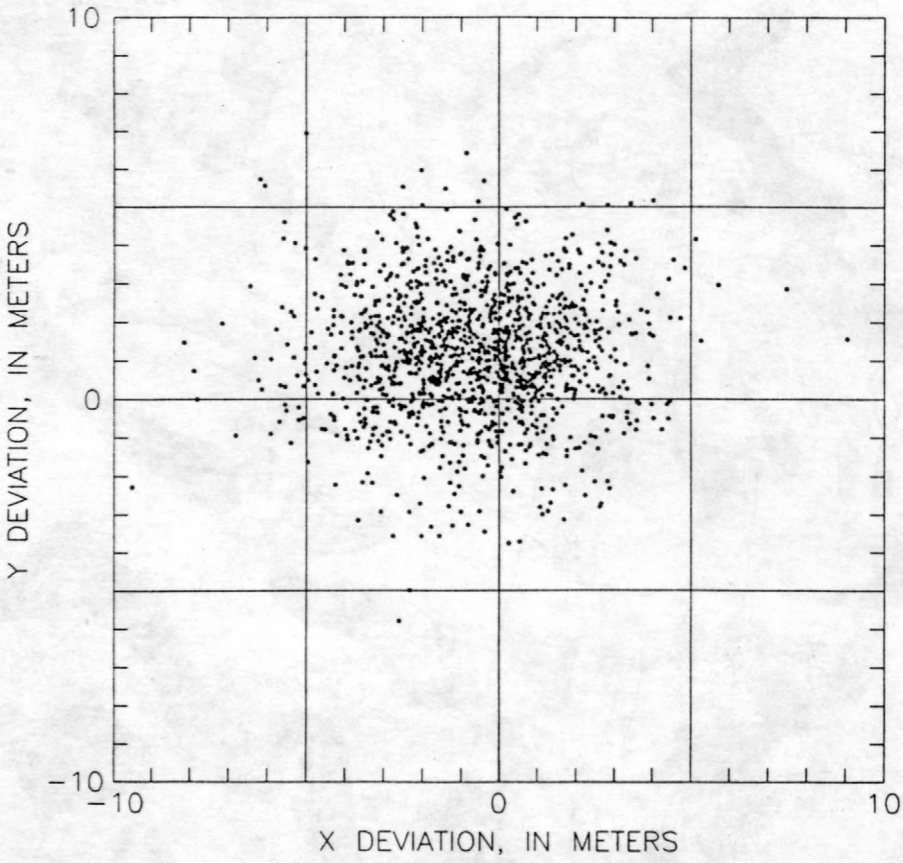


Figure 2.--The deviations of the measured location from the nominal location of the altitude points. There were a total of 1312 altitude points measured on flight 41, August 19, 1983. Of the total points, there were five for which either the x or y deviation was greater than 10 m, these points were usually on steep terrain on either side of the glacier. Of the remaining 1307 points, the mean x deviation was -0.649 m with a standard deviation of 2.200 m, and the mean y deviation and standard deviation was 1.186 m and 1.617 m respectively. These biases result from the method by which the operator approached each point in the stereo models.

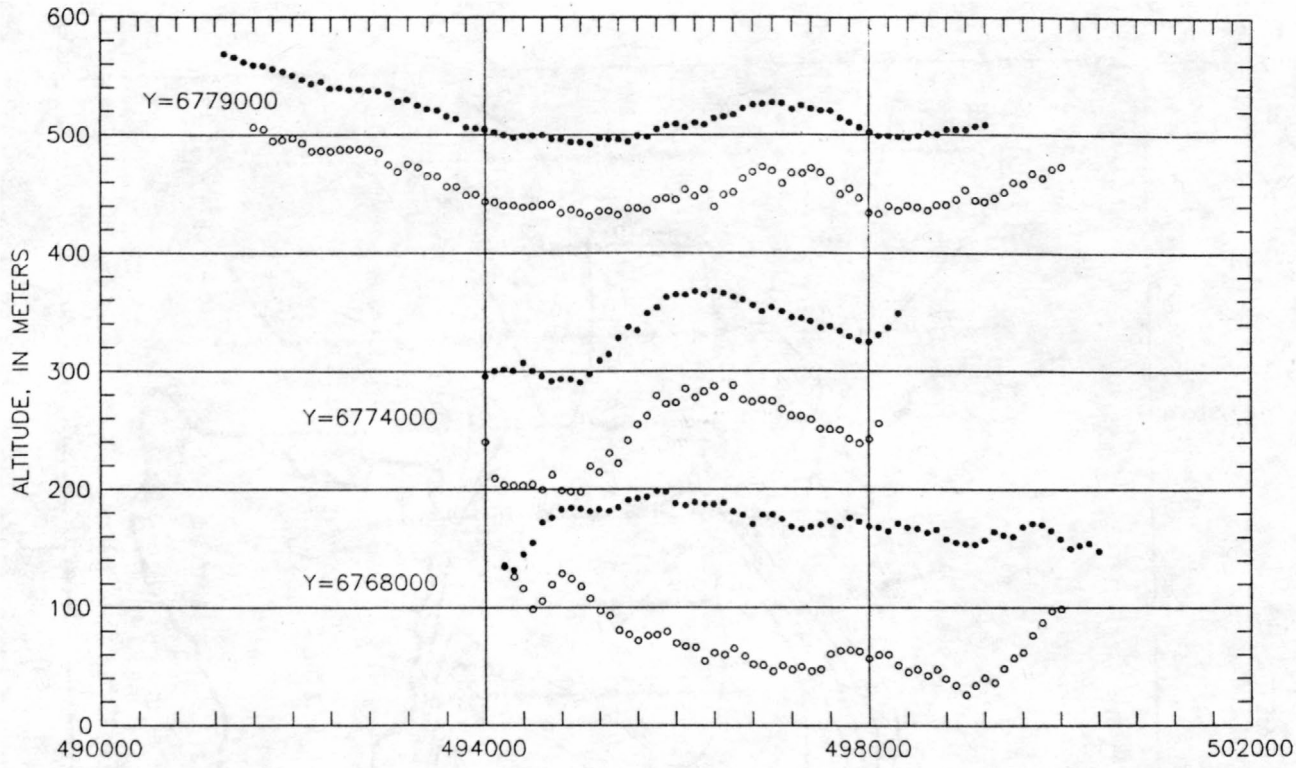


Figure 3.--Three Columbia Glacier transverse altitude profiles for August 15, 1984 (solid circles) and September 7, 1990 (open circles).

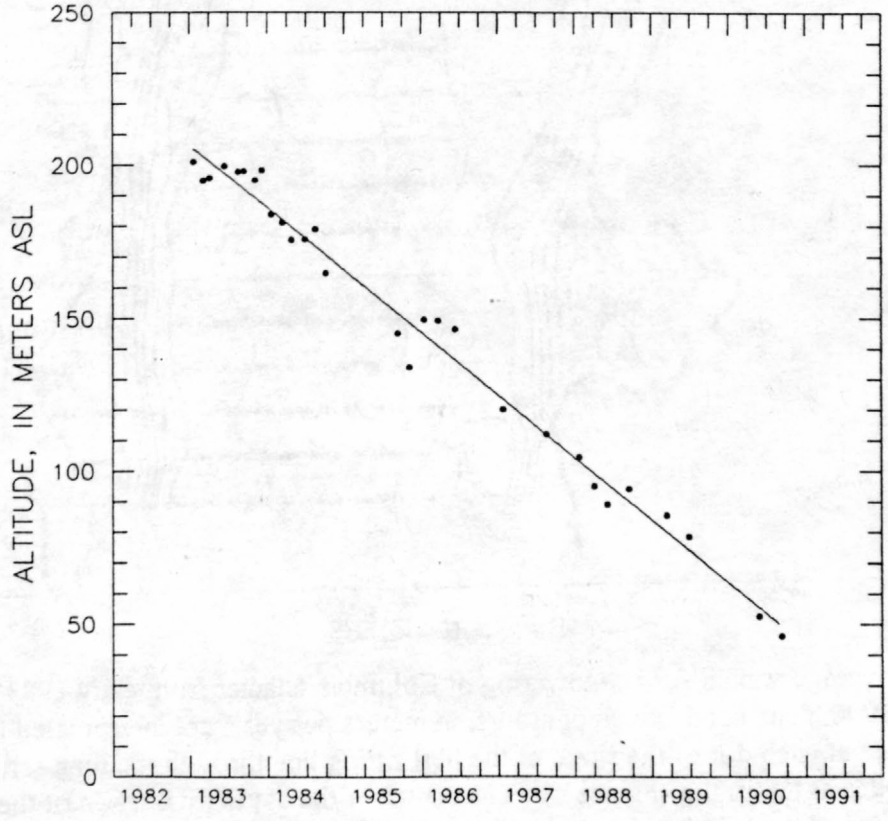


Figure 4.--Altitude as a function of time at nominal point X=497000, Y=6768000. The slope of the linear fit is -20.4 meters per year. A linear fit was made for all of the approximately 1000 grid points, and the results were contoured (Figure 5) to show the average annual surface lowering over the entire lower reach.

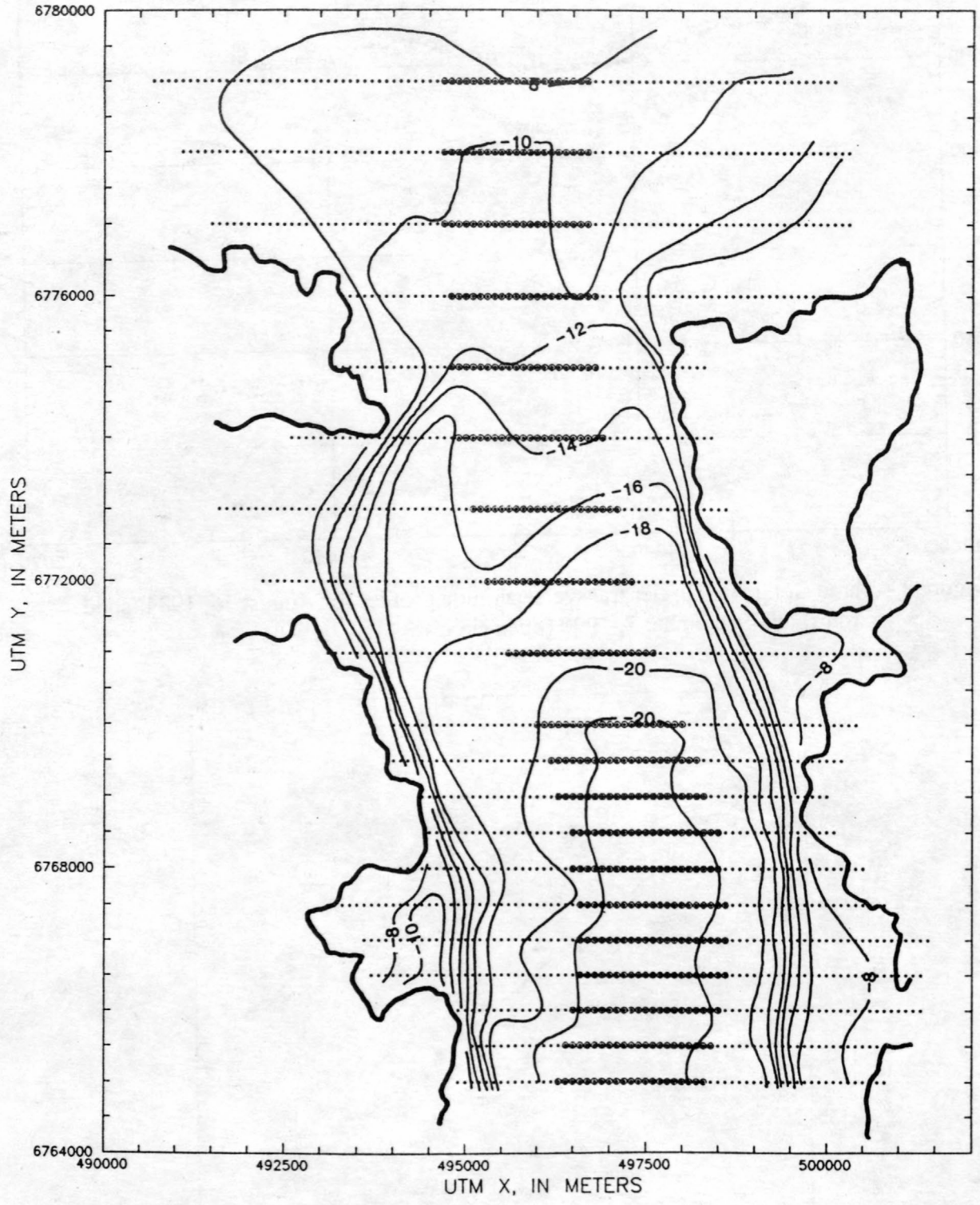


Figure 5.--The average annual surface lowering of Columbia Glacier from early 1983 to late 1990. The hand-drawn contours, in meters per year, are interpolated from a value at each dot of the slope of the best fitting line through the time series of altitudes at that point (Figure 4). The center of the southern portion of the lower reach had slightly less annual lowering than adjacent areas. The circled dots are the 21 points on each transverse altitude profile that were used to determine the average altitude along each transverse profile on each date.

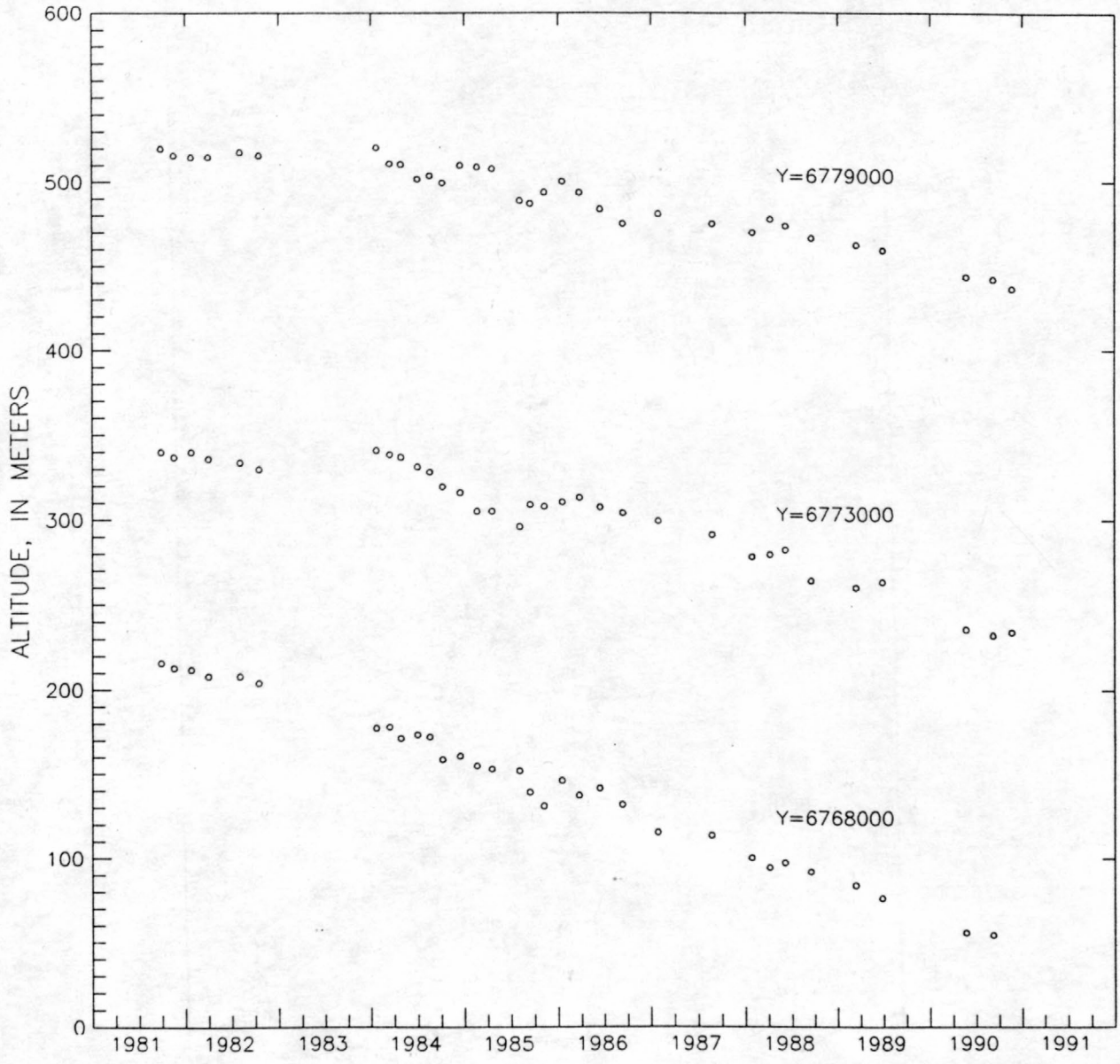


Figure 6.--The average altitude of three transverse profiles of Columbia Glacier from mid-1981 to late 1990. These values are the average altitude of the 21 points (Figure 5) for the respective profiles.

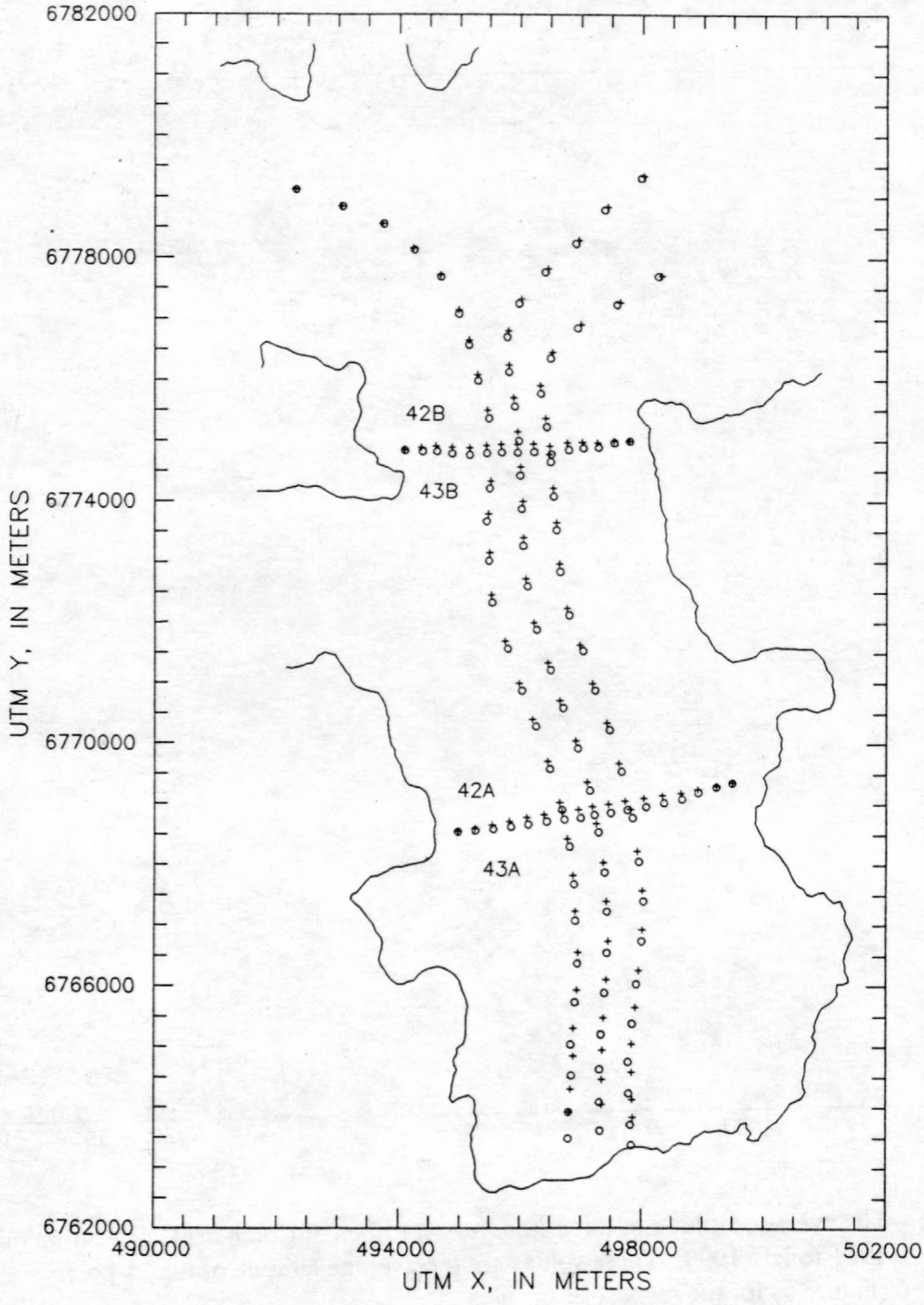


Figure 7.--The positions on September 16, 1983 (crosses) and November 6, 1983 (circles) of features used to measure velocity. Velocity measurements were usually concentrated along three longitudinal lines near the glacier centerline. For this interval, transverse profiles of velocity were also measured.

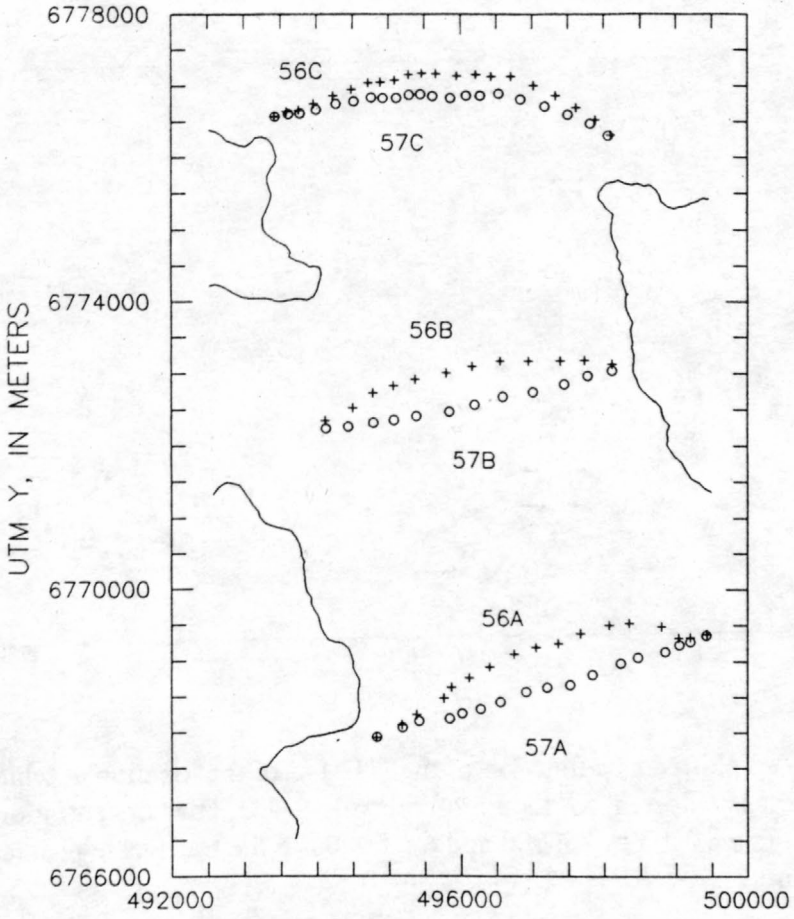


Figure 8.--Positions of features used to measure speed on three transverse profiles on November 7, 1985 (crosses) and January 16, 1986 (circles).

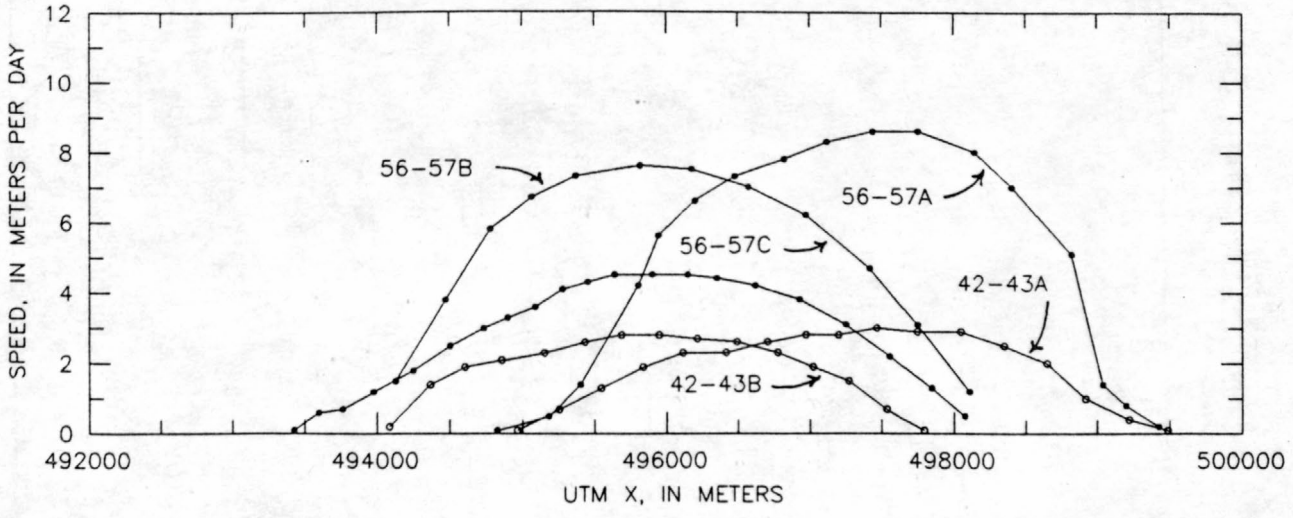


Figure 9.--Ice speed across two transverse profiles for the flight interval 42-43, and three transverse profiles for the flight interval 56-57. Speeds are calculated using both the X and Y displacement components. These transverse speed profiles are produced from the displacement shown on Figures 7 and 8 (Profiles 42A, B; 43A, B; 56A, B, C; 57A, B, C).

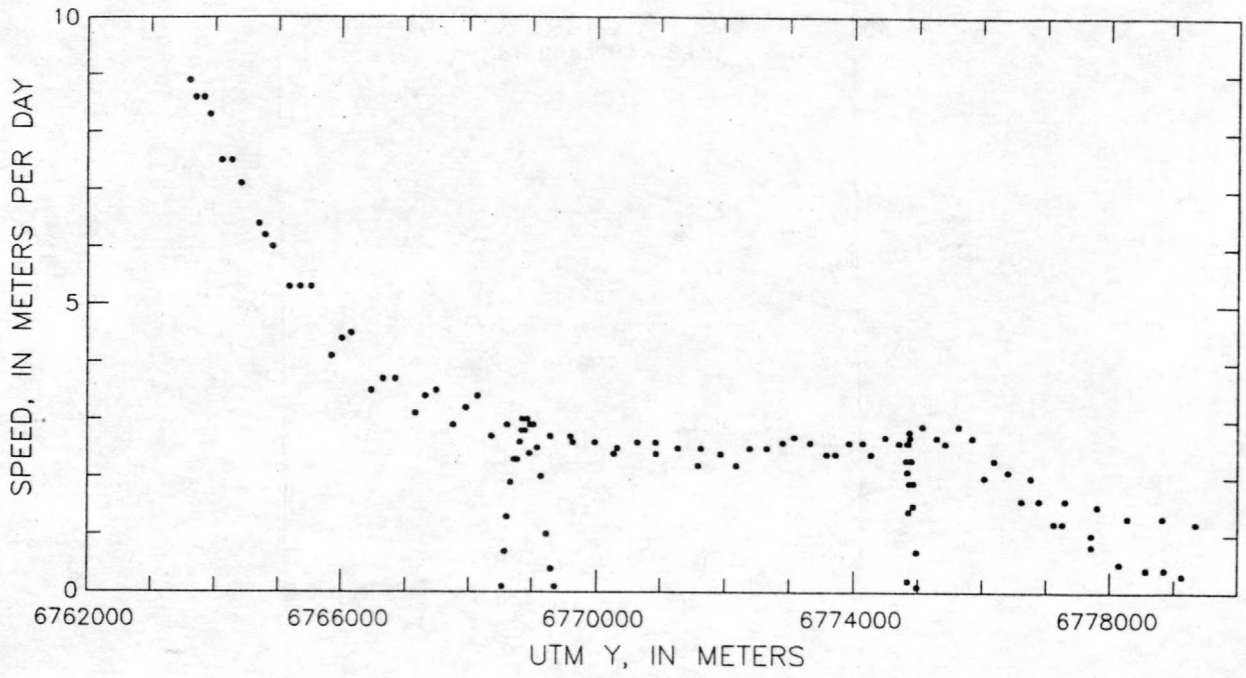


Figure 10.--Ice speed plotted as a function of the UTM Y of the location at which the speed was measured, for the flight interval 42-43. The concentration of measurements at Y=6769000 and 6775000 are the transverse profiles shown in Figure 7.

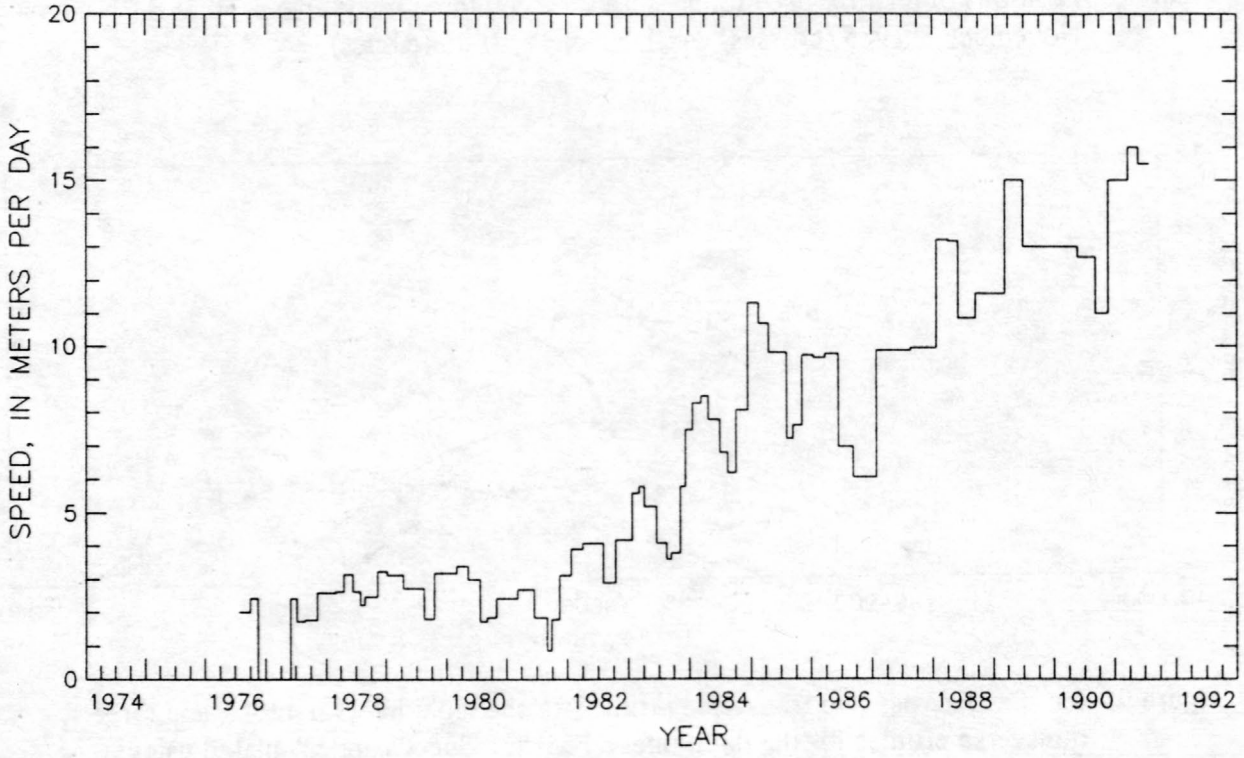


Figure 11.--Average ice speed over flight intervals at Y=6768000, as a function of time. The transverse location of this series of speed measurements varies slightly, but is always within 500 m of the same position near the centerline.

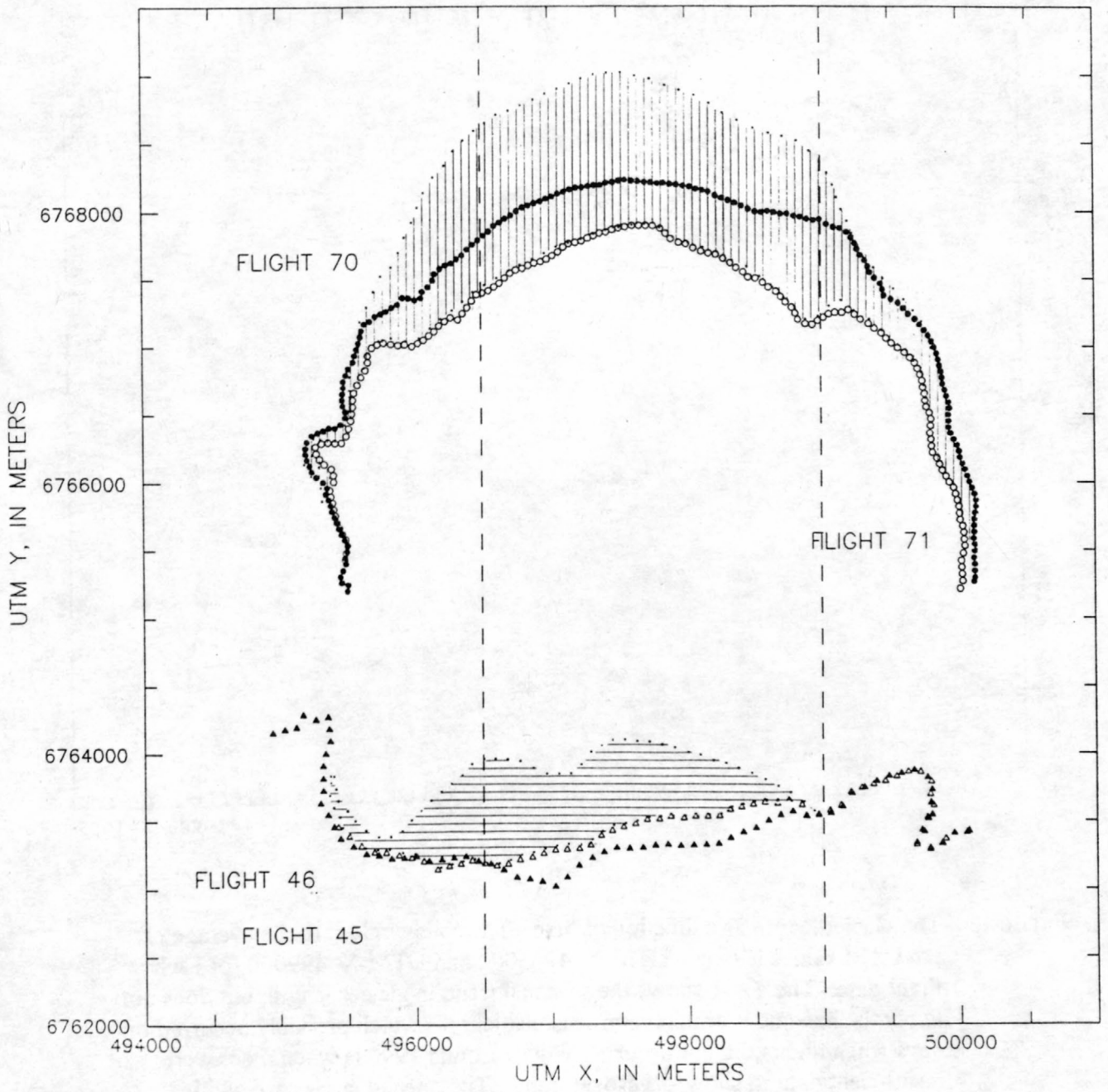


Figure 12.--Terminus position on four dates: January 20, 1984 (flight 45, indicated by open triangles), March 12, 1984 (flight 46, indicated by solid triangles), September 7, 1990 (flight 70, indicated by open circles), and November 21, 1990 (flight 71, indicated by solid circles). The glacier length (Figure 13) was determined by averaging the UTM Y of the points between the dashed lines for each of the respective dates. The area indicated by horizontal lines was calved between flights 45 and 46; and the area indicated by vertical lines was calved between flights 70 and 71.

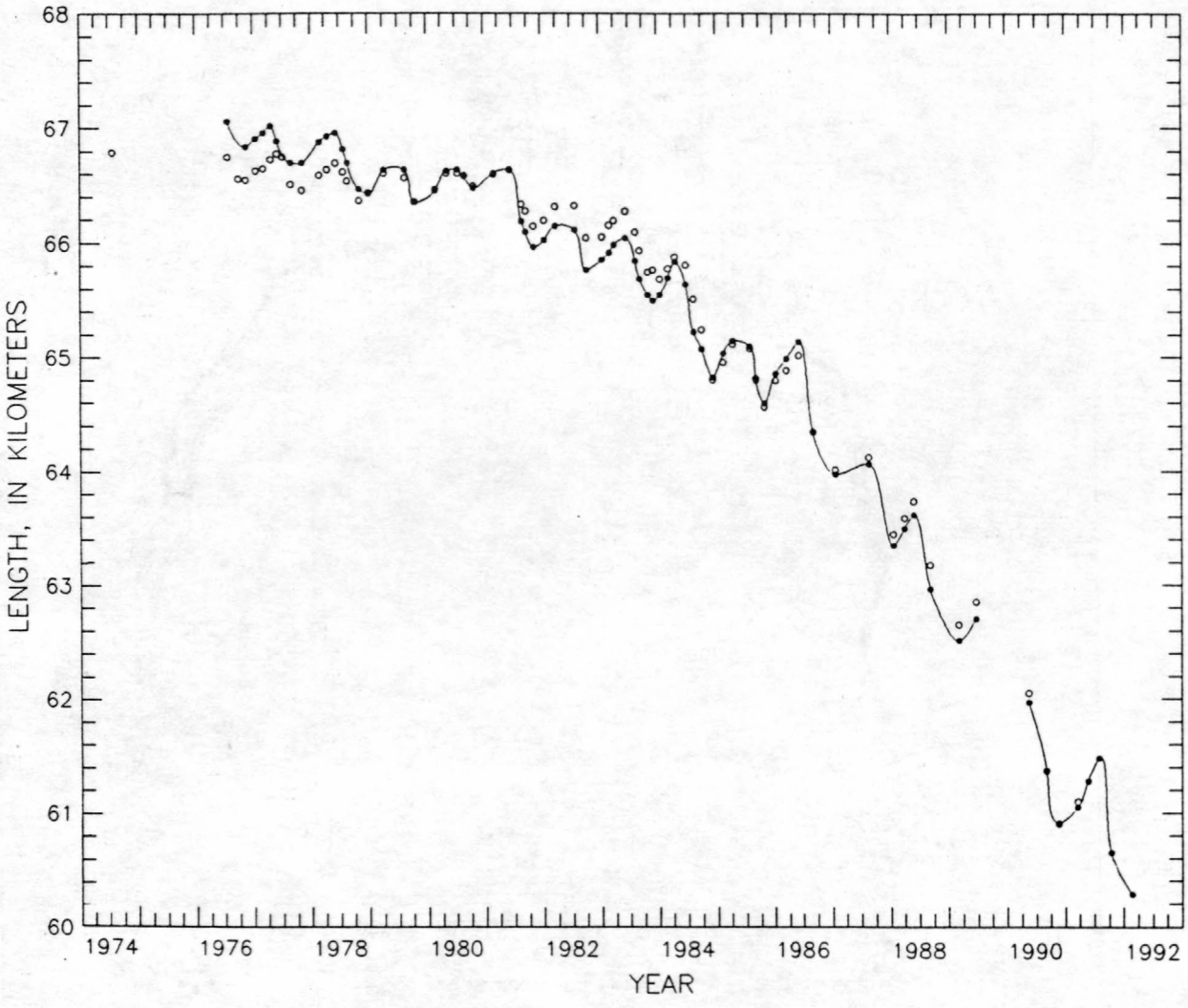


Figure 13.--The glacier length as a function of time. The solid circles are the average of the UTM values between UTM X=4965000 and UTM X=499000 for each flight date. The curve shows the seasonal trend in glacier length, but does not imply the maximum or minimum seasonal lengths which probably occurred on days when flights did not occur. The gap around 1990 is when there were insufficient data to show a seasonal trend. The opened circles are width-averaged lengths using a curvilinear system reported in Meier and others (1985b), and are shown here to allow comparison between the results from the two different width-averaging methods.

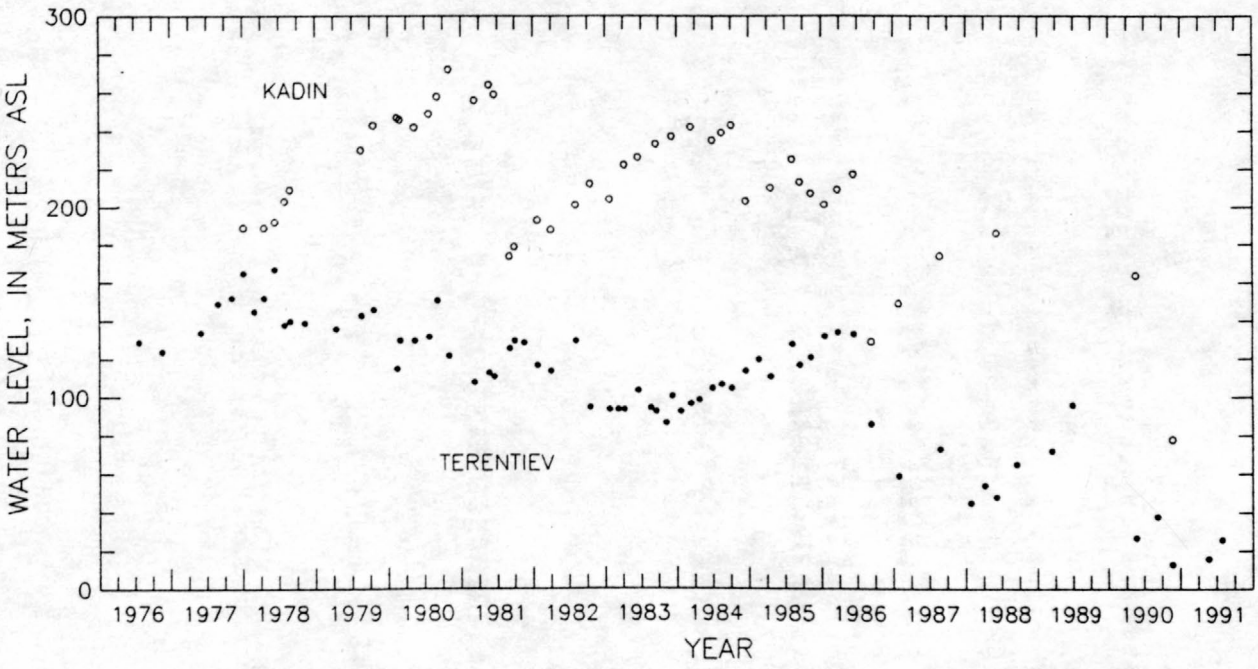


Figure 14.--Water level in Terentiev (solid circles) and Kadin (open circles) Lakes as a function of time.

Table 1. Columbia Glacier flight dates and summary of data volume

Flight #	Date	Flight alt.[1] (m)	Decimal year	Day number[2]	Number of alt. meas.[3]	Terentiev Lake level (m)	Kadin H Lake level (m)[4]	Glacier length (km)
1	29JUL57	9000	1957.574	-7460				66.84
2	27JUL74	7920	1974.568	-1253				66.79
3	24JUL76	5490	1976.561	-525		129		66.75
4	01OCT76	5490	1976.750	-456				66.56
5	17NOV76	5490	1976.879	-409		124		66.55
6	19JAN77	5490	1977.051	-346				66.63
7	07MAR77	5490	1977.180	-299				66.65
8	23APR77	5490	1977.309	-252				66.73
9	02JUN77	5490	1977.418	-212		134		66.78
10	07JUL77	7010	1977.514	-177				66.75
11	29AUG77	7010	1977.659	-124		149		66.51
12	08NOV77	7010	1977.854	-53		152		66.46
12A	08NOV77	8230						
13	28FEB78	6400	1978.160	59		145		66.59
14	19APR78	7010	1978.297	109		152	189	66.64
14A	19APR78	7770						
15	11JUN78	7101	1978.442	162		167	192	66.70
15A	11JUN78	7770						
16	30JUL78	7101	1978.576	211		138	203	66.62
16A	30JUL78	8530						
17	26AUG78	7010	1978.650	238		140	209	66.54
18	08NOV78	5490	1978.853	312		139		66.37
19	06JAN79	6100	1979.014	371				66.44
20	12APR79	7010	1979.277	467		136		66.61
21	18AUG79	7010	1979.628	595		143	230	66.57
22	20OCT79	7010	1979.800	658		146	243	66.36
23	29FEB80	7010	1980.162	790		115	246	66.47
24	12MAY80	7010	1980.361	863		130	242	66.61
25	22JUL80	7010	1980.556	934		132	249	66.61
26	02SEP80	7010	1980.671	976		151	258	66.59
27	30OCT80	7010	1980.830	1034		122	272	66.50
28	07MAR81	7010	1981.180	1162		108	256	66.60
29	16JUN81	7010	1981.457	1263		111	259	66.64
30	01SEP81	7010	1981.667	1340		126	174	66.34
31	26SEP81	6400	1981.736	1365		130	179	66.28
32	15NOV81	7010	1981.873	1415		129		66.15
33	22JAN82	7010	1982.059	1483		117	193	66.20
34	31MAR82	7010	1982.245	1551		114	188	66.32
35	02AUG82	7015	1982.585	1675		130	201	66.33
36	15OCT82	7015	1982.787	1749		95	212	66.05
37	21JAN83	7015	1983.056	1847	1303	94	204	66.06
38	07MAR83	6760	1983.179	1892	1303	94		66.16
39	07APR83	6700	1983.264	1923	1222	94	222	66.20
40	17JUN83	7050	1983.458	1994	1221	104	226	66.28
41	19AUG83	6820	1983.631	2057	1312	95		66.10
42	16SEP83	7060	1983.707	2085	1305	93	233	65.94
43	06NOV83	6950	1983.847	2136	1320	87		65.75
44	08DEC83	6880	1983.934	2168	1298	101	237	65.77
45	20JAN84	6710	1984.052	2211	1319	93		65.69
46	12MAR84	6870	1984.195	2263	1325	97	242	65.78
47	24APR84	6620	1984.312	2306	1241	99		65.88
48	28JUN84	7020	1984.490	2371	1246	105	235	65.81
49	15AUG84	7240	1984.622	2419	1327	107	239	65.51
50	04OCT84	6800	1984.759	2469	1325	105	243	65.24
51	14DEC84	7015	1984.953	2540		114	203	64.80
52	18FEB85	7015	1985.134	2606		120		64.95
53	18APR85	7015	1985.295	2665		111	210	65.11
54	04AUG85	7015	1985.591	2773		128	225	65.07
55	13SEP85	7070	1985.700	2813	1316	117	213	64.81
56	07NOV85	6640	1985.851	2868	1290	121	207	64.56
57	16JAN86	6700	1986.043	2938	1298	132	201	64.79
58	24MAR86	6820	1986.226	3005	1291	134	209	64.88
59	13JUN86	7020	1986.448	3086	1281	133	217	65.01
60	10SEP86	6950	1986.691	3175	1302	86	129	64.35
61	26JAN87	6670	1987.072	3314	1248	59	149	64.01
62	22AUG87	7110	1987.642	3522	1285	73	174	64.12
63	26JAN88	6540	1988.071	3679	1197	45		63.44
64	05APR88	6630	1988.263	3749	1205	54		63.58
65	04JUN88	6960	1988.427	3809	1181	48	186	63.73
66	14SEP88	6950	1988.707	3911	1138	65		63.17
67	12MAR89	6950	1989.197	4090	1052	72		62.65
68	26JUN89	6850	1989.487	4196	1039	96		62.85
69	22MAY90	6840	1990.390	4526	973	27	164	62.05
70	07SEP90	7190	1990.686	4634	1220	38		61.37
71	21NOV90	6790	1990.891	4709	828	13	78	60.90
72	20MAR91	7015	1991.217	4828				61.10
73	22MAY91	7015	1991.390	4891		16		61.28
74	27JUL91	7400	1991.579	4957		26		61.48
75	11OCT91							

[1] Flight line altitudes taken from Fountain (1982) prior to flight 35, and from the block adjustment after flight 34. When no block adjustment was available, the nominal altitude of 7015 m is shown.
[2] Day 1 is January 1, 1978.
[3] Altitudes were measured on flights 1-36 and 51-54, and were reported in Fountain (1982), and Krimmel (1987).
[4] Photo coverage did not always include Terentiev and Kadin Lakes, resulting in missing data on those dates.

Table 2. Comparison of results obtained by NMD and results obtained for this paper
[The difference in the locations of 20 of the points marked and measured by NMD and remeasured by the author on flights 36 and 55 are shown here. For flight 36 the X, Y, and Z means are 1.3, -0.1, and 0.0 m respectively, and the X, Y, and Z standard deviations are 1.0, 1.1, and 5.1 m respectively. For flight 55, the same set of values are -0.7, -0.2, -1.7, 1.3, 1.8, and 1.7]

NMD IPP #	X DIFF (m)	Y DIFF (m)	Z DIFF (m)
	FLIGHT 36		
1905	0	0	3
1906	1	-2	4
2007	1	-1	3
2158	1	-3	0
2207	2	-1	-1
2259	0	0	-4
2358	1	-1	-3
2510	1	0	-5
2808	2	1	-5
2857	3	1	-3
4501	0	0	8
4622	0	1	7
4722	2	0	8
4723	2	-1	8
4801	2	0	2
4802	1	2	2
4904	1	1	-6
4929	1	0	-5
5026	1	1	-7
5126	4	0	-6
	FLIGHT 55		
2508	1	-3	-2
2511	2	0	-2
2512	-1	0	-1
2514	-1	2	-4
2516	0	3	-4
2605	-2	-3	1
2607	-1	-2	-2
2609	-1	-2	-2
2610	-1	-2	-2
2611	-1	-2	1
2612	0	0	-1
2613	0	1	-1
2614	1	1	-2
2615	0	2	-3
2710	-3	-1	-3
2711	-3	-1	-2
2712	-3	-1	-2
2713	-1	0	-4
2716	-1	2	-1
2717	1	2	3

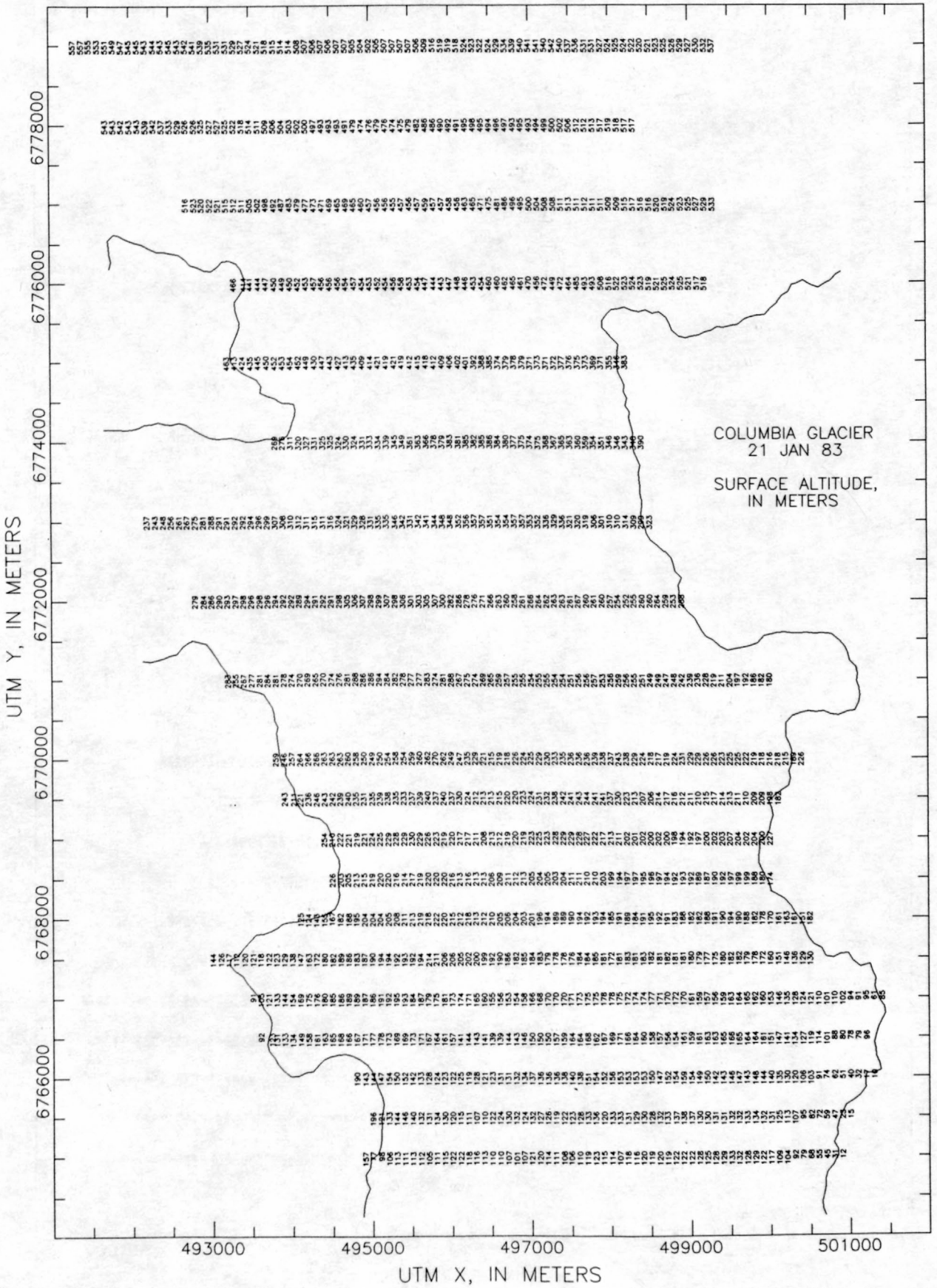
Table 3. Columbia Glacier flight intervals and changes during intervals

Flight number on 1st & 2nd date	1st date	2nd date	Number of days between flights	Number of velocity meas.(1)	Calved volume (km^3/year)	Calved ice height(2)
3-4	24JUL76	01OCT76	69			
4-5	01OCT76	17NOV76	47			
5-6	17NOV76	19JAN77	63			
6-7	19JAN77	07MAR77	47			
7-8	07MAR77	23APR77	47			
8-9	23APR77	02JUN77	40			
9-10	02JUN77	07JUL77	35			
10-11	07JUL77	29AUG77	53			
11-12	29AUG77	08NOV77	71			
12-13	08NOV77	28FEB78	112			
13-14	28FEB78	19APR78	50			
14-15	19APR78	11JUN78	53		0.4	66
15-16	11JUN78	30JUL78	49		1.5	73
16-17	30JUL78	26AUG78	27		1.8	73
17-18	26AUG78	08NOV78	74			
18-19	08NOV78	06JAN79	59		1.6	66
19-20	06JAN79	12APR79	96		0.7	73
20-21	12APR79	18AUG79	128		0.8	77
21-22	18AUG79	20OCT79	63		2.0	86
22-23	20OCT79	29FEB80	132		0.9	77
23-24	29FEB80	12MAY80	73		0.2	64
24-25	12MAY80	22JUL80	71		0.9	71
25-26	22JUL80	02SEP80	42		1.0	69
26-27	02SEP80	30OCT80	58		0.8	73
27-28	30OCT80	07MAR81	128		0.4	78
28-29	07MAR81	16JUN81	101		0.6	80
29-30	16JUN81	01SEP81	77		2.2	85
30-31	01SEP81	26SEP81	25		1.3	68
31-32	26SEP81	15NOV81	50		2.1	78
32-33	15NOV81	22JAN82	68		1.3	71
33-34	22JAN82	31MAR82	68		.9	63
34-35	31MAR82	02AUG82	124		1.4	68
35-36	02AUG82	15OCT82	74		2.6	75
36-37	15OCT82	21JAN83	98	87	1.8	72
37-38	21JAN83	07MAR83	45	86	1.2	62
38-39	07MAR83	07APR83	31	95	1.0	62
39-40	07APR83	17JUN83	71	84	1.1	66
40-41	17JUN83	19AUG83	103	95	2.1	67
41-42	19AUG83	16SEP83	28	93	3.4	67
42-43	16SEP83	06NOV83	51	111	2.8	69
43-44	06NOV83	08DEC83	32	84	3.1	65
44-45	08DEC83	20JAN84	43	90	3.0	68
45-46	20JAN84	12MAR84	52	87	2.2	61
46-47	12MAR84	24APR84	43	92	1.9	53
47-48	24APR84	28JUN84	65	93	3.0	55
48-49	28JUN84	15AUG84	48	82	4.4	56
49-50	15AUG84	04OCT84	50	166	3.6	54
50-51	04OCT84	14DEC84	71		3.6	53
51-52	14DEC84	18FEB85	66		2.3	66
52-53	18FEB85	18APR85	59		2.4	54
53-54	18APR85	04AUG85	108		2.5	55
54-55	04AUG85	13SEP85	40	430	3.6	40
55-56	13SEP85	07NOV85	55	81	2.8	48
56-57	07NOV85	16JAN86	70	245	1.6	41
57-58	16JAN86	24MAR86	67	113	1.9	52
58-59	24MAR86	13JUN86	81	79	1.9	46
59-60	13JUN86	10SEP86	89	77	3.6	51
60-61	10SEP86	26JAN87	139	102	2.2	66
61-62	26JAN87	22AUG87	208	24	2.1	59
62-63	22AUG87	26JAN88	157	54	3.7	58
63-64	26JAN88	05APR88	70	87	2.7	52
64-65	05APR88	04JUN88	60	87	2.7	41
65-66	04JUN88	14SEP88	102	45	3.9	43
66-67	14SEP88	12MAR89	179	29	3.0	61
67-68	12MAR89	26JUN89	106	14	2.8	58
68-69	26JUN89	22MAY90	330	6		
69-70	22MAY90	07SEP90	108	18	3.5	42
70-71	07SEP90	21NOV90	75	60	3.9	45
71-72	21NOV90	20MAR91	119	7		
72-73	20MAR91	22MAY91	63	5		
73-74	22MAY91	27JUL91	66	40	3.0	52
74-75	27JUL91	11OCT91	76			

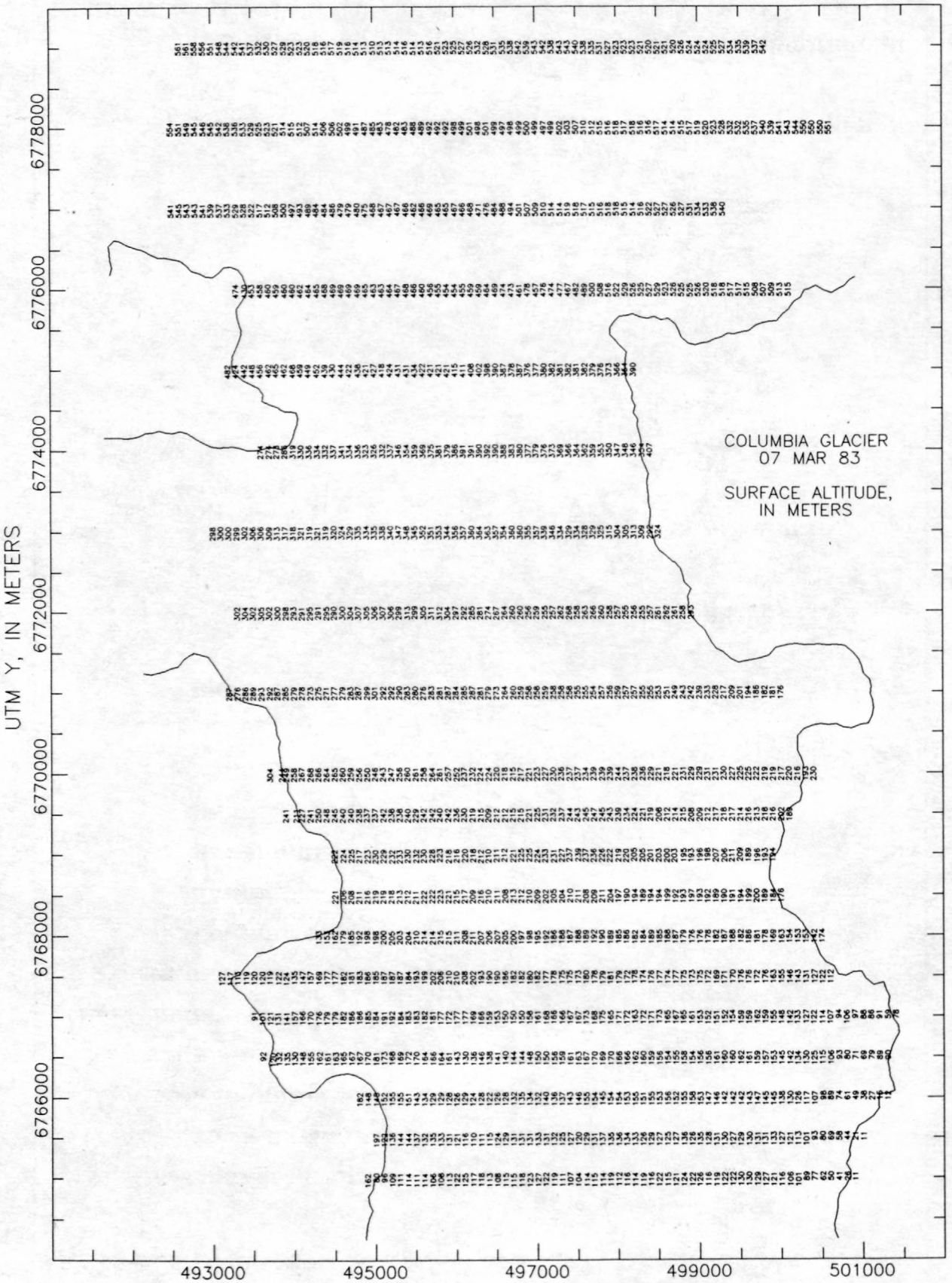
(1) Velocities were measured for intervals 3-4 to 35-36 and 50-51 to 53-54, and were reported in Fountain (1982) and Krimmel (1987).

(2) Photography was of insufficient quality, or the interval between flights was too long, to obtain calving data for some intervals, resulting in missing data.

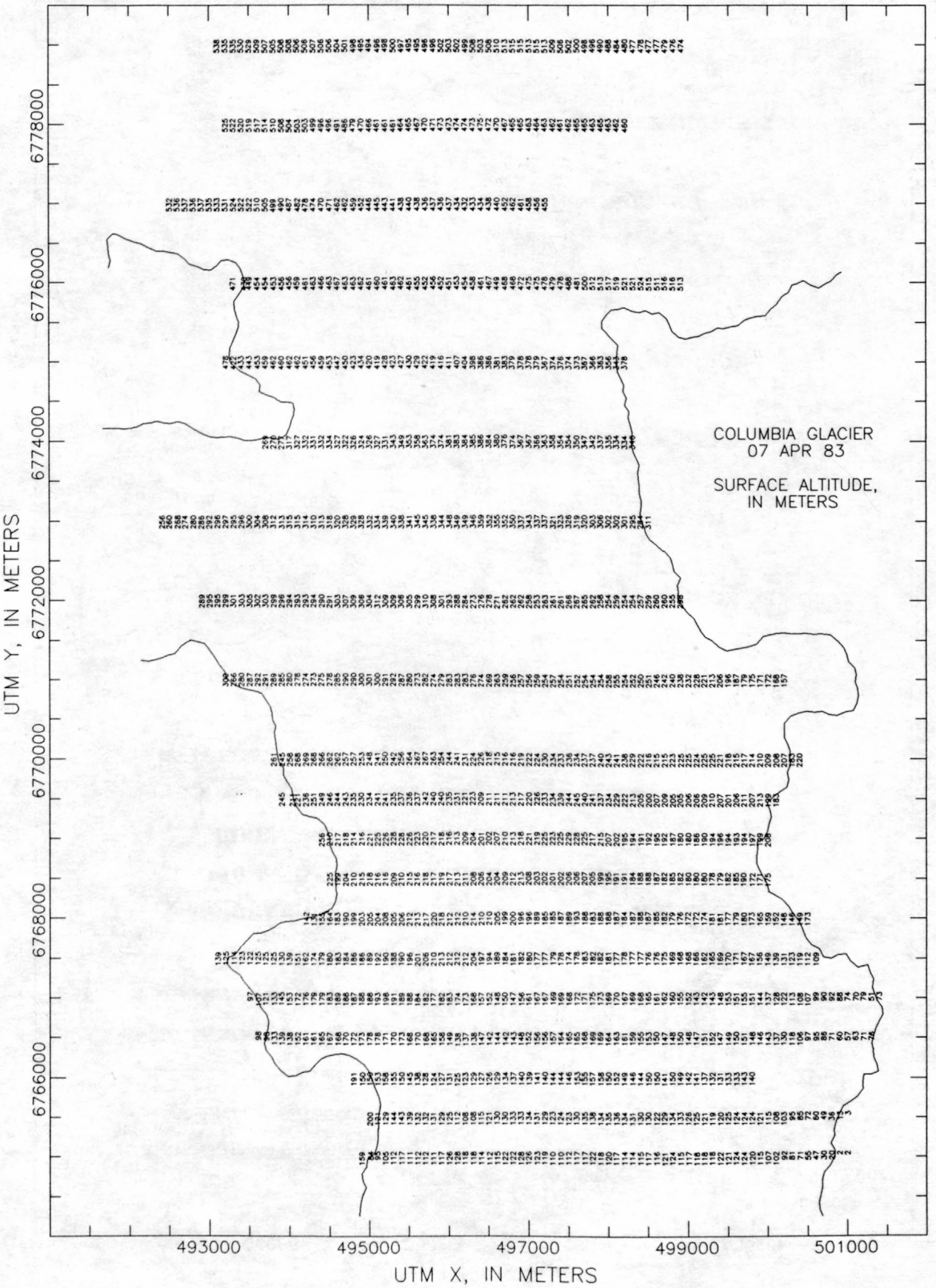
Appendix 1. Altitudes at Columbia Glacier grid points at multiples of 100 m UTM X spacing and multiples of 500 or 1000 m UTM Y spacing. The tens digit of each value is placed at the values position. The quality of photography on flights 72 and 73 was insufficient to allow measurement of the altitude grids in those dates.



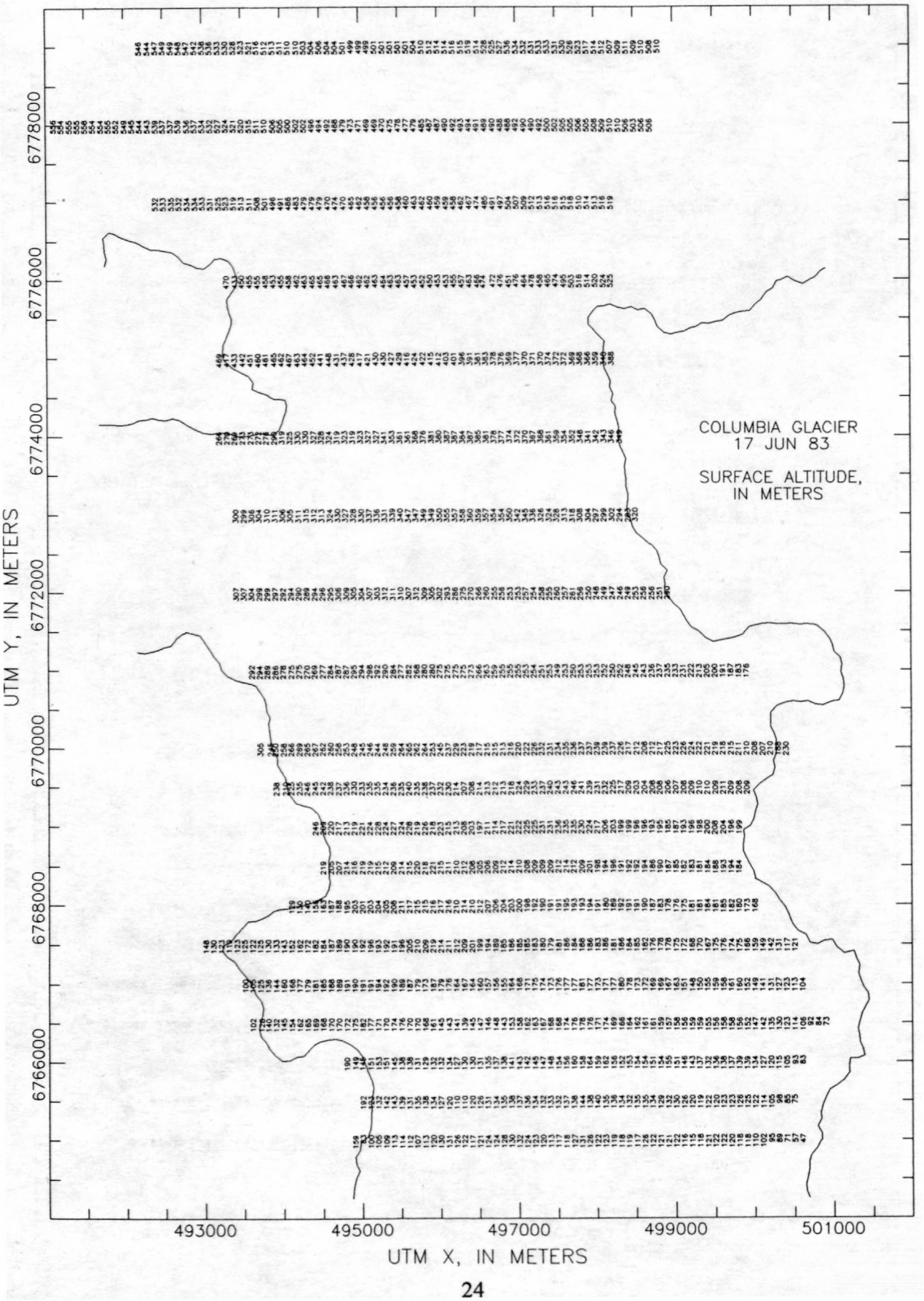
Appendix 1. Altitudes at Columbia Glacier grid points at multiples of 100 m UTM X spacing and multiples of 500 or 1000 m UTM Y spacing. The tens digit of each value is placed at the values position. The quality of photography on flights 72 and 73 was insufficient to allow measurement of the altitude grids in those dates.



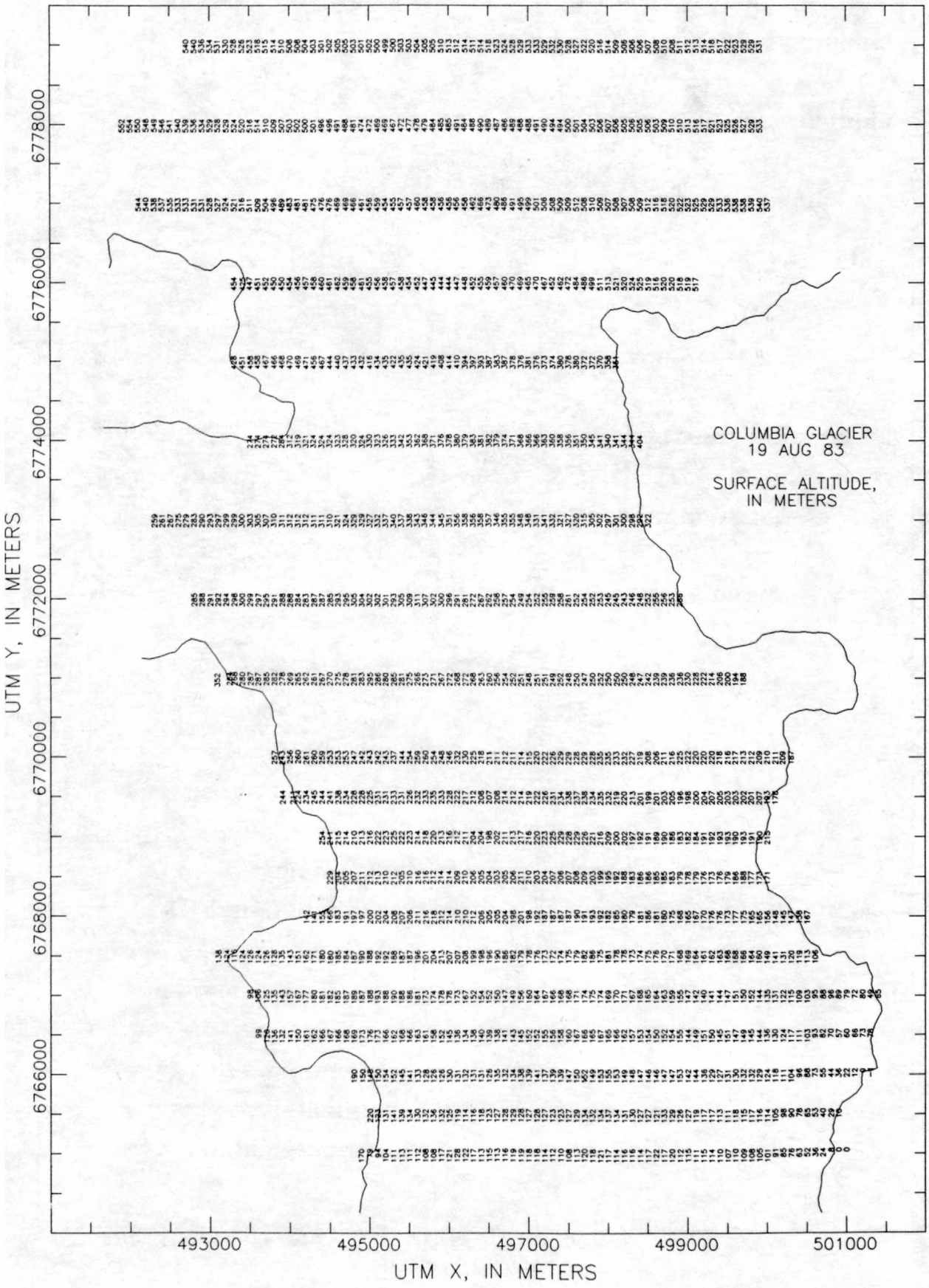
Appendix 1. Altitudes at Columbia Glacier grid points at multiples of 100 m UTM X spacing and multiples of 500 or 1000 m UTM Y spacing. The tens digit of each value is placed at the values position. The quality of photography on flights 72 and 73 was insufficient to allow measurement of the altitude grids in those dates.



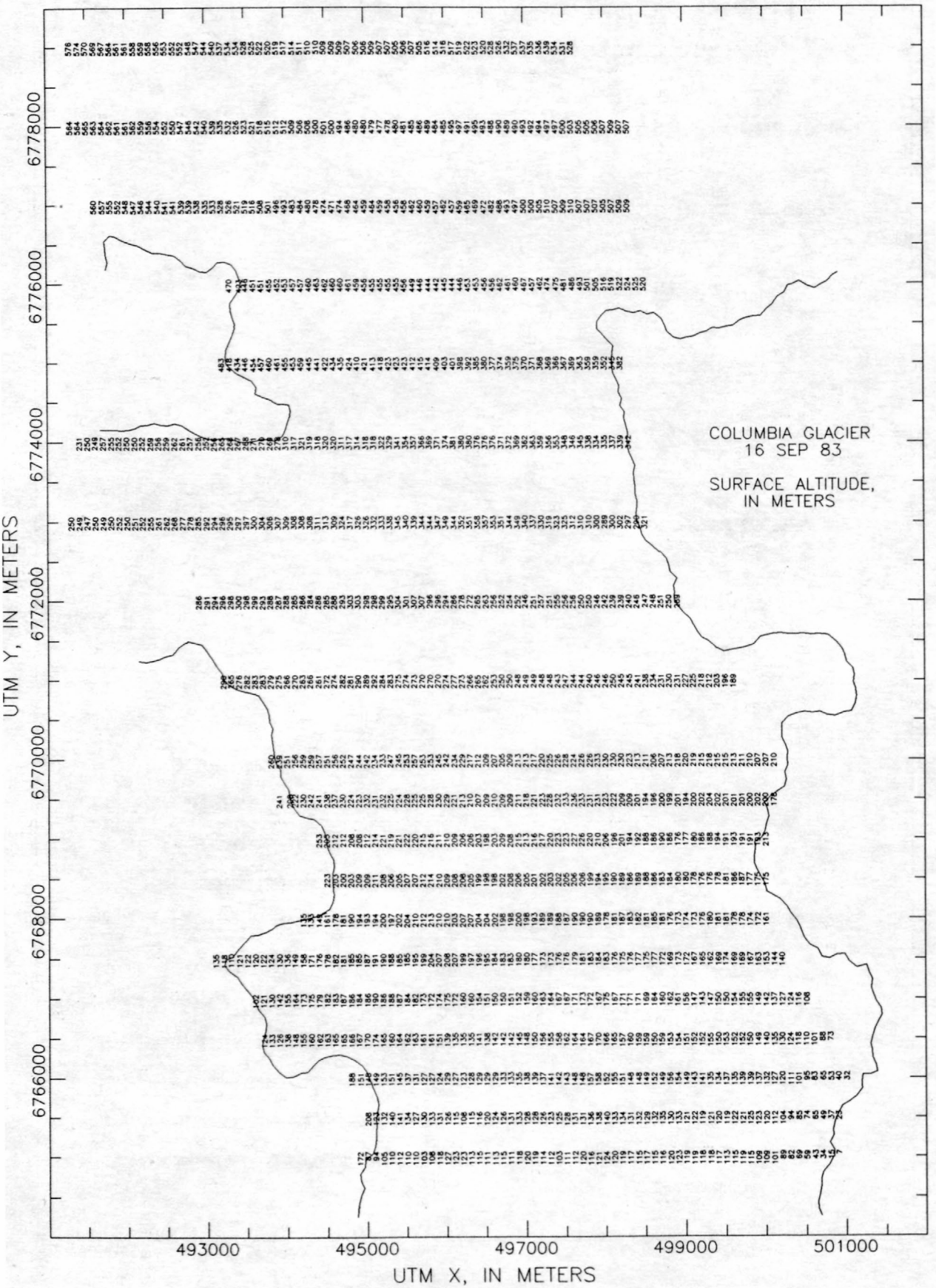
Appendix 1. Altitudes at Columbia Glacier grid points at multiples of 100 m UTM X spacing and multiples of 500 or 1000 m UTM Y spacing. The tens digit of each value is placed at the values position. The quality of photography on flights 72 and 73 was insufficient to allow measurement of the altitude grids in those dates.



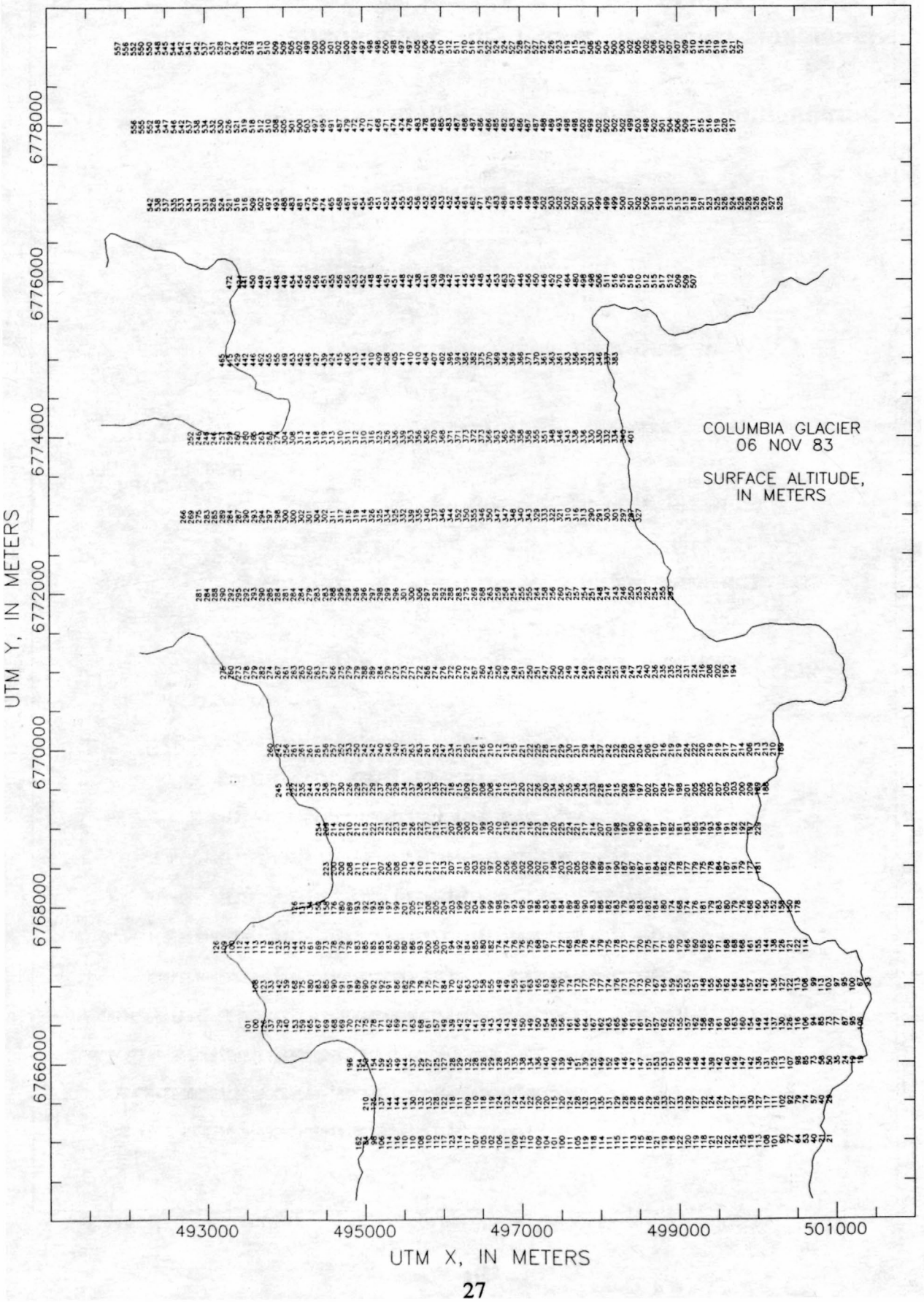
Appendix 1. Altitudes at Columbia Glacier grid points at multiples of 100 m UTM X spacing and multiples of 500 or 1000 m UTM Y spacing. The tens digit of each value is placed at the values position. The quality of photography on flights 72 and 73 was insufficient to allow measurement of the altitude grids in those dates.



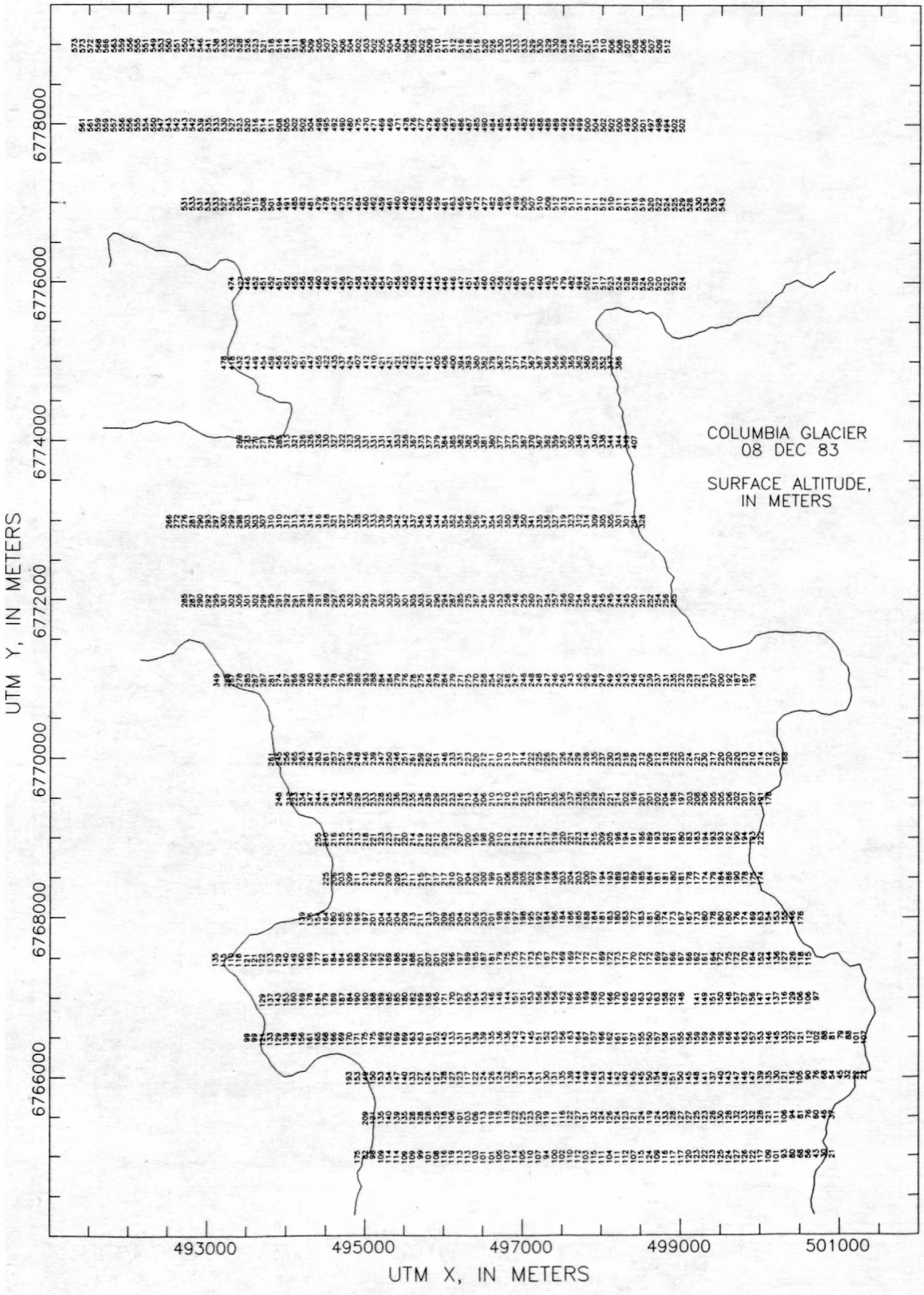
Appendix 1. Altitudes at Columbia Glacier grid points at multiples of 100 m UTM X spacing and multiples of 500 or 1000 m UTM Y spacing. The tens digit of each value is placed at the values position. The quality of photography on flights 72 and 73 was insufficient to allow measurement of the altitude grids in those dates.



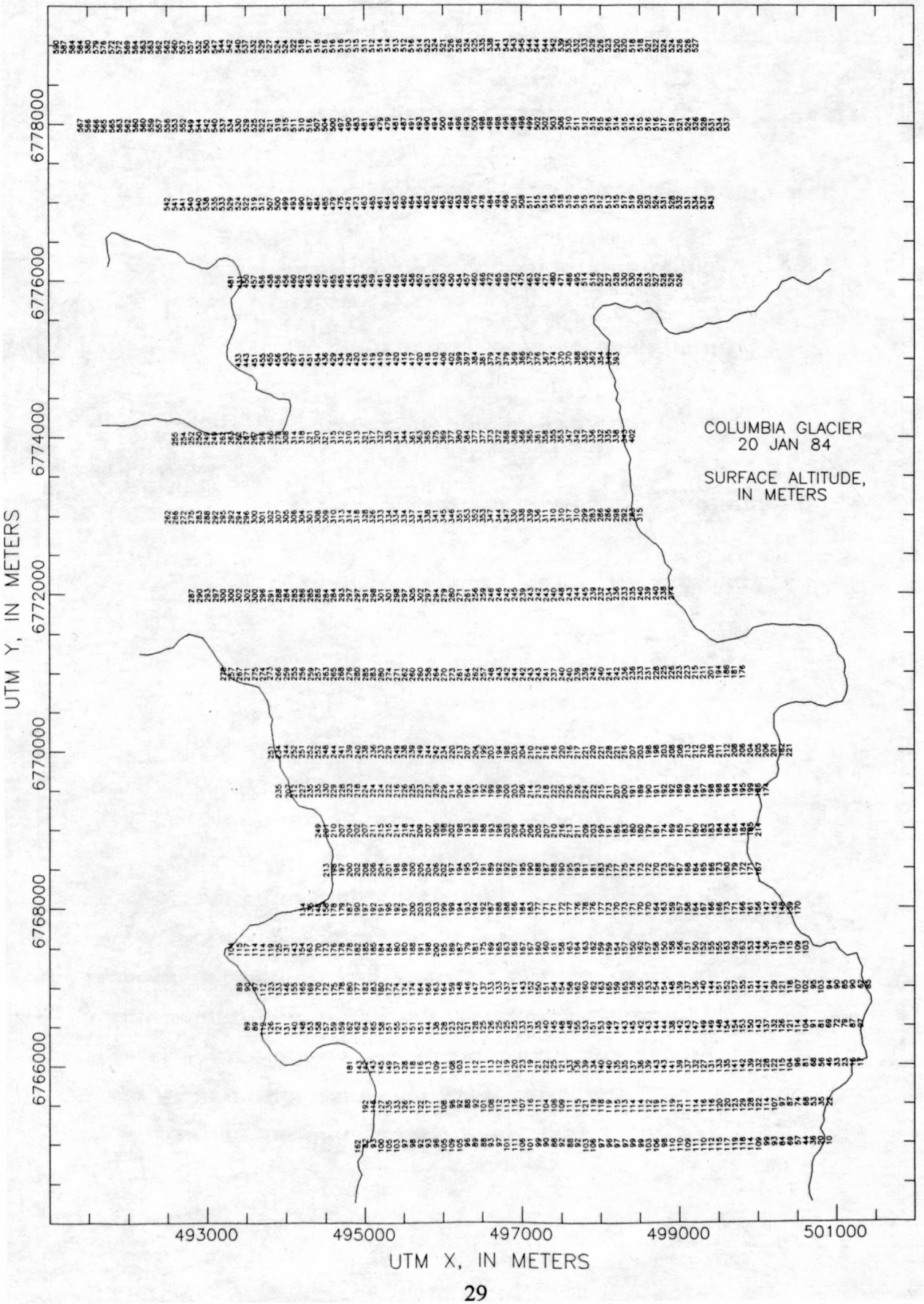
Appendix 1. Altitudes at Columbia Glacier grid points at multiples of 100 m UTM X spacing and multiples of 500 or 1000 m UTM Y spacing. The tens digit of each value is placed at the values position. The quality of photography on flights 72 and 73 was insufficient to allow measurement of the altitude grids in those dates.



Appendix 1. Altitudes at Columbia Glacier grid points at multiples of 100 m UTM X spacing and multiples of 500 or 1000 m UTM Y spacing. The tens digit of each value is placed at the values position. The quality of photography on flights 72 and 73 was insufficient to allow measurement of the altitude grids in those dates.



Appendix 1. Altitudes at Columbia Glacier grid points at multiples of 100 m UTM X spacing and multiples of 500 or 1000 m UTM Y spacing. The tens digit of each value is placed at the values position. The quality of photography on flights 72 and 73 was insufficient to allow measurement of the altitude grids in those dates.



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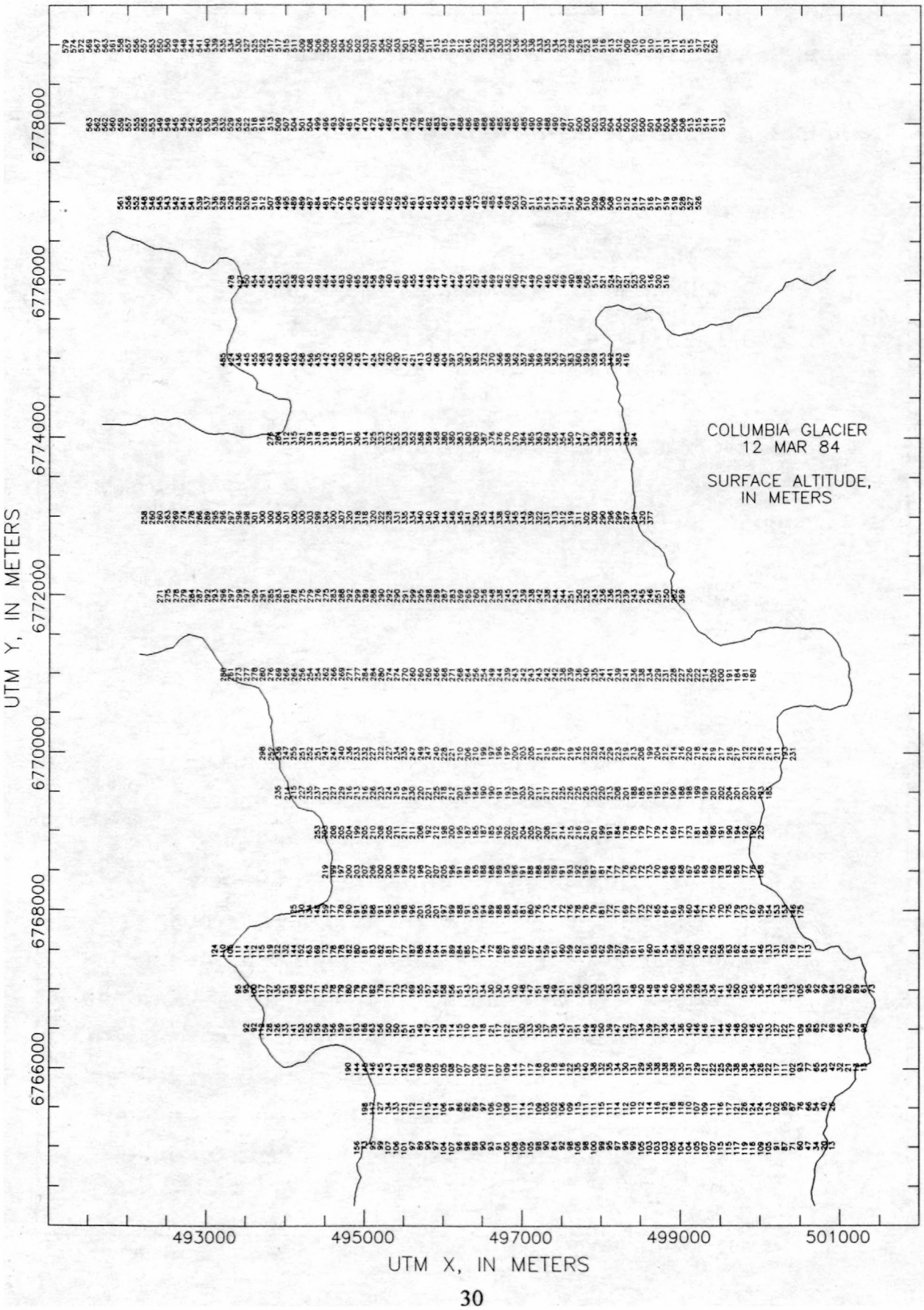

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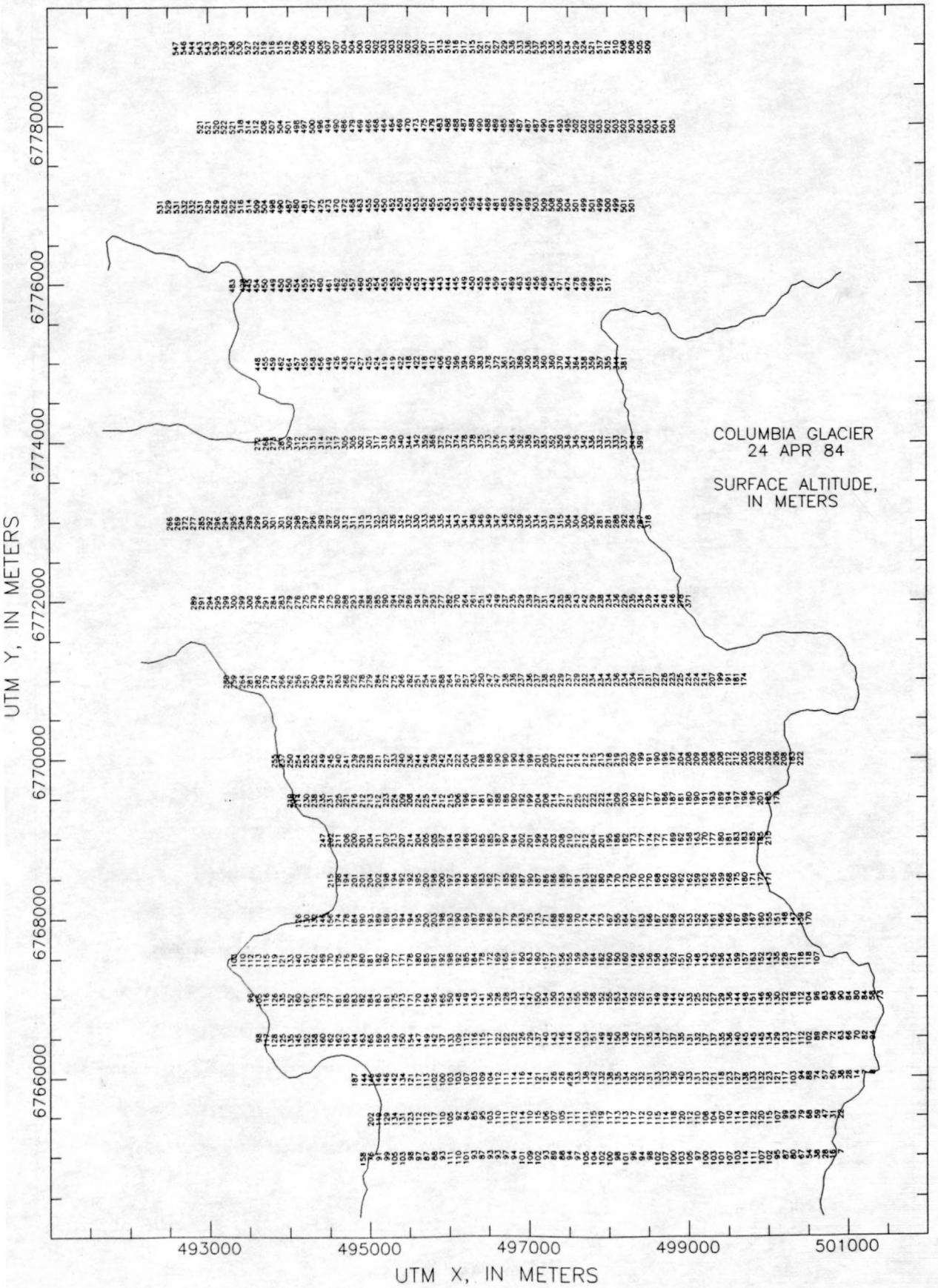

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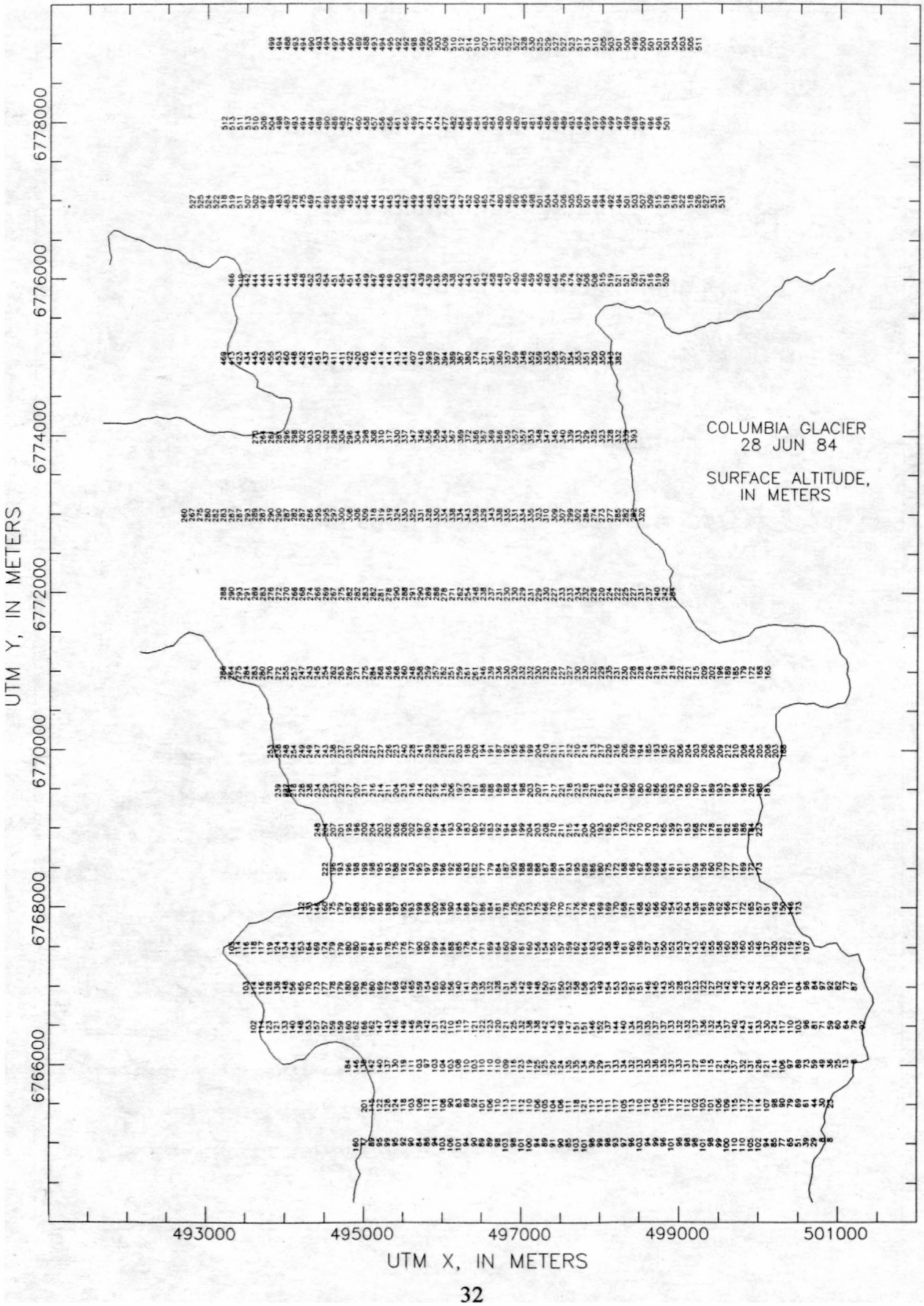

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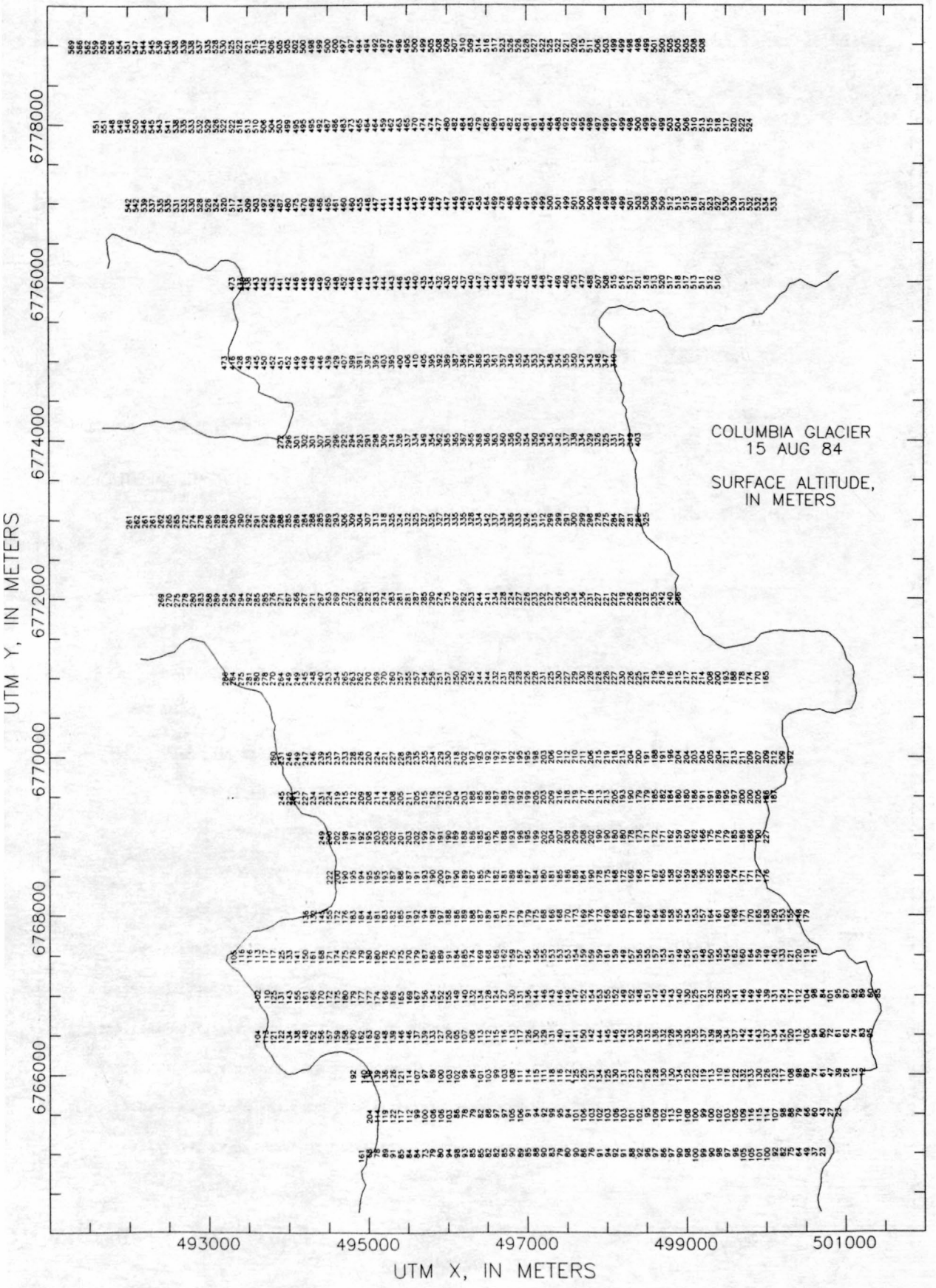
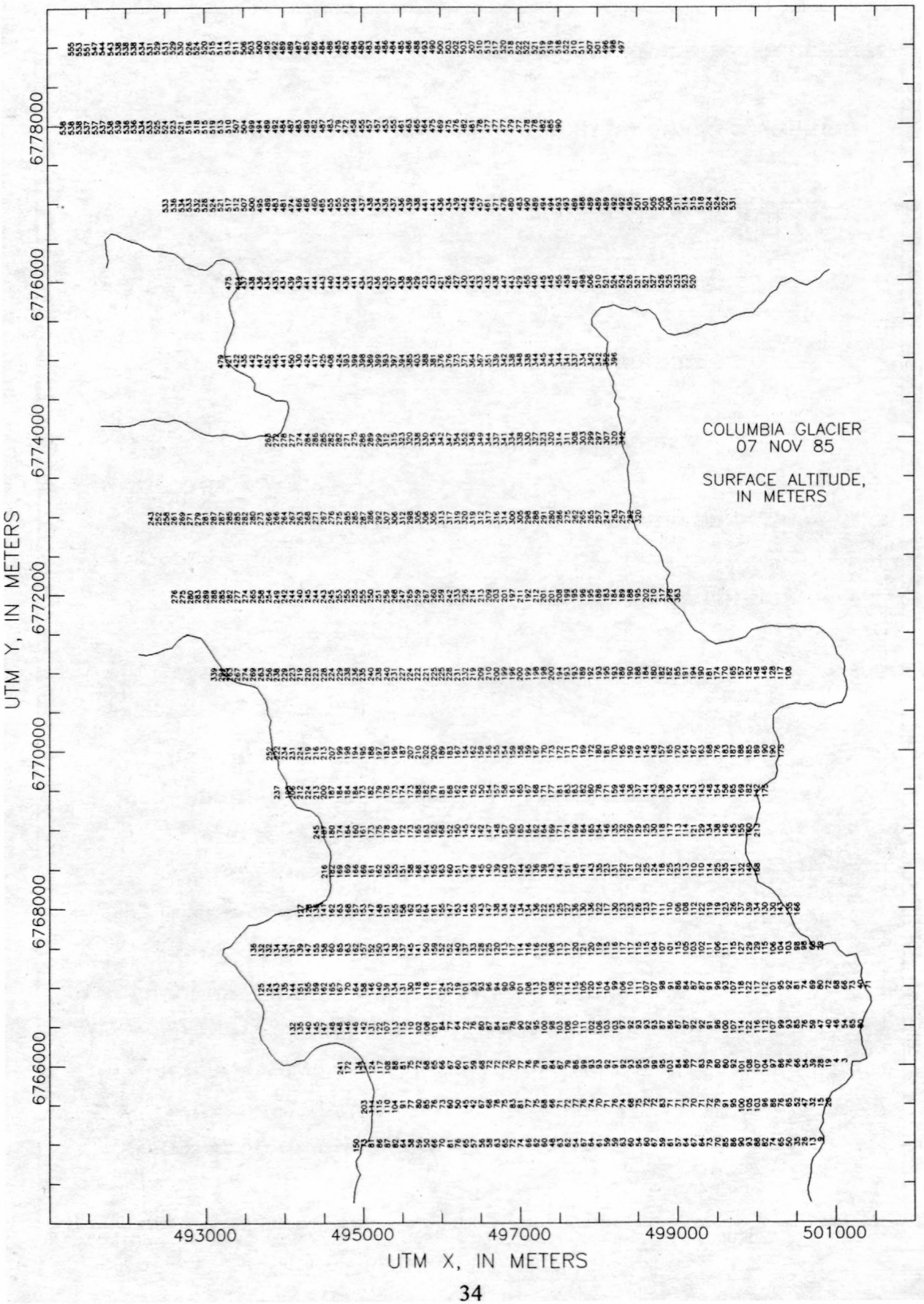
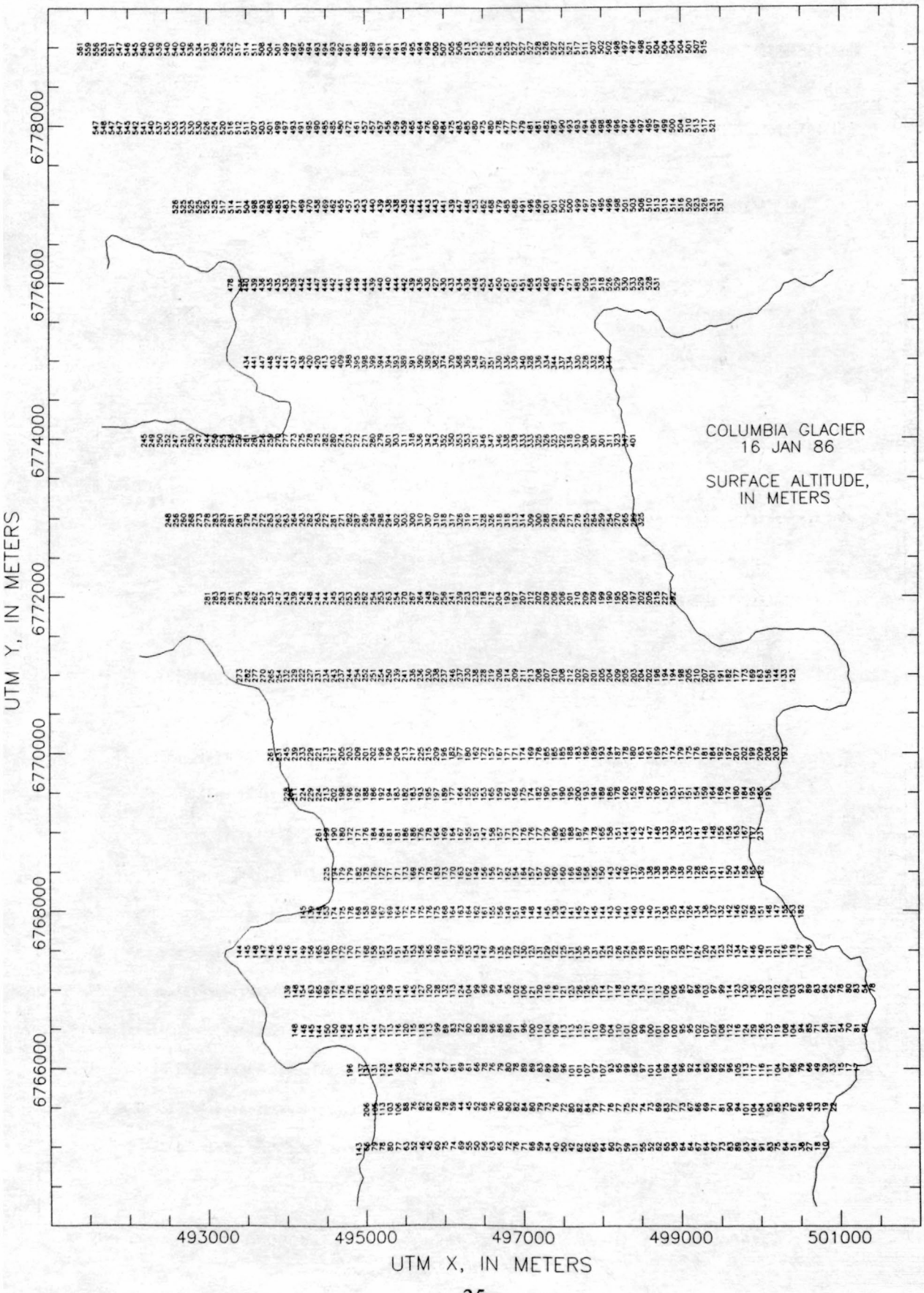


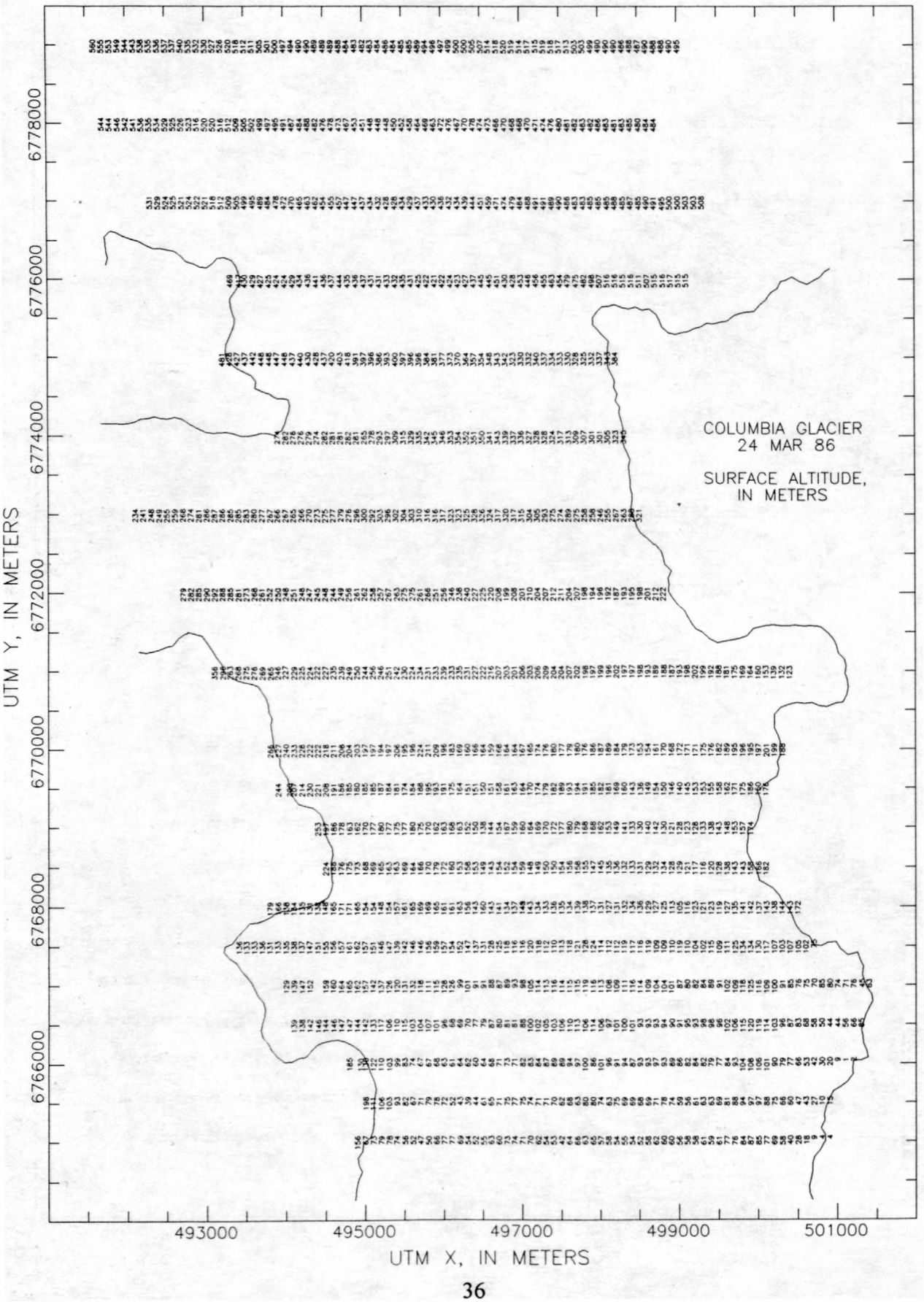
Appendix 1. Altitudes at Columbia Glacier grid points at multiples of 100 m UTM X spacing and multiples of 500 or 1000 m UTM Y spacing. The tens digit of each value is placed at the values position. The quality of photography on flights 72 and 73 was insufficient to allow measurement of the altitude grids in those dates.



Appendix 1. Altitudes at Columbia Glacier grid points at multiples of 100 m UTM X spacing and multiples of 500 or 1000 m UTM Y spacing. The tens digit of each value is placed at the values position. The quality of photography on flights 72 and 73 was insufficient to allow measurement of the altitude grids in those dates.



Appendix 1. Altitudes at Columbia Glacier grid points at multiples of 100 m UTM X spacing and multiples of 500 or 1000 m UTM Y spacing. The tens digit of each value is placed at the values position. The quality of photography on flights 72 and 73 was insufficient to allow measurement of the altitude grids in those dates.



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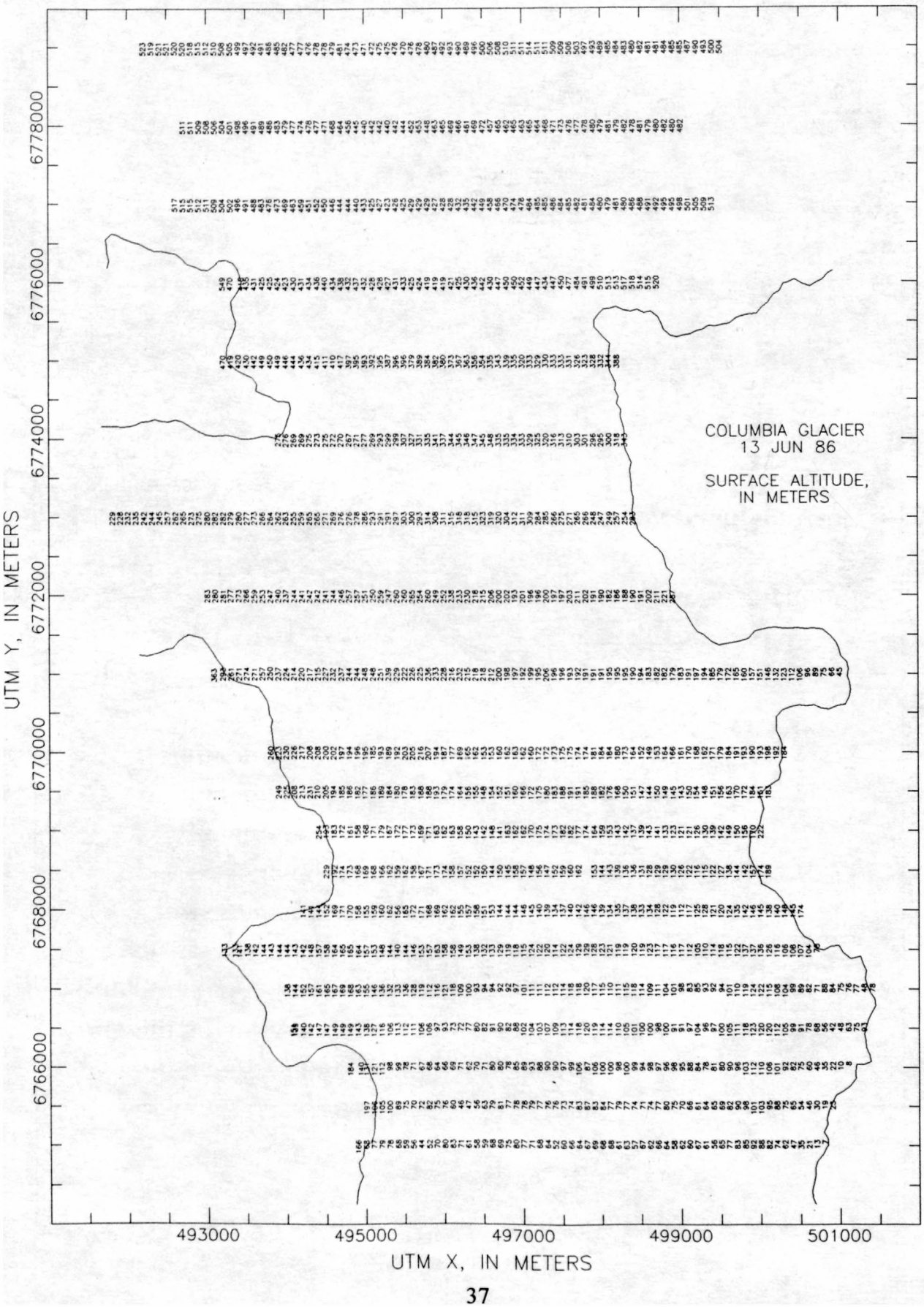
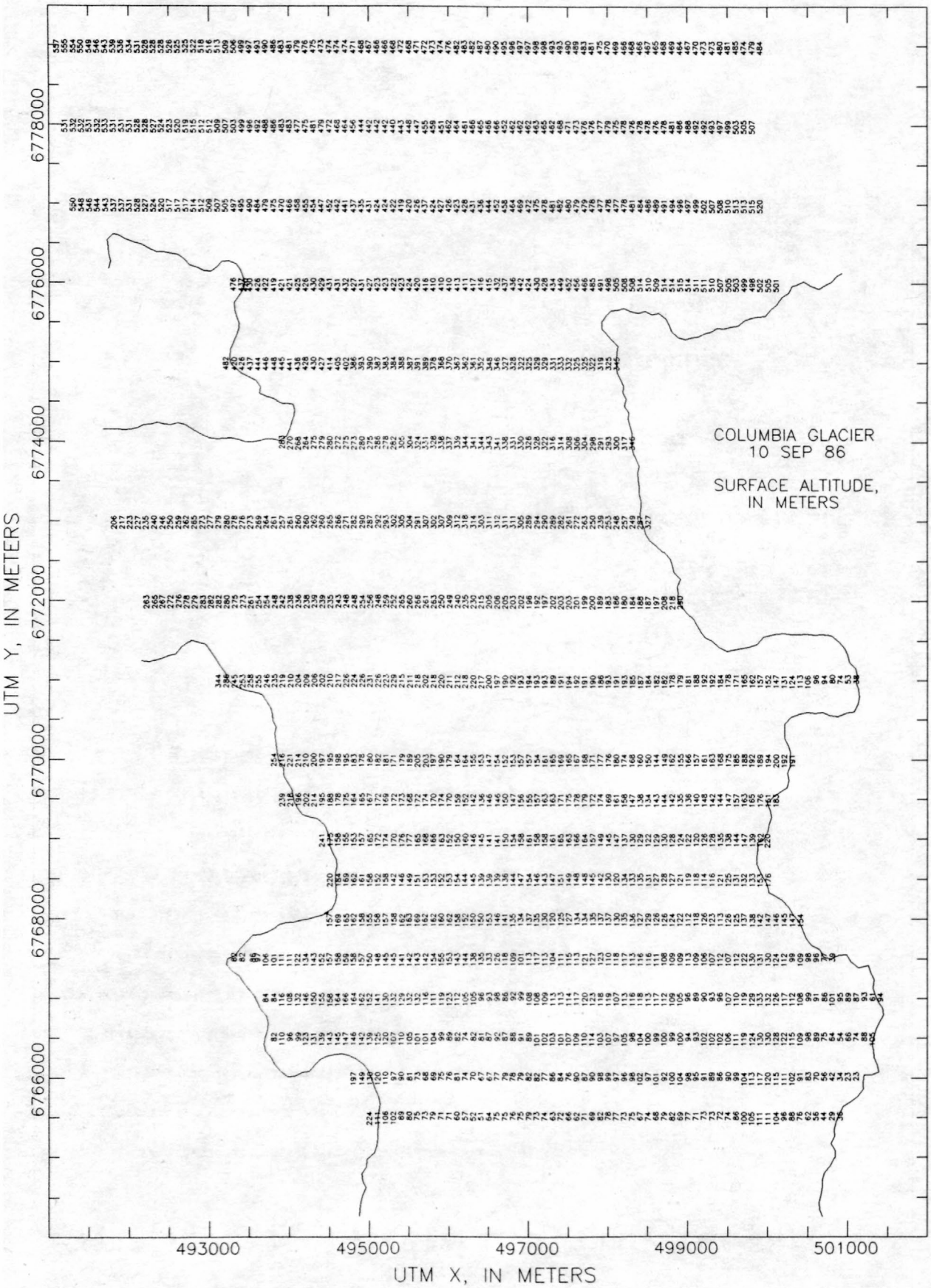


Appendix 1. Altitudes at Columbia Glacier grid points at multiples of 100 m UTM X spacing and multiples of 500 or 1000 m UTM Y spacing. The tens digit of each value is placed at the values position. The quality of photography on flights 72 and 73 was insufficient to allow measurement of the altitude grids in those dates.



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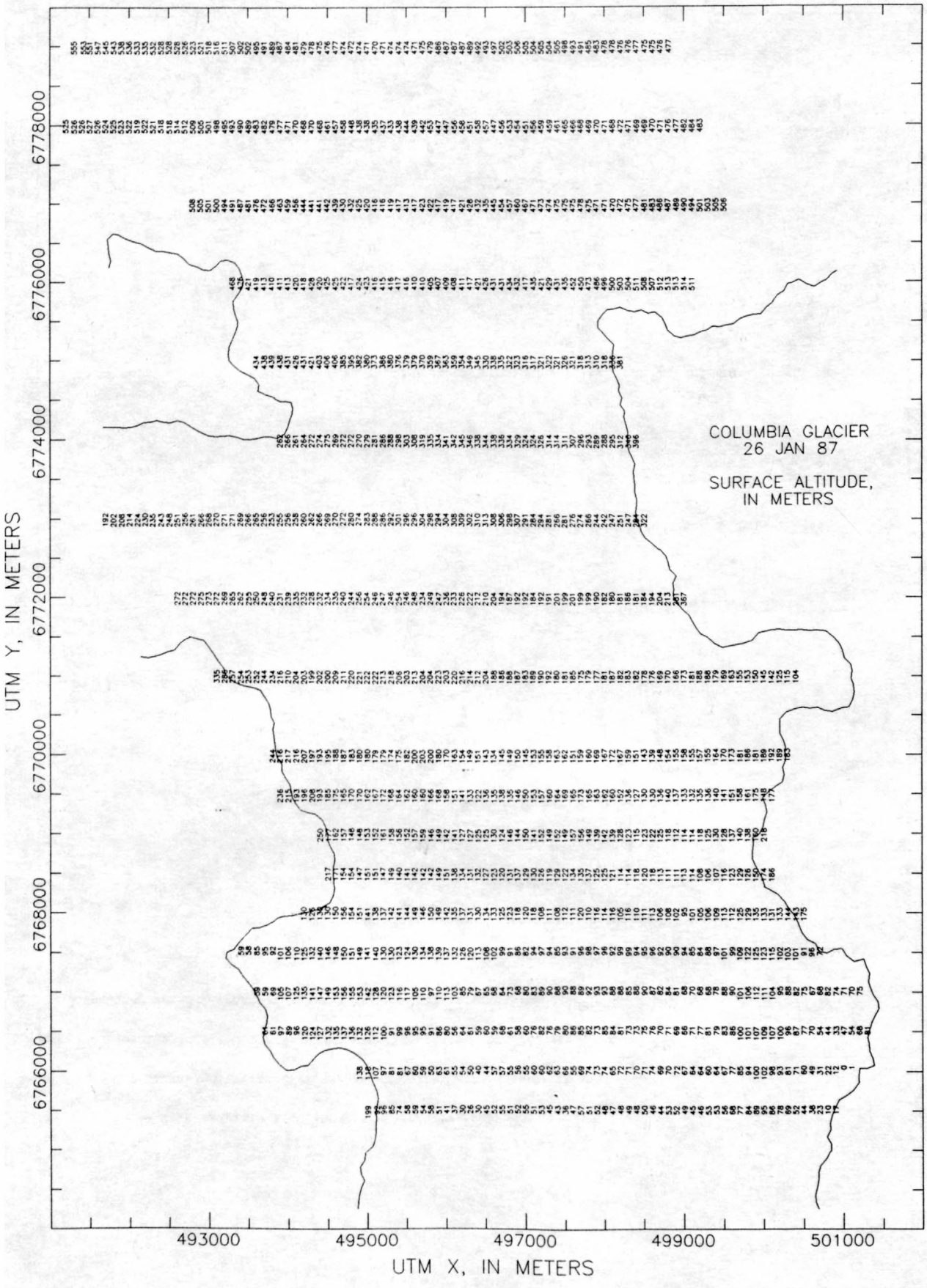
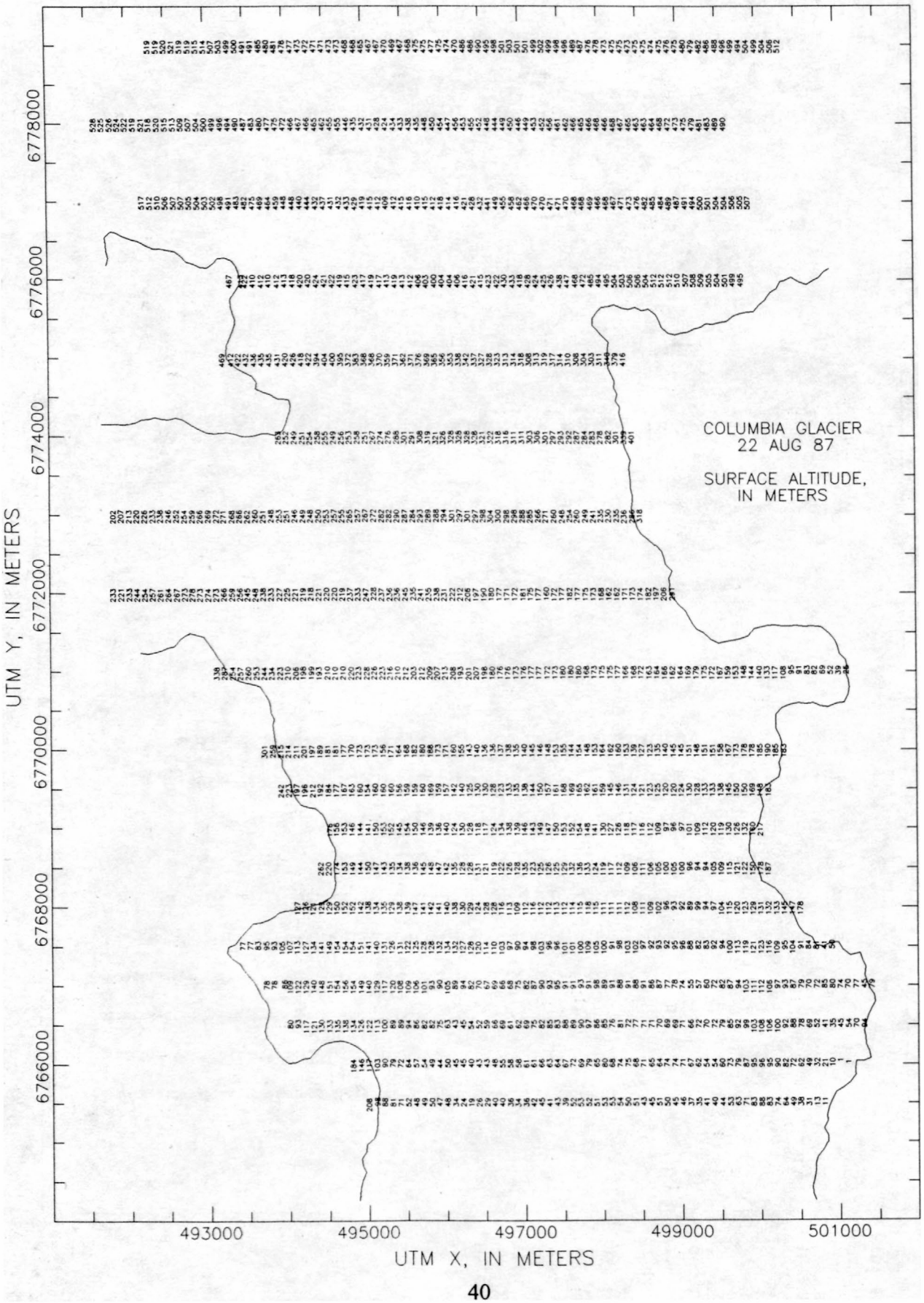
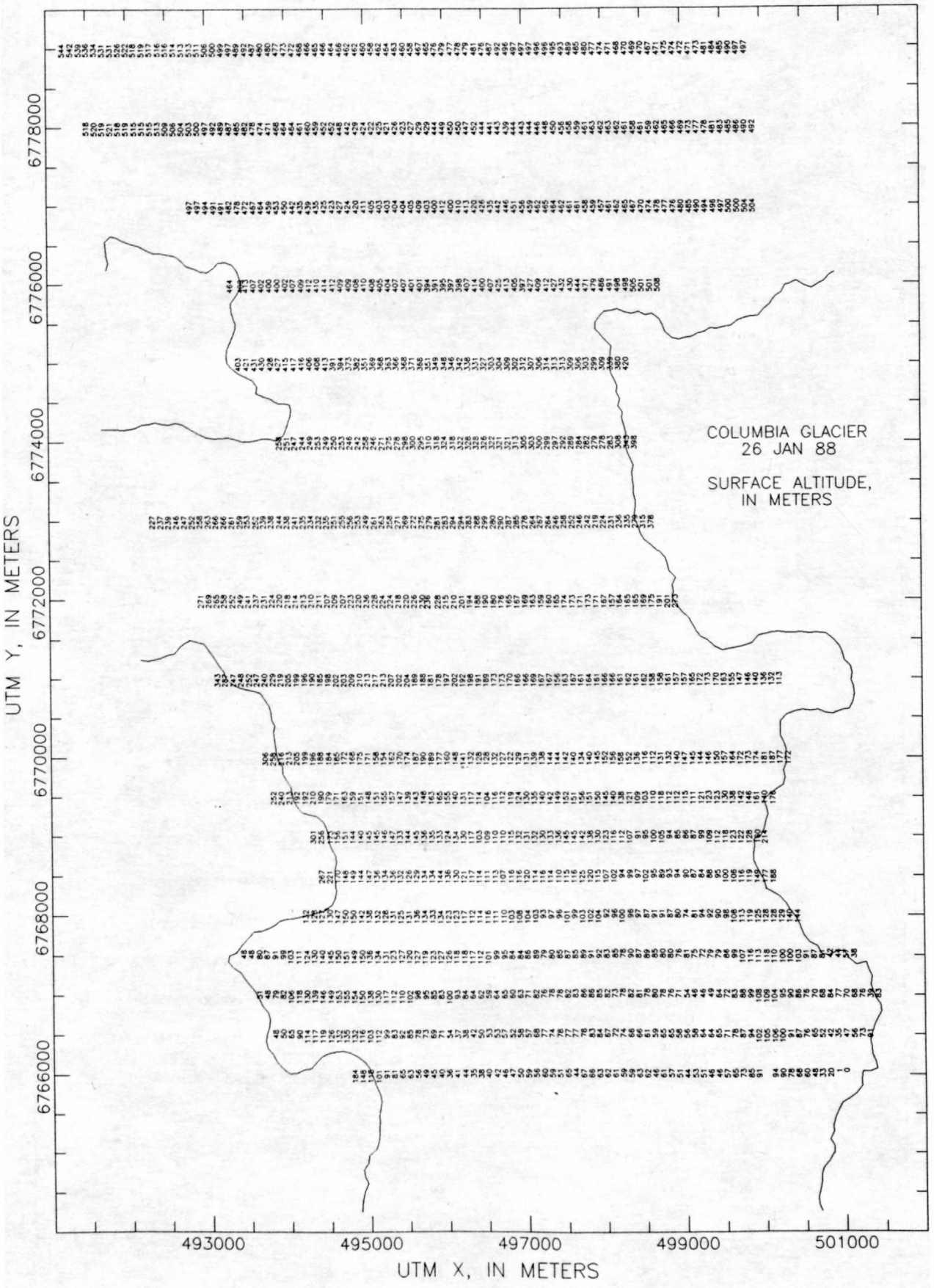


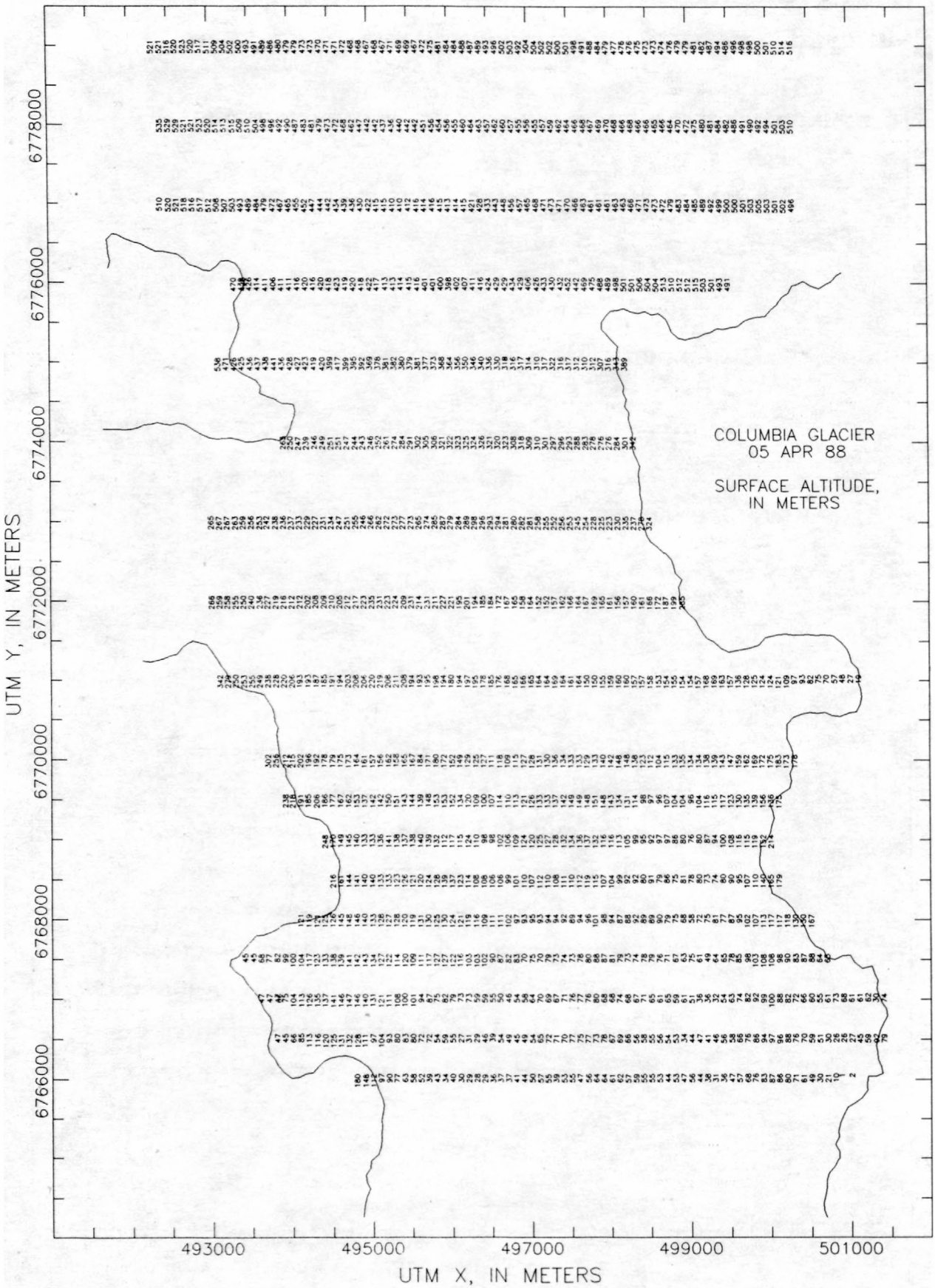
Appendix 1. Altitudes at Columbia Glacier grid points at multiples of 100 m UTM X spacing and multiples of 500 or 1000 m UTM Y spacing. The tens digit of each value is placed at the values position. The quality of photography on flights 72 and 73 was insufficient to allow measurement of the altitude grids in those dates.



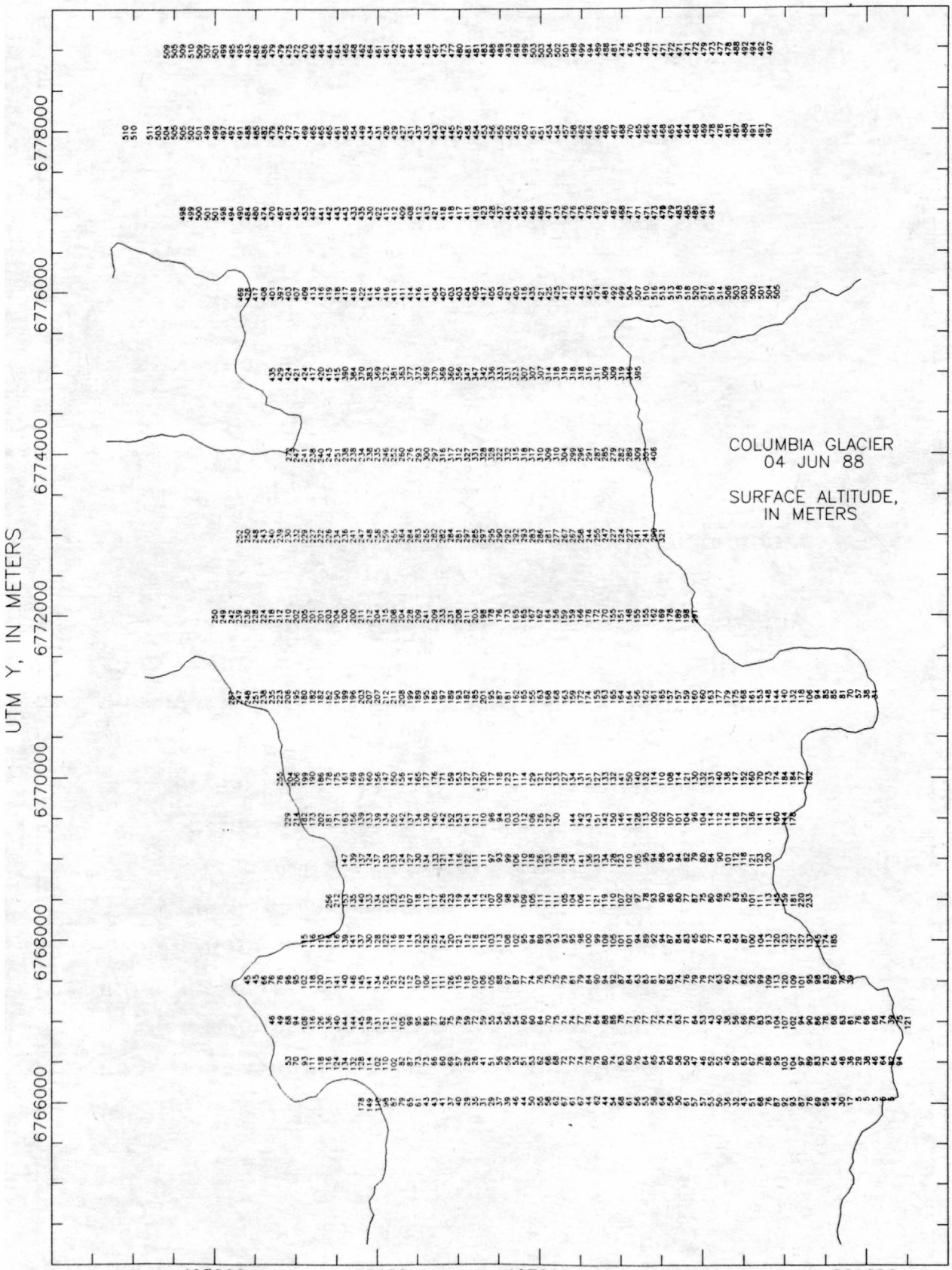
Appendix 1. Altitudes at Columbia Glacier grid points at multiples of 100 m UTM X spacing and multiples of 500 or 1000 m UTM Y spacing. The tens digit of each value is placed at the values position. The quality of photography on flights 72 and 73 was insufficient to allow measurement of the altitude grids in those dates.



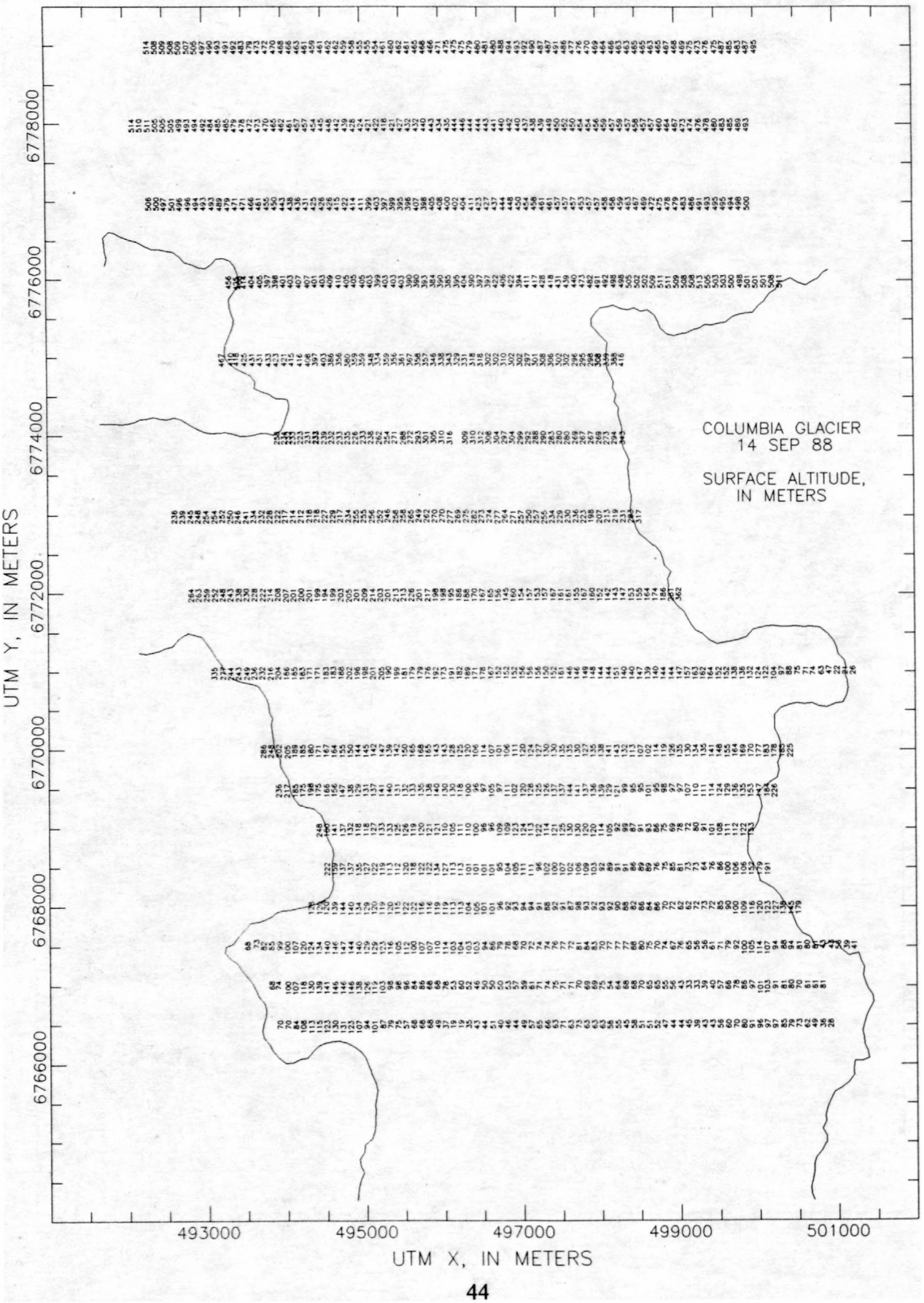
Appendix 1. Altitudes at Columbia Glacier grid points at multiples of 100 m UTM X spacing and multiples of 500 or 1000 m UTM Y spacing. The tens digit of each value is placed at the values position. The quality of photography on flights 72 and 73 was insufficient to allow measurement of the altitude grids in those dates.



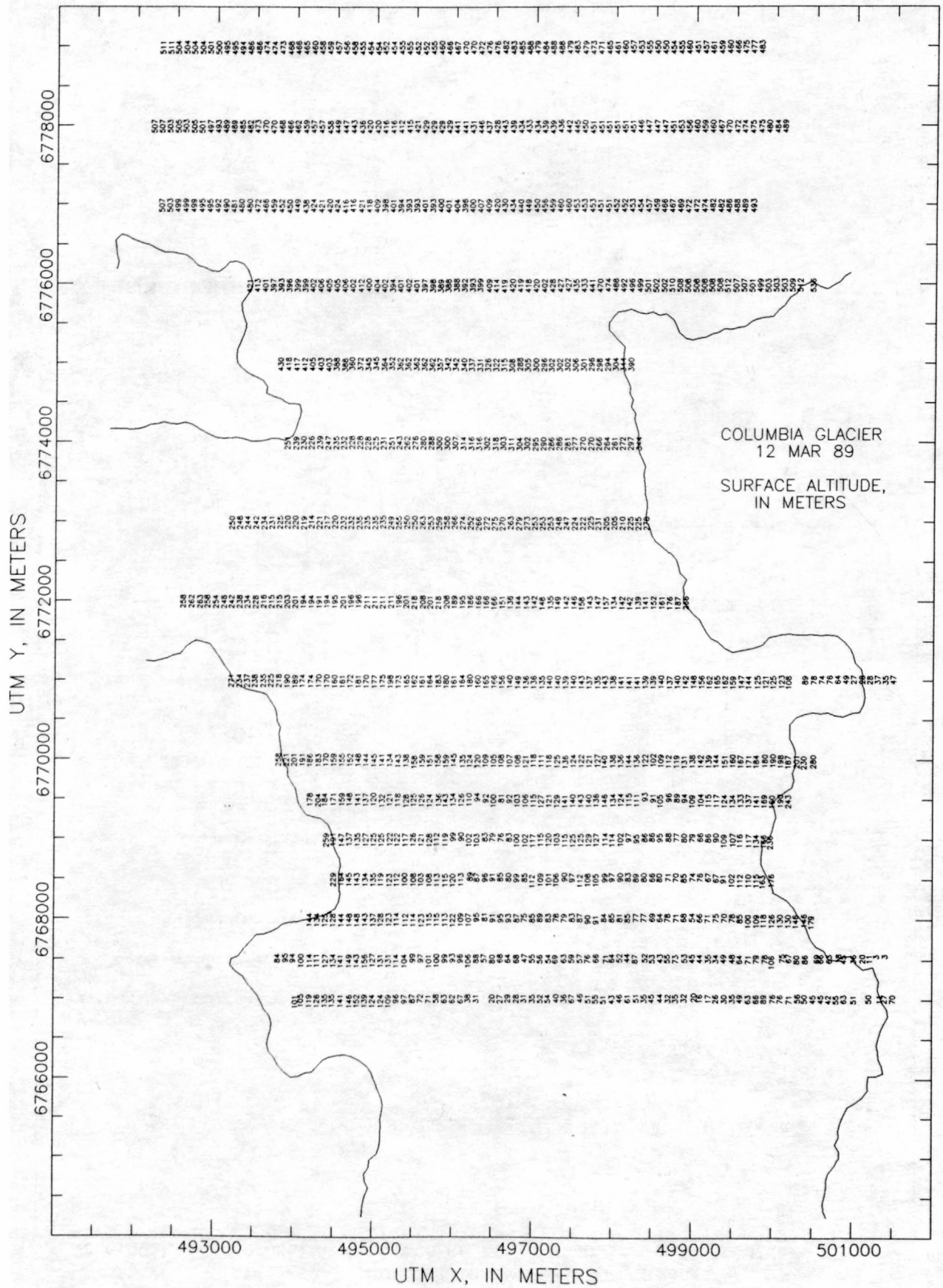
Appendix 1. Altitudes at Columbia Glacier grid points at multiples of 100 m UTM X spacing and multiples of 500 or 1000 m UTM Y spacing. The tens digit of each value is placed at the values position. The quality of photography on flights 72 and 73 was insufficient to allow measurement of the altitude grids in those dates.



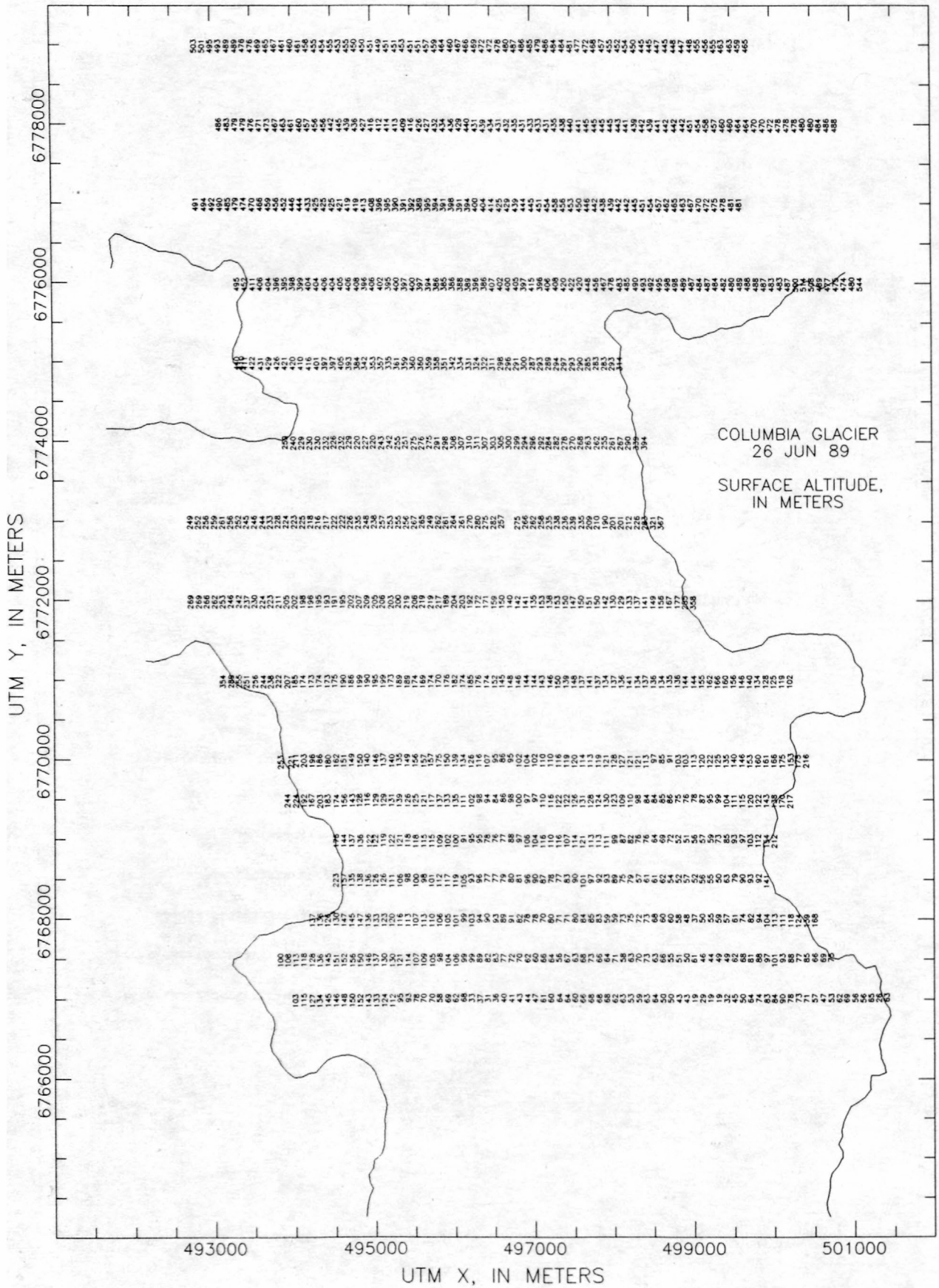
Appendix 1. Altitudes at Columbia Glacier grid points at multiples of 100 m UTM X spacing and multiples of 500 or 1000 m UTM Y spacing. The tens digit of each value is placed at the values position. The quality of photography on flights 72 and 73 was insufficient to allow measurement of the altitude grids in those dates.



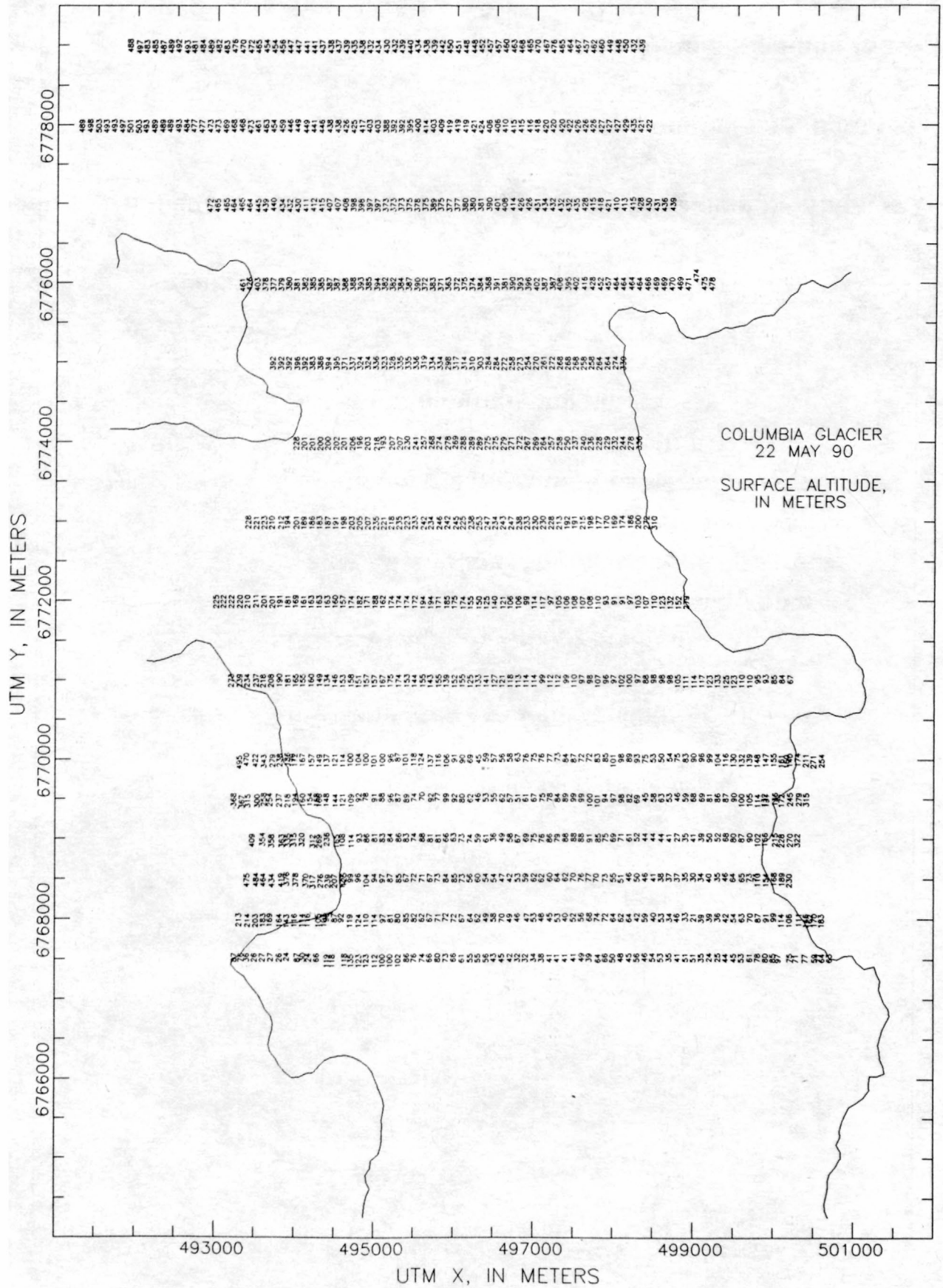
Appendix 1. Altitudes at Columbia Glacier grid points at multiples of 100 m UTM X spacing and multiples of 500 or 1000 m UTM Y spacing. The tens digit of each value is placed at the values position. The quality of photography on flights 72 and 73 was insufficient to allow measurement of the altitude grids in those dates.



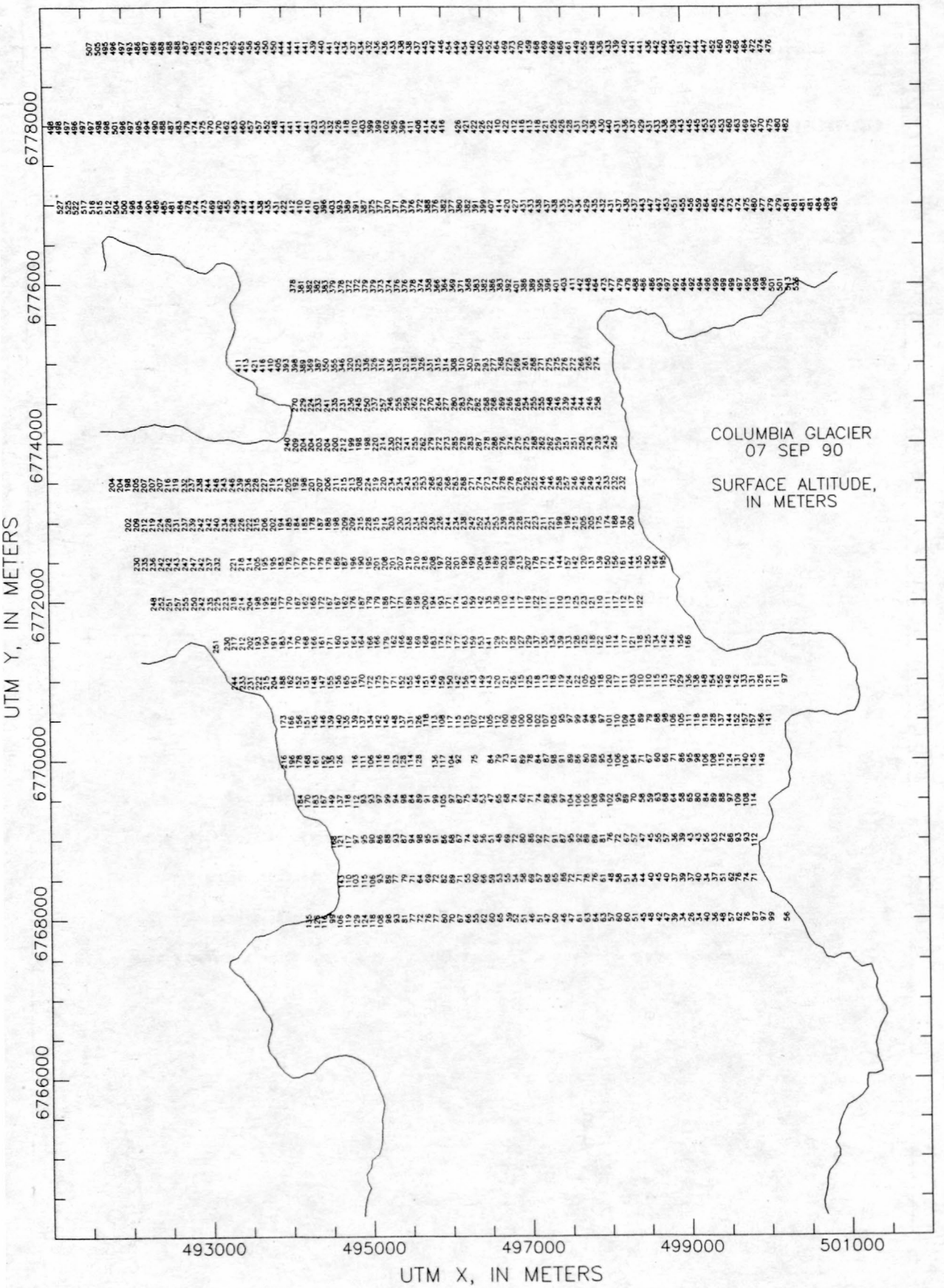
Appendix 1. Altitudes at Columbia Glacier grid points at multiples of 100 m UTM X spacing and multiples of 500 or 1000 m UTM Y spacing. The tens digit of each value is placed at the values position. The quality of photography on flights 72 and 73 was insufficient to allow measurement of the altitude grids in those dates.



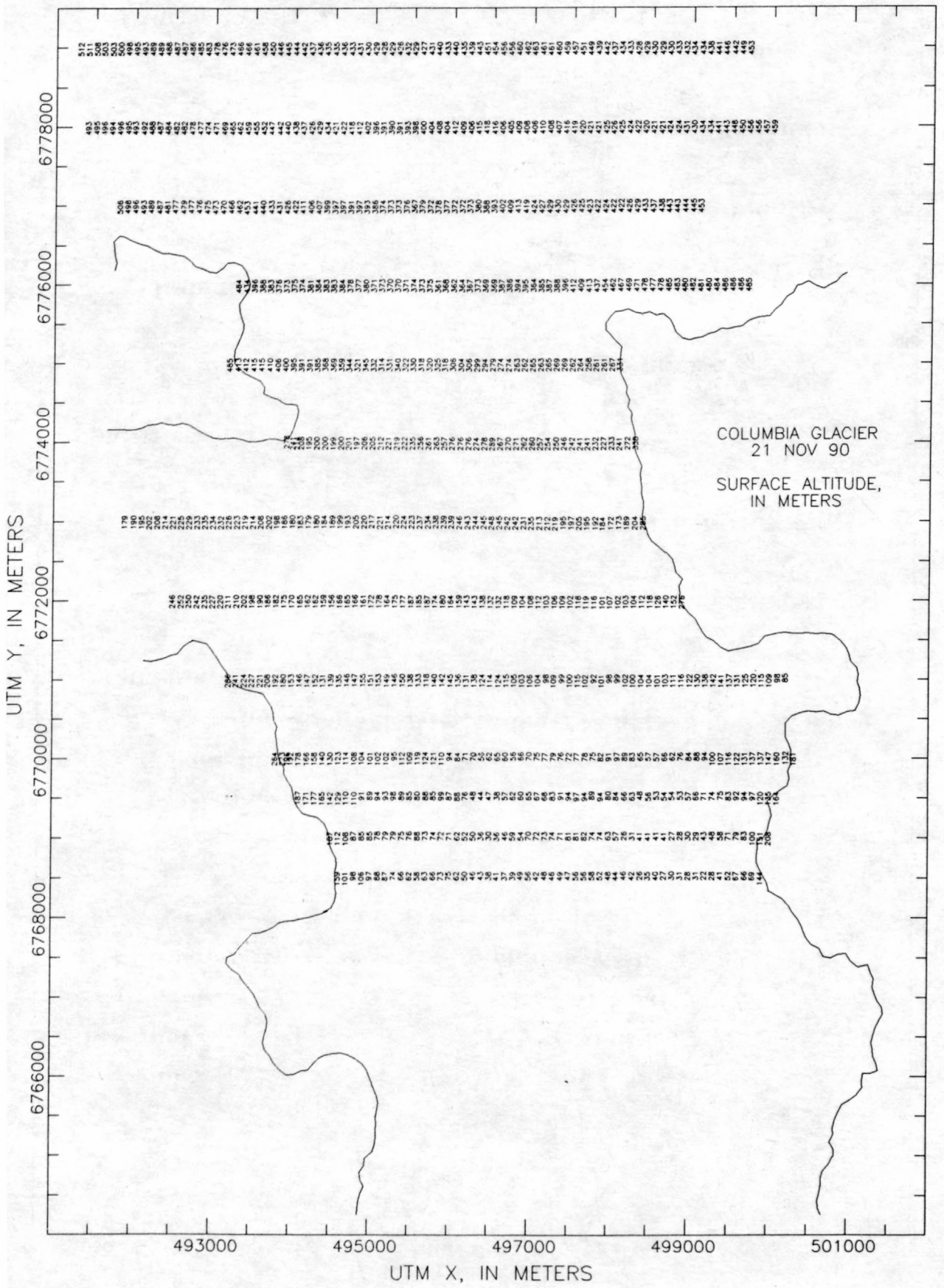
Appendix 1. Altitudes at Columbia Glacier grid points at multiples of 100 m UTM X spacing and multiples of 500 or 1000 m UTM Y spacing. The tens digit of each value is placed at the values position. The quality of photography on flights 72 and 73 was insufficient to allow measurement of the altitude grids in those dates.



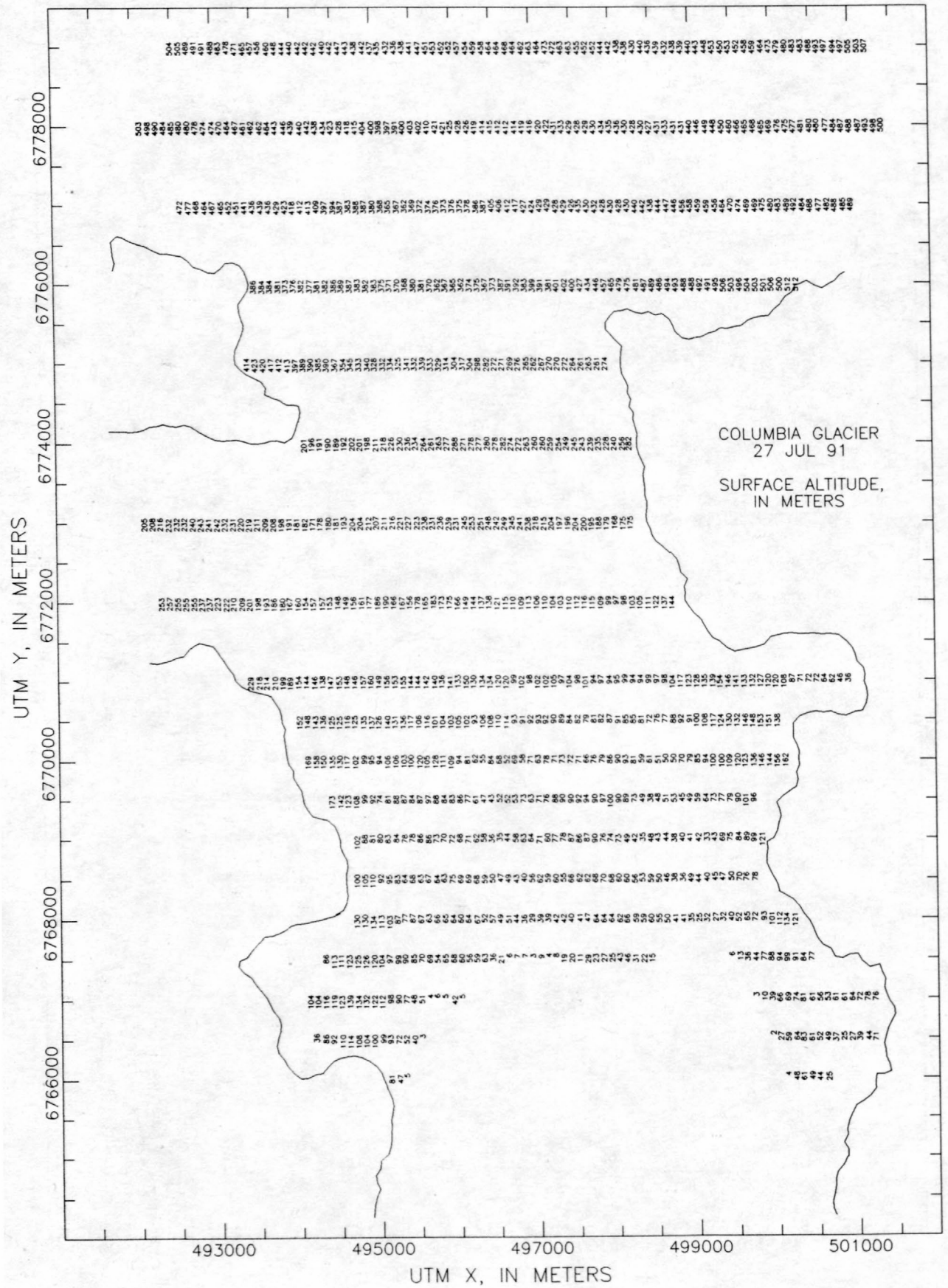
Appendix 1. Altitudes at Columbia Glacier grid points at multiples of 100 m UTM X spacing and multiples of 500 or 1000 m UTM Y spacing. The tens digit of each value is placed at the values position. The quality of photography on flights 72 and 73 was insufficient to allow measurement of the altitude grids in those dates.



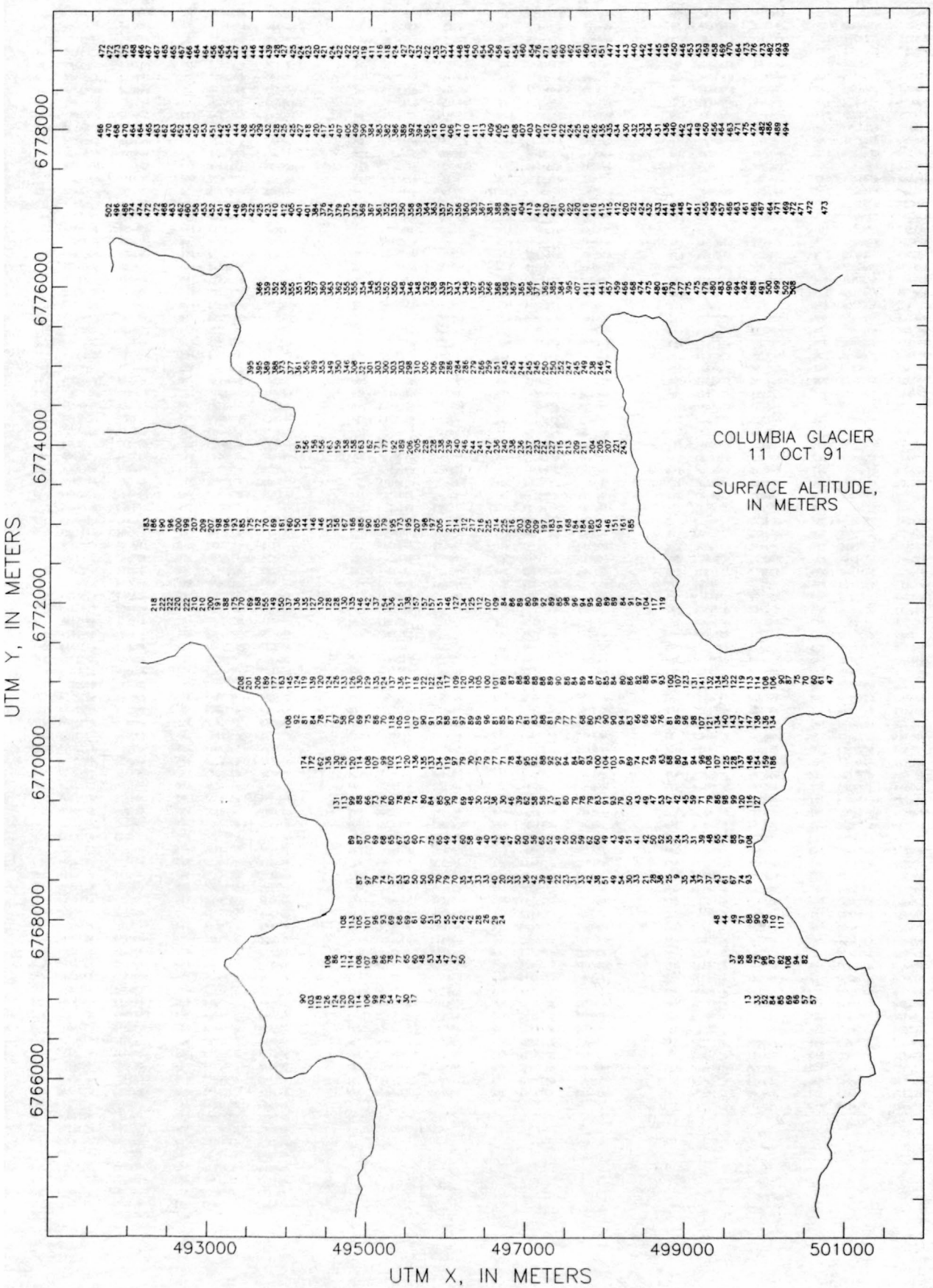
Appendix 1. Altitudes at Columbia Glacier grid points at multiples of 100 m UTM X spacing and multiples of 500 or 1000 m UTM Y spacing. The tens digit of each value is placed at the values position. The quality of photography on flights 72 and 73 was insufficient to allow measurement of the altitude grids in those dates.



Appendix 1. Altitudes at Columbia Glacier grid points at multiples of 100 m UTM X spacing and multiples of 500 or 1000 m UTM Y spacing. The tens digit of each value is placed at the values position. The quality of photography on flights 72 and 73 was insufficient to allow measurement of the altitude grids in those dates.



Appendix 1. Altitudes at Columbia Glacier grid points at multiples of 100 m UTM X spacing and multiples of 500 or 1000 m UTM Y spacing. The tens digit of each value is placed at the values position. The quality of photography on flights 72 and 73 was insufficient to allow measurement of the altitude grids in those dates.



Appendix 2. Location of features used for Columbia Glacier velocity measurements

[The location of each feature is measured on the two indicated dates, shown side by side]

VELOCITY POINT LOCATIONS

15OCT82			21JAN83		
X	Y	Z	X	Y	Z
496982	6764055	113	496953	6763148	69
497477	6764068	99	497398	6763138	59
497521	6764271	111	497486	6763387	74
498307	6764202	102	498163	6763522	57
496730	6764423	124	496680	6763648	80
497514	6764576	108	497451	6763766	88
498284	6764564	123	498155	6763879	71
496803	6764848	130	496746	6764132	101
497539	6764979	118	497462	6764264	98
498308	6764992	134	498198	6764354	115
496866	6765271	136	496799	6764630	110
497574	6765384	136	497490	6764740	109
498282	6765414	147	498181	6764827	120
496869	6765661	147	496800	6765098	123
497564	6765829	157	497484	6765242	124
498257	6765923	157	498173	6765359	126
496874	6766106	151	496823	6765616	137
497569	6766320	164	497512	6765772	139
498239	6766411	173	498184	6765889	151
496848	6766602	158	496823	6766153	144
497509	6766805	187	497483	6766320	160
498157	6766891	194	498148	6766418	163
496786	6767103	155	496792	6766708	149
497419	6767308	174	497430	6766867	172
498101	6767464	183	498119	6767020	177
496686	6767640	198	496733	6767261	179
497318	6767862	186	497367	6767456	182
497968	6768043	198	498015	6767624	190
496585	6768167	211	496666	6767823	205
497229	6768425	208	497306	6768049	198
497910	6768652	212	497983	6768275	204
496511	6768737	215	496605	6768432	215
497112	6769010	226	497209	6768668	214
497766	6769223	237	497862	6768875	217
496330	6769342	225	496425	6769053	213
496971	6769618	229	497069	6769313	230
497649	6769819	247	497738	6769505	242
496203	6769880	239	496317	6769600	225
496871	6770200	236	496972	6769917	233
497475	6770414	247	497567	6770141	241
496032	6770506	263	496158	6770225	243
496722	6770773	258	496833	6770486	243
497339	6771011	261	497432	6770758	258
495910	6771162	299	496022	6770882	284
496520	6771423	274	496632	6771144	270
497127	6771659	275	497215	6771427	277
495780	6771725	317	495876	6771443	305
496357	6771974	287	496460	6771706	272
497011	6772215	277	497075	6771986	263
495687	6772290	326	495751	6772008	309
496270	6772514	323	496331	6772232	298
496862	6772756	340	496907	6772494	314
495656	6772818	342	495680	6772530	337
496246	6773010	355	496266	6772722	355
496796	6773219	368	496820	6772967	362
495653	6773294	361	495624	6773027	348
496226	6773490	382	496210	6773218	374
496745	6773693	378	496751	6773438	387
495615	6773742	378	495562	6773494	365
496177	6773974	391	496152	6773705	381
496694	6774123	380	496706	6773876	385
495564	6774203	373	495543	6773968	370
496125	6774428	391	496115	6774158	392
496657	6774581	391	496657	6774324	392
495520	6774679	405	495512	6774428	383
496072	6774937	412	496099	6774662	388
496553	6775048	398	496595	6774795	394
495423	6775193	441	495456	6774930	423
495997	6775450	437	496047	6775166	421
496517	6775604	435	496567	6775348	408
495393	6775632	462	495442	6775385	446
495967	6775889	451	496006	6775619	440
496531	6776086	476	496528	6775836	456
495356	6776140	469	495377	6775928	463
496005	6776415	465	495992	6776188	454
496819	6776497	506	496749	6776321	495
497330	6776798	516	497241	6776704	518
495203	6776999	467	495197	6776844	456
494850	6777431	475	494865	6777334	469
494591	6777894	495	494615	6777828	489
494060	6778291	526	494087	6778263	514
496057	6777468	483	495988	6777327	472
496426	6777997	512	496352	6777872	495
496973	6778484	522	496898	6778369	517
497550	6779032	536	497470	6778924	537
498373	6779419	534	498295	6779326	541
499095	6778284	514	499016	6778247	527

VELOCITY POINT LOCATIONS

21JAN83			07MAR83		
X	Y	Z	X	Y	Z
496738	6763333	81	496756	6762903	82
497315	6763471	76	497327	6763035	71
498003	6763584	70	498035	6763188	67
496779	6763746	89	496778	6763365	78
497396	6763838	89	497397	6763431	79
498046	6763973	85	498037	6763596	55
496820	6764145	104	496801	6763778	94
497462	6764262	98	497439	6763885	94
498112	6764383	113	498074	6764019	90
496889	6764607	121	496861	6764261	118
497500	6764746	107	497464	6764399	104
498134	6764906	113	498083	6764577	123
496895	6765132	131	496857	6764817	131
497500	6765271	120	497459	6764956	117
498152	6765465	132	498107	6765159	127
496888	6765649	134	496854	6765366	136
497495	6765809	139	497456	6765512	131
498169	6765975	156	498129	6765675	149
496855	6766149	143	496829	6765891	141
497461	6766345	157	497431	6766062	153
498144	6766516	170	498124	6766235	166
496798	6766807	151	496793	6766567	147
497418	6767003	174	497413	6766742	174
498125	6767174	182	498126	6766908	181
496764	6767379	172	496777	6767149	162
497367	6767615	180	497384	6767370	175
498044	6767778	193	498059	6767521	187
496639	6767995	206	496683	6767784	202
497260	6768241	200	497304	6768009	191
497897	6768507	205	497942	6768274	205
496518	6768617	219	496575	6768422	218
497129	6768848	224	497187	6768632	210
497743	6769129	236	497803	6768910	224
496380	6769174	215	496441	6768984	205
496989	6769462	227	497049	6769261	228
497596	6769728	245	497656	6769526	245
496237	6769751	232	496308	6769568	217
496815	6770063	221	496878	6769875	220
497400	6770334	242	497463	6770152	236
496107	6770333	249	496192	6770150	243
496660	6770665	246	496730	6770474	235
497230	6770956	259	497292	6770781	261
495950	6770932	280	496022	6770746	273
496510	6771250	269	496581	6771059	270
497094	6771503	268	497154	6771341	272
495827	6771522	307	495897	6771338	304
496371	6771828	274	496439	6771651	275
496983	6772070	264	497024	6771917	263
495687	6772128	311	495729	6771941	308
496244	6772388	311	496288	6772206	292
496850	6772601	326	496881	6772425	313
495583	6772695	333	495600	6772498	339
496183	6772883	348	496201	6772684	338
496774	6773075	362	496790	6772902	363
495528	6773222	349	495509	6773040	349
496160	6773407	376	496150	6773214	378
496833	6773519	379	496848	6773345	384
495512	6773740	372	495485	6773565	383
496125	6773907	388	496105	6773723	387
496793	6774036	381	496800	6773876	385
495492	6774226	362	495468	6774056	364
496086	6774450	387	496079	6774263	395
496717	6774576	386	496740	6774410	399
495448	6774759	404	495452	6774584	398
496040	6774955	409	496065	6774765	399
496663	6775126	391	496692	6774962	386
495375	6775286	440	495402	6775110	442
495990	6775464	432	496028	6775266	437
496588	6775585	432	496622	6775414	412
495283	6775799	458	495311	6775645	461
495915	6775995	446	495934	6775821	451
496733	6776122	478	496718	6775968	478
497131	6776486	514	497083	6776393	514
495297	6776302	463	495310	6776164	468
495823	6776582	465	495815	6776440	473
494936	6776913	470	494948	6776825	478
495909	6777222	470	495873	6777107	472
494732	6777441	476	494745	6777374	479
494385	6777943	501	494405	6777903	505
493937	6778392	522	493951	6778375	527
496190	6777813	498	496145	6777716	493
496631	6778305	517	496587	6778220	520
497195	6778721	536	497151	6778642	537
497850	6779156	546	497811	6779085	542
498507	6779468	555	498460	6779405	547
499166	6779701	580	499122	6779652	558

VELOCITY POINT LOCATIONS

07MAR83			07APR83		
X	Y	Z	X	Y	Z
496661	6763178	84	496678	6762928	94
497364	6763279	70	497394	6762989	66
498000	6763442	66	498030	6763172	69
496763	6763475	86	496778	6763227	88
497375	6763652	89	497384	6763385	86
497995	6763698	70	498012	6763440	58
496833	6763958	107	496828	6763717	96
497434	6764076	98	497427	6763830	94
498042	6764202	104	498028	6763951	90
496859	6764358	117	496844	6764127	111
497442	6764522	99	497425	6764293	112
498040	6764653	120	498012	6764427	117
496894	6764891	130	496873	6764678	123
497478	6765027	108	497459	6764815	112
498085	6765183	126	498058	6764974	117
496926	6765401	136	496909	6765204	139
497494	6765604	134	497474	6765399	126
498080	6765758	162	498058	6765553	139
496920	6765956	141	496908	6765776	135
497485	6766153	154	497471	6765957	153
498053	6766348	176	498038	6766148	167
496873	6766521	147	496873	6766350	151
497460	6766725	170	497453	6766541	172
498005	6766935	178	498010	6766745	177
496829	6767058	160	496840	6766895	160
497412	6767291	174	497426	6767116	173
497971	6767538	190	497987	6767354	180
496756	6767575	186	496784	6767418	180
497344	6767847	185	497371	6767676	182
497909	6768099	199	497936	6767924	196
496656	6768097	209	496690	6767947	208
497243	6768387	210	497281	6768222	197
497821	6768667	215	497855	6768497	203
496544	6768645	216	496585	6768502	214
497115	6768931	228	497157	6768774	222
497666	6769213	239	497704	6769048	239
496458	6769201	223	496499	6769061	208
497005	6769546	220	497045	6769396	223
497543	6769817	242	497583	6769673	249
496244	6769779	224	496303	6769638	221
496799	6770107	222	496843	6769966	229
497322	6770431	242	497364	6770287	240
496035	6770371	250	496099	6770228	241
496614	6770696	253	496667	6770554	243
497162	6771006	264	497211	6770869	254
495887	6770898	284	495940	6770757	263
496451	6771278	281	496507	6771135	277
496959	6771555	267	497005	6771420	272
495773	6771437	306	495821	6771289	305
496329	6771758	285	496384	6771611	282
496827	6771993	267	496865	6771857	263
495720	6771943	319	495750	6771793	319
496227	6772215	296	496265	6772073	287
496724	6772449	317	496755	6772305	293
495628	6772363	331	495651	6772216	323
496149	6772600	327	496171	6772454	316
496665	6772844	351	496672	6772700	335
495575	6772802	340	495580	6772656	342
496117	6773049	365	496116	6772897	347
496626	6773230	375	496627	6773092	364
495566	6773246	361	495550	6773109	351
496096	6773468	379	496080	6773326	372
496554	6773664	387	496573	6773503	386
495569	6773672	373	495543	6773538	373
496079	6773927	393	496062	6773782	385
496573	6774090	390	496564	6773953	386
495575	6774198	373	495558	6774065	367
496111	6774439	389	496070	6774284	391
496573	6774570	387	496577	6774428	389
495585	6774671	396	495581	6774530	386
496069	6774861	406	496075	6774711	395
496548	6775037	402	496565	6774890	389
495581	6775066	440	495594	6774916	424
496036	6775265	433	496057	6775110	423
496519	6775435	428	496538	6775287	409
495515	6775438	462	495534	6775290	457
495976	6775650	448	495996	6775497	440
496492	6775802	458	496501	6775657	443
495494	6775818	459	495511	6775688	450
495966	6776014	464	495997	6775854	452
496536	6776140	487	496510	6776003	479
495410	6776287	467	495413	6776168	442
496775	6776549	503	496734	6776453	461
495276	6776715	474	495269	6776614	444
495786	6776918	469	495764	6776808	440
495446	6777352	485	495432	6777260	443
495982	6777370	481	495952	6777276	447
496351	6777886	498	496313	6777800	470
496738	6778373	528	496697	6778298	495
497239	6778792	544	497201	6778725	502
497869	6779185	541	497832	6779119	505
498436	6779476	548	498396	6779416	510
494675	6777565	482	494681	6777509	478
494370	6778097	517	494375	6778057	502
493942	6778451	532	493951	6778427	511

Appendix 2. Location of features used for Columbia Glacier velocity measurements

[The location of each feature is measured on the two indicated dates, shown side by side]

VELOCITY POINT LOCATIONS

07APR83			17JUN83		
X	Y	Z	X	Y	Z
496650	6763662	89	496765	6763139	103
497206	6763768	98	497241	6763227	77
497640	6763775	96	497693	6763215	71
498006	6763841	84	498053	6763307	56
497796	6764000	93	497825	6763458	71
496723	6764106	108	496705	6763630	101
497270	6764211	101	497259	6763703	100
497824	6764300	114	497827	6763772	82
496777	6764579	124	496744	6764112	111
497300	6764651	111	497271	6764173	102
497855	6764703	139	497823	6764234	106
496822	6765036	124	496785	6764599	125
497371	6765124	113	497330	6764680	120
497891	6765207	136	497841	6764767	133
496935	6765526	138	496894	6765115	133
497468	6765662	130	497427	6765239	122
498012	6765728	156	497969	6765308	128
496905	6766013	147	496860	6765642	148
497469	6766175	163	497421	6765771	156
498042	6766318	169	498002	6765900	166
496884	6766522	154	496853	6766168	156
497474	6766710	162	497453	6766330	167
498002	6766839	182	497998	6766453	179
496848	6767019	150	496839	6766689	158
497452	6767269	175	497461	6766906	177
497978	6767431	172	497993	6767067	187
496801	6767629	188	496832	6767298	181
497383	6767859	188	497431	6767506	185
497934	6768070	193	497983	6767709	194
496755	6768225	210	496823	6767901	208
497274	6768447	213	497349	6768107	206
497818	6768710	221	497902	6768363	210
496635	6768687	202	496718	6768379	211
497138	6768980	235	497231	6768656	221
497657	6769271	243	497758	6768942	225
496468	6769264	212	496554	6768978	213
496993	6769553	224	497086	6769248	236
497501	6769823	243	497589	6769523	248
496322	6769837	225	496424	6769561	222
496842	6770096	227	496943	6769809	219
497325	6770394	236	497422	6770114	237
496125	6770379	252	496258	6770096	231
496657	6770665	250	496767	6770374	234
497111	6770983	273	497219	6770705	254
495926	6770906	285	496047	6770612	263
496430	6771227	278	496550	6770930	267
496922	6771537	275	497026	6771273	268
495739	6771541	305	495853	6771236	293
496249	6771818	286	496369	6771527	288
496796	6772085	267	496871	6771832	267
495622	6772154	303	495695	6771846	313
496149	6772422	311	496223	6772123	297
496657	6772697	343	496714	6772395	297
495538	6772730	331	495559	6772406	333
496100	6773041	364	496119	6772709	349
496615	6773192	384	496644	6772889	363
495562	6773305	355	495529	6773011	351
496108	6773525	377	496092	6773211	373
496606	6773685	388	496617	6773392	386
495605	6773818	378	495545	6773501	363
496125	6773979	390	496099	6773670	386
496570	6774134	386	496576	6773846	392
495624	6774293	380	495585	6774010	370
496132	6774443	384	496109	6774136	389
496562	6774562	383	496598	6774268	376
495594	6774803	411	495600	6774505	378
496085	6774915	408	496125	6774601	387
496533	6775046	393	496590	6774753	382
495524	6775298	439	495573	6774977	431
496011	6775426	439	496079	6775101	414
496526	6775521	429	496594	6775230	394
495538	6775774	428	495582	6775462	450
496006	6775868	412	496052	6775561	435
496547	6775936	430	496579	6775643	434
496716	6776469	460	496632	6776248	480
494704	6776920	474	494717	6776804	472
494494	6777589	491	494516	6777503	484
494096	6778023	516	494140	6777995	508
496011	6777625	462	495928	6777462	475
496497	6778079	484	496401	6777933	496
496994	6778549	495	496899	6778415	516
497434	6778857	506	497339	6778730	530
498033	6779142	503	497942	6779028	528
498680	6779463	510	498578	6779364	531

VELOCITY POINT LOCATIONS

17JUN83			19AUG83		
X	Y	Z	X	Y	Z
496611	6763294	102	496620	6762883	76
497366	6763545	86	497407	6763060	87
497979	6763816	85	498015	6763378	57
496688	6763584	98	496708	6763206	73
497381	6763872	99	497421	6763402	83
496700	6763853	100	496695	6763473	81
496744	6764235	115	496732	6763858	98
497363	6764230	110	497355	6763824	93
498003	6764215	109	498000	6763793	84
496768	6764641	136	496749	6764275	122
497402	6764652	119	497384	6764278	101
497967	6764651	127	497942	6764295	101
496832	6764973	142	496814	6764637	119
497408	6765078	121	497386	6764740	101
497967	6765127	136	497936	6764794	117
496878	6765452	147	496848	6765146	123
497429	6765540	140	497403	6765213	115
497986	6765581	158	497959	6765256	121
496879	6765866	149	496857	6765587	137
497421	6765969	162	497391	6765665	134
498015	6766063	163	497984	6765750	151
496848	6766263	152	496835	6765998	137
497430	6766443	174	497413	6766155	150
498025	6766561	183	498021	6766271	156
496858	6766748	158	496857	6766502	154
497414	6766959	177	497417	6766695	166
497982	6767177	182	497999	6766905	174
496818	6767315	177	496840	6767084	159
497372	6767531	188	497395	6767282	171
497927	6767735	200	497957	6767477	187
496786	6767854	198	496829	6767623	197
497324	6768072	201	497368	6767830	187
497875	6768268	215	497913	6768022	198
496692	6768343	217	496756	6768130	212
497262	6768565	216	497323	6768334	203
497793	6768800	210	497855	6768558	203
496576	6768864	214	496644	6768659	206
497124	6769070	239	497195	6768850	220
497649	6769307	242	497723	6769078	233
496465	6769350	233	496539	6769147	210
496998	6769625	227	497071	6769410	229
497478	6769921	241	497557	6769710	235
496336	6769899	230	496423	6769692	218
496846	6770169	228	496927	6769961	220
497314	6770523	211	497388	6770340	232
496170	6770497	250	496277	6770291	236
496659	6770793	263	496753	6770577	242
497128	6771126	262	497224	6770936	252
495950	6771110	297	496045	6770889	280
496482	6771416	283	496579	6771196	266
496948	6771732	272	497029	6771538	263
495822	6771735	323	495905	6771523	293
496323	6772010	288	496410	6771809	254
496834	6772280	290	496898	6772081	258
495654	6772238	326	495707	6772005	313
496237	6772484	315	496290	6772263	298
496700	6772770	347	496740	6772551	326
495559	6772812	351	495572	6772572	336
496149	6772977	359	496171	6772736	340
496686	6773179	369	496709	6772960	357
495547	6773244	360	495520	6773008	341
496125	6773417	379	496111	6773180	365
496596	6773599	384	496602	6773372	375
495522	6773682	362	495478	6773458	361
496100	6773880	388	496074	6773644	375
496574	6774046	385	496578	6773825	388
495517	6774140	366	495478	6773927	360
496045	6774296	388	496025	6774062	387
496537	6774498	376	496557	6774272	379
495503	6774597	393	495489	6774372	362
495998	6774737	397	496005	6774498	378
496482	6774937	389	496514	6774705	373
495466	6775018	436	495481	6774782	398
495957	6775193	422	496006	6774941	405
496400	6775389	415	496449	6775147	389
495412	6775489	455	495442	6775248	437
495908	6775653	447	495956	6775406	432
496330	6775835	457	496360	6775593	442
495351	6775953	468	495383	6775756	462
495859	6776143	457	495874	6775923	445
496418	6776265	477	496403	6776047	471
495947	6776658	462	495906	6776474	453
496680	6776705	507	496614	6776560	493
496269	6777311	467	496194	6777178	459
497124	6777079	513	497039	6776978	501
497639	6777325	510	497559	6777256	517
498629	6778134	519	498572	6778086	505
494568	6777274	476	494591	6777199	472
494340	6777671	491	494361	6777610	483
494013	6778094	512	494040	6778063	503
496568	6777928	495	496502	6777812	481
497038	6778524	528	496977	6778410	512
497310	6779151	554	497258	6779049	533
497962	6779708	555	497905	6779615	545
498590	6779501	549	498527	6779416	532

VELOCITY POINT LOCATIONS

19AUG83			16SEP83		
X	Y	Z	X	Y	Z
496771	6763467	85	496785	6763238	82
497377	6763607	74	497358	6763363	67
497913	6763639	62	497926	6763428	68
496821	6763810	103	496810	6763616	88
497381	6763905	88	497378	6763697	87
497913	6763978	87	497912	6763771	69
496838	6764125	107	496829	6763939	102
497392	6764229	91	497384	6764040	93
497914	6764312	105	497894	6764123	102
496849	6764456	113	496836	6764285	107
497413	6764542	102	497402	6764367	102
497935	6764662	113	497916	6764497	118
496867	6764805	122	496853	6764651	111
497427	6764928	111	497410	6764778	100
497952	6765036	126	497930	6764890	129
496890	6765244	133	496870	6765109	132
497419	6765393	125	497399	6765255	114
497960	6765549	145	497933	6765412	148
496922	6765798	136	496906	6765679	133
497473	6765971	148	497450	6765844	146
498027	6766110	166	498008	6765985	155
496945	6766385	146	496935	6766275	150
497501	6766561	157	497488	6766443	161
498040	6766695	172	498030	6766580	171
496940	6766945	155	496937	6766849	156
497486	6767152	172	497479	6767047	169
498037	6767338	176	498035	6767234	179
496898	6767548	177	496902	6767452	179
497437	6767763	187	497444	6767669	181
497980	6768010	180	497991	6767912	182
496758	6768060	199	496777	6767983	203
497320	6768352	209	497340	6768260	195
497875	6768611	200	497891	6768522	206
496617	6768700	211	496638	6768620	203
497157	6768988	224	497180	6768901	217
497708	6769310	243	497731	6769224	234
496489	6769307	206	496511	6769232	207
497013	6769582	223	497037	6769506	223
497504	6769897	230	497527	6769823	243
496303	6769888	220	496334	6769814	216
496842	6770177	220	496866	6770102	219
497347	6770506	240	497365	6770433	240
496111	6770442	253	496149	6770363	242
496659	6770771	264	496691	6770690	249
497108	6771105	264	497140	6771032	255
495930	6771036	289	495961	6770952	282
496442	6771324	277	496475	6771243	273
496937	6771638	264	496963	6771565	264
495758	6771634	301	495781	6771551	311
496279	6771911	279	496307	6771830	276
496769	6772200	277	496790	6772127	259
495623	6772267	320	495641	6772184	313
496173	6772529	321	496187	6772450	316
496671	6772751	349	496681	6772670	325
495564	6772823	343	495567	6772736	337
496086	6773016	368	496087	6772930	348
496586	6773202	368	496573	6773107	371
495544	6773289	363	495531	6773207	352
496070	6773495	378	496063	6773408	367
496566	6773692	393	496564	6773612	382
495526	6773759	376	495505	6773680	366
496060	6773969	386	496049	6773884	378
496541	6774155	387	496547	6774070	381
495531	6774228	372	495517	6774147	364
496033	6774413	385	496029	6774329	382
496481	6774622	383	496491	6774537	377
495476	6774685	401	495469	6774596	393
495990	6774886	413	496000	6774796	402
496456	6775108	399	496470	6775022	389
495453	6775168	434	495460	6775077	429
495945	6775344	448	495955	6775255	434
496415	6775566	445	496430	6775492	412
495383	6775625	450	495399	6775544	437
495871	6775781	446	495878	6775696	439
496412	6776035	466	496411	6775953	454
495275	6776112	458	495282	6776048	460
495836	6776244	457	495838	6776169	457
496630	6776549	490	496607	6776491	483
495157	6776617	461	495158	6776564	459
495853	6776721	463	495841	6776657	463
497093	6776957	506	497062	6776921	507
497774	6777357	509	497751	6777334	505
498540	6777750	520	498535	6777720	505
494948	6777182	460	494954	6777143	460
496038	6777270	472	496017	6777222	474
496452	6777813	487	496431	6777771	486
496914	6778340	498	496894	6778299	504
497479	6778854	525	497464	6778819	518
498117	6779315	528	498101	6779282	521
494627	6777711	473	494637	6777683	483
494150	6778245	504	494165	6778230	518
493652	6778602	514	493660	6778590	525
493001	6778958	535	493014	6778948	550

Appendix 2. Location of features used for Columbia Glacier velocity measurements

[The location of each feature is measured on the two indicated dates, shown side by side]

VELOCITY POINT LOCATIONS

16SEP83			06NOV83		
X	Y	Z	X	Y	Z
497862	6763825	81	497840	6763371	47
496802	6763913	102	496798	6763476	69
497347	6764041	87	497320	6763604	77
497851	6764128	102	497822	6763707	66
496835	6764296	106	496800	6763917	80
497346	6764454	94	497310	6764074	83
497840	6764585	105	497793	6764228	92
496881	6764847	115	496845	6764524	101
497352	6764939	115	497310	6764625	96
497842	6765052	117	497784	6764752	104
496878	6765304	126	496838	6765036	112
497377	6765473	129	497336	6765206	111
497899	6765645	142	497848	6765380	137
496935	6765941	138	496905	6765734	126
497425	6766109	143	497392	6765886	139
497959	6766263	143	497920	6766035	151
496958	6766552	153	496947	6766375	143
497452	6766739	165	497435	6766550	155
498012	6766929	172	498002	6766741	174
496903	6767232	175	496911	6767074	155
497425	6767398	181	497435	6767224	177
498015	6767574	192	498031	6767396	177
496867	6767824	203	496890	6767676	192
497364	6768033	201	497389	6767872	185
497924	6768221	206	497953	6768050	200
496775	6768425	218	496814	6768293	207
497255	6768673	217	497289	6768531	205
497811	6768911	228	497849	6768763	220
494965	6768536	222	494965	6768530	212
495250	6768588	219	495258	6768551	213
495534	6768636	224	495556	6768571	221
495821	6768703	224	495850	6768612	217
496103	6768766	222	496135	6768655	218
496398	6768817	212	496437	6768703	203
496686	6768861	216	496727	6768736	213
496956	6768898	226	496994	6768764	215
497181	6768949	225	497220	6768812	206
497447	6768990	233	497489	6768844	219
497730	6769038	238	497769	6768895	217
498033	6769089	218	498072	6768947	210
498335	6769134	215	498365	6769011	199
498640	6769176	200	498657	6769078	194
498913	6769241	199	498922	6769189	190
499221	6769299	206	499221	6769281	206
499489	6769355	212	499485	6769348	212
496652	6769011	217	496688	6768892	198
497100	6769342	235	497142	6769210	230
497626	6769656	246	497668	6769527	239
496445	6769687	226	496491	6769564	226
496905	6770033	222	496949	6769906	233
497426	6770329	237	497468	6770212	233
496205	6770384	246	496263	6770268	245
496654	6770700	253	496706	6770579	240
497184	6770983	255	497235	6770874	252
495979	6770989	283	496028	6770863	267
496445	6771325	273	496499	6771209	274
496978	6771626	268	497028	6771525	269
495749	6771677	311	495794	6771557	300
496223	6771984	283	496272	6771869	278
496764	6772222	278	496801	6772115	268
495513	6772444	321	495530	6772317	315
496091	6772710	341	496121	6772584	308
496637	6772959	352	496653	6772828	349
495490	6773140	358	495478	6773005	338
496055	6773385	363	496047	6773251	368
496592	6773635	382	496594	6773512	382
495470	6773775	367	495441	6773655	342
496038	6773990	381	496023	6773860	375
496536	6774202	381	496544	6774069	394
495503	6774320	360	495488	6774200	359
496002	6774553	381	495996	6774417	382
496472	6774768	381	496494	6774640	372
494084	6774840	461	494087	6774831	460
494355	6774881	438	494378	6774816	418
494596	6774906	418	494616	6774813	401
494857	6774884	383	494862	6774777	367
495153	6774871	413	495154	6774754	382
495428	6774912	411	495439	6774782	397
495683	6774936	415	495692	6774795	398
495944	6774935	404	495955	6774794	400
496209	6774941	388	496226	6774804	382
496480	6774900	379	496505	6774768	386
496769	6774956	371	496792	6774839	379
497013	6774968	375	497035	6774872	371
497263	6774954	373	497281	6774880	373
497532	6774989	367	497541	6774953	368
497789	6774985	365	497796	6774984	357
495955	6775136	411	495975	6774991	406
496410	6775357	406	496433	6775220	404
495453	6775491	444	495477	6775360	435
495889	6775702	433	495909	6775557	442
496328	6775907	445	496336	6775770	440
495289	6776085	457	495299	6775984	456
495811	6776246	450	495810	6776129	449
496525	6776455	485	496495	6776355	467
495142	6776656	459	495143	6776576	451

VELOCITY POINT LOCATIONS (continued)

16SEP83			06NOV83		
X	Y	Z	X	Y	Z
495799	6776806	457	495779	6776706	455
496995	6776913	505	496940	6776856	507
497636	6777272	505	497586	6777237	501
498314	6777710	511	498262	6777703	514
494970	6777148	462	494977	6777087	464
496017	6777331	471	495980	6777257	464
496453	6777829	486	496408	6777767	479
496951	6778296	508	496913	6778241	499
497428	6778839	527	497387	6778784	525
498021	6779354	532	497981	6779310	525
494667	6777727	484	494681	6777689	492
494226	6778157	513	494242	6778135	510
493719	6778561	523	493739	6778556	521
493044	6778846	543	493064	6778839	539
492288	6779120	561	492301	6779116	550

VELOCITY POINT LOCATIONS

06NOV83			08DEC83		
X	Y	Z	X	Y	Z
497089	6763894	84	497058	6763487	77
497693	6764063	94	497672	6763643	77
498355	6764144	85	498315	6763773	60
497090	6764423	96	497065	6764064	97
497722	6764560	120	497689	6764205	101
498375	6764650	126	498329	6764347	98
497107	6765000	107	497083	6764691	102
497702	6765122	132	497661	6764822	115
498361	6765211	129	498313	6764950	126
497111	6765562	133	497082	6765297	125
497665	6765724	141	497632	6765448	128
498273	6765828	156	498242	6765576	139
497631	6766325	158	497606	6766081	145
498225	6766524	168	498219	6766294	144
496951	6766707	150	496944	6766515	142
497580	6766941	176	497575	6766729	169
498200	6767149	176	498206	6766946	166
496907	6767340	168	496919	6767169	161
497498	6767596	178	497515	6767407	170
498083	6767852	190	498101	6767663	178
496825	6767971	198	496852	6767812	191
497388	6768215	199	497414	6768045	187
497949	6768468	210	497982	6768295	194
496703	6768571	207	496740	6768433	208
497235	6768841	216	497275	6768690	214
497769	6769100	228	497816	6768945	217
496531	6769152	221	496566	6769023	217
497096	6769424	225	497134	6769287	228
497636	6769733	241	497679	6769595	241
496336	6769737	218	496385	6769619	208
496910	6769987	226	496953	6769863	223
497485	6770267	227	497525	6770146	236
496188	6770323	243	496243	6770201	238
496740	6770543	243	496786	6770420	232
497294	6770825	251	497336	6770711	245
496039	6770874	275	496088	6770755	272
496570	6771121	267	496615	6771000	262
497120	6771358	258	497163	6771248	272
495848	6771471	300	495890	6771340	307
496411	6771742	265	496460	6771625	278
496984	6771951	278	497012	6771855	277
495806	6772111	320	495837	6771990	318
496327	6772355	310	496356	6772241	291
496905	6772587	320	496926	6772470	322
495707	6772770	352	495712	6772647	351
496259	6772968	353	496269	6772841	356
496818	6773144	359	496829	6773039	356
495686	6773343	354	495669	6773226	348
496233	6773552	377	496224	6773438	378
496785	6773673	382	496784	6773569	375
495650	6773859	359	495627	6773752	368
496207	6774082	380	496202	6773965	379
496753	6774212	372	496759	6774112	374
495620	6774407	371	495610	6774302	363
496187	6774597	376	496188	6774481	383
496725	6774741	362	496742	6774640	369
495603	6774905	417	495612	6774792	403
496112	6775110	407	496127	6774990	400
496688	6775252	383	496700	6775150	391
495511	6775447	437	495531	6775337	444
496053	6775650	432	496070	6775532	428
496597	6775823	454	496604	6775719	437
495420	6776025	465	495433	6775933	461
496012	6776203	456	496014	6776101	446
496636	6776352	486	496612	6776266	478
495285	6776532	461	495288	6776458	463
496020	6776686	454	496004	6776603	454
496895	6776811	497	496855	6776755	499
497330	6777182	514	497289	6777147	505
497857	6777525	503	497820	6777495	514
498492	6777930	509	498468	6777909	502
499267	6778343	510	499260	6778335	491
496069	6777222	472	496038	6777159	465
496257	6777766	490	496224	6777712	483
496578	6778258	509	496547	6778209	510
497090	6778790	523	497060	6778743	525
497657	6779255	536	497630	6779213	541
498283	6779630	535	498251	6779593	548
498922	6779904	552	498881	6779877	565
495091	6777090	455	495091	6777029	461
494824	6777628	481	494827	6777591	478
494308	6778155	509	494320	6778137	514
493716	6778598	521	493732	6778597	526
493044	6778924	547	493050	6778926	548

Appendix 2. Location of features used for Columbia Glacier velocity measurements

[The location of each feature is measured on the two indicated dates, shown side by side]

VELOCITY POINT LOCATIONS

08DEC83			20JAN84		
X	Y	Z	X	Y	Z
496988	6764001	97	496906	6763390	82
496928	6764331	102	496861	6763753	83
497620	6764154	95	497520	6763541	69
498290	6764216	103	498223	6763625	42
498346	6764836	115	498255	6764347	97
497642	6764827	113	497574	6764283	83
496924	6764821	109	496869	6764287	99
496909	6765456	127	496855	6765007	112
497629	6765511	128	497550	6765048	111
498290	6765517	126	498207	6765088	99
498226	6766142	144	498158	6765731	130
497591	6766188	155	497543	6765769	126
496931	6766116	148	496891	6765746	127
496831	6766795	138	496823	6766471	125
497515	6766842	162	497494	6766478	152
498163	6766862	163	498146	6766496	154
498048	6767661	187	498063	6767327	173
497425	6767554	173	497438	6767235	158
496745	6767430	181	496763	6767141	157
496617	6768037	201	496670	6767775	188
497290	6768183	196	497336	6767890	161
497927	6768244	196	497969	6767931	174
497777	6768913	215	497840	6768632	194
497162	6768830	210	497233	6768565	186
496528	6768681	203	496599	6768446	201
496380	6769279	218	496449	6769063	201
497001	6769458	221	497069	6769219	217
497610	6769573	236	497689	6769316	226
497454	6770210	232	497521	6769993	221
496812	6770125	220	496884	6769905	203
496097	6769899	238	496185	6769683	219
495915	6770534	260	496014	6770320	254
496603	6770742	249	496685	6770519	232
497284	6770850	246	497359	6770640	235
497096	6771475	269	497179	6771279	238
496454	6771379	279	496546	6771155	250
495761	6771297	292	495853	6771081	279
495710	6771897	302	495780	6771682	300
496342	6771980	272	496430	6771777	259
496986	6772045	246	497037	6771875	248
496894	6772632	328	496935	6772429	293
496283	6772543	322	496332	6772330	292
495607	6772507	319	495642	6772286	314
495589	6773046	347	495588	6772832	344
496264	6773061	353	496282	6772846	341
496840	6773109	361	496864	6772922	345
496806	6773610	373	496817	6773427	366
496219	6773580	374	496208	6773374	368
495629	6773540	365	495597	6773340	347
495590	6773998	365	495558	6773808	361
496216	6774061	383	496204	6773854	375
496800	6774082	374	496814	6773920	371
496754	6774537	375	496778	6774366	372
496177	6774494	390	496170	6774293	382
495593	6774455	375	495577	6774270	367
495495	6774868	408	495502	6774670	386
496121	6774909	396	496142	6774701	383
496680	6774960	372	496710	6774778	367
496610	6775387	410	496648	6775205	390
496044	6775344	426	496090	6775132	413
495429	6775301	439	495461	6775100	427
495378	6775712	458	495410	6775541	451
495987	6775773	441	496020	6775569	430
496587	6775821	456	496607	6775635	431
496556	6776227	479	496526	6776060	476
495953	6776211	455	495953	6776029	454
495323	6776133	458	495341	6775977	466
495225	6776601	457	495224	6776468	469
495939	6776629	462	495917	6776473	470
496646	6776665	500	496588	6776542	492
496846	6777183	484	496763	6777093	497
495931	6777160	465	495895	6777033	472
495193	6777152	458	495195	6777040	464
494937	6777710	470	494941	6777621	475
495903	6777677	478	495855	6777562	480
497432	6777651	503	497360	6777573	518
498075	6778030	516	498015	6777961	518
498687	6778344	501	498638	6778290	517
499368	6778601	508	499315	6778563	518
496063	6778206	500	496014	6778101	507
496501	6778645	518	496452	6778551	524
497001	6778964	531	496947	6778872	542
497584	6779324	546	497539	6779238	553
498242	6779718	552	498192	6779643	552
498992	6780090	567	498937	6780030	569
494517	6778153	508	494535	6778104	511
493933	6778539	529	493952	6778519	533
493268	6778854	541	493292	6778840	548
492539	6779159	555	492571	6779153	561
491590	6779343	568	491625	6779334	582

VELOCITY POINT LOCATIONS

20JAN84			12MAR84		
X	Y	Z	X	Y	Z
496929	6763933	75	496818	6763149	64
496964	6764208	94	496860	6763466	87
497626	6764145	93	497577	6763337	50
498232	6764151	80	498158	6763430	42
498223	6764520	97	498126	6763836	72
497647	6764536	78	497563	6763809	65
496964	6764634	101	496880	6763932	87
496976	6765124	123	496896	6764495	112
497582	6765134	98	497490	6764495	94
498233	6765087	103	498123	6764485	99
498245	6765623	125	498147	6765071	97
497602	6765650	124	497511	6765064	101
496969	6765650	114	496893	6765094	108
496958	6766168	131	496906	6765687	125
497585	6766199	147	497510	6765657	116
498248	6766214	155	498171	6765686	127
498209	6766803	155	498190	6766321	147
497591	6766757	163	497559	6766260	153
496950	6766711	136	496932	6766264	128
496922	6767232	161	496920	6766821	136
497573	6767302	160	497580	6766856	144
498218	6767304	166	498229	6766851	157
498124	6768025	180	498174	6767592	164
497495	6767919	171	497543	6767498	162
496920	6767787	184	496966	6767389	157
496840	6768363	200	496934	6768002	189
497417	6768508	184	497500	6768117	180
498002	6768616	193	498081	6768215	180
497896	6769204	213	497996	6768843	202
497284	6769112	216	497387	6768751	205
496711	6768967	210	496815	6768638	200
496582	6769530	198	496511	6769138	192
497119	6769685	212	497241	6769361	221
497696	6769854	228	497804	6769531	233
497511	6770412	224	497615	6770127	219
496927	6770235	214	497045	6769936	209
496353	6770052	229	496481	6769753	194
496152	6770583	245	496307	6770286	218
496736	6770774	240	496869	6770469	214
497324	6770958	238	497446	6770685	230
497147	6771516	250	497263	6771272	254
496567	6771329	263	496702	6771031	258
496008	6771201	297	496153	6770910	261
495846	6771801	312	495966	6771511	246
496412	6771913	254	496541	6771634	248
497002	6772074	248	497081	6771841	255
496814	6772661	332	496877	6772383	298
496246	6772571	313	496324	6772279	275
495694	6772404	324	495768	6772099	312
495539	6773018	347	495557	6772712	334
496118	6773096	368	496140	6772792	349
496725	6773159	360	496760	6772891	344
496659	6773699	376	496669	6773426	387
496084	6773665	378	496064	6773385	364
495482	6773568	366	495439	6773310	343
495472	6774137	355	495432	6773899	334
496037	6774202	380	496015	6773935	361
496625	6774204	383	496645	6773955	372
496584	6774737	371	496613	6774482	365
495981	6774681	384	495979	6774407	369
495409	6774643	382	495393	6774395	360
495361	6775138	433	495393	6774874	404
495949	6775144	417	495996	6774859	397
496539	6775199	394	496594	6774941	375
496481	6775642	420	496533	6775389	395
495898	6775610	433	495957	6775325	421
495335	6775538	449	495383	6775287	444
495279	6775991	462	495308	6775780	460
495857	6776054	451	495882	6775801	444
496415	6776091	463	496418	6775839	453
496510	6776604	490	496463	6776423	469
495730	6776657	462	495699	6776453	466
496916	6777147	504	496805	6777031	506
495714	6777259	472	495660	6777095	461
495011	6776928	465	495013	6776798	462
494795	6777504	475	494809	6777416	468
495987	6777894	497	495920	6777765	487
498183	6778423	520	498101	6778354	523
498979	6778570	520	498910	6778546	527
496457	6778386	515	496384	6778278	502
497047	6778926	537	496974	6778829	535
497688	6779402	555	497615	6779320	550
498360	6779872	555	498286	6779809	551
494338	6778103	521	494365	6778060	504
493726	6778583	537	493753	6778579	520
493131	6778876	556	493157	6778874	539
492482	6779121	566	492502	6779117	562

VELOCITY POINT LOCATIONS

12MAR84			24APR84		
X	Y	Z	X	Y	Z
496981	6763651	79	496888	6763014	57
496975	6764010	91	496898	6763414	72
497558	6763871	86	497473	6763255	33
498097	6763917	77	498067	6763344	43
498144	6764303	92	498086	6763748	59
497565	6764338	93	497502	6763759	77
496944	6764422	104	496891	6763864	89
496980	6764826	106	496920	6764296	103
497623	6764772	101	497544	6764221	75
498190	6764723	96	498112	6764214	86
498244	6765143	100	498161	6764677	97
497674	6765217	108	497592	6764724	100
497011	6765291	110	496947	6764814	107
497053	6765781	124	496999	6765348	114
497710	6765790	139	497634	6765321	114
498288	6765719	136	498210	6765275	110
498301	6766357	146	498254	6765936	131
497680	6766406	153	497630	6765964	132
497049	6766365	131	497025	6765975	118
497037	6766934	148	497028	6766568	133
497651	6766984	155	497638	6766588	153
498238	6766951	154	498237	6766556	140
498182	6767534	160	498198	6767152	147
497585	6767494	163	497607	6767121	150
496967	6767401	161	496979	6767052	142
496915	6767969	190	496967	6767639	171
497509	6768085	173	497557	6767729	162
498119	6768178	177	498155	6767813	159
498031	6768723	189	498095	6768387	174
497387	6768638	206	497461	6768308	182
496774	6768468	199	496851	6768161	189
496659	6769015	199	496750	6768732	194
497266	6769197	214	497351	6768884	200
497877	6769335	218	497964	6769020	201
497709	6769896	221	497789	6769607	226
497120	6769744	209	497203	6769463	208
496555	6769579	188	496641	6769298	189
496359	6770124	225	496463	6769853	200
496949	6770300	217	497042	6770029	199
497522	6770456	225	497600	6770195	218
497354	6770975	247	497437	6770733	231
496750	6770842	241	496852	6770574	224
496172	6770651	258	496291	6770385	232
495959	6771356	284	496065	6771083	271
496552	6771490	256	496656	6771219	239
497167	6771554	253	497246	6771335	249
496981	6772157	256	497037	6771937	230
496328	6772108	272	496424	6771848	245
495793	6772017	297	495877	6771742	292
495719	6772665	322	495764	6772379	305
496259	6772780	322	496297	6772504	302
496869	6772836	332	496908	6772584	309
496763	6773258	363	496781	6773012	349
496241	6773241	353	496243	6772966	333
495679	6773172	338	495668	6772904	324
495697	6773616	363	495654	6773358	346
496237	6773687	373	496215	6773424	368
496723	6773685	378	496727	6773443	365
496694	6774093	368	496701	6773855	368
496198	6774143	387	496177	6773877	370
495684	6774070	360	495640	6773822	353
495660	6774551	378	495640	6774304	359
496151	6774591	378	496151	6774326	379
496635	6774568	370	496657	6774329	375
496577	6775074	383	496618	6774833	366
496083	6775070	405	496120	6774800	383
495588	6775012	429	495611	6774753	402
495544	6775438	451	495592	6775175	436
496047	6775497	432	496105	6775223	417
496567	6775483	415	496618	6775243	384
496576	6775953	460	496592	6775709	429
496060	6775962	448	496088	6775707	436
495530	6775882	457	495572	6775641	452
495533	6776344	463	495535	6776133	453
496068	6776452	468	496051	6776237	457
496652	6776394	481	496603	6776188	471
496850	6776798	505	496766	6776664	501
495890	6776877	452	495853	6776685	454
495386	6776681	464	495383	6776504	456
495394	6777132	466	495388	6776973	455
496134	6777239	458	496066	6777081	455
496366	6777624	478	496284	6777485	471
495387	6777596	468	495373	6777453	450
494848	6777906	475	494360	6778175	504
496481	6778135	499	496410	6778012	501
498162	6778414	507	498089	6778320	501
498671	6778856	514	498605	6778779	507
496705	6778653	529	496640	6778532	521
494334	6778231	511	494360	6778177	506
493802	6778476	523	493835	6778451	520
497043	6779144	544	496975	6779027	542
497418	6779538	555	497355	6779429	552
499299	6779300	534	499236	6779225	513

Appendix 2. Location of features used for Columbia Glacier velocity measurements

[The location of each feature is measured on the two indicated dates, shown side by side]

VELOCITY POINT LOCATIONS

24APR84			28JUN84		
X	Y	Z	X	Y	Z
496872	6764127	95	496753	6763315	69
497468	6764392	66	497407	6763567	58
498044	6764232	85	497982	6763436	33
498098	6764625	92	497998	6763884	67
497546	6764732	88	497455	6763953	69
496850	6764658	103	496766	6763901	78
496933	6765104	104	496854	6764394	95
497590	6765095	99	497488	6764382	97
498159	6764991	96	498047	6764305	89
498221	6765466	113	498110	6764833	99
497653	6765564	117	497538	6764906	99
497014	6765580	109	496926	6764938	121
497046	6766061	127	496973	6765495	116
497689	6766083	132	497593	6765449	103
498325	6766003	133	498210	6765366	104
498257	6766577	140	498207	6766005	134
497697	6766633	156	497643	6766042	134
497059	6766598	137	497018	6766062	119
497074	6767141	150	497067	6766632	140
497696	6767193	118	497690	6766629	150
498265	6767150	150	498262	6766603	151
498299	6767791	161	498326	6767271	163
497650	6767798	165	497689	6767279	159
497020	6767715	174	497063	6767237	153
496915	6768196	178	497008	6767741	172
497581	6768373	187	497669	6767883	179
498233	6768429	171	498293	6767944	178
498057	6769005	187	498170	6768544	178
497442	6768922	209	497564	6768453	188
496806	6768750	203	496931	6768322	185
496677	6769256	197	496801	6768848	191
497264	6769479	213	497395	6769045	215
497865	6769586	227	497999	6769151	194
497686	6770178	216	497813	6769802	223
497089	6770014	204	497222	6769617	210
496515	6769811	191	496652	6769415	196
496265	6770384	218	496427	6769984	184
496848	6770590	222	496997	6770191	201
497457	6770738	233	497584	6770370	219
497200	6771399	240	497323	6771056	231
496601	6771207	244	496764	6770809	221
496011	6771006	266	496184	6770610	228
495802	6771651	295	495964	6771239	279
496369	6771801	255	496533	6771408	247
496998	6771903	239	497111	6771571	237
496893	6772326	272	496979	6772012	220
496271	6772269	281	496408	6771881	246
495726	6772191	296	495844	6771780	289
495666	6772689	329	495736	6772280	289
496257	6772782	332	496319	6772358	279
496847	6772828	332	496909	6772441	280
496819	6773228	353	496834	6772867	314
496266	6773266	361	496274	6772844	336
495744	6773205	354	495730	6772786	313
495755	6773658	361	495684	6773259	332
496256	6773709	372	496223	6773298	353
496746	6773656	375	496760	6773284	353
496727	6774109	369	496735	6773745	362
496237	6774135	377	496197	6773721	372
495727	6774100	362	495658	6773714	355
495675	6774543	378	495634	6774160	347
496180	6774589	380	496163	6774188	345
496650	6774576	365	496683	6774214	357
496634	6775070	375	496704	6774700	359
496125	6775031	399	496167	6774615	371
495620	6774970	413	495636	6774566	369
495145	6774923	406	495145	6774579	355
495066	6775401	444	495129	6775046	420
495502	6775430	444	495568	6775016	420
496032	6775490	425	496112	6775061	395
496540	6775516	413	496612	6775130	365
496531	6776109	471	496526	6775726	433
495984	6775961	450	496068	6775562	423
495476	6775934	460	495526	6775541	442
495011	6775886	456	495064	6775616	440
494964	6776366	462	494980	6776119	454
495380	6776447	459	495380	6776122	457
495933	6777172	459	495847	6776912	448
495522	6777211	444	495488	6776956	444
494851	6776900	456	494860	6776710	459
494581	6777444	484	494611	6777309	467
496068	6777650	483	495955	6777430	462
497368	6778040	494	497224	6777878	485
498401	6778116	502	498271	6778022	509
499091	6778493	503	498966	6778424	497
499659	6778617	515	499535	6778566	503
496327	6778120	497	496214	6777921	483
496698	6778496	517	496584	6778311	501
497108	6778928	534	496991	6778752	521
497659	6779332	545	497543	6779173	539
498298	6779762	538	498168	6779622	535
494495	6778063	498	494530	6777960	491
494041	6778373	516	494089	6778326	504

VELOCITY POINT LOCATIONS

28JUN84			15AUG84		
X	Y	Z	X	Y	Z
496774	6764553	106	496717	6763973	65
497413	6764684	97	497360	6764117	77
498041	6764666	98	497966	6764120	75
498088	6765170	102	498003	6764696	90
497426	6765184	93	497360	6764694	80
496818	6764900	99	496767	6764388	90
496866	6765277	107	496801	6764821	98
496935	6765858	117	496890	6765465	103
497487	6765777	113	497426	6765333	83
498120	6765725	129	498052	6765287	104
498169	6766287	145	498121	6765880	140
497568	6766353	138	497526	6765943	129
496992	6766360	128	496959	6765994	115
497027	6766884	145	497016	6766548	130
497588	6766883	158	497575	6766520	134
498190	6766862	141	498184	6766492	154
498156	6767335	167	498167	6766983	156
497565	6767361	167	497580	6767017	159
496979	6767294	158	496996	6766979	152
496888	6767841	180	496933	6767545	152
497520	6767925	172	497565	6767602	156
498128	6767945	171	498164	6767609	169
498060	6768482	184	498113	6768168	180
497435	6768448	184	497504	6768143	175
496823	6768320	190	496898	6768038	190
496712	6768929	186	496794	6768670	184
497255	6769104	212	497341	6768821	192
497883	6769225	212	497966	6768939	199
497664	6769896	217	497754	6769647	216
497057	6769725	196	497148	6769469	211
496503	6769650	188	496596	6769399	192
496357	6770217	207	496468	6769969	193
496827	6770399	205	496923	6770146	199
497418	6770559	218	497507	6770325	207
497167	6771198	241	497266	6770980	228
496559	6771059	246	496672	6770814	228
496075	6770854	256	496199	6770613	233
495707	6771581	295	495813	6771312	268
496280	6771648	261	496400	6771400	262
496812	6771781	225	496901	6771558	234
496622	6772338	253	496703	6772109	239
496135	6772214	259	496237	6771973	257
495577	6772170	294	495650	6771910	285
495497	6772749	306	495526	6772482	288
496060	6772793	321	496106	6772524	288
496524	6772817	314	496568	6772559	300
496475	6773449	360	496481	6773201	341
496040	6773433	358	496024	6773174	346
495493	6773409	333	495460	6773164	332
495525	6773970	342	495484	6773738	350
496074	6773980	365	496049	6773733	362
496512	6773980	377	496514	6773737	363
496565	6774501	355	496590	6774274	349
496062	6774508	367	496052	6774255	352
495537	6774465	344	495515	6774231	333
495543	6774940	404	495557	6774687	375
496045	6775061	401	496082	6774795	370
496492	6775110	366	496540	6774870	350
496483	6775661	423	496533	6775422	395
495995	6775615	431	496049	6775351	411
495456	6775477	437	495510	6775233	425
495354	6776077	446	495391	6775880	447
495928	6776182	442	495943	6775957	437
496449	6776233	468	496428	6776014	445
496515	6776783	486	496450	6776635	468
495849	6776722	442	495830	6776544	449
495294	6776660	443	495300	6776501	445
495038	6777154	450	495051	6777042	443
495817	6777284	455	495776	6777145	447
497145	6777954	483	497064	6777854	478
495832	6777855	476	495779	6777724	473
494719	6777740	467	494739	6777657	466
494172	6778090	502	494200	6778055	500
495893	6778411	486	495845	6778290	488
497511	6778408	499	497446	6778315	487
497859	6778930	509	497800	6778843	505
498267	6779358	516	498218	6779284	520
498762	6779773	545	498691	6779708	544
499304	6780093	562	499219	6780044	576
496261	6779054	511	496207	6778957	511
496700	6779575	530	496646	6779477	526
497206	6780043	554	497143	6779963	554

VELOCITY POINT LOCATIONS

15AUG84			04OCT84		
X	Y	Z	X	Y	Z
496983	6764841	102	496905	6764275	68
497730	6764739	104	497629	6764159	79
497769	6764898	92	497670	6764344	65
498150	6764961	93	498048	6764454	74
497728	6765226	117	497631	6764722	83
497133	6765266	90	497050	6764762	83
496590	6765081	96	496540	6764605	75
496626	6765421	109	496571	6765012	75
496695	6765879	105	496659	6765514	95
497150	6765751	110	497086	6765314	89
497817	6765793	126	497735	6765332	95
498214	6765705	136	498131	6765274	82
497204	6766123	124	497159	6765730	92
496729	6766486	119	496703	6766157	106
497272	6766466	132	497237	6766089	112
497860	6766447	150	497804	6766035	125
498429	6766423	142	498380	6766057	124
497284	6766789	145	497258	6766437	121
496736	6767134	134	496751	6766837	128
497269	6767136	153	497272	6766806	133
497862	6767134	158	497856	6766784	143
498437	6767089	154	498425	6766744	138
498419	6767845	168	498443	6767540	147
497808	6767783	181	497839	6767456	150
497122	6767681	167	497144	6767385	147
496571	6767564	174	496605	6767296	146
496469	6768217	191	496536	6767985	178
497035	6768325	188	497093	6768049	170
497726	6768431	183	497778	6768140	165
498349	6768494	175	498394	6768223	161
498212	6769078	176	498269	6768829	164
497615	6769036	219	497684	6768767	194
497004	6768895	204	497071	6768645	182
496409	6768741	194	496478	6768521	171
495913	6769277	192	495994	6769090	179
496328	6769233	191	496406	6769020	178
496840	6769359	190	496914	6769128	194
497467	6769534	223	497547	6769282	211
498042	6769638	235	498102	6769401	199
497830	6770254	220	497888	6770058	203
497255	6770142	214	497330	6769924	203
496652	6769959	193	496727	6769741	175
496174	6769825	198	496264	6769613	182
495770	6769856	234	495850	6769657	213
496029	6770236	244	496134	6770023	220
496508	6770402	223	496594	6770188	206
497050	6770589	228	497130	6770366	202
497567	6770713	230	497648	6770536	213
497393	6771093	236	497463	6770913	217
496858	6770971	218	496950	6770752	216
496350	6770780	250	496451	6770567	214
495903	6770620	236	496003	6770406	224
495559	6770423	234	495657	6770233	242
495385	6770917	260	495474	6770711	247
495772	6771100	276	495862	6770882	251
496209	6771213	260	496300	6770989	256
496707	6771339	238	496801	6771129	228
497195	6771477	251	497268	6771300	239
497065	6771792	238	497134	6771620	231
496579	6771702	233	496664	6771495	229
496078	6771597	285	496173	6771378	262
495642	6771512	274	495728	6771282	261
495249	6771402	264	495328	6771192	258
495099	6771830	278	495149	6771636	270
495573	6771970	296	495631	6771750	289
495970	6772016	281	496048	6771798	276
496427	6772096	254	496504	6771893	235
496939	6772135	226	497000	6771951	221
496848	6772540	282	496899	6772337	255
496364	6772477	288	496397	6772270	266
495915	6772429	289	495965	6772205	269
495499	6772381	305	495534	6772159	292
494965	6772235	293	494990	6772047	287
494853	6772708	305	494845	6772526	290
495440	6772853	308	495444	6772617	311
495868	6772805	305	495896	6772557	308
496294	6772849	329	496326	6772628	304
496748	6772913	313	496812	6772707	305
496720	6773267	343	496753	6773062	333
496292	6773295	343	496268	6773082	329
495858	6773251	342	495840	6773023	332
495429	6773258	331	495398	6773050	317
494889	6773182	301	494873	6772993	304
494921	6773685	312	494876	6773531	306
495432	6773713	340	495391	6773519	333
495854	6773738	359	495819	6773526	339
496286	6773726	368	496267	6773508	358
496730	6773670	353	496746	6773471	354
496758	6774153	365	496764	6773964	359
496295	6774149	364	496278	6773934	356
495878	6774161	363	495846	6773950	351
495444	6774166	331	495407	6773968	334
494965	6774168	316	494924	6774006	304
494959	6774579	337	494949	6774418	316
495446	6774633	371	495436	6774440	338
495898	6774610	359	495888	6774379	370

Appendix 2. Location of features used for Columbia Glacier velocity measurements

[The location of each feature is measured on the two indicated dates, shown side by side]

VELOCITY POINT LOCATIONS

15AUG84			04OCT84		
(continued)					
X	Y	Z	X	Y	Z
496319	6774581	366	496317	6774360	365
496801	6774610	354	496790	6774397	358
496717	6774974	357	496751	6774783	347
496281	6774988	374	496313	6774767	358
495877	6775033	401	495906	6774810	380
495431	6775010	408	495447	6774800	380
495000	6774936	409	495004	6774754	372
494934	6775361	426	494969	6775207	422
495376	6775406	437	495416	6775199	422
495849	6775464	418	495887	6775236	406
496259	6775491	424	496303	6775263	388
496705	6775425	385	496737	6775232	355
496688	6775948	452	496686	6775753	421
496234	6775982	437	496246	6775768	420
495769	6775912	435	495799	6775702	421
495326	6775824	450	495361	6775637	436
494896	6775697	456	494931	6775569	444
494818	6776110	452	494838	6776009	444
495237	6776215	450	495256	6776064	442
495700	6776346	445	495698	6776165	430
496169	6776380	456	496143	6776194	441
496650	6776426	482	496601	6776264	464
496682	6776762	488	496608	6776636	480
496162	6776782	447	496111	6776629	449
495668	6776746	447	495658	6776588	446
495202	6776671	448	495211	6776539	441
494738	6776528	447	494756	6776432	444
494714	6776888	456	494734	6776800	456
495181	6776980	451	495188	6776857	440
495647	6777057	454	495632	6776918	446
496129	6777094	459	496078	6776955	445
496706	6777136	457	496631	6777029	470
496842	6777513	467	496767	6777414	467
496115	6777411	463	496056	6777289	450
495652	6777409	459	495627	6777279	448
495181	6777376	450	495185	6777260	444
494672	6777274	468	494700	6777197	467
494616	6777634	473	494633	6777566	465
495145	6777748	460	495146	6777649	443
495667	6777773	469	495635	6777653	457
496125	6777748	480	496076	6777636	461
497002	6777924	494	496936	6777831	473
497335	6778443	499	497277	6778355	495
496209	6778041	494	496161	6777937	479
496314	6778402	506	496267	6778303	496
495846	6778471	503	495808	6778373	492
495715	6778083	483	495682	6777978	477
495021	6778170	470	495020	6778093	463
494449	6778098	496	494472	6778051	491
494134	6778548	509	494162	6778523	502
493361	6778971	529	493388	6778959	520
492496	6779300	544	492524	6779290	547
495123	6778706	491	495115	6778642	488
495408	6779295	508	495385	6779239	497
495842	6779765	515	495812	6779706	504
496394	6780213	536	496353	6780146	531
496069	6778789	511	496019	6778696	496
496296	6779144	515	496246	6779058	514
496547	6779484	536	496504	6779400	527
496810	6779771	549	496760	6779692	537
497146	6780039	543	497090	6779960	548
497460	6780286	559	497408	6780220	549
497852	6780558	550	497796	6780498	542
496609	6778763	522	496559	6778667	511
497043	6779066	537	496996	6778972	524
497483	6779382	544	497436	6779298	532
497977	6779678	540	497926	6779602	528
498482	6779858	549	498430	6779793	537
497924	6778964	514	497875	6778885	503
498745	6779274	510	498690	6779209	505

VELOCITY POINT LOCATIONS

13SEP85			07NOV85		
X	Y	Z	X	Y	Z
497101	6765342	77	497014	6764779	65
497431	6765311	73	497315	6764704	20
497981	6765197	76	497836	6764615	49
498024	6765538	86	497903	6764979	57
497483	6765606	81	497377	6765031	50
497052	6765645	81	496957	6765080	71
497041	6765963	92	496963	6765464	76
497522	6765950	106	497431	6765418	60
498050	6765859	99	497945	6765311	63
498126	6766386	111	498055	6765870	86
497594	6766432	115	497514	6765926	83
497045	6766474	97	497001	6766014	84
497110	6767082	126	497097	6766671	98
497599	6767025	118	497573	6766565	111
498127	6766955	122	498115	6766498	108
498116	6767612	140	498141	6767173	111
497584	6767606	135	497609	6767186	112
497065	6767557	131	497093	6767167	115
496980	6768183	157	497051	6767817	139
497477	6768305	151	497546	6767907	126
498002	6768358	143	498070	6767953	125
497869	6769105	178	497962	6768745	149
497342	6768944	173	497437	6768582	158
496834	6768798	171	496950	6768497	158
496681	6769334	162	496801	6769056	160
497171	6769501	182	497270	6769169	173
497703	6769685	200	497804	6769352	176
497478	6770277	188	497581	6769989	182
496965	6770109	176	497077	6769813	167
496484	6769934	174	496603	6769638	154
496280	6770517	221	496416	6770225	188
496744	6770717	207	496864	6770420	180
497276	6770864	209	497387	6770589	197
497064	6771464	216	497158	6771195	205
496505	6771311	232	496638	6771017	210
496031	6771121	276	496158	6770827	226
495756	6771754	282	495888	6771493	272
496270	6771904	238	496404	6771620	239
496848	6772069	224	496930	6771821	206
496660	6772599	302	496725	6772317	256
496104	6772583	290	496166	6772279	252
495565	6772489	292	495635	6772231	281
495424	6773188	321	495395	6772903	308
496014	6773270	334	496006	6772964	319
496579	6773266	343	496600	6772984	329
496573	6773843	348	496564	6773578	349
496039	6773881	352	495997	6773594	347
495492	6773869	320	495436	6773605	326
495492	6774564	352	495460	6774305	325
496027	6774546	347	496007	6774246	353
496714	6774545	349	496734	6774299	334
496653	6775270	349	496705	6775034	359
495942	6775211	391	495995	6774902	384
495455	6775123	415	495486	6774834	388
494699	6775713	448	494731	6775593	434
495312	6775773	434	495376	6775496	437
495845	6775860	418	495894	6775565	410
496525	6775880	437	496557	6775602	410
496501	6776465	464	496438	6776230	457
495765	6776445	429	495762	6776214	434
495215	6776368	432	495241	6776182	435
494629	6776240	441	494661	6776136	448
495104	6776983	432	495122	6776829	443
495767	6777019	436	495734	6776828	438
496589	6777057	454	496486	6776910	462
496038	6777629	454	495968	6777478	454
496331	6778173	481	496262	6778040	494
496726	6778590	495	496655	6778468	507
497135	6778947	512	497064	6778830	520
497732	6779322	514	497662	6779219	527
498325	6779587	518	498247	6779496	524
498931	6779852	540	498852	6779777	540
498279	6778597	478	498192	6778513	509
498006	6778962	488	497931	6778861	502
497474	6779730	534	497405	6779628	538
497182	6780109	540	497109	6780016	542
494835	6777535	444	494865	6777435	459
494367	6777957	478	494412	6777893	481
493755	6778292	495	493795	6778267	487
493105	6778527	519	493147	6778514	512
492455	6778733	544	492487	6778723	533

VELOCITY POINT LOCATIONS

07NOV85			16JAN86		
X	Y	Z	X	Y	Z
495398	6764890	75	495393	6764884	73
496720	6765447	79	496558	6764583	66
497183	6765367	62	497002	6764448	64
497611	6765345	73	497421	6764395	48
497981	6765230	66	497789	6764289	58
498351	6765091	55	498172	6764211	59
499104	6764537	75	499092	6764514	76
499830	6765055	91	499826	6765055	95
499320	6765041	66	499308	6765033	72
498695	6765780	90	498526	6765080	65
498383	6765478	73	498209	6764650	68
498182	6765943	102	498026	6765095	69
497779	6766005	104	497620	6765128	71
496832	6766012	74	496710	6765259	78
495535	6765426	86	495531	6765419	87
495362	6766202	87	495372	6766193	115
496901	6766565	82	496828	6765871	72
497782	6766666	119	497688	6765864	96
498493	6766395	101	498369	6765624	91
499496	6765480	76	499485	6765480	86
499574	6765954	93	499570	6765952	100
499691	6766663	106	499678	6766671	125
499654	6767271	120	499647	6767274	126
498448	6767321	122	498444	6766648	114
497764	6767449	129	497781	6766745	129
496858	6767261	109	496863	6766639	90
495469	6766776	137	495518	6766728	130
495197	6766763	147	495206	6766755	143
495136	6767466	156	495139	6767456	158
495244	6767832	159	495255	6767802	153
495916	6767710	178	495998	6767426	169
496925	6768141	147	497026	6767541	126
497608	6768310	143	497735	6767656	143
498382	6768507	139	498468	6767928	134
499685	6768043	124	499680	6768038	150
499526	6768736	126	499518	6768729	152
498115	6769328	161	498293	6768741	138
499427	6769380	143	499423	6769365	164
499199	6769331	143	499200	6769275	157
499032	6769326	137	499045	6769225	145
498796	6769488	153	498846	6769131	149
498347	6769531	149	498463	6769053	146
498068	6769505	180	498225	6768970	161
497670	6769387	187	497836	6768808	173
497359	6769248	182	497523	6768670	171
497039	6769192	170	497201	6768635	172
496740	6769092	183	496909	6768573	179
496400	6768920	150	496556	6768433	159
496123	6768766	172	496283	6768332	169
495870	6768635	174	496024	6768273	174
495767	6768487	170	495840	6768199	175
495384	6768251	170	495419	6768160	184
495179	6768110	169	495186	6768076	163
494824	6767934	171	494831	6767935	176
494764	6768647	169	494776	6768646	183
494621	6769300	201	494625	6769290	204
496276	6769913	175	496470	6769429	165
496883	6770143	173	497054	6769649	182
497553	6770232	188	497708	6769753	202
498274	6770346	195	498390	6769989	184
499329	6770084	171	499323	6770074	186
499179	6770769	194	499181	6770765	208
498154	6771166	206	498227	6770929	212
497360	6771107	207	497543	6770654	199
496565	6770963	220	496767	6770467	195
495765	6770816	214	495996	6770328	210
495250	6770640	234	495442	6770215	230
494461	6769911	218	494476	6769898	218
494273	6770831	231	494290	6770773	237
493385	6771320	284	493386	6771316	285
493767	6771101	273	493773	6771097	268
493930	6770688	238	493931	6770680	237
494964	6771557	252	495074	6771134	256
495299	6771425	253	495489	6770924	233
495645	6771500	256	495844	6770991	240
496308	6771830	244	496516	6771345	228
496439	6771344	236	496646	6770850	222
496922	6771579	217	497106	6771133	218
497269	6771727	219	497419	6771363	221
497728	6771912	209	497819	6771655	222
498186	6771945	193	498220	6771833	204
498442	6772009	192	498445	6771975	202
498681	6772171	211	498677	6772170	218
498870	6771806	217	498859	6771805	230
498784	6771487	216	498779	6771472	228
499154	6771230	189	499142	6771228	210
498459	6772571	207	498451	6772565	220
497005	6772415	257	497111	6772009	219
496171	6772368	264	496335	6771893	248
495465	6772252	282	495572	6771750	271
494942	6772021	273	495030	6771604	264
493674	6771674	268	493682	6771670	270
493686	6772229	274	493690	6772216	267
493679	6772935	280	493677	6772923	275
494124	6772352	260	494128	6772245	255
494499	6772530	265	494443	6772270	249

Appendix 2. Location of features used for Columbia Glacier velocity measurements

[The location of each feature is measured on the two indicated dates, shown side by side]

VELOCITY POINT LOCATIONS

(continued)

07NOV85			16JAN86		
X	Y	Z	X	Y	Z
494777	6772727	270	494785	6772324	263
495064	6772826	290	495070	6772357	269
495361	6772916	300	495380	6772408	283
495796	6773006	313	495840	6772477	281
496162	6773094	326	496197	6772573	294
496557	6773170	327	496594	6772680	299
496945	6773170	322	497007	6772743	296
497395	6773170	303	497445	6772847	288
497727	6773177	292	497772	6772965	283
498110	6773123	273	498111	6773037	274
498201	6773518	294	498202	6773494	300
498085	6774002	308	498083	6773999	311
497355	6773760	331	497402	6773471	330
496834	6773845	339	496852	6773428	342
496101	6773336	336	496095	6772830	324
496067	6773569	345	496017	6773072	327
496071	6773749	347	496006	6773261	337
496090	6774050	354	496028	6773561	354
495341	6773714	325	495244	6773276	314
495054	6773764	300	494954	6773378	293
494688	6773936	291	494637	6773682	291
493847	6773476	291	493842	6773461	280
494021	6773926	287	494023	6773918	290
495296	6774406	336	495221	6773995	297
496059	6774310	361	496006	6773824	354
496038	6774614	357	496000	6774125	353
496000	6774804	369	495996	6774313	348
495953	6775030	385	495989	6774531	353
496693	6774423	350	496704	6773984	356
496735	6774863	344	496789	6774451	338
497271	6774387	328	497308	6774139	333
497537	6774302	336	497566	6774162	323
497984	6774470	346	497985	6774464	338
497958	6774988	344	497960	6774996	348
497557	6775028	349	497579	6774942	343
497117	6775224	360	497161	6774945	350
496276	6775319	398	496368	6774829	365
495888	6775234	400	495954	6774725	362
495864	6775433	405	495955	6774919	383
495165	6775093	407	495183	6774669	360
494550	6774654	367	494550	6774437	324
494227	6774598	343	494224	6774532	326
494028	6774778	443	494028	6774762	430
494143	6775113	449	494157	6775071	449
494482	6775456	444	494531	6775321	452
494988	6775561	433	495080	6775196	425
495390	6775712	440	495484	6775264	424
495761	6775606	414	495865	6775100	395
495695	6775812	429	495789	6775328	416
495655	6776044	435	495731	6775594	430
496072	6775820	420	496169	6775323	403
496595	6775761	430	496674	6775326	376
497026	6775777	416	497058	6775460	370
497469	6775885	434	497439	6775729	406
497903	6775427	363	497902	6775430	359
497804	6775659	432	497799	6775658	435
498037	6775914	516	498029	6775914	522
497606	6776154	488	497545	6776039	488
497000	6776169	476	496952	6775851	444
497259	6776533	504	497130	6776345	505
496933	6776729	500	496782	6776493	491
496644	6776498	477	496551	6776155	473
496156	6776154	438	496190	6775690	420
496193	6776600	445	496128	6776221	444
495685	6776266	435	495724	6775843	433
495663	6776519	432	495666	6776133	438
495642	6776661	448	495631	6776294	447
495670	6776951	447	495632	6776611	447
495322	6776273	440	495369	6775906	445
494887	6776122	448	494957	6775854	445
494394	6775868	442	494420	6775749	447
493937	6775670	439	493944	6775650	438
493649	6776172	447	493669	6776150	440
494028	6776252	444	494038	6776185	439
494423	6776496	449	494452	6776345	452
494824	6776660	453	494850	6776438	457
495243	6776732	446	495253	6776425	440
499756	6776755	534	499725	6776785	560
498096	6776318	514	498059	6776310	525
497884	6776527	517	497809	6776478	532
497617	6776696	501	497495	6776599	509
497328	6776869	493	497176	6776713	508
497017	6777009	489	496843	6776808	497
496710	6777128	466	496534	6776891	474
496436	6777130	449	496276	6776862	455
496216	6777156	438	496088	6776867	446
495946	6777139	440	495859	6776833	445
495662	6777172	445	495613	6776859	447
495460	6777180	444	495444	6776881	444
495274	6777163	434	495283	6776879	443
495075	6777084	435	495103	6776831	440
494883	6777054	453	494916	6776827	457
494716	6777043	457	494754	6776835	472
494482	6776955	463	494523	6776786	461
494227	6776870	462	494270	6776747	460

VELOCITY POINT LOCATIONS

(continued)

07NOV85			16JAN86		
X	Y	Z	X	Y	Z
493961	6776752	469	493993	6776673	466
493755	6776665	468	493770	6776617	460
493585	6776639	463	493607	6776607	474
493420	6776569	476	493428	6776568	472
493044	6777156	527	493075	6777140	522
493797	6777359	508	493858	6777306	493
494757	6777409	464	494796	6777225	459
495668	6777677	454	495604	6777401	446
496623	6777788	460	496463	6777562	461
497626	6777443	483	497454	6777302	500
498328	6777946	484	498190	6777833	503
499283	6778472	498	499151	6778411	502
498754	6779120	500	498615	6778994	507
497895	6778990	512	497773	6778825	508
497550	6778318	487	497404	6778137	492
496646	6778523	509	496523	6778313	505
495633	6778220	472	495561	6777974	471
495587	6778720	489	495511	6778510	483
494632	6778078	492	494672	6777931	481
493742	6778071	521	493809	6778027	509
493149	6777849	545	493205	6777825	525
492694	6778058	522	492759	6778036	538
492895	6778467	524	492961	6778443	526
493177	6778868	519	493246	6778841	520
493915	6778696	502	493978	6778656	501
494695	6778886	495	494714	6778805	487
495609	6779158	488	495538	6778992	489
496417	6779045	511	496296	6778845	505
497452	6779238	528	497331	6779052	527
496924	6779559	538	496801	6779370	529
496403	6779776	533	496293	6779596	526
495762	6779493	495	495684	6779339	490
495128	6779503	492	495100	6779420	490
494658	6779688	498	494660	6779664	496
494197	6779338	500	494233	6779308	498
493430	6779286	509	493489	6779256	508
492481	6779128	529	492545	6779103	537
491546	6780051	560	491600	6780030	564
492896	6779751	522	492948	6779735	524
493677	6779672	507	493712	6779648	507
494140	6780084	516	494150	6780080	512
494642	6780428	516	494638	6780426	518
495130	6780302	502	495113	6780266	501
495551	6780122	501	495507	6780035	492
495966	6779951	508	495890	6779810	497
497232	6780162	538	497104	6780002	545
496166	6780348	510	496086	6780224	509
496469	6780671	526	496383	6780555	521
496788	6780969	539	496695	6780862	534
497159	6781262	535	497058	6781156	543
497703	6781677	538	497590	6781586	545
495916	6780856	517	495869	6780789	524
495349	6781029	515	495346	6781018	522
495826	6781508	521	495825	6781501	526

VELOCITY POINT LOCATIONS

16JAN86			24MAR86		
X	Y	Z	X	Y	Z
499370	6764693	77	499371	6764679	64
499158	6764301	53	499161	6764278	50
498087	6765193	74	497926	6764328	59
497324	6765169	69	497162	6764256	47
496856	6765416	85	496698	6764601	68
497520	6765621	87	497379	6764767	53
498176	6765883	103	498044	6765074	66
497569	6766095	100	497445	6765287	67
496888	6766025	82	496781	6765304	76
495561	6765669	76	495548	6765668	88
496231	6766471	81	496129	6765884	72
496990	6766610	99	496930	6765934	85
497669	6766612	120	497582	6765854	99
498227	6766586	116	498158	6765840	102
499570	6766265	111	499576	6766261	98
495734	6766748	129	495684	6766591	111
496358	6767246	135	496374	6766739	84
496997	6767179	117	496987	6766542	96
497724	6767278	127	497728	6766582	120
498295	6767249	128	498306	6766569	115
499609	6767859	141	499613	6767855	129
499214	6768620	140	499228	6768547	123
498309	6767995	154	498339	6767352	128
497639	6768028	149	497717	6767379	117
496884	6767858	155	496957	6767270	123
496096	6767955	172	496102	6767508	167
495554	6767561	169	495564	6767453	151
495080	6767305	169	495079	6767298	150
494877	6768531	186	494876	6768528	183
495507	6768287	168	495563	6768150	173
495956	6768745	184	496014	6768323	169
496712	6768480	161	496857	6767943	152
497447	6768794	173	497584	6768196	147
498060	6768761	163	498186	6768174	143
497979	6769395	189	498130	6768849	153
497307	6769391	200	497469	6768838	177
496683	6769218	171	496843	6768714	171
495396	6769157	193	495500	6768916	178
495876	6769552	205	496052	6769117	174
496303	6769998	178	496496	6769517	159
497004	6770160	185	497177	6769671	177
497735	6770357	181	497879	6769917	188
498355	6770270	190	498451	6769943	167
499068	6769894	185	499078	6769855	167
498802	6770888	204	498820	6770849	205
497451	6771188	218	497609	6770807	204
496763	6771008	219	496966	6770520	196
496169	6770881	241	496388	6770392	196
495298	6770747	244	495496	6770316	235
495256	6770015	208	495416	6769666	195
494771	6769795	219	494777	6769772	219
494204	6770543	227	494219	6770518	235
494633	6770977	245	494792	6770650	233
494968	6771383	261	495112	6770973	261
495740	6771669	280	495938	6771172	258
496495	6771753	227	496700	6771278	220
497455	6771847	233	497587	6771544	231
497402	6772425	241	497486	6772094	213
496274	6772297	262	496478	6771814	220
495197	6772047	272	495317	6771553	237
494074	6772385	259	494087	6772303	259
494833	6772705	276	494851	6772279	265
495357	6772870	313	495389	6772348	274
496153	6772996	320	496214	6772475	285
493354	6771857	285	493363	6771854	287
493484	6772760	282	493491	6772757	284
493827	6773262	283	493833	6773249	280
497147	6773300	330	497214	6772917	298
496215	6773662	352	496196	6773157	332
496838	6774110	343	496865	6773727	336
496112	6774415	352	496080	6773924	348
495458	6774045	320	495371	6773608	315
495832	6775094	401	495882	6774586	356
496668	6775049	365	496790	6774645	344
496553	6775911	456	496630	6775466	388
495737	6775709	434	495841	6775205	404
494976	6775520	452	495070	6775155	421
494145	6775373	443	494163	6775325	437
493839	6775985	437	493856	6775970	429
494641	6776247	447	494691	6776062	442
495313	6776695	447	495364	6776372	434
495764	6776461	445	495778	6776073	433
496702	6776677	491	496580	6776392	469
496817	6777368	479	496647	6777163	461
495823	6777119	450	495807	6776863	433
494629	6777139	461	494686	6776960	455
494147	6776585	456	494168	6776496	443
493374	6776812	528	493394	6776814	511
493722	6777160	504	493778	6777124	492
494813	6777667	467	494858	6777500	448
495449	6777508	451	495431	6777239	440
496074	6777647	476	495961	6777400	450
497489	6777765	495	497325	6777606	480
498366	6778016	504	498246	6777914	486
499410	6778478	510	499293	6778428	484
498304	6778686	502	498190	6778548	485

Appendix 2. Location of features used for Columbia Glacier velocity measurements

[The location of each feature is measured on the two indicated dates, shown side by side]

VELOCITY POINT LOCATIONS

16JAN86			24MAR86		
(continued)					
X	Y	Z	X	Y	Z
497283	6778491	508	497156	6778303	487
496303	6778198	499	496191	6777980	479
495647	6778354	489	495580	6778122	464
494723	6778302	488	494766	6778176	479
494288	6777999	496	494362	6777902	490
493595	6778007	510	493667	6777976	502
492906	6777785	537	492960	6777774	520
491761	6778011	555	491805	6778008	548
492834	6778553	541	492899	6778538	538
492995	6779146	537	493062	6779133	533
493652	6778967	520	493720	6778954	513
494691	6779086	500	494719	6779036	490
495931	6778965	512	495836	6778769	494
496064	6779516	516	495971	6779353	496
496766	6778930	525	496650	6778737	512
497022	6779467	548	496903	6779290	533
497763	6779203	531	497644	6779029	511
498774	6779505	537	498650	6779370	512

VELOCITY POINT LOCATIONS

24MAR86			13JUN86		
X	Y	Z	X	Y	Z
497545	6765150	75	497346	6764050	46
497015	6765545	77	496825	6764544	75
497571	6765534	69	497387	6764494	54
498147	6765514	80	497955	6764510	59
497741	6765919	103	497572	6764918	83
498335	6766211	98	498187	6765286	81
497615	6766390	112	497483	6765432	71
496900	6766310	88	496781	6765475	90
497076	6767066	117	497032	6766269	95
497619	6767067	118	497568	6766192	99
498268	6767134	114	498243	6766284	111
498134	6767813	126	498168	6766990	126
497588	6767694	123	497628	6766883	124
496860	6767636	139	496899	6766915	128
496809	6768348	159	496959	6767652	143
497533	6768523	159	497653	6767754	136
497995	6768344	149	498100	6767549	127
497984	6768909	160	498142	6768172	135
497726	6769480	197	497915	6768764	144
497192	6769374	175	497380	6768685	163
496658	6769123	159	496855	6768483	158
496375	6769780	164	496584	6769182	141
496891	6770071	182	497097	6769455	164
497406	6770223	195	497607	6769605	194
497037	6770806	201	497267	6770193	192
496500	6770613	203	496732	6769986	168
495942	6770364	199	496223	6769767	150
495667	6771072	248	495938	6770455	210
496177	6771267	260	496445	6770653	199
496703	6771515	217	496956	6770915	204
496610	6772131	228	496826	6771555	215
495922	6771969	283	496172	6771343	256
495355	6771754	267	495612	6771113	257
497009	6772394	260	497141	6771885	200
497190	6773132	317	497262	6772666	266
496524	6772855	317	496621	6772225	237
495723	6772958	324	495739	6772231	267
493595	6772988	281	493588	6772975	277
495217	6773433	300	495044	6772853	279
495989	6773740	344	495905	6773103	307
496615	6773536	349	496629	6772939	327
497248	6774263	328	497303	6773939	335
496189	6774671	359	496162	6774045	357
495570	6774405	335	495471	6773839	320
495088	6774048	301	494948	6773556	294
495636	6775103	411	495670	6774476	348
496574	6775281	373	496672	6774720	355
496082	6775730	415	496215	6775082	373
495469	6775640	433	495584	6775027	405
496933	6775864	439	496972	6775418	353
496969	6776282	488	496883	6775867	440
496440	6776196	452	496462	6775608	409
495589	6776315	431	495637	6775774	435
494244	6776261	439	493799	6775694	437
493798	6775709	436	494254	6776122	440
496648	6776950	474	496434	6776596	466
495652	6777130	432	495593	6776709	427
494489	6776892	462	494519	6776662	452
493015	6777079	530	493036	6777061	522
494001	6777062	479	494058	6776946	471
495126	6777434	445	495145	6777108	443
495829	6777751	463	495710	6777405	440
497123	6777532	479	496877	6777280	468
499184	6778539	492	499004	6778442	492
497822	6778448	487	497626	6778223	484
496802	6778452	498	496625	6778172	490
494817	6777899	460	494851	6777660	448
494213	6777795	488	494281	6777657	468
493196	6777669	522	493262	6777622	510
493220	6778444	527	493295	6778403	505
493891	6778486	506	493968	6778421	491
494733	6778833	488	494750	6778704	482
496207	6778939	503	496043	6778659	489
497507	6779188	527	497333	6778939	520
499319	6779409	524	499135	6779246	502
498767	6779587	526	498576	6779395	513
496851	6779771	534	496676	6779524	526
494622	6779370	506	494620	6779308	492
493218	6779114	528	493291	6779073	512
492680	6779246	552	492750	6779213	526

VELOCITY POINT LOCATIONS

13JUN86			10SEP86		
X	Y	Z	X	Y	Z
496708	6766018	90	496617	6765335	77
497469	6766039	108	497320	6765227	58
498166	6766014	113	498013	6765205	73
497336	6766440	111	497242	6765706	80
499547	6765989	100	499541	6765986	106
498406	6766859	116	498372	6766196	98
497845	6766881	128	497780	6766150	124
497302	6766785	111	497242	6766102	85
496737	6766606	99	496691	6766002	86
495827	6766505	116	495824	6766406	94
494713	6767246	187	494715	6767241	182
496468	6767680	164	496549	6767185	113
497271	6767344	129	497277	6766710	112
497833	6767398	138	497863	6766731	129
498344	6767999	143	498402	6767392	131
497694	6767961	146	497761	6767326	136
497194	6767856	136	497251	6767271	121
496509	6768184	154	496642	6767703	149
497066	6768368	154	497185	6767810	135
497635	6768419	158	497742	6767815	139
498083	6769261	166	498203	6768738	137
497448	6769084	187	497581	6768525	154
496888	6768923	172	497038	6768412	153
496173	6769111	163	496317	6768689	152
495603	6768684	171	495717	6768432	168
495422	6769700	175	495555	6769352	172
495918	6769718	206	496079	6769291	169
496648	6769584	171	496800	6769114	174
497256	6769719	179	497406	6769216	174
496324	6770154	179	496519	6769696	159
496921	6770403	173	497096	6769913	166
497457	6770535	188	497600	6770094	170
497734	6771141	206	497844	6770817	191
496643	6771016	212	496837	6770550	174
495977	6770892	227	496190	6770433	184
495679	6771598	249	495864	6771109	218
496344	6771736	241	496544	6771278	210
497393	6771952	216	497495	6771653	201
496803	6772230	228	496941	6771820	208
495241	6772480	283	495303	6771989	259
495755	6772848	307	495808	6772320	272
496176	6773696	338	496448	6772645	282
497046	6773025	298	497118	6772607	262
496176	6773697	343	496131	6773192	326
495509	6773532	338	495426	6773041	307
493587	6772977	278	493665	6772751	277
495027	6773878	287	494930	6773488	289
495712	6774077	341	495625	6773591	330
496296	6774522	356	496280	6774009	353
497001	6774908	339	497071	6774558	333
496392	6775161	372	496481	6774657	345
495725	6774902	390	495753	6774408	335
494968	6774844	376	494963	6774454	312
494147	6775607	433	494175	6775549	426
495011	6775554	445	495100	6775107	395
496042	6775811	424	496138	6775286	395
496449	6776047	449	496504	6775565	388
496978	6776107	473	496951	6775748	415
497784	6776554	509	497711	6776468	508
497228	6776688	504	497092	6776498	483
496613	6776591	476	496502	6776239	445
495517	6776132	452	495592	6775687	424
494491	6776127	453	494534	6775965	437
495680	6776921	436	495650	6776587	421
493847	6777025	472	493914	6776959	466
494648	6777378	449	494709	6777204	445
496316	6777812	459	496143	6777550	448
497314	6778243	481	497176	6778044	468
498777	6778348	491	498664	6778241	491
498232	6778817	495	498112	6778661	483
496812	6778828	517	496696	6778616	506
495653	6778254	468	495575	6778013	452
495909	6779122	507	495830	6778923	488
493993	6777839	482	494069	6777767	477
493559	6777497	501	493642	6777462	500
493469	6778945	508	493548	6778908	501

Appendix 2. Location of features used for Columbia Glacier velocity measurements

[The location of each feature is measured on the two indicated dates, shown side by side]

VELOCITY POINT LOCATIONS

10SEP86			26JAN87		
X	Y	Z	X	Y	Z
499473	6765024	71	499470	6765010	56
498122	6766568	118	497958	6765441	62
497763	6766547	117	497622	6765415	55
497269	6766534	99	497123	6765490	52
496754	6766432	87	496628	6765536	56
495555	6765522	75	495554	6765508	59
495310	6766048	100	495300	6766033	64
495495	6766691	115	495494	6766654	96
495310	6767289	146	495309	6767276	131
496694	6766894	103	496656	6766040	65
497239	6767015	115	497173	6766055	67
497857	6767025	135	497786	6765982	76
498230	6767819	138	498266	6766933	90
497762	6767593	126	497791	6766661	96
497180	6767492	122	497196	6766619	91
496586	6767445	138	496631	6766692	76
496453	6768154	145	496621	6767471	104
497053	6768077	135	497172	6767284	100
497618	6768190	122	497733	6767336	106
498092	6768989	153	498242	6768278	120
497474	6768877	153	497654	6768103	123
496878	6768688	171	497075	6767974	124
496237	6768900	164	496458	6768345	141
496637	6769311	158	496866	6768701	151
497219	6769483	172	497437	6768809	144
496968	6770149	168	497173	6769551	158
496375	6769968	168	496601	6769393	146
495887	6769681	189	496115	6769156	148
495542	6770492	217	495803	6769958	209
496059	6770694	204	496333	6770116	171
496643	6770890	197	496875	6770301	174
497313	6770744	188	497518	6770180	169
496425	6771542	206	496673	6770955	202
495802	6771397	232	496044	6770816	194
495372	6771254	237	495600	6770683	197
494789	6771835	258	494885	6771437	242
495330	6772389	288	495427	6771812	247
495765	6772140	286	495990	6771546	249
496315	6772193	244	496539	6771627	207
497256	6772120	204	497400	6771702	199
497187	6773034	302	497298	6772555	250
496658	6772952	331	496787	6772339	243
495601	6773083	306	495631	6772461	277
494881	6773142	306	494833	6772697	278
494010	6772533	261	494023	6772496	248
496166	6773555	335	496165	6772941	308
496964	6774164	328	497003	6773690	325
495739	6774015	341	495660	6773460	319
495148	6773974	293	495043	6773540	289
494738	6774297	313	494684	6774006	280
495188	6774680	352	495155	6774206	294
496246	6774661	350	496253	6774071	349
496605	6775158	362	496706	6774630	336
496790	6775563	380	496883	6775089	331
496131	6775753	410	496251	6775142	365
495598	6775240	409	495664	6774648	354
495021	6775399	418	495115	6774916	372
494293	6775299	433	494318	6775206	429
493928	6774915	435	493932	6774913	430
493957	6775687	419	493978	6775658	424
493623	6776229	428	493631	6776221	424
494268	6776397	430	494309	6776268	426
495723	6776764	434	495694	6776326	422
496687	6776738	461	496518	6776375	455
497354	6777090	477	497148	6776898	482
498103	6777686	484	497929	6777549	480
496972	6777772	460	496766	6777525	451
496095	6777789	464	495954	6777486	446
495687	6777359	442	495619	6777005	429
494898	6777120	435	494944	6776864	432
493811	6776981	471	493873	6776917	467
493338	6777651	506	493419	6777617	506
494429	6777758	452	494497	6777614	449
495256	6778098	452	495197	6777817	433
492497	6778140	557	492555	6778115	528
493158	6778352	509	493234	6778320	514
494217	6778307	490	494294	6778221	487
494627	6778492	492	494664	6778384	472
495645	6778529	474	495550	6778275	460
496332	6778557	490	496196	6778298	485
497210	6778480	481	497043	6778242	477
498048	6778424	484	497876	6778237	481
498862	6778261	484	498707	6778164	475
499008	6779938	528	498833	6779778	527
498232	6779245	481	498081	6779043	488
497271	6779504	528	497124	6779280	522
496620	6779481	507	496460	6779263	503
495660	6779219	488	495579	6779031	480
494881	6779135	483	494886	6779051	479
493877	6779098	488	493942	6779064	497
493029	6779087	531	493104	6779057	524
492348	6779301	542	492412	6779281	529
491737	6780009	556	491801	6779993	554
493855	6780404	512	493863	6780397	519
494480	6779872	491	494489	6779861	495
495498	6779753	479	495466	6779638	486

VELOCITY POINT LOCATIONS (continued)

10SEP86			26JAN87		
X	Y	Z	X	Y	Z
495829	6780364	503	495762	6780258	508
496814	6780110	521	496665	6779909	520
497555	6780354	521	497395	6780178	535
497503	6781256	519	497345	6781122	535
498458	6781441	518	498274	6781310	532
498175	6781900	521	498007	6781786	532

VELOCITY POINT LOCATIONS

26JAN87			22AUG87		
X	Y	Z	X	Y	Z
496758	6768690	142	497015	6766669	80
497426	6768738	140	497663	6766531	88
496625	6769186	145	497078	6767349	2
496168	6769875	162	496725	6768209	14
496420	6770379	177	497008	6768733	40
496815	6770607	179	497409	6768987	51
496043	6771255	239	496688	6769612	34
496396	6771493	227	497073	6769880	49
495564	6772406	266	496120	6770744	97
495972	6772567	275	496605	6770957	87
495895	6773030	295	496420	6771442	3
494494	6777188	451	494607	6776672	36
495786	6777409	438	495685	6776491	17
495962	6777967	466	495703	6777160	30
496658	6778157	478	496219	6777431	31
493875	6778000	486	494063	6777822	72
492936	6779160	522	493121	6779104	22
493846	6778622	496	494026	6778510	81
496049	6778685	487	495699	6777960	41
496348	6779130	497	495951	6778456	76
496784	6778654	504	496378	6777972	51
497593	6779066	511	497205	6778461	74
498249	6779330	503	497881	6778800	77
497121	6779596	529	496727	6778988	96

Appendix 2. Location of features used for Columbia Glacier velocity measurements

[The location of each feature is measured on the two indicated dates, shown side by side]

VELOCITY POINT LOCATIONS

22AUG87			26JAN88		
X	Y	Z	X	Y	Z
496972	6767735	114	496970	6766194	72
497369	6767770	104	497353	6766080	63
497518	6768051	119	497573	6766394	72
497004	6768103	117	497100	6766586	78
497457	6768513	123	497636	6766956	86
497773	6769199	162	498066	6767697	94
497204	6769062	151	497507	6767643	95
496594	6768891	124	496958	6767641	97
496528	6769533	137	496914	6768354	119
496964	6769725	146	497346	6768472	116
497520	6769790	163	497881	6768489	121
497205	6770415	163	497621	6769250	155
496666	6770274	152	497069	6769152	136
496211	6770072	148	496633	6768969	108
495896	6770731	168	496370	6769656	129
496365	6770829	194	496826	6769745	130
496746	6771019	183	497187	6769910	141
496556	6771832	187	497017	6770773	164
496084	6771601	237	496580	6770530	164
495555	6771445	241	496042	6770340	165
495438	6772398	264	495824	6771206	213
495959	6772389	236	496358	6771302	216
496232	6772749	273	496538	6771714	178
496713	6772774	284	496976	6771819	183
496377	6773383	312	496463	6772328	212
495652	6774168	316	495478	6773231	295
496721	6774521	321	496716	6773586	327
496259	6775222	370	496314	6774161	341
495758	6774840	370	495656	6773875	317
495230	6774849	359	495157	6774032	267
495765	6775721	404	495911	6774647	341
493977	6775539	419	493972	6775528	411
493848	6776073	418	493868	6776036	410
494086	6776726	447	494141	6776555	426
495662	6776929	435	495708	6776459	418
498066	6777247	474	497781	6777057	465
496115	6777665	449	495959	6777199	422
493578	6777471	485	493710	6777401	478
492996	6777977	508	493127	6777928	503
493665	6778068	492	493808	6777987	478
493385	6778801	499	493523	6778748	494
492902	6778553	513	493036	6778502	498
492823	6779269	515	492941	6779220	511
494581	6779672	487	494596	6779653	489
495872	6778333	465	495684	6777866	428
496576	6778196	468	496240	6777744	440
497109	6778332	469	496843	6777941	447
497897	6778575	479	497636	6778251	468
498470	6778923	475	498239	6778671	474
497301	6779009	504	497083	6778637	481
496276	6778936	484	496062	6778527	467
495813	6780033	500	495687	6779801	473
496691	6780009	522	496464	6779675	505
497391	6779796	529	497160	6779463	520

VELOCITY POINT LOCATIONS

26JAN88			05APR88		
X	Y	Z	X	Y	Z
495083	6768077	149	495083	6768072	148
494332	6767061	147	494326	6767060	140
495263	6766731	105	495261	6766731	104
496863	6766782	63	496767	6765870	47
497313	6766839	85	497198	6765811	61
497989	6766859	88	497881	6765755	62
496851	6767270	68	496817	6766395	62
497449	6767312	84	497425	6766315	65
498103	6767341	88	498103	6766320	75
499669	6766520	86	499658	6766521	83
499654	6767472	105	499645	6767481	93
496896	6767857	115	496963	6766988	71
497422	6767925	99	497520	6767015	76
498034	6767994	103	498102	6767033	88
497812	6768898	137	498015	6768061	96
497239	6768811	137	497428	6767970	93
496708	6768677	115	496884	6767876	100
496441	6769378	110	496678	6768705	109
497048	6769531	132	497276	6768774	119
497635	6769635	150	497852	6768838	126
497309	6770374	156	497549	6769701	144
496703	6770168	146	496948	6769499	130
496194	6769994	143	496470	6769338	104
495942	6770723	186	496259	6770056	123
496427	6770954	197	496713	6770286	141
497006	6771148	182	497288	6770492	152
496801	6772037	176	497064	6771435	179
496108	6771772	212	496407	6771106	185
495495	6771598	232	495768	6770922	195
495222	6772566	257	495315	6771914	221
495731	6772702	289	495885	6772007	236
496458	6772801	271	496577	6772154	185
496643	6773819	318	496632	6773224	319
496017	6773697	334	495939	6773063	297
495393	6773576	292	495292	6772982	272
495444	6774450	312	495345	6773918	287
496081	6774561	327	496028	6773939	326
497917	6774160	284	497915	6774143	286
493918	6773296	257	493914	6773283	247
493681	6771770	245	493686	6771775	231
495778	6774466	318	495688	6773873	320
496441	6774894	328	496488	6774285	333
496112	6775201	362	496199	6774561	333
495347	6775007	359	495365	6774452	309
495070	6775580	391	495191	6775075	375
495553	6775624	408	495678	6775002	376
496437	6775898	419	496540	6775318	356
496832	6775865	422	496894	6774501	335
497303	6775638	361	497331	6775411	333
495782	6776078	406	495880	6775498	387
495877	6776674	412	495845	6776195	410
495211	6776490	409	495257	6776101	426
494480	6776180	420	494524	6776000	436
493753	6775959	406	493762	6775953	419
493809	6776651	439	493827	6776598	443
494330	6776849	440	494377	6776686	438
494820	6777097	430	494868	6776831	435
495713	6777368	426	495663	6777013	426
496545	6777289	429	496344	6776992	434
497775	6777529	465	497580	6777379	495
497182	6777958	452	496989	6777728	452
495922	6778112	454	495798	6777813	444
494746	6777981	443	494799	6777787	444
494168	6777702	457	494258	6777600	453
493598	6777303	476	493675	6777272	483
492987	6777035	503	493004	6777040	503
492886	6777803	504	492955	6777786	502
493200	6778455	488	493285	6778427	503
494056	6778359	476	494142	6778300	485
493554	6779127	483	493630	6779099	486
491992	6780025	523	492051	6780015	524
493598	6780584	512	493605	6780579	513
494626	6779866	477	494634	6779858	493
494703	6778980	467	494775	6778928	470
495485	6778900	458	495415	6778685	461
496322	6778896	483	496186	6778643	480
496957	6778889	501	496815	6778651	498
498047	6778783	471	497897	6778585	473
498446	6778044	468	498284	6777915	491
499256	6779521	516	499094	6779372	505
497977	6779538	506	497838	6779337	511
496726	6779600	509	496587	6779373	506
495536	6779513	464	495465	6779362	477
495988	6780520	493	495895	6780388	498
496932	6780484	528	496795	6780311	525
498413	6781267	532	498231	6781143	535
497370	6782099	523	497287	6782037	511

VELOCITY POINT LOCATIONS

05APR88			04JUN88		
X	Y	Z	X	Y	Z
497016	6766636	71	496943	6765824	62
497598	6766642	74	497510	6765716	47
498177	6767500	80	498231	6766648	72
497580	6767405	81	497590	6766576	89
497011	6767370	75	497018	6766608	68
496809	6768220	98	496958	6767524	79
497371	6768277	101	497500	6767508	74
498017	6768389	100	498128	6767606	88
497757	6769192	138	497949	6768486	119
497151	6769145	137	497344	6768456	106
496516	6768955	99	496722	6768344	98
496434	6769589	108	496645	6769001	111
496924	6769823	109	497134	6769211	135
497523	6769939	125	497743	6769304	133
497214	6770783	151	497446	6770201	148
496595	6770644	155	496839	6770052	127
496002	6770427	153	496303	6769849	129
495680	6771338	214	495948	6770729	187
496207	6771572	210	496478	6770972	178
496841	6771742	178	497073	6771175	179
496571	6772524	243	496772	6772006	155
495971	6772457	246	496171	6771858	216
495437	6772304	244	495589	6771710	220
495386	6773259	284	495359	6772669	256
496013	6773393	311	495991	6772791	261
496608	6773428	335	496637	6772871	276
496737	6774158	323	496747	6773667	318
496316	6773992	335	496263	6773414	316
495883	6774145	316	495784	6773582	308
495188	6774017	269	495075	6773556	258
495235	6774859	364	495225	6774370	289
495924	6774989	368	495944	6774406	315
496522	6775021	342	496610	6774491	313
496917	6775409	345	496986	6775016	319
496970	6775917	432	496996	6775537	355
496517	6776242	448	496547	6775749	406
496361	6775775	412	496483	6775222	356
495674	6775702	399	495795	6775122	368
495258	6775506	413	495366	6774992	374
493768	6775476	431	493765	6775463	414
494810	6775973	431	494870	6775569	420
495687	6776389	417	495722	6775917	404
497073	6776443	486	496952	6776151	452
497914	6776128	503	497899	6776103	492
497984	6776429	480	497929	6776395	496
499747	6776778	519	499739	6776773	519
499271	6777048	500	499226	6777032	508
497607	6777377	469	497420	6777217	470
496621	6777086	446	496437	6776799	443
495809	6777142	425	495723	6776765	423
494703	6776961	440	494746	6776724	432
494164	6776583	433	494184	6776466	422
493298	6776798	512	493317	6776789	499
493803	6777385	495	493877	6777320	472
494533	6777612	451	494602	6777427	445
495700	6777861	447	495615	6777553	421
496185	6777889	455	496048	6777600	436
496934	6777687	448	496726	6777445	441
499656	6778214	500	499562	6778201	491
499292	6778763	484	499138	6778671	470
498489	6778140	480	498340	6778012	479
497777	6778430	485	497614	6778235	482
496889	6778565	499	496742	6778323	478
496010	6778764	499	495887	6778513	472
495358	6778670	478	495299	6778425	460
494789	6778712	487	494814	6778583	471
494139	6778244	501	494217	6778152	485
493089	6777826	540	493157	6777776	527
492503	6777947	538	492553	6777925	521
493613	6778876	500	493675	6778825	482
494589	6779575	482	494594	6779538	480
495600	6779649	475	495521	6779488	467
496321	6779545	508	496184	6779326	503
497298	6779508	526	497151	6779293	529
498704	6779229	485	498553	6779065	476
498618	6779875	527	498446	6779712	513
499629	6779763	564	499462	6779629	547
499436	6781398	546	499259	6781294	529
498138	6782042	522	497979	6781930	523
498051	6780891	512	497883	6780745	521
497031	6781309	528	496908	6781189	526
496833	6780439	533	496693	6780264	524
496172	6780447	496	496067	6780295	499
493482	6780543	512	493486	6780518	520
493717	6779993	491	493729	6779971	494
493044	6779745	508	493085	6779711	494
492779	6779299	520	492842	6779260	520

Appendix 2. Location of features used for Columbia Glacier velocity measurements

[The location of each feature is measured on the two indicated dates, shown side by side]

VELOCITY POINT LOCATIONS

04JUN88			14SEP88		
X	Y	Z	X	Y	Z
496766	6767457	87	496787	6766466	51
497422	6767402	81	497413	6766237	44
498119	6767382	86	498133	6766158	68
498116	6768154	103	498216	6767028	73
497369	6768112	102	497458	6767032	76
496726	6767996	97	496852	6767038	56
496515	6768761	107	496786	6767908	95
497233	6768890	133	497442	6767863	89
497763	6768895	137	497968	6767831	83
497464	6769833	142	497740	6768906	119
497001	6769665	129	497279	6768759	108
496326	6769490	114	496613	6768703	94
495965	6770254	163	496328	6769460	108
496555	6770560	162	496873	6769747	117
497274	6770782	160	497599	6769948	138
496286	6771465	216	496657	6770651	166
495656	6771070	196	496036	6770242	156
495404	6772085	247	495704	6771246	195
496038	6772350	228	496320	6771515	187
495664	6772934	281	495849	6772073	206
495550	6773747	285	495417	6772973	261
496124	6774051	320	496008	6773186	286
495106	6774166	259	494964	6773539	236
495571	6774577	304	495454	6773846	267
496033	6774701	336	495977	6773902	314
495960	6775288	373	496068	6774462	319
495992	6775957	395	496153	6775138	344
495478	6775637	412	495628	6774836	341
494829	6775246	414	494912	6774693	296
494524	6776340	430	494586	6776086	409
495772	6777237	431	495679	6776746	413
497964	6777770	478	497746	6777580	455
498652	6778409	475	498455	6778256	464
499354	6778866	498	499142	6778753	469
498210	6779005	484	498031	6778769	467
496942	6778553	492	496753	6778231	470
496084	6777787	459	495907	6777391	424
495060	6777540	438	495095	6777194	401
494084	6776917	458	494136	6776776	419
494031	6777896	482	494146	6777788	461
493184	6778251	501	493287	6778214	493
493402	6778979	508	493500	6778938	491
494043	6778608	483	494150	6778544	472
495968	6778807	489	495814	6778480	459
497191	6779397	527	497055	6779111	505

VELOCITY POINT LOCATIONS

14SEP88			12MAR89		
X	Y	Z	X	Y	Z
499749	6766486	75	499737	6766491	70
499374	6769449	117	499374	6769441	109
496906	6769286	126	497310	6767259	69
496111	6769848	141	496715	6768241	89
495703	6770521	153	496388	6769005	106
496463	6770869	179	497069	6769216	117
496864	6770539	135	497437	6768821	114
496980	6771120	163	497623	6769437	136
495582	6771550	215	496250	6769947	119
496070	6771821	193	496760	6770223	108
495810	6772287	222	496458	6770661	143
495236	6772248	231	495769	6770711	161
495503	6773051	281	495942	6771426	202
495570	6774034	299	495419	6772408	232
493698	6772708	229	493710	6772710	237
494649	6777038	421	494758	6776507	409
494083	6776993	456	494222	6776738	431
493795	6777388	464	493983	6777239	444
493355	6777800	491	493546	6777721	475
495807	6777846	434	495610	6777089	404
496202	6778638	466	495908	6778016	440
496752	6779475	499	496434	6778946	480
497803	6779647	504	497475	6779170	499
499061	6779564	515	498707	6779209	461
498325	6778997	466	497997	6778582	459
497200	6778771	481	496877	6778219	451
494598	6779603	480	494630	6779550	473
493278	6778989	499	493447	6778932	486
492601	6779297	516	492766	6779247	514

VELOCITY POINT LOCATIONS

12MAR89			26JUN89		
X	Y	Z	X	Y	Z
499163	6770056	136	499155	6770047	125
497211	6769575	112	497592	6768268	71
496954	6770091	115	497352	6768842	113
495908	6770573	148	496440	6769427	87
496106	6771267	201	496614	6770080	118
496070	6771831	206	496585	6770663	151
496051	6772622	240	496455	6771472	188
495720	6771696	218	496220	6770511	153
496059	6777801	438	495858	6777273	408
496086	6778411	464	495855	6777910	446
496987	6779122	501	496730	6778713	467
497865	6778673	463	497598	6778314	443
498008	6779309	488	497764	6778951	470
499187	6779987	518	498868	6779727	507

Appendix 2. Location of features used for Columbia Glacier velocity measurements
[The location of each feature is measured on the two indicated dates, shown side by side]

VELOCITY POINT LOCATIONS

26JUN89			22MAY90		
X	Y	Z	X	Y	Z
496389	6778882	475	495826	6777630	411
497158	6779303	498	496537	6778218	435
497084	6779966	512	496451	6778962	453
497377	6780282	513	496723	6779355	491
498116	6779507	494	497502	6778576	446
498589	6779846	496	497943	6779014	438

VELOCITY POINT LOCATIONS

22MAY90			07SEP90		
X	Y	Z	X	Y	Z
499006	6770269	80	499014	6770267	105
497041	6769310	69	497349	6768049	49
496480	6769628	40	496818	6768480	57
496985	6769915	65	497337	6768737	80
496743	6770647	96	497154	6769557	83
496303	6770469	94	496706	6769379	76
495567	6771415	153	496074	6770328	88
496078	6771600	172	496575	6770529	99
495688	6772403	190	496118	6771338	151
493842	6777380	451	493975	6777271	431
493697	6778671	476	493824	6778617	447
496250	6777756	414	496044	6777298	398
496100	6778608	450	495909	6778189	429
496780	6778856	468	496549	6778474	451
497414	6778894	466	497204	6778535	447
498163	6779542	464	497931	6779243	462
497056	6779766	508	496834	6779433	480
496411	6779380	468	496199	6779018	461

VELOCITY POINT LOCATIONS

07SEP90			21NOV90		
X	Y	Z	X	Y	Z
499386	6769090	65	499388	6769106	76
497699	6769129	98	497886	6768350	52
497061	6769066	78	497273	6768317	39
496390	6768775	51	496618	6768125	40
496266	6769347	61	496475	6768748	54
496839	6769634	79	497058	6768976	72
497476	6769921	84	497682	6769283	90
498748	6770916	115	498753	6770920	117
497205	6770524	105	497440	6769893	80
496574	6770267	79	496833	6769674	57
495966	6770054	100	496232	6769460	62
495677	6770756	115	496005	6770166	100
496220	6771027	156	496507	6770421	107
496806	6771233	126	497070	6770653	103
497417	6771929	130	497555	6771617	132
495966	6771720	187	496252	6771119	155
495381	6771579	167	495651	6771018	136
495201	6772313	192	495340	6771766	176
495871	6772426	191	496040	6771841	162
496664	6772654	216	496825	6772109	113
496788	6773644	273	496800	6773171	274
496126	6773430	271	496096	6772864	241
496161	6774337	278	496099	6773794	280
495528	6774219	259	495395	6773762	228
493200	6772728	230	493209	6772737	232
493959	6773338	201	493964	6773340	202
495029	6773609	230	494929	6773201	246
495453	6774839	313	495416	6774353	262
496273	6774930	299	496331	6774394	277
497662	6774909	259	497666	6774895	269
496108	6775748	358	496237	6775197	329
495604	6775524	356	495724	6774990	340
494325	6776104	381	494359	6776010	389
494883	6776730	390	494920	6776495	395
495677	6777073	378	495627	6776762	370
496625	6777008	413	496449	6776759	400
497433	6776608	439	497412	6776563	448
497972	6776017	462	497971	6776025	468
499356	6776410	477	499348	6776416	484
499790	6778004	459	499705	6777982	457
498672	6777189	450	498587	6777160	444
498967	6778331	425	498841	6778261	430
497816	6777646	432	497658	6777520	432
497124	6777451	420	496937	6777264	421
496399	6777860	416	496295	6777625	407
494762	6777733	397	494822	6777563	395
494155	6777007	416	494224	6776908	417
493543	6777577	469	493621	6777546	448
492892	6778374	490	492965	6778357	487
493154	6779016	472	493231	6778998	478
494474	6778615	441	494525	6778532	439
494645	6779688	460	494655	6779678	451
495101	6779434	441	495062	6779365	445
495830	6778324	430	495738	6778082	414
496553	6778806	458	496436	6778590	451
497600	6778560	439	497483	6778379	432
498367	6779190	435	498245	6779046	437
499336	6779569	489	499198	6779451	484
497307	6779832	491	497182	6779659	488
496577	6780447	481	496466	6780307	483

Appendix 2. Location of features used for Columbia Glacier velocity measurements
[The location of each feature is measured on the two indicated dates, shown side by side]

VELOCITY POINT LOCATIONS

21NOV90			22MAR91		
X	Y	Z	X	Y	Z
496767	6770153	63	497272	6768526	101
496094	6770389	98	496684	6768869	100
496629	6770643	104	497169	6769086	101
496223	6771149	143	496826	6769636	101
495619	6771377	166	496320	6769912	100
495988	6778051	419	495840	6777479	363
496528	6779150	458	496361	6778725	424

VELOCITY POINT LOCATIONS

22MAR91			22MAY91		
X	Y	Z	X	Y	Z
497481	6768945	65	497701	6767949	49
496733	6769292	60	496984	6768392	56
497114	6769741	80	497371	6768826	74
496337	6770514	97	496658	6769672	60
495973	6771408	169	496337	6770575	97

VELOCITY POINT LOCATIONS

22MAY91			27JUL91		
X	Y	Z	X	Y	Z
498047	6768554	65	498294	6767572	41
497088	6768583	60	497298	6767626	30
496966	6769048	68	497201	6768120	32
496789	6769595	65	497056	6768727	59
496628	6770123	64	496912	6769302	77
495865	6769866	97	496182	6769111	60
495784	6770485	120	496158	6769697	70
496406	6770733	121	496739	6769914	51
496958	6770919	115	497286	6770090	96
496868	6771570	110	497230	6770782	102
496209	6771371	175	496580	6770549	101
495541	6771173	170	495921	6770335	91
496137	6771838	194	496485	6770998	119
496067	6772399	213	496366	6771578	150
496041	6773058	290	496133	6772218	157
495323	6772972	266	495350	6772143	186
495621	6773495	269	495562	6772766	226
495096	6773832	241	494932	6773229	213
496138	6774005	310	495988	6773217	269
495761	6774249	291	495610	6773542	264
495134	6774592	264	495011	6774033	187
495795	6774702	307	495688	6773985	247
495667	6775263	368	495728	6774507	276
496250	6775691	356	496414	6774954	294
495587	6775831	379	495752	6775102	341
496013	6776904	383	495917	6776428	380
494600	6777259	419	494676	6777023	405
495798	6777392	400	495688	6776996	376
496613	6777484	409	496385	6777173	386
497135	6778019	435	496917	6777764	409
497756	6778467	445	497566	6778242	433
498578	6778784	457	498418	6778628	435
495992	6778053	441	495845	6777719	398
496408	6778683	470	496254	6778394	445
497008	6779223	499	496847	6778966	474
497740	6779773	504	497585	6779559	477
494395	6777781	428	494482	6777627	421
493996	6778386	459	494078	6778329	449
493472	6778816	483	493559	6778775	477
492820	6779207	502	492893	6779182	483

Appendix 2. Location of features used for Columbia Glacier velocity measurements
[The location of each feature is measured on the two indicated dates, shown side by side]

VELOCITY POINT LOCATIONS					
27JUL91			11OCT91		
X	Y	Z	X	Y	Z
496642	6769166	58	497002	6768349	44
497165	6769406	74	497503	6768527	24
496765	6769540	52	497096	6768712	46
496470	6769694	33	496801	6768886	30
496986	6769937	71	497309	6769120	40
496574	6770192	80	496919	6769394	54
496138	6770401	107	496540	6769597	40
496720	6770628	82	497063	6769829	45
496281	6770899	121	496690	6770112	42
495880	6771200	166	496317	6770403	85
496481	6771437	149	496865	6770608	90
495989	6771755	187	496390	6770942	120
495423	6771983	190	495757	6771226	146
496199	6772283	169	496550	6771557	110
495808	6772371	183	496091	6771558	148
495442	6772707	227	495594	6771936	166
496079	6773168	238	496229	6772364	148
495425	6773807	238	495318	6773210	189
495582	6774494	282	495509	6773899	217
496087	6774562	282	496075	6773915	238
495851	6775647	364	495808	6775437	324
495031	6775867	387	495144	6775594	334
494888	6776412	383	494998	6776127	354
494770	6776968	403	494859	6776726	375
495749	6777087	385	495760	6776734	369
496644	6777131	406	496480	6776828	388
497097	6777650	413	496925	6777419	410
497608	6778106	431	497476	6777892	416
498272	6778344	437	498171	6778175	427
498844	6778629	430	498720	6778494	446
494680	6777527	391	494796	6777324	377
495819	6777785	406	495769	6777466	372
496115	6778390	441	496044	6778108	413
496536	6778964	455	496448	6778714	453
497153	6779457	488	497054	6779228	464
497849	6779873	478	497758	6779669	471
498631	6780121	491	498500	6779953	488
494415	6778099	437	494531	6777948	413
493865	6778626	445	493990	6778562	422
493236	6778944	471	493356	6778893	451
492569	6779179	491	492676	6779142	463

Appendix 3. Columbia Glacier terminus points

[These points are listed in the order in which they occur along the terminus, beginning on the west side]

TERMINUS POINTS 21JAN83	
X	Y
494928	6764057
495009	6764130
495094	6764168
495183	6764168
495252	6764087
495273	6763998
495284	6763908
495293	6763817
495295	6763727
495271	6763633
495250	6763540
495244	6763448
495255	6763359
495250	6763266
495244	6763175
495222	6763080
495225	6762990
495263	6762903
495321	6762819
495355	6762733
495411	6762650
495500	6762655
495591	6762656
495688	6762598
495771	6762645
495857	6762682
495939	6762739
496025	6762771
496110	6762810
496196	6762847
496283	6762885
496371	6762913
496462	6762930
496556	6762904
496649	6762889
496741	6762878
496832	6762886
496921	6762900
497014	6762882
497105	6762899
497192	6762927
497270	6763028
497359	6763047
497445	6763086
497531	6763122
497617	6763165
497707	6763171
497800	6763178
497890	6763189
497983	6763182
498073	6763206
498160	6763238
498248	6763268
498335	6763305
498429	6763287
498515	6763337
498606	6763353
498694	6763385
498784	6763405
498877	6763415
498958	6763511
499047	6763543
499138	6763554
499235	6763515
499326	6763536
499416	6763565
499504	6763596
499591	6763641
499672	6763739
499761	6763658
499810	6763572
499733	6763506

TERMINUS POINTS 07MAR83	
X	Y
495229	6764119
495254	6764033
495266	6763945
495272	6763854
495277	6763766
495274	6763675
495265	6763585
495217	6763490
495231	6763402
495240	6763314
495232	6763224
495229	6763133
495229	6763042
495238	6762953
495257	6762866
495302	6762782
495349	6762698
495443	6762648
495531	6762649
495623	6762632
495713	6762628
495801	6762633
495889	6762654
495977	6762675
496063	6762696
496153	6762688
496242	6762682
496329	6762698
496417	6762703
496511	6762669
496599	6762674
496684	6762708
496765	6762776
496849	6762816
496931	6762874
497018	6762893
497106	6762902
497195	6762899
497284	6762899
497364	6762974
497452	6763000
497539	6763022
497625	6763044
497711	6763075
497797	6763100
497883	6763127
497972	6763130
498062	6763124
498148	6763153
498233	6763187
498316	6763244
498402	6763267
498489	6763296
498575	6763336
498662	6763353
498745	6763406
498837	6763387
498890	6763483
498974	6763553
499062	6763566
499148	6763589
499242	6763561
499334	6763535
499422	6763549
499508	6763583
499590	6763647
499664	6763744
499745	6763665
499800	6763583
499725	6763499

TERMINUS POINTS 07APR83	
X	Y
494947	6764034
495018	6764097
495094	6764147
495179	6764168
495253	6764099
495273	6764012
495272	6763919
495283	6763831
495287	6763740
495276	6763643
495257	6763542
495229	6763440
495233	6763348
495237	6763255
495245	6763165
495238	6763070
495238	6762978
495252	6762891
495277	6762807
495329	6762731
495386	6762657
495490	6762630
495592	6762598
495685	6762599
495781	6762587
495871	6762589
495971	6762569
496058	6762582
496146	6762594
496243	6762583
496325	6762614
496420	6762605
496525	6762567
496613	6762579
496688	6762633
496767	6762674
496845	6762716
496929	6762741
497018	6762752
497107	6762763
497193	6762783
497283	6762788
497363	6762833
497436	6762892
497519	6762933
497597	6762981
497672	6763040
497751	6763081
497836	6763109
497925	6763122
498019	6763121
498126	6763078
498209	6763110
498284	6763167
498361	6763219
498458	6763203
498540	6763240
498616	6763292
498693	6763344
498773	6763384
498870	6763376
498892	6763476
498968	6763532
499057	6763544
499142	6763570
499240	6763561
499347	6763519
499436	6763531
499524	6763553
499601	6763606
499649	6763714
499745	6763704
499771	6763619
499785	6763530
499740	6763495

TERMINUS POINTS 17JUN83	
X	Y
494932	6764063
495011	6764149
495101	6764171
495199	6764149
495229	6764059
495218	6763964
495251	6763876
495264	6763783
495227	6763682
495209	6763585
495193	6763487
495172	6763390
495188	6763298
495204	6763206
495222	6763114
495197	6763015
495199	6762921
495217	6762831
495272	6762747
495353	6762666
495460	6762592
495564	6762538
495666	6762491
495753	6762536
495838	6762585
495930	6762608
496023	6762618
496117	6762617
496218	6762583
496307	6762505
496404	6762493
496507	6762449
496603	6762441
496700	6762423
496798	6762398
496895	6762386
496987	6762404
497078	6762419
497163	6762475
497192	6762575
497247	6762679
497329	6762753
497421	6762765
497506	6762821
497585	6762903
497654	6763010
497736	6763081
497823	6763126
497908	6763177
497994	6763226
498085	6763259
498176	6763274
498268	6763286
498368	6763254
498463	6763246
498550	6763288
498639	6763315
498723	6763369
498816	6763381
498879	6763486
498964	6763552
499057	6763560
499146	6763592
499242	6763585
499344	6763536
499439	6763542
499532	6763547
499610	6763632
499686	6763734
499755	6763652
499804	6763568
499740	6763536

TERMINUS POINTS 19AUG83	
X	Y
494951	6764105
495034	6764161
495119	6764200
495211	6764184
495305	6764105
495279	6764010
495260	6763917
495298	6763831
495317	6763742
495266	6763646
495211	6763547
495210	6763455
495204	6763363
495231	6763274
495261	6763186
495274	6763095
495282	6763005
495275	6762914
495295	6762826
495344	6762741
495412	6762658
495508	6762597
495597	6762611
495684	6762644
495770	6762679
495858	6762705
495953	6762664
496045	6762646
496133	6762666
496217	6762708
496302	6762752
496388	6762799
496479	6762794
496570	6762781
496659	6762791
496750	6762780
496839	6762790
496928	6762808
497016	6762829
497106	6762833
497193	6762857
497274	6762939
497357	6763003
497442	6763064
497523	6763144
497603	6763240
497688	6763283
497775	6763313
497864	6763329
497953	6763336
498043	6763337
498135	6763320
498228	6763303
498317	6763322
498414	6763262
498500	6763314
498582	6763402
498672	6763406
498764	6763403
498850	6763448
498931	6763543
499014	6763608
499109	6763572
499195	6763620
499285	6763629
499377	6763610
499473	6763568
499560	6763603
499632	6763702
499717	6763762
499743	6763674
499807	6763591
499786	6763552

TERMINUS POINTS 16SEP83	
X	Y
494928	6764057
494998	6764162
495088	6764180
495176	6764212
495269	6764140
495337	6764061
495301	6763955
495310	6763863
495325	6763772
495319	6763677
495249	6763573
495236	6763476
495234	6763381
495259	6763292
495289	6763205
495317	6763118
495325	6763025
495331	6762932
495342	6762839
495358	6762747
495416	6762667
495517	6762637
495596	6762703
495686	6762724
495775	6762746
495862	6762779
495955	6762791
496041	6762824
496117	6762903
496195	6762972
496274	6763042
496365	6763070
496451	6763100
496539	6763126
496628	6763147
496721	6763165
496811	6763187
496906	6763184
496996	6763198
497087	6763215
497178	6763232
497269	6763244
497361	6763256
497455	6763256
497554	6763239
497640	6763273
497731	6763285
497823	6763300
497913	6763321
498002	6763341
498093	6763354
498188	6763348
498284	6763338
498386	6763299
498469	6763367
498546	6763438
498628	6763484
498715	6763511
498809	6763515
498900	6763529
498983	6763574
499069	6763604
499159	6763619
499248	6763637
499341	6763637
499444	6763596
499538	6763596
499618	6763654
499651	6763757
499742	6763769
499755	6763678
499812	6763597
499820	6763560

Appendix 3. Columbia Glacier terminus points

[These points are listed in the order in which they occur along the terminus, beginning on the west side]

TERMINUS POINTS 06NOV83

X	Y
494817	6764094
494850	6764188
494899	6764104
494982	6764174
495071	6764194
495156	6764246
495247	6764259
495341	6764259
495374	6764171
495370	6764080
495324	6763983
495342	6763895
495372	6763808
495360	6763717
495333	6763622
495304	6763523
495275	6763428
495292	6763340
495319	6763252
495343	6763164
495371	6763075
495400	6762987
495404	6762896
495504	6762848
495587	6762905
495669	6762984
495753	6763036
495841	6763071
495924	6763129
496007	6763194
496094	6763221
496187	6763222
496274	6763250
496364	6763262
496450	6763300
496539	6763317
496627	6763349
496714	6763381
496804	6763399
496894	6763414
496979	6763456
497068	6763474
497159	6763479
497250	6763489
497341	6763497
497431	6763498
497523	6763497
497613	6763507
497706	6763487
497788	6763409
497861	6763329
497962	6763254
498062	6763191
498146	6763242
498224	6763327
498302	6763406
498378	6763506
498463	6763543
498545	6763597
498626	6763662
498716	6763662
498813	6763623
498911	6763578
498998	6763610
499084	6763633
499168	6763677
499256	6763686
499347	6763689
499439	6763679
499533	6763658
499609	6763748
499684	6763844
499783	6763779
499758	6763685
499812	6763602
499759	6763525

TERMINUS POINTS 08DEC83

X	Y
494932	6764067
494969	6764163
495057	6764201
495144	6764248
495231	6764289
495323	6764288
495388	6764204
495381	6764112
495344	6764016
495355	6763926
495376	6763837
495390	6763746
495368	6763652
495343	6763558
495307	6763462
495293	6763369
495293	6763277
495387	6763259
495397	6763169
495487	6763184
495577	6763209
495668	6763218
495760	6763228
495852	6763226
495944	6763239
496037	6763226
496130	6763227
496229	6763166
496322	6763152
496416	6763149
496507	6763157
496595	6763195
496682	6763241
496768	6763298
496856	6763334
496945	6763358
497031	6763405
497121	6763422
497212	6763431
497301	6763460
497391	6763467
497482	6763475
497571	6763501
497660	6763530
497750	6763540
497841	6763544
497931	6763558
498021	6763567
498113	6763564
498203	6763582
498292	6763604
498379	6763649
498468	6763665
498562	6763659
498653	6763656
498744	6763659
498838	6763628
498936	6763568
499023	6763607
499111	6763643
499197	6763688
499290	6763719
499380	6763726
499469	6763752
499556	6763784
499640	6763835
499728	6763864
499810	6763780
499760	6763685
499824	6763600
499743	6763507
499739	6763504

TERMINUS POINTS 20JAN84

X	Y
495427	6763463
495511	6763392
495595	6763320
495691	6763275
495780	6763274
495871	6763253
495963	6763233
496056	6763208
496156	6763148
496240	6763170
496325	6763186
496411	6763212
496503	6763190
496595	6763171
496683	6763185
496768	6763215
496854	6763232
496938	6763260
497022	6763283
497110	6763290
497197	6763294
497280	6763323
497357	6763391
497438	6763430
497522	6763454
497606	6763478
497691	6763509
497780	6763512
497869	6763531
497960	6763521
498047	6763533
498136	6763531
498224	6763539
498305	6763582
498391	6763601
498477	6763623
498563	6763641
498656	6763630
498744	6763653
498839	6763620
498876	6763538
498963	6763552
499048	6763581
499131	6763617
499205	6763715
499287	6763747
499372	6763774
499458	6763797
499541	6763832
499624	6763867
499714	6763865
499794	6763792
499784	6763701
499806	6763618
499768	6763525
499767	6763523
499737	6763429
499686	6763330
499781	6763306
499864	6763340
499893	6763375

TERMINUS POINTS 12MAR84

X	Y
494949	6764159
495037	6764182
495125	6764200
495176	6764293
495268	6764259
495357	6764279
495367	6764187
495372	6764097
495337	6764004
495318	6763913
495318	6763821
495321	6763731
495298	6763639
495352	6763553
495398	6763465
495443	6763378
495539	6763318
495632	6763265
495726	6763255
495819	6763231
495909	6763234
496000	6763245
496093	6763210
496185	6763222
496276	6763233
496367	6763241
496460	6763206
496552	6763187
496647	6763142
496742	6763086
496835	6763073
496927	6763057
497022	6763021
497108	6763087
497195	6763174
497290	6763230
497379	6763271
497469	6763303
497564	6763297
497661	6763304
497753	6763320
497844	6763327
497936	6763318
498032	6763322
498123	6763328
498215	6763333
498307	6763376
498406	6763420
498497	6763452
498591	6763506
498680	6763547
498769	6763571
498871	6763539
498963	6763546
499055	6763560
499142	6763610
499213	6763708
499305	6763749
499395	6763796
499485	6763836
499575	6763858
499668	6763878
499765	6763823
499796	6763735
499789	6763641
499797	6763550
499761	6763533
499761	6763532
499723	6763438
499684	6763345
499781	6763297
499868	6763341
499955	6763416
500048	6763421
500064	6763433

TERMINUS POINTS 24APR84

X	Y
494957	6764155
495040	6764177
495123	6764196
495176	6764292
495270	6764244
495353	6764264
495369	6764179
495360	6764091
495329	6763999
495296	6763908
495308	6763822
495298	6763732
495283	6763643
495299	6763558
495339	6763476
495355	6763391
495411	6763311
495505	6763237
495595	6763212
495690	6763149
495781	6763122
495872	6763099
495963	6763078
496050	6763075
496136	6763086
496221	6763102
496308	6763112
496396	6763116
496489	6763079
496577	6763081
496599	6762996
496697	6762930
496790	6762893
496884	6762849
496973	6762852
497054	6762902
497139	6762940
497221	6762983
497297	6763073
497384	6763099
497467	6763139
497550	6763174
497633	6763212
497721	6763219
497813	6763203
497905	6763181
497999	6763151
498091	6763163
498180	6763164
498270	6763157
498350	6763233
498432	6763284
498510	6763360
498593	6763410
498674	6763479
498760	6763513
498849	6763519
498940	6763515
499027	6763528
499111	6763567
499193	6763636
499273	6763713
499358	6763750
499441	6763800
499529	6763829
499616	6763853
499704	6763861
499795	6763782
499780	6763691
499811	6763606
499732	6763528
499717	6763497
499716	6763499
499718	6763410
499688	6763316
499781	6763302
499867	6763335
499949	6763390
499971	6763395

TERMINUS POINTS 28JUN84

X	Y
494950	6764156
495040	6764187
495128	6764225
495211	6764304
495309	6764277
495364	6764191
495339	6764093
495304	6763995
495273	6763897
495278	6763804
495284	6763711
495239	6763612
495273	6763521
495294	6763430
495331	6763342
495436	6763266
495532	6763187
495536	6763095
495639	6763033
495747	6762957
495841	6762960
495931	6762982
496019	6763020
496110	6763028
496204	6763025
496303	6763030
496395	6763036
496488	6763032
496577	6763057
496668	6763073
496750	6763144
496842	6763171
496933	6763186
497021	6763221
497102	6763306
497183	6763389
497267	6763457
497355	6763492
497445	6763508
497534	6763525
497627	6763521
497725	6763488
497826	6763421
497927	6763366
498019	6763366
498107	6763391
498199	6763382
498300	6763313
498392	6763304
498470	6763403
498561	6763410
498646	6763448
498736	6763456
498823	6763480
498907	6763523
499002	6763513
499087	6763557
499171	6763600
499253	6763663
499337	6763708
499417	6763782
499502	6763823
499591	6763836
499682	6763843
499782	6763771
499776	6763689
499775	6763689
499811	6763602
499731	6763524
499727	6763431
499679	6763333
499772	6763305
499834	6763317

Appendix 3. Columbia Glacier terminus points

[These points are listed in the order in which they occur along the terminus, beginning on the west side]

TERMINUS POINTS 15AUG84	
X	Y
494918	6764132
494998	6764205
495093	6764225
495169	6764318
495276	6764292
495369	6764317
495401	6764225
495388	6764122
495362	6764015
495340	6763908
495327	6763802
495326	6763701
495306	6763595
495298	6763494
495359	6763410
495476	6763345
495582	6763271
495619	6763180
495728	6763141
495827	6763148
495917	6763188
496025	6763156
496117	6763186
496208	6763218
496283	6763312
496368	6763377
496457	6763413
496548	6763454
496637	6763497
496722	6763559
496811	6763598
496902	6763636
496995	6763665
497076	6763742
497151	6763838
497229	6763920
497319	6763957
497413	6763991
497508	6764009
497607	6764012
497710	6763996
497812	6763986
497918	6763959
498025	6763887
498132	6763854
498241	6763814
498352	6763767
498455	6763749
498567	6763700
498677	6763654
498779	6763645
498890	6763574
498983	6763595
499084	6763590
499160	6763680
499241	6763749
499324	6763815
499414	6763852
499503	6763889
499600	6763892
499701	6763887
499812	6763838
499829	6763743
499793	6763707
499792	6763708
499794	6763610
499720	6763509
499696	6763404
499713	6763310
499814	6763316
499900	6763369
499988	6763417
500081	6763438
500158	6763523
500241	6763582
500331	6763618
500409	6763666

TERMINUS POINTS 07NOV85	
X	Y
495139	6764301
495211	6764399
495268	6764320
495350	6764370
495433	6764401
495478	6764499
495513	6764592
495571	6764690
495649	6764756
495734	6764769
495825	6764753
495909	6764783
496008	6764721
496102	6764688
496194	6764672
496282	6764682
496373	6764667
496458	6764704
496541	6764732
496627	6764751
496713	6764769
496801	6764777
496868	6764701
496964	6764666
497052	6764666
497143	6764655
497235	6764641
497326	6764634
497419	6764616
497511	6764596
497607	6764570
497702	6764533
497801	6764476
497902	6764407
497954	6764327
498024	6764251
498121	6764201
498205	6764232
498283	6764293
498373	6764294
498468	6764270
498562	6764239
498663	6764169
498723	6764088
498748	6764003
498776	6763919
498809	6763836
498829	6763751
498825	6763661
498912	6763587
499001	6763586
499094	6763568
499139	6763666
499116	6763753
499137	6763847
499181	6763944
499258	6764028
499342	6764067
499424	6764113
499508	6764139
499596	6764155
499691	6764129
499771	6764054
499786	6763967
499768	6763875
499866	6763827
499870	6763738
499786	6763703
499774	6763683

TERMINUS POINTS 16JAN86	
X	Y
495107	6764286
495161	6764385
495247	6764424
495262	6764336
495345	6764397
495432	6764425
495432	6764515
495455	6764609
495535	6764681
495621	6764716
495716	6764695
495809	6764683
495899	6764690
495995	6764658
496094	6764604
496196	6764529
496290	6764511
496345	6764429
496446	6764358
496536	6764367
496633	6764334
496726	6764318
496816	6764317
496907	6764310
497000	6764292
497094	6764268
497186	6764252
497279	6764237
497372	6764221
497464	6764206
497556	6764188
497649	6764173
497739	6764180
497831	6764171
497926	6764134
498022	6764083
498115	6764059
498202	6764069
498294	6764069
498386	6764058
498476	6764062
498573	6764043
498666	6764011
498758	6763991
498849	6763976
498888	6763892
498881	6763802
498887	6763713
498976	6763638
499069	6763612
499105	6763706
499075	6763792
499111	6763886
499176	6763985
499236	6764082
499316	6764138
499399	6764180
499484	6764204
499569	6764217
499660	6764200
499755	6764155
499812	6764075
499791	6763984
499756	6763890
499850	6763850
499907	6763768
499828	6763710
499745	6763680
499741	6763678

TERMINUS POINTS 24MAR86	
X	Y
495091	6764244
495139	6764347
495215	6764421
495278	6764341
495355	6764408
495431	6764482
495466	6764581
495549	6764622
495646	6764599
495742	6764578
495828	6764610
495915	6764631
496018	6764586
496114	6764512
496172	6764433
496274	6764408
496319	6764326
496420	6764255
496521	6764209
496628	6764140
496724	6764129
496818	6764123
496923	6764063
497020	6764036
497107	6764064
497195	6764087
497288	6764079
497383	6764071
497479	6764051
497578	6764023
497678	6763983
497769	6763991
497868	6763955
497951	6763880
498047	6763866
498121	6763946
498194	6764042
498278	6764077
498377	6764048
498474	6764029
498572	6764005
498668	6763997
498764	6763980
498858	6763907
498902	6763825
498873	6763726
498969	6763654
499069	6763616
499112	6763716
499089	6763805
499125	6763906
499158	6764007
499233	6764088
499319	6764129
499400	6764185
499487	6764207
499574	6764233
499671	6764214
499774	6764161
499822	6764080
499803	6763984
499766	6763882
499865	6763856
499920	6763776
499838	6763719
499808	6763710

TERMINUS POINTS 13JUN86	
X	Y
494989	6764222
495083	6764233
495122	6764331
495209	6764408
495270	6764319
495358	6764393
495447	6764452
495533	6764542
495627	6764565
495719	6764584
495813	6764595
495911	6764575
496011	6764523
496115	6764453
496214	6764429
496293	6764343
496391	6764296
496486	6764290
496581	6764282
496676	6764198
496776	6764170
496871	6764086
496958	6764001
497059	6763917
497156	6763892
497249	6763895
497347	6763895
497442	6763889
497541	6763841
497638	6763823
497736	6763782
497836	6763739
497933	6763697
498034	6763630
498098	6763731
498195	6763692
498267	6763794
498280	6763890
498381	6763823
498469	6763887
498573	6763864
498669	6763846
498766	6763807
498783	6763714
498879	6763673
498976	6763628
499072	6763602
499123	6763702
499111	6763794
499136	6763890
499192	6763989
499278	6764064
499365	6764119
499450	6764183
499541	6764210
499633	6764220
499727	6764199
499819	6764115
499806	6764021
499776	6763925
499876	6763849
499910	6763760
499842	6763728
499842	6763728
499753	6763689
499809	6763603
499726	6763515
499719	6763422
499682	6763323
499777	6763300
499867	6763336
499906	6763385

TERMINUS POINTS 10SEP86	
X	Y
495105	6764292
495167	6764395
495251	6764462
495285	6764374
495369	6764439
495420	6764540
495498	6764646
495548	6764746
495630	6764825
495715	6764885
495806	6764901
495892	6764952
495982	6764971
496078	6764953
496174	6764947
496267	6764954
496356	6764982
496446	6765013
496535	6765042
496624	6765067
496714	6765096
496803	6765130
496893	6765149
496987	6765146
497084	6765120
497185	6765070
497283	6765041
497383	6764998
497481	6764961
497583	6764911
497679	6764829
497700	6764738
497804	6764669
497907	6764598
498003	6764518
498104	6764467
498204	6764424
498302	6764345
498404	6764284
498504	6764236
498602	6764157
498700	6764128
498800	6764077
498850	6763991
498907	6763905
498935	6763815
498952	6763724
498997	6763637
499091	6763633
499087	6763727
499094	6763821
499104	6763916
499172	6764020
499251	6764124
499336	6764186
499422	6764233
499511	6764259
499603	6764274
499698	6764271
499798	6764231
499849	6764144
499841	6764050
499793	6763949
499768	6763852
499860	6763866
499926	6763782
499843	6763713
499751	6763696
499808	6763611
499793	6763559
499792	6763559
499710	6763481
499692	6763386
499746	6763300
499826	6763318

Appendix 3. Columbia Glacier terminus points

[These points are listed in the order in which they occur along the terminus, beginning on the west side]

TERMINUS POINTS 26JAN87	
X	Y
495071	6764298
495156	6764366
495218	6764456
495304	6764515
495313	6764427
495274	6764336
495359	6764415
495388	6764506
495420	6764596
495439	6764686
495456	6764775
495463	6764864
495461	6764952
495504	6765043
495588	6765135
495675	6765168
495763	6765163
495851	6765165
495942	6765117
496031	6765121
496117	6765153
496203	6765220
496291	6765280
496379	6765293
496467	6765298
496554	6765322
496643	6765318
496731	6765315
496821	6765324
496911	6765334
497001	6765333
497089	6765331
497179	6765332
497272	6765319
497360	6765312
497451	6765283
497540	6765253
497633	6765197
497725	6765146
497816	6765111
497906	6765072
497998	6764999
498091	6764922
498181	6764837
498273	6764774
498362	6764752
498451	6764667
498542	6764635
498633	6764606
498723	6764575
498815	6764518
498905	6764482
498996	6764455
499084	6764469
499173	6764458
499262	6764445
499351	6764429
499440	6764433
499529	6764430
499619	6764413
499710	6764402
499800	6764386
499891	6764328
499951	6764242
499938	6764152
499855	6764060
499807	6763969
499782	6763879
499871	6763874
499959	6763884
500049	6763870
500138	6763851
500052	6763786
499964	6763749
499878	6763724
499789	6763714
499803	6763626
499821	6763595
499820	6763595
499735	6763522
499739	6763433
499693	6763342
499784	6763291
499871	6763337
499882	6763346

TERMINUS POINTS 22AUG87	
X	Y
494965	6764191
495040	6764287
495133	6764379
495226	6764474
495320	6764517
495312	6764422
495271	6764327
495346	6764422
495386	6764517
495430	6764611
495439	6764705
495461	6764800
495465	6764896
495461	6764990
495532	6765085
495627	6765027
495721	6765040
495816	6764999
495911	6764986
496005	6765003
496098	6765075
496192	6765164
496286	6765216
496379	6765235
496474	6765256
496568	6765295
496663	6765316
496758	6765326
496852	6765321
496947	6765316
497041	6765314
497136	6765237
497231	6765215
497325	6765184
497419	6765145
497514	6765114
497610	6765050
497707	6764985
497777	6764891
497867	6764799
497962	6764805
498056	6764796
498151	6764773
498245	6764701
498340	6764631
498435	6764609
498528	6764619
498623	6764593
498717	6764563
498812	6764521
498907	6764430
499001	6764402
499098	6764358
499191	6764398
499284	6764473
499378	6764516
499471	6764580
499564	6764621
499657	6764622
499753	6764585
499847	6764505
499942	6764443
500011	6764350
500005	6764256
499929	6764161
499875	6764075
499876	6764076
499799	6763980
499766	6763886
499860	6763882
499953	6763903
500049	6763898
500143	6763865
500050	6763792
499957	6763761
499863	6763731
499770	6763693
499806	6763600
499777	6763557

TERMINUS POINTS 26JAN88	
X	Y
495166	6764373
495228	6764471
495305	6764532
495314	6764446
495279	6764352
495356	6764412
495413	6764509
495469	6764606
495480	6764695
495487	6764783
495516	6764877
495445	6764952
495488	6765048
495544	6765144
495570	6765236
495574	6765324
495591	6765414
495624	6765506
495697	6765594
495783	6765595
495869	6765606
495947	6765667
496030	6765694
496122	6765668
496212	6765657
496296	6765672
496380	6765695
496463	6765721
496549	6765726
496636	6765732
496721	6765740
496807	6765751
496893	6765757
496980	6765755
497070	6765746
497161	6765729
497252	6765708
497330	6765767
497413	6765789
497500	6765789
497589	6765781
497682	6765769
497773	6765748
497860	6765747
497949	6765744
498040	6765721
498137	6765670
498235	6765610
498332	6765555
498430	6765504
498520	6765491
498618	6765439
498708	6765427
498796	6765440
498890	6765404
498987	6765352
499082	6765312
499163	6765343
499262	6765283
499326	6765206
499396	6765132
499447	6765053
499500	6764974
499595	6764936
499654	6764859
499744	6764786
499818	6764712
499916	6764660
500012	6764613
500105	6764583
500194	6764582
500283	6764572
500377	6764546
500432	6764518

TERMINUS POINTS 05APR88	
X	Y
495162	6764376
495222	6764471
495303	6764539
495309	6764452
495273	6764360
495354	6764415
495379	6764506
495413	6764599
495429	6764689
495449	6764780
495458	6764870
495456	6764958
495481	6765049
495558	6765144
495566	6765233
495578	6765324
495568	6765411
495595	6765502
495685	6765480
495774	6765477
495859	6765491
495950	6765481
496035	6765500
496120	6765534
496206	6765560
496290	6765594
496376	6765616
496461	6765644
496546	6765661
496636	6765673
496725	6765682
496813	6765686
496902	6765675
496993	6765664
497082	6765654
497170	6765654
497260	6765635
497353	6765602
497445	6765571
497533	6765574
497621	6765584
497710	6765592
497800	6765569
497892	6765534
497984	6765512
498078	6765468
498170	6765435
498263	6765405
498358	6765359
498447	6765353
498537	6765347
498627	6765325
498724	6765259
498813	6765256
498902	6765260
498998	6765203
499092	6765165
499180	6765179
499268	6765200
499355	6765232
499452	6765179
499536	6765101
499563	6765015
499643	6764937
499716	6764856
499791	6764777
499886	6764727
499980	6764677
500078	6764606
500169	6764594
500257	6764598
500348	6764585
500439	6764564
500448	6764587

TERMINUS POINTS 04JUN88	
X	Y
495204	6764437
495271	6764543
495309	6764457
495273	6764357
495355	6764411
495392	6764513
495428	6764613
495436	6764710
495456	6764807
495435	6764896
495453	6764993
495494	6765094
495555	6765200
495585	6765300
495669	6765345
495758	6765270
495855	6765247
495944	6765271
496026	6765328
496109	6765375
496201	6765385
496286	6765427
496376	6765440
496470	6765452
496560	6765471
496650	6765490
496738	6765518
496832	6765522
496931	6765501
497023	6765507
497122	6765478
497220	6765456
497315	6765447
497412	6765426
497506	6765430
497600	6765427
497694	6765430
497784	6765449
497885	6765415
497982	6765402
498087	6765343
498186	6765318
498263	6765239
498360	6765223
498446	6765268
498540	6765277
498638	6765262
498736	6765254
498839	6765217
498929	6765247
499019	6765268
499099	6765344
499184	6765395
499288	6765352
499365	6765273
499469	6765200
499567	6765124
499637	6765044
499680	6764957
499716	6764868
499783	6764787
499887	6764736
499990	6764661
500097	6764595
500190	6764606
500287	6764598
500387	6764577
500458	6764625

TERMINUS POINTS 14SEP88	
X	Y
495225	6764470
495317	6764520
495312	6764427
495272	6764332
495352	6764430
495392	6764524
495424	6764618
495437	6764711
495467	6764803
495433	6764897
495450	6764990
495501	6765084
495543	6765177
495568	6765269
495580	6765362
495672	6765431
495763	6765461
495852	6765553
495864	6765645
495895	6765737
495983	6765830
496054	6765925
496144	6765976
496235	6765999
496324	6766065
496414	6766108
496505	6766162
496595	6766227
496686	6766256
496777	6766274
496868	6766284
496961	6766254
497053	6766229
497147	6766207
497239	6766195
497331	6766201
497423	6766194
497516	6766178
497609	6766169
497701	6766154
497794	6766129
497888	6766087
497981	6766042
498075	6765973
498170	6765920
498265	6765854
498358	6765824
498451	6765791
498542	6765782
498636	6765764
498729	6765716
498821	6765750
498914	6765716
499006	6765695
499100	6765665
499194	6765638
499287	6765622
499381	6765551
499476	6765470
499549	6765382
499595	6765289
499630	6765197
499670	6765107
499704	6765015
499734	6764925
499778	6764835
499871	6764776
499967	6764717
500022	6764627
500114	6764595
500204	6764622
500297	6764617
500388	6764611
500394	6764703
500431	6764801
500462	6764859

Appendix 3. Columbia Glacier terminus points

[These points are listed in the order in which they occur along the terminus, beginning on the west side]

TERMINUS POINTS 12MAR89

X	Y
495237	6764471
495298	6764386
495278	6764290
495337	6764391
495382	6764490
495423	6764588
495440	6764683
495460	6764779
495436	6764869
495413	6764959
495472	6765060
495519	6765160
495557	6765259
495505	6765347
495508	6765442
495525	6765537
495517	6765630
495536	6765727
495591	6765827
495589	6765922
495595	6766017
495618	6766115
495666	6766217
495748	6766310
495783	6766409
495866	6766486
495954	6766531
496023	6766636
496110	6766692
496197	6766741
496289	6766754
496380	6766781
496475	6766774
496568	6766781
496664	6766782
496754	6766815
496855	6766753
496956	6766711
497053	6766698
497154	6766645
497252	6766611
497351	6766561
497449	6766531
497547	6766499
497648	6766470
497739	6766489
497835	6766480
497928	6766488
498024	6766470
498118	6766462
498217	6766420
498316	6766377
498415	6766335
498514	6766288
498612	6766254
498706	6766172
498807	6766116
498901	6766115
498989	6766175
499083	6766172
499176	6766187
499270	6766188
499366	6766188
499466	6766139
499533	6766052
499593	6765966
499625	6765874
499662	6765784
499668	6765687
499693	6765596
499722	6765506
499754	6765415
499792	6765326
499860	6765240
499876	6765144
499857	6765048
499846	6764952
499948	6764886
500030	6764803
500099	6764717
500197	6764684
500289	6764703
500363	6764806
500451	6764861
500525	6764963
500610	6765031

TERMINUS POINTS 26JUN89

X	Y
495207	6764444
495282	6764546
495320	6764461
495285	6764363
495367	6764428
495402	6764526
495432	6764622
495443	6764717
495470	6764813
495416	6764897
495424	6764990
495501	6765078
495515	6765172
495541	6765269
495493	6765353
495497	6765447
495523	6765544
495519	6765635
495522	6765727
495580	6765830
495577	6765922
495568	6766013
495601	6766110
495677	6766200
495757	6766277
495842	6766312
495919	6766402
495999	6766469
496089	6766483
496179	6766499
496270	6766512
496360	6766529
496450	6766544
496534	6766586
496622	6766607
496713	6766612
496805	6766612
496900	6766591
496997	6766561
497096	6766525
497193	6766493
497290	6766460
497383	6766450
497478	6766450
497571	6766442
497670	6766400
497764	6766396
497861	6766376
497962	6766324
498058	6766249
498160	6766184
498245	6766107
498344	6766069
498444	6766017
498541	6765991
498620	6765912
498722	6765852
498812	6765858
498908	6765834
498996	6765857
499092	6765839
499179	6765863
499269	6765909
499347	6765998
499431	6766046
499524	6766042
499574	6765957
499616	6765872
499648	6765784
499675	6765694
499697	6765606
499752	6765523
499790	6765437
499821	6765349
499853	6765262
499871	6765172
499858	6765077
499849	6764984
499902	6764901
500003	6764826
500073	6764745
500121	6764687

TERMINUS POINTS 22MAY90

X	Y
495391	6764910
495402	6764956
495419	6765003
495433	6765049
495479	6765062
495503	6765110
495490	6765155
495512	6765203
495528	6765250
495485	6765292
495462	6765338
495478	6765385
495488	6765433
495503	6765479
495510	6765526
495517	6765573
495479	6765617
495452	6765663
495435	6765708
495422	6765753
495411	6765798
495402	6765844
495388	6765889
495381	6765934
495393	6765981
495414	6766029
495415	6766074
495407	6766120
495358	6766157
495309	6766198
495280	6766242
495323	6766283
495369	6766285
495417	6766263
495462	6766277
495504	6766325
495528	6766373
495546	6766420
495557	6766466
495562	6766512
495553	6766558
495553	6766604
495567	6766651
495603	6766699
495645	6766744
495672	6766792
495677	6766839
495686	6766885
495731	6766902
495775	6766936
495822	6766926
495844	6766879
495854	6766833
495899	6766843
495943	6766883
495987	6766913
496031	6766938
496078	6766928
496122	6766943
496165	6766976
496186	6767023
496230	6767047
496279	6767020
496324	6767035
496370	6767029
496416	6767020
496461	6767037
496506	6767052
496550	6767071
496596	6767087
496642	6767078
496688	6767081
496742	6767095
496789	6767090
496836	6767082
496881	6767107
496928	6767116
496973	6767128
497020	6767125
497064	6767167
497110	6767179
497158	6767176
497203	6767176
497250	6767173
497302	6767156
497348	6767154
497395	6767154
497441	6767146
497489	6767126
497536	6767123
497582	6767125
497629	6767119
497676	6767113

TERMINUS POINTS 22MAY90 (continued)

X	Y
497722	6767097
497755	6767054
497803	6767030
497849	6767027
497894	6767029
497940	6767022
497985	6767016
498031	6766997
498079	6766980
498126	6766965
498172	6766960
498218	6766941
498265	6766910
498311	6766912
498358	6766887
498403	6766892
498449	6766885
498498	6766890
498543	6766883
498590	6766871
498637	6766846
498683	6766838
498709	6766885
498662	6766911
498706	6766944
498753	6766922
498799	6766898
498844	6766894
498888	6766916
498897	6766962
498940	6766985
498985	6766988
499030	6766992
499075	6766995
499118	6767025
499139	6767072
499182	6767115
499225	6767127
499270	6767144
499314	6767164
499360	6767168
499408	6767138
499451	6767095
499479	6767051
499505	6767007
499513	6766962
499524	6766917
499532	6766872
499536	6766827
499553	6766782
499563	6766736
499570	6766688
499584	6766643
499605	6766595
499625	6766550
499644	6766505
499685	6766462
499705	6766418
499725	6766374
499738	6766328
499753	6766283
499771	6766238
499795	6766192
499813	6766148
499845	6766104
499862	6766060
499887	6766015
499922	6765971
499949	6765928
499963	6765883
499977	6765837
499983	6765788
500001	6765742
500014	6765698
500018	6765651
500023	6765604
500028	6765558
500034	6765512
500032	6765466
500024	6765418
500016	6765372
500013	6765327
500015	6765282
500004	6765229
499980	6765180
499945	6765133
499931	6765085
499916	6765035
499926	6764990
499958	6764947
500003	6764906
500029	6764863

TERMINUS POINTS 22MAY90 (continued)

X	Y
500066	6764817
500087	6764773
500126	6764743

TERMINUS POINTS 07SEP90

X	Y
495491	6765433
495499	6765486
495510	6765540
495495	6765585
495470	6765627
495450	6765670
495431	6765714
495421	6765761
495407	6765807
495401	6765856
495389	6765901
495381	6765948
495410	6766009
495409	6766058
495391	6766105
495340	6766138
495305	6766176
495282	6766218
495278	6766266
495321	6766292
495369	6766298
495419	6766294
495469	6766296
495503	6766346
495521	6766401
495538	6766457
495546	6766509
495552	6766561
495552	6766611
495563	6766665
495587	6766722
495614	6766780
495647	6766833
495667	6766889
495666	6766939
495695	6766997
495737	6767022
495783	6767034
495837	6767023
495889	6767015
495937	6767020
495991	6767007
496035	6767029
496077	6767053
496115	6767085
496155	6767116
496191	6767159
496234	6767189
496275	6767217
496331	6767201
496365	6767247
496399	6767293
496434	6767340
496469	6767387
496515	6767400
496561	6767416
496602	6767443
496642	6767471
496681	6767506
496720	6767541
496761	6767566
496809	6767579
496851	6767600
496895	6767617
496942	6767627
496985	6767647
497027	6767672
497069	6767699
497107	6767735
497148	6767761
497196	6767769
497241	6767781
497285	6767801
497328	6767820
497372	6767839
497420	6767848
497464	6767865
497509	6767879
497556	6767887
497608	6767897
497658	6767899
497707	6767898
497758	6767896
497814	6767877
497852	6767841
497889	6767801
497947	6767771
497999	6767762
498053	6767730
498111	6767706
498165	6767693
498220	6767681
498276	6767650

Appendix 3. Columbia Glacier terminus points

[These points are listed in the order in which they occur along the terminus, beginning on the west side]

TERMINUS POINTS 07SEP90 (continued)

X	Y
498331	6767619
498375	6767583
498427	6767550
498464	6767513
498516	6767506
498570	6767474
498612	6767438
498666	6767406
498701	6767368
498737	6767329
498782	6767288
498807	6767246
498828	6767200
498883	6767169
498935	6767164
498976	6767192
499018	6767215
499059	6767243
499106	6767253
499156	6767254
499204	6767274
499250	6767239
499296	6767205
499352	6767173
499396	6767138
499446	6767104
499480	6767065
499519	6767028
499565	6766993
499615	6766959
499653	6766921
499687	6766882
499709	6766838
499727	6766795
499740	6766748
499747	6766699
499759	6766652
499763	6766602
499770	6766554
499793	6766511
499803	6766464
499802	6766414
499796	6766360
499806	6766314
499808	6766264
499814	6766215
499848	6766176
499867	6766130
499885	6766085
499913	6766043
499935	6765999
499966	6765958
499981	6765913
499994	6765867
500007	6765822
500012	6765772
500016	6765723
500034	6765678
500042	6765630
500043	6765579
500049	6765531
500038	6765476
500023	6765421
500026	6765372
500029	6765321
500032	6765271
500014	6765215
499991	6765157
499961	6765098
499940	6765041
499932	6764988
499965	6764948
499998	6764909
500026	6764868
500053	6764826
500084	6764786
500131	6764751
500176	6764766
500216	6764796
500254	6764836
500299	6764854
500347	6764866
500395	6764876
500438	6764897
500478	6764932
500515	6764972
500557	6765001
500597	6765030
500636	6765065
500637	6765066

TERMINUS POINTS 21NOV90

X	Y
495415	6764582
495426	6764628
495436	6764674
495442	6764719
495452	6764765
495468	6764811
495472	6764857
495431	6764836
495391	6764875
495385	6764919
495401	6764965
495430	6765013
495452	6765060
495495	6765067
495507	6765115
495477	6765155
495505	6765203
495512	6765249
495466	6765264
495455	6765307
495474	6765354
495496	6765403
495491	6765448
495505	6765494
495504	6765539
495486	6765581
495463	6765622
495446	6765665
495429	6765707
495412	6765749
495395	6765792
495385	6765835
495371	6765878
495350	6765919
495359	6765965
495330	6766006
495282	6766044
495249	6766084
495233	6766126
495215	6766168
495204	6766212
495204	6766256
495213	6766302
495251	6766349
495292	6766370
495334	6766386
495375	6766405
495419	6766404
495460	6766431
495496	6766480
495495	6766526
495479	6766568
495474	6766612
495477	6766657
495483	6766704
495483	6766749
495502	6766796
495520	6766842
495556	6766892
495566	6766939
495580	6766986
495596	6767032
495609	6767079
495618	6767125
495639	6767172
495680	6767193
495719	6767228
495761	6767249
495802	6767268
495843	6767294
495885	6767318
495922	6767366
495967	6767362
496013	6767349
496055	6767364
496067	6767411
496109	6767446
496144	6767495
496158	6767542
496198	6767580
496239	6767606
496281	6767620
496322	6767650
496363	6767679
496401	6767721
496441	6767758
496482	6767788
496522	6767824
496563	6767852
496602	6767894
496644	6767917
496685	6767945
496727	6767970

TERMINUS POINTS 21NOV90 (continued)

X	Y
496768	6768000
496809	6768027
496852	6768043
496895	6768058
496939	6768071
496982	6768090
497025	6768106
497068	6768125
497111	6768143
497155	6768159
497199	6768171
497244	6768174
497289	6768184
497334	6768190
497379	6768191
497422	6768208
497467	6768214
497512	6768225
497556	6768231
497605	6768225
497651	6768222
497699	6768217
497745	6768215
497793	6768208
497839	6768212
497885	6768203
497932	6768199
497980	6768189
498027	6768183
498076	6768166
498123	6768156
498170	6768145
498221	6768117
498269	6768099
498318	6768082
498367	6768063
498416	6768042
498465	6768020
498514	6768000
498561	6767996
498606	6768002
498655	6767992
498703	6767981
498751	6767984
498800	6767967
498848	6767960
498898	6767945
498946	6767937
498991	6767943
499043	6767909
499094	6767886
499143	6767879
499193	6767850
499226	6767809
499253	6767767
499268	6767723
499292	6767681
499326	6767639
499348	6767596
499363	6767552
499397	6767510
499439	6767469
499454	6767425
499465	6767381
499516	6767354
499567	6767328
499604	6767287
499639	6767246
499690	6767207
499723	6767165
499755	6767124
499785	6767082
499809	6767038
499829	6766994
499846	6766950
499857	6766905
499867	6766860
499879	6766816
499884	6766770
499889	6766724
499904	6766680
499917	6766634
499932	6766590
499939	6766544
499930	6766497
499932	6766450
499932	6766404
499947	6766359
499970	6766314
499994	6766271
500009	6766227
500015	6766181

TERMINUS POINTS 21NOV90 (continued)

X	Y
500033	6766136
500053	6766092
500069	6766046
500085	6766002
500102	6765958
500122	6765914
500131	6765869
500131	6765822
500125	6765775
500118	6765728
500116	6765681
500116	6765634
500113	6765587
500120	6765541
500120	6765494
500115	6765443
500122	6765396
500121	6765346
500123	6765299
500115	6765267

TERMINUS POINTS 22MAR91

X	Y
495478	6765235
495487	6765226
495463	6765315
495479	6765410
495506	6765507
495477	6765595
495429	6765681
495387	6765766
495359	6765857
495337	6765948
495278	6766034
495219	6766119
495179	6766208
495204	6766304
495289	6766379
495378	6766401
495450	6766507
495440	6766598
495455	6766693
495461	6766788
495513	6766890
495550	6766990
495570	6767087
495604	6767185
495681	6767285
495780	6767246
495871	6767259
495963	6767273
496062	6767238
496126	6767341
496185	6767442
496266	6767533
496349	6767595
496442	6767607
496532	6767629
496620	6767669
496710	6767701
496798	6767739
496884	6767784
496972	6767819
497060	6767853
497153	6767888
497241	6767923
497330	6767954
497422	6767975
497514	6767994
497607	6768007
497697	6768028
497785	6768050
497878	6768052
497970	6768055
498064	6768059
498165	6768003
498259	6768000
498350	6768005
498448	6767998
498543	6768001
498635	6768037
498725	6768056
498814	6768084
498908	6768100
499006	6768071
499091	6768118
499191	6768067
499291	6768012
499362	6767927
499404	6767842
499411	6767751
499429	6767660
499467	6767570
499520	6767485
499573	6767400
499658	6767320
499755	6767239
499797	6767150
499829	6767063
499876	6766978
499889	6766888
499912	6766798
499947	6766701
499982	6766614
499997	6766521
500018	6766433
500044	6766345
500070	6766256
500095	6766160
500126	6766071
500168	6765986
500188	6765895
500201	6765806
500206	6765762

TERMINUS POINTS 22MAY91

X	Y
495478	6766791
495529	6766899
495543	6767004
495547	6767107
495628	6767211
495730	6767130
495838	6767090
495947	6767027
496041	6767065
496126	6767165
496217	6767217
496305	6767274
496391	6767357
496479	6767412
496567	6767477
496660	6767512
496751	6767555
496848	6767561
496939	6767602
497033	6767623
497133	6767628
497229	6767648
497333	6767640
497419	6767719
497511	6767757
497612	6767765
497709	6767774
497805	6767791
497910	6767773
498015	6767731
498117	6767710
498214	6767725
498309	6767740
498408	6767739
498501	6767783
498594	6767811
498684	6767862
498775	6767907
498873	6767907
498962	6767975
499047	6768048
499153	6768020
499250	6768033
499334	6767946
499401	6767859
499435	6767766
499437	6767667
499468	6767572
499535	6767485
499572	6767392
499679	6767347
499774	6767264
499802	6767171
499837	6767077
499878	6766985
499898	6766888
499946	6766797
499993	6766707
500013	6766612
500021	6766514
500050	6766420
500086	6766323
500119	6766225
500142	6766129
500171	6766028
500199	6765934
500215	6765838
500198	6765736
500165	6765628
500158	6765525
500153	6765426
500149	6765323
500134	6765222
500058	6765105
500001	6764994
500058	6764905
500108	6764815
500204	6764831
500294	6764884
500379	6764887
495529	6765555
495451	6765641
495411	6765733
495386	6765830
495363	6765931
495295	6766022
495236	6766112
495194	6766205
495232	6766311
495317	6766385
495413	6766400
495458	6766509
495438	6766604

Appendix 3. Columbia Glacier terminus points

[These points are listed in the order in which they occur along the terminus, beginning on the west side]

TERMINUS POINTS
22MAY91
(continued)

X	Y
495426	6766703
495458	6766764

TERMINUS POINTS
27JUL91

X	Y
495460	6764860
495390	6764948
495452	6765056
495464	6765157
495461	6765256
495485	6765360
495508	6765463
495489	6765560
495433	6765650
495385	6765741
495355	6765837
495343	6765934
495282	6766024
495223	6766117
495190	6766211
495217	6766315
495305	6766385
495397	6766426
495439	6766532
495434	6766632
495465	6766738
495497	6766842
495548	6766949
495580	6767055
495601	6767159
495694	6767226
495739	6767132
495823	6767044
495874	6766953
495972	6766959
496042	6767071
496132	6767140
496191	6767250
496282	6767312
496367	6767398
496462	6767426
496550	6767493
496640	6767546
496739	6767544
496836	6767559
496941	6767523
497039	6767546
497141	6767532
497241	6767537
497343	6767515
497445	6767513
497543	6767517
497645	6767497
497747	6767506
497846	6767512
497948	6767502
498053	6767486
498159	6767438
498259	6767433
498360	6767431
498454	6767456
498541	6767546
498640	6767545
498743	6767524
498834	6767577
498922	6767642
499014	6767708
499098	6767821
499180	6767929
499280	6767951
499387	6767898
499461	6767810
499464	6767711
499465	6767612
499489	6767513
499541	6767419
499626	6767334
499727	6767247
499785	6767155
499835	6767059
499884	6766958
499906	6766859
499933	6766763
499962	6766669
499990	6766570
500014	6766473
500047	6766380
500066	6766283
500092	6766189
500123	6766089
500153	6765993
500174	6765897
500157	6765791
500139	6765687
500139	6765587
500144	6765485
500157	6765387
500152	6765288

TERMINUS POINTS
27JUL91
(continued)

X	Y
500120	6765184
500037	6765087
500003	6764982
500066	6764892
500178	6764814
500268	6764869
500365	6764881
500464	6764885
500551	6764969
500640	6765029
500639	6765029

TERMINUS POINTS
11OCT91

X	Y
495470	6764648
495473	6764692
495489	6764733
495493	6764776
495512	6764816
495511	6764860
495476	6764833
495442	6764863
495423	6764902
495427	6764946
495438	6764988
495454	6765029
495493	6765050
495532	6765070
495551	6765109
495515	6765134
495508	6765177
495522	6765218
495492	6765250
495491	6765294
495505	6765335
495521	6765376
495542	6765415
495544	6765458
495552	6765501
495542	6765544
495525	6765584
495501	6765621
495483	6765662
495459	6765699
495444	6765740
495425	6765781
495412	6765823
495397	6765865
495382	6765906
495367	6765948
495346	6765986
495324	6766023
495304	6766062
495280	6766099
495254	6766135
495243	6766178
495239	6766222
495246	6766265
495268	6766303
495297	6766337
495331	6766365
495370	6766382
495410	6766404
495452	6766417
495490	6766438
495494	6766482
495489	6766525
495489	6766570
495493	6766615
495492	6766659
495511	6766698
495514	6766742
495531	6766783
495533	6766827
495541	6766869
495557	6766911
495584	6766945
495610	6766981
495622	6767025
495617	6767070
495620	6767115
495623	6767160
495631	6767203
495639	6767246
495674	6767278
495713	6767297
495758	6767301
495801	6767303
495845	6767301
495871	6767264
495905	6767236
495936	6767206
495956	6767166
495949	6767123
495937	6767081
495969	6767051
496010	6767034
496048	6767012
496072	6767050
496083	6767094
496098	6767136
496119	6767174
496143	6767212
496162	6767252
496165	6767298
496170	6767342
496194	6767380

TERMINUS POINTS
11OCT91
(continued)

X	Y
496223	6767414
496252	6767447
496283	6767478
496305	6767517
496321	6767559
496347	6767594
496368	6767633
496393	6767670
496420	6767707
496449	6767741
496481	6767772
496512	6767803
496543	6767836
496573	6767868
496608	6767896
496645	6767922
496682	6767946
496722	6767969
496762	6767990
496799	6768016
496832	6768047
496864	6768077
496899	6768106
496936	6768130
496961	6768166
496994	6768195
497019	6768231
497053	6768260
497084	6768292
497125	6768308
497165	6768328
497202	6768352
497245	6768360
497289	6768361
497333	6768368
497376	6768377
497420	6768381
497462	6768395
497505	6768410
497541	6768437
497585	6768451
497627	6768462
497672	6768469
497716	6768469
497761	6768467
497806	6768472
497850	6768480
497895	6768478
497938	6768469
497986	6768465
498031	6768462
498075	6768472
498119	6768480
498163	6768479
498206	6768474
498251	6768468
498296	6768469
498341	6768470
498385	6768460
498429	6768456
498474	6768455
498520	6768451
498560	6768473
498605	6768471
498649	6768476
498690	6768457
498733	6768441
498778	6768437
498822	6768437
498867	6768434
498911	6768442
498910	6768487
498871	6768508
498832	6768528
498790	6768541
498747	6768554
498794	6768560
498837	6768550
498882	6768538
498920	6768515
498963	6768503
499006	6768488
499038	6768456
499058	6768416
499085	6768381
499093	6768338
499120	6768302
499145	6768264
499177	6768234
499209	6768202
499231	6768164
499228	6768119

TERMINUS POINTS
11OCT91
(continued)

X	Y
499218	6768076
499251	6768046
499287	6768019
499319	6767990
499360	6767970
499390	6767937
499431	6767917
499461	6767884
499489	6767849
499509	6767809
499524	6767767
499526	6767723
499535	6767678
499540	6767634
499536	6767590
499532	6767546
499558	6767509
499600	6767490
499636	6767463
499652	6767421
499680	6767386
499713	6767357
499720	6767312
499747	6767276
499774	6767240
499804	6767207
499827	6767169
499834	6767125
499846	6767082
499857	6767038
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