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PALEOMAGNETIC RECONNAISSANCE OF THE GRUPO DIABASICO WESTERN ANDES (COLOMBIA)

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CONTENT

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SUMMARY

A paleomagnetic reconnaissance has been carried out on the Grupo Diabásico of the western Cordillera from the Colombian Andes, between El Tambo and El Penol, Departamento Nariño. The Grupo Diabásico wich is of Cretaceous age is thought to be of submarine origin and to have undergone a low grade metamorphism.

The geometric mean of the natural remanent magnetization JNRM = 8.8 x 10^{-5} G. The low field magnetic susceptibility geometric mean $\chi = 8.87 \times 10^{-4}$ G/Oe gives a Koenigsberger ratio of 0.28 indicating that the dominant magnetization is a induced one.

Some pilot samples have been progressively demagnetized by alternating fields up to 600 O°. A viscous remanence test was applied to reject unstable sample.

Despite the non ideal quality of the remanent magnetization a virtual geomagnetic pole has been calculated: pole latitude: 65° S; pole longitude: 186° E.

1. INTRODUCTION

A paleomagnetic reconnaissance has been carried out on six sites of the Grupo Diabasico of the Western Cordillera from the Colombian Andes between El Penol, Departamento Nariño as one of us (A.E.) is carrying out a detailed petrological study in this area.

The Grupo Diabasico which is of Cretaceous age is thought to be of submarine origin and to have undergone a low grade metamorphism.

2. LABORATORY PROCEDURES

Two to five hand samples, oriented by using a sun compass, were taken at each of the six studied sites. Every hand sample was cored and cut in the laboratory to give cylindrical specimens of 2.5 cm in diameter and 2.2. cm in length.

The direction and the intensity of all specimens were measured on a Digico computerized spinner magnetometer. Stepwise alternating field demagnetization was carried out with a two axis tumbler. The demagnetization at each step has been made twice by inverting the direction of tumbling in order to avoid systematic effects due to sample spinning (HILLHOUSE, 1977).

3. NATURAL MAGNETIC PROPERTIES

The investigated properties listed in Table I are: the intensity of natural remanent magnetization JNRM' the low field susceptibility (χ) and the Koeningsberger ratio (remanent magnetization over the induced magnetization) for the local field of 0,35 Oe.

The NRM intensities vary from 0.14 x 10^{-4} to 2.80 x 10^{-4} G, the geometric mean being 0.88 x 10^{-4} G, whilst the susceptibilities vary from 1.57 x 10^{-4} to 27.92 x 10^{-4} G/Oe.

Therefore the Koeningsberger ratio $Q\chi$ is always lower than 1 with a geometric mean of 0.28 indicating that the remanence is carried by large multidomain grains of titanomagnetite (DAY, 1977: RAHMAN, DUNCAN and PARRY, 1973).

If these rocks are of oceanic origin they should, in comparison with in situ basalts, have a remanent magnetization in the order of 10^{-2} G, an initial susceptibility between 10^{-2} and 10^{-3} G/Oe amd a $Q\chi$ greater than 1. As this is not the case one has to relate lower magnetization to the transformation of the titanomagnetites to hematite and sphene during the development of the low grade regional metamorphism.

4. PALEOMAGNETIC RESULTS

A viscous magnetization test was carried out with the laboratory field and samples which had an inacceptable level of viscosity were rejected. These were samples with a $Q\chi$ less than 0.2 suggesting that a multidomain component of low stability dominates their natural remanence.

One pilot specimen from each site was submitted to A.F. demagnetization in a field up to 600 Oe; Figure 1 shows their behaviour. One notices thar all our specimens have a median destructive field (MDF) in the range of 60 to 250 Oe but most of them have a MDF of 150 Oe this indicates a rather soft magnetization probably multidomain.

The demagnetization curves have a more or less pronounced plateau at intermediate fields revealing a more stable component of RM carried by pseudo single domain titanomagnetites.

A field of 150 Oe was chosen as an optimum cleaning field and all the remaining samples were cleaned in this peak field.

A mean paleodirection has been calculated from 9 samples, Declination 25°, Inclination 8.°5 with statistical parameters; precision parameter k = 25.4, $\alpha 95 = 10^{\circ}.3$ and length of resultant vector R = 8.6862.

Despite the non-ideal quality of the remanent magnetization a virtual geomagnetic paleopole (VGP) has been calculated, in order to make a comparison with other published results from South America for the Cretaceous. The VGP (South pole) is shown by a cross in Fig. 2 together with other poles from Creer (1962, 1970): 1, Brazil; 2, Perú. 3, Colombia; 4, Venezuela.

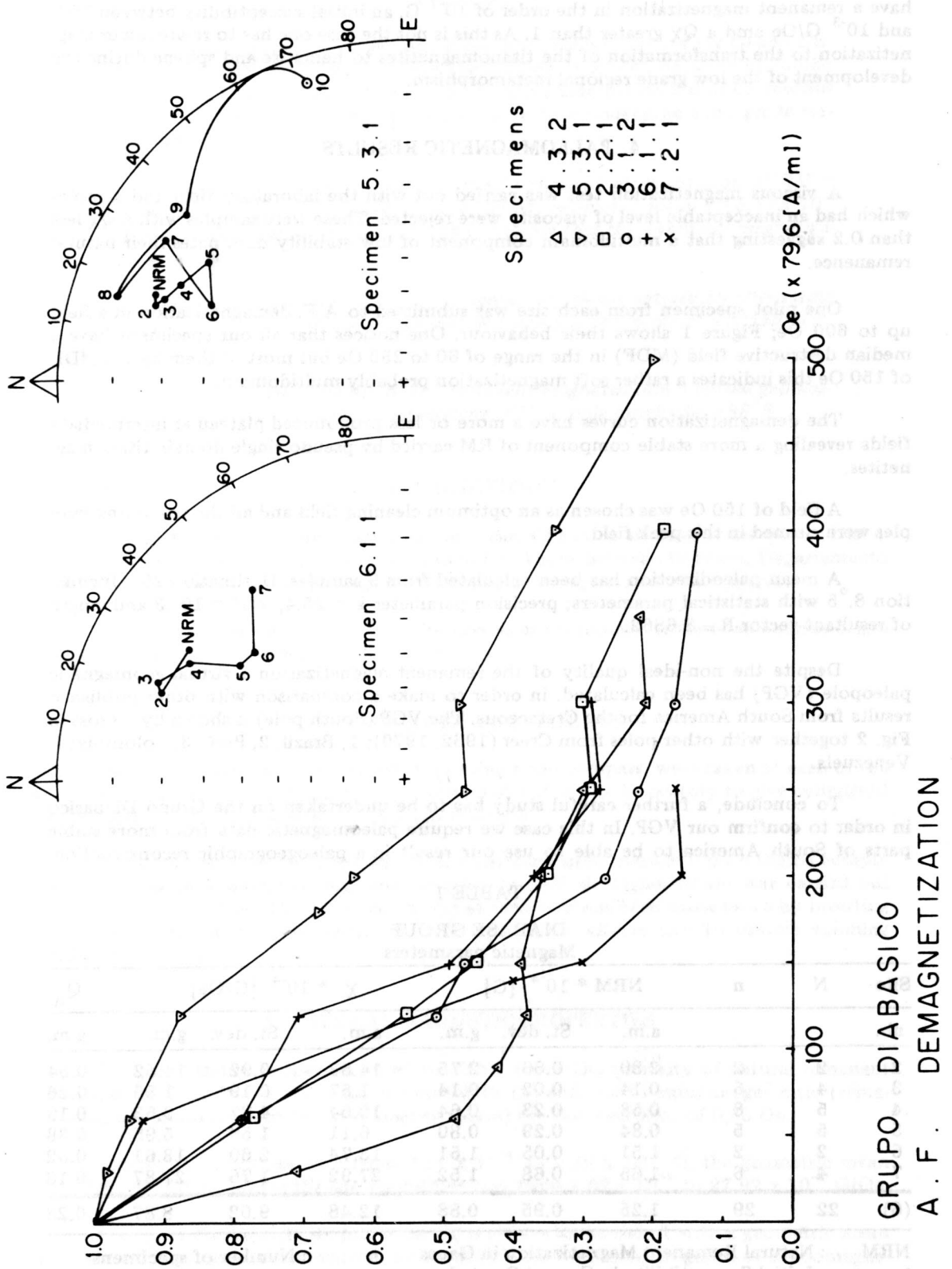
To conclude, a further careful study has to be undertaken on the Grupo Diabasico in order to confirm our VGP. In this case we require paleomagnetic data from more stable parts of South America to be able to use our result in a paleogeographic reconstruction.

TABLE 1

DIABASE GROUP
Magnetic parameters

Site	N	n	NRM * 10^{-4} [G]			χ * 10^{-4} [G/Oe]			Q_n
nb.			a.m.	St. dev.	g.m.	a.m.	St. dev.	g.m.	g.m.
2	2	2	2.80	0.66	2.75	14.53	0.92	14.52	0.54
3	4	6	0.14	0.02	0.14	1.57	0.19	1.56	0.26
4	5	8	0.58	0.23	0.64	10.64	4.97	9.53	0.19
5	5	5	0.84	0.29	0.80	6.11	1.59	5.95	0.38
6	2	2	1.51	0.05	1.51	13.74	2.60	13.61	0.32
7	4	6	1.65	0.68	1.52	27.92	1.76	27.87	0.16
(6)	22	29	1.25	0.95	0.88	12.48	9.02	8.87	0.28

NRM : Natural Remanent Magnetization in Gauss
χ : Initial Susceptibility in Gauss / Oersted
Q_T : Koenigsberger ratio with a field of 0.35 Oe.
N : Number of samples
n : Number of specimens
a.m. : Arithmetic mean
St. Dev. : Standard deviation
g.m. : Geometric mean


GRUPO DIABASICO
A. F. DEMAGNETIZATION
Specimens
4.3.2
5.3.1
2.2.1
3.1.2
6.1.1
7.2.1
Oe (x 79.6 [A/m])
Specimen 5.3.1
Specimen 6.1.1
NRM
N
E

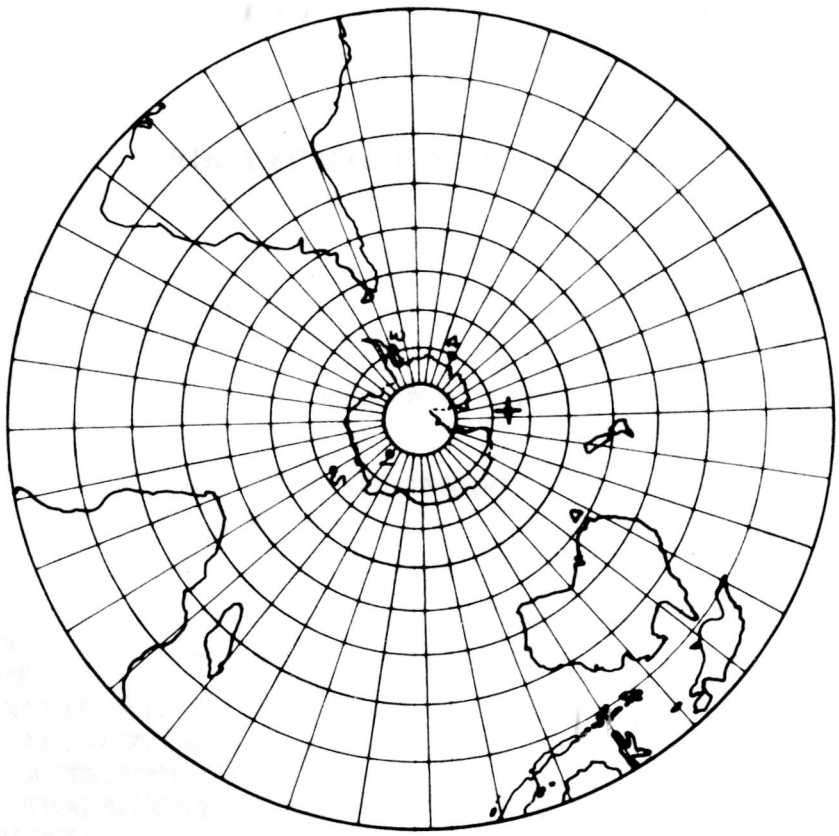


FIG. 2: Colombian virtual geomanetic pole + (VGP) for the Grupo Diabásico Western Andes compared with published South American Cretaceous paleomagnetic pole positions.

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