Quel rôle joue la zone non-saturée dans le transfert des radionucléides dans le site de stockage "La Forêt Rousse" à Tchernobyl ?

What role for the unsaturated zone at the Red Forest waste burial site in Chernobyl?

The Chernobyl Pilot Site (CPS) is a research area for groundwater and soil studies situated in the Red Forest at about 2.5 km from the Nuclear Power Plant (NPP) number 4 that exploded in the night of 26/04/1986. CPS is centred around an unlined waste trench in which mostly hot fuel particles along with debris of the irradiated forest have been buried. These trenches -of which hundreds exist in the area-, were dug rapidly in a post-accidental phase when the main concern was to lower radiation impact to the "liquidators", people working on building the shelter around the reactor in the aftermath of the accident.

A plume of ^{90}Sr (and a Pu plume) is clearly discernible in the underlying phreatic aquifer downstream from this trench. The question remains however whether the unsaturated zone (UZ) is a zone of downward transfer or a buffer zone diminishing the impact of the waste trench. Two tracer tests, one with unmarked distilled water and one with KBr as tracer salt were conducted in the UZ at the site in respectively October 2008 and October 2009. The distilled water test was easily interpretable by fitting of the van Genuchten curves and inverse modeling of observed water content and pressure head profiles using HYDRUS 2D/3D and Hytec. The KBr tracer test was conducted over a period of 18 months and shows downward flow after snowmelt and upward flow (and consequently possible recycling of K^+ by plants) during summer. Peak concentration were modelled and fitted with Hydrus 2D/3D using root uptake to explain the observed potassium profiles.