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Preconditioning factors for the unstable eastern Rockall Bank slope, NE Atlantic

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This work explores the preconditioning factors that render the eastern slope of the Rockall Bank particularly unstable and thus have led to multiple slope collapses in the last 25 ka. Rockall Bank is a steep-margined structural high in the NE Atlantic, west of Ireland, separated from the Irish and British continental slopes by the 3000 m deep Rockall Trough. The eastern slope of Rockall Bank is characterised by a large number of landslide scars and mass flow deposits, collectively known as the Rockall Bank Slide Complex (RBSC). The seafloor morphology currently seen on the Rockall Bank slope is the cumulative result of multiple phases of slope collapse that were distinct, separate events. This indicates that the eastern flank of Rockall Bank is preconditioned to instability for reasons that will be explored in this study.

Rockall Trough is dominated by bottom currents that flow in an anticlockwise direction, entering the Trough in the south, flowing along the Irish margin towards the north, before turning towards the southwest as a result of its interaction with the local topography, impinging on Rockall Bank and creating sediment wave fields and large contourite drifts. Georgiopoulou et al. [1] and Elliott et al. [2] have shown that these bottom currents have been crucially responsible for the multiple slope collapses of the RBSC, through differential sedimentation and localised erosion. However, the physical properties and mechanical characteristics of the sediments deposited by these bottom currents have not been examined before in the context of preconditioning the slope for instability.

During research cruise CE14011 on the research vessel Celtic Explorer, a number of gravity cores and Remotely Operated Vehicle (ROV) push cores were collected. Here we report on the grain size properties, water content and shear strength of the sediments making up the slope in the RBSC area and consider their role in preconditioning the slope for recurrent failure. With multiple C14 dates we are now able to establish the sedimentation rates and show how highly variable sedimentation rates across a relatively narrow region can be when the region is affected by bottom current activity. To our knowledge, this is the first time such a large number of cores from a single slide complex have been so intensively studied in considering the predisposition of slope to recurrent collapses, much like it is done to assess the hazard potential in terrestrial landslides.

References:

[1] Georgiopoulou et al. (2013) Mar Geol (336): 198-214

[2] Elliott et al. (2010) Mar Petr Geol (27):92-107