

Groundwater Level Modeling Using Remote Sensing and Artificial Intelligence

Halima Hilal¹, Marc Leblanc², Tarik Bouramtane¹, Ilias Kacimi¹.

¹*Laboratory of Geoscience, Water and Environment, (LG2E-CERNE2D), Department of Earth Sciences, Faculty of Sciences, Mohammed V University in Rabat, Av Ibn Battouta, B.P. 1014, Rabat 10000, Morocco.*

²*UMR 1114 INRAE EMMAH, Hydrogeology Laboratory, Avignon University, 84916 Avignon, France.*

**Email : halima.hilal@um5r.ac.ma | Marc.leblanc@univ-avignon.fr | t.bouramtane@um5r.ac.ma | i.kacimi@um5r.ac.ma*

Abstrat:

Globally, groundwater serves more than 2 billion people or 33% of the world's freshwater withdrawals in the domestic (36%), agricultural (42%) and industrial (27%) sectors. The impacts of urbanization, population growth, economic and agricultural development are increasingly affecting global water and food security. This contribution of groundwater is likely to be even greater in Africa and in particular in arid and semi-arid countries. This study aims to develop an innovative approach combining space-based remote sensing, in-situ measurements and artificial intelligence to predict the evolution of groundwater quantity up to several months in advance.

Spatial data from earth observation satellites allow to obtain near-real time data and to use in predictive model's other variables such as vegetation indices and land use. In this study, we focus on the challenges related to the use of remote sensing data as input for artificial intelligence models, in particular: How do remote sensing product resolutions influence the model's outcome? what is the contribution of Multi-scale NDVI extraction to groundwater level forecasting using AI models? How does the extraction of NDVI images as a predictive variable contribute to GWL predictions using AI models? What is the impact of land use in GWL forecasting using IA? To answer these questions several techniques were first applied using an extraction of the NDVI at different scales based on circular extraction. Secondly, a statistical analysis and comparison of the prediction results using artificial neural network, for each extraction scale was performed to determine the impact of the scale extraction of the NDVI in the groundwater level prediction. This approach was developed and tested in the wells located in the Oum Er-Rbia basins.

Keywords :

Artificial intelligence; remote sensing; Groundwater level; artificial neural networks; earth observation satellites.