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Study of the transfers of uranium to terrestrial plants using isotopes

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There are several sources/pathways of contamination of the terrestrial plants by radionuclides in the close environment of a nuclear facility : deposition of airborne particles on leaves, root uptake, watering with contaminated water, etc. Thus, a field study was carried out in order to better understand the potential sources of uranium in the terrestrial plants in the close vicinity of an U-conversion facility. Indeed, in such specific context, two potential sources of uranium occur namely (1) uranium coming from the atmosphere due to the present days releases from the facility and (2) uranium coming from the soil which is contaminated by the former releases (conversion of uranium from spent fuel between 1960 and 1982). This legacy source of uranium is characterized by the presence of ^{236}U (artificial isotope of uranium), whereas natural uranium, *i.e.* without ^{236}U, is released nowadays in the atmosphere.

In the current study we used activity and isotopes ratios, namely $^{238}U/^{232}Th$ and $^{236}U/^{238}U$ in different matrices such as terrestrial plants (namely tree leaves and local foodstuffs), soil and aerosols. Results show that $^{238}U/^{232}Th$ determined in terrestrial plants decreases when the distance to the facility increases showing excess uranium due to the release in the atmopshere by the U-conversion facility. $^{236}U/^{238}U$ determined in both plants and soil also decreases when the distance to the facility increases. Theses ratios have allowed to determine the proportion of legacy uranium (coming from the soil) in plant and in aerosols. Especially, similar $^{236}U/^{238}U$ ratio determined in both plants and aerosols shows that the transfer of ^{236}U to the plants is due to the deposition of atmospheric microparticles originating from the soil on the leaves, rather than by root uptake. Thus even if the U-atmospheric releases of the facility has drastically decreased along years, the contamination of the plants will remain on the long term due to the transfer of the microparticles containing legacy uranium-236 from the soil.