Sleets Gill Cave

[SD 959 692]

Highlights

Sleets Gill Cave and the adjacent Dowkabottom Cave constitute fragments of an ancient, deep phreatic cave system truncated by surface lowering and now exposed out of equilibrium with the present geomorphology. The sediments within both caves contain clasts derived from strata no longer surviving at outcrop. Sleets Gill Cave contains the finest examples in Britain of both abandoned and intermittently active phreatic lifts.

Introduction

Sleets Gill Cave and Dowkabottom Cave lie on the western side of Littondale, just above its confluence with Wharfedale (Figure 2.1). The plateau above the caves is developed largely on the Great Scar Limestone, with only two very small outliers of Yoredale facies shales surviving within the catchment. The water from both caves resurges under normal flow conditions at Moss Beck Rising, 1 km east of the Sleets Gill entrance. The caves have remained largely undocumented. Sleets Gill Cave was described by Monico (1989b), and all the caves were described briefly by Long (1974) and Brook *et al.* (1988); Long (1992) made further comment on the unusual hydrology and flooding regimes.

Description

Sleets Gill Cave (Figure 2.42) is entered through a 3 m wide arch at the head of a normally dry stream bed, 60 m above the floor of Littondale. The entrance passage is an inclined tube descending to a depth of 24 m, where it levels out into the Main Gallery, a 4 m diameter phreatic tube which can be followed for 370 m to a choke. An immature active streamway lies below and just south of the old phreatic conduit, and provides access beneath the choke into a continuation of the large, relict phreatic tunnel. The Ramp is a large phreatic tube ascending over 60 m at an angle of 35° to a calcited boulder choke.

The choked ends of Sleets Gill Cave lie more than 100 m below Dowkabottom, a large, shallow closed depression cut in the limestone just below the main plateau level. Low rock scars line most of its perimeter, but its floor is grass on a thick soil. Behind the western wall of the depression, Dowkabottom Cave is another fragment of largely abandoned phreatic conduit, accessible through a rift in the flat floor of an outer, higher basin (Figure 2.42). Most of its passages are large phreatic tunnels, rectangular in section due to block fall; one section is developed along a fault as a narrow rift 20 m high. This cave contains more extensive sediment deposits than does Sleets Gill Cave, and they include calcite flowstones and clastics with pebbles of Yoredale sandstone.

Interpretation

The Sleets Gill entrance passage and the Ramp both carried water upwards and are spectacular examples of relict phreatic lifts. They both ascend at an angle of 35°, cutting through the horizontal limestone with no visible sign of structural control. Their locations appear to have been guided purely by hydraulic factors where water was escaping from deep contemporary phreatic zones towards resurgences in the floor of Littondale when this was at much higher levels early in the Pleistocene. There is no evidence of the relative ages, except that the Ramp's position further into the hill suggests that it is the older, whose flow was subsequently captured by a new lower route along the Main Gallery. The entrance passage is truncated by the modern hillside, and the Ramp is choked at its upper end, so that it is unclear whether the inclined passages were the lower sections of deep vauclusian risings, or were merely phreatic lifts midway along deep karstic conduits. The passages of Dowkabottom Cave appear to be upstream fragments of the same old phreatic cave system, but their higher level suggests that they could represent earlier phases of the cave development.

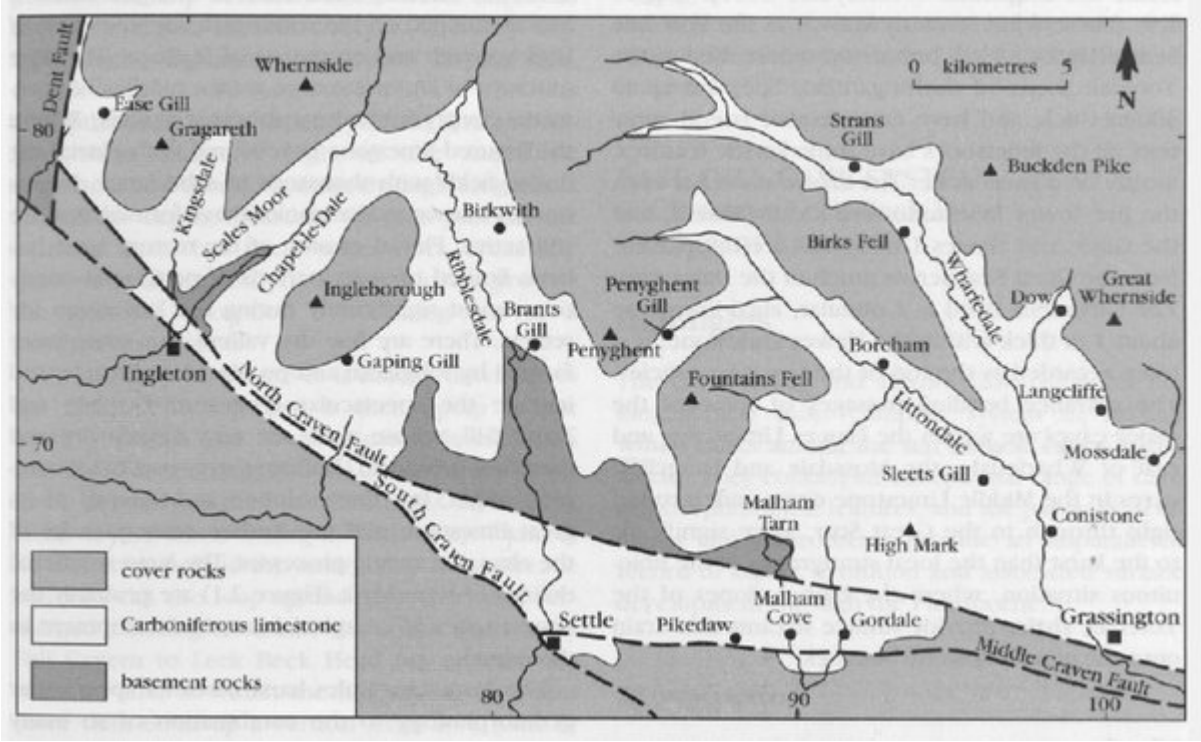
The altitude of the cave system, now in the flanks of Littondale and with the main passage perched 65 m above the adjacent valley floor, indicates that it is of considerable age. The cave may encompass a geomorphological history spanning the entire glacial modification of Littondale, since the phreatic top of the Ramp is at an altitude at least 130 m above the present dale floor. The mean rate of valley floor excavation in the western Yorkshire Dales is 0.12 m/ka (Waltham, 1986), which suggests that Sleets Gill Cave is at least 1.1 Ma old. Sandstone pebbles in some of the clastic deposits of Dowkabottom Cave were derived from rocks of the Yoredale facies, now stripped from the plateau of Great Scar Limestone; their presence suggests that either the cave formed when the Yoredale cover was more extensive, or the Yoredale material was derived from a partial cover of glacial debris, subsequently largely eroded away. The sediment and speleothem sequence within these caves constitute a stratigraphical record of the evolution of Littondale, yet to be elucidated in full.

The present hydrology is complex, with percolation water derived largely from distant autogenic sources draining via immature caves to a resurgence near the valley floor. Response to heavy rainfall is delayed, but the outlets from Sleets Gill Cave, to both the permanent Moss Beck resurgence and also a flood rising below the entrance (Figure 2.42) appear to be constricted. Flood waters back up in the cave's large tunnels, find various fissure outlets to the rocky channel of Sleets Gill Beck, and in high flood create a temporary vauclusian rising when they overflow the lip at the cave entrance.

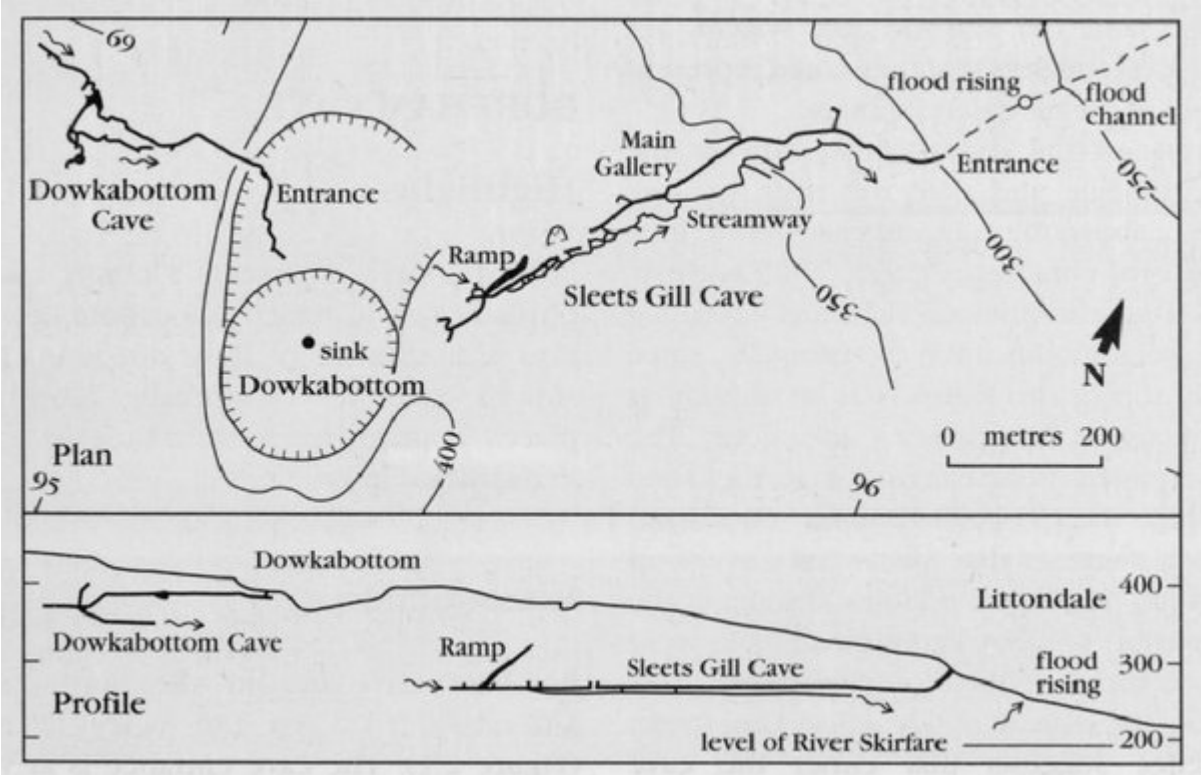
Conclusion

The two caves are fragments of a very old system which once carried deep phreatic flow from a large limestone plateau towards Littondale prior to its glacial entrenchment. Sleets Gill Cave contains Britain's finest examples of steeply inclined phreatic tubes, which may have fed ancient vauclusian risings. An immature modern phreas, fed by autogenic input and draining to a valley floor resurgence, lies alongside the larger abandoned passages, and the ancient phreatic conduits may still be utilized during periods of high flow.

References



(Figure 2.1) Outline map of the Yorkshire Dales karst, with locations referred to in the text. The Carboniferous limestone shown includes all the Great Scar Limestone (Kilnsey, Cove and Gordale Formations) and also the lower Yoredale limestones (of the Wensleydale Group) where they are hydrologically linked to the Great Scar and are therefore part of the same karst unit. Higher limestones within the Yoredale Series are not marked. Basement rocks are Palaeozoic slates and greywackes. Cover rocks are the Yoredale facies of the middle and late Brigantian Wensleydale Formation and various Upper Carboniferous and Permian clastic formations.



(Figure 2.42) Outline map and profile of Sleets Gill Cave and its associated karstic features (from surveys by University of Leeds Speleological Association and others).