

VELOCITY AND SURFACE ALTITUDE OF THE LOWER PART OF HUBBARD GLACIER

ALASKA, AUGUST 1978

By Robert M. Krimmel and William G. Sikonja

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## CONVERSION FACTORS

For use of readers who prefer to use inch-pound units, conversion factors for metric (International System) units used in this report are given below:

| <u>Multiply metric unit</u> | <u>By</u> | <u>To obtain inch-pound unit</u> |
|-----------------------------|-----------|----------------------------------|
| grad                        | 0.9       | degree                           |
| kilometer                   | 0.6214    | mile                             |
| meter                       | 3.281     | foot                             |

## SYMBOLS AND ABBREVIATIONS

| <u>Symbol</u> | <u>Name</u>   | <u>Units</u> |
|---------------|---|--------------|
| ID #          | Identification number   | --           |
| Km            | Kilometer   | km           |
| m             | Meter   | m            |
| UTM           | Universal Transverse Mercator   | --           |
| V             | Velocity  | m/day        |
| VX            | Velocity in the X direction   | m/day        |
| VY            | Velocity in the Y direction   | m/day        |
| X             | Horizontal component, positive to east  | m            |
| Y             | Horizontal component, positive to north   | m            |
| Z             | Vertical component above National Geodetic<br>Vertical Datum of 1929 (NGVD of 1929) | m            |

VELOCITY AND SURFACE ALTITUDE OF THE LOWER PART OF HUBBARD GLACIER,  
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by Robert M. Krimmel and William G. Sikonja

ABSTRACT

The terminus position and locations of numerous points on the lower part of Hubbard Glacier were determined from 1:58,000 scale vertical aerial photographs taken July 30, 1978 and August 23, 1978. The same surface features were located on each set of photography, allowing displacement during the time interval to be measured. Velocity of the lower glacier for the 24-day interval was about 7 meters per day. The terminus receded 45 meters between the two dates.

INTRODUCTION

Calving speed of several Alaska tidewater glaciers was measured to provide data for a comprehensive study at Columbia Glacier, Alaska (Brown and others, 1982). One of the glaciers measured was the Hubbard. In the late spring of 1986, Hubbard Glacier advanced sufficiently to close the entrance to Russell Fiord. Proposals were made to begin a comprehensive study of Hubbard Glacier to determine the stability and longevity of the ice dam across the entrance to Russell Fiord. This report contains photogrammetric data that may be of use to proposed Hubbard Glacier research.

Vertical aerial photography of the lower part of Hubbard Glacier was obtained on July 30, 1978 and August 23, 1978. Natural features, such as crevasse intersections, on the surface of the glacier can be followed between the two flight dates; this allows measurement of the surface movement. Data given in this report include the control used for the photogrammetry (table 1), the horizontal (X,Y) coordinates of points along

the terminus on both dates (tables 2 and 3), the horizontal (X,Y) and vertical (Z) coordinates of each of many glacier points for each date (tables 5 and 6), and the change in position of the glacier points between the two dates (table 6).

#### CONTROL AND COORDINATE SYSTEM

Control for the photogrammetry was extended toward the east from existing National Oceanic and Atmospheric Administration (NOAA) horizontal control in Disenchantment Bay. Stations HUBB, BANCAS, LEFTY, HAENKE, and LUFF were established by NOAA; stations START, SCARP, and STRIB (fig. 1, table 1) were established specifically for the Hubbard Glacier velocity measurements. All the stations were marked with temporary photo panels prior to the August 23, 1978 aerial photography. Surveying was done with theodolites reading to 0.0001 grads and estimated to be accurate to 0.0010 grads, and a microwave electronic distance measuring device estimated to be accurate to 0.1 m (meters). The altitude of HAENKE was determined by measuring the vertical distance to the tide level, the level of which was established by using NOAA-predicted tide tables for Yakutat, Alaska. The altitude of the net was thus referenced to NGVD of 1929 and estimated to be accurate to 0.5 m.

Geodetic calculations were made using a three-dimensional survey adjustment (Sikonja, 1977) and are estimated to be internally accurate to 0.3 m in X, Y, and Z, which is well within the limits of the photogrammetry methods used. In addition to latitude, longitude, and altitude, Table 1 gives the station locations in the Universal Transverse Mercator (UTM) system. In Tables 2-6 positions are UTM, but with 580,000 meters subtracted from the easting (X) and 6,650,000 meters subtracted from the northing (Y).

## TERMINUS AND GLACIER POINTS

The UTM coordinates of 232 points were determined photogrammetrically by the U.S. Geological Survey's Western Mapping Center in Menlo Park, California by using methods described by Meier (Meier and others, 1985). The Hubbard Glacier photography was flown at a nominal scale of 1:58,000, whereas the Columbia Glacier photography described by Meier and others (1985) was flown at a scale of 1:46,000. On the basis of results from Meier and others (1985) and the difference in scales, it is concluded that the accuracy of the Hubbard points is about 2.5 meters in both the horizontal and vertical.

Tables 2 and 3 show the X and Y coordinates of 51 (July 30, 1978) and 71 (August 23, 1978) points at the ice-water interface, the glacier terminus. These points also are shown on figures 2 and 3 as diamonds. Tables 4 and 5 give the X, Y, and Z for 55 glacier points on both July 30, 1978 and August 23, 1978.

## VELOCITY AND SURFACE ALTITUDE

The change in coordinates of a point between the photo dates gives the displacement vector for the period. Table 6 gives the mid-point of each vector, its X and Y components in meters per day, and the total horizontal displacement in meters per day. Figure 4 shows the same information. It is estimated, based on information from Meier and others (1985, page F7) that the velocities are accurate to 0.2 m/day. Altitude changes are not easy to discern because each point is moving downslope on a surface that has a gentle slope and that is falling in time owing to ablation. Figures 2 and 3 show the altitude of each point and the point's location on the respective date.

The terminus retreated between July 30 and August 23. The area of the polygon formed by a point near the southeast terminus margin (UTM



588343, 6651938), a point near the northwest terminus margin (UTM 582482, 6658502), and the terminus points on July 30 was  $1.22 \times 10^7 \text{ m}^2$ . The area of the polygon with the same end points and the terminus points on August 23 was  $1.18 \times 10^7 \text{ m}^2$ . The change in area between dates divided by the 8,800 m distance between the end points gives terminus recession of 45 m. The average speed of points near the terminus (I.D. 101-105) was 7 m/day. Over the 24-day interval the glacier would have advanced 168 m had there been no calving. The difference between the ice displacement and the terminus position change for the interval was 213 m, thus the calving speed was 9 m/day.

## REFERENCES

- Brown, C.S., Meier, M.F., and Post, Austin, 1982, Calving speed of Alaska tidewater glaciers, with application to Columbia Glacier: U.S. Geological Survey Professional Paper 1258-C, 13 p.
- Meier, M.F., Rasmussen, L.A., Krimmel, R.M., Olsen, R.W., and Frank, David, 1985, Photogrammetric determination of surface altitude, terminus position, and ice velocity of Columbia Glacier, Alaska: U.S. Geological Survey Professional Paper 1258-F, 41 p.
- Sikonia, W.G., 1977, Three-dimensional geodetic survey adjustment: U.S. Geological Survey Computer Contribution, U.S. Department of Commerce, National Technical Information Service, PB-278 600, 189 p.

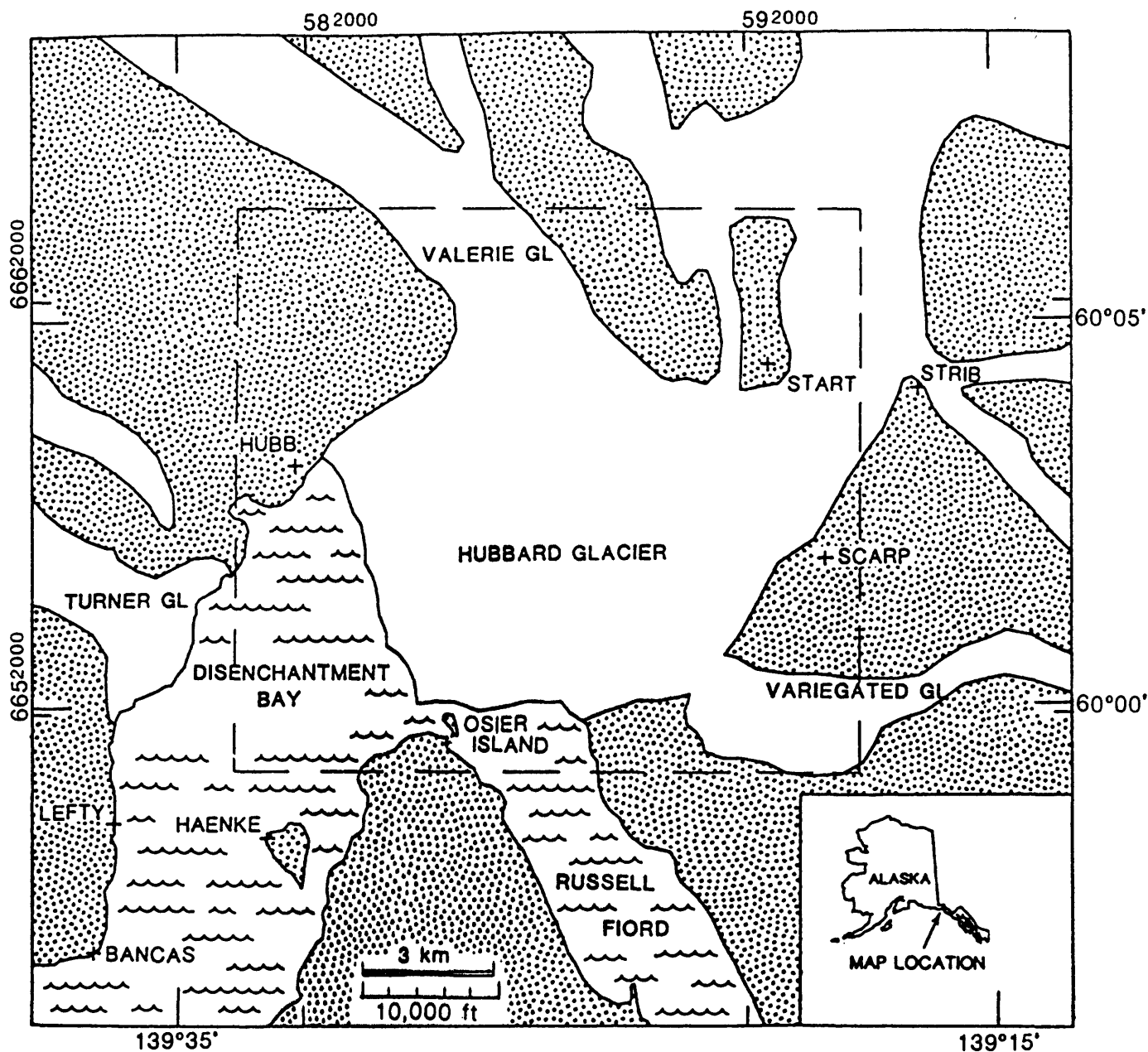


Figure 1 -- The lower Hubbard Glacier, Alaska. Control points used for the photogrammetry are shown as crosses. The dashed box indicates the approximate area shown in figures 2, 3, and 4. The terminus position is for 1974. Station LUFF is out of the map area toward the southwest.

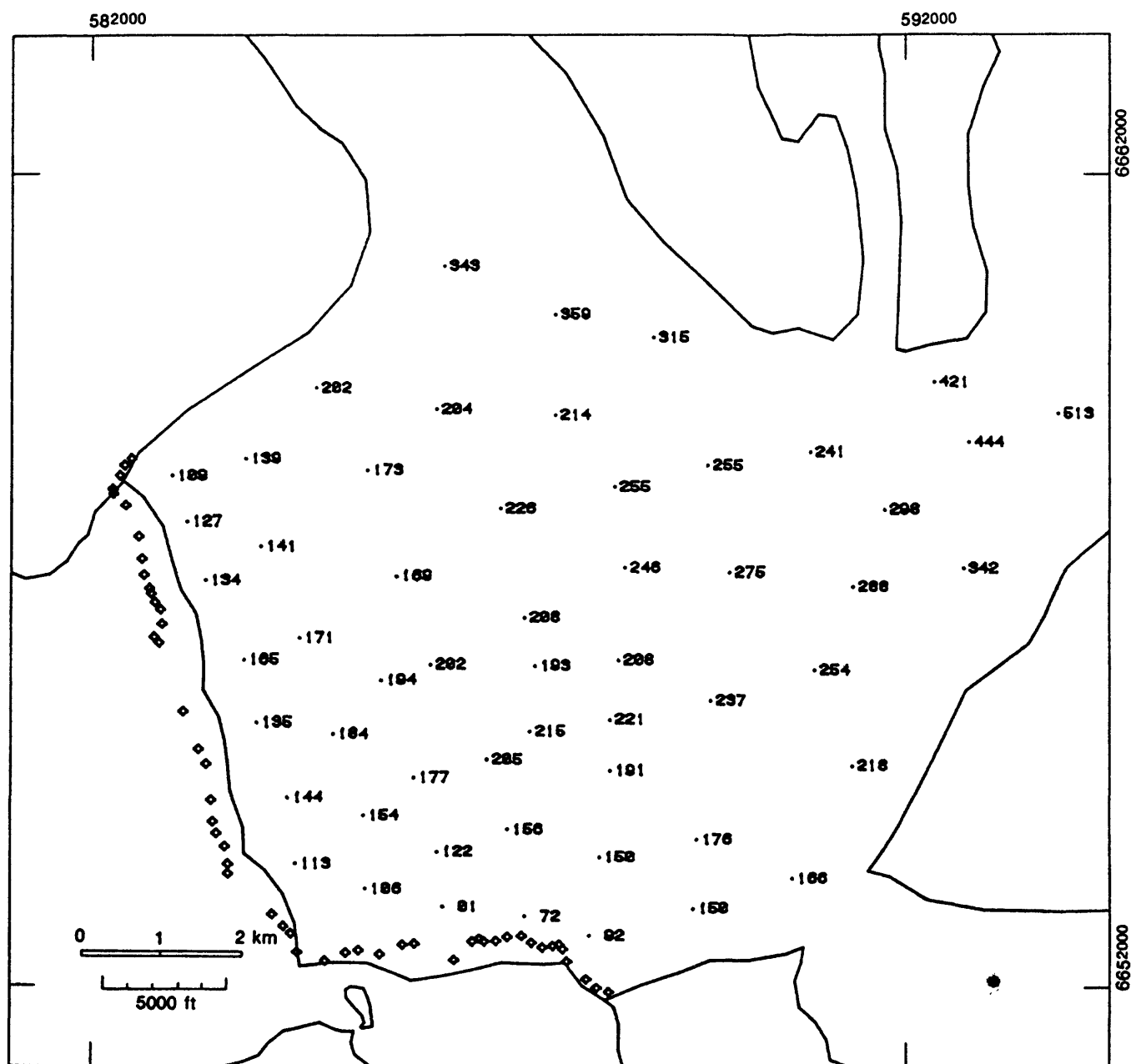


Figure 2 -- Photogrammetrically determined altitudes, in meters above NGVD of 1929, of points on July 30, 1978. The diamonds indicate photogrammetrically determined points along the terminus on the same date. The solid line terminus position is for 1974.

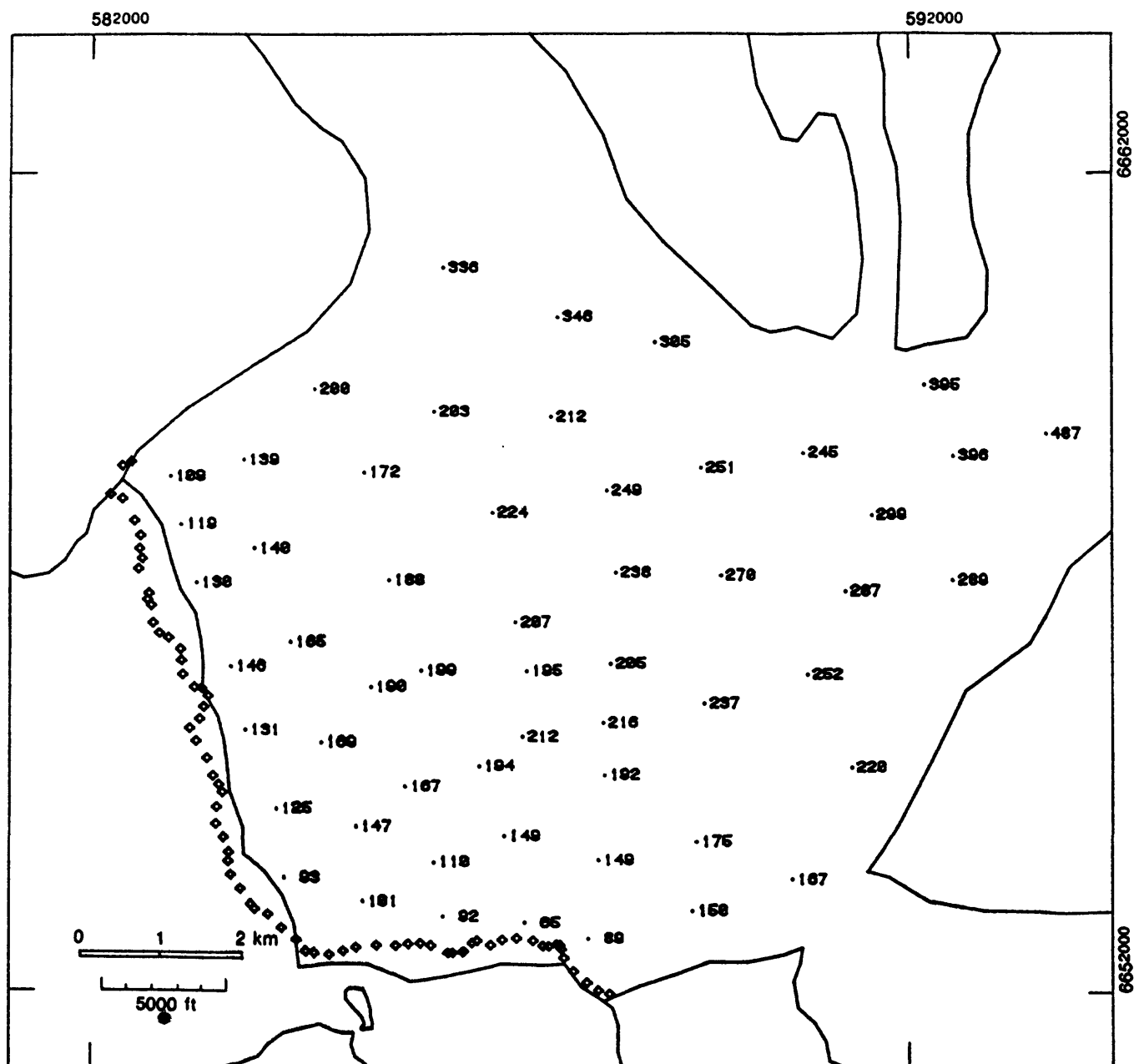


Figure 3 -- Photogrammetrically determined altitudes, in meters above NGVD of 1929, of points on August 23, 1978. The diamonds indicate photogrammetrically determined points along the terminus on the same date. The solid line terminus position is for 1974.

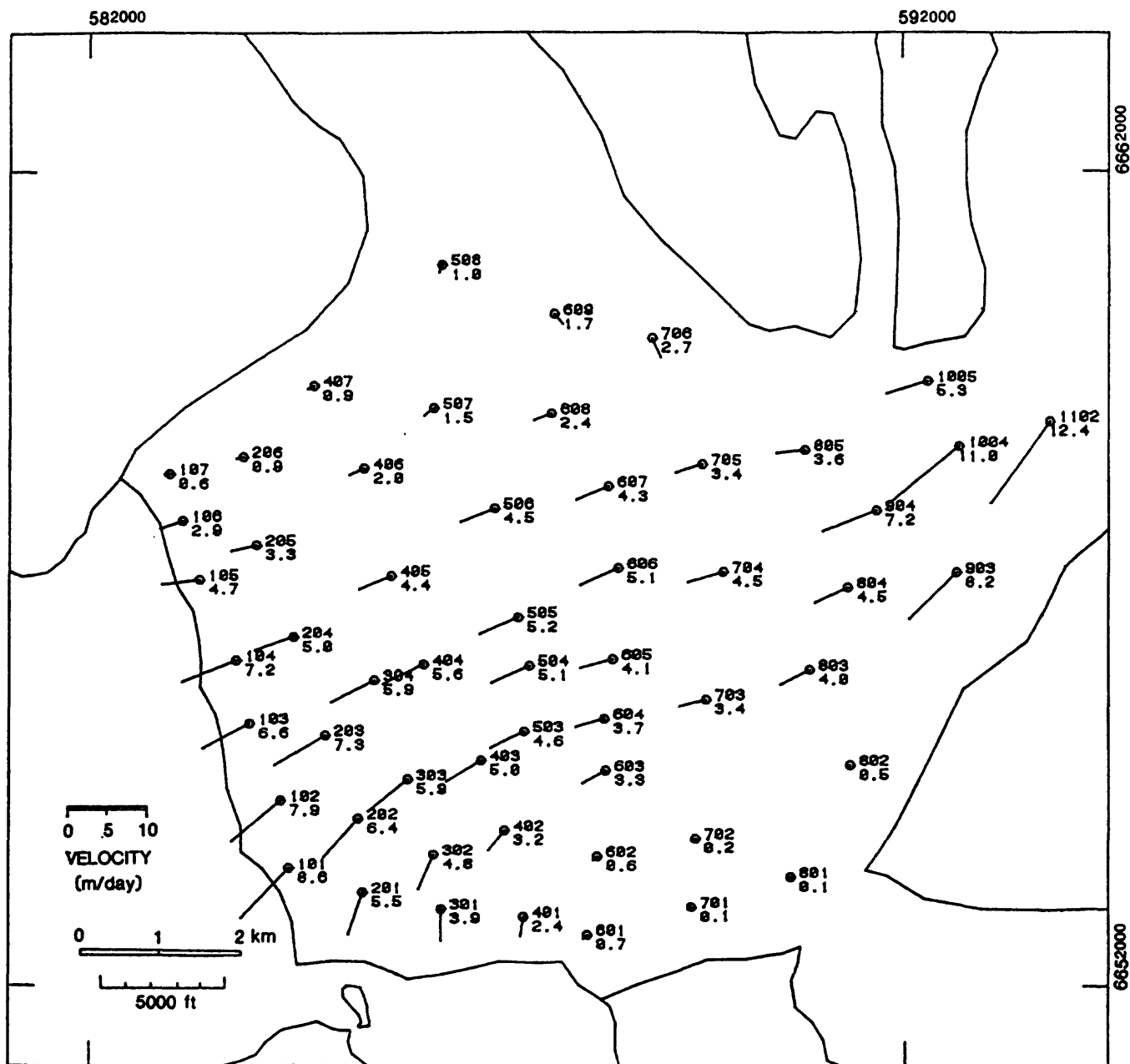


Figure 4 -- The midpoints of trajectories of Hubbard Glacier flow between July 30, 1978 and August 23, 1978 are shown as a circle. The upper number beside each circle is the point ID #, the lower number is the velocity in m/day. Radiating from the circle, is the direction of flow. The magnitude of the vector is also indicated by the scale on the figure.

Table 1 -- The control stations used in the photogrammetry. West Latitude and north Longitude are in degrees, minutes, and decimal seconds. Altitude (Z) is in meters referenced to NGVD of 1929. Universal Transverse Mercator (UTM), zone 7 positions in meters.

| NAME   | LONGITUDE   | LATITUDE  | Z     | UTM EASTING | UTM NORTHING |
|--------|-------------|-----------|-------|-------------|--------------|
| LEFTY  | -139.363295 | 59.582805 | 16.0  | 577637.2    | 6649176.0    |
| BANCAS | -139.370622 | 59.564709 | 12.6  | 577186.5    | 6646042.6    |
| HAENKE | -139.324708 | 59.581899 | 14.9  | 581132.8    | 6648970.8    |
| LUFF   | -139.373925 | 59.541070 | 10.2  | 576774.4    | 6641194.6    |
| HUBB   | -139.320386 | 60.030741 | 16.4  | 581617.7    | 6657907.1    |
| START  | -139.202692 | 60.042508 | 741.7 | 592337.0    | 6660564.3    |
| STRIB  | -139.164410 | 60.040563 | 828.2 | 595796.7    | 6660050.7    |
| SCARP  | -139.190649 | 60.015238 | 571.6 | 593700.4    | 6655872.5    |

Table 2 -- Hubbard Glacier terminus position, July 30, 1978. X = UTM easting - 580,000 m, Y = UTM northing - 6,550,000 m. These points are shown in figure 2 as diamonds in the order of ID # from southeast to northwest.

| ID #  | X    | Y    | ID #  | X    | Y    | ID #  | X    | Y    |
|-------|------|------|-------|------|------|-------|------|------|
| 91001 | 8343 | 1938 | 91002 | 8195 | 1988 | 91003 | 8068 | 2096 |
| 91004 | 7834 | 2315 | 91005 | 7781 | 2469 | 91006 | 7736 | 2523 |
| 91007 | 7660 | 2503 | 91008 | 7533 | 2488 | 91009 | 7399 | 2547 |
| 91010 | 7280 | 2633 | 91011 | 7111 | 2610 | 91012 | 6970 | 2562 |
| 91013 | 6823 | 2554 | 91014 | 6767 | 2591 | 91015 | 6678 | 2554 |
| 91016 | 6453 | 2330 | 91017 | 5970 | 2532 | 91018 | 5827 | 2518 |
| 91019 | 5546 | 2402 | 91020 | 5292 | 2452 | 91021 | 5137 | 2414 |
| 91022 | 4880 | 2323 | 91024 | 4536 | 2426 | 91025 | 4459 | 2658 |
| 91026 | 4369 | 2748 | 91027 | 4232 | 2891 | 91033 | 3687 | 3395 |
| 91034 | 3685 | 3510 | 91036 | 3649 | 3730 | 91037 | 3540 | 3892 |
| 91038 | 3496 | 4041 | 91039 | 3477 | 4306 | 91042 | 3410 | 4755 |
| 91043 | 3319 | 4937 | 91046 | 3129 | 5400 | 91050 | 2826 | 6238 |
| 91051 | 2763 | 6307 | 91052 | 2864 | 6471 | 91053 | 2845 | 6644 |
| 91054 | 2775 | 6732 | 91055 | 2728 | 6840 | 91056 | 2707 | 6907 |
| 91057 | 2639 | 7075 | 91058 | 2610 | 7268 | 91060 | 2569 | 7549 |
| 91062 | 2409 | 7931 | 91064 | 2260 | 8072 | 91065 | 2250 | 8130 |
| 91066 | 2343 | 8298 | 91067 | 2396 | 8423 | 91068 | 2482 | 8504 |

Table 3 -- Hubbard Glacier terminus position, August 23, 1978. X = UTM easting - 580,000 m, Y = UTM northing - 6,550,000 m. These points are shown in figure 3 as diamonds in the order of ID # from southeast to northwest.

| ID #  | X    | Y    | ID #  | X    | Y    | ID #  | X    | Y    |
|-------|------|------|-------|------|------|-------|------|------|
| 92001 | 8353 | 1939 | 92002 | 8216 | 1985 | 92003 | 8073 | 2080 |
| 92004 | 7911 | 2217 | 92005 | 7789 | 2386 | 92006 | 7756 | 2493 |
| 92007 | 7741 | 2542 | 92008 | 7700 | 2550 | 92009 | 7604 | 2527 |
| 92010 | 7534 | 2529 | 92011 | 7413 | 2601 | 92012 | 7218 | 2627 |
| 92013 | 7040 | 2603 | 92014 | 6896 | 2544 | 92015 | 6729 | 2593 |
| 92016 | 6667 | 2565 | 92017 | 6566 | 2464 | 92018 | 6547 | 2455 |
| 92019 | 6431 | 2445 | 92020 | 6373 | 2444 | 92021 | 6163 | 2536 |
| 92022 | 6036 | 2561 | 92023 | 5887 | 2558 | 92024 | 5736 | 2534 |
| 92025 | 5499 | 2536 | 92026 | 5255 | 2511 | 92027 | 5099 | 2469 |
| 92028 | 4924 | 2431 | 92029 | 4743 | 2446 | 92030 | 4638 | 2465 |
| 92031 | 4526 | 2606 | 92032 | 4348 | 2760 | 92033 | 4182 | 2925 |
| 92034 | 4014 | 2986 | 92035 | 3963 | 3047 | 92036 | 3838 | 3234 |
| 92037 | 3719 | 3404 | 92038 | 3686 | 3573 | 92039 | 3694 | 3682 |
| 92040 | 3625 | 3862 | 92041 | 3530 | 4034 | 92042 | 3538 | 4243 |
| 92043 | 3612 | 4424 | 92044 | 3565 | 4517 | 92045 | 3496 | 4631 |
| 92046 | 3420 | 4845 | 92047 | 3289 | 5058 | 92048 | 3208 | 5216 |
| 92049 | 3330 | 5323 | 92050 | 3381 | 5471 | 92051 | 3434 | 5605 |
| 92052 | 3355 | 5696 | 92053 | 3265 | 5710 | 92054 | 3128 | 5870 |
| 92055 | 3110 | 6038 | 92056 | 3095 | 6175 | 92057 | 2949 | 6315 |
| 92058 | 2833 | 6369 | 92059 | 2757 | 6500 | 92060 | 2733 | 6711 |
| 92061 | 2690 | 6778 | 92062 | 2710 | 6855 | 92063 | 2581 | 7156 |
| 92064 | 2623 | 7280 | 92065 | 2591 | 7403 | 92066 | 2606 | 7565 |
| 92067 | 2533 | 7752 | 92068 | 2385 | 8015 | 92069 | 2239 | 8073 |
| 92070 | 2384 | 8425 | 92071 | 2496 | 8472 |       |      |      |



Table 4 -- Points on Hubbard Glacier, July 30, 1978. X = UTM easting - 580,000 m, Y = UTM northing - 6,650,000 m, Z in meters above NGVD of 1929. The ID # of each point corresponds to the ID # in table 5. These points can be identified on figure 2 by the altitude.

| ID # | X     | Y    | Z   | ID # | X     | Y    | Z   | ID # | X     | Y     | Z   |
|------|-------|------|-----|------|-------|------|-----|------|-------|-------|-----|
| 101  | 4518  | 3519 | 113 | 102  | 4419  | 4343 | 144 | 103  | 4038  | 5262  | 135 |
| 104  | 3880  | 6030 | 165 | 105  | 3404  | 7004 | 134 | 106  | 3171  | 7732  | 127 |
| 107  | 2986  | 8296 | 109 | 201  | 5376  | 3207 | 106 | 202  | 5347  | 4118  | 154 |
| 203  | 4972  | 5129 | 184 | 204  | 4562  | 6301 | 171 | 205  | 4088  | 7425  | 141 |
| 206  | 3899  | 8503 | 139 | 301  | 6312  | 2987 | 91  | 302  | 6245  | 3667  | 122 |
| 303  | 5958  | 4587 | 177 | 304  | 5558  | 5784 | 194 | 401  | 7320  | 2872  | 72  |
| 402  | 7110  | 3945 | 156 | 403  | 6855  | 4810 | 205 | 404  | 6162  | 5973  | 202 |
| 405  | 5751  | 7061 | 169 | 406  | 5394  | 8369 | 173 | 407  | 4765  | 9373  | 202 |
| 503  | 7383  | 5156 | 215 | 504  | 7448  | 5962 | 193 | 505  | 7319  | 6553  | 208 |
| 506  | 7024  | 7894 | 226 | 507  | 6238  | 9113 | 204 | 508  | 6332  | 10870 | 343 |
| 601  | 8103  | 2634 | 92  | 602  | 8231  | 3601 | 150 | 603  | 8362  | 4678  | 191 |
| 604  | 8359  | 5302 | 221 | 605  | 8466  | 6030 | 208 | 606  | 8545  | 7164  | 246 |
| 607  | 8421  | 8163 | 255 | 608  | 7697  | 9045 | 214 | 609  | 7699  | 10272 | 359 |
| 701  | 9373  | 2965 | 150 | 702  | 9423  | 3817 | 176 | 703  | 9594  | 5533  | 237 |
| 704  | 9826  | 7110 | 275 | 705  | 9560  | 8428 | 255 | 706  | 8901  | 9991  | 315 |
| 801  | 10590 | 3337 | 166 | 802  | 11332 | 4730 | 218 | 803  | 10869 | 5907  | 254 |
| 804  | 11352 | 6930 | 288 | 805  | 10821 | 8595 | 241 | 903  | 12708 | 7160  | 342 |
| 904  | 11736 | 7884 | 298 | 1004 | 12782 | 8719 | 444 | 1005 | 12351 | 9452  | 421 |
| 1102 | 13890 | 9065 | 513 |      |       |      |     |      |       |       |     |

Table 5 -- Points on Hubbard Glacier, August 23, 1978. X = UTM easting - 580,000 m, Y = UTM northing - 6,650,000 m, Z in meters above NGVD of 1929. The ID # of each point corresponds to the ID # in table 4. These points can be identified on figure 3 by the altitude.

| ID # | X     | Y    | Z   | ID # | X     | Y    | Z   | ID # | X     | Y     | Z   |
|------|-------|------|-----|------|-------|------|-----|------|-------|-------|-----|
| 101  | 4376  | 3370 | 93  | 102  | 4274  | 4222 | 125 | 103  | 3897  | 5190  | 131 |
| 104  | 3719  | 5967 | 146 | 105  | 3292  | 6990 | 130 | 106  | 3105  | 7708  | 119 |
| 107  | 2972  | 8294 | 109 | 201  | 5334  | 3082 | 101 | 202  | 5246  | 4002  | 147 |
| 203  | 4822  | 5040 | 169 | 204  | 4448  | 6262 | 165 | 205  | 4011  | 7408  | 140 |
| 206  | 3878  | 8498 | 139 | 301  | 6311  | 2893 | 82  | 302  | 6200  | 3562  | 110 |
| 303  | 5848  | 4498 | 167 | 304  | 5431  | 5720 | 190 | 401  | 7311  | 2814  | 65  |
| 402  | 7064  | 3885 | 149 | 403  | 6752  | 4747 | 194 | 404  | 6041  | 5916  | 199 |
| 405  | 5654  | 7020 | 180 | 406  | 5351  | 8349 | 172 | 407  | 4746  | 9364  | 200 |
| 503  | 7284  | 5108 | 212 | 504  | 7337  | 5911 | 195 | 505  | 7204  | 6503  | 207 |
| 506  | 6923  | 7853 | 224 | 507  | 6210  | 9089 | 203 | 508  | 6323  | 10848 | 336 |
| 601  | 8093  | 2622 | 89  | 602  | 8220  | 3591 | 149 | 603  | 8293  | 4639  | 192 |
| 604  | 8274  | 5278 | 216 | 605  | 8370  | 6004 | 205 | 606  | 8433  | 7114  | 238 |
| 607  | 8325  | 8123 | 249 | 608  | 7644  | 9025 | 212 | 609  | 7725  | 10242 | 346 |
| 701  | 9371  | 2964 | 150 | 702  | 9419  | 3814 | 175 | 703  | 9516  | 5513  | 237 |
| 704  | 9722  | 7079 | 270 | 705  | 9482  | 8403 | 251 | 706  | 8926  | 9932  | 305 |
| 801  | 10589 | 3335 | 167 | 802  | 11322 | 4725 | 220 | 803  | 10783 | 5864  | 252 |
| 804  | 11254 | 6882 | 287 | 805  | 10736 | 8585 | 245 | 903  | 12570 | 7021  | 289 |
| 904  | 11576 | 7821 | 299 | 1004 | 12577 | 8553 | 396 | 1005 | 12229 | 9415  | 395 |
| 1102 | 13716 | 8825 | 487 |      |       |      |     |      |       |       |     |

Table 6 -- Velocities of points on Hubbard Glacier, averaged over interval July 30, 1978 to August 23, 1978. X, Y, and Z is the midpoint between the positions on the two dates. VX is the X component of velocity, VY is the Y component of velocity, and V is the total horizontal velocity, all in meters per day.

| ID # | X       | Y       | Z     | VX   | VY    | V    |
|------|---------|---------|-------|------|-------|------|
| 101  | 4447.0  | 3444.5  | 103.0 | -5.9 | -6.2  | 8.6  |
| 102  | 4346.5  | 4282.5  | 134.5 | -6.0 | -5.0  | 7.9  |
| 103  | 3967.5  | 5226.0  | 133.0 | -5.9 | -3.0  | 6.6  |
| 104  | 3799.5  | 5998.5  | 155.5 | -6.7 | -2.6  | 7.2  |
| 105  | 3348.0  | 6997.0  | 132.0 | -4.7 | -0.6  | 4.7  |
| 106  | 3138.0  | 7720.0  | 123.0 | -2.8 | -1.0  | 2.9  |
| 107  | 2979.0  | 8295.0  | 109.0 | -0.6 | -0.1  | 0.6  |
| 201  | 5355.0  | 3144.5  | 103.5 | -1.8 | -5.2  | 5.5  |
| 202  | 5296.5  | 4060.0  | 150.5 | -4.2 | -4.8  | 6.4  |
| 203  | 4897.0  | 5084.5  | 176.5 | -6.3 | -3.7  | 7.3  |
| 204  | 4505.0  | 6281.5  | 168.0 | -4.8 | -1.6  | 5.0  |
| 205  | 4049.5  | 7416.5  | 140.5 | -3.2 | -0.7  | 3.3  |
| 206  | 3888.5  | 8500.5  | 139.0 | -0.9 | -0.2  | 0.9  |
| 301  | 6311.5  | 2940.0  | 86.5  | 0.0  | -3.9  | 3.9  |
| 302  | 6222.5  | 3614.5  | 116.0 | -1.9 | -4.4  | 4.8  |
| 303  | 5903.0  | 4542.5  | 172.0 | -4.6 | -3.7  | 5.9  |
| 304  | 5494.5  | 5752.0  | 192.0 | -5.3 | -2.7  | 5.9  |
| 401  | 7315.5  | 2843.0  | 68.5  | -0.4 | -2.4  | 2.4  |
| 402  | 7007.0  | 3915.0  | 152.5 | -1.9 | -2.5  | 3.2  |
| 403  | 6803.5  | 4778.5  | 199.5 | -4.3 | -2.6  | 5.0  |
| 404  | 6101.5  | 5944.5  | 200.5 | -5.0 | -2.4  | 5.6  |
| 405  | 5702.5  | 7040.5  | 174.5 | -4.0 | -1.7  | 4.4  |
| 406  | 5372.5  | 8359.0  | 172.5 | -1.8 | -0.8  | 2.0  |
| 407  | 4755.5  | 9368.5  | 201.0 | -0.8 | -0.4  | 0.9  |
| 503  | 7333.5  | 5132.0  | 213.5 | -4.1 | -2.0  | 4.6  |
| 504  | 7392.5  | 5936.5  | 194.0 | -4.6 | -2.1  | 5.1  |
| 505  | 7261.5  | 6528.0  | 207.5 | -4.8 | -2.1  | 5.2  |
| 506  | 6973.5  | 7873.5  | 225.0 | -4.2 | -1.7  | 4.5  |
| 507  | 6224.0  | 9101.0  | 203.5 | -1.2 | -1.0  | 1.5  |
| 508  | 6327.5  | 10059.0 | 339.5 | -0.4 | -0.9  | 1.0  |
| 601  | 8098.0  | 2628.0  | 90.5  | -0.4 | -0.5  | 0.7  |
| 602  | 8225.5  | 3596.0  | 149.5 | -0.5 | -0.4  | 0.6  |
| 603  | 8327.5  | 4658.5  | 191.5 | -2.9 | -1.6  | 3.3  |
| 604  | 8316.5  | 5290.0  | 218.5 | -3.5 | -1.0  | 3.7  |
| 605  | 8418.0  | 6017.0  | 206.5 | -4.0 | -1.1  | 4.1  |
| 606  | 8489.0  | 7139.0  | 242.0 | -4.7 | -2.1  | 5.1  |
| 607  | 8373.0  | 8143.0  | 252.0 | -4.0 | -1.7  | 4.3  |
| 608  | 7670.5  | 9035.0  | 213.0 | -2.2 | -0.8  | 2.4  |
| 609  | 7712.0  | 10257.0 | 352.5 | 1.1  | -1.3  | 1.7  |
| 701  | 9372.0  | 2964.5  | 150.0 | -0.1 | 0.0   | 0.1  |
| 702  | 9421.0  | 3815.5  | 175.5 | -0.2 | -0.1  | 0.2  |
| 703  | 9555.0  | 5523.0  | 237.0 | -3.3 | -0.8  | 3.4  |
| 704  | 9774.0  | 7094.5  | 272.5 | -4.3 | -1.3  | 4.5  |
| 705  | 9521.0  | 8415.5  | 253.0 | -3.3 | -1.0  | 3.4  |
| 706  | 8913.5  | 9961.5  | 310.0 | 1.0  | -2.5  | 2.7  |
| 801  | 10589.5 | 3336.0  | 166.5 | 0.0  | -0.1  | 0.1  |
| 802  | 11327.0 | 4727.5  | 219.0 | -0.4 | -0.2  | 0.5  |
| 803  | 10026.0 | 5885.5  | 253.0 | -3.6 | -1.8  | 4.0  |
| 804  | 11303.0 | 6906.0  | 287.5 | -4.1 | -2.0  | 4.5  |
| 805  | 10778.5 | 8590.0  | 243.0 | -3.5 | -0.4  | 3.6  |
| 903  | 12639.0 | 7090.5  | 315.5 | -5.8 | -5.8  | 8.2  |
| 904  | 11656.0 | 7852.5  | 298.5 | -6.7 | -2.6  | 7.2  |
| 1004 | 12679.5 | 8636.0  | 420.0 | -8.5 | -6.9  | 11.0 |
| 1005 | 12290.0 | 9433.5  | 408.0 | -5.1 | -1.5  | 5.3  |
| 1102 | 13803.0 | 8945.0  | 500.0 | -7.3 | -10.0 | 12.4 |