

Modelling tritium flux from freshwater to atmosphere: application to the Loire river

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Tritium is one of the major radionuclide released by nuclear power plant (NPP) in rivers. However, HTO flux from water to air is never considered when assessing health effects of such releases. The aim of this paper is to present the result of a research program named LORA conducted on the Loire river (France). To improve our understanding of HTO flux from surface water to air, three field campaigns were organized to measure simultaneously activities in air on the river bank using an innovative system called PREVAIR [1] and in water during NPP's radioactive releases. The measurements show that even in the absence of water evaporation, water vapor is enriched in tritium, in accordance with a diffusion of HTO along its own concentration gradient. These results were used to calibrate the exchange velocities. The average of these estimated exchange velocities is more than one order of magnitude higher than those calculated in literature from indoor experiments. The range of these values was also larger showing that outdoor study covers a wide range of conditions influencing HTO flux. No correlation was observed between exchanges velocities and meteorological conditions. However, there was a significant difference between day and night with a higher value observed during the day. This process was included in a hydrodynamic model [2], which was used to evaluate HTO air activity during a long period of simulation and to estimate the contribution of this process to the dose. Its contribution can be considered as negligible in this case compared to the others pathways (i.e. ingestion of water or foodstuffs).

1. Maro D. and Tenailleau L. (2005). Radioprotection, 40: p. S589-S594.
2. Siclet F. et al. (2002). Radioprotection, 37(4): p. 399-410.