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Recharging the phreatic aquifer in the upper Friuli plain, Italy, by a large infiltration basin

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Even though the Friuli Region, northern Italy, is one of Italy's rainiest areas with an average yearly rainfall that ranges between 1300 mm along the cost up to 3000 mm at the Alps foothills, the groundwater level is continuously decreasing over the last years. To cope with this reduction of water availability and increase the subsurface storage of high-quality surficial waters that usually are lost during winter flowing into the northern Adriatic Sea, an artificial recharge project is ongoing within the WARBO LIFE+ Project funded by EU. WARBO is aimed at implementing large-scale use of artificial recharge in Italy where water directives still strongly limit its application. The project involves regional authorities and public and private stakeholders operating in the field of water management and treatment with the aim of guaranteeing the future application of the defined methods and the development of specific experimental protocols to overcome the boundaries posed by the current legislation.

In this context, the Mereto recharge site selected in the upper Fruili plain is emblematic. Here a large infiltration basin, about 6 m deep and 45×7 m^2 wide, was built in the early 2000s but the use was prohibited by law soon after the construction. Only recently, within the WARBO Project, the possibility of implementing the recharge has been allowed. The site is characterized by an elevation of 105 m above msl and the depth to the water table averages 50 m. Below a few meter-thick organic soil, the aquifer is composed by coarse deposits with an estimated thickness of 225 m and an average vertical hydraulic conductivity equal to 10^{-4} m/s. A 0.1 m^3/s infiltration flow has been preliminary estimated (corresponding to an infiltration rate of 60 cm/h), with the water availability that is guaranteed during winter period by an irrigation channel connected to the Tagliamento and Ledra River.

The contribution describes the geophysical investigations and in-situ tests carried out to characterize the vadose zone and the unconfined aquifer in the study area and the outcome of preliminary analytical and numerical computations to predict the effect of the artificial recharge. The results of these investigations will greatly reduce the hydrogeological knowledge gaps and will be used to fine tune the recharge program and to define the monitoring concept. This contribution aims to provide a methodology for the implementation of managed aquifer recharge programs using existing structures.