

7-11 - PALEOMAGNETIC INVESTIGATION : ROTATION OF THE ARGOLIS PENINSULA ?

by R. PUCHER - D. BANNERT, K. FROMM -

In the last few years many hypotheses about the circummediterranean mountain systems in terms of plate tectonics have been proposed (RYAN, W.B.F. et al., 1970 - MC KENZIE., 1970) Paleogeographical and geophysical observations form the basis of new interpretations of geodynamic mechanisms and orogenetic phases. Considering these hypotheses and previous geological work of one of the authors (D. BANNERT), a field trip was conducted in 1971 to collect paleomagnetic samples in Greece with the aim to compare paleogeographic and paleomagnetic measurements.

Geological situation : The Pindos mountain chains in the Northern part of Greece strike approximately NNW-SSE. Paleogeographic studies by BRUNN (1956) and AUBOUIN (1959) show orogenetic movements and flysch transgression from East to West. In the Argolis peninsula the strike of tectonical units is East-West. Paleogeographic studies showed that the flysch transgressed from South to North (BANNERT & BENDER, 1968). The peninsula is bounded by areas of subvolcanic activity and by morphological depression zones.

If we rotate the Argolis peninsula anticlockwise about 100° , tectonical and paleogeographical structures would match those predominate in Greece.

Some of the samples were collected near Mikroleizura in the Pindos mountains, 12 kms NE of Grevena on the left banks of the Haliakmon river from two sites of four different lava strata. According to BRUNN (1956), this region is built up of Jurassic gabbros as part of a huge submarine ophiolitic extrusion. Other samples were taken on the Argolis peninsula from four sites south of Lighourion from Jurassic diabases of the same volcanic cycle as the gabbros near Grevena.

Laboratory measurements : All samples were a.c. demagnetized up to 500 Oe peak value. Pillow diabase samples turned out as to be reoriented after initial cooling and therefore unsuitable for paleomagnetic work in favor of compact diabase layers.

According to the lava deposition as more or less horizontal lava flows, the remanence direction were dipcorrected. Both sampling areas show parallel and reversed remanence directions. Since we are not interested in magnetic reversals here but only in the direction of the remanence axis, the direction of the "reversed remanence" has been changed into "normal" direction. Then the remanence of the samples of the Pindos area resulted in the mean direction with $D=334^\circ$, $I=22^\circ$ with $\alpha 95^\circ=9^\circ$, that of the Argolis peninsula in $D=82^\circ$, $I=19^\circ$ with $\alpha 95^\circ=17^\circ$ (see figure 1). The declination difference of both mean directions appears to be $100^\circ - 110^\circ$.

Discussion : The strike and dip of the lavas at our sampling sites are comparable to the same as those measured throughout these areas. From that and since the data cover a time span large enough for at least one magnetic reversal, the authors are convinced that the obtained data is of more than just local importance. The mean direction of the remanence correspond to a virtual pole position for the Pindos area of 112°W 53°N and for the Argolis peninsula of 110°E 12°N. The pole position of the Pindos area is in much better agreement with the Jurassic pole position of Africa of 120°W 65°N than that of stable Europe 160°E 65°N (see ZIJDERVELD, V.D. VOO, 1973). This may be an indication that the Argolis and the sampling sites at the Pindos mountains may be part of rock units which are rotated in different ways and to different degrees since their formation.

The declination difference of both sampling areas of about 110° the authors interpret as indication for a clockwise rotation of the Argolis peninsula relative to the Pindos mountain chains later than Upper Jurassic times. This statement, based on the present data, should only be taken as a contribution to the latest discussion of crustal tectonics in Greece. The authors feel that the next step should be a paleomagnetic study of other areas with East-West striking rock units like Boeotia or Attica as well as the Othrys mountains.

References : AUBOUIN J., 1959 - Ann. géol. des pays hellén., vol 10:525 pp. Athens. BANNERT D. & H. BENDER, 1968 - Geologica et Palaeontologica, vol. 2, p. 151-162, Marburg. BRUNN, J.H., 1956 - Ann. géol. des pays hellén., vol. 7: 358 pp., Athens. Mc. KENZIE, D.P., 1970.- Nature, vol. 226 (5242): 239-243. RYAN, W.B.F., D.J. STANLEY, J.B. HERSEY, D.A. FAHLQUIST, T.D. ALLAN, 1970.- In the Sea pp. 387 - 492, edit. A.E. MAXWELL, WILEY-Interscience, London. ZIJDERVELD, J.D.A., R. VAN DER VOO, 1973. - In: Continental Drift, Sea Floor Spreading and Plate Tectonics, edit. by D.H. TARLING, pp. 133-162, Academic Press, London.

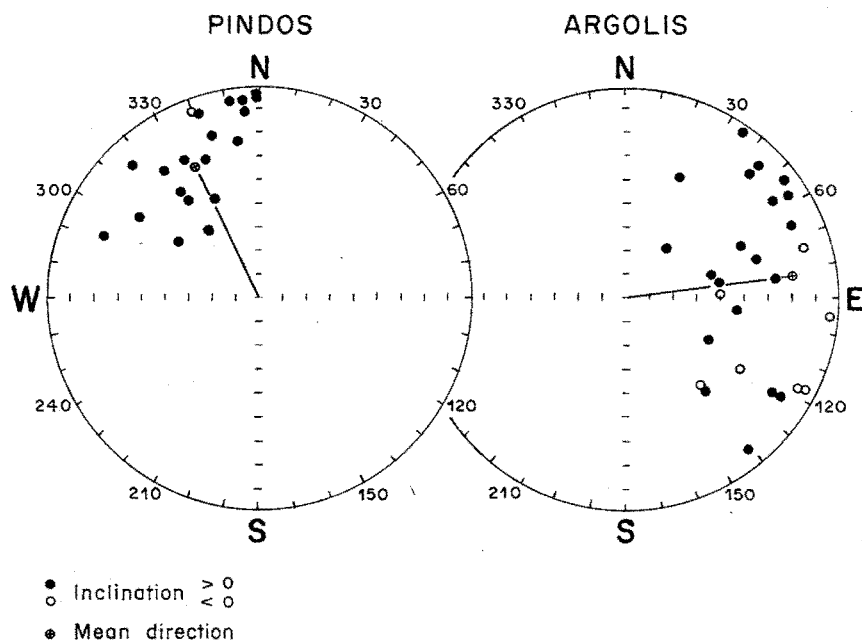


Fig. 1 : Equal-area projection of the direction of remanence for both sampling areas. The directions are dipcorrected, the samples are a.c. demagnetized with $H_{\sim} = 500$ Oe peak value. The declination difference of both mean values is $\Delta D = 108^{\circ}$.

Interventions à la suite du 7-11 -

JACOBSHAGEN - 1. Following the hypothesis of block rotation of the Argolis peninsula where do you assume the northern limitation of the block characterised by EW folds ?

2. The amount of clockwise rotation of 108° could be splitted : partly it could be due to the amount of overthrusting of the Subpelagonic Nap increasing from S to N. Another part could be referred to large scale bending of the mountain belts. Finally, local tectonic deformations could be a third possibility for the explanation of the angular difference.

Answer : We had the starting position of the palaeogeographic fact difference in strike of 120° in Argolis and Pindos, this we wanted

BOBIER - Dans les roches volcaniques soumises à des actions tectoniques apparaissent des phénomènes d'anisotropie magnétiques qui perturbent la direction de l'aimantation rémanente.

Avez-vous fait des mesures d'anisotropie dans les roches que vous avez étudiées ?

Answer : We did not perform anisotropic checks. I think our samples are not seriously influenced tectonically since the originally horizontal lava-layers just have been moved to a dip of about 40° - 50°