

Orbital control of the anoxic events in the Hauterivian and Barremian stages

Mathieu Martinez^{1*}, Roque Aguado², Miguel Company³, Jose Sandoval³, Luis O'Dogherty⁴

1 : Géosciences Rennes – CNRS : UMR 6118, Univ Rennes – France

2 : Departamento de Geología y CEACTierra, Universidad de Jaén – Spain

3 : Departamento de Estratigrafía y Paleontología, Universidad de Granada – Spain

4 : Departamento Ciencias de la Tierra, Universidad de Cádiz – Spain

Episodes of Environmental Changes (EECs) correspond to reinforced greenhouse conditions associated to modifications of the carbon cycle that punctuated the Early Cretaceous. From the latest Hauterivian to the Barremian, three EECs occurred (the Faraoni, Mid-Barremian and Taxy events). Despite the $\delta^{13}\text{C}_{\text{carb}}$ shows various trends during these events, they are all associated to short-lived geographic expansion of organic-rich deposits in the western Tethys. We propose here an astronomical calibration of the latest Hauterivian-earliest Aptian from the Subbetic Domain (SE Spain) to better constrain the pacing of these events and understand their forcing mechanisms. The sedimentary series studied are composed of orbitally-forced hemipelagic marl-limestone alternations. Magnetic susceptibility was measured every 7 cm using a Kappabridge KLY-3. Spectral analyses revealed the pervasive presence of the eccentricity cycles. Interpretations are notably validated by lithostratigraphic and biostratigraphic correlations between the sections. The duration of the Barremian Stage is calculated at 4.25 ± 0.17 Ma. Anchoring this duration to recently published radio-astrochronological time scales, the base of the Barremian Stage is dated at 125.91 ± 0.06 Ma and the top of the Barremian Stage at 121.67 ± 0.16 Ma. The EECs of the latest Hauterivian and Barremian stages show a pacing of 2.34 Myr, suggesting a control of the long eccentricity cycle on the expansion of oceanic anoxic conditions in the Tethys through changes in humid/arid cycle, weathering, sea level and fertilization of the sea surface.

Mots-Clés : Early Cretaceous, oceanic anoxic events, Episodes of Environmental Changes, carbon cycle, orbital forcing, eccentricity