
Hollows Farm

[NY 245 170]

F. Moseley

Highlights

This site provides unique continuous exposures across the critical junction between the Skiddaw Group and the Borrowdale Volcanic Group. Many of the erosional features associated with the unconformity are seen, but the main Caledonian cleavage post-dates these features and affects both Groups.

Introduction

The exposures around Grange and Hollows Farm are important in the discussion concerning the Skiddaw Group–Borrowdale Volcanic Group junction (Soper, 1970; Jeans, 1971, 1972; Mitchell *et al.*, 1972; Wadge, 1972). Soper (1970), especially, used these exposures to refute the hypothesis of Simpson (1967), that this junction was a large-scale unconformity, the product of orogeny. A defence of the latter position, based upon these exposures has been presented by Mitchell *et al.* (1972, pp. 455–8). The general arguments concerning this junction are set out in the introduction to this chapter and in the description of the Warnscale Bottom site.

Description

At several localities (1–7 of (Figure 3.13)) the relationships at the Borrowdale–Skiddaw junction are seen in complementary illustrative outcrops.

Locality 1: At Grange [NY 253 175] Skiddaw slates are exposed on a glacially smoothed slab adjacent to the river. The bedding is tightly folded with a N–S trend, but with no obvious cleavage. It is likely that these folds are slumps.

Locality 2: In Greenup Sike [NY 246 176] there is a thin sandstone band in slate which reveals a fold with vertical plunge. This is believed to be a slump fold which has been deformed by the late-Caledonian deformation (D_1).

Locality 3: The classic locality in Scarbrow Wood [NY 249 170] exposes the Skiddaw Group–Borrowdale Volcanic Group junction, and has been controversial for over 100 years (see Mitchell *et al.*, 1972). Soper (1970, Locality B) reported that here andesite tuff rests on an eroded surface of a conglomerate of mudstone fragments. The tuff also contains mudstone fragments and a single cleavage affects all rocks, including the underlying Skiddaw slates, which itself is tuffaceous. It is now suggested that a minor unconformity can be seen here, but also that the minor folds in the Skiddaw slates, in adjacent sections, are due to slumping and not to tectonic activity — see the Introduction to this chapter. Nearby, Soper (1970, Locality C) reported a tuff-filled channel in the underlying conglomeratic mudstone, and that cleavage passes across the junction.

Locality 4: On the fellside immediately above Scarbrow Wood [NY 247 170], observations may be made which are similar to those made at Locality 3 — see above. Soper (1970, Locality D) observed here, that the S_1 cleavage is deformed by F_2 folds, which have horizontal axial planes and a gentle north-easterly plunge.

Localities 5, 6, and 7: Adjacent to these outcrops (Locality 5, [NY 245 169]), gently dipping andesitic tuffs are faulted against the Skiddaw Group. Higher up the fellside below Blea Crag (Localities 6 and 7, [NY 242 170] and [NY 241 171]) there are other exposures of the junction, which here consists of a thin conglomerate made up of Skiddaw mudstone pebbles resting on Skiddaw mudstone (Soper, 1970, Locality F). Bedding in the pebbles is disturbed, but cleavage has a common attitude in pebbles and matrix.

Interpretation

The interpretation of this site relies on criteria which are very similar to those used at Warnscale Bottom — see above. However, the principal attraction of this site is that it appears to provide, albeit poorly exposed, continuous sections across the Skiddaw–Borrowdale junction. It is reported (see Mitchell *et al.*, 1972, p. 457) that the slate itself is tuffaceous and that continuous bedding is difficult to define within a few metres of the first true volcanics. The topmost mudrocks appear, in places, to comprise a conglomerate of mudstone fragments, with no consistent orientation, set in a mudstone matrix. Locally, the lowest tuff contains mudstone fragments. A difficulty seems to be the identification and placing of any single surface of unconformity, although local erosional surfaces at the base of tuff horizons are claimed.

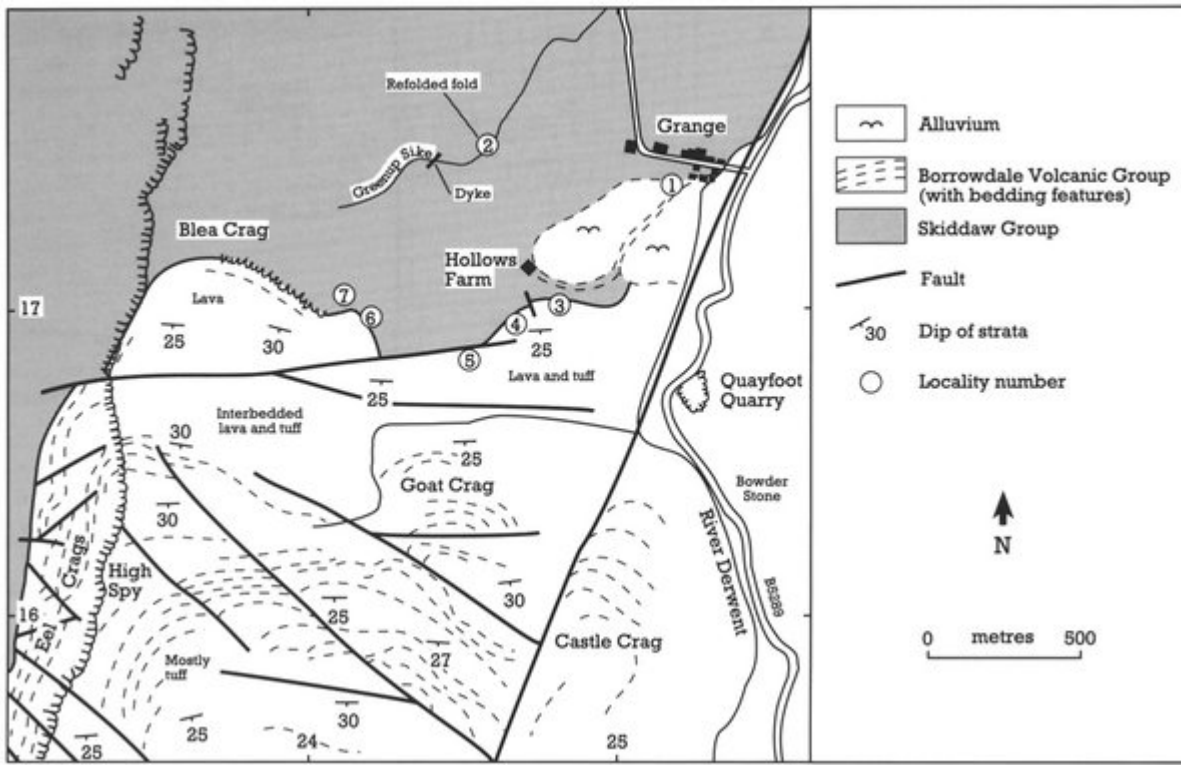
The site also appears to provide evidence that the principal cleavage in the pelites passes continuously into or, at least has the same attitude as, the tuffs above. This must be strong evidence that whatever the nature of the unconformity, it did not post-date major cleavage-related deformation. The cleavage common to both the Skiddaw and Borrowdale Groups is that of the main end- Caledonian deformation. Against this evidence, as at Warnscale Bottom, is the presence of tight, locally overturned, minor folds in the bedded mudrocks, which are absent in the tuffs above. Soper (*in* Mitchell *et al.*, 1972, p. 456) argued that this was due to the inability of the competent tuffs to develop minor folding comparable with that in the Skiddaw Group, rather than pre-volcanic folding. However, Soper (*in* Branney and Soper, 1988) now accepts the recent proposal by Webb and Cooper (1988) that such folds resulted from slumping.

Conclusions

These exposures provide important evidence for the nature of the unconformity between two of the major stratigraphical units in the Lake District. Unique continuous sections across the junctions show it to be transitional, although marked by various erosional features, which may be related to the initiation of volcanicity and slumping. There appears to be no evidence that the unconformity was related to an early compressional phase during a mountain-building episode, as was once suggested.

It is now assumed, on the basis of the fact that both the Skiddaw Group and the Borrowdale Group volcanics share the same cleavage pattern (fine, closely spaced, parallel fractures), that Caledonian deformation events are much younger than the age of the unconformity. Therefore the unconformity, once assumed to be evidence of early Caledonian earth movements during the Ordovician, is now taken to represent lesser-order intra-Ordovician movements and folding in the Skiddaw Group. Caledonian folding and cleavage was superimposed much later probably during the Devonian.

[References](#)



(Figure 3.13) Geological map of the junction between the Borrowdale Volcanic Group and the Skiddaw Group in the area around Grange-in-Borrowdale, Cumbria, showing localities mentioned in the text.