



Why do karst catchments exhibit higher sensitivity to climate change? Evidence from a modified Budyko model

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Karst landscape, covers more than 10% of the global land surface and plays an important role in supporting ecosystems and human society, may be strongly influenced by climate change. Vegetation available water (VAW) is a key variable impacting the sensitivity of ecosystems to a changing environment. However, VAW in karst region is difficult to determine and remains uncertain. This study improved a dynamic Budyko-type water balance model, by introducing a nonlinear equation linking climate, vegetation and Budyko-type water balance. This model was calibrated using evolutionary algorithm based on monthly runoff. Comparison results in the Pearl, Yangtze and 12 karst catchments in south China, suggested high effectiveness of this improved model in simulating monthly runoff and evapotranspiration. Furthermore, in the 12 karst catchments, the max VAW was negatively correlated to the portion of karst landscape of the catchment (POK, $r=-0.63, \alpha=0.027$) and the elasticity of evapotranspiration to precipitation ($r=-0.60, \alpha=0.04$). These implied that karst catchments with higher POK had lower VAW, making the ecosystems rely more on precipitation.