Late Cretaceous (Cenomanian to Campanian) calcareous nannofossils from northern Germany as a record for shallow marine coastal dynamics

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The early Late Cretaceous was characterized by a warm equable climate and a global sea level rise of approximately +100 m, causing the flooding of vast continental areas. These conditions were favorable for calcareous phytoplankton radiation, evidenced by a unique diversity and high abundances in pelagic to hemipelagic environments. Previous studies on calcareous nannofossil biostratigraphy and paleoecology of Cretaceous and Cenozoic sediments focused on open oceanic chalks and marls, including the sites investigated by DSDP (Deep Sea Drilling Project) and IODP (International Ocean Discovery Program). For this study, we analysed the nannofossil assemblages of marginal marine sediments, recovered in six cores drilled in northwest Germany. The wells cored the entire Cenomanian - Campanian succession in a nearshore setting, deposited about 5–10 km off the former coast located farther south. The sediments encountered are dominated by glauconitic marls and sand-rich limestones, which yield rich and diverse calcareous nannofossil assemblages. These assemblages have been studied in detail with respect to their biostratigraphy and ecology. In addition, stable isotopes ($\delta^{13}C$) have been measured, which allow a calibration of the biostratigraphic findings.

The glauconite rich sediments cover an interval of earliest Cenomanian (nannofossil zones UC0-1a) to Early Campanian age (nannofossil zone UC14). Seven major hiatuses, which are stratigraphically of different age, have been recognized. These are related to a) eustatically controlled shifts of the former shoreline and b) synsedimentary tectonics and subsequent erosion. The recognition and accurate dating of these hiatuses results in a detailed reconstruction of the dynamic evolution of the former coastline. Our calcareous nannofossil findings allow to differentiate between eustatic and epirogenetic sea-level fluctuations. In addition to the global eustatic sea level rise of the Cenomanian – Turonian interval, synsedimentary tectonic movements influenced the sedimentation patterns. Local tectonics of Late Cenomanian–Early Turonian age caused the uplift of a regional swell structure approximately 15 km north off the former coast. These movements are thought to be related to a major regional inversion in the Coniacian–Santonian.