Paleomagnetic constraints for the timing of volcanism from the Gurghiu, Harghita and Perșani Mountains (East Carpathians)

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Sampling area: Gurghiu (36), North Harghita (37), South Harghita (38), Persani (39)
K-Ar ages of sampled areas according to Pecskay et al. (2006) and references therein.
Paleomagnetic method

Quality criteria: 2 demagnetization methods; full demagnetization of each specimen; minimum 5 samples per site; precision parameter $k > 50$ (Johnson et al., 2008)
Dispersion of directions is produced only by the secular variation of the geomagnetic field.

Total number of sites: 235

Site mean directions
Objective:

Correlation of main eruption phases with magnetic polarity time scale based on available radiometric ages and geographical distribution of magnetic polarity
Difficulties:
1. K-Ar ages have errors which cover several reversals (no unique solution)
2. Correlation with polarity time scale suggest that the “true age” is located near the limits of error bars.

Solutions:
1. Identification of time interval of main phase of volcanic activity supported by most of K-Ar ages.
2. Identification of most probable chrons which fit both this time interval and geographical distribution of magnetic polarity data.
Gurghiu
Jirca and Fancel-Lapusna volcanic structures

Jirca: dominant reversed polarity
Fancel – Lapusna: mixt magnetic polarities

Jirca: C4r (8.1-8.7 Ma)
Fancel-Lapusna: C4r – C4n (7.5-8.7 Ma)
C4r – C4n (7.5-8.7 Ma)

C3An: 6.0-6.7 Ma

A pause of ~ 0.8 Ma?
Gurghiu
Bacta volcanic structures

Jirca: C4r (8.1-8.7 Ma)
Fancel-Lapusna: C4r – C4n (7.5-8.7 Ma)
Bacta: C3Ar – C3B (6.7 – 7.5 Ma)

Bacta: 1 site with reversed polarity
Gurghiu
Seaca-Tatarca, Borzont, Sumuleu, Ciumani-Fierastraie volcanic structures

Dominat normal polarity

Jirca: C4r (8.1-8.7 Ma)
Fancel-Lapusna: C4r – C4n (7.5-8.7 Ma)
Bacta: C3Ar – C3B (6.7 – 7.5 Ma)
Seaca-Tatarca, Borzont, Sumuleu, Ciumani-Fierastraie: C3An (6.0-6.7 Ma)
North Harghita
Ostoros and Ivo-Cocoizas volcanic structures

Only reversed polarity

Ostoros, Ivo-Cocoizas and southern tip of Gurghiu: C3 (5.2 – 6.0 Ma)
North Harghita
Varghis volcanic structures

Mixt polarities

Ostoros, Ivo-Cocoiazas and southern tip of Gurghiul: C3 (5.2 – 6.0 Ma)
Varghis and northern part of South Harghita: C3n (4.1 – 5.2 Ma)
South Harghita
Luci-Lazu volcanic structures

Mixt polarities

Main phases Luci-Lazu:
1. End of C3n
2. C2Ar
3. Beginning of C2An
~ 3.5 – 4.5 Ma
South Harghita
Cucu and Pilisca volcanic structures

Main phases:

Cucu:
End of C2An (1n)
Beginning of C2r
~ 2.5 - 3.0 Ma

Pilisca:
C2r – C1r
~ 1.5 – 2.6 Ma

Cucu: dominant normal polarities
Pilisca: dominant reversed polarities
Both domes have identical directions:
1. Contemporaneous
2. Short time interval

Malnas and Bixad C2n ~ 1.8 Ma

Is this the correct solution?
New ages!
South Harghita
Balvanyos and Ciomadu volcanic structures

Balvanyos: C1r1n ~ 1 Ma
Puturosu and Ciomadu: C1n

Alternativ solution only C1n

Balvanyos: normal polarity
Ciomadu: normal polarity
Persani volcanic structures

Ar-Ar ages from Panaiotu et al., 2013)

Cobb Mountain subchron ~1.2 Ma
CONCLUSIONS

1. The paleomagnetic results are consistent with the currently accepted model of a progressive migration of the main volcanic activity from North to South.

2. The migration took place in time steps of around 1 Ma or less according to the magnetic polarity data. However inside each step the volcanism can be episodic.
To be continued in the Calimani Mountains.

The truth is out there!

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