Glacier variations in Iceland 1930-1995
From the database of the Iceland Glaciological Society

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Abstract *– Observations of the advance and retreat of glaciers in Iceland from 1930 to 1995 are presented in tables and graphs. The records, which have previously been published in yearly reports in Jökull, have been computerised, checked and corrected and are available on the Internet. Most of the non-surging glaciers retreated strongly during the early half of the monitoring period followed by a readvance or a slowing of the retreat after about 1970. Observations of surge-type glaciers are dominated by the surge events.*

INTRODUCTION

In the year 1930, the meteorologist Jón Eyþórsson began monitoring the advance and retreat of glaciers in Iceland on a yearly basis (Eyþórsson, 1931). During the 1930s, he started out with 44 different glaciers and outlet glaciers, some of them measured at up to five different locations. Of those, 28 are still attended annually but some have been abandoned at least for the time being. Thirteen new glacier tongues have been added in later decades so that monitoring is now carried out on 41 glaciers or outlet glaciers at 55 locations. The measurements of each year are reported in the journal *Jökull* and the measurements of the first 10 and 30 years were summarised and interpreted by Eyþórsson (1942, 1963).

The monitored glaciers are located in different parts of Iceland and few are accessible by conventional roads. Measurements are carried out by lay people of different occupations, often members of the Iceland Glaciological Society. Through the years, most of them have been farmers. Many of them have carried on for decades. The record holder had in 1995 measured his glaciers for 49 consecutive years not missing out on a single year!

In the beginning, most of the bench marks established at the glacier fronts were cairns of rock, but gradually they have been substituted by poles of steel engraved with a number and the emblem of the Glaciological Society. Measurements are in most cases made by tape or a string of known length.

Reports were made in a personal letter to the late Jón Eyþórsson until 1966. These letters are archived at the Glaciological Society. Since 1967, the surveyor has filled in a form stating the measured distances together with a brief description if something unusual was observed at the site. Since 1964, a subset of the data has been sent to the World Glacier Monitoring Service (WGMS) (Permanent Service on the Fluctuations of Glaciers of the IUGG - FAGS ICSU, 1973, 1977, 1985; World Glacier Monitoring Service, 1988, 1993), where it is available in the publications of the WGMS and electronically.

This paper publishes all the observations since Jón Eyþórsson's initiation of regular glacier monitoring in Iceland in the 1930's. The data are compiled from the original records, the yearly reports in *Jökull* (Eyþórsson/Rist/Sigurðsson, 1951-95) and from Eyþórsson (1942, 1963). The original reports have been checked and a few errors and misinterpretations which were found in the yearly reports have been corrected.

In some cases, the location of glacier termini before the initiation of regular monitoring has been inferred from maps, aerial photographs or other means by geologists or other scientists working in the area. Some such observations from this and the previous century are included in the data compiled here as in Eyþórsson (1942, 1963). This compilation of such observations is, however, not a complete cataloguing of all available evidence of that kind. The compilation of the regular observations of glacier variations in Iceland presented here is, on the other hand, meant to be a complete catalogue of the data in the archives of the Iceland Glaciological Society from 1930 to 1995.

The data published in this paper are available from the anonymous ftp site of the National Energy Authority in Iceland *(net address: ftp.os.is, location: /pub/glaciers/variations, files: advret.zip or advret.gz).*

OBSERVATIONS OF GLACIER VARIATIONS IN ICELAND

In addition to the work started by Jón Eyþórsson in the 1930s, the variations of glaciers in Iceland have been observed or derived by indirect means by several other workers. Jón Eyþórsson (1935) wrote an article on the variation of Drangajökull from historical accounts. Sigurður Þórarinsson used information from annals and other sources to derive the variations of outlet glaciers from Drangajökull and of south flowing glaciers from Vatnajökull after 1690 (Thorarinsson, 1943; Þórarinsson 1974). He also used old historical accounts to derive the variations of Breiðamerkurjökull which has in recent centuries advanced over a region which was populated for several centuries after the settlement of Iceland in the 9th century (Thorarinsson, 1941, 1956; Þórarinsson, 1974; Björnsson, 1996). F. Björnsson (1998) describes information from various sources about the location of the terminus of Breiðamerkurjökull in this and the previous century and concludes that the retreat of both Breiðamerkurjökull and other glaciers in the vicinity was very slow during the first quarter of the 20th century.

Glaciers in Iceland are described in an extensive chapter in Thoroddsen's (1932) geographical descrip-

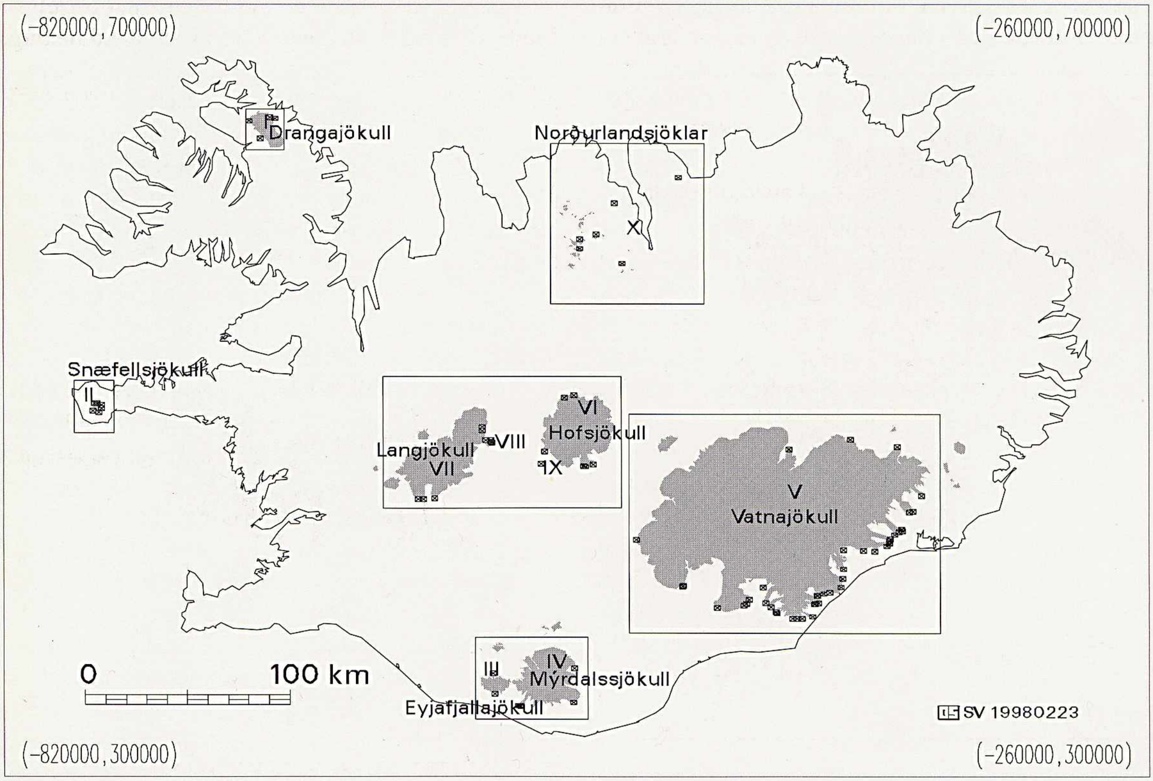

Fig. 1. Map showing the location of monitored glacier termini in the data set.
– Yfirlitskort.

tion of Iceland. This work includes information on the elevation of the equilibrium line of several glaciers at the turn of the century.

Eiríksson (1932) describes the position of several outlet glaciers at the south-eastern margin of Vatnajökull and Bárðarson (1934) describes glacier variations in Iceland on the basis of old historical accounts and other sources, including observations from the beginning of this century. Glaciological knowledge in Iceland before 1800 was summarised by Sigurður Þórarinsson (Thorarinsson, 1960), but this description does not contain much information about glacier variations.

Björnsson's (1979) overview article in *Jökull* describes glaciers in Iceland in general and includes a description of changes in glaciation, both prehistoric changes and variations since the settlement of Iceland.

Maps published in 1905 by the Danish General Staff based on surveying carried out in 1903 and 1904 (Nørlund, 1944), contain information about the position of many glacier tongues on the southern margin of Vatnajökull and Mýrdalsjökull at this time. The maps were used by Eyþórsson (1931, 1942, 1963) to establish the position of several termini in this area before his initiation of regular glacier monitoring in 1930.

Oblique aerial photographs, taken by the Danish General Staff in 1937 and 1938 provide some information about the position of glaciers in several locations in Iceland. These photographs are, however, not easily interpreted in quantitative terms and have not been much used.

Aerial photographs take by the U.S. Army Map Service in 1945 and 1946, and by the U.S. Defense Mapping Agency in 1960 and 1961 cover the whole of Iceland and provide extensive information on the position of glaciers at two different points in time. The earlier set of photographs is the basis of maps published by the Army Map Service in 1949-1951 in the scale of 1:50,000, which show the location of the termini of most glaciers in Iceland. Another set of 1:50,000 scale maps was published by the Defence Mapping Agency in cooperation with Landmælingar

Fig. 2. Location maps of Drangajökull (a) and Snæfellsjökull (b). – *Yfirlitskort af Drangajökli (a) og Snæfellsjökli (b).*

Table 1. Measurement period and characteristics of the glaciers in the glacier variation data set. If the locations of the termini have been inferred from maps, aerial photographs or other indirect sources before the initiation of regular monitoring, then the first year of such information is given in the measurement period column separated from the measurement period itself by a comma. – *Mælitímabil og kennistærðir fyrir jökla þar sem jöklabreytingar hafa verið mældar. Ef staða jökulsporða áður en mælingar hófust hefur verið metin út frá kortum, loftmyndum eða öðrum heimildum þá er kemur upphafsár slíkra gagna fram fremst í tímabilsdálknum.*

	Glacier	Aspect	Measurement period Years	Area km^2	Length km	Elev. range m a.s.l.
I.	**Drangajökull**					
	1. Leirufjarðarjökul[1]	W	1887, 1931-	27	6	140-900
	2. Kaldalónsjökul[1]	SW	1840, 1931-	37	6	140-900
	3. Reykjarfjarðarjökul[1]	NE	1850, 1931-	22	7	100-900
	4. Þaralátursjökull	NE	1931-1941	7	3.5	300-800
II.	**Snæfellsjökull**					
	1. Hyrningsjökull	E	1931-	2	2	700-1450
	2. Jökulháls	NE	1934-	2.5	3	700-1350
	3. Norðurkinn	N	1934-1949	1.5	2.5	700-1300
	4. Blágilsjökull	N	1930-1954	3	2.5	700-1450
	5. Hólatindajökull	SW	1930-1936	1	1	1000-1400
	6. Suðurkinn	S	1930-1933	1	1.5	800-1400
III.	**Eyjafjallajökull**					
	1. Gígjökull	N	1930-	7.5	7.5	190-1660
	2. Seljavallajökull	S	1930-1950	3	3.5	700-1660
IV.	**Mýrdalsjökull**					
	1. Sólheimajökull	SSW	1930-	44	15	110-1500
	2. Kötlujökull	ESE	1993-	133	23	200-1500
	3. Öldufellsjökul[1]	E	1961-	40	15	320-1400
V.	**Vatnajökull**					
	1. Skeiðarárjökull[1]	S	1904, 1932-	1380	50	100-1740
	2. Morsárjökull	SW	1932-	30	10	180-1380
	3. Skaftafellsjökull	SW	1932-	85	18	100-1900
	4. Svínafellsjökull	WSW	1904, 1932-	24	12	120-2100
	5. Virkisjökull	WSW	1932-	6	8.5	150-2100
	6. Falljökull	WSW	1957-	8	8	140-2000
	7. Gljúfursárjökull	S	1932-1960	4	4.5	850-1740
	8. Stigárjökull	S	1933-1939	5	5.5	600-1740
	9. Hólárjökull	S	1933-1939	5	7	240-1750
	10. Kvíárjökull	SE	1934-	24	13	40-2100
	11. Hrútárjökull	E	1947-	12	8.5	100-1900
	12. Fjallsjökull	E	1933-	48	15	40-2040
	13. Breiðamerkurjökull, west stream[1]	SE	1933-	160	20	60-1900
	---"---, middle stream[1]	SE	1932-	210	30	40-1730
	---"---, east stream[1]	SE	1932-	540	40	0-1730
	14. Fellsárjökull	S	1940-1964	7	5.5	440-1500
	15. Brókarjökull	ESE	1935-1994	5	3	200-1200
	16. Birnudalsjökull	S	1935-1966	0.5	-	1000-1100
	17. Eyvindstungnajökull	S	1935-1966	-	-	400-
	18. Skálafellsjökull	ESE	1905, 1930-	100	25	60-1480
	19. Heinabergsjökull	SE	1905, 1930-	85	25	60-1520
	20. Fláajökull	SE	1905, 1930-	180	29	50-1520
	21. Svínafellsjökull, Hornaf.	SE	1934-1992	200	19	20-1500
	22. Hoffellsjökull	SE	1930-1979	230	21	20-1460
	23. Hoffellsdalsjökull	S	1935-1945	-	-	340-
	24. Eyjabakkajökul[1]	N/NNE	1971-1985	109	18	680-1520
	25. Brúarjökul[1]	N	1963-1988	1700	45	550-1900
	26. Kverkjökull	N	1963-1993	29	11	900-1920
	27. Tungnaárjökul[1]	SW	1944, 1955-	235	40	580-1720
	28. Síðujökul[1]	SSW	1933, 1964-	500	40	590-1740

Glacier	Aspect	Measurement period Years	Area km²	Length km	Elev. range m a.s.l.
VI. Hofsjökull					
1. Blágnípujökull	SW	1932-1941	51	13	860-1750
2. Nauthagajökull	S	1932-	25	18	630-1780
3. Múlajökul[1]	SE	1932-	70	20	610-1800
4. Sátujökull	N	1950-	90	20	860-1800
VII. Langjökull					
1. Hagafellsjökull vestar [1]	S	1890, 1934-	150	18	450-1350
2. Hagafellsjökull eystri [1]	S	1890, 1934-	105	19	440-1350
3. Jökulkrókur	NE	1890, 1933-	55	11	720-1350
VIII. Hrútfell					
1. Norðurkinn, austur	NE	1933-1948	0.5	1.5	750-1400
2. Norðurkinn, mið	NE	1933-1959	0.5	1.5	750-1400
3. Norðurkinn, vestur	NE	1933-1959	1	3	690-1400
4. Norðvesturjökull	NW	1933-1959	1	2	750-1300
IX. Kerlingarfjöll					
1. Loðmundarjökull	N	1932-1962	1.5	2	960-1300
X. Norðurlandsjöklar					
1. Gljúfurárjökull	N	1939-	3	2.5	600-1340
2. Hálsjökull	N	1972-	0.5	1	760-1010
3. Tungnahryggsjökull	NNW	1939-1958	4	2.5	700-1340
4. Barkárdalsjökull	NE	1900, 1975-	3	1.5	950-1350
5. Bægisárjökull	N	1939-1957	2	1.5	940-1300
6. Grímslandsjökull	NNW	1993-	2	2	550-1040

[1] Surge-type glacier

Íslands in 1988-1990. This set of maps covers the middle part of Iceland, but the mapping has not been completed for the eastern and western parts.

Guttormur Sigbjarnarson derived the variations of south flowing glaciers from Langjökull (Sigbjarnarson, 1967), since approximately 1890, and north flowing glaciers from Hofsjökull (Sigbjarnarson, 1981), since the turn of the century, from geological evidence, aerial photographs and maps.

Maps of the bedrock and ice surface of the main ice caps of Iceland have been made by the Science Institute of the University of Iceland (Björnsson, 1988; Björnsson and others, 1992; Björnsson, and Pálsson, 1991; Björnsson and Pálsson, 1994). These maps show the outlines of Hofsjökull, large areas of Vatnajökull and Mýrdalsjökull, usually at the time of the mapping, but sometimes derived from other older information such as aerial photographs.

Several foreign scientists and students have done geomorphological and geological research on Icelandic glaciers in this century. Some of their results have been incorporated in the tables of glacier variations below. Results of such investigations have not been systematically catalogued and further work needs to be done in order to extract more information about glacier variations in Iceland from these sources.

DESCRIPTION OF GLACIERS

Most of the monitored glaciers in Iceland are outlet glaciers from larger ice caps, the largest of which are Vatnajökull, Hofsjökull, Langjökull and Mýrdalsjökull (Fig. 1). Each of the ice caps and the monitored outlet glaciers is briefly described below. Some glaciers have been monitored at several locations, sometimes in order to observe different branches or streams of a large outlet glacier, but more often in order to obtain a better picture of the average or overall behaviour of the glacier. Table 1 lists the glaciers grouped according to the corresponding ice cap or area. The length of the centre line of the glaciers, the area and the elevation range are mainly derived from two series of 1:50,000 scale maps: the AMS Series C762, compiled from aerial photographs taken in 1945 and 1946, and the DMA Series C761 compiled in 1988-1990 from "best available sources", probably aerial or space based images taken in the 1980s. The information about Drangajökull and Snæfellsjökull in the west and about Öræfajökull and Vatnajökull east of Öræfajökull in the east are based on the AMS Series C762. The information about most of the other glaciers is based on the DMA Series C761. Information on Nauthagajökull, Múlajökull, Sátujökull, Tungnaárjökull and Eyjabakkajökull are derived from glacier maps in Björnsson (1988).

DRANGAJÖKULL

Drangajökull is an ice cap on the NW peninsula with three major outlet glaciers descending below 200 m a.s.l., Leirufjarðarjökull, Kaldalónsjökull and Reykjarfjarðarjökull (Fig. 2a). They are all surge-type. The area of the ice cap was 160 km^2 in 1960 (Björnsson, 1978) and it reaches a maximum elevation of 925 m a.s.l.

Leirufjarðarjökull in the north-western part of the ice cap was monitored by two farmers from 1931 to 1960 and by an inhabitant of a neighbouring town since 1966. The glacier surged in the 1830s (Eyþórsson, 1935) and 1930s and a third surge started in 1995.

Kaldalónsjökull on the south-western side has been monitored since 1931 by two farmers, a father and a son. As for Leirufjarðarjökull, surges were recorded in the 1830s (Eyþórsson, 1935) and 1930s and more recently in 1995.

Surveys of *Reykjarfjarðarjökull* on the north-eastern side have been carried out by local farmers and by the same one from 1948 to 1995. The glacier surged in the 1830s (Eyþórsson, 1935) and 1930s.

Local farmers made measurements at *Þaraláturs-jökull*, which is a small outlet glacier to the north of Reykjarfjarðarjökull, in the 1930s. The last 5 measurements published in Eyþórsson (1963) are not tabulated here since the observer stated that the terminus was covered with firn. No surges are recorded.

SNÆFELLSJÖKULL

The Snæfellsjökull ice cap covers a central volcano at the western end of the Snæfellsnes peninsula (Fig. 2b). It is the westernmost glacier in Iceland and had an area of 11 km^2 in 1960 (Björnsson, 1978). Summit elevation is 1446 m a.s.l. No historical eruptions are known in Snæfellsjökull. Five different locations were chosen for monitoring in the early 1930s.

Hyrningsjökull and *Jökulháls* on the eastern margin of the ice cap have been monitored to the present day. The terminus at Jökulháls has been inactive during this period and covered by snow for decades and therefore not accessible for measurements since the 1950s. Hyrningsjökull, a non-surging glacier has, on the other hand, been highly active and has given a

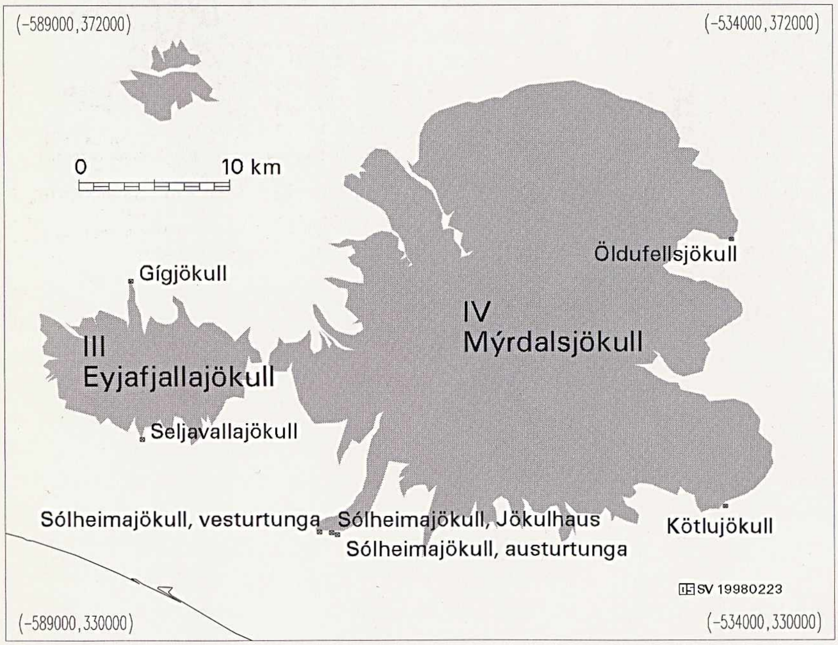

Fig. 3. Location map of Eyjafjallajökull and Mýrdalsjökull.
–*Yfirlitskort af Eyjafjallajökli og Mýrdalsjökli.*

clear signal of climate changes. Two farmers, a father and a son, have carried out the measurements since 1961, but prior to that several people did the readings. The mark at location 1 was moved in 1963 and there is a one year gap in the record at this point in time when the glacier was slowly retreating according to observations at the terminus that year. The gap was filled with the average rate of retreat of two years preceding and two years following the gap.

Hólatindajökull, Blágilsjökull and *Norðurkinn* on the western and northern margins of the ice cap were measured for a some time between 1930 and 1954.

Hyrningsjökull and Blágilsjökull were monitored at two and three adjacent locations, respectively, in the 1930s and 1940s, in order to obtain a better picture of the average variations of the termini. Hyrningsjökull is currently monitored at one location, but observations of Blágilsjökull were abandoned in 1954.

EYJAFJALLAJÖKULL

Eyjafjallajökull is an ice cap in central southern Iceland with many outlet glaciers (Fig. 3). The area was 78 km^2 in 1973 (Björnsson, 1978). Two of the outlet glaciers have been monitored. The ice cap covers the summit of a central volcano that has erupted once in historical time (1821-1823). The summit elevation is 1666 m a.s.l.

Gígjökull is an outlet glacier that runs to the north out of the summit crater. The tongue calves into a proglacial lake. It has been monitored since 1930,

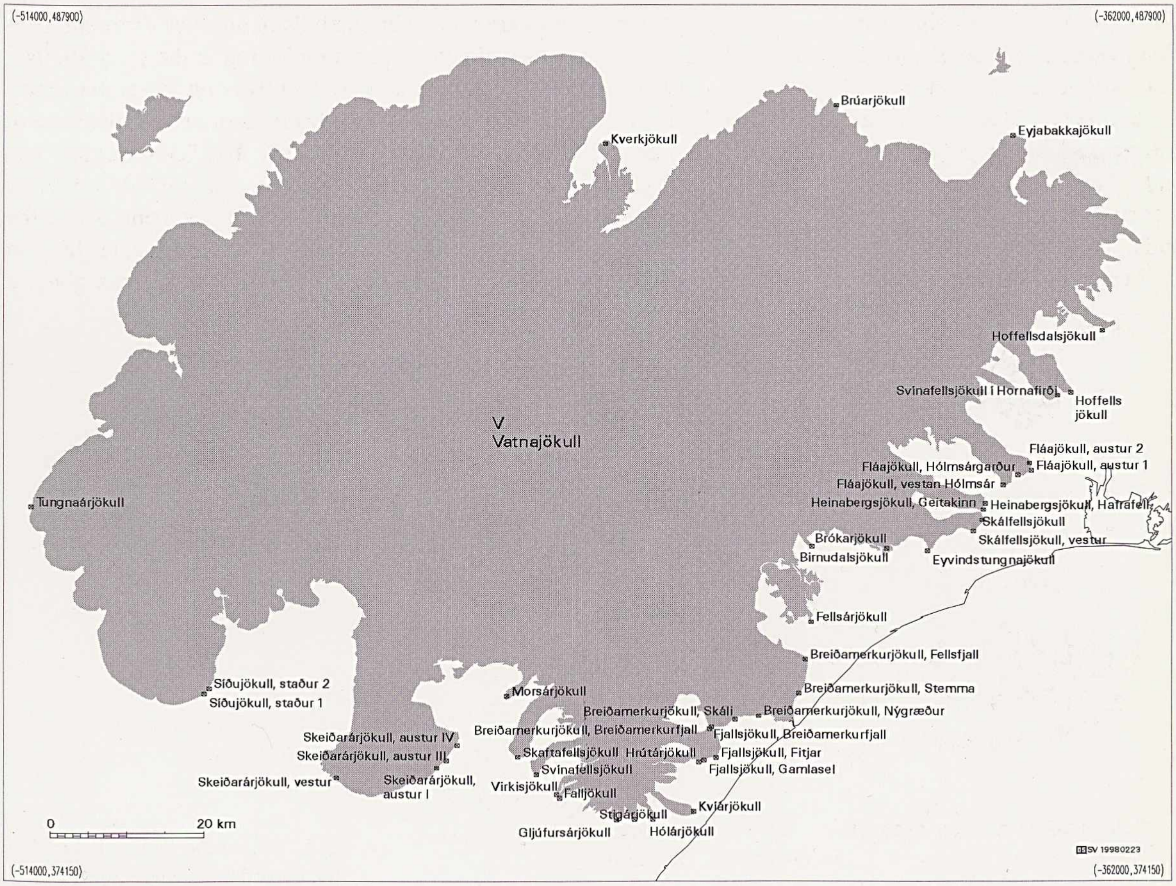

Fig. 4. Location map of Vatnajökull.
–*Yfirlitskort af Vatnajökli.*

first by local farmers, and for the last 3 decades by professional surveyors. Measurements from 1943-46 were not listed in Eyþórsson (1963). They are tabulated here based on the original sources. The variations from 1946 to 1954 are based on the observation that the glacier was slowly retreating 1946 to 1947, on aerial photographs from 1945, 1960 and 1980 and on the total change over the period 1943 to 1954 given in Eyþórsson (1963).

Seljavallajökull is an outlet glacier that runs to the south and was monitored at two locations for some time in the 1930s and 1940s by local farmers.

MÝRDALSJÖKULL

Mýrdalsjökull is an ice cap in central southern Iceland with many outlet glaciers (Fig. 3). It had an area of about 580 km^2 in 1991 according to Björnsson and Pálsson (1994). The glacier covers a central volcano with a 110 km^2 caldera. Summit elevation reaches close to 1500 m a.s.l. Volcanic eruptions have occurred on average twice a century through historical time. Some of those have melted 8 km^3 of ice or more causing huge jökulhlaups (Tómasson, 1996). The last large jökulhlaup occurred in 1918.

Sólheimajökull is a valley glacier that runs out of the caldera towards south. The snout bifurcates and has been measured at three locations since 1930 by members of the Iceland Glaciological Society.

Kötlujökull is an expanded foot glacier on the eastern side of Mýrdalsjökull. It is just recently taken up for monitoring by a local farmer. For six centuries all major jökulhlaups from Mýrdalsjökull have issued from this main outlet glacier of the ice cap.

Öldufellsjökull is a surge-type glacier that runs towards east. Surges occur approximately every ten years on average. The glacier has been monitored by local farmers since 1961.

VATNAJÖKULL

Vatnajökull is the largest ice cap in Iceland covering many volcanoes (Fig. 4). It had an area of 8100 km^2 in 1991 according to Landsat images. The ice cap is a

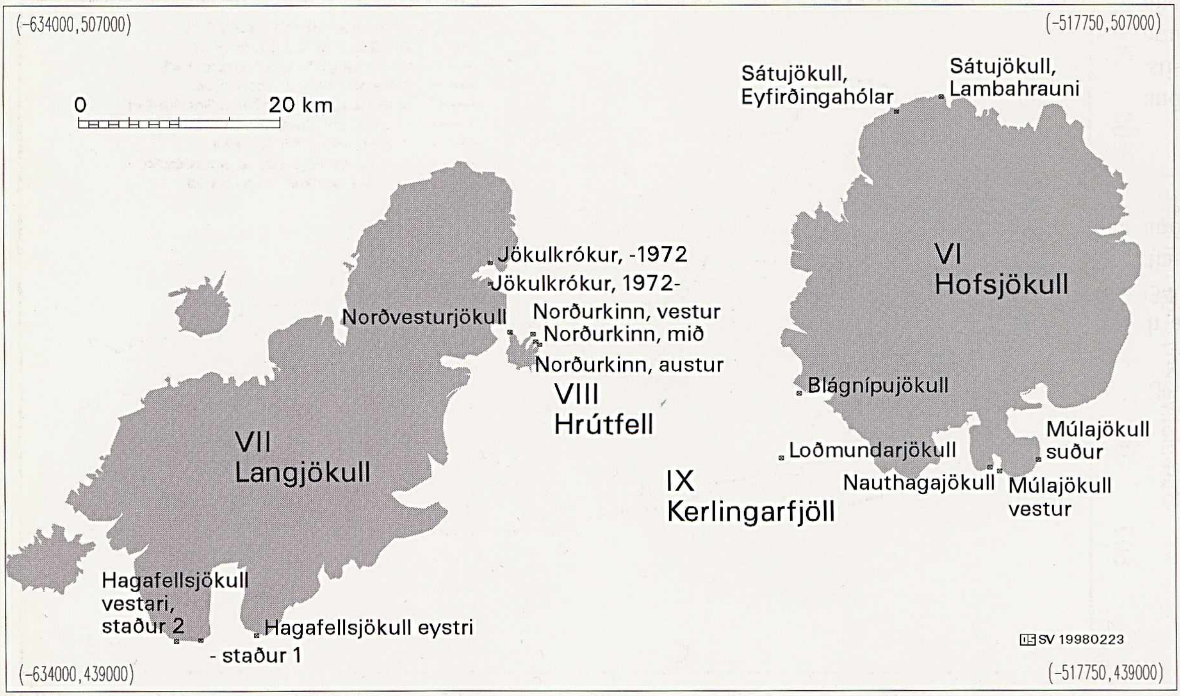

Fig. 5. Location map of Hofsjökull and Langjökull. The map also show the location of glaciers in Hrútfell and the location of Loðmundarjökull in Kerlingarfjöll.
– *Yfirlitskort af Hofsjökli and Langjökli. Kortið sýnir einnig jökla á Hrútfelli og Loðmundarjökul í Kerlingarfjöllum.*

Fig. 6. Location map of monitored glacier termini in Tröllaskagi and neighbouring areas, northern Iceland.
– *Yfirlitskort af jökulsporðum á Tröllaskaga og á nærliggjandi svæðum á Norðurlandi þar sem mælingar á stöðu jökulsporða hafa farið fram.*

source of many jökulhlaups, which originate from ice dammed lakes, are induced by geothermal melting, and, occasionally, are caused by volcanic eruptions. Vatnajökull has many surge-type and non-surging outlet glaciers. Some of them are of mixed type, featuring both surges and variations induced by climate fluctuations. Large, lobate, surge-type outlet glaciers flow to the north and west, but many of the outlet glaciers along the south-eastern margin are smaller, steeper and non-surging. Öræfajökull is an independent ice cap with many steep outlet glaciers to the west, south and east. On the north side, it merges with the south side of Vatnajökull. It has an elevation range of more than 2000 m.

Skeiðarárjökull is a large outlet glacier at the southern margin of Vatnajökull. Two medial moraines divide Skeiðarárjökull into three different ice streams. The middle and west stream are mixed-type as they surge at irregular intervals, but the terminus variations nevertheless reveal decadal variations in the mass balance.

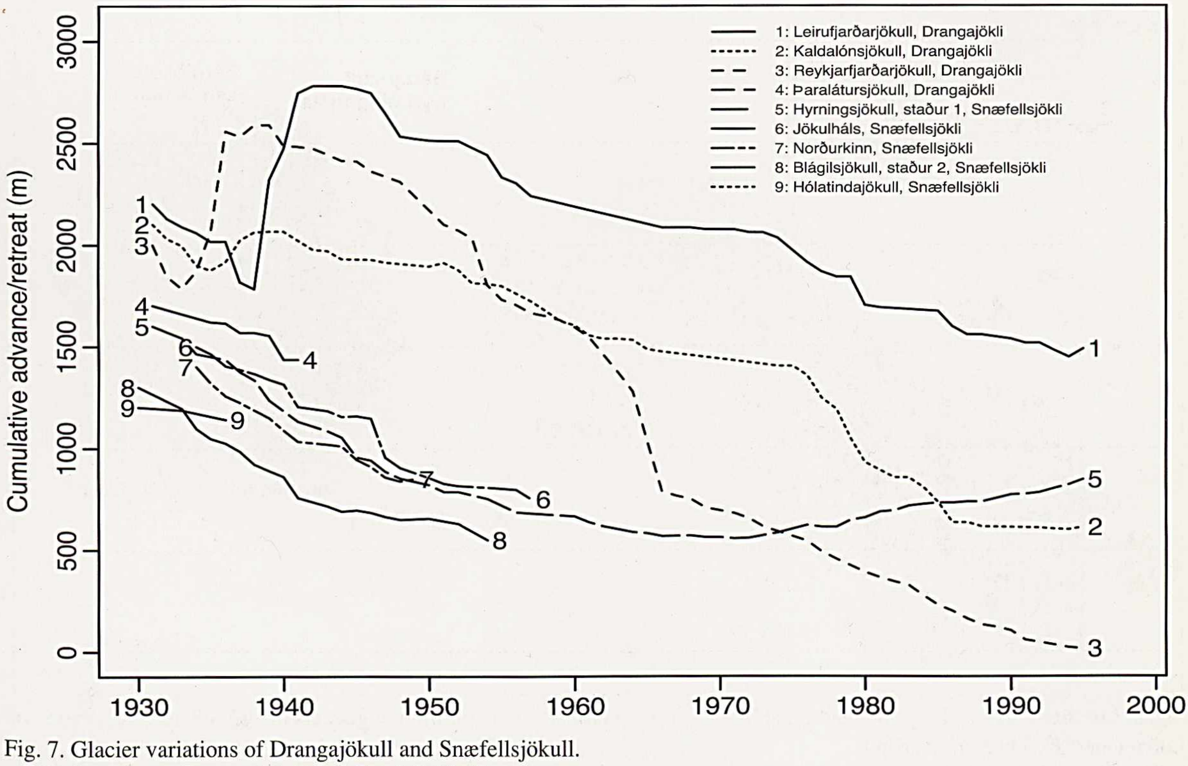

Fig. 7. Glacier variations of Drangajökull and Snæfellsjökull.
– *Jöklabreytingar, Drangajökull and Snæfellsjökull.*

The western side has been monitored since 1932 by two local farmers, a father and son. The eastern side was monitored by local farmers at up to 5 locations from 1932-1979 and by a member of the Iceland Glaciological Society since 1980 at three different locations in order to observe differences in the variations of this large outlet glacier.

Morsárjökull was monitored by local farmers in the period 1932-1979 and by a member of the Iceland Glaciological Society since 1980. It falls down a 350 m high ice fall about 5 km from the terminus. A medial moraine runs downglacier from the ice fall.

Skaftafellsjökull has been monitored since 1932 by local farmers and by the same one since 1947. For some time around the middle of the century there were marks at four different locations by the terminus, but the monitoring is currently only carried out at one location. A medial moraine runs 9 km along the south-eastern margin.

Svínafellsjökull, which runs from Öræfajökull, has been monitored since 1932 at up to five different locations, but the monitoring is currently only carried out at one location. The next eight glaciers listed below are also a part of Öræfajökull.

Virkisjökull and *Falljökull* are currently independent valley glaciers but the two snouts coalesced on the lowland below Öræfajökull in the early decades of the century. The glaciers were separated around 1940 and Falljökull has been monitored separately since 1957.

Gljúfursárjökull, Stigárjökull and *Hólárjökull* are small valley glaciers that run to the south from Öræfajökull. They were monitored by local farmers.

Kvíárjökull, Hrútárjökull and *Fjallsjökull* have been monitored by local farmers, a father and his sons. They have also carried out the monitoring of the western part of Breiðamerkurjökull. The terminus of Kvíárjökull is surrounded by huge, semi-circular, prehistoric moraines which contained the advance of the glacier during the Little Ice Age. Fjallsjökull has been monitored at three locations, two adjacent locations near the southern margin and one close to the northern

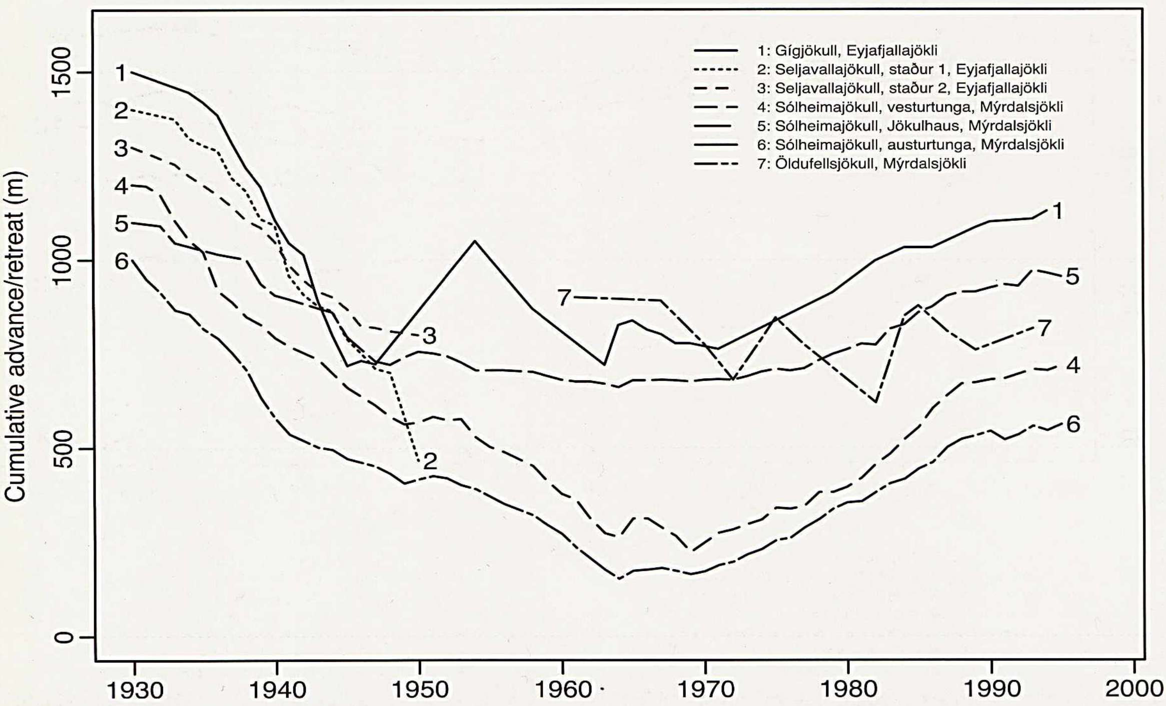

Fig. 8. Glacier variations of Eyjafjallajökull and Mýrdalsjökull.
–Jöklabreytingar, Eyjafjallajökull and Mýrdalsjökull.

margin. The glacier calves into a proglacial lagoon, Fjallsárlón.

Breiðamerkurjökull is a large outlet glacier which is composed of three ice streams, designated western-, central- and eastern branch (Björnsson and others, 1992; Björnsson, 1996). The branches are separated by two distinct medial moraines. The glacier has been monitored at up to 7 locations by local farmers since 1932. The western branch, which calves into a proglacial lagoon, Breiðárlón, is divided into two parts by a medial moraine. The westernmost part originates in the summit caldera of Öræfajökull. The eastern branch calves into a tidal lagoon, Jökulsárlón, which has a maximum depth of approximately 200 m. Surge activity in the eastern branch has been described in historical accounts from the 18th and 19th centuries and during the first decades of the 20th century (Pálsson, 1945; Thienemann, 1824; Björnsson, 1996; F. Björnsson, this volume). Small scale surge activity has also been recorded in the central branch and in the western branch.

Fellsárjökull is not a part of the Vatnajökull ice cap since it is only connected to the main ice cap by firn fields across a water divide. It was monitored by a local farmer.

Brókarjökull was monitored by local farmers until

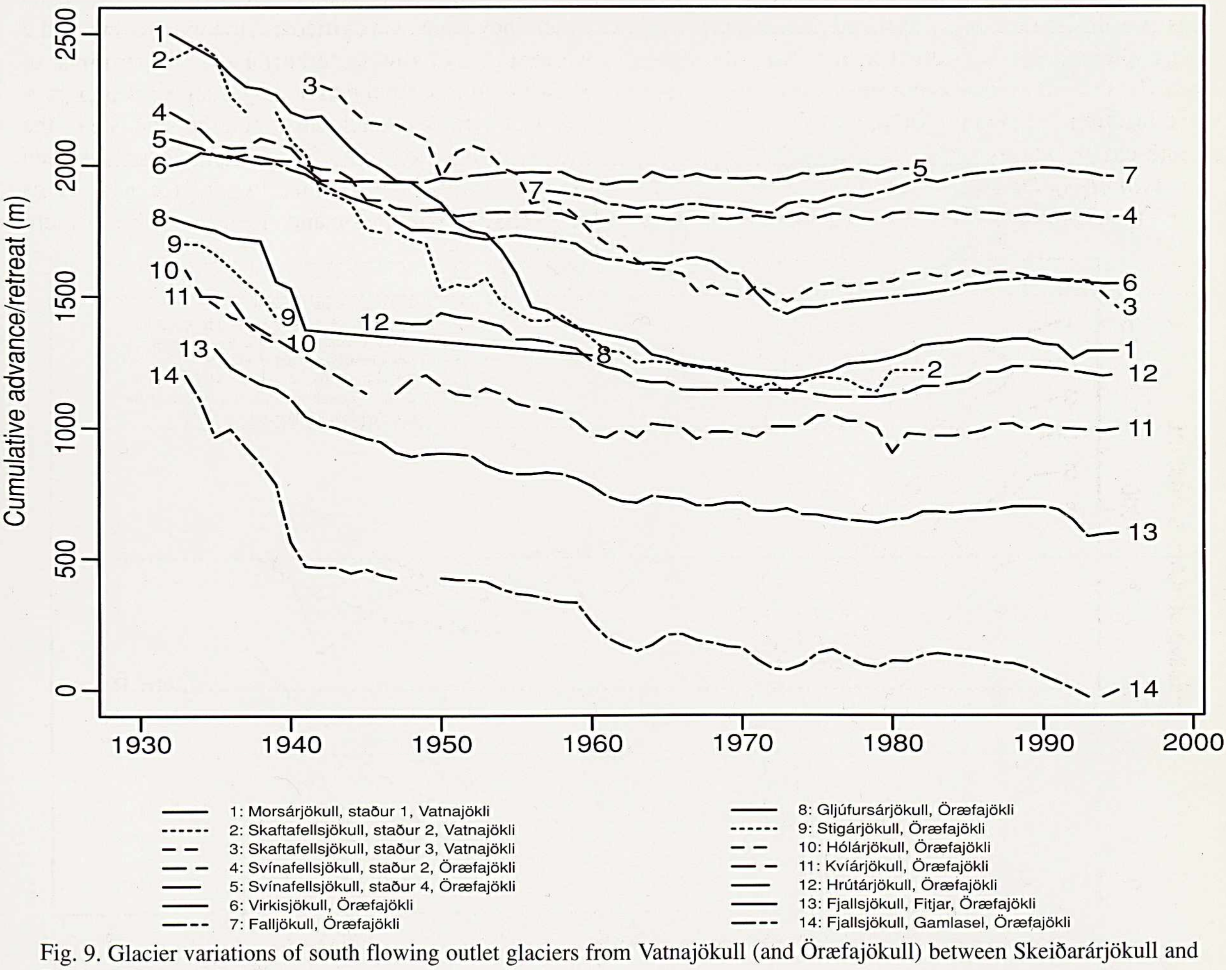

Fig. 9. Glacier variations of south flowing outlet glaciers from Vatnajökull (and Öræfajökull) between Skeiðarárjökull and Breiðamerkurjökull.
–Jöklabreytingar, suðurhluti Vatnajökuls (og Öræfajökull) milli Skeiðarárjökuls and Breiðamerkurjökuls.

1971 and since then by various people.

Birnudalsjökull is a small glacier at the head of a valley facing south-east at the southern margin of Vatnajökull. It is not a part of Vatnajökull since it is only connected to the main ice cap by firn fields across a water divide. It was monitored by local farmers.

Eyvindstungnajökull (also called Sultartungnajökull) bifurcates from the outlet glacier Skálafellsjökull. The length along the centre line and the area are hard to define and are not stated in Table 1. The glacier was monitored by local farmers.

Skálafellsjökull has been monitored at two locations by local farmers until 1971 and by various people since 1990. It coalesced with Heinabergsjökull in the beginning of the measurement period. Sometimes during the period 1968-1984 the glacier did advance according to aerial photographs, but this advance is lost in a gap in the monitoring from 1968 to 1990. The gap may be filled to some extent with remote sensing information.

Heinabergsjökull was monitored at two locations by local farmers until 1967 when a proglacial lake prohibited further tape measurements. It has been measured with theodolite by a teacher and students at a local secondary school since 1990. The glacier is divided by a 11 km long medial moraine. It currently calves into a proglacial lake.

Fláajökull is a valley glacier with an expanded foot lobe which has been monitored at four different locations since 1930, by local farmers until 1972 and by various people since 1975.

The snout of *Hoffellsjökull* is divided by a small

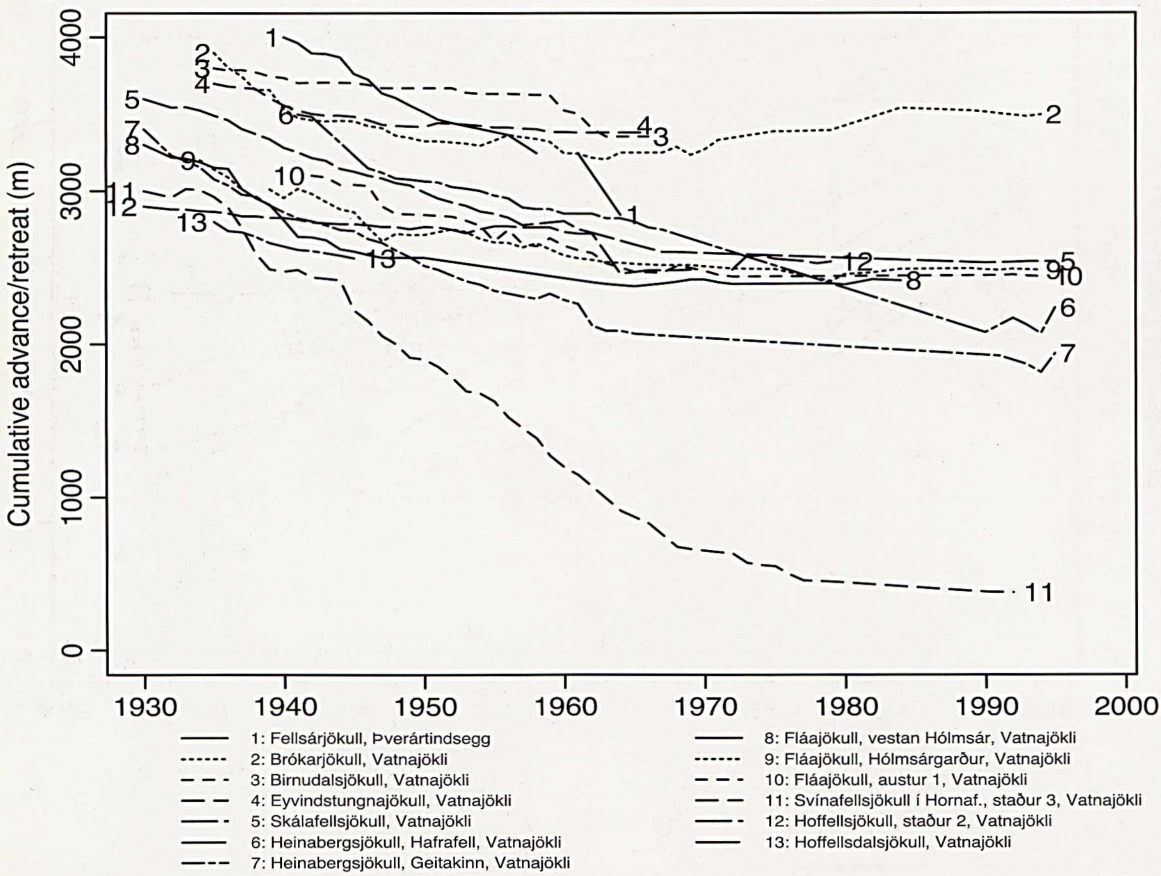

Fig. 10. Glacier variations of outlet glaciers in the south-eastern part of Vatnajökull (east of Breiðamerkurjökull). – *Jöklabreytingar, suðurausturhluti Vatnajökuls(austan Breiðamerkurjökuls).*

mountain ridge and the eastern branch terminates in a proglacial lake. It was monitored at three locations in the period 1930-1979. Since 1980 the terminus has been fluctuating in approximately the same position, although it is thinning. It has not been accessible for measurements since 1979 because of the lake. The western branch, which is named *Svínafellsjökull í Hornafirði*, has been monitored since 1930 by local farmers. In the earlier part of the period it was monitored at three locations.

Hoffellsdalsjökull is a bifurcation from the outlet glacier Lambatungnajökull. It was monitored at three locations for a short period in the 1930s and 1940s. The length along the centre line and the area are therefore hard to define and are not stated in Table 1.

Eyjabakkajökull is a surge-type glacier which has been monitored by sighting from a distance. The advance retreat record is therefore not reliable. The surge period is about a 35 years, possibly quite irregular as the glacier is composed of two branches, a valley glacier from SE and an outlet glacier from the main ice cap, both of which may be surge-type. The two branches are separated by a distinct 10 km long medial moraine. The eastern branch is 17 km along the centre line and drains 55 km² with elevations in the range 680-1560 m a.s.l. The western branch is 16 km along the centre line and drains 50 km² with elevations in the range 680-1320 m a.s.l. (Björnsson, 1988).

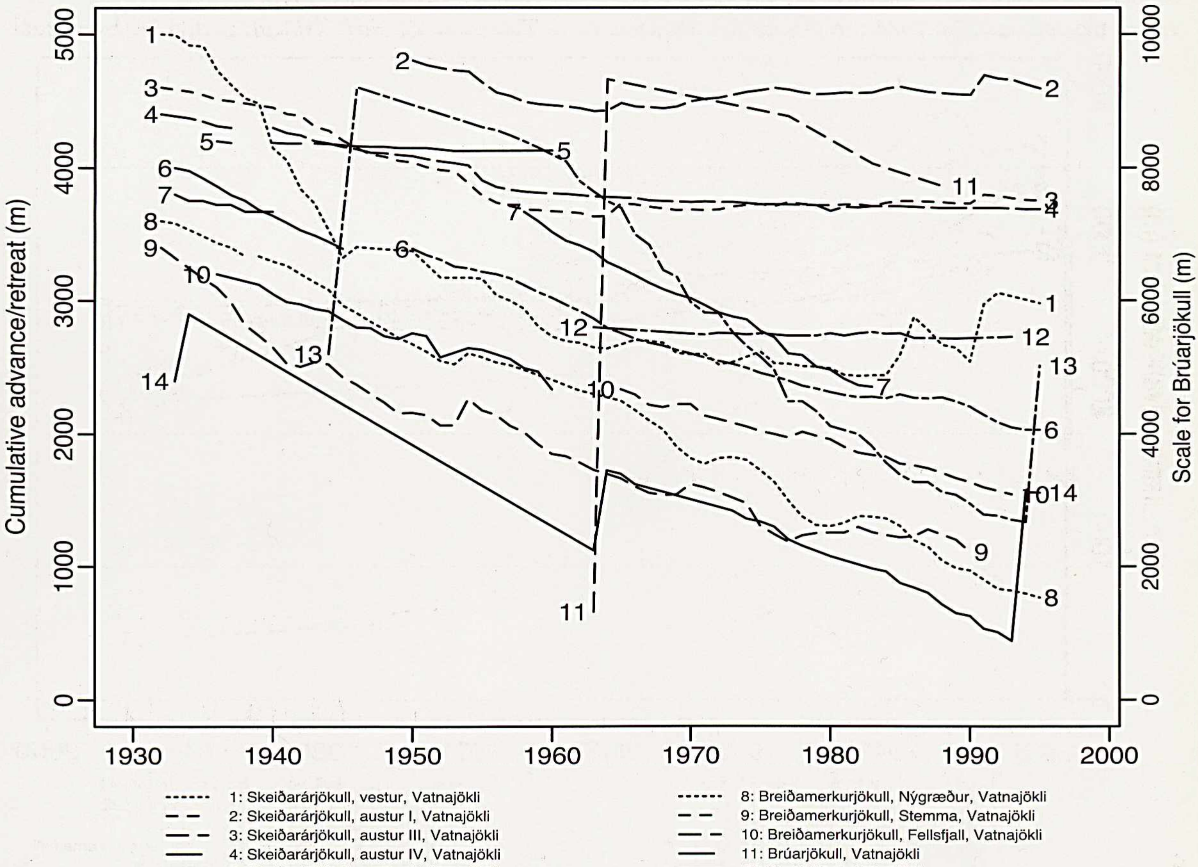

Fig. 11. Glacier variations of Skeiðarárjökull in Vatnajökull and of outlet glaciers on the northern and western sides of Vatnajökull. – *Jöklabreytingar, Skeiðarárjökull og skriðjöklar í norður- og vesturhluta Vatnajökuls.*

Brúarjökull is a large surge-type outlet glacier with a surge period of 70-100 years. It is known to advance 8-10 km during surges (Thorarinsson, 1969), which are the most dramatic surges of glaciers in Iceland. It has been monitored sporadically since 1963.

Kverkjökull is an outlet glacier from the summit caldera of Kverkfjöll which has been monitored since 1971 by the National Energy Authority.

Tungnaárjökull is a surge-type outlet glacier which surged in 1945-46 and in 1994-95. It is 40 km along the centre line and drains 169 km^2 (235 km^2 within ice divides) of the ice cap (Björnsson, 1988). It has been monitored since 1955 by members of the Iceland Glaciological Society. Variations of Tungnaárjökull, including the surge of 1945-46, are described in Guðmundsson and Björnsson (1992).

Síðujökull is a surge-type outlet glacier with a surge period of about 30 years. It surged in 1934, 1963-64 and 1994. It has been monitored at two adjacent locations since 1964 by members of the Iceland Glaciological Society.

HOFSJÖKULL

Hofsjökull is circular ice cap in central Iceland with many outlet glaciers (Fig. 5). The area was estimated 923 km^2 by Björnsson (1988) based on several different sources. The ice cap covers a central volcano with a big caldera. Post glacial volcanic activity with-

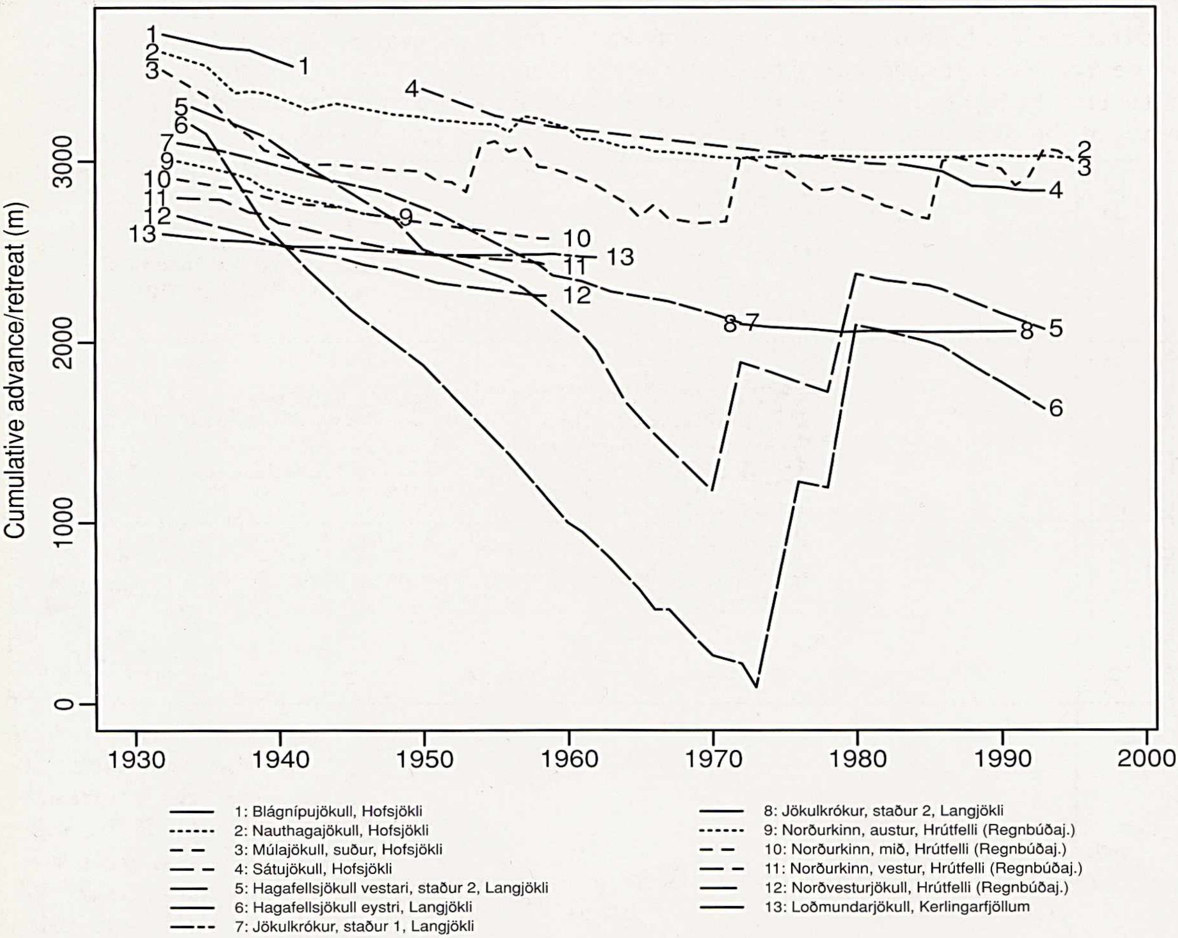

Fig. 12. Glacier variations of Hofsjökull, Langjökull, Hrútfellsjökull and Loðmundarjökull.
– Jöklabreytingar, Hofsjökull, Langjökull, Hrútfellsjökull and Loðmundarjökull.

in the current margins of the ice cap has been identified. The summit elevation is 1800 m a.s.l.

Blágnípujökull is an outlet glacier facing southwest. The glacier bifurcates around the mountain Blágnípa. The eastern branch was monitored for a short period in the 1930s by Jón Eyþórsson.

Nauthagajökull is a bifurcation from the western side of Múlajökull. Small surges have been observed. In the beginning, local farmers did the surveying, but since 1969, the measurements have been carried out by members of the Iceland Glaciological Society.

Múlajökull is a surge-type outlet glacier on the southern side of Hofsjökull. Surges have been recorded with a 6-7 year interval for the last few decades. They only seem to affect the ablation area. The glacier is monitored at two different locations, one at the western side and another one on the eastern side of the lobe. In the beginning, local farmers did the surveying, but since 1969, the measurements have been carried out by members of the Iceland Glaciological Society.

Sátujökull is a broad outlet glacier on the northern side of Hofsjökull which has been monitored at two locations, at Lambahraun until 1982 and at Eyfirðingahólar since 1983. The monitoring was initially carried out by local farmers. Since 1981 it has been done by members of the Iceland Glaciological Society. The records from the two locations are combined in Figure 12 since they do not overlap in time.

LANGJÖKULL

Langjökull is an oblong ice cap oriented SW-NE in central western Iceland with many outlet glaciers (Fig. 5). It had an area of 953 km^2 in 1973 (Björnsson, 1978). The maximum elevation is about 1450 m a.s.l. The area is volcanically active although no postglacial volcanic activity within the glacier has been pinpointed. Three of the outlet glaciers have been monitored

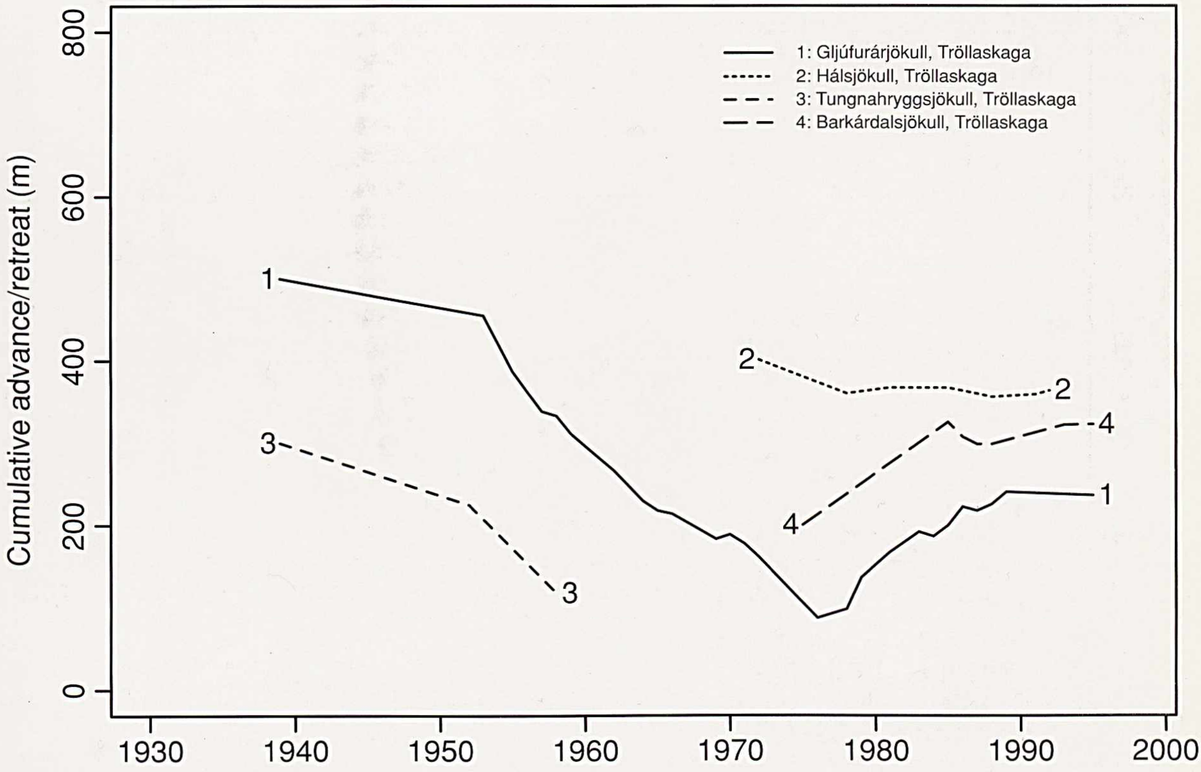

Fig. 13. Glacier variations in Tröllaskagi and neighbouring areas, northern Iceland.
– *Jöklabreytingar, skriðjöklar á Tröllaskaga og Norðurlandi.*

since 1933 or 1934, by lay people in the beginning and by professional surveyors since the 1960s.

Hagafellsjökull vestari surged in 1972 and 1980 but previous surges are not recorded (Theodórsson, 1980). It has been monitored at two locations.

Hagafellsjökull eystri surged in 1976 and 1980 but previous surges are not recorded (Theodórsson, 1980).

Jökulkrókur (Fúlakvísl, Þjófadalir) is located on the eastern margin of Langjökull. Until 1972 the glacier margin was monitored at a location north of the valley Þjófadalir at the outlet of the river Fúlakvísl, but after that the monitoring has been carried out at a location south of the valley. There are no recorded surges in this part of the margin of Langjökull.

The approximate location of the termini of Hagafellsjökull vestari and Hagafellsjökull eystri around 1890 has been inferred by Sigbjarnarson (1967).

HRÚTFELLSJÖKULL (REGNBÚÐAJÖKULL)

Hrútfellsjökull is a 7 km^2 ice cap in central Iceland with several outlet glaciers (Fig. 5). The summit of the ice cap is 1400 m a.s.l. Three of the outlet glaciers run parallel to each other towards NE and one faces N. They were monitored by Jón Eyþórsson from 1933 to 1959.

LOÐMUNDARJÖKULL (KERLINGARFJÖLL)

Loðmundarjökull is a small glacier in central Iceland (Fig. 5) which was monitored by Jón Eyþórsson from 1932 to 1962.

GLJÚFURÁRJÖKULL

Gljúfurárjökull is a valley glacier in central northern Iceland (Fig. 6). A bench mark was established in 1939 but the marks are very vulnerable in the area be-

Table 2. Glacier variations in Iceland 1930-1995. Records marked with a superscripted star are shown in Figures 7-13. Glacier variations of several glaciers in Iceland prior to 1930 derived from historical accounts or other indirect sources are given in the second column. Superscripted numbers in the second column refer to footnotes with additional information at the end of the table. The last column gives the total variation during the longest unbroken period of observations within the monitoring period for each measurement location.

Jökull		30/31	31/32	32/33	33/34	34/35	35/36	36/37	37/38	38/39	39/40	40/41	41/42	42/43	43/44	44/45	45/46	46/47	47/48	48/49	49/50	50/51	51/52	52/53	53/54	54/55	55/56	56/57	57/58	58/59
I. DRANGAJÖKULL																														
	1840-1931																													
1. Leirufjarðarjökull*	-3250[1]		-71	-40	-30	-42	0	-200	-35	+539	+150	+272	+37	0		-15	-20	-100	-115	-12	-8	-4	0	-68		-110	-30	-63		
	1887-1931																													
2. Kaldalónsjökull*	-340[2]		-70	-34	-95	-26	+39	+107	+41	+2	+2	-91		-5	-41	-3		-14	-19			-17		-68	-3	-12	-73		-48	-48
	1850-1931																													
3. Reykjafjarðarjökull*	-2400[3]		-154	-60	+82	+194	+495	-27	+57	+2	-102	-5	-8	-29	-34	-2	-48	-54		-210			-30	-40	-228	-72	-26	-40	-15	-20
4. Þaralátursjökull*			-80				-6	-47	0	-14	-119	0																		
II. SNÆFELLSJÖKULL																														
1. Hyrningsjökull, staður 1*			-57		-78	-30		-60	-40	-100	-52	-50	-48		-30	-100	-15	-55	-32	-33		-35	0	-35		-65		-6		-14
---„---, staður 2			-31		-78	-33		-25	-105	-35	-15	-50	-30		-40	-25	-30	-50	-128	-62				-40						
2. Jökulháls*						-35	-61	-19	-20	-28	-22	-110	-21		-28	+3	-12	-192	-50	-50		-30	-10	-10		-10		-48		
3. Norðurkinn*						-80	-65	-30	-38	-37	-60	-55	-15		-10	-66	-34	-52	-20	+10										
4. Blágilsjökull, staður 1		-103			-100	-50	-23	-30	-38	-37	-60	-55	-15		-10	-66	-34	-52	-20											
---„---, staður 2*		-103			-100	-50	-23	-38	-66	-32	-27	-104	-41		-25	+6	-12	-21	-15	+5		-25		-80						
---„---, staður 3		-103			-100	-50	-23	-10	-98	-61	-12	-135	-15		-3	-22	-6	-30	0											
5. Hólatindajökull*		-12			-48																									
III. EYJAFJALLAJÖKULL																														
1. Gígjökull*		-55				-25	-35	-72	-68	-50	-88	-62	-31	-123	-91	-82	+14	-10	+328							-181				
2. Seljavallajökull, staður 1*		-26			-50	-20	-13	-72	-36	-74	-16	-136	-50	-30	-14	-74	-37	-41	-11	-234										
---„---, staður 2*		-45			-30	-25	-27	-30	-37	-20	-37	-63	-41	-28	-16	-31	-46	-4	-9	-11										
IV. MÝRDALSJÖKULL																														
1. Sólheimajökull, vesturtunga*		-3	-22	-70	-52	-32	-103	-30	-40	-21	-35	-22	-35		-37	-38	-47		-30	-20	+5	+15	-9	+3	-48	-26	-14	-37		-40
---„---, Jökulhaus*		-9		-46	-30			-14		-65	-30	-11	-24		-10	-65	-65		-10	+20	+15	-5	-7	-17	-21	0	0	-5		-10
---„---, austurtunga*		-52	-35	-47	-10	-40	-25	-40	-45	-75	-53	-42	-35		-5	-25	-20		-20	-25	+10	+10	-7	-18	-10	-20	-20	-30		-25
2. Kötlujökull																														
3. Öldufellsjökull*																														

cause of land slides and avalanches. Local farmers have surveyed the snout for most of the time but in the late 1970s and 1980s visiting students from Exeter, England, did the measurements.

HÁLSJÖKULL

Hálsjökull is a small glacier in central northern Iceland (Fig. 6). Surveying has been done by teachers at a local secondary school.

TUNGNAHRYGGSJÖKULL

Tungnahryggsjökull consists of two separate cirque glaciers in central northern Iceland (Fig. 6). The eastern glacier is 4 km^2 with a 2.5 km long centre line and an elevation in the range 700-1340 m a.s.l. It was monitored for a short period around the middle of the century. The western glacier is 5 km^2 with a 2.5 km long centre line and an elevation in the range 800-1340 m a.s.l. It has not been monitored.

BARKÁRDALSJÖKULL

Barkárdalsjökull is a cirque glacier in central northern Iceland (Fig. 6) which is monitored by the Swiss geographer Thomas Häberle. The approximate location of the terminus around 1900 has been inferred from the position of moraines in front of the terminus.

BÆGISÁRJÖKULL

Bægisárjökull is a cirque glacier in central northern Iceland (Fig. 6). Surveying was started in 1939, but the glacier has only been measured a few times until recently. In recent years the monitoring has been carried out by a teacher and students at a local secondary school.

– Jöklarbreytingar á Íslandi 1930-1995. Mæliraðir sem merktar eru með stjörnu eru sýndar á 7.-13. mynd. Breytingar nokkurra jökla fyrir 1930, sem metnar hafa verið út frá sögulegum gögnum eða öðrum óbeinum heimildum, eru tilgreindar fremst í töflunni. Tölur í öðrum dálki töflunnar vísa til neðanmálsgreina með viðbótarupplýsingum á næstu blaðsíðu. Síðasti dálkur töflunnar sýnir heildarbreytingu á stöðu sporðsins á lengsta óslitna tímabili síðan mælingar hófust á viðkomandi stað.

59/60	60/61	61/62	62/63	63/64	64/65	65/66	66/67	67/68	68/69	69/70	70/71	71/72	72/73	73/74	74/75	75/76	76/77	77/78	78/79	79/80	80/81	81/82	82/83	83/84	84/85	85/86	86/87	87/88	88/89	89/90	90/91	91/92	92/93	93/94	94/95	Total	Period
-156							0	0	-9	0	0	-14	0	-25	-118		-48	-24	0	-140	-10	-18				-75	-40	-1	-19		-22	0	-37	-32	+39	-714	31-95
-24	-50	-16	-1	-5	-46	-12	-68								0	-48	-108	-56	-144	-116	-74		0	-50	-72	-100	0	-20	-4				-6	-3	+12	-1487	31-95
-34	-51	-84	-92	-90	-490		-23	-13	-44	-27		-25	-40	-46		-25	-52	-36	-34	-30	-27	-20	-16	-52	-48	-29	-37	-30	-10	-18	-47	-10	-25		-8	-1987	31-95
																																				-266	31-41
	-30	-20	-14	-14	-8	-14	+4		-10	0	-6	+5	+24		+38		-9	+2	+34	+11	+28	+7	+22	+9	+5	0	+8	0	+35		+2	+9	+20	+16	+28	-753	31-95
																																				-777	31-54
																																				-753	34-57
																																				-552	34-49
																																				-693	30-48
																																				-751	30-54
																																				668	30-48
																																				-60	30-36
-149				+106	+12	-24	-12	-25	0	-15		+150								+85			+35		0		+53			+15	+7			+22		-371	30-94
																																				-934	30-50
																																				-500	30-50
-35	-15	-50	-40	-10	+50	0	-25	-22	-42	+26	+25	+9	+14	+12	+31	-2	+7	+37	-1	+14	+24	+37	+27	+40	+31	+51	+35	+30	+2	+9	+2	+13	+12	-3	+13	-482	30-95
-10	-5	-1	-6	-8	+18	0	+1	-1	-4	+5	+2	-1	+9	+11	+8	-4	+5	+22	+17	+11	+16	-3	+42	+12	+32	+15	+29	+10	+1	+10	+10	-5	+43	-8	-10	-146	30-95
-25	-37	-28	-30	-25	+22	+3	+4	-8	-9	+8	+16	+9	+21	+13	+24	+7	+27	+22	+27	+17	+4	+24	+23	+11	+28	+16	+42	+20	+9	+13	-23	+13	+24	-12	+16	-438	30-95
																																		-20		-20	93-95
		-9						-116			-94		+106		+58	-71		-155					+231		+27	-68		-50		+57						-84	61-93

Table 2. continued

Jökull		30/31	31/32	32/33	33/34	34/35	35/36	36/37	37/38	38/39	39/40	40/41	41/42	42/43	43/44	44/45	45/46	46/47	47/48	48/49	49/50	50/51	51/52	52/53	53/54	54/55	55/56	56/57	57/58	58/59
V. VATNAJÖKULL	1904-1932																													
1. Skeiðarárjökull, vestur*	390			-3	-77	-9	-185	-106	-100	-40	-336	-89	-215	-110	-200	-210	+84	-8	-10	-11		-199		0		-10	-120	-44	-60	-130
---„---, austur I*																						-33	-23	-16	-10	-83	-71	-27	-43	-20
---„---, austur II	260			-30		-25	-36	-13	-43	-3		-18	-22	+1	-2	-2	-11	-8	-9	0										
---„---, austur III*	260			-30		-25	-36	-11	-50			-47	-13	-83	-31	-71	-56	-47	-18	-31	-15	-31	-24	-10	-88	-93	-53	-23	-26	-8
---„---, austur IV*				-30		-25	-36	-10				-39	-20	-43	-16	-27	-17	-25	-3	-17	-8	-21	-16	-13	-16	-113	-51	-21	-14	-7
---„---, austur V*								-14				-7	+3		-7	-6	-9	-4	-3	-5	-2	-2	-19		+3					
2. Morsárjökull, staður 1*				-95			-60	-46	-9	-25	-65	-20	+5	-63	-58	-51	-32	-43	-6	-44	-35	-76	-30	-10	-62	-89	-129	-15	-37	-28
---„---, staður 2								-15	-45	-24				-8	-12	-14	-14	-5	-79	-16	-6	-15	-11	-13	-12	-87	-75	-12	-41	-26
3. Skaftafellsjökull, staður 1																						+14	-4	+4	-44	-18	-21	-5	+8	-10
---„---, staður 2*				+60		-45	-155	-60			-105	-55	-140	-15	-31	-100	-10		-28	-15	-182	+25	-10	+35	-92	-42	-29	0	+18	-40
---„---, staður 3*														-22	-63	-54	-7		-32	-27	-143	+94	+28	-22	-64	-23	-113	+10	-12	-48
---„---, staður 4									-21	-5	-35	-106	-126	-14	-54	-50	-16	-6	-28	-17	-158	+83	+5	-2	-19	-43	-24	+8	-5	-41
4. Svínafellsjökull, staður 1																						-10	0	+10	+4	-27	-2	+12	-50	-10
---„---, staður 2*	-25			-65		-55	-15	+2	+35	-19	-18	-63	-17	-2	-36	-79	-3	-30	-7	-3	+6	-26	+5	+8	+2	-2	+2	-5	-3	-22
---„---, staður 3				-65		-10	0	+4	-14	-2	-23	-3	-37	-1	-50	-22	-5	-87	-2	-3	-10	-27	+2	+15	+9	-17	-4	+3	0	-6
---„---, staður 4*	+55			-33		-29	-10	+12	-10	-13	-2	-26	-49	0	-3	+2	-2	-2	0	-2	+17	-4	+11	+6	+5	+1	+3	-4	+2	-25
---„---, staður 5				-33		-10	-10	+2	-42		-12	-6	-2	-5	-3	+4	-3	-3	0	0	-30	-7	+4	+3		+5	+5	-35	0	-10
5. Virkisjökull*				+13	+33	-7	-6	-16	-11	0	-24	-18	-35	-30	-24	-19	-20	-50	-35	0	-5	-6	-17	-7	+10	+5	-15		-8	-10
6. Falljökull*																													-8	-7
7. Gljúfursárjökull*				-19	-18	-10	-29	-6	-8	-154	-26	-157	-100																	
8. Stigárjökull*					-3	-35	-54	-53	-45	-90																				
9. Hólárjökull*					-94	-38	-46	-22	-50	-30																				
10. Kvíárjökull*						0	-10	-80	-280										+50	+20	-45	-29	-8	+30	-23	-36	-13	-7	-15	-35
11. Hrútárjökull*																			-5	-1	+41	-15	-6	-15	-15	-51	0	-8	-15	-12
12. Fjallsjökull, Gamlasel*					-95	-140	+30	-70	-60	-80	-220	-94	-6	0	-20	+14	-21	-13				-7	-1	-8	-28	-17	-6	-14	-13	-2
---„---, Fitjar*							-70	-34	-29	-17	-40	-68	-29	-13	-42		-12	-41	-16	+8	+3	-3	-5	-37	-25	-10	0	+5	-6	-16
---„---, Breiðam.fj.					-5	-49	-35	-50															-3	-8	-3	+3	0	+4	+7	-7
13. Breiðamerkurjökull, Breiðam.fj.*					-25	-55	-60	-64	-46	-70	-42	-53	-55	-40	-46	-52						-47	-35	-55	-10	-25	-20	-30	-50	-53
---„---, Krókur					-65	-20				-70	-35	-52	-60		-33	-87	-84	-52	-76	-41	-37	-24	-13	-17	-43	-57	-14	-24	-24	
---„---, Skáli*					-50	0	-30	0	-50	0	-0																			70
---„---, Hálfdanaröldu					-70	-30	-70	-40	-190		-45											-3	-22	+14	+2	0	-4			
---„---, Nýgræður*				-16	-50	-49	-50	-34	-66		-40	-30	-65	-60	-55	-120	-55	-65	-55	-65	-50	-56	-68	-26	+80	-30	-38	-22	-35	-40
---„---, Stemma*				-230			-70	-109	-170	-81	-86	-120	-29	+35	-18	-92	-58	-70	-65	-83	+6	-19	-76	0	+197	-83	-38	-81	-46	-93
---„---, Fellsfjall*								-26	-26	-26	-68	-61	-20	-32	-18	-65	-55	-8	-58	-22	+41	-12	-161	+70		-15	-69		-69	-24
14. Fellsárjökull*												-35	-68	-4	-23	-106	-37	-89	-30	-50	-45	-47	-22	-80				-120		
15. Brókarjökull*							-96	-54	-90	0	-125	-57	-18	-5	+1	-2	-28	-16	-50	-15	-20	0	-8	-7	-15	+33	+37	-15	-10	-20
16. Birnudalsjökull*							-13	+1	-12	-27	-11	-34	+3		-3		-10	-23	-2					-30	-5	-2	-1	-1	-3	-2
17. Eyvindstungnajökull*							-18	-10	-5	-60	-50	-31	-24	-10	-2	-8	-20	-30	-7	-6	-1	+24	-4	-6	-8	-10	-2	-5	-5	-17
	1905-1930																													
18. Skálafellsjökull*	-350	-57		+5	-25	-30	-31	-56	-35	-34	-56	-30	-37	-18	-50	-20	-25	-20	-30	-15	-45	-40	-25	-25	-35	-15	-25	-50		+25
---„---, vestur						-15	-33	-62	-20	-10	-13	-35		-15	-16	-5	-13	-11	-8	-3	-10	-22	-17	-32	-37	-35	0	-8	0	-30
19. Heinabergsjökull, Hafrafell*	-450	-170		-32	-43	-62	-48	-97	-38	-25	-32		-15	-335				-30	-40	-6	-13	-6	-30	-10	-15	-30	-20	-60	-10	
---„---, Geitakinn*	-450	-170		-32	-43	-78	-40	-60	-10	-60	-45	-40	-20	-25	-30	-10	-50	-25	-50	-45	-55	-25	-40	-35	-25	-40	-20	-15	-15	+30
20. Fláajökull, vestan Hólmsár*	-250	-80		-7	-24	-36	-10	-130	-60	-44	-100	-108	-3	-18	-62	-12	-23	-20	0	0	0	-161								
---„---, Hólmsárgarður*						-60	-50	-80			-55	+59	-34	-50	-50	-20	-100	-88	+48	-7	-2	+39		-20	-45	-20	-5	-30	+25	-75
---„---, austur 1*	-400	-108		+3	-42	-140	-100	-150	+10	-40	-52	-105		-10	-49		-9	-134	-46	-5	-5	-10		-25	-35	-100	+75	-95	-15	+55
---„---, austur 2						-65	-50	-70	+15	-45	-40	-100	-50	0	-30	+8	-28	-100	-65	-10	-10	-8		-13	-44	-20	-5	-5	-20	+10
21. Svínafellsjökull, Hornaf., staður 1	-550	-40		+55	-9	-44	-104	-144	-126	-95	-38	+23	-45	-75		-115	-100	-90	-82	-80	-24	-56	-53	-17	-15	-60	+28	-10	-35	
---„---, staður 2	-550	-40		+55	-9	-44	-100	-130	-130											-96	-43	-57	-35	-10	-20	-25	+55	-80	-42	-82
---„---, staður 3*	-550	-40		+55	-9	-44	-70	-130	-170	-102	-15	+9	-47	-20		-195	-73	-97	-50	-90	-10	-50	-70	-90	-15	-53	-103	-70	-70	-110
22. Hoffellsjökull, staður 1							-7	-7	-8	-15	-3	-25	-25	+18		+10	-10	-3	-30	-25	+20	-5	-22	+22	-50	+10	0		0	
---„---, staður 2*		-20		0	-10	-5	-10	-18	-2	-10	-2	-11	-17	-10		0	-10	-10	0	-15	+14	-4	-15	-20	+25	+20	0	-10	0	
---„---, staður 3							+2	+1	-25	-4	-4	-27	-15	-15		+5	+30	+5	+15	+5	-26	+6	-15	+12	-15	-17	-20	-7	+5	+10
23. Hoffellsdalsjökull*							-60	-10	-30	-40	-43		-7	-30		-20														
24. Eyjabakkajökull																														
25. Brúarjökull*																														
26. Kverkjökull*																														
27. Tungnaárjökull*																+2000		-300									-20	-40	-40	-50
28. Síðujökull, staður 1*					+500	-1780																								
---„---, staður 2					+500	-1780																								

59/60	60/61	61/62	62/63	63/64	64/65	65/66	66/67	67/68	68/69	69/70	70/71	71/72	72/73	73/74	74/75	75/76	76/77	77/78	78/79	79/80	80/81	81/82	82/83	83/84	84/85	85/86	86/87	87/88	88/89	89/90	90/91	91/92	92/93	93/94	94/95	Total	Period
-80	-34	-15	-35	-8	+30	+37	-9	-14	-77	-10	-1	-75	+16	+40	+40	-90	-5	-15	-5	-15	-45	-10	+6	-2	+151	+290	-96	-114	-20	-105	+429	+86		-77		-2020	32-95
-9	-7	-11	-23	+6	+54	-24	-5	-11	+13	+39	+20	+9	+21	+22	+12	+19	-14	-21	-16	+6	+7	-2	+5	+27	+13	-20	-16	-8	-11	-2	+147	-28	-9	-33	-31	-207	50-95
																																				-221	32-49
-8	-5	-5	-27	+3	+95	-8	-19	-12	-11	+4	-7	+6	+23	+11	+7	-15	+27	-15	-9	0	+7	-2	-10	+23	+16	0	-6	-6	-7	0	+64	-10	-16	-11	-7	-850	32-95
-6	-4	-9	-8	-3	-4	-5	-19	-3	-3	-4	+3	-4	-2	-5	-12		-2		-6	-43	+30	-2	+8	+1	0	-5	-5	-4	0	0	0	-3	-1	-4	-3	-614	40-95
																																				-54	43-60
-14	-13	-11	-15	-50	-11	-23	-8	-12	-12	-11	-4	-7	-5	+6	+24		+26	+12		+13	+19	+28	+8	+3	+12	0	-8	+9	0	-20	-3	-52	+31	0	0	-1211	32-95
																																				-530	36-59
-10	-38	-7	-32	0			-13																													-163	50-64
-48	-45	-7	-42	+7	-5	-10	-10	0	-5	-55	-20	+22	-42	+45	+20	-5	-7	-33	-10	+80	0															-530	47-82
-63	-42	-10	-55	-30	-5	-15	-67	+22	-33	-12	+45	-33	-27	+30	+33	+7	-15	+10	+10		+26	+9	-15	+5	+20	-15	+5	+1	-14	-2	-12	0	-6	-46	-56	-702	47-95
-48	-50	-30	-70	0	-25	-30	-30	-6	-14	-10	-12	-14	+1	-5	-10	-10	+12	-12																		-1037	37-78
-29	-18	0	0	0	0	0	0	+5	0	-5	0	-20	-10	-10	-5	+45	-3	-2	0	-47	+12	+45														-115	50-82
-10	+6	+14	0	0	-10	-1	+11	-5	-4	+6	+8	-10	+4	+13	-17	+16	-3	-18	-3	+25	+6	-5	-5	+12	-13	+8	-5	-9	+8	-14	+11	+7	-11	-7	+5	-400	32-95
-29	-1	+17	+13	-10	-8	-5	+23																													-355	32-67
-12	-10	+12	0	+35	-19	+1	+12	-14	-3	-2	+5	-11	+6	+20	-5	+7	+12	-4	-10	+16	+2															-117	32-81
																																				-153	32-53
-42	-17	-5	-12	+4	-4	+18	+5	-15	-40	-10	-70	-60	-20	+25	0	+10	+10			+30			+8	+10	+18	+5	+10	+3	+6			-22			0	-457	32-95
-12	-23	-5	-13	+8	-5	+12	+3	-10	-3	-7	-10	-5	+35	+10	-5	+19	+11	-10	+29		+21	+17	-10	+15	+13	+7	+5	+8	+4	+3	-3	-14	-3	-14	-1	+52	57-95
																																				-527	32-60
																																				-280	33-39
																																				-280	33-39
-49	-12	+32	-31	+52	-7	-7	-46	+28	0	-5	-13	+39	0	0	+41	+2	-22	0	-27	-95	+75	-4	-6	0	+10	+10	+25	+3	-28	+25	-14		-11		+6	-140	47-95
-48	-22	-14	-36	-10	0	-27	-3	0	0	0	0	0	0	-5	-13	-8	0	0	0	+8	+10	+23	0	+12	+8	+35	0	+22	0	-4	-5		-28		+5	-202	47-95
-78	-55	-30	-20	+20	+40	+2	-24	-9	-14	-5	-46	-34	-4	+19	+46	+12	-31	-28	-7	+25	-3	+23	+9	-10	-4	-9	-12	-4	-17	-31	-25	-25	-30		+25	-455	50-93
-28	-40	-19	-6	+25	-6	-7	-24	0	+12	0	-31	-2	+10	-22	-1	-11	-9	-4	-6	+11	+5	+26	0	-4	+6	+3	+4	+10	0	0	-9	-39	-67	+10	+5	-705	35-95
-6	-31	-1	-15	-1	0	0	-5	-3	+4	+4	-2	-2	0		-6	+8	-12	-3	+5		-4	+9	+6		+11	-2	+3		-21			-22	-15	-20	-5	-133	51-95
-43	-52	-47	-57	-70	-42	-43	-29	-20	-34	-30	-27	-27	-24	-27	-40	-25	-32	-40	-20	-27	-23	-14	+4	-15	+31	-26	-3	+7	-28	-39	-62	-57	-40	-18	0	-1364	50-95
																																				-626	43-58
-85	-62	-37	-48	-77	-45	-55	-57	-45	-41	-30	-53	-53	-34	-20	-85	-50	-121	-14	-88	-18	-70	-49	-12													-1319	58-83
																																				445	33-40
-35	-40	-40	-25	-55		-70	-75	-70	-132	-85	-42	+42	+8	-20	-80	-88	-135	-125	-62	-12	+26	+53	-2	-16	-57	-108	-44	-108	-54	-16	-70	-69	-16	-20	-30	-2567	39-95
-75	-16	-48	-58	-30	-35	-60	-45	-20	+5	+80	-28	-36	-80		-174	-63	-55	+47	+18	+6	0	+41	-37	-22	-16	+8	+52	-42	-38	-90						-2290	32-90
-138						-35	-80	-17	+23	0	-88	-26	-56		-37	-22	-24	-45	-34	-24	-58	-44	-15	-14	-50	-14	-24	-33	-40	-30	-40	-24	-25			-876	65-93
			-400																																	-756	40-58
-75	-5	-25	-10	+45	0	0	0	+36	-50	+31	+65		+56			0		+8				+142					-18			-7	-12	-18		+11		-406	35-94
-101	-20	-100	-50	0	0	0				-																										446	35-66
-3	-3	0	0	-1	0	0																														-322	35-66
	-50	-50		-50		-50		0				-							71												+2		+5	+2		-1061	30-95
-70	-30	-10	-5	-5	-20	-25	+10	+6	0	-5	-50											-9														-663	34-92
30	0	0	-30	0	-20	-40	-15												-668												+91		-45	-55	+169	-1263	41-95
-40	-25	-142	-33	0	-20													-146														-55		-53	+126	-1461	30-95
			-9	-10	-5	+17		+12	+14	0	-17	-11				+4				-7	+31		-8													-887	30-84
	-20	-10	-15	-5	-6	-9		0	-1	-6	-6	-8		-5			-79			+46	+9		+25				+1			-6	-5	+10	-5	-2		-527	39-94
-50	-30	-20	-65	-25	-30	-6	-5	+40	-11	-19	-25	-10										+5										+6	-7	-5		-606	45-94
-10	-50	-80	-15	-5	-70	-10	+30	+9	-1	-3	+10	-10		-8					+48																	-910	34-82
																																				-1351	30-58
-105	-106	-242	-125																																	-1013	48-64
-75	-53	-77	-155		-85		-150		-18		-30		-57	-15	-7	-53	-42	-8							-67						-2					-2623	30-92
-10	0	-70	-50																																	-285	35-64
30	-10	0	-260		+20		0		+5				+85	+7	-22	-5	-10	-13	+23																	-415	30-69
-105	+55	-30	-120																																	-294	35-64
																																				-240	35-45
												+1350	+620		-18	-5	-27	-13	0	-12	0	+10	-10	-20	-12											+1863	71-85
				+8000							-550									-710						-338										+6402	63-88
							-56					+12	-1	-8	+7	-7	-10	0	-2	+20	-18	+18	+6	-10	+1	-32		-7			+13					-74	63-93
-50	-55	-145	-80	-70	-50	-200	-77	-190	-55	-192	-77	-4	-141	-106	-83	-101	-233	-1	-71	-114	-31	-28	-93	-121	-89	-59	0	-73	-21	-66	-81	-9	-31	-17	+1175	-89	44-95
				+600	-25	-77				-202				-57	-24	-37	-96	-47	-78			-95		-21	-85	-34	-38	-90	-64	-23	-95	-27	-63	+1117	-3	-844	33-95
				+600	-25	-77				-249				-63	-58	-43	-33	-99	-57			-93		-57	-53	-33	-54	-126	-59	-23	-170		-97	+1160	-4	-993	33-95

Jökull		30/31	31/32	32/33	33/34	34/35	35/36	36/37	37/38	38/39	39/40	40/41	41/42	42/43	43/44	44/45	45/46	46/47	47/48	48/49	49/50	50/51	51/52	52/53	53/54	54/55	55/56	56/57	57/58	58/59
VI. HOFSJÖKULL																														
1. Blágnípujökull*							-72		-15			-90																		
2. Nauthagajökull*						-73		-152	+10	-10	-26		-64		+34				-60	-8	-7	-19	-4	-9	-6	-4	-40	+86	-13	-27
3. Múlajökull, vestur									-22	-31	+10		-49		+24				+15	+11	-18	-2	-23	+3	+62	+5	-28	-29	-37	-48
---„---, suður*						-140		-167	-50	-82	-22		-56		0				-35	0	-6	-49	-9	-54	+257	+24	-60	+26	-107	-10
4. Sátujökull, Lambahraun*																										-150		-30		-30
---„---, Eyþrðingahólar*																														
VII. LANGJÖKULL	1890-1934																													
1. Hagafellsjökull vestari, staður 1	-792									-160			-170						-290		-168						-168	-50		-250
---„---, staður 2*	-792									-160			-170						-290		-168						-168	-50		-250
2. Hagafellsjökull eystri*	-1350[4]					-50				-500			-250			-225					-300						-500			-375
3. Jökulkrókur, 1932-1972*							-41		-40						-131			-50				-125					-205		-80	-60
---„---, 1972-*																														
VIII. HRÚTFELL																														
1. Norðurkinn, austur*							-50	-20	-25	-56	-20	-25			-50		-45		-20											
2. Norðurkinn, mið*							-40	-10	-16	-29	-20	-15			-24		-34		-30			-30							-77	-3
3. Norðurkinn, vestur*							-10	-35	-38	-8	-50	-15			-60		-40		-30			-30							-45	-21
4. Norðvesturjökull*							-65	-18	-25	-25	-30	-20			-46		-45		-30			-70							-70	0
IX. KERLINGAFJÖLL																														
1. Loðmundarjökull*							-36		-7	-13	-7	-7		-4	-2	-8						-34					-1	+4	-2	+3
X. NORÐURLANDSJÖKLAR																														
1. Gljúfurárjökull*																								-46		-68	-25	-23	-6	-21
2. Hálsjökull*																														
3. Tungnahryggsjökull*																							-75						-107	
	1900-1975																													
4. Barkárdalsjökull*	-300																													
6. Bægisárjökull																												-101		
7. Grímslandsjökull																														

1 The variation of Leirufjarðarjökull between 1840 and 1931 is given in Eyþórsson (1935). It was –1100 m between 1840 and 1886, –220 m from 1886 to 1898, –1300 m from 1898 to 1913 and –630 m from 1913 to 1931.

2 The variation of Kaldalónsjökull between 1887 and 1931 is given in Eyþórsson (1935).

3 The variation of Reykjafjarðarjökull between 1850 and 1931 is given in Eyþórsson (1935). It was –1500 between 1850 and 1914, –650 m from 1914 to 1929 and –250 m from 1929 to 1931.

4 The retreat of Hagafellsjökull eystri between 1890 and 1934 is given in Sigbjarnarson (1967). It was –115 m between 1890 and 1902 and –635 m from 1902 to 1929 and –600 m from 1929 to 1934.

GRÍMSLANDSJÖKULL

Grímslandsjökull is a cirque glacier in central northern Iceland (Fig. 6). Surveying was started in 1993 by a teacher at a local secondary school.

GLACIER VARIATIONS

The measured variations of the glaciers in the data set are tabulated in Table 2 and selected records are shown in Figures 7-13. Each measurement location is tabulated separately in cases when two or more locations on the same glacier tongue were monitored simultaneously. The table thus gives the original measurements without averaging or interpretation.

Table 1 gives the measurement period and some characteristics of each glacier and figures 2-6 show location maps of the glaciers. Most measurement sites are marked on the maps, except for sites which are very close to each other and which are observed mainly in order to obtain more representative values for the average variations over some part of a terminus.

Figures 7-13 show that most of the non-surging glaciers retreated strongly during the early half of the observation period from 1930 to 1995, followed by a readvance or a slowing of the retreat after about 1970. The records of surge-type glaciers, which are marked with a superscripted 1 in Table 1, are dominated by

59/60	60/61	61/62	62/63	63/64	64/65	65/66	66/67	67/68	68/69	69/70	70/71	71/72	72/73	73/74	74/75	75/76	76/77	77/78	78/79	79/80	80/81	81/82	82/83	83/84	84/85	85/86	86/87	87/88	88/89	89/90	90/91	91/92	92/93	93/94	94/95	Total	Period
																																				-177	32-41
-26	-58	-5		-43	-1	-22	-5		-13	-11	-6	-6	+8	+1	+2		+4	-1	+1		-6	-2	+1	+4	-5	0	+1		+7	+4	-8	+1	+3	-9	-2	-584	32-95
-18	-27	-6		-14	+13	+71	-13		-85	0	+3	+60	+8	-14	-15		+6	0	+1		-14	-7	+5	+11	+6	+34	+26		-52	-26	-2	+24	+49	-47	-8	-188	37-95
-31		-62		-99	-79	+71	-78		-26	+4	+7	+363	-22	-42	-15		-113	+1	+17		-63	-42	-21	-33	-16	+318	+17		-45	-16	-91	+49	+153	-15	-52	-501	32-95
																					-205	-2														-417	50-82
																								-15	-13	-15		-80	-3	-5	-11	-8	0			-150	83-93
		-90		-363		-169				-270		+678		-77				-126		+718		-28			-8	-16				-216						-1223	34-90
		-90		-282		-180				-313		+708		-51		-59		-53		+650		-34			-29	-24				-132			-86			-1231	34-93
	-50		-155		-170	-107	0		-175	-77		-45	-133			+1139		-34		+900		-33			-60	-25		-105	-46	-45			-149			-1570	34-93
	-31		-59				-54			-69		-50																								-995	33-72
														-17			-14		-16		+6				-4						+3					-42	72-91
																																				-311	33-48
																																				-328	33-59
																																				-382	33-59
																																				-444	33-59
	-14	-3																																		-131	32-62
		-45		-37	-12	-4			-30	+5	-11	-16				-74		+11	+39		+30		+25	-5	+13	+23	-5	+8	+15						-4	-263	39-95
																		-40			+7				0		-7	-4			+3	+5				-36	72-92
																																				-182	39-58
																									+125	-18	-8	0					+23		+1	+123	75-95
																	-100																			-101	39-57
																																		-32		-32	93-94

the surge events. The glacier variation records are further discussed and related to the climate of Iceland during the observation period by Jóhannesson and Sigurðsson (this volume).

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Ágrip

Jöklabreytingar á Íslandi 1930-1995

Árið 1930 hóf Jón Eyþórsson veðurfræðingur að mæla skipulega jökulsporða víðs vegar á Íslandi. Þeim mælingum hefur verið haldið áfram fram á þennan dag og á vegum Jöklarannsóknafélags Íslands síðan það var stofnað um miðja öldina. Mælingar hvers árs hafa birst í tímaritinu *Jökli* og eru þær merkileg heimild um jöklabreytingar á landinu á þessari öld. Mælingarnar í heild sinni eru teknar saman í þessari grein, endurskoðar og fyllri en áður.

Mælingarnar sýna að jöklar sem ekki eru framhlaupsjöklar hopuðu ört á fyrri hluta tímabilsins en flestir þeirra gengu fram eða stóðu í stað eftir 1970. Framhlaupsjöklar hopuðu eða gengu fram, að mestu óháð veðurfari.

Í greininni er hverjum mældum jökli lýst og mælistaðir við jökuljaðar sýndir á kortum. Mældar breytingar á stöðu jökulsporða milli ára eru sýndar í töflum og á línuritum. Í töflu 1 eru taldir upp þeir jöklar sem mældir hafa verið ásamt ýmsum landfræðilegum upplýsingum. Í töflu 2 er tilgreind hver einstök mæling frá upphafi og í nokkrum tilvikum upplýsingar um breytingar fyrir tímabil reglulegra mælinga.