THE FANOS GRANITE IN THE AXIOS ZONE: AN ISLAND ARC MAGMATISM? DURING THE JURASSIC

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ABSTRACT

The Fanos granite occurs in the Paionia Subzone of the Eastern Axios-Vardar Zone in Northern Greece. It is a Late Jurassic (158±1 Ma), N-S trending granite, intruding the Mesozoic back-arc Geuvgeuli ophiolitic complex (Peonia Subzone). For the better understanding of the geotectonic evolution of the broader area, the Fanos granite is compared with the Mid-Late Jurassic Kastaneri volcano-sedimentary formation allocated on the eastern part of the Paikon Massif, on which the Geuvgeuli ophiolites were obducted. The origin of the Fanos granite as well as the possible geotectonic setting of the granite, in the Neotethys (=Axios/Vardar ocean) are some of the main topics that we address in our study. The rock samples of the area were analyzed by X-ray fluorescence for major and trace elements. Taking into account our structural and geochemical data along with the existing isotopic and geotectonic data of the broader Axios-Vardar Zone, we suggest that the studied granitic rocks were formed during an intraoceanic subduction within the Axios-Vardar ocean (=Neotethys).

1 INTRODUCTION – GEOLOGICAL SETTING

In Northern Greece, the Axios Zone comprises the Almopia Subzone in the West, the Paion Subzone in the Middle and the Paonia Subzone in the East (Mercier 1968, Ricou & Godfriniaux 1995, Brown & Robertson 2003). (Fig. 1). Several models have been proposed for the structural evolution and tectonic setting of this area. The Geuvgeuli ophiolitic complex occurs in the Paonia Subzone and is forming a distinct NW-SE trending, exposed both in Greece and former Yugoslavia. This Mesozoic complex has the form of a large ophiolitic thrust, obducted on the eastern part of the Paikon Massif (Fig. 2a). The Geuvgeuli ophiolites are intruded by the Fanos granite, a Late Jurassic (158 ±1 after Anders et al. 2005), N-S trending granite (Fig. 2a, b). For the better understanding of the geotectonic evolution of the broader area, the Fanos granite is compared with a volcano-sedimentary formation of Mid-Late Jurassic age, the Kastaneri formation, al-
located on the eastern part of the Paikon massif (Pai-
kon Subzone).

In our study we address three major topics: a) the
origin of the Fanos granite, b) the geochemical corre-
lation between Fanos granite and Kastaneri formation
and c) the relationship of the granite with the remnants
of an oceanic island-arc or an active continental mar-
gin geotectonic setting situated in the Neotethys
(=Axios/Vardar ocean).

2 DATA - METHODS

The Fanos granite is composed of three main rock
types namely aplitic granite, coarse grain granite and
microgranite evolved by fractional crystallization
(Christofides et al. 1990). The collected rock samples,
from the study area, are granites, aplitic granites, mi-
crogranites, rhyolites, quartz diorites, migmatites and
amphibolites. According to our field observations, the
initial intrusion character of the granitic bodies at the
eastern contact of the Fanos granite with the host ophi-
olitic rocks is well preserved. On the contrary the
western contact between ophiolites and the Fanos
granite is overprinted by a few meters thick, westward-
vergent semiductile thrust zone along which the gran-
ite overthrusts the ophiolitic rocks. Taking into account
the overall structural setting for the broader area of the
Axios zone and Pelagonian nappe (Vergely & Mercier
(2000, Brown & Robertson 2003, Kiliaros et al. 2010, Katrivanos et al. 2013) the overthrusting should be related to the Early Cretaceous compressional event recognized in the study area. Brittle deformation characterizes mainly the granitic body expressed by thrust faults, as well as high angle normal fault, thick cataclasites and a dense joint nest.

The samples were analysed by XRF for major and trace elements. The granite shows peraluminous character, high-K calc-alkaline affinities and I-type features. The trace element patterns along with the isotopic composition of the rocks indicate absence of continental crustal material contamination. Moreover, the geochemical data imply a common origin between the Fanos granite and the Kastaneri formation. The Sr initial isotopic ratios of the granite range between 0.70519 and 0.70559 while the Nd initial isotopic ratios range between 0.51236 and 0.51239 (Šarić et al. 2008) reflecting EM-I (Enriched Mantle-I) component.

3 CONCLUSIONS

According to our structural and geochemical investigations in combination with the existing isotopic and geotectonic data, we proposed a model for the geotectonic setting of the Fanos granite. During the Late Jurassic, in the Axios-Vardar (=Neotethys) ocean area, occurred the initial phase of an intra-oceanic subduction. At the same time, along the subduction zone, the metamorphic sole started to form, (Fig. 3a). Gradually an ensimatic island arc together with a back arc basin started to form (Paionia ophiolites). This stage is related with the formation of the initial magma of the Fanos granite and the volcano-sedimentary Kastaneri formation (Paikon Subzone), (Fig. 3b).

Fig. 3. Proposed model showing the geotectonic position of the Fanos granite in an island–arc setting during an intra-oceanic subduction in the Axios/Vardar ocean (=Neotethys). The tectonic emplacement of the granite took place together with the westward obduction of the Neotethyan ophiolites of the Axios/Vardar ocean on the Pelagonian continental margin.
Finally, in the Late Jurassic, the Fanos granite emplaced together with the westward obducted ophiolite on the eastern Pelagonian continental margin. A high pressure-low temperature metamorphism (HP-LT) of Middle to Late Jurassic age suspected by Baroz et al. (1987), related to the tectonic overpressure caused by thrusting of the ophiolites, (Fig. 3c). Retrogression of the HP-LT metamorphism in greenschist facies conditions, followed during the Late Jurassic –Early Cretaceous (Katrivanos et al. 2013).

REFERENCES