Some Brief Observations on the Geology of the Faroe Islands

Sheila Pitts

Summary

Some recent exposures, recorded during a visit in 1972, are described. The basic geology is explained in part by summarising the work of the Danish Geological Survey (1970). The three series, of Palaeocene and Eocene age, are known as the Lower, Middle and Upper Basalt Series.

Introduction

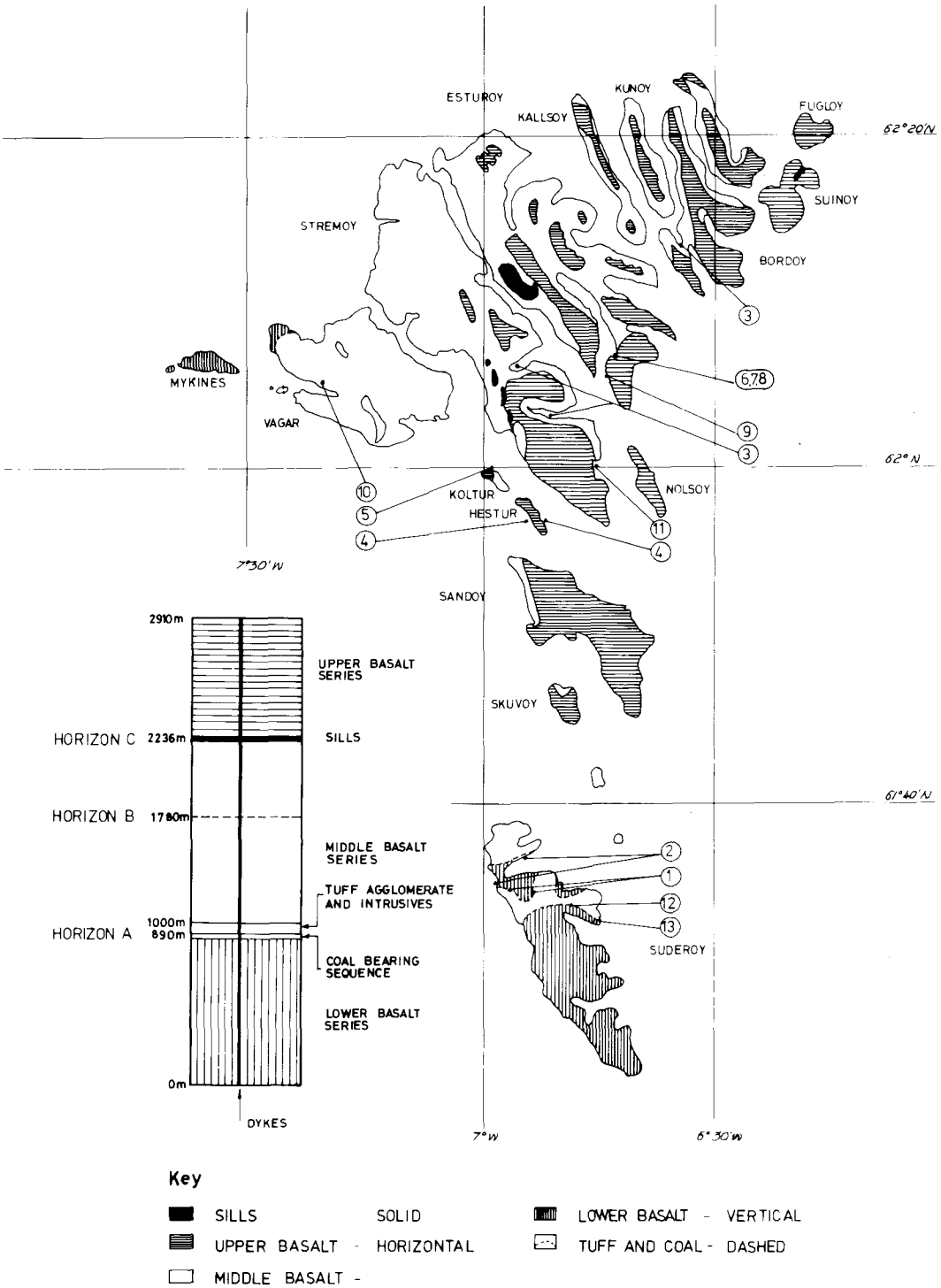
The Faroe Islands are situated in the north Atlantic between Iceland, Norway and the Shetland Islands. They are a part of the North Atlantic Basalt Province, which includes Northern Ireland, western Scotland, the Faroes and Iceland, west Greenland and south Baffin, Jan Mayen and Spitzbergen. The Faroes form an elevated part of the Wyville-Thompson Ridge, an extinct area of the Mid-Atlantic ridge system, and their basalts are of Palaeocene and Eocene age (Rasmussen and Nue-Nygard, 1970).

The landscape is typically "stepped" corresponding with lava flows, and the fjords and sounds show the NW-SE trend of the oceanic ridge, which continues as far as S.E. Iceland. During the Pleistocene the islands formed a centre of glacial erosion. They have an average altitude of 300m. rising to 882m., so altitude would have been a factor in initiating glaciation within moist Atlantic westerly winds. The maximum orientation of cirques is towards the N.E. as it is in Scotland.

Geology and Topography

Three basalt series, Lower Middle and Upper, form the major part of the islands (Fig.1). Most of the flows of the Upper and Lower series are separated by tuff layers of a characteristic rust brown colour. Strata of the Middle series are usually thinner than the others, and being more easily eroded they form a smoother landscape. The youngest basalts are those of the dykes and sills found through all three series, and displayed in the landscape by differential erosion or resistence. When the islands were mapped, stratigraphical correlation was achieved by the use of marker horizons which are obvious in the cliffs or as resistant landforms over high ground, and they were given the letters A, B, C.

The A horizon represents the longest known pause in volcanism, at the end of the Lower Series. It is the coal-bearing shale sequence of up to 15m. It is poor in fossils, but micro-fossils indicate an Eocene age (Rasmussen and Nue-Nygard 1970). It rests on the uneven eroded surface of the lower Series. The very variable coal seams are up to 0.8m thick and coal is still mined for local use.



Geological Map of the Faroe Islands

Fig. 1.

The Tuff-Agglomerate zone above the coal represents the explosive activity beginning the Middle Basalt Series. Tuff everywhere is easily eroded, and this largest tuff stratum, together with the coal sequence outcrops in the extreme west of the islands from north to south, often forming a dramatic reddish-brown shelf in the coastal scenery.

The B horizon is an unusually resistant basalt flow within the Middle Series; useful for correlation between one island and another in the otherwise smooth landscape of the Middle Series.

The C horizon is the base of the Upper Series, and consists of two or three flows of particularly resistant compact basalt, often between porphyritic and amygdaloidal basalts of less resistance. These flows rest on an irregular eroded surface of rocks of the Middle Series. The C horizon is well exposed on many of the eastern islands especially in cliffs (Fig. 2).

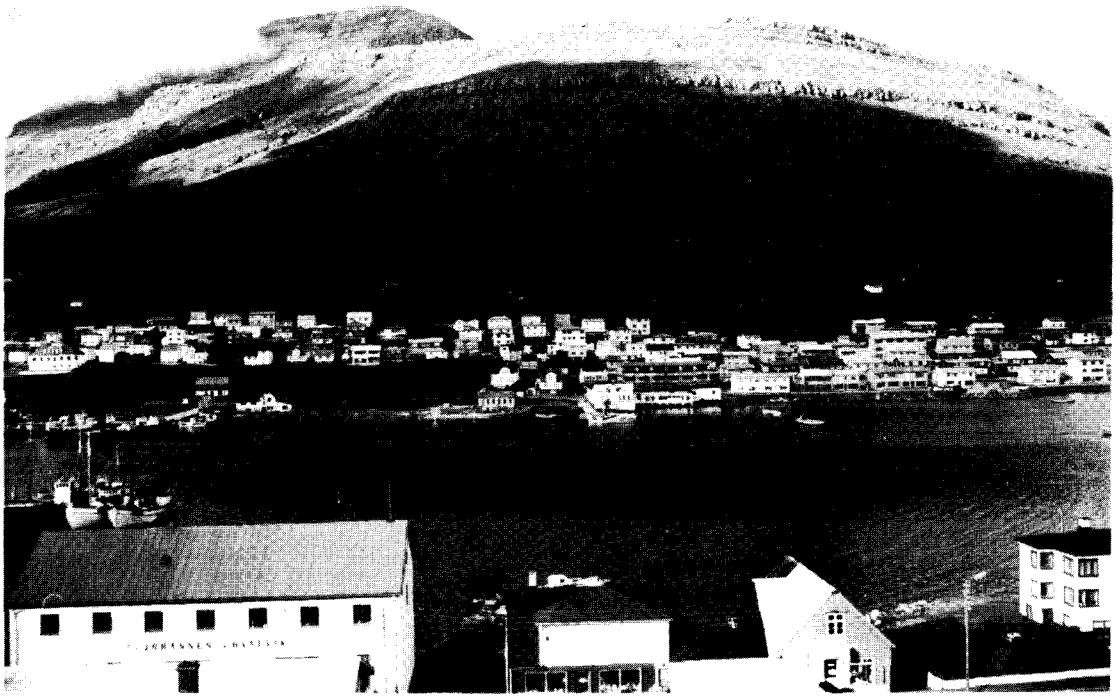
The geology of the islands makes itself apparent everywhere. Torshavn was originally built on a thick lava flow, and the present harbour has been extended back into this with difficulty. Cliff coastlines are almost universal and in the exposed north and west they rise vertically to a maximum of 850m. and continue to a depth of 50m. This steepness is due to intense marine erosion of the tuff bands, with undermining of the near horizontal basalt. Although the dip varies, it is nowhere above 5^{0}. Faults are usually steep and often occur in multiple parallel groups called lamellar zones. Erosion by ice, sea and streams has made much impression on these areas, and displays well the relationship between scenery and structure. The impermeable nature of the basalt is the first factor in agriculture, where reclamation of the localised low ground at the head of fjords must always begin with drainage. Very scattered glacial debris and solifluction terraces provide land which is capable of drainage and use, but in its natural state it is often below the water table and covered with peat. Despite its abundance, water is difficult to collect because it tumbles everywhere over mountains and cliffs, so upland lakes are the most important economic source.

The geology is also dispayed in various road cuttings and harbour works. Road tunnels below the mountains show dry, bare rock walls, except in one wet and lined area of a tunnel in the sothernmost island, which may be associated with a fault zone. Large zeolites were seen in road cuttings in lower strata of the Middle Series (Fig.3), and amygdaloidal and plagioclase basalts were exposed in new harbour works at the base of the Upper Series. Many volcanic vents are exposed in the Middle Series, usually in cliff sections. Three islands have a saucer shaped sill across their entire width, and in the largest island the main road follows the course of the resistant outcrop of a sill over the mountains. Faults often with eroded dykes give shelter to many small villages, or are filled with long concrete staircases up to a village on the plateau. The only possible site for an airfield is a rise of Middle Basalt between the heads of two fjords on Vagar, but it is a difficult journey to the capital. Even the famous bird colonies use the geology, nests being made in tuff hollows between basalt where the young are fairly safe, but there is danger from the descent of fowling Faroe Islanders whose feet use the same ledges while seeking puffins for the pot.

Some Important Exposures

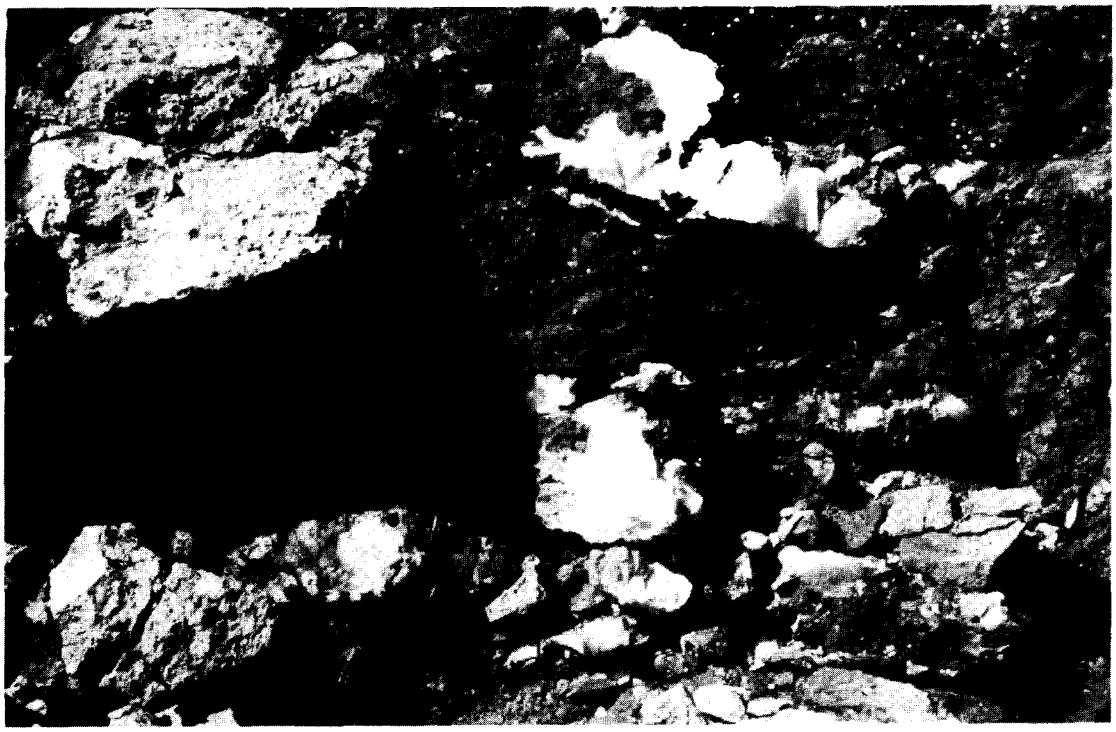
1. Coal, Suderoy.

   Exposed and partly covered by grass and scree, with adits beside the road from the tunnel on the west side of Hvalbar valley. Corresponding outcrops and adits beside the track round the east side of the valley. The main coal seam here is 0.8m thick.



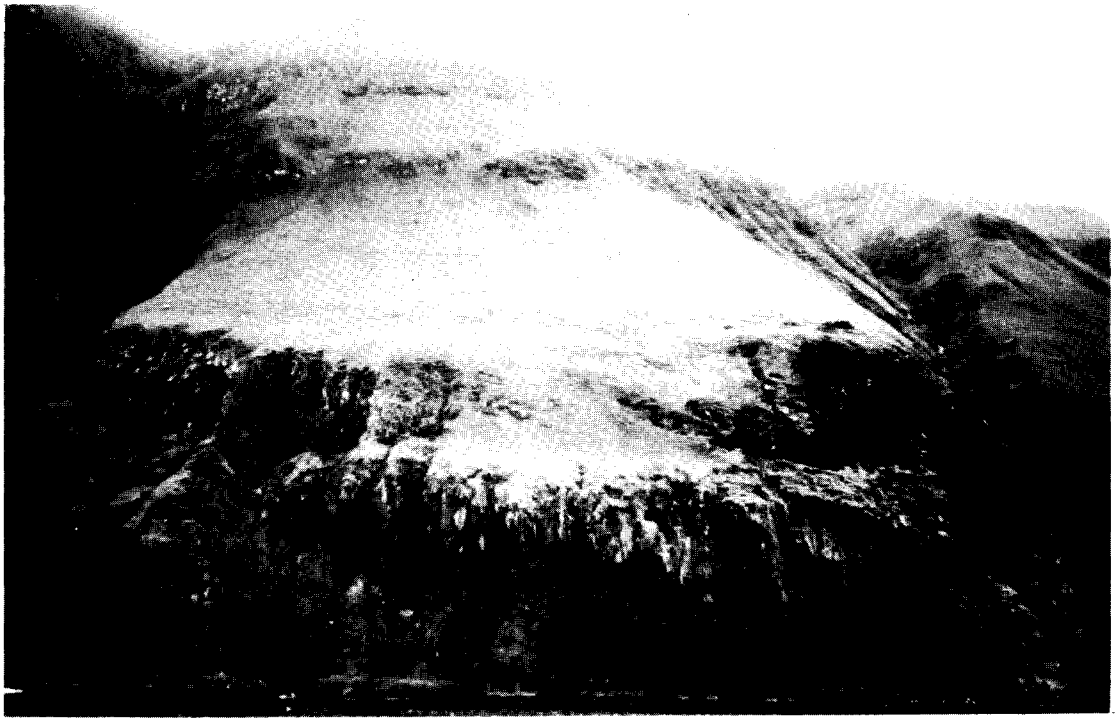
The Basalt lavas of the C horizon, Klakksvik

Fig. 2.



Zeolites in basalt, Sarvagfjord.

Fig. 3.



Volcanic vent and associated lavas, Koltur

Fig. 4.

Skalafjord Dyke

Fig. 5

2. Tuff agglomerate, Suderoy.

   On the cliffs of Hvalbar fjord, north side, and sea cliffs to the west, which show a very prominent shelf at this horizon.

3. C horizon.

   Resistant flows at the base of the Upper Series (Fig. 2).
   They occur similarly on nearby islands, and around the inner two thirds of Kjollefjord and Kaldbaksfjord north of Torshavn.

4. Lamellar zones.

   One of these areas of parallel fractures occurs through the island of Hestur, where the faults are exposed symmetrically on each long coastline.

5. Volcanic vent.

   Exposed in cliff section at the north end of Koltur, just above sea level, and showing the feeder channel at the base of the saucer shaped plug. (Fig. 4) Middle Basalt Series.

6. Amygdaloidal basalt, with blue green copper containing minerals and calcite.

7. Welded tuffs, attached to 8.

8. Basalt with 3-4cm. phenocrysts of plagioclase, and surface with 1cm. calcite rhombs. (6, 7 and 8 occur in successive flows, Skalafjord, in new harbour road at south side of Runavik, at the C horizon.)

9. Basalt dyke crossing basalt flows, 2km. south of other Runavik exposures along the same road. This was 7m. wide, with sharp junctions, and had much smaller jointing. (See Fig.5).

10. Zeolites in basalt, Sorvagfjord, 2km. along the coast track to Bour. Basalt for roadstone was quarried nearby but had not affected the exposure. Zeolite diameters in several places were 15cm. The white radiating crystals were presumed to be natrolite.

11. The Thick Lava, Torshavn, Upper Series. Tinganes headland in the centre of the harbour contains the oldest part of the town, built on this lava. It is 30m. thick, and fresh exposures were due to the harbour extension.

REFERENCE

RASMUSSEN, and NUE-NYGARD 1970. The Geology of the Faroe Islands. Danish Geological Survey, Copenhagen.