



Modelling dense water cascading at Rockall Bank

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Rockall Bank is a large bank located in the subpolar region of the northeast Atlantic, approximately 600km off the coast of Scotland, which is separated from the European shelf by the Rockall Trough. The topography in this area is steep, particularly at the south-eastern edge of the Bank where water depth drops relatively quickly from 100m or less to more than 2000m.

Winter convection in the area can reach a depth of 600m, which is deeper than much of Rockall Bank. This causes the water column over the bank to become cooler than the surrounding deeper water, leading to the formation of a 'cold water patch' over the bank which persists approximately from November to April (Shapiro et al, 2003). This water is known to leave the Bank as a dense water cascade (Ivanov et al, 2004).

This study is using POLCOMS to model Rockall Bank under a variety of scenarios in order to investigate this cascading. POLCOMS is a three-dimensional baroclinic model that is well suited to modelling areas with steep bottom topography.

The results indicate that when the model is initialised with a homogeneous temperature distribution the heat flux between the air and ocean is sufficient to create favourable conditions for cascading and intermittent plumes of dense water can be seen moving down the slope. However, when a more realistic water temperature distribution was modelled the 'cold water patch' is formed but the density difference was not great enough to allow the water to escape from the bank. This is likely to be due to the absence of wind mixing as well as the fact that the year modelled (winter 2001 - spring 2002) was relatively warm.

Current work is looking at the effect that climatic conditions such as air temperature

and wind speed have on the formation of cool water at Rockall Bank and whether cascading can occur.

Ivanov VV, Shapiro GI, Huthnance JM, et al, 2004. Cascades of dense water around the world ocean. *Progress In Oceanography*, 60 (1): 47-98 2004

Shapiro GI, Huthnance JM, Ivanov VV, 2003. Dense water cascading off the continental shelf. *J.Geophysical Research-Oceans*,108 (C12): Art. No. 3390