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# Coupled modeling of vapor phase diffusion and natural attenuation of gasoline hydrocarbons in vadose zone and capillary fringe

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The unsaturated zone including the capillary fringe is a very dynamic and active environment for biogeochemical processes. Modeling of fate and transport of organic pollutants has to account for vapor phase and water transport under variably saturated conditions coupled to the biogeochemical processes occurring. This study presents results from numerical simulations validated with data of the well-controlled field experiment at air force base Værløse (Denmark) on volatilization of a multi-component organic mixture in the unsaturated zone. Sensitivity analyses show that the overall biodegradation rates depend mainly on properties of the organic pollutants such as Henry's Law constant, the soil water content, and on the individual degradation rate constants or temperature. Low Henry's law constants result in relatively high biodegradation rates whereas compounds with high vapor pressure und low water solubility are lost to the atmosphere. The contaminant transfer rates into groundwater are relatively small, but lead locally to concentrations above the legal limit in the capillary fringe region. Contaminant transport by seepage water is just minor compared to diffusive vapor phase fluxes of volatile compounds.