Integrated Methodology for Tracing Toxic Pollutants in the Subsoil and the Groundwater from Agricultural and Industrial activities

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The contamination of groundwater aquifers by toxic organic pollutants from industrial and agricultural sites is a widespread environmental problem which restricts the use of groundwater resources and the regeneration of contaminated sites. Pollution occurs either from diffuse sources, when pollutants are spread over wide areas, for instance when pesticides or fertilizers are used on agricultural land, and from point sources, for instance chemicals leaking from industrial pipes or storage tanks. Pollutants on the land surface can be flushed through the soil and rock into groundwater aquifers under the influence of gravity and capillarity. Once a pollutant reaches an aquifer, its impact will depend on its chemistry, on the nature of the aquifer and on the distance between the source of pollution and the point at which groundwater reaches the surface again, either in a river or by being pumped. Some pollutants will naturally degrade, or will be filtered out of the water as it flows through the aquifer. Others will be persistent, e.g. oil products, and need to be removed before the water can be used.

The accurate prediction of the dispersion rates of pollutants in soils is a challenging problem due to the complexity of transport mechanisms in fluid - solid systems and the difficulty in characterizing and representing accurately the complicated and heterogeneous nature of a porous medium. Since there are different sources of uncertainty related with groundwater modelling, it is very difficult, if not impossible, to collect all the required data with a high degree of accuracy. As a result, the output of numerical modelling of groundwater pollution has always a certain degree of uncertainty.
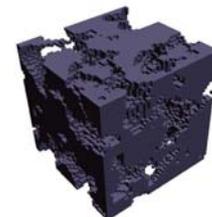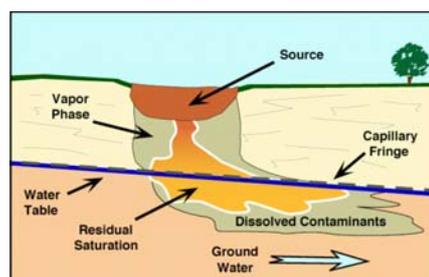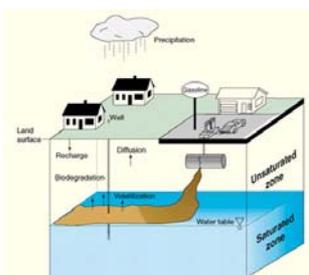
The purpose of the current research is to **develop an integrated methodology for tracing toxic pollutants using a combination of sophisticated image management systems, advanced soil characterization, numerical modelling and advanced experimental techniques already used in the petroleum industry.** This tool can be used to estimate the environmental impact of industrial or/and agricultural activities at groundwater resources. The tool can be applied to the selection of proper locations for industrial operations and also for the assessment of groundwater pollution thought the selection of proper remediation strategies for contaminated grounds.

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