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COMPARISON OF TREE CORING AND SOIL GAS SAMPLING FOR SCREENING OF CONTAMINATED SITES

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ABSTRACT

Site characterization is often time consuming and a financial burden for the site owners, which raises a demand for rapid and inexpensive (pre)screening methods.

Phytoscreening by tree coring has shown to be a useful tool to detect subsurface contamination, especially of chlorinated solvents. However the application and dissemination of the method is still limited. On the other hand, soil gas sampling for mapping of volatile organic compounds in the subsurface is a common and commercially applied method. Both methods are semi-quantitative, low-invasive and inexpensive, which makes them suitable as initial screening methods for site characterization.

The aim of this study is to compare tree coring and soil gas sampling to evaluate to which extent tree coring may supplement or substitute soil gas sampling as a site contaminant screening tool. And where both methods are feasible, evaluate when (with respect to compounds, soil properties, and locations) one method is preferred over the other.

Fields sampling was performed at European sites contaminated with fuel components or chlorinated solvents from former site activities (industrial production, gas stations, air base or gas plant) in fall 2012 and 2013. Samples from different tree species such as willow, asp, oak, birch and pine were collected and analyzed by headspace GC-MS. The soil gas measurements were conducted by consulting engineering firms as part of the site characterization prior to the tree core sampling events. Results obtained both by tree coring and soil gas sampling are compared and held up against quantitative results obtained by groundwater- and/or soil sample analysis.

Significant correlation between the methods is not always the case. However, both methods can detect contamination in the shallow subsurface and then identify high risk areas. The uptake of BTEX into trees varies to a greater extent with the tree species and the site conditions than chlorinated solvents, which lead to greater uncertainty.

Both methods have their advantages and disadvantages. Hence, the methods supplement each other.

Based on results from these initial screening methods, other more advanced/quantitative and cost-intensive methods can be focused, with the overall goal to make site characterization more complete and/or efficient.

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