

APTIAN CARBON-ISOTOPE RECORD FROM SERGIPE-ALAGOAS BASIN: NEW INSIGHTS ON OCEANIC ANOXIC EVENT 1a AND THE ENTRANCE OF SEAWATER INTO THE SOUTH ATLANTIC

Tedeschi, L. R. 1,2; Jenkyns, H. C. 2, Robinson, S. A. 2, Lana, C. C.3, Santos, M. R. F. M. 1, Tognoli, F. M. W. 4

1 Research Centre of Petrobras (CENPES); 2 University of Oxford; 3 Retired from CENPES; 4 Universidade do Vale do Rio dos Sinos (UNISINOS)

ABSTRACT: The extent of synchronous evaporite deposition in the central segment of the South Atlantic is poorly known. Furthermore, the environmental effects of early Aptian OAE1a at lower palaeolatitudes in the central segment of the South Atlantic, potentially associated with the entrance of seawater into more northerly basins, have not been investigated. This study aims to assess the relative timing and palaeogeographical significance of environmental changes in the northern region of the central segment of the South Atlantic by comparison to changes in southern Brazilian basins in the context of their relationship with OAE1a. The work presented here was performed using samples from Petrobras Well D (10°35' S; 37°05'W), which was spudded onshore at 92 metres above sea level in the Castanhal oil field (Sergipe-Alagoas Basin). The sequence cored from the base to the top comprises: basement (376.30–365.34 m), Muribeca Formation (365.34–147.20 m), and Riachuelo Formation (147.20–77.0 m). All the members of the Muribeca Formation were cored: Carmópolis Member (365.34–264.90 m), Ibura Member (264.88–163.70 m) and Oiteirinhos Member (163.70–147.20 m). From the Riachuelo Formation, only the Angico and Maruim Members (147.20–77.0 m) were recovered. Carbon-isotope ratios derived from organic matter ($\delta^{13}\text{C}_{\text{OM}}$) associated with total organic and inorganic carbon (TOC and TIC), sulphur content (SC), pyrolysis data (S1, hydrogen and oxygen indexes, maximum temperature of S2 peak (Tmax) and pollen stratigraphy are presented in this study. These new $\delta^{13}\text{C}_{\text{OM}}$ data provide a unique view of Aptian palaeoenvironmental history of this low-latitude equatorial region and record the transition from continental to shallow-water marine settings. Comparison of the $\delta^{13}\text{C}_{\text{OM}}$ record with that from the Campos–Santos Basins and an age-calibrated Tethyan reference curve allows construction of a detailed chemostratigraphic framework for Petrobras Well D. The evidence suggests that the interval represented by OAE 1a was dominated by deposition of coarse immature clastic sediments of the Carmópolis Member and shales from the base of the Ibura Member, both deposited in predominantly continental environments with marine influence. Organic matter deposited during OAE 1a in Petrobras Well D has relatively higher hydrogen indices than sediments deposited above this interval. It is suggested that Carmópolis and Ibura Members were deposited synchronously with evaporite formation in the southern Brazilian basins. The refined stratigraphy of Well D suggests synchronicity between a dramatic change in water chemistry, interpreted as entrance of seawater with higher sulphur content into the Sergipe-Alagoas Basin during the siliciclastic deposition of Carmópolis Member and the major South Atlantic evaporites present in the Campos and Santos Basins (Retiro and Ariri Formations). It is also suggested that more soluble salts (sylvinite, carnallite and tachyhydrite) in the Ibura Member (deposited elsewhere in Sergipe-Alagoas Basin) post-date the major South Atlantic evaporites present in the Campos and Santos Basins (Retiro and Ariri Formations), although the lines of evidence are not totally conclusive.

KEYWORDS: Carbon-isotope stratigraphy, Oceanic Anoxic Event 1a.