Studies upon radon and thoron emissions associated with the geological structures of the Apuseni Moutains, Romania

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Radon (^{222}Rn; originating from ^{238}U with a half-life of 3.82 days) and thoron (^{220}Rn; originating from ^{232}Th with half-life of 55.3 sec) are natural radioactive elements that are everywhere presents in the earth crust, and from they are gases, they have great mobility to get to considerable distances in geological media. This property makes both useful as trace elements in the environment. Their concentration in the geological formations depends on diffusion and convection of the gas and on its decay rate (Etiope and Martinelli, 2002). Radon and thoron generally migrate together to the surface along faults and fractures that are produced in rocks in the Earth's crust within geological times. Due to the much shorter half-life of thoron in contrast with the longer half-life of radon, thoron researches may be more accurate to establish the location of the tectonic elements in the earth crust. This statement can be verified by monitoring the flux of radon and thoron to the surface, or measuring its concentration in soil gas respectively (Font at al, 2008).

In the Apuseni Mountains of western Romania the correlation of the thoron and radon emissions with the petrographic and tectonic elements are clear. The highest emissions were traced in the northern Apuseni Mountains inside the "Bihor Autochtonous" structure which is an elevated part of the Pannonian Plate / Preapulian craton and which was not folded during the Mesozoic and Neozoic tectonic events. Here the nature of the rocks (granites, gneisses, mica shales) enhance great level of radon and thoron in the soil (30-40 kBq) while along the deep crustal faults separating the massive crustal blocks the levels are quite high (50-70 kBq). Within the deeply folded nappe region of the southern Apuseni (the area of the so called Transylvanian, Biharia and Codru nappes) the crustal faults which are not deep due to folding and the nature of the rocks (basalts, gabbros, limestones and flysch) induce much lower levels of thoron and radon emissions (3 – 15 kBq) in the background but with yet higher levels along the fault lines (18 - 30 kBq).

References

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