

Glaciation of the Scottish Borders

Glacial Landsystems Working Group

26th - 28th October 2012



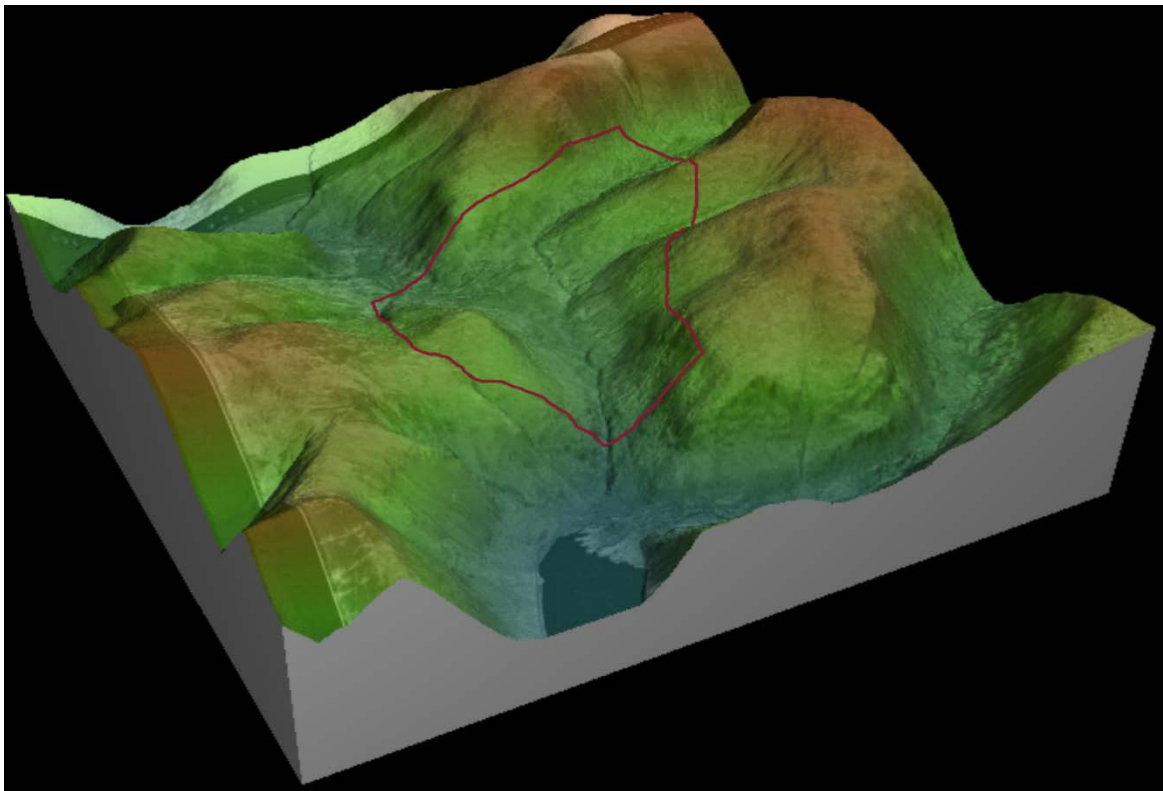
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The BGS Talla Earth Observatory Site – Clive Auton, Jez Everest

A unique combination of conventional surveying and non-invasive techniques have been applied to characterising the geomorphology, soils and shallow substrates of a typical small catchment in Scotland. Integration of geospatial, geophysical and geotechnical data, in the resulting digital 3D model, have enabled the nature and extent of individual components of the landscape to be measured and their relationships at depth to interpreted and visualised. This type of baseline data is fundamental to better understanding past, and monitoring and measuring the impacts of future environmental changes in such environmentally sensitive areas.

The 'Original' Talla Site area



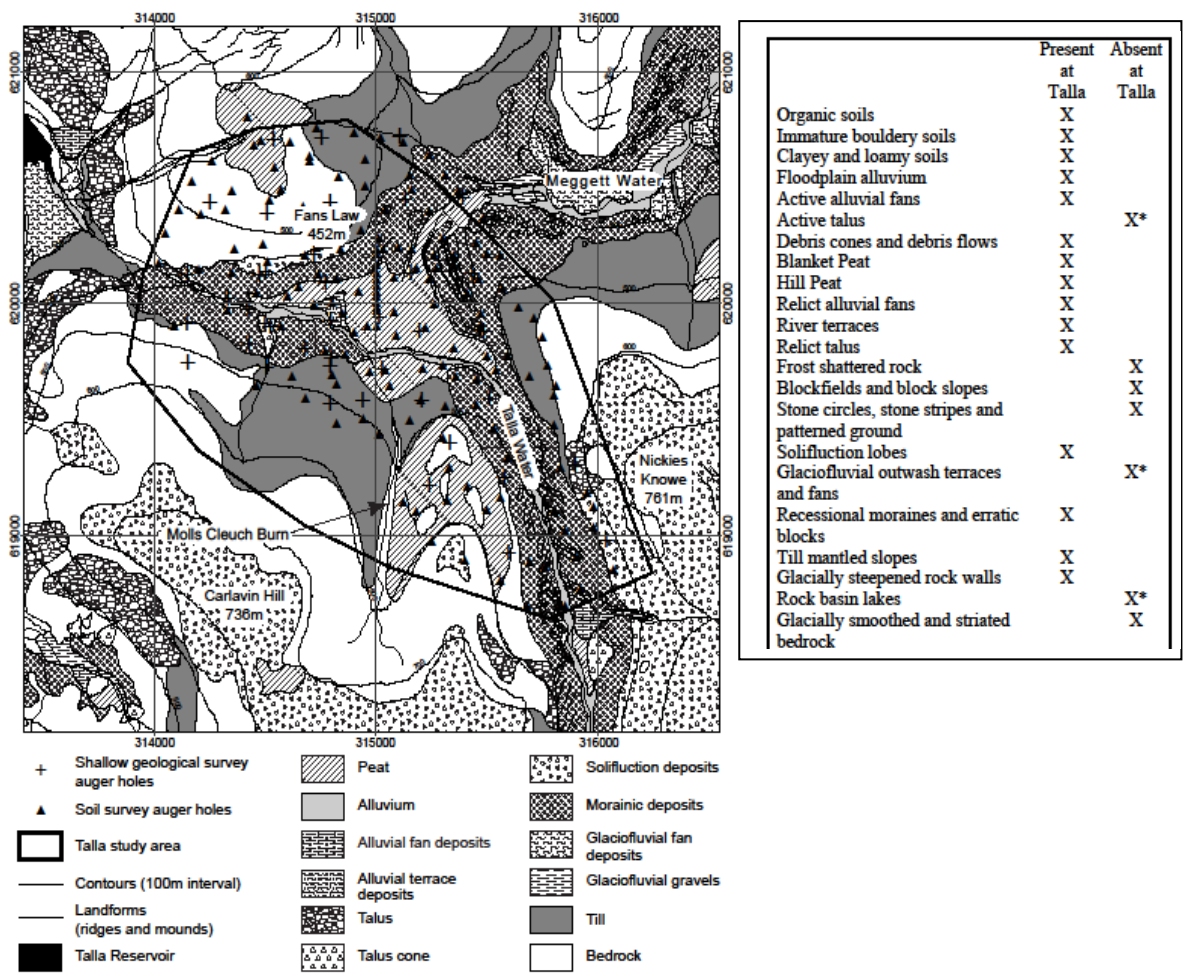
The principle aims of the investigations at the Talla site were to

- (i) develop a combination of techniques for mapping the landscape in three dimensions
- (ii) to establish a baseline from which the palaeo-environmental evolution of the area could be assessed and against which monitoring of impacts of future environmental changes could be undertaken.

This required a multidisciplinary approach, where conventional surveying methods (mapping, augering, drilling and pitting) were combined with more advanced techniques (terrestrial LiDAR scanning, Electrical Resistivity Tomography [ERT], Ground Probing Radar [GPR] and Panda penetrometer traverses) to characterise the landscape and its components.

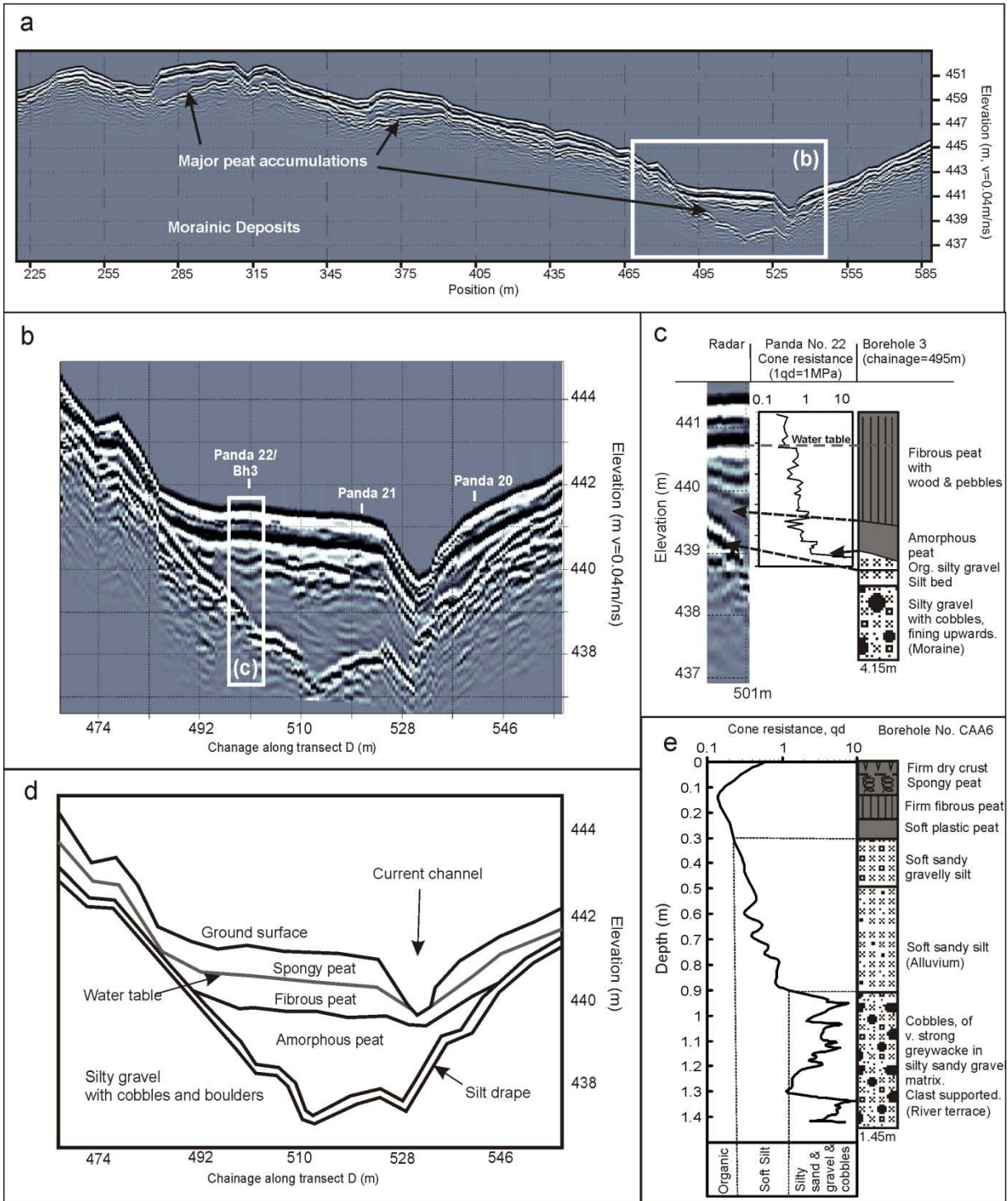
The data from this integrated field methodology was combined within 3D modelling software, enabling holistic representation of Quaternary landforms and sediments from a remote upland area for which little previous data existed. These are detailed in Scheib *et. al.*, (2008).

Associated with the moraines are small areas of glaciofluvial deposits on the pass. These form relatively flat areas of outwash sand and gravels. The solifluction deposits are composed primarily of frost shattered material, but incorporating some till, and now support a thin covering of modern soil. Small areas of blockfield close to areas of exposed bedrock forming the mountain summits. The deposits are composed entirely of angular to sub-angular clasts of greywacke. Some small areas of inactive talus exist on the valley sides of the Talla Water, found below bedrock exposures, and composed of angular clasts up to 10cm in diameter. These are likely to be paraglacial in origin, with some reactivation during Holocene cold episodes. Features associated with fluvial activity reflect the small size of the Talla Burn, with relatively narrow terraces, composed primarily of cobbles and pebbles, and the modern floodplain similarly floored with coarse material, or bedrock in the uppermost and lowermost reaches.



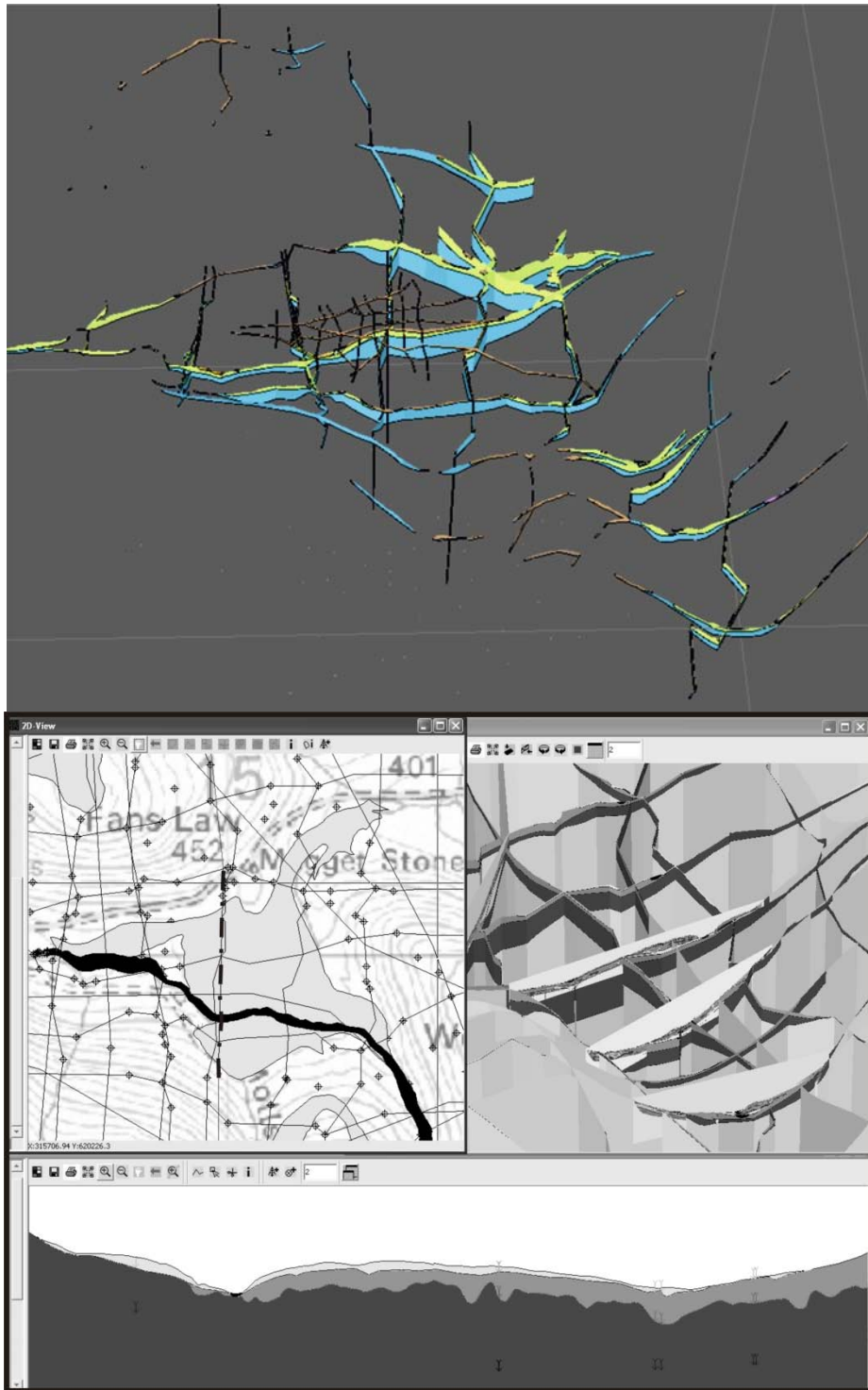
Geological map of the superficial deposits of the site. * Features that occur in areas adjacent to the Observatory Site

An example of combination of techniques used to investigate the Quaternary deposits in 3D.



Correlation of GPR, penetrometer measurements, trial pitting and drilling to produce a cross section through the concealed units on the valley floor. This type of data eventually was combined to produce a 3D model of the site using the GSI3D modelling package.

Upper image shows fence correlation of Quaternary units viewed looking towards the north west;
Lower image shows fence of basin infill and form of rockhead on a south-north transect.



The site is now being used to monitor environmental changes, notably establishing lag times in the shallow water cycle, between precipitation events, shallow groundwater movements, stream flow shallow groundwater movements.

Reference: Scheib, A., Arkley, S., Auton, C., Boon, D., Everest, J., Kuras, O., Pearson, S., Raines, M. and Williams, J. 2008. Multidisciplinary characterisation and modelling a small upland catchment in Scotland. *Questiones Geographicae*, 27, A/2, 45-62