

ON THE USE OF FINITE-DIFFERENCE AND NEURAL-NETWORK MODELS TO EVALUATE THE IMPACT OF THE DIMINUTION OF RAINFALL GROUNDWATER'S OVEREXPLOITATION

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Abstract

The purpose of this study is to include expert knowledge as one part of the modelling system and thereby offer the chance to create a productive interactive system between expert, mathematical model, ASM ([1]), and artificial neural networks (ANNs). An attempt to determine outflow-influencing parameters in order to simulate spring flow is presented.

Keywords: Models, Behaviour, Algerian Basin

The Bouteldja dune aquifer (NE of Algeria) is fed by rains and streaming water on the sandy argillaceous relieves in the Est. The lateral passage to the gravel of the Bouteldja Plain is marked by numerous bogs that correspond to the piezometric level. These bogs have long been an environment for migratory birds and a natural reserve for many species. However, the continued exploitation of about 30 wells has negatively influenced the hydrodynamic equilibrium of the aquifer and has brought a diminution of spring's capacity ([2], [3]). In this study, we tried by using a hydrodynamic model and the neural network to ascertain the state of the resources and to identify the factors responsible for the decreasing flows of the three principal springs of the area (Bougles, Bourdim and Titteri) by using neural networks. The calibration in the non-steady state allowed for the depletion of the layer storage, related essentially to an overexploitation, and a weak recharge to be taken into account. This hydraulic deficit was represented by a drop of the piezometric surface (Figure 1) that can amount to 30 m, and by a closely corresponding reduction of the areal extent through which groundwater emerges into the surface. This situation had a direct consequence on the surface, on the hydrologic regime of the wet areas, and on the degradation of the water quality of rivers and lakes. The ANNs show that the decrease in flows of the springs is not only due to the unfavourable climatic conditions, but also to the intensive exploitation of the aquifer. These results show that the groundwater reserves are decreasing over time, thus highlighting the need to take some urgent measures to stop this phenomenon.

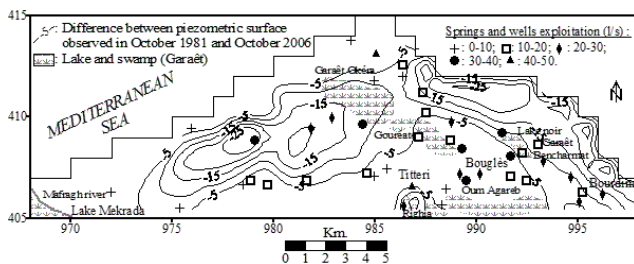


Fig. 1. Drawdown map of the massif of Bouteldja's aquifer (October 1981–October 1994).

References

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