Orbital Tuning of Marl-Limestone Alternations (Upper Tithonian to Upper Berriasian) in North-South Axis (Tunisia): Geochronology and Sequence Implications

Authors : Hamdi Omar Omar, Hela Fakhfakh, Chokri Yaich

Abstract : This work reflects the integration of different techniques, such as field sampling and observations, magnetic susceptibility measurement, cyclostratigaraphy and sequence stratigraphy. The combination of these results allows us to reconstruct the environmental evolution of the Sidi Khalif Formation in the North-South Axis (NOSA), aged of Upper Tithonian, Berriasian and Lower Valanginian. Six sedimentary facies were identified and are primarily influenced by open marine sedimentation receiving increasing terrigenous influx. Spectral analysis, based on MS variation (for the outcropped section) and wireline logging gamma ray (GR) variation (for the sub-area section) show a pervasive dominance of 405-kyr eccentricity cycles with the expression of 100-kyr eccentricity, obliquity and precession. This study provides (for the first time) a precise duration of 2.4 myr for the outcropped Sidi Khalif Formation with a sedimentation rate of 5.4 cm/kyr and the sub-area section to 3.24 myr with a sedimentation rate of 7.64 cm/kyr. We outlined 27 5th-order depositional sequences, 8 Milankovitch depositional sequences and 2 major 3rd-order cycles for the outcropping section, controlled by the long eccentricity (405 kyr) cycles and the precession index cycles. This study has demonstrated the potential of MS and GR to be used as proxies to develop an astronomically calibrated time-scale for the Mesozoic era.

Keywords : Berriasian, magnetic susceptibility, orbital tuning, Sidi Khalif Formation