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Geomorphological mapping in arid regions supported by the analysis of shrub patterns

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Arid and semi-arid areas are often covered by sparse and patchy vegetation with spatial patterns being related to water scarcity. The patterns are governed to a high degree by topography and substrate that in turn reflect prevalent geomorphological and hydrological processes. We hypothesize that this relation can be utilized to support geomorphological mapping in dryland areas.
The aim of this study is to develop an approach towards automated geomorphological mapping in drylands at the hillslope scale. Geomorphological mapping was carried out at the experimental catchment site nearby Sede Boqer, Israel, along two hillslope transects. Twenty rectangular plots were surveyed to determine the percent vegetation cover. A ground based hyperspectral camera was used to image the transects with a spatial resolution of 0.05 cm. Plant canopy was obtained using a supervised classification. In addition, an aerial photo with a spatial resolution of 0.5 m was utilize to map plants at a larger spatial extent.
Both datasets were used to calculate spatial pattern indices such as vegetation density, lacunarity, bare area fragmentation index and patch upslope side length/area ratio. All indices were investigated regarding their scale invariance with respect to the differently resolved datasets. Indices with a high degree of explanatory power and scale invariance were then used as variables in a decision tree model for automated geomorphological mapping.
Preliminary results indicate that the spatial pattern indices can be used as an identification tool of geomorphological units and ecohydrological environments. The result suggests that geomorphological mapping in arid and semi-arid areas can be supported by vegetation detection using remote sensing and digital image processing.