



Overland flow velocities on semiarid hillslopes

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A series of 188 rainfall plot simulations was conducted on grass, shrub, oak savanna, and juniper sites in Arizona and Nevada. A total of 897 flow velocity measurements was obtained on 3.6% to 39.6% slopes with values ranging from 0.007 m/s to 0.115 m/s. The experimental data showed that flow velocity on inter-rill areas of rangelands was related to discharge and ground litter cover and was independent of slope gradient or soil characteristics. A power model was proposed to express this relationship. These findings support the slope-velocity equilibrium hypothesis. Namely, eroding soil surfaces evolve such that steeper areas develop greater hydraulic roughness. As a result overland flow velocity becomes independent of the slope gradient over time. Our findings have implications for soil erosion modeling suggesting that hydraulic friction is a dynamic, slope and discharge dependent property.