Organically bound tritium in freshwater ecosystems : long term trends in the environment of nuclear power stations

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Measurements of organically bound tritium in the aquatic environment of French NPP started in 1978. Since then, measurements have been performed periodically in fish, vegetation and sediments, upstream and downstream of the 15 NPP sites located along rivers. Examination of the results shows that the impact of PWR tritium discharges is detectable only in low flow rivers, with low background OBT activities. In these situations, the observed increase in plant and fish OBT is proportional to the discharge added HTO concentration in water, in agreement with specific activity models [1]. No influence of NPP discharges on the tritium level in sediment has been observed.

Background OBT concentrations upstream of all NPP are also discussed. OBT levels in sediments are always larger than in plants and fish, themselves larger than HTO in river water. The magnitude of these differences and the long term trends depend on the river basin and can be explained by the different nature of tritium contamination. In river catchments , where atmospheric test fallout was the main source of tritium , a decreasing trend in OBT level is observed over the last thirty years, the OBT in sediment being still larger than OBT in fish and plants by a factor of 10. In other basins, such as the Rhone river, where the source of contamination could be linked to the past luminous paint industry, OBT in sediment can reach several thousands Bq/L with no long term change; concentrations in plants and fish are lower by 3 orders of magnitude . These results clearly demonstrate the existence of organically bound tritium pools in the environment with slow turn-over rates and low bioavailibility.

[1]IAEA –2010- Handbook of parameters values for the prediction of radionuclide transfer in terrestrial and freshwater environments– TRS 472 – 194 p.