Comparative repartition of ^{226}Ra, ^{238}U, ^{234}U and ^{230}Th in soils taken in the vicinity of ANDRA underground research laboratory (Bure, France)

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According to experimental studies the partition coefficient of radium between soil and soil water sounds a “key parameter” for the transfer to the vegetation. However no clear correlation has been established up to now between transfer of radium and any soil phases able to trap radium such as Fe-Mn-Al oxides, organic matter and clays. Some authors report the strong affinity of radium for clay minerals. On the other hand Thiry et al. (2008) show an association of radium with Fe-Al hydroxides rather than with exchangeable soil fraction and Greeman et al. (1999) observe that radium is mainly associated with organic fraction and that no relation occurs with clay. Before any nuclear operations, the radiological background in soils was measured in the vicinity of Andra underground research laboratory (URL)) of Bure, N-E of France. Thus in addition to ^{226}Ra, main U-decay products namely ^{238}U, ^{234}U and ^{230}Th were determined by TIMS, allowing us to compare the repartition of radium with other radionuclides in soil profiles and their potential transfer to the vegetation.

The variations of activity and activity ratios in soils show that ^{230}Th and ^{238}U, more mobile than ^{226}Ra, undergo leaching whereas ^{226}Ra accumulates in soils. Especially the variations of ^{226}Ra activity in soils from site to site are correlated with clay content implying that phases from the finest soil fraction are able to trap radium. Contrary to soil, $^{226}Ra/^{238}U$ and $^{226}Ra/^{230}Th$ recorded by litters suggest that those latters are strongly depleted in ^{226}Ra. These preliminary data are consitent with a fractionation of radium at the soil/vegetation interface with respect to uranium and thorium.