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Small-scale rainfall–runoff experiments and numerical simulation in a typical small karst basin of Houzhai, Guizhou Province, China

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Abstract Although the runoff plot experiment is one of the important ways to research the rainfall–runoff process under different conditions, few runoff plots have been built in karst basins due to the complex hydrogeological conditions of karst aquifers. According to the characteristics of large surface leakage coefficient and lack of surface runoff in the typical small karst basin of Houzhai, China, field rainfall–runoff experiments were done in three locations from upstream to downstream with different landforms, soil conditions, and rock fracture development degree in both bare and covered carbonate rock area in Guizhou Province, southwestern China. The runoff components proportion was analysed based on the preliminary law of rainfall–runoff process gained from the observation data. Moreover, a numerical model to simulate soil water motion under experimental conditions was established using HYDRUS-1D. The simulated proportion of runoff components is basically consistent with the field-measured results and the relative error is less than 3.5%.

Key words Houzhai karst basin; bare area; covered area; rainfall–runoff experiments; HYDRUS-1D; numerical simulation