Estimating vegetation parameter for soil erosion assessment in an alpine region by means of QuickBird imagery

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Soil erosion rates in alpine regions are related to high spatial variability complicating assessment of risk and damages. A crucial parameter triggering soil erosion that can be derived from satellite imagery is fractional vegetation cover (FVC). The objective of this study is to assess the applicability of normalized differenced vegetation index (NDVI), linear spectral unmixing (LSU) and mixture tuned matched filtering (MTMF) in estimating abundance of vegetation cover in alpine terrain. To account for the small scale heterogeneity of the alpine landscape we used high resolved multispectral QuickBird imagery (pixel resolution = 2.4 m) of a site in the Urseren Valley, Central Swiss Alps (67 km(2)). A supervised land-cover classification was applied (total accuracy 93.3%) prior to the analysis in order to stratify the image. The regression between ground truth FVC assessment and NDVI as well as MTMF-derived vegetation abundance was significant (r(2) = 0.64, r(2) = 0.71, respectively). Best results were achieved for LSU (r(2) = 0.85). For both spectral unmixing approaches failed to estimate bare soil abundance (r(2) = 0.39 for LSU, r(2) = 0.28 for MTMF) due to the high spectral variability of bare soil at the study site and the low spectral resolution of the QuickBird imagery. The LSU-derived FVC map successfully identified erosion features (e.g. landslides) and areas prone to soil erosion. FVC represents an important but often neglected parameter for soil erosion risk assessment in alpine grasslands.

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