



Cold water formation over Rockall Bank: A view from space

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Rockall Bank is a large bank situated in the northeast Atlantic approximately 600km off the coast of Scotland and, along with the adjacent Hatton Bank, is separated from the European shelf by the Rockall Trough. It is very shallow in places (typically 100-150 m), and rises above the sea surface at Rockall rock itself. Away from the bank the seabed slopes down to more than 1500m making a particularly steep slope at the southeastern edge of the bank.

Winter convection in the area can reach a depth of 600m, which is deeper than much of Rockall Bank. As a result, the water cools to a lower temperature than in the surrounding deep areas that leads to the formation over Rockall Bank of a “cold water patch” (Shapiro et al, 2003). This water, which is formed from around November-April leaves the Bank as a dense water cascade (Ivanov et al, 2004).

As the cold water patch is formed due to air-sea interaction, it is likely to give a surface signature, so satellite sea surface temperature (SST) data were analysed in order to determine if it could be seen using remote sensing. The data used were weekly (8-day) and monthly AVHRR SST composites and daily Microwave OI (Optimally Interpolated) SST for the relevant months obtained from NASA JPL and REMSS respectively.

The AVHRR data are affected by cloud cover and are therefore patchy in their coverage, however in composites where part or all of Rockall Bank can be seen there is a clear temperature difference. The cold water may be seen in both the weekly and monthly data, however the weekly AVHRR composites are more obscured by cloud. Day and night data were analysed separately, but no significant difference could be seen in the strength of the temperature signal.

Unlike the AVHRR, Microwave OI data are unaffected by cloud cover but do have a reduced spatial resolution. The cold water patch can also be clearly seen in many of the Microwave OI data. However, with the shorter time scale (daily) compared to the AVHRR data (weekly and monthly), this surface temperature difference is more variable.

In both data sets, the temperature is clearly linked to the topography, particularly at the southeastern boundary of the bank. The colder patch is 1-2 deg C cooler than the surface water adjacent to it, over the Rockall Trough, and tends to be seen within the area which corresponds to the 500m depth contour. The size of the patch on the surface varies, but is of the order of 100-200km across.

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References.

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