

Foundation for Glacier and Environmental Research
Juneau Icefield Research Program
Seattle, Washington
and
Glaciological and Arctic Sciences Institute
University of Idaho
Moscow, Idaho

JIRP Open File Survey Report—2001



**GEODETTIC ACTIVITIES DURING
THE
2001 JUNEADU ICEFIELD RESEARCH PROGRAM
FIELD SEASON**

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Foundation for Glacier and Environmental Research
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Cover photo: Performing a GPS survey on the Vaughan Lewis Glacier, Juneau Icefield, Alaska, August, 2001. The Vaughan Lewis Glacier is known for a series of spectacular wave and band ogives at the base of the Vaughan Lewis Icefall. A longitudinal survey was performed to quantify the amplitude and wavelength of the ogives. Lakes in the troughs between several crests provided a unique challenge, requiring the combination of GPS positioning and hydrologic soundings to determine the underwater elevation of the ice surface. Photo by Scott McGee.

All data contained herein were collected from 1992 to 2001 by the Foundation for Glacier and Environmental Research, Juneau Icefield Research Program with additional financial support from the University of Idaho, National Science Foundation, NASA, the Army Research Office, and the Universität der Bundeswehr, Munich, Germany. These data are available to the public at no charge for scholarly use. Researchers wishing to use the information contained herein may do so provided the author and the Foundation for Glacier and Environmental Research, Juneau Icefield Research Program are properly credited and cited as the originators of the data.

Survey reports from previous field seasons of the Juneau Icefield Research Program may be obtained from the Foundation for Glacier and Environmental Research at the above address, or on the Internet at <http://crevassezone.org>.

CONTENTS

SUMMARY.....	1
1. Introduction.....	2
2. Survey Methods.....	5
2.1 Establishment of Profiles.....	5
2.2 GPS Survey Methods	5
3. Survey Projects	6
3.1 Transverse Profiles	7
3.1.1 Surface Velocity.....	7
3.1.1.1 Taku Glacier	7
3.1.1.2 Icy Basin	10
3.1.1.3 Gilkey Glacier.....	12
3.1.2 Short-term Height Change	12
3.1.3 Long-term Height Change	14
3.1.3.1 Taku and Demorest Glaciers.....	15
3.1.3.2 Gilkey Glacier.....	15
3.1.3.3 Lemon Glacier	17
3.2 Longitudinal profiles	19
3.2.1 Surface velocity and Gradient.....	20
3.2.1.1 Taku/Matthes/Llewellyn Glaciers.....	20
3.2.1.2 Northwest and West Branches of the Taku Glacier.....	22
3.2.2 Long-term height change	32
3.2.2 Long-term height change	33
3.2.2.1 Taku / Matthes / Llewellyn Glaciers.....	33
3.2.2.2 Demorest Glacier.....	35
3.2.2.3 Southwest Branch of the Taku Glacier	37
3.2.2.4 Northwest and West Branches of the Taku Glacier.....	38
3.2.3 Longitudinal Surface Flow Times.....	42
3.3 Profile 4	44
3.3.1 Height Change and Local Surface Mass Balance	45
3.3.2 Strain	53
3.4 Matthes Glacier / Llewellyn Glacier Divide.....	54
3.5 Gilkey Glacier Surveys	56
3.5.1 Ogive Wavelength and Amplitude.....	56
3.6 Test Pits	60
4. Future Work.....	61
5. Acknowledgements.....	61
References.....	62
Appendix 1 – GPS Benchmark Coordinates.....	67
Appendix 2 – Movement Profile Flag Coordinates	69
Appendix 3 – Surface Movement Vectors.....	127
Appendix 4 – Short-term Height Change Graphs.....	134
Appendix 5 – Longitudinal Surface Flow Times.....	139
Appendix 6 – Profile 4 Surface Elevations, 1993 to 2001.....	147
Appendix 7 – Profile 4 Surface Strain, July 19-25, 2001	148
Notes	149

GEODETTIC ACTIVITIES DURING THE 2001 JUNEAU ICEFIELD RESEARCH PROGRAM FIELD SEASON

FOUNDATION FOR GLACIER AND ENVIRONMENTAL RESEARCH,
JUNEAU ICEFIELD RESEARCH PROGRAM,
SEATTLE, WASHINGTON

SUMMARY

The JIRP 2001 field season proved to be a productive one for the survey team. GPS surveys were conducted at six previously established transverse movement profiles. Four longitudinal movement profiles were extended in length, and one new longitudinal movement profile was established. Additional surveys were conducted within the wave-bulge zone of the Vaughan Lewis Glacier, including a longitudinal profile to determine the wavelength and amplitude of the ogives. Several 1995 positions on the Gilkey Glacier were also resurveyed this year, and a new benchmark was established at Knowl Point. The locations of several mass balance test pits were also surveyed.

As in past years, the survey work focused on determining surface movements, surface elevations and changes, strain rates, ablation data, and local surface mass balance. Additionally, evaluation of the surface velocity along the longitudinal profiles has enabled the calculation of more precise flow lag times for the Taku, Matthes, Llewellyn, Demorest, Southwest Branch, Northwest Branch, and West Branch Glaciers. Results of the surveys show that, for the third consecutive year, there was an overall increase in surface elevations on the Juneau Icefield, ranging from the Lemon Glacier to the Llewellyn Glacier at F-10 Peak. As with the conditions seen in 2000, the surface elevation of the Gilkey Glacier decreased from 2000 to 2001. Evaluation of the local surface mass balance changes at Profile 4 reveals a positive net balance for the third consecutive year. The observed surface velocities at all locations remain consistent with that found in previous years.

1. INTRODUCTION

The 2001 JIRP field season was significant in that more survey work was accomplished, in terms of points surveyed, than was done in any other previous season. The number of surveys completed in 2000 was certainly impressive, at 570 points surveyed. However, this was easily surpassed in 2001, due to several special projects that were undertaken this year. The surveys conducted this summer comprised 17 distinct profiles with a total of 1,919 points, and considering the resurvey of selected flags, a grand total of 2,079 points were surveyed in 2001. Figure 1 presents a graphical timeline of the surveys, while Table 1 provides additional details of the surveys completed during the 2001 field season. Refer to Figure 2 for a map showing the locations of profiles surveyed.

The major focus of the survey program this season was to continue monitoring the network of longitudinal profiles that has been established over the past three years. The longitudinal network was also extended this year with additional points on the lower Taku Glacier, the West Branch and the Echo Glacier branches of the Taku Glacier, and the Rhino Peak and Snow Towers branches of the Northwest Branch of the Taku Glacier. A new benchmark was established on Knowl Point in order to provide control for the extension of the profiles on the Northwest and West branches of the Taku Glacier. Together, these new longitudinal points added 34 kilometers to the existing network of 93.5 kilometers of longitudinal profiles. Approximately 25 kilometers remain to be surveyed, primarily on the upper Demorest Glacier.

Continuing a project started in 1995 with the first survey of the Matthes/Llewellyn divide area, a comprehensive topographic survey of this area was completed this summer. Over 1,200 points were surveyed with kinematic differential GPS to produce a topographic map of 19.5 square kilometers at the divide between the Matthes and Llewellyn Glaciers.

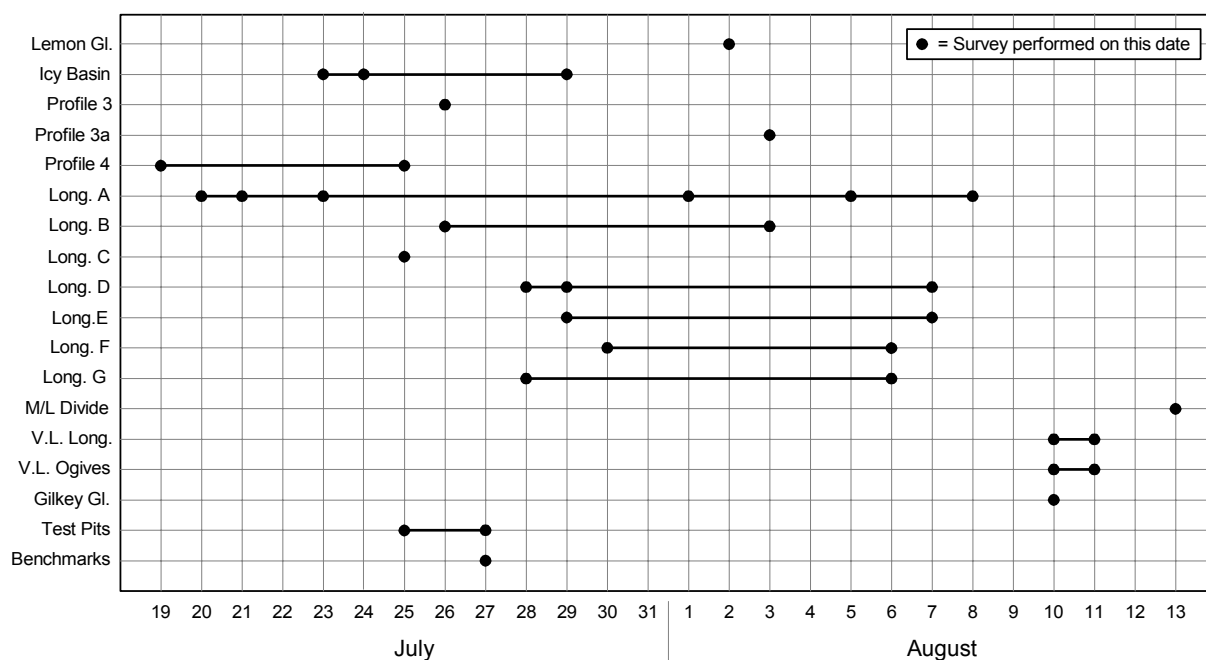


Figure 1: Timeline of surveys conducted during the 2001 JIRP field season.

PROFILE	LOCATION	SURVEY DATES	DATA COLLECTED	SURVEY METHOD	# OF FLAGS
Profile 3	Demorest Glacier	July 26, 2001	HC	RT-DGPS	12
Profile 3a	Demorest Glacier	August 3, 2001	HC	RT-DGPS	15
Profile 4	Taku Glacier	July 19, 2001 July 25, 2001	MV, AB, HC, MB, SR	RT-DGPS RT-DGPS	31 31
Longitudinal A	Taku / Matthes / Llewellyn Glaciers	July 20, 2001 July 21, 2001 July 23, 2001 August 1, 2001 August 5, 2001 August 8, 2001	MV, AB, HC, GR	RT-DGPS (all dates)	36 17 10 27 31 8
Longitudinal B	Demorest Glacier	July 26, 2001 August 3, 2001	HC, GR	RT-DGPS (all dates)	24 10
Longitudinal C	Southwest Branch	July 25, 2001	HC, GR	RT-DGPS	28
Longitudinal D	Northwest Branch	July 28, 2001 July 29, 2001 August 7, 2001	MV, HC, AB, GR	RT-DGPS (all dates)	30 18 34
Longitudinal E	West Branch of Northwest Branch	July 29, 2001 August 7, 2001	MV, AB, GR	RT-DGPS (all dates)	14 14
Longitudinal F	West Branch	July 30, 2001 August 6, 2001	MV, HC, AB, GR	RT-DGPS (all dates)	25 12
Longitudinal G	Echo Glacier Branch	July 28, 2001 August 6, 2001	MV, AB, GR	RT-DGPS (all dates)	11 11
Icy Basin	Icy Basin	July 23, 2001 July 24, 2001 July 29, 2001	MV, AB	RT-DGPS (all dates)	22 15 37
Lemon Glacier	Lemon Glacier	August 2, 2001	HC, MB	RT-DGPS	123
M/L Divide	Matthes / Llewellyn Glacier Divide area	August 13, 2001	POS, TM	RT-DGPS	1218
VL Longitudinal	Vaughan Lewis Glacier below Icefall	August 10, 2001 August 11, 2001	POS, GR	RT-DGPS	180
VL Ogives	Vaughan Lewis Glacier below Icefall	August 10, 2001 August 11, 2001	MV, AB	RT-DGPS	11 11
Gilkey Trench	Gilkey Glacier	August 10, 2001	HC	RT-DGPS	9
Test Pits	Various locations	July 25, 2001 July 27, 2001	POS	Garmin	3
Benchmarks	NW Branch Taku Gl.	July 27, 2001	POS	DGPS	1

Explanation of Codes			
Data Collected:	AB	= Ablation	MV = Movement
	HC	= Height comparison	POS = Position
	MB	= Mass balance	SR = Strain rates
	TM	= Topographic mapping	GR = Surface Gradient
Survey Method:	DGPS	= Rapid static differential GPS	
	RT-DGPS	= Real time differential GPS	
	Garmin	= Garmin 45 handheld GPS	

Table 1: Detail of surveys conducted during the 2001 JIRP field season.



Figure 2: Location of transverse and longitudinal profiles surveyed during the 2001 JIRP field season.

Two special projects were completed in the Gilkey Trench, focusing on the ogive zone of the Vaughan Lewis Glacier. Velocities at the crests of the first four ogives were determined, and a longitudinal profile down the center of the ogives, from Ogive 1 to Ogive 11 was established. This longitudinal profile reveals the wavelength and amplitude of the ogives, from the foot of the Vaughan Lewis Icefall to the point at which the amplitude of the ogives is reduced to zero.

As with the previous several years, all survey work was accomplished using real-time differential GPS, utilizing Leica System 530 survey-grade receivers. The use of snow machines and Thiokol oversnow vehicles again contributed to the very productive season. Scott McGee and Walter Welsch supervised all survey work and provided fundamental lecture and field training for all the students on the summer program. Comprehensive GPS theory and field instruction were given to the six students that formed the core survey group.

2. SURVEY METHODS

As in the past several years, standard rapid static and real-time differential GPS methods were utilized for all of the 2001 surveys. For a complete description of the techniques used, refer to the discussion by Lang (1993) and McGee (1994). However, recognizing that these references may be unavailable to the reader of this report, and in order to document the procedures used and to provide evidence of the quality and validity of the data collected, a brief overview of the methodology used for the 2001 survey work will be given here.

2.1 ESTABLISHMENT OF PROFILES

One of the main goals of the surveying program is to collect data that allows quantitative comparison of surface movement and surface elevation change from year to year. In order to ensure the consistency of year-to-year movement and elevation data, all survey flags were located within one meter of the standard point coordinates as published in the JIRP Coordinate Tables (McGee, 2000a). Refer to Appendix 2 for the JIRP 2001 flag placement coordinates. The official stakeout coordinates from the Coordinate Tables were entered into a Garmin 48 handheld GPS receiver. The driver of the vehicle used the Garmin unit to navigate to within several meters of the stakeout locations. A member of the survey crew then used the same stakeout coordinates programmed into the Leica GPS to locate and survey the point within ± 1 meter of the official stakeout coordinates.

2.2 GPS SURVEY METHODS

After the initial establishment of the survey profiles was completed, the points were surveyed. Because of the survey program's emphasis on extending the longitudinal network and monitoring annual surface height change, less importance was placed on surface velocity determination for several of the traditional transverse profiles and for those points of the longitudinal profiles that were surveyed in 1999 and 2000. These points were surveyed only once in 2001 in order to determine annual height change.

Those points comprising the extension of the longitudinal profiles, and those within Profile 4, Icy Basin, the Vaughan Lewis Longitudinal, and the Vaughan Lewis ogives, were surveyed two times, with the time differential between the surveys ranging from 1 day to 6

days. The survey timeline is shown in Figure 1. For all real-time surveys, a reference receiver was centered and leveled on a tripod over an appropriate bedrock benchmark (a listing of GPS benchmarks is presented in Appendix 1). Concurrently, a roving receiver was placed at each flag of a movement profile, and both the reference and roving receivers collected coincident GPS data simultaneously. The antenna of the roving receiver was mounted on an aluminum monopole, which was placed in the same hole from which the survey flag was extracted. The height of the antenna above the snow surface was measured and noted. For rapid-static work (determination of GPS coordinates of a new benchmark at Knowl Point) the roving receiver collected readings at 15-second intervals for two hours. Real-time methods required only enough time at each flag sufficient to obtain a position fix from the reference receiver, typically around 5-10 seconds.

At the completion of a survey all data was downloaded from the roving and reference receivers for post-processing. Coordinates were then transformed from a geocentric coordinate system to one based on the JIRP coordinate system. This system utilizes a Transverse Mercator projection centered on the Juneau Icefield. The parameters of the JIRP coordinate system are shown in Table 2. All final horizontal coordinates are accurate to approximately 2-3 cm, with heights being accurate to some 5 cm or so. All heights in this report are with respect to the height above the WGS84 ellipsoid, in meters.

PARAMETER	VALUE	ARC/INFO PROJECTION FILE
Projection	Transverse Mercator	projection transverse
Units	Meters	units meters
Central Meridian	134° 00' 00" West	datum wgs84
Latitude of Origin	0° 00' 00" North	spheroid wgs84
Zone Width	3° 00' 00"	parameters
Central Meridian Scale	1.000000	1 /*Scale of central meridian
False Easting	500,000 meters	-134 00 00 /*Longitude of origin
False Northing	0 meters	00 00 00 /*Latitude of origin
		500000 /*False easting
		0 /*False northing

Table 2: Parameters of the JIRP coordinate system. The column "Projection File" lists the parameters required to transform from the JIRP system to a different projection using Arc/Info.

3. SURVEY PROJECTS

The major focus of the 2001 survey program was to determine surface velocities, surface elevations, surface gradients, and strain rates across the largest extent of the Juneau Icefield as practicable. To this end, survey work commenced on July 19 and finished on August 13, with a total of 2,079 points surveyed. These surveys ranged from Goat Ridge on the Taku Glacier, to the Camp 15 Peak area on the West Branch of the Taku Glacier, to Camp 26 on the Llewellyn Glacier, to the Lemon Glacier.

As in 1999 and 2000, the extension and survey of the longitudinal profiles was the main focus of the 2001 field season. Despite persistent rain and whiteout conditions in July, the

survey crew succeeded in establishing an additional 34 kilometers of longitudinal profiles on the Taku, Demorest, Southwest Branch, Northwest Branch, West Branch, Matthes, and Llewellyn Glaciers. Additionally, all longitudinal points that were first established and surveyed in 1999 and 2000 were again surveyed this year. Combined, the 1999-2001 longitudinal profiles encompass 127.5 kilometers of the Taku/Llewellyn glacier system.

Other survey work accomplished this year included ongoing surveys of the standard transverse movement profiles, with emphasis on long-term height change rather than velocity determination. This was necessary so that adequate field time could be allocated to the longitudinal surveys. Additionally, surveys were performed on the first 11 wave ogives at the base of the Vaughan Lewis Icefall, and several points surveyed on the Gilkey Glacier in 1995 were resurveyed this year. Three transverse and one longitudinal profile on the Lemon Glacier were also resurveyed this year.

3.1 TRANSVERSE PROFILES

Surface velocity, short-term height change, and long-term height change at the transverse profiles are discussed in this section. Refer to Section 3.2 for a discussion of the survey results at the longitudinal profiles.

3.1.1 SURFACE VELOCITY

Although emphasis was given to surveying the longitudinal profiles, the standard transverse movement profiles remain an important element in the ongoing monitoring of the Juneau Icefield. Periodic annual surveys of these profiles allow quantitative comparisons of the temporal velocity and height changes across the Icefield, at a variety of elevations. With 22 transverse profiles already established, it is not possible to survey each one every year. With this in mind, 3 profiles were selected for resurvey in 2000. Several of these profiles have not been surveyed in recent years, notably Profile 2 on the Taku Glacier, Profile 8 on the Matthes Glacier, Profile 9 on the Vaughan Lewis Glacier, Profile 11 on the Llewellyn Glacier, and the 1995 GPS points on the Gilkey Glacier.

The discussion in this section will focus on the surface velocity at the transverse profiles. Refer to Section 3.2.1 for details regarding the surface velocities along the longitudinal profiles. All surface velocity data are presented in Appendix 3.

3.1.1.1 TAKU GLACIER

The main Taku/Matthes/Llewellyn (TML) glacier system bisects the southern half of the Juneau Icefield, extending some 93 kilometers from the tidewater of Taku Inlet in Alaska to the terminal lake of the Llewellyn Glacier in British Columbia. To date, a total of ten transverse profiles have been established on the TML system (additionally, other transverse profiles have been established on other glaciers of the Juneau Icefield), with a spacing of 5 to 10 kilometers. Of these ten, only Profile 4 was resurveyed during the 2001 field season.

Profile 4 is located on the main Taku Glacier at Camp 10 and extends southwesterly 4.8 kilometers from Taku B to just downglacier of Shohorn Peak. Of the numerous cross-glacier profiles on the Juneau Icefield, this profile has the most extensive continuous survey history.

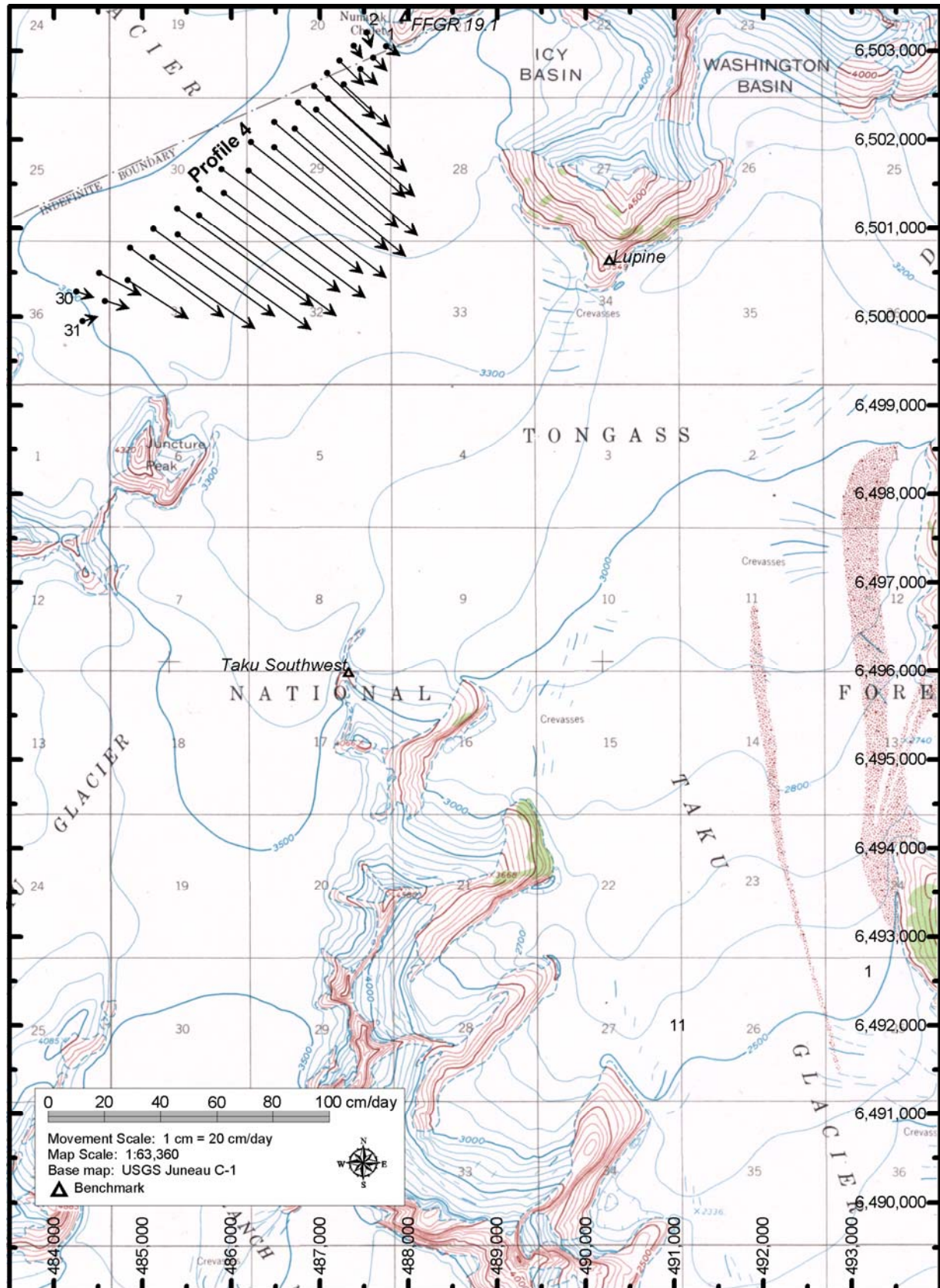


Figure 3: Surface movement vectors at Profile 4, Taku Glacier.

Although early surveys of Profile 4 varied in the number of points and in the location of those points, this situation was rectified in 1993 with the establishment, via GPS, of standardized stake-out coordinates and with the number of points surveyed, as detailed in the JIRP movement profile stake-out coordinate tables (McGee, 2000a). Profile 4 consists of 31 flags arranged in two parallel transects, placed approximately 240 meters apart, which are offset so as to form a series of 29 triangles between the 16 flags on the downglacier transect and the 15 flags on the upglacier transect. All surveys since 1993 have utilized this arrangement, which allows for the computation of strain rates, height change, and mass balance in addition to velocity, and their annual comparison. As in past years, the benchmark FFGR 19.1 (Scott) at Camp 10 was utilized as the real-time GPS reference point.

The maximum measured velocity in 2000 was 62.1 cm/day at Flag 19, and the mean velocity for all 31 flags was 35.3 cm/day. These data show no statistically significant deviation of the measured velocities from 1993 through 2000. Therefore, a steady-state flow regime is operative. The mean elevation of all flags at Epoch 0 in 2001 was 1129.33 meters.

The cross-glacier velocity distribution curves along the downglacier line and the upglacier line are shown in Figures 5 and 6, respectively. Among the two parallel transects, the downglacier line had the highest measured velocity of 62.1 cm/day at Flag 19. The maximum velocity measured at the upglacier line was 61.9 cm/day at Flag 18. Mean velocities are 34.8 cm/day for the downglacier line and 35.9 cm/day for the upglacier line. Again, no significant velocity differences are found between the two parallel transects. This is supported by the observation of a lack of unusual crevassing or other surface strain indicators in the 240-meter lateral distance between the two transects.

Figures 3, 4, and 5 reveal that the flow at this profile can be characterized as a transitional stage between parabolic and block-schollen. Well-defined marginal crevasse zones give clear indication of large velocity differences along both margins of the profile, while the central portion between Flags 13 and

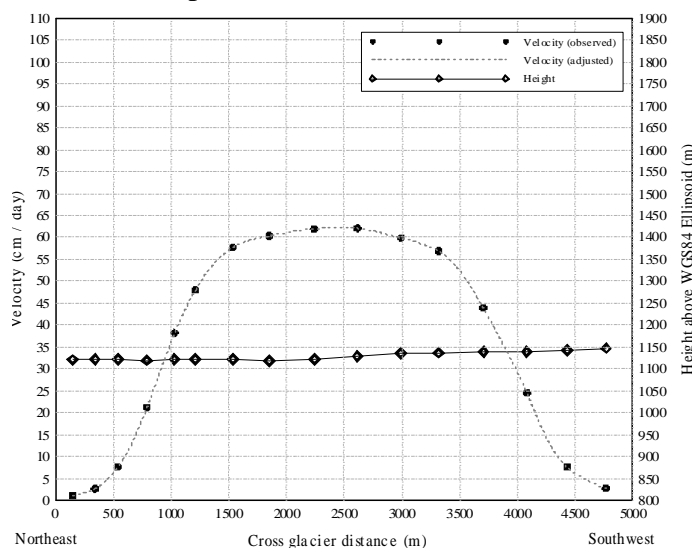


Figure 4: Surface velocity and height of Profile 4, lower line

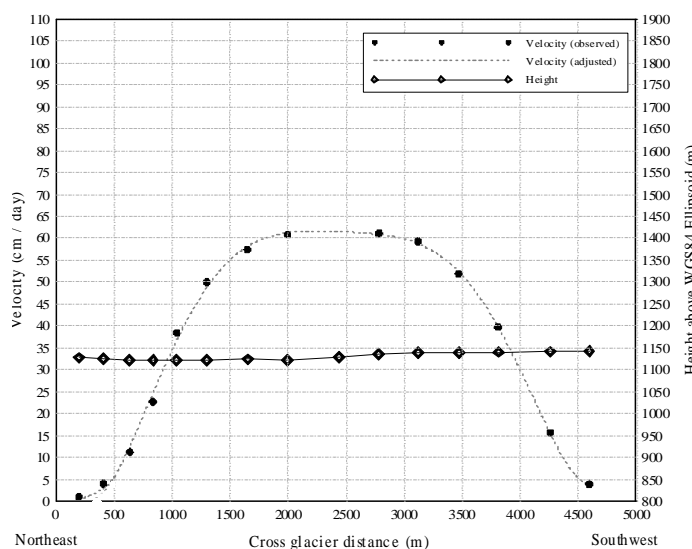


Figure 5: Surface velocity and height of Profile 4, upper line

23 moves as a coherent block, with no evidence of crevasses. Although the marginal crevasses are numerous, the shear zones are not nearly as chaotic as those at Profile 2, some 12 kilometers further downglacier.

3.1.1.2 ICY BASIN

Icy Basin is a small glacier-filled cirque situated approximately 30 kilometers upglacier from the terminus of the Taku Glacier. It is immediately southeast of Camp 10, bordering the Vantage Peak nunatak. The basin is roughly U-shaped in plan view, and approximately 1.6 kilometers in diameter. The surface elevation is roughly 1,100 meters above the WGS84 ellipsoid. The dominant feature of the basin is a large surficial lake adjacent to the headwall of Vantage Peak. Seppälä (1973) described the formation of Salla Lake, as it is named. The focus of this paper was on explaining the morphology of the lake and its subsequent annual subglacial draining.

Casual observations of the lake and the ice of Icy Basin throughout a period of years reveals that, while Salla Lake does in fact appear at the surface of the glacier, it is quite likely that there is an additional quantity of englacial and/or subglacial water that is entrapped by the ice. Salla Lake usually drains by early to mid-July, with subsequent crevasses appearing as a series of circumferential bands around the perimeter of the lake. In concert with the appearance of the crevasses, the ice at the bed of the lake seems to slump downward, giving the impression of the draining of an englacial or subglacial lake. It has been informally speculated by some researchers on the Juneau Icefield that there may be some sort of eddy flow occurring in the ice of the Basin. The speculation is that the main mass of the Taku Glacier, as it flows southeastward across the mouth of Icy Basin, forms a dam that prevents the ice of the Basin from entering the Taku Glacier system. Thus, any movement of the ice must somehow be redirected to a southeast direction, but because of the influence of the Taku Glacier, it stays within the confines of the cirque, eventually to become a counterclockwise-moving mass that is constrained within the walls of the cirque.

In order to test this idea, a series of four profiles were established in Icy Basin in the summer of 2001. The profiles were arranged in three transverse lines and one short longitudinal line. Line 1 extended from the base of the Camp 10 hill across the mouth of the Basin to the west ridge of Taku A peak. Line 2 was roughly parallel to Line 1, but was located midway between the cirque headwall and the mouth. Line 3, although not perfectly straight like Lines 1 and 2, was located as near the edge of the drained Salla Lake as was practicable due to the presence of the numerous large concentric crevasses. Line 4 was a longitudinal profile at the mouth of the Basin and intersected Line 1 at a somewhat perpendicular angle. By measuring the velocity and plotting the movement vectors of the 37 stakes in these four profiles, it should be possible to ascertain if eddy flow is in fact occurring.

Figure 6 presents the somewhat inconclusive results of the survey. There are clearly some outliers in the dataset, evidenced by the observed velocities and vectors at Line 1. The velocities at this line are the least of all the points surveyed. This makes sense because this line is nearer the blocking effect of the main Taku glacier, and it is farthest away from the influence of the cirque sidewalls and the local influence of the drained lake. Lines 2 and 3 show a more expected velocity and vector pattern. The vectors along the south half of these lines reflect the downslope movement of the ice on the cirque headwalls, while the vectors along the north half are directed toward the lake. This is apparently due to the concentric

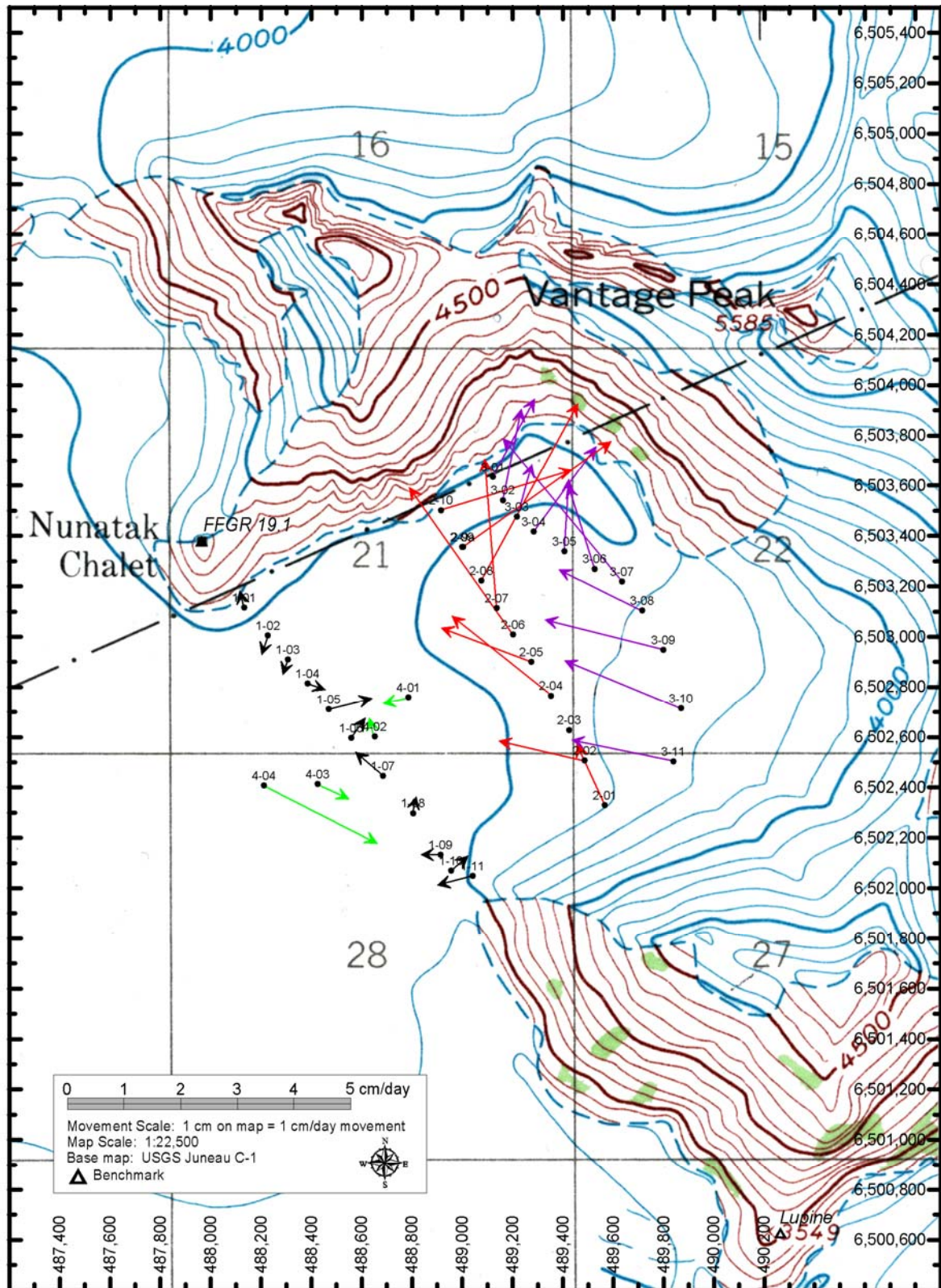


Figure 6: Surface movement vectors at Icy Basin.

crevassing around the lake. As the subglacial water drained, the ice apparently slumped, forming the extensional concentric crevasse pattern. As a result, the surface vectors would also show movement toward the lake, and this is borne out by the survey observations.

With the small velocities in the Basin, it may be desirable to repeat this survey at a future date, but with a survey period of at least 12-14 days. This survey was conducted over a period of only 6 days, which explains some of the erratic results. Appendix 2 lists the survey data for the Icy Basin profiles. The movement data are shown in Appendix 3.

3.1.1.3 GILKEY GLACIER

The confluence zone of the Gilkey Glacier has been the site of numerous surface velocity studies in the past (McGee, 1990; Lang, 1995; Welsch, et al., 1997). In particular, the wave ogives, or wave bulges as they are sometimes called, have been surveyed to determine the velocity along the crests of the ogives. The most recent survey of this type was performed in 2000, and was repeated again in 2001. Due to time constraints, only the first three ogives were surveyed this year, in contrast to the first ten ogives that were measured in 2000. In addition, a longitudinal profile extending downglacier along the centerline of the ogives was surveyed this year. The results of this survey are presented in Section 3.5.1.

The surface velocity along the crests of the first three ogives at the base of the Vaughan Lewis Icefall is displayed in Figure 7, and tabulated in Appendix 3. As can be seen, the velocities are rather consistent, ranging from 33.7 cm/day to 41.1 cm/day. The movement vectors are as expected.

3.1.2 SHORT-TERM HEIGHT CHANGE

For the purposes of this report, short-term height change is defined as the change in height of the glacier surface between the summer Epoch 0 and Epoch 1 surveys, typically covering a time span of 7 to 14 days. Ablation, downslope movement, and firn compaction are the main contributors to short-term height change. The accuracy to which this change can be detected on a glacier with survey-grade differential GPS is roughly 1-5 cm, depending on the magnitude of suncup-induced surface roughness. A smooth surface devoid of suncups allows for more precise measurement of the GPS antenna above the well-defined snow surface. The presence of large suncups mandates estimation of the mean surface between the crest and the troughs. With a smooth, suncup-free surface (typical at the higher elevations of the Matthes and Llewellyn Glaciers), surface heights relative to a known benchmark can be determined within about ± 0.5 -1 cm. As the surface becomes rougher, the height determination may degrade to ± 5 -6 cm. Nevertheless, with an elapsed time between Epoch 0 and Epoch 1 surveys of 7 to 14 days, and daily ablation rates of roughly 5-8 cm/day, it is possible to determine significant short-term height changes during the time period of the surveys. It is important to note that the short-term height changes reported here include the component of downslope movement of the surveyed flags. Surface height changes due to the downslope movement of the flags between Epoch 0 and Epoch 1 have not been extensively investigated on the Juneau Icefield. However, with surface gradients ranging from 1-2 degrees, the contribution to short-term height change due to downslope movement amounts to roughly 20% of the total observed short-term height change. The remaining 80% can be attributed to actual ablation of the surface.

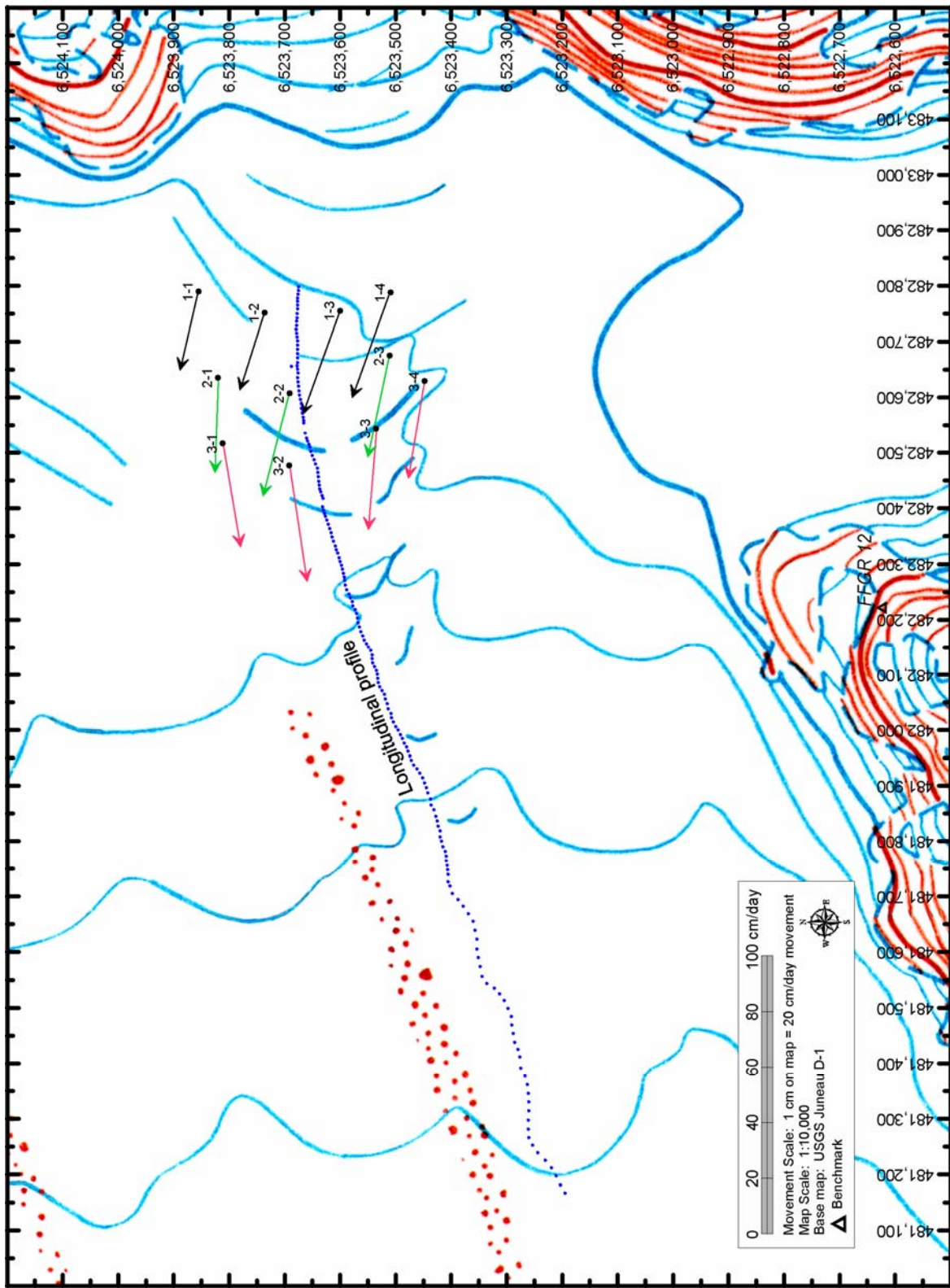


Figure 7: Surface movement vectors on the Gilkey Glacier, and location of the ogive longitudinal profile.

Most survey work this summer focused on the longitudinal profiles and as a result, only Profile 4 and the transverse profiles at Icy Basin and the Vaughan Lewis Glacier wave ogives were surveyed twice. The short-term height change for these profiles is shown in Table 3. Refer to Appendix 4 for detailed graphs of short-term height change at the transverse and longitudinal profiles. Appendix 2 lists the surveyed height of the flags at all profiles for both the Epoch 0 and Epoch 1 surveys.

PROFILE	MEAN SURFACE HEIGHT OF PROFILE AT EPOCH 0 (HAE M)	SHORT-TERM HEIGHT CHANGE (CM/DAY)		
		MINIMUM	MAXIMUM	MEAN
Icy Basin Line 1	1098.06	-3.3	-6.2	-5.0
Icy Basin Line 2	1104.52	-3.7	-9.7	-7.0
Icy Basin Line 3	1101.03	-5.6	-8.0	-6.4
Icy Basin Line 4	1097.57	-4.6	-5.5	-5.2
V.L. ogive 1	1098.87	-3.2	-7.6	-5.7
V.L. ogive 2	1091.31	-4.5	-10.1	-8.2
V.L. ogive 3	1088.31	-3.2	-5.9	-4.3
4	1129.333	-3.3	-9.6	-6.2

Table 3: Short-term height change at Profile 4 and Icy Basin on the Taku Glacier, and on the Vaughan Lewis Glacier wave ogives.

3.1.3 LONG-TERM HEIGHT CHANGE

Long-term height change analysis is important in determining the relationship between surface height changes, the elevation of ablation and accumulation zones, and the accumulation area ratio (AAR) of a glacier system. This is particularly important when assessing the likely response of a glacier to climate change because the zones of net increase or decrease in elevation of the surface with respect to the elevation of the accumulation and ablation zones determine whether the glacier will ultimately advance, retreat, or remain stable. This is because changes in surface height have a direct correlation with mass balance. For example, suppose a glacier has an AAR of 0.67. In this case, the accumulation area is twice the size of the ablation area. If the surface height increases 2 meters water equivalent in the accumulation area, then the glacier will likely increase its mass (assuming that the accumulation is not offset by extreme ablation lower on the glacier). In addition, since the accumulation area is twice the size of the ablation area, the surface height of the glacier in the ablation zone (and/or retreat of the terminus) would have to decrease 4 meters water equivalent to nullify the 2 meter surface height increase in the accumulation area.

Recognizing the critical importance of surface height changes and the elevations at which they occur, and the ability of GPS to consistently measure heights over time, transverse and longitudinal profiles on the Juneau Icefield are monitored to determine long-term height changes. As used in this report, long-term height change refers to the change in height of the glacier surface from one year to another. This is determined by taking GPS height readings in subsequent years at the standard flag coordinates as published in the JIRP Coordinate Tables (McGee, 2000a). Because the measurements are taken within a 10-50 cm radius of the

location of measurements in previous years, the contribution of downslope movement to height change is eliminated. Thus, long-term height change reflects a true measure of the increase or decrease of mass on an annual basis.

This section presents the long-term height change data for the transverse profiles (refer to Section 3.2.2 for a discussion of long-term height change along the longitudinal profiles). The analysis here focuses on change only between 2000 and 2001. A multi-year comparison of cumulative height change at each profile is beyond the scope of this annual report. Refer to previous JIRP survey reports for data concerning the surveyed heights of profiles in years not covered in this section.

All long-term height change data presented in this section are based on the actual dates of survey, without any interpolation or adjustment. Long-term height change data are reported here as either positive or negative; positive height change indicates a net increase in mass during the survey period, whereas negative height change results in a net decrease in mass.

3.1.3.1 TAKU AND DEMOREST GLACIERS

Three transverse profiles on the Taku and Demorest Glaciers were surveyed in 2001. These ranged from Profile 3 at an elevation of 1037 meters on the Demorest Glacier to Profile 3a in the middle sector of the Demorest Glacier, at an elevation of 1358 meters.

All three profiles show net retained accumulation that resulted in an increase in the surface height, as shown in Table 4. The time interval between the 2000 and 2001 surveys was one to three days less than a full year. Taking this into account, and adjusting for daily ablation for these few days, results in a net mean surface elevation increase for these three profiles of 1 meter, or 0.55 meter water equivalent. The maximum surface height change of +1.30 meters was observed at Profile 3, at an elevation of 1037 meters.

PROFILE	TIME PERIOD		MEAN SURFACE HEIGHT IN 2001 AT EPOCH 0 (HAE M)	LONG-TERM HEIGHT CHANGE (M)		
	FROM	TO		MINIMUM	MAXIMUM	MEAN
3	7/29/2000	7/26/2001	1036.90	+1.14	+1.56	+1.30
4 (lower)	7/21/2000	7/19/2001	1128.24	+0.77	+1.67	+1.12
4 (upper)	7/21/2000	7/19/2001	1129.73	+0.76	+1.27	+1.00
3a	8/4/2000	8/3/2001	1357.99	+0.56	+2.83	+1.10

Table 4: Long-term height change at the transverse profiles on the Taku and Demorest Glaciers.

3.1.3.2 GILKEY GLACIER

During the 1990 summer field season, 45 points were established throughout the convergence zone of the Gilkey, Vaughan Lewis, and Unnamed Glaciers in the Gilkey Trench below Camp 18. Survey flags were placed at each of the 45 points. The objective was to determine, using theodolite and EDM techniques, the flow regime in the convergence zone and to relocate and resurvey the flags in successive years in order to determine actual annual velocity. Annual surveys were conducted up to 1995, at which time all the flags had moved through the

convergence zone, effectively concluding the project. The results of this project are described by Lang and Welsch (1997, pp. 109-113).

The 1995 GPS survey work in the Gilkey Trench included the relocation and resurvey of 7 of the 9 flags of Profile D across the Gilkey Glacier just upglacier from the convergence zone. Two of the 3 flags of Profile E on the Little Vaughan Lewis Glacier were also surveyed. The purpose of the 1995 GPS survey was to establish baseline surface heights for subsequent future comparison. Unlike all other established profiles on the Juneau Icefield, the points surveyed on the Gilkey Glacier are well within the ablation zone.

In 2001, all 9 of the 1995 baseline points were again surveyed via real-time GPS. Comparison of the 1995, 2000, and 2001 surface elevations reveals significant downwasting of the glacier surface (see Table 5). Refer to Appendix 2 for the survey observations.

Results show a net decrease in surface elevation from 2000 to 2001, continuing the trend seen since 1995. The greatest decrease in surface elevation was along the eastern half of the Gilkey Glacier. This is the area in which the glacier flows south, just upglacier from the point where it makes a right-angle turn to the west. Interestingly, the surface elevation decrease on the western half of the Gilkey was negligible. Flags D6 and D9 appear to have slightly increased in elevation, however this is most likely due to not being able to measure the exact spot as was surveyed in 2000. The area is highly crevassed and in several instances the 2001 location was in a crevasse, forcing measurement at the edge of the crevasse nearest the 2000 location.

The mean elevation decrease from 2000 to 2001 was 0.77 meter (0.69 meter water equivalent) at Profiles D and E. The rapid thinning seen in the Gilkey Trench since 1995 is continuing, and is expected to continue in future years. Although surveys have not been conducted downglacier from the convergence zone, it can be postulated that an even greater rate of mass loss than that observed in the convergence zone may occur nearer the terminus of the Gilkey Glacier.

FLAG	SURFACE HEIGHT AUG. 12, 1995 (M)	SURFACE HEIGHT AUG. 12, 2000 (M)	SURFACE HEIGHT AUG. 10, 2001 (M)	HEIGHT CHANGE 1995 TO 2000 (M)	HEIGHT CHANGE 2000 TO 2001 (M)
D1	1097.91	1085.72	1084.54	-12.18	-1.18
D2	1104.78	1092.37	1091.04	-12.41	-1.33
D5	1097.57	1085.11	1084.29	-12.46	-0.82
D6	1100.47	1087.73	1087.88	-12.75	+0.15
D7	1079.32	1066.06	1065.97	-13.26	-0.09
D8	1094.57	1079.86	1079.61	-14.71	-0.26
D9	1077.08	1063.18	1063.35	-13.90	+0.17
E2	1106.68	1094.11	1091.99	-12.57	-2.12
E3	1105.83	1092.05	1090.62	-13.79	-1.43
MEAN	1096.02	1082.91	1082.14	-13.11	-0.77

Table 5: Long-term height change for the Gilkey Glacier at transverse Profiles D and E, 1995 to 2001.

3.1.3.3 LEMON GLACIER

Beginning in 1997, several profiles have been surveyed on the Lemon Glacier. The purpose of these surveys is to monitor height change and surface mass balance conditions. The surveys conducted in 1997, 1998, and 1999 utilized three transverse profiles and one longitudinal profile in the vicinity of Camp 17. In 2001, an additional transverse profile was added 1-kilometer further downglacier from the existing profiles, and the existing longitudinal profile was extended downglacier to the new transverse line. The current configuration of the Lemon Glacier profiles consists of 4 transverse lines and 1 longitudinal line. Appendix 2 lists the easting, northing, and height coordinates for these lines as surveyed in 2001.

Overall, the surface height within the area that was surveyed on the Lemon Glacier was 0.85 meter higher in 2001 than it was in 1999. This positive mass balance equates to a water equivalent of 0.47 meter at a surface firn density of 0.55 g/cm^3 for the period from July 18, 1999 to August 2, 2001. Table 6 presents the height change data for the Lemon glacier profiles. Flags 97-130 were established in 2001, therefore a comparison with 1999 cannot be accomplished for these flags. Figure 8 shows the spatial distribution of the height changes on the Lemon Glacier.

LEMON GLACIER PROFILES	FLAGS	TIME PERIOD		MEAN SURFACE HEIGHT IN 2001 AT EPOCH 0 (HAE M)	LONG-TERM HEIGHT CHANGE (M)		
		FROM	TO		MINIMUM	MAXIMUM	MEAN
1	80-95	7/18/1999	8/2/2001	1242.73	+0.18	+0.75	+0.41 ¹
2	1-30	7/18/1999	8/2/2001	1231.98	+0.53	+2.34	+1.10
3	31-55	7/18/1999	8/2/2001	1200.60	+0.32	+1.96	+0.73
4	97-120	---	8/2/2001	1107.02	---	---	---
5	56-79	7/18/1999	8/2/2001	1212.75 ¹	+0.38 ²	+1.81 ²	+0.73 ²
	121-130	---	8/2/2001	1147.37	---	---	---

¹ Does not include Flag 80 (outlier at +4.60).

² Does not include Flags 74-79, as these were not surveyed in 2001.

Table 6: Long-term height change at the Lemon Glacier.

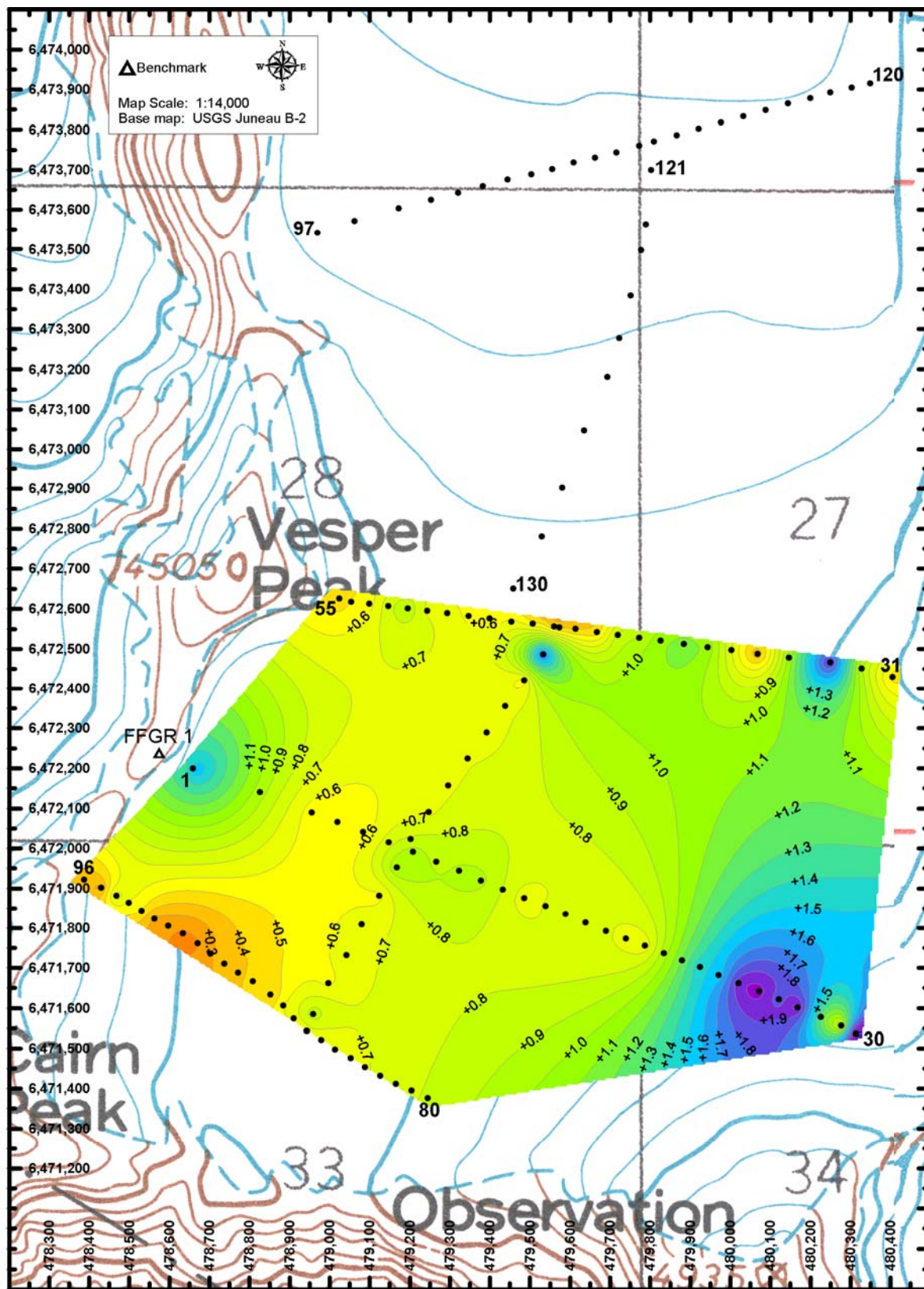


Figure 8: Long-term height change on the Lemon Glacier, July 18, 1999 to August 2, 2001. Isolines indicate the magnitude of surface height increase. Flags 97-130 were not surveyed in 1999, thus height change for these flags cannot be determined.

3.2 LONGITUDINAL PROFILES

While the transverse profiles have provided invaluable data relating to the flow regime of the Taku Glacier and its tributaries, they have not allowed a comprehensive examination of the surface morphology and flow patterns across the entire extent of the Juneau Icefield. Recognizing this shortcoming, a comprehensive network of longitudinal profiles was first established in 1999. These longitudinal profiles are designed to ultimately extend along the centerlines of the main Taku/Matthes/Llewellyn Glaciers and the major tributaries to them. Initially, the glaciers of the Taku system have been given first priority. Thereafter, it is hoped that the longitudinal network can be further extended to include the main Llewellyn Glacier system and possibly the Norris Glacier.

Unlike the transverse profiles, the longitudinal profiles provide detailed data regarding the flow regime along the entire length of the surveyed glaciers, at a nominal flag spacing of 500 meters. Data collected includes surface velocity, surface height, surface gradient, and both short-term (1-2 weeks) and long-term (annual) height change. The height change data, in particular, may provide important insights into accumulation and ablation patterns across the Icefield with respect to elevation.

The continued monitoring and extension of the longitudinal profiles on the Taku Glacier system was the major focus of the survey program in 2001. Of the initial 150 kilometers of longitudinal profiles first planned during the winter of 1998, 49.5 kilometers were established and surveyed during the 1999 JIRP field season. This network was further extended during the summer of 2000 with the survey of an additional 44 kilometers, and summer of 2001 saw an additional 40.5 kilometers established and surveyed. At the same time, the existing network of 93.5 kilometers first surveyed in 1999 and 2000 were again resurveyed in 2001 to allow for the determination of annual height change. We now have a longitudinal network extending across 134 kilometers of the Taku Glacier and its tributaries.

The flags of Longitudinal A, on the Taku/Matthes/Llewellyn system, were renumbered this year. This was necessary because the original numbering system began with Flag 1 at the current terminus location. As the Taku Glacier continues to advance toward Taku Point, future extension of the longitudinal in concert with the advancement of the terminus would have necessitated an illogical numbering scheme. Beginning this year, the flag numbers for Longitudinal A begin with Flag 1 at the bedrock of Taku Point, on the south bank of the Taku River. The numbers continue northward from Taku Point to the terminus, and connect with the existing flags of Longitudinal A. The nominal 500-meter spacing is maintained with the new numbering system. The net result of this change is the addition of 25 new flags that extend from Taku Point to the location of the original Flag 1 position. The numbering system for Longitudinal A now starts with Flag 1 at Taku Point and extends to Flag 147 on the Llewellyn Glacier near Camp 26.

The significant increase in retained accumulation seen across the Icefield during the summer of 2001 allowed the extension of the survey of Longitudinal A an additional 5 kilometers downglacier from the most downglacier point that was surveyed in 2000. This is in the area where the Taku Glacier valley is at its narrowest point, and it is some 6-7 kilometers downglacier from the location of the historical névé line.

The extension of the longitudinal profiles was focused mainly on the Northwest and West Branches of the Taku Glacier. Longitudinal D, which begins at Longitudinal F (the West Branch), was extended an additional 17 kilometers to the south, past Rhino Peak and onto the head of the Mendenhall Glacier. Longitudinal E was newly established on the Snow Towers

Branch of the Taku Glacier. Fourteen flags, extending 7 kilometers to the Herbert/Taku divide were surveyed. Longitudinal F was also extended this year with the addition of 12 flags. And a new profile, Longitudinal G, was established across 5.5 kilometers of the Echo Glacier. This glacier begins at an indistinct divide in the vicinity of Echo Mountain. Refer to Figure 2 for a map showing the locations and extent of all longitudinal profiles surveyed in 2001.

3.2.1 SURFACE VELOCITY AND GRADIENT

Perhaps one of the most interesting applications of longitudinal velocity is the evaluation of the velocity as it relates to elevation, gradient, and the locations of glaciomorphological features such as the terminus, ELA, and glacial divides. As with the transverse profiles, surveys of the longitudinal profiles in 1999, 2000, and 2001 have shown no significant difference in the surface velocities from one year to the next.

3.2.1.1 TAKU/MATTHES/LLEWELLYN GLACIERS

The Taku, Matthes, and Llewellyn glacier system extends from Taku Inlet, Alaska to near Atlin Lake, British Columbia, a distance of 93 kilometers. The broad divide between the Matthes and Llewellyn Glaciers is located 58 kilometers from the Taku Glacier terminus (in 2001, the terminus was approximately 1.5 kilometers north of the bedrock on the south side of the Taku River at Taku Point). Beginning approximately 12 kilometers upglacier from the Taku Glacier terminus (Point 28) and extending nearly to Camp 26 (Point 147), 60 kilometers have now been surveyed at a nominal observation interval of 500 meters. See Table 7 for a list of GPS reference points used for the surveys. The survey data confirm the general trend of increasing velocity with increasing distance from the Matthes/Llewellyn divide (see Figure 13). This is true on both the Taku/Matthes Glaciers and the Llewellyn Glacier.

LONGITUDINAL A	REFERENCE POINT USED	EASTING (LONGITUDE)	NORTHING (LATITUDE)
Points 28 to 60	Lupine (Taku A)	490,263.717 (134° 10' 3.247" W)	6,500,621.560 (58° 37' 20.701" N)
Points 61 to 78	Scott (Camp 10)	487,963.303 (134° 12' 26.303" W)	6,503,372.111 (58° 38' 49.388" N)
Points 79 to 100	C-9 Bolt	489,442.431 (134° 10' 55.823" W)	6,510,665.042 (58° 42' 45.226" N)
Points 101 to 120	FFGR 39 (Blizzard)	487,443.145 (134° 13' 2.776" W)	6,524,360.975 (58° 50' 7.663" N)
Points 121 to 147	FFGR 62 (F-10)	492,497.562 (134° 7' 49.040" W)	6,535,469.195 (58° 56' 7.081" N)

Table 7: GPS reference points used for the survey of Longitudinal A. Easting and northing coordinates are with respect to the JIRP coordinate system (see Table 2). Latitude and longitude are with respect to the WGS84 datum and spheroid.

Significant retained accumulation from the winter of 2000-2001 allowed for the extension of Longitudinal A downglacier from Flag 38 to Flag 28, approximately 12 kilometers upglacier from the location of the Taku terminus in 2001. This is below the historical mid-summer névé line and in an area where the valley is at its minimum width of 3 kilometers. Not surprisingly, the highest velocities thus far recorded on the Taku Glacier occur here. The velocity at Point 28 was 1.14 m/day. In fact, the velocities measured at the newly established Flags 28-37 show velocities decreasing from Flag 28 upglacier to Flag 37. This seems to indicate that the velocity, downglacier from Flag 28, may in fact be even greater than that found at Flag 28. Therefore, the maximum velocity on the Taku Glacier is likely to be found somewhere between Flag 28 and the location of transverse Profile 1, which was observed to have a maximum velocity of 84 cm/day in 1994.

Figure 9 graphs the velocity versus the surface height and the centerline distance from Taku Point for Longitudinal A. Relative velocities are indicated by the size of the circles; the larger the circle, the higher the velocity. Refer to Appendix 3 for a tabular listing of the velocities at Flags 28-37. The surface gradient between adjacent surveyed points (28 to 29, 29 to 30, etc.) is indicated by the vertical bars, the magnitude of which is shown on the right-hand Y-axis. All points surveyed to date are shown; Flags 49-110 were first surveyed for velocity in 1999 (shown in green), Flags 38-48 and Flags 111-147 were first surveyed for velocity in 2000 (shown in red), and Flags 28-37 were first surveyed for velocity in 2001, shown in blue. All comments by Welsch (1999) and McGee (2000b) regarding Flags 38-147 remain valid; therefore this discussion will focus mainly on the new points surveyed in 2001.

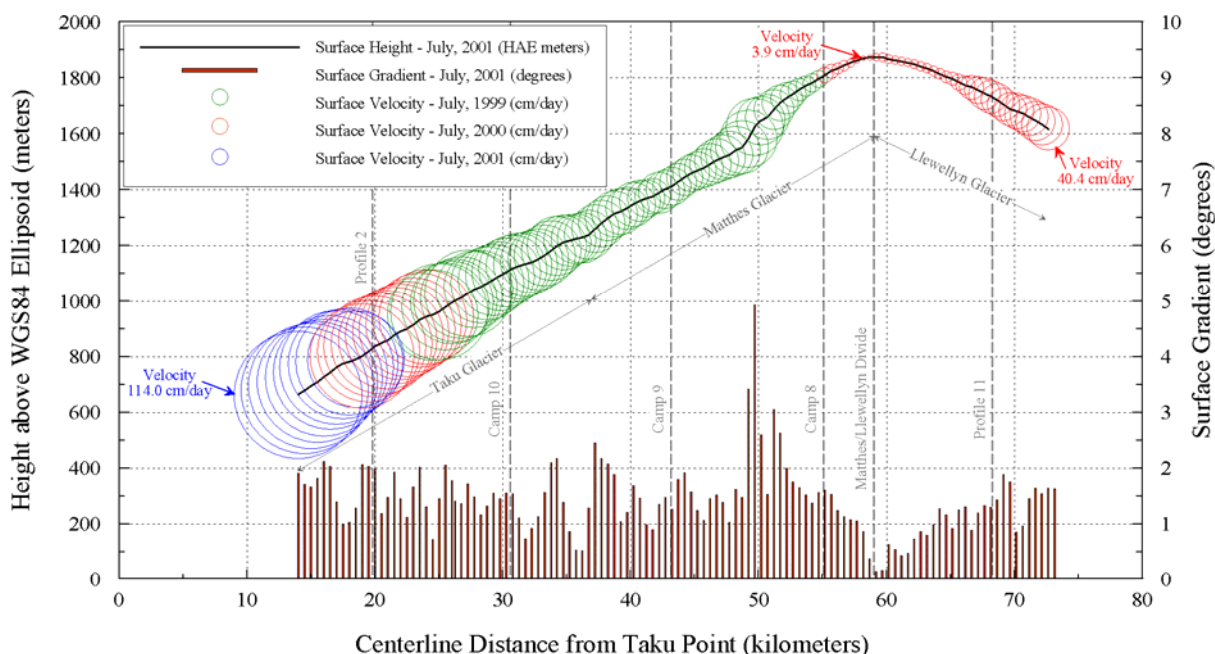


Figure 9: Gradient and relative surface velocity as a function of elevation and distance from the terminus of the Taku Glacier along Longitudinal A. The magnitude of velocity is indicated by the size of the circles. Velocity and height were observed at 500 meter intervals along the longitudinal centerline of the Taku, Matthes, and Llewellyn Glaciers. The effect of valley width on velocity is not considered here. Refer to Welsch, et al (1999, Fig. 13) for additional details.

POINTS FROM-TO	GRADIENT (DEGREES)	MEAN VELOCITY (CM/DAY)
28-29	1.91	1.139
29-30	1.71	1.132
30-31	1.66	1.103
31-32	1.81	1.067
32-33	2.12	1.039
33-34	2.03	1.025
34-35	1.40	1.004
35-36	0.99	0.973
36-37	1.02	0.915

Table 8: Surface gradient and velocity for those flags of Longitudinal A that were newly established in 2001. Refer to Lang (1999) for the gradient and velocity between Flags 24 and 85, and to McGee (2000b) for the gradient and velocity between Flags 38-48 and Flags 111-147.

Beginning at Flag 28 (the point closest to the Taku terminus) at a height of 663.3 meters, the velocity was observed to be 114 cm/day. The Taku Glacier slopes at about 1.9 degrees at this point. Continuing upglacier to Flag 117, the velocity decreases to 3.9 cm/day at a height of 1870 meters. The surface slope varies from 1 to 2 degrees between Flags 28 to 37. Referring to Figure 9, it can be seen that the centerline velocity of the Taku and Matthes Glaciers gradually decreases with increasing distance from Taku Point. A notable exception occurs some 50 kilometers from Taku Point, where increased velocities (~51 cm/day) occur over a 1-kilometer distance. As noted by Welsch (1999), this is due to the significant gradient increase of the Matthes Glacier (~5 degrees) in conjunction with local narrowing of the constraining valley walls. Velocities measured in 1999 upglacier from the steep slope gradually decrease from 43.6 cm/day at Flag 101, to 3.9 cm/day at Flag 117 in the vicinity of the Matthes/Llewellyn divide. From the divide, velocities increase to 40.4 cm/day at Flag 147 on the Llewellyn Glacier. Refer to Figure 14 for a plot of the 2001 surface velocities along Longitudinal A.

A vertical cross-section along Longitudinal A reveals a bench and step morphology on the surface of the Taku and Matthes Glaciers. This is clearly seen by the vertical bars in Figure 9, where surface gradients vary intermittently between 1 and 2 degrees. Upglacier from the steep 5 degree slope of the Matthes Glacier at kilometer 50, surface gradients consistently decrease to 0.1 degree at the divide. The gradient then increases from the divide to Flag 139 on the Llewellyn Glacier, where it was observed to be 1.9 degrees in 2000. From Flag 139 to 147, the surface gradient is similar to the bench and step morphology of the Taku and Matthes Glaciers.

3.2.1.2 NORTHWEST AND WEST BRANCHES OF THE TAKU GLACIER

Two new longitudinal profiles (D and F) were extended on the Northwest and West Branches of the Taku Glacier, and one new longitudinal (E) was established in 2001.

Longitudinal D begins at the centerline of the Taku Glacier between Taku Northwest Point and Taku C Peak, and trends in a northwest and westerly direction to a point midway between Knowl Peak and Tricouni Peak. It then turns south and follows the centerline of the tributary branch on the west side of Flower Tower, Little Matterhorn, Cathedral Peak, and the Taku Towers, continuing south past Rhino Peak to the divide between the Taku and Mendenhall Glaciers (see Figure 2). Point numbering begins with Flag 1 on the Taku Glacier and ends with Flag 50 west of the Taku Towers, giving a total length of 25 kilometers for the profile. Surveys on July 28 and 29 extended this profile 17 kilometers from Flag 15 to Flag 48, on the Mendenhall Glacier side of the Taku/Mendenhall divide.

Longitudinal E, newly established this year, branches off from Flag 28 of Longitudinal D. It trends in a southwesterly direction for 7 kilometers to the divide between the Taku and Herbert Glaciers. Fourteen flags were surveyed in order to determine both velocity and gradient.

Longitudinal F begins with Point 1 at the location where Longitudinal D makes the turn to the south. The profile proceeds west along the centerline of the West Branch to a point north of Tricouni Peak where it makes a gradual turn to the south-southwest, terminating with Point 27 at the divide between the West Branch and the Eagle Glacier (see Figure 2). In 2001, Flags 15-26 were established and surveyed for surface velocity and gradient. The total distance of Longitudinal F is approximately 13.5 kilometers.

In order to extend the surveys across the western sector of the Taku Glacier system, it was necessary to establish a new benchmark for the use of the GPS base station. This benchmark, named Knowl, was set on a small nunatak of the same name some 2.5 kilometers west of Taku Northwest Point, and is the most westerly outcrop of Carpet Peak. From this location, a radio link between the base station and the rover can be maintained over 13-14 kilometers, allowing surveys to extend to the Taku/Mendenhall divide area. See Table 12 for a list of the benchmarks used for the surveys of Longitudinals D, E, F, and G.

There are no unusual results seen in the velocities and vectors measured at Longitudinals D, E, and F (see Figures 15 and 16). The minimum velocity at Longitudinal D was 1 cm/day and the maximum was 28.3 cm/day. Longitudinal E had a minimum of 0.5 cm/day and a maximum of 10.3 cm/day. The minimum at Longitudinal F was 2.1 cm/day and the maximum was 9.3 cm/day. These results are only for the points within the profiles that were first established and surveyed in 2001. Refer to Welsch (1999) and McGee (2000b) for the velocities measured at the other points of the longitudinals.

The movement vectors at Longitudinals D, E, and F reveal the locations of the divides between the Taku Glacier system and the Mendenhall and Herbert Glaciers. The Taku/Mendenhall divide is located between Flags 43 and 44 of Longitudinal D, and the divide between the Taku and Herbert Glaciers along Longitudinal E is between Flags 10 and 11 of that profile (see Figure 15). The divide between the Taku and Herbert Glaciers at Longitudinal F is somewhat uncertain, as we were not able to survey points beyond Flag 26. The movement vector at Flag 26 indicates cross-glacier flow, neither directed toward the Herbert Glacier nor the Taku Glacier (see Figure 16). The vector at Flag 25 was not obtained because the radio link between the reference and roving receivers was not obtained at the time of the first survey. However, it is certain that the vector direction at this flag is toward the Taku system. It may be possible that the Taku/Herbert divide at Longitudinal F is located southwest of Flag 26. Only the establishment of additional flags will determine this. It would

be necessary to establish a new benchmark in the vicinity of Flag 26 in order to extend this profile.

The gradient of the Northwest and West Branches is fairly consistent at around 1° (see Figures 10, 11, and 12). The one notable exception is between Longitudinal F Points 5 and 6, located midway between transverse Profiles 6 and 6c. The maximum gradient here is 2.84° . Tables 9 and 10 present the surface gradient along Longitudinals D, E, and F for those points first established and surveyed in 2001.

Longitudinal G, a new profile established this year, is located in a sector of the Taku Glacier system that is somewhat of a sub-tributary of the Northwest Branch. The profile extends 5 kilometers north from Flag 9 of Longitudinal D, and it reaches the divide area between the Taku and Echo Glaciers. This divide delineates flow to the south, via the Taku Glacier, and flow to the north, via the Echo Glacier into Avalanche Canyon. Eleven flags were established and surveyed in 2001. The minimum velocity was 2 cm/day at Flag 11, and the maximum was 31.2 cm/day at Flag 1. Refer to Figures 13 and 17 for details on the surface flow at this profile. The surface gradient is shown in Table 11 and Figure 13. As with Longitudinal F, this profile needs to be extended another 1 kilometer in order to definitively delineate the divide between the Taku Glacier and the Echo Glacier. This would be a simple matter, as the Taku D Lower benchmark is nearby.

An interesting observation at this longitudinal was the observation of a grizzly bear in the vicinity of Flag 6 on August 6, 2001. We observed the bear walking along the base of Taku D. It then continued west some 5-6 kilometers up the middle of the West Branch, where it then turned north toward the peaks lining the north margin of the glacier.

LONG. D FROM-TO	GRADIENT (DEGREES)	MEAN VELOCITY (CM/DAY)	LONG. D FROM-TO	GRADIENT (DEGREES)	MEAN VELOCITY (CM/DAY)
15-16	1.10	0.280	31-32	1.82	0.063
16-17	1.08	0.277	32-33	1.21	0.077
17-18	1.03	0.273	33-34	0.91	0.075
18-19	1.35	0.266	34-35	0.80	0.072
19-20	1.53	0.259	35-36	0.84	0.069
20-21	1.10	0.248	36-37	1.08	0.067
21-22	1.05	0.230	37-38	1.03	0.062
22-23	1.49	0.204	38-39	0.93	0.053
23-24	1.69	0.178	39-40	0.75	0.041
24-25	1.41	0.158	40-41	1.01	0.032
25-26	1.02	0.140	41-42	1.27	0.025
26-27	0.79	0.114	42-43	1.21	0.015
27-28	0.83	0.087	43-44	0.41	0.012
28-29	0.78	0.073	44-45	1.41	0.019
29-30	0.22	0.060	45-46	0.60	0.044
30-31	1.80	0.051	46-47	1.54	0.071
			47-48	1.25	0.083

Table 9: Surface gradient and velocity for those flags of Longitudinal D, which were newly established in 2001.

LONG. E FROM-TO	GRADIENT (DEGREES)	MEAN VELOCITY (CM/DAY)	LONG. F FROM-TO	GRADIENT (DEGREES)	MEAN VELOCITY (CM/DAY)
1-2	0.97	0.100	15-16	1.11	0.090
2-3	0.71	0.087	16-17	0.74	0.082
3-4	0.69	0.071	17-18	0.74	0.075
4-5	0.73	0.053	18-19	1.35	0.074
5-6	1.23	0.040	19-20	1.11	0.067
6-7	0.88	0.033	20-21	0.87	0.059
7-8	0.79	0.026	21-22	1.21	0.052
8-9	0.54	0.027	22-23	0.90	0.046
9-10	0.91	0.020	23-24	0.50	0.037
10-11	0.25	0.009	24-25	No data	No data
11-12	-0.49	0.012	25-26	57.89	0.021
12-13	-0.57	0.022			
13-14	-0.56	0.030			

Table 10: Surface gradient and velocity for those flags of Longitudinal E and Longitudinal F, which were newly established in 2001.

LONG. G FROM-TO	GRADIENT (DEGREES)	MEAN VELOCITY (CM/DAY)
1-2	0.53	0.302
2-3	0.20	0.243
3-4	0.62	0.137
4-5	0.98	0.065
5-6	1.00	0.044
6-7	0.96	0.035
7-8	0.82	0.031
8-9	0.74	0.031
9-10	0.40	0.029
10-11	0.03	0.023

Table 11: Surface gradient and velocity for those flags of Longitudinal G, which were newly established in 2001.

PROFILE (POINTS)	REFERENCE POINT USED	EASTING (LONGITUDE)	NORTHING (LATITUDE)
Long. D (1 to 16)	Taku NW (UniBm)	479,188.345 (134° 21' 30.949" W)	6,505,144.633 (58° 39' 45.478" N)
Long. D (17 to 48)	Knowl	476,860.898 (134° 23' 55.244" W)	6,504,945.914 (58° 39' 38.631" N)
Long. E (1 to 14)	Knowl	476,860.898 (134° 23' 55.244" W)	6,504,945.914 (58° 39' 38.631" N)
Long. F (1 to 26)	Knowl	476,860.898 (134° 23' 55.244" W)	6,504,945.914 (58° 39' 38.631" N)
Long. G (1 to 11)	Taku NW (UniBm)	479,188.345 (134° 21' 30.949" W)	6,505,144.633 (58° 39' 45.478" N)

Table 12: GPS reference points used for the survey of Longitudinals D, E, F, and G. Easting and northing coordinates are with respect to the JIRP coordinate system (see Table 2). Latitude and longitude are with respect to the WGS84 datum and spheroid.

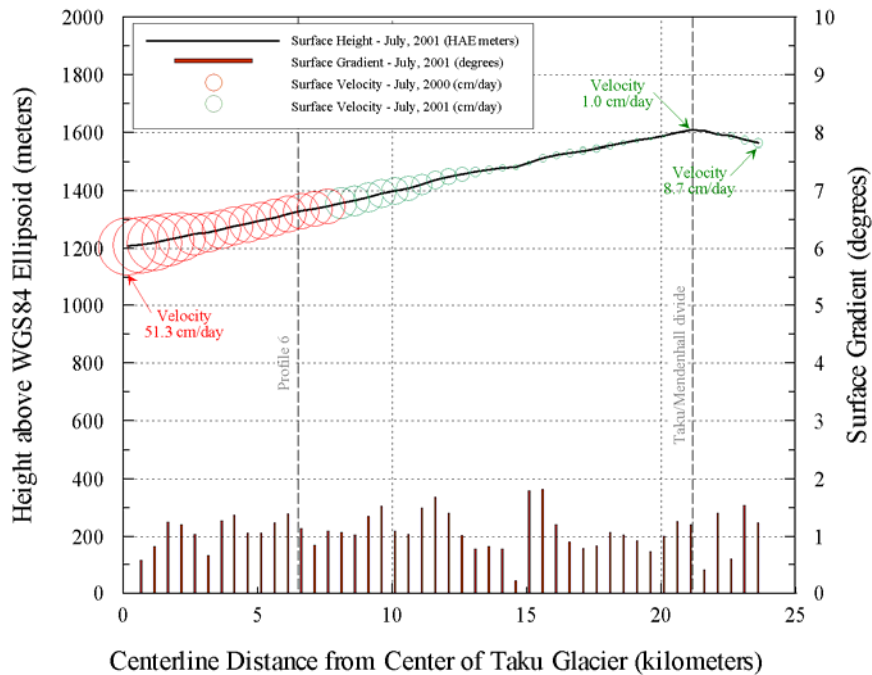


Figure 10: Gradient and relative surface velocity as a function of elevation and distance from the centerline of the Taku Glacier along Longitudinal D. The magnitude of velocity is indicated by the size of the circles. Velocity and height were observed at 500 meter intervals along the longitudinal centerline of the profile.

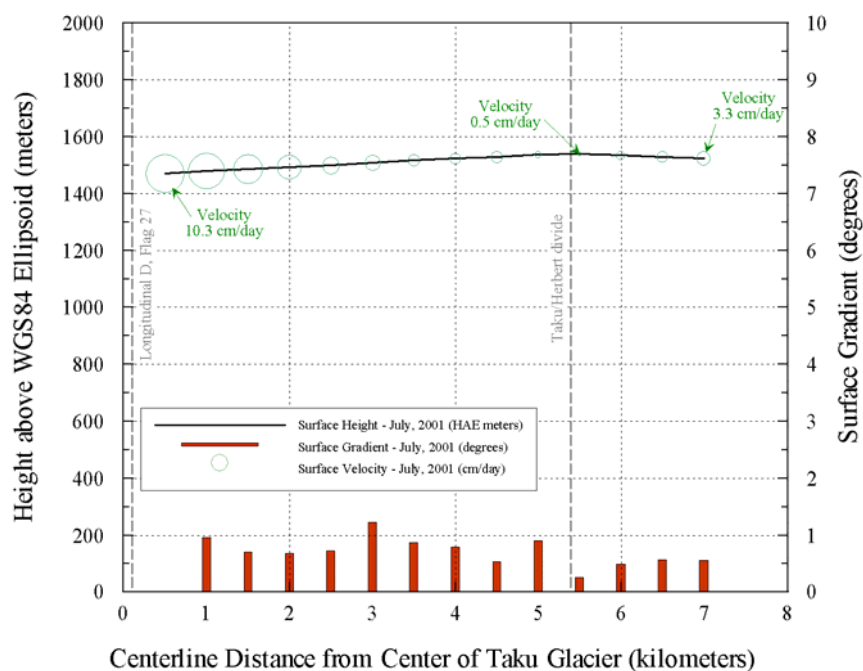


Figure 11: Gradient and relative surface velocity as a function of elevation and distance from the centerline of the Taku Glacier along Longitudinal E. The magnitude of velocity is indicated by the size of the circles. Velocity and height were observed at 500 meter intervals along the longitudinal centerline of the profile.

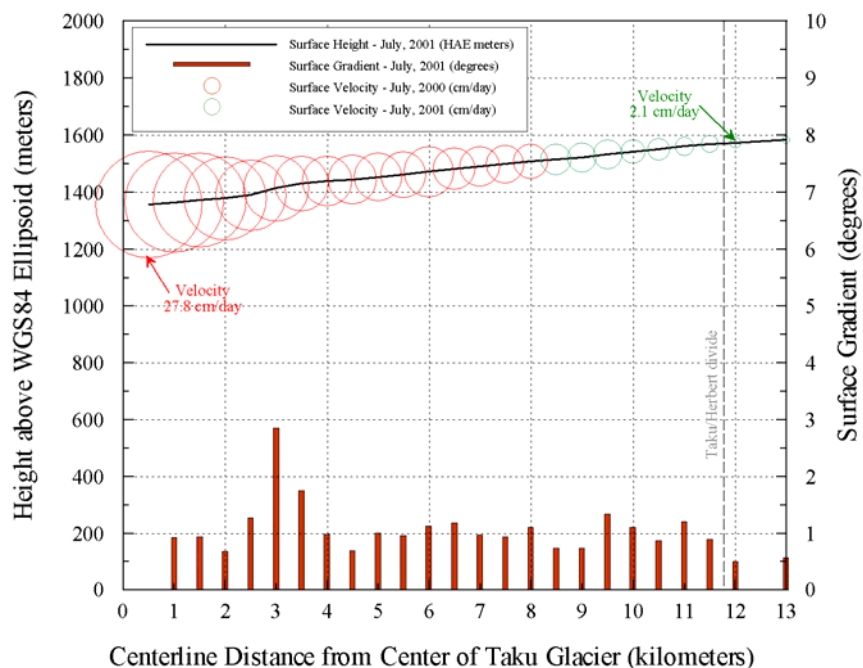


Figure 12: Gradient and relative surface velocity as a function of elevation and distance from the centerline of the Taku Glacier along Longitudinal F. The magnitude of velocity is indicated by the size of the circles. Velocity and height were observed at 500 meter intervals along the longitudinal centerline of the profile.

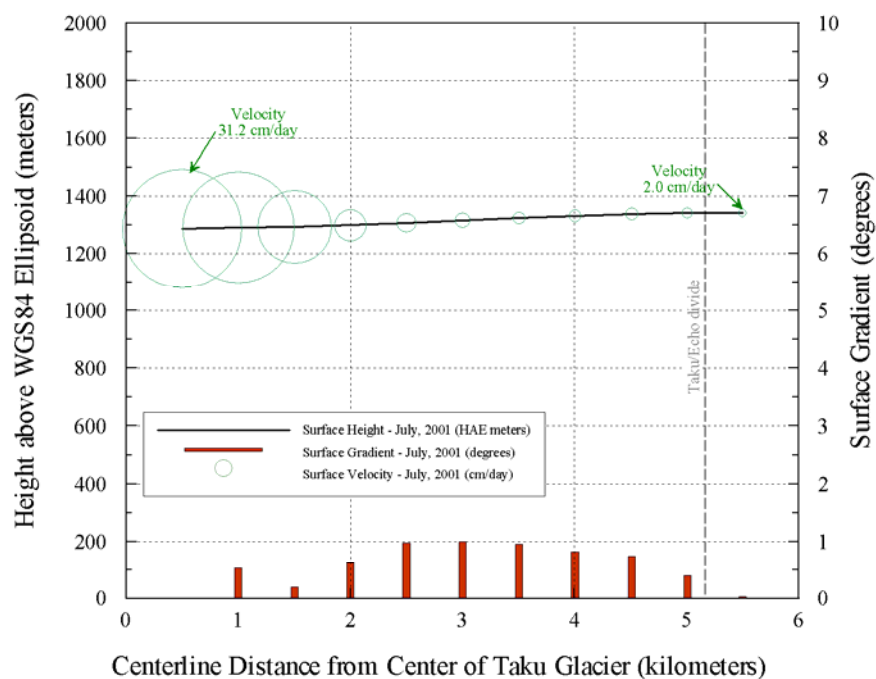


Figure 13: Gradient and relative surface velocity as a function of elevation and distance from the centerline of the Taku Glacier along Longitudinal G. The magnitude of velocity is indicated by the size of the circles. Velocity and height were observed at 500 meter intervals along the longitudinal centerline of the profile.

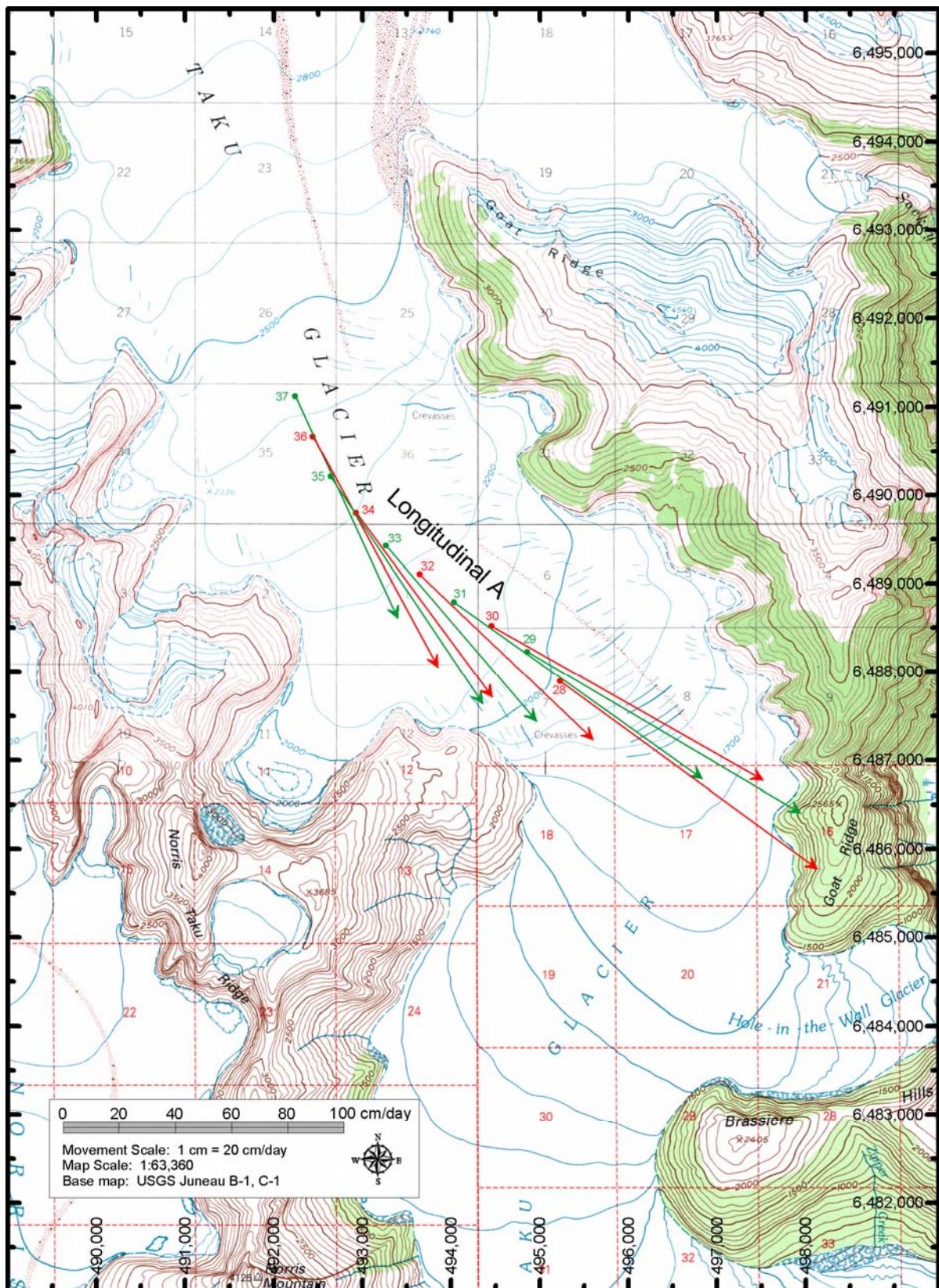


Figure 14: Movement vectors along Longitudinal Profile A for those points first surveyed in 2001 (Flags 28-37).

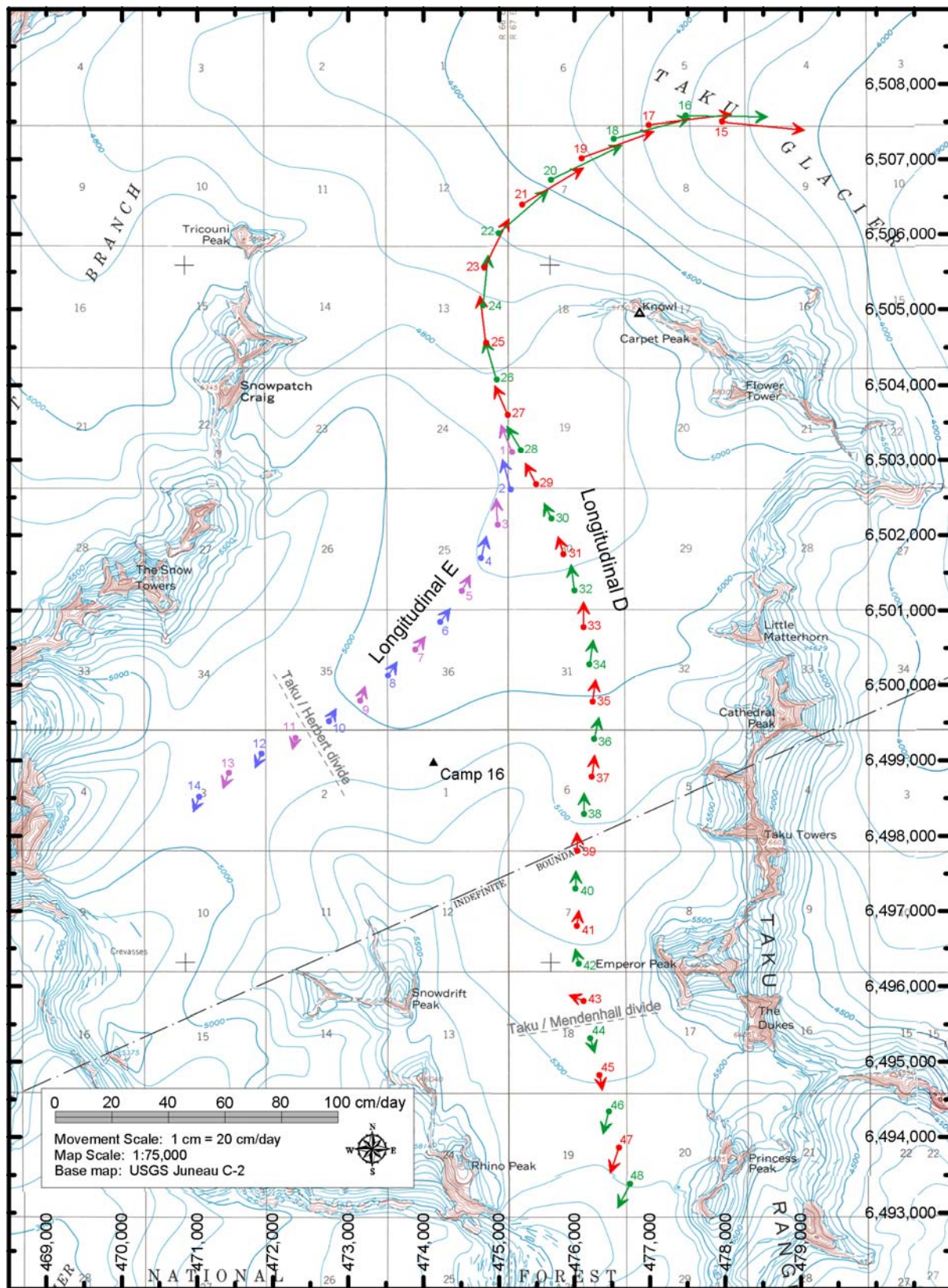


Figure 15: Movement vectors along Longitudinal Profiles D and E for those points first surveyed in 2001 (Longitudinal D, Flags 15-48; Longitudinal E, Flags 1-14).

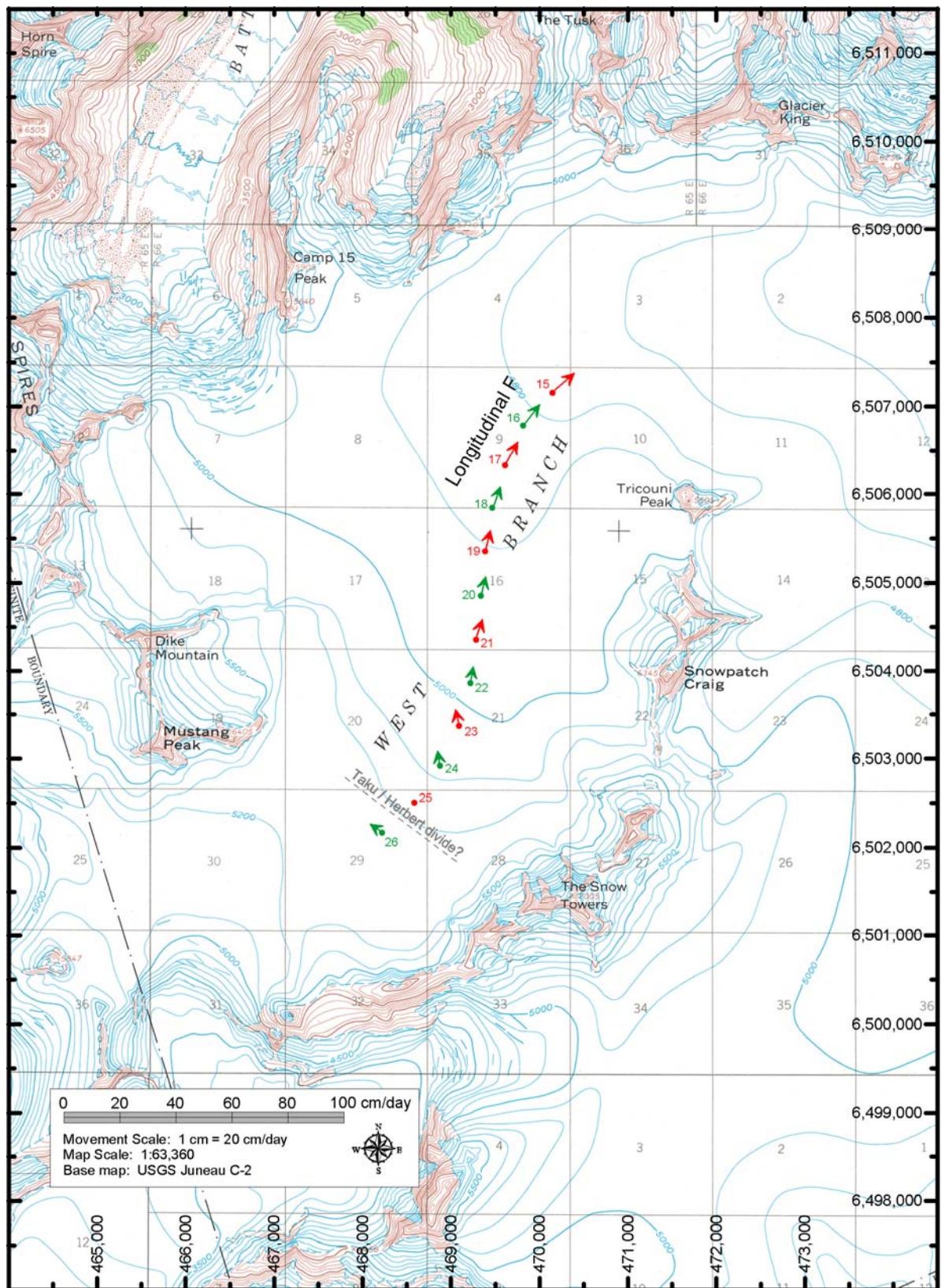


Figure 16: Movement vectors along Longitudinal Profile F for those points first surveyed in 2001 (Flags 15-24, 26). Movement vector for Flag 25 was not obtained.

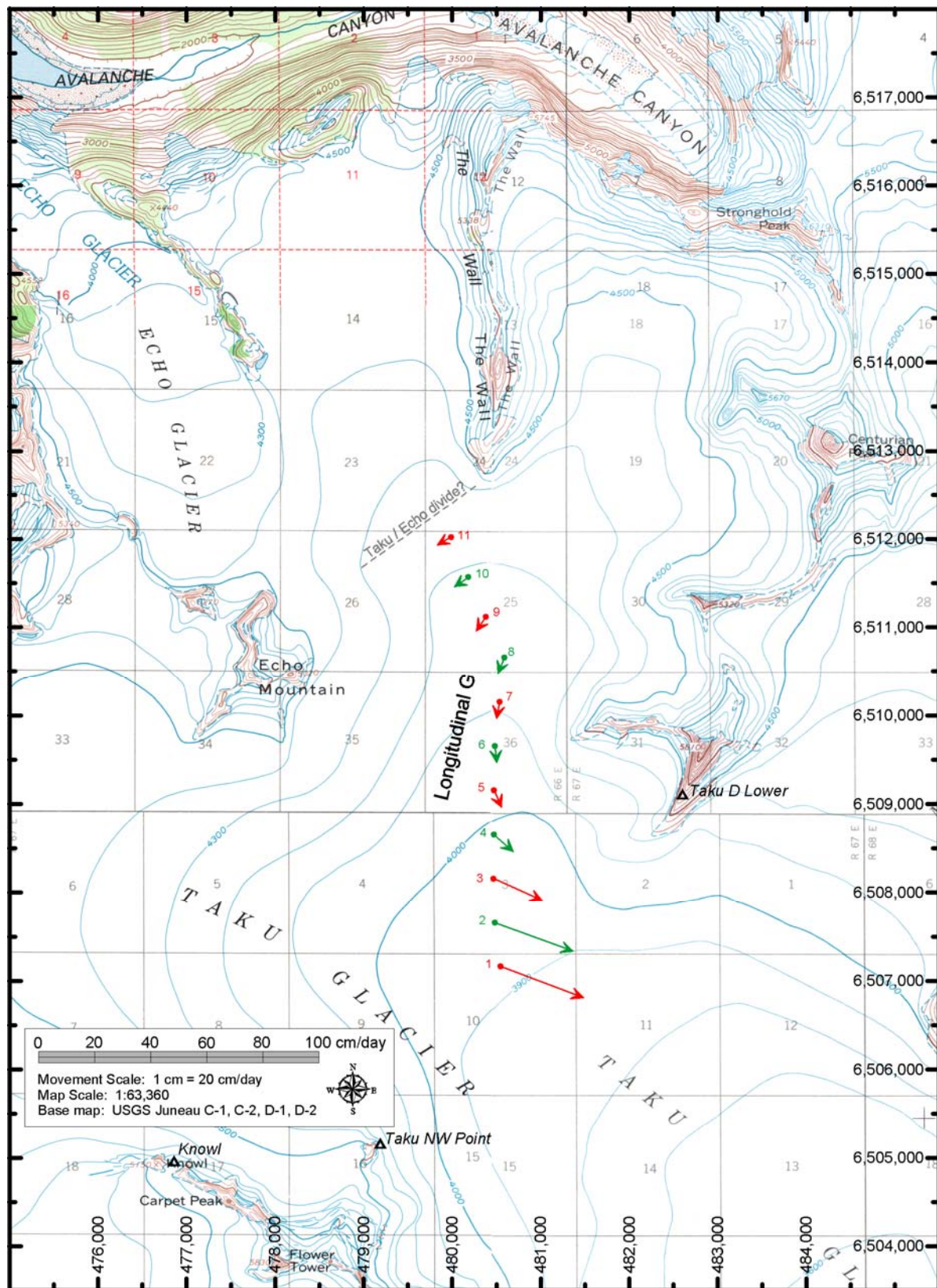


Figure 17: Movement vectors along Longitudinal Profile G for those points first surveyed in 2001 (Flags 1-11).

3.2.2 LONG-TERM HEIGHT CHANGE

The longitudinal profiles contribute to a greater understanding of the velocity fields and mass balance of the Juneau Icefield. This network of profiles, across the entire extent of the Icefield, enables a close examination of the relationship between surface elevation and year-to-year height change. By determining the elevation at which the least and greatest height change occurs, it is possible to make more precise predictions of glacier advance, retreat, or stability.

Weather conditions and field logistics from year-to-year conspire to produce time intervals between annual surveys of slightly less or slightly more than one year. For example, Points 63-75 of Longitudinal A were surveyed on August 3, 1999 and August 1, 2000, giving a time interval of 363 days. This makes it necessary to adjust the data to a 365 day time period by adjusting the surveyed heights either up or down, based on the average daily summer ablation rate times the number of days that must be either subtracted or added to the dates of the Epoch 0 or Epoch 1 surveys that will result in a time period of exactly 365 days. This adjustment was done for all points compared here. Thus the height change data reported in this section reflects the height change over a full one year time period. These data are reported in terms of the change in surface elevation above the WGS84 ellipsoid rather than in terms of water equivalent.

This year, the surface elevations of 109 points along Longitudinal A, 34 points along Longitudinal B, 16 points along Longitudinal C, 16 points along Longitudinal D, and 18 points along Longitudinal F were determined and compared with the elevations from the 2000 surveys. For all but a few points, there was an increase in surface elevation of the points, indicating a positive mass balance for the 2000-2001 time period. This correlates well with the height change data found at the transverse profiles (see Section 3.1.3). The only exception to the system-wide increase in surface height from July, 2000 to July, 2001 was the area between Flags 129-141 of Longitudinal A on the Llewellyn Glacier. The surface height at these flags decreased an average of 0.21 meter.

3.2.2.1 TAKU / MATTHES / LLEWELLYN GLACIERS

The Taku/Matthes/Llewellyn system provides a unique opportunity to examine mass balance trends along a 100-kilometer north/south transect from the maritime conditions of Taku Inlet to the interior continental climate of the Atlin Lake area. This year, 119 points along Longitudinal A were surveyed. Of these, 109 points were also surveyed in 2000 (Flags 38-146). The adjusted 2001 elevations of Flags 38-146 range from 802.48 meters at Flag 38 (located at Profile 2 at the north end of Goat Ridge) to 1874.56 meters at Flag 119 (located at the Matthes/Llewellyn divide), to 1618.95 meters at Flag 146 on the Llewellyn Glacier. This is an elevation range of 1072.08 meters over a longitudinal distance of 53.64 kilometers.

The survey data show a strong relationship between elevation and surface height change for the Taku and Matthes Glaciers (see Table 13 and Figure 19). The greatest increase in the surface elevation was observed at the lowest elevations along Longitudinal A on the Taku Glacier. This was clearly evident in the snowcover that remained in mid-July in the vicinity of Goat Ridge. The accumulation was so great in fact, that we were able to drive snowmachines some 5 kilometers further downglacier than has ever been done in the past 56-year history of the Juneau Icefield Research Program. This is what allowed us to establish and survey Flags

28-37 of Longitudinal A. Nearing the divide between the Matthes and Llewellyn Glaciers, the magnitude of surface height change decreased, to +0.256 meter at the divide (Flag 119). All points surveyed on the Taku and Matthes Glaciers experienced an increase in surface height.

The surface height change of the Llewellyn Glacier was a bit more varied. From the Matthes/Llewellyn divide at Flag 119 downglacier to Flag 128, the height change was positive. From Flags 129 to 141, the height change was negative, and from Flags 142 to 146 the change was positive. Figure 18 clearly shows the trend in surface height change versus surface elevation. From 2000 to 2001, the entire Taku Glacier system experienced positive height change, while the surface height of the Llewellyn Glacier increased near the Matthes/Llewellyn divide and decreased in the vicinity of Profile 11.

FLAGS	EPOCH 0 DATE	EPOCH 1 DATE	ELEVATION RANGE (M)	MEAN HEIGHT CHANGE (M)
38 to 62	7/24/2000	7/24/2001	802 to 1117	+1.41
63 to 78	7/23/2000	7/23/2001	1127 to 1314	+1.02
79 to 100	8/1/2000	8/1/2001	1323 to 1625	+0.69
101 to 119	8/2/2000	8/2/2001	1647 to 1875	+0.44
120 to 127	8/2/2000	8/2/2001	1873 to 1834	+0.12
128 to 134	8/3/2000	8/3/2001	1826 to 1766	-0.08
135 to 146	8/4/2000	8/4/2001	1756 to 1619	-0.14

Table 13: Adjusted survey dates, elevation ranges, and mean long-term height change for Flags 24-146 of Longitudinal A. Future survey dates for the points listed should be adjusted to match those shown here. Flags 38-119 are on the Taku/Matthes system, and Flags 120-146 are on the Llewellyn Glacier.

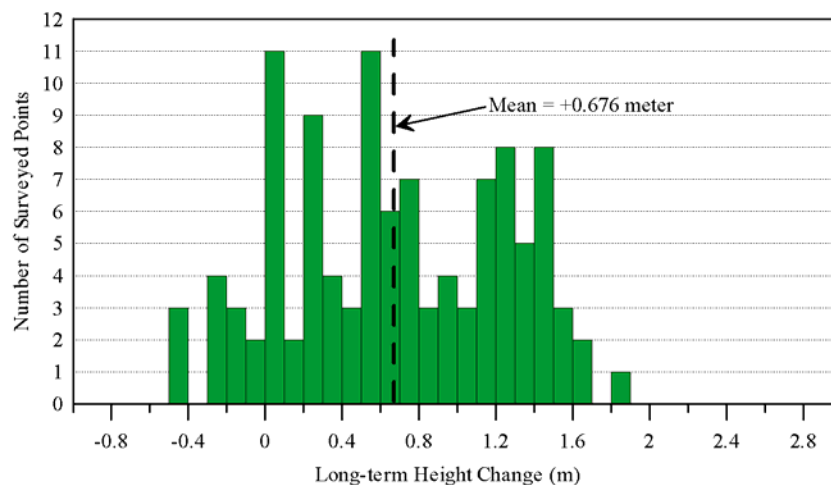


Figure 18: Histogram of long-term height change for Longitudinal A from 2000 to 2001. The mean surface elevation increase was 0.676 meter.

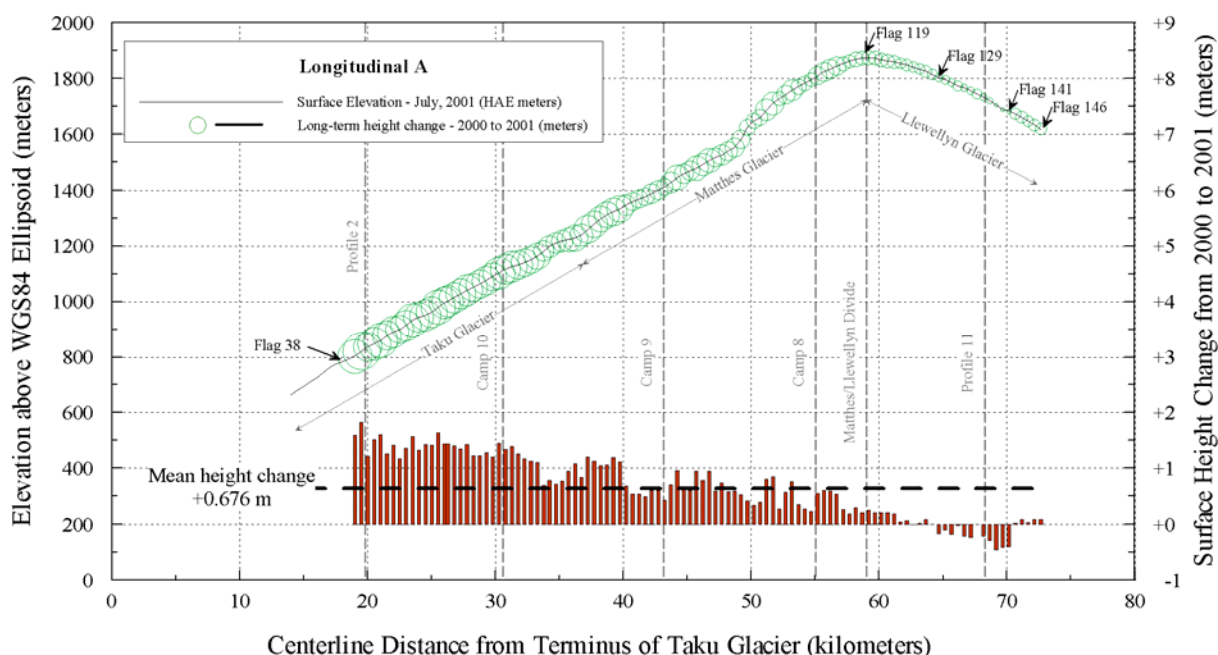


Figure 19: Long-term surface height change as a function of elevation and distance from the terminus of the Taku Glacier along Longitudinal A from 2000 to 2001. The magnitude of height change is indicated by the size of the circles and the length of the vertical bars. Height change was measured at 500 meter intervals along 53.6 kilometers of the Taku, Matthes, and Llewellyn Glaciers from Flags 38 to 146. The surface elevation increased between Flags 38-128 and Flags 142-146. It decreased at Flags 129-141. The mean surface elevation increase for the area between Flags 38 and 146 was 0.676 m.

3.2.2.2 DEMOREST GLACIER

All 34 points along Longitudinal B, first established and surveyed in 1999 and 2000, were resurveyed in 2001. These points ranged in elevation from 963.45 meters at Point 1 to 1353.78 meters at Point 34 in 2001.

Unlike Longitudinal A on the Taku/Matthes/Llewellyn glaciers, Longitudinal B on the Demorest Glacier does not appear to exhibit a strong relationship between elevation and height change (see Figure 20). Flags 1-19 had a mean surface height increase of 1.33 meters, while the surface height at Flags 20-33 increased only 0.60 meter. The height change at each of the flags within each bin (Flags 1-19 and Flags 20-33) was relatively consistent. The wide discrepancy of the mean height change between the bins is most likely due to the fact that the comparison date for Flags 1-19 was July 26, while it was August 7 for Flags 20-33. The height change results for Flag 34 were unreliable and are not considered in this analysis.

Overall, the Demorest Glacier at Longitudinal B had a mean surface elevation in 2001 that was 1.02 meters higher than it was in 2000.

FLAGS	EPOCH 0 DATE	EPOCH 1 DATE	ELEVATION RANGE (M)	MEAN HEIGHT CHANGE (M)
1 to 19	7/26/2000	7/26/2001	963 to 1171	+1.33
20 to 33	8/7/2000	8/7/2001	1181 to 1346	+0.60

Table 14: Adjusted survey dates, elevation ranges, and mean long-term height change for Flags 1-33 of Longitudinal B. Future survey dates for the points listed should be adjusted to match those shown here. Flag 34 was an outlier and is not included here.

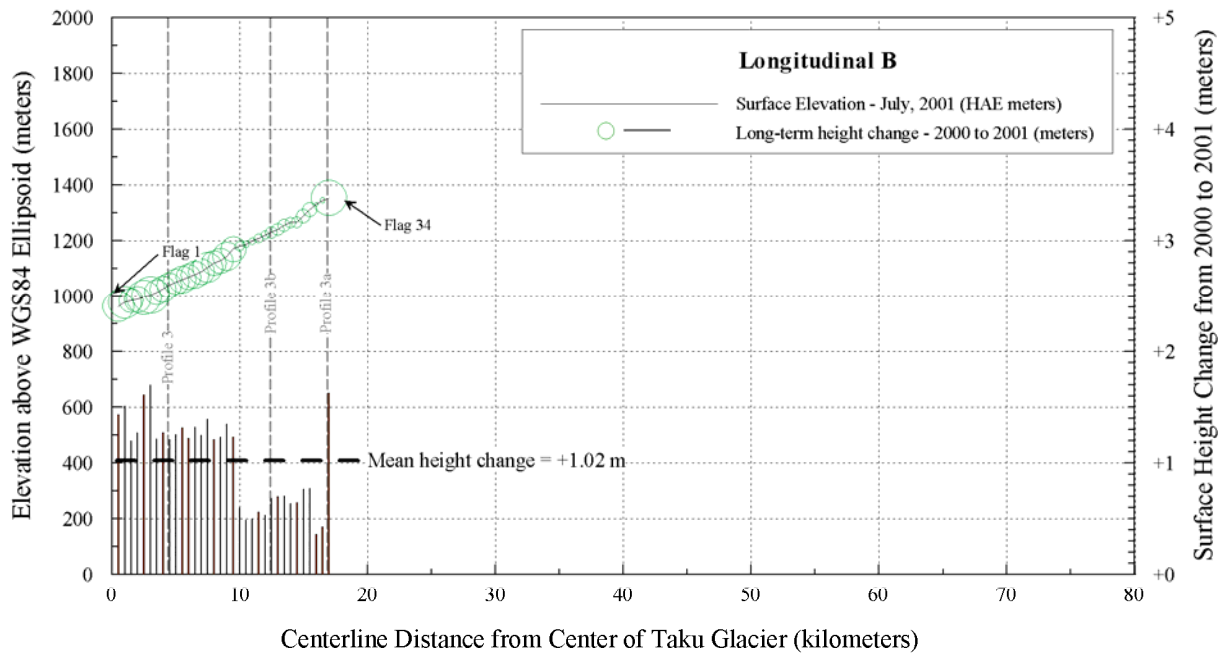


Figure 20: Long-term surface height change as a function of elevation and distance from the centerline of the Taku Glacier along Longitudinal B from 2000 to 2001. The magnitude of height change is indicated by the size of the circles and the length of the vertical bars. Height change was measured at 500 meter intervals along 17 kilometers of the Demorest Glacier between Flags 1 and 34. Height change for Flag 34 is an outlier and should be disregarded. It is not included in the mean height change.

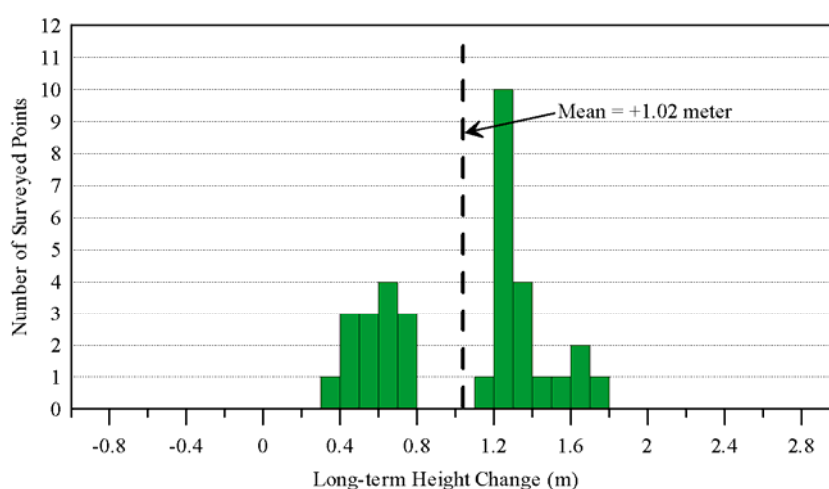


Figure 21: Histogram of long-term height change for Longitudinal B from 2000 to 2001. The mean surface elevation increase was 1.02 meter.

3.2.2.3 SOUTHWEST BRANCH OF THE TAKU GLACIER

Longitudinal C was first established on the Southwest Branch of the Taku Glacier in 1999, when Flags 1-14 were set and surveyed twice. In 2000, two additional flags were set, however they were surveyed only once, preventing the calculation of surface movement for these two flags. The profile was further extended in 2001 to the divide between the Southwest Branch and the Norris Glacier in Death Valley. Benchmark “Lupine” at Sunday Point served as the site for the GPS base station. Unfortunately, the 12 flags added this year were surveyed only one time, so velocities cannot be calculated.

As with Longitudinals A and B, this profile also experienced an increase in the surface elevation from 2000 to 2001. As with Longitudinal A, there seems to be somewhat of an inverse correlation between height change and surface elevation. The greatest height change occurred along the lower elevation portions of the profile, while the least magnitude of height change occurred at the higher elevation area of the profile (see Figure 22).

FLAGS	EPOCH 0 DATE	EPOCH 1 DATE	ELEVATION RANGE (M)	MEAN HEIGHT CHANGE (M)
1 to 16	7/26/2000	7/26/2001	1018 to 1169	+0.99

Table 15: Adjusted survey dates, elevation ranges, and mean long-term height change for Flags 1-16 of Longitudinal C. Future survey dates for the points listed should be adjusted to match those shown here.

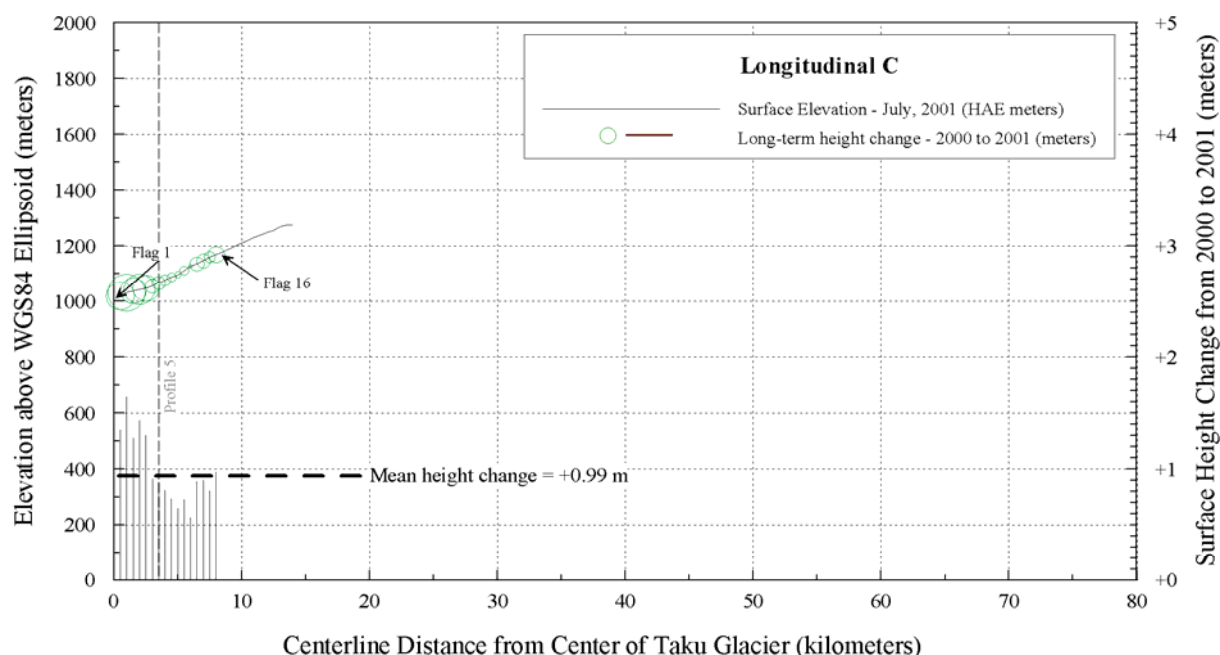


Figure 22: Long-term surface height change as a function of elevation and distance from the centerline of the Taku Glacier along Longitudinal C from 2000 to 2001. The magnitude of height change is indicated by the size of the circles and the length of the vertical bars. Height change was measured at 500 meter intervals along 8 kilometers of the Southwest Branch between Flags 1 and 16.

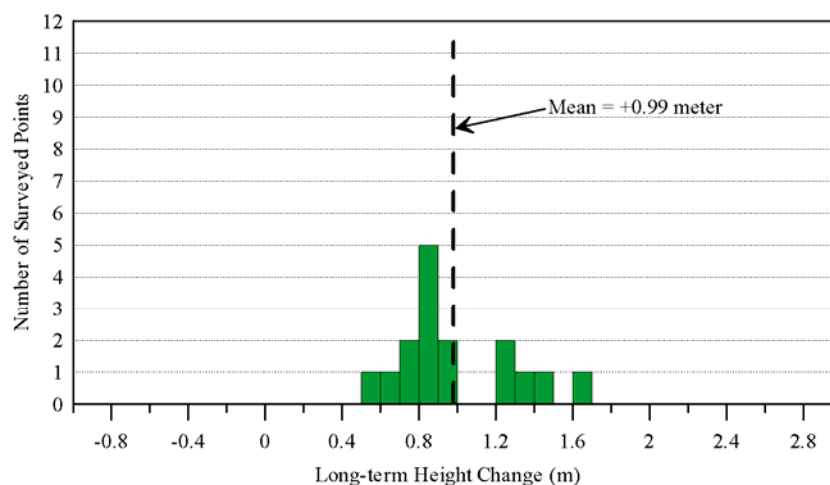


Figure 23: Histogram of long-term height change for Longitudinal C from 2000 to 2001. The mean surface elevation increase was 0.99 meter.

3.2.2.4 NORTHWEST AND WEST BRANCHES OF THE TAKU GLACIER

Longitudinal D begins at the centerline of the Taku Glacier directly east of the Taku NW Point benchmark. It follows the centerline of the Northwest Branch, curving to the south

between Knowl Point and Tricouni Peak, and terminating at the divide between the Taku and Mendenhall Glaciers in the vicinity of Rhino Peak and Princess Peak. The profile was first established in 2000, when Flags 1-16 were surveyed. The profile was extended in 2001 to the Taku/Mendenhall divide with the establishment of Flags 17 to 48. Flags 1-16 were surveyed in both 2000 and 2001, allowing the comparison of annual surface elevation change. Benchmark “Knowl” on Knowl Point was set and surveyed in order to support the extension of the profile.

It is not possible to determine a correlation between surface height change and elevation for this profile, as the elevation range between Flag 1 and Flag 16 is only 139 meters. As with the other longitudinal profiles, the surface heights for all flags of Longitudinal D increased from 2000 to 2001. The mean surface height increase for Flags 1-16 was 0.63 meter.

FLAGS	EPOCH 0 DATE	EPOCH 1 DATE	ELEVATION RANGE (M)	MEAN HEIGHT CHANGE (M)
1 to 16	7/28/2000	7/28/2001	1209 to 1348	+0.63

Table 16: Adjusted survey dates, elevation ranges, and mean long-term height change for Flags 1-16 of Longitudinal D. Future survey dates for the points listed should be adjusted to match those shown here.

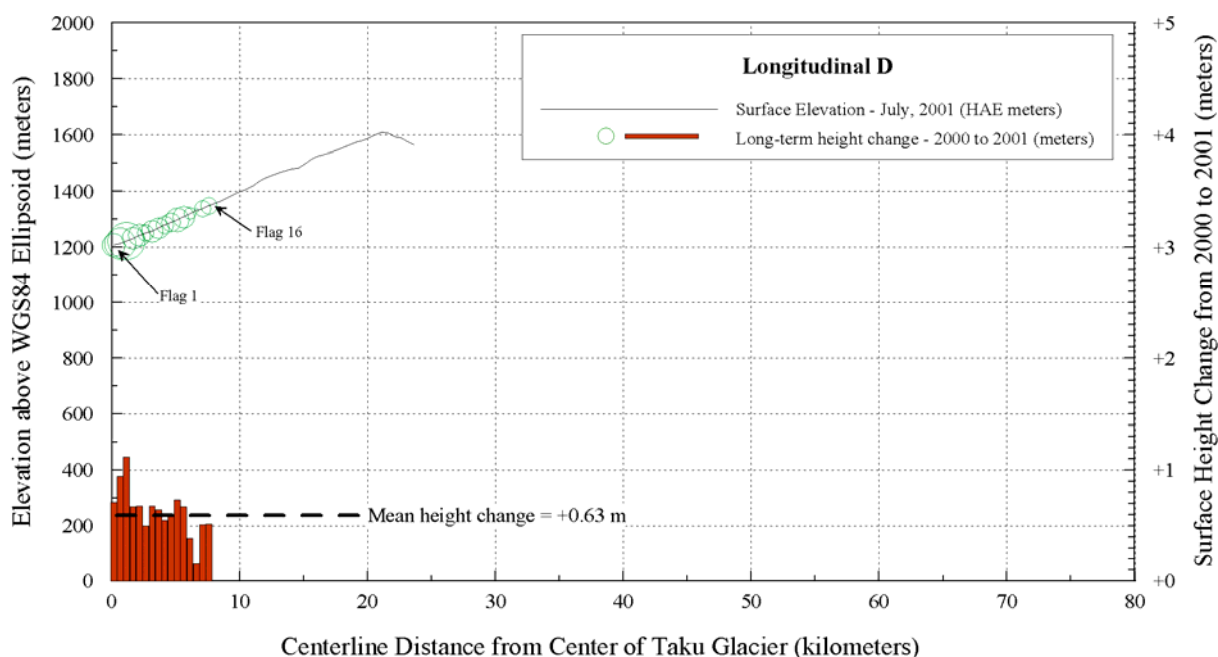


Figure 24: Long-term surface height change as a function of elevation and distance from the centerline of the Taku Glacier along Longitudinal D from 2000 to 2001. The magnitude of height change is indicated by the size of the circles and the length of the vertical bars. Height change was measured at 500 meter intervals along 8 kilometers of the Northwest Branch between Flags 1 and 16.

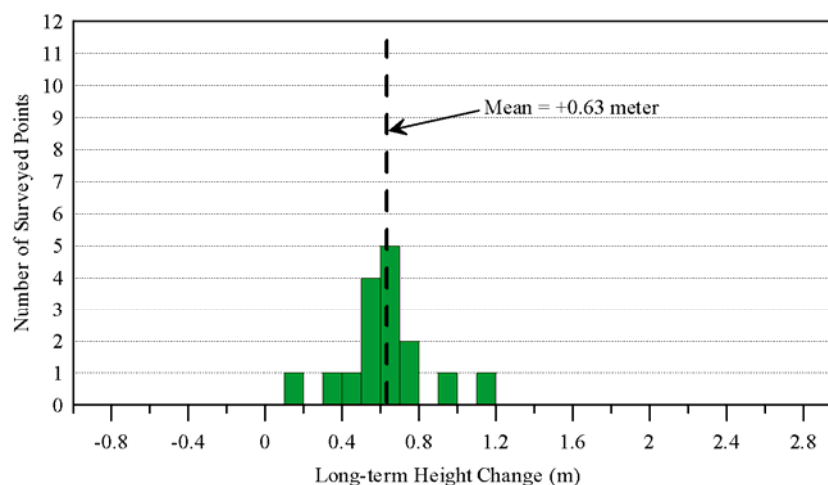


Figure 25: Histogram of long-term height change for Longitudinal D from 2000 to 2001. The mean surface elevation increase was 0.63 meter.

Longitudinal F branches off from Longitudinal D at a point due north of Knowl Point, and trends west and southwest 13 kilometers along the centerline of the West Branch to the divide between the Taku, Herbert, and Eagle Glaciers. Flags 1-18 of this profile were first established in 2000. The surveys in 2001 extended the profile from Flags 19 to 26. Flags 1-18 are used for the annual height change comparison, as these flags were surveyed in both 2000 and 2001. Benchmark “Knowl” at Knowl Point served as the site for the GPS base station.

As with Longitudinal D, the elevation range from Flag 1 to Flag 16 of Longitudinal F is too small to definitively ascertain a correlation between the surface height change and elevation. All flags experienced an increase in surface elevation from 2000 to 2001. The mean height increase for Flags 1-18 was 0.53 meter.

FLAGS	EPOCH 0 DATE	EPOCH 1 DATE	ELEVATION RANGE (M)	MEAN HEIGHT CHANGE (M)
1 to 18	7/30/2000	7/30/2001	1357 to 1522	+0.53

Table 17: Adjusted survey dates, elevation ranges, and mean long-term height change for Flags 1-18 of Longitudinal F. Future survey dates for the points listed should be adjusted to match those shown here.

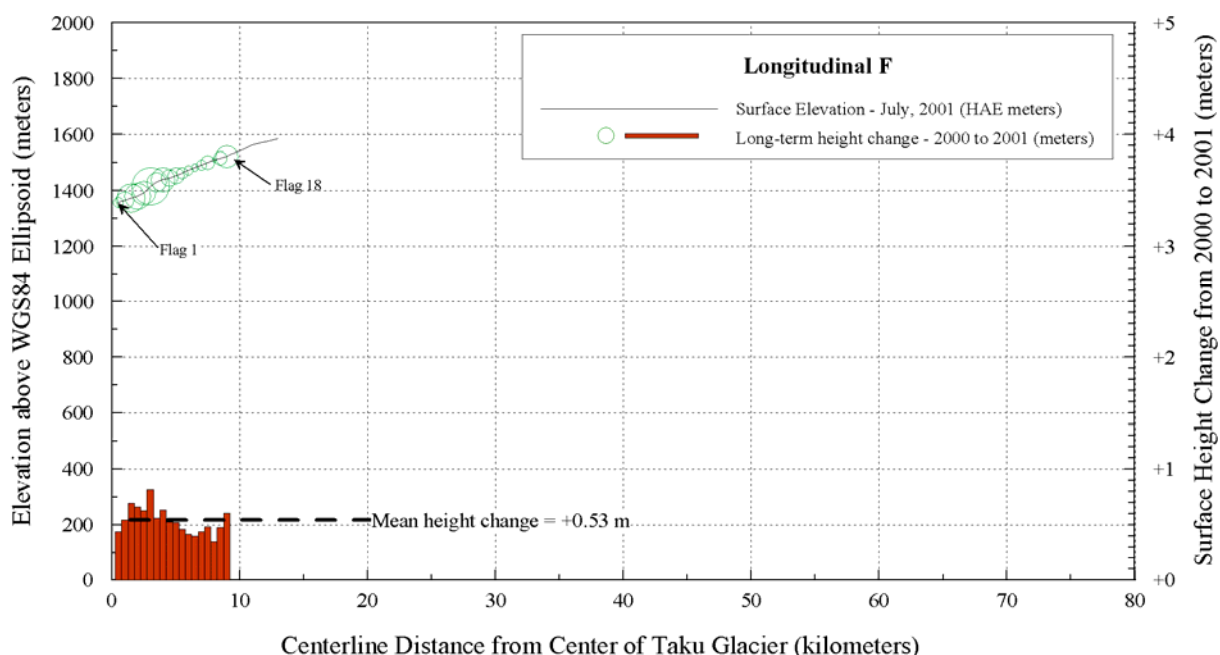


Figure 26: Long-term surface height change as a function of elevation and distance from Flag 16 of Longitudinal D along Longitudinal F from 2000 to 2001. The magnitude of height change is indicated by the size of the circles and the length of the vertical bars. Height change was measured at 500 meter intervals along 9 kilometers of the West Branch between Flags 1 and 18.

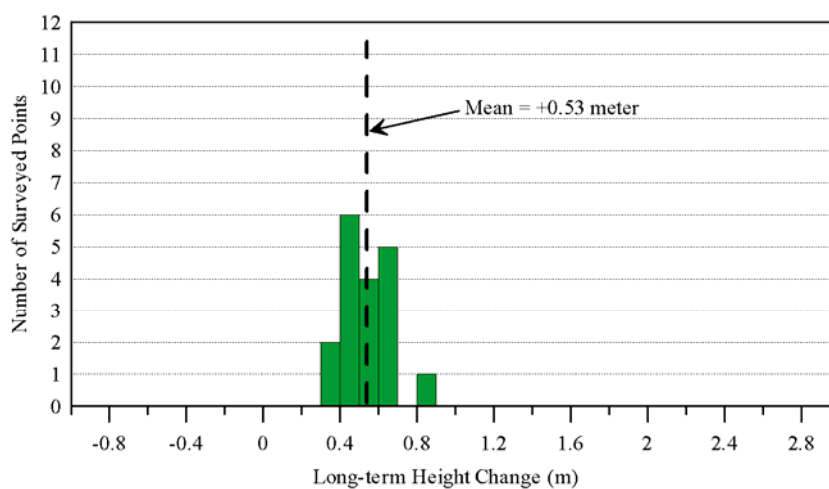


Figure 27: Histogram of long-term height change for Longitudinal F from 2000 to 2001. The mean surface elevation increase was 0.53 meter.

3.2.3 LONGITUDINAL SURFACE FLOW TIMES

With the establishment of the longitudinal profiles, it is now possible to quantitatively determine system-wide longitudinal flow times with a much higher degree of accuracy than has been possible in the past. Previously, estimates of flow time were based on the observed surface velocity at widely spaced (8-12 km apart) transverse profiles, with no data for the intervening 8-12 km gaps. The current longitudinal profiles provide much higher resolution data due to the nominal flag spacing of 500 meters.

Calculation of the longitudinal surface flow is based on surveyed surface velocities at an interval of 500 meters. For each flag pair (e.g., Flag 50 to Flag 49, Flag 48 to Flag 47, etc.) the velocity at each flag is used to determine the mean velocity between the flag pairs. The surface slope between the flag pairs is used in the calculation of the time it takes the upglacier flag to move to the location of the downglacier flag of the flag pairs. The flow times of all the flag pairs are then summed to derive the cumulative flow time in units of days. This is then converted to cumulative flow time in years, taking into account leap years.

This calculation of surface flow times is only theoretical, as it does not account for the vertical component of glacier movement. It assumes that a particle of ice at the surface of the glacier remains on the surface as it moves downglacier. In reality, there is a downward velocity component in the accumulation zone and an upward velocity component in the ablation area. These vertical velocity components differ from the surface velocity, and have not yet been measured on the Juneau Icefield. The calculation of surface flow times reported here is intended to be used only for the comparison of longitudinal flow times of the various glaciers with respect to each other.

Table 18 presents summary data for the longitudinal profiles. Detailed data are shown in Appendix 5.

GLACIER	PROFILE	FROM	TO	SLOPE DISTANCE (KM)	SURFACE FLOW TIME (YEARS)	MEAN VELOCITY (M/YEAR)
Matthes / Taku	A	A117	A28	44.193	348.050	126.973
Demorest	B	B34	B5	14.472	151.572	95.479
Llewellyn	A	A118	A147	14.458	309.541	46.708
Northwest Branch	D	D43	D1	20.956	607.416	34.500
Southwest Branch	C	C14	C6	3.992	124.578	32.044
West Branch	F	F26	D16	12.991	446.218	29.114
Snow Towers Branch	E	E10	E1	4.495	319.811	14.055

Table 18: Longitudinal flow times for Profiles A through F. As would be expected, the main trunk of the Taku Glacier (which includes the Matthes Glacier) has the highest mean velocity. Tributaries to the main trunk have slower mean velocities. Refer to Figure 28 for a map showing the locations of the noted profiles.

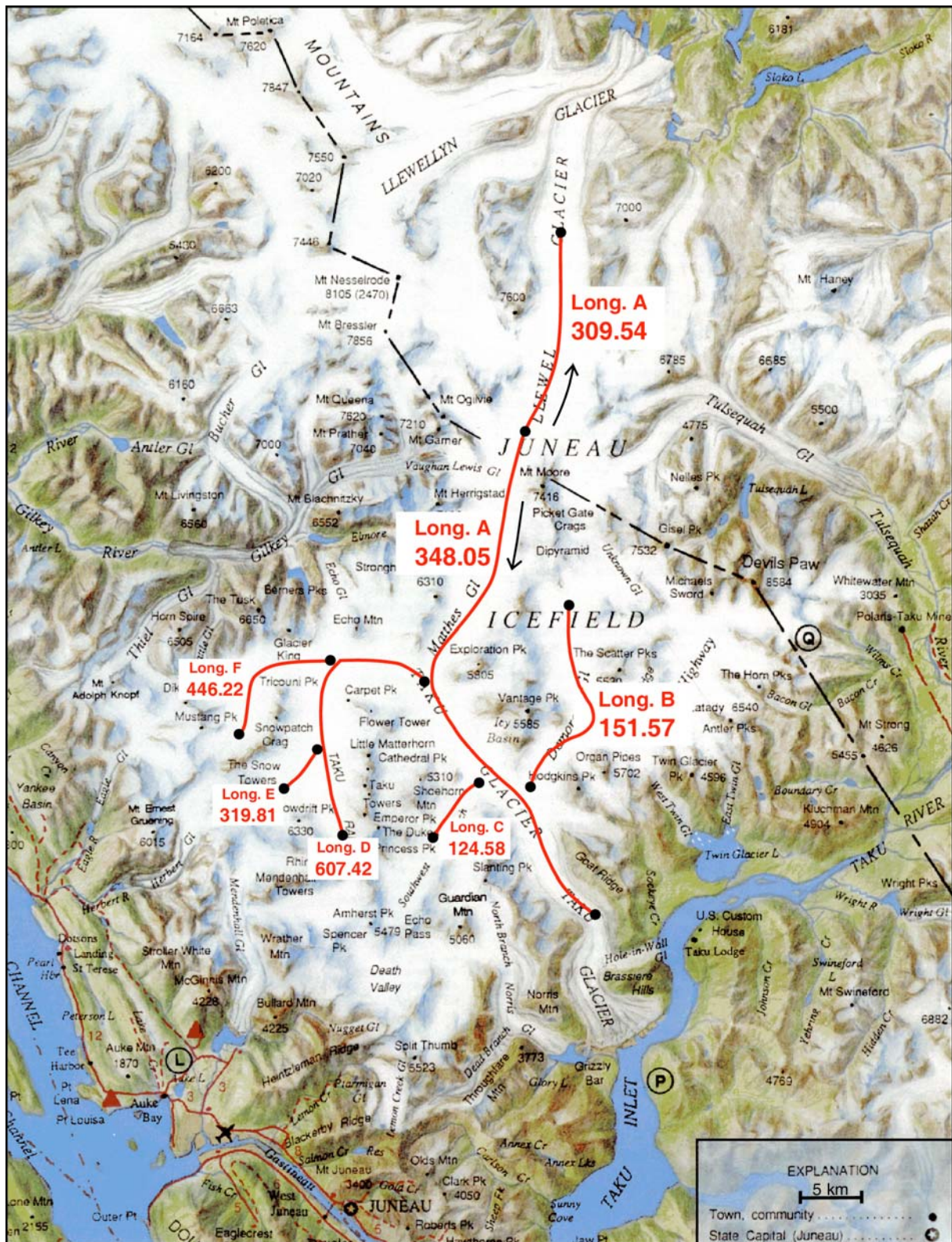


Figure 28: Plot of longitudinal surface flow times. Numbers refer to the time in years it takes for ice to flow from the upglacier black dots to the downglacier dots for each profile.

With the strongly positive mass balance in the summer of 2001, it was possible to extend Longitudinal A 5.5 kilometers further down the Taku Glacier with the addition of Flags 28 to 37. The original flag numbering scheme for this profile placed Flag 1 at an arbitrary point some 12 kilometers upglacier from the terminus as shown on the USGS 1:63,360 Juneau B-1 quadrangle dated 1948, with minor revisions in 1971. Thus, under the original scheme, extension of the profile downglacier would have resulted in flag numbers with negative numbers. Additionally, the old scheme was not referenced to a fixed point. To rectify these problems, the numbering scheme for Longitudinal A was modified in 2001, using Taku Point, on the south side of the Taku River, as the fixed starting point of the numbering system. With Flag 1 at Taku Point, flags proceed across the Taku River and up the Taku Glacier every 500 meters to the downglacier end of the existing profile. The net result of modifying the numbering system was to add 25 flags, forcing the reassignment of flag numbers for the entire Longitudinal A profile. Conversion of the pre-2001 numbering system to the new one is accomplished by adding 25 to the pre-2001 flag numbers.

The extension of Longitudinal A provides additional velocity data for the computation of the longitudinal surface flow time from the Matthes/Llewellyn divide to the Taku terminus. McGee (2000b) computed the flow time from Flag 117 to Flag 38 at 334.676 years. The addition of Flags 37 to 28 in 2001 increases the longitudinal distance of the profile 5.5 kilometers, adding 13.374 years to the flow time estimate. In other words, based on surface velocity data taken at 500 meter intervals along the centerline of the Matthes and Taku Glaciers, the flow time from Flag 117 at the Matthes/Llewellyn Divide to Flag 28, approximately 12 kilometers upglacier from the terminus (as shown on the USGS 1:63,360 Juneau B-1 quadrangle dated 1948), is 348.05 years, over a slope distance of 44.193 kilometers. This gives a mean flow rate of 126.973 meters per year.

As shown in Table 18, the Taku/Matthes system has the highest mean annual velocity of the glaciers thus far surveyed. The annual flow of the Demorest Glacier is 75 percent that of the Taku/Matthes at 95 meters per year. Other tributaries of the Taku Glacier show corresponding slower rates of annual movement. This is to be expected, and no unusual results are seen in the data.

3.3 PROFILE 4

Profile 4, located on the main Taku Glacier some 30 kilometers upglacier from the terminus, has historically been the focus of much research. Miller (1951) conducted glacier borehole research to investigate ice fabric structures and firn stratigraphy, and to determine englacial temperatures and the vertical flow profile. Long-term mass balance studies (Pelto and Miller, 1990) have documented the dynamic response of the Taku Glacier to decadal climate cycles, and seismic reflection studies by Poulter (1950), Sprenke, et al (1993), and Echelmeyer, et al (1995) have investigated the ice thickness of the Taku Glacier at this location. Surface velocity, strain-rate, and volume change studies by Kersting (1986), Daellenbach and Welsch (1993), Lang (1993, 1995, 1997, 1999), and McGee (1988, 1994, 1996, 1997) have provided detailed information relating to the flow regime of the Taku Glacier at this profile.

3.3.1 HEIGHT CHANGE AND LOCAL SURFACE MASS BALANCE

GPS, coupled with computer-aided surface modeling, provides a unique opportunity to monitor the volume change of a glacier through time. Recent efforts by Hock and Jensen (1999) and Hagen, et al (1999) have demonstrated the effectiveness and utility of this technique. With the advent of the use of GPS on the Juneau Icefield in 1992, the Juneau Icefield Research Program initiated a long-term monitoring program in 1993 to determine the temporal and spatial distribution changes of mass at Profile 4. This is accomplished by the annual GPS survey of two parallel, transverse profiles comprised of 31 stakes stretching across the Taku Glacier from Camp 10 to Shoehorn Peak (see Figure 3). The annual placement of the stakes is accomplished with the aid of real-time differential GPS and is in accordance with the stakeout coordinates published by McGee (2000a).

The mean annual surface height change at Profile 4 is calculated by taking the mean of three calculation methods — the interpolated grids method, the prism method, and the direct method. The interpolated grid method relies on the use of three-dimensional surface modeling software to create surface models of the profile based on the surveyed surface heights (adjusted to conform to an annual survey date of July 25). The volume of each surface model above a baseline elevation, in conjunction with the surface area, allows for the calculation of mean height change across the extent of the profile. The prism method is non-interpolative, instead obtaining the mean volume and height change of the profile by simply determining the volume of each irregular triangular prism within the profile. The upper base of each triangular prism is bounded by three flags of the profile which define a surface triangle (e.g., Flags 1, 2, and 3; Flags 2, 3, and 4; etc.). The lower base is set at an elevation of 1100 meters with the lateral edges defined by vertically projecting the coordinates of the three flags of the upper base to intersect with the lower base. The configuration of Profile 4 defines 29 such triangular prisms. Summation of the volumes and surface areas of all the prisms within the profile gives the mean volume and height change. The third method, the direct method, calculates the height change at each of the 31 flags by simply comparing the July 25 adjusted heights from one year to the next. The height change is calculated directly from the adjusted surveyed heights, rather than deriving the height change from the change in volume, as the interpolated heights and prism methods do. The final volume and height change is determined by taking the mean of all three methods. Refer to McGee (1993, 1997, 2000c) for complete details on the survey and data analysis procedures used for this project.

With a now nine-year record of height change at Profile 4, a pattern revealing the record-breaking climate of the mid-to-late 1990s is seen. During the first year of the project, the mean height of the Taku Glacier at Profile 4 increased a modest 9 cm. The surface elevation then decreased each year from 1994 to 1998. The 1999, 2000, and 2001 surveys reveal a return to positive mass balance as evidenced by increases in the mean surface height. Table 19 presents the data for each of the three calculation methods on an annual basis. The cumulative height change is shown in Table 20. Figure 29 presents the annual and cumulative height change data in a graphic format. The normalized, July 25 elevations of all 31 flags of Profile 4, from 1993 to 2001, are shown in Appendix 6.

TIME PERIOD	ANNUAL HEIGHT CHANGE BY CALCULATION METHOD			MEAN (M)
	INTERPOLATED GRIDS (M)	PRISM METHOD (M)	DIRECT METHOD (M)	
1993 baseline	—	—	—	0
1993 to 1994	+0.089	+0.088	+0.097	+0.091
1994 to 1995	-1.361	-1.343	-1.294	-1.333
1995 to 1996	-0.660	-0.654	-0.687	-0.667
1996 to 1997	-0.441	-0.438	-0.493	-0.457
1997 to 1998	-1.084	-1.068	-1.043	-1.065
1998 to 1999	+0.603	+0.594	+0.571	+0.589
1999 to 2000	+1.426	+1.411	+1.420	+1.419
2000 to 2001	+0.904	+0.892	+0.892	+0.896

Table 19: Annual height change at Profile 4 based on three methods for calculating height change. Annual mass balance was positive from 1993 to 1994, negative from 1994 to 1998, and again positive from 1998 to 2001.

TIME PERIOD	CUMULATIVE HEIGHT CHANGE BY CALCULATION METHOD			MEAN (M)
	INTERPOLATED GRIDS (M)	PRISM METHOD (M)	DIRECT METHOD (M)	
1993 baseline	—	—	—	—
1993 to 1994	+0.089	+0.088	+0.096	+0.091
1993 to 1995	-1.272	-1.256	-1.198	-1.242
1993 to 1996	-1.932	-1.910	-1.885	-1.909
1993 to 1997	-2.373	-2.348	-2.378	-2.366
1993 to 1998	-3.456	-3.416	-3.421	-3.431
1993 to 1999	-2.854	-2.823	-2.850	-2.842
1993 to 2000	-1.428	-1.412	-1.430	-1.423
1993 to 2001	-0.524	-0.520	-0.538	-0.527

Table 20: Cumulative height change at Profile 4 based on three methods for calculating height change. Despite positive mass balance from 1998 to 2001, the mean surface height at Profile 4 remains 0.527 meter lower than it was during the 1993 baseline year.

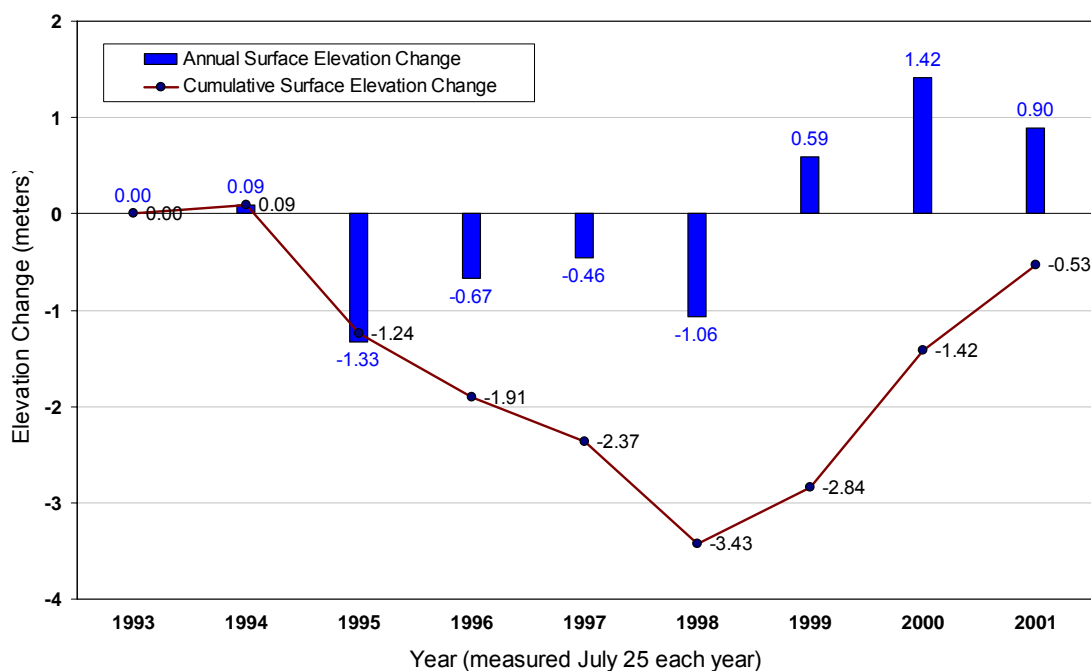


Figure 29: Mean year-to-year and cumulative surface height change of the Taku Glacier at Profile 4 from 1993 to 2001.

Annual three-dimensional modeling of the glacier surface at Profile 4 provides a means to determine not only the surface height change, and hence mass balance, but also to determine the spatial distribution of mass as it varies from year to year, and cumulatively. Figures 30-38 show the year-to-year spatial distribution changes at Profile 4, along with the cumulative effects from 1993 to 2001. In all figures, yellow, orange, and red represent a decrease in surface height and mass balance. Green, blue, and violet indicate an increase in surface height and mass balance. As seen in Figure 30, the mass increased for approximately 75% of the profile from 1993 to 1994. The mean surface height increase was 9.1 cm (5 cm water equivalent, based on a surface firn density of 0.55 g/cm^3). The decrease in surface height from 1993 to 1994 occurred primarily at the southwest end of Profile 4, with decreases also evident near the center and northeast end of the profile. 1994 marked the beginning of a four-year negative balance trend as seen in Figures 31-34. From 1994 to 1995, the mean surface height decrease was 1.332 meters (0.733 meter w.e.). The mean surface height decreased 0.666 meter (0.366 meter w.e.) from 1995 to 1996. The mean decrease was slightly less from 1996 to 1997 at 0.457 meter (0.251 meter w.e.), but then more than doubled between 1997 and 1998, with a mean surface height decrease of 1.066 meters (0.586 meter w.e.). The spatial distribution of the height and mass decrease from 1994 to 1998 was relatively uniform across the extent of the profile. After four consecutive years of negative mass balance, there was a mean surface height increase of 0.589 meter (0.324 meter w.e.) from 1998 to 1999. Figure 35 shows the spatial distribution pattern between 1998 and 1999, with the maximum increase occurring near the center of the profile. The positive mass balance trend continued from 1999 to 2000, with a mean surface height increase of 1.412 meters (0.777 meter w.e.). The spatial

distribution pattern was remarkably consistent from 1999 to 2000, as shown in Figure 36. The positive balance trend continued for the third consecutive year from 2000 to 2001, with the mean surface height increasing 0.896 meter (0.493 meter w.e.). Figure 38 presents the cumulative surface height change from 1993 to 2001. The mean decrease in surface height over this nine year time period was 0.527 meters (0.290 meter w.e.).

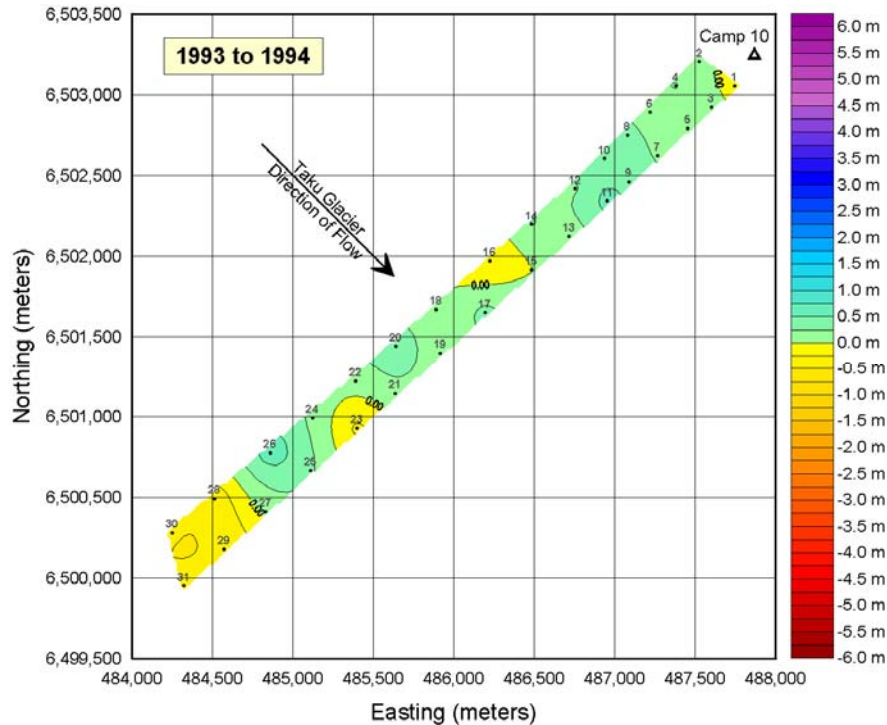


Figure 30: Surface height change at Profile 4 from July 25, 1993 to July 25, 1994.

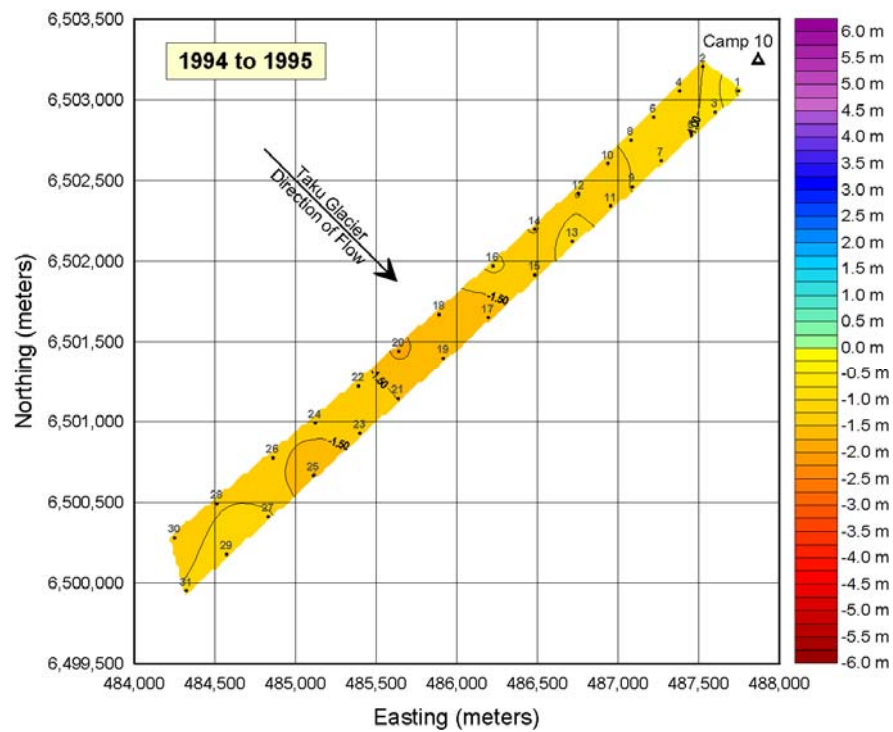


Figure 31: Surface height change at Profile 4 from July 25, 1994 to July 25, 1995.

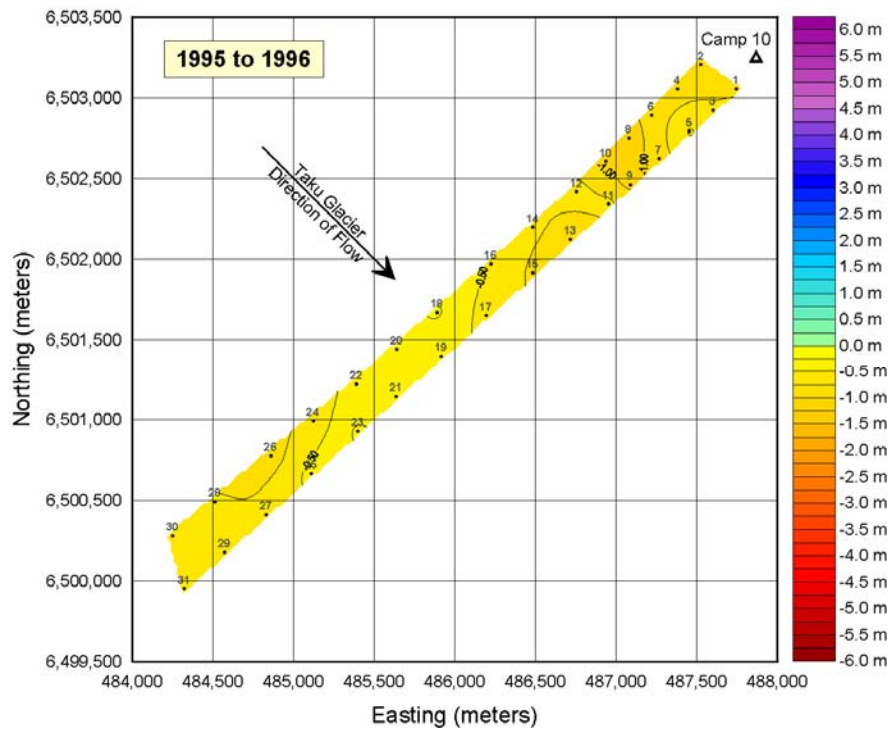


Figure 32: Surface height change at Profile 4 from July 25, 1995 to July 25, 1996.

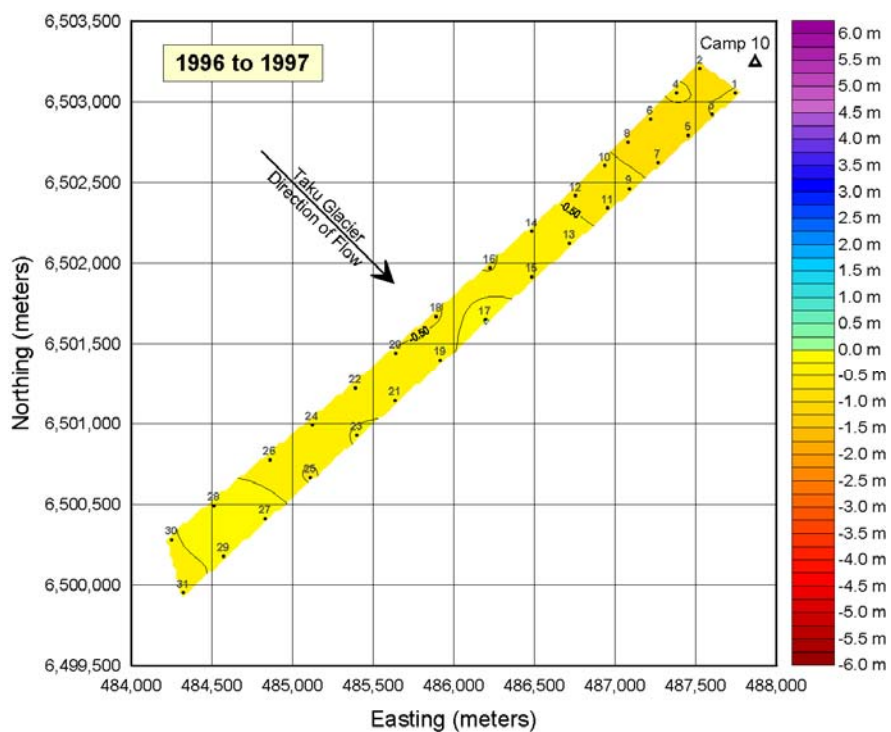


Figure 33: Surface height change at Profile 4 from July 25, 1996 to July 25, 1997.

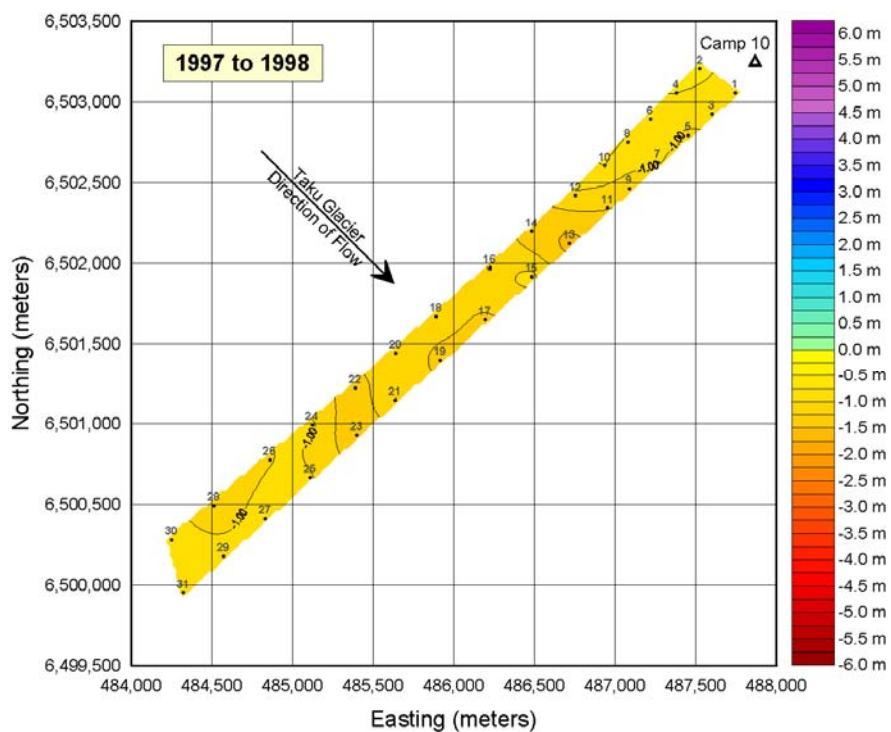


Figure 34: Surface height change at Profile 4 from July 25, 1997 to July 25, 1998.

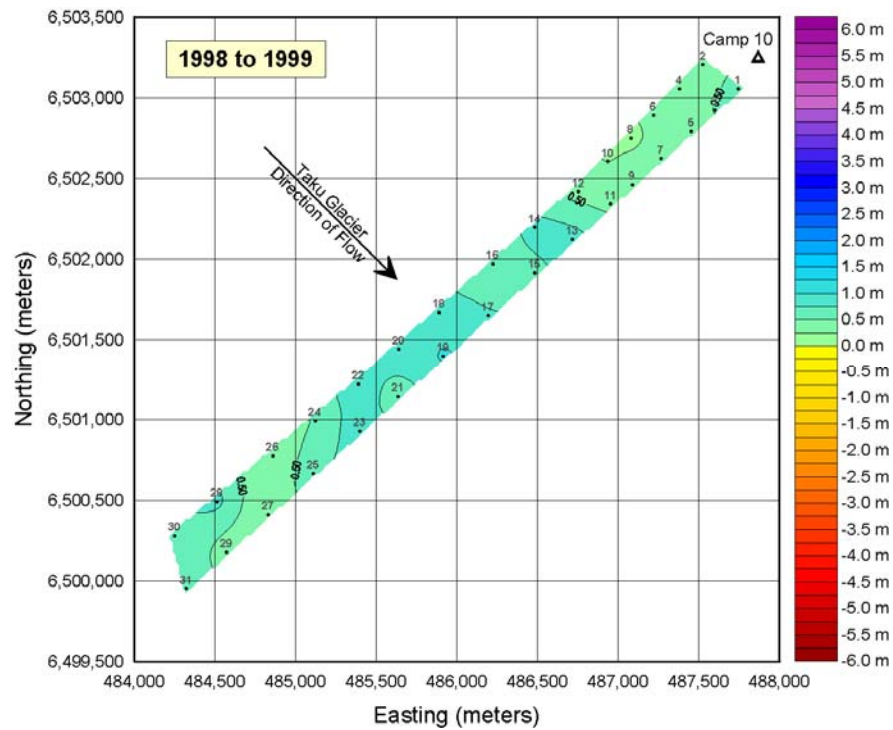


Figure 35: Surface height change at Profile 4 from July 25, 1998 to July 25, 1999.

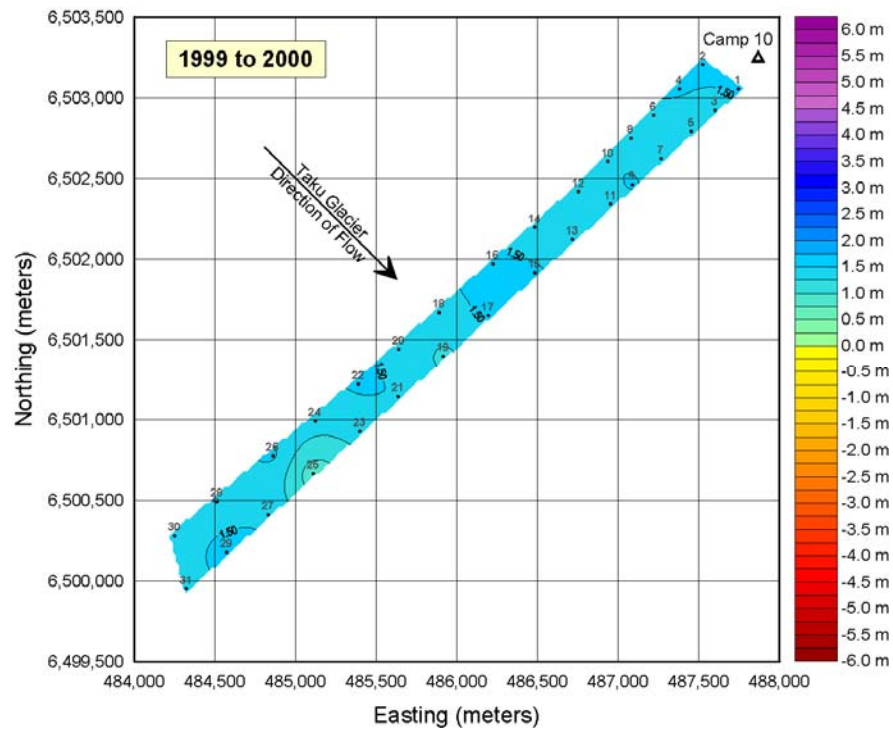


Figure 36: Surface height change at Profile 4 from July 25, 1999 to July 25, 2000.

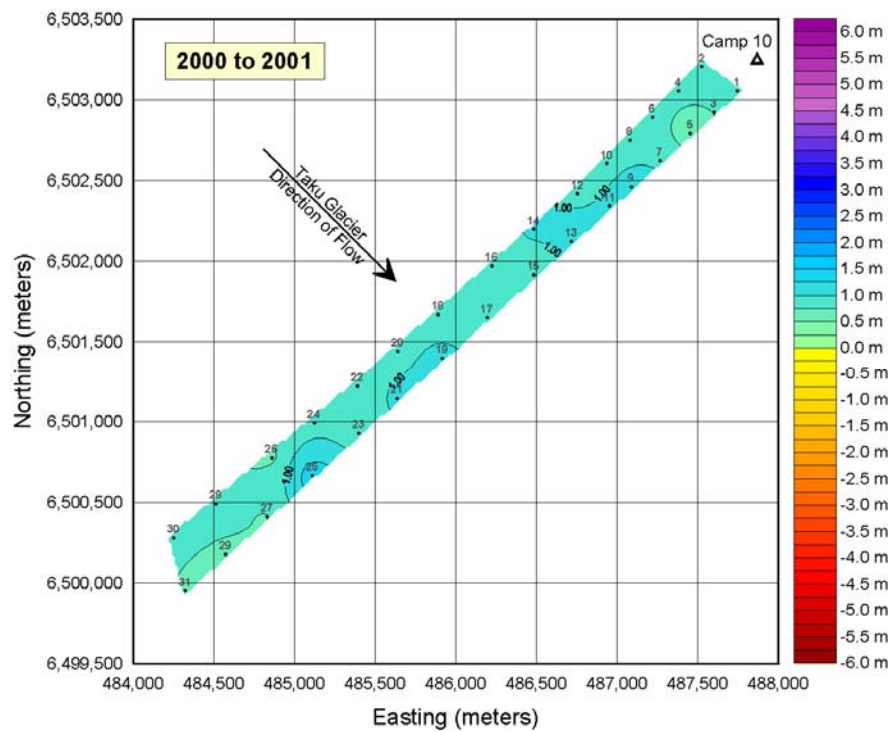


Figure 37: Surface height change at Profile 4 from July 25, 2000 to July 25, 2001.

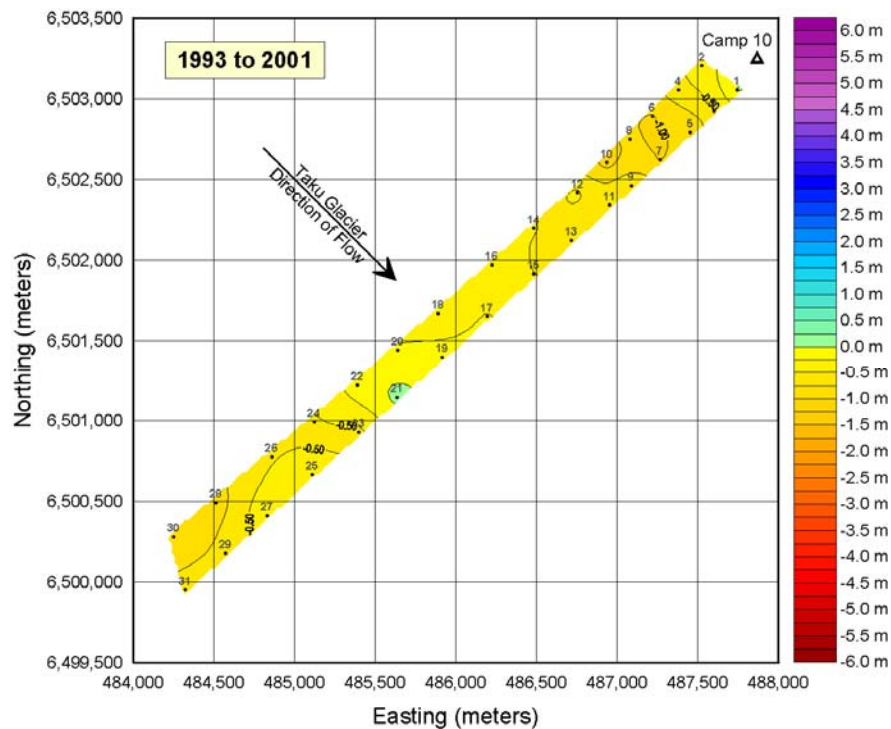


Figure 38: Surface height change at Profile 4 from July 25, 1993 to July 25, 2001.

3.3.2 STRAIN

In conjunction with the monitoring of surface height and mass balance change at Profile 4, strain rates have been analyzed annually. This is accomplished by determining the change in the geometry of the triangles formed by the dual line setup of Profile 4. Calculation of strain rates is based on the method described by Welsch (1987), which evaluates the changes in the elements (interior angles and the length of sides) of a triangle. The result, strain, is expressed in terms of a strain ellipse, with the maximum strain (e_1) representing extension and the minimum strain (e_2) representing compression. Vertical strain (e_3) is derived from the equation $e_1 + e_2 + e_3 = 0$. Additionally, the orientation of the strain ellipse is given by the value θ .

The strain regime at Profile 4 has been relatively consistent since 1993. Figure 39 presents the results of the 2001 strain analysis of the profile. Lang (1999) presents the strain results from 1993 to 1999. As seen in Figures 39 and 40, both extensional and compressional strains are greatest along the northeast and southwest margins of the profile. Strains in the center of the profile are relatively small. As expected, this is consistent with the flow and crevasse patterns of the Taku Glacier. As seen in Figures 3, 4, and 5, the rate of increase in the surface flow is greatest along the margins, with the rate of increase lessening to zero in the center of the glacier. This reflects the normal flow and strain regime, and resultant crevassing, of a glacier exhibiting a mode of flow somewhere between parabolic and rectilinear. The computed strain data are presented in Appendix 7.

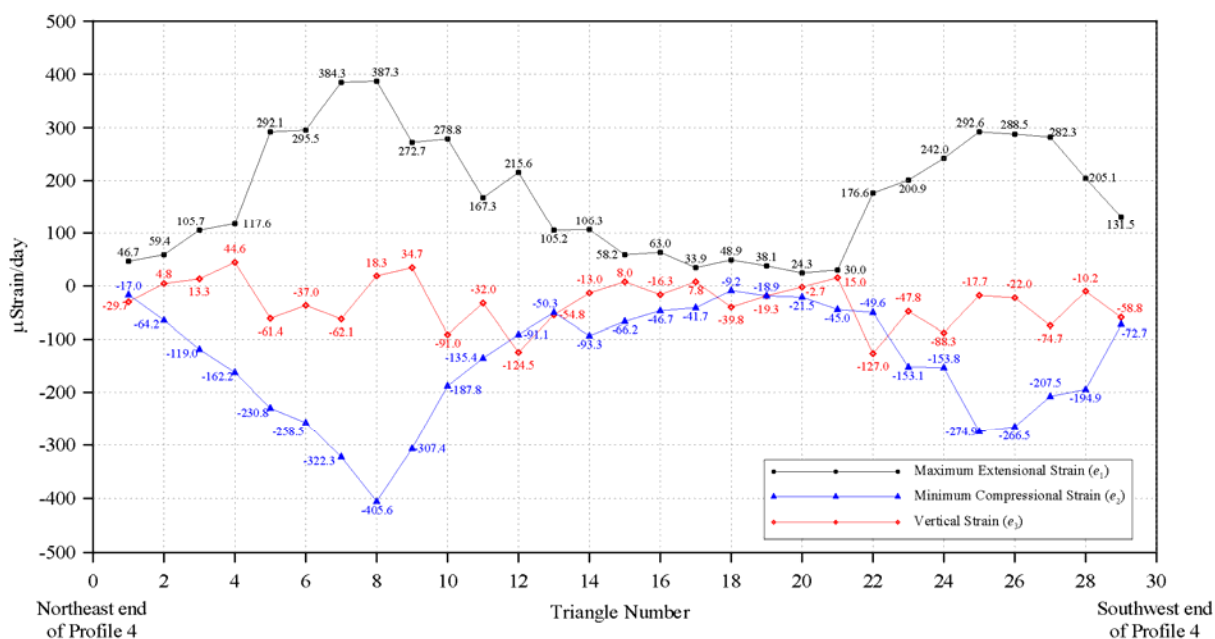


Figure 39: Observed surface strains at Profile 4 between July 19 and July 25, 2001. Maximum strain is extensional and minimum strain is compressional. A positive vertical strain indicates an increase in surface elevation, while a negative vertical strain results in a lowering of the surface.

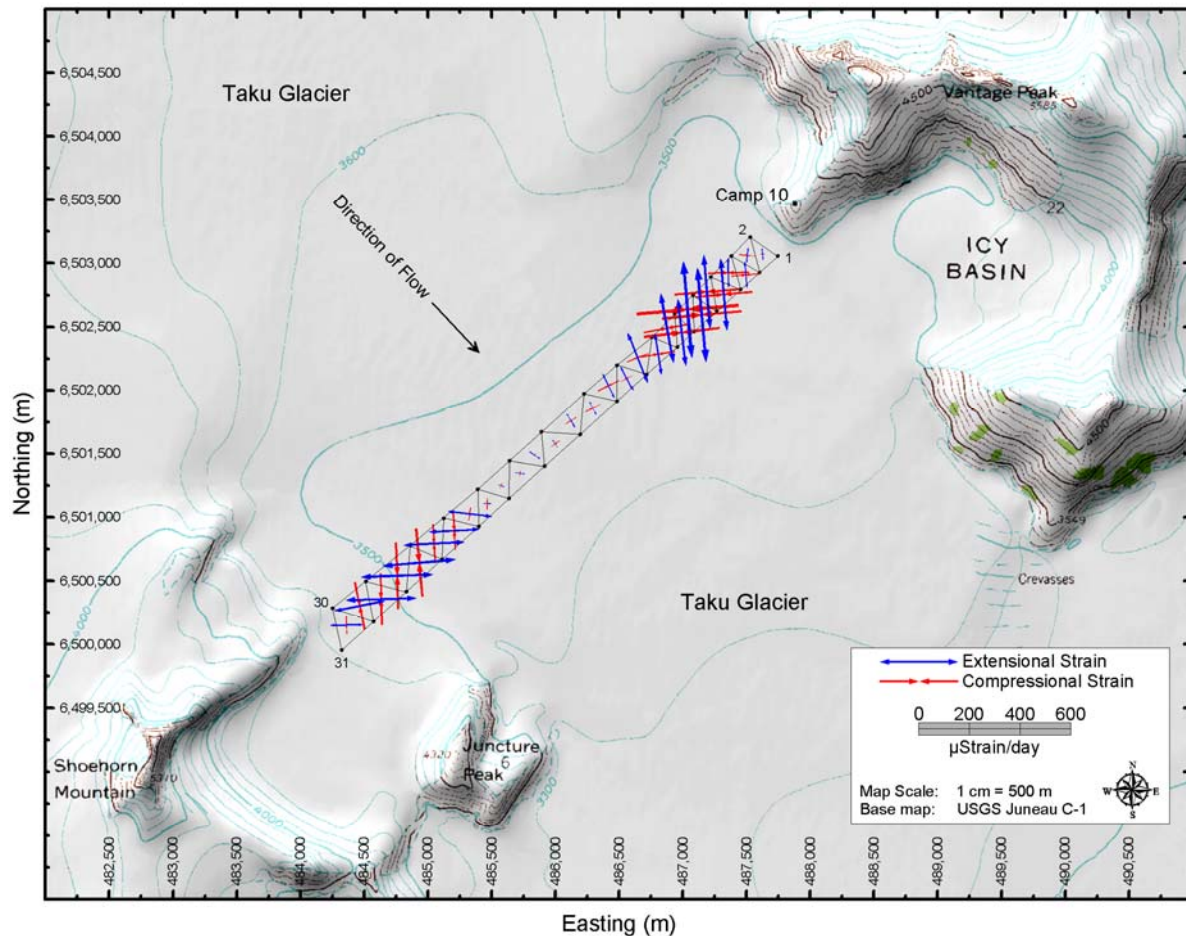


Figure 40: Surface strain at Profile 4, Taku Glacier, from July 19 to July 25, 2001. Crevasse zones along the margins are clearly defined by the large magnitude of strain relative to the central sector, while the central portion of the glacier undergoes minimal stress and is crevasse-free.

3.4 MATTHES GLACIER / LLEWELLYN GLACIER DIVIDE

The divide between the Matthes and Llewellyn Glaciers has been of interest in recent years because it offers the potential for ice core climate research. Ranging in elevation from 1800 meters to 2000 meters just north of the Alaska/Canada boundary, the divide area experiences the least amount of summer ablation on the Juneau Icefield, which, when combined with minimal movement and ice deformation, provides an almost ideal environment for the retrieval of ice cores.

The divide between the Matthes and Llewellyn Glaciers is morphologically complex, being in fact a three-way glacial divide with a small influx of ice from the west. The Llewellyn Glacier trends north from the divide, the Matthes Glacier trends southerly, and the eastern sector of the divide forms the head of the east-trending Tulsequah Glacier. A small accumulation area to the west of the divide, and several tens of meters higher, contributes a minor quantity of ice to the divide plateau. The easterly-trending surface flow vectors reflect the inflow of this ice mass (see Figure 41).

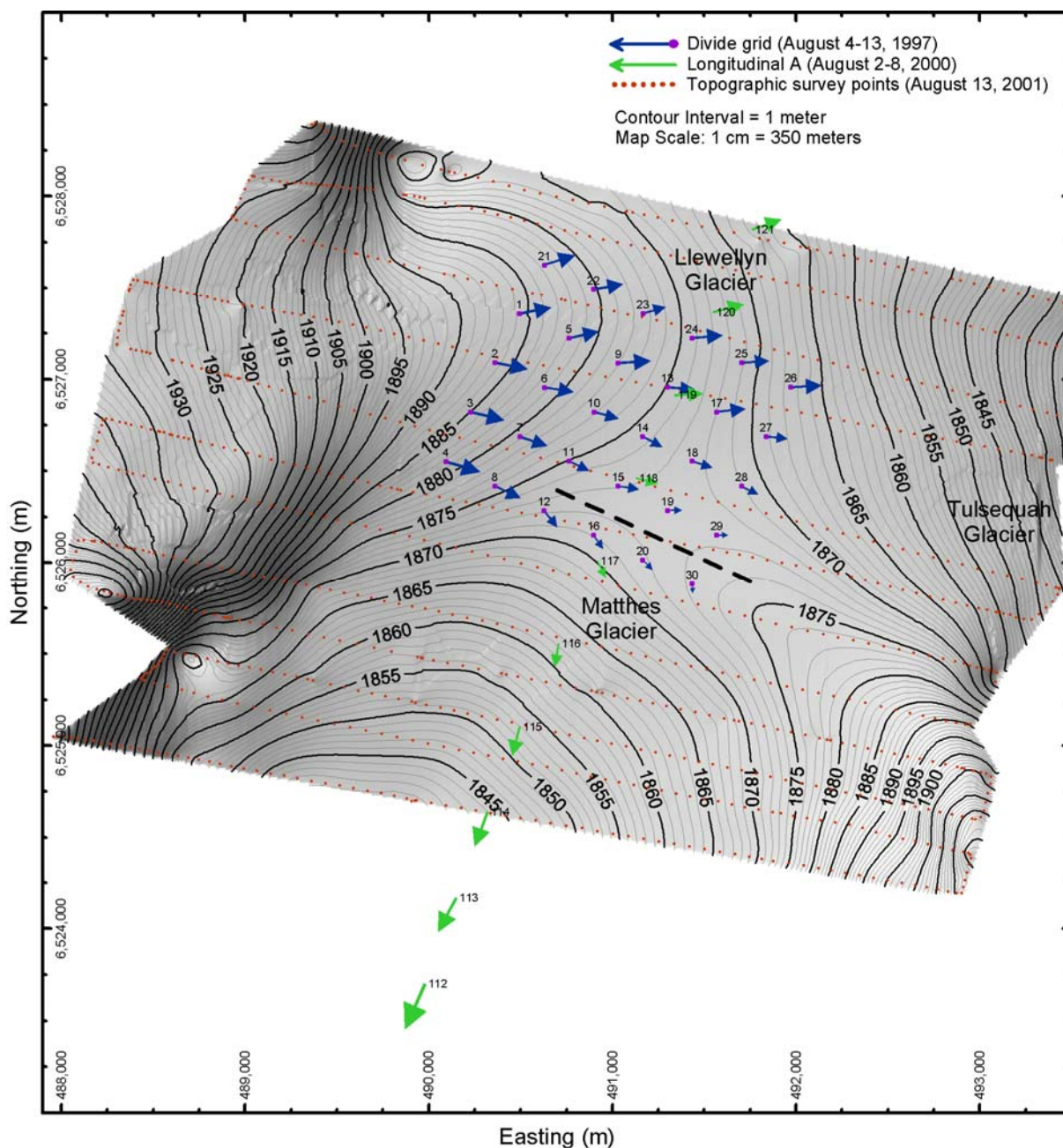


Figure 41: Topographic map of the Matthes Glacier/Llewellyn Glacier divide. Contour interval is one meter, as interpolated from the X, Y, and Z coordinates of 1,218 surveyed points. Data were collected using differential, kinematic, survey-grade GPS.

Recognizing the importance that ice core studies could contribute to the understanding of the climate record of southeast Alaska, the Juneau Icefield Research Program began preliminary studies in 1997 to determine the depth of the ice, the surface velocity and direction of movement, the location of the surface divide and minimum movement, and to ascertain if the surface divide coincided with the bedrock divide (Sprenke, 1999). To

determine the surface velocity field, a grid of 30 points was established and surveyed in August, 1997. The grid was oriented transverse to the longitudinal centerline of the Matthes and Llewellyn Glaciers, roughly straddling the divide. Establishment of Longitudinal A in 2000 augmented the divide grid. Results of the surveys reveal the zone of minimum surface movement, and the divergent movement vectors to be in the southeast corner of the grid between Flags 19, 20, 29, and 30. The minimum velocity observed in 1997 was 1.3 cm/day at Flag 30.

While work in 1997 and 2000 defined the velocity field at the Matthes/Llewellyn divide, it did not ascertain the overall topography of the area. An objective of the survey program in 2001 was to conduct a topographic survey of the divide. This was accomplished in 3½ hours on August 13, the last day in which the GPS survey equipment was available for use. To accomplish this survey, the roving GPS was affixed to a snowmobile and configured for a kinematic survey, with a 10-second recording interval. The GPS base station was placed at FFGR 39 at Blizzard Point. Beginning on the Llewellyn Glacier side of the divide, 12 transverse profiles were surveyed (see Figure 41). A total of 1,218 points were measured, providing X, Y, and Z coordinates from which a topographic map was generated using Surfer, a commercial 3-D surface modeling computer program. Contours, with an interval of one meter, were interpolated from the surveyed points. Coordinates of the surveyed points are presented in Appendix 2.

Figure 41 presents the generated topographic map, with movement vectors from the 1997 divide grid and 2000 Longitudinal A profile superimposed. The approximate position of the Matthes/Llewellyn divide is indicated by the dashed line. From this divide, the Matthes Glacier flows south-southwest, the Llewellyn Glacier flows north-northeast, and the Tulsequah Glacier flows east-southeast..

3.5 GILKEY GLACIER SURVEYS

Several survey projects were conducted in the Gilkey Trench in 2001. The major focus was on determining the wavelength and amplitude of the wave bulges and ogives at the base of the Vaughan Lewis Icefall. Other adjunct projects included a resurvey of wave bulge surface velocity and determining surface height change on the Gilkey Glacier. These two projects are discussed in previous sections of this report. Refer to Section 3.1.1.3 and Figure 7 for details on the surface velocity of wave bulges 1 through 3. Surface height change of the Gilkey Glacier is presented in Section 3.1.3.2 and Table 5.

3.5.1 OGIVE WAVELENGTH AND AMPLITUDE

The Vaughan Lewis Glacier is known for its well-defined series of wave bulges and ogives. This glacier heads in a cirque basin west of the Matthes Glacier, and some two kilometers south of the Alaska/Canada border. From its divide with the Matthes Glacier, it flows approximately four kilometers to the edge of the cirque basin, spilling down some 600 meters in a spectacular icefall (see Figure 42).

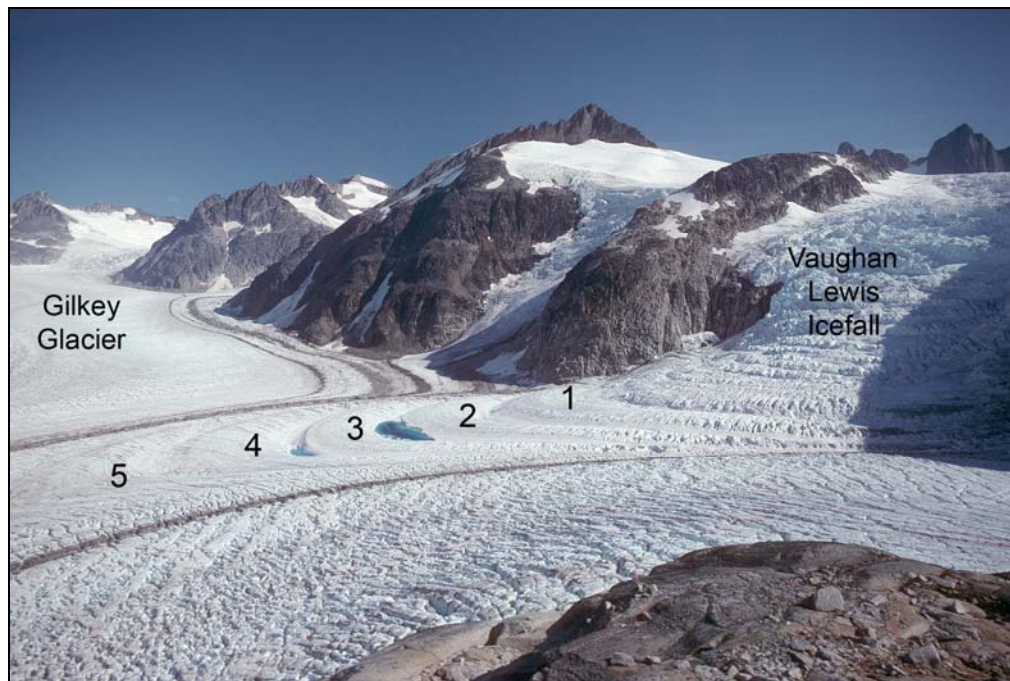


Figure 42: View of the Vaughan Lewis Icefall and the first five bulges at its base, as seen from Camp 19. The first three arcuate surface structures are classified as wave bulges, downglacier from which are wave ogives which de-amplify at ogive 12 to become two-dimensional. View is to the northeast. Photo taken August 16, 1989.



Figure 43: Detailed view of wave bulges 2, 3, and 4. Photo taken August 16, 1989.

Numerous interesting morphological structures are present at the base of the Vaughan Lewis Icefall, including ogives, wave bulges, supraglacial lakes and streams, flow and tectonic foliation, and an extensive medial moraine system. Principal among these features are the ogives and wave bulges. Typically, most glaciologists refer to alternating light and dark banded structures on the surface of a glacier as ogives. Those with no amplitude are simply known as ogives, while those with an undulating vertical cross-section are referred to as wave ogives. The term ogive refers to a bullet shape, similar to the shape that would be produced by compressing the limbs of a semi-circle toward its center, resulting in an elongated, ellipse-type structure with a somewhat pointed central sector. As applied to glaciological structures, the pointed end of the ogive is downglacier of the ends of the limbs. The ogive shape becomes more pronounced over time due to the increased rate of flow in the middle of the glacier as compared to its sides.

The structures at the base of the Vaughan Lewis Icefall include typical ogives and wave ogives. These ogives generally begin at the fourth bulging structure downglacier from the base of the icefall. Upglacier from this point, three structures similar to wave ogives exist. As with wave ogives, they exhibit a light and dark banded structure, have amplitude, and one forms every year. Unlike true ogives however, they have a semi-circular plan view rather than a bullet shape. Technically, these are undeformed ogives, but are referred to in this report as wave bulges, in order to differentiate them from the true ogives immediately downglacier from them.

The objective of this survey was to determine the physical characteristics of the wave bulges and ogives at the base of the Vaughan Lewis Icefall. This included the wavelength, amplitude, cross-sectional profile, surface elevations of the crests and troughs, and the depth of the supraglacial lakes in the troughs. Given the significant decrease in surface height of the glaciers in the Gilkey Trench in recent years (see Section 3.1.3.2 for additional discussion), quantifying these characteristics will allow for detailed temporal and spatial monitoring of the ogives and wave bulges.

This survey was conducted using standard real-time differential GPS techniques utilizing a survey-grade Leica System 530 GPS. A total of 179 points were surveyed along a longitudinal profile through the centerline of the bulges and ogives, starting at the lowest part of the trough upglacier from wave bulge 1 and extending downglacier to the trough on the downglacier side of ogive 11. The total distance surveyed was 1.75 kilometers, with an average spacing of 9.8 meters. Lakes in the troughs between wave bulges 1 through 4 prevented direct measurement of the surface height of the ice in the troughs. To obtain this important measurement, an inflatable rubber raft was used in conjunction with the GPS system. A weighted sounding line was used to find the deepest water that was in line with the longitudinal profile. Once positioned, a GPS reading was recorded and the depth of the water at that position was noted. The water depth and height of the GPS antenna above the water surface were then subtracted from the GPS-obtained height, giving the elevation of the ice at the bottom of the lake.

The results of the survey are shown in Figure 44 and Table 21. Appendix 2 lists the surveyed coordinates. As referenced in this report, wave bulge #1 is the first fully-formed bulge at the immediate base of the Vaughan Lewis Icefall, with well-defined troughs both upglacier and downglacier from the crest of the bulge. The average gradient from the crest of wave bulge 1 to the crest of ogive 11 is 5 degrees. Because of the gradient, the troughs on the upglacier and downglacier sides of the crests are at differing elevations. Thus the amplitude of

the bulges and ogives is dependant upon whether the height differential is measured from the crest to either the upglacier or downglacier trough. This issue is resolved by calculating the average of the upglacier and downglacier amplitude for each crest. The wavelength is calculated from crest to crest. The wavelength of bulges 1 through 4 is relatively consistent at around 130 meters, after which the wavelength steadily increases. For example, the wavelength between the crests of ogives 7 and 8 is 224 meters. From ogive 8, the wavelength decreases. From examining the morphology of the bulges and ogives in Figure 44, several distinct zones can be identified. The first three structures at the base of the icefall are characterized by short wavelength and high amplitude. These are the hemispherical wave bulges in the compression zone at the base of the icefall. In plan view they exhibit minimal lateral deformation of the limbs. The fourth bulge represents a transitory stage between the true wave bulges and the wave ogives. In plan view, the effects of lateral compression and flow deformation begin to transform this structure from a hemispherical wave bulge to a bullet, or chevron, shaped ogive. Ogives 5, 6, and 7 are located within the extension zone downglacier from the compression zone at the base of the icefall, while ogives 8 through 11 appear to be located in another compression zone. The amplitude of the wave bulges and ogives decreases to nearly zero at ogive 11. Downglacier from the crest of ogive 11 the amplitude disappears and the ogives are represented as typical two-dimensional alternating light and dark banded surface structures.

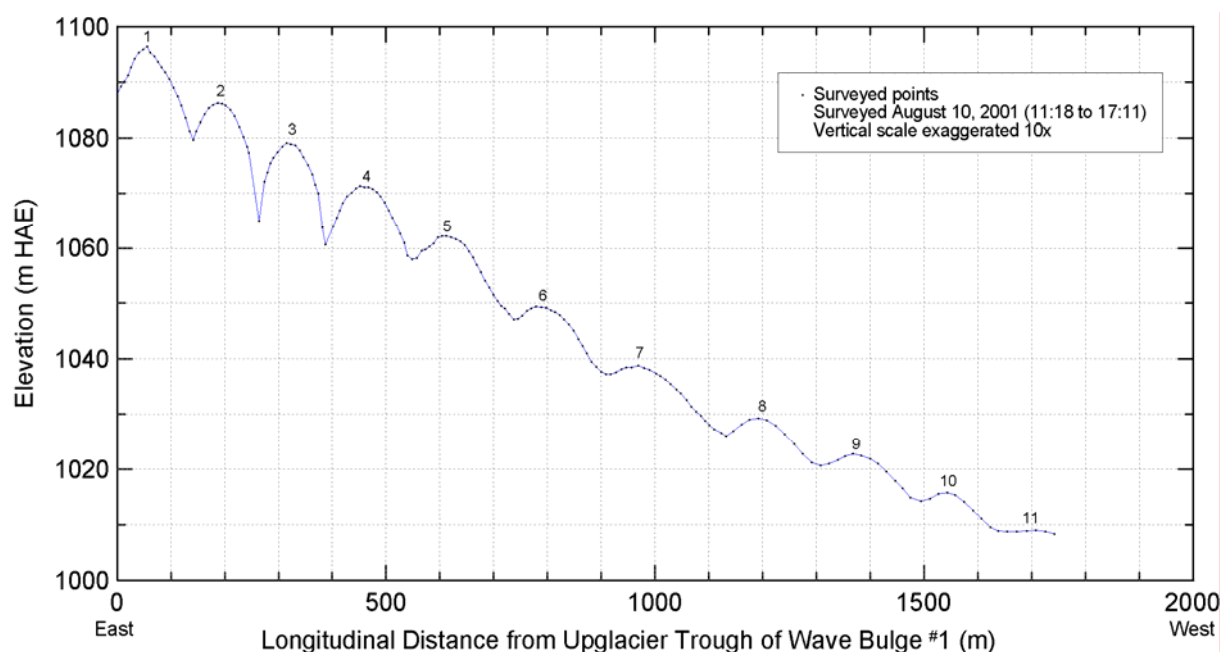


Figure 44: Longitudinal cross-section through the Vaughan Lewis Glacier from wave bulge 1 downglacier to ogive 11. Refer to Figure 7 for a planimetric view of this profile.

OGIVE	WAVELENGTH CREST TO CREST (M)	AMPLITUDE (M)			UPLACIER TROUGH HEIGHT (M)	CREST HEIGHT (M)	DOWNGLACIER TROUGH HEIGHT (M)
		CREST TO UPLACIER TROUGH	CREST TO DOWNGLACIER TROUGH	AVERAGE			
1	----	8.62	16.74	12.68	1087.79	1096.41	1079.67
2	1•2: 130.69	6.61	21.29	13.95	1079.67	1086.28	1064.99
3	2•3: 128.08	14.09	18.45	16.27	1064.99	1079.08	1060.63
4	3•4: 136.94	10.64	13.32	11.98	1060.63	1071.27	1057.95
5	4•5: 152.21	4.30	15.22	9.76	1057.95	1062.24	1047.02
6	5•6: 174.83	2.30	12.07	7.19	1047.02	1049.32	1037.25
7	6•7: 189.93	1.54	12.73	7.14	1037.25	1038.79	1026.06
8	7•8: 223.54	3.15	8.52	5.84	1026.06	1029.21	1020.70
9	8•9: 175.62	2.08	8.54	5.31	1020.70	1022.78	1014.24
10	9•10: 175.60	1.56	7.05	4.31	1014.24	1015.80	1008.75
11	10•11: 164.66	0.20	0.60	0.40	1008.75	1008.95	1008.36

Table 21: Wavelength, amplitude, and other characteristics of the first 11 wave bulges and ogives at the base of the Vaughan Lewis Icefall. Surveyed August 10, 2001.

3.6 TEST PITS

In addition to the standard glacier survey work performed, the survey team also provides locational support to other research projects on the Juneau Icefield. The mass balance team annually digs and analyzes the depth and water equivalent of the previous winter's retained accumulation. These pits are dug in the same general area every year, but are not always in the areas where the standard survey work is performed. On those occasions when a test pit is near a survey project, or where a test pit is observed by the survey team, it is located via handheld GPS. The GPS used for this purpose is a commercial recreational or resource grade GPS with an accuracy of 3-10 meters. Three test pits were surveyed in 2001, as shown in Table 22.

LOCATION	LATITUDE (WGS84)	LONGITUDE (WGS84)	DATE SURVEYED
Flag 12, Longitudinal C, Southwest Branch	58° 34' 27.7" N	134° 15' 28.6" W	7/25/2001
Head of Southwest Branch	58° 31' 09.0" N	134° 19' 38.4" W	7/25/2001
Flat plateau north of Camp 16, west of Taku Towers	58° 37' 59.8" N	134° 26' 00.8" W	7/27/2001

Table 22: Mass balance test pits surveyed in 2001.

4. FUTURE WORK

Steady progress has been made on determining the overall velocity field and vertical elevation profiles of the main portion of the Juneau Icefield. Future survey work should focus on extending the extension of Longitudinal B to the divide between the Demorest and Tulsequah Glaciers. This will require the establishment of a new benchmark east of Camp 8. Longitudinal profiles must also be established and surveyed on the Hades Highway branch of the Demorest Glacier, also requiring a new benchmark. Additionally, Flags 17-28 of Longitudinal C have been surveyed for position only. These flags must be surveyed twice in the same field season to determine the surface movement.

5. ACKNOWLEDGEMENTS

As usual, the survey work detailed in this report could not have been accomplished without the financial, logistical, and field support of the Foundation for Glacier and Environmental Research, Juneau Icefield Research Program. Financial support from NASA enabled several students to assist with the survey projects. Significant personnel and equipment support was provided by the Universität der Bundeswehr in Munich, Germany. As always, many thanks are extended to Dr. Maynard Miller and Joan Miller for their countless efforts in organizing and carrying out the summer field season. The tireless efforts of Annette Erickson and other staff in providing the necessary logistical support in Juneau during the summer are greatly appreciated.

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APPENDICES

APPENDIX 1

GPS BENCHMARK COORDINATES

GPS BENCHMARKS (JIRP COORDINATE SYSTEM)			
BENCHMARK	EASTING (M)	NORTHING (M)	HEIGHT ¹ (M)
FFGR 1 ² (C-17)	478,573.838	6,472,234.227	1,301.709
FFGR 6 (Cleaver)	483,309.746	6,524,118.094	1,388.753
FFGR 12 (C-19)	482,221.820	6,522,621.728	1,292.865
FFGR 18 (C-19)	482,304.622	6,522,507.563	1,285.892
FFGR 19 (C-10)	488,001.820	6,503,290.614	1,180.836
FFGR 19C (C-10)	487,983.651	6,503,410.033	1,198.000
FFGR 24 (C-18 Hill)	484,189.635	6,524,371.872	1,733.416
FFGR 31 (C-8)	492,136.624	6,521,147.773	2,051.576
FFGR 31 (Cleaver)	483,705.534	6,524,279.606	1,623.548
FFGR 34 (C-18 Hill)	484,554.464	6,524,402.905	1,734.890
FFGR 39 (Blizzard)	487,443.145	6,524,360.975	1,984.385
FFGR 43 (Cleaver)	483,990.101	6,524,352.738	1,703.762
FFGR 44 (Cleaver)	483,834.598	6,524,280.382	1,669.527
FFGR 45 (C-18 Hill)	484,309.150	6,524,412.394	1,746.191
FFGR 53 (C-19)	482,195.157	6,522,670.922	1,277.773
FFGR 62 (F10)	492,497.562	6,535,469.195	1,860.563
FFGR 63 (C-18 Hill)	484,315.335	6,524,309.996	1,723.699
FFGR 64 (C-18 Hill)	484,219.214	6,524,334.390	1,727.783
FFGR 65 (Taku D)	482,942.072	6,509,779.956	1,774.109
FFGR 68 (C-18 Hill)	484,425.554	6,524,412.335	1,751.611
C-9 Bolt	489,442.431	6,510,665.042	1,554.938
C-10A	489,181.351	6,501,882.011	1,105.758
Knowl	476,860.898	6,504,945.914	1,533.461
Lupine (Taku A)	490,263.717	6,500,621.560	1,080.574
N1 (C-18)	484,073.444	6,524,262.764	1,698.457
N2 (Cleaver)	483,956.314	6,524,239.526	1,682.217
Scott (C-10)	487,963.303	6,503,372.111	1,189.740
SW Taku Pt.	487,320.590	6,495,968.917	1,133.488
Taku D Lower	482,601.539	6,509,092.743	1,399.213
Taku NW Pt (USGS)	479,186.763	6,505,147.716	1,402.060
Taku NW (UniBm)	479,188.345	6,505,144.633	1,402.149
Vista (C-9 East)	489,873.478	6,510,298.945	1,564.057

¹ Height above WGS84 ellipsoid, in meters.

² Coordinates were obtained by single-point positioning.

GPS BENCHMARKS (GEOGRAPHIC COORDINATES — WGS84 DATUM)			
BENCHMARK	WEST LONGITUDE	NORTH LATITUDE	HEIGHT ¹ (M)
FFGR 1 ² (C-17)	134° 21' 57.942684"	58° 22' 01.732978"	1,301.709
FFGR 6 (Cleaver)	134° 17' 20.377172"	58° 49' 59.308553"	1,388.753
FFGR 12 (C-19)	134° 18' 27.762700"	58° 49' 10.792606"	1,292.865
FFGR 18 (C-19)	134° 18' 29.436030"	58° 49' 12.377740"	1,285.892
FFGR 19 (C-10)	134° 12' 23.899681"	58° 38' 46.758278"	1,180.836
FFGR 19C (C-10)	134° 12' 25.049008"	58° 38' 50.615966"	1,198.000
FFGR 24 (C-18 Hill)	134° 16' 25.595230"	58° 50' 07.629607"	1,733.416
FFGR 31 (C-8)	134° 08' 09.785576"	58° 48' 24.218727"	2,051.576
FFGR 31 (Cleaver)	134° 16' 55.748732"	58° 50' 04.582822"	1,623.548
FFGR 34 (C-18 Hill)	134° 16' 02.860336"	58° 50' 08.680180"	1,734.890
FFGR 39 (Blizzard)	134° 13' 02.775834"	58° 50' 07.663122"	1,984.385
FFGR 43 (Cleaver)	134° 16' 38.028785"	58° 50' 06.984705"	1,703.762
FFGR 44 (Cleaver)	134° 16' 47.703578"	58° 50' 04.625407"	1,669.527
FFGR 45 (C-18 Hill)	134° 16' 18.155186"	58° 50' 08.954924"	1,746.191
FFGR 53 (C-19)	134° 18' 29.438155"	58° 49' 12.378488"	1,277.773
FFGR 62 (F10)	134° 07' 49.040300"	58° 56' 07.080992"	1,860.563
FFGR 63 (C-18 Hill)	134° 16' 17.743731"	58° 50' 05.646451"	1,723.699
FFGR 64 (C-18 Hill)	134° 16' 23.741807"	58° 50' 06.422174"	1,727.783
FFGR 65 (Taku D)	134° 17' 39.370491"	58° 42' 15.874914"	1,774.109
FFGR 68 (C-18 Hill)	134° 16' 10.898731"	58° 50' 08.968227"	1,751.611
C-9 Bolt	134° 10' 55.822743"	58° 42' 45.226060"	1,554.938
C-10A	134° 11' 10.525565"	58° 38' 01.345224"	1,105.758
Knowl	134° 23' 55.243719"	58° 39' 38.631082"	1,533.461
Lupine (Taku A)	134° 10' 03.247227"	58° 37' 20.700786"	1,080.574
N1 (C-18)	134° 16' 32.810299"	58° 50' 04.088062"	1,698.457
N2 (Cleaver)	134° 16' 40.105698"	58° 50' 03.321412"	1,682.217
Scott (C-10)	134° 12' 26.303369"	58° 38' 49.388336"	1,189.740
SW Taku Pt.	134° 13' 04.662101"	58° 34' 50.057832"	1,133.488
Taku D Lower	134° 18' 00.327718"	58° 41' 53.616470"	1,399.213
Taku NW Pt (USGS)	134° 21' 31.048187"	58° 39' 45.577275"	1,402.060
Taku NW (UniBm)	134° 21' 30.949035"	58° 39' 45.477910"	1,402.149
Vista (C-9 East)	134° 10' 28.987537"	58° 42' 33.431361"	1,564.057

¹ Height above WGS84 ellipsoid, in meters.² Coordinates were obtained by single-point positioning.

APPENDIX 2

MOVEMENT PROFILE FLAG COORDINATES

LEMON GLACIER — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
1	478,658.154	6,472,199.498	1,259.404	08/02/01	13:31
2	478,658.244	6,472,199.217	1,259.385	08/02/01	13:32
3	478,826.165	6,472,140.846	1,235.808	08/02/01	13:37
4	478,955.840	6,472,091.340	1,225.599	08/02/01	13:39
5	479,018.078	6,472,066.182	1,222.356	08/02/01	13:41
6	479,082.940	6,472,041.138	1,219.659	08/02/01	13:42
7	479,146.702	6,472,015.960	1,217.602	08/02/01	13:44
8	479,207.148	6,471,991.941	1,215.875	08/02/01	13:46
9	479,265.866	6,471,967.248	1,214.131	08/02/01	13:48
10	479,322.340	6,471,944.183	1,212.660	08/02/01	13:49
11	479,376.838	6,471,919.856	1,211.451	08/02/01	13:50
12	479,431.976	6,471,896.759	1,210.300	08/02/01	13:52
13	479,485.437	6,471,876.006	1,209.215	08/02/01	13:53
14	479,538.809	6,471,855.518	1,208.618	08/02/01	13:54
15	479,588.810	6,471,835.422	1,208.561	08/02/01	13:56
16	479,638.749	6,471,814.428	1,209.326	08/02/01	13:58
17	479,689.396	6,471,792.804	1,210.701	08/02/01	13:59
18	479,738.705	6,471,773.457	1,212.680	08/02/01	14:01
19	479,786.913	6,471,755.162	1,215.446	08/02/01	14:03
20	479,833.231	6,471,736.459	1,219.960	08/02/01	14:05
21	479,879.605	6,471,719.317	1,225.329	08/02/01	14:08
22	479,924.303	6,471,702.075	1,230.881	08/02/01	14:09
23	479,969.988	6,471,681.966	1,235.818	08/02/01	14:11
24	480,019.978	6,471,662.060	1,239.845	08/02/01	14:13
25	480,070.392	6,471,641.818	1,243.593	08/02/01	14:15
26	480,120.778	6,471,621.525	1,250.334	08/02/01	14:17
27	480,166.741	6,471,602.305	1,261.597	08/02/01	14:20
28	480,226.060	6,471,578.086	1,279.043	08/02/01	14:22
29	480,276.075	6,471,556.329	1,292.197	08/02/01	14:24
30	480,313.312	6,471,535.732	1,302.258	08/02/01	14:26
31	480,404.969	6,472,429.576	1,244.449	08/02/01	12:33
32	480,327.213	6,472,450.472	1,223.863	08/02/01	12:37
33	480,249.111	6,472,466.534	1,203.825	08/02/01	12:39
34	480,147.046	6,472,478.220	1,189.989	08/02/01	12:41
35	480,068.240	6,472,488.109	1,185.324	08/02/01	12:43
36	480,002.342	6,472,497.292	1,183.876	08/02/01	12:50

LEMON GLACIER — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
37	479,942.866	6,472,504.729	1,183.478	08/02/01	12:51
38	479,883.413	6,472,512.772	1,183.631	08/02/01	12:52
39	479,825.836	6,472,520.991	1,184.098	08/02/01	12:57
40	479,772.162	6,472,528.651	1,184.771	08/02/01	12:58
41	479,718.708	6,472,535.241	1,185.631	08/02/01	12:59
42	479,666.653	6,472,542.702	1,186.366	08/02/01	13:01
43	479,613.341	6,472,550.371	1,187.532	08/02/01	13:02
44	479,560.059	6,472,556.890	1,188.943	08/02/01	13:03
45	479,505.753	6,472,563.422	1,190.681	08/02/01	13:04
46	479,452.851	6,472,569.246	1,192.798	08/02/01	13:05
47	479,398.764	6,472,576.720	1,195.261	08/02/01	13:07
48	479,346.484	6,472,582.944	1,198.432	08/02/01	13:08
49	479,293.069	6,472,589.336	1,202.395	08/02/01	13:09
50	479,242.452	6,472,595.442	1,206.806	08/02/01	13:11
51	479,194.439	6,472,602.292	1,211.652	08/02/01	13:13
52	479,146.214	6,472,608.016	1,216.712	08/02/01	13:14
53	479,098.346	6,472,613.359	1,222.170	08/02/01	13:16
54	479,052.653	6,472,618.304	1,228.419	08/02/01	13:18
55	479,023.771	6,472,626.486	1,233.808	08/02/01	13:19
56	479,573.384	6,472,554.584	1,188.564	08/02/01	12:22
57	479,532.305	6,472,486.176	1,193.518	08/02/01	12:25
58	479,484.979	6,472,421.843	1,195.999	08/02/01	12:26
59	479,437.627	6,472,357.064	1,199.557	08/02/01	12:29
60	479,391.446	6,472,289.719	1,202.764	08/02/01	12:31
61	479,343.446	6,472,223.991	1,205.939	08/02/01	12:33
62	479,295.597	6,472,156.784	1,208.949	08/02/01	12:35
63	479,247.279	6,472,091.868	1,212.149	08/02/01	12:37
64	479,201.744	6,472,024.047	1,215.418	08/02/01	12:38
65	479,166.979	6,471,952.476	1,218.042	08/02/01	12:41
66	479,123.442	6,471,881.578	1,219.971	08/02/01	12:43
67	479,079.250	6,471,808.888	1,221.479	08/02/01	12:46
68	479,041.131	6,471,732.612	1,222.549	08/02/01	12:48
69	478,996.945	6,471,663.169	1,224.157	08/02/01	12:50
70	478,958.882	6,471,585.553	1,225.458	08/02/01	12:52
71	478,942.243	6,471,544.012	1,225.082	08/02/01	12:54
72	478,942.447	6,471,543.905	1,225.103	08/02/01	12:55
73	478,978.495	6,471,520.694	1,224.774	08/02/01	12:57
74	No data	No data	No data	No data	No data
75	No data	No data	No data	No data	No data
76	No data	No data	No data	No data	No data
77	No data	No data	No data	No data	No data

LEMON GLACIER — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
78	No data	No data	No data	No data	No data
79	No data	No data	No data	No data	No data
80	479,244.480	6,471,376.639	1,246.706	08/02/01	13:26
81	478,909.624	6,471,574.541	1,225.842	08/02/01	13:31
82	478,883.367	6,471,607.264	1,226.636	08/02/01	13:37
83	478,851.499	6,471,633.561	1,227.701	08/02/01	13:45
84	478,808.233	6,471,667.033	1,229.666	08/02/01	13:47
85	478,770.915	6,471,688.086	1,231.460	08/02/01	13:48
86	478,736.834	6,471,711.166	1,233.585	08/02/01	13:49
87	478,702.112	6,471,736.579	1,235.984	08/02/01	13:51
88	478,669.811	6,471,762.758	1,238.706	08/02/01	13:52
89	478,633.826	6,471,786.067	1,241.966	08/02/01	13:53
90	478,596.848	6,471,805.385	1,245.630	08/02/01	13:55
91	478,562.242	6,471,824.021	1,249.459	08/02/01	13:56
92	478,530.044	6,471,844.013	1,254.006	08/02/01	13:57
93	478,498.463	6,471,863.444	1,258.869	08/02/01	13:58
94	478,467.433	6,471,881.821	1,264.662	08/02/01	13:59
95	478,429.323	6,471,901.997	1,272.855	08/02/01	14:00
96	No data	No data	No data	No data	No data
97	478,968.726	6,473,542.348	1,130.386	08/02/01	11:06
98	479,061.864	6,473,571.691	1,121.423	08/02/01	11:08
99	479,171.738	6,473,603.947	1,113.439	08/02/01	11:09
100	479,253.250	6,473,625.227	1,109.025	08/02/01	11:11
101	479,320.747	6,473,642.549	1,106.179	08/02/01	11:12
102	479,381.408	6,473,659.462	1,104.146	08/02/01	11:14
103	479,443.169	6,473,676.206	1,102.413	08/02/01	11:16
104	479,502.922	6,473,689.235	1,101.405	08/02/01	11:17
105	479,554.647	6,473,702.080	1,101.509	08/02/01	11:18
106	479,608.264	6,473,718.311	1,102.557	08/02/01	11:19
107	479,662.186	6,473,731.053	1,104.321	08/02/01	11:32
108	479,715.835	6,473,743.794	1,106.206	08/02/01	11:34
109	479,771.680	6,473,760.587	1,107.320	08/02/01	11:35
110	479,809.401	6,473,770.855	1,108.045	08/02/01	11:36
111	479,866.544	6,473,786.535	1,107.831	08/02/01	11:38
112	479,920.387	6,473,802.568	1,107.146	08/02/01	11:39
113	479,976.829	6,473,818.150	1,106.085	08/02/01	11:40
114	480,032.249	6,473,834.236	1,104.906	08/02/01	11:43
115	480,088.216	6,473,848.811	1,103.828	08/02/01	11:47
116	480,143.292	6,473,865.395	1,103.062	08/02/01	11:48
117	480,198.737	6,473,878.706	1,102.734	08/02/01	11:49
118	480,248.824	6,473,892.511	1,102.963	08/02/01	11:50

LEMON GLACIER — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
119	480,302.384	6,473,904.633	1,103.999	08/02/01	11:52
120	480,348.945	6,473,915.733	1,107.538	08/02/01	11:57
121	479,801.438	6,473,699.885	1,112.017	08/02/01	11:37
122	479,788.488	6,473,563.849	1,119.277	08/02/01	11:42
123	479,777.569	6,473,497.672	1,123.523	08/02/01	11:55
124	479,750.467	6,473,384.544	1,131.860	08/02/01	11:57
125	479,721.920	6,473,278.022	1,140.364	08/02/01	11:59
126	479,692.978	6,473,181.624	1,147.257	08/02/01	12:01
127	479,635.213	6,473,047.997	1,158.900	08/02/01	12:03
128	479,580.406	6,472,903.421	1,171.205	08/02/01	12:07
129	479,529.204	6,472,781.125	1,179.874	08/02/01	12:09
130	479,458.483	6,472,651.235	1,189.413	08/02/01	12:11

PROFILE 3 (LOWER DEMOREST GLACIER) — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
1	491,627.141	6,501,358.271	1,018.796	7/26/01	12:01
2	491,862.917	6,501,154.390	1,024.239	7/26/01	12:09
3	492,098.797	6,500,950.664	1,026.971	7/26/01	12:18
4	492,334.508	6,500,746.853	1,031.480	7/26/01	12:43
5	492,570.369	6,500,543.233	1,030.252	7/26/01	12:55
6	492,806.066	6,500,338.826	1,029.354	7/26/01	13:06
7	493,041.594	6,500,135.004	1,038.313	7/26/01	13:15
8	493,277.695	6,499,931.316	1,048.142	7/26/01	13:31
9	493,513.509	6,499,727.920	1,051.339	7/26/01	13:41
10	493,749.546	6,499,523.793	1,050.119	7/26/01	13:52
11	493,985.208	6,499,319.560	1,048.150	7/26/01	14:04
12	494,103.094	6,499,235.251	1,045.648	7/26/01	14:11

PROFILE 3A (DEMOREST GLACIER EAST OF CAMP 9) — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
1	492,009.481	6,510,931.270	1,356.650	8/3/01	10:00
2	492,309.449	6,510,940.918	1,345.904	8/3/01	10:07
3	492,609.063	6,510,949.875	1,339.093	8/3/01	10:10
4	492,909.607	6,510,958.515	1,337.682	8/3/01	10:12
5	493,209.287	6,510,968.154	1,337.169	8/3/01	10:14
6	493,509.269	6,510,977.180	1,340.220	8/3/01	10:16
7	493,808.925	6,510,986.291	1,344.852	8/3/01	10:18
8	494,108.860	6,510,995.323	1,350.399	8/3/01	10:20
9	494,408.692	6,511,004.430	1,356.549	8/3/01	10:24
10	494,708.403	6,511,013.659	1,361.548	8/3/01	10:26
11	495,008.388	6,511,022.720	1,366.999	8/3/01	10:35
12	495,308.159	6,511,031.686	1,371.698	8/3/01	10:38
13	495,608.230	6,511,040.472	1,377.708	8/3/01	10:41
14	495,908.064	6,511,050.052	1,384.631	8/3/01	10:43
15	495,458.195	6,511,036.079	1,374.703	8/3/01	10:46

PROFILE 4 (TAKU GLACIER AT CAMP 10) — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
1	487,744.566	6,503,055.302	1,120.274	7/19/01	14:10
2	487,527.241	6,503,206.878	1,126.917	7/19/01	14:29
3	487,601.302	6,502,925.703	1,122.572	7/19/01	14:26
4	487,380.143	6,503,056.574	1,125.501	7/19/01	14:39
5	487,454.381	6,502,792.911	1,122.291	7/19/01	14:35
6	487,219.488	6,502,893.124	1,122.712	7/19/01	14:47
7	487,266.689	6,502,623.384	1,119.942	7/19/01	15:15
8	487,079.533	6,502,749.984	1,121.856	7/19/01	15:03
9	487,088.905	6,502,462.479	1,121.090	7/19/01	15:24
10	486,936.574	6,502,604.282	1,121.647	7/19/01	15:09
11	486,955.311	6,502,341.379	1,121.358	7/19/01	15:31
12	486,755.622	6,502,418.710	1,121.580	7/19/01	15:15
13	486,716.533	6,502,125.350	1,121.397	7/19/01	15:38
14	486,483.971	6,502,199.453	1,123.321	7/19/01	15:22
15	486,484.469	6,501,915.594	1,117.937	7/19/01	15:43
16	486,222.765	6,501,971.643	1,122.416	7/19/01	15:28
17	486,193.379	6,501,651.589	1,122.189	7/19/01	16:01
18	485,891.794	6,501,670.511	1,128.508	7/19/01	15:41
19	485,915.986	6,501,399.686	1,128.587	7/19/01	16:10
20	485,639.772	6,501,442.873	1,134.429	7/19/01	15:48
21	485,636.588	6,501,145.860	1,135.222	7/19/01	16:22
22	485,391.531	6,501,220.459	1,138.901	7/19/01	16:05
23	485,397.679	6,500,929.100	1,136.801	7/19/01	16:27
24	485,121.728	6,500,992.535	1,139.200	7/19/01	16:15
25	485,110.542	6,500,667.913	1,138.746	7/19/01	16:41
26	484,858.932	6,500,777.757	1,140.588	7/19/01	16:22
27	484,829.885	6,500,413.832	1,139.410	7/19/01	16:49
28	484,511.889	6,500,493.706	1,140.968	7/19/01	16:32
29	484,572.786	6,500,179.147	1,143.094	7/19/01	16:55
30	484,251.651	6,500,281.723	1,142.533	7/19/01	16:39
31	484,324.314	6,499,952.897	1,147.343	7/19/01	16:56

PROFILE 4 (TAKU GLACIER AT CAMP 10) — EPOCH 1					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
1	487,744.619	6,503,055.267	1,119.865	7/25/01	18:45
2	487,527.259	6,503,206.820	1,126.538	7/25/01	14:37
3	487,601.418	6,502,925.588	1,122.237	7/25/01	18:41
4	487,380.285	6,503,056.378	1,125.303	7/25/01	14:43
5	487,454.736	6,502,792.603	1,121.946	7/25/01	18:38
6	487,219.965	6,502,892.648	1,122.469	7/25/01	14:47
7	487,267.647	6,502,622.503	1,119.648	7/25/01	18:33
8	487,080.519	6,502,749.048	1,121.584	7/25/01	14:51
9	487,090.628	6,502,460.898	1,120.695	7/25/01	18:29
10	486,938.290	6,502,602.749	1,121.289	7/25/01	14:54
11	486,957.520	6,502,339.445	1,121.036	7/25/01	18:26
12	486,757.888	6,502,416.714	1,121.208	7/25/01	16:17
13	486,719.202	6,502,123.042	1,120.915	7/25/01	18:21
14	486,486.611	6,502,197.209	1,122.896	7/25/01	16:12
15	486,487.296	6,501,913.231	1,117.445	7/25/01	18:15
16	486,225.644	6,501,969.377	1,122.056	7/25/01	16:06
17	486,196.352	6,501,649.266	1,121.662	7/25/01	18:10
18	485,894.794	6,501,668.283	1,127.928	7/25/01	16:40
19	485,919.017	6,501,397.437	1,128.140	7/25/01	18:05
20	485,642.748	6,501,440.690	1,134.037	7/25/01	16:45
21	485,639.514	6,501,143.710	1,134.750	7/25/01	17:59
22	485,394.439	6,501,218.379	1,138.490	7/25/01	16:49
23	485,400.485	6,500,927.097	1,136.362	7/25/01	17:52
24	485,124.269	6,500,990.709	1,138.811	7/25/01	16:54
25	485,112.719	6,500,666.395	1,138.322	7/25/01	17:47
26	484,860.861	6,500,776.343	1,140.320	7/25/01	16:58
27	484,831.135	6,500,413.045	1,139.055	7/25/01	17:42
28	484,512.725	6,500,493.268	1,140.735	7/25/01	17:13
29	484,573.227	6,500,179.016	1,142.697	7/25/01	17:37
30	484,251.877	6,500,281.653	1,142.214	7/25/01	17:27
31	484,324.471	6,499,952.947	1,147.026	7/25/01	17:32

ICY BASIN (TAKU GLACIER AT CAMP 10) — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
1-01	488,132.894	6,503,115.838	1,101.449	07/23/01	16:19
1-02	488,227.306	6,503,005.034	1,098.546	07/23/01	16:27
1-03	488,306.694	6,502,910.844	1,097.894	07/23/01	16:31
1-04	488,384.706	6,502,815.279	1,097.661	07/23/01	16:34
1-05	488,469.253	6,502,710.975	1,097.568	07/23/01	16:38
1-06	488,558.899	6,502,597.723	1,097.926	07/23/01	16:51
1-07	488,685.015	6,502,446.055	1,098.324	07/23/01	16:55
1-08	488,803.651	6,502,298.531	1,097.972	07/23/01	17:00
1-09	488,913.311	6,502,134.313	1,097.673	07/23/01	17:03
1-10	488,955.224	6,502,069.981	1,096.758	07/23/01	17:07
1-11	489,040.058	6,502,049.251	1,096.872	07/23/01	17:11
2-01	489,566.291	6,502,330.834	1,125.596	07/23/01	17:24
2-02	489,485.163	6,502,508.087	1,119.402	07/23/01	17:29
2-03	489,424.950	6,502,628.570	1,116.130	07/23/01	17:32
2-04	489,352.303	6,502,766.184	1,111.556	07/23/01	17:39
2-05	489,273.667	6,502,899.901	1,107.250	07/23/01	17:45
2-06	489,201.422	6,503,008.494	1,103.256	07/23/01	17:49
2-07	489,135.992	6,503,113.722	1,099.298	07/23/01	17:52
2-08	489,074.492	6,503,222.395	1,094.872	07/23/01	17:54
2-09	488,999.014	6,503,356.777	1,092.176	07/23/01	18:00
2-9a	489,002.702	6,503,355.930	1,092.166	07/23/01	18:02
2-10	488,915.475	6,503,502.544	1,088.020	07/23/01	18:06
3-01	489,120.300	6,503,634.466	1,083.688	07/24/01	9:57
3-02	489,161.028	6,503,542.677	1,083.872	07/24/01	10:01
3-03	489,216.987	6,503,476.788	1,081.497	07/24/01	10:04
3-04	489,282.494	6,503,417.237	1,080.347	07/24/01	10:06
3-05	489,404.679	6,503,339.065	1,083.066	07/24/01	10:09
3-06	489,524.861	6,503,269.727	1,091.045	07/24/01	10:12
3-07	489,634.755	6,503,219.667	1,101.700	07/24/01	10:20
3-08	489,714.878	6,503,103.895	1,118.005	07/24/01	10:23
3-09	489,797.895	6,502,948.754	1,125.471	07/24/01	10:25
3-10	489,868.341	6,502,714.899	1,129.898	07/24/01	10:48
3-11	489,838.586	6,502,503.559	1,132.774	07/24/01	10:51
4-01	488,786.165	6,502,759.567	1,099.843	07/24/01	11:09
4-02	488,651.267	6,502,603.723	1,098.579	07/24/01	11:06
4-03	488,425.177	6,502,414.230	1,096.648	07/24/01	11:14
4-04	488,211.463	6,502,408.150	1,095.188	07/24/01	11:17
4-04	488,132.894	6,503,115.838	1,101.449	07/23/01	16:19

ICY BASIN (TAKU GLACIER AT CAMP 10) — EPOCH 1					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
1-01	488,132.892	6,503,115.846	1,101.197	07/29/01	14:38
1-02	488,227.300	6,503,005.015	1,098.261	07/29/01	14:41
1-03	488,306.693	6,502,910.841	1,097.554	07/29/01	14:44
1-04	488,384.723	6,502,815.273	1,097.346	07/29/01	14:49
1-05	488,469.295	6,502,710.986	1,097.314	07/29/01	14:58
1-06	488,558.914	6,502,597.745	1,097.639	07/29/01	15:07
1-07	488,684.988	6,502,446.078	1,097.986	07/29/01	15:15
1-08	488,803.653	6,502,298.539	1,097.679	07/29/01	15:20
1-09	488,913.301	6,502,134.313	1,097.360	07/29/01	15:31
1-10	488,955.240	6,502,069.995	1,096.563	07/29/01	15:36
1-11	489,040.024	6,502,049.242	1,096.505	07/29/01	15:43
2-01	489,566.261	6,502,330.898	1,125.265	07/29/01	15:56
2-02	489,485.077	6,502,508.107	1,119.183	07/29/01	16:03
2-03	489,352.177	6,502,766.282	1,111.219	07/29/01	16:10
2-04	489,352.178	6,502,766.283	1,111.212	07/29/01	16:11
2-05	489,273.546	6,502,899.947	1,106.914	07/29/01	16:15
2-06	489,201.311	6,503,008.651	1,102.851	07/29/01	16:18
2-07	489,135.978	6,503,113.903	1,098.790	07/29/01	16:22
2-08	489,074.592	6,503,222.579	1,094.292	07/29/01	16:50
2-09	488,999.170	6,503,356.888	1,091.675	07/29/01	16:42
2-9a	489,002.892	6,503,356.046	1,091.668	07/29/01	16:43
2-10	488,915.633	6,503,502.593	1,087.556	07/29/01	17:11
3-01	489,120.338	6,503,634.537	1,083.265	07/29/01	17:34
3-02	489,161.045	6,503,542.763	1,083.547	07/29/01	17:42
3-03	489,217.000	6,503,476.834	1,081.178	07/29/01	17:48
3-04	489,282.550	6,503,417.314	1,079.985	07/29/01	17:51
3-05	489,404.683	6,503,339.129	1,082.742	07/29/01	17:56
3-06	489,524.837	6,503,269.803	1,090.726	07/29/01	18:02
3-07	489,634.642	6,503,219.804	1,101.387	07/29/01	18:14
3-08	489,714.801	6,503,103.933	1,117.691	07/29/01	18:20
3-09	489,797.788	6,502,948.781	1,125.170	07/29/01	18:31
3-10	489,868.234	6,502,714.943	1,129.541	07/29/01	18:36
3-11	489,838.494	6,502,503.578	1,132.384	07/29/01	18:42
4-01	488,786.146	6,502,759.563	1,099.550	07/29/01	18:58
4-02	488,651.265	6,502,603.731	1,098.299	07/29/01	19:02
4-03	488,425.205	6,502,414.217	1,096.356	07/29/01	19:07
4-04	488,211.568	6,502,408.097	1,094.942	07/29/01	19:11
4-04	488,132.892	6,503,115.846	1,101.197	07/29/01	14:38

LONGITUDINAL A (TAKU/MATTHES/LLEWELLYN GLACIERS) — EPOCH 0						
NEW FLAG #	OLD FLAG #	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
28	3	495,227.702	6,487,893.762	663.262	07/20/01	13:46
29	4	494,855.097	6,488,229.104	679.992	07/20/01	13:37
30	5	494,452.531	6,488,524.171	694.878	07/20/01	13:31
31	6	494,030.311	6,488,792.840	709.383	07/20/01	13:24
32	7	493,642.649	6,489,105.498	725.149	07/20/01	13:18
33	8	493,265.106	6,489,432.137	743.665	07/20/01	13:13
34	9	492,924.122	6,489,802.566	761.534	07/20/01	13:08
35	10	492,639.500	6,490,212.433	773.722	07/20/01	13:01
36	11	492,436.060	6,490,669.104	782.337	07/20/01	12:53
37	12	492,237.706	6,491,127.695	791.251	07/20/01	12:46
38	13	492,067.455	6,491,597.494	802.479	07/20/01	12:42
39	14	491,894.458	6,492,066.190	820.454	07/20/01	12:37
40	15	491,772.313	6,492,551.863	837.216	07/20/01	12:22
41	16	491,710.225	6,493,049.625	847.864	07/20/01	12:17
42	17	491,687.769	6,493,551.406	860.842	07/20/01	12:13
43	18	491,658.088	6,494,051.644	877.353	07/20/01	12:09
44	19	491,606.718	6,494,547.122	890.131	07/20/01	12:05
45	20	491,525.378	6,495,040.665	899.668	07/20/01	12:01
46	21	491,428.749	6,495,532.044	914.385	07/20/01	11:57
47	22	491,308.917	6,496,018.337	932.187	07/20/01	11:53
48	23	491,146.576	6,496,491.240	943.346	07/20/01	11:49
49	24	490,889.527	6,496,929.555	949.796	07/20/01	11:43
50	25	490,565.607	6,497,307.638	962.330	07/20/01	15:11
51	26	490,192.953	6,497,639.478	980.493	07/20/01	15:15
52	27	489,812.451	6,497,965.323	995.731	07/20/01	15:18
53	28	489,618.494	6,498,129.012	1,001.958	07/20/01	15:21
54	29	489,235.885	6,498,450.267	1,013.865	07/20/01	15:25
55	30	488,848.705	6,498,769.074	1,028.905	07/20/01	15:28
56	31	488,470.905	6,499,100.943	1,042.003	07/20/01	15:32
57	32	488,098.863	6,499,436.694	1,051.968	07/20/01	15:35
58	33	487,723.759	6,499,767.147	1,063.444	07/20/01	15:39
59	34	487,348.857	6,500,100.881	1,077.112	07/20/01	15:43
60	35	486,999.337	6,500,455.616	1,089.746	07/20/01	16:04
61	36	486,652.303	6,500,815.688	1,103.519	07/20/01	16:08
62	37	486,312.190	6,501,181.199	1,116.775	07/20/01	16:12
63	38	485,985.389	6,501,559.484	1,126.531	07/20/01	16:15
64	39	485,675.875	6,501,949.593	1,132.674	07/21/01	11:00
65	40	485,364.369	6,502,341.673	1,140.558	07/21/01	11:08
66	41	485,064.950	6,502,746.478	1,150.419	07/21/01	11:12
67	42	484,784.380	6,503,161.041	1,164.018	07/21/01	11:18

LONGITUDINAL A (TAKU/MATTHES/LLEWELLYN GLACIERS) — EPOCH 0						
NEW FLAG #	OLD FLAG #	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
68	43	484,537.175	6,503,595.758	1,181.943	07/21/01	11:22
69	44	484,290.190	6,503,967.963	1,198.965	07/21/01	11:27
70	45	484,084.564	6,504,426.690	1,211.115	07/21/01	11:40
71	46	483,954.437	6,504,907.871	1,218.617	07/21/01	11:54
72	47	483,910.898	6,505,404.185	1,223.451	07/21/01	11:59
73	48	483,900.198	6,505,903.502	1,228.037	07/21/01	13:14
74	49	483,952.561	6,506,402.367	1,238.983	07/21/01	13:19
75	50	484,058.022	6,506,888.876	1,260.673	07/21/01	13:23
76	51	484,277.656	6,507,336.925	1,279.524	07/21/01	13:28
77	52	484,569.024	6,507,741.207	1,297.502	07/21/01	13:32
78	53	484,851.900	6,508,149.951	1,313.835	07/21/01	13:36
79	54	485,108.809	6,508,581.960	1,323.096	07/21/01	13:40
80	55	485,356.202	6,509,017.561	1,333.596	07/21/01	13:46
81	56	485,598.043	6,509,453.915	1,347.807	08/01/01	13:01
82	57	485,844.252	6,509,890.081	1,360.449	08/01/01	13:04
83	58	486,093.574	6,510,323.933	1,369.015	08/01/01	13:08
84	59	486,352.610	6,510,750.539	1,376.809	08/01/01	13:11
85	60	486,622.631	6,511,171.179	1,388.692	08/01/01	13:14
86	61	486,907.902	6,511,581.934	1,401.524	08/01/01	13:17
87	62	487,209.567	6,511,979.632	1,412.320	08/01/01	13:20
88	63	487,519.864	6,512,370.110	1,428.245	08/01/01	13:25
89	64	487,829.390	6,512,765.134	1,445.305	08/01/01	13:28
90	65	488,126.962	6,513,166.696	1,458.678	08/01/01	13:31
91	66	488,414.237	6,513,574.612	1,469.438	08/01/01	13:33
92	67	488,676.886	6,513,997.129	1,478.991	08/01/01	13:36
93	68	488,896.232	6,514,444.890	1,491.508	08/01/01	13:38
94	69	489,045.297	6,514,919.176	1,504.886	08/01/01	13:44
95	70	489,154.789	6,515,405.878	1,516.566	08/01/01	13:47
96	71	489,161.526	6,515,901.225	1,525.539	08/01/01	13:49
97	72	489,071.851	6,516,388.674	1,539.413	08/01/01	13:52
98	73	488,909.278	6,516,860.794	1,552.228	08/01/01	13:55
99	74	488,844.954	6,517,355.809	1,581.973	08/01/01	13:57
100	75	488,838.067	6,517,852.632	1,624.755	08/01/01	14:00
101	76	488,853.575	6,518,347.992	1,647.187	08/01/01	14:03
102	77	488,886.987	6,518,845.203	1,660.574	08/01/01	14:23
103	78	488,939.325	6,519,340.655	1,687.550	08/01/01	14:25
104	79	488,996.293	6,519,837.212	1,710.543	08/01/01	14:28
105	80	489,057.130	6,520,334.372	1,727.466	08/01/01	14:30
106	81	489,151.948	6,520,825.169	1,743.078	08/01/01	14:33
107	82	489,247.083	6,521,315.493	1,757.727	08/01/01	14:35
108	83	489,358.583	6,521,802.235	1,770.560	08/08/01	11:39

LONGITUDINAL A (TAKU/MATTHES/LLEWELLYN GLACIERS) — EPOCH 0						
NEW FLAG #	OLD FLAG #	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
109	84	489,506.361	6,522,278.132	1,782.436	08/08/01	11:55
110	85	489,654.314	6,522,754.722	1,795.953	08/08/01	11:58
111	86	489,809.012	6,523,229.595	1,809.928	08/08/01	12:02
112	87	489,978.971	6,523,699.626	1,823.421	08/08/01	12:04
113	88	490,149.133	6,524,168.109	1,834.177	08/08/01	12:07
114	89	490,319.248	6,524,637.646	1,843.934	08/08/01	12:10
115	90	490,495.293	6,525,103.029	1,852.973	08/08/01	12:12
116	91	490,706.941	6,525,556.221	1,862.290	08/05/01	13:39
117	92	490,917.380	6,526,008.624	1,869.940	08/05/01	13:35
118	93	491,128.137	6,526,461.048	1,873.065	08/05/01	13:30
119	94	491,337.755	6,526,912.869	1,874.378	08/05/01	13:21
120	95	491,548.834	6,527,365.355	1,872.841	08/05/01	13:19
121	96	491,759.331	6,527,818.794	1,867.374	08/05/01	13:16
122	97	491,966.170	6,528,271.320	1,862.648	08/05/01	13:12
123	98	492,172.469	6,528,724.390	1,858.944	08/05/01	13:10
124	99	492,387.991	6,529,173.619	1,854.736	08/05/01	13:07
125	100	492,602.189	6,529,625.703	1,848.427	08/05/01	13:03
126	101	492,813.767	6,530,075.868	1,840.895	08/05/01	12:55
127	102	493,026.931	6,530,526.840	1,834.065	08/05/01	12:52
128	103	493,214.349	6,530,990.068	1,825.715	08/05/01	12:46
129	104	493,394.127	6,531,455.755	1,814.483	08/05/01	12:43
130	105	493,567.726	6,531,923.872	1,804.141	08/05/01	12:40
131	106	493,730.855	6,532,395.676	1,796.230	08/05/01	12:37
132	107	493,894.668	6,532,868.700	1,785.236	08/05/01	12:34
133	108	494,017.295	6,533,351.821	1,774.043	08/05/01	12:31
134	109	494,140.628	6,533,836.154	1,766.119	08/05/01	12:28
135	110	494,263.738	6,534,319.168	1,755.839	08/05/01	12:24
136	111	494,386.549	6,534,801.756	1,744.511	08/05/01	12:07
137	112	494,514.933	6,535,284.707	1,733.041	08/05/01	12:04
138	113	494,639.456	6,535,767.638	1,720.538	08/05/01	12:01
139	114	494,743.679	6,536,255.837	1,703.934	08/05/01	11:58
140	115	494,848.563	6,536,743.897	1,688.713	08/05/01	11:56
141	116	494,952.635	6,537,229.419	1,681.350	08/05/01	11:53
142	117	495,045.488	6,537,721.198	1,673.371	08/05/01	11:45
143	118	495,109.468	6,538,214.241	1,660.795	08/05/01	11:43
144	119	495,173.309	6,538,708.716	1,646.446	08/05/01	11:40
145	120	495,237.166	6,539,201.839	1,633.172	08/05/01	11:37
146	121	495,301.374	6,539,697.417	1,618.888	08/05/01	11:34
147	122	No data	No data	No data	No data	No data

The flag numbers for Longitudinal A were reassigned this year. This was necessary because the original numbering system began with Flag 1 at the present Taku Glacier terminus. The new numbering system begins with Flag 1 at the bedrock of Taku Point, across the Taku River from the terminus. This will allow the continued use of the new numbering system even as the Taku advances or recedes in the future.

LONGITUDINAL A (TAKU/MATTHES/LLEWELLYN GLACIERS) — EPOCH 1						
NEW FLAG #	OLD FLAG #	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
28	3	495,230.530	6,487,891.710	662.762	07/23/01	15:18
29	4	494,858.098	6,488,227.343	679.578	07/23/01	14:59
30	5	494,455.521	6,488,522.475	694.569	07/23/01	14:52
31	6	494,033.002	6,488,790.918	709.035	07/23/01	14:47
32	7	493,644.973	6,489,103.275	724.852	07/23/01	14:43
33	8	493,267.138	6,489,429.744	743.368	07/23/01	14:38
34	9	492,925.952	6,489,800.077	761.235	07/23/01	13:33
35	10	492,641.141	6,490,209.965	773.425	07/23/01	13:13
36	11	492,437.420	6,490,666.570	782.031	07/23/01	12:41
37	12	492,238.792	6,491,125.335	790.920	07/23/01	12:34

Only Flags 28-37 of Longitudinal A were surveyed a second time. This year was the first time that these points had been surveyed, so they were resurveyed in order to obtain velocity.

LONGITUDINAL B (DEMOREST GLACIER) — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
1	490,756.974	6,497,410.760	963.449	07/26/01	11:26
2	490,726.122	6,497,907.583	978.744	07/26/01	11:35
3	490,830.969	6,498,393.087	984.332	07/26/01	11:40
4	491,050.755	6,498,840.681	988.260	07/26/01	11:45
5	491,377.641	6,499,212.503	995.992	07/26/01	11:49
6	491,790.886	6,499,498.062	1,004.185	07/26/01	11:54
7	492,235.178	6,499,730.224	1,014.202	07/26/01	11:59
8	492,684.752	6,499,945.306	1,026.014	07/26/01	12:04
9	493,117.671	6,500,194.978	1,040.681	07/26/01	12:09
10	493,564.643	6,500,418.561	1,052.254	07/26/01	12:14
11	493,989.982	6,500,677.824	1,060.492	07/26/01	12:19
12	494,413.490	6,500,940.145	1,069.990	07/26/01	12:23
13	494,810.757	6,501,238.800	1,078.033	07/26/01	12:32
14	495,165.759	6,501,591.235	1,088.976	07/26/01	12:42
15	495,483.791	6,501,968.402	1,104.499	07/26/01	12:49
16	495,732.499	6,502,400.941	1,120.024	07/26/01	12:57
17	495,894.537	6,502,875.014	1,128.921	07/26/01	13:04
18	495,987.354	6,503,365.528	1,145.354	07/26/01	13:07
19	495,989.827	6,503,864.795	1,170.526	07/26/01	13:11
20	495,941.052	6,504,359.971	1,182.124	07/26/01	13:15
21	495,864.560	6,504,850.138	1,189.235	07/26/01	13:19
22	495,719.360	6,505,325.546	1,200.046	07/26/01	13:27
23	495,497.078	6,505,774.590	1,211.030	07/26/01	13:33
24	495,248.623	6,506,209.016	1,222.006	07/26/01	13:39
25	495,037.630	6,506,662.325	1,231.373	08/03/01	11:34
26	494,854.687	6,507,126.817	1,241.354	08/03/01	11:29
27	494,690.332	6,507,599.212	1,255.820	08/03/01	11:25
28	494,530.510	6,508,074.701	1,266.113	08/03/01	11:20
29	494,391.233	6,508,553.258	1,267.691	08/03/01	11:16
30	494,281.880	6,509,041.128	1,288.876	08/03/01	11:07
31	494,193.195	6,509,530.180	1,312.604	08/03/01	11:04
32	494,177.440	6,510,028.876	1,332.432	08/03/01	11:01
33	494,192.461	6,510,525.600	1,345.917	08/03/01	10:59
34	494,282.624	6,511,013.727	1,354.113	08/03/01	10:55

LONGITUDINAL C (TAKU SW BRANCH) — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
1	489,153.809	6,498,307.544	1,018.130	07/25/01	14:48
2	488,654.906	6,498,351.015	1,031.353	07/25/01	14:59
3	488,156.899	6,498,317.744	1,037.812	07/25/01	15:09
4	487,670.895	6,498,185.777	1,042.682	07/25/01	15:17
5	487,235.704	6,497,941.826	1,046.631	07/25/01	15:22
6	486,870.029	6,497,605.917	1,055.014	07/25/01	15:26
7	486,548.767	6,497,225.969	1,065.677	07/25/01	15:30
8	486,232.735	6,496,840.986	1,075.247	07/25/01	15:41
9	485,914.554	6,496,458.309	1,086.721	07/25/01	15:46
10	485,611.454	6,496,063.039	1,096.891	07/25/01	15:50
11	485,307.455	6,495,666.556	1,111.986	07/25/01	15:54
12	485,006.245	6,495,264.229	1,126.073	07/25/01	16:00
13	484,718.189	6,494,857.236	1,134.601	07/25/01	16:07
14	484,440.975	6,494,443.191	1,145.713	07/25/01	16:17
15	484,156.924	6,494,031.933	1,159.555	07/25/01	16:22
16	483,873.516	6,493,618.847	1,168.899	07/25/01	16:27
17	483,597.213	6,493,204.584	1,178.631	07/25/01	16:37
18	483,320.296	6,492,786.812	1,188.177	07/25/01	16:42
19	483,039.283	6,492,369.678	1,200.750	07/25/01	16:46
20	482,758.809	6,491,957.603	1,211.521	07/25/01	16:51
21	482,477.833	6,491,544.731	1,220.719	07/25/01	16:57
22	482,198.009	6,491,133.963	1,230.694	07/25/01	17:02
23	481,915.336	6,490,721.166	1,240.868	07/25/01	17:07
24	481,634.045	6,490,308.903	1,248.174	07/25/01	17:11
25	481,359.857	6,489,890.123	1,255.829	07/25/01	17:15
26	481,087.121	6,489,472.597	1,267.226	07/25/01	17:19
27	480,807.389	6,489,056.342	1,275.983	07/25/01	17:23
28	480,545.104	6,488,669.598	1,274.830	07/25/01	17:28

LONGITUDINAL D (TAKU NORTHWEST BRANCH) — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
1	483,965.198	6,504,345.588	1,208.551	07/28/01	11:16
2	483,617.811	6,504,705.162	1,213.764	07/28/01	11:22
3	483,260.827	6,505,053.181	1,221.167	07/28/01	11:25
4	482,878.584	6,505,374.433	1,231.619	07/28/01	11:29
5	482,486.281	6,505,682.773	1,242.181	07/28/01	11:32
6	482,085.076	6,505,979.635	1,251.078	07/28/01	11:35
7	481,672.922	6,506,262.792	1,257.120	07/28/01	11:38
8	481,252.568	6,506,529.849	1,268.199	07/28/01	11:42
9	480,838.469	6,506,756.439	1,279.460	07/28/01	11:45
10	480,392.870	6,506,982.462	1,288.768	07/28/01	13:33
11	479,914.760	6,507,132.078	1,298.172	07/28/01	13:36
12	479,426.659	6,507,236.809	1,308.910	07/28/01	13:38
13	478,939.317	6,507,330.641	1,320.794	07/28/01	13:41
14	478,448.481	6,507,421.309	1,330.505	07/28/01	14:02
15	477,957.459	6,507,505.490	1,338.338	07/28/01	14:06
16	477,471.034	6,507,579.854	1,347.805	07/28/01	14:09
17	476,984.168	6,507,457.935	1,357.277	07/28/01	14:13
18	476,520.843	6,507,275.387	1,366.226	07/28/01	14:17
19	476,094.206	6,507,016.407	1,377.981	07/28/01	14:21
20	475,687.381	6,506,727.948	1,391.308	07/28/01	14:25
21	475,308.937	6,506,402.201	1,400.877	07/28/01	14:28
22	474,995.153	6,506,014.747	1,409.985	07/28/01	14:32
23	474,802.539	6,505,552.350	1,423.044	07/28/01	16:10
24	474,782.393	6,505,051.370	1,437.806	07/28/01	16:14
25	474,829.564	6,504,555.451	1,450.069	07/28/01	16:17
26	474,966.852	6,504,076.837	1,458.941	07/28/01	16:21
27	475,116.445	6,503,601.620	1,465.775	07/28/01	16:24
28	475,288.470	6,503,132.810	1,473.005	07/28/01	16:28
29	475,490.553	6,502,675.758	1,479.851	07/28/01	16:42
30	475,691.726	6,502,217.791	1,481.749	07/28/01	16:49
31	475,854.276	6,501,743.200	1,497.531	07/29/01	11:49
32	476,000.706	6,501,264.410	1,513.465	07/29/01	11:52
33	476,115.985	6,500,778.536	1,524.006	07/29/01	11:55
34	476,194.752	6,500,283.479	1,532.007	07/29/01	11:59
35	476,239.171	6,499,783.022	1,538.986	07/29/01	12:05
36	476,258.539	6,499,282.764	1,546.346	07/29/01	12:09
37	476,229.471	6,498,784.339	1,555.755	07/29/01	12:12
38	476,128.065	6,498,295.386	1,564.754	07/29/01	12:16
39	476,037.200	6,497,802.371	1,572.894	07/29/01	12:22
40	476,010.845	6,497,300.470	1,579.433	07/29/01	12:26

LONGITUDINAL D (TAKU NORTHWEST BRANCH) — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
41	476,029.187	6,496,797.708	1,588.343	07/29/01	12:29
42	476,058.246	6,496,300.400	1,599.398	07/29/01	12:34
43	476,117.310	6,495,804.953	1,609.921	07/29/01	12:39
44	476,205.534	6,495,311.449	1,606.329	07/29/01	12:43
45	476,330.060	6,494,826.524	1,594.009	07/29/01	12:49
46	476,456.198	6,494,341.923	1,588.766	07/29/01	12:54
47	476,589.670	6,493,861.259	1,575.357	07/29/01	12:57
48	476,734.373	6,493,381.578	1,564.465	07/29/01	13:03

LONGITUDINAL D (TAKU NORTHWEST BRANCH) — EPOCH 1					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
15	477,960.222	6,507,505.226	1,337.739	08/07/01	9:47
16	477,473.753	6,507,579.815	1,347.216	08/07/01	9:50
17	476,986.865	6,507,458.248	1,356.723	08/07/01	9:53
18	476,523.397	6,507,276.070	1,365.684	08/07/01	9:56
19	476,096.614	6,507,017.314	1,377.370	08/07/01	9:59
20	475,689.633	6,506,729.054	1,390.589	08/07/01	10:01
21	475,310.957	6,506,403.403	1,400.186	08/07/01	10:04
22	474,996.768	6,506,016.176	1,409.293	08/07/01	10:06
23	474,803.360	6,505,553.988	1,422.414	08/07/01	10:09
24	474,782.563	6,505,052.995	1,437.232	08/07/01	10:12
25	474,829.390	6,504,556.887	1,449.558	08/07/01	10:14
26	474,966.486	6,504,078.063	1,458.462	08/07/01	10:17
27	475,116.062	6,503,602.472	1,465.190	08/07/01	10:21
28	475,288.094	6,503,133.478	1,472.402	08/07/01	10:25
29	475,490.261	6,502,676.341	1,479.251	08/07/01	10:27
30	475,691.513	6,502,218.269	1,481.211	08/07/01	10:30
31	475,854.155	6,501,743.607	1,497.032	08/07/01	10:32
32	476,000.618	6,501,265.116	1,512.981	08/07/01	10:46
33	476,115.985	6,500,779.204	1,523.449	08/07/01	10:51
34	476,194.849	6,500,284.151	1,531.503	08/07/01	10:54
35	476,239.257	6,499,783.633	1,538.600	08/07/01	10:56
36	476,258.656	6,499,283.376	1,545.865	08/07/01	10:59
37	476,229.534	6,498,784.919	1,555.323	08/07/01	11:05
38	476,128.059	6,498,295.913	1,564.380	08/07/01	11:24
39	476,037.186	6,497,802.793	1,572.392	08/07/01	11:26
40	476,010.850	6,497,300.779	1,578.895	08/07/01	11:29
41	476,029.220	6,496,797.971	1,587.912	08/07/01	11:31
42	476,058.203	6,496,300.572	1,598.910	08/07/01	11:34
43	476,117.226	6,495,804.986	1,609.398	08/07/01	11:36
44	476,205.568	6,495,311.338	1,605.791	08/07/01	11:38
45	476,330.096	6,494,826.294	1,593.410	08/07/01	11:40
46	476,456.066	6,494,341.383	1,588.158	08/07/01	11:43
47	476,589.438	6,493,860.585	1,574.761	08/07/01	11:51
48	476,734.018	6,493,380.888	1,563.774	08/07/01	11:55

LONGITUDINAL E (TAKU WEST BRANCH) — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
1	475,171.608	6,503,106.364	1,472.272	07/29/01	13:46
2	475,151.770	6,502,607.001	1,480.695	07/29/01	14:04
3	474,980.751	6,502,137.086	1,486.923	07/29/01	14:07
4	474,761.437	6,501,689.438	1,492.917	07/29/01	14:12
5	474,507.725	6,501,258.496	1,499.269	07/29/01	14:16
6	474,220.474	6,500,848.766	1,510.000	07/29/01	14:19
7	473,889.613	6,500,476.214	1,517.650	07/29/01	14:23
8	473,529.854	6,500,127.702	1,524.599	07/29/01	14:31
9	473,161.846	6,499,790.882	1,529.260	07/29/01	14:44
10	472,744.198	6,499,520.473	1,537.161	07/29/01	15:00
11	472,298.026	6,499,299.424	1,539.328	07/29/01	15:04
12	471,847.592	6,499,088.159	1,535.091	07/29/01	15:07
13	471,420.015	6,498,831.304	1,530.120	07/29/01	15:11
14	471,027.333	6,498,521.724	1,525.261	07/29/01	15:15

LONGITUDINAL E (TAKU WEST BRANCH) — EPOCH 1					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
1	475,171.274	6,503,107.223	1,471.751	08/07/01	12:24
2	475,151.542	6,502,607.833	1,480.202	08/07/01	12:27
3	474,980.712	6,502,137.783	1,486.400	08/07/01	12:30
4	474,761.559	6,501,689.991	1,492.463	08/07/01	12:32
5	474,507.891	6,501,258.832	1,498.771	08/07/01	12:34
6	474,220.666	6,500,849.047	1,509.514	08/07/01	12:37
7	473,889.764	6,500,476.402	1,517.131	08/07/01	12:39
8	473,529.974	6,500,127.896	1,524.070	08/07/01	12:43
9	473,161.915	6,499,791.118	1,528.770	08/07/01	12:47
10	472,744.254	6,499,520.573	1,536.632	08/07/01	12:49
11	472,298.014	6,499,299.377	1,538.772	08/07/01	12:51
12	471,847.527	6,499,088.013	1,534.603	08/07/01	12:54
13	471,419.933	6,498,831.088	1,529.639	08/07/01	12:56
14	471,027.217	6,498,521.452	1,524.692	08/07/01	13:02

LONGITUDINAL F (TAKU WEST BRANCH) — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
1	476,975.806	6,507,646.349	1,357.243	07/30/01	11:26
2	476,481.560	6,507,690.376	1,365.265	07/30/01	11:30
3	475,982.385	6,507,716.506	1,373.524	07/30/01	11:32
4	475,483.238	6,507,736.241	1,379.536	07/30/01	11:41
5	474,983.054	6,507,742.568	1,390.658	07/30/01	11:44
6	474,484.858	6,507,748.759	1,415.562	07/30/01	11:47
7	473,985.821	6,507,754.821	1,430.823	07/30/01	11:50
8	473,486.541	6,507,758.806	1,439.411	07/30/01	11:53
9	472,988.546	6,507,762.983	1,445.464	07/30/01	11:57
10	472,488.234	6,507,767.602	1,454.242	07/30/01	12:00
11	471,991.218	6,507,752.028	1,462.674	07/30/01	12:02
12	471,493.012	6,507,736.693	1,472.515	07/30/01	12:05
13	470,998.878	6,507,664.063	1,482.867	07/30/01	12:07
14	470,544.123	6,507,456.571	1,491.363	07/30/01	12:09
15	470,145.700	6,507,155.790	1,499.581	07/30/01	12:12
16	469,813.064	6,506,784.619	1,509.211	07/30/01	12:15
17	469,607.214	6,506,328.670	1,515.704	07/30/01	12:18
18	469,467.325	6,505,846.705	1,522.175	07/30/01	12:22
19	469,384.584	6,505,351.453	1,533.978	07/30/01	12:25
20	469,338.025	6,504,853.294	1,543.631	07/30/01	12:30
21	469,281.367	6,504,353.316	1,551.313	07/30/01	13:57
22	469,215.193	6,503,857.287	1,561.899	07/30/01	13:08
23	469,088.899	6,503,373.280	1,569.759	07/30/01	13:15
24	468,872.376	6,502,919.464	1,574.105	07/30/01	13:18
25					
26	468,219.011	6,502,170.187	1,583.951	07/30/01	13:36

LONGITUDINAL F (TAKU WEST BRANCH) — EPOCH 1					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
15	470,146.201	6,507,156.227	1,499.165	08/06/01	15:55
16	469,813.452	6,506,785.112	1,508.815	08/06/01	15:58
17	469,607.474	6,506,329.155	1,515.355	08/06/01	16:06
18	469,467.496	6,505,847.207	1,521.778	08/06/01	16:09
19	469,384.717	6,505,351.964	1,533.540	08/06/01	16:12
20	469,338.136	6,504,853.714	1,543.224	08/06/01	16:19
21	469,281.486	6,504,353.702	1,550.974	08/06/01	16:24
22	469,215.262	6,503,857.620	1,561.504	08/06/01	16:27
23	469,088.831	6,503,373.593	1,569.400	08/06/01	16:31
24	468,872.347	6,502,919.671	1,573.708	08/06/01	16:34
25	468,586.174	6,502,508.721	1,580.842	08/06/01	16:40
26	468,218.886	6,502,170.275	1,583.617	08/06/01	16:43

LONGITUDINAL G (TAKU WEST BRANCH) — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
1	480,544.969	6,507,163.343	1,287.340	07/28/01	13:12
2	480,479.315	6,507,659.966	1,292.001	07/28/01	11:54
3	480,465.304	6,508,159.416	1,293.769	07/28/01	12:00
4	480,469.028	6,508,658.368	1,299.134	07/28/01	12:05
5	480,472.602	6,509,157.336	1,307.643	07/28/01	12:10
6	480,482.851	6,509,657.088	1,316.331	07/28/01	12:14
7	480,531.759	6,510,156.203	1,324.699	07/28/01	12:17
8	480,587.276	6,510,655.658	1,331.919	07/28/01	12:22
9	480,377.236	6,511,117.265	1,338.509	07/28/01	12:39
10	480,182.393	6,511,570.297	1,341.909	07/28/01	12:50
11	479,984.954	6,512,020.628	1,342.132	07/28/01	12:53

LONGITUDINAL G (TAKU WEST BRANCH) — EPOCH 1					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
1	480,547.582	6,507,162.358	1,286.796	08/06/01	11:50
2	480,481.791	6,507,659.068	1,291.485	08/06/01	11:56
3	480,466.881	6,508,158.692	1,293.280	08/06/01	12:00
4	480,469.577	6,508,657.880	1,298.678	08/06/01	12:05
5	480,472.777	6,509,156.934	1,307.242	08/06/01	12:08
6	480,482.892	6,509,656.744	1,315.884	08/06/01	12:11
7	480,531.710	6,510,155.927	1,324.255	08/06/01	12:20
8	480,587.172	6,510,655.398	1,331.434	08/06/01	12:25
9	480,377.076	6,511,117.031	1,338.000	08/06/01	12:28
10	480,182.192	6,511,570.165	1,341.482	08/06/01	12:31
11	479,984.798	6,512,020.540	1,341.668	08/06/01	12:33

VAUGHAN LEWIS LONGITUDINAL (GILKEY TRENCH) — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
1	482,797.778	6,523,674.641	1,087.788	08/10/01	11:18
2	482,791.089	6,523,675.060	1,089.255	08/10/01	11:19
3	482,784.463	6,523,675.729	1,090.146	08/10/01	11:20
4	482,777.910	6,523,676.645	1,091.200	08/10/01	11:21
5	482,771.473	6,523,676.596	1,092.668	08/10/01	11:22
6	482,764.950	6,523,676.823	1,094.185	08/10/01	11:22
7	482,757.814	6,523,676.908	1,095.297	08/10/01	11:23
8	482,749.906	6,523,677.381	1,095.930	08/10/01	11:23
9	482,741.914	6,523,677.750	1,096.412	08/10/01	11:43
10	482,735.821	6,523,678.469	1,095.357	08/10/01	11:44
11	482,728.556	6,523,678.717	1,094.624	08/10/01	11:44
12	482,721.557	6,523,678.960	1,093.714	08/10/01	11:45
13	482,714.922	6,523,678.184	1,092.716	08/10/01	11:46
14	482,708.353	6,523,677.592	1,091.765	08/10/01	11:46
15	482,701.063	6,523,677.132	1,090.487	08/10/01	11:47
16	482,693.433	6,523,676.910	1,088.952	08/10/01	11:47
17	482,685.752	6,523,676.753	1,087.480	08/10/01	11:47
18	482,678.545	6,523,676.933	1,085.727	08/10/01	11:48
19	482,671.026	6,523,677.066	1,083.530	08/10/01	11:48
20	482,662.744	6,523,676.840	1,081.190	08/10/01	11:49
21	482,656.177	6,523,677.319	1,081.029	08/11/01	12:03
21a	482,655.195	6,523,687.879	1,081.004	08/11/01	12:08
22	482,650.338	6,523,676.414	1,081.198	08/10/01	11:52
23	482,643.455	6,523,676.192	1,082.786	08/10/01	12:12
24	482,635.613	6,523,676.353	1,084.185	08/10/01	12:12
25	482,627.811	6,523,676.296	1,085.343	08/10/01	12:13
26	482,619.774	6,523,675.376	1,085.826	08/10/01	12:13
27	482,611.605	6,523,674.152	1,086.277	08/10/01	12:14
28	482,603.786	6,523,673.176	1,086.137	08/10/01	12:14
29	482,596.541	6,523,671.555	1,085.753	08/10/01	12:16
30	482,588.226	6,523,670.334	1,084.924	08/10/01	12:16
31	482,580.270	6,523,669.549	1,083.894	08/10/01	12:17
32	482,571.456	6,523,668.181	1,081.954	08/10/01	12:17
33	482,564.236	6,523,666.731	1,080.184	08/10/01	12:18
34	482,557.740	6,523,665.804	1,078.427	08/10/01	12:18
35	482,554.087	6,523,665.272	1,077.271	08/10/01	12:19
36	482,535.470	6,523,663.164	1,071.742	08/11/01	13:31
37	482,525.500	6,523,660.306	1,072.118	08/10/01	12:24
38	482,520.856	6,523,658.591	1,073.727	08/10/01	12:27
39	482,515.174	6,523,656.759	1,075.355	08/10/01	12:27

VAUGHAN LEWIS LONGITUDINAL (GILKEY TRENCH) — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
40	482,509.386	6,523,655.038	1,076.453	08/10/01	12:28
41	482,502.425	6,523,652.607	1,077.418	08/10/01	12:28
42	482,494.576	6,523,650.218	1,078.416	08/10/01	12:29
43	482,486.910	6,523,647.326	1,079.077	08/10/01	12:29
44	482,479.071	6,523,644.040	1,078.855	08/10/01	12:30
45	482,471.419	6,523,641.203	1,078.702	08/10/01	12:32
46	482,464.053	6,523,640.315	1,077.694	08/10/01	12:32
47	482,456.230	6,523,639.609	1,076.533	08/10/01	12:33
48	482,448.094	6,523,638.849	1,075.027	08/10/01	12:34
49	482,440.748	6,523,637.540	1,073.375	08/10/01	12:39
50	482,434.498	6,523,636.541	1,071.551	08/10/01	12:40
51	482,429.629	6,523,634.714	1,069.946	08/10/01	12:41
52	482,422.297	6,523,632.695	1,063.783	08/11/01	14:57
53	482,417.230	6,523,630.508	1,063.729	08/11/01	15:01
54	482,402.452	6,523,632.095	1,063.986	08/10/01	12:47
55	482,396.334	6,523,630.226	1,065.564	08/10/01	12:48
56	482,390.461	6,523,628.162	1,066.836	08/10/01	12:49
57	482,385.280	6,523,626.441	1,068.184	08/10/01	12:50
58	482,378.579	6,523,623.603	1,069.435	08/10/01	12:50
59	482,370.485	6,523,621.762	1,070.115	08/10/01	12:53
60	482,363.018	6,523,618.748	1,070.853	08/10/01	12:54
61	482,355.193	6,523,616.484	1,071.269	08/10/01	12:54
62	482,347.981	6,523,614.477	1,071.147	08/10/01	12:55
63	482,340.201	6,523,611.987	1,071.048	08/10/01	12:56
64	482,332.777	6,523,609.102	1,070.812	08/10/01	12:57
65	482,325.993	6,523,606.665	1,070.224	08/10/01	12:57
66	482,319.755	6,523,604.540	1,069.398	08/10/01	12:59
67	482,311.763	6,523,602.296	1,068.318	08/10/01	12:59
68	482,304.628	6,523,600.204	1,066.789	08/10/01	12:59
69	482,297.616	6,523,597.784	1,065.509	08/10/01	13:00
70	482,290.830	6,523,595.632	1,064.087	08/10/01	13:01
71	482,283.911	6,523,594.330	1,062.658	08/10/01	13:01
72	482,276.664	6,523,592.755	1,061.000	08/10/01	13:07
73	482,270.553	6,523,591.872	1,058.592	08/10/01	13:09
74	482,262.480	6,523,591.189	1,057.948	08/10/01	13:11
75	482,253.813	6,523,588.216	1,058.183	08/10/01	13:11
76	482,246.056	6,523,584.302	1,059.460	08/10/01	13:12
77	482,239.644	6,523,581.150	1,059.710	08/10/01	13:12
78	482,232.713	6,523,577.847	1,060.253	08/10/01	13:13
79	482,225.276	6,523,577.389	1,060.880	08/10/01	13:13
80	482,218.142	6,523,573.289	1,061.932	08/10/01	13:14

VAUGHAN LEWIS LONGITUDINAL (GILKEY TRENCH) — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
81	482,211.272	6,523,570.467	1,062.244	08/10/01	13:14
82	482,202.915	6,523,568.884	1,062.213	08/10/01	13:15
83	482,194.630	6,523,567.918	1,062.003	08/10/01	13:16
84	482,186.572	6,523,565.417	1,061.630	08/10/01	13:17
85	482,178.315	6,523,562.647	1,061.238	08/10/01	13:17
86	482,170.905	6,523,559.689	1,060.480	08/10/01	13:18
87	482,163.533	6,523,556.679	1,059.441	08/10/01	13:18
88	482,156.506	6,523,552.529	1,058.227	08/10/01	13:19
89	482,150.459	6,523,548.877	1,057.001	08/10/01	13:20
90	482,144.143	6,523,545.074	1,055.601	08/10/01	13:20
91	482,136.367	6,523,542.404	1,054.059	08/10/01	13:21
92	482,129.496	6,523,542.310	1,052.850	08/10/01	13:21
93	482,121.803	6,523,541.599	1,051.510	08/10/01	13:22
94	482,114.441	6,523,538.201	1,050.337	08/10/01	13:22
95	482,107.878	6,523,534.878	1,049.527	08/10/01	13:23
96	482,101.603	6,523,532.748	1,049.075	08/10/01	13:23
97	482,094.049	6,523,531.961	1,048.069	08/10/01	13:24
98	482,085.721	6,523,531.236	1,047.020	08/10/01	13:24
99	482,078.276	6,523,529.076	1,047.176	08/10/01	13:25
100	482,071.940	6,523,524.168	1,047.711	08/10/01	13:27
101	482,064.402	6,523,520.145	1,048.636	08/10/01	13:27
102	482,056.266	6,523,518.192	1,049.012	08/10/01	13:28
103	482,048.205	6,523,514.768	1,049.320	08/10/01	13:28
104	482,038.733	6,523,513.151	1,049.282	08/10/01	13:29
105	482,030.070	6,523,508.802	1,049.135	08/10/01	13:30
106	482,022.142	6,523,507.234	1,048.777	08/10/01	16:11
107	482,014.565	6,523,504.067	1,048.441	08/10/01	16:12
108	482,006.522	6,523,500.127	1,047.883	08/10/01	16:12
109	482,000.176	6,523,495.415	1,047.080	08/10/01	16:13
110	481,992.281	6,523,491.113	1,046.161	08/10/01	16:13
111	481,984.863	6,523,487.588	1,045.058	08/10/01	16:14
112	481,976.528	6,523,484.363	1,043.625	08/10/01	16:14
113	481,969.612	6,523,480.419	1,042.400	08/10/01	16:15
114	481,961.849	6,523,477.685	1,041.051	08/10/01	16:15
115	481,953.483	6,523,474.729	1,039.476	08/10/01	16:16
116	481,945.749	6,523,471.599	1,038.581	08/10/01	16:16
117	481,938.084	6,523,467.445	1,037.651	08/10/01	16:16
118	481,930.668	6,523,461.694	1,037.253	08/10/01	16:20
119	481,923.494	6,523,456.425	1,037.265	08/10/01	16:20
120	481,914.697	6,523,451.463	1,037.571	08/10/01	16:21
121	481,905.849	6,523,447.692	1,038.150	08/10/01	16:21

VAUGHAN LEWIS LONGITUDINAL (GILKEY TRENCH) — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
122	481,896.984	6,523,444.744	1,038.485	08/10/01	16:22
123	481,888.024	6,523,442.206	1,038.529	08/10/01	16:23
124	481,876.468	6,523,437.310	1,038.794	08/10/01	16:24
125	481,865.643	6,523,435.957	1,038.374	08/10/01	16:25
126	481,856.932	6,523,430.959	1,038.050	08/10/01	16:25
127	481,845.166	6,523,427.566	1,037.371	08/10/01	16:27
128	481,836.832	6,523,425.476	1,036.894	08/10/01	16:27
129	481,827.771	6,523,423.189	1,036.309	08/10/01	16:27
130	481,818.679	6,523,420.102	1,035.465	08/10/01	16:28
131	481,808.333	6,523,419.889	1,034.487	08/10/01	16:29
132	481,800.655	6,523,417.551	1,033.791	08/10/01	16:30
133	481,790.582	6,523,414.610	1,032.557	08/10/01	16:30
134	481,782.110	6,523,410.990	1,031.365	08/10/01	16:31
135	481,773.042	6,523,409.000	1,030.497	08/10/01	16:31
136	481,764.584	6,523,408.799	1,029.665	08/10/01	16:32
137	481,756.673	6,523,407.591	1,028.840	08/10/01	16:32
138	481,748.841	6,523,406.405	1,028.080	08/10/01	16:32
139	481,740.162	6,523,405.544	1,027.228	08/10/01	16:33
140	481,726.465	6,523,405.342	1,026.593	08/10/01	16:35
141	481,719.057	6,523,402.417	1,026.063	08/10/01	16:35
142	481,705.345	6,523,397.823	1,026.928	08/10/01	16:37
143	481,694.400	6,523,387.998	1,028.162	08/10/01	16:37
144	481,682.651	6,523,378.047	1,029.038	08/10/01	16:38
145	481,669.336	6,523,368.986	1,029.212	08/10/01	16:39
146	481,655.454	6,523,360.747	1,028.910	08/10/01	16:41
147	481,639.064	6,523,357.337	1,027.895	08/10/01	16:42
148	481,623.385	6,523,353.535	1,026.391	08/10/01	16:42
149	481,605.645	6,523,353.218	1,024.588	08/10/01	16:43
150	481,589.799	6,523,351.024	1,022.760	08/10/01	16:43
151	481,574.163	6,523,347.266	1,021.195	08/10/01	16:44
152	481,557.187	6,523,344.674	1,020.696	08/10/01	16:44
153	481,544.619	6,523,335.678	1,021.078	08/10/01	16:45
154	481,535.713	6,523,322.518	1,021.617	08/10/01	16:45
155	481,525.937	6,523,313.049	1,022.347	08/10/01	16:46
156	481,514.032	6,523,304.512	1,022.777	08/10/01	16:47
157	481,499.674	6,523,297.169	1,022.492	08/10/01	16:47
158	481,484.814	6,523,291.904	1,021.942	08/10/01	16:49
159	481,469.853	6,523,290.733	1,021.022	08/10/01	16:49
160	481,454.756	6,523,288.102	1,019.587	08/10/01	16:50
161	481,438.654	6,523,285.381	1,017.919	08/10/01	16:50
162	481,425.515	6,523,280.010	1,016.530	08/10/01	16:51

VAUGHAN LEWIS LONGITUDINAL (GILKEY TRENCH) — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
163	481,411.882	6,523,276.553	1,014.893	08/10/01	16:52
164	481,391.878	6,523,274.427	1,014.235	08/10/01	16:54
165	481,377.267	6,523,267.042	1,014.673	08/10/01	16:55
166	481,362.091	6,523,262.375	1,015.545	08/10/01	16:56
167	481,345.706	6,523,261.213	1,015.799	08/10/01	16:56
168	481,330.968	6,523,259.985	1,015.336	08/10/01	16:58
169	481,314.942	6,523,260.152	1,014.117	08/10/01	16:58
170	481,298.032	6,523,261.253	1,012.590	08/10/01	16:59
171	481,281.961	6,523,260.648	1,011.076	08/10/01	16:59
172	481,266.095	6,523,259.689	1,009.585	08/10/01	17:00
173	481,252.807	6,523,253.489	1,008.867	08/10/01	17:00
174	481,239.319	6,523,243.980	1,008.779	08/10/01	17:08
175	481,226.130	6,523,230.758	1,008.750	08/10/01	17:08
176	481,212.430	6,523,218.967	1,008.923	08/10/01	17:09
177	481,197.572	6,523,210.691	1,008.950	08/10/01	17:10
178	481,181.583	6,523,203.196	1,008.742	08/10/01	17:10
179	481,166.955	6,523,194.379	1,008.355	08/10/01	17:11

GILKEY GLACIER — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
1	482,609.786	6,524,214.441	1,084.542	08/10/01	15:52
2	482,598.364	6,524,318.419	1,091.040	08/10/01	15:57
3	482,180.685	6,524,157.436	1,084.292	08/10/01	16:11
4	482,135.322	6,524,374.315	1,087.876	08/10/01	16:20
5	481,881.146	6,524,226.568	1,065.968	08/10/01	16:27
6	481,954.579	6,524,370.656	1,079.605	08/10/01	16:33
7	481,770.054	6,524,314.507	1,063.353	08/10/01	16:53
8	482,993.324	6,524,326.447	1,091.989	08/10/01	17:12
9	482,914.600	6,524,267.175	1,090.619	08/10/01	17:15

VAUGHAN LEWIS OGIVES— EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
wb1-1	482,789.875	6,523,855.133	1,092.359	08/10/01	11:02
wb1-2	482,751.690	6,523,736.577	1,093.586	08/10/01	11:09
wb1-3	482,754.809	6,523,600.255	1,101.714	08/10/01	11:48
wb1-4	482,787.452	6,523,508.947	1,107.820	08/10/01	11:43
wb2-1	482,635.333	6,523,820.108	1,088.441	08/10/01	12:15
wb2-2	482,607.153	6,523,691.319	1,086.172	08/10/01	12:11
wb2-3	482,674.744	6,523,510.540	1,099.330	08/10/01	12:02
wb3-1	482,516.246	6,523,811.890	1,087.740	08/10/01	12:55
wb3-2	482,476.707	6,523,692.423	1,080.922	08/10/01	12:49
wb3-3	482,543.645	6,523,535.853	1,088.721	08/10/01	12:40
wb3-4	482,628.912	6,523,448.099	1,095.842	08/10/01	12:34

VAUGHAN LEWIS OGIVES— EPOCH 1					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
wb1-1	482,789.505	6,523,855.220	1,092.327	08/11/01	11:10
wb1-2	482,751.319	6,523,736.694	1,093.508	08/11/01	11:49
wb1-3	482,754.441	6,523,600.388	1,101.668	08/11/01	11:46
wb1-4	482,787.084	6,523,509.081	1,107.747	08/11/01	11:43
wb2-1	482,634.990	6,523,820.119	1,088.395	08/11/01	12:40
wb2-2	482,606.775	6,523,691.414	1,086.072	08/11/01	12:36
wb2-3	482,674.383	6,523,510.618	1,099.227	08/11/01	12:30
wb3-1	482,515.883	6,523,811.829	1,087.697	08/11/01	12:50
wb3-2	482,476.301	6,523,692.362	1,080.863	08/11/01	12:56
wb3-3	482,543.279	6,523,535.880	1,088.688	08/11/01	13:09
wb3-4	482,628.561	6,523,448.157	1,095.802	08/11/01	13:05

TEST PITS — EPOCH 0			
LOCATION	Longitudinal C, Flag C-12	Head of Southwest Branch	Flat plateau north of C-16, west of Taku Towers
LATITUDE	58° 34' 27.7N	58° 31' 09.0 N	58° 37' 59.8 N
LONGITUDE	134° 15' 28.6" W	134° 19' 38.4" W	134° 26' 00.8" W
JIRP EASTING	484,992.036	480,924.843	474,816.927
JIRP NORTHING	6,495,285.388	6,489,155.072	6,501,900.540
DATE MEASURED	7/25/01	7/25/01	7/27/01

MATTHES / LLEWELLYN DIVIDE — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
1	489,364.811	6,528,392.252	1,941.340	08/13/01	11:44
2	489,364.814	6,528,392.243	1,941.321	08/13/01	11:44
3	489,364.812	6,528,392.249	1,941.327	08/13/01	11:44
4	489,364.809	6,528,392.253	1,941.341	08/13/01	11:44
5	489,381.540	6,528,400.670	1,941.012	08/13/01	11:44
6	489,411.202	6,528,383.860	1,936.915	08/13/01	11:45
7	489,440.760	6,528,352.217	1,932.733	08/13/01	11:45
8	489,480.584	6,528,321.584	1,927.008	08/13/01	11:45
9	489,532.783	6,528,298.799	1,919.987	08/13/01	11:45
10	489,597.325	6,528,275.961	1,910.279	08/13/01	11:45
11	489,669.648	6,528,254.288	1,896.214	08/13/01	11:45
12	489,735.608	6,528,234.492	1,884.245	08/13/01	11:46
13	489,800.019	6,528,216.056	1,876.647	08/13/01	11:46
14	489,870.454	6,528,195.041	1,873.397	08/13/01	11:46
15	489,965.546	6,528,169.818	1,873.534	08/13/01	11:46
16	490,067.220	6,528,145.015	1,876.065	08/13/01	11:46
17	490,112.272	6,528,134.155	1,873.279	08/13/01	11:47
18	490,142.026	6,528,127.738	1,873.703	08/13/01	11:47
19	490,200.436	6,528,116.743	1,874.494	08/13/01	11:47
20	490,268.992	6,528,100.458	1,875.325	08/13/01	11:47
21	490,351.390	6,528,080.548	1,875.930	08/13/01	11:47
22	490,435.993	6,528,057.733	1,876.294	08/13/01	11:47
23	490,520.146	6,528,034.621	1,876.337	08/13/01	11:48
24	490,607.172	6,528,014.586	1,876.172	08/13/01	11:48
25	490,694.650	6,527,997.627	1,875.836	08/13/01	11:48
26	490,783.218	6,527,979.242	1,875.497	08/13/01	11:48
27	490,871.191	6,527,962.856	1,875.053	08/13/01	11:48
28	490,955.196	6,527,943.930	1,875.337	08/13/01	11:49
29	491,075.853	6,527,917.581	1,874.906	08/13/01	11:49
30	491,075.866	6,527,917.695	1,875.020	08/13/01	11:49
31	491,075.867	6,527,917.718	1,874.964	08/13/01	11:49
32	491,076.110	6,527,919.055	1,874.091	08/13/01	11:49
33	491,109.429	6,527,913.032	1,873.989	08/13/01	11:49
34	491,173.085	6,527,900.328	1,873.682	08/13/01	11:50
35	491,246.143	6,527,883.882	1,873.115	08/13/01	11:50
36	491,325.445	6,527,867.526	1,872.469	08/13/01	11:50
37	491,404.492	6,527,852.228	1,871.784	08/13/01	11:50
38	491,487.456	6,527,835.464	1,870.931	08/13/01	11:50
39	491,574.385	6,527,818.443	1,869.959	08/13/01	11:50
40	491,662.272	6,527,801.821	1,868.989	08/13/01	11:51
41	491,802.053	6,527,770.709	1,868.697	08/13/01	11:51

MATTHES / LLEWELLYN DIVIDE — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
42	491,802.034	6,527,770.701	1,868.594	08/13/01	11:51
43	491,802.145	6,527,771.609	1,867.235	08/13/01	11:51
44	491,849.804	6,527,761.730	1,866.649	08/13/01	11:51
45	491,934.713	6,527,745.070	1,865.586	08/13/01	11:52
46	492,022.084	6,527,726.380	1,865.662	08/13/01	11:52
47	492,068.018	6,527,717.065	1,865.417	08/13/01	11:52
48	492,068.175	6,527,718.104	1,864.054	08/13/01	11:52
49	492,114.793	6,527,708.479	1,863.310	08/13/01	11:52
50	492,186.581	6,527,693.144	1,862.195	08/13/01	11:52
51	492,260.745	6,527,676.910	1,861.004	08/13/01	11:53
52	492,335.623	6,527,660.730	1,859.706	08/13/01	11:53
53	492,410.223	6,527,646.764	1,858.413	08/13/01	11:53
54	492,482.828	6,527,632.322	1,857.089	08/13/01	11:53
55	492,556.071	6,527,616.255	1,855.793	08/13/01	11:53
56	492,632.990	6,527,600.870	1,854.293	08/13/01	11:53
57	492,708.402	6,527,583.839	1,852.694	08/13/01	11:54
58	492,851.755	6,527,550.688	1,849.819	08/13/01	11:55
59	492,895.161	6,527,539.806	1,848.734	08/13/01	11:55
60	492,968.808	6,527,522.878	1,846.888	08/13/01	11:55
61	493,048.021	6,527,506.431	1,844.949	08/13/01	11:55
62	493,129.326	6,527,487.851	1,843.044	08/13/01	11:55
63	493,209.575	6,527,470.099	1,841.162	08/13/01	11:55
64	493,290.859	6,527,452.136	1,838.960	08/13/01	11:56
65	493,371.476	6,527,433.603	1,836.401	08/13/01	11:56
66	493,456.029	6,527,415.454	1,833.320	08/13/01	11:56
67	493,540.404	6,527,398.015	1,830.154	08/13/01	11:56
68	493,625.234	6,527,378.795	1,827.063	08/13/01	11:56
69	493,709.458	6,527,357.321	1,824.322	08/13/01	11:56
70	493,793.515	6,527,338.874	1,821.947	08/13/01	11:57
71	493,875.274	6,527,319.614	1,819.602	08/13/01	11:57
72	493,956.955	6,527,297.754	1,817.460	08/13/01	11:57
73	494,039.973	6,527,277.204	1,815.401	08/13/01	11:57
74	494,123.440	6,527,256.497	1,813.258	08/13/01	11:57
75	494,209.798	6,527,235.168	1,810.873	08/13/01	11:57
76	494,242.960	6,527,226.881	1,810.030	08/13/01	11:58
77	494,307.008	6,527,210.629	1,808.256	08/13/01	11:58
78	494,386.574	6,527,190.884	1,805.874	08/13/01	11:58
79	494,473.002	6,527,169.129	1,803.522	08/13/01	11:58
80	494,561.380	6,527,146.318	1,801.395	08/13/01	11:58
81	494,651.520	6,527,126.117	1,799.780	08/13/01	11:58
82	494,739.670	6,527,107.460	1,798.857	08/13/01	11:59

MATTHES / LLEWELLYN DIVIDE — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
83	494,828.715	6,527,093.319	1,798.584	08/13/01	11:59
84	494,915.300	6,527,077.707	1,798.608	08/13/01	11:59
85	494,998.395	6,527,062.500	1,798.995	08/13/01	11:59
86	495,080.396	6,527,047.002	1,798.807	08/13/01	11:59
87	495,161.651	6,527,028.595	1,799.157	08/13/01	11:59
88	495,247.083	6,527,010.368	1,799.192	08/13/01	12:00
89	495,331.024	6,526,994.276	1,799.754	08/13/01	12:00
90	495,413.490	6,526,978.881	1,800.438	08/13/01	12:00
91	495,493.980	6,526,958.790	1,802.147	08/13/01	12:00
92	495,568.802	6,526,942.893	1,807.358	08/13/01	12:00
93	495,632.780	6,526,931.852	1,814.866	08/13/01	12:00
94	495,690.425	6,526,923.906	1,822.640	08/13/01	12:01
95	495,739.528	6,526,917.450	1,828.562	08/13/01	12:01
96	495,788.238	6,526,905.711	1,833.551	08/13/01	12:01
97	495,837.390	6,526,891.199	1,837.837	08/13/01	12:01
98	495,887.051	6,526,874.912	1,841.832	08/13/01	12:01
99	495,937.267	6,526,857.721	1,845.373	08/13/01	12:01
100	495,987.384	6,526,841.639	1,848.816	08/13/01	12:02
101	496,009.218	6,526,835.535	1,850.264	08/13/01	12:02
102	496,004.054	6,526,801.759	1,850.114	08/13/01	12:02
103	495,991.293	6,526,752.644	1,849.835	08/13/01	12:02
104	495,981.850	6,526,703.813	1,849.875	08/13/01	12:02
105	495,976.427	6,526,656.689	1,850.581	08/13/01	12:02
106	495,965.168	6,526,614.840	1,851.072	08/13/01	12:03
107	495,963.719	6,526,613.545	1,850.959	08/13/01	12:03
108	495,930.178	6,526,613.315	1,847.782	08/13/01	12:03
109	495,891.480	6,526,621.220	1,844.129	08/13/01	12:03
110	495,852.671	6,526,630.124	1,840.855	08/13/01	12:03
111	495,804.623	6,526,639.347	1,836.357	08/13/01	12:03
112	495,753.497	6,526,647.794	1,829.792	08/13/01	12:04
113	495,719.144	6,526,649.027	1,824.322	08/13/01	12:04
114	495,671.067	6,526,648.825	1,815.943	08/13/01	12:04
115	495,618.078	6,526,657.708	1,807.547	08/13/01	12:04
116	495,558.944	6,526,671.316	1,800.935	08/13/01	12:04
117	495,495.118	6,526,685.644	1,797.552	08/13/01	12:04
118	495,420.360	6,526,702.359	1,797.156	08/13/01	12:05
119	495,340.920	6,526,720.761	1,797.387	08/13/01	12:05
120	495,256.190	6,526,738.533	1,796.583	08/13/01	12:05
121	495,172.883	6,526,757.828	1,795.821	08/13/01	12:05
122	495,090.866	6,526,776.498	1,796.176	08/13/01	12:05
123	495,057.805	6,526,784.803	1,796.309	08/13/01	12:05

MATTHES / LLEWELLYN DIVIDE — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
124	495,057.814	6,526,784.638	1,795.783	08/13/01	12:06
125	495,022.604	6,526,792.232	1,795.675	08/13/01	12:06
126	494,960.167	6,526,807.194	1,795.536	08/13/01	12:06
127	494,895.704	6,526,822.500	1,795.390	08/13/01	12:06
128	494,827.849	6,526,840.589	1,795.404	08/13/01	12:06
129	494,753.690	6,526,858.333	1,795.589	08/13/01	12:06
130	494,678.809	6,526,876.277	1,796.132	08/13/01	12:07
131	494,607.319	6,526,893.956	1,796.712	08/13/01	12:07
132	494,531.537	6,526,911.430	1,797.836	08/13/01	12:07
133	494,458.198	6,526,928.652	1,799.451	08/13/01	12:07
134	494,383.747	6,526,945.506	1,801.599	08/13/01	12:07
135	494,308.308	6,526,963.377	1,804.220	08/13/01	12:07
136	494,270.897	6,526,972.408	1,805.002	08/13/01	12:08
137	494,239.782	6,526,980.589	1,806.037	08/13/01	12:08
138	494,210.906	6,526,989.524	1,806.929	08/13/01	12:08
139	494,173.551	6,526,997.175	1,808.089	08/13/01	12:08
140	494,130.642	6,527,006.918	1,809.354	08/13/01	12:08
141	494,097.561	6,527,012.437	1,810.227	08/13/01	12:08
142	494,085.820	6,527,013.734	1,810.601	08/13/01	12:09
143	494,061.087	6,527,021.113	1,811.302	08/13/01	12:09
144	494,012.357	6,527,032.284	1,812.776	08/13/01	12:09
145	493,960.970	6,527,044.226	1,814.148	08/13/01	12:09
146	493,904.072	6,527,058.033	1,815.715	08/13/01	12:09
147	493,840.664	6,527,074.344	1,817.358	08/13/01	12:09
148	493,774.963	6,527,089.873	1,819.060	08/13/01	12:10
149	493,707.988	6,527,105.118	1,820.822	08/13/01	12:10
150	493,639.800	6,527,120.953	1,822.747	08/13/01	12:10
151	493,602.507	6,527,128.620	1,823.766	08/13/01	12:10
152	493,584.908	6,527,132.391	1,824.331	08/13/01	12:10
153	493,535.447	6,527,142.867	1,825.866	08/13/01	12:10
154	493,494.428	6,527,156.155	1,827.175	08/13/01	12:11
155	493,467.662	6,527,167.254	1,828.148	08/13/01	12:11
156	493,418.137	6,527,179.068	1,829.889	08/13/01	12:11
157	493,359.933	6,527,192.561	1,831.827	08/13/01	12:11
158	493,356.423	6,527,193.383	1,831.931	08/13/01	12:11
159	493,325.881	6,527,200.289	1,832.932	08/13/01	12:11
160	493,271.267	6,527,213.258	1,834.791	08/13/01	12:12
161	493,212.498	6,527,226.641	1,836.698	08/13/01	12:12
162	493,151.010	6,527,241.035	1,838.667	08/13/01	12:12
163	493,086.009	6,527,255.914	1,840.705	08/13/01	12:12
164	493,017.558	6,527,272.590	1,842.552	08/13/01	12:12

MATTHES / LLEWELLYN DIVIDE — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
165	492,948.707	6,527,288.824	1,844.330	08/13/01	12:12
166	492,879.921	6,527,305.412	1,846.129	08/13/01	12:13
167	492,813.364	6,527,321.797	1,847.976	08/13/01	12:13
168	492,747.433	6,527,338.100	1,849.763	08/13/01	12:13
169	492,680.841	6,527,353.754	1,851.291	08/13/01	12:13
170	492,614.847	6,527,368.435	1,852.948	08/13/01	12:13
171	492,547.824	6,527,384.289	1,854.761	08/13/01	12:13
172	492,480.824	6,527,399.219	1,856.513	08/13/01	12:14
173	492,414.401	6,527,415.018	1,858.037	08/13/01	12:14
174	492,347.613	6,527,430.877	1,859.413	08/13/01	12:14
175	492,281.031	6,527,446.746	1,860.697	08/13/01	12:14
176	492,216.000	6,527,463.314	1,862.101	08/13/01	12:14
177	492,148.627	6,527,479.652	1,863.607	08/13/01	12:14
178	492,081.767	6,527,497.196	1,864.896	08/13/01	12:15
179	492,012.030	6,527,514.331	1,866.111	08/13/01	12:15
180	491,946.104	6,527,530.517	1,867.178	08/13/01	12:15
181	491,876.599	6,527,546.499	1,868.078	08/13/01	12:15
182	491,809.414	6,527,563.015	1,868.833	08/13/01	12:15
183	491,740.511	6,527,581.067	1,869.605	08/13/01	12:15
184	491,670.169	6,527,596.741	1,870.449	08/13/01	12:16
185	491,598.984	6,527,611.228	1,871.304	08/13/01	12:16
186	491,528.729	6,527,627.416	1,872.116	08/13/01	12:16
187	491,459.834	6,527,643.639	1,872.797	08/13/01	12:16
188	491,388.199	6,527,661.476	1,873.501	08/13/01	12:16
189	491,318.908	6,527,678.192	1,874.286	08/13/01	12:16
190	491,247.230	6,527,695.710	1,874.957	08/13/01	12:17
191	491,174.671	6,527,714.835	1,875.576	08/13/01	12:17
192	491,101.021	6,527,732.933	1,876.264	08/13/01	12:17
193	491,026.765	6,527,748.124	1,876.908	08/13/01	12:17
194	490,951.254	6,527,764.766	1,877.483	08/13/01	12:17
195	490,876.908	6,527,781.664	1,878.000	08/13/01	12:17
196	490,804.445	6,527,799.219	1,878.512	08/13/01	12:18
197	490,738.307	6,527,814.760	1,878.955	08/13/01	12:18
198	490,666.657	6,527,831.695	1,879.384	08/13/01	12:18
199	490,591.686	6,527,850.446	1,879.879	08/13/01	12:18
200	490,519.917	6,527,867.972	1,880.243	08/13/01	12:18
201	490,447.372	6,527,884.233	1,880.505	08/13/01	12:18
202	490,375.768	6,527,901.379	1,880.614	08/13/01	12:19
203	490,303.523	6,527,916.442	1,880.662	08/13/01	12:19
204	490,233.783	6,527,931.331	1,880.460	08/13/01	12:19
205	490,164.648	6,527,946.818	1,880.035	08/13/01	12:19

MATTHES / LLEWELLYN DIVIDE — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
206	490,089.836	6,527,963.396	1,879.358	08/13/01	12:20
207	489,977.310	6,527,988.123	1,878.425	08/13/01	12:20
208	489,952.187	6,527,994.516	1,878.298	08/13/01	12:20
209	489,921.215	6,528,000.156	1,878.484	08/13/01	12:20
210	489,876.437	6,528,006.189	1,878.677	08/13/01	12:20
211	489,863.140	6,528,008.232	1,878.500	08/13/01	12:20
212	489,863.181	6,528,008.760	1,877.935	08/13/01	12:21
213	489,863.266	6,528,009.473	1,877.292	08/13/01	12:21
214	489,702.329	6,528,037.620	1,889.308	08/13/01	12:21
215	489,663.787	6,528,042.788	1,893.652	08/13/01	12:22
216	489,617.969	6,528,044.948	1,899.306	08/13/01	12:22
217	489,571.660	6,528,043.640	1,904.859	08/13/01	12:22
218	489,530.384	6,528,048.906	1,909.744	08/13/01	12:22
219	489,498.087	6,528,054.974	1,913.179	08/13/01	12:22
220	489,497.800	6,528,055.019	1,913.170	08/13/01	12:22
221	489,467.177	6,528,057.944	1,915.922	08/13/01	12:23
222	489,443.378	6,528,060.459	1,917.751	08/13/01	12:23
223	489,419.327	6,528,063.723	1,919.393	08/13/01	12:23
224	489,387.936	6,528,066.315	1,921.109	08/13/01	12:23
225	489,359.935	6,528,069.821	1,922.585	08/13/01	12:23
226	489,332.706	6,528,072.612	1,923.676	08/13/01	12:23
227	489,332.685	6,528,072.613	1,923.578	08/13/01	12:24
228	489,303.457	6,528,073.740	1,924.338	08/13/01	12:24
229	489,268.990	6,528,072.126	1,924.906	08/13/01	12:24
230	489,231.740	6,528,073.158	1,925.367	08/13/01	12:24
231	489,190.034	6,528,079.725	1,925.830	08/13/01	12:24
232	489,144.186	6,528,089.948	1,926.369	08/13/01	12:24
233	489,096.550	6,528,099.783	1,926.836	08/13/01	12:25
234	489,050.282	6,528,109.002	1,927.636	08/13/01	12:25
235	489,040.171	6,528,111.087	1,927.855	08/13/01	12:25
236	489,020.089	6,528,085.785	1,927.333	08/13/01	12:25
237	488,997.879	6,528,038.696	1,926.355	08/13/01	12:25
238	488,974.291	6,527,989.376	1,925.669	08/13/01	12:25
239	488,950.526	6,527,939.670	1,925.326	08/13/01	12:26
240	488,930.675	6,527,895.523	1,925.169	08/13/01	12:26
241	488,926.422	6,527,886.104	1,925.160	08/13/01	12:26
242	488,950.507	6,527,869.212	1,924.320	08/13/01	12:26
243	489,004.911	6,527,852.347	1,922.833	08/13/01	12:26
244	489,058.818	6,527,836.872	1,921.322	08/13/01	12:26
245	489,114.974	6,527,818.973	1,919.816	08/13/01	12:27
246	489,177.828	6,527,800.192	1,918.038	08/13/01	12:27

MATTHES / LLEWELLYN DIVIDE — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
247	489,246.141	6,527,778.678	1,916.029	08/13/01	12:27
248	489,316.513	6,527,758.957	1,913.391	08/13/01	12:27
249	489,372.685	6,527,745.172	1,910.223	08/13/01	12:27
250	489,372.682	6,527,745.175	1,910.232	08/13/01	12:27
251	489,420.945	6,527,732.061	1,907.540	08/13/01	12:28
252	489,495.296	6,527,713.038	1,902.967	08/13/01	12:28
253	489,543.970	6,527,701.165	1,899.828	08/13/01	12:28
254	489,601.637	6,527,688.064	1,896.355	08/13/01	12:28
255	489,604.850	6,527,686.999	1,896.901	08/13/01	12:28
256	489,611.272	6,527,685.884	1,896.589	08/13/01	12:28
257	489,670.208	6,527,671.816	1,893.942	08/13/01	12:29
258	489,722.075	6,527,660.100	1,892.173	08/13/01	12:29
259	489,788.945	6,527,645.259	1,890.517	08/13/01	12:29
260	489,865.129	6,527,627.781	1,889.654	08/13/01	12:29
261	489,948.531	6,527,608.903	1,889.230	08/13/01	12:29
262	490,084.131	6,527,577.033	1,889.201	08/13/01	12:30
263	490,083.938	6,527,577.300	1,888.987	08/13/01	12:30
264	490,083.939	6,527,577.300	1,888.994	08/13/01	12:30
265	490,136.366	6,527,566.677	1,888.833	08/13/01	12:30
266	490,213.174	6,527,548.676	1,888.319	08/13/01	12:30
267	490,289.088	6,527,530.983	1,887.757	08/13/01	12:30
268	490,368.975	6,527,513.410	1,886.995	08/13/01	12:31
269	490,455.560	6,527,494.224	1,885.982	08/13/01	12:31
270	490,564.625	6,527,470.836	1,884.601	08/13/01	12:31
271	490,616.026	6,527,460.639	1,883.898	08/13/01	12:32
272	490,722.987	6,527,436.649	1,882.703	08/13/01	12:32
273	490,743.669	6,527,432.802	1,882.374	08/13/01	12:32
274	490,799.561	6,527,420.630	1,881.711	08/13/01	12:32
275	490,865.859	6,527,405.413	1,880.924	08/13/01	12:33
276	490,936.571	6,527,389.588	1,880.032	08/13/01	12:33
277	491,010.813	6,527,372.837	1,879.242	08/13/01	12:33
278	491,084.932	6,527,355.376	1,878.360	08/13/01	12:33
279	491,161.611	6,527,339.500	1,877.518	08/13/01	12:33
280	491,239.625	6,527,321.579	1,876.651	08/13/01	12:33
281	491,320.154	6,527,302.716	1,875.677	08/13/01	12:34
282	491,398.462	6,527,282.945	1,874.722	08/13/01	12:34
283	491,478.578	6,527,263.345	1,873.814	08/13/01	12:34
284	491,557.721	6,527,243.070	1,872.849	08/13/01	12:34
285	491,637.837	6,527,223.267	1,872.005	08/13/01	12:34
286	491,718.976	6,527,203.262	1,871.148	08/13/01	12:34
287	491,799.608	6,527,183.094	1,870.123	08/13/01	12:35

MATTHES / LLEWELLYN DIVIDE — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
288	491,880.640	6,527,162.604	1,868.789	08/13/01	12:35
289	491,959.535	6,527,141.581	1,867.676	08/13/01	12:35
290	492,039.112	6,527,122.742	1,866.578	08/13/01	12:35
291	492,119.695	6,527,104.690	1,865.280	08/13/01	12:35
292	492,202.340	6,527,086.291	1,863.616	08/13/01	12:35
293	492,281.950	6,527,068.151	1,862.076	08/13/01	12:36
294	492,364.554	6,527,051.352	1,860.467	08/13/01	12:36
295	492,445.162	6,527,034.276	1,858.892	08/13/01	12:36
296	492,524.245	6,527,016.047	1,857.136	08/13/01	12:36
297	492,604.967	6,526,998.262	1,855.351	08/13/01	12:36
298	492,685.960	6,526,978.491	1,853.455	08/13/01	12:36
299	492,768.356	6,526,958.397	1,851.355	08/13/01	12:37
300	492,850.515	6,526,940.088	1,849.079	08/13/01	12:37
301	492,935.493	6,526,919.815	1,846.549	08/13/01	12:37
302	493,112.020	6,526,878.414	1,841.002	08/13/01	12:38
303	493,137.768	6,526,871.793	1,840.127	08/13/01	12:38
304	493,217.914	6,526,854.494	1,837.330	08/13/01	12:38
305	493,290.421	6,526,836.468	1,835.036	08/13/01	12:38
306	493,365.892	6,526,818.971	1,832.207	08/13/01	12:38
307	493,419.318	6,526,807.205	1,829.966	08/13/01	12:38
308	493,467.242	6,526,796.358	1,827.682	08/13/01	12:39
309	493,512.112	6,526,786.183	1,826.393	08/13/01	12:39
310	493,555.981	6,526,775.831	1,824.587	08/13/01	12:39
311	493,596.829	6,526,766.242	1,822.936	08/13/01	12:39
312	493,641.831	6,526,755.668	1,821.083	08/13/01	12:39
313	493,700.297	6,526,741.031	1,818.780	08/13/01	12:39
314	493,757.132	6,526,726.185	1,816.544	08/13/01	12:40
315	493,757.047	6,526,726.442	1,816.936	08/13/01	12:40
316	493,783.233	6,526,719.933	1,816.226	08/13/01	12:40
317	493,825.897	6,526,708.051	1,815.351	08/13/01	12:40
318	493,860.469	6,526,699.706	1,815.164	08/13/01	12:40
319	493,860.816	6,526,699.747	1,813.660	08/13/01	12:40
320	493,877.909	6,526,695.036	1,813.048	08/13/01	12:41
321	493,929.196	6,526,681.515	1,811.200	08/13/01	12:41
322	493,985.714	6,526,668.146	1,809.537	08/13/01	12:41
323	494,032.086	6,526,656.740	1,808.077	08/13/01	12:41
324	494,064.876	6,526,648.261	1,807.188	08/13/01	12:41
325	494,126.339	6,526,631.867	1,805.528	08/13/01	12:41
326	494,164.159	6,526,622.781	1,805.189	08/13/01	12:42
327	494,164.218	6,526,622.794	1,806.733	08/13/01	12:42
328	494,164.313	6,526,622.877	1,808.803	08/13/01	12:42

MATTHES / LLEWELLYN DIVIDE — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
329	494,283.238	6,526,593.898	1,798.397	08/13/01	12:43
330	494,303.509	6,526,588.113	1,797.661	08/13/01	12:43
331	494,357.833	6,526,574.248	1,795.911	08/13/01	12:43
332	494,414.928	6,526,561.667	1,794.499	08/13/01	12:43
333	494,469.259	6,526,549.853	1,792.906	08/13/01	12:43
334	494,517.421	6,526,538.118	1,791.982	08/13/01	12:43
335	494,573.453	6,526,525.110	1,791.469	08/13/01	12:44
336	494,628.476	6,526,511.730	1,791.336	08/13/01	12:44
337	494,686.315	6,526,499.006	1,791.436	08/13/01	12:44
338	494,744.890	6,526,483.288	1,791.678	08/13/01	12:44
339	494,804.861	6,526,470.553	1,792.301	08/13/01	12:44
340	494,869.294	6,526,454.639	1,792.872	08/13/01	12:44
341	494,934.008	6,526,439.602	1,793.207	08/13/01	12:45
342	495,002.943	6,526,424.304	1,793.568	08/13/01	12:45
343	495,072.203	6,526,410.123	1,793.503	08/13/01	12:45
344	495,141.993	6,526,396.558	1,793.150	08/13/01	12:45
345	495,211.794	6,526,381.042	1,792.498	08/13/01	12:45
346	495,282.327	6,526,364.589	1,792.593	08/13/01	12:45
347	495,352.380	6,526,346.919	1,792.111	08/13/01	12:46
348	495,421.948	6,526,326.694	1,791.271	08/13/01	12:46
349	495,493.910	6,526,307.468	1,791.405	08/13/01	12:46
350	495,561.526	6,526,291.433	1,793.369	08/13/01	12:46
351	495,627.255	6,526,276.571	1,795.810	08/13/01	12:46
352	495,691.345	6,526,260.663	1,798.584	08/13/01	12:46
353	495,751.046	6,526,244.154	1,802.131	08/13/01	12:47
354	495,802.639	6,526,233.020	1,808.284	08/13/01	12:47
355	495,841.042	6,526,225.357	1,815.702	08/13/01	12:47
356	495,874.302	6,526,217.856	1,822.736	08/13/01	12:47
357	495,908.646	6,526,208.639	1,829.620	08/13/01	12:47
358	495,922.402	6,526,186.615	1,831.657	08/13/01	12:47
359	495,919.069	6,526,155.067	1,829.386	08/13/01	12:48
360	495,905.581	6,526,121.132	1,823.905	08/13/01	12:48
361	495,881.983	6,526,106.241	1,816.062	08/13/01	12:48
362	495,857.350	6,526,104.321	1,809.554	08/13/01	12:48
363	495,809.869	6,526,108.714	1,802.197	08/13/01	12:48
364	495,743.146	6,526,118.521	1,797.493	08/13/01	12:48
365	495,678.938	6,526,130.363	1,794.139	08/13/01	12:49
366	495,614.407	6,526,139.979	1,791.844	08/13/01	12:49
367	495,549.724	6,526,151.258	1,790.043	08/13/01	12:49
368	495,484.754	6,526,176.128	1,788.056	08/13/01	12:49
369	495,415.370	6,526,182.490	1,786.060	08/13/01	12:49

MATTHES / LLEWELLYN DIVIDE — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
370	495,347.728	6,526,193.617	1,786.728	08/13/01	12:49
371	495,276.609	6,526,204.816	1,787.379	08/13/01	12:50
372	495,198.695	6,526,217.504	1,788.454	08/13/01	12:50
373	495,120.069	6,526,231.353	1,790.090	08/13/01	12:50
374	494,976.391	6,526,257.734	1,791.161	08/13/01	12:50
375	494,974.995	6,526,258.003	1,791.186	08/13/01	12:51
376	494,926.183	6,526,266.449	1,791.161	08/13/01	12:51
377	494,858.555	6,526,278.462	1,790.826	08/13/01	12:51
378	494,782.226	6,526,292.111	1,789.991	08/13/01	12:51
379	494,701.581	6,526,307.097	1,788.874	08/13/01	12:51
380	494,617.975	6,526,322.404	1,788.002	08/13/01	12:52
381	494,487.993	6,526,344.959	1,787.802	08/13/01	12:52
382	494,434.155	6,526,355.306	1,788.326	08/13/01	12:52
383	494,372.267	6,526,366.965	1,789.723	08/13/01	12:53
384	494,308.761	6,526,379.181	1,791.765	08/13/01	12:53
385	494,271.035	6,526,386.188	1,793.449	08/13/01	12:53
386	494,238.772	6,526,390.971	1,794.084	08/13/01	12:53
387	494,194.146	6,526,399.751	1,796.191	08/13/01	12:53
388	494,160.360	6,526,406.169	1,797.530	08/13/01	12:53
389	494,124.411	6,526,414.107	1,798.894	08/13/01	12:54
390	494,069.992	6,526,423.714	1,801.671	08/13/01	12:54
391	494,015.017	6,526,435.619	1,803.928	08/13/01	12:54
392	493,950.110	6,526,448.449	1,806.235	08/13/01	12:54
393	493,914.413	6,526,457.037	1,807.879	08/13/01	12:54
394	493,878.153	6,526,464.509	1,809.092	08/13/01	12:54
395	493,824.470	6,526,475.597	1,811.079	08/13/01	12:55
396	493,785.572	6,526,484.295	1,812.516	08/13/01	12:55
397	493,756.657	6,526,489.487	1,813.463	08/13/01	12:55
398	493,728.408	6,526,494.494	1,814.429	08/13/01	12:57
399	493,392.164	6,526,558.643	1,833.480	08/13/01	12:57
400	493,382.214	6,526,560.446	1,833.967	08/13/01	12:57
401	493,338.868	6,526,570.505	1,835.986	08/13/01	12:57
402	493,327.321	6,526,574.661	1,836.455	08/13/01	12:58
403	493,327.323	6,526,574.620	1,836.432	08/13/01	12:58
404	493,327.338	6,526,574.682	1,836.531	08/13/01	12:58
405	493,327.436	6,526,574.784	1,836.821	08/13/01	12:58
406	493,327.613	6,526,574.977	1,837.343	08/13/01	12:58
407	493,327.317	6,526,574.661	1,836.395	08/13/01	12:58
408	493,324.819	6,526,575.721	1,836.607	08/13/01	12:59
409	493,282.287	6,526,585.349	1,838.672	08/13/01	12:59
410	493,235.476	6,526,596.159	1,840.263	08/13/01	12:59

MATTHES / LLEWELLYN DIVIDE — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
411	493,170.496	6,526,606.806	1,842.692	08/13/01	12:59
412	493,099.517	6,526,619.173	1,845.152	08/13/01	12:59
413	493,025.215	6,526,633.063	1,847.411	08/13/01	12:59
414	492,948.867	6,526,646.820	1,849.530	08/13/01	13:00
415	492,873.362	6,526,660.583	1,851.429	08/13/01	13:00
416	492,797.129	6,526,674.116	1,853.450	08/13/01	13:00
417	492,720.259	6,526,688.407	1,855.448	08/13/01	13:00
418	492,641.971	6,526,702.198	1,857.266	08/13/01	13:00
419	492,567.980	6,526,716.940	1,858.828	08/13/01	13:00
420	492,493.376	6,526,731.211	1,860.162	08/13/01	13:01
421	492,417.045	6,526,745.554	1,861.409	08/13/01	13:01
422	492,339.069	6,526,759.710	1,862.641	08/13/01	13:01
423	492,261.870	6,526,774.383	1,863.720	08/13/01	13:01
424	492,187.853	6,526,788.729	1,864.752	08/13/01	13:01
425	492,110.301	6,526,803.388	1,865.787	08/13/01	13:01
426	492,030.625	6,526,818.343	1,866.840	08/13/01	13:02
427	491,949.958	6,526,833.002	1,867.806	08/13/01	13:02
428	491,866.575	6,526,848.106	1,868.797	08/13/01	13:02
429	491,782.535	6,526,864.432	1,869.807	08/13/01	13:02
430	491,699.036	6,526,880.078	1,870.695	08/13/01	13:02
431	491,615.597	6,526,895.562	1,871.598	08/13/01	13:02
432	491,533.767	6,526,909.586	1,872.551	08/13/01	13:03
433	491,451.866	6,526,924.608	1,873.485	08/13/01	13:03
434	491,371.609	6,526,939.688	1,874.150	08/13/01	13:03
435	491,292.109	6,526,954.547	1,874.949	08/13/01	13:03
436	491,211.083	6,526,969.716	1,875.730	08/13/01	13:03
437	491,129.168	6,526,984.204	1,876.509	08/13/01	13:03
438	491,046.790	6,526,998.610	1,877.309	08/13/01	13:04
439	490,960.555	6,527,012.942	1,878.198	08/13/01	13:04
440	490,876.971	6,527,027.535	1,879.222	08/13/01	13:04
441	490,794.267	6,527,043.078	1,880.189	08/13/01	13:04
442	490,710.348	6,527,058.833	1,881.330	08/13/01	13:04
443	490,624.699	6,527,074.512	1,882.523	08/13/01	13:04
444	490,539.537	6,527,090.580	1,883.887	08/13/01	13:05
445	490,455.149	6,527,105.685	1,885.309	08/13/01	13:05
446	490,372.341	6,527,121.689	1,886.557	08/13/01	13:05
447	490,289.385	6,527,138.544	1,887.759	08/13/01	13:05
448	490,207.773	6,527,157.197	1,889.068	08/13/01	13:05
449	490,129.157	6,527,175.788	1,890.377	08/13/01	13:05
450	490,050.466	6,527,194.818	1,891.674	08/13/01	13:06
451	489,970.430	6,527,211.442	1,893.054	08/13/01	13:06

MATTHES / LLEWELLYN DIVIDE — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
452	489,890.308	6,527,228.834	1,894.436	08/13/01	13:06
453	489,812.612	6,527,248.225	1,895.920	08/13/01	13:06
454	489,735.927	6,527,265.073	1,897.673	08/13/01	13:06
455	489,660.628	6,527,282.475	1,899.504	08/13/01	13:06
456	489,587.225	6,527,296.917	1,901.389	08/13/01	13:07
457	489,513.151	6,527,311.782	1,903.612	08/13/01	13:07
458	489,443.331	6,527,324.924	1,905.894	08/13/01	13:07
459	489,373.478	6,527,338.693	1,908.278	08/13/01	13:07
460	489,304.580	6,527,351.709	1,910.568	08/13/01	13:07
461	489,257.624	6,527,360.273	1,912.052	08/13/01	13:07
462	489,212.876	6,527,367.115	1,913.396	08/13/01	13:08
463	489,152.484	6,527,378.185	1,914.928	08/13/01	13:08
464	489,093.712	6,527,389.797	1,916.364	08/13/01	13:08
465	489,038.077	6,527,400.246	1,917.847	08/13/01	13:08
466	488,994.171	6,527,407.643	1,919.421	08/13/01	13:08
467	488,985.780	6,527,408.867	1,920.248	08/13/01	13:08
468	488,985.953	6,527,408.396	1,921.097	08/13/01	13:09
469	488,986.172	6,527,407.822	1,922.115	08/13/01	13:09
470	488,906.089	6,527,422.838	1,920.863	08/13/01	13:09
471	488,875.271	6,527,429.032	1,921.842	08/13/01	13:10
472	488,835.804	6,527,438.150	1,922.667	08/13/01	13:10
473	488,793.848	6,527,449.144	1,923.657	08/13/01	13:10
474	488,758.390	6,527,457.092	1,924.510	08/13/01	13:10
475	488,724.003	6,527,464.137	1,925.262	08/13/01	13:10
476	488,685.689	6,527,472.845	1,926.407	08/13/01	13:10
477	488,650.397	6,527,481.598	1,926.841	08/13/01	13:11
478	488,613.336	6,527,491.873	1,927.808	08/13/01	13:11
479	488,571.797	6,527,502.564	1,928.834	08/13/01	13:11
480	488,530.610	6,527,513.583	1,929.922	08/13/01	13:11
481	488,490.849	6,527,522.855	1,930.955	08/13/01	13:11
482	488,467.155	6,527,528.337	1,931.641	08/13/01	13:11
483	488,466.999	6,527,528.371	1,931.624	08/13/01	13:12
484	488,466.996	6,527,528.384	1,931.640	08/13/01	13:12
485	488,452.378	6,527,531.736	1,932.016	08/13/01	13:12
486	488,415.503	6,527,541.613	1,932.875	08/13/01	13:12
487	488,389.966	6,527,544.931	1,933.424	08/13/01	13:12
488	488,376.495	6,527,518.851	1,933.360	08/13/01	13:12
489	488,369.081	6,527,492.735	1,933.010	08/13/01	13:13
490	488,367.184	6,527,484.016	1,932.640	08/13/01	13:13
491	488,337.415	6,527,370.084	1,933.290	08/13/01	13:14
492	488,331.341	6,527,348.031	1,933.300	08/13/01	13:14

MATTHES / LLEWELLYN DIVIDE — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
493	488,320.947	6,527,305.073	1,933.462	08/13/01	13:14
494	488,311.165	6,527,266.303	1,933.693	08/13/01	13:14
495	488,304.758	6,527,228.225	1,933.736	08/13/01	13:14
496	488,301.135	6,527,191.220	1,933.694	08/13/01	13:14
497	488,303.264	6,527,188.884	1,933.215	08/13/01	13:15
498	488,376.765	6,527,165.275	1,933.194	08/13/01	13:15
499	488,407.483	6,527,157.736	1,932.605	08/13/01	13:15
500	488,438.672	6,527,152.283	1,931.977	08/13/01	13:16
501	488,462.655	6,527,146.967	1,931.383	08/13/01	13:16
502	488,462.834	6,527,147.303	1,931.234	08/13/01	13:16
503	488,483.357	6,527,141.538	1,930.661	08/13/01	13:16
504	488,601.958	6,527,104.359	1,928.878	08/13/01	13:17
505	488,606.354	6,527,103.057	1,928.739	08/13/01	13:17
506	488,654.198	6,527,089.693	1,927.900	08/13/01	13:17
507	488,710.114	6,527,073.093	1,926.984	08/13/01	13:17
508	488,760.614	6,527,057.756	1,926.224	08/13/01	13:17
509	488,801.726	6,527,046.405	1,925.732	08/13/01	13:17
510	488,854.621	6,527,032.239	1,923.998	08/13/01	13:18
511	488,888.816	6,527,022.576	1,922.987	08/13/01	13:18
512	488,906.627	6,527,018.479	1,922.409	08/13/01	13:18
513	488,906.437	6,527,018.651	1,922.073	08/13/01	13:18
514	488,906.216	6,527,018.929	1,921.596	08/13/01	13:18
515	488,923.000	6,527,014.265	1,922.327	08/13/01	13:18
516	488,960.076	6,527,005.120	1,921.439	08/13/01	13:19
517	488,960.111	6,527,005.123	1,921.458	08/13/01	13:19
518	488,960.104	6,527,005.103	1,921.403	08/13/01	13:19
519	488,960.068	6,527,005.189	1,921.554	08/13/01	13:19
520	488,960.099	6,527,005.115	1,921.456	08/13/01	13:23
521	488,960.161	6,527,004.802	1,921.216	08/13/01	13:23
522	488,960.149	6,527,004.730	1,921.259	08/13/01	13:23
523	488,968.206	6,527,003.521	1,921.409	08/13/01	13:23
524	489,013.516	6,526,992.349	1,920.448	08/13/01	13:23
525	489,068.836	6,526,976.394	1,919.340	08/13/01	13:23
526	489,129.896	6,526,960.352	1,918.114	08/13/01	13:24
527	489,199.922	6,526,940.308	1,916.632	08/13/01	13:24
528	489,273.019	6,526,920.893	1,914.555	08/13/01	13:24
529	489,347.555	6,526,901.209	1,911.931	08/13/01	13:24
530	489,428.471	6,526,879.223	1,908.629	08/13/01	13:24
531	489,511.312	6,526,854.120	1,904.796	08/13/01	13:24
532	489,596.425	6,526,830.566	1,900.814	08/13/01	13:25
533	489,680.066	6,526,809.076	1,897.118	08/13/01	13:25

MATTHES / LLEWELLYN DIVIDE — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
534	489,763.159	6,526,788.407	1,893.759	08/13/01	13:25
535	489,844.539	6,526,766.959	1,890.972	08/13/01	13:25
536	489,924.687	6,526,744.524	1,888.627	08/13/01	13:25
537	490,005.215	6,526,723.665	1,886.664	08/13/01	13:25
538	490,084.411	6,526,702.989	1,885.077	08/13/01	13:26
539	490,167.558	6,526,682.806	1,883.441	08/13/01	13:26
540	490,252.873	6,526,662.086	1,881.910	08/13/01	13:26
541	490,338.821	6,526,639.349	1,880.351	08/13/01	13:26
542	490,426.675	6,526,617.816	1,878.862	08/13/01	13:26
543	490,516.009	6,526,595.207	1,877.381	08/13/01	13:26
544	490,607.762	6,526,571.670	1,876.202	08/13/01	13:27
545	490,700.142	6,526,547.350	1,875.178	08/13/01	13:27
546	490,791.190	6,526,524.700	1,874.433	08/13/01	13:27
547	490,880.896	6,526,501.860	1,873.852	08/13/01	13:27
548	490,969.238	6,526,480.148	1,873.540	08/13/01	13:27
549	491,056.719	6,526,458.800	1,873.252	08/13/01	13:27
550	491,145.994	6,526,437.643	1,872.989	08/13/01	13:28
551	491,232.936	6,526,415.966	1,872.754	08/13/01	13:28
552	491,317.750	6,526,394.176	1,872.560	08/13/01	13:28
553	491,402.046	6,526,373.991	1,872.421	08/13/01	13:28
554	491,488.363	6,526,352.338	1,872.225	08/13/01	13:28
555	491,576.551	6,526,331.697	1,872.005	08/13/01	13:28
556	491,664.340	6,526,310.393	1,871.766	08/13/01	13:29
557	491,751.851	6,526,289.053	1,871.300	08/13/01	13:29
558	491,836.722	6,526,267.834	1,870.859	08/13/01	13:29
559	491,920.124	6,526,247.059	1,870.396	08/13/01	13:29
560	492,003.399	6,526,225.059	1,869.754	08/13/01	13:29
561	492,087.965	6,526,203.333	1,868.928	08/13/01	13:29
562	492,169.697	6,526,182.249	1,868.130	08/13/01	13:30
563	492,254.459	6,526,160.365	1,867.101	08/13/01	13:30
564	492,338.832	6,526,138.366	1,866.185	08/13/01	13:30
565	492,420.229	6,526,116.561	1,865.243	08/13/01	13:30
566	492,499.760	6,526,094.449	1,864.299	08/13/01	13:30
567	492,580.654	6,526,072.875	1,863.239	08/13/01	13:30
568	492,663.667	6,526,050.485	1,861.968	08/13/01	13:31
569	492,746.404	6,526,029.830	1,860.666	08/13/01	13:31
570	492,825.625	6,526,009.577	1,859.009	08/13/01	13:31
571	492,905.463	6,525,989.592	1,857.216	08/13/01	13:31
572	492,988.023	6,525,968.351	1,855.326	08/13/01	13:31
573	493,069.714	6,525,948.047	1,853.260	08/13/01	13:31
574	493,151.073	6,525,929.003	1,850.633	08/13/01	13:32

MATTHES / LLEWELLYN DIVIDE — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
575	493,231.273	6,525,909.455	1,847.694	08/13/01	13:32
576	493,311.338	6,525,888.567	1,844.667	08/13/01	13:32
577	493,362.247	6,525,876.466	1,842.948	08/13/01	13:32
578	493,413.854	6,525,863.153	1,841.353	08/13/01	13:32
579	493,429.423	6,525,859.210	1,840.356	08/13/01	13:32
580	493,429.782	6,525,859.040	1,840.977	08/13/01	13:33
581	493,434.881	6,525,854.898	1,840.737	08/13/01	13:33
582	493,421.645	6,525,823.459	1,841.332	08/13/01	13:33
583	493,396.895	6,525,787.016	1,842.548	08/13/01	13:33
584	493,359.705	6,525,753.128	1,844.037	08/13/01	13:33
585	493,323.146	6,525,717.098	1,845.279	08/13/01	13:33
586	493,284.103	6,525,687.601	1,846.595	08/13/01	13:34
587	493,239.561	6,525,690.074	1,848.654	08/13/01	13:34
588	493,196.334	6,525,699.790	1,850.920	08/13/01	13:34
589	493,164.154	6,525,713.411	1,852.467	08/13/01	13:34
590	493,128.617	6,525,720.534	1,853.871	08/13/01	13:34
591	493,101.725	6,525,726.201	1,855.399	08/13/01	13:34
592	493,088.599	6,525,729.676	1,855.863	08/13/01	13:35
593	493,041.587	6,525,740.481	1,857.626	08/13/01	13:35
594	492,991.551	6,525,751.177	1,859.349	08/13/01	13:35
595	492,931.435	6,525,764.915	1,860.964	08/13/01	13:35
596	492,867.734	6,525,780.208	1,862.377	08/13/01	13:35
597	492,800.480	6,525,796.928	1,863.529	08/13/01	13:35
598	492,730.139	6,525,814.170	1,864.762	08/13/01	13:36
599	492,654.597	6,525,833.004	1,865.817	08/13/01	13:36
600	492,581.951	6,525,851.253	1,866.628	08/13/01	13:36
601	492,512.195	6,525,868.367	1,867.478	08/13/01	13:36
602	492,444.712	6,525,886.434	1,868.159	08/13/01	13:36
603	492,375.353	6,525,903.698	1,869.004	08/13/01	13:36
604	492,303.069	6,525,922.334	1,869.880	08/13/01	13:37
605	492,228.949	6,525,939.954	1,870.644	08/13/01	13:37
606	492,152.269	6,525,955.023	1,871.391	08/13/01	13:37
607	492,075.443	6,525,970.317	1,871.941	08/13/01	13:37
608	491,998.424	6,525,985.357	1,872.495	08/13/01	13:37
609	491,921.750	6,526,000.948	1,872.801	08/13/01	13:37
610	491,842.916	6,526,015.197	1,873.046	08/13/01	13:38
611	491,763.533	6,526,029.820	1,873.176	08/13/01	13:38
612	491,691.492	6,526,042.477	1,873.179	08/13/01	13:38
613	491,621.886	6,526,056.495	1,873.076	08/13/01	13:38
614	491,547.731	6,526,071.046	1,873.052	08/13/01	13:38
615	491,470.679	6,526,084.847	1,872.973	08/13/01	13:38

MATTHES / LLEWELLYN DIVIDE — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
616	491,392.896	6,526,100.317	1,872.883	08/13/01	13:39
617	491,313.830	6,526,115.144	1,872.751	08/13/01	13:39
618	491,255.085	6,526,125.879	1,872.499	08/13/01	13:39
619	491,187.309	6,526,139.643	1,872.218	08/13/01	13:39
620	491,113.933	6,526,154.325	1,872.030	08/13/01	13:39
621	491,038.629	6,526,168.726	1,871.813	08/13/01	13:39
622	490,963.650	6,526,184.300	1,871.584	08/13/01	13:40
623	490,888.001	6,526,198.927	1,871.413	08/13/01	13:40
624	490,815.456	6,526,213.648	1,871.336	08/13/01	13:40
625	490,739.859	6,526,228.253	1,871.397	08/13/01	13:40
626	490,661.256	6,526,243.214	1,871.578	08/13/01	13:40
627	490,583.510	6,526,258.062	1,871.829	08/13/01	13:40
628	490,506.108	6,526,273.096	1,872.292	08/13/01	13:41
629	490,426.770	6,526,288.547	1,872.944	08/13/01	13:41
630	490,348.505	6,526,303.071	1,873.716	08/13/01	13:41
631	490,273.258	6,526,317.686	1,874.643	08/13/01	13:41
632	490,202.154	6,526,331.261	1,875.677	08/13/01	13:41
633	490,130.305	6,526,344.796	1,876.741	08/13/01	13:41
634	490,057.568	6,526,358.065	1,877.783	08/13/01	13:42
635	489,985.049	6,526,371.838	1,878.943	08/13/01	13:42
636	489,913.758	6,526,384.756	1,880.140	08/13/01	13:42
637	489,846.000	6,526,397.509	1,881.401	08/13/01	13:42
638	489,830.657	6,526,400.397	1,881.750	08/13/01	13:42
639	489,830.661	6,526,400.397	1,881.785	08/13/01	13:42
640	489,830.664	6,526,400.387	1,881.777	08/13/01	13:43
641	489,830.661	6,526,400.387	1,881.773	08/13/01	13:43
642	489,830.661	6,526,400.388	1,881.778	08/13/01	13:43
643	489,830.667	6,526,400.388	1,881.773	08/13/01	13:43
644	489,830.662	6,526,400.395	1,881.788	08/13/01	13:43
645	489,830.662	6,526,400.387	1,881.775	08/13/01	13:43
646	489,830.662	6,526,400.390	1,881.784	08/13/01	13:44
647	489,830.661	6,526,400.396	1,881.785	08/13/01	13:44
648	489,830.661	6,526,400.373	1,881.779	08/13/01	13:44
649	489,830.664	6,526,400.372	1,881.767	08/13/01	13:44
650	489,830.671	6,526,400.389	1,881.782	08/13/01	13:44
651	489,795.836	6,526,407.248	1,882.591	08/13/01	13:44
652	489,734.126	6,526,421.504	1,884.439	08/13/01	13:45
653	489,667.735	6,526,437.368	1,886.918	08/13/01	13:45
654	489,599.770	6,526,453.371	1,890.228	08/13/01	13:45
655	489,530.729	6,526,469.007	1,894.443	08/13/01	13:45
656	489,464.386	6,526,484.342	1,899.224	08/13/01	13:45

MATTHES / LLEWELLYN DIVIDE — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
657	489,400.851	6,526,500.138	1,904.382	08/13/01	13:45
658	489,336.361	6,526,516.086	1,909.583	08/13/01	13:46
659	489,272.084	6,526,532.113	1,914.458	08/13/01	13:46
660	489,206.549	6,526,547.786	1,918.608	08/13/01	13:46
661	489,140.769	6,526,563.859	1,921.589	08/13/01	13:46
662	489,078.100	6,526,579.921	1,923.501	08/13/01	13:46
663	489,012.392	6,526,597.525	1,924.781	08/13/01	13:46
664	488,946.308	6,526,612.825	1,925.617	08/13/01	13:47
665	488,882.676	6,526,628.349	1,926.498	08/13/01	13:47
666	488,819.896	6,526,643.858	1,927.689	08/13/01	13:47
667	488,757.271	6,526,659.750	1,929.106	08/13/01	13:47
668	488,694.716	6,526,674.601	1,930.778	08/13/01	13:47
669	488,667.950	6,526,680.605	1,931.429	08/13/01	13:47
670	488,634.830	6,526,687.882	1,932.096	08/13/01	13:48
671	488,603.085	6,526,695.456	1,932.998	08/13/01	13:48
672	488,603.100	6,526,695.440	1,933.022	08/13/01	13:48
673	488,603.089	6,526,695.447	1,933.003	08/13/01	13:48
674	488,603.090	6,526,695.450	1,933.009	08/13/01	13:48
675	488,603.096	6,526,695.432	1,932.996	08/13/01	13:48
676	488,603.092	6,526,695.441	1,933.005	08/13/01	13:49
677	488,603.091	6,526,695.452	1,933.008	08/13/01	13:49
678	488,603.094	6,526,695.450	1,933.046	08/13/01	13:49
679	488,590.989	6,526,699.291	1,933.335	08/13/01	13:49
680	488,556.524	6,526,710.096	1,934.238	08/13/01	13:49
681	488,535.040	6,526,714.844	1,934.405	08/13/01	13:49
682	488,528.764	6,526,716.229	1,934.568	08/13/01	13:50
683	488,485.758	6,526,726.455	1,935.449	08/13/01	13:50
684	488,435.704	6,526,739.400	1,936.465	08/13/01	13:50
685	488,380.688	6,526,751.695	1,937.528	08/13/01	13:50
686	488,348.953	6,526,760.106	1,938.061	08/13/01	13:50
687	488,315.952	6,526,768.504	1,938.548	08/13/01	13:50
688	488,276.849	6,526,777.916	1,939.048	08/13/01	13:51
689	488,241.936	6,526,786.580	1,939.763	08/13/01	13:51
690	488,224.919	6,526,777.397	1,940.090	08/13/01	13:51
691	488,217.895	6,526,750.531	1,940.537	08/13/01	13:51
692	488,205.337	6,526,711.311	1,941.151	08/13/01	13:51
693	488,194.270	6,526,663.233	1,941.844	08/13/01	13:51
694	488,175.521	6,526,616.961	1,942.416	08/13/01	13:52
695	488,166.159	6,526,572.785	1,942.966	08/13/01	13:52
696	488,172.701	6,526,546.223	1,943.120	08/13/01	13:52
697	488,204.523	6,526,536.151	1,942.944	08/13/01	13:52

MATTHES / LLEWELLYN DIVIDE — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
698	488,254.616	6,526,521.443	1,942.406	08/13/01	13:52
699	488,311.308	6,526,505.224	1,941.716	08/13/01	13:52
700	488,357.363	6,526,493.559	1,939.932	08/13/01	13:53
701	488,387.186	6,526,486.211	1,939.085	08/13/01	13:53
702	488,446.662	6,526,473.254	1,937.502	08/13/01	13:53
703	488,511.192	6,526,457.202	1,935.889	08/13/01	13:53
704	488,579.660	6,526,440.242	1,934.446	08/13/01	13:53
705	488,649.637	6,526,423.530	1,933.060	08/13/01	13:53
706	488,722.572	6,526,405.840	1,931.827	08/13/01	13:54
707	488,793.569	6,526,389.659	1,930.824	08/13/01	13:54
708	488,863.842	6,526,375.441	1,929.772	08/13/01	13:54
709	488,931.141	6,526,361.323	1,928.001	08/13/01	13:54
710	489,001.129	6,526,345.419	1,925.091	08/13/01	13:54
711	489,075.819	6,526,327.494	1,920.588	08/13/01	13:54
712	489,145.497	6,526,311.019	1,915.713	08/13/01	13:55
713	489,218.532	6,526,294.829	1,909.697	08/13/01	13:55
714	489,293.539	6,526,279.466	1,902.469	08/13/01	13:55
715	489,360.316	6,526,265.072	1,895.623	08/13/01	13:55
716	489,433.950	6,526,249.219	1,888.914	08/13/01	13:55
717	489,504.384	6,526,232.729	1,883.891	08/13/01	13:55
718	489,578.218	6,526,214.509	1,880.068	08/13/01	13:56
719	489,656.429	6,526,197.942	1,877.707	08/13/01	13:56
720	489,733.968	6,526,181.503	1,876.127	08/13/01	13:56
721	489,812.121	6,526,163.005	1,874.817	08/13/01	13:56
722	489,893.425	6,526,144.270	1,873.546	08/13/01	13:56
723	489,974.534	6,526,124.557	1,872.341	08/13/01	13:56
724	490,059.487	6,526,104.273	1,871.048	08/13/01	13:57
725	490,146.934	6,526,083.234	1,869.937	08/13/01	13:57
726	490,234.300	6,526,061.702	1,868.969	08/13/01	13:57
727	490,322.796	6,526,040.895	1,868.195	08/13/01	13:57
728	490,411.602	6,526,019.971	1,867.695	08/13/01	13:57
729	490,501.960	6,525,997.349	1,867.404	08/13/01	13:57
730	490,590.460	6,525,977.109	1,867.475	08/13/01	13:58
731	490,677.057	6,525,956.687	1,867.744	08/13/01	13:58
732	490,764.577	6,525,936.684	1,868.132	08/13/01	13:58
733	490,854.440	6,525,915.738	1,868.671	08/13/01	13:58
734	490,944.222	6,525,894.360	1,869.267	08/13/01	13:58
735	491,033.452	6,525,873.095	1,869.985	08/13/01	13:58
736	491,121.000	6,525,851.163	1,870.639	08/13/01	13:59
737	491,207.860	6,525,829.420	1,871.353	08/13/01	13:59
738	491,294.628	6,525,809.219	1,871.955	08/13/01	13:59

MATTHES / LLEWELLYN DIVIDE — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
739	491,379.957	6,525,789.513	1,872.568	08/13/01	13:59
740	491,466.106	6,525,769.702	1,873.165	08/13/01	13:59
741	491,551.712	6,525,748.713	1,873.749	08/13/01	13:59
742	491,637.313	6,525,728.354	1,874.377	08/13/01	14:00
743	491,721.823	6,525,709.332	1,874.778	08/13/01	14:00
744	491,807.020	6,525,688.285	1,875.295	08/13/01	14:00
745	491,890.817	6,525,663.316	1,875.633	08/13/01	14:00
746	491,976.451	6,525,645.208	1,875.939	08/13/01	14:00
747	492,060.831	6,525,627.207	1,876.105	08/13/01	14:00
748	492,146.940	6,525,608.637	1,876.206	08/13/01	14:01
749	492,228.336	6,525,591.409	1,876.270	08/13/01	14:01
750	492,311.276	6,525,574.292	1,876.349	08/13/01	14:01
751	492,393.555	6,525,558.450	1,876.328	08/13/01	14:01
752	492,478.066	6,525,541.997	1,876.119	08/13/01	14:01
753	492,560.672	6,525,524.736	1,875.940	08/13/01	14:01
754	492,641.165	6,525,507.846	1,875.694	08/13/01	14:02
755	492,722.093	6,525,490.530	1,875.131	08/13/01	14:02
756	492,801.588	6,525,474.187	1,873.882	08/13/01	14:02
757	492,864.864	6,525,460.353	1,872.301	08/13/01	14:02
758	492,911.795	6,525,447.543	1,870.767	08/13/01	14:02
759	492,946.890	6,525,437.377	1,869.231	08/13/01	14:02
760	492,984.853	6,525,427.521	1,866.783	08/13/01	14:03
761	493,021.609	6,525,419.749	1,864.141	08/13/01	14:03
762	493,052.145	6,525,413.601	1,861.362	08/13/01	14:03
763	493,074.475	6,525,409.368	1,858.703	08/13/01	14:03
764	493,093.234	6,525,396.192	1,856.240	08/13/01	14:03
765	493,085.717	6,525,346.857	1,857.212	08/13/01	14:07
766	492,946.576	6,525,120.000	1,889.578	08/13/01	14:07
767	492,946.571	6,525,120.001	1,889.576	08/13/01	14:07
768	492,920.511	6,525,117.268	1,890.518	08/13/01	14:07
769	492,871.803	6,525,124.272	1,890.761	08/13/01	14:08
770	492,815.706	6,525,136.255	1,890.359	08/13/01	14:08
771	492,754.371	6,525,149.989	1,889.371	08/13/01	14:08
772	492,690.904	6,525,163.118	1,888.170	08/13/01	14:08
773	492,618.884	6,525,178.049	1,886.615	08/13/01	14:08
774	492,543.588	6,525,195.316	1,885.011	08/13/01	14:08
775	492,460.950	6,525,214.176	1,883.240	08/13/01	14:09
776	492,375.493	6,525,233.573	1,881.606	08/13/01	14:09
777	492,290.691	6,525,254.106	1,880.076	08/13/01	14:09
778	492,204.899	6,525,271.240	1,878.919	08/13/01	14:09
779	492,119.810	6,525,286.875	1,877.744	08/13/01	14:09

MATTHES / LLEWELLYN DIVIDE — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
780	492,034.910	6,525,305.491	1,876.641	08/13/01	14:09
781	491,948.111	6,525,323.339	1,875.553	08/13/01	14:10
782	491,861.595	6,525,340.963	1,874.364	08/13/01	14:10
783	491,772.367	6,525,359.971	1,872.997	08/13/01	14:10
784	491,685.300	6,525,378.296	1,871.720	08/13/01	14:10
785	491,598.711	6,525,396.149	1,870.675	08/13/01	14:10
786	491,514.394	6,525,414.183	1,869.876	08/13/01	14:10
787	491,427.861	6,525,432.068	1,869.014	08/13/01	14:11
788	491,343.809	6,525,449.306	1,868.108	08/13/01	14:11
789	491,260.825	6,525,466.770	1,867.406	08/13/01	14:11
790	491,179.957	6,525,485.166	1,866.746	08/13/01	14:11
791	491,100.911	6,525,503.901	1,866.189	08/13/01	14:11
792	491,020.340	6,525,522.350	1,865.661	08/13/01	14:11
793	490,939.704	6,525,540.312	1,864.988	08/13/01	14:12
794	490,858.759	6,525,558.146	1,864.289	08/13/01	14:12
795	490,778.151	6,525,576.525	1,863.533	08/13/01	14:12
796	490,695.855	6,525,594.395	1,862.728	08/13/01	14:12
797	490,614.723	6,525,612.003	1,861.921	08/13/01	14:12
798	490,534.643	6,525,629.249	1,861.346	08/13/01	14:12
799	490,453.818	6,525,646.369	1,860.990	08/13/01	14:13
800	490,371.905	6,525,663.619	1,860.750	08/13/01	14:13
801	490,290.364	6,525,681.400	1,860.636	08/13/01	14:13
802	490,208.257	6,525,698.520	1,860.620	08/13/01	14:13
803	490,128.905	6,525,715.622	1,860.930	08/13/01	14:13
804	490,054.613	6,525,732.052	1,861.436	08/13/01	14:13
805	489,981.723	6,525,746.109	1,862.105	08/13/01	14:14
806	489,908.266	6,525,760.605	1,862.818	08/13/01	14:14
807	489,836.820	6,525,775.132	1,863.601	08/13/01	14:14
808	489,759.386	6,525,789.983	1,864.504	08/13/01	14:14
809	489,686.109	6,525,805.355	1,865.347	08/13/01	14:14
810	489,613.253	6,525,820.106	1,866.200	08/13/01	14:14
811	489,539.766	6,525,834.752	1,867.162	08/13/01	14:15
812	489,465.370	6,525,852.270	1,868.234	08/13/01	14:15
813	489,401.011	6,525,866.875	1,869.570	08/13/01	14:15
814	489,335.019	6,525,879.271	1,871.889	08/13/01	14:15
815	489,274.638	6,525,890.692	1,875.651	08/13/01	14:15
816	489,215.777	6,525,901.737	1,881.205	08/13/01	14:15
817	489,159.972	6,525,912.122	1,887.874	08/13/01	14:16
818	489,101.573	6,525,921.455	1,895.274	08/13/01	14:16
819	489,045.816	6,525,931.342	1,902.026	08/13/01	14:16
820	488,989.432	6,525,942.947	1,908.045	08/13/01	14:16

MATTHES / LLEWELLYN DIVIDE — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
821	488,931.307	6,525,955.799	1,913.080	08/13/01	14:16
822	488,869.717	6,525,969.568	1,917.335	08/13/01	14:16
823	488,805.348	6,525,985.045	1,921.214	08/13/01	14:17
824	488,738.559	6,526,000.134	1,925.520	08/13/01	14:17
825	488,671.671	6,526,015.570	1,930.243	08/13/01	14:17
826	488,610.370	6,526,029.545	1,934.640	08/13/01	14:17
827	488,553.546	6,526,042.471	1,938.245	08/13/01	14:17
828	488,502.873	6,526,053.958	1,940.393	08/13/01	14:17
829	488,477.050	6,526,059.329	1,940.994	08/13/01	14:18
830	488,443.078	6,526,066.676	1,942.192	08/13/01	14:18
831	488,399.413	6,526,075.453	1,944.021	08/13/01	14:18
832	488,367.021	6,526,080.076	1,945.824	08/13/01	14:18
833	488,366.370	6,526,079.826	1,946.339	08/13/01	14:18
834	488,365.484	6,526,080.755	1,945.005	08/13/01	14:18
835	488,344.349	6,526,084.510	1,945.823	08/13/01	14:19
836	488,302.218	6,526,093.048	1,947.643	08/13/01	14:19
837	488,259.774	6,526,101.661	1,949.396	08/13/01	14:19
838	488,218.288	6,526,110.809	1,950.764	08/13/01	14:19
839	488,181.948	6,526,118.099	1,951.510	08/13/01	14:19
840	488,164.879	6,526,119.193	1,951.770	08/13/01	14:19
841	488,119.898	6,526,124.893	1,952.243	08/13/01	14:20
842	488,091.328	6,526,122.332	1,952.723	08/13/01	14:20
843	488,080.535	6,526,061.988	1,956.418	08/13/01	14:20
844	488,063.160	6,526,010.405	1,960.201	08/13/01	14:20
845	488,050.172	6,525,962.375	1,963.646	08/13/01	14:20
846	488,065.554	6,525,921.800	1,966.514	08/13/01	14:20
847	488,104.302	6,525,892.714	1,967.899	08/13/01	14:21
848	488,146.260	6,525,868.836	1,968.644	08/13/01	14:21
849	488,191.558	6,525,854.653	1,969.473	08/13/01	14:21
850	488,229.594	6,525,843.280	1,970.493	08/13/01	14:21
851	488,265.144	6,525,834.302	1,970.374	08/13/01	14:21
852	488,306.361	6,525,823.692	1,968.920	08/13/01	14:21
853	488,338.214	6,525,814.745	1,966.345	08/13/01	14:22
854	488,362.802	6,525,806.891	1,963.842	08/13/01	14:22
855	488,394.250	6,525,799.458	1,959.653	08/13/01	14:22
856	488,426.527	6,525,797.191	1,954.640	08/13/01	14:22
857	488,462.296	6,525,795.155	1,948.608	08/13/01	14:22
858	488,490.483	6,525,793.037	1,943.375	08/13/01	14:22
859	488,518.305	6,525,788.185	1,937.904	08/13/01	14:23
860	488,548.557	6,525,781.838	1,931.833	08/13/01	14:23
861	488,589.997	6,525,773.324	1,923.193	08/13/01	14:23

MATTHES / LLEWELLYN DIVIDE — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
862	488,632.491	6,525,761.944	1,912.794	08/13/01	14:23
863	488,677.068	6,525,749.194	1,901.533	08/13/01	14:23
864	488,726.365	6,525,737.847	1,892.269	08/13/01	14:23
865	488,775.916	6,525,725.582	1,886.586	08/13/01	14:24
866	488,836.799	6,525,711.933	1,883.369	08/13/01	14:24
867	488,880.087	6,525,703.623	1,883.182	08/13/01	14:24
868	488,880.091	6,525,703.619	1,883.218	08/13/01	14:24
869	488,892.365	6,525,700.695	1,882.874	08/13/01	14:24
870	488,908.255	6,525,697.377	1,882.520	08/13/01	14:24
871	488,908.248	6,525,697.365	1,882.493	08/13/01	14:25
872	488,908.239	6,525,697.400	1,882.561	08/13/01	14:25
873	488,908.245	6,525,697.379	1,882.509	08/13/01	14:25
874	488,927.930	6,525,693.579	1,881.204	08/13/01	14:25
875	488,968.619	6,525,686.387	1,880.269	08/13/01	14:25
876	489,026.610	6,525,673.937	1,878.373	08/13/01	14:25
877	489,093.443	6,525,660.135	1,875.618	08/13/01	14:26
878	489,172.309	6,525,644.583	1,871.794	08/13/01	14:26
879	489,257.112	6,525,628.581	1,867.922	08/13/01	14:26
880	489,342.780	6,525,609.174	1,864.951	08/13/01	14:26
881	489,427.871	6,525,590.130	1,862.923	08/13/01	14:26
882	489,515.009	6,525,572.344	1,861.368	08/13/01	14:26
883	489,607.996	6,525,553.268	1,859.939	08/13/01	14:27
884	489,701.969	6,525,533.676	1,858.551	08/13/01	14:27
885	489,797.810	6,525,513.510	1,857.308	08/13/01	14:27
886	489,938.835	6,525,483.952	1,856.919	08/13/01	14:27
887	489,938.775	6,525,483.971	1,857.024	08/13/01	14:27
888	489,938.770	6,525,483.924	1,856.968	08/13/01	14:28
889	489,938.763	6,525,483.906	1,856.904	08/13/01	14:28
890	489,938.787	6,525,483.845	1,856.855	08/13/01	14:28
891	489,938.787	6,525,483.825	1,856.858	08/13/01	14:28
892	489,938.787	6,525,483.847	1,856.881	08/13/01	14:28
893	489,938.779	6,525,483.834	1,856.899	08/13/01	14:28
894	489,938.796	6,525,483.846	1,856.892	08/13/01	14:29
895	489,938.781	6,525,483.837	1,856.873	08/13/01	14:29
896	489,959.434	6,525,479.507	1,856.769	08/13/01	14:29
897	489,960.062	6,525,479.400	1,856.848	08/13/01	14:29
898	489,960.066	6,525,479.400	1,856.856	08/13/01	14:29
899	489,960.055	6,525,479.394	1,856.839	08/13/01	14:29
900	489,960.074	6,525,479.403	1,856.860	08/13/01	14:30
901	489,960.085	6,525,479.383	1,856.812	08/13/01	14:30
902	489,960.072	6,525,479.389	1,856.814	08/13/01	14:30

MATTHES / LLEWELLYN DIVIDE — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
903	489,960.050	6,525,479.377	1,856.846	08/13/01	14:30
904	489,960.062	6,525,479.404	1,856.854	08/13/01	14:30
905	489,960.059	6,525,479.379	1,856.840	08/13/01	14:30
906	489,960.064	6,525,479.418	1,856.873	08/13/01	14:32
907	489,960.018	6,525,479.067	1,856.399	08/13/01	14:32
908	489,960.040	6,525,478.977	1,856.330	08/13/01	14:32
909	489,960.060	6,525,479.002	1,856.314	08/13/01	14:33
910	489,960.242	6,525,478.937	1,856.320	08/13/01	14:33
911	489,965.636	6,525,477.749	1,856.323	08/13/01	14:33
912	490,025.415	6,525,465.875	1,856.145	08/13/01	14:33
913	490,102.986	6,525,450.177	1,855.774	08/13/01	14:33
914	490,185.035	6,525,435.249	1,855.491	08/13/01	14:33
915	490,269.926	6,525,418.777	1,855.419	08/13/01	14:34
916	490,395.008	6,525,394.957	1,856.279	08/13/01	14:34
917	490,394.931	6,525,395.032	1,856.416	08/13/01	14:34
918	490,394.901	6,525,395.138	1,856.579	08/13/01	14:34
919	490,394.905	6,525,395.150	1,856.531	08/13/01	14:34
920	490,394.903	6,525,395.136	1,856.551	08/13/01	14:35
921	490,394.896	6,525,395.160	1,856.595	08/13/01	14:35
922	490,394.955	6,525,395.052	1,855.932	08/13/01	14:35
923	490,421.162	6,525,389.879	1,856.089	08/13/01	14:35
924	490,484.630	6,525,377.126	1,856.696	08/13/01	14:35
925	490,558.577	6,525,362.170	1,857.398	08/13/01	14:35
926	490,638.224	6,525,345.835	1,858.305	08/13/01	14:36
927	490,716.634	6,525,330.113	1,859.226	08/13/01	14:36
928	490,799.158	6,525,315.028	1,860.081	08/13/01	14:36
929	490,883.727	6,525,298.982	1,860.473	08/13/01	14:36
930	490,915.828	6,525,293.598	1,862.089	08/13/01	14:36
931	490,915.865	6,525,293.394	1,861.627	08/13/01	14:36
932	490,915.868	6,525,293.295	1,861.465	08/13/01	14:37
933	490,915.873	6,525,293.240	1,861.271	08/13/01	14:37
934	490,915.895	6,525,293.186	1,861.175	08/13/01	14:37
935	490,915.898	6,525,293.170	1,861.099	08/13/01	14:37
936	490,915.888	6,525,293.172	1,861.095	08/13/01	14:37
937	490,915.901	6,525,293.172	1,861.040	08/13/01	14:37
938	490,915.882	6,525,293.215	1,861.133	08/13/01	14:38
939	490,945.138	6,525,287.310	1,861.352	08/13/01	14:38
940	491,010.468	6,525,273.254	1,861.809	08/13/01	14:38
941	491,079.683	6,525,258.277	1,862.405	08/13/01	14:38
942	491,150.661	6,525,245.281	1,863.125	08/13/01	14:38
943	491,220.687	6,525,232.288	1,863.681	08/13/01	14:38

MATTHES / LLEWELLYN DIVIDE — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
944	491,293.817	6,525,216.372	1,864.462	08/13/01	14:39
945	491,372.340	6,525,199.333	1,865.310	08/13/01	14:39
946	491,450.594	6,525,183.628	1,866.167	08/13/01	14:39
947	491,528.858	6,525,166.646	1,867.105	08/13/01	14:39
948	491,608.422	6,525,149.770	1,867.521	08/13/01	14:39
949	491,662.762	6,525,139.232	1,869.017	08/13/01	14:39
950	491,662.757	6,525,139.177	1,868.982	08/13/01	14:40
951	491,688.706	6,525,134.464	1,869.430	08/13/01	14:40
952	491,755.455	6,525,120.447	1,870.653	08/13/01	14:40
953	491,825.498	6,525,105.843	1,871.952	08/13/01	14:40
954	491,900.210	6,525,088.868	1,873.411	08/13/01	14:40
955	491,972.533	6,525,074.004	1,874.744	08/13/01	14:40
956	492,048.887	6,525,058.562	1,876.316	08/13/01	14:41
957	492,126.127	6,525,041.457	1,877.060	08/13/01	14:41
958	492,167.990	6,525,033.463	1,878.805	08/13/01	14:41
959	492,167.988	6,525,033.361	1,878.507	08/13/01	14:41
960	492,167.994	6,525,033.291	1,878.339	08/13/01	14:41
961	492,167.982	6,525,033.274	1,878.306	08/13/01	14:41
962	492,167.982	6,525,033.280	1,878.308	08/13/01	14:42
963	492,167.994	6,525,033.251	1,878.272	08/13/01	14:42
964	492,168.001	6,525,033.222	1,878.186	08/13/01	14:42
965	492,167.988	6,525,033.243	1,878.232	08/13/01	14:42
966	492,167.978	6,525,033.228	1,878.220	08/13/01	14:42
967	492,167.970	6,525,033.244	1,878.233	08/13/01	14:42
968	492,167.991	6,525,033.239	1,878.202	08/13/01	14:43
969	492,167.995	6,525,033.233	1,878.162	08/13/01	14:43
970	492,167.990	6,525,033.230	1,878.137	08/13/01	14:43
971	492,167.996	6,525,033.219	1,878.157	08/13/01	14:43
972	492,167.993	6,525,033.235	1,878.153	08/13/01	14:43
973	492,167.960	6,525,033.130	1,878.367	08/13/01	14:43
974	492,187.645	6,525,028.978	1,878.808	08/13/01	14:44
975	492,251.058	6,525,014.028	1,880.191	08/13/01	14:44
976	492,317.928	6,524,999.473	1,881.748	08/13/01	14:44
977	492,390.761	6,524,985.642	1,883.523	08/13/01	14:44
978	492,463.729	6,524,972.133	1,885.736	08/13/01	14:44
979	492,536.095	6,524,957.133	1,888.256	08/13/01	14:44
980	492,607.232	6,524,942.196	1,891.107	08/13/01	14:45
981	492,672.844	6,524,928.684	1,894.189	08/13/01	14:45
982	492,742.496	6,524,914.004	1,897.586	08/13/01	14:45
983	492,811.697	6,524,898.684	1,900.735	08/13/01	14:45
984	492,878.526	6,524,883.867	1,903.112	08/13/01	14:45

MATTHES / LLEWELLYN DIVIDE — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
985	492,902.276	6,524,878.438	1,903.688	08/13/01	14:45
986	492,902.284	6,524,878.424	1,903.669	08/13/01	14:46
987	492,902.217	6,524,878.671	1,904.302	08/13/01	14:46
988	492,902.218	6,524,878.656	1,904.287	08/13/01	14:46
989	492,915.792	6,524,875.590	1,904.619	08/13/01	14:46
990	492,964.630	6,524,864.550	1,905.167	08/13/01	14:46
991	493,004.494	6,524,855.466	1,904.727	08/13/01	14:46
992	493,033.487	6,524,848.619	1,903.239	08/13/01	14:47
993	493,060.614	6,524,829.956	1,901.630	08/13/01	14:47
994	493,057.375	6,524,791.277	1,903.858	08/13/01	14:47
995	493,044.280	6,524,742.266	1,907.312	08/13/01	14:47
996	493,030.905	6,524,691.976	1,911.048	08/13/01	14:47
997	493,021.653	6,524,648.707	1,914.071	08/13/01	14:47
998	493,004.719	6,524,610.729	1,917.238	08/13/01	14:48
999	492,973.899	6,524,600.337	1,918.327	08/13/01	14:48
1000	492,956.152	6,524,603.582	1,917.289	08/13/01	14:48
1001	492,904.504	6,524,613.530	1,914.487	08/13/01	14:48
1002	492,846.685	6,524,625.404	1,911.432	08/13/01	14:48
1003	492,782.050	6,524,639.213	1,907.612	08/13/01	14:48
1004	492,720.160	6,524,652.167	1,903.188	08/13/01	14:49
1005	492,649.577	6,524,667.015	1,897.814	08/13/01	14:49
1006	492,579.551	6,524,682.354	1,893.475	08/13/01	14:49
1007	492,508.115	6,524,697.169	1,890.019	08/13/01	14:49
1008	492,432.190	6,524,713.118	1,886.937	08/13/01	14:49
1009	492,350.091	6,524,729.756	1,884.127	08/13/01	14:49
1010	492,269.270	6,524,745.376	1,881.657	08/13/01	14:50
1011	492,189.323	6,524,761.775	1,879.388	08/13/01	14:50
1012	492,108.003	6,524,779.424	1,877.331	08/13/01	14:50
1013	492,027.011	6,524,797.133	1,875.410	08/13/01	14:50
1014	491,944.486	6,524,814.734	1,873.459	08/13/01	14:50
1015	491,861.680	6,524,832.515	1,871.723	08/13/01	14:50
1016	491,782.664	6,524,849.981	1,870.327	08/13/01	14:51
1017	491,704.154	6,524,866.302	1,869.087	08/13/01	14:51
1018	491,625.511	6,524,883.039	1,867.734	08/13/01	14:51
1019	491,547.048	6,524,899.025	1,866.368	08/13/01	14:51
1020	491,470.748	6,524,915.535	1,865.070	08/13/01	14:51
1021	491,391.656	6,524,931.690	1,863.662	08/13/01	14:51
1022	491,312.664	6,524,947.846	1,862.538	08/13/01	14:52
1023	491,233.876	6,524,963.677	1,861.395	08/13/01	14:52
1024	491,154.782	6,524,980.024	1,860.429	08/13/01	14:52
1025	491,074.715	6,524,996.590	1,859.454	08/13/01	14:52

MATTHES / LLEWELLYN DIVIDE — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
1026	490,995.117	6,525,011.816	1,858.505	08/13/01	14:52
1027	490,918.267	6,525,027.323	1,857.594	08/13/01	14:52
1028	490,845.312	6,525,041.763	1,856.961	08/13/01	14:53
1029	490,767.093	6,525,059.115	1,856.196	08/13/01	14:53
1030	490,689.780	6,525,074.878	1,855.326	08/13/01	14:53
1031	490,610.243	6,525,092.438	1,854.390	08/13/01	14:53
1032	490,530.374	6,525,109.647	1,853.507	08/13/01	14:53
1033	490,450.988	6,525,127.049	1,852.740	08/13/01	14:53
1034	490,371.328	6,525,142.661	1,851.714	08/13/01	14:54
1035	490,289.605	6,525,159.976	1,850.965	08/13/01	14:54
1036	490,211.623	6,525,176.013	1,850.575	08/13/01	14:54
1037	490,136.788	6,525,191.955	1,850.542	08/13/01	14:54
1038	490,063.371	6,525,206.476	1,850.683	08/13/01	14:54
1039	489,987.048	6,525,222.963	1,851.040	08/13/01	14:54
1040	489,926.788	6,525,235.929	1,852.257	08/13/01	14:55
1041	489,926.800	6,525,235.857	1,852.138	08/13/01	14:55
1042	489,926.738	6,525,235.646	1,851.284	08/13/01	14:55
1043	489,907.388	6,525,239.980	1,851.403	08/13/01	14:55
1044	489,835.211	6,525,255.356	1,852.026	08/13/01	14:55
1045	489,763.775	6,525,269.532	1,852.512	08/13/01	14:55
1046	489,690.465	6,525,285.227	1,852.895	08/13/01	14:56
1047	489,615.064	6,525,301.161	1,853.770	08/13/01	14:56
1048	489,539.366	6,525,318.019	1,854.909	08/13/01	14:56
1049	489,463.156	6,525,334.366	1,856.206	08/13/01	14:56
1050	489,369.487	6,525,355.180	1,859.165	08/13/01	14:56
1051	489,369.333	6,525,354.985	1,858.183	08/13/01	14:57
1052	489,340.740	6,525,361.317	1,858.813	08/13/01	14:57
1053	489,280.897	6,525,376.142	1,860.380	08/13/01	14:57
1054	489,216.570	6,525,389.164	1,862.121	08/13/01	14:57
1055	489,150.257	6,525,401.731	1,864.326	08/13/01	14:57
1056	489,084.660	6,525,414.276	1,866.746	08/13/01	14:57
1057	489,022.345	6,525,426.578	1,868.704	08/13/01	14:58
1058	488,963.672	6,525,437.525	1,869.783	08/13/01	14:58
1059	488,907.495	6,525,448.812	1,869.835	08/13/01	14:58
1060	488,851.545	6,525,459.384	1,868.778	08/13/01	14:58
1061	488,793.716	6,525,474.135	1,866.705	08/13/01	14:58
1062	488,732.365	6,525,489.088	1,864.420	08/13/01	14:58
1063	488,672.074	6,525,499.068	1,864.393	08/13/01	14:59
1064	488,616.532	6,525,509.858	1,869.937	08/13/01	14:59
1065	488,578.696	6,525,522.504	1,879.349	08/13/01	14:59
1066	488,560.437	6,525,499.350	1,880.750	08/13/01	14:59

MATTHES / LLEWELLYN DIVIDE — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
1067	488,552.235	6,525,476.963	1,879.956	08/13/01	14:59
1068	488,540.621	6,525,461.686	1,881.006	08/13/01	14:59
1069	488,525.754	6,525,446.174	1,882.809	08/13/01	15:00
1070	488,509.425	6,525,433.072	1,885.155	08/13/01	15:00
1071	488,497.115	6,525,420.635	1,886.520	08/13/01	15:00
1072	488,481.866	6,525,403.441	1,887.959	08/13/01	15:00
1073	488,464.143	6,525,393.541	1,890.523	08/13/01	15:00
1074	488,448.002	6,525,380.221	1,892.227	08/13/01	15:00
1075	488,433.038	6,525,366.863	1,893.627	08/13/01	15:01
1076	488,449.245	6,525,354.617	1,889.206	08/13/01	15:01
1077	488,502.420	6,525,341.821	1,880.872	08/13/01	15:01
1078	488,577.494	6,525,324.743	1,873.543	08/13/01	15:01
1079	488,654.888	6,525,306.816	1,869.170	08/13/01	15:01
1080	488,721.674	6,525,288.239	1,867.074	08/13/01	15:01
1081	488,796.126	6,525,267.783	1,865.961	08/13/01	15:02
1082	488,875.343	6,525,249.706	1,865.301	08/13/01	15:02
1083	488,958.521	6,525,230.421	1,863.464	08/13/01	15:02
1084	489,045.305	6,525,212.605	1,860.236	08/13/01	15:02
1085	489,134.576	6,525,193.888	1,856.860	08/13/01	15:02
1086	489,222.984	6,525,175.074	1,854.409	08/13/01	15:02
1087	489,309.084	6,525,155.672	1,852.522	08/13/01	15:03
1088	489,396.220	6,525,135.595	1,850.896	08/13/01	15:03
1089	489,484.205	6,525,117.724	1,849.769	08/13/01	15:03
1090	489,571.463	6,525,100.677	1,849.123	08/13/01	15:03
1091	489,658.007	6,525,083.003	1,848.540	08/13/01	15:03
1092	489,743.308	6,525,065.004	1,847.902	08/13/01	15:03
1093	489,826.600	6,525,049.068	1,847.436	08/13/01	15:04
1094	489,911.285	6,525,029.636	1,846.950	08/13/01	15:04
1095	489,996.531	6,525,011.048	1,846.547	08/13/01	15:04
1096	490,080.795	6,524,994.043	1,846.446	08/13/01	15:04
1097	490,163.441	6,524,977.584	1,846.744	08/13/01	15:04
1098	490,244.482	6,524,961.058	1,847.490	08/13/01	15:04
1099	490,325.740	6,524,945.611	1,848.294	08/13/01	15:05
1100	490,405.215	6,524,929.297	1,849.175	08/13/01	15:05
1101	490,484.771	6,524,913.900	1,850.251	08/13/01	15:05
1102	490,563.412	6,524,898.426	1,851.213	08/13/01	15:05
1103	490,644.557	6,524,883.571	1,852.108	08/13/01	15:05
1104	490,724.990	6,524,866.693	1,852.959	08/13/01	15:05
1105	490,804.504	6,524,850.508	1,853.937	08/13/01	15:06
1106	490,882.841	6,524,832.343	1,854.912	08/13/01	15:06
1107	490,960.755	6,524,817.160	1,856.053	08/13/01	15:06

MATTHES / LLEWELLYN DIVIDE — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
1108	491,036.396	6,524,803.106	1,857.175	08/13/01	15:06
1109	491,115.980	6,524,786.587	1,858.476	08/13/01	15:06
1110	491,192.199	6,524,771.303	1,859.799	08/13/01	15:06
1111	491,268.648	6,524,755.922	1,861.079	08/13/01	15:07
1112	491,346.929	6,524,739.687	1,862.136	08/13/01	15:07
1113	491,422.778	6,524,724.558	1,863.326	08/13/01	15:07
1114	491,499.651	6,524,711.056	1,864.797	08/13/01	15:07
1115	491,575.105	6,524,697.116	1,866.226	08/13/01	15:07
1116	491,650.700	6,524,680.973	1,867.768	08/13/01	15:07
1117	491,722.029	6,524,666.381	1,869.231	08/13/01	15:08
1118	491,794.493	6,524,652.139	1,870.691	08/13/01	15:08
1119	491,872.095	6,524,638.452	1,872.252	08/13/01	15:08
1120	491,915.191	6,524,631.275	1,873.182	08/13/01	15:08
1121	491,983.492	6,524,618.812	1,874.700	08/13/01	15:08
1122	492,058.567	6,524,606.289	1,876.940	08/13/01	15:08
1123	492,134.578	6,524,594.542	1,879.549	08/13/01	15:09
1124	492,211.900	6,524,583.516	1,882.415	08/13/01	15:09
1125	492,288.847	6,524,570.287	1,885.394	08/13/01	15:09
1126	492,362.512	6,524,552.368	1,888.301	08/13/01	15:09
1127	492,435.788	6,524,530.318	1,891.228	08/13/01	15:09
1128	492,508.305	6,524,507.629	1,893.962	08/13/01	15:09
1129	492,580.039	6,524,494.320	1,896.616	08/13/01	15:10
1130	492,649.681	6,524,480.209	1,899.708	08/13/01	15:10
1131	492,718.503	6,524,464.593	1,903.789	08/13/01	15:10
1132	492,785.549	6,524,446.922	1,908.751	08/13/01	15:10
1133	492,850.047	6,524,431.036	1,914.227	08/13/01	15:10
1134	492,909.479	6,524,422.446	1,919.180	08/13/01	15:10
1135	492,935.194	6,524,415.440	1,921.325	08/13/01	15:11
1136	492,948.309	6,524,408.362	1,921.506	08/13/01	15:11
1137	492,952.039	6,524,385.373	1,920.652	08/13/01	15:11
1138	492,939.461	6,524,349.848	1,919.746	08/13/01	15:11
1139	492,929.405	6,524,307.632	1,918.317	08/13/01	15:11
1140	492,919.449	6,524,266.456	1,917.519	08/13/01	15:11
1141	492,910.012	6,524,227.505	1,917.701	08/13/01	15:12
1142	492,900.786	6,524,194.371	1,918.174	08/13/01	15:12
1143	492,875.123	6,524,194.542	1,915.749	08/13/01	15:12
1144	492,827.585	6,524,201.295	1,912.883	08/13/01	15:12
1145	492,770.888	6,524,213.605	1,910.365	08/13/01	15:12
1146	492,709.979	6,524,227.781	1,907.214	08/13/01	15:12
1147	492,650.345	6,524,238.241	1,904.891	08/13/01	15:13
1148	492,575.733	6,524,250.738	1,902.678	08/13/01	15:13

MATTHES / LLEWELLYN DIVIDE — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
1149	492,498.099	6,524,264.165	1,900.159	08/13/01	15:13
1150	492,420.449	6,524,276.838	1,897.065	08/13/01	15:13
1151	492,344.917	6,524,290.256	1,893.547	08/13/01	15:13
1152	492,270.228	6,524,304.021	1,889.593	08/13/01	15:13
1153	492,193.806	6,524,317.639	1,885.398	08/13/01	15:14
1154	492,120.273	6,524,330.002	1,881.571	08/13/01	15:14
1155	492,041.144	6,524,344.570	1,878.061	08/13/01	15:14
1156	491,958.876	6,524,357.999	1,874.976	08/13/01	15:14
1157	491,873.689	6,524,372.090	1,872.321	08/13/01	15:14
1158	491,813.423	6,524,383.965	1,870.604	08/13/01	15:14
1159	491,743.354	6,524,396.006	1,868.849	08/13/01	15:15
1160	491,666.661	6,524,409.237	1,867.134	08/13/01	15:15
1161	491,585.534	6,524,423.402	1,865.669	08/13/01	15:15
1162	491,502.562	6,524,437.494	1,864.148	08/13/01	15:15
1163	491,418.526	6,524,451.569	1,862.460	08/13/01	15:15
1164	491,334.832	6,524,465.615	1,860.939	08/13/01	15:15
1165	491,251.318	6,524,479.132	1,859.432	08/13/01	15:16
1166	491,169.030	6,524,493.988	1,857.748	08/13/01	15:16
1167	491,086.638	6,524,507.857	1,856.116	08/13/01	15:16
1168	491,003.560	6,524,521.085	1,854.293	08/13/01	15:16
1169	490,918.581	6,524,536.077	1,852.482	08/13/01	15:16
1170	490,833.539	6,524,551.329	1,850.763	08/13/01	15:16
1171	490,748.340	6,524,564.801	1,849.093	08/13/01	15:17
1172	490,663.694	6,524,579.278	1,847.808	08/13/01	15:17
1173	490,582.528	6,524,593.450	1,846.775	08/13/01	15:17
1174	490,498.933	6,524,606.733	1,845.925	08/13/01	15:17
1175	490,417.177	6,524,619.930	1,844.972	08/13/01	15:17
1176	490,336.469	6,524,633.994	1,844.094	08/13/01	15:17
1177	490,256.182	6,524,647.747	1,843.437	08/13/01	15:18
1178	490,176.419	6,524,660.925	1,842.860	08/13/01	15:18
1179	490,094.596	6,524,675.374	1,842.193	08/13/01	15:18
1180	490,013.500	6,524,689.678	1,841.278	08/13/01	15:18
1181	489,933.263	6,524,704.647	1,840.753	08/13/01	15:18
1182	489,907.211	6,524,697.843	1,840.408	08/13/01	15:18
1183	489,923.958	6,524,699.521	1,840.631	08/13/01	15:19
1184	489,879.740	6,524,713.455	1,840.673	08/13/01	15:19
1185	489,812.362	6,524,727.883	1,840.589	08/13/01	15:19
1186	489,740.985	6,524,742.122	1,840.913	08/13/01	15:19
1187	489,666.889	6,524,755.672	1,841.084	08/13/01	15:19
1188	489,590.181	6,524,769.629	1,841.198	08/13/01	15:19
1189	489,513.577	6,524,783.610	1,841.235	08/13/01	15:20

MATTHES / LLEWELLYN DIVIDE — EPOCH 0					
FLAG	EASTING (M)	NORTHING (M)	HEIGHT (M)	DATE	TIME
1190	489,437.693	6,524,796.515	1,841.209	08/13/01	15:20
1191	489,361.335	6,524,808.187	1,841.319	08/13/01	15:20
1192	489,283.456	6,524,822.761	1,841.758	08/13/01	15:20
1193	489,211.923	6,524,836.493	1,842.648	08/13/01	15:20
1194	489,139.314	6,524,850.503	1,844.259	08/13/01	15:20
1195	489,065.690	6,524,862.478	1,846.427	08/13/01	15:21
1196	488,992.944	6,524,876.114	1,848.767	08/13/01	15:21
1197	488,925.419	6,524,889.077	1,850.773	08/13/01	15:21
1198	488,862.449	6,524,903.264	1,852.419	08/13/01	15:21
1199	488,806.029	6,524,914.605	1,853.506	08/13/01	15:21
1200	488,745.677	6,524,924.205	1,854.401	08/13/01	15:21
1201	488,691.490	6,524,934.352	1,855.649	08/13/01	15:22
1202	488,635.156	6,524,943.836	1,858.026	08/13/01	15:22
1203	488,578.185	6,524,952.361	1,862.182	08/13/01	15:22
1204	488,523.507	6,524,962.188	1,867.798	08/13/01	15:22
1205	488,473.311	6,524,972.952	1,873.293	08/13/01	15:22
1206	488,424.698	6,524,982.813	1,878.020	08/13/01	15:22
1207	488,375.366	6,524,990.707	1,882.243	08/13/01	15:23
1208	488,322.052	6,525,000.880	1,887.425	08/13/01	15:23
1209	488,268.471	6,525,010.240	1,894.486	08/13/01	15:23
1210	488,220.506	6,525,018.878	1,902.416	08/13/01	15:23
1211	488,175.319	6,525,026.140	1,909.848	08/13/01	15:23
1212	488,131.424	6,525,034.379	1,917.158	08/13/01	15:23
1213	488,087.001	6,525,041.272	1,923.611	08/13/01	15:24
1214	488,049.864	6,525,045.926	1,928.818	08/13/01	15:24
1215	488,010.062	6,525,049.836	1,934.326	08/13/01	15:24
1216	487,976.197	6,525,051.829	1,938.077	08/13/01	15:24
1217	487,955.377	6,525,051.807	1,939.625	08/13/01	15:24
1218	487,955.389	6,525,051.810	1,939.617	08/13/01	15:24

APPENDIX 3 SURFACE MOVEMENT VECTORS

ICY BASIN PROFILES (TAKU GLACIER AT CAMP 10) JULY 23 AND 24, 2001 → JULY 29, 2001 FLAGS PR1 01 TO PR2 10 SURVEYED JULY 23, 2001 → JULY 29, 2001 FLAGS PR3 01 TO PR4 04 SURVEYED JULY 24, 2001 → JULY 29, 2001							
FLAG	FLAG DISTANCES		FLAG MOVEMENT			SURFACE HEIGHT CHANGE	
	FLAG TO FLAG (M)	SUM (M)	TOTAL (M)	DAILY (M)	BEARING (GON)	TOTAL (M)	DAILY (CM)
PR1 01	—	0.000	0.008	0.001	384.4042	-0.252	-4.25
PR1 02	145.572	145.572	0.020	0.003	219.4729	-0.285	-4.81
PR1 03	123.184	268.755	0.003	0.001	220.4833	-0.340	-5.74
PR1 04	123.363	392.119	0.018	0.003	121.6000	-0.315	-5.31
PR1 05	134.267	526.386	0.043	0.007	83.6929	-0.254	-4.28
PR1 06	144.438	670.824	0.027	0.004	38.0965	-0.287	-4.84
PR1 07	197.252	868.076	0.035	0.006	344.9179	-0.338	-5.70
PR1 08	189.309	1057.385	0.008	0.001	15.5958	-0.293	-4.94
PR1 09	197.466	1254.851	0.010	0.002	299.9999	-0.313	-5.27
PR1 10	76.781	1331.632	0.021	0.004	54.2379	-0.195	-3.28
PR1 11	87.330	1418.962	0.035	0.006	283.5261	-0.367	-6.18
PR2 01	0.000	0.000	0.071	0.012	372.0946	-0.331	-5.57
PR2 02	194.937	194.937	0.088	0.015	314.5465	-0.219	-3.69
PR2 03	134.691	329.628	155.758*	*	369.0512*	-4.911*	-82.64*
PR2 04	155.612	485.241	0.159	0.027	342.6436	-0.344	-5.79
PR2 05	155.125	640.366	0.129	0.022	323.1279	-0.336	-5.66
PR2 06	130.429	770.795	0.192	0.032	360.8216	-0.405	-6.82
PR2 07	123.911	894.706	0.182	0.031	395.0857	-0.508	-8.56
PR2 08	124.868	1019.575	0.209	0.035	31.6924	-0.580	-9.74
PR2 09	154.128	1173.703	0.191	0.032	60.6297	-0.501	-8.43
PR2 9A	3.784	1177.487	0.223	0.037	65.1054	-0.498	-8.38
PR2 10	170.600	1348.086	0.165	0.028	80.8555	-0.464	-7.78
PR3 01	0.000	0.000	0.081	0.015	31.2847	-0.423	-7.95
PR3 02	100.419	100.419	0.088	0.016	12.4242	-0.325	-6.11
PR3 03	86.445	186.864	0.048	0.009	17.5342	-0.319	-5.99
PR3 04	88.530	275.394	0.095	0.018	40.0304	-0.362	-6.80
PR3 05	145.052	420.446	0.064	0.012	3.9737	-0.324	-6.09
PR3 06	138.750	559.195	0.080	0.015	380.5271	-0.319	-5.99
PR3 07	120.759	679.954	0.178	0.033	356.0929	-0.313	-5.87
PR3 08	140.794	820.748	0.086	0.016	329.1852	-0.314	-5.89
PR3 09	175.956	996.704	0.110	0.021	315.7357	-0.301	-5.64
PR3 10	244.235	1240.939	0.116	0.022	324.8369	-0.357	-6.70
PR3 11	213.424	1454.363	0.094	0.018	312.9653	-0.390	-7.32

ICY BASIN PROFILES (TAKU GLACIER AT CAMP 10) JULY 23 AND 24, 2001 → JULY 29, 2001 FLAGS PR1 01 TO PR2 10 SURVEYED JULY 23, 2001 → JULY 29, 2001 FLAGS PR3 01 TO PR4 04 SURVEYED JULY 24, 2001 → JULY 29, 2001							
FLAG	FLAG DISTANCES		FLAG MOVEMENT			SURFACE HEIGHT CHANGE	
	FLAG TO FLAG (M)	SUM (M)	TOTAL (M)	DAILY (M)	BEARING (GON)	TOTAL (M)	DAILY (CM)
PR4 01	0.000	0.000	0.019	0.004	286.7904	-0.293	-5.50
PR4 02	206.118	206.118	0.008	0.002	384.4042	-0.280	-5.25
PR4 03	294.999	501.117	0.031	0.006	127.6720	-0.292	-5.48
PR4 04	213.800	714.918	0.118	0.022	129.7588	-0.246	-4.62
MEAN	—	—	0.085	0.015	—	-0.341	-6.01

* Invalid data. Not used in calculation of means.

PROFILE 4 — DOWNGLACIER LINE (TAKU GLACIER AT CAMP 10) JULY 19, 2001 → JULY 25, 2001							
FLAG	FLAG DISTANCES		FLAG MOVEMENT			SURFACE HEIGHT CHANGE	
	FLAG TO FLAG (M)	SUM (M)	TOTAL (M)	DAILY (M)	BEARING (GON)	TOTAL (M)	DAILY (CM)
1	—	0.000	0.064	0.010	137.1554	-0.409	-6.61
3	193.185	193.185	0.163	0.026	149.7244	-0.335	-5.42
5	198.039	391.224	0.470	0.076	145.4945	-0.345	-5.59
7	252.918	644.143	1.302	0.212	147.3360	-0.294	-4.79
9	239.787	883.929	2.338	0.382	147.2656	-0.395	-6.45
11	180.312	1064.241	2.936	0.480	145.7805	-0.322	-5.26
13	321.999	1386.241	3.529	0.577	145.3904	-0.482	-7.88
15	312.812	1699.053	3.685	0.603	144.3235	-0.492	-8.06
17	392.978	2092.031	3.773	0.620	142.2254	-0.527	-8.65
19	374.703	2466.733	3.774	0.621	140.6393	-0.447	-7.35
21	377.480	2844.213	3.631	0.598	140.3424	-0.472	-7.78
23	322.587	3166.800	3.448	0.569	139.4670	-0.439	-7.25
25	388.158	3554.958	2.654	0.439	138.7641	-0.424	-7.01
27	378.584	3933.541	1.477	0.245	135.7717	-0.355	-5.88
29	348.105	4281.646	0.460	0.076	118.3824	-0.397	-6.58
31	336.047	4617.693	0.165	0.027	80.3720	-0.317	-5.26
MEAN	307.846	—	2.117	0.348	137.4022	-0.403	-6.61

PROFILE 4 — UPGLACIER LINE (TAKU GLACIER AT CAMP 10) JULY 19, 2001 → JULY 25, 2001							
FLAG	FLAG DISTANCES		FLAG MOVEMENT			SURFACE HEIGHT CHANGE	
	FLAG TO FLAG (M)	SUM (M)	TOTAL (M)	DAILY (M)	BEARING (GON)	TOTAL (M)	DAILY (CM)
2	—	0.000	0.061	0.010	180.8428	-0.379	-6.31
4	210.307	210.307	0.242	0.040	160.0856	-0.198	-3.30
6	229.185	439.493	0.674	0.112	149.9332	-0.243	-4.05
8	200.191	639.684	1.360	0.227	148.3442	-0.272	-4.54
10	204.123	843.807	2.301	0.384	146.4180	-0.358	-5.98
12	259.192	1102.999	3.020	0.500	145.9724	-0.372	-6.16
14	349.096	1452.095	3.465	0.574	144.8495	-0.425	-7.04
16	346.592	1798.687	3.664	0.608	142.4506	-0.360	-5.97
18	447.462	2246.149	3.737	0.619	140.6667	-0.580	-9.60
20	339.609	2585.758	3.691	0.611	140.2904	-0.392	-6.49
22	333.304	2919.062	3.575	0.593	139.5277	-0.411	-6.82
24	353.190	3272.252	3.129	0.519	139.6684	-0.389	-6.45
26	339.398	3611.650	2.392	0.397	140.2692	-0.268	-4.45
28	448.468	4060.118	0.944	0.157	130.7234	-0.233	-3.86
30	335.650	4395.768	0.237	0.039	119.1217	-0.319	-5.29
MEAN	313.983	—	2.166	0.359	144.6109	-0.347	-5.75

LONGITUDINAL A (TAKU GLACIER AT GOAT RIDGE) JULY 20, 2001 → JULY 23, 2001							
FLAG	FLAG DISTANCES		FLAG MOVEMENT			SURFACE HEIGHT CHANGE	
	Flag to Flag (m)	SUM (M)	TOTAL (M)	DAILY (M)	BEARING (GON)	TOTAL (M)	DAILY (CM)
28	—	0.000	3.494	1.140	139.9608	-0.500	-16.32
29	501.287	501.287	3.480	1.138	133.7829	-0.414	-13.54
30	499.123	1000.410	3.438	1.125	132.8477	-0.309	-10.11
31	500.453	1500.863	3.307	1.082	139.4841	-0.348	-11.38
32	498.033	1998.896	3.216	1.051	148.5861	-0.297	-9.71
33	499.231	2498.127	3.139	1.026	155.1822	-0.297	-9.71
34	503.476	3001.603	3.089	1.024	159.6393	-0.299	-9.91
35	499.000	3500.602	2.964	0.985	162.6440	-0.297	-9.87
36	499.936	4000.538	2.876	0.961	168.6417	-0.306	-10.23
37	499.650	4500.188	2.598	0.868	172.5440	-0.331	-11.06
MEAN	500.021	—	3.160	1.040	151.3313	-0.340	-11.19

LONGITUDINAL D (NORTHWEST BRANCH, WEST OF TAKU TOWERS) FLAGS 15-30 SURVEYED JULY 28, 2001 → AUGUST 7, 2001 FLAGS 31-48 SURVEYED JULY 29, 2001 → AUGUST 7, 2001							
FLAG	FLAG DISTANCES		FLAG MOVEMENT			SURFACE HEIGHT CHANGE	
	FLAG TO FLAG (M)	SUM (M)	TOTAL (M)	DAILY (M)	BEARING (GON)	TOTAL (M)	DAILY (CM)
15	498.186	6959.450	2.776	0.283	106.0644	-0.599	-6.10
16	492.077	7451.526	2.719	0.277	100.9131	-0.589	-6.00
17	501.899	7953.425	2.715	0.277	92.6446	-0.554	-5.64
18	497.990	8451.415	2.644	0.269	83.3646	-0.542	-5.52
19	499.089	8950.504	2.573	0.262	77.0673	-0.611	-6.22
20	498.714	9449.218	2.509	0.256	70.9372	-0.719	-7.32
21	499.331	9948.548	2.351	0.239	65.8281	-0.691	-7.04
22	498.579	10447.127	2.156	0.220	53.8852	-0.692	-7.05
23	500.910	10948.038	1.832	0.188	29.5789	-0.630	-6.46
24	501.385	11449.422	1.634	0.168	6.6359	-0.574	-5.89
25	498.157	11947.580	1.447	0.148	392.3235	-0.511	-5.24
26	497.915	12445.495	1.279	0.131	381.5311	-0.479	-4.91
27	498.206	12943.701	0.934	0.096	373.1051	-0.585	-6.00
28	499.375	13443.076	0.767	0.079	367.3622	-0.603	-6.19
29	499.734	13942.810	0.652	0.067	370.4396	-0.600	-6.16
30	500.204	14443.014	0.523	0.054	373.3133	-0.538	-5.53
31	501.656	14944.671	0.425	0.047	381.6033	-0.499	-5.58
32	500.681	15445.352	0.711	0.079	392.1055	-0.484	-5.41
33	499.362	15944.714	0.668	0.075	0.0000	-0.557	-6.22

LONGITUDINAL D (NORTHWEST BRANCH, WEST OF TAKU TOWERS) FLAGS 15-30 SURVEYED JULY 28, 2001 → AUGUST 7, 2001 FLAGS 31-48 SURVEYED JULY 29, 2001 → AUGUST 7, 2001							
FLAG	FLAG DISTANCES		FLAG MOVEMENT			SURFACE HEIGHT CHANGE	
	FLAG TO FLAG (M)	SUM (M)	TOTAL (M)	DAILY (M)	BEARING (GON)	TOTAL (M)	DAILY (CM)
34	501.284	16445.998	0.679	0.076	9.1263	-0.504	-5.63
35	502.424	16948.423	0.617	0.069	8.9021	-0.386	-4.31
36	500.633	17449.055	0.623	0.070	12.0256	-0.481	-5.37
37	499.272	17948.327	0.583	0.065	6.8880	-0.432	-4.83
38	499.358	18447.685	0.527	0.059	399.2752	-0.374	-4.17
39	501.319	18949.003	0.422	0.047	397.8888	-0.502	-5.60
40	502.592	19451.596	0.309	0.034	1.0300	-0.538	-6.00
41	503.096	19954.692	0.265	0.030	7.9465	-0.431	-4.81
42	498.156	20452.849	0.177	0.020	384.4042	-0.488	-5.45
43	498.955	20951.804	0.090	0.010	323.8308	-0.523	-5.84
44	501.328	21453.132	0.116	0.013	181.0776	-0.538	-6.01
45	500.659	21953.790	0.233	0.026	190.1157	-0.599	-6.69
46	500.748	22454.539	0.556	0.062	215.2625	-0.608	-6.79
47	498.851	22953.390	0.713	0.080	221.1046	-0.596	-6.66
48	501.032	23454.422	0.776	0.087	230.2505	-0.691	-7.72
MEAN	499.848	—	1.118	0.116	—	-0.551	-5.89

LONGITUDINAL E (SNOW TOWERS FORK OF NORTHWEST BRANCH) JULY 29, 2001 → AUGUST 7, 2001							
FLAG	FLAG DISTANCES		FLAG MOVEMENT			SURFACE HEIGHT CHANGE	
	FLAG TO FLAG (M)	SUM (M)	TOTAL (M)	DAILY (M)	BEARING (GON)	TOTAL (M)	DAILY (CM)
1	0.000	0.000	0.922	0.103	376.3919	-0.521	-5.83
2	499.757	499.757	0.863	0.097	382.9722	-0.493	-5.52
3	500.068	999.824	0.698	0.078	396.4416	-0.523	-5.86
4	498.485	1498.310	0.566	0.063	13.8233	-0.454	-5.08
5	500.081	1998.390	0.375	0.042	29.2129	-0.498	-5.58
6	500.392	2498.782	0.340	0.038	38.1598	-0.486	-5.44
7	498.261	2997.043	0.241	0.027	43.0790	-0.519	-5.81
8	500.886	3497.929	0.228	0.026	35.2657	-0.529	-5.93
9	498.876	3996.806	0.246	0.028	18.1083	-0.490	-5.49
10	497.545	4494.351	0.115	0.013	32.4987	-0.529	-5.94
11	497.928	4992.278	0.049	0.005	215.9141	-0.556	-6.24
12	497.518	5489.796	0.160	0.018	226.6654	-0.488	-5.48
13	498.795	5988.591	0.231	0.026	223.0981	-0.481	-5.40
14	500.039	6488.630	0.296	0.033	225.6631	-0.569	-6.39
MEAN	499.125	—	0.381	0.043	—	-0.510	-5.71

LONGITUDINAL F (WEST BRANCH OF TAKU GLACIER) JULY 30, 2001 → AUGUST 6, 2001							
FLAG	FLAG DISTANCES		FLAG MOVEMENT			SURFACE HEIGHT CHANGE	
	FLAG TO FLAG (M)	SUM (M)	TOTAL (M)	DAILY (M)	BEARING (GON)	TOTAL (M)	DAILY (CM)
15	499.209	6984.982	0.665	0.093	54.3370	-0.416	-5.81
16	498.412	7483.394	0.627	0.088	42.4482	-0.396	-5.53
17	500.264	7983.658	0.550	0.077	31.3278	-0.349	-4.88
18	501.856	8485.514	0.530	0.074	20.9009	-0.397	-5.55
19	502.116	8987.630	0.528	0.074	16.2099	-0.438	-6.12
20	500.330	9487.960	0.434	0.061	16.4489	-0.407	-5.69
21	503.178	9991.138	0.404	0.057	19.0378	-0.339	-4.77
22	500.424	10491.561	0.340	0.048	13.0072	-0.395	-5.53
23	500.213	10991.774	0.320	0.045	386.3809	-0.359	-5.03
24	502.823	11494.598	0.209	0.029	391.1388	-0.397	-5.56
25	—	—	—	—	—	—	—
26	994.134	12488.731	0.153	0.021	339.0506	-0.334	-4.68
MEAN	499.148	—	0.433	0.061	—	-0.384	-5.38

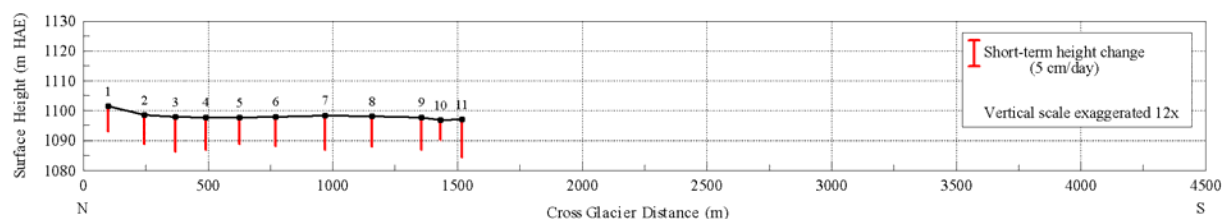
LONGITUDINAL G (ECHO GLACIER) JULY 28, 2001 → AUGUST 6, 2001							
FLAG	FLAG DISTANCES		FLAG MOVEMENT			SURFACE HEIGHT CHANGE	
	FLAG TO FLAG (M)	SUM (M)	TOTAL (M)	DAILY (M)	BEARING (GON)	TOTAL (M)	DAILY (CM)
1	0.000	0.000	2.792	0.312	122.9494	-0.544	-6.08
2	500.944	500.944	2.634	0.293	122.1498	-0.516	-5.73
3	499.646	1000.590	1.735	0.193	127.3998	-0.489	-5.43
4	498.966	1499.556	0.735	0.082	146.2595	-0.456	-5.07
5	498.981	1998.537	0.438	0.049	173.8615	-0.401	-4.46
6	499.857	2498.394	0.346	0.038	192.4480	-0.447	-4.97
7	501.506	2999.900	0.280	0.031	211.1858	-0.444	-4.93
8	502.531	3502.431	0.280	0.031	224.2238	-0.485	-5.39
9	507.147	4009.578	0.283	0.032	238.1809	-0.509	-5.66
10	493.155	4502.732	0.240	0.027	263.0072	-0.427	-4.75
11	491.711	4994.444	0.179	0.020	267.3028	-0.464	-5.16
MEAN	499.444	—	0.904	0.101	—	-0.471	-5.24

VAUGHAN LEWIS OGIVES (BASE OF VAUGHAN LEWIS ICEFALL) AUGUST 10, 2000 → AUGUST 11, 2000							
FLAG	FLAG DISTANCES		FLAG MOVEMENT			SURFACE HEIGHT CHANGE	
	FLAG TO FLAG (M)	SUM (M)	TOTAL (M)	DAILY (M)	BEARING (GON)	TOTAL (M)	DAILY (CM)
Ogive1-1	0.000	0.000	0.380	0.378	314.7021	-0.032	-3.18
Ogive1-2	124.554	124.554	0.389	0.379	319.4482	-0.078	-7.59
Ogive1-3	136.358	260.911	0.391	0.392	322.0784	-0.046	-4.61
Ogive1-4	96.968	357.879	0.392	0.392	322.2312	-0.073	-7.30
Ogive2-1	0.000	0.000	0.343	0.337	302.0409	-0.046	-4.52
Ogive2-2	131.836	131.836	0.390	0.383	315.6751	-0.100	-9.82
Ogive2-3	193.002	324.837	0.369	0.362	313.5470	-0.103	-10.10
Ogive3-1	0.000	0.000	0.368	0.369	289.4010	-0.043	-4.32
Ogive3-2	125.840	125.840	0.411	0.409	290.5060	-0.059	-5.87
Ogive3-3	170.279	296.119	0.367	0.360	304.6879	-0.033	-3.24
Ogive3-4	122.357	418.476	0.356	0.348	310.4254	-0.040	-3.92
MEAN	137.649	—	0.378	0.374	309.522	-0.059	-5.86

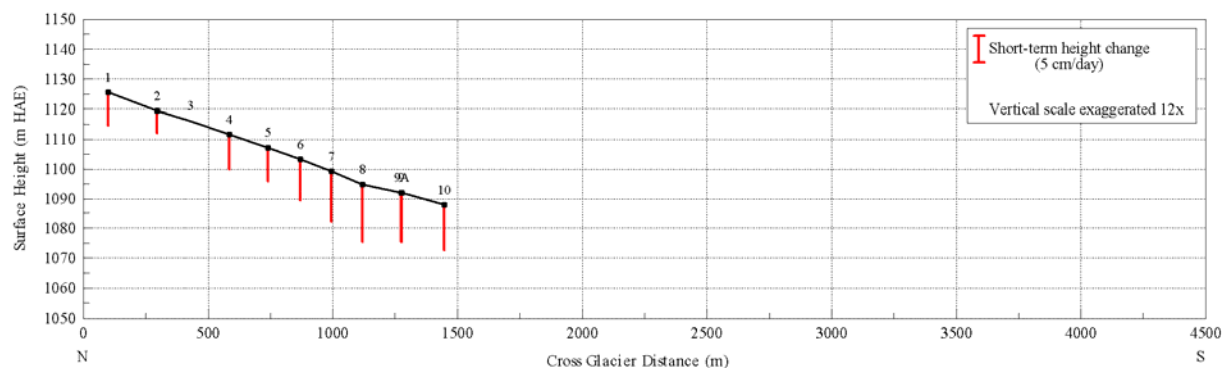
APPENDIX 4

SHORT-TERM HEIGHT CHANGE GRAPHS

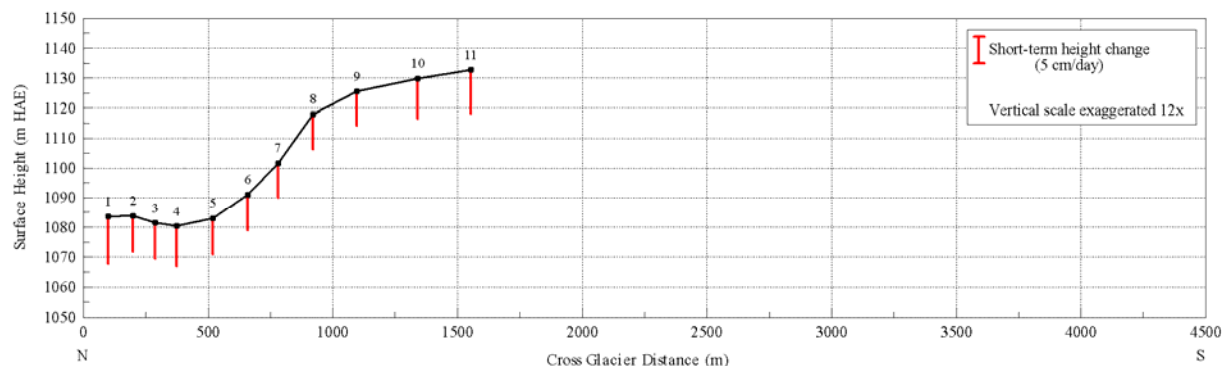
The following graphs show the magnitude of the change in surface height for those profiles surveyed twice during the summer of 2001. Vertical red bars indicate the magnitude of change during the summer survey period. All profiles experienced a lowering of the surface. Refer to Appendix 3 for a tabular listing of the magnitude of short-term height change.



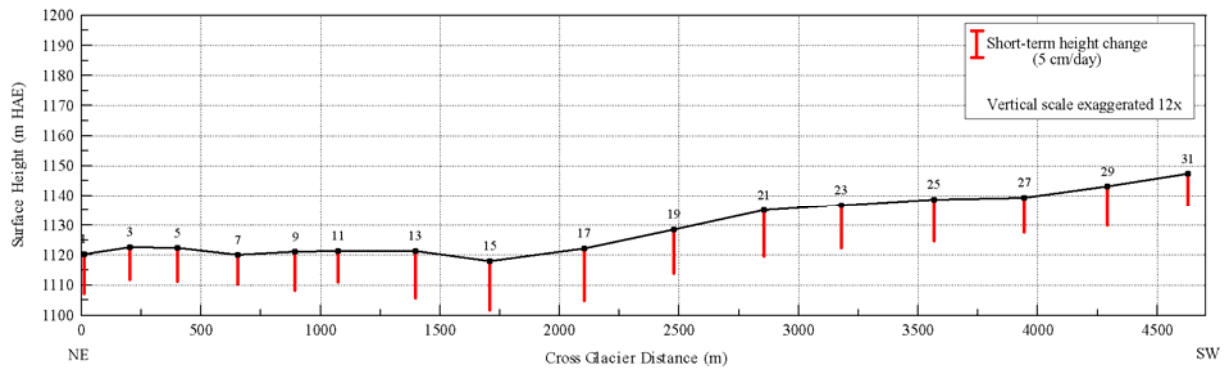
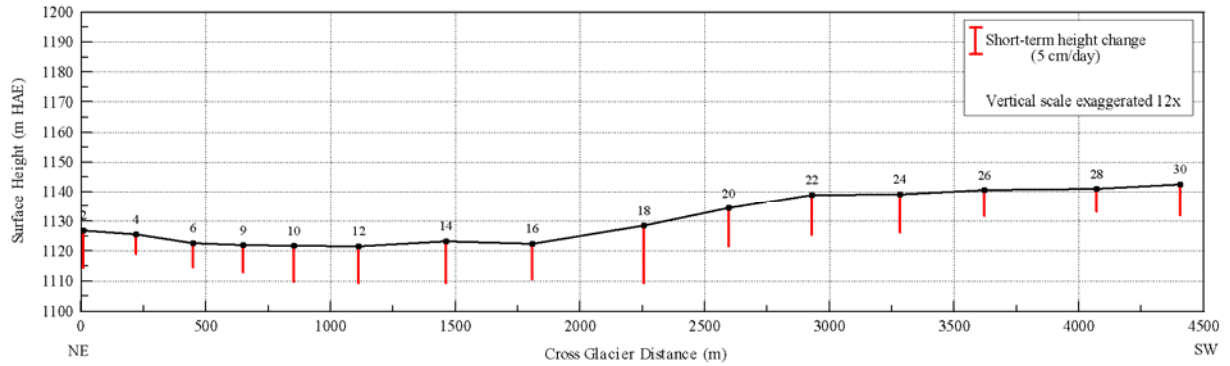
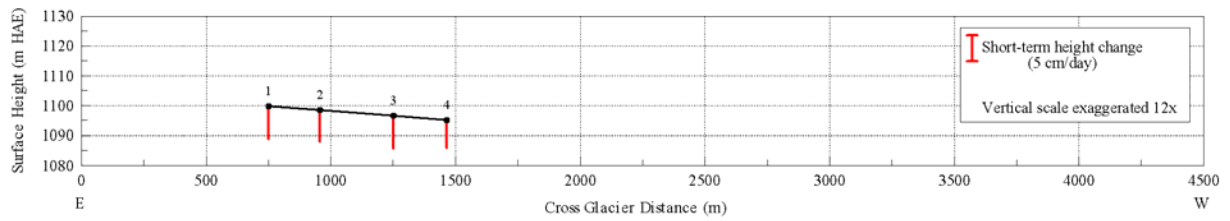
Short-term Height Change at Icy Basin Profile 1 (July 23 to July 29, 2001)

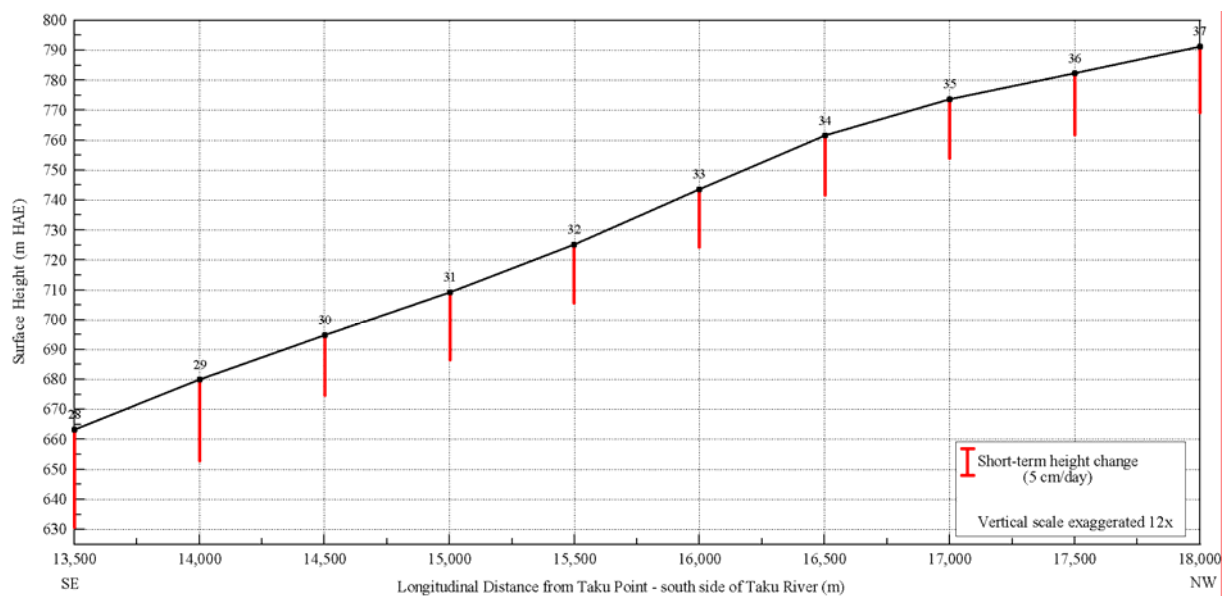


Short-term Height Change at Icy Basin Profile 2 (July 23 to July 29, 2001)

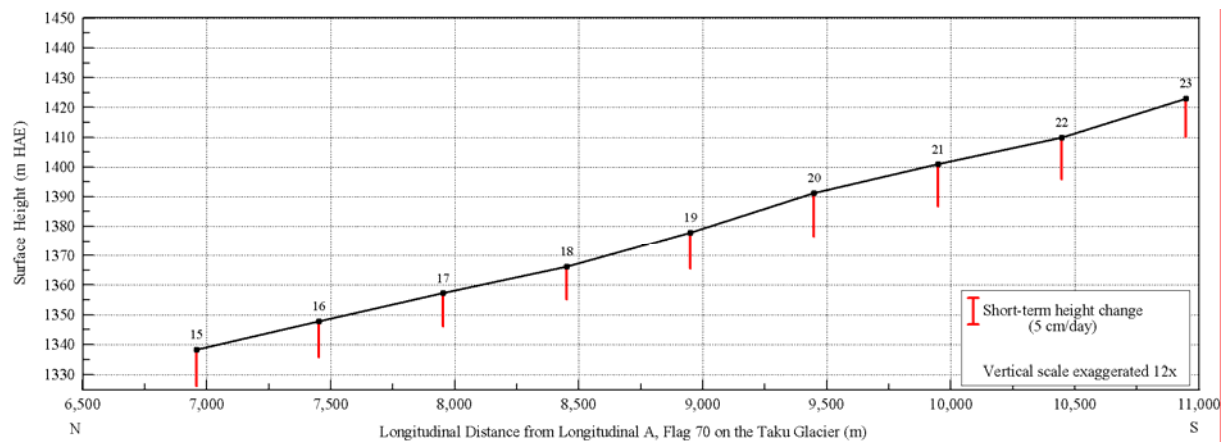


Short-term Height Change at Icy Basin Profile 3 (July 24 to July 29, 2001)

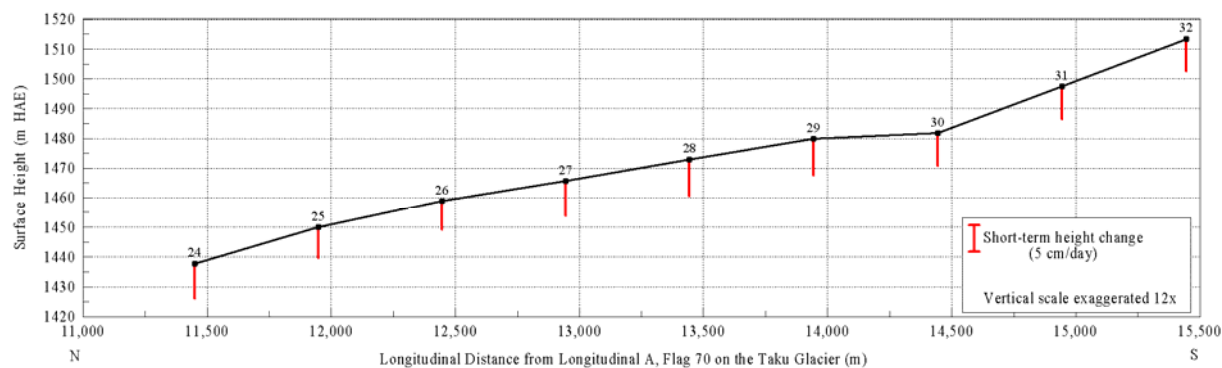




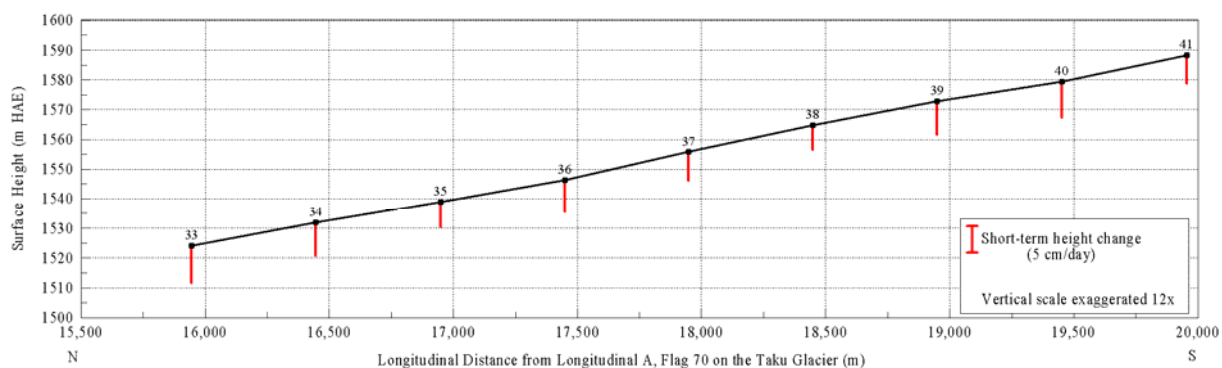
Short-term Height Change at Longitudinal A (July 20 to July 23, 2001)



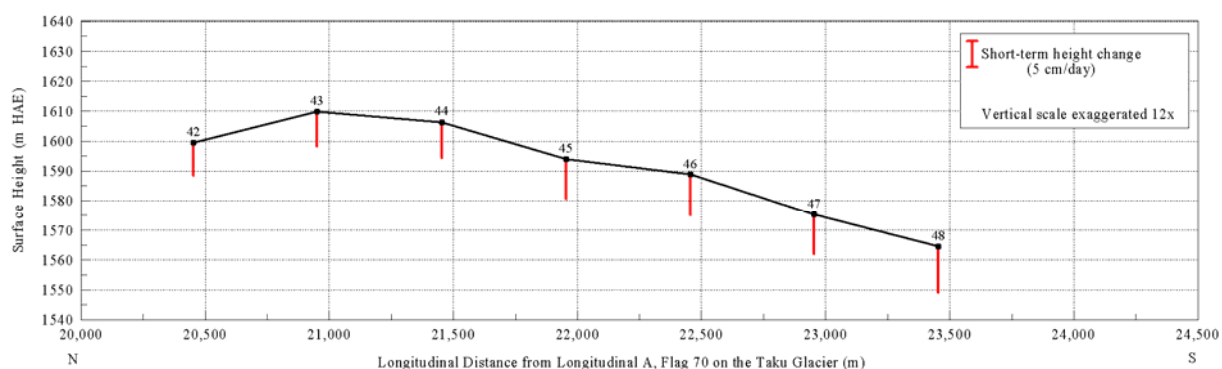
Short-term Height Change at Longitudinal D, Flags 15-23 (July 28 to August 7, 2001)



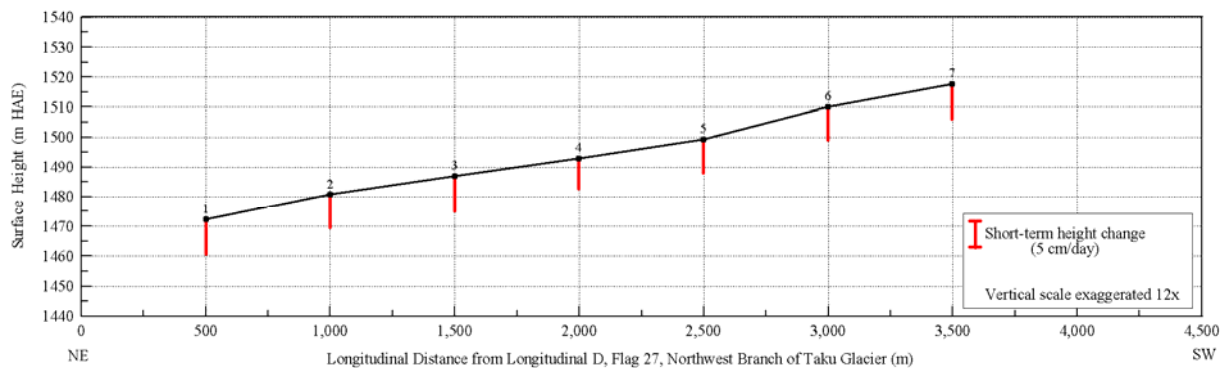
Short-term Height Change at Longitudinal D, Flags 24-32 (July 28 to August 7, 2001)



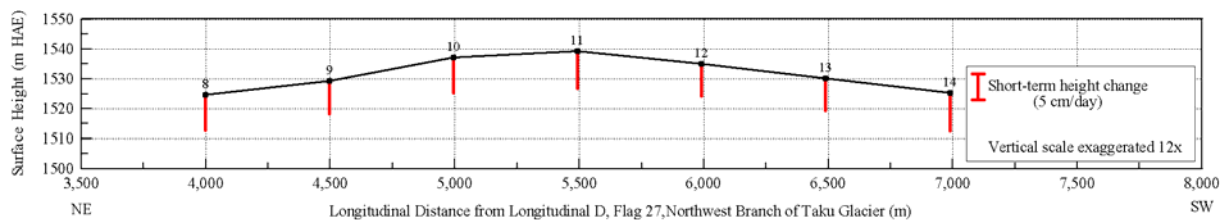
Short-term Height Change at Longitudinal D, Flags 33-41 (July 29 to August 7, 2001)



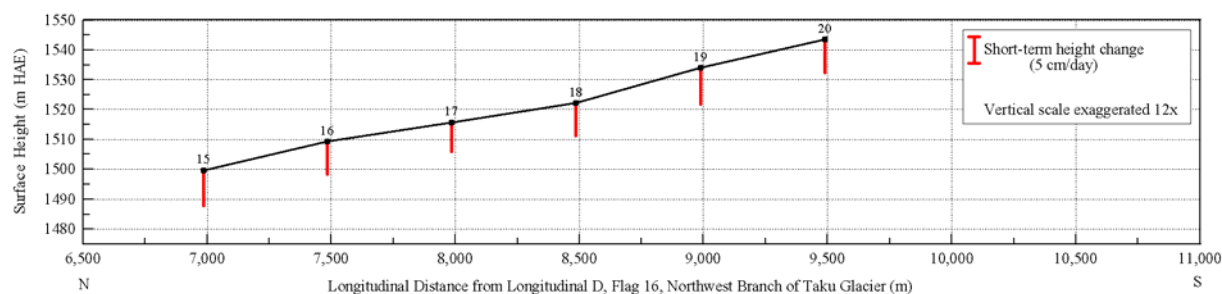
Short-term Height Change at Longitudinal D, Flags 42-48 (July 29 to August 7, 2001)



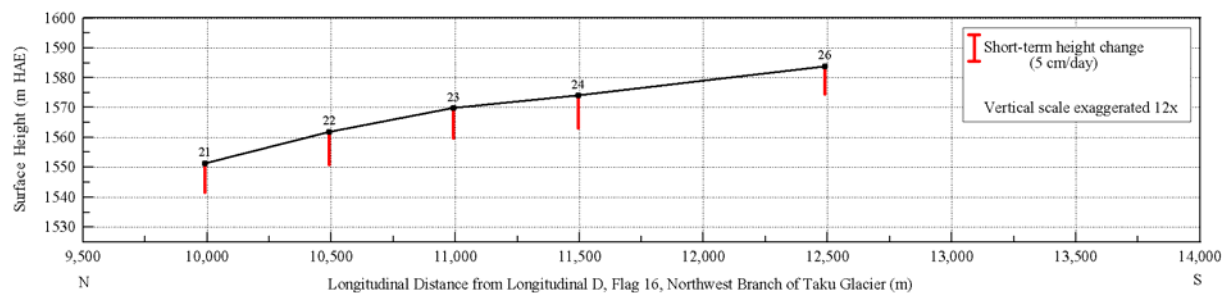
Short-term Height Change at Longitudinal E, Flags 1-7 (July 29 to August 7, 2001)



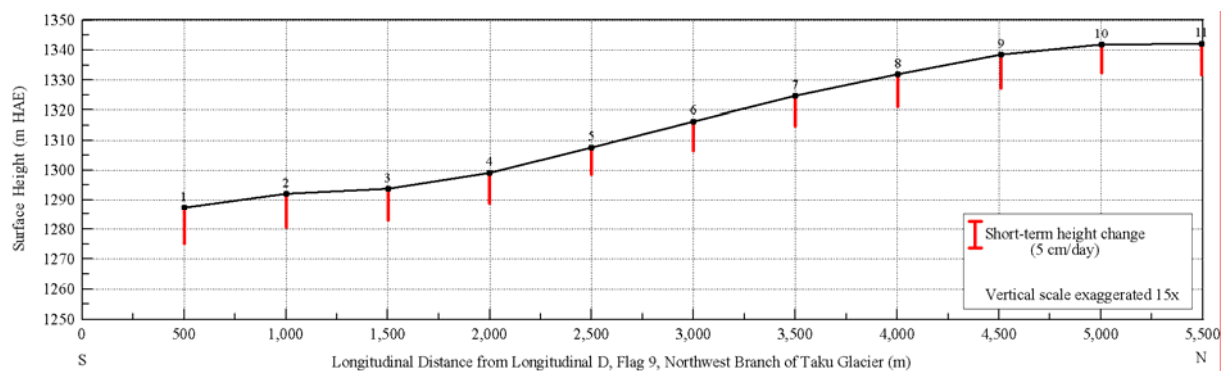
Short-term Height Change at Longitudinal E, Flags 8-14 (July 29 to August 7, 2001)



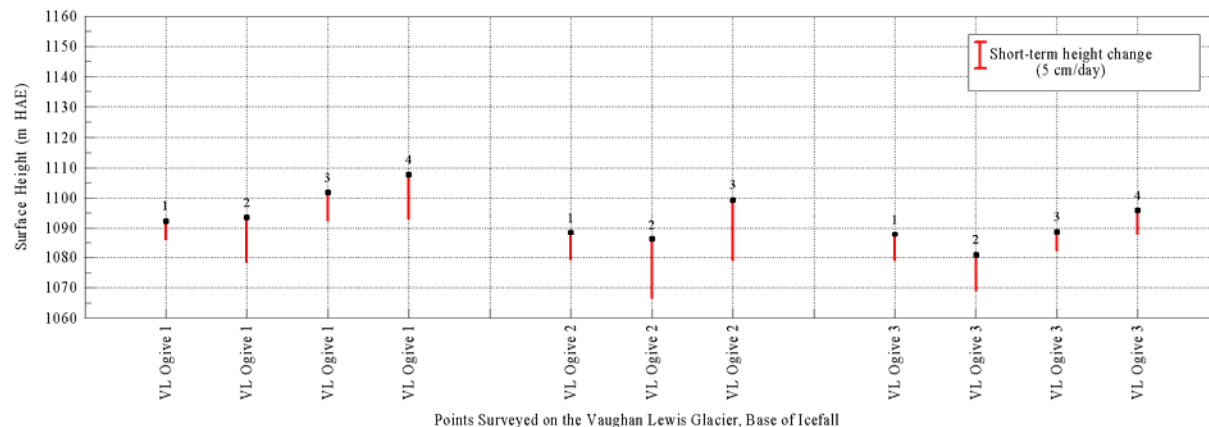
Short-term Height Change at Longitudinal F, Flags 15-20 (July 30 to August 6, 2001)



Short-term Height Change at Longitudinal F, Flags 21-26 (July 30 to August 6, 2001)



Short-term Height Change at Longitudinal G, Flags 1-11 (July 28 to August 6, 2001)



Short-term Height Change at Ogives 1-3, Vaughan Lewis Glacier (August 10 to August 11, 2001)

APPENDIX 5

LONGITUDINAL SURFACE FLOW TIMES

LONGITUDINAL A (MATTHES AND TAKU GLACIERS)					
FROM — TO	MEAN VELOCITY/DAY BETWEEN FROM AND TO POINTS (M)	FROM — TO SLOPE DISTANCE (M)	FROM — TO MOVEMENT TIME (YEARS)	CUMULATIVE SLOPE DISTANCE (KM)	CUMULATIVE MOVEMENT TIME (YEARS)
a117 — a116	0.046	499.158	29.407	0.499	29.407
a116 — a115	0.063	500.105	21.864	0.999	51.271
a115 — a114	0.081	497.492	16.740	1.497	68.011
a114 — a113	0.094	499.390	14.515	1.996	82.526
a113 — a112	0.112	498.868	12.216	2.495	94.741
a112 — a111	0.134	499.879	10.245	2.995	104.986
a111 — a110	0.147	500.467	9.324	3.495	114.310
a110 — a109	0.160	498.542	8.517	3.994	122.826
a109 — a108	0.175	498.518	7.815	4.492	130.641
a108 — a107	0.190	499.151	7.202	4.992	137.843
a107 — a106	0.216	499.938	6.330	5.492	144.173
a106 — a105	0.257	499.981	5.320	5.991	149.492
a105 — a104	0.300	501.187	4.579	6.493	154.071
a103 — a103	0.337	500.544	4.069	6.993	158.141
a103 — a102	0.375	498.907	3.640	7.492	161.781
a102 — a101	0.416	498.598	3.280	7.991	165.061
a101 — a100	0.474	495.951	2.867	8.487	167.928
a100 — a99	0.511	498.927	2.675	8.986	170.603
a99 — a98	0.492	500.349	2.782	9.486	173.386
a98 — a97	0.459	499.126	2.976	9.985	176.361
a97 — a96	0.431	495.994	3.150	10.481	179.512
a96 — a95	0.410	495.316	3.311	10.976	182.823
a95 — a94	0.396	499.009	3.452	11.475	186.275
a94 — a93	0.380	497.592	3.581	11.973	189.856
a93 — a92	0.358	498.638	3.815	12.472	193.671
a92 — a91	0.340	497.541	4.005	12.969	197.677
a91 — a90	0.331	499.010	4.122	13.468	201.798
a90 — a89	0.325	499.995	4.209	13.968	206.008
a89 — a88	0.326	501.648	4.217	14.470	210.225
a88 — a87	0.334	499.086	4.092	14.969	214.317
a87 — a86	0.340	499.806	4.027	15.469	218.344
a86 — a85	0.353	499.606	3.872	15.968	222.216
a85 — a84	0.343	500.356	3.996	16.469	226.212
a84 — a83	0.325	499.806	4.207	16.968	230.419
a83 — a82	0.348	499.793	3.928	17.468	234.347

LONGITUDINAL A (MATTHES AND TAKU GLACIERS)					
FROM — TO	MEAN VELOCITY/DAY BETWEEN FROM AND TO POINTS (M)	FROM — TO SLOPE DISTANCE (M)	FROM — TO MOVEMENT TIME (YEARS)	CUMULATIVE SLOPE DISTANCE (KM)	CUMULATIVE MOVEMENT TIME (YEARS)
a82 — a81	0.379	500.984	3.620	17.969	237.967
a81 — a80	0.388	499.527	3.529	18.469	241.497
a80 — a79	0.397	500.687	3.450	18.969	244.947
a79 — a78	0.412	502.995	3.344	19.472	248.291
a78 — a77	0.406	496.930	3.351	19.969	251.642
a77 — a76	0.408	499.358	3.347	20.469	254.989
a76 — a75	0.422	498.754	3.238	20.968	258.228
a75 — a74	0.430	499.065	3.177	21.467	261.404
a74 — a73	0.440	501.037	3.118	21.968	264.523
a73 — a72	0.445	497.866	3.064	22.465	267.587
a72 — a71	0.454	499.856	3.013	22.965	270.599
a71 — a70	0.479	498.318	2.849	23.464	273.448
a70 — a69	0.510	503.245	2.700	23.967	276.149
a69 — a68	0.531	446.994	2.305	24.414	278.454
a68 — a67	0.541	500.534	2.532	24.914	280.986
a67 — a66	0.547	500.988	2.506	25.415	283.492
a66 — a65	0.555	503.300	2.482	25.919	285.974
a65 — a64	0.568	500.870	2.415	26.420	288.389
a64 — a63	0.580	497.783	2.349	26.917	290.738
a63 — a62	0.598	500.339	2.292	27.418	293.030
a62 — a61	0.613	498.873	2.228	27.917	295.259
a61 — a60	0.619	498.274	2.206	28.415	297.464
a60 — a59	0.628	500.530	2.182	28.915	299.647
a59 — a58	0.646	501.918	2.127	29.417	301.773
a58 — a57	0.655	500.506	2.093	29.918	303.866
a57 — a56	0.670	501.486	2.049	30.419	305.916
a56 — a55	0.731	502.886	1.882	30.922	307.798
a55 — a54	0.755	501.655	1.819	31.424	309.616
a54 — a53	0.741	500.305	1.848	31.924	311.464
a53 — a52	0.747	253.377	0.929	32.178	312.393
a52 — a51	0.766	498.622	1.783	32.676	314.176
a51 — a50	0.828	502.139	1.660	33.178	315.836
a50 — a49	0.842	497.649	1.619	33.676	317.455
a49 — a48	0.832	507.937	1.671	34.184	319.126
a48 — a47	0.850	500.563	1.613	34.684	320.739
a47 — a46	0.852	501.147	1.611	35.186	322.350
a46 — a45	0.858	500.707	1.598	35.686	323.948
a45 — a44	0.863	500.445	1.588	36.187	325.536
a44 — a43	0.869	497.870	1.568	36.685	327.104

LONGITUDINAL A (MATTHES AND TAKU GLACIERS)					
FROM — TO	MEAN VELOCITY/DAY BETWEEN FROM AND TO POINTS (M)	FROM — TO SLOPE DISTANCE (M)	FROM — TO MOVEMENT TIME (YEARS)	CUMULATIVE SLOPE DISTANCE (KM)	CUMULATIVE MOVEMENT TIME (YEARS)
a43 — a42	0.880	501.570	1.560	37.186	328.663
a42 — a41	0.896	502.316	1.534	37.688	330.198
a41 — a40	0.911	501.667	1.508	38.190	331.706
a40 — a39	0.918	501.359	1.495	38.692	333.201
a39 — a38	0.929	500.353	1.475	39.192	334.676
a38 — a37	0.903	499.453	1.515	39.691	336.190
a37 — a36	0.915	499.729	1.495	40.191	337.686
a36 — a35	0.973	500.010	1.407	40.691	339.092
a35 — a34	1.004	499.148	1.361	41.190	340.453
a34 — a33	1.025	503.793	1.346	41.694	341.799
a33 — a32	1.039	499.574	1.317	42.194	343.115
a32 — a31	1.067	498.282	1.279	42.692	344.394
a31 — a30	1.103	500.663	1.242	43.193	345.637
a30 — a29	1.132	499.345	1.208	43.692	346.845
a29 — a28	1.139	501.566	1.205	44.193	348.050

LONGITUDINAL A (LLEWELLYN GLACIER)					
FROM — To	MEAN VELOCITY/DAY BETWEEN FROM AND To POINTS (M)	FROM — To SLOPE DISTANCE (M)	FROM — To MOVEMENT TIME (YEARS)	CUMULATIVE SLOPE DISTANCE (KM)	CUMULATIVE MOVEMENT TIME (YEARS)
a118 — a119	0.059	498.412	23.177	0.498	23.177
a119 — a120	0.073	498.921	18.834	0.997	42.011
a120 — a121	0.076	500.143	17.990	1.497	60.000
a121 — a122	0.073	497.524	18.620	1.995	78.621
a122 — a123	0.070	497.872	19.394	2.493	98.015
a123 — a124	0.072	498.244	18.990	2.991	117.005
a124 — a125	0.075	500.127	18.313	3.491	135.318
a125 — a126	0.078	497.735	17.401	3.989	152.719
a126 — a127	0.083	498.968	16.449	4.488	169.169
a127 — a128	0.086	499.373	15.806	4.987	184.975
a128 — a128	0.092	499.667	14.886	5.487	199.861
a129 — a130	0.100	499.365	13.606	5.986	213.467
a130 — a131	0.112	498.403	12.144	6.485	225.611
a131 — a132	0.130	501.502	10.527	6.986	236.138
a132 — a133	0.155	498.299	8.775	7.485	244.913
a133 — a134	0.192	500.138	7.117	7.985	252.030
a134 — a135	0.232	498.493	5.880	8.483	257.910
a135 — a136	0.265	498.086	5.137	8.981	263.047
a136 — a137	0.288	499.747	4.751	9.481	267.798
a137 — a138	0.293	498.971	4.664	9.980	272.461
a138 — a139	0.290	499.076	4.707	10.479	277.168
a139 — a140	0.293	499.826	4.678	10.979	281.846
a140 — a141	0.305	496.771	4.467	11.476	286.313
a141 — a142	0.319	500.473	4.295	11.976	290.608
a142 — a143	0.334	497.205	4.082	12.473	294.689
a143 — a144	0.346	498.898	3.946	12.972	298.635
a144 — a145	0.357	497.352	3.816	13.470	302.452
a145 — a146	0.372	499.774	3.680	13.969	306.132
a146 — a147	0.392	488.575	3.409	14.458	309.541

Longitudinal B (Demorest Glacier)					
From — To	Mean Velocity/day Between From and To Points (m)	From — To Slope Distance (m)	From — To Movement Time (years)	Cumulative Slope Distance (km)	Cumulative Movement Time (years)
b34 — b33	0.184	496.338	7.401	0.496	7.401
b33 — b32	0.190	497.020	7.174	0.993	14.575
b32 — b31	0.205	499.704	6.689	1.493	21.264
b31 — b30	0.212	497.422	6.429	1.990	27.693
b30 — b29	0.219	499.933	6.248	2.490	33.940
b29 — b28	0.248	498.613	5.498	2.989	39.438
b28 — b27	0.258	501.247	5.315	3.490	44.753
b27 — b26	0.245	500.899	5.598	3.991	50.350
b26 — b25	0.252	499.658	5.434	4.491	55.784
b25 — b24	0.257	500.470	5.334	4.991	61.118
b24 — b23	0.260	500.536	5.275	5.492	66.393
b23 — b22	0.265	500.181	5.159	5.992	71.552
b22 — b21	0.278	497.782	4.906	6.490	76.458
b21 — b20	0.293	496.287	4.642	6.986	81.100
b20 — b19	0.316	497.773	4.309	7.484	85.409
b19 — b18	0.334	499.138	4.091	7.983	89.500
b18 — b17	0.339	499.681	4.032	8.483	93.532
b17 — b16	0.339	501.350	4.052	8.984	97.585
b16 — b15	0.324	498.834	4.212	9.483	101.797
b15 — b14	0.312	493.799	4.338	9.977	106.135
b14 — b13	0.297	500.480	4.608	10.477	110.743
b13 — b11	0.280	994.289	9.982	11.471	120.725
b11 — b10	0.272	497.902	5.011	11.969	125.736
b10 — b9	0.257	499.920	5.333	12.469	131.069
b9 — b8	0.248	500.205	5.518	12.969	136.587
b8 — b7	0.266	498.602	5.133	13.468	141.720
b7 — b6	0.278	501.244	4.939	13.969	146.659
b6 — b5	0.280	502.561	4.913	14.472	151.572

LONGITUDINAL C (SOUTHWEST BRANCH OF THE TAKU GLACIER)					
FROM — To	MEAN VELOCITY/DAY BETWEEN FROM AND To POINTS (M)	FROM — To SLOPE DISTANCE (M)	FROM — To MOVEMENT TIME (YEARS)	CUMULATIVE SLOPE DISTANCE (KM)	CUMULATIVE MOVEMENT TIME (YEARS)
c14 — c13	0.100	498.728	13.693	0.499	13.693
c13 — c12	0.087	498.593	15.606	0.997	29.299
c12 — c11	0.081	502.715	17.083	1.500	46.382
c11 — c10	0.079	499.864	17.222	2.000	63.604
c10 — c9	0.088	498.480	15.529	2.498	79.133
c9 — c8	0.089	497.653	15.318	2.996	94.451
c8 — c7	0.088	498.587	15.566	3.495	110.018
c7 — c6	0.094	497.263	14.560	3.992	124.578

LONGITUDINAL D (NORTHWEST BRANCH OF THE TAKU GLACIER)					
FROM — To	MEAN VELOCITY/DAY BETWEEN FROM AND To POINTS (M)	FROM — To SLOPE DISTANCE (M)	FROM — To MOVEMENT TIME (YEARS)	CUMULATIVE SLOPE DISTANCE (KM)	CUMULATIVE MOVEMENT TIME (YEARS)
d43 — d42	0.015	499.066	91.091	0.499	91.091
d42 — d41	0.025	498.279	54.569	0.997	145.660
d41 — d40	0.032	503.175	43.051	1.501	188.710
d40 — d39	0.041	502.635	33.979	2.003	222.689
d39 — d38	0.053	501.385	25.900	2.505	248.589
d38 — d37	0.062	499.439	22.055	3.004	270.644
d37 — d36	0.068	499.361	20.254	3.503	290.899
d36 — d35	0.070	500.687	19.724	4.004	310.622
d35 — d34	0.073	502.473	18.975	4.506	329.597
d34 — d33	0.076	501.348	18.180	5.008	347.778
d33 — d32	0.077	499.474	17.760	5.507	365.537
d32 — d31	0.063	500.935	21.770	6.008	387.307
d31 — d30	0.051	501.905	27.211	6.510	414.518
d30 — d29	0.061	500.208	22.636	7.010	437.154
d29 — d28	0.073	499.781	18.744	7.510	455.898
d28 — d27	0.088	499.427	15.627	8.010	471.525
d27 — d26	0.114	498.253	12.019	8.508	483.544
d26 — d25	0.140	497.994	9.774	9.006	493.318
d25 — d24	0.158	498.308	8.635	9.504	501.952
d24 — d23	0.178	501.602	7.715	10.006	509.668
d23 — d22	0.204	501.081	6.725	10.507	516.393
d22 — d21	0.230	498.662	5.949	11.005	522.341
d21 — d20	0.248	499.422	5.525	11.505	527.866
d20 — d19	0.259	498.892	5.274	12.004	533.140

LONGITUDINAL D (NORTHWEST BRANCH OF THE TAKU GLACIER)					
FROM — To	MEAN VELOCITY/DAY BETWEEN FROM AND To POINTS (M)	FROM — To SLOPE DISTANCE (M)	FROM — To MOVEMENT TIME (YEARS)	CUMULATIVE SLOPE DISTANCE (KM)	CUMULATIVE MOVEMENT TIME (YEARS)
d19 — d18	0.266	499.227	5.148	12.503	538.288
d18 — d17	0.273	498.070	4.995	13.001	543.283
d17 — d6	0.277	501.989	4.962	13.503	548.244
d16 — d5	0.283	492.143	4.764	13.995	553.009
d15 — d14	0.291	498.714	4.697	14.494	557.706
d14 — d13	0.294	498.672	4.644	14.993	562.350
d13 — d12	0.299	497.020	4.550	15.490	566.900
d12 — d11	0.303	498.649	4.509	15.988	571.409
d11 — d10	0.308	501.288	4.460	16.490	575.869
d10 — d9	0.314	499.459	4.348	16.989	580.217
d9 — d8	0.320	472.022	4.042	17.461	584.259
d8 — d7	0.327	498.793	4.179	17.960	588.439
d7 — d6	0.345	499.655	3.970	18.459	592.408
d6 — d5	0.389	498.784	3.514	18.958	595.922
d5 — d4	0.439	499.383	3.114	19.458	599.037
d4 — d3	0.473	499.321	2.890	19.957	601.927
d3 — d2	0.492	499.376	2.782	20.456	604.709
d2 — d1	0.505	499.354	2.707	20.956	607.416

LONGITUDINAL E (SNOW TOWERS FORK OF THE NORTHWEST BRANCH OF THE TAKU GLACIER)					
FROM — To	MEAN VELOCITY/DAY BETWEEN FROM AND To POINTS (M)	FROM — To SLOPE DISTANCE (M)	FROM — To MOVEMENT TIME (YEARS)	CUMULATIVE SLOPE DISTANCE (KM)	CUMULATIVE MOVEMENT TIME (YEARS)
e10 — e9	0.021	497.608	66.457	0.498	66.457
e9 — e8	0.027	498.898	50.589	0.997	117.047
e8 — e7	0.027	500.935	51.754	1.497	168.801
e7 — e6	0.033	498.320	41.979	1.996	210.780
e6 — e5	0.040	500.507	34.258	2.496	245.038
e5 — e4	0.053	500.121	26.081	2.996	271.119
e4 — e3	0.071	498.521	19.360	3.495	290.479
e3 — e2	0.088	500.106	15.648	3.995	306.127
e2 — e1	0.100	499.828	13.685	4.495	319.811

LONGITUDINAL F (WEST BRANCH OF THE TAKU GLACIER)					
FROM — TO	MEAN VELOCITY/DAY BETWEEN FROM AND TO POINTS (M)	FROM — TO SLOPE DISTANCE (M)	FROM — TO MOVEMENT TIME (YEARS)	CUMULATIVE SLOPE DISTANCE (KM)	CUMULATIVE MOVEMENT TIME (YEARS)
f26 — f24	0.025	994.182	108.877	0.994	108.877
f24 — f23	0.037	502.842	37.208	1.497	146.085
f23 — f22	0.047	500.275	29.455	1.997	175.541
f22 — f21	0.053	500.536	26.103	2.498	201.643
f21 — f20	0.059	503.237	23.352	3.001	224.996
f20 — f19	0.068	500.423	20.298	3.501	245.293
f19 — f18	0.074	502.255	18.582	4.004	263.876
f18 — f17	0.076	501.897	18.200	4.506	282.076
f17 — f16	0.085	500.512	16.133	5.006	298.209
f16 — f15	0.097	498.445	14.086	5.505	312.296
f15 — f14	0.104	499.254	13.167	6.004	325.463
f14 — f13	0.109	499.789	12.557	6.504	338.020
f13 — f12	0.122	499.534	11.213	7.003	349.232
f12 — f11	0.127	498.719	10.774	7.502	360.006
f11 — f10	0.124	497.379	10.988	7.999	370.994
f10 — f9	0.129	500.317	10.652	8.500	381.646
f9 — f8	0.131	498.076	10.391	8.998	392.036
f8 — f7	0.138	499.281	9.875	9.497	401.911
f7 — f6	0.159	499.419	8.617	9.996	410.528
f6 — f5	0.179	498.729	7.616	10.495	418.144
f5 — f4	0.201	500.419	6.808	10.996	424.952
f4 — f3	0.231	499.585	5.926	11.495	430.878
f3 — f2	0.252	499.822	5.431	11.995	436.309
f2 — f1	0.269	496.225	5.055	12.491	441.364
f1 — d16	0.282	499.789	4.854	12.991	446.218

LONGITUDINAL G (SNOW TOWERS FORK OF THE NORTHWEST BRANCH OF THE TAKU GLACIER)					
FROM — TO	MEAN VELOCITY/DAY BETWEEN FROM AND TO POINTS (M)	FROM — TO SLOPE DISTANCE (M)	FROM — TO MOVEMENT TIME (YEARS)	CUMULATIVE SLOPE DISTANCE (KM)	CUMULATIVE MOVEMENT TIME (YEARS)
g11 — g10	0.023	491.712	57.666	0.492	57.666
g10 — g9	0.029	493.167	46.333	0.985	103.999
g9 — g8	0.031	507.190	44.343	1.492	148.342
g8 — g7	0.031	502.583	44.211	1.995	192.553
g7 — g6	0.035	501.575	39.438	2.496	231.991
g6 — g5	0.044	499.933	31.385	2.996	263.376
g5 — g4	0.065	499.053	20.966	3.495	284.342
g4 — g3	0.137	498.995	9.957	3.994	294.298
g3 — g2	0.243	499.650	5.636	4.494	299.934
g2 — g1	0.302	500.966	4.535	4.995	304.469

APPENDIX 6

SURFACE ELEVATIONS AT PROFILE 4, 1993 TO 2001

The data in the following table represent the annual surveyed elevations of the 31 flags of Profile 4 as adjusted to the standard July 25 measurement date.

FLAG	ELEVATION (METERS ABOVE WGS84 ELLIPSOID)								
	1993	1994	1995	1996	1997	1998	1999	2000	2001
1	1119.852	1119.712	1119.258	1118.492	1117.755	1116.810	1117.351	1118.938	1119.865
2	1126.923	1127.012	1126.009	1125.174	1124.304	1123.633	1124.055	1125.725	1126.538
3	1122.832	1122.969	1122.095	1121.371	1120.630	1119.721	1120.234	1121.481	1122.237
4	1125.882	1126.146	1124.930	1124.049	1123.357	1122.611	1122.956	1124.491	1125.303
5	1122.850	1122.966	1121.965	1121.496	1120.560	1119.512	1119.849	1121.322	1121.946
6	1123.484	1123.614	1122.522	1121.613	1120.742	1119.897	1120.193	1121.637	1122.469
7	1120.656	1120.882	1119.808	1118.947	1118.077	1117.092	1117.425	1118.712	1119.648
8	1122.545	1122.874	1121.783	1120.645	1119.810	1119.043	1119.256	1120.741	1121.584
9	1121.201	1121.600	1120.377	1119.311	1118.679	1117.479	1117.916	1119.464	1120.695
10	1122.394	1122.754	1121.279	1120.202	1119.514	1118.770	1119.014	1120.497	1121.289
11	1121.657	1122.262	1120.793	1120.109	1119.511	1118.267	1118.696	1119.987	1121.036
12	1121.675	1121.901	1120.663	1120.006	1119.448	1118.405	1118.821	1120.269	1121.208
13	1121.566	1121.661	1120.580	1119.590	1119.200	1117.612	1118.472	1119.832	1120.915
14	1123.383	1123.648	1122.108	1121.450	1121.101	1119.661	1120.482	1121.846	1122.896
15	1117.945	1117.940	1116.604	1115.803	1115.383	1114.449	1115.128	1116.670	1117.445
16	1122.471	1122.218	1121.047	1120.528	1120.005	1119.013	1119.617	1121.159	1122.056
17	1121.898	1122.234	1120.483	1119.877	1119.899	1118.589	1119.360	1120.910	1121.662
18	1128.331	1128.335	1126.707	1126.491	1125.941	1124.837	1125.678	1127.090	1127.928
19	1128.305	1128.404	1126.888	1126.455	1126.134	1124.804	1125.842	1127.027	1128.140
20	1134.260	1134.696	1132.867	1132.486	1132.003	1130.874	1131.705	1133.157	1134.037
21	1134.681	1134.869	1133.364	1132.868	1132.584	1131.601	1132.204	1133.695	1134.750
22	1138.596	1138.685	1137.382	1136.945	1136.534	1135.168	1136.062	1137.586	1138.490
23	1136.935	1136.628	1135.203	1135.003	1134.798	1133.288	1134.164	1135.556	1136.362
24	1139.334	1139.522	1138.113	1137.418	1136.997	1136.037	1136.551	1137.904	1138.811
25	1138.734	1139.024	1137.252	1136.849	1136.301	1135.319	1136.060	1136.873	1138.322
26	1140.840	1141.494	1140.094	1139.224	1138.843	1137.834	1138.078	1139.627	1140.320
27	1139.350	1139.409	1138.197	1137.490	1137.453	1136.608	1136.864	1138.318	1139.055
28	1141.612	1141.157	1139.878	1139.152	1138.967	1137.734	1138.566	1139.804	1140.735
29	1143.362	1142.899	1141.810	1141.122	1140.884	1139.981	1140.338	1142.012	1142.697
30	1143.137	1142.646	1141.209	1140.486	1140.228	1139.432	1140.128	1141.420	1142.214
31	1147.676	1147.197	1145.975	1145.288	1145.017	1144.250	1144.952	1146.282	1147.026
MEAN	1129.496	1129.592	1128.298	1127.611	1127.118	1126.075	1126.646	1128.066	1128.957

APPENDIX 7 **SURFACE STRAINS AT PROFILE 4, JULY 19 TO JULY 25, 2001**

TRIANGLE	FLAGS	μ STRAIN / DAY			ORIENTATION (θ)
		MAXIMUM STRAIN (e_1)	MINIMUM STRAIN (e_2)	VERTICAL STRAIN (e_3)	
1	1 2 3	46.675	-16.960	-29.714	105.927
2	2 3 4	59.357	-64.168	4.811	94.600
3	3 4 5	105.726	-119.008	13.282	106.246
4	4 5 6	117.594	-162.227	44.633	101.231
5	5 6 7	292.130	-230.775	-61.355	105.617
6	6 7 8	295.470	-258.487	-36.982	105.417
7	7 8 9	384.321	-322.254	-62.066	105.760
8	8 9 10	387.282	-405.588	18.305	105.435
9	9 10 11	272.725	-307.402	34.677	107.484
10	10 11 12	278.808	-187.759	-91.050	111.797
11	11 12 13	167.310	-135.355	-31.955	110.244
12	12 13 14	215.591	-91.059	-124.532	123.995
13	13 14 15	105.176	-50.330	-54.846	132.110
14	14 15 16	106.269	-93.253	-13.015	128.391
15	15 16 17	58.229	-66.218	7.988	228.930
16	16 17 18	63.023	-46.749	-16.274	134.376
17	17 18 19	33.904	-41.742	7.837	139.632
18	18 19 20	48.940	-9.164	-39.776	-38.261
19	19 20 21	38.109	-18.858	-19.250	91.612
20	20 21 22	24.284	-21.538	-2.746	181.593
21	21 22 23	29.956	-44.970	15.014	198.978
22	22 23 24	176.609	-49.649	-126.960	192.153
23	23 24 25	200.950	-153.118	-47.832	3.381
24	24 25 26	242.048	-153.760	-88.288	3.418
25	25 26 27	292.601	-274.944	-17.657	5.611
26	26 27 28	288.487	-266.497	-21.990	2.161
27	27 28 29	282.274	-207.534	-74.741	1.871
28	28 29 30	205.116	-194.889	-10.227	12.769
29	29 30 31	131.540	-72.718	-58.822	101.426

The orientation of θ is clockwise from grid north of the JIRP coordinate system, in gons (grads).

NOTES

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