

FIELD SAMPLING AND ANALYTICAL METHODS FOR MONITORING VOLATILE ORGANIC COMPOUNDS IN KARST SPRINGS

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Abstract

The U.S. Geological Survey (USGS), in cooperation with the Tennessee Department of Environment and Conservation, Division of Superfund, is studying the occurrence, fate, and transport of chlorinated solvents in karst regions of Tennessee. One objective of this study is to evaluate water-quality monitoring techniques that may be suitable for karst areas. Automatic volatile organic compound (VOC) samplers, portable gas chromatographs (GCs), and passive adsorption samplers were evaluated as potential monitoring techniques at three karst springs in middle Tennessee. Automatic VOC samplers and a portable GC were used to collect VOC data at intervals ranging from 30 minutes (during selected storms) to 1 week (during base-flow conditions). Passive adsorption samplers were deployed concurrently with the automatic samplers to obtain time-integrated data. The usefulness of continuous water-quality monitors in the development of VOC sampling strategies also was examined. Water temperature, specific conductance, pH, and dissolved oxygen data were collected over a 15-month period to characterize the variability in water quality at the karst springs.

Results from this investigation indicate that continuous water-quality data are useful in documenting the water-quality signatures of karst springs and can aid in the development of site-specific VOC sampling strategies. Results from this investigation also indicate that automatic VOC samplers and portable GCs can be used to document the variability in VOC concentrations in karst springs. VOC concentrations measured in samples collected using automatic VOC samplers were comparable to results from replicate grab samples, and VOC concentrations measured using a portable GC were comparable to results from replicate samples analyzed by the USGS National Water Quality Laboratory. Results from this investigation suggest that passive adsorption samplers may be potential tools for monitoring VOC concentrations in karst springs. However, additional laboratory and field studies are needed to adequately document the behavior of the passive samplers when exposed to fluctuating VOC concentrations and to document the relation between the mass of a VOC adsorbed by a passive sampler and time-integrated average VOC concentration in a spring.