Changing paleo-environments of the Lutetian to Priabonian beds of Adelholzen (Helvetic Unit, Bavaria, Germany)

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The Adelholzen Section is located southwest of Siegsdorf in southern Bavaria, Germany. The section covers almost the entire Lutetian and ranges into the Priabonian. It is part of the Helvetic (tectonic) Unit and represents the sedimentary processes that took place on the southern shelf to upper bathyal of the European platform at that time. Six lithologic units occur in the Adelholzen-Section: 1) marly, glauconitic sands with predominantly *Assilina,* 2) marly bioclastic sands with predominantly *Nummulites*, 3) glauconitic sands, 4) marls with *Discocyclina*, 5) marly brown sand. These units were combined as “Adelholzener Schichten” and can be allocated to the Kressenberg Formation. For the sixth unit, Stockletten, no formal name has been established. The total thickness of all units exposed is about 18 m.

The Adelholzen-Section is rich in planktic and benthic foraminifera. Planktic foraminifera form up to 80% of the total foraminiferal assemblages in the Stockletten, but also the basal nummulitic marls contain about 20% of planktic species. The ratio of planktic to benthic foraminifera is considered to be a good estimator also for paleo-water depth estimations at least during the Cenozoic. The percentage of planktic foraminifera in the assemblages points to depth ranges from 50 m (inner shelf) at the base of the section to a maximum of c. 600 m (upper bathyal) in the Stockletten. Nummulitids and macrofossil assemblages (oysters, spondylids, sea urchins, serpulids, crabs, bryozoans, shark teeth) however point to shallower paleo-water depths, in particular for the basal and middle lithologic units. The succession shows two distinct increases in paleo-water depth (transgressive phases): a first step at the beginning of the *Discocyclina*-marl sedimentation and a second, more pronounced step at the base of the Stockletten.

The number of heterotrophic planktic and benthic foraminifera is largely coupled to primary surface productivity as these groups either feed directly on diatoms, coccolithophores or other algae (planktic foraminifera) or depend on the organic rain that reaches the seafloor (benthic foraminifera). Foraminiferal abundance is therefore a good estimator for paleo-productivity of ancient eco-systems. The rather parallel curves for planktic and benthic foraminiferal abundance are both pointing to at least two transgressive phases that resulted in increased nutrient mobilization and subsequent increased numbers of foraminifera. The second one coincides with the Mid-Eocene Climatic Optimum. The benthic foraminiferal assemblages are dominated by rather large planoconvex or lenticular species (*Cibicidoides, Gavelinella, Lenticulina* etc.), pointing to oxic conditions at the seafloor.

All samples from the section contain very rich calcareous nannoplankton with the dominance of small reticulofenestrids, *Reticulofenestra dictyoda* and *Cyclicargolithus floridanus.* Small reticulofenestrids generally dominate nannoplankton assemblages along continental margin. High amounts of *Reticulofenestra minuta* can be interpreted as indicator of warm, well stratified water column. Low percentages of *Coccolithus pelagicus* point to oligotrophic paleo-environments and is in good agreement with the foraminiferal interpretations.