

Radioactivity in soils of the São Paulo State, Brazil

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Abstract

For proper management of soil and groundwater quality, background levels of toxic elements in a given ecosystem must be known. The main aim of the present study is to perform a radioactive characterization of representative soils from the São Paulo State, in order to determine background levels for some selected radionuclides, which could be used as a quality reference value.

Soil types and sampling places were chosen according to their representativeness and spatial distribution in the State geological formations, taking also into account their nearness to large urban areas. Thirty samples were collected in areas presenting low anthropic perturbation - native vegetation or ancient reforestation -, minimizing the chances that selected areas could have sustained anthropic effects in recent past. Activity concentration of U-nat, Th-nat, ²²⁸Th, ²²⁸Ra, ²²⁶Ra, ²¹⁰Pb, ¹³⁷Cs and ⁴⁰K were evaluated and correlated with soil mineralogical characteristics. The samples were measured by means of passive gamma spectrometry and spectrophotometry, employing Arsenazo III.

Results showed a wide variation on background levels for natural radionuclides of the uranium and thorium series, and very low concentration of ¹³⁷Cs from radioactive fallout, ranging from <47 to 411 Bq.kg⁻¹ for U-nat, 8 to 82 Bq.kg⁻¹ for Th-nat, 4.8 to 120 Bq.kg⁻¹ for ²²⁸Th, 3.3 to 97.6 Bq.kg⁻¹ for ²²⁸Ra, 1.0 to 61.8 Bq.kg⁻¹ for ²²⁶Ra, <20 to 121 Bq.kg⁻¹ for ²¹⁰Pb, 0.8 to 4.1 Bq.kg⁻¹ for ¹³⁷Cs and 15.3 to 516 Bq.kg⁻¹ for ⁴⁰K. No significant correlation could be observed between the clay, silt and sand content in the samples and the respective activity concentration of the radionuclides.

KEYWORDS: soil; radioactivity, background.

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