CHARACTERIZATION OF GEOLOGICAL RADIOACTIVITY IN A CHIHUAHUA, MÉXICO BASIN

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Abstract: Groundwater radioactivity is becoming more and more evident as water tables drop in the region. Lately, this phenomenon is clear around the city of Chihuahua. There are several outcrops inside the hydrologic Chihuahua basin which show uranium minerals of volcanic origin in relation with high-to-low temperature hydrothermal activity. The hydrothermal activity is also associated with the felsic volcanic rocks of the Upper Volcanic Series of the Sierra Madre Occidental. The objective of the study was to characterize the uranium concentration levels of outcrops in the San Marcos and Victorino areas, north of Chihuahua City. A total of fifty-eight uraniferous rock samples were characterized by the optic microscopy device with results validated by the DRX and MEB. These characterization studies found the following uranium mineral species: Uraninite, (UO₂⁺ₓ), uranofane, Ca(UO₂)₂Si₂O₇·6H₂O, metatyuyamunite, Ca(UO₂)(V₂O₈)(H₂O)₅, masuyite, Pb(UO₂)₃O₃(OH.3H₂O), and becquerelite Ca(UO₂)₆O₄(OH)₆·8H₂O. Along with these species, several more radiometric anomalies were detected around these areas, but with lower radioactive intensity. During the second phase of the study, sediment samples, drilling chips and powder, shrub plants, San Marcos dam water and several drill holes located down the dam were analyzed. Some lacustrine sediments and rich organic paleosoils were found in argillaceous strata and lenses, which act as ionic traps. These traps capture the radioactive isotopes that flow freely as solute in the groundwater. This study found that the presence of uranium mineral species in the Chihuahua Basin groundwater might be of natural origin. But it leads to the presence of radionuclides hazards in Chihuahua city gronwater, which will impact to the public health, because of the high radiometric levels reached. The average radioactive level reaches values above the 560 Bq/m³ as normated by the NOM-127-SSA1.