AUSTRALIAN NATIONAL ANTARCTIC RESEARCH EXPEDITIONS

ANARE RESEARCH NOTES 64

Ice sheet topography and surface characteristics in eastern Wilkes Land, East Antarctica

Ian D. Goodwin

ANTARCTIC DIVISION
AUSTRALIA

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DEPARTMENT OF THE ARTS, SPORT,
THE ENVIRONMENT, TOURISM AND TERRITORIES

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ICE SHEET TOPOGRAPHY AND SURFACE CHARACTERISTICS IN EASTERN WILKES LAND, EAST ANTARCTICA

by

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ABSTRACT

A comprehensive survey of the ice-sheet topography and surface physical characteristics was conducted by ANARE glaciological teams in eastern Wilkes Land during the period 1980-86. Oversnow operations were between 112°E and 132°E extending from the coast to 69°S and covered the elevation range 800-2300 m asl. This report presents the data set collected on the surface topography, and the spatial distribution of snow accumulation rates, snow surface microrelief and surface wind fields, snow surface physical properties and firn temperatures.

1. INTRODUCTION

The 1980-82 and 1985-86 Australian National Antarctic Research Expeditions (ANARE) conducted glaciological traverses in eastern Wilkes Land. These traverses operated from Casey (66°17'S, 110°33'E) between 112°E and 132°E and approximately traversed the 1500 m and 2000 m contours of the East Antarctic ice sheet. In 1983-84 and 1986 ANARE glaciological traverses were conducted in southern Wilkes Land towards Vostok (78°27'S, 106°51'E) and west in Queen Mary Land along the 2000 m contour towards Mirny (66°33'S, 93°01'E). These oversnow traverses formed part of Australia's contribution to the International Antarctic Glaciology Project (IAGP).

This report partially presents the results of the eastern Wilkes Land traverses which operated wholly within the katabatic slope region of East Antarctica. The single dominating feature of this region is the persistent katabatic wind which drains cold air from the ice sheet's interior, down slope to the coast. This katabatic wind is fundamental in controlling the physical characteristics of the snow surface and the firn-pack outlined in this report. The following sections describe the data sampling techniques applied and summarise the measurements collected.

The original field data and processed data are held at the Glaciology Section, Australian Antarctic Division.

2. SURFACE TOPOGRAPHY

2.1 OUTLINE

Reconnaissance data on the ice sheet surface topography of eastern Wilkes Land were obtained by NASA from Seasat radar altimetry south to 72°S. A preliminary surface elevation map with 100 m contours was published by Zwally et. al. (1983). In addition during a joint US, UK and Danish program, surface topographic profiles were obtained between 1967 and 1979 using aircraft altimetry over a coarse grid (50-100 km). These data are published by Drewry (1983) and cover eastern Wilkes Land from Dome C (74°34'S, 123°10'E) to the coast and as far west as 112°E.

In 1980-82 and 1985 surface topographic profiles were obtained on all ANARE traverse routes in eastern Wilkes Land using continuous barometric levelling techniques. These routes, labelled A, C, D and E, are shown in Figure 1. Route A follows the regional fall line along the 112°E longitude between the Law Dome saddle (67°15'S) at 800 m asl and A028 (68°24'S) at 1650 m asl. The major route E approximately follows the 2000 m contour along the 69°S latitude between 112°E and 131°E. This route covers the 1600-2250 m asl elevation range, and crosses a major east Antarctic ridge system which extends from the ice divide at Dome C to the coast near Porpoise Bay (see Figure 1). Route C runs parallel to route E in the vicinity of the 1500 m contour between 1280 and 1500 m asl. Route D is an ancilliary route connecting routes C and E.

2.2 MEASUREMENT AND DATA REDUCTION TECHNIQUES

Ice sheet surface elevations were measured using barometric levelling techniques. These involved the simultaneous measurement and logging of surface barometric pressure and temperature using two calibrated digital barometers and thermometers. The barometers were logged continuously on a chart recorder providing a barometric profile along the routes. The profile was controlled every 2 km by manual barometric pressure and temperature readings. The barometric levelling runs were absolutely controlled by surface elevations obtained from Doppler satellite positioning

surveys (DSPS) at intervals of 25 km on route C and 50 km on routes A and E. Repeated levelling runs on route E were completed on both outward and return journeys in 1981, 1982 and 1985. Consequently five or six complete sets of data were collected providing a check on the measurement and later data reduction. The most consistent and complete data set was collected in 1982 and is presented at Appendix I(d).

Generally the measurement method allowed one barometer to be held stationary at a DSPS control point whilst the other barometer was travelling. This resulted in a physical separation of 50-100 km between barometers. Pressures recorded by the stationary barometer together with pressures recorded by an automatic weather station (AWS) at A028 (68°24'S, 112°13'E) were used to calculate temporal fluctuations in synoptic pressure. These synoptic pressure changes were subtracted from the barometric levelling profile obtained from the moving barometer.

The corrected barometric pressures were converted to elevations using the modified pressure/height relationship

$$dz = -k. \ln (1 + dp/p)$$

where dz is the elevation increment between markers, dp is the pressure increment and p is the pressure at one of them. K is a constant determined empirically to scale the cumulative pressure increments between the absolute elevation control (DSPS stations) at the ends of each levelling run. The absolute accuracy for elevations calculated over 50 km legs using the above methods is ±5 m. Surface elevations were calculated from the barometric pressures at intervals of 0.5 km for routes C, D and E and at 1.0 km intervals for route A. The elevations are given with respect to the Navsat co-ordinate system and are based on the reference spheroid NWL-8E.

2.3 TOPOGRAPHICAL PROFILES

Final topographic profiles were calculated from data collected in 1973 for route A, 1982 for route E and 1985 for routes C and D.

Surface slopes were calculated from the above profiles over 2 km intervals for route A and 1 km intervals for routes C, D and E. Generally the slopes lie in the range -1.5 to +2.5% and typically -0.5 to +1.5% for route A and -0.5 to +0.5% for routes C, D and E.

Surface topographic profiles and derived surface slopes for route A, route E, route C and route D are shown in Figures 2, 3, 4 and 5 respectively. Appendixes I(a-d) list the data for the four profiles.

Master files containing the geodetic coordinates for route markers and control points are listed at Appendixes VI(a-c).

3. SNOW ACCUMULATION RATES

3.1 OUTLINE OF MEASUREMENTS

Snow accumulation data were collected on routes A and E and were made on dual tagged bamboo cane markers spaced at 2 km intervals along the routes. The measurements along route A were made in autumn and spring during the period 1973-86. Route E measurements were made in autumn and spring during 1980-82 and 1985 along the initial 75 km length to GD03 (69°00'S, 115°50'E). A complete set of measurements was collected along the entire length of route E,

during the spring seasons 1982 and 1985. This data set comprises 375 canes along the 760 km route.

3.2 SNOW ACCUMULATION RATES

Snow accumulation rates were calculated from the spring epoch data sets for both routes A and E. These rates were converted from snow volume to mass using a mean measured snow density of 420 kg m^{-3} for the upper 1 m of snowpack.

The spatial distribution of snow accumulation rates is plotted for routes A and E in Figures 6 and 7(a) respectively. The data are listed at Appendixes II(a) and II(b).

Snow accumulation rates are in the range 300-1200 kg m^{-2} a^{-1} for route A and 77-848 kg m^{-2} a^{-1} for route E. The spatial variability of these rates calculated over 20 km and expressed as the ratio of the standard deviation to the mean ($s / \bar{x}$) is 34% for route A and 23% for route E. A 20 km window was applied to the data for analysis on the basis of its correlation to the mesoscale topographic roughness. The 20 km mean accumulation rate distribution for route E is shown in Figure 7(b), together with the corresponding spatial variability ($s / \bar{x}$) distribution in Figure 7(c). The 20 km mean, standard deviation and variability values for route E are listed at Appendix II(c). In addition 20 km mean accumulation rate distributions for 1980-81 and 1981-82 are listed at Appendix II(d), and are shown in Figures 8(a) and 8(b). Whilst the spatial distributions for both years are similar, the mean inter-annual variability is as high as 24%.

4. SNOW SURFACE MICRORELIEF AND SURFACE WIND FIELDS

Observations of snow surface microrelief type, size and orientation were carried out in autumn and spring on all routes at intervals of 4 km and 8 km. At each site, measurements were conducted over a 500 m x 500 m quadrat.

4.1 SURFACE MICRORELIEF TYPE

The surface microrelief types at each site were classified into erosion, reshuffled or deposition. These classes comprise the following sub-classes:

i) *Erosional surface type*
- eg wind glazed and crusted, with etched pits and transverse ridges
- ef fine split sastrugi
- eb mature broad sastrugi
- ep wind crusted, with etched pits and transverse ridges
- el lanceolate sastrugi

ii) *Reshuffled surface type (free depositional forms)*
- rb drift snow forming banks, dunes and juvenile lanceolate sastrugi

iii) *Depositional surface type (forced depositional forms)*
- dd precipitated drift forming dunes
- db precipitated drift forming fields, spots and strips

To aid the spatial analysis of surface microrelief data in this section, the microrelief type data have been combined into one of the three major categories, i.e. erosion, reshuffled or deposition. However, in section 5 of this report which details the snow surface physical properties, the microrelief type sub-classes are used to describe individual surfaces upon which physical

measurements were made. Photographs depicting the individual surface type characteristics are shown in Plates 1-10.

4.2 SURFACE MICRORELIEF SIZE

Each of the observed types were then classified into size classes based on the following size scale developed and used by the Japanese Antarctic Research Expeditions (JARE) traverse program (Fujiwara and Yashoicho 1971).

A Glazed surface
B Smooth surface with some faint marks
C Less than 10 cm in mean height
D 10-20 cm in mean height
E 20-40 cm in mean height
F 40-70 cm in mean height
G More than 70 cm in mean height.

4.3 SURFACE MICRORELIEF DATA

Appendixes III(a-f) list microrelief type size and orientation data for routes A, C, D and E for both the autumn and spring 1985 seasons.

4.4 GEOGRAPHIC DISTRIBUTION OF SURFACE MICRORELIEF TYPE AND SIZE

In order to analyse the spatial distribution of surface microrelief types, the reshuffled and deposition classes have been combined for comparative purposes with the erosion class, since the two former classes represent both free and forced depositional forms.

The north-south distribution of erosion and depositional microrelief size for route A is shown in Figures 9(a) and 9(b). The peaks in the erosional microrelief size occur in the undulating topography between 80 and 120 km south of A015. Figures 10(a) and 10(b) show the 20 km mean distribution of erosional and depositional microrelief size for route E for the autumn season and Figures 11(a) and 11(b) show the 20 km mean distribution for the spring season. For the 150 km overlap between A028 and GD03, the autumn microrelief was approximately one third the size of the spring features and was dominated by low friable barchan dunes, whilst the spring surface was dominated by high sastrugi and longitudinal dunes. To determine the geographic distribution and dominance of microrelief types, along route E, the microrelief balance or difference in height between depositional and erosional features was calculated for the 20 km mean spring measurements. Figure 12 shows the resulting microrelief balance distribution for route E. A negative microrelief size indicates the dominance of erosional features whilst a positive size indicates the dominance of depositional features. Figure 12 shows the transition from erosional to depositional features or a positive microrelief balance with increasing elevation along route E. The 20 km mean surface microrelief size and balance distributions for route E are listed at Appendixes III(g) and III(h).

4.5 GEOGRAPHIC DISTRIBUTION OF SURFACE MICRORELIEF ORIENTATION AND SURFACE WIND FIELDS

The primary erosion surface orientations measured along route E in autumn and spring are plotted in Figures 13 and 14 respectively. These vectors delineate the dominant surface wind direction and do not imply wind speed. The microrelief surface orientations have resulted from the prolonged exposure of the snow surface to the dominant surface wind. In Figure 16, the vectors represent the orientations measured on the dominant continuous erosion surface (eg) which was characterised by a wind glaze and crust with etched pits and transverse ridges. This surface type was traced for the entire traverse length. These orientations show consistent relative alignment and are deflected to the west of the fall line by approximately 50°; and are coincident with the

dominant surface wind direction encountered during the traverse. Consequently, these surface microrelief orientations have been interpreted as the dominant surface katabatic wind directions for the summer/autumn and winter/spring seasons.

The spring wind directions are deflected by 15-25° to the south when compared to the autumn wind directions for the same routes along the overlapping 150 km section east of A028. The autumn wind directions lie roughly parallel to the depositional features measured in spring and autumn. These depositional features reflect the prevailing wind directions associated with the large scale circulation patterns.

5. SNOW SURFACE PHYSICAL PROPERTIES

5.1 SNOW SURFACE DENSITY AND HARDNESS MEASUREMENTS

Surface snow density and hardness were measured at intervals of 8 km along all routes. The measurements were made in shallow pits at 0-5 cm and 5-10 cm depths. The density samples were collected using a 300 cc stainless steel tube and weighed using a 1 kg spring balance. The hardnesses were measured using a 0-10 kg cm^{-2} and 0-100 kg cm^{-2} Canadian ram hardness gauge.

At each site the density and hardness measurements were carried out on all the surface types present. These surface types were described in the preceding section. The density, hardness and surface type data for all routes are listed at Appendixes IV(a-e).

5.2 GEOGRAPHIC DISTRIBUTION OF SURFACE DENSITY AND HARDNESS

The snow surface types encountered in autumn were dominated by the reshuffled (rb) type, whilst in spring the erosion (eg) type was predominant. The latter type was continuous for the entire length of route E. Consequently the spatial distribution of density and hardness values along route E was investigated for measurements made on the above two surface types. Figure 15 shows the autumn distribution of surface density and hardness for the surface type (rb). The spring distribution for the surface type (eg) is shown in Figure 16 together with the distribution of surface glazing development.

In addition, the 20 km mean snow density distribution for the 0-10 cm depth is shown in Figure 17 and listed at Appendix IV(f).

6. FIRN TEMPERATURES

6.1 FIRN TEMPERATURE MEASUREMENTS

Firn temperatures were measured at seventeen sites using two temperature bridges with platinum resistance probes (μ = 0.00385) in 10-20 m holes drilled by a 5 cm diameter steam drill and in 30-35 m holes drilled manually using the PICO (Polar Ice Coring Office) lightweight coring auger. The temperature bridge/probe combinations were calibrated in ice baths before and after the two major traverses, and the R_O values determined for the reduction of resistance data. There was no significant drift in the R_O values. The steam drill holes were drilled in autumn or early spring on the outward journey and firn temperatures were measured on the return journey. This allowed a mininum time of two weeks for the holes to cool and stabilise. During the

measurement phase, the probe was lowered or raised to the appropriate depth in the hole and allowed to stabilise, until the resistance value reached a zero time rate drift. The probe was held in contact with the hole wall for all measurements. Care was taken to enclose the top of the holes with polystyrene stoppers to prevent cold air spilling down the hole. A chart recorder was used to record the output resistance values from the temperature bridge, to enable a higher resolution resistance measurement. Resistances were measured to 0.001 ohms corresponding to 0.0025°C temperature. All measured resistance values were corrected for any deviation from the R_O value.

6.2 GEOGRAPHIC DISTRIBUTION OF SHALLOW FIRN TEMPERATURES

The measured firn temperatures for 10 and 20 m depths, together with their corresponding surface elevations, are listed at Appendixes V(a) and V(b). The actual measurement depth is listed and corresponds to the depth below the snow surface at the time of measurement. Figure 18 shows the temperature-elevation relationship for the 20 m temperatures. The 10 m temperature distribution is similar to the 20 m distribution except that it is slightly offset according to site, seasonal time of measurement and surface gradient.

The surface lapse rate for eastern Wilkes Land calculated from the 20 m depth firn temperatures and corresponding elevations is

Lapse rate = - 0.96°C/100 m

6.3 DETAILED FIRN TEMPERATURE-DEPTH PROFILES

At five sites, spaced at intervals of 150 km along route E, detailed snow temperature-depth profiles were recorded to depths of 35 m. These detailed profiles are listed for GD03, GD06, GD09, GD12 and GD15 at Appendixes V(c-g). Figures 19(a-e) show the firn temperature-depth profiles.

ACKNOWLEDGMENTS

The success of the field program is largely the result of the dedication and support of the 1980, 1981, 1982 and 1985 ANARE wintering expeditioners at Casey. However the Wilkes Land traverses required comprehensive planning and massive logistical preparations in Australia which involved many Antarctic Division staff. The overall co-ordination and supervision of the Wilkes Land traverse program was provided by Mr Neal Young of the Glaciology Section of the Antarctic Division in Melbourne. The author also acknowledges the guidance and assistance offered by his colleagues at the Glaciology Section, in particular Dr Ian Allison.

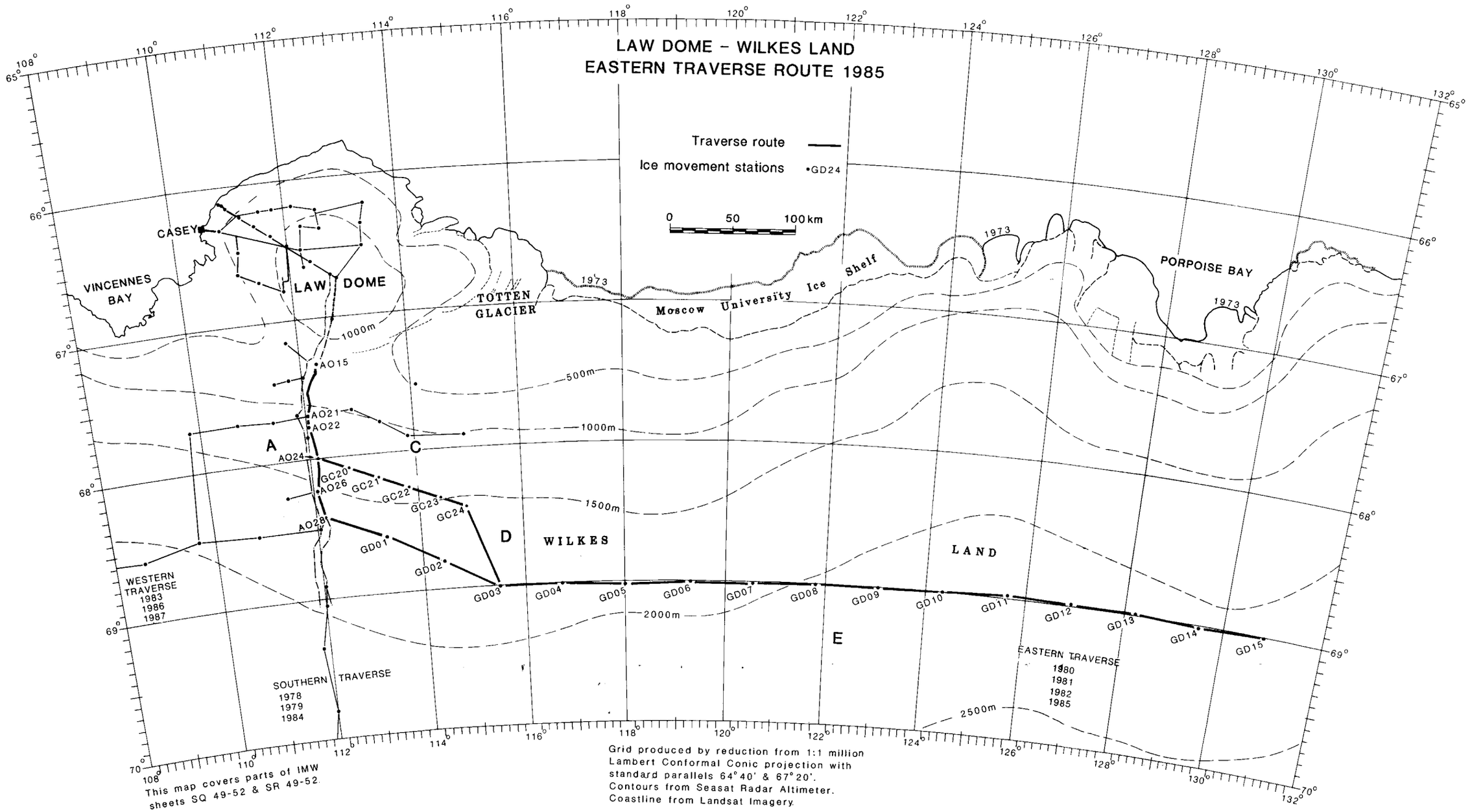


Figure 1. Map of eastern Wilkes Land showing ANARE traverse routes A, C, D and E.

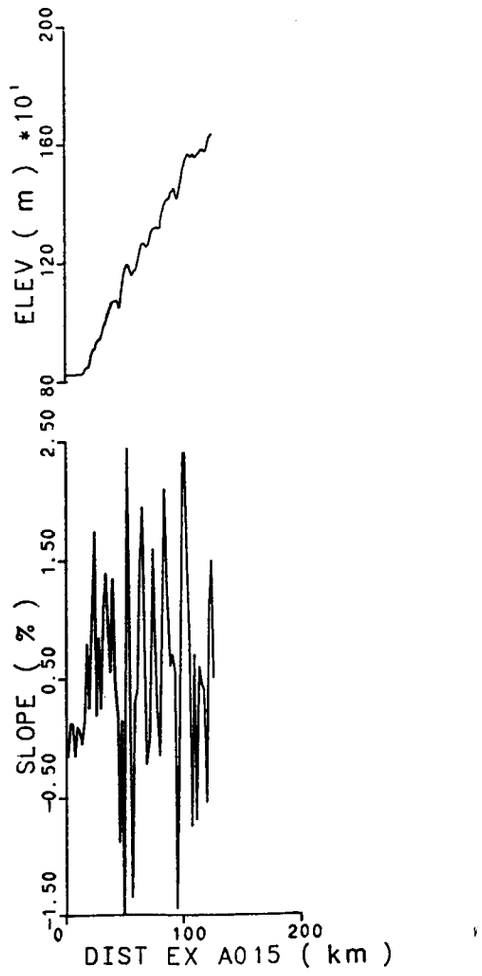


Figure 2. Route A surface topographic profile and derived surface slopes.

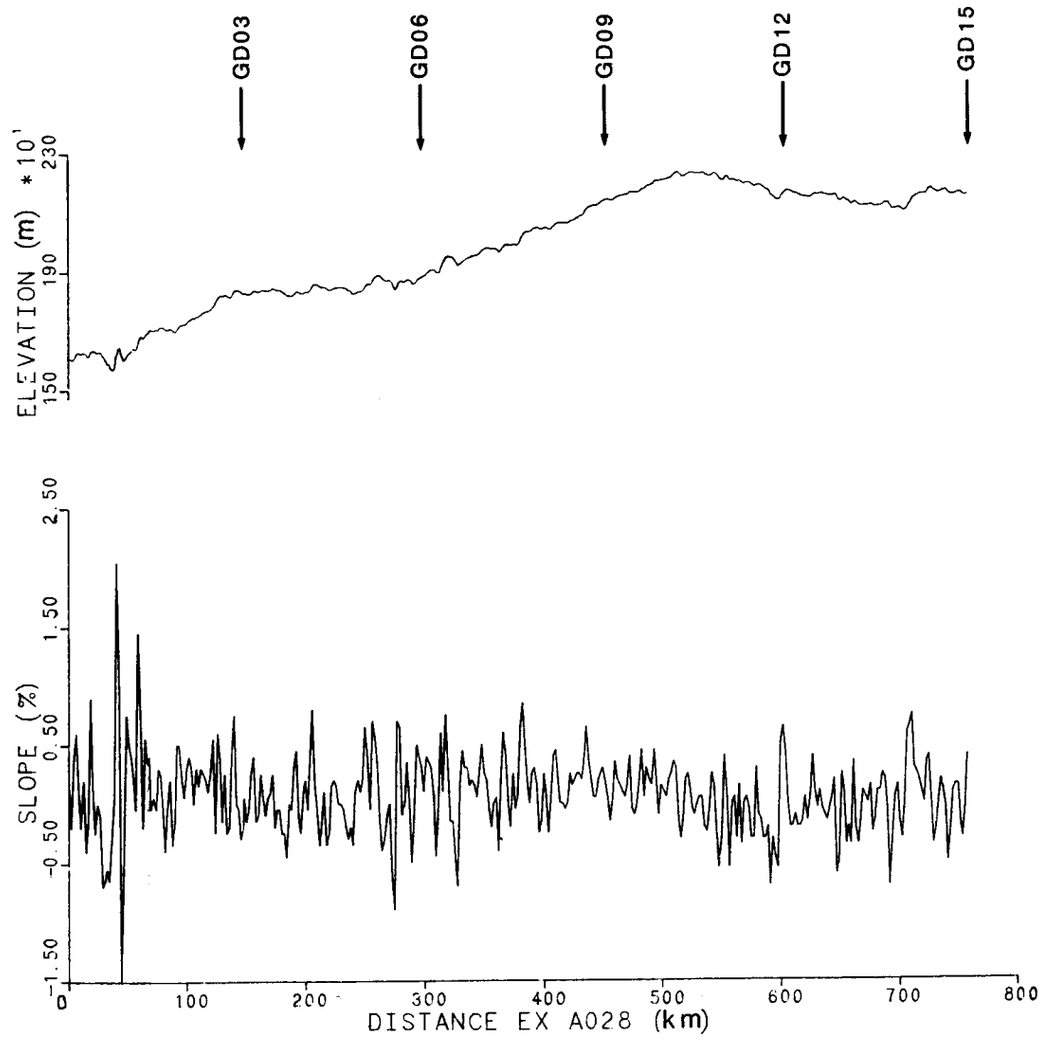
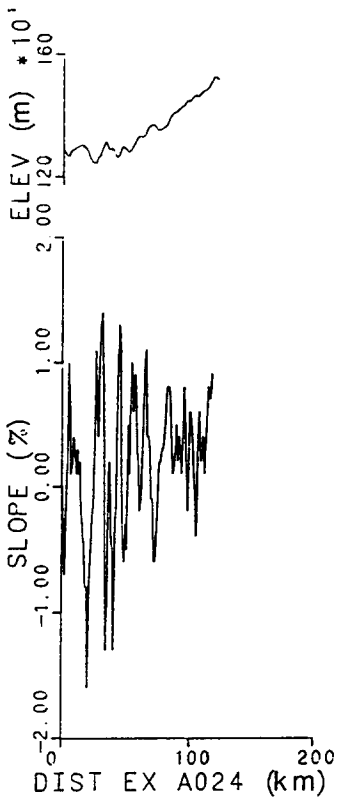


Figure 3. Route E surface topographic profile and derived surface slopes.



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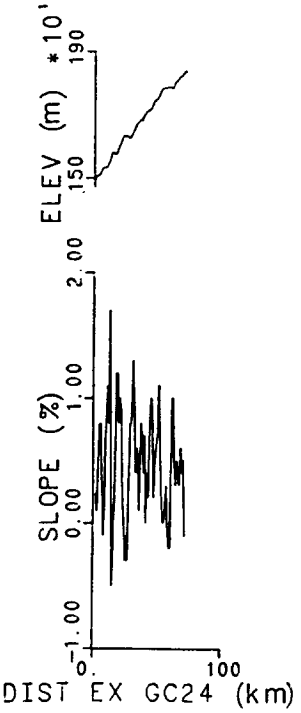

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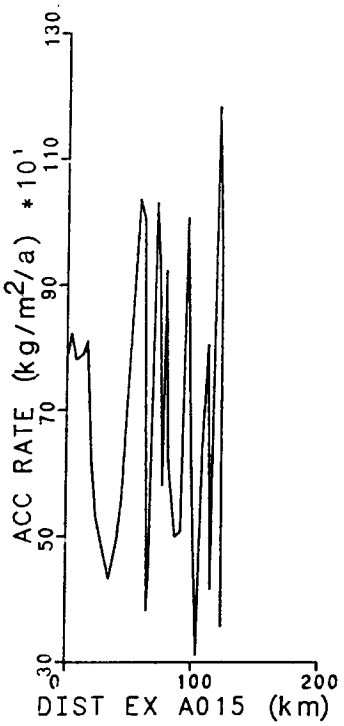

Figure 4. Route C surface topographic profile and derived surface slopes.

Figure 5. Route D surface topographic profile and derived surface slopes.

Figure 6. Route A mean accumulation rate distribution for 1973-86.

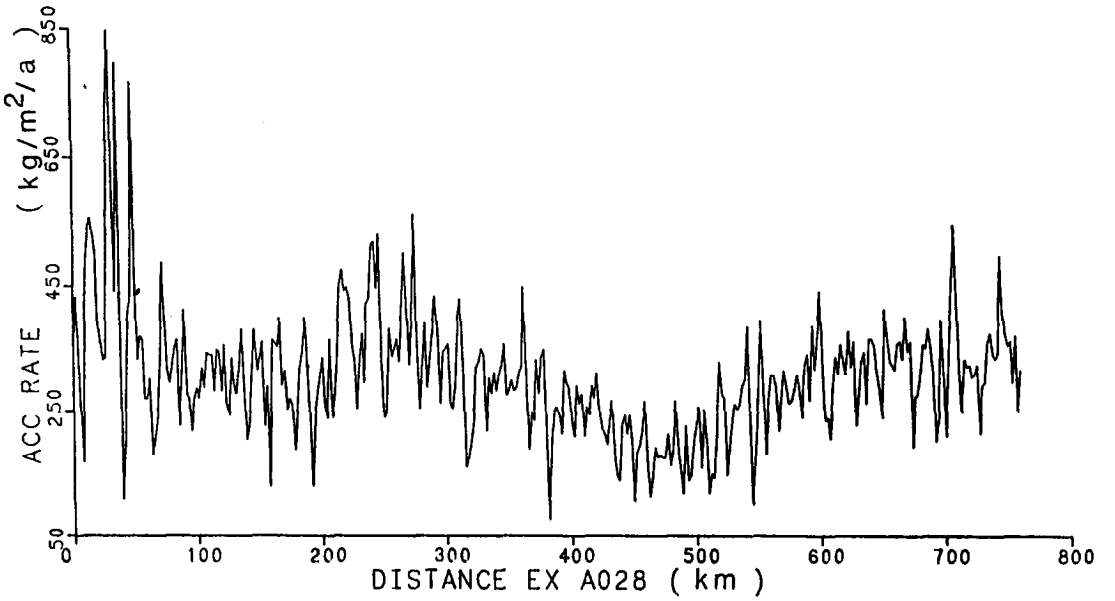

Figure 7(a). Route E mean accumulation rate distribution for 1982-85.

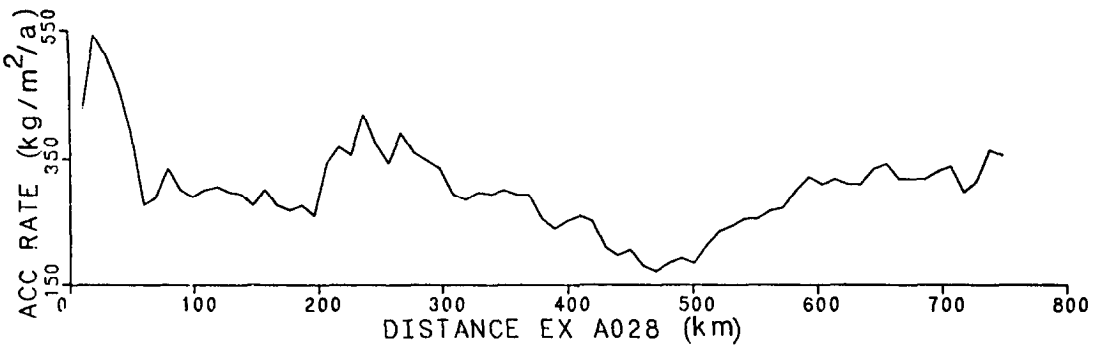

Figure 7(b). Route E 20 km mean accumulation rate distribution for 1982-85.

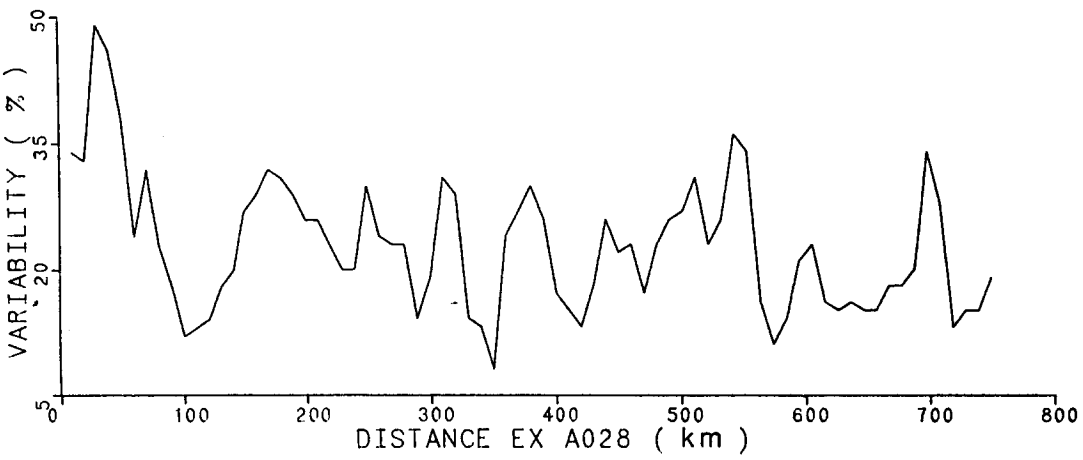

Figure 7(c). Route E 20 km mean accumulation variability distribution for 1982-85. The variability factor is calculated from the ratio: 20 km standard deviation/20 km mean.

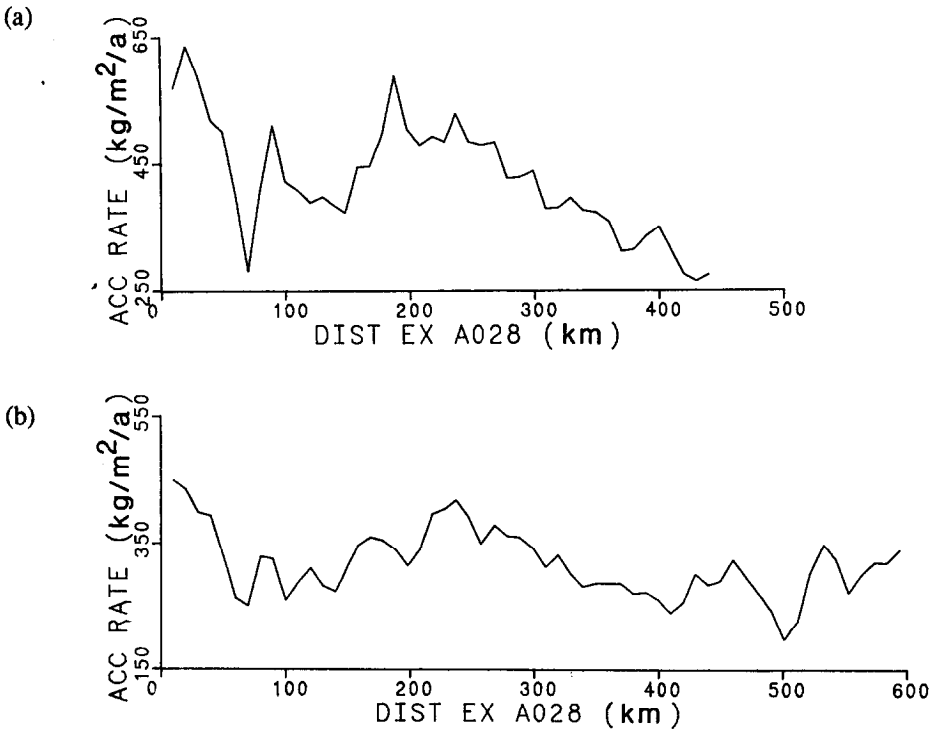

Figure 8. Route E 20 km mean annual accumulation rate distribution for (a) 1980-81, (b) 1981-82.

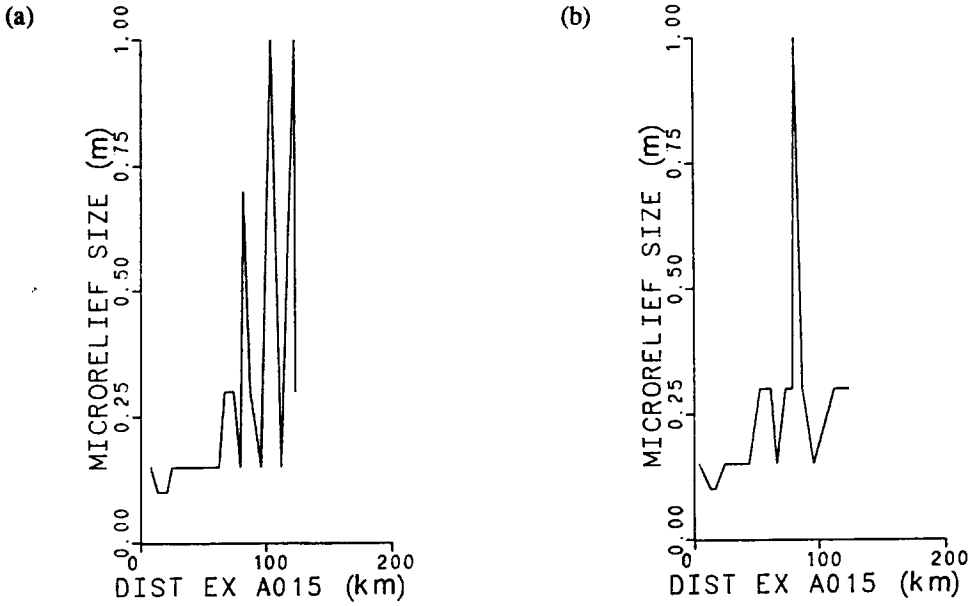

Figure 9. Route A spring microrelief size distribution (a) erosional, (b) depositional.

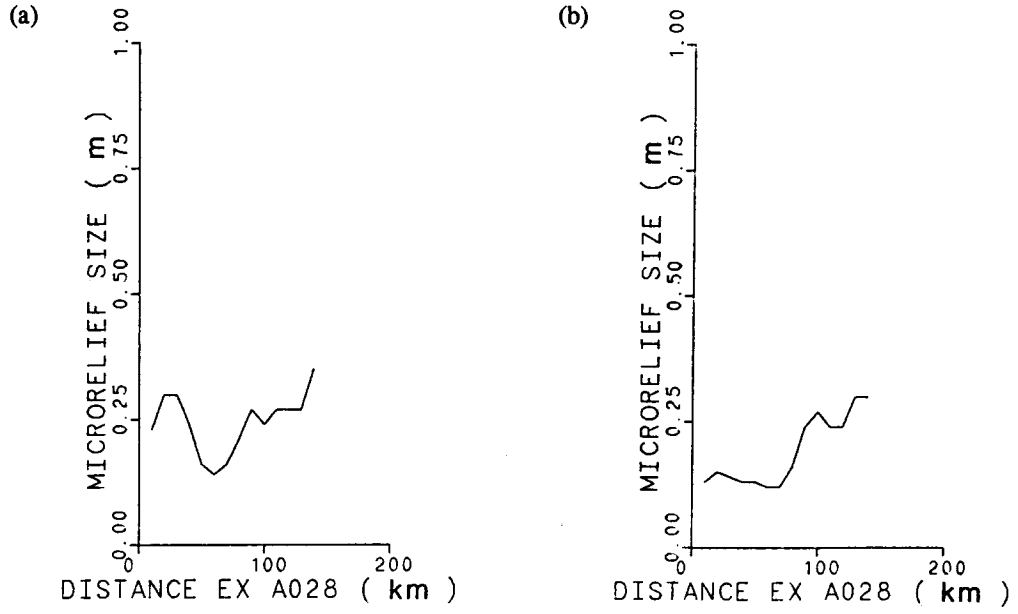

Figure 10. Route E 20 km mean autumn microrelief size distribution
(a) erosional, (b) depositional.

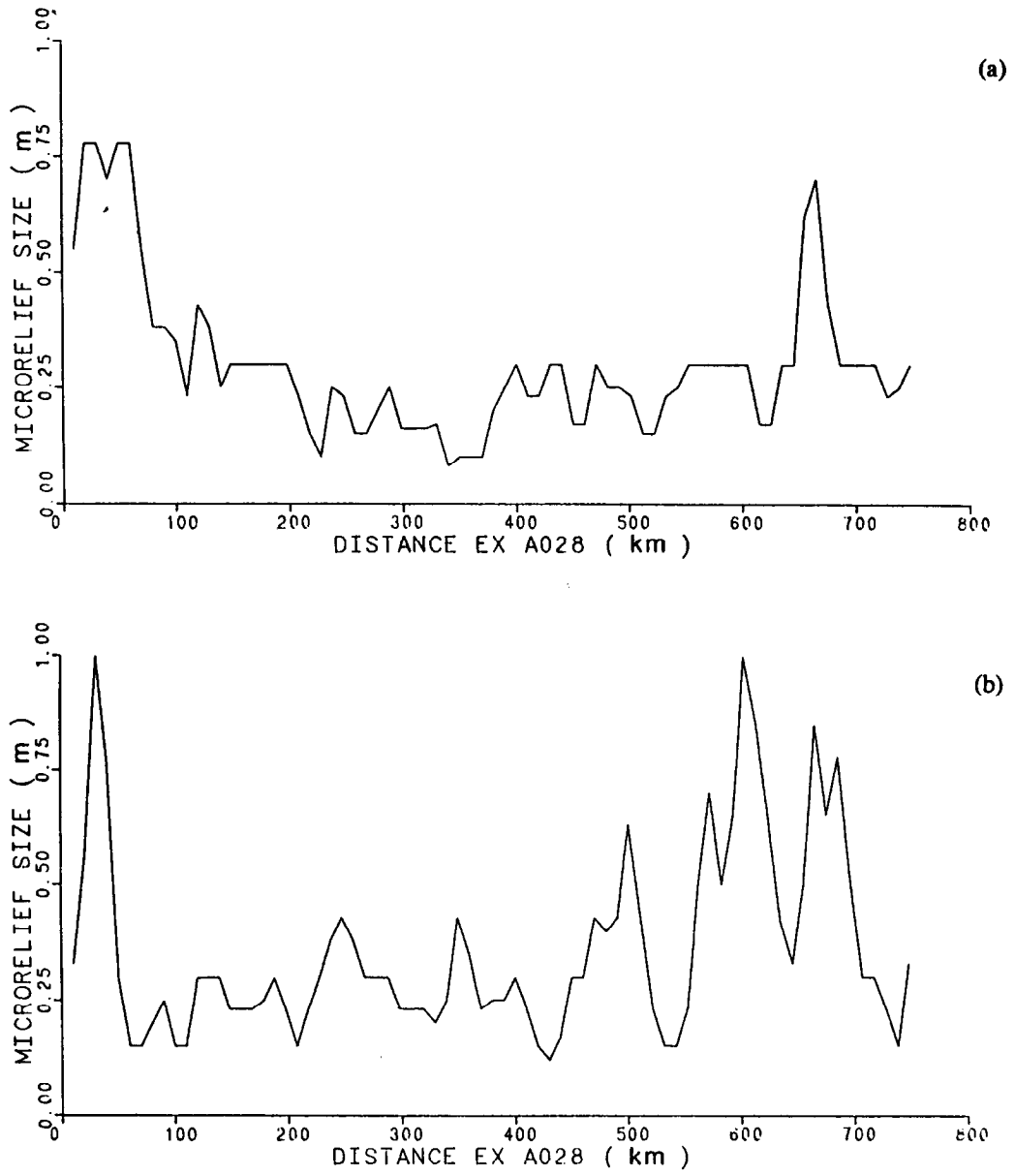

Figure 11. Route E 20 km mean spring microrelief size distribution (a) erosional, (b) depositional.

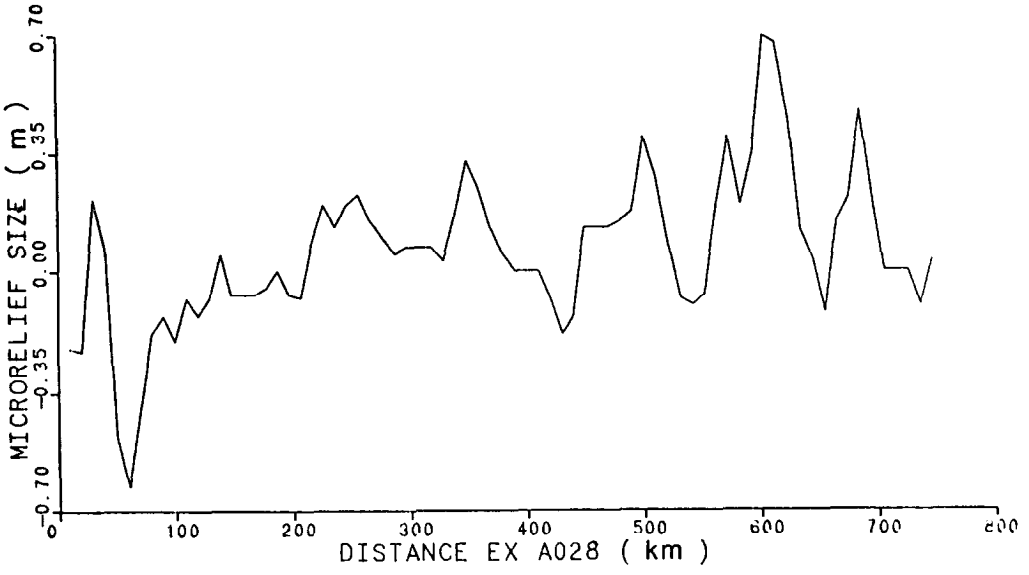

Figure 12. Route E 20 km mean microrelief balance distribution. A positive microrelief size for a route indicates the dominance of depositional forms, whilst a negative size indicates the dominance of erosional forms.

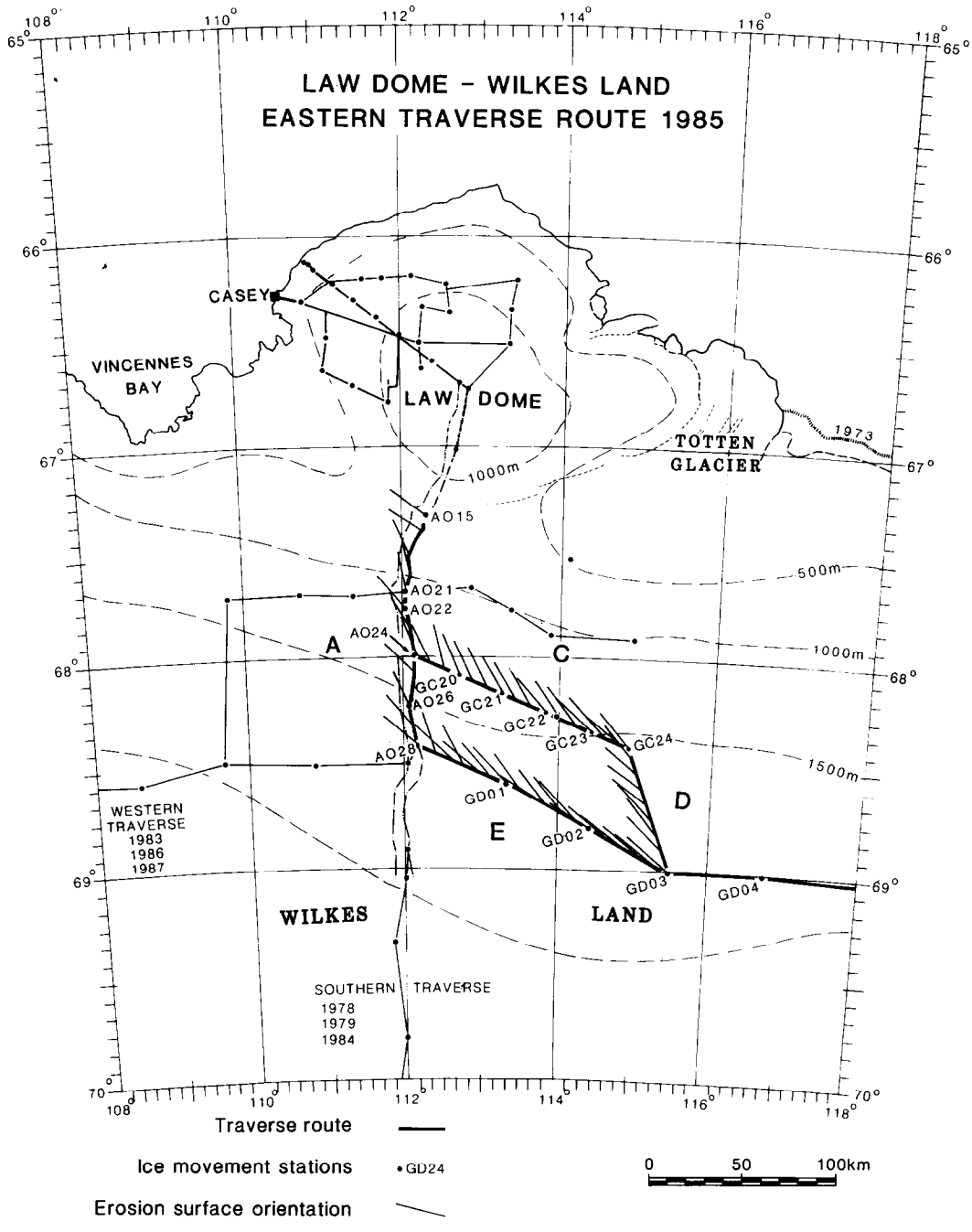

Figure 13. Route E autumn primary erosion surface orientations. The arrows depict the orientation of primary erosion surface features and are interpreted as the katabatic wind directions for autumn.

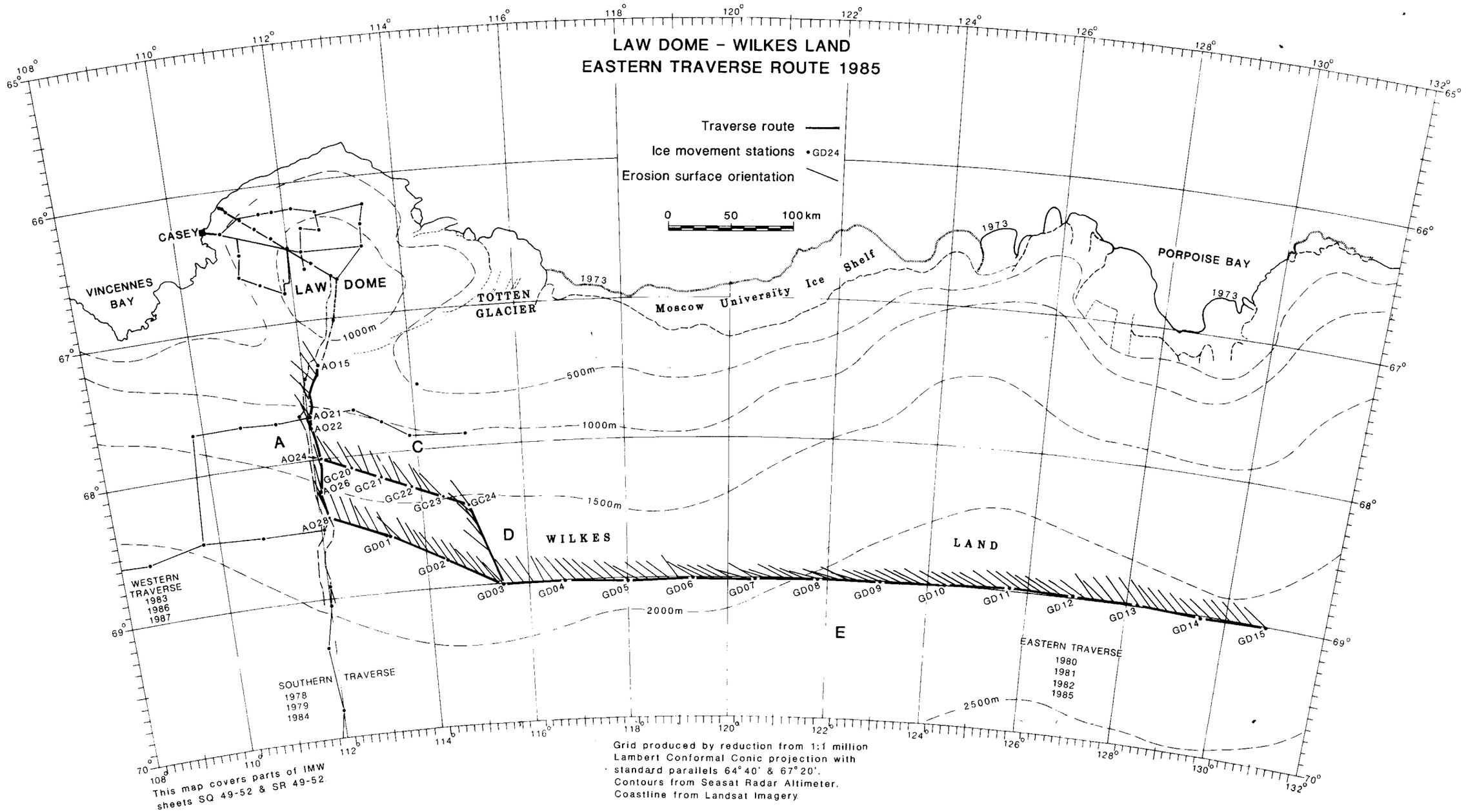

Figure 14. Route E spring primary erosion surface orientations. The arrows depict the orientations of primary erosion surface features and are interpreted as the katabatic wind directions for spring.

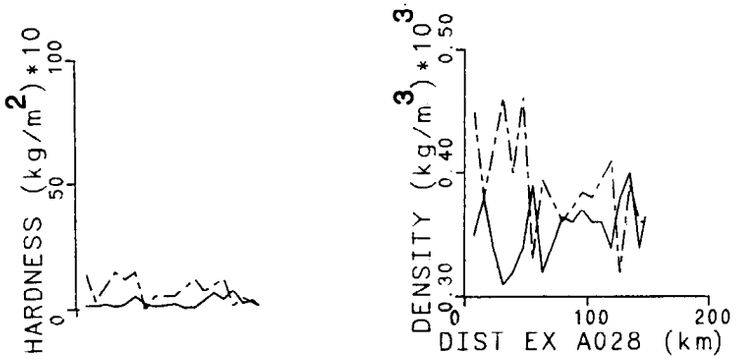

Figure 15. Route E autumn surface density and hardness distribution.

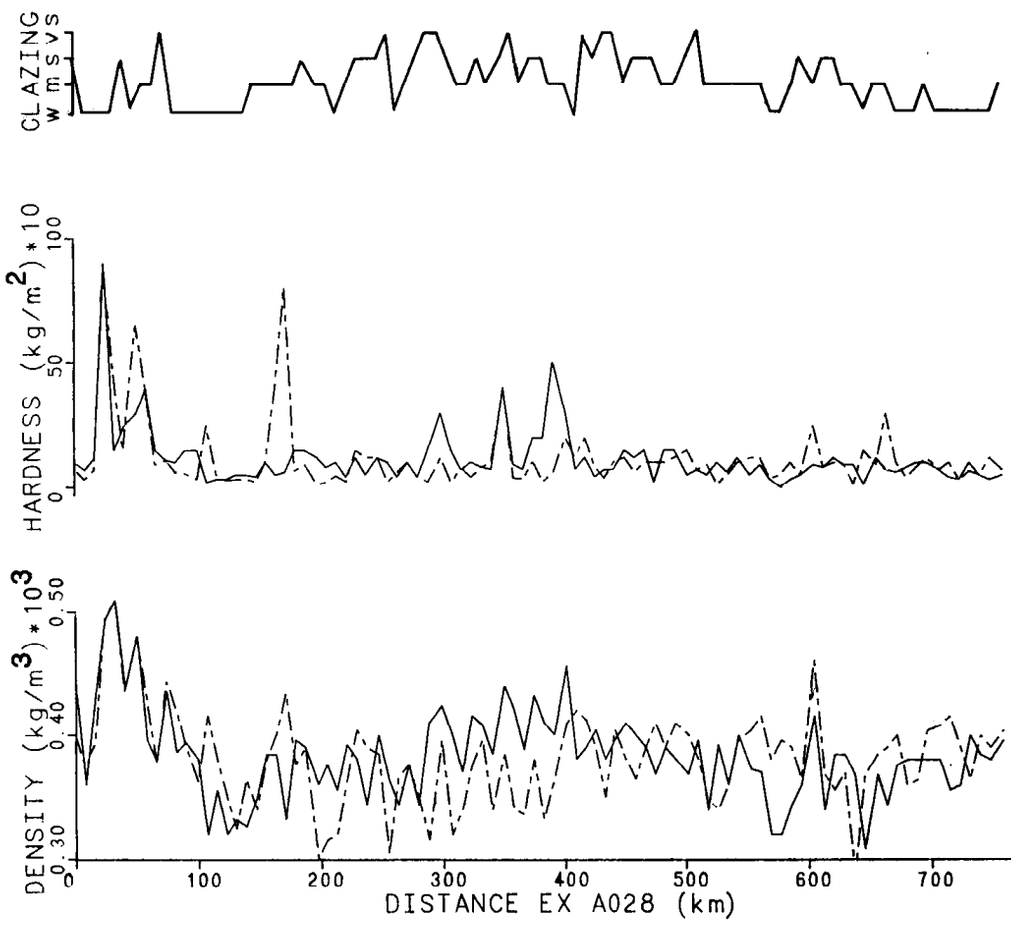

Figure 16. Route E spring surface density, hardness and glazing distribution. The degree of glazing is represented by weak (w), moderate (m), strong (s) and very strong (vs).

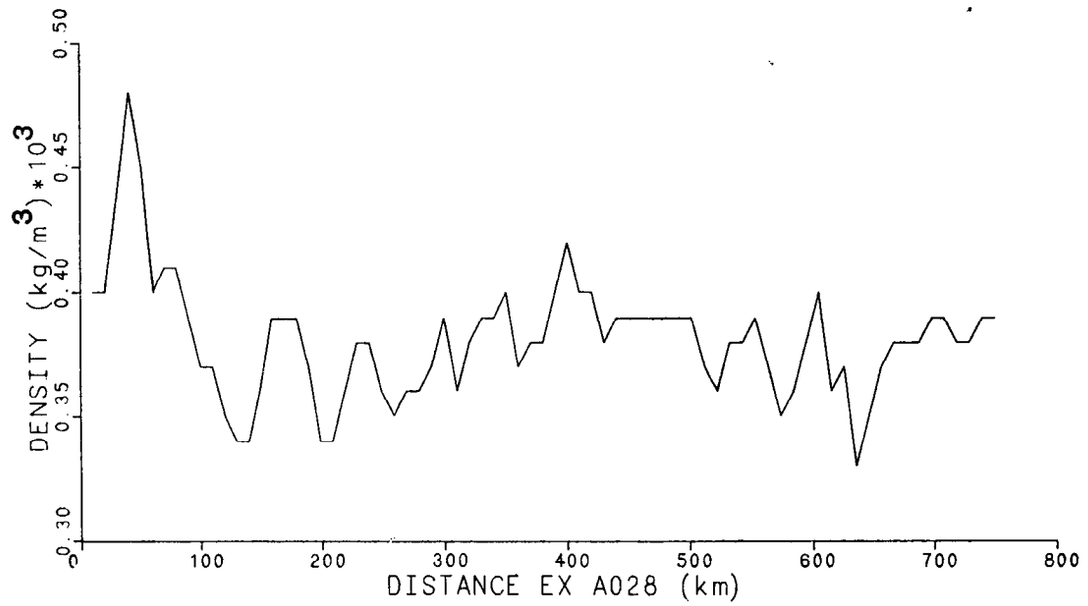

Figure 17. Route E 20 km mean surface density distribution.

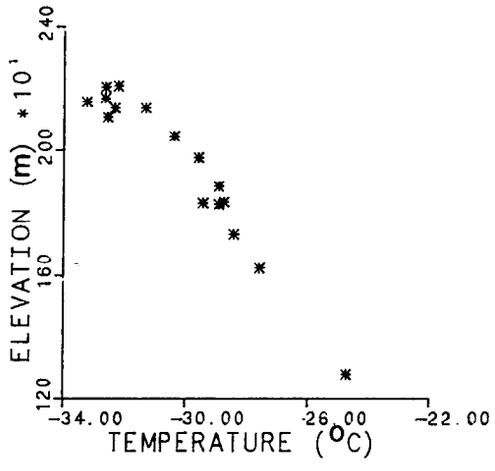

Figure 18. Eastern Wilkes Land surface temperature-elevation relationship from 20 m depth firn temperatures.

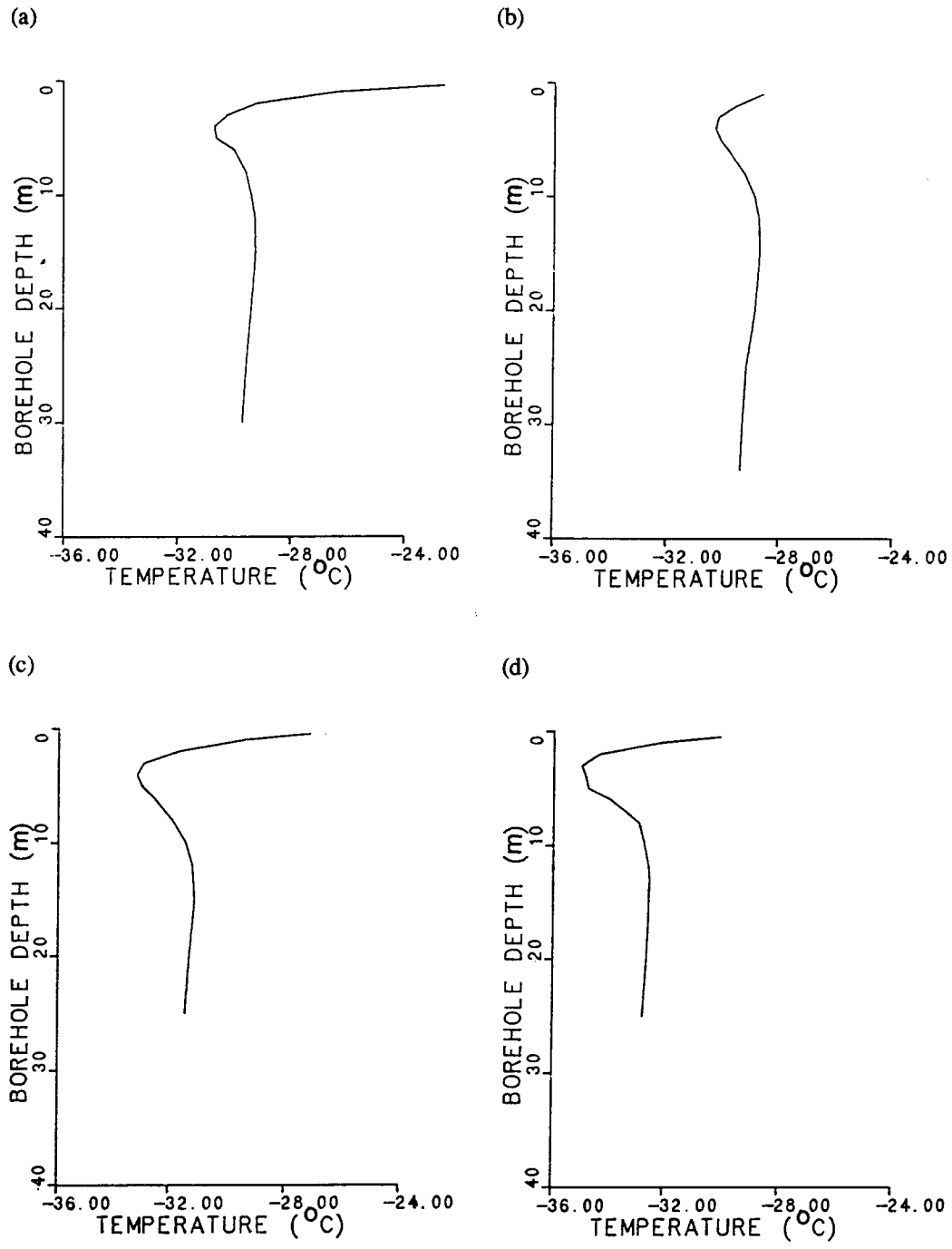

Figure 19. Route E firn temperature-depth profiles (a) GD03, (b) GD06, (c) GD09, (d) GD12 and (e) GD15.

(e)

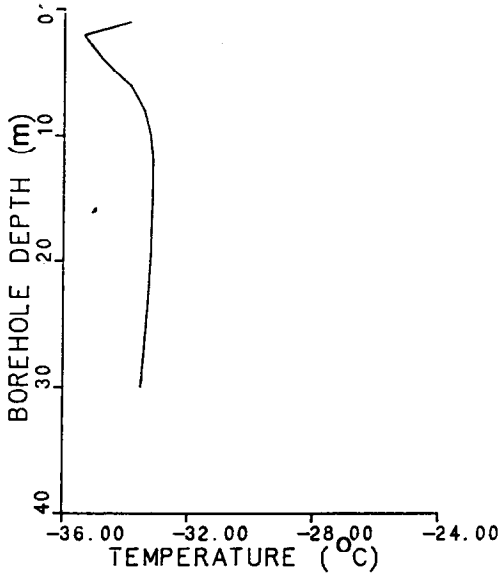
BOREHOLE DEPTH (m)
0
10
20
30
40
-36.00
-32.00
-28.00
-24.00
TEMPERATURE (°C)

Plate 1. Erosional surface type eg. The surface is dominated by strong glazing accompanied by etched pits and transverse ridges. The view is downwind. A longitudinal dune of friable drift snow lies in the left.

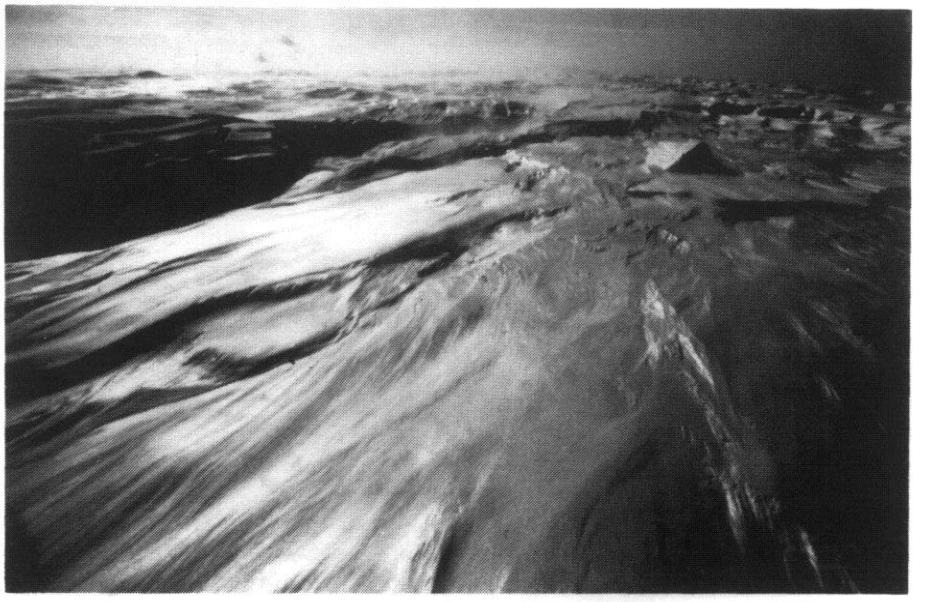

Plate 2. Erosional surface type eg. The very strongly glazed surface has developed on a previously reshuffled surface. Note the lanceolate sastrugi in the upper left. The view is downwind.

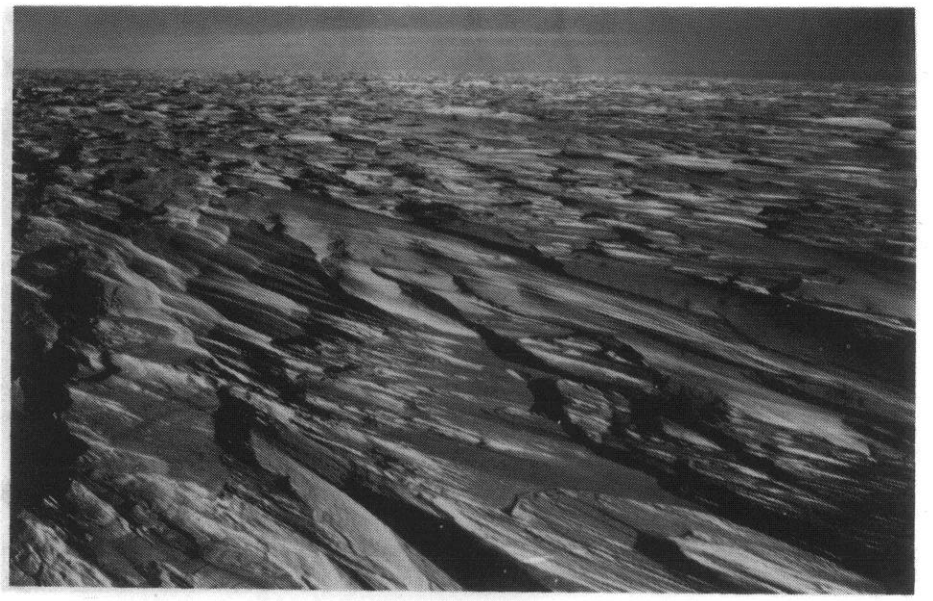

Plate 3. Erosional surface type ef. The fine split sastrugi have developed along laminations in the surface snow. The laminations are the result of depositional processes under drifting snow storm conditions. The wind direction is from right to left.

Plate 4. Erosional surface type eb. Broad mature sastrugi with grooves dominate the surface with laminated drift in the foreground. The sastrugi have developed on an eroded transverse dune. The wind direction is right to left.

Plate 5. Erosional surface type eb. Broad mature sastrugi developed on an eroded barchan dune. The apex of the dune is 2 m above the surrounding surface. The view is downwind.

Plate 6. Erosional surface type eb. Narrow mature sastrugi, 1.5 m high with deep grooves and extensive under cutting. The wind direction is right to left.

Plate 7. Erosional surface type ep. The wind crusted surface contains etched pits and the view is downwind. The marker is 1 m long and is graduated in 0.1 m intervals.

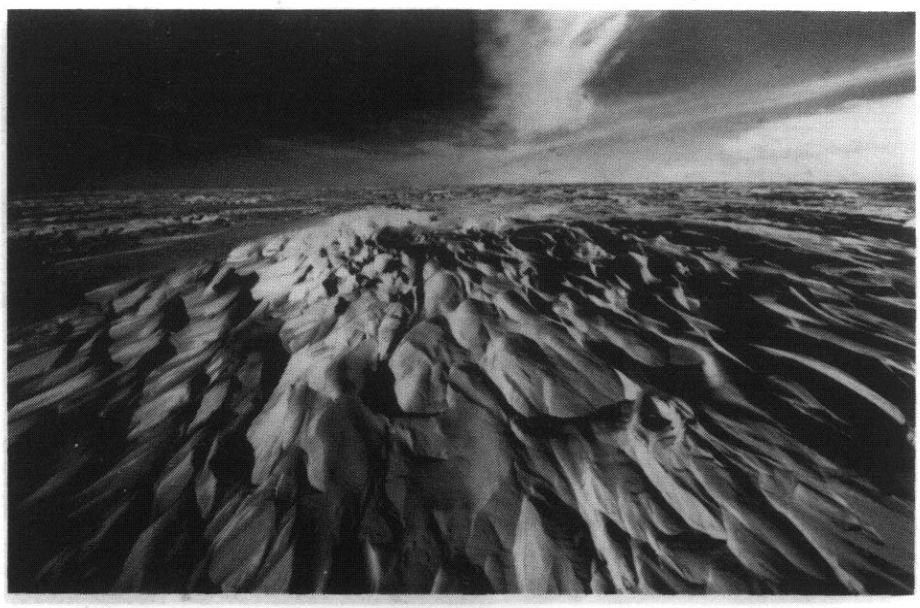

Plate 8. Erosional surface type el. Mature lanceolate sastrugi 0.2-0.5 m in height are developed on a previous reshuffled surface. A longitudinal dune is preserved on the left. The view is downwind.

Plate 9. **Reshuffled** surface type rb. Juvenile lanceolate sastrugi developed in wind crusted and laminated snow, and surrounded by low friable drifting dunes. The view is upwind. The lanceolate sastrugi are 0.3-0.5 m in height.

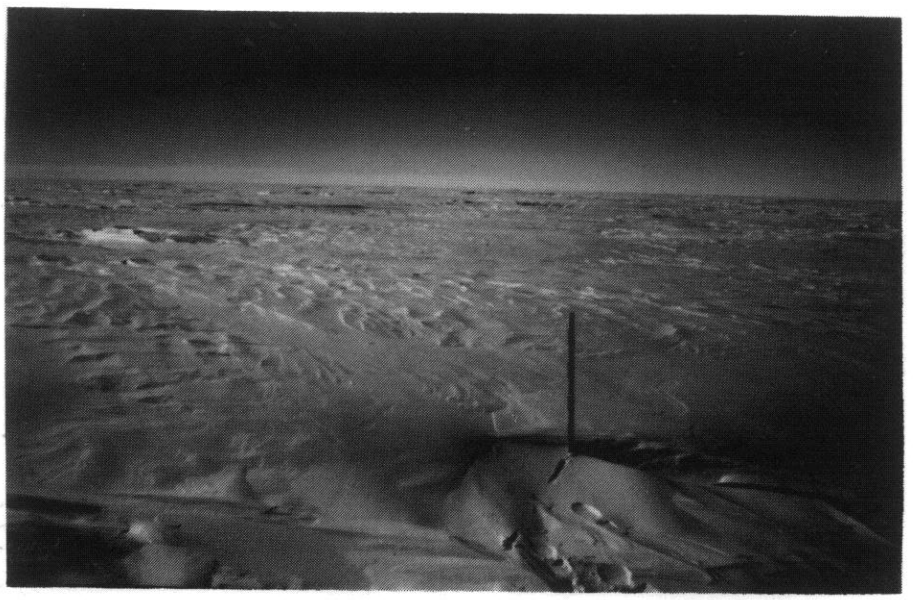

Plate 10. Depositional surface type dd. Longitudinal dune which formed in snow precipitated during the passage of a cyclonic system. The dune is orientated right to left. The marker is 1 m long and is graduated in 0.1 m intervals.

APPENDIX Ia
ROUTE A SURFACE TOPOGRAPHY

MARK	DIST km	ELEV m	SLOPE %	MARK	DIST km	ELEV m	SLOPE %
A015	0.0	801			51.3	1161	
	0.3	799	-0.15	A022	52.7	1173	0.20
	1.3	799			54.3	1167	
	2.3	801	0.13		55.3	1153	-1.35
A015/1	3.6	802			56.3	1140	
	4.3	802	0.12	A022/1	57.1	1134	
	5.3	804			57.3	1135	0.30
	6.3	800	-0.15		58.3	1146	
A016	7.3	801			59.3	1153	0.40
	8.3	801	0.10		60.3	1154	
	9.3	803		A022/2	61.3	1163	1.45
	10.3	804	0.05		62.3	1183	
	11.3	804			63.3	1203	1.95
A017	12.7	803	-0.05	A022/3	64.5	1226	
	13.3	803			65.3	1238	1.10
	14.3	805	0.15	A023	66.0	1242	
	15.3	806			67.3	1245	-0.22
A017/1	16.3	812	0.80		68.3	1237	
	17.3	822			69.3	1228	0.00
	18.3	827	0.25	A023/2	70.9	1237	
	19.3	827			71.3	1243	
A017/2	20.0	826	0.85		72.3	1259	1.60
	21.3	844		A023/3	73.4	1277	
	22.3	870	1.75		74.3	1286	0.75
A018	23.7	886			75.3	1292	
	25.3	889	0.19	A024	76.5	1294	0.20
	26.3	903	1.35		77.3	1296	
	27.3	916			78.3	1295	-0.15
	28.3	921	0.25	A024/2	78.9	1294	
	29.3	921			79.3	1293	
	30.3	944	1.10	A024/3	81.1	1294	0.95
	31.3	943			81.3	1312	
	32.3	959	1.40		82.3	1337	2.10
	33.3	971			83.3	1354	
A019	34.3	976	1.00		84.3	1378	1.30
	35.3	991			85.3	1380	
	36.3	1004	0.55	A025	86.7	1388	0.60
	37.3	1012			88.3	1392	
	38.3	1026	1.35		89.3	1401	0.70
	39.3	1039			90.3	1416	
A020	40.3	1047	0.50	A025/1	91.1	1413	0.55
	41.3	1049			92.3	1427	
	42.3	1050	0.17		93.3	1413	-1.45
A021	43.7	1053			94.3	1398	
	44.3	1051	-0.88		95.3	1389	0.25
	45.3	1039		A025/2	95.7	1393	
	46.3	1026	0.15		96.3	1403	
	47.3	1042			97.3	1425	2.40
	48.3	1084	-1.50		98.3	1451	
	49.3	1112			99.3	1477	2.41
	50.3	1142	2.45	A025/3	100.0	1492	

APPENDIX Ia
ROUTE A SURFACE TOPOGRAPHY

MARK	DIST km	ELEV m	SLOPE %	MARK	DIST km	ELEV m	SLOPE %
	101.3	1512	1.43		113.3	1544	0.45
	102.3	1525			114.3	1548	
	103.3	1534	0.85		115.3	1556	0.40
A026	104.3	1542			116.3	1556	
	105.3	1535	-0.75		117.3	1553	-0.55
	106.3	1527			118.3	1545	
	107.3	1534	0.70		119.3	1552	1.10
A026/1	108.3	1541		A027/1	120.3	1567	
	109.3	1531	-0.70		121.3	1585	1.50
	110.3	1527			122.3	1597	
	111.3	1535	0.60	A027/2	123.2	1602	0.50
A026/2	112.3	1539		A028	124.1	1607	

APPENDIX Ib
ROUTE E SURFACE TOPOGRAPHY

MARK	DIST km	ELEV m	SLOPE %	MARK	DIST km	ELEV m	SLOPE %
A028	0.0	1607			25.3	1632	0.091
	0.5	1608	0.300	E013	25.8	1633	
	1.0	1610			26.3	1632	-0.300
	1.5	1608	-0.300		26.8	1630	
E001	2.0	1607			27.3	1626	-0.900
	2.5	1606	-0.100	E014	27.8	1621	
	3.0	1606			28.3	1618	-0.500
	3.5	1606	0.000		28.8	1616	
E002	4.0	1606			29.3	1614	-0.400
	4.5	1610	0.800	E015	29.8	1612	
	5.0	1614			30.3	1608	-0.900
	5.6	1618	0.727		30.8	1603	
E003	6.1	1622			31.3	1599	-0.900
	6.6	1625	0.500	E016	31.8	1594	
	7.1	1627			32.3	1593	-0.200
	7.6	1629	0.556		32.8	1592	
E004	8.0	1632			33.3	1591	-0.200
	8.5	1630	-0.300	E017	33.8	1590	
	9.0	1629			34.3	1585	-1.100
	9.4	1627	-0.333		34.8	1579	
E005	9.9	1626			35.3	1576	-0.600
	10.4	1625	-0.091	E018	35.8	1573	
	11.0	1625			36.3	1573	0.100
	11.5	1628	0.500		36.8	1574	
E006	12.0	1630			37.3	1573	-0.111
	12.5	1630	-0.100	E019	37.7	1573	
	13.0	1629			38.3	1579	1.182
	13.5	1628	-0.200		38.8	1586	
E007	14.0	1627			39.3	1603	3.300
	14.5	1624	-0.600	E020	39.8	1619	
	15.0	1621			40.3	1623	0.800
	15.5	1619	-0.400		40.8	1627	
E008	16.0	1617			41.3	1636	1.800
	16.5	1618	0.100	E021	41.8	1645	
	17.0	1618			42.3	1645	0.100
	17.5	1624	1.100		42.8	1646	
E009	18.0	1629			43.4	1636	-1.818
	18.4	1632	0.625	E022	43.9	1626	
	18.8	1634			44.4	1620	-1.200
	19.3	1635	0.222		44.9	1614	
E010	19.7	1636			45.4	1609	-1.111
	20.2	1636	0.100	E023	45.8	1604	
	20.7	1637			46.3	1604	0.100
	21.2	1636	-0.200		46.8	1605	
E011	21.7	1635			47.3	1609	0.700
	22.2	1633	-0.300	E024	47.8	1612	
	22.7	1632			48.4	1616	0.727
	23.2	1631	-0.200		48.9	1620	
E012	23.7	1630			49.5	1623	0.636
	24.2	1631	0.200	GD01	50.0	1627	
	24.7	1632			50.5	1628	0.333

APPENDIX Ib
ROUTE E SURFACE TOPOGRAPHY

MARK	DIST km	ELEV m	SLOPE %	MARK	DIST km	ELEV m	SLOPE %
	50.9	1630			76.4	1709	0.300
	51.3	1631	0.222		76.9	1711	
E026	51.8	1632			77.4	1713	0.500
	52.3	1635	0.545	E039	77.9	1716	
	52.9	1638			78.4	1716	0.000
	53.4	1641	0.600		78.9	1716	
E027	53.9	1644			79.4	1716	0.000
	54.4	1643	-0.200	E040	79.9	1716	
	54.9	1642			80.4	1716	-0.100
	55.4	1641	-0.300		80.9	1715	
E028	55.9	1639			81.4	1712	-0.500
	56.4	1640	0.200	E041	81.9	1710	
	56.9	1641			82.4	1708	-0.300
	57.4	1648	1.300		82.9	1707	
E029	57.9	1654			83.4	1706	-0.200
	58.4	1662	1.600	E042	83.9	1705	
	58.9	1670			84.4	1706	0.100
	59.4	1676	1.100		84.9	1706	
E030	59.9	1681			85.4	1708	0.400
	60.4	1683	0.300	E043	85.9	1710	
	60.9	1684			86.4	1710	0.000
	61.4	1681	-0.500		86.9	1710	
E031	61.9	1679			87.4	1708	-0.400
	62.4	1679	0.100	E044	87.9	1706	
	62.9	1680			88.4	1705	-0.300
	63.4	1682	0.400		88.9	1703	
E032	63.9	1684			89.4	1701	-0.556
	64.4	1687	0.700	E045	89.8	1698	
	64.9	1691			90.3	1699	0.200
	65.4	1692	0.300		90.8	1700	
E033	65.9	1694			91.3	1702	0.400
	66.4	1696	0.400	E046	91.8	1704	
	66.9	1698			92.3	1707	0.600
	67.4	1700	0.400		92.8	1710	
E034	67.9	1702			93.3	1712	0.500
	68.3	1704	0.444	E047	93.8	1715	
	68.8	1706			94.3	1717	0.500
	69.3	1707	0.111		94.8	1720	
E035	69.7	1707			95.3	1721	0.300
	70.2	1706	-0.200	E048	95.8	1723	
	70.7	1705			96.3	1724	0.100
	71.3	1704	-0.091		96.8	1724	
E036	71.8	1704			97.3	1724	0.000
	72.3	1705	0.182	E049	97.8	1724	
	72.9	1706			98.3	1724	0.100
	73.4	1706	0.000		98.8	1725	
E037	73.9	1706			99.3	1726	0.200
	74.4	1706	-0.100	GD02	99.8	1727	
	74.9	1705			100.3	1729	0.400
	75.4	1706	0.300		100.8	1731	
E038	75.9	1708			101.4	1734	0.545

APPENDIX Ib
ROUTE E SURFACE TOPOGRAPHY

MARK	DIST km	ELEV m	SLOPE %	MARK	DIST km	ELEV m	SLOPE %
E051	101.9	1737			127.3	1816	0.556
	102.4	1738	0.222	E064	127.7	1819	
	102.8	1739			128.2	1820	0.300
	103.3	1739	0.100		128.7	1822	
E052	103.8	1740			129.2	1821	-0.200
	104.3	1743	0.500	E065	129.7	1820	
	104.8	1745			130.2	1820	-0.100
	105.4	1746	0.091		130.7	1819	
E053	105.9	1746			131.2	1820	0.300
	106.4	1746	-0.100	E066	131.7	1822	
	106.9	1745			132.2	1823	0.200
	107.4	1747	0.400		132.7	1824	
E054	107.9	1749			133.2	1824	-0.100
	108.4	1750	0.200	E067	133.7	1823	
	108.9	1751			134.2	1821	-0.400
	109.4	1751	0.000		134.7	1819	
E055	109.9	1751			135.2	1818	-0.300
	110.4	1753	0.300	E068	135.7	1816	
	110.9	1754			136.2	1816	-0.100
	111.4	1755	0.300		136.7	1815	
E056	111.9	1757			137.2	1815	0.000
	112.4	1758	0.300	E069	137.7	1815	
	112.9	1760			138.2	1820	0.900
	113.4	1763	0.500		138.7	1824	
E057	113.9	1765			139.2	1829	1.000
	114.4	1765	0.000	E070	139.6	1833	
	114.8	1765			140.1	1836	0.600
	115.3	1766	0.200		140.6	1839	
E058	115.8	1767			141.1	1839	0.000
	116.3	1768	0.200	E071	141.6	1839	
	116.8	1769			142.1	1839	0.000
	117.3	1769	0.000		142.6	1839	
E059	117.8	1769			143.1	1839	0.000
	118.3	1770	0.200	E072	143.5	1839	
	118.8	1771			144.0	1839	-0.100
	119.3	1772	0.222		144.5	1838	
E060	119.7	1773			145.0	1836	-0.400
	120.3	1774	0.273	E073	145.5	1834	
	120.8	1776			146.0	1833	-0.200
	121.3	1778	0.500		146.5	1832	
E061	121.8	1781			147.0	1830	-0.400
	122.3	1784	0.600	E074	147.5	1828	
	122.8	1787			147.7	1828	0.000
	123.3	1790	0.667		147.8	1828	
E062	123.7	1793			148.0	1828	0.000
	124.3	1798	0.818	GD03	148.2	1828	
	124.8	1802			148.7	1828	0.100
	125.3	1806	0.800		149.2	1829	
E063	125.8	1810			149.7	1828	-0.222
	126.3	1812	0.400	E076	150.1	1827	
	126.8	1814			150.6	1827	-0.100

APPENDIX Ib
ROUTE E SURFACE TOPOGRAPHY

MARK	DIST km	ELEV m	SLOPE %	MARK	DIST km	ELEV m	SLOPE %
	151.1	1826			176.5	1840	0.000
	151.6	1826	-0.100		177.0	1840	
E077	152.1	1825			177.5	1840	0.000
	152.6	1825	0.000	E090	178.0	1840	
	153.1	1825			178.5	1839	-0.100
	153.6	1826	0.100		179.0	1839	
E078	154.1	1826			179.5	1838	-0.200
	154.7	1828	0.364	E091	180.0	1837	
	155.2	1830			180.8	1834	-0.467
	155.7	1833	0.500		181.5	1830	
E079	156.2	1835			181.8	1832	0.600
	156.7	1837	0.300	E092	182.0	1833	
	157.2	1838			182.5	1831	-0.400
	157.7	1838	-0.100		183.0	1829	
E080	158.2	1837			183.5	1827	-0.400
	158.7	1836	-0.200	E093	184.0	1825	
	159.2	1835			184.5	1823	-0.500
	159.7	1834	-0.200		185.0	1820	
E081	160.2	1833			185.5	1820	-0.100
	160.7	1833	0.000	E094	186.0	1819	
	161.2	1833			186.5	1820	0.100
	161.7	1834	0.200		187.0	1820	
E082	162.2	1835			187.5	1820	0.000
	162.7	1837	0.300	E095	188.0	1820	
	163.2	1838			188.5	1819	-0.100
	163.7	1839	0.200		189.0	1819	
E083	164.2	1840			189.5	1820	0.200
	164.7	1839	-0.100	E096	190.0	1821	
	165.2	1839			190.5	1823	0.400
	165.7	1838	-0.100		191.0	1825	
E084	166.2	1838			191.5	1828	0.600
	166.7	1838	-0.100	E097	192.0	1831	
	167.2	1837			192.5	1832	0.300
	167.7	1837	0.000		193.0	1834	
E085	168.1	1837			193.5	1834	0.000
	168.6	1838	0.100	E098	194.0	1834	
	169.1	1838			194.5	1833	-0.200
	169.6	1838	0.100		195.0	1832	
E086	170.1	1839			195.5	1830	-0.300
	170.6	1840	0.100	E099	196.0	1829	
	171.1	1840			196.5	1828	-0.200
	171.6	1842	0.444		197.0	1827	
E087	172.0	1844			197.5	1828	0.100
	172.5	1844	0.100	GD04	198.0	1828	
	173.0	1845			198.5	1829	0.111
	173.5	1844	-0.100		198.9	1829	
E088	174.0	1844			199.4	1830	0.222
	174.5	1842	-0.300	E101	199.8	1831	
	175.0	1841			200.3	1832	0.200
	175.5	1841	-0.100		200.8	1833	
E089	176.0	1840			201.3	1833	-0.100

APPENDIX Ib
ROUTE E SURFACE TOPOGRAPHY

MARK	DIST km	ELEV m	SLOPE %	MARK	DIST km	ELEV m	SLOPE %
E102	201.8	1832			227.2	1848	0.000
	202.3	1832	0.000	E115	227.7	1848	
	202.8	1832			228.2	1848	0.000
	203.3	1833	0.200		228.7	1848	
E103	203.8	1834			229.2	1848	0.000
	204.3	1837	0.500	E116	229.7	1848	
	204.8	1839			230.2	1848	0.000
	205.3	1843	0.889		230.7	1848	
E104	205.7	1847			231.2	1848	0.000
	206.2	1851	0.800	E117	231.7	1848	
	206.7	1855			232.2	1848	-0.100
	207.2	1857	0.400		232.7	1847	
E105	207.7	1859			233.2	1846	-0.100
	208.2	1859	0.000	E118	233.7	1846	
	208.7	1859			234.2	1845	-0.300
	209.2	1859	0.000		234.7	1843	
E106	209.7	1859			235.2	1841	-0.400
	210.2	1859	-0.100	E119	235.7	1839	
	210.7	1858			236.2	1838	-0.200
	211.2	1856	-0.400		236.7	1837	
E107	211.7	1854			237.2	1837	0.000
	212.2	1853	-0.300	E120	237.7	1837	
	212.7	1851			238.2	1835	-0.400
	213.2	1850	-0.300		238.7	1833	
E108	213.7	1848			239.2	1830	-0.700
	214.2	1848	0.000	E121	239.7	1826	
	214.7	1848			240.2	1826	0.000
	215.2	1849	0.100		240.7	1826	
E109	215.7	1849			241.2	1826	0.000
	216.2	1850	0.100	E122	241.7	1826	
	216.7	1850			242.2	1827	0.200
	217.3	1848	-0.273		242.7	1828	
E110	217.8	1847			243.2	1830	0.400
	218.3	1845	-0.400	E123	243.7	1832	
	218.8	1843			244.2	1832	0.000
	219.4	1842	-0.273		244.7	1832	
E111	219.9	1840			245.2	1833	0.100
	220.4	1839	-0.222	E124	245.7	1833	
	220.8	1838			246.2	1834	0.100
	221.3	1839	0.111		246.7	1834	
E112	221.7	1839			247.2	1834	0.000
	222.2	1840	0.200	GD05	247.7	1834	
	222.7	1841			248.2	1836	0.400
	223.2	1842	0.200		248.7	1838	
E113	223.7	1843			249.2	1841	0.700
	224.2	1844	0.200	E126	249.7	1845	
	224.7	1845			250.2	1848	0.600
	225.3	1846	0.182		250.7	1851	
E114	225.8	1847			251.3	1854	0.636
	226.3	1847	0.111	E127	251.8	1858	
	226.7	1848			252.3	1858	0.100

APPENDIX Ib
ROUTE E SURFACE TOPOGRAPHY

MARK	DIST km	ELEV m	SLOPE %	MARK	DIST km	ELEV m	SLOPE %
	252.8	1859			279.2	1865	0.400
	253.4	1858	-0.091		279.7	1867	
E128	253.9	1858			280.3	1868	0.182
	254.4	1858	0.000	E141	280.8	1869	
	254.9	1858			281.3	1867	-0.400
	255.4	1860	0.500		281.8	1865	
E129	255.9	1863			282.3	1864	-0.100
	256.4	1867	0.900	E142	282.8	1864	
	256.9	1872			283.3	1864	0.100
	257.4	1876	0.778		283.8	1865	
E130	257.8	1879			284.3	1868	0.500
	258.3	1881	0.400	E143	284.8	1870	
	258.8	1883			285.3	1871	0.200
	259.4	1884	0.182		285.8	1872	
E131	259.9	1885			286.4	1872	0.000
	260.4	1887	0.400	E144	286.9	1872	
	260.9	1889			287.4	1872	0.000
	261.4	1889	0.000		287.9	1872	
E132	261.9	1889			288.5	1870	-0.273
	262.4	1887	-0.300	E145	289.0	1869	
	262.9	1886			289.5	1865	-0.700
	263.4	1884	-0.500		290.0	1862	
E133	263.9	1881			290.5	1860	-0.400
	264.5	1879	-0.273	E146	291.0	1858	
	265.0	1878			291.6	1859	0.091
	265.6	1876	-0.364		292.1	1859	
E134	266.1	1874			292.6	1861	0.400
	266.6	1873	-0.200	E147	293.1	1863	
	267.1	1872			293.6	1866	0.600
	267.7	1870	-0.273		294.1	1869	
E135	268.2	1869			294.6	1872	0.600
	268.7	1869	0.100	E148	295.1	1875	
	269.2	1870			295.6	1876	0.200
	269.7	1871	0.200		296.1	1877	
E136	270.2	1872			296.6	1878	0.200
	270.8	1871	-0.182	E149	297.1	1879	
	271.3	1870			297.6	1881	0.400
	271.9	1868	-0.364		298.1	1883	
E137	272.4	1866			298.6	1883	0.100
	273.0	1862	-0.727	GD06	299.1	1884	
	273.5	1858			299.6	1885	0.100
	274.0	1852	-1.100		300.1	1885	
E138	274.5	1847			300.6	1887	0.273
	275.0	1844	-0.700	E151	301.2	1888	
	275.5	1840			301.7	1891	0.500
	276.1	1841	0.182		302.2	1893	
E139	276.6	1842			302.7	1895	0.400
	277.2	1848	1.091	E152	303.2	1897	
	277.7	1854			303.7	1898	0.300
	278.2	1859	0.900		304.2	1900	
E140	278.7	1863			304.7	1903	0.600

APPENDIX Ib
ROUTE E SURFACE TOPOGRAPHY

MARK	DIST km	ELEV m	SLOPE %	MARK	DIST km	ELEV m	SLOPE %
E153	305.2	1906			331.0	1927	0.545
	305.7	1906	0.000	E166	331.5	1930	
	306.2	1906			332.0	1932	0.300
	306.7	1906	0.100		332.5	1933	
E154	307.2	1907			333.0	1935	0.400
	307.7	1907	0.000	E167	333.5	1937	
	308.2	1907			334.0	1938	0.200
	308.8	1905	-0.273		334.5	1939	
E155	309.3	1904			335.0	1940	0.300
	309.8	1901	-0.667	E168	335.5	1942	
	310.2	1898			336.0	1943	0.300
	310.8	1897	-0.273		336.5	1945	
E156	311.3	1895			337.0	1946	0.200
	311.8	1895	0.100	E169	337.5	1947	
	312.3	1896			338.0	1948	0.100
	312.8	1897	0.100		338.5	1948	
E157	313.3	1897			339.0	1949	0.200
	313.8	1903	1.100	E170	339.5	1950	
	314.3	1908			340.0	1951	0.200
	314.8	1914	1.200		340.5	1952	
E158	315.3	1920			341.1	1953	0.182
	315.8	1925	1.000	E171	341.6	1954	
	316.3	1930			342.1	1954	0.100
	316.9	1935	0.909		342.6	1955	
E159	317.4	1940			343.1	1954	-0.100
	317.9	1942	0.500	E172	343.6	1954	
	318.4	1945			344.1	1955	0.200
	318.9	1947	0.400		344.6	1956	
E160	319.4	1949			345.1	1957	0.200
	319.9	1951	0.300	E173	345.6	1958	
	320.4	1952			346.1	1959	0.300
	320.9	1951	-0.200		346.6	1961	
E161	321.4	1950			347.1	1964	0.500
	321.9	1950	-0.100	E174	347.6	1966	
	322.4	1949			348.1	1968	0.500
	322.9	1949	-0.100		348.6	1971	
E162	323.4	1948			349.1	1972	0.300
	323.9	1947	-0.200	GD07	349.6	1974	
	324.4	1946			350.1	1975	0.200
	324.9	1944	-0.400		350.6	1976	
E163	325.4	1942			351.1	1977	0.300
	325.9	1938	-0.700	E176	351.6	1979	
	326.4	1935			352.1	1979	0.100
	326.9	1932	-0.700		352.6	1980	
E164	327.4	1928			353.1	1980	0.100
	327.9	1925	-0.700	E177	353.6	1981	
	328.4	1921			354.1	1980	-0.200
	328.9	1922	0.200		354.6	1979	
E165	329.4	1923			355.1	1977	-0.300
	329.9	1924	0.100	E178	355.6	1976	
	330.4	1924			356.1	1976	-0.100

APPENDIX Ib
ROUTE E SURFACE TOPOGRAPHY

MARK	DIST km	ELEV m	SLOPE %	MARK	DIST km	ELEV m	SLOPE %
	356.6	1975			382.1	2018	0.700
	357.1	1975	0.000		382.6	2021	
E179	357.6	1975			383.1	2025	0.700
	358.1	1975	0.000	E192	383.6	2028	
	358.6	1975			384.1	2029	0.300
	359.1	1976	0.100		384.6	2031	
E180	359.6	1976			385.1	2032	0.300
	360.1	1976	0.000	E193	385.6	2034	
	360.6	1976			386.1	2035	0.100
	361.1	1974	-0.400		386.6	2035	
E181	361.6	1972			387.1	2035	-0.100
	362.4	1968	-0.467	E194	387.6	2034	
	363.1	1965			388.1	2035	0.100
	363.4	1967	0.600		388.6	2035	
E182	363.6	1968			389.1	2036	0.100
	364.1	1969	0.300	E195	389.6	2036	
	364.6	1971			390.1	2038	0.400
	365.1	1974	0.700		390.6	2040	
E183	365.6	1978			391.1	2042	0.300
	366.1	1981	0.500	E196	391.6	2043	
	366.6	1983			392.1	2045	0.300
	367.1	1986	0.500		392.6	2046	
E184	367.6	1988			393.1	2046	0.000
	368.1	1989	0.300	E197	393.6	2046	
	368.6	1991			394.1	2048	0.300
	369.1	1991	0.000		394.6	2049	
E185	369.6	1991			395.1	2048	-0.200
	370.1	1991	0.000	E198	395.6	2047	
	370.6	1991			396.1	2046	-0.300
	371.1	1990	-0.300		396.6	2044	
E186	371.6	1988			397.1	2043	-0.200
	372.1	1987	-0.100	E199	397.6	2042	
	372.6	1987			398.1	2041	-0.100
	373.1	1988	0.300		398.6	2041	
E187	373.6	1990			399.1	2042	0.100
	374.1	1991	0.200	GD08	399.6	2042	
	374.6	1992			400.1	2044	0.400
	375.1	1992	-0.100		400.6	2046	
E188	375.6	1991			401.1	2047	0.300
	376.1	1991	-0.100	E201	401.6	2049	
	376.6	1990			402.1	2048	-0.200
	377.1	1988	-0.300		402.6	2047	
E189	377.6	1987			403.1	2046	-0.300
	378.1	1989	0.400	E202	403.6	2044	
	378.6	1991			404.1	2043	-0.200
	379.1	1993	0.400		404.6	2042	
E190	379.6	1995			405.1	2041	-0.200
	380.1	2000	0.900	E203	405.6	2040	
	380.6	2004			406.1	2042	0.300
	381.1	2009	1.000		406.6	2043	
E191	381.6	2014			407.1	2046	0.500

APPENDIX Ib
ROUTE E SURFACE TOPOGRAPHY

MARK	DIST km	ELEV m	SLOPE %	MARK	DIST km	ELEV m	SLOPE %
E204	407.6	2048			432.9	2090	0.100
	408.1	2050	0.300	E217	433.4	2090	
	408.6	2051			433.9	2093	0.600
	409.1	2053	0.444		434.4	2096	
E205	409.5	2055			434.9	2100	0.700
	410.0	2057	0.500	E218	435.4	2103	
	410.5	2060			435.9	2106	0.600
	411.0	2061	0.200		436.4	2109	
E206	411.5	2062			436.9	2111	0.500
	412.0	2063	0.200	E219	437.4	2114	
	412.5	2064			437.9	2115	0.200
	413.0	2064	0.000		438.4	2116	
E207	413.5	2064			438.9	2117	0.200
	414.0	2064	0.000	E220	439.4	2118	
	414.5	2064			439.9	2119	0.200
	415.0	2064	0.000		440.4	2120	
E208	415.5	2064			440.9	2120	0.100
	416.0	2064	0.000	E221	441.4	2121	
	416.5	2064			441.9	2121	0.000
	417.0	2064	0.000		442.4	2121	
E209	417.5	2064			442.9	2121	0.000
	418.0	2064	-0.100	E222	443.4	2121	
	418.5	2063			443.9	2122	0.100
	419.0	2063	-0.100		444.4	2122	
E210	419.5	2062			444.9	2123	0.200
	420.0	2063	0.100	E223	445.4	2124	
	420.5	2063			445.9	2125	0.200
	421.0	2064	0.200		446.4	2126	
E211	421.5	2065			446.9	2127	0.333
	422.0	2066	0.300	E224	447.3	2129	
	422.5	2068			447.8	2130	0.200
	423.0	2069	0.200		448.3	2131	
E212	423.5	2070			448.8	2133	0.400
	424.0	2071	0.100	GD09	449.3	2135	
	424.5	2071			449.8	2136	0.200
	425.0	2072	0.100		450.3	2137	
E213	425.5	2072			450.8	2138	0.200
	426.0	2074	0.300	E226	451.3	2139	
	426.5	2075			451.8	2140	0.200
	427.0	2076	0.333		452.3	2141	
E214	427.4	2078			452.9	2141	0.091
	427.9	2079	0.200	E227	453.4	2142	
	428.4	2080			453.9	2142	0.000
	428.9	2081	0.200		454.4	2142	
E215	429.4	2082			455.0	2141	-0.091
	429.9	2084	0.300	E228	455.5	2141	
	430.4	2085			456.1	2140	-0.182
	430.9	2086	0.300		456.6	2139	
E216	431.4	2088			457.2	2138	-0.182
	431.9	2088	0.100	E229	457.7	2137	
	432.4	2089			458.2	2138	0.300

APPENDIX Ib
ROUTE E SURFACE TOPOGRAPHY

MARK	DIST km	ELEV m	SLOPE %	MARK	DIST km	ELEV m	SLOPE %
	458.7	2140			484.6	2177	0.400
	459.2	2141	0.300		485.1	2179	
E230	459.7	2143			485.7	2180	0.273
	460.2	2145	0.400	E243	486.2	2182	
	460.7	2147			486.7	2183	0.300
	461.3	2148	0.182		487.2	2185	
E231	461.8	2149			487.7	2187	0.400
	462.3	2150	0.200	E244	488.2	2189	
	462.8	2151			488.7	2189	0.000
	463.3	2152	0.200		489.2	2189	
E232	463.8	2153			489.8	2190	0.182
	464.3	2153	0.100	E245	490.3	2191	
	464.8	2154			490.8	2192	0.100
	465.4	2155	0.091		491.3	2192	
E233	465.9	2155			491.9	2194	0.273
	466.4	2156	0.100	E246	492.4	2195	
	466.9	2156			492.9	2198	0.600
	467.4	2157	0.100		493.4	2201	
E234	467.9	2157			493.9	2202	0.222
	468.4	2157	0.000	E247	494.3	2203	
	468.9	2157			494.8	2204	0.200
	469.5	2158	0.091		495.3	2205	
E235	470.0	2158			495.9	2203	-0.273
	470.5	2159	0.200	E248	496.4	2202	
	471.0	2160			496.9	2202	0.100
	471.5	2161	0.200		497.4	2203	
E236	472.0	2162			498.0	2204	0.182
	472.5	2165	0.600	E249	498.5	2205	
	473.0	2168			499.0	2205	0.100
	473.5	2167	-0.200		499.5	2206	
E237	474.0	2166			500.1	2206	0.000
	474.5	2167	0.100	GD10	500.6	2206	
	475.0	2167			501.1	2207	0.182
	475.5	2167	0.000		501.7	2208	
E238	476.0	2167			502.3	2209	0.182
	476.5	2166	-0.200	E251	502.8	2210	
	477.0	2165			503.3	2209	-0.100
	477.6	2166	0.091		503.8	2209	
E239	478.1	2166			504.3	2210	0.300
	478.6	2166	-0.100	E252	504.8	2212	
	479.1	2165			505.3	2212	0.100
	479.6	2166	0.200		505.8	2213	
E240	480.1	2167			506.3	2213	0.000
	480.6	2168	0.200	E253	506.8	2213	
	481.1	2169			507.3	2215	0.500
	481.6	2170	0.200		507.8	2218	
E241	482.1	2171			508.4	2219	0.273
	482.6	2174	0.700	E254	508.9	2221	
	483.1	2178			509.4	2223	0.400
	483.6	2176	-0.300		509.9	2225	
E242	484.1	2175			510.5	2228	0.455

APPENDIX Ib
ROUTE E SURFACE TOPOGRAPHY

MARK	DIST km	ELEV m	SLOPE %
E255	511.0	2230	
	511.5	2231	0.100
	512.0	2231	
	512.5	2232	0.100
E256	513.0	2232	
	513.5	2230	-0.400
	514.0	2228	
	514.5	2226	-0.400
E257	515.0	2224	
	515.5	2223	-0.200
	516.0	2222	
	516.5	2219	-0.500
E258	517.0	2217	
	517.5	2218	0.200
	518.0	2219	
	518.5	2219	0.000
E259	519.0	2219	
	519.5	2221	0.400
	520.0	2223	
	520.5	2224	0.273
E260	521.1	2226	
	521.6	2227	0.200
	522.1	2228	
	522.6	2229	0.200
E261	523.1	2230	
	523.6	2230	0.000
	524.1	2230	
	524.6	2230	0.000
E262	525.1	2230	
	525.6	2230	-0.100
	526.1	2229	
	526.6	2229	-0.100
E263	527.1	2228	
	527.7	2228	-0.091
	528.2	2227	
	528.8	2227	0.000
E264	529.3	2227	
	529.8	2227	0.000
	530.3	2227	
	530.8	2227	0.000
E265	531.3	2227	
	531.8	2228	0.100
	532.3	2228	
	532.8	2229	0.100
E266	533.3	2229	
	533.8	2229	0.000
	534.3	2229	
	534.8	2229	0.000
E267	535.3	2229	
	535.8	2227	-0.400
	536.3	2225	
	536.9	2224	-0.091
E268	537.4	2224	
	537.9	2222	-0.400
	538.4	2220	
	539.0	2219	-0.182
E269	539.5	2218	
	540.0	2218	0.091
	540.6	2219	
	541.1	2219	0.100
E270	541.6	2220	
	542.1	2222	0.400
	542.6	2224	
	543.2	2226	0.364
E271	543.7	2228	
	544.2	2228	-0.100
	544.7	2227	
	545.3	2227	-0.091
E272	545.8	2226	
	546.3	2224	-0.400
	546.8	2222	
	547.3	2219	-0.600
E273	547.8	2216	
	548.3	2213	-0.500
	548.8	2211	
	549.4	2208	-0.545
E274	549.9	2205	
	550.5	2205	0.091
	551.0	2206	
	551.5	2205	-0.182
GD11	552.1	2204	
	552.7	2209	0.909
	553.2	2214	
	553.8	2216	0.273
E276	554.3	2217	
	554.8	2216	-0.200
	555.3	2215	
	555.9	2212	-0.545
E277	556.4	2209	
	556.9	2207	-0.500
	557.4	2204	
	557.9	2204	0.000
E278	558.4	2204	
	558.9	2204	0.000
	559.4	2204	
	560.0	2205	0.091
E279	560.5	2205	
	561.1	2205	0.000
	561.6	2205	
	562.1	2203	-0.400
E280	562.6	2201	
	563.1	2200	-0.200

APPENDIX Ib
ROUTE E SURFACE TOPOGRAPHY

MARK	DIST km	ELEV m	SLOPE %	MARK	DIST km	ELEV m	SLOPE %
	563.6	2199			589.8	2170	-0.400
	564.1	2201	0.300		590.3	2168	
E281	564.6	2202			590.8	2164	-0.800
	565.1	2202	0.000	E294	591.3	2160	
	565.6	2202			591.8	2157	-0.600
	566.2	2199	-0.455		592.3	2154	
E282	566.7	2197			592.9	2152	-0.364
	567.2	2196	-0.200	E295	593.4	2150	
	567.7	2195			593.9	2149	-0.200
	568.3	2193	-0.273		594.4	2148	
E283	568.8	2192			594.9	2145	-0.500
	569.3	2193	0.300	E296	595.4	2143	
	569.8	2195			595.9	2141	-0.400
	570.3	2195	0.100		596.4	2139	
E284	570.8	2196			597.0	2139	-0.091
	571.4	2196	0.000	E297	597.5	2138	
	571.9	2196			598.0	2138	0.000
	572.5	2195	-0.091		598.5	2138	
E285	573.0	2195			599.0	2140	0.400
	573.5	2195	0.000	E298	599.5	2142	
	574.0	2195			600.0	2145	0.600
	574.5	2194	-0.200		600.5	2148	
E286	575.0	2193			601.1	2152	0.727
	575.6	2191	-0.364	E299	601.6	2156	
	576.1	2189			602.2	2159	0.455
	576.6	2187	-0.400		602.7	2161	
E287	577.1	2185			603.3	2164	0.545
	577.6	2184	-0.200	GD12	603.8	2167	
	578.1	2183			604.3	2168	0.200
	578.6	2184	0.300		604.8	2169	
E288	579.1	2186			605.4	2170	0.182
	579.6	2187	0.300	E301	605.9	2171	
	580.1	2189			606.4	2170	-0.200
	580.6	2189	0.000		606.9	2169	
E289	581.1	2189			607.4	2168	-0.200
	581.7	2188	-0.182	E302	607.9	2167	
	582.2	2187			608.4	2166	-0.200
	582.8	2187	-0.091		608.9	2165	
E290	583.3	2186			609.5	2164	-0.182
	583.8	2185	-0.200	E303	610.0	2163	
	584.3	2184			610.5	2162	-0.200
	584.8	2183	-0.333		611.0	2161	
E291	585.2	2181			611.5	2161	-0.100
	585.7	2180	-0.300	E304	612.0	2160	
	586.2	2178			612.6	2159	-0.091
	586.8	2176	-0.364		613.1	2159	
E292	587.3	2174			613.6	2158	-0.100
	587.8	2173	-0.200	E305	614.1	2158	
	588.3	2172			614.6	2156	-0.300
	588.8	2172	0.000		615.1	2155	
E293	589.3	2172			615.6	2154	-0.300

APPENDIX Ib
ROUTE E SURFACE TOPOGRAPHY

MARK	DIST km	ELEV m	SLOPE %	MARK	DIST km	ELEV m	SLOPE %
E306	616.1	2152			642.4	2151	0.000
	616.7	2152	-0.091	E319	642.9	2151	
	617.2	2151			643.4	2152	0.100
	617.7	2150	-0.100		643.9	2152	
E307	618.2	2150			644.4	2153	0.200
	618.7	2149	-0.200	E320	644.9	2154	
	619.2	2148			645.4	2155	0.200
	619.7	2148	0.100		645.9	2156	
E308	620.2	2149			646.5	2154	-0.364
	620.8	2149	0.000	E321	647.0	2152	
	621.3	2149			647.5	2148	-0.800
	621.8	2148	-0.200		648.0	2144	
E309	622.3	2147			648.5	2140	-0.700
	622.8	2146	-0.100	E322	649.0	2137	
	623.3	2146			649.6	2135	-0.273
	623.9	2145	-0.091		650.1	2134	
E310	624.4	2145			650.6	2135	0.200
	624.9	2146	0.200	E323	651.1	2136	
	625.4	2147			651.6	2137	0.300
	625.9	2149	0.300		652.1	2139	
E311	626.4	2150			652.6	2141	0.400
	626.9	2153	0.500	E324	653.1	2143	
	627.4	2155			653.7	2142	-0.182
	628.0	2156	0.273		654.2	2141	
E312	628.5	2158			654.7	2138	-0.600
	629.0	2157	-0.100	GD13	655.2	2135	
	629.5	2157			655.7	2135	-0.100
	630.0	2156	-0.100		656.2	2134	
E313	630.5	2156			656.7	2134	-0.100
	631.1	2156	0.000	E326	657.2	2133	
	631.6	2156			657.7	2132	-0.300
	632.1	2157	0.200		658.2	2130	
E314	632.6	2158			658.8	2126	-0.727
	633.1	2158	0.000	E327	659.3	2122	
	633.6	2158			659.8	2122	0.100
	634.1	2158	0.100		660.3	2123	
E315	634.6	2159			660.9	2125	0.364
	635.2	2158	-0.182	E328	661.4	2127	
	635.7	2157			661.9	2128	0.300
	636.2	2156	-0.100		662.4	2130	
E316	636.7	2156			662.9	2130	0.000
	637.2	2155	-0.100	E329	663.4	2130	
	637.7	2155			663.9	2128	-0.400
	638.3	2154	-0.182		664.4	2126	
E317	638.8	2153			664.9	2123	-0.500
	639.3	2153	-0.100	E330	665.4	2121	
	639.8	2152			665.9	2120	-0.200
	640.3	2152	-0.100		666.4	2119	
E318	640.8	2151			666.9	2118	-0.200
	641.3	2151	0.000	E331	667.4	2117	
	641.8	2151			667.9	2117	-0.100

APPENDIX Ib
ROUTE E SURFACE TOPOGRAPHY

MARK	DIST km	ELEV m	SLOPE %	MARK	DIST km	ELEV m	SLOPE %
	668.4	2116			694.7	2106	0.000
	668.9	2116	0.000		695.2	2106	
E332	669.3	2116			695.8	2106	0.000
	669.9	2117	0.182	E345	696.3	2106	
	670.4	2118			696.9	2106	0.091
	671.0	2119	0.091		697.4	2107	
E333	671.5	2119			697.9	2109	0.300
	672.0	2119	0.000	E346	698.4	2110	
	672.5	2119			699.0	2110	0.000
	673.0	2118	-0.100		699.5	2110	
E334	673.5	2118			700.0	2110	0.000
	674.0	2118	0.100	E347	700.5	2110	
	674.5	2119			701.0	2109	-0.300
	675.1	2119	0.000		701.5	2107	
E335	675.6	2119			702.0	2105	-0.400
	676.1	2121	0.300	E348	702.5	2103	
	676.6	2122			703.0	2102	-0.200
	677.1	2121	-0.333		703.5	2101	
E336	677.5	2119			704.0	2101	0.000
	678.0	2118	-0.200	E349	704.5	2101	
	678.5	2117			705.0	2101	0.000
	679.1	2116	-0.182		705.5	2101	
E337	679.6	2115			706.0	2103	0.444
	680.1	2115	-0.100	GD14	706.4	2105	
	680.6	2114			706.9	2109	0.800
	681.2	2115	0.182		707.4	2113	
E338	681.7	2116			708.0	2117	0.636
	682.2	2116	0.000	E351	708.5	2120	
	682.7	2116			709.0	2123	0.600
	683.3	2117	0.091		709.5	2126	
E339	683.8	2117			710.0	2130	0.900
	684.3	2117	0.100	E352	710.5	2135	
	684.8	2118			711.1	2138	0.545
	685.3	2118	0.100		711.6	2141	
E340	685.8	2119			712.1	2143	0.400
	686.4	2121	0.364	E353	712.6	2145	
	686.9	2123			713.1	2146	0.200
	687.5	2124	0.273		713.6	2147	
E341	688.0	2126			714.2	2148	0.273
	688.5	2126	0.100	E354	714.7	2150	
	689.0	2127			715.2	2151	0.200
	689.6	2127	0.000		715.7	2152	
E342	690.1	2127			716.2	2153	0.100
	690.6	2126	-0.100	E355	716.7	2153	
	691.1	2126			717.3	2155	0.273
	691.6	2123	-0.700		717.8	2156	
E343	692.1	2119			718.3	2157	0.200
	692.7	2116	-0.636	E356	718.8	2158	
	693.2	2112			719.3	2158	0.000
	693.7	2109	-0.600		719.8	2158	
E344	694.2	2106			720.4	2158	-0.091

APPENDIX Ib
ROUTE E SURFACE TOPOGRAPHY

MARK	DIST km	ELEV m	SLOPE %	MARK	DIST km	ELEV m	SLOPE %
E357	720.9	2157			740.0	2168	-0.273
	721.4	2158	0.100		740.5	2167	
	721.9	2158			741.0	2164	-0.600
	722.4	2158	0.000	E367	741.5	2161	
E358	722.9	2158			742.0	2159	-0.400
	723.5	2162	0.636		742.5	2157	
	724.0	2165			743.1	2156	-0.182
	724.5	2168	0.700	E368	743.6	2155	
E359	725.0	2172			744.1	2154	-0.200
	725.5	2173	0.100		744.6	2153	
	726.0	2173			745.1	2153	0.000
	726.6	2175	0.364	E369	745.6	2153	
E360	727.1	2177			746.2	2154	0.182
	727.6	2175	-0.400		746.7	2155	
	728.1	2173			747.2	2155	0.000
	728.6	2171	-0.500	E370	747.7	2155	
E361	729.1	2168			748.2	2157	0.300
	729.7	2167	-0.182		748.7	2158	
	730.2	2166			749.3	2160	0.273
	730.7	2165	-0.100	E371	749.8	2161	
E362	731.2	2165			750.3	2161	0.000
	731.7	2163	-0.300		750.8	2161	
	732.2	2162			751.3	2162	0.100
	732.7	2161	-0.200	E372	751.8	2162	
E363	733.2	2160			752.4	2160	-0.364
	733.8	2161	0.182		752.9	2158	
	734.3	2162			753.4	2157	-0.300
	734.9	2163	0.091	E373	753.9	2155	
E364	735.4	2163			754.4	2153	-0.300
	735.9	2165	0.333		754.9	2152	
	736.3	2166			755.5	2151	-0.182
	736.9	2167	0.182	E374	756.0	2150	
E365	737.4	2168			756.5	2150	0.100
	737.9	2168	0.000		757.0	2151	
	738.4	2168			757.5	2153	0.400
	738.9	2169	0.200	GD15	758.0	2155	
E366	739.4	2170					

APPENDIX Ic
ROUTE C SURFACE TOPOGRAPHY

MARK	DIST km	ELEV m	SLOPE %	MARK	DIST km	ELEV m	SLOPE %
A024	0.0	1282	0.000		25.5	1246	
	0.5	1279			26.0	1251	1.100
	1.0	1278	-0.400		26.5	1257	
	1.5	1275			27.0	1260	0.600
	2.0	1271	-0.700		27.5	1263	
	2.5	1268			28.0	1264	0.400
	3.0	1267	-0.200		28.5	1267	
	3.5	1266			29.0	1272	0.900
	4.0	1265	0.200		29.5	1276	
	4.5	1268			30.0	1282	1.300
	5.0	1273	1.000		30.5	1289	
	5.5	1278			31.0	1298	1.400
	6.0	1281	0.700		31.5	1303	
	6.5	1285			32.0	1307	0.800
	7.0	1285	0.100		32.5	1311	
	7.5	1286			33.0	1310	-0.500
	8.0	1288	0.200		33.5	1306	
	8.5	1288			34.0	1299	-1.300
	9.0	1290	0.400		34.5	1293	
	9.5	1292			35.0	1288	-0.800
	10.0	1292	0.300		35.5	1285	
	10.5	1295			36.0	1285	0.100
	11.0	1296	0.100		36.5	1286	
	11.5	1296			37.0	1288	0.200
	12.0	1298	0.300		37.5	1288	
	12.5	1299			38.0	1287	-0.400
	13.0	1300	0.100		38.5	1284	
	13.5	1300			39.0	1282	-0.500
	14.0	1302	0.200		39.5	1279	
	14.5	1302			40.0	1272	-1.300
	15.0	1301	-0.200		40.5	1266	
	15.5	1300			41.0	1259	-0.300
	16.0	1299	-0.300		41.5	1263	
	16.5	1297			42.0	1261	-0.200
	17.0	1294	-0.500		42.5	1261	
	17.5	1292			43.0	1263	0.800
	18.0	1286	-0.800		43.5	1269	
	18.5	1284			44.0	1275	1.300
	19.0	1281	-0.800		44.5	1282	
	19.5	1276			45.0	1290	1.200
	20.0	1266	-1.600		45.5	1294	
	20.5	1260			46.0	1294	0.000
	21.0	1256	-0.800		46.5	1294	
	21.5	1252			47.0	1289	-0.500
	22.0	1249	-0.600		47.5	1289	
	22.5	1246			48.0	1285	-0.600
GC20	23.0	1243	-0.300		48.5	1283	
	23.5	1243		GC21	49.0	1282	-0.300
	24.0	1243	-0.100		49.5	1280	
	24.5	1242			50.0	1277	-0.500
	25.0	1242	0.400		50.5	1275	

APPENDIX Ic
ROUTE C SURFACE TOPOGRAPHY

MARK	DIST km	ELEV m	SLOPE %	MARK	DIST km	ELEV m	SLOPE %
	51.0	1276	0.500		76.5	1348	0.200
	51.5	1280			77.0	1348	
	52.0	1282	0.100		77.5	1349	0.300
	52.5	1281			78.0	1351	
	53.0	1285	0.700		78.5	1353	0.300
	53.5	1288			79.0	1354	
	54.0	1295	1.000		79.5	1355	0.400
	54.5	1298			80.0	1358	
	55.0	1302	0.600		80.5	1360	0.600
	55.5	1304			81.0	1364	
	56.0	1310	0.900		81.5	1368	0.800
	56.5	1313			82.0	1372	
	57.0	1317	0.900		82.5	1377	0.800
	57.5	1322			83.0	1380	
	58.0	1324	0.300		83.5	1385	0.800
	58.5	1325			84.0	1388	
	59.0	1326	0.200		84.5	1392	0.700
	59.5	1327			85.0	1395	
	60.0	1326	-0.200		85.5	1397	0.300
	60.5	1325			86.0	1398	
	61.0	1324	-0.100		86.5	1399	0.100
	61.5	1324			87.0	1399	
	62.0	1325	0.100		87.5	1401	0.200
	62.5	1325			88.0	1401	
	63.0	1326	0.500		88.5	1402	0.300
	63.5	1330			89.0	1404	
	64.0	1333	1.000		89.5	1407	0.500
	64.5	1340			90.0	1409	
	65.0	1346	1.100		90.5	1410	0.200
	65.5	1351			91.0	1411	
	66.0	1354	0.400		91.5	1414	0.400
	66.5	1355			92.0	1415	
	67.0	1357	0.400		92.5	1416	0.300
	67.5	1359			93.0	1418	
	68.0	1361	0.300		93.5	1419	0.100
	68.5	1362			94.0	1419	
	69.0	1362	-0.100		94.5	1421	0.400
	69.5	1361			95.0	1423	
	70.0	1360	-0.100		95.5	1426	0.800
	70.5	1360			96.0	1431	
	71.0	1359	-0.600		96.5	1433	0.500
	71.5	1354			97.0	1436	
	72.0	1353	-0.600		97.5	1437	0.100
	72.5	1348			98.0	1437	
	73.0	1346	-0.400		98.5	1436	-0.200
	73.5	1344		GC23	99.0	1435	
GC22	74.0	1343	-0.200		99.5	1435	0.300
	74.5	1343	0.100		100.0	1438	
	75.0	1344			100.5	1442	0.600
	75.5	1345	0.200		101.0	1444	
	76.0	1346			101.5	1448	0.500

APPENDIX Ic
ROUTE C SURFACE TOPOGRAPHY

MARK	DIST km	ELEV m	SLOPE %	MARK	DIST km	ELEV m	SLOPE %
	102.0	1449			113.0	1471	0.300
	102.5	1451	0.300		113.5	1473	
	103.0	1452			114.0	1475	0.500
	103.5	1452	0.100		114.5	1478	
	104.0	1453			115.0	1481	0.800
	104.5	1453	-0.100		115.5	1486	
	105.0	1452			116.0	1489	0.700
	105.5	1448	-0.400		116.5	1493	
	106.0	1448			117.0	1496	0.700
	107.0	1452	0.467		117.5	1500	
	107.5	1455			118.0	1505	0.900
	108.0	1458	0.600		118.5	1509	
	108.5	1461			119.0	1511	
	109.0	1461	0.200		119.5		
	109.5	1463			120.0		
	110.0	1464	0.200		120.5		
	110.5	1465			121.0	1511	
	111.0	1468	0.400		121.5		
	111.5	1469			122.0		
	112.0	1470	0.100		122.5		
	112.5	1470		GC24	123.0	1503	

APPENDIX Id
ROUTE D SURFACE TOPOGRAPHY

MARK	DIST km	ELEV m	SLOPE %	MARK	DIST km	ELEV m	SLOPE %
GC24	0.0	1503			27.0	1627	-0.300
	1.8	1509	0.240		27.5	1626	
	2.5	1509			28.0	1627	0.400
	3.0	1509	0.100		28.5	1630	
	3.5	1510			29.0	1634	0.800
	4.0	1511	0.500		29.5	1638	
	4.5	1515			30.0	1641	0.800
	5.0	1518	0.800		30.5	1646	
	5.5	1523			31.0	1654	1.300
	6.0	1527	0.800		31.5	1659	
	6.5	1531			32.0	1663	0.900
	7.0	1534	0.300		32.5	1668	
	7.5	1534			33.0	1670	0.400
	8.0	1533	-0.100		33.5	1672	
	8.5	1533			34.0	1674	0.600
	9.0	1534	0.100		34.5	1678	
	9.5	1534			35.0	1680	0.400
	10.0	1536	0.700		35.5	1682	
	10.5	1541			36.0	1682	0.100
	11.0	1546	1.100		36.5	1683	
	11.5	1552			37.0	1679	0.800
	12.0	1554	0.800		37.5	1691	
	12.5	1560			38.0	1695	0.700
	13.0	1569	1.700		38.5	1698	
	13.5	1577			39.0	1700	0.400
	14.0	1581	0.400		39.5	1702	
	14.5	1581			40.0	1707	0.700
	15.0	1579	-0.500		40.5	1709	
	15.5	1576			41.0	1710	0.000
	16.0	1576	0.000		41.5	1709	
	16.5	1576			42.0	1710	0.400
	17.0	1576	0.300		42.5	1713	
	17.5	1579			43.0	1715	0.200
	18.0	1584	1.200		43.5	1715	
	18.5	1591			44.0	1719	0.900
	19.0	1598	1.200		44.5	1724	
	19.5	1603			45.0	1729	1.000
	20.0	1604	0.800		45.5	1734	
	20.5	1611			46.0	1740	0.800
	21.0	1617	1.000		46.5	1742	
	21.5	1621			47.0	1743	0.200
	22.0	1628	0.900		47.5	1744	
	22.5	1630			48.0	1747	0.500
	23.0	1632	0.300		48.5	1749	
	23.5	1633			49.0	1751	0.600
	24.0	1633	0.000		49.5	1755	
	24.5	1633			50.0	1759	0.700
	25.0	1631	-0.300		50.5	1762	
	25.5	1630			51.0	1769	1.100
	26.0	1630	-0.100		51.5	1773	
	26.5	1629			52.0	1776	0.600

APPENDIX Id
ROUTE D SURFACE TOPOGRAPHY

MARK	DIST km	ELEV m	SLOPE %	MARK	DIST km	ELEV m	SLOPE %
	52.5	1779			62.5	1800	
	53.0	1781	0.300		63.0	1802	0.500
	53.5	1782			63.5	1805	
	54.0	1781	0.000		64.0	1806	0.300
	54.5	1782			64.5	1808	
	55.0	1782	0.000		65.0	1810	0.500
	55.5	1782			65.5	1813	
	56.0	1783	0.100		66.0	1815	0.400
	56.5	1783			66.5	1817	
	57.0	1784	0.300		67.0	1819	0.300
	57.5	1786			67.5	1820	
	58.0	1786	-0.100		68.0	1823	0.600
	58.5	1785			68.5	1826	
	59.0	1786	-0.200		69.0	1829	0.400
	59.5	1783			69.5	1830	
	60.0	1781	-0.200		70.0	1834	0.500
	60.5	1781			70.5	1835	
	61.0	1783	0.900		71.0	1835	-0.100
	61.5	1790		GD03	71.5	1834	
	62.0	1795	1.000				

APPENDIX IIa
ROUTE A SNOW ACCUMULATION RATES
1973 - 1986 MEAN

MARK	$kg/m^2/a$
A015	781
A015/1	823
A016	781
A017	790
A017/1	811
A017/2	617
A018	529
A019	433
A020	496
A021	559
A022/1	1037
A022/2	1004
A022/3	382
A023	445
A023/2	1033
A023/3	932
A024	580
A024/2	924
A024/3	617
A025	500
A025/1	508
A025/2	1008
A025/3	575
A026	311
A026/1	638
A026/2	806
A027/1	1184
A027/2	945
A028	357

APPENDIX IIb
ROUTE E SNOW ACCUMULATION RATES
1982 - 1985 CANE DATA

DATE 1985	MARK	SINCE	ACCUMULATION SNOW m	SNOW m/a	kg/m^2/a
28/09	E001-82	21/09/82	3.13	1.03	433
28/09	E002-82	21/09/82	2.37	0.79	332
28/09	E003-82	23/09/82	1.77	0.59	248
28/09	E004-82		1.20	0.40	168
29/09	E005-85	23/09/82	3.42	1.14	479
29/09	E006-85	23/09/82	3.81	1.27	533
29/09	E007-82	23/09/82	3.96	1.32	554
29/09	E008-82		-	-	
29/09	E009-82	23/09/82	3.57	1.19	500
29/09	E010-82	24/09/82	2.77	0.92	386
29/09	E011-82		-	-	
03/10	E012-82	24/09/82	2.40	0.79	332
03/10	E013-82		2.41	0.80	336
03/10	E014-82		5.20	1.72	722
03/10	E015-85		6.11	2.02	848
03/10	E016-85	24/09/82	4.16	1.37	575
04/10	E017-82	24/09/82	3.17	1.05	441
04/10	E018-82		5.76	1.90	798
04/10	E019-82		2.96	0.98	412
04/10	E020-82		0.79	0.26	109
04/10	E021-82	25/09/82	1.47	0.49	206
04/10	E022-82		2.88	0.95	399
04/10	E023-82		3.10	1.02	428
04/10	E024-82	25/09/82	5.55	1.83	769
04/10	GD01-85	16/04/85	0.54	1.15	483
06/10	E026-82	25/09/82	2.40	0.79	332
06/10	E027-82		2.65	0.88	370
06/10	E028-82		2.64	0.87	365
06/10	E029-82		1.94	0.64	269
06/10	E030-82	27/09/82	1.93	0.64	269
06/10	E031-82		2.20	0.72	302
06/10	E032-81	27/09/82	1.37	0.43	181
06/10	E033-82		1.49	0.48	202
06/10	E034-82		1.73	0.57	239
06/10	E035-82	28/09/82	2.31	0.75	315
06/10	E036-85	16/04/85	0.59	1.16	487
06/10	E037-82	28/09/82	2.88	0.95	399
06/10	E038-82		2.25	0.75	315
06/10	E039-82		2.11	0.70	294
06/10	E040-85	16/04/85	0.68	0.77	323
06/10	E041-82	29/09/82	2.55	0.84	353
06/10	E042-82		2.62	0.87	365
06/10	E043-82		1.64	0.54	227
07/10	E044-81	29/09/82	2.25	0.75	315
07/10	E045-85		2.96	0.98	412
07/10	E046-82	29/09/82	2.00	0.66	277
07/10	E047-82	29/09/82	1.93	0.64	269
07/10	E048-82		1.57	0.52	218
07/10	E049-82		1.94	0.64	269

APPENDIX IIb
ROUTE E SNOW ACCUMULATION RATES
1982 - 1985 CANE DATA

DATE 1985	MARK	SINCE	ACCUMULATION SNOW m	SNOW m/a	kg/m^2/a
07/10	GD02-81	04/10/82	2.05	0.68	286
08/10	E051-82	04/10/82	1.91	0.64	269
08/10	E052-81	23/10/81	3.00	0.76	319
08/10	E053-82	04/10/82	2.06	0.68	286
08/10	E054-82		2.47	0.82	344
08/10	E055-82		2.43	0.81	340
08/10	E056-82		2.43	0.81	340
08/10	E057-82		2.00	0.67	281
09/10	E058-82		2.49	0.83	349
09/10	E059-82		2.45	0.82	344
09/10	E060-82		2.03	0.67	281
09/10	E061-82		2.55	0.85	357
09/10	E062-82		1.88	0.62	260
09/10	E063-82	05/10/82	1.75	0.58	244
09/10	E064-82	05/10/82	2.41	0.80	336
09/10	E065-82		2.12	0.69	290
09/10	E066-82		1.98	0.66	277
09/10	E067-82		2.30	0.77	323
09/10	E068-82		2.73	0.91	382
09/10	E069-82		2.11	0.70	294
09/10	E070-82		1.48	0.49	206
09/10	E071-82		1.65	0.55	231
09/10	E072-82		2.43	0.72	302
09/10	E073-82		2.74	0.91	382
09/10	E074-82		2.43	0.80	336
09/10	GD03-82		-	-	
12/10	E076-82		-	-	
12/10	E077-82	06/10/82	2.60	0.86	361
12/10	E078-82		1.64	0.54	227
12/10	E079-82		2.09	0.69	290
12/10	E080-82	06/10/82	0.94	0.31	130
12/10	E081-82		2.64	0.87	365
12/10	E082-82		-	-	
12/10	E083-82		2.53	0.84	353
12/10	E084-82		2.88	0.95	399
12/10	E085	29/10/81	2.74	0.69	290
12/10	E086-82	07/10/82	2.27	0.75	315
12/10	E087-82	07/10/82	1.83	0.60	252
12/10	E088-82		1.93	0.64	269
12/10	E089-82		1.87	0.62	260
12/10	E090	29/10/81	1.79	0.45	189
12/10	E091-82	07/10/82	1.82	0.60	252
12/10	E092-82		2.29	0.76	319
12/10	E093		2.49	0.82	344
12/10	E094		2.88	0.95	399
12/10	E095		-	-	
12/10	E096-82		1.75	0.58	244
12/10	E097-82		0.92	0.31	130
12/10	E098-82	07/10/82	1.74	0.58	244

APPENDIX IIb
ROUTE E SNOW ACCUMULATION RATES
1982 - 1985 CANE DATA

DATE 1985	MARK	SINCE	ACCUMULATION SNOW m	SNOW m/a	kg/m^2/a
12/10	E099-82		1.96	0.65	273
12/10	GD04		-	-	
16/10	E101	11/10/82	2.40	0.80	336
16/10	E102		1.87	0.62	260
16/10	E103		1.73	0.57	239
16/10	E104-82		2.63	0.87	365
16/10	E105		1.71	0.57	239
16/10	E106		2.02	0.67	281
16/10	E107		2.47	0.82	344
16/10	E108		3.23	1.07	449
16/10	E109		3.40	1.13	475
16/10	E110		3.17	1.05	441
17/10	E111		3.22	1.07	449
17/10	E112		3.10	1.02	428
17/10	E113		2.57	0.85	357
17/10	E114	11/10/82	2.34	0.78	328
17/10	E115-80	12/10/82	1.80	0.60	252
17/10	E116		2.40	0.80	336
17/10	E117		2.68	0.89	374
17/10	E118		2.11	0.70	294
17/10	E119		3.01	1.00	420
17/10	E120		3.08	1.02	428
17/10	E121		3.67	1.22	512
17/10	E122		3.69	1.23	517
17/10	E123		3.20	1.06	445
17/10	E124		3.78	1.26	529
14/10	GD05		2.35	0.78	328
17/10	E126	12/10/82	1.71	0.57	239
17/10	E127		1.81	0.60	252
17/10	E128		2.75	0.91	382
17/10	E129		2.41	0.80	336
17/10	E130		2.49	0.83	349
18/10	E131	13/10/82	2.61	0.87	365
18/10	E132		2.34	0.78	328
18/10	E133		2.86	0.95	399
18/10	E134		3.60	1.19	500
18/10	E135		3.02	1.00	420
18/10	E136		2.32	0.77	323
18/10	E137		2.85	0.95	399
18/10	E138		4.00	1.33	559
18/10	E139		2.56	0.85	357
18/10	E140		1.81	0.60	252
18/10	E141		2.28	0.76	319
18/10	E142		2.81	0.93	391
18/10	E143	14/10/82	2.05	0.68	286
18/10	E144		2.45	0.81	340
18/10	E145		2.70	0.90	378
18/10	E146		3.10	1.03	433
18/10	E147		2.75	0.91	382

APPENDIX IIb
ROUTE E SNOW ACCUMULATION RATES
1982 - 1985 CANE DATA

DATE 1985	MARK	SINCE	ACCUMULATION SNOW m	SNOW m/a	kg/m^2/a
18/10	E148		1.88	0.62	260
18/10	E149	14/10/82	2.47	0.82	344
18/10	GD06	18/10/82	2.50	0.83	349
18/10	E151	18/10/82	2.54	0.85	357
18/10	E152		1.86	0.62	260
18/10	E153		1.83	0.60	252
18/10	E154		2.06	0.69	290
18/10	E155	08/11/81	3.77	0.95	399
19/10	E156	18/10/82	3.07	1.02	428
19/10	E157		2.19	0.73	307
19/10	E158		1.17	0.38	160
19/10	E159		1.28	0.42	176
19/10	E160		1.44	0.48	202
19/10	E161		1.66	0.56	235
19/10	E162		2.27	0.76	319
19/10	E163		2.35	0.78	328
19/10	E164		2.48	0.83	349
19/10	E165	08/11/81	3.20	0.81	340
19/10	E166		1.55	0.52	218
19/10	E167		2.16	0.72	302
19/10	E168		1.97	0.66	277
19/10	E169	19/10/82	2.21	0.74	311
19/10	E170		2.00	0.67	281
19/10	E171		2.19	0.73	307
19/10	E172		2.33	0.77	323
19/10	E173		2.55	0.85	357
19/10	E174		1.96	0.65	273
20/10	GD07		2.08	0.67	281
20/10	E176	19/10/82	2.14	0.71	298
20/10	E177		2.00	0.67	281
21/10	E178		2.03	0.68	286
21/10	E179		2.23	0.74	311
21/10	E180		2.31	0.76	319
21/10	E181		3.21	1.07	449
21/10	E182		2.39	0.80	336
21/10	E183		1.35	0.45	189
21/10	E184		1.79	0.59	248
21/10	E185		1.67	0.56	235
21/10	E186		2.37	0.79	332
21/10	E187		1.98	0.66	277
21/10	E188	20/10/82	2.46	0.80	336
21/10	E189		2.50	0.83	349
21/10	E190		1.48	0.49	206
21/10	E191		0.54	0.18	77
21/10	E192		1.49	0.49	206
21/10	E193		1.78	0.59	248
21/10	E194		1.82	0.61	256
21/10	E195	20/10/82	1.74	0.58	244
21/10	E196	21/10/82	1.56	0.51	214

APPENDIX IIb
ROUTE E SNOW ACCUMULATION RATES
1982 - 1985 CANE DATA

DATE 1985	MARK	SINCE	ACCUMULATION SNOW m	SNOW m/a	kg/m^2/a
21/10	E197		2.25	0.75	315
21/10	E198		2.12	0.70	294
21/10	E199		2.04	0.68	286
21/10	GD08		1.63	0.54	227
26/10	E201	21/10/82	1.51	0.50	210
26/10	E202		2.06	0.69	290
26/10	E203		1.86	0.62	260
26/10	E204	21/10/82	1.98	0.66	277
26/10	E205	21/10/82	1.51	0.50	210
26/10	E206		1.82	0.61	256
26/10	E207		1.75	0.58	244
26/10	E208		2.06	0.69	290
26/10	E209	21/10/82	1.93	0.64	269
26/10	E210	22/10/82	2.22	0.74	311
26/10	E211		1.84	0.60	252
26/10	E212		1.57	0.53	223
26/10	E213		1.51	0.51	214
26/10	E214		1.42	0.47	197
26/10	E215		1.66	0.56	235
26/10	E216		1.88	0.63	265
26/10	E217		1.28	0.43	181
26/10	E218		1.06	0.35	147
26/10	E219	22/10/82	0.98	0.33	139
26/10	E220	22/10/82	1.65	0.55	231
26/10	E221		1.73	0.58	244
26/10	E222		1.52	0.51	214
26/10	E223		1.73	0.58	244
26/10	E224		1.46	0.49	206
26/10	GD09		0.75	0.25	105
27/10	E226	29/10/82	1.33	0.44	185
27/10	E227		1.42	0.47	197
27/10	E228		1.55	0.52	218
27/10	E229		1.90	0.63	265
27/10	E230		1.24	0.41	172
27/10	E231		0.81	0.27	113
27/10	E232		1.04	0.34	143
27/10	E233		1.38	0.46	193
27/10	E234		1.26	0.42	176
27/10	E235		1.28	0.43	181
27/10	E236		1.26	0.42	176
27/10	E237	29/10/82	1.26	0.42	176
27/10	E238		1.57	0.51	214
27/10	E239		1.16	0.39	164
27/10	E240		1.37	0.45	189
27/10	E241	31/10/82	1.88	0.63	265
27/10	E242		1.32	0.44	185
27/10	E243		1.08	0.36	151
27/10	E244		0.84	0.28	118
27/10	E245		1.62	0.54	227

APPENDIX IIb
ROUTE E SNOW ACCUMULATION RATES
1982 - 1985 CANE DATA

DATE 1985	MARK	SINCE	ACCUMULATION SNOW m	SNOW m/a	kg/m^2/a
27/10	E246		1.00	0.33	139
27/10	E247		1.06	0.35	147
27/10	E248		1.44	0.48	202
27/10	E249-81		1.66	0.54	227
27/10	GD10	31/10/82	1.83	0.61	256
31/10	E251	04/11/82	1.14	0.38	160
31/10	E252		1.81	0.60	252
31/10	E253		1.43	0.48	202
31/10	E254		0.83	0.28	118
31/10	E255	04/11/82	1.09	0.36	151
31/10	E256		1.03	0.34	143
31/10	E257		1.58	0.53	223
31/10	E258		2.32	0.78	328
31/10	E259	22/11/81	2.61	0.66	277
31/10	E260	04/11/82	1.92	0.64	269
31/10	E261		1.05	0.35	147
31/10	E262		1.41	0.47	197
31/10	E263		1.72	0.57	239
31/10	E264		1.84	0.62	260
31/10	E265		1.79	0.60	252
31/10	E266		1.86	0.62	260
31/10	E267	22/11/81	2.71	0.69	290
31/10	E268	04/11/82	2.11	0.71	298
31/10	E269	22/11/81	3.62	0.92	386
31/10	E270		1.47	0.49	206
31/10	E271	04/11/82	0.71	0.24	101
31/10	E272		1.34	0.45	189
31/10	E273		1.87	0.63	265
31/10	E274		2.82	0.94	395
31/10	GD11		-	-	
01/11	E276	09/11/82	1.27	0.43	181
01/11	E277		1.83	0.62	260
01/11	E278		2.17	0.73	307
01/11	E279		2.17	0.73	307
01/11	E280		2.03	0.68	286
01/11	E281		1.55	0.52	218
01/11	E282		1.91	0.64	269
01/11	E283		2.23	0.75	315
01/11	E284		2.03	0.68	286
01/11	E285		1.84	0.62	260
01/11	E286		1.88	0.63	265
01/11	E287		2.00	0.67	281
01/11	E288		2.17	0.73	307
01/11	E289		2.02	0.68	286
01/11	E290	09/11/82	1.71	0.57	239
01/11	E291		2.29	0.77	323
01/11	E292		2.42	0.81	340
01/11	E293		1.87	0.63	265
01/11	E294		2.74	0.92	386

APPENDIX IIb
ROUTE E SNOW ACCUMULATION RATES
1982 - 1985 CANE DATA

DATE 1985	MARK	SINCE	ACCUMULATION SNOW m	SNOW m/a	kg/m^2/a
01/11	E295		2.23	0.75	315
01/11	E296		2.62	0.88	370
01/11	E297	23/11/81	4.15	1.05	441
01/11	E298	09/11/82	2.26	0.76	319
01/11	E299		1.68	0.56	235
01/11	GD12		1.71	0.57	239
02/11	E301	12/11/82	1.46	0.49	206
02/11	E302		2.05	0.69	290
02/11	E303		2.38	0.80	336
02/11	E304		2.16	0.73	307
02/11	E305		2.51	0.85	357
02/11	E306		2.31	0.78	328
02/11	E307		2.18	0.73	307
02/11	E308		2.67	0.90	378
02/11	E309		2.27	0.76	319
02/11	E310	12/11/82	2.56	0.86	361
02/11	E311		1.60	0.54	227
02/11	E312		1.91	0.64	269
02/11	E313		2.31	0.78	328
02/11	E314		2.44	0.82	344
02/11	E315		1.83	0.62	260
02/11	E316		2.59	0.87	365
02/11	E317		2.58	0.87	365
02/11	E318		2.50	0.84	353
02/11	E319		2.19	0.74	311
02/11	E320		2.00	0.67	281
02/11	E321		1.69	0.57	239
02/11	E322		2.91	0.98	412
02/11	E323		2.61	0.88	370
02/11	E324		2.33	0.78	328
02/11	GD13		-	-	
03/11	E326	13/11/82	2.24	0.75	315
03/11	E327		2.52	0.85	357
03/11	E328		2.54	0.86	361
03/11	E329		2.36	0.79	332
03/11	E330	13/11/82	2.81	0.95	399
03/11	E331		2.44	0.82	344
03/11	E332		2.55	0.86	361
03/11	E333		1.36	0.46	193
03/11	E334		1.92	0.65	273
03/11	E335		1.92	0.65	273
03/11	E336		2.21	0.74	311
03/11	E337		2.52	0.85	357
03/11	E338		2.46	0.83	349
03/11	E339		2.69	0.91	382
03/11	E340	14/11/82	2.49	0.84	353
03/11	E341		2.19	0.74	311
03/11	E342		1.42	0.48	202
03/11	E343		1.68	0.57	239

APPENDIX IIb
ROUTE E SNOW ACCUMULATION RATES
1982 - 1985 CANE DATA

DATE 1985	MARK	SINCE	ACCUMULATION SNOW m	SNOW m/a	kg/m^2/a
03/11	E344		2.79	0.94	395
03/11	E345		2.16	0.73	307
03/11	E346		1.48	0.50	210
03/11	E347		2.42	0.81	340
03/11	E348		3.05	1.03	433
03/11	E349		3.82	1.29	542
03/11	GD14		-	-	
07/11	E351	14/11/82	2.20	0.74	311
07/11	E352		1.76	0.59	248
07/11	E353		2.36	0.79	332
07/11	E354		2.27	0.76	319
07/11	E355		2.31	0.77	323
07/11	E356		2.15	0.72	302
07/11	E357		2.19	0.73	307
07/11	E358		2.31	0.77	323
07/11	E359		1.53	0.51	214
07/11	E360		2.05	0.69	290
07/11	E361		2.10	0.70	294
07/11	E362		2.53	0.85	357
07/11	E363		2.66	0.89	374
07/11	E364		2.42	0.81	340
07/11	E365		2.36	0.79	332
07/11	E366		2.42	0.81	340
07/11	E367		3.51	1.18	496
07/11	E368		2.92	0.98	412
07/11	E369		2.62	0.88	370
07/11	E370	14/11/82	2.51	0.84	353
07/11	E371		2.57	0.86	361
07/11	E372		2.08	0.70	294
07/11	E373		2.63	0.88	370
07/11	E374		1.75	0.59	248
07/11	GD15		2.23	0.75	315

APPENDIX IIc
ROUTE E SNOW ACCUMULATION RATES
1982 - 1985 20 km MEAN, STANDARD DEVIATION AND VARIABILITY

MARK	ACCUMULATION $kg/m^2/a$			MARK	ACCUMULATION $kg/m^2/a$		
	$\bar{X}$	S	S/$\bar{X}$ %		$\bar{X}$	S	S/$\bar{X}$ %
E005	428	147	34	E190	256	76	30
E010	542	176	33	E195	239	63	26
E015	508	248	49	E200	252	42	17
E020	462	214	46	E205	260	38	15
E025	391	155	38	E210	252	34	13
E030	277	67	24	E215	210	39	18
E035	289	92	32	E220	197	50	26
E040	336	76	23	E225	206	46	22
E045	302	55	18	E230	181	42	23
E050	290	34	12	E235	172	29	17
E055	302	38	13	E240	185	42	23
E060	307	42	14	E245	193	50	26
E065	298	55	18	E250	185	50	27
E070	294	59	20	E255	214	67	31
E075	277	76	27	E260	235	55	23
E080	302	88	29	E265	244	63	26
E085	277	88	32	E270	256	92	36
E090	269	84	31	E275	256	88	34
E095	277	80	29	E280	269	42	16
E100	260	67	26	E285	273	29	11
E105	344	88	26	E290	302	42	14
E110	370	84	23	E295	323	67	21
E115	357	71	20	E300	311	71	23
E120	420	84	20	E305	319	50	16
E125	374	113	30	E310	311	46	15
E130	344	84	24	E315	311	50	16
E135	391	88	23	E320	336	50	15
E140	361	84	23	E325	344	50	15
E145	349	50	14	E330	319	59	18
E150	336	63	19	E335	319	59	18
E155	294	92	31	E340	319	63	20
E160	286	84	29	E345	332	113	34
E165	298	42	14	E350	340	97	28
E170	294	38	13	E355	298	39	13
E175	302	25	8	E360	315	46	15
E180	294	71	24	E365	365	55	15
E185	294	80	27	E370	357	67	19

APPENDIX IId
ROUTE E SNOW ACCUMULATION RATES
1980 - 1982 ANNUAL 20 km MEAN

MARK	1980-81	1981-82	MARK	1980-81	1981-82
	$kg/m^2/a$	$kg/m^2/a$		$kg/m^2/a$	$kg/m^2/a$
E005	570	450	E155	379	313
E010	637	435	E160	380	333
E015	588	399	E165	396	303
E020	519	394	E170	376	282
E025	500	331	E175	372	288
E030	400	263	E180	358	287
E035	280	251	E185	311	287
E040	411	330	E190	314	271
E045	511	326	E195	336	274
E050	422	260	E200	350	261
E055	408	288	E205	312	241
E060	389	311	E210	274	258
E065	398	283	E215	264	303
E070	383	274	E220	275	285
E075	372	307	E225		292
E080	445	348	E230		326
E085	446	361	E235		297
E090	498	355	E240		271
E095	589	342	E245		244
E100	504	315	E250		198
E105	480	342	E255		228
E110	494	398	E260		305
E115	485	406	E265		351
E120	530	420	E270		326
E125	485	393	E275		273
E130	480	351	E280		304
E135	485	380	E285		322
E140	427	363	E290		322
E145	429	361	E295		342
E150	439	344			

Note - These accumulation rates were converted from single year snow volume to mass using a mean measured snow density of 400 kg m^{-3} for the upper 0.5 m of snowpack.

APPENDIX IIIa
ROUTE A SURFACE MICRORELIEF TYPE, SIZE AND ORIENTATION
EARLY AUTUMN, 1985

SITE	DATE	EROSION	RESHUFFLED	DEPOSITION
A015/1	1/4	C	D*	C
A017/2		123E*	E	
A018		153E*		E
A019		156E*		E
A020	3/4	165E*		E
A021		167E*		
A022		E*		
A022A+2	9/4	138E*		
A022B+2		152D*		
A023A		150D*		
A023A+4		150D*		
A023B+2		140D*	E	
A024/2		E*		
A025	13/4	136D*		
A025/2		120D*	E	
A026		155E*	C	
A026/2		140D	115D*	
A027/2	14/4	120D	120C*	
A028		130D	125D*	

* DENOTES THE DOMINANT SURFACE TYPE AT EACH SITE

APPENDIX IIIb
ROUTE A SURFACE MICRORELIEF TYPE, SIZE AND ORIENTATION
LATE AUTUMN, 1985

SITE	DATE	EROSION	RESHUFFLED	DEPOSITION
A016	22/5	138D*		138E
A017		150,140D*		
A017/1		153,123E*		153E
A017/2		148D*		
AQ18		153D*		153D
A019		153E*		122,153D
A021		163E*		
A022	21/5	163D*		
A022B	13/5	162,172E*		162,145E
A023A+4		161,152E*		135,161E
A023A		162D*		135D
A023B		161E*		152E
A024/2		158D*		

* DENOTES THE DOMINANT SURFACE TYPE AT EACH SITE

APPENDIX IIIc
ROUTE A SURFACE MICRORELIEF TYPE, SIZE AND ORIENTATION
SPRING, 1985

SITE	DATE	EROSION	RESHUFFLED	DEPOSITION
A015/1	19/9			154D*
A016	21/9	152D*		
A017		140C		114C*
A017/1		143C		88C*
A017/2		143C*		
A018		143D		103D*
A019		158D*		
A021	22/9	152,123D*		143D
A022		161D*		148E
A022A		153D*		138E
A022B		165D	145E*	
A023A		161E*	168D	
A023B		169E*	159E	
A024/2	24/9	170D*	154E	
A024/3	26/9	F	G*	
A025	27/9	168E*	158E	
A025/2		166D*	154D	
A026		173G*		
A026/2	28/9	177D*	161E	
A027/2		163G*	168E	
A028		159F	155E*	

* DENOTES THE DOMINANT SURFACE TYPE AT EACH SITE

APPENDIX IIId
ROUTE A MEAN SURFACE MICRORELIEF SIZE
SPRING, 1985

MARK	DEPOSITIONAL MICRORELIEF m	EROSIONAL MICRORELIEF m
A015/	0.15	
A016		0.15
A017	0.10	0.10
A017/1	0.10	0.10
A017/2		0.10
A018	0.15	0.15
A019		0.15
A021	0.15	0.15
A022	0.30	0.15
A022A	0.30	0.15
A022B	0.30	0.15
A023A	0.15	0.30
A023B	0.30	0.30
A024/2	0.30	0.15
A024/3	1.00	0.70
A025	0.30	0.30
A025/2	0.15	0.15
A026		1.00
A026/2	0.30	0.15
A027/2	0.30	1.00
A028	0.30	0.30

APPENDIX IIIe
ROUTES C AND D SURFACE MICRORELIEF TYPE, SIZE AND ORIENTATION
LATE AUTUMN, 1985

SITE	DATE	EROSION	RESHUFFLED	DEPOSITION
GD03	21/4	128F	145E*	90D
GD03+4	23/4	128D	145C*	90C
GD03+8		135,140C*		
GD03+12		135D	120,135C*	
GD03+16			D*	
GD03+20	25/4	139,129E*		146D
GD03+24		136D*	126C	114C
GD03+28		134,145D*	126,139C	140D
GD03+32		130D*	124,130C	114D
GD03+36		124D*	134C	
GD03+40		124D*	139C	
GD03+44	27/4	123,135F	135E*	
GD03+48		133,143E*	143D	
GD03+52		129,143E*		114D
GD03+56		128,143E	143F*	
GD03+60		139E	139F*	113D
GD03+64		125,141E	141E*	
GC24	29/4	137E	137,146C*	73C
GC24+4	01/5	126D	136E*	110D
GC24+12		138E	146G*	
GC24+16		134E	143,153F*	E
GC24+20		143,153D*	143E	
GC23	02/5	133D	133G*	
GC23+4		138,143E*		
GC23+8		142,151D*	142F	
GC23+12		145,128E*	143F	
GC23+16		144,133E*	E	
GC23+20		153,143D*	153E	
GC22		138D	148E*	
GC22+4	08/5	145,150D*	D	
GC22+8		150D*		
GC22+12		148E*		
GC22+16	09/5	148D*	148D	
GC22+20		147E*		
GC21	10/5	150E	150E*	
GC21+4		148E	E*	
GC21+8		155D	155G*	
GC21+12	11/5	154E*	156D	
GC21+16		154D*	D	
GC21+20		152D*		
GC21+24		152E*		
GC20	12/5	156,151F*		156E
GC20+4	13/5	166,160D*		166D
GC20+8		166D*		
GC20+12		153,141D*		F
GC20+16		151D*		151E
GC20+20		161D*		
A024/2		158D*		

* DENOTES THE DOMINANT SURFACE TYPE AT EACH SITE

APPENDIX IIIf
ROUTES C AND D SURFACE MICRORELIEF TYPE, SIZE AND ORIENTATION
SPRING, 1985

SITE	DATE	EROSION
GD03	10/10	140E
GD03+24		143D
GD03+28		133D
GD03+32		133D
GD03+36		143D
GD03+40		148E
GD03+44		148E
GD03+48		133E
GD03+52		138E
GD03+56		138E
GD03+60		138E
GD03+64		138E
GC24		148E
GC23+4		140E
GC23+8		148E
GC23+12		150E
GC23+16		156E
GC23+20		151E
GC22		148F
GC22+4		170F
GC22+8		163G
GC22+12		161G
GC22+16		156G
GC22+20		155G
GC21		162F
GC21-4		177D
GC21+8		166E
GC21+12		183E
GC21+16		174F
GC21+20		158E
GC20		157E
GC20-4		E
GC20+8		146E
GC20+12		156F
GC20+16		154F
GC20+20		151F
A024/2		153F

* DENOTES THE DOMINANT SURFACE TYPE AT EACH SITE

APPENDIX IIIg
ROUTE E SURFACE MICRORELIEF TYPE, SIZE AND ORIENTATION
AUTUMN, 1985

SITE	DATE	EROSION	RESHUFFLED	DEPOSITION
A028	14/4	130D	125D*	
E002			125D*	
E004		162E	128D*	
E006		138,145E*	115D	
E008		132D	122,152C*	
E010		140E	120C*	
E012		150E	150E*	120D
E014		140C	123,160C*	C
E015-016		F-G		
E016		130,147F	135,150C*	C
E018		130C	158C*	C
E020		138,145D	153C*	110,155D
E022		138E	115,150C*	150D
E024		135D	149D*	149D
E026	16/4	140D	128C*	
E028		140D	140,105D*	
E030		140C*	120,135C	
E031		E		
E032		140D*	125,130C	
E034		120C	120,130D*	
E036		125D*	120,125C	
E038		140D	125,110C*	
E040	17/4	135D	110,125D*	
E042		140E	115,125D*	
E044		135E	125D*	125E
E046		135E	120,125D*	110E
E048		130D	122D*	D
E050	18/4	120E	137E*	95E
E052		120D	135E*	95E
E054		130,100E	125,140E*	
E056	19/4	117E	115,135D*	105D
E058		125E	135E*	102C
E060		125,135E	115,135D*	95C
E062		120D	130E*	100D
E064		120,127E	112,127E*	100C
E066		127,135E	135E*	102C
E068		120,130E*	120E	110E
E070		125,130E	110,125E*	100E
E072		132E	127E*	90D
E075	21/4	128F	145E*	90D

* DENOTES THE DOMINANT SURFACE TYPE AT EACH SITE

APPENDIX IIIh
ROUTE E SURFACE MICRORELIEF TYPE, SIZE AND ORIENTATION
SPRING, 1985

SITE	DATE	GLAZE	EROSION	RESHUFFLED	DEPOSITION
A028	28/9	S	159F*	155E	
E004	29/9	W	165F*	170D	
E008		W	165,159F*	170D	170F
E012	03/10	W	168,161G*		
E016	04/10	W	155F*	153G	
E018-019				G	
E020		S	158G*		
E025		W	156,145F*	135E	
E029	06/10	M	140,145G*		
E033		M	158F*	D	
E037		VS	155,130F*	155D	
E041		W	150E*	136D	
E045	07/10	W	155,150E*	155E	
E050		W	150,130F*	150E	
E054	08/10	W	150,130D*	D	
E058	09/10	W	150E*	110E	110E
E062		W	140E*	100E	100E
E064			F-G		
E066		W	145E*	105E	105E
E070		W	145D*	E	E
E075	10/10	M	140E*	135E	E
E079	12/10	M	145E*	125D	105D
E083		M	145,120E*	125E	105E
E087		M	150,140E*	130D	100D
E091		M	154E*	130D	
E095		S	145,135E*	135E	E
E100	14/10	M	140E*	110E	
E104	16/10	M	137,113E*	110D	
E108		W	135D*	105D	
E112	17/10	M	133D*	108E	
E116		S	128C*	103E	103E
E120		S	133D*	105E	
E125		S	128E*	118F	
E129		VS	118D*	101E	
E133	18/10	W	128D*	108E	
E137		M	128,143D*	103E	
E141		S	128E*	108E	
E145		VS	143D*	111E	
E150		VS	120E*	108E	
E154		S	115B*	95D	
E158	19/10	M	115E*	100E	
E162		M	115D*	100D	
E166		S	115,95D*	97D	
E170		M	105C*	90E	
E175		S	119,104C*	89,104E	
E179	21/10	VS	105,115D*	95,115F	
E183		M	108,115C*	115D	
E187		S	115D*	90E	100E
E191		S	115E*	100D	
E195		M	110D*	100,110E	120E
E200	22/10	M	103E*	103E	

APPENDIX IIIh
ROUTE E SURFACE MICRORELIEF TYPE, SIZE AND ORIENTATION
SPRING, 1985

SITE	DATE	GLAZE	EROSION	RESHUFFLED	DEPOSITION
E204	26/10	W	108E*	93E	
E208		VS	103D*	103D	
E212		S	108,103E*	103D	
E216		VS	105,113E*	103C	
E220		S	111E*	103D	
E225	27/10	M	110E*	104E	
E229		S	110C*	102E	
E233		S	112E*	117E	
E237		S	114E*	122E	47E
E240				F-G	
E241		M	112,122E*	119E	
E245		M	117,127D*	122E	
E250	28/10	S	115,135E*	100,120G	135G
E254	31/10	VS	116D	106F	
E258		M	115D*	105E	
E262		M	115,130D*	110D	
E266		M	115,130E*	110D	
E270	01/11	M	120D*	120D	
E275		M	122,134E*	122D	
E279		M	120E*	117E	
E283		W	122,132E*	122D	117F
E287		W	117,127E*	117D	117G
E291		M	117,107E*	117E	
E295		S	117,132E*		
E300	02/11	M	116,126E*	116D	101G
E304		S	119,116E*		G
E308		S	136,151C*	136E	G
E312		M	126,111E*	126D	126F
E316		M	131,121E*	126D	
E320		W	136,151E*	128D	136F
E325	03/11	M	137,127E*	135E	
E328			G		
E329		M	137F*		137G
E333		W	132,147F*		107G
E337		W	132E*	132E	132E
E341		W	132,127E*	132D	117G
E345		M	132E*	D	112F
E350	04/11	W	125E*		100,130E
E354	07/11	W	125,130E*	110E	
E358		W	130,140E*	110E	
E362		W	130,125D*	105D	
E366		W	130,125E*	130D	
E370		W	130E*	130D	
E375		M	124E*	178C	91G

* DENOTES THE DOMINANT SURFACE TYPE AT EACH SITE

APPENDIX IIIi
ROUTE E 20 km MEAN SURFACE MICRORELIEF BALANCE
AUTUMN, 1985

MARK	DEPOSITIONAL MICRORELIEF m	EROSIONAL MICRORELIEF m	BALANCE D - E m
E005	0.13	0.23	-0.10
E010	0.15	0.30	-0.15
E015	0.14	0.30	-0.16
E020	0.13	0.24	-0.11
E025	0.13	0.16	-0.03
E030	0.12	0.14	-0.02
E035	0.12	0.16	-0.04
E040	0.16	0.21	-0.05
E045	0.24	0.27	-0.03
E050	0.27	0.24	0.03
E055	0.24	0.27	-0.03
E060	0.24	0.27	-0.03
E065	0.30	0.27	0.03
E070	0.30	0.35	-0.05

APPENDIX IIIj
ROUTE E 20 km MEAN SURFACE MICRORELIEF BALANCE
SPRING, 1985

MARK	DEPOSITIONAL MICRORELIEF m	EROSIONAL MICRORELIEF m	BALANCE D - E m
E005	0.33	0.55	-0.22
E010	0.55	0.78	-0.23
E015	1.00	0.78	0.22
E020	0.77	0.70	0.07
GD01	0.30	0.78	-0.48
E030	0.15	0.78	-0.63
E035	0.15	0.55	-0.40
E040	0.20	0.38	-0.18
E045	0.25	0.38	-0.13
GD02	0.15	0.35	-0.20
E055	0.15	0.23	-0.08
E060	0.30	0.43	-0.13
E065	0.30	0.38	-0.08
E070	0.30	0.25	0.05
GD03	0.23	0.30	-0.07
E080	0.23	0.30	-0.07
E085	0.23	0.30	-0.07
E090	0.25	0.30	-0.05
E095	0.30	0.30	0.00
GD04	0.23	0.30	-0.07
E105	0.15	0.23	-0.08
E110	0.23	0.15	0.08
E115	0.30	0.10	0.20
E120	0.38	0.25	0.13
GD05	0.43	0.23	0.20
E130	0.38	0.15	0.23
E135	0.30	0.15	0.15
E140	0.30	0.20	0.10
E145	0.30	0.25	0.05
GD06	0.23	0.16	0.07
E155	0.23	0.16	0.07
E160	0.23	0.16	0.07
E165	0.20	0.17	0.03
E170	0.25	0.08	0.17
GD07	0.43	0.10	0.33
E180	0.35	0.10	0.25
E185	0.23	0.10	0.13
E190	0.25	0.20	0.05
E195	0.25	0.25	0.00
GD08	0.30	0.30	0.00
E205	0.23	0.23	0.00
E210	0.15	0.23	-0.08
E215	0.12	0.30	-0.18
E220	0.17	0.30	-0.13
GD09	0.30	0.17	0.13
E230	0.30	0.17	0.13
E235	0.43	0.30	0.13
E240	0.40	0.25	0.15
E245	0.43	0.25	0.18

APPENDIX IIIj
ROUTE E 20 km MEAN SURFACE MICRORELIEF BALANCE
SPRING, 1985

MARK	DEPOSITIONAL MICRORELIEF m	EROSIONAL MICRORELIEF m	BALANCE D - E m
GD10	0.63	0.23	0.40
E255	0.43	0.15	0.28
E260	0.23	0.15	0.08
E265	0.15	0.23	-0.08
E270	0.15	0.25	-0.10
GD11	0.23	0.30	-0.07
E280	0.50	0.30	0.20
E285	0.70	0.30	0.40
E290	0.50	0.30	0.20
E295	0.65	0.30	0.35
GD12	1.00	0.30	0.70
E305	0.85	0.17	0.68
E310	0.63	0.17	0.46
E315	0.42	0.30	0.12
E320	0.33	0.30	0.03
GD13	0.50	0.62	-0.12
E330	0.85	0.70	0.15
E335	0.65	0.43	0.22
E340	0.78	0.30	0.48
E345	0.52	0.30	0.22
GD14	0.30	0.30	0.00
E355	0.30	0.30	0.00
E360	0.23	0.23	0.00
E365	0.15	0.25	-0.10
E370	0.33	0.30	0.03

APPENDIX IVa
ROUTE A SURFACE DENSITY AND HARDNESS
EARLY AUTUMN, 1985

DATE	SITE	DENSITY $kg/m^3 \times 10^3$		HARDNESS $kg/m^2 \times 10$		TYPE
		0-5cm	5-10cm	0-5cm	5-10cm	
	A015/1	0.350	0.340	0.5	2.5	db
01/4	A017/1	0.460	0.440	2	4.5	ef
	A018	0.330	0.360	3	8.5	ef
	A019	0.354	0.360	4	8	ep
		0.550		0.5		dd
03/4	A020	0.436	0.304	8	0.5	ep
	A021	0.500	0.476	3	3	ef
	A022	0.374	0.380	1	15	ef
09/4	A022A	0.430	0.340	15	1	ep
	A023A	0.376	0.410	8	15	ep
	A023B	0.500	0.390	6	5	ep
13/4	A025	0.380	0.340	15	2	ef
	A025/2	0.470	0.390	15	2	ef
	A026	0.440	0.400	15	15	ep
	A026/2	0.390	0.470	0.5	15	rb
14/4	A027/2	0.400	0.380	0.5	4.5	rb
		0.500		20		eb
	A028	0.410	0.380	1.5	0.5	rb
		0.440		15		eb

APPENDIX IVb
ROUTE A SURFACE DENSITY AND HARDNESS DATA
LATE AUTUMN, 1985

DATE	SITE	DENSITY $kg/m^3 \times 10^3$		HARDNESS $kg/m^2 \times 10$		TYPE
		0-5cm	5-10cm	0-5cm	5-10cm	
13/5	A024/2	0.424	0.360	25	3	ep
	A023A	0.430	0.430	7	10	ep
	A022B	0.380	0.400	7	7	ep
21/5	A021	0.444		60		eg
22/5	A022	0.380	0.356	5	3	ep
	A018	0.416	0.410	9	9	ep
	A017/1	0.460		60		ep
	A015/1	0.444	0.446	30	30	ep

APPENDIX IVc
ROUTE A SURFACE DENSITY AND HARDNESS
SPRING, 1985

DATE	SITE	DENSITY $kg/m^3 \times 10^3$		HARDNESS $kg/m^2 \times 10$		TYPE
		0-5cm	5-10cm	0-5cm	5-10cm	
21/9	A015/1	0.414	0.364	8	5.5	db
	A017/1	0.374	0.386	6	3	db
	A018	0.350	0.362	4.5	1.5	db
	A019	0.286	0.360	0.25	9.5	rb
22/9	A021	0.440	0.380	4	25	eg
	A022	0.394	0.374	5	3.5	eg
	A022B	0.432	0.422	8	10	rb
	A023B	0.394	0.330	12	4	eg
24/9	A024/2	0.390	0.396	15	15	eg
		0.370	0.394	3.5	4	rb
27/9	A025	0.412	0.430	9	65	eg
	A025/2	0.414	0.370	20	4.5	eg
	A026	0.468	0.316	12	2.5	eg
28/9	A026/2	0.450	0.366	11	6	eg
	A028	0.440	0.400	10	7.5	eg
		0.420	0.390	2	4	rb

APPENDIX IVd
ROUTE E SURFACE DENSITY AND HARDNESS
LATE AUTUMN, 1985

DATE	SITE	DENSITY $kg/m^3 \times 10^3$		HARDNESS $kg/m^2 \times 10$		TYPE
		0-5cm	5-10cm	0-5cm	5-10cm	
14/4	GD004	0.350	0.450	1.5	15	rb
	GD008	0.380	0.380	1.5	3.5	rb
	GD012	0.440		15		eb
		0.340		2		rb
	GD016	0.310	0.460	1	15	rb
		0.460				eb
	GD020	0.320	0.400	2	12	rb
	GD024	0.340	0.460	5	15	rb
16/4	GD028	0.390	0.330	2	0.5	rb
	GD032	0.320	0.394	1	5	rb
	GD036	0.440	0.460	8.5	10	eb
17/4	GD040	0.364	0.360	2	5	rb
	GD044	0.420	0.500	2	10	ef
		0.360		0.5		rb
		0.424				dd
	GD048	0.370	0.384	0.5	12	rb
18/4	GD052	0.360	0.380	3	7	rb
19/4	GD056	0.360		6		el
	GD060	0.340	0.410	3.5	12	rb
		0.394		1.5		eb
	GD064	0.380	0.320	7	1	ep
		0.480		12		eb
	GD068	0.400	0.390	2	4	rb
		0.350	0.440	5	10	eb
	GD072	0.340	0.360	3	2.5	rb
22/4	GD03	0.364	0.360	1	1	rb
		0.476		30		eb
		0.340	0.350	2.5	2.5	ep
23/4	GD03+8	0.360	0.452	4	20	ep
	GD03+16	0.370	0.410	3	15	rb
25/4	GD03+24	0.360	0.404	4	12	ep
	GD03+32	0.354	0.360	5	12	ep
26/4	GD03+48	0.360	0.340	10	8	ep
		0.350		6.5		rb
27/4	GD03+56	0.350	0.346	3		ep
		0.440	0.410	15	10	eb
	GD03+64	0.396	0.456	2.5	20	ep
29/4	GC24	0.360	0.390	4.5	8	ep
		0.364	0.370	9	5	eb
		0.225				db
1/5	GC24+12	0.470	0.420	15	15	ep
	GC24+20	0.350	0.300	4	0.5	ep
2/5	GC23	0.400		1		rb
		0.404		15		ep
	GC23+8	0.310	0.380	3.5	15	ep
	GC23+16	0.410	0.400	0.5	15	ep
	GC22	0.400	0.330	15	3.5	ep
8/5	GC22+8	0.310	0.454	1.5	30	ep
9/5	GC22+16	0.436	0.440	50	15	ep
10/5	GC21	0.304	0.420	1.5	40	ep

APPENDIX IVd
ROUTE E SURFACE DENSITY AND HARDNESS
LATE AUTUMN, 1985

DATE	SITE	DENSITY $kg/m^3 \times 10^3$		HARDNESS $kg/m^2 \times 10$		TYPE
		0-5cm	5-10cm	0-5cm	5-10cm	
	GC21+8	0.452	0.444	6	25	ep
11/5	GC21+16	0.460	0.420	4	30	ep
12/5	GC20	0.454	0.460	15	30	ep
	"	0.476		10		dd
13/5	GC20+8	0.440	0.476	20	25	ep
	GC20+16	0.364	0.422	2.5	12	dd
		0.476		12		ep

APPENDIX IVe
ROUTE E SURFACE DENSITY AND HARDNESS
SPRING, 1985

DATE	SITE	DENSITY $kg/m^3 \times 10^3$		HARDNESS $kg/m^2 \times 10$		TYPE
		0-5cm	5-10cm	0-5cm	5-10cm	
28/9	A028	0.440	0.400	10	7.5	eg
		0.420	0.390	2	4	r
		0.394	0.350	6.5	7.5	eg
29/9	GD004	0.360	0.374	7.5	3	ef
		0.510		70		eb
	GD008	0.434	0.394	12	7	ef
		0.510		70		eb
03/10	GD012	0.494	0.494	90	90	ep
		0.420	0.330	20	8.5	ef
		0.410		20		eg
			0.520		4	el
04/10	GD016	0.510	0.510	15	45	eg
	GD020	0.438	0.436	25	15	eg
05/10	GD01	0.480	0.480	30	65	eg
		0.354	0.400	10	15	eg
		0.490	0.450	8	3	rb
06/10	GD029	0.396	0.430	40	40	eg
		0.414	0.386	70	15	eb
	GD033	0.378	0.376	15	9	eg
		0.438		25		ef
	GD037	0.436	0.444	11	11	eg
		0.380	0.390	10	6	eg
		0.402		70		eg
	GD041	0.386	0.420	10	6	eg
07/10	GD045	0.394	0.390	15	5.5	eg
		0.490		9		ef
	GD02	0.380	0.362	15	3	eg
		0.450		50		eb
		0.494		3		rb
08/10	GD054	0.320	0.416	2	25	eg
09/10	GD058	0.356	0.380	3	5	eg
	GD062	0.320	0.350	3	2.5	eg
	GD066	0.332	0.324	5	3	eg
		0.454		50		ef
	GD070	0.326	0.364	5	3	eg
10/10	GD03	0.350	0.340	4.5	2	eg
		0.260		0.5		dd
		0.440		30		ef
12/10	GD079	0.384	0.380	10	10	eg
	GD083	0.384	0.400	5.5	40	eg
	GD087	0.332	0.434	6	80	eg
	GD091	0.396	0.376	15	6.5	eg
	GD095	0.390	0.390	15	9	eg
14/10	GD04	0.360	0.300	12	1	eg
		0.436		10		rb
		0.474		25		ef
		0.480		40		ef
16/10	GD104	0.376	0.316	8	2	eg
	GD108	0.356	0.320	10	4.5	eg
		0.324		2		rb

APPENDIX IVe
ROUTE E SURFACE DENSITY AND HARDNESS
SPRING, 1985

DATE	SITE	DENSITY $kg/m^3 \times 10^3$ 0-5cm	DENSITY $kg/m^3 \times 10^3$ 5-10cm	HARDNESS $kg/m^2 \times 10$ 0-5cm	HARDNESS $kg/m^2 \times 10$ 5-10cm	TYPE
17/10	GD112	0.392	0.364	4.5	2	eg
	GD116	0.380	0.404	12	15	eg
	GD120	0.344	0.390	5	12	eg
	GD05	0.400	0.384	12	12	eg
		0.390	0.376			rb
		0.480		90		eb
	GD129	0.364	0.304	10	2	eg
18/10	GD133	0.344	0.366	4.5	6	eg
	GD137	0.376	0.376	10	10	eg
	GD141	0.344	0.350	4	4	eg
	GD145	0.410	0.316	15	2	eg
18/10	GD06	0.424	0.396	30	12	eg
		0.426		15		rb
		0.450		35		eb
	GD154	0.400	0.320	15	2	eg
19/10	GD158	0.370	0.340	7.5	7.5	eg
	GD162	0.416	0.376	10	4	eg
	GD166	0.408	0.396	8	8	eg
	GD170	0.384	0.340	7	10	eg
	GD07	0.440	0.384	40	40	eg
21/10	GD179	0.420	0.340	9.5	3.5	eg
	GD183	0.388	0.336	7	3	eg
	GD187	0.432	0.380	20	10	eg
	GD191	0.410	0.332	20	2	eg
	GD195	0.400	0.364	50	6	eg
22/10	GD08	0.456	0.410	30	20	eg
26/10	GD204	0.380	0.420	7	12	eg
	GD208	0.390	0.412	12	20	eg
	GD212	0.404	0.390	4	8	eg
	GD216	0.380	0.350	7	3.5	eg
	GD220	0.396	0.404	7	10	eg
27/10	GD09	0.410	0.380	15	12	eg
		0.420	0.480	45	65	eg
	GD229	0.400	0.364	12	6	eg
	GD233	0.390	0.390	15	10	eg
	GD237	0.368	0.410	2.5	10	eg
	GD241	0.390	0.390	15	10	eg
	GD245	0.380	0.410	15	12	eg
28/10	GD10	0.368	0.400	5	15	eg
		0.392	0.360	10	3	ef
		0.432		35		dd
31/10	GD254	0.396	0.380	7	7	eg
	GD258	0.340	0.348	5.5	9	eg
	GD262	0.392	0.340	10	1	eg
	GD266	0.360	0.360	6.5	5	eg
01/11	GD270	0.400	0.396	12	10	eg
	GD11	0.372	0.404	5	12	eg
	GD279	0.370	0.416	9	12	eg
	GD283	0.320	0.380	3	3.5	eg
	GD287	0.320	0.396	0.5	5	eg

APPENDIX IVe
ROUTE E SURFACE DENSITY AND HARDNESS
SPRING, 1985

DATE	SITE	DENSITY $kg/m^3 \times 10^3$		HARDNESS $kg/m^2 \times 10$		TYPE
		0-5cm	5-10cm	0-5cm	5-10cm	
	GD291	0.344	0.390	3	10	eg
	GD295	0.360	0.364	5	5	eg
02/11	GD12	0.416	0.460	9	25	eg
		0.360	0.404	5	20	el
	GD304	0.340	0.368	8	8	eg
	GD308	0.384	0.356	12	10	eg
	GD312	0.384	0.370	9	9	eg
	GD316	0.368	0.288	9	1	eg
	GD320	0.308	0.368	1	15	eg
03/11	GD13	0.368	0.384	12	9	eg
		0.452		12		rb
	GD329	0.344	0.390	7.5	30	eg
	GD333	0.376	0.400	6.5	10	eg
	GD337	0.380	0.360	8	4	eg
	GD341	0.380	0.364	10	8	eg
	GD345	0.380	0.404	10	12	eg
04/11	GD14	0.380	0.408	7	7	eg
		0.440		6		dd
07/11	GD354	0.356	0.416	4	10	eg
	GD358	0.360	0.390	3	3	eg
	GD362	0.400	0.364	10	6.5	eg
	GD366	0.384	0.400	5	5	eg
	GD370	0.380	0.390	3	12	eg
12/11	GD15	0.396	0.404	5	7	eg
		0.250	0.208	0.5	0.5	dd

APPENDIX IVf
ROUTE E 20 km MEAN SURFACE DENSITY
SPRING, 1985

MARK	DENSITY $kg/m^3 \times 10^3$ 0-10cm	MARK	DENSITY $kg/m^3 \times 10^3$ 0-10cm
E005	0.40	E195	0.40
E015	0.44	E200	0.42
E020	0.48	E205	0.40
E025	0.45	E210	0.40
E030	0.40	E215	0.38
E035	0.41	E220	0.39
E040	0.41	E225	0.39
E045	0.39	E230	0.39
E050	0.37	E235	0.39
E055	0.37	E240	0.39
E060	0.35	E245	0.39
E065	0.34	E250	0.39
E070	0.34	E255	0.37
E075	0.36	E260	0.36
E080	0.39	E265	0.38
E085	0.39	E270	0.38
E090	0.39	E275	0.39
E095	0.37	E280	0.37
E100	0.34	E285	0.35
E105	0.34	E290	0.36
E110	0.36	E295	0.38
E115	0.38	E300	0.40
E120	0.38	E305	0.36
E125	0.36	E310	0.37
E130	0.35	E315	0.33
E135	0.36	E320	0.35
E140	0.36	E325	0.37
E145	0.37	E330	0.38
E150	0.39	E335	0.38
E155	0.36	E340	0.38
E160	0.38	E345	0.39
E165	0.39	E350	0.39
E170	0.39	E355	0.38
E175	0.40	E360	0.38
E180	0.37	E365	0.39
E185	0.38	E370	0.39
E190	0.38		

APPENDIX Va
ROUTE E 10 m DEPTH FIRN TEMPERATURES
1985

SITE	DATE MEAS	DEPTH m	TEMP °C	ALTITUDE m
GD01	05/10	10.4	-27.18	1626
GD02	07/10	10.3	-28.03	1731
GD03	12/12	10.0	-29.41	1832
GD04	08/12	10.0	-29.09	1829
GD05	07/12	10.1	-28.86	1836
GD06	03/12	10.0	-28.92	1887
GD07	02/12	10.1	-29.70	1977
GD08	30/11	10.1	-30.53	2046
GD09	26/11	10.0	-31.46	2138
GD10	25/11	10.2	-32.41	2210
GD11	24/11	10.1	-32.77	2206
GD12	21/11	10.0	-32.70	2170
GD13	18/11	10.0	-32.46	2139
GD14	17/11	10.0	-32.75	2108
GD15	12/11	10.0	-33.26	2159
GC21	19/12	10.0	-24.76	1281
GC23	22/12	10.0	-23.86	1432

APPENDIX Vb
ROUTE E 20 m DEPTH FIRN TEMPERATURES
1985

SITE	DATE MEAS	DEPTH m	TEMP °C	ALTITUDE m
GD01	05/10	20.4	-27.58	1626
GD02	07/10	20.3	-28.41	1731
GD03	11/12	20.0	-29.42	1832
GD04	07/12	20.0	-28.89	1829
GD05	06/12	20.1	-28.73	1836
GD06	02/12	20.0	-28.90	1887
GD07	01/12	20.1	-29.55	1977
GD08	01/12	19.1	-30.37	2046
GD09	27/11	20.0	-31.32	2138
GD10	25/11	20.2	-32.22	2210
GD11	24/11	20.1	-32.63	2206
GD12	21/11	20.0	-32.64	2170
GD13	18/11	18.3	-32.33	2139
GD14	17/11	18.4	-32.56	2108
GD15	12/11	20.0	-33.25	2159
GC21	19/12	20.0	-24.74	1281

APPENDIX Vc
ROUTE E GD03 DEPTH - FIRN TEMPERATURE PROFILE
DATE 10 - 16/12/85

DEPTH m	TEMP °C
0.5	-22.61
1	-26.31
2	-29.20
3	-30.23
4	-30.68
5	-30.61
6	-30.00
8	-29.59
10	-29.41
12	-29.28
15	-29.25
20	-29.42
25	-29.59
30	-29.71

APPENDIX Vd
ROUTE E GD06 DEPTH - FIRN TEMPERATURE PROFILE
DATE 2 - 6/12/85

DEPTH m	TEMP °C
1	-28.67
2	-29.58
3	-30.23
4	-30.33
5	-30.15
6	-29.83
8	-29.28
10	-28.92
12	-28.76
15	-28.74
20	-28.90
25	-29.20
30	-29.32
34	-29.38

APPENDIX Ve
ROUTE E GD09 DEPTH - FIRN TEMPERATURE PROFILE
DATE 26 - 29/11/85

DEPTH m	TEMP °C
0.5	-27.18
1	-29.43
2	-31.69
3	-32.93
4	-33.18
5	-33.00
6	-32.60
8	-31.92
10	-31.46
12	-31.23
15	-31.15
20	-31.32
25	-31.46

APPENDIX Vf
ROUTE E GD12 DEPTH - FIRN TEMPERATURE PROFILE
DATE 19 - 23/11/85

DEPTH m	TEMP °C
0.5	-30.08
1	-32.17
2	-34.35
3	-35.00
4	-34.83
5	-34.73
6	-33.90
8	-32.90
10	-32.70
12	-32.55
13	-32.52
14	-32.55
15	-32.55
20	-32.64
25	-32.76

APPENDIX Vg
ROUTE E GD15 DEPTH - FIRN TEMPERATURE PROFILE
DATE 12 - 16/11/85

DEPTH m	TEMP °C
1	-33.94
2	-35.40
4	-34.77
5	-34.37
6	-33.92
8	-33.46
10	-33.26
12	-33.18
15	-33.19
20	-33.25
25	-33.40
30	-33.56

APPENDIX VIa
ROUTE A GEODETIC POSITION CONTROL

MARK	DIST km	LAT deg	LONG deg	ELEV m
A015	0.00	-67.3303	112.3087	801
A021	43.70	-67.6849	112.0450	1053
A022	52.70	-67.7714	112.0463	1174
A024	76.5	-67.9833	112.1500	1294
A026/2	112.30	-68.2306	112.0814	1539
A028	124.10	-68.4061	112.2104	1607

APPENDIX VIb
ROUTES C AND D GEODETIC POSITION CONTROL

MARK	DIST km	LAT deg	LONG deg	ELEV m
AO24A	0.00	-67.9833	112.1500	1288
GC20	23.00	-68.0715	112.7035	1244
GC21	49.00	-68.1636	113.2625	1282
GC22	74.00	-68.2437	113.8060	1343
GC23	99.00	-68.3253	114.3776	1436
GC24	123.00	-68.4155	114.9121	1503
GD03	194.50	-69.0001	115.4957	1828

APPENDIX VIc
ROUTE E GEODETIC POSITION CONTROL

MARK	DIST km	LAT deg	LONG deg	ELEV m
A028	0.00	-68.4061	112.2104	1607
E001	2.09	-68.4159	112.2545	1607
E002	4.08	-68.4253	112.2965	1606
E003	6.07	-68.4346	112.3386	1622
E004	7.96	-68.4435	112.3786	1632
E005	9.85	-68.4524	112.4185	1626
E006	11.84	-68.4617	112.4606	1630
E007	13.83	-68.4711	112.5028	1627
E008	15.82	-68.4804	112.5449	1617
E009	17.81	-68.4897	112.5871	1629
E010	19.80	-68.4958	112.6338	1636
E011	21.79	-68.5017	112.6805	1635
E012	23.78	-68.5077	112.7273	1630
E013	25.77	-68.5137	112.7741	1633
E014	27.76	-68.5197	112.8208	1621
E015	29.75	-68.5257	112.8676	1612
E016	31.74	-68.5317	112.9145	1594
E017	33.73	-68.5377	112.9613	1590
E018	35.72	-68.5437	113.0081	1573
E019	37.71	-68.5512	113.0533	1573
E020	39.70	-68.5586	113.0985	1619
E021	41.69	-68.5660	113.1437	1645
E022	43.68	-68.5735	113.1889	1626
E023	45.67	-68.5809	113.2341	1604
E024	47.66	-68.5869	113.2811	1612
GD01	49.65	-68.5929	113.3280	1627
E026	51.64	-68.6022	113.3699	1632
E027	53.63	-68.6115	113.4119	1644
E028	55.62	-68.6208	113.4539	1639
E029	57.61	-68.6301	113.4959	1654
E030	59.60	-68.6380	113.5399	1681
E031	61.59	-68.6459	113.5839	1679
E032	63.58	-68.6538	113.6280	1684
E033	65.57	-68.6617	113.6721	1694
E034	67.56	-68.6696	113.7162	1702
E035	69.55	-68.6775	113.7603	1707
E036	71.54	-68.6854	113.8044	1704
E037	73.53	-68.6934	113.8485	1706
E038	75.52	-68.7013	113.8927	1708
E039	77.51	-68.7092	113.9368	1716
E040	79.50	-68.7171	113.9810	1716
E041	81.49	-68.7250	114.0252	1710
E042	83.48	-68.7329	114.0694	1705
E043	85.47	-68.7417	114.1125	1710
E044	87.46	-68.7504	114.1555	1706
E045	89.45	-68.7592	114.1986	1698
E046	91.44	-68.7679	114.2417	1704
E047	93.43	-68.7766	114.2849	1715
E048	95.42	-68.7854	114.3280	1723
E049	97.41	-68.7942	114.3711	1724
GD02	99.40	-68.8029	114.4143	1727

APPENDIX VIc
ROUTE E GEODETIC POSITION CONTROL

MARK	DIST km	LAT deg	LONG deg	ELEV m
E051	101.39	-68.8110	114.4585	1737
E052	103.38	-68.8191	114.5028	1740
E053	105.37	-68.8272	114.5470	1746
E054	107.36	-68.8353	114.5913	1749
E055	109.35	-68.8434	114.6356	1751
E056	111.34	-68.8515	114.6799	1757
E057	113.33	-68.8596	114.7242	1765
E058	115.32	-68.8677	114.7686	1767
E059	117.31	-68.8758	114.8129	1769
E060	119.30	-68.8839	114.8573	1773
E061	121.29	-68.8920	114.9016	1781
E062	123.28	-68.9001	114.9460	1793
E063	125.27	-68.9082	114.9905	1810
E064	127.26	-68.9163	115.0349	1819
E065	129.25	-68.9244	115.0794	1820
E066	131.24	-68.9325	115.1238	1822
E067	133.23	-68.9406	115.1683	1823
E068	135.22	-68.9487	115.2128	1816
E069	137.21	-68.9568	115.2573	1815
E070	139.20	-68.9649	115.3018	1833
E071	141.19	-68.9730	115.3464	1839
E072	143.18	-68.9811	115.3909	1839
E073	145.17	-68.9892	115.4355	1834
E074	147.16	-68.9973	115.4801	1828
GD03	147.86	-69.0001	115.4957	1828
E076	149.85	-68.9973	115.5452	1827
E077	151.84	-68.9961	115.5952	1825
E078	153.83	-68.9948	115.6452	1826
E079	155.82	-68.9936	115.6952	1835
E080	157.81	-68.9923	115.7451	1837
E081	159.80	-68.9926	115.7953	1833
E082	161.79	-68.9945	115.8452	1835
E083	163.78	-68.9964	115.8951	1840
E084	165.77	-68.9983	115.9450	1838
E085	167.76	-68.9986	115.9951	1837
E086	169.75	-68.9973	116.0451	1839
E087	171.74	-68.9977	116.0953	1844
E088	173.73	-68.9980	116.1454	1844
E089	175.72	-68.9998	116.1953	1840
E090	177.71	-69.0017	116.2452	1840
E091	179.70	-69.0020	116.2954	1837
E092	181.69	-69.0023	116.3455	1833
E093	183.68	-69.0042	116.3954	1825
E094	185.67	-69.0061	116.4454	1819
E095	187.66	-69.0064	116.4955	1820
E096	189.65	-69.0067	116.5457	1821
E097	191.64	-69.0070	116.5958	1831
E098	193.63	-69.0074	116.6460	1834
E099	195.62	-69.0077	116.6961	1829
GD04	197.61	-69.0080	116.7463	1828
E101	199.60	-69.0100	116.7962	1831

APPENDIX VIc
ROUTE E GEODETIC POSITION CONTROL

MARK	DIST km	LAT deg	LONG deg	ELEV m
E102	201.59	-69.0165	116.8432	1832
E103	203.58	-69.0185	116.8931	1834
E104	205.57	-69.0174	116.9431	1847
E105	207.56	-69.0163	116.9931	1859
E106	209.55	-69.0152	117.0431	1859
E107	211.54	-69.0156	117.0933	1854
E108	213.53	-69.0161	117.1434	1848
E109	215.52	-69.0165	117.1936	1849
E110	217.51	-69.0169	117.2437	1847
E111	219.50	-69.0174	117.2939	1840
E112	221.49	-69.0178	117.3440	1839
E113	223.48	-69.0183	117.3942	1843
E114	225.47	-69.0203	117.4441	1847
E115	227.46	-69.0207	117.4942	1848
E116	229.45	-69.0227	117.5442	1848
E117	231.44	-69.0231	117.5943	1848
E118	233.43	-69.0236	117.6445	1846
E119	235.42	-69.0240	117.6946	1839
E120	237.41	-69.0245	117.7448	1837
E121	239.40	-69.0233	117.7948	1826
E122	241.39	-69.0222	117.8448	1826
E123	243.38	-69.0211	117.8949	1832
E124	245.37	-69.0200	117.9449	1833
GD05	247.36	-69.0204	117.9950	1834
E126	249.35	-69.0192	118.0448	1845
E127	251.44	-69.0196	118.0972	1858
E128	253.43	-69.0185	118.1470	1858
E129	255.52	-69.0189	118.1994	1863
E130	257.41	-69.0178	118.2467	1879
E131	259.40	-69.0150	118.2959	1885
E132	261.39	-69.0154	118.3458	1889
E133	263.38	-69.0143	118.3956	1881
E134	265.47	-69.0130	118.4479	1874
E135	267.56	-69.0118	118.5001	1869
E136	269.55	-69.0106	118.5499	1872
E137	271.64	-69.0094	118.6021	1866
E138	273.63	-69.0098	118.6520	1847
E139	275.71	-69.0085	118.7042	1842
E140	277.80	-69.0073	118.7565	1863
E141	279.89	-69.0077	118.8088	1869
E142	281.98	-69.0081	118.8612	1864
E143	283.97	-69.0054	118.9104	1870
E144	286.26	-69.0041	118.9676	1872
E145	288.25	-69.0045	119.0175	1869
E146	290.34	-69.0032	119.0697	1858
E147	292.53	-69.0037	119.1246	1863
E148	294.72	-69.0041	119.1795	1875
E149	296.81	-69.0045	119.2318	1879
GD06	298.90	-69.0049	119.2842	1884
E151	300.89	-69.0034	119.3337	1888
E152	302.98	-69.0051	119.3856	1897

APPENDIX VIc
ROUTE E GEODETIC POSITION CONTROL

MARK	DIST km	LAT deg	LONG deg	ELEV m
E153	304.97	-69.0052	119.4352	1906
E154	307.06	-69.0053	119.4873	1907
E155	309.15	-69.0054	119.5395	1904
E156	311.14	-69.0055	119.5891	1895
E157	313.23	-69.0055	119.6412	1897
E158	315.22	-69.0056	119.6909	1920
E159	317.31	-69.0057	119.7430	1940
E160	319.30	-69.0058	119.7926	1949
E161	321.29	-69.0059	119.8423	1950
E162	323.38	-69.0059	119.8944	1948
E163	325.46	-69.0060	119.9465	1942
E164	327.55	-69.0061	119.9986	1928
E165	329.44	-69.0062	120.0458	1923
E166	331.53	-69.0063	120.0979	1930
E167	333.72	-69.0063	120.1525	1937
E168	335.71	-69.0095	120.2014	1942
E169	337.70	-69.0127	120.2502	1947
E170	339.69	-69.0128	120.2998	1950
E171	341.68	-69.0129	120.3495	1954
E172	343.77	-69.0130	120.4016	1954
E173	345.86	-69.0130	120.4538	1958
E174	347.95	-69.0131	120.5059	1966
GD07	349.84	-69.0132	120.5531	1974
E176	351.83	-69.0129	120.6026	1979
E177	353.82	-69.0127	120.6521	1981
E178	355.81	-69.0124	120.7017	1976
E179	357.90	-69.0121	120.7536	1975
E180	359.89	-69.0118	120.8032	1976
E181	361.78	-69.0116	120.8502	1972
E182	363.67	-69.0113	120.8972	1968
E183	365.76	-69.0110	120.9492	1978
E184	367.95	-69.0107	121.0037	1988
E185	369.94	-69.0105	121.0532	1991
E186	371.93	-69.0102	121.1028	1988
E187	374.02	-69.0099	121.1548	1990
E188	376.01	-69.0096	121.2043	1991
E189	378.10	-69.0093	121.2563	1987
E190	380.09	-69.0091	121.3058	1995
E191	382.08	-69.0088	121.3553	2014
E192	384.07	-69.0085	121.4049	2028
E193	386.06	-69.0082	121.4544	2034
E194	388.15	-69.0080	121.5064	2034
E195	390.14	-69.0077	121.5559	2036
E196	392.13	-69.0074	121.6054	2043
E197	394.22	-69.0071	121.6574	2046
E198	396.21	-69.0069	121.7070	2047
E199	398.30	-69.0066	121.7590	2042
GD08	400.29	-69.0063	121.8085	2042
E201	402.28	-69.0063	121.8583	2049
E202	404.27	-69.0064	121.9082	2044
E203	406.26	-69.0064	121.9580	2040

APPENDIX VIc
ROUTE E GEODETIC POSITION CONTROL

MARK	DIST km	LAT deg	LONG deg	ELEV m
E204	408.25	-69.0064	122.0079	2048
E205	410.24	-69.0065	122.0577	2055
E206	412.23	-69.0065	122.1075	2062
E207	414.22	-69.0065	122.1574	2064
E208	416.21	-69.0066	122.2072	2064
E209	418.20	-69.0066	122.2570	2064
E210	420.19	-69.0066	122.3069	2062
E211	422.18	-69.0067	122.3567	2065
E212	424.17	-69.0067	122.4066	2070
E213	426.16	-69.0067	122.4564	2072
E214	428.25	-69.0068	122.5087	2078
E215	430.34	-69.0068	122.5611	2082
E216	432.23	-69.0068	122.6084	2088
E217	434.22	-69.0068	122.6583	2090
E218	436.21	-69.0069	122.7081	2103
E219	438.20	-69.0069	122.7579	2114
E220	440.19	-69.0069	122.8078	2118
E221	442.18	-69.0070	122.8576	2121
E222	444.17	-69.0070	122.9075	2121
E223	446.16	-69.0070	122.9573	2124
E224	448.15	-69.0071	123.0072	2129
GD09	450.14	-69.0066	123.0570	2135
E226	452.23	-69.0063	123.1093	2139
E227	454.22	-69.0061	123.1591	2142
E228	456.31	-69.0059	123.2114	2141
E229	458.40	-69.0056	123.2637	2137
E230	460.49	-69.0054	123.3160	2143
E231	462.48	-69.0051	123.3659	2149
E232	464.57	-69.0049	123.4182	2153
E233	466.66	-69.0046	123.4704	2155
E234	468.65	-69.0044	123.5203	2157
E235	470.73	-69.0041	123.5726	2158
E236	472.82	-69.0039	123.6249	2162
E237	474.81	-69.0036	123.6747	2166
E238	476.90	-69.0034	123.7270	2167
E239	478.99	-69.0031	123.7793	2166
E240	481.08	-69.0029	123.8316	2167
E241	483.07	-69.0026	123.8814	2171
E242	485.16	-69.0024	123.9337	2175
E243	487.25	-69.0021	123.9859	2182
E244	489.24	-69.0019	124.0357	2189
E245	491.33	-69.0016	124.0880	2191
E246	493.42	-69.0014	124.1403	2195
E247	495.41	-69.0012	124.1901	2203
E248	497.50	-69.0009	124.2424	2202
E249	499.59	-69.0006	124.2947	2205
GD10	501.68	-69.0004	124.3470	2206
E251	503.77	-68.9997	124.3994	2210
E252	505.76	-68.9990	124.4493	2212
E253	507.85	-68.9983	124.5018	2213
E254	509.94	-68.9975	124.5542	2221

APPENDIX VIc
ROUTE E GEODETIC POSITION CONTROL

MARK	DIST km	LAT deg	LONG deg	ELEV m
E255	512.03	-68.9968	124.6066	2230
E256	514.02	-68.9961	124.6565	2232
E257	516.11	-68.9954	124.7089	2224
E258	518.20	-68.9947	124.7614	2217
E259	520.29	-68.9940	124.8138	2219
E260	522.28	-68.9933	124.8637	2226
E261	524.36	-68.9926	124.9161	2230
E262	526.35	-68.9919	124.9660	2230
E263	528.44	-68.9911	125.0184	2228
E264	530.53	-68.9904	125.0708	2227
E265	532.62	-68.9897	125.1232	2227
E266	534.61	-68.9890	125.1732	2229
E267	536.70	-68.9883	125.2256	2229
E268	538.79	-68.9876	125.2780	2224
E269	540.78	-68.9869	125.3279	2218
E270	542.87	-68.9862	125.3803	2220
E271	544.96	-68.9855	125.4327	2228
E272	546.95	-68.9848	125.4826	2226
E273	549.04	-68.9840	125.5350	2216
E274	551.13	-68.9833	125.5874	2205
GD11	553.22	-68.9826	125.6398	2204
E276	555.31	-68.9828	125.6924	2217
E277	557.30	-68.9830	125.7424	2209
E278	559.39	-68.9831	125.7950	2204
E279	561.48	-68.9833	125.8475	2205
E280	563.57	-68.9835	125.9001	2201
E281	565.56	-68.9837	125.9501	2202
E282	567.65	-68.9839	126.0027	2197
E283	569.74	-68.9841	126.0552	2192
E284	571.83	-68.9843	126.1078	2196
E285	573.82	-68.9844	126.1578	2195
E286	575.91	-68.9846	126.2104	2193
E287	577.90	-68.9848	126.2604	2185
E288	579.98	-68.9850	126.3130	2186
E289	582.07	-68.9852	126.3655	2189
E290	584.16	-68.9854	126.4181	2186
E291	586.15	-68.9855	126.4681	2181
E292	588.24	-68.9857	126.5206	2174
E293	590.33	-68.9859	126.5732	2172
E294	592.32	-68.9861	126.6232	2160
E295	594.41	-68.9863	126.6758	2150
E296	596.50	-68.9865	126.7283	2143
E297	598.49	-68.9866	126.7783	2138
E298	600.58	-68.9868	126.8309	2142
E299	602.67	-68.9870	126.8834	2156
GD12	604.83	-68.9872	126.9378	2167
E301	606.89	-68.9864	126.9895	2171
E302	608.95	-68.9856	127.0411	2167
E303	611.01	-68.9848	127.0928	2163
E304	613.07	-68.9840	127.1445	2160
E305	615.13	-68.9832	127.1961	2158

APPENDIX VIc
ROUTE E GEODETIC POSITION CONTROL

MARK	DIST km	LAT deg	LONG deg	ELEV m
E306	617.19	-68.9825	127.2478	2152
E307	619.25	-68.9817	127.2995	2150
E308	621.31	-68.9809	127.3511	2149
E309	623.37	-68.9801	127.4028	2147
E310	625.43	-68.9793	127.4544	2145
E311	627.49	-68.9801	127.5060	2150
E312	629.55	-68.9809	127.5575	2158
E313	631.61	-68.9818	127.6091	2156
E314	633.67	-68.9826	127.6606	2158
E315	635.73	-68.9834	127.7122	2159
E316	637.79	-68.9843	127.7637	2156
E317	639.85	-68.9851	127.8153	2153
E318	641.91	-68.9859	127.8669	2151
E319	643.97	-68.9867	127.9184	2151
E320	646.03	-68.9876	127.9700	2154
E321	648.09	-68.9884	128.0216	2152
E322	650.15	-68.9892	128.0732	2137
E323	652.21	-68.9900	128.1247	2136
E324	654.27	-68.9925	128.1758	2143
GD13	656.33	-68.9933	128.2274	2135
E326	658.29	-68.9933	128.2765	2133
E327	660.25	-68.9933	128.3256	2122
E328	662.31	-68.9933	128.3772	2127
E329	664.37	-68.9933	128.4289	2130
E330	666.43	-68.9933	128.4806	2121
E331	668.49	-68.9933	128.5322	2117
E332	670.55	-68.9933	128.5839	2116
E333	672.61	-68.9932	128.6356	2119
E334	674.67	-68.9932	128.6872	2118
E335	676.73	-68.9932	128.7389	2119
E336	678.79	-68.9948	128.7904	2119
E337	680.85	-68.9965	128.8420	2115
E338	682.91	-68.9981	128.8935	2116
E339	684.97	-68.9997	128.9451	2117
E340	686.92	-69.0012	128.9940	2119
E341	688.98	-69.0028	129.0456	2126
E342	691.04	-69.0044	129.0972	2127
E343	693.21	-69.0061	129.1513	2119
E344	695.16	-69.0076	129.2003	2106
E345	697.22	-69.0092	129.2519	2106
E346	699.28	-69.0109	129.3035	2110
E347	701.34	-69.0125	129.3550	2110
E348	703.40	-69.0141	129.4066	2103
E349	705.46	-69.0157	129.4582	2101
GD14	707.52	-69.0173	129.5098	2105
E351	709.58	-69.0168	129.5617	2120
E352	711.64	-69.0164	129.6136	2135
E353	713.70	-69.0159	129.6655	2145
E354	715.76	-69.0155	129.7174	2150
E355	717.82	-69.0150	129.7693	2153
E356	719.88	-69.0145	129.8212	2158

APPENDIX VIc
ROUTE E GEODETIC POSITION CONTROL

MARK	DIST km	LAT deg	LONG deg	ELEV m
E357	721.94	-69.0141	129.8731	2157
E358	724.00	-69.0136	129.9250	2158
E359	726.06	-69.0132	129.9769	2172
E360	728.12	-69.0127	130.0288	2177
E361	730.18	-69.0122	130.0807	2168
E362	732.24	-69.0118	130.1326	2165
E363	734.30	-69.0113	130.1845	2160
E364	736.47	-69.0108	130.2390	2163
E365	738.42	-69.0104	130.2883	2168
E366	740.48	-69.0099	130.3402	2170
E367	742.54	-69.0095	130.3921	2161
E368	744.60	-69.0090	130.4440	2155
E369	746.66	-69.0086	130.4959	2153
E370	748.72	-69.0081	130.5478	2155
E371	750.78	-69.0076	130.5997	2161
E372	752.84	-69.0072	130.6515	2162
E373	754.90	-69.0067	130.7034	2155
E374	756.96	-69.0063	130.7553	2150
GD15	759.02	-69.0058	130.8072	2155

REFERENCES

Drewry, D.J. (Ed.) (1983). *Antarctica: glaciological and geophysical folio.* Scott Polar Research Institute, Cambridge.

Fujiwara, K. *and* Yasoicho, E. (1971). Preliminary report of glaciological studies. In: M. Murayama (Ed.). *Report of the Japanese traverse, Syowa-South Pole 1968-1969.* Polar Research Centre, National Science Museum, Tokyo.

Zwally, H.J., Bindschadler, R.A., Brenner, A.C., Martin, T.V. *and* Thomas, T.H. (1983). Surface elevation contours of Greenland and Antarctic ice sheets. *Journal of Geophysical Research 88*:1589-1596.

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