The Storr

Highlights

The site contains excellent continuous exposures through lavas of the Beinn Edra Group, which is the oldest in the Skye Main Lava Series (SMLS). There is clear evidence that the lavas were erupted subaerially and weathered under warm, wet conditions. The abundant and varied suites of zeolite minerals formed under hydrothermal conditions after the lavas had solidified. The lavas show subtle variations in composition, and these have helped to elucidate the petrogenesis of the SMLS.

Introduction

North of Portree, the Trotternish escarpment provides classic exposures of transitional to mildly alkaline olivine basalt lava flows (Figure 2.4). These lavas form the Beinn Edra Group of the Skye Main Lava Series (Table 2.2). Secondary hydrothermal mineralization within parts of the lava flows has produced an extensive suite of zeolite and associated minerals infilling vesicles.

The succession has been described in detail by Anderson and Dunham (1966) and Thompson *et al.* (1972);the late-stage mineralization has been investigated by King (1977).

Description

Between Beinn Dearg [NG 477 504] and Coire Scamadal [NG 495 547], the spectacular east-facing Trotternish escarpment is formed by massive lava flows belonging to the Beinn Edra Group (Anderson and Dunham, 1966; cover photograph and (Figure 2.5)). The visible succession is about 250 m thick and it is estimated that a further 120 m is concealed beneath the scree and landslip which mantle the lower slopes. In a detailed section measured up the Storr Gully [NG 495 539] and in the cliff south of Coire Faoin [NG 497 535], Anderson and Dunham (op. cit.) identified at least 24 lava flows with an aggregate thickness of about 250 m. Individual flows vary from about a metre to over 30 m in thickness, are frequently separated by red bole horizons and are cut by a number of NW-trending basalt dykes. Almost all of the flows are olivine-phyric basalts; two near the base are feldspar-phyric and the succession is capped by a flow of columnar-jointed hawaiite and finally by a mugearite. Several of the flows contain coarse pegmatoid segregations and virtually all are conspicuously amygdaloidal. Geochemical investigations by Thompson *et al.* (1972) have shown that the lowermost flows tend to be transitional, hypersthene-normative basalts, whereas the higher ones are mildly alkaline, nepheline-normative olivine basalts. Several of the flows used in the geochemical study by Thompson *et al.* (1972) and subsequently by Moorbath and Thompson (1980) in a study of the strontium isotope geochemistry of the SMLS were obtained from A'Chorra-bheinn [NG 484 489] about 3 km SSW of the site. These lavas are the lateral equivalent of lavas in the Storr succession.

The basaltic lavas which form the landslipped masses and scree at the base of the Storr cliffs (see cover photograph and (Figure 2.5)) [NG 495 540] and in Coire Faoin [NG 497 537] are highly amygdaloidal. The lavas are exceptionally rich in secondary, hydrothermal zeolites, allied silicates and other materials. The minerals include analcite, apophyllite, calcite, chabazite, chlorite, gyrolite, heulandite, levynite, mesolite, scolecite, stilbite and thomsonite.

The late-stage amygdale minerals are most abundant in the scoriaceous flow tops and flow bases and are relatively uncommon in the more massive (and unaltered) central parts of the flows.

Interpretation

The basalts of the Beinn Edra Group heralded the beginning of flood basalt volcanism in northern Skye following initial explosive activity (see Fiurnean to Rubha na h-Airde Glaise). The fissures from which the lavas were extruded were

probably located in Trotternish (Anderson and Dunham, 1966). These may now be occupied by NW-trending picrite dykes such as those at Beinn Tuath [NG 435 530] and Glenuachdarach [NG 430 585] to the west of the site. The lavas were erupted subaerially and subjected to intense weathering. This caused leaching and oxidation and formed the bright red bole horizons which now separate many of the flows. Similar present-day weathering occurs where there is a combination of a warm climate and abundant rainfall; thus the presence of bole horizons in the Palaeocene lavas of Skye and other areas in the BTVP implies tropical or subtropical conditions.

The geochemical data obtained by Thompson *et al.* (1972) and Moorbath and Thompson (1980) from flows in the Beinn Edra Group provided some of the evidence for variability in both bulk chemistry and isotopes which lead to the novel hypothesis of magma plumbing beneath northern Skye (see Introduction, above; also cf. (Figure 5.3)).

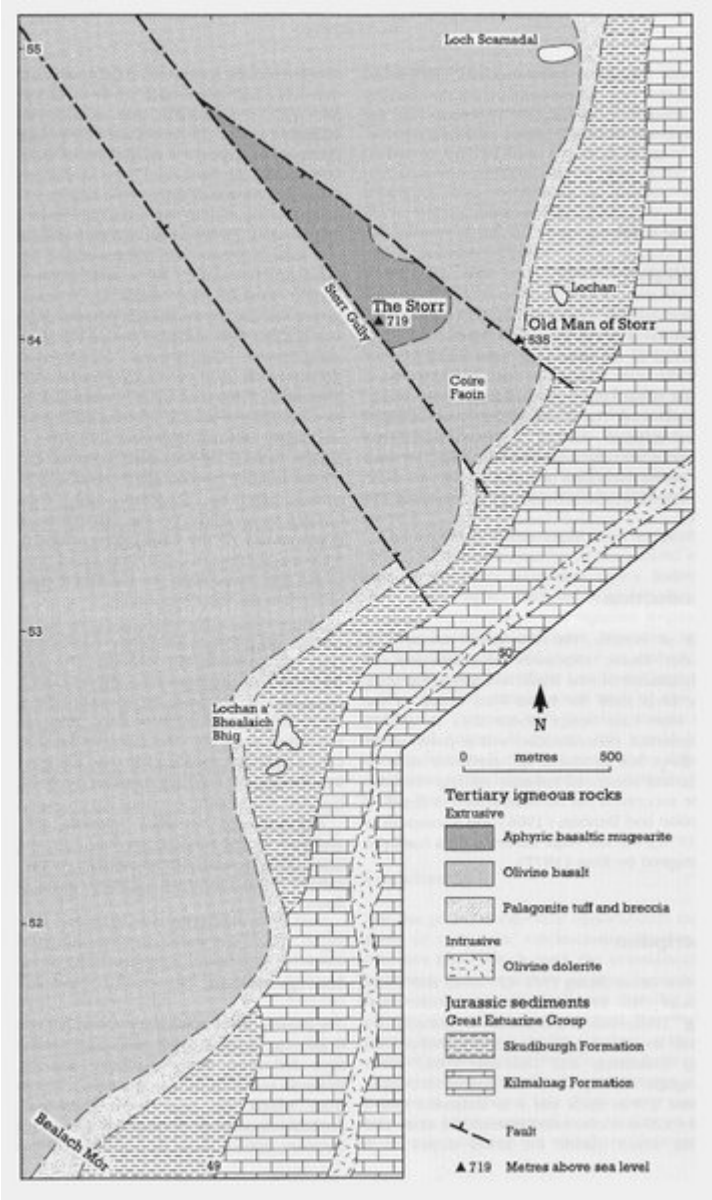
The distribution of the zeolites and associated minerals in lava piles is known to be controlled by a combination of temperature, pressure, circulation of heated aqueous fluids and the bulk composition of the rock (Walker, 1960). A study of the lavas of the Beinn Edra Group by King (1977) has shown that much of the group contains zeolite assemblages similar to the analcime–natrolite zone defined by Walker (1960). In the alkali olivine basalts of the upper part of the sequence at the Storr, analcite is lacking and instead, first mesolite and then thomsonite–chabazite assemblages are present. However, the reappearance of analcite in the hawaiite which caps the cliff adds support to the suggestion by Walker that the chemistry of the host rock plays an important role in determining the types of zeolites and associated minerals formed by the circulating fluids.

Conclusions

The importance of this site lies in the continuous excellent exposure through the Beinn Edra Group which forms the base of the Skye Main Lava Series (Table 2.2). At least 24 flows are exposed (Anderson and Dunham, 1966, pp. 83–4); the interrelationships show that they accumulated subaerially and were subjected to deep weathering under wet, warm tropical or subtropical conditions. The site is particularly noted for the abundance and variety of zeolite minerals within the lavas which provide conclusive evidence of hydrothermal activity after solidification.

The site is a vital link in the chain of geochemical evidence obtained from the Skye lavas which suggests that they were derived from the upper mantle and rose towards the surface in small batches, each batch having its own history of crystal fractionation and contamination by crustal rocks as it passed through the Palaeocene crust.

References



(Figure 2.4) Geological map of the Storr site (adapted from the British Geological Survey 'One-Inch' map, Northern Skye Sheet 80 and parts of 81, 90 and 91).

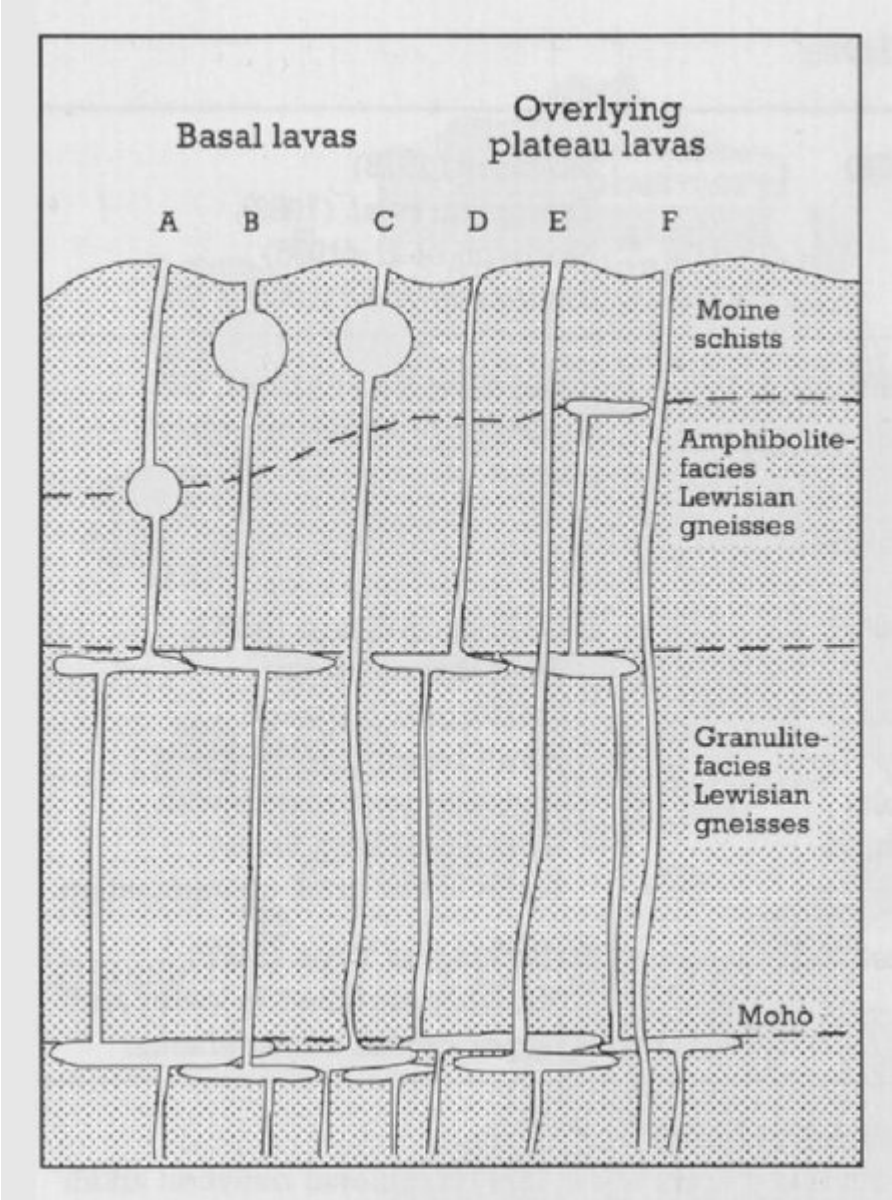
NORTHERN SKYE (1) Anderson and Dunham (1966)	WEST-CENTRAL SKYE (2) Williamson (1979)	Based mainly on NORTHERN SKYE (3) Thompson *et al.* (1972)
	7. Talisker Group	Preshal Mhor tholeiitic basalts
5. Osdale Group	6. Loch Dubh Group 5. Arnaval Group	
4. Bracadale Group	4. Tusdale Group	Skye Main Lava Series
3. Beinn Totaig Group	3. Cruachan Group*	Transitional and alkali-olivine basalts, hawaiites, mugearites, benmoreites and trachytes. More fractionated types are more common in the higher groups.
2. Ramascaig Group	2. Bualintur Group	
1. Beinn Edra Group	1. Meacnaish Group	

Individual groups are probably geographically restricted (see, for example, Anderson and Dunham, 1966, figure 13).

* The thick fluviatile conglomerates of the Allt Geodh a' Ghamhna site are at the base of this group.

(Table 2.2) Correlation of the divisions of the Palaeocene lavas of the Isle of Skye (mainly after Williamson, 1979, table 1).

(Figure 2.5) Basalt lavas of the Skye Main Lava Series. Slipped masses of lava, including the Old Man of Storr pinnacle, occur in the foreground and to the right. Storr site, Skye. (Photo: C.H. Emeleus.)



(Figure 5.3) Sketch of the magmatic plumbing beneath south-west Mull during extrusion of the Palaeocene basaltic lavas (after Morrison et al., 1985, fig. 4). See text for explanation.