Correlations between outdoor ^{222}Rn level and concentration of ^{232}Th and ^{238}U in Olteț River sediments, Romania

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Geology controls the source and distribution of radon. This research proposes to emphasize the existing lithological contrasts in the Olteț River Basin through correlation between content of radon measured in outdoor air and concentration of uranium and thorium from river sediments.

The lithology of the Olteț River Basin is represented by metamorphic rocks associated with granite and granitoid massifs and limestone in upper part, followed by clays, marls, sands, that are characterized by the presence of lignite seams in the middle and lower zone of the basin.

A total of 44 measurements of radon in outdoor air were made in points distributed along the Olteț River with an equidistance of about 3-4 km, from the same points were collected sediment river samples. The recordings of radon activity concentration (Bq/m^3) was made using a portable alpha radon monitor (PYLON AB 5), with CPRD detector at a height of 100 cm above soil level. The specific activity of ^{238}U and ^{232}Th in sediment samples have been determined by gamma-ray spectrometry using an HPGe detector (ORTEC). The content of ^{238}U and ^{232}Th in sediment samples are in good agreement with in-situ measurements for radon.

The concentration of ^{222}Rn along the Olteț River ranged between 3.2 and 46.7 Bq/m^3. The average of ^{238}U specific activity in river sediments is 40.8 Bq/kg and 65.9 Bq/Kg for ^{232}Th. The highest radon level (46.7 Bq/m^3) measured corresponds to the maximum level of uranium determined in river sediments being associated with presence of coal seams and alluvial deposits enriched in fossil materials in the middle Olteț zone. This situation suggested that the uranium was secondary accumulated in coal seams, uranium being derived by leaching of the granitic rocks, mobilized as uranyl ion, precipitate from surface and ground waters and strongly absorbed by organic matter from coal. In zone where occurs granitic and metamorphic rocks, radon concentration has an average (35 Bq/m^3) comparable to typical values of derivatives from granitic and metamorphic rocks.

The spatial distribution of radon concentration indicates the geological and geochemical associations with moderate radon potential. Relatively high levels of radon emissions are associated with unconsolidated deposits with above average uranium contents.