End-778

Cruise Report Endurance 1977-8

1. Introduction

The work undertaken during the first work period of the 1977-8 season for the University of Birmingham is part of a continuing geophysical study of the Scotia Sea, undertaken by the Antarctic Marine group in the Department of Geological Sciences. It followed on directly from the similar survey undertaken last season, again being a bathymetric and magnetometer survey of a selected area, plus passage measurements where useful. The aim of the survey was to establish whether the ocean floor in the selected area had identical structure to that surveyed in the previous season. Analysis of the results from 1976-7 had led to the development of a geological model of the area predicting this similarity, hence the results of this survey would test the geological model.

2. Narrative

HMS Endurance sailed from Port Stanley on 18th December to undertake hydrographic survey tasks in Choiseul Sound, then left for South Georgia on 21st December.

Magnetometer measurements were started at 1330 on the 22nd and data, including bathymetry, was collected on the passage to South Georgia. It was possible to make a diversion from the direct route in order to collect data in a previously unsurveyed area on the northern continental shelf of South Georgia. In this area a highly magnetic rock body was discovered, possibly indicating the presence of lavas or intrusive igneous rocks in an area thought to be composed of sandstones.

The Christmas period was spent in the South Georgia area with the Endurance flight undertaking aerial photographic work for D.O.S. and B.A.S. During ship passage between flying periods coastal passage sounding and magnetometer surveys were undertaken, mostly on the southern continental shelf in the area south and west of Annenkov Island.

On the afternoon of the 31st December the magnetometer was streamed for the passage to the South Sandwich Islands. The track was designed to cross the active oceanic spreading centre which divides the South Sandwich Islands from the Central Scotia

Sea. A good quality record was obtained across this region clearly showing a magnetic reversal anomaly sequence confirming the age of this spreading centre as 8 million years.

At the northern end of the South Sandwich Island arc, course was made to cross a volcanic centre charted at 15 fathoms depth by HMS Protector in 1963. To general surprise a minimum sounding of 670 metres was obtained. The ship steamed down the eastern side of the islands during the night of 1st/2nd January and the following day. Continuous passage bathymetry and magnetic measurements were recorded, as well as fixing the position of the islands by radar and visual fixes combined with Satnav data, and aerial photography to count for seal populations.

South of the islands a westward course was set to recross the South Sandwich oceanic spreading centre. On the way to this feature an unknown shoal bank at about 150 metres depth was discovered. After crossing the spreading centre the continuation of the track westwards was made impossible by the presence of pack ice and thick fog. The pack ice front was skirted to the north, with the ship stopping to drift overnight 3rd/4th January due to the concentration of ice and poor visibility. At the same time an apparent intermittent fault in the magnetometer occured (see Equipment Performance) and the instrument was off for a total of 23 hours for testing. For half of this time the ship was drifting, so no data was lost.

On reaching the primary survey area at 0100 5th January the survey had to be replanned to accommodate the weather and ice conditions as well as the restricted time available. This situation underlined the advantages of carrying the investigating scientist on board so that such survey modifications can be carried out to the best scientific advantage. The modified survey lines were steamed during the period 5th to 7th January, ending with a dog-leg track to the B.A.S. base at Signy Island, South Orkneys. A preliminary analysis of the data from this period suggests that despite the truncation of the survey, it may still provide enough information to test our ideas of the age of this part of the ocean floor. The track towards the South Orkney Islands

end 78

revealed that the 5,500 metre deep South Orkney Trench lies significantly further south than was previously thought from the previously available data.

The daylight hours of 8th January were spent at anchor off the B.A.S. base with shore leave for the ship's company and guided tours of the base led by the B.A.S. personnel. Details of the survey just completed were transmitted to colleagues aboard RRS Bransfield.

During the period 2000/7th to 2100/10th January on passage from Signy Island to Port Stanley the magnetometer was streamed and routine magnetic and bathymetric data collected. Unfortunately it was not possible, as originally planned, to make a substantial diversion from the direct track, but a minor diversion was made to avoid duplicating previous tracks and the data acquired, as with all passage data, will be useful in building up our general data coverage of the Scotia and Weddell Seas. The ship anchored in Port Stanley at 0900/11th.

3. Cruise Statistics:

Time from Choiseul Sound to Port Stanley	22 days
Time at anchor or alongside	3½ "
Other survey tasks	5 "
Magnetometer survey and passage time	13½ "
Magnetometer downtime	1 day

~5800 km

4. Equipment Performance

Magnetometer:

The magnetometer performed adequately, as last season, but was abnormally sensitive to the sensor tuning. In view of the report from the refit service at Taunton that it had performed normally there, the cause is probably ship-generated electrical noise. This view is supported by tests of noise levels made by the maintainers doing a major check-through of the system. The noise is probably a result of the condition and distribution of the ship's wiring and is practically an insoluble problem. Though the equipment performance is degraded below design levels, the data obtained is quite adequate for the type of survey undertaken.

The seal of the electrical connector to the towed sensor

of the ship's equipment failed and the connector had to be remade with the kit provided in the spares box. An electrical failure in one of the amplifier boards was corrected by replacement of the failed circuit board. An intermittent fault producing very erratic readings caused a major overhaul of the equipment but was eventually traced to an arcing flourescent tube in the Junior Rates' Dining Hall.

The new connectors fitted at the Quarter Deck connection point were trouble-free throughout the work.

Echo Sounder:

The precision depth recorder had no significant down-time and produced good records, the only problem being poor annotation of these. This problem could be eased by providing an automatic time-marking facility for the recorder.

Satellite Navigator:

This equipment developed a series of faults during the work period. While the fixes produced are perfectly acceptable for accuracy, the scarcity of successfully computed fixes during periods of the survey make the system barely adequate. The overriding problem is its dependence on continued manual tuning to obtain frequent good quality fixes.

5. Acknowledgements

I would like to thank Captain Wallis and the ship's company for their assistance throughout the work period. In particular the willing help and co-operation of Lt. Cdr. Banyard (hydrographer) and Lt. Foster (navigator) contributed greatly to the success of the survey.

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