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Geogenic radon potential map of Pest County, Hungary: Methodology of field measurements

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Last year we reported the first results of geogenic radon mapping in Hungary. Laboratory gamma-spectroscopy measurements on soil samples in Pest County show higher radium concentration collected on soils developed on loess compared to those developed on sand. These Quaternary sediments cover large part of the studied area. Another result of this study is the countywide radium data which can be applied to create radon potential map. Finally, we can provide input parameters for European Atlas of Natural Radiation, not only radon concentration in soil gas and soil permeability, but geological formations, external gamma-dose rate, Ra, U, Th and K-40 concentrations in soils.

Since then soil gas radon concentration and soil permeability measurements have been carried out in the studied area in two scales. Firstly, using a 10×10 km grid for the whole Pest county mapping and secondly a 1×1 km grid for 5 settlements extended on different geological formations (completed 1-3 measurements on cells). Diverse geology of this area provides us to study different geological formations, which are Mesozoic carbonates (limestone and dolomite), Tertiary volcanic rocks (andesite, dacite and rhyolite), Tertiary sedimentary rocks (marl, clay and sandstone) and Quaternary sediments (loess, sand, gravel and clay). There is a clear indication that fluvial sediments have an enhanced radon potential.

The methodology of mapping is based on measuring radon concentration in soil gas by RAD7 radon monitor coupled with soil gas probe, and also determining in situ permeability of soil by RADON - JOK portable permeameter at 70-80 cm depth, respectively. Also, external gamma-dose rate is measured at each site. Besides measurements for mapping, the radon concentration in soil gas is measured at one site during a one year period for better understanding the seasonally variation of it. Results of a half year period from August to January show that its values are ranged between 3,7 and 24 kBq/m3. The average values are 7 kBq/m3 for August, 8,5 kBq/m3 for September, 17 kBq/m3 for October, 16 kBq/m3 for November, 19 kBq/m3 for December and 17,5 kBq/m3 for January. These results clearly show that the lowest soil gas radon concentration is in Summer and the highest in Winter. It indicates that it is necessary to correct the radon concentration values taking into account the seasonal variability.