Towards a Chemostratigraphic Approach to Determine the Barremian-Aptian Boundary

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The Barremian-Aptian (B/A) boundary was traditionally reported to characterize a major shift in facies from generally shallower to deeper water sediments, hence the lithologic change became often the hallmark of that transitional stage (e.g. NW Germany, MUTTERLÖSE, 1998; Mexico, IMLAY, 1937). Subsequent studies revealed that the global change assumed at the boundary occurred diachronously (e.g., NE Mexico, BARRAGAN & MAURRASSE, 2008); SE France, Provence, MOULLADE et al., 1998), implying that lithology itself could not be a valid criterion to define the stage boundary. Identification of the B/A boundary using biostratigraphy has proven to be problematic as well, especially in sections with a marked expression of oxygen-depleted conditions where index taxa are lacking or very rare. Faunal variations and the possible lack of synchronism in biostratigraphic events are among the main factors associated with these uncertainties in chronologic reliability (e.g. AGUADO et al., 2014).

Since chemostratigraphic data based on carbon isotope ($\delta^{13}C_{org}$ and $\delta^{13}C_{carb}$) variations in Lower Cretaceous sediments have been calibrated with magnetostratigraphy and dependable microfossils at different Tethyan sections and elsewhere, they thus provide an improved resource that reflects extant fluctuations in the ocean carbon reservoir suitable for regional correlation. Published C-isotope curves have indeed shown a consistent negative shift (up to -1.5 ‰) associated with the Barremian-Aptian boundary at different localities worldwide: e.g., Cau section, NE Spain; Provencal platform, SE France; Organyà Basin, Catalunya, Spain; Apulia carbonate platform of the Borgo Celano section, Italy; Adriatic platform, Croatia; IODP Site 765 in the Argo Abyssal Plain, located north of the Exmouth Plateau NW of Australia; Comanche carbonate platform, northern Gulf of Mexico. The constancy of the negative trend in the $\delta^{13}C$ record and its concurrence with the Barremian-Aptian transition suggests a relatively synchronous change in the global carbon reservoir coincident with the stage boundary. Thus, albeit modulating effects conditioned by biotic factors inherent to local basins, this negative shift in $\delta^{13}C_{org}$ and $\delta^{13}C_{carb}$ can be applied as a potentially more accurate chronostratigraphic tool to determine the B/A boundary independent of biostratigraphic ambiguities.

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