Geophysical Research Abstracts, Vol. 9, 02969, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-02969

Study of natural U-Th series radionuclides behaviour in superficial water for management of water quality in U mine environment

J. Moulin, J.-L. Reyss

Laboratoire des Sciences du Climat et de l'Environnement (CEA/CNRS/UVSQ), Gif-sur-Yvette, France (jeanne.moulin@cea.fr)

Superficial water contamination by natural U-Th series radionuclides may have an impact on the quality of water and consequently on human health. Therefore we investigate radionuclides content of a brook (Sagnes, Limousin, France) which floods a peat bog contaminated by a former uranium mine. Chemical behaviour of several decay products of the U-series radionuclides in natural waters is still poorly known, especially in the ^{235}U family. In order to prevent a potential contamination, the speciation of U-series nuclides must be studied.

The strategy consists in analysing waters up and downstream the peat bog to investigate the physical form of radionuclides: particulate, colloidal or dissolved. After filtration (0.45μm) and ultrafiltration (10 kD), water samples are measured for their gamma activity with very low background, high efficiency gamma spectrometers implanted in the Underground Laboratory of Modane (France). After two counting stages, activities of $^{235-238}$U, $^{234-228-227}$Th, $^{226-228-223}$Ra, ^{210}Pb and ^{7}Be are determined.

Downstream the peat bog, whereas ^{238}U increases by a factor of 15 to 40, ^{226}Ra increases by a factor of 6 to 14 and ^{232}Th family does not vary. All radium isotopes are present in dissolved form. ^{234}Th, decay product of ^{238}U, is mostly associated with the colloidal fraction while ^{232}Th is always particular. ^{210}Pb in the brook upstream the mine influence is dissolved whereas the same isotope discharged by the peat bog is in the particulate form. Moreover we found an important (20 mBq/L) activity of ^{227}Ac in the $<$0.45 μm fraction of natural waters. ^{227}Ac has a high conversion factor (1.1μSv/Bq) and it should be taken into account in the equivalent dose estimates.