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Master Thesis Defense

Entitled

MICROGRAVITY, HYDROLOGICAL AND METEOROLOGICAL MONITORING OF SHALLOW GROUND WATER AQUIFER IN AL- AIN (UAE)

by

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Abstract

The United Arab Emirates (UAE) is situated within an arid zone where the climate is arid and the recharge of the groundwater is very low. Groundwater is the primary source of water in the United Arab Emirates. However, rapid expansion, population growth, agriculture, and industrial activities have negatively affected these limited water resources. The shortage of water resources has become a serious concern due to the over-pumping of groundwater to meet demand. In addition to the deficit of groundwater, the UAE has one of the highest per capita water consumption rates in the world. The study area is located in Al-Ain city. Al-Ain is the second largest city in Abu Dhabi Emirates and the third largest city in the UAE. The groundwater in this region has been overexploited.

In this study, a combination of time-lapse measurements of microgravity and depth to groundwater level in selected wells in Al-Ain city was used to estimate the variations in groundwater storage. Relative gravity measurements were acquired using the Scintrex CG-6 Autograv from March 2018 to March 2019. This latest generation gravimeter from Scintrex Ltd, provides fast, precise gravity measurements and automated corrections for temperature, tide, instrument tilt and rejection of data noise. The CG-6 gravimeter has a resolution of 0.1□Gal. The purpose of this study is to estimate the groundwater storage changes in the shallow aquifers based on the application of microgravity method. The gravity method is a nondestructive technique that allows collection of data at almost any location over the aquifer.

The microgravity changes from March 2018 to March 2019 at five water wells located in Al-Ain (Abu Dhabi Emirate, UAE) are ranging from 10.7 □Gal to 45.30 □Gal referenced to base station (UAEU, E-4 building) data of March 2018. The calculated water storage changes from microgravity changes at five wells during the same period is ranging from 3.05 m to 14.18 m, which is highly correlated (R^2=0.8) with observed water level changes at four wells from Falaj Hazza (except UAEU well). From this study, we conclude that water storage changes can be estimated from microgravity changes using this equation: □S = 15.98 □g + 2.79.

The study will be useful in water management considerations in Al-Ain and the developed model can be enhanced by increasing the microgravity monitoring wells within Al-Ain city.

Keywords: microgravity, groundwater aquifer, storage change, Al-Ain.