

Second annual report on grant GR3/1954

Introduction

The grant was awarded to support investigations of continental margins and anomalous oceanic regions of the north-eastern North Atlantic between Scotland and East Greenland. During 1973, the first year of the grant, a substantial amount of new data was obtained on cruise 5/73 of RRS Shackleton and this is now being evaluated and interpreted. During 1974 further data on the East Greenland margin and west Rockall margin was obtained on RRS Shackleton cruise 3/74, but because of a week's delay at the start and bad weather at the end of the cruise, the objective of working in the Denmark Strait region remains unfulfilled.

Cruise 3/74 of RRS Shackleton

RRS Shackleton sailed from Barry on 7 August 1974 and arrived back at Barry at the end of the cruise on 11 September, a total duration of five weeks. The original sailing date was postponed for a day because of late arrival of the flexotir array. Two days after sailing it was necessary to return to Greenock for repair to the flexotir array drum shaft, and a day after sailing again it was necessary to put back into Oban to land the Captain who had developed pneumonia and to obtain a replacement. Consequently the first week of the cruise was lost, which meant that the research programme had to be substantially curtailed because of the long passage time involved in working off East Greenland.

It was originally intended to devote the first half of the cruise to extending our coverage of the East Greenland margin south of the 1973 area, and the second half to investigating the Denmark Strait region, with an intervening call at Julianehab (Reykjavik was avoided on advice of the Foreign Office). As a result of the delay the call at Julianehab was put back a few days. This meant

that we had only about half the planned time working on the southern part of the East Greenland margin, but good results were obtained on a few days series of gravity, magnetic and seismic profiles across this margin between 60° and 65° N. During the second leg of the cruise, exceptionally bad weather developed at the time the Denmark Strait region was reached and there was insufficient time left to make it worth waiting for improved conditions. Consequently this part of the investigations had to be abandoned for 1974, and the last few days of the cruise were used to study the continental margin west of Rockall as the weather conditions allowed.

Thus the original plans for the cruise had to be considerably modified because of delays and bad weather. However, where conditions permitted, full use of the available time was made and good results were obtained. A copy of the cruise report accompanies this report, and the ship tracks are shown in Figs. 1 and 2.

Interpretation of results

The results obtained during the 1973 cruise have been processed and interpreted during the year. Mr. J.E. Lewis, a third year NERC supported research student, has been working on results from the region between Faeroe Islands and Rockall Bank. Excellent seismic reflection data was obtained in this region and this has made it possible to delineate the extent and depth of reflector R and to study the underlying and overlying sediments of contrasting type in some detail. The underlying basement and crustal structure is being studied using the gravity and magnetic results. The relationships of the sediments to the shallow banks and to the continental margin west of the Faeroe-Rockall Plateau are of particular interest.

Mr. P.S. Featherstone, a second year NERC supported research student, is working on the results from the East Greenland margin obtained during the 1973 and 1974 cruises. The seismic reflection

results obtained are of great interest, as they show that the normal oceanic sediments younger than magnetic anomaly 24 (60 My about) appear to lie unconformably on an older sequence of sediments on the continental rise. These older sediments form the scarp of the margin. They themselves appear to overlies a sequence of seaward dipping reflectors which extend out to the beginning of magnetic anomaly 24. Thus there appears to be either a much earlier period of ocean floor spreading represented here, or alternatively there has been a substantial subsidence of continental crust. In either case the margin is highly unusual.

The sono-buoy system for obtaining wide-angle reflection and refraction results has been particularly useful in both the East Greenland and Faeroe-Rockall regions in giving velocities of the deeper sediments. Mr. C.D.T. Walker, a third year research student supported by a Northern Ireland government grant has been working on this aspect, and his observational work has been complemented by a theoretical study of the pattern of wide angle reflection amplitudes and their use in determining density.

Publications

As yet there have been no publications on results obtained during the 1973 and 1974 cruises, but a preliminary paper on the sediment and deep structure of the East Greenland margin is now being prepared, possibly for submission to Nature. The Ph.D. theses of Mr. Lewis and Mr. Walker are expected to be submitted in autumn 1975.

Future plans

During summer 1975 the ship-time will be used in connection with the Hebridean Margin Seismic Experiment, for which a supplementary grant was awarded. Because of our inability to obtain results from the critical Denmark Strait region in 1973 or 1974, I have requested an extension of the grant to cover a further requested cruise to the region in 1976.

M.H.P. Bott
 Department of Geological Sciences
 University of Durham.