Geophysical Research Abstracts
Vol. 13, EGU2011-7230, 2011
EGU General Assembly 2011

Enhanced In Situ Soil Analysis (EnISSA) of volatiles and semi-volatile components.

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To meet the growing need for accurate and sensitive contaminated site investigation of large plumes of (semi) volatiles, a fast semi-quantitative in situ soil analysis method with low detection limits (ug/l-level) using the Membrane Interface Probe (MIP) is developed.
Accurate soil investigation and its sampling program is a critical component of reliable, efficient and cost-effective cleanup processes. Traditional sampling methods are characterised by low detection levels and a broad analysis spectrum. However delineation of the contaminated area by traditional sampling methods is not only a time and cost consuming task but also parts of the contaminated area could be overlooked. “On site” soil screening technologies such as the MIP and ROST techniques are already frequently applied to obtain additional information which cannot be obtained by traditional sampling methods. These techniques give detailed soil profiles on the field making “on site” decisions possible. However, they suffer from relatively high detection limits and cannot measure individual components (sum detectors). The purpose of the EnISSA technique is to combine the best of both worlds by generating on the field detailed soil profiles with low detection levels and a broad analysis spectrum, hence supporting reliable dynamic sampling plans.
Although MIP has proven its use in source zones survey, the characterisation of plumes is hampered by the elevated detection limits of the conventional detectors (PID, ECD, FID) compared to detection limits in off-site laboratories. Secondly, since the conventional detectors are sum detectors the information obtained by MIP cannot be compared with soil clean-up reference values which are determined for individual components. With the recent development of new detector types like the XSD for chlorinated volatile compounds, lower detection limits are possible, but they remain a-specific detectors. Therefore time inefficient and cost consuming extensive classic sampling methods are still needed and asked by regulators in a post-survey characterisation and confirmation phase.
The EnISSA method uses a GCMS system which is connected to the MIP by an innovative gas sampling system. A highly improved analysis method results in cycle times of 1 min. Using this technique, individual components can be characterised with detection limits in the range of 10 ug/l. The combination of smart method optimisation and innovative gas sampling is unique and makes it possible to qualify and quantify pollutant cocktails and degradation products within the time frame of conventional MIP. Using the conventional MIP-speed (30 cm/min), each 30 cm a characterisation of the pollution is possible on ug/l level, giving a detailed view of biodegradation processes.
The main purpose of the EnISSA MIP is to improve the conceptual site model. Since the EnISSA MIP gives an optimal balance between a low spatial uncertainty and a low analytical uncertainty, the EnISSA MIP can contribute to decrease the overall uncertainty in a conceptual site model. The three dimensional image of the contaminated site which is obtained using the EnISSA MIP makes it possible to define strategic locations for sampling wells and makes strategies such as search and remediate possible. Targeted remediation leads to an improved remedial action with in the case of in-situ remediation reduced consumption of reagents.