



## **Effects of subalpine grassland management on hydrology and vegetation productivity**

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Grassland and pastures are very typical land uses in subalpine and alpine environments. Grass is typically subjected to management practices that can change the biophysical structure of the plant canopy through defoliation and alter soil hydraulic properties. These changes are expected to impact hydrological and energy fluxes as well as vegetation primary productivity. In this study a mechanistic model is used to investigate the effects of management practices (grass cut, grazing, and the consequent soil compaction due to treading by animals) on water and carbon dynamics. The model is first confirmed using energy, water, and carbon fluxes measured at three eddy covariance stations above grasslands in Switzerland and discharge measured in a small experimental catchment. Successively, a series of virtual experiments are conceived to elucidate the impacts of management scenarios at the plot and catchment scales.

Numerical results show that only the most severe management actions such as low grass cuts or heavy grazing intensities are able to influence the long-term hydrological behavior. Moderate grassland management practices are unlikely to be effective in modifying the system both at the local and catchment scale. An important exception is represented by the short-term effect of soil compaction that can reduce infiltration capacity leading to peak flow considerably higher than in undisturbed conditions. The productivity of vegetation in absence of nutrient limitation is affected by the different management scenarios with tolerable disturbances that lead to higher aboveground net primary production. Such a result can have important consequences in terms of grassland management planning.