

# Analysis of gamma radioactive isotopes content in surface soil layers near Longyearbyen, Spitsbergen

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## Abstract

Arctic regions are valuable source of information regarding the global environment pollution. Because in Arctic regions there are no major local emission sources, the region is polluted mainly from emissions sources located in Europe, North America and Siberia.

In our survey, soil samples, from surface down to approx. 5 cm, were collected in the vicinity of Longyearbyen, administrative center of Svalbard Archipelago (Kłos et al. 2017).

In the soil samples activity concentrations of 10 gamma radioactive isotopes were determined. They were elements of radioactive decay series: uranium-actinium (U-235, Th-231), thorium (Ac-228, Pb-212, Bi-212) uranium-radium (Pb-214, Bi-214, Pb-210), natural K-40 and artificial Cs-137.

For data analysis the activity concentrations of the radioisotopes were recalculated to their mass fractions. The calculated concentrations were used in the balances construction (Egozcue and Pawlowsky-Glahn 2005).

Different number of concentrations and different balance structures were used in the data analysis. The balances were grouped according to the concentrations number in numerator and denominator. Their actual variances were calculated and the balances were consequently sorted.

In the result's analysis the balances with the highest and the lowest variance were considered. Analysis of the balance's structures in relation to its variability enabled drawing conclusions regarding common relationships between concentrations.

Relationships between radioisotopes concentrations were found for some radioisotopes belonging to the same decay series but also for the ones not radio-chemically related. A relationship between K-40 and radioisotopes from thorium series suppose a certain geochemical composition of local soil. Though, concentrations of Pb-210, which are expected to remain in equilibrium with parent Pb-214/Bi-214, were higher and more differentiated than the expected ones. This observation supposed Pb-210 deposition originated from external sources, possibly related to fossil fuels combustion (Agnieszka Dołhańczuk-Śródka et al. 2015; Godyń et al. 2013).

## References

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