



Analyzing initial geomorphologic processes and structures: An alternative remote sensing approach

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The initial phase of the ecosystem development is usually characterized by overall imbalances and, thus, a huge dynamic of the ongoing processes. Especially the formation of surface structures due to erosion and sedimentation processes alters both the morphology and behaviour of the system. However, the quantification of these processes is not trivial. Some methods like classical terrestrial erosion measurement techniques might have undesirable effects on the ecosystem itself. Others, like laser scanning techniques do not influence the system but are very cost-intensive. An alternative method might be the photogrammetric analysis of aerial photographs. This technique allows for the calculation of precise digital elevation models not only with a high spatial but also temporal resolution. The amount of erosion and sedimentation processes can be quantified if digital elevation models calculated for different moments are compared.

A pilot study for an innovative and cost efficient approach was carried out to study the evolution of small-scaled landforms with special emphasis on erosion gullies. The test site for this technique was an approximately 1 ha sub-site of an artificial catchment which represents the initial stage of an establishing ecosystem with still ongoing erosive landform evolution processes. Due to the fact that the investigated catchment has been left to an unrestricted succession, disturbances by scientific measurements have to be minimized. Therefore, the comparatively cost efficient remote sensing tool was tested to overcome this methodological problem. The study was conducted in summer 2009, four years after final levelling of the catchments' surface.

Aerial photographs were taken by a commercial digital camera using an innovative microdrone-based tool. The pictures were analysed using a commercial remote sensing software for digital photogrammetry to calculate digital elevation models of the site. The results of this pilot study are promising. Compared with other terrestrial investigation methods for gully erosion the recording of soil erosion phenomena by remote sensing techniques or analytical digital photogrammetry seems to be an advantageous alternative. The availability of the microdrone allows an easy and continuous access to aerial photographs. Experiences and results of the application of a microdrone combined with a digital camera are presented here.