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THE INITIATION AND THE RESUMPTION OF THE CALLOVO-OXFORDIAN CRISIS OF CARBONATE PRODUCTIVITY: RELATIONS WITH ANOXIC EVENTS AND PALAEOCLIMATE

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During the Jurassic and Cretaceous times, the tropical climate, high CO_2 content of the atmosphere and the low bathymetry were favorable to the carbonate productivity in the epieric seas of Western Europe. This was materialized by the installation of thick and vast carbonate platforms in the sedimentary basins located northerly of the Proto-Atlantic/Tethys axis. However, this carbonate sedimentation was periodically interrupted by episodes of argillaceous or interrupted/condensed sedimentation. One of the most severe crisis of carbonate productivity lasted at the Callovo-Oxfordian transition (≈164-154 Ma). Several origins have been proposed to explain this major perturbation of the sedimentary record (eustatism, volcanism, meteoritic impact, *etc*.) and but they are still debated.

In this work, we studied the stratigraphic evolution of molecular biomarkers through this crisis on many locations in Western Europe. Samples from 5 wells drilled in the Paris basin (MSE 101, HTM 102, EST 312, EST 342 for the Eastern part and A 901 for the Northern part) as well as the wells Parson Drove and DSDP 534A drilled in the Yorkshire (England) and the Central Atlantic respectively. We evidence two events.

1. An oceanic anoxic event (OAE) which had variable intensity and duration in space. It is highlighted by relatively high TOC values as well as the presence of photic zone and/or sediment anoxia biomarkers. This event starts at the beginning of the Middle Callovian and is recorded by argillaceous sediments deposited just above the Dogger carbonate platform. This major perturbation of the marine water chemistry and of the carbon cycle could explain: 1) the rapid decrease of the carbonate productivity, 2) a cooling during the Upper Callovian by inverse greenhouse effect which inhibits the resumption of the carbonate productivity just after the end of the anoxic event (Dromart et al., 2003). Furthermore, our data indicate that during the anoxic event the photic zone was always anoxic while bottom waters and sediment were anoxic only locally and periodically. This suggests that the anoxia began at the top of the water column and extended at depth, occasionally reaching the sediment/water interface

occasionally. Such propagation of the anoxia indicates that the mechanism leading to the anoxia should by an eutrophication of the photic zone.

2. A paleoflora change occurring at the end of the lower Oxfordian. It is expressed by the increase of the Pinaceae abundance as indicated by a major change of the vascular plant biomarkers distribution. This paleofloral evolution reflects a paleoclimatic change interpreted as an increase of aridity (Hautevelle et al., 2006). This paleoclimatic change signs the return of favorable conditions for carbonate sedimentation which starts during the Middle Oxfordian and leads to the development of major carbonate platforms during the Upper Oxfordian.

Thus, these two events recognized by molecular organic geochemistry explain the processes and mechanisms leading to the initiation, the perduration and the resumption of the Callovo-Oxfordian crisis of the carbonate productivity (fig. 1).

Furthermore, the core A 901 presents a continuous stratigraphic succession from the Triassic to the Oxfordian and had also recorded the Toarcian and the Upper Bajocian crisis of the carbonate productivity. A current study of this core indicates that a similar scenario can be proposed to explain the occurrence of the other Jurassic crisis of the carbonate productivity.

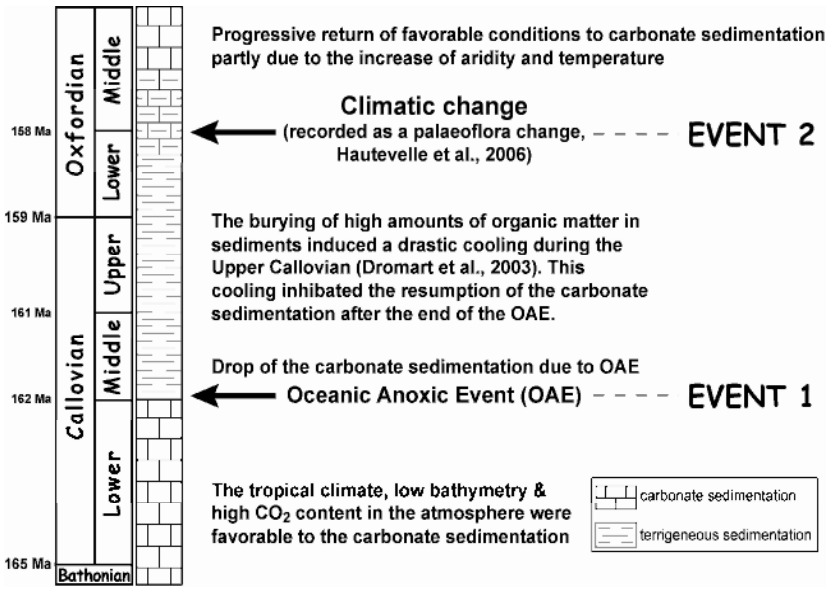

Figure 1. Scenario proposed to explain the initiation, perduration and resumption of the Callovo-Oxfordian crisis of carbonate productivity

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