Old Man, Gugh, St Agnes

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Highlights

This site affords the finest exposures of aeolian sandloess on the Isles of Scilly. This material, dated by thermoluminescence (TL) and optical techniques to the Late Devensian, is widespread on the islands but the quality of the exposures here have led to the selection of Old Man as the stratotype for the Old Man Sandloess. This unit lies between layers of granitic head at the site, thus demonstrating its stratigraphic context. The Old Man Sandloess is of significance because it has been demonstrated that there is a genetic link between this material and the Scilly Till; the absolute dates on the Sandloess therefore relate directly to the age of the glacial event which affected Scilly.

Introduction

Barrow (1906) reported the widespread occurrence of 'iron-cement', a ferruginous and micaceous sandy silt, on Scilly. He noted that this material often forms the highest part of the Head, but that its contact with the Head is … distinctly sharp, suggesting a somewhat different origin from the latter' (Barrow, 1906; p. 20). He commented that 'The origin of this curious deposit is no means clear; it is distinctly micaceous and far finer in texture than normal blown sand, as well as of a totally different colour and composition' (Barrow, 1906; p. 21). He speculated that the deposit might be of aeolian origin derived from material released from frost action; 'The idea of invoking the aid of frost in the production of this material is based on its substantial identity both in composition, mode of occurrence, and geological age, with the matrix of an undoubted glacial deposit … ' (Barrow, 1906; p. 21). Barrow therefore hinted at a possible genetic relationship between the 'iron-cement' and the glacial material found on the northern islands.

Arkell (1943) commented that … in the Scilly Isles, where the main head is covered by loess identical with the *limon* of Brittany … ' (Arkell, 1943; p. 159) and later quotes W.B.R. King in a personal communication linking the loess of Brittany, Normandy, the Channel Islands and the Isles of Scilly. This was the first recognition that the 'iron-cement' described by Barrow was in fact loessic.

However, Mitchell and Orme (1967) did not recognize loessic sediments on the islands. They were critical of Barrow's interpretation of the 'iron-cement' and proposed a different hypothesis for its origin:

'In post-glacial time, soil-forming processes have developed a podsol profile on the Upper Head. The B-horizon is deeply coloured by iron and humus, and is sometimes cemented by silica and iron oxide. This material Barrow described as iron-cement, and he regarded it as being essentially the same as the cemented outwash gravel … This confusion of two deposits of entirely different origin vitiates much of Barrow's description of the glacial deposits' (Mitchell and Orme, 1967; p. 68). This hypothesis was rejected by Scourse (1991).

The existence of loessic sediments on the islands was supported by Catt and Staines (1982). On the basis of particle-size analysis and heavy mineralogy they recognized the significance of coarse loess as a soil parent material on Scilly. Wintle (1981) dated two samples of this material from St Mary's and St Agnes to 18 600 ± 3700 BP (QTL–1f and QTL–1d). Further absolute dates on this material were published by Smith *et al.* (1990) using the optical technique.

Scourse (1991) identified coarse loess as a significant sedimentary unit within the Pleistocene sequence on the islands (Figure 8.3). He was able to demonstrate a genetic relationship between this material and the Scilly Till on the basis of particle-size distributions, mineralogy, patterns of sedimentation, stratigraphy and absolute age. He defined the unit as the Old Man Sandloess from this site on Gugh, St Agnes, and noted a limited distribution of the material south of the ice limit across the northern islands (Figure 8.1). North of the ice limit the Sandloess has been mixed with glaciofluvial (Tregarthen Gravel) and glacial (Scilly Till) sediment, and soliflucted downslope as the Hell Bay Gravel (Figure 8.3).

The Old Man Sandloess is of stratigraphic significance because it provides evidence in support of the Late Devensian glaciation of the northern islands (Scourse, 1991). The absolute age of this unit, derived from the TL and optical methods, directly relates to the age of the glacial event because of the demonstrated genetic link between the Old Man Sandloess and the Scilly Till.

Description

The Old Man section is located on the north-east coast of Gugh (St Agnes; [SV 893 085]); the name 'Old Man' is derived from a prominent standing stone positioned a few metres upslope. The section comprises:

3. Granitic head (0.2 m)

2. Light brown to ochre sandy silt (1.0 m)

1. Coarse granitic head (1.5 m)

The lower head contains occasional very well-rounded granite boulders, probably incorporated into the head from an underlying raised beach. There are good exposures of cobble-rich raised beach deposits underlying the head at other sites along the eastern coast of Gugh indicating that this is the probable source.

The sandy silt is moderately well sorted with a dominant mode in the coarse silt fraction, and a subdominant mode in the medium sand fraction; the grain-size distribution has a high kurtosis. The unit possesses a columnar structure and small pinhole voids are visible in the sediment fabric.

Interpretation

The grain-size and structural characteristics of the sandy silt (bed 2) are characteristic features of *in situ* loess (Mellors, 1977). This material at Old Man is typical of the Scilly loesses in containing consistently more sand than clay (Cat and Staines, 1982; Scourse, 1991). It is too coarse to be defined as true loess, but too fine to be defined as coversand. The Old Man material is typical in having a dominant modal class either in the coarse silt or fine sand fraction, with total sand usually more than 25% and total clay less than 10%. In The Netherlands and Belgium, sediment with these characteristics is commonly distributed in a transitional belt between true loess and coversand, and is known as 'sandloess'. Comparable material on Scilly was thus defined as the Old Man Sandloess by Scourse (1991) from the type-site at Old Man.

Scourse (1991) defined four facies of the Old Man Sandloess on the basis of structural and grain-size criteria. The stratotype of the Old Man Sandloess is typical of facies A. This is interpreted as *in situ* material because it contains the columnar structure and pinhole voids characteristic of *in situ* loess (Mellors, 1977). The other facies are interpreted to have been deposited through water (facies B), or reworked by fluvial (facies C) or soliflual (facies D) processes. All the facies described by Scourse (1991) represent stages along a continuum from *in situ material* to sandloess intermixed to such an extent with other material that its identity is only barely recognizable. Scourse (1991) further noted that the matrix of the soliflual Hell Bay Gravel is identical to the Old Man Sandloess, indicating that the Hell Bay Gravel comprises glacially derived material (Scilly Till, Tregarthen Gravel) thoroughly mixed with Old Man Sandloess and reworked downslope by solifluction. He noted that the Old Man Sandloess is confined to the area outside the ice limit (Figure 8.1).

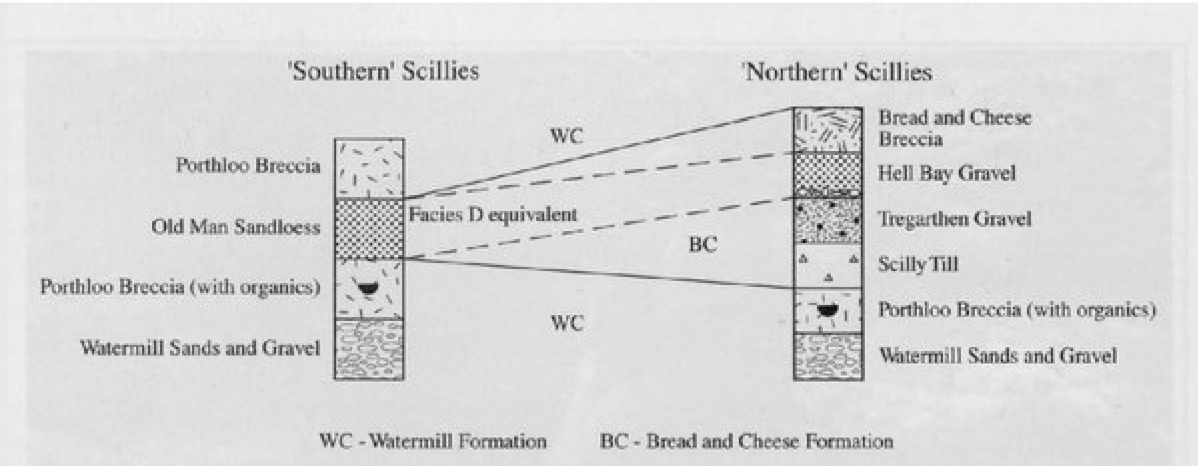
Two samples of the Old Man Sandloess have been dated to 18 600 ± 3700 BP (QTL–lf, sample from St Mary's; QTL–1d, sample from St Agnes) using the TL method (Wintle, 1981). These dates therefore suggest that this material is of Late Devensian age. This interpretation has been partially supported by two optical dates of 20 ka ± 7 ka BP and 26 ka + 10 ka/– 9 ka BP (Smith *et al.,* 1990) from the same material. These dates are stratigraphically significant because Scourse (1991) has interpreted a genetic link between the glacigenic units of the northern Scillies (Scilly Till, Tregarthen Gravel) and the Old Man Sandloess. The relative coarseness of the Sandloess is interpreted as a function of proximity to glacially derived source material, and the mineralogy of the Scilly Till is sufficiently similar to the Sandloess to suggest a genetic relationship between the two units (Catt, 1986; Scourse, 1991). Aeolian loessic processes in association with the glacial advance therefore resulted in the contemporary deposition of the Old Man Sandloess in the southern Isles of Scilly with glacial deposition in the northern islands. The Late Devensian dates for deposition of the Old Man Sandloess can therefore be used to constrain the age of the glacial event.

At locations where the Old Man Sandloess is absent, it is not possible to discriminate between the upper and lower units of Porthloo Breccia (Figure 8.3). At sites such as Old Man, however, the Sandloess lies clearly between two units of granitic head. The dates on the Sandloess therefore also help to constrain phases of active solifluction in the Isles of Scilly.

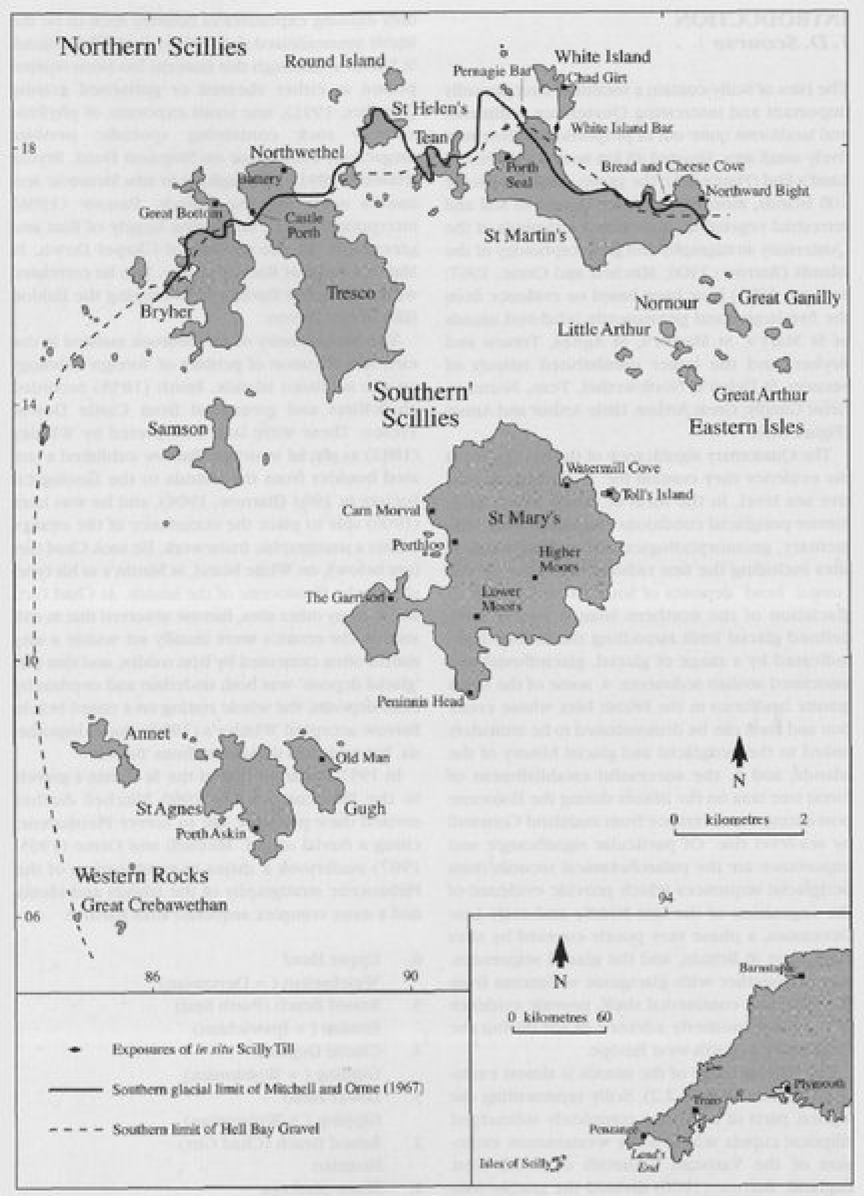
Conclusion

This site contains the best exposures on the Isles of Scilly of sandy silts deposited by wind action beyond the southern limit of an ice sheet which crossed the northern islands at about 19 ka BP. The silts were picked up from the outwash plain in front of the glacier by strong winds, and therefore contain the same minerals found in the glacial deposits in the northern islands. The silts have yielded absolute dates which help to constrain the age of the glaciation of the Isles of Scilly to the last major ice-sheet glaciation of the British Isles, the Late Devensian.

References



(Figure 8.3) A lithostratigraphic model for the Isles of Scilly. (Adapted from Scourse, 1991.)



(Figure 8.1) The Isles of Scilly: critical sites, exposures of the Scilly Till, the southern limit of the Hell Bay Gravel and Mitchell and Orme's (1967) glacial limit. (Adapted from Scourse, 1991.)