Mitigation strategies to reduce saltwater intrusion in coastal aquifers: the testing site of Ca’ Pasqua, Italy.

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Seawater intrusion in coastal aquifers is a worldwide problem caused by natural processes but significantly worsened by aquifer overexploitation for drinking water supply and irrigation, land subsidence, sea levels rise, and climate changes, which contribute to the reduction of groundwater natural recharge.

Within the framework of an Interreg Italy-Croatia collaboration project (Italy – Croatia 2014 – 2020 CBC Programme), MoST (MOonitoring Sea-water intrusion in coastal aquifers and Testing pilot projects for its mitigation), a study area located at Ca’ Pasqua, in the southern part of the Venice lagoon, Italy, is used as a pilot site to develop and test possible solutions to issues of coastal seawater intrusion. The project consists of two main phases. The first phase is devoted to the collection of hydro-geophysical information and data in the study area and to mimic the dynamics of the relevant processes in laboratory experiments. In the second phase, appropriate countermeasures (e.g., underground barriers, recharge wells, recharge drains, cut-off walls) will be considered to limit or mitigate the seawater intrusion/contamination and their efficiency will be tested. These activities will be carried out with the involvement of local populations and authorities, which will benefit the most by these actions, thanks to their final implications in terms of enhanced crop productivity and touristic activities.

Within the context of this project, we present the results of a numerical modeling study, whereby a finite difference model, SEAWAT, is used to test the potential effects of one of the aforementioned countermeasures, a recharge drain located in a sandy paleochannel which seems to represent a preferential pathway for saline intrusion but can also be used to convey freshwater to reduce soil salinization. The model is set up by integrating information derived from in-situ monitoring and observations of precipitation, rivers hydrometric heads, evapotranspiration and tide levels for a period of about 10 years. A number of different scenarios are modelled and compared, allowing us to predict the resulting seawater intrusion mitigation and its uncertainty.