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Comparative study on change in groundwaters of rural and urban areas in Korea: effects of climate change

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Groundwater occupies a considerable proportion of the world's water resources and is affected by climate change. It is important to understand how water budget responds to future precipitation variability for sustainable management of groundwater resources. In order to evaluate the effects of climate change on groundwater resources in the future, it is necessary to not only collect field data but also predict groundwater change using some groundwater numerical modelling. In this study, a relevant climate change scenario (RCP 4.5) was adopted and Visual MODFLOW was used as a main tool for predicting water budget. The predicted precipitation and air temperature data were obtained from Climate Change Information Center (CCIC) of Korea. By using the data on the scenario from 2011 to 2100, the future water budget was calculated using groundwater numerical modelling for both Wonju (WJ: urban area) and Yanggu (YG: rural area) of Gangwon Province in Korea. The model calibration was done by the groundwater level measured at 10 monitoring wells. For the numerical prediction, the groundwater recharge (WJ: 10.1%, YG: 13.3%) was estimated using watertable fluctuation (WTF) method and a concept of threshold precipitation (WJ: 240.5 mm, YG: 363.8 mm) was applied. Consequently, the water levels in both Wonju and Yanggu showed gradually increasing trends and ranged from 3.0 to 10.8 m, from 0.5 to 1.8 m in 2100, respectively. Under annual precipitation fluctuation on the scenario (2011-2100), water budget IN-OUT value (-0.87$\sim$1.07 m^3/day) in Wonju city gradually increases while that (-0.73$\sim$0.46 m^3/day) of Yanggu county does not. However, its annual difference is enlarged with year for both areas. The results indicate that securing groundwater resource and its management will be difficult because of frequent annual change of the groundwater storage. This work was supported by Science High School R&E program (No. C1008804-01-01) and the National Research Foundation of Korea (NRF) grant funded by the Korea government (MEST) (No. 2012-0002628).