The digital approach to understanding the Quaternary evolution of the Vale of York, UK

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Introduction

During the Devensian glaciation, the Vale of York was glaciated with ice moving southwards and ploughing into a large proglacial lake (Eake Moraine) impounded by North Sea ice blocking the Humber Gap. Laminated clay forming the Hengesthurst Glaciolacustrine Formation were deposited here. The ice then overrode the lake deposits forming a terminal moraine at Escrick which is now confirmed as the last glacial maximum limit (LGM).

The ice then wasted back forming another moraine complex of York, then others further to the north-west. Longitudinal drainage routes in the ice resulted in linear eskers belts and the impounding of proglacial meltwater resulted in several glacial lakes in front, between and behind the moraines. The lithostratigraphy of these superficial deposits is shown to the right and the geometrical relationship below right.

Datasets and interpretation

Detailed GSI3D borehole interpretations and 3D models for the area around York and Doncaster showing the Quaternary deposits of the Vale of York. More than 600 detailed boreholes were used to construct the sections using G3IED. This software utilises the digital elevation model, geological surface framework and borehole data to enable the geologist to construct regularly spaced intersecting fence diagrams. Mathematical interpolation between the nodes of the sections and the unit boundaries produces a solid model composed of stacked triangulated objects representing the geological units.

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Conclusions

By combining 3D data from thousands of boreholes with detailed geological mapping and by utilising DEM interpretations we have a new understanding of the Quaternary geology of the Vale of York.

We conclude that the last glacial maximum (LGM) limit of the Devensian ice was at the Escrick Moraine. No evidence of glacial till deposits has been found in the proglacial lake deposits to the south. The survey has given new insight into the glacial and pro-glacial processes that affected this area during the Devensian glaciation.