The early Late Cretaceous transgression in the Busko Zdrój area (southern Poland) – facies development, syn-sedimentary tectonic events and palaeorelief of basement

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The Busko Zdrój Spa area is situated in the most southeasterly corner of the Miechów Trough (= Nida Synclinorium) which belongs to southernmost part of the Szczecin-Łódź-Miechów Synclinorium as Alpine (Laramide) tectonic units of extra-Carpathian Poland. The Cretaceous deposits overlie unconformably the Jurassic rocks (mainly Kimmeridgian) and are represented by the Upper Albian–Lower Maastrichtian, and in the southern part of the Miechów Trough they are covered by the Miocene deposits of the Carpathian Foredeep (Fore-Carpathian Depression). Palaeogeographically, this is part of the so-called Polish Basin (= German-Polish Cretaceous Basin), and during the early Late Cretaceous times (the latest Albian?–Cenomanian) has been covered by an epicontinental sea as a result of the rapid transgression, which mainly deposited glauconitic-rich conglomerates and sandstones. These rocks are the lowermost part of the Cenomanian–Santonian siliciclastic-carbonate sequence which is overlying by carbonate sequence of the Campanian–Lower Maastrichtian strata. In the SW part of the Miechów Trough these sequences are sometimes full of condensation features (hard grounds, hiatuses and discontinuities). On the contrary, the opposite NE side of this trough (Busko Zdrój vicinity), these units are practically deprived of such structures. Usually the thickness of the lower sequence is less than 300 m, whereas the upper one is about 450 m.

Recently, 6 new boreholes (OB-I – OB-VI) have been drilled in the vicinity of Busko Zdrój, which were partially cored both in the so-called mid-Cretaceous (Cenomanian–Turonian) and Upper Cretaceous (Coniacian–Campanian) strata. The lowermost deposits are developed as deep-green glauconitic siliciclastic rocks represented by conglomerates (poorly-sorted) and sandstones with high-hydrodynamic regime features as cross-bedding structures of large scale (OB-II). In the same horizon some redeposition of sediments produced large clasts of glauconitic-poor sandstones which were incorporated to glauconitic-rich matrix (OB-I) also occur. The thickness of these Cenomanian deposits in analyzed boreholes are variable and never exceed 20-25 meters, but according to former drills may reach even 100 m. The overlying strata, sometimes with full record of transitional sequence, are more and more carbonatic and pelagic up to the open-marine limestones with cherts of Turonian in age (OB-I, II, III). After such unification of facies started very thick sequence of spotty-limestones/marly limestones and opoka-limestones/marls full in Planolites/Chondrites-type trace fossils. In the lowermost part of this unit spectacular syn-sedimentary slump structures occur which indicate intensive gravitational mass-movements on the sea-floor. Most probably, both Cenomanian and Turonian sedimentary-tectonic events mentioned above, were connected with syn-sedimentary tectonic reorganization and movements which presumably reflect origin of the early Late Cretaceous tilted blocks on the Peri-Tethys region as effect of extensional regime on the Tethyan ocean margin. Therefore, the relief of basement before, during and even after the so-called mid-Cretaceous transgression was very distinct and supported by such tectonic events/regime.