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Management of karstic coastal groundwater in a changing environment (Salento, southern Italy)

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We have been witness, during the second half of the 20th century, of an increase of groundwater discharge. Today a great number of aquifers are overexploited in the world. Problems ties to overexploitation, as piezometric decline and increase of seawater intrusion, are so more amplify in the coastal aquifers, and in particular, in karst coastal aquifers. Seawater intrusion, in fact, is a pervasive problem affecting coastal aquifer, where the concentration of population and the increasing water demand creates risks of overexploitation, especially in those areas where is the only resource of drinking and irrigation water. The whole effect could be a groundwater quality and quantity degradation. This is very often the case of coastal karst aquifers of Mediterranean countries. The general purpose of this paper is to prove the capability of large-scale numerical models in management of groundwater, in particular for achieve forecast scenarios to evaluate the impacts of climate change on groundwater resources. Study area is the karst coastal aquifer of Salento (Southern Italy), largely utilized to satisfy the agricultural demand and drinking demand with huge effects in terms of reduced availability and increasing salinity. The computer codes selected for numerical groundwater modelling were MODFLOW and SEAWAT. Groundwater flow modelling is based on the concept of a equivalent homogeneous porous medium. Three forecast transient scenarios, referred to 2001-2020, 2021-2040 and 2041-2060, were implemented, on the basis of calibrated and validated model, with the aim to predicting the evolution of piezometric level and seawater intrusion. The scenarios were discussed considering the effects of climate change, sea level rise and change of sea salinity. Some irrigation discharge scenarios were considered in the discussion . Results shows qualitative and quantitative groundwater trends from 1930 to 2060 and emphasizes an essential decrease of piezometric level and a huge worsening of the groundwater salinisation due seawater intrusion.
More details on previous results of this research activity were recently published (Polemio and Romanazzi, 2012; Romanazzi and Polemio, 2013).

References

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