

Manchester Geographical Society



Funding Report

From Summits to Cirques: Deciphering the nature and rate of ice loss from the last Welsh Ice Cap using high-resolution glacial geochronology

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Background

The upland areas of the Brecon Beacons have long been regarded as significant ice accumulation and dispersal centres during Quaternary glaciations (Carr, 2020). However, evidence of Younger Dryas glacial activity is widely debated and many landforms are yet to be proven to be Younger Dryas in age (Shakesby and Matthews, 2009).

Rationale

The MGS postgraduate research grant was acquired to fund research trips to both Fan Gyhirych (Brecon Beacons) and Tarren y Fforch (Rhondda Valleys).

In the Brecon Beacons, it is assumed that Fan Gyhirych was last glaciated in the Younger Dryas due to the presence of a well-developed cirque and moraines on the cirque floor, but the timing of glaciation has never been proven. A complicating factor is the morphometry of the moraine in the basin, which arcs away from the cirque rather than towards it. At other cirques nearby, similar moraine morphologies have been used to argue that these moraines were formed by valley glaciers penetrating upper valleys from an earlier ice cap to the north (Jansson and Glasser, 2008), rather than a Younger Dryas cirque glacier. This is strongly disputed by some (Shakesby and Matthews, 2009).

South of the Brecon Beacons lie examples of low elevation cirques which have received little interest in the literature. It is unclear whether these cirques (e.g. Tarren y Fforch) and associated moraines were occupied by glaciers in the same period as those in the Brecon Beacons and rest of Wales to the north.

Results/discussion

Fan Gyhrych

A steep sided cirque with an amphitheatre shaped headwall rising to a summit at 725m. It is viable that a glacier existed at this cirque during the Younger Dryas period, although last ice occupation may have been restricted to the small hollow on the headwall.

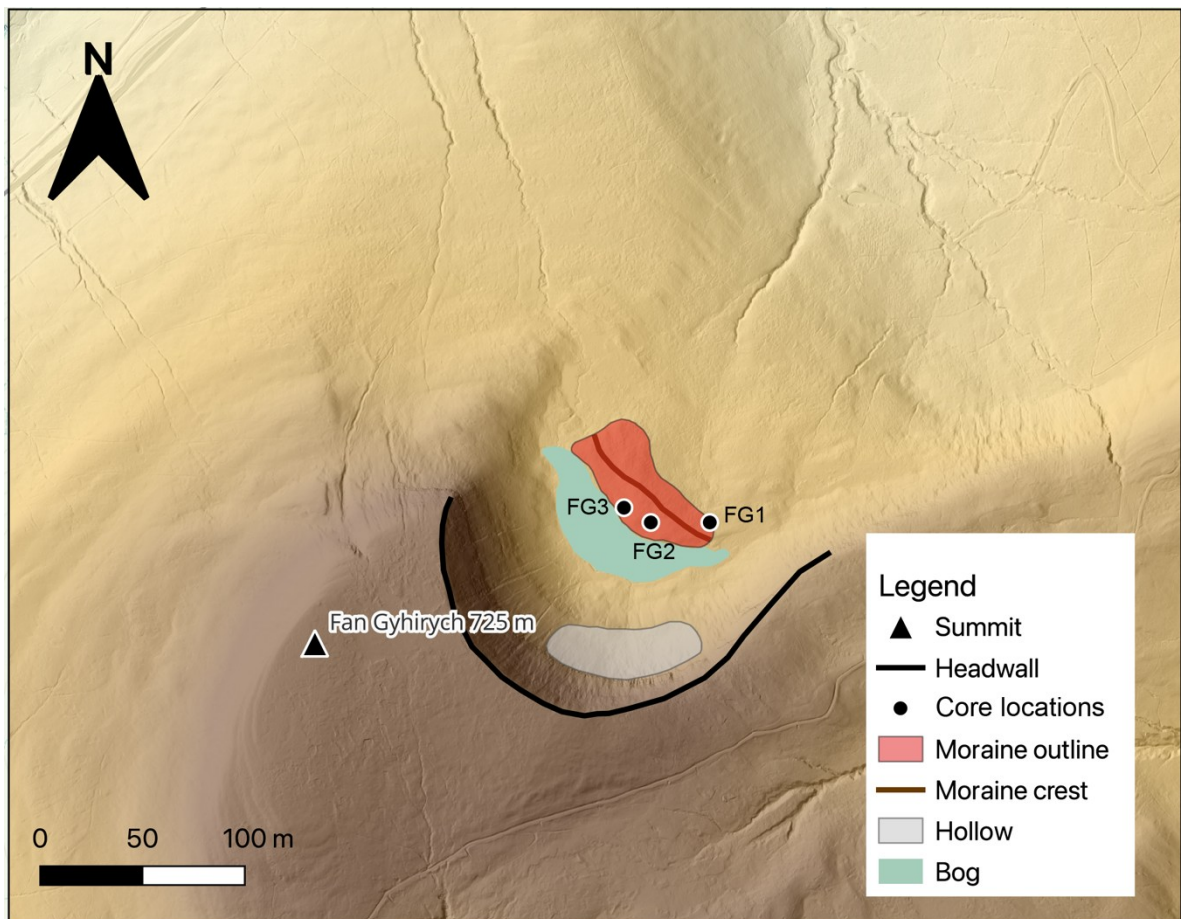


Fig 1: Location map showing the site geomorphology along with coring locations.

A sediment core at FG1, outside the moraine, stopped at 125 cm (figure 2a). A core at FG2, taken from inside the moraine, reached 325cm and displayed dark bands on the bottommost (50cm) segment. This was catalogued in the field as a tripartite sequence, but could also be a

result of erosional processes and potential inwash (see fig 2b). A final core at FG3, taken towards the middle of the moraine flank, reached red clay before stopping on basal till (fig 2c).

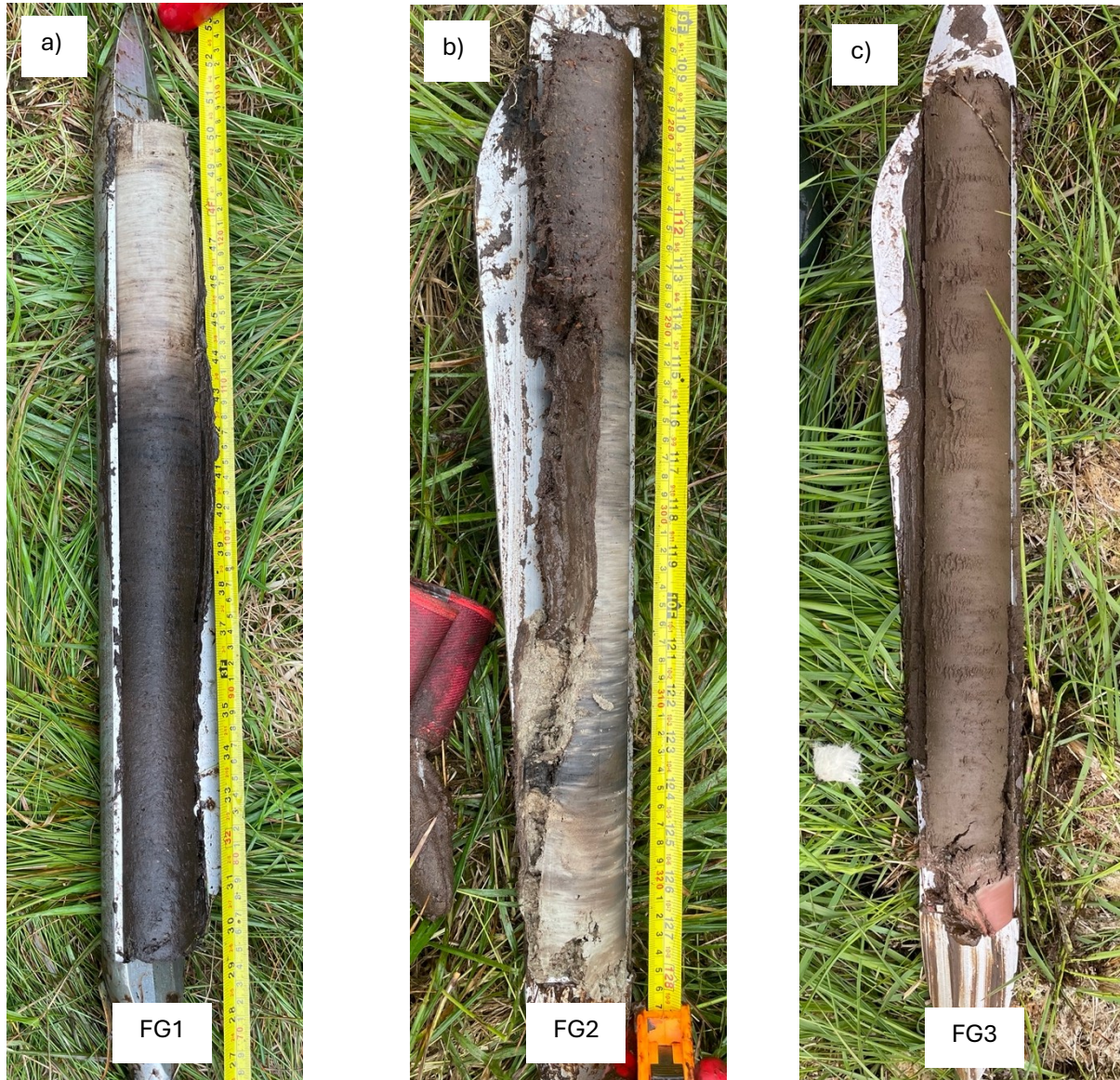


Fig 2: a) Outer moraine core grading from organic peat to grey clay. b) Inner moraine core showing dark organic intrusions within the basal grey clay. c) Inner moraine core reaching basal red clay in the bottom 5 cm.

Tarren y Fforch

Located near Nant y Moel in the Ogmore valley (close to the Rhondda valley), this consists of a steep headwall which rises to ~380 m, enclosing two bogs hemmed in by a clear arcuate moraine on its northern side and multiple moraines tracking down valley, becoming less defined further out from the cirque.

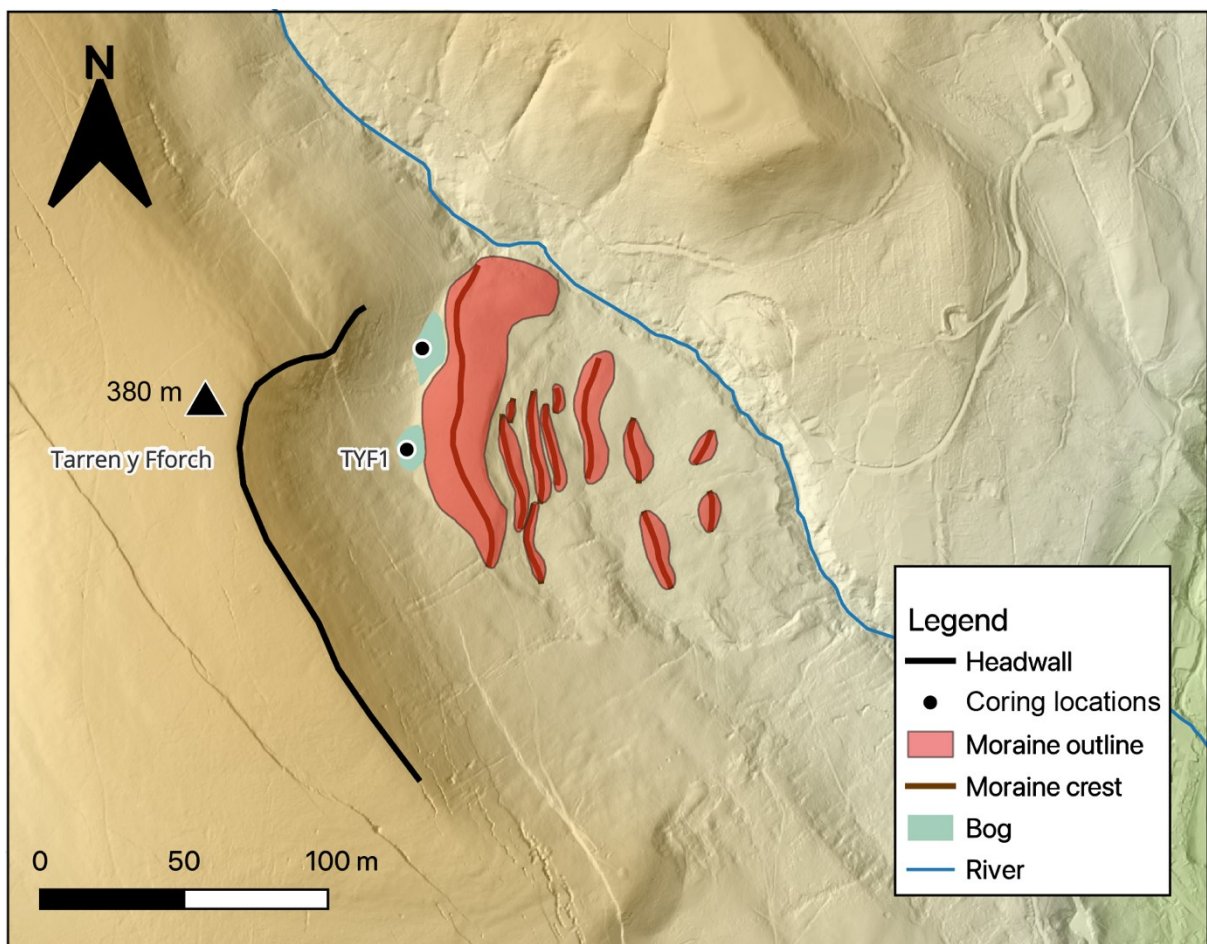


Fig 4: Location map showing the site geomorphology along with coring locations.

TYF1 reached the base at 165 cm. The basal section (115-165) displays a darker organic band (highlighted in fig 5) before transitioning again to light grey clay. We retrieved four duplicate cores to check this stratigraphy which all displayed the same pattern.



Figure 5: Field photo showing potential tripartite sequence transitioning into blue grey clay, expected to align with glacial conditions.

Future work

After transporting the cores back to the laboratory we took multiple pollen samples to check the biostratigraphy of the cores. We also carried out loss on ignition analysis to obtain the organic content of the cores. We have since taken samples for radiocarbon dating focussing on the potential tripartite sections and basal organics. This is ongoing PhD research which will benefit from further investigative research.

Reference list

Carr, S. (2020) 'The Brecon Beacons', in Goudie, A. and Migoñ, P. (eds.) *Landscapes and Landforms of England and Wales*. Cham: Springer International Publishing, pp. 553-566.

Jansson, K. N. and Glasser, N. F. (2008) 'Modification of peripheral mountain ranges by former ice sheets: The Brecon Beacons, Southern UK', *Geomorphology*, 97(1-2), pp. 178-189.

Shakesby, R. A. and Matthews, J. A. (2009) 'Comments on Jansson, KN and Glasser, NF (2008) "Modification of peripheral mountain ranges by former ice sheets: The Brecon Beacons, southern UK," *Geomorphology* 97, 178–189', *Geomorphology*, 110(3-4), pp. 217-225.