

Comparison of soil/solution distribution of a fresh radionuclides contamination (^{137}Cs , ^{129}I and ^{233}U) added under organic or water pathways with their natural endogenous isotopes

SARAH ZAMANE^{1,2}, LOIC CARASCO¹, DANIEL ORJOLLET¹, ARNAUD MARTIN-GARIN¹, JEROME ROSE³ AND FREDERIC COPPIN¹

¹IRSN

²Aix-marseille University

³Aix Marseille Univ, CNRS, IRD, INRAE, Coll France, CEREGE UMR 7330

Presenting Author: sarah.zamane@irsn.fr

Due to nuclear activities, radionuclides (RNs) could be disseminated in environment following accidental or chronic releases. In models used to predict their behaviour, their distribution in the soil/solution system is often estimated using a partition coefficient (Kd), relating the total concentration of RN in the soil to that present in solution.

The use of Kd model assumes that RNs are in equilibrium between soil and solution and, if the same value is used for short to long term modelling, assumes Kd value is not time dependant. However, for some RNs, several studies showed a stabilization of RNs in soils over time. This stabilization depends on the nature of RN considered, on soil geochemical parameters and/or on the nature of the contamination. For this last point, recent studies shown that ^{137}Cs water available fraction from soil differs if the contamination is due to contaminated water or contaminated leaves.

Obtaining Kd values in line with the required time scale for long-term assessment of RNs transfer could be difficult because the time scale of prediction is longer than the existing contamination. To compensate this lack of data, natural endogenous isotopes of the targeted RNs, could be used to mimic long term behavior of freshly added radionuclides. However, some biases could exist in this transposition. The major one is that a part of the natural isotopes could be included in the mineral matrix and not available for soil to water transfer. In addition to the Kd determination, the objective of this work is to determine the isotope soil water available fraction and its associated $Kd_{\text{available}}$ for freshly added RNs and their natural endogenous isotope.

To reach this objective a cocktail of radionuclides having different soil behaviors (^{137}Cs , ^{129}I , ^{233}U) was added under liquid or organic (from plants that have been previously contaminated) pathways to four soils presenting contrasted geochemical properties. Their water available fraction and $Kd_{\text{available}}$ were determined by a successive desorption batch method, whereas their distribution within the solid phase was studied with chemical sequential extraction experiments. The obtained results for added RNs were compared with their natural endogenous