INTRODUCTION

The Carpathian Mountains represent the middle segment of the 160 km-long Calimani–Gurghiu–Harghita volcanic chain located along the inner (western) side of the East Carpathian orogenic zone (Fig. 1).

The volcanic arc of the Carpathian Mountains is dominantly calc-alkaline displaying a subduction-type geochemical signature (Rahelscu & Sandulescu 1973; Sebehi et al. 2004; Mason et al. 1996). The volcanic rocks are andesites and pyroclastic andesites, with minor exceptions (basaltic andesites and dacites) (Sebeghi et al. 2004). These types of volcanic edifices in the Gurghiu Mountains include composite volcanoes with or without a caldera, shield volcanoes, and lava dome complexes. From north to south, there are five edifices of this kind, namely: Jerec, Fântâna-Lapunsa, Seaca-Tatare, Sumuleu and Călimani–Ferestrau (Fig. 2). In addition, there are two lava dome complexes – Borzont and Bucu. Except for the late-stage Fântâna–Lapunsa, all these are lava-dominated volcanoes (Sebeghi et al. 2004).

Previous paleomagnetic results from the Gurghiu Mountains have been published by Patrascu, 1976.

The present palaeomagnetic study is focused on the 6.8–7.1 Ma interval of volcanic activity. Sampling sites for paleomagnetic investigations cover the following structures: Seaca-Tatare, Borzont, Sumuleu and Călimani–Ferestrau (Fig. 2).

ARCHAEOLOGICAL AND GEOLOGICAL SURVEYS

The studied samples were collected from 17 sites (Fig. 3). They were obtained using a portable drill and oriented using both a magnetic and solar compass. Up to three standard 25×22 mm cylinder specimens were recovered from each core.

- Sampling was done using both alternating field (AF) demagnetization and thermal demagnetization (Fig. 3b). The remanent magnetizations measurements were made with a JR-6A Dual Speed Spinning Magnetometer. The results of the gradual demagnetization were graphically represented by Zijderveld’s method (Zijderveld 1967) which permits the structural analysis of the NRM. The method consists in the reconstruction of fossil declination, fossil inclination and magnetization intensity which remained after each demagnetization step, in orthogonal diagrams.

- On orthogonal demagnetization diagrams, individual magnetizations were identified as linear segments in both horizontal and vertical projections defined by three or more demagnetization steps. Characteristic directions were determined using principal component analysis. All accepted linear segments have maximum angular deviation (MAD) values of less than 5°.

The method of Fisher, assuming circular distribution of individual magnetization directions about a true mean direction, was employed to estimate site-mean directions and associate statistics.

RESULTS

The oriented samples were collected from 17 sites (Fig. 3). They were obtained using a portable drill and oriented using both a magnetic and solar compass. Up to three standard 25×22 mm cylinder specimens were recovered from each core.

- The structure of the natural remanent magnetization (NRM) of pilot specimens was studied using both alternating field (AF) demagnetization and thermal demagnetization (Fig. 3b). The remanent magnetizations measurements were made with a JR-6A Dual Speed Spinning Magnetometer. The results of the gradual demagnetization were graphically represented by Zijderveld’s method (Zijderveld 1967) which permits the structural analysis of the NRM. The method consists in the reconstruction of fossil declination, fossil inclination and magnetization intensity which remained after each demagnetization step, in orthogonal diagrams.

- On orthogonal demagnetization diagrams, individual magnetizations were identified as linear segments in both horizontal and vertical projections defined by three or more demagnetization steps. Characteristic directions were determined using principal component analysis. All accepted linear segments have maximum angular deviation (MAD) values of less than 5°.

- The method of Fisher, assuming circular distribution of individual magnetization directions about a true mean direction, was employed to estimate site-mean directions and associate statistics.

CONCLUSIONS

Distribution of magnetic polarities in the Gurghiu Mountains is in agreement with the K-Ar ages of the volcanism (Sebeghi et al. 2004) (Fig.5). The results are compatible with the accepted model of progressive migration of volcanic activity from north to south. Area mean direction based on 32 sites is: declination = 253° and inclination = 84.6°.

The result shows the absence of important vertical axis rotation during the 6.8–7.1 Ma range (Fig. 6).

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Palaeomagnetic Study of the Miocene Volcanism in the Southern Part of the Gurghiu Mountains (Eastern Carpathians)

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