Regional Study of Groundwater and Bedrock Structures

Digitized bedrock elevation data created from the bedrock geology maps have recently become available in Ohio of the United States. This digitized geographic and geologic information enables the spatial analysis using the geographical information system. This study analyzed the digitized bedrock and groundwater well data, assessed trends in groundwater over time and relationship between bedrock and groundwater mapping the groundwater table fluctuation over time in the region.

Out of the 3,834 groundwater wells studied, 3,676 (95.9%) had their water tables within the drift layer and 158 groundwater wells (4.1%) below or within bedrock structures. Furthermore, out of the 83 classified bedrock structures in the studied region, 21 contain groundwater wells. Of these 21 bedrock structures, nearly 80% of them collect groundwater below bedrock surface. The Mississippian Cuyahoga Group and Pennsylvanian Allegany Pottsville Group contain the majority of the groundwater wells in the studied region. It is found that the groundwater table generally follows the topography of the ground surface and glaciated plateau contains the majority of the bedrock wells studied.

Based on the spatial analysis performed, it showed significant fluctuations of groundwater table over time in the region. Results indicated that the fluctuation effect was more profound on bedrock groundwater wells than their counterparts of non-bedrock wells. Furthermore, the groundwater recharge rate for bedrock layers can be continuous or intermittent depending on the subsurface conditions. These factors may have resulted in the significant depletion of bedrock groundwater from 1971-1980. In general, groundwater existing in the bedrock takes a longer time to recover depletion than its counterpart in the drift soil layers. It is found that the groundwater table dropped over time in the southwest part of the studied region while the northeast area had a sudden drop in the 1980s and an increase in the 1990s.

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