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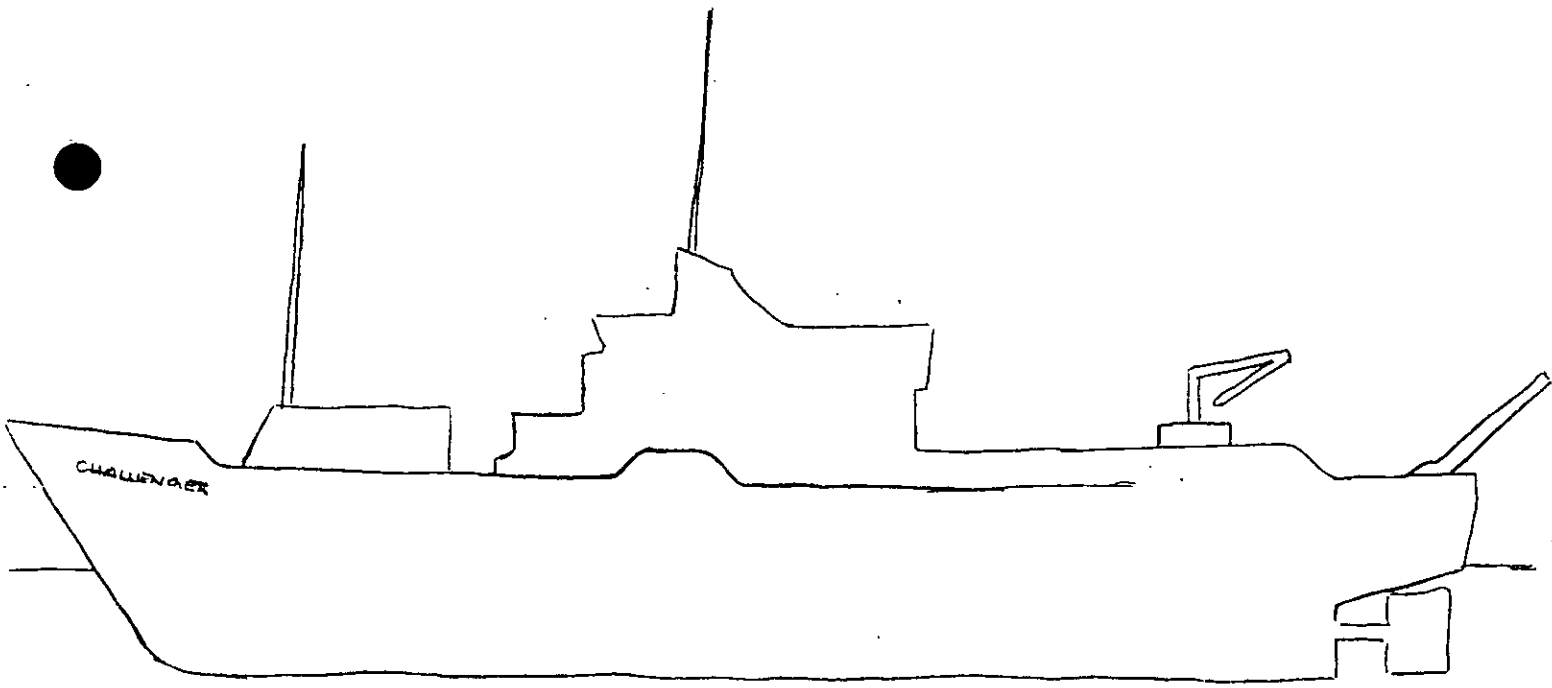
UNIVERSITY OF EDINBURGH

Department of Geology



Report on Cruise 1/84 of RRS CHALLENGER

6-20 June, 1984

REPORT ON CRUISE 1/84 OF RRS CHALLENGER

6-20 June 1984

Scientific Objectives

The broad objective was to complete geophysical data collection for a project on the geological evolution of southern Rockall Trough. With existing Edinburgh gravity, magnetic and seismic reflection data and seismic reflection data from the Institute of Oceanographic Sciences profile coverage of the area was quite comprehensive on a regional basis. Specific objectives were:

1) to obtain two new cross-trough lines to infill data gaps and to provide more continuous profiles from one trough margin to the other,

2) to acquire a seismic profile through IPOD site 610,

3) to improve gravity and seismic reflection coverage on the western flank of southern Rockall Trough,

4) to examine in detail with box surveys two small areas on opposite sides of the trough where matching, correlateable geological structures might be present.

Analogue seismic reflection profiling, gravity, magnetic and bathymetric recording were to be used throughout.

An additional objective was to test lay and shoot at a new Cambridge University instrument, PUMA (Pull Up Multichannel Array). Two 12 hour periods were set aside for this.

Scientific Personnel

R.A. Scrutton	(Edinburgh University)	P.S.O.
P.A.D Bentley	(" ")	
M.C. Sinha	(Cambridge University)	
C. Powell	(" ")	
P. Carter	(" ")	
A. Cumming	(RVS, Barry)	
M. Beney	(" ")	
J. Strangeward	(" ")	
D. Booth	(" ")	
M. Geogehegan	(Geological Survey of Ireland)	

Narrative

CHALLENGER was due to sail from Falmouth at 0800, 6 June but an oil leak on the overhauled gearbox and overdue trials on a new boiler following refit delayed sailing until 2400, 8 June. The cruise dates were extended to 21 June to compensate a little for this. The ship arrived at the first possible test site for the PUMA, north of the Scillies, in the morning of 9 June but thick fog prevented deployment. Course was therefore set for the surveying starting point on Porcupine Bank west of Ireland. Trials on most of the seismic equipment took place en route. During this time weather conditions deteriorated slightly to force 4-5.

Geophysical surveying began in the morning of 11 June with PES, gravimeter, magnetometer, and seismic profiling using a 3 channel hydrophone array, two $40in^3$ airguns, 3 EPC recorders operating at different frequencies and an analogue tape recorder. As severe tangling affected the hoses and leads to the two $40in^3$ airguns they were replaced by a single $160in^3$ gun. This improved seismic penetration but there was a slight loss of resolution and a drop in firing rate from 16s to 24s. This was unfortunate since a higher resolution record was sought through IPOD site 610.

Recording continued smoothly until early morning of 12 June, by which time weather conditions had deteriorated to gale force and the ship was rolling very heavily. Then the ship's engine stopped and as the ship started drifting towed equipment had to be recovered. The engine was restarted within half an hour but surveying was suspended until weather conditions improved.

Surveying recommenced early in the afternoon of 12 June. Apart from a brief break because of another engine failure and the use of a $160in^3$ airgun with a wave-shape kit on part of one line and the two $40in^3$ guns on another, profiling continued until 18 June. The wave-shape kit produced a sharp record although penetration was much reduced. Throughout this period frontal weather conditions, misty and breezy, prevailed. LORAN proved to be an essential navigation aid during the box survey at 54°-54½°N.

On completion of surveying course was set for a site south of Blackstones Bank where PUMA trials could take place. These began early in the morning of 20 June in force 4 weather conditions that worsened to force 6 during the trials. Launching the array was straight forward, but recovery, with the ship trying to go astern, proved difficult - the array effectively acted as an anchor as the hydrophone winch pulled the ship backwards. About 5 hours was spent airgunning at the array.

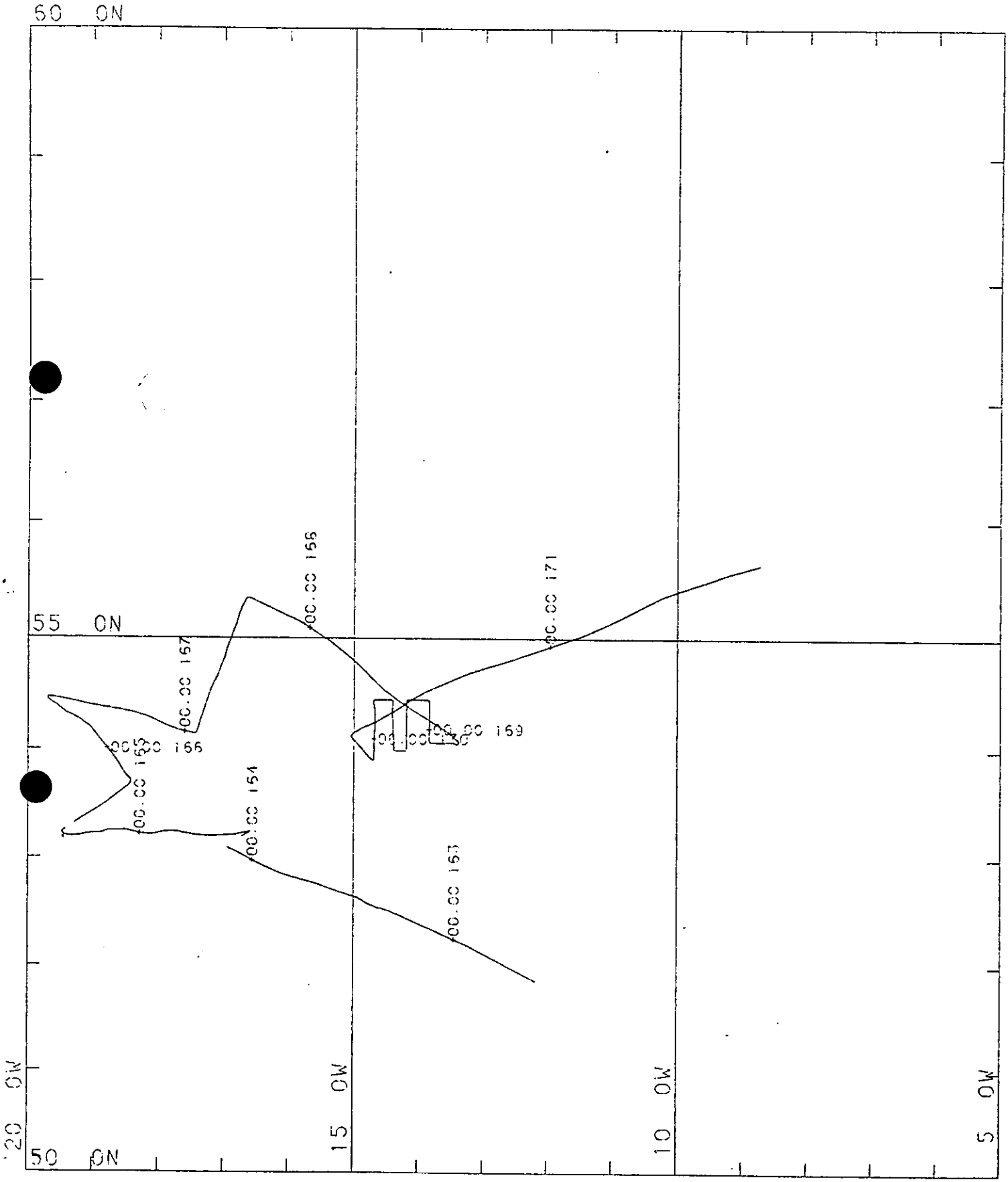
At 1600 the ship was underway for Ardrossan where it docked at 0800 on 21 June.

Results

Most of the cruise objectives were met. 1450 km of geophysical data were collected; the western box survey was not carried out through lack of time. Data quality was fair to good, the seismic reflection data being affected by occasional poor weather and the lack of a large enough compressor to maintain an ideal 16s firing rate with a large air gun. Cross-over errors in the gravity data, both internal and external to the survey, were in the region of 1 to 2 mGal but magnetic anomaly differences at crossing points were a few tens of nT suggesting heading errors in the data. All navigation, gravity and magnetic data were digitally logged at 1s intervals and bathymetry at 10m intervals, processed, plotted and listed in interpretable form before the cruise finished.

Several major fault scarps and some graben structures were observed on seismic reflection records on the trough flanks. The combined seismic and magnetic data confirmed that the major magnetic anomalies in the trough are due to magnetisation contrasts deep in the crust and gravity data confirmed the presence of a major circular positive anomaly in the west-central part of the southern trough.

In the PUMA trials the instrument had run and recorded on all twelve channels, but the tape cycling sequence had been reset accidently at launching so no airgun shots were recorded. Noise levels on the instrument appeared acceptable.



CHALLENGER CRUISE 1/84

PVS MERCATOR PROJECTION 20:46:02 20-JUN-84

SCALE 1 TO 4600000. (NATURAL SCALE AT LAT. 57.0) PLOT NO 55

INTERNATIONAL SPHEROID PROJECTED AT LATITUDE 0.0N