



Real-Time Visualization of Advective Groundwater Flow

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As the portfolio of contaminated sites matures, long-term monitoring is becoming the primary factor governing costs for managing historical releases to soil and groundwater. Current best practices include manually collecting water level on a frequency of months to years. Infrequent collection of water level data can miss dynamic aspects of groundwater flow. Alternatively, pressure transducers can be installed in monitoring wells to continuously collect water level data. Unfortunately, infrequent manual downloads of water level data can miss important events that require timely response.

Here we show how low-cost sensors, connected to wireless communication systems can provide vivid, real-time displays of groundwater flow paths via online dashboards. Using planar regressions of three or more head values, automated algorithms transform water levels into vectors of groundwater flow. This automated process negates the need for gathering data by hand, which delays response to adverse conditions. A novel addition of Monte Carlo simulations advance an understanding of the possible range of flow conditions.

The results of this study can lead to increased understanding of site wide flow conditions and help determine when to collect more expensive, high-resolution data. Flow conditions synergistically coupled with redox and temperature data will provide more data, lower cost, and greater safety for workers.