Sedimentological characteristics of Iskar Carbonate Group (Middle Triassic) in the Belogradchik region – preliminary results

Седиментоложка характеристика на Искърската карбонатна група (Среден Триас) в Белоградчишко – предварителни резултати

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The northwesternmost surface exposures of Triassic sediments in the country's territory occur in the vicinity of Belogradchik town. In particular rocks assigned to Iskar Carbonate Group (Middle Triassic) have total thickness of about 100 m (Tronkov, 1973). The main objective of the newly accomplished field and micropetrographic study on three cross-sections of this unit in the northern part of Granitovo strip ("Granitovo", "Bobuk dol", "Road-Oreshets") is to interpret the depositional environment of the carbonate and clastic sediments building up three formerly established formations (Edivetar F., Babino F., Toshkovdol F.). For its achievement structural and textural features of the rocks were studied as well as their bedding relationships. In addition some diagenetic imprints in the limestones and dolostones were described.

The conducted microfacies analysis gives grounds to distinguish five Microfacies Types (MFT) in Edivetar Formation: sandy bioclastic grainstones, sandy peloidal grainstones, sandy bioclastic wackstones/packstones (predominant), sandy bioclastic-intraclastic packstones, and lime mudstones. Typical for almost all limestones is the elevated amount of clastic admixtures reaching about 35% of the rock volume. Another subordinate lithologic type in this lithostratigraphic unit is very fine to fine grained arkosic calcareous sandstones. In turn the rocks of Babino Formation are respectively subdivided into six Microfacies Types: intraclastic grainstones, brachiopod rudstones/floatstones, bioclastic grainstones, peloidal grainstones/packstones, bioclastic wackestones/packstones (predominant), and lime mudstones. Finally, five Microfacies Types are distinguished in Toshkovdol Formation: ooid grainstones (predominant), intraclastic rudstones/grainstones, peloidal grainstones/packstones, bioclastic rudstones/packstones, and lime mudstones. Despite some obvious similarities in terms of the above-mentioned microfacies characteristics the interpretation of the depositional environments of the three units is quite different. These differences become more pronounced if results from the field observations are considered, e.g. analysis of bedding relationships and specific structural features of the carbonate and clastic rocks. Thus the applied combined approach helps to outline the depositional trend in the confines of the study area during the Middle Triassic epoch.

In the background of the configurated Early Triassic carbonate ramp across the present-day territory of Northwestern Bulgaria (Čatalov, 1988) the transgression in the Belogradchik region occurred considerably later, e.g. in Early Anisian time (Tronkov, 1968; Tronkov, 1973). In this context the sandy limestones and calcareous sandstones of Edivetar Formation display characteristics of subtidal deposits. Therefore the available data testify to a relatively rapid transition from continental to virtual marine sedimentation, e.g. without formation of transitional environments such as in the rest parts of the mentioned vast area (coastal plain or tidal flat). The subtidal setting had most probably maximum depth of a few metres as indicated by the common occurrence of ooids in the limestones. Moreover, elevated seawater salinity is inferred from the abundant but not diverse fossil association comprising bivalves, gastropods, crinoids, foraminifers, and ostracods. Bioclastic sediments were formed on a large scale as a constant mixing of different allochem types was typical (fossils, intraclasts, ooids, peloids). The deposition took place above the normal wave base, e.g. in the limits of an inner-ramp zone. The almost equal presence of winnowed and non-winnowed limestone textures in the section of Edivetar Formation implies alternating periods of slightly and strongly agitated hydrodynamic conditions at the seafloor. In partic-

ular the observed herring-bone cross bedding in some beds is possible evidence for local influence of tidal currents. The constant supply of terrigenous material was most likely related with the adjacent source-land dominated by Paleozoic granites and Lower Triassic clastites (as revealed by the composition of light and heavy mineral fractions including lithic grains).

The poorly exposed lower levels of Babino Formation might be conditionally interpreted as products of mixed clayey-carbonate sedimentation with progressive (e.g. upward in the section) decrease of the amount of siliciclastic admixtures. The lower part of the overlying Zmiyanski Member (Tronkov, 1973) is represented by alternation of intraclastic, peloidal and bioclastic grainstones/packstones and lime mudstones. These rocks display clear bedding, structural, and textural characteristics indicating storm origin for the bulk of the grain-supported sediments such as hummocky cross lamination, intrabed contacts of subaqueous washout (locally with high amplitude), convex-up disarticulated bivalve and brachiopod shells, and absence of allochem grading. The long-lasting and/or frequent character of the storm conditions is emphasized by the presence of amalgamated storm layers, abundant intraclasts, strongly reworked skeletal fragments, predominant grain-supported fabrics, and moderate to good degree of allochem sorting. The facies interpretation of these limestones is deposition in a mid-ramp zone with formation of proximal tempestites and background sedimentation of lime mud. In turn the upper part of Zmiyanski Member consists of thin-bedded allochemic and micritic limestones as the former show diagnostic features of distal tempestites. Their megascopic characteristics include small bed thickness (locally with pinching-out or lenticular form), truncating lower bed surfaces, hummocky cross lamination, ripple marks, flat lamination, normal graded bedding, gutter casts, convex-up disarticulated bivalve and brachiopod shells. The microtextural evidences comprise low allochem-matrix ratio, infiltration fabrics plus shelter effects with subsequent geopetal filling, relatively poor degree of allochem reworking, and insignificant presence of small intraclasts. The overlying brachiopod beds are built up of allochthonous and paraautochthonous floatstones/rudstones with respectively disarticulated and articulated brachiopod shells in mostly convex-up position (commonly associated with bivalve coquinas and crinoid ossicles). These shell pavements imply storm-induced deposition in an outer-ramp zone. The outlined herein vertical proximal-distal trend greatly resembles the one established by Chatalov and Vangelov (2001) for exposures of Babino Formation in Iskar River gorge and Vratsa Balkan.

The sediments of Toshkovdol Formation were deposited entirely in the limits of an inner-ramp zone. The relatively shallow water depth is indicated by the large occurrence of ooids. In turn the massive presence of winnowed textures, various intraclasts and strongly reworked bioclasts in most microfacies types implies predominant agitated hydrodynamics at the seafloor presumably favoured by waves and currents. The maximum high-energy conditions resulted in disintegration of semiconsolidated fine-grained lime muddy sediments and subsequent formation of intraclasts reaching locally rudite size. Meanwhile, the constant influx of seawater favoured precipitation of marine phreatic cements. The observed diverse fossil association testifies to normal salinity and good oxygenation of the seawater. The deposition occurred along with formation of fringing carbonate shoals having mobile and migrating character. Non-winnowed sediments were accumulated in deeper quiet-water sectors in the framework of the configurated shoal complex that were peripheral to the active shoals or were in the form of depressions between them (Chatalov, 2002).

The most significant diagenetic events that have affected the primary lime sediments comprise intensive marine phreatic cementation (observed in limestones from all three units), partial or complete dolomitization, and local macroscale dissolution (manifested only in rocks of Toshkovdol Formation). In this context the described by Chatalov (2009) open and cement-filled moldic, interparticle, and fenestral (vuggy) porosity types were interpreted as telogenetic, e.g. products of diagenesis related with an ancient unconformity.

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