



LATE CIMMERIAN TECTONICS OF THE TRIASSIC AND JURASSIC ROCKS IN LOUDA KAMCHIA, EAST STARA PLANINA MTS. (BULGARIA)

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Introduction

The study of the Triassic and Jurassic rocks in Eastern Stara Planina Mts. started in the beginning of the 20th century. Kockel (1929) and Bernd (1934) already demonstrated that a large number of Triassic and Jurassic outcrops represented huge exotic blocks (later named olistolites), and this view has been entirely or partially shared by later authors (Ганев, 1961; Кънчев, Енчева, 1967; Кънчев, 1993, 1995, etc.). Начев et al. (1967) introduced the hypothesis that all Triassic and Jurassic rocks in eastern Stara Planina Mts. represented olistolites into the Upper Cretaceous black shales of the Kotel Fm. Чумаченко & Чернявска (1989) established a lithostratigraphy for the Jurassic, and Будуров et al. (1997), for the Triassic sediments. Будуров et al. (2004) suggested that in many localities in the Louda Kamchia Valley the Triassic and the Jurassic rocks are in superposition, and the boundary Triassic/Jurassic is situated within the Sini Vir Formation.

Stratigraphy

The Triassic and Jurassic deposits in eastern Stara Planina Mts. are of two types (Fig. 1): (a) parautochthonous (basinal Tethyan) type, and (b) allochthonous - olistolites, formed by shelf (Peri-Thethyan) Triassic and Jurassic sediments, and by exotic blocks, coming from the partly destroyed Mator rift basin (Fig. 2).

The Tethyan (parautochthonous) Triassic rocks are subdivided into: Mayadere Fm. (Spathian), Gyurgenliya Fm. (Lower Anisian-Lower Carnian), and Glogova Fm. (Upper Carnian-Norian to Rhaetian) (Будуров et al., 1997), and the Jurassic sediments in Sini Vir Fm. (now referred to Norian-Toarcian, p.p.), Balaban Fm. (Тоarcian p.p.) (Чумаченко, Чернявска, 1989), and Kotel Fm (Начев et al., 1967) (Aalenian-Middle Bathonian?). The stratotype of Mayadere Fm. (93.5m) is located in the Maya Dere Valley South of the village Veselinovo. It is represented by irregular alternation of marls, shales, silstones, sandstones and limestones. The relative amount of shales and silstones is greater in the basal parts of the section, and is gradually replaced upwards by marls with limestones interbeds. The age corresponds to the upper parts of the Olenekian Stage (Spathian). The stratotype of Gyurgenliya Fm. (29.7 m) is located also in the Maya Dere Valley and follows upwards above the Mayadere Fm. and is built up of gray, gray-greenish, reddish or yellowish limestones, in the lower part interbedded with marls, and locally, with silicites. The age is determined as Lower Anisian-Lower Carnian. The stratotype of Glogova Fm. (cc. 30m) is situated along the road Kotel-Omourtag. There the formation is represented by an irregular alternation of marls (dominating in the lower parts) with thin-bedded limestones,

silty limestones, calcareous siltstones and peloidal limestones (mainly in the upper parts). The age is Late Carnian-Norian-Rhaetian (?). The stratotype of Sini Vir Fm. (c. 500-800 m.) is situated in the valley of Eleshnitsa River. The unit is characterized by a siliciclastic alternation – sandstones to calcareous sandstones, aleurolites and argillites to marls, containing many sideritic concretions. In the vicinities of Dropla Village it contains abundant conglomerates, regarded as the result of a paleo-delta. In some sediments, described by Kockel (1929) as "Schwarzflysch serie" (regarded here as lower parts of the Sini Vir Fm), Кънчев & Енчева (1967) and Кънчев (1993, 1995) indicated the presence of Upper Triassic *Halobia*. Будуров et al. (2004) unified the "black flysch" and the Sini Vir Fm. in a single lithostratigraphic unit, referred to Norian –Toarcian (p.p.). The holostratotype of Balaban Fm. is located in the Balaban Dere Valley, South of the Dobromir Village; and it is built by thick bedded sandstones (cc. 60 m); in the vicinities of Dropla Village it contains abundant conglomerates formed in a paleo-delta. The age is attributed to the Toarcian, due to its stratigraphic position. The Kotel Fm. (cc. 1000 m) has an Aalenian-Middle Bathonian age. It is introduced by Начев et al. (1967) as an Upper Cretaceous lithostratigraphic unit. Later Чумаченко & Чернявска (1989) returned its Middle Jurassic age, assumed by Чернявска (1965). The Kotel Fm. is built up by black shales containing many Triassic and Jurassic olistolites.

Late Cimmerian tectonics

The pre-Late Cretaceous (and most probably, pre-Callovia) tectonics is represented by few West-East elongated folds (Fig. 2) often overturned to the North, and namely, the Dropla and Mator-Planina anticlines and the Kodzhakaya and Strouya synclines.

The southernmost structure is the *Dropla anticline* (named after the village Dropla, located in its core). The structure is cored by the sediments of the Sini Vir Fm., and the limbs are built by the Balaban Fm. Its northern limb is overturned over the sediments of the Kotel Fm. In the vicinities of the villages Snezha and Zaimchevo only its northern limb is preserved whereas the southern limb is covered by Upper Cretaceous - Paleogene sediments. In the Ajvadzhik Dere the core of the Dropla anticline is displaced along faults to South-West. The outcrop of the Mayadere Fm., SW of Ortobair Hill is interpreted as relicts of the core of this anticline, exposed now between Upper Cretaceous and Paleogene sediments (Fig.1, section A-B).

The *Kodzhakaya syncline* is situated to the North of Dropla anticline. It is structured predominantly by the black shales of the Kotel Fm., containing many Triassic and Jurassic allochthonous blocks. It is exposed in the Balaban

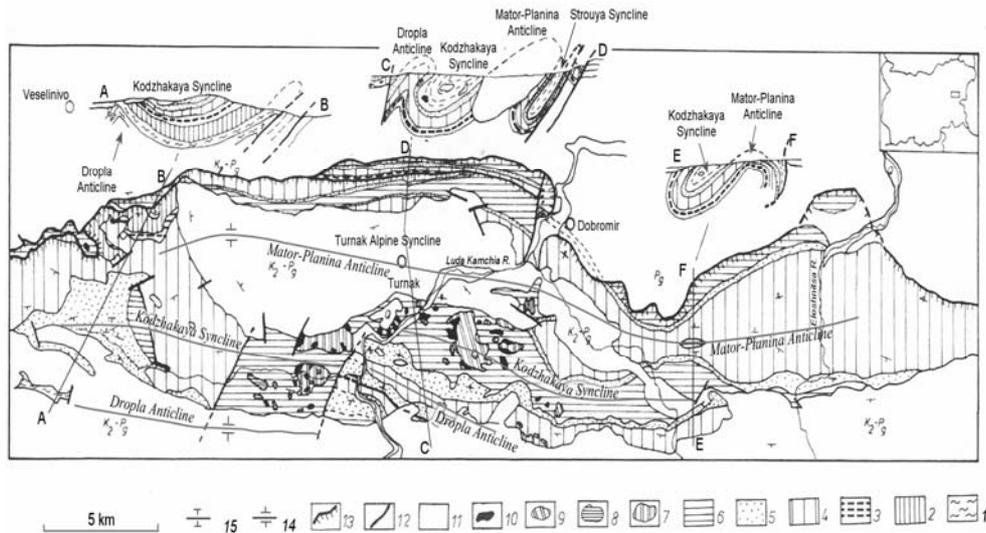


Fig. 1. Correlation of Triassic and Jurassic sections in Eastern Stara Planina Mts

1 - conglomerates, 2 - sandstones, 3 - shales, 4 - black shales with *Bositra alpina*, 5 - shales with olistolites, 6 - marls, 7 - limestones, thin bedded, 8 - limestones, thick bedded, 9 - biotretic limestones, 10 - sandy limestones, 11 - nodular limestones, 12 - bioclastic limestones, 13 - neptunian dykes, 14 - bioturbated surface, 15 - eroded sediments

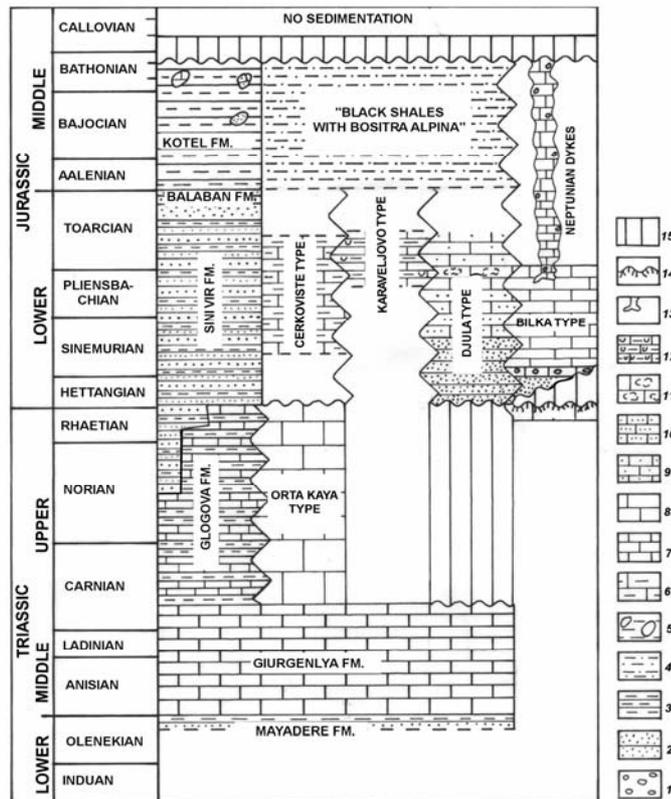


Fig. 2. Geological map of the Triassic and Jurassic sediments in the region of Louda Kamchia Stara Planina Mts. (reinterpreted after Кънчев, 1993)

Paraautochthonous (basin) sediments: 1 - Mayadere Formation (Spathian), 2 - Gyurgenliya Formation (Lower Anisian-Lower Carnian), 3 - Glogova Formation (Upper Carnian-Norian to Rhaetian (?), 4 - Sini Vir Formation (Norian?-Toarcian), 5 - Balaban Formation (Toarcian), 6 - Kotel Formation (Aalenian-Middle Bathonian ?); *allochthonous, predominantly shelf sediments (in olistolites)*, 7 - Lower Triassic marls and limestones, 8 - Anisian-Carnian limestones; 9 - Norian-Rhaetian Orta Kaya type limestones, 10 - Lower and Middle Jurassic sediments; 11 - younger rocks (Lower and Upper Cretaceous, Paleogene, and Quaternary); 12 - fault; 13 - overthrust.

Dere valley, to the West of which the Upper Triassic blocks of Kodzha, Ouch and Orta Kaya Hills are included in the Kotel Fm. The structure continues in the valley of Ajvajik Dere where between Louda Kamchia River and the former village Djula the core of the Kodzhakaya syncline is destroyed by the Ajvadzhikdere Late Cimmerian horst. The latter is built up by the black shales of Kotel Fm., containing many Triassic and Jurassic blocs; in the vicinities of Ortabair Hill the syncline is structured by the rocks of Balaban Fm.

To the North of Kodzhakaya syncline is situated the *Mator-Planina anticline* (Чумаченко & Чернявска, 1989, 1990). In the East it begins in the valley of Eleshnitsa River; the core (Chechme Bair Hill) is built by the alternation of limestones and marls of Glogova Fm. In the vicinities of Strouya Village is exposed its overturned northern limb. In Maya Dere Valley crops out the southern limb of its core, structured by Mayadere Fm., Gurgentlya Fm., Glogova Fm. and Sini Vir Fm. The core is overthrust over the Kotel Fm. of the North anticlinal limb. The Mator-Planina anticline continues in direction of Kotel and the Vratnik Pass, South of the village Bozhevtsi. The anticline crest in the band between the Balaban Dere Valley and to West of the Turnak Village is eroded before the Late Cretaceous, and the Upper Cretaceous sediments structure the Alpine Turnak syncline, superimposed over the core of the Late Cimmerian Mator-Planina anticline.

To the North of the Mator-Planina anticline, in the valley

References

- Будуров, К., Загорчев, И., Трифонова, Е., Петрунова, Л. 1997. Триасът в Източна Стара планина. Литостратиграфски бележки. – *Сп. Бълг. Геол. д-во*, 58/2; 101-110.
- Ганев, М. 1961. Стратиграфия на триаса от Лудокамчийския дял на Източна Стара планина. – *Труд. Геол. Бълг., сер. Статигр. и тект.*, 2; 55-74.
- Кънчев, И. 1993. *Геоложка карта на България 1:100 000. Лист Айтос*. ВТС.
- Кънчев, И. 1995. *Обяснителна записка към Геоложката карта на България 1:100 000. Лист Айтос*. Геология и Геофизика АД, София.
- Кънчев, И., Енчева, М. 1967. Върху възрастта на “черния флиш” от Лудокамчийския дял на Източна Стара планина. – *Спис. Бълг. Геол. д-во*, 28,3; 363-367.
- Кънчев, И., Иванова-Панайотова, В. 1972. Бележки върху присъствието на триас и субинтрузивен магматизъм между селата Веселиново и Звезда, Източна Стара планина. – *Спис. Бълг. Геол. д-во*, 33, 3; 361-367.
- Начев, И., Сапунов, И., Стефанов, Ю. 1967. Котленската олистостромна формация в източната част на балканидите. – *Спис. Бълг. Геол. д-во*, 29, 1; 26-38.
- Чернявска, С. 1965. Резултати от споро-поленовия анализ на тъмните аргилити в Източна Стара планина. – *Тр. Геол. България, Сер. Палеонтология*, 7; 261-301.
- Чумаченко, П., Чернявска, С. 1989-1990. Юрская система в Восточной Стара-Планине. I. Стратиграфия; II. of Kodzha Dere, North of the village Turnak, another overturned syncline (Strouya syncline) is exposed. Its core is built by the black shales of the Kotel Fm. and the limbs – by these of the Sini Vir and Balaban Fm. To the North, its northern limb is in contact by a reverse fault with the northern limb of an anticline. According to Чумаченко & Чернявска (1990) these structures are folded before the Middle Callovian.
- Conclusion**
- The Late Cimmerian tectonic structure of the Louda Kamchiya part of the East Stara planina Mountains consists of a series of folds (Dropla and Mator-Planina anticlines and Kodzhakaya and Strouya synclines) often overturned to the North. They are elements of a huge thrust sheet thrust to the North in pre-Late Cretaceous, and most probably, in pre-Middle Callovian times. A number of the formations involved possess a Tethyan signature and olistostrom character, and contain numerous endo- and exoolistolites of different size and age. According to our opinion, the Triassic/Jurassic boundary is situated within the Sini Vir Formation and has a transitional character. Thus, the Mator basin is one of the very few places in Bulgaria devoid of the Early Cimmerian (Triassic/Jurassic) unconformity and hiatus.
- Acknowledgements.** The present study was made under the project NZ-1310/03 of the Bulgarian NCSR.
- Палеогеографическа и палеотектоническа еволюция. – *Geologica Balc.*, 19, 4; 33-65; 20, 4; 17-58.
- Berndt H. 1934. Trias and Jura des Ostbalkans. – *Ber. Verh. Sachs.Akad. Wiss., Leipzig, Math.-Phys. Kl.*, 86; 3-102.
- Budurov, K., Ivanova, D., Petrunova, L., Tchoumatchenco, P., Zagorchev I. 2003. The eastern Stara Planina Mts. (Triassic and Jurassic) – an example of geosite framework. In: *Geological heritage concept conservation and protection policy in Central Europe*. 3-4 October 2003, Cracow, Poland. Abstracts and field trip Guide-book, 16-17.
- Budurov, K., Ivanova, D., Koleva-Rekalova, E., Petrunova, L., Tchoumatchenco, P., Yaneva, M., Zagorchev, I. 2004. Triassic and Jurassic in East Stara Planina Mts. (Bulgaria) and the problems of their boundary. – *Proceedings of Intern. Symp. on Earth System Sciences, September 8-10, 2004*; 337-344.
- Kockel, C. W. 1929. Transgressionen und Überschiebungen im Ostbalkan. – *Geol. Rundschau*, 20, 4-5; 319-330.
- Tchoumatchenco, P., Peybernès, B., Cernjavska, S., Lachkar, G., Surmont, J., Dercourt, J., Ivanov, Z., Rolando, J.-P., Sapunov, I., Thierry, J. 1992. Étude d’un domaine de transition Balkan-Moésie: évolution paléogéographique et paléotectonique du sillon du Jurassique inférieur et moyen dans la Stara Planina orientale (Bulgarie orientale). – *Bull. Soc. Géol. France*, 163, 1; 49-61.