



## Astrochronology of the Pliensbachian–Toarcian transition in the Foum Tillicht section (central High Atlas, Morocco)

Mathieu Martinez (1), Stéphane Bodin (2), and François-Nicolas Krencker (2)

(1) MARUM, Universität Bremen, Leobener Str., 28359 Bremen, Germany (mmartinez@marum.de), (2) Ruhr-Universität Bochum, Institut für Geologie, Mineralogie und Geophysik, 44870 Bochum, Germany

The Pliensbachian and Toarcian stages (Early Jurassic) are marked by a series of carbon cycle disturbances, major climatic changes and severe faunal turnovers. An accurate knowledge of the timing of the Pliensbachian–Toarcian age is a key for quantifying fluxes and rhythms of faunal and geochemical processes during these major environmental perturbations. Although many studies provided astrochronological frameworks of the Toarcian Stage and the Toarcian oceanic anoxic event, no precise time frame exists for the Pliensbachian–Toarcian transition, often condensed in the previously studied sections. Here, we provide an astrochronology of the Pliensbachian–Toarcian transition in the Foum Tillicht section (central High Atlas, Morocco). The section is composed of decimetric hemipelagic marl-limestone alternations accompanied by cyclic fluctuations in the  $\delta^{13}\text{C}_{\text{micrite}}$ . In this section, the marl-limestone alternations reflect cyclic sea-level/climatic changes, which triggers rhythmic migrations of the surrounding carbonate platforms and modulates the amount of carbonate exported to the basin. The studied interval encompasses 142.15 m of the section, from the base of the series to a hiatus in the Early Toarcian, marked by an erosional surface. The Pliensbachian–Toarcian (P-To) Event, a negative excursion in carbonate  $\delta^{13}\text{C}_{\text{micrite}}$ , is observed *pro parte* in this studied interval.  $\delta^{13}\text{C}_{\text{micrite}}$  measurements were performed every  $\sim 2$  m at the base of the section and every 0.20 m within the P-To Event interval. Spectral analyses were performed using the multi-taper method and the evolutive Fast Fourier Transform to get the accurate assessment of the main significant periods and their evolution throughout the studied interval. Two main cycles are observed in the series: the 405-kyr eccentricity cycles is observed throughout the series, while the obliquity cycles is observed within the P-To Event, in the most densely sampled interval. The studied interval covers a 3.6-Myr interval. The duration of the part of P-To Event covered in this analysis is assessed at 0.70 Myr. In addition, the interval from the base of the Toarcian to the first occurrence of the calcareous nannofossil *C. superbus* has a duration assessed from 0.47 to 0.55 Myr. This duration is significantly higher than most of assessments obtained by former cyclostratigraphy analyses, showing that previous studies underestimated the duration of this interval, often condensed in the Western Tethys. This study shows the potential of the Foum Tillicht section to provide a refined time frame of the Pliensbachian–Toarcian boundary, which could be integrated in the next Geological Time Scale.