HYDROSCAPE: A new versatile software program for predicting contaminant transport in groundwater

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Understanding how contaminants are transported in the subsurface is a major problem in hydrogeology. To help resolve the uncertainties associated with groundwater transport, complex numerical models are often used to predict how a contaminant plume evolves through time. However, numerical simulations can be costly and time consuming. Analytical solutions to the advection-dispersion equation (ADE), a partial differential equation that governs solute movement in groundwater, are invaluable for rapid and inexpensive assessments of contaminant scenarios and for verifying numerical models. These solutions often require simplified representations of the aquifer (homogeneous) and source region (constant concentration throughout time) which restrict their applicability to real systems. Although useful, many of these solutions are also not explicitly coded into user-friendly programs which would promote their broader use by professionals.

We present a new software package, HYDROSCAPE, which contains many analytical solutions to the ADE to allow hydrogeologists to easily compute and compare various groundwater contaminant scenarios. HYDROSCAPE is displayed in an easy-to-use interface that produces high quality outputs, including contour maps of the plume, breakthrough curves at user-defined points, concentration profiles along arbitrary transects, and videos of plume evolution. HYDROSCAPE also allows the user to import field data to aid with calibration.

One advantage of HYDROSCAPE over other similar software packages is that the equations (e.g [1] [2]) in HYDROSCAPE are modified to reduce the source region limitations. We allow for spatial concentration variations within the source region, and allow the user to define an arbitrary source function and geometry. Although some restrictions still exist, by allowing the source region to vary in space and time, HYDROSCAPE can be applied quickly and easily to a wide variety of reasonably complex contaminant transport scenarios.

[1] Baetslé LH (1969) Prog. Nuclear Energy, Series XII, *Health Physics*, 707-730. [2] Domenico PA (1987) *J. Hydrology* **91:** 49-58.