

# Upper Cretaceous shallow-marine deposits of the southwestern Münsterland (northwest Germany) influenced by synsedimentary tectonics



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## ABSTRACT

During the Late Cretaceous global sea level rise, marine nearshore sedimentary rocks were deposited in the Münsterland (northwest Germany). Thirteen borehole cores recently drilled in the southwestern part of the Münsterland have supplied new data on the lithostratigraphy and facies patterns of these deposits. By combining biostratigraphy (planktonic/benthic foraminifera, calcareous nannofossils), gamma ray data and lithological observations from the drill cores and from auxiliary chipped drillings a detailed correlation scheme of the Cenomanian–Campanian succession has been established. The successions studied show considerable variations in thickness and lithology over an area of 850 square kilometres. The western part of the study area is dominated by a homogeneous sequence of glauconitic sandstones and marlstones (greensands). Eastwards, the lithology becomes more variable and marls predominate, particularly in Coniacian and lower–middle Santonian strata. The new findings allow for a revision of the current lithological scheme used for Upper Cretaceous deposits in the western part of northern Germany. A major result is the evidence for synsedimentary tectonics as a driving force for the formation of an intrabasinal structural high which has been derived from spatial facies and thickness patterns of lower Turonian deposits. The Late Cretaceous synsedimentary inversion tectonics is examined in two examples, yielding a maximum movement rate of 0.1 mm/year for the early Santonian. Local geological mapping activities within the study area have provided a stripped map of the Cretaceous cover and a base Cretaceous subsurface contour map.

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## 1. Introduction and geological setting

The study area is located in the southwestern part of northern Germany and covers an area of 850 square kilometres. It is positioned along the southern rim of the Münsterland Cretaceous Basin, a basinal structure yielding up to 2000 m of middle Albian to upper Campanian deposits (see Fig. 1). The near-horizontally bedded Cretaceous deposits are covered by unconsolidated Quaternary

sedimentary rocks of a thickness of 5–25 m and in the west by fine-grained Paleogene strata of up to 180 m in thickness.

The recent study succeeds our previous work (Dölling et al., 2014) and is the result of a detailed geological mapping programme (scale 1:50,000) of the Geological Survey of North Rhine-Westphalia. The top of the Carboniferous and its coal-bearing series corresponds to the base of the Upper Cretaceous, except in the northwestern and northern part of the study area where the Cretaceous rests on Permian to Triassic deposits. The Cretaceous successions were already reasonably well documented from mining wells and shafts based on the stratigraphical knowledge at that time and results published in maps (Wolansky, 1950, 1951, 1957, 1962, 1966, 1967). The geology of the southern rim of the Münsterland is well documented on the basis of mapping activities of

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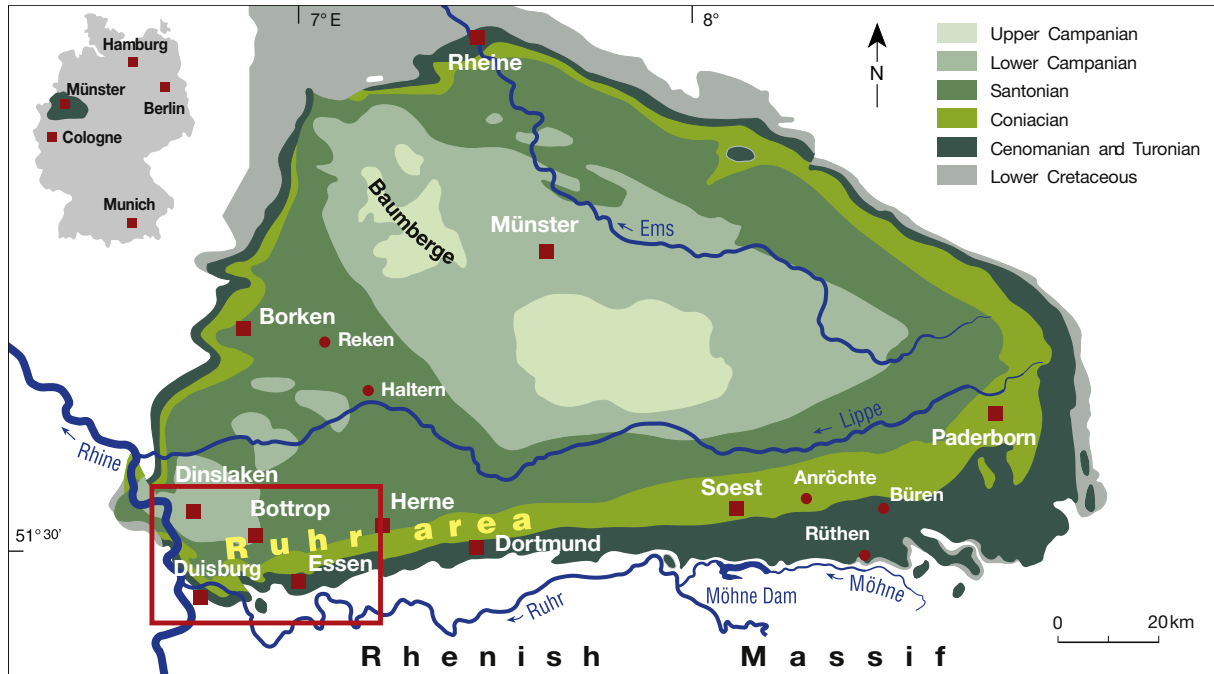
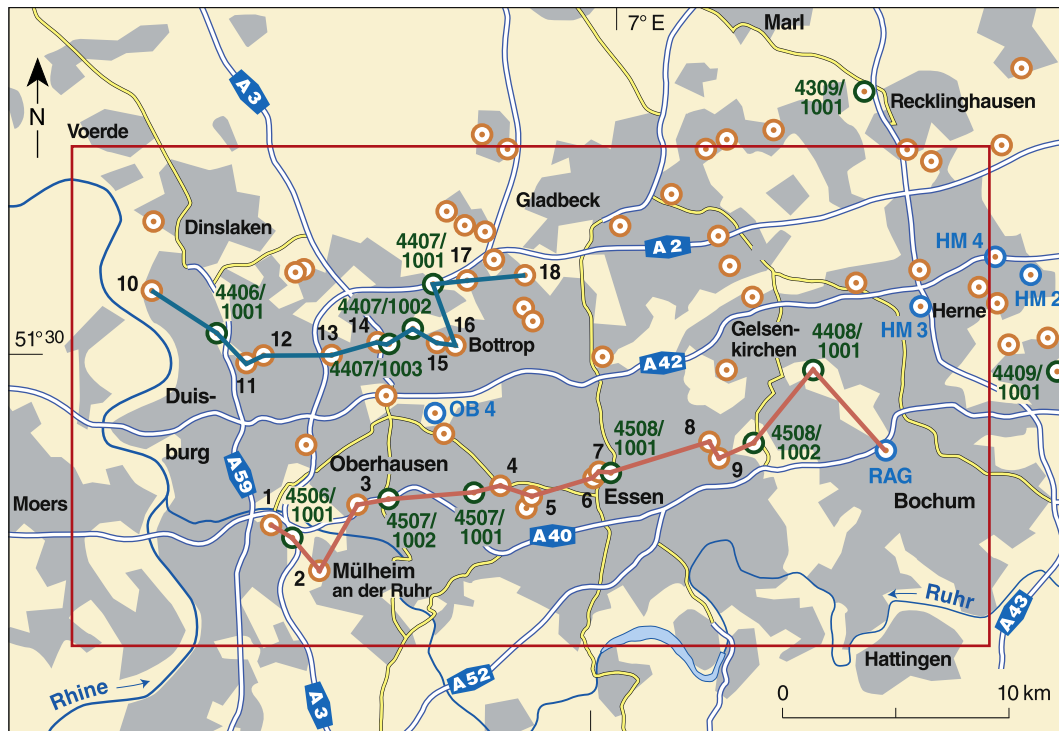


Fig. 1. Geological map of the Münsterland Cretaceous Basin (Paleogene, Neogene and Quaternary removed), with location of the study area (red box; modified from Hiss and Mutterlose, 2010). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)



- core drillings of the GD NRW (2009–2015)
- other core drillings (archives of the GD NRW)
- chipped drillings 2008–2016 (water wells, geothermal wells)
- cross-section 1
- cross-section 2

Fig. 2. Boreholes with GR logs (for a list of boreholes, see Appendix A).

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