GEOPHYSICS

Palæomagnetism of Some Dolerite Intrusions from the Theron Mountains and Whichaway Nunataks, Antarctica

As a part of the scientific activity of the Commonwealth Trans-Antarctic Expedition a collection of eight oriented samples was made by Stephenson from dolerite sills and dykes in the region of the Theron Mountains, Shackleton Range and Whichaway Nunataks. The seven intrusions which have been sampled bear petrological affinities with the Karroo Dolerites of South Africa and with the dolerite sills of Tasmania, and are thought to be of comparable age. They intrude flat-lying sediments and show no evidence of post-formational tilting.

The directions of remanent magnetization have been measured by Blundell and are shown in Fig. 1. These are arranged in two groups, normal and reversed, which are 180° apart. The two groups have been combined by reversing the polarity of those with downward dips to provide a mean direction of magnetization with azimuth 64° E. of N. and dip 68° up. The circle of 95 per cent confidence, applying Fisher's statistics[1], has a radius of 12 deg.

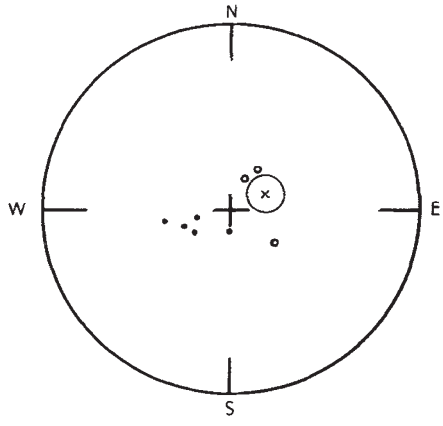

Fig. 1. Stereogram of directions of magnetization of Antarctic Dolerite intrusions. ○, dip up ; ●, dip down ; ×, mean direction with circle of 95 per cent confidence

Storage tests similar to those already described[2] were applied during the measurements of magnetic direction and indicated a stable magnetization. It is also evident from Fig. 1 that there is a high degree of stability, for the normal and reversed groups have remained 180° apart and at a substantial angle to the present field direction. The samples are unaltered chemically and there is no evidence of the development of any secondary magnetization, so it may be presumed that the mean direction of magnetization is a true record of the field direction when the rocks were intruded. Since seven intrusions from a wide area were sampled, the effects of local variations in the geomagnetic field and of secular variation are unlikely to be significant.

Over a period of 1,000 years or more, the geomagnetic field appears on average to resemble that of a geocentric axial dipole. On this basis the position of the (south) pole relative to the Theron Mountains when the sills were intruded was at lat. 54° S., long. 136° W. with an oval of 95 per cent confidence of 16° radius. This pole position may be compared with those similarly derived for the Karroo Dolerites

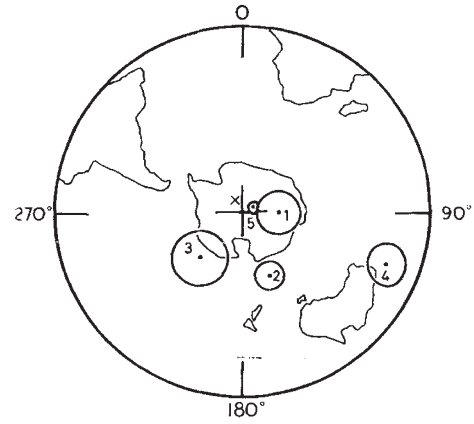

Fig. 2. Jurassic Poles for Africa (1), Australia (2), Antarctica (3), India (4) and South America (5), with ovals of 95 per cent confidence. ×, sampling area

of South Africa[3], the Tasmanian Dolerites[4], the Rahajmahal Traps of India[5] and the Serra Geral lavas of Brazil[6], shown in Fig. 2. The age correlation between these rocks is not good, but it may be stated with some confidence that they are all Jurassic, and are the same age to within 30 million years. The difference between the Antarctic and Indian pole positions is more than 100°, and though this could be explained in terms of Gold's mechanism[7] for polar wandering, it seems unlikely in view of the relatively small variation in pole positions from the Jurassic to the present day relative to a single continent. The scatter in pole positions shown in Fig. 2 is more indicative of relative movement of the continents, and it is interesting to note that these results are not inconsistent with earlier reconstructions put forward on independent evidence by proponents of the continental drift hypothesis.

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Palæomagnetism in Some Norwegian Sparagmites and the Late Pre-Cambrian Ice Age

Pre-Pleistocene glacial deposits have been claimed from many ages and latitudes. Palæomagnetic studies of the Permian tillites in Australia[1] suggest that they were near the geomagnetic, and probably also the geographical pole. The late Pre-Cambrian ('Eo-Cambrian', Varangian, Sinian, etc.) tillites are of special interest for several reasons :

(1) Widespread occurrences have been claimed[2] and many are well established, for example, in Australia, China, Greenland, Norway and Spitsbergen.

(2) Their stratigraphical position suggests that all are referable to one major glacial period (with, however, interglacial or interstadial intervals). It is therefore a key horizon in international correlation below the fossiliferous Lower Cambrian.