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Analysis of vegetation distribution in relation to surface morphology

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The scaling relationship between curvature, and local slope of a given point on the landscape and its drainage area reveal information about the dominant erosion processes over geomorphic time scales. Vegetation is known to influence erosion rates and landslide initiation, and also it is influenced by such processes and climatic regimes. Understanding the influence of vegetation dynamics on landscape organization is a fundamental challenge in the Earth Science field. In this study we considered two headwater catchments with vegetation mostly characterized by grass species (high altitude grassland), but also shrubs (mainly *Alnus viridis*), and high forest (mainly *Picea abies*) are common. We analyzed then the statistics related to vegetation distribution and different morphological patterns. High resolution LiDAR data served as the basis upon which derive Digital Terrain Models (DTMs) and mathematical attributes of landscape morphology including slope gradient, drainage area, aspect, surface curvature, topographic wetness index, slope – area and curvature – area loglog diagrams. The results reveal distinct differences in the curvature-area and slope-area relationships of each vegetation type. For a given drainage area, mean landscape slope is generally found to increase with woody vegetation. Profound landsliding signature is detected in areas interested by *Alnus viridis* distribution, thus underlining the relation between such pioneer species with slope instability. This preliminary analysis suggested that, when high resolution topography is available, is possible to better characterize the vegetation distribution based on surface morphology thus providing a useful tool for better understanding the processes and the role of vegetation in the landscape evolution.