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ASSESSMENT OF TRACE METAL LEVELS AT BAIXADA SANTISTA USING ICP-OES – SOUTHEASTERN BRAZIL

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The study of trace metal levels in different regions is very common nowadays (e.g., Kim et al., 2016; Mahiques et al., 2016; Xu et al., 2016). It is well known that trace metals can be useful tools to study elemental contamination and assessment of trace metals background. The quantification of these elements is normally made using mass spectrometry (e.g., Al Rashdi et al., 2015; Wysocka et al., 2016), optical emission spectrometry (e.g., Kim et al., 2016; Wang et al., 2015) or atomic emission spectrometry (e.g., Gupta et al., 2014; Song et al., 2014). All methods present the advantage of being multi-elementary quantifications with low detection limits.

The Baixada Santista, located at southeastern Brazil, hosts the largest port of Latin America and the largest Industrial Complex of Brazil. It is a complex estuarine system in which human activities compete against each other causing harm to the ecosystem. Measuring trace metal contents could support environmental studies due to such activities, and this study aims at assessing trace metal contents using ICP-OES at Baixada Santista.

About 260 surface sediment samples were collected along the Estuarine Complex of Santos and São Vicente using a stainless steel Van Veen grab. The samples were freeze-dried and homogenized and then submitted to an acid digestion (USEPA, 1996) in order to transfer all adsorbed (adsorbed to carbonate, organic matter and fine fraction) trace metals to the available fraction. The elements Al, As, Cd, Cr, Cu, Fe, Ni, Pb, Sc, V and Zn were quantified by ICP-OES. Besides, the grain fraction was also quantified by wet sieving.

Quality control was performed using the Method Detection Limit (MDL), Method Quantification Limit (MQL), precision and accuracy in order to validate the used method. The equipment was adjusted using a known operation range to follow a linear reading and a chosen wavelength to establish selectivity.

The results of all trace metals are given on Table 1. For most of the elements, except Cd and As, the observed levels were above the MQL with imprecision ranging from 20 to 30%. Analyzing the certified reference material, the method could be validated presenting precision and accuracy.

Table 1. Descriptive parameters for the trace metals levels at Baixada Santista

	Mean \pm SD	Median	Range
Al	15862.08 \pm 9240.09	16028.6	1693.82 – 42819.3
As	7.16 \pm 2.89	7.25	< MQL – 14.74
Cd	< MQL	< MQL	< MQL
Cr	18.93 \pm 9.54	20.25	2.50 – 44.77
Cu	10.19 \pm 7.61	9.01	0.50 – 48.78
Fe	18979.43 \pm 9049.34	19255.6	1532.66 – 43798.20
Ni	7.82 \pm 4.05	8.26	0.95 – 19.28
Pb	12.16 \pm 8.48	10.94	1.30 – 64.02
Sc	3.07 \pm 1.59	3.25	0.31 – 6.06
V	21.17 \pm 9.61	23.13	2.28 – 43.42
Zn	57.74 \pm 69.96	46.98	5.81 – 912.56

The levels presented a normal distribution with some outliers, which suggests that the main reason for all the variation is the grain size distribution. In spite of the normal variety of the found concentrations, the outliers point to contaminated points inside the estuarine system in which deserve some attention.

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