

The underground karst development characteristics and its influence on exploitation of karst groundwater in Guilin urban area Southwest China

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The exploitation and utilization of karst groundwater is an effective way to solve the prominent contradiction between supply and demand of water resources in Guilin City, Southwest China. In this study, we investigated systematically the underground karst developmental characteristics and further explored its influence on the migration and occurrence of karst groundwater in Guilin urban area. The results show that the thick limestone formation of D₃r is the most ideal exploited aquifer due to its highest karst development and the most abundant karst groundwater. The main karst development zone is above 90 m a.s.l., which accounts for 88.5 % karst caves, and 11.5 % karst caves are located in the weak karst developed zone of 40~90 m a.s.l.. The karst is not developed below 40 m a.s.l., thus the borehole depth for groundwater extraction is suggested to be about 100-120 m due to the ground surface elevation of Guilin urban area being 140~160 m asl. The zone above 120 m asl is not the optimal karst groundwater exploitation section because of its the high karst cave filling rate (82.89 %) and the low water-filling cavity ratio (16.95-30.08 %). The karst caves are easy to connect with surface water and more possible to led to collapse when extracting groundwater in the zone. The zone between 120~90 m asl could be more optimal to extract groundwater due to its medium scale of karst caves, relatively low karst cave filling rate (62.07%), and high water-filling cavity rate (30.43%-62.1%) relatively. Meanwhile, the favorable groundwater exploitation and utilization region is located in the eastern study area, which has the highest underground karst development degree with the highest percentage of borehole encountering cavern (80.21%), linear karst rate (8.58%) and the lowest karst cave filling rate (65.61%). This study could provide a scientific basis for the exploitation of karst groundwater and the construction of backup emergency water source in the classic karst urban area.