Dilution and volatilization of groundwater contaminant discharges in streams - DTU Orbit (30/11/2018)

Dilution and volatilization of groundwater contaminant discharges in streams

An analytical solution to describe dilution and volatilization of a continuous groundwater contaminant plume into streams is developed for risk assessment. The location of groundwater plume discharge into the stream (discharge through the side versus bottom of the stream) and different distributions of the contaminant plume concentration (Gaussian, homogeneous or heterogeneous distribution) are considered. The model considering the plume discharged through the bank of the river, with a uniform concentration distribution was the most appropriate for risk assessment due to its simplicity and limited data requirements. The dilution and volatilization model is able to predict the entire concentration field, and thus the mixing zone, maximum concentration and fully mixed concentration in the stream. It can also be used to identify groundwater discharge zones from in-stream concentration measurement. The solution was successfully applied to published field data obtained in a large and a small Danish stream and provided valuable information on the risk posed by the groundwater contaminant plumes. The results provided by the dilution and volatilization model are very different to those obtained with existing point source models, with a distributed source leading to a larger mixing length and different concentration field. The dilution model can also provide recommendations for sampling locations and the size of impact zones in streams. This is of interest for regulators, for example when developing guidelines for the implementation of the European Water Framework Directive.

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