Sedimentology and source to sink for water ressource quality assessment in Jordan. Insights from geological distribution of radioactivity within Jordan Paleozoic sandstone on the prediction of radionuclides content in groundwaters.

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Résumé

Paleozoic (Cambrian to Ordovician) sandstones aquifers are extending from North Africa to the Arabic Peninsula and form giant, mainly fossil aquifers, which are exploited in many countries for agricultural and drinking waters need. In south Jordan the Ram group/ Disi aquifer is exploited as a first order drinking water resources in Jordan and Amman. As in most other equivalent aquifer and in large proportion of sandstone aquifer around the world, the Disi aquifer locally bear naturally radioactive waters. MWI/WAJ and BRGM are currently leading a project to reduce and remediate possible occurrences of radioactive groundwaters. This project aims to 1) identify the groundwater contaminations and its variations, 2) understand its origin and the main processes involved, 3) propose solutions to avoid/ reduce groundwater radioactivity from well to country scale.
We present here the first results, focusing on the distribution of radioactivity within the sediments, which is the first step to be able to understand the groundwater radioactivity. The main groundwater radioactivity is 228 Ra that correspond to the Thorium disintegration chain. Thorium is particularly present in some heavy minerals (Monazite, zircon etc)... Along representative sections in south Jordan (Wadi Rum), we carried out a detailed sedimentological logging and a measurement of radioactive content (handheld gamma ray spectrometer) of the whole Ram group.

Doing this, we:

- refine the characterization of sedimentary facies and evolution through time of their mineralogical content, while recomposing main depositional environments and sequences in the

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Ram group.

- Identify typical pattern of radioactive signatures, which are closely correlated to sedimentary facies and lithology.
The field based well-log sections are then correlated with available gamma ray loggings in boreholes. The detailed correlations of this dataset (outcrops and well log , using gamma ray as a common tool) allows to recompose the 3D geometry, sedimentary facies evolution and radioactivity content of the different levels in the Ram group Aquifer.

Mots-Clés: Jordanie, Paleozoique, Radionucléides, sédimentologie, minéraux lourds.