

Field Validation of Helium as a Tracer Gas During Soil Vapor Sample Collection

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The use of tracer gas is becoming a commonly specified field quality assurance method for identifying atmospheric short-circuiting during the collection of subsurface soil vapor samples. This paper presents the results of a field validation study of the use of helium as a tracer, utilizing a commercially available helium leak detector. The paper also presents observations on the frequency and degree of short-circuiting observed in soil vapor sampling from replicate installations of implants installed in differing soil types and depths.

The tracer gas field validation was conducted in two parts. The first part examined the ability of the method to detect short-circuiting in implants installed at four and eight feet below the ground surface. The implants were designed to short-circuit by introducing higher permeability material around the implant tubing and annular space. Following installation, a container was placed directly over the implant at the ground surface and filled with helium. Soil gas was then withdrawn from the implant and measured for helium. Conditions were varied and replicates were performed to investigate factors contributing to short-circuiting, and to establish response times and detection levels.

The second phase of the study investigated the frequency and magnitude of leakage, under typical field conditions and standard installation protocols. A total of sixty-four soil replicate vapor implants were installed by a field team experienced in soil vapor sampling. Thirty-two implants were installed in a sandy soil horizon and thirty-two in glacial till, to depths of four and eight feet below the ground surface. The frequency of atmospheric short circuiting was monitored as per the validated helium tracer field protocol, with consideration of soil type, depth, time and total volume of soil gas collected.