Loch Sguabain

OS Grid Reference: NM633305

Highlights

The site contains excellent examples of pillow lavas formed when basalts were erupted into the early, South-East Caldera lake. The pillow lavas are veined by granite and thermally metamorphosed where they are intruded by the Glen More ring-dyke.

Introduction

The site encompasses the north-western slopes of Bheinn Fhada aboveLoch Sguabain where a representative section through lavas belonging to the Central Group within the early South-East Caldera is exposed (Table 5.1). Exceptionally well-developed pillow lavas dominate the interest of the site and other features include acid veining and thermal metamorphism of the lavas at the contact with the quartz-gabbro/granophyre Glen More ring-dyke. The lavas within this site have received no detailed investigation sinceBailey *et al*. (1924) carried out the regional survey. However, the geochemical work ofBeckinsale *et al*. (1978) and Morrison (1978) on the Mull lavas in general has applications to the tholeiitic Central Group lavas of this site.

Description

The lava flows exposed in the craggy outcrops aboveLoch Sguabain (Fig. 5.8) are sparsely feldspar-phyric and aphyric tholeiitic to transitional basalts forming part of the outer, earlier zone of lavas in the South-East Caldera (Bailey *et al*., 1924). The basalts here lie within the zone of pneumatolysis associated with the Mull central complex; the effects of this hydrothermal alteration include the albitization of feldspar, decomposition of olivine and secondary epidote and quartz in veins and vesicles.

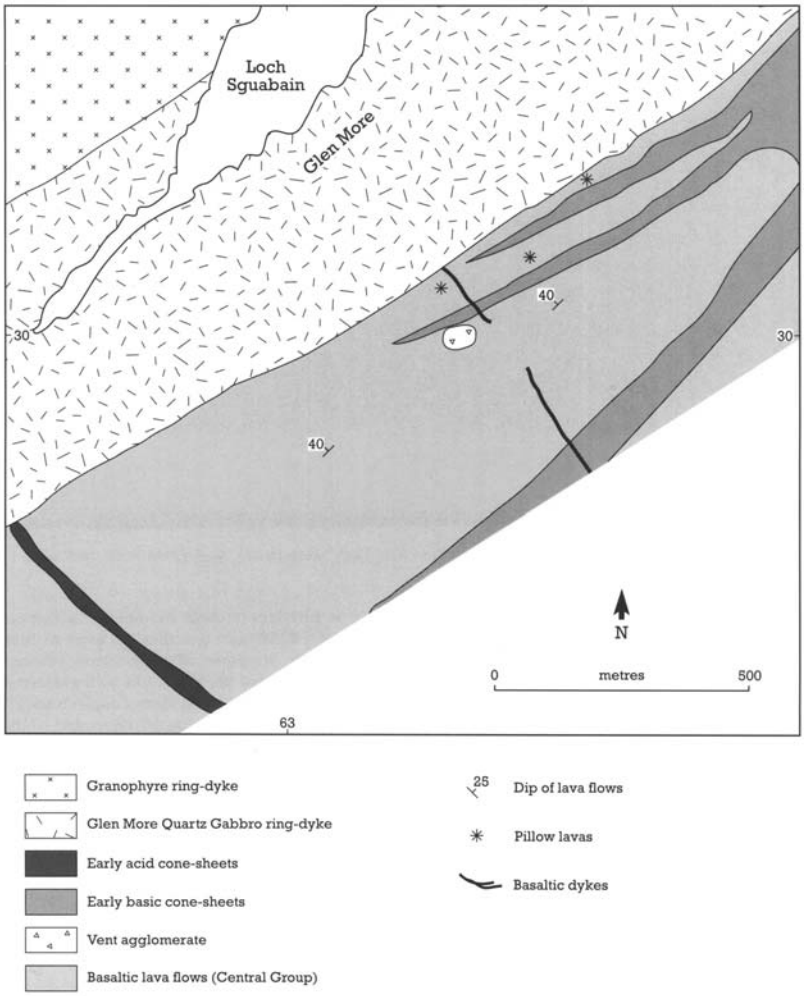

Figure 5.8: Geological map of the Loch Sguabain site (adapted from the British Geological Survey 'One Inch' map, Sheet 44, Mull)

Excellent pillow structures are located at the summit of the first ridge on Beinn Fhada (Fig. 5.9), south-east of the loch (NM 630 304). The individual pillows here average 0.6–0.7 m in diameter and have clearly identifiable chilled margins, within which lie concentric zones rich in vesicles. Altered, fine-grained, hyaloclastite tuffs surround the pillows, and thin-bedded tuffs are occasionally present in the lava sequence.

Figure 5.9: Basaltic pillow lavas, formed in a caldera lake. Loch Sguabain site, Mull. (Photo: A.P. McKirdy.)

The South-East Caldera lavas have been intruded by what appears to be an extension of the Glen More ring-dyke composed of quartz gabbro which passes upwards into granophyre. South-east of Loch Sguabain, granophyric net-veined breccia becomes progressively more evident at higher levels in the intrusion, with the uppermost portions showing a preponderance of granophyre to gabbro or coarse dolerite. Granophyric veins are also common in the lavas near the contact. The lavas have been thermally altered by the intrusion and a thin zone of granular hornfels is developed at the contacts. In addition, early basic cone-sheets, which dip north-westwards at angles approaching 45°, intrude the lavas within the site.

Interpretation

Pillow lavas occur in the basal parts of several of the lava fields of the BTVP (for example Mull, Ardtun; Rum, Fionchra) but they are not recorded within central complexes except on Mull. The widespread occurrence of pillows in the basalts exposed in Glen More, and particularly on this site, and the manner in which they appear to lie within an arcuate zone (Bailey *et al.*, 1924, fig. 18), has been interpreted as being due to accumulation within a caldera which was, from time to time, occupied by a lake. The early-established, arcuate fracture defining the caldera guided later intrusions belonging to the Glen More Centre (Centre 1, Table 5.1). This occurrence is also of importance since it records overlap between the last-preserved stages of major basalt lava accumulation on Mull and the establishment of strongly centralized igneous activity. The occurrence is of general importance since it provides a clear example of a caldera within the BTVP and can thus be used to help elucidate the structure of areas where calderas may be present but are much less well preserved (for example Skye,Kilchrist; Rum, Cnapan Breaca).

Granophyric veins cutting the lavas next to the dolerite and gabbro of the Glen More ring-dyke were thought to have been derived from the intrusion (Bailey *et al.*, 1924) which elsewhere shows the intimate association of basic and acidic rocks (Cruach Choireadail).

Conclusions

A caldera collapse structure formed at an early stage in the history of the Mull central complex. It was filled by the latest tholeiitic lavas of the regional lava succession, which developed distinctive pillow structures as they came into contact with the waters of a caldera lake. The arcuate fracture defining the caldera continued to be active after lava accumulation ceased and guided subsequent ring-dyke intrusions in the Glen More Centre. The lower, gabbroic and

doleritic part of the Glen More ring-dyke intrudes and bakes the pillow lavas and is probably also the source of numerous white, granitic veins cutting the lavas near the contact.

Reference list

Bailey, E.B., Clough, C.T., Wright, W.B.*et al*. (1924) *Tertiary and Post-Tertiary Geology of Mull*, *Loch Aline and Oban*. Memoir of the Geological Survey of Great Britain, HMSO, Edinburgh.

Beckinsale, R.D., Pankhurst, R.J., Skelhorn, R.R.*et al*. (1978) Geochemistry and petrogenesis of the early Tertiary lava pile of the Isle of Mull, Scotland.*Contributions to Mineralogy and Petrology*, **66**, 415–27.

Morrison, M.A. (1978) The use of ‘immobile’ trace elements to distinguish palaeotectonic affinities of metabasalts: applications to the Palaeocene basalts of Mull and Skye, NW Scotland. *Earth and Planetary Science Letters*, **39**, 407–16.