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# Spore-pollen assemblage records delayed terrestrial cooling in response to organic carbon burial during OAE1a

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Cretaceous oceanic anoxic events (OAEs) have received considerable attention during the last couple of decades and a wealth of information has been obtained on the stratigraphy, paleoceanography and biogeochemistry of these episodes. Up to now, research focused mainly on the marine OAE record, whereas studies investigating the response of the continental biosphere to OAEs are comparatively rare. Here, a quantitative spore-pollen record is presented, which covers the entire Early Aptian OAE1a interval including its onset and aftermath. Sporomorph-bearing deposits from the Forcall Formation, Maestrat basin of E Spain, have been investigated using bulk rock geochemistry (TOC, $CaCO_3$, carbon isotopes) as well as palynofacies analysis and palynology. The carbon-isotope trend shows a very distinct pattern and enables detailed correlation with established curves covering OAE1a. A total of 28 different genera of spores and pollen have been distinguished within the studied 38 samples. Whereas pteridophyte spores and conifer-derived bisaccate pollen show only minor variations with stratigraphic height, non-saccate gymnosperm pollen (notably Classopollis, Araucariacites, Inaperturopollenites) record a major shift during and in the aftermath of OAE1a. Classopollis pollen, produced by the xerophytic Cheirolepidiaceae, is the dominant pollen group before the event (80-90 %) and shows a distinct two-step decrease with lowest abundances (as low as 21 %) occurring within the positive carbon isotope anomaly (C7 segment in Bover-Arnal et al. 2011). This gradual decline is followed by a subsequent rise in Classopollis pollen reaching almost pre-OAE values of 60-80 %. In contrast, Araucariacites and Inaperturopollenites pollen show a distinct increase from low background values (less than 10 %) to become a significant component of the palynological assemblage during the Classopollis drop. The observed changes in pollen distribution patterns are interpreted to reflect a major change in the composition of the hinterland vegetation of the Maestrat basin, most probably due to short-lived but pronounced climatic cooling. Temperature anomalies driven by organic carbon burial and associated $CO_2$ decline have been postulated for all major Mesozoic OAEs. The palynomorph record from eastern Iberia indicates that the climax of this cooling episode (represented by the Classopollis minimum) was significantly delayed in comparison to the end of organic carbon-rich deposition in the world oceans.