Antarctic Science 2 (3): 265–266 (1990)

Short note

European geological initiative for the Shackleton Range

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Received and accepted 14 June 1990

Introduction

The Shackleton Range occupies a key geological position in Antarctica (Fig. 1). Its location, at the edge of the continental craton between the mobile belts of the Transantarctic Mountains (TAM) and the stable platform of Dronning Maud Land (Neuschwabenland), and its geological constitution offer possibilities for: understanding the nature of the 'Pacific' margin of the Antarctic craton during the Palaeozoic, distinguishing between subduction- and collision-related tectonics at an ancient continental margin, and contributing to the debate on the relationship between East and West Antarctica. The structural orientation of the range, at right angles to the trend of the TAM, has puzzled geologists ever since its discovery.

Workshop

Twenty-nine earth scientists from four European countries (FRG, GDR, UK and USSR) gathered at the Bundesanstalt für Geowissenschaften und Rohstoffe (BGR) in Hannover during 23–27 April 1990, to discuss the geology of the Shackleton Range. The objectives of the meeting were to clarify our understanding of the geology of the Shackleton Range, to achieve a consensus by which it would be possible collectively to publish a geological map, and to review the needs for further geological research in the region. All three objectives were met with a high degree of international accord.

The bulk of the week's work consisted of reviewing the geological knowledge of the Shackleton Range and in trying to reconcile the inevitable differences in interpretation. Major topics of discussion were the metamorphic complexes, radiometric dating, structure, stratigraphy and sedimentology, and geological relations with other regions. It was clear from the discussion that many significant geological advances had been made in recent years, the most important being:

1. stratigraphical proof for the existence of Proterozoic and Cambrian sedimentary sequences,
2. identification of nappe tectonics (Fig. 2) in the Shackleton Range (the first known from anywhere in Antarctica),
3. recognition of the Ross Orogeny in the southern Shackleton Range, on the basis of radiometric dating and structural and metamorphic studies,
4. development of a model for the petrological evolution of the basement,
5. recognition of an intricate interleaving of crustal and supracrustal units in the northern Shackleton Range, and
6. identification of critical areas where further research is needed (see below) to clarify our understanding of the geology of the Shackleton Range and to contribute to our better understanding of crustal processes in general.

Although a few differences of interpretation remain, the group was successful in agreeing on a working stratigraphical scheme for the range (Table I), thus providing a basis for the preparation of a geological map at a scale of 1:250 000. This map will be published on behalf of the community by the British Antarctic Survey in its BAS GEOMAP series. A first draft of the geological map was plotted during the meeting, and an outline and chapter authorship for the accompanying explanatory text were established. Work is in progress by the Institut für Angewandte Geodäsie (IFAG) on a new satellite image mosaic which will be used to update the existing topographic base for the geological map.

Plans

It was resolved that plans should be drawn up for a European (FRG, GDR, UK & USSR) expedition to the Shackleton Range in three or four years time, with the express aims of resolving outstanding differences of geological interpretation, and of addressing a number of problems identified during the workshop.

1. Identification of and relationship between crustal and supracrustal rocks.
2. Understanding the nature of the basement in the northern part of the range. The southern part is cratonic. Is this true of the north also, or is it part of a mobile belt?
3. Determination of exactly which representatives of the Ross Orogeny are present in the northern Shackleton

https://doi.org/10.1017/S0954102090000359 Published online by Cambridge University Press

Table I. Stratigraphical scheme for the Shackleton Range (as agreed by members of the Hannover workshops).

Read Mountains area		All other parts of Shackleton Range
	Former Turnpike Bluff Group	Volcanogenic sedimentary rocks (?Jurassic)
		(Otter Highlands Formation
		((Ordovician-Silurian)
		Blaiklock Glacier Group (
		(Mount Provender Formation
	Mount Wegener Formation (Lower Cambrian) **Wyeth Heights Formation**	
Watts Needle Formation	**Stephenson Bastion Formation**	
	) *Former*	(Pioneer Group*
	) *Shackelton Range*	(Haskard Group*
Read Group* (> 1300 Ma)	) *Metamorphic Complex*	(Metamorphic rocks (mixed Pioneer & Haskard groups)

Bold type = rock units already defined in the literature
* New stratigraphical units, to be defined in the explanation to the geological map.

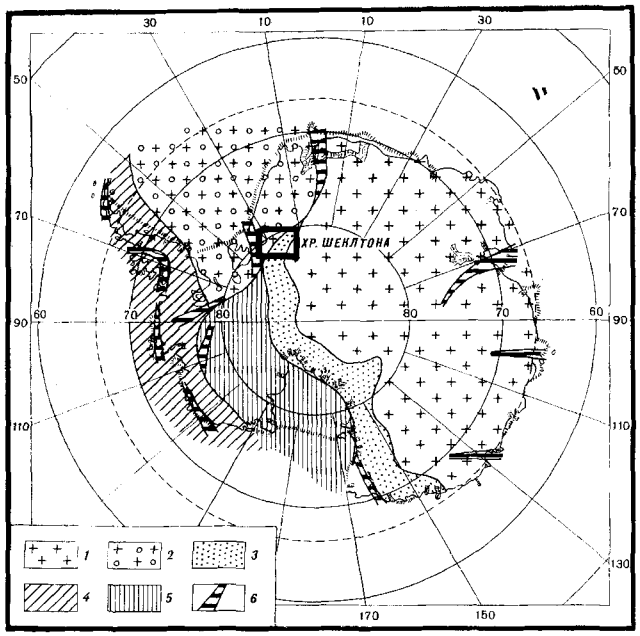


Fig. 1 Enigmatic position of the Shackleton Range (box) at right angles to the trend of the Transantarctic Mountains (3); East Antarctic craton (1), supra-Archaean plate of the Weddell Sea, (2); from Grikurov & Dibner 1979, fig. 4).

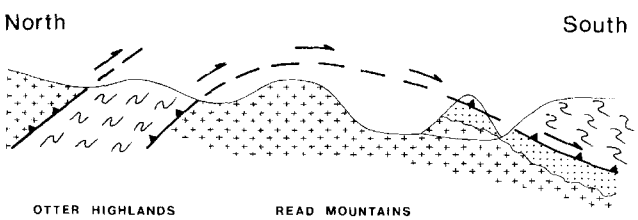


Fig. 2 Nappe tectonics in the Read Mountains; in interpretation by Roland *et al.*, (1988, fig. 12)

Range; are there related tectonic structures, ophiolite sequences, intrusions, or metamorphic events?

4. Are the Early Palaeozoic events in the range, recognized by radiometric dating, related to the Panafrican event recorded in Dronning Maud Land?
5. Is the Shackleton Range a rotated block as suggested by its apparently discordant structural trend and, if so, when was it rotated?
6. Why are Beacon and Ferrar supergroup rocks apparently absent? Was the Shackleton Range a source area for the Beacon Supergroup?
7. Improvement of the bio- and chronostratigraphy of metasedimentary units of probable Proterozoic to Ordovician age, and an investigation of the magneto-stratigraphy of the undeformed units.
8. Investigation of the young block- and rift-tectonic structure of the range, using remote sensing techniques and fission-track studies.

As far as possible logistic and scientific expertise would be pooled to make the expedition as effective as possible.

References

GRIKUROV, G.E., & DIBNER, A.F. 1979. Vozrast i strukturnoe polozhenie osadochnykh tolsh v zapadnoy chasti Khrebta Sheklton (Antarktida). [Age and structural position of the sedimentary deposits in western Shackleton Range (Antarctica) *Antarktica*, **18**, 20-31.

ROLAND, N.W, KLEINSCHMIDT, G. & BUGGISCH, W. 1988. Geological expedition to the Shackleton Range - GEISHA 1987/88 - Nappe structure and a meteorite find. *BGR Circular*, **7**, 3-20.

https://doi.org/10.1017/S0954102090000359 Published online by Cambridge University Press