



Field experiments and numerical simulations of phreatic aquifer response to pond infiltration at the eastern Alps foothills, Italy

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A large volume of surficial fresh high-quality water flows every year from the eastern Alps foothills into the northern Adriatic sea through a number of rivers (e.g., the Tagliamento, Isonzo, Livenza rivers). Crossing a highly permeable plain just south of the Alpine range, the rivers naturally recharge along their course a thick phreatic aquifer mainly composed by gravel and fractured conglomerates. The river waters are distributed across the territory through a dense channel network used for irrigation during the hot season. From autumn to spring this water could be used to recharge the aquifer through a number of large infiltration ponds excavated in the early 2000s, but never used because of legislative limitation. Within the WARBO LIFE+ project, the Environmental Agency of the region has allowed to use the Mereto infiltration basin for recharging the aquifer, after detailed test for surficial water quality and compatibility with the groundwater. The pond is about 6 m deep and $45 \times 7 \text{ m}^2$ wide. The site, which is characterized by an elevation of 105 m above msl and a 50 m depth to the phreatic water table, has been accurately characterized by geophysical (geoelectrical, georadar, seismic) surveys and a number of 70 m deep boreholes drilled in the basin surroundings. The permeability evaluated through pumping tests in these boreholes is on the order of 10^{-4} m/s . Recharge started in December 2013 with an infiltration on the order of $720 \text{ m}^3/\text{day}$. The collected data, i.e. the water volume flowed into the pond, its water level, and the piezometric evolution in the wellbores around the basin have been used for the calibration of a finite element three-dimensional variably-saturated flow model. The calibrated model will be used to manage the full-scale recharge project in the future.