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Simulation of the transfer of hydrocarbons in unconfined aquifer in tropical zone: the case of benzene

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Groundwater is the largest global reserves of continental freshwater (Bosca, 2002) and also an important source of drinking water in many parts of the world (Brassington. 2007). However, this resource is today threatened by pollution such as inadequate supply of drinking water services, inaccessibility and / or dilapidated sanitation facilities and excessive use fertilizers, and industrial wastewater and solid waste pesticides (Boubacar, 2010) and the rapid urbanization in great cities (Foster, 2001).
Abidjan, the largest city in Côte d'Ivoire is also facing pollution problems such as illegal dumping of waste, waste oil spilled garages, land application of domestic and industrial wastewater, automotive workshops, over-exploitation of sand in the Ebrié lagoon, open waste dump of Akouédo and the spill of about 400,000 liters of toxic waste from the ship "Probo Koala" in August 2006. The Abidjan aquifer or the Continental terminal aquifer is the main source of supply drinking water. It is mainly composed of sandy and it is an unconfined aquifer as a whole (Jourda, 1987). According to Gilli and al., (2012), the recharge of unconfined aquifers comes mostly from the infiltration of surface water including rainwater. These waters on their transport in the basement could carry certain pollutants into groundwater. Kouamé (2007) reports a potential groundwater pollution of the "Continental terminal" aquifer in Abidjan. In addition to the cases cited pollution, there has been a proliferation of service stations in the district of Abidjan and this can cause possible pollution. We deemed it necessary to conduct a study on the groundwater pollution of Abidjan by oil in general. We chose benzene to simulate organic pollution in case of accident. To observe the likely evolution of such contaminants in the subsurface, we developed hydrogeological models that couple groundwater flow and benzene transport with FEFLOW software in steady and transient states. The models are composed of two layers. The first layer is composed of clay sands and the second layer of coarse sands with the hydraulic conductivity respectively 1.10-5 and 5.10-4 m / s. The simulation of 400 mg / l of benzene for 50 years in transient state shows that the plume infiltrates down to 105 m, very closed to the saturated zone.

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