

BRITISH ANTARCTIC SURVEY SCIENTIFIC REPORTS

No. 40. J. R. BLACKIE. Analysis of Auroral Observations, Halley Bay, 1960. 1964. 50 pp. 24s. 0d.

THIS is the second report dealing with the observations of the Aurora Australis made at Halley Bay. The report describes the visual observations and the results obtained with a 16 mm. all-sky camera.

A large proportion of the report deals with a statistical break-down of the visual observations. These were made every 15 min. during the hours of darkness, but, as the author points out, the sky was obscured for much of this time by cloud or drifting snow. After allowing for these interruptions, as far as is possible the data are used to produce graphs showing the diurnal variations in the occurrence of the aurora as a whole and of the various forms separately. The variations in the elevations of arcs and the bearings of their centres are also examined.

The author has made a particular study of the form usually entered as a "glow" in most observers' reports. Hitherto this form has frequently been regarded as simply an arc whose bottom border is out of sight below the horizon. In the present report, however, the conclusion is reached that the glow is a distinct form in its own right; a suggested definition is that it is a form of lower intensity than an arc but covering a much larger area of sky. These glows are not to be confused with the red glows seen from inside the auroral zone.

After dealing with the statistical results, the report goes on to describe a few selected displays in detail, displays which, it is claimed, are "typical" of those seen at the station. The behaviour of the magnetic elements as these displays develop is also described.

Finally, the observations made in 1960 are compared with those of previous years. All the figures given indicate that there is a strong connection between the characteristics of the aurora at Halley Bay and the phase of the sunspot cycle.

No. 46. D. H. GRIFFITHS, R. P. RIDDIHOUGH, H. A. D. CAMERON and P. KENNETT. Geophysical Investigation of the Scotia Arc. 1964. 43 pp. 18s. 0d.

THIS report is an account of geophysical investigations carried out by members of the Department of Geology, University of Birmingham, with the collaboration of the British Antarctic Survey. The work, which is being continued, is still in a relatively early stage, and so the account is more in the nature of a summary of progress than a final report since much of the interpretation has not yet been completed. The first main section describes the gravity survey. This is followed by an account of the magnetic measurements, after which are given the preliminary results of the seismic investigations. There is a concluding section in which the implications of the data are briefly discussed.

The gravity survey is based on a network of primary stations, situated mainly at the occupied British Antarctic Survey scientific stations. Measurements between stations were repeated as often as possible to improve accuracy, and it is estimated that this is of the order of a few tenths of a milligal. The principal area covered by the survey includes the South Shetland Islands and the west coast of northern Graham Land together with the offshore islands. Measurements have also been made in South Georgia, the South Sandwich Islands, the South Orkney Islands and elsewhere, bringing the total number of stations to about 150. The measurements are based on the value of gravity at Ezeiza international airport, Buenos Aires, to which the survey is connected by way of Port Stanley and Montevideo. These links were measured with a Worden gravimeter carried by sea and are thus subject to some uncertainty. A list of station positions and values is given and there are sketch maps showing the exact sites of all base stations. The results are also presented on a fold-out map in the form of Bouguer anomalies.

The magnetic measurements were all made at sea using a towed proton magnetometer. No correction could be made for diurnal variation but the data were corrected for secular

change. The measurements were made mostly during crossings of the Scotia Sea between the various island groups, individual traverses being usually 50 miles (95 km.) or more apart. Traverses in the Bransfield Strait and off the north coast of the South Shetland Islands are more numerous and it has been possible to draw a contour map of this area showing the major anomalies. So far no detailed systematic study has been made of the anomalies but an attempt has been made to divide the region into areas on the basis of what is called "magnetic character". Essentially the classification depends on the nature of the relationships between three parameters measured off the anomalies along the length of the profiles. Boundaries are marked on the profiles where a change in the relationship occurs and a simple statistical test is used to classify the anomalies. Where appropriate the boundaries are extended from profile to profile and the map thus produced delineates areas of different magnetic type. It is believed that these are related to geological structure but so far, with the exception of one area just south of the Burdwood Bank in Drake Passage, the connection between structure and form of the magnetic anomaly has not been studied. In this area it seems that the anomalies originate from bodies occurring at a relatively shallow depth below the sea floor which vary mainly in their horizontal dimensions. This suggested that the anomalies could be due either to the subsurface topography of igneous rocks or to major intrusions and some dimensions are given. With the simple method of analysis used it was not possible to differentiate between these two suggestions.

The authors stress that the method of classification described has not yet been fully tested, but they consider that in some regions it may prove to be a useful indication of geological boundaries and trends. A preliminary map of the Scotia Sea based on the method is given.

A preliminary interpretation of a number of seismic refraction lines in Bransfield Strait is given. The information obtained, together with that derived from the gravity and magnetic data, has been synthesized to produce a section across the South Shetland Islands showing the main features of the structure. The main point of interest is the uplift of the high-velocity crustal layer (7 km./sec.) beneath the islands.

There is also brief mention of reversed refraction lines which were shot on a traverse across the Scotia Sea from the South Orkney Islands to South Georgia. It appears that the main crustal layer has a velocity of about 6 km./sec. or less, indicating that the area is not typically oceanic.

Inevitably the concluding section is very tentative as the data already collected have not yet been fully interpreted. Also the Scotia Sea and Scotia Ridge cover so large an area and are so little known that as yet only a small section of the region has been looked at in any detail.