



Environment tracers application to groundwater circulation assessment in an alluvial aquifer in Central Italy

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Groundwater vulnerability assessment is an important tool in order to plan any groundwater protection strategy. The aim of this study is to experiment a specific approach to give a conceptual model about groundwater circulation characterization. This approach has been applied to a suspected contaminated site in a large alluvial plain, made of sediments coming from weathered volcanic rocks, laying on marine sediments, where more than thirty years ago had been built a very important urban waste solid landfill. In referring to this case history it has been pointed out the importance of natural chemical interaction between ground water and rock mass, especially when pyroclastic origin sediments are involved. The landfill had been isolated from the surrounding environment, especially to protect aquifers, by a waterproof diaphragm. This land is characterised by intensive agricultural and industrial activities (oil refineries, medical waste incinerators, concrete production, tar factory). The study will highlight the importance of environmental tracers which provide information about the flow and mixing processes of water coming from different sources. They are also useful to point out directions of groundwater flow and to determine origin. Environmental tracers are natural chemical and isotopic substances that can be measured in groundwater and used to understand hydrologic properties of aquifers. They may be input into the hydrological system from the atmosphere at recharge and/or are added/lost/exchanged inherently as waters flow over and through materials. Variations in their chemical abundances and isotopic compositions can be used as tracers to determine sources (provenance), pathways (of reaction or interaction) and also timescales (dating) of environmental processes. In combination with these, the basic idea is to use. In this case environmental tracers have been integrated by temperature and electric conductivity logs, to better investigate different levels of faster or slower circulation of groundwater. The obtained results are very interesting for investigate complex circulation of groundwater like it happens in many alluvial aquifer environment.