Geophysical Research Abstracts
Vol. 15, EGU2013-1290, 2013
EGU General Assembly 2013
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Basement-controlled multiple slope collapses, Rockall Bank Slide Complex, NE Atlantic

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The Rockall Bank is a structural high forming the steep western margin of the Rockall Trough in the NE Atlantic, west of Ireland. The eastern flank of the Rockall Bank is dominated by the scarps of a large slide complex, the Rockall Bank Slide Complex (RBSC), with unusually low aspect ratio (120 km wide and 150 km long). Cross-cutting scarps and overlapping depositional lobes suggest a long history of slope instability. Strong ocean currents sweeping this margin are considered to have contributed to this extensive slope failure.

With the use of 2D vintage seismic, high-resolution multibeam bathymetry, a TOBI mosaic and one piston core we demonstrate that the escarpment may be the product of multiple slope collapses. A systematic examination of the dataset demonstrates a direct relationship between the RBSC seafloor scarps and the basement morphology. Reconstructions of the pre-slide seafloor suggest a volume of collapsed sediments in the range of 265 -765 km3. Seismic facies investigation indicates that the slope and failed sediments comprise almost exclusively contourites that are well known to be prone to failure.

At least three episodes of instability since 16ka BP are identified through detailed analysis of the seismic and bathymetric data. Each individual event generated a slide with a more typical elongate morphology and a higher aspect ratio than the overall slide complex. A fourth episode is also observed which is either an abandoned slope collapse or currently taking place.

This study 1) highlights the importance of deeply-buried structures in the stability of slopes, 2) shows how detailed analyses across large areas of slope instability can reveal smaller-scale multiple events, and 3) demonstrates that where contour-swept slopes are steep, the resulting intensification of near-bottom velocities prevents healing slope processes and as a result steep slopes remain steep and thus unstable.