VARIATIONS OF GLACIERS IN ICELAND, 1930–47

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IN the accompanying Table (see p. 251) I have collected the variations of Icelandic glaciers during the period 1930–47. Before 1930 no regular or accurate measurements of the glaciers were made, but much information about their advance and recession is available in various books and documents. This information was collected by G. Bárdarson [1] and was later discussed by S. Thorarinsson.[2]

In 1930 and the following years I erected markers on a number of glacier tongues.[3] In 1930 and 1932 H. H. Eiríksson [4] of the Technical School in Reykjavík placed markers on four big outlet glaciers of Vatnajökull, *i.e.* Nos. 10, 15, 16 and 17 in the Table.

The markers are chiefly cairns of stone, or, in some places, iron rods. On the big glaciers there are usually three to six markers and the figures given in the Table are averages.

Since the markers were established the distance from them to the ice margin has been measured every year in September or October, generally by farmers in the neighbourhood. The inland glaciers have, for the greater part, been measured by me personally but in some cases by farmers when fetching sheep from the mountain pastures in the autumn. The glaciers have, generally speaking, been retreating during the period under review but the outlets of Drangajökull are an interesting exception. The glacier of Kaldalón advanced 191 m. in 1935–40, that of Reykjafjördur, 750 m. in 1933–36 and that of Leirufjördur, 999 m. in 1938–42. The observations at Tharaláturs-fjördur are doubtful as snow has sometimes covered its snout at the time of measurement.

The outlets from Drangajökull are famous for sudden advances—without being disturbed by volcanic activities. These are listed in my paper.[5]

Snæfellsjökull has been continually receding. On my first visit the distance of the ice margin from the outermost moraines was very short. In some places the moraines rest on postglacial lava fields. As no eruptions are known to have taken place in this district since the settlement of Iceland —and there is no glacial debris outside them—the position of the moraines must indicate the greatest extension of the glacier in the last 1000 years at least. How much or how often the glacier has oscillated *within* these boundaries is of course quite unknown.

At Skeidarárjökull the conditions are abnormal, owing to frequent volcanic activities within its regime. In 1932 I surveyed its front. By comparison with the Danish General Staff map of 1904 the glacier shows a considerable advance as a result of its oscillations in the period 1904–32. As the great eruption of Grimsvötn took place only two years later (1934), the advance might have been a forerunner. In the summer of 1929 the glacier advanced very abruptly, breaking some telephone poles that had been newly erected. In 1938 an outburst swept away the markers at the eastern half of the margin and some of them at the western. As a rule it is difficult to reach the western edge on account of rivers and quicksand, and the measurements there do not claim any high degree of accuracy. The 60 m. advance of Skaftsfellsjökull in 1932–34 seems rather doubtful but by no means impossible.

The northern and the southern halves of Svínafellsjökull show a marked discrepancy. The figures for 1904–32 are based on my observations in relationship with the General Staff map. At Gljúfurárjökull observations were discontinued in 1941 as the tongue broke off from the upper glacier and became dead ice.

Stígárjökull and Hólárjökull came down to the low land when observations began. After 1939 they receded to deep clefts and became inaccessible. "They now form beautiful ice falls in their clefts," writes our observer.

	1930/31	'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
I. DRANGAJÖKULL																	
1. Kaldalón		−70	−34	−95	−26	+39	+107	+ 41	+ 2	+ 2	−91		− 5	−41	0	− 3	− 14
2. Leirufjördur		− 71	−42	−30	−42	0	−200	− 35	+540	+150	+272	+ 37	0	0	− 15	−20	−100
3. Reykjafjördur		−154	− 60	+ 80	+190	+488	− 27	+ 51	+ 2	−102	− 5	− 8	− 29	−34	− 2	− 48	− 90
4. Tharalátursfjördur			− 80			− 6	− 47	0	− 14	−119	0	+ 5	+ 76	− 3	+56	− 8	?
II. SNÆFELLSJÖKULL																	
1. Hyrningsjökull		−44		−78	−32	− 33	− 42	− 70	− 70	− 34	− 50	−39		− 35	− 63	− 23	− 53
2. Jökulháls					− 25	− 16	− 19	− 20	− 29	− 22	−110	−21		− 28	+ 3	− 12	− 92
3. Nordurkinn					− 80	− 65	− 30	− 38	− 37	− 60	− 55	− 15		− 10	− 66	− 34	− 52
4. Blágilsjökull		−103		−100	− 57	− 23	− 24	− 82	− 46	− 20	−120	− 28		− 14	− 8	− 9	− 25
5. Hólatindajökull		− 12			− 48												
III. EYJAFJALLAJÖKULL																	
1. Gígjökull		−55			− 18	− 40	− 113	− 68	− 50	− 88	− 62	− 36	− 118	− 91	− 82	+143	?
2. Seljavallajökull		− 35		− 40	− 22	− 18	− 45	− 43	− 47	− 27	−100	− 46	− 29	− 15	− 53	− 42	− 23
IV. MÝRDALSJÖKULL																	
1. Sólheimajökull (W)	− 3	− 22	− 76	− 74	− 32	−103	− 30	− 40	− 21	− 35	− 22	−35		− 37	− 38	−47	
—„— (E)	− 52	− 35	− 47	− 10	− 40	− 25	− 40	− 45	− 75	− 53	− 42	−35		− 5	− 25	−20	
2. Jökulhöfud	−9		− 46		− 30		− 14		− 65	− 30	− 11	−24		− 10	− 65	− 65	
V. VATNAJÖKULL	1931/32																
1. Skeidarárjökull (W)	+390		− 3	− 60	− 9	− 54	− 51	− 46	− 40	− 3	− 452	− 215	− 110	− 200	− 110	− 16	− 14
—„— (E)	+260		−30		− 25	− 36	− 12	1	− 43	− 2·5	− 56	− 13	− 29	− 14	− 27	− 46	− 21
2. Morsárjökull			−95			− 60	− 30	− 20	− 25	− 38	− 3·5	+ 8	− 35	− 35	− 33	− 23	− 24
3. Skaftafellsjökull			+60		− 45	− 155	− 71	− 21	− 5	− 65	− 80	− 133	− 17	− 49	− 65	− 22	− 63
4. Svínafellsjökull (N)	− 25		− 65		− 15	0	+ 3	− 15	− 10	− 20·5	− 33	− 27	− 2	− 43	− 30	− 4	− 58
—„— (S)	+ 55		− 33		− 20	− 10	+ 7	− 10	− 13	− 7	− 16	− 26	− 2	− 3	+ 3	− 3	− 3
5. Virkisjökull (Falljökull)			+ 13	+ 33	− 7	− 6	− 16	− 16	0	− 24	− 18	− 35	− 30	− 24	− 19	− 20	− 50
6. Gljúfurárjökull			− 19	− 18	− 10	− 29	− 6	− 8	− 154	− 26	− 187						
7. Stígárjökull		0	?	?	− 35	− 54	− 53	− 45	− 90								
8. Hólárjökull			− 10	− 30	− 38	− 46	− 30	− 50	− 30								
9. Kviárjökull		0			0	− 10	− 80				− 280					−	−
10. Breidamerkurjökull (W)			− 16	− 50	− 49	− 60	− 41	− 47	− 48	− 60	− 59	− 43	− 30	− 37	− 60	− 43	− 43
—„— (E)				−230		− 36	− 79	− 98	− 54	− 77	− 96	− 28	+ 1	− 18	− 57	− 78	− 39
11. Fellsjökull											− 35	− 68	− 4	− 23	− 37	− 106	− 89
12. Brókarjökull						− 96	− 54	− 90	0	− 125	− 57	− 18	− 5	+ 1	− 2	− 28	− 16
13. Birnujökull						− 13	+ 1	− 12	− 27	− 11	− 34	+ 10	− 7	+ 7	− 10	− 10	− 23
14. Eyvindstungnakollur	1929/30					− 18	− 10	− 5	− 60	− 50	− 31	− 24	− 10	− 2	− 8	− 20	− 30
15. Heinabergsjökull (S)	−350	− 57	+ 5	− 25	− 23	− 32	− 59	− 28	− 22	− 35	− 30	− 45	− 28	− 32	− 13	− 19	− 19
—„— (N)	− 450	−170	− 32	− 43	− 70	− 44	− 78	− 24	− 43	− 39	− 20	− 68	− 23	− 40	− 25	− 137	− 28
16. Fláajökull (W)	−250	− 80	− 7	− 24	− 36	− 10	− 130	− 60	− 44	− 100	− 108	− 3	− 18	− 62	− 12	− 23	− 20
—„— (E)	−400	−108	+ 3	− 42	− 75	− 67	− 100	+ 34	− 42	− 49	− 49	− 46	− 25	− 26	+ 17	− 46	−107
17. Hoffellsjökull (W)	−550	− 40	+55	− 9	− 44	− 91	− 135	− 142	− 98	− 32	+ 16	− 31	−47		−155	− 86	− 93
—„— (E)		− 20	0	− 10	− 5	− 5	− 8	− 12	− 10	− 3	− 24	− 19	−21		+ 5	+ 3	− 3
18. Hoffellsdalsjökull						− 60	− 10	− 30	− 40	− 43		− 7	− 30		− 20		
VI. HOFSJÖKULL																	
1. Blágnípujökull				−72			−15		− 90								
2. Nauthagajökull				− 73		−152	+ 10	− 10	− 26	−64		+34					
3. Múlajökull				−140		−167	− 36	− 55	− 6	−93		+12					
VII. LANGJÖKULL																	
1. Fúlakvísl					− 41		− 40				−131				− 50		
2. Hagafellsjökull (W)						−160				−170							
3. Hagafellsjökull (E)						−500				−250							
VIII. HRUTAFELL																	
1. Nordurkinn (E)					− 50	− 20	− 25	− 56	− 20	− 25		−50			− 45		
—„— (M)					− 40	− 10	− 16	− 29	− 20	− 15		− 24			− 34		
—„— (W)					− 10	− 35	− 38	− 8	− 50	− 15		− 60			− 40		
2. Nordvesturjökull (NW-glacier)					− 65	− 18	− 25	− 25	− 30	− 20		− 46			− 45		
IX. KERLINGARFJÖLL																	
1. Lodmundarjökull				−36			−		−13	− 7	− 7	−4		− 2	− 8		

Hoffellsjökull was minutely investigated by the Swedish-Icelandic expeditions in 1936–37–38 and described by Ahlmann and Thorarinsson.[6]

The measured outlets of Hofsjökull are all on the southern side of the ice cap, far from all inhabited places. They have therefore been visited only about every second or third year.

The same is the case with Langjökull and Hrútafell. Hagafellsjökull Vestri has been observed from cairns built by Mr. J. Wright's expedition in 1934.[7] The retreat of Hagafellsjökull Eystri has also been determined by comparison with his map.

In northern Iceland there is a number of small glaciers on the high mountain range between Skagafjördur and Eyjafjördur. I visited some of these in 1939 and built markers on the most important. Most of the snouts reaching down to the highest valleys had then retreated about

200 m. from their outermost moraines, which were covered with alpine vegetation on their outside slopes. I have not however succeeded in establishing regular observations.

The only conclusion that can be reached at present by these observations seems to be that in about 1930 the glacier snouts were still in advanced positions, although the glaciers had been mainly thinning and receding for more than 100 years. But of their minimal extension in accordance with the highest possible climatic optimum in Iceland we know nothing as yet.

MS. received 5 May 1948

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INTERNATIONAL GEOLOGICAL CONGRESS, LONDON, 1948

In spite of the clash with the meeting of the International Union of Geodesy and Geophysics in Oslo, many members of the British Glaciological Society attended the International Geological Congress held in London during August and September 1948. In general, topics of interest to glaciologists were not particularly well represented in the papers presented to the Congress. For those who were interested in the chronology of the Pleistocene there was a special Section H dealing with the Pliocene–Pleistocene boundary, containing many valuable papers covering a wide field. Otherwise glaciological items were distributed through Section M under "Other Subjects."

There glaciology was represented by an important paper by Professor Arnold Heim dealing with the glaciation of South America and its relation to the tectonics of the region. Heim considers that distribution of Pleistocene glaciers could not wholly be explained by climatic change. He infers that Pleistocene tectonic movements have had a major influence on the extent of the glaciers during successive glaciations, in particular the southern Andes were higher in the Pleistocene than now, whilst the northern Andes were lower. It is clear that such considerations must have a significant bearing on the inferences as to climate that are drawn from the former extent of the glaciers.

A paper from the doyen of glaciologists, W. H. Hobbs, attributed a special significance to large erratic boulders glaciated on their undersides only. He refers to these as "saxums," and claims that such boulders represent residual masses of rock from the pre-glacial weathered zone that were glacially transported. They are usually found at or near the glacier front, and have only been seen in association with the deposits of the initial glaciation.

Frozen ground phenomena of Pleistocene age and their significance in engineering problems were the subject of a paper by Professor Guido Zuruba. In the periglacial region of central Bohemia superficial disturbances are attributed to the former presence of ground ice in a deeply frozen but unglaciated region. Some are comparable with ice wedge structures in the Cambridge district described by Patterson, and others with some of the disturbances in the Northampton Ironstone Field described by Hollingworth, Taylor and Kellaway.

The concentration of alluvial gold as a result of glacial action in the highlands of south-west