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NEWS RELEASE
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Volatile Dense Chemical Liquids in Groundwaters Can Produce Slowly Bubbling Gas Flow

Researchers discover dramatic implications of a previously overlooked mode of transport of common contaminants

MADISON, WI, JUNE 19, 2009 -- Despite decades of research, the cleanup of soil and groundwater contaminated by dense non-aqueous phase liquids (DNAPLs) used in numerous industrial applications remains a daunting challenge. These compounds, including degreasers, dry cleaning fluids, creosote, solvents and coal tar, when present below ground can generate hazardous concentrations for decades to centuries as they dissolve into the surrounding groundwater. The successful cleanup of DNAPL-contaminated sites depends on our ability to understand the processes that transfer the contamination from the source of a spill to the surrounding groundwater. Until recently, this understanding has been based primarily on the consideration of mass transfer between DNAPL and water only. However, gas bubbles that can be present near DNAPL contamination, produced naturally or by the application of cleanup technologies, have not been considered in common conceptual models.

Researchers Kevin G. Mumford, James E. Smith, and Sarah E. Dickson of McMaster University have been studying the effect of these gas bubbles on the mass transfer from DNAPL sources. In a recent study funded in part by the Natural Science and Engineering Research Council (NSERC) of Canada, they showed that the mass transfer from volatile DNAPL sources to trapped gas bubbles can result in the expansion and potentially rapid movement of the bubbles. In laboratory experiments conducted in water and coarse sand the repeated expansion, break away, and buoyant vertical movement of gas bubbles above a pool of the DNAPL 1,1,1-trichloroethane was studied over a 70-day period. Pictures collected showed repeated trapping and collisions of large bubble clusters, which produced what appeared as long fingers of gas that grew well above the surface of the DNAPL pool. The height travelled by the bubbles was much higher than the height that is normally considered when studying DNAPL dissolving into groundwaters with no bubbles present. These results were published in the May issue of *Vadose Zone Journal*, and were recently presented at the American Geophysical Union (AGU) Fall meeting in San Francisco, CA in December 2008.

The extensive vertical movement of gas bubbles observed in this research changes how we think about DNAPL dissolving and moving in groundwaters. It provides a pathway for the movement of DNAPL contamination at greater rates and to greater heights above the source contamination than previously expected. This could dramatically change the interpretation of dissolved DNAPL concentrations used to locate and characterize groundwater contamination zones for risk assessment and cleanup planning. This research continues in order to improve our predictive abilities including developing approaches to simulate the process using computer models.

The full article is available for no charge for 30 days following the date of this summary. View the abstract at http://vzj.scijournals.org/cgi/content/full/8/2/404.

Vadose Zone Journal, http://www.vadosezonejournal.org/ is a unique publication outlet for interdisciplinary research and assessment of the biosphere, with a focus on the vadose zone, the mostly unsaturated zone between the soil surface and the permanent groundwater table. VZJ is a peer-reviewed, international, online journal publishing reviews, original research, and special sections across a wide range of disciplines that involve the vadose zone, including those that address broad scientific and societal issues. VZJ is published by Soil Science Society of America, with Geological Society of America as a cooperator.

The Soil Science Society of America (SSSA) is a progressive, international scientific society that fosters the transfer of knowledge and practices to sustain global soils. Based in Madison, WI, and founded in 1936, SSSA is the professional home for 6,000+ members dedicated to advancing the field of soil science. It provides information about soils in relation to crop production, environmental quality, ecosystem sustainability, bioremediation, waste management, recycling, and wise land use.

SSSA supports its members by providing quality research-based publications, educational programs, certifications, and science policy initiatives via a Washington, DC, office. For more information, visit www.soils.org.

SSSA is the founding sponsor of an approximately 5,000-square foot exhibition, Dig It! The Secrets of Soil, which opened July 19, 2008 at the Smithsonian's National Museum of Natural History in Washington, DC.