

Oceanic changes in a greenhouse world: insights into Late Albian – Early Cenomanian sediments from western Tethys and north Atlantic

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The mixed carbonate-siliciclastic shallow water sediments of the Lusitanian Basin (central Portugal) have been demonstrated to be a promising environmental and climate archive for the Barremian to middle Albian period (Burla, 2007; Burla et al, 2008). In this work we are focusing on the upper Albian to lower Cenomanian part of this succession, showing that local and supra-regional paleoenvironmental events are recorded also in this interval. Using carbon isotope stratigraphy we correlate the studied sections with other coeval ones, especially with the pelagic sediments from Itlay (Southern Alps and the Central Apennines), Switzerland (Helvetic Nappe) and North Atlantic. This allows first an inter-regional comparison between North Atlantic and Tethyan realms, in order to identify the global or local significance of the occurring events, second to observe the sedimentary response to these events both in deep and in shallow water depositional systems.

Upper Albian sediments of the Lusitanian Basin are mainly subtidal limestones, rich in oysters and other fossils and with variable terrigenous fraction. They display second and third order sea level cycles characterized by lateral facies variability: in the area of Ericeira they are formed mainly by oysters, rudists, with other bivalves and echinoderms, whereas orbitolines get dominant in other sections (e.g. Crismina). Coeval pelagic sediments display very heterogeneous successions, often with repeated episodes of anoxic condition, very different from one site to the other. Especially in the Tethyan realm a gradual turn into more homogeneous and less anoxic deep-water condition occurs at the end of the Albian. A nearly 2‰ positive shift is observed in the carbonate carbon isotope curve of the composite section measured in the area around Ericeira. The carbon isotope curve correlates well with pelagic successions from the NE Atlantic, SE France and Central Italy in which the isotopic positive shift occurs just above a black shale-rich interval. This has been interpreted as the signature of the global Oceanic Anoxic Event 1d.

A detailed comparison is performed between the OAE 1d intervals in the Lusitanian Basin, in the Southern Alps (Monte Baldo) and in the central Apennines (Monte Petrano: Piali level). The positive isotopic shift occurs with lower amplitude, 0.5‰, in the sections from Italy, testifying to slightly different responses to the carbon cycle perturbation between shallow and deep water environments. Despite a crisis of carbonate platforms is documented world-wide in the late Albian (Grötsch et al, 1993; Fernández-Mendiola & García-Mondéjar, 1997), the OAE 1d in the Lusitanian Basin is not accompanied by reef collapse or carbonate crisis. Carbonate decrease and siliciclastic beds occur gradually 50 to 65 meters above the carbon isotope positive shift, near the Albian-Cenomanian boundary.