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Soil-vegetation interaction on slopes with shrub encroachment in the central Alps - simple measurements for complex slopes?

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In the European Alps many high mountain grasslands which where traditionally used for summer pasturing and haying have been abandoned during the last decades. Abandonment of mown or grazed grasslands causes a shift in vegetation composition, e.g. a change in landscape ecology and geomorphology. From a short term perspective, alpine areas are very fragile ecosystems and are highly sensitive to changing environmental conditions. Land use change can affect runoff and water erosion rates, snow gliding and avalanches as well as mass wasting in high-energy mountain environments. The effect of land use intensification on surface processes is well documented. However, the effect of land abandonment on surface resistance to eroding processes is discussed controversially in literature, particularly in relation to its short term and long-term consequences. Generally, perennial vegetation is considered to improve the mechanical anchoring of loose surface material and the regulation of the soil water budget including the control over the generation of runoff. This study aimed at determining the effect of green alder encroachment in the Unteralpvalley in the Swiss Alps. A range of measurements of the mechanical strength of the soil under green alder stands ranging from 15 to 90 years of age and a control site still used for grazing were conducted. Unlike the literature on the effects of perennial vegetation suggest, the data presented in this study show that soil shear strength is decreasing with along the sampled chronosequence, including compared to the grazed reference site. A possible explanation for this decline in soil stability with shrub encroachment is the loosing effect of the green alder roots on the soil structure, which causes an increase in porosity and thus less friction between soil particles. As a consequence, rates of water erosion may decline with shrub encroachment, but frequency of creeping and sliding may increase.