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High-resolution C stable-isotope profile obtained from the correlation of four overlapping Aptian sediment cores (D1 to D4) at Cau (Prebetic Zone, Spain): Preliminary results

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The Early Aptian Oceanic Anoxic Event 1a (OAE1a, 120 Ma) is associated to massive burial of organic matter in marine sediments, is recorded in all major ocean basins and is considered an excellent example of an OAE. Previous studies have documented the stable C-isotope stratigraphy of OAE1a through different sections worldwide. Nevertheless, detailed high-resolution records across the entire event are still required to accurately determine the precise timing and rates of the different environmental and biotic changes that occurred during the OAE1a
With this aim, four overlapping sediment cores, designated D1 to D4, have been obtained from the Aptian Almadich Formation (ca. 200 m. thick) at Cau section (Alicante province, SE Spain), where deposition occurred on a highly subsiding sector of a tilted block, located in the distal parts of the Prebetic Platform. Previous work on the exposed Aptian succession at Cau has focused on the stratigraphy, bioevents, C-isotope stratigraphy, and organic and elemental geochemistry, and on reconstructing pCO_2 [1] These studies reveal that the Cau section represents an excellent site to investigate OAE1a, based on its unusually high thickness and stratigraphic continuity, and the quality and preservation of fossils and the geochemical signatures.
To fully sample the Almadich succession four drills were planned: three of which were completed in the autumn of 2015 [2], and the fourth in the autumn of 2017. Systematic sampling of the cores for C- and O-isotope geochemistry, minor- and trace-elemental analysis, biomarkers, and micropaleontology, was performed. Gamma-ray logs, carbonate carbon-isotope (δ13Ccarb) data and cut-core images, have been the main basis used for correlation of the cores. Cores D3 and D4 show an overlap of about 16 m (lowest part of D3 correlates with the highest part of the D4 core). Cores D2 and D3 overlap by about 5 m and D1 and D2 by about 11 m. These overlaps have allowed us to obtain a complete C-isotope profile, in which the C-isotope segments differentiated by Menegatti et al. (1998) [3] and Bralower et al. (1999) [4] have been identified. Here we present the C-isotope stratigraphy, together with associated facies types, magnetic susceptibility measured from core in the laboratory, and geophysical log profiles measured down-hole.
Correlation of the C-isotope profiles of the four cores demonstrates a number of features. The upper parts of the cores, showing visual evidence of oxidation, record erratic and lower δ13Ccarb values than the corresponding intervals in core sampled below the surface weathering zone. Similarly, outcrop carbonate C-isotope values are generally lower than those obtained from the cores. This poses a potential problem of correlation between outcrop and core profiles if the absolute values of the δ13Ccarb profiles are to be considered.

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