PALEOMAGNETISM OF GABBROS OF THE EARLY PROTEROZOIC BLACHFORD LAKE INTRUSIVE SUITE AND THE EASTER ISLAND DYKE, GREAT SLAVE LAKE, NWT: POSSIBLE EVIDENCE FOR THE EARLIEST CONTINENTAL DRIFT

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Abstract. The Caribou Lake gabbro, part of the Blachford Lake Intrusive Suite accurately dated at -2186 ± 10 mA, has a predominant NW-SE magnetization with a mean, irrespective of sign, of $D = 119°$, $I = 50°$, $A_{95} = 5°$ and a palaeopole 14°N, 064°W; it has not proved possible to determine if the magnetization is primary. The Easter Island dyke, less well-dated in the range -2200 to -2500 Ma, has a predominant WNW+ magnetization, whose mean, when corrected for an 8° tilt, is $D = 288°$, $I = 46°$, $A_{95} = 5°$ and palaeopole is 32°S, 2°W; the magnetization is probably primary. A vertical magnetization ($D$), not significantly different from the present field, occurs sporadically in both units and is considered to be Late Phanerozoic in age. Palaeopoles from the Caribou Lake gabbro and the Easter Island dyke, together with those already known from Early Proterozoic intrusives of the Archaean Slave Structural Province, roughly define a swath (the Slave Track) which maps the motion of the Slave Province relative to the geomagnetic axis during this interval. The corresponding array of palaeopoles (the Superior Track) from the Superior Structural Province does not fall in the same place. Hence it would appear that Slave and Superior were not in their present relative positions in the Early Proterozoic in disagreement with arguments that have been made for a fixed supercontinent during much of the Proterozoic. Mid-Proterozoic paleomagnetic signatures indicate that Slave and Superior had assumed their present relative position by about -1750 Ma. These Early Proterozoic relative motions are the earliest for which there is palaeomagnetic evidence.

1. Introduction

New palaeomagnetic results from the Canadian Shields are described. It is appropriate that a volume in honour of S. K. Runcorn should contain a contribution on this topic because it was he who first initiated palaeomagnetic study of Canadian Shield rocks. This first study, begun in June 1951 and made in collaboration with the senior author, was of the Torridonian sandstone of northwestern Scotland. In the Precambrian, this part of Scotland belonged to an enlarged Canadian Shield. It was through this study, and through essentially contemporaneous work in South Africa on the Pilansberg dykes by Gough (1956), that the existence of a geomagnetic field in the Precambrian was established, that serial reversals in pre-Tertiary rocks were discovered, and that palaeodirections in older rocks systematically oblique to the present axis were established (Runcorn, 1955). The latter phenomenon is what we now call apparent polar wandering (apw), the palaeomagnetic signature of continental drift, and it is with this that our paper is mainly concerned.
The rock-units concerned are Early Proterozoic. They are intrusives into the Archaean Slave Structural Province in the northwestern part of the Canadian Shield (Figure 1, see also Figure 15). Units whose palaeomagnetism already has been described are, the Big Spruce Complex (Irving and McGlynn, 1976), and the Dogrib, Indin and ‘X’ dykes (McGlynn and Irving, 1975). Our new data are from gabbros of the Blachford Intrusive Suite and the Easter Island dyke, and, together with earlier results, they may be used to suggest the path of apparent polar wander (apw) for the Slave Province during the Early Proterozoic. Such a path may eventually aid correlation and the study of thermal history, but of more immediate interest is the possibility of comparing it with the contemporaneous apw path from the Superior Structural Province to determine if these two Archaean blocks have undergone relative motions, as would be expected if the intervening Hudsonian orogen is the product of plate tectonic processes.

The problem is of general importance because if Early Proterozoic relative motions could be demonstrated they would be the oldest yet recorded – they would be the