



## **Gully erosion processes impacted by vegetation on gully beds based on an in situ scouring experiment in a Dry-hot Valley of Southwest China**

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Vegetation can protect soil from water erosion. Some previous researches on the subjects of vegetation and gully erosion were mainly focused on the topography changes cause by vegetation and the conservation effects and techniques. While the mechanics of vegetation effects on the hydraulic processes of gully bed to influence the erosion processes were still not very clear.

In this study, an in situ scouring experiment was conducted 11 times assuming a consistent flow condition (7 times with a flow discharge of 83.3L/min and 4 times with a flow discharge of 166.7 L/min on five gully head plots with gully bed lengths of 20 m, which were constructed with similar initial topography (height of the headcuts were 0.5m, the slope of gully beds were from 18.2% to 19.1%) and same soil type (Dry red soil which classified as Rhodoxeralfs in USDA Soil Taxonomy ). Five vegetation condition levels were set on gully bed (the same vegetation density and different lengths of the vegetation sites as 0 m, 4m, 8m, 12m and 16m). Each scouring last 1h and the flow rate, flow depth and flow width were recorded every 10 minutes, after each scouring the topography changes were measured by RTK GPS.

The total gully bed erosion volume (TEV) exhibited a significant exponentially decreasing relationship with increasing length of the vegetation sites (VL) due to the similar relationship between the VL and the runoff erosion capacity. The hydrodynamic parameters in the vegetation sites were clearly lower than those in bare sites and caused the average TEV of the vegetation sites to be approximately 3.3 times lower than that of the bare gully bed. However, the vegetation protection efficiency did not increase as the length of the vegetation sites increased. The hydrodynamics of the bare site sections showed a good relationship with TEV, while in the vegetation sites, the relationship was quite weak, indicating that hydraulics conditions were not the main factors influencing gully bed erosion in the vegetation sites in this study.