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High-resolution C and O stable-isotope geochemistry and correlation of three lower Aptian sediment cores (D1, D3 and D4) at Cau (Prebetic Zone, Spain): Preliminary results

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The Aptian Oceanic Anoxic Event 1a (OAE1a, 120 Ma) is associated to massive burial of organic matter in marine sediments and is recorded in all major ocean basins. It represents an excellent example of an OAE, and is believed to reflect a major perturbation in climatic and oceanic environmental conditions that caused abrupt changes in the global carbon cycle. Several previous studies have documented the stable C-isotope stratigraphy of OAE1a through different sections worldwide. Nevertheless, detailed high-resolution studies across the entire event are still required to accurately determine the precise timing and rates of the different environmental and biotic changes that occurred.

The Cau section is located in the easternmost part of the Prebetic Zone (Betic Cordillera), which represents the platform deposits of the Southern Iberian palaeomargin. The Lower Aptian of the Cau section consists of a hemipelagic unit (Almadich Formation, ca. 200 m thick), deposited in a highly subsiding sector of a tilted block, located in the distal parts of the Prebetic Platform. Previous work on the exposed Lower Aptian succession at Cau has focused on the stratigraphy, bioevents, C-isotope stratigraphy, and organic and elemental geochemistry, and on reconstructing pCO_2 from organic geochemistry proxies. 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.

Here we present results of three high-resolution C-isotope profiles based on the analysis of samples from the three Cau sediment cores, which were drilled in autumn 2015. The three drills were separated by about 193 m, with D1 being about 20 m topographically higher than D3, and D3 15 m higher than D4. Cores D3 and D4 show an overlap of about 18 m, which corresponds to the lowest part of D3 and the highest part of the D4 core. The shape of the δ13C profiles in the overlapping portions of these two cores is essentially identical, allowing for the lower resolution of the basal D3 profile, for which a smaller number of samples were analyzed. The overlap between the D1 and D3 remains unclear, which necessitated the drilling of an intervening site (D2) in November 2017. The data from the previous cores extend the C-isotope record of the Cau core into the upper part of OAE1a and represent a more continuous record at much higher resolution than published outcrop studies. This leads to the refining of the correlation with previously defined C-isotope segments of Menegatti et al. (1998), recognised worldwide.

Along with the C-isotope stratigraphy, correlated with biostratigraphic and geochemical data from outcrop studies, profiles of magnetic susceptibility (measured from core in the laboratory) and geophysical log profiles measured down-hole are presented. A preliminary sedimentological study of the facies types in the cores provides information on the environmental and diagenetic changes accompanying OAE1a on the Prebetic Platform.

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