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Bajocian high-amplitude relative sea-level fluctuations in Morocco: Regional control or global sea-level changes?

Stephane Bodin (1), Malte Mau (1,2), Jan Danisch (1), Driss Sadki (3), and Alexis Nutz (1)

(1) Aarhus University, Department of Geoscience, Aarhus, Denmark, (2) Copenhagen University, Department of Geosciences and Natural Resource Management, Copenhagen, Denmark, (3) Department of Geology, Faculty of Science, Moulay Ismaïl University, Zitoune, 11201 Meknes, Morocco

Mesozoic sea-level fluctuations have been a matter of debate for several decades, especially the veracity and origin of sea-level cycles that have a periodicity of about 1 Myr or less. The debate lies in the main driving mechanism for sequence development (global sea-level or sediment flux variations) as well as the reason behind water exchanges between the continents and the oceans (glacio- or aquifer-eustatism). In this study, we focus on the carbonate-dominated Bajocian (Middle Jurassic) sedimentary record of the Central High Atlas Basin of Morocco. Several aspects make this basin an appropriate location for discussing Middle Jurassic sea-level changes. Firstly, the outstanding exposures of the High Atlas Mountains, with continuous exposures for 10s of kilometres, allow to describe and track sedimentary packages and their bounding surfaces from proximal to distal settings. Moreover, a combination of ammonite biostratigraphy and carbon-isotopes chemostratigraphy allows to temporarily constrain their development, which permits to correlate and compare the Central High Atlas sedimentary record to other basins. Finally, due to high-subsidence rates, thick Bajocian sedimentary sequences have accumulated, ensuring to minimize condensation and hiatus that might prevail in other basins due to a lack of accommodation space creation. Two Bajocian long-term transgressive-regressive (T-R) packages are observed throughout the basin. They are modulated by several medium-term T-R packages, that have each an approximate duration of 1 Myr. These sequences can also be correlated on a basinwide scale. Short-term, decametric T-R sequences are the building blocks of packages. They are not correlatable over long distances. In fact, exceptional exposures clearly highlight their localised extension, showing textbook stacking patterns that can be used to better constrain medium-term sequences. Hence, combined with sedimentological and facies analyses, architectural evidence illustrates that several of the medium-term sequences are characterized by the presence of a falling stage and lowstand systems tract (FSST and LST), demonstrating that medium-term T-R stacking patterns are not solely linked to fluctuation in sediment supply, but also to episodes of relative sea-level fall. Comparison with Bajocian deposits from Scotland, where good biostratigraphic dating is also available, shows that similar sea-level fall can be observed, highlighting their potential global character. The two long-term Bajocian sequences are more difficult to correlate on a global scale, suggesting that they are rather primarily linked to fluctuation in regional sediment supply. The cause of the medium-term sea-level fall is currently unknown, but it is here interesting to note that a relatively cool globate climate has been postulated for the Middle Jurassic, leaving the glacio-eustasy hypothesis open. Further investigations, notably better constraining paleo-temperature evolutions during the Bajocian, are however needed to reach such conclusion.