



## The Plakalnitsa Fault Zone characteristics in the area of Dragoybalkan ridge, West Bulgaria

### Характеристика на Плакалнишката разломна зона в района на Драгойбалканския рид, Западна България

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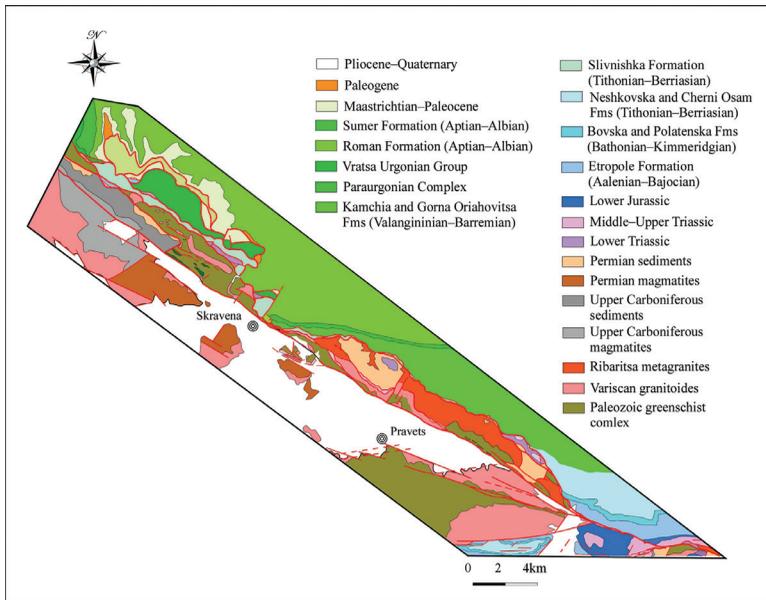
The Plakalnitsa Fault Zone (PFZ) is one of the most prominent tectonic boundaries on the territory of Bulgaria along the front of the Balkanide orogen. It can be traced for over than 300 km from the Timok river valley in Eastern Serbia (Timok fault) to central parts of Stara Planina Mountain as single fault plain or few kilometer wide fault zone. It was first characterized by Bonchev (1910) under the name “Plakalnitsa fault” in the region of Vratsa Balkan. According to Kockel (1927), this is the most important and large fault structure in Western Bulgaria, comparable to the “Chudnite Skali” Dislocation and the Shipka-Sliven zone to the east. Later Janichevsky (1935) proves the compressive character of the structure. The variable characteristics and segmentation of deformation are the main reasons to be known and described under numerous of names (Bonchev, 1971) but not well characterized in regional aspects yet.

The orientation of the PFZ varies from 135° to 120° in the area of Dragoybalkan ridge. Its width is from several tens of meters up to 2 km. The zone has a imbricate structure and the dip of the frontal fault surfaces (often overlapping) varies from sub-vertical to 70° in the valley of Malak Iskar River, to 65–40° by Praveshka Lakavitsa and Tseritsa, and below 20° at the village of Skravena (according to drilling data). In the northwest direction, sub-horizontal shearings are also located at the frontal parts of the zone, but with sub-vertical in its internal parts also, often with a strike-slip component.

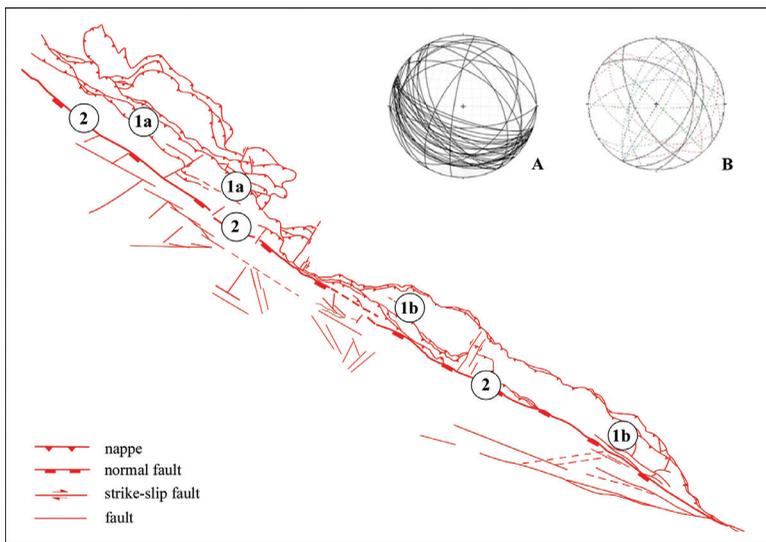
The well exposed outcrops along the Dragoybalkan ridge in Botevgrad vicinity are good example for the heterogeneity and fast lateral changes in the PFZ in short distances. In the area the field data allow to be characterized two domains with contrast composition, which we named Lyutidol-Lipnitsa and Temush-Urvich (Fig. 1, 2). In the first domain the hanging wall of the zone is composed of metamorphosed during the Variscan orogeny in green-schist

facies volcano-sedimentary complex (Cambrian–Ordovician?) and intruded into them syn- to post-metamorphic small granitoid intrusions. In this domain these rocks are thrustured toward southwest, over the Upper Carboniferous and Permian sedimentary and volcanic rocks (back thrust). Northeastward the metamorphites overrides more than 3 km wide sub-thrust zone including slices of Triassic to Paleogene sedimentary rocks, with dying-out and shallowing toward the foot wall intensity of deformation. There are numerous orthogonal or oblique dextral and sinistral strike-slip faults combined with normal faulting displacements in the volume of the zone, but also back thrusts, triangular zones and flower structures. This domain is limited to the east by a right-lateral strike-slip/normal fault surface, and to the east of it the thickness of the zone to the next domain is only a few tens of meters.

In the Temush-Urvich domain the PFZ hanging wall is presented by Ribaritsa type metamorphosed granitoids (Angelov et al., 2010) thrustured by low-grade volcano-sedimentary complex and intruded into them granitoids. They are transgressively overlaid by Permian and Triassic clastic rocks, later involved in transpressional deformations, located mainly along the zone roots. The faults in the zone core are oriented obliquely to the main zone trend and combined with the right-lateral displacements. The sinistral and dextral strike-slip orthogonal fault system is develop mainly in the central part of the domain and not documented in the sub-thrust zone. The sub-thrust zone itself is missing or very narrow, represented by Lower–Middle Triassic or Jurassic sediments. In front of this domain and in its frames were documented Upper Cretaceous magmatic activity, localized in its southeastern part. In the northwestern part was established not described so far brittle-ductile shear zone with most probably Early Alpine age. This segment ends in the valley of the Malak Iskar



**Fig. 1.** Schematic Geological Map of the Plakalnitsa Fault Zone in the area of Dragoybalkan ridge (modified after Geological Map of R. Bulgaria on Scale 1:50 000)



**Fig. 2.** Schematic fault map of the studied area: 1a, Lyutidol-Lipnitsa domain, 1b, Temush-Urvich domain; 2, Dragoybalkan fault. Stereo-plot diagram (lower hemisphere) of the measured fault plains: A, in the zone hanging wall; B, in the sub-thrust zone.

River, where the area is only a few tens of meters wide, south of the village of Laga.

Zh. Ivanov et al. (2004, unpublished report) and Petrov (2005) interpreted the PFZ as Late Alpine negative flower structure. The Dragoybalkan fault is accepted as roots of the zone, extensionally reactivated during the Late Pliocene. The low-grade metamorphic overprint on the Paleozoic rocks, the syn- to post-metamorphic granitoids and especially the “Ribaritsa type” granite developed only in the frames of the zone are evidences for the Variscan activity of the PFZ. All these facts are evidences for the polyphasal reactivation and evolution of the PFZ and its significant role as a major tectonic boundary. The characteristics of the zone east and westward differs from in the studied area, which confirm the heterogeneity of the deformation style along the trace of the PFZ.

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