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Groundwater Discharge to River and Related Heavy Metal Fluxes in a Mountain Mining Area of Dabaoshan, Southern China

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Groundwater inflow to river and the related heavy metal fluxes were estimated in a mountain mining area named Dabaoshan, Southern China. Mining activities had been conducted over 40 years there. Shallow aquifers were seriously contaminated by toxic heavy metals in this area as a result of the discharge of acid mine drainage. Contaminated aquifers are long-term pollution sources to the rivers, even after the mining activities were stopped. The natural tracer ^{222}Rn was used for the estimation of groundwater inflow to Hengshi River in the study area. Two rounds of field works were carried out in both wet and dry seasons from 2016 to 2017. Total groundwater inflow was estimated to be 21.5×10^3 m^3 day^{-1} in wet season and 1.9×10^3 m^3 day^{-1} in dry season, respectively. Comparing with other areas, although groundwater inflow rate in Dabaoshan is much lower, the magnitudes of groundwater-driven inputs of heavy metals are much higher or at least quite similar, especially for Cu, Zn and Mn fluxes. This study suggests that fluxes of heavy metals via groundwater discharge processes are remarkable pollution sources to rivers in the mountain mining area. Meanwhile, even for a gaining river in mountain area, aquifers can still be influenced by the polluted river water. The results also demonstrated that concentrations of Cd, Co, Cu, Ni, Mn, Fe, Zn and Tl in groundwater increased where river water recharges to the surrounding aquifer.