Poster V.3

REGIONAL SEA LEVEL CHANGE STUDY BASED ON ESTUARINE SEDIMENT COLOR & BIOGEOCHEMISTRY – PRELIMINARY RESULTS

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Coastal zones play a significant role in the regional development and have been an important area for human occupation through time. The study of estuarine sediments applied to sea level changes had always been of extreme importance, as it reflects the coastal line evolution, either by local, regional or global changes. In this sense, efforts have been made in order to develop new techniques that enable the acquirement of high-resolution sedimentary data. For the first time, sampling and analytical techniques from deep-sea studies were applied to estuarine environment. Sediment cores were collected in 4 estuaries from the Algarve region (Guadiana, Almargem, Arade and Alvor), south of Portugal. A hand corer was used, and for each estuary three cores were collected c.a. 50 m apart, perpendicularly to the main channel of the estuary. Each sediment core had three centimeters of diameter and c.a. three meters length. The magnetic susceptibility and the color of the sediments were acquired every five centimeters, using the magneto-susceptometer SM-20 and the spectrophotometer Colortron, respectively. Sediment core surface was digitized using the Scanner Mustek 1200 A3 PRO. Sediment samples have been taken every five centimeters of the cores and freeze for subsequent major and minor elements analysis, iron oxidation state analysis, organic matter concentration analysis, grain size and mineralogy. A good reproducibility was observed for both magneto-susceptometer and color instruments. The viability of acquiring digital images from core surface with the scanner was observed in opposition to the use of photographic equipment, reducing the problems related to illumination and amplification of photographs. Some correlation between the color parameters (CIE Lab) and the magnetic susceptibility has already been observed. We also aim to find some correlation between chemical composition, mineralogy, grain size and magnetic susceptibility with the color parameters Lab. If observed, color parameters will be useful for obtaining quick and cheap profiles of sedimentary records which will allow: i) cross correlation between cores; ii) better assessment of sediment accumulation rate variations and therefore iii) a better approximation for C sequestration calculation. This work is from a research project integrated in the POCTI from the *Fundação para a Ciência e Tecnologia*, supported by FEDER and OE (POCTI/CTA/39733/2001).

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Studying transitional systems such as estuaries is a hard task mainly due to the lack of continuous data acquisition techniques. In the present project, an effort have been made in order to try to develop the use of spectrophotometry and magnetic susceptibility on sedimentary cores from estuaries allowing at least the existence of almost continuous data profiles for future core correlations and comparisons.

For this purpose, four estuaries from the Algarve region (Fig. 1) have been sampled with a hand corer reaching ± 3 m in depth. The first results from two cores, core AL3 and AR1, respectively from Alvor and Arade estuaries (Fig. 1), are presented here.

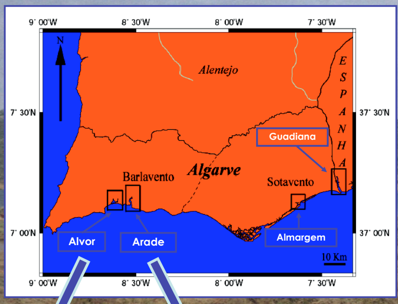

Figure 1 – Map from the Algarve region with the location of the estuaries in study.

Results for color parameters CIE Lab, magnetic susceptibility and geochemistry data are illustrated in figures 2 to 5. The use of Principal Component Analysis seemed important in order to identify possible elemental association with color parameters and/or magnetic susceptibility.

Not shown here is the negative correlation between the mean parameter from granulometry and the magnetic susceptibility.

Alvor Core AL3

Arade Core AR1

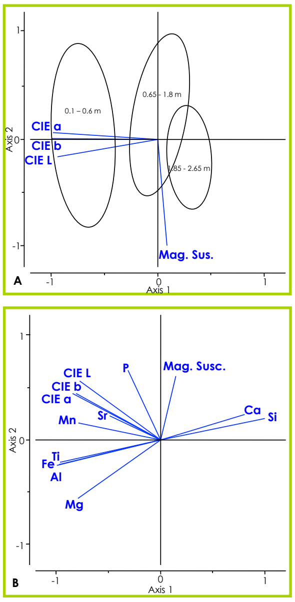

Figure 2 – Principal component analysis of data from core AL3. Variables (**A**): color parameters CIE L, CIE a, CIE b; Magnetic Susceptibility. Total sample number = 52. Variables (**B**): color parameters CIE L, CIE a, CIE b; Magnetic Susceptibility; elements (%) Si, Al, Fe, Mn, Mg, Ca, Ti, P, Sr. Total sample number = 12.

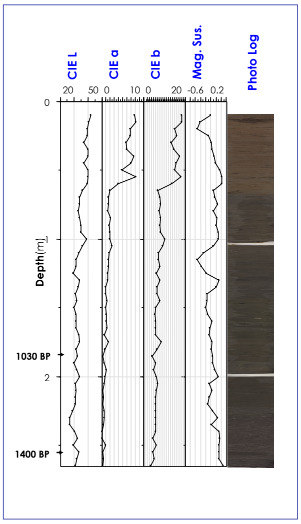

Figure 3 – Core AL3 profile for color parameters CIE L, CIE a, CIE b, Magnetic Susceptibility and photographic Log. AMS radiocarbon age (+/- 40 BP). Total sample number = 52.

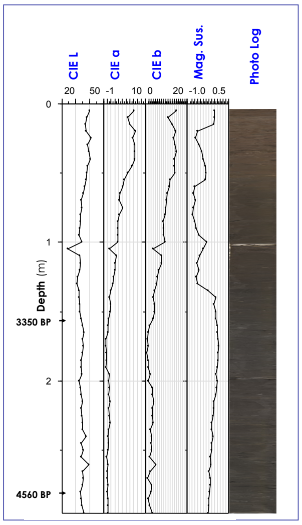

Figure 4 – Core AR1 profile for color parameters CIE L, CIE a, CIE b, Magnetic Susceptibility and photographic Log. AMS radiocarbon age (+/- 40 BP). Total sample number = 59.

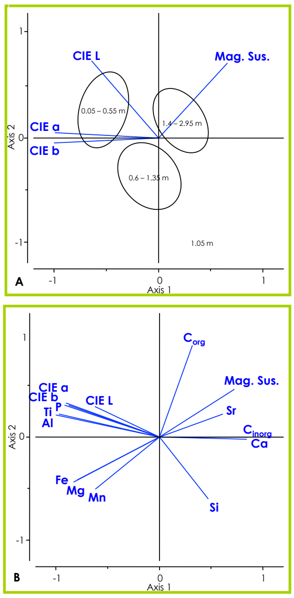

Figure 5 – Principal component analysis of data from core AR1. Variables (**A**): color parameters CIE L, CIE a, CIE b; Magnetic Susceptibility. Total sample number = 59. Variables (**B**): color parameters CIE L, CIE a, CIE b; Magnetic Susceptibility; elements (%) Si, Al, Fe, Mn, Mg, Ca, Ti, P, Sr, C_{org}, C_{inorg}. Total sample number = 14.

Figures 2 and 5 did allow to observe several depth sample association (Fig. 2A and 5A), and several element association (Fig. 2B and 5B), or even to confirm what seem obvious from depth profiles in relation with color associations (Fig 3. and 4).

Unfortunately, the observed associations are not the same from one core to the other which reflects the influence of the local drainage basin characteristics: the Alvor basin includes ultra basic rocks from the Monchique intrusion, whereas the Arade Basin is predominated by metamorphic rocks (graywackes and schistes) and carbonated sedimentary rocks (mainly limestones).

To try to find a regional signal in the studied cores, samples scores from PCAs made on some geochemical data (Si, Al, Fe, Mn, Mg, Ca, Ti, P, Sr) are presented on figure 6.

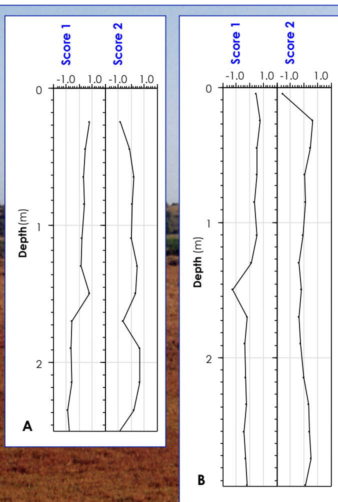

Figure 6 – Profiles of sample scores for axis 1 and 2, obtained from PCA's for elements Si, Al, Fe, Mn, Mg, Ca, Ti, P, Sr in core AL3 – **A**, and in core AR1 – **B**.

The natural variation of samples is explained at 79% and 74% for core AL3 and AR1 respectively with the two axis. Some interesting features appear when comparing score profiles from both cores with geochemical parameters :

Score 1 profiles seem to react strongly with continental source, Si, Al, Fe, Mg ($0,77 < R^2 < 0,98$);

Score 2 profiles seem to answer to marine impulses of productivity, P, Sr, C_{org} ($0,34 < R^2 < 0,84$).

Within these two cores, the information is not sufficient to reach a reliable relation between any of the studied parameters and the color parameters. Although, we hope that with the 10 other cores collected in the region, some better indexes will be developed in order to allow comparison between estuaries, based on color parameters.

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