

# SEASONAL CHANGES IN THE CONCENTRATIONS OF GAMMA ISOTOPES IN SOIL OF THE FOREST AREAS OF THE KARKONOSZE MOUNTAINS

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## Introduction

Soil is an important part of the environment in forest ecosystems. It is the top part of the lithosphere created under the influence of soil-forming processes from the bedrock. It is known that the total content of radionuclides in soil is not only related to their bedrock abundance, but is also the result of the soil processes and external occurrences affecting the soil, for example pollution deposition and changes in the composition of the precipitation. Most of them are directly related to the seasons' changes

## Aim of the study

The aim of the study was to investigate year-round changes in the concentrations of the selected gamma radioisotopes.

## Material and methods

The soil samples were collected in forest areas in Karkonosze Mountains during three seasons: spring, summer and fall. After manual removal of impurities and drying in 323 K the samples were sieved through a mesh of diameter 2.0 mm. The activity concentrations of gamma radioisotopes (among others: Cs-137, Pb-210, Tl-208, Pb-214, Bi-214) were carried out by means of a gamma-spectrometer with a germanium detector HPGe (Canberra) of high resolution. Geometry of samples was Marinelli beaker, 450 cm<sup>3</sup>. Measuring process and analysis of spectra were computer controlled with use of the software GENIE 2000.

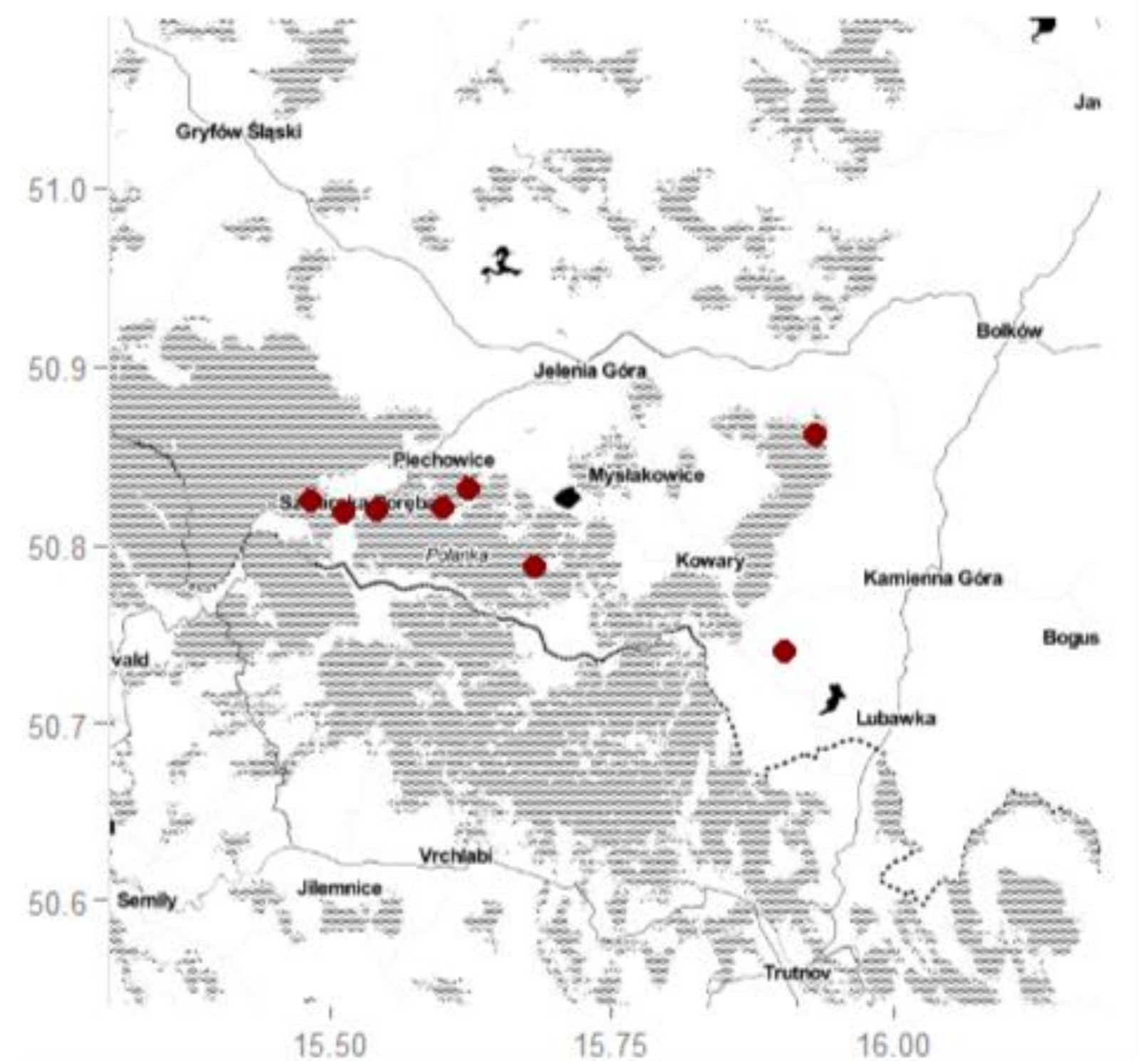


Figure 1. Location of sampling sites.

## Results

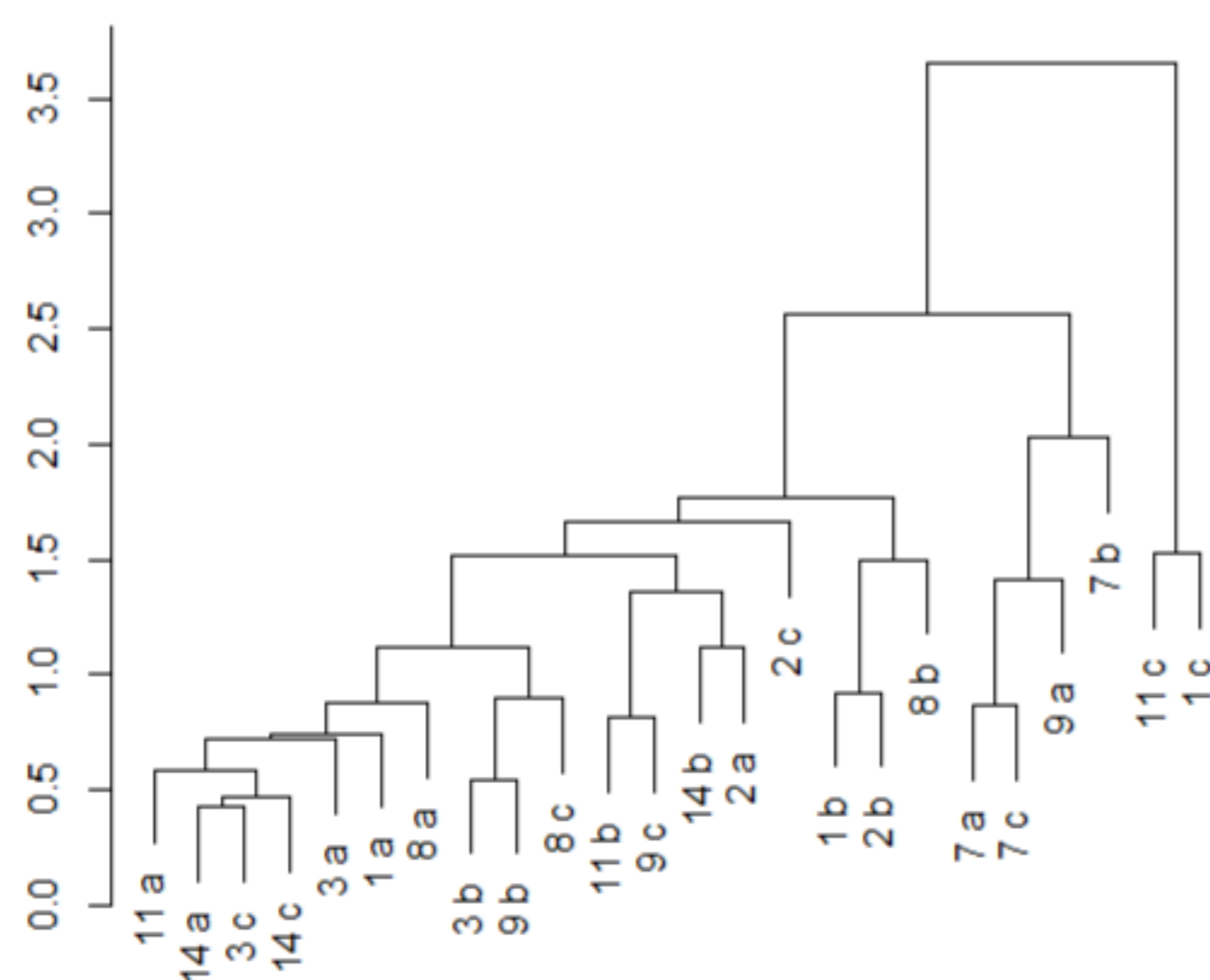


Figure 2. Dendrogram showing a tendency to cluster in which the coordinates of points are determined by concentrations of radioisotopes in the soil, where the seasons are described with small letters: spring (a), summer (b), fall (c).



Figure 3. Dendrograms showing a tendency to cluster in which the coordinates of points are determined by concentrations of radioisotopes Bi-214, Pb-214, Pb-210 in the soil in the spring (a).

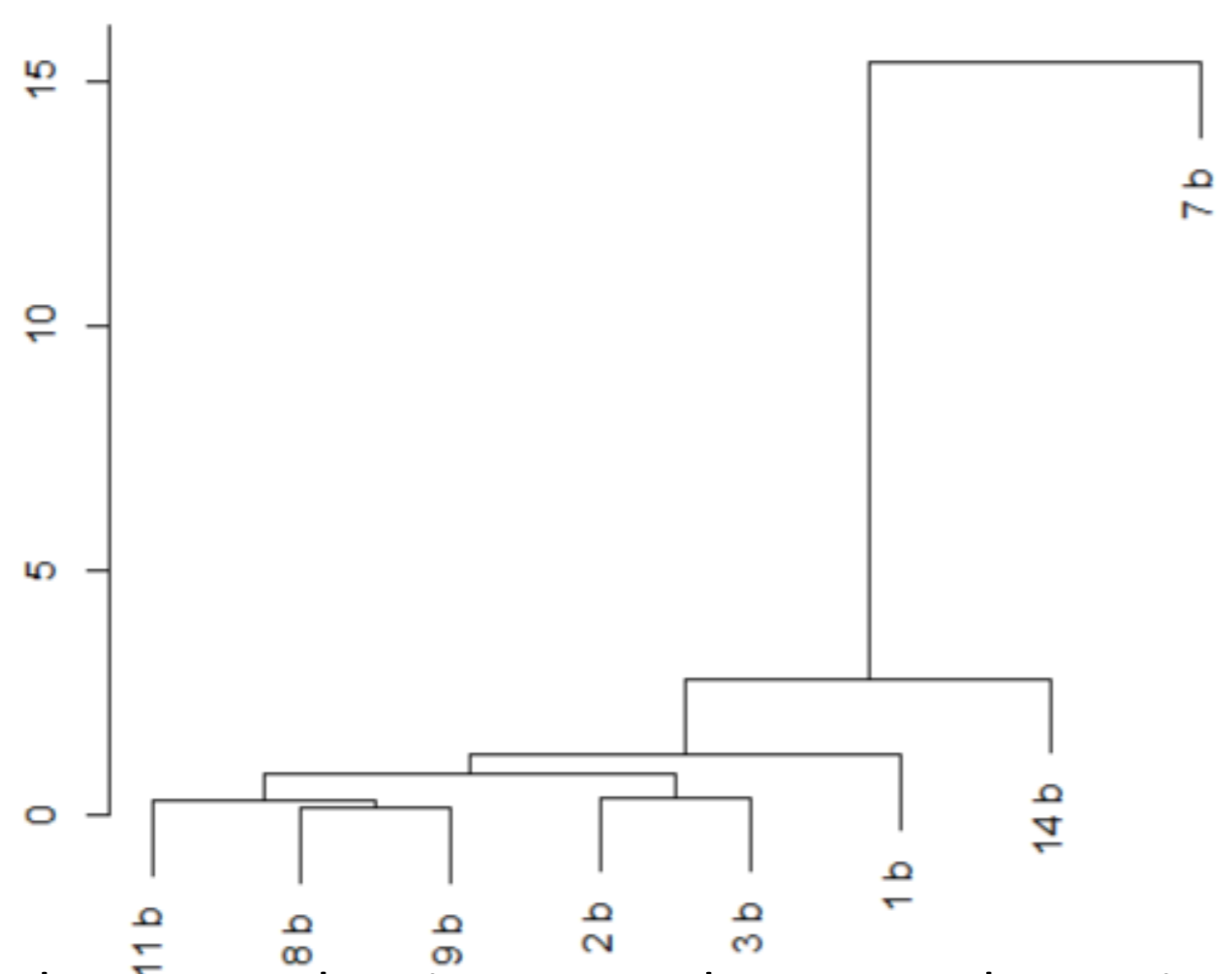


Figure 4. Dendrograms showing a tendency to cluster in which the coordinates of points are determined by concentrations of radioisotopes Bi-214, Pb-214, Pb-210 in the soil in the summer (b).

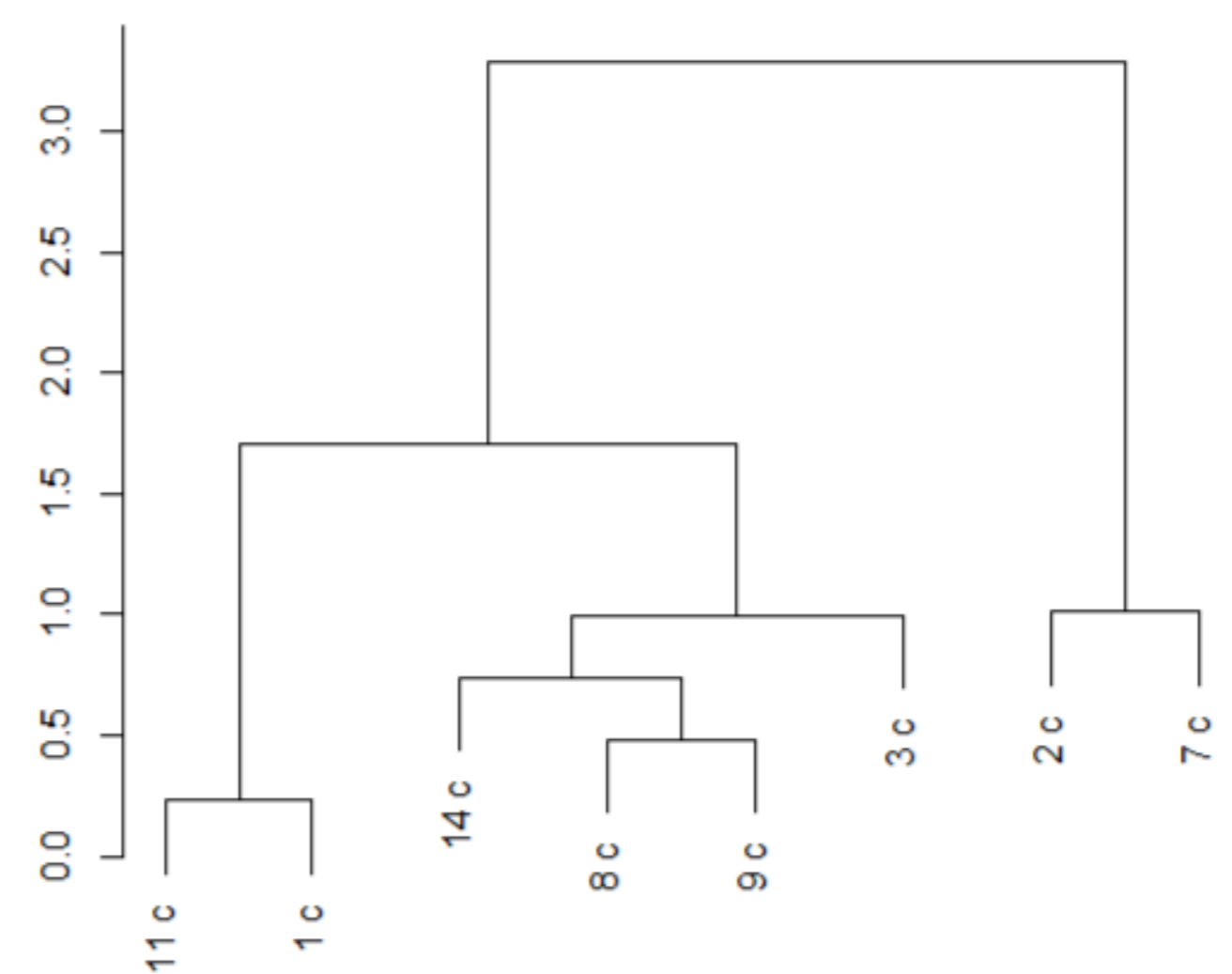


Figure 5. Dendrograms showing a tendency to cluster in which the coordinates of points are determined by concentrations of radioisotopes Bi-214, Pb-214, Pb-210 in the soil in the fall (c).

## Conclusions

- The results obtained for the Karkonosze Mountains indicate that seasonal changes have much greater influence on radionuclide concentrations in soil than local factors.
- The studies have shown high association of Pb-210, Bi-214 and Pb-214 isotopes, which in spring and fall showed the same trends for clustering.