

Late Cretaceous Inversion Tectonics in Northern Germany deciphered by calcareous nannofossils

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The depositional history of Late Cretaceous sediments in northern Germany was partly controlled by differential subsidence and uplift, causing a complex distribution pattern. Following a eustatic sea-level rise in the early Late Cretaceous (Cenomanian, Turonian), which caused a flooding of major parts of northern Germany this area experienced an inversion in the mid Late Cretaceous (Coniacian, Santonian). The former Lower Saxony Basin, the main area of sedimentation in the Early Cretaceous, experienced uplift along a major fault zone, the Osning Lineament. At the same time the Münsterland, positioned south of the Osning Lineament, subsided and formed a major depositional centre for sediments supplied by the uplifted area in the north.

Two quarries near the Osning Lineament expose an extended and complete succession of lower Cenomanian to lower Coniacian marine sediments. They play a crucial role for the understanding of the tectonic setting and the Late Cretaceous inversion of northern Germany. The uppermost part of the 350 m thick sedimentary sequence (Turonian, Coniacian) is characterised by chaotic structural conditions. Submarine slides and phacoids, olistolith-like sediment bodies up to several meters in diameter, are the dominant features. Previous studies analysed and dated similar slides based on foraminifera. The poor preservation of foraminifera was a great obstacle and did not allow a high resolution biostratigraphic assignment. Based on calcareous nannofossil dating, the phacoids are of middle Turonian age (nannofossil zone UC9a), the surrounding matrix is of middle Coniacian age (nannofossil zone UC10). For the first time reworked Cenomanian material has been recognized in the samples. The new biostratigraphic data are used to estimate the timing and the rates of erosion in the inverted area. Uplift most likely started in the late middle or early late Turonian.