Little Asby Scar and Potts Valley

[NY 68 09]–[NY 70 09]

Highlights

Little Asby Scar and the adjacent Potts Valley contain a distinctive area of limestone pavements, cliffs, scree and rough grassland which has origins traceable to pre-Devensian glacial erosion. Many of the pavement features appear to have preglacial elements.

Introduction

The Potts Valley is a major breach through the eastern end of the limestone escarpment which extends between Orton and Kirkby Stephen, north of the Howgill Fells (Figure 3.1). The south-facing escarpment is formed of the Great Scar Limestone, whose structure and lithology broadly continue those of the Great Asby Scar site immediately to the west. little Asby Scar forms the high ground just west of the Potts Valley, whose western flank provides the type sequence for the Asbian stage of the Lower Carboniferous (George *et al.,* 1976), where the Holkerian Ashfell Sandstone meets the Asbian limestones and shales passing up into the Great Scar Limestone. Published research on the karst geomorphology is minimal and the site literature is incidental (Ward and Evans, 1975).

Description

South of the main scarp, Potts Beck drains a lowland formed on the shales and impure limestones of the Orton Group. The beck then flows north as an underfit on an alluviated floor through the narrower, rocky valley which breaches the scarp (Figure 3.19). Springs from the Orton limestones add to the flow of the beck, but infiltration to the Great Scar Limestone drains to various small risings on the dip slope to the north. Limestone screes and inclined scars form the western slope of the valley, but are largely obscured by a bank of glacial till on the eastern side.

The major part of the gently graded scarp face is formed in the mixed sedimentary sequence of the Orton Group, where the thin limestones form a few low scars. Only the crest of the escarpment is formed by the Great Scar limestone. The pavements are formed only on the more massive beds within this unit, and lie in the terraced, sloping benches above small scars on the upper part of the scarp face. The northern flank of the escarpment is hardly a dip slope, as the dip is steeper than the surface profile, and the pavements again form on only narrow outcrops.

On little Asby Scar the main pavements slope north at 10–18°, and are very well dissected. The more massive beds have some large clints, scored by mature rundkarren runnels and shallow kamenitzas. Most grikes are deep and 100–200 mm wide, but those in a distinctive sub-set are 1–2 m wide, shallow and commonly infilled. These wider grikes are common near the ridge crest and are formed on the same systems of tectonic joints as the deep and narrow kluftkarren; they are mostly spaced 10–30 m apart. The pavements are noticeably discontinuous, forming strips only a few metres in width along the tops of some of the scars. East of Potts Valley, the limestone has a generally thicker cover of soil and grass. There is no significant surface drainage.

Interpretation

Potts Beck originally had a much larger catchment, before capture of its headwaters by the River Lune. The valley through the limestone escarpment was cut by a larger river draining much of the northern slopes of the Howgill Fells (McConnel, 1939; King, 1976), and was probably incised to close to its present depth early in the Pleistocene. Subsequently, the valley may have acted as an iceway, or carried subglacial meltwater, but modification by glacial scour was probably very limited, as the site lay at a basal ice shed (Mitchell, 1994). This protection from glacial erosion may account for the survival of many older landforms on the higher parts of the escarpment, and it is likely that some

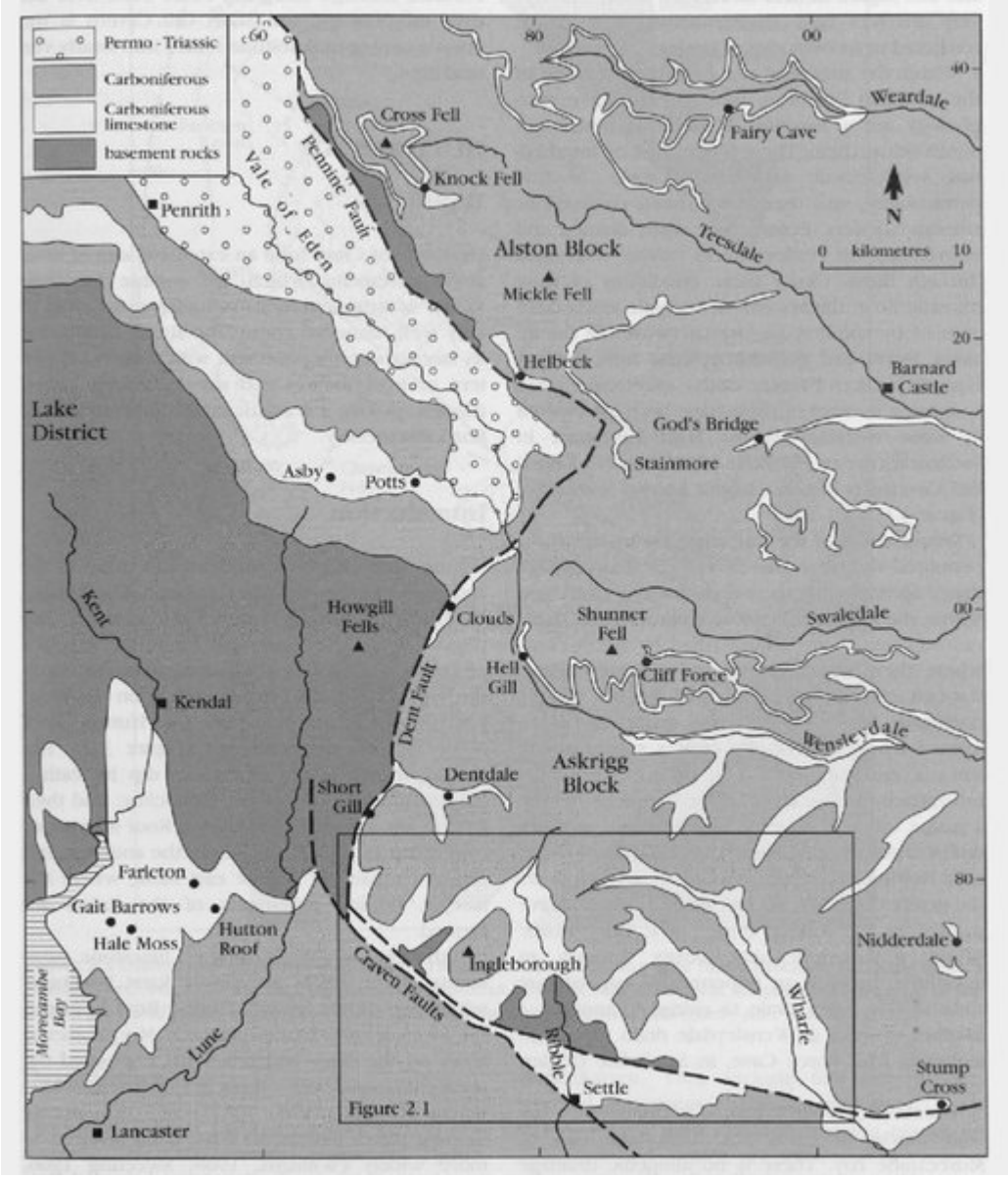
components of the limestone pavements predate the Devensian glaciation, though there are no absolute dates to confirm this.

The bimodal distribution of grike widths provides evidence for some inheritance of older features. The narrow grikes are clearly postglacial, but those of the wider sub-set appear to be pre-Devensian relics, as solution rates recorded widely on the Pennine limestones (Sweeting, 1966; Rose and Vincent, 1986c) could not account for kluftkarren 2 m wide within the 10 000 years of the Holocene. The very dissected nature of the pavements also reflects their considerable age, but the bulk of the rundkarren runnels are less than 400 mm deep and could therefore be entirely postglacial. This suggests the possibility that glacial scour removed a top bed of limestone, with its older runnels, and the surviving grikes are just the lower parts of interglacial kluftkarren which reached down through two or more beds.

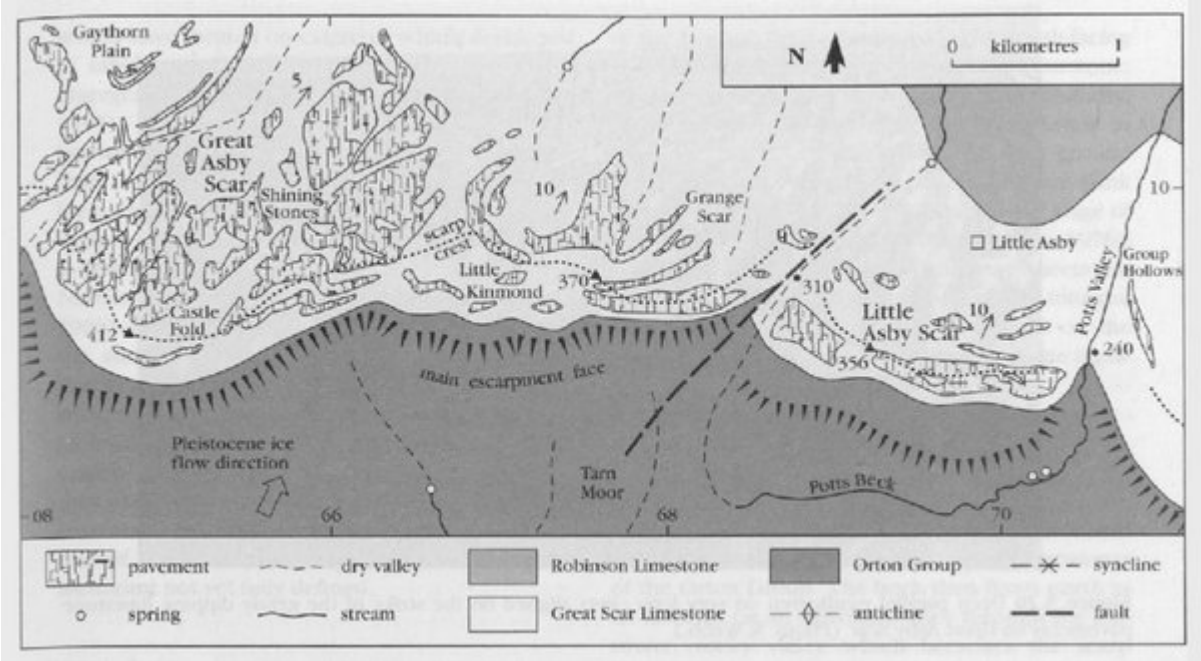
Conclusions

The limestone outcrops on Little Asby Scar have well dissected limestone pavements within an area which lay on a basal ice shed through much of the Pleistocene glaciations. It is likely that many of the pavement landforms were inherited from preglacial features which escaped complete removal by glacial erosion. The site also contains the type section of the Asbian stage of the Carboniferous.

References



(Figure 3.1) Outline map of the karst regions in the northern Pennines, with locations referred to in the text. The other Carboniferous rocks are the non-carbonates of the Orton Group and Yoredale facies of the Dinantian, and the Namurian, but they include thin bands of limestone with lesser karst features not shown on this map. The Carboniferous limestone includes the Dinantian Great Scar Limestone, the Yoredale limestones with significant karst, and the Main or Great Limestone of Namurian age. The basement rocks are Lower Palaeozoic non-carbonates. Details and locations in the southern Dales are shown in (Figure 2.1).



(Figure 3.19) Outline map of the karst features on the limestone escarpment between Great Asby Scar and Potts Valley. The Robinson Limestone includes a thin shale separating it from the Great Scar.