# SEA-LEVEL RISE EPISODES DURING THE HOLOCENE IN THE POTENGI–JUNDIAI ESTUARY, NE BRAZIL INFERRED FROM DIRECT ANALYTICAL PYROLYSIS (Py-GC/MS) OF SEDIMENTS.

M. Kumar[1], T. Boski[1], F. P. Lima-Filho[2], F.H.R. Bezerra[2], F.J. González-Vila[3], N.T. Jiménez-Morillo[3], José A. González-Pérez[3]*

[1]CIMA, University of Algarve, Faro, Portugal.
[2]Dept. Geology, Universidade Federal do Rio Grande do Norte, Natal, Brazil
[3]IRNAS-CSIC, Seville, Spain
*Corresponding author: Jag@irnase.csic.es

## Introduction

Understanding sea-level changes on various time-scales is important because it is usually associated to climate changes (Milne, 2008). Sediments in estuaries may retain a continuous record of climatic and environmental markers surrogated to factors like relative sea level (RSL), vegetation cover, and connectivity with the open ocean. Sediments accumulated since the last glacial maximum (LGM; c. 20 kyr.) are particularly informative and encompass valuable information to infer accurate RSL curves. Lipid biomarkers are preserved in sediments and include molecular markers like *n*-alkanes and *n*-alkanoic acids increasingly used for paleoclimate and paleoenvironmental reconstructions (Eglinton and Eglinton, 2008). In this communication analytical pyrolysis (Py-GC/MS) is used to study the structure of organic matter (OM) contained in dated sediments from core Ig-8 (31.5 m depth). This technique has been previously used to monitor past environmental changes in the area (Boski et al., 2015a). The core was drilled in the area of central flood delta of Potengi-Jundiai estuary, through the sedimentary sequence accumulated since ca 10 kyr cal BP (Boski et al., 2015b). Direct pyrolysis was performed in a double-shot pyrolyzer (Frontier Lab 2020i) attached to a GC/MS system (Agilent 6890N + 5973MSD). Detailed chromatographic conditions can be found elsewhere (Boski et al., 2015a). In short, samples were thoroughly homogenized and samples introduced (1 mg) into a preheated micro-furnace at 500 ºC for 1 min and evolved gases transferred to the GC/MS for analysis. Compounds assignment was done via single-ion monitoring and by comparison with published and stored (NIST and Wiley libraries) data.

## Results

Marked compositional differences between the OM of different ages were found. Specifically, the *n*-alkane series were found particularly informative in discriminating OM sources (terrigenous vs marine). In the surface, the alkane series was characterized by a high average chain length (ACL) value indicating a clear influence from terrestrial vegetation. From 6.5 to 11.5 m depth (Cal. Age c. 7800-8000 yr BP) an increase in the terrigenous contribution is observed by an increase in ACL values in correspondence with $\delta^{13}C$ depletion. At 22.8 m depth and at 26.6 m (Cal. Age c. 8200-9200 yr BP) inputs from terrestrial plants were again detected, but for short periods of time. Bellow 26.6 m (Cal. Age c. 9300 yr BP), the influence is clearly marine and ends at 29.45 m with a neat alteration of sediment isotopic signature with a $\delta^{13}C$ enriched layer and absence of organic markers, indicating the occurrence of sedimentary conditions favouring carbonate formation. Below this depth (Cal. Age > 9500 yr BP), the OM in the sediments shows a conspicuous terrestrial influence (depleted conductivity and $\delta^{13}C$ and increase in alkanes ACL and long vs short chain length (L/S) ratio) that increase towards bottom of the core down at 30.95 m. This possibly indicates a drastic sea-level change during this period of time. The observed compositional variability of OM reflects the evolutionary

history of the Estuary in which the following stages may be distinguished: fluvial to i) estuarine transition, ii) unrestricted access of marine waters, iii) fast se level rise possibly reflecting melt water pulse 1C (Teller et al., 2002; Stokes et al., 2016) accompanied by mangrove migration iv) terminal infilling of the estuary.

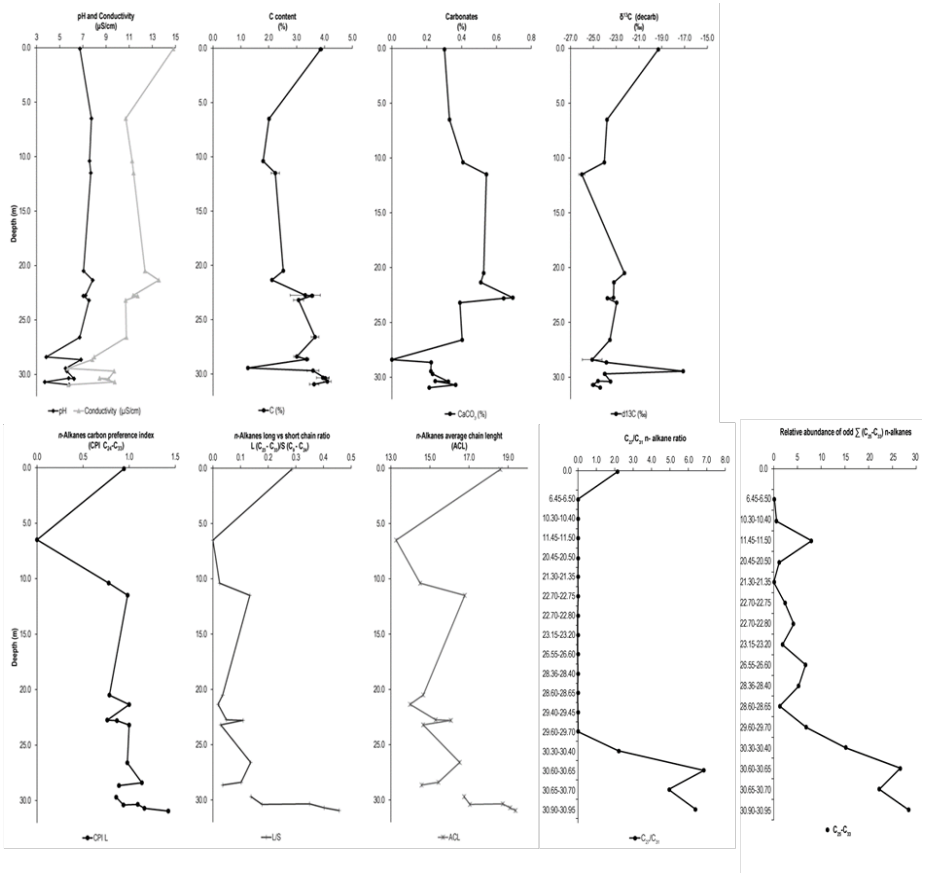


***Figure 1:*** *Downcore variations in pH and conductivity, bulk sediment characteristics (carbon contents and isotopic composition) and n-alkanes biogeochemical variables (carbon preference index (CPI), Long/Short chain ratio (L/S), average chain length, C27/C31 ratio and sum of long chain (C27-C33)).*

**References**


Boski, T., Angulo, R.J., Sousa Bezerra, M.C., Barboza, E.G., Knicker, H., González-Pérez, J.A., González-Vila, F.J., 2015a. Progradation rates of coastal barriers estimated from the 14C age of soil organic matter. J. Quat. Sc. 30, 9-18.

Boski, T., Bezerra. F.H.R., Pereira, L.F., Souza, A.M., Maia, R.P., Lima-Filho, F.P., 2015b. Sea-level rise 8.2 ka recorded in the sediments of the Potengi-Jundiai Estuary, NE Brasil. Marine Geol. 365, 1-13.

Eglinton, T.I., Eglinton, G., 2008. Molecular proxies for paleoclimatology. Earth Planet. Sc. Lett. 275 (2008) 1-16.

Milne, G., 2008. How the climate drives sea-level changes A&G. 49, 2.24-2.28.

Stokes, C.R., Margold, M., Clark, C.D., Tarasov, L., 2016. Ice stream activity scaled to ice sheet volume during Laurentide Ice Sheet deglaciation. Nature 530, 322-326.

Teller, J.T., Leverington, D.W., Mann, J.D., 2002. Freshwater outbursts to the ocean from glacial Lake Agassiz and climate change during the last deglaciation. Quaternary Sci. Rev. 21, 879-887.


**Acknowledgements**


The Spanish Ministry of Economy and Competitiveness (MINECO) is acknowledge for project (CGL2016-78937-R). The authors wish to thank Alba Carmona and Desiré Monis for their valuable technical assistance in Py/GC-MS analysis.