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Characteristics of Rainfall- Groundwater Level Response in Taipei City, Taiwan

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The Taipei Basin, Taiwan has been densely populated and highly economically developed in recent decades. Global climate change has led to frequently flooding and drought events in recent years, formulating suitable measures to mitigate climatic disaster has become a crucial issue in this city. The sponge city concept is one of the most important options for disaster mitigation in highly urbanization areas. However, the city is also potentially threatened by soil liquefaction due to its sedimentary geology and increasing groundwater level. High groundwater level might be a key limiting factor in the promotion of sponge city. The aim of this study was to understand the relationship between rainfall and groundwater level and the impacts of cumulative rainfall, depth to groundwater table, and impervious pavement ratio on the rainfall/groundwater level response in study area. The cross-correlation function (CCF) was applied to analyze the correlation between rainfall and groundwater level data obtained from 20 observed wells and nearby rainfall gages during dry and wet seasons from 2012 to 2017. The significance groundwater recharge response can be found in 61% and 37% of the observation wells during the wet and dry seasons, respectively. Compared with the factors such as cumulative rainfall, and depth to groundwater table, the ratio of surface impervious pavement is the primary affecting factor behind the correlation between rainfall and groundwater level response. The analysis results also show the areas with shallow groundwater level, high imperious pavement ratio, and the groundwater level with no significant response to rainfall, are almost overlapped with the middle and high level liquefaction potential areas in this city. Measures such as the application of the sponge city concept to increase infiltration should be carefully reevaluated in this city. The research results can provide a reference for the future development of urban water resources management and disaster mitigation strategies under the challenge of globe climate change.