Isotopic and Radioactivity Fingerprinting of Groundwater in the United Arab Emirates

A pilot investigation using radioactivity together with chemical features was conducted to characterize groundwater sampled from wells drilled in fractured Paleogen-Neogen carbonate rocks along the foothill of about 1200 m asbl high mountain and wells drilled in Quaternary clastic sediments from a nearby alluvial plain in the southeastern part of the UAE. These two water modes are relatively easily separated by their chloride and EC (salt content) contents and provide an ideal case for testing radioactivity fingerprints. The groundwater of the alluvial plain, which is expected to reflect a short distance precipitation recharge source, indicates a concentration of $^{222}$Rn and $^{226}$Ra 2–3 orders of magnitude lower than the groundwater of the carbonate rocks. The range of variability for gross alpha is similar, but the gross beta activity indicates only 1 order of magnitude difference between the two water types. The radioactively richer groundwater of the carbonate aquifers compared to the alluvium plane may reflect the signature of deep basinal fluids. These marked differences in radioactivity of the two water modes clearly suggests that radioactive fingerprinting can provide a potential method for the identification groundwater sources in the UAE.

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