

Short Communication

A CONTINUOUS SEISMIC SECTION ACROSS THE CONTINENTAL SLOPE OFF IRELAND

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SUMMARY

Continuous seismic reflection data show that there are no unconsolidated sediments on the outer part of the Irish continental shelf west of Donegal Bay and on the upper part of the slope. Both the “basement” and the sediment cover on the lower part of the slope are heavily intersected, presumably by faults.

During trials with a newly built air gun profiler (EWING and ZAUNERE, 1964) on board H.N.M.S. “Onvervaard” in June 1966, a continuous seismic section has been obtained across the Irish continental shelf and slope West of Donegal Bay at $54^{\circ} 40' \text{ N}$ (Fig.1; bathymetry after HILL, 1956). Due to technical imperfections the penetration was not yet maximal. Still, some interesting features were revealed.

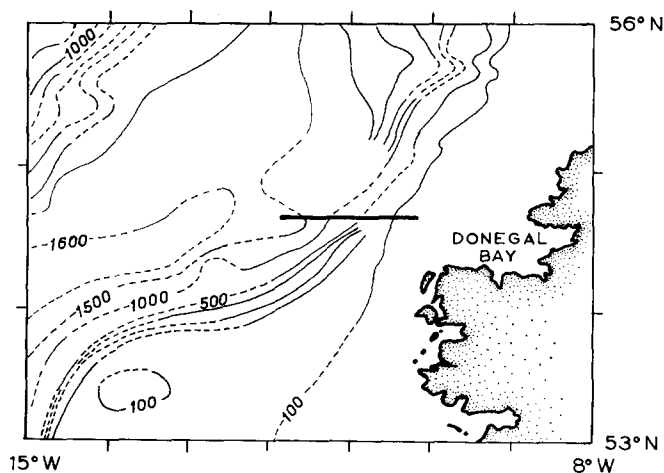


Fig.1. Situation sketch (bathymetry after HILL, 1956).

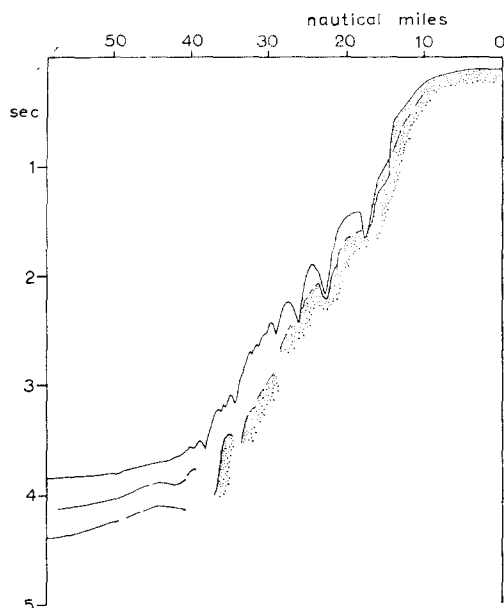


Fig.2. The seismic section. The coordinates of point 0 are $54^{\circ} 40' \text{N } 10^{\circ} 15' \text{W}$.

Fig.2 is a reproduction of the section. The vertical scale is a time scale. With a sound velocity in water of 1,500 m/sec, one second represents 750 m water depth. The velocity in unconsolidated sediments is higher, of the order of 1,800–2,000 m/sec for the first few hundreds of meters, which means that one second represents 900–1,000 m of sediment. The ship's speed was 8 knots. The resulting vertical exaggeration is approximately thirty times.

Compared with other sections across continental slopes, there are two remarkable features. First, no unconsolidated sediments have been detected on the shelf and on the slope to a depth of ca. 1,000 m, the resolution of the instrumentation being of the order of 40 m. This can be inferred from the incoherent character of the reflected signal and from the lack of penetration. The second echo at 10–17 miles has the same character as the bottom echo, being probably a side echo.

The second noteworthy feature is the ruggedness of the slope itself. Both the sediment cover and the basement (stippled in Fig.2) are heavily indented. Since the direction and the general pattern of these indentations are not known, their nature cannot yet be established. The only certain conclusion can be that the basement furrows are not the result of recent erosion, as the relief is partly covered (from 22 to 25 miles) by unconsolidated sediments. It is further difficult to imagine that ocean currents are strong enough to erode consolidated rock. Turbidity currents would require a higher situated source area, which cannot be placed very well. We therefore favour the solution that we are dealing with faulting. Detailed surveying could confirm this view. The younger sediments do not form a layer of equal thickness on

the basement nor smooth out the basement relief. In fact they seem to accentuate the basement relief in places. No explanation can be offered for this feature. On the lower part of the slope (from 30 miles onward) one further sees the effect of slumping. It is here that the contact with basement was lost. The slope has an overall gradient of 1 : 20 and then passes into the oceanic basin between Ireland and Rockall Bank. The subbottom reflector at about 0.5 sec depth under the basin (slope 1 : 800) is sedimentary.

It would be worth-while to investigate whether the absence of sediments on the shelf and part of the slope, and the dissected character of the latter are more general features in the northern part of the North Atlantic. If so, this could be related to the remarkable geomorphological phenomenon that the ocean here is surrounded by relatively high, uplifted coasts, sloping away from the ocean, as first noticed by HOLTEDAHL (1953). This again might be related to the abundant production of basalt in this part of the North Atlantic Ocean, to which Iceland and possibly also the oceanic ridges from Iceland towards Norway and Greenland bear witness. Speaking in terms of continental drift and mantle convection currents, the abundancy of basalt might be seen in connection with the circumstance that the Atlantic Ocean is narrowing towards the North, thus confining within a relatively small area the basaltic segregation products of a mantle convection cell that normally are spread out over a large area.

ACKNOWLEDGEMENTS

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