摘要

本研究結合重力觀測與地電觀測技術，於名竹盆地計算地下水含量變化之可行性評估。重力測量技術可獲得研究區域之地底下質量變化，地電阻觀測技術可得知研究區域地下水面位置。本研究於 2016 年 9 月、12 月，2017 年 3 月、6 月等進行共四次的重力與地電組聯合施測。在重力測量實測方面，本團隊利用絕對重力儀 FG5 和相對重力儀 CG5 來獲取名竹盆地上共 19 個重力點位觀測值；在地電阻實測方面，本團隊於濁水溪北岸拉設數條測線，以獲取測區地下水位位置。所有重力與地電阻觀測結果，與 5 公尺數值地形模型、名竹盆地地下水井等資料再結合，來推求名竹盆地 2016 年 9 月至 2017 年 6 月間的地下水含量變化。本研究主要研究課題包括：(1)分析測站的選點位置適宜性；(2)最佳地質密度差之決定；(3) 評估重力觀測距離對於地下水變化的影響；(4)評估地下水位變化對重力值的影響。由於本研究實測重力與地電阻結果差異過大，故無法精確計算地下水含量，故本文改以模擬不同測試案例來探求地質密度差、地下水變化與重力變化三者間之關係。由模擬結果可得知當地下水位變化達 3 公尺以上時，CG5 才能有較顯著的重力變化。

關鍵字：重力測量、地電阻、地下水、CG5

Abstract

We combine the technologies of gravimetry and electrical resistivity tomography (ERT) to estimate the groundwater content in Minzhu Basin. Gravimetry and ERT can be used to obtain mass variations and groundwater levels, respectively. Four joint surveying missions combined with gravimetry and ERT were carried out in September, December in 2016, and March and June in 2017, respectively. On field surveys of gravimetry, we use the absolute gravimeter FG5 and relative gravimeter CG5 to collect the gravity observations at 19 gravity stations in Minzhu Basin; on field surveys of ERT, we lay surveying profiles on north side of Jhuoshuei River to collect the ERT observations. The gravimetry-derived and ERT-derived data will be combined with the data of 5m resolution DEM and ground water wells in Minzhu Basin area in order to estimate groundwater changes during the period from September 2016 to June 2017. Overall, the main research topics of this study include: (1) analyze the suitability of the gravity and ERT observing stations; (2) determine the best density contrast; (3) analyze the influence of gravity observation distance on groundwater change; (4) analyze the influence of groundwater level change on gravity values. Due to the obvious difference between the gravimetry-derived and ERT-derived results, accurate estimate for groundwater content is not feasible. Thus we design different simulated study cases to explorer the relations between density contrast, groundwater variation and gravity change. Based on the simulated results, the groundwater level changing above than 3m at least can be observed by CG5.

Keywords: Gravimetry, Electrical Resistivity Tomography, Ground water, CG5