



Hydrological connectivity, vegetation and erosion in a semi-arid Sahelian landscape

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This study discusses the role of hydrological connectivity and erosion response for a semi-arid catchment in Burkina Faso in relation to vegetation patterns. The study is carried out in the Sanmatenga province along a typical landscape gradient from typical laterite inselbergs with semi-natural shrub vegetation to an ephemeral river floodplain. The landscape was subdivided into hydrological response units, and for each of these units vegetation cover and pattern, land use, soil structural stability and organic carbon, crusting and infiltration rates were determined both for bare and vegetated surfaces within the individual response units. Furthermore hydrological and erosion connectivity for the response units was determined using landscape metrics, derived from processed high resolution aerial photographs.

It was found that there is a clear distinction between infiltration and soil structural stability between bare crusted, vegetated and or agricultural fields, and consequently a prominent difference in the heterogeneity of infiltration pattern for each of the response units. Furthermore landscape metrics, derived from vegetation patterns, in combination with general slope direction showed that hydrological connectivity was largest directly at the footslopes and smallest in the agricultural fields where soil and water conservation measures are present.

These results indicate that erosion and sediment delivery and transport is disconnected or connected depending on the vegetation pattern derived connectivity, intensity of rainfall and the position of response units in the landscape. Lower rainfall intensities don't show hillslope runoff and erosion on the steeper inselberg hillslopes, whereas the footslopes then generate runoff and erosion. Runoff and erosion occur in all response units once the threshold for runoff generation is surpassed on the inselberg, delivering also coarse grained material from the inselberg to the footslopes. More downslope water and sediments are (partly) being captured in the agricultural areas by stone lines and grass hedges (haies vives) where it is (partly) used for agricultural practices. From the results it can be concluded that runoff and erosion processes and patterns have clear scale dependent thresholds related to vegetation, land use, soil and water conservation measures as well as to rainfall magnitude and duration.