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Firm core data from shallow drilling investigations
in eastern Wilkes Land, East Antarctica

Ian D. Goodwin



ANTARCTIC DIVISION
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FIRN CORE DATA FROM SHALLOW DRILLING INVESTIGATIONS IN EASTERN WILKES LAND, EAST ANTARCTICA

by

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ABSTRACT

A shallow firn core drilling program was conducted in eastern Wilkes Land in 1985 by an ANARE glaciological team. In conjunction with surveys carried out on ice sheet topography and snow surface characteristics, 250 m of firn cores were retrieved from 15 shallow boreholes to investigate the firn-pack structure and firn stratigraphy. Firn layer density, grain size and visible stratigraphy were measured on all cores. The measured firn core data are presented.

1. INTRODUCTION

A major objective of the International Antarctic Glaciological Project (IAGP) over the past decade has been to measure and define the mass balance distribution over the Wilkes Land region of the East Antarctic ice sheet. Australia has participated by conducting Australian National Antarctic Research Expeditions (ANARE) glaciological traverses in Wilkes Land between 1971 and 1986. These traverses operated from Casey station (66°17'S, 110°33'E) and achieved the greatest areal coverage of Wilkes Land from 1978-86 by establishing an eastern (E), southern (A) and western (W) route (Figure 1). The E and W routes approximately traverse the 2000 m contour between 95°E and 131°E, whilst route A extends from the coast to 74°S inland approximately along the 112°E longitude.

During 1985, in conjunction with the resurvey of route E, shallow firn core drilling and stratigraphic investigations were carried out at 50 km intervals between 112°E and 132°E. This route is located wholly within the katabatic slope region of East Antarctica. The dominating feature of the region is the persistent katabatic wind which drains cold air down from the ice sheet's interior to the coast. This katabatic wind is fundamental in controlling the firnification processes operating at the snow surface and within the snow/firn-pack.

Preliminary snow stratigraphic investigations were carried out in 2-3 m deep pits along the same route in 1982, and were reported by Jones (1983). These observations showed that the region was dominated by annual net accumulation which was marked by thin ice crusts in the snow-pack. These ice crusts were attributed to surface sintering of saltating snow grains following kinetic energy loss under constantly strong katabatic wind flow. Jones (1983) also reported the formation of thin radiation glazes during the summer season. From his observations it was recognised that a detailed investigation of the physical characteristics and stratigraphy of the firn-pack could produce extended records of annual net accumulation and define the firn-pack structure for later correlation with remotely sensed data, in particular satellite passive microwave (FSMR) data.

This report lists the firn core data obtained during the 1985 drilling and stratigraphic investigations and describes the drilling operations. Detailed density, grain size and visible stratigraphic profiles were measured in the field on a total of 250 m of firn cores drilled from 15 boreholes ranging from 10-35 m in depth. Temporal accumulation records have been interpreted from both the firn core data listed in this report and additional oxygen-isotope measurements made on the cores in Australia. A major supporting data bank on snow surface characteristics, accumulation rates and topography obtained in 1985 along route E is reported in Goodwin (1988).

2. DRILLING METHODS

A total 250 m of firm cores were drilled and retrieved using the PICO (Polar Ice Coring Office) lightweight hand-operated coring auger described by Koci and Kuivinen (1984). The components of the auger are shown in Figure 2.

Shallow boreholes were drilled at 5 m, 10 m and 30-35 m depths along the traverse route. The drilling sites were located at each of the 15 Doppler satellite positioning survey stations spaced at 50 km intervals along the route. They are denoted by the prefix GD in Figure 1. The 10 m boreholes were drilled to obtain firm core representing accumulation over the previous decade (1975-85). These holes were extended to 30-35 m depth at 150 km intervals along the route (GD03, GD06, GD09, GD12 and GD15) to represent accumulation over the past five decades (1935-85). These depths were estimated from accumulation rates measured on marker canes at the surface between 1982 and 1985, prior to the drilling operations. The 5 m depth holes were adjacent (within 1 m) to the deeper 30-35 m depth poles to provide duplicate cores for additional measurements.

The 10 m holes were drilled without lifting tackle and the total drilling time including setting up and logging the core totalled 1.5 hours. For holes drilled deeper than 10 m a 'tripod' system was used to lift the drill string. The 'tripod' consisted of a bipod constructed from scaffold pipe erected on the raised (1.5 m high) blade of a Caterpillar D5 tractor. The bipod arrangement was supported by rope and chain to the rear of the cabin. The tripod was 6 m above the drilling platform. This enabled 5 m lengths of the drill string to be assembled or disassembled in the hole, each time the string was raised or lowered. The lifting tackle comprised 15 mm thick manilla rope, one double sheaf block and one single sheaf block. To break the core before raising the drill string, two loops of rope were attached around the T handle, to take the full weight of the drill and to apply a constant force, whilst two people lifted the T handle with a jerking motion. This method of lifting and breaking proved to be simple and effective. The total drilling time for 0-25 m, 0-30 m and 0-35 m depths was 5.5 hours, 8.5 hours and 13 hours respectively. All cores were logged on site. The drilling process is illustrated in Plates 1 - 9.

Excellent core retrieval and quality was achieved using 45° angled, drill head cutters and a 2 m long core barrel. Generally, each retrieved core section was between 0.85 and 1.1 m long.

3. FIRN CORE MEASUREMENTS AND DATA

Following the completion of the drilling and core retrieval phase at each site, the cores were measured and sampled in a field laboratory (Plate 9). The cores, except GD06 and GD09 which were archived for detailed analysis in Australia, were measured for visible stratigraphy, grain size and density. The methods are outlined below.

3.1 VISIBLE STRATIGRAPHY AND GRAIN SIZE MEASUREMENTS

Core sections were measured and logged for visible stratigraphy and grain size on a transmission light box in the outer cold room of the laboratory. The temperature of the work area was maintained by the outside ambient air temperature, which was generally -15 to -35°C. The position of every optically different firn layer was measured by tape and the corresponding grain size of each layer was measured using a hand held 7 x optical magnifier with a 0.1 mm resolving graticule. Thus, the grain size measurements were made on bulk longitudinal sections. Ice crusts, including transparent radiation crusts/glazes and opaque wind crusts/glazes were described and their thickness measured.

3.2 DENSITY MEASUREMENTS

Density measurements were made on every layer identified in the visible stratigraphy. Each firn layer was cut from the remaining core section and its diameter and length measured using vernier calipers and weighed on a 2.5 kg beam balance. The densities were then calculated from the core dimensions and core mass.

3.3 FIRN CORE DATA

Firn core data comprising layer density, grain size and ice crust thickness are listed for the borehole sites (except GD06 and GD09) in Appendixes I to XIII. The corresponding density, grain size and ice crust profiles for each borehole site are shown in Figures 3 to 15. Density and grain size data are tabulated against the bottom depth of the corresponding layer thickness whilst the ice crust data are plotted against actual depth of occurrence. The site characteristics for each borehole are listed in Table 1. These include geographic position, surface elevation, accumulation rate and mean annual surface temperature. Detailed firn temperature-depth profiles for each borehole are reported in Goodwin (1988).

Both the firn layer density and grain size profiles display cyclicity, which results from the development of depth hoar within the annual firn layer. The depth hoar corresponds to the lower density values in the profile and develops beneath the strong ice crusts identified by the visible stratigraphy, as a result of upward water vapour transport under strong temperature gradients. The ice crusts represent the successive seasonal surface layers which were observed throughout the ANARE traverses in the region. The thickest crusts in the range 0.7-4.0 mm represent the autumn or early winter wind crust which forms under persistent strong winds (30-50 knots) during a major hiatus in snow supply and consequently marks the end of the balance year. It is spatially continuous and well developed which results in its preservation in the firn-pack. The thinner crusts in the range 0.3-0.5 mm represent the late spring and summer radiation crusts. Both types of crusts are impermeable.

the ice crust data are plotted against actual depth of occurrence. The site characteristics for each borehole are listed in Table 1. These include geographic position, surface elevation, accumulation rate and mean annual surface temperature. Detailed firm temperature-depth profiles for each borehole are reported in Goodwin (1988).

Both the firm layer density and grain size profiles display cyclicity, which results from the development of depth hoar within the annual firm layer. The depth hoar corresponds to the lower density values in the profile and develops beneath the strong ice crusts identified by the visible stratigraphy, as a result of upward water vapour transport under strong temperature gradients. The ice crusts represent the successive seasonal surface layers which were observed throughout the ANARE traverses in the region. The thickest crusts in the range 0.7-4.0 mm represent the autumn or early winter wind crust which forms under persistent strong winds (30-50 knots) during a major hiatus in snow supply and consequently marks the end of the balance year. It is spatially continuous and well developed which results in its preservation in the firm-pack. The thinner crusts in the range 0.3-0.5 mm represent the late spring and summer radiation crusts. Both types of crusts are impermeable.

SITE	LATITUDE			LONGITUDE			ELEVATION	ACCUMULATION RATE	MEAN ANNUAL TEMPERATURE
	S			E					
	°	'	''	°	'	''	m	kg/m ² /a	°C
GD01	68	35	35	113	19	41	1626	378	-27.6
GD02	68	48	10	114	24	51	1731	370	-28.4
GD03	69	00	01	115	29	44	1832	368	-29.4
GD04	69	00	29	116	44	47	1829	320	-28.9
GD05	69	01	14	117	59	42	1836	323	-28.9
GD06	69	00	18	119	17	03	1887	349*	-28.9
GD07	69	00	48	120	33	11	1977	275	-29.6
GD08	69	00	23	121	48	31	2046	270	-30.4
GD09	69	00	24	124	03	25	2138	195*	-31.3
GD10	69	00	01	124	20	49	2210	246	-32.2
GD11	68	58	57	125	38	23	2206	289	-32.6
GD12	68	59	14	126	56	16	2170	253	-32.6
GD13	68	59	36	128	13	39	2139	311	-32.3
GD14	69	01	02	129	30	35	2108	329	-32.6
GD15	69	00	21	130	48	26	2159	360	-33.3

NOTE - * Denotes accumulation rates calculated from cane measurements 1982 - 85, and all other rates were calculated from stratigraphic measurements 1973 - 85.

Table 1. Site characteristics for eastern Wilkes Land firm boreholes.

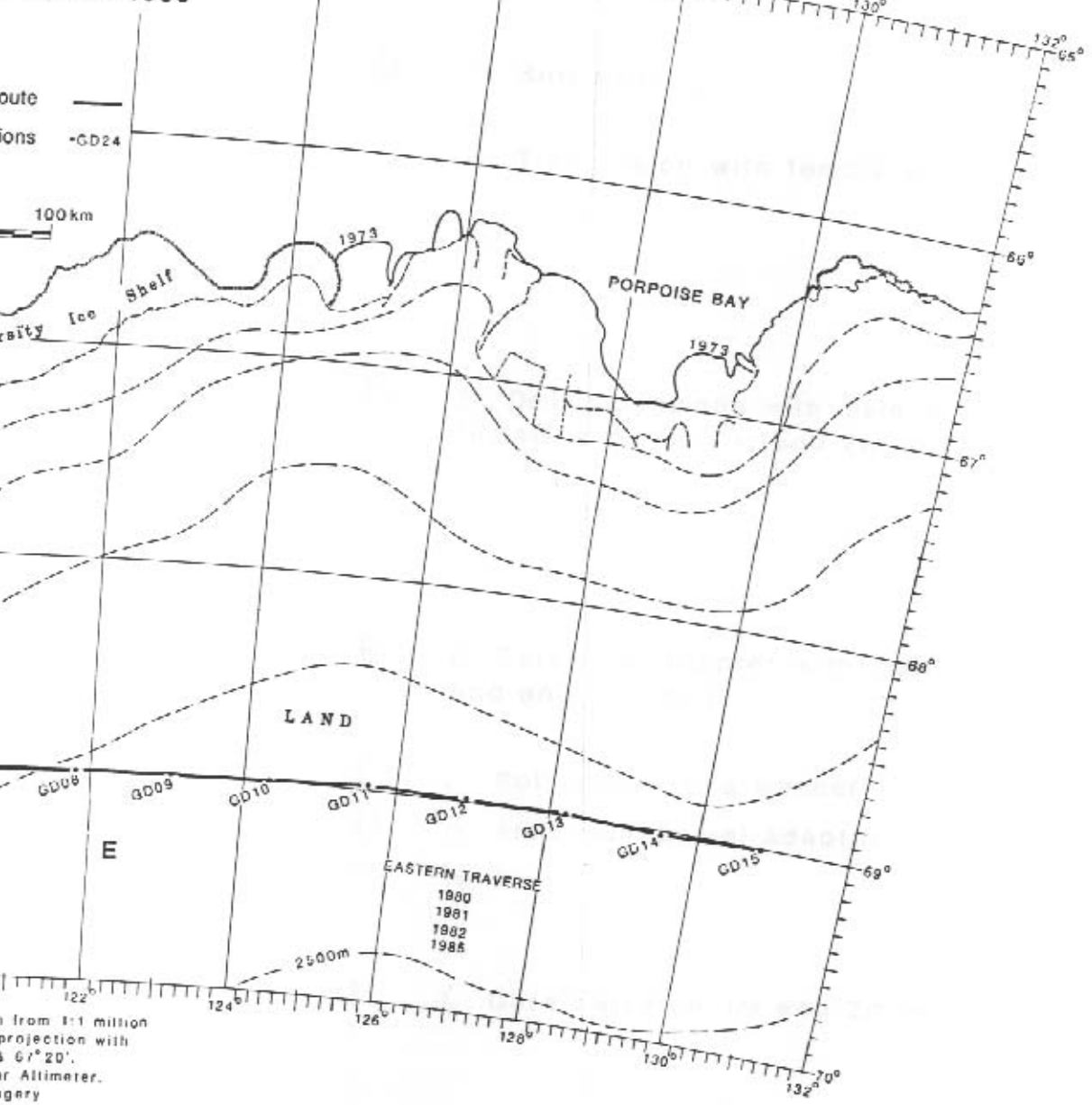
ACKNOWLEDGMENTS

The shallow drilling program was executed during the 1985 eastern Wilkes Land traverses which totalled almost eight months fieldwork in the region. The success of the program is due to the dedication, co-operation and good humour displayed by its six members. The logistical support of the 1985 ANARE wintering expeditioners at Casey is gratefully acknowledged. Guidance and assistance was offered by the author's colleagues at the Glaciology Section of the Antarctic Division, in particular Mr Neal Young.



Figure 1. Eastern Wilkes Land showing ANARE traverse route E. The 15 shallow boreholes are located at the positions marked GD01-GD15.

ELKES LAND
E ROUTE 1985



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projection with
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J. J. Dyer
K. Mack
Geological Survey of Canada

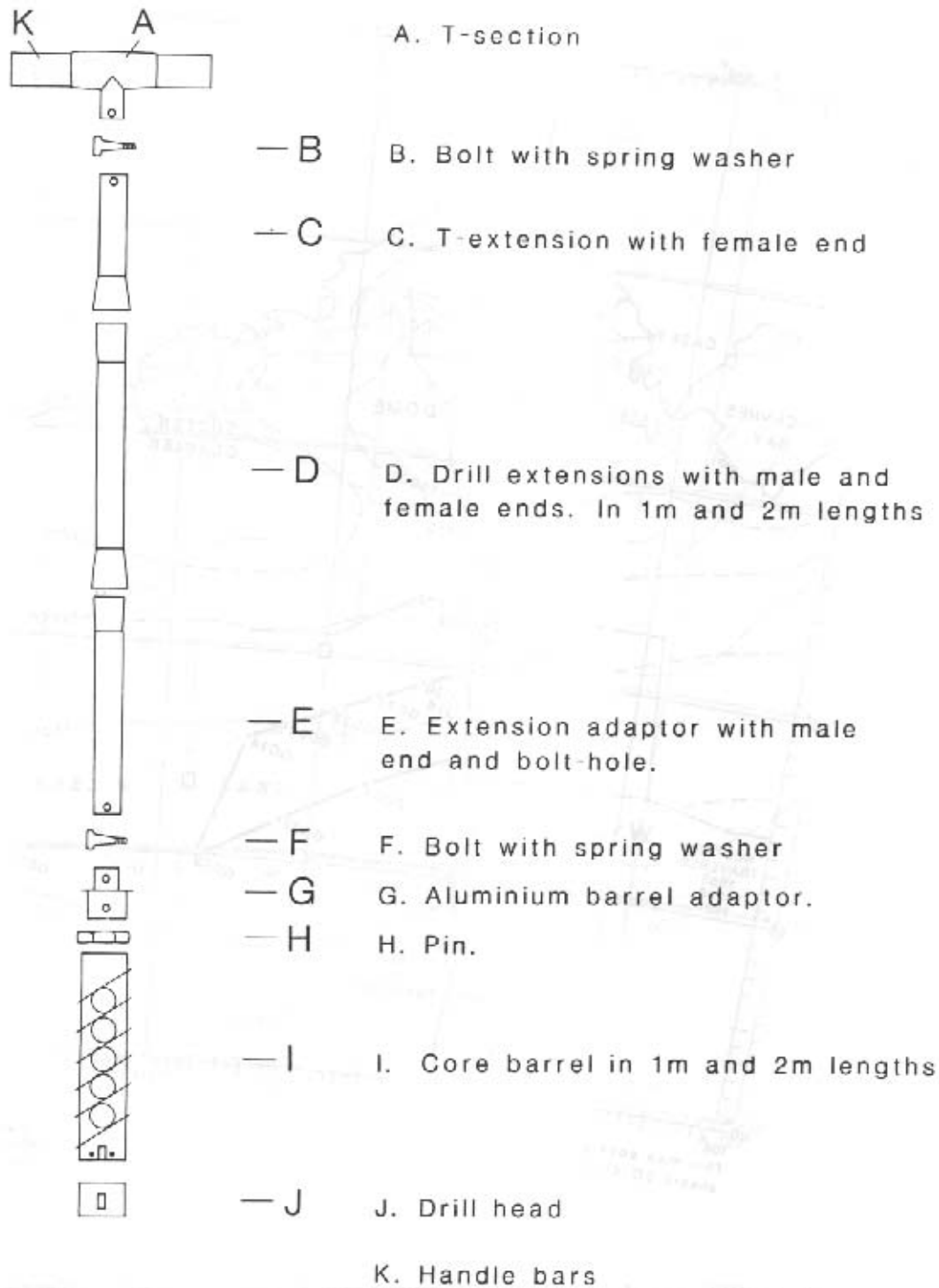


Figure 2. Components of the PICO lightweight hand coring auger.

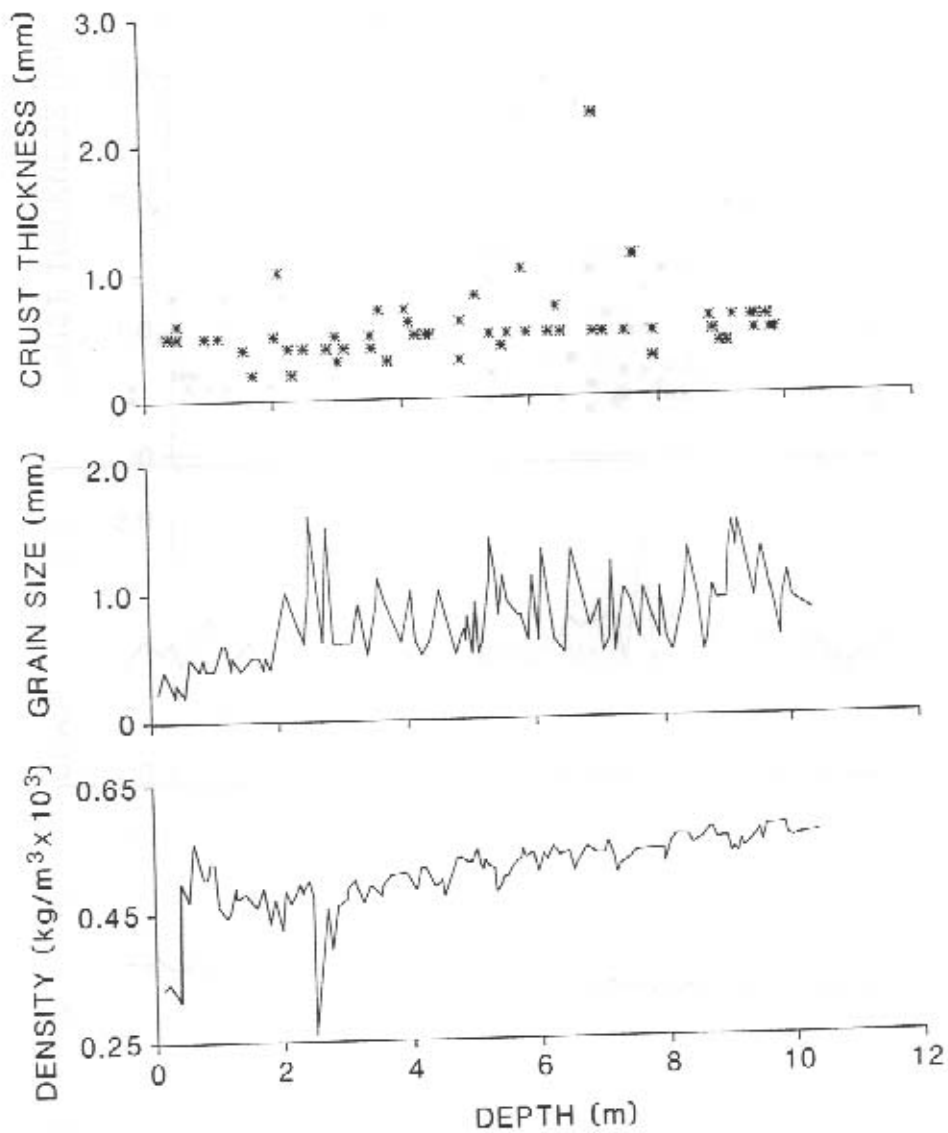


Figure 3. Firn layer density, grain size and ice crust thickness depth profiles for the GD01 core.

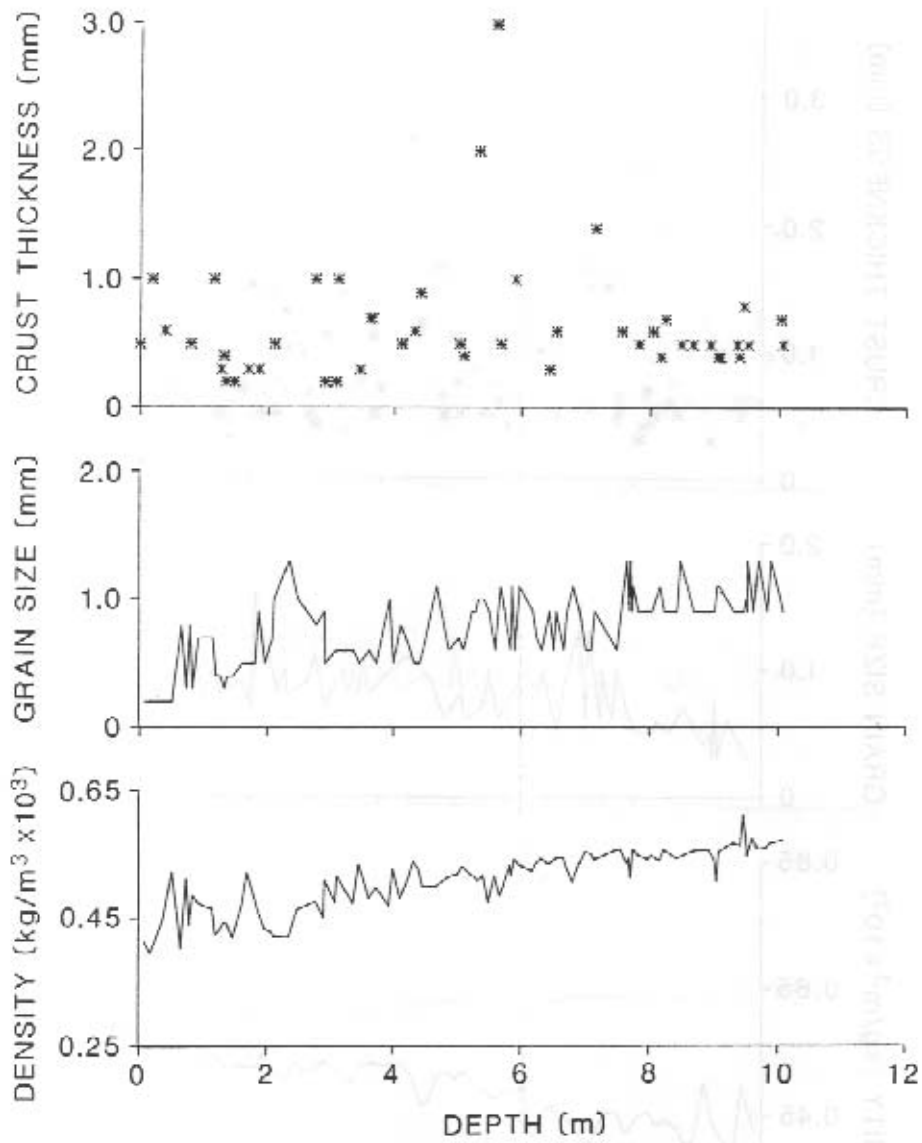


Figure 4. Firm layer density, grain size and ice crust thickness depth profiles for the GD02 core.

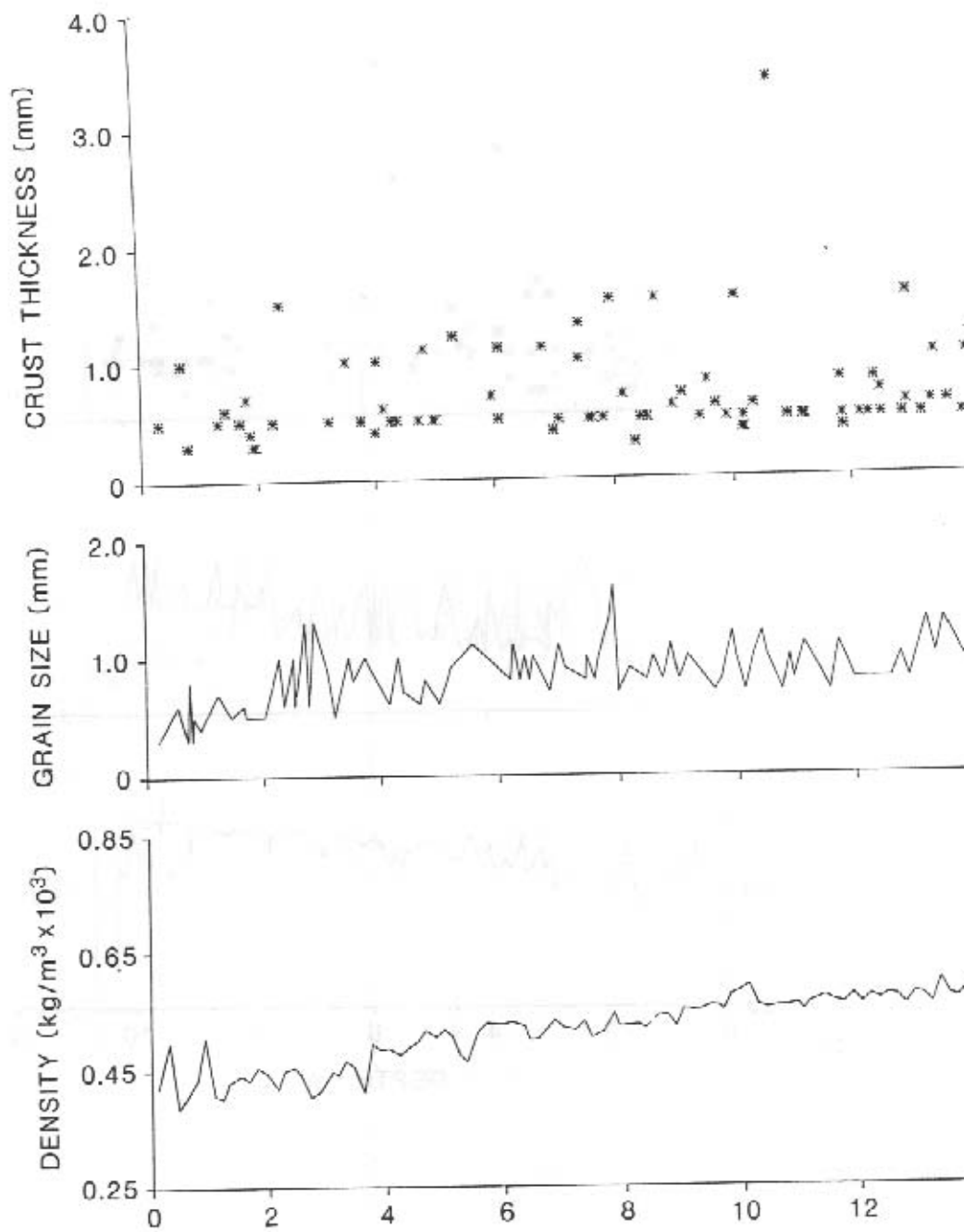
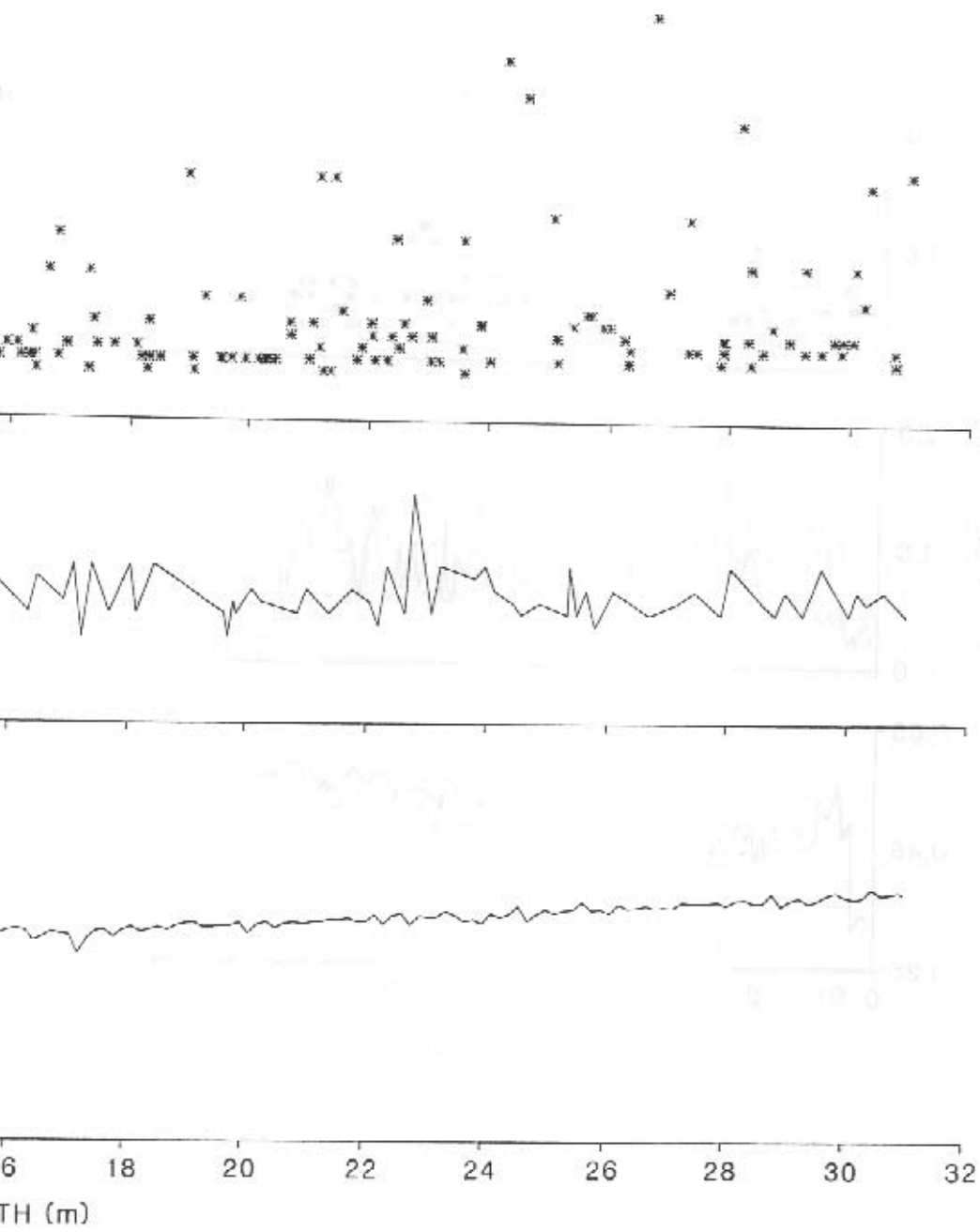


Figure 5. Firm layer density, grain size and ice crust thickness depth profiles for the GD03 core.



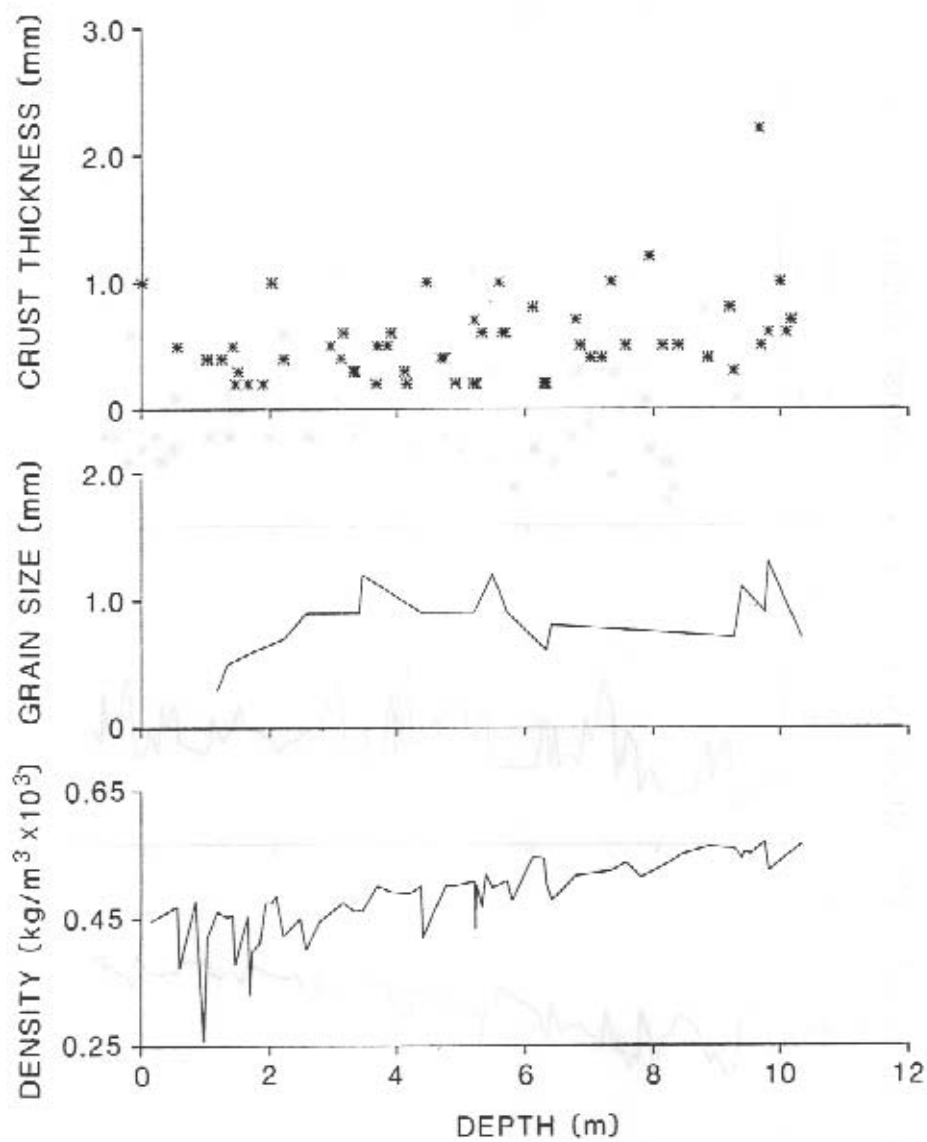


Figure 6. Firm layer density, grain size and ice crust thickness depth profiles for the GD04 core.

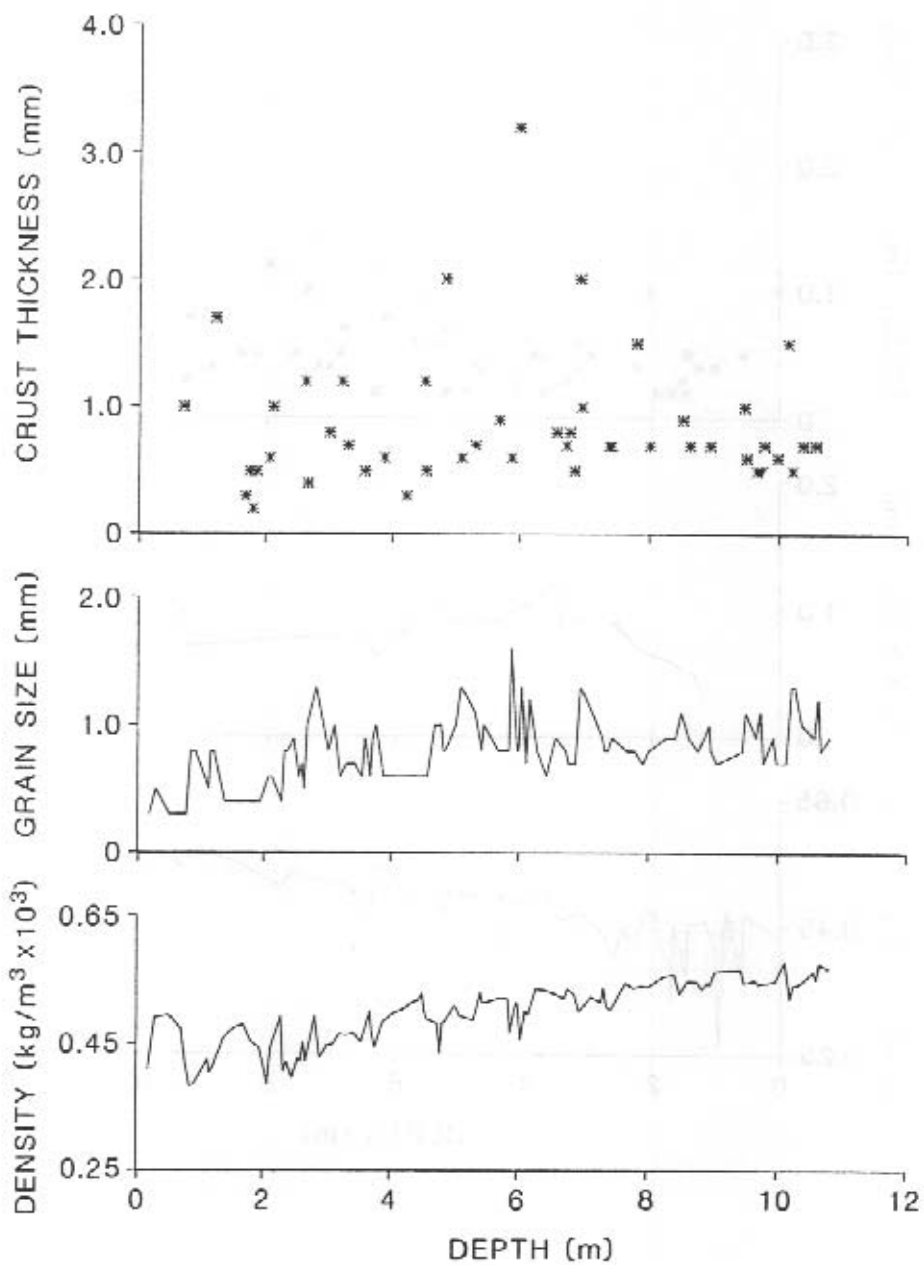


Figure 7. Firm layer density, grain size and ice crust thickness depth profiles for the GD05 core.

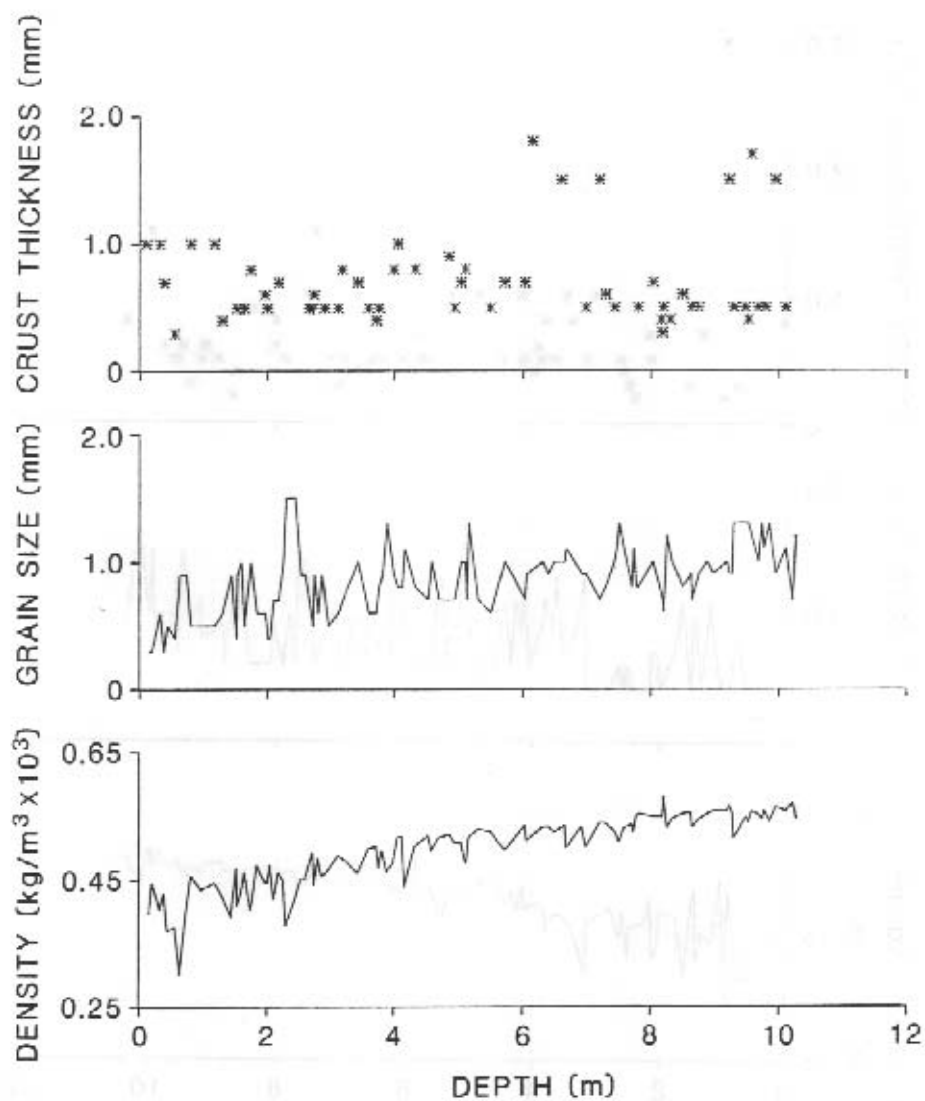


Figure 8. Firn layer density, grain size and ice crust thickness depth profiles for the GD07 core.

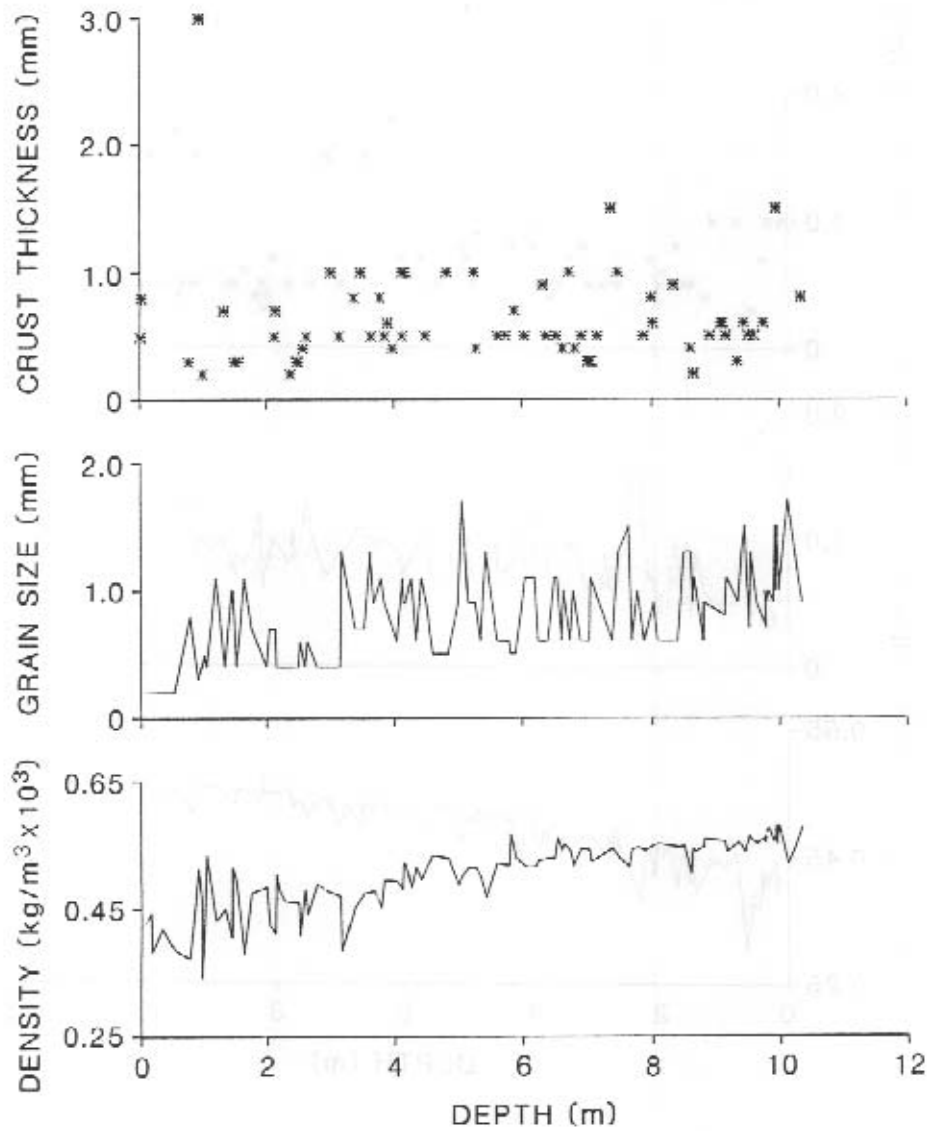


Figure 9. Firm layer density, grain size and ice crust thickness depth profiles for the GD08 core.

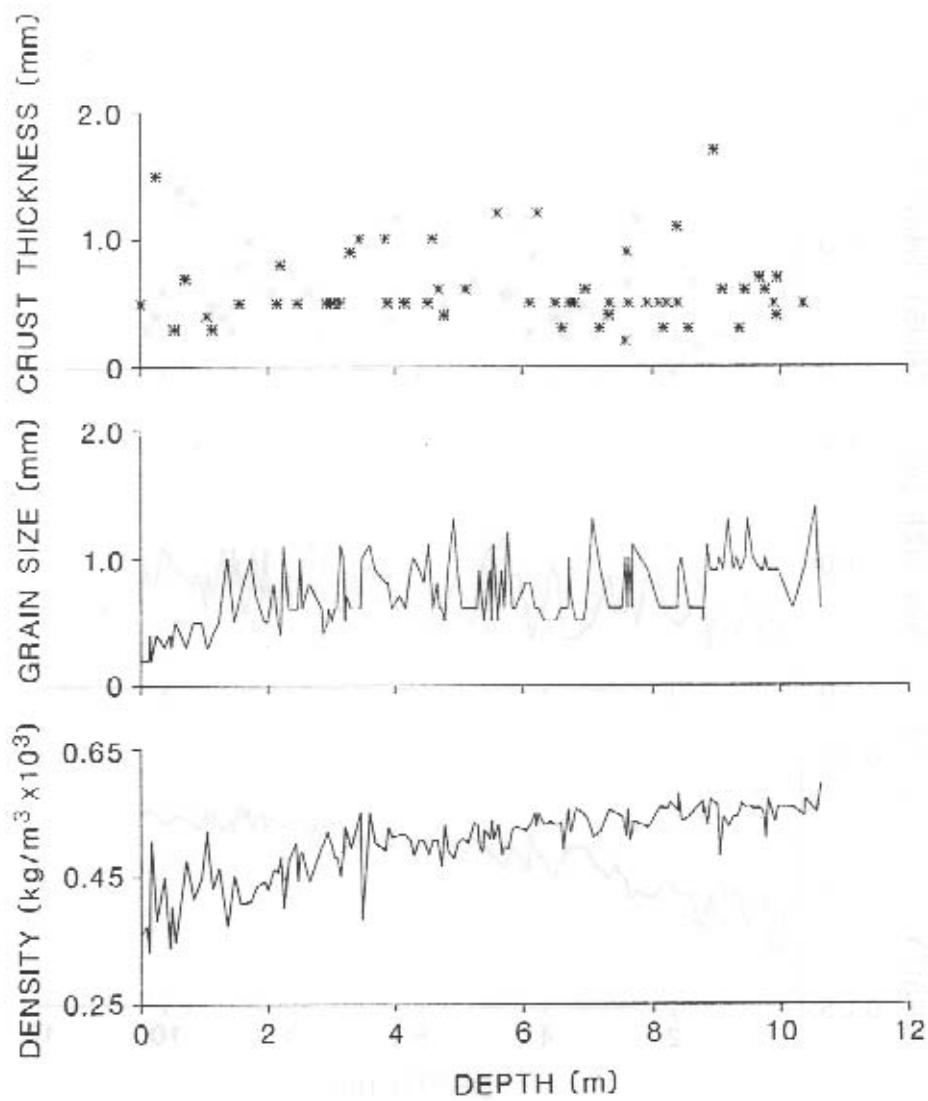


Figure 10. Firn layer density, grain size and ice crust thickness depth profiles for the GD10 core.

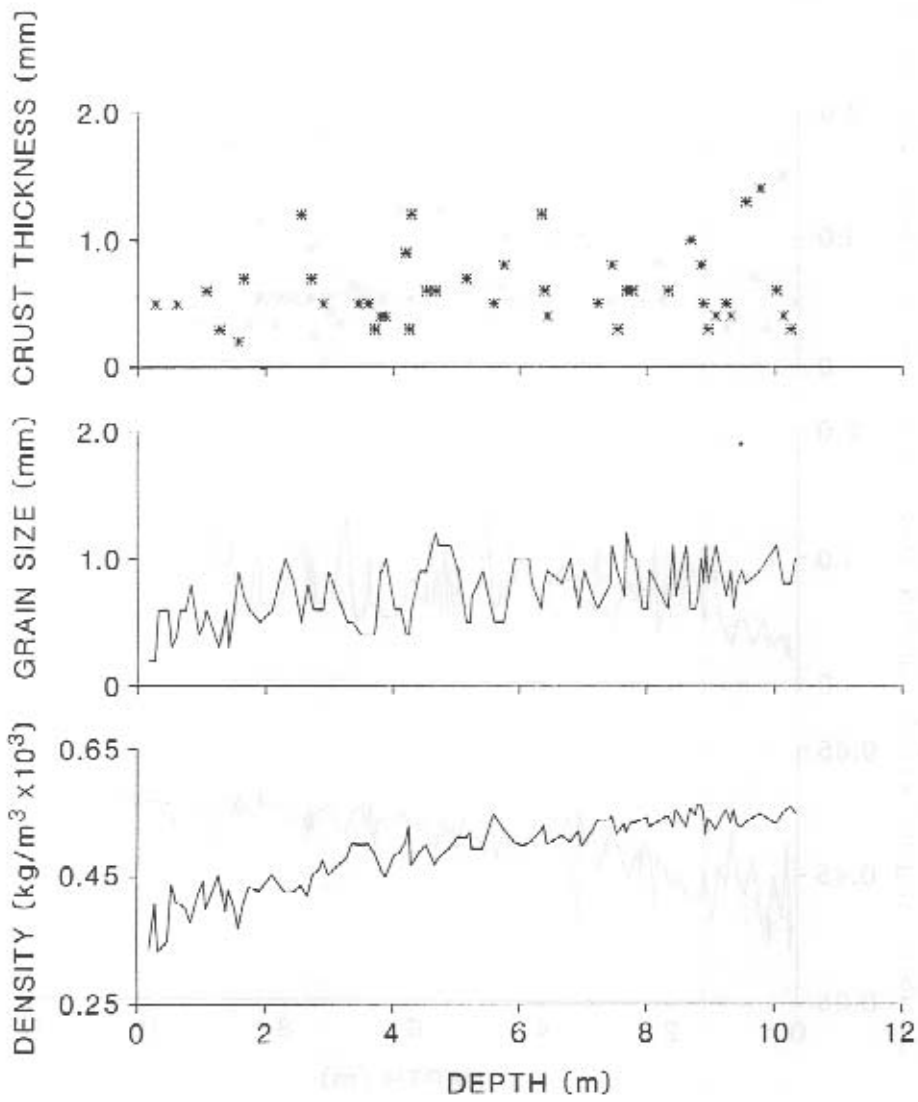


Figure 11. Firm layer density, grain size and ice crust thickness depth profiles for the GD11 core.

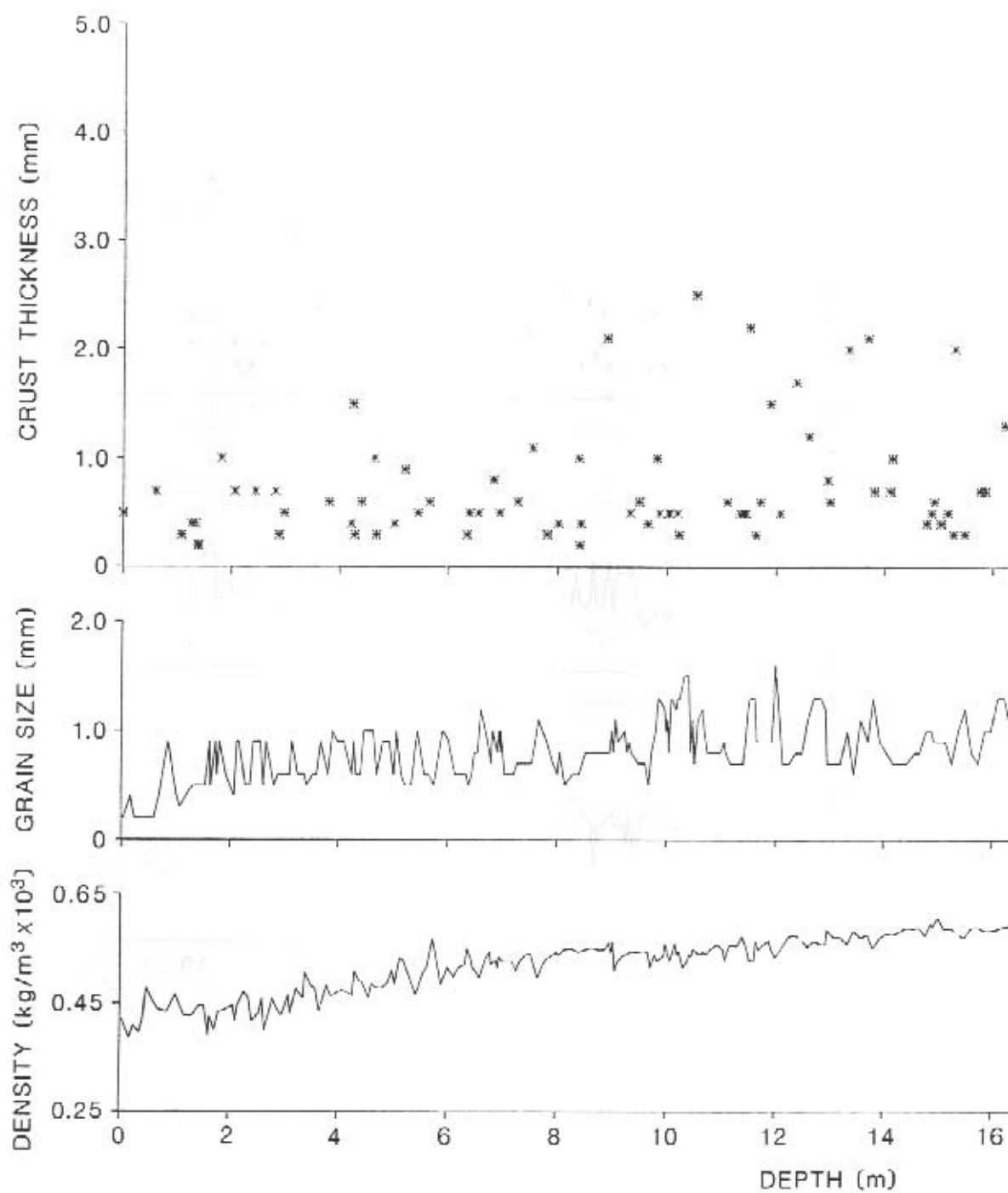
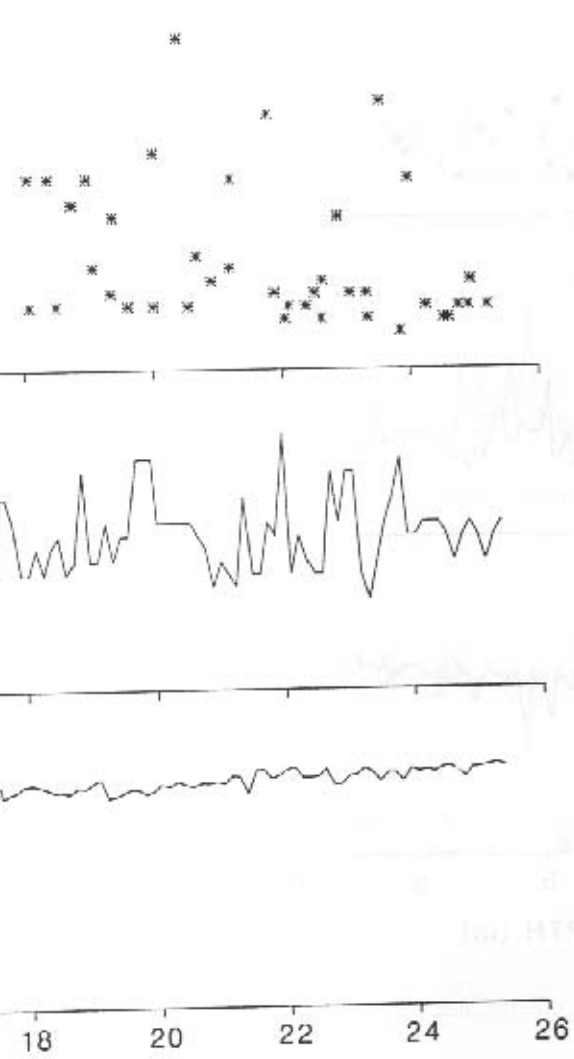


Figure 12. Firm layer density, grain size and ice crust thickness depth profiles for the GD12 core.



DEPTH (m)

Time (hours) from 0000 to 2400

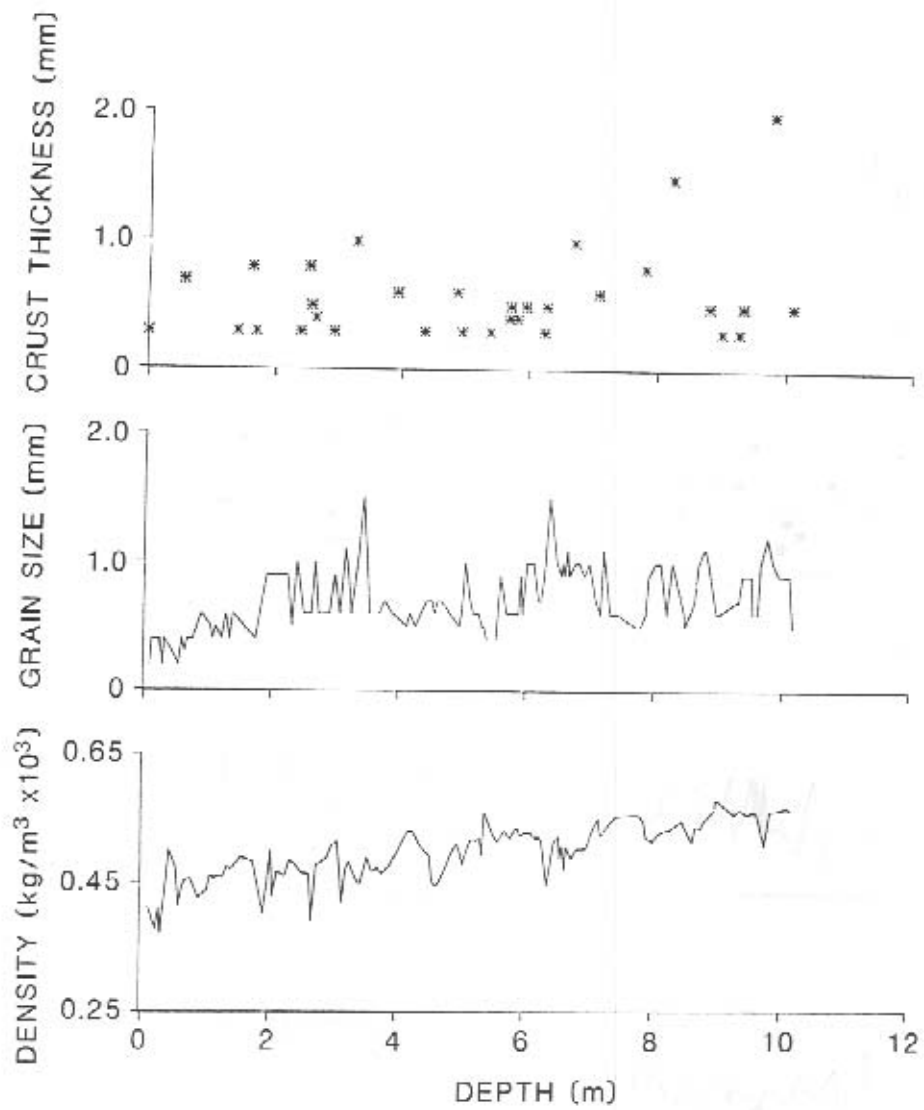


Figure 14. Firm layer density, grain size and ice crust thickness depth profiles for the GD14 core.

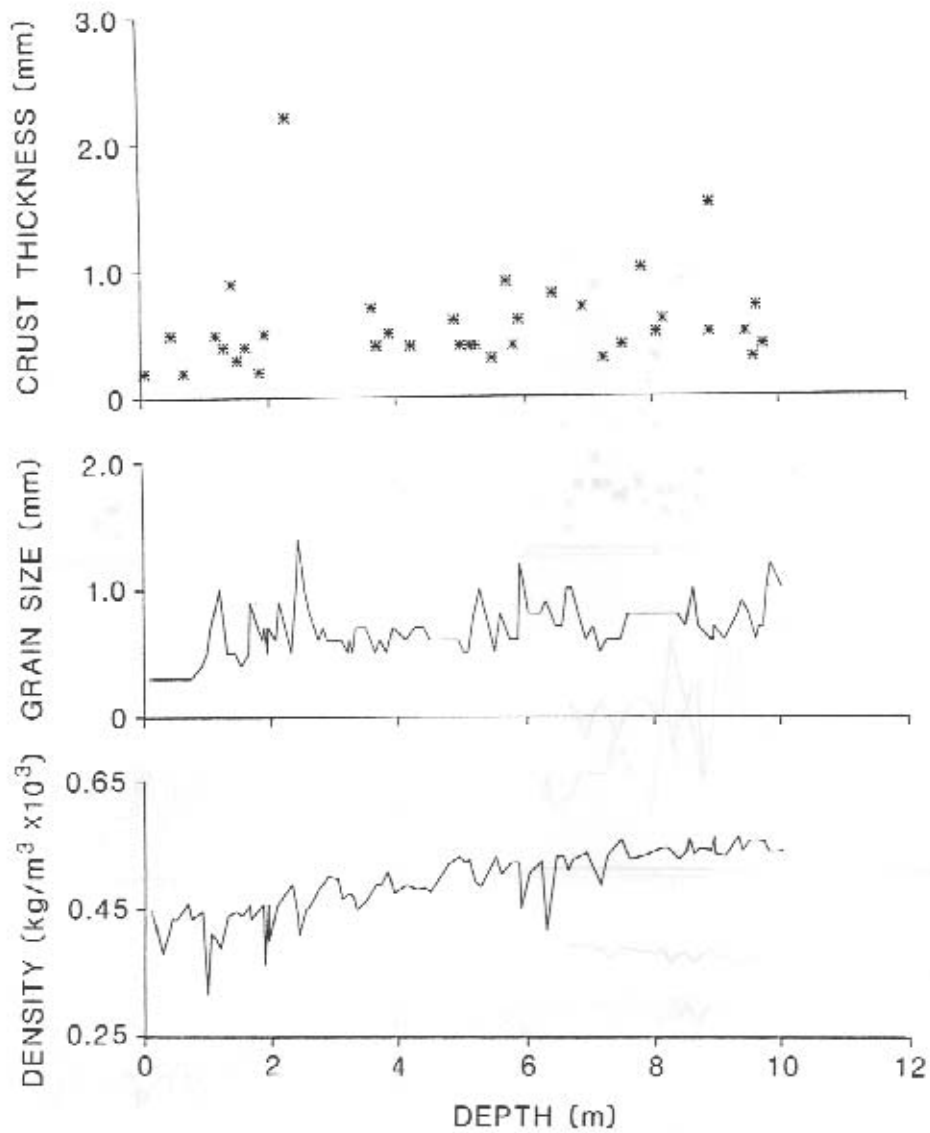


Figure 13. Firn layer density, grain size and ice crust thickness depth profiles for the GD13 core.

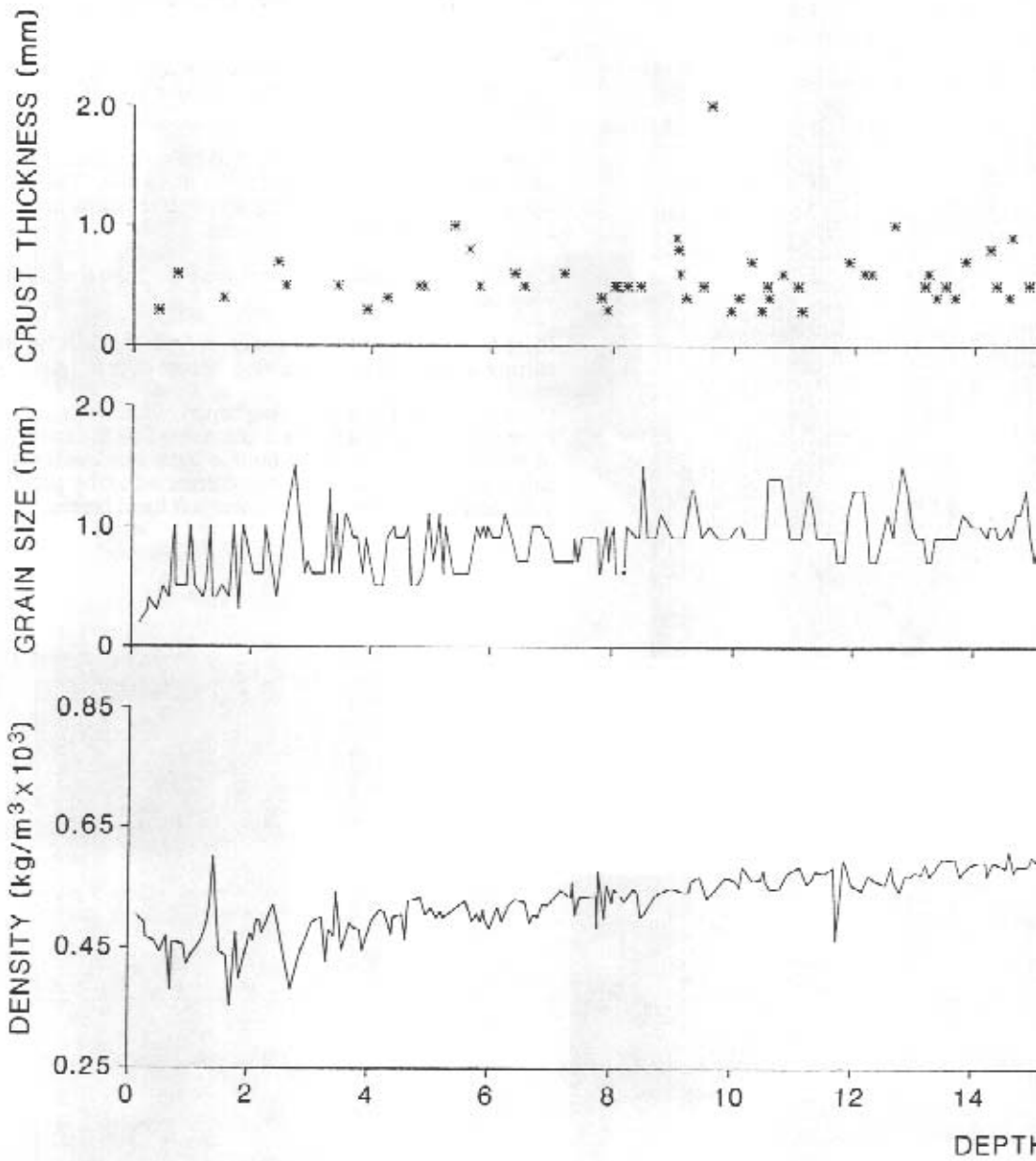
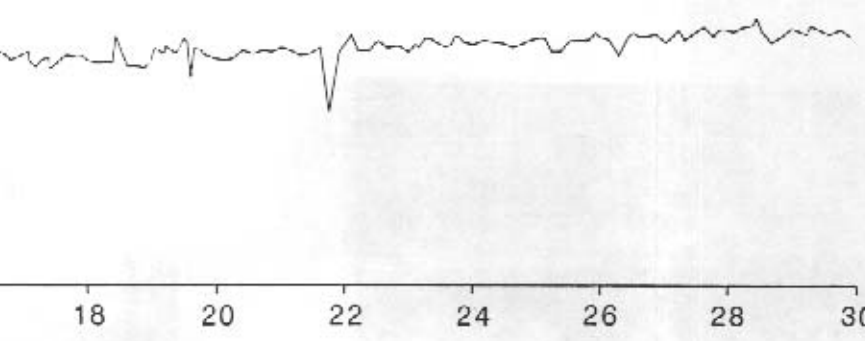
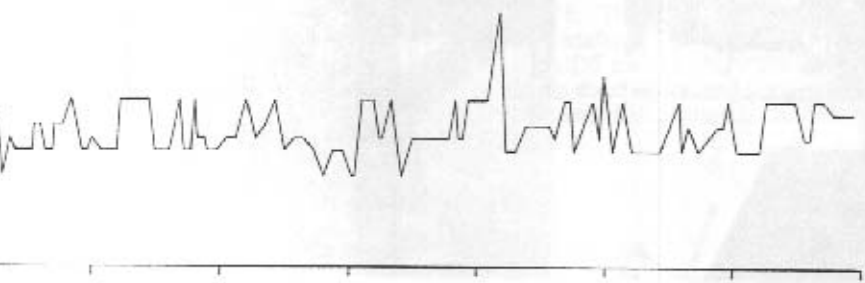
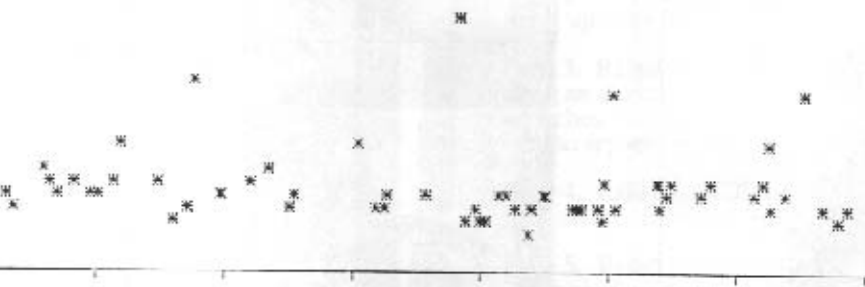
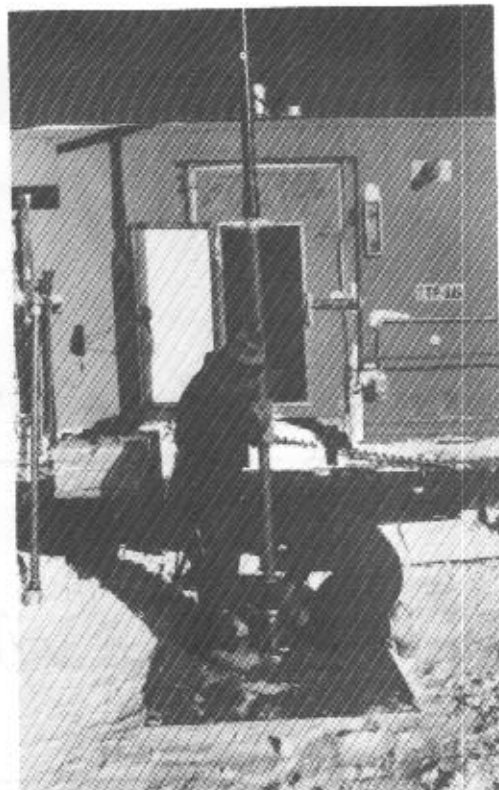


Figure 15. Firn layer density, grain size and ice crust thickness depth profiles for the GD15 core.



18 20 22 24 26 28 30



from left to right, top to bottom:

Plate 1. Shallow borehole drilling using the PICO hand coring auger. Note the plywood board to protect the hole opening.

Plate 2. Breaking the core section by applying a constant force to the T handle and lifting, to raise the PICO drill string up the hole.

Plate 3. Raising the 5 m long drill string sections at a time, using an aluminium yoke under the male join. Two chain wrenches, one on the female join and one below the join, are used to separate the string sections.

Plate 4. Raising the drill barrel section. Note the aluminium yoke on the male join.

Plate 5. Removing the core section from the drill barrel and storing in flexible plastic tubing, before core logging.

Plate 6. The PICO drill lifting tripod, which was constructed from scaffold pipe sections and mounted on the raised blade of the D5 tractor. Note the double sheaf block at the apex and single sheaf block and karabina connected to the aluminium yoke and drill section in the lower left hand corner.



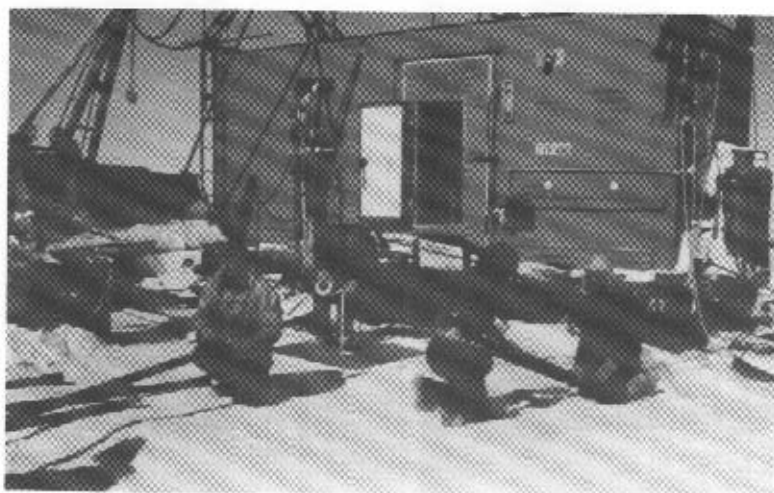


left:

Plate 7. Raising a 5 m PICO drill string, including the barrel and core section, from the hole using the 6 m high tripod.

below:

Plate 8. PICO drilling. While the hole depth is measured, two drillers connect drill string while, two other drillers remove, store and log the retrieved core section.



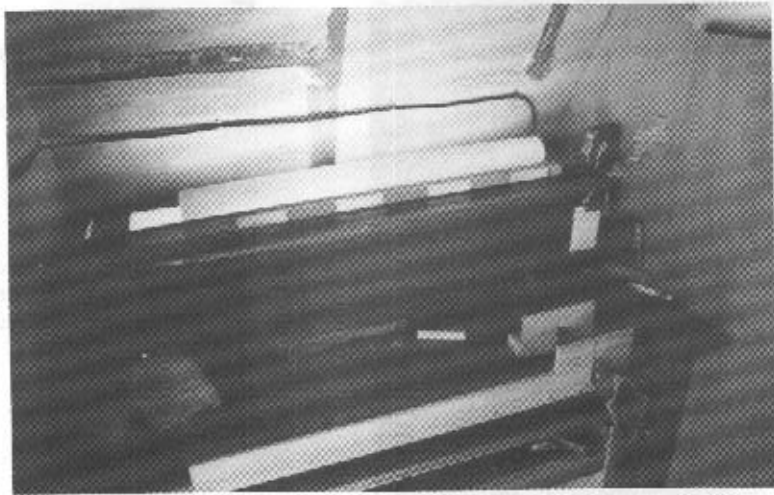


Plate 9. Core section (0.8 m long) on transmission light box, mounted in the field laboratory cold room. Note the tenon saw and guides for cutting the firm layer section.

APPENDIX I
 GD01 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH m	DENSITY kg/m ³ x 10 ³	GRAIN SIZE mm	ICE CRUST THICKNESS mm
0.08	0.331	0.2	
0.20	0.342	0.4	
0.37	0.314	0.2	0.5
0.38	0.498	0.3	
0.51	0.470	0.2	0.5
0.52			0.6
0.59	0.561	0.5	
0.74	0.503	0.4	
0.80	0.505	0.5	
0.86	0.528	0.4	
0.93	0.526	0.4	
0.95			0.5
0.99	0.461	0.4	
1.11	0.443	0.6	
1.17	0.450	0.6	0.5
1.26	0.491	0.4	
1.27	0.472	0.5	
1.40	0.480	0.4	
1.55			0.4
1.58	0.458	0.5	
1.68	0.489	0.5	0.2
1.76	0.450	0.4	
1.79	0.433	0.5	
1.87	0.471	0.4	
1.99	0.423		
2.04	0.484		0.5
2.12	0.464	1.0	1.0
2.19	0.476	0.9	
2.26	0.495		0.4
2.30	0.478		
2.31	0.484		0.2
2.40	0.498	0.6	
2.47	0.474	1.0	
2.49	0.260	1.6	0.4
2.69	0.457	0.6	
2.76	0.393	1.5	
2.86	0.461	0.6	0.4
3.00	0.470		0.5
3.02	0.489		0.3
3.13	0.500		0.4
3.15	0.490	0.6	
3.25	0.464	0.9	
3.35	0.490		
3.39	0.489	0.5	
3.53	0.475	0.9	0.5
3.55	0.490	1.1	0.4
3.68	0.506	0.9	0.7
3.80			0.3
3.92	0.510	0.6	
4.08	0.481	1.0	0.7

APPENDIX I

GD01 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH m	DENSITY kg/m ³ x 10 ³	GRAIN SIZE mm	ICE CRUST THICKNESS mm	STATION	DEPTH
4.14	0.516	0.6	0.6	520	400.0
4.23	0.515	0.5	0.5	520	500.0
4.35	0.488	0.6		520	600.0
4.40	0.489	0.7	0.5	520	800.0
4.47	0.497		0.5	520	900.0
4.51	0.471	1.0		520	1000.0
4.72	0.530			520	1100.0
4.77	0.532	0.5		520	1200.0
4.90	0.523	0.7		520	1300.0
4.93	0.526	0.6	0.3	520	1400.0
4.95	0.523	0.8	0.6	520	1500.0
5.03	0.544	0.5		520	1600.0
5.08	0.519	0.9		520	1700.0
5.12	0.512	0.5		520	1800.0
5.15	0.529			520	1900.0
5.19	0.520	0.6	0.8	520	2000.0
5.30	0.513	1.1		520	2100.0
5.31	0.494	1.4		520	2200.0
5.33	0.478			520	2300.0
5.40	0.486	1.1	0.5	520	2400.0
5.44	0.501	0.8		520	2500.0
5.51	0.502	1.1		520	2600.0
5.59	0.517	0.9	0.4	520	2700.0
5.68	0.527		0.5	520	2800.0
5.73	0.528			520	2900.0
5.75	0.545	0.8		520	3000.0
5.79	0.531	0.8		520	3100.0
5.91	0.539	0.6	1.0	520	3200.0
5.98	0.507	1.1	0.5	520	3300.0
6.07	0.536	0.6		520	3400.0
6.13	0.527	1.3		520	3500.0
6.22	0.547			520	3600.0
6.31	0.534	0.6	0.5	520	3700.0
6.43			0.7	520	3800.0
6.47	0.539	0.5		520	3900.0
6.51			0.5	520	4000.0
6.55	0.509	1.0		520	4100.0
6.59	0.521	1.3		520	4200.0
6.75	0.546			520	4300.0
6.80	0.542			520	4400.0
6.88	0.536	0.7		520	4500.0
7.02	0.535	0.9	0.5	520	4600.0
7.07	0.555	0.5	2.2	520	4700.0
7.16	0.529	0.6	0.5	520	4800.0
7.20	0.504	1.2		520	4900.0
7.25	0.518	0.5		520	5000.0
7.40	0.527	1.0		520	5100.0
7.50	0.538	0.9	0.5	520	5200.0
7.63	0.540	0.6	1.1	520	5300.0
7.69	0.541	1.0	1.1	520	5400.0

APPENDIX I
 GD01 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH m	DENSITY kg/m ³ x 10 ³	GRAIN SIZE mm	ICE CRUST THICKNESS mm
7.93	0.540	0.6	0.3
7.94	0.519	1.0	0.5
8.04	0.552	0.6	
8.13	0.563	0.5	
8.31	0.562	0.9	
8.38	0.548	1.3	
8.54	0.558	0.9	
8.62	0.568	0.5	
8.68	0.574	0.6	
8.76	0.555	1.0	
8.82	0.558	0.9	0.6
8.87			0.5
8.92	0.558		
8.97	0.533	0.9	0.4
9.02	0.540	1.3	
9.08	0.533	1.5	0.4
9.13	0.555	1.3	
9.17	0.540	1.5	0.6
9.36	0.560		
9.42	0.570	0.9	
9.47	0.550	1.1	0.6
9.51			0.5
9.53	0.576	1.3	0.6
9.70	0.577	0.9	0.6
9.76			0.5
9.82	0.579	0.6	
9.84			0.5
9.85	0.562	0.9	
9.94	0.556	1.1	
10.01	0.560	0.9	
10.33	0.565	0.8	

APPENDIX II
 GDO2 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH m	DENSITY kg/m ³ × 10 ³	GRAIN SIZE mm	ICE CRUST THICKNESS mm
0.00			0.5
0.10	0.412	0.2	
0.19	0.395	0.2	1.0
0.39	0.449	0.2	0.6
0.52	0.524	0.2	
0.66	0.402	0.8	
0.74	0.513	0.3	
0.79	0.439	0.8	0.5
0.84	0.486	0.3	
0.93	0.474	0.7	
1.02	0.469	0.7	
1.15	0.465	0.7	1.0
1.20	0.424	0.4	
1.27	0.432	0.4	0.3
1.31			0.4
1.34	0.445	0.3	0.2
1.38	0.442	0.4	
1.47	0.419	0.4	0.2
1.61	0.472	0.5	
1.69	0.521	0.5	0.3
1.81	0.482	0.5	
1.86	0.462	0.9	0.3
1.96	0.434	0.5	
2.08	0.428	0.7	
2.10	0.422	1.0	0.5
2.34	0.420	1.3	
2.47	0.464	1.0	
2.74			1.0
2.76	0.477	0.8	
2.89	0.450	0.9	0.2
2.91	0.510	0.5	
3.07	0.475	0.6	0.2
3.09	0.517	0.6	1.0
3.34	0.472	0.6	
3.43	0.535	0.5	0.3
3.58	0.481	0.6	0.7
3.63			0.7
3.70	0.498	0.5	
3.90	0.470	1.0	
3.96	0.527	0.5	
4.08	0.480	0.8	0.5
4.29	0.538	0.5	0.6
4.38	0.524	0.5	0.9
4.43	0.499	0.6	
4.64	0.499	1.1	
4.84	0.514	0.6	
5.00	0.519	0.7	0.5
5.06	0.530	0.6	0.4
5.19	0.517	0.9	
5.25	0.514	0.9	

APPENDIX II
 GD02 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH	DENSITY	GRAIN SIZE	ICE CRUST THICKNESS
m	kg/m ³ x 10 ³	mm	mm
5.29	0.507	1.0	2.0
5.37	0.517	1.0	
5.46	0.473	0.9	
5.57	0.517	0.6	3.0
5.65	0.484	1.1	0.5
5.81	0.532	0.6	
5.83	0.515	1.1	
5.88	0.542	0.6	1.0
5.95	0.533	1.1	
6.17	0.523	0.9	
6.23	0.535	0.7	
6.31	0.543	0.6	
6.43	0.534	0.9	0.3
6.50	0.539	0.6	
6.54	0.543	0.9	0.6
6.67	0.545	0.6	
6.72	0.528	0.9	
6.82	0.505	1.1	
6.92	0.534	0.9	
7.02	0.553	0.6	
7.11	0.550	0.6	
7.16	0.541	0.9	1.4
7.52	0.556	0.6	
7.58	0.556	0.9	0.6
7.67	0.535	1.3	
7.70	0.543	0.9	
7.73	0.512	1.3	
7.75	0.523	0.9	
7.77	0.558	1.1	
7.85	0.548	0.9	0.5
8.00	0.541	0.9	
8.06	0.548	0.9	0.6
8.18	0.538	1.1	0.4
8.25	0.556	0.9	0.7
8.45	0.542	0.9	
8.50	0.545	1.3	0.5
8.68			0.5
8.71	0.554	0.9	
8.95	0.556	0.9	0.5
9.03	0.541	0.9	
9.06	0.506	1.1	0.4
9.10	0.553	1.1	0.4
9.33	0.567	0.9	
9.36			0.5
9.37			0.5
9.40			0.4
9.44	0.562	0.9	
9.46			0.8
9.49	0.610	0.9	
9.51	0.586	1.0	

APPENDIX III
 GD03 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH m	DENSITY kg/m ³ × 10 ³	GRAIN SIZE mm	ICE CRUST THICKNESS mm	SITE NAME
0.10	0.423			
0.19		0.3		
0.30	0.498	0.4	0.5	
0.45	0.386			
0.53		0.6		
0.60	0.408			
0.69		0.3	1.0	
0.72		0.8		
0.76	0.437	0.3		
0.79		0.5	0.3	
0.90	0.507	0.4		
1.06	0.407			
1.20	0.403	0.7		
1.30	0.430		0.5	
1.43		0.5	0.6	
1.50	0.442			
1.63	0.433	0.6		
1.67		0.5	0.5	
1.78	0.455		0.7	
1.84			0.4	
1.89			0.3	
1.94	0.445		0.3	
1.99		0.5		
2.12	0.419			
2.24	0.449	1.0	0.5	
2.33		0.6		
2.40	0.455		1.5	
2.49		1.0		
2.51	0.443	0.6		
2.68	0.404	1.3		
2.74		0.6		
2.83	0.414	1.3		
3.05	0.447	0.9		
3.15	0.442	0.6		
3.18		0.5	0.5	
3.28	0.465			
3.42	0.454	1.0		
3.50		0.8	1.0	
3.60	0.411			
3.71		1.0		
3.75	0.495		0.5	
3.89	0.484			
4.00			0.4	
4.04	0.486		1.0	
4.15		0.6	0.6	
4.24	0.475			
4.28			0.5	
4.30		1.0		
4.38	0.488	0.7	0.5	
4.54	0.498			

APPENDIX III
 GD03 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH m	DENSITY kg/m ³ x 10 ³	GRAIN SIZE mm	ICE CRUST THICKNESS mm
4.67	0.517	0.6	
4.75		0.8	0.5
4.85	0.505		1.1
4.99	0.518	0.6	0.5
5.05			0.5
5.13	0.505	0.8	
5.19		0.9	
5.25	0.473		
5.36	0.463		1.2
5.55	0.514	1.1	
5.70	0.529		
5.85	0.527		
5.98	0.526		0.7
6.10			0.5
6.12	0.531		1.1
6.20		0.8	
6.25		1.1	
6.35	0.523	0.8	
6.43	0.500	1.0	
6.51		0.8	
6.58	0.502	1.0	
6.73	0.519		
6.86	0.534	0.7	1.1
7.02	0.520	1.1	0.4
7.12		0.9	0.5
7.20	0.517		
7.35	0.532		
7.45		0.8	1.0
7.47	0.504	1.0	1.3
7.60		0.8	0.5
7.67	0.514	1.0	0.5
7.85	0.545	1.3	0.5
7.93	0.523	1.6	
8.00		0.7	1.5
8.10	0.525		
8.17		0.9	0.7
8.25	0.526		
8.37	0.519		0.3
8.47		0.8	0.5
8.58	0.541	1.0	0.5
8.74	0.542	0.8	1.5
8.88	0.523	1.1	
9.00	0.552	0.8	0.6
9.15	0.550	1.0	0.7
9.3	0.551		
9.45	0.558		0.5
9.57			0.8
9.60	0.556	0.7	
9.67	0.549		
9.71		0.8	0.6

APPENDIX III
 GDO3 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH m	DENSITY kg/m ³ x 10 ³	GRAIN SIZE mm	ICE CRUST THICKNESS mm	WATER CONTENT %
9.80	0.576			
9.90		1.2	0.5	
9.95	0.582	1.0		8.0
10.07			1.5	4.2
10.10	0.592	0.7		
10.16			0.4	
10.18			0.5	
10.20			0.4	1.1
10.25	0.558	1.0		
10.35			0.6	
10.40	0.552	1.2		
10.48		1.0		
10.60	0.556			8.0
10.74	0.556	0.7	3.3	5.1
10.86		1.0		9.1
10.92	0.560	0.8	0.5	
11.02	0.548			
11.11	0.561	1.1		8.0
11.18			0.5	
11.22			0.5	
11.37	0.572			
11.55	0.564	0.7		
11.70	0.560	1.1		0.2
11.82			0.8	
11.85	0.576		0.5	
11.86			0.4	5.1
11.95		0.8		
12.00	0.560			
12.15	0.574		0.5	8.1
12.30	0.566		0.5	1.0
12.40			0.8	
12.45	0.575			
12.51			0.7	8.1
12.52			0.5	
12.60	0.572	0.8		
12.75	0.557	1.0		8.0
12.88			0.5	
12.90	0.577	0.8		
12.95			0.6	5.1
12.98			1.5	
13.05	0.574			
13.20	0.559	1.3	0.5	
13.35	0.600	1.0		
13.37			0.6	
13.44			1.0	
13.50	0.572	1.3		9.1
13.65	0.569		0.6	8.1
13.80	0.588	1.0		5.0
13.90			0.5	
13.95	0.593			

APPENDIX III
 GDO3 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH	DENSITY	GRAIN SIZE	ICE CRUST THICKNESS
m	kg/m ³ x 10 ³	mm	mm
13.98			1.0
14.06			1.2
14.10	0.588	0.8	0.5
14.25	0.570	1.5	
14.37			0.5
14.40	0.578		
14.45			1.2
14.55	0.583	1.1	
14.70	0.597		
14.74			2.0
14.77			0.5
14.81			0.4
14.85	0.578	0.9	
15.00	0.577	1.1	
15.15	0.590	1.0	
15.28			2.0
15.29			0.5
15.30	0.592	0.9	
15.38			0.5
15.42			0.5
15.44			0.5
15.45	0.585		0.5
15.60	0.601	1.0	
15.61			2.6
15.74			0.5
15.75	0.579	1.2	
15.81			0.5
15.90	0.596		
15.92			0.6
16.05	0.602		
16.10			0.6
16.16			0.5
16.20	0.605		
16.32			0.5
16.34			0.7
16.35	0.601	0.9	
16.40			0.5
16.42			0.4
16.50	0.584	1.2	
16.61			1.2
16.65	0.591		
16.77			1.5
16.79			0.5
16.80	0.600		
16.92			0.6
16.95	0.596	1.0	
17.10	0.594	1.3	
17.25	0.564	0.7	
17.29			1.2
17.30			0.4

APPENDIX III
 GDO3 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH m	DENSITY $\text{kg/m}^3 \times 10^3$	GRAIN SIZE mm	ICE CRUST THICKNESS mm
17.36			0.8
17.40	0.588	1.3	
17.43			0.6
17.55	0.601		
17.70	0.604	0.9	
17.72			0.6
17.85	0.591		
18.00	0.603		
18.04		1.3	
18.10			0.6
18.15	0.609	0.9	
18.18			0.5
18.28			0.4
18.30	0.600		0.8
18.31			0.5
18.45	0.604	1.3	
18.50			0.5
18.60	0.608		
18.75	0.603		
18.90	0.611		
18.93			2.0
19.05	0.615		
19.06			0.5
19.08			0.4
19.20	0.616		
19.26			1.0
19.35	0.608		
19.50	0.609		
19.53			0.5
19.56			0.5
19.65	0.611	0.9	
19.71		0.7	0.5
19.80	0.610	1.0	
19.84		0.9	1.0
19.94			0.5
19.95	0.617		
20.10	0.598	1.1	
20.17			0.5
20.25	0.613	1.0	
20.27			0.5
20.29			0.5
20.36			0.5
20.40	0.618		
20.45			0.5
20.55	0.607		
20.67			0.8
20.69			0.7
20.70	0.615		
20.85	0.617	0.9	
21.00	0.614	1.1	0.5

APPENDIX III
 GD03 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH	DENSITY	GRAIN SIZE	ICE CRUST THICKNESS
m	kg/m ³ x 10 ³	mm	mm
21.05			0.8
21.13			2.0
21.15	0.618		
21.17			0.6
21.24			0.4
21.30	0.618		
21.37			0.4
21.38		0.9	2.0
21.45	0.622		
21.53			0.9
21.60	0.621		
21.75	0.624	1.1	
21.79			0.5
21.87			0.6
21.90	0.618		
22.02			0.8
22.04			0.7
22.05	0.618	1.0	
22.09			0.5
22.20	0.630	0.8	
22.30			0.5
22.35	0.613	1.3	
22.37			0.7
22.43			1.5
22.50	0.628		0.6
22.57			0.8
22.65	0.632	0.9	
22.70			0.7
22.80	0.613	1.9	
22.94			1.0
22.95	0.628		
23.03			0.5
23.04			0.7
23.10	0.625	0.9	
23.17			0.5
23.25	0.626	1.3	
23.40	0.636		
23.55	0.629		0.6
23.56			1.5
23.59			0.4
23.70	0.619		
23.81		1.2	
23.85	0.623		0.8
23.87			0.8
24.00	0.615	1.3	
24.02			0.5
24.15	0.632	1.1	
24.21			3.0
24.30	0.626		
24.45	0.631	1.0	

APPENDIX III

GDO3 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH	DENSITY	GRAIN SIZE	ICE CRUST THICKNESS	TEMPERATURE	WATER CONTENT
m	kg/m ³ x 10 ³	mm	mm	°C	%
24.56			2.7		
24.60	0.645	0.9			
24.75	0.620				
24.90	0.631	1.0			
25.04			1.7		
25.05	0.640			0.1	
25.11			0.7		
25.13			0.7		
25.14			0.5	0.0	
25.20	0.633			0.1	
25.35	0.638	0.9			
25.38		1.3	0.8		
25.50	0.640	0.9			
25.61			0.9		
25.65	0.652	1.1		0.0	
25.68			0.9		
25.80	0.638	0.8			
25.87			0.8	0.1	
25.95	0.640				
26.00			0.8		
26.10	0.633	1.1			
26.22			0.7		
26.25	0.648			0.0	
26.29			0.5		
26.30			0.5		
26.32			0.6	0.1	
26.40	0.641				
26.55	0.643				
26.63			3.4	0.1	
26.70	0.646	0.9			
26.85	0.642			0.1	
26.96			1.1		
27.00	0.644				
27.15	0.642	1.0			
27.28			1.7		
27.29			0.6		
27.30	0.652			0.0	
27.43			0.6		
27.45	0.650	1.1			
27.60	0.651				
27.75	0.651				
27.85			0.5		
27.87			0.7		
27.89			0.6		
27.90	0.653	0.9			
27.91			0.7		
28.05	0.646	1.3			
28.12			2.5		
28.20	0.656				
28.29			0.7		

APPENDIX III
 GDO3 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH m	DENSITY kg/m ³ × 10 ³	GRAIN SIZE mm	ICE CRUST THICKNESS mm
28.32			1.3
28.34			0.5
28.35	0.657		
28.50	0.650		
28.53			0.6
28.59		1.0	
28.65	0.652		
28.69			0.8
28.80	0.667	0.9	
28.95	0.645	1.1	
28.97			0.7
29.10	0.656		
29.22			1.3
29.23			0.6
29.25	0.660	0.9	
29.40	0.650		
29.50			0.6
29.55	0.655	1.3	
29.70	0.664		
29.71			0.7
29.83			0.6
29.85	0.669		0.7
30.00	0.661	0.9	
30.03			0.7
30.06			1.3
30.15	0.657	1.1	
30.21			1.0
30.28			2.0
30.30	0.660	1.0	
30.45	0.675		
30.60	0.664	1.1	
30.72			0.6
30.74			0.5
30.75	0.666		
30.90	0.669		
30.95			2.1
30.96	0.665	0.9	

APPENDIX IV
 GDO4 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH m	DENSITY kg/m ³ x 10 ³	GRAIN SIZE mm	ICE CRUST THICKNESS mm
0.00			1.0
0.16	0.447		
0.56	0.470		0.5
0.60	0.372		
0.85	0.478		
0.98	0.258		
1.02	0.420		0.4
1.18	0.461	0.3	
1.26			0.4
1.34	0.452	0.5	
1.43	0.456		0.5
1.47	0.377		0.2
1.51			0.3
1.67	0.454		0.2
1.71	0.331		
1.74	0.398	0.6	
1.86	0.412		
1.90			0.2
1.94	0.475		
2.03	0.475		1.0
2.11	0.485		
2.22	0.423	0.7	0.4
2.27	0.427		
2.49	0.451		
2.58	0.401	0.9	
2.80	0.446		
2.96			0.5
3.13			0.4
3.16	0.475		0.6
3.33			0.3
3.35	0.461		0.3
3.42	0.463	0.9	
3.47	0.460	1.2	
3.51	0.468		
3.69			0.2
3.71	0.500		0.5
3.86			0.5
3.92	0.491		0.6
4.13			0.3
4.16			0.2
4.21	0.489		
4.39	0.500	0.9	
4.42	0.419		
4.48			1.0
4.69			0.4
4.75			0.4
4.76	0.500		0.4
4.90	0.501		
4.92			0.2
5.20			0.2

APPENDIX IV

GD04 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH m	DENSITY kg/m ³ x 10 ³	GRAIN SIZE mm	ICE CRUST THICKNESS mm
5.22	0.508	0.9	0.7
5.24	0.433		
5.25	0.503		0.2
5.34	0.468		0.6
5.40	0.518		
5.50	0.497	1.2	
5.60			1.0
5.65			0.6
5.70			0.6
5.72	0.509	0.9	
5.80	0.477		
6.12	0.545		0.8
6.30	0.543		0.2
6.33			0.2
6.34	0.502	0.6	0.2
6.42	0.478	0.8	
6.79	0.516		0.7
6.86			0.5
7.02			0.4
7.20			0.4
7.34	0.524		1.0
7.56	0.537		0.5
7.80	0.513		
7.93			1.2
8.15			0.5
8.26	0.537		
8.39			0.5
8.43	0.549		
8.86	0.561		0.4
9.21			0.8
9.27	0.558	0.7	0.3
9.39	0.543	1.1	
9.43	0.553		
9.53	0.550		
9.67			2.2
9.70			0.5
9.76	0.569	0.9	
9.82	0.523	1.3	0.6
10.01			1.0
10.10			0.6
10.17			0.7
10.33	0.565	0.7	

APPENDIX V
 GDO5 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH	DENSITY	GRAIN SIZE	ICE CRUST THICKNESS	SOI	SOI2	MIANG	STIRN	STIRN2
m	kg/m ³ x 10 ³	mm	mm	mm	mm	mm	mm	mm
0.19	0.411	0.3				8.0	184.0	47.2
0.29	0.491	0.5				8.0	184.0	47.2
0.50	0.495	0.3				8.0	184.0	47.2
0.70	0.472	0.3	1.0	8.0	8.0	184.0	47.2	
0.77	0.420	0.3		8.0	8.0	184.0	47.2	
0.84	0.384	0.8				8.0	184.0	47.2
0.91	0.387	0.8				8.0	184.0	47.2
1.12	0.425	0.5		8.0	8.0	184.0	47.2	
1.15	0.405	0.8				8.0	184.0	47.2
1.20	0.413	0.8	1.7	8.0	8.0	184.0	47.2	
1.37	0.459	0.4		8.0	8.0	184.0	47.2	
1.52	0.475	0.4		8.0	8.0	184.0	47.2	
1.67	0.481	0.4	0.3	8.0	8.0	184.0	47.2	
1.74	0.464	0.4	0.5	8.0	8.0	184.0	47.2	
1.79	0.453	0.4	0.2	8.0	8.0	184.0	47.2	
1.85	0.448	0.4	0.5	8.0	8.0	184.0	47.2	
1.92	0.445	0.4		8.0	8.0	184.0	47.2	
2.05	0.388	0.6	0.6	8.0	8.0	184.0	47.2	
2.10	0.444	0.6	1.0	8.0	8.0	184.0	47.2	
2.26	0.493	0.4		8.0	8.0	184.0	47.2	
2.30	0.407	0.8		8.0	8.0	184.0	47.2	
2.35	0.422	0.8				8.0	184.0	47.2
2.43	0.397	0.9		8.0	8.0	184.0	47.2	
2.52	0.427	0.6		8.0	8.0	184.0	47.2	
2.56	0.422	0.7		8.0	8.0	184.0	47.2	
2.60	0.454	0.5	1.2	8.0	8.0	184.0	47.2	
2.64	0.423	1.0	0.4	8.0	8.0	184.0	47.2	
2.78	0.493	1.3		8.0	8.0	184.0	47.2	
2.86	0.428	1.1		8.0	8.0	184.0	47.2	
2.97	0.448	0.8	0.8	8.0	8.0	184.0	47.2	
3.07	0.450	1.0		8.0	8.0	184.0	47.2	
3.16	0.466	0.6	1.2	8.0	8.0	184.0	47.2	
3.26	0.464	0.7	0.7	8.0	8.0	184.0	47.2	
3.37	0.467	0.7		8.0	8.0	184.0	47.2	
3.49	0.453	0.6		8.0	8.0	184.0	47.2	
3.53	0.467	0.9	0.5	8.0	8.0	184.0	47.2	
3.64	0.502	0.6		8.0	8.0	184.0	47.2	
3.68	0.466	0.9		8.0	8.0	184.0	47.2	
3.73	0.444	1.0		8.0	8.0	184.0	47.2	
3.85	0.484	0.6	0.6	8.0	8.0	184.0	47.2	
4.01	0.497	0.6		8.0	8.0	184.0	47.2	
4.20	0.505	0.6	0.3	8.0	8.0	184.0	47.2	
4.30	0.514	0.6		8.0	8.0	184.0	47.2	
4.41	0.518	0.6		8.0	8.0	184.0	47.2	
4.47	0.528	0.6	1.2	8.0	8.0	184.0	47.2	
4.50	0.500	0.6	0.5	8.0	8.0	184.0	47.2	
4.54	0.489	0.6		8.0	8.0	184.0	47.2	
4.65	0.484	1.0		8.0	8.0	184.0	47.2	
4.70	0.481	1.0		8.0	8.0	184.0	47.2	
4.75	0.436	1.0		8.0	8.0	184.0	47.2	

APPENDIX V
 GD05 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH	DENSITY	GRAIN SIZE	ICE CRUST THICKNESS	WATER CONTENT	WATER CONTENT
m	kg/m ³ x 10 ³	mm	mm	mm	%
4.79	0.483	0.8		1.6	223.0
4.82	0.483	0.8	2.0	2.0	191.0
5.00	0.510	1.0		2.0	209.0
5.08	0.493	1.3	0.6	1.0	171.0
5.29	0.486	1.1	0.7	2.0	194.0
5.40	0.530	0.8		2.0	181.0
5.43	0.513	1.0		2.0	182.0
5.66	0.520	0.8	0.9	2.0	174.0
5.83	0.520	0.8		2.0	166.0
5.86	0.467	1.6	0.6	2.0	174.0
5.96	0.515	0.8	3.2	2.0	162.0
5.99	0.509	0.8		2.0	174.0
6.03	0.456	1.3		2.0	154.0
6.10	0.501	0.7		2.0	164.0
6.16	0.495	1.2		2.0	154.0
6.28	0.535	0.8		2.0	164.0
6.43	0.533	0.6		2.0	164.0
6.57	0.528	0.9	0.8	2.0	162.0
6.73	0.520	0.8	0.7	2.0	164.0
6.78	0.535	0.7	0.8	2.0	164.0
6.86			0.5	2.0	164.0
6.89	0.527	0.7		2.0	172.0
6.93			2.0	2.0	164.0
6.96	0.500	1.3	1.0	2.0	174.0
7.14	0.523	1.1		2.0	174.0
7.30	0.515	0.9		2.0	174.0
7.34	0.537	0.8		2.0	164.0
7.39	0.507	0.8	0.7	2.0	164.0
7.43			0.7	2.0	164.0
7.45	0.503	0.9		2.0	164.0
7.69	0.545	0.8		2.0	174.0
7.81	0.537	0.8	1.5	2.0	164.0
7.93	0.541	0.7		2.0	164.0
8.02	0.538	0.8	0.7	2.0	164.0
8.29	0.556	0.9		2.0	164.0
8.44	0.558	0.9		2.0	164.0
8.53	0.528	1.1	0.9	2.0	164.0
8.64	0.547	0.9	0.7	2.0	164.0
8.79	0.547	0.8		2.0	164.0
8.87	0.535	0.9		2.0	164.0
8.95	0.546	1.0	0.7	2.0	164.0
8.98	0.541	0.8		2.0	164.0
9.07	0.563	0.7		2.0	164.0
9.47	0.565	0.8	1.0	2.0	164.0
9.51	0.544	1.1	0.6	2.0	164.0
9.68	0.549	0.9	0.5	2.0	164.0
9.74	0.542	1.1	0.5	2.0	164.0
9.78	0.544	0.7	0.7	2.0	164.0
9.93	0.546	0.9		2.0	164.0
9.99	0.548	0.7	0.6	2.0	164.0

APPENDIX VI
 GDO7 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH	DENSITY	GRAIN SIZE	ICE CRUST THICKNESS
m	kg/m ³ x 10 ³	mm	mm
0.10			1.0
0.15	0.398	0.3	
0.19	0.446	0.3	
0.32	0.403	0.6	1.0
0.38	0.430	0.3	0.7
0.43	0.370	0.5	
0.55	0.376	0.4	0.3
0.63	0.302	0.9	
0.73	0.402	0.9	
0.80	0.457	0.5	1.0
0.96	0.435	0.5	
1.16	0.446	0.5	1.0
1.29	0.424	0.6	0.4
1.43	0.392	0.9	
1.52	0.470	0.4	
1.53	0.410	0.9	0.5
1.59	0.429	1.0	
1.64	0.462	0.5	0.5
1.74	0.401	1.0	0.8
1.84	0.473	0.6	
1.96	0.447	0.6	0.6
2.00	0.445	0.4	0.5
2.04	0.474	0.4	
2.09	0.419	0.7	
2.17	0.462	0.7	0.7
2.25	0.450	1.0	
2.29	0.378	1.5	
2.44	0.419	1.5	
2.53	0.452	0.9	
2.59	0.450	0.9	
2.66	0.475	0.7	0.5
2.72	0.494	0.5	0.5
2.74	0.442	0.9	0.6
2.80	0.484	0.6	
2.86	0.455	0.9	
2.90			0.5
2.95	0.466	0.5	
3.12	0.488	0.6	0.5
3.18			0.8
3.26	0.478	0.8	
3.43	0.460	1.0	0.7
3.60	0.499	0.6	0.5
3.72	0.503	0.6	0.4
3.76	0.469	0.8	0.5
3.81	0.495	0.9	
3.88	0.463	1.3	
3.98	0.478	0.9	0.8
4.05	0.517	0.8	1.0
4.12	0.518	0.8	
4.16	0.440	1.1	

APPENDIX VI
 GD07 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH m	DENSITY kg/m ³ x 10 ³	GRAIN SIZE mm	ICE CRUST THICKNESS mm
4.33	0.503	0.8	0.8
4.54	0.519	0.7	
4.59	0.495	1.0	
4.71	0.516	0.7	
4.86	0.521	0.7	0.9
4.95	0.507	0.7	0.5
5.05	0.507	1.0	0.7
5.11	0.478	1.0	0.8
5.14	0.476	0.7	
5.17	0.516	1.3	
5.31	0.529	0.7	
5.51	0.525	0.6	0.5
5.73	0.495	1.0	0.7
6.04	0.535	0.7	0.7
6.07	0.511	0.9	
6.16			1.8
6.31	0.532	1.0	
6.41	0.533	0.9	
6.50	0.524	1.0	
6.61			1.5
6.66	0.535	1.0	
6.68	0.499	1.1	
6.93	0.533	0.9	
6.99	0.500	0.9	0.5
7.21	0.539	0.7	1.5
7.30	0.538	0.8	0.6
7.44	0.525	1.0	0.5
7.48	0.518	1.1	
7.51	0.509	1.3	
7.59	0.530	1.1	
7.71	0.537	0.8	
7.74	0.523	1.1	
7.78	0.548	0.8	
7.81	0.553	0.8	0.5
8.04	0.548	1.0	0.7
8.17			0.4
8.19	0.547	0.7	0.3
8.21	0.580	0.6	0.5
8.26	0.530	1.2	
8.32			0.4
8.34	0.544	1.0	
8.50	0.553	0.8	0.6
8.63	0.554	0.9	
8.65	0.531	0.7	0.5
8.76	0.544	0.9	0.5
8.89	0.552	1.0	
8.98	0.557	0.9	
9.21	0.557	1.0	
9.24	0.565	0.9	1.5
9.29	0.553	0.9	

APPENDIX VII
 GDOB CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH m	DENSITY kg/m ³ x 10 ³	GRAIN SIZE mm	ICE CRUST THICKNESS mm
0.00			0.5
0.01			0.8
0.06	0.428	0.2	
0.14	0.443	0.2	
0.16	0.382	0.2	
0.32	0.419	0.2	
0.51	0.385	0.2	
0.75	0.371	0.8	0.3
0.88	0.513	0.3	
0.93	0.464	0.4	3.0
0.94	0.341	0.4	
0.98	0.417	0.5	0.2
1.02	0.534	0.4	
1.17	0.431	1.1	
1.31	0.450	0.4	0.7
1.41	0.405	1.0	
1.42	0.515	1.0	
1.48	0.494	0.4	0.3
1.54	0.437	0.7	0.3
1.60	0.380	1.1	
1.72	0.476	0.7	
1.96	0.485	0.4	
2.01	0.424	0.7	
2.10	0.411	0.7	0.5
2.12	0.505	0.4	0.7
2.16	0.480	0.4	
2.25	0.462	0.4	
2.36	0.461	0.4	0.2
2.47	0.459	0.4	0.3
2.48			0.3
2.49	0.409	0.6	0.3
2.56			0.4
2.57	0.481	0.4	
2.61	0.441	0.6	0.5
2.76	0.489	0.4	
2.92	0.478	0.4	
3.00			1.0
3.13	0.470	0.4	0.5
3.15	0.384	1.3	
3.35	0.453	0.7	0.8
3.46			1.0
3.50	0.475	0.7	
3.60	0.477	1.3	
3.63			0.5
3.65	0.479	0.9	
3.77	0.452	1.1	0.8
3.82	0.495	0.9	
3.84			0.5
3.89			0.6
3.97			0.4

APPENDIX VII
 GD08 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH	DENSITY	GRAIN SIZE	ICE CRUST THICKNESS		
m	kg/m ³ x 10 ³	mm	mm		
4.02	0.493	0.6			
4.11	0.481	1.1			
4.12	0.523	0.9	0.5		
4.13			1.0		
4.15	0.518	0.9			
4.17			1.0		
4.24	0.483	1.1			
4.31	0.515	0.6			
4.40	0.495	1.1			
4.48	0.515	0.9	0.5		
4.58	0.533	0.5			
4.83	0.528	0.5	1.0		
5.00	0.487	0.9			
5.06	0.502	1.7			
5.15	0.514	0.9			
5.26	0.514	0.9	1.0		
5.29			0.4		
5.34	0.499	0.6			
5.43	0.467	1.3			
5.60	0.521	0.6			
5.63			0.5		
5.72	0.518	0.6			
5.76			0.5		
5.80	0.518	0.6			
5.82	0.566	0.5			
5.90	0.529	0.5	0.7		
6.05	0.515	1.1	0.5		
6.20	0.515	1.1			
6.25	0.525	0.6			
6.34			0.9		
6.39			0.5		
6.40	0.529	0.6			
6.50	0.529	1.1			
6.55	0.560	1.1	0.5		
6.62	0.540	0.6			
6.65	0.551	1.0	0.4		
6.75	0.539	0.6	1.0		
6.80	0.517	1.0			
6.84			0.4		
6.91	0.543	0.6			
6.94			0.5		
7.04	0.541	0.6	0.3		
7.06	0.523	1.1	0.3		
7.10			0.3		
7.18			0.5		
7.40	0.544	0.6	1.5		
7.50	0.529	1.3	1.0		
7.66	0.514	1.5			
7.70	0.543	0.6			
7.79	0.545	1.0			

APPENDIX VIII

GD10 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH m	DENSITY kg/m ³ x 10 ³	GRAIN SIZE mm	ICE CRUST THICKNESS mm	FIELD MEASURED TEMPERATURE °C	DEPTH m
0.00			0.5	2.0	0.00
0.02	0.363	0.2			
0.08	0.374	0.2		2.0	0.08
0.13	0.332	0.2		2.0	0.13
0.14	0.437	0.4			
0.16	0.506	0.2		2.0	0.16
0.24	0.381	0.4	1.5	2.1	0.24
0.37	0.450	0.3		2.1	0.37
0.45	0.338	0.4		2.0	0.45
0.47	0.404	0.3		2.1	0.47
0.53	0.347	0.5	0.3	2.0	0.53
0.69			0.7	2.0	0.69
0.70	0.476	0.3	0.7		
0.81	0.416	0.5			
0.94	0.449	0.5			
1.02	0.521	0.3		2.0	1.02
1.03			0.4	2.1	1.03
1.04	0.488	0.3		2.0	1.04
1.11	0.431	0.4	0.3	2.1	1.11
1.21	0.464	0.5		2.1	1.21
1.34	0.373	1.0		2.0	1.34
1.44	0.452	0.5		2.1	1.44
1.54	0.408	0.7	0.5		
1.70	0.411	1.0		2.0	1.70
1.79	0.434	0.7			
1.92	0.444	0.5		2.0	1.92
1.97	0.429	0.5		2.0	1.97
2.07	0.462	0.8		2.0	2.07
2.13	0.457	0.5	0.5	2.1	2.13
2.18	0.481	0.4	0.8	2.0	2.18
2.22	0.400	1.1		2.1	2.22
2.29	0.476	0.6		2.1	2.29
2.40	0.503	0.6		2.1	2.40
2.43	0.443	0.6	0.5	2.1	2.43
2.47	0.486	1.0		2.1	2.47
2.50	0.488	0.6		2.1	2.50
2.61	0.441	0.8		2.0	2.61
2.82	0.497	0.6			
2.84	0.498	0.4			
2.91	0.520	0.5	0.5		
2.92	0.512	0.6			
2.98	0.497	0.5	0.5		
3.02	0.479	0.6	0.5		
3.06	0.480	0.6			
3.12	0.450	1.1	0.5		
3.16	0.487	1.0			
3.18	0.527	0.5			
3.20	0.519	0.7			
3.27	0.493	0.6	0.9		
3.41			1.0		

APPENDIX VIII
 GD10 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH m	DENSITY kg/m ³ x 10 ³	GRAIN SIZE mm	ICE CRUST THICKNESS mm	AGE yr	ICE CRUST THICKNESS mm	AGE yr
3.42	0.550	0.6			2.0	1.0
3.45	0.380	1.0			0.1	
3.57	0.548	1.1			1.0	
3.66	0.501	0.9			2.0	
3.83	0.490	0.8	1.0		2.0	
3.87	0.526	0.8	0.5		2.0	
3.93	0.510	0.6			2.0	
4.05	0.514	0.7			1.1	
4.14	0.514	0.6	0.5		2.0	
4.22	0.503	0.9			2.0	
4.27	0.481	1.0				
4.36	0.507	0.9				
4.43	0.503	0.8			2.0	
4.51	0.484	1.1	0.5		0.1	
4.58	0.505	0.6	1.0		2.0	
4.65	0.506	0.8			0.1	
4.68	0.484	0.6	0.6		2.0	
4.71	0.464	0.6			1.1	
4.76	0.528	0.5	0.4		2.0	
4.82	0.488	0.9			2.0	
4.91	0.476	1.3				
4.98	0.501	0.9			2.0	
5.04	0.508	0.6			2.0	
5.12			0.6		2.0	
5.13	0.501	0.6			2.0	
5.23	0.532	0.6			0.1	
5.29	0.529	0.6			2.0	
5.32	0.494	0.9			2.0	
5.37	0.486	0.6			2.0	
5.40	0.521	0.5			2.0	
5.49	0.507	0.9			1.1	
5.52	0.536	0.5			2.0	
5.55	0.505	1.1			2.0	
5.62	0.530	0.5	1.2		2.0	
5.68	0.482	0.9			0.1	
5.72	0.496	0.6				
5.78	0.491	1.2			2.0	
5.85	0.523	0.6			1.1	
5.90	0.526	0.6			2.0	
6.05	0.520	0.8			0.1	
6.12	0.531	0.8	0.5		2.0	
6.19	0.547	0.6			2.0	
6.21	0.526	0.6			0.1	
6.25	0.546	0.6	1.2		2.1	
6.33	0.528	0.5			2.0	
6.42	0.534	0.5			2.0	
6.52	0.528	0.5	0.5		2.0	
6.60	0.532	0.6			0.1	
6.63	0.490	0.6	0.3		2.0	
6.70	0.545	0.6			2.0	

APPENDIX VIII
 GD10 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH m	DENSITY kg/m ³ × 10 ³	GRAIN SIZE mm	ICE CRUST THICKNESS mm
6.71	0.553	0.6	
6.73	0.522	1.0	
6.75	0.518	0.7	0.5
6.83	0.555	0.5	0.5
6.94	0.545	0.5	
6.98	0.540	0.6	0.6
7.03	0.528	0.9	
7.09	0.509	1.3	
7.21	0.520	0.9	0.3
7.34	0.552	0.6	
7.35			0.4
7.36			0.5
7.55	0.541	0.6	
7.61	0.510	1.0	0.2
7.63	0.555	0.6	0.9
7.66	0.505	1.0	0.5
7.70	0.521	0.6	
7.71	0.535	1.1	
7.93	0.525	0.9	0.5
8.12	0.557	0.6	0.5
8.19			0.3
8.24	0.554	0.6	0.5
8.28	0.565	0.6	
8.40	0.550	0.6	1.1
8.41	0.579	0.9	0.5
8.46	0.534	1.0	
8.58	0.542	0.6	0.3
8.78	0.567	0.6	
8.79	0.548	0.5	
8.81	0.557	0.6	
8.86	0.529	1.1	
8.90	0.569	0.9	
8.97	0.563	0.9	1.7
9.02	0.560	0.9	
9.05	0.480	1.0	
9.10			0.6
9.11	0.543	0.9	
9.19	0.526	1.3	
9.27	0.542	0.9	
9.32	0.542	1.0	
9.37	0.553	0.9	0.3
9.40	0.563	0.9	
9.46	0.557	1.0	0.6
9.50	0.559	1.3	
9.58	0.555	1.0	
9.69	0.555	0.9	0.7
9.74	0.547	0.9	
9.77	0.508	1.0	0.6
9.81	0.570	0.9	
9.92	0.533	0.9	0.5

APPENDIX IX

GD11 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH m	DENSITY kg/m ³ x 10 ³	GRAIN SIZE mm	ICE CRUST THICKNESS mm
0.19	0.335	0.2	
0.28	0.408	0.2	0.5
0.33	0.333	0.6	
0.47	0.350	0.6	
0.53	0.439	0.3	
0.61	0.408	0.4	0.5
0.66	0.409	0.6	
0.75	0.401	0.6	
0.83	0.378	0.8	
0.95	0.424	0.4	
1.03	0.444	0.5	
1.07	0.399	0.6	0.6
1.27	0.453	0.3	0.3
1.37	0.396	0.6	
1.41	0.430	0.3	
1.52	0.398	0.7	
1.57	0.369	0.9	0.2
1.65	0.409	0.7	0.7
1.74	0.434	0.6	
1.90	0.428	0.5	
2.10	0.454	0.6	
2.29	0.426	1.0	
2.43	0.427	0.8	
2.54	0.437	0.5	1.2
2.65	0.420	0.8	
2.70			0.7
2.73	0.453	0.6	
2.83	0.462	0.6	
2.89	0.477	0.6	0.5
2.98	0.453	0.9	
3.26	0.480	0.5	
3.34	0.502	0.5	
3.44			0.5
3.48	0.500	0.4	
3.60	0.502	0.4	0.5
3.70	0.487	0.4	0.3
3.79	0.466	0.9	0.4
3.82	0.457	0.9	
3.88	0.450	1.0	0.4
4.02	0.483	0.6	
4.11	0.489	0.6	
4.19	0.505	0.4	0.9
4.24	0.530	0.4	
4.25			0.3
4.28	0.468	0.6	1.2
4.42	0.488	0.9	
4.52	0.500	0.9	0.6
4.67	0.469	1.2	0.6
4.72	0.479	1.1	
4.91	0.496	1.1	

APPENDIX IX
 GD11 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH m	DENSITY $\text{kg/m}^3 \times 10^3$	GRAIN SIZE mm	ICE CRUST THICKNESS mm
5.03	0.512	0.9	
5.15	0.511	0.5	0.7
5.22	0.519	0.5	
5.24	0.494	0.7	
5.42	0.493	0.9	
5.60	0.548	0.5	0.5
5.76	0.524	0.5	0.8
5.93	0.503	1.0	
6.04	0.498	1.0	
6.15	0.503	1.0	
6.19	0.506	0.8	
6.34	0.522	0.6	1.2
6.38	0.531	0.8	0.6
6.43	0.500	0.9	0.4
6.67	0.514	0.8	
6.81	0.503	1.0	
6.93	0.521	0.6	
6.98	0.496	0.8	
7.02	0.503	0.9	
7.15	0.522	0.7	
7.23	0.538	0.6	0.5
7.43	0.539	0.8	
7.45	0.545	1.1	0.8
7.54	0.517	0.9	0.3
7.65	0.533	0.7	
7.68	0.518	1.2	0.6
7.76	0.535	1.0	0.6
7.81	0.535	1.0	
7.92	0.539	0.6	
8.00	0.542	0.6	
8.03	0.528	0.9	
8.33	0.545	0.6	0.6
8.41	0.527	1.1	
8.45	0.554	0.7	
8.62	0.527	1.1	
8.68	0.557	0.6	1.0
8.75	0.545	0.6	
8.79	0.563	0.7	
8.83	0.561	1.0	0.8
8.88	0.549	0.8	0.5
8.91	0.516	1.1	
8.95	0.541	0.8	0.3
9.07	0.523	1.1	0.4
9.23	0.554	0.7	0.5
9.30	0.534	0.9	0.4
9.35	0.554	0.6	
9.41	0.531	0.8	
9.49	0.526	0.9	
9.55	0.535	0.8	1.3
9.76	0.548	0.9	1.4

APPENDIX IX

GD11 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH	DENSITY	GRAIN SIZE	ICE CRUST THICKNESS	DEPTH	DENSITY
m	kg/m ³ x 10 ³	mm	mm	m	kg/m ³ x 10 ³
10.02	0.532	1.1	0.6	10.02	0.532
10.13	0.550	0.8	0.4	10.13	0.550
10.24	0.559	0.8	0.3	10.24	0.559
10.32	0.548	1.0		10.32	0.548
				10.40	0.540
				10.45	0.535
				10.50	0.530
				10.55	0.525
				10.60	0.520
				10.65	0.515
				10.70	0.510
				10.75	0.505
				10.80	0.500
				10.85	0.495
				10.90	0.490
				10.95	0.485
				11.00	0.480
				11.05	0.475
				11.10	0.470
				11.15	0.465
				11.20	0.460
				11.25	0.455
				11.30	0.450
				11.35	0.445
				11.40	0.440
				11.45	0.435
				11.50	0.430
				11.55	0.425
				11.60	0.420
				11.65	0.415
				11.70	0.410
				11.75	0.405
				11.80	0.400
				11.85	0.395
				11.90	0.390
				11.95	0.385
				12.00	0.380
				12.05	0.375
				12.10	0.370
				12.15	0.365
				12.20	0.360
				12.25	0.355
				12.30	0.350
				12.35	0.345
				12.40	0.340
				12.45	0.335
				12.50	0.330
				12.55	0.325
				12.60	0.320
				12.65	0.315
				12.70	0.310
				12.75	0.305
				12.80	0.300
				12.85	0.295
				12.90	0.290
				12.95	0.285
				13.00	0.280
				13.05	0.275
				13.10	0.270
				13.15	0.265
				13.20	0.260
				13.25	0.255
				13.30	0.250
				13.35	0.245
				13.40	0.240
				13.45	0.235
				13.50	0.230
				13.55	0.225
				13.60	0.220
				13.65	0.215
				13.70	0.210
				13.75	0.205
				13.80	0.200
				13.85	0.195
				13.90	0.190
				13.95	0.185
				14.00	0.180
				14.05	0.175
				14.10	0.170
				14.15	0.165
				14.20	0.160
				14.25	0.155
				14.30	0.150
				14.35	0.145
				14.40	0.140
				14.45	0.135
				14.50	0.130
				14.55	0.125
				14.60	0.120
				14.65	0.115
				14.70	0.110
				14.75	0.105
				14.80	0.100
				14.85	0.095
				14.90	0.090
				14.95	0.085
				15.00	0.080

APPENDIX X
 GD12 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH	DENSITY	GRAIN SIZE	ICE CRUST THICKNESS
m	kg/m ³ x 10 ³	mm	mm
0.00			0.5
0.04	0.420	0.2	
0.17	0.386	0.4	
0.24	0.409	0.2	
0.36	0.397	0.2	
0.42	0.420	0.2	
0.48	0.479	0.2	
0.60	0.455	0.2	0.7
0.69	0.439	0.4	
0.86	0.435	0.9	
1.02	0.468	0.4	
1.08	0.451	0.3	0.3
1.18	0.427	0.4	
1.26			0.4
1.32	0.428	0.5	
1.34			0.4
1.37			0.2
1.39			0.2
1.44	0.446	0.5	
1.54	0.446	0.5	
1.61	0.391	0.9	
1.63	0.427	0.5	
1.73	0.402	0.9	
1.75	0.411	0.6	
1.80	0.434	0.9	1.0
1.92	0.438	0.6	
2.06			0.7
2.07	0.447	0.4	
2.12	0.417	0.9	
2.16	0.446	0.9	
2.28	0.471	0.5	
2.36	0.459	0.5	
2.42	0.417	0.9	
2.43			0.7
2.55	0.432	0.9	
2.61	0.459	0.5	
2.66	0.401	0.9	
2.81	0.458	0.5	0.7
2.88	0.441	0.6	0.3
2.97	0.428	0.6	0.5
3.10	0.466	0.6	
3.13	0.432	0.9	
3.23	0.477	0.6	
3.36	0.459	0.6	
3.40	0.506	0.5	
3.52	0.481	0.6	
3.59	0.478	0.6	
3.66	0.435	0.9	
3.80	0.483	0.6	0.6
3.88	0.464	1.0	

APPENDIX X

GD12 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH	DENSITY	GRAIN SIZE	ICE CRUST THICKNESS
m	kg/m ³ x 10 ³	mm	mm
3.96	0.469	0.9	
4.08	0.474	0.9	
4.20			0.4
4.22	0.467	0.6	1.5
4.26	0.464	0.9	0.3
4.30	0.510	0.6	
4.38	0.491	0.6	0.6
4.44	0.490	1.0	
4.56	0.460	1.0	
4.62	0.487	1.0	1.0
4.67			0.3
4.69	0.479	0.6	
4.80	0.478	0.9	
4.92	0.489	0.9	
5.00	0.511	0.6	0.4
5.04	0.486	1.0	
5.14	0.534	0.6	
5.18			0.9
5.20	0.528	0.5	
5.32	0.495	0.5	
5.43	0.466	1.0	0.5
5.56	0.505	0.6	
5.64	0.518	0.6	0.6
5.74	0.569	0.5	
5.90	0.485	1.0	
6.00	0.517	0.9	
6.12	0.498	0.6	
6.22	0.516	0.6	
6.33	0.521	0.6	0.3
6.37	0.549	0.5	0.5
6.43	0.534	0.6	
6.48	0.513	0.8	
6.54	0.508	0.8	0.5
6.60	0.496	1.2	
6.72	0.534	0.9	
6.79	0.544	0.7	
6.81	0.521	1.0	0.8
6.89	0.529	0.8	
6.92	0.515	1.0	0.5
6.95	0.536	0.8	
6.96	0.531	1.0	
7.03	0.526	0.6	
7.20	0.526	0.6	
7.27	0.510	0.7	0.6
7.34	0.525	0.7	
7.46	0.539	0.7	
7.55	0.540	0.7	1.1
7.68	0.496	1.1	
7.82	0.529	0.9	0.3
7.94	0.537	0.7	

APPENDIX X
 CD12 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH m	DENSITY kg/m ³ × 10 ³	GRAIN SIZE mm	ICE CRUST THICKNESS mm
8.02	0.543	0.6	0.4
8.06	0.537	0.8	
8.16	0.548	0.5	
8.30	0.549	0.6	
8.40			1.0
8.42	0.543	0.6	0.2
8.44			0.4
8.54	0.547	0.8	
8.66	0.551	0.8	
8.78	0.547	0.8	
8.90	0.547	0.8	2.1
8.98	0.560	0.8	
9.02	0.542	1.0	
9.05	0.561	0.8	
9.09	0.510	1.1	
9.14	0.525	0.9	
9.26	0.539	1.0	
9.30	0.538	0.8	
9.34	0.541	0.9	0.5
9.38	0.544	0.8	
9.50	0.543	0.7	0.6
9.62	0.545	0.7	
9.66			0.4
9.69	0.542	0.5	
9.74	0.516	0.8	
9.82	0.538	1.0	1.0
9.87	0.527	1.3	0.5
9.98	0.537	1.2	
10.01	0.558	1.0	
10.04	0.549	1.1	0.5
10.06	0.539	0.8	0.5
10.10	0.529	1.3	
10.20	0.559	1.2	0.5
10.23	0.537	1.3	0.3
10.26	0.545	1.3	
10.34	0.516	1.5	
10.42	0.527	1.5	
10.46	0.541	0.8	
10.50	0.535	1.1	
10.52	0.549	0.7	2.5
10.58	0.542	1.1	
10.67	0.539	1.2	
10.70	0.544	1.0	
10.76	0.539	0.8	
10.82	0.548	0.8	
10.94	0.557	0.8	
11.00	0.554	0.8	
11.06	0.548	0.9	
11.10	0.529	0.8	0.6
11.18	0.556	0.7	

APPENDIX X
 GD12 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH m	DENSITY kg/m ³ x 10 ³	GRAIN SIZE mm	ICE CRUST THICKNESS mm
11.32	0.555	0.7	
11.34			0.5
11.42	0.573	0.7	0.5
11.44			0.5
11.50	0.546	1.2	2.2
11.53	0.530	1.3	
11.63	0.527	1.3	0.3
11.66	0.565	0.9	
11.71	0.548	0.9	0.6
11.78	0.556	0.9	
11.89			1.5
11.90	0.565	0.9	
11.94	0.550	0.9	
12.02	0.534	1.6	
12.08			0.5
12.14	0.551	0.7	
12.26	0.572	0.7	
12.37			1.7
12.38	0.576	0.8	
12.50	0.566	0.8	
12.62	0.553	1.1	1.2
12.74	0.564	1.3	
12.86	0.558	1.3	
12.95	0.557	1.2	
12.97			0.8
12.98	0.584	0.7	
13.01			0.6
13.10	0.571	0.7	
13.22	0.571	0.7	
13.34	0.558	1.0	2.0
13.46	0.583	0.6	
13.58	0.571	1.1	
13.70			2.1
13.72	0.576	0.9	
13.82	0.550	1.3	0.7
13.94	0.569	0.9	
14.06	0.578	0.8	
14.11			0.7
14.15			1.0
14.18	0.576	0.7	
14.30	0.581	0.7	
14.42	0.588	0.7	
14.57	0.586	0.8	
14.66	0.589	0.8	
14.78	0.573	1.0	0.4
14.88			0.5
14.90	0.596	1.0	
14.93	0.590	0.9	0.6
15.02	0.607	0.9	
15.05			0.4

APPENDIX X
 GD12 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH m	DENSITY kg/m ³ × 10 ³	GRAIN SIZE mm	ICE CRUST THICKNESS mm
15.14	0.585	0.9	
15.17			0.5
15.26	0.587	0.7	
15.28			0.3
15.30			2.0
15.38	0.576	1.0	
15.48			0.3
15.50	0.570	1.2	
15.62	0.587	0.8	
15.74	0.589	0.7	
15.77			0.7
15.86	0.582	1.0	0.7
15.98	0.582	1.0	
16.10	0.585	1.3	
16.22	0.590	1.3	1.3
16.34	0.591	1.0	
16.46	0.587	1.0	
16.58	0.584	1.2	
16.65			0.6
16.70	0.598	0.8	
16.82	0.595	0.9	0.4
16.85			0.7
16.94	0.578	1.3	
17.04			0.7
17.06	0.591	1.0	
17.18	0.598	1.0	
17.25			0.7
17.30	0.601	0.8	
17.42	0.601	0.8	
17.48			0.5
17.54	0.599	0.9	
17.58	0.582	1.5	4.2
17.62			
17.66	0.588	1.5	
17.78	0.592	1.3	
17.90	0.601	0.9	
18.02	0.603	0.9	
18.08			1.5
18.09			0.5
18.14	0.600	1.1	
18.26	0.596	0.9	
18.38	0.591	1.1	
18.40			1.5
18.50	0.592	1.2	
18.52			0.5
18.62	0.588	0.9	
18.74	0.598	1.0	
18.77			1.3
18.86	0.596	1.7	
18.98	0.605	1.0	

APPENDIX X
 GD12 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH m	DENSITY kg/m ³ x 10 ³	GRAIN SIZE mm	ICE CRUST THICKNESS mm
18.99			1.5
19.08			0.8
19.10	0.610	1.0	
19.22	0.581	1.3	
19.34	0.584	1.0	
19.36			0.6
19.40			1.2
19.46	0.589	1.2	
19.58	0.595	1.2	
19.63			0.5
19.70	0.593	1.8	
19.82	0.586	1.8	
19.94	0.592	1.8	
20.02			0.5
20.03	0.601	1.3	
20.04			1.7
20.18	0.598	1.3	
20.30	0.606	1.3	
20.42	0.600	1.3	
20.44			2.6
20.54	0.598	1.3	
20.57			0.5
20.66	0.603	1.2	
20.70			0.9
20.78	0.602	1.1	
20.90	0.605	0.8	
20.93			0.7
21.02	0.601	1.0	
21.14	0.614	0.9	
21.22			0.8
21.24			1.5
21.26	0.612	0.8	
21.38	0.587	1.5	
21.50	0.623	0.9	
21.62	0.622	0.9	
21.74	0.609	1.3	
21.82			2.0
21.86	0.614	1.2	
21.90			0.6
21.98	0.623	2.0	
22.06			0.4
22.10	0.626	0.9	
22.12			0.5
22.22	0.610	1.2	
22.34	0.610	1.0	
22.38			0.5
22.46	0.612	0.9	
22.51			0.6
22.58	0.623	0.9	
22.61			0.4

APPENDIX X
 GD12 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH	DENSITY	GRAIN SIZE	ICE CRUST THICKNESS
m	kg/m ³ x 10 ³	mm	mm
22.63			0.7
22.70	0.599	1.7	
22.82	0.599	1.3	
22.88			1.2
22.94	0.612	1.7	
23.06	0.614	1.7	0.6
23.18	0.624	0.9	
23.30	0.617	0.7	
23.32			0.6
23.33			0.4
23.42	0.603	1.0	
23.54	0.617	1.3	
23.55			2.1
23.66	0.617	1.5	
23.78	0.603	1.8	
23.84			0.3
23.90	0.623	1.2	
23.98			1.5
24.02	0.618	1.2	
24.14	0.621	1.3	
24.24			0.5
24.26	0.617	1.3	
24.38	0.624	1.3	
24.50	0.626	1.2	
24.51			0.4
24.59			0.4
24.62	0.619	1.0	
24.74	0.609	1.2	0.5
24.86	0.624	1.3	
24.90			0.5
24.93			0.7
24.98	0.624	1.2	
25.10	0.628	1.0	
25.19			0.5
25.22	0.630	1.2	
25.34	0.626	1.3	

APPENDIX XI
 GD13 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH m	DENSITY kg/m ³ x 10 ³	GRAIN SIZE mm	ICE CRUST THICKNESS mm
0.05			0.2
0.09	0.447	0.3	
0.27	0.380	0.3	
0.42	0.436	0.3	
0.47	0.432	0.3	0.5
0.66	0.459	0.3	0.2
0.72	0.434	0.3	
0.89	0.447	0.4	
0.98	0.316	0.5	
1.03	0.412	0.7	
1.17	0.388	1.0	0.5
1.28	0.440	0.5	0.4
1.41	0.446	0.5	0.9
1.50	0.439	0.4	0.3
1.63	0.456	0.5	0.4
1.65	0.434	0.9	
1.85	0.457	0.6	0.2
1.88	0.363	0.7	
1.93	0.458	0.5	
1.94	0.400	0.7	0.5
2.05	0.454	0.6	
2.10	0.462	0.9	
2.30	0.488	0.5	2.2
2.39	0.438	1.1	
2.41	0.409	1.4	
2.51	0.447	1.0	
2.60	0.457	0.8	
2.74	0.483	0.6	
2.81	0.490	0.7	
2.87	0.501	0.6	
3.03	0.496	0.6	
3.09	0.465	0.6	
3.20	0.474	0.5	
3.22	0.473	0.6	
3.28	0.468	0.5	
3.32	0.449	0.7	
3.48	0.463	0.7	
3.63	0.488	0.5	0.7
3.71	0.486	0.6	0.4
3.81	0.508	0.5	
3.91	0.474	0.7	0.5
4.13	0.487	0.6	
4.26			0.4
4.28	0.480	0.7	
4.41	0.483	0.7	
4.94			0.6
4.50	0.476	0.6	
4.79	0.520	0.6	
4.94	0.531	0.6	
5.02			0.4

APPENDIX XI
 GD13 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH	DENSITY	GRAIN SIZE	ICE CRUST THICKNESS
m	kg/m ³ x 10 ³	mm	mm
5.03	0.521	0.5					
5.10	0.526	0.5					
5.19	0.492	0.8	0.4				
5.28	0.484	1.0	0.4				
5.52	0.531	0.5	0.3				
5.60	0.503	0.8					
5.75	0.522	0.6	0.9				
5.85			0.4				
5.87	0.522	0.6					
5.90	0.451	1.2					
5.93			0.6				
6.03	0.505	0.8					
6.22	0.524	0.8					
6.30	0.416	0.9					
6.46	0.531	0.7	0.8				
6.56	0.532	0.7					
6.63	0.510	1.0					
6.70	0.526	1.0					
6.92	0.537	0.6	0.7				
7.04	0.510	0.7					
7.15	0.486	0.5					
7.26	0.533	0.6	0.3				
7.48	0.558	0.6					
7.56			0.4				
7.60	0.527	0.8					
7.86	0.534	0.8	1.0				
8.09	0.544	0.8	0.5				
8.20	0.545	0.8	0.6				
8.38	0.527	0.8					
8.50	0.539	0.7					
8.54	0.559	0.8					
8.62	0.535	1.0					
8.70	0.544	0.7					
8.89	0.541	0.6					
8.92			0.5				
8.94	0.561	0.6	1.5				
8.95	0.536	0.7					
9.11	0.532	0.6					
9.32	0.563	0.8					
9.38	0.541	0.9					
9.49	0.557	0.8	0.5				
9.60	0.557	0.6	0.3				
9.65	0.556	0.7	0.7				
9.72	0.554	0.7					
9.76	0.544	1.0	0.4				
9.82	0.538	1.2					
10.00	0.541	1.0					

APPENDIX XII

GD14 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH m	DENSITY $\text{kg/m}^3 \times 10^3$	GRAIN SIZE mm	ICE CRUST THICKNESS mm
0.00			0.3
0.10	0.414	0.2	
0.13	0.412	0.4	
0.24	0.379	0.4	
0.29	0.411	0.2	
0.32	0.373	0.4	
0.44	0.501	0.3	
0.54	0.475	0.2	0.7
0.59	0.415	0.4	
0.64	0.443	0.3	
0.68	0.454	0.4	
0.77	0.458	0.4	
0.90	0.427	0.6	
1.04	0.442	0.5	
1.08	0.463	0.4	
1.13	0.458	0.5	
1.22	0.462	0.4	
1.28	0.461	0.6	
1.34	0.477	0.4	
1.39	0.471	0.6	0.3
1.56	0.491	0.5	
1.61			0.8
1.69			0.3
1.75	0.483	0.4	
1.92	0.403	0.9	
2.03	0.501	0.9	
2.06	0.429	0.9	
2.13	0.468	0.9	
2.24	0.461	0.9	
2.32	0.485	0.5	
2.38	0.481	1.0	0.3
2.50	0.466	0.6	0.8
2.55			0.5
2.62	0.464	0.6	0.4
2.67	0.392	1.0	
2.74	0.478	0.6	
2.91	0.490	0.6	0.3
2.98	0.508	0.9	
3.06	0.514	0.6	
3.14	0.419	1.1	
3.19	0.470	0.9	
3.24	0.484	0.6	1.0
3.35	0.456	1.1	
3.42	0.449	1.5	
3.53	0.490	0.6	
3.61	0.468	0.6	
3.69	0.474	0.6	
3.76	0.465	0.7	
3.89	0.478	0.6	0.6

APPENDIX XII
 GD14 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH m	DENSITY kg/m ³ × 10 ³	GRAIN SIZE mm	ICE CRUST THICKNESS mm
4.10	0.519	0.5	
4.16	0.531	0.6	
4.24	0.531	0.5	
4.33	0.513	0.6	0.3
4.42	0.500	0.7	
4.51	0.493	0.7	
4.55	0.452	0.6	
4.60	0.446	0.7	
4.65	0.450	0.7	
4.83			0.6
4.93	0.513	0.5	0.3
4.97	0.500	0.6	
5.03	0.479	1.0	
5.12	0.505	0.7	
5.16	0.518	0.6	
5.25	0.516	0.6	
5.30	0.521	0.5	
5.34	0.495	0.5	
5.38	0.559	0.4	0.3
5.53	0.523	0.4	
5.59	0.514	0.9	
5.68			0.4
5.69	0.532	0.6	0.5
5.79	0.520	0.6	0.4
5.87	0.535	0.6	
5.90	0.535	0.9	
5.93			0.5
5.94	0.523	0.6	
6.00	0.529	1.0	
6.10	0.529	1.0	
6.19	0.519	0.7	
6.23	0.523	0.7	0.3
6.26			0.5
6.28	0.517	0.9	
6.36	0.448	1.5	
6.48	0.515	1.0	
6.55	0.523	0.9	
6.56	0.490	1.0	
6.60	0.509	0.9	
6.64	0.473	1.1	
6.67	0.508	0.9	1.0
6.75	0.489	1.0	
6.82	0.504	1.0	
6.90	0.504	0.9	
6.97	0.505	1.0	
7.07			0.6
7.09	0.537	0.7	
7.16	0.551	0.6	
7.20	0.524	1.1	
7.32	0.541	0.6	

APPENDIX XII

GD14 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH m	DENSITY $\text{kg/m}^3 \times 10^3$	GRAIN SIZE mm	ICE CRUST THICKNESS mm	WGT % H ₂ O	WGT % S ₂ O ₈	WGT % CaCO ₃	WGT % Fe ₂ O ₃	WGT % MgO	WGT % Al ₂ O ₃	WGT % SiO ₂	WGT % K ₂ O	WGT % Na ₂ O	WGT % Total
7.44	0.554	0.6											
7.73	0.556	0.5											
7.80	0.556	0.5	0.8										
7.88	0.547	0.6											
7.92	0.522	0.9											
8.02	0.515	1.0											
8.10	0.527	1.0											
8.21	0.532	0.6	1.5										
8.29	0.533	1.0											
8.49	0.547	0.6											
8.50	0.544	0.5											
8.64	0.514	0.7											
8.70	0.538	1.0											
8.78	0.536	1.1											
8.82	0.545	1.1	0.5										
9.00	0.565	0.6											
9.02	0.580	0.6	0.3										
9.29			0.3										
9.31	0.557	0.7											
9.35	0.560	0.7	0.5										
9.40	0.564	0.9											
9.53	0.556	0.9											
9.56	0.560	0.6											
9.64	0.560	0.6											
9.67	0.552	1.0											
9.77	0.509	1.2	2.0										
9.86	0.562	1.0											
9.96	0.563	0.9											
10.12	0.567	0.9	0.5										
10.18	0.563	0.5											

APPENDIX XIII
 GD15 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH	DENSITY	GRAIN SIZE	ICE CRUST THICKNESS	GRAIN SIZE	ICE CRUST THICKNESS
m	kg/m ³ x 10 ³	mm	mm	mm	mm
0.13	0.503	0.2			
0.26	0.491	0.3			
0.28	0.468	0.4			
0.42	0.462	0.3	0.3		
0.52	0.443	0.5			
0.62	0.470	0.4			
0.70	0.380	1.0			
0.72	0.444	1.0			
0.74	0.461	0.5	0.6		
0.92	0.456	0.5			
0.97	0.423	1.0			
1.05	0.440	0.5			
1.19	0.459	0.4			
1.23	0.469	0.5			
1.30	0.492	1.0			
1.35	0.522	0.4			
1.41	0.602	0.4			
1.51	0.443	0.5	0.4		
1.63	0.436	0.4			
1.70	0.352	1.0			
1.80	0.476	0.3			
1.86	0.398	1.0			
2.03	0.475	0.6			
2.08	0.461	0.6			
2.14	0.495	0.6			
2.19	0.495	0.6			
2.23	0.474	1.0			
2.42	0.522	0.4	0.7		
2.55	0.460	1.0	0.5		
2.72	0.381	1.5			
2.88	0.446	0.6			
2.93	0.458	0.7			
3.01	0.480	0.6			
3.07	0.493	0.6			
3.22	0.501	0.6			
3.30	0.426	1.3			
3.34	0.479	0.6			
3.42	0.470	1.1	0.5		
3.46	0.543	0.6			
3.56	0.447	1.1			
3.64	0.473	1.0			
3.69	0.491	0.9			
3.76	0.483	0.9			
3.85	0.479	0.6			
3.90	0.446	0.9	0.3		
4.05	0.496	0.5			
4.20	0.513	0.5			
4.24			0.4		
4.27	0.509	0.9			
4.38	0.472	1.0			

APPENDIX XIII
 CD15 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH m	DENSITY kg/m ³ x 10 ³	GRAIN SIZE mm	ICE CRUST THICKNESS mm
4.41	0.501	0.9	
4.56	0.506	0.9	
4.62	0.464	1.0	
4.67	0.528	0.5	
4.76	0.531	0.5	0.5
4.86	0.534	0.6	0.5
4.95	0.504	1.1	
5.03	0.517	0.7	
5.09	0.506	0.9	
5.13	0.500	1.1	
5.20	0.511	0.6	
5.23	0.500	1.0	
5.38	0.510	0.6	1.0
5.55	0.524	0.6	
5.62	0.528	0.6	0.8
5.72	0.495	0.9	
5.76	0.499	1.0	
5.79			0.5
5.81	0.507	0.9	
5.87	0.493	1.0	
5.92	0.514	0.9	
5.94	0.498	1.0	
6.02	0.482	0.9	
6.16	0.518	0.9	
6.23	0.494	1.1	
6.35	0.522	0.9	
6.39			0.6
6.45	0.531	0.7	
6.54			0.5
6.57	0.527	0.7	
6.61	0.526	0.7	
6.69	0.491	1.0	
6.75	0.506	1.0	
6.82	0.501	1.0	
6.90	0.524	0.9	
6.97	0.520	0.9	
7.05	0.528	0.7	
7.20	0.545	0.7	0.6
7.37	0.533	0.7	
7.39	0.558	0.9	
7.44	0.504	0.7	
7.50	0.533	0.9	
7.69	0.536	0.9	
7.78	0.537	0.9	
7.80	0.483	0.6	
7.82	0.578	0.6	0.4
7.92	0.498	1.0	0.3
7.96	0.555	0.7	
7.99	0.544	0.9	
8.04	0.524	1.0	0.5

APPENDIX XIII
 GD15 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH m	DENSITY kg/m ³ x 10 ³	GRAIN SIZE mm	ICE CRUST THICKNESS mm	NO. OF GRAINS	NO. OF ICE CRUSTS
8.08	0.548	0.6	0.5		
8.22	0.532	0.6		2.1	20.21
8.25	0.527	1.0	0.5	2.1	20.21
8.40	0.548	0.9		0.1	20.21
8.46	0.541	0.9	0.5	0.0	20.21
8.51	0.500	1.5		2.0	20.21
8.59	0.510	0.9		2.0	20.21
8.73	0.534	0.9		2.0	20.21
8.81	0.541	1.1		2.0	20.21
9.00	0.549	0.9		2.0	20.21
9.05	0.549	0.9	0.9	0.0	20.21
9.08			0.8		
9.11			0.6		
9.20	0.543	0.9	0.4	2.0	20.21
9.31	0.542	1.3		0.1	20.21
9.35	0.562	1.3		0.1	20.21
9.48	0.569	0.9	0.5	2.0	20.21
9.61	0.532	1.0	2.0	0.1	20.21
9.75	0.547	0.9		2.0	20.21
9.90	0.566	0.9		2.0	20.21
9.95	0.566	0.9	0.3	2.0	20.21
10.08	0.562	1.0	0.4	2.0	20.21
10.15	0.551	1.0		2.0	20.21
10.20	0.584	0.9		1.1	20.21
10.28			0.7	1.1	20.21
10.35	0.561	0.9		2.1	20.21
10.46			0.3	2.0	20.21
10.50	0.565	0.9		2.0	20.21
10.55	0.580	0.9	0.5	2.0	20.21
10.58	0.558	1.4	0.4	2.0	20.21
10.65	0.548	1.4		2.0	20.21
10.80	0.550	1.4	0.6	2.0	20.21
10.95	0.575	0.9		2.1	20.21
11.06			0.5		
11.13	0.585	0.9	0.3	2.0	20.21
11.25	0.557	1.3		1.1	20.21
11.35	0.566	1.1		1.1	20.21
11.40	0.578	0.9		0.0	20.21
11.55	0.574	0.9		2.0	20.21
11.70	0.584	0.9		2.1	20.21
11.75	0.463	0.7		2.0	20.21
11.87	0.596	0.7		2.0	20.21
11.91	0.586	1.1	0.7	2.0	20.21
12.00	0.555	1.3		2.1	20.21
12.16	0.545	1.3	0.6	2.1	20.21
12.28	0.571	0.7	0.6	2.0	20.21
12.39	0.562	0.7		2.0	20.21
12.57	0.555	1.1		0.1	20.21
12.66	0.588	0.9	1.0	0.0	20.21
12.70	0.562	1.1		0.0	20.21

APPENDIX XIII

GD15 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH m	DENSITY $\text{kg/m}^3 \times 10^3$	GRAIN SIZE mm	ICE CRUST THICKNESS mm
12.80	0.542	1.5	
12.90	0.570	1.3	
12.97	0.568	1.0	
13.05	0.576	0.9	
13.16	0.572	0.9	0.5
13.22	0.590	0.7	0.6
13.29	0.569	0.7	
13.35	0.576	0.9	0.4
13.50	0.598	0.9	0.5
13.65	0.596	0.9	0.4
13.71	0.599	0.9	
13.80	0.569	1.1	
13.83			0.7
13.95	0.588	1.0	
14.09	0.592	1.0	
14.22	0.593	0.9	
14.25	0.570	1.0	0.8
14.35	0.592	1.0	0.5
14.40	0.590	0.9	
14.46	0.587	0.9	
14.57	0.582	1.0	0.4
14.62	0.611	0.9	0.9
14.70	0.576	1.1	
14.76	0.585	1.1	
14.85	0.585	1.3	
14.89			0.5
14.93	0.586	0.9	
15.00	0.601	0.7	
15.11	0.589	0.9	0.5
15.18	0.590	0.7	0.6
15.32	0.579	1.1	
15.45	0.606	0.9	
15.50	0.568	1.3	
15.56	0.602	1.0	0.8
15.60	0.584	1.1	
15.73	0.591	1.1	
15.82	0.594	1.1	
15.90	0.596	0.9	
15.98	0.592	1.3	0.5
16.05	0.585	1.1	
16.17	0.596	1.1	0.6
16.26	0.601	1.1	0.5
16.29	0.585	0.7	0.5
16.35	0.600	1.3	
16.50	0.594	1.3	
16.62	0.615	0.7	0.6
16.73	0.609	1.0	0.5
16.80	0.601	0.9	
16.95	0.609	0.9	
17.08	0.615	0.9	

APPENDIX XIII
 GD15 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH m	DENSITY kg/m ³ x 10 ³	GRAIN SIZE mm	ICE CRUST THICKNESS mm
17.10	0.599	1.1	
17.20	0.591	1.1	0.8
17.28	0.602	0.9	
17.30			0.7
17.40	0.606	0.9	
17.42	0.588	1.1	0.6
17.55	0.599	1.1	
17.67	0.610	1.3	0.7
17.85	0.606	0.9	
17.93	0.609	0.9	0.6
18.00	0.601	1.0	
18.06			0.6
18.15	0.598	0.9	
18.30	0.599	0.9	0.7
18.40	0.598	0.9	1.0
18.45	0.639	1.3	
18.64	0.592	1.3	
18.75	0.593	1.3	
18.90	0.590	1.3	
18.99	0.602	0.9	0.7
19.05	0.621	0.9	
19.20	0.612	0.9	
19.23	0.624	0.9	0.4
19.38	0.612	1.3	
19.45	0.624	0.9	0.5
19.50	0.636	0.9	
19.53			1.5
19.55	0.630	0.9	
19.60	0.575	1.3	
19.65	0.621	1.0	
19.76	0.618	1.0	
19.80	0.611	0.9	
19.95	0.605	0.9	0.6
19.98			0.6
20.10	0.602	1.0	
20.25	0.605	1.0	
20.40	0.618	1.3	
20.42			0.7
20.55	0.612	1.0	
20.70	0.618	1.1	0.8
20.85	0.615	1.3	
21.00	0.622	0.9	
21.03			0.5
21.10			0.6
21.15	0.617	1.0	
21.30	0.610	1.0	
21.45	0.613	0.9	
21.61	0.622	0.7	
21.75	0.521	0.9	
21.90	0.615	0.9	

APPENDIX XIII

GD15 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH m	DENSITY kg/m ³ x 10 ³	GRAIN SIZE mm	ICE CRUST THICKNESS mm
22.05	0.635	0.7	
22.09	0.643	0.7	1.0
22.20	0.618	1.3	
22.37	0.618	1.3	0.5
22.47	0.630	1.0	
22.51	0.633	1.0	0.5
22.54			0.6
22.65	0.622	1.3	
22.82	0.626	0.7	
22.99	0.616	1.0	
23.10	0.628	1.0	
23.15	0.623	1.0	0.6
23.25	0.638	1.0	
23.36	0.635	1.0	
23.40	0.631	1.0	
23.55	0.624	1.0	
23.65	0.628	1.3	2.0
23.70	0.640	1.0	
23.77	0.640	1.0	0.4
23.85	0.631	1.3	
23.93			0.5
24.00	0.628	1.3	0.4
24.08			0.4
24.15	0.634	1.3	
24.29			0.6
24.34	0.631	2.0	
24.41			0.6
24.45	0.630	0.9	
24.54			0.5
24.60	0.624	0.9	
24.75	0.629	1.1	0.3
24.80			0.5
24.90	0.636	1.1	
24.99			0.6
25.01			0.6
25.05	0.639	1.1	
25.11	0.636	1.1	
25.20	0.618	1.0	
25.35	0.618	1.3	
25.44	0.629	1.3	0.5
25.50	0.635	0.9	0.5
25.58			0.5
25.80	0.637	1.3	
25.83			0.5
25.90	0.648	1.0	0.4
25.93			0.7
25.95	0.641	1.5	
26.05			1.4
26.10	0.636	0.9	0.5
26.25	0.612	1.3	

APPENDIX XIII
 GD15 CORE - FIRN LAYER DENSITY, GRAIN SIZE AND ICE CRUST THICKNESS DATA

DEPTH m	DENSITY kg/m ³ x 10 ³	GRAIN SIZE mm	ICE CRUST THICKNESS mm
26.40	0.642	0.9	
26.48	0.648	0.9	
26.55	0.642	0.9	
26.70	0.643	0.9	
26.75			0.7
26.78			0.7
26.80			0.5
26.85	0.646	0.9	
26.91			0.6
26.98			0.7
27.00	0.632	1.1	
27.15	0.647	1.3	
27.20	0.653	0.9	
27.30	0.637	1.1	
27.45	0.649	0.9	0.6
27.60	0.658	1.0	0.7
27.75	0.642	1.1	
27.83	0.654	1.1	
27.90	0.654	1.3	
28.05	0.650	0.9	
28.20	0.658	0.9	
28.28			0.6
28.35	0.661	0.9	
28.41	0.673	0.9	0.7
28.50	0.650	1.3	1.0
28.53			0.5
28.65	0.633	1.3	
28.75			0.6
28.80	0.643	1.3	
28.95	0.656	1.3	
29.04			1.4
29.10	0.650	1.0	
29.19	0.646	1.0	
29.25	0.660	1.3	
29.34			0.5
29.40	0.653	1.3	
29.55	0.646	1.2	
29.57			0.4
29.70	0.654	1.2	
29.71	0.654	1.2	0.5
29.85	0.644	1.2	

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