



Biomarker characterization of the record of the OAE1a (early Aptian) in Betic and Cantabrian basins (Spain)-Sedimentary implications

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Molecular analyses of sedimentary organic matter are powerful tools in assessing the origin of organic matter and its thermal maturity as well as constraining ancient environmental conditions, such as marine productivity, anoxia in bottom waters or the photic zone and sea surface temperatures. This communication presents the study of four sections recording the OAE1a (early Aptian) in Spain, which are located in two broad basins respectively located in the South and the North of Iberia: the Southern Iberian Palaeomargin (Carbonero - CAB, La Frontera - XF and Cau - CAU sections) and the Cantabrian Basin (Puente Nansa - PN section). These sections represent depositional settings ranging from platform (CAU, PN) to pelagic environments (CAB, XF). C-isotope profiles and biostratigraphic data are used to define the interval corresponding to the OAE 1a. Here we focus on the biomarker composition of the organic-rich facies, and the integration of these data with the sedimentology, stratigraphy and paleogeography.

The study has been based mainly upon the analysis of samples with Gas Chromatography-Mass Spectrometry (GCMS). Four main groups of compounds are present in all sections: n-alkanes, isoprenoids, hopanes and steranes. n-Alkanes and isoprenoids (pristane and phytane) are dominant in most samples. To facilitate interpretation of these distributions, we have calculated the TAR (terrestrial aquatic ratio derived from the ratio of long to short chain compounds) and also the OEP (odd over even predominance of n-alkanes). The ratio of pristane to phytane and various isoprenoid/n-alkanes ratios have also been calculated. The hopanes are represented by a range of C27 to C35 components, with the specific isomers varying amongst the sections due to differences in thermal maturity. Steranes occur as a range of C27, C28 and C29 isomers, whereas diasteranes only occur in the most thermally mature section (CAB). Other compounds of interest include gammacerane and dinosterane.

The analysis of the data shows interesting differences between the studied sections, of which thermal maturity appears to be a first order control. The n-alkane distribution (OEP) and sterane and hopane epimer ratios ($20S/(20R+20S)$ steranes and $22S/(22R+22S)$ hopanes) all reveal that the CAB section is thermally mature, whereas the nearby XF section is very immature. CAU section shows a very low maturity, and PN shows intermediate values. The isoprenoids/n-alkanes ratios also present different values between the four sections. These differences help constrain the paleogeographic and sedimentary interpretation of the studied sections. Organic matter is derived from a range of terrestrial, marine and bacterial sources. Maturity varies strongly, even between nearby sections (CAB and XF), probably in relation with tectonic and volcanic synsedimentary activity. The distribution of n-alkanes (TAR ratios), would indicate a trend from predominance of marine plants in the CAB samples, towards a higher proportion of continental input to XF, PN and CAU sections, consistent with the paleogeography, but observed differences in thermal maturity could also account for this trend. The dominance of the C29 isomers in steranes in all sections would indicate a contribution from higher plants. The presence of gammacerane as well as a high C29/C30 hopane ratios could indicate water column stratification and anoxia at the water/sediment interface, respectively, although these features are not always present and other proxies for anoxia (e.g. isorenieratene derivatives) have not been detected with the method used. The vertical trends observed reveal notable changes through time; therefore, a higher resolution study along the sections will provide new evidence for furthering our understanding of the causes and extent of OAE1a.

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