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Radionuclides from U-238 and Th-232 series and K-40 determined in environmental samples collected in the catchment area of Ponte Nova reservoir, São Paulo, Brazil

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Naturally occurring radiation constitutes an important part of the environmental characterization and monitoring. This radiation is mostly due to radionuclides present in soil, sediment, water and air. Due to its physical and chemical properties, each type of soil contains radionuclides in different activity concentration, because pedogenic processes selected them. These processes end up bringing radionuclides from rock to the soil, where rivers and streams capture them by erosion and re-suspension. Soil, in the form of dust, may be raised by winds and other atmospheric phenomena bringing with it some radionuclides. The quantity of radionuclides in soil and water can change due to large building projects like dam and reservoir constructions, which tend to accumulate radionuclides upstream. Ponte Nova Reservoir in the Upper Tietê River system is the first major dam in a water system that supplies millions of people from São Paulo metropolitan area, as well as farms and factories. Due to a recent drought in southeastern Brazil, water supply has been in focus. In this work, the natural radionuclides U-238, Th-232, Th-228, Ra-226, Ra-228, Pb-210 and K-40 were determined in a sediment core and water collected in this reservoir, and also in a soil profile, which was chosen by the lithological characteristics of São Paulo state in the catchment area of the major tributary river (Rio Claro River). All the samples were analyzed by gamma-ray spectrometry and instrumental neutron activation analyzes. Basic physical and chemical analyzes that include humidity, pH, porosity, and grain size analysis were also performed. Results have shown that activity concentrations for Ra-226 and K-40 were within the global mean UNSCEAR soil values, ranging from 32 to 43 mBq.kg⁻¹ for Ra-226 and from 155 to 1430 mBq.kg⁻¹ for K-40. Cluster analysis and correlation matrix were performed with the results obtained and clearly showed a correlation between the radionuclides determined in the sediment and soil samples.