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Preliminary results of ^{238}U, ^{232}Th and trace elements determined in soil and sediment profiles collected in Ponte Nova Reservoir, São Paulo, Brazil

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Reservoirs have been built around the world since the early XX century until 1970's and 1980's, in order to supply water for populations and years later generate electricity. In Brazil, the majority of the reservoirs has the main objective of supplying water to the population, controlling the flow of rivers and generating electricity. The state of São Paulo, located in the Southeast region of the country has at least 15 reservoirs that are considered medium to large and are used to provide water for the biggest population of the country (Esteves, 2011).

The Tietê River, the most important river of the state of São Paulo, from its source in the city of Salesópolis to its mouth on the Parana River is dammed in several parts and forms large artificial reservoirs. Ponte Nova reservoir, located in the cities of Salesópolis and Biritiba Mirim, is one the large reservoirs formed by the waters of the Tietê River near its source. It was the first reservoir built in this part of the river in 1972 in order to control the ebb of the Tietê River in the metropolitan region of São Paulo. Ponte Nova also supplies water for the cities in its surroundings, and especially for a large region producing agricultural products for the city of São Paulo (Tundisi and Tundisi, 2008).

The watersheds that form an artificial reservoir, like Ponte Nova, interact with the soil around the reservoir and its sediment, through physical and chemical weathering. This interaction can change the quality of the water from a reservoir, especially when these water bodies go through drought periods.

Hence it is important not only one monitoring the quality of water from a reservoir, but also to analyze its soil and sediment, because a reservoir is the final destination of all the alterations that may have occurred around the area.

Therefore the objectives of this work were to present preliminary results of the trace elements As, Ba, Br, Ca, Ce, Co, Cr, Cs, Eu, Fe, Hf, K, La, Lu, Na, Nd, Rb, Sb, Sc, Ta, Tb, Th, U, Yb and Zn, using Instrumental Neutron Activation Analysis (INAA).This technique has been extensively used in geochemical studies due to the possibility of multielemental analyses at the same time with excellent precision and accuracy without a previous process of sample digestion; the detection limits varied from 0.01 to 1 mg kg^{-1} for most elements.

Three soils profiles and three sediment cores were collected in the three most important lithologies of the reservoir; the first upstream, the second downstream and the third in the main tributary of the reservoir, Claro River. The lithology of this reservoir has a predominance of metamorphic rocks, calcisilicates and amphibolites, with the presence of granite calcialkalines (Perrota et al, 2005).

The soils profiles of 1,2 m long were cut each 5 cm, and the sediment cores, varying from 50 cm to 80 cm long, each 3 cm. The samples, soil and sediment, were dried at room temperature, sieved in a 2.00 mm sieve, ground in a mortar, and then homogenized before analysis.

For INAA, about 150 mg of sediment and reference materials were accurately weighed and sealed in pre-cleaned polyethylene bags, and were irradiated for 8 hours, under a thermal neutron flux of 1 to $5x10^{12}$ n cm^{-2} s^{-1} at the IEA-R1 nuclear research reactor at IPEN. Two series of counting were made: the first, after one week decay where As, Br, Ca, K, La, Na, Nd, U, Sb, Sm and Yb were measured and the second, after 15-20 days where the others elements were measured. Gamma spectrometry was performed using a Germanium detector hyperpure (HPGe) with relative efficiency of 23% and resolution of 2.1 keV for the ^{60}Co, INTERTECHNIQUE, with an associated electronics. Spectra were analyzed using the Winner Winner Inter Gamma the ORTEC 6.0 program. For methodology validation regarding precision and accuracy reference materials SL-1 (Lake Sediment – IAEA) and Montana II soils (NIST) were used (Damatto, 2010).

The results obtained showed a clear correlation between the radionuclides determined in the soil and sediment samples. The enrichment factor and geoaccumulation index were used as a geochemical tool to evaluate a probable contamination of the reservoir.

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