Marginal marine foraminifera and thecamoebians in the Upper Cretaceous to Eocene deposits of the south-central Pyrenees, Spain

Barbara Medioli
Department of Earth Sciences, Dalhousie University, Halifax, Nova Scotia B3H 3J5, Canada

The Upper Cretaceous to Eocene marginal marine sediments, in the northeastern Pyrenees of Spain, is a classic area in which to study sequence stratigraphy. Sequence stratigraphy requires strong sea-level control. The lignites found throughout the sequences, once assumed to be freshwater deposits can provide accurate sea-level markers if microfossils reveal them to be marginal marine. This study used samples collected around different lignite layers in the Pyrenees and prepared using new techniques developed for the preparation of such samples. The foraminifera and thecamoebians provide evidence that the lignites and surrounding sediments are marginal marine deposits. Thus the Pyrenean lignites can be used to accurately relocate former sea levels and to supply the vertical limits of the closing of high and low order transgressive cycles. The evidence discussed in this study indicates that the accurate reconstruction of very old paleo sea levels is feasible, and that the methods here developed can be used for a thorough study of the marginal marine sediments of the entire Pyrenean sequence. In addition, the microfaunae from these sequences share similarities with those described in modern day, as well as Cretaceous and Carboniferous estuarine deposits. The similarities suggest two more ideas: (i) that microorganisms in highly stressed areas, such as marshes, did not evolve as quickly as more open marine assemblages; and (ii) that the methods used in this paper can be routinely applied to establish paleo-sea levels in deposits from the Paleozoic to the Present.

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