Geophysical Research Abstracts
Vol. 15, EGU2013-5178, 2013
EGU General Assembly 2013

Large Glacitectonic structures on the Dogger Bank, southern North Sea; Implications for glacial dynamics, glacial limits, and interplay between the British and Fennoscandinavian Ice Sheets

Dayton Dove (1), Carol Cotterill (1), Dave Long (1), Astrid Ruiter (1,2), Emrys Phillips (1), Leo James (3), and Carl Fredrik Forsberg (4)

(1) British Geological Survey, United Kingdom (dayt@bgs.ac.uk), (2) Queen Mary, University of London, UK, (3) RPS Energy, Woking, UK, (4) Norwegian Geotechnical Institute, Oslo, Norway

Recently acquired 2D seismic data (sparker) acquired over the Dogger Bank (DB) reveal large glacitectonic structures associated with late-Pleistocene glacial incursion into the southern North Sea. The densely populated survey data (100m line spacing) collected for the purposes of offshore windfarm development on the DB, allow for pseudo-3D interpretation. The sparker data show discrete thrust faults extending from within ∼5 m of the seabed to ∼200 m depth, and consistently terminate at one of two décollement surfaces. Preliminary mapping and amplitude extraction maps reveal the thrusts to occur in a series of thrust blocks (5-8 faults), with each set encompassing an area of approximately 6 km along-strike and 2 km at right angles. The overall zone of thrusting is up to 16 x 6 km on the western edge of the DB. The strike of the faults indicates ice-flow from the west. Other deformation structures include: open, recumbent, and fault propagation folds, as well as back thrusts, and pop-up structures.

The relief of the DB (dimensions) is entirely accounted for by what has historically been termed the 'DB Formation'. These new data reveal that this seismostratigraphic unit likely consists of deposits from a variety of glacially influenced depositional regimes. The observed thrusts penetrate through the 'DB formation', indicating this phase of intense deformation post-dated the initial construction of the bank. Less pronounced glacial deformation affects much of the rest of the DB, and the products of this deformation (push-moraine complexes?) were possibly integral to the construction of the bank itself. While the style and fabric (NS?) of this deformation is less clear, it is likely there were multiple incursions of glacial ice, from different directions (and sources?), into this area where late-Pleistocene glaciation limits are poorly understood.

Several mechanisms for forming such glacitectonic features have been proposed, and the thrust blocks here may have been caused by sub-glacial (gravitational spreading), ice-marginal (push-moraine complex), or pro-glacial (ice-push) processes, or a combination of the three at an oscillating ice-margin. The thrusts appear to have no surface expression, suggesting the topography was removed either by late-stage glacial erosion or Holocene marine transgression.

Work to date on the paleoenvironmental implications of the data has been preliminary. The exact style, pattern, and timing glacial deformation (and associated sedimentation) on the Dogger Bank and circum-southern North Sea, and glacial history of the region, will be the focus of a Ph.D studentship which commenced Sept. 2012.