Geophysical Research Abstracts
Vol. 21, EGU2019-8893, 2019
EGU General Assembly 2019

Innovative solutions to extend selectivity and sensitivity of VOC analysis in soils.

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The volatile organic compounds (VOCs) in soils stem from a large variety of different sources within soils as soils act as both sources and sinks for these compounds. Many of the VOCs formed in soils are produced by soil microorganisms living within them. There have been many efforts to fingerprint the VOC profiles from these complex microbial habitats, most of which are based on the use of solid phase microextraction (SPME). This automated extraction method allows the monitoring of the community structure, physiological state, and activity of any microbial community in a soil without the need of manual extraction or cultivation procedures.
SPME is a fast, economical and solvent-free methodology widely used for the environmental analysis of soils in combination with GC-MS. The methodology using SPME in headspace (HS-SPME) analysis has been used to determine VOCs in a wide range of different soils of varying textures, organic matrices from manures and composts from different origins.
In this presentation we discuss an innovative mode of extending the sensitivity of SPME extraction called SPME-trap in which a refocussing cold trap is used to further pre-concentrate analytes released from a SPME fibre used on soil samples before the analytes are injected into the GC-MS system.
Other techniques commonly used to monitor the VOC fingerprints from soils are static headspace, headspace- or immersive- high capacity sorptive extraction or thermal desorption using sorbent-packed tubes for active or passive, in situ sampling of soil. The focusing trap technology used in this study allows the combination of all these techniques to be run on a single analytical system without the change of hardware; it also allows single and multiple extractions to be carried out automatically on a single sample to increase the analytical sensitivity, thus achieving a comprehensive VOC profile.
To illustrate the enhanced capabilities of SPME-trap we investigate the fingerprints of VOCs for a 50 cm soil profile of a loamy and clayey floodplain soils with naturally high groundwater around Llantrisant, UK with a variety of different VOC sample preparation methods showing the benefits of adding high-performance trapping technology to the VOC analysis of soils.