Development of a Systematic Approach to Accurately Measure Trace Levels of VOCs and SVOCs in Soil and Sediment with High Moisture Content

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Why?

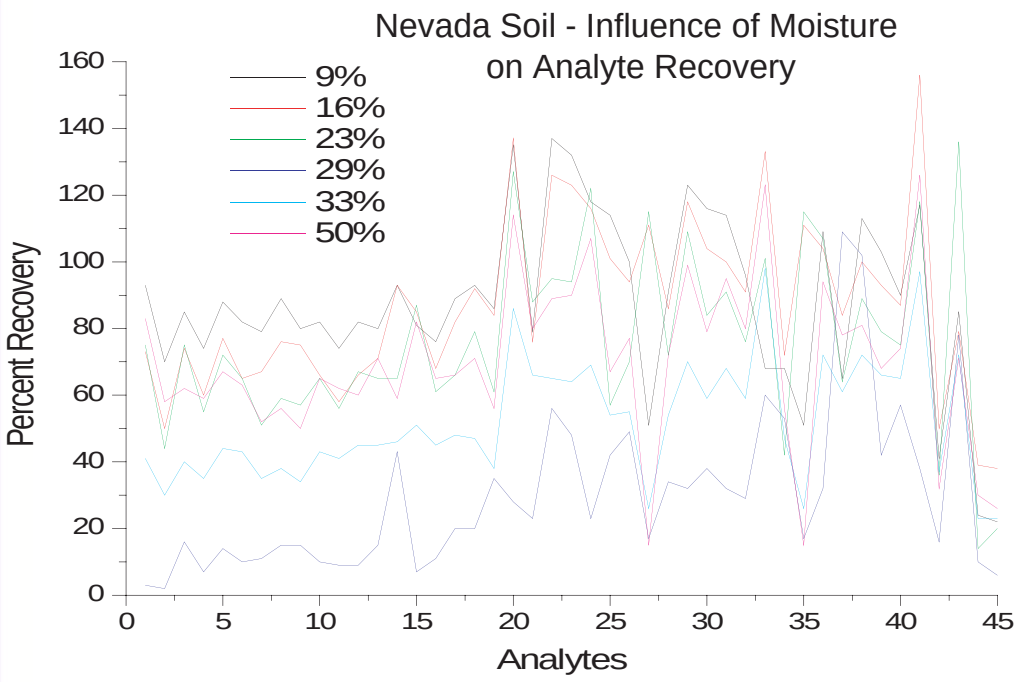
The development of a single EPA method capable of accurately measuring trace volatile organic compounds (VOCs), water-soluble VOCs, and semi-volatile organic compounds (SVOCs) is important for accurate and rapid risk assessment at Superfund, Resource Conservation and Recovery Act (RCRA), and Brownfields site redevelopment programs as well as ongoing state site remediation projects.

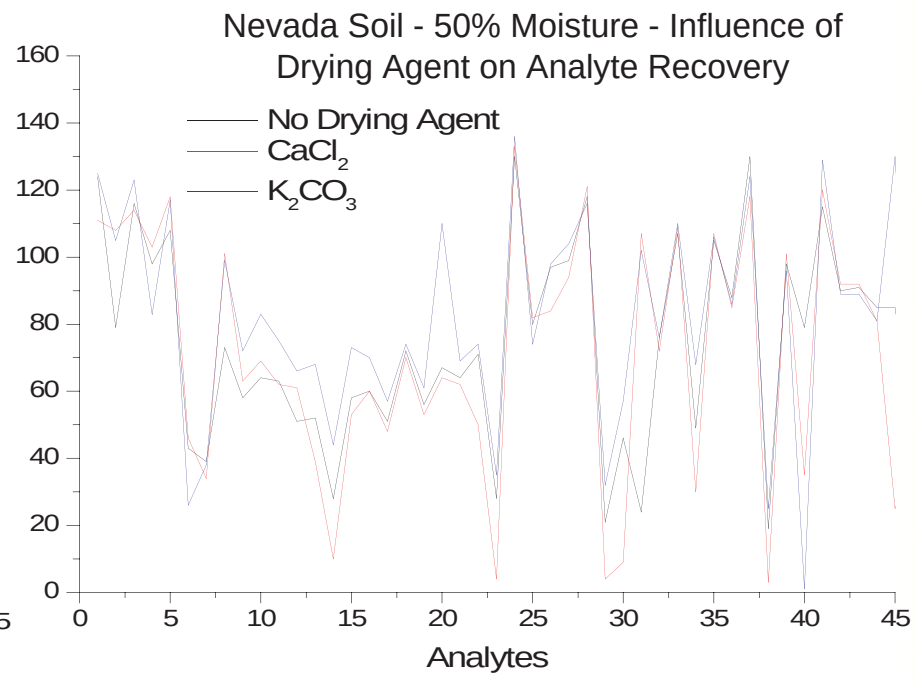
How?

Thermal extraction was selected for examination because the technique is simpler and more efficient than the present EPA purge-and-trap methods, and all water-soluble compounds are amenable to the procedure. Efforts were made to modify commonly used instrumentation (e.g., Archon™ autosampler) and incorporate the compounds used for quality control in the present EPA methods (e.g., internal standards, surrogates) so the proposed method can be easily adopted by routine analytical laboratories.

Results

Currently, the use of thermal extraction for VOCs with the Archon™ autosampler has been evaluated with three soils: a soil with high clay and negligible organic content from Georgia; a soil with low clay and medium organic content from Oregon; and a soil with low clay and high organic content from Nevada. The influence of moisture on recovery of VOCs showed a decrease in recovery with increased moisture (left graph below). To improve the recovery of analytes in moist soils, the use of a drying agent was evaluated. In the Nevada soil with a 50% moisture content, a significant increase in recovery for a majority of analytes did not result with the use of either drying agent ($CaCl_2$ or K_2CO_3; right graph below). Future research will evaluate additional drying agents and other means of increasing the analyte recovery in high moisture soils and sediments.





Ongoing Research

A modified Archon™ autosampler with a 200°C upper temperature limit for sample thermal desorption is currently undergoing evaluations for recovery of SVOCs. Once this SVOC system has been optimized, the research will continue with the connection of the VOC and SVOC gas chromatography/mass spectrometry (GC/MS) systems to a single autosampler. When this connectivity is achieved, the evaluation of the dual GC/MS thermal desorption analytical system will begin. This research should be completed by the end of 2005.

Collaborators

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