TEMPORAL EVALUATION OF ORGANIC MATTER SOURCES IN TODOS OS SANTOS BAY (BAHIA, BRASIL) THOUGH THE USE OF STABLE ISOTOPE

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Introduction

Studies of the sedimentary organic matter (OM) characteristics can afford important information about environmental changes (Bauer et al., 2013). The analyses of stable isotopes of carbon ($\delta^{13}C$) in the OM bulk are often used as tools to elucidate the sources of OM to marine systems (Li et al., 2016). The Todos os Santos Bay (TSB, Figure 1) is the second largest bay in Brazil. It is characterized as a fluvial-marine depositional environment. Discharge of fresh water to TSB is made mainly by three river systems: Paraguaçu, Jaguaripe, and Subaé. The water exchange of TSB with the ocean is made mainly through the Salvador Channel (Cirano and Lessa, 2007). The purpose of this present study was assessing the changes of OM sources deposited in TSB.

Four cores were collected on the northeast of the bay (Figure 1). They were sectioned and the samples were freeze-dried. The sedimentation rate was verified through the analyses of Pb^{210}. The total organic carbon content (TOC) and $\delta^{13}C$ were analyzed in decarbonated samples through the use of an elemental analyzer coupled to an isotopic ratio mass spectrometer.

Results

The sedimentation ratios found to T1, T2, T3 and T4 were, respectively, 0.79 cm $year^{-1}$, 0.96 cm $year^{-1}$, 0.60 cm $year^{-1,}$ and 0.67 cm $year^{-1}$. They were in the range of previous studies done in TSB (Argolo, 2001). The TOC levels found in the samples ranged from 0.9 to 2.8%. The levels were in the range of other bays (Barros et al., 2010). There were no significant differences in concentrations between the cores ($p<0.05$).

The $\delta^{13}C$ ranged from -24.2 to -21.8 ‰. T3 presented higher values of $\delta^{13}C$ (-21.4±0.5 ‰) when compared to T1, T2 and T4 (-23.4±0.7 ‰, -22.7±0.3 ‰, -22.6±0.4 ‰, respectively), showing higher predominance of phytoplankton to its sedimentary OM (Zhou et al., 2006). This core has lower influence from rivers.

It was observed in T1 that, until 1968, values of $\delta^{13}C$ decreased, stabilizing until the present. Regarding T2, values of $\delta^{13}C$ increased gradually until 1963, becoming stable until 1991, then get more depleted until the present. Concerning T3, it was possible to verify that, in 1959, levels of $\delta^{13}C$ increased, until 1993, then begin decreasing again. During 1960 and 1993, a Pb smelter operated near the Subaé river (Figure 1). Dust emissions of smelters are important trails of contamination and can be responsible for the observed variations. In T4, there is a noted depletion of $\delta^{13}C$ levels after 1973, showing a higher influence of terrigenous material on OM deposited after this period (Zhou et al., 2006). This area is under influence of the Port of Aratu (Figure 1), which was constructed in 1975.

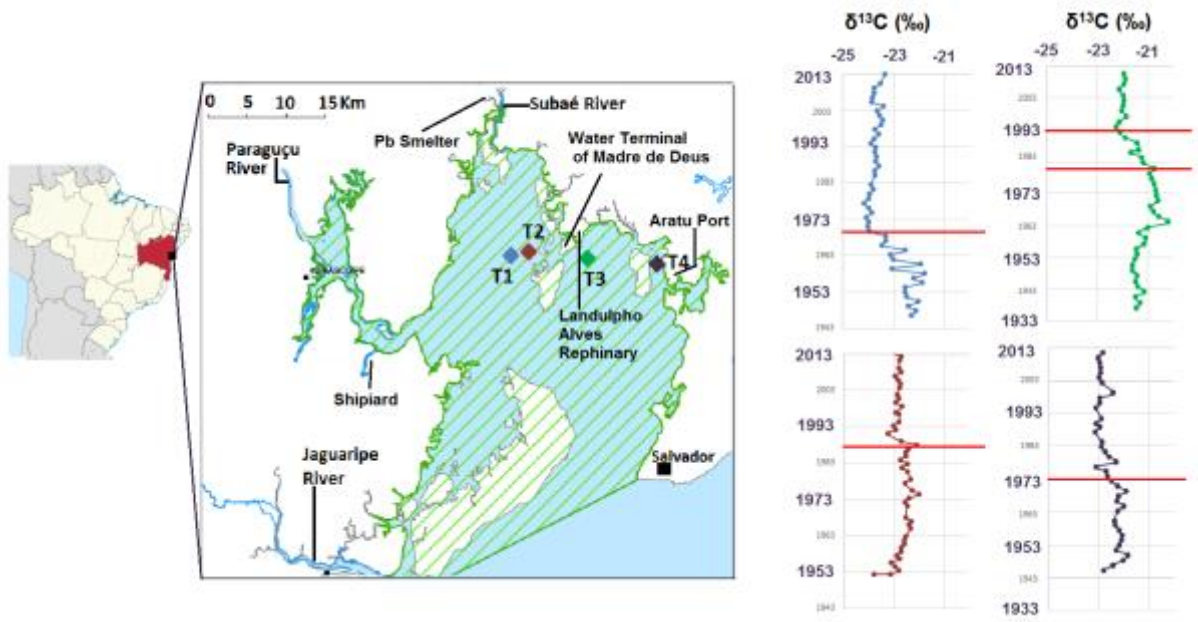

Figure 1 *Geographic location of Todos os Santos Bay, collection area of cores T1 (blue), T2 (red), T3(green) and T4 (purple) and profiles of* $\delta^{13}C$.

Conclusions

Sources of organic matter in All Saints' Bay can be marine or terrigenous. The predominance of sources depends on of the proximity of the main rivers that discharges in the bay. Differences of sources along time are mainly related to anthropogenic impacts, such as the presence of a smelter or the construction of a harbor.

References

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