

Indoor radon risk associated to granitoids and possible relation with ELA in Northern Portugal

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In the Northern Portugal several granitoids occur, namely granodiorites, two-mica, muscovite and biotite granites. For these granitoids, a correlation between U and Th contents and the presence of accessory minerals such as zircon, apatite, monazite, uraninite, thorite, coffinite, allanite, xenotime and thorium-uranium phosphates were observed.

The granitoids have a radiometric background (137.6 nGy.h⁻¹), mass activity of ²²⁶Ra (105.6 Bq.kg⁻¹) and ²²²Rn (9.8 Bq.kg⁻¹), potential of radon production (172.4 Bq.m⁻³.s⁻¹), radon in soils (111 kBq.m⁻³) and indoor (423 Bq.m⁻³), much higher than the metasediments. However, the metasediments have more than double the emanation coefficient (23.4 %) compared to granitoids. In fact, the presence of faults and overthrusts nearby of buildings, induced an increase in the indoor radon concentration. In addition, the annual average indoor radon were higher, than the imposed limit by the EU directive (300 Bq.m⁻³) and annual average higher. These pathways acting as the main conveying means between rocks uranium bearing and the surface, enhancing health risks in this region. In hospitals in the North of Portugal, an epidemiological survey was carried out on patients with confirmed or probable Amyotrophic lateral sclerosis (ALS), in an attempt to find genetic and environmental indicators that would justify the apparent increase in the number of cases of this pathology in the region, mainly in men and in 7th decade of age. Regarding the ALS risk factors, it seems that environmental risk, gamma radiation exposure, radon and heavy metals, could justify the high prevalence of this disease in Northern Portugal. Specifically, in this region exposure to gamma radiation due to radon appears to be associated with increase in new cases of ALS. These pathways acting as the main conveying means between rocks and the surface, enhancing health risks in this region. The uranium content and potential radon production in the rocks, concentration in soils and major tectonic structures condition the free circulation of radon in soils and the concentration in dwellings. It is therefore recommended for strategic purposes of land use planning to introduce new architectural techniques in constructed buildings, safeguarding the licensing of new constructions in granite areas and ventilation in existing buildings