Hascosay

[HU 554 915]–[HU 561 917]

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Introduction

The cliffs on the south-east side of the small island of Hascosay, off the east coast of Yell, are unique in that they expose a complete section through the Hascosay Slide Zone, here only some 400 m wide. The slide-zone rocks are in contact with the rocks of the Boundary Zone on either side (Figure 9.10) and (Figure 9.11). Much of the trace of the Hascosay Slide Zone lies offshore and although it can be traced sporadically for 15 km along the north-east coast of Yell, only partial sections are seen. The slide zone lies within the Boundary Zone, which separates the Moine and Dalradian rocks in Shetland, but its role and mechanisms of formation are unclear.

The Hascosay Slide Zone is made up of closely packed masses of coarse-grained hornblendic gneisses, resembling those seen in the Eastern Gneisses and the Lewisianoid inliers in the Moine succession, contained within fine-grained, dominantly hornblendic mylonitic rocks. Flinn (1994) has described the zone in detail and termed the mylonitic rocks 'blastomylonites', reflecting their pervasive recrystallization at high temperatures during mylonitization. He divided the mylonitic rocks into three types: 'aplite-blastomylonites', which are white in colour and have the field appearance of tectonized aplites; 'banded blastomylonites' with alternating dark (hornblende ± biotite) and light (feldspar + quartz) laminae; and 'psammitic blastomylonites' which appear to be mylonitized country rocks. The foliation in the mylonitic rocks trends parallel to the outcrop of the slide zone, and dips westwards at 30°–45°.

Description

The GCR site extends over a *c.* 700 m-long section of 10–25 m-high cliffs around the promontory on the south-east side of the island of Hascosay, by Ramna Geo and Greybearded Man. Here, the Hascosay Slide Zone is dominated by banded blastomylonite, together with abundant thin concordant bands of mylonitized aplitic rocks, which are especially numerous near its eastern boundary. Relict masses of hornblende gneiss occur within the mylonitic rocks. They can be seen at various points, including Greybearded Man [HU 5582 9147] and the small peninsula at [HU 556 915] immediately east of Ramna Geo, where the hornblende gneiss is heavily sheared and partially mylonitized. Farther east, at [HU 5594 9151], are little-deformed relict mafic gneiss masses formed dominantly of clinopyroxene, garnet and brown hornblende. At [HU 5597 9155] a relict lens of quartzofeldspathic gneiss is seen. The resistant masses form lenticular bodies which are wrapped by the laminae in the surrounding mylonites, and which grade into the mylonites over a few centimetres, both on their external margins and in internal ductile shear-zones.

The western margin of the slide zone is exposed at Ramna Geo, where the mylonites are in sharp contact with psammites of the Boundary Zone. The psammites are well bedded in parts and even flaggy. In places they exhibit weakly developed leucosomes, and plagioclase microporphyroblasts are abundant in some areas.

Along the coast west of the slide zone the layering in the psammites dips in all directions at shallow angles reflecting a domal pattern of folding. In some places the domes are cored by near-spherical masses ('balls) of dolerite ranging in diameter from 2–7m. The best exposure is near the western end of the GCR site, at [HU 5547 9147]. The dolerites have been partially or completely metamorphosed, with the outer shells of the balls having been converted to hornblende schist. In thin section the fresher, central parts of the larger balls are seen to be ophitic dolerites formed of large augites (several millimetres across), well-twinned unzoned labradorite, and ilmenite together with micro-granular aggregates of hypersthene. Their geochemistry shows that the dolerites have a sub-alkaline tholeiitic basaltic composition of MORB affinity (Flinn, 1994). The globular shape is of intrusive, not tectonic, origin; similar metadolerites occur sporadically for 13 km to the south along the south-east coast of Yell.

The eastern boundary of the slide zone is very well exposed in the cliffs at the east end of the Hascosay section [HU 560 915], but the precise location is difficult to fix due to the presence of thin, conformable mylonitized aplitic rocks for some metres to the east in strongly schistose psammites. The rocks to the east of the slide zone are typical psammites of the Boundary Zone, containing areas of gneiss with variably developed plagioclase microporphyroblasts. The development of these porphyroblasts has accompanied the destruction of sedimentary bedding and banding. Both the psammites and the microporphyroblast gneiss contain bands of hornblende schist, with minor agmatite veins and aplitic sheets that show both conformable and cross-cutting relationships.

Interpretation

The Hascosay Slide Zone has formed through intense deformation and recrystallization under amphibolite-facies metamorphic conditions. Prior to the deformation, the rocks of the slide zone appear to have comprised masses of hornblendic gneiss, together with felsic gneisses, mafic and ultrabasic igneous rocks, psammites, aplitic microgranites and pegmatitic granites. The less-resistant rocks have been mylonitized, whereas the more-resistant elements have been sheared and recrystallized but not mylonitized to the same extent. These more-massive competent rocks form the relict gneiss masses that can be seen in the Hascosay section.

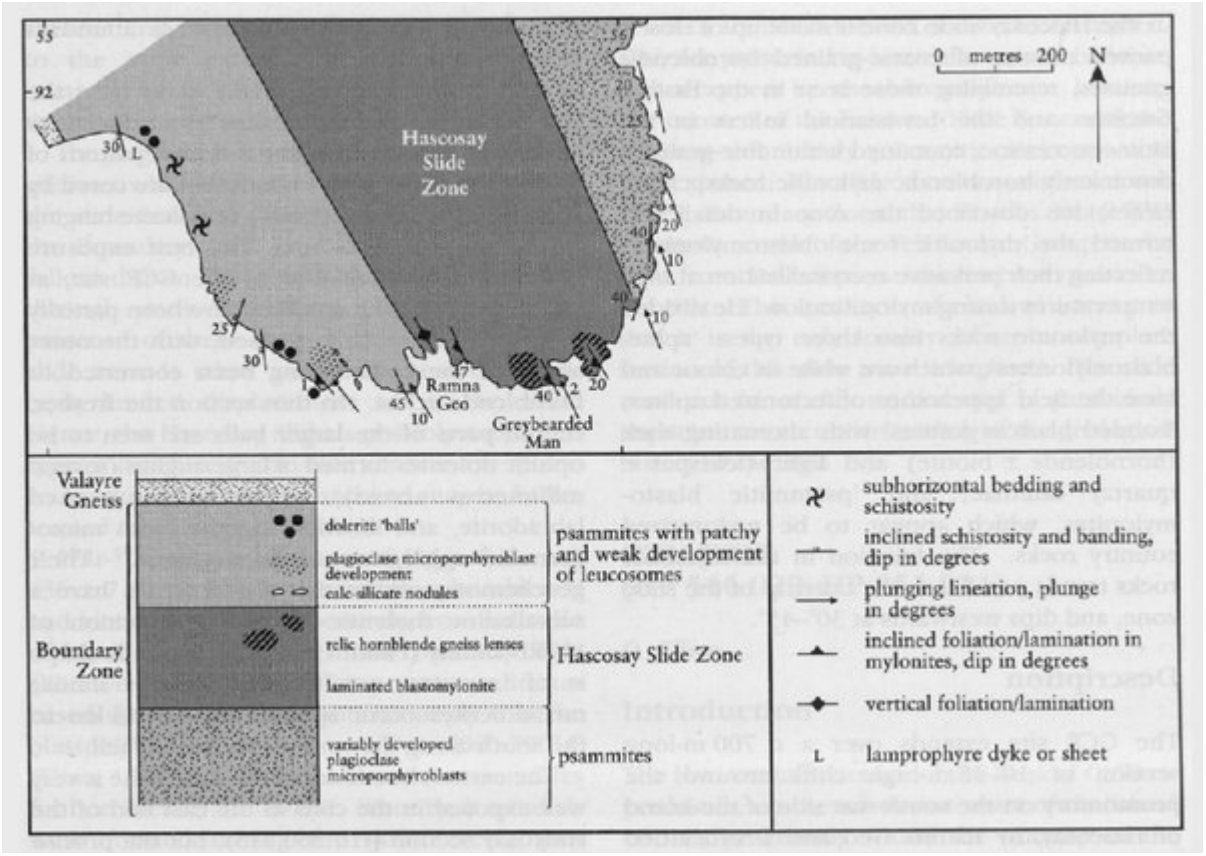
The plagioclase-microporphyroblast psammitic gneisses which form the rocks on either side of the slide zone on Hascosay are found only in the Boundary Zone (Flinn, 1994) and can be followed from Hascosay NNE to Unst and SSW through south-east Yell to Lunna Ness. The presence of these rocks on both sides of the slide zone is taken to indicate that there has been limited displacement across the slide. Hence, the Hascosay Slide is possibly a different type of structure to the slide zones in the Moine rocks of north-west Scotland and may be better termed the 'Hascosay Welt'.

^{40}Ar-^{39}Ar step-heating ages of 496 ± 6 Ma and 436 ± 7 Ma have been obtained from hornblende and biotite separates respectively, from a sample of hornblendic mylonite in the Hascosay Slide (Roddom *et al.,* 1994). Temperature estimates based on mineral compositions imply that the blastomylonites were formed at 6000–700^{0} C (Flinn, 1994), i.e. above the closure temperatures for hornblende and biotite. Since both minerals were formed during the same event, they probably record cooling ages post-dating the mylonitization, with the younger age given by the biotite reflecting the time taken for the slide to cool from the closure temperature for hornblende to that for biotite. It should be noted that the hornblende age from the blastomylonites is not significantly different to the hornblende age obtained by the same dating method for the onset of obduction of the ophio-lite in Fetlar to the east (Flinn *et al.,* 1991).

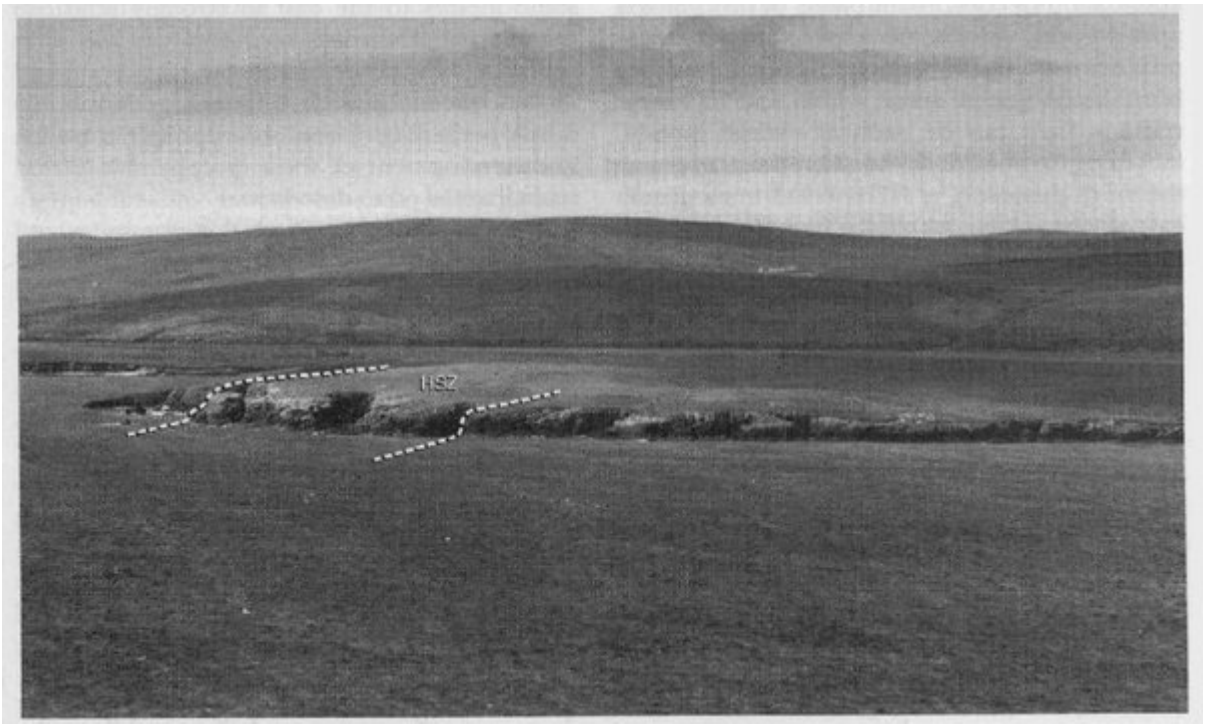
Conclusions

The low cliffs of the south-east coast of the island of Hascosay provide a complete and continuous section through the Hascosay Slide Zone. Here, mafic and felsic gneisses, mafic and ultramafic intrusive bodies, psammites, and aplitic and pegmatitic granites have been intensely deformed under amphibolite-facies metamorphic conditions, leading to the formation of blastomylonites. The rocks within the zone were mainly hornblendic mafic gneisses, and deformation has occurred at sufficiently high temperature for recrystallization to take place continuously during deformation. Relict masses of the parent gneisses still remain, some of which are not deformed or even recrystallized. They are preserved as lenticular masses between and wrapped by the blastomylonite laminae. The contacts of the Hascosay Slide Zone with the adjacent dominantly psammitic rocks are also well exposed. The slide zone is a major element of the Boundary Zone that divides Moine-like psammitic rocks of the Yell Sound Group to the west from Dalradian metasedimentary rocks to the east. This locality is of national interest in that it is the only locality where a complete section of this slide zone is exposed. The slide zone can be readily studied and is particularly important to our understanding of the geological history of the area.

References



(Figure 9.10) Map of the south-east part of the island of Hascosay.



(Figure 9.11) View of the south-east part of Hascosay with the east coast of Yell behind. The cliff section through the Hascosay Slide Zone is indicated (see Figure 9.10). (Photo: D. Flinn.)