Hydrogeological and geophisical studies in the Mereto di Tomba area (High Friuli Plain) directed to application of water reborn techniques

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In the last decades, the generalised lowering of piezometric levels in the High Friuli plain, produced by an increasing of anthropic pressure, has been strengthened by a climate change showing a marked variability in the precipitation conditions, with a larger number of extreme events and longer dry periods. The consequences on the hydrologic cycle are represented by a diminishing effective infiltration amount, an augmenting evapotranspiration rate and a more scarce water-courses' discharge. Within the framework of the Warbo Project, supported by the European Union, hydrogeological and geophisical studies are performed in the Mereto di Tomba area to evaluate the impacts of artificial recharge and to develop of reliable models for managing artificial recharge activities.

The hydrogeological features of the area was investigated by means of the quantitative and qualitative monitoring network. Weekly piezometric measures, physical-chemical parameters and chemical analysis on the underground water, river and spring samples, have been performed in order to characterized the dynamics of the unconfined aquifer.

The expected efficiency of the groundwater artificial recharge at Mereto has been simulated by a three-dimensional variably-saturated finite-element model. The model accurately represents the geologic litho-stratigraphy of the area as detected by a number of wells and geophysical surveys. Some sensitivity analyses have been performed to investigate the infiltration rates from the pond, the fate through the vadose zone of the infiltrated water, the rise in the piezometric level, and the area affected by the recharge.

The conceptual model was built based on the stratigraphy of the nearby piezometers and a infiltration test. Recharge rates and influence areas were calculated recurring to several analytical and mathematic methods, all with reliable and similar results. The results were used for the definition of a monitoring network to analyze the effects of artificial recharge and calibrate the model.

The indirect geophysical methods was applied to build the geometries of the unconfined aquifer. By the use and the integration of the two techniques, the GPR and ERT, was possible to investigated subsoil with good vertical and horizontal resolution up to about 80 m depth. discriminating saturated levels that will be input for the analysis, parameterization and reconstruction of the hydrogeological model. The use of ERT for greater depths showed the presence of the permeable fractured conglomerates that may conditioning the movement of underground water.