



## The Thracian Suture – does it exist?

### Съществува ли Тракийската сутура?

*Ianko Gerdjikov<sup>1</sup>, Alexandre Kounov<sup>2</sup>, Anna Lazarova<sup>3</sup>, Kamen Bonev<sup>4</sup>,  
Neven Georgiev<sup>1</sup>, Dian Vangelov<sup>1</sup>*

*Янко Герджиков<sup>1</sup>, Александър Кунов<sup>2</sup>, Анна Лазарова<sup>3</sup>, Камен Бонев<sup>4</sup>,  
Невен Георгиев<sup>1</sup>, Диан Вангелов<sup>1</sup>*

<sup>1</sup> Sofia University, Departement of Geology and Paleontology; E-mail: janko@gea.uni-sofia.bg; neven@gea.uni-sofia.bg; dedo@gea.uni-sofia.bg

<sup>2</sup> Geological-Paleontological Institute, Departement Geowissenschaften Universität Basel; E-mail: a.kounov@unibas.ch

<sup>3</sup> Geological Institute, BAS, Acad. G. Bonchev Str., Bl. 24, 1113 Sofia; E-mail: alazarova@geology.bas.bg

<sup>4</sup> Earth Sciences Hazard Group; E-mail: eshgroup@gmail.com

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The nature of the contact between the low-grade (usually referred as Diabase-Phyllitoid Complex – DPC) and the high-grade (usually referred as part of Pre-Cambrian Thracian Massif) Pre-Mesozoic metamorphic rocks in Bulgaria, although largely discussed in numerous papers, is still a matter of significant controversy. Sharing the same age (Late Neoproterozoic, von Quadt et al., 1998; Graf, 2001), the two main occurrences of low-grade rocks in Bulgaria represent different lithostratigraphic successions. In Stara Planina Mountain, the low-grade complex consists of ophiolites and deep-sea sediments (DPC) whereas in SW Bulgaria it consists of imbricated together fragments with ophiolitic (Frolosh Formation) and island arc (Struma Diorites Formation) origin. Concerning the high-grade metamorphic rocks along Sredna Gora Mountain, they have been recently determined as Variscan (Carrigan et al., 2006). In SW Bulgaria, the high-grade metamorphics have reached the metamorphism peak between 139-112 Ma (Kounov et al., in press). Farther south, the high-grade metamorphic basement is represented by Ograjden-Vertiskos Complex – one of the least known metamorphic complexes in Bulgaria. Our detailed work along the southern slopes of Stara Planina, Sredna Gora and Kraishte Zones combined with recent geochronological data allow questioning some of the previous ideas concerning the character of contacts between the low-grade and high-grade complexes.

Previously the contacts between the Late Neoproterozoic low-grade oceanic-derived rocks and the high-grade complex in Bulgaria were interpreted as a Variscan suture whereas the so-called Sredna Gora terrane (high-grade basement of Sredna Gora Zone) is thrust over Balkan terrane (low-grade basement of

the Moesian platform) (Haydoutov, 1991; Carrigan et al., 2005). In fact the field relations indicate a much more complicated relationship between the rocks of these two units. In SW Bulgaria the low-grade rocks are overlying the high-grade complex whereas in Stara Planina Mountain the high-grade rocks are structurally above (using orientation of the foliation as a reference). Therefore, the proposed by Haydoutov (1991) “Thracian suture” must actually encompass two different tectonic zones.

The first tectonic zone, where the high-grade complex is overlying the low-grade metamorphics, could be traced along the southern slopes of Stara Planina Mountain (Belev, 1967; Ivanov et al., 1987; Antonov et al., 2003). This is the Stargel-Boluvania tectonic zone (SBTZ), which age is well constrained as late Variscan (Gerdjikov et al., 2007). The SBTZ marks a sharp jump in the metamorphic grade. It is characterized by inverted metamorphic gradient where migmatitic gneisses are structurally above very low-grade metabasites and phyllites. Our structural observations show that this zone does not represent a syn-metamorphic thrust because the ductile shearing was dominantly strike-slip. Therefore, unlike the previous interpretations we regard this contact as a crustal-scale transpressional shear zone juxtaposing the high-grade basement to the low-grade metamorphics. The dominant strike-slip shearing along this contact is even more pronounced in the Central Stara Planina Mtn., where deformed granitoids, of probable Late Variscan age, bear almost E-W trending lineation on steeply dipping to the south foliation planes (Gerdjikov et al., 2008).

The second tectonic zone, along which the low-grade rocks are overlying the high-grade complex is

traced from Vakarel hills and Lozenska Mountain to the SW and was described as the Gabrov dol ductile fault (Bonev et al., 1995). At the first glance this contact looks like the perfect suture – low-grade ophiolites and island arc fragments overlay continental crust, but several pieces of information are inconsistent with such an interpretation: 1) Upper colliding block is missing. There is no single piece of evidences suggesting that the low-grade metamorphics in SW Bulgaria are tectonically covered by another sialic crustal fragment. 2) There are no data for HP metamorphism in the proposed suture zone. 3) The low-grade rocks are rather old (Late Neoproterozoic) and there are no associated younger marine or oceanic sediments. 4) The reported kinematics for the shearing (Bonev et al., 1995) along the Gabrov dol ductile fault are more consistent with extensional mode rather than thrusting/obduction. 5) The timing of suturing. An important and still not resolved question concerns the age of the shearing along the Gabrov dol fault. It is equally regarded as Variscan ductile thrust zone and pre-73 Ma extensional low angle fault. Up to now the only available constraint for the age of this shear zone is the age of migmatization in Central Sredna Gora (336 Ma; Carrigan et al., 2006) and the emplacement of the Plana Pluton (~73 Ma; Bonev et al., 1995) sealing the contact. As the shearing is reported to be post-peak metamorphism, therefore the age of the fault has to be Late Variscan or younger. Following the general logic of the orogen evolution, the suturing is

rather characteristic for the earlier stages before significant crustal thickening to take place. In the case of the Gabrov dol contact it is obvious that the shearing post-dated the crustal thickening and migmatization in the gneissic basement. Taken alone, none of these lines of evidences can be regarded as decisive, but combined they indicate that the Gabrov dol zone is unlikely to be a Variscan suture.

Our structural data and analysis reveals that: 1) The contact between the low-grade and the high-grade rocks in Central and SW Bulgaria represents two major tectonic zones with different geometry and kinematics. 2) The low grade metamorphic rocks occur in two different tectonic positions in relation to the gneiss-migmatitic core of the Variscan orogen. This strongly suggests that the low-grade rocks could not be incorporated into a single unit, but probably represent remnants of different Late Neoproterozoic – Early Paleozoic ophiolite-floored basins, with or without including island arc rocks. In this logic, the DPC is an obsolete term and its use is misleading. 3) Although the presence of the Cadomian oceanic fragments, in the Variscan orogen in Bulgaria, undoubtedly evidences the existence of the Late Neoproterozoic oceanic basins, the time and the character of their closure and post-suturing evolution are still not fully understood and correctly constrained.

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