



Uranium-238, Thorium-232, Potassium-40 and Cesium-137 in the surface layers of soils from Lehliu area, Romania

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The aim of this study is assessment of the background of natural radionuclides (U-238, Th-232, K-40) and anthropogenic nuclide (Cs-137) in the surface layers of soils from Lehliu area. Also, can be estimated contribution of fertilizers in increasing levels of radionuclides from soil. The geochemical sampling area covers all surface of Geological map of Romania 1:100.000, Lehliu sheet, situated in south-east part of Romania at latitude 44°30' of 44°40' to north and a longitude of 26°45' to 27°00' east. Almost 80% of the area is agricultural land, of which more than half is arable, and the remaining of 20% is grassing land. Representative soils of this area, according to the Romanian Soil Taxonomic Classification are cernisol (cernoziom cambic) and luvisol (preluvosol and luvosol). Cernisols are formed on deposits consolidated of loess (upper Pleistocene) and luvisols are developed on sand deposits, (lower Holocene). Both deposits contain the levels rich in carbonates, clay minerals and fossil sills. These geological particularities affecting and controlling the distribution of natural radionuclides in soil, especially the distribution of potassium-40.

U-238, Th-232, K-40, Cs-137 were analyzed in 16 soil samples collected in 2013 after an geochemical sampling network, one representative sample for each square kilometer. Activity concentrations of these elements were measured non-destructively using gamma-ray spectrometry with HPGe detector and PC based MCA. The specific activity ranges of the radionuclides for all of the soils were as follows: K-40, 320 - 512 Bq/kg; Th-232, 14.68 - 28.25 Bq/kg; U-238, 8.11 - 18.78 Bq/kg and Cs-137, 3.20 - 6.1 Bq/kg. These concentrations were found to be within the range specified by UNSCEAR. However, a slight increasing trend of U-238, Th-232, particularly K-40 activity was observed in the samples of cultivated soil comparing with grassing soil, these differences may be associated with the presence of fertilizers. Concentration of Cs-137 from soil decreases with depth, clay minerals and soils rich in exchangeable potassium adsorb cesium by binding the cations to interlayer positions of the clay particles. Unlike uranium which is mobile element in soil surface, thorium, potassium and cesium has low mobility and their concentrations in soil reflect these variation in parental material, their distribution in soil being dependents by pH, organic matter content, clay minerals from soils.