

Reinvestigating an interval of the English Wealden (non-marine Lower Cretaceous): Integrated analysis for palaeoenvironmental and climate cyclicities

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Although increasing over the last years, relatively few studies on changing palaeoenvironments and climate cycles in non-marine archives of the Cretaceous greenhouse Earth do exist. This is primarily a result of the nature of non-marine or terrestrial deposits – strong lateral facies change on local scales and the strong local to regional control of deposition – as well as the lack of high-resolution stratigraphy and correlations to the marine record. On the other hand, major advances in the refinements of the Cretaceous timescale now facilitate the correlation and dating of short-term sea-level records and their supposable relation to climate and/or tectonic events with appropriate resolution, i.e. on Milankovitch scales. Innovations and progress in non-marine bio-, magneto- and chemostratigraphy as well as growing data on Lower and Upper Cretaceous non-marine successions are promising towards approaches for supraregional correlation of these deposits and their appropriate correlation to the Cretaceous marine standard sections. However, convincing evidence for orbitally (climate) driven cyclicity in non-marine Lower Cretaceous deposits is thus far sparse.

The non-marine Wealden deposits of England have been used eponymously for widely distributed similar Lower Cretaceous non-marine facies, and they are a ‘classical’ example for a Mesozoic non-marine succession for which depositional cycles have been suggested since the 1970s, including the famous ostracod ‘faunicycles’ by F.W. Anderson, but so far lack convincing analyses and remain to be tested. The project ‘Lower Cretaceous Climate and Non-marine Stratigraphy (LCCNS)’ funded by the Austrian Science Fund (FWF) analyses a chosen interval of the English Wealden at the Clock House Brickworks pit (near Capel, Surrey, England, UK) for orbitally/climate driven cyclicities with an interdisciplinary methodology: micropalaeontology, sedimentology, and geochemistry. Ostracod (aquatic microcrustaceans with calcified shell) faunal composition changes are correlated with the variation of geochemical and sedimentological parameters through time to draw conclusions regarding the controlling (palaeoenvironmental) factors and their regulating mechanisms (‘climate changes’, orbital cycles?), while magnetostratigraphy is used for chronological control. First results will be presented here. The crucial point of the approach is that the fluctuating evolution of a Wealden ecosystem over time is presumed to be climatically (and thus, orbitally) controlled and that the cyclic changes deducible from multiple proxies in its geologic record can be tested and used for cyclostratigraphy.