

Soil movements and erosion rates on karst critical zone Southwest China

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The karst region of Southwest China is one of the largest karst areas in the world. Karst Critical Zone has a ground and underground dual-hydrogeological structure, which impact special rainfall - runoff process and soil erosion process and paths. Surface runoff and soil loss on the karst hill slopes were very small, the highest annual surface runoff coefficients at limestone slopes were less than 5%, and annual soil loss was less than 50 Mg km⁻². Most rainfall water was infiltrated into underground through limestone fissures and fractures, while little was in the form of surface runoff. The ¹³⁷Cs technique was used to date the sediment deposits in six karst depressions, to estimate average surface erosion rates on slopes from their catchments. The estimates of soil loss rates obtained from this study evidenced considerable variability. A value of 1.0 t km⁻² year⁻¹ was obtained for a catchment under original dense karst forest, but the erosion rates ranged between 19.3 t km⁻² year⁻¹ and 48.7 t km⁻² year⁻¹ in four catchments under secondary forest or grasses, where the original forest cover had been removed in the Ming and Qing dynasties, several hundred years ago. The highest rate of 1643 t km⁻² year⁻¹ was obtained for a catchment underlain by clayey carbonate rocks, where the soil cover was thicker and more extensive than in the other catchments and extensive land reclamation for cultivation. Compared to the non - karst areas, the paths of soil loss in karst area are very complicated, including the surface erosion, bank erosion and underground soil loss (mainly through fissures and fractures of rocks). Sediment source of karst catchment is composed by the surface erosion (from karst slope), bank erosion (from channel banks) and soil underground loss (from the carbonate rock fissures or factures). when catchment less than 0.5 km², slope soil loss slight, sediment source mainly came from bank erosion and soil underground loss; as the catchment area increase, the proportion of bank erosion and soil underground loss increased.