Novel Technology for Sampling Volatiles in the Unsaturated Zone

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Background/Objectives. The objective is to introduce a novel technology that allows sampling and quantification of volatile organic compounds (VOC) in pore water in the unsaturated zone. This opens up for the possibility to quantify the concentration of VOCs in the source area directly, eliminating the need for uncertain equilibrium calculations. The technology allows pore water sampling at a wide range of depths in the unsaturated zone and can be applied for semi-quantitative assessment of biological degradation during vertical transport.

Approach/Activities. The technique is based on installation of a suction cell in the sampling point, and pore water is drawn from the unsaturated zone and passed through a SorbiCell®VOC where VOC's are adsorbed and conserved. The adsorption cell eliminates vapor stripping of VOCs during sampling, since the vacuum is applied to a vacuum chamber "downstream" of the SorbiCell. The amount of sampled pore water is monitored using a load cell, which enables the control unit to calculate flow and continuously regulate the vacuum setpoint if the flow exceeds the flow limits for the SorbiÂCell. The vacuum is controlled by a small vacuum pump, and the installation can run on a standard auto battery for about 3 months. The control unit is equipped with a GSM modem which passes sampling data to an online spread sheet, making it possible to check the sampling status from the office and know when sampling is complete.

The presentation will include a presentation of the new equipment/approach, field experience from a site contaminated with chlorinated solvents, and examples on how these data can improve the Conceptual Site Model, and improve risk assessments.

Results/Lessons Learned. The presented technology allows us to quantify the pore water concentration of VOC's in the unsaturated zone. This enables us to base estimates of vertical flux of for example chlorinated compounds to underlying groundwater aquifers, based on actual measurements of seepage concentrations rather than calculated concentrations. The presentation will exemplify various applications and results of the technique and highlight practical applications.