A PRELIMINARY STUDY ON A MANGROVE CORE USING NEUTRON ACTIVATION TECHNIQUE

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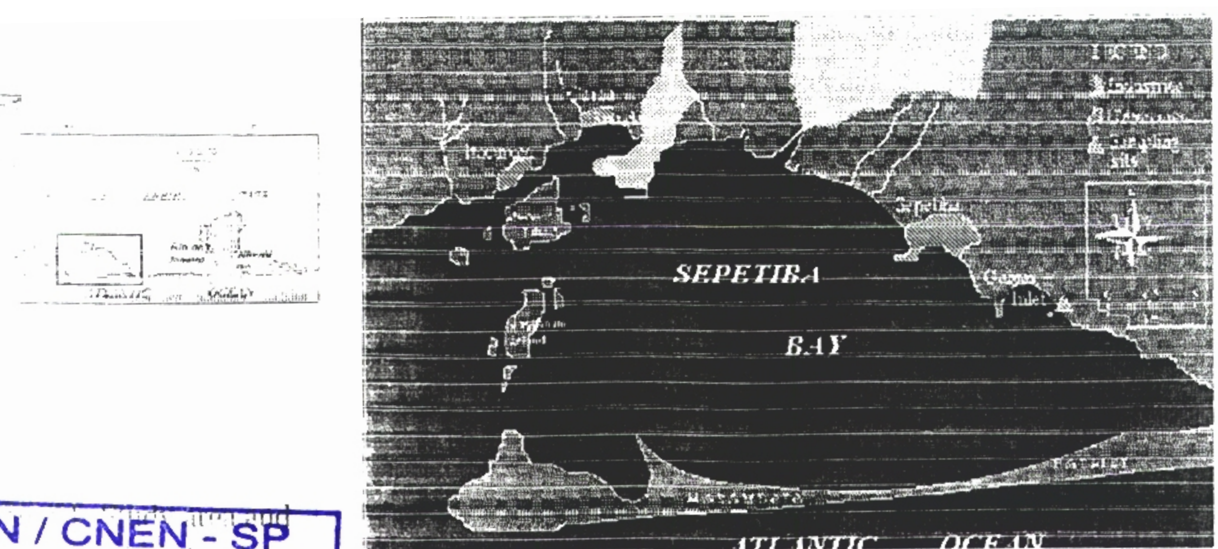
INTRODUCTION

Sepetiba bay, located in the Southeast coast of Rio de Janeiro - Brazil, houses in its sourroundings important industrial plants, that provides the bay with high loads of pollutants, specially heavy metals (Rodrigues, 1990; Barcellos, 1995). Although a great deal of research concerning heavy metal distribution and behaviour in Sepetiba Bay has been done in recent years (*e.g.*: Lacerda, 1983; Lacerda *et al.*, 1987 ; Wasserman *et al.*, 1991), only a few metals had the attention of the researchers. This is probably due to the fact that the technique utilized is frequently atomic absorption spectrophotometry that demands a great effort to obtain few metals. The utilization of the neutron activation technique is an powerfull tool for the determination of elements like metals (Ba, Ca, Co, Cr, Cs, Fe, Hf, Na, Rb, Sc, Zn), rare earths (La, Ce, Nd, Sm, Eu, Tb, Yb and Lu), actinideans (Th, U), non-metals and semi-metals (As, Br, Sb, Se) that are the subject of this research.

MATERIAL AND METHODS

Sampling and Sample preparation: One 30 cm sediment core was sampled in a fringe mangrove area in Sepetiba Bay (figure 1). The core was collected in an intertidal zone in between the trees. Another core was collected in the tidal plaine in front of the mangrove, but will be subject of another paper. The core was sliced every 3 cm, where water content and fine grained fraction (<63μm) were measured. Sediment samples were dried and ground for neutron activation analysis.



Neutron activation Analysis: The sediment samples were irradiated in the IEA-R1 nuclear reactor of the Institute of Nuclear Energy Research (IPEN) for 16 hours at a thermal flux of about 10^{12} ncm^{-2} s^{-1}. The measurements of the induced gamma-ray activity were carried out in a GX2020, hyper-pure Ge detector, connected to a S-100 MCA (Camberra) and a personal computer. The resolution (FWHM) of the system was 1.90 keV for the 1332 keV gamma-ray of ^{60}Co.

RESULTS AND DISCUSSION

The results are presented in the form of graphs in figure 2.

The water content show a typical profile of an intertidal area, showing increasing values with depth. There is a possible control of the metal contents in sediments concerning the tide hight, due to leaching of the top levels during low tide, that reduces concentration and re-increasing concentration during high tide. Such a behaviour was not observed for any of the elements measured in this study. Actualy, this effect can be observed in the very first centimeters of the sediment but, as our cores were sliced every 3 cm, the sensibility was probably not good enough to outline this process.

Although granulometry has shown to be a major factor controlling metal concentrations, the studied sediment profile did not show a signifant variation (around 75 to 80%). hence. variations in concentrations are due to other parameters like industrialization, or different rates of weathering with time.

The metal profiles shown in figure 2 suggest three types of distinct behaviour: 1) no variation is observed with depth. As, Br, Ca, Fe, Na and Sb can be placed in this cathegory; 2) few metals showed a tendency to have concentrations increasing with depth. Those are Cs. Rb, Sc, Se; 3) decreasing concentrations with depth are a typical behaviour for elements of antropogenic origin. In Sepetiba bay, the repported sedimentation rate ranges between 1 and 3 cm per year (Silva-Filho et al., unpublished). If it is assumed a sedimentation rate of 1 cm per year, the studied core would reach the last 30 years, corresponding to early stages of industrialization of the area. The metals classified in this cathegory are Ba. Ce. Eu. La. Lu. Nd. Sm. Tb. Th. U. Yb. Zn.

Some other metal concentrations in Sepetiba bay have shown this same behaviour, like Cr. Cu. Ni and Cd (Lacerda, 1983). These metals were confirmed as of antropogenic origin. For the rare earths and other elements studied in this work. two possible sources are to be confirmed. The neighbouring lithology has not been subject to detailed geochemical studies. but can be considered as possible sources. The metallurgic activities in the area can also represent an important source.

Further studies on the geochemistry of the possible sources should include the sampling of neighbouring rocks and soils and the ore used in the metallurgic industries in the area.

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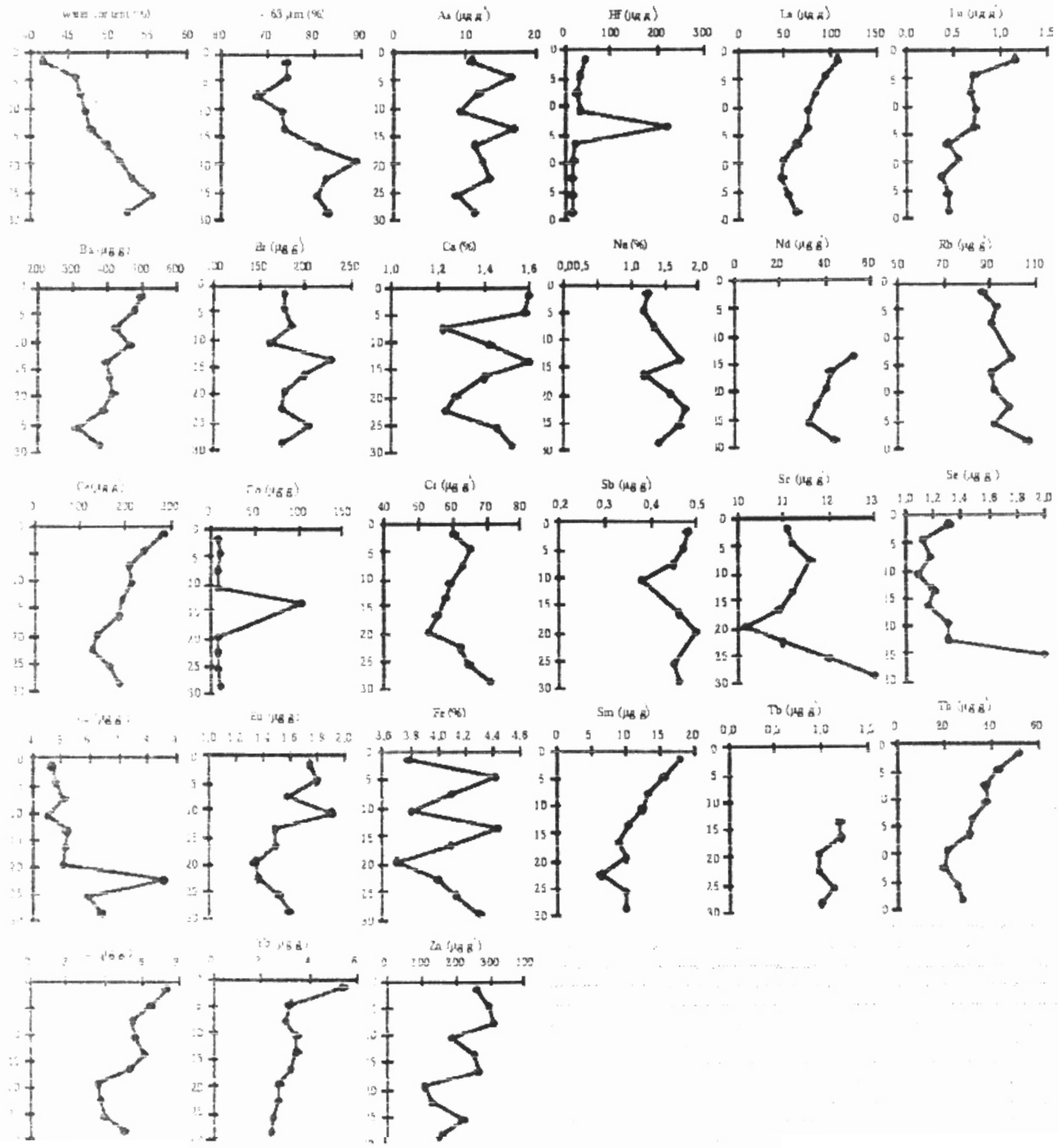

Figure 2: Profiles of the measured parameters