Geodetic Activities During the 1998 Juneau Icefield Research Program Field Season

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1. Introduction

The surveying program of the summer Institute of the Juneau Icefield Research Program (JIRP) initially served the determination of glacier surface velocities. With the continuous improvement of the surveying instruments, the scope of investigations expanded. The maintenance and enlargement of geodetic networks as reference frames for the investigations of other geosciences, the derivation of glacial strain rates, the monitoring of short and long term height changes and numerous special investigations (accurate determination of the terminus of the Taku Glacier etc.) are nowadays routine tasks. All efforts are aimed to a better understanding of the system "glacier" and its complex interaction with long and short term variations of the climate. Besides these scientific tasks, JIRP is a rigid training course in field work for all students of geosciences. Participating in various surveying projects the students are taught the set-up and logistical aspects of surveying tasks, different surveying techniques, evaluation procedures and the critical interpretation of the results obtained.

2. Survey projects

Using Real-Time-GPS (RT-GPS) intensively in 1998, the survey campaign was focused on the re-establishment of the exact profile locations of former years to gather reliable data for the variation of surface velocities and long term height changes. Eight profiles on the Demorest, Taku, Matthes and Vaughan-Lewis Glacier were re-established at their last year's positions, covering elevations from 1000 m to 1800 m. Two new profiles were set up to diminish the existing information gaps for two of the main feeders within the Taku Glacier system (LANG, 1997a): one on the Upper Demorest Glacier (Profile IIIa) and another one on the Middle Matthes Glacier (Profile VIIb).

Another research project carried out last season was the quantification of the obviously dramatic loss in volume of the Lemon Creek Glacier. Based on some simplifications a mean loss of 10.5 m in height of the uppermost quarter of the glacier within the period 1989-1997 had been revealed (LANG, 1997a). The resurvey of the 1997 points enabled the comparison without any hypothesis and the statement whether this trend is continuing.

All measurements were carried out using GPS, mostly in real time mode. Theory, principles and evaluation of GPS observations are not described in this report; they are well known and can be reviewed in many publications (e.g . WELLS et al., 1986; SEEBER, 1993).

In Fig. 1 the locations of all survey projects on the Juneau Icefield in 1998 are shown, a related timetable is given in Table 1. Coordinates of all points measured this summer can be found in appendix B1 (Movement Profiles, pp. 25-36) and B2 (Miscellaneous Projects, pp. 37-41).

Profile Project resp.	Location	Survey Dates	Purpose	Type of measure-ment	No. of pts.
Profile III	Demorest Glacier (Taku A - Hodgkins Peak)	July 26, 1998 August 1, 1998	AB, MV	RT-GPS RAPID	12 11
Profile IIIa	Upper Demorest Glacier (Spider Mt.- Peak 5370)	August 6, 1998 August 11, 1998	AB, MV	RT-GPS RT-GPS	15 15
Profile IV	Taku Glacier (C-10 - Shoehorn Peak)	July 25, 1998 August 2, 1998	AB, HC, MV MB, SR	RT-GPS RT-GPS	31 31
Profile V	Taku Glacier SW Branch (SW Taku Pt. - Juncture Peak)	July 27, 1998 August 2, 1998	AB, HC, MV	RT-GPS RAPID	12 12
Profile VI	Taku Glacier NW Branch (NW Taku Pt. - Echo Mt.)	July 28, 1998 August 4, 1998	AB, HC, MV	RT-GPS RT-GPS	16 16
Profile VIa	Taku Glacier NW Branch (NW Taku Pt. - Taku D)	July 31, 1998 August 4, 1998	AB, HC, MV	RT-GPS RT-GPS	16 16
Profile VII	Matthes Glacier (Camp 9 - Centurian Peak)	July 30, 1998 August 7, 1998	AB, HC, MV	RT-GPS RT-GPS	16 16
Profile VIIa	Matthes Glacier (Taku C - Taku D)	July 29, 1998 August 4, 1998	AB, HC, MV	RT-GPS RT-GPS	14 14
Profile VIIb	Matthes Glacier (The Citadel - Spirit Range)	August 1, 1998 August 7, 1998	AB, MV	RT-GPS RT-GPS	11 11
Height changes	Lemon Creek Glacier Vaughan Lewis Glacier	August 3, 1998 August 12, 1998	HC HC	RT-GPS RT-GPS	95 8
JIRP network	C-10 area C-9 area	July 25, 1998 August 1, 1998	POS POS	STATIC STATIC	1 1

Explanation:

Purpose of survey: AB = Ablation; HC = Height comparison; MB = Mass balance; MV = Movement; POS = Position; SR = Strain rates

Type of measurement: STATIC = Static GPS survey; RAPID = Rapid Static GPS survey; RT-GPS = Real-Time GPS survey

Table 1: Timetable of the survey work carried out during the 1998 JIRP campaign

2.1. Densification of the JIRP network

The Demorest Glacier represents the eastern border of the JIRP network. Only a few benchmarks exist along that glacier and most of them are not suitable for a RT-GPS reference station. To provide a proper reference for Profile III and IIIa within the JIRP coordinate system, two new benchmarks were established. Lupine Pt. is located on the southern end of the ridge coming down from Taku A near Height 3549. Vista Pt. is situated on the rocky outcrops some 300 m east of Camp 9. Static GPS observations of two hours each were carried out to provide reliable coordinates for the new benchmarks.

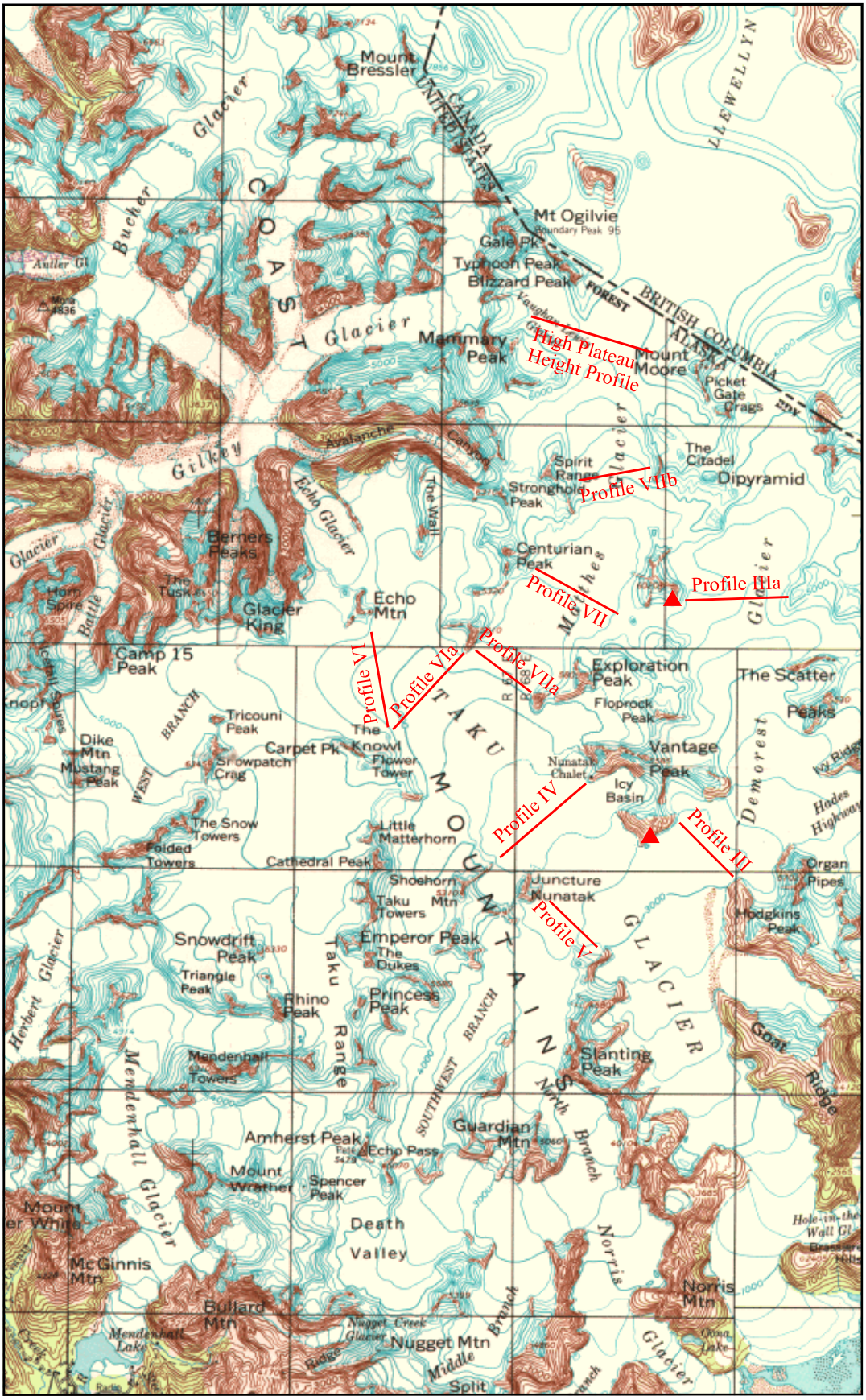

Fig. 1: Location of the 1998 survey projects on the Juneau Icefield (▲ = new benchmark)

2.2. Movement vector determination

Differential GPS observations provide a high relative accuracy. Using short baselines (< 5 km), standard deviations of 1 cm in position and 3 cm in height can be achieved with Rapid Static or RT-GPS measurement techniques. Taking into account that usually a 1" x 2" flagpole is used as a point marker on the sun-cup covered glacier surface, an accuracy of 5 cm in both position and height can be assumed. Therefore a total movement and short term height change less than 20 cm for a distinct point have to be seen as insignificant. In appendices C1 (pp. 43-49) and C2 (pp. 51-59) all movement vectors and height changes are shown; insignificant values are marked in grey.

For the derivation of the mean velocity a best fit polynom of forth order was normally used for each profile.

2.2.1. Demorest Glacier

The Demorest Glacier covers with some 175 km^2 quite the same area as the NW Branch of the Taku Glacier west of Profile VI. The mean and maximum velocities of Profiles III and VI are nearly identical. As shown by SPRENKE (1996), the cross-section of both profiles is similar; it can, therefore, be concluded that the masses of the Demorest Glacier and the NW Branch are nearly the same. A substantial ice thickness of the wide plains in the west and northwest of the Taku Range are further suggestions.

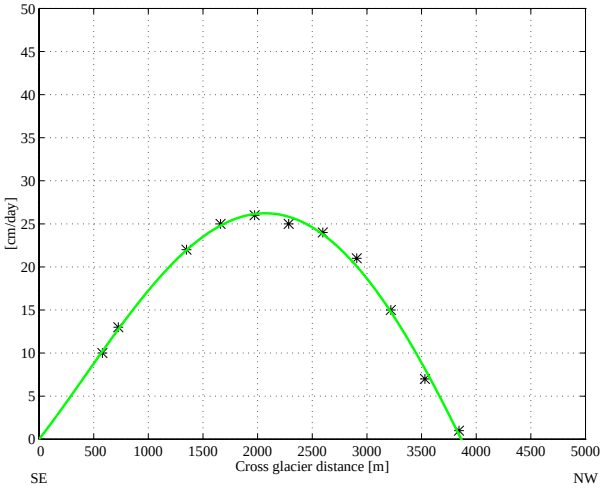

Fig. 2: Profile III - measured (*) and adjusted (-) velocities

Profile III (App. C1, p. 45) was observed in 1992 to 1996 using GPS, but the varying locations of the profile and the distribution of the flags proved to be insufficient. Now the profile has been located on a line from the southwestern end of Washington Basin to the western end of the basin below Hodgkins Peak and the Organ Pipes, where all masses of the most eastern feeder of the Taku Glacier have to pass through. An influence of the Taku Glacier on the mode of flow can be neglected, since the profile is situated 1 km above the confluence zone of the Demorest and the Taku Glacier. As can be seen in Fig. 2, the mode of flow is parabolic. The mean velocity (18 cm/day) and the maximum velocity of 26 cm/day are in good accordance with mean values of the last decade (LANG and WELSCH, 1997).

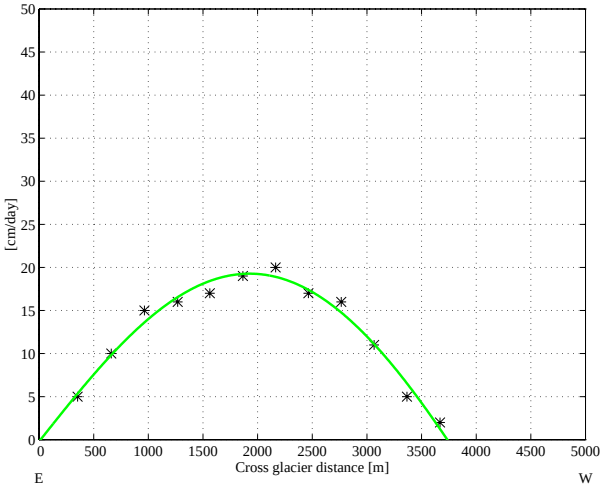

Fig. 3: Profile IIIa - measured (*) and adjusted (-) velocities

Profile IIIa (App. C1, p. 49) is located about 9 km below the nevé area of the Demorest Glacier and some 13 km up-glacier from Profile III. The profile traverses the glacier on a line from the southeast corner of “Spider Mt.” to the unnamed Peak in the southwest vicinity of Peak 5370. The flow pattern is parabolic (Fig. 3) showing a mean velocity of 12 cm/day and a maximum velocity of 20 cm/day. Due to insignificant movement combined with odd orientations, the movement vectors at the eastern and western ends were disregarded in the calculation of the mean movement. All movement vectors have a southwestern orientation indicating that the ridge coming down from Peak 5370 continues well below the profile.

2.2.2. Main Taku Glacier and Taku SW-Branch

Profile IV, consisting of two parallel lines some 300 m apart, traverses the Main Taku Glacier between Camp 10 and the northeast ridge of Shoehorn Mountain (App. C1, p. 45). The movement patterns of both lines are nearly identical: parabolic in- and decrease of the velocities on the northeast and southwest ends and rectilinear flow in the center extending some 2 km with a uniform velocity of about 60 cm/day. The outflow from the basin east of Shoehorn Mountain is causal for the change of the orientations of the movement vectors on the southwest end of both lines. A mean velocity of 36 cm/day for Profile IV was calculated. Fig. 4 depicts the measured and adjusted velocities of Profile IV in 1998. These results support the findings of a parabolic flow type with a broadened central zone (LANG and WELSCH, 1997). Since 1993 identical positions were used for the movement vector determination at Profile IV. During this timespan the magnitude and orientation of the individual movement vectors show a high degree of accordance. In general, the differences in velocities and orientations do not exceed 2 cm/day and 2 gon resp., showing impressively that there is no change of the glacial behavior in this area.

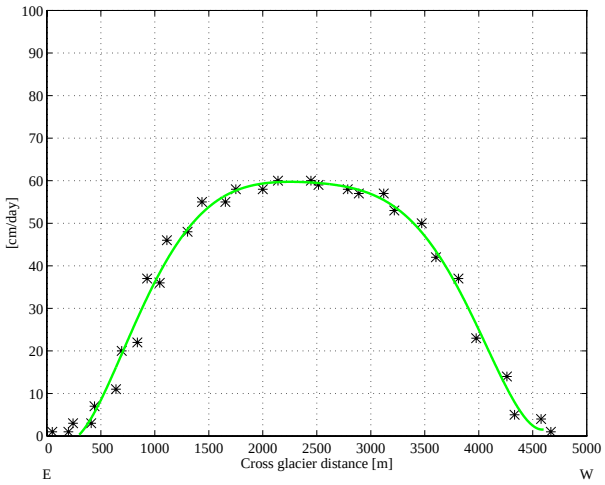

Fig. 4: Profile IV - measured (*) and adjusted (-) velocities

The Southwest Branch covering some 40 km^2 forms the smallest contributary within the Taku Glacier system. Profile V is located about 500 m above the confluence area with the Main Taku Glacier between SW Taku Point and Juncture Peak. Profile V allows to monitoring the flow of all the ice masses of the feeder with the lowest elevation of the Taku Glacier system. In Fig. 5 the observed and adjusted velocities for Profile V are

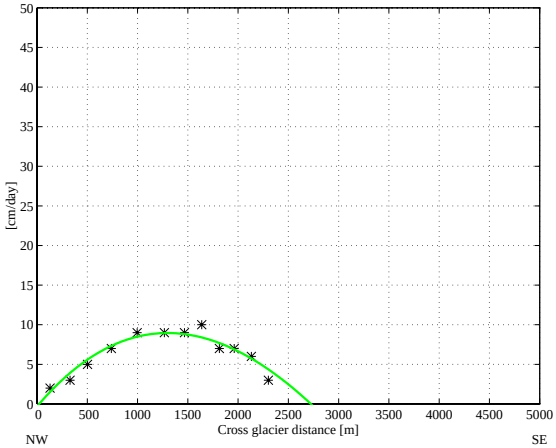

Fig. 5: Profile V - measured (*) and adjusted (-) velocities

shown. The flow pattern is perfectly parabolic. The maximum velocity of 10 cm/day and a mean of 6 cm/day corresponds very well with the values shown by LANG and WELSCH (1997). The variations of the movement vectors derived over the years at the same positions are in general negligible.

2.2.3. Lower Matthes Glacier and Taku NW-Branch

Profile VI (App. C1, p. 47) stretches from NW Taku Point to Echo Mountain. A parabolic type of flow with a sharper increase in velocity on the northern end is found (Fig. 6). The adjusted velocities suggest that the northernmost point of the profile, even being more than 1 km away from the glacier's border at Echo Mountain, marks the area, where substantial movement starts along that profile. The maximum (28 cm/day) and mean velocities (18 cm/day) are in agreement with the values found over the last decade (LANG and WELSCH, 1997).

Profile VIa (App. C1, p.47) traverses the NW Branch between NW Taku Point and Taku D. The movements of points 1 and 2, situated on the ridge coming down from Taku D, are not significant. Therefore, both points were not included in the calculation of the mean velocity. The flow has to be characterized as perfectly parabolic (Fig. 7). Compared to 1994, as the profile was measured last in the same position, the movement vectors do not differ more than 3 cm/day in velocity and 8 gon in orientation. The mean (20 cm/day) and the maximum velocity (31 cm/day) agree with results of former years.

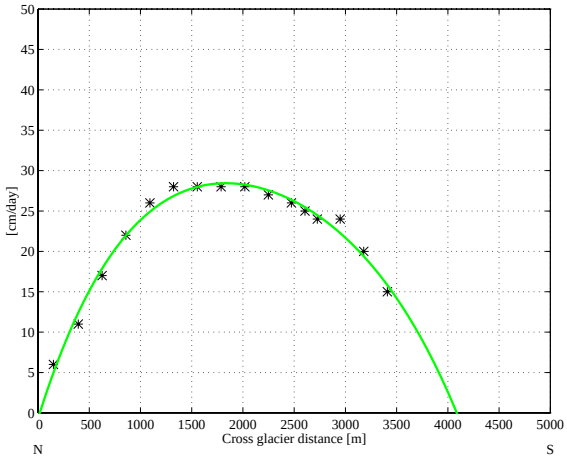

Fig. 6: Profile VI - measured (*) and adjusted (-) velocities

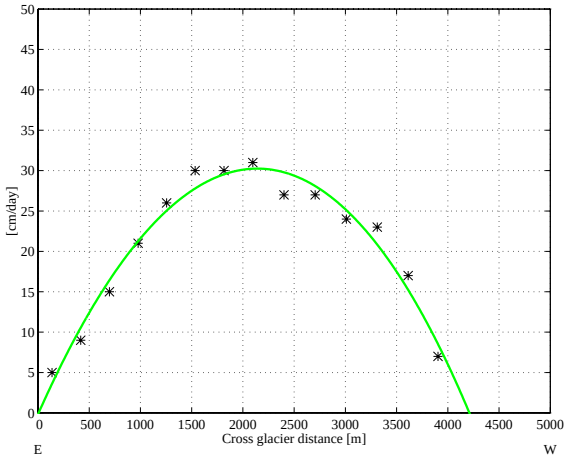

Fig. 7: Profile VIa - measured (*) and adjusted (-) velocities

Profile VII traverses the Matthes Glacier on a line from Camp 9 to Centurian Peak. It is located 5 km above the confluence with the NW-Branch. The mode of flow is parabolic with a broadened central zone of uniform velocity (Fig. 8). The insignificant movements found on the eastern end of the profile reflect the outflow of the small basin below Camp 9 towards the Matthes Glacier. Not taking into account points 1 to 4, the mean velocity is 22 cm/day and the maximum velocity 32 cm/day. Compared to former years the deviations in velocity and orientation of the movement vectors are negligible; thus no change in the glacial behavior can be seen.

The recommendation to re-arrange the point positions of Profile VII (LANG, 1997a)

must be repeated: Whereas points no. 1-4 experience insignificant movements, which are not caused by the Matthes Glacier, the profile is too short on the western end. The profile should be extended for some 500 m (2 or 3 points) in the western direction.

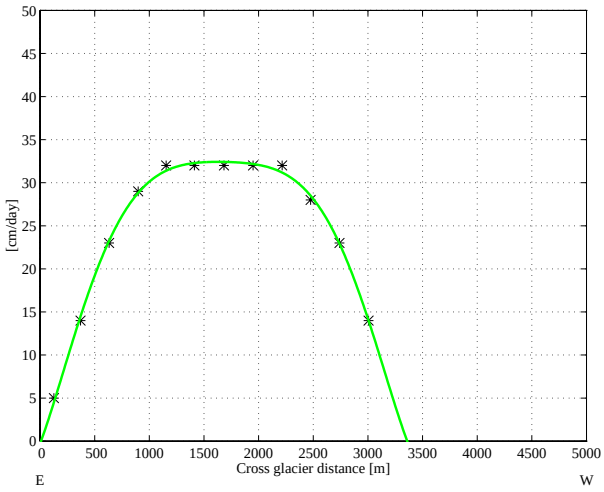

Fig. 8: Profile VII - measured (*) and adjusted (-) velocities

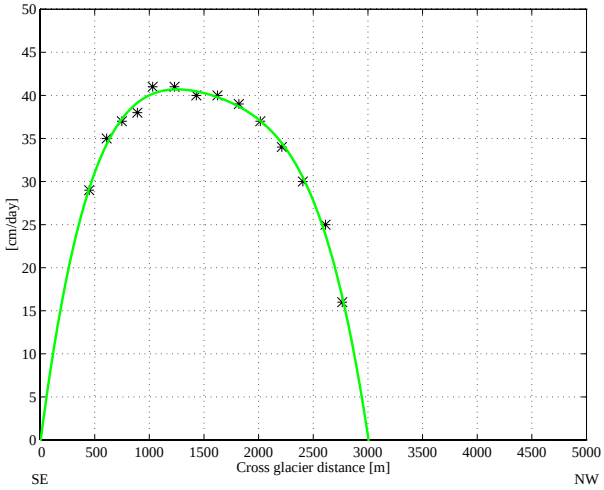

Fig. 9: Profile VIIa - measured (*) and adjusted (-) velocities

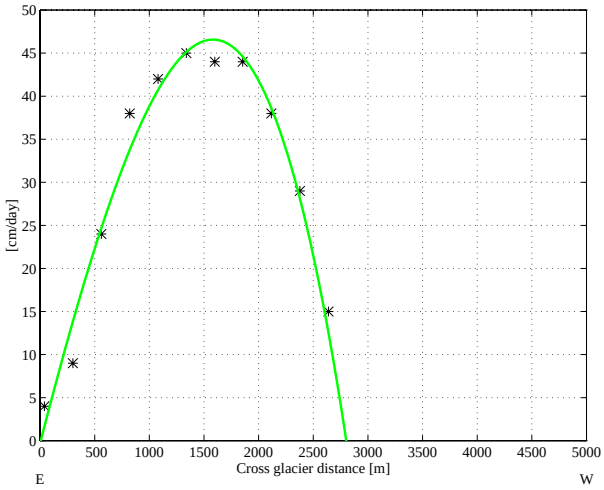

Fig.10: Profile VIIb - measured (*) and adjusted (-) velocities

Towards the confluence with the NW-Branch of the Taku Glacier the Matthes Glacier valley narrows substantially. Over a distance of only 5 km the glacier's width diminishes from 4 km at Profile VII to some 3 km at Profile VIIa (App. C1, p. 47). Between Profiles VII and VIIa no masses are added to the Matthes Glacier; therefore, the gain in velocity is caused by the changing topography. The increase of the maximum and mean velocities to 42 cm/day and 31 cm/day resp. is proportional to the decrease in width. The flow pattern is parabolic (Fig. 9) and the differences to the movement vectors derived in former years at the same positions are negligible (1 cm/day in velocity and 3 gon in orientation are the maximum values). This supports the previous statement, that there is no detectable change in the flow pattern on the Lower Matthes Glacier.

Again an older suggestion is repeated: At the end of the existing profile substantial movement rates (18 cm/day and 31 cm/day at the western and eastern end resp.) occur. Two points on both ends of the profile should be added to verify the sharp drop in velocity which can be seen in the adjusted velocities in Fig. 9.

With the exception of the middle part of the Matthes Glacier, there were movement profiles every 5 km. To close the gap between Profile VIII and VII, which are some 12 km apart, Profile VIIb was established (App. C1, p. 49). It is located between The Citadel and the central part of the Spirit Range. The flow type of this profile is parabolic. The maximum velocity of 45 cm/day is the highest found at all Matthes Glacier movement profiles. The smallest width of about 2.8 km combined

with the steepest section of the glacier (the gradient is some 5°) is causative. The resulting "bursting effect" can clearly be seen in the adjusted velocities (Fig. 10). The mean velocity at Profile VIIb is 29 cm/day.

2.3. Height and volume changes

The change of heights between two surveys of a particular point moving on a glacier is mainly a result of two processes: the ablation and the downhill movement of the point. Since the effects of the two processes are generally not separated, the phrase "short term height change" is used in the following (App. C3, pp. 61-68). It should not be mixed up with the pure ablation.

As stated before, the accuracy of a GPS determined height is about 5 cm. Therefore, the standard deviation of a height difference is some 7 cm. The timespan between two surveys is some 6 days on average; the standard deviations of the daily height changes are therefore in the range of 1 cm/day.

The heights of the glacier's surface at a specific point position can be compared, if the same position of the point is used year after year and if its height is determined on the same day of the year. In practice, however, a survey can hardly be realized exactly on the same date. Therefore, the height values to be compared have to be interpolated taking the rates of the short term height changes into consideration. The year to year height changes are referred to as "long term height changes" (App. D, pp. 69-74).

MCGEE (1997) discussed the use of GPS for the determination of local surface mass balance. All mass balance data are given in the unit "water equivalent" to allow the comparison of different ice densities. Traditionally, mass balance data are sampled digging snow pits. This method allows firstly to determine reliable density data, and secondly to find the margin of the last year's firn layer. In contrast, GPS observations can give only height changes of distinct points. To distinguish the traditional mass balance results from GPS derived ones, the latter are called "volume change".

2.3.1. Short term height and volume changes

Plots of all short term height changes are shown in appendix C2 (pp. 51-59), the corresponding numbers are given in App. C3 (pp. 61-68). In general, the short term height changes along an individual profile show great variations without any regional patterns. As expected, smaller height changes in higher elevations can be seen. The extremely low height change at Profile IIIa is a result of snowfall between the two survey epochs.

In principle, it is possible to use the data of the short term height changes of the double lines of Profile IV to calculate the volume change in this area. The results may be misleading: the downhill movement of the points pretend a bigger change in height, whereas the deformation of the point grid results in a different area. That can falsify the result in either way. Therefore the numbers of the volume change during the summer period of 1998 are given in App. E (pp. 75-78) without discussion.

The loss of volume at Profile IV from 1997 to 1998 is amounts to $1 \cdot 10^6$ m^3. That is twice the value of the year before and the forth season in row with loss of volume. This means less accumulation during the winter and/or more ablation during the summer.

It is suggested to determine local glacier gradients using a simple setup: measuring one point up- and down-glacier in the direction of the slope at each profile point allows to calculate the slope. The distance between the profile point and the "gradient determination point" should exceed 25 m for significant gradients.

2.3.2. Long term height and volume changes

The numbers of the long term height changes can be found in App. D (pp. 71-74). It is clearly visible that all profiles experienced a loss in height during the last year.

The point positions of 1994 and 1995 resp., were used for Profile VIa and Profile VI. The loss in height averaging 2.6 m and 3.8 m (Figs. 11, 12) can testify the steady trend of decrease in height determined at other profiles in previous years. Whereas the loss at Profile VI is quite constant across the profile, it decreases from northeast (Taku D) to southwest (Taku NW Point) at Profile VIa. A reason for this fact, especially the differences on both margins of the profile, cannot be seen.

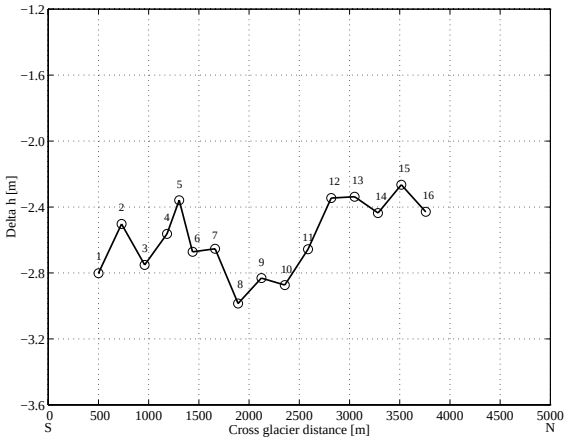

Fig. 11: Height change at Profile VI (1995 to 1998)

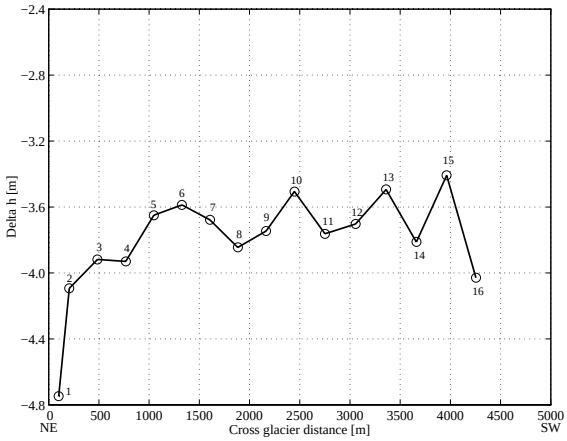

Fig. 12: Height change at Profile VIa (1995 to 1998)

The heights of all points on Profile IV were reduced by 1.0 m in average (Fig. 13). Analyzing the changes for the upper and lower line a similar pattern of height changes can be seen. Beginning at the eastern end close to Camp 10 both lines show an increasing loss in height reaching peak values at point 13 and 14 resp. Further to the west, the height loss decreases slowly reaching values on the western end similar to those on the eastern end.

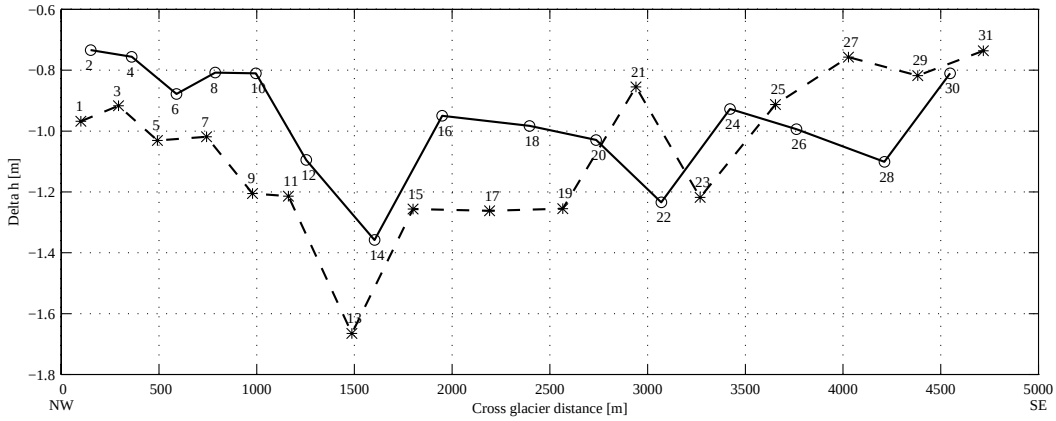

Fig. 13: Height change at Profile IV (1997 to 1998). Upper line: solid, lower line: dashed

The heights of the points of Profile V are rather uniformly lower by 0.94 m in 1998 as compared to 1997 (Fig. 14).

Profiles VII and VIIa situated 350 m and 250 m resp. higher lost about 1.3 m on average (Figs. 15, 16). The height changes of both profiles have to be characterized as erratic, differences of some 0.5 m occur within 200 m. A trend relating bigger losses with higher elevations of the profiles can be seen with some caution for the period 1997-1998 (Table 2).

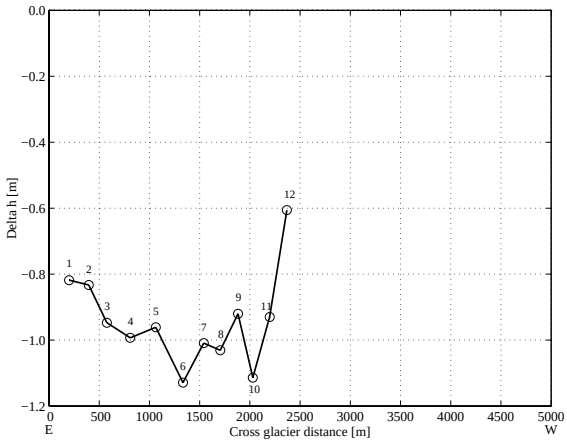

Fig. 14: Height change at Profile V (1997 to 1998)

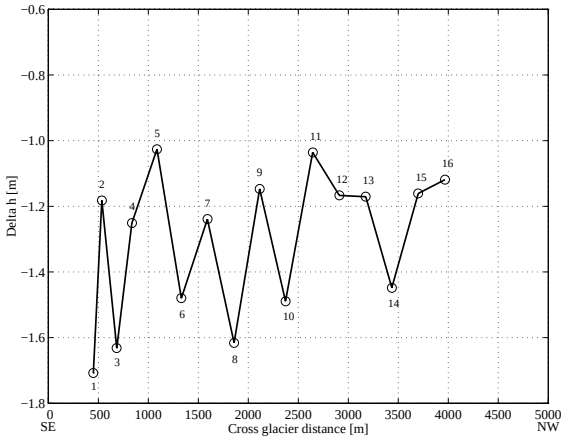

Fig. 15: Height change at Profile VII (1997 to 1998)

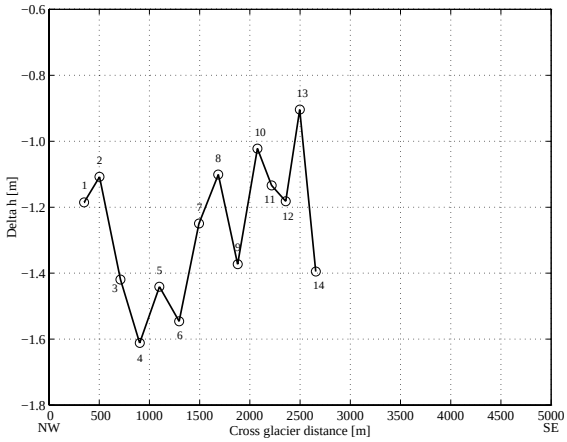

Fig. 16: Height change at Profile VIIa (1997 to 1998)

Unfortunately, neither profiles in the ablation area of the Taku Glacier nor profiles on the High Plateau were observed this summer. Due to the lack of additional information it cannot be clarified whether the pattern is local or representative for the entire Icefield.

Profile	Mean elevation [m]	Mean height change 1997-1998 [m]
V	1070	-0.94
IV low	1125	-0.96
IV up	1127	-1.07

Profile	Mean elevation [m]	Mean height change 1997-1998 [m]
VIIa	1276	-1.26
VII	1426	-1.29

Tab. 2: Mean height changes versus elevation

LANG (1993) investigated a height profile on the High Plateau set in 1952 and detected a gain in elevation of 10 to 15 m. 8 out of 16 points of this profile could be resurveyed this summer. A mean loss in elevation of 4.1 m between 1993 and 1998 is a clear evidence thatthe trend of mass wastage has already reached the High Plateau.

A mean loss in height of at least 10.5 m for the uppermost 20% of the Lemon Creek Glacier for the period 1989-1997 was revealed by LANG (1997a). A resurvey was conducted in 1998. The mean loss in height was 2.2 m between 1997 and 1998 (Fig. 17). It

correponds to a loss of volume of $11.5 \cdot 10^6$ m^3. The yearly loss of volume from 1989 to 1997 was $7.5 \cdot 10^6$ m^3 (LANG, 1997a), while MARCUS et al. (1995) found $4.1 \cdot 10^6$ m^3 for the period 1957-1989. Taking the massive mass wastage as given, the Lemon Creek Glacier will not exist anymore by the mid of the next century.

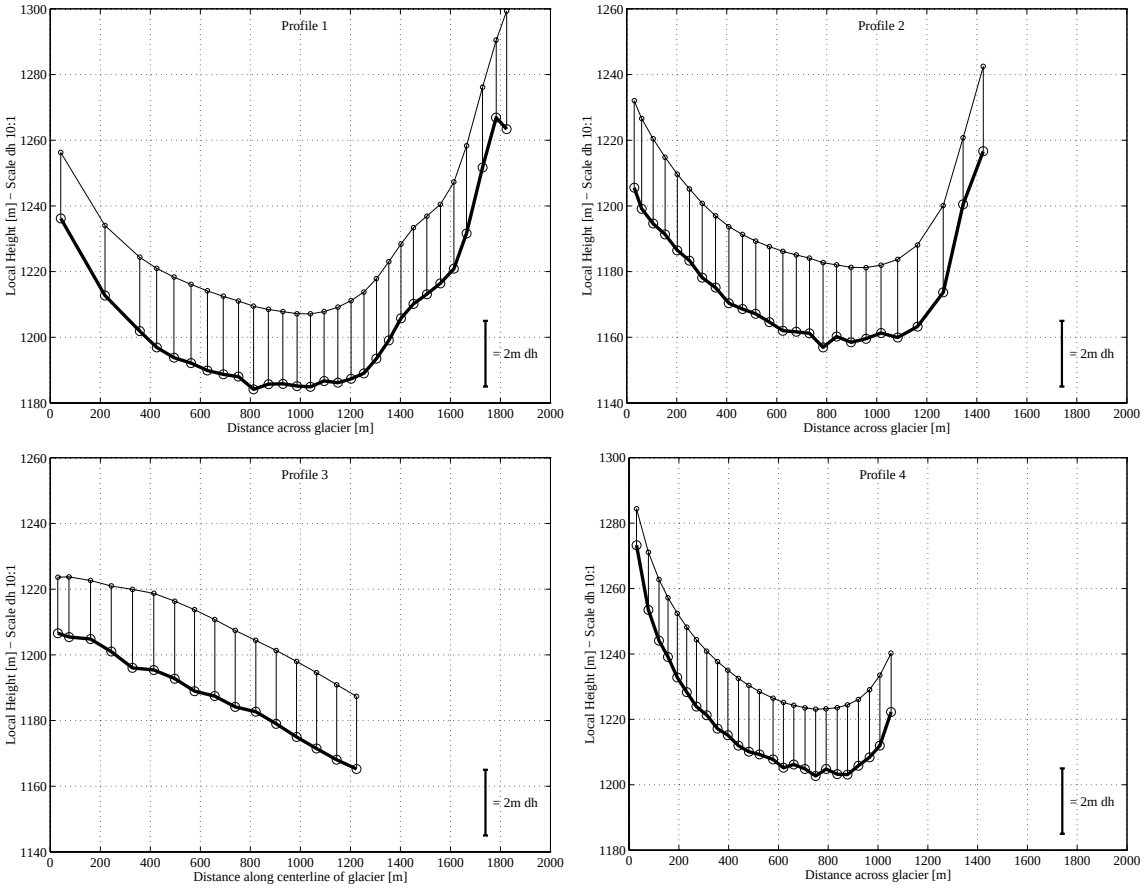

Fig. 17: Lemon Creek Glacier height change 1997-1998: Profiles 1 - 4. Upper line: glacier surface 1997, lower line: glacier surface 1998.

2.4. Strain

According to WELSCH (1997) strain rates can be derived from repeated observations of geometrical figures like triangles. Strain rate measurements are a contribution to stress and strain relations which are the basis for further glacier studies applying methods of continuum mechanics.

The distribution of the strain rates across the main Taku Glacier on Profile IV proved to be consistent over the years. As an example the maximal principle strain rate e1 is shown in Fig. 18.

On the eastern end very small strain rates are dominant, indicating only little stress within the first 500 m of the profile. This is in accordance with the small increase of velocity in this area. Within the next 1 km the maximum principle strain rates magnify by a factor of 10 caused by the rapid increase of the glaciers flow rate. As a consequence numerous shear crevasses are found in this area. In the central section of Profile IV a more or less homogeneous movement indicated by strain rates which are as low as at the eastern

end is present. Here no crevasses at all can be seen on the glaciers surface. Towards the western end the velocity slows down causing again a peak of maximum principle strain. Again a lot of shear crevasses are present in that section of the glacier. The velocity and the strain rates at the western end of the profile, being 2-4 times bigger than those on the eastern end, show the disturbing influence of the ice flow from the basin between Shoehorn Mountain and Juncture Peak. Numbers are given in appendix F (p.81).

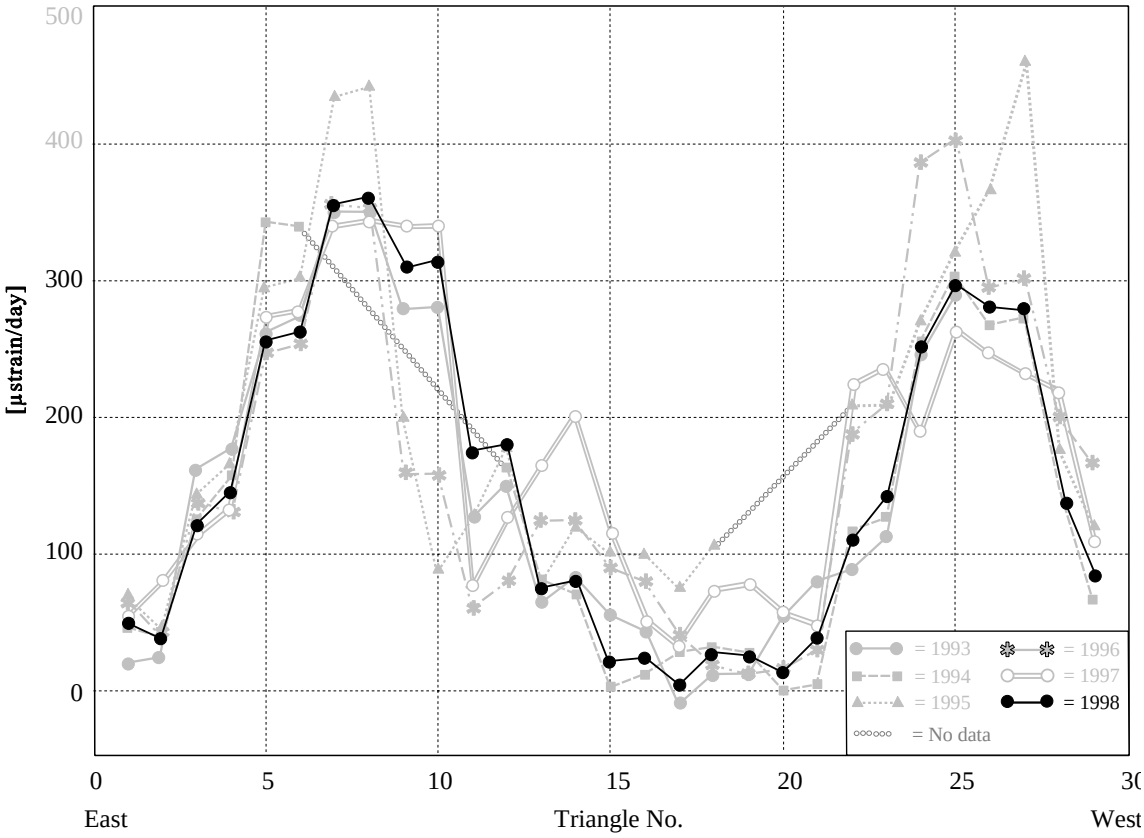

Fig. 18: Maximum principle strain rate (e1) at Profile IV, 1993-1998. Data for 1998 are in black

3. Proposals

The surveying program as practiced this summer proved to be a good compromise between keeping up the records of the traditional movement profiles, investigating new areas and special topics and last but not least the teaching of the students. It is suggested to keep up a similar schedule in future which allows to measure about 5-7 old profiles each season and leaves enough time to establish 2-4 new profiles to fill the gap between existing profiles (e. g. on the Demorest Glacier) or to investigate glaciers which have not been explored. Special investigations (Lemon Creek Glacier height comparison e.g.) consuming time up to 1 week will still fit in.

Some of the existing profiles should be re-arranged (see chapter 2.2.3.), and for reliable short term height changes a greater timespan between both surveys is advised. The determination of local glacier gradients will allow to derive the pure ablation from GPS observations only. The resurvey of profiles in lower (Profile II e.g.) and highest elevations (Profile VIII e.g.) is necessary to gather more data for long term height changes.

A large-scale project would be a longitudinal profile of the entire Taku-Matthes-Llewellyn-Glacier system.

All areas where two glaciers merge or separate are of general interest. A grid type setup can help to deliniate the areas of separating glaciers and to reveal the dynamics of merging glaciers. The areas for investigations of that type are e. g. the Matthes/Vaughan Lewis Glacier Divide, the merging zone of the North and Northwest Branch of the Taku Glacier, the confluence zone of Matthes and Taku Glacier and the the area where the Southwest Branch and the North Branch of the Norris Glacier separate. The confluence area of the Demorest and the Taku Glacier and the separating zone of the Taku and the Hole-in-the-Wall Glacier require more logistic efforts, but they are probably the most interesting areas to investigate.

A possible focus for the survey work in the near future is the Llewellyn Glacier. Profiles on the Llewellyn Glacier in similar elevations as on the Taku Glacier will provide a lot of information as to find different flow regimes of glaciers on the maritime and the continental side of the Icefield. Especially long term height change data will lead to a better understanding of the entire Icefield and the complex processes controlling the fluctuations of the glaciers.

The small-scale flow pattern of the Taku Glacier (as an example) should be investigated (LANG, 1997b) on the basis of a permanently monitoring GPS-receiver array.

In general, the flow pattern of the Taku Glacier system seems to be well-known after many years of intensive observations. It is advised to monitor in future height changes rather than the changes of the flow patterns as indicators of climatic changes such as global warming etc.

4. Acknowledgment

The professional support and the excellent logistics provided by Prof. Dr. M. M. Miller made the completion of this summer's survey program possible. All this could not have been performed without the excellent off-ice logistics handled perfectly by Joan Miller and Rebecca Dayton and the all the participants of the 1998 summer Institute who always helped out when necessary.

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Appendix A

Coordinates of JIRP benchmarks (ITRF93)

Date of last revision:
October 1, 1998

Camp 10 area						
Point name	Point number	GPS	Year	Easting [m]	Northing [m]	Height [m]
FFGR 19	1	*	1995	488001.819	6503290.614	1180.835
FFGR 19B	1.1	-	1985	488383.812	6503660.530	1241.866
FFGR 19D	1.2	-	1985	488260.073	6503696.172	1254.266
FFGR 19C	1.3	*	1995	487983.650	6503410.034	1197.999
Taku B Lower	1.4	-	1983	488291.605	6503745.868	-
Camp 10 North	1.5	-	1987	487953.316	6503398.642	-
SW-Taku	2	-	1987	487333.574	6495903.938	-
SW-Taku East	2.1	-	1987	487312.700	6495908.412	-
SW Taku Lower	2.2	*	1992	487320.590	6495968.918	1133.487
Taku A	3	-	1982	490529.133	6501653.627	1512.038
Taku B	4	-	1981	488584.437	6504541.022	1590.036
Taku B Cairn	4.1	-	1983	488583.775	6504540.870	-
Taku C	5	-	1982	485696.044	6506827.041	1545.431
Taku C Lower	5.1	-	1987	485645.149	6506713.779	1528.351
Sunday Point	6	-	1987	490254.409	6500611.311	-
Sunday Point Cairn	6.1	-	1987	490235.701	6500682.263	-
Taku D	7	-	1983	482941.369	6509777.053	-
Taku D Cairn (FFGR65)	7.1	*	1995	482942.071	6509779.957	1774.108
Taku D Lower	8	*	1995	482601.539	6509092.743	1399.212
Camp 9	9	*	1996	489442.404	6510665.079	1556.223
Camp 9 Cairn	9.1	-	1983	489443.183	6510663.361	-
NW Taku	10	*	1995	479186.763	6505147.717	1402.060
NW Taku Cairn	10.1	*	1997	479188.345	6505144.663	1402.149
Shoehorn Peak	11	-	1981	482657.922	6500295.567	1326.342
Juncture Peak	12	-	1983	485056.994	6498619.047	1339.311
Juncture Peak Lower	12.1	-	1983	485424.713	6498221.909	-
Bavaria Point	13	-	1987	489420.666	6501375.002	-
Glacier King	14	-	1982	474734.289	6509446.896	1481.238
Glacier King Cairn	14.1	-	1982	474736.005	6509445.705	-
Camp 10 A	15	*	1992	489181.351	6501882.011	1105.757
Vantage Peak	16	-	1982	490390.615	6504291.679	1709.737
Twin Peak Geodetic	17	-	1981	500177.078	6499821.685	-
Scott	19.1	*	1995	487963.303	6503372.111	1189.739
Exploration Peak	-	-	1984	487450.796	6507809.503	-

Camp 10 area - continued						
Point name	Point number	GPS	Year	Easting [m]	Northing [m]	Height [m]
Lupine	-	*	1998	490263.717	6500621.560	1080.574
Vista (Camp 9)	-	*	1998	489873.478	6510298.945	1564.057

Camp 18 area						
Point name	Point number	GPS	Year	Easting [m]	Northing [m]	Height [m]
FFGR 45 (Camp 18 Hill)	1	*	1997	484309.150	6524412.394	1746.191
Camp 8	2	-	1987	492140.788	6521149.048	-
FFGR 31 (Camp 8)	2.1	*	1993	492136.624	6521147.773	2051.576
FFGR 39 (Blizzard Pt.)	4	*	1993	487443.145	6524360.975	1984.385
FFGR 68 (Camp 18 Hill)	5	*	1997	484425.554	6524412.335	1751.611
FFGR 24 (Camp 18 Hill)	6	*	1995	484189.635	6524371.872	1733.416
FFGR 43 (Camp 18)	7	*	1995	483990.101	6524352.738	1703.762
FFGR 44 (Cleaver)	8	*	1997	483834.598	6524280.382	1669.572
FFGR 31 (Cleaver)	9	*	1997	483705.534	6524279.606	1623.548
FFGR 49 (Cleaver)	11	-	1982	483244.123	6524040.612	-
FFGR 48 (Cleaver)	12	-	1982	483375.593	6524007.974	-
Camp 19	14	-	1981	482226.811	6522614.250	-
FFGR 18 (Camp 19)	15	-	1982	482294.684	6522477.554	-
FFGR 12 (Camp 19)	16	*	1995	482221.820	6522621.728	1292.865
Mammary Peak Pt.	17	*	1997	484896.620	6522670.609	1928.018
Mt. Moore	18	-	1983	492458.688	6521225.686	2176.952
Mt. Moore Cairn	18.1	-	1983	492460.494	6521228.959	-
FFGR 63 (Camp 18 Hill)	22	*	1997	484315.335	6524309.996	1723.699
FFGR 64 (Camp 18 Hill)	23	*	1997	484219.214	6524334.390	1727.783
Camp 19TL	25	-	1981	482224.893	6522611.681	-
FFGR 04 (Cleaver)	26	*	1995	483309.746	6524118.094	1388.753
FFGR 53 (Camp 19)	27	*	1995	482195.157	6522670.922	1277.773
FFGR 42	28	-	1982	483435.183	6524134.408	1426.096
N1 (Camp 18)	29	*	1995	484073.444	6524262.764	1698.457
N2 (Camp 18)	30	*	1997	483956.314	6524239.526	1682.217
FFGR 34 (Camp 18 Hill)	31	*	1997	484554.464	6524402.905	1734.890
FFGR 62 (F10 Pt.)	32	*	1997	492497.562	6535469.195	1860.563

* = Coordinates derived using GPS measurements Year = year of (last) observation

Appendix B1

Coordinate Listing of Movement Profile Flags

Profile III (Demorest Glacier, Taku A – Hodgkins Peak)

Epoch 0					
Point	Easting [m]	Northing [m]	Height [m]	Date	Time
DEM 01	491627.092	6501358.341	1015.502	26.07.98	14:12
DEM 02	491863.045	6501154.453	1021.433	26.07.98	14:30
DEM 03	492098.691	6500950.694	1024.527	26.07.98	14:45
DEM 04	492334.550	6500746.715	1028.892	26.07.98	15:02
DEM 05	492570.303	6500542.930	1027.469	26.07.98	15:15
DEM 06	492806.204	6500338.978	1026.323	26.07.98	15:28
DEM 07	493041.918	6500135.149	1035.233	26.07.98	15:42
DEM 08	493277.750	6499931.499	1045.193	26.07.98	15:55
DEM 09	493513.500	6499727.599	1048.162	26.07.98	16:09
DEM 10	493749.400	6499523.786	1046.943	26.07.98	16:24
DEM 11	493985.208	6499319.847	1044.863	26.07.98	16:50
DEM 12	494102.992	6499234.961	1042.122	26.07.98	17:03
Epoch 1					
Point	Easting [m]	Northing [m]	Height [m]	Date	Time
DEM 01	491627.036	6501358.293	1015.276	01.08.98	11:38
DEM 02	491862.679	6501154.223	1021.048	01.08.98	12:06
DEM 03	492097.910	6500950.223	1024.251	01.08.98	12:31
DEM 04	492333.507	6500746.035	1028.675	01.08.98	12:52
DEM 05	492569.035	6500542.256	1027.191	01.08.98	13:13
DEM 06	492804.892	6500338.298	1026.050	01.08.98	13:34
DEM 07	493040.539	6500134.483	1034.877	01.08.98	13:55
DEM 08	493276.435	6499930.859	1044.771	01.08.98	14:17
DEM 09	493512.328	6499727.038	1047.861	01.08.98	14:39
DEM 10	-	-	-	-	-
DEM 11	493984.636	6499319.359	1044.537	01.08.98	16:35
DEM 12	494102.564	6499234.569	1041.852	01.08.98	17:13

- = not accessible

Profile IIIa (Upper Demorest Glacier, Spider Mt. – Peak 5370)

Epoch 0					
Point	Easting [m]	Northing [m]	Height [m]	Date	Time
DEM UP 01	492009.623	6510931.508	1353.893	06.08.98	14:21
DEM UP 02	492309.418	6510940.505	1342.190	06.08.98	14:41
DEM UP 03	492611.682	6510949.446	1336.141	06.08.98	14:50
DEM UP 04	492911.977	6510958.459	1335.046	06.08.98	15:03
DEM UP 05	493213.040	6510967.214	1334.314	06.08.98	15:12
DEM UP 06	493513.443	6510976.268	1337.257	06.08.98	15:20
DEM UP 07	493812.929	6510959.012	1341.298	06.08.98	15:33
DEM UP 08	494111.535	6510937.036	1346.994	06.08.98	15:48
DEM UP 09	494411.866	6510968.232	1353.299	06.08.98	15:58
DEM UP 10	494704.175	6511000.425	1358.564	06.08.98	16:07
DEM UP 11	495008.084	6511022.715	1364.069	06.08.98	16:17
DEM UP 12	495308.586	6511060.254	1369.620	06.08.98	16:27
DEM UP 13	495611.287	6511117.032	1375.575	06.08.98	16:36
DEM UP 14	495905.878	6511179.804	1380.051	06.08.98	16:45
DEM UP 15	496204.957	6511220.425	1383.554	06.08.98	16:58
Epoch 1					
Point	Easting [m]	Northing [m]	Height [m]	Date	Time
DEM UP 01	492009.582	6510931.485	1353.750	11.08.98	12:23
DEM UP 02	492309.406	6510940.417	1342.202	11.08.98	12:29
DEM UP 03	492611.602	6510949.223	1336.065	11.08.98	12:35
DEM UP 04	492911.896	6510957.939	1334.920	11.08.98	12:41
DEM UP 05	493212.771	6510966.475	1334.181	11.08.98	12:46
DEM UP 06	493513.106	6510975.496	1337.139	11.08.98	12:51
DEM UP 07	493812.598	6510958.084	1341.154	11.08.98	12:56
DEM UP 08	494111.075	6510936.207	1346.886	11.08.98	13:01
DEM UP 09	494411.533	6510967.472	1353.271	11.08.98	13:06
DEM UP 10	494703.828	6510999.729	1358.546	11.08.98	13:12
DEM UP 11	495007.729	6511022.084	1364.028	11.08.98	13:17
DEM UP 12	495308.310	6511059.841	1369.562	11.08.98	13:24
DEM UP 13	495611.151	6511116.848	1375.527	11.08.98	13:31
DEM UP 14	495905.837	6511179.786	1379.943	11.08.98	13:36
DEM UP 15	496204.973	6511220.424	1383.523	11.08.98	13:40

Profile IV (Taku Glacier, Camp 10 – Shoehorn Mt.) - Lower Line

Epoch 0					
Point	Easting [m]	Northing [m]	Height [m]	Date	Time
TAKU IV 01	487744.632	6503055.348	1116.810	25.07.98	15:19
TAKU IV 03	487601.311	6502925.760	1119.721	25.07.98	15:40
TAKU IV 05	487454.274	6502792.760	1119.512	25.07.98	15:59
TAKU IV 07	487266.711	6502623.382	1117.092	25.07.98	16:12
TAKU IV 09	487089.026	6502462.371	1117.479	25.07.98	16:27
TAKU IV 11	486955.287	6502341.608	1118.267	25.07.98	16:36
TAKU IV 13	486716.593	6502124.922	1117.612	25.07.98	16:44
TAKU IV 15	486484.707	6501915.538	1114.449	25.07.98	16:58
TAKU IV 17	486193.441	6501651.496	1118.589	25.07.98	17:12
TAKU IV 19	485916.210	6501399.765	1124.804	25.07.98	17:28
TAKU IV 21	485636.773	6501146.058	1131.601	25.07.98	17:50
TAKU IV 23	485397.797	6500929.143	1133.288	25.07.98	18:04
TAKU IV 25	485110.413	6500668.046	1135.319	25.07.98	18:17
TAKU IV 27	484830.001	6500413.725	1136.608	25.07.98	18:33
TAKU IV 29	484572.894	6500179.142	1139.981	25.07.98	18:44
TAKU IV 31	484323.380	6499953.498	1144.250	25.07.98	18:55
Epoch 1					
Point	Easting [m]	Northing [m]	Height [m]	Date	Time
TAKU IV 01	487744.667	6503055.328	1116.507	02.08.98	11:31
TAKU IV 03	487601.450	6502925.612	1119.382	02.08.98	11:36
TAKU IV 05	487454.683	6502792.410	1119.224	02.08.98	11:40
TAKU IV 07	487267.822	6502622.332	1116.667	02.08.98	11:44
TAKU IV 09	487091.143	6502460.386	1117.105	02.08.98	11:49
TAKU IV 11	486957.902	6502339.158	1117.841	02.08.98	11:52
TAKU IV 13	486719.769	6502122.078	1117.073	02.08.98	11:56
TAKU IV 15	486488.080	6501912.552	1114.006	02.08.98	12:00
TAKU IV 17	486197.072	6501648.599	1118.041	02.08.98	12:04
TAKU IV 19	485919.842	6501396.906	1124.262	02.08.98	12:11
TAKU IV 21	485640.320	6501143.428	1131.058	02.08.98	12:17
TAKU IV 23	485401.145	6500926.705	1132.802	02.08.98	12:22
TAKU IV 25	485113.084	6500666.176	1134.871	02.08.98	12:28
TAKU IV 27	484831.468	6500412.756	1136.185	02.08.98	12:38
TAKU IV 29	484573.306	6500179.045	1139.641	02.08.98	12:44
TAKU IV 31	484323.485	6499953.534	1143.903	02.08.98	12:50

Profile IV (Taku Glacier, Camp 10 – Shoehorn Mt.) – Upper Line

Epoch 0					
Point	Easting [m]	Northing [m]	Height [m]	Date	Time
TAKU IV 02	487527.632	6503207.124	1123.633	25.07.98	21:17
TAKU IV 04	487380.418	6503056.449	1122.611	25.07.98	21:11
TAKU IV 06	487218.933	6502892.464	1119.897	25.07.98	21:03
TAKU IV 08	487078.999	6502749.715	1119.043	25.07.98	20:56
TAKU IV 10	486936.595	6502604.031	1118.770	25.07.98	20:42
TAKU IV 12	486754.744	6502419.293	1118.405	25.07.98	20:31
TAKU IV 14	486483.465	6502199.106	1119.661	25.07.98	20:23
TAKU IV 16	486222.354	6501972.235	1119.013	25.07.98	20:15
TAKU IV 18	485891.981	6501670.438	1124.837	25.07.98	20:06
TAKU IV 20	485640.206	6501443.092	1130.874	25.07.98	19:59
TAKU IV 22	485391.234	6501220.904	1135.168	25.07.98	19:51
TAKU IV 24	485397.797	6500929.143	1133.288	25.07.98	18:04
TAKU IV 26	484858.926	6500778.449	1137.834	25.07.98	19:35
TAKU IV 28	484512.393	6500493.794	1137.734	25.07.98	19:26
TAKU IV 30	484251.735	6500282.273	1139.432	25.07.98	19:04
Epoch 1					
Point	Easting [m]	Northing [m]	Height [m]	Date	Time
TAKU IV 02	487527.697	6503207.055	1123.288	02.08.98	14:38
TAKU IV 04	487380.593	6503056.312	1122.280	02.08.98	14:33
TAKU IV 06	487219.522	6502891.866	1119.522	02.08.98	14:29
TAKU IV 08	487080.232	6502748.529	1118.663	02.08.98	14:24
TAKU IV 10	486938.665	6502602.198	1118.385	02.08.98	14:19
TAKU IV 12	486757.592	6502416.880	1117.821	02.08.98	14:13
TAKU IV 14	486486.660	6502196.275	1119.309	02.08.98	14:09
TAKU IV 16	486225.799	6501969.313	1118.471	02.08.98	14:04
TAKU IV 18	485895.605	6501667.542	1124.275	02.08.98	13:59
TAKU IV 20	485643.766	6501440.293	1130.379	02.08.98	13:55
TAKU IV 22	485394.754	6501218.295	1134.795	02.08.98	13:49
TAKU IV 24	485124.439	6500990.331	1135.574	02.08.98	13:41
TAKU IV 26	484861.239	6500776.781	1137.399	02.08.98	13:34
TAKU IV 28	484513.312	6500493.232	1137.464	02.08.98	13:28
TAKU IV 30	484252.045	6500282.162	1139.085	02.08.98	13:19

Profile V (Taku Glacier SW Branch, Juncture Peak – SW Taku Pt.)

Epoch 0					
Point	Easting [m]	Northing [m]	Height [m]	Date	Time
SW TAKU 01	485734.934	6498030.241	1057.694	27.07.98	13:16
SW TAKU 02	485859.543	6497874.725	1060.374	27.07.98	13:27
SW TAKU 03	485960.888	6497735.179	1063.596	27.07.98	13:41
SW TAKU 04	486104.600	6497545.751	1065.902	27.07.98	13:53
SW TAKU 05	486273.234	6497351.707	1065.797	27.07.98	14:10
SW TAKU 06	486450.146	6497147.074	1065.254	27.07.98	14:26
SW TAKU 07	486577.406	6496992.281	1068.432	27.07.98	15:07
SW TAKU 08	486689.254	6496863.499	1072.837	27.07.98	15:27
SW TAKU 09	486805.435	6496732.171	1076.544	27.07.98	15:38
SW TAKU 10	486904.540	6496621.638	1077.823	27.07.98	15:47
SW TAKU 11	487012.312	6496489.213	1079.144	27.07.98	16:00
SW TAKU 12	487116.862	6496357.558	1081.400	27.07.98	16:09
Epoch 1					
Point	Easting [m]	Northing [m]	Height [m]	Date	Time
SW TAKU 01	485735.050	6498030.249	1057.301	02.08.98	17:11
SW TAKU 02	485859.694	6497874.874	1059.986	02.08.98	16:42
SW TAKU 03	485961.097	6497735.425	1063.289	02.08.98	16:17
SW TAKU 04	486104.866	6497546.085	1065.637	02.08.98	15:44
SW TAKU 05	486273.516	6497352.187	1065.476	02.08.98	15:17
SW TAKU 06	486450.445	6497147.528	1064.976	02.08.98	14:50
SW TAKU 07	486577.616	6496992.752	1068.112	02.08.98	14:20
SW TAKU 08	486689.607	6496863.979	1072.522	02.08.98	13:54
SW TAKU 09	486805.674	6496732.522	1076.205	02.08.98	13:29
SW TAKU 10	486904.749	6496621.968	1077.630	02.08.98	12:38
SW TAKU 11	487012.542	6496489.457	1078.847	02.08.98	12:07
SW TAKU 12	487116.929	6496357.719	1081.109	02.08.98	11:32

Profile VI (Taku Glacier NW Branch, Taku NW Pt. – Echo Mt.)

Epoch 0					
Point	Easting [m]	Northing [m]	Height [m]	Date	Time
NW TAKU 01	478980.405	6505811.798	1323.826	28.07.98	13:34
NW TAKU 02	478921.868	6506034.876	1325.569	28.07.98	13:56
NW TAKU 03	478861.617	6506256.826	1324.990	28.07.98	14:10
NW TAKU 04	478798.169	6506470.393	1324.908	28.07.98	14:25
NW TAKU 05	478770.829	6506588.025	1324.207	28.07.98	14:42
NW TAKU 06	478742.781	6506717.567	1323.019	28.07.98	14:52
NW TAKU 07	478690.483	6506936.339	1321.291	28.07.98	15:06
NW TAKU 08	478636.432	6507159.066	1321.655	28.07.98	15:21
NW TAKU 09	478581.715	6507384.291	1325.161	28.07.98	15:38
NW TAKU 10	478526.179	6507610.291	1328.575	28.07.98	15:51
NW TAKU 11	478471.852	6507835.291	1332.097	28.07.98	16:05
NW TAKU 12	478415.948	6508059.032	1334.075	28.07.98	16:17
NW TAKU 13	478358.025	6508285.777	1335.106	28.07.98	16:31
NW TAKU 14	478307.161	6508512.636	1335.593	28.07.98	16:44
NW TAKU 15	478255.234	6508738.728	1335.590	28.07.98	16:59
NW TAKU 16	478204.596	6508976.266	1334.215	28.07.98	17:08
Epoch 1					
Point	Easting [m]	Northing [m]	Height [m]	Date	Time
NW TAKU 01	478981.430	6505811.807	1323.477	04.08.98	11:23
NW TAKU 02	478923.218	6506034.766	1325.217	04.08.98	11:28
NW TAKU 03	478863.241	6506256.698	1324.695	04.08.98	11:33
NW TAKU 04	478799.821	6506470.239	1324.543	04.08.98	11:38
NW TAKU 05	478772.533	6506587.905	1324.081	04.08.98	11:41
NW TAKU 06	478744.590	6506717.477	1322.744	04.08.98	11:45
NW TAKU 07	478692.311	6506936.233	1320.970	04.08.98	11:49
NW TAKU 08	478638.315	6507158.904	1321.333	04.08.98	11:54
NW TAKU 09	478583.650	6507384.059	1324.819	04.08.98	11:59
NW TAKU 10	478528.059	6507610.085	1328.303	04.08.98	12:06
NW TAKU 11	478473.718	6507835.044	1331.821	04.08.98	12:11
NW TAKU 12	478417.696	6508058.861	1333.872	04.08.98	12:16
NW TAKU 13	478359.528	6508285.683	1334.857	04.08.98	12:20
NW TAKU 14	478308.303	6508512.531	1335.360	04.08.98	12:26
NW TAKU 15	478255.968	6508738.655	1335.408	04.08.98	12:31
NW TAKU 16	478204.972	6508976.274	1333.990	04.08.98	12:35

Profile VIa (Taku Glacier NW Branch, Taku NW Pt. – Taku D)

Epoch 0					
Point	Easting [m]	Northing [m]	Height [m]	Date	Time
NW TAKU A01	482197.174	6508672.641	1273.489	31.07.98	14:39
NW TAKU A02	482130.610	6508590.706	1273.565	31.07.98	14:31
NW TAKU A03	481951.420	6508373.943	1270.646	31.07.98	14:25
NW TAKU A04	481774.091	6508156.307	1270.783	31.07.98	14:18
NW TAKU A05	481597.348	6507939.844	1270.056	31.07.98	14:12
NW TAKU A06	481420.435	6507722.331	1270.633	31.07.98	14:03
NW TAKU A07	481244.715	6507506.377	1271.984	31.07.98	13:57
NW TAKU A08	481070.660	6507289.723	1274.862	31.07.98	13:48
NW TAKU A09	480893.424	6507070.450	1277.124	31.07.98	13:35
NW TAKU A10	480717.519	6506850.287	1279.366	31.07.98	13:07
NW TAKU A11	480527.099	6506613.228	1281.505	31.07.98	12:59
NW TAKU A12	480335.568	6506377.056	1283.596	31.07.98	12:53
NW TAKU A13	480144.829	6506140.020	1282.069	31.07.98	12:46
NW TAKU A14	479954.670	6505905.549	1280.348	31.07.98	12:39
NW TAKU A15	479767.915	6505669.615	1278.444	31.07.98	12:17
NW TAKU A16	479586.505	6505441.722	1280.710	31.07.98	12:26
Epoch 1					
Point	Easting [m]	Northing [m]	Height [m]	Date	Time
NW TAKU A01	482197.265	6508672.584	1273.359	04.08.98	15:01
NW TAKU A02	482130.634	6508590.705	1273.460	04.08.98	14:56
NW TAKU A03	481951.605	6508373.840	1270.514	04.08.98	14:51
NW TAKU A04	481774.383	6508156.083	1270.607	04.08.98	14:45
NW TAKU A05	481597.816	6507939.470	1269.907	04.08.98	14:41
NW TAKU A06	481421.184	6507721.903	1270.412	04.08.98	14:37
NW TAKU A07	481245.636	6507505.884	1271.902	04.08.98	14:30
NW TAKU A08	481071.746	6507289.239	1274.803	04.08.98	14:24
NW TAKU A09	480894.539	6507069.955	1276.909	04.08.98	14:18
NW TAKU A10	480718.661	6506849.791	1279.327	04.08.98	14:12
NW TAKU A11	480528.124	6506612.811	1281.518	04.08.98	14:06
NW TAKU A12	480336.574	6506376.661	1283.434	04.08.98	14:01
NW TAKU A13	480145.764	6506139.700	1281.846	04.08.98	13:56
NW TAKU A14	479955.552	6505905.262	1280.160	04.08.98	13:52
NW TAKU A15	479768.565	6505669.369	1278.236	04.08.98	13:47
NW TAKU A16	479586.783	6505441.640	1280.555	04.08.98	13:41

Profile VII (Matthes Glacier, Camp 9 – Centurian Peak)

Epoch 0					
Point	Easting [m]	Northing [m]	Height [m]	Date	Time
CAMP_9 01	489081.738	6510948.645	1464.653	30.07.98	12:52
CAMP_9 02	489007.050	6510989.125	1451.918	30.07.98	13:01
CAMP_9 03	488875.535	6511059.291	1437.939	30.07.98	13:09
CAMP_9 04	488742.183	6511131.048	1429.033	30.07.98	13:15
CAMP_9 05	488520.710	6511249.359	1424.747	30.07.98	13:20
CAMP_9 06	488306.174	6511364.429	1424.999	30.07.98	13:44
CAMP_9 07	488074.792	6511486.436	1424.307	30.07.98	13:51
CAMP_9 08	487839.997	6511611.040	1422.398	30.07.98	13:58
CAMP_9 09	487614.448	6511731.485	1421.731	30.07.98	14:06
CAMP_9 10	487386.289	6511854.338	1414.222	30.07.98	14:14
CAMP_9 11	487147.384	6511982.390	1408.508	30.07.98	14:20
CAMP_9 12	486912.630	6512108.008	1412.955	30.07.98	14:35
CAMP_9 13	486677.895	6512231.729	1419.964	30.07.98	14:41
CAMP_9 14	486445.796	6512351.026	1416.573	30.07.98	14:47
CAMP_9 15	486214.412	6512478.085	1416.176	30.07.98	14:54
CAMP_9 16	485980.567	6512606.193	1424.005	30.07.98	15:01
Epoch 1					
Point	Easting [m]	Northing [m]	Height [m]	Date	Time
CAMP_9 01	489081.609	6510948.533	1464.281	07.08.98	17:25
CAMP_9 02	489006.948	6510989.103	1451.547	07.08.98	17:22
CAMP_9 03	488875.406	6511059.280	1437.562	07.08.98	17:19
CAMP_9 04	488741.954	6511131.029	1428.708	07.08.98	17:14
CAMP_9 05	488520.432	6511249.062	1424.497	07.08.98	17:10
CAMP_9 06	488305.421	6511363.608	1424.786	07.08.98	17:06
CAMP_9 07	488073.692	6511484.924	1423.955	07.08.98	17:03
CAMP_9 08	487838.572	6511609.122	1422.081	07.08.98	17:00
CAMP_9 09	487612.925	6511729.395	1421.274	07.08.98	16:57
CAMP_9 10	487384.782	6511852.239	1413.864	07.08.98	16:54
CAMP_9 11	487145.941	6511980.230	1408.142	07.08.98	16:49
CAMP_9 12	486911.234	6512105.839	1412.528	07.08.98	16:45
CAMP_9 13	486676.548	6512229.558	1419.555	07.08.98	16:40
CAMP_9 14	486444.712	6512349.041	1416.238	07.08.98	16:35
CAMP_9 15	486213.766	6512476.366	1416.224	07.08.98	16:30
CAMP_9 16	485980.333	6512605.051	1423.584	07.08.98	16:26

Profile VIIa (Lower Matthes Glacier, Taku D – Taku C)

Epoch 0					
Point	Easting [m]	Northing [m]	Height [m]	Date	Time
LOW MAT 01	483727.102	6509199.523	1299.311	29.07.98	14:58
LOW MAT 02	483850.104	6509108.182	1298.608	29.07.98	14:45
LOW MAT 03	484016.963	6508984.146	1298.990	29.07.98	14:38
LOW MAT 04	484171.562	6508870.356	1298.500	29.07.98	14:31
LOW MAT 05	484329.753	6508753.347	1298.381	29.07.98	14:25
LOW MAT 06	484487.913	6508637.259	1297.688	29.07.98	14:18
LOW MAT 07	484645.853	6508520.820	1299.119	29.07.98	14:11
LOW MAT 08	484802.290	6508406.584	1306.388	29.07.98	14:04
LOW MAT 09	484954.609	6508294.373	1314.702	29.07.98	13:56
LOW MAT 10	485116.188	6508176.565	1319.045	29.07.98	13:15
LOW MAT 11	485229.480	6508093.575	1319.721	29.07.98	13:23
LOW MAT 12	485343.782	6508009.456	1321.395	29.07.98	13:29
LOW MAT 13	485455.943	6507927.853	1321.998	29.07.98	13:35
LOW MAT 14	485584.534	6507833.560	1321.325	29.07.98	13:42
Epoch 1					
Point	Easting [m]	Northing [m]	Height [m]	Date	Time
LOW MAT 01	483726.456	6509198.778	1299.058	04.08.98	15:15
LOW MAT 02	483849.037	6509107.096	1298.337	04.08.98	15:20
LOW MAT 03	484015.719	6508982.793	1298.700	04.08.98	15:23
LOW MAT 04	484170.118	6508868.857	1298.211	04.08.98	15:27
LOW MAT 05	484328.225	6508751.723	1297.961	04.08.98	15:32
LOW MAT 06	484486.286	6508635.554	1297.294	04.08.98	15:36
LOW MAT 07	484644.092	6508519.129	1298.706	04.08.98	15:42
LOW MAT 08	484800.537	6508404.899	1305.974	04.08.98	15:48
LOW MAT 09	484952.807	6508292.651	1314.385	04.08.98	15:51
LOW MAT 10	485114.408	6508174.827	1318.650	04.08.98	15:55
LOW MAT 11	485227.759	6508091.982	1319.316	04.08.98	15:58
LOW MAT 12	485342.128	6508007.906	1320.989	04.08.98	16:04
LOW MAT 13	485454.399	6507926.404	1321.661	04.08.98	16:15
LOW MAT 14	485583.248	6507832.328	1321.008	04.08.98	16:21

Profile VIIb (Middle Matthes Glacier, The Citadel – Spirit Range)

Epoch 0					
Point	Easting [m]	Northing [m]	Height [m]	Date	Time
MID MAT 01	490216.098	6517031.994	1593.218	01.08.98	13:23
MID MAT 02	489959.082	6516988.121	1579.689	01.08.98	13:38
MID MAT 03	489705.508	6516930.609	1571.612	01.08.98	13:51
MID MAT 04	489450.625	6516880.140	1567.828	01.08.98	14:05
MID MAT 05	489196.178	6516828.615	1556.677	01.08.98	14:14
MID MAT 06	488942.805	6516777.430	1545.942	01.08.98	14:19
MID MAT 07	488687.580	6516726.074	1550.372	01.08.98	14:28
MID MAT 08	488437.607	6516676.265	1558.489	01.08.98	14:38
MID MAT 09	488179.919	6516624.377	1561.307	01.08.98	14:45
MID MAT 10	487924.023	6516572.850	1569.675	01.08.98	15:11
MID MAT 11	487667.760	6516521.488	1580.317	01.08.98	15:20
Epoch 1					
Point	Easting [m]	Northing [m]	Height [m]	Date	Time
MID MAT 01	490215.937	6517031.809	1592.991	07.08.98	15:20
MID MAT 02	489958.893	6516987.586	1579.449	07.08.98	15:16
MID MAT 03	489705.383	6516929.176	1571.336	07.08.98	15:07
MID MAT 04	489450.624	6516877.850	1567.545	07.08.98	15:03
MID MAT 05	489196.308	6516826.063	1556.301	07.08.98	14:57
MID MAT 06	488943.123	6516774.737	1545.641	07.08.98	14:53
MID MAT 07	488687.993	6516723.471	1550.186	07.08.98	14:45
MID MAT 08	488438.029	6516673.674	1558.028	07.08.98	14:41
MID MAT 09	488180.375	6516622.121	1561.013	07.08.98	14:28
MID MAT 10	487924.462	6516571.204	1569.484	07.08.98	14:22
MID MAT 11	487668.126	6516520.704	1580.048	07.08.98	14:11

Appendix B2

Coordinate Listing of Locations related to various projects

Height Comparison Lemon Creek Glacier

Point	Easting [m]	Northing [m]	Height [m]	Date	Time
LEMON 01	478658.262	6472199.599	1256.451	03.08.98	09:43
LEMON 02	478658.715	6472199.343	1256.276	03.08.98	09:46
LEMON 03	478825.821	6472140.683	1234.029	03.08.98	09:51
LEMON 04	478955.447	6472091.175	1224.351	03.08.98	09:56
LEMON 05	479018.493	6472066.189	1221.016	03.08.98	09:59
LEMON 06	479082.730	6472041.499	1218.343	03.08.98	10:02
LEMON 07	479146.316	6472015.944	1216.123	03.08.98	10:05
LEMON 08	479207.332	6471991.612	1214.126	03.08.98	10:10
LEMON 09	479265.793	6471967.518	1212.471	03.08.98	10:12
LEMON 10	479322.247	6471944.475	1211.031	03.08.98	10:14
LEMON 11	479377.544	6471920.662	1209.475	03.08.98	10:19
LEMON 12	479431.808	6471897.055	1208.468	03.08.98	10:26
LEMON 13	479485.613	6471876.246	1207.829	03.08.98	10:30
LEMON 14	479538.548	6471855.091	1207.184	03.08.98	10:33
LEMON 15	479588.488	6471835.365	1207.144	03.08.98	10:36
LEMON 16	479638.532	6471814.039	1207.812	03.08.98	10:39
LEMON 17	479689.134	6471792.950	1209.147	03.08.98	10:41
LEMON 18	479738.203	6471772.949	1211.161	03.08.98	10:43
LEMON 19	479786.642	6471755.559	1213.816	03.08.98	10:45
LEMON 20	479833.178	6471736.873	1217.887	03.08.98	10:48
LEMON 21	479879.198	6471719.458	1223.004	03.08.98	10:52
LEMON 22	479924.504	6471702.106	1228.432	03.08.98	10:54
LEMON 23	479970.083	6471682.085	1233.335	03.08.98	10:56
LEMON 24	480020.330	6471662.332	1236.905	03.08.98	10:59
LEMON 25	480070.860	6471642.306	1240.471	03.08.98	11:01
LEMON 26	480120.592	6471621.640	1247.248	03.08.98	11:06
LEMON 27	480166.817	6471602.147	1258.282	03.08.98	11:11
LEMON 28	480225.988	6471577.996	1276.100	03.08.98	11:15
LEMON 29	480276.447	6471556.351	1290.416	03.08.98	11:18
LEMON 30	480313.297	6471536.088	1299.361	03.08.98	11:21
LEMON 31	480404.861	6472429.325	1242.435	03.08.98	12:09
LEMON 32	480326.985	6472450.524	1220.720	03.08.98	12:14
LEMON 33	480248.807	6472466.461	1200.106	03.08.98	12:19
LEMON 34	480146.585	6472478.313	1188.070	03.08.98	12:23
LEMON 35	480068.020	6472488.253	1183.712	03.08.98	12:27
LEMON 36	480002.255	6472496.949	1181.977	03.08.98	12:31
LEMON 37	479942.835	6472504.856	1181.219	03.08.98	12:34
LEMON 38	479883.808	6472512.735	1181.278	03.08.98	12:36

Point	Easting [m]	Northing [m]	Height [m]	Date	Time
LEMON 39	479826.123	6472520.814	1182.043	03.08.98	12:38
LEMON 40	479772.300	6472528.614	1182.714	03.08.98	12:41
LEMON 41	479718.624	6472534.967	1184.103	03.08.98	12:45
LEMON 42	479666.473	6472542.638	1185.070	03.08.98	12:47
LEMON 43	479613.477	6472550.017	1186.186	03.08.98	12:51
LEMON 44	479560.182	6472556.628	1187.608	03.08.98	13:00
LEMON 45	479505.857	6472563.393	1189.264	03.08.98	13:04
LEMON 46	479452.810	6472568.795	1191.290	03.08.98	13:10
LEMON 47	479399.073	6472576.366	1193.704	03.08.98	13:14
LEMON 48	479346.289	6472582.800	1196.982	03.08.98	13:16
LEMON 49	479293.028	6472589.389	1200.814	03.08.98	13:19
LEMON 50	479242.804	6472595.779	1205.180	03.08.98	13:21
LEMON 51	479194.514	6472601.905	1209.621	03.08.98	13:23
LEMON 52	479146.158	6472608.061	1214.828	03.08.98	13:25
LEMON 53	479098.404	6472613.240	1220.430	03.08.98	13:27
LEMON 54	479052.947	6472618.276	1226.601	03.08.98	13:31
LEMON 55	479024.208	6472626.162	1232.034	03.08.98	13:34
LEMON 56	479573.369	6472554.717	1187.339	03.08.98	13:44
LEMON 57	479532.450	6472486.391	1190.928	03.08.98	13:49
LEMON 58	479484.979	6472421.672	1194.558	03.08.98	13:52
LEMON 59	479437.868	6472356.767	1197.988	03.08.98	13:54
LEMON 60	479391.332	6472289.935	1201.352	03.08.98	13:56
LEMON 61	479343.997	6472223.745	1204.394	03.08.98	13:59
LEMON 62	479295.621	6472156.597	1207.394	03.08.98	14:02
LEMON 63	479246.994	6472091.563	1210.716	03.08.98	14:05
LEMON 64	479201.899	6472023.945	1213.730	03.08.98	14:08
LEMON 65	479167.006	6471952.672	1216.341	03.08.98	14:10
LEMON 66	479123.504	6471881.347	1218.710	03.08.98	14:13
LEMON 67	479078.954	6471809.053	1219.921	03.08.98	14:16
LEMON 68	479041.399	6471732.784	1220.968	03.08.98	14:21
LEMON 69	478996.684	6471662.874	1222.626	03.08.98	14:24
LEMON 70	478959.013	6471585.373	1223.740	03.08.98	14:27
LEMON 71	478942.273	6471543.815	1223.661	03.08.98	14:29
LEMON 72	478942.561	6471543.743	1223.533	03.08.98	14:31
LEMON 73	478978.198	6471520.870	1223.069	03.08.98	14:37
LEMON 74	479013.315	6471497.201	1223.251	03.08.98	14:40
LEMON 75	479052.535	6471476.545	1223.560	03.08.98	14:43
LEMON 76	479087.453	6471454.077	1224.433	03.08.98	14:44
LEMON 77	479125.919	6471432.895	1226.050	03.08.98	14:46
LEMON 78	479164.994	6471412.310	1229.057	03.08.98	14:49

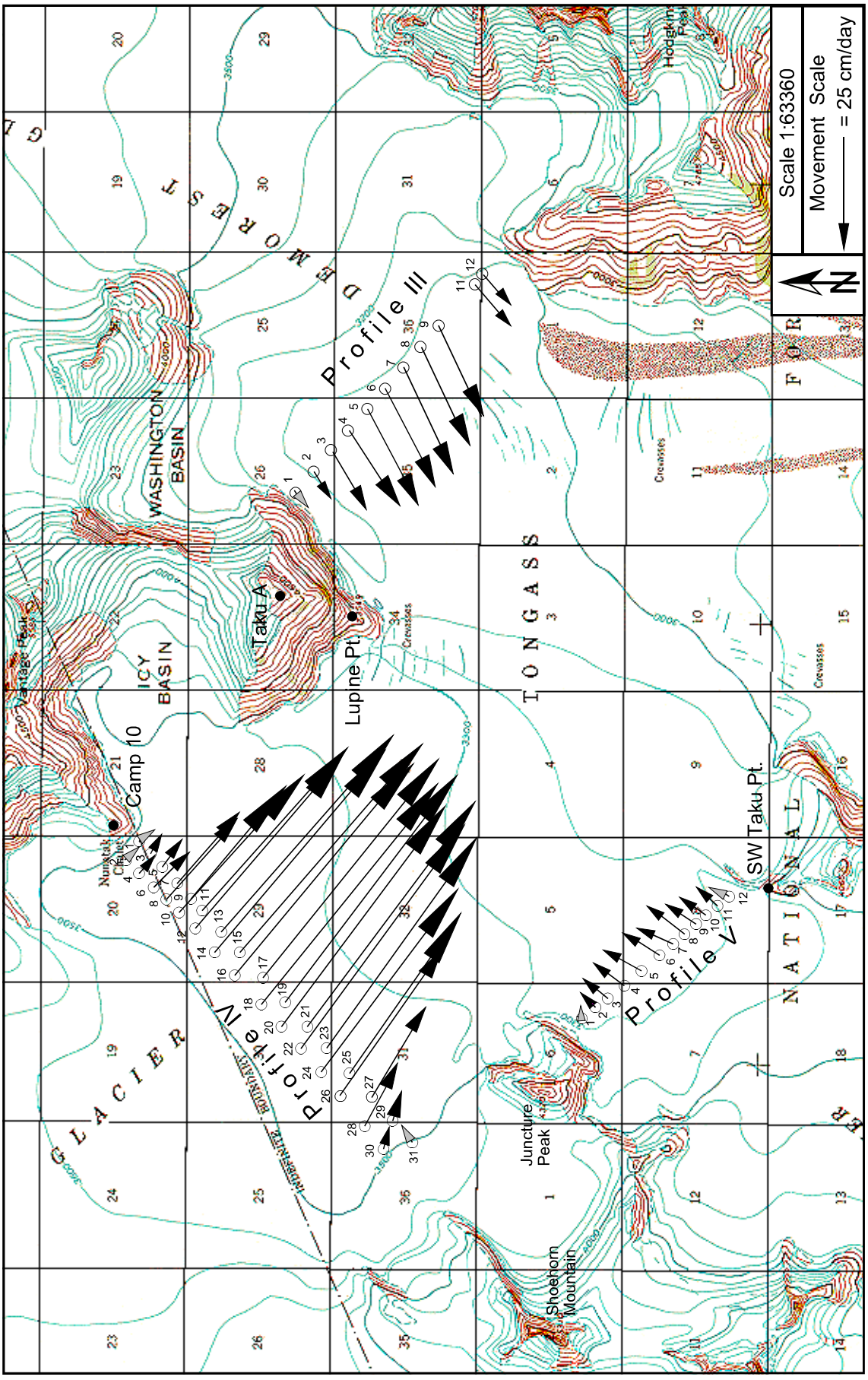
Point	Easting [m]	Northing [m]	Height [m]	Date	Time
LEMON 79	479203.713	6471395.794	1233.492	03.08.98	14:50
LEMON 80	479244.546	6471376.732	1240.199	03.08.98	14:53
LEMON 81	478909.468	6471574.605	1224.289	03.08.98	15:00
LEMON 82	478883.180	6471607.004	1225.147	03.08.98	16:11
LEMON 83	478851.551	6471633.738	1226.463	03.08.98	16:15
LEMON 84	478807.903	6471667.140	1228.474	03.08.98	16:17
LEMON 85	478771.001	6471688.024	1230.366	03.08.98	16:20
LEMON 86	478736.467	6471711.089	1232.513	03.08.98	16:22
LEMON 87	478702.058	6471736.239	1235.000	03.08.98	16:24
LEMON 88	478669.759	6471762.513	1237.660	03.08.98	16:28
LEMON 89	478633.731	6471786.447	1240.857	03.08.98	16:30
LEMON 90	478596.843	6471805.265	1244.338	03.08.98	16:31
LEMON 91	478562.242	6471824.055	1248.201	03.08.98	16:36
LEMON 92	478529.986	6471843.611	1252.432	03.08.98	16:41
LEMON 93	478498.541	6471863.634	1257.218	03.08.98	16:45
LEMON 94	478467.280	6471881.603	1262.738	03.08.98	16:48
LEMON 95	478429.825	6471901.963	1271.095	03.08.98	16:52
LEMON 96	478386.753	6471922.344	1284.409	03.08.98	16:56

Height Comparison Vaughan Lewis Glacier

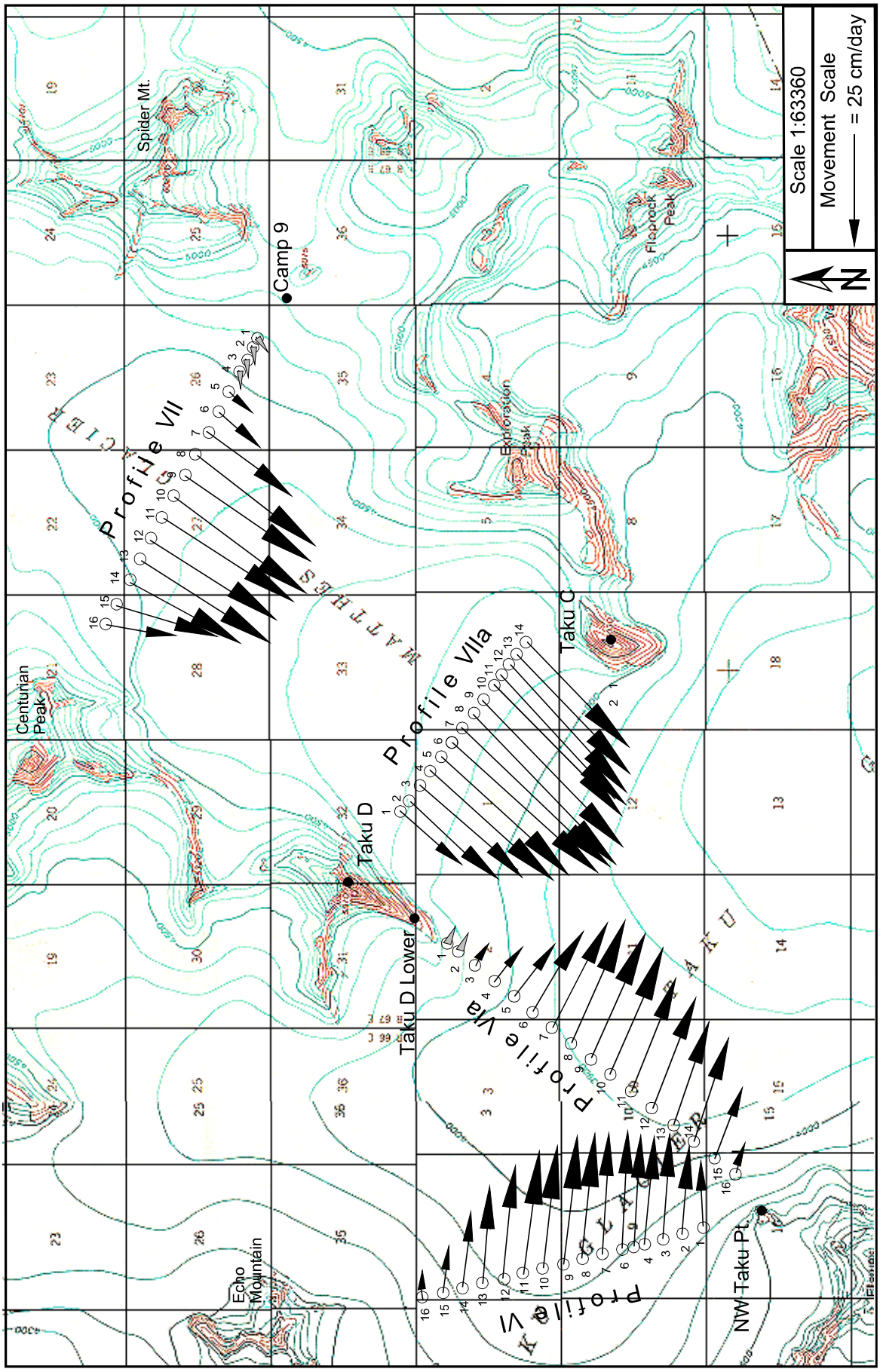
Point	Easting [m]	Northing [m]	Height [m]	Date	Time
VL_1952 01	485781.717	6523140.053	1753.343	12.08.98	11:50
VL_1952 02	486080.524	6523046.707	1757.588	12.08.98	11:59
VL_1952 03	486399.619	6522946.485	1762.431	12.08.98	12:05
VL_1952 04	486677.224	6522859.696	1768.983	12.08.98	12:13
VL_1952 05	486975.990	6522765.825	1777.630	12.08.98	12:20
VL_1952 06	487295.853	6522665.498	1786.538	12.08.98	12:25
VL_1952 07	487594.062	6522572.243	1786.999	12.08.98	12:34
VL_1952 16	490322.715	6521716.426	1787.066	12.08.98	13:16

Appendix C1

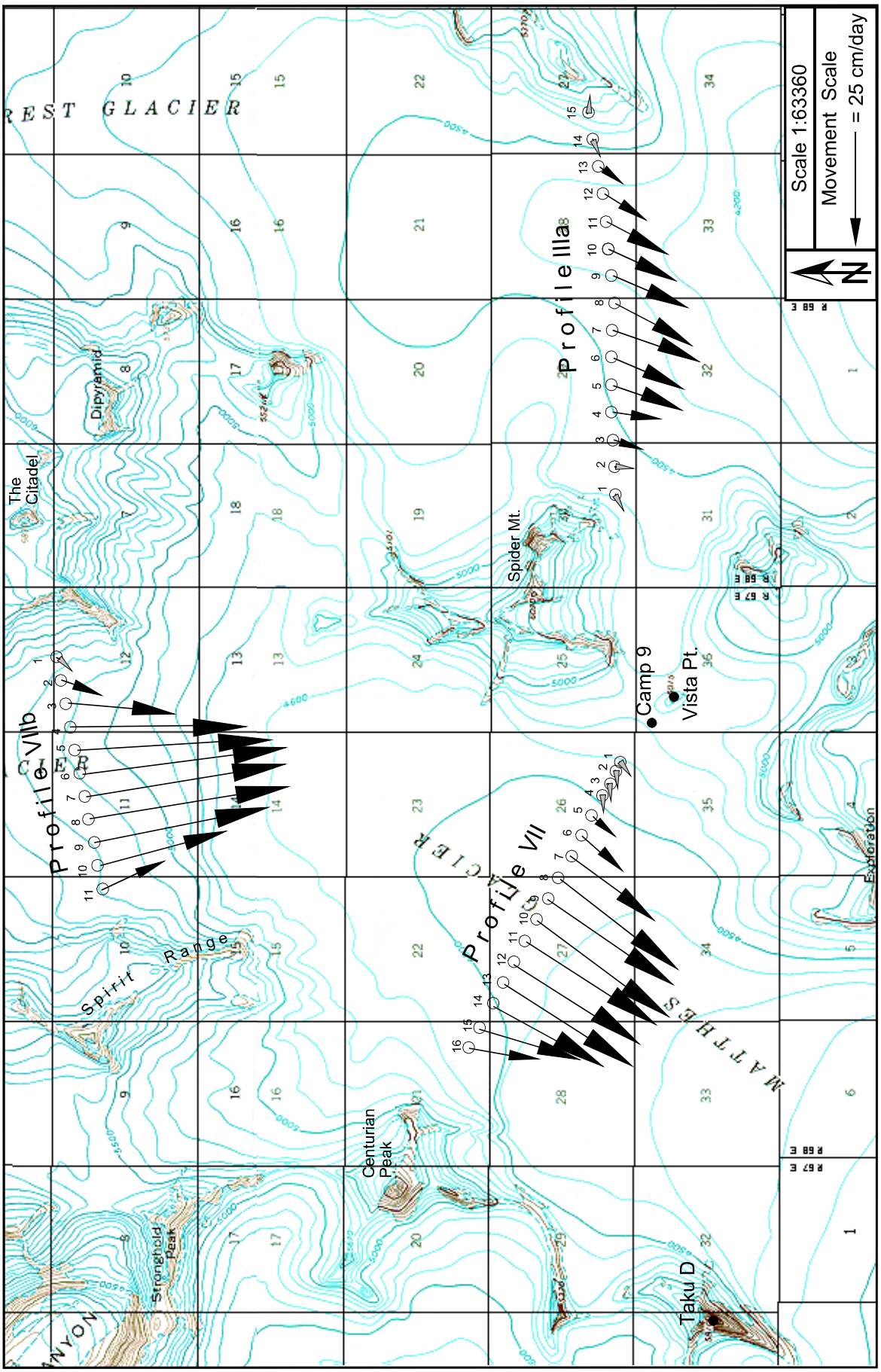
Plots
of Movement Vectors



Movement profiles on the Lower Demorest and Main Taku Glacier



Movement profiles on the Lower Matthes and Taku Glacier

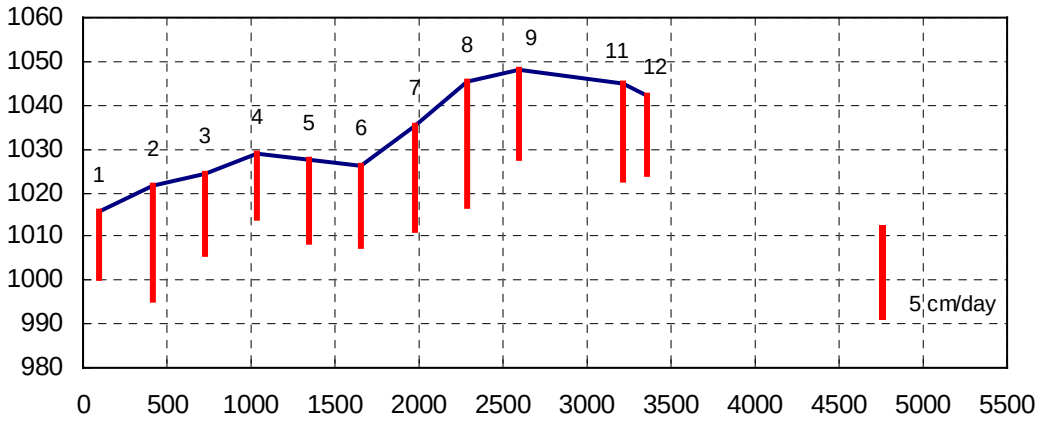


Movement profiles on the Upper Demorest and Middle Matthes Glacier

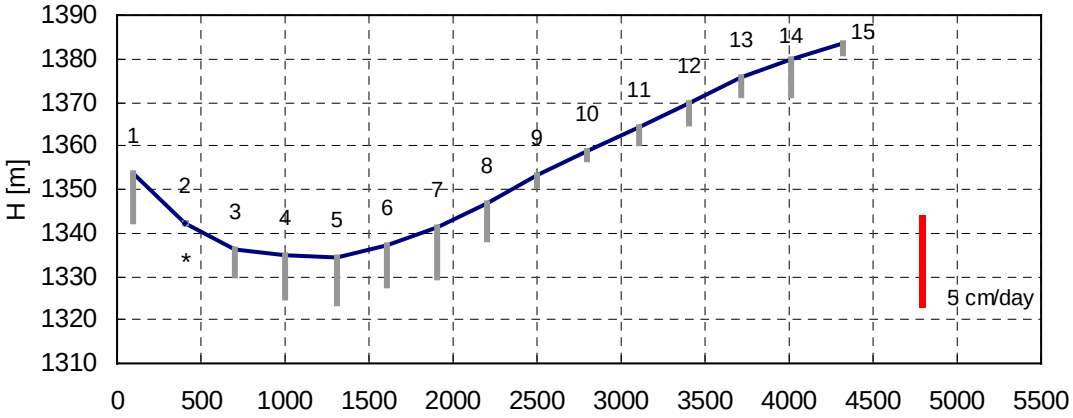
Appendix C2

Plots
of Short Term Height Changes

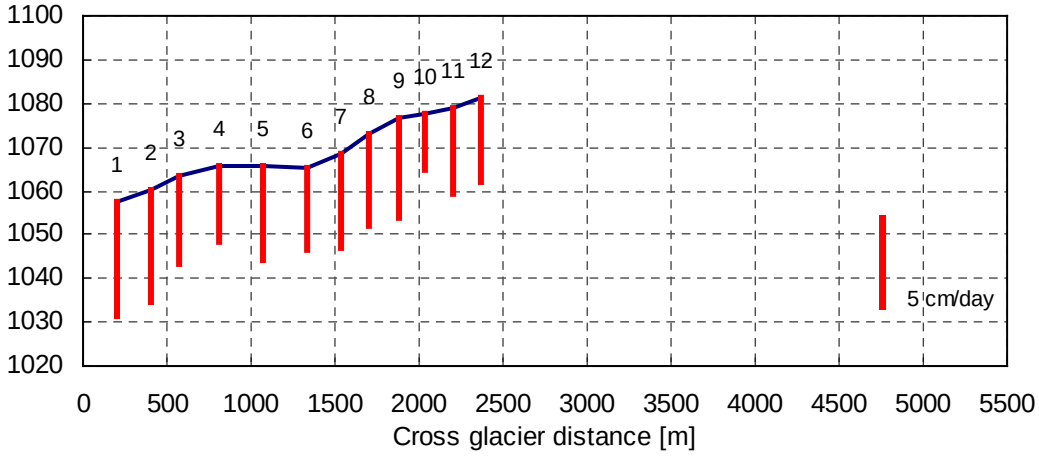
Profile III 26.7. - 1.8.98



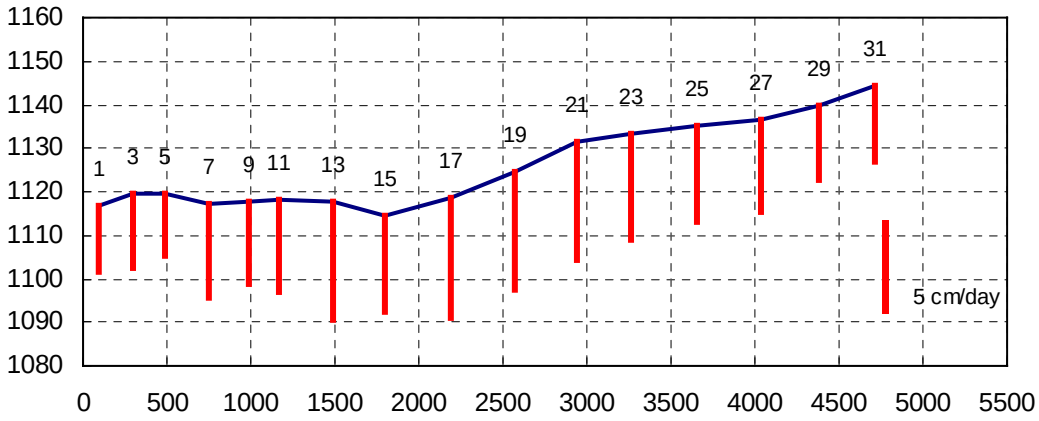
Profile IIIa 6.8. - 11.8.98



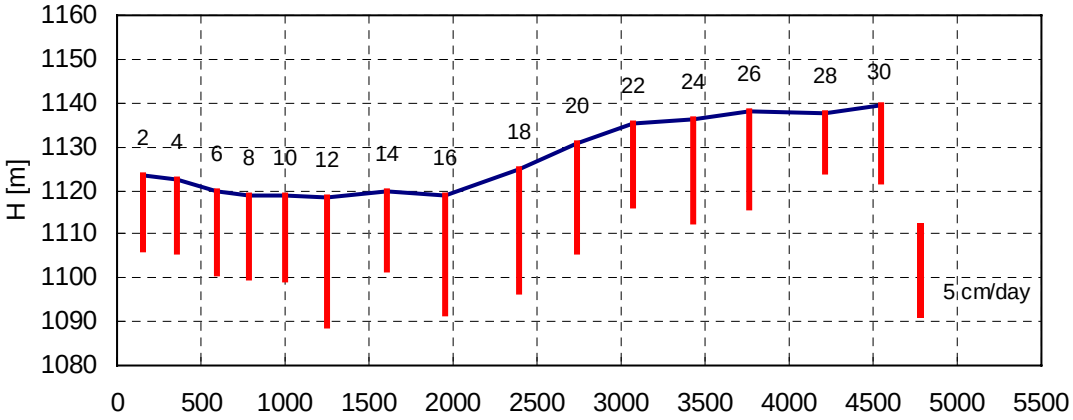
Profile V 27.7. - 2.8.98



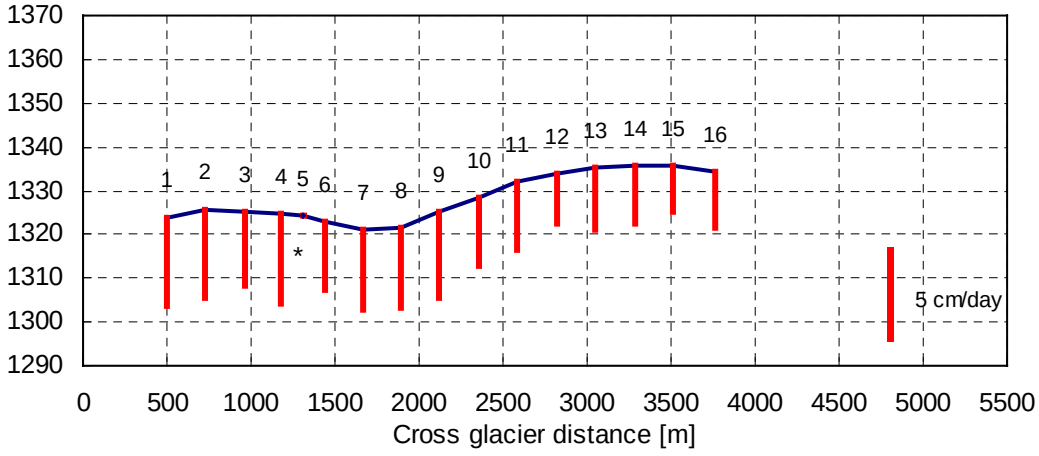
Profile IV (Lower Line) 25.7. - 2.8.98



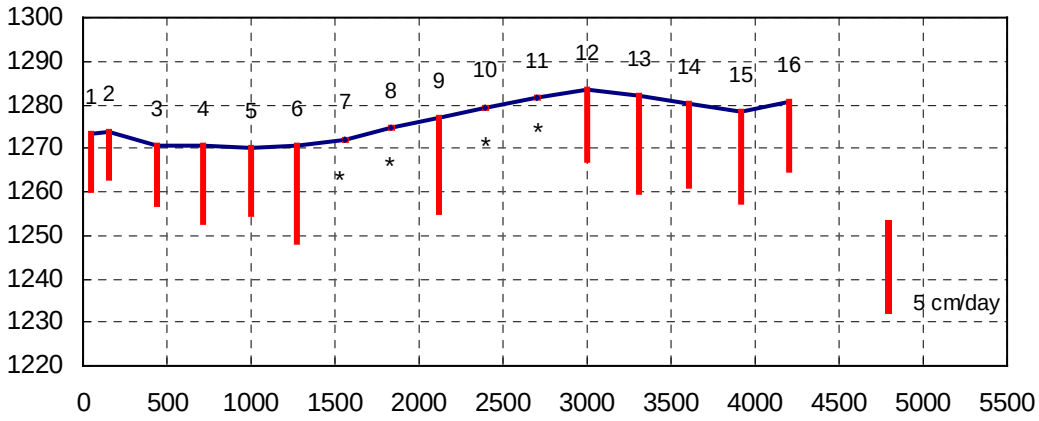
Profile IV (Upper Line) 25.7. - 2.8.98



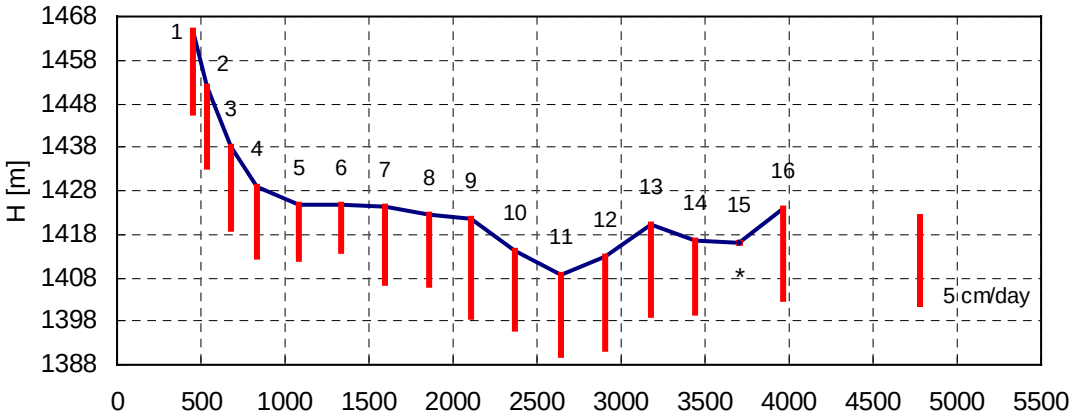
Profile VI 28.7. - 4.8.98



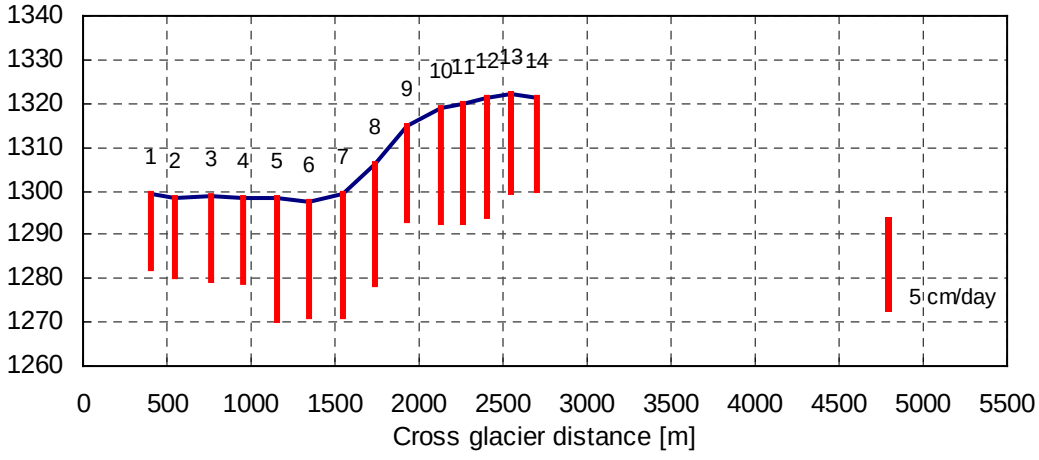
Profile VIa 31.7. - 4.8.98

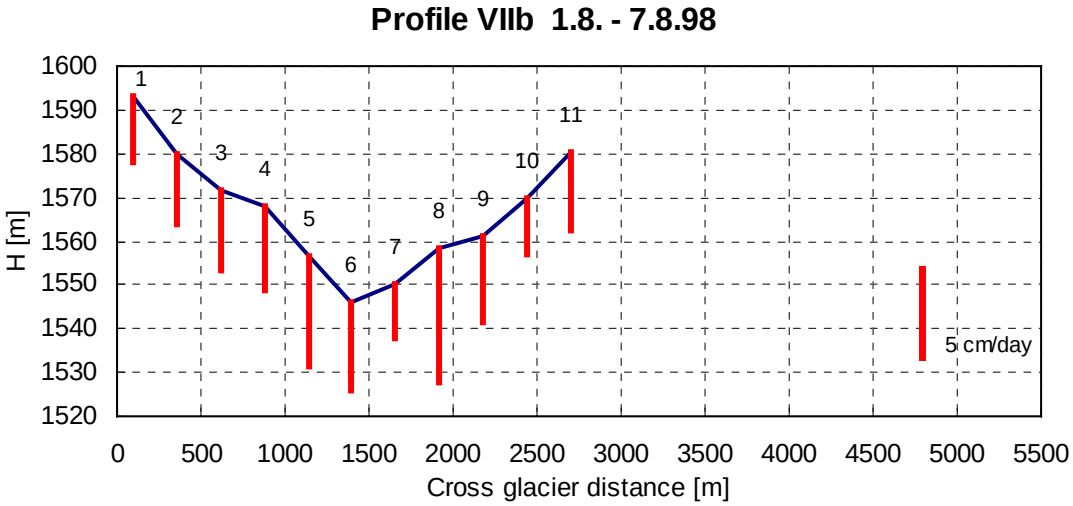


Profile VII 30.7. - 7.8.98



Profile VIIa 29.7 - 4.8.98





: significant height change

: insignificant height change

* : outlier

Appendix C3

Movement Vectors
and
Short Term Height Changes
(Tables)

Profile III (Demorest Glacier, Taku A – Hodgkins Peak)

Point	Point to point distance [m]	Sum of distances [m]	Total Movement [m]	Daily Movement [m]	Bearing of movement [gon]	Total height change [cm]	Daily height change [cm]
DEM 01	0.00	0.00	0.07	0.01	254.89	-22.6	-3.8
DEM 02	311.84	311.84	0.43	0.07	264.28	-38.5	-6.4
DEM 03	311.52	623.36	0.91	0.15	265.45	-27.6	-4.6
DEM 04	311.83	935.19	1.25	0.21	263.22	-21.7	-3.6
DEM 05	311.62	1246.81	1.44	0.24	268.90	-27.8	-4.6
DEM 06	311.84	1558.66	1.48	0.25	269.56	-27.3	-4.6
DEM 07	311.62	1870.28	1.53	0.26	271.36	-35.6	-5.9
DEM 08	311.59	2181.87	1.46	0.24	271.16	-42.2	-7.0
DEM 09	311.69	2493.56	1.30	0.22	271.58	-30.1	-5.0
DEM 11	623.51	3117.08	0.75	0.13	255.03	-32.6	-5.4
DEM 12	145.19	3262.26	0.58	0.10	252.79	-27.0	-4.5

Profile IIIa (Upper Demorest Glacier, Spider Mt. – Peak 5370)

Point	Point to point distance [m]	Sum of distances [m]	Total Movement [m]	Daily Movement [m]	Bearing of movement [gon]	Total height change [cm]	Daily height change [cm]
UP DEM 01	0.00	0.00	0.05	0.01	267.45	-14.3	-2.9
UP DEM 02	299.93	299.93	0.09	0.02	208.63	*	*
UP DEM 03	302.40	602.33	0.24	0.05	221.93	-7.6	-1.5
UP DEM 04	300.43	902.76	0.53	0.11	209.84	-12.6	-2.5
UP DEM 05	301.19	1203.95	0.79	0.16	222.22	-13.3	-2.7
UP DEM 06	300.54	1504.49	0.84	0.17	226.20	-11.8	-2.4
UP DEM 07	299.98	1804.47	0.99	0.20	221.81	-14.4	-2.9
UP DEM 08	299.41	2103.88	0.95	0.19	232.25	-10.8	-2.2
UP DEM 09	301.95	2405.83	0.83	0.17	226.29	-2.8	-0.6
UP DEM 10	294.08	2699.91	0.78	0.16	229.44	-1.8	-0.4
UP DEM 11	304.73	3004.63	0.72	0.14	232.62	-4.1	-0.8
UP DEM 12	302.84	3307.47	0.50	0.10	237.50	-5.8	-1.2
UP DEM 13	307.98	3615.45	0.23	0.05	240.52	-4.8	-1.0
UP DEM 14	301.20	3916.65	0.04	0.01	273.66	-10.8	-2.2
UP DEM 15	301.82	4218.48	0.02	0.00	103.97	-3.1	-0.6

Profile IV (Taku Glacier, Camp 10 – Shoehorn Mt.) – Lower Line

Point	Point to point distance [m]	Sum of distances [m]	Total Movement [m]	Daily Movement [m]	Bearing of movement [gon]	Total height change [cm]	Daily height change [cm]
TAKU IV 01	0.00	0.00	0.04	0.01	133.05	-30.3	-3.8
TAKU IV 03	193.22	193.22	0.20	0.03	152.00	-33.9	-4.2
TAKU IV 05	198.26	391.48	0.54	0.07	145.06	-28.8	-3.6
TAKU IV 07	252.72	644.21	1.53	0.19	148.20	-42.5	-5.3
TAKU IV 09	239.78	883.99	2.90	0.36	147.95	-37.4	-4.7
TAKU IV 11	180.19	1064.19	3.58	0.45	147.93	-42.6	-5.3
TAKU IV 13	322.38	1386.56	4.26	0.53	146.49	-53.9	-6.7
TAKU IV 15	312.43	1698.99	4.50	0.56	146.13	-44.3	-5.5
TAKU IV 17	393.13	2092.13	4.65	0.58	142.87	-54.8	-6.9
TAKU IV 19	374.47	2466.59	4.62	0.58	142.45	-54.2	-6.8
TAKU IV 21	377.43	2844.02	4.42	0.55	140.62	-54.3	-6.8
TAKU IV 23	322.74	3166.76	4.14	0.52	140.07	-48.6	-6.1
TAKU IV 25	388.28	3555.04	3.26	0.41	138.88	-44.8	-5.6
TAKU IV 27	378.56	3933.61	1.76	0.22	137.16	-42.3	-5.3
TAKU IV 29	348.04	4281.65	0.42	0.05	114.72	-34.0	-4.3
TAKU IV 31	336.41	4618.06	0.11	0.01	78.97	-34.7	-4.3

Profile IV (Taku Glacier, Camp 10 – Shoehorn Mt.) – Upper Line

Point	Point to point distance [m]	Sum of distances [m]	Total Movement [m]	Daily Movement [m]	Bearing of movement [gon]	Total height change [cm]	Daily height change [cm]
TAKU IV 02	0.00	0.00	0.09	0.01	151.90	-34.5	-4.3
TAKU IV 04	210.65	210.65	0.22	0.03	142.28	-33.1	-4.1
TAKU IV 06	230.15	440.80	0.84	0.11	150.48	-37.5	-4.7
TAKU IV 08	199.90	640.70	1.71	0.21	148.76	-38.0	-4.8
TAKU IV 10	203.72	844.42	2.76	0.35	146.14	-38.5	-4.8
TAKU IV 12	259.23	1103.65	3.73	0.47	144.75	-58.4	-7.3
TAKU IV 14	349.39	1453.04	4.27	0.53	146.16	-35.2	-4.4
TAKU IV 16	345.90	1798.94	4.52	0.57	144.78	-54.2	-6.8
TAKU IV 18	447.47	2246.41	4.64	0.58	142.92	-56.2	-7.0
TAKU IV 20	339.23	2585.64	4.53	0.57	142.42	-49.5	-6.2
TAKU IV 22	333.70	2919.34	4.38	0.55	140.61	-37.3	-4.7
TAKU IV 24	353.50	3272.84	3.91	0.49	140.54	-46.3	-5.8
TAKU IV 26	338.71	3611.55	2.85	0.36	139.77	-43.5	-5.4
TAKU IV 28	448.46	4060.01	1.08	0.13	134.94	-27.0	-3.4
TAKU IV 30	335.68	4395.69	0.33	0.04	121.89	-34.7	-4.3

Profile V (Taku glacier SW Branch, Juncture Peak – SW Taku Pt.)

Point	Point to point distance [m]	Sum of distances [m]	Total Movement [m]	Daily Movement [m]	Bearing of movement [gon]	Total height change [cm]	Daily height change [cm]
SW TAKU 01	0.00	0.00	0.12	0.02	95.62	-39.3	-6.5
SW TAKU 02	199.28	199.28	0.21	0.04	50.42	-38.8	-6.5
SW TAKU 03	172.46	371.74	0.32	0.05	44.83	-30.7	-5.1
SW TAKU 04	237.77	609.52	0.43	0.07	42.82	-26.5	-4.4
SW TAKU 05	257.08	866.60	0.56	0.09	33.82	-32.1	-5.3
SW TAKU 06	270.50	1137.10	0.54	0.09	37.08	-27.8	-4.6
SW TAKU 07	200.39	1337.49	0.52	0.09	26.70	-32.0	-5.3
SW TAKU 08	170.57	1508.06	0.60	0.10	40.37	-31.5	-5.3
SW TAKU 09	175.34	1683.41	0.42	0.07	38.06	-33.9	-5.7
SW TAKU 10	148.46	1831.86	0.39	0.07	35.94	-19.3	-3.2
SW TAKU 11	170.74	2002.60	0.34	0.06	48.12	-29.7	-5.0
SW TAKU 12	168.12	2170.72	0.17	0.03	25.11	-29.1	-4.9

Profile VI (Taku Glacier NW Branch, Taku NW Pt. – Echo Mt.)

Point	Point to point distance [m]	Sum of distances [m]	Total Movement [m]	Daily Movement [m]	Bearing of movement [gon]	Total height change [cm]	Daily height change [cm]
NW TAKU 01	0.00	0.00	1.03	0.15	99.44	-34.9	-5.0
NW TAKU 02	230.63	230.63	1.35	0.19	105.18	-35.2	-5.0
NW TAKU 03	229.98	460.61	1.63	0.23	105.01	-29.5	-4.2
NW TAKU 04	222.79	683.40	1.66	0.24	105.92	-36.5	-5.2
NW TAKU 05	120.76	804.17	1.71	0.24	104.48	*	*
NW TAKU 06	132.54	936.71	1.81	0.26	103.16	-27.5	-3.9
NW TAKU 07	224.93	1161.65	1.83	0.26	103.69	-32.1	-4.6
NW TAKU 08	229.19	1390.84	1.89	0.27	105.46	-32.2	-4.6
NW TAKU 09	231.77	1622.62	1.95	0.28	107.60	-34.2	-4.9
NW TAKU 10	232.72	1855.34	1.89	0.27	106.95	-27.2	-3.9
NW TAKU 11	231.46	2086.81	1.88	0.27	108.38	-27.6	-3.9
NW TAKU 12	230.61	2317.42	1.76	0.25	106.21	-20.3	-2.9
NW TAKU 13	234.02	2551.45	1.51	0.22	103.98	-24.9	-3.6
NW TAKU 14	232.49	2783.94	1.15	0.16	105.84	-23.3	-3.3
NW TAKU 15	231.97	3015.92	0.74	0.11	106.31	-18.2	-2.6
NW TAKU 16	242.87	3258.80	0.38	0.05	98.65	-22.5	-3.2

Profile VIa (Taku Glacier NW Branch, Taku NW Pt. – Taku D)

Point	Point to point distance [m]	Sum of distances [m]	Total Movement [m]	Daily Movement [m]	Bearing of movement [gon]	Total height change [cm]	Daily height change [cm]
NW TAKU A1	0.00	0.00	0.11	0.03	135.62	-13.0	-3.2
NW TAKU A2	105.57	105.57	0.02	0.01	102.65	-10.5	-2.6
NW TAKU A3	281.24	386.80	0.21	0.05	132.34	-13.2	-3.3
NW TAKU A4	280.73	667.54	0.37	0.09	141.66	-17.6	-4.4
NW TAKU A5	279.45	946.99	0.60	0.15	142.92	-14.9	-3.7
NW TAKU A6	280.37	1227.37	0.86	0.22	133.05	-22.1	-5.5
NW TAKU A7	278.41	1505.78	1.04	0.26	131.29	*	*
NW TAKU A8	277.91	1783.69	1.19	0.30	126.69	*	*
NW TAKU A9	281.95	2065.63	1.22	0.30	126.60	-21.5	-5.4
NW TAKU A10	281.81	2347.44	1.25	0.31	126.09	*	*
NW TAKU A11	304.07	2651.51	1.11	0.28	124.60	*	*
NW TAKU A12	304.07	2955.58	1.08	0.27	123.82	-16.2	-4.0
NW TAKU A13	304.25	3259.83	0.99	0.25	120.99	-22.3	-5.6
NW TAKU A14	301.89	3561.72	0.93	0.23	120.03	-18.8	-4.7
NW TAKU A15	300.90	3862.62	0.69	0.17	123.03	-20.8	-5.2
NW TAKU A16	291.28	4153.90	0.29	0.07	118.26	-15.5	-3.9

Profile VII (Matthes Glacier, Camp 9 – Centurian Peak)

Point	Point to point distance [m]	Sum of distances [m]	Total Movement [m]	Daily Movement [m]	Bearing of movement [gon]	Total height change [cm]	Daily height change [cm]
CAMP_9 01	0.00	0.00	0.17	0.02	254.48	-37.2	-4.6
CAMP_9 02	84.95	84.95	0.10	0.01	286.48	-37.1	-4.6
CAMP_9 03	149.06	234.01	0.13	0.02	294.58	-37.7	-4.7
CAMP_9 04	151.43	385.45	0.23	0.03	294.73	-32.5	-4.1
CAMP_9 05	251.09	636.54	0.41	0.05	247.90	-25.0	-3.1
CAMP_9 06	243.45	879.99	1.11	0.14	247.25	-21.3	-2.7
CAMP_9 07	261.58	1141.57	1.87	0.23	240.04	-35.2	-4.4
CAMP_9 08	265.81	1407.38	2.39	0.30	240.68	-31.7	-4.0
CAMP_9 09	255.69	1663.07	2.59	0.32	240.09	-45.7	-5.7
CAMP_9 10	259.13	1922.20	2.58	0.32	239.64	-35.8	-4.5
CAMP_9 11	271.06	2193.26	2.60	0.32	237.49	-36.6	-4.6
CAMP_9 12	266.25	2459.51	2.58	0.32	236.41	-42.7	-5.3
CAMP_9 13	265.34	2724.86	2.55	0.32	235.35	-40.9	-5.1
CAMP_9 14	260.96	2985.82	2.26	0.28	231.82	-33.5	-4.2
CAMP_9 15	263.97	3249.79	1.84	0.23	222.88	*	*
CAMP_9 16	266.64	3516.43	1.17	0.15	212.87	-42.1	-5.3

Profile VIIa (Lower Matthes Glacier, Taku D – Taku C)

Point	Point to point distance [m]	Sum of distances [m]	Total Movement [m]	Daily Movement [m]	Bearing of movement [gon]	Total height change [cm]	Daily height change [cm]
LOW MAT 01	0.00	0.00	0.99	0.16	245.48	-25.3	-4.2
LOW MAT 02	153.21	153.21	1.52	0.25	249.44	-27.1	-4.5
LOW MAT 03	207.91	361.12	1.84	0.31	247.33	-29.0	-4.8
LOW MAT 04	191.96	553.08	2.08	0.35	248.81	-28.9	-4.8
LOW MAT 05	196.76	749.84	2.23	0.37	248.06	-42.0	-7.0
LOW MAT 06	196.19	946.03	2.36	0.39	248.51	-39.4	-6.6
LOW MAT 07	196.22	1142.26	2.44	0.41	251.29	-41.3	-6.9
LOW MAT 08	193.71	1335.96	2.43	0.41	251.26	-41.4	-6.9
LOW MAT 09	189.19	1525.15	2.49	0.42	251.44	-31.7	-5.3
LOW MAT 10	199.97	1725.12	2.49	0.41	250.76	-39.5	-6.6
LOW MAT 11	140.44	1865.55	2.35	0.39	252.46	-40.5	-6.7
LOW MAT 12	141.92	2007.47	2.27	0.38	252.07	-40.6	-6.8
LOW MAT 13	138.71	2146.18	2.12	0.35	252.02	-33.7	-5.6
LOW MAT 14	159.46	2305.64	1.78	0.30	251.37	-31.7	-5.3

Profile VIIb (Middle Matthes Glacier, The Citadel – Spirit Range)

Point	Point to point distance [m]	Sum of distances [m]	Total Movement [m]	Daily Movement [m]	Bearing of movement [gon]	Total height change [cm]	Daily height change [cm]
MID MAT 01	0.00	0.00	0.25	0.04	245.59	-22.7	-3.8
MID MAT 02	260.73	260.73	0.57	0.09	221.62	-24.0	-4.0
MID MAT 03	260.01	520.75	1.44	0.24	205.54	-27.6	-4.6
MID MAT 04	259.83	780.58	2.29	0.38	200.03	-28.3	-4.7
MID MAT 05	259.61	1040.19	2.56	0.43	196.76	-37.6	-6.3
MID MAT 06	258.49	1298.68	2.71	0.45	192.52	-30.1	-5.0
MID MAT 07	260.34	1559.02	2.64	0.44	189.98	-18.6	-3.1
MID MAT 08	254.89	1813.91	2.63	0.44	189.72	-46.1	-7.7
MID MAT 09	262.86	2076.77	2.30	0.38	187.30	-29.4	-4.9
MID MAT 10	261.03	2337.80	1.70	0.28	183.41	-19.1	-3.2
MID MAT 11	261.36	2599.16	0.87	0.14	172.19	-26.9	-4.5

* = outlier

Appendix D

Long Term Height Changes (Tables)

Profile IV (Taku Glacier) height differences 1997-1998
Reference day : July, 28

Lower Line

Point	Position difference [m]	Delta height [m]
TAKU IV 01	1.4	-0.97
TAKU IV 03	1.5	-0.92
TAKU IV 05	0.5	-1.03
TAKU IV 07	1.4	-1.02
TAKU IV 09	4.3	-1.20
TAKU IV 11	3.0	-1.21
TAKU IV 13	3.1	-1.66
TAKU IV 15	2.4	-1.25
TAKU IV 17	5.4	-1.26
TAKU IV 19	5.7	-1.25
TAKU IV 21	6.3	-0.85
TAKU IV 23	3.1	-1.21
TAKU IV 25	3.1	-0.91
TAKU IV 27	7.6	-0.75
TAKU IV 29	0.7	-0.82
TAKU IV 31	0.5	-0.73

Upper Line

Point	Position difference [m]	Delta height [m]
TAKU IV 02	0.5	-0.73
TAKU IV 04	0.4	-0.75
TAKU IV 06	1.2	-0.87
TAKU IV 08	2.5	-0.80
TAKU IV 10	0.7	-0.81
TAKU IV 12	0.7	-1.09
TAKU IV 14	0.2	-1.36
TAKU IV 16	0.4	-0.95
TAKU IV 18	0.4	-0.98
TAKU IV 20	0.8	-1.03
TAKU IV 22	1.0	-1.23
TAKU IV 24	2.0	-0.92
TAKU IV 26	0.6	-0.99
TAKU IV 28	0.4	-1.10
TAKU IV 30	0.6	-0.81

Profile V (Taku Glacier SW Branch) height differences 1997-1998
Reference day: July, 27

Point	Position difference [m]	Delta height [m]
SW TAKU 01	0.2	-0.82
SW TAKU 02	0.0	-0.83
SW TAKU 03	0.4	-0.94
SW TAKU 04	1.2	-0.99
SW TAKU 05	0.8	-0.96
SW TAKU 06	0.8	-1.13

Point	Position difference [m]	Delta height [m]
SW TAKU 07	1.1	-1.01
SW TAKU 08	1.0	-1.03
SW TAKU 09	0.8	-0.92
SW TAKU 10	0.4	-1.11
SW TAKU 11	0.3	-0.93
SW TAKU 12	0.3	-0.61

Profile VI (Taku Glacier NW Branch) height differences 1995-1998
Reference day: August, 08

Point	Position difference [m]	Delta height [m]
NW TAKU 01	1.4	-2.80
NW TAKU 02	2.5	-2.50
NW TAKU 03	2.7	-2.75
NW TAKU 04	2.6	-2.56
NW TAKU 05	2.7	-2.36
NW TAKU 06	2.8	-2.67
NW TAKU 07	3.0	-2.65
NW TAKU 08	3.0	-2.98

Point	Position difference [m]	Delta height [m]
NW TAKU 09	3.1	-2.83
NW TAKU 10	3.0	-2.87
NW TAKU 11	2.9	-2.65
NW TAKU 12	2.7	-2.34
NW TAKU 13	2.3	-2.33
NW TAKU 14	2.0	-2.43
NW TAKU 15	1.3	-2.26
NW TAKU 16	0.5	-2.43

Profile VIa (Taku Glacier NW- Taku D) height differences 1994-1998
Reference day: July, 31

Point	Position difference [m]	Delta height [m]
NW TAKU A01	0.6	-4.74
NW TAKU A02	0.4	-4.08
NW TAKU A03	0.6	-3.91
NW TAKU A04	0.2	-3.92
NW TAKU A05	0.3	-3.64
NW TAKU A06	1.1	-3.58
NW TAKU A07	1.6	-3.68
NW TAKU A08	1.6	-3.84

Point	Position difference [m]	Delta height [m]
NW TAKU A09	1.9	-3.75
NW TAKU A10	1.3	-3.51
NW TAKU A11	1.4	-3.77
NW TAKU A12	1.0	-2.80
NW TAKU A13	1.2	-3.50
NW TAKU A14	1.1	-3.82
NW TAKU A15	1.0	-3.41
NW TAKU A16	1.0	-4.02

Profile VII ((Matthes Glacier near Camp 9) height differences 1997-1998
Reference day : July, 29

Point	Position difference [m]	Delta height [m]
CAMP_9 01	1.1	-1.71
CAMP_9 02	0.9	-1.18
CAMP_9 03	1.0	-1.63
CAMP_9 04	0.2	-1.25
CAMP_9 05	1.3	-1.03
CAMP_9 06	1.4	-1.48
CAMP_9 07	1.3	-1.24
CAMP_9 08	1.0	-1.62

Point	Position difference [m]	Delta height [m]
CAMP_9 09	1.7	-0.93
CAMP_9 10	1.7	-1.49
CAMP_9 11	1.8	-1.04
CAMP_9 12	1.3	-1.17
CAMP_9 13	1.7	-1.17
CAMP_9 14	1.0	-1.45
CAMP_9 15	0.6	-1.16
CAMP_9 16	0.5	-1.12

Profile VIIa (Lower Matthes Glacier) height differences 1997-1998
Reference day: July, 29

Point	Position difference [m]	Delta height [m]
LOW MAT 01	1.0	-1.10
LOW MAT 02	3.9	-1.02
LOW MAT 03	1.8	-1.32
LOW MAT 04	1.9	-1.52
LOW MAT 05	1.8	-1.30
LOW MAT 06	2.1	-1.42
LOW MAT 07	2.3	-1.11

Point	Position difference [m]	Delta height [m]
LOW MAT 08	2.3	-0.96
LOW MAT 09	1.6	-1.27
LOW MAT 10	1.7	-0.89
LOW MAT 11	1.8	-1.00
LOW MAT 12	1.8	-1.05
LOW MAT 13	2.3	-0.79
LOW MAT 14	1.8	-1.29

Lemon Creek Glacier height differences August 2, 1997- August 3, 1998

Point	Position difference [m]	Delta height [m]
Lemon 01	0.1	-1.95
Lemon 02	0.1	-2.01
Lemon 03	0.1	-2.13
Lemon 04	0.1	-2.25
Lemon 05	0.1	-2.41
Lemon 06	0.2	-2.45
Lemon 07	0.2	-2.40
Lemon 08	0.2	-2.42
Lemon 09	0.1	-2.38
Lemon 10	0.1	-2.30
Lemon 11	0.6	-2.53
Lemon 12	0.1	-2.27
Lemon 13	0.1	-2.20
Lemon 14	0.5	-2.20
Lemon 15	0.2	-2.22
Lemon 16	0.3	-2.11
Lemon 17	0.2	-2.30
Lemon 18	0.5	-2.38
Lemon 19	0.2	-2.48
Lemon 20	0.3	-2.43
Lemon 21	0.1	-2.39
Lemon 22	0.2	-2.27
Lemon 23	0.1	-2.32
Lemon 24	0.1	-2.38
Lemon 25	0.0	-2.40

Point	Position difference [m]	Delta height [m]
Lemon 26	0.1	-2.64
Lemon 27	0.0	-2.66
Lemon 28	0.1	-2.44
Lemon 29	0.1	-2.35
Lemon 30	0.1	-3.60
Lemon 31	0.1	-2.58
Lemon 32	0.1	-2.02
Lemon 33	0.1	-2.65
Lemon 34	0.0	-2.48
Lemon 35	0.1	-2.38
Lemon 36	0.1	-2.07
Lemon 37	0.1	-2.16
Lemon 38	0.2	-2.28
Lemon 39	0.1	-2.18
Lemon 40	0.2	-2.58
Lemon 41	0.2	-2.29
Lemon 42	0.1	-2.34
Lemon 43	0.2	-2.42
Lemon 44	0.2	-2.30
Lemon 45	0.2	-2.21
Lemon 46	0.3	-2.27
Lemon 47	0.1	-2.33
Lemon 48	0.1	-2.19
Lemon 49	0.1	-2.27
Lemon 50	0.1	-2.18

Lemon Creek Glacier height differences August 2, 1997- August 3, 1998 (cont.)

Point	Position difference [m]	Delta height [m]
Lemon 51	0.1	-2.31
Lemon 52	0.0	-2.35
Lemon 53	0.1	-2.58
Lemon 54	0.1	-2.74
Lemon 55	0.0	-2.65
Lemon 56	0.2	-2.21
Lemon 57	0.3	-2.29
Lemon 58	0.1	-2.31
Lemon 59	0.2	-2.30
Lemon 60	0.2	-2.23
Lemon 61	0.2	-2.17
Lemon 62	0.2	-2.33
Lemon 63	0.2	-2.33
Lemon 64	0.2	-2.48
Lemon 65	0.1	-2.36
Lemon 66	0.0	-2.33
Lemon 67	0.0	-2.39
Lemon 68	0.1	-2.00
Lemon 69	0.1	-1.78
Lemon 70	0.1	-1.83
Lemon 71	0.1	-1.70
Lemon 72	0.1	-1.87
Lemon 73	0.1	-2.04

Point	Position difference [m]	Delta height [m]
Lemon 74	0.3	-1.84
Lemon 75	0.2	-2.04
Lemon 76	0.1	-2.13
Lemon 77	0.0	-2.02
Lemon 78	0.1	-2.07
Lemon 79	0.0	-2.15
Lemon 80	0.1	-1.79
Lemon 81	0.1	-1.81
Lemon 82	0.0	-2.00
Lemon 83	0.1	-1.87
Lemon 84	0.1	-1.92
Lemon 85	0.1	-2.03
Lemon 86	0.0	-2.06
Lemon 87	0.1	-1.98
Lemon 88	0.1	-2.05
Lemon 89	0.1	-1.96
Lemon 90	0.1	-2.05
Lemon 91	0.1	-1.99
Lemon 92	0.1	-1.96
Lemon 93	0.2	-1.81
Lemon 94	0.1	-1.87
Lemon 95	0.3	-1.76
Lemon 96	0.2	-1.11

Vaughan Lewis height differences August 2, 1993 - August 12, 1998

Point	Position difference [m]	Delta height [m]
VL_1952 01	0.1	-4.00
VL_1952 02	0.0	-4.02
VL_1952 03	0.1	-3.90
VL_1952 04	0.3	-4.01

Point	Position difference [m]	Delta height [m]
VL_1952 05	0.0	-3.98
VL_1952 06	0.0	-4.30
VL_1952 07	0.1	-4.19
VL_1952 16	0.7	-4.42

Appendix E

Volume Changes

Profile IV (Taku Glacier, Camp 10 – Shoehorn Mt.) 1997, July 28 – 1998, July 28

	July 28, 1997			July 28, 1998				
Triangle Points	Area [m²]	Σ(dh/3) [m]	Volume [m³]	Area [m²]	Σ(dh/3) [m]	Volume [m³]	Delta Area [m²]	Delta Volume [m³]
1 2 3	24715.1	6.80	168087.6	24936.8	5.93	147907.3	221.7	-20180.3
2 3 4	26412.7	8.66	228725.2	26260.6	7.86	206445.9	-152.1	-22279.4
3 4 5	24502.4	7.39	181146.6	24298.6	6.49	157817.0	-203.9	-23329.7
4 5 6	26992.3	7.43	200642.8	27346.1	6.55	179091.5	353.8	-21551.2
5 6 7	28770.2	5.67	163127.1	29284.5	4.70	137568.3	514.3	-25558.7
6 7 8	21501.9	5.43	116683.5	22235.6	4.53	100723.2	733.7	-15960.3
7 8 9	25208.5	4.73	119244.4	26336.5	3.72	98075.3	1128.0	-21169.1
8 9 10	21392.3	5.22	111767.9	21191.4	4.29	90874.7	-200.9	-20893.2
9 10 11	18864.9	5.10	96135.4	18681.7	4.02	75172.4	-183.2	-20963.1
10 11 12	25377.1	5.34	135530.5	25591.2	4.31	110202.3	214.1	-25328.2
11 12 13	31024.4	5.22	161957.7	30997.7	3.90	120922.5	-26.7	-41035.3
12 13 14	35589.1	5.74	204364.5	35741.5	4.37	156366.3	152.4	-47998.2
13 14 15	32877.4	4.50	147805.8	33011.0	3.07	101472.4	133.6	-46333.5
14 15 16	37085.1	4.72	175165.3	37164.1	3.54	131580.1	79.0	-43585.2
15 16 17	42790.4	4.31	184383.8	42885.8	3.16	135462.8	95.4	-48921.0
16 17 18	48938.6	7.67	375114.6	48617.1	6.61	321187.5	-321.5	-53927.1
17 18 19	40804.0	9.70	395689.9	40567.3	8.54	346315.0	-236.7	-49374.8
18 19 20	37090.9	13.72	508924.1	36829.9	12.64	465471.9	-261.0	-43452.2
19 20 21	40734.9	15.94	649137.7	41061.0	14.90	611623.7	326.1	-37514.0
20 21 22	36530.0	19.41	708864.6	36589.0	18.37	672187.3	59.0	-36677.3
21 22 23	35921.7	20.27	728277.1	35569.7	19.18	682122.6	-352.1	-46154.6
22 23 24	39362.3	21.79	857586.7	40132.1	20.67	829360.2	769.8	-28226.5
23 24 25	44034.5	21.72	956459.5	45218.2	20.71	936319.6	1183.7	-20139.9
24 25 26	41194.2	23.17	954386.1	41428.9	22.23	920897.6	234.7	-33488.5
25 26 27	46751.7	23.31	1089627.3	47468.5	22.42	1064420.7	716.7	-25206.6
26 27 28	59538.0	24.20	1440661.7	59088.3	23.25	1373862.6	-449.7	-66799.1
27 28 29	48939.3	24.87	1216940.0	47553.5	23.98	1140263.3	-1385.8	-76676.7
28 29 30	47732.7	25.84	1233191.2	47394.9	24.93	1181523.8	-337.9	-51667.4
29 30 31	49035.6	27.88	1366900.4	49101.7	27.09	1330249.9	66.1	-36650.5
SUM	1039712.3	365.72	14876528.9	1042583.2	335.96	13825487.5	2870.8	-1051041.4

Profile IV (Taku Glacier, Camp 10 – Shoehorn Mt.) 1998, July 25 – August 2

	July 25, 1998			August 2, 1998				
Triangle Points	Area [m²]	Σ(dh/3) [m]	Volume [m³]	Area [m²]	Σ(dh/3) [m]	Volume [m³]	Delta Area [m²]	Delta Volume [m³]
1 2 3	24936.6	6.05	150983.1	24937.2	5.73	142782.0	0.5	-8201.1
2 3 4	26261.2	7.99	209782.8	26259.6	7.65	200885.7	-1.6	-8897.1
3 4 5	24297.4	6.61	160719.5	24300.5	6.30	152979.9	3.1	-7739.6
4 5 6	27346.5	6.67	182492.6	27345.4	6.34	173424.4	-1.2	-9068.2
5 6 7	29281.2	4.83	141535.5	29290.1	4.47	130955.9	8.9	-10579.5
6 7 8	22237.0	4.68	104009.8	22233.3	4.28	95247.4	-3.7	-8762.4
7 8 9	26335.6	3.87	101953.8	26337.9	3.48	91612.0	2.3	-10341.8
8 9 10	21189.9	4.43	93885.2	21194.1	4.05	85857.2	4.2	-8028.0
9 10 11	18676.7	4.17	77919.4	18689.9	3.78	70591.7	13.1	-7327.7
10 11 12	25587.5	4.48	114649.1	25597.2	4.02	102789.8	9.7	-11859.2
11 12 13	30998.9	4.09	126930.2	30995.7	3.58	110913.1	-3.2	-16017.1
12 13 14	35728.2	4.56	162896.6	35763.7	4.07	145474.7	35.5	-17421.9
13 14 15	33007.8	3.24	106967.1	33016.5	2.80	92314.2	8.8	-14653.0
14 15 16	37162.2	3.71	137785.2	37167.3	3.26	121239.7	5.0	-16545.6
15 16 17	42893.1	3.35	143706.0	42873.9	2.84	121733.2	-19.2	-21972.8
16 17 18	48618.8	6.81	331240.1	48614.4	6.26	304439.8	-4.4	-26800.3
17 18 19	40569.1	8.74	354708.9	40564.4	8.19	332330.2	-4.7	-22378.7
18 19 20	36828.5	12.84	472816.9	36832.3	12.31	453233.3	3.7	-19583.6
19 20 21	41065.7	15.09	619804.0	41053.4	14.57	597997.6	-12.3	-21806.4
20 21 22	36595.2	18.55	678755.4	36579.0	18.08	661250.3	-16.2	-17505.1
21 22 23	35573.7	19.35	688435.0	35563.1	18.89	671608.3	-10.7	-16826.6
22 23 24	40128.1	20.83	835908.8	40139.0	20.39	818448.3	10.9	-17460.5
23 24 25	45223.8	20.88	944332.8	45209.1	20.42	922973.0	-14.7	-21359.9
24 25 26	41418.4	22.40	927635.0	41446.4	21.95	909664.9	27.9	-17970.1
25 26 27	47458.4	22.59	1071942.3	47485.3	22.15	1051879.6	27.0	-20062.7
26 27 28	59077.6	23.39	1381943.9	59106.3	23.02	1360390.5	28.7	-21553.4
27 28 29	47545.9	24.11	1146220.0	47566.2	23.76	1130331.5	20.3	-15888.5
28 29 30	47406.9	25.05	1187495.4	47374.8	24.73	1171579.2	-32.1	-15916.2
29 30 31	49100.1	27.22	1336554.2	49104.3	26.88	1319744.6	4.2	-16809.6
SUM	1042550.0	340.60	13994008.5	1042640.1	328.21	13544671.9	90.1	-449336.6

Appendix F

Strain Rates

Profile IV (Taku Glacier, Camp 10 – Shoehorn Mt.)

Triangle Points	e1 [µstrain/day]	e2 [µstrain/day]	e3 [µstrain/day]	Θ [gon]
1 2 3	52.9	-50.2	-2.76	94.10
2 3 4	41.9	-49.4	7.5	110.19
3 4 5	125.3	-109.6	-15.9	110.74
4 5 6	158.0	-163.4	5.4	95.83
5 6 7	253.6	-215.7	-37.9	102.86
6 7 8	257.4	-278.3	20.9	101.69
7 8 9	361.0	-350.1	-11.0	102.90
8 9 10	368.3	-343.0	-25.2	108.83
9 10 11	311.9	-223.7	-88.2	107.04
10 11 12	315.9	-268.0	-47.8	110.50
11 12 13	180.6	-193.1	12.6	105.98
12 13 14	184.2	-59.8	-124.4	111.45
13 14 15	77.5	-44.3	-33.2	119.02
14 15 16	84.8	-67.8	-17.0	123.94
15 16 17	26.4	-82.3	55.9	155.42
16 17 18	31.3	-42.6	11.3	113.68
17 18 19	3.0	-17.5	14.6	7.88
18 19 20	36.8	-24.1	-12.7	181.61
19 20 21	36.0	-73.3	37.3	189.94
20 21 22	17.4	-72.9	55.5	190.11
21 22 23	40.2	-77.8	37.6	11.75
22 23 24	109.1	-75.0	-34.6	1.52
23 24 25	138.8	-179.5	40.7	9.17
24 25 26	254.8	-170.3	-84.5	199.95
25 26 27	297.6	-226.3	-71.2	4.16
26 27 28	284.8	-224	-60.8	3.22
27 28 29	281.1	-227.5	-53.6	2.39
28 29 30	132.3	-216.9	84.6	16.75
29 30 31	81.1	-70.3	-10.8	19.15