Geochemical variability and sequence stratigraphic interpretation of the mudstone- dominated Lower Cretaceous succession in the eastern Lower Saxony Basin, Germany

Hauke Thöle (1), Ulrich Heimhofer (1), Jochen Erbacher (2), André Bornemann (2), and Friedrich-Wilhelm Luppold (3)

(1) Institut für Geologie, Leibniz Universität Hannover, Germany, (2) Bundesanstalt für Geowissenschaften und Rohstoffe (BGR), Hannover, Germany, (3) LBEG Niedersachsen, Hannover, Germany

Fine-grained sedimentary rocks predominantly composed of silts and clays (mudstones) are currently a popular topic within industry and academia. Of particular interest is to better constrain the pervasive facies variability present within these rocks. Despite their apparent homogeneity at core and outcrop scale, mudstones can actually be highly heterogeneous when examined in detail.

We used geochemical and palynofacies analyses to delineate the facies variability present within the mudstone-dominated Lower Cretaceous succession in the eastern Lower Saxony Basin (LSB). In addition, the data-set is used to establish a sequence stratigraphic framework based on X-ray fluorescence (XRF) chemostratigraphy and palynofacies within apparently homogeneous mudstone successions. Our study is based on three scientific drill cores (Scharnhorst 3, Scharrel 10 and Frielingen 9) which were drilled during 2012–2014. Because of their close geographical location and similar palaeoenvironmental setting, these cored sections can be considered as one complete, 510-m-thick composite section covering the late Berriasian to earliest Aptian interval. All cores have been analysed for major and minor elements (Al, Si, S, K, Ca, Ti, Mn, Fe) by X-ray fluorescence (XRF) core scanning analysis at 1 cm resolution. The resulting trends for each element were analysed in terms of facies variability and to capture relative shifts in shoreline trajectories. For example, elemental ratios indicative of coarser clastic input (e.g., Si/Al) are used to decipher proximal to distal trends within the studied sediments. In order to better understand the nature of geochemical variations, XRF core scanning analyses are compared with palynofacies results.