



## **Rock outcrops shape soil surface water distribution at Karst- implication for plants and subterranean geography**

You xin Shen (1), Yang Yu (2), and Zhijie Shan (2)

(1) Key Laboratory of Tropical Forest Ecology, Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences, Menglun, Yunnan 666303, P.R. China; 2: Restoration Ecology Group, Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences, Kunming, (2) Department of Sediment Research, China Institute of Water Resources and Hydropower Research.

Rocky outcrops (ROCs) are frequently visible in terrestrial ecosystems, typically in karst landscapes. However, the detailed water redistribution and its hydrological effects have not been clearly evaluated. Instruments were developed and installed to collect and quantify water received by and subsequently funneled off by ROCs in three karst slopes with: 1) secondary forest; 2) anthropogenic forest; and 3) desertified ecosystem without tall trees in Shilin, Southwest China. The results indicate that outcrops delivered nearly half of the annual water received to nearby soil patches by means of runoff. The ratio of water received and exported to the soil by outcrops varies across different ecosystems and different seasons. On average, 5.18 [U+F0B1] 0.96 g m<sup>-2</sup> organic carbon, 1.69 [U+F0B1] 0.12 g m<sup>-2</sup> N, 0.08 [U+F0B1] 0.01 g m<sup>-2</sup> P, and 1.80 [U+F0B1] 0.34 g m<sup>-2</sup> K was received from water input by rock outcrops, and 3.39 [U+F0B1] 0.36 g m<sup>-2</sup> organic carbon, 0.64 [U+F0B1] 0.13 g m<sup>-2</sup> N, 0.12 [U+F0B1] 0.09 g m<sup>-2</sup> P, and 1.01 [U+F0B1] 0.27 g m<sup>-2</sup> K were exported to nearby soil patches via runoff over the year. Giving the high volumetric ratio of rock heterogeneity at the three ecosystem (of the 0-20 cm depth surface layer of the 2 m x 2 m samples ranged from 7.1% to 79.4%), the new external annual receiving rate on soil patches within a 2 m [U+2179] 2 m sample of the three ecosystems under the highest rock ratio (r=79.4%) was 1.43-5.44 folds of supply of water, TOC, N, P and K of the patches without rock emergence, respectively. This larger difference of water supply, as well as the side effects on nutrients contained in the water will bring huge effect on soil water, runoff at surface and underground, and bring huge effect on the dissolution difference at subterranean karst.