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New time constraints from $^{40}Ar/^{39}Ar$ geochronology on andesitic-dacitic lavas and acidic dyke rocks: An attempt to date the associated mineralization in the Western Thrace supra-detachment basin (Kirki, NE Greece)

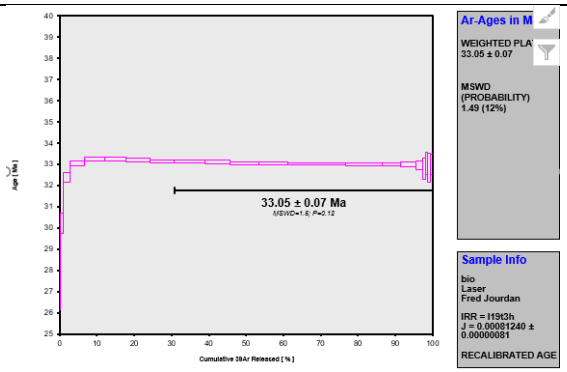
Nikolaos Skarpelis[1], Fred Jourdan[2], and Dimitrios Papanikolaou[3]
[1]National and Kapodistrian University of Athens, Faculty of Geology and Geoenvironment, Athens, Greece (skarpelis@geol.uoa.gr)
[2]School of Earth and Planetary Sciences, Curtin University, Australia
[3]National and Kapodistrian University of Athens, Faculty of Geology and Geoenvironment, Athens, Greece

Epithermal and porphyry-type mineralization is genetically associated with acidic dyke rocks in a part of the supra-detachment Western Thrace Basin. $^{40}Ar/^{39}Ar$ ages on biotite of an andesitic lava dome and on K-feldspar of quartz-feldspar porphyritic dykes were determined and thus, new temporal constraints on the age of volcanism and mineralization were obtained.

Biotite of an andesitic lava dome yields a $^{40}Ar/^{39}Ar$ plateau age of 33.05 ± 0.07 Ma (P=0.12). The dated andesite is considered as representative of the andesitic-dacitic rocks of large volcanic and subvolcanic bodies in the Western Thrace basin (Mavropetra Formation, Kirki area). Andesitic rocks indicate affinities of calc-alkaline to high-K calc-alkaline series magmatism. They are coeval to the high-K calc-alkaline magmatic suite of Leptokarya – Kirki, which forms an ENE-WSW 30 km long magmatic dome, developed between the Rhodope metamorphics extending northwards and the overlying detached Melia non-metamorphic formations and Middle-Upper Eocene molassic clastics, extending southwards.

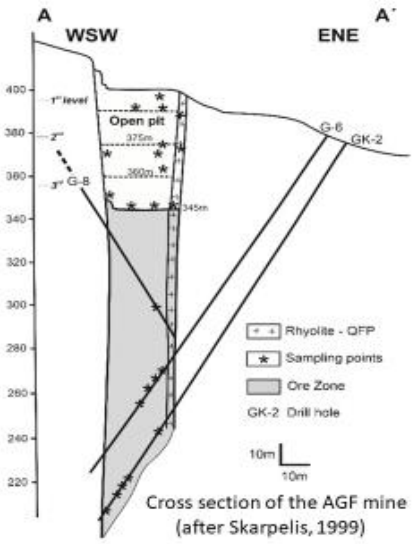
Smaller bodies of acidic dyke rocks (rhyolite and quartz-feldspar porphyry), crosscut the overall dome structure with the andesitic-dacitic volcanics, the Middle-Upper Eocene clastic sediments, the mafic rocks of the Melia unit, the metamorphics of the Kechros Unit of Rhodope and the Leptokarya - Kirki granitoids. They appear with planar subvertical boundaries following a general NNW-SSE trend, perpendicular to the main ENE-WSW dome structure. They are concentrated along a major fault zone (Ag. Filippos fault), with high- to intermediate sulfidation epithermal polymetallic sulfide mineralization, as well as in a roughly 8 km long and 1 km wide fracture zone to the east and northeast of Aisymi village with porphyry-type mineralization. Structural observations document the mega-tension gashes nature of the dykes with pronounced sinistral strike-slip kinematic indicators of the Kirki mineralized tectonic zone. K-feldspars from quartz-feldspar porphyritic dykes at Kirki yield a $^{40}Ar/^{39}Ar$ plateau age of a 31.89 ± 0.12 Ma (P=0.08). The acidic dyke rocks contain calc-alkaline to high-K calc-alkaline differentiation trends. They exhibit marked enrichment of LREE relative to the HREE, flat HREE pattern, negative Eu anomaly and Eu/Eu* values ranging between 0.32 and 0.82.

In conclusion, the ENE-SSW Leptokarya - Kirki granitic dome was developed contemporaneously with the andesitic-dacitic volcanics at the contact between the Rhodope metamorphics and the detached Melia formations and Middle-Upper Eocene clastics at about 33 Ma, followed by the NNW-SSE transverse faults and acidic dykes with epithermal and porphyry-type mineralization at about 32 Ma.



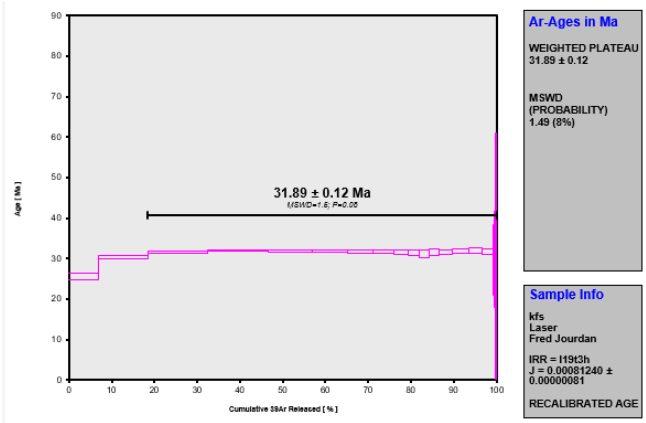
The dated andesite at Pagoni Rachi Hills (left) and $^{40}Ar/^{39}Ar$ plateau age of biotite

AGF abandoned mine: The open pit, Oct. 2010



Cross section of the AGF mine (after Skarpelis, 1999)

The Agios Filippos abandoned open pit mine (left) and cross section on the basis of drilling data (Skarpelis, 1999)



Part of an acidic dyke (Aisymi area) (left) and $^{40}Ar/^{39}Ar$ plateau age of K-feldspar of the Quartz-Feldspar Porphyry dyke rocks at Kirki (south of the AGF abandoned mine)