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Phytoscreening of BTEX and chlorinated solvents by tree coring

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Background/Objectives. Site characterization is often time consuming and a financial burden for the site owners, which raises a demand for rapid and inexpensive screening methods. Tree coring is a phytoscreening method useful for detection of contamination with organic compounds. The method takes advantage of the natural ability of trees to absorb water, nutrients and prospective contaminants from the soil pore water into their roots and upwards to the stem from where a core is sampled. Samples are then analyzed for the contaminants in the wood. The results give an impression of the contaminant level in the subsurface and plumes may be mapped. Various plants can be used for phytoscreening, however trees are preferable to smaller plants as their large root system can absorb chemicals from a broader and deeper area.

Approach/Activities. In this study tree coring is tested for fuel components and chlorinated solvents. The method was applied at various European sites contaminated with PCE/TCE or BTEXs due to former site activities (industrial production, gas stations, air base or gas plant). Tree core samples were collected in fall 2013 and analyzed by HS-GC/MS. Results were used to map the plume(s). The measured concentrations are also compared to concentrations detected in soil and/or groundwater. Furthermore, the two screening technologies Tree coring and Soil air sampling have been compared to evaluate the feasibility of the tree coring method.

Results/Lessons Learned. The method of tree coring can detect contamination with BTEX and chlorinated solvents in the shallow subsurface. The uptake of BTEX into trees varies to a greater extent with the site conditions and tree species than chlorinated solvents, which lead to greater uncertainty.

Tree coring is semi-quantitative, low-invasive and inexpensive, which makes it suitable as initial screening methods. The method is useful at large sites and at sites where conventional site characterization methods can be limited due to the sensitivity of the site (e.g. private land, moor, rocks and forest) or due to (former) activities at the site like explosive hazard which poses a risk when drilling. Phytoscreening by tree coring can be used to focus other more advanced and cost-intensive screening methods, with the overall goal to make site characterization more complete and/or efficient.