Mam Tor

Highlights

Mam Tor is the type locality for the Mam Tor Formation, an interval of turbidite deposits derived from the large fluvial deltas further north.

Introduction

A landslip scar [SK 130 836] on the south-east side of Mam Tor, 2.5 km west-north-west of Castleton, Derbyshire, provides a spectacular exposure of part of the lower Millstone Grit Group as developed in the Central Province (Figure 9.9). The lower part of the section has been described by Jackson (1927), and the turbidites in the upper part are dealt with in detail by Allen (1960). Other, shorter accounts can be found in Collinson and Walker (1967) and Stevenson and Gaunt (1971).

Description

The lower part of the section belongs to the Edale Shales. Three blocks of shales were described by Jackson (1927), although Stevenson and Gaunt (1971) regard only one of these as *in situ.* This was 18 m of shales with thin siltstone and ironstone ribs, belonging to the basinal mudstone fades of Collinson (1988). They were probably deposited in quiet, relatively deep-water conditions.

Above the Edale Shales are about 120 m of alternating couplets of sandstones and shales belonging to the Mam Tor Formation, the lowest part of the Kinderscout Grit Subgroup. The base of each unit is marked by a prominent sandstone with an erosive base and showing a variety of different sole-markings and bottom structures. In the lower 30 m of the formation, these sedimentary structures give a palaeocurrent direction of roughly ENE/WSW, changing to almost N/S at higher levels. Also present in many of the sandstones are penecontemporaneous deformation structures, including convolute bedding, crumpled bedding and slump-ball structures. This prominent sandstone then fines upwards through finer laminated sandstones, siltstones, mudstones and eventually black paper-shales. This type of fining-upwards sequence is typical of distal turbidite deposits. These particular examples are thought to be the result of turbidity currents that originated on the submarine slope of a large delta lying to the north (Allen, 1960; Walker, 1966a; Collinson, 1970).

The only biostratigraphical evidence here is based on marine fossils from the Edale Shales Formation. Jackson (1927) found assemblages belonging to the *E. bisulcatum* (Arnsbergian), *H. proteus* (Alportian) and *R. circumplicatile* (Kinderscoutian) zones in the loose blocks in the base. As this is part of a large landslip, however, it is impossible to be certain how they fit in with the *in situ* parts of the section. The *in situ* block yield limited assemblages from several horizons, included *Reticuloceras* sp., *Vallites* sp., *Caneyella* sp. and *Dunbarella rhythmica* (Jackson), which according to Jackson indicate the *R. nodosum* Zone (middle Kinderscoutian).

From the main part of the landslip scar, the shales immediately underlying the Mam Tor Formation have yielded *Reticuloceras reticulatum* Bisat, *Dunbarella* sp. and *Posidoniella* sp. This clearly belongs to the lower part of the *R. reticulatum* Zone (upper Kinderscoutian). The Mam Tor Formation itself yields few fossils other than bivalves and indeterminable plant fragments. However, from its regional setting, the entire formation probably belongs to the upper Kinderscoutian.

Interpretation

This is the best and most typical exposure of the Mam Tor Formation, and is normally taken as the type section. It is a variable unit; Stevenson and Gaunt (1971) report that only 1.5 km to the east the sandstones have become much thinner and less frequent, while elsewhere the sandstones develop into mappable units.

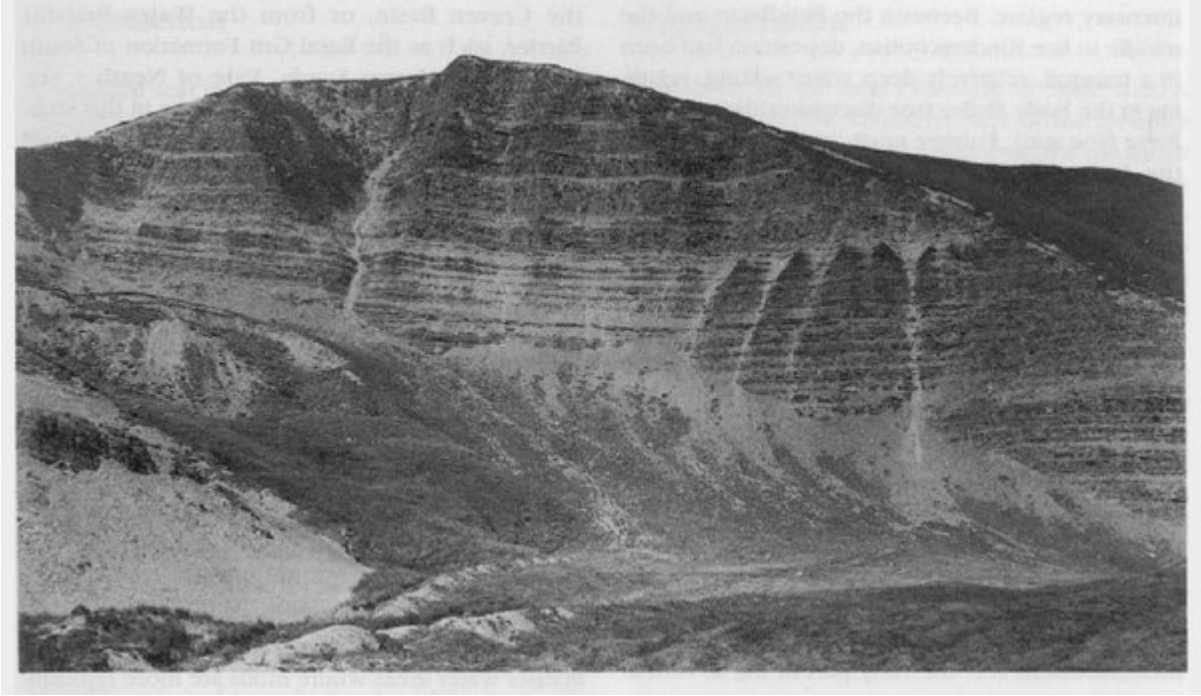
The Mam Tor beds are thought to be an interval of turbidites in the southern part of the Central Province, and mark a significant change in the sedimentary regime. Between the Pendleian and the middle to late Kinderscoutian, deposition had been in a tranquil, relatively deep water setting, resulting in the Edale Shales (see discussion above on the River Noe site). Further north in the basin, and in the Craven Basin, deposits of this age are the remains of Mississippi-sized deltas being produced by large river systems flowing from Caledonian Highlands to the north. During the Namurian, these deltas prograded steadily southwards, but did not reach the southern parts of the Central Province such as the Edale Basin until the very late Kinderscoutian. However, in these more southern areas, the deltas were prefaced by pulses of sands being reworked from the delta front by turbidity currents, the earliest of which produced the Mam Tor Formation. The Mam Tor section not only provides a fine exposure of these turbidites, which have allowed detailed sedimentological analysis (e.g. Allen, 1960), but also establishes the time of the sedimentary change as early Late Kinderscoutian (i.e. the early part of the *R. reticulatum* Zone time).

The nearest comparison with the Mam Tor beds is the Pendle Grit Formation of the Craven Basin and the Longnor Sandstone of the Staffordshire Basin, both being turbidites. However, they occupy different stratigraphical positions, the Pendle Grits being Pendleian and the Longnor Sandstone topmost Kinderscoutian. Elsewhere in Britain, the lower *R. reticulatum* Zone is mainly represented by deltaic sandstones derived from the Caledonian Highlands, such as the Lower Kinderscout Grit of the Craven Basin, or from the Wales–Brabant Barrier, such as the Basal Grit Formation of South Wales (e.g. Marros Sands, Vale of Neath — see Chapter 4). There are basinal deposits in this stratigraphical position, such as in the Widmerpool Gulf (Falcon and Kent, 1960) and in the central part of the South Wales Basin (e.g. Barland Common). However, these are all in basinal mudstone facies, with no evidence of clastic turbidites.

Conclusions

Mam Tor is the most important exposure of rocks of the Mam Tor Formation, which are about 315 million years old. They are alternating beds of sandstones and shales deposited in a marine setting, near the foot of a large river delta. The sandstones are thought to represent turbidite deposits, formed when sediment from the delta was disturbed, possibly by seismic movement, and flowed down into deeper water areas where muds are more typically deposited.

References



(Figure 9.9) Mam Tor Formation (Millstone Grit) exposed at Mam Tor. Reproduced by permission of the Director, British Geological Survey: NERC copyright reserved (L211).