PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY A MATHEMATICAL, PHYSICAL & ENGINEERING SCIENCES

Discussion of the Results in Terms of Polar Wandering

K. M. Creer

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VII. DISCUSSION OF THE RESULTS IN TERMS OF POLAR WANDERING

CONTENTS

The palaeomagnetic poles deduced in the foregoing papers are tabulated and placed into magnetic age groups.

The poles have been plotted together with some previously established palaeomagnetic poles.

1. INTRODUCTION

The polar wandering curve for S. America has already been fairly well defined and described in the review papers listed in the introductory paper to this series. Some of the data presented here supersede previously published pole positions which have been slightly modified as a result of thermal cleaning of the n.r.m. Many new data have been added.

The work described here, having resulted from a reconnaissance survey, should be regarded as forming a framework which is already being strengthened by more detailed studies, particularly of Argentine rocks.

2. LIST OF PALAEOMAGNETIC POLE POSITIONS

The palaeomagnetic pole positions obtained from the studies described in these papers are listed in table 1 with their c.s.d. and c.s.e. angles. The stratigraphic age of each rock formation is also given, although in some cases this is not known precisely.

The poles have been placed into seven groups. Group A consists of poles deduced from lower Palaeozoic formations, namely Cambrian and Ordovician red beds from northwest Argentina, while group B consists of an Ordovician and a Devonian pole derived from Bolivian formations. The question of whether the different pole positions given by these Argentinian and the Bolivian Ordovician formations is due to a real age difference or due to errors introduced in restoring the strata to their ancient horizontal positions must remain open for the present.

Group C comprises poles derived from Middle and Upper Devonian and Carboniferous formations. Two Carboniferous formations (the Taiguati and Pipiral) each yield two poles, one belonging to group C and one to group D. The latter consists mainly of Permo–Carboniferous data.

Group D poles are derived from reversely magnetized rocks, with the sole exception of the Pipiral pole. Hence they would appear to belong to the Kiaman magnetic interval.

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TABLE 1. SUMMARY OF PALAEOMAGNETIC POLES FOR SOUTH AMERICA

identification no.	place	formation	stratigraphic age	number of measurements	treatment	magnetic age group	south palaeopole lat.	long.	δ	δ_m
1a	N.W.A.	red beds	Cambrian and Cambro-Ordovician	13	thermal (*a*)	A	8° N	40° W	60	14
1b				18	thermal (*b*)	A	15° N	22° W	66	16
2	N.W.A.	red beds	Ordovician	42	thermal (*a*)	A	11° N	27° W	34	5
3	Bol.	sediments	Ordovician	18	thermal (*b*)	B	4° N	58° W	35	8
4	Bol.	sediments	Devonian	26	thermal (*a*)	B	7° N	53° W	62	12
5	N.E.B.	Passagem and Picos	Devonian	12	thermal (*a*)	C	30° S	47° W	64	18
6	Bol.	Taiguati (N)	Carboniferous	14†	n.r.m. (*d*)	C	31° S	24° W	22	6
7	Col.	Pipiral (R)	Carboniferous	7	n.r.m. (*d*)	C	39° S	12° W	15	6
8	N.W.A.	Paganzo II	Ur. Carboniferous	22†	n.r.m. (*d*)	D	65° S	44° W	25	6
9	N.E.B.	Piaui	Ur. Carboniferous	44†	thermal (*a*)	D	55° S	12° W	39	6
10	Bol.	Taiguati (R)	Permo-Carboniferous	21†	n.r.m. (*d*)	D	54° S	15° W	13	3
11	Col.	Pipiral (N)	Permo-Carboniferous	4	n.r.m. (*d*)	D	64° S	16° E	20	10
12	N.E.B.	Motuca	Triassic	24†	thermal (*a*)	E	81° S	64° W	—	—
13	N.W.A.	Paganzo III	Permo-Triassic	15†	n.r.m. (*d*)	E	76° S	157° W	36	8
14	N.W.A.	red beds (S & J)	Triassic	17†	n.r.m. (*d*)	E	67° S	105° W	24	6
15	Col.	Girón	Triassic	11	thermal (*a*)	E	77° S	106° W	66	20
16	Col.	Aptraxa	Cretaceous (Lr)	23†	n.r.m.	F	80° S	72° W	10	2
17	V	Yeguera (N)	Cretaceous	10†	n.r.m. (*e*)	F	68° S	127° W	17	5
18	V	Yeguera (R)	Cretaceous	12†	n.r.m. (*e*)	F	81° S	120° W	11	3
19	P	Herradura, Vinchos and Moracoche	Cretaceous	40†	n.r.m. (*d*)	F	63° S	30° E	23	4
20	S.E.B.	Serra Geral	Cretaceous	30‡	a.f.	F	78° S	54° E	17	3
21	P	Boqueron	Tertiary	15†	thermal (*c*)	G	79° S	58° W	14	6
22	W.A.	lavas	Tertiary	7‡	a.f.	G	86° S	14° E	13	5
23	W.A.	lavas	Quaternary	11‡	a.f.	G	85° S	74° W	21	6

1. Identification number refers to figure 1.

2. Col. 2: N.W.A. = N.W. Argentina; Bol. = Bolivia; N.E.B. = N.E. Brazil; Col. = Colombia; V = Venezuela; P = Peru; S.E.B. = S.E. Brazil and W.A. = W. Argentina.

3. In column headed number of measurements, the number given refers to hand sample means, except those marked (†) which refer to specimen disks or (‡) which refer to site means or lava flow means.

4. Treatment: thermal (*a*) means that the r.m. have been thermally demagnetized at a particular temperature; thermal (*b*) that a population of r.m. directions has been formed after cleaning at various different temperatures selected for each sample; thermal (*c*) means that although thermal cleaning has been carried out the n.r.m. data were preferred because the mean direction did not migrate during cleaning while the population of directions became more scattered, (*d*) means that only well-grouped n.r.m. directions were used, (see p. 530) and (*e*) that the fold test indicates stability of the n.r.m.

5. Magnetic age group—see text.

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TABLE 2. SUMMARY OF PALAEOMAGNETIC SOUTH POLES

(obtained from data in table 1)

magnetic age group	estimated stratigraphical age range	no. of formations	whether or not all are cleaned	south palaeomagnetic pole			
				lat.	long.	δ	δ_m
A	Cambrian–Ordovician	3	yes	11° N	30° W	(10°)	(15°)
B	Ordovician–M. Devonian	2	yes	6° N	55° W	—	—
C	M. Devonian–M. Carboniferous	4	no	35° S	30° W	13°	15°
C	M. Devonian–M. Carboniferous	3	yes	34° S	28° W	(16°)	(19°)
D	M. Carboniferous–Permian	4	no	62° S	13° W	12°	14°
E	Permo–Triassic and Triassic	4	no	78° S	105° W	11°	12°
F	Cretaceous*	5	no	86° S	38° W	19°	18°
F	Cretaceous	1	yes	78° S	54° E	—	—
G	Tertiary and Quaternary	3	yes	84° S	50° W	6°	9°

* Includes late Cretaceous data.

Permo–Triassic and Triassic formations yield palaeomagnetic poles close to the present geographic pole and comprise group E. Creer, Embleton & Valencio (1969, 1970) have obtained a mean pole for seven different igneous and sedimentary formations, some not included in table 1. The mean position differs significantly from the well-established Serra Geral Cretaceous pole (Creer 1962) and hence Cretaceous poles have been placed in a separate group, F.

Tertiary poles (Creer & Valencio 1969) have been placed in group G and Quaternary also in group G. Whether groups E, F and G can really be individually defined remains to be established. The main difficulty is to distinguish between primary and secondary magnetization because the two magnetizing fields were almost parallel.

All poles have been plotted in figure 1. Mean pole positions have been calculated for each group and are given in table 2.

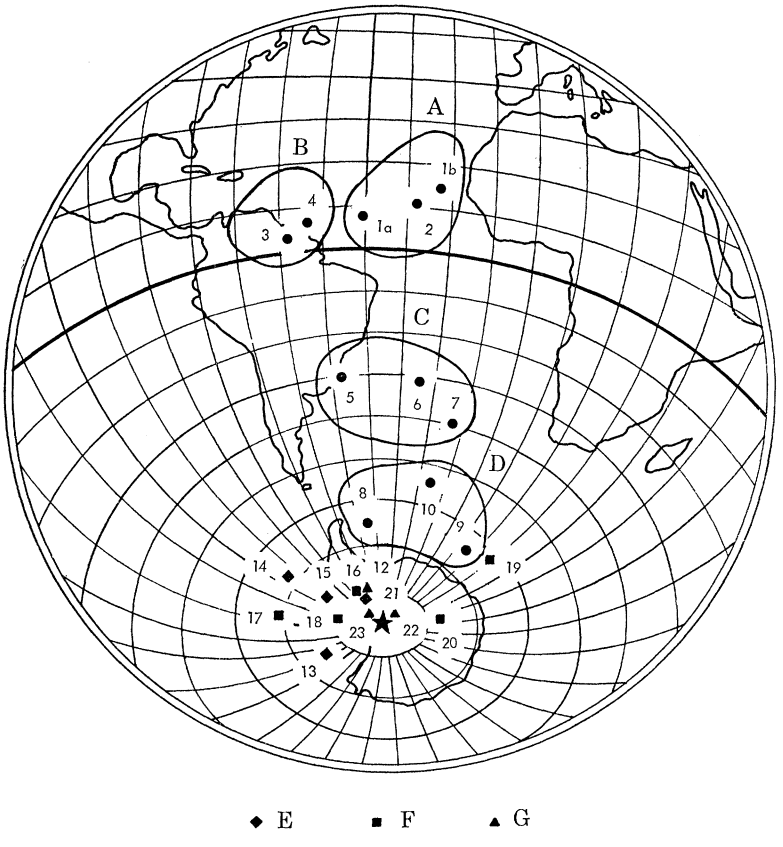

FIGURE 1

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