

An Cleireach

OS Grid Reference: NG335444

Highlights

The site contains an excellent example of a coarse gabbroic-anorthosite (allivalite) sheet cutting the Skye Main Lava Series. The rock provides textural evidence that the sheet became choked with early-formed plagioclase megacrysts crystallized from a low-alkali, high-calcium tholeiitic basalt magma, and it demonstrates that this distinctive magma was available at a late stage in the igneous history of northern Skye.

Introduction

Substantial dyke-like bodies and occasional sills, containing coarse gabbroic anorthosite (allivalite) and gabbro, intrude the plateau lavas of north-west Skye, following the NNW trend of the regional dyke-swarm (Fig. 2.9). The characteristics of these intrusions are demonstrated by the gabbroic anorthosite intrusion at An Cleireach. The dykes are of significant petrogenetic importance in understanding the igneous activity of northern Skye.

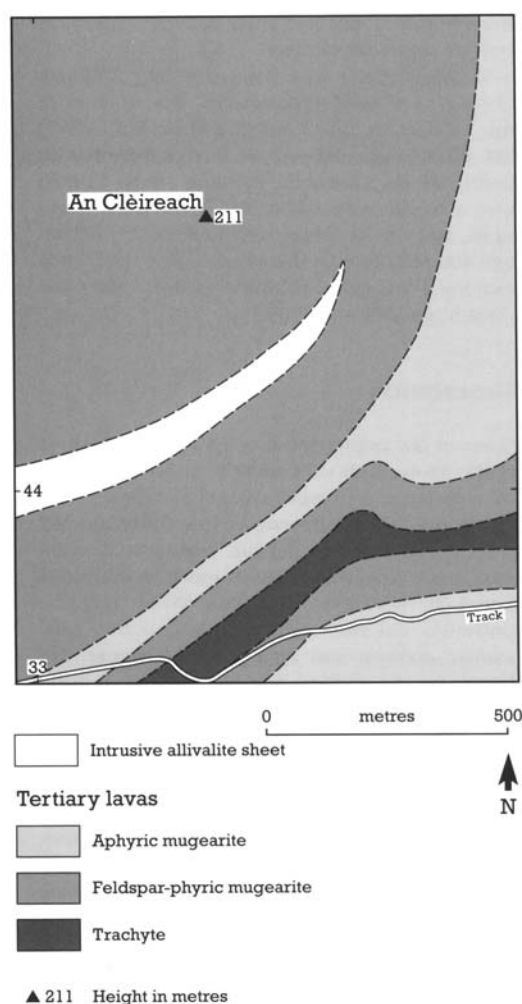


Figure 2.9: Geological map of the An Cleireach site (adapted from the British Geological Survey 'One-Inch' map, Northern Skye Sheet 80 and parts of 81, 90 and 91)

Following their discovery by Harker (1904), they were described by Anderson and Dunham (1966). In a subsequent investigation, Martin (1969) coined the term 'Oseitic Group' for the intrusions. Donaldson (1977a) has given a detailed account of their petrology and suggested that they form volcanic plugs.

Description

At An Clèireach (NG 335 443; Fig. 2.9), a gabbroic anorthosite intrusion cuts the mugearitic and trachytic lava flows of the Bracadale Group (Anderson and Dunham, 1966). It belongs to the group of coarse-grained, basic and ultrabasic dyke and pod-like intrusions in the area between Bracadale and Beinn a Chlìrich (NG 332 451) mapped by Anderson and Dunham (1966) and collectively termed the Oseitic Group by Martin (1969) after the River Ose.

The intrusion at An Clèireach is poorly exposed, and Donaldson (1977a, Fig. 2) shows two disconnected outcrops. It is depicted on the British Geological Survey maps (Sheet 80) as a kilometre-long NNW-trending dyke, up to 150 m wide and, within the site, a sill-like apophysis skirting around the southern slopes of An Clèireach; this is one of the few sills shown to intrude the lavas (cf. Harker, 1904). The intrusion consists of coarse-grained, gabbroic anorthosite (allivalite on the BGS maps) with thin, basaltic marginal facies at the contact with the lavas. The anorthosite is dominated by calcic plagioclase megacrysts (bytownite/anorthite) subophitically enclosed by large augite crystals. Donaldson (1977a) provides detailed descriptions of the petrography and mineralogy of this distinctive group of intrusions.

Interpretation

The coarse-grained dykes lie on the axis of maximum dilation of the regional dyke swarm (Speight *et al.*, 1982). The spatially linked outcrops of the group suggest that they mark a major fissure from which the, now mostly eroded, youngest lavas on Skye (Upper Bracadale Group) were erupted.

Donaldson (1977a) has suggested that the dykes represent a concentration of solids, mainly plagioclase megacrysts, mobilized and subsequently sedimented by a basaltic liquid which erupted at the surface as lava. The plagioclase megacrysts, together with subordinate olivine, were envisaged to have crystallized in a small, shallow magma chamber from low-alkali, high-calcium olivine tholeiite liquids. The crystals were carried up by pulses of this magma into the feeder dykes, where they were concentrated and settled out, possibly by flow differentiation. The host magma subsequently erupted at the surface as low-alkali, high-calcium olivine tholeiites, the relicts of which are found in the vicinity of the dykes (Donaldson, 1977a). After the dyke had become 'choked' with crystals, the eruption site shifted to form new dykes/pods. Thus, according to Donaldson, this distinctive group of dykes represents a series of volcanic feeder plugs.

The geochemistry of these intrusions confirms the existence of low-alkali, high-calcium tholeiitic magmas, similar to those found in the Talisker site (Preshal More and Preshal Beg), towards the end of Tertiary volcanism in northern Skye. Their exact age and position in the igneous stratigraphy of Skye is not known but their petrography and chemistry suggests links with gabbros in the Cuillin centre (see below). These rocks provide a further indication that this distinctive magma type developed widely with time in the British Tertiary Volcanic Province (see Talisker site).

Conclusions

The intrusion within this site is a representative of a group, intruding the Skye Main Lava Series of northern Skye, which demonstrates that low-alkali, high-calcium tholeiitic magmas became widely available in Skye, and elsewhere in the BTVP, after the eruption of substantial amounts of alkali-olivine and transitional basaltic magmas. The dykes are late in the igneous sequence in northern Skye, but may be coeval with intrusions in the Cuillin centre. The petrography of the dykes shows that they accumulated large amounts of early-formed crystals from the tholeiitic magmas.

Reference list

Anderson, F.W. and Dunham, K.C. (1966) *The Geology of Northern Skye*. Memoir of the Geological Survey of Great Britain, HMSO, Edinburgh.

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- Donaldson, C.H. (1977a) Petrology of anorthite-bearing gabbroic anorthosite dykes in north-west Skye. *Journal of Petrology*, **18**, 595–620.
- Harker, A. (1904) *The Tertiary Igneous Rocks of Skye*. Memoir of the Geological Survey of Great Britain, HMSO, Edinburgh.
- Martin, J.H. (1969) A petrographic study of the allivalite dykes of north Skye. Unpublished Ph.D. Thesis, University of St Andrews.
- Speight, J.M., Skelhorn, R.R., Sloan, T., *et al.* (1982) The dyke swarms of Scotland. In *Igneous Rocks of the British Isles*. (ed. D.S. Sutherland), Wiley, Chichester, pp. 449–59.