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GROUNDWATER POTENTIAL MAPPING USING BOOSTED REGRESSION TREE AND CLASSIFICATION AND REGRESSION TREES MODELS IN THE EMIRATE OF DUBAI, UNITED ARAB EMIRATES

Abstract

Groundwater is the main source for land development in the Arabian Gulf countries, particularly in the United Arab Emirates (UAE). In the UAE, rainfall is scarce, as response to climate change, and the groundwater table is sharply depleting due to over-pumping and the increasing population. This study proposes an integrated approach for groundwater potential mapping over a regional scale from multi-sources of remote sensing such as Landsat 8, Advanced Land Observing Satellite (ALOS PALSAR) images and DEMs with a spatial resolution of 30 m as well as and gravity anomalies. The approach integrates machine learning such as boosted regression tree (BRT), classification and regression trees (CART). The approach starts by constructing a set of groundwater conditioning factors (GWCFs) using automatic and semi-automatic algorithms. These GWCFs include altitudes, topographic slope, slope aspect, topographic curvature, drainage network, lithology, fault zones, distance from faults, distance from drainage network, fault density, drainage network density and land use land cover (LULC). Hydrological information about groundwater productivity of groundwater wells distributed in the UAE will also include. The wells' locations will be divided into 70

The optimal parameters; the number of additive trees, learning rate and the proportion of sub-sampling will be tested. Here, the random point's values will be extracted from each groundwater conditioning factor (GWCFs) for the absence and presence of the GWCFs by running the CART and BRT models. The proposed approach provides new hydrological maps and database can help to explore sites of groundwater in shallow and deep aquifer. The GWCFs and the proposed approach will apply in this study could be applicable to map groundwater potential over a regional scale in similar regions such as the Arabian Sahara in Egypt and Libya.