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Milankovitch Control on Sequence Formation; Evidence for Sea-Level Change Forced by the 400KYR Long Eccentricity Cycle in the Cretaceous and Paleogene

Shallow marine successions preserved in passive margin basins of Cenomanian and Eocene-Oligocene provide evidence of the interplay of sea-level change, interpreted from sequence stratigraphical analysis, and orbital cyclicity, the frequencies of which are identified by time-series analysis of long data sets. This new evidence leads to the conclusion that the 400kyr long eccentricity cycle was a major control on 3rd order sequence formation in pre-Quaternary strata.

The Cenomanian succession of the Cauvery Basin, SE India contains an expanded succession of coastal plain deposits which can be dated with precision from the use of cosmopolitan ammonite taxa and thus correlated accurately to marine successions elsewhere. The succession includes palaeosols, fluvial/tidal channels, and offshore sands which provide detailed evidence of sea-level changes. Using high-resolution biostratigraphy it is possible to correlate 11 individual sequences to Europe, 8000km distant. These sequences coincide precisely with 400 kyr long eccentricity cycles and are interpreted as glacioeustatic cycles.

An expanded estuarine Eocene-Oligocene succession, Isle of Wight, SE England, UK has been tuned to the orbital signal using clay mineral data, notably the abundance of neoformed illite. Spectral analysis shows strong evidence of forcing by obliquity (40kyr) and eccentricity (100, 400 kyr). The sequences identified from sedimentological and faunal evidence are exactly coincident with the long eccentricity cycle.