

Studia breviora

How old the acidic dykes of the Zvezdel swarm (Eastern Rhodopes, Bulgaria) are?

Linear E-W (85-100°) to WNW-ESE (110-120°) dyke swarms are important magmato-tectonic structures in the Eastern Rhodope and in the eastern part of the Central Rhodope areas of the Paleogene Macedono-Rhodope-North Aegean Magmatic Zone (MRNAMZ).

The Zvezdel dyke swarm (90-100°) is intruded into high grade metamorphics and into their stratified cover of Priabonian – Lower Oligocene sedimentary, volcanic and volcanoclastic rocks, which built up the south part of the Zvezdel volcanic massif (Zvezdel volcano – Lilov et al., 1987; Недялков, 1987). Some authors (Иванов, 1984; Lilov et al., 1987 etc.) considered it as an eastern portion of the Galenit dyke swarm, described also (Бахнева-Стефанова & Стефанов, 1973) as Ardino swarm. The Zvezdel swarm is long more than 15 km. Its width is varying from 500-600 m up to 3 km. The irregularly hydrothermally altered “Куми” rhyolitic dykes, cropping out near the Bulgarian-Greece border (Eleutheriades & Christofides, 1980) obviously can be regarded as its echelonned prolongation. In the confine of the Zvezdel swarm the dykes (0.5-40 m thick) associate with a few irregular stock-like bodies and cryptodomes (or laccoliths?) cropping out on some hundreds m² up to 1 km² (Недялков, 1987, Fig. 1). They are predominantly acidic (dacites, rhyodacites, rhyolites), with the intermediate varieties (phenoandesites, latites, basaltic andesites) being strongly subordinated. The respective rocks belong to the high-K calc-alkaline and shoshonitic series. Most of them are irregularly hydrothermally altered.

The Zvezdel dykes are assumed to be products of the youngest (Late Oligocene and even Miocene) – postsedimentary magmatic events in the Tertiary orogenic

development of Eastern Rhodopes (Иванов, 1984; Harkovska et al., 1989; Yanev & Bardintzeff, 1996). The only one K-Ar age (27 Ma) determined on a “rhyolitic dyke”, exposed along Momchilgrad-Podkova road at 3 km NE of Podkova railway station (Lilov et al., 1987), seemed to support that considerations.

Recently another three E-W to NW-SE (90°, 102° and 130°) trending Zvezdel acidic dykes, exposed along the road mentioned above, have been analysed (Table 1). All of the K-Ar ages obtained agree with each other within the limits of the analytical error. The agreement between the w. r. and the biotite ages suggests that both of them reflect a real Early Rupelian (acc. to the Gradshtein & Ogg's – 1996 time scale) geological age. These K-Ar ages indicate that at least a part of the Zvezdel swarm acidic dykes have been intruded not after, but contemporarily to the paroxysmal (Early Rupelian – 31-33 Ma after Lilov et al., 1987, Yanev & Bardintzeff, 1996) Tertiary magmatic activity.

The new K-Ar ages of Zvezdel dykes confirm the Kostov's suggestion (Костов, 1954) that the Eastern Rhodope dyke swarms were feeding structures of the Paleogene extrusive rocks. They agree also with the petrologic data of Марчев (1985) showing that some of the intermediate and acidic flows near the village of Bezvodno (Eastern Rhodopes) were fed by dykes.

If the Chattian w. r. age of the Zvezdel acidic dyke, reported by Lilov et al. (1987) will be considered as a real geological age, the new K-Ar dating could be interpreted as a result of two main stages of dyke intrusions: during the Early Rupelian (32.2-31.23±1.20 Ma) and at least 4,5 Ma later – in the Early Chattian (27 Ma – Lilov et al., 1987).

Table 1

New K-Ar age determinations of acidic bodies from the Zvezdel dyke swarm

Sample N	Morphology of the sampled body and location of the samples	Rock type	Dated fraction	K%	⁴⁰ Ar rad %	⁴⁰ Ar rad ccSTP/g	K-Ar age Ma
1 4Z	Cryptodome or laccolith (?) – at 180 m NW (300°) of Kouvandzhic peak.	phenodacite	Bi	7.16	81.0	3.764×10 ⁻⁶	31.23±1.19
2 6Z	Dyke – at 1125 m SW (250°) from Yapruluk peak	phenodacite	w.r.	4.46	76.8	5.633 ×10 ⁻⁶	32.20±1.24
3 7 ₁ Z	Dyke – at 1080 m W (265°) from Yapruluk peak	phenodacite	w.r.	4.68	85.8	5.835 ×10 ⁻⁶	31.79±1.21

The atomic constants used are after Steiger & Jager (1976).

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