

Conceptual and numerical model of submarine and subaerial coastal springs of Mar Piccolo (Taranto, Southern Italy)

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The Mar Piccolo (literally "small sea"), a sea internal basin which is part of the Taranto Gulf, located along the Ionian coast in Southern Italy (Apulia region), represents a peculiar and sensitive environmental area and a social emergency due to the pollution of sea water and sediments due to the effect of the neat industrial area of Taranto. The paper describes the methodological approach to define the conceptualisation of the hydrogeological basin of main subaerial and submarine coastal springs of the Mar Piccolo. The geochemical discussion concerning spring groundwater was finalised to define the effect of seawater intrusion. These waters are characterised by high values of electrical conductivity and high concentrations of alkaline ions (Na^+ and K^+) and chloride ion and show typical chemical characteristics of fresh groundwater contaminated by seawater intrusion. The groundwater composition of the subaerial springs of Mar Piccolo is controlled by the combined effects of calcite dissolution and ion exchange. A basic model of the coastal aquifer was realised with the purpose to assess the mean annual and monthly value of spring outflows in Mar Piccolo. The computer codes selected for numerical groundwater modelling were MODFLOW and SEAWAT. The active domain of the model was about 978 km² with a total number of 391200 cells. The research pursues the knowledge of the hydrological balance of the internal sea, the geochemistry of groundwater, and the groundwater discharge effect on the ecological equilibrium of the coastal environment in the framework of a wide Italian research program called RITMARE.