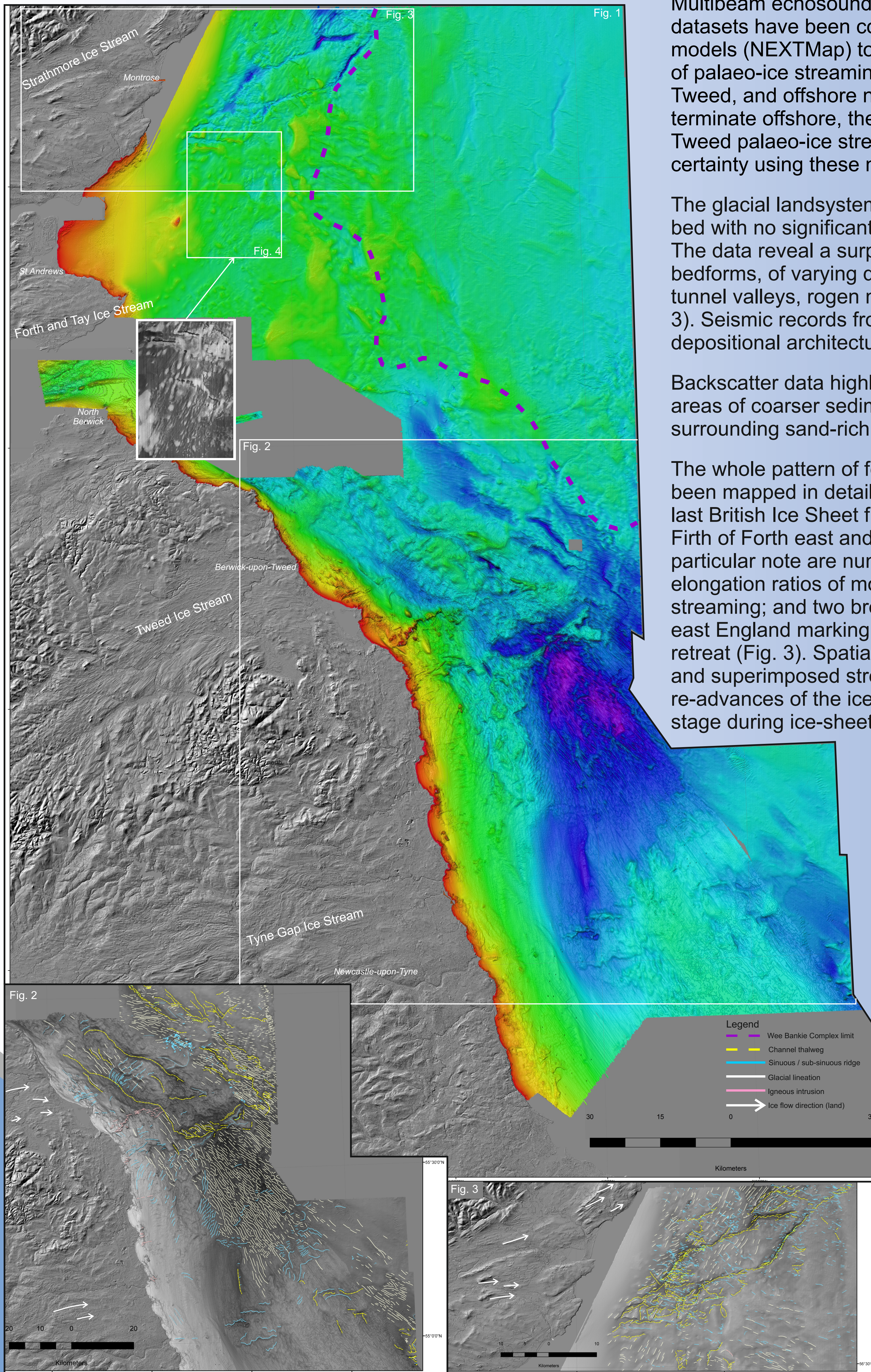


Ice streaming and ice-sheet re-advances in SE Scotland and NE England: new evidence from multibeam echosounder data

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Multibeam echosounder and other 'best available' bathymetry datasets have been combined with high-resolution digital surface models (NEXTMap) to reveal strong onshore-offshore evidence of palaeo-ice streaming in the catchments of the Forth and the Tweed, and offshore north-east England. Long suspected to terminate offshore, the flow path and dimensions of the Forth and Tweed palaeo-ice streams can now be reconstructed with some certainty using these new data (Fig. 1).

The glacial landsystem is extremely well preserved on the sea bed with no significant burial by modern sediments (Fig. 2 and 3). The data reveal a surprising number of moraines and streamlined bedforms, of varying dimensions; along with meltwater channels, tunnel valleys, rogen moraines and possible eskers (Fig. 2 and 3). Seismic records from the region confirm the erosional and depositional architecture of these glacial features.

Backscatter data highlight features such as drumlins (Fig. 4) as areas of coarser sediments easily distinguishable from the surrounding sand-rich sea bed.

The whole pattern of features, covering around 10,000 km², has been mapped in detail and charts a fast-flowing corridor of the last British Ice Sheet from the Scottish Central Lowlands and Firth of Forth east and south-east into the North Sea Basin. Of particular note are numerous highly elongate bedforms, with elongation ratios of more than 10:1, strongly suggestive of ice streaming; and two broad arcuate morainic belts offshore north-east England marking frontal positions of the ice sheet during retreat (Fig. 3). Spatial relationships between the moraine belts and superimposed streamlined bedforms indicate considerable re-advances of the ice margin in this area, possibly at a late stage during ice-sheet deglaciation.

Wee Bankie Moraine Complex

The Wee Bankie Moraine Complex was considered to be the maximum extent of late Weichselian grounded ice. this limit is represented here as a dashed purple line (Fig. 1). New evidence suggest the Wee Bankie may instead represent a glacial still-stand.

Fig. 1) Overview of the study area showing available elevation data used during this project. Maximum water depths within the study area are 113m below sea level.

Fig. 2) Inset map of southern section of study area showing geomorphological interpretation. See Fig. 1 for location and legend.

Fig. 3) Inset map of northern section of study area showing geomorphological interpretation. See Fig. 1 for location and legend.

Fig. 4) Inset map showing backscatter data over an area of drumlins and ice-streaming features sometimes called 'mega-scale glacial lineations'.

NEXTMap Britain elevation data is from Intermap Technologies.

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