Determination and speciation of anthropogenic tritium in the Loire River estuary (France).

O. PÉRON[1]*, L. PASTOR[2], C. GÉGOUT[1], E. FOURRÉ[3], F. SICLET[2], G. MONTAVON[1] AND C. LANDESMAN[1]

[1]SUBATECH, UMR 6457, rue Alfred Kastler, 44307 Nantes, France
(*correspondence: olivier.peron@subatech.in2p3.fr)
[2]EDF, LNHE, 6 quai Wattier 78400 Chatou Cedex, France
[3]LSCE, Orme des Merisers, CEN Saclay, 91191 Gif sur Yvette Cedex, France

The aim of radioecology is to understand the transfer of radionuclides through the ecosystem. It relies stongly on field studies which can provide useful information on the presence of radionuclides in the environment, and their origins (natural and anthropogenic). In this study, the radioactive isotope of hydrogen, *i.e.* tritium (^{3}H or T), is considered. Tritium is a beta emitter with a radioactive half life of 12.3 years. It is present in the environment in three principal forms: tritiated water (HTO or tissue free water), organically bound tritium (OBT) and tritiated gas (HT). Tritiated water is the most abundant chemical form of tritium in the aquatic and terrestrial environment. OBT can be subdivided in two fractions: the exchangeable OBT refers to tritium atoms that are easily exchanged (*e.g.* bound to nitrogen, oxygen or sulfur atoms), while the non-exchangeable OBT refers to the remaining OBT covalently bound to carbon atoms. The non exchangeable hydrogen pool is considered as the only hydrogen fraction that faithfully records the history of environmental tritium seen by living organisms.

In this study, mud and water samples from the Loire estuary, the outlet of a watershed where several nuclear power plants are located, were analyzed. Mud samples were subjected to freeze-drying and combustion as pre treatment in order to recover free HTO and total OBT. HTO and total OBT activities ranged between 4 and 26 Bq.L^{-1} and between 10 and 25 Bq.L^{-1} of combustion water, respectively. To estimate the non exchangeable OBT activity in these samples, the exchangeable pool of hydrogen within the matrix has to be known. A dedicated experimental set up was thus developped in order to determine the fraction of exchangeable hydrogen (α). It consists in a temperature and humidity controlled glove box where different environmental matrixes are exposed to specific atmospheres with fixed H/D (deuterium) or H/T pressure ratios. The calibration phase of the method was perfomed using cellulose matrix.