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Paleoecology of benthic foraminifers from Paleogene shelf environments: Example from the "Latdorf" transgression in northeastern Germany

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A sediment section from the Eocene-Oligocene transition of the Harz foreland in northeastern Germany has been investigated with respect to sedimentary facies and benthic foraminiferal assemblages. The main objectives were the paleoecological interpretation of the benthic foraminiferal faunas and the reconstruction of the paleoenvironmental evolution of the southeastern paleo-North Sea. The studied sediments were deposited during the so-called "Latdorf" transgression that flooded huge areas in Central and Northern Europe andcorresponds to global sequence cycle TA 4.3 of Haq et al. (1987, Science 235, 1156-1167). The regional impacts of this transgression on shelf environments and ecosystems are largely unknown because most shallow marine sediments from this time interval have been eroded by subsequent regressions and transgression and by glacial advances during the Pleistocene. The sediment section has been assigned to nannoplankton zone NP21 but more refined biostratigraphic evaluation was hampered by the lack of planktonic foraminiferal marker species. The studied sediments exhibit a progradation of sediment facies with coarse-grained sediments at the basis and low-cemented marls with various contents of siliciclastic particles above, containing both calcite and aragonite microfossils in excellent preservation. The up-section increase in the relative proportion of planktonic foraminifers documents the general transgressive trend witha deepening from an inner to outer neritic depositional environment. The benthic foraminiferal faunas are characterized by high foraminiferal numbers, variable diversities, and the dominance of epifaunal and shallow infaunal taxa. This suggests generally favorable shelf environments with well-ventilated bottom waters and mesotrophic conditions. Three and four benthic foraminiferal assemblages were distinguished using Q-mode and R-mode Principal Component Analysis, respectively. The Q-mode PCs comprise the Cibicides tenellus tenellus, Melonis affinis and Uvigerina tenuistriata tenuistriata assemblages, the R-mode PCs comprise the Alabamina wolterstorffi/ Pullenia bulloides, Spiroplectinella carinata carinata, Siphotextularia chilostoma and Cibicides tenellus tenellus assemblages. The different assemblages suggest a close association with specific depositional conditions, food sources and environmental stability, best comparable to progradational systems in modern-day river-dominated shelf environments. Specifically, local changes in substrate and inferred food quality can be attributed to fluvial influence of the Mid-German Estuary, which was located in the southeast of the northern Harz foreland. The documented benthic foraminiferal faunal succession and shelf ecosystem evolution is typical for Paleogene transgressional systems observed in other parts of the paleo-North Sea, the Paratethys and the Tethyan realm.