

Groundwater/Surface Water Interaction Induced by the Artificial Stream Weir

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The impermeable artificial weir on the streambed may change the interfacial condition between stream and surrounding aquifer. As a result, the additional interaction between groundwater and stream water can be induced. Enforcing stress on the groundwater flow, this study investigated the interaction between groundwater and stream water systems, which is caused by the artificial weir on streambed. The study area is Nami Natural Recreation Woods located in Chungcheongnam-do Geumsan-gun Nami-myeon Geoncheon-ri. In this study both of hydrophysical method (hydraulic head, measurement of stream discharge) and hydrochemical method (pH, EC, major ion analysis) were applied. In order to understand the relationship between each of study results, cross-correlation analysis is performed and results of geophysical logging and lugeon test at the studied wells were also compared with results from this study. It can be stated from results of hydrophysical method that water level fluctuation at BH-14, installed by the weir horizontal section, showed the higher frequency and increment in double-recession pattern than water level fluctuations at other monitoring wells. Comparing the upstream flow rate with the downstream flow rate, flow rates at downstream were mostly higher than flow rates at upper stream, so the stream across the study area can be concluded as the gaining stream, in which flow rate is increased by the base flow along with the downward distance. It can be extracted, using the results by hydrochemical method as natural tracer that groundwater at BH-14 has similar characteristics of stream water. The cross-correlations between each of the data from hydrophysical method and hydrochemical method were analyzed as the linear time series analysis. From results from the correlation analyses, water levels at BH-14 and stream weir showed the highest cross-correlation in hydrophysical aspects. On the other hand the correlation between stream weir and bridge was the highest in hydrochemical aspects. This is owed that interaction to the physical action such as water level happens with the pressure propagation - not with mass transfer, but the hydrochemical interaction, caused by mass transport, takes much more times. Results from the geophysical logging and lugeon tests can support the referred interpretations. In conclusion impermeable artificial weir on streambed changes the interfacial condition between the stream and surrounding aquifers. The induced water flux into the groundwater system during flood time make water level at BH-14 increase instantly and groundwater quality highly similar to the quality of stream water. Referred similarities in both of water level and water quality at BH-14 become much higher when water level at weir grow higher.