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Study on The Spatial Variability of Soil Hydraulic Conductivities in Heterogenic Karst Slopes

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The understanding of the spatial variability of soil hydraulic property is crucial to the study of several hydrological and ecological processes in karst environments. Karst environments are extremely fragile because of thin soil, small soil water holding capacity and quite high soil distribution heterogeneity. A marked intensification of agricultural land use and deforestation due to increase of population and thus expansion of agricultural areas has made the karst environment even more delicate. In this study, soil properties and soil hydraulic conductivities (K) along six land use types karst slopes were measured, each of which has a different karst microhabitats including the Soil Surface (thick soil layer), Rock-Soil (thin soil layer contacting rock surface) and Karren Soil (soil filled in rock crevices or fractures). The statistical results from the measurements show that: 1. The soil hydraulic conductivities in forest area were quite high compared to non-karst areas because of the thin soil and cracks and fractures well development in carbonate rocks. 2. Land use changes strongly affect the soil properties and soil hydraulic conductivities (K) in these karst microhabitats. Compared with undisturbed forest karst slopes, the K values are 54.5% and 61.8% smaller in the fire or cut and the pasture human disturbed areas, respectively. Human activities significantly change soil properties and decrease permeability of soils when the forest was destroyed. Measured K values were 0.3∼1cm/min and 0.2∼0.3 cm/min for the forest soils and the human disturbed areas, respectively. However, these decreasing trends of the K values in the three types of karst microhabitats were different. The K values were decreased significantly in the Soil Surface and Rock-Soil microhabitats, compared to that of Karren Soil microhabitats when the land use change from forest to cutting or pasture area. The K values decreased 71.9% and 79.6% in Soil Surface and Rock-Soil microhabitats, and it were reduced by 36.5% in Karren Soil. It means that soil in rock crevices or fractures microhabitats in karst slopes were less influenced by the land use changes. These results offer useful information to further investigate the response of ecosystem evolution to hydrodynamic processes in highly heterogeneity karst slopes.