

Artificial Neural Network (ANN)-based Modelling to Predict Groundwater Levels in the Chtouka Aquifer, Morocco

Context

In Morocco, the Chtouka region is a major producer of fruits and vegetables intended for exportation. This is only possible through irrigated agriculture and a combined use of surface water and groundwater resources. Owing to the semi-arid climate, surface water resources are scarce and irrigation relies heavily on groundwater resources. Intense pumping in the Chtouka coastal aquifer is responsible for the observed water table decline, which exacerbates seawater intrusion and threatens freshwater resources. In the near future, water demand is expected to increase due to population growth, increased demand for irrigation and climate change. Consequently, groundwater levels are expected to continue to decline.

Previous work

To investigate the behavior of the Chtouka aquifer, a numerical model was developed using the MODFLOW code. However, due to data insufficiency especially regarding the aquifer geometry, the model has so far failed to reproduce properly the aquifer dynamics. A model based on the Artificial Neural Network (ANN) approach is proposed as an alternative to a “traditional” groundwater model.

Objective

Develop an ANN-based model to provide new insights into the aquifer dynamics.

Main tasks

1. Literature review on the ANN approach and the Chtouka aquifer (existing model and available data);
2. Presentation of a modelling strategy;
3. Data analysis and formatting for use in the ANN-based model;
4. Development of the ANN-based model;
5. Analysis and interpretation of the results;
6. Writing of the master thesis.

Requirements

Programming skills in R or Python. English is the working language for this master thesis.

Partner institution

This thesis will be carried out in collaboration with the sub-departments “Groundwater Resources – Quality and Dynamics” (Dr Nelly Montcoudiol) and “Basic Information – Groundwater and Soil” (Dr Stefan Broda) of the Federal Institute of Geosciences and Natural Resources (BGR), Hannover, Germany.

Further information

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