

## **Facies Sedimentology and Astronomic Calibration of the Reinech Member (Lutetian)**

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**Abstract :** The Upper Lutetian alternating marl-limestone succession of Reineche Member was deposited over a warm shallow carbonate platform that permits Nummulites proliferation. High-resolution studies of 30 meters thick Nummulites-bearing Reineche Member, cropping out in Central Tunisia (Jebel Siouf), have been undertaken, regarding pronounced cyclical sedimentary sequences, in order to investigate the periodicity of cycles and their related orbital-scale oceanic and climatic changes. The palaeoenvironmental and palaeoclimatic data are preserved in several proxies obtainable through high-resolution sampling and laboratories measurement and analysis as magnetic susceptibility (MS) and carbonates contents in conjunction with a wireline logging tools. The time series analysis of proxies permits to establish cyclicity orders present in the studied intervals which could be linked to the orbital cycles. MS records provide high-resolution proxies for relative sea level change in Late Lutetian strata. The spectral analysis of MS fluctuations confirmed the orbital forcing by the presence of the complete suite of orbital frequencies in the precession of 23 ka, the obliquity of 41 ka, and notably the two modes of eccentricity of 100 and 405 ka. Regarding the two periodic sedimentary cycles detected by wavelet analysis of proxy fluctuations which coincide with the long-term 405 ka eccentricity cycle, the Reineche Member spanned 0,8 Myr. Wireline logging tools as gamma ray and sonic were used as a proxies to decipher cyclicity and trends in sedimentation and contribute to identifying and correlate units. There are used to constraint the highest frequency cyclicity modulated by a long term wavelength cycling apparently controlled by clay content. Interpreted as a result of variations in carbonate productivity, it has been suggested that the marl-limestone couplets, represent the sedimentary response to the orbital forcing. The calculation of cycle durations through Reineche Member, is used as a geochronometer and permit the astronomical calibration of the geologic time scale. Furthermore, MS coupled with carbonate contents, and fossil occurrences provide strong evidence for combined detrital inputs and marine surface carbonate productivity cycles. These two synchronous processes were driven by the precession index and 'fingerprinted' in the basic marl-limestone couplets, modulated by orbital eccentricity.

**Keywords :** magnetic susceptibility, cyclostratigraphy, orbital forcing, spectral analysis, Lutetian

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