Allt Geodh a' Ghamhna

Highlights

The site forms a vital link in a chain of localities extending from Muck and Eigg to Rum, Canna and Sanday and Skye which demonstrate that the Skye centre is younger than the Rum centre and that there were two periods during which substantial lava piles built up, one before and one after emplacement of the Rum centre. The site provides a superb section through waterlain sediments intercalated in the lava succession. The dominance of sandstone and arkose clasts of Torridonian facies indicates a Torridonian upland source; granophyre clasts were most probably derived from Rum, but the provenance of porphyritic rhyolite clasts is unknown.

Introduction

The Allt Geodh a' Ghamhna site contains the finest exposures on Skye of interstratified sediments and basic lavas. The sediments occur towards the local base of the plateau lava succession and consist of lenticular, channel-shaped bodies of conglomerates, sandstones and thin coal horizons. Harker (1904) recorded the succession at this locality but misinterpreted the sandstones as tuffs. Subsequently, a comprehensive field investigation of the Tertiary lava succession in west-central Skye, incorporating a study of the sedimentary deposits in this site, has been carried out by Williamson (1979) and the granophyre clasts have been chemically analysed (Meighan *et al.*, 1981).

Description

The inter-lava sedimentary deposits at Geodh a' Ghamhna are well exposed where the Allt Geodh a' Ghamhna reaches the sea cliffs immediately east of Rubha Thearna Sgurr [NG 365 197].

Williamson (1979) has recorded in detail the succession on the south side of the stream (Table 2.3). A few obscure, poorly preserved plant remains have been found in sandstones beneath the thin coal seams (Table 2.3). There is an abundance of arkosic sandstone clasts (Torridonian?) and Palaeocene granophyre and porphyritic rhyolite, but the scarcity of basalt pebbles in the conglomerates is notable.

At Geodh a' Ghamhna, the conglomerates are irregularly intruded by a sill with andesitic affinities, and the lavas forming the sea cliffs are traversed by several tholeiitic sheets dipping to the north. The lavas exposed on the north side of the stream, beneath the conglomerate, show many well-developed red and purple-red bole horizons.

Interpretation

Inter-lava sedimentary deposits are found at three main localities on Skye, namely Glen Osdale, Glen Brittle and Allt Geodh a' Ghamhna. All of these localities contain sediments of a similar nature, but those within the Allt Geodh a' Ghamhna are particularly well developed and exposed.

The channel-like nature of the sedimentary bodies is consistent with deposition in a fluviatile environment which was active during volcanic activity and the extrusion of the plateau lavas. The characteristics of the conglomerates, dominated by arkosic sandstone clasts, suggests that they are largely derived from the erosion of a high relief, Torridonian source area. The scarcity of basaltic clasts also suggests that the lavas were not deeply dissected and probably occupied a gently subsiding basin flanked by Torridonian highlands.

Williamson (1979) has suggested that the conglomerates were deposited during periods of flash flooding; probably the sandstones and certainly the coals belong to quieter periods of sedimentation. He also suggested (1979) that the source for the Torridonian clastic material may have lain to the south and that the sediments of Skye, Rum (Fionchra) and Canna (see Sanday and Compass Hill) belong to a more-or-less penecontemporaneous fluviatile system.

The origin of the granophyre and rhyolite pebbles found in the conglomerates is problematic since they could suggest the existence of early Tertiary acid intrusions on Skye. Although the clasts are broadly similar to some of the western Red Hills granitic rocks they cannot have come from that source, for the Red Hills granites demonstrably post-date the Cuillin gabbros which, in turn, intrude the Skye Main Lava Series. Clearly, a pre-lava source is required and this could have been on Skye, in the general area of the central complex (cf. J.D. Bell, 1966, 1976; Walker, 1975). However, a study by Meighan *et al.* (1981) strongly suggests that the acid rocks may ultimately have been derived from the Rum central complex, where both granophyres and rhyolite (felsites) were deeply eroded during the early Tertiary along with Torridonian sandstones. Furthermore, detritus from Rum is known to have spread at least as far as Canna–Sanday (Emeleus, 1973). Thus, this site is an important link in a chain of sites which strongly indicates that the Skye Main Lava Series and the Skye central complex post-dated the Rum central complex (for example, Mussett *et al.*, 1988).

Conclusions

The dominance of sandstone and arkose clasts and the paucity of basalt pebbles in the conglomerates of this site indicate the former presence of a lava field traversed by streams and rivers which drained from a hilly, or possibly even mountainous, Torridonian hinterland. The additional presence of porphyritic rhyolite and granophyre clasts points to (presumably) Tertiary plutonic rocks intruding the Torridonian and also to the possibility of early acid lavas or ash flows of Tertiary age (cf. Cnapan Breaca, Rum). The provenance of the porphyritic rhyolite (felsite) cobbles and pebbles is not yet known; however, the petrography and geochemistry of the granophyre clasts singles out Rum as their most likely source. If this hypothesis is correct, this is one of the few instances where it is possible to obtain relative ages of the Tertiary central complexes. The site is thus a vital link in demonstrating that the Skye centre post-dates the central complex of Rum and that there must have been at least two periods of plateau lava eruption, one of which (the lavas of Eigg and Muck) preceded emplacement of the central complex of Rum and another (Canna–Sanday; north-west Rum; Skye Main Lava Series) which formed after the Rum volcano had been unroofed.

(Table 2.3) The succession at Allt Geodh a' Ghamhna (after Williamson, 1979, table 2)

14	Thin, alkali olivine basalts with scoriaceous tops	7 m
13	Massive basaltic lava with pillow structures towards the base	5 m
12	Thin white ash	0.03 m
11	Coal	0.05 m
10	Sandstone with obscure plant remains occurring as diffuse carbonaceous streaks	0.2 m
9	and rootlets, possibly seat earth Coal	0.01–0.05 m
8	Conglomerate with well-packed, rounded pebbles and cobbles of granophyre, quartzite, porphyritic rhyolite and red arkose. Clasts have a maximum diameter of 0.10–0.15 m, and are set in a pale sandy matrix	3.2 m
7	Sandstone with micaceous partings	0.2 m
6	Coal	0.02 m
5	Sandstone with plant remains	1.8 m

4	Conglomerate with a more sandy matrix than Bed 2, and a smaller proportion of acid igneous to arenaceous sediments than Bed 8. Rare pebbles of amygdaloidal and feldspar macroporphyritic basalt. Clast size <0.30 m, averaging 0.10–0.15 m. Thin lenses of white sandstone in lower horizons	2.3 m
3	Fine-grained sandstone, laminated base	1.1 m
2	Massive conglomerate with densely packed, crudely imbricated clasts of red arkose up to 0.30 m in diameter. Contains green siltstones with a sandstone wedge thickening to the north	2.75 m
1	Highly amygdaloidal basaltic lavas forming the top of the cliff at about 125 m elevation	10 m

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