

# Geoloski profil planine Avale (severna Šumadija) - uvid u litostratigrafiju i tektonske strukture

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## GEOLOSKI PROFIL PLANINE AVALE (SEVERNA ŠUMADIJA) - UVID U LITOSTRATIGRAFIJU I TEKTONSKE STRUKTURE

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### Ključne reči: sutura, paraflis, bazalna navlaka, transkurentni rased

Mezozojske formacije Šumadije dele tektonsko-stratigrafsku evoluciju južnijih delova suture jedinica Adrijskog i Evropskog afiniteta, uključujući gornjojursku obdukciju, krednu subdukciju i paleogenu kontinentalnu koliziju. Finalni rezultat dugovremene evolucije u geodinamički složenom ambijentu su komplikovani tektonski i litostratigrafski odnosi različitih mezozojskih formacija suture. Geološki profil kroz planinu Avalu omogućava uvid u skoro potpunu sukcesiju mezozojskih formacija i prostorne pozicije i kinematiku značajnih tektonskih struktura najsevernijih segmenata suture u Šumadiji.

U tektonskom kontekstu, mezozojske formacije okoline Beograda najčešće su interpretirane kao deo Istočne Vardarske ofiolitske jedinice (IVO) i Sava sutura zone (SZ) (Toljić et al., 2018; Schmid et al., 2020). Litostratigrafske jedinice IVO su ofioliti i ofiolitski melanž, berijasko-baremski paraflis, urgonski krečnjaci, alb-cenomanski klastično-karbonatni sedimenti i konijak-santonski klastično-karbonatni deponati asocirani sa sindepozicionim vulkanitima.

Litostratigrafske jedinice Sava sutura zone su klastično-karbonatni flis kampan-mastrihtske starosti („Barajevski flis”) i klastični flis mastrihtsko-paleogene starosti („Ostružnički flis”).

U tektonskom profilu Avale ističu se dve značajne strukture: Belorečki rased i Avalski rased. Belorečki rased (BR) je složena ZJZ vergentna navlaka koja razdvaja mezozojske formacije Istočne Vardarske ofiolitske jedinice (na istok-severoistoku) od gornjokredno-paleogenih fliševa Sava sutura zone (na zapad-jugozapadu). Po reversnim rasedima ove strukture opserviran je tektonski transport ka ZJZ. Avalski rased (AR) je lokalna, reversna zapadnovergentska struktura.

Takođe, u području Avale su opservirani i transkurentno desni rasedi pružanja SSZ-JJI, aktivni u kompresiji orijentacije S-J. Mereni su u krednim sedimentima, uključujući i u biostratigrafski dobro definisanim santonskim laporcima i vulkanoklastitima. Kako su opservirani transkurentni rasedi očigledno post-konsolidacioni fenomen, isključena je njihova gornjokredna starost.

U svetlu prezentiranih podataka o litostratigrafskim i tektonskim osobinama područja Avale, najvažniji zaključci su:

- U okolini Beograda se nalaze ekvivalenti dve tektonske jedinice: Istočne Vardarske ofiolitske jedinice i Sava sutura zone; U okolini Beograda nema ekvivalenta Jadar-Kopaonik jedinice; Ofioliti i ofiolitski melanž su deo Istočne Vardarske ofiolitske jedinice; Belorečki rased je bazalna navlaka Istočne Vardarske ofiolitske jedinice. Asocijacija reversnih raseda je bila aktivna u kompresiji upravnoj na pružanja suture; Transkurentno desni rasedi pružanja SSZ-JJI su bili aktivni u kompresiji orijentacije S-J i post-kredne su strukture.

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## GEOLOGICAL PROFILE ACROSS THE AVALA MT (NORTHERN ŠUMADIJA) - INSIGHT INTO LITHOSTRATIGRAPHY AND TECTONIC STRUCTURES

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### **Key words: suture, paraflysch, basal thrust, strike-slip fault**

Mesozoic formations in Šumadija share the tectonic-stratigraphic evolution of the southern parts of the suture between the units of the Adria and European affinity, including the Upper Jurassic obduction, Cretaceous subduction and the Paleogene continental collision. The long-lasting evolution in a geodynamic complex domain led to complicated tectonic and lithostratigraphic relationships between different Mesozoic formations of the suture. Geological profile across the mount Avala allows insight into the almost complete succession of Mesozoic formations, spatial distribution, and kinematics of important tectonic structures of the northernmost suture segment in Šumadija.

Mesozoic formations in the vicinity of Belgrade were regarding tectonics commonly interpreted as a part of the Eastern Vardar ophiolitic unit (EVO) and the Sava suture zone (SZ) (Toljić et al., 2018; Schmid et al., 2020). Lithostratigraphic units in the EVO are ophiolites and ophiolitic mélange, Berriasian to Barremian paraflysch, Urgonian limestones, Albian-Cenomanian clastic-carbonate sediments and Coniacian-Santonian clastic-carbonate deposits associated with syndepositional volcanics.

Lithostratigraphic units of the Sava suture zone are clastic-carbonate flysch of the Campanian-Maastrichtian age („Barajevo flysch”) and clastic flysch of the Maastrichtian-Paleogene age („Ostružnica flysch”).

Two important structures could be distinguished in the tectonic profile across the Avala Mt: Bela Reka Fault (BRF) and the Avala Fault (AF). The BRF is a complex WSW vergent thrust that separates Mesozoic formations of the Eastern Vardar ophiolitic unit (on the east-northeast) from the Upper Cretaceous-Paleogene flysch in the Sava suture zone (on the west-southwest). Tectonic transport to WSW was observed along the BRF. Avala Fault is a local west-vergent reverse structure.

In the foothill of Avala NNW-SSE dextral strike-slip faults were also analyzed, active in N-S oriented compression. Faults were measured within the Cretaceous sediments, including the biostratigraphically well-established Santonian marlstones and volcanoclastites. The observed faults obviously are of post-consolidation origin; hence their Upper Cretaceous age is excluded.

In the light of presented data on lithostratigraphic and tectonic features of the Avala Mt, the most important conclusions are:

- In the vicinity of Belgrade parts of two tectonic units are exposed: the Eastern Vardar ophiolitic unit and the Sava suture zone.
- In the vicinity of Belgrade there are no equivalents of the Jadar-Kopaonik unit.
- Ophiolites and ophiolitic mélange are a part of the Eastern Vardar ophiolitic unit.
- The Bela Reka Fault is a basal thrust of the EVO. Association of reverse faults was active in compression perpendicular to the direction of suture.
- The dextral strike-slip faults of the NNW-SSE direction, active in N-S oriented compression, are post-Cretaceous structures.

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