

Emplacement and fabric-forming conditions of plutons from structural and magnetic fabric analysis: A case study of the Plana pluton (Central Bulgaria)

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Abstract: The relationship between intensity parameters such as the corrected anisotropy degree P' and mean susceptibility Km for plutons with similar magnetic mineralogy, yields a criterion to determine the origin of their magnetic fabric: for a same mineralogy, the higher the P' values for the same mean susceptibility Km (irrespective of its absolute value), the higher was possible tectonic effect. Using this criterion, comparison of the magnetic fabric of the Upper Cretaceous mid- to shallow crustal level Plana pluton with that of other small Upper Cretaceous plutonic bodies in Sredna Gora Zone (Central and Southeast Bulgaria) highlights the structural evolution of the Plana pluton. The central part of Plana pluton and its southwest, west and east margins have preserved their emplacement fabric. Along its northern contact the magnetic fabric of the pluton was affected by the last movements within the Okol Shear Zone where high-temperature S/L mylonites developed. The fabric of the pluton at its southeastern border was disturbed during the intrusion of the neighboring Gutsal pluton. The similarity in the orientation of magmatic and magnetic structures preserved in the central and southern parts of the Plana pluton and the transition from magmatic to high-temperature superimposed foliations and lineations at its north contact point to a composite superimposed shear-induced and emplacement-related magmatic magnetic fabric. Nearly vertical orientation of magnetic and magmatic foliations and lineations from the undeformed parts of the pluton shows a process of vertical magma rising and emplacement. The sub-vertical high-temperature solid-state mylonitic foliation and dip-parallel stretching lineation in the pluton along its northern contact reveals the transpression nature of the deformation in the vicinity of Okol Shear Zone with a strong pure shear component. The smooth transition between the deformed and undeformed parts of Plana pluton reveals the syn-kinematic character of the emplacement. This finding is in agreement with the kinematics from the other domains of the Maritsa Fault System as well as with emplacement mechanisms of other Upper Cretaceous plutons in Sredna Gora Zone. On the basis of the results obtained, a model is proposed, suggesting a continuous opening for the emplacement of the compositionally heterogeneous igneous rocks of the Plana pluton.

Keywords: Anisotropy, Magnetic susceptibility, Pluton emplacement, Tectonics