



The evolution of Early Cretaceous shallow-water carbonate platforms in times of frequent oceanic anoxia

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The Early Cretaceous greenhouse world witnessed different episodes of pronounced paleoenvironmental change, which were associated with substantial shifts in the global carbon and phosphorus cycles. They impacted the growth of carbonate platforms on the shelf, lead to the development of widespread anoxic zones in deeper water, and influenced evolutionary pattern in general. A first phase (the Weissert episode) occurred during the Valanginian, which is indicated by a positive shift in the carbon-isotope record, widespread platform drowning, and evolutionary change. The spreading of anoxic conditions was limited to marginal basins and the positive change in carbon isotopes is linked to the storage of vegetal carbon in coal deposits rather than to organic matter in marine sediments. A second phase (the Faraoni episode) of important environmental change is observed near the end of the Hauterivian, where short and repetitive episodes of anoxia occurred in the Tethyan realm. This phase goes along with a decline in platform growth, but is barely documented in the carbon-isotope record. A third and most important episode (the Selli episode) took place in the early Aptian, and resulted in the widespread deposition of organic-rich sediments, a positive carbon-isotope excursion and the disappearance of Urgonian-type carbonate platforms. Often considered to represent short and singular events, these Early Cretaceous phases are in fact preceded by periods of warming, increased continental weathering, and increased nutrient throughput. These preludes in environmental change are important in that they put these three Early Cretaceous episodes into a longer-term, historic perspective, which allow us to better understand the mechanisms leading to these periods of pronounced global change.