

A Sharp Interface Model for Simulating Seawater Intrusion in the Coastal Aquifer of Wadi Nador (Algeria)

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Abstract : Seawater intrusion is a significant challenge faced by coastal aquifers in the Mediterranean basin. This study aims to determine the position of the sharp interface between seawater and freshwater in the aquifer of Wadi Nador, located in the Wilaya of Tipaza, Algeria. A numerical areal sharp interface model using the finite element method is developed to investigate the spatial and temporal behavior of seawater intrusion. The aquifer is assumed to be homogeneous and isotropic. The simulation results are compared with geophysical prospection data obtained through electrical methods in 2011 to validate the model. The simulation results demonstrate a good agreement with the geophysical prospection data, confirming the accuracy of the sharp interface model. The position of the sharp interface in the aquifer is found to be approximately 1617 meters from the sea. Two scenarios are proposed to predict the interface position for the year 2024: one without pumping and the other with pumping. The results indicate a noticeable retreat of the sharp interface position in the first scenario, while a slight decline is observed in the second scenario. The findings of this study provide valuable insights into the dynamics of seawater intrusion in the Wadi Nador aquifer. The predicted changes in the sharp interface position highlight the potential impact of pumping activities on the aquifer's vulnerability to seawater intrusion. This study emphasizes the importance of implementing measures to manage and mitigate seawater intrusion in coastal aquifers. The sharp interface model developed in this research can serve as a valuable tool for assessing and monitoring the vulnerability of aquifers to seawater intrusion.

Keywords : seawater intrusion, sharp interface, coastal aquifer, algeria

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