Derby Delf Quarry

Highlights

Derby Dell Quarry provides one of the best exposures of giant cross-bedding in the Kinderscout Grit Formation, and has been important for showing that it was formed mainly as transverse bars in a large river system.

Introduction

This disused quarry [SE 017 160] on the north side of Booth Wood Reservoir, 11 km west of Huddersfield, West Yorkshire, provides a laterally extensive exposure of sandstones of the Kinderscout Grit Formation, as developed in the central part of the Central Province. The geology is described by McCabe (1975, 1977).

Description

The exposed sequence is 40 m thick, and consists mainly of sandstones. There is no biostratigraphical control, but mapping by McCabe (1975) has demonstrated that they belong to the Kinderscout Grit Formation, and most likely to the lower member.

Two facies were identified here by McCabe (1975, 1977). The most spectacular has very large-scale cross-bedding, which has been referred to by McCabe as 'giant cross beds'. Such 'giant cross beds' were defined by McCabe as having sets at least 3 m thick, although at Derby Dell they are 34 m or more thick. The sandstones in this facies are generally coarse, often with small pebbles and granules, and occasional ferruginous horizons.

The second facies was referred to as undulatory bedded sandstones, and occurs in the lower part of the sequence here, separated from the facies with 'giant cross beds' by an erosion surface. The individual beds vary markedly in thickness along their length, usually in the range of 10–20 cm. The beds are coarse-grained and massive, except for some cross-lamination on the western side of certain bed undulations.

Interpretation

This is a unique site for demonstrating features of the sedimentology of the Kinderscout Grit, in particular the association between the 'giant cross beds' and undulatory beds facies. The type of large-scale cross-bedding visible here has been known in the Kinderscout Grit for a long time and was interpreted as being generated in delta lobes, advancing in response to eustatic sea-level changes (Collinson, 1968, 1969). However, McCabe (1975, 1977) noted that there are no fine-grained, pro-delta type deposits associated with the sandstones, and also that the undulatory beds are atypical of deltaic sequences. He instead interpreted the Kinderscout Grit as being deposited in large fluvial channels, probably as transverse bars in a braided river setting; the cross-bedded units represent the body of the bars, whilst the undulatory beds are the remains of sand ribbons formed as bar-front spurs. McCabe argued that the bars were probably attached to the sides of the bank, although Collinson (1988) maintained that some may also have been mid-channel forms. Their progressive migration downstream resulted in the characteristic large-scale cross-bedding.

The size of river required to generate such deposits in the way suggested by McCabe is considerable. Channel widths of up to 2 km and depths of 40 m have been suggested. If correct, it confirms the scale of the fluvio-deltaic system that was responsible for the deposition of the Millstone Grit Group in the basins of the Central Province.

Conclusions

Derby Delf Quarry is the best exposure of giant cross-bedding in the Kinderscout Grit Formation, in rocks which are about 318 million years old. They suggest that the rocks were formed in a large river system, with channels up to possibly

40 m deep.

References