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Sequence stratigraphy of the lower Upper Cretaceous Elbtal Group (Saxony, Germany): new data from Middle Cenomanian–Upper Turonian outcrops and boreholes

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The formations of the Saxonian Cretaceous have been combined in the so-called Elbtal Group. Their sedimentation took place in a terrestrial to neritic environment palaeogeographically located between the Mid-European Island (MEI) in the SW and the Lusatian Massif in the NE. The through extended from the narrow marine strait of Saxony into the broad Bohemian Cretaceous Basin (Czech Republic) further to the SE. Deposition has been dominated by marine siliciclastics that accumulated on a graded shelf with basically three main facies zones: the coarse-grained nearshore zone ("Küstensandsteinzone"), the transitional zone ("Faziesübergangszone") and the fine-grained marly offshore facies zone ("Plänerfazies").

In general, transgression proceeded in late Early Cenomanian times from the N. Relictic remains of these marine bioclastic conglomerates (Meißen Formation) only occur in the northwesternmost area of the basin around Meißen and are related to the highstand of the depositional sequence Cenomanian 3 (DS Ce 3). After a short stratigraphic gap, onlap continued in the Middle Cenomanian with the following Niederschöna Formation consisting of coarse-grained braided river deposits at the base grading via carbonaceous point-bar cycles of a meandering river system into bioturbated, partly cross-bedded estuarine sediments toward the top. These sediments record DS Ce 4 and are capped by a paleosol. Sedimentation of DS Ce 5 started with a renewed transgressional pulse initiating the Late Cenomanian. The strata consist of bioturbated, cross-bedded predominantly fine- to medium-grained quartz sandstones with some shell-rich horizons corresponding to the Oberhäslich Formation. The unconformably overlying DS Tu 1 comprises the uppermost Cenomanian Dölzschen Formation and the Lower Turonian part of the Schmilka Formation. The onset of this depositional sequence is marked by a major transgression ("plenus Transgression) drowning the remaining pre-transgression topography (onlap of Dölzschen Formation onto basement highs). The lowermost Turonian "Lohmgrund Marl" defines the base of the Schmilka Formation changing gradually into strongly bioturbated, silty Pläner and coarsening upward into moderately bioturbated, thick-bedded–massive, mainly fine-grained quartz sandstones with occasional clayey or silty layers, shell-rich horizons and sparse wood remains. After an interruption in sedimentation indicated by a root horizon or a conspicuous erosional surface, the Schmilka Formation continues with similar lithology into the early Middle Turonian. It is replaced up-section by the overlying Middle–Upper Turonian Postelwitz Formation, characterized by decreasing thickness of bedding and stronger sedimentary variability (grain size, bioturbation, glauconite and fossil content), including the intercalation of thick units of silty Pläner. The lithological variations of sandy and Pläner intervals nicely reflect the Middle–Late Turonian sea-level changes of DS Tu 2 (early Middle Turonian), DS Tu 3 (late Middle–earliest Late Turonian) and DS Tu 4 (early Late–mid-Late Turonian): Pläner units represent transgressive and highstand conditions, sand packages late highstand as well as falling and lowstand systems tracts. A major mid-Late Turonian sea-level fall is indicated in the upper Postelwitz Formation, initiating DS Tu 5 (Late Turonian) with a strongly basin-ward prograding unit of coarse-grained sandstone. The following transgression culminated in a prominent maximum flooding interval represented by the intercalation of a clayey–fine-grained regional marker bed, forming the base of the Schrammstein Formation (thick-bedded, unfossiliferous medium- to coarse-grained quartz sandstones).

In conclusion, all depositional sequences of Middle Cenomanian–Late Turonian age and their bounding unconformities (sequence boundaries SB Ce 4 and 5, SB Tu 1–4) reported from coeval sections around the MEI (e. g., Münsterland Creatceous Basin, Lower Saxonian and Danubian Cretaceous) and other Cretaceous basins in the Tethyan region (e. g., Egypt) are also developed in the Saxonian Cretaceous, supporting eustatic sea-level changes as main triggers for the sequence stratigraphic architecture of the Elbtal Group.