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The influence of low permeability lenses on artificial groundwater recharge

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In the last thirty years, the aquifer systems of Central Veneto (Italy) have been exploited for domestic, industrial and agricultural uses and this increasing demand of water has caused a relevant reduction of groundwater heads. The water extraction exceeds the recharge resulting in a continuous decrease of groundwater levels; to invert this trend the possibility of artificial groundwater recharge should be considered. In this paper we shown the results of a study on an artificial recharge system for the phreatic aquifer in the upper alluvial plain in the province of Vicenza (Veneto-Italy). An experimental set up, consisting of two recharge basins (52x54m, 32x32min in size respectively; 1,5m in depth), was built in the area of an abandoned quarry, where the alluvial deposits are characterized by high values of hydraulic conductivity. The basins were equipped with piezometers and hydrometers for the measurement of the infiltration rates and the fluctuations of the groundwater level owing to recharge. Before and after infiltration tests granulometric analysis were carried out to estimate the degree of turbidity in the irrigation water used for recharge and the consequent clogging of the basin soil. A numerical flow model is used to simulate the effects of artificial groundwater recharge at a larger scale. The infiltration rate estimated in the tests are extrapolated to other portions of the territory characterized by similar geology. Different recharge conditions are obtained by varying infiltration rates and location of the recharge basins in the upper alluvial plain. We study the efficiency of the system in recharging the regional aquifer in the presence of uncertainties of the geometrical characterization of low permeability lenses.