

## **Environmental tritium balance of the Valduc Centre for Nuclear Studies at the scale of a hydrogeologically closed system**

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Since the late 60's, the French nuclear site of Valduc, located 250 km South-East from Paris, has been discharging tritium to the atmosphere. The annual tritium discharge decreased from 100 g in 1974 to less than 1 g in 2009. Those discharges have led to a transfert to the nearby groundwater and rivers. A balance of the tritium migrating through the hydrogeological system is presented for the 1969-2009 period.

Valduc is located in the middle of a 40 km<sup>2</sup> watershed. Among the interlocked catchments, this one has been selected because it coincides with a hydrogeologically closed system. It has been equipped with more than 30 piezometric wells used for water table monitoring and 4 gauging stations used for spring and river flow monitoring. The geological formations, down to 150 m in depth, are made of an alternation of limestones, marls and clays from the Jurassic period. The two main limestone units are aquifers. The lower aquifer sustains the unique perennial river of the watershed. An interannual balance of water based on estimated infiltration and runoff, piezometric maps and river flow, is assessed. It shows that almost the total amount of deep percolation and runoff in the watershed exit in the river at the outlet of the basin. This hydrogeologically closed system enables us to estimate the annual incoming and outgoing tritium content.

The annual wet and dry deposition of tritium (corrected from reemission) is estimated by atmospheric modelling. The outgoing is calculated at the outlet of the system from the measured tritium content and the river flow. It occurs that during the 1969-2009 period, 8 g of tritium infiltrated whereas less than 1 g flowed out of the river. Due to radioactive decay only 1 g of tritium remains in the hydrogeological system today. Time residence of tritium is calculated.