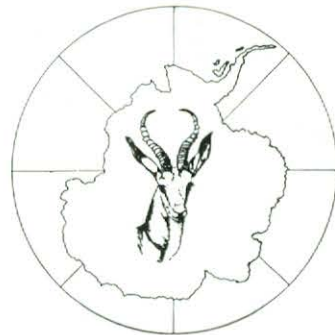




# ANTARKTIESE BULLETIN

Sponsored by—Onder beskerming van  
BP Southern Africa (Pty.) Ltd.



JULY  
to  
SEPTEMBER

Vol. 2  
1970 — No. 3

JULIE  
tot  
SEPTEMBER

Published by the South African Antarctic Association  
32 Park Avenue, Bordeaux, Randburg

Uitgee deur die Suid-Afrikaanse Antarktiese Vereniging  
Parklaan 32, Bordeaux, Randburg

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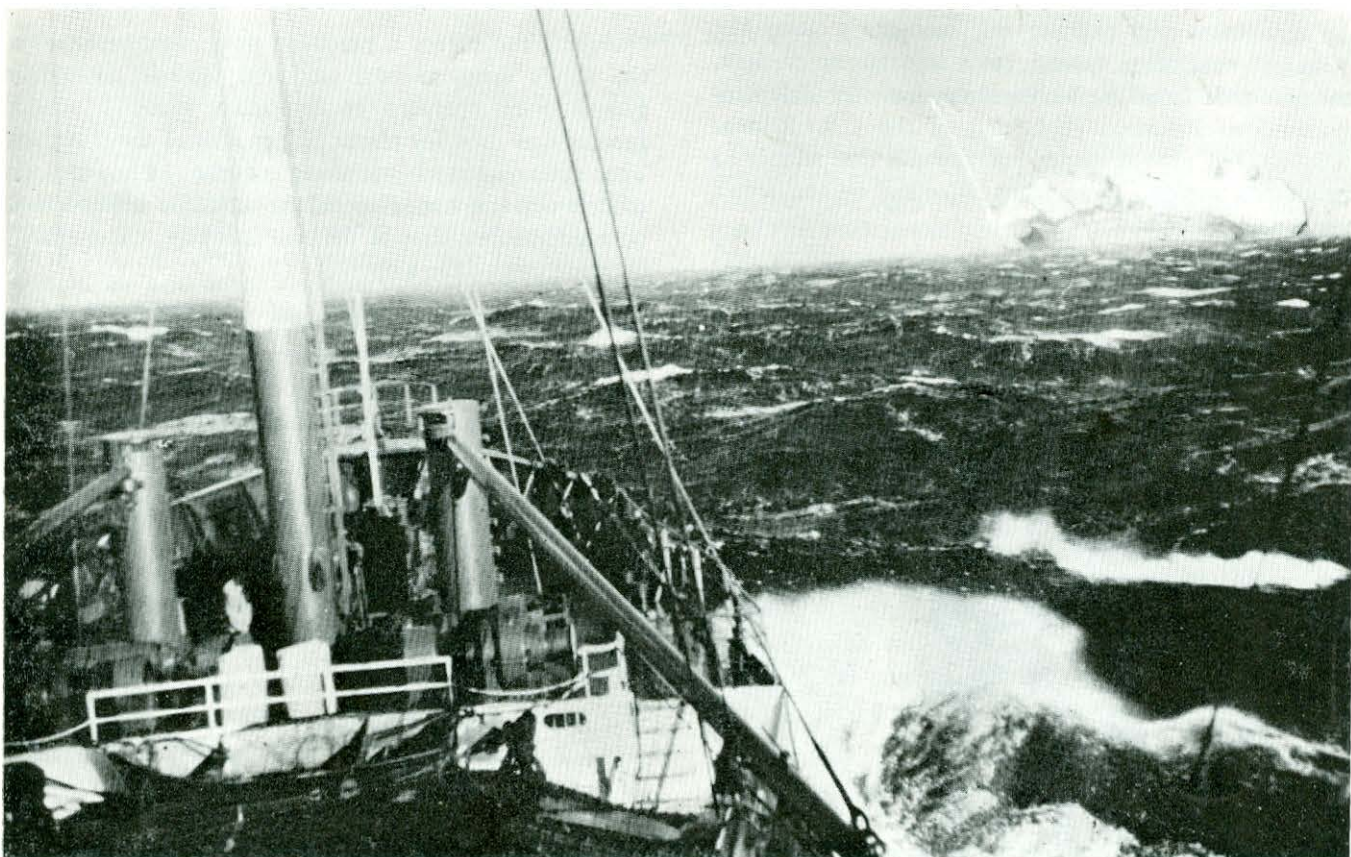
## MID-OCEAN RIDGE PROJECT

By P. A. VOLCKMAN (*National Institute for Telecommunications Research of the Council for Scientific and Industrial Research*)

The least known major section of the world-encircling ocean seismic ridge system is that of the south-west Indian Ocean ridge, and a knowledge of its development and present activity is essential to an understanding of the history of the southern continents and ocean basins.

For this reason a detailed bathymetric and magnetic

survey was carried out on a selected area of the ridge north-east of Marion Island. The survey was done during March/April, 1970 as an extension to the regular summer trip by the M.V. *R.S.A.* to Marion Island and was carried out as a joint project by the universities of Cape Town and the Witwatersrand, the major cost being borne by



*Op pad na Marioneiland.*

the South African National Committee for Oceanographic Research (SANCOR). The scientific team consisted of D. M. Barrett, Dr. H. W. Bergh, T. F. Dreyer, J. Engelbrecht, J. Hope and P. A. Volckman.

As with most undertakings one encounters difficulties of which we had our share, one of them being inadequate laboratory space on the *R.S.A.* which was designed mainly as a supply and not a research ship. This problem was overcome by making use of the helicopter hangar where a lattice of duck-boards was secured to the deck and work-benches fastened on top of this, providing a spacious, if not entirely weatherproof laboratory.

Sharing a fenced-off section of the laboratory were seventy chickens who were in for a new experience. They soon learnt that unless they stood up and compensated for the ship's roll, they would spend most of their time sliding about the straw-covered deck. To add to their confusion they were never quite sure whether it was day or night, as continuous monitoring of the instruments meant that the lights were permanently on. Having spent six days standing and trying to sleep, it was a weary bunch of chickens that arrived at Marion Island. We were not sorry to see them go as the laboratory was beginning to get that "farmyard smell", which was quite a shock to the system when coming on watch in the early hours of the morning.

The cruise to Marion Island gave us a chance to check the equipment and practice our navigation using the "Omega" navigation system. As a separate experiment, an ionosonde from the National Institute for Telecommunications Research (N.I.T.R.) of the C.S.I.R. was installed, but proved rather unsuccessful due mainly to unsuitable antenna dimensions afforded by the ship's structure.

After spending a couple of days at Marion Island discharging supplies and changing weather teams, we sailed north-east of Marion Island to the survey area of approximately 1.5 degrees square, the choice of which was based on existing geophysical knowledge and magnetic and bathymetric data obtained while passing through this area on the way to Marion Island.

The survey area was to be traversed along parallel lines separated by 5 miles, to an accuracy of 1 mile. To achieve this a continuous, all weather navigation system was required. The "Omega" V.L.F. navigation system was chosen, and as this was the first time that the system had been used in these regions, the N.I.T.R. assisted with the installation and operation of the system.

In order to obtain a position fix it is necessary to compare the phase of the V.L.F. transmissions from at

least two stations, with the phase of a rubidium standard on the ship. The stations monitored included the Omega transmissions at 13.6 kHz from Aldra (Norway), Forrestdport (New York) and Trinidad, and as a safeguard against loss of reception of more than two of these distant Omega stations, the non-Omega transmission at 22.3 kHz from Northwest Cape, Australia was also monitored. Although the Omega system will eventually provide world coverage with eight stations, the present four are only intended to cover most of the northern hemisphere. However, operated as a relative navigation system and by monitoring diurnal phase variations of the transmissions while at Marion Island, before and after the twelve days in the survey area, an accuracy of approximately 1 mile was achieved.

By giving the bridge updated position data every half hour, it was possible to keep fairly accurately to the preset course, despite severe weather conditions. Although the officers were at first rather sceptical of our box of flashing lights and insisted on taking celestial fixes when possible, they soon appreciated that our task would have been impossible without Omega.

During the twelve days in the survey area, continuously bad weather was experienced with several force ten to eleven gales which was made worse by the ship's rolling characteristics and the traverses which were very nearly parallel to the waves.

During the survey a precision proton magnetometer, the ship's echo sounder and the Omega navigation system were operated continuously, while a seismic profiler was used for about 50 per cent of the traverses. The enthusiastic co-operation of the team, captain, officers and crew enabled all the scientific objectives to be accomplished despite the continuously severe rolling and pitching of the ship.

In the scientific log, mention is made of the poor functioning of the Mufax recorder, due to "a heavy blow received during a severe roll of the ship". However, it fails to mention the heavy blow received by a member of the team when his airborne body struck the recorder.

After twelve days in the survey area, extreme weather conditions necessitated the return to Marion Island where a few remaining supplies were landed while the Omega phase variations were monitored for 24 hours. We then proceeded to battle our way through a few more storms on our way back to Cape Town.

The information from the data recorded during this successful cruise has led to an improved understanding of this region of the south-west Indian Ocean ridge.

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Cover Picture: *For the surprised reader, the ice-berg in the picture on our front cover was expertly added for effect by our photographer.*