





PH.D.

1964

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A 9 Iceland

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PhD. Thesis '64



To be returned to the  
ACADEMIC REGISTRAR,  
UNIVERSITY OF LONDON,  
SENATE HOUSE, W.C.1  
with the Examiners' Report

THE VOLCANIC GEOLOGY OF THE AUSTURHORN AREA,  
SOUTH-EASTERN ICELAND

A Thesis submitted for a Ph.D. Degree  
at  
London University

by  
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1964





Hvalnes Farm and the eastern end of the Austurhorn Ridge

Abstract

Part of a Tertiary volcanic centre, the Alftafjordur volcano, and a later, apparently unrelated, gabbro-granophyre stock, the Austurhorn intrusion, are described.

The Alftafjordur volcano is closely comparable to the Breiddalur volcano (Walker, 1963) further north and was active at the same time. Acid lavas and pyroclastics predominate in the core of the volcano, where there is evidence of cauldron subsidence. At the edge of the core there is a separate small collapse area in which many extrusive xenolithic acid sheets, interpreted as tuffolavas, outcrop. Flank lavas, mainly thin tholeiites, dip outwards from the core when allowance is made for the regional westward dip and interfinger with flood basalts to the west in "cedar-tree" fashion. Minor intrusions, which include a dyke swarm, many basic sheets, a number of columnar-jointed tholeiitic bodies, two small gabbro masses and a group of gravity differentiated porphyritic sheets, are mostly related to the volcano, as is also a zone of propylitic alteration.

Besides gabbro and granophyre, the Austurhorn intrusion also includes, in the east, a net-veined complex where inclusions of basic rock are enclosed in and veined by granophyre. Many of the basic inclusions are texturally zoned, with finer-grained margins; these inclusions are considered to represent intrusions of basic magma into acid magma which probably originated from basic sheets cutting granophyre outside the net-veined complex. The contact relationships of the intrusion are discussed and although initially it seemed that the gabbro was older than the granophyre, it is thought that the reverse age relationship is the correct one, and that the granophyre magma was emplaced first, displacing the country rocks by stoping, followed by gabbro magma and finally basic magma which formed intrusive sheets outside and intrusive pillows inside the net-veined complex.



Contents		Page
General Introduction .. .. .		6
Part I The Alftafjordur Volcano		
Chapter 1 Introduction .. .. .		10
Chapter 2 Field Identification of Rock Types..		12
Lavas .. .. .		12
Pyroclastic Rocks .. .. .		14
Volcanic Conglomerates .. .. .		16
Chapter 3 The Core of the Volcano .. .. .		17
The Caldera .. .. .		19
The Marginal Zone .. .. .		24
Chapter 4 The Maelifell Collapse Area .. .. .		27
General Description .. .. .		27
Xenolithic Acid rocks .. .. .		33
Formation of the Maelifell Collapse Area .. .. .		38
Chapter 5 The Flanks of the Volcano .. .. .		40
North of the Sela River .. .. .		40
Hlidarfjall .. .. .		42
Krossanesfjall, Maelifellsdalur and Hvaldalur .. .. .		43
Chapter 6 The Envelope of the Volcano .. .. .		47
The Fossarvik Porphyritic Group .. .. .		47
The Succession above the Fossarvik Group .. .. .		48
Chapter 7 Minor Intrusions .. .. .		52
Dykes .. .. .		52
Sills .. .. .		56
Thin Intrusive Sheets .. .. .		57
Other Acid Minor Intrusions .. .. .		57
The Columnar-jointed Tholeiite Intrusions .. .. .		61
The Krossanesfjall Gabbros .. .. .		68
The Differentiated Sheets .. .. .		75
Chapter 8 Secondary Alteration and Amygdale Minerals ..		87
Alftafjordur Aureole .. .. .		87
Austurhorn Aureole .. .. .		89
Regional Zeolitisation .. .. .		90
Certain Amygdale Minerals .. .. .		90
Chapter 9 Summary of Conclusions .. .. .		93
Part II The Austurhorn Intrusion		
Chapter 10 Introduction .. .. .		95



	Page
Chapter 11 Field Relationships .. .. .	100
Form of the Intrusion and mode of Emplacement .. .. .	100
External Contacts of the Intrusion .. .. .	102
Contact of the Hvalnesfjall Gabbro with the Granophyre	104
Minor Intrusive Sheets associated with the Austurhorn Intrusion .. .. .	106
Chapter 12 The Granophyre .. .. .	109
Field Description .. .. .	109
Petrography .. .. .	110
Chemistry .. .. .	116
Chapter 13 The Hvalnesfjall Gabbro .. .. .	121
Field Description .. .. .	121
Petrography.. .. .	123
Chapter 14 The Net-veined Complex .. .. .	128
Introduction .. .. .	128
Basic Pillows .. .. .	128
Large Basic Masses .. .. .	133
Hybrid Rocks .. .. .	144
Normal Xenoliths.. .. .	145
Acid Rocks .. .. .	145
Petrography .. .. .	146
Chapter 15 Formation of the Net-veined Complex .. .. .	157
Introduction .. .. .	157
Theories of Pillow Formation .. .. .	160
Objections to the Fluidisation Theory .. .. .	161
Objections to the Replacement Theory .. .. .	163
Adoption of the Commingling Theory .. .. .	165
The Commingling Theory applied to the Austurhorn net-veined complex .. .. .	167
The Relationship of the Net-veined Complex to the Austurhorn Intrusion as a whole .. .. .	171
Chapter 16 Contact Relationships of the Granophyre .. .. .	174
Chapter 17 The Relative Age of the Hvalnesfjall Gabbro and the Sequence of Intrusion within the Austurhorn Mass .. .. .	177
Chapter 18 Summary of Conclusions.. .. .	180
Appendix An X-ray Investigation of the Alkali Feldspar in the Austurhorn Intrusion .. .. .	182
Acknowledgements.. .. .	185
References .. .. .	186



### General Introduction

The Austurhorn area (fig. 1 and Map 1) is situated in the Tertiary volcanic district of eastern Iceland and lies to the south of the large area of Tertiary lavas mapped by Walker (1959<sup>t</sup>), 1960, 1963). It is bounded by Alftafjordur\* in the north, the open sea in the east and the Lon lagoon in the south, while the western boundary is taken approximately along the line of the Vikura and Heidara rivers.

In eastern Iceland three types of igneous activity may be distinguished, flood basalt eruptions of regional extent, localised central eruption from large composite volcanoes and, in the south-west, major plutonic intrusions. All three types are found in the area mapped. The products of a Tertiary volcanic centre, the Alftafjordur Volcano, which include voluminous acid lavas and pyroclastic rocks, cover much of the area, while typical flood basalts outcrop in the west and a gabbro-granophyre intrusive mass, the Austurhorn intrusion, occurs in the south. This intrusion is younger than, and does not appear to be directly related to, the Alftafjordur Volcano.

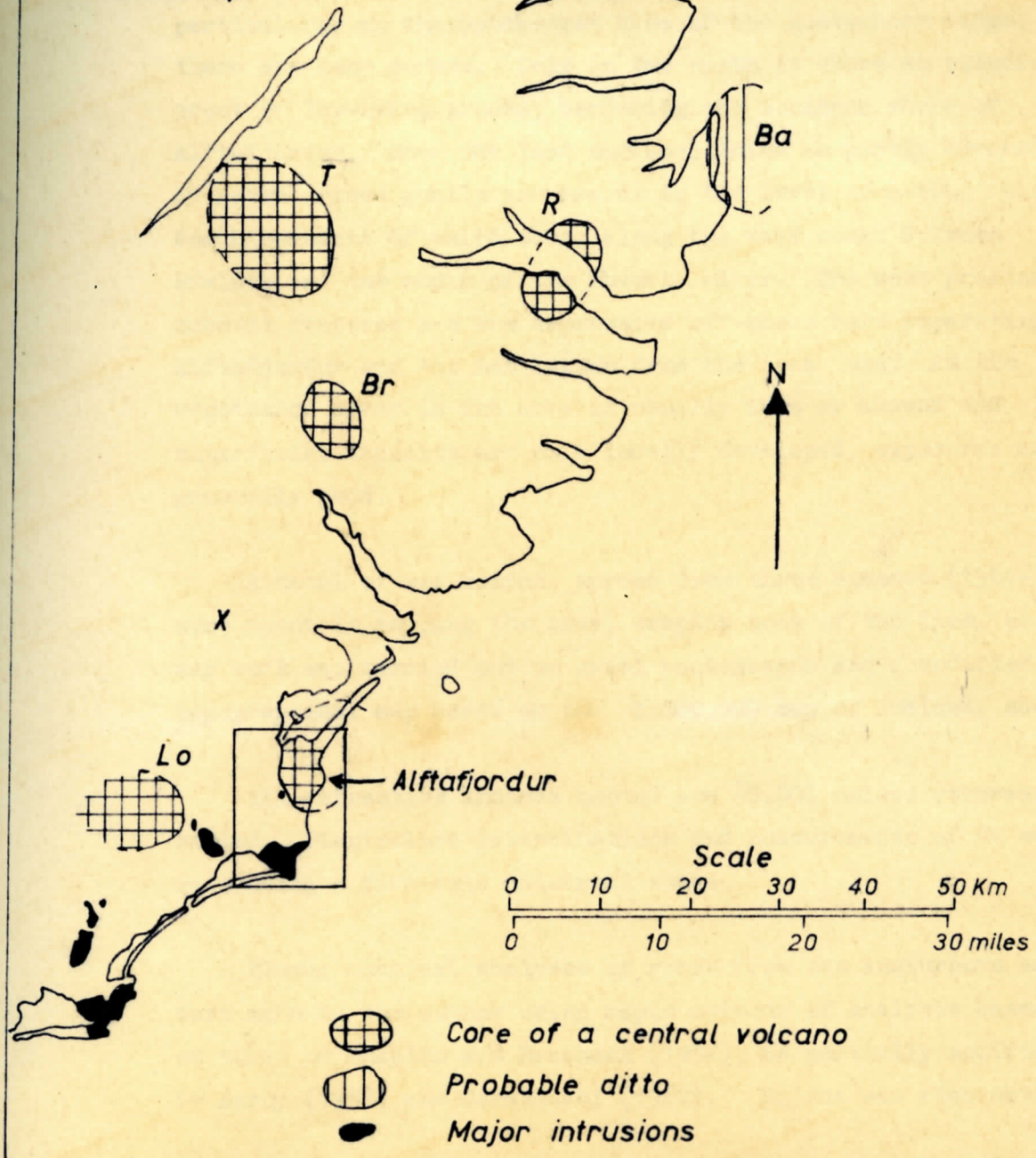
Very little geological literature has been published on the Austurhorn area. Thoroddsen (1906) indicated the presence of acid rocks on the low-lying ground south of Alftafjordur on his geological map of Iceland and he also noted the occurrence of gabbro and granophyre at the eastern end of the Austurhorn ridge (1896). The only later work on the Austurhorn intrusion is that of Hawkes (in Cargill et al, 1928) who described the intrusion

\*In the text and on accompanying maps the Icelandic letters Ð and ð are transliterated as D and d, and Þ as Th. All accents are omitted.



Fig.1 Index-map of  
Eastern Iceland  
showing location of area mapped  
and the positions of other  
Tertiary volcanoes

L....Lodmundarfjordur  
Ba..Bardnes  
R...Reydarfjordur  
T....Thingmuli  
Br..Breiddalur  
Lo..Lon  
X...Centre concealed  
down dip





in more detail and interpreted it as a composite stock. The present work confirms this view.

Most of the area is mountainous and peaks are connected by knife-edge ridges separated from each other by deep glaciated valleys. The higher peaks, which rise to more than 750m., were probably nunataks during the Ice Age. Slopes are generally steep, particularly on the south-west side of the Austurhorn ridge, and there are many screes. Only in the north is there an extensive tract of low-lying ground, bordering the southern shore of Alftafjordur. Here the land surface, which is partly covered by marsh, rises gently southwards to the level of a 10m. raised beach, remnants of which occur along the east coast between Hvalnes and the mouth of the Thvotta river. The most prominent coastal features are the impressive off-shore bars separating Alftafjordur and the Lon lagoon from the open sea. As the vegetation cover in the area is usually thin or absent and superficial deposits are only locally developed, exposures are generally good.

A total of six months, spread over three summers (1961-3) were spent in mapping the area, camping most of the time, and the map work was carried out on areal photographs and a modified topographical map based on the 1:100,000 map of Iceland, sheet 106.

All refractive indices quoted are  $\pm 0.002$  unless otherwise stated. Plagioclase determinations and measurements of 2V were made using a five-axis universal stage.

Eleven chemical analyses of rocks from the Austurhorn area were made by the author using rapid methods of analysis based on those of Shapiro and Brannock (1952), as partially modified by Mercy (1956) and Carmichael (1962). Silica was also determined

by a combined gravimetric-colourimetric method (Jeffery and Wilson, 1960)

The thesis is divided into two parts, the first part dealing with the Alftafjordur volcano and the second part with the Austurhorn intrusion. A geological map of the whole of the Austurhorn area (Map 1) is enclosed.