



Estimating badland denudation with pin measurements and high resolution Digital Elevation Models derived from UAV image analysis

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The denudation of soil or soft rock surfaces by non-concentrated flow is mostly estimated by relating the sediment discharge observed at the outlet of a plot or natural micro-catchment to their respective surface areas. This approach generates an average denudation rate, but ignores spatial patterns of erosion and deposition. A well established approach to capture such spatial differences are pins, which deliver a highly precise point measurement of surface elevation change. Advances in the development of Unmanned Aerial Vehicles (UAVs) and image processing in the past decades offer an additional tool for mapping erosion and deposition at millimetre scale for continuous surfaces. In this study, pin and UAV-derived erosion data for a badland area in the Karoo rangelands, South Africa, are compared. The results show that typical annual erosion rates in the study area are lower than the differences between two DEMs generated a year apart. This illustrates that in situations where erosion rates are low, pins still offer the faster and more reliable results. For their extrapolation, on the other hand, UAV-derived DEMs provide suitable topographic data.