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Impact of land use changes on soil hydrology in the Ursern Valley, Switzerland

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The Swiss Alps are intensively exploited. Species-rich plant communities and landscape diversity will decline with current trends in land use. The main changes in the plant cover have been the expansion of wild plants (e.g., green alder) covering the already restricted grassland plots. The main aim of this study is to assess the effects of these changes on the hydrodynamic aspects of the flow process. For this purpose, irrigation experiments were carried out on grassland and green alder soils of different field slopes. Surface runoff (SR) as well as the soil moisture at two different depths were measured during the irrigation. Results from the irrigation experiments were such that they left open if slope is a determining factor or not due to the difference in initial soil conditions during the irrigation experiments. To clarify this, we reproduced SR values using the dual-porosity MACRO model setting similar initial soil and irrigation conditions. The results of the modelling showed the high dependence of the SR on the field slope and the vegetation types. While infiltration excess overland flow dominates in grassland, green alder soil enhances the infiltrability and consequently prevents or at least reduces SR compared to grassland. We plan to extend these experiments to other areas and to investigate the long term measurements of SR under natural precipitations for grassland and green alder.