The late Middle Jurassic–Late Jurassic geodynamic revolution on the Balkans

Късносредноюрско-късноюрска геодинамична революция на Балканите

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The analysis of the Triassic and Jurassic formations in Bulgaria has revealed the presence of two principal distinct sedimentation types called Peri-Tethyan and Tethyan. The boundaries between the formal lithostratigraphic units and the facies in both types (Zagorchev et al., 2009) have a diachronous character, and are cited hereafter only in a most generalized manner. The early Mesozoic Tethyan sedimentation was usually characterized by deeper facies and continuity from the Permian (?) or Early Triassic to late Middle Triassic. This type of sedimentation was related to an early Mesozoic ocean (Küre Ocean, Stampfli, Hochard, 2009) almost consumed in Late Jurassic and Cretaceous times. It was typical of the Mator (Kotel) Basin, the Veleka Nappe in Bulgarian Strandzha and some of the nappes in Turkish Strandzha (İstranja), as well as of Northern Dobrudzha (Dobrogea) and South Crimea. Another Tethyan-type sedimentation developed in the Circum-Rhodope Belt, and was linked to the Vardar Ocean that was closed in latest Jurassic to Early Cretaceous time. The Peri-Tethyan realm embraced the Moesian Platform and most of the Balkanides and Srednogorie. The early Mesozoic sedimentation was characterized by shallow marine (terrigenous and platform carbonate) sedimentation with several breaks (discontinuities, diastems). The Triassic sedimentation exhibits a full cycle beginning with red terrestrial mature conglomerate, quartz sandstone or arkose, continuing into transgressive terrigenous and carbonate deposits to carbonate platform, and ending with regressive red carbonate, marl and coarse sandstone or conglomerate. The Peri-Tethyan Jurassic was characterized by an initial diachronous terrestrial sedimentation followed by a diachronous transgression – locally as early as in the Hettangian (Izdremets Paleograben and other Jurassic paleograbens in the Jurassic Moesia), and usually in the Toarcian or Aalenian–Bajocian (Dragoman Horst of West Bulgaria and East Serbia, and horst structures in Jurassic Moesia). Generally, the Peri-Tethyan Lower Jurassic is of *Gresten* type, the Middle Jurassic is represented by the type “Black shale with *Posidonomya alpina* Grass” and dark fossil-rich limestone; the carbonate Callovian–Upper Jurassic succession was in the Oxfordian (p.p.)–Kimmeridgian–Tithonian (p.p.) of *Ammonitico rosso* type, and in the Tithonian (p.p.) consisted of micritic limestones (close to the *Majolica* type). The sequence continues in the predominantly carbonate Early Cretaceous sedimentation. Diachronously being opened in the Callovian–Kimmeridgian interval, the Nish-Troyan Flysch Trough developed at the southern edge of the Peri-Tethyan Balkan-Moesian Sea and reached its climax in Tithonian to early Berriasian times (Nachev, 1974).

The early Mesozoic realm underwent a profound reorganization in late Middle Jurassic (Callovian) to Late Jurassic times that could be characterized as a geodynamic and palaeogeographic revolution. It consisted in several coeval to slightly diachronous major events that ended in earliest Cretaceous times.

These events could be listed as follows:

1. Compressional deformations occurred in Callovian times, and resulted in the closure of the Mator Basin (Tchoumatchenco, Černjavska, 1990; Tchoumatchenco et al., 2004; Tchoumatchenco, 2006) with formation of the nappe system of the Matorides (Kotel Strip), and in the formation of the Strandzhides to the south (future Veleka Unit in Strandzha).

2. Deformations and amphibolite facies metamorphism occurred in the Sakar Unit (Čatalov, 1991) probably in latest Triassic time (early Cimmerian orogenic “phase”) with a late metamorphic event of earliest Cretaceous age recorded with K-Ar dates of about 140 Ma (Lilov, 1990).

3. Parts of the Serbo-Macedonian Massif and of the Struma Unit, the whole Rhodope Massif, the Ihtiman, Central Sredna Gora and Sakar Units, the Strandzhides (without the future Sarpdere nappe, Bedi et al., 2013) and the Matorides (Tchoumatchenco, Černjavska, 1990) were welded into a “new Thracian Massif” (Tchoumatchenco, 2006) with positive ten-

dencies, and formation at its steep northern edge of the Nish-Troyan Flysch Trough.

4. Late Callovian to Tithonian (mostly between 160 and 150 Ma with latest dates of about 140 Ma) anatexis and crustal flow at middle to deep crustal levels (amphibolite facies conditions) is recorded in the Rhodope Massif (Zagorchev et al., 2015).

5. Jurassic deformations and metamorphism at 165–141 Ma were superimposed over the Cadomian to Palaeozoic basement in Southern (Turkish) Strandzha (Bedi et al., 2013; Natal'in et al., 2016).

6. The Circum-Rhodope Belt (characterized by Triassic and Early to Middle Jurassic Tethyan-type sedimentation and Triassic basic volcanism) suffered intensive deformations at shallow to middle crustal levels, and greenschist to very low-grade metamorphism (Boyanov et al., 1990; Bonev, Stampfli, 2006).

7. The side effects of the enumerated events may be sought (Nachev, 1972; Belivanova, Sapunov, 2003) in the Jurassic (Early Callovian) diastem (hardgrounds) encountered in the close Peri-Tethyan realm and in the zoogenic-oolithic sediments of the Sokolov Venets Marker – in the areas situated at a greater distance from the Rhodope Massif (Tchoumatchenco et al., 2011).

The analysis of these phenomena exhibits a rough synchroneity of events occurring in several tectonic zones and at different structural crustal levels within the time span from the Late Callovian (about 165 Ma) to mid Berriasian (c. 140 Ma). However, the events are not strictly simultaneous having a diachronous character when considered in details. The Callovian compression in the Tethyan realm and within the thickened lower and middle crust of the Rhodope was related to the Vardar subduction. It has been followed by extension, crustal melting and irregular flow. The gradual and diachronous uplift of the Rhodope region and of the whole assembled Jurassic Thracian Massif (and the Morava Unit at the north-west) in latest Callovian to late Berriasian time was accompanied north-east of the front of this uplift by downwarping, and formation and development of the Nish-Troyan Flysch Trough.

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