2016 Rio norm VIII
Eighth International Symposium on Naturally Occurring Radioactive Material – NORM VIII
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DESAFIOS E SOLUÇÕES

A Study of the Variability and Spatial Distribution of Natural Radionuclides in the soil of Minas Gerais state

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CNEN 60 anos CDTN

Objectives

The study area comprises the whole territory of Minas Gerais state. The state draws more than 160 million tons per year of iron ore and accounts for 29% of all mineral production in the country, 53% of the production of metallic minerals and about 50% of all the gold produced in Brazil**. The objective of this studies was to determine the Quality Reference Values (QRVs) since it will contribute to the establishment of criteria and guide lines for the prevention and control of potentially toxic chemicals in the soil that will be important for the management of contaminated areas in the state. From the results of radionuclides ^{238}U, ^{226}Ra, ^{210}Pb, ^{232}Th and ^{228}Ra concentrations, statistical studies to assess variability and spatial distribution were carried out.**

Methodology

One hundred and fifty-three samples were randomly collected at a depth of 0-20 cm that is the portion equivalent to horizont A, observing the predominance of preserved or minimally impacted vegetation.

Analysis: U and Th (ICP-MS) and ^{226}Ra, ^{210}Pb and ^{228}Ra (gamma spectrometry).

The QRV of each substance was based on the 75th percentile of the sample universe.

In this work, appropriate statistical tools such as **control charts** and **GIS** were used .

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Summary of Results

Table 1 - Values determined for the Quality Reference - QRV, mean, standard deviation and Upper Control Limit (Bq kg^{-1})

Radionuclide	QRV-(75th percentile)	Mean	Standard desviation	UCL
^{238}U	43.25	36.9	39.8	101.9
^{226}Ra	64.1	51.3	54.1	144.3
^{210}Pb	76.4	62.7	43.4	145.4
^{232}Th	90.8	74.3	74.6	183.7
^{228}Ra	88.1	71.3	65.9	178.6

Table 2 – Activity concentration for radionuclides of the ^{238}U series in points considered outlyers (Bq kg^{-1})

Sample	^{238}U	^{226}Ra	^{210}Pb	Location / Major Minerals
44	105.0	181.0	-	Diamantina/ Gold and Quartz
124	337.8	549.8	441.5	Ouro Preto/ Iron and Gold
126	125.3	229.6	188.9	Amarantina/ Gold
131	-	-	153.5	Igarapé/ Iron
136	-	-	147.5	Sabará/ Iron and Gold
145	134.0	-	-	São João Del Rey/ Iron
159	106.5	-	-	Patrocínio/ Titanium and Phosphate
180	181.9	-	-	Araxá/ Niobium and Phosphate
181	210.3	207.0	166.0	Araxá/ Niobium, Titanium and Manganese
182	193.6	228.00	180.0	Poços de Caldas/ Bauxite and Aluminum

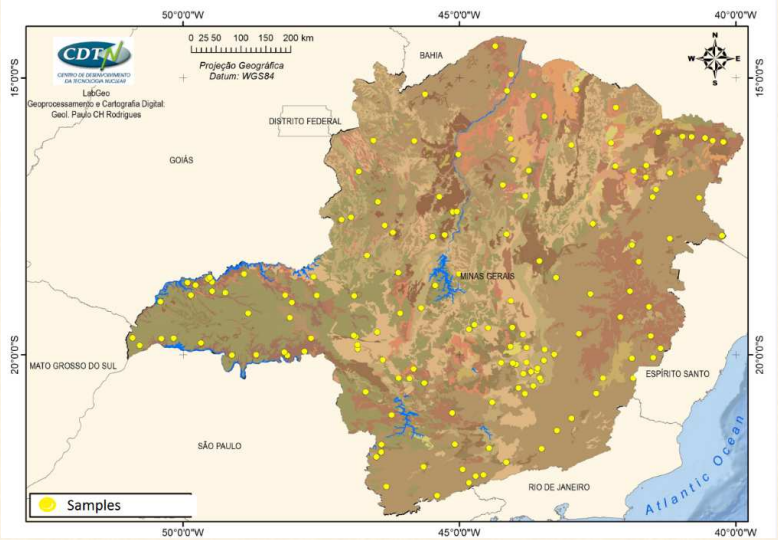

Table 3 – Activity concentration for radionuclides of the ^{238}U series in points considered outlyers (Bq kg^{-1})

Sample	^{232}Th	^{228}Ra	Location / Major Minerals
21	239.0		Abaeté/ Phosphate
122		198.30	Romaria/ Gold and Diamond
144	249.7	272.0	Piumhí / Iron, copper, chromium, nickel and dolomite
153	199.7		Sapucaia de Guanhães/ ron, Gold and Granite
180	597.9	474.0	Araxá/ Niobium and Phosphate
181	606.0	501.0	Araxá/ Niobium, Titanium and Manganese
182	324.7	284.0	Poços de Caldas/ Bauxite and Aluminum

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