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Surveying accuracy of badland surface morphology in Central Spanish Pyrenees using a high resolution terrestrial LIDAR scanner

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Terrestrial LIDAR scanning (TLS) serves as a monitoring tool to observe changes in surface morphology for areas covering $>10^3$ m^2 with a resolution for single scans of up to 5 mm. Traditional measurement methods like erosion pins and Sedimentation Erosion Tables (SET) can be used to document ground level changes on plot scale but face the drawback of a point measurement and intervening into the area of interest. In contrast, TLS provide a non-invasive three-dimensional surface observation, wherefore reference objects are arranged along the boundaries of scanning sections. Data collected with TLS can be used for both calculation of volumetric changes as well as documentation of surface conditions (e.g. rill structure, surface roughness). Therefore they provide an ideal tool to estimate sediment erosion rates of badlands, e.g. caused by rainfall and water flows.

But to what extend does data processing affect the quality of the raw dataset? The calculation of erosion rates by volumetric changes of intermittent measurements is a result of a workflow consisting of a series of single steps that modifies the original pointcloud. We therefore studied on the one hand the impact of accuracy of the realization of the reference network as part of the fieldwork and on the other hand the effects of data processing.

Our study area is the Isábena catchment (445 km^2) located in the Central Spanish Pyrenees. The catchment includes a large system of badlands being one of the major sediment sources. So far we conducted several investigations of an experimental setup as well as one survey within the study area in October 2010 using a Riegl VZ-400 observing the surface conditions of a badland (19000 m^2) which serves as one of the major sediment source areas within the Isábena catchment.

In order to estimate the accuracy for future TLS derived volumetric changes within the badland system, we present the results of our data processing uncertainty studies.