

The impact of clogging layer on groundwater flow pattern beneath streambed by using numerical method

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In Taiwan, steep mountain streams could be cut off during dry seasons, which impacts the rivers' ecosystem. The stream cut-off can be related to the high streambed percolation since the streambed usually consists of coarse sand with high permeability. Studies have shown that the sediment deposited on the streambed forming a thin layer with lower hydraulic conductivity, which is referred to as the "clogging layer". The layer significantly affects the infiltration or percolation rate beneath the stream bed. In this study, we quantified the effects of the clogging layer on the infiltration rate and the groundwater flow pattern beneath the stream bed by numerical simulations and lysimeter experiments. Our simulations showed that a lowering of the groundwater table turned connected surface water-groundwater into disconnected when the streambed covered by a clogging layer. Once the surface water and groundwater was disconnected, an unsaturated zone appeared in the aquifer beneath the streambed, and the infiltration rate reached to the maximum rate. Our simulation also showed that the occurrence of the clogging layer significantly changed the patterns of groundwater flow beneath the stream bed. It can influence substantially on the residence times of groundwater and the transport of nutrients between surface and subsurface water.

Keywords: Clogging layer, Infiltration rate, Groundwater flow